CONSTANT PRESSURE EXPANSION VALVES (HOT GAS BYPASS)



■ Introduction

The PTV series bypass valve is an energy regulating valve, It is used to ensure the continuous operation of a compressor when the suction pressure is lower than preset value. It can allow a portion of the high-temperature and high-pressure hot gas discharged from the compressor's exhaust port to bypass through the pipeline and flow into the low-pressure chamber of the compressor. This raises the suction pressure, preventing it from dropping below the preset limit and thereby avoiding compressor shutdown, ensuring continuous operation.

1. Applications of the Hot Gas Bypass Valve:

-Refrigeration Capacity Control:

By adjusting the opening of the hot gas bypass valve, the flow rate of hot gas from the high-pressure side of the compressor can be controlled. This allows regulation of the refrigeration capacity to match the load of the evaporator, avoiding operation under low or excessive load conditions and improving energy efficiency.

-Partial Load Replacement:

By bypassing hot gas from the compressor's high-pressure side to the low-pressure side, part of the load is offset. This prevents the suction pressure from falling too low and causing the compressor to shut down, ensuring stable system operation.

-Energy Efficiency Improvement:

Accurate control of the refrigeration capacity through the hot gas bypass valve helps improve the overall energy efficiency of the refrigeration system and reduce energy waste.

2. Features:

-High control accuracy, easy adjustment, convenient installation and a wide operating and capacity range.

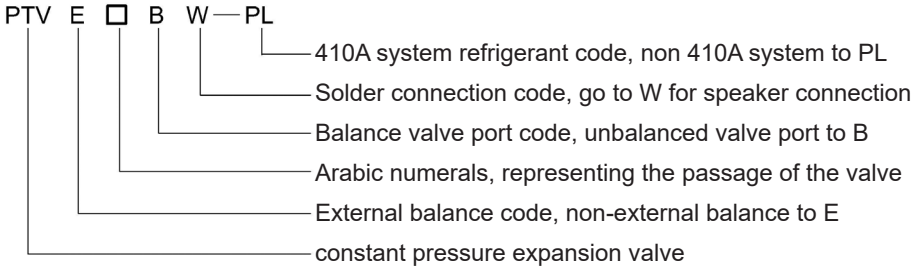
-Unique design of the balance flow ports effectively eliminates the fluctuations in control accuracy caused by pressure drop when the medium passes through the ports

- it comes in two forms: internal balance and external balance.

■ Technical Parameters

- Environmentally temperature: -25~+80°C
- Medium temperature: -25~+100°C
- Maximum working pressure: 2.5MPa (4.2MPa for 410A system)
- Test pressure: 3MPa (4.5MPa for 410A system)
- Applicable medium: R134a、R22、R407C、R40-4A、R507、R410A

■ Model naming method



■ Type & data

Model	Nominal capacity(KW)					Outlet pressure adjusting range MPa
	R134a	R22	R407C	R404A/R507	R410A	
PTV8B	2.8	4.5	4.5	3.6		0.03~0.6
PTV6BW	1.9	3	3	1.9		
PTV8BW	2.8	4.5	4.5	3.6		
PTV10BW	4.3	6.8	6.8	5.8		
PTV12W	7.8	10.5	10.5	9.5		
PTV16BW	17.4	21.1	21.1	22.5		
PTV18BW	32.9	32.2	32.2	34.8		
PTV6BW-PL					3.4	
PTV8BW-PL					5.5	
PTV10BW-PL					7.5	0.5~1.0
PTV12W-PL					11.8	
PTV16BW-PL	12.03	20.88	20.88	14.81	24.1	
PTV18BW-PL	12.6	28.26	28.26	28.26	36.8	

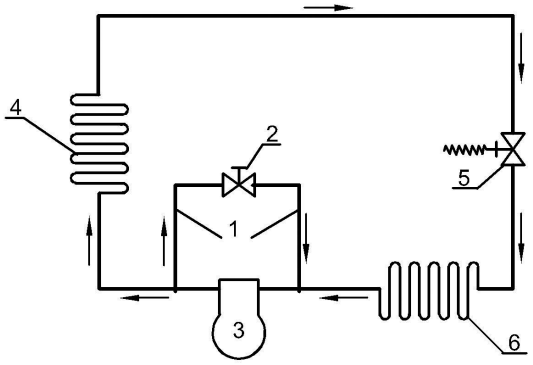
The nominal capacity is based on a change in evaporation temperature from valve closure to rated open state of 3.3 °C, exhaust gas temperature to isentropic compression temperature to 17 °C, condensation temperature of 37.8 °C, and subcooling degree of 0 °C compressor superheat of 14 °C.
The factory setting pressure is 0.35MPa, the adjustment knob rotates clockwise one turn, the opening pressure increases by 0.1MPa, and vice versa.

■ Installation implementation

The PTV bypass valve is typically installed on the bypass line of the high-pressure side of the compressor in a refrigeration system. Two implementation schemes are now available for installation:

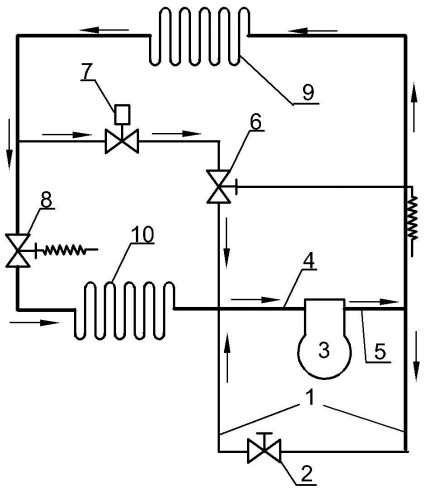
● Scheme 1 (see Figure 1):
The inlet of the bypass valve is connected to the compressor's discharge line, and the outlet is connected to the compressor's suction line. The high-temperature, high-pressure saturated vapor discharged from the compressor enters the bypass valve and is injected into the compressor suction port. This raises the suction temperature, preventing the compressor from shutting down due to excessively low suction temperatures, thereby ensuring continuous operation.

● Scheme 2 (see Figure 2):
This is a typical scheme. In Scheme 1, to prevent excessive suction pressure and temperature caused by injecting high-temperature, high-pressure saturated vapor from the bypass valve directly into the compressor suction port, a liquid injection valve is added to the liquid line between the condenser outlet and the compressor inlet. The purpose is to inject low-temperature liquid refrigerant from the condenser into the compressor suction port through the injection valve. This helps lower the compressor's discharge temperature and prevents it from rising excessively due to too much hot vapor from the bypass valve, which could otherwise lead to compressor shutdown. As a result, the compressor maintains a stable discharge temperature and continues to operate reliably.



1.Bypass valve 2.Bypass valve 3.compressor
4.Condenser 5.Expansion valve 6.Evaporator

Picture 1



1.Bypass valve
2.Bypass valve
3.compressor
4.Suction pipe
5.exhaust pipe
6.temperature responsive expansion valve
7.solenoid valve
8.Expansion valve
9.Condenser
10.Evaporator

Picture 2

■ System Diagram

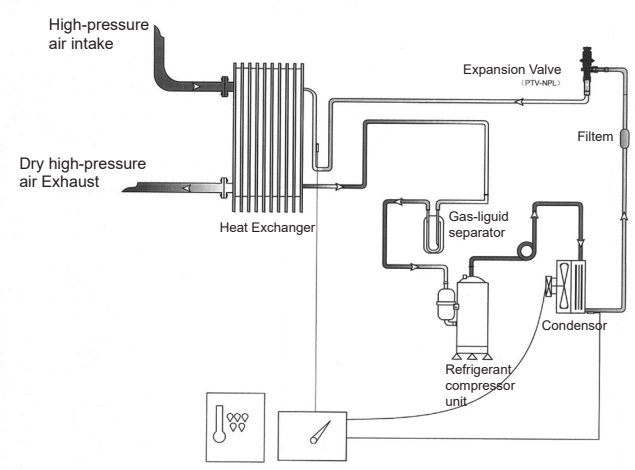


Figure 1

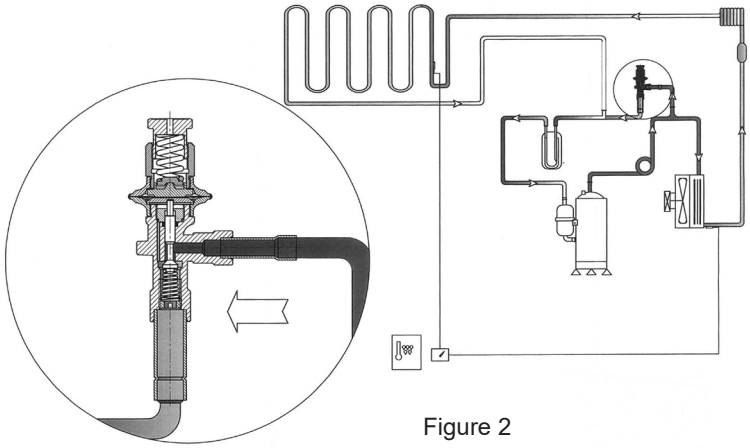


Figure 2

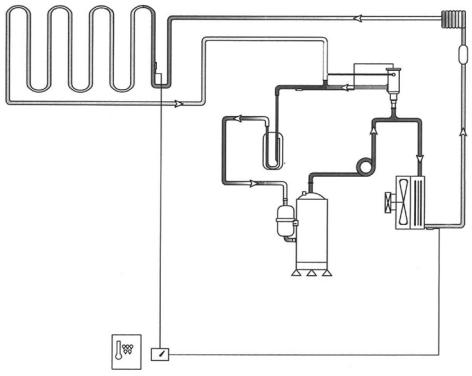


Figure 3

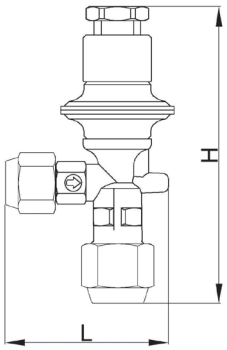
■ Model Selection

- Selection Criteria for PTV Series Hot Gas Bypass Valves:
  - Type of refrigerant used in the refrigeration system
  - Required cooling capacity
  - Compressor discharge pressure
- Selection Steps for PTV Series Hot Gas Bypass Valves:
  - Based on the given refrigerant type, required cooling capacity, and compressor discharge pressure, refer to the specifications in Table 1 to identify the appropriate hot gas bypass valve model.

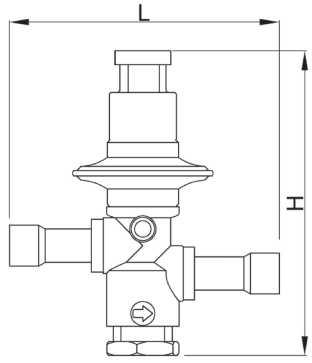
■ Example

- Seleting of a valve size
  - Refrigerant：R22
  - The required refrigeration capacity：6.8KW
  - Outlet pressure：0.3MPa
- According to the table, the model shall be PTV10BW

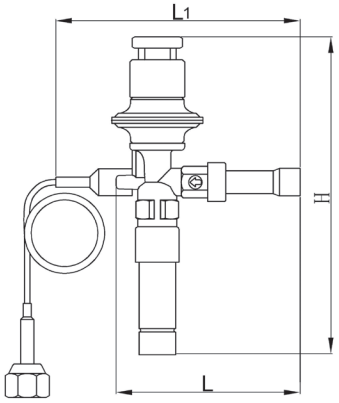
■ Dimensions



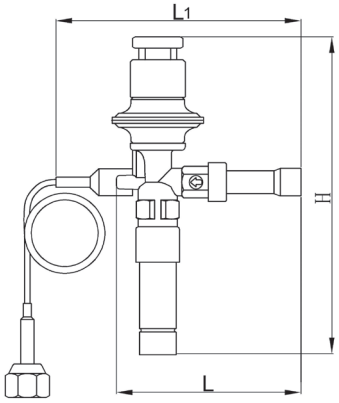
PTV8B



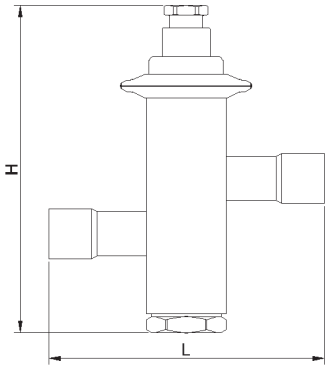
PTV5BW PTV12W PTVE12W
PTVE15BW PTVE16BW
PTVE18BW PTV12W–PL



PTV6BW PTV8BW
PTVE8BW PTV8BW–PL



PTV10BW PTVE10BW
PTV10BW–PL



PTV18W–PL

model	Dimensions mm		Connectio			
			Welded Tube ODF in.		Speaker tube in.	
	H	L	Inlet	Outlet	Inlet	Outlet
PTV8B	105	58			3/8	1/2
PTV6BW	140	80	3/8	1/2		
PTV8BW						
PTV10BW		77	1/2	5/8		
PTV12W	110	94				
PTV16BW			5/8	5/8		
PTV18BW	140	154	7/8	7/8		
PTV8BW-PL		80	3/8	1/2		
PTV10BW-PL		77	1/2	5/8		
PTV12W-PL	110	98				
PTV18W-PL	164	138	7/8	7/8		

External Balance connection: Speaker tube Φ6 ,Welded tube OFD Φ6

■ Capacity table（unit：KW）

Refrigerant	Minimum permissible evaporation temperature (℃)	Model and adjusting range (Kw)											
		PTV5BW			PTV6BW			PTV8B/PTV8BW			PTV10BW		
	Outlet pressure (Mpa)	0.38	0.52	0.6	0.38	0.52	0.6	0.38	0.52	0.6	0.38	0.52	0.6
R134a	5	1.41	1.51	1.35	1.78	1.9	1.7	2.67	2.8	2.55	4.5	4.3	4.2
	-5	1.44	1.37	1.24	1.74	2.1	1.85	2.72	2.54	2.34	4.1	3.9	3.8
	-15	1.34	1.09	1.03	1.87	2.63	2.22	2.53	2.02	1.95	3.9	3.7	3.5
R22/ R407C	5	1.4	2.04	1.95	2.05	3	2.86	3.3	4.5	4.29	7.1	6.8	6.6
	-5	1.55	2.25	2.15	1.85	2.72	2.59	3.65	4.96	4.73	7.2	6.9	6.7
	-15	2.22	2.11	2.02	1.29	2.9	2.76	5.23	4.65	4.43	7.5	7.1	6.9
	-25	2.08	1.76	1.68	1.38	3.47	3.32	4.9	3.88	3.7	7.3	7	6.7
R404A / R507	5	2.03	2.17	1.94	3	3.2	2.86	4.5	4.8	4.3	7.4	7.2	7.1
	-5	2.21	2.36	2.23	2.75	2.94	2.49	4.89	5.22	4.94	7.6	7.4	7.3
	-15	2.35	2.5	2.24	2.6	2.77	2.47	5.2	5.53	4.96	7.9	7.6	7.5
	-25	3.39	2.15	1.97	1.79	3.23	2.81	7.51	4.75	4.37	8	7.7	7.6

Refrigerant	Minimum permissible evaporation temperature (℃)	Model and adjusting range (Kw)											
		PTV12W			PTV15BW			PTV16BW			PTV18BW		
	Outlet pressure (Mpa)	0.38	0.52	0.6	0.207	0.552	0.6	0.207	0.552	0.6	0.207	0.552	0.6
R134a	5	8.3	7.8	7.7	10	9.4	9.3	19.5	17.4	16.82	42.4	32.9	30.3
	–5	7.6	7.1	6.9	9.2	8.6	8.4	17.4	15.5	14.97	32.9	25.5	23.5
	–15	7.2	6.7	6.5	8.7	8.1	7.9	17.2	15.1	14.52	33.1	26.2	24.3
R22/ R407C	5	11.1	10.5	10.3	13	12.3	12.3	24	21.1	20.3	41	32.2	29.8
	–5	11.2	10.7	10.4	13.2	12.5	12.3	24.6	22	21.28	44.3	34.8	32.2
	–15	11.7	11	10.7	13.7	12.9	12.7	26	23.2	22.42	48.9	38.3	35.3
	–25	11.3	10.9	10.4	13.2	12.8	12.7	26.2	23.4	22.62	49.6	38.7	35.7
R404A / R507	5	11.6	11.3	11.2	13.6	13.2	13.1	25.4	23	22.3	45.3	35.9	33.3
	–5	12	11.7	11.6	14.1	13.7	13.6	26.1	23.6	22.9	46.2	36.6	33.9
	–15	12.4	12	11.8	14.5	14.1	13.9	27.9	25.2	24.5	52	41.2	38.2
	–25	12.6	12.1	11.9	14.7	14.1	13.93	28.4	25.6	24.8	53.8	42.6	39.5