

Data sheet

Evaporator pressure regulator

Type KVP



The KVP is mounted in the suction line after the evaporator and is used to:

1. Maintain a constant evaporating pressure and thereby a constant surface temperature on the evaporator. The regulation is modulating. By throttling in the suction line, the amount of refrigerant gas is matched to the evaporator load.
2. Protect against an evaporating pressure that is too low (e.g. as protection against freezing in a water chiller). The regulator closes when the pressure in the evaporator falls below the set value.
3. Differentiate between the evaporating pressures in two or more evaporators in systems with one compressor.

Features

- Accurate, adjustable pressure regulation
- Wide capacity and operating range
- Pulsation damping design
- Stainless steel bellows
- Compact angle design for easy installation in any position
- "Hermetic" brazed construction
- 1/4 in. Schrader valve for pressure testing
- Available with flare and ODF solder connections
- KVP 12 – KVL 22: may be used in the following EX range: Category 3 (Zone 2)

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Approvals

UL LISTED, file SA7200

Technical data

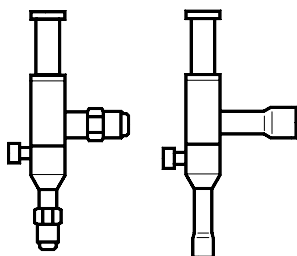
Refrigerants	R22, R1270*, R134a, R290*, R404A, R407A, R407C, R407F, R448A, R449A, R450A, R452A, R507A, R513A, R600*, R600a* * KVP 12 – KVP 22 only
Regulating range	0 – 5.5 bar Factory setting = 2 bar
Maximum working pressure	PS/MWP PS = 18 bar
Maximum test pressure	Pe = PS × 1.1 = 19.8 bar
Medium temperature range	-45 – 130 °C
Maximum P-band	KVP 12 – 22: 1.7 bar KVP 28 – 35: 2.8 bar
K _v -value ¹⁾ with offset 0.6 bar	KVP 12 – 22: 1.7 m ³ / h KVP 28 – 35: 2.8 m ³ / h
K _v -value ¹⁾ with maximum P-band	KVP 12 – 22: 2.5 m ³ / h KVP 28 – 35: 8.0 m ³ / h

¹⁾ The K_v value is the flow of water in [m³ / h] at a pressure drop across valve of 1 bar, ρ = 1000 kg / m³.

This product (KVP 12 – KVP 22) is evaluated for R290, R600, R600a and R1270 by ignition source assessment in accordance with standard EN13463-1.

For complete list of approved refrigerants, visit www.products.danfoss.com and search for individual code numbers, where refrigerants are listed as part of technical data.

Ordering



Type	Rated capacity ¹⁾ [kW]				Flare connection ²⁾		Code no.	Solder connection		Code no.
	R22	R134a	R404A/R507	R407C	[in]	[mm]		[in]	[mm]	
KVP 12	4.0	2.8	3.6	3.7	1/2	12	034L0021	1/2	–	034L0023
	4.0	2.8	3.6	3.7	–	–	–	–	12	034L0028
KVP 15	4.0	2.8	3.6	3.7	5/8	16	034L0022	5/8	16	034L0029
KVP 22	4.0	2.8	3.6	3.7	–	–	–	7/8	22	034L0025
KVP 28	8.6	6.1	7.7	7.9	–	–	–	1 1/8	–	034L0026
	8.6	6.1	7.7	7.9	–	–	–	–	28	034L0031
KVP 35	8.6	6.1	7.7	7.9	–	–	–	1 3/8	35	034L0032

¹⁾ Rated capacity is the regulator capacity at evaporating temperature t_e = -10 °C
condensing temperature t_c = 25 °C
pressure drop in regulator Δp = 0.2 bar
offset = 0.6 bar

To select the product for other conditions or refrigerants, use Danfoss Coolselector^{®2}.

²⁾ KVP supplied without flare nuts. Separate flare nuts can be supplied:

1/2 in / 12 mm, code no. 011L1103

5/8 in / 16 mm, code no. 011L1167

The connection dimensions chosen must not be too small, as gas velocities in excess of 40 m / s at the inlet of the regulator can result in flow noise.

REACH requirements

Note:

All Danfoss products fulfill the requirements in REACH.

One of the obligations in REACH is to inform customers about presence of Candidate list substances if any, we hereby inform you about one substance on the candidate list: an O-ring used in this product contains Diisopentylphthalat (CAS no: 605-50-5) in a concentration above 0.1% w/w.

Capacity
Regulator capacity Q_e ¹⁾ [kW] with offset = 0.6 bar
R22

Type	Pressure drop in regulator Δp	Evaporating temperature t_e [°C]							
	[bar]	-30	-25	-20	-15	-10	-5	0	5
KVP 12 KVP 15 KVP 22	0.1	1.9	2.1	2.3	2.6	2.9	3.2	3.5	3.8
	0.2	2.5	2.9	3.2	3.6	4.0	4.4	4.9	5.3
	0.3	3.0	3.4	3.8	4.3	4.8	5.3	5.9	6.5
	0.4	3.3	3.8	4.3	4.9	5.5	6.1	6.7	7.4
	0.5	3.4	4.1	4.7	5.3	6.0	6.7	7.4	8.2
	0.6	3.6	4.2	5.0	5.7	6.4	7.2	8.0	8.8
KVP 28 KVP 35	0.1	4.0	4.5	5.0	5.6	6.2	6.8	7.5	8.2
	0.2	5.4	6.2	6.9	7.7	8.6	9.5	10.4	11.4
	0.3	6.3	7.3	8.2	9.3	10.3	11.5	12.6	13.9
	0.4	7.0	8.1	9.2	10.4	11.7	13.0	14.4	15.8
	0.5	7.4	8.7	10.0	11.4	12.8	14.3	15.9	17.5
	0.6	7.6	9.1	10.6	12.2	13.8	15.4	17.1	18.9

Regulator capacity Q_e ¹⁾ [kW] with offset = 0.6 bar
R134a

Type	Pressure drop in regulator Δp	Evaporating temperature t_e [°C]							
	[bar]	-15	-10	-5	0	5	10	15	20
KVP 12 KVP 15 KVP 22	0.1	1.8	2.1	2.3	2.6	2.9	3.2	3.6	3.9
	0.2	2.5	2.8	3.2	3.6	4.0	4.5	5.0	5.5
	0.3	2.9	3.4	3.8	4.3	4.9	5.4	6.0	6.6
	0.4	3.2	3.7	4.3	4.9	5.5	6.1	6.8	7.6
	0.5	3.4	4.0	4.6	5.3	6.0	6.8	7.5	8.3
	0.6	3.5	4.2	4.9	5.7	6.4	7.3	8.1	9.0
KVP 28 KVP 35	0.1	3.9	4.5	5.0	5.6	6.2	6.9	7.6	8.4
	0.2	5.3	6.1	6.9	7.8	8.7	9.6	10.6	11.7
	0.3	6.3	7.2	8.2	9.3	10.4	11.6	12.9	14.2
	0.4	6.9	8.0	9.2	10.5	11.8	13.2	14.6	16.2
	0.5	7.3	8.6	10.0	11.4	12.9	14.5	16.1	17.9
	0.6	7.5	9.0	10.5	12.1	13.8	15.6	17.4	19.3

¹⁾ The capacities are based on
liquid temperature ahead of expansion valve $t_i = 25$ °C
regulator offset = 0.6 bar
Dry saturated gas ahead of regulator

Correction factors for liquid temperature t_i

t_i [°C]	15	20	25	30	35	40
R22	0.93	0.96	1.0	1.04	1.08	1.13
R134a	0.92	0.96	1.0	1.05	1.10	1.16

Correction factors for offset

Offset [bar]	0.2	0.4	0.6	0.8	1.0	1.2	1.4
KVP 12	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 15	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 28	–	1.4	1.0	0.77	0.67	0.59	0.53
KVP 35	–	1.4	1.0	0.77	0.67	0.59	0.53

Capacity
(continued)

Regulator capacity Q_e ¹⁾ [kW] with offset = 0.6 bar

R404A/R507

Type	Pressure drop in regulator Δp	Evaporating temperature t_e [°C]							
	[bar]	-35	-30	-25	-20	-15	-10	-5	0
KVP 12 KVP 15 KVP 22	0.1	1.4	1.6	1.8	2.1	2.3	2.6	2.8	3.2
	0.2	1.9	2.2	2.5	2.8	3.2	3.6	4.0	4.4
	0.3	2.2	2.5	3.0	3.5	3.9	4.4	4.8	5.4
	0.4	2.4	2.9	3.3	3.9	4.3	4.9	5.5	6.2
	0.5	2.5	3.1	3.6	4.2	4.8	5.5	6.1	6.8
	0.6	2.6	3.2	3.9	4.4	5.1	5.8	6.5	7.4
KVP 28 KVP 35	0.1	2.9	3.4	3.9	4.4	5.0	5.5	6.0	6.8
	0.2	4.0	4.7	5.4	6.2	6.8	7.7	8.4	9.6
	0.3	4.7	5.5	6.4	7.3	8.2	9.2	10.3	11.6
	0.4	5.1	6.1	7.2	8.2	9.3	10.5	11.7	13.2
	0.5	5.5	6.6	7.7	9.0	10.2	11.4	12.9	14.5
	0.6	5.7	6.9	8.2	9.6	10.9	12.4	13.8	15.7

Regulator capacity Q_e ¹⁾ [kW] with offset = 0.6 bar

R407C

Type	Pressure drop in regulator Δp	Evaporating temperature t_e [°C]							
	[bar]	-30	-25	-20	-15	-10	-5	0	5
KVP 12 KVP 15 KVP 22	0.1	1.6	1.8	2.0	2.3	2.7	3.0	3.3	3.6
	0.2	2.2	2.5	2.8	3.2	3.7	4.1	4.6	5.1
	0.3	2.6	3.0	3.4	3.9	4.4	4.9	5.5	6.2
	0.4	2.8	3.3	3.8	4.4	5.1	5.7	6.3	7.1
	0.5	2.9	3.6	4.2	4.8	5.5	6.2	7.0	7.9
	0.6	3.1	3.7	4.5	5.1	5.9	6.7	7.5	8.4
KVP 28 KVP 35	0.1	3.4	3.9	4.5	5.0	5.7	6.3	7.1	7.9
	0.2	4.6	5.4	6.1	6.9	7.9	8.8	9.8	10.9
	0.3	5.4	6.4	7.3	8.4	9.5	10.7	11.8	13.3
	0.4	6.0	7.0	8.2	9.4	10.8	12.1	13.5	15.2
	0.5	6.4	7.6	8.9	10.3	11.8	13.3	14.9	16.8
	0.6	6.5	7.9	9.4	11.0	12.7	14.3	16.1	18.1

¹⁾ The capacities are based on
liquid temperature ahead of expansion valve $t_l = 25$ °C
regulator offset = 0.6 bar
Dry saturated gas ahead of regulator

Correction factors for temperature t_l

t_l	15	20	25	30	35	40
[°C]						
R404A/R507	0.89	0.94	1.0	1.07	1.16	1.26
R407C	0.91	0.95	1.0	1.05	1.11	1.18

Correction factors for offset

Offset	0.2	0.4	0.6	0.8	1.0	1.2	1.4
[bar]							
KVP 12	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 15	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 28	–	1.4	1.0	0.77	0.67	0.59	0.53
KVP 35	–	1.4	1.0	0.77	0.67	0.59	0.53

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Sizing

For optimum performance, it is important to select a KVP valve according to system conditions and applications.

The following data must be used when sizing a KVP valve:

- Refrigerant
- Evaporator capacity: Q_e in [kW]
- Evaporating temperature (required temperature): t_e in [°C]
- Minimum evaporating temperature: t_e in [°C]
- Liquid temperature ahead of expansion valve: t_l in [°C]
- Connection type: flare or solder
- Connection size in [in.]

Valve selection

Example

When selecting the appropriate valve it may be necessary to convert the actual evaporator capacity using a correction factor. This is required when your system conditions are different than the table conditions. The selection is also dependant on the acceptable pressure drop across the valve.

The following example illustrates how this is done:

- Refrigerant: R134a
- Evaporator capacity: $Q_e = 4.2$ kW
- Evaporating temperature: $t_e = 5$ °C ~ 2.5 bar
- Minimum evaporating temperature: 1.4 °C ~ 2.1 bar
- Liquid temperature ahead of expansion valve: $t_l = 30$ °C
- Connection type: Solder
- Connection size: $\frac{5}{8}$ in.

Step 1

Determine the correction factor for liquid temperature t_l ahead of expansion valve.

From the correction factors table (see below) a liquid temperature of 30 °C, R134a corresponds to a factor of 1.05.

Correction factors for liquid temperature t_l

t_l [°C]	10	15	20	25	30	35	40	45	50
R134a	0.88	0.92	0.96	1.0	1.05	1.10	1.16	1.23	1.31
R22	0.90	0.93	0.96	1.0	1.05	1.10	1.13	1.18	1.24
R404A/R507	0.84	0.89	0.94	1.0	1.07	1.16	1.26	1.40	1.57
R407C	0.88	0.91	0.95	1.0	1.05	1.11	1.18	1.26	1.35

Step 2

Determine the correction factor for the valve offset.

The offset is defined as the difference between the design evaporating pressure and the minimum evaporating pressure.

From the offset correction factor table, an offset of 0.4 bar (2.5 – 2.1) corresponds to a factor of 1.4.

Correction factors for offset

Offset [bar]	0.2	0.4	0.6	0.8	1.0	1.2	1.4
KVP 12	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 15	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 22	2.5	1.4	1.0	0.77	0.67	0.59	–
KVP 28	–	1.4	1.0	0.77	0.67	0.59	0.53
KVP 35	–	1.4	1.0	0.77	0.67	0.59	0.53

Step 3

Corrected evaporator capacity is

$$Q_e = 1.05 \times 1.4 \times 4.2 = 6.2 \text{ kW}$$

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Valve selection (continued)

Step 4

Now select the appropriate capacity table (R134a) and choose the column for an evaporating temperature of $t_e = 5^\circ\text{C}$.

Using the corrected evaporator capacity, select a valve that provides an equivalent or greater capacity at an acceptable pressure drop.
KVP 12, KVP 15, KVP 22 delivers 6.4 kW at a 0.6 bar pressure drop across the valve.

KVP 28, KVP 35 delivers 6.2 kW at a 0.1 bar pressure drop across the valve.

Based on the required connection size of $\frac{5}{8}$ in., the KVP 15 is the proper selection for this example.

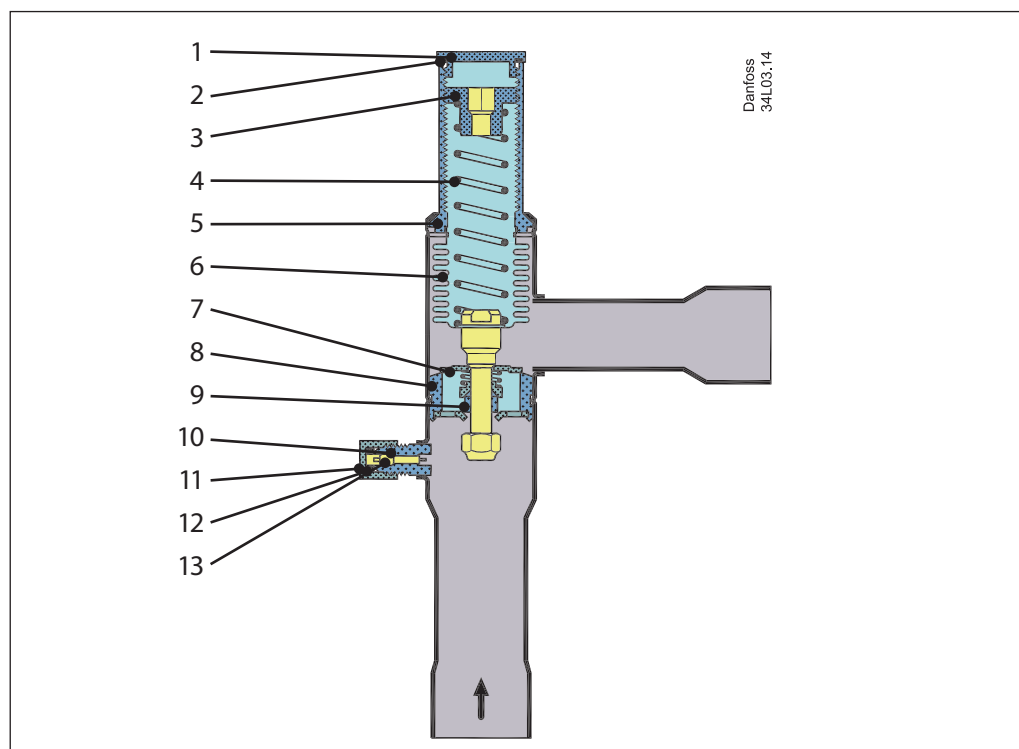
Step 5

KVP 15, $\frac{5}{8}$ in. solder connection:
code no. **034L0029**, see Ordering table.

Design / Function

KVP

1. Protective cap
2. Gasket
3. Setting screw
4. Main spring
5. Valve body
6. Equalization bellows
7. Valve plate
8. Valve seat
9. Damping device
10. Pressure gauge connection
11. Cap
12. Gasket
13. Insert



The evaporator pressure regulator, type KVP opens on a rise in pressure on the inlet side, i.e. when the pressure in the evaporator exceeds the set value.

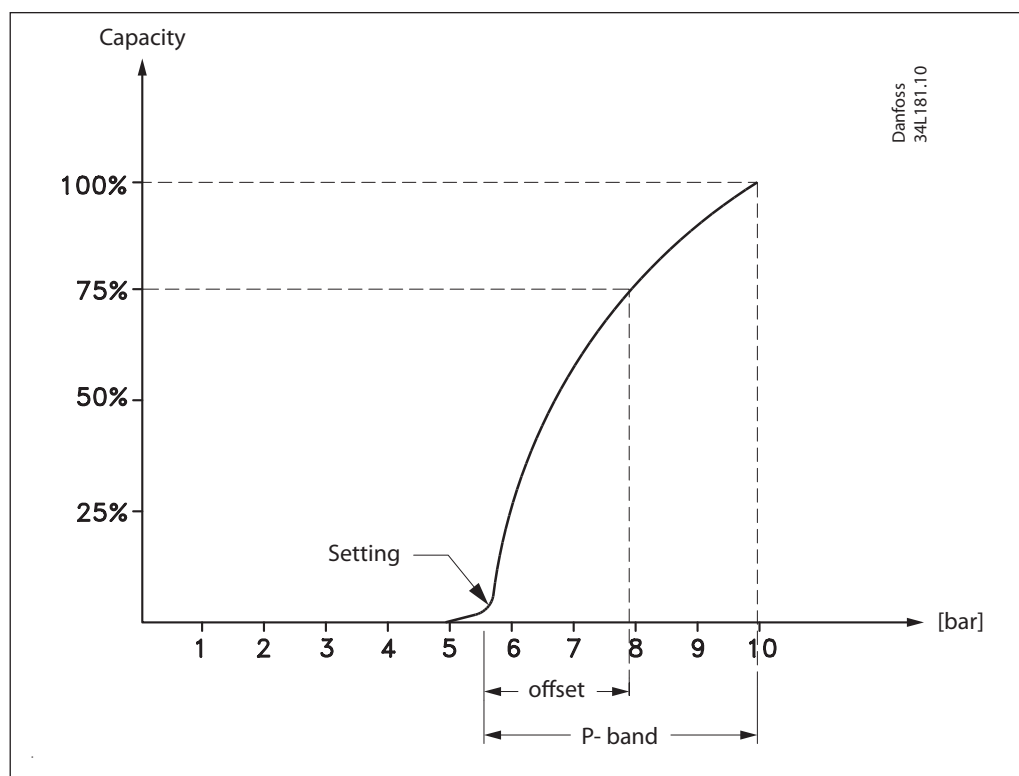
Type KVP regulates inlet pressure only. Pressure variations on the outlet side of the regulator do not affect the degree of opening as the valve is equipped with equalization bellows (6).

The bellows have an effective area corresponding to that of the valve seat neutralising any affect to the setting.

The KVP is also equipped with a damping device (9) providing protection against pulsations which can normally arise in a refrigeration system.

The damping device helps to ensure long life for the regulator without impairing regulation accuracy.

P-band and Offset



Proportional band

The proportional band or P-band is defined as the amount of pressure required to move the valve plate from a closed to a fully open position.

Example

If the valve is set to open at 4 bar and the valve P-band is 1.7, the valve will provide maximum capacity when the inlet pressure reaches 5.7 bar.

Offset

The offset is defined as the permissible pressure variation in evaporator pressure (temperature). It is calculated as the difference between the required working pressure and the minimum allowable pressure.

The offset is always a part of the P-band.

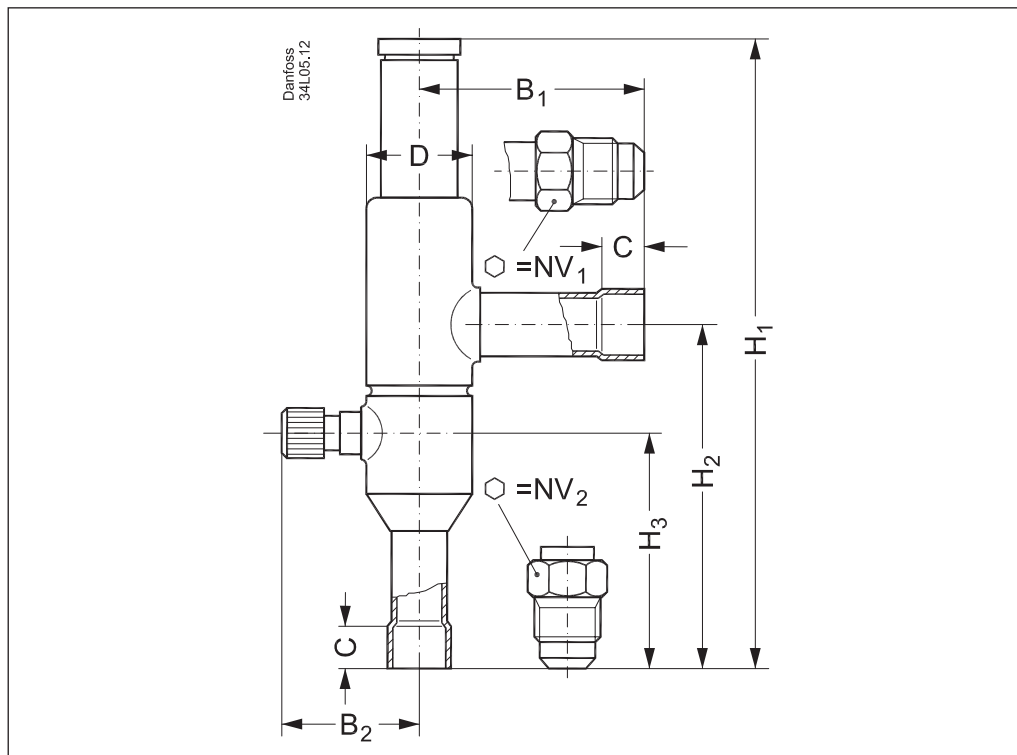
Example with R22

A working temperature of 5 °C ~ 4.9 bar is required, and the temperature must not drop below 0.5 °C ~ 4.1 bar.

The offset will then be 0.8 bar.

When selecting a valve, be sure to correct the evaporator capacity based on the required offset.

Dimensions and weights



Type	Connection				NV ₁	NV ₂	H ₁	H ₂	H ₃	B ₁	B ₂	C	øD	Net weight
	Flare		Solder ODF											
	[in.]	[mm]	[in.]	[mm]										
KVP 12	1/2	12	1/2	12	19	19	179	99	66	64	41	10	30	0.4
KVP 15	5/8	16	5/8	16	24	24	179	99	66	64	41	12	30	0.4
KVP 22	–	–	7/8	22	24	24	179	99	66	64	41	17	30	0.4
KVP 28	–	–	1 1/8	28	24	24	259	151	103	105	48	20	43	1.0
KVP 35	–	–	1 3/8	35	–	–	259	151	103	105	48	25	43	1.0