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

# Safety Exhaust Valve Modular Connection Type

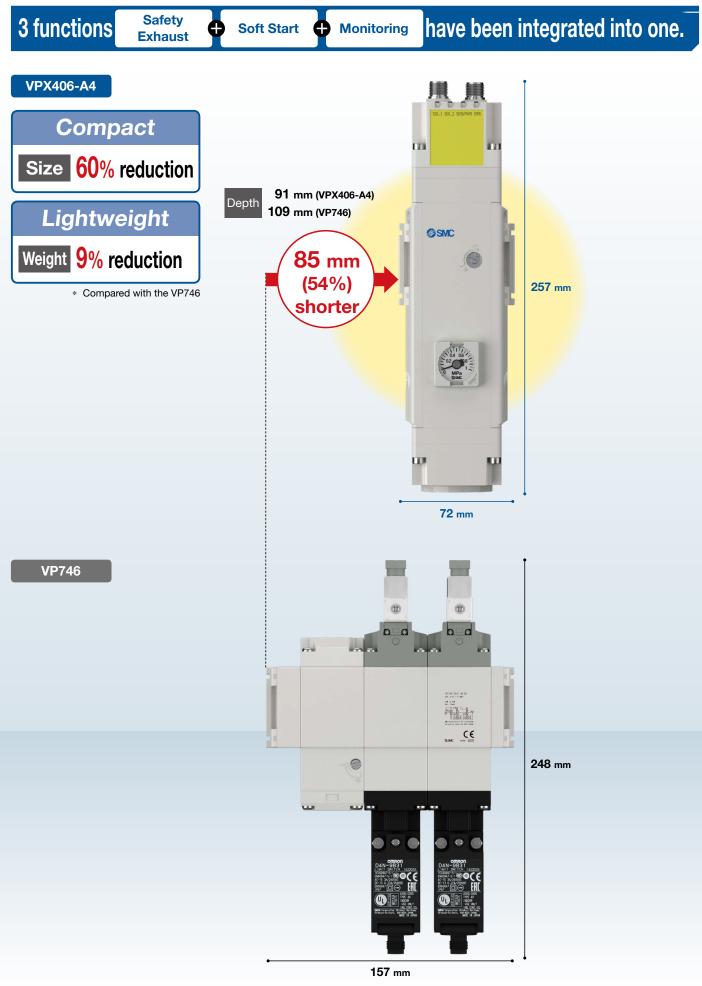
\* The type without a pressure gauge and with digital pressure switch specification are UL certified. Refer to page 7 for details.







# Safety Exhaust Valve/Modular Connection Type VPX400 series



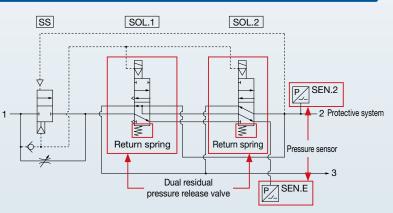
# **Series variations**

#### Max. PL AC size VPX406-A3 AC30 25.0 (AC30 connection) Safety VPX406-A4 $2 \Rightarrow 3$ 31.0 3, 4 PL e AC40 exhaust (AC40 connection) $(A \Rightarrow R)$ 1 valve VPX406-A6 AC50/ 35.8 (AC50/60 connection) 8 60 ·\*\* Residual pressure release valve a a 8.3 AC30 VP546 $2 \Rightarrow 3$ 3.4 PL e $(A \Rightarrow R)$ Residual pressure release valve AC40 12.3 **VP746**

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

# System protection through "Safety Exhaust" function

- Valves return to de-energised position via spring force in the case of power loss.
- If one of the residual pressure release valves fails to operate, the other one releases the residual pressure.
- Built in pressure sensor monitors valve operations.



# Display of monitoring status: Fault can be checked visually as well as by signal.



**SMC** 

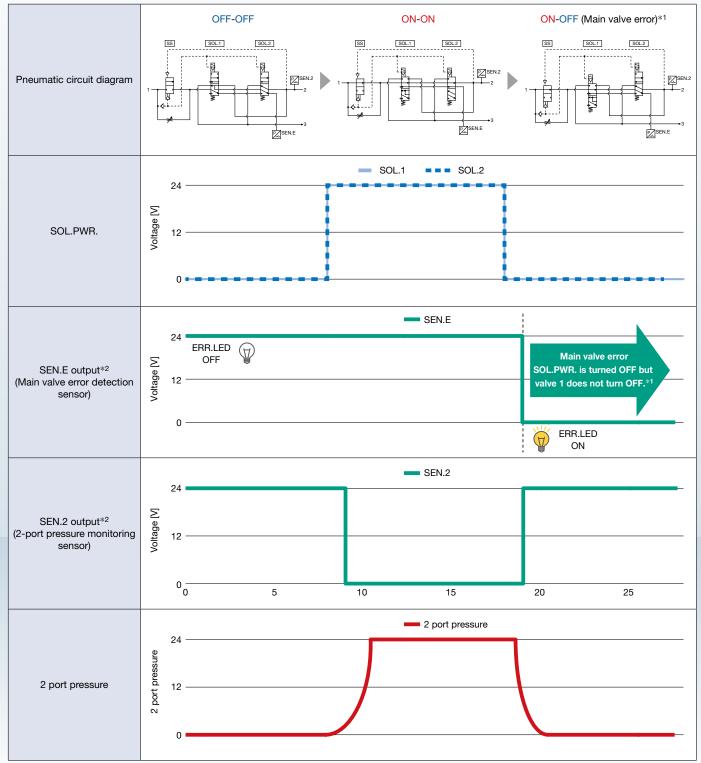
# SOL.1/SOL.2/SEN.E/SEN.2 input/output signal diagram

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 error 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 error 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 or outpu SEN.E SEN.2 Actuation SOL.1 SOL.2 ERR.LED 2 port pressure OFF OFF ON OFF ON OFF Normal operation ON ON OFF ON OFF ON OFF Main valve ON OFF ON ON OFF error OFF ON OFF ON ON OFF

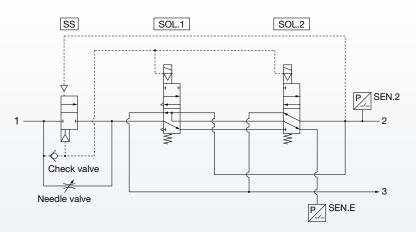


\*1 This assumes that SOL.1 (valve 1) does not OFF.

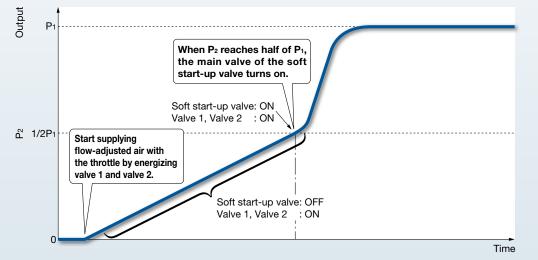
\*2 In SEN.E and SEN.2, relation of pressure and output are inverted. When pressure is detected in SEN.E or SEN.2 their output signal is 0 V

# 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 (P2) vs Time Graph

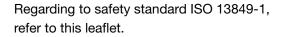


Built-in check valve to the pilot flow path prevents the pilot pressure drop. (to prevent malfunction due to inlet pressure fluctuation)

# **Standards and Enclosure**



\*2 It is IP40 depending on the type of pressure gauge. For details, refer to the valve specifications.





# **SMC**

# CONTENTS

# Safety Exhaust Valve/Modular Connection Type VPX400 Series



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Dimensions	p. 10
Valve Wiring Diagrams, Optional Accessories	·····p. 14

# Safety Exhaust Valve/ Modular Connection Type VPX400 Series

How to Order





#### Pressure specifications

K High pressure (0.25 to 1.0 MPa)

2 Coil specifications

T With power-saving circuit

### 4 Electrical entry

КО	M12 connector, Without connector cable
Κ	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

 with light/surge voltage suppressor

 NZ
 With light/surge voltage suppressor

# 3 Rated voltage

24 VDC

### 6 Pressure sensor wiring specifications

-	<b>U</b> .
D	Double common
N1	Negative common, Wiring type 1
N2	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 Press	sure gauge	type	UL-compliant
Nil*1		Without pressure gauge	0
<b>G</b> *2	Pressure	Round type pressure gauge (with limit indicator)	—
M*2 gauge		Round type pressure gauge (with color zone)	-
E		Square embedded type pressure gauge (with limit indicator)	_
E1		Output: NPN output, Electrical entry: Wiring bottom entry	0
E2	Digital	Output: NPN output, Electrical entry: Wiring top entry	0
E3	pressure switch	Output: PNP output, Electrical entry: Wiring bottom entry	0
E4		Output: PNP output, Electrical entry: Wiring top entry	0

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

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

		Pressure gauge type			
8 Pre	essure gauge unit	Nil/M	G/E	E1 to E4	
Nil	Pressure gauge in SI units: MPa	0	0	0	
<b>Z</b> *1	Pressure gauge: MPa/psi dual scale	—	0	0	
<b>ZA</b> *2	Digital pressure switch: With unit selection function	—	_	0	

\*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.)

### Onnected AC size

Symbol	Connected AC size 1/2 port	Flow rate characteristics $(2 \Rightarrow 3)$		Port size 3 port	
	1/2 0011	C [dm³/(s·bar)]	b	0 001	
A3	AC30	0 25.0 0.20			
A4	AC40	31.0	0.15	G1"	
A6	AC50/60	35.8	0.10		

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

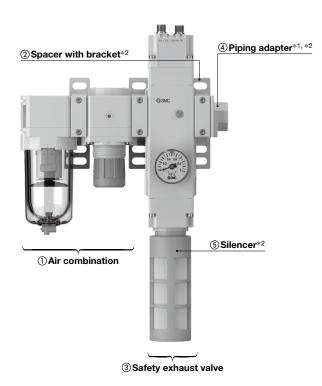
Symbol	Pressure gauge type Thread type	Nil/ G/M	E/E1 to E4
Nil	Rc	∆*2	0
Ν	NPT	O*2	_
F	G	∆*2	_

\*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 safety 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 safety exhaust valve, and between the safety 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 –

①Air combination AC40B-04E-D ······1 pc.
② Spacer with bracket Y400T-D ······2 pcs.
③Safety 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.

Safety	Air combination		Spacer with	Piping	Cilonaan
exhaust valve	Model	Component	bracket	adapter	Silencer
VPX406-A3		AF30-D	Y300T-D	E300-□ 03-D	INA-25- 100
VPA400-A3	AC30□-D AR3	AR30-D			
VPX406-A4	AC40□-D	AF40-D	Y400T-D	E400-□ 04-D	
		AR40-D			
	AC50□-D -	AF50-D	Y600T-D	E400-□ 06-D	
VPX406-A6		AR50-D			
		AF60-D			
		AR60-D			

### **Valve Specifications**

	ï				
	Fluid		Air		
				· · · ·	
Valve specifications (SOL.) Fault detection (SOL.) Fault detection (SOL.) Fault detection (SOL.) Pr Rait All pressure Switch (Pressure Selected)*7					
		emperatures			
		quency <sup>*3</sup>	11	Hz	
			N	0	
	Pilot exhaust		Individua	l exhaust	
Valva	Lubrication		Not po	ossible	
	alve pecifications         Mounting orientation         Unrestricted           Impact/Vibration resistance*4         150/30 m/s <sup>2</sup> Enclosure         Pressure gauge type: E1, E2, E3, E4         IP65           Pressure gauge type: E1, E2, E3, E4         IP40           Operating environment         Indoors           Electrical wiring         M12 connector x 2 pcs.           Indicator light         SOL1/SOL.2/SEN.PWR.*5         LED (Green)           Electrical wiring         ERR.*6         LED (Red)           Surge voltage suppressor         Diode           Polarity protection circuit         Yes           Bro         1,083,893 cycles           Bro         1,083,893 cycles           Allowable voltage         ±10%           VOL         -a%6           OOL)         Pressure sensor           Pressure sensor         Sensor E           Sensor 2         For 2 port output detection           Sensor 2         For 2 port output detection           Power consumption         0.3 W × 2           Output type         PNP Open collector output           Output type         PNP Open collector output           Notable voltage fluctuation         ±10% of the rated voltage rinple or less           Power consump	tricted			
opeenioudene	Impact/Vibration re	esistance*4	150/30	0 m/s <sup>2</sup>	
	Enclosure	Pressure gauge type: Nil, G, M, E	IP	65	
	Pressure gauge type: E1, E2, E3, E4		IP	40	
	Operating environment		Indo	oors	
	Electrical wiring		M12 connec	ctor x 2 pcs.	
	Indicator light	SOL.1/SOL.2/SEN.PWR.*5	LED (0	Green)	
	indicator light	ERR.*6	LED	(Red)	
	Surge voltage suppressor		Diode		
	Polarity protection circuit				
	<b>B</b> 10D		1,083,89	13 cycles	
Coil	Rated voltage		24 \	/DC	
	Allowable voltage fluctuation		Pated voltage	+10%	
	Allowable voltage i		hated voltage	-8%	
(SOL.)	Power	a of actuation	0.45	W x 2	
Valve specifications	consumption	Holding	0.2 V	V x 2	
	Prossure concor	Sensor E	For fault	detection	
	Fiessure sensor	Sensor 2	0.25 to 1.0 MPa           1.5 MPa*2           0 to 50°C (No freezing)           Operating/Stored: 35 to 85%RH (No condensation)           1 Hz           No           Individual exhaust           Not possible           Unrestricted           150/30 m/s²           M, E           1965           E3, E4           Individual exhaust           M12 connector x 2 pcs.           LED (Green)           LED (Red)           Diode           Yes           1,083,893 cycles           24 VDC           Rated voltage           +10%           Rated voltage           -8%           0.2 W x 2           For fault detection           24 VDC           +10% of the rated voltage with 10% voltage ripple or le           0.3 W x 2           PNP open collector output           Hysteresis mode           80 mA           1 V or less (at load current of 80 mA)           1 V or less (at load current of 80 mA)           No           0.01 MPa           24 VDC	put detection	
	Rated voltage		24 \	/DC	
			$\pm 10\%$ of the rated voltage wi	th 10% voltage ripple or less	
	Power consumptio	n	0.3 V	V x 2	
	Output type		1 Hz         No         Individual exhaust         Not possible         Unrestricted         150/30 m/s²         3, M, E         IP65         E3, E4         Indoors         M12 connector x 2 pcs.         LED (Green)         LED (Red)         Diode         Yes         1,083,893 cycles         24 VDC         Rated voltage         +10%         Rated voltage         -8%         0.45 W x 2         0.2 W x 2         For fault detection         For fault detection         For 2 port output detection         24 VDC         ±10% of the rated voltage with 10% voltage ripple or less         0.3 W x 2         PNP open collector output         Hysteresis mode         80 mA         1 V or less (at load current of 80 mA)         No         0.01 MPa         24 VDC         ±10% of the rated voltage with 10% voltage ripple or less         No         0.01 MPa         24 VDC         ±10% of the rated voltage with 10% voltage ripple or less         NPN or	llector output	
	Output mode		Hysteresis mode		
			80 mA		
	Internal voltage dro	ор	1 V or less (at load current of 80 mA)		
	Short circuit protect	ction	N	0	
Digital		ettable increment			
switch		fluctuation	-		
			NPN or PNP open collector output		
			±1% F.S.		
	Display accuracy		±1% F.S. ±1 digit (at 25°C ±3°C)		
selecteuj	Electrical wiring		M12 co	nnector	

\*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.

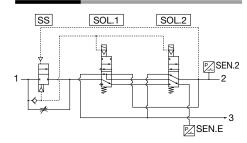
\* This valve is a large flow rate pilot-operated solenoid valve. If the operating pressure falls below 0.25 MPa due to a pressure drop caused by insufficient air supply, it may not be able to switch properly.

### **Flow Rate Characteristics**

	Flow rate characteristics				
Series	1 → 2	$1 \rightarrow 2$ $2 \rightarrow 3$		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	1.71
VPX406-A6	22.6	0.25	35.8	0.10	1.81

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

### Symbols

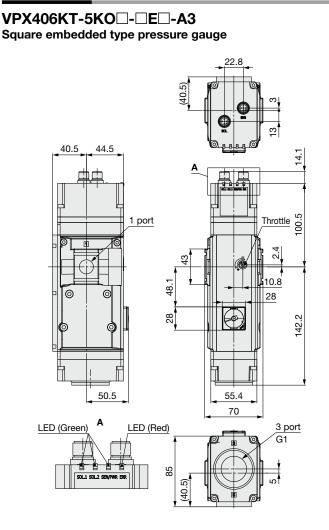


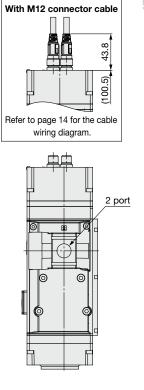
9



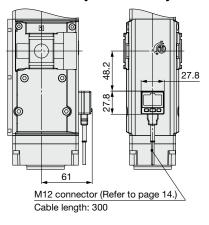
# Safety Exhaust Valve/Modular Connection Type VPX400 Series

### Dimensions

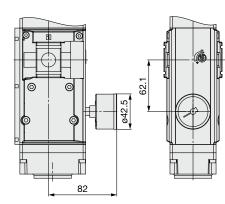




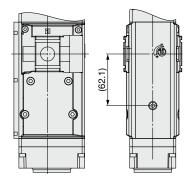




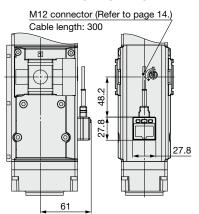
VPX406KT-5KO□-□<sup>G</sup><sub>M</sub>□-A3 Round type pressure gauge



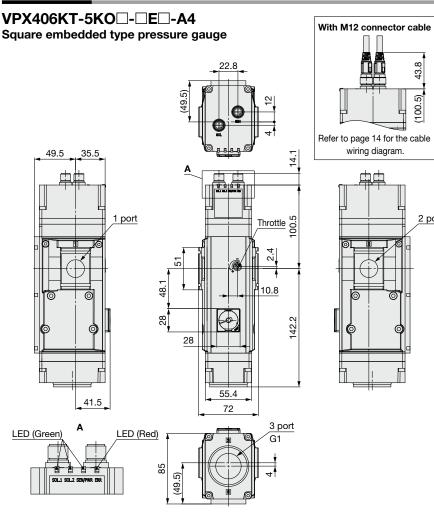
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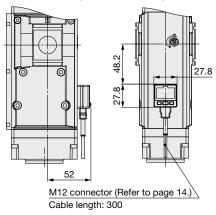


### **Dimensions**

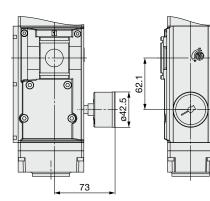


ŪŸŌ

Digital pressure switch/ Electrical entry: Bottom entry



VPX406KT-5KOD-DGMD-A4 Round type pressure gauge



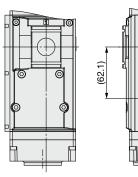
#### Without pressure gauge

ĪĒ

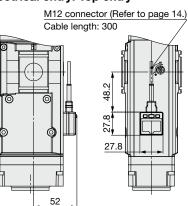
43.8

(100.5)

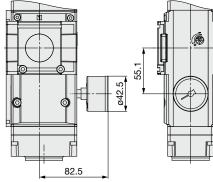
2 port

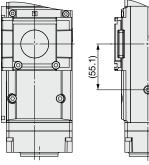


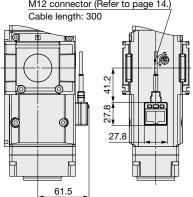
#### Digital pressure switch/ **Electrical entry: Top entry**



#### Dimensions VPX406KT-5KOD-DED-A6 With M12 connector cable Square embedded type pressure gauge ŪŸŌ 43.8 22.8 40) 2 (100. Refer to page 14 for the cable wiring diagram. 40 45 4. 山中 Throttle 20 2 port 1 port 4 2 **VPX406KT-5KO**□-□**E**<sup>1</sup><sub>3</sub>□-A6 Digital pressure switch/ 10.8 4 0 **Electrical entry: Bottom entry** 8 135.2 Ø 28 27.8 41.2 ľ Ħ 55.4 51 ω 2 80 Ĥ 3 port Α LED (Green) LED (Red) G1 5.5 Τ F 85 61.5 (40) 6 M12 connector (Refer to page 14.) Cable length: 300 VPX406KT-5KO□-□₽2□-A6 Digital pressure switch/ Round type pressure gauge Without pressure gauge **Electrical entry: Top entry** M12 connector (Refer to page 14.) Cable length: 300

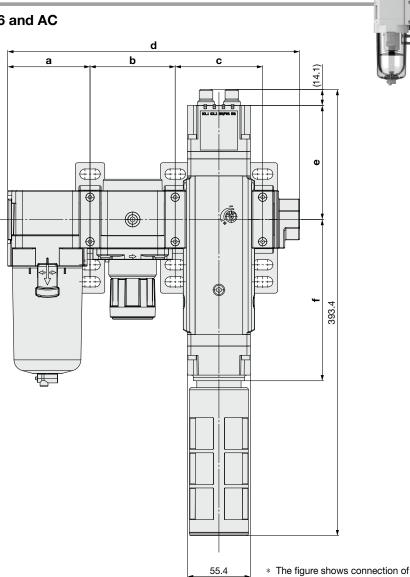






## Dimensions

Assembly drawing of VP406 and AC



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

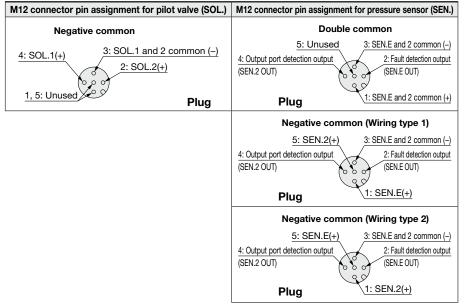
Model	а	b	С	d	е	f	Note
VPX406KT-5	55.1	57.2	74.2	215.6	100.5	142.2	AC30B-03-D Y300T-D E300-03-D
VPX406KT-5	72.6	75.2	77.1	257.3	100.5	142.2	AC40B-04-D Y400T-D E400-04-D
VPX406KT-5	93.1	96.2	86.2	317.6	107.5	135.2	AC50B-10-D Y600T-D E600-10-D
	98.1	101.2	86.2	327.6	107.5	135.2	AC60B-10-D Y600T-D E600-10-D

# VPX400 Series Valve Wiring Diagrams, Optional Accessories

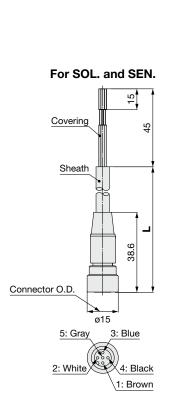
For details on optional accessories, refer to the Web Catalog.

### **Connector Cord Assembly for Pressure Switch**

#### Valve Wiring Diagrams



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



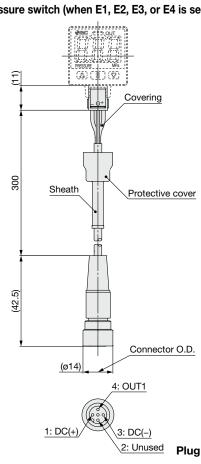
Socket

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.	ø6.5 mm
Cover diameter	ø1.8 mm
Conductor cross section	0.5 mm <sup>2</sup>

**SMC** 

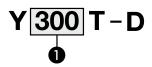


Sheath O.D.	ø3.4 mm
Cover diameter	ø1.16 mm
Conductor cross section	0.2 mm <sup>2</sup>

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

14

### Spacer with Bracket



Spacer with bracket (Y□T-D)

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.

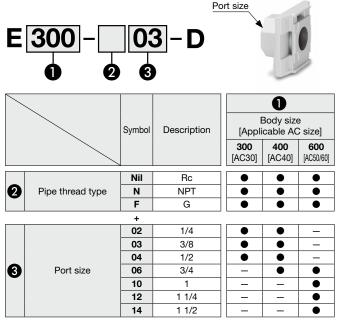
#### Performance

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

	ØB     End plate       (Resin)       Case       (Resin)       Sound absorbing material       (Resin sintered body)							
<ul> <li></li> </ul>			Dimensi	ons		[mm]		
			Port size	Α	В	С		
		Rectification plate	G1	148.1	ø52	136.6		
	(Stainless steel) Port size	* 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

 $\cdot$  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.



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

# ▲ 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)<sup>\*1</sup>, and other safety regulations.

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.

## **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.
  - 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.

- 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

#### \*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.

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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

- The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.<sup>\*3)</sup> 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.

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

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4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN Phone: 03-5207-8249 Fax: 03-5298-5362 https://www.smcworld.com © 2024 SMC Corporation All Rights Reserved