Inspections Division
Date: 04/25/14

Submittal

SUBM #- 01

1000 Riverside MHS-PPL
Job # 13431

General Contractor……..... Stroudwater Construction
96 Ocean Street
South Portland, Maine 04106

Submitted By…….. Johnson and Jordan, Inc.
18 Mussey Road
Scarborough, Maine 04074

Subcontractor……

Supplier…….. Emerson-Swan
4 Fundy Road Suite 203
Falmouth Maine

Specification Section…….....

Paragraph.....

Item..... Dri-Steam Humidifiers.

JOHNSON&JORDAN,INC.
18 Mussey Rd. Scarborough, Me
Approved:_____Approved as noted:_____
Re-Submit_____Reviewed___X_____
Subject to Architects approval:_____
Date:_____1/17/14_____By:Patrick J. Caskin Sr.

Inspections Division
Date: 04/25/14

RISTEEM HUMIDIFIER COMPANY
A SUBSIDIARY OF RESEARCH PRODUCTS CORPORATION

January 20, 2014

PROJECT:	Portland Library, Riverside
ADDRESS:	Portland, ME

Specification Section:

Consulting Engineer:	Johnson & Jordan
Contractor:	Johnson & Jordan
Representative:	Emerson Swan, Inc.
Representative Phone:	207-781-2046

Inspections Division
Date: 04/25/14

t Name: Portland library
Date: 01.20.2014 **Unit of Measure:** Inch−Pound
ifier Tag: H1 4 Ton 375 CFM OA

m Quantity:	1	**Calculation Method:**	Mechanical	**Airflow (CFM)**	1600.00
Elevation (feet)	62.0	**Desired Dry Bulb (°F)**	70.0	**Entering Outside Air (%)**	27
Entering Dry Bulb (°F)	−3.0	**Desired RH (%)**	40	**Load (lbs/hr)**	11.02
Entering RH (%)	73	**Actual RH (%)**	40		

(All Values are per unit, unless otherwise noted)

Energy Source	Electric
Water Type	Potable
Total Humidifier Capacity (lbs/hr)	12.0

Model	Multi	Qty.	Volts/Phase/Amp (Each)	Humidifier Outlet			Size (inches) W x H x L	Stages	kW
				Type	Diameter (inches)	Qty.			
CRUV−4		**1**	**208/Three/16.7**	**Hose**	**1 1/2**	**1**	**12.50 x 11.63 x 15.50**	**1**	**4.0**

Selected Humidifier Options:
- Type of Water:Potable
- DRANE−KOOLER
- DRANE−KOOLER, Wall Mount
- Evaporating Chamber Insulation

Selected Control Options:
- VAPOR−LOGIC 4
- Type of Control, Modulating
- Time Proportioning
- Modulating, DRI−STEEM
- Humidity Transmitter, Duct
- Humidistat, On−Off High Limit, Duct
- Airflow Proving Switch, Pressure

Selected Cabinet Options:
- Control Cabinet
- Wired Electric SubPanel
- Keypad, Language, English
- Keypad, Unit Of Measure, Inch−Pound

Humidifier Notes:
Minimum water conductivity of 2 grains/gallon (100 µS/cm)
Power block maximum wire connection size of 6 gauge.

Model	Qty.	Dispersion Tube		Dispersion Inlet	
		Length (inches)	Diameter (inches)	Type	Diameter (inches)
Single Tube 1.5", with Drain Single Tube Only	1	20	1.5	Hose	1 1/2

Duct Conditions

Absorption Dist. (inches)	15	**Airflow**	Horizontal
Duct Width (inches)	20	**Air Velocity (ft/min)**	823
Duct Height (inches)	14	**Airflow Pressure Drop (in.)**	0.025
Entering Duct Temp (°F)	54.5	**Entering RH (%)**	54
Leaving Duct Temp (°F)	55.0	**Leaving RH (%)**	67
Header Location	Outside Duct	**Heat Gain: Assembly (°F)**	0.08
Water Seal Location	Outside Duct	**Heat Gain: Steam (°F)**	0.4
		Ins. Load + Loss (lbs/hr)	Not Calculated

Selected Dispersion Options:
- Hard Pipe Kit
- Insulated Tube(s)

Inspections Division
Date: 04/25/14

t Name: Portland library
Date: 01.20.2014 **Unit of Measure:** Inch−Pound
ifier Tag: H2 7.5 TON 500 cfm OA

m Quantity:	1	**Calculation Method:**	Mechanical	**Airflow (CFM)**	3000.00
Elevation (feet)	62.0	**Desired Dry Bulb (°F)**	70.0	**Entering Outside Air (%)**	19.7
Entering Dry Bulb (°F)	−3.0	**Desired RH (%)**	40	**Load (lbs/hr)**	15.08
Entering RH (%)	73	**Actual RH (%)**	40		

(All Values are per unit, unless otherwise noted)

Energy Source	Electric
Water Type	Potable
Total Humidifier Capacity (lbs/hr)	18.0

Model	Multi	Qty.	Volts/Phase/Amp (Each)	Humidifier Outlet			Size (inches) W x H x L	Stages	kW
				Type	Diameter (inches)	Qty.			
CRUV−6		**1**	**208/Three/25.0**	**Hose**	**1 1/2**	**1**	**16.88 x 13.25 x 16.00**	**1**	**6.0**

Selected Humidifier Options:
- Type of Water:Potable
- DRANE−KOOLER
- DRANE−KOOLER, Wall Mount
- Evaporating Chamber Insulation

Selected Control Options:
- VAPOR−LOGIC 4
- Type of Control, Modulating
- Time Proportioning
- Modulating, DRI−STEEM
- Humidity Transmitter, Duct
- Humidistat, On−Off High Limit, Duct
- Airflow Proving Switch, Pressure

Selected Cabinet Options:
- Control Cabinet
- Wired Electric SubPanel
- Keypad, Language, English
- Keypad, Unit Of Measure, Inch−Pound

Humidifier Notes:
Minimum water conductivity of 2 grains/gallon (100 µS/cm)
Power block maximum wire connection size of 6 gauge.

Model	Qty.	Dispersion Tube		Dispersion Inlet	
		Length (inches)	Diameter (inches)	Type	Diameter (inches)
Single Tube 1.5", with Drain Single Tube Only	1	24	1.5	Hose	1 1/2

Duct Conditions

Absorption Dist. (inches)	13	**Airflow**	Horizontal
Duct Width (inches)	24	**Air Velocity (ft/min)**	1125
Duct Height (inches)	16	**Airflow Pressure Drop (in.)**	0.035
Entering Duct Temp (°F)	54.7	**Entering RH (%)**	57
Leaving Duct Temp (°F)	55.0	**Leaving RH (%)**	67
Header Location	Outside Duct	**Heat Gain: Assembly (°F)**	0.05
Water Seal Location	Outside Duct	**Heat Gain: Steam (°F)**	0.30
		Ins. Load + Loss (lbs/hr)	Not Calculated

Selected Dispersion Options:
- Hard Pipe Kit
- Insulated Tube(s)

Inspections Division
Date: 04/25/14

t Name: Portland library
Date: 01.20.2014 **Unit of Measure:** Inch−Pound
ifier Tag: H3 10 TON 900 CFM OA

m Quantity:	1	**Calculation Method:**	Mechanical	**Airflow (CFM)**	4000.00
Elevation (feet)	62.0	**Desired Dry Bulb (°F)**	70.0	**Entering Outside Air (%)**	23.5
Entering Dry Bulb (°F)	−3.0	**Desired RH (%)**	40	**Load (lbs/hr)**	23.98
Entering RH (%)	73	**Actual RH (%)**	40		

(All Values are per unit, unless otherwise noted)

Energy Source	Electric
Water Type	Potable
Total Humidifier Capacity (lbs/hr)	24.0

Model	Multi	Qty.	Volts/Phase/Amp (Each)	Humidifier Outlet			Size (inches) W x H x L	Stages	kW
				Type	Diameter (inches)	Qty.			
CRUV−8		**1**	**208/Three/33.3**	**Hose**	**1 1/2**	**1**	**16.88 x 13.25 x 16.00**	**1**	**8.0**

Selected Humidifier Options:
- Type of Water:Potable
- DRANE−KOOLER
- DRANE−KOOLER, Wall Mount
- Evaporating Chamber Insulation

Selected Control Options:
- VAPOR−LOGIC 4
- Type of Control, Modulating
- Time Proportioning
- Modulating, DRI−STEEM
- Humidity Transmitter, Duct
- Humidistat, On−Off High Limit, Duct
- Airflow Proving Switch, Pressure

Selected Cabinet Options:
- Control Cabinet
- Wired Electric SubPanel
- Keypad, Language, English
- Keypad, Unit Of Measure, Inch−Pound

Humidifier Notes:
Minimum water conductivity of 2 grains/gallon (100 µS/cm)
Power block maximum wire connection size of 6 gauge.

Model	Qty.	Dispersion Tube		Dispersion Inlet	
		Length (inches)	Diameter (inches)	Type	Diameter (inches)
Single Tube 1.5", with Drain Single Tube Only	1	24	1.5	Hose	1 1/2

Duct Conditions

Absorption Dist. (inches)	21	**Airflow**	Horizontal
Duct Width (inches)	24	**Air Velocity (ft/min)**	1200
Duct Height (inches)	20	**Airflow Pressure Drop (in.)**	0.035
Entering Duct Temp (°F)	54.6	**Entering RH (%)**	54
Leaving Duct Temp (°F)	55.0	**Leaving RH (%)**	67
Header Location	Outside Duct	**Heat Gain: Assembly (°F)**	0.04
Water Seal Location	Outside Duct	**Heat Gain: Steam (°F)**	0.4
		Ins. Load + Loss (lbs/hr)	Not Calculated

Selected Dispersion Options:
- Hard Pipe Kit
- Insulated Tube(s)

Inspections Division
Date: 04/25/14

t Name: Portland library
Date: 01.20.2014 **Unit of Measure:** Inch−Pound
ifier Tag: H4 Estimated 20 Ton, 1800 OA

m Quantity:	1	**Calculation Method:**	Mechanical	**Airflow (CFM)**	8000.00
Elevation (feet)	62.0	**Desired Dry Bulb (°F)**	70.0	**Entering Outside Air (%)**	23
Entering Dry Bulb (°F)	−3.0	**Desired RH (%)**	40	**Load (lbs/hr)**	46.94
Entering RH (%)	73	**Actual RH (%)**	40		

(All Values are per unit, unless otherwise noted)

Energy Source	Electric
Water Type	Potable
Total Humidifier Capacity (lbs/hr)	48.0

Model	Multi	Qty.	Volts/Phase/Amp (Each)	Humidifier Outlet			Size (inches) W x H x L	Stages	kW
				Type	Diameter (inches)	Qty.			
CRUV−16		**1**	**208/Three/44.4**	**Hose**	**1 1/2**	**1**	**16.88 x 14.88 x 16.00**	**1**	**16.0**

Selected Humidifier Options:
- Type of Water:Potable
- DRANE−KOOLER
- DRANE−KOOLER, Wall Mount
- Evaporating Chamber Insulation

Selected Control Options:
- VAPOR−LOGIC 4
- Type of Control, Modulating
- SSR
- Modulating, DRI−STEEM
- Humidity Transmitter, Duct
- Humidistat, On−Off High Limit, Duct
- Airflow Proving Switch, Pressure

Selected Cabinet Options:
- Control Cabinet
- Wired Electric SubPanel
- Keypad, Language, English
- Keypad, Unit Of Measure, Inch−Pound

Humidifier Notes:
Minimum water conductivity of 2 grains/gallon (100 µS/cm)
Power block maximum wire connection size of 6 gauge.

Model	Qty.	Header Size (inches)	Tube (inches)			Tube Qty.	Dispersion Inlet		Face Dimensions (inches)	
			Size	Center	Active Length		Type	Diameter (inches)	Width	Height
RAPID−SORB 1.5"	1	2	1.5	12	30	2	Hose	1 1/2	24	35

Duct Conditions

Absorption Dist. (inches)	7	**Airflow**	Horizontal
Duct Width (inches)	24	**Air Velocity (ft/min)**	1333
Duct Height (inches)	36	**Airflow Pressure Drop (in.)**	0.0
Entering Duct Temp (°F)	54.5	**Entering RH (%)**	53
Leaving Duct Temp (°F)	55.0	**Leaving RH (%)**	66
Header Location	Outside Duct	**Heat Gain: Assembly (°F)**	0.13
Water Seal Location	Outside Duct	**Heat Gain: Steam (°F)**	0.4
		Ins. Load + Loss (lbs/hr)	Not Calculated

Selected Dispersion Options:
- Hard Pipe Kit
- Insulated Tube(s)

Confirm 24 Wide x 36 high

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Figure 1-1:
CRUV (tap/softened water) field piping overview

Notes:

- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Offset humidifier from floor drain to prevent flash steam from rising into the humidifier.
- Dashed lines indicate provided by installer.
- The water supply inlet is more than 1" (25 mm) above the skim/overflow port, eliminating the possibility of backflow or siphoning from the tank. No additional backflow prevention is required; however, governing codes prevail.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

mc_071210_1603 DC-1133

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CRUV humidifier, tap/softened water

Table 2-1:
CRUV capacities, electrical specifications, and weights

CRUV model	Maximum steam capacity**		Current draw (amps)											Shipping weight***		Operating weight***	
			Single-phase						Three-phase								
kW	lbs/hr	kg/h	120V	208V	240V	277V	480V	600V	208V	240V	277V	480V	600V	lbs	kg	lbs	kg
2	6	2.7	16.7	9.6	8.3	7.2	4.2	3.3	—	—	—	—	—	25	11	45	20
4	12	5.4	~~33.5~~	~~19.2~~	~~16.7~~	~~14.4~~	~~8.3~~	~~6.7~~	16.7*	~~14.4*~~	~~12.5~~	~~7.2*~~	~~5.8*~~	27	12	47	21
6	18	8.2	~~—~~	~~20.8~~	~~25.0~~	~~21.7~~	~~12.5~~	~~10.0~~	25.0*	~~21.7*~~	~~18.8~~	~~10.8~~	~~8.7~~	37	17	75	34
8	24	10.9	~~—~~	~~38.5~~	~~33.3~~	~~28.9~~	~~16.7~~	~~13.3~~	33.3*	~~28.9*~~	~~25.0~~	~~14.4*~~	~~11.5*~~	37	17	75	34
10	30	13.6	—	—	41.7	36.1*	20.8	16.7	29.1*	25.3*	21.9	12.6*	10.1*	39	18	90	41
12	36	16.3	—	—	—	43.3	25.0	20.0	33.3	28.9	25.0	14.4	11.5	39	18	90	41
14	42	19.1	—	—	—	—	29.2	23.3	38.9	33.7	29.2	16.8	13.5	39	18	90	41
16	48	21.8	~~—~~	~~—~~	~~—~~	~~—~~	~~33.3~~	~~26.7~~	44.4	~~38.5~~	~~33.3~~	~~19.2~~	~~15.4~~	39	18	90	41
21	63	28.6	—	—	—	—	43.8	35.0	—	—	43.8	25.3	20.2	43	20	104	47
25	75	34.0	—	—	—	—	—	41.7	—	—	—	30.1	24.1	43	20	104	47
30	90	40.9	—	—	—	—	—	—	—	—	—	36.1	28.9	48	22	109	49
34	102	46.3	—	—	—	—	—	—	—	—	—	40.9	32.7	48	22	109	49

* For wire sizing, the highest leg draw is shown due to current imbalance.
** Total humidifier load = load to meet design conditions + load to compensate for steam loss from the dispersion assembly and interconnecting piping. If total humidifier load is more than the humidifier's maximum capacity, design conditions will not be met. For steam loss data see the DRI-STEEM Design Guide available for downloading and printing at www.dristeem.com
*** Depending on configuration, add up to 28 lbs (13 kg) for weight of control cabinet, subpanel, and other electrical control components.

mc_071210_1440

Note: The fill valve, drain valve, probes, and temperature sensors use Class 2, 24 VAC power.

Table 2-2:
Steam connection sizes

CRUV model	Steam outlet
2, 4, 6, 8	1 ½" hose or NPT connection
10, 12, 14 ,16	1 ½" or 2" hose or NPT connection
21, 25, 30, 34	2" hose or NPT connection

mc_052410_1705-CRUV

Figure 2-1:
Steam outlet connections

The steam outlet is designed to connect to a vapor hose or NPT connection.

Tap/softened water CRUV shown.

mc_052510_1531-CRUV

DC-1168

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Figure 3-1:
CRUV dimensions

Tap/softened water CRUV shown

Electrical conduit knockouts:

- CRUV Models 2 and 4 have combination knockout for ½" and ¾" conduit connectors; knockout diameters are 22.3 mm and 28.6 mm.
- CRUV Models 6 through 34 have combination knockout for ¾" and 1" conduit connectors; knockout diameters 28.6 mm and 34.9 mm.

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OM-2004, OM-2002, OM-2003

Table 3-1:
CRUV dimensions

CRUV model	A		B		C		D		E		F	
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
2, 4	4.50	114	15.50	394	12.50	318	9.00	229	9.00	229	12.13	308
6, 8	7.18	183	16.00	406	16.88	429	10.00	254	14.34	369	13.25	337
10, 12, 14, 16	7.18	183	16.00	406	16.88	429	11.75	199	14.34	364	14.88	378
21, 25, 30, 34	7.18	183	16.00	406	16.88	429	13.25	337	14.34	364	16.38	416

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Evaporative-type single dispersion tube with condensate drain
Horizontal and vertical airflow

Figure 1-1:
Single dispersion tube with condensate wasted to drain

Notes:
1. Dashed lines indicate provided by installer.
2. Review drawings and tables on all pages of this document.

DC-1046a

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Evaporative-type single dispersion tube with condensate drain
Horizontal and vertical airflow

Table 3-1:
Maximum steam carrying capacity and length of interconnecting vapor hose, tubing, and pipe*

Vapor hose†††						Copper or stainless steel tubing and Schedule 40 steel pipe					
Hose I.D.		Maximum capacity		Maximum length**		Tube or pipe size***		Maximum capacity		Maximum developed length†	
inches	DN	lbs/hr	kg/h	ft	m	inches	DN	lbs/hr	kg/h	ft	m
1½	40	150	68	10	3	1½	40	150	68	20	6
2	50	250	113	10	3	2	50	220	100	30	9
						3††	80††	450	204	80	24
						4††	100††	750	340	100	30
						5††	125††	1400	635	100	30
						6††	150††	2300	1043	100	30

* Based on total maximum pressure drop in hose, tubing, or pipe of 5" wc (1244 Pa)
** Maximum recommended length for vapor hose is 10' (3 m). Longer distances can cause kinking or low spots.
*** To minimize loss of capacity and efficiency, insulate tubing and pipe.
† Developed length equals measured length plus 50% of measured length to account for pipe fittings.
†† Requires flange connection.
††† When using vapor hose, use DRI-STEEM vapor hose for best results. Field-supplied hose may have shorter life and may cause foaming in the evaporating chamber resulting in condensate discharge at the dispersion assembly. Do not use vapor hose for outdoor applications.

Table 3-2:
Heights required to overcome humidifier internal pressure (H1 and H2)

Unit output			Water seal height (H1)		Air vent height (H2)	
kW	lbs/hr	kg/h	inches	mm	inches	mm
≤ 48	≤ 138	≤ 62	12	305	22.5	572
49-64	139-183	63-83	15	381	27.5	699
> 64	> 183	> 84	18	457	30.5	775

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Evaporative-type Rapid-sorb unit with header outside duct Horizontal airflow

Figure 1-1:
Rapid-sorb in a horizontal airflow with header outside duct

* Pitch vapor hose, tubing, or pipe toward Rapid-sorb:
- 2"/ft (15%) when using vapor hose
- 1/8"/ft (1%) when using tubing or pipe

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Evaporative-type Rapid-sorb unit with header outside duct Horizontal airflow

Table 2-1:
Maximum steam carrying capacity and length of interconnecting vapor hose, tubing, and pipe*

Vapor hose†††						Copper or stainless steel tubing and Schedule 40 steel pipe					
Hose I.D.		Maximum capacity		Maximum length**		Tube or pipe size***		Maximum capacity		Maximum developed length†	
inches	DN	lbs/hr	kg/h	ft	m	inches	DN	lbs/hr	kg/h	ft	m
1½	40	150	68	10	3	1½	40	150	68	20	6
2	50	250	113	10	3	2	50	220	100	30	9
						3††	80††	450	204	80	24
						4††	100††	750	340	100	30
						5††	125††	1400	635	100	30
						6††	150††	2300	1043	100	30

* Based on total maximum pressure drop in hose, tubing, or pipe of 5" wc (1244 Pa)
** Maximum recommended length for vapor hose is 10' (3 m). Longer distances can cause kinking or low spots.
*** To minimize loss of capacity and efficiency, insulate tubing and pipe.
† Developed length equals measured length plus 50% of measured length to account for pipe fittings.
†† Requires flange connection.
††† When using vapor hose, use DRI-STEEM vapor hose for best results. Field-supplied hose may have shorter life and may cause foaming in the evaporating chamber resulting in condensate discharge at the dispersion assembly. Do not use vapor hose for outdoor applications.

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Drane-kooler™ water tempering device

Figure 1-1:
Drane-kooler piping

Table 1-2:
Drane-kooler capacities*

	Maximum flow rate		Maximum temperature	
	U.S. gpm	L/m	°F	°C
Hot water inflow	6	22.7	212	100
Cold water inflow**	6	22.7	70	21
Tempered water outflow	12	45.4	140	60

Note:
* This table applies only if one humidifier is connected to one Drane-kooler, with no more than 10' (3m) of vertical dimension between the Drane-kooler and the humidifier.
** Cold water inflow pressure must be between 25 psi and 80 psi (172 kPa and 552 kPa).

Table 1-1:
Drane-kooler connections

Hot water inlet connection	1" (DN25) pipe thread
Tempered water outlet connection	2" (DN50) pipe thread
Cold water supply connection	3/8" (DN10) pipe thread

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Step-by-step installation instructions

1. Verify that maximum flow of hot water into the Drane-kooler does not exceed 6 U.S. gallons per minute (gpm) (22.7 L/m).
2. Note that there are three connections to be made to the Drane-kooler:
   - Cold water supply
   - Hot water inlet (from a humidifier or other appliance)
   - Tempered water piping to drain
3. Position the Drane-kooler to allow the most direct path of piping to minimize fittings (see the piping diagram on Page 1).
4. Position unions on all connections as close to the Drane-kooler as possible to make cleaning and maintenance easier.
5. Cold water supply connection instructions:
   - Cold water supply connection on valve is 3/8" (DN10) pipe thread.
   - Pipe a 3/8" (DN10) line directly to the Drane-kooler from the main water supply line.

     To ensure adequate water pressure to the Drane-kooler, do not connect to a supply water line that is dedicated to other appliances.

     If installing the Drane-kooler with a humidifier, do not branch off the 1/4" (DN8) cold water supply line to the humidifier.
   - Verify that the supply water pressure to the valve is at least 25 psi (172 kPa) and not more than 80 psi (552 kPa).
   - Install a cold water supply union as close to the Drane-kooler as possible.
   - Install a cold water shut-off valve before the union in the cold water supply line.
6. Hot water inlet connection instructions:
   - Hot water inlet connection is 1" (DN25) pipe thread.
   - Locate a union as close to the Drane-kooler as possible
   - Run 1" (DN25) pipe as directly as possible from the hot water appliance (humidifier) to the Drane-kooler. If the piping to the hot water inlet has a horizontal run, maintain a pitch to the Drane-kooler of at least 1/8"/ft (1%).
7. Tempered water (to drain) connection instructions:
   - Tempered water outlet connection is 2” (DN50) pipe thread.
   - Install a union as close to the Drane-kooler as possible.
   - Run a 2” (DN50) pipe as directly as possible from the Drane-kooler to the drain. Maintain a pitch to drain of at least 1/8”/ft (1%).
   - Make sure there is a 1” (25 mm) air gap between the drain piping and the drain.

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Figure 3-1:
Drane-kooler dimensions

Table 3-1:
Drane-kooler dimensions

	Description	inches	mm
A	Height with floor stand (from floor to top of hot water inlet in 1" [25 mm] increments)	8.25 to 12.25	210 to 312
	Height with floor stand and extension (from floor to top of hot water inlet in 1" [25 mm] increments)	13.25 to 20.25	337 to 515
B	Height from bottom of tank to top of hot water inlet	7.5	191
C	Height from bottom of tank to top of valve	10.5	268
D	Height from top of hot water inlet to top of valve	3.0	76
E	Height from bottom of tank to center of mounting hole	6.25	159
F	Height from bottom of tank to center of tempered water outlet	3.0	76
G	Width of tank and tempered water outlet	7.5	191
H	Width of mounting plate holes, center to center	4.0	102
J	Length, from valve inlet to mounting plate	12.0	305

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Three mounting options

Use one of the mounting options shown on this page to ensure that the Drane-kooler will be properly supported and not secured entirely by piping. Floor stand and suspension mount hanger assembly are ordered separately.

Figure 4-1:
Standard wall mount

OM-1114

Figure 4-2:
Optional suspension mount*

OM-1116

Note:
* The optional suspension mount hanger assembly includes an L-bracket, two nuts, and two bolts that attach to the Drane-kooler. Beam clamp assembly and 1/4" threaded rod are supplied by others.

Figure 4-3:
Optional floor mount

OM-1115

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Date: 04/25/14

DRISTEEM®

MODEL: KHD-2-DS
RELATIVE HUMIDITY TRANSMITTER
DUCT

DESCRIPTION

The **Model KHD Duct Relative Humidity Transmitter** monitors relative humidity in an air duct and generates an output proportional to the humidity.

The transmitter uses a thin film capacitive polymer sensor protected from dust and dirt by a porous filter. Standard output is 4 to 20 mA (0 to 100% RH). A conformal coating protects sensitive sensor circuits and components from condensation.

The **Model KHD** enclosure incorporates an electrical junction box with a 6" aluminum probe. The junction box accommodates 1/2" conduit and mounts from the outside of the duct.

SPECIFICATIONS

GENERAL	
Accuracy	±2% (includes hysteresis, stability, and linearity)
Hysteresis	±1% of RH, 10 to 90 to 10% RH
Stability	±2% of RH over 24 months typical
Linearity	±1% of RH typical
Sensing Element	Thin-film capacitive polymer with porous filter
Temperature Dependence	Negligible between 32°F and 122°F (0° and 50°C)
Time Constant	60 sec in slow-moving air
ELECTRICAL	
Power Requirement	
4 to 20 mA	12 (min) to 28 (max) VDC @ 4 to 20 mA
Signal Output	
Current	4 to 20 mA loop current, 2-wire powered DC; maximum load resistance at 12 VDC is 100Ω, at 28 VDC is 900Ω
HUMIDITY	
Range	0 to 100% RH
PHYSICAL	
Dimensions	See outline drawing
Weight	1.2 lb.
ENVIRONMENTAL	
Operating	
Temperature	-4° to 140°F (-20° to 60°C)
Humidity	0 to 95% RH non-condensing
Storage	
Temperature	-4° to 158°F (-20° to 70°C)
Humidity	0 to 95% RH non-condensing

DIMENSIONS

DRISTEEM CORPORATION, SUBSIDIARY OF RESEARCH PRODUCTS CORPORATION
14949 TECHNOLOGY DRIVE, EDEN PRAIRIE, MINNESOTA 55344 TELEPHONE: (800) 328-4447, FAX: (952) 229-3200
Data Sheet 052-0033-03

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INSTALLATION

Mounting

Do not install the **Model KHD** transmitter where the ambient exceeds the specified operating environment. Select a location on the duct wall. Locate the probe in the duct away from heat and cold sources and at least 20 feet from a steam vapor humidifier. The humidifier may expel water with minerals, and the drying minerals may affect the filter and sensor.

Remove cover from the enclosure. Cut a 7/8" hole in the duct wall. Insert the probe into the duct. Secure the enclosure to the duct wall with self-tapping screws with large heads.

Connecting

Connect the power and RH signal return from the building system per the wiring diagram.

WIRING - KHD

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IRFLOW PROVING SWITCH

Model AFS–222-112

P/N 406190
Air Pressure Sensing Switch with Adjustable Set Point Range

Application

The **Model AFS-222-112** is a general purpose proving switch designed for HVAC and Energy Management applications. It may be used to sense positive, negative, or differential air pressure. The AFS-222-112 is equipped with convenient barbed sample line connectors that accept flexible tubing.

General Description & Operation

The plated housing contains a diaphragm, a calibration spring and a snap-acting SPDT switch.The barbed sample line connections located on each side of the diaphragm accept flexible tubing.

An enclosure cover guards against accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover will accept a ½" conduit connection.

Dimensions in Inches (Millimeters)

Figure 1: Mount with the diaphragm in any vertical plane.

Mounting (see Figure 1)

Select a mounting location which is free from vibration. The **AFS-222-112** must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two 3/16" diameter holes in the integral mounting bracket. The mounting holes are 3-7/8" apart.

Air Sampling Connection (see Figure 2)

The **AFS-222-112** is equipped with two slip-on sample line connectors, situated on either side of the diaphragm as shown in Figure 2. These connectors are suitable for flexible tubing. Locate the sampling probe a minimum of 1.5 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to Figure 2 to identify the high pressure inlet (H) and the low pressure inlet (L). Select one of the five application options listed below (on page 2), and connect the sample lines as recommended.

(Figure 2)

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igure 3)

(Figure 4)

POSITIVE PRESSURE ONLY: Connect the sample line to inlet H; inlet L remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet L; inlet H remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet L. Connect the lower negative sample to inlet H.

TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet H. Connect the lower positive sample to inlet L.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet H. Connect the negative sample to inlet L.

Electrical Connections (see Figure 3)

Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position.The snap switch has screw top terminals with cup washers. Wire alarm and control applications as shown in Figure 4.

Field Adjustment

The adjustment range of an **AFS-222-112** Air Switch is 0.05 ±.02" w.c. to 12.0" w.c.. To adjust the set point, t urn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw 4 complete turns in a clockwise direction to engage the spring. From this point, the next ten turns will be used for the actual calibration. **Each full turn represents approximately 1.2" w.c.**

Please note: To properly calibrate an air switch, a digital manometer or other measuring device should be used to confirm the actual set point.

SPECIFICATIONS

Model AFS-222-112 Air Flow Switch

Mounting Position: Mount with the diaphragm in any vertical plane.
Set Point Range: 0.05 ± 0.02" w.c. to 12.0"w.c.
Field Adjustable "Operate Range": 0.07"w.c. to 12.0" w.c.
Field Adjustable "Release Range": 0.04"w.c. to 11.2" w.c.
Approximate Switching Differential: Progressive, increasing from 0.02± 0.01" w.c. at minimum set point to approximately 0.8 " w.c. at maximum set point.
Measured Media: Air, or combustion by-products that will not degrade silicon.
Maximum Pressure: ½ psi (0.03 bar)
Operating Temperature Range: -40F to 180F (-40 to 82C)
Life: 100,000 cycles minimum at 1/2 psi maximum pressure each cycle and at maximum rated electrical load.
Electrical Rating: 300 VA pilot duty at 115 to 277 VAC, 15 amps noninductive to 277 VAC, 60 Hz.
Contact Arrangement: SPDT
Electrical Connections: Screw-type terminals with cup washers.
Conduit Opening: 7/8" diameter opening accepts ½" conduit.
Sample Line Connections: Two barbed ¼" connectors will accept flexible tubing.
Shipping Weight: 1.2 lbs.

ACCESSORIES

Sample line probes.
Orifice plugs (pulsation dampers).
Consult Factory for special features, packaging and labeling services.

LOCATION OF SAMPLE LINES FOR TYPICAL APPLICATIONS

Pressure Conversion Table

1"wc = 0.0361psi or 0.0735"Hg
1"Hg = 0.491psi or 13.6" wc
1psi = 27.7"wc or 2.036"Hg

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DUCT ON/OFF HIGH LIMIT

HC-101 Series, HC-201

Two-Position Electric Controller

These controllers provide low or line voltage on-off single stage control of humidifiers, dehumidifiers, valves, solenoid valves, compressors, relays, etc.

Features:

- SPDT switching for humidification/dehumidification.
  Agency listed room and duct units.
  Long life nylon elements.
  Standard locking feature.

Model Chart

Description.

Model No.	Description	Scale Range % RH	Differential % RH	
			Switch	Interstage
HC-101	Room	10 to 90	5	—
HC-201	Duct	15 to 95		

Maximum Electrical Ratings.

Model No.	AC Volt 50/60 Hz	FLA	LRA	Resistive Amps	Pilot Duty VA
HC-101	24	—	—	8	60
HC-201	240	3.6	21.6		345

Blank cover insert and 5/64" Allen head cover screw included to convert room humidistat to concealed adjustment if required.

HC-101

Figure 1 Blank Cover (HC-101).

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I01 Series, HC-201

Installation Information.

Model No.	Connections	Dimensions	Cover Material
HC-101	6 in. (150 mm) color coded leads	4-3/8 H x 2-7/8 W x 1-5/8 D in. (111 x 73 x 41 mm)	Beige Plastic
HC-201	Coded screw terminals	4-3/4 H x 6-1/2 W x 2-1/4 D in. (121 x 165 x 57 mm)	Metal

Specifications

Control dial settings	Refer to Description Model Chart.
Humidity sensing element	Nylon ribbon.
Differential	Refer to Description Model Chart.
Environment	
Ambient temperature limits	Operating: 40 to 125°F (4 to 52°C). Shipping and Storage: -40 to 140°F (-40 to 60°C).
Humidity	5 to 95% RH non-condensing.
Locations	NEMA Type 1.
Electrical Switch	One snap-acting SPDT.
Ratings	Refer to Maximum Electrical Ratings Model Chart.
Connections	Refer to Installation Information Model Chart.
Mounting	
HC-101	Flush or surface switch boxes or, for 24 V only, directly to wall.
HC-201	In any position on the outside surface of return air duct.
Dimensions	Refer to Installation Information Model Chart.
Cover	Refer to Installation Information Model Chart.

Accessories

Model No.	Description
Accessories for HC-101 only	
AT-504	Aux. mounting base.
AT-505	Wall box cover plate.
AT-546	Aux. mounting base.
AT-1104	Cast guard.
AT-1155	Plastic guard.
AT-1165	Plastic guard.

Typical Applications

Figure 2 HC-101, and HC-201 Switch Action and Terminal Identification.