Series VC

Direct Operated 2 Port Solenoid Valve for Heated Water

Series VCB

Multipurpose Valve for Heated Water

Direct Operated 2 Port Solenoid Valve for Heated Water

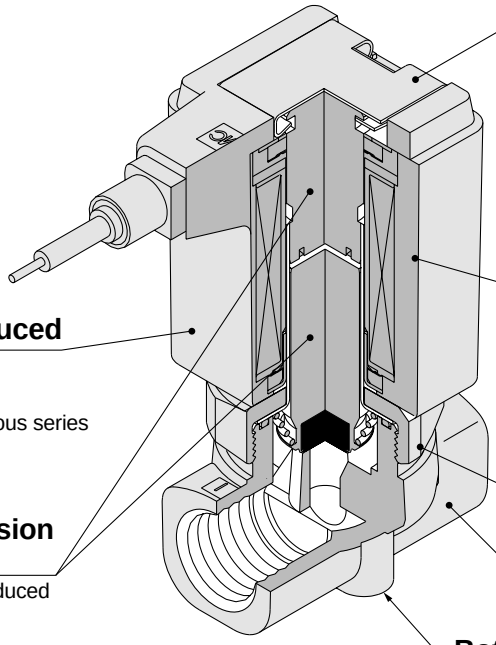
Series VCB

Improved durability (Nearly twice the life of the previous series)

Use of special magnetic material reduces the operating resistance of moving parts. Longevity, wear resistance and corrosion resistance improved.

High flow rate: 157 to 2062 Nℓ/min

Compact: Single valve volume reduced 15% (Class 3)



Clip type

Quick change coil
Clip design makes coil replacement easy.

Flame resistant molded coil material
UL94 V-0 standard

Coil size and weight reduced
New compact coil reduces the size and weight of the valve
Volume: –15%
Weight: –20%
} Compared to previous series (Class 3)

Threaded assembly
Simplifies maintenance

Improved corrosion resistance
Special materials introduced

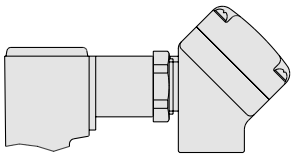
Improved corrosion resistance

Bottom mounting threads
Mounting bracket also available

Enclosure: Dust-proof & splash-proof (IP65 equivalent)

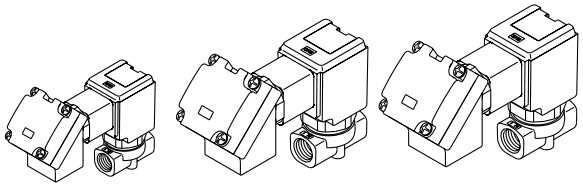
Wiring specifications (Class H coil)

Wiring variations



Conduit terminal

Three compact sizes available



VCB2 Class 2 | VCB3 Class 3 | VCB4 Class 4

Direct Operated 2 Port Solenoid Valve for Heated Water

Series VCB

How to Order Valves

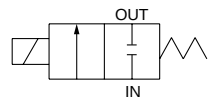
VC B 2 1 – 1 G 2 02 [ ] [ ] [ ] – Q

For heated water
When no symbol is shown for material and insulation type
- Body material: CAC406
- Seal material: FKM
- Coil insulation: Class H

Series

2	Class 2
3	Class 3
4	Class 4

Valve type

1	N.C. 

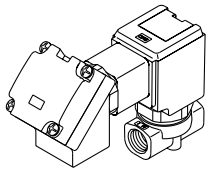
Voltage

1	100VAC
2	200VAC
3	110VAC
4	220VAC
36	230VAC
9	∗Other, less than 250VAC

Order Made ∗ Consult SMC regarding other voltages.

Electrical entry

T – With conduit terminal
TL – With conduit terminal and light



Option

Nil	None
F	Foot type bracket

Material and insulation type

Symbol	Body material	Seal material	Coil insulation
Nil	CAC406 (BC6)	FKM	Class H
M		EPDM	
N	SUS	FKM	
P		EPDM	

Thread type

Nil	Rc
N	NPT
F	G

Port size

Symbol	Port size	Class 2	Class 3	Class 4
01	1/8 (6A)	○	—	—
02	1/4 (8A)	○	○	○
03	3/8 (10A)	—	○	○
04	1/2 (15A)	—	○	○
06	3/4 (20A)	—	—	○

Orifice size

Symbol	Orifice size (mmø)	Class 2	Class 3	Class 4
2	2	○	—	—
3	3	○	○	○
4	4	○	○	○
5	5	○	○	○
7	7	—	○	○
10	10	—	○	○

∗ Refer to the table below for orifice and port size combinations.

Orifice and port size combinations

Class	Port size	Orifice size (mmø)					
		2	3	4	5	7	10
2	1/8 (6A)	●	●	●	●	—	—
	1/4 (8A)	●	●	●	●	—	—
3	1/4 (8A)	—	●	●	●	●	—
	3/8 (10A)	—	●	●	●	●	●
	1/2 (15A)	—	—	—	—	—	●
4	1/4 (8A)	—	●	●	●	●	—
	3/8 (10A)	—	●	●	●	●	●
	1/2 (15A)	—	—	—	—	—	●
	3/4 (20A)	—	—	—	—	—	●

Standard Specifications

Valve specifications	**Valve construction**		Direct operated poppet
	Fluid		Heated water (99°C or less)
	Withstand pressure MPa		5.0
	Body material		CAC406 (BC6), SUS
	Seal material		FKM, EPDM
	Ambient temperature °C		–20 to 100
	Fluid temperature °C		99 or less
	Enclosure		Dust proof, Splash proof (equivalent to IP65)
	Environment		Location without corrosive or explosive gases
	Valve leakage cm^3/min		0 (with water pressure)
	Mounting orientation		Unrestricted
	Vibration/Impact resistance m/s^2 Note 1)		30/150 or less
Coil Specifications	**Rated voltage**		100VAC, 110VAC, 200VAC, 220VAC, 230VAC (50/60Hz)
	Allowable voltage fluctuation		±10% of rated voltage
	Coil insulation type		Class H
	Power consumption W 50/60Hz		VCB2: 4.9/4.1, VCB3: 7.7/6.6, VCB4: 10.5/9.3
	Apparent power VA 50/60Hz	**Inrush**	VCB2: 22/19, VCB3: 36/30, VCB4: 45/37
		Holding	VCB2: 10/8, VCB3: 15/13, VCB4: 19/16

Note 1) Vibration resistance … Conditions when tested with one sweep of 10 to 300Hz in the axial direction and at a right angle to the armature, in both energized and deenergized states

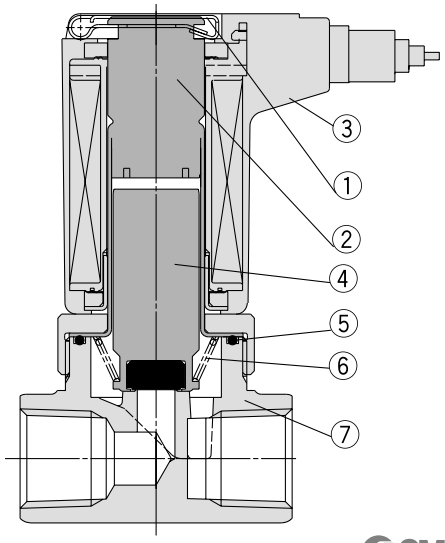
Impact resistance ..... Conditions when tested with a drop tester in the axial direction and at a right angle to the armature, one time each in energized and deenergized states

Characteristic Specifications

Model	Class	Port size Note 1)	Orifice size mmø Note 1)	Maximum operating pressure differential MPa	Effective area mm^2 (Nℓ/min)	Maximum operating pressure MPa	Weight kg
VCB2	2	1/8 (6A) 1/4 (8A)	2	2.0	2.8 (157)	3.0	1/8: 0.21 1/4: 0.24
			3	0.8	5.9 (324)		
			4	0.5	9.2 (500)		
			5	0.3	11.7 (638)		
VCB3	3	1/4 (8A) 3/8 (10A) 1/2 (15A)	3	2.0	6.3 (344)	3.0	1/4: 0.42 3/8: 0.40 1/2: 0.49
			4	0.8	9.7 (530)		
			5	0.5	14.4 (785)		
			7	0.2	24.8 (1354)		
			10	0.1	37.8 (2061)		
VCB4	4	1/4 (8A) 3/8 (10A) 1/2 (15A) 3/4 (20A)	3	3.0	6.3 (344)	3.0	1/4: 0.58 3/8: 0.55 1/2: 0.62 3/4: 0.78
			4	1.3	10.8 (589)		
			5	0.7	15.3 (834)		
			7	0.3	24.8 (1354)		
			10	0.12	37.8 (2061)		

Note 1) Refer to model selection on page 5 regarding port size and orifice size combinations.

Construction

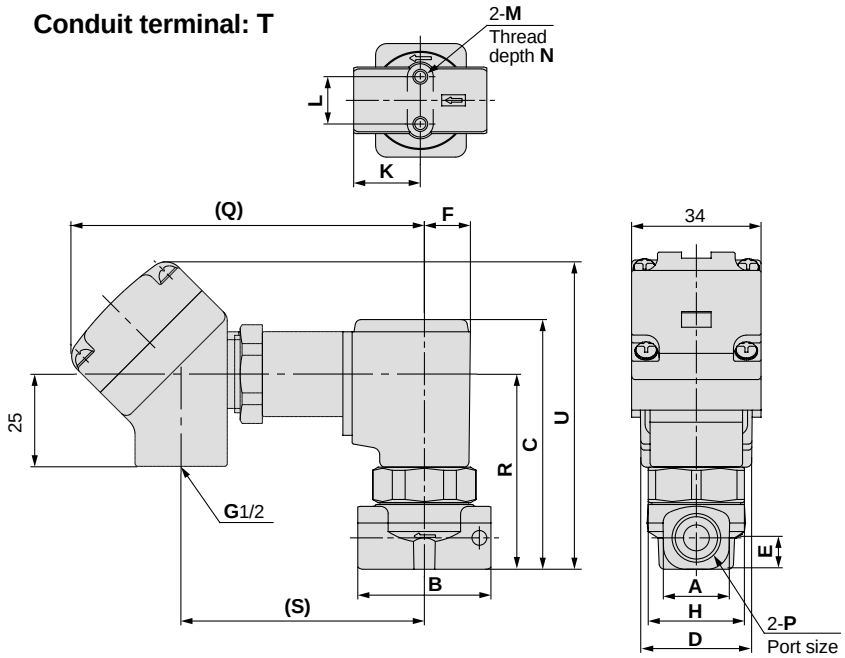


Parts list

No.	Description	Material
		Standard
1	**Clip**	Stainless steel
2	**Core assembly**	Stainless steel/Cu
3	**Coil assembly**	Class H
4	**Armature assembly**	Stainless steel/FKM (EPDM)
5	**Seal**	FKM (EPDM)
6	**Return spring**	Stainless steel
7	**Body**	CAC406 (stainless steel)

Dimensions

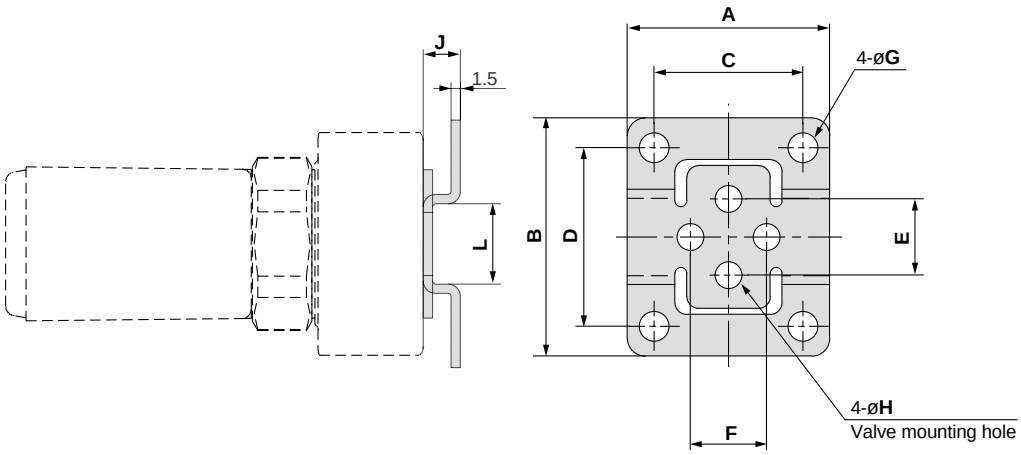
Conduit terminal: T



(mm)

Model	P Port size	A	B	C	D	E	F	H	K	L	M	N	Electrical entry			
													Conduit terminal: T			
													Q	R	S	U
VCB21	1/8	13.5	28	64	31	6.5	12.5	28	14	12.8	M4	4.5	99	50	66	83
	1/4	18	36	67.5	31	8.5	12.5	28	18	12.8	M4	6	99	53	66	86
VCB31	1/4, 3/8	22	40	81.5	36.5	11	15	32	20	19	M5	8	101	66.5	68	99
	1/2	30	50	86	36.5	13.5	15	32	25	23	M5	8	101	71	68	104
VCB41	1/4, 3/8	22	45	90	41	11	17	36	22.5	23	M5	8	103	74.5	70	107
	1/2	30	50	94	41	13.5	17	36	25	23	M5	8	103	78.5	70	111.5
	3/4	35	60	102	41	17.5	17	36	30	28.2	M5	8	103	86.5	70	119

Bracket Dimensions



Bracket material: Stainless steel

Bracket mounting dimensions

(mm)

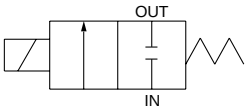
Valve model	Port size	Bracket part no.	A	B	C	D	E	F	G	H	J	L
VCB2□	1/8, 1/4	VCW20-12-01A	34	40	25	30	12.8	12.8	5	4.5	6	13
VCB3□	1/4, 3/8	VCW30-12-02A	42	52	30	40	19	19	6	5.5	7	19
	1/2	VCW30-12-04A	48	56	36	44	23	23	6	5.5	7	23
VCB4□	1/4, 3/8	VCW40-12-02A	42	52	30	40	23	23	6	5.5	7	19
	1/2	VCW30-12-04A	48	56	36	44	23	23	6	5.5	7	23
	3/4	VCW40-12-06A	56	65	44	53	28.2	28.2	6	5.5	7	26

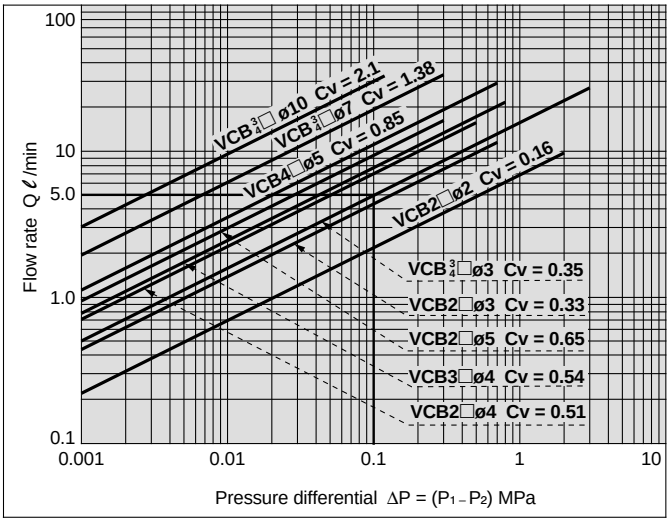
∗ Two mounting screws (for mounting bracket) are included with the above parts.

Model Selection

VCB (for heated water) 2 port solenoid valve

Model	Material		Class	Port size	Orifice size mmø					
	Body	Seal			2	3	4	5	7	10
VCB (for heated water) 2 port solenoid valve	CAC406 (SUS)	FKM (EPDM)	2	1/8 (6A)	●	●	●	●	—	—
				1/4 (8A)	●	●	●	●	—	—
			3	1/4 (8A)	—	●	●	●	●	—
				3/8 (10A)	—	●	●	●	●	●
				1/2 (15A)	—	—	—	—	—	●
			4	1/4 (8A)	—	●	●	●	●	—
				3/8 (10A)	—	●	●	●	●	●
				1/2 (15A)	—	—	—	—	—	●
				3/4 (20A)	—	—	—	—	—	●





Viewing the graph

To generate a water flow of 5ℓ/min at a differential pressure of 0.1MPa, an effective area with Cv factor 0.35 (VCB$^{3}_{4}$□, ø3) or more is required.

How to find the flow rate for water

- Formula based on Cv factor
  $Q = 14.2 \cdot Cv \cdot \sqrt{10.2 \cdot \Delta P}$ … ℓ/min
- Formula based on effective area (Smm²)
  $Q = 0.8 \cdot S \cdot \sqrt{10.2 \cdot \Delta P}$ …… ℓ/min

Q: Flow rate (ℓ/min)
ΔP: Pressure differential (P_1 — P_2)
P_1: Upstream pressure (MPa)
P_2: Downstream pressure (MPa)
S: Effective area (mm²)
Cv: Cv factor

Explanation of Terminology

Pressure Terminology

1. Maximum operating pressure differential

This indicates the maximum pressure differential (the difference between the upstream and downstream pressure) which can be allowed for operation with the valve closed or open. When the downstream pressure is 0MPa, this becomes the maximum operating pressure.

2. Maximum operating pressure

This indicates the upper limit of pressure that can be applied inside the pipelines (line pressure).

(The pressure differential of the solenoid valve unit must be no more than the maximum operating pressure differential.)

3. Proof pressure

The pressure which must be withstood without deterioration in performance when the valve returns to the operating pressure range (the value under the specified conditions).

Electrical Terminology

1. Surge voltage

A high voltage which is momentarily generated in the shut-off unit by shutting off the power.

Other

1. Materials

FKM: Fluoro rubber – Trade names: Viton®, Dai-el®, etc.
EPDM: Ethylene propylene rubber
CAC406: Bronze (BC6)
C37: Brass
SUS: Stainless steel

Series VCB
2 Port Solenoid Valve for Fluid Control Precautions

Wiring

⚠Caution

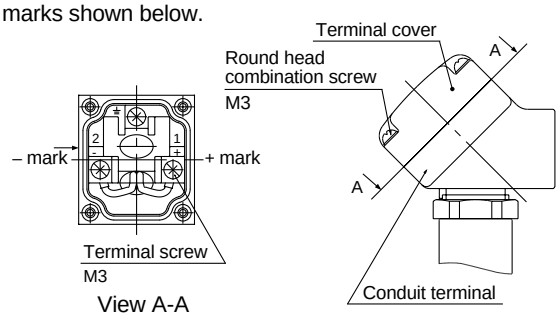
1. **As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25mm^2 for wiring. Furthermore, do not allow excessive force to be applied to the lines.**
2. **Use electrical circuits which do not generate chattering in their contacts.**
3. **Use voltage which is within ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.**
4. **When surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid.**

Electrical Connections

⚠Caution

Conduit terminal

In the case of the conduit terminal, make connections according to the marks shown below.



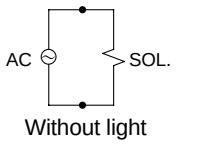
View A-A
(Internal connection diagram)

∗ Tighten the terminal cover screws and terminal screws with a torque of 0.5N·m.

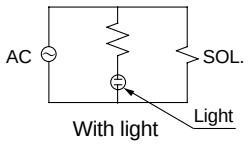
Electrical Circuits

⚠Caution

Conduit terminal



Without light



With light

Operating Environment

⚠Warning

1. **Do not use valves in atmospheres of corrosive gases, chemicals, salt water, water, or where there is direct contact with any of these.**
2. **Do not use in explosive atmospheres.**
3. **Do not use in locations subject to vibration or impact.**
4. **Do not use in locations where radiated heat will be received from nearby heat sources.**
5. **Employ suitable protective measures in locations where there is contact with water droplets, oil or welding spatter, etc.**

Maintenance

⚠Warning

1. Perform maintenance in accordance with the procedures in the instruction manual.

Improper handling can cause damage or malfunction of machinery and equipment, etc. In addition, perform maintenance inspections once every six months to ensure optimum performance.

2. Removing the product

The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

Removal

1. Shut off the fluid supply and release the fluid pressure in the system.
2. Shut off the power supply.
3. Demount the product.

3. Low frequency operation

Switch valves at least once every 30 days to prevent malfunction.

⚠Caution

1. Filters and strainers

1. Be careful regarding clogging of filters and strainers.
2. Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1MPa.
3. Clean strainers when the pressure drop reaches 0.1MPa.

2. Storage

In case of long term storage after use with heated water, first thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

Operating Precautions

⚠Warning

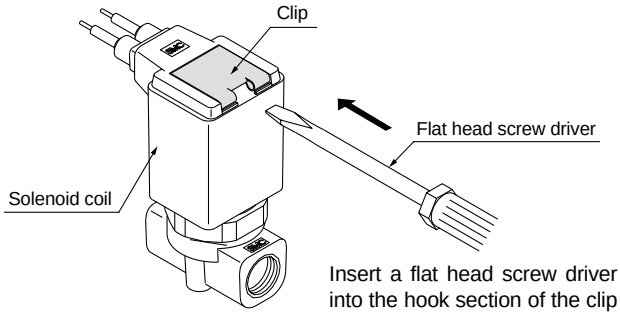
1. **Valves will reach high temperatures from high temperature fluids. Use caution, as there is a danger of being burned if a valve is touched directly.**
2. **Valves may reach high temperatures when continuously energized. Use caution, as there is a danger of being burned if a valve is touched directly.**

Series VCB
Specific Product Precautions

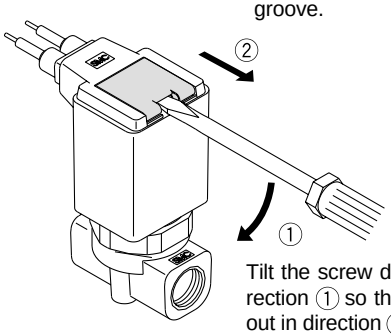
Replacing the Solenoid Coil

⚠Caution

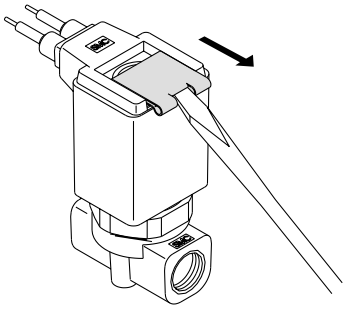
The valve will reach high temperatures from high temperature fluids such as heated water. Confirm that the valve has cooled sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

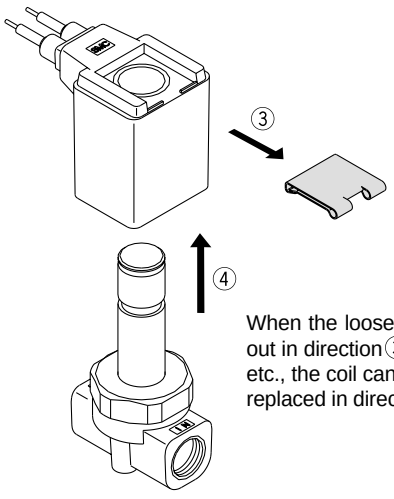


Insert a flat head screw driver into the hook section of the clip groove.



Tilt the screw driver down in direction ① so that the clip slides out in direction ②.





When the loosened clip is pulled out in direction ③ using pinchers, etc., the coil can be removed and replaced in direction ④.

After replacing the coil, the clip is reinstalled by pushing it back in the direction opposite to its removal.

Replacement Parts

Solenoid coil part numbers

VCS | **20** | **1** | **G** | ☐

Series

20	Class 2
30	Class 3
40	Class 4

Voltage

1	100VAC
2	200VAC
3	110VAC
4	220VAC
36	230VAC

Lead wire length

Nil	300mm
L1	600mm
L2	1000mm
L3	1500mm
L4	3000mm

Note) Grommet type only

Electrical entry

T	With conduit terminal
TL	With conduit terminal/light

- **Clip part numbers**

AZ-T-VCB

Note) Indicate the valve model, as a label will be attached to the clip.

- **Seal part numbers**

Valve

For VCB20

OR-1860-120- **F**

F: FKM
E: EPDM

For VCB30

OR-2380-130- **F**

F: FKM
E: EPDM

For VCB40

OR-2600-180- **F**

F: FKM
E: EPDM

If external leakage occurs after replacing the coil, replace the above seals.