

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

For Water and Oil



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

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR**
- VXH
- VXF
- VX3
- VXA

Variations

Valve

Normally closed (N.C.)

Normally open (N.O.)

When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Electrical entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal

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 — CAC408

Seal — NBR, FKM

Model

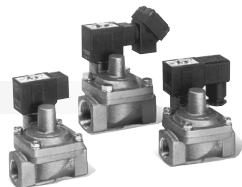
Model	Port size Rc	Orifice dia. (mmØ)
VXR215 ^ø	1/2, 3/4	20
VXR226 ^ø	1	25
VXR227 ^ø	1 1/4	35
VXR238 ^ø	1 1/2	40
VXR239 ^ø	2	50

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

Applicable Fluids Check List

Normally Closed (N.C.)

Refer to page 325 for specifications and models.



Option Symbol and Composition

Option symbol	Seal material	Coil insulation type	Body, Shading coil material
Standard	NBR	B	CAC408, Copper
A	FKM		
D	FKM		

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 327 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	CAC408, Copper	POM
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.

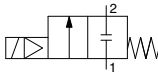
Normally Closed (N.C.)

Fluid

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

Note) Refer to page 324 "Applicable Fluids Check List" for details of special fluids outside of the standard options and specifications.

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Model/Valve Specifications <Normally Closed>

Connection Thread	Orifice diameter (mm)	Model	Min. operating pressure differential (MPa) ^{Note 2)}	Max. operating pressure differential ^{Note 2)} (MPa)		Flow rate characteristics		Max. system pressure (MPa) ^{Note 2)}	Weight (g) ^{Note 1)}
				Water	Oil	Water, Kv	Oil, Cv converted		
1/2	20	VXR2150-04	0.04	1.0	0.7	5.7	6.5	1.5	1250
3/4	20	VXR2150-06				6.4	7.5		1250
1	25	VXR2260-10				10.3	12		1730
1 1/4	35	VXR2270-12				18.9	22		2900
1 1/2	40	VXR2380-14				25.7	30		3700
2	50	VXR2390-20				42.8	48		4600

Note 1) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal 60 g for conduit terminal type respectively.

Note 2) Refer to "Glossary of Terms" on page 309 for details of max. operating pressure differential min. operating pressure differential and max. system pressure.

⚠ Be sure to read "Specific Product Precautions."

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
VXR22	DC	—	—	—	6	55
		50	40	18	7.5	60
VXR23	AC	60	35	12	6	50
		—	—	—	8	60
VXR23	DC	50	50	21	11	65
		60	45	17	9.5	60
		—	—	—	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.

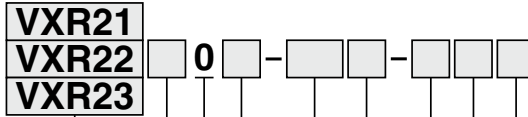
Fluid and Ambient Temperature

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 mm²/s or less
 Note 2) "D" in parentheses is an option symbol.

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

How to Order (Normally Closed)



Model ●

Body size ●

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

Valve/Body ●

0	Normally closed/Single unit
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Solenoid valve option ●

Nil	Standard
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Select an option symbol in page 324 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.

● 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.

● Electrical entry

G	Grommet
C	Conduit
D	DIN terminal
T	Conduit terminal

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

● 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 332 for ordering coil only.

● Thread type

Nil	Rc
T	NPTF
F	G*
N	NPT

* For connection, prepare a fitting compliant with ISO 16030 and JIS B 8674.

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) VXR21 series, 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)	●	●	—	●	—	—	
DC	8 (48 V)	●	●	—	—	●	—	
	5 (24 V)	●	●	●	—	—	—	
	6 (12 V)	●	●	●	—	—	—	

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



Made to Order Specifications

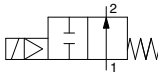
Splashproof Specifications (Based on JIS C 0920 / Based on IEC529IP-X4)

VXR [Model] — [Port size] — [Electrical entry] - X36

DIN terminal or class H coil not available.

Normally Open (N.O.)

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

⚠ Be sure to read “Specific Product Precautions.”

Fluid

Standard specifications		Option ^{Note1)}	
Water (Standard, up to 60°C)		High temperature water	(D)
Turbine oil		High temperature oil	(D)

Note) Refer to page 324 “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.

Model/Valve Specifications <Normally Open>

Connection	Orifice diameter (mmø)	Model	Min. operating pressure differential ^{Note 2)} (MPa)	Max. operating pressure differential ^{Note 2)} (MPa)		Flow rate characteristics		Max. system pressure ^{Note 2)} (MPa)	Weight ^{Note 1)} (g)
				Water	Oil	Water, Kv	Oil, Cv converted		
1/2	20	VXR2152-04	0.04	0.7	0.6	5.7	6.5	1.5	1270
3/4	20	VXR2152-06				6.4	7.5		1270
1	25	VXR2262-10				10.3	12		1770
1 1/4	35	VXR2272-12				18.9	22		2900
1 1/2	40	VXR2382-14				25.7	30		3700
2	50	VXR2392-20				42.8	48		4600

Note 1) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 2) Refer to “Glossary of Terms” on page 309 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
VXR22	DC	—	—	—	6	50
		50	45	20	8	55
VXR23	AC	60	40	15	6.5	45
		—	—	—	8	50
VXR23	DC	50	60	25	10.5	60
		60	50	20	9.5	50
VXR23	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.

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

How to Order (Normally Open)

Model

VXR21
VXR22
VXR23

Body size

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

Valve/Body

2	Normally open/Single unit
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Solenoid valve option

Nil	Standard
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Select an option mark in page 324 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.

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.

Electrical entry

G	Grommet
C	Conduit
D	DIN terminal
T	Conduit terminal

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

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 332 for ordering coil only.

Thread type

Nil	Rc
T	NPTF
F	G*
N	NPT

* For connection, prepare a fitting compliant with ISO 16030 and JIS B 8674.

**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) VXR22 series, 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		
	G	C	D, T	L, Z	S	T	G, C	S	L, Z
Electrical entry									
Electrical option	S ^{Note}	—	S	L, Z	—	—	S	L, Z	—
AC	1 (100 V)	●	●	●	●	●	●	●	●
	2 (200 V)	●	●	●	●	●	●	●	●
	3 (110 V)	●	●	●	●	●	●	●	●
	4 (220 V)	●	●	●	●	●	●	●	●
DC	7 (240 V)	●	●	●	—	●	●	—	—
	8 (48 V)	●	●	—	—	—	●	—	—
	5 (24 V)	●	●	●	—	—	—	—	—
	6 (12 V)	●	●	●	—	—	—	—	—

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



Made to Order Specifications

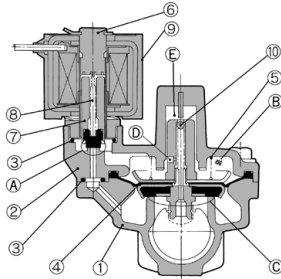
Splashproof Specifications (Based on JIS C 0920
Based on IEC529IP-X4)

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 (A) opens. Then the pressure in the pressure action chamber (B) falls to open the main valve (C).

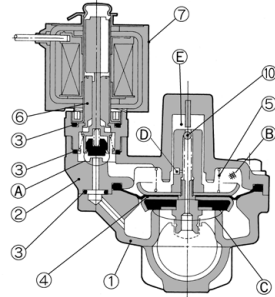
< Valve closed > When the coil (9) is not energized, the pilot valve (A) is closed and the pressure in the pressure action chamber (B) rises and the main valve (C) closes.

Water hammer relieving

Check valve mechanism is provided in the (E) side of the supply orifice (D) and (E) and supply into the pressure action chamber (B) 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 (C) becomes small, (E) is blocked. A low valve closing speed relieves the water hammer.

No.	Description	Material	
		Standard	Option
1	Body	CAC408	—
2	Bonnet	CAC408	—
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 (A) closes, the pressure in the pressure action chamber (B) rises and the main valve (C) closes.

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

Water hammer relieving

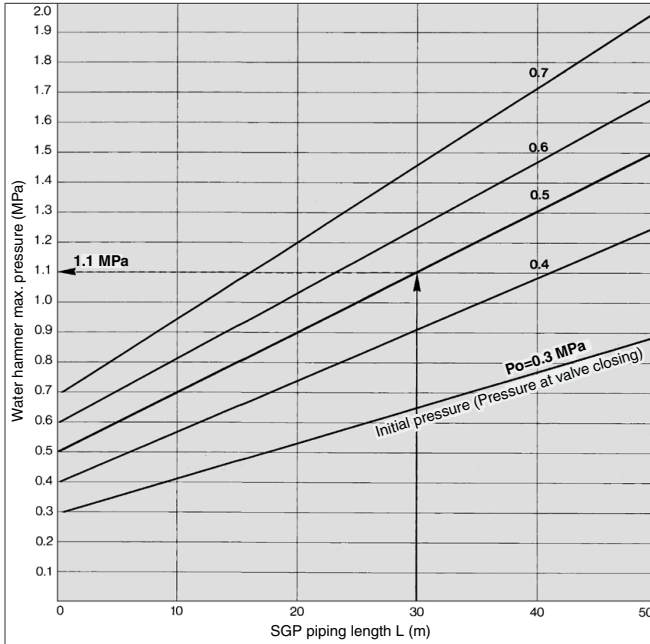
Check valve mechanism is provided in the (E) side of the supply orifice (D) and (E) and supply into the pressure action chamber (B) can be controlled with two stages by moving the diaphragm assembly (4). After release of the energizing, when the open amount of the main valve (C) becomes small, (E) is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

No.	Description	Material	
		Standard	Option
1	Body	CAC408	—
2	Bonnet	CAC408	—
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, POM, PTFE	Stainless steel, Copper FKM, PTFE
7	Coil assembly	Class B molded	Class H molded

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

VXR21/22/23 Series

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



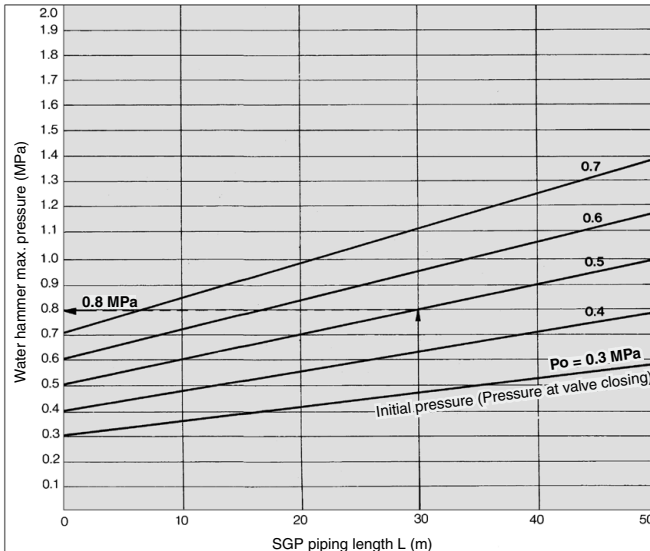
Water hammer

(Example) VXR2 series 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)



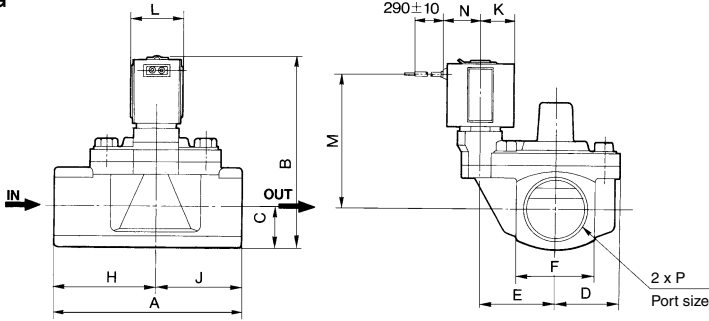
How to read the graph

When the SGP piping having the same bore as the solenoid valve is 30 m. in 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.)

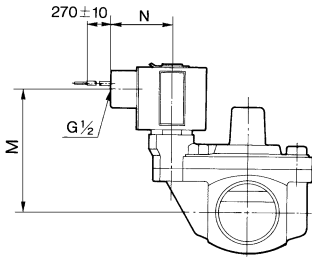
Dimensions

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

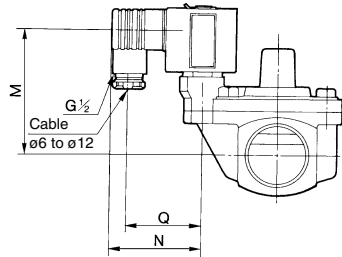
Grommet: G



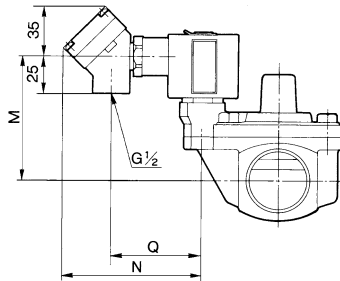
Conduit: C



DIN terminal: D



Conduit terminal: T



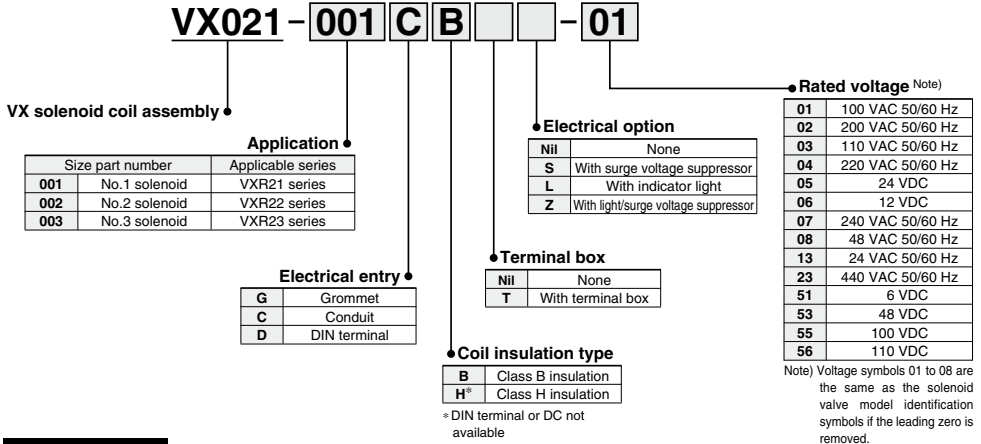
Model		Port size P	A	B	C	D	E	F	H	J	K	L	Electrical entry									
													Grommet		Conduit		DIN terminal		Conduit terminal			
Normally closed	Normally open												M	N	M	N	M	N	Q	M	N	Q
VXR2150- ⁰⁶ / ₀₄	VXR2152- ⁰⁶ / ₀₄	1/2, 3/4	80	101 (112)	18	32.5	36	36	39	41	20	30	74 (81)	23	67 (74)	39	67 (74)	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.

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR**
- VXH
- VXF
- VX3
- VXA

Solenoid Coil Assembly

How to Order Solenoid Coil Assembly



Ordering example

- (Example) VXR21 series, 100 VAC, class B insulation, grommet
(Part no.) **VX021-001GB-01**
- (Example) VXR22 series, 220 VAC, class B insulation, DIN terminal (with terminal box)
(Part no.) **VX021-002DBT-04**
- (Example) VXR23 series, 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	—	—	—
	CB	—	—	—
Conduit	CH	—	—	—
	CBT	CBTS	CBTL	CBTZ
	CHT	CHTS	CHTL	CHTZ
	DBT	—	—	—
DIN terminal	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 — Solenoid coil assembly model with -X36 added at the end.