

Pilot - Operated Control Valve

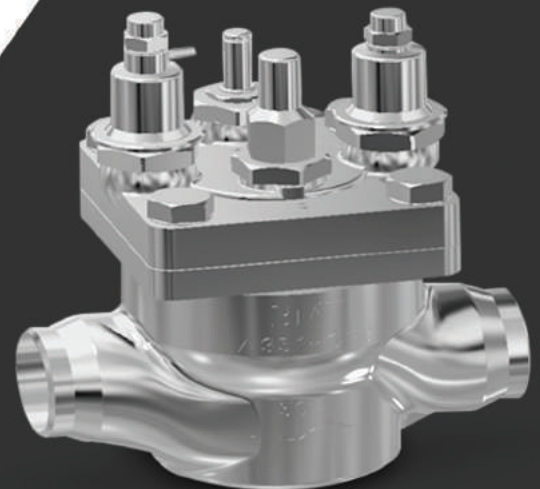
| Pilot - Operated Control Valve

| Pilot Unit

Constant & Differential-pressure Pilot Unit for Low/High Pressure

| CO2 Solenoid Valve

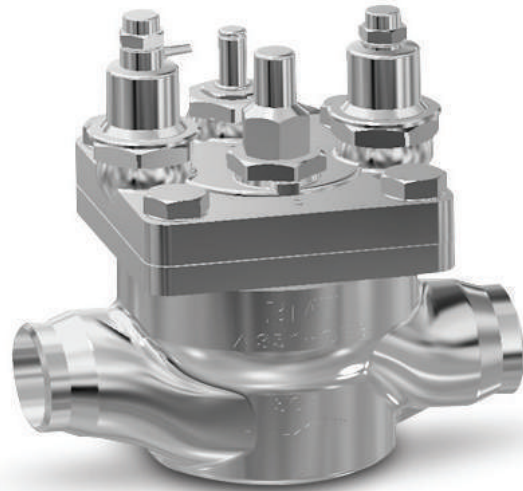
BMT Co., Ltd.
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Pilot - Operated Control Valve

Features

- RCV pilot-operated Control valves belong to the ICV(Industrial Control Valve) family.
- The valve comprises three main components: valve body, function module and top cover.
- RCV pilot-operated Control valves are pilot operated valves for regulating pressure, temperature and ON/OFF function in refrigeration systems. RCV valves are designed for low and high-pressure refrigerants.
- RCV valves can be used on the high and low pressure sides, in wet and dry suction lines and in liquid lines without phase change (i.e. where no expansion takes place in the valve).
- The function of RCV valves is dependent on the pilot pressure applied from either a pilot valve or external pilot pressure source.
- RCV 1 pilot has one pilot pressure connection and RCV 3 pilot has three pilot pressure connections.



Technical Data

- Refrigerants: Applicable to HCFC, HFC, R717(Ammonia) and R744(CO₂)
- Temperature Range: -60/+120°C(-76/+248°F)
- Pressure Range:
 - Max. Working Pressure: 52 bar (754 psi)
- Opening Differential Pressure:
 - Fully Open: Min. 0.2 bar (min. 3 psi)

Design

RCV valves are designed as pilot operated valves requiring minimal pressure differential to open.

If the pressure difference is 0 bar / 0 psi, the RCV valve will be closed.

If the pressure difference is 0.2 bar / 3 psi or more, the RCV valve will be fully open.

At pressure differences between 0.07 bar / 1 psi and 0.2 bar / 3 psi, the opening degree will be correspondingly proportional.

The RCV is available for use with either one or three pilot valves.

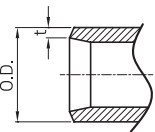
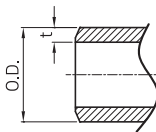
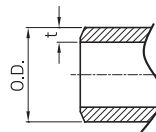
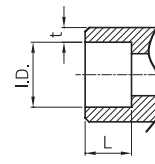
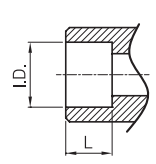
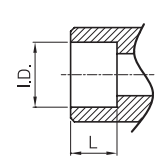
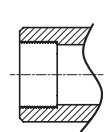
Two of the three pilot pressure connections(S1 and S2) are connected in series whilst the third(p) is connected in parallel to S1 and S2.

This allows different combinations of pilot valves to be used, thus providing numerous variations in control functions.

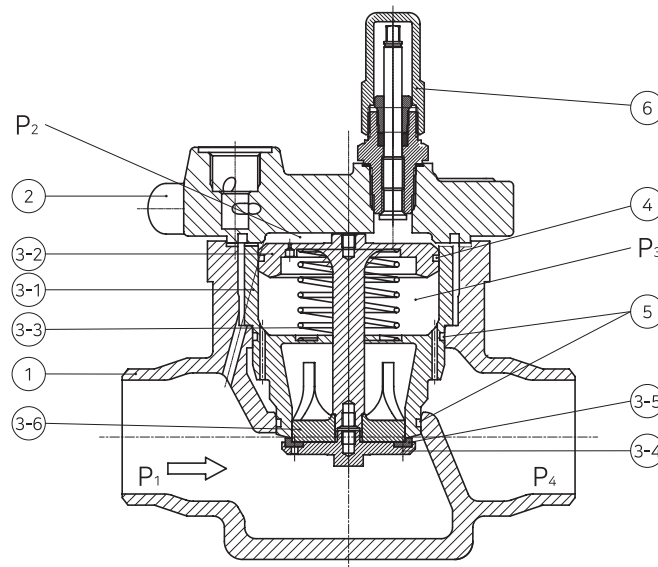
Connections:

There is a very wide range of connection types available with RCV valves:

- D: Butt weld, DIN(2448)
- A: Butt weld, ANSI(B36.10)
- J: Butt weld, JIS(B S 602)
- S: Socket weld, ANSI(B 16.11)
- B: Solder connection, DIN(2856)
- C: Solder connection, ANSI(B 16.22)
- F: Female pipe thread, (ANSI/ASME B 1.20.1)

D	A	J	S	B	C	F
						
Butt weld DIN	Butt weld ANSI	Butt weld JIS	Socket weld ANSI	Solder DIN	Solder ANSI	Female pipe Thread

Function



RCV 1 Pilot

NO.	Description	Material	Q'TY
1	Body	A351-CF3	1
2	Top cover	A351-CF3	1
3-1	Cylinder	A276-316	1
3-2	Piston shaft	A276-316	1
3-3	Spring	SUS304	1
3-4	Piston plate	A276-316	1
3-5	Teflon plate	PTFE	1
3-6	Cone	A276-316	1
4	Piston ring	PTFE	1
5	O-ring	Chloroprene	2
6	Manual ASS'Y	-	1

The RCV main valve is a pilot operated valve. The types of pilot valves used determine the function.

The RCV main valve with pilot valve(s) controls refrigerant flow by modulation or on / off in accordance with the pilot valve and main valve status.

The manual spindle can be used to open the valve plate.

The opening degree of the main valve is determined by the pressure difference (differential pressure) between pressure p_2 , which acts on top of the piston shaft (3-2), and pressure p_3 , which acts on the underside of the servo piston.

If this pressure difference is 0, the main valve will be fully closed.

If the pressure difference is 0.2 bar / 3 psi or greater, the main valve will be fully open.

At pressure differences ($p_2 - p_3$) between 0.07 bar / 1 psi and 0.2 bar / 3 psi, the degree of opening will be correspondingly proportional.

The port of the throttle cone (3-6) is V-shaped, which provide good regulation characteristic to pilot operated main valves even at low loads.

P_3 pressure is equal to the valve outlet pressure (P_4), due to a clearance between the piston shaft (3-2) and the function module.

The opening degree of the RCV valve is therefore controlled by the application of P_2 pressure acting on top of the piston, which is equal to or greater than valve outlet pressure (P_4).

$p_2 = p_4 \sim$ closed

$p_2 = p_4 + 0.2 \text{ bar} / 3 \text{ psi} \sim$ fully open

$p_4 \leq p_2 \leq p_4 + 0.2 \text{ bar} / 3 \text{ psi} \sim$ proportional degree of opening.

Configuration examples (continued)

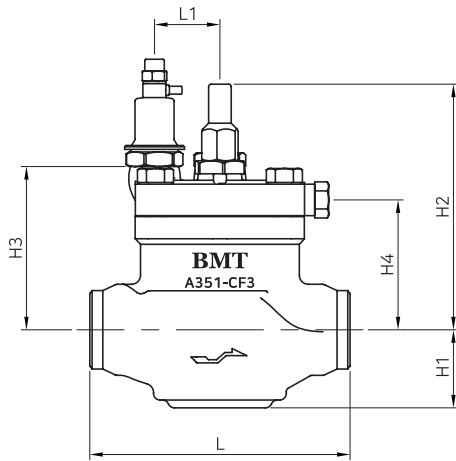
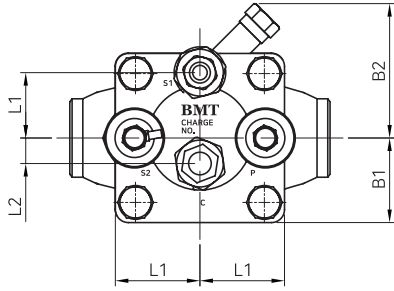
Configuration examples - 1 Pilot								Description
Type	RCV1	CPU	DPU	EVM	EXT.	RPU	EPU	
Type-1		●						Constant pressure regulation. -0.66 to 7 bar g (19.5 in. Hg to 102 psi g) → CPU -0.66 to 28 bar g (19.5 in. Hg to 406 psi g) → CPU-HP
Type-2			●					Differential pressure regulation. 0 to 7 bar g (0 to 102 psi g) → DPU 0 to 22 bar g (0 to 319 psi g) → DPU-HP
Type-3	●			●				On / off regulation. solenoid valve → (NO / NC TYPE)
Type-4					●			Regulation with external control pressure.
Type-5						●		Crankcase pressure regulation. (Max.suction pressure regulation) -0.45 to 7 bar g (13.3 in. Hg to 102 psi g)
Type-6							●	Electronically controlled media temperature regulation. -1 to 8 bar g (0 in. Hg to 116 psi g)

Configuration examples

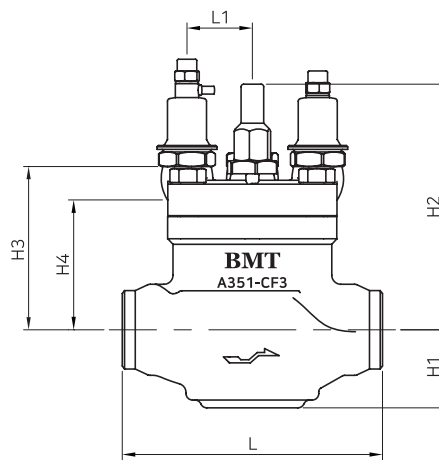
Configuration examples - 3 Pilot										Description
Type	RCV3	CPU	CPU-HP	DPU	EVM	EXT.	RPU	EPU	A+B A	
Type-1		●			● ●					Constant pressure regulation combined with electrical shut off and wide open. -0.66 to 7 bar g (19.5 in. Hg to 102 psi g)
Type-2		● ●			●					Constant pressure regulation with change-over between two preset evaporating pressures. -0.66 to 7 bar g (19.5 in. Hg to 102 psi g)
Type-3		●			●	●				External control pressure with electrical shut off combined with constant pressure regulation. -0.66 to 7 bar g (19.5 in. Hg to 102 psi g)
Type-4	●			●	● ●					Differential pressure regulation. combined with electrical wide open and shut off. 0 to 7 bar g (0 to 102 psi g)
Type-5			●		● ●					Constant pressure regulation combined with electrical shut off and wide open. -0.66 to 28 bar g (19.5 in. Hg to 406 psi g)
Type-6			● ●		●					Constant pressure regulation with change-over between two preset evaporating pressures. -0.66 to 28 bar g (19.5 in. Hg to 406 psi g)
Type-7					● ●			●		Electronically controlled media temperature regulation combined with electrical shut off and wide open. -1 to 8 bar g (0 in. Hg to 116 psi g)
Type-8					●		●		●	Crankcase pressure regulation (max.suction pressure regulation) combined with shut off. -0.45 to 7 bar g (13.3 in. Hg to 102 psi g)

* Please contact the engineer for other functions.

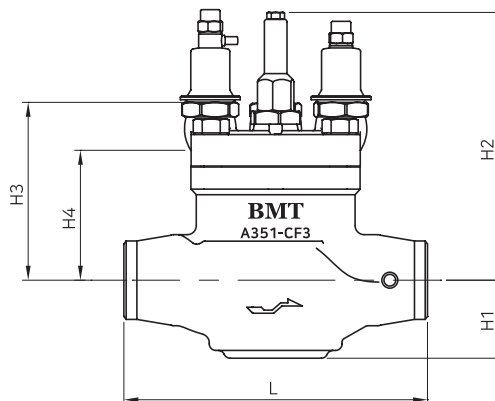
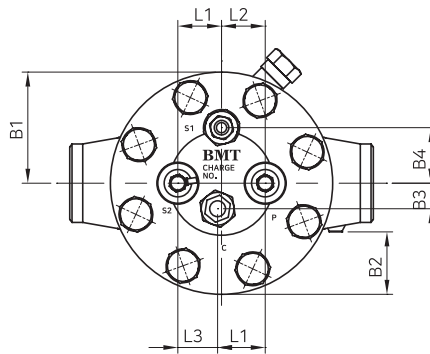
Dimensions and weights (continued)



RCV 1 pilot (RCV 25A ~ 65A)



RCV 3 pilot (RCV 25A ~ 65A)



RCV 3 pilot (RCV 100A ~ 150A)

Dimensions and weights (continued)

*RCV 25

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	B1	B2
RCV16-12A1	1 Pilot	12	20 A (3/4 in)	mm	38	146.5	88	61	135	52	17	43	89
RCV16-12A3	3 Pilot			in.	1.5	5.77	3.46	2.4	5.31	2.05	0.67	1.69	3.5
RCV16-16A1	1 Pilot		25 A (1 in)	mm	38	146.5	88	61	135	52	17	43	89
RCV16-16A3	3 Pilot			in.	1.5	5.77	3.46	2.4	5.31	2.05	0.67	1.69	3.5
RCV16-12S1	1 Pilot		20 SOC (3/4 in)	mm	38	146.5	88	61	135	52	17	43	89
RCV16-12S3	3 Pilot			in.	1.5	5.77	3.46	2.4	5.31	2.05	0.67	1.69	3.5
RCV16-16S1	1 Pilot		25 SOC (1 in)	mm	38	146.5	88	61	147	52	17	43	89
RCV16-16S3	3 Pilot			in.	1.5	5.77	3.46	2.4	5.79	2.05	0.67	1.69	3.5
RCV16-14C1	1 Pilot		22 SA (7/8 in)	mm	38	146.5	88	61	135	52	17	43	89
RCV16-14C3	3 Pilot			in.	1.5	5.77	3.46	2.4	5.31	2.05	0.67	1.69	3.5

*RCV 32

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	B1	B2
RCV20-20A1	1 Pilot	18	32 A (1-1/4 in)	mm	41	161.5	102	75	145	52	17	52	89
RCV20-20A3	3 Pilot			in.	1.61	6.36	4.02	2.95	5.71	2.05	0.67	2.05	3.5
RCV20-20S1	1 Pilot		32 SOC (1-1/4 in)	mm	41	161.5	102	75	148	52	17	52	89
RCV20-20S3	3 Pilot			in.	1.61	6.36	4.02	2.95	5.83	2.05	0.67	2.05	3.5

*RCV 40

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	B1	B2
RCV24-24A1	1 Pilot	30	40 A (1-1/2 in)	mm	49.5	167	106	77	160	52	17	53	89
RCV24-24A3	3 Pilot			in.	1.95	6.57	4.17	3.03	6.3	2.05	0.67	2.09	3.5
RCV24-24S1	1 Pilot		40 SOC (1-1/2 in)	mm	49.5	167	106	77	180	52	17	53	89
RCV24-24S3	3 Pilot			in.	1.95	6.57	4.17	3.03	7.09	2.05	0.67	2.09	3.5

*RCV 50

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	B1	B2
RCV32-32A1	1 Pilot	45	50 A (2 in)	mm	60	180	121	92	200	52	17	62	92
RCV32-32A3	3 Pilot			in.	2.36	7.09	4.76	3.62	7.87	2.05	0.67	2.44	3.62
RCV32-32S1	1 Pilot		50 SOC (2 in)	mm	60	180	121	92	216	52	17	62	92
RCV32-32S3	3 Pilot			in.	2.36	7.09	4.76	3.62	8.5	2.05	0.67	2.44	3.62

*RCV 65

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	B1	B2
RCV40-40A1	1 Pilot	68	65 A (2-1/2 in)	mm	66	203	140	117	230	52	17	72	92
RCV40-40A3	3 Pilot			in.	2.6	8	5.51	4.61	9.06	2.05	0.67	2.83	3.62
RCV40-40S1	1 Pilot		65 SOC (2-1/2 in)	mm	66	203	140	117	230	52	17	72	92
RCV40-40S3	3 Pilot			in.	2.6	8	5.51	4.61	9.06	2.05	0.67	2.83	3.62

Dimensions and weights

*RCV 100

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	L3	B1	B2	B3	B4
RCV64-64A1	1 Pilot	145	100 A (4 in)	mm	110	374	238	195	295	62	52	52	110	40	54	34
RCV64-64A3	3 Pilot			in.	4.33	14.7	9.37	7.68	11.6	2.44	2.05	2.05	4.33	1.57	2.13	1.34

*RCV 125

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	L3	L4	B1	B2	B3	B4
RCV80-80A1	1 Pilot	210	125 A (5 in)	mm	140	385	245	215	350	85	58	56	86	132	46	52	46
RCV80-80A3	3 Pilot			in.	5.51	15.2	9.65	8.46	13.8	3.35	2.28	2.2	3.39	5.2	1.81	2.05	1.81

*RCV 150

Part Number		Kv	Connection	Unit	H1	H2	H3	H4	L	L1	L2	L3	L4	B1	B2	B3	B4
RCV96-96A1	1 Pilot	356	150 A (6 in)	mm	170	426	298	255	445	108	60	70	98	152	50	50	52
RCV96-96A3	3 Pilot			in.	6.69	16.77	11.73	10.04	17.5	4.25	2.36	2.76	3.86	5.98	1.97	1.97	2.05

Ordering Information

Example :

RCV16 - 12A1

1
2
3
4
5

1. Valve Series

RCV

2. Body Size

Size	1"	1-1/4"	1-1/2"	2"	2-1/2"	4"	5"	6"
Designation	16	20	24	32	40	64	80	96

3. End Connection Size

Size	3/4"	7/8"	1"	1-1/4"	1-1/2"	2"	2-1/2"	4"	5"	6"
Designation	12	14	16	20	24	32	40	64	80	96

4. End Connection

- D: Butt weld, DIN(2448)
- A: Butt weld, ANSI(B36.10)
- J: Butt weld, JIS(B S 602)
- S: Socket weld, ANSI(B 16.11)
- B: Solder connection, DIN(2856)
- C: Solder connection, ANSI(B 16.22)
- F: Female pipe thread, (ANSI/ASME B 1.20.1)

5. Pilot Unit Quantity

- 1 Pilot : 1
- 3 Pilot : 3

Pilot Unit

Constant-pressure Pilot Unit for Low/High Pressure

Design and function

CPU is a constant-pressure pilot valve available in low-pressure and high-pressure versions. The pilot valve is used to maintain a constant pressure on the RCV main valve inlet side. The low-pressure version (LP) must not be subjected to pulsation.

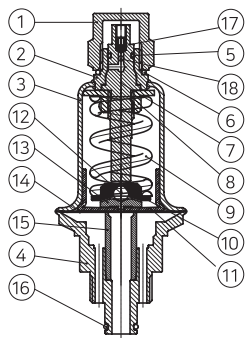
Technical data

Low-pressure version

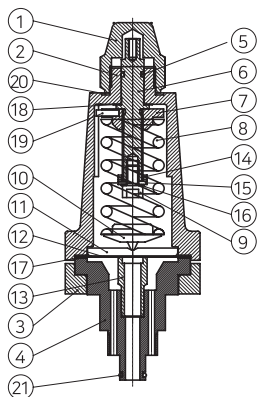
Part Number	MWP	Temperature range	Pressure range
CPU-LP-01	17 bar g	-50 to 120°C	0 to 7 bar g
CPU-LP-02	17 bar g	-50 to 120°C	-0.66 to 2 bar g

High-pressure version

Part Number	MWP	Temperature range	Pressure range
CPU-HP-01	28 bar g	-50 to 120°C	4 to 22 bar g
CPU-HP-02	28 bar g	-50 to 120°C	4 to 28 bar g
CPU-HP-03	28 bar g	-50 to 120°C	-0.66 to 7 bar g
CPU-HP-04	40 bar g	-50 to 120°C	4 to 28 bar g



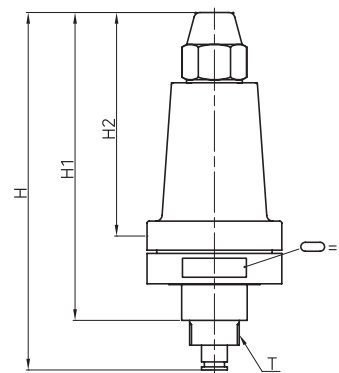
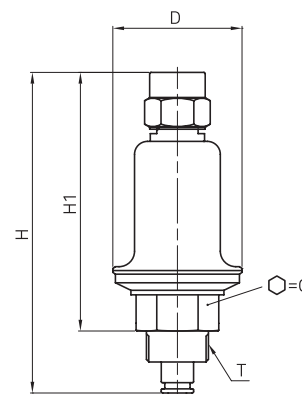
CPU-LP



CPU-HP

NO.	Description	Material	QTY
1	Cap nut	A276-316	1
2	Housing cap	A276-316	1
3	Housing	A240-316	1
4	Body	A276-316	1
5	O-ring	NBR	1
6	O-ring	NBR	1
7	Center shaft	A276-316	1
8	Center shaft guide	A276-316	1
9	Spring	SS316	1
10	Spring guide	A276-316	1
11	Diaphragm guide	A240-316	1
12	Steel ball	A276-316	1
13	Steel ball guide	A276-316	1
14	Diaphragm	A240-316	1
15	Body seat	A276-316	1
16	O-ring	NBR	1
17	Hex socket bolt	SS304	1
18	Pressure regulating ball	A276-316	1

NO.	Description	Material	QTY
1	Cap nut	A276-316	1
2	Housing	A276-316	1
3	Bolted Bonnet	A276-316	1
4	Body	A276-316	1
5	O-ring	NBR	1
6	Center shaft	A276-316	1
7	Center shaft guide	A276-316	1
8	Spring	SS316	1
9	Hex socket bolt	SS316	1
10	Spring guide	A276-316	1
11	Diaphragm guide	A276-316	1
12	Diaphragm	A240-316	2
13	Body seat	A276-316	1
14	Washer	A240-316	3
15	Washer	A240-316	1
16	Washer	A240-316	1
17	Gasket	-	2
18	Washer	A240-316	1
19	Guide bar	A276-316	1
20	Gasket	-	1
21	O-ring	NBR	1



Dimension(mm)

Model	H	H1	H2	D	C	T
CPU-LP	124	100	-	50	32	M24 X 1.5
CPU-HP	173	149	108	-	32	M24 X 1.5

Pilot Unit

Differential-pressure Pilot Unit for Low/High Pressure

Design and function

DPU is a differential-pressure pilot valve available in low-pressure and high-pressure versions. The pilot valve is used to maintain a constant differential pressure between the DPU valve reference pressure connection and the RCV main valve inlet pressure.

Technical data

Low-pressure version

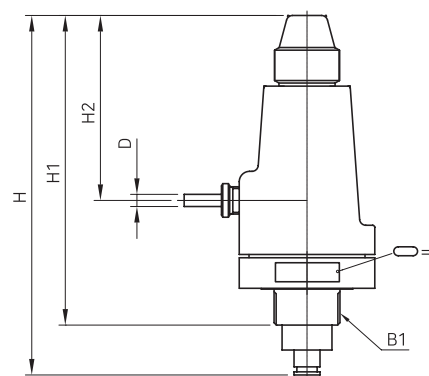
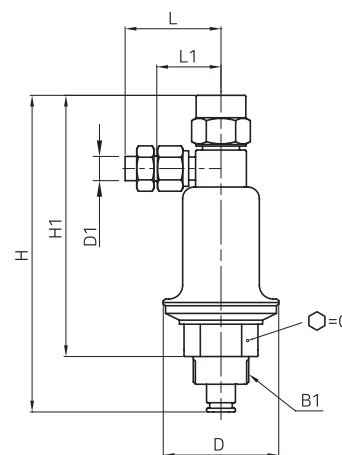
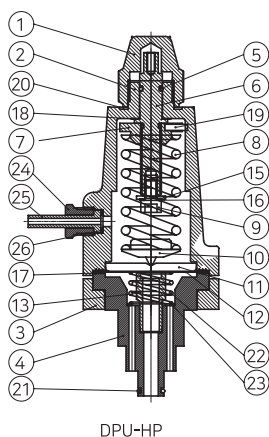
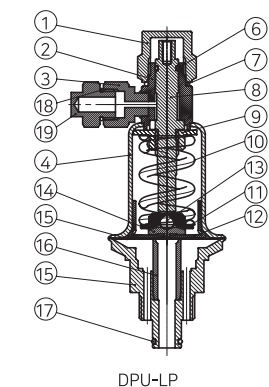
Part Number	MWP	Temperature range	Pressure range (ΔP)
DPU-LP-01	17 bar g	-50 to 120°C	$\Delta p = 0$ to 7 bar g

High-pressure version

Part Number	MWP	Temperature range	Pressure range
DPU-HP-01	28 bar g	-50 to 120°C	$\Delta p = 0$ to 7 bar g
DPU-HP-02	40 bar g	-50 to 120°C	$\Delta p = 4$ to 22 bar g

NO.	Description	Material	QTY
1	Cap nut	A276-316	1
2	Housing cap	A276-316	1
3	Nipple	A276-316	1
4	Housing	A240-316	1
5	Body	A276-316	1
6	O-ring	NBR	1
7	O-ring	NBR	1
8	Center shaft	A276-316	1
9	Center shaft guide	A276-316	1
10	Spring	SS316	1
11	Spring guide	A276-316	1
12	Diaphragm guide	A240-316	1
13	Steel ball	A276-316	1
14	Steel ball guide	A276-316	1
15	Diaphragm	A240-316	1
16	Body seat	A276-316	1
17	O-ring	NBR	1
18	O-ring	NBR	1
19	Nipple bolt	A276-316	1

NO.	Description	Material	QTY
1	Cap nut	A276-316	1
2	Housing	A276-316	1
3	Bolted Bonnet	A276-316	1
4	Body	A276-316	1
5	O-ring	NBR	1
6	Center shaft	A276-316	1
7	Center shaft guide	A276-316	1
8	Spring-1	SS316	1
9	Hex socket bolt	SS316	1
10	Spring guide	A276-316	1
11	Diaphragm guide	A276-316	1
12	Diaphragm	A240-316	2
13	Body seat	A276-316	1
15	Washer	A240-316	1
16	Washer	A240-316	1
17	Gasket	-	2
18	Washer	A240-316	1
19	Guide bar	A276-316	1
20	Gasket	-	1
21	O-ring	NBR	1
22	Spring-2	SS316	1
23	Washer	A240-316	1
24	Union nut	A276-316	1
25	Nipple	A276-316	1
26	Washer	A240-316	1



Dimension(mm)

Model	H	H1	H2	L	L1	D	D1	C	B1
DPU-LP	137	113	-	41.5	27.5	50	10.5	32	M24 X 1.5
DPU-HP	173	149	89	-	-	5.9	-	32	M24 X 1.5

CO₂ Solenoid Valve

Application

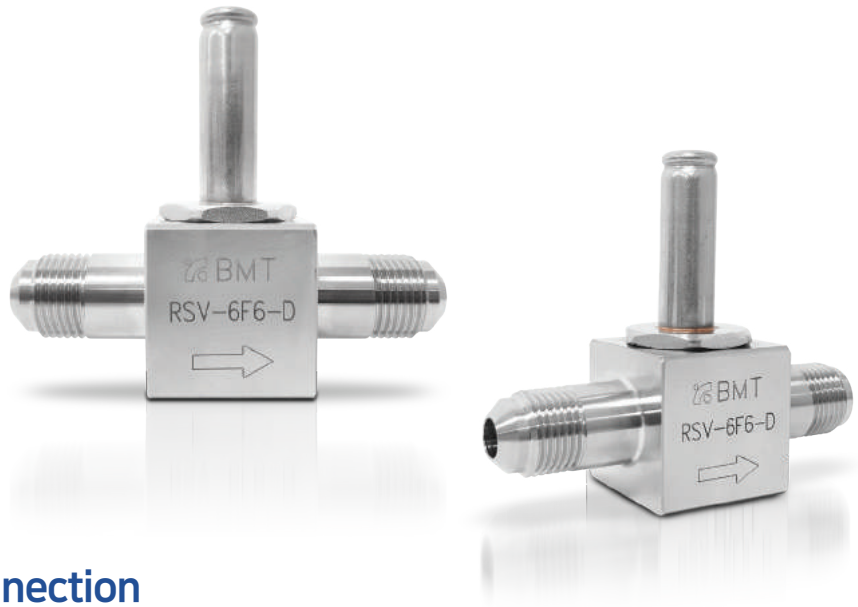
By switching the electromagnetic coil to cut off or activate the refrigerant flow, RSV series solenoid valves are used in refrigerant control of heat pumps, air conditioning, and refrigeration and freezing systems.

Features

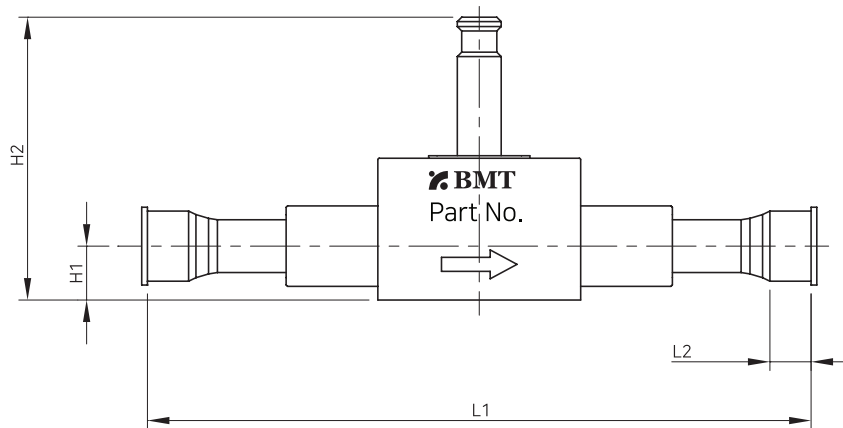
- Applied in liquid, suction, and hot gas pipe line;
- Suitable for all fluorinated refrigerants;
- Non-Asbestos Gasket;
- NC (normally closed);
- Available with versions with and without bracket.

Technical data

- Applicable Refrigerants: R744(CO₂) + PAG oil
- Applicable Relative Humidity: ≤95%
- Media Temperature: -30°C to +120°C
- Ambient Temperature: -30°C to +55°C
- Max. Operating Pressure: 14.0MPa
- Internal Leakage: ≤50mL/min
- Life Cycle: ≥100,000



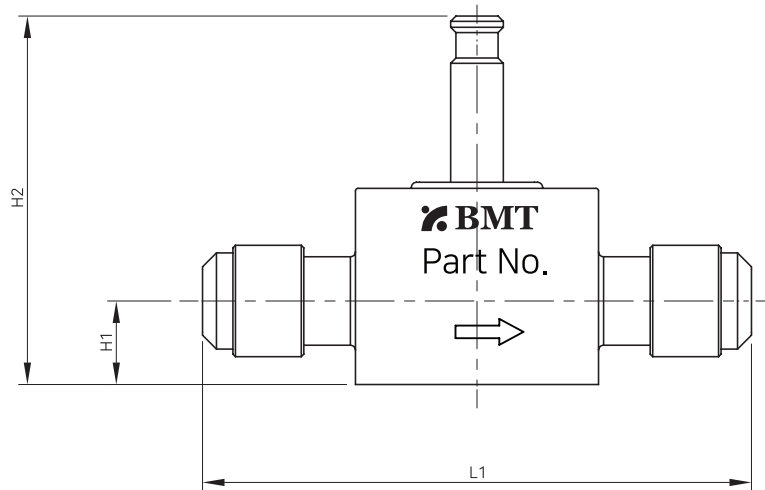
Dimensions - Solder Connection



Dimension(mm)

Part Number	Connection		H1 mm	H2 mm	L1 mm	L2 mm	Width mm
	in.	mm					
RSV-4S4-D	1/4	6	12	76	102	7	30
RSV-6S4-D	1/4	6	12	76	102	7	30
RSV-6S6-D	3/8	10	12	76	108	9	30
RSV-8S6-G	3/8	10	13	80	112	9	36
RSV-8S8-G	1/2	12	13	80	128	10	36
RSV-10S8-G	1/2	12	17	95	128	10	46
RSV-10S10-G	5/8	16	17	95	156	12	46
RSV-14S10-G	5/8	16	18	100	166	12	56
RSV-14S12-G	3/4	19	18	100	166	17	56
RSV-14S14-G	7/8	22	18	100	176	17	56

Dimensions - Flare Connection



Dimension(mm)

Part Number	Connection		H1 mm	H2 mm	L1 mm	Width mm
	in.	mm				
RSV-4F4-D	1/4	6	12	76	58	30
RSV-6F4-D	1/4	6	12	76	58	30
RSV-6F6-D	3/8	10	12	76	64	30
RSV-8F6-G	3/8	10	13	80	70	36
RSV-8F8-G	1/2	12	13	80	74	36
RSV-10F8-G	1/2	12	17	95	86	46
RSV-10F10-G	5/8	16	17	95	92	46
RSV-14F10-G	5/8	16	18	100	106	56
RSV-14F14-G	7/8	22	18	100	106	56

Ordering Information

Example : **RSV** - **4S4** - **D**

1
2
3
4
5

1. Valve Series

RSV

2. Body Size

Size	1/4"	3/8"	1/2"	5/8"	7/8"
Designation	4	6	8	10	14

3. End Connection

S: Solder

F: Flare

4. End Connection Size

Size	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"
Designation	4	6	8	10	12	14

5. Actuation

Actuation	Direct	Diaphragm	Piston
Designation	D	G	P

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VALVES & REGULATORS

Ultra High Purity (UHP) series

Diaphragm/Bellows/Check Valves

Clean Ball Valves

Regulators

Instrumentation series

Ball/Needle/Check Valves

Manifold/Monoflange Valves

Relief/Bleed/Purge/Toggle Valves

High Pressure Valves

Water Regulators

Process series

Ball/Globe Valves

Block & Bleed Valves

Cryogenic Valves

FITTINGS

Ultra High Purity (UHP) series

Weld & Metal Seal Fittings

Bend Fittings

Instrumentation series

SUPERLOK Tube Fittings

i-Fitting®

Bite Type Tube Fittings

High Pressure Fittings

37° Flared Tube Fittings

Instrument Thread Fittings

O-ring Face Seal Fittings

Push-on Hose Fittings

Pre-forming Fittings

ELECTRIC & ENERGY

Smart Distribution Board

Compact Switchboard

Motor Control Center (MCC)

Energy Management System

Electric Heat Tracing (EHT) System