AHRI CERTIFIED PERFORMANCE DATA | PARALLEL UNITS

KQFP																	
UNIT SIZE	INLET SIZE	PRIMARY CFM	Min. Ps	FAN		FAN ONLY SOUND POWER, Lw						PRIMARY ONLY @ 1.5" INLET Ps					
				CFM	Watts	2	3	4	5	6	7	2	3	4	5	6	7
DISCHARGE DATA																	
2	6	400	0.200	400	355	69	66	62	57	53	50	64	58	52	45	42	39
3	8	700	0.200	700	400	73	71	67	62	60	59	69	63	54	49	44	40
4	10	1100	0.200	800	445	70	67	63	60	58	55	73	66	56	55	52	45
5	12	1600	0.200	1350	710	76	69	66	65	64	63	71	61	58	55	52	44
6	14	2100	0.200	1700	775	75	73	70	66	63	62	73	64	61	57	53	47
7	16	2800	0.200	1800	1300	78	74	70	70	68	67	80	71	66	64	60	53
RADIATED DATA																	
2	6	400	0.200	400	355	71	67	60	60	53	49	56	51	46	40	38	36
3	8	700	0.200	700	400	70	67	62	58	52	52	64	57	50	45	40	35
4	10	1100	0.200	800	445	67	65	61	59	54	52	65	59	53	46	42	39
5	12	1600	0.200	1350	710	74	69	65	61	60	57	66	59	55	50	46	43
6	14	2100	0.200	1700	775	74	71	68	64	60	58	70	60	57	51	48	44
7	16	2800	0.200	1800	1300	79	76	68	66	62	59	75	68	64	62	59	57

QFV																	
UNIT SIZE	INLET SIZE	PRIMARY CFM	MIN. Ps	FAN		FAN ONLY SOUND POWER, Lw						PRIMARY ONLY @ 1.5" INLET Ps					
				CFM	Watts	2	3	4	5	6	7	2	3	4	5	6	7
DISCHARGE DATA																	
2	6	400	0.200	330	190	72	62	60	58	54	53	81	75	67	63	59	53
3	8	700	0.200	505	230	72	62	60	58	55	54	81	78	70	67	61	55
4	10	1100	0.200	850	350	73	65	64	64	61	60	82	78	72	69	64	58
5	12	1600	0.200	1285	800	75	69	67	68	65	64	82	77	75	71	67	62
6	14	2100	0.200	1545	800	77	70	68	68	62	63	83	79	77	72	69	64
7	16	2800	0.200	1805	1030	78	69	70	71	67	66	84	81	79	76	72	67
RADIATED DATA																	
2	6	400	0.200	330	190	71	65	60	58	52	47	67	60	57	50	45	38
3	8	700	0.200	505	230	71	65	60	57	52	47	70	64	63	56	51	46
4	10	1100	0.200	850	350	73	68	62	61	58	57	75	70	67	59	55	49
5	12	1600	0.200	1285	800	74	69	67	68	65	62	74	68	66	58	54	50
6	14	2100	0.200	1545	800	75	72	67	67	65	62	73	68	65	59	56	51
7	16	2800	0.200	1805	1030	75	73	68	67	64	63	81	79	77	71	68	65

KLPP																	
UNIT SIZE	INLET SIZE	PRIMARY CFM	MIN. Ps	FAN		FAN ONLY SOUND POWER, Lw						PRIMARY ONLY @ 1.5" INLET Ps					
				CFM	Watts	2	3	4	5	6	7	2	3	4	5	6	7
DISCHARGE DATA																	
2	8	700	0.140	600	275	70	64	60	58	52	49	75	71	64	58	54	49
4	12	1575	0.766	800	400	70	65	66	62	55	55	80	106	97	107	121	137
RADIATED DATA																	
2	8	700	0.140	600	275	67	63	61	57	50	40	71	66	60	55	52	48
4	12	1575	0.220	800	400	67	67	66	63	57	48	72	69	65	58	52	48

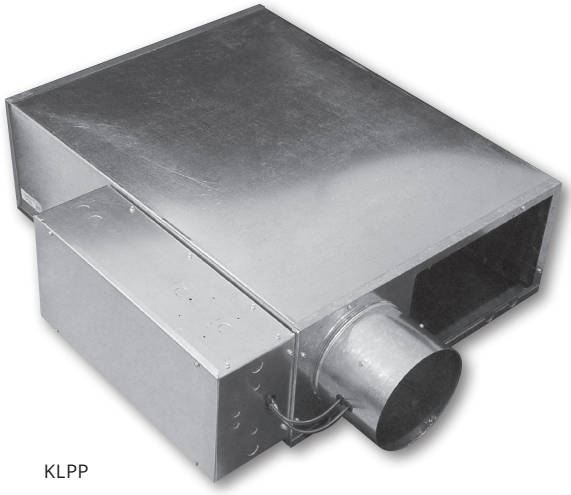
NOTES: All sound data is based on tests conducted in accordance with AHRI 880-11. Sound power levels are in dB, re 10^{-12} Watts. Discharge sound power is the sound emitted from the unit discharge. Discharge sound power has been corrected for end reflection. Radiated sound power is the sound transmitted through the casing walls. See Krueger's selection program for specific sound data for optional liners; 1/2", dual density liner shown. See Krueger's Terminal Unit Engineering section for reductions and definitions.

AHRI CERTIFIED™ www.ahridirectory.org VAV Terminals AHRI Standard 880

INTRODUCTION

The KLPP low profile parallel fan-powered induction terminals are designed to maintain optimum temperatures in the conditioned zone through economical recirculation of plenum return air and accurate control of primary air (cooling) to the zone. The KLP fan terminals offer excellent performance and affordability in a compact unit with optimum physical dimensions of 11" in unit height, which is useful where building height limits dictate shallow ceiling plenums.

The Model KLPP features intermittent parallel fan operation. The KLPP is designed to maintain optimum occupant comfort levels by supplying warm induced plenum air, cold primary air (VAV), or a mixture of both to condition the space. The KLPP fan cycles on to satisfy zone heating requirements. Optional heating coils provide terminal heat only after the fan has cycled on. Primary air is modulated with direct digital, analog, or pneumatic pressure independent type controls.



KLPP

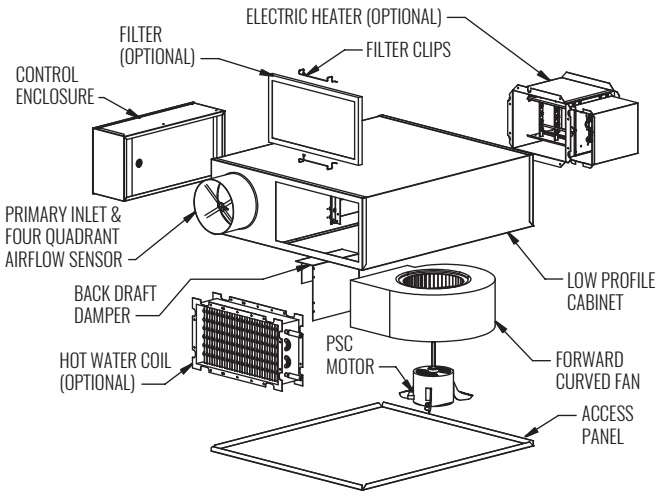
MODEL

KLPP - Low Profile, Parallel Fan Powered Terminal Unit

FEATURES

- Unit size 2 & 4: Only 11" high to accommodate installation in low height ceiling plenum spaces
- Airflow capacities: Up to 2060 CFM for the KLPP to allow airflow control for commercial applications
- Heavy gage galvanized steel casing for unit strength and product durability
- Several casing liner options provide quiet and clean operation
- Fully removable, bottom access panel included with each unit for easy access to all internal components
- Control enclosure located on left-hand or right-hand side for easier installation
- Single point electrical connection minimizes number of ceiling plenum electrical connections
- Recirculation multi-voltage fan motors are quiet, reliable, and permanently lubricated; energy efficient ECM motors are available
- Electronic speed control (SCR) allows field adjustable fan airflow
- Isolated motor/blower assembly limits casing acoustical transmission
- ETL listings are under UL 60335-2-40 electrical safety
- AHRI listings are certified in accordance with AHRI standard 880 testing standard
- External filter option allows quick and easy access for routine replacement
- Pneumatic, analog, and digital controls may be customized for many building systems; BACnet/BMS compatible digital controls can be provided by Krueger
- Auxiliary heat offers a wide range of options, including electric and hot water heat
- LineaHeat solid state electronic proportional control of electric heat is available with or without leaving air temperature control
- AC solid state relays offer silent operation for staged electric heat
- Revit models are available at www.krueger-hvac.com/revit

EXPLODED VIEW



PRODUCT DESCRIPTION

CASING

- All KLPP unit casing panels are constructed of 20 gage galvanized steel.
- Removable bottom panel allows easy access to all internal components.
- The KLPP unit is equipped with a backdraft damper to prevent primary air entering ceiling plenum through induced inlet.

INLET COLLARS

- All round, 20 gage inlet collars accommodate standard spiral and flex duct sizes. Size 4 units also offer an 8" x 14" rectangular inlet.
- The primary air inlet is located on either the left-hand or right-hand side of the unit inlet panel of KLPP unit. (Hand is determined by looking at the unit in the direction of airflow with the unit in the installed position.)

OUTLET CONNECTIONS

- All outlet connections are rectangular and require a flanged duct connection.

DAMPER ASSEMBLY

- All unit sizes on the KLPP with exception the rectangle inlet option on unit size 4, utilize a round volume control damper. The unit size 4 with 8" x 14" inlet on the KLPP have a rectangular volume control damper.
- All damper assemblies are equipped with a solid shaft that rotates in self lubricating Delrin® bearings.
- Damper blade incorporates a flexible gasket for tight airflow shutoff and operates over a full 90 degree rotation.
- The damper position is marked by an arrow embossment on the end of the damper shaft.

INDUCED AIR INLET

- Induced air inlet filters (disposable, construction type) are available. These filters are typically used for job start-up and are provided with clip frames for easy filter replacement.

CASING LINERS

All liners are attached to the unit casing with both adhesive and weld pins to ensure long term durability (excludes Sterilwall and Perforated Doublewall). The standard liner option is 1/2" thick, 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A.

- **(Optional)** Cellular Insulation: 1/2" thick, 1 1/2 lb. density, smooth surface, polyolefin, closed-cell foam insulation for fiber free application. Cellular insulation meets UL 181 and NFPA 90A and does not support mold or bacteria growth.
- **(Optional)** Sterilwall Insulation: 1/2", 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A, enclosed between the unit casing and a non-perforated internal sheet metal cover extending over the fiberglass insulation, as well as covering the liner cut edges.
- **(Optional)** Perforated Doublewall Insulation: 1/2", 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A, enclosed between the unit casing and a perforated internal sheet metal cover extending over the fiberglass insulation, as well as covering the liner cut edges.
- **(Optional)** Foil Encapsulated Insulation: Foil reinforced, wrapped edges, 1/2" thick, 1 1/2 lb. density fiberglass insulation that meets UL 181 and NFPA 90A.

AIRFLOW SENSOR

- All units are equipped with a factory installed inlet airflow sensor device.
- K4 LineaCross: A four-quadrant, multi-point, center averaging airflow sensor.
- **(Optional)** A linear, multi-point, velocity averaging airflow sensor with an amplified signal.
- Balancing taps are provided for easy airflow verification.

FAN MOTORS

- Fan motors are single-voltage (120,208/240 and 277) 1-phase, permanent split capacitor (PSC) type.
- **(Optional)** [120, 208/240, or 277 volt, 1-phase] ECM (electronically commutated motor) fan motor is available.
- Units equipped with [120, 208/240 or 277 volt, 1-phase] electric heat have fan motors wired with the same line voltage. Units with [208 volt, 3-phase, 3-wire] electric heat utilize 208/240 volt fan motors. Units with [480 volt, 3-phase, 4-wire] heat are equipped with 277 volt fan motors.
- Quick electrical disconnects are provided on the motor wiring.
- A motor disconnect switch is available. (This option is not available if the unit is equipped with electric heat including the door locking disconnect option.)
- Motor fusing is available.

FAN SPEED CONTROL

- All units with PSC motors are equipped with SCR fan speed controller capable of reducing fan output by as much as 50 to 55%.
- All units with optional ECM motors include either a manual or remote adjustable speed controller. The manual adjustable speed controller features a digital display that alternates between the RPM of the motor and percentage of flow and can be set and adjusted in the field. The remote adjustable speed controller communicates with a DDC controller to remotely set and/or adjust the fan speed using either a 0-10 VDC or 2-10 VDC signal and provides a manual override capability to set and/or adjust the fan speed in the field.

CONTROLS

- Pneumatic, analog or direct digital control types are available. Digital controls can be provided by others or Krueger for factory mounting. A "no control" unit is also available for field mounting of direct digital controls.

PRODUCT DESCRIPTION (CONTINUED)

HOT WATER HEAT

- One or two row coils are constructed of 10 aluminum fins per inch with 1/2" O.D. sweat type, left-hand or right hand, tubing connections. The coil tubing is water leakage tested to 400 psig.

ELECTRIC HEAT

- Heaters are UL listed and are constructed of 20 gage galvanized steel.
- Available combinations are: [120, 208/240, or 277 volt, 1-phase], [208 volt, 3-phase, 3-wire], [480 volt, 3-phase, 4-wire]
- See fan motor description for electric heat/fan motor combinations.
- Standard heaters are equipped with automatic reset thermal cutout, magnetic contactors, airflow proving switch, and 80/20 Ni-Cr heating elements.
- Electric heater options include fused or non-fused door interlocking disconnect switch, fuse-block, manual reset cutout, and dust tight enclosure construction.
- AC solid state relays offer silent operation for staged electric heat.
- LineaHeat solid state electronic proportional control of electric heat is available with or without leaving air temperature control. See Krueger's Terminal Unit Engineering section for additional information.

CONTROL TRANSFORMERS

- Units with and without electric heat include a factory supplied, mounted and wired control transformer, mounted inside the electric heat enclosure for electronic control applications.

LABELS

- Label information adhered to each unit includes model name, unit size, configuration code, airflow (CFM), balancing chart, tagging data, electrical ratings, removal of fan protection packing material information, and all required agency listings.

PACKAGING

- Units are palletized. Each pallet of units is banded and stretch wrapped with cellophane.

UNIT CAPACITIES

UNIT SIZE	INLET SIZE	PRIMARY AIRFLOW		FAN AIRFLOW		MOTOR HP	MOTOR TYPE	MOTOR FLA		
		MAX	MIN	MAX	MIN			120V	208/240V	277V
2	6	515	90 or 0	665	350	1/6	PSC	3	1.4	1
	8	920	160 or 0							
	10	1430	250 or 0							
4	8	920	160 or 0	855	420	1/4		4.3	1.7	1.4
	10	1430	250 or 0							
	8 x 14	2060	360 or 0							

UNIT SIZE	INLET SIZE	PRIMARY AIRFLOW		FAN AIRFLOW		MOTOR HP	MOTOR TYPE	MOTOR FLA		
		MAX	MIN	MAX	MIN			120V	208/240V	277V
2	6	515	90 or 0	820	125	1/3	EC	5	2.8	2.6
	8	920	160 or 0							
	10	1430	250 or 0							
4	8	920	160 or 0	885	135	1/3		5	2.8	2.6
	10	1430	250 or 0							
	8 x 14	2060	360 or 0							

NOTES: KLPP maximum primary airflow (CFM) is based on 1.00" WG differential pressure signal from inlet airflow sensor. Minimum recommended airflow (CFM) is based on 0.03" WG differential pressure of the inlet airflow sensor, or 0 CFM. 0.03" WG is equal to 15%–20% of the nominal flow rating of the terminal. Less than 15%-20% may result in greater than +/-5% control of box flow. Maximum/minimum fan airflow (CFM) based on 0.25" WG external downstream static pressure. KLPP airflows based on water coil on induction port. See page B2-145 for complete fan curves.

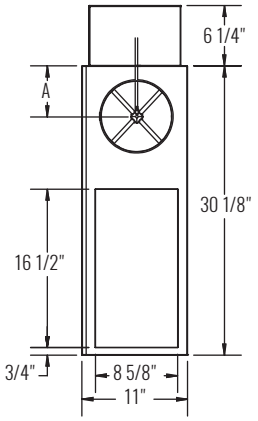
DAMPER LEAKAGE

INLET SIZE	DAMPER LEAKAGE		
	1.5" WG	3.0" WG	6.0" WG
	CFM	CFM	CFM
6	4	5	7
8	4	5	7
10	4	5	7

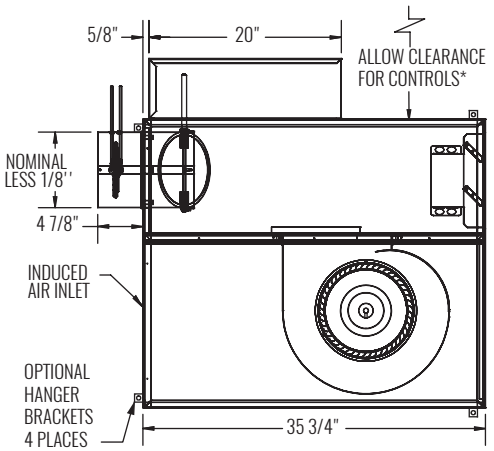
NOTES: Damper leakage is measured with the damper fully closed using an actuator. A precision low flow orifice is used upstream of the unit to measure the leakage rate as a function of the measured upstream static pressure. Leakage testing conducted in accordance with ASHRAE 130-2008.

DIMENSIONAL DATA | BASE UNIT

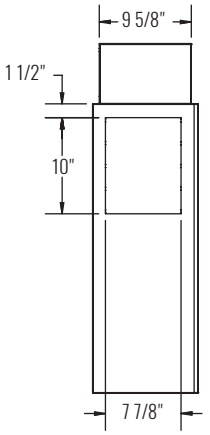
SIZE 2	
INLET SIZE	A
06"	5"
08"	6"
10"	7"



INLET VIEW: SIZE 2

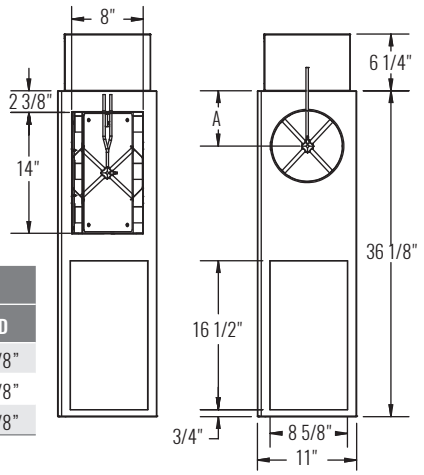


PLAN VIEW: SIZE 2

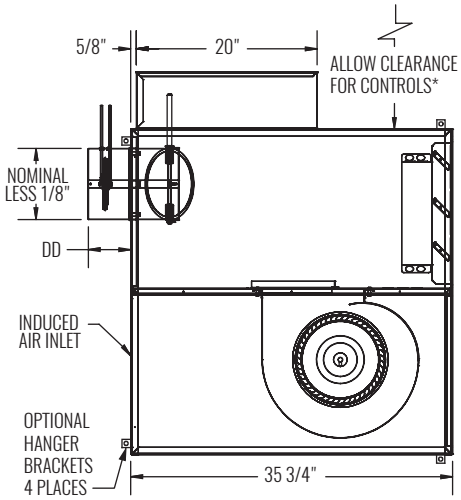


DISCHARGE VIEW: SIZE 2

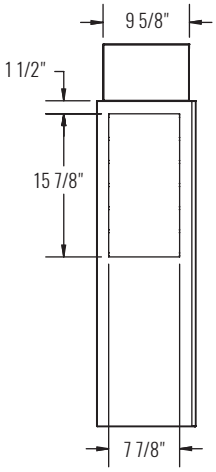
SIZE 4		
INLET SIZE	A	DD
08"	7"	4 7/8"
10"	9"	4 7/8"
12" (8"x14")	-	3 7/8"



INLET VIEW: SIZE 4



PLAN VIEW: SIZE 4



DISCHARGE VIEW: SIZE 4

* Check NEC for unit clearance requirements.

NOTE: Left-hand base unit with electronic control enclosure shown; right-hand is available.

STANDARD FEATURES

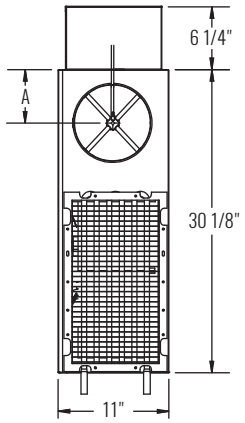
- 20 gage galvanized steel casing construction
- Height is 11"
- Control enclosure for electronic components
- 1/2" thick, dual density fiberglass insulation that meets NFPA 90A and UL 181 safety requirements
- [120, 208/240, or 277 volt, single-voltage, 1-phase, single speed] permanently lubricated PSC motors
- Field adjustable fan speed controller
- Removable bottom panel allows easy access to all internal components for maintenance
- Four quadrant, center averaging airflow sensor
- Includes 24 volt control transformer
- ETL listed; adherence to UL 60335-2-40 and CSA C22.2 No. 60335-2-40
- AHRI certified sound ratings

OPTIONAL FEATURES

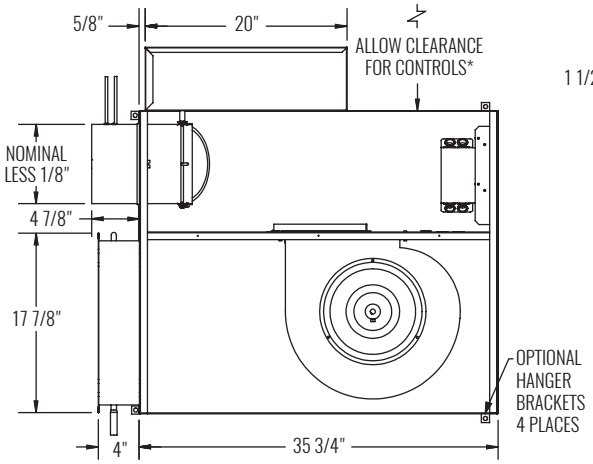
- Liners: 1/2" Cellular insulation, 1/2" Foil encapsulated fiberglass insulation, Sterilwall, or Perforated doublewall
- Linear averaging airflow sensor
- [120, 208/240, or 277 volt, single-voltage] ECM motor with manual or remote adjustable speed controller
- Left-hand or right-hand control enclosure
- Motor toggle disconnect switch
- Motor fusing
- Induced air filter, construction type; 18"x11"x1"
- Hanger brackets

DIMENSIONAL DATA | BASE UNIT WITH HOT WATER HEAT

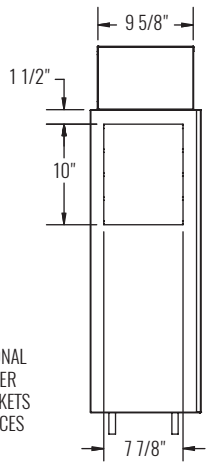
SIZE 2	
INLET SIZE	A
06”	5”
08”	6”
10”	7”



INLET VIEW: SIZE 2

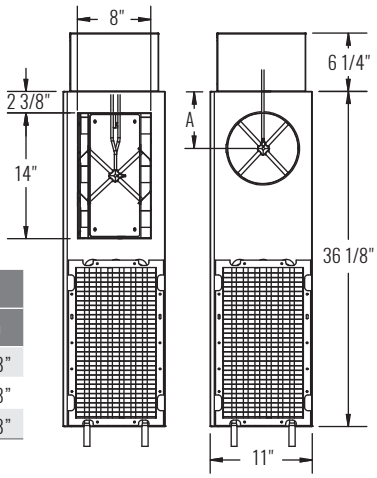


PLAN VIEW: SIZE 2

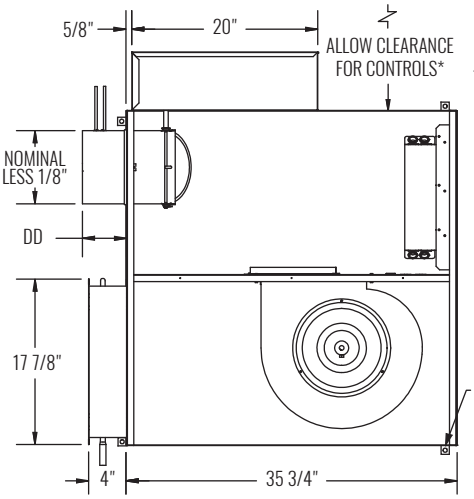


DISCHARGE VIEW: SIZE 2

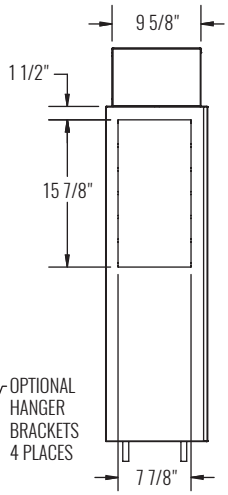
SIZE 4		
INLET SIZE	A	DD
08”	7”	4 7/8”
10”	9”	4 7/8”
12” (8”x14”)	-	3 7/8”



INLET VIEW: SIZE 4



PLAN VIEW: SIZE 4



DISCHARGE VIEW: SIZE 4

* Check NEC for unit clearance requirements.

NOTE: Left-hand base unit with electronic control enclosure shown; right-hand is available.

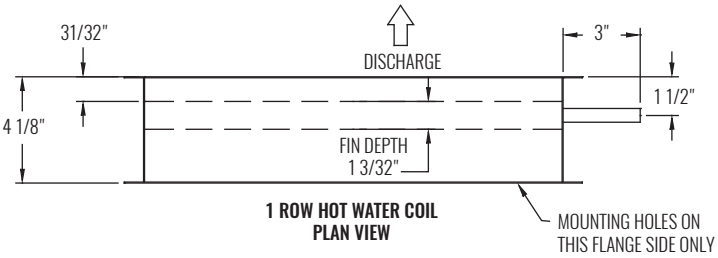
STANDARD FEATURES

- 20 gage galvanized steel casing construction
- Height is 11”
- Control enclosure for electronic components
- 1/2” thick, dual density fiberglass insulation that meets NFPA 90A and UL 181 safety requirements
- [120, 208/240, or 277 volt, single-voltage, 1-phase, single speed] permanently lubricated PSC motors
- Field adjustable fan speed controller
- Removable bottom panel allows easy access to all internal components for maintenance
- Four quadrant, center averaging airflow sensor
- Includes 24 volt control transformer
- ETL listed; adherence to UL 60335-2-40 and CSA C22.2 No. 60335-2-40
- AHRI certified sound ratings

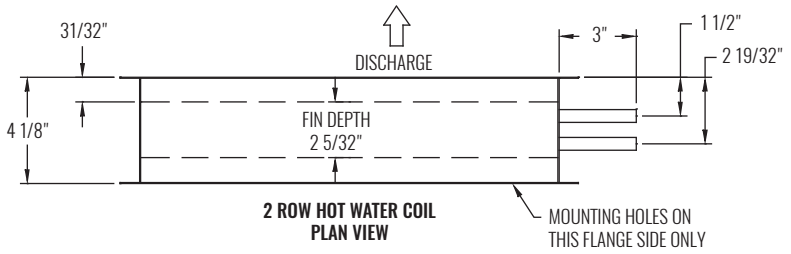
OPTIONAL FEATURES

- Liners: 1/2” Cellular insulation, 1/2” Foil encapsulated fiberglass insulation, Sterilwall, or Perforated doublewall
- Linear averaging airflow sensor
- [120, 208/240, or 277 volt, single-voltage] ECM motor with manual or remote adjustable speed controller
- Left-hand or right-hand control enclosure
- Left-hand or right-hand hot water coil connection; hot water coil connection is opposite of control enclosure
- Motor toggle disconnect switch
- Motor fusing
- Induced air filter, construction type; 18”x11”x1”
- Dust tight control enclosure
- Hanger brackets

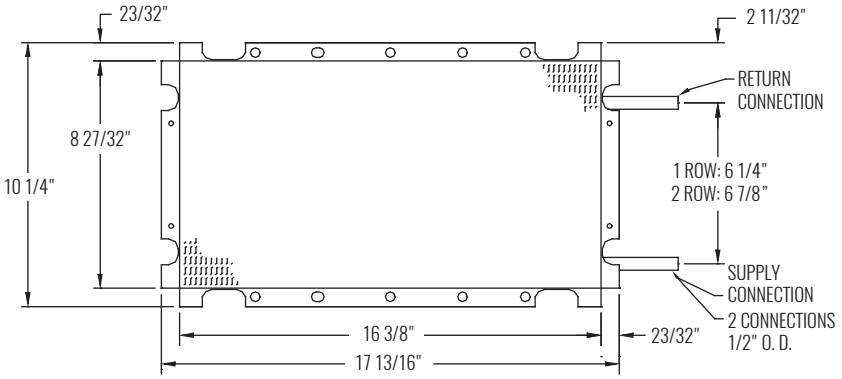
DIMENSIONAL DATA | HEATING COIL



1 ROW HOT WATER COIL
PLAN VIEW



2 ROW HOT WATER COIL
PLAN VIEW



FRONT VIEW

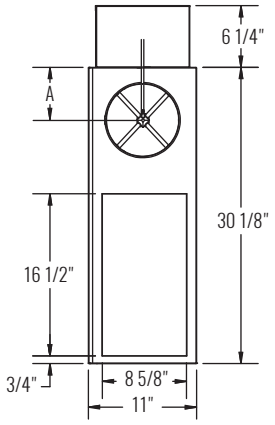
STANDARD FEATURES

- KLPP Coils are shipped from the factory attached to the induced air inlet
- Hot water coils are configured for a flanged ductwork connection; coil section is uninsulated
- Coils are not for steam applications
- Contact your Krueger Representative for high capacity or steam coil information
- Connection Tubing - 1/2" O. D. male solder
- Coil Casing - 20 gage galvanized steel
- Coil Tubing - 1/2" O. D. x 0.016" thick copper
- Coil Fins - 0.0045" thick aluminum, 10 per inch; mechanically bonded to tubing

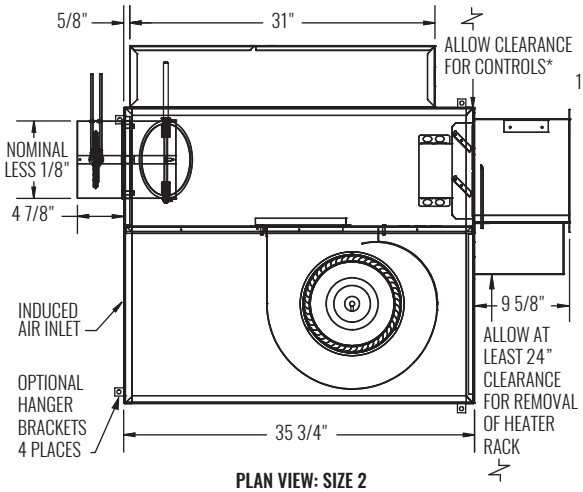
NOTE: For hot water performance data tables, visit the Krueger website at www.krueger-hvac.com or download the Krueger selection software to run customized selections. The selection program can provide performance data with different entering air and water conditions as well as show effects of altitude and glycol on the heating performance of the water coil. The selection software also allows selections to be saved in a schedule format that can be imported onto a set of project drawings.

DIMENSIONAL DATA | BASE UNIT WITH ELECTRIC HEAT

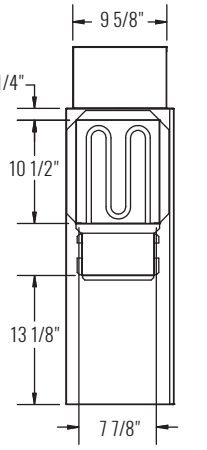
SIZE 2	
INLET SIZE	A
06"	5"
08"	6"
10"	7"



INLET VIEW: SIZE 2

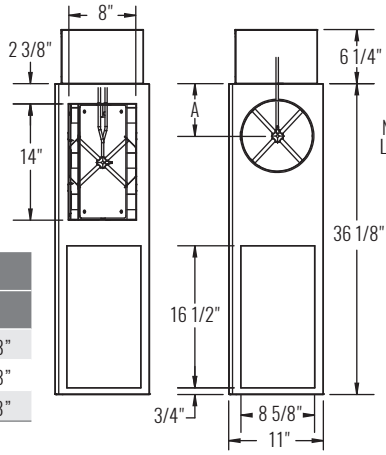


PLAN VIEW: SIZE 2

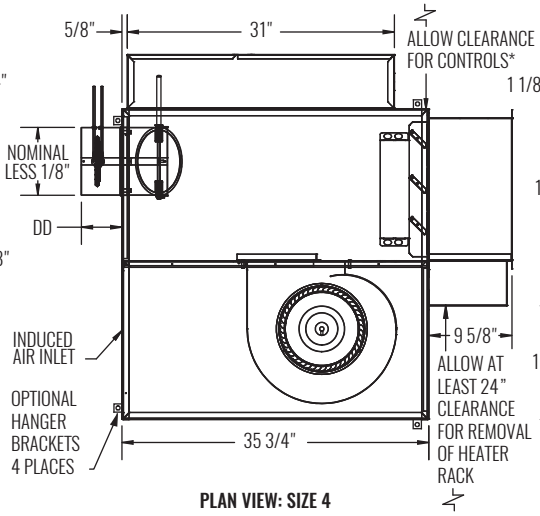


DISCHARGE VIEW: SIZE 2

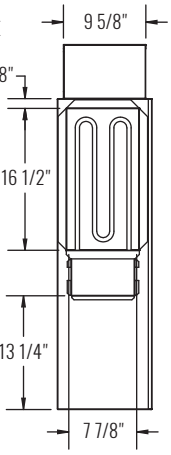
SIZE 4		
INLET SIZE	A	DD
08"	7"	4 7/8"
10"	9"	4 7/8"
12" (8"x14")	-	3 7/8"



INLET VIEW: SIZE 4



PLAN VIEW: SIZE 4



DISCHARGE VIEW: SIZE 4

* Check NEC for unit clearance requirements.

NOTES: Left-hand base unit with electronic control enclosure shown; right-hand is available. See next page for electric heat standard features.

STANDARD FEATURES

- 20 gage galvanized steel casing construction
- Height is 11"
- Control enclosure for electronic components
- 1/2" thick, dual density fiberglass insulation that meets NFPA 90A and UL 181 safety requirements
- [120, 208/240, or 277 volt, single-voltage, 1-phase, single speed] permanently lubricated PSC motors
- Field adjustable fan speed controller
- Removable bottom panel allows easy access to all internal components for maintenance
- Four quadrant, center averaging airflow sensor
- Flanged discharge connection on electric heat coil
- Single point electrical connection
- Includes 24 volt control transformer
- ETL listed; adherence to UL 60335-2-40 and CSA C22.2 No. 60335-2-40
- AHRI certified sound ratings

OPTIONAL FEATURES

- LineaHeat solid state electronic controlled heater with or without leaving air temperature control
- Liners: 1/2" Cellular insulation, 1/2" Foil encapsulated fiberglass insulation, Sterilwall, or Perforated doublewall
- Linear averaging airflow sensor
- [120, 208/240, or 277 volt, single-voltage] ECM motor with manual or remote adjustable speed controller
- Left-hand or right-hand control enclosure
- Induced air filter, construction type; 18"x10"x1"
- Fused or non-fused door interlocking disconnect
- Dust tight control enclosure
- Motor fusing
- Manual reset cutout
- Hanger brackets
- AC Solid State Relays
- Fuse-block

ELECTRIC HEAT FEATURES & CAPACITIES

The kW charts below indicates the maximum and minimum safe limit capacities for each of the KLPP units and has been specifically designed for Krueger fan powered terminals. For safe operation, the electric heater controls are interlocked with the airflow proving switch to allow the heater to energize only after the fan is running. Each terminal unit has been tested by ETL in accordance with UL standards.

ELECTRIC HEAT STANDARD FEATURES

- 20 Gage galvanized steel casing construction.
- Line voltage combinations:
  [120, 208/240, or 277 volt, 1-phase]
  [208 volt, 3-phase, 3-wire] [480 volt, 3-phase, 4-wire]
- NEMA 2 electric heat control enclosure.
- Flanged discharge for field duct connection.
- Single point connection between the heater and the fan motor (see combinations below).
- 80/20 Ni-Cr heating elements.
- Automatic reset thermal cutout.
- Magnetic contactors.
- Positive pressure airflow switch.

NOTE: A minimum of 0.1" w.g. downstream static pressure is required in the duct to ensure proper heater operation.

OPTIONAL HEATER CONTROL

- LineaHeat solid state electronic proportional control of electric heat is available with or without leaving air temperature control. See Krueger's Terminal Unit Engineering section for additional information.

MAXIMUM kW

VOLTAGE / PHASE	PSC MOTOR		EC MOTOR	
	UNIT SIZE 2	UNIT SIZE 4	UNIT SIZE 2	UNIT SIZE 4
	MAX	MAX	MAX	MAX
120v / 1Ph	5.0	5.0	5.0	5.0
208v / 1Ph	5.5	8.0	9.0	9.0
240v / 1Ph	5.5	8.0	10.5	10.5
277v / 1Ph	5.5	8.0	10.5	11.5
208v / 3Ph	5.5	8.0	9.5	11.5
480v / 3Ph	5.5	8.0	10.5	11.5

NOTES: Maximum values apply to staged heaters only.
Contact your local Krueger representative for LineaHeat limits.

SINGLE POINT CONNECTION COMBINATIONS ELECTRIC HEATER/FAN MOTOR

- [120, 208/240 or 277 volt, 1-phase] electric heat includes fan motor wired with same line voltage.
- [208 volt, 3-phase, 3-wire] electric heat utilizes a 208/240 volt, 1-phase fan motor.
- [480 volt, 3-phase, 4-wire] electric heat is equipped with 277 volt, 1-phase fan motor.

$$kW = \frac{CFM \times \Delta T\ (°F)}{3160}$$

CALCULATING ELECTRIC HEATER AMPERES

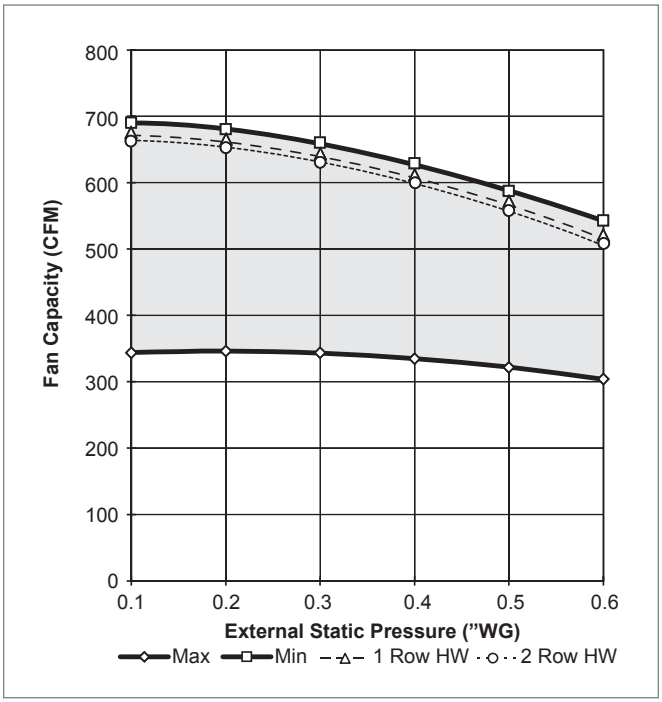
$$\text{Single Phase Amperes} = \frac{\text{Watts}}{\text{Line Voltage}}$$

$$\text{Three Phase Amperes} = \frac{\text{Watts}}{\text{Line Voltage} \times 1.73}$$

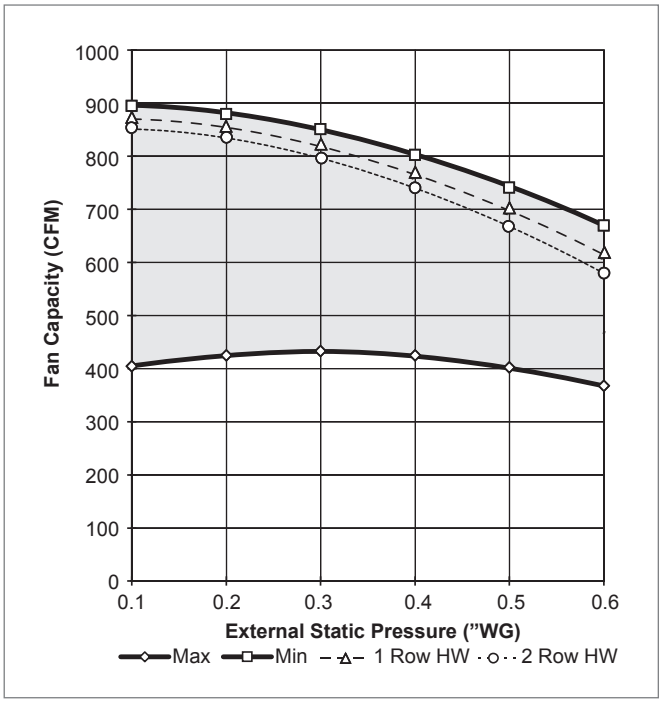
NOTES: When selecting electric heaters, do not exceed 120°F discharge air temperature, per NEC. The ASHRAE Handbook of Fundamentals states that discharge temperatures in excess of 90°F are likely to result in objectionable air temperature stratification in the space. Also, ventilation short circuiting may occur. ASHRAE Standard 62 now limits discharge temperatures to 90°F or increasing the ventilation rate when heating from the ceiling.

FAN CURVES | PSC

KLPP, PSC FAN CURVE, UNIT SIZE 2

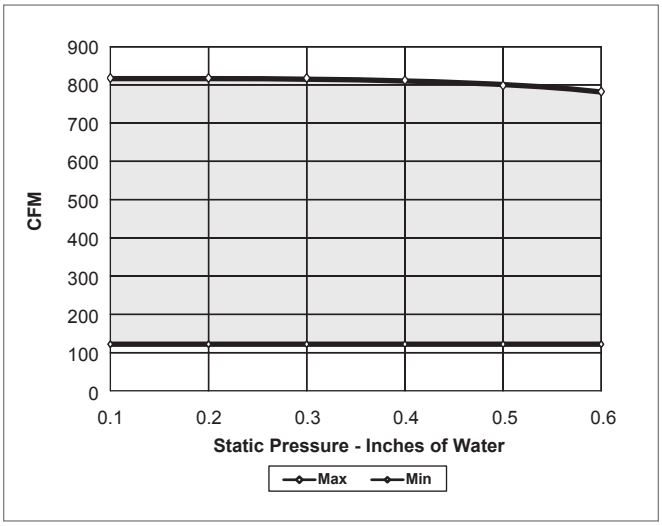


KLPP, PSC FAN CURVE, UNIT SIZE 4

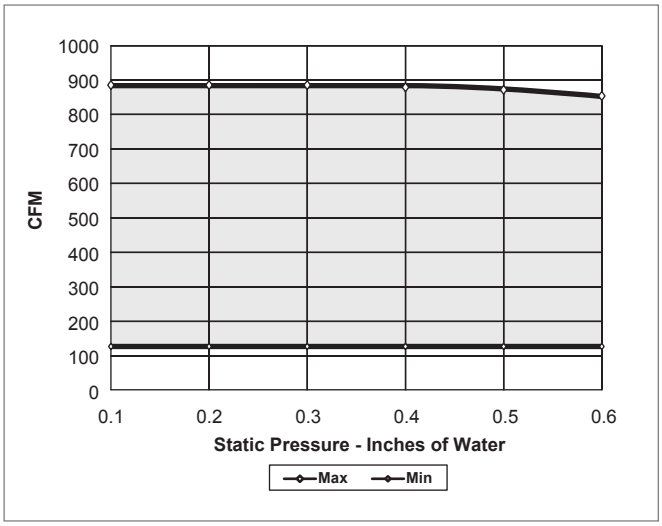


NOTES: Fan speed controller (SCR) is standard with each unit. Fan curves indicate maximum and minimum achievable flow reductions using SCR speed control. Units must be selected to operate within the flow and external static pressure ranges as shown. Fan discharge air volume will be reduced approximately 5% when unit is equipped with optional factory supplied electric heat coils.

KLPP, ECM FAN CURVE, UNIT SIZE 2



KLPP, ECM FAN CURVE, UNIT SIZE 4



NOTES: Manual or remote adjustable speed controller is standard with each unit. Fan curves indicate the maximum and minimum achievable airflows. See Product Description section, page B2-136 for definitions of manual and remote adjustable speed controllers. Units must be selected to operate within the airflow and external static pressure ranges shown.

KLPP

Fan Powered Terminal Units | Low Profile, Parallel Flow

KRUEGER

PERFORMANCE DATA | DISCHARGE & RADIATED SOUND

FAN ONLY DISCHARGE AND RADIATED SOUND

UNIT SIZE	FLOW RATE		DISCHARGE SOUND POWER							RADIATED SOUND POWER						
			OCTAVE BAND SOUND POWER, Lw						Lp	OCTAVE BAND SOUND POWER, Lw						Lp
	CFM	(L/s)	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
2	250	(118)	56	51	50	46	40	29	**24**	53	51	50	45	36	24	**25**
	375	(177)	63	57	54	52	45	38	**29**	59	57	55	51	42	31	**30**
	450	(212)	66	60	56	54	48	42	**31**	62	59	58	53	45	35	**32**
	525	(248)	68	62	58	56	50	46	**33**	65	61	59	55	48	37	**35**
	600	(283)	**70**	**64**	**60**	**58**	**52**	**49**	**35**	**67**	**63**	**61**	**57**	**50**	**40**	**36**
4	460	(217)	61	56	57	52	44	40	**31**	61	57	57	52	45	34	**32**
	525	(248)	63	58	59	54	47	43	**34**	62	60	59	55	48	37	**34**
	600	(283)	65	60	61	57	49	47	**36**	64	62	61	57	51	40	**37**
	725	(342)	68	64	64	60	53	52	**40**	66	66	64	61	55	45	**40**
	800	(378)	**70**	**65**	**66**	**62**	**55**	**55**	42	**67**	**67**	**66**	**63**	**57**	**48**	41

UNIT DISCHARGE SOUND

UNIT SIZE	INLET SIZE	FLOW RATE		MIN Δ Ps		PRIMARY @ 0.5" Δ Ps							PRIMARY @ 1.5" Δ Ps							PRIMARY @ 2.0" Δ Ps						
						OCTAVE BAND SOUND POWER, Lw						Lp	OCTAVE BAND SOUND POWER, Lw						Lp	OCTAVE BAND SOUND POWER, Lw						Lp
		CFM	(L/s)	"WG	(Pa)	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
2	8	250	(118)	0.018	(4)	55	46	49	43	36	26	-	63	55	55	49	41	33	-	65	57	57	50	42	34	**21**
		400	(189)	0.046	(11)	61	54	53	47	43	34	-	68	62	59	53	47	40	**21**	70	65	61	54	48	42	**24**
		550	(260)	0.086	(22)	64	59	55	50	47	39	-	72	67	62	56	51	45	**26**	74	70	64	57	52	47	**29**
		700	(330)	**0.140**	(35)	67	62	57	52	50	43	**20**	**75**	**71**	**64**	**58**	**54**	**49**	**31**	77	73	66	59	56	50	**33**
		920	(434)	0.242	(60)	71	67	60	55	54	47	**24**	78	75	66	60	58	53	**34**	80	78	68	62	59	55	**37**
4	8	800	(378)	0.198	(49)	63	57	53	47	44	34	-	71	66	63	56	54	45	**23**	73	68	65	59	56	48	**25**
		1025	(484)	0.324	(81)	66	60	56	51	48	39	-	74	69	66	60	58	50	**27**	76	71	68	62	60	53	**30**
	x	1275	(602)	0.502	(125)	69	63	59	54	52	43	-	77	72	69	63	61	54	**30**	79	74	71	65	64	57	**33**
	14	**1575**	(743)	**0.766**	(191)	72	66	62	57	55	47	**23**	**80**	**75**	**71**	**66**	**65**	**58**	**34**	82	77	74	68	67	60	**37**
		1800	(849)	1.000	(249)	74	68	63	59	57	49	**26**	81	77	73	68	67	60	**36**	83	79	76	70	69	63	**39**

UNIT RADIATED SOUND

UNIT SIZE	INLET SIZE	FLOW RATE		MIN Δ Ps		PRIMARY @ 0.5" Δ Ps							PRIMARY @ 1.5" Δ Ps							PRIMARY @ 2.0" Δ Ps						
						OCTAVE BAND SOUND POWER, Lw						Lp	OCTAVE BAND SOUND POWER, Lw						Lp	OCTAVE BAND SOUND POWER, Lw						Lp
		CFM	(L/s)	"WG	(Pa)	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
2	8	250	(118)	0.018	(4)	52	48	42	36	31	27	-	57	54	46	39	35	33	**22**	58	55	47	40	36	34	**24**
		400	(189)	0.046	(11)	58	54	49	43	39	34	**23**	63	59	53	47	43	40	**29**	64	61	53	47	44	41	**31**
		550	(260)	0.086	(22)	62	57	53	48	44	38	**28**	67	63	57	52	48	44	**33**	69	65	58	52	49	46	**35**
		700	(330)	**0.140**	(35)	66	60	57	52	48	42	**31**	**71**	**66**	**60**	**55**	**52**	**48**	**37**	72	67	61	56	53	49	**38**
		920	(434)	0.242	(60)	69	63	60	56	52	46	**36**	74	69	64	60	56	52	**40**	76	71	65	60	57	53	**42**
4	8	800	(378)	0.198	(49)	56	55	50	42	36	31	**24**	65	64	57	48	41	38	**34**	68	66	59	49	43	40	**37**
		1025	(484)	0.324	(81)	58	57	53	46	40	34	**27**	68	66	60	51	45	42	**36**	70	68	62	53	47	44	**39**
	x	1275	(602)	0.502	(125)	60	58	55	49	43	38	**30**	70	68	63	55	49	45	**38**	72	70	65	56	50	47	**41**
	14	**1575**	(743)	**0.766**	(191)	62	60	58	52	47	41	**33**	**72**	**69**	**65**	**58**	**52**	**48**	**41**	74	71	67	59	53	50	**43**
		1800	(849)	1.000	(249)	64	61	60	54	49	43	**35**	73	70	67	59	54	51	**43**	75	72	69	61	55	52	**45**

NOTES: Discharge sound power is the sound emitted from the unit discharge. Discharge sound power has been corrected for end reflection. Radiated sound power is the sound transmitted through the casing walls. All sound data is based on tests conducted in accordance with AHRI 880-11. Sound power levels are in dB, re 10^{-12} Watts. ΔPs is the difference in static pressure from inlet to discharge. NC application data is from AHRI Standard 885-08 Appendix E, as a function of flow rate shown. AHRI certification points are shown in bold, white font. For a complete list of AHRI certified data, see pages B2-3 and B2-4. All other data points listed are application ratings outside the scope of the Certification Program. See Krueger's selection program for specific sound data for optional liners; 1/2", dual density liner shown. Dash indicates a NC is less than 20. See Krueger's Terminal Unit Engineering section for reductions and definitions.

CONTROL INFORMATION

SEQUENCE OF OPERATION

Standard KLPP sequence of operation has the induced air flow fan operating intermittently, providing supplemental ceiling plenum/return air to the space for heat.

HEATING MODE

When the zone is at maximum heating demand, the primary air damper maintains a minimum volume of primary airflow. The fan supplies a constant flow of air to the zone by inducing a maximum amount of warm air from the ceiling plenum. Electric or hot water heat, if supplied, operates at maximum capacity.

As zone temperature rises, the optional heat, if supplied, cycles off. The fan continues to induce the maximum amount of ceiling plenum air. As zone temperature reaches setpoint, the fan will cycle off and a minimum amount of air will be discharged from the unit.

COOLING MODE

As zone temperature rises above setpoint, the fan remains off and the primary air damper begins to modulate toward full open.

As the zone temperature continues to rise, the primary air damper will continue to modulate toward open. When the conditioned zone is at maximum cooling demand, the primary air damper will maintain a constant maximum flow setting. With pressure independent controls, the damper will maintain airflow settings regardless of central system pressure fluctuations.

DIRECT DIGITAL CONTROL ARRANGEMENTS

Visit Krueger's website at www.krueger-hvac.com or contact your Krueger representative for a complete list of factory mounted direct digital control arrangements.

CONTROL OPTIONS

- **Pneumatic Controls**: Pressure independent control packages are available with or without hot water or electric heat. All control arrangements include an inlet flow sensor, fan speed controller, and fan PE switch.
- **Analog Controls**: Pressure independent control packages are available with or without hot water or electric heat, automatic night shutdown or night setback. All control arrangements include an inlet flow sensor, control enclosure, fan speed controller, transformer to 24 volts, fan relay, and wall thermostat to match the control type.
- **Direct Digital Controls**: Smart Equipment control packages are provided and programmed by the factory for in-house mounting, piping, and wiring.
  - BACnet Compatible: 7301-7309
  - Standalone: 6301-6309

  Other digital control packages can be supplied to the factory for mounting, piping, and wiring.

  Contact your Krueger representative for a complete list of direct digital control arrangements.
- **No Control Unit**: Units are factory supplied without controls, assuming that the unit is being used for field mounting of direct digital control equipment. This arrangement includes an inlet flow sensor, control enclosure, fan speed controller, transformer to 24 volts, and fan relay.

CONTROL INFORMATION (CONTINUED)

The following list shows the standard control arrangements available with the KLPP product offering. Each control approach offers a variety of pressure independent operating functions; combinations of control functions are identified by the Krueger control package number.

PNEUMATIC CONTROL ARRANGEMENTS

1400 - Single Function Controller; DA-NO with or without Hot Water or Electric Heat
1401 - Single Function Controller; RA-NC with or without Hot Water or Electric Heat
1402 - Multi-function Controller; DA-NO with or without Hot Water or Electric Heat
1403 - Multi-function Controller; RA-NO with or without Hot Water or Electric Heat
1404 - Multi-function Controller; DA-NC with or without Hot Water or Electric Heat
1405 - Multi-function Controller; RA-NC with or without Hot Water or Electric Heat

Pneumatic Control Legend:

DA - Direct Acting Thermostat
RA - Reverse Acting Thermostat
NO - Normally Open Damper Position
NC - Normally Closed Damper Position
Single Function Controller - Provides Single Function, DA-NO or RA-NC
Multi-function Controller - Capable of Providing DA-NO, DA-NC,RA-NC or RA-NO Functions

ANALOG CONTROL ARRANGEMENTS

2300 - Cooling with Sequenced Fan
2301 - Cooling with Sequenced Fan and Automatic Night Shutdown
2302 - Cooling with Sequenced Fan and Automatic Night Setback
2303 - Cooling with Sequenced Fan and On/Off Hot Water Heat
2304 - Cooling with Sequenced Fan, ON/OFF Hot Water Heat, and Automatic Night Shutdown
2305 - Cooling with Sequenced Fan, ON/OFF Hot Water Heat, and Automatic Night Setback
2306 - Cooling with Sequenced Fan and Proportional Hot Water Heat
2307 - Cooling with Sequenced Fan, Proportional Hot Water Heat, and Automatic Night Shutdown
2308 - Cooling with Sequenced Fan, Proportional Hot Water Heat, and Automatic Night Setback
2309 - Cooling with Sequenced Fan and Up to Two Stages of Electric Heat
2310 - Cooling with Sequenced Fan, Up to Two Stages of Electric Heat, and Automatic Night Shutdown
2311 - Cooling with Sequenced Fan, Up to Two Stages of Electric Heat and Automatic Setback
2313 - Cooling with Sequenced Fan and Proportional Electric Heat
2314 - Cooling with Sequenced Fan, Proportional Electric Heat, and Automatic Night Shutdown

SUGGESTED SPECIFICATION & CONFIGURATION

KLPP UNIT

Fan powered terminal unit shall be a low profile type of 11" height and 35 3/4" in length, complete factory assembled and wired with motor, blower, mixing plenum and primary air damper contained in a single unit housing. Unit shall be Krueger model KLPP.

Primary airflow controller shall compensate for central system pressure fluctuations. When room temperature requires maximum heating, the (direct digital) (analog) (pneumatic) pressure independent velocity controller maintains the minimum primary airflow setting by modulating the damper. The induction fan shall run and the electric heating coil or hot water coil, if supplied, is energized (activated). As room temperature begins to rise, the heating coil is de-energized (deactivated). As room temperature calls for maximum cooling, the velocity controller shall maintain primary airflow setting.

Terminals shall be tested by use of the AHRI Standard 880. The terminal unit shall be ETL listed as a complete assembly. All electrical components shall be UL listed and installed in accordance with the National Electric Code. All electrical components shall be mounted in sheet metal control enclosures. Electrical connection shall be single point.

Unit casing shall be constructed of not less than 20 gage galvanized steel. Unit discharge shall be rectangular, suitable for flanged duct connections.

Unit labels shall be adhered to each unit including model size, airflow (CFM), balancing chart, and tagged data.

KLPP unit shall be equipped with a factory installed airflow sensing device. Provide a K4 LineaCross, four quadrant, multi-point center averaging sensor with an amplified signal.

- **(Optional)** Provide a linear, multi-point, velocity averaging sensor with an amplified signal.

Provide balancing taps to allow for easy airflow verification.

Terminal unit shall be provided with a heavy gage galvanized steel backdraft damper.

Fan motor and all interior components must be accessible through a removable bottom access panel.

Fan shall be of the forward curve, centrifugal type. The fan motor shall be [120, 208/240, 277 volt, 1-phase, 60 cycle, single-speed], energy efficient design, permanently lubricated, using permanent split capacitor for starting and be specifically designed for use with an SCR fan speed controller. Motor must have thermal overload protection. The fan motor shaft shall be connected directly to the fan and the entire fan assembly shall be isolated from the unit casing to prevent transmission of vibration.

- **(Optional)** ECM Fan Motor: The fan motor shall be [120, 208/240, or 277 volt, 1-phase] ECM (electronically commutated motor) fan motors including either a manual or remote adjustable speed controller. The manual adjustable speed controller is field set and adjustable with a digital display, alternating between RPM and percentage full airflow. The remote adjustable speed controller provides a means to remotely set and/or adjust the fan speed.

The radiated and discharge attenuation factors for the specified NC levels shall be based on attenuation factors from AHRI Standard 885-08 Appendix E, which includes room absorption, environmental adjustment factor, duct insertion, end reflection and duct branching.

CASING LINERS

Unit casing shall be lined with dual density, 1/2" thick, 1 1/2" lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A. Insulation shall be attached to the unit casing by adhesive and weld pins.

- **(Optional)** Cellular Insulation: Unit casing shall be lined with 1/2" thick, 1 1/2" lb. density, smooth surface, polyolefin, closed-cell, foam insulation for fiber free application. Cellular insulation meets UL 181 and NFPA 90A and does not support mold or bacteria growth. Insulation shall be attached to the unit casing by adhesive and weld pins.
- **(Optional)** Foil Encapsulated Insulation: Unit casing shall be lined with nylon reinforced, foil-wrapped exposed edges, 1/2" thick, 1 1/2" lb. density fiberglass insulation that meets UL 181 and NFPA 90A. Insulation shall be attached to the unit casing by adhesive and weld pins.
- **(Optional)** Sterilwall Insulation: Unit casing shall be lined with 1/2", 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A, enclosed between the unit casing and a non-perforated internal sheet metal cover extending over the fiberglass insulation, as well as covering the liner cut edges.
- **(Optional)** Perforated Doublewall Insulation: Unit casing shall be lined with 1/2", 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A, enclosed between the unit casing and a perforated internal sheet metal cover extending over the fiberglass insulation, as well as covering the liner cut edges.

SUGGESTED SPECIFICATION & CONFIGURATION (CONTINUED)

Electric coils shall be supplied by the terminal unit manufacturer and shall be ETL listed in accordance with UL standards. Construct coil casing with minimum of 20 gage galvanized steel. Elements shall be nickel chrome and supported by ceramic insulators. The integral control panel shall be housed in a NEMA 2 enclosure for access to all controls and safety devices.

ELECTRIC HEATING COILS

Electric coils shall contain a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow.

- **(Optional)** Electric coils shall include fused or non-fused door interlocking disconnect switch, AC Solid State Relay, fuse-block, manual reset cutout, and/or dust tight enclosure construction.
- **(Optional)** LineaHeat solid state electronic proportional control of electric heat shall meet the requirements of ASHRAE Standard 62, Addenda N.
- **(Optional)** LineaHeat solid state electronic controlled heater with control of the leaving air temperature limiting the unit discharge temperature to a set value.

HOT WATER COILS

Hot water coil casing shall be constructed with minimum 20 gage galvanized steel with flanged discharge for attachment to downstream ductwork. The hot water coil may also be factory attached to the upstream side of the induced air inlet. Coils shall be factory installed on the terminal unit. Fins shall be rippled and corrugated heavy gage aluminum, mechanically bonded to tubes. Tubes shall be copper with minimum wall thickness of 0.016" and with male solder header connections. Coils shall be leak tested to 400 psi. Number of coil rows and circuits shall be selected to provide performance as required by the plans. Coil performance data shall be based on tests run in accordance with AHRI Standard 410.

SUGGESTED SPECIFICATION & CONFIGURATION (CONTINUED)

1. SERIES: (XXXX)
KLPP - Low Profile, Fan Powered Terminal Unit

2. SENSOR TYPE: (X)
1 - Linear Averaging
3 - K4 LineaCross (Four Quadrant, Standard)

3. LINER TYPE: (X)
0 - 1/2" Liner
4 - Sterilwall with 1/2" Dual Density
6 - 1/2" Foil Encapsulated
A - Perforated Doublewall with 1/2" Dual Density
F - 1/2" Cellular

4. UNIT CASING CONTROLS: (XX)
1L - Left-hand Side, 20 Gage
1R - Right-hand Side, 20 Gage

5. UNIT SIZE: (X)
2 - Available Inlet Size: 6", 8", 10"
4 - Available Inlet Sizes: 10", 8" x 14"

6. INLET CODE: (XX)
06 - 6" Round
08 - 8" Round
10 - 10" Round
12 - 8" x 14" Rectangle ^^

7. MOTOR VOLTAGE: (X)
1 - 120V, 1-Phase
2 - 208/240V, 1-Phase
3 - 277V, 1-Phase
4 - ECM Motor, 120V, 1-Phase **
5 - ECM Motor, 208/240V, 1-Phase **
6 - ECM Motor, 277V, 1-Phase **

8. CONTROL TYPE: (XXXX)
(2XXX) - Analog
(7XXX) - Digital, BACnet Compatible
(6XXX) - Digital, Standalone
(XXXX) - Factory Mounted, Provided by Others
(1XXX) - Pneumatic

9. UNIT ACCESSORIES: (X) (X) (X) (X)
0 - None
A - Motor Toggle Disconnect *
F - Fan Motor Fuse
R - Induction Inlet Filter
S - Hanger Brackets

10.WATER HEAT:
(ROWS/CONNECTION HAND) (XXX)
000 - N/A / None
W61 - 1 Row/Right/Induced Air Inlet ^
W62 - 2 Row/Right/Induced Air Inlet ^
W71 - 1 Row/Left/Induced Air Inlet ^
W72 - 2 Row/Left/Induced Air Inlet ^

11.ELECTRIC HEAT: (XX)
00 - None
E1 - 120v/1-Phase
E2 - 208v/1-Phase
E3 - 240v/1-Phase
E4 - 277v/1-Phase
E6 - 208v/3-Phase/3-Wire
E9 - 480v/3-Phase/4-Wire

LINEAHEAT: (XX)
L1 - 120v/1-Phase
L2 - 208v/1-Phase
L3 - 240v/1-Phase
L4 - 277v/1-Phase
L6 - 208v/3-Phase/3-Wire
L9 - 480v/3-Phase/4-Wire

12.ELECTRIC HEAT STEPS: (X)
0 - None
1 - 1-Stage
2 - 2-Stage
3 - 3-Stage

13.HEAT COIL ACCESSORIES: (X) (X) (X) (X) (X)
0 - None
C - Fuse Block
F - Manual Reset Cutout
G - Dust-tight Construction
H - Staged Solid State Relays
K - Door-interlocking Fused Disconnect
L - Door-interlocking Non-fused Disconnect

* Motor Toggle Disconnect not available with electric heat.
** Manual or remote adjustable speed controller for ECM motor option is required.
^ Water coil connection must be opposite of control enclosure.
^^ KLPP size 4 only.

SAMPLE CONFIGURATION: KLPP - 3 - 5 - 1L - 2 - 06 - 2 - 6303 - A - F - 0 - 0 - 000 - E32 - 2 - 0000