



GS Series

GSTC/GSP Indoor

GSTC Outdoor

Engineering Manual

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RECORD OF REVISIONS

For each revision, put the revised pages in your manual and discard the superseded pages. Write the revision number and revision date, date put in manual, and the incorporator's initials in the applicable columns on the Record of Revisions.

Revision Number	Revision Date	Date Put In Manual	By	Revision Number	Revision Date	Date Put In Manual	By

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10-00

PRINCIPLE OF OPERATION

1. PRINCIPLE OF OPERATION

A. Combustion System

- (1) The combustion system is based on a fully modulating forced draft combustion air blower, a negative pressure regulated gas valve, and a 100% premix burner. On a call for humidity, the combustion air blower starts and creates a negative pressure across an orifice located at the air inlet.
- (2) The blower is energized to purge the system, then the hot surface igniter is activated. During this time the electronic ignition module does a diagnostic check of safety systems including the air-proving switch, which senses the negative pressure at the air inlet orifice. After the function of the safety systems has been verified, the gas valve will open and the gas/air mixture is ignited by the hot surface igniter.
- (3) If a flame is sensed by the flame sensor, the gas valve remains open and combustion continues. If a flame is not sensed, the above sequence is repeated to a maximum of three times after which the ignition module will lock out. The gas valve maintains a constant ratio air to gas independent of blower speed or external conditions. This air and fuel is thoroughly mixed in the blower and then forced through the burner ports where ignition occurs.
- (4) Hot products of combustion are forced through a baffle inside the heat exchanger and then vented outside. The heat exchanger has a large flat surface to minimize scale build-up and promote scale shedding to the bottom of the tank. This self-cleaning action helps to maintain the efficiency of the heat exchanger while the smooth surfaces allow for easy cleaning when necessary.
- (5) The GS 100 has a single removable combustion chamber/heat exchanger. The combustion system is duplicated on larger units with multiple chambers inside a common tank.

Table 1. Technical Data

SPECIFICATION	UNIT TYPE					
	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
Rated Capacity: lbs/hr*	25-105	25-210	25-315	25-420	25-525	25-630
Rated Capacity: kg/hr*	11-48	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 (< 10 ppm) and Low (NOx <40 ppm)					
GSTC/GSP Rated Amps	1.1	1.9	2.7	3.5	4.3	5.2
Voltage/Phase	208-240/1 Standard					
GSTC Outdoor Rated Amps	3.2	4.0	6.9	7.7	10.6	11.5
Voltage/Phase	208-240/1 Standard					
GSTC/GSP Rated Amps	2.1	3.7	5.3	6.8	8.4	10
Voltage/Phase	120/1 Standard					
GSTC Outdoor Rated Amps	6.3	7.4	13.7	15.2	21.0	22.6
Voltage/Phase	120/1 Standard					

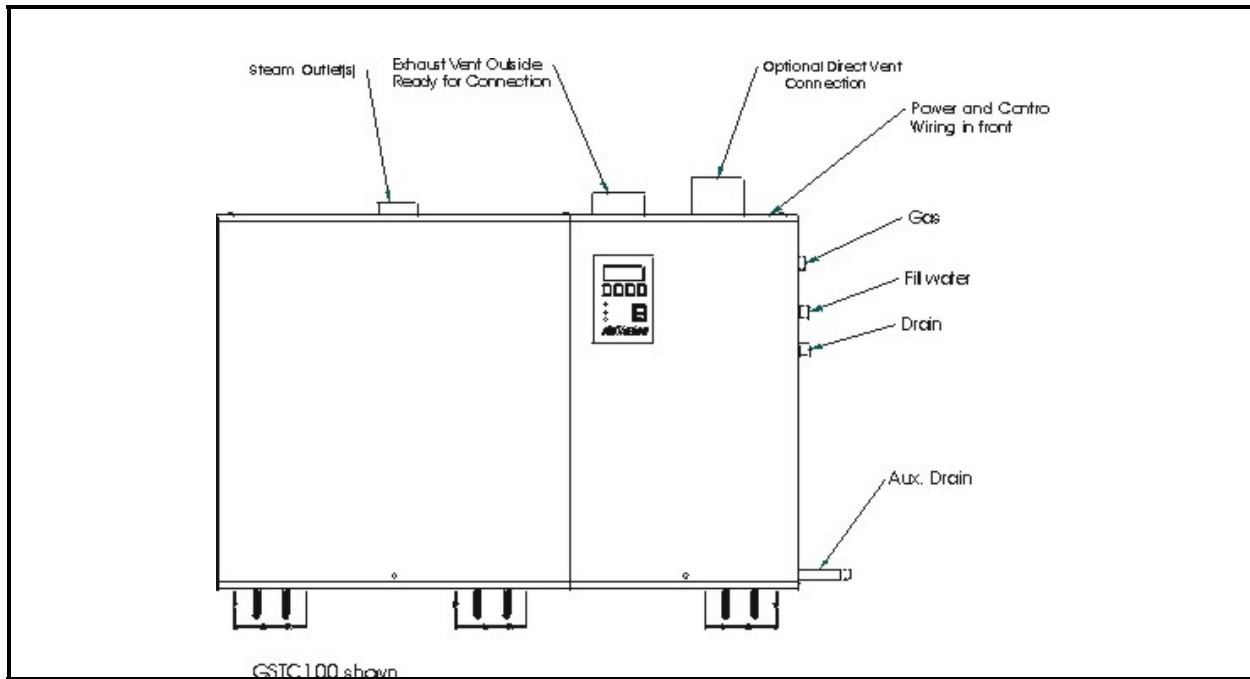


Figure 1. GS Indoor Series

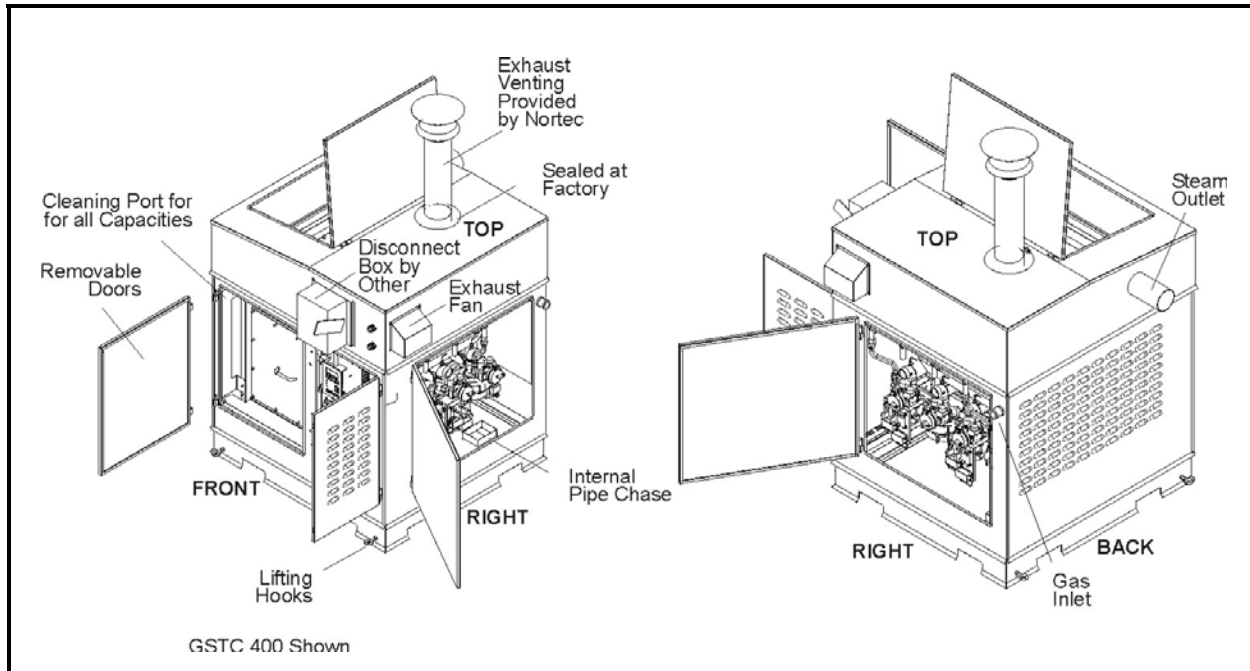


Figure 2. GS Outdoor Series

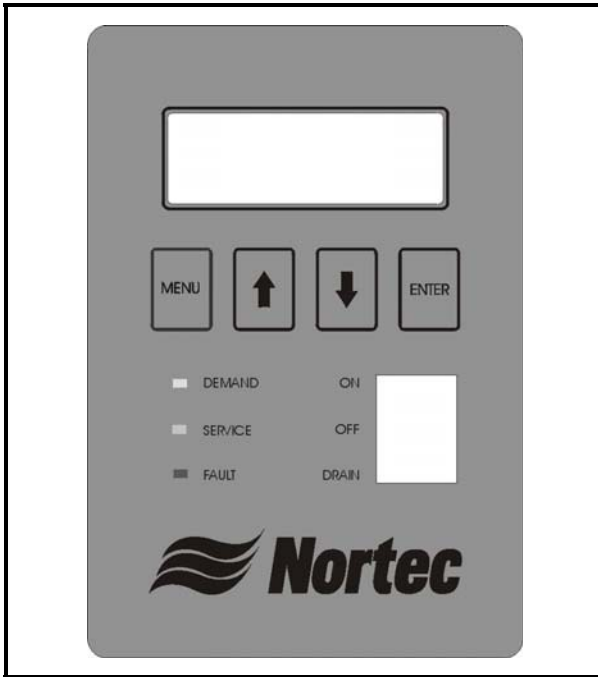


Figure 3. GSTC Key Pad

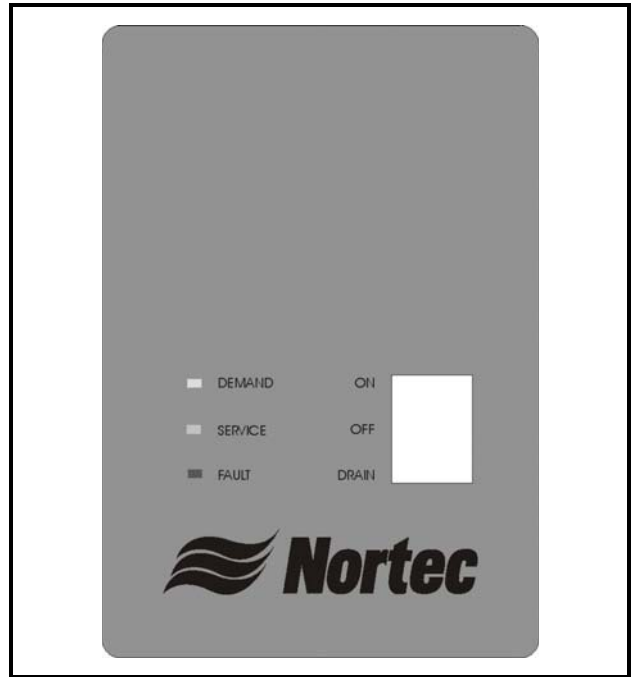


Figure 4. GSP Key Pad

Table 2. Standard Features

Standard Features	GSTC	GSP*
Steam Capacity adjustment	x	
Full size alphanumeric display and keypad	x	
Total Controller with Modbus host protocol	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	
Adjustable drain with no call for humidity	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	
On/off cycling prevention	x	
Full tank blowdown capability via timer or external trigger	x	x
Board mounted display for fault and demand indication	not req.	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
Output display	x	x
Precise five level water level indication	x	x
Status indicator lamps	x	x
Backlit display	x	x
B or BH venting options	x	x
BH stack vent (outdoor only)	x	
Large Side tank cleaning port	x	x
Top access cleaning (300, 400, 500 & 600 lb models)	x	x
Single water connections	x	x
Turn-down ratio from maximum output to 25lbs/hr(11kg/hr)	x	x
Time proportioning below 25lbs/hr(11kg/hr)	x	x
120V or 208-240V power supply	x	x
Freeze Protection (Outdoor only) See Section 10-30, Page 24.	x	
Integral enclosure (outdoor only)	x	
Nortec Links Building Management System capable using BACnet or LonWorks N2 protocols	o	o
Nortec OnLine for web based monitoring and control	o	
Sealed combustion / Direct vent	o	o
Floor stand	o	o
Distribution Systems		
Short Absorption Manifold SAM-e	o	o
Steam Distributor	o	o
Blower Pack	o	o
x = standard o = optional		

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10-10 OPERATION

1. WATER MANAGEMENT – BETTER EFFICIENCY THAN EVER

A. Introduction

- (1) The GS Series of humidifiers is equipped with a unique float chamber water level monitoring device. Two magnetic floats (one is a backup) measure 5 different water levels in the humidifier for proper operation. The float chamber and board are located away from the boiling action to increase reading accuracy and reduce mineral build-up since it is not in the boiling water.
- (2) The float chamber is connected to the tank under the water level and above the water level to ensure equalization of pressure between the tank and float chamber. In addition cooling water is introduced in the float chamber to reduce scale build-up.
- (3) The unit also includes an internal 1" air gap and a vacuum breaker to prevent siphoning effect.
- (4) On initial start-up, the solenoid operated fill valve fills the tank. The water level will reach the backup float first and then the main float. As a safety precaution, if the back-up and main float read a different water level at any time during the operation of the unit, the unit will shut down on a fault.
- (5) On initial start-up, the unit will fill to the top yellow position, and activate an internal test to confirm operation of the drain pump to ensure the drain is not blocked.
- (6) The drain pump is then activated until the water level goes down to the green middle level, and the combustion sequence will start upon a demand for humidity. During the steam production, the unit will also self-check if the floats and drain pump are operational by activating a drain sequence every 24 hours (adjustable to time of day).

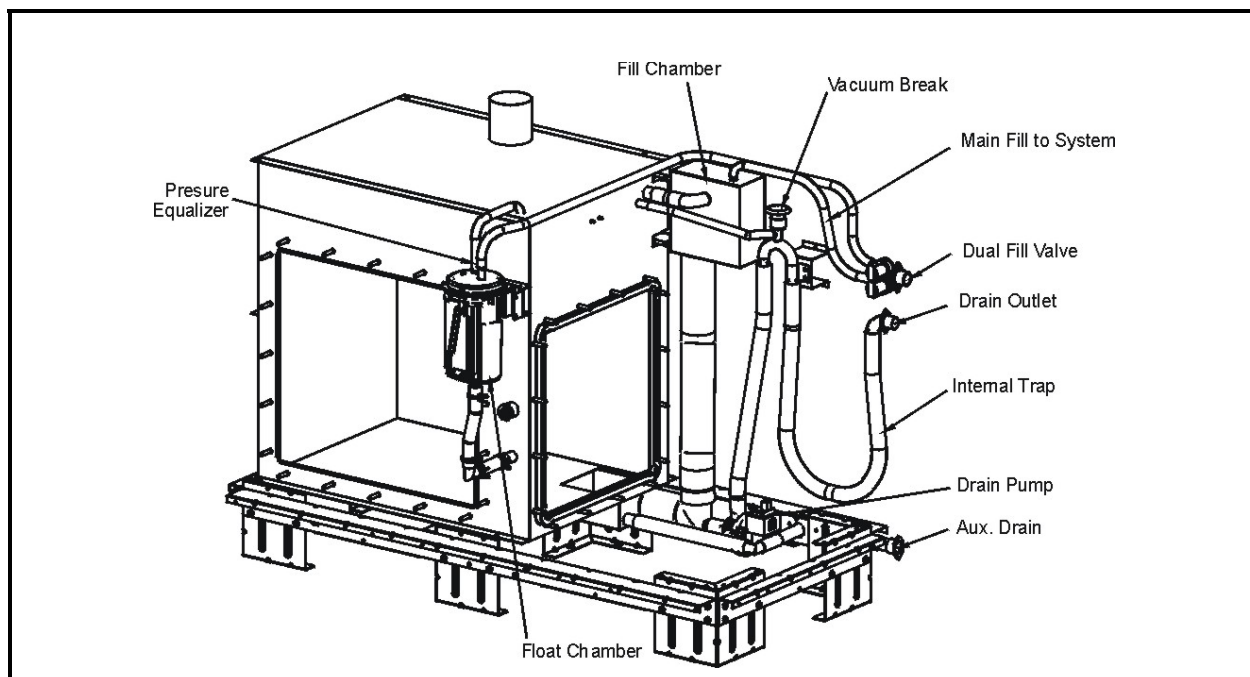
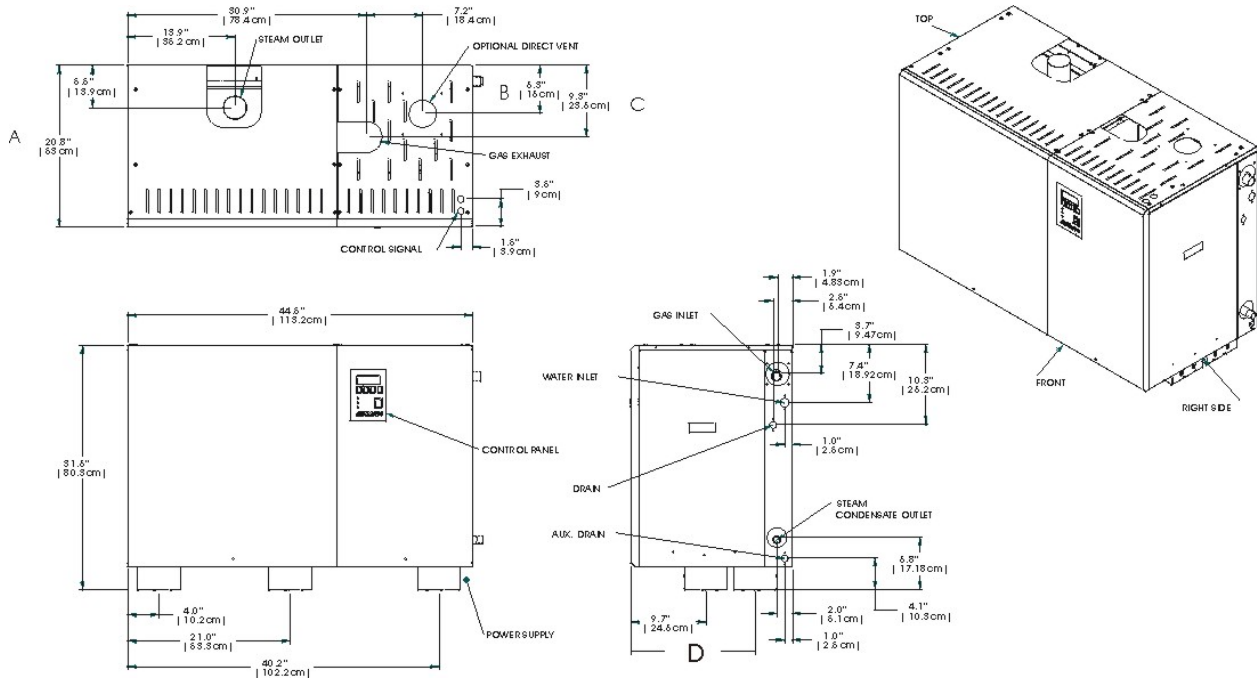
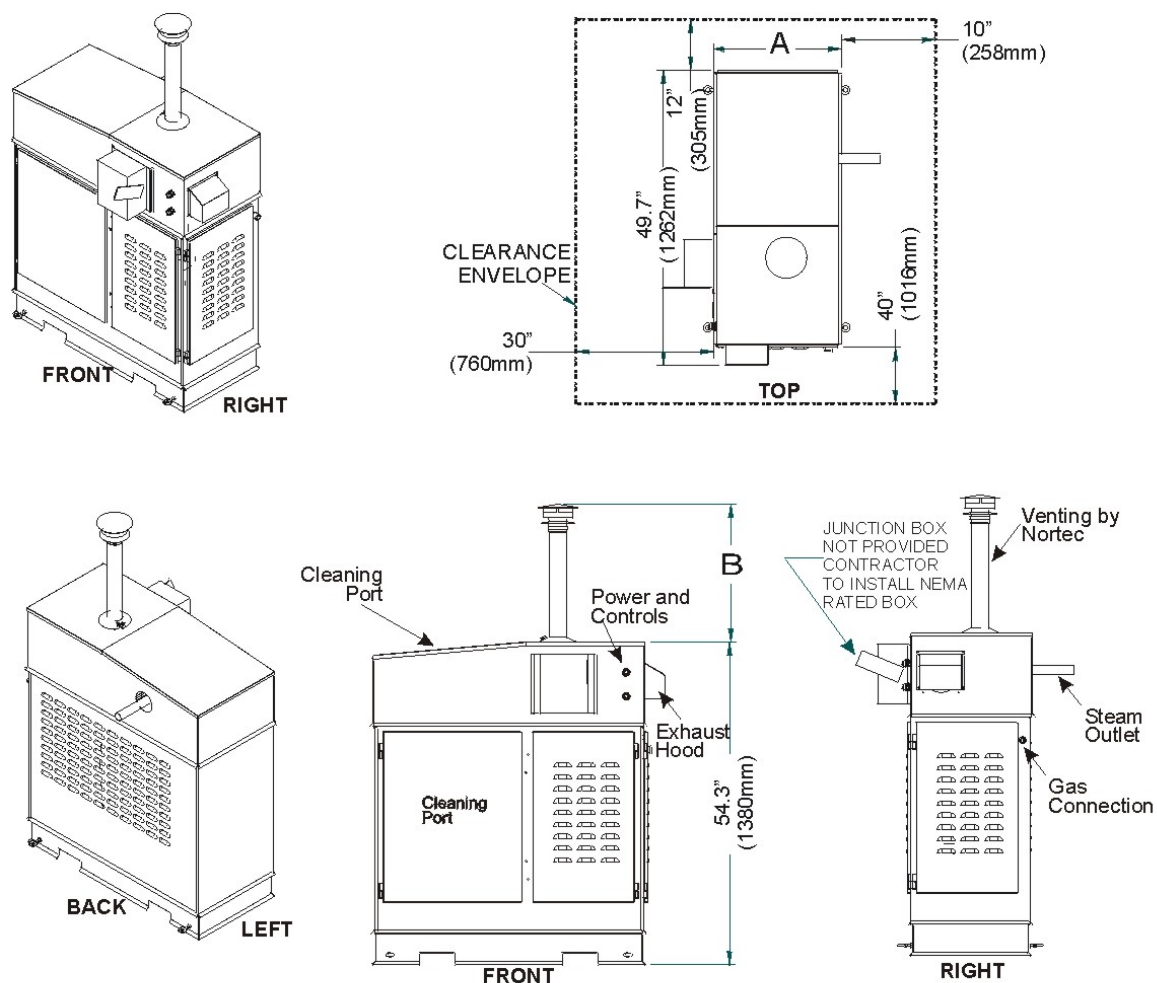


Figure 1. Humidifier Tank



Model	A		B		C		D		Vent Dia B Type		Vent Dia BH Type		Shipped Weight		Operating Weight		Steam Outlet		Gas Supply	
	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm	lbs	kg	lbs	kg	in	cm	in (NPT)	cm (NPT)
GSTC 100	20.8	52.8	6.3	16	9.3	23.6	16.1	40.8	4	10.2	3	7.6	267	121	423	192	1 x 1.75	1 x 4.4	0.5	1.27
GSTC 200	27.2	69	11.6	29.5	14.6	37.1	22.4	56.8	5	12.7	4	10.2	355	161	599	272	1 x 3	1 x 7.6	0.75	1.91
GSTC 300	42.7	109	10.9	27.8	14.6	37.1	38	96.4	7	17.8	5	12.7	485	220	970	440	1 x 3	1 x 7.6	1	2.54
GSTC 400	42.7	109	10.9	27.8	14.6	37.1	38	96.4	7	17.8	5	12.7	529	240	992	450	1 x 4	1 x 10.2	1	2.54
GSTC 500	58.3	148	7.4	18.7	14.4	36.6	53.6	136	8	20.3	6	15.2	659	299	1364	619	1 x 4	1 x 10.2	1.25	3.18
GSTC 600	58.3	148	7.4	18.7	14.4	36.6	53.6	136	8	20.3	6	15.2	703	319	1384	628	1 x 4	1 x 10.2	1.25	3.18

Figure 2. Physical Dimensions – GS Indoor Humidifier



Model	A		B		Shipped Weight		Operating Weight		Steam Outlet		Gas Supply	
	in	cm	in	cm	lbs	kg	lbs	kg	in	cm	in (NPT)	cm (NPT)
GSTC 100 Outdoor	21.5	54.6	23.2	58.9	400	181	556	252	1 x 1.75	1 x 4.4	0.5	1.27
GSTC 200 Outdoor	27.9	70.8	24.3	61.7	500	227	744	338	1 x 3	1 x 7.6	0.75	1.91
GSTC 300 Outdoor	43.5	111	24.9	63.2	700	363	1185	539	1 x 3	1 x 7.6	1	2.54
GSTC 400 Outdoor	43.5	111	24.9	63.2	745	339	1210	550	1 x 4	1 x 10.2	1	2.54
GSTC 500 Outdoor	59.1	150	25.5	64.7	800	363	1505	684	1 x 4	1 x 10.2	1.25	3.18
GSTC 600 Outdoor	59.1	150	25.5	64.7	844	384	1525	693	1 x 4	1 x 10.2	1.25	3.18

Figure 3. Physical Dimensions – GS Outdoor Humidifier

B. Safety Water Level Control Check

- (1) To ensure safe operation, the humidifier constantly monitors the back up float of the humidifier and also performs float checks at regular intervals.

C. Self Diagnostic

- (1) This feature allows the user to activate various hardware elements within the system to prove operational compliance.

D. Energy Efficient Blowdown Sequence – Unique to Nortec

- (1) Fill valve and blow down sequences are based on steam production and not time of operation to increase efficiency of the unit. If the demand signal controls the unit at the minimum output, of 25 lbs/hr, only 25% of 25 lbs/hr will be drained.

E. Internal Drain Water Tempering

- (1) The unique design for the internal Drain Water Cooler from NORTEC will ensure water tempering at all times of the water going to drain. The fresh fill water will completely mix with incoming hot water from the tank during blow down or drain cycles and ensure water does not exit the system at more than 140°F (60°C).
- (2) When the “SMART” feature is enabled on the TC version, the temperature of the tank is monitored and fresh cold water will be used only when drain water is above 140°F (60°C).

F. Capacity Turn Down

- (1) The GS humidifier is capable of full modulation of the output of each burner down to 25 lbs/hr. For example on a four-burner system, such as the GS 400, the turndown ratio is 6% of total output.
- (2) When the control signal requires less than 25 lbs/hr output, the internal controller of the unit takes over with a unique time proportioning algorithm and to control the output and modulate down to 0 lbs/hr.

G. GSTC Unit Networking

- (1) The new TC controller of the GS Series allows staged modulation through networking of up to 10 units when higher capacities of steam require multiple units. The modulating signal will be wired to the master unit and this one will control the output of the other units for seamless modulation from 25 lbs/hr up to 6300 lbs/hr. All units will be configured as master or staged. The operational range of each unit will be set in the internal controller at the factory. A control modulation signal to the master unit and a three-wire connection between each unit being staged is all that is required.

2. CONTROLS

A. Introduction

- (1) The GSTC model features a backlit alphanumeric keypad for user interface, which allows for adjustment of operating parameters and displays system operating status.
- (2) The GSP model uses status indication lights.

- (3) All control electronics are integral to humidifier cabinet and do not require separate cabinet on the humidifier.

B. Remote Fault Indication

- (1) The GS Series provides output signals of the following type:
 - (a) Humidifier "ON"
 - (b) Humidifier "Active"
 - (c) Humidifier "Service"
 - (d) Humidifier "Fault"

C. Modulating Controls

- (1) All models accept a single or dual channel input control signal(s) of the following type(s):
 - (a) 0-20 mA
 - (b) 4-20 mA
 - (c) 0-5 VDC
 - (d) 1-5 VDC
 - (e) 0-10 VDC
 - (f) 2-10 VDC
- (2) The GS Series can accept the following inputs:
 - (a) Two different modulating inputs demand or transducer signal.
 - (b) Full tank blowdown activation (24 VAC).

D. On / Off Controls

- (1) Safety on/off controls are available from NORTEC as safety accessories. These controls are highly recommended by NORTEC for high limit or air proving. If controls were not ordered with the humidifier, they must be supplied by others.

3. ELECTRICAL

- (1) Humidifiers require field wiring to primary voltage terminal blocks. The power requirement is a 120 or 208-240 V single-phase supply. Wiring is fed through a 7/8" hole on lower right hand side of control compartment.
- (2) External wiring sizes must be in accordance with NEC and/or CEC and existing local electrical codes and by-laws.

4. VENTING

- (1) The GS Series of Gas Steam humidifiers offer tremendous venting capability. Whether you use galvanized B venting or special BH venting, the GS Series comes ready for field connection. Please make sure that the correct size of vent is used and follows local codes for proper operation of the unit.
- (2) Humidifiers can be vented up to 100 ft (30 m) equivalent without requiring power assistance. The GS Series can be vented horizontally through the wall or vertically

through the roof without any special requirements when using BH venting. Required vent flue size depends on unit model. All connections to the flue pipes are made without having to open the humidifier cabinetry.

- (3) The GS Outdoor Series comes complete with BH vent, ready for easy assembly.

5. CLEARANCES

- (1) The clearance dimensions shown in Figure 4 and 5 are for reference only and are the minimum requirements for maintenance of the humidifier.
- (2) All units have frontal cleaning port access.
- (3) For GS 100/200, frontal cleaning port access is required only. For GS 300/400, top access is accessible from the front without clearance on the left side. For GS 500/600, left side clearance is required to allow cleaning of the back of the heat exchanger.

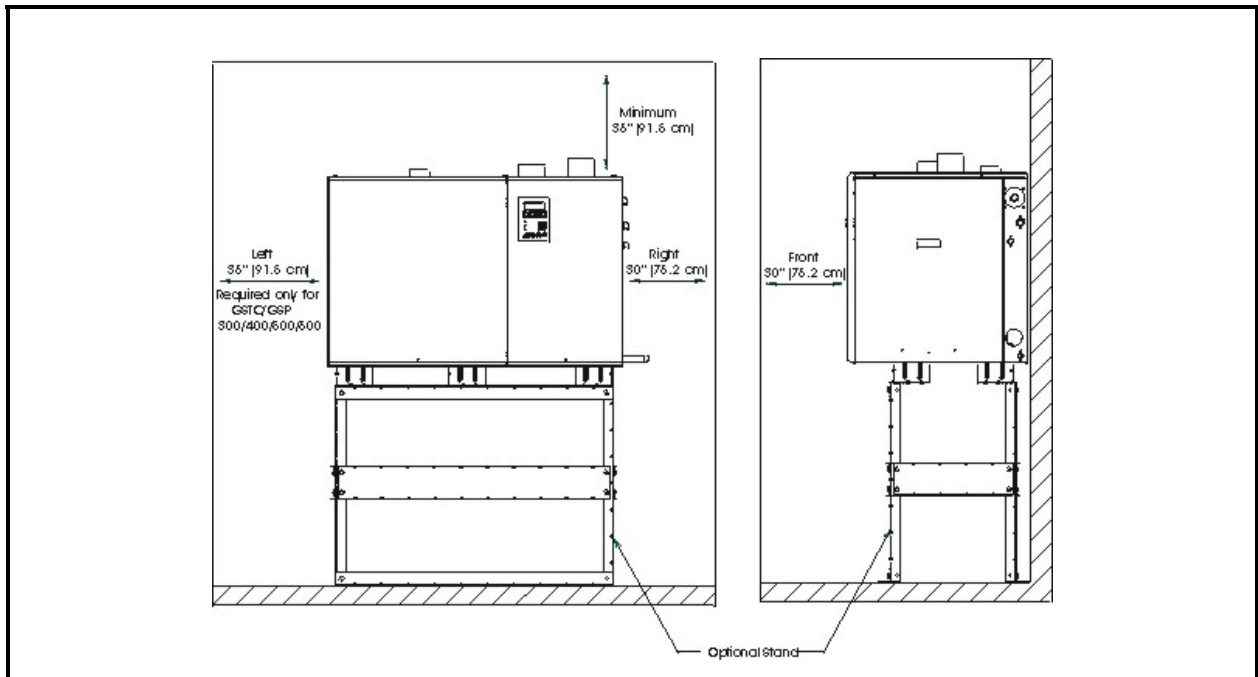


Figure 4. GSTC/GSP Indoor Clearance

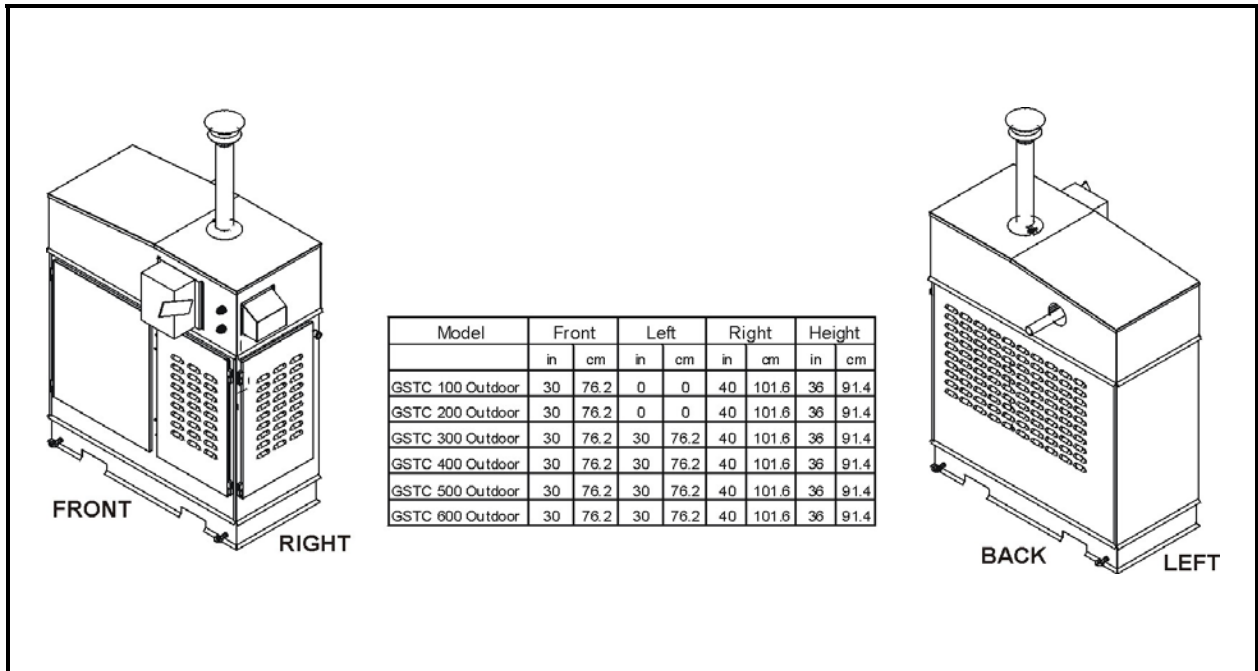


Figure 5. GSTC Outdoor Clearance

6. STEAM INSTALLATION GUIDELINES

- (1) The GS Series humidifier comes with a single steam outlet on all capacities. The GS 100, 200/300, 400/500/600 have respectively (1.75" (4.4 cm) O.D., 3" (7.6 cm) O.D. and 4" (10.16) O.D.). Consult option and accessories section for more details. Refer to the Steam Absorption and Distribution Manual, Form #XX-231 for design of the steam distribution system.

7. CALCULATION OF ANNUAL OPERATING COSTS

A. Natural Gas Humidifier

- (1) Annual operating cost equals: annual hours of operation, times energy cost, times humidifier capacity.
- (a) Example: GS 100
 - (b) Natural gas cost \$4.50 (U.S.) per million BTU
 - (c) \$0.45 (U.S.) per Therm (100,000 BTU) Annual hours of operation = 2000 at full output (Equivalent to comfort humidification in upper mid-west.)
 - (d) Input of humidifier = 140,000 BTU/hr
 - (e) Total energy used = $2000 \times 140,000 = 280,000,000$ BTU
 - (f) Annual Cost = $238 \times 4.50 = \$1260.00$

B. Electric Gas Humidifier

- (1) Annual operating cost equals: annual hours of operation, times energy cost, times humidifier capacity.
- (a) Example: NHMC 100
 - (b) Electricity cost (usage charge) \$0.08 per kw/hr.
 - (c) Annual hours of operation = 2000 at full output (Equivalent to comfort humidification in mid-west.)
 - (d) Input of humidifier = 34 kw
 - (e) Total energy used = $2000 \times 34 = 68,000$ kw/hr
 - (f) Annual Cost = $68,000 \times 0.08 = \$5,440.00$

C. Operating Cost Savings

- (1) Gas vs Electric = more than 4 times the operating cost.

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10-20

MAINTENANCE

1. WATER CONDITIONS VS. HUMIDIFIER CLEANING REQUIREMENTS

- (1) The GS Series humidifiers are to operate on cold potable, De-Ionized (DI) or Reverse-Osmosis (RO) water supply and since the output of all GS Series humidifiers is pure clean steam, minerals from the incoming water are left behind. These minerals will eventually coat the tank walls or settle to the bottom of the tank. The mineral content of the incoming water, the unit running time, output capacity setting and blowdown rate ultimately determine time between each cleaning.
- (2) The Gas Steam humidifier will periodically “blowdown” or skim water from the tank to reduce the concentration of total dissolved solids that accumulate during long-term operation. The Gas Steam humidifiers are shipped from the factory set at 25% of output. This setting ensures that scale build-up will be minimized for most water conditions. The amount of blowdown is field adjustable.
- (3) The unit also monitors operation time and will indicate to the user when maintenance is required. This time is adjustable to adapt to your water conditions but is set from the factory at 500 hours of 100% operation.
- (4) Three parameters will help determine the proper blowdown setting of the Gas Steam humidifier.
 - (a) Water hardness
 - (b) Silica content
 - (c) Chlorides
- (5) Due to the wide range of water conditions found throughout North America it is important that the blowdown is set according to the local water conditions. By water conditions we are referring to the hardness of the water supplied to the humidifier. The hardness is measured in grains per gallon. It is also important to test for silica content. Silicates may cause foaming and contribute to scale buildup in the humidifier tank and float chamber. When excessive foaming occurs. Consult factory for possible solutions.
- (6) If you are unaware of the hardness or silica content of your water supply, there are many “do it yourself” kits, which can be purchased, or there are several companies that will perform the tests for a reasonable price. You can even contact your municipality for your water condition.
- (7) It is possible to reduce this setting according to observation and guidelines in the blowdown setting table found in the GS Installation Manual (Form # XX-287). Also, when high silica content has been identified, the humidifier tank and float chamber will require increased maintenance and the blowdown setting should be increased to maximum setting. In this case silica content may determine the appropriate blowdown setting.
- (8) Softened water is recommended if the incoming water has a hardness in excess of 8 grains/gal (136 ppm).
- (9) Reverse osmosis (RO) water can provide very long times between cleaning since it is cleaner than softened water. Deionized (DI) water can reduce the

maintenance a step further than RO and all the GS Series components are ready for RO or DI water use as a standard.

- (10) Contact your local Nortec representative for a quotation of a water treatment system suited for your application.

2. PREVENTIVE MAINTENANCE

- (1) The installation manuals of the GS Series of Gas Steam humidifier come with a complete Maintenance chart in order to guide internal personnel in cleaning and monitoring activities. Like any other appliance the Gas-Steam humidifier requires monitoring to ensure efficient operation throughout the life of the unit.
- (2) While in operation, the unit will blowdown scaled water through a drain pump keeping control on the water concentration based on steam output. For longer intervals between cleaning, the unit may be completely drained down to reduce the mineral concentration and bring in new fresh water in the system.
- (3) The FTBD (Full Tank Blow Down) can be activated through the software or dip switches based on:
 - (a) Time of day setting. When the 25 - 400 hours interval (adjustable) is reached the unit will wait until the set time of day before activating the full tank blowdown.
 - (b) External trigger using 24Vac signal from the building management system to the input terminal of the humidifier.
- (4) Following the full tank blowdown, the unit will refill and perform a float check. Whenever possible, use this feature to reduce mineral accumulation in the system and reduce the time required to clean the interior of the reservoir.

3. PRE-CLEANING SEQUENCE

- (1) When cleaning of the reservoir is required, use the tank pre-clean feature. This pre-cleaning sequence will drain the full content of the unit, fill back-up, and re-drain any residual scale that has fallen from the cold water refilling. This sequence is not an alternative to cleaning the humidifier, it is meant to reduce the time required to clean the tank.
- (2) Full Size Frontal Opening: Every GS Series Gas Steam Humidifier comes complete with a full size frontal opening to allow bottom cleaning of the tank and heat exchanger. This opening allows quick and easy cleaning without removing the steam outlet of the unit.

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10-30

OPTIONS & ACCESSORIES

1. OPTIONS AND ACCESSORIES AVAILABLE

A. Nortec Modulating Humidistat with Digital Display

- (1) NORTEC humidistats for GSTC or GSP Gas Steam humidifiers feature proportional + integral control with setpoint range of 10-95% RH. The humidistat connects directly to the low voltage terminal strip via 3 wires (shielded if run exceeds 10 m). The humidistat accurately controls RH in a zone or space.
- (2) Humidistat Specifications:
 - (a) Operating Conditions: 41°F-122°F (5°C-50°C)
 - (b) Control: 0-95% RH non-condensing
 - (c) Sensor: 0-100% RH
 - (d) Humidity Sensor: Solid-state humidity sensor. Suitable for normal, clean air. Not to be used in corrosive or harmful environment.
 - (e) Resolution: +/- 0.1%
 - (f) Repeatability: 0.5%
 - (g) Accuracy of Sensor: +/- 3% RH from 0-100% RH Range: 10-90% RH for 32°F-122°F (0°C-50°C)
 - (h) Temperature Effect: 0.05% /°F
 - (i) Outputs: 0-10 VDC
 - (j) Power: 24 VAC -15%, +10% 50/60 Hz; 2 VA

B. Humidistat with Integral Sensor and Controller with Digital Display

- (1) **151-0142** - Modulating 0-10 VDC wall mounted humidistat, P + I control humidistat with setpoint range of 0-95% RH. Connects directly to the GSTC or GSP low voltage terminal strip via 2 wires (shielded if run exceeds 10 m) and accurately controls RH in a zone or space. Time proportioning control not acceptable.
- (2) **252-0266** - Modulating 0-10 VDC duct mounted humidistat, P + I control humidistat with setpoint range of 10-95% RH. Connects directly to the GSTC or GSP low voltage terminal strip via 2 wires (shielded if run exceeds 10 m) and accurately controls RH in a zone or space. Can be used as a control humidistat if placed in return air or as high limit if placed in supply. (Time proportioning control not acceptable.)

C. Humidistat with Integral Sensor

- (1) **150-9857** - Remote duct or modulating high limit sensor.
- (2) **150-9858** - Remote wall mounted sensor.
- (3) **252-0263** - Outdoor duct mounted temperature sensor. Can provide energy savings and prevent window condensation by reading outdoor temperature and resets the humidity control to prevent condensation.

D. Nortec On / Off Controls with Digital Display

- (1) **252-0273** - Duct Mounted Safety High Limit On/Off Humidistat (if used) is wired to make on drop in humidity, break on rise to safety setpoint. It should be set to approximately 85% RH as a safety to prevent saturation and wetting in the duct.
- (2) **132-9203** - A Duct Mounted Safety Air-Proving On/Off Switch (if used) is wired to make on airflow, break on no flow. It is used as a safety to prevent saturation when no air is flowing through the duct.
- (3) **Low Humidity Alarm Package** - Low limit on/off humidistat duct or wall mounted, alarm light with engraved faceplate sized to fit standard 2" x 3" recessed electrical wall box supplied by others. Activates alarm light if duct or room airdrops below setpoint.
 - (a) Duct – 253-3365
 - (b) Wall – 253-3366
- (4) **High Humidity Alarm Package** - High limit on/off humidistat duct or wall mounted, alarm light with engraved faceplate sized to fit standard 2" x 3" recessed electrical wall box supplied by others. Stops humidifier and activates alarm light if duct or room air approaches saturation.
 - (a) Duct – 253-3363
 - (b) Wall – 253-3364

E. Configuration Option

- (1) **150-7057** - This option allows the Gas Steam humidifier to operate using propane energy.

F. Direct Vent

- (1) GS Indoor Direct Vent Package allows GS unit to be installed in an environment where the air cannot be used for combustion for one of the following reasons: chemicals or excessive dust is present in the air or the room is under excessive negative or positive pressure. All these factors could affect adversely the normal operation of the unit.
 - (a) GS 100 - 150-7067
 - (b) GS 200 - 150-7068
 - (c) GS 300 - 150-7069
 - (d) GS 400 - 150-7070
 - (e) GS 500 - 150-7071
 - (f) GS 600 - 150-7072

G. Stand

- (1) GS Series Stands are optional with all models. The floor stands will help raise the unit to maximum of 27" (69 cm) high.

H. Keep Warm

- (1) **150-7059** - GSP Keep Warm Feature, allow water temperature in the tank to be maintained between 140°F (60°C) and 160°F (71°C) allows for quick response of the unit on a call for humidity and to reduce possible bacteria growth for health concerns.

I. Indoor Freeze Protection

- (1) 150-7058 - GSTC Indoor Freeze protection package provides the unit configured with keep warm feature, remote fault indication and a normally open drain valve to protect if freezing conditions may occur. The keep warm feature will ensure the water temperature is kept between 140°F (60°C) and 160°F (71°C).
- (2) The remote fault indication will allow service personnel to be advised of the unit's operational status and the normally open drain valve will ensure the unit is drained if a power outage.
- (3) Drain and fill lines outside of the cabinet, must be protected from freezing with heat trace. Unit must be enclosed in a weather enclosure with heat source.
- (4) A remote alarm must be installed in case the unit faults using remote fault indication and status indication.

J. Outdoor Freeze Protection (Standard with all GS Outdoor Enclosures)

- (1) Outdoor units are configured with the Keep Warm feature enabled to maintain the tank water temperature between 140°F (60°C) and 160°F (71°C). Included is a factory installed normally open drain valve that will ensure the unit drains in the event of a power outage. Also a factory-installed heater will be included to maintain an operating temperature range within the electrical compartment. The heater is powered from the humidifier. Field supplied heat-tracing needs to be installed on all fill line piping exposed to outdoor temperature. If fill line pipe freezing is a concern a field supplied normally open valve can be used to drain the fill line.
 - (a) 150-8116 - GSTC Outdoor 100
 - (b) 150-8117 - GSTC Outdoor 200
 - (c) 150-8118 - GSTC Outdoor 300/400
 - (d) 150-8119 - GSTC Outdoor 500/600

K. ON-LINE

- (1) Nortec OnLine is a remote interactive communication package that allows satellite contacts to monitor, maintain and control a humidification center from any location worldwide using standard internet connections. This advanced software shows graphic representations of the humidifier and its key parameters (up to 75 functions).

L. LINKS 2

- (1) Nortec LINKS 2 is the combination of LINKS (building management system communication hardware) and OnLine (Internet communication hardware) allowing humidifiers to communicate to a building management system (BMS) as well as the Internet. Up to 8 humidifiers can be connected to 1 LINKS 2 controller (1 master and 7 slaves). The controller is factory installed and is located internally to the humidifier. Simply specify at the time of order the operating protocol needed. LINKS 2 comes standard with Internet capabilities however OnLine service needs to be specified at time of order.
- (2) Operating Protocols:
 - a) 252-7116 – BACnet / IP

- b) 252-7111 - BACnet MSTP
- c) 252-7113 – Johnson N2
- d) 252-7113 – LonWorks
- (3) Features
 - a) Digital Feedback for unit standby/humidifying mode.
 - b) Digital feedback for service required.
 - c) Digital feedback for fault indication.
 - d) System demand display.
 - e) Control room setpoint.
 - f) Control high limit setpoint.
 - g) Control room %RH.
 - h) Control high limit %RH.
 - i) Control enable/disable.
 - j) Networking capabilities of linking 8 units to one Nortec controller.

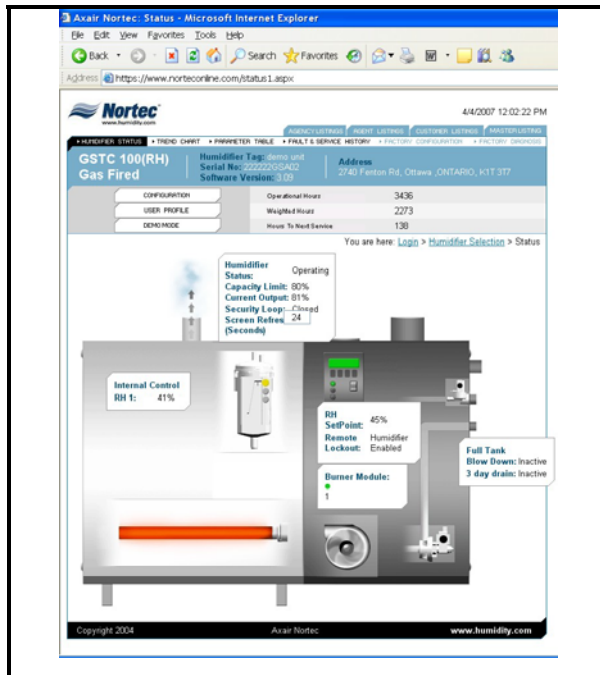


Figure 1. NORTEC Online

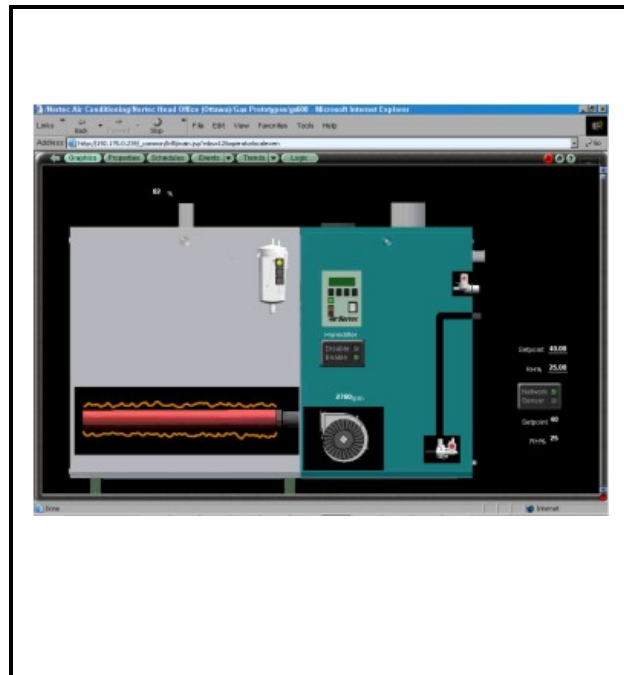


Figure 2. NORTEC LINKS 2

M. DRAIN WATER SUMP PUMP

- (1) Externally mounted below humidifier. For use when no floor drain is available and water must be pumped higher than the bottom of the humidifier (special high temperature model). Rated for use with all GS models. Recommended model: W.W. Grainger #4RD29 or #4RD32.

N. STEAM DISTRIBUTION

- (1) Used in ducts or air handling units, available in stainless steel.
- (2) Steam is dispersed through evenly spaced outlet orifices and upward perpendicular to the airflow.
- (3) When steam is dispersed through evenly spread outlet orifices that are along the steam distributors “active zone”. They are offset 45° from vertical to address potential static pressure induced by downward airflow. The distributor is rotated when installed.

O. REMOTE MOUNTED BLOWER PACK

- (1) RMBP 208-240V- 1709701 Blower Pack
- (2) Direct steam distribution system that allows for direct space/room humidification when steam introduction into a ducted system is not feasible. The factory assembled Blower Pack includes integral steam distributor, an internal steam hose and condensate connection for simple installation including 3 individual 110 cfm blower fans that can be powered by a separate 115 V single phase power supply or can be ordered with a factory installed step down transformer for all standard primary voltages. The Blower Pack features an adjustable fan to provide different angles allowing for a flexible install. A temperature sensor enables fans when steam production begins, while maintaining a quiet operational environment. The Remote Mounted Blower Pack ships fully assembled and ready for easy installation with NH, GS, SE Technologies.
- (3) See Blower Pack distribution for more information.

P. SHORT ABSORPTION MANIFOLD

- (1) See Short Absorption Manifold Engineering Manual for model numbers.

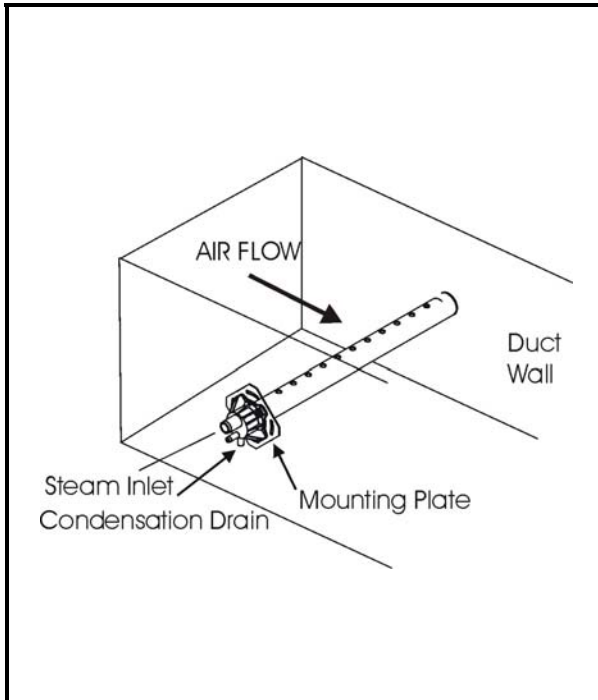


Figure 3. Steam Distributor

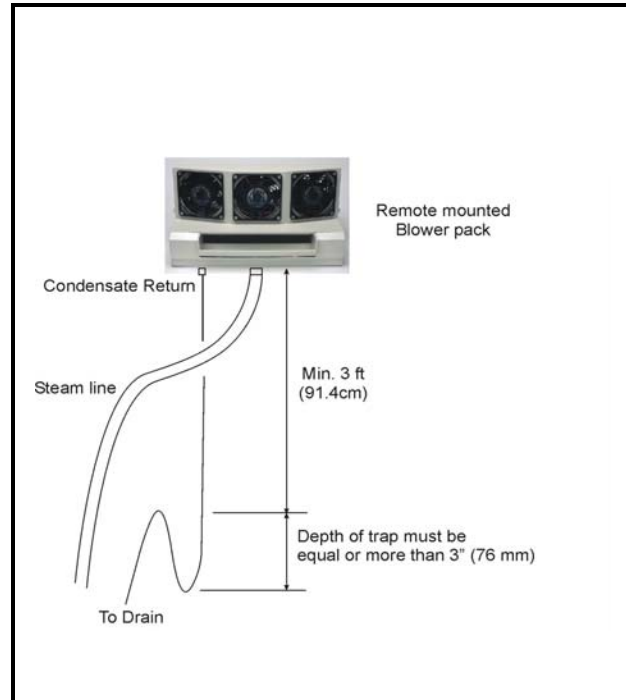


Figure 4. Blower Pack

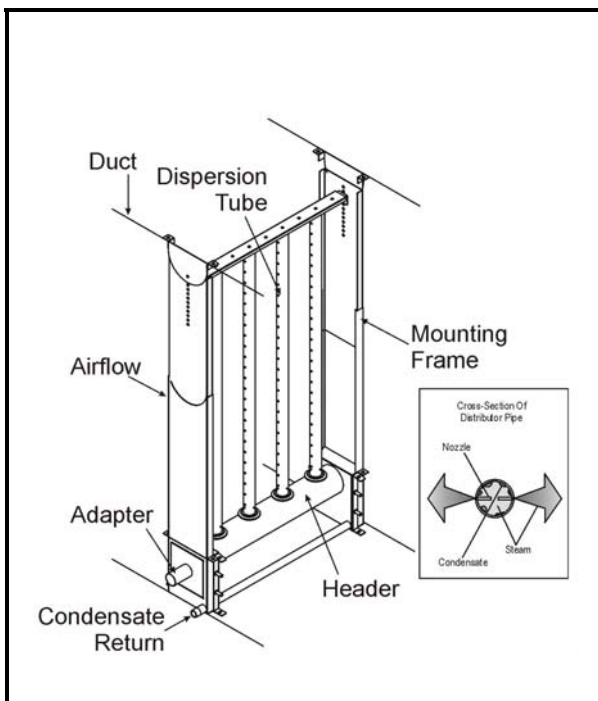


Figure 5. Short Absorption Manifold

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SPECIFICATION

1. GENERAL

A. General

- (1) NORTEC GS Series Gas-Fired Humidifier[s] as indicated on drawing[s] and as indicated on schedule[s].
- (2) Complete and operable humidification system [which meets applicable building codes].
- (3) Equipment start-up and project inspection by qualified factory trained representative.

B. Quality Assurance

- (1) Manufacturer: For each product specified, provide components by same manufacturer throughout.
- (2) Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction, and marked for intended use.
- (3) Comply with ARI 640, "Standard for Commercial and Industrial Humidifiers."
- (4) Products shall be supported with a warranty that ensures the product will be free from defects in materials and workmanship for a period of two years after shipment.
- (5) Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Commissioning Authority. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Project Closeout, Section 01700, for substantial completion details. Refer to Section 01810, Commissioning, for detailed commissioning requirements.
- (6) Products specified below are to be manufactured in an ISO 9001-2000 certified facility.

C. Submittals

- (1) Submit product data under provisions of Section 15010. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Include rated capacities, operating weights, furnished specialties, and accessories.
- (2) Submit manufacturer's installation instructions.
- (3) Submit operation and maintenance data.
- (4) Submit coordination drawings. Detail fabrication and installation of humidifiers. Include piping details, plans, elevations, sections, details of components, and dispersion tubes. Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, and required clearances.
- (5) Submit wiring diagrams including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

- (6) Submit minimum water quality requirements and water pressure requirements.

D. Extra Materials

- (1) Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

E. References

- (1) ANSI/NFPA 70 - National Electrical Code.

F. Coordination

- (1) Coordinate location and installation of humidifiers in ducts and air-handling units. Revise locations and elevations to suit field conditions and to ensure proper humidifier operation.

XXXXX OR XXXXX

- (2) Coordinate location and installation of humidifier in the space it serves with the electrical, mechanical, and plumbing contractors.

2. PRODUCTS

A. Gas Fired Steam Humidifier - GSTC

- (1) Packaged unit, floor mounted, gas-fired, steam generating system available at 105 lbs/hr (48 kg/hr), 210 lbs/hr (95 kg/hr), 315 lbs/hr (143 kg/hr), 420 lbs/hr (191 kg/hr), 525 lbs/hr (238 kg/hr), 630 lbs/hr (286 kg/hr), suitable for immediate, or future, use of all water types including, De-Ionized (DI), Reverse Osmosis (RO), potable and softened water, without modification required, CSA certified.
- (2) Packaged unit, wall mounted, methods of distribution require a steam distributor[s] or Short Absorption Manifold [s] [SAM-e] for mounting into AHU/duct[s] or Remote Mounted Blower Pack[s] [RMBP] for direct space applications [refer to options schedule].
- (3) Enclosed cabinet, powder painted steel construction and air gap between cabinet and insulated humidifier tank ensures safe surface temperature.
 - (a) Evaporation tank and all internal tank components to be constructed of 304 stainless steel.
 - (b) Humidifier requires zero clearance to combustibles and shall be installed against a partition to minimize floor space required. All tank surfaces shall be insulated with minimum 1" (25 mm) thick insulation and enclosed within unit cabinetry to ensure safe surface temperature, high overall efficiency, and fast unit response time. Units with exposed insulation shall not be acceptable.
 - (c) Maintenance shall not require the removal of the steam lines.
 - (d) Standard internal drain water cooler to ensure drain water tempering to 140° F (60 °C). If external drain water cooler required, provide factory cross-braced unit stand and factory supplied stainless steel p-trap.
 - (e) Blow-down p-trap, factory installed, enclosed in cabinet, prevents steam leakage to drain. Field installation not acceptable.

- (f) Provide easily accessible, primary voltage terminal block, internal to cabinetry, for single point field connection of electrical supply.
 - (g) Single point connection for gas inlet must be provided. Internal piping from gas inlet to burners must be factory installed and tested. Field piping from the gas inlet to the burners is not allowed.
 - (h) Humidifier to prevent “back-siphoning” using an internal air gap for supply water, to meet local plumbing codes.
 - (i) Drain line to include a vacuum breaker to prevent siphon drainage of the tank.
 - (j) Allowance for combustion air shall be provided in cabinet ventilation design. Option for direct vent of combustion must be available for use with BH exhaust vent.
- (4) Gas appliance shall be low emission. Units with Carbon Monoxide (CO) levels higher than 10 ppm and Nitrous Oxide (NOx) levels above 40 ppm are not acceptable.
- (a) System shall be rated as a class I appliance certified for use with exhaust vent type B.
XXXXX OR XXXXX
 - (b) System shall be rated as a class III appliance certified for use with exhaust vent type BH.
XXXXX OR XXXXX
 - (c) System shall be rated as a class III appliance certified for use with exhaust vent type BH and use with direct vent of combustion air. (Must be specified for factory configuration)
- (5) Stainless Steel combustion chamber(s)/heat exchanger(s) shall have flat surfaces to retard scale build-up. Tubular heat exchangers are not acceptable.
- (a) Each burner, capable of true modulation will provide steam production of 25 to 105 lbs/hr (11 to 48 kg/hr). Time proportioning modulation is not acceptable.
 - (b) Units with multiple heat exchangers, models 210 to 630 lbs/hr (95 kg/hr to 286 kg/hr) must be capable of producing a minimum output of 25 lbs/hr (11kg/hr).
 - (c) Units with multiple heat exchangers, models 210 to 630 lbs/hr (95 kg/hr to 286 kg/hr) must alternate the lead burners (duty cycle) to promote equal usage.
 - (d) Gas system with gas valve(s), explosion proof, premix combustion air blower(s), microprocessor controlled ignition, flame sensing and fault indicator light(s), 100% premix infrared burner(s), hot surface igniters(s) and heat transfer efficiency maintained over all operating ranges.

- (e) Blower speed rotation must to be monitored to ensure proper control of input modulation. System will lock out gas valve operation if proper blower speed is not detected.
 - (f) A secondary combustion air safety, in addition to blower speed monitoring, utilizing a mechanical pressure differential switch, must be used with each blower to ensure combustion air is entering the pre-mix blower properly.
 - (g) Modular heat exchanger shall be easily removable through unit sidewall.
 - (h) Removable cover at front of unit facilitates easy cleaning (when applicable) with complete access to tank and heat exchanger surfaces.
- (6) Automatic water level control within a separate float chamber, isolated from the boiling action, to prevent false water level indication.
- (a) Fill rate must modulate to match capacity demand to ensure consistent output. Fill cycles based on low water only is not acceptable.
 - (b) System shall fill through the bottom of the tank to reduce steam-quenching effect and noise level. Filling at top of the tank is not acceptable.
 - (c) Unit water level is to be continuously monitored with a dual magnetic electronic float system, located outside of the boiling water to ensure accurate water level control and reduced maintenance. Cool fill water is to be supplied into the sensing chamber to keep the device cool. Systems using conductivity probes or floats located within hot reservoir water are not acceptable.
 - (d) Tank and float chamber to be separated with a minimum of 1" (25 mm) rigid insulation, minimizing potential scale build up on float mechanisms, due to heating of the contained water.
 - (e) Humidifier shall have a dual fill valve to feed water to the tank and float chamber, to reduce scaling and mineral build up on the magnetic floats.
 - (f) Float chamber to include LED indication of five possible water level indications.
 - (g) Ongoing self-diagnostics including periodic float operation and fill/drain rate verification.
 - (h) Positive drainage/blow-down using a drain pump, drawing water from the bottom of the tank, maximizing mineral evacuation (when applicable). Skimmer not acceptable.
 - (i) Blow down interval shall be based on actual steam production, and must be adjustable to compensate for all water conditions, to ensure maximum energy and maintenance efficiency.
 - (j) Pre-cleaning flushing feature shall be provided to reduce maintenance time.
 - (k) Must include end of season blow-down feature to evacuate contained water and minerals after 72 hours with no demand for humidification.

- (7) Factory mounted, full size, backlit, Liquid Crystal Display provides full operational status. Display to include a keypad for user interface and adjustment of operational parameters including:
- (a) Unit output (lbs/hr or kg/hr) 25 lbs/hr to full output.
 - (b) Water level in the tank.
 - (c) Modulating control demand status.
 - (d) On/off control and safety (High limit, air proving) circuit status.
 - (e) Actual room and/or duct RH, and humidity set point, when using transducer input(s).
 - (f) Controller configuration (Proportional band and integral) when using transducer input(s).
 - (g) Troubleshooting guide with scroll down menu.
 - (h) Fault indication including date and time history.
 - (i) Maintenance intervals.
 - (j) Fill and drain status.
 - (k) Drain/flush intervals and duration.
 - (l) Date and time.
 - (m) Capacity limitation.
 - (n) 72 hours drain enable/disable.
 - (o) Control type configuration on/off or full modulation when demand signal(s), or transducer input(s) are provided.
 - (p) Up to 10 humidifiers, supplying one AHU or area, can be controlled in series from one modulating humidity control system.
 - (q) BACnet, LonWorks, or Johnson N2 capable to interface for monitoring and control from a Building Management System (BMS/BAS).
 - (r) Total Controller is Modbus native for (BMS/BAS) communication for remote monitoring and control of humidifier.
 - (s) Web base capable via the Internet for remote monitoring or control of humidifier.

NOTE:

All operational parameters factory set to reduce field set-up time.

- (8) Standard of acceptance: NORTEC GSTC.
- (9) Optional accessories:
 - (a) Refer to options schedule.

3. EXAMINATION

A. Examination

- (1) Examine ducts, air-handling units, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- (2) Examine roughing-in for piping systems to verify actual locations of piping connections before humidifier installation.
- (3) Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation

- (1) Install humidifiers and steam dispersion panels per manufacturers' instructions.
- (2) Seal humidifier dispersion-tube duct penetrations with flange.
- (3) Install with required clearance for service and maintenance.

C. Testing

- (1) System verification testing is part of the commissioning process. Verification testing shall be performed by the Contractor and witnessed and documented by the Commissioning Authority. Refer to section 01810, Commissioning, for system verification tests and commissioning requirements.

XXXXX OR XXXXX

- (2) Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
 - (a) Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - (b) Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
 - (c) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Training

- (1) Training of the Owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans. Refer to System Demonstrations, section 01670, for contractor training requirements. Refer to section 01810, Commissioning, for further contractor training requirements.

XXXXX OR XXXXX

- (2) Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain humidifiers.
 - (a) Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 - (b) Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
 - (c) Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - (d) Schedule training with Owner, through Architect, with at least seven days advance notice.

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WARRANTY

- (1) WALTER MEIER INC. and/or WALTER MEIER LTD. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted (with the exception of the cylinder), are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.
- (2) THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.
- (3) The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.
- (4) THE COMPANY's limited warranty on accessories, not of the companies manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.
- (5) THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.
- (6) THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.
- (7) THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

**walter
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