Large Size 3 Port Solenoid Valve

VP3145/3165/3185 Series

Rubber Seal

RoHS CE

Large flow capacity, small exhaust resistance

(Refer to "Flow Rate 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.

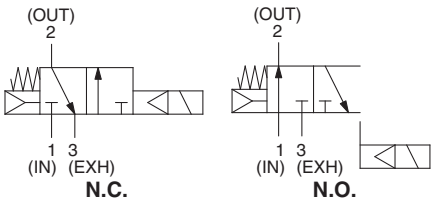
Possible to use in vacuum or under low pressures

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

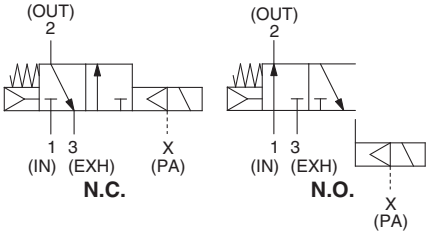
Free mounting orientation

Symbol

Internal pilot
<Standard>



External pilot



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

Made to Order

Made to Order
(Refer to pages 5 to 7 for details.)

How to Order

VP3 1 4 5 ☐ - 04 1 G A ☐ - ☐ - Q

VP series 3 port solenoid valve

Number of solenoids

1	Single

Body size

4	1/2
6	1
8	1 1/2

Body type

5	Body ported

Valve option

—	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	1/2 (15A)	●		
06	3/4 (20A)	●	●	
10	1 (25A)		●	
12	1 1/4 (32A)		●	●
14	1 1/2 (40A)			●
20	2 (50A)			●

Thread type

—	Rc
F	G
N	NPT
T	NPTF

Pilot option

—	Standard (Internal pilot)
1	External pilot

Type of actuation

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

Electrical entry

D	DIN terminal
DL*	DIN terminal with indicator light
DS*	DIN terminal with surge voltage suppressor
DZ*	DIN terminal with light/surge voltage suppressor

* Semi-standard

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

* Semi-standard
For other rated voltages, please consult with SMC.

How to Order Pilot Valve Assembly

VT3113 − 00 1 G - Q

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

* Semi-standard
For other rated voltages, please consult with SMC.

Electrical entry

D	DIN terminal
DL*	DIN terminal with indicator light
DS*	DIN terminal with surge voltage suppressor
DZ*	DIN terminal with light/surge voltage suppressor

* Semi-standard

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

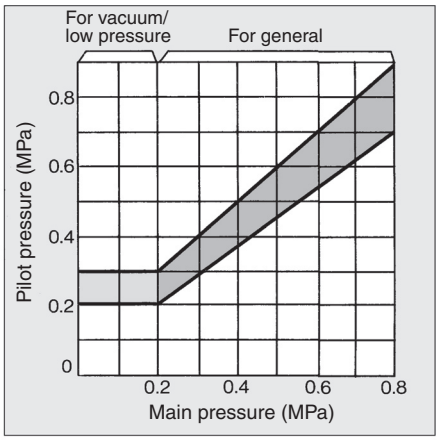
External Pilot

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 8419: 2010. (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 energised and de-energised 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 energised and de-energised 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**	DIN terminal (D)	
	Option	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 Rate Characteristics/Weight

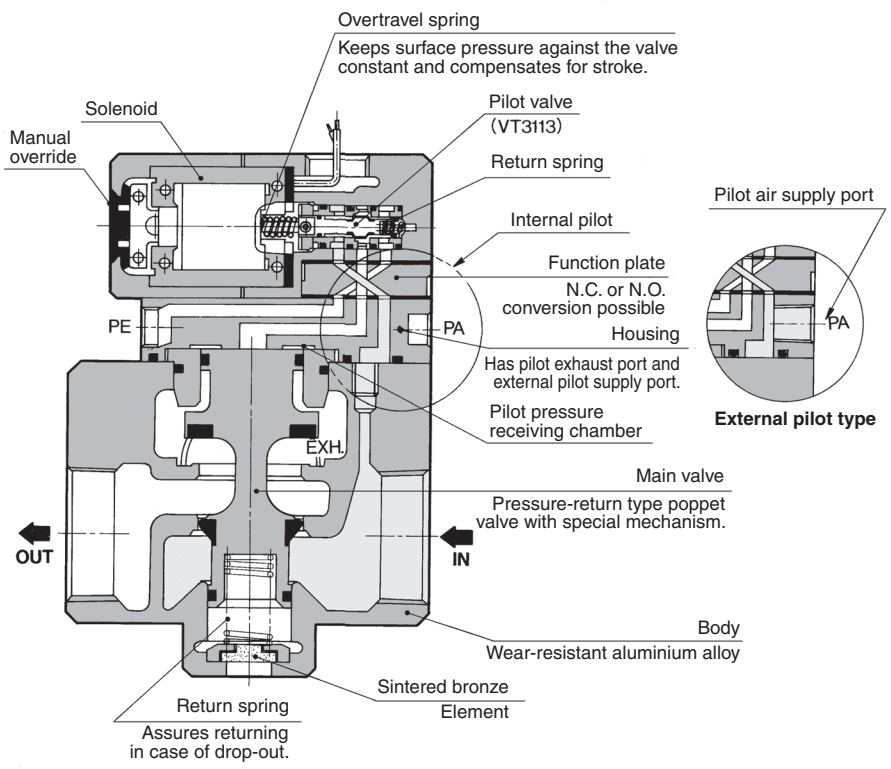
Valve model	Port size		Flow rate characteristics							
			1 → 2 (IN → OUT)				2 → 3 (OUT → EXH)			
	1(IN), 2(OUT)	3(EXH)	C [dm³/(s·bar)]	b	Cv	Q [l/min (ANR)]*1	C [dm³/(s·bar)]	b	Cv	Q [l/min (ANR)]*1
VP3145	3/8	3/4	19	0.43	5.5	5284	18	0.47	5.4	5163
	1/2		23	0.32	6.2	5924	21	0.39	5.8	5672
	3/4		28	0.36	7.6	7406	26	0.35	7.0	6831

*1 These values have been calculated according to ISO 6358 and indicate the flow rate under standard conditions with an inlet pressure of 0.6 MPa (relative pressure) and a pressure drop of 0.1 MPa.

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

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:

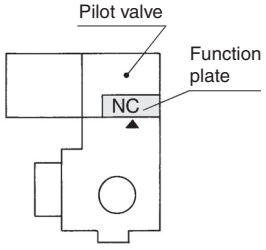
EXH port = Vacuum pump/ Blower } (Suction side)
OUT port = Tank/ Vacuum pad } (Load side)
IN port = Plug (2 port valve) Air releasing Air pressure-in

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)

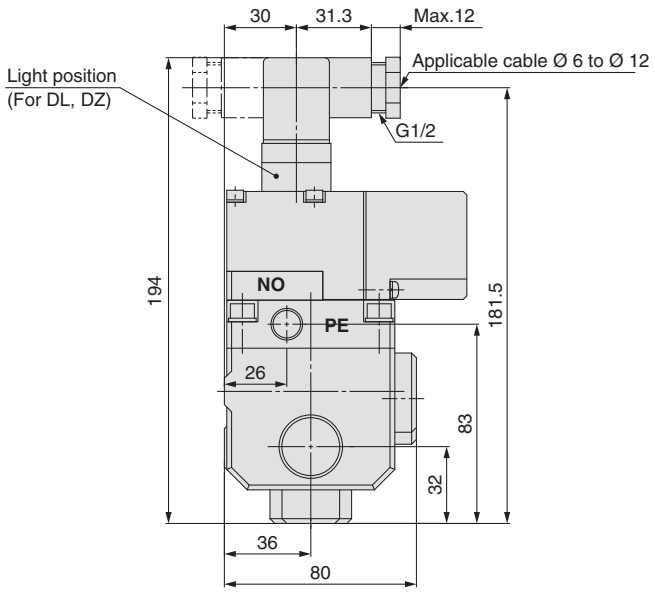
N.C./N.O. Conversion

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.

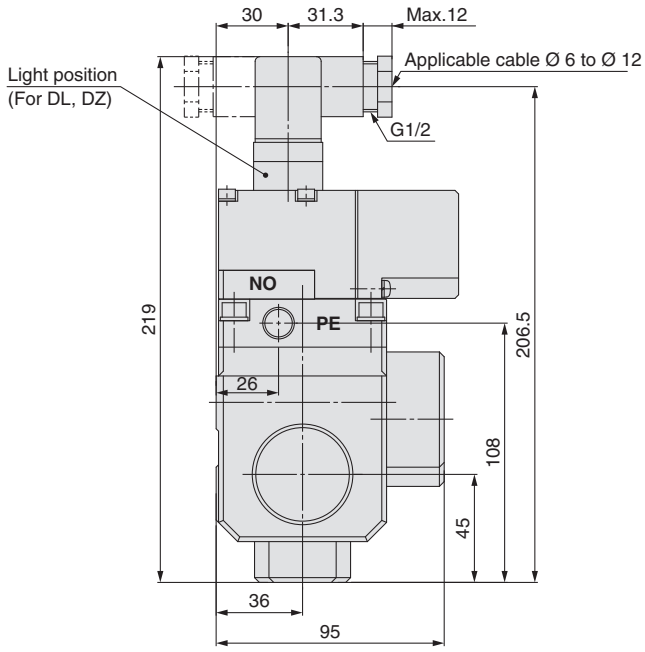


Dimensions: VP3145/3165/3185

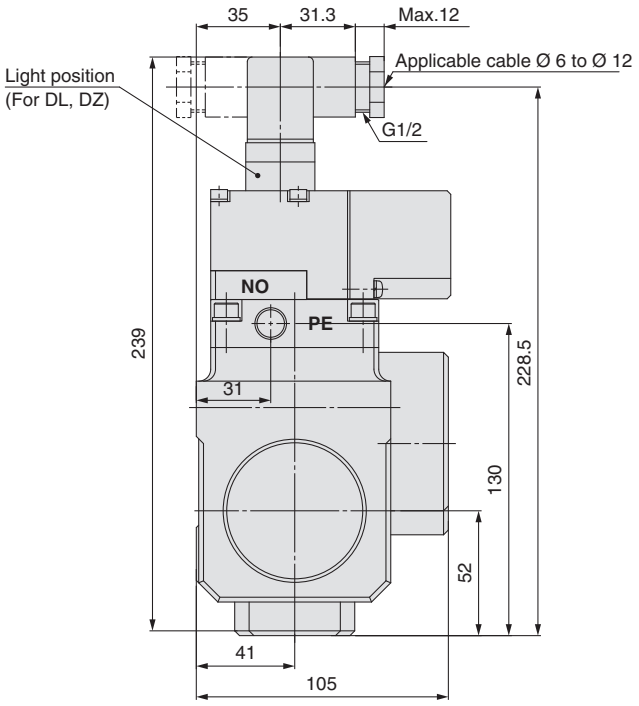
DIN terminal: VP3145□-□□D□$^{A}_{B}$□



DIN terminal: VP3165□-□□D□$^{A}_{B}$□



DIN terminal: VP3185□-□□D□$^{A}_{B}$□



VP3145/3165/3185 Series
Made to Order

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

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			●

Thread type

—	Rc
F	G
N	NPT
T	NPTF

Type of actuation

X80	Double solenoid
X81	Single solenoid

External pilot

Passage, Type of actuation

A	N.C.
B	N.O.

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

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.
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	●

Light/Surge voltage suppressor

		DC	AC
—	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

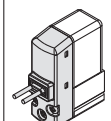
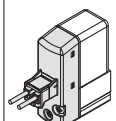
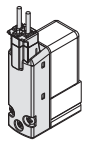
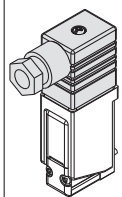
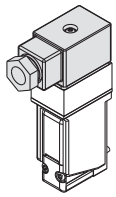
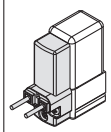
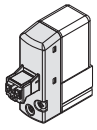
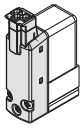
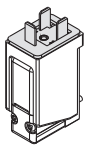
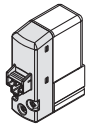
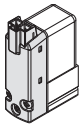
K	High pressure type

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		

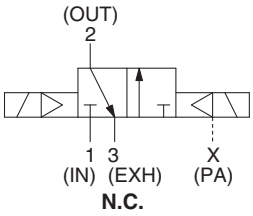
Light/Surge voltage suppressor

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

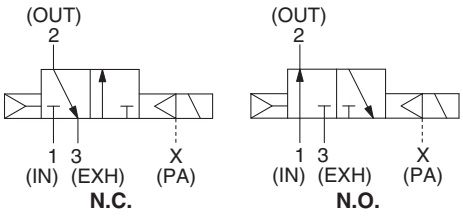
Note 1) AC type has a surge voltage suppressor, since a rectifier is built into the product.

∗ 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 energised and de-energised 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 energised and de-energised 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	±10 % of rated voltage		
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

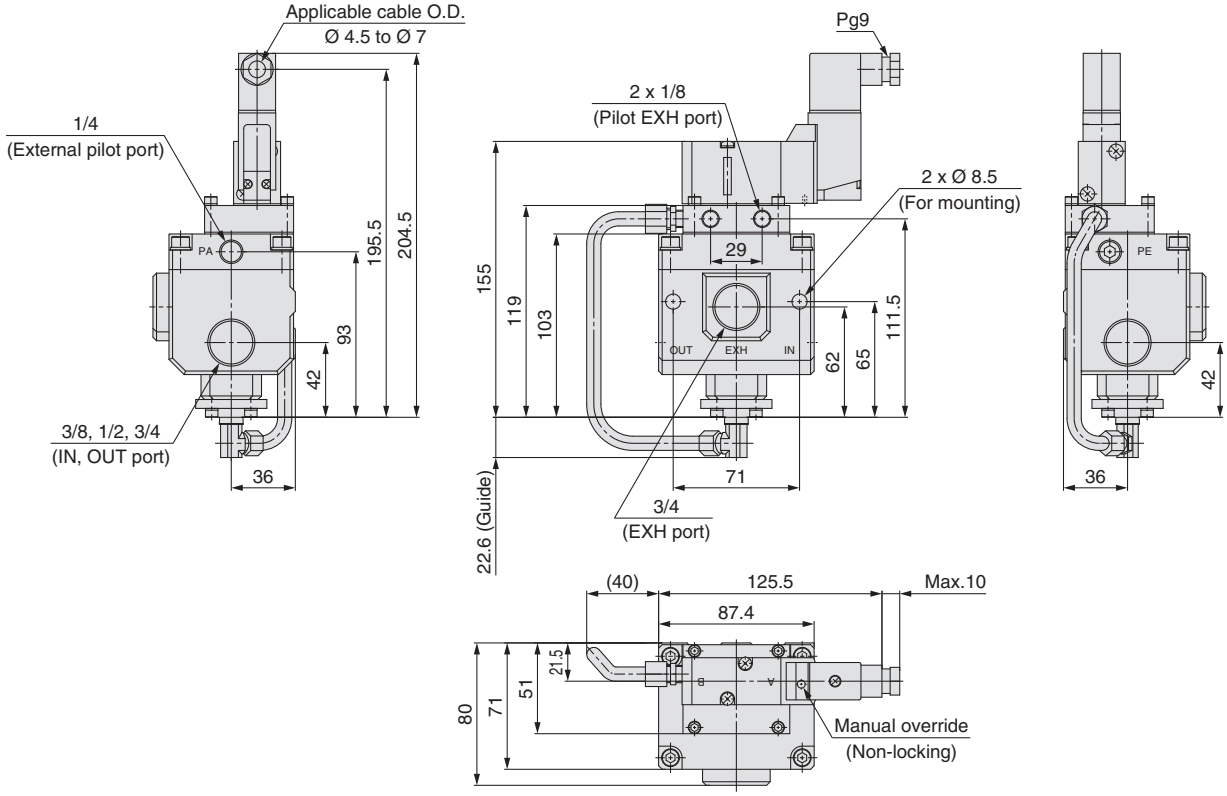
* A rectifying circuit is used in the AC type.
Note) At rated voltage

⚠ Caution

Piping and other usage are the same as standard products.

Dimensions

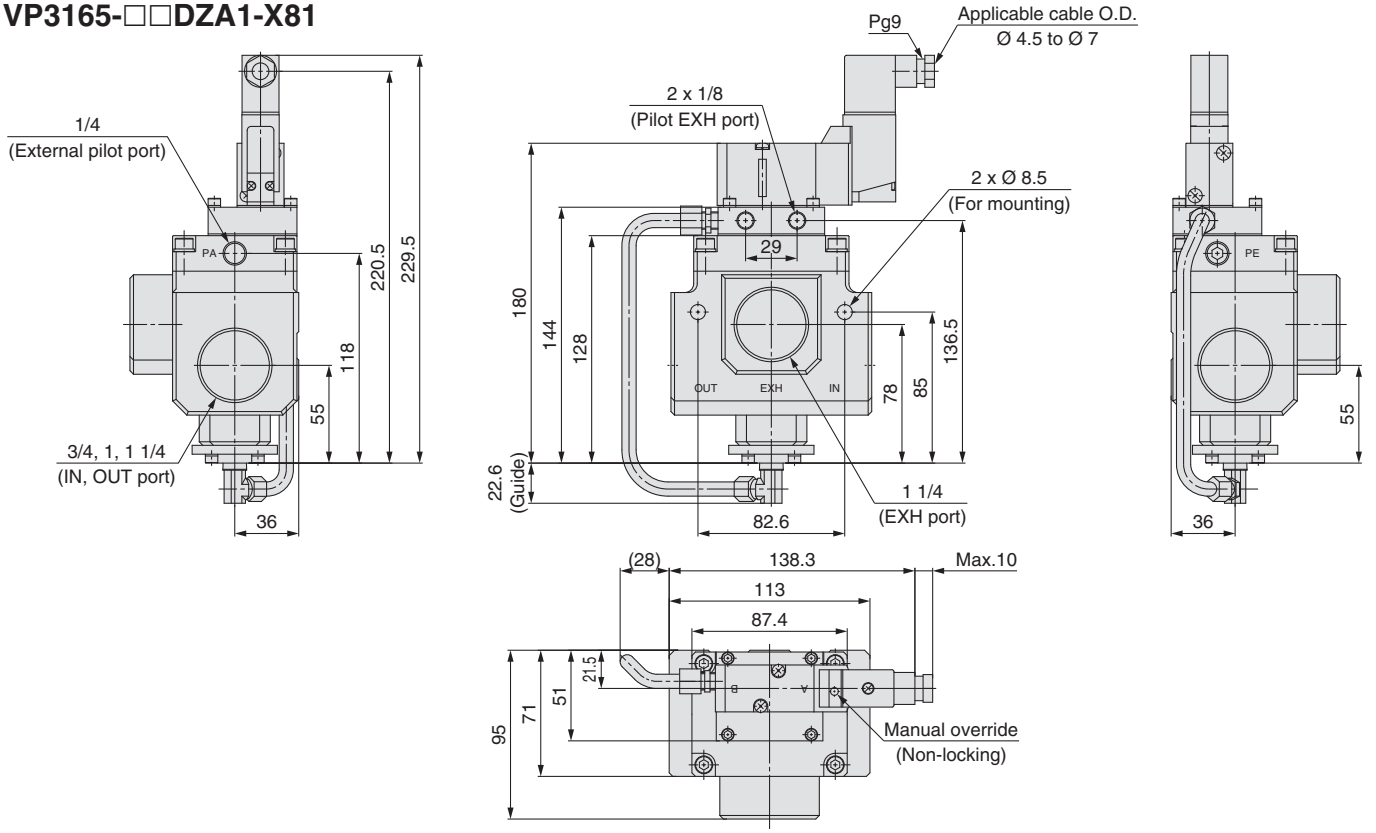
VP3145-□□DZA1-X81



- In the case of B spec. of -X81 (N.O. spec.), VF3140K 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.

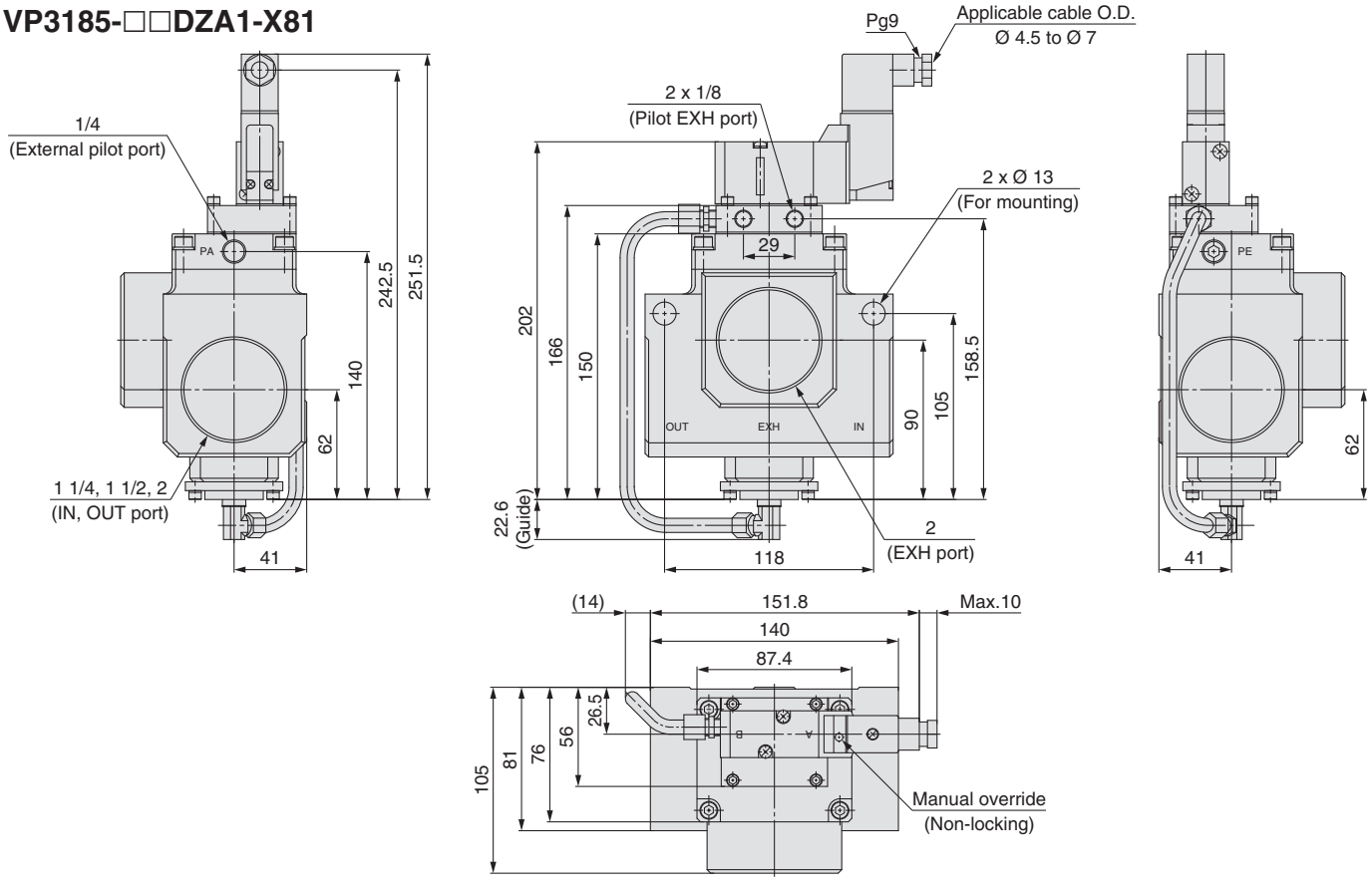
Dimensions

VP3165-□□DZA1-X81



• In the case of B spec. of -X81 (N.O. spec.), VF3140K 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.), VF3140K 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.

VP3145/3165/3185 Series
Specific Product Precautions

Be sure to read this before handling the products.

⚠ 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).

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 converting 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 matter.

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

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

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 ③f and place a lead wire into the bracket ③d, and then tighten it once again.
b) The maximum size for the round terminal ⑨ is 1.25 mm²—3.5 and for the Y terminal is 1.25 mm²—4.
c) Cable ⑧ outside diameter: Ø 6 to Ø 12 mm

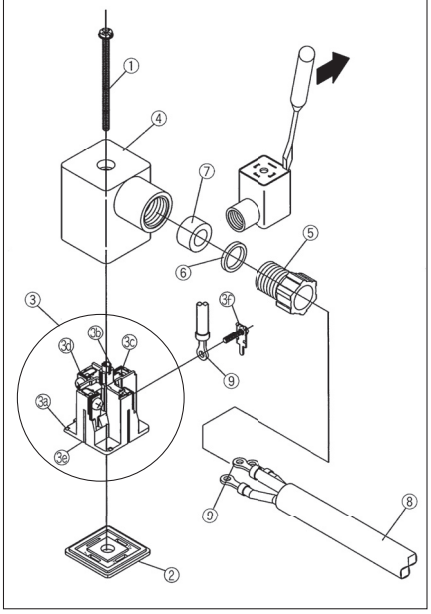
Note) For the one with outside diameter ranged between Ø 9 to Ø 12 remove the inside parts of the rubber seal ⑦ before using.

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 ② 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



⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution," "Warning"** or **"Danger."** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) [1], and other safety regulations.

⚠ **Caution:**	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
⚠ **Warning:**	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **Danger:**	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots - Safety.
etc.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

1. The product is provided for use in manufacturing industries.
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. [2] Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

⚠ Caution

SMC products are not intended for use as instruments for legal metrology.
Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

SMC Corporation (Europe)

Austria	+43 (0)2262622800	www.smc.at	office@smc.at
Belgium	+32 (0)33551464	www.smc.be	info@smc.be
Bulgaria	+359 (0)2807670	www.smc.bg	office@smc.bg
Croatia	+385 (0)13707288	www.smc.hr	office@smc.hr
Czech Republic	+420 541424611	www.smc.cz	office@smc.cz
Denmark	+45 70252900	www.smcdk.com	smc@smcdk.com
Estonia	+372 651 0370	www.smcee.ee	info@smcee.ee
Finland	+358 207513513	www.smc.fi	smcfi@smc.fi
France	+33 (0)164761000	www.smc-france.fr	supportclient@smc-france.fr
Germany	+49 (0)61034020	www.smc.de	info@smc.de
Greece	+30 210 2717265	www.smchellas.gr	sales@smchellas.gr
Hungary	+36 23513000	www.smc.hu	office@smc.hu
Ireland	+353 (0)14039000	www.smcautomation.ie	sales@smcautomation.ie
Italy	+39 03990691	www.smcitalia.it	mailbox@smcitalia.it
Latvia	+371 67817700	www.smc.lv	info@smc.lv
Lithuania	+370 5 2308118	www.smclt.lt	info@smclt.lt
Netherlands	+31 (0)205318888	www.smc.nl	info@smc.nl
Norway	+47 67129020	www.smc-norge.no	post@smc-norge.no
Poland	+48 222119600	www.smc.pl	office@smc.pl
Portugal	+351 214724500	www.smc.eu	apoioclientept@smc.smces.es
Romania	+40 213205111	www.smcromania.ro	smcromania@smcromania.ro
Russia	+7 (812)3036600	www.smc.eu	sales@smcru.com
Slovakia	+421 (0)413213212	www.smc.sk	office@smc.sk
Slovenia	+386 (0)73885412	www.smc.si	office@smc.si
Spain	+34 945184100	www.smc.eu	post@smc.smces.es
Sweden	+46 (0)86031240	www.smc.nu	smc@smc.nu
Switzerland	+41 (0)523963131	www.smc.ch	info@smc.ch
Turkey	+90 212 489 0 440	www.smcturkey.com.tr	satis@smcturkey.com.tr
UK	+44 (0)845 121 5122	www.smc.uk	sales@smc.uk
South Africa	+27 10 900 1233	www.smcza.co.za	zasales@smcza.co.za

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