

Safety Standard ISO 13849-1 Applicable (Corresponding to Categories 3 and 4)

New



# Safe Exhaust Valve Modular Connection Type

\* The type without a pressure gauge and with digital pressure switch specification are UL certified. Refer to page 7 for details.

## Exhaust flow rate characteristics [L/min(ANR)]

**10,500** (VPX406-A3)

**13,000** (VPX406-A4)

**15,000** (VPX406-A6)

\* At 0.6 MPa

## Space saving & Lightweight

3 functions have been integrated.

Dual residual pressure  
release valve



Soft start-up  
valve



Main valve  
inconsistency detection

Modular connection  
is possible.

(AC30/40/50/60-D Series)



**VPX400 Series**



CAT.ES11-121A

# Safe Exhaust Valve/Modular Connection Type **VPX400 Series**

**3 functions** Dual residual pressure release valve + Soft start-up valve + Main valve inconsistency detection **have been integrated into one.**

**VPX406-A4**

**Compact**  
Volume **60%** reduction

**Lightweight**  
Weight **9%** reduction

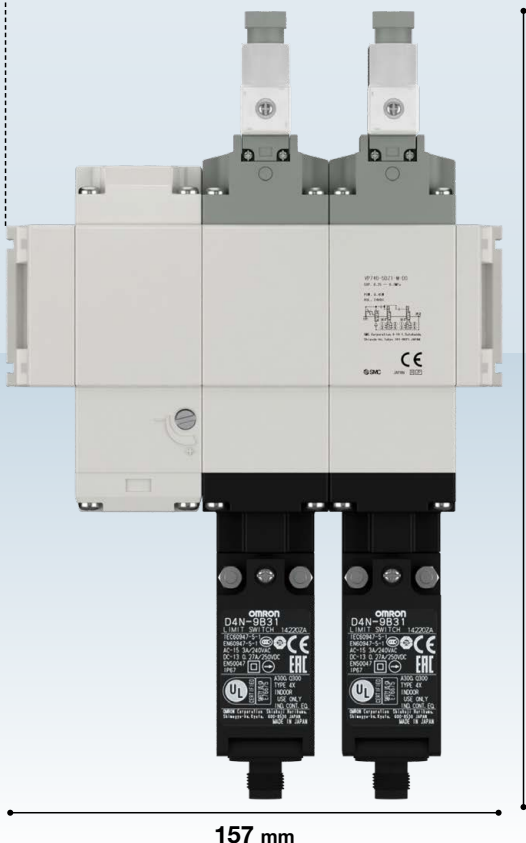
\* Compared with the VP746

Depth **91 mm (VPX406-A4)**  
**109 mm (VP746)**

**85 mm (54%) shorter**



**VP746**



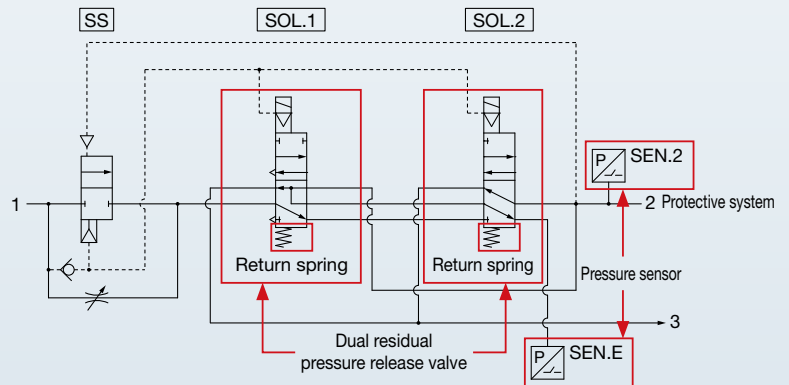
## Series variations

High flow rate: Approx. 3.0 times (AC30 connection) / Approx. 2.5 times (AC40 connection)

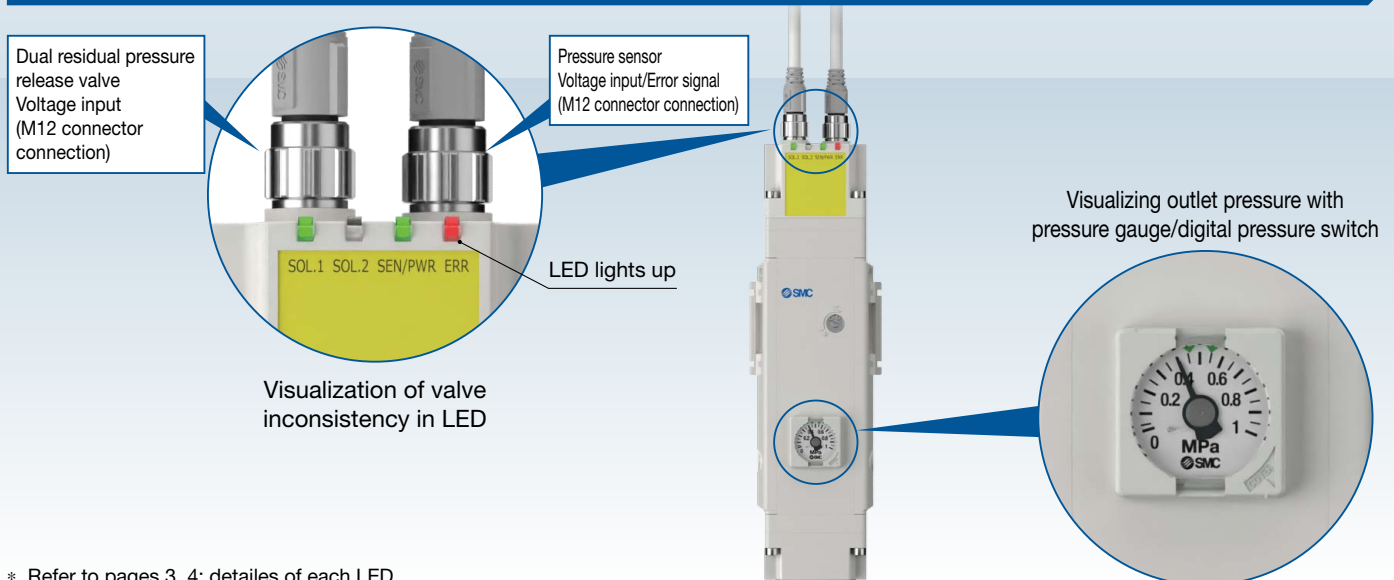
Series	Category	Compatible Max. PL	Connected AC size	Flow rate characteristics							Passage
				C[dm <sup>3</sup> /(s·bar)]							
				5	10	15	20	25	30	35	
Safe exhaust valve	3, 4	PL e	AC30	25.0							2 ⇒ 3 (A ⇒ R)
			AC40	31.0							
			AC50/60	35.8							
Residual pressure release valve VP546	3, 4	PL e	AC30	8.3							2 ⇒ 3 (A ⇒ R)
Residual pressure release valve VP746			AC40	12.3							

## Deliver protective system by “Safety Exhaust”

- Ensure exhaust (spring return) when power failure generation
- If one of the residual pressure release valves fails to operate, the other one releases the residual pressure.
- Built-in pressure sensor is used to detect inconsistencies of valve operations.



## Visualization in emergencies: Fault can be checked visually as well as by signal.



\* Refer to pages 3, 4: details of each LED

# SOL.1/SOL.2/SEN.E/SEN.2 input/output signal diagram

This valve is dual residual pressure release exhaust valve, and main valve position can be monitored by built-in pressure sensor to monitor to confirm the status of main valve inconsistency or normal operation. The table below shows the energizing status of the respective valve, sensor waveform, and 2 port pressure waveform.

SOL.1 (Valve 1) : 1st exhaust valve

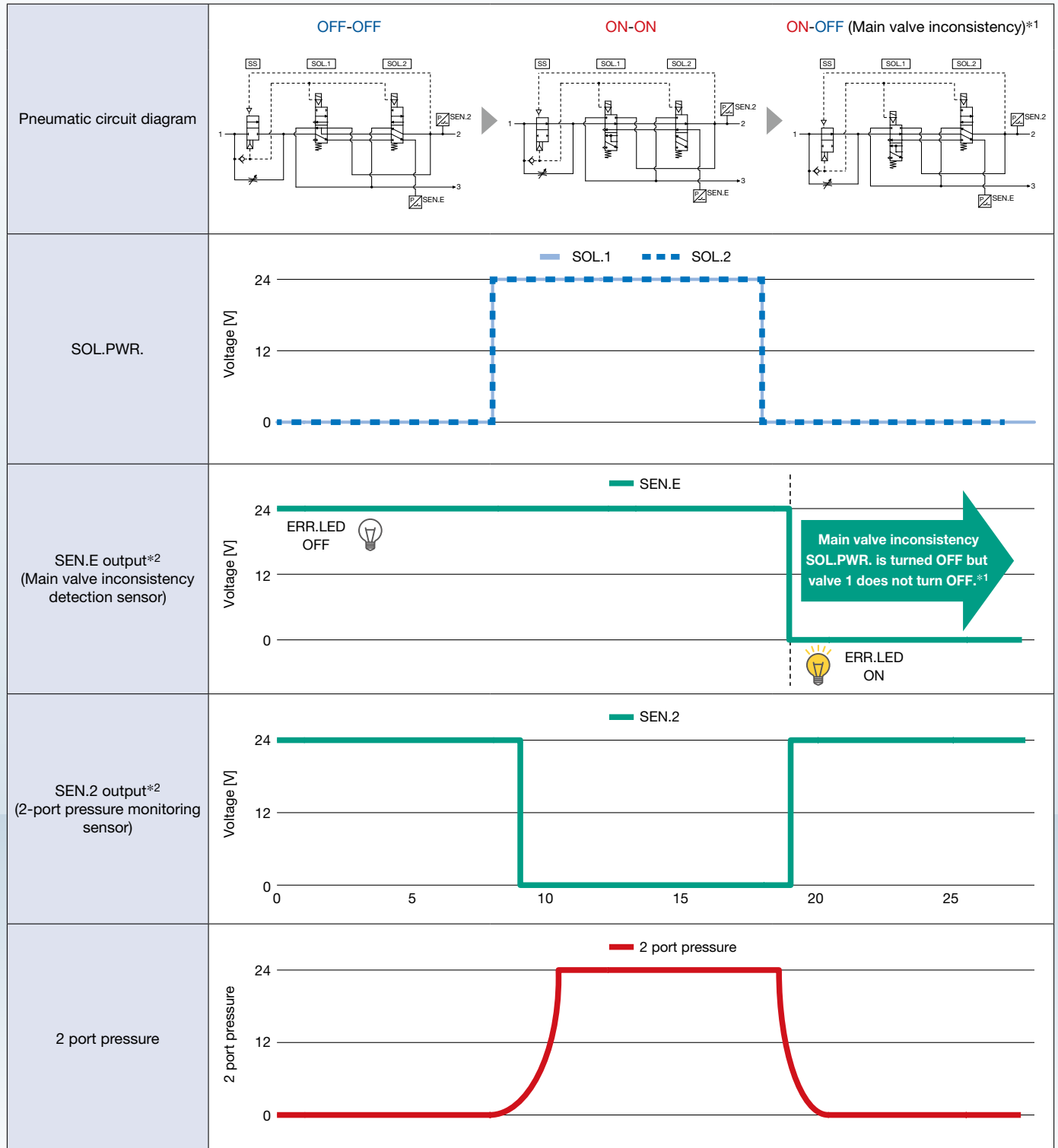
SOL.2 (Valve 2) : 2nd exhaust valve

Sensor E (SEN.E): Sensor to monitor the inconsistency status between two valves (SOL.1/SOL.2)

Sensor 2 (SEN.2): Sensor to monitor pressure in output port (2 port) of valve

Sensor Output Chart

Actuation	Valve energization		Pressure sensor output			
	SOL.1	SOL.2	SEN.E	ERR.LED	SEN.2	2 port pressure
Normal operation	OFF	OFF	ON	OFF	ON	OFF
	ON	ON	ON	OFF	OFF	ON
Main valve inconsistency	ON	OFF	OFF	ON	ON	OFF
	OFF	ON	OFF	ON	ON	OFF

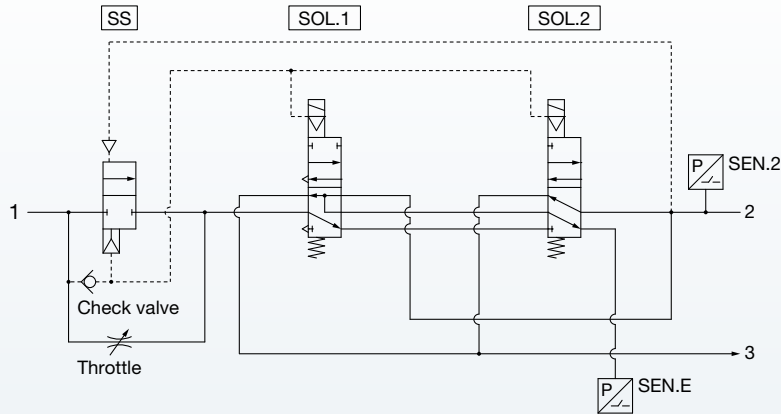


\*1 This assumes that SOL.1 (valve 1) does not OFF.

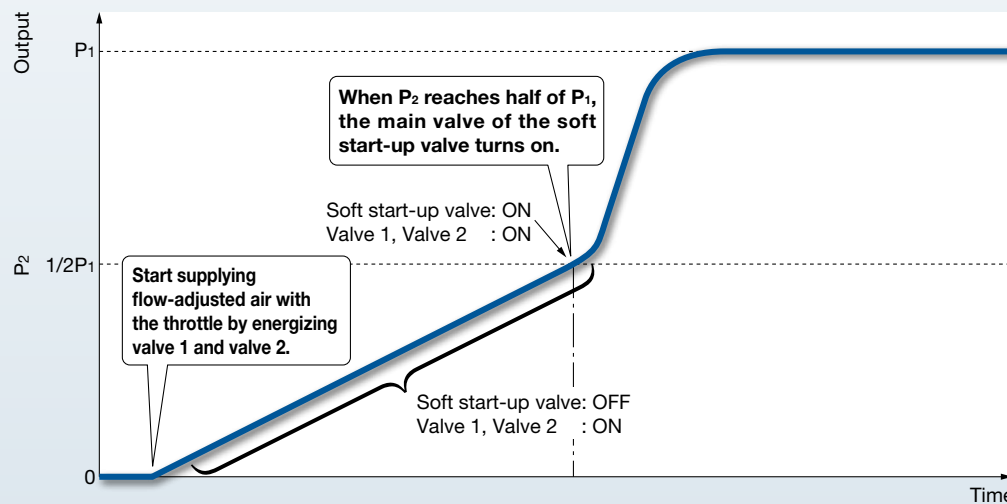
\*2 In SEN.E and 2, relation of pressure and output are inverted. When pressure is detected in SEN.E or 2, output of OUT stops.

## With soft start-up function & pilot flow path check valve

A function to gradually increase the initial pressure of the pneumatic system has been added.



Output Pressure ( $P_2$ ) vs Time Graph



Built-in check valve to the pilot flow path prevents the pilot pressure drop (to prevent false operation) by the inlet pressure fluctuation.

## Standards and Enclosure

Series	Category	Required performance level (Max.)	Standards						Soft start-up valve	Enclosure
			Machinery directive	2006/42/EC		CE/UKCA	UL/cUL	RoHS		
			Harmonized standards	EN ISO 13849-1: 2015	EN ISO 13849-2: 2012					
Safe exhaust valve <b>VPX406</b>	3, 4	PL e								IP65*1

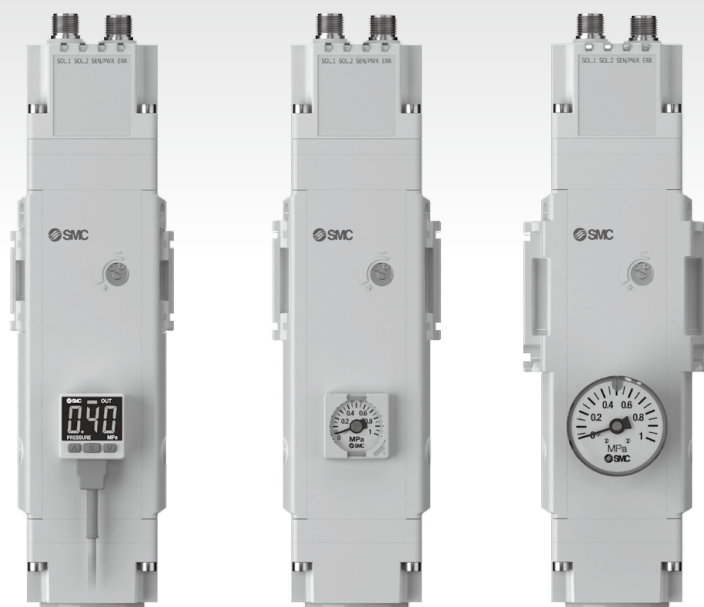
\*1 It is IP40 depending on the type of pressure gauge. For details, refer to the valve specifications.



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## Safe Exhaust Valve/Modular Connection Type **VPX400 Series**



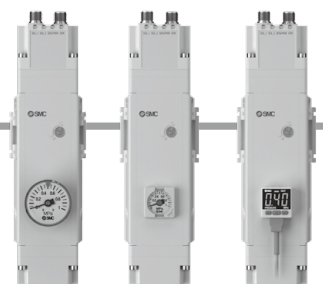
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# Safe Exhaust Valve/ Modular Connection Type VPX400 Series

## How to Order

VPX406 **K** **T** - **5** **KO** **NZ** - **D** **□** **□** - **A4** **□**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩



### ① Pressure specifications

<b>K</b>	High pressure (0.25 to 1.0 MPa)
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### ② Coil specifications

<b>T</b>	With power-saving circuit
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### ③ Rated voltage

<b>5</b>	24 VDC
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### ④ Electrical entry

<b>KO</b>	M12 connector, Without connector cable
<b>K</b>	With M12 connector, Cable length: 3000 mm

\* When option "K" (With M12 connector cable) is selected, 2 cables are included.

### ⑤ Light/surge voltage suppressor and common specification

<b>NZ</b>	With light/surge voltage suppressor Negative common
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### ⑥ Pressure sensor wiring specifications

<b>D</b>	Double common
<b>N1</b>	Negative common, Wiring type 1
<b>N2</b>	Negative common, Wiring type 2

\* They are not wiring specifications of pressure gauge type and digital pressure switch. Refer to pages 8 and 9.

### ⑦ Pressure gauge type

			UL-compliant
<b>Nil</b> *1	Pressure gauge	Without pressure gauge	○
<b>G</b> *2		Round type pressure gauge (with limit indicator)	—
<b>M</b> *2		Round type pressure gauge (with color zone)	—
<b>E</b>	Digital pressure switch	Square embedded type pressure gauge (with limit indicator)	—
<b>E1</b>		Output: NPN output, Electrical entry: Wiring bottom entry	○
<b>E2</b>		Output: NPN output, Electrical entry: Wiring top entry	○
<b>E3</b>		Output: PNP output, Electrical entry: Wiring bottom entry	○
<b>E4</b>	Output: PNP output, Electrical entry: Wiring top entry	○	

\*1 Without pressure gauge, pressure gauge connection thread is fitted with a plug.

\*2 Pressure gauge type G, M is included with pressure gauge.

### ⑧ Pressure gauge unit

		Pressure gauge type		
		Nil/M	G/E	E1 to E4
<b>Nil</b>	Pressure gauge in SI units: MPa	○	○	○
<b>Z</b> *1	Pressure gauge: MPa/psi dual scale	—	○	○
<b>ZA</b> *2	Digital pressure switch: With unit selection function	—	—	○

\*1 This product is for overseas use only according to the New Measurement Act. (The SI unit is provided for use in Japan.)

The digital pressure switch will be equipped with the unit selection function, setting to psi initially.

\*2 This product is for overseas use only according to the New Measurement Act. (The SI unit is provided for use in Japan.)

### ⑨ Connected AC size

Symbol	Connected AC size 1/2 port	Flow rate characteristics (2 ⇒ 3)		Port size 3 port
		C [dm <sup>3</sup> /(s·bar)]	b	
<b>A3</b>	AC30	25.0	0.20	G1"
<b>A4</b>	AC40	31.0	0.15	
<b>A6</b>	AC50/60	35.8	0.10	

### ⑩ Thread type

[Pressure gauge connection thread (1/8")]\*1

Symbol	Pressure gauge type		Nil/ G/M	E/E1 to E4
	Thread type			
<b>Nil</b>	Rc	△*2	○	
<b>N</b>	NPT	○*2	—	
<b>F</b>	G	△*2	—	

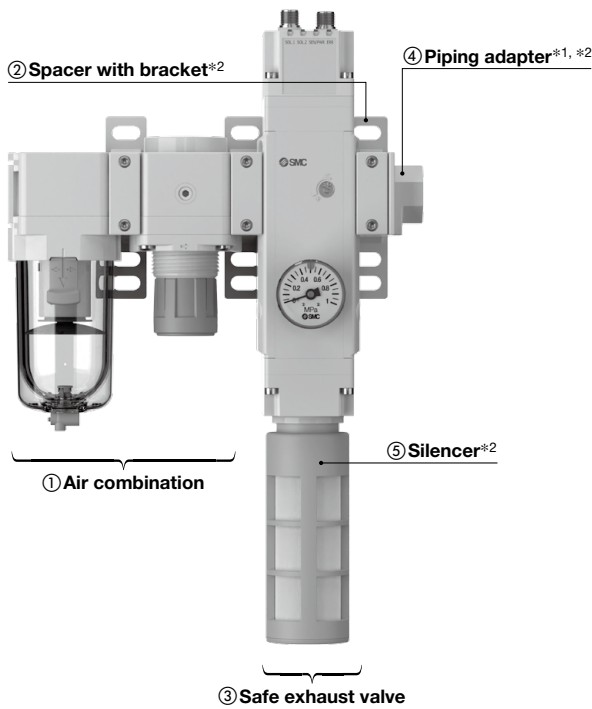
\*1 The thread is cut only when pressure gauge type "Nil," "G," or "M" is selected.

\*2 When "G" is selected for the pressure gauge type, and "Z" is selected for the pressure gauge unit, only "N" (NPT) is supported.

\* Port (exhaust port) is only G thread regardless of thread type.



## Assembly Example



- \*1 No connection thread in safe exhaust valve  
Order a piping adapter separately.
- \*2 Refer to page 15 for details on the spacer with bracket, piping adapter, and silencer.
- \* Combination with lubricator cannot be used.
- \* Between air combination and the safe exhaust valve, and between the safe exhaust valve and piping adapter, we recommend to install spacer with bracket to consider effect of moment, vibration, and impact.

**Products do not come assembled. They should be ordered separately and assembled by the customer.**

Please contact your local sales representative for more details.

### Assembly Example

- ① Air combination AC40B-04E-D ..... 1 pc.
- ② Spacer with bracket Y400T-D ..... 2 pcs.
- ③ Safe exhaust valve  
VPX406KT-5KONZ-DG-A4 ..... 1 pc.
- ④ Piping adapter E400-04-D ..... 1 pc.
- ⑤ Silencer INA-25-100 ..... 1 pc.

### Applicable Combinations/Attachment Part Nos.

Safe exhaust valve	Air combination		Spacer with bracket	Piping adapter	Silencer
	Model	Component			
VPX406-A3	AC30□-D	AF30-D	Y300T-D	E300-□03-D	INA-25-100
		AR30-D			
VPX406-A4	AC40□-D	AF40-D	Y400T-D	E400-□04-D	
		AR40-D			
VPX406-A6	AC50□-D	AF50-D	Y600T-D	E400-□06-D	
		AR50-D			
	AC60□-D	AF60-D			
		AR60-D			

# VPX400 Series

## Valve Specifications

Valve specifications	Fluid		Air		
	Type of actuation		N.C. (Spring return)*1		
	Operating pressure range		0.25 to 1.0 MPa		
	Proof pressure		1.5 MPa*2		
	Ambient and fluid temperatures		0 to 50°C (No freezing)		
	Humidity range		Operating/Stored: 35 to 85%RH (No condensation)		
	Max. operating frequency*3		1 Hz		
	Manual override		No		
	Pilot exhaust		Individual exhaust		
	Lubrication		Not possible		
	Mounting orientation		Unrestricted		
	Impact/Vibration resistance*4		150/30 m/s <sup>2</sup>		
	Enclosure	Pressure gauge type: Nil, G, M, E		IP65	
		Pressure gauge type: E1, E2, E3, E4		IP40	
	Operating environment		Indoors		
	Electrical wiring		M12 connector x 2 pcs.		
	Indicator light	SOL.1/SOL.2/SEN.PWR.*5		LED (Green)	
		ERR.*6		LED (Red)	
	Surge voltage suppressor		Diode		
	Polarity protection circuit		Yes		
B <sub>10D</sub>		1,083,893 cycles			
Coil specifications (SOL.)	Rated voltage		24 VDC		
	Allowable voltage fluctuation		Rated voltage	+10% -8%	
	Power consumption	Inrush		0.45 W x 2	
		Holding		0.2 W x 2	
Pressure sensor	Sensor E		For fault detection		
	Sensor 2		For 2 port output detection		
Fault detection specifications (SEN.)	Rated voltage		24 VDC		
	Allowable voltage fluctuation		±10% of the rated voltage with 10% voltage ripple or less		
	Power consumption		0.3 W x 2		
	Output type		PNP open collector output		
	Output mode		Hysteresis mode		
	Max. load current		80 mA		
	Internal voltage drop		1 V or less (at load current of 80 mA)		
	Short circuit protection		No		
Digital pressure switch (Pressure gauge type: E1/E2/E3/E4 selected)*7	Display/Smallest settable increment		0.01 MPa		
	Rated voltage		24 VDC		
	Allowable voltage fluctuation		±10% of the rated voltage with 10% voltage ripple or less		
	Output type		NPN or PNP open collector output		
	Repeatability		±1% F.S.		
	Display accuracy		±1% F.S. ±1 digit (at 25°C ±3°C)		
	Electrical wiring		M12 connector		

\*1 Soft-start valve is air return type.

\*2 Since proof pressure is hazard free pressure with no damage, do not apply a pressure more than operating pressure range. Malfunction or air leakage may result.

\*3 Duty ratio: 50%, With no load

\*4 Impact resistance: No malfunction occurred when it is tested 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)

\*5 SEN.PWR. lights up when 2 pressure sensors are energized simultaneously.

\*6 ERR. lights up when 2 spools are inconsistencies.

\*7 For other specifications, refer to the ISE35 series operation manual.

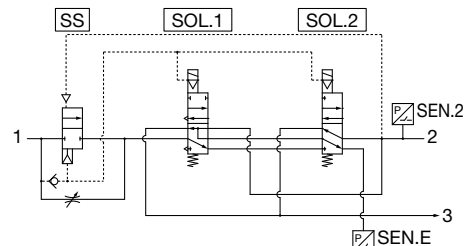
\* This valve is a large flow rate pilot-operated solenoid valve. If the operating pressure falls below 0.25 MPa due to a pressure drop caused by insufficient air supply, it may not be able to switch properly.

## Flow Rate Characteristics

Series	Flow rate characteristics				Weight [kg]
	1 → 2		2 → 3		
	C [dm <sup>3</sup> /(s·bar)]	b	C [dm <sup>3</sup> /(s·bar)]	b	
VPX406-A3	16.2	0.40	25.0	0.20	1.71
VPX406-A4	20.0	0.30	31.0	0.15	
VPX406-A6	22.6	0.25	35.8	0.10	1.81

\* Weight is when there is no M12 connector cable (V100-200-5-30). M12 connector cable weight (2 pcs.) = 0.4 kg

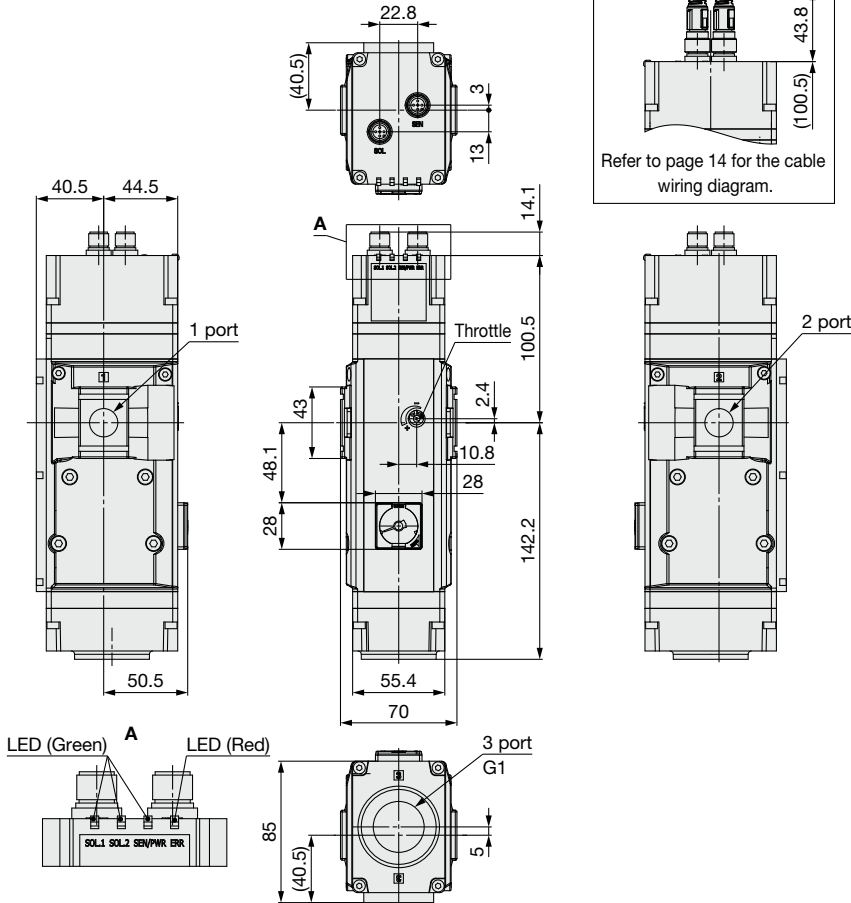
## Symbols



**Dimensions**

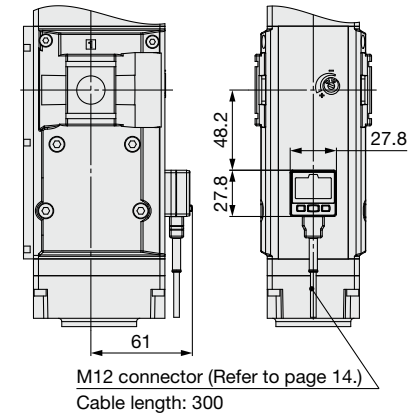
**VPX406KT-5KO□-□E□-A3**

Square embedded type pressure gauge



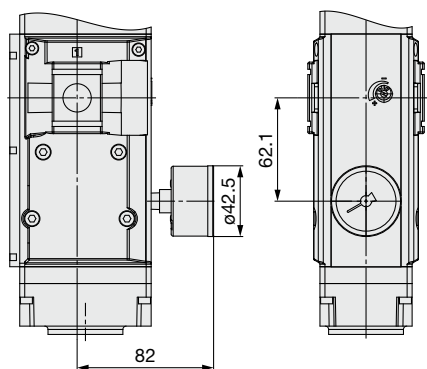
**VPX406KT-5KO□-□E<sup>1</sup><sub>E3</sub>□-A3**

Digital pressure switch/  
Electrical entry: Bottom entry



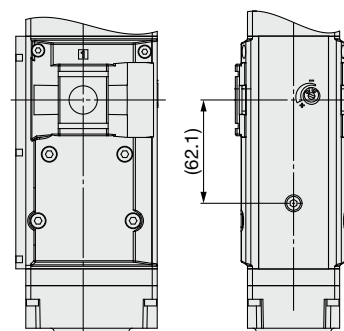
**VPX406KT-5KO□-□G<sub>M</sub>□-A3**

Round type pressure gauge



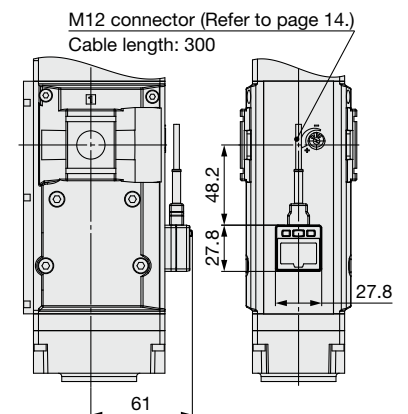
**VPX406KT-5KO□-□□-A3**

Without pressure gauge



**VPX406KT-5KO□-□E<sup>2</sup><sub>E4</sub>□-A3**

Digital pressure switch/  
Electrical entry: Top entry

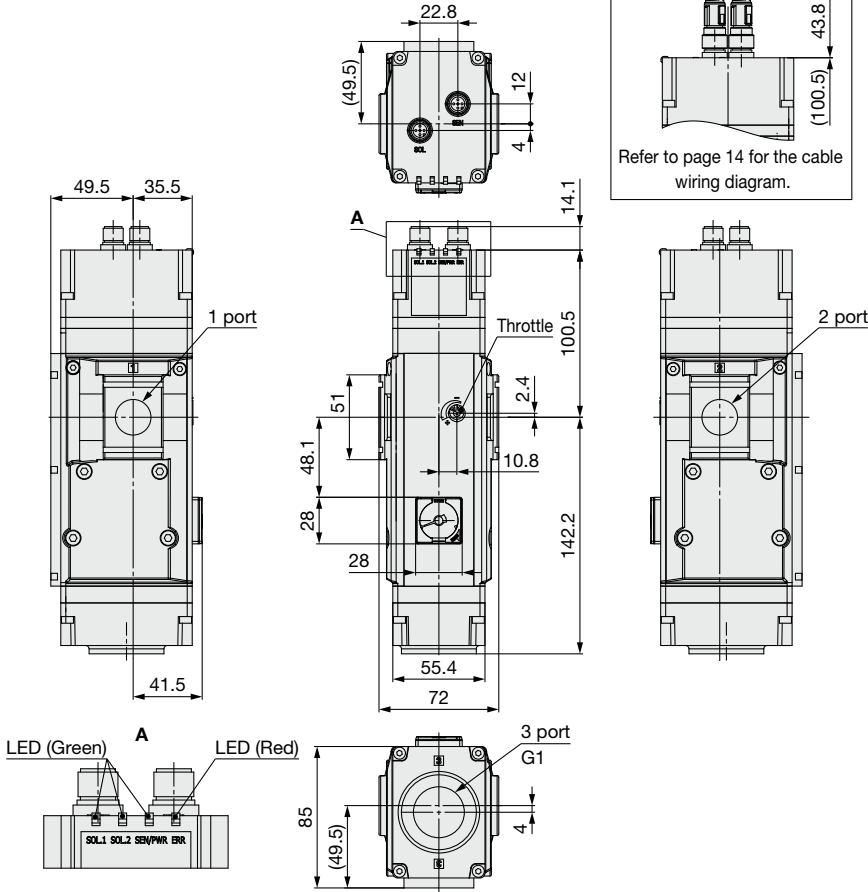


# VPX400 Series

## Dimensions

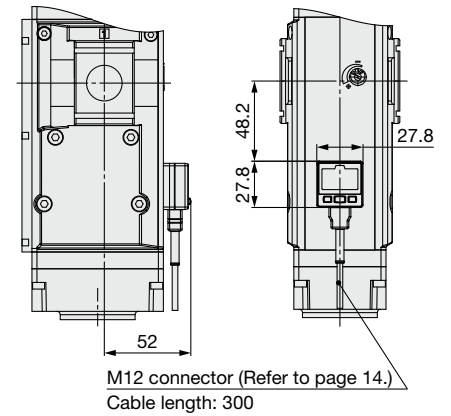
### VPX406KT-5KO□-□E□-A4

Square embedded type pressure gauge



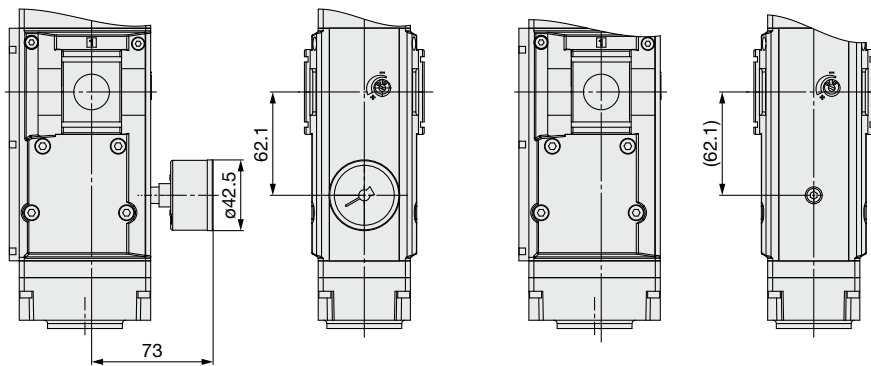
### VPX406KT-5KO□-□E<sub>3</sub>□-A4

Digital pressure switch/  
Electrical entry: Bottom entry



### VPX406KT-5KO□-□G<sub>M</sub>□-A4

Round type pressure gauge

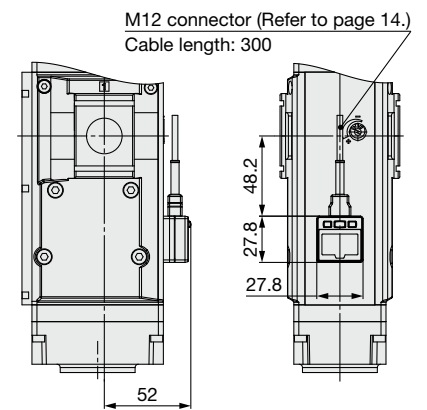


### VPX406KT-5KO□-□□-A4

Without pressure gauge

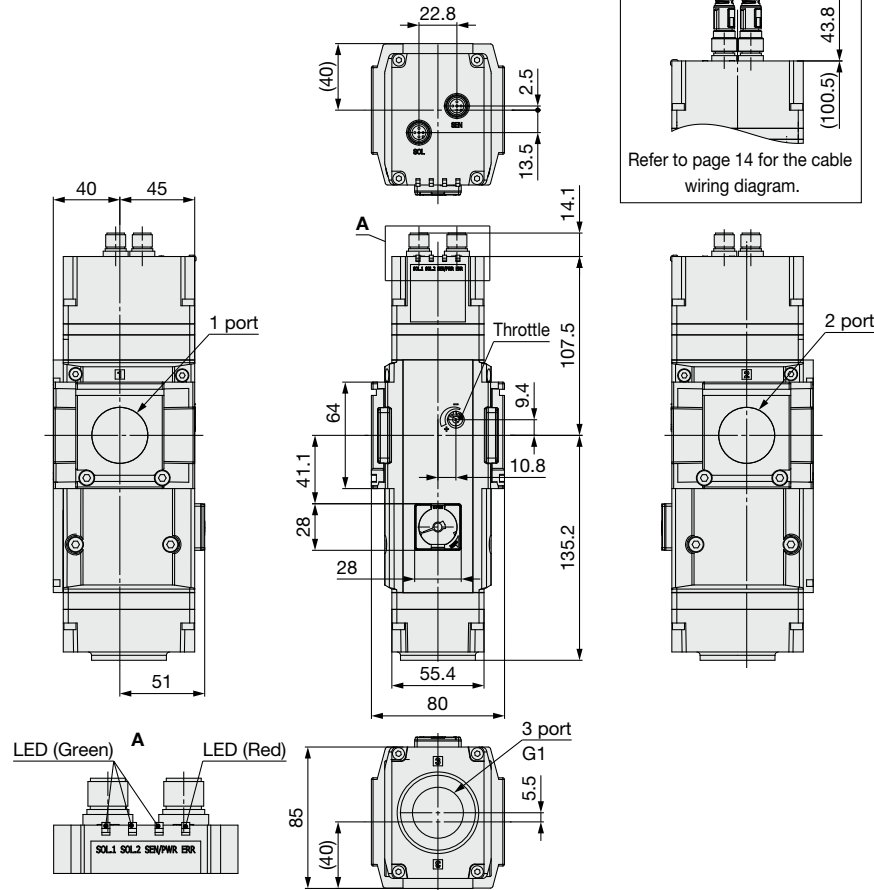
### VPX406KT-5KO□-□E<sub>4</sub>□-A4

Digital pressure switch/  
Electrical entry: Top entry

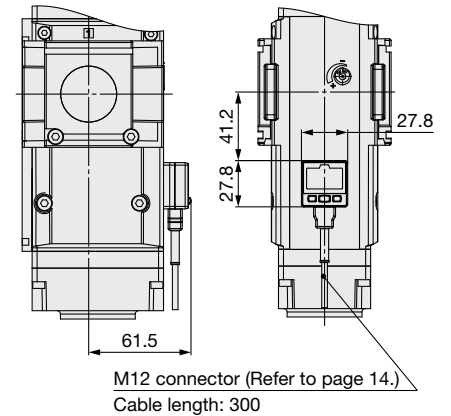


**Dimensions**

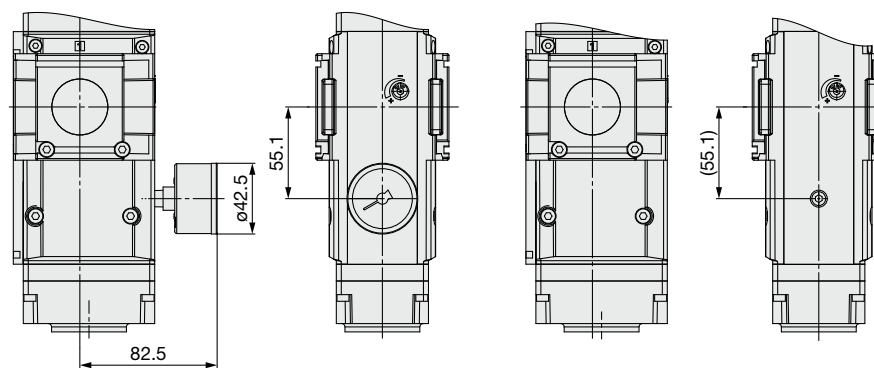
**VPX406KT-5KO□-□E□-A6**  
Square embedded type pressure gauge



**VPX406KT-5KO□-□E3□-A6**  
Digital pressure switch/  
Electrical entry: Bottom entry

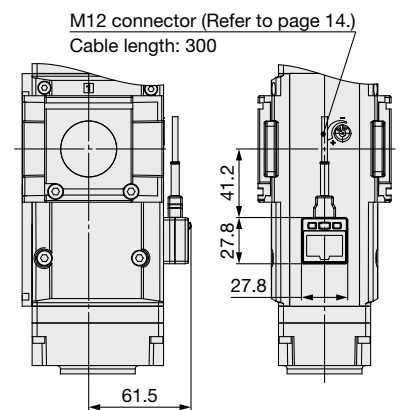


**VPX406KT-5KO□-□GM□-A6**  
Round type pressure gauge



**VPX406KT-5KO□-□□-A6**  
Without pressure gauge

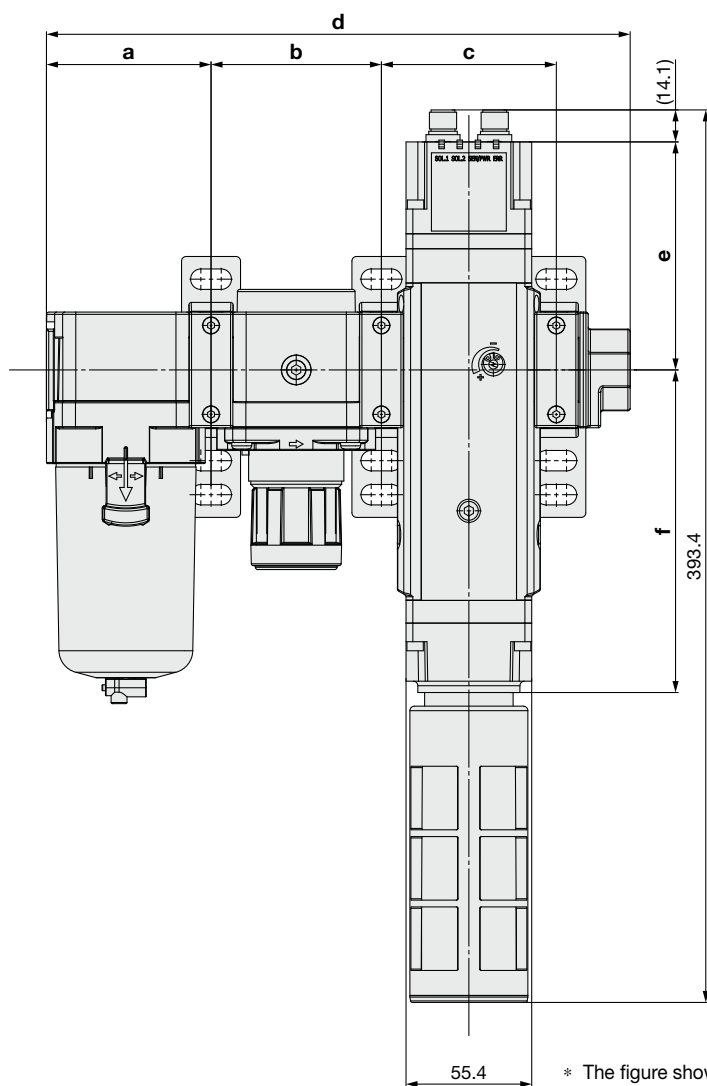
**VPX406KT-5KO□-□E2□-A6**  
Digital pressure switch/  
Electrical entry: Top entry



# VPX400 Series

## Dimensions

### Assembly drawing of VP406 and AC



\* The figure shows connection of VPX406-A4 and AC40.

Model	a	b	c	d	e	f	Note
VPX406KT-5□□-□□□-A3□	55.1	57.2	74.2	215.6	100.5	142.2	AC30B-03-D Y300T-D E300-03-D
VPX406KT-5□□-□□□-A4□	72.6	75.2	77.1	257.3	100.5	142.2	AC40B-04-D Y400T-D E400-04-D
VPX406KT-5□□-□□□-A6□	93.1	96.2	86.2	317.6	107.5	135.2	AC50B-10-D Y600T-D E600-10-D
	98.1	101.2	86.2	327.6	107.5	135.2	AC60B-10-D Y600T-D E600-10-D

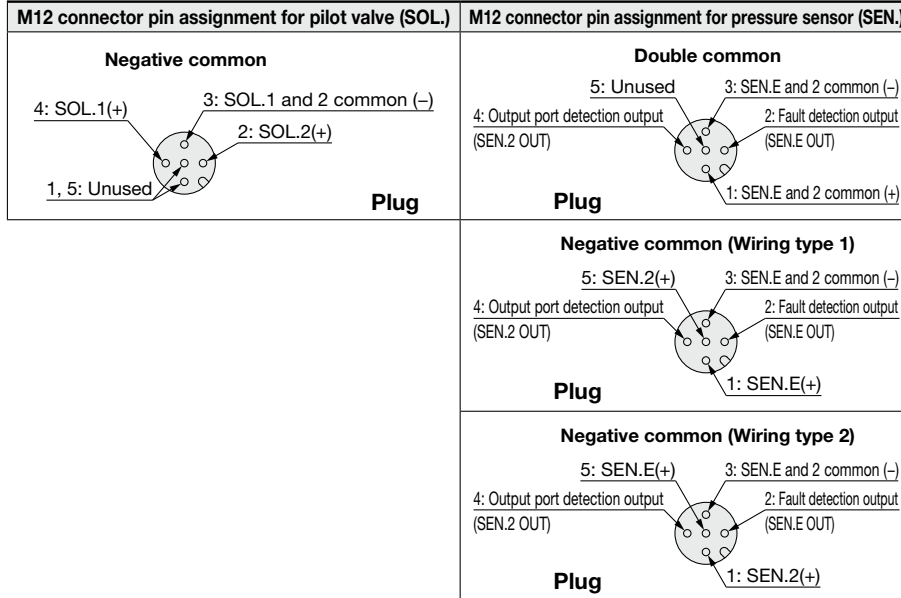
# VPX400 Series

# Valve Wiring Diagrams, Optional Accessories

For details on optional accessories, refer to the **Web Catalog**.

## Connector Cord Assembly for Pressure Switch

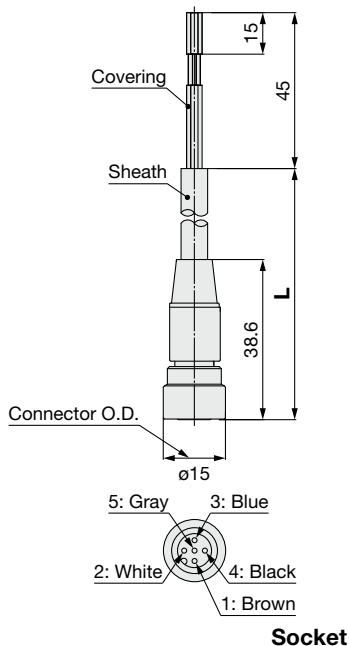
### Valve Wiring Diagrams



## M12 Connector Cable (For SOL., SEN., and Pressure switch)

For pressure switch (when E1, E2, E3, or E4 is selected)

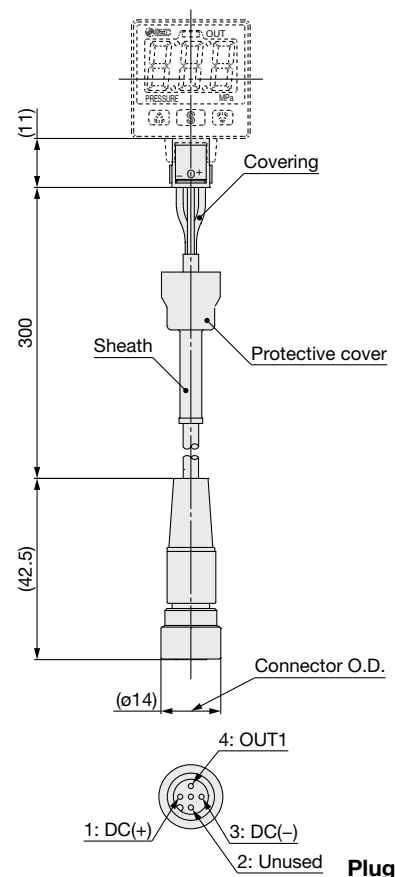
For SOL. and SEN.



Part no.	Lead wire length (L)
V100-200-5-10	1000 mm
V100-200-5-30	3000 mm
V100-200-5-50	5000 mm

\* The cable wiring numbers correspond to the wiring numbers in the valve wiring diagram above. Refer to the valve wiring diagram for wiring.

Sheath O.D.	φ6.5 mm
Cover diameter	φ1.8 mm
Conductor cross section	0.5 mm <sup>2</sup>



Sheath O.D.	φ3.4 mm
Cover diameter	φ1.16 mm
Conductor cross section	0.2 mm <sup>2</sup>

# VPX400 Series

## Spacer with Bracket

Y **300** T - D

①

Spacer with bracket  
(Y□T-D)



① Symbol	Connected AC size
300	A3 (AC30)
400	A4 (AC40)
600	A6 (AC50/60)

\* For specifications and dimensions, refer to the AC series catalog.

## Silencer

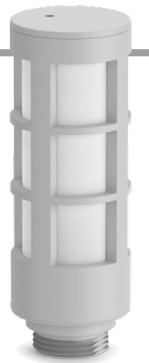
INA - 25 - 100

### Specifications

Fluid	Air
Max. operating pressure*1	1.0 MPa
Noise reduction	24 dB(A)*2
Ambient and fluid temperatures	0 to 50°C (No freezing)

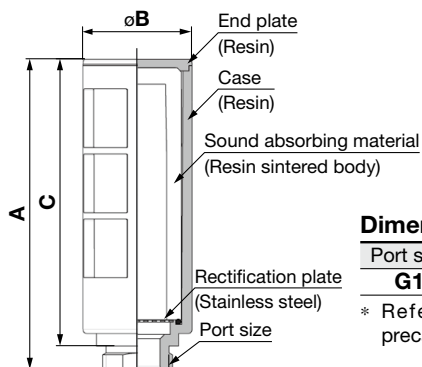
\*1 It indicates the inlet pressure of the valve.

\*2 The value may vary depending on the pneumatic circuit or pressure that is exhausted from the valve.



### Performance

Effective area [mm <sup>2</sup> ]	Sonic conductance C [dm <sup>3</sup> /(s·bar)]	Weight [g]
180	36	150



### Dimensions [mm]

Port size	A	B	C
G1	148.1	ø52	136.6

\* Refer to the AN series for precautions such as mounting.

## Piping Adapter: 1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2

· Using on the inlet side or the outlet side of the valve makes it easier to perform maintenance, as the component can be installed/removed without removing the piping.

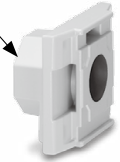
Port size

E **300** - □ **03** - D

①

②

③



	Symbol	Description	① Body size [Applicable AC size]		
			300 [AC30]	400 [AC40]	600 [AC50/60]
② Pipe thread type	Nil	Rc	●	●	●
	N	NPT	●	●	●
	F	G	●	●	●
+					
③ Port size	02	1/4	●	●	—
	03	3/8	●	●	—
	04	1/2	●	●	—
	06	3/4	—	●	●
	10	1	—	—	●
	12	1 1/4	—	—	●
14	1 1/2	—	—	●	




\* For specifications and dimensions, refer to the AC series catalog.



Safety standard ISO 13849-1 compliant.

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.

## Safety Instructions

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

\*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components  
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components  
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements  
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots 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 catalog 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. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.**
  1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
  2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits\*2), press clutches, brake circuits\*2), safety equipment\*2), etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
  3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

\*2) Except for machinery safety in factory automation applications

### Caution

**We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.**  
**Use in non-manufacturing industries is not covered.**  
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.  
The new Measurement Act prohibits use of any unit other than SI units in Japan.

### 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.\*3)  
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 catalog for the particular products.  
**\*3) 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.

 **Safety Instructions** Be sure to read the “Handling Precautions for SMC Products” (M-E03-3) and “Operation Manual” before use.

**SMC Corporation**