

# Tranquility® 20 Single-Stage (TS) Series Submittal Data

Models TSD/HV 009 - 070  
50Hz - HFC-410A

English Language/S-I Units



Revised: 8 April, 2016



## *SUBMITTAL DATA - S-I UNITS*

Unit Designation: \_\_\_\_\_

Job Name: \_\_\_\_\_

Architect: \_\_\_\_\_

Engineer: \_\_\_\_\_

Contractor: \_\_\_\_\_

## *PERFORMANCE DATA*

Cooling Capacity: \_\_\_\_\_ kW

EER: \_\_\_\_\_

Heating Capacity: \_\_\_\_\_ kW

COP: \_\_\_\_\_

Ambient Air Temp: \_\_\_\_\_ °C

Entering Water Temp (Clg): \_\_\_\_\_ °C

Entering Air Temp (Clg): \_\_\_\_\_ °C

Entering Water Temp (Htg): \_\_\_\_\_ °C

Entering Air Temp (Htg): \_\_\_\_\_ °C

Airflow: \_\_\_\_\_ l/s

Fan Speed or Motor/RPM/Turns: \_\_\_\_\_

Operating Weight: \_\_\_\_\_ (kg)

## *ELECTRICAL DATA*

Power Supply: \_\_\_\_\_ Volts

\_\_\_\_\_ Phase \_\_\_\_\_ Hz

Minimum Circuit Ampacity: \_\_\_\_\_

Maximum Overcurrent Protection: \_\_\_\_\_

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# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS Series Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TS	V	024	A	V	F	2	0	C	L	T	S			

**SERIES**  
TS = Tranquility® Single Stage

**CONFIGURATION**  
V = Vertical Up  
H = Horizontal  
D = Vertical Down

**UNIT SIZE**  
009 - V  
012 - V  
018 - V  
024 - V, U  
030 - V, U  
036 - V, U  
042 - U  
048 - U  
060 - U  
070 - U

**REVISION LEVEL**  
A = 006-012, 024-070  
B = 018

**VOLTAGE**  
V = 220-240/50/1  
U = 380-420/50/3

**CONTROLS**  
F = CXM  
G = DXM  
H = CXM w/LON  
J = DXM w/LON  
T = CXM w/MPC  
U = DXM w/MPC  
-----  
O = CXM  
Q = DXM  
V = CXM w/LON  
W = DXM w/LON  
Y = CXM w/MPC  
Z = DXM w/MPC

**STANDARD**  
S = Standard

**SUPPLY AIR FLOW & MOTOR CONFIGURATION**

Option	Supply	Configuration	Motor
T	Top	TSV	PSC
D	Down	TSD	PSC
B	Back	TSH	PSC
S	Straight	TSH	PSC

**RETURN AIR FLOW CONFIGURATION**  
L = Left Return  
R = Right Return

**HEAT EXCHANGER OPTIONS**

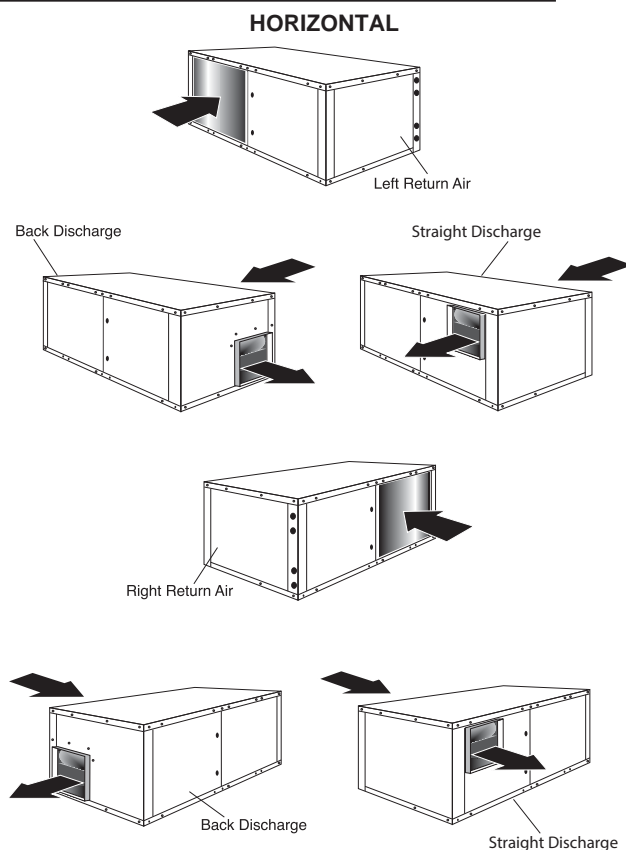
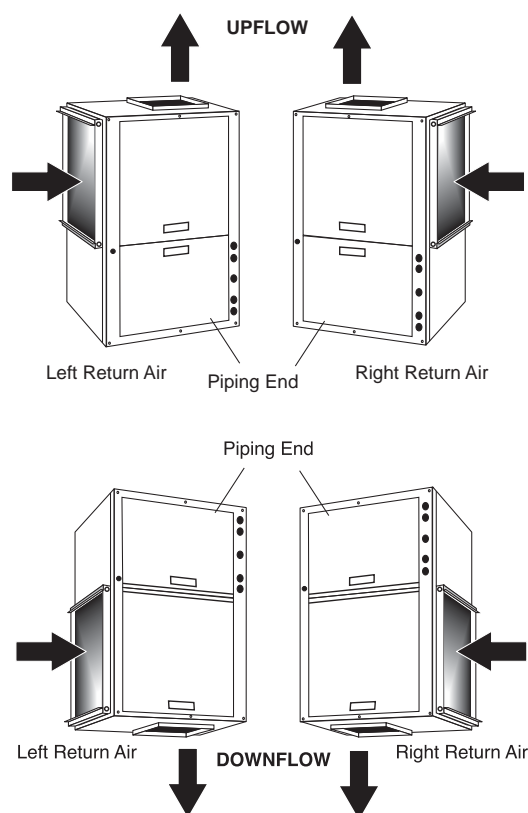
	Non Coated Air Coil	Tin Plated Air Coil
	Copper Cupro-Nickel	Copper Cupro-Nickel
Standard	C	N
Motorized Valve	T	S

**WATER CIRCUIT OPTIONS**  
0 = None  
2 = HWG (Coil Only)  
6 = HWG (Coil Only) w/Auto Flow Regulator 2.5 GPM/Ton  
7 = HWG (Coil Only) w/Auto Flow Regulator 3.0 GPM/Ton  
8 = Auto Flow Regulator 2.5 GPM/Ton  
9 = Auto Flow Regulator 3.0 GPM/Ton

**CABINET**

OPTION	RANGE	ULTRA QUIET	1" FILTER RAIL	2" FILTER RAIL	1" FILTER FRAME	2" FILTER FRAME
1	STANDARD RANGE	YES		NO		YES
A		NO	YES		NO	
J		NO		YES		NO
K		NO			YES	NO
2	EXTENDED RANGE	YES		NO		YES
C		NO	YES		NO	
L		NO		YES		NO
M		NO			YES	NO
3	STANDARD RANGE	YES		NO		YES
E		NO	YES		NO	
P		NO		YES		NO
4		YES			YES	NO
G	EXTENDED RANGE	YES		NO		YES
R		NO	YES		NO	
S		NO		YES		NO
		NO			YES	NO

**WITH DISCONNECT**



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# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



Performance Data - AHRI/ASHRAE/ISO 13256-1

Model	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 30°C		Heating 20°C		Cooling 15°C		Heating 10°C		Cooling 25°C		Heating 0°C	
	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP
TSH/V009	2.29	4.5	2.70	4.8	2.73	7.4	2.29	4.3	2.46	5.3	1.73	3.4
TSH/V012	2.88	4.5	3.36	4.5	3.27	7.2	2.87	4.0	3.03	5.3	2.31	3.5
TSH/V/D018	4.58	4.5	5.46	5.2	5.24	7.5	4.46	4.5	4.80	5.6	3.44	3.6
TSH/V/D024	6.18	4.9	7.03	4.9	7.04	7.8	5.94	4.3	6.48	5.8	4.51	3.7
TSH/V/D030	6.94	4.6	8.29	5.0	7.80	6.9	6.98	4.4	7.24	5.3	5.60	3.8
TSH/V/D036	8.12	5.0	9.45	5.5	9.18	7.6	7.81	4.8	8.49	5.8	6.10	3.9
TSH/V/D042	9.21	4.8	11.73	5.4	10.56	7.3	9.52	4.6	9.68	5.9	7.50	3.8
TSH/V/D048	11.57	4.6	14.24	5.0	13.27	7.0	11.63	4.4	12.29	5.3	9.26	3.7
TSH/V/D060	15.02	4.8	16.71	5.0	16.50	7.0	13.94	4.5	15.58	5.5	11.04	3.7
TSH/V/D070	16.62	4.3	20.37	5.0	18.98	6.5	16.48	4.3	17.43	5.0	12.82	3.6



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - Selection Notes

For operation in the shaded area when water is used in lieu of an antifreeze solution, the LWT (Leaving Water Temperature) must be calculated. Flow must be maintained to a level such that the LWT is maintained above 5°C when the JW3 jumper is not clipped (see example below). This is due to the potential of the refrigerant temperature being as low as 0°C with 5°C LWT, which may lead to a nuisance cutout due to the activation of the Low Temperature Protection. JW3 should never be clipped for standard range equipment or systems without antifreeze.

### Example:

At 10°C EWT (Entering Water Temperature) and 0.28 l/s (minimum flow rate), a TS036 unit has a HE of 5.84 kW. To calculate LWT, rearrange the formula for HE as follows:

$$HE = TD \times \text{Flow} \times 4.18$$

where HE = Heat of Extraction (kW); TD = temperature difference (EWT - LWT); and Flow = Water Flow Rate in l/s

$$TD = HE / (\text{l/s} \times 4.18)$$

$$TD = 5.84 / (0.28 \times 4.18)$$

$$TD = 5^\circ\text{C}$$

$$\text{LWT} = \text{EWT} - TD$$

$$\text{LWT} = 10 - 5 = 5^\circ\text{C}$$

In this example, as long as the EWT does not fall below 10°C, the system will operate as designed at 0.28 l/s. For EWTs below 10°C, higher flow rates will be required (open loop systems with EWT below 10°C, for example, require the middle flow rate).

	HC kW	Power kW	HE kW	LAT °C	COP W/W
	5.46	1.75	3.70	29.6	3.11
6.68	6.07	1.78	4.30	30.7	3.42
6.97	6.31	1.79	4.52	31.1	3.53
7.16	6.43	1.79	4.64	31.3	3.59
6.72	6.80	1.81	5.00	31.9	3.77
6.89	7.08	1.82	5.26	32.4	3.89
7.12	7.23	1.82	5.40	32.7	3.96
7.98	7.73	1.88	5.84	33.6	4.10
8.24	8.05	1.90	6.16	34.1	4.24
	8.23	1.91	6.33	34.4	4.32
	8.29	1.87	6.42	34.6	4.43
		1.89	6.77	35.2	
			6.96		



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



Performance Data - TSV/H009

118 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.17	19.5	Operation Not Recommended						1.48	0.52	0.96	30.4	2.87
0	0.09	5.4	2.93	2.02	0.69	0.33	3.26	8.83	1.72	0.53	1.19	32.1	3.23
	0.13	10.5	2.98	2.05	0.69	0.30	3.29	9.82	1.80	0.54	1.26	32.6	3.34
	0.17	18.6	3.01	2.07	0.69	0.29	3.30	10.37	1.84	0.54	1.30	32.9	3.4
5	0.09	5.2	2.84	1.97	0.69	0.37	3.21	7.65	1.98	0.55	1.43	33.9	3.6
	0.13	10.0	2.90	2.01	0.69	0.34	3.25	8.48	2.06	0.55	1.51	34.5	3.72
	0.17	17.7	2.94	2.02	0.69	0.33	3.26	8.95	2.11	0.56	1.55	34.8	3.79
10	0.09	4.9	2.74	1.92	0.70	0.41	3.15	6.64	2.22	0.56	1.66	35.6	3.95
	0.13	9.5	2.81	1.96	0.70	0.38	3.20	7.34	2.31	0.57	1.75	36.2	4.08
	0.17	16.7	2.85	1.98	0.69	0.37	3.22	7.73	2.36	0.57	1.79	36.6	4.15
15	0.09	4.6	2.63	1.87	0.71	0.46	3.08	5.77	2.45	0.57	1.88	37.2	4.28
	0.13	8.9	2.71	1.91	0.71	0.42	3.13	6.37	2.55	0.58	1.97	37.9	4.42
	0.17	15.8	2.75	1.93	0.70	0.41	3.15	6.71	2.61	0.58	2.03	38.3	4.5
20	0.09	4.4	2.50	1.82	0.73	0.50	3.00	5.01	2.67	0.58	2.09	38.8	4.59
	0.13	8.4	2.59	1.86	0.72	0.47	3.06	5.53	2.78	0.59	2.19	39.5	4.74
	0.17	14.8	2.63	1.88	0.71	0.45	3.08	5.81	2.84	0.59	2.25	39.9	4.82
25	0.09	4.1	2.35	1.76	0.75	0.55	2.90	4.24	2.92	0.59	2.33	40.5	4.93
	0.13	7.9	2.44	1.80	0.74	0.52	2.96	4.68	3.03	0.60	2.44	41.3	5.08
	0.17	13.9	2.49	1.82	0.73	0.51	2.99	4.92	3.10	0.60	2.50	41.7	5.16
30	0.09	3.8	2.20	1.71	0.77	0.60	2.81	3.66	3.13	0.60	2.53	42.0	5.2
	0.13	7.3	2.30	1.74	0.76	0.57	2.87	4.03	3.25	0.61	2.64	42.8	5.34
	0.17	13.0	2.35	1.76	0.75	0.55	2.90	4.23	3.32	0.61	2.71	43.3	5.42
35	0.09	3.7	2.05	1.64	0.80	0.65	2.70	3.13	Operation Not Recommended				
	0.13	7.1	2.15	1.68	0.78	0.62	2.77	3.45					
	0.17	12.5	2.19	1.70	0.78	0.60	2.80	3.63					
40	0.09	3.4	1.88	1.58	0.84	0.71	2.59	2.66					
	0.13	6.5	1.98	1.62	0.82	0.68	2.66	2.94					
	0.17	11.5	2.03	1.64	0.81	0.66	2.69	3.09					
45	0.09	3.3	1.71	1.50	0.88	0.76	2.47	2.24					
	0.13	6.3	1.81	1.54	0.85	0.73	2.54	2.47					
	0.17	11.1	1.86	1.57	0.84	0.71	2.57	2.60					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/H012

142 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.22	27.6	Operation Not Recommended						2.01	0.67	1.34	31.8	3.00
0	0.11	4.2	3.11	2.06	0.66	0.44	3.55	7.04	2.32	0.70	1.62	33.6	3.33
	0.17	14.4	3.15	2.08	0.66	0.42	3.57	7.49	2.41	0.70	1.71	34.1	3.43
	0.22	26.2	3.24	2.13	0.66	0.41	3.65	7.86	2.46	0.71	1.76	34.4	3.48
5	0.11	3.8	3.22	2.15	0.67	0.48	3.70	6.72	2.62	0.72	1.90	35.3	3.64
	0.17	13.7	3.25	2.15	0.66	0.45	3.70	7.16	2.72	0.73	1.99	35.9	3.73
	0.22	24.8	3.27	2.17	0.66	0.44	3.72	7.41	2.77	0.73	2.04	36.2	3.77
10	0.11	3.4	3.22	2.16	0.67	0.52	3.75	6.14	2.89	0.74	2.14	36.9	3.88
	0.17	12.9	3.26	2.17	0.67	0.49	3.75	6.59	2.98	0.75	2.23	37.4	3.95
	0.22	23.5	3.28	2.18	0.67	0.48	3.76	6.83	3.02	0.76	2.27	37.7	3.99
15	0.11	3.0	3.18	2.15	0.68	0.57	3.75	5.53	3.10	0.76	2.33	38.1	4.05
	0.17	12.1	3.23	2.17	0.67	0.54	3.77	5.98	3.18	0.77	2.40	38.6	4.11
	0.22	22.1	3.25	2.18	0.67	0.52	3.78	6.2	3.21	0.78	2.44	38.8	4.14
20	0.11	2.6	3.07	2.10	0.69	0.63	3.70	4.88	3.27	0.78	2.48	39.1	4.18
	0.17	11.3	3.15	2.14	0.68	0.59	3.74	5.31	3.33	0.79	2.54	39.5	4.23
	0.22	20.7	3.18	2.15	0.68	0.57	3.76	5.54	3.35	0.79	2.56	39.6	4.25
25	0.11	2.2	2.90	2.04	0.70	0.70	3.60	4.16	3.40	0.79	2.61	39.9	4.28
	0.17	10.5	3.00	2.08	0.69	0.66	3.66	4.56	3.44	0.80	2.64	40.1	4.31
	0.22	19.4	3.05	2.09	0.69	0.64	3.69	4.77	3.45	0.80	2.65	40.2	4.32
30	0.11	1.8	2.72	1.98	0.73	0.76	3.48	3.58	3.46	0.80	2.66	40.2	4.33
	0.17	9.8	2.84	2.02	0.71	0.72	3.56	3.94	3.48	0.80	2.68	40.4	4.35
	0.22	18	2.89	2.04	0.70	0.70	3.59	4.13	3.48	0.80	2.68	40.4	4.36
35	0.11	1.6	2.53	1.91	0.76	0.83	3.35	3.05	Operation Not Recommended				
	0.17	9.4	2.65	1.95	0.74	0.79	3.43	3.37					
	0.22	17.3	2.71	1.97	0.73	0.76	3.47	3.54					
40	0.11	1.2	2.31	1.84	0.80	0.90	3.21	2.58					
	0.17	8.6	2.44	1.88	0.77	0.86	3.29	2.85					
	0.22	15.9	2.50	1.90	0.76	0.83	3.34	3.00					
45	0.11	1.0	2.09	1.77	0.85	0.97	3.06	2.15					
	0.17	8.2	2.22	1.81	0.82	0.93	3.15	2.38					
	0.22	15.2	2.28	1.83	0.80	0.91	3.19	2.51					

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# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/D/H018

236 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.35	26.9	Operation Not Recommended						3.07	0.99	2.08	30.8	3.09
0	0.18	4.8	5.25	3.68	0.70	0.67	5.92	7.84	3.48	1.02	2.46	32.2	3.40
	0.26	14.5	5.31	3.69	0.69	0.64	5.94	8.35	3.62	1.03	2.59	32.7	3.51
	0.35	24.1	5.36	3.69	0.69	0.62	5.98	8.65	3.70	1.04	2.66	33.0	3.57
5	0.18	4.1	5.27	3.75	0.71	0.72	5.99	7.28	3.94	1.05	2.89	33.8	3.76
	0.26	13.8	5.31	3.76	0.71	0.69	6.00	7.72	4.11	1.06	3.05	34.4	3.89
	0.35	22.1	5.36	3.78	0.70	0.67	6.03	8.01	4.19	1.06	3.14	34.7	3.96
10	0.18	3.4	5.23	3.77	0.72	0.80	6.03	6.56	4.40	1.07	3.33	35.4	4.13
	0.26	11.7	5.31	3.81	0.72	0.75	6.06	7.08	4.59	1.07	3.52	36.1	4.27
	0.35	19.3	5.34	3.81	0.71	0.73	6.07	7.34	4.69	1.08	3.62	36.5	4.35
15	0.18	2.1	5.06	3.68	0.73	0.87	5.93	5.80	4.86	1.08	3.78	37.1	4.48
	0.26	10.3	5.18	3.75	0.72	0.82	6.00	6.32	5.08	1.09	3.99	37.8	4.64
	0.35	17.9	5.23	3.77	0.72	0.79	6.02	6.58	5.20	1.10	4.10	38.3	4.73
20	0.18	2.1	4.85	3.56	0.73	0.96	5.81	5.06	5.33	1.11	4.22	38.7	4.82
	0.26	9.7	4.99	3.64	0.73	0.90	5.89	5.55	5.58	1.12	4.46	39.6	4.97
	0.35	16.5	5.06	3.68	0.73	0.87	5.93	5.81	5.72	1.13	4.58	40.1	5.05
25	0.18	1.4	4.57	3.40	0.74	1.07	5.64	4.27	5.88	1.14	4.74	40.6	5.14
	0.26	8.3	4.73	3.49	0.74	1.00	5.74	4.71	6.17	1.17	5.00	41.7	5.27
	0.35	15.2	4.81	3.54	0.74	0.97	5.78	4.95	6.33	1.19	5.14	42.2	5.33
30	0.18	1.4	4.30	3.26	0.76	1.18	5.48	3.65	6.38	1.19	5.19	42.4	5.35
	0.26	7.6	4.47	3.35	0.75	1.11	5.58	4.04	6.71	1.23	5.47	43.6	5.43
	0.35	13.8	4.56	3.39	0.74	1.07	5.63	4.25	6.89	1.26	5.63	44.2	5.46
35	0.18	1.4	4.02	3.12	0.78	1.30	5.32	3.10	Operation Not Recommended				
	0.26	7.6	4.19	3.20	0.76	1.22	5.42	3.43					
	0.35	13.4	4.28	3.25	0.76	1.18	5.47	3.61					
40	0.18	1.0	3.74	3.00	0.80	1.43	5.18	2.61					
	0.26	6.9	3.91	3.07	0.79	1.35	5.26	2.89					
	0.35	12.4	3.99	3.11	0.78	1.31	5.31	3.05					
45	0.18	0.7	3.47	2.90	0.84	1.59	5.06	2.19					
	0.26	6.2	3.63	2.96	0.81	1.50	5.12	2.43					
	0.35	11.7	3.71	2.99	0.81	1.45	5.16	2.55					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/D/H024

330 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.5	38.6	Operation Not Recommended						4.13	1.31	2.82	34.5	3.15
0	0.25	10.3	7.07	4.89	0.69	0.81	7.88	8.74	4.70	1.34	3.36	36.5	3.52
	0.38	21.4	7.11	4.90	0.69	0.78	7.88	9.15	4.88	1.34	3.53	37.1	3.63
	0.50	35.2	7.13	4.90	0.69	0.76	7.89	9.38	4.97	1.35	3.62	37.4	3.69
5	0.25	9.0	7.04	4.93	0.70	0.88	7.92	7.98	5.32	1.36	3.96	38.7	3.91
	0.38	19.3	7.10	4.93	0.70	0.84	7.94	8.46	5.53	1.37	4.16	39.4	4.03
	0.50	31.0	7.13	4.94	0.69	0.82	7.95	8.71	5.64	1.38	4.26	39.8	4.10
10	0.25	9.0	6.99	4.96	0.71	0.99	7.98	7.03	6.08	1.42	4.66	41.3	4.27
	0.38	17.9	7.05	4.97	0.71	0.94	7.99	7.50	6.32	1.43	4.89	42.2	4.41
	0.50	29.6	7.08	4.97	0.70	0.92	7.99	7.73	6.44	1.44	5.01	42.6	4.48
15	0.25	8.3	6.83	4.97	0.73	1.06	7.89	6.46	6.53	1.42	5.12	42.9	4.62
	0.38	17.2	6.93	4.98	0.72	1.00	7.93	6.94	6.78	1.43	5.36	43.8	4.76
	0.50	27.6	6.97	4.98	0.71	0.97	7.94	7.18	6.92	1.43	5.49	44.3	4.83
20	0.25	7.6	6.64	4.94	0.74	1.16	7.80	5.70	7.11	1.44	5.67	45.0	4.93
	0.38	15.9	6.76	4.96	0.73	1.10	7.86	6.17	7.38	1.45	5.93	45.9	5.08
	0.50	26.2	6.82	4.97	0.73	1.06	7.88	6.40	7.52	1.46	6.06	46.4	5.15
25	0.25	6.9	6.36	4.88	0.77	1.3	7.66	4.88	7.75	1.47	6.28	47.2	5.27
	0.38	15.2	6.51	4.92	0.76	1.23	7.74	5.31	8.04	1.48	6.55	48.2	5.42
	0.50	24.1	6.58	4.93	0.75	1.19	7.77	5.53	8.19	1.49	6.70	48.7	5.49
30	0.25	6.9	6.07	4.79	0.79	1.44	7.51	4.22	8.29	1.50	6.79	49.1	5.54
	0.38	14.5	6.25	4.84	0.78	1.36	7.60	4.61	8.58	1.51	7.07	50.1	5.68
	0.50	23.4	6.33	4.87	0.77	1.32	7.64	4.81	8.74	1.52	7.22	50.7	5.75
35	0.25	6.9	5.75	4.66	0.81	1.59	7.35	3.61	Operation Not Recommended				
	0.38	14.1	5.94	4.74	0.80	1.50	7.44	3.95					
	0.50	22.8	6.03	4.77	0.79	1.46	7.49	4.14					
40	0.25	6.6	5.40	4.50	0.83	1.77	7.16	3.05					
	0.38	13.4	5.60	4.60	0.82	1.67	7.27	3.36					
	0.50	21.7	5.70	4.64	0.81	1.62	7.32	3.52					
45	0.25	6.2	5.01	4.31	0.86	1.96	6.97	2.56					
	0.38	13.1	5.23	4.42	0.85	1.85	7.08	2.82					
	0.50	21.4	5.34	4.48	0.84	1.80	7.14	2.97					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/D/H030

378 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.50	38.6	Operation Not Recommended						4.98	1.52	3.45	30.9	3.26
0	0.25	10.3	7.43	5.21	0.70	1.02	8.45	7.30	5.50	1.55	3.95	32.1	3.54
	0.38	21.4	7.47	5.21	0.70	0.98	8.45	7.59	5.71	1.56	4.15	32.5	3.65
	0.50	35.2	7.50	5.22	0.70	0.96	8.46	7.81	5.82	1.57	4.25	32.8	3.71
5	0.25	9.0	7.89	5.57	0.71	1.11	9.00	7.12	6.13	1.59	4.55	33.5	3.87
	0.38	19.3	7.94	5.58	0.70	1.07	9.00	7.44	6.38	1.60	4.78	34.0	3.99
	0.50	31.0	7.98	5.60	0.70	1.04	9.02	7.67	6.51	1.61	4.90	34.3	4.05
10	0.25	9.0	8.09	5.78	0.71	1.25	9.34	6.48	6.94	1.66	5.28	35.2	4.18
	0.38	17.9	8.15	5.78	0.71	1.19	9.34	6.84	7.22	1.68	5.55	35.8	4.31
	0.50	29.6	8.19	5.79	0.71	1.16	9.35	7.07	7.38	1.69	5.69	36.2	4.37
15	0.25	8.3	7.88	5.70	0.72	1.33	9.21	5.94	7.41	1.66	5.75	36.3	4.47
	0.38	17.2	8.05	5.77	0.72	1.25	9.30	6.42	7.72	1.68	6.05	36.9	4.60
	0.50	27.6	8.11	5.79	0.71	1.22	9.33	6.66	7.89	1.69	6.20	37.3	4.67
20	0.25	7.6	7.56	5.54	0.73	1.44	9.00	5.25	8.05	1.70	6.35	37.7	4.74
	0.38	15.9	7.80	5.66	0.73	1.36	9.16	5.74	8.39	1.72	6.67	38.4	4.88
	0.50	26.2	7.90	5.71	0.72	1.32	9.22	5.99	8.57	1.73	6.84	38.8	4.95
25	0.25	6.9	7.12	5.32	0.75	1.59	8.71	4.49	8.77	1.74	7.03	39.3	5.03
	0.38	15.2	7.40	5.46	0.74	1.50	8.89	4.94	9.14	1.77	7.38	40.1	5.17
	0.50	24.1	7.53	5.53	0.73	1.45	8.98	5.18	9.34	1.78	7.56	40.5	5.24
30	0.25	6.9	6.71	5.10	0.76	1.73	8.44	3.87	9.39	1.79	7.61	40.6	5.26
	0.38	14.5	6.99	5.24	0.75	1.63	8.62	4.28	9.78	1.81	7.97	41.5	5.40
	0.50	23.4	7.13	5.32	0.75	1.58	8.71	4.50	9.99	1.83	8.16	41.9	5.47
35	0.25	6.9	6.29	4.89	0.78	1.90	8.19	3.31	Operation Not Recommended				
	0.38	14.1	6.56	5.02	0.77	1.79	8.35	3.67					
	0.50	22.8	6.70	5.09	0.76	1.74	8.44	3.86					
40	0.25	6.6	5.91	4.70	0.80	2.09	8.00	2.83					
	0.38	13.4	6.15	4.81	0.78	1.97	8.11	3.12					
	0.50	21.7	6.27	4.88	0.78	1.91	8.18	3.29					
45	0.25	6.2	5.60	4.59	0.82	2.32	7.92	2.42					
	0.38	13.1	5.78	4.65	0.80	2.17	7.96	2.66					
	0.50	21.4	5.89	4.69	0.80	2.11	7.99	2.79					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



Performance Data - TSV/D/H036

472 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.57	40.7	Operation Not Recommended						5.46	1.75	3.70	29.6	3.11
0	0.28	11.7	8.48	6.00	0.71	1.27	9.75	6.68	6.07	1.78	4.30	30.7	3.42
	0.43	22.8	8.55	6.01	0.70	1.23	9.77	6.97	6.31	1.79	4.52	31.1	3.53
	0.57	39.3	8.60	6.03	0.70	1.20	9.80	7.16	6.43	1.79	4.64	31.3	3.59
5	0.28	10.3	9.00	6.58	0.73	1.34	10.34	6.72	6.80	1.81	5.00	31.9	3.77
	0.43	22.1	9.04	6.60	0.73	1.31	10.36	6.89	7.08	1.82	5.26	32.4	3.89
	0.57	37.2	9.14	6.67	0.73	1.28	10.42	7.12	7.23	1.82	5.40	32.7	3.96
10	0.28	9.0	9.09	6.77	0.75	1.52	10.61	5.98	7.73	1.88	5.84	33.6	4.10
	0.43	21.4	9.17	6.81	0.74	1.45	10.62	6.34	8.05	1.90	6.16	34.1	4.24
	0.57	35.9	9.36	6.89	0.74	1.41	10.77	6.62	8.23	1.91	6.33	34.4	4.32
15	0.28	8.3	8.81	6.76	0.77	1.58	10.39	5.57	8.29	1.87	6.42	34.6	4.43
	0.43	20.0	9.01	6.83	0.76	1.50	10.52	6.00	8.66	1.89	6.77	35.2	4.58
	0.57	34.5	9.11	6.85	0.75	1.47	10.58	6.21	8.86	1.90	6.96	35.6	4.66
20	0.28	7.6	8.43	6.60	0.78	1.70	10.13	4.96	9.06	1.91	7.15	35.9	4.74
	0.43	20.0	8.70	6.72	0.77	1.61	10.32	5.40	9.48	1.93	7.54	36.6	4.90
	0.57	33.1	8.83	6.77	0.77	1.57	10.40	5.61	9.71	1.94	7.76	37.0	4.99
25	0.28	6.9	7.93	6.36	0.80	1.85	9.78	4.29	9.95	1.96	7.99	37.5	5.08
	0.43	19.3	8.24	6.51	0.79	1.76	9.99	4.69	10.43	1.98	8.45	38.3	5.26
	0.57	31.0	8.39	6.58	0.78	1.71	10.10	4.91	10.70	2.00	8.70	38.8	5.35
30	0.28	6.2	7.50	6.15	0.82	2.00	9.50	3.75	10.75	2.00	8.75	38.9	5.37
	0.43	17.9	7.79	6.29	0.81	1.90	9.69	4.11	11.29	2.03	9.26	39.8	5.56
	0.57	30.3	7.94	6.36	0.80	1.85	9.79	4.30	11.59	2.05	9.54	40.3	5.66
35	0.28	5.9	7.12	6.01	0.84	2.18	9.30	3.27	Operation Not Recommended				
	0.43	17.9	7.36	6.09	0.83	2.06	9.42	3.58					
	0.57	29.6	7.50	6.15	0.82	2.00	9.50	3.74					
40	0.28	5.5	6.84	5.93	0.87	2.37	9.21	2.89					
	0.43	17.6	7.01	5.97	0.85	2.25	9.26	3.12					
	0.57	28.3	7.12	6.01	0.84	2.18	9.30	3.26					
45	0.28	5.5	6.65	5.92	0.89	2.58	9.23	2.58					
	0.43	17.2	6.78	5.99	0.88	2.46	9.24	2.75					
	0.57	27.6	6.87	6.01	0.87	2.39	9.26	2.87					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/D/H042

543 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.69	27.6	Operation Not Recommended						6.79	2.14	4.65	30.4	3.18
0	0.35	7.6	10.03	7.41	0.74	1.33	11.37	7.52	7.50	2.16	5.34	31.4	3.48
	0.52	15.2	10.17	7.39	0.73	1.31	11.48	7.77	7.79	2.17	5.63	31.9	3.60
	0.69	26.9	10.31	7.43	0.72	1.27	11.57	8.13	7.96	2.17	5.78	32.1	3.66
5	0.35	6.9	10.67	8.07	0.76	1.51	12.18	7.07	8.41	2.19	6.22	32.8	3.85
	0.52	14.5	10.79	8.05	0.75	1.45	12.24	7.44	8.78	2.20	6.58	33.4	3.99
	0.69	25.5	10.97	8.12	0.74	1.41	12.39	7.76	8.98	2.21	6.77	33.7	4.06
10	0.35	6.2	10.77	8.31	0.77	1.68	12.44	6.42	9.38	2.23	7.15	34.3	4.21
	0.52	14.5	10.91	8.31	0.76	1.58	12.49	6.89	9.82	2.25	7.57	35.0	4.37
	0.69	24.8	11.04	8.35	0.76	1.54	12.58	7.17	10.06	2.26	7.80	35.4	4.46
15	0.35	6.2	10.35	8.13	0.79	1.81	12.16	5.73	10.38	2.27	8.10	35.8	4.56
	0.52	13.8	10.65	8.26	0.78	1.71	12.36	6.21	10.88	2.30	8.58	36.6	4.72
	0.69	24.1	10.81	8.32	0.77	1.65	12.46	6.53	11.04	2.31	8.73	36.9	4.78
20	0.35	5.5	9.80	7.83	0.80	1.95	11.75	5.03	11.38	2.33	9.04	37.4	4.88
	0.52	13.8	10.18	8.04	0.79	1.85	12.03	5.51	11.92	2.37	9.55	38.2	5.03
	0.69	22.1	10.37	8.13	0.78	1.80	12.17	5.77	12.18	2.39	9.80	38.6	5.10
25	0.35	4.8	9.09	7.41	0.82	2.13	11.22	4.27	12.49	2.41	10.08	39.1	5.18
	0.52	13.1	9.50	7.66	0.81	2.02	11.52	4.70	13.06	2.46	10.60	39.9	5.31
	0.69	22.1	9.71	7.78	0.80	1.97	11.68	4.93	13.35	2.49	10.87	40.4	5.37
30	0.35	4.8	8.45	7.04	0.83	2.29	10.74	3.69	13.39	2.49	10.90	40.4	5.38
	0.52	12.4	8.85	7.27	0.82	2.18	11.02	4.07	13.95	2.55	11.40	41.3	5.48
	0.69	21.4	9.06	7.40	0.82	2.12	11.18	4.27	14.23	2.58	11.64	41.7	5.51
35	0.35	4.5	7.88	6.72	0.85	2.46	10.34	3.20	Operation Not Recommended				
	0.52	12.4	8.22	6.90	0.84	2.34	10.55	3.52					
	0.69	20.7	8.40	7.01	0.83	2.27	10.67	3.70					
40	0.35	4.1	7.43	6.52	0.88	2.62	10.05	2.84					
	0.52	12.1	7.67	6.61	0.86	2.50	10.18	3.06					
	0.69	20.0	7.82	6.69	0.86	2.44	10.25	3.21					
45	0.35	4.1	7.17	6.47	0.90	2.73	9.90	2.63					
	0.52	11.7	7.29	6.48	0.89	2.66	9.95	2.75					
	0.69	20.0	7.39	6.51	0.88	2.61	10.00	2.83					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Performance Data - TSV/D/H048

614 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.76	33.1	Operation Not Recommended						8.58	2.76	5.82	31.6	3.11
0	0.38	9.0	13.25	9.22	0.70	1.84	15.09	7.20	9.37	2.80	6.57	32.7	3.35
	0.57	17.9	13.33	9.24	0.69	1.77	15.10	7.53	9.76	2.82	6.94	33.2	3.47
	0.76	31.0	13.38	9.26	0.69	1.74	15.12	7.70	9.97	2.83	7.14	33.5	3.53
5	0.38	8.3	13.45	9.48	0.70	1.98	15.43	6.80	10.43	2.85	7.58	34.1	3.66
	0.57	17.9	13.54	9.51	0.70	1.90	15.45	7.11	10.91	2.87	8.03	34.7	3.80
	0.76	30.3	13.61	9.51	0.70	1.86	15.46	7.33	11.17	2.89	8.29	35.1	3.87
10	0.38	7.6	13.33	9.59	0.72	2.19	15.52	6.09	11.56	2.91	8.65	35.6	3.98
	0.57	17.2	13.55	9.64	0.71	2.06	15.61	6.59	12.14	2.94	9.20	36.4	4.13
	0.76	29.0	13.63	9.64	0.71	1.99	15.62	6.84	12.46	2.96	9.50	36.8	4.21
15	0.38	6.9	12.91	9.45	0.73	2.37	15.28	5.45	12.75	2.98	9.77	37.2	4.28
	0.57	16.5	13.25	9.57	0.72	2.22	15.47	5.96	13.44	3.02	10.42	38.1	4.45
	0.76	27.6	13.39	9.60	0.72	2.15	15.54	6.22	13.82	3.04	10.78	38.7	4.54
20	0.38	6.9	12.39	9.26	0.75	2.57	14.96	4.82	13.99	3.05	10.94	38.9	4.58
	0.57	15.9	12.80	9.41	0.73	2.41	15.21	5.31	14.78	3.11	11.68	40.0	4.76
	0.76	26.2	12.99	9.48	0.73	2.33	15.32	5.57	15.22	3.14	12.09	40.6	4.85
25	0.38	6.2	11.74	9.02	0.77	2.83	14.57	4.15	15.44	3.15	12.29	40.9	4.90
	0.57	15.9	12.18	9.18	0.75	2.65	14.84	4.59	16.35	3.22	13.14	42.1	5.08
	0.76	24.8	12.40	9.26	0.75	2.57	14.97	4.83	16.86	3.25	13.61	42.8	5.18
30	0.38	6.2	11.17	8.84	0.79	3.09	14.25	3.61	16.74	3.25	13.49	42.6	5.16
	0.57	15.2	11.60	8.97	0.77	2.89	14.49	4.01	17.75	3.32	14.42	44.0	5.34
	0.76	24.1	11.82	9.05	0.77	2.80	14.62	4.23	18.30	3.37	14.94	44.7	5.43
35	0.38	5.9	10.63	8.73	0.82	3.38	14.01	3.14	Operation Not Recommended				
	0.57	14.8	11.02	8.80	0.80	3.16	14.18	3.49					
	0.76	23.4	11.23	8.86	0.79	3.06	14.29	3.67					
40	0.38	5.5	10.19	8.69	0.85	3.70	13.89	2.75					
	0.57	14.1	10.50	8.71	0.83	3.47	13.97	3.03					
	0.76	22.4	10.68	8.75	0.82	3.35	14.03	3.19					
45	0.38	5.5	9.86	8.76	0.89	4.05	13.91	2.44	Operation Not Recommended				
	0.57	13.8	10.11	8.77	0.87	3.82	13.94	2.64					
	0.76	22.1	10.26	8.80	0.86	3.70	13.96	2.77					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



Performance Data - TSV/D/H060

755 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	0.95	34.5	Operation Not Recommended						10.19	3.22	6.97	31.2	3.16
0	0.47	4.1	15.85	11.49	0.73	2.27	18.12	6.99	11.16	3.28	7.88	32.2	3.40
	0.71	15.9	16.12	11.57	0.72	2.24	18.37	7.18	11.60	3.31	8.30	32.7	3.51
	0.95	33.1	16.52	11.78	0.71	2.22	18.73	7.45	11.85	3.32	8.52	33.0	3.57
5	0.47	3.4	16.45	12.10	0.74	2.44	18.89	6.75	12.42	3.35	9.07	33.6	3.71
	0.71	15.2	16.60	12.12	0.73	2.35	18.95	7.08	12.96	3.38	9.58	34.2	3.83
	0.95	31.0	16.74	12.14	0.73	2.31	19.05	7.25	13.26	3.40	9.86	34.5	3.90
10	0.47	2.8	16.58	12.42	0.75	2.65	19.23	6.25	13.75	3.43	10.32	35.1	4.01
	0.71	14.5	16.74	12.42	0.74	2.50	19.24	6.68	14.38	3.46	10.92	35.8	4.16
	0.95	29.6	16.83	12.42	0.74	2.45	19.27	6.88	14.72	3.48	11.25	36.2	4.23
15	0.47	2.1	16.27	12.45	0.77	2.90	19.18	5.60	15.11	3.50	11.60	36.6	4.31
	0.71	14.5	16.56	12.50	0.75	2.71	19.27	6.10	15.82	3.54	12.28	37.4	4.47
	0.95	28.3	16.66	12.51	0.75	2.64	19.30	6.32	16.21	3.56	12.65	37.8	4.55
20	0.47	2.1	15.77	12.29	0.78	3.16	18.92	5.00	16.47	3.58	12.89	38.1	4.60
	0.71	13.8	16.18	12.43	0.77	2.96	19.13	5.47	17.26	3.62	13.64	38.9	4.76
	0.95	26.9	16.35	12.48	0.76	2.87	19.21	5.70	17.68	3.65	14.03	39.4	4.85
25	0.47	1.4	15.04	11.98	0.80	3.47	18.51	4.34	18.00	3.67	14.34	39.8	4.91
	0.71	13.1	15.55	12.21	0.78	3.25	18.81	4.78	18.85	3.72	15.13	40.7	5.07
	0.95	24.8	15.79	12.30	0.78	3.15	18.94	5.01	19.29	3.75	15.54	41.2	5.15
30	0.47	1.4	14.32	11.64	0.81	3.77	18.09	3.79	19.29	3.75	15.55	41.2	5.15
	0.71	12.4	14.88	11.91	0.80	3.54	18.41	4.21	20.15	3.81	16.35	42.1	5.29
	0.95	24.1	15.15	12.03	0.79	3.42	18.57	4.43	20.59	3.84	16.75	42.6	5.36
35	0.47	1.0	13.55	11.25	0.83	4.11	17.67	3.29	Operation Not Recommended				
	0.71	12.4	14.13	11.54	0.82	3.86	17.98	3.66					
	0.95	23.4	14.42	11.69	0.81	3.73	18.15	3.86					
40	0.47	0.7	12.77	10.85	0.85	4.49	17.26	2.84					
	0.71	12.1	13.34	11.15	0.84	4.21	17.55	3.17					
	0.95	22.1	13.63	11.30	0.83	4.08	17.71	3.34					
45	0.47	0.7	12.01	10.47	0.87	4.91	16.93	2.44					
	0.71	11.7	12.55	10.74	0.86	4.61	17.16	2.72					
	0.95	21.4	12.83	10.89	0.85	4.46	17.30	2.88					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



Performance Data - TSV/D/H0070

802 l/s Nominal Airflow

EWT °C	FLOW l/s	PD kPa	TC kW	SC kW	S/T	Power kW	HR kW	EER W/W	HC kW	Power kW	HE kW	LAT °C	COP W/W
-5	1.04	62.7	Operation Not Recommended						11.74	3.73	8.01	32.1	3.15
0	0.52	16.5	18.09	12.96	0.72	2.69	20.78	6.72	12.84	3.81	9.03	33.3	3.37
	0.78	35.9	18.29	13.03	0.71	2.58	20.87	7.09	13.39	3.84	9.54	33.8	3.48
	1.04	55.2	18.41	13.08	0.71	2.53	20.94	7.28	13.69	3.86	9.83	34.1	3.54
5	0.52	15.2	19.09	13.80	0.72	2.87	21.97	6.65	14.34	3.90	10.44	34.8	3.67
	0.78	33.8	19.23	13.83	0.72	2.74	21.98	7.01	15.04	3.95	11.09	35.5	3.81
	1.04	51.7	19.30	13.85	0.72	2.68	21.98	7.20	15.43	3.97	11.46	35.9	3.88
10	0.52	13.8	19.32	14.18	0.73	3.13	22.45	6.16	15.97	4.00	11.97	36.5	3.99
	0.78	31.0	19.51	14.19	0.73	2.95	22.46	6.62	16.82	4.06	12.76	37.4	4.15
	1.04	48.3	19.60	14.21	0.72	2.86	22.47	6.85	17.29	4.09	13.21	37.9	4.23
15	0.52	11.7	18.73	14.05	0.75	3.40	22.13	5.51	17.69	4.11	13.58	38.3	4.30
	0.78	27.6	19.21	14.22	0.74	3.18	22.39	6.04	18.68	4.17	14.51	39.3	4.48
	1.04	44.1	19.40	14.27	0.74	3.08	22.48	6.30	19.23	4.21	15.02	39.9	4.57
20	0.52	11.7	17.95	13.73	0.76	3.69	21.64	4.86	19.44	4.22	15.22	40.1	4.60
	0.78	27.6	18.60	14.01	0.75	3.45	22.04	5.40	20.55	4.30	16.25	41.2	4.78
	1.04	43.4	18.88	14.12	0.75	3.33	22.21	5.67	21.16	4.34	16.82	41.8	4.88
25	0.52	11.0	16.92	13.24	0.78	4.07	20.99	4.15	21.44	4.36	17.08	42.1	4.92
	0.78	26.2	17.66	13.60	0.77	3.80	21.46	4.65	22.65	4.45	18.20	43.4	5.09
	1.04	42.1	18.02	13.76	0.76	3.66	21.68	4.92	23.30	4.50	18.80	44.1	5.18
30	0.52	11.0	15.96	12.75	0.80	4.46	20.41	3.58	23.14	4.49	18.65	43.9	5.16
	0.78	25.5	16.72	13.14	0.79	4.15	20.87	4.03	24.39	4.59	19.80	45.2	5.31
	1.04	40.7	17.10	13.33	0.78	4.00	21.10	4.27	25.04	4.65	20.39	45.8	5.39
35	0.52	10.7	15.01	12.27	0.82	4.89	19.90	3.07	Operation Not Recommended				
	0.78	24.8	15.73	12.64	0.80	4.55	20.28	3.46					
	1.04	39.6	16.12	12.83	0.80	4.39	20.50	3.67					
40	0.52	10.0	14.14	11.84	0.84	5.39	19.52	2.62					
	0.78	23.4	14.78	12.16	0.82	5.01	19.79	2.95					
	1.04	37.6	15.13	12.33	0.82	4.83	19.96	3.13					
45	0.52	9.7	13.41	11.53	0.86	5.96	19.37	2.25					
	0.78	22.8	13.92	11.74	0.84	5.53	19.46	2.52					
	1.04	36.5	14.22	11.88	0.84	5.33	19.55	2.67					

Interpolation is permissible; extrapolation is not.

All entering air conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

AHRI/ISO certified conditions are 27°C DB and 19°C WB in cooling and 20°C DB in heating.

Table does not reflect fan or pump power corrections for AHRI/ISO conditions.

All performance data is based upon the lower voltage of dual voltage rated units.

Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.

Operation below 4°C EWT is based upon a 15% methanol antifreeze solution.

Operation below 16°C EWT requires optional insulated water/refrigerant circuit.

See performance correction tables for operating conditions other than those listed above.

Gray shaded area refers to calculations required to determine if heating water flow is sufficient for non-antifreeze systems.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Air Flow Correction Table

### PSC Fan Motor

Airflow	Cooling					Heating		
% of Rated	Total Capacity	Sensible Capacity	S/T	Power	Heat of Rejection	Heating Capacity	Power	Heat of Extraction
68%	0.9465	0.8019	0.8472	0.9614	0.9496			
75%	0.9602	0.8350	0.8696	0.9675	0.9617	0.9740	1.0936	0.9425
81%	0.9724	0.8733	0.8981	0.9744	0.9728	0.9810	1.0635	0.9592
88%	0.9831	0.9149	0.9306	0.9821	0.9829	0.9876	1.0379	0.9744
94%	0.9923	0.9578	0.9653	0.9906	0.9920	0.9940	1.0167	0.9880
100%	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
106%	1.0062	1.0392	1.0328	1.0102	1.0070	1.0057	0.9878	1.0105
113%	1.0109	1.0733	1.0617	1.0211	1.0130	1.0112	0.9800	1.0194
119%	1.0141	1.1001	1.0848	1.0329	1.0180	1.0163	0.9705	1.0284
125%	1.0159	1.1174	1.0999	1.0455	1.0220	1.0211	0.9614	1.0368
130%	1.0161	1.1229	1.1050	1.0562	1.0244	1.0247	0.9554	1.0430

Black area denotes where operation is not recommended.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Entering Air Correction Table

Heating (Nominal Airflow)			
Entering Air DB °C	Heating Capacity	Power	Heat of Extraction
10	1.0378	0.8291	1.0907
13	1.0281	0.8711	1.0679
16	1.0177	0.9176	1.0431
18	1.0068	0.9681	1.0166
20	1.0000	1.0000	1.0000
21	0.9954	1.0219	0.9887
24	0.9837	1.0787	0.9596
27	0.9719	1.1379	0.9298

Cooling (Nominal Airflow)												
Entering Air WB °C	Total Capacity	Sensible Cooling Capacity Multiplier - Entering DB °C									Power	Heat of Rejection
		16	18	21	24	27	29	32	35	38		
7	0.6729	*	*	*	*	*	*	*	*	*	0.9870	0.7339
10	0.7521	0.8602	*	*	*	*	*	*	*	*	0.9876	0.7978
13	0.8300	0.7278	0.8327	0.9622	*	*	*	*	*	*	0.9898	0.8610
16	0.9067		0.6327	0.8063	0.9888	*	*	*	*	*	0.9934	0.9235
18	0.9821			0.6128	0.8173	1.0448	*	*	*	*	0.9985	0.9853
19	1.0000			0.5607	0.7696	1.0000	1.1784	*	*	*	1.0000	1.0000
19	1.0119			0.5249	0.7365	0.9688	1.1478	*	*	*	1.0010	1.0098
21	1.0562				0.6021	0.8415	1.0241	1.2257	*	*	1.0052	1.0463
24	1.1292					0.5937	0.7857	0.9986	1.2059	*	1.0134	1.1067

\* = Sensible capacity equals total capacity

AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 27.0°C DB/19.0°C WB, 1 and Heating - 20.0°C DB/15.0°C WB entering air temperature



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Motorized Water Valve Correction Table

Model	Kv	Cv	MOPD		WPD Adders		
			kPa	Psig	l/s	kPa	Psig
009	4.2	4.9	1034	150	0.09	0.55	0.08
	4.2	4.9	1034	150	0.13	1.24	0.18
	4.2	4.9	1034	150	0.18	2.27	0.33
012	4.2	4.9	1034	150	0.11	0.90	0.13
	4.2	4.9	1034	150	0.16	1.93	0.28
	4.2	4.9	1034	150	0.22	3.51	0.51
018	8.8	10.3	861	125	0.18	0.48	0.07
	8.8	10.3	861	125	0.26	1.10	0.16
	8.8	10.3	861	125	0.35	2.00	0.29
024	8.8	10.3	861	125	0.25	1.03	0.15
	8.8	10.3	861	125	0.38	2.34	0.34
	8.8	10.3	861	125	0.50	4.13	0.6
030	8.8	10.3	861	125	0.25	1.03	0.15
	8.8	10.3	861	125	0.38	2.34	0.34
	8.8	10.3	861	125	0.50	4.13	0.6
036	8.8	10.3	861	125	0.28	1.31	0.19
	8.8	10.3	861	125	0.43	2.96	0.43
	8.8	10.3	861	125	0.57	5.24	0.76
042	8.8	10.3	861	125	0.35	2.00	0.29
	8.8	10.3	861	125	0.52	4.41	0.64
	8.8	10.3	861	125	0.69	7.85	1.14
048	8.8	10.3	861	125	0.38	2.34	0.34
	8.8	10.3	861	125	0.57	5.24	0.76
	8.8	10.3	861	125	0.76	9.37	1.36
060	7.6	8.9	861	125	0.47	4.89	0.71
	7.6	8.9	861	125	0.71	11.02	1.6
	7.6	8.9	861	125	0.95	19.57	2.84
070	7.6	8.9	861	125	0.52	5.93	0.86
	7.6	8.9	861	125	0.78	13.30	1.93
	7.6	8.9	861	125	1.04	23.70	3.44



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Antifreeze Correction Table

Antifreeze Type	Antifreeze %	Cooling			Heating		WPD Corr. Fct. EWT -1°C
		EWT 32°C			EWT -1°C		
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Blower Performance Data (PSC Motor) - Standard Unit

Model	Voltage	Fan Speed	Rated Airflow (l/s)	Min Airflow (l/s)	Airflow (l/s) at External Static Pressure (Pa)									
					0	25	50	75	100	125	150	175	200	225
TS/H/V 009	220V	HIGH	118	94	160	149	142	130	115					
TS/H/V 009	220V	MED	118	94	153	143	134	123	110					
TS/H/V 009	220V	LOW	118	94	137	128	121	112	96					
TS/H/V 012	220V	HIGH	142	118	217	204	191	177	161	150	120			
TS/H/V 012	220V	MED	142	118	196	186	176	162	148	134				
TS/H/V 012	220V	LOW	142	118	165	160	153	142	131					
TS/H/V 018	220V	HIGH	236	165	369	362	350	327	294	258	92			
TS/H/V 018	220V	MED	236	165	321	319	313	294	270	229	84			
TS/H/V 018	220V	LOW	236	165	287	285	280	268	247	201	79			
TS/H/V 024	220V	HIGH	330	236	412	404	391	365	328	286	223			
TS/H/V 024	220V	MED	330	236	347	344	339	322	296	254				
TS/H/V 024	220V	LOW	330	236	292	291	289	276	255	220				
TS/H/V 024	380V	HIGH	330	236	422	411	395	370	334	294	227			
TS/H/V 024	380V	MED	330	236	361	355	344	325	298	259				
TS/H/V 024	380V	LOW	330	236	329	325	317	301	281	248				
TS/H/V 030	220V	HIGH	378	283	547	514	480	439	390	340	284			
TS/H/V 030	220V	MED	378	283	488	464	434	399	354	307	285			
TS/H/V 030	220V	LOW	378	283	431	414	393	363	328	286				
TS/H/V 030	380V	HIGH	378	283	516	496	471	433	391	344	285			
TS/H/V 030	380V	MED	378	283	456	443	425	395	361	315	284			
TS/H/V 030	380V	LOW	378	283	398	395	386	370	340	305				
TS/H/V 036	220V	HIGH	472	330	719	714	696	672	639	586	385	331		
TS/H/V 036	220V	MED	472	330	533	536	536	527	496	387	331			
TS/H/V 036	220V	LOW	472	330	463	467	470	464	414	358				
TS/H/V 036	380V	HIGH	472	330	722	713	701	676	640	500	411	331		
TS/H/V 036	380V	MED	472	330	570	574	569	556	494	435	346			
TS/H/V 036	380V	LOW	472	330	524	524	525	515	473	400	339			
TS/H/V 042	380V	HIGH	543	401	645	634	616	598	558	489	401			
TS/H/V 042	380V	MED	543	401	513	506	496	475	440	370				
TS/H/V 042	380V	LOW	543	401	446	443	437	426	404					
TS/H/V 048	380V	HIGH	614	472	822	800	770	735	685	635	574	498		
TS/H/V 048	380V	MED	614	472	701	693	674	649	613	568	502			
TS/H/V 048	380V	LOW	614	472	628	625	612	591	554	515				
TS/H/V 060	380V	HIGH	755	590	993	968	962	934	889	842	797	732	680	594
TS/H/V 060	380V	MED	755	590	901	897	891	859	832	797	752	700	639	
TS/H/V 060	380V	LOW	755	590	847	839	832	812	786	759	712	667	618	
TS/H/V 070	380V	HIGH	802	684	1124	1088	1046	1001	951	892	843	779	702	
TS/H/V 070	380V	MED	802	684	1045	1014	980	950	897	855	806	751		
TS/H/V 070	380V	LOW	802	684	986	959	932	898	865	824	781			



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I

## Physical Data



Model	009	012	018	024	030	036	042	048	060	070
Compressor (1 Each)	Rotary		Scroll							
Factory Charge HFC-410A [kg]	0.88	0.96	1.13	1.59	1.64	1.98	2.27	2.27	3.86	4.08
<b>PSC Fan Motor &amp; Blower (3 Speeds)</b>										
Fan Motor [W]	37	93	124	149	249	373	373	560	746	746
High Static Fan Motor [W]	N/A	N/A	149	249	373	373	560	560	746	Not Available
Blower Wheel Size (dia x w) - [mm]	152 X 127	152 X 127	229 x 178	229 x 178	229 x 178	254 x 254	254 x 254	254 x 254	279 x 254	279 x 254
<b>Water Connection Size</b>										
FPT (in)	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"	1"	1"
<b>HWG Connection Size</b>										
FPT (in)	N/A	N/A	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
<b>Coax Volume</b>										
Volume [liters]	1.10	1.70	2.12	2.88	2.88	3.48	4.69	4.69	5.91	5.91
<b>Vertical Upflow/Downflow</b>										
Air Coil Dimensions (h x w) - [mm]	406 x 406 Upflow Only	406 x 406 Upflow Only	610 x 508	711 x 508	711 x 508	711 x 635	813 x 635	813 x 635	914 x 635	914 x 635
Standard Filter - [25.4mm] Throwaway, qty [mm]	406 x 508	406 x 508	610 x 610	711 x 610	711 x 610	711 x 762	2 - 406 x 762	2 - 406 x 762	1 - 406 x 762; 1 - 508 x 762	1 - 406 x 762; 1 - 508 x 762
Weight - Operating [kg]	71	73	117	121	122	148	188	189	200	201
Weight - Packaged [kg]	75	77	121	125	126	153	192	193	205	205
<b>Horizontal</b>										
Air Coil Dimensions (h x w) - [mm]	406 x 406	406 x 406	457 x 686	457 x 787	457 x 787	508 x 889	508 x 1016	508 x 1016	508 x 1143	508 x 1143
Standard Filter [25.4mm] Throwaway, qty [mm]	406 x 508	406 x 508	2 - 457 x 457	2 - 457 x 457	2 - 457 x 457	1 - 305 x 508; 1 - 508 x 635	1 - 457 x 508; 1 - 508 x 610	1 - 457 x 508; 1 - 508 x 610	2 - 508 x 610	2 - 508 x 610
Weight - Operating [kg]	71	73	117	121	122	148	188	189	200	201
Weight - Packaged [kg]	75	77	121	125	126	153	192	193	205	205

All units have dual vibration isolation compressor mounts for quiet operation, thermal expansion valves for refrigerant metering, and 22.2 mm & 28.6 mm electrical knockouts to accommodate field wiring.

FPT - Female Pipe Thread.

Condensate Drain Connection is 3/4" FPT.

Unit Maximum Water Working Pressure	
Options	Max Pressure [kPa]
Base Unit	3447
Internal Motorized Water Valve (MWV)	2,068
Internal Auto Flow Valve	2,068

Use the lowest maximum pressure rating when multiple options are combined.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Horizontal - Dimensional Data

Horizontal Model		Overall Cabinet		
		*A Width	B Length	C Height
009 - 012	cm	56.8	107.8	43.1
018	cm	56.8	158.0	48.9
024 - 030	cm	56.8	158.0	48.9
036	cm	64.5	180.8	54.0
042 - 048	cm	64.5	193.5	54.0
060 - 070	cm	64.5	206.2	54.0

\*Does not include air filter supports. Add 5.1cm when a 25.4mm filter is used, add 7.6cm when a 50.8mm filter is used.

Horizontal Model		Water Connections						
		1	2	3	4	5	Water Loop FPT	HWG FPT
		Loop In D	Loop Out E	HWG In F	HWG Out G	H		
009 - 012	cm	9.3	24.2	N/A	N/A	2.0	1/2"	N/A
018	cm	5.2	25.4	35.2	42.9	1.5	3/4"	1/2"
024 - 030	cm	5.2	25.4	35.2	42.9	1.5	3/4"	1/2"
036	cm	8.6	27.5	39.7	47.9	1.5	3/4"	1/2"
042 - 048	cm	8.6	27.5	39.7	47.9	1.5	1"	1/2"
060 - 070	cm	8.6	27.5	39.7	47.9	1.5	1"	1/2"

Horizontal Model		Electrical Knockouts		
		J 22.2 mm	K 22.2 mm	L 28.6 mm
		Low Voltage	External Pump	Power Supply
009 - 012	cm	9.4	15.6	21.9
018	cm	9.2	15.6	21.9
024 - 030	cm	9.2	15.6	21.9
036	cm	9.2	15.6	21.9
042 - 048	cm	9.2	15.6	21.9
060 - 070	cm	9.2	15.6	21.9

### Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Horizontal units shipped with filter bracket only. This bracket should be removed for return duct connection
3. Discharge flange and hanger brackets are factory installed.
4. Condensate is 3/4" NPT.
5. CCP and BSP requires 61 cm service access.
6. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.

### Legend:

CCP = Control/Compressor Access Panel

BSP = Blower Service Panel

\*ASP = Additional Service Panel (not required)

FPT = Female Pipe Thread

### Note:

\*ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.



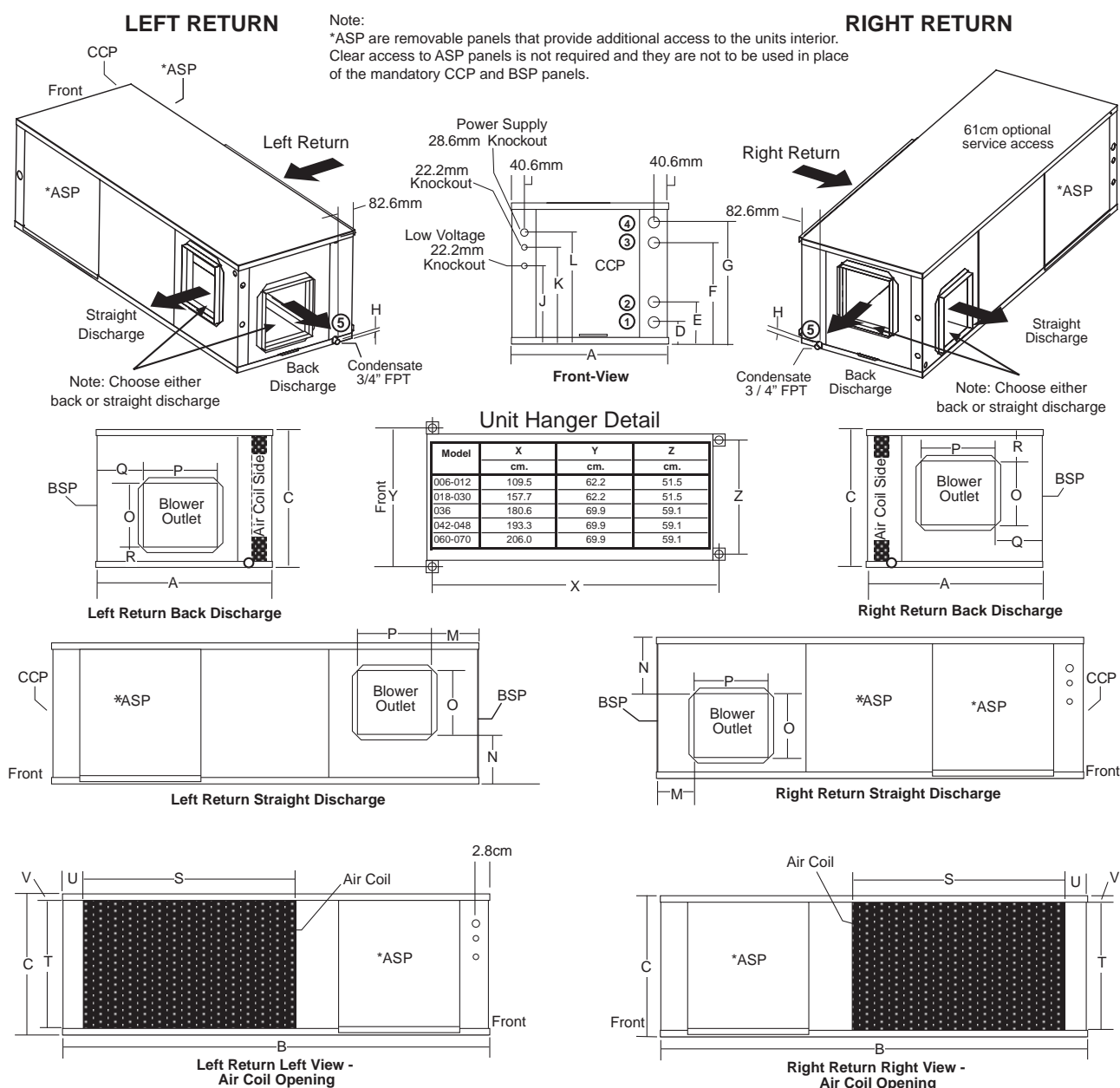
# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Horizontal - Dimensional Data

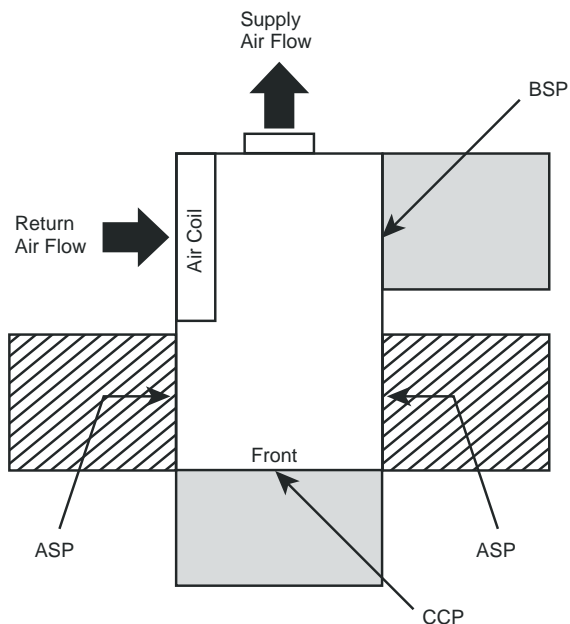
Horizontal Model		Discharge Connection Duct Flange Installed						Return Connection Using Return Air Opening				Return Connection Using Optional Air Filter Frame			
		M	N	O Supply Height	P Supply Width	Q	R	S Return Width	T Return Height	U	V	S Return Width	T Return Height	U	V
009 - 012	cm	13.4	10.3	22.5	22.5	13.4	10.3	43.4	38.9	5.3	2.5	45.0	36.1	5.8	4.3
018	cm	9.3	5.1	39.4	31.8	9.2	5.2	71.4	43.9	15.7	2.5	85.8	41.0	5.8	4.3
024 - 030	cm	9.3	5.1	39.4	31.8	9.2	5.2	81.5	43.9	5.8	2.5	85.8	41.0	5.8	4.3
036	cm	8.0	3.1	48.3	44.5	8.0	2.6	91.7	49.0	5.8	2.5	88.3	46.1	7.8	4.3
042 - 048	cm	8.0	3.1	48.3	44.5	8.0	2.6	104.4	49.0	5.8	2.5	101.0	46.1	7.8	4.3
060 - 070	cm	8.0	3.1	48.3	44.5	8.0	2.6	117.1	49.0	5.8	2.5	113.7	46.1	7.8	4.3

All dimensions +/- 5.1 mm.

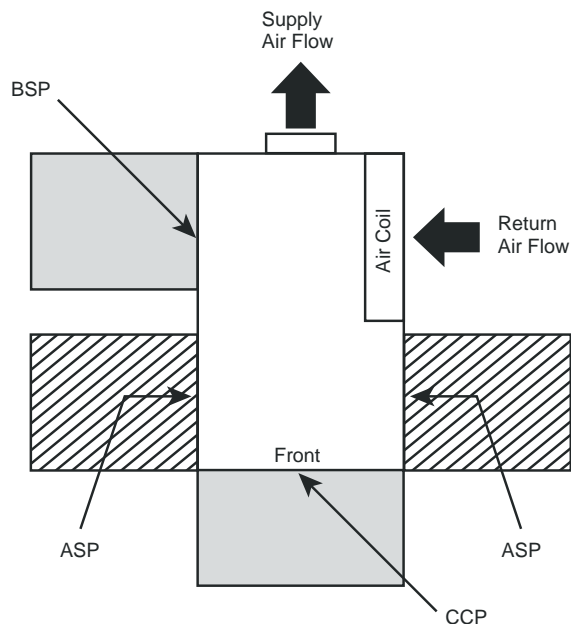




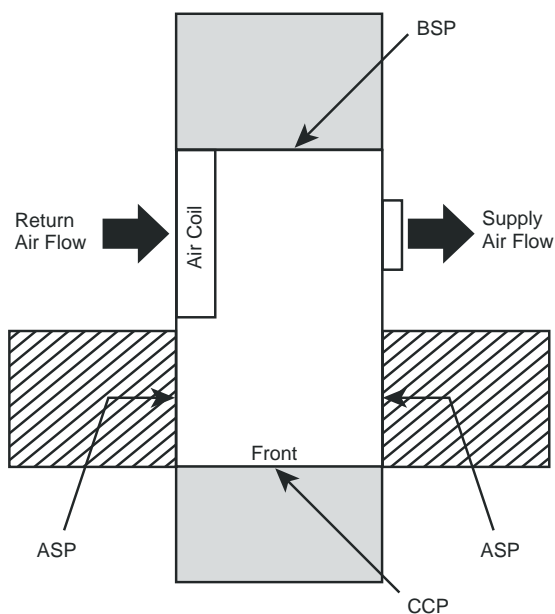
**Left Return Back Discharge**



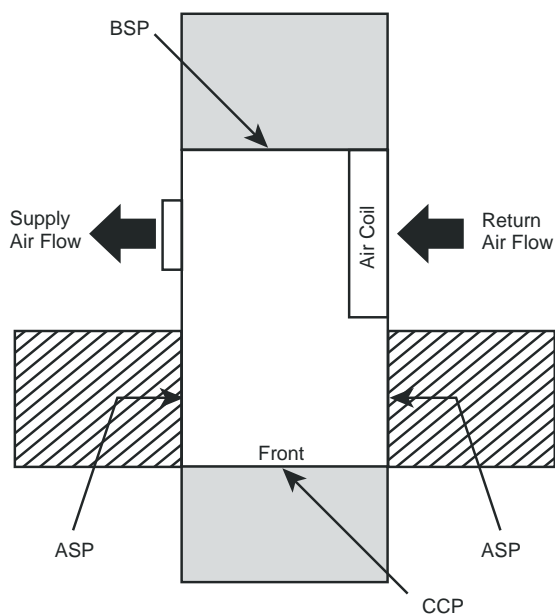
**Right Return Back Discharge**



**Left Return Straight Discharge**



**Right Return Straight Discharge**



 = mandatory 61 cm service access

 = (optional) additional 61 cm service access

**Notes:**

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. CCP and BSP requires 61 cm service access.
3. Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.
4. ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.

**Legend:**

CCP = Control/Compressor Access Panel  
BSP = Blower Service Panel  
ASP = Additional Service Panel (not required)



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Vertical Upflow - Dimensional Data

Vertical Upflow Model		Overall Cabinet		
		*A Width	B Depth	C Height
009 - 012	cm	56.8	54.9	87.6
018	cm	56.8	65.1	113.3
024 - 030	cm	56.8	65.1	123.2
036	cm	64.5	77.8	128.3
042 - 048	cm	64.5	77.8	138.4
060 - 070	cm	64.5	77.8	148.6

\*Does not include air filter supports. Add 5.1cm when a 25.4mm filter is used, add 7.6cm when a 50.8mm filter is used.

Vertical Upflow Model		Water Connections						
		1	2	3	4	5		
		Loop In D	Loop Out E	HWG In F	HWG Out G	H	Water Loop FPT	HWG FPT
009 - 012	cm	9.4	24.6	N/A	N/A	18.7	1/2"	N/A
018	cm	5.2	25.4	35.2	42.9	19.8	3/4"	1/2"
024 - 030	cm	5.2	25.4	35.2	42.9	19.8	3/4"	1/2"
036	cm	8.6	27.5	39.7	47.9	19.8	3/4"	1/2"
042 - 048	cm	8.6	27.5	39.7	47.9	19.8	1"	1/2"
060 - 070	cm	8.6	27.5	39.7	47.9	19.8	1"	1/2"

Vertical Upflow Model		Electrical Knockouts		
		J 22.2mm	K 22.2mm	L 28.6mm
		Low Voltage	External Pump	Power Supply
009 - 012	cm	9.5	15.9	22.2
018	cm	9.2	15.6	21.9
024 - 030	cm	9.2	15.6	21.9
036	cm	9.2	15.6	21.9
042 - 048	cm	9.2	15.6	21.9
060 - 070	cm	9.2	15.6	21.9

### Notes:

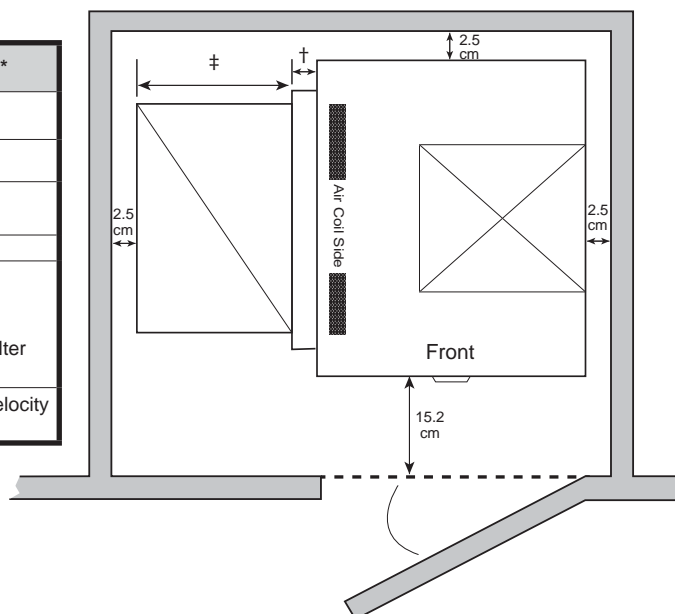
1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available.
3. Discharge flange is field installed.
4. Condensate is 3/4" FPT PVC and is switchable from front to side.
5. Units are shipped with an air filter supported by a set of filter rails. These rails are not suitable for supporting duct work. If a return air duct is to be connected to the unit, these rails should be removed and replaced with the ClimateMaster AFF Series accessory filter frame or some other air filter support system.

### Legend:

CCP = Control/Compressor Access Panel  
 BSP = Blower Service Panel  
 ASP = Additional Service Panel (not required)  
 FPT = Female Pipe Thread

Recommended Minimum Installation Clearances for Vertical Units*	
2.5 cm	Back of unit
	Side opposite return air
15.2 cm	Front if hard piped
Return Air Side	
2.5 cm	Ducted return
	- ‡ Add for duct width
	- † Add 5.1 cm for 25.4 mm filter frame/rail or 7.6 cm for 50.8 mm filter frame/rail
	Free (open) return - calculate required dimension for a maximum velocity of 3.0 m/s

\*Field installed accessories (hoses, air cleaners, etc.) may require additional space. Top supply air is shown, the same clearances apply to bottom supply air units.



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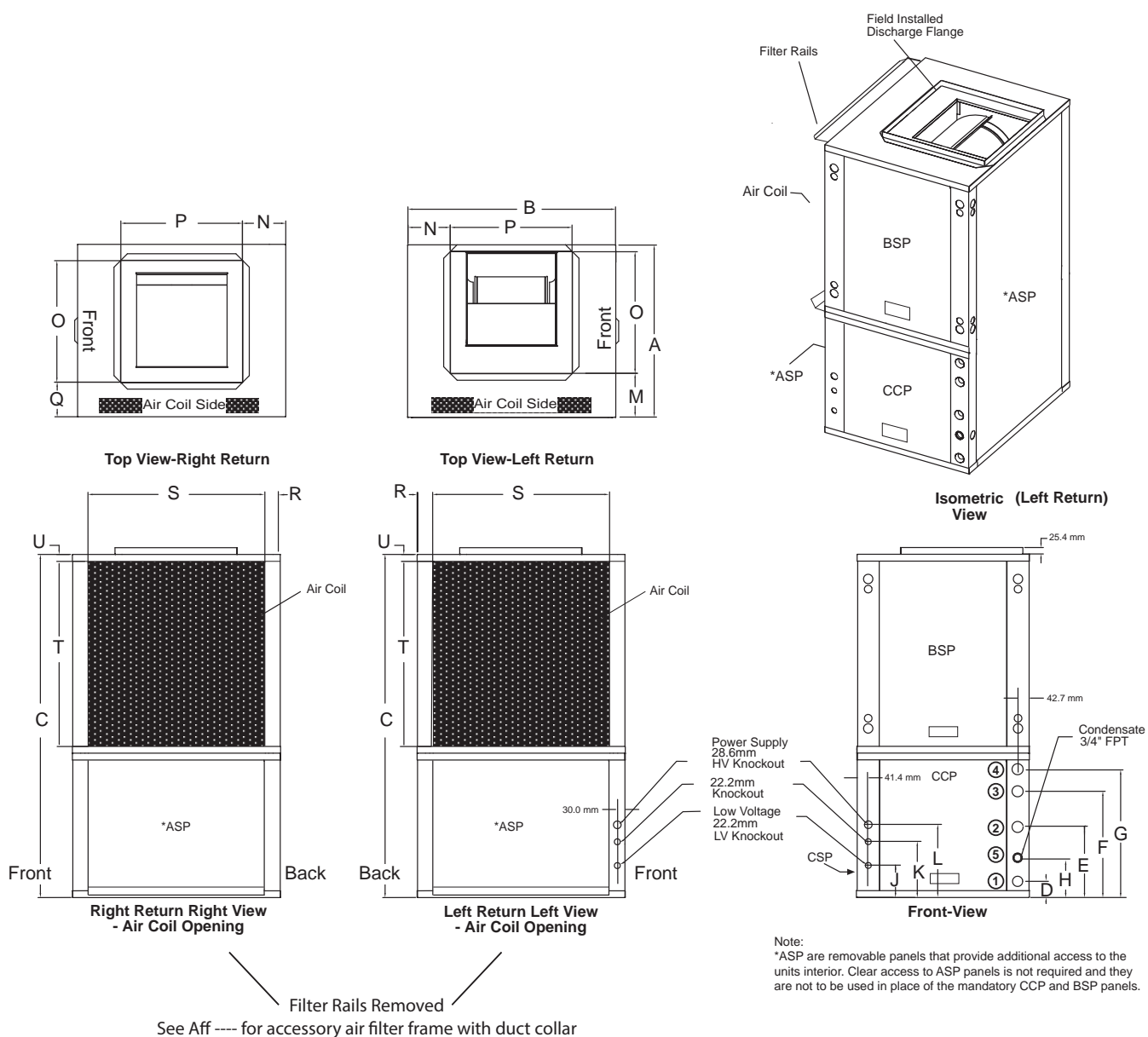
# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Vertical Upflow - Dimensional Data

Vertical Upflow Model		Discharge Connection Duct Flange Installed					Return Connection Using Return Air Opening				Return Connection Using Optional Air Filter Frame			
		M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U	R	S Return Depth	T Return Height	U
009 - 012	cm	17.0	16.0	22.9	22.9	17.0	5.8	43.4	38.9	2.5	4.3	45.0	36.1	4.3
018	cm	18.3	14.8	35.6	35.6	12.4	5.8	53.6	60.2	2.5	4.3	56.4	66.5	4.3
024 - 030	cm	18.3	14.8	35.6	35.6	12.4	5.8	53.6	70.4	2.5	4.3	56.4	66.5	4.3
036	cm	16.1	16.0	45.7	45.7	13.5	5.8	66.3	70.4	2.5	4.3	69.1	66.5	4.3
042 - 048	cm	16.1	16.0	45.7	45.7	13.5	5.8	66.3	80.5	2.5	4.3	69.1	76.7	4.3
060 - 070	cm	16.1	16.0	45.7	45.7	13.5	5.8	66.3	90.7	2.5	4.3	69.1	86.9	4.3

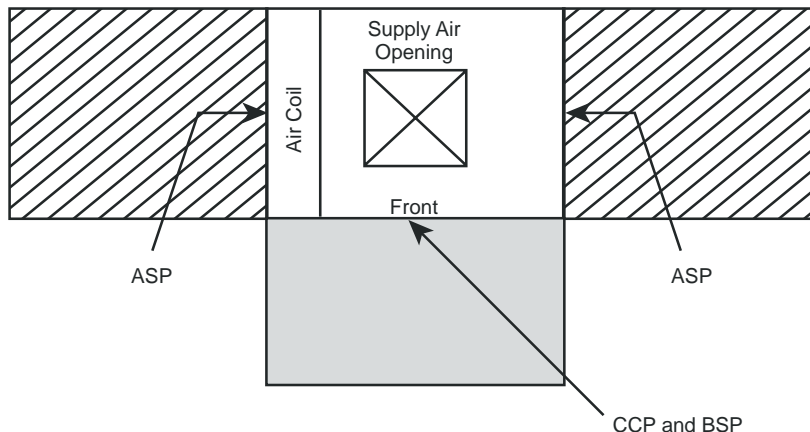
All dimensions +/- 5.1 mm.



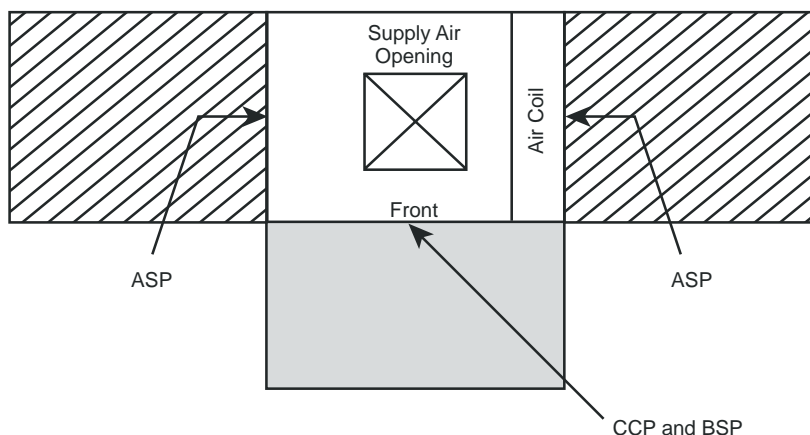


## Vertical Units

Left Return



Right Return



 = mandatory 61 cm service access

 = (optional) additional 61 cm service access

Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available.
3. ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.
4. Top supply air is shown, the same clearances apply to bottom supply air units.

Legend:

CCP = Control/Compressor Access Panel

BSP = Blower Service Panel

ASP = Additional Service Panel (not required)



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Vertical Downflow - Dimensional Data

Vertical Downflow Model		Overall Cabinet		
		*A Width	B Depth	C Height
018	cm	56.8	65.1	122.9
024 - 030	cm	56.8	65.1	133.4
036	cm	64.5	77.8	138.4
042 - 048	cm	64.5	77.8	148.6
060 - 070	cm	64.5	77.8	158.8

\*Does not include air filter supports. Add 5.1cm when a 25.4mm filter is used, add 7.6cm when a 50.8mm filter is used.

Vertical Downflow Model		Water Connections						
		1	2	3	4	5	Water Loop FPT	HWG FPT
		Loop In D	Loop Out E	HWG In F	HWG Out G	H		
018	cm	43.7	23.6	13.7	6.1	9.2	3/4"	1/2"
024 - 030	cm	45.5	26.7	14.5	6.1	9.2	3/4"	1/2"
036	cm	45.5	26.7	14.5	6.1	9.2	3/4"	1/2"
042 - 048	cm	45.5	26.7	14.5	6.1	9.2	1"	1/2"
060 - 070	cm	45.5	26.7	14.5	6.1	9.2	1"	1/2"

Vertical Downflow Model		Electrical Knockouts		
		J 22.2mm	K 22.2mm	L 28.6mm
		Low Voltage	External Pump	Power Supply
018	cm	9.2	15.6	21.9
024 - 030	cm	9.2	15.6	21.9
036	cm	9.2	15.6	21.9
042 - 048	cm	9.2	15.6	21.9
060 - 070	cm	9.2	15.6	21.9

### Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available.
3. Condensate is 3/4" FPT PVC and is switchable from front to side.
4. Units are shipped with an air filter supported by a set of filter rails. These rails are not suitable for supporting duct work. If a return air duct is to be connected to the unit, these rails should be removed and replaced with the ClimateMaster AFF Series accessory filter frame or some other air filter support system.

### Legend:

CCP = Control/Compressor Access Panel

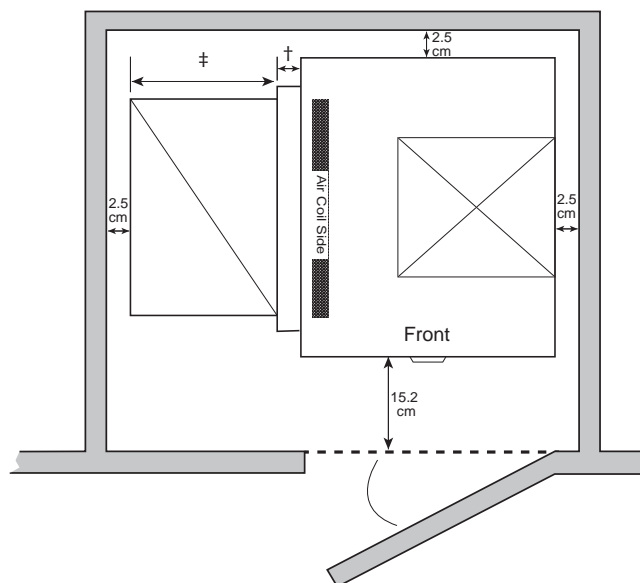
BSP = Blower Service Panel

ASP = Alternative Service Panel

FPT = Female Pipe Thread

Recommended Minimum Installation Clearances for Vertical Units*	
2.5 cm	Back of unit
	Side opposite return air
15.2 cm	Front if hard piped
Return Air Side	
2.5 cm	Ducted return
	- ± Add for duct width
	- † Add 5.1 cm for 25.4 cm filter frame/rail or 7.6 cm for 50.8 filter frame/rail
	Free (open) return - calculate required dimension for a maximum velocity of 3.0 m/s

\*Field installed accessories (hoses, air cleaners, etc.) may require additional space. Top supply air is shown, the same clearances apply to bottom supply air units.





# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## TS - Vertical Downflow - Dimensional Data

Vertical Downflow Model		Discharge Connection Duct Flange Installed					Return Connection Using Return Air Opening				Return Connection Using Optional Air Filter Frame			
		M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U	R	S Return Depth	T Return Height	U
018	cm	17.1	21.4	25.7	23.0	27.4	5.6	53.6	60.2	53.8	4.3	56.4	56.4	55.6
024 - 030	cm	17.1	21.4	25.7	23.0	27.4	5.6	53.6	70.4	53.8	4.3	56.4	66.5	55.6
036	cm	18.3	22.9	34.0	32.7	26.5	5.6	66.3	70.4	58.9	4.3	69.1	66.5	60.7
042 - 048	cm	18.3	22.9	34.0	32.7	26.5	5.6	66.3	80.5	58.9	4.3	69.1	76.7	60.7
060 - 070	cm	18.3	22.9	34.0	32.7	26.5	5.6	66.3	90.7	58.9	4.3	69.1	86.9	60.7

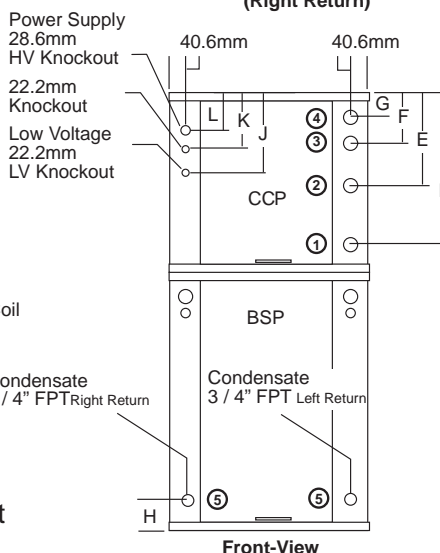
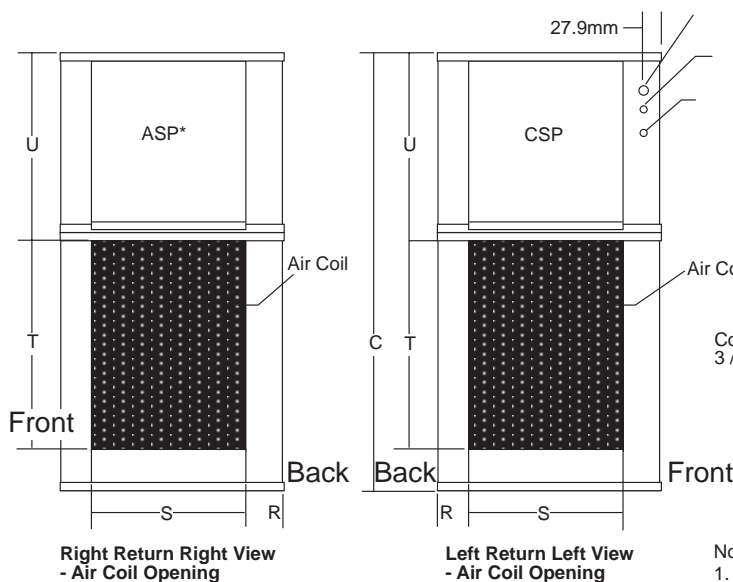
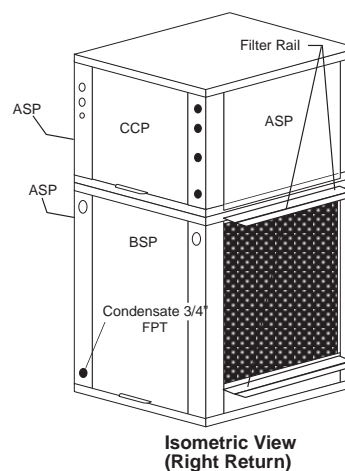
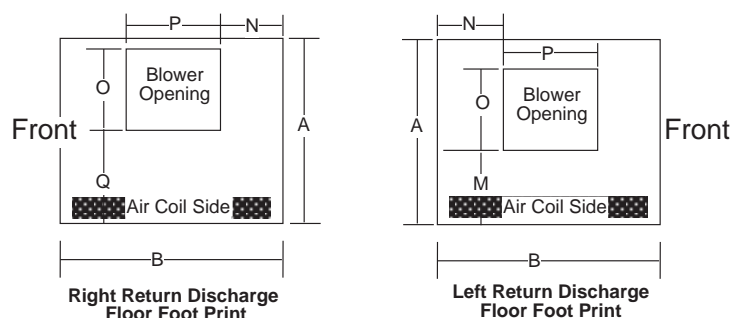
All dimensions +/- 5.1 mm.

### Legend:

CCP = Control/Compressor Access Panel

BSP = Blower Service Panel

ASP = Additional Service Panel (not required)



### Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front & Side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available.
3. Condensate is 3/4" FPT PVC.
4. ASP are removable panels that provide additional access to the units interior. Clear access to ASP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Corner Weights for TSH Series Units

Model		Total	Left-Front*	Right-Front*	Left-Back*	Right-Back*
009	kg	71	24.9	15.0	16.3	14.5
012	kg	73	25.4	15.4	16.8	15.0
018	kg	117	35.4	29.3	30.0	21.6
024	kg	122	35.7	30.5	31.7	22.7
030	kg	122	36.0	30.7	31.9	22.9
036	kg	148	47.4	34.0	38.0	29.0
042	kg	188	65.4	41.8	44.3	36.2
048	kg	189	65.8	42.0	44.5	36.4
060	kg	200	82.7	32.9	35.6	48.9
070	kg	201	83.1	33.0	35.7	49.1

\*Front is control box end.



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



## Electrical Data

Model	Voltage Code	Rated Voltage	Min/Max	RLA	LRA	Compressor Qty	Fan Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR
009	V	220/240/50/1	197/254	3.2	17.0	1	0.3	3.5	4.3	15
012	V	220/240/50/1	197/254	4.0	19.0	1	0.7	4.7	5.7	15
018	V	220/240/50/1	197/254	7.1	44.0	1	0.9	8.0	9.8	15
024	V	220/240/50/1	197/254	10.9	58.0	1	0.9	11.8	14.5	25
024	U	380/420/50/3	342/462	4.0	24.0	1	0.6	4.6	5.6	15
030	V	220/240/50/1	197/254	10.9	58.0	1	1.6	12.5	15.2	25
030	U	380/420/50/3	342/462	4.5	26.0	1	0.9	5.4	6.5	15
036	V	220/240/50/1	197/254	12.5	61.0	1	2.0	14.5	17.6	30
036	U	380/420/50/3	342/462	4.5	32.0	1	1.2	5.7	6.8	15
042	U	380/420/50/3	342/462	5.1	35.0	1	1.0	6.1	7.4	15
048	U	380/420/50/3	342/462	7.1	48.0	1	1.7	8.8	10.6	15
060	U	380/420/50/3	342/462	9.6	64.0	1	2.5	12.1	14.5	20
070	U	380/420/50/3	342/462	9.6	74.0	1	2.6	12.2	14.6	20



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I



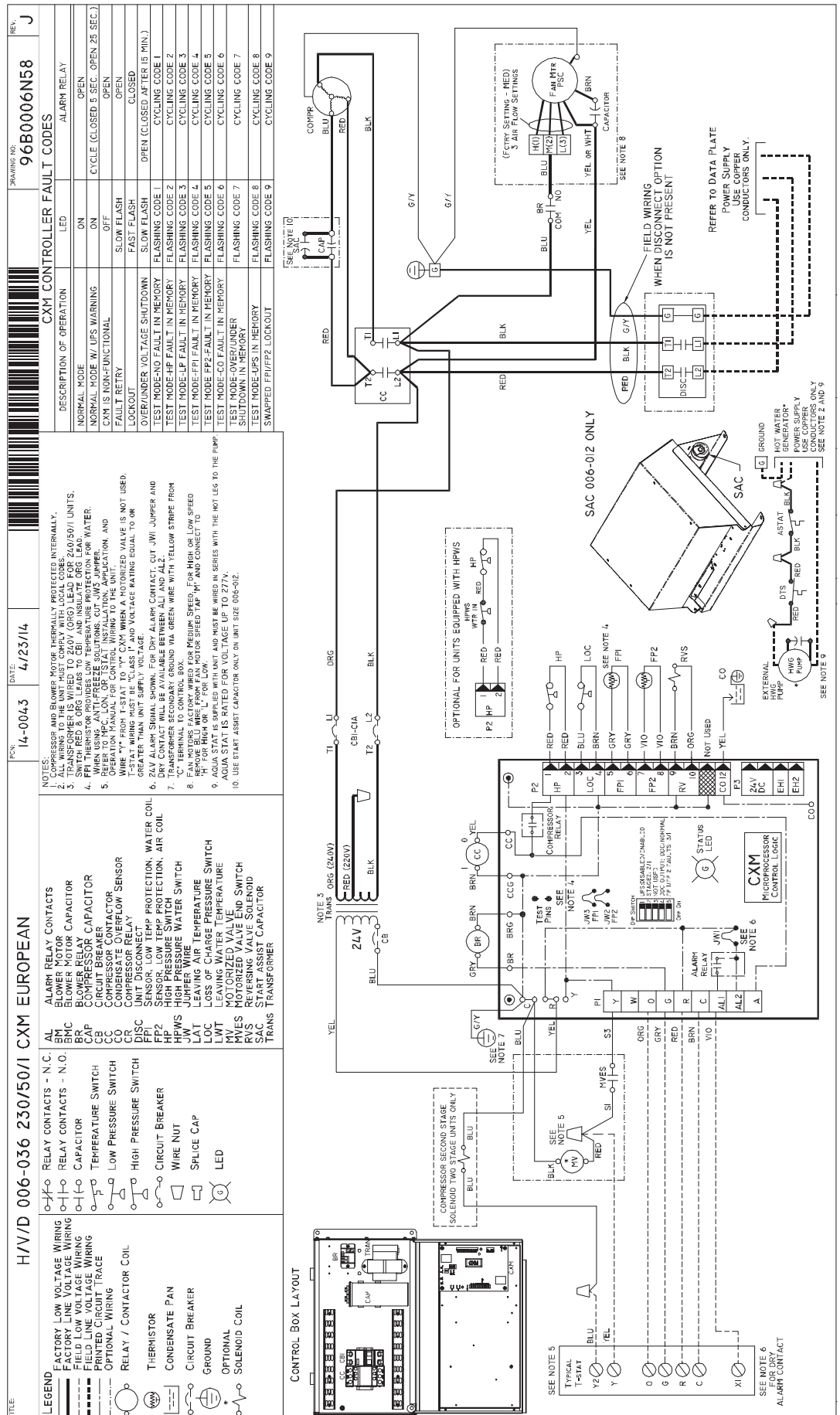
## TS Series Wiring Diagram Matrix

Only CXM and DXM diagrams, with a representative diagram of LON and MPC Options are presented in this submittal. Other diagrams can be located online at [climatemaster.com](http://climatemaster.com) using the part numbers presented below.

Model	Refrigerant	Wiring Diagram Part Number	Sizes	Electrical V-Hz-Ph	Control	DDC	Fan Motor
TS Series Single Phase	EarthPure® HFC-410A	96B0006N58	009 - 036	220-50-1	CXM	-	PSC
		96B0006N60				LON	
		96B0006N62				MPC	
		96B0006N59			DXM	-	
		96B0006N61				LON	
		96B0006N63				MPC	
TS Series Three Phase	EarthPure® HFC-410A	96B0008N50	024 - 070	380-50-3	CXM	-	PSC
		96B0008N52				LON	
		96B0008N54				MPC	
		96B0008N51			DXM	-	
		96B0008N53				LON	
		96B0008N55				MPC	

All wiring diagrams available at [climatemaster.com](http://climatemaster.com).

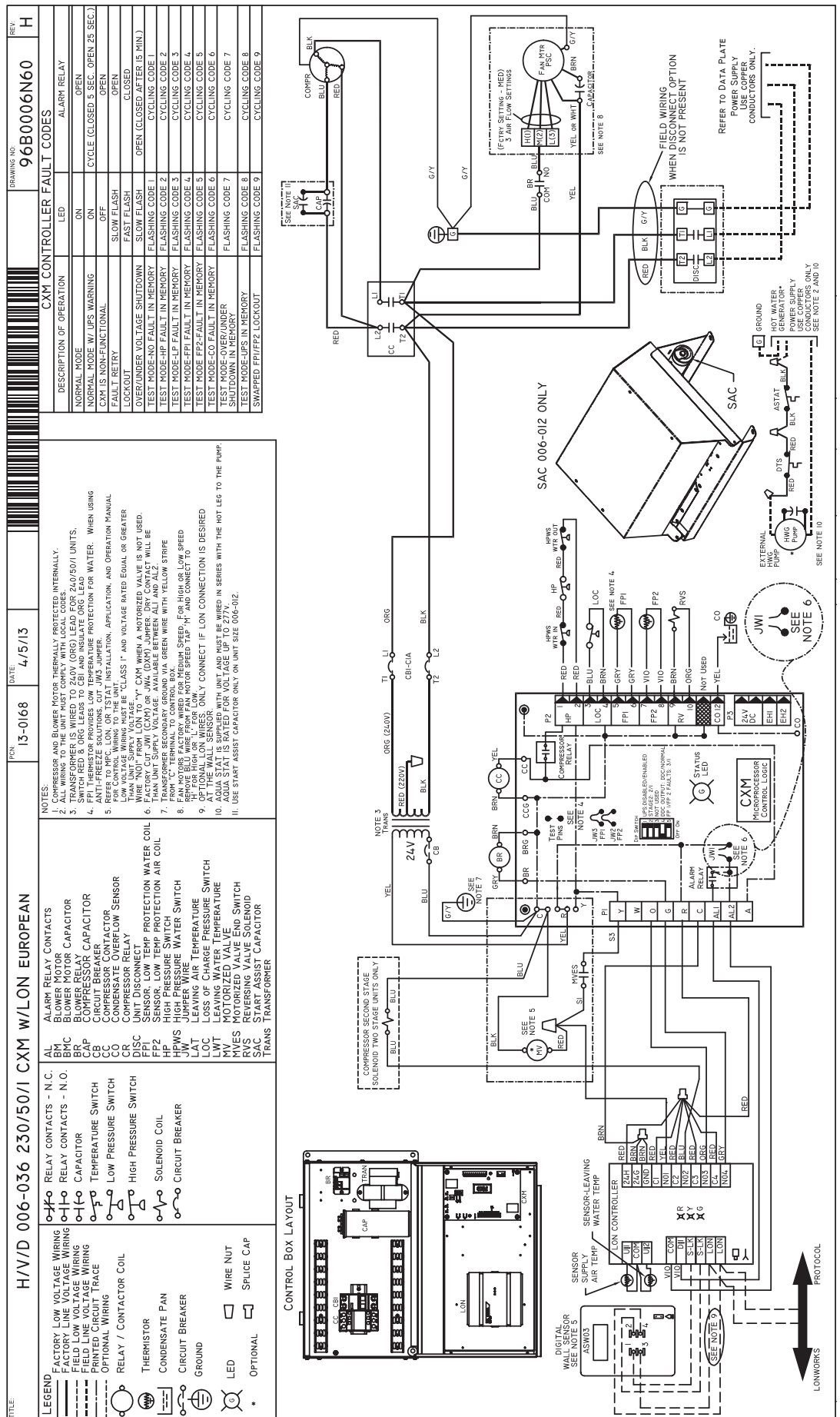




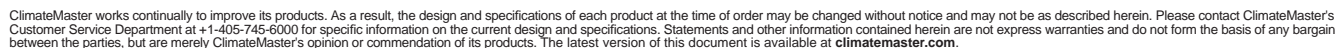




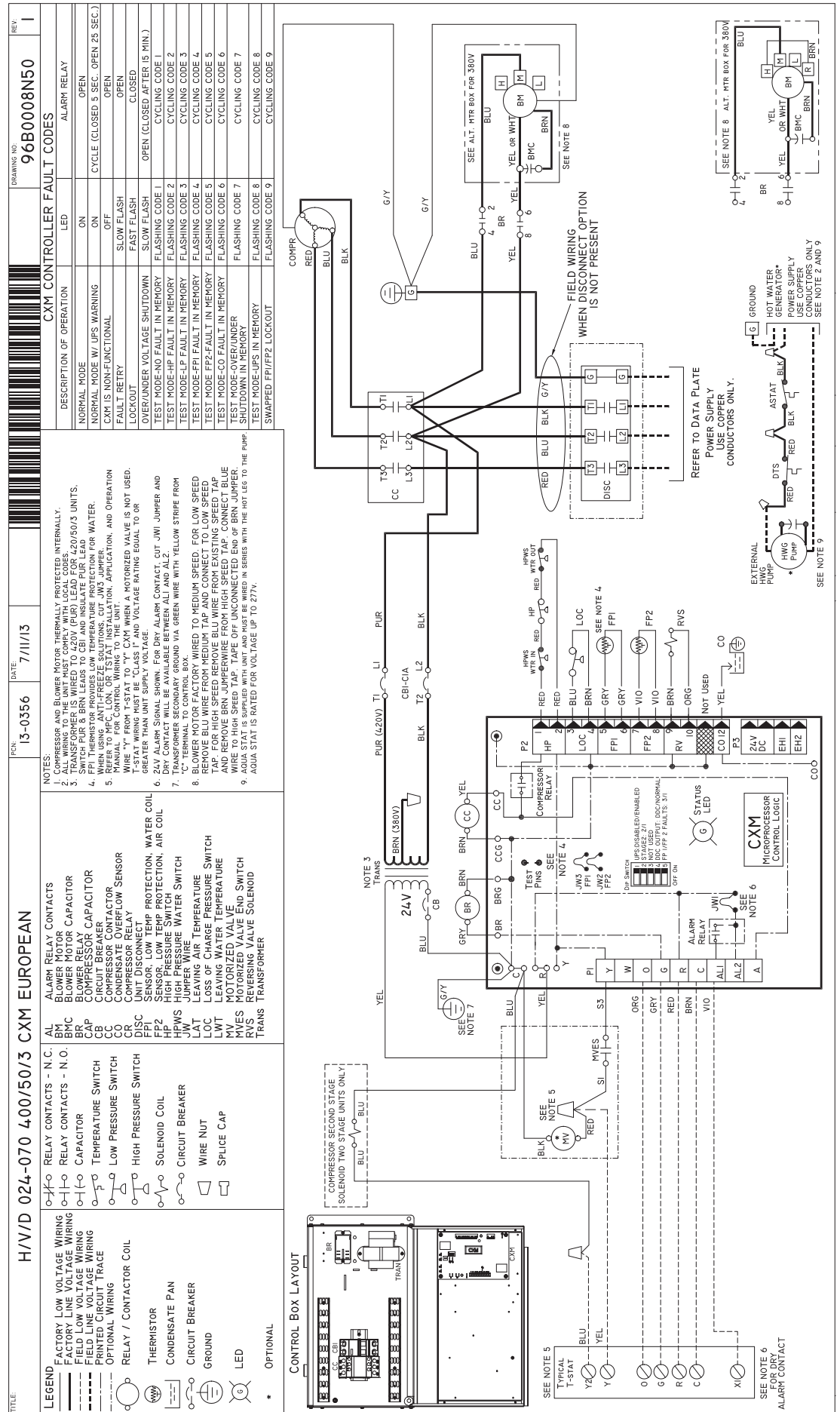




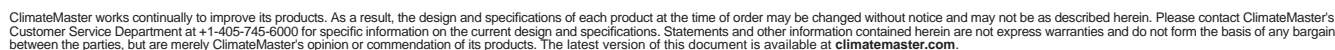














**General:**

Furnish and install ClimateMaster "Tranquility® 20" Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from -6.7° to 48.9°C as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated in accordance with International Standards Organization (ISO) 13256-1.

All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit. ***Note: If unit fails the factory acceptance test it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.***

**Basic Construction:**

Horizontal Units shall have one of the following air flow arrangements: Left Inlet/Straight (Right) Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge; or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.

Vertical Units shall have one of the following air flow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, Left Return/Bottom Discharge, Right Return/Bottom Discharge as shown on the plans.

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units (horizontal and vertical) must have a minimum of three access panels for serviceability of compressor compartment. **Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.**

Compressor section interior surfaces shall be lined with 12.7mm thick, dual density, 28 kg/m<sup>3</sup> acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 12.7mm thick, single density, 28 kg/m<sup>3</sup> foil backed fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. **Units without foil backed insulation in the air handling section will not be accepted.**

The heat pumps shall be fabricated from heavy gauge galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection.

Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

All horizontal units to have factory installed 25.4mm discharge air duct collars, 25.4mm filter rails with 25.4mm filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 25.4mm filter rails with 25.4mm filters factory installed. **If units with these factory installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.**

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have a factory installed 25.4mm wide filter rail for filter removal from either side. Units shall have a 25.4mm thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings, and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench. **Water connections that protrude through the cabinet or require the use of a backup wrench shall not be allowed.** All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. **Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.** Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

Option: Contractor shall install 50.8mm filter racks with removable access door and 50.8mm MERV11 pleated throwaway filters on all units.

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Option: UltraQuiet package (available on TS018-070 Units) shall consist of high technology sound attenuating material that is strategically applied to the compressor and air handling compartment casings and fan scroll in addition to the standard ClimaQuiet system design, to further dampen and attenuate sound transmissions. Compressor is mounted on specially engineered sound-tested spring isolators.

Option: The unit will be supplied with cupro nickel coaxial water to refrigerant heat exchanger.

Option: The unit will be supplied with internally factory mounted two-way water valve for variable speed pumping requirements.

Option: The unit will be supplied with internally factory mounted automatic water flow regulators.

Option: The unit shall be supplied with extended range Insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

Option: The unit shall be supplied with a hot water generator (desuperheater).

#### Fan and Motor Assembly:

Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed, permanently lubricated, PSC type, with internal thermal overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan motor on small and medium size units (018-048) shall be isolated from the fan housing by a torsionally flexible motor mounting system with rubber type grommets to inhibit vibration induced high noise levels associated with "hard wire belly band" motor mounting. The fan motor on larger units (060 & 070) shall be isolated with flexible rubber type isolation grommets only. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. Airflow / Static pressure rating of the unit shall be based on a dry coil and a clean filter in place. **Ratings without filter, or on an ESP less than 6.35 mm w.g. shall NOT be acceptable.**

#### Refrigerant Circuit:

All units shall contain an EarthPure® (HFC-410A) sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. **Units that cannot be reset at the thermostat shall not be acceptable.**

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on vibration isolation springs or grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. All units (except units with rotary compressors) shall include a discharge muffler to further enhance sound attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 4309 kPa refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 4309 kPa working refrigerant pressure and 3447 kPa working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 184 kg-cm direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from -6.7° to 48.9°C. Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

#### Drain Pan:

The drain pan shall be constructed Stainless Steel to inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to FPT fitting. **No hidden internal tubing extensions from pan outlet extending to**





**unit casing (that can create drainage problems) will be accepted.** The unit as standard will be supplied with solid-state electronic condensate overflow protection. **Mechanical float switches will NOT be accepted.**

Vertical units shall be furnished with a PVC FPT condensate drain connection and an internal factory installed condensate trap. **If units without an internal trap are used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.**

#### Electrical:

A control box shall be located within the unit compressor compartment and shall contain a 50VA transformer, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor.

#### Solid State Control System (CXM):

Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

- a. Anti-short cycle time delay on compressor operation.
- b. Random start on power up mode.
- c. Low voltage protection.
- d. High voltage protection.
- e. Unit shutdown on high or low refrigerant pressures.
- f. Unit shutdown on low water temperature.
- g. Condensate overflow electronic protection.
- h. Option to reset unit at thermostat or disconnect.
- i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
- j. Ability to defeat time delays for servicing.
- k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
- l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
- m. 24V output to cycle a motorized water valve or other device with compressor contactor.
- n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
- o. Water coil low temperature sensing (selectable for water or anti-freeze).
- p. Air coil low temperature sensing.

**NOTE: Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.**

#### Option: Enhanced solid state control system (DXM)

This control system features two stage control of cooling and two stage control of heating modes for exacting temperature and dehumidification purposes.

This control system coupled with a multi-stage thermostat will better dehumidify room air by automatically running the heat pump's fan at lower speed on the first stage of cooling thereby implementing low sensible heat ratio cooling. On the need for higher cooling performance the system will activate the second stage of cooling and automatically switch the fan to the higher fan speed setting. This system may be further enhanced with a humidistat. **Units not having automatic low sensible heat ratio cooling will not be accepted;** as an alternate a hot gas reheat coil may be provided with control system for automatic activation.

Control shall have all of the above mentioned features of the CXM control system along with the following expanded features:

- a. Removable thermostat connector.
- b. Night setback control.
- c. Random start on return from night setback.
- d. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.).
- e. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
- f. Dry contact night setback output for digital night setback thermostats.

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- g. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
- h. Ability to work with heat pump thermostats using O or B reversing valve control.
- i. Emergency shutdown contacts.
- j. Boilerless system heat control at low loop water temperature.
- k. Ability to allow up to 3 units to be controlled by one thermostat.
- l. Relay to operate an external damper.
- m. Ability to automatically change fan speed from multistage thermostat.
- n. Relay to start system pump.
- o. 75 VA control transformer. Control transformer shall have load side short circuit and overload protection via a built in circuit breaker.

## Remote Service Sentinel (CXM/DXM):

Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. Upon cycling the G (fan) input 3 times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. **Units that do not provide this remote service sentinel shall not be acceptable.**

## Option: Lonworks interface system

Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a LONWORKS interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

- a. Space temperature
- b. Leaving water temperature
- c. Discharge air temperature
- d. Command of space temperature setpoint
- e. Cooling status
- f. Heating status
- g. Low temperature sensor alarm
- h. Low pressure sensor alarm
- i. High pressure switch alarm
- j. Condensate sensor alarm
- k. Hi/low voltage alarm
- l. Fan "ON/AUTO" position of space thermostat as specified above
- m. Unoccupied / occupied command
- n. Cooling command
- o. Heating command
- p. Fan "ON / AUTO" command
- q. Fault reset command
- r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

## Option: MPC (Multiple Protocol Control) interface system

Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

- a. Space temperature
- b. Leaving water temperature
- c. Discharge air temperature
- d. Command of space temperature setpoint
- e. Cooling status
- f. Heating status
- g. Low temperature sensor alarm
- h. Low pressure sensor alarm
- i. High pressure switch alarm
- j. Condensate overflow alarm
- k. Hi/low voltage alarm
- l. Fan "ON/AUTO" position of space thermostat as specified above





- m. Unoccupied / occupied command
- n. Cooling command
- o. Heating command
- p. Fan "ON/AUTO" command
- q. Fault reset command
- r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

## Warranty:

Climate Master shall warranty equipment for a period of 12 months from start up or 18 months from shipment (whichever occurs first).

Option: Two-Year Extended Warranty provides coverage for a period of 30 months from date of shipment or 24 months from the date of start-up (whichever occurs first).

Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.

## FIELD INSTALLED OPTIONS

### Hose Kits:

All units shall be connected with hoses. The hoses shall be 2 feet (61cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

### Valves:

The following valves are available and will be shipped loose:

- a. Ball valve; bronze material, standard port full flow design, FPT connections.
- b. Ball valve with memory stop and PT port.
- c. "Y" strainer with blowdown valve; bronze material, FPT connections.
- d. Motorized water valve; slow acting, 24v, FPT connections.

### Hose Kit Assemblies:

The following assemblies ship with the valves already assembled to the hose described:

- a. Supply and return hoses having ball valve with PT port.
- b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
- c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
- d. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

### Thermostats:

The thermostat shall be a ClimateMaster mechanical or electronic type thermostat as selected below with the described features:

- a. Single Stage Standard Manual Changeover (ATM11C11)  
Thermostat shall be a single-stage, digital, manual changeover with HEAT-OFF-COOL system switch and fan ON-AUTO switch. Thermostat shall have a mechanical temperature set point indicator. Thermostat shall only require 4 wires for connection. Mercury bulb thermostats are not acceptable.
- b. Single Stage Digital Auto or Manual Changeover (ATA11U01)  
Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. The Thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.
- c. Single Stage Digital Automatic or Manual Changeover with Two-Speed Fan Control (ATA11C04) – DXM and PSC Fan required  
Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch, fan ON-AUTO switch, and fan LO-HI switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. A fault LED shall be provided to display specific fault condition. Thermostat shall allow use of an accessory remote temperature sensor (AST009), but may be operated with internal sensor via orientation of a jumper.
- d. Single Stage Digital Automatic Changeover (ATA11C06)  
Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. A fault LED shall





be provided to display specific fault condition. Thermostat shall allow use of an accessory remote temperature sensor (AST009), but may be operated with internal sensor via orientation of a jumper.

e. Multistage Digital Automatic Changeover (ATA22U01)

Thermostat shall be multi-stage (2H/2C), manual or automatic changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, set-point(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to indicate specific fault condition(s). Thermostat shall provide temperature display offset for custom applications. Thermostat shall allow unit to provide better dehumidification with optional DXM controller by automatically using lower fan speed on stage 1 cooling (higher latent cooling) as main cooling mode, and automatically shifting to high speed fan on stage 2 cooling.

f. Multistage Manual Changeover Programmable 5/2 Day (ATP21U01)

Thermostat shall be 5 day/2 day programmable (with up to 4 set points per day), multi-stage (2H/1C), manual changeover with HEAT-OFF-COOL-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, set-point(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of set-point(s) without batteries. Thermostat shall provide convenient override feature to temporarily change set point.

g. Multistage Automatic or Manual Changeover Programmable 7 Day (ATP32U03)

Thermostat shall be 7 day programmable (with up to 4 set points per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have a blue backlit dot matrix LCD display with temperature, set-points, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of set-points without batteries. Thermostat shall provide heating set-point range limit, cooling set-point range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

h. Multistage Automatic or Manual Changeover Programmable 7 Day with Humidity Control (ATP32U04)

Thermostat shall be 7 day programmable (with up to 4 set points per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Separate dehumidification and humidification set points shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow thermostat dehumidification mode to operate with ClimaDry reheat or with ECM fan dehumidification mode via settings changes. Thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, set-points, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of set-points without batteries. Thermostat shall provide heating set-point range limit, cooling set-point range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

#### DDC Sensors:

ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional interface system described above. Several types as described below:

- Sensor only with no display (LON and MPC).
- Sensor with override (LON only).
- Sensor with setpoint adjustment and override (MPC only).
- Sensor with setpoint adjustment and override, LCD display, status/fault indication (LON and MPC).



# TS Series 50Hz - HFC-410A Submittal Data Eng/S-I

Notes:





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## Revision History

Date:	Item:	Action:
8 April, 2016	Engineering Specifications	Updated run test text
13 August, 2015	Decoder Engineering Specifications	Removed CE Text
23 July, 2015	Wiring Diagram Matrix	Updated
08 April, 2015	Entire Document	Misc. Edits, Clearances
30 September, 2014	Electrical Data Table	Updated Voltage Codes
07 January, 2013	Physical Data Table	Updated
13 September, 2012	Decoder	Removed size 006
02 November, 2011	Decoder	Updated
07 October, 2011	Dimensional Data Optional Filter Frame	Updated
09 August, 2011	Unit Maximum Working Water Pressure	Updated to Reflect New Safeties
10 June, 2011	Performance Data Table	Updated
19 October, 2010	Entire Document	Features changes, disconnect, extended range, and UltraQuiet insulation
28 September, 2010	Engineering Specifications	Updated
05 August, 2010	Entire Document	Remove I-P units Updated guide specifications and field options
08 January, 2010	Size 006 and ECM	Removed
16 October, 2008	Electrical Data Table	Corrected
20 November, 2007	First Published	