# Direct Air Operated 2 Port Valve Series VXA21/22 For Air, Gas, Vacuum, Water and Oil



# Normally Closed (N.C.)/Normally Open (N.O.)



### **Construction/Components**



#### Normally open (N.O.)



No	Description	Ivialerial			
INO.	Description	Standard	Option		
1	Body	Brass	Stainless steel		
0	Valve	Stainless steel, Brass,	Stainless steel		
2	assembly	NBR, Polyacetal	FPM/EPR		
3	Piston assembly	Polyacetal/NBR	_		
4	Piston spring	Stainless steel	_		
5	Pilot cover	Aluminium	_		
6	O ring	NBR	FPM/EPR		

### **Applicable Fluids**

Standard	Option (1)
Nater (Standard, Up to 40°C)	Vacuum (Up to 10 <sup>-3</sup> Torr)······(V, M)
Air (Standard, dry), Turbine oil	Non-leak (10 <sup>-5</sup> atm cc/sec or less)······(V, M)
/acuum (Up to 1 Torr)	
Carbon dioxide (CO <sub>2</sub> ), Nitrogen gas(N <sub>2</sub> )	
Freon11, 113, 114	

Note 1) Refer to p.4.0-12 "Applicable Fluid Check List" for detail of a special fluid out of the standard and the option specifications.

Option (1)

#### **Model/Valve Specifications**

Port size Rc(PT)	Orifice size (mmø)	Flo Cv	w rate Effective area (mm <sup>2</sup> )	Model	Max.operating presure differential (MPa)	Max. system pressure (MPa)	Proof pressure (MPa)	Weight (g)												
1/8	3	0.33	6	VXA2120	1.0															
(6A)	4.5	0.61	11	VXA2130	0.5			170												
	3	0.33	6	VXA2120	1.0	1.0		170												
1/4 (8A) 6	1 E	5 0.61	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	11	VXA2130	0.5	1.0		
	4.5			VXA2230	1.0			050												
	6	1.05	19	VXA224 <sup>2</sup>	0.6			250												
	8	1.7	31	VXA225 <sup>2</sup>	0.2	0.4	4.5	0.40												
	10	1.9	34	VXA226 <sup>2</sup>	0.1	0.4	1.5	340												
	4.5	0.61	11	VXA2230	1.0	4.0		050												
3/8	6	1.05	19	VXA224 <sup>2</sup>	0.6	1.0		250												
(10A)	8	1.7	31	VXA225 <sup>2</sup>	0.2			0.40												
	10	2.4	43	VXA226 <sup>2</sup>	0.1	0.4		340												
1⁄2 (15A)	10	2.4	43	VXA226 <sup>2</sup>	0.1			420												

Note) Refer to p.4.0-14 the glossary for detail of max. operating pressure differential and max. system pressure.

### **Ambient and Fluid Temperature**

		Ambient				
Temperature	Water	Air	Oil	Vacuum (3)	temperture	
	(Standard)	(Standard)	(Standard)	(V, M)	°C	
Max.	40	60	40	40	40	
Min.	1	-5 (1)	-5 (2)	-5	-5	

Note 1) Dew point: -5°C or less Note 2) 500cSt or less

Note 3) "V" and "M" in the parenthesis are option symbols.

### Tightness of Valve(Leakage)

Fluid	Air	Liquid	Non-leak Vacuum <sup>(2)</sup> V, M
NBR, FPM, EPR	≤1cm³/min	≤0.1cm <sup>3</sup> /min <sup>(1)</sup>	≤10 <sup>-₅</sup> atm cc/sec

Note 1) Different from the operating condition of pressure.

Note 2) Value on option "V", "M" (Non-leak, Vacuum).

### **Pilot Pressure**

Туре	Pressure (MPa)
VXA21□□ VXA22□□	0.25 to 0.7

# VXA21/22



#### Table 1) Port/Orifice Size

Model		Orifice size (No.)				
VV A 24	VX A 22	2	3	4	5	6
VXA21	VXAZZ	(3mmø)	(4.5mmø)	(6mmø)	(8mmø)	(10mmø)
01 (1⁄8)	—			—	_	—
02 (1/4)				—		—
_	02 (1/4)	—				
	03 (3⁄8)		•		•	•
	04 (1/2)	—	—	—	—	

#### **Ordering Example**

(Example) Series VXA21, Orifice size 4.5mmø, Normal closed, Rc(PT)1/4 (Part number)**VXA2130-02** 

#### Table ② Bracket Part Number

Model	Part number
VXA212□	VX070-020
VXA213	VX070-020
VXA223	VX070 022
VXA224□	VX070-022
VXA225□	VX070-029
VXA226□	VX070-029

VX VN□ VQ

# VXA21/22

#### Dimensions (Orifice size 3 mmø, 4.5 mmø, 6 mmø) VXA212, VXA213, VXA223, VXA224



#### Dimensions (Orifice size 8mmø, 10mmø) VXA225□, VXA226□



VX

**VN** 

# VVXA21/22



# VVXA21/22

### Dimensions



<sup>[ ]:</sup> Individual pressure style

# Direct Air Operated 3 Port Valve Series VXA31/32 For Air, Gas, Vacuum, Water and Oil



# Proper selection of body and sealing materials permits application of a wide variety of fluids.

Application can be matched by simply choosing body material (Brass or Stainless steel) and seal material(NBR, FPM or EPR).

- C.O. style easy to use; operatable as either N.C. or N.O.
  - Easy to disassemble and reassemble in a short time.
- Compatible with high viscosity fluids (500cSt).

VX
VN□
VQ

Common (C.O.)	Pilot pc     Connecting pr     Pilot press	ort (Free take of ort size — Rc( sure — 0.25	f direction) PT) <sup>1/</sup> 8 5 to 0.7 (MPa)
	Model Model	Connecting port	Orifice size
	VXA3114	1/8 1/4	1.5
	VXA3124	1/8, 1/4	2.2
	VXA3134	1/8, 1/4	3
Material •	VXA3224	1/4 , 3/8	2.2
Body — Brass Stainless steel	VXA3234	1/4, 3/8	3
Seal — NBR, FPM, EPR	VXA3244	1/4, 3/8	4

### Variations



# Common (C.O.)

### **Applicable Fluids**

Standard	Option <sup>(1)</sup>
Water (Standard, Up to 40°C)	Vacuum (Up to 10 <sup>-3</sup> Torr) ······ (V, M)
Air (Standard, Dry),	Non-leak (10 <sup>-5</sup> atm cc/sec or less)······ (V, M)
Turbine oil,	
Vacuum (Up to 1 Torr),	
Carbon dioxide (CO <sub>2</sub> ), Nitrogen gas (N <sub>2</sub> ),	
Freon11, 113, 114	
Note 1) Refer to p.4.0-13 "Application	able Fluid Check List" for detail of a special fluid out of the standard

and the option specifications.

### **Model/Valve Specifications**

Port	Orifice	Flow	rate		Max. operating	Max. system	Proof pressure (MPa)	(1) Weight
size Rc(PT)	size (mmø)	Cv	Effective orifice (mm <sup>2</sup> )	Model	differential (MPa)	pressure (MPa)		(g)
	1.5	0.08	1.4	VXA3114	1.0	_	1.5	
1⁄8 (6A)	2.2	0.16	2.8	VXA3124	0.5			280
	3	0.24	4.3	VXA3134	0.3			
	1.5	0.08	1.4	VXA3114	1.0	- 1.0		
	2.2	0.16	2.8	VXA3124	0.5			
1/. (0 \)		0.19	3.4	VXA3224	1.0			410
1/4 (OA)	3	0.24	4.3	VXA3134	0.3			280
		0.33	6	VXA3234	0.6			
	4	0.5	9	VXA3244	0.3			
3⁄8 (10A)	2.2	0.19	3.4	VXA3224	1.0			410
	3	0.33	6	VXA3234	0.6			
	4	0.5	9	VXA3244	0.3			

Note 1) Refer to p.4.0-14 the glossary for detail of max.operating pressure differential and max. system pressure.

### **Ambient and Fluid Temperature**

		Ambient			
Temperature	Water	Air	Oil	Vacuum <sup>(3)</sup>	temperature
	(Standard)	(Standard)	(Standard)	(V, M)	°C
Max.	40	60	40	40	40
Min.	1	-5 <sup>(1)</sup>	-5(2)	-5	-5

Note 1) Dew point:  $-10^{\circ}$ C or less. Note 2) 500cSt or less. Note 3) "V", "M" in the parenthesis are option symbols.

### Tightness of Valve(Leakage)

Fluid	Air	Liquid	Non-leak, Vacuum <sup>(2)</sup>
NBR, FPM, EPR	≤1cm³/min	≤0.1cm <sup>3</sup> /min <sup>(1)</sup>	≤10 <sup>-5</sup> atm cc/sec
~		•	•

Note 1) Differ from the operating condition of pressure.

Note 2) Value on option "V", "M" (Non-leak, Vacuum).

#### **Pilot Pressure**

Model	Pressure MPa
VXA31□4 VXA32□4	0.25 to 0.7





### **Construction/Components**



No	Description	Mat	erial
INO.	Description	Standard	Option
1	Body assembly	Brass	Stainless steel
2	Retainer assembly	Brass	Stainless steel
(3)	Valve	NBR	FPM/EPR
9	assembly	Polyacetal	Stainless steel
(4)	Adapter	Brass	Stainless steel
(5)	Travel	Stainless steel,	FPM/EPR
	assembly	NBR, Polyacetal	Stainless steel
6	Pilot cover	Aluminium	—
7	Piston spring	Stainless steel	—
8	Piston assembly	Polyacetal, NBR	_
9	O ring	NBR	FPM/EPR

# VXA31/32



#### Table 1) Port/Orifice Size

Valve (Port size)			Orifice s	ize (No.)	
VY A 21	1/1/ 4.22	1	2	3	4
VAAST	VAA3Z	(1.5mmø)	(2.2mmø)	(3mmø)	(4mmø)
01 (1/8)	—			•	—
02 (1/4)		•		•	_
	02 (1/4)	_		•	•
	03 (¾)	—		•	

#### **Ordering Example**

(Example) Series VXA31, Orifice size 1.5mmø, Rc(PT)1/8 (Part number) VXA3114-01



# VXA31/32



#### How to Read the Graph

In the sonic flow region: For a flow of 100 d/min.(ANR) Orifice Ø3 (VXA313 $_{0}^{4}$ ).....P<sub>1</sub>  $\cong$  0.1MPa Orifice Ø2.2 (VXA312 $_{0}^{4}$ ).....P<sub>1</sub>  $\cong$  0.23MPa Orifice Ø1.5 (VXA311 $_{0}^{5}$ )....P<sub>1</sub>  $\cong$  0.55MPa

#### How to Calculate Flow/Air

(1) Equation in the domain of subsonic flow  $P_1+0.1013=(1 \text{ to } 1.8941)(P_2+0.1013)$ 

- Calculation by Cv factor Q=4073.4.Cv.√△P(P₂+0.1013).......ℓ/min(ANR)
- ②Equation in the domain of sonic flow P1+0.1013 ≥1.8941(P2+0.1013)
- Calculation by Cv factor
- Q=1972.8·Cv·(P<sub>1</sub>+0.1013)·············//min(ANR) • Calculation by effective area

#### Water



#### How to Read the Graph

In case of a flow of 2 *d*/min. Orifice Ø3 valve (VXA3134).... $\triangle P \cong 0.033MPa$ Orifice Ø2.2 valve (VXA3124)... $\triangle P \cong 0.085$  MPa Orifice Ø1.5 valve (VXA3114)... $\triangle P \cong 0.31MPa$ 

#### How to Calculate Flow/Water

- Q : Flow (Air ℓ/min(ANR)), (Steam kg/h), (Water ℓ/min)
- $\triangle P$ : Pressure differential (P<sub>1</sub>–P<sub>2</sub>)
- P1 : Upstream pressure (MPa)
- P<sub>2</sub> : Downstream pressure (MPa)
- $\theta$  : Fluid temperature (°C)
- S : Effective area (mm<sup>2</sup>)
- Cv : Cv factor (/)

# VXA31/32

#### Dimensions



# Direct Air Operated 3 Port Valve/Manifold Series VVXA31/32 For Air, Gas, Vacuum and Oil



### Variations



# VVXA31/32

# Common (C.O.)

### **Applicable Fluids**

Standard	Option <sup>(1)</sup>			
Air (Standard, Dry),	Vaccum (Up to 10 <sup>-3</sup> Torr) (V)			
Vaccum (Up to 1 Torr),	Non-leak or less (10 <sup>-5</sup> atm cc/sec or less) (V)			
Turbine oil,				
Carbon dioxide (CO <sub>2</sub> ), Nitrogen gas (N <sub>2</sub> )				
Freon 11, 113, 114	Others			
Note 1) Refer to p.4.0-13 "Applicable Fluid Check List" for detail of a special fluid out of the standard				

and the option specifications.

### Symbol



#### **Construction/Components**



No	Description	Mat	erial
INO.	Description	Standard	Options
1	Manifold body, base	Aluminum	Brass (Base is aluminum.)
2	Valve assembly	NBR Polyacetal	EPR/FPM
3	Adapter	Aluminum	EPR/FPM
4	Travel assembly	NBR Polyacetal	EPR/FPM
5	O ring	NBR	EPR/FPM
6	Pilot cover	Aluminum	—
$\bigcirc$	Piston spring	Stainless steel	—
8	Piston	NBR Polyacetal	_
9	Gasket	NBR	FPM/EPR

### **Manifold Specifications**

Manifold	B Mount		
Manifold base	Common supply, Common exhaust, Common out		
Number of valves	2 to 10 stations		
Blanking plate	VVXA31	VX011-004	
(With gasket, screws)	VVXA32	VX011-005	

### Manifold Base and Applicable Valve

Manifold base	Individual port Rc(PT)	Applicable valve	Base weight (g)	
VVXA311-stations	1/8		n X 100+50	
VVXA312-stations	1/4	VA3103-00		
VVXA321-stations	1/8		n V 160 J 70	
VVXA322-stations	1/4	VA32D3-00	n X 160+70	

### **Model/Valve Specifications**

Orifice	Flow	rate		Max. operating	Max. system	Proof	(1)
size (mmø)	Cv	Effective area (mm <sup>2</sup> )	Model	pressure differential (MPa)	pressure (MPa)	pressure (MPa)	(g)
1.5	0.08	1.4	VXA3115-00	1.0			150
	0.16	2.8	VXA3125-00	0.5			150
2.2	0.19	3.4	VXA3225-00	1.0	1.0	15	230
2	0.24	4.3	VXA3135-00	0.3	1.0	1.5	150
3	0.33	6	VXA3235-00	0.6			220
4	0.5	9	VXA3245-00	0.3			230

Note 1) •Add the V type (VXA31) 80g, (VXA32)130g.

• Refer to p.4.0-14 the glossary for detail of max. operating pressure and max. system.

### **Ambient and Fluid Temperature**

	F			
Temperature	Air (Standard)	Oil (Standard)	Vacuum <sup>(3)</sup> (V)	Ambient temperature °C
Max.	60	40	40	40
Min.	-5 <sup>(1)</sup>	-5 <sup>(2)</sup>	-5	-5

Note 1) Dew point: -5°C or less Note 2) 500cSt or less

Note 3) "V" in the parenthesis is option symbol.

### Tightness of Valve(Leakage)

Fluid	Air	Liquid	Non-leak, Vacuum <sup>(2)</sup>
NBR, FPM, EPR	≤1 cm <sup>3</sup> /min	≤0.1cm <sup>3</sup> /min <sup>(1)</sup>	≤10 <sup>-5</sup> atm cc/sec

Note 1) Differ from the operating conditon of pressure.

Note 2) Value on option "V" (Non-leak, Vacuum).

#### **Pilot Pressure**

Model	Pressure MPa
VXA31□5 VXA32□5	0.25 to 0.7

# VVXA31/32



# VVXA31/32

#### Dimensions



# **Applicable Fluid Check List**

# 2 Port Direct Air Operated Series VXA21/22

# Normally Closed (N.C.), Normally Open (N.O

Refer to p.4.1-58, 4.1-59 for specifications and models.

### **Option Symbol and Configuration**

Option Symbol	Seal material	Body material	Holder material (Driving parts)
Standard	NBR		
А	FPM	Brass	
В	EPR		
G	NBR		Polyacetal
Н	FPM		
J	EPR	Stainlage Steel	
M* (Non-leak)	FPM	Stallliess Steel	
Ν	FPM		Ctainlaga Ctaol
Р	EPR		Stainless Steel
V* (Non-leak)	FPM	Brass	Polyacetal

Note) Grease for vacuum has been applied to the sliding part of option symbol "M", "V", silicone grease to the other options.

# Manifold Series VVXA21/22

# Normally Closed (N.C.), Normally Open (N.O.)

Refer to p.4.1-64, 4.1-65 for specifications and models.

### Fluid and Option

Option symbol	Seal material	Body material	Holder material (Driving parts)
Standard	NBR		
A	FPM	Aluminium	Delvegetel
В	EPR	Aluminium	Polyacetai
V* (Non-leak)	FPM		



Note) Grease for vacuum has been applied to the sliding part of option symbol "V", silicone grease to the other options.

### **Fluid and Options**

Fluid(Application)	Option symbol and body material		
Fluid(Application)	Brass	Stainless steel	
Silicon oil	А	Н	
Vacuum (Up to 10 <sup>-3</sup> Torr)	V	М	
Fuel oil (Up to 60°C)	А	Н	
Insulating oil	А	Н	
Non-leak (10 <sup>-5</sup> atm cc/sec)	V	М	
Brake oil	В	Р	
Water (Up to 60°C)	A	Н	

Note 1) The leakage amount(10<sup>-5</sup>atm cc/sec)of "V" option is valued when differential pressure is 0.1MPa. Note 2) When using other fluids, contact SMC.



### Fluid and Options

Fluid(Application)	Option symbol	
Silicone oil	A	
Vacuum (Up to 10 <sup>-3</sup> Torr)	V	
Fuel oil (Up to 60°C)	A	
Insulating oil	A	
Brake oil	В	
Non-leak (10 <sup>-5</sup> atm cc/sec)	V	
Note 1) The leakage amount (10 <sup>-5</sup> atm cc/sec) of "V" option is valued when differential pressure is		

option is valued when differential pressure is 0.1MPa.

Note 2) When using other fluids, contact SMC.

# Series VX

# **Applicable Fluid Check List**

## 3 Port Direct Air Operated Series VXA31/32

# Common (C.O.)

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#### Refer to p.4.1-68, 4.1-69 for specifications and models.

### **Option Symbol and Configuration**

Option symbol	Seal material	Body material	Support material (Driving Parts)
Standard	NBR		
А	FPM	Brass	
В	EPR		
G	NBR		Polyacetal
Н	FPM		
J	EPR	Stainloss stool	
M* (Non-leak)	FPM	Stall less steel	
Ν	FPM		
Р	EPR		Stainless steel
V* (Non-leak)	FPM	Brass	Polyacetal



Note) Grease for vacuum has been applied to the sliding part of option symbol "M", "V". Silicone grease to the other options.

# Manifold Series VVXA31/32

# Common (C.O.)



Refer to p.4.1-74, 4.1-75 for specifications and models.

### **Option Symbol and Configuration**

Option	Seal	Body	Support	
symbol	material	material	material (Driving Parts)	
Standard	NBR		Polycostal	
A	FPM	Aluminium		
В	EPR		Folyacetai	
V* (Non-leak)	FPM	Brass (2)		



Note 2) Manifold base material: Aluminium



### Fluid and Options

Eluid(Application)	Option symbol and Body material		
Fluid(Application)	Brass	Stainless steel	
Silicon oil	A	Н	
Vacuum (Up to 10 <sup>-3</sup> Torr)	V	М	
Fuel oil (Up to 60°C)	A	Н	
Insulating oil	A	Н	
Non-leak (10 <sup>-5</sup> atm cc/sec)	V	М	
Brake oil	В	Р	
Water (Up to 60°C)	A	Н	

Note 1) The leakage amount (10<sup>-5</sup>atm cc/sec) of "V", "M" option is valued when differential pressure is 0.1MPa.

Note 2) When using other fluids, contact SMC.



### Fluid and Options

Fluid(Application)	Option symbol	
Vacuum (Up to 10 <sup>-3</sup> Torr)	V	
Vacuum pad	Standard	
Non-leak (10 <sup>-5</sup> atm cc/sec)	V	
Brake oil	В	
Note 1) The leakage amount (10 <sup>-5</sup> atm cc/sec) of "V"option is valued when differential pressure is 0.1MPa		

Note 2) When using other fluids, contact SMC.

# Glossary

#### **Pneumatic Terms**

#### 1 Max. operating pressure differential

This pressure difference is the highest pressure difference allowable to operate (a difference between the pressures in the primary slide and the secondary side) in an open state and the closed state of valve. A case of 0 kgf/cm<sup>2</sup> in the secondary side results in the highest operating pressure.

#### 2 Min. operating pressure differential

This pressure difference is the lowest pressure difference (a difference between the pressures in the primary side and secondary side) required to hold the main valve fully open.

#### 3 Max. system presure

This pressure is the limit of pressure that can be applied to pipe line (Line pressure) [the pressure difference in a solenoid valve must be maintained less than the highest operating pressure difference.]

#### ④ **Proof pressure.**

This is the pressure that can be withstood without deterioration of the performance when valve returnes within the range of the operating pressure.(A value under a specified condition.)

#### **(5) Vaccuum pressure (Torr)**

The absolute pressure is expressed. 0 Torr=Absolute pressure 0.760 Torr=Atmospheric pressure (Gauge pressure 0 Kgf/cm2) (1 torr=1.33 X 102 Pa)

#### Electrical Terms

#### 1) Volt-ampere(VA)

Volt-ampere is the product of voltage (V) and current (A). Power dissipation (W): For AC , W=V/A  $\cos\theta$ . For DC, W=V/A (Note)  $\cos\theta$  (Note)  $\cos\theta$  shows power factor.

#### **2** Surge voltage

The surge voltage is a high voltage generated momentarily when cutting the power supply.

#### **3 Hum sound**

The hum sound is a noise generated through repeated adsorption and releasing on an armature adsorption surface. For an AC solenoid, no shading coil allows releasing by spring reaction because of the existance of a 0 point (twice per frequency) of the suction force.



I Check Safty Instructions on p.0-33 and common precautions on	I
p.0-37 to 0-40.	- 1

### Others

 Material NBR: Nitrile rubber FPM: Fluororubber EPR: Ethylene-propylene rubber (=EPDM) PTFE: Tetrafluoroethylene reain Polyacetal (POM)

#### 2 Leakage amount

Vacuum leak amount 1atm-cc/sec: The leakage amount is 1cc per second in conversion to atmospheric pressure. 1atm-cc/sec=0.76 Torr-1/sec=760Lu/sec

#### 3 Oil preserve treatment

After assembly, a valve is put through a parts washer to remove any oil used during assembly.

#### (4) Symbol

The JIS symbol is  $(\Box \Box \Box \dagger M)$ : this designates the valve to be normally closed. However, in situations where the secondary pressure exceeds the primary side pressure, the resulting back pressure will cause back flow through the valve.

