Water Hammer Relief, Pilot Operated 2 Port Solenoid Valve

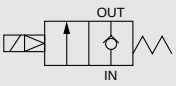
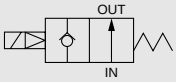
Series VXR21/22/23

For Water and Oil

- **Water hammer is alleviated.**
- **Easy to disassemble and reassemble in a short time.**

Variations

Valve

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

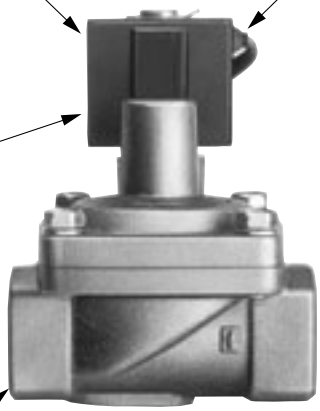
Rated voltage

□AC
Standard — 100 V, 200 V
Option — 48 V, 110 V, 220 V, 240 V

□DC
Standard — 24 V
Option — 12 V

Material

Body — BC6
Seal — NBR, FKM



Electrical entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal

Model

Model	Port size Rc	Orifice dia. (mmø)
VXR215$^{2}_{0}$	1/2, 3/4	20
VXR226$^{2}_{0}$	1	25
VXR227$^{2}_{0}$	1 1/4	35
VXR238$^{2}_{0}$	1 1/2	40
VXR239$^{2}_{0}$	2	50

Applicable Fluids Check List

Water Hammer Relief/Pilot Operated 2 Port Solenoid Valve Series VXR21/22/23

Normally Closed (N.C.)

Refer to page 159 for specifications and models.

Option Symbol and Composition

Option symbol	Seal material	Coil insulation type	Body, Shading coil material
Standard	NBR	B	BC6, Copper
A	FKM		
D	FKM	H	

Fluid Name and Option

Fluid (Application)	Option symbol
Heated water (up to 80°C)	D
Fuel oil (up to 60°C)	A
Fuel oil (up to 80°C)	D

∗ If using for other fluids, please contact SMC.

Normally Open (N.O.)

Refer to page 161 for specifications and models.

Option Symbol and Composition

Option symbol	Seal material	Coil insulation type	Body, Shading coil material	Holder material (in core assembly)
Standard	NBR	B	BC6, Copper	Polyacetal
A	FKM			
D	FKM	H		Stainless Steel

Fluid Name and Option

Fluid (Application)	Option symbol
Heated water (up to 80°C)	D
Fuel oil (up to 60°C)	A
Fuel oil (up to 80°C)	D

∗ If using for other fluids, please contact SMC.

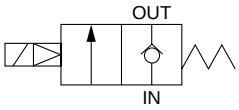
Normally Closed (N.C.)

Fluid

Standard specifications	Option
Water (Standard, up to 60°C) Turbine oil	High temperature water ····· (D) High temperature oil ····· (D)

Note) Refer to page 158 "Applicable Fluids Check List" for details of special fluids outside of the standard options and specifications.

JIS Symbol



Model/Valve Specifications <Normally Closed>

Connection Thread	Orifice diameter (mmø)	Model	Min.operating pressure differential (MPa)	Max. operating pressure differential (MPa)		Flow characteristics Water, Oil		Max. system pressure (MPa)	Mass Note) (g)
				Water	Oil	Av x 10^{-6} (m^2)	Cv converted		
1/2	20	**VXR2150-04**	0.04	1.0	0.7	160	6.5	1.5	1250
3/4	20	**VXR2150-06**				180	7.5		1250
1	25	**VXR2260-10**				290	12		1730
1 1/4	35	**VXR2270-12**				530	22		2900
1 1/2	40	**VXR2380-14**				720	30		3700
2	50	**VXR2390-20**				1200	48		4600

Note) Mass of grommet type. Add 10 g for conduit type, 30 g for DIN terminal 60 g for conduit terminal type respectively.
- Refer to “Glossary of Terms” on page 26 for details of max. operating pressure differential min. operating pressure differential and max. system pressure.

Solenoid Specifications

Model	Power source	Frequency (Hz)	Apparent power (VA)		Power consumption W (Holding)	Temperature rise (°C) (Rated voltage)
			Inrush	Holding		
VXR21	AC	50	20	11	4.5	45
		60	17	7	3.2	35
	DC	–	–	–	6	55
VXR22	AC	50	40	18	7.5	60
		60	35	12	6	50
	DC	–	–	–	8	60
VXR23	AC	50	50	21	11	65
		60	45	17	9.5	60
	DC	–	–	–	11.5	65

Note)
- They are values in an ambient temperature of 20°C ±5°C and application of rated voltage.
- Changing a coil from AC to DC is possible, but it's impossible to change from DC to AC.
  (Hum sound may generate because of no shading coil for DC.)
- Return voltage is 20% or more of the rated value at AC power and 2% or more at the DC power.
- Allowable voltage fluctuation is ±10% of the rated voltage.

Fluid and Ambient Temperature

Temperature conditions	Power source	Fluid temperature (°C)				Ambient temperature (°C)
		Water (Standard)	Oil (Standard)	High temperature water Note 2) (D)	High temperature oil Note 2) (D)	
Maximum	AC	60	60	80	80	60
	DC	40	40	–	–	40
Minimum	AC/DC	1	–5 Note 1)	–	–	–10

Note 1) 50 mm^2/s or less
Note 2) “D” in parentheses is an option symbol.

How to Order (Normally Closed)

VXR21 / VXR22 / VXR23 □ **0** □ – □□ – □□□

Model

Body size

5	20A
6	25A
7	32A
8	40A
9	50A

Valve/Body

0	Normally closed/Single unit

Solenoid valve option

Nil	Standard

Select an option mark in page 158 by "Applicable Fluids Check List" for special fluids outside of the standard.

Port size

04	1/2
06	3/4
10	1
12	1 1/4
14	1 1/2
20	2

∗ Refer to the table (1) given below for availability.

Thread type

Nil	Rc
T	NPTF
F	G
N	NPT

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
8	48 VAC 50/60 Hz
9	Other (Please contact SMC separately.)

∗ Refer to the table (2) given below for availability.

Refer to page 166 for ordering coil only.

Electrical entry

G	Grommet
C	Conduit
D	DIN terminal
T	Conduit terminal

∗ Refer to the table (2) given below for availability.

Electrical option

Nil	None
S	With surge voltage suppressor
L	With indicator light
Z	With light/surge voltage suppressor

∗ Refer to the table (2) given below for availability.

Table(1)
Connection Size and Applicable Model

Size	Applicable model
1/2	VXR2150-04
3/4	VXR2150-06
1	VXR2260-10
1 1/4	VXR2270-12
1 1/2	VXR2380-14
2	VXR2390-20

Ordering example

(Example) Series VXR21, Rc 3/4, 24 VDC,
Conduit terminal
(Part no.) **VXR2150-06-5T**

Table(2)
Rated Voltage-Electrical Entry-Electrical Option

Insulation type		Class B				Class H		
Electrical entry		G	C	D, T		G, C	T	
Electrical option		S Note)	—	S	L, Z	—	S	L, Z
AC	**1** (100 V)	●	●	●	●	●	●	●
	2 (200 V)	●	●	●	●	●	●	●
	3 (110 V)	●	●	●	●	●	●	●
	4 (220 V)	●	●	●	●	●	●	●
	7 (240 V)	●	●	●	–	●	●	–
	8 (48 V)	●	●	●	–	–	●	–
DC	**5** (24 V)	●	●	●	●	–	–	–
	6 (12 V)	●	●	●	–	–	–	–

Note) Surge voltage suppressor is attached in the middle of lead wire.

Made to Order Specifications

Splashproof Specifications (Based on JIS C 0920 / Based on IEC529IP-X4)

VXR Model — Port size — Electrical entry - X36

DIN terminal or class H coil not available.

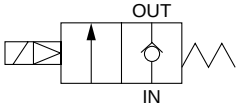
Normally Open (N.O.)

Fluid

Standard specifications	Option Note)
Water (Standard, up to 60°C) Turbine oil	High temperature water ····· (D) High temperature oil ····· (D)

Note) Refer to page 158 "Applicable Fluids Check List" for details of special fluids outside of the standard options and specifications.
The armature in standard products is coated in grease.

JIS Symbol



Model/Valve Specifications <Normally Open>

Connection Thread	Orifice diameter (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)		Flow characteristics Water, Oil		Max. system pressure (MPa)	Note) Mass (g)
				Water	Oil	Av x 10^{-6} m^2	Cv converted		
1/2	20	**VXR2152-04**	0.04	0.7	0.6	160	6.5	1.5	1270
3/4	20	**VXR2152-06**				180	7.5		1270
1	25	**VXR2262-10**				290	12		1770
1 1/4	35	**VXR2272-12**				530	22		2900
1 1/2	40	**VXR2382-14**				720	30		3700
2	50	**VXR2392-20**				1200	48		4600

Note) Mass of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.
- Refer to “Glossary of Terms” on page 26 for details of max. operating pressure differential and min. operating pressure differential and max. system pressure.

Solenoid Specifications

Model	Power source	Frequency (Hz)	Apparent power (VA)		Power consumption (W) (Holding)	Temperature rise (°C) (Rated voltage)
			Inrush	Holding		
VXR21	AC	50	25	12	5	50
		60	20	8	3.5	35
	DC	–	–	–	6	50
VXR22	AC	50	45	20	8	55
		60	40	15	6.5	45
	DC	–	–	–	8	50
VXR23	AC	50	60	25	10.5	60
		60	50	20	9.5	50
	DC	–	–	–	11.5	55

Note)
- They are values in an ambient temperature of 20°C ± 5°C and application of rated voltage.
- Changing coils from AC to DC and vice versa is impossible. because of different core shapes.
- Return voltage is 20% or more of the rated value at AC power and 5% or more at the DC power.
- Allowable voltage fluctuation is ±10% of the rated voltage.

Fluid and Ambient Temperature

Temperature conditions	Power source	Fluid temperature (°C)				Ambient temperature (°C)
		Water (Standard)	Oil (Standard)	High temperature water Note 2) (D)	High temperature oil Note 2) (D)	
Maximum	AC	60	60	80	80	60
	DC	40	40	–	–	40
Minimum	AC/DC	1	–5 Note 1)	–	–	–10

Note 1) 50 mm²/s or less
Note 2) “D” in parentheses is an option symbol.

How to Order (Normally Open)

VXR21 / VXR22 / VXR23 □ **2** □ – □□ – □□□

Model

Electrical option

Nil	None
S	With surge voltage suppressor
L	With indicator light
Z	With light/surge voltage suppressor

∗ Refer to the table (2) given below for availability.

Body size

5	20A
6	25A
7	32A
8	40A
9	50A

Electrical entry

G	Grommet
C	Conduit
D	DIN terminal
T	Conduit terminal

∗ Refer to the table (2) given below for availability.

Valve/Body

2	Normally open/Single unit

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
8	48 VAC 50/60 Hz
9	Other (Please contact SMC separately)

∗ Refer to the table (2) given below for availability.

Refer to page 166 for ordering coil only.

Solenoid valve option

Nil	Standard

Select an option mark in page 158 by "Applicable Fluids Check List" for special fluids outside of the standard.

Port size

04	1/2
06	3/4
10	1
12	1 1/4
14	1 1/2
20	2

∗ Refer to the table (1) given below for availability.

Thread type

Nil	Rc
T	NPTF
F	G
N	NPT

Table (1) Connection Size and Applicable Model

Size	Applicable model
1/2	VXR2152-04
3/4	VXR2152-06
1	VXR2262-10
1 1/4	VXR2272-12
1 1/2	VXR2382-14
2	VXR2392-20

Ordering example

(Example) Series VXR22, Rc 1 1/4, 200 VAC, Conduit terminal

(Part no.) **VXR2272-12-2G**

Table (2) Rated Voltage-Electrical Entry-Electrical Option

Insulation type		Class B				Class H		
Electrical entry		G	C	D, T		G, C	T	
Electrical option		S Note)	—	S	L, Z	—	S	L, Z
AC	**1** (100 V)	●	●	●	●	●	●	●
	2 (200 V)	●	●	●	●	●	●	●
	3 (110 V)	●	●	●	●	●	●	●
	4 (220 V)	●	●	●	●	●	●	●
	7 (240 V)	●	●	●	–	●	●	–
	8 (48 V)	●	●	●	–	–	●	–
DC	**5** (24 V)	●	●	●	●	–	–	–
	6 (12 V)	●	●	●	–	–	–	–

Note) Surge voltage suppressor is attached in the middle of lead wire.

Made to Order Specifications

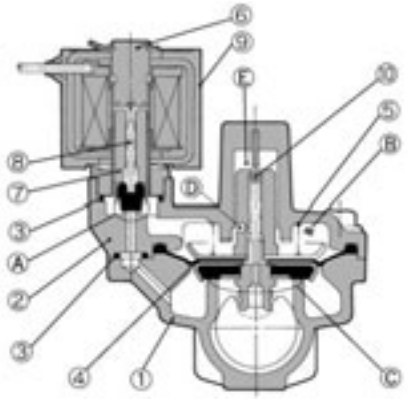
Splashproof Specifications (Based on JIS C 0920, Based on IEC529IP-X4)

VXR Model — Port size — Electrical entry - X36

DIN terminal or class H coil not available.

Construction/Principal Parts Material

Normally Closed (N.C.)



Operation

< Valve opened > When the coil ⑨ is energized the armature assembly ⑦ is attracted into the core of the core assembly ⑥ and the pilot valve Ⓐ opens. Then the pressure in the pressure action chamber Ⓑ falls to open the main valve Ⓒ.

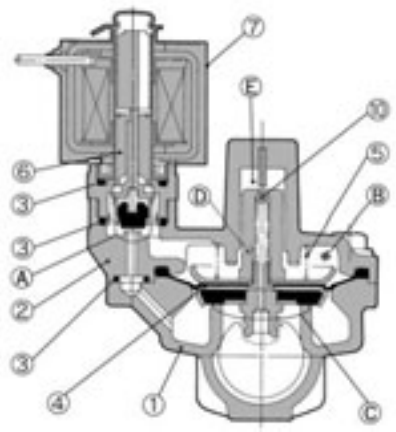
< Valve closed > When the coil ⑨ is not energized, the pilot valve Ⓐ is closed and the pressure in the pressure action chamber B rises and the main valve Ⓒ closes.

Water hammer relieving

Check valve mechanism is provided in the Ⓔ side of the supply orifice Ⓓ and Ⓔ and supply into the pressure action chamber Ⓑ can be controlled with two stages by moving the diaphragm assembly ④. After release of the energy, when the open amount of the main valve Ⓒ becomes small, Ⓔ is blocked. A low valve closing speed relieves the water hammer.

No.	Description	Material	
		Standard	Option
1	**Body**	BC6	—
2	**Bonnet**	BC6	—
3	**O-ring**	NBR	FKM
4	**Diaphragm assembly**	Stainless steel, Brass NBR	Stainless steel, Brass FKM
5	**Valve spring**	Stainless steel	—
6	**Core assembly**	Stainless steel, Copper	—
7	**Armature assembly**	Stainless steel, NBR	Stainless steel, FKM
8	**Return spring**	Stainless steel	—
9	**Coil assembly**	Class B molded	Class H molded

Normally Open (N.O.)



Operation

< Valve closed > When the coil ⑦ is energized the opened pilot Ⓐ closes, the pressure in the pressure action chamber Ⓑ rises and the main valve Ⓒ closes.

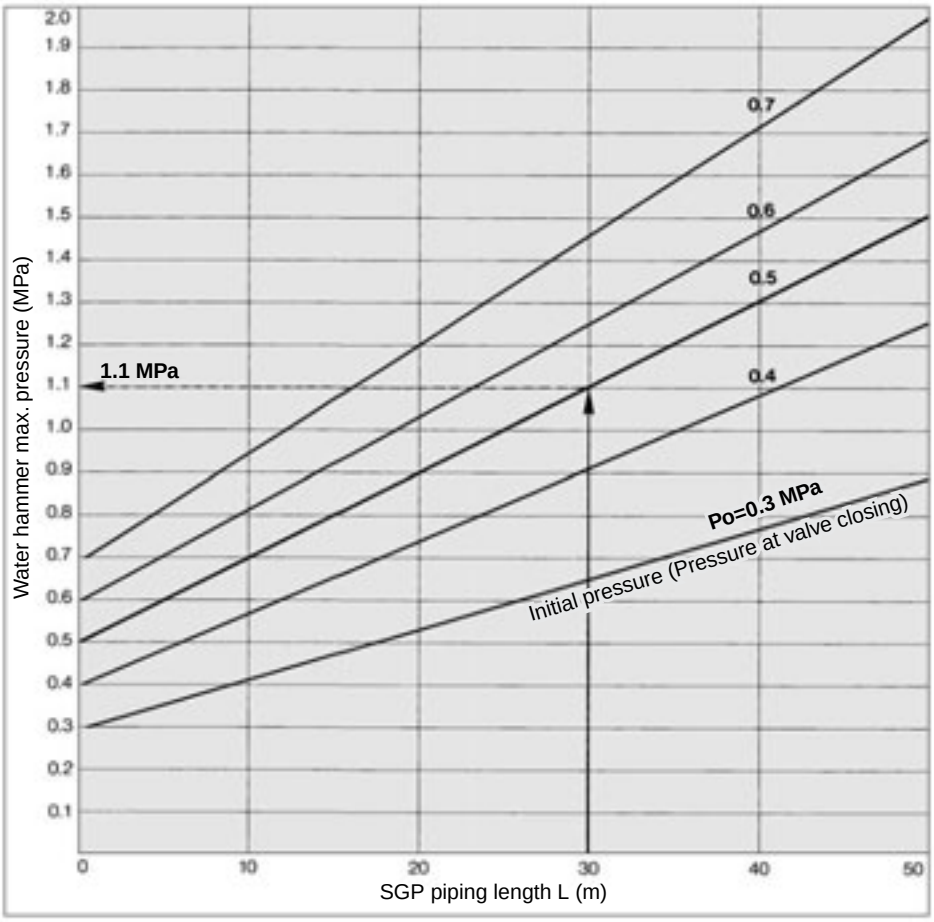
< Valve opened > When the coil ⑦ is not energized, the closed pilot valve Ⓐ opens, the pressure in the pressure action chamber Ⓑ drops and the main valve Ⓒ opens.

Water hammer relieving

Check valve mechanism is provided in the Ⓔ side of the supply orifice Ⓓ and Ⓔ and supply into the pressure action chamber Ⓑ can be controlled with two stages by moving the diaphragm assembly ④. After release of the energizing, when the open amount of the main valve Ⓒ becomes small, Ⓔ is blocked. A low valve closing speed relieves the water hammer.

No.	Description	Material	
		Standard	Option
1	**Body**	BC6	—
2	**Bonnet**	BC6	—
3	**O-ring**	NBR	FKM
4	**Diaphragm assembly**	Stainless steel, Brass NBR	Stainless steel, Brass FKM
5	**Valve spring**	Stainless steel	—
6	**Core assembly**	Stainless steel, Copper, NBR, Polyacetal, PTFE	Stainless steel, Copper FKM, PTFE
7	**Coil assembly**	Class B molded	Class H molded

Water Hammer Relieving Characteristics (VXR2150/2152/2260/2262)



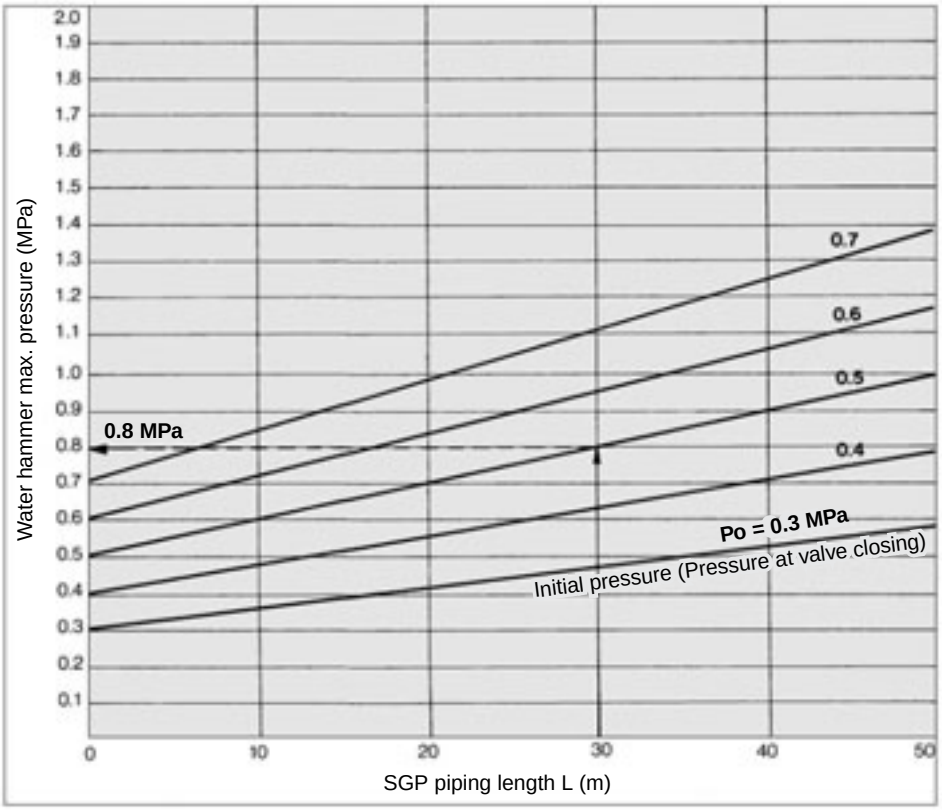
Water hammer

(Example) Series VXR2 prevents damage of piping, equipment and system and generation of vibration through a great relieving of a water hammer generated using an ordinary solenoid valve.

How to read the graph

When the SGP piping having the same bore as the solenoid valve is 30 m in length, the maximum pressure at the initial pressure of 0.5 MPa results in about 1.1 MPa. (General purpose solenoid valve is 4.0 to 7.0 MPa.)

Water Hammer Relieving Characteristics (VXR2270/2272/2380/2382/2390/2392)



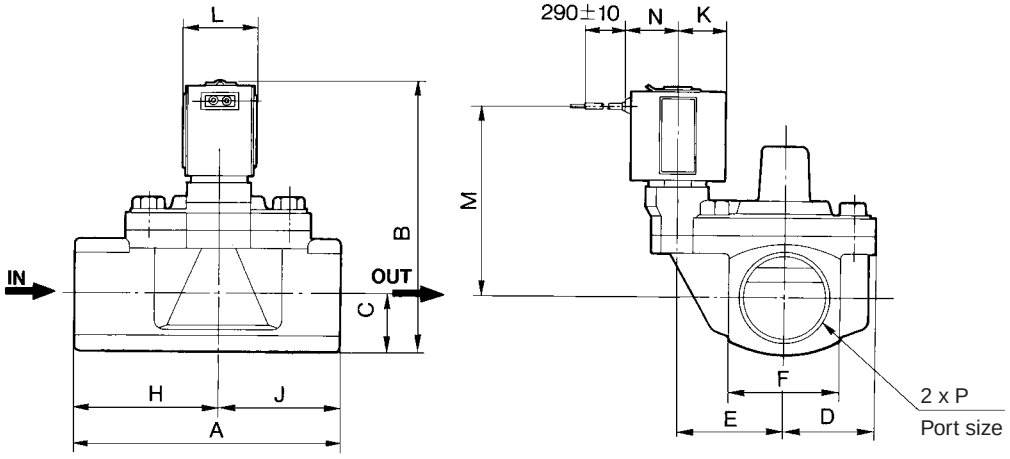
How to read the graph

When the SGP piping having the same bore as the solenoid valve is 30 m. in the length, the maximum pressure at the initial pressure of 0.5 MPa results in about 0.8 MPa. (General purpose solenoid valve is 2.0 to 4.0 MPa.)

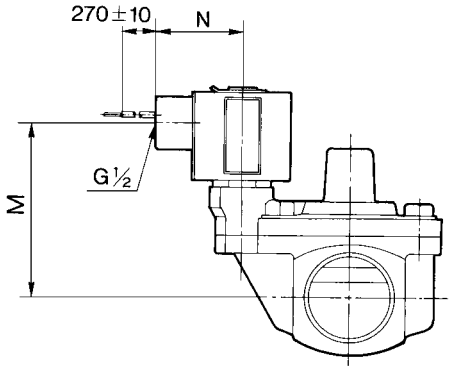
Dimensions

Normally closed: VXR21□0/22□0/23□0 Normally open: VXR21□2/22□2/23□2

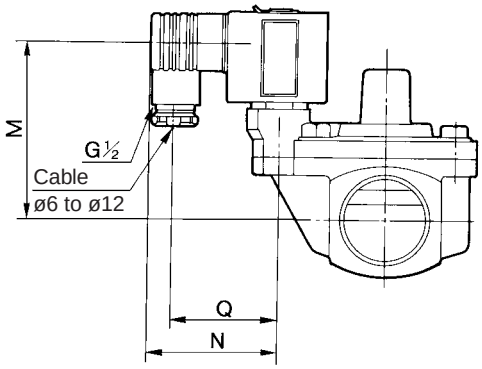
Grommet: G



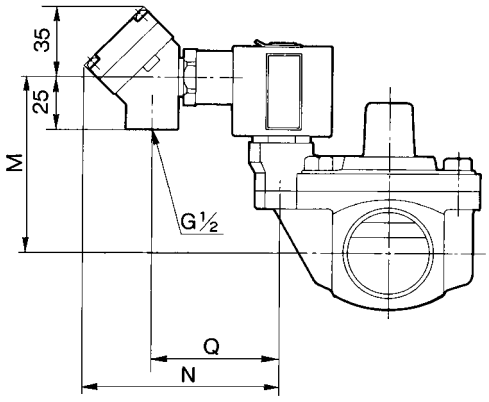
Conduit: C



DIN terminal: D



Conduit terminal: T



Model		Port size P Rc	A	B	C	D	E	F	H	J	K	L	Electrical entry									
													Grommet		Conduit		DIN terminal			Conduit terminal		
Normally closed	Normally open												M	N	M	N	M	N	Q	M	N	Q
VXR2150-$^{06}_{04}$	**VXR2152-$^{06}_{04}$**	1/2, 3/4	80	101 (112)	18	32.5	36	36	39	41	20	30	74 (81)	23	67 (74)	39	67 (74)	59	47	67 (74)	92	59
VXR2260-10	**VXR2262-10**	1	90	119 (136)	21	36.5	40	42	45	45	23	35	88 (98)	25.5	80 (90)	41.5	80 (90)	60	48	80 (90)	95	62
VXR2270-12	**VXR2272-12**	1 1/4	125	126 (143)	26.5	43.5	51.5	53	67.5	57.5	23	35	90 (100)	25.5	82 (92)	41.5	82 (92)	60	48	82 (92)	95	62
VXR2380-14	**VXR2382-14**	1 1/2	132	142 (157)	30	46.5	54.5	60	72	60	25.5	40	101 (111)	28	93 (103)	44.5	93 (103)	62	50	93 (103)	97	64
VXR2390-20	**VXR2392-20**	2	150	153 (168)	35.5	52	59	70	81	69	25.5	40	106 (116)	28	98 (108)	44.5	98 (108)	62	50	98 (108)	97	64

( ): N.O.

Solenoid Coil Assembly

How to Order Solenoid Coil Assembly

VX021 − 001 C B □ □ − 01

VX solenoid coil assembly

Application

Size part number		Applicable series
001	No.1 solenoid	Series VXR21
002	No.2 solenoid	Series VXR22
003	No.3 solenoid	Series VXR23

Electrical entry

G	Grommet
C	Conduit
D	DIN terminal

Coil insulation type

B	Class B insulation
H*	Class H insulation

* DIN terminal or DC not available

Terminal box

Nil	None
T	With terminal box

Electrical option

Nil	None
S	With surge voltage suppressor
L	With indicator light
Z	With light/surge voltage suppressor

Rated voltage Note)

01	100 VAC 50/60 Hz
02	200 VAC 50/60 Hz
03	110 VAC 50/60 Hz
04	220 VAC 50/60 Hz
05	24 VDC
06	12 VDC
07	240 VAC 50/60 Hz
08	48 VAC 50/60 Hz
13	24 VAC 50/60 Hz
23	440 VAC 50/60 Hz
51	6 VDC
53	48 VDC
55	100 VDC
56	110 VDC

Note) Voltage symbols 01 to 08 are the same as the solenoid valve model identification symbols if the leading zero is removed.

Ordering example

(Example) Series VXR21, 100 VAC, class B insulation, grommet
(Part no.) **VX021-001GB-01**

(Example) Series VXR22, 220 VAC, class B insulation, DIN terminal (with terminal box)
(Part no.) **VX021-002DBT-04**

(Example) Series VXR23, 24 VDC, conduit terminal, with light/surge voltage suppressor
(Part no.) **VX021-003CBTZ-05**

Coil Combination Table

(Electrical entry - Coil insulation type - Electrical option)

Electrical entry	Without electrical option	With electrical option		
		With surge voltage suppressor	With indicator light	With light/surge voltage suppressor
Grommet	GB	GBS	—	—
	GH	—	—	—
Conduit	CB	—	—	—
	CH	—	—	—
	CBT	CBTS	CBTL	CBTZ
	CHT	CHTS	CHTL	CHTZ
DIN terminal	DB	—	—	—
	DBT	DBTS	DBTL	DBTZ

* Applicable voltages for with indicator light or with light/surge voltage suppressor are 100 VAC, 200 VAC, 110 VAC, 220 VAC and 24 VDC.
* Applicable voltages for CHTL or CHTZ are 100 VAC, 200 VAC, 110 VAC and 220 VAC.

Made to Order specifications

Splashproof Specifications (Based on JIS-C-0920 Based on IEC5291-X4)

Model — Sonlenoid coil assembly model with -X36 added at the end.