Large Size 3 Port Solenoid Valve

Series VP3145/3165/3185

Rubber Seal

CE

[Option]

Note) CE-compliant: D/DL/DS/DZ only (Electrical entry)

Large flow capacity, small exhaust resistance

(Refer to "Flow Characteristic" table.)

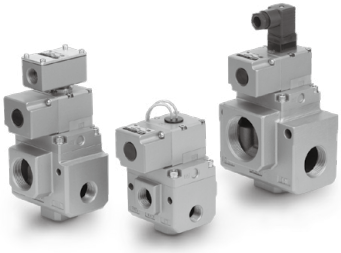
Easy conversion to N.C. or N.O.

Function plate makes it possible to use as a N.C. or N.O. valve with the port unchanged.

Possible to use in vacuum or under low pressures

Vacuum: Up to 101.2 kPa
Low pressure: 0 to 0.2 MPa

Free mounting orientation



How to Order

VP3 1 4 5 □ - 04 1 G A □ - □ - □

Series VP 3 port solenoid valve

Number of solenoids

1	Single

Body size

4	½
6	1
8	1 ½

Body type

5	Body ported

Valve option

Nil	For general
V	For vacuum/low pressure

Port size (IN, OUT port)

Symbol	Port size Rc (Nominal size)	VP3145	VP3165	VP3185
03	3/8 (10A)	●		
04	½ (15A)	●		
06	¾ (20A)	●	●	
10	1 (25A)		●	
12	1 ¼ (32A)		●	●
14	1 ½ (40A)			●
20	2 (50A)			●

Coil rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3*	110 VAC, 50/60 Hz
4*	220 VAC, 50/60 Hz
5	24 VDC
6*	12 VDC
7*	240 VAC, 50/60 Hz
9*	Other

* Semi-standard

Electrical entry

		CE-compliant
G	Grommet	—
T	Conduit terminal	—
D	DIN terminal	●
TL*	Conduit terminal with indicator light	—
TS*	Conduit terminal with surge voltage suppressor	—
TZ*	Conduit terminal with light/surge voltage suppressor	—
DL*	DIN terminal with indicator light	●
DS*	DIN terminal with surge voltage suppressor	●
DZ*	DIN terminal with light/surge voltage suppressor	●

* Semi-standard

Type of actuation

A	N.C. (Normally closed)
B	N.O. (Normally open)

Pilot option

Nil	Standard (Internal pilot)
1	External pilot

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

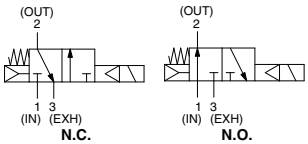
CE-compliant

Nil	—
Q	CE-compliant Note)

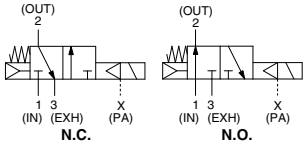
Note) Electrical entry: D/DL/DS/DZ only

Symbol

Internal pilot
<Standard>



External pilot



Note) N.O. valve operates properly only when appropriate pressure is applied to the pilot.

How to Order Pilot Valve Assembly

VT3113 − 00 1 G - □

Coil rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3*	110 VAC, 50/60 Hz
4*	220 VAC, 50/60 Hz
5	24 VDC
6*	12 VDC
7*	240 VAC, 50/60 Hz
9*	Other

* Semi-standard

Electrical entry

		CE-compliant
G	Grommet	—
T	Conduit terminal	—
D	DIN terminal	●
TL*	Conduit terminal with indicator light	—
TS*	Conduit terminal with surge voltage suppressor	—
TZ*	Conduit terminal with light/surge voltage suppressor	—
DL*	DIN terminal with indicator light	●
DS*	DIN terminal with surge voltage suppressor	●
DZ*	DIN terminal with light/surge voltage suppressor	●

* Semi-standard

CE-compliant

Nil	—
Q	CE-compliant Note)

Note) Electrical entry: D/DL/DS/DZ only

Note) The pilot valve assembly shown above includes the function plate and gasket.

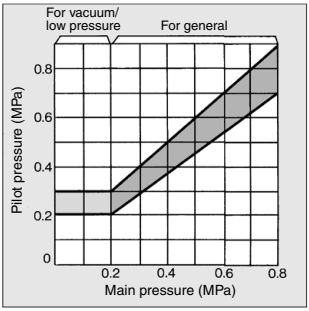
Made to Order

Made to Order
(Refer to pages 1875 to 1877 for details.)

External Pilot

Use external pilot model in the following cases.
- Vacuum or low pressure (0.2 MPa or less): Vacuum/Low pressure type
- Using the valve with supply port external throttle: General type
- Air pressure of supply port is slow: General type
- Resistance in outlet side is small in case of air blowing or filling an air tank: General type

Note 1) Keep external pilot pressure within the pressure range below.
Note 2) Conversion of internal pilot and external pilot can not be done.



Specifications

Fluid		Air					
Type of actuation		N.C. or N.O. (Convertible)					
Pilot type		Internal pilot	External pilot				
		For general	For vacuum/low pressure			For general	
Operating pressure range (MPa)	**Main pressure**	0.2 to 0.8	−101.2 kPa to 0.2			0.2 to 0.8	
	Pilot pressure		0.2 to 0.3			Refer to the graph left.	
Ambient and fluid temperature (°C)		0 (No freezing) to 60					
Response time (ms) (1) **(at the pressure of 0.5 MPa)**		ON	AC	30 or less	OFF	AC	30 or less
			DC	40 or less		DC	30 or less
Max. operating frequency (Hz)		3					
Lubrication (2)		Required (Equivalent to turbine oil Class1 ISO VG32)					
Manual override		Yes (Non-locking)					
Mounting orientation		Unrestricted					
Impact/Vibration resistance (m/s²) (3)		150/50					

Note 1) Based on dynamic performance test, JIS B 8374-1981. (Coil temperature: 20°C, at rated voltage, without surge voltage suppressor)
Note 2) This solenoid valve requires lubrication. Use turbine oil Class 1 (ISO VG32).
Note 3) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values at the initial period)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 1000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

Solenoid Specifications

Electrical entry	**Standard**		Grommet (G), Conduit terminal (T) DIN terminal (D)
	Option		Conduit terminal with indicator light (TL), Conduit terminal with surge voltage suppressor (TS), Conduit terminal with light/surge voltage suppressor (TZ), DIN terminal with indicator light (DL), DIN terminal with surge voltage suppressor (DS), DIN terminal with light/surge voltage suppressor (DZ)
Coil rated voltage (V)	**AC (50/60 Hz)**		100, 200, 110 *, 220 *, 240 *
	DC		12 *, 24
Allowable voltage fluctuation			−15 to +10% of rated voltage
Apparent power Note)	**AC**	**Inrush**	73 VA (50 Hz), 58 VA (60 Hz)
		Holding	28 VA (50 Hz), 17 VA (60 Hz)
Power consumption Note)	**DC**		12 W

* Semi-standard
Note) At rated voltage

Flow Characteristics/Weight

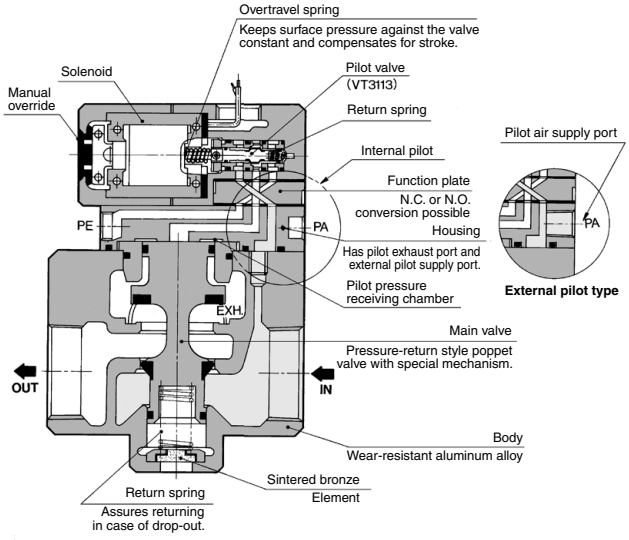
Valve model	Port size		Flow characteristics						Weight * (kg)
			1 → 2 (IN → OUT)			2 → 3 (OUT → EXH)			
	1(IN), 2(OUT)	3(EXH)	C [dm³/(s·bar)]	b	Cv	C [dm³/(s·bar)]	b	Cv	Grommet
VP3145	3/8	3/4	19	0.43	5.5	18	0.47	5.4	1.5
	1/2		23	0.32	6.2	21	0.39	5.8	
	3/4		28	0.36	7.6	26	0.35	7.0	

Valve model	Port size		Effective area (mm²)		Weight * (kg)
	1 (IN), 2 (OUT)	3(EXH)	1 → 2 (IN → OUT)	2 → 3 (OUT → EXH)	Grommet
VP3165	3/4	1 1/4	230	280	2.0
	1		280	310	
	1 1/4		310	330	
VP3185	1 1/4	2	570	650	2.8
	1 1/2		650	670	
	2		650	670	

* For grommet
Conduit terminal··· +0.2 kg

Construction/Internal Pilot

As in the figure below, this pilot-operated solenoid valve consists of a compact 3 port solenoid valve as the pilot valve and a large 3 port valve as the main valve.
The pilot valve controls opening and closing the main valve. N.C. or N.O. function conversion can be done by switching the pilot passage.



Note) Pilot valve and body are shown in a different direction from the actual product in order to show the construction and air passage.

Piping (Vacuum Use)

1. Piping in general:

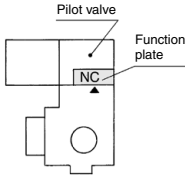
EXH port = Vacuum pump/ Blower } (Suction side)
OUT port = Tank/ Vacuum pad } (Load side)
IN port = Plug (2 port valve) Air releasing Air pressure-in

2. Following the above piping, vacuum passage is switched between OUT and EXH, therefore, N.C./N.O. indication on the function plate and switching of the vacuum passage are reversed; N.C. (Normally closed) in vacuum passage are reversed:

"N.C." indicated on the plate
→ N.O. in vacuum passage (Normally open)
"N.O." indicated on the plate
→ N.C. in vacuum passage (Normally closed)

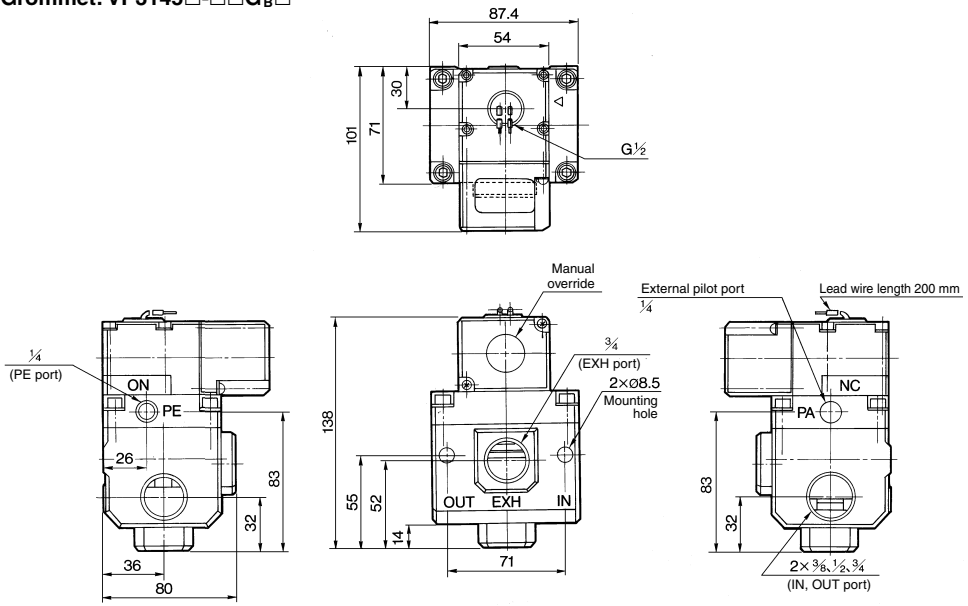
N.C./N.O. Conversion

To convert valve operation from N.C. to N.O. or N.O. to N.C., remove the pilot valve, move the function plate along the gasket, both top and bottom until the mark ▶ meets N.C. (N.O.)
Please note however, that the N.O. valve functions properly only when the appropriate pressure is applied to the valve.



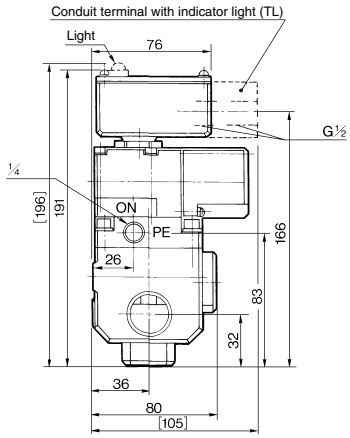
Dimensions: VP3145

Grommet: VP3145□-□□G$^{A}_{B}$□



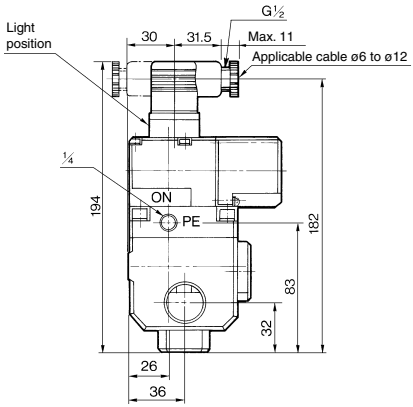
Note) External pilot port Rc 1/4 is processed for threads in external pilot model only.

Conduit terminal: VP3145□-□□T$^{A}_{B}$□



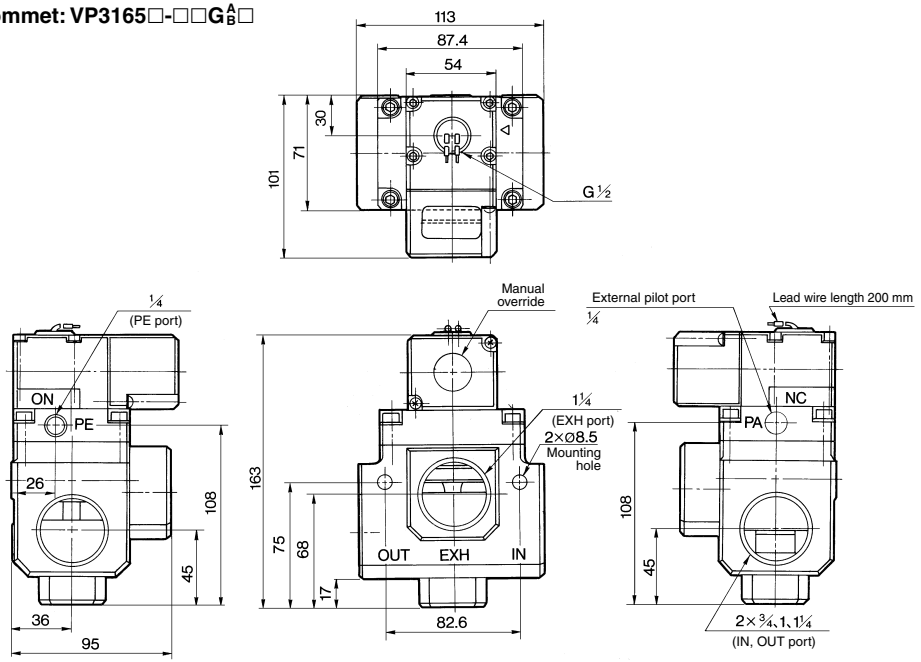
[ ]: With indicator light (TL)

DIN terminal: VP3145□-□□D$^{A}_{B}$□



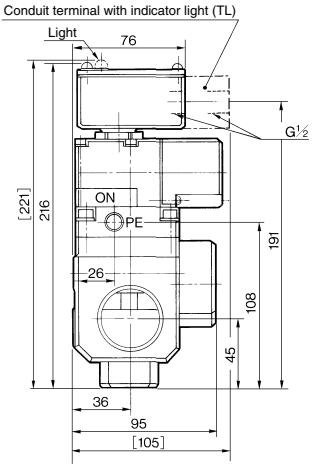
Dimensions: VP3165

Grommet: VP3165□-□□G$^{A}_{B}$□



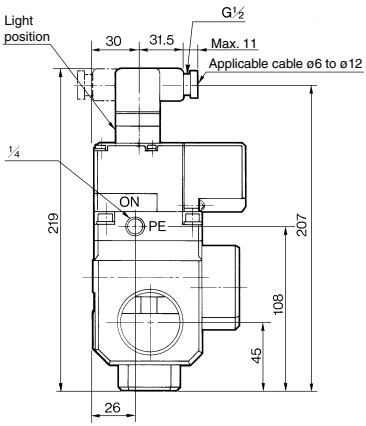
Note) External pilot port Rc 1/4 is processed for threads in external pilot model only.

Conduit terminal: VP3165□-□□T$^{A}_{B}$□



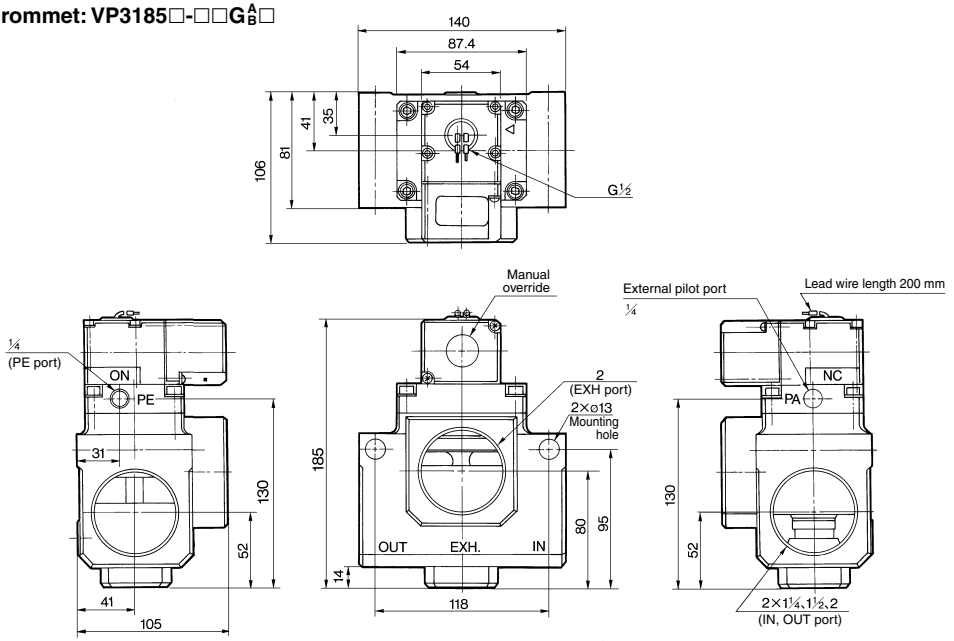
[ ]: With indicator light (TL)

DIN terminal: VP3165□-□□D$^{A}_{B}$□



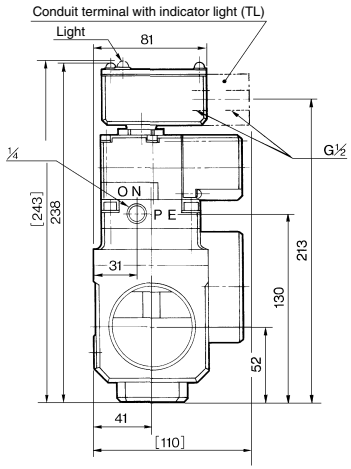
Dimensions: VP3185

Grommet: VP3185□-□□G$^{A}_{B}$□



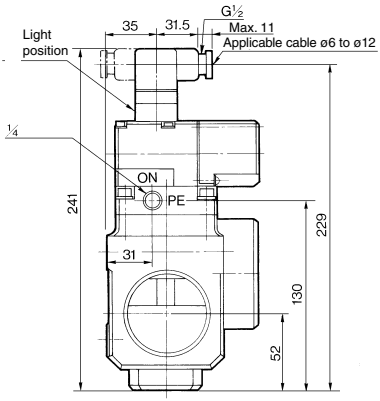
Note) External pilot port Rc 1/4 is processed for threads in external pilot model only.

Conduit terminal: VP3185□-□□T$^{A}_{B}$□



[ ]: With indicator light (TL)

DIN terminal: VP3185□-□□D$^{A}_{B}$□



Series VP3145/3165/3185
Made to Order

Please contact SMC for detailed dimensions, specifications and lead times.

Note) CE-compliant: D/DO only (Electrical entry)

[Option]

Made to Order

1 Main Value Double Acting Type

Symbol: **-X80, -X81**

VP31 [4] 5- [06] [1] [D] [Z] [A] [1] - [N] - [X81] - [ ]

Body size

4	1/2
6	1
8	1 1/2

Port size (IN, OUT port)

Symbol	Port size	VP3145	VP3165	VP3185
03	3/8	●		
04	1/2	●		
06	3/4	●	●	
10	1		●	
12	1 1/4		●	●
14	1 1/2			●
20	2			●

Rated voltage

1	100 VAC (50/60 Hz)
2	200 VAC (50/60 Hz)
3	110 VAC (50/60 Hz)
4	220 VAC (50/60 Hz)
5	24 VDC
6	12 VDC
7	240 VAC (50/60 Hz)

Electrical entry

			U, Z spec.	CE-compliant
G	Grommet (300 mm)		●	—
H	Grommet (600 mm)		●	—
T	Conduit terminal		●	—
D	DIN terminal	With connector	●	●
DO		Without connector	—	●
L	L plug connector	With lead wire	●	—
LN		Without lead wire	●	—
LO		Without connector	●	—
M	M plug connector	With lead wire	●	—
MN		Without lead wire	●	—
MO		Without connector	●	—

External pilot

Thread type

Nil	Rc
F	G
N	NPT
T	NPTF

Type of actuation

X80	Double solenoid
X81	Single solenoid

CE marking

Nil	None
Q	CE-compliant*

* D/DO/DZ/DU only

Passage, Type of actuation

A	N.C.
B	N.O.

* In the case of -X80, only N.C. is available.

Light/Surge voltage suppressor

		DC	AC
Nil	Without light/surge voltage suppressor	●	● Note 1)
U	With light/surge voltage suppressor	●	—
Z	With light/surge voltage suppressor	—	●

Note 1) AC type has a surge voltage suppressor, since a rectifier is built into the product.

* In the DIN terminal type, since a light is installed in the connector, DOU and DOZ are not available.

How to Order Pilot Valve Assembly

VF3 [1] 40 [K] - [1] [D] [Z] 1

Type of actuation

1	Single (X81)
2	Double (X80)

Pressure specification

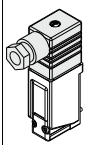
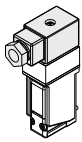
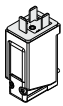
K	High pressure type

Note) High pressure type should be selected for this product.

Rated voltage

1	100 VAC (50/60 Hz)
2	200 VAC (50/60 Hz)
3	110 VAC (50/60 Hz)
4	220 VAC (50/60 Hz)
5	24 VDC
6	12 VDC
7	240 VAC (50/60 Hz)

Electrical entry

Grommet	L plug connector	M plug connector	DIN terminal	Conduit terminal
 **G**: Lead wire length 300 mm **H**: Lead wire length 600 mm	 **L**: With lead wire (Length 300 mm)	 **M**: With lead wire (Length 300 mm)	 **D**: With connector	 **T**: Condait terminal
 **G**: Lead wire length 300 mm **H**: Lead wire length 600 mm DC without light/surge voltage suppressor	 **LN**: Without lead wire	 **MN**: Without lead wire	 **DO**: Without connector	*E: Grommet terminal type has been discontinued. Please replace it with conduit terminal type.
	 **LO**: Without connector	 **MO**: Without connector		

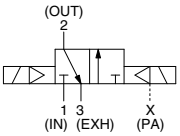
Light/Surge voltage suppressor

		DC	AC
Nil	Without light/surge voltage suppressor	●	● Note 1)
U	With light/surge voltage suppressor	●	—
Z	With light/surge voltage suppressor	—	●

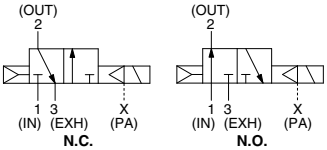
Note 1) AC type has a surge voltage suppressor, since a rectifier is built into the product.

* In the DIN terminal type, since a light is installed in the connector, DOU and DOZ are not available.

Symbol
-X80



-X81



Specifications

Valve configuration	External pilot 3 port solenoid valve
Type of actuation	Double solenoid (-X80), Single solenoid (-X81)
Fluid	Air
Operating pressure range	–101.2 kPa to 0.8 MPa
Pilot pressure	85 to 115% of main pressure, Min. 0.2 MPa
Ambient and fluid temperature	0 to 50°C (No freezing)
Lubrication Note 1)	Required (Equivalent to turbine oil Class 1 ISO VG32)
Mounting orientation	Unrestricted
Impact/Vibration resistance Note 2)	150/50 m/s^2

Note 1) This solenoid valve requires lubrication. Use turbine oil Class 1 (ISO VG32).
Note 2) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values at the initial period)
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 1000 Hz. Test was performed at both energized and de-energized states in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

Solenoid Specifications

Electrical entry	Grommet, Conduit terminal, DIN terminal L plug connector, M plug connector		
Coil rated voltage (V)	AC (50/60 Hz)		100, 200, 110, 220, 240
	DC		24, 12
Allowable voltage fluctuation	–15 to 10%		
Apparent power (VA) Note)	AC*	1.55 (With indicator light: 1.65) DIN/Conduit terminal with indicator light: 1.7	
Power consumption (W) Note)	DC	Without indicator light	1.5
		With indicator light	1.55, DIN/Conduit terminal with indicator light: 1.75

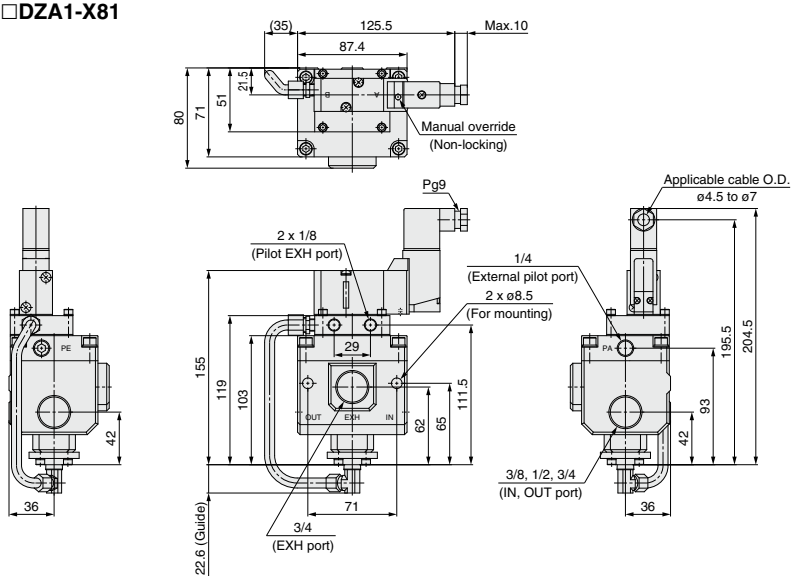
* A rectifying circuit is used in the AC type.
Note) At rated voltage

⚠ Caution

Piping and other usage are the same as standard products.

Dimensions

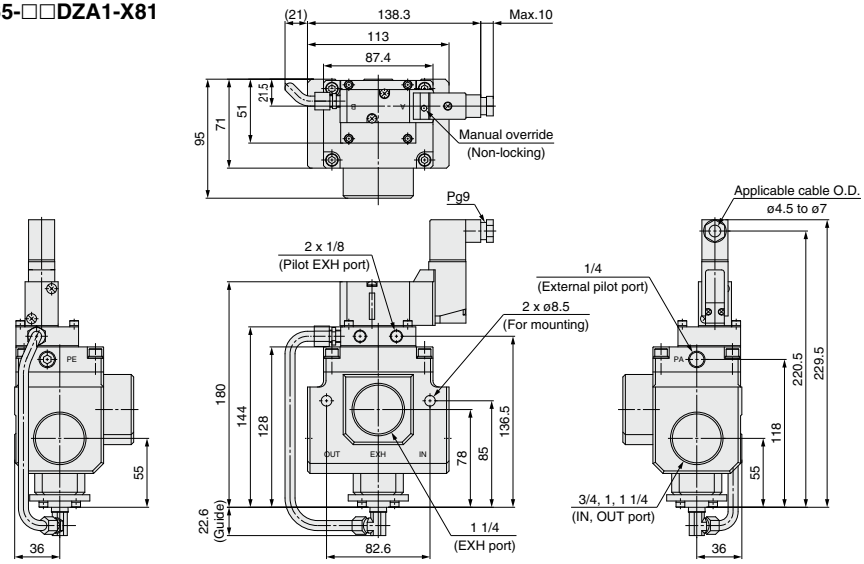
VP3145-□□DZA1-X81



- In the case of B spec. of -X81 (N.O. spec.), VF3140 solenoid has to be positioned at left, when looking at the EXH port in the front face.
- In the case of -X80, VF3240K-□□□1 (Pilot valve) will be mounted.

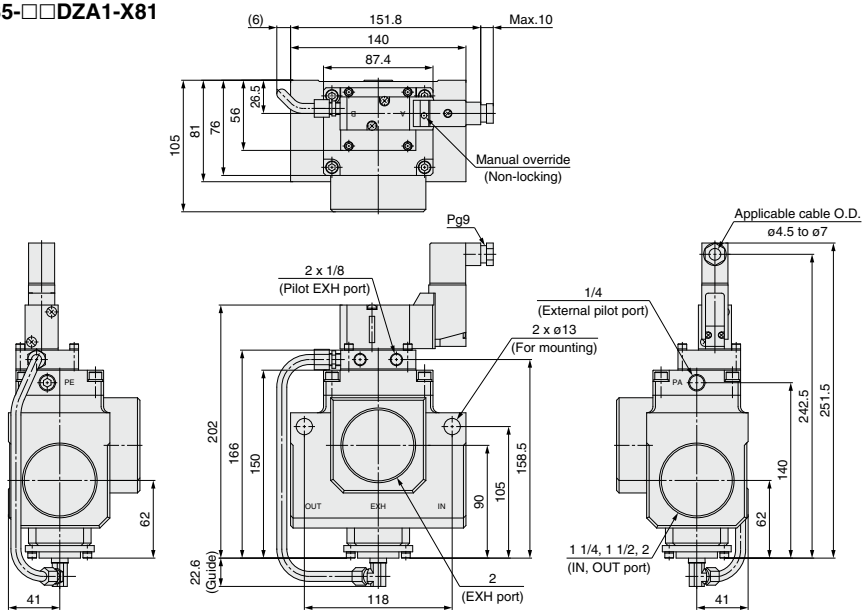
Dimensions

VP3165-□□DZA1-X81



• In the case of B spec. of -X81 (N.O. spec.), VF3140 solenoid has to be positioned at left, when looking at the EXH port in the front face.
• In the case of -X80, VF3240K-□□□1 (Pilot valve) will be mounted.

VP3185-□□DZA1-X81



• In the case of B spec. of -X81 (N.O. spec.), VF3140 solenoid has to be positioned at left, when looking at the EXH port in the front face.
• In the case of -X80, VF3240K-□□□1 (Pilot valve) will be mounted.

Series VP3145/3165/3185
Specific Product Precautions

Be sure to read before handling.
Refer to front matter 53 for Safety Instructions and pages 3 to 8 for 3/4/5 Port Solenoid Valve Precautions.

⚠ Caution

Piping
If supply port air pressure drops to less than 0.2 MPa, the valve may malfunction. In such a case, use external pilot type.
(When throttling IN port, or operating with OUT port open to the atmosphere or in a similar operation.)

Pressure balance among each port
This solenoid valve is pressure-unbalanced type. Operate it within this pressure range: IN ≥ OUT ≥ EXH. If not operated in the range, the valve will malfunction.

Use as 2 port valve
1. Plug EXH port in case of pressure-in and plug IN port in case of vacuum use.
2. This valve has slight air leakage and can not be used for such purposes as holding air pressure (including vacuum) in the pressure container.

Supply air
Install an air filter and a lubricator on the upstream side.

Lubrication
This solenoid valve requires lubrication. Use turbine oil Class 1 (ISO VG32).
As for details, refer to page 6.

Environment
If using the valve in a dusty environment, install a silencer at EXH port and PE port to prevent dust from entering.

N.C./N.O. conversion
When changing the direction of a function plate to convert from N.C. to N.O. and vice versa, note that the equipment to be connected will act reversely.

How to Calculate the Flow Rate
For obtaining the flow rate, refer to front matters 42 to 45.

Light/Surge Voltage Suppressor

	Grommet (G)	Conduit terminal (T)	DIN terminal (D)
With indicator light (L)	None	Neon bulb, Coil	48 VDC or less: LED, Coil 100 VAC or more: Neon bulb, Coil
Surge voltage suppressor (S)		Varistor, Coil	
With light/surge voltage suppressor (Z)	None	Neon bulb, Varistor, Coil	48 VDC or less: LED, Varistor, Coil 100 VAC or more: Neon bulb, Varistor, Coil

"Items that are marked "With indicator light," "With surge voltage suppressors," and "With light/surge voltage suppressor" are all non-polar types.

How to Use DIN Terminal

1. Disassembly
1) After loosening the screw ①, then if the housing ④ is pulled in the direction of the screw, the connector will be removed from the body of equipment (solenoid, etc.).
2) Pull out the screw ①, then remove the gasket ㉓ or ⑳.
3) On the bottom part of the terminal block ③, there's a cut-off part (indication of an arrow) ㉛. If a small flat head screwdriver is inserted between the opening in the bottom, terminal block ③ will be removed from the cover ④.
(Refer to the figure below.)
4) Remove the cable gland ⑤ and plain washer ⑥ and rubber seal ⑦ .

2. Wiring
1) Pass them through the cable ⑧ in the order of cable ground ⑤, washer ⑥, rubber seal ⑦, and then insert into the housing ④.
2) Dimensions of the cable ⑧ are the figure as below. Skin the cable and crimp the crimped terminal ⑨ to the edges.
3) Remove the screw with washer ㉜ from the bracket ㉝. (Loosen in the case of Y-shape type terminal.) As shown in the below figure, mount a crimped terminal ⑨, and then again tighten the screw ㉜.

Note) Tighten within the tightening torque of 0.5 N·m ±15%.

Note: a It is possible to wire even in the state of bare wire. In that case, loosen the screw with washer ㉜ and place a lead wire ㉞ into the bracket, and then tighten it once again.
b Maximum size of crimped terminal ⑨ is up to 1.25 mm² —3.5 when O terminal. For Y terminal, it is up to 1.25 mm² —4.
c Cable ⑧ outside diameter: ø6 to ø12 mm

Note) For the one with the outside diameter ranged between ø9 to ø12 mm, remove the inside parts of the rubber seal ⑦ before using.

3. Assembly
1) Terminal block ③ connected with housing ④ should be reinstated.
(Push it down until you hear the click sound.)
2) Putting rubber seal ⑦, plain washer ⑥, in this order into the cable introducing slit on the housing ④, then further tighten the cable gland ⑤ securely.
3) By inserting gasket ㉓ or ⑳ between the bottom part of the terminal block ③ and a plug on an equipment, screw in ① on top of the housing ④ and tighten it.

Note) Tighten within the tightening torque of 0.5 N·m ±20%.

Changing the entry direction
The cable entry direction of a connector can be changed as desired (4 directions at 90° intervals), depending on the combination of a housing ④ and a terminal block ③.

Exploded view