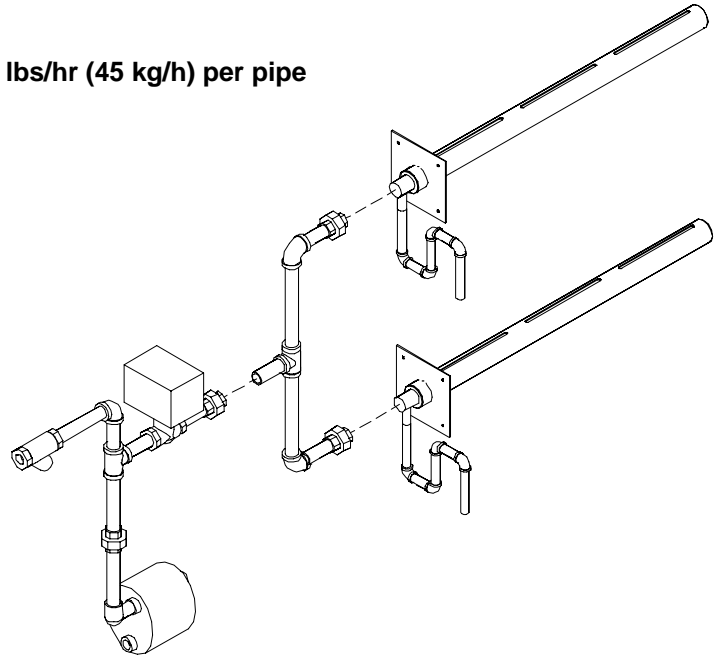
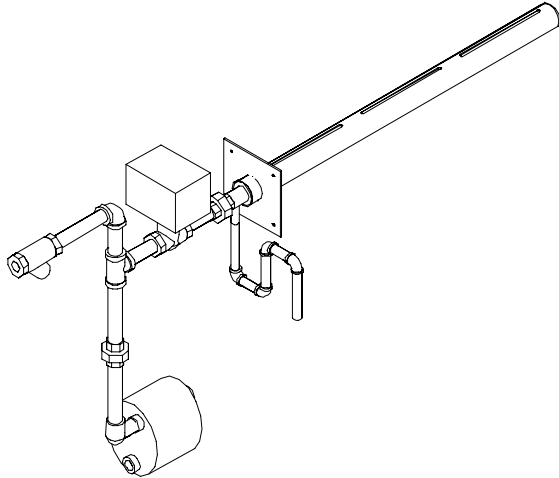


## Design Manual For UltimateSteam Direct Steam Humidifiers

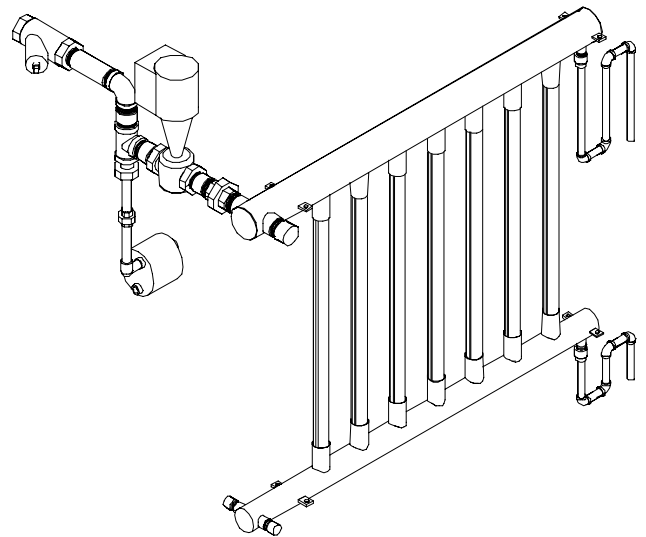
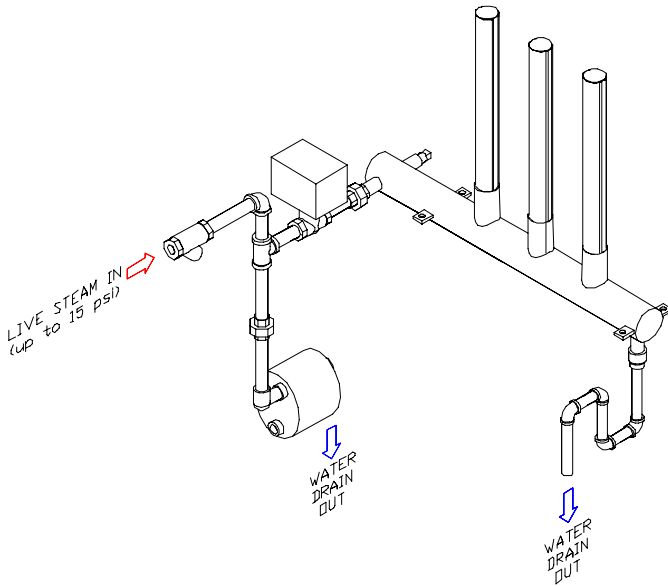
### Three Systems For Flexibility

Single pipe - up to 100 lbs/hr (45 kg/h) per pipe



Multi-pipe/bottom feed - up to 541 lbs/hr (246 kg/h)

Multi-pipe/topfeed - up to 2,200 lbs/hr (1000 kg/h)



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## HOW THE ULTIMATESTEAM WORKS

Steam enters the UltimateSteam manifold from a control valve and immediately drops to atmospheric pressure. This is important as this stops further steam expansion and produces the maximum condensate drop out, resulting in very high quality steam to be discharged to the duct.

The steam then discharges through vertical slots which produce a 100% steam to air contact ratio, resulting in the shortest possible evaporation distance. The manifolds are also coated with a proprietary high tech 30 mil thick insulation that reduces condensate and duct heat gain.

## NOMENCLATURE

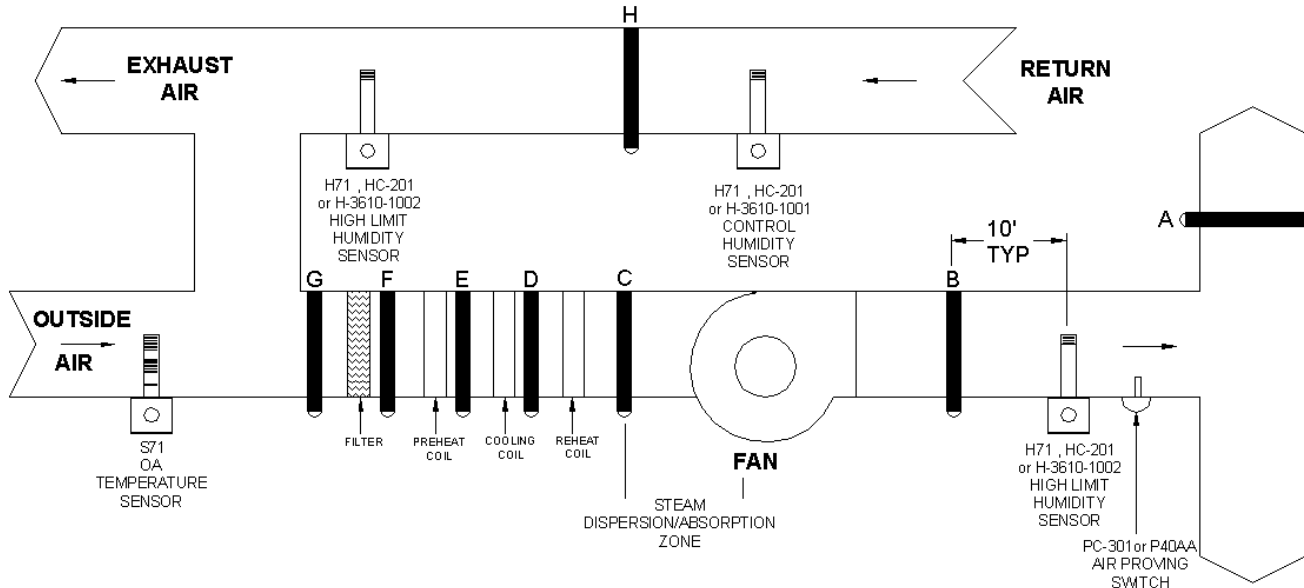
Any UltimateSteam Humidification System consists of 1) a steam control valve & electronic or pneumatic actuator, 2) a humidifier distribution manifold sized for the duct or air handler, 3) steam trap and strainer, 4) the controlling humidistats and/or sensors and 5) any optional equipment required.

The steam humidifier models are designated as follows:

<b>Model Selection</b>				
<b>DS</b>	<b>B</b>	<b>H</b>	<b>F</b>	<b>00000</b>
DS = UltimateSteam	Type	Width	Height	Version
	0=single pipe	A=12 (300 mm)	A=12 (300 mm)	Internal Use Only
	B=bottom fed	B=18 (450 mm)	B=18 (450 mm)	
	T=top fed	C=24 (600 mm)	C=24 (600 mm)	
		D=36 (900 mm)	D=36 (900 mm)	
		E=48 (1200 mm)	E=48 (1200 mm)	
		F=60 (1500 mm)	F=60 (1500 mm)	
		G=72 (1800 mm)	G=72 (1800 mm)	
		H=84 (2100 mm)	H=84 (2100 mm)	
		I=96 (2400 mm)	I=96 (2400 mm)	
		L=108 (2700 mm)	L=108 (2700 mm)	
		M=120 (3000 mm)	M=120 (3000 mm)	

## Step 1: Locate The UltimateSteam Manifold

Properly locating the UltimateSteam humidifier and its controls in your air handler or duct is very important - most steam absorption problems are the result of improper installation.



### Locations:

- A. BEST: locate far enough from elbow to be in laminar air flow. Maintain evaporation distance.
- B. BEST: locate with enough distance for proper evaporation and to avoid turbulence from the fan.
- C. GOOD: providing there is enough distance for proper evaporation from the humidifier manifold to the fan inlet (back of fan doesn't really matter).
- D. OK: providing there is enough distance for proper evaporation from the humidifier manifold to the heating coil (particularly if the heating coil is electric)
- E. POOR: workable if the cooling coil is inactive during humidifier operation. An active cooling coil will remove the moisture the humidifier is trying to put in.
- F. POOR: same problems as C&D plus the air may be very cold, increasing evaporation distance or causing condensation.
- G. POOR: same problems as C, D, & E plus the filters may get wet producing an unsafe conditions with growth of biologicals.
- H. POOR: only workable if the system is 100% recirculated air with no exhaust.

The following pages have nomographs and formulas for evaporation distance.

**To determine the UltimateSteam evaporation distance (English):**

**1. Formula For Calculating UltimateSteam Evaporation Distance:**

The following formula is for approximating evaporation distances (range: 35 - 90°F, 10-99%RH).

$$\frac{(\text{Leaving \%RH} - \text{Entering \%RH}) \times ((\text{duct width} \times \text{duct height}) / (\text{humidifier width} \times \text{humidifier height})) \times ((100 - \text{duct temperature}) / 100)}{}$$

Accordingly, if you have a 48" x 36" humidifier in a 48" x 36" duct with entering condition of 30%RH and leaving condition of 70%RH and duct temperature of 55°F:

$$(70 - 30) \times ((48 \times 36) / (48 \times 36)) \times ((100 - 55) / 100) = 18 \text{ inches evaporation distance}$$

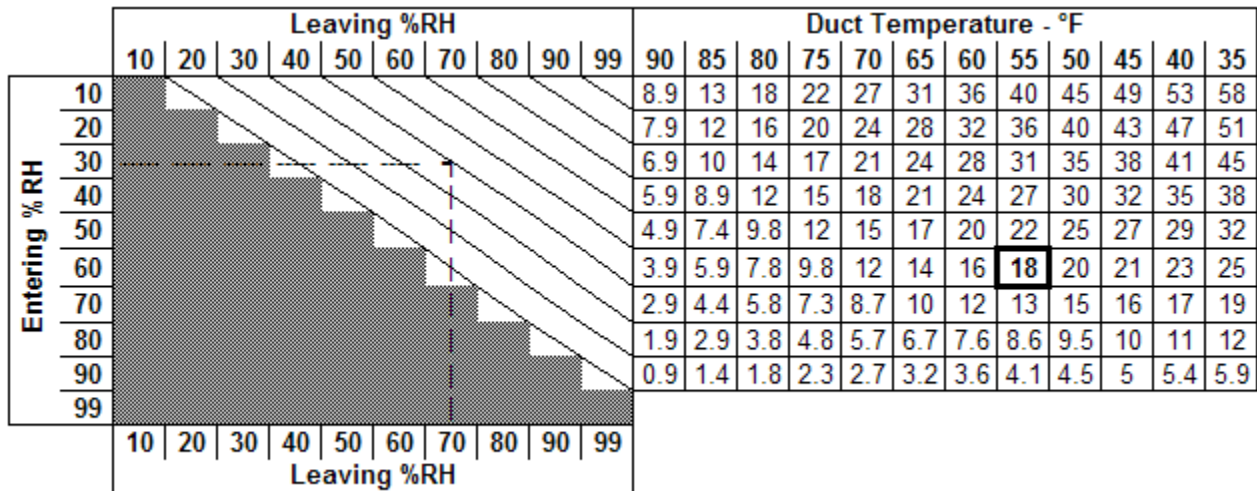
If the actual humidifier was a smaller size (36" x 24" in a 48" x 36" duct):

$$(70 - 30) \times ((48 \times 36) / (36 \times 24)) \times ((100 - 55) / 100) = 36 \text{ inches evaporation distance}$$

Since duct velocity has a self-canceling effect, this formula works on velocities up to 2,000 fpm. Be sure to use accurate entering and leaving conditions at the worst point, ie: highest differential.

**2. Nomograph For Determining UltimateSteam Evaporation Distance:**

To use nomograph, move horizontal from the Entering %RH to the vertical intersection of the Leaving %RH. Then move diagonally left and down to the duct intersection of the horizontal temperature line, and horizontal across to the vertical intersection of the Duct temperature.



Example: Entering 30%RH, Leaving 70%RH, Temperature 55°F = 18 inches

**NOTES:**

1. Nomograph assumes an UltimateSteam manifold sized properly to the duct size.
2. Carel considers evaporation distance to be the point where the average droplet size is below 0.5 microns (invisible). "Non-wetting distance" as used by some competitors is undefined.
3. DS0 single pipe UltimateSteam units are generally 2 times the above evaporation distances, but adding multiple DS0 pipes reduces the evaporation distance by the square.

**To determine the UltimateSteam evaporation distance (Metric):**

**1. Formula For Calculating UltimateSteam Evaporation Distance:**

The following formula is for approximating evaporation distances (range: 1 - 32°C, 10-99%RH).

$$\frac{(\text{Leaving \%RH} - \text{Entering \%RH}) \times ((\text{duct width} \times \text{duct height}) / (\text{humidifier width} \times \text{humidifier height})) \times ((100 - (1.8 \times \text{duct temperature} + 32)) / 100) \times 25.4}{}$$

Accordingly, if you have a 1200mm x 900mm humidifier in a 1200mm x 900mm duct with entering condition of 30%RH and leaving condition of 70%RH and duct temperature of 13°C:

$$(70 - 30) \times ((1200 \times 900) / (1200 \times 900)) \times ((100 - (1.8 \times 13 + 32)) / 100) \times 25.4 = 453\text{mm evaporation distance}$$

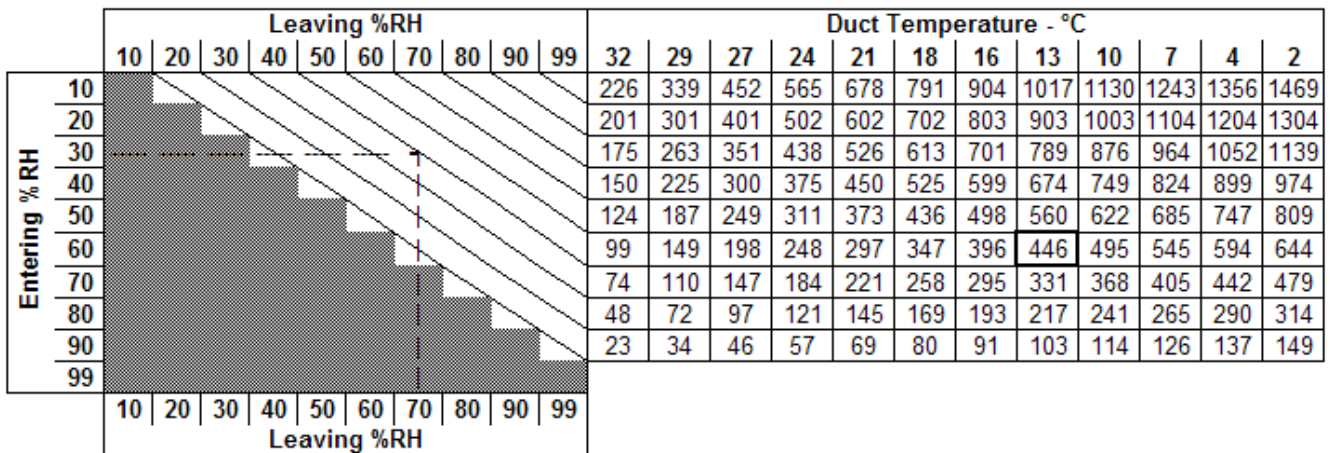
If the actual humidifier was a smaller size (900mm x 600mm in a 1200mm x 900mm duct):

$$(70 - 30) \times ((1200 \times 900) / (900 \times 600)) \times ((100 - (1.8 \times 13 + 32)) / 100) \times 25.4 = 906\text{mm evaporation distance}$$

Since duct velocity has a self-canceling effect, this formula works on velocities up to 10 mps. Be sure to use accurate entering and leaving conditions at the worst point, ie: highest differential.

**2. Nomograph For Determining UltimateSteam Evaporation Distance:**

To use nomograph, move horizontal from the Entering %RH to the vertical intersection of the Leaving %RH. Then move diagonally left and down to the duct intersection of the horizontal temperature line, and horizontal across to the vertical intersection of the Duct temperature.



Example: Entering 30%RH, Leaving 70%RH, Temperature 13°C = 446mm

**NOTES:**

1. Nomograph assumes an UltimateSteam manifold sized properly to the duct size.
2. Carel considers evaporation distance to be the point where the average droplet size is below 0.5 microns (invisible). "Non-wetting distance" as used by some competitors is undefined.
3. DS0 single pipe UltimateSteam units are generally 2 times the above evaporation distances, but adding multiple DS0 pipes reduces the evaporation distance by the square.

## Step 2. Select Steam Valve and Actuator

The following table shows the capacity of each valve at 2 to 60 psi steam pressure (0.14 to 4 Bar), its size, and Cv rating. Select the appropriate Cv size valve by the available steam pressure and load requirement.

### ENGLISH

	Steam Pressure, PSI													Inlet FPT	Valve Cv
	2	5	10	15	20	25	30	35	40	45	50	55	60		
Maximum Capacity - lbs/hr	6.7	11	16.7	21.6										1/2	0.4
	10.5	17.4	26	34										1/2	0.63
	16.6	28	42	54	65	72	81	90	100	109	118	127	136	1/2	1
	27	44	67	86	104	116	131	145	160	174	189	204	218	1/2	1.6
	42	69	104	135	163	181	204	227	249	272	295	318	340	1/2	2.5
	67	110	167	216	261	290	326	362	399	435	471	507	544	1/2	4
	105	174	263	341	411	456	513	570	628	685	742	799	857	3/4	6.3
	166	275	417	541	653	724	815	906	996	1087	1178	1269	1360	1	10
	266	441	667	867	1044	1158	1303	1449	1594	1740	1885	2031	2176	1-1/4	16
	416	689	1042	1355	1632	1810	2037	2264	2492	2719	2946	3173	3401	1-1/2	25
666	1102	1667	2168										2	40	

### METRIC

	Steam Pressure, Bar													Inlet FPT	Valve Cv
	0.14	0.34	0.69	1	1.4	1.7	2.1	2.4	2.8	3.1	3.4	3.8	4.1		
Maximum Capacity - kg/h	3	5	7.6	9.8										1/2	0.4
	4.8	7.9	11.8	15.5										1/2	0.63
	7.5	12.7	19.1	24.5	30	33	37	41	45	50	54	58	62	1/2	1
	12	20	30	39	47	53	60	66	73	79	86	93	99	1/2	1.6
	19	31	47	61	74	82	93	103	113	124	134	145	155	1/2	2.5
	30	50	76	98	119	132	148	165	181	198	214	230	247	1/2	4
	48	79	120	155	187	207	233	259	285	311	337	363	390	3/4	6.3
	75	125	190	246	297	329	370	412	453	494	535	577	618	1	10
	121	200	303	394	475	526	592	659	725	791	857	923	989	1-1/4	16
	189	313	474	616	742	823	926	1029	1133	1236	1339	1442	1546	1-1/2	25
303	501	758	985										2	40	

Using the Cv rating of the selected valve, you can then select the proper part number from the following chart, based on pressure and standard or stainless steel requirements.

### Valve Assemblies

Valve Cv	Pressure Valve Fittings	Standard		Stainless Steel	
		2-15 psi (0.14-1 Bar) Brass, SS trim Black iron	20-60 psi (1.4-4 Bar) Brass, SS trim Black iron	2-15 psi (0.14-1 Bar) Bronze, SS trim Stainless Steel	20-60 psi (1.4-4 Bar) Bronze, SS trim Stainless Steel
	0.4	DSAK24V00A		DSAK24VS0A	
	0.63	DSAK24V00B		DSAK24VS0B	
	1	DSAK24V00C	DSAK24V0HC	DSAK24VS0C	DSAK24VSHC
	1.6	DSAK24V00D	DSAK24V0HD	DSAK24VS0D	DSAK24VSHD
	2.5	DSAK24V00E	DSAK24V0HE	DSAK24VS0E	DSAK24VSHE
	4	DSAK24V00F	DSAK24V0HF	DSAK24VS0F	DSAK24VSHF
	6.3	DSAK34V00G	DSAK34V0HG	DSAK34VS0G	DSAK34VSHG
	10	DSAK44V00H	DSAK44V0HH	DSAK44VS0H	DSAK44VSHH
	16	DSAK54V00I	DSAK54V0HI	DSAK54VS0I	DSAK54VSHI
	25	DSAK64V00J	DSAK64V0HJ	DSAK64VS0J	DSAK64VSHJ
	40	DSAK84V00K		DSAK84VS0K	

Using the Valve Cv again, select the appropriate actuator (Electronic or Pneumatic) for the steam pressure range.

**Valve Actuators**

	Pressure	Electronic		Pneumatic	
		2-15 psi (0.14-1 Bar)	20-60 psi (1.4-4 Bar)	2-15 psi (0.14-1 Bar)	20-60 psi (1.4-4 Bar)
<b>Valve Cv</b>	0.4	DSA004E001		DSA004P001	
	0.63	DSA004E001		DSA004P001	
	1	DSA004E001	DSA004E002	DSA004P001	DSA004P002
	1.6	DSA004E001	DSA004E002	DSA004P001	DSA004P002
	2.5	DSA004E001	DSA004E002	DSA004P001	DSA004P002
	4	DSA004E001	DSA004E002	DSA004P001	DSA004P002
	6.3	DSA004E001	DSA004E002	DSA004P001	DSA004P002
	10	DSA004E001	DSA004E002	DSA004P001	DSA004P003
	16	DSA004E002	DSA004E002	DSA004P002	DSA004P003
	25	DSA004E002	DSA004E002	DSA004P002	DSA004P003
40	DSA004E002		DSA004P003		

Example: A valve for 100 lbs/hr at 10 psi with electronic actuator would be:

Part No. DSAK24V00E which is a 1/2" valve with a 2.5 Cv.

Part No. DSA004E001 is the mating electronic actuator.

Alternatively Part No. DSA004P001 would be appropriate pneumatic actuator.

**NOTE: The valves in the shaded area work ONLY with the DST (top fed) models.**

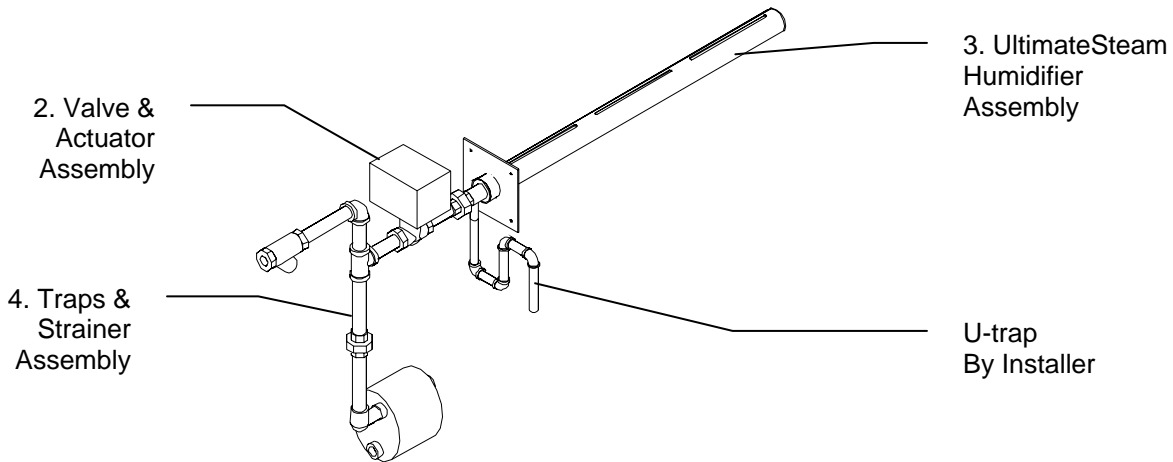
**Step 2A. Select which type of UltimateSteam to use**

- If your valve selection from Step 2 above is in the shaded area of the table (1-1/4" or greater), then you must use the DST top fed model (Step 3C).
- If the required capacity is greater than 541 lbs/hr, then you must use a DST top fed model (Step 3C).
- If the required capacity is greater than 100 lbs/hr, but less than 542 lbs/hr, you can use the DSB bottom fed model (Step 3B).
- If the required capacity is 100 lbs/hr or less, and the available evaporation distance is 36" or greater, then you can use the DS0 single pipe model (Step 3A).
- If the available evaporation distance is less than 36", then you should generally use either the DSB or DST multi-pipe models.

### Step 3: Size The UltimateSteam Manifold

#### Step 3A: DS0 Single Manifolds

This version is equal to the standard jacketed steam humidifier and consists of a single distributor pipe up to 72 inches (1800 mm) long. The distributor pipe is actually a pipe within a pipe and having the special insulation coating on the outside. These are NOT short absorption distance humidifiers.



#### ENGLISH

	Nominal Length	Actual Length	2A. Part No.	Maximum Capacity	Weight	Box Size
WIDTH-Inches	12"	11"	DS0A000000	50 lbs/hr	5 lbs	9x7x17"
	18"	17"	DS0B000000	50 lbs/hr	6 lbs	9x7x23"
	24"	23"	DS0C000000	100 lbs/hr	7 lbs	9x7x29"
	36"	35"	DS0D000000	100 lbs/hr	10 lbs	9x7x41"
	48"	47"	DS0E000000	100 lbs/hr	12 lbs	9x7x53"
	60"	59"	DS0F000000	100 lbs/hr	14 lbs	9x7x65"
	72"	71"	DS0G000000	100 lbs/hr	17 lbs	9x7x77"

#### METRIC

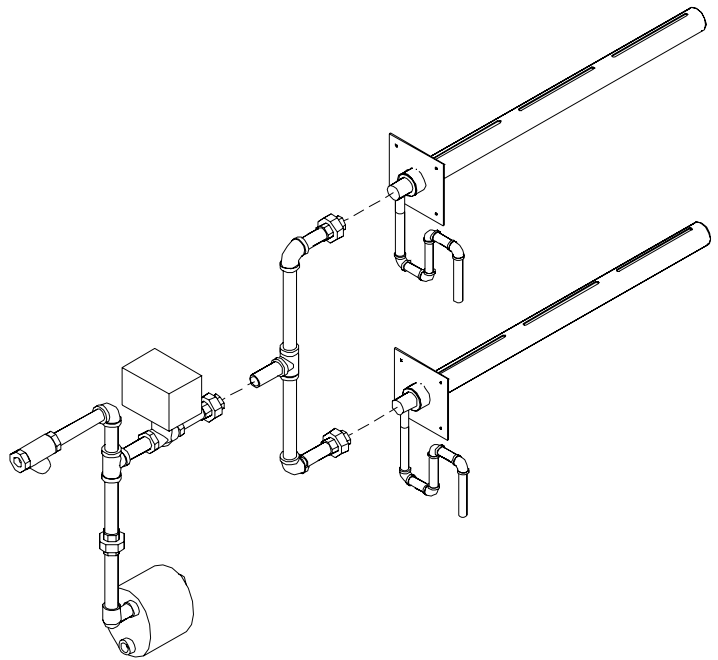
	Nominal Length	Actual Length	2A. Part No.	Maximum Capacity	Weight	Box Size
WIDTH-mm	300	280	DS0A000000	23 kg/h	2.3 kg	229x178x432
	450	432	DS0B000000	23 kg/h	2.8 kg	229x178x585
	600	585	DS0C000000	45 kg/h	3.2 kg	229x178x737
	900	889	DS0D000000	45 kg/h	4.6 kg	229x178x1042
	1200	1194	DS0E000000	45 kg/h	5.5 kg	229x178x1347
	1500	1499	DS0F000000	45 kg/h	6.4 kg	229x178x1651
	1800	1803	DS0G000000	45 kg/h	7.7 kg	229x178x1956

The DS0 model UltimateSteam single manifolds are designed to be mounted to the side of a duct or air handler and extend into the plenum. Select the closest nominal size manifold that is equal to or less than the duct width.

Example: A DS0D UltimateSteam manifold will fit a 36" (900 mm) wide duct. It will NOT fit a 35" (889 mm) duct. The trap assembly requires a 19 inch (480 mm) drip leg.

Multiple DS0 manifolds may be connected a single valve & trap assembly if required.

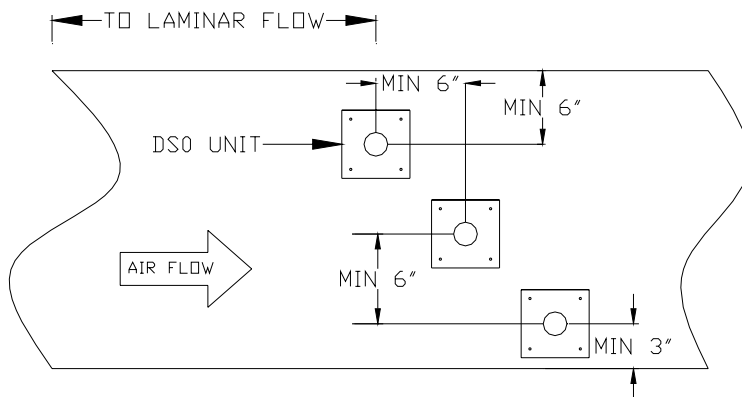
Size the valve & trap for the required capacity and add DS0 manifolds as necessary to meet the capacity.



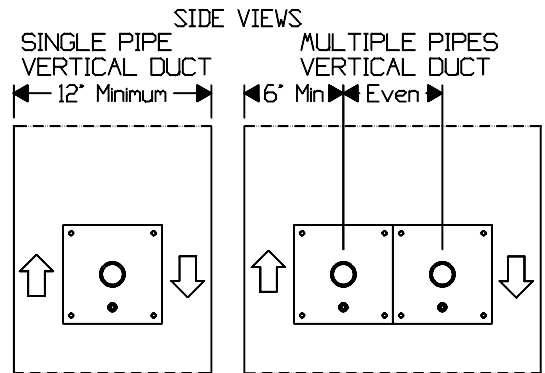
to

Generally the distributor manifolds should be mounted in the center of the air stream, far enough down stream of any elbows or turns to be in the laminar air flow. Multiple pipes need to be evenly spaced to cover the duct surface area.

SIDE VIEW

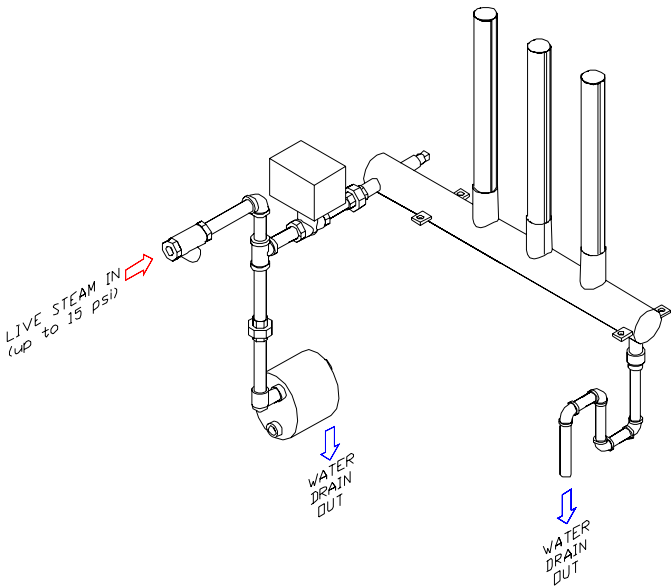


In vertical ducts, the distributor manifolds are mounted in the center with the slots facing up. The airflow may be up or down, but when the airflow is down, maximum velocity is 1,500 fpm (7.62 m/s).



**OR Step 3B: DSB Bottom Fed Manifold Models**

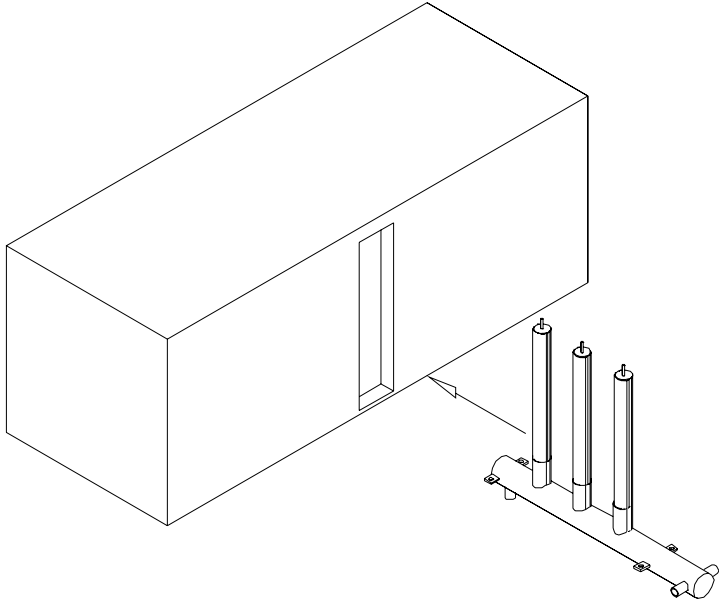
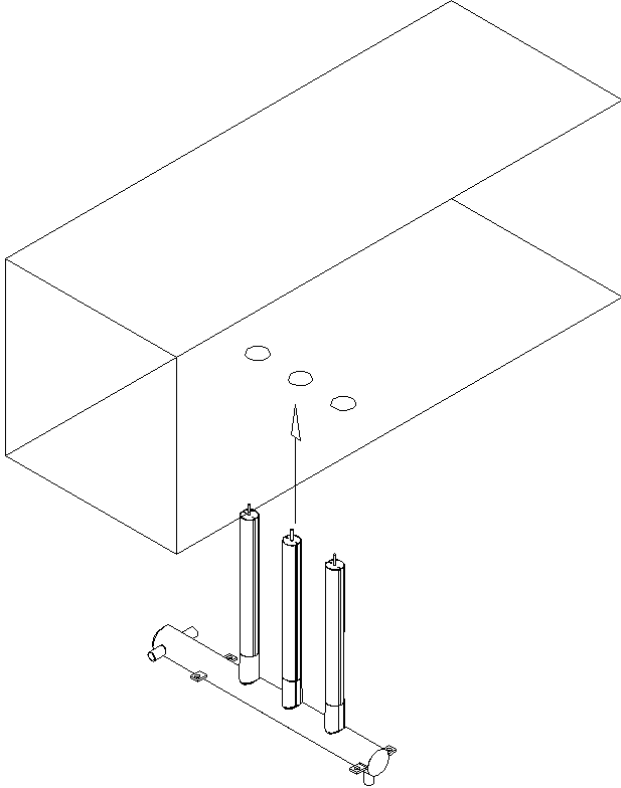
DSB bottom fed manifold models are designed to push steam up the vertical distribution pipes while allowing condensate to run down. The bottom feeder manifold works as both steam feed/condensate drain and condensate separator.



With the feed manifold hanging underneath,

OR

With the entire system in the duct



TOP VIEW

All UltimateSteam multi-manifold systems (DSB, DST) are designed so that 6" (150 mm) clearance should be allowed from the vertical distribution tubes on each end of the manifold to the sides of the duct or air handler.

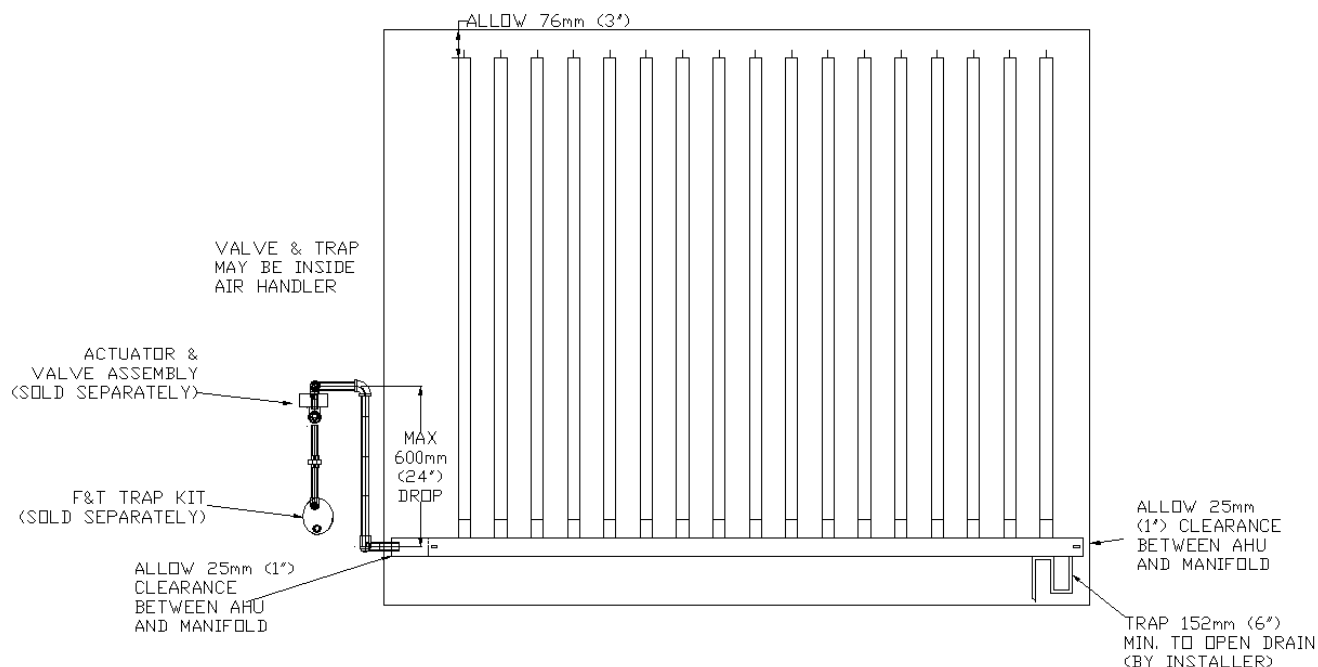
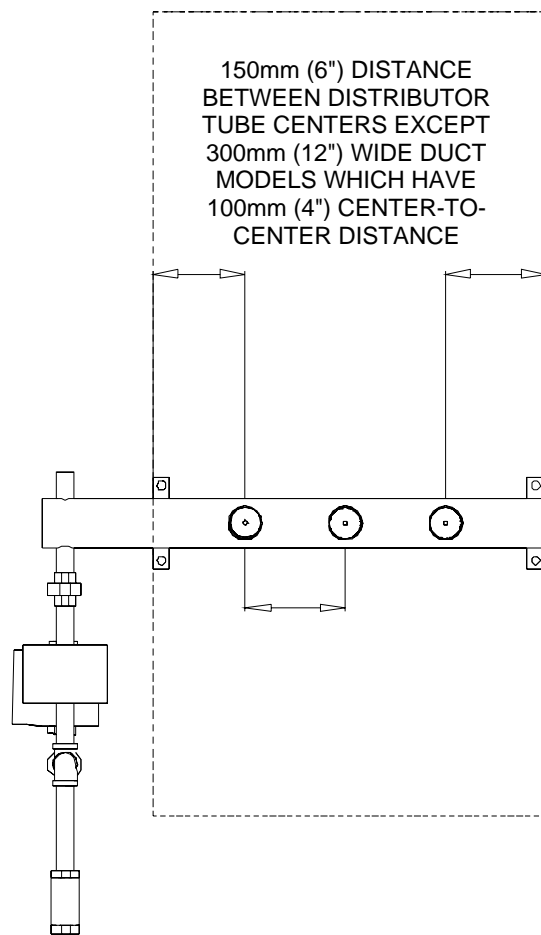
If the feeder manifold is placed in or under the duct, the first 6" (150 mm) of the feed end should extend out past the edge of the duct.

In the case of duct installation, the trap and control valve assemblies are usually located external to the duct. The nominal size of the UltimateSteam is designed to fit the same size nominal duct or larger.

Example: A DSBED, 48" wide x 36" high (1200 mm wide x 900 mm high) UltimateSteam manifold will fit a 48" wide by 36" high (1200 mm wide x 900 mm high) duct.

When installed inside an air handler, the system must be downsized by one size in both height and width to accommodate the necessary traps and control valve.

Example: A DSBED UltimateSteam manifold will fit a 60" wide by 48" high (1500 mm wide x 1200 mm high) air handler with all traps and control valve inside.



DSB Models Size Selection Chart – ENGLISH

		Nominal Width - inches										
		18 (B)	24 (C)	36 (D)	48 (E)	60 (F)	72 (G)	84 (H)	96 (I)	108 (L)	120 (M)	
Nominal Height - inches	12 (A)	Actual Size	24x12	30x12	42x12	54x12	66x12	78x12	90x12	102x12	114x12	126x12
		Max lbs/hr	100	150	250	350	450	541	541	541	541	541
		Weight (lbs)	16	20	28	36	44	52	60	68	76	84
	18/24 (B/C)	Actual Size	24x16	30x16	42x16	54x16	66x16	78x16	90x16	102x16	114x16	126x16
		Max lbs/hr	150	225	375	525	541	541	541	541	541	541
		Weight (lbs)	16	20	28	36	44	52	60	68	76	84
	36 (D)	Actual Size	24x28	30x28	42x28	54x28	66x28	78x28	90x28	102x28	114x28	126x28
		Max lbs/hr	150	225	375	525	541	541	541	541	541	541
		Weight (lbs)	18	23	33	43	53	63	73	83	93	103
	48 (E)	Actual Size	24x40	30x40	42x40	54x40	66x40	78x40	90x40	102x40	114x40	126x40
		Max lbs/hr	150	225	375	525	541	541	541	541	541	541
		Weight (lbs)	20	26	38	50	62	74	86	98	110	122
60 (F)	Actual Size	24x52	30x52	42x52	54x52	66x52	78x52	90x52	102x52	114x52	126x52	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	22	29	43	57	71	85	99	113	127	141	
72 (G)	Actual Size	24x64	30x64	42x64	54x64	66x64	78x64	90x64	102x64	114x64	126x64	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	24	32	48	64	80	96	112	128	144	160	
84 (H)	Actual Size	24x76	30x76	42x76	54x76	66x76	78x76	90x76	102x76	114x76	126x76	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	26	35	53	71	89	107	125	143	161	179	
96 (I)	Actual Size	24x88	30x88	42x88	54x88	66x88	78x88	90x88	102x88	114x88	126x88	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	28	38	58	78	98	118	138	158	178	198	
108 (L)	Actual Size	24x100	30x100	42x100	54x100	66x100	78x100	90x100	102x100	114x100	126x100	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	30	41	63	85	107	129	151	173	195	217	
120 (M)	Actual Size	24x112	30x112	42x112	54x112	66x112	78x112	90x112	102x112	114x112	126x112	
	Max lbs/hr	150	225	375	525	541	541	541	541	541	541	
	Weight (lbs)	32	44	68	92	116	140	164	188	212	236	

**NOTES:**

\*: 12 inch and 18 inch models MUST be mounted with the traps and valve outside of the duct.

Units outside shaded area (smaller than 36 inches wide x 24 inches high) may NOT have the traps and valve mounted inside the duct or AHU.

Trap assembly height = 19 inches. Traps hang either below the humidifier header or must be mounted higher and the steam supply then piped down into the header.

**Example:**

**DSB H C =**

DSB model, nominal 84" wide by 24" high (actual = 90" wide by 18" high) with a maximum capacity of 541 lbs/hr.

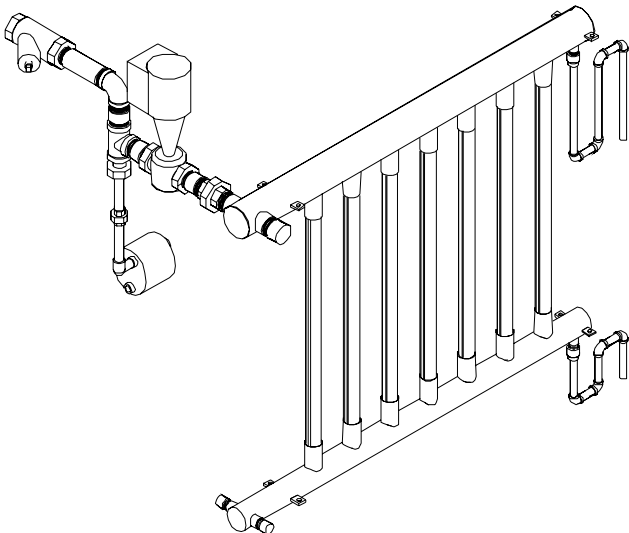
DSB Models Size Selection Chart – METRIC

		Nominal Width - mm										
		450 (B)	600 (C)	900 (D)	1200 (E)	1500 (F)	1800 (G)	2100 (H)	2400 (I)	2700 (L)	3000 (M)	
Nominal Height - mm	300 (A)	Actual Size	610x305	762x305	1067x305	1372x305	1676x305	1981x305	2286x305	2591x305	2896x305	3200x305
		Max kg/h	45.5	68.2	113.6	159.1	204.5	245.9	245.9	245.9	245.9	245.9
		Weight (kg)	7	9	13	16	20	24	27	31	35	38
	450/600 (B/C)	Actual Size	610x406	762x406	1067x406	1372x406	1676x406	1981x406	2286x406	2591x406	2896x406	3200x406
		Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9
		Weight (kg)	7	9	13	16	20	24	27	31	35	38
	900 (D)	Actual Size	610x711	762x711	1067x711	1372x711	1676x711	1981x711	2286x711	2591x711	2896x711	3200x711
		Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9
		Weight (kg)	8	10	15	20	24	29	33	38	42	47
	1200 (E)	Actual Size	610x1016	762x1016	1067x1016	1372x1016	1676x1016	1981x1016	2286x1016	2591x1016	2896x1016	3200x1016
		Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9
		Weight (kg)	9	12	17	23	28	34	39	45	50	55
1500 (F)	Actual Size	610x1321	762x1321	1067x1321	1372x1321	1676x1321	1981x1321	2286x1321	2591x1321	2896x1321	3200x1321	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	10	13	20	26	32	39	45	51	58	64	
1800 (G)	Actual Size	610x1626	762x1626	1067x1626	1372x1626	1676x1626	1981x1626	2286x1626	2591x1626	2896x1626	3200x1626	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	11	15	22	29	36	44	51	58	65	73	
2100 (H)	Actual Size	610x1930	762x1930	1067x1930	1372x1930	1676x1930	1981x1930	2286x1930	2591x1930	2896x1930	3200x1930	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	12	16	24	32	40	49	57	65	73	81	
2400 (I)	Actual Size	610x2235	762x2235	1067x2235	1372x2235	1676x2235	1981x2235	2286x2235	2591x2235	2896x2235	3200x2235	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	13	17	26	35	45	54	63	72	81	90	
2700 (L)	Actual Size	610x2540	762x2540	1067x2540	1372x2540	1676x2540	1981x2540	2286x2540	2591x2540	2896x2540	3200x2540	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	14	19	29	39	49	59	69	79	89	99	
3000 (M)	Actual Size	610x2845	762x2845	1067x2845	1372x2845	1676x2845	1981x2845	2286x2845	2591x2845	2896x2845	3200x2845	
	Max kg/h	68.2	102.3	170.5	238.6	245.9	245.9	245.9	245.9	245.9	245.9	
	Weight (kg)	15	20	31	42	53	64	75	85	96	107	

**OR Step 3C: DST Top Fed Manifold Models**

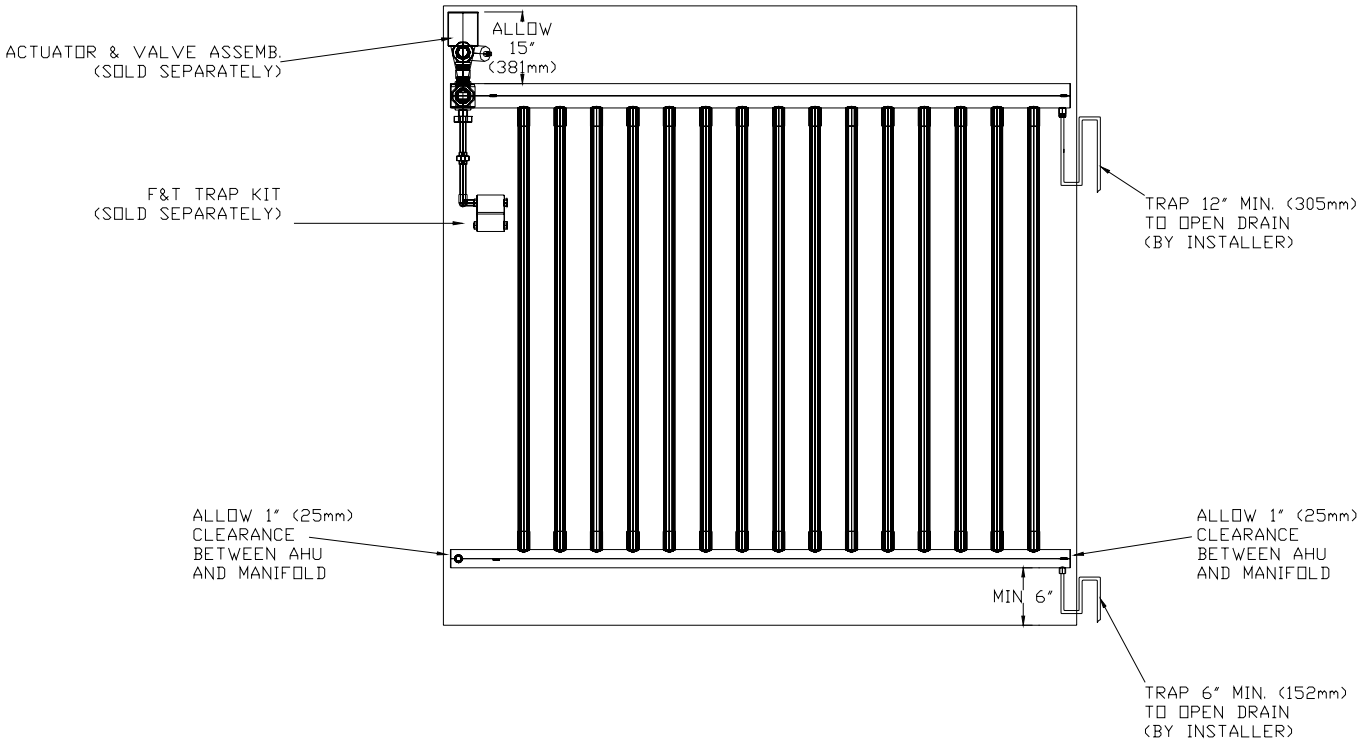
The DST top fed manifold models essentially double the output capacity by allowing both steam and condensate to run downward in the same direction.

If installed in the duct, the first 6" of the top and bottom manifolds would extend outside of the duct.



When installed inside an air handler, the unit must be downsized by one (1) nominal size in width and two (2) nominal sizes in height.

Example: A DSTGF (72" wide x 60" high) will fit an air handler with internal dimensions of 84" wide by 84" high.



DST Models Size Selection Chart – ENGLISH

			Nominal Width - inches							
			36 (D)	48 (E)	60 (F)	72 (G)	84 (H)	96 (I)	108 (L)	120 (M)
Nominal Height - inches	24 (C)	Actual Size	42x20	54x20	66x20	78x20	90x20	102x20	114x20	126x20
		Max lbs/hr	667	933	1,200	1,467	1,467	1,467	1,467	1,467
		Weight (lbs)	46	60	74	88	102	116	130	144
	36 (D)	Actual Size	42x32	54x32	66x32	78x32	90x32	102x32	114x32	126x32
		Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200
		Weight (lbs)	51	67	83	99	115	131	147	163
	48 (E)	Actual Size	42x44	54x44	66x44	78x44	90x44	102x44	114x44	126x44
		Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200
		Weight (lbs)	56	74	92	110	128	146	164	182
	60 (F)	Actual Size	42x56	54x56	66x56	78x56	90x56	102x56	114x56	126x56
Max lbs/hr		1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
Weight (lbs)		61	81	101	121	141	161	181	201	
72 (G)	Actual Size	42x68	54x68	66x68	78x68	90x68	102x68	114x68	126x68	
	Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
	Weight (lbs)	66	88	110	132	154	176	198	220	
84 (H)	Actual Size	42x80	54x80	66x80	78x80	90x80	102x80	114x80	126x80	
	Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
	Weight (lbs)	71	95	119	143	167	191	215	239	
96 (I)	Actual Size	42x92	54x92	66x92	78x92	90x92	102x92	114x92	126x92	
	Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
	Weight (lbs)	76	102	128	154	180	206	232	258	
108 (L)	Actual Size	42x104	54x104	66x104	78x104	90x104	102x104	114x104	126x104	
	Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
	Weight (lbs)	81	109	137	165	193	221	249	277	
120 (M)	Actual Size	42x116	54x116	66x116	78x116	90x116	102x116	114x116	126x116	
	Max lbs/hr	1,000	1,400	1,800	2,200	2,200	2,200	2,200	2,200	
	Weight (lbs)	86	116	146	176	206	236	266	296	

**NOTES:**

Bottom manifold P-trap requires minimum of 6" clearance.

Valve adds 15 inches to the top of the DST models.

**Example:**

DST H C =

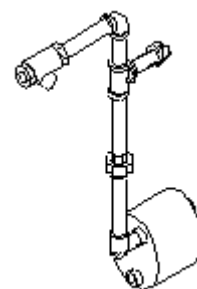
DST model, nominal 84" wide by 24" high (actual = 90" wide by 20" high) with a maximum capacity of 1,467 lbs/hr.

DST Models Size Selection Chart – METRIC

		Nominal Width - mm								
		900 (D)	1200 (E)	1500 (F)	1800 (G)	2100 (H)	2400 (I)	2700 (L)	3000 (M)	
Nominal Height - mm	600 (C)	Actual Size	1067x508	1372x508	1676x508	1981x508	2286x508	2591x508	2896x508	3200x508
		Max kg/h	303.2	424.1	545.5	666.8	666.8	666.8	666.8	666.8
		Weight (kg)	21	27	34	40	46	53	59	65
	900 (D)	Actual Size	1067x813	1372x813	1676x813	1981x813	2286x813	2591x813	2896x813	3200x813
		Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000
		Weight (kg)	23	30	38	45	52	60	67	74
	1200 (E)	Actual Size	1067x1118	1372x1118	1676x1118	1981x1118	2286x1118	2591x1118	2896x1118	3200x1118
		Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000
		Weight (kg)	25	34	42	50	58	66	75	83
1500 (F)	Actual Size	1067x1422	1372x1422	1676x1422	1981x1422	2286x1422	2591x1422	2896x1422	3200x1422	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	28	37	46	55	64	73	82	91	
1800 (G)	Actual Size	1067x1727	1372x1727	1676x1727	1981x1727	2286x1727	2591x1727	2896x1727	3200x1727	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	30	40	50	60	70	80	90	100	
2100 (H)	Actual Size	1067x2032	1372x2032	1676x2032	1981x2032	2286x2032	2591x2032	2896x2032	3200x2032	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	32	43	54	65	76	87	98	109	
2400 (I)	Actual Size	1067x2337	1372x2337	1676x2337	1981x2337	2286x2337	2591x2337	2896x2337	3200x2337	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	35	46	58	70	82	94	105	117	
2700 (L)	Actual Size	1067x2642	1372x2642	1676x2642	1981x2642	2286x2642	2591x2642	2896x2642	3200x2642	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	37	50	62	75	88	100	113	126	
3000 (M)	Actual Size	1067x2946	1372x2946	1676x2946	1981x2946	2286x2946	2591x2946	2896x2946	3200x2946	
	Max kg/h	454.5	636.4	818.2	1000	1000	1000	1000	1000	
	Weight (kg)	39	53	66	80	94	107	121	135	

Step 4: Select Steam Trap & Strainer Kit

Valve Cv	Part No.	Description
<b>Black Iron 2 to 60 psi</b>		
10 or less	DSAK44T000	1" Steam trap & strainer with plumbing kit
Greater than 10	DSAK84T000	2" Steam trap & strainer with plumbing kit
<b>Stainless Steel 2 to 60 psi</b>		
10 or less	DSAK44TS00	1" Steam trap & strainer with plumbing kit, all Stainless Steel
Greater than 10	DSAK84TS00	2" Steam trap & strainer with plumbing kit, all Stainless Steel



## Step 5: Select Controls

### **Electronic (For use with electronic valve actuators)**

***A typical controls package consists of:***

- a Modulating Electronic Humidistat (wall or duct), OR an HC-101 wall or HC-201 duct on/off humidistat;
- a HC-201 high-limit safety duct humidistat;
- a PC-301 air proving switch

Part No.	Description
<b>Modulating Electronic Humidistats:</b>	
H270W	Wall mount humidistat, internal RH sensor, 0-10 Vdc
H270WOA	Wall mount humidistat, internal RH sensor, 0-10 Vdc, OA air temp. sensor reduces RH setpoint as OA temperature goes down
H270WHL	Wall mount humidistat, internal RH sensor, 0-10 Vdc, duct hi-limit sensor
H270WHLOA	Wall mount humidistat, internal RH sensor, 0-10 Vdc, duct hi-limit sensor, OA temp. sensor reduces RH setpoint as OA temperature goes down
H270D	Duct mount humidistat, 0-10 Vdc
H270DOA	Duct mount humidistat, 0-10 Vdc, OA air temp. sensor reduces RH setpoint as OA temperature goes down
H270DHL	Duct mount humidistat, 0-10 Vdc, duct hi-limit sensor
H270DHLOA	Duct mount humidistat, 0-10 Vdc, duct hi-limit sensor, OA temp. sensor reduces RH setpoint as OA temperature goes down
H263	Diagnostic/programming tool with digital display
<b>Humidity Controls (On/Off):</b>	
HC-101	Wall Mount Humidistat, 20-80%
HC-201	Duct Mount Humidistat, 20-95% (also high limit)
<b>Miscellaneous Controls:</b>	
PC-301	Duct Mount Differential Air Pressure Switch

#### **NOTES:**

1. H270WHL and H270DHL humidistats have factory set high-limit setting of 85%RH with a 6.4% proportional band.
2. H270WHLOA and H270DHLOA humidistats have factory set high-limit setting of 85%RH with a 6.4% proportional band and a 20%RH set point auto-adjust from 32°F to -22°F.
3. Factory settings in the H270 humidistats may be ordered specially set for \$50 NET adder.
4. The H263 is a diagnostic tool that plugs into the H270 instruments and then allows field changing of the temperature and humidity limits, alarms and set points. This would be in place of ordering factory modifications.

#### **Controls Examples**

Example 1: On/Off control

- 1 - HC-101 wall mount humidistat (control)
- 1 - HC-201 duct mount humidistat (high-limit on/off)
- 1 - PC-301 air proving switch (safety)

Example 2: Modulating with high limit

- 1 - H270W wall mount modulating humidistat (control, 0-10 Vdc)
- 1 - HC-201 duct mount humidistat (high-limit on/off)
- 1 - PC-301 air proving switch (safety on/off)

Example 3: Modulating with high limit for VAV (Variable Air Volume) systems

- 1 - H270WHL wall mount modulating humidistat (control, 0-10 Vdc) with duct mount high-limit sensor
- 1 - PC-301 air proving switch (safety on/off)

Example 4: Modulating with high limit for VAV (Variable Air Volume) systems with outside air compensation

- 1 - H270WHLOA wall mount modulating humidistat (control, 0-10 Vdc) with duct mount high-limit sensor and outside air temperature sensor.

- 1 - PC-301 air proving switch (safety on/off)

NOTE: This arrangement automatically reduces the indoor humidity setting as the outside temperature becomes colder. This is to eliminate condensation on the windows.

**Pneumatic (For use with pneumatic valve actuators)**

***A typical controls package consists of:***

- a Modulating Pneumatic Humidistat (wall or duct);
- a high-limit safety duct humidistat;
- an air proving switch

Part No.	Description
<b>Modulating Pneumatic Humidistats (For use with pneumatic valve actuators):</b>	
H-4100-203	Room Control Humidistat (add T-4002-124 & T-4000-2138) (10-95%)
T-4002-124	Mounting bracket (used with H-4100-203)
T-4000-2138	Beige plastic cover for H-4100 (used with H-4100-203)
H-3610-1002	Duct Control Humidistat (10-55% range, preset at 35%)
<b>Pneumatic Hi-Limit Duct Humidistat:</b>	
H-3610-1001	Duct High Limit Humidistat (50-90% range, preset at 85%)
<b>Pneumatic Air Flow Switch:</b>	
F40AA2C	Air Flow Switch
<b>Pneumatic Restrictors:</b>	
R-3714-3000	Diode Tee
R-3710-1007	Restrictor

**Controls Examples**

Modulating control:

- 1 - H-4100-203 wall mount humidistat (control)
- 1 - H-3610-1001 duct mount humidistat (high-limit)
- 1 - F40AA2C air proving switch (safety)
- 1 - R-3714-3000 restrictor tee
- 1 - R-3710-1007 restrictor

## Final Examples:

**A steam humidifier is required for a 60" (1500 mm) wide by 48" (1200 mm) high duct, having a capacity of 840 lbs/hr (382 kg/h) at 15 psi (1 Bar), with electronic actuator.**

### Selection:

- 1 - DST F E 0000 UltimateSteam Humidifier
- 1 - DSAK54V00I Steam valve kit
- 1 - DSA004E002 Electronic actuator
- 1 - DSAK84T000 Steam trap & strainer kit

### Optional:

- 1 - H270W Wall mount humidistat, 0-10 Vdc
- 1 - HC-201 Hi-limit duct humidistat
- 1 - PC-301 Air proving switch

**A steam humidifier is required for a 100" (2540 mm) wide by 90" (2286 mm) high air handler, having a capacity of 1100 lbs/hr (500 kg/h) at 15 psi (1 Bar), with an electronic actuator.**

### Selection:

- 1 - DST H G 0000 UltimateSteam Humidifier
- 1 - DSAK64V00J Steam valve kit
- 1 - DSA004E002 Electronic actuator
- 1 - DSAK84T000 Steam trap & strainer kit

### Optional:

- 1 - H270DHL Duct mount humidistat with hi-limit duct sensor, 0-10 Vdc
- 1 - PC-301 Air proving switch

**A steam humidifier is required for a 34" (864 mm) wide by 22" (559 mm) high duct, having a capacity of 85 lbs/hr (39 kg/h) at 10 psi (0.69 Bar), with a pneumatic actuator.**

### Selection:

- 1 - DS0 C 0 0000 UltimateSteam Humidifier
- 1 - DSAK24V00E Steam valve kit
- 1 - DSA004P001 Pneumatic actuator
- 1 - DSAK44T000 Steam trap & strainer kit

### Optional:

- 1 - H-4100-203 Room Control Humidistat
- 1 - T-4002-124 Mounting bracket
- 1 - T-4000-2138 Beige plastic cover for H-4100
- 1 - H-3610-1001 Duct High Limit Humidistat
- 1 - F40AA2C Air Flow Switch
- 1 - R-3714-3000 Diode Tee
- 1 - R-3710-1007 Restrictor

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