

QFV

Introduction: QFV

The QF fan-powered induction terminal units 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 QF fan terminal units offer excellent performance characteristics and affordability in a compact unit with optimum physical dimensions.

The Model QFV parallel fan powered terminal unit features intermittent parallel fan operation. The QFV 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 QFV fan cycles on to satisfy zone heating requirements. Optional heating coils provide supplemental heat only after the fan has cycled on.

Primary air is modulated with direct digital, analog, or pneumatic pressure independent type controls.

MODEL

QFV - Parallel Fan Powered Terminal Unit

FEATURES

- Compact unit casing dimensions accommodate installation in reduced ceiling plenum spaces.
- Airflow capacities range up to 3660 CFM for the QFV products to allow flow control for commercial applications.
- 22 Gage galvanized steel case construction with an optional 20 gage galvanized steel case for unit strength and product durability.
- Several types of casing liner options provide quiet and clean operation.
- Round inlet sizes ranging from 6" through 16" diameter are slightly undersized to fit standard spiral and flex duct for quick installation.
- Each unit size offers multiple primary inlet sizes to allow for flexible system design.
- Fully removable bottom access panel is included with each unit for easy access to all internal components for maintenance.
- Optional induced air attenuator for reduced radiated sound.
- Single point electrical connection minimizes number of ceiling plenum electrical connections.
- Recirculation multi-voltage fan motors are quiet, reliable, and permanently lubricated.
- Electronic speed control (SCR) allows field adjustable fan airflow.
- Isolated motor/blower assembly limits casing acoustical transmission.
- ETL listings are under UL 1995 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.
- Auxiliary heat offers wide range of options, including electric and hot water heat.
- Pneumatic, analog, and digital controls may be customized for many building systems. BACnet/BMS compatible digital controls can be provided by Krueger.
- 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.

QFV Unit Capacities & Damper Leakage
QFV, UNIT CAPACITIES

Unit Size	Inlet Size	QFV with PSC Motor							QFV with Attenuator				
		Primary Airflow		Fan Airflow		Motor HP	Motor Amps			Primary Airflow		Fan Airflow	
		Max.	Min.	Max.	Min.		120V	208/240V	277V	Max.	Min.	Max.	Min.
2	6	515	90 or 0	400	200	1/10	1.6	0.9	0.7	515	90 or 0	400	200
	8	920	160 or 0							920	160 or 0		
3	8	920	160 or 0	600	300	1/10	2	1.2	0.9	920	160 or 0	600	300
	10	1430	250 or 0							1430	250 or 0		
4	10	1430	250 or 0	1050	480	1/4	3.2	1.9	1.4	1430	250 or 0	1050	480
	12	2060	360 or 0							2060	360 or 0		
5	12	2060	360 or 0	1500	860	1/2	7.3	4.1	3.1	2060	360 or 0	1500	860
	14	2800	480 or 0							2800	480 or 0		
6	14	2800	480 or 0	1800	930	1/2	10.1	5.1	4.2	2800	480 or 0	1800	930
	16	3660	630 or 0							3660	630 or 0		
7	16	3660	630 or 0	2200	1140	3/4	9.5	5.8	4.4	3660	630 or 0	2200	1140

NOTES: QFV 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) is based on 0.25" WG external downstream static pressure. See page B2-78 and B2-79 for complete fan curves.

QFV, DAMPER LEAKAGE DETAIL

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
12	4	5	7
14	4	6	8
16	5	7	9

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.

QFV Product Description**CASING**

- All QFV unit casing panels are constructed of 22 gage galvanized steel with a 20 gage option.
- Removable bottom panel allows easy access to all internal components.
- The QFV 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.
- The primary air inlet is located on the left hand side of the unit inlet panel of all sizes of QFV units.

OUTLET CONNECTIONS

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

DAMPER ASSEMBLY

- All units utilize a round volume control damper 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 ATTENUATOR

- A lined sound attenuator, which reduces radiated sound, is available.
- See Krueger's selection software for adjusted radiated sound data.

INDUCED AIR INLET FILTER

- 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. The standard liner option is 1/2" thick, 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A.

- **(Optional) 1" Thick Insulation:** 1" thick, 1 1/2 lb. dual density fiberglass insulation that meets UL 181 and NFPA 90A.
- **(Optional) Cellular Insulation:** 1/2" or 1" 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) Foil Encapsulated Insulation:** Foil reinforced, wrapped edges, 1/2" or 1" 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 multi-voltage [120,208/240 or 277V, single-phase] permanent split capacitor (PSC) type.
- Units equipped with [120, 208/240 or 277 volt, single-phase] electric heat have fan motors wired with the same line voltage. Units with [208 volt, three-phase, three-wire] electric heat utilize 208/240 volt fan motors. Units with [480 volt, three-phase, four-wire] heat are equipped with 277 volt fan motors.
- Quick electrical disconnects are provided on the motor wiring.
- A motor disconnect switch is available (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 an SCR fan speed controller capable of reducing fan output by as much as 50-55%.

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 with control enclosure is also available for field mounting of direct digital controls.

HOT WATER HEAT

- One or two row coils are constructed of ten aluminum fins per inch with 5/8" O.D. sweat type connection. Left-hand or right hand, tubing connection is available. The coil tubing is water leakage tested to 400 psig.
- Access panel in the hot water unit casing is available for upstream cleaning of the coil fins.
- Vent and drain option is available.

QFV Product Description

ELECTRIC HEAT

- Heaters are UL listed and are constructed of 20 gage galvanized steel.
- Available combinations are:
 - [120, 208/240, or 277 volt, single phase],
 - [208 volt, three-phase, three-wire],
 - [480 volt, three-phase, four-wire]
- See fan motor description for electric heat/fan motor combinations.
- Heaters are equipped with standard 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.
- LineaHeat solid state electronic proportional control of electric heat is available with or without leaving air temperature control. Contact your Krueger representative or the Krueger website for additional information. See Krueger's Terminal Unit Engineering section for additional information.
- AC solid state relays offer silent operation for staged electric heat.

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

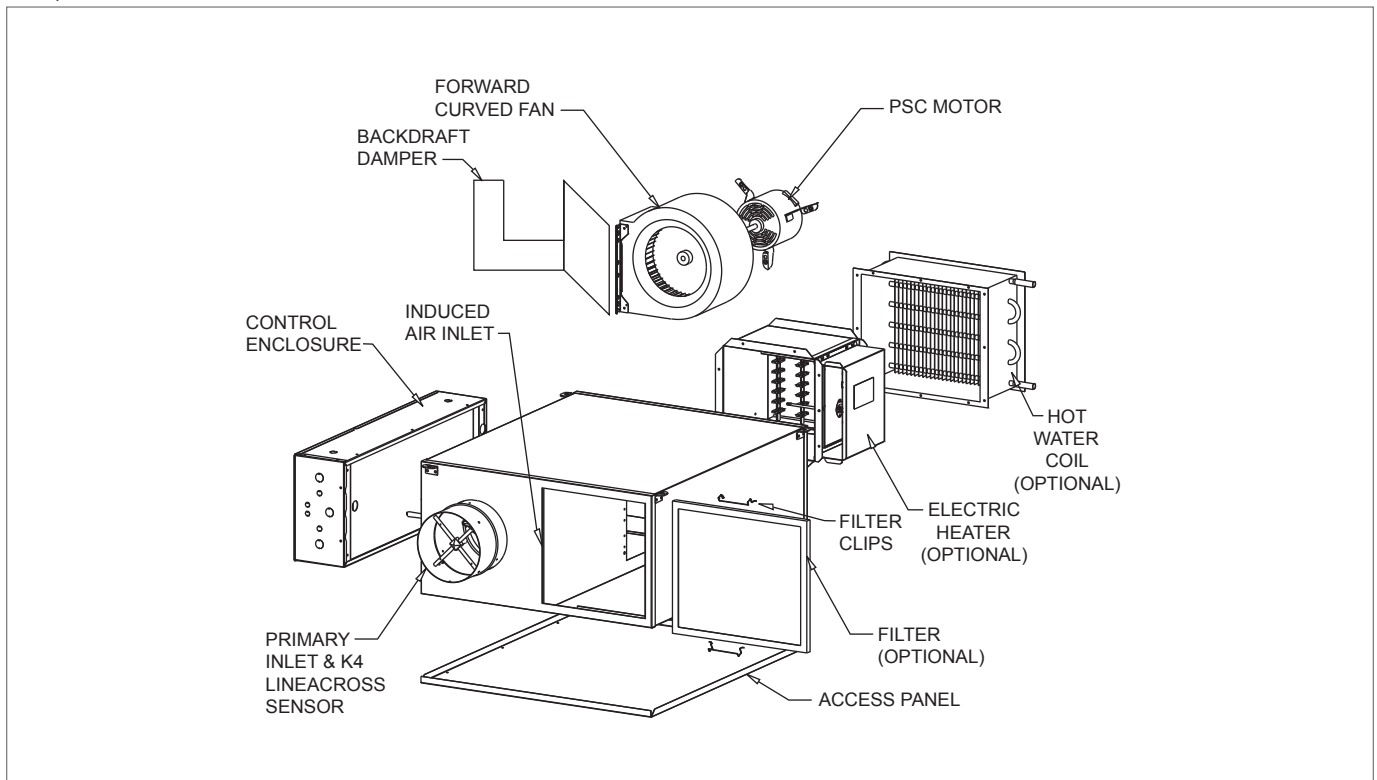
- Label information adhered to each unit includes model name, unit size, configuration code, airflow (CFM), balancing chart, tagging data, electrical ratings, removal of fan protection packing material information, and all required agency listings.

PACKAGING

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

QFV Exploded View

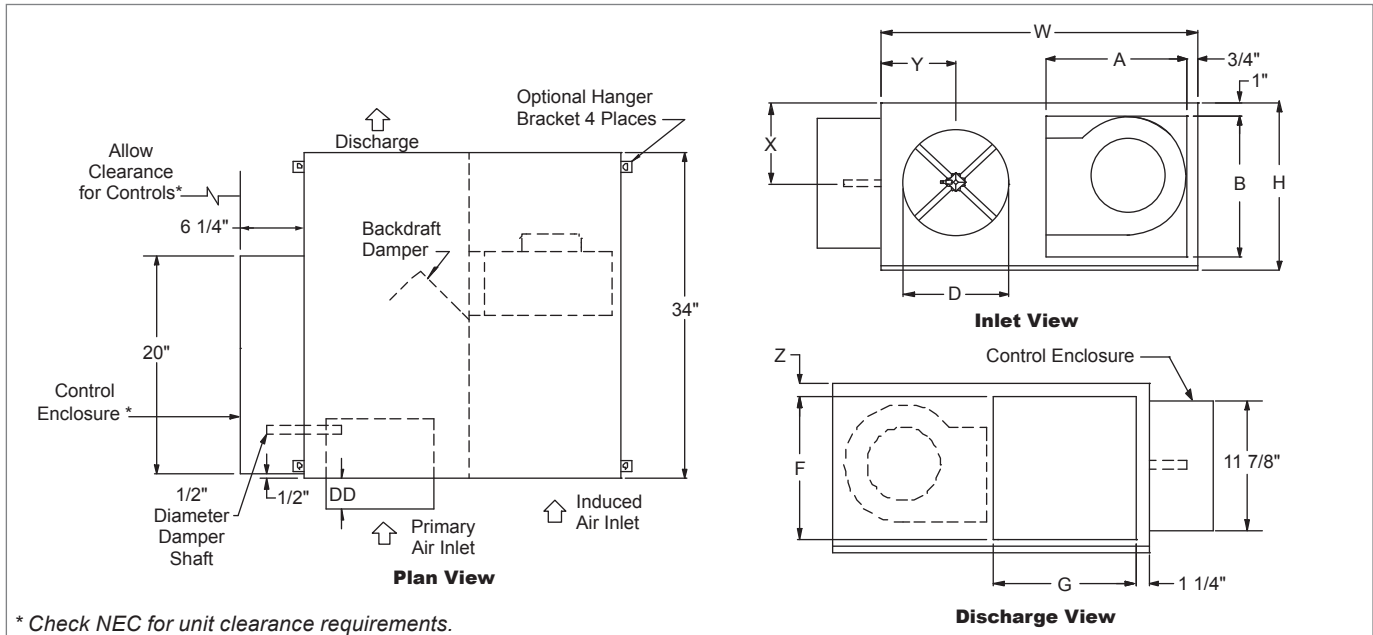
QFV, EXPLODED VIEW



QFV | Standard, Parallel Flow

QFV Base Unit Dimensional Information

QFV BASE UNIT, INLET, PLAN, AND DISCHARGE VIEWS



FAN POWERED TERMINAL UNITS

QFV BASE UNIT, DIMENSIONAL DETAILS

Unit Size	Inlet Size	Max. Primary CFM	Max. Fan CFM	PSC HP	W	H	Induced Air		D	Discharge		X	Y	Z
							A	B		F	G			
2	06	515	400	1/10	29"	15"	13"	13"	5 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
2	08	920	400	1/10	29"	15"	13"	13"	7 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
3	08	920	600	1/10	29"	15"	13"	13"	7 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
3	10	1430	600	1/10	29"	15"	13"	13"	9 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
4	10	1430	1050	1/4	29"	15"	13"	13"	9 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
4	12	2060	1050	1/4	29"	15"	13"	13"	11 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
5	12	2060	1500	1/2	37"	17 3/4"	17"	15 3/4"	11 7/8"	14"	15 1/2"	8 7/8"	8"	1 7/8"
5	14	2800	1500	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
6	14	2800	1800	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
6	16	3660	1800	1/2	37"	17 3/4"	17"	15 3/4"	15 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
7	16	3660	2200	3/4	37"	17 3/4"	17"	15 3/4"	15 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"

NOTES: Unit available as left-hand primary air configuration only.

QFV Base Unit Features & Options

STANDARD FEATURES

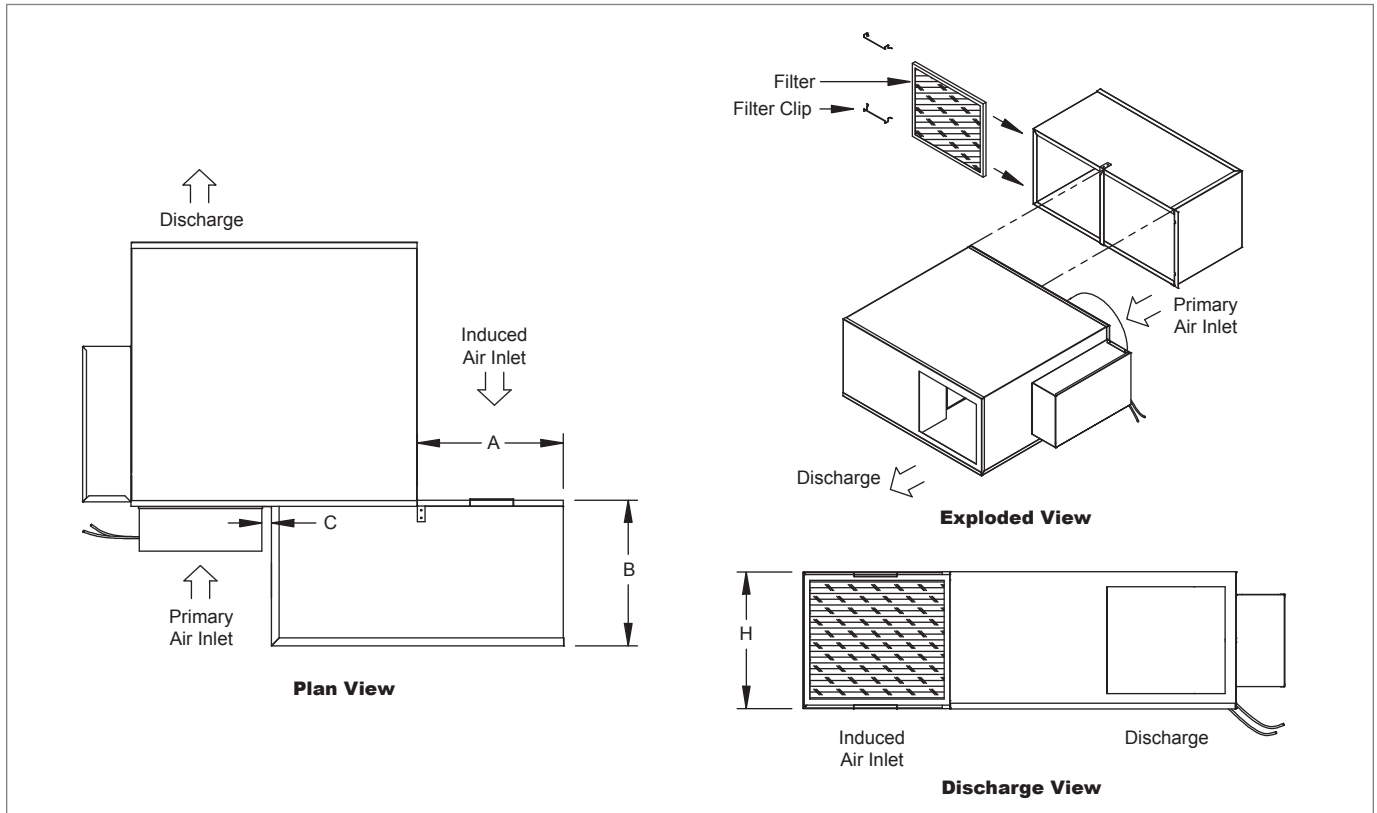
- 22 Gage galvanized steel casing construction.
- Control enclosure for electronic components.
- 1/2" Thick, Dual density fiberglass insulation that meets NFPA 90A and UL 181 safety requirements.
- [120, 208/240, or 277 volt, multi-voltage, single-phase, single-speed] permanently lubricated PSC motors.
- Field adjustable fan speed control.
- Backdraft damper.
- Removable bottom panel allows easy access to all internal components for maintenance.
- Four quadrant, center averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"); sizes 12 - 16 (DD = 6 7/8").
- Discharge requires flanged duct; connection by others.
- Includes 24 volt control transformer.
- ETL listed; adherence to UL 1995 and CSA C22.2 No. 236.95.
- AHRI certified sound ratings.

OPTIONAL FEATURES

- 20 Gage galvanized steel casing construction.
- Liners: 1/2" or 1" Cellular insulation, 1" Dual density fiberglass insulation, or 1/2" or 1" Foil encapsulated fiberglass insulation.
- Linear averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"), sizes 12 - 16 (DD = 6 7/8").
- Motor disconnect.
- Motor fusing.
- Induced air filter, construction type; unit sizes 2 - 4 (15"x15"x1"); unit sizes 5 - 7 (19"x17"x1").
- Induced air inlet attenuator.
- Dust tight control enclosure.
- Hanger brackets.

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QFV Attenuator Dimensional Information
QFV ATTENUATOR, EXPLODED, PLAN, AND DISCHARGE VIEWS


FAN POWERED TERMINAL UNITS

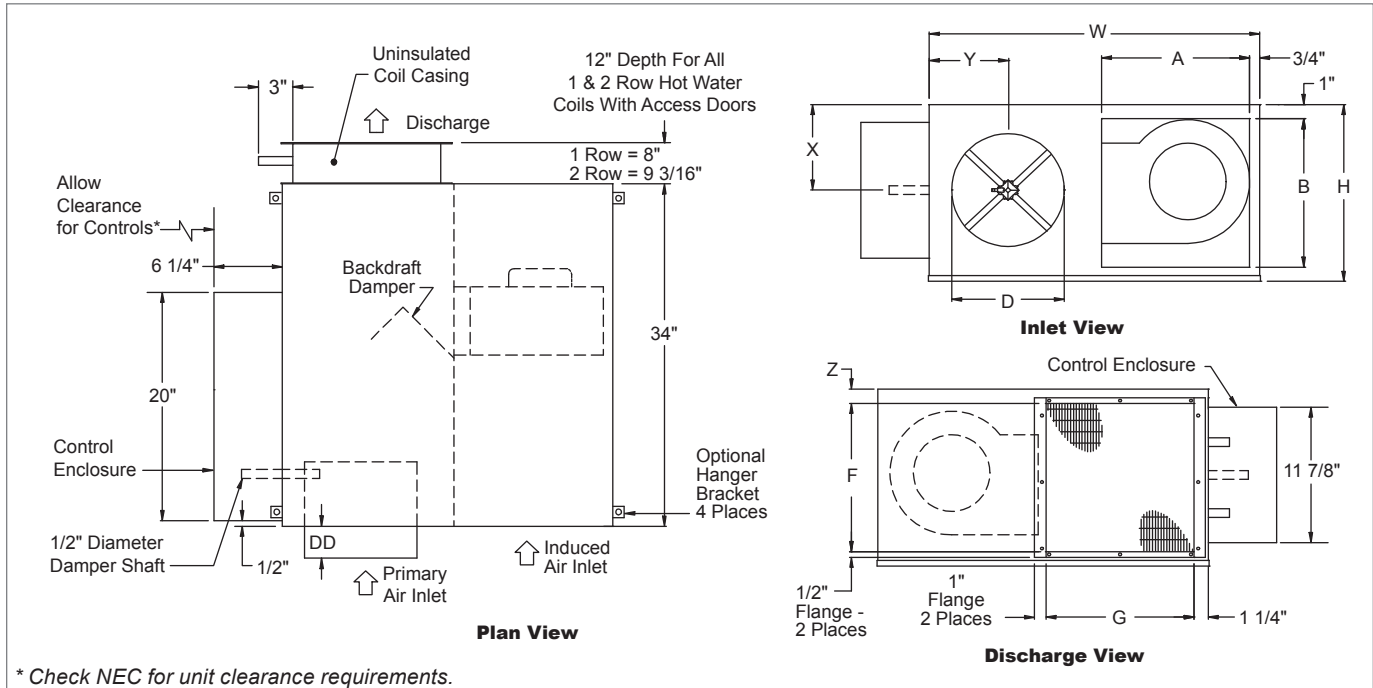
QFV ATTENUATOR, DIMENSIONAL DETAILS

Unit Size	Inlet Size	H	A	B	C
2	6	15"	15"	15"	4 1/2"
2	8	15"	15"	15"	3 1/2"
3	8	15"	15"	15"	3 1/2"
3	10	15"	15"	15"	2 1/2"
4	10	15"	15"	15"	2 1/2"
4	12	15"	15"	15"	1 1/2"
5	12	17 1/2"	19"	19"	3 1/4"
5	14	17 1/2"	19"	19"	2 1/4"
6	14	17 1/2"	19"	19"	2 1/4"
6	16	17 1/2"	19"	19"	1 1/4"
7	16	17 1/2"	19"	19"	1 1/4"

QFV | Standard, Parallel Flow

QFV Base Unit with Hot Water Heat Dimensional Information

QFV BASE UNIT WITH HOT WATER HEAT, INLET, PLAN, AND DISCHARGE VIEWS



* Check NEC for unit clearance requirements.

QFV BASE UNIT WITH HOT WATER HEAT, DIMENSIONAL DETAILS

Unit Size	Inlet Size	Max. Primary CFM	Max. Fan CFM		PSC HP	W	H	Induced Air		D	Discharge		X	Y	Z
			1 Row	2 Row				A	B		F	G			
2	06	515	400	375	1/10	29"	15"	13"	13"	5 7/8"	12 1/2"	15"	7 1/2"	6 7/8"	1 3/4"
2	08	920	400	375	1/10	29"	15"	13"	13"	7 7/8"	12 1/2"	15"	7 1/2"	6 7/8"	1 3/4"
3	08	920	550	525	1/10	29"	15"	13"	13"	7 7/8"	12 1/2"	15"	7 1/2"	6 7/8"	1 3/4"
3	10	1430	550	525	1/10	29"	15"	13"	13"	9 7/8"	12 1/2"	15"	7 1/2"	6 7/8"	1 3/4"
4	10	1430	1000	900	1/4	29"	15"	13"	13"	9 7/8"	12 1/2"	22"	7 1/2"	6 7/8"	1 3/4"
4	12	2060	1000	900	1/4	29"	15"	13"	13"	11 7/8"	12 1/2"	22"	7 1/2"	6 7/8"	1 3/4"
5	12	2060	1400	1300	1/2	37"	17 3/4"	17"	15 3/4"	11 7/8"	15"	22"	8 7/8"	8"	1 7/8"
5	14	2800	1400	1300	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	15"	22"	8 7/8"	9"	1 7/8"
6	14	2800	1700	1600	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	15"	24 1/2"	8 7/8"	9"	1 7/8"
6	16	3660	1700	1600	1/2	37"	17 3/4"	17"	15 3/4"	15 7/8"	15"	24 1/2"	8 7/8"	9"	1 7/8"
7	16	3660	2000	1800	3/4	37"	17 3/4"	17"	15 3/4"	15 7/8"	15"	24 1/2"	8 7/8"	9"	1 7/8"

NOTES: Unit available as left-hand primary air configuration only.

QFV Base Unit with Hot Water Heat Features & Options

STANDARD FEATURES

- 22 Gage galvanized steel casing construction.
- 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, multi-voltage, single-phase, single-speed] permanently lubricated PSC motors.
- Field adjustable fan speed control.
- Removable bottom panel allows easy access to all internal components for maintenance.
- Four quadrant center averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"); sizes 12 - 16 (DD = 6 7/8").
- Flanged discharge connection on hot water coils.
- Includes 24 volt control transformer.
- ETL listed; adherence to UL 1995 and CSA C22.2 No. 236.95.
- AHRI certified sound ratings.

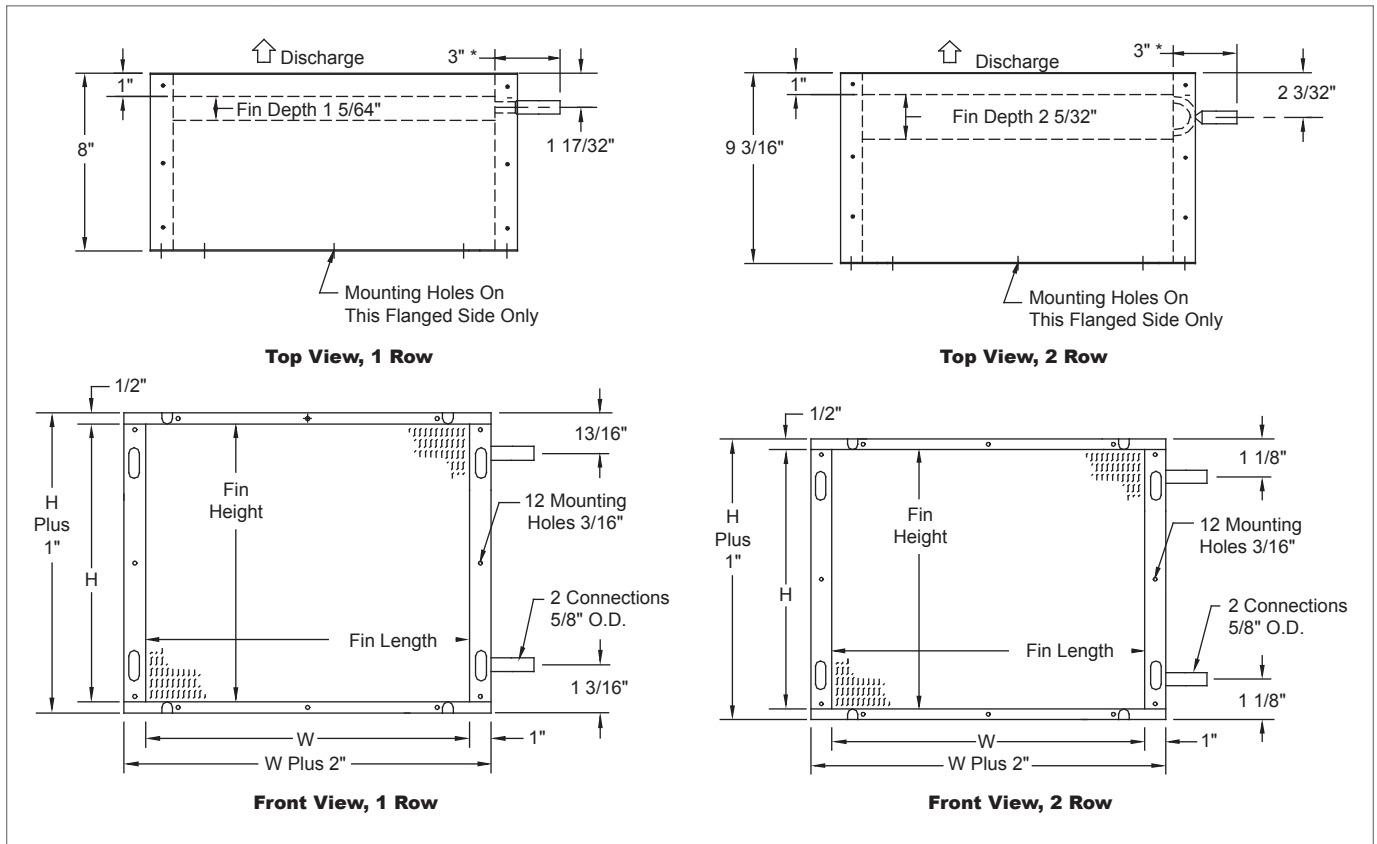
OPTIONAL FEATURES

- 20 Gage galvanized steel casing construction.
- Liners: 1/2" or 1" Cellular insulation, 1" Dual density fiberglass insulation, or 1/2" or 1" Foil encapsulated fiberglass insulation.
- Linear averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"), sizes 12 - 16 (DD = 6 7/8").
- Hot water coil vent and drain.
- Coil access panel.
- Induced air filter, construction type; unit sizes 2 - 4 (15"x15"x1"); unit sizes 5 - 7 (19"x17"x1").
- Induced air inlet attenuator (extends 6").
- Dust tight control enclosure.
- Motor disconnect.
- Motor fusing.
- Hanger brackets.

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QFV Hot Water Coil Dimensional Information
QFV HOT WATER COIL, TOP AND FRONT VIEWS


FAN POWERED TERMINAL UNITS

QFV HOT WATER COIL, DIMENSIONAL DETAILS

Unit Size	W	H
2	15"	12 1/2"
3	15"	12 1/2"
4	22"	12 1/2"
5	22"	15"
6	24 1/2"	15"
7	24 1/2"	15"

NOTE: 6 1/16" Length connection with vent and drain.

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.

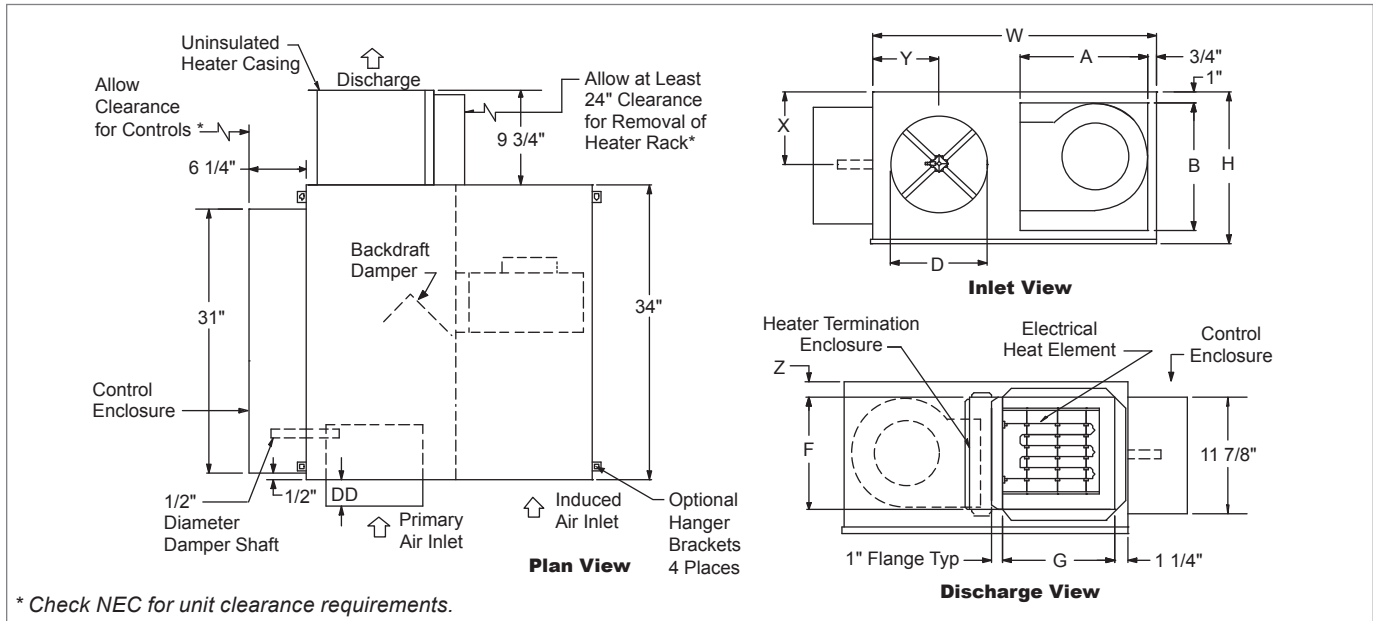
QFV Hot Water Coil Features & Options
STANDARD FEATURES

- QFV Coils are shipped from the factory attached to the unit discharge.
- Hot water coils are configured for a flanged duct work connection. Coil section is uninsulated.
- Coils are not for steam applications.
- Contact your Krueger Representative for high capacity or steam coil information.
- Connection Tubing - 5/8" 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.
- Optional vent and drain.
- Optional access panel.

QFV | Standard, Parallel Flow

QFV Unit with Electric Heat Dimensional Information

QFV UNIT WITH ELECTRIC HEAT, INLET, PLAN, AND DISCHARGE VIEWS



* Check NEC for unit clearance requirements.

QFV UNIT WITH ELECTRIC HEAT, DIMENSIONAL DETAILS

Unit Size	Inlet Size	Max. Primary CFM	Max. Fan CFM	PSC HP	W	H	Induced Air		D	Discharge		X	Y	Z
							A	B		F	G			
2	06	515	400	1/10	29"	15"	13"	13"	5 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
2	08	920	400	1/10	29"	15"	13"	13"	7 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
3	08	920	600	1/10	29"	15"	13"	13"	7 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
3	10	1430	600	1/10	29"	15"	13"	13"	9 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
4	10	1430	1050	1/4	29"	15"	13"	13"	9 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
4	12	2060	1050	1/4	29"	15"	13"	13"	11 7/8"	11 1/2"	11 1/2"	7 1/2"	6 7/8"	1 3/4"
5	12	2060	1500	1/2	37"	17 3/4"	17"	15 3/4"	11 7/8"	14"	15 1/2"	8 7/8"	8"	1 7/8"
5	14	2800	1500	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
6	14	2800	1800	1/2	37"	17 3/4"	17"	15 3/4"	13 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
6	16	3660	1800	1/2	37"	17 3/4"	17"	15 3/4"	15 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"
7	16	3660	2200	3/4	37"	17 3/4"	17"	15 3/4"	15 7/8"	14"	15 1/2"	8 7/8"	9"	1 7/8"

NOTES: Unit available as left-hand primary air configuration only. See next page for electric heat standard features.

QFV Unit with Electric Heat Features & Options

STANDARD FEATURES

- 22 Gage galvanized steel casing construction.
- 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, multi-voltage, single-phase, single-speed] permanently lubricated PSC motors.
- Field adjustable fan speed control.
- Removable bottom panel allows easy access to all internal components for maintenance.
- Four quadrant center averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"); sizes 12 - 16 (DD = 6 7/8").
- Flange discharge connection on electric heat coil.
- Single point electrical connection.
- Includes 24 volt control transformer.
- ETL listed; adherence to UL 1995 and CSA C22.2 No. 236.95.
- AHRI certified sound ratings.

OPTIONAL FEATURES

- 20 Gage galvanized steel casing construction.
- LineaHeat solid state electronic proportional control of electric heat.
- Liners: 1/2" or 1" Cellular insulation, 1" Dual density fiberglass insulation, or 1/2" or 1" Foil encapsulated fiberglass insulation.
- Linear averaging airflow sensor; inlet sizes 6 - 10 (DD = 4 7/8"), sizes 12 - 16 (DD = 6 7/8").
- Fused or non-fused door interlocking disconnect.
- Hanger brackets.
- Induced air filter, construction type; unit sizes 2 - 4 (15"x15"x1"); unit sizes 5 - 7 (19"x17"x1").
- Induced air inlet attenuator.
- Manual reset cutout.
- Dust tight control enclosure.
- Motor fusing.
- AC solid state relay.
- Fuse-block.

FAN POWERED TERMINAL UNITS

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QFV Electric Heat Features & Capacities

The kW charts below indicates the maximum and minimum safe limit capacities for each of the QFV 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, single-phase]
[208 volt, three-phase, three-wire]
[480 volt, three-phase, four-wire]
- NEMA 2 electric heat control enclosure.
- Control transformer for analog and direct digital controls.
- 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 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.
- AC solid state relays offer silent operation for staged electric heat.

SINGLE POINT CONNECTION COMBINATIONS

ELECTRIC HEATER/FAN MOTOR

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

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

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.

QFV MINIMUM kW

Unit Sizes	1 Phase				3 Phase				
	120 Volt	208 Volt	240 Volt	277 Volt	208 Volt	480 Volt	5-7		
Stage 1	0.5	0.5	1	0.5	1	1	1.5	2.5	2
Stage 2	1	1	1.5	1	1.5	1.5	1.5	2.5	2
Stage 3	1.5	1.5	2	1.5	2.5	2	1.5	2.5	2

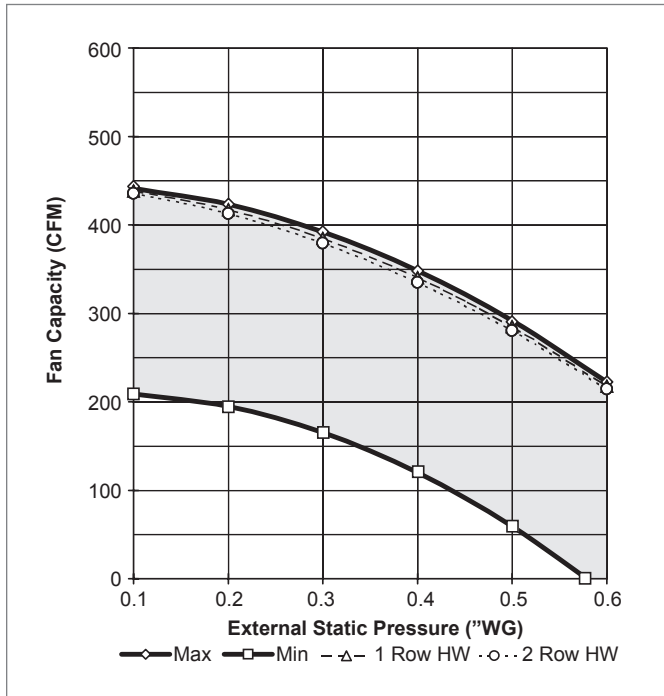
QFV MAXIMUM kW

Unit Size	1 Phase				3 Phase	
	120 Volt	208 Volt	240 Volt	277 Volt	208 Volt	480 Volt
2	4.0	4.0	4.0	4.0	4.0	4.0
3	5.5	6.0	6.0	6.0	6.0	6.0
4	5.0	6.0	6.0	6.0	6.0	6.0
5	4.5	9.0	9.0	12.0	12.0	12.0
6	4.5	8.5	8.5	12.0	14.0	14.0
7	4.5	8.5	8.5	12.0	15.0	18.0

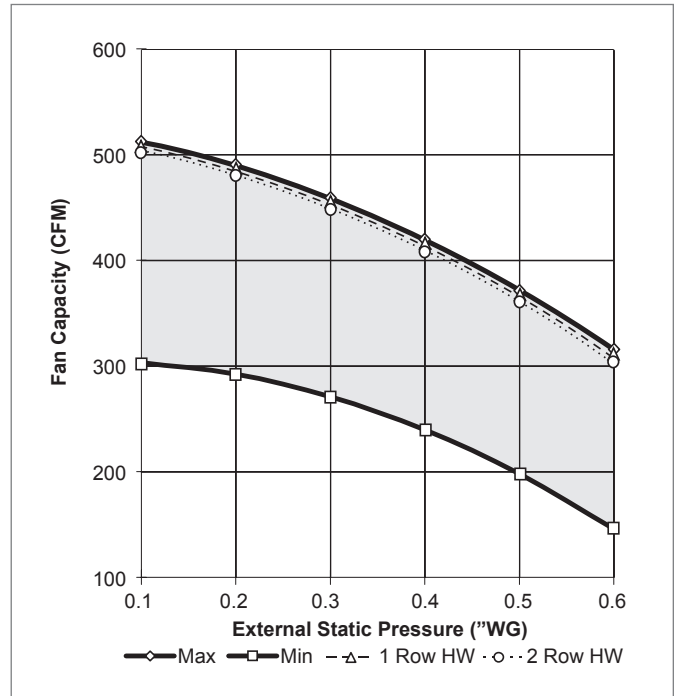
NOTES: Minimum and maximum values apply to staged heaters only. Contact your local Krueger representative for LineaHeat limits.

QFV PSC Fan Curves

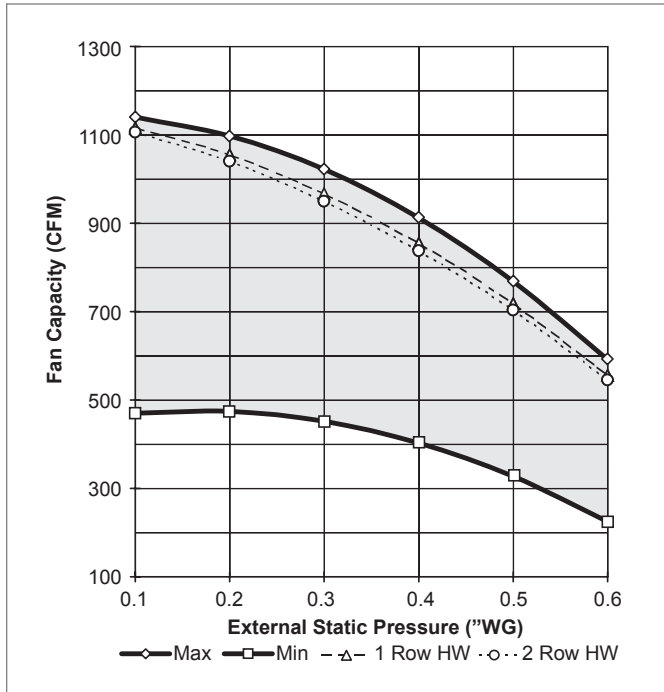
QFV PSC FAN CURVE, UNIT SIZE 2



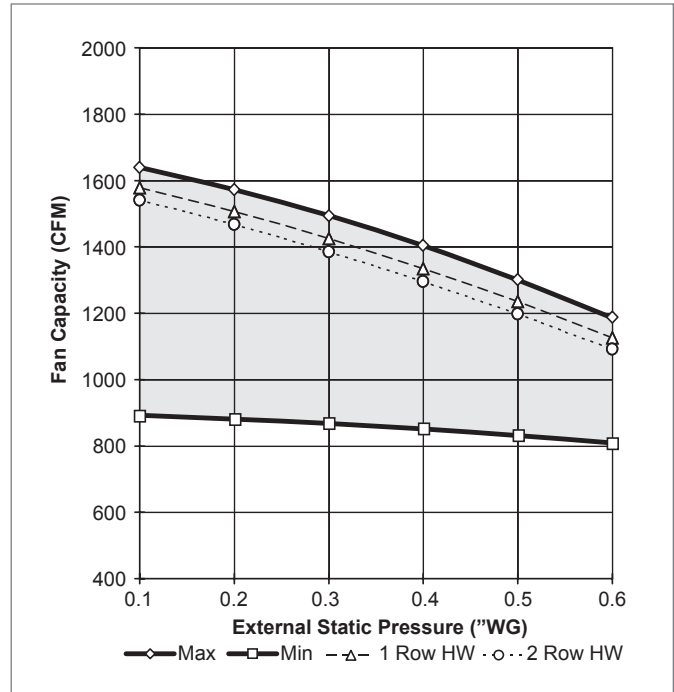
QFV PSC FAN CURVE, UNIT SIZE 3



QFV PSC FAN CURVE, UNIT SIZE 4



QFV PSC FAN CURVE, UNIT SIZE 5



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.

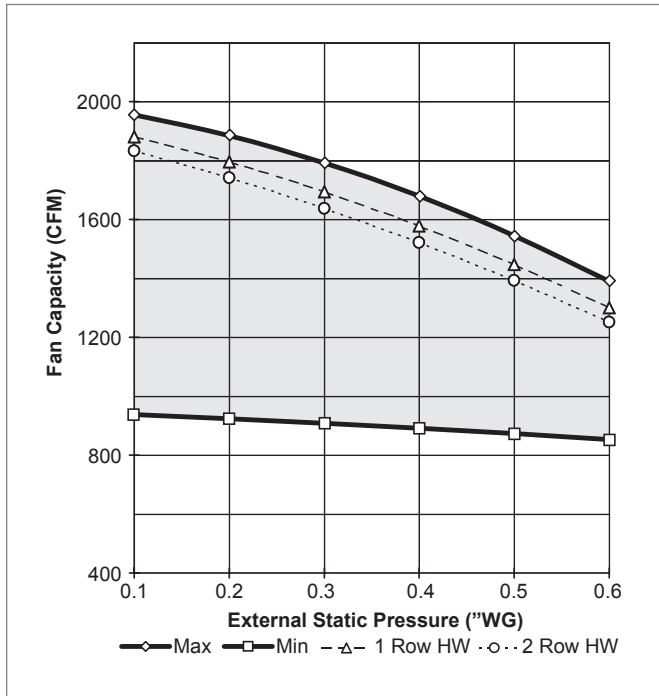
FAN POWERED TERMINAL UNITS

Q T >

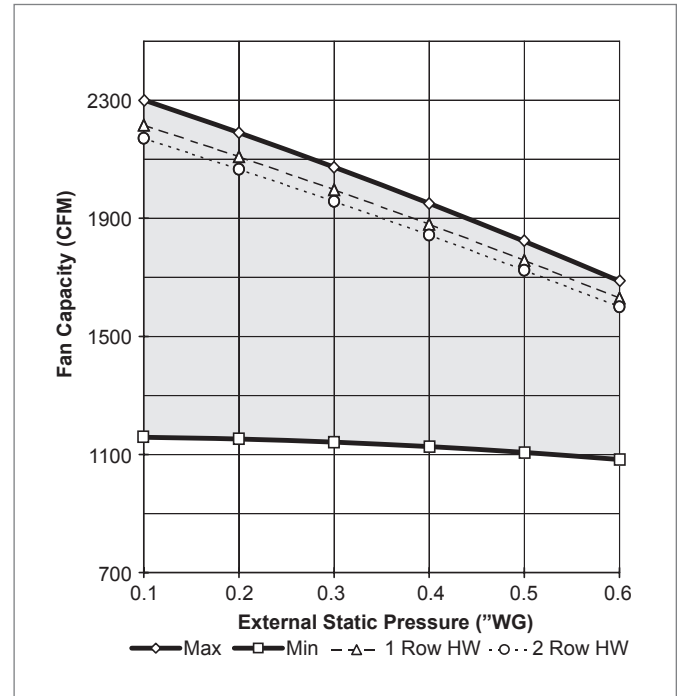
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QFV PSC Fan Curves

QFV PSC FAN CURVE, UNIT SIZE 6



QFV PSC FAN CURVE, UNIT SIZE 7



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. See Krueger's selection software for fan curves for QFV with attenuator.

FAN POWERED TERMINAL UNITS

AHRI Certified Performance Data for Parallel Fan Powered Terminal Units
KQFP, ULTRA QUIET PARALLEL FAN POWERED TERMINAL UNIT

Unit Size	Inlet Size	Primary CFM	Min. Ps	Discharge Data													
				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
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

Unit Size	Inlet Size	Primary CFM	Min. Ps	Radiated Data													
				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
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, PARALLEL FAN POWERED TERMINAL UNIT

Unit Size	Inlet Size	Primary CFM	Min. Ps	Discharge Data													
				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
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

Unit Size	Inlet Size	Primary CFM	Min. Ps	Radiated Data													
				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
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, LOW PROFILE PARALLEL FAN POWERED TERMINAL UNIT

Unit Size	Inlet Size	Primary CFM	Min. Ps	Discharge Data													
				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
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

Unit Size	Inlet Size	Primary CFM	Min. Ps	Radiated Data													
				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
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

NOTE: See notes on previous page.


 VAV Terminals
 AHRI Standard 880

FAN POWERED TERMINAL UNITS

C E R T I F I E D - D A T A

QFV | Standard, Parallel Flow

QFV Discharge Sound Performance Data

QFV, DISCHARGE SOUND DATA

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
						2	3	4	5	6	7	NC		2	3	4	5	6	7	NC		2	3	4	5	6	7	NC	
2	6	100	(47)	0.013	(3.11)	56	47	44	40	36	31	-	59	54	48	45	43	40	-	60	55	50	47	45	42	-			
		200	(94)	0.050	(12.44)	67	58	53	49	44	38	24	70	64	57	54	51	46	28	71	66	59	56	53	48	29			
		300	(142)	0.113	(27.99)	74	64	59	55	48	41	28	77	71	63	60	56	50	32	78	72	64	61	58	52	33			
		400	(189)	0.200	(49.77)	78	69	62	58	52	44	34	81	75	67	63	59	53	38	82	77	68	65	61	55	39			
		500	(236)	0.313	(77.76)	82	72	65	61	54	46	39	85	78	69	66	62	55	43	86	80	71	68	64	57	44			
3	8	180	(85)	0.013	(3.29)	54	52	49	44	37	32	-	60	58	56	51	46	43	-	61	60	58	53	48	45	-			
		360	(170)	0.053	(13.16)	65	62	56	52	45	38	-	70	68	63	59	53	49	27	72	70	65	61	56	52	29			
		540	(255)	0.119	(29.62)	71	67	60	56	49	42	26	77	74	67	64	58	53	34	78	76	69	66	60	56	36			
		700	(330)	0.200	(49.77)	75	71	62	59	52	45	30	81	78	70	67	61	55	38	82	79	72	69	63	58	40			
		900	(425)	0.331	(82.27)	79	75	65	62	55	47	33	85	81	72	69	64	58	41	86	83	74	71	66	60	43			
4	10	290	(137)	0.014	(3.46)	59	55	53	51	42	34	-	65	64	61	60	52	44	23	67	66	63	62	55	47	26			
		580	(274)	0.056	(13.84)	67	62	59	56	49	41	20	74	71	67	65	59	52	30	76	73	69	67	61	54	33			
		870	(411)	0.125	(31.13)	72	67	62	59	53	46	24	79	75	70	68	62	56	34	81	78	72	70	65	59	37			
		1100	(519)	0.200	(49.77)	75	69	64	60	55	48	28	82	78	72	69	64	58	37	84	80	74	72	67	61	40			
		1450	(684)	0.348	(86.48)	79	72	66	62	57	51	32	85	81	74	71	67	61	41	87	83	76	74	70	64	43			
5	12	420	(198)	0.014	(3.43)	60	54	54	49	43	38	-	66	63	63	60	53	49	20	68	65	66	63	56	51	23			
		840	(396)	0.055	(13.72)	68	62	60	55	50	45	-	75	70	69	66	60	56	28	76	72	72	68	63	59	30			
		1260	(595)	0.124	(30.86)	73	66	63	58	55	49	25	79	74	73	69	65	60	33	81	76	75	72	67	63	35			
		1600	(755)	0.200	(49.77)	76	69	65	60	57	52	28	82	77	75	71	67	62	36	84	79	77	73	70	65	39			
		2100	(991)	0.345	(85.73)	79	71	68	62	60	54	32	85	80	77	73	70	65	40	87	82	79	76	72	68	43			
6	14	570	(269)	0.015	(3.67)	62	57	53	49	45	39	-	71	67	64	61	56	50	25	73	70	67	63	58	53	29			
		1140	(538)	0.059	(14.67)	69	63	60	56	52	47	-	77	73	71	67	63	58	32	80	76	74	70	65	61	35			
		1710	(807)	0.133	(33.00)	73	67	64	59	56	51	24	81	77	75	70	67	62	36	84	80	78	73	69	65	40			
		2100	(991)	0.200	(49.77)	75	69	66	61	58	53	27	83	79	77	72	69	64	39	86	82	80	75	72	67	42			
		2850	(1345)	0.368	(91.66)	78	72	69	64	61	57	31	87	82	80	75	72	68	42	89	85	83	78	75	71	45			
7	16	740	(349)	0.014	(3.48)	64	60	57	52	49	44	-	72	70	68	64	60	54	28	74	73	71	67	62	57	31			
		1480	(698)	0.056	(13.90)	70	66	63	58	55	51	23	78	76	74	70	66	61	35	80	79	77	73	69	64	38			
		2220	(1048)	0.126	(31.29)	74	69	67	62	59	54	27	82	79	77	74	70	65	39	84	82	80	77	73	68	42			
		2800	(1321)	0.200	(49.77)	76	71	69	64	61	57	29	84	81	79	76	72	67	41	86	84	82	79	75	70	44			
		3700	(1746)	0.349	(86.90)	78	73	71	66	64	59	32	86	83	82	78	75	70	44	89	86	85	81	77	73	47			

FAN POWERED TERMINAL UNITS

NOTES: Discharge sound power is the sound emitted from the unit discharge. All sound data is based on tests conducted in accordance with AHRI 880-11 and corrected for end reflection. 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 B2-4 and B2-5. 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.

Q F V

QFV Radiated Sound Performance Data

QFV, RADIATED SOUND DATA

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
						2	3	4	5	6	7	NC		2	3	4	5	6	7	NC		2	3	4	5	6	7	NC	
2	6	100 (47)	0.013 (3.11)	42	36	35	29	24	16	-	46	39	40	35	30	23	-	47	40	41	36	32	25	-					
		200 (94)	0.050 (12.44)	53	46	44	37	31	23	-	57	49	49	42	37	30	23	57	50	50	44	39	32	24					
		300 (142)	0.113 (27.99)	59	52	49	41	35	27	23	63	55	54	47	42	35	28	64	56	55	48	43	37	30					
		400 (189)	0.200 (49.77)	63	56	52	44	38	30	27	67	60	57	50	45	38	32	68	60	59	51	46	40	34					
		500 (236)	0.313 (77.76)	67	59	55	47	41	33	31	70	63	60	52	47	40	35	71	64	62	54	49	42	37					
3	8	180 (85)	0.013 (3.29)	48	42	42	35	31	26	-	54	50	50	44	39	34	25	56	52	53	47	42	36	27					
		360 (170)	0.053 (13.16)	56	50	49	41	37	32	23	62	57	57	50	45	40	32	64	59	59	53	47	42	34					
		540 (255)	0.119 (29.62)	61	54	52	45	41	36	27	67	62	61	54	49	44	36	69	64	63	56	51	46	38					
		700 (330)	0.200 (49.77)	64	57	55	47	43	38	29	70	64	63	56	51	46	38	72	66	65	58	53	48	41					
		900 (425)	0.331 (82.27)	67	59	57	49	45	40	32	73	67	65	58	53	48	41	74	69	68	60	55	50	43					
4	10	290 (137)	0.014 (3.46)	48	43	42	36	31	23	-	57	53	52	46	40	33	26	59	56	55	48	43	35	29					
		580 (274)	0.056 (13.84)	58	52	50	43	38	32	24	66	62	60	53	48	41	35	69	65	62	55	50	44	38					
		870 (411)	0.125 (31.13)	64	57	54	47	43	37	29	72	67	64	57	52	46	40	74	70	67	59	55	49	42					
		1100 (519)	0.200 (49.77)	67	60	57	49	45	40	32	75	70	67	59	55	49	42	77	73	69	62	57	52	45					
		1450 (684)	0.348 (86.48)	71	64	60	52	48	43	36	79	73	70	62	58	53	47	81	76	72	64	60	55	49					
5	12	420 (198)	0.014 (3.43)	50	46	46	40	36	31	-	57	53	52	45	42	39	27	59	55	54	47	43	40	29					
		840 (396)	0.055 (13.72)	59	54	53	47	43	37	27	66	61	59	52	48	44	34	68	63	61	53	50	46	36					
		1260 (595)	0.124 (30.86)	64	58	57	51	47	40	32	71	65	63	56	52	48	39	73	67	65	57	54	50	40					
		1600 (755)	0.200 (49.77)	67	61	59	53	49	42	34	74	68	66	58	54	50	41	76	70	67	60	56	52	43					
		2100 (991)	0.345 (85.73)	70	64	62	56	51	44	37	77	71	68	61	57	52	44	79	73	70	62	59	54	47					
6	14	570 (269)	0.015 (3.67)	52	49	47	42	39	30	21	59	58	56	51	47	39	31	61	60	59	53	49	42	34					
		1140 (538)	0.059 (14.67)	59	54	52	46	44	36	26	66	63	61	55	52	45	36	68	66	66	63	57	54	39					
		1710 (807)	0.133 (33.00)	64	58	55	49	46	40	29	71	67	64	58	55	49	39	73	69	66	60	57	51	42					
		2100 (991)	0.200 (49.77)	66	59	56	50	48	42	31	73	68	65	59	56	51	41	75	71	68	61	58	53	43					
		2850 (1345)	0.368 (91.66)	69	62	58	52	50	44	34	76	71	67	61	58	54	43	78	73	70	63	60	56	46					
7	16	740 (349)	0.014 (3.48)	60	59	57	49	46	44	32	66	68	66	60	57	55	42	67	71	69	63	60	58	45					
		1480 (698)	0.056 (13.90)	68	65	62	55	52	49	37	73	74	72	66	63	60	48	75	76	74	68	65	63	51					
		2220 (1048)	0.126 (31.29)	73	69	65	58	55	52	41	78	77	75	69	66	63	51	79	80	77	72	69	66	54					
		2800 (1321)	0.200 (49.77)	75	71	67	60	57	54	43	81	79	77	71	68	65	53	82	82	79	73	70	68	56					
		3700 (1746)	0.349 (86.90)	78	73	69	62	59	56	46	84	82	79	73	70	67	56	85	84	81	76	73	70	58					

NOTES: 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. AHRI certification points are shown in bold, white font. For a complete list of AHRI certified data, see pages B2-4 and B2-5. 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.

FAN POWERED TERMINAL UNITS

Q F V

QFV | Standard, Parallel Flow

QFV Radiated & Discharge Sound Performance Data

QFV, FAN ONLY RADIATED & DISCHARGE SOUND DATA

FAN POWERED TERMINAL UNITS

Unit Size	Flow Rate		Radiated Sound Power							Discharge Sound Power						
			Octave Band Sound Power, Lw							Lp	Octave Band Sound Power, Lw					
	CFM	(L/s)	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
2	190	(90)	68	62	57	55	49	43	32	66	55	55	53	49	47	22
	250	(118)	69	64	59	57	51	45	34	69	58	57	55	52	50	26
	300	(142)	71	65	60	58	52	46	36	71	60	59	57	53	52	24
	330	(156)	71	65	60	58	52	47	36	72	62	60	58	54	53	26
	400	(189)	72	66	61	59	53	48	38	74	64	61	59	56	55	28
3	300	(142)	64	57	53	48	43	35	28	57	48	50	47	42	37	-
	350	(165)	66	59	55	51	46	39	30	61	52	53	50	46	42	-
	400	(189)	68	61	57	53	48	42	32	65	56	56	53	49	46	-
	450	(212)	69	63	58	55	50	44	34	69	59	58	55	52	50	22
	505	(238)	71	65	60	57	52	47	36	72	62	60	58	55	54	27
4	475	(224)	63	62	53	49	47	45	32	66	61	60	53	51	49	-
	625	(295)	67	65	58	55	52	50	35	69	63	62	58	56	54	22
	775	(366)	71	67	61	59	56	55	37	72	64	64	63	60	58	23
	850	(401)	73	68	62	61	58	57	38	73	65	64	64	61	60	24
	1050	(496)	76	69	66	66	62	61	43	75	66	66	68	65	64	28
5	925	(437)	64	60	64	64	57	52	39	70	66	63	60	58	56	23
	1050	(496)	68	64	65	65	60	56	41	72	67	64	63	60	59	24
	1175	(555)	71	67	66	67	63	60	42	74	68	66	66	63	62	26
	1285	(606)	74	69	67	68	65	62	43	75	69	67	68	65	64	28
	1450	(684)	77	72	69	69	68	66	45	77	70	69	70	68	67	30
6	980	(462)	66	64	63	57	55	52	38	72	64	61	53	52	52	23
	1185	(559)	70	67	65	61	59	56	40	74	67	64	59	57	57	26
	1390	(656)	73	70	66	64	63	60	42	76	69	67	64	60	60	28
	1545	(729)	75	72	67	67	65	62	44	77	70	68	68	62	63	30
	1800	(849)	79	75	68	70	69	66	48	78	72	71	73	66	66	32
7	980	(462)	67	63	61	56	53	52	36	75	59	62	58	56	55	27
	1260	(595)	71	67	64	61	58	57	39	76	63	65	63	60	59	29
	1540	(727)	73	71	66	64	61	60	42	77	66	68	67	64	63	30
	1805	(852)	75	73	68	67	64	63	45	78	69	70	71	67	66	32
	2100	(991)	78	75	70	70	67	66	48	79	72	72	74	69	69	33

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 B2-4 and B2-5. 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.

QFV Control Information

SEQUENCE OF OPERATION

The standard QFV 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. Primary air passing over the backdraft device prevents airflow into the fan wheel which would otherwise lead to backward rotation of the wheel and loss of primary airflow into the plenum.

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.

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, fan PE switch, and control enclosure
- **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.

The following list shows the standard control arrangements available with the QFV 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 Steps of Electric Heat
- 2310 - Cooling with Sequenced Fan, Up to Two Steps of Electric Heat, and Automatic Night Shutdown
- 2311 - Cooling with Sequenced Fan, Up to 2 Steps 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

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.

QFV Engineering Specification & Configuration**QFV UNIT**

Fan powered terminal unit shall be completely factory assembled and wired with motor, blower, mixing plenum, and primary air damper contained in a single unit housing. Unit shall be Krueger model QFV.

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 shall maintain the minimum primary airflow setting by modulating the damper. The induction fan shall run, and the electric heating coil (hot water coil), if supplied, shall be energized (activated). As room temperature begins to rise, the heating coil shall be de-energized (deactivated). As room temperature calls for maximum cooling, the velocity controller shall maintain the maximum primary airflow setting.

Terminals shall be certified by use of the AHRI Standard 880 Certification Program and carry the AHRI seal.

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 connections shall be single point.

Unit casing shall be constructed of not less than 22 gage galvanized steel. All primary air inlet collars shall accommodate standard flex duct sizes. 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, electrical information, and tagging data.

Terminal unit shall be provided with 20 gage galvanized steel backdraft damper. Gravity operated backdraft damper shall not be acceptable. Primary airflow shall prevent backdraft damper from opening.

QFV 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.

The primary air damper assembly shall be constructed of heavy gage galvanized steel with solid shaft rotating in self lubricating Delrin® bearings. Damper shaft shall be marked on the end to indicate damper position. Damper blade shall incorporate a flexible gasket for tight airflow shutoff and operate over a full 90 degree rotation.

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, multi-voltage, single-

phase, single-speed, 60 cycle] 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 fan motor shall be isolated from the unit casing to prevent transmission of vibration.

The radiated and discharge attenuation factors for the specified NC levels shall be based on either room absorption, plus an environmental adjustment factor or the 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 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)** 1" Thick Insulation: Unit casing shall be lined with 1" 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" or 1" 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 foil reinforced, wrapped edges, 1/2" or 1" 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.

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 20 gage galvanized steel. Elements shall be 80/20 Ni-Cr and supported by ceramic isolators. The integral control panel shall be housed in a NEMA 2 enclosure with hinged access door 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.

QFV Engineering Specification & Configuration

HOT WATER COILS

Hot water coil casing shall be constructed with minimum 20 gage galvanized steel with flanged discharge for attachment to downstream duct work. 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.

1. SERIES: (XXX)

QFV - 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 | 6 - 1/2" Foil Encapsulated |
| 1 - 1" Liner | 9 - 1" Foil Encapsulated |
| F - 1/2" Cellular | H - 1" Cellular |

4. UNIT CASING CONTROLS: (XX)

- 0L - Left-hand Side, 22 Gage
- 1L - Left-hand Side, 20 Gage

5. UNIT SIZE: (X)

- 2 - Available Inlet Size: 6", 8"
- 3 - Available Inlet Sizes: 8", 10"
- 4 - Available Inlet Sizes: 10", 12"
- 5 - Available Inlet Sizes: 12", 14"
- 6 - Available Inlet Sizes: 14", 16"
- 7 - Available Inlet Sizes: 16"

6. INLET CODE: (XX)

- | | |
|----------|----------|
| 06 - 6" | 12 - 12" |
| 08 - 8" | 14 - 14" |
| 10 - 10" | 16 - 16" |

7. MOTOR VOLTAGE: (X)

- 1 - 120V, 1-Phase
- 2 - 208/240V, 1-Phase
- 3 - 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) (X) (X)

- 0 - None
- A - Motor Toggle Disconnect *
- E - Dust-tight Control Enclosure
- F - Fan Motor Fuse
- N - Induction Inlet Attenuator with Filter
- R - Induction Inlet Filter
- S - Hanger Brackets
- T - Induction Inlet Attenuator

10. WATER HEAT:
(ROWS/CONNECTION HAND) (XXX)

- 000 - N/A / None
- W11 - 1 Row/Right/No Access
- W12 - 2 Row/Right/No Access
- W21 - 1 Row/Left/No Access
- W22 - 2 Row/Left/No Access
- W31 - 1 Row/Right/Access
- W32 - 2 Row/Right/Access
- W41 - 1 Row/Left/Access
- W42 - 2 Row/Left/Access

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. ELECTRIC HEAT COIL ACCESSORIES: (X) (X) (X) (X) (X)

- 0 - None
- C - Fuse Block
- E - Chicago Code Construction
- F - Manual Reset Cutout
- G - Dust-tight Construction
- H - Staged Solid State Relays
- K - Door-interlocking Fused Disconnect
- L - Door-interlocking Non-fused Disconnect
- P - Water Coil Vent & Drain

* Motor Toggle Disconnect not available with electric heat.

SAMPLE CONFIGURATION: QFV - 3 - 1 - 0L - 4 - 12 - 1 - 7306 - F - W42