Pilot Operated/Zero Pressure Differential Operation

2 Port Solenoid Valve

Series VXZ

Change of valve style from N.C. to N.O. is simple.

Low power consumption, long life, and high reliability type molded coil

VXZ22 7.5/6W (50/60Hz AC)
VXZ23 11/9.5W (50/60Hz AC)

Excellent maintainability

Separation of movable iron core and diaphragm valve permits easy disassembly/reassembly.

Compact, light, and large valve capacity

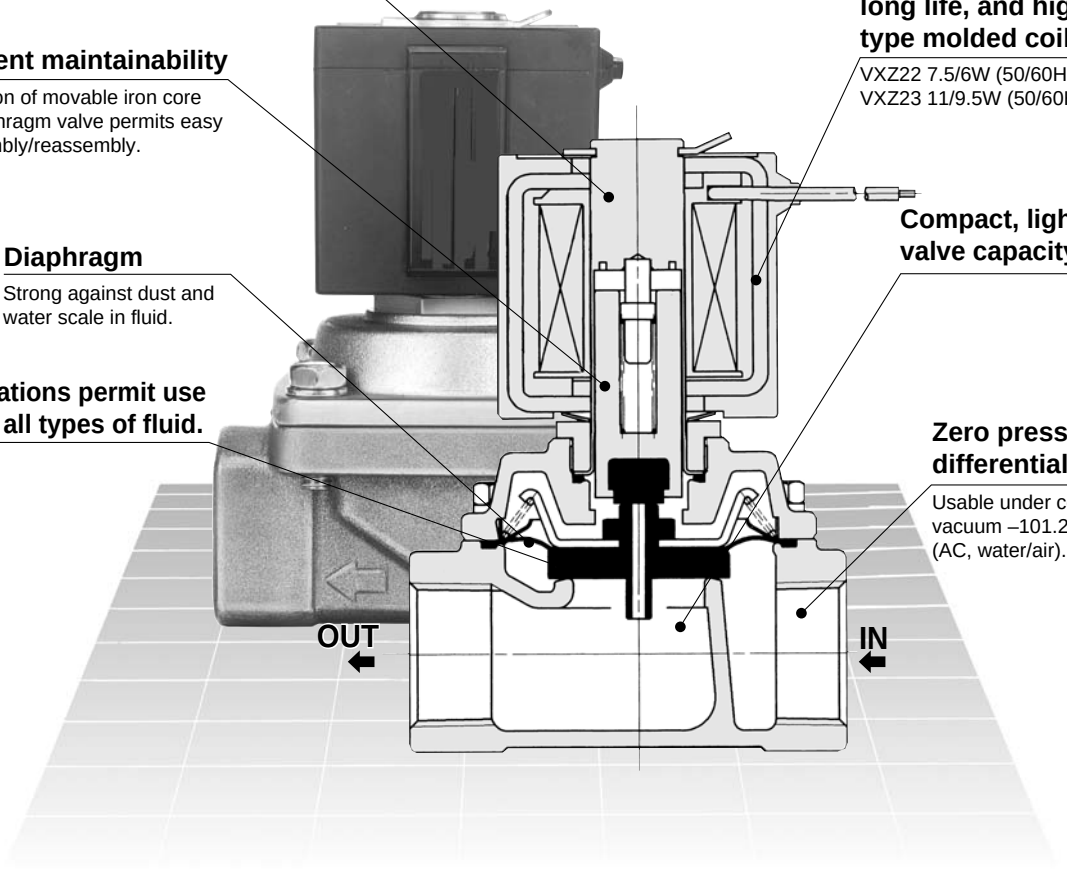
Diaphragm

Strong against dust and water scale in fluid.

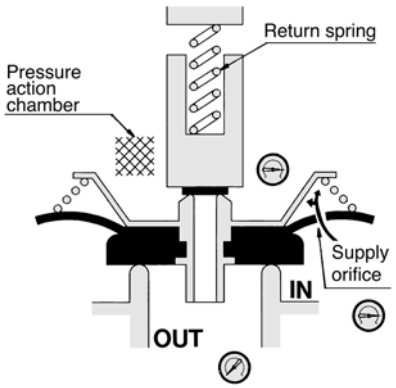
Wide variations permit use of almost all types of fluid.

Zero pressure differential operation

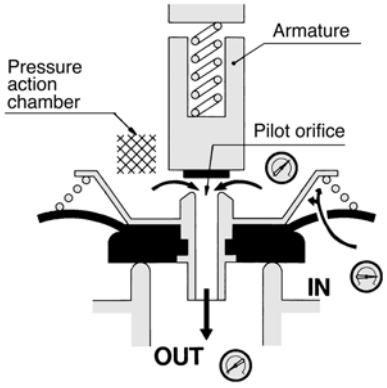
Usable under conditions of vacuum –101.2kPa to 1MPa (AC, water/air).



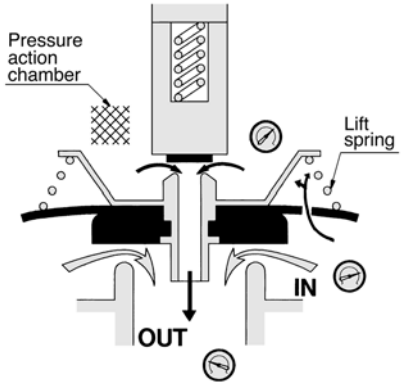
When power is not supplied >> **Right after power is supplied (Pilot valve opens)** >> **When power is being supplied (Main valve opens.)**



Fluid from the IN side goes through the supply orifice and fills the pressure action chamber.
The main valve is kept closed by the force pushing down the valve and the reaction force of the return spring.



When power is supplied to the coil, the armature begins to be attracted, and the pilot orifice opens.
The fluid filled in the pressure action chamber flows through the pilot orifice to the OUT side.



Since the fluid is discharged from the pilot orifice, the pressure in the pressure action chamber decreases.
The force pushing down the valve weakens, and the pressure pushing up the valve over-comes the said force. Thus the main valve opens.
When the IN side has no pressure, or when the pressure is very low,the reaction force of the lift spring opens the main valve.

How to Order

Model — Port size

2230	**02** (1/4)
2230	**03** (3/8)
2240	**04** (1/2)
2350	**06** (3/4)
2360	**10** (1)

Thread

—	Rc(PT)
T	NPTF
F	G(PF)
N	NPT

Electrical option

—	Without light/surge voltage suppressor
S	With surge voltage suppressor
L	With light
Z	With light voltage suppressor

∗ See table ① below for applications.

◀N.C.▶ **Normally closed** VXZ 2230 ☐ — 02 ☐ — 1 D ☐ — Q

▶N.O.◀ **Normally open** VXZ 2232 ☐ — 02 ☐ — 1 D ☐ — Q

Electrical entry

G	Grommet
C	Conduit
T	Conduit terminal
D	DIN terminal (With connector)
DO	DIN terminal (Without connector)

∗ See table ① below for applications.

Optional solenoid valve

—	Standard.

For special non-standard fluid, see the "applicable fluid check list" and select an option code.

Model — Port size

2232	**02** (1/4)
2232	**03** (3/8)
2242	**04** (1/2)
2352	**06** (3/4)
2362	**10** (1)

Rated voltage

1**	100V AC 50/60Hz
2**	200V AC 50/60Hz
3**	110V AC 50/60Hz
4**	220V AC 50/60Hz
5	24V DC
6	12V DC
7**	240V AC 50/60Hz
8**	48V AC 50/60Hz
9**	Other (less than 240V)

∗ See Table ① below for applications
∗∗ Din type only available.

Contact SMC for other voltages (9)

⚠ Protective class class I (Mark: ⏚)

Fluid

Standard specifications	Option (1)
Air (general, dry)	Air (dry) ····· (T)
Vacuum (up to 1Torr)	High temp, water ····· (D, E)
Turbine oil, Carbon dioxide gas (CO_2),	Argon, helium ····· (F)
Nitrogen gas (N_2)	⋮
Freon 11, 113, 114	(Others)

Note 1) See the "Applicable fluid check list" on p.4.1-59 for special nonstandard fluid and details of optional specifications.

Fluid and Ambient Temperature

Temp. conditions	Power supply	Fluid temp. °C					Ambient temp °C
		Water (Standard)	Air (Standard)	Oil (Standard)	High temp. water (D.E.N.P) (3)	High temp. oil (D.N) (3)	
Max.	AC	60	80	60	99	100	60
	DC	40	60	40	—	—	40
Min.	AC, DC	1	–10(1)	–5(2)	—	—	–10

Note 1) Dew point is below –10°C Note 2) Below 50cSt
Note 3) The parenthesized D.E.N.P represent option codes.

Table ① Rated voltage-Electrical entry-Electrical option

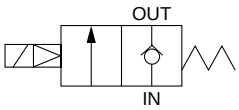
Insulation		Class B			
Electrical entry		G	C	D, T	
Electrical option		S(1)	—	S	L, Z
AC	**1** (100V)	—	—	●	●
	2 (200V)	—	—	●	●
	3 (110V)	—	—	●	●
	4 (220V)	—	—	●	●
	7 (240V)	—	—	●	—
	8 (48V)	—	—	●	—
DC	**5** (24V)	●	●	●	●
	6 (12V)	●	●	●	—

Note 1) The surge voltage suppressor is attached in the middle of a lead wire.

⚠ Caution

Refer to p.0-33 for Safety Instructions and p.0-37 to 0-40 for common precautions.

Symbol



◀N.C.▶ Normally closed

Model/Valve Specifications

Port size	Orifice dia. (mmø)	Flow rate coefficient Nℓ/min	Flow rate coefficient Effective area (mm^2)	Model	Min oper. press. diff. (MPa)	Max. operating press. diff. (MPa) Water AC	Water DC	Air AC	Air DC	Oil AC	Oil DC	Max. system pressure (MPa)	(1) Weight (g)
1/4	10	1864.85	34	**VXZ2230-02**	0	1.0	0.7	1.0	0.7	0.7	0.7	1.5	550
3/8	10	2355.60	43	**VXZ2230-03**		1.0	0.7	1.0	0.7	0.7	0.7		550
1/2	15	5201.95	95	**VXZ2240-04**		1.0	0.7	1.0	0.7	0.7	0.7		760
3/4	20	9029.80	165	**VXZ2350-06**		1.0	1.0	1.0	1.0	0.7	0.7		1,300
1	25	11778	215	**VXZ2360-10**		1.0	1.0	1.0	1.0	0.7	0.7		1,480

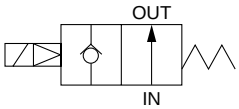
Note 1) Values for the grommet style. Add 10g for the conduit style, 30g for the DIN connector style, 60g for the terminal style.
- See the "Terminology on p.4.0-12 for details of max. operating pressure difference and max. system pressure.

Solenoid Specifications

Model	Power supply	Frequency Hz	Apparent power VA Inrush	Apparent power VA Holding	Power consumption W (Holding)	Temp rise °C (Rated voltage)
VXZ22	AC	50	60(53)	18	7.5	60
		60	51(44)	12	6	50
	DC	—	—	—	8	60
VXZ23	AC	50	80	21	11	65
		60	67	17	9.5	60
	DC	—	—	—	11.5	65

Note)
- The return voltage is 20% or more of the rated voltage for AC and 2% or more for DC.
- The allowable voltage fluctuation rate is ±10% of the rated value for both AC and DC.
- When the ambient temperature is 20°C ±5°C and rated voltage is applied.
- **Coil change from AC to DC or DC to AC is impossible because the iron core shapes are different.**
- The apparent power in the parenthesis is for VXZ2230.

Symbol



▶N.O.◀ Normally open

Model/Valve Specifications

Port size	Orifice dia. (mmø)	Flow rate coefficient Nℓ/min	Flow rate coefficient Effective area (mm^2)	Model	Min oper. press. diff. (MPa)	Max. operating press. diff. (MPa) Water AC	Water DC	Air AC	Air DC	Oil AC	Oil DC	Max. system pressure (MPa)	(1) Weight (g)
1/4	10	1864.85	34	**VXZ2232-02**	0	0.7	0.6	0.7	0.6	0.7	0.6	1.5	600
3/8	10	2355.60	43	**VXZ2232-03**		0.7	0.6	0.7	0.6	0.7	0.6		600
1/2	15	5201.95	95	**VXZ2242-04**		0.7	0.6	0.7	0.6	0.7	0.6		850
3/4	20	9029.80	165	**VXZ2352-06**		0.7	0.6	0.7	0.6	0.7	0.6		1,370
1	25	11778	215	**VXZ2362-10**		0.7	0.6	0.7	0.6	0.7	0.6		1,550

Note 1) Values for the grommet style. Add 10g for the conduit style, 30g for the DIN connector style, and 60g for the terminal style.
- See the "Terminology on p.4.0-12 for details of max. operating pressure difference and max. system pressure.

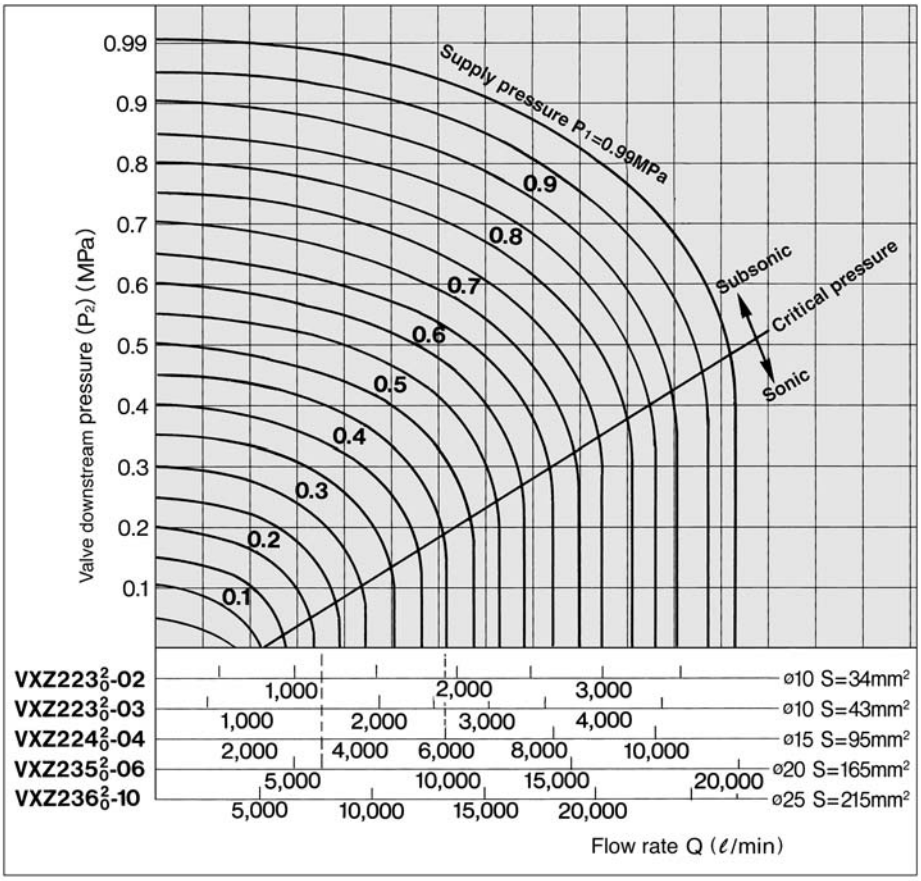
Solenoid Specifications

Model	Power supply	Frequency Hz	Apparent power VA Inrush	Apparent power VA Holding	Power consumption W (Holding)	Temp rise °C (Rated voltage)
VXZ22	AC	50	66(60)	20	8	55
		60	57(51)	15	6.5	45
	DC	—	—	—	8	50
VXZ23	AC	50	93	25	11	60
		60	79	20	9.5	50
	DC	—	—	—	11.5	55

Note)
- The return voltage is 20% or more of the rated voltage for AC and 5% or more for DC.
- The allowable voltage fluctuation rate is ±10% of the rated voltage value for both AC and DC.
- When the ambient temperature is 20°C ±5°C and rated voltage is applied.
- **Coil change from AC to DC or DC to AC is impossible because the iron core shapes are different.**
- The apparent power in the parenthesis is for VXZ2232.

Flow Characteristics

Air



How to Read Chart

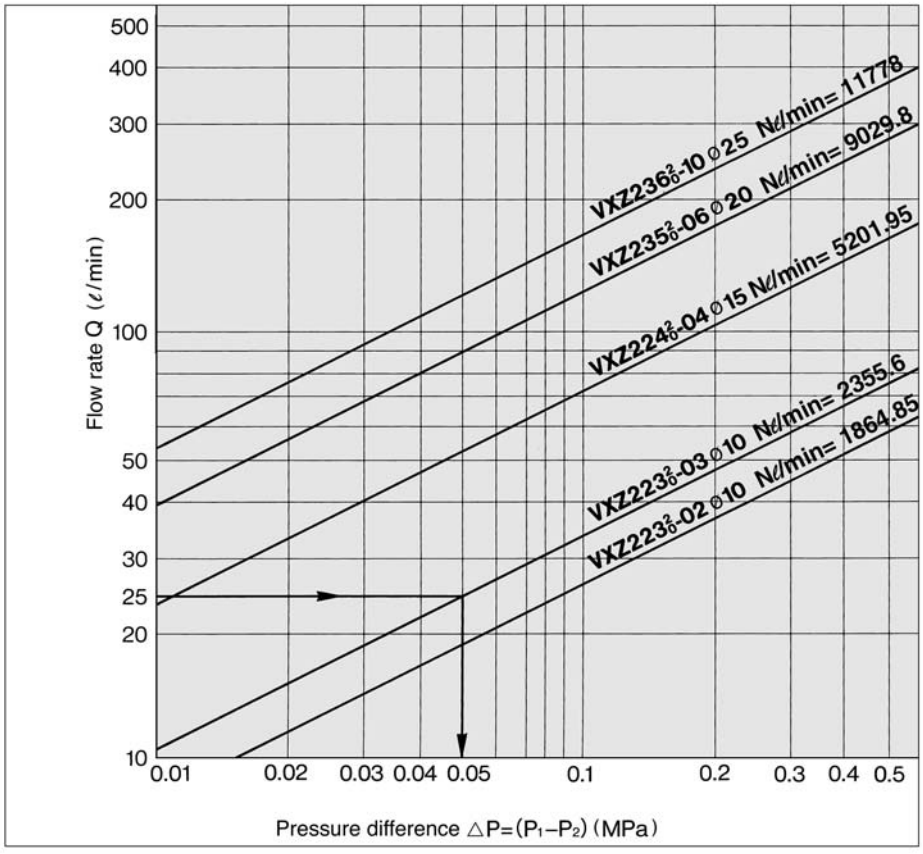
The pressure in the sonic region for the flow rate of 6000ℓ/min (ANR) is $P_1 \cong 4.7$MPa for the orifice of 15 dia. (VXZ224$^{2}_{0}$-04) and $P_1 \cong 2.3$MPa for the orifice of 20 dia. (VXZ235$^{2}_{0}$-06).

How to Calculate flow rate/Air

① In subsonic region:
$P_1+0.1013=(1 \text{ to } 1.8941)(P_2+0.1013)$
- Formula with Cv factor
  $Q=4073.4 \cdot Cv \cdot \sqrt{\triangle P(P_2+0.1013)}$ ··· ℓ/min (ANR)
- Formula with effective orifice
  $Q=226.3 \cdot S \cdot \sqrt{\triangle P(P_2+0.1013)}$ ····· ℓ/min (ANR)

② In sonic region
$P_1+0.1013 \geqq 1.8941(P_2+0.1013)$
- Formula with Cv factor
  $Q=1972.8 \cdot Cv \cdot (P_1+0.1013)$ ····· ℓ/min (ANR)
- Formula with effective orifice
  $Q=109.6 \cdot S \cdot (P_1+0.1013)$ ····· ℓ/min (ANR)

Water



How to Read Chart

The pressure difference for the flow rate of 25ℓ/min. is $\triangle P \cong 0.05$MPa for the orifice orifice of ø10 dia. (VXZ223$^{2}_{0}$-03)

How to Calculate Flow Rate/Water

- Formula with Cv factor
  $Q=14.2 \cdot Cv \cdot \sqrt{10.2 \cdot \triangle P}$ ····· ℓ/min
- Formula with effective orifice (Smm²)
  $Q=0.8 \cdot S \cdot \sqrt{10.2 \cdot \triangle P}$ ····· ℓ/min

Q : Flow rate (Air ℓ/min), (Steam kg/h), (Water ℓ/min)
△P: Pressure difference (P_1-P_2)
P_1 : Upstream pressure (kgf/cm²)
P_2 : Downstream pressure (kgf/cm²)
θ : Air temperature (°C)
S : Effective orifice (mm²)
Cv : Cv factor (/)

Applicable Fluid Check List

◀N.C.▶ Normally closed

See p.4.1-57 for model and specifications.

Option code and components

Option code	Seal material	Coil insulation	Main body, shading coil material
Standard	NBR	B	Brass or BC6, copper
A	FPM		
B	EPR		
D	FPM	H	
E	EPR		
F*	FPM	B	
G	NBR		
H	FPM		Stainless steel, silver
J	EPR		
L*	FPM		
N	FPM	H	
P	EPR		
T*	NBR	B	Brass or BC6, copper
X*	FPM		

Note 1) The option code with "∗" stands for non-lube treatment. Suffix "–X21" should be added to the parts number of other options for non-lube treatment.
Note 2) The option "T/X" has a long life iron core, but water is not applicable.

Fluid name and options

Fluid (application)	Option code and body material	
	Brass or BC6	Stainless steel
Argon	F	L
Argon (long life)	X	—
Ethyl alcohol	F, B	L, J
Ethylene glycol	B	J
Caustic sode (25%≧)	—	J
Air (dry)	T	—
Light oil	A	H
Silicon oil	A	H
Heavy oil (up to 60°C)	A	H
Heavy oil (up to 100°C)	D	N
Steam system (boiler water)	—	G, J
Steam system (condensate)	E	P
Insulation oil	A	H
Naphtha	A	H
Parachloroetylene	A	H
Brake oil	B	J
Water (up to 99°C)	D, E	N, P

▶N.O.◀ Normally open

See p.4.1-57 for model and specifications.

Option code and components

Option code	Seal material	Coil insulation	Main body, shading coil material	Holder material (In core ass'y)
Standard	NBR	B	Brass or BC6, copper	Polyacetal
A	FPM			
B	EPR			
D	FPM	H		Stainless steel
E	EPR			
F*	FPM	B		Polyacetal
G	NBR		Stainless steel, silver	
H	FPM			
J	EPR			
L*	FPM			
N	FPM	H		Stainless steel
P	EPR			
T*	NBR	B	Brass or BC6, copper	Polyacetal
X*	FPM	H		Stainless steel

Note 1) The option code with "∗" stands for non-lube treatment. Suffix "–X21" should be added to the parts number of other options for non-lube treatment.
Note 2) The option "T/X" has a long life iron core, but water is not applicable.

Fluid name and options

Fluid (application)	Option code and body material	
	Brass or BC6	Stainless steel
Argon	F	L
Caustic soda (25%≧)	—	J
Air (dry)	T	—
Light oil	A	H
Silicon oil	A	H
Heavy oil (up to 60°C)	A	H
Heavy oil (up to 100°C)	D	N
Steam system (boiler water)	—	G, J
Steam system (condensate)	E	P
Insulation oil	A	H
Parachloroetylene	A	H
Brake oil	B	J
Water (up to 99°C)	E	N, P

Selection procedures

① Selection of port size
② Selection of material according to the operating temperature and type of fluid
③ Selection of power voltage and electrical entry

Valve

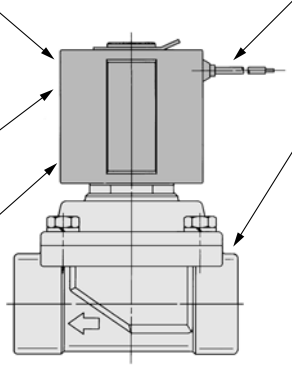
◀N.C.▶ Normally open
▶N.O.◀ Normally closed

Solenoid coil

Coil: Class B

Rated voltage

☐AC (DIN type only available)
Standard ——— 100V, 200V
Option ——— 48V, 110V, 220V, 240V
☐DC
Standard ——— 24V
Option ——— 12V



Electrical entry

- Grommet
- Conduit
- DIN connector
- Conduit terminal

Material

Body —— Brass/BC6, SUS
Seal —— NBR, EPR, FPM

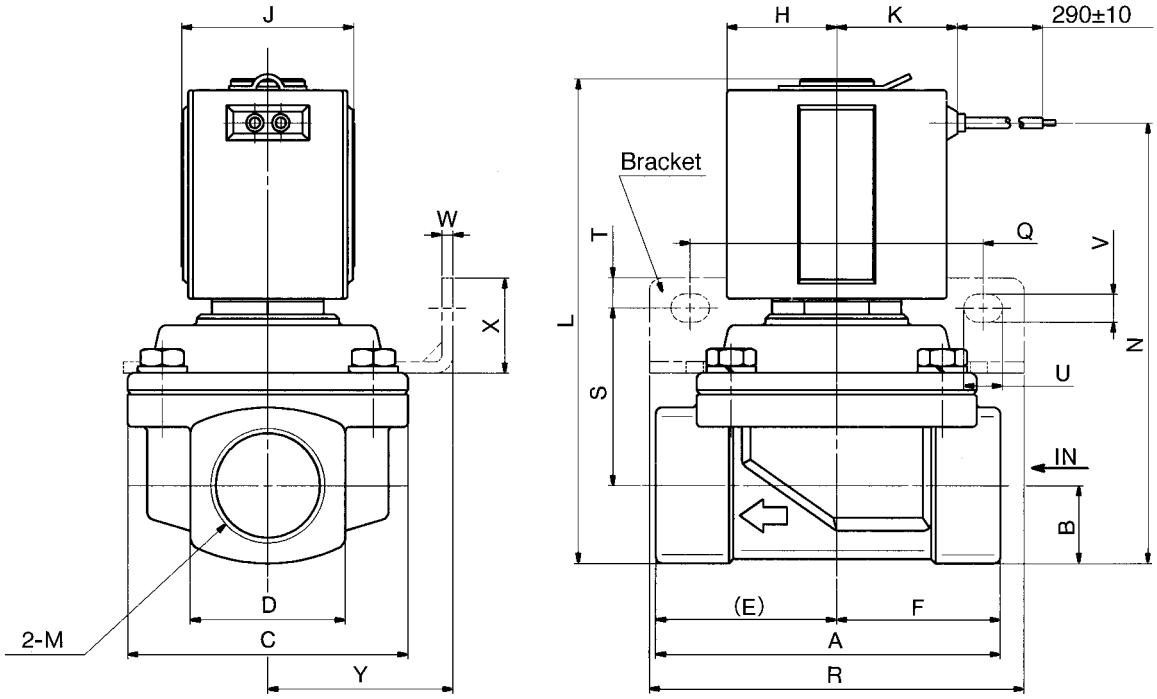
Model

Model	Port size	Orifice dia. (mmø)
VXZ223$^{2}_{0}$	1/4 3/8	10
VXZ224$^{2}_{0}$	1/2	15
VXZ235$^{2}_{0}$	3/4	20
VXZ236$^{2}_{0}$	1	25

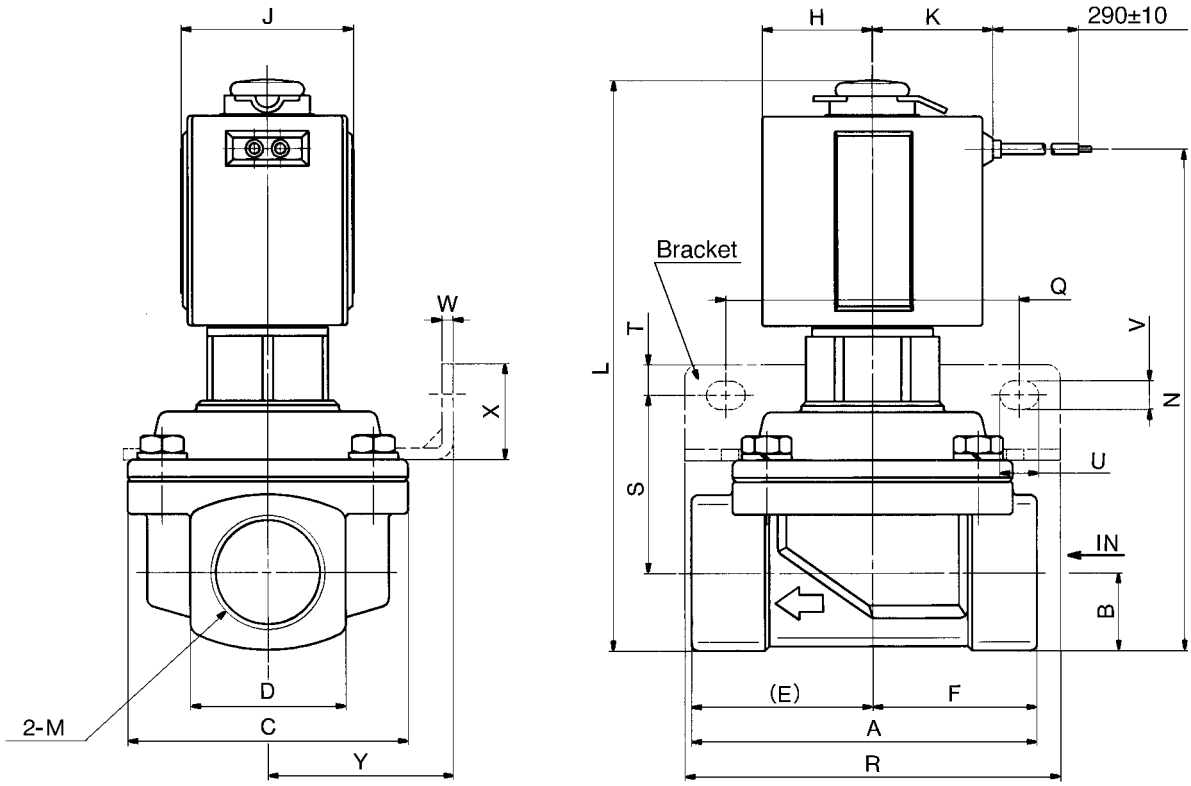
Dimensions

Grommet: G

◀N.C.▶ Normally closed: VXZ2230, 2240, 2350, 2360



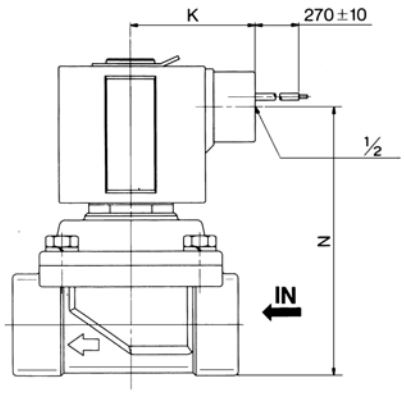
▶N.O.◀ Normally open: VXZ2232, 2242, 2352, 2362



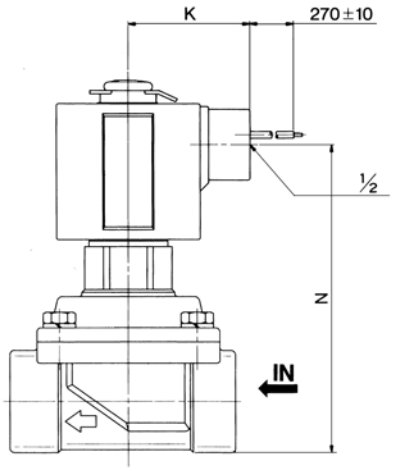
Model		Port size M	A	B	C	D	E	F	H	J	K	N.C.		N.O.		Q	R	S	T	U	V	W	X	Y
N.C.	N.O.											L	N	L	N									
VXZ2230	**VXZ2232**	1/4, 3/8	50	11	40	22	24	26	23	35	25	89	79.5	108	93	52	67	25.5	6	7.5	5.5	1.6	14	28
VXZ2240	**VXZ2242**	1/2	63	14	52	28	33	30	23	35	25	97	87.5	117	102	60	75	33	7	8.5	6.5	2.3	17	35
VXZ2350	**VXZ2352**	3/4	80	18	65	36	42	38	25.5	40	28	112	101.5	130	115.5	68	87	41	7	9	6.5	2.6	22	43
VXZ2360	**VXZ2362**	1	90	21	70	42	47	43	25.5	40	28	117	106.5	135	120.5	73	92	44	7	9	6.5	2.6	22	45

Conduit: C

◀N.C.▶ Normally closed



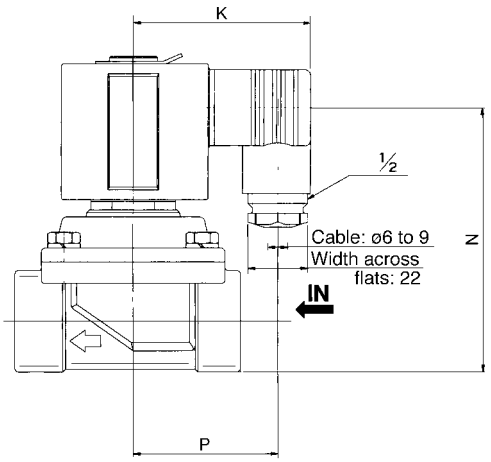
▶N.O.◀ Normally open



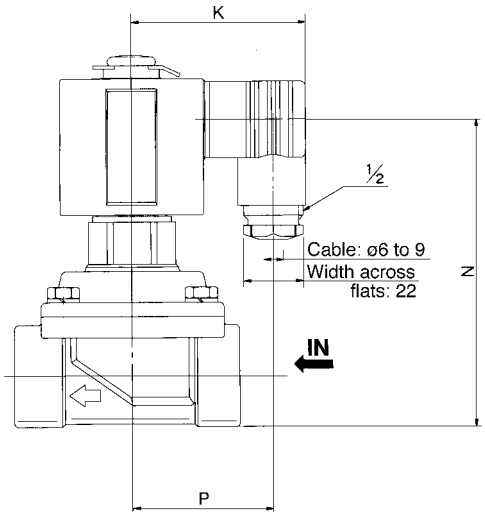
Model		K	N	
N.C.	N.O.		N.C.	N.O.
VXZ2230	VXZ2232	41	72	88
VXZ2240	VXZ2242	41	80	97
VXZ2350	VXZ2352	44	95	108.5
VXZ2360	VXZ2362	44	100	113.5

DIN connector: D

◀N.C.▶ Normally closed



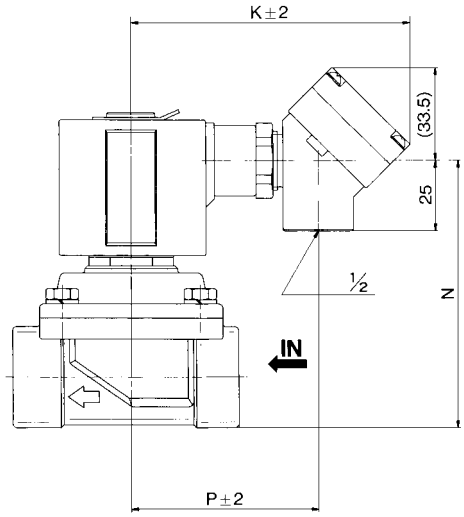
▶N.O.◀ Normally open



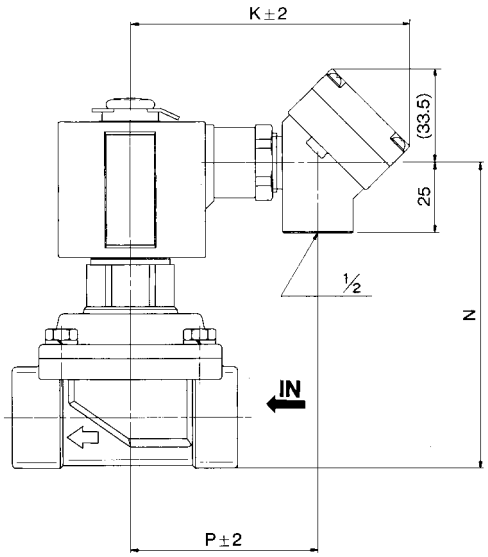
Model		K	N		P
N.C.	N.O.		N.C.	N.O.	
VXZ2230	VXZ2232	60	72	88	48
VXZ2240	VXZ2242	60	80	97	48
VXZ2350	VXZ2352	62	95	108.5	50
VXZ2360	VXZ2362	62	100	113.5	50

Conduit Terminal: T

◀N.C.▶ Normally closed



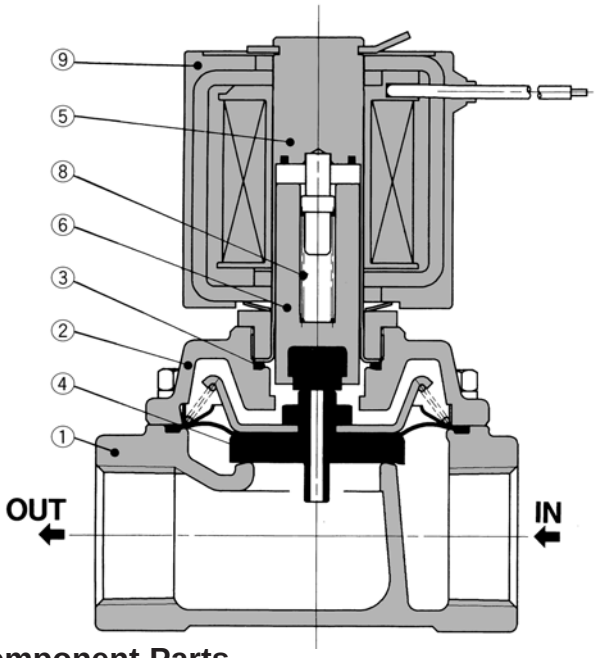
▶N.O.◀ Normally open



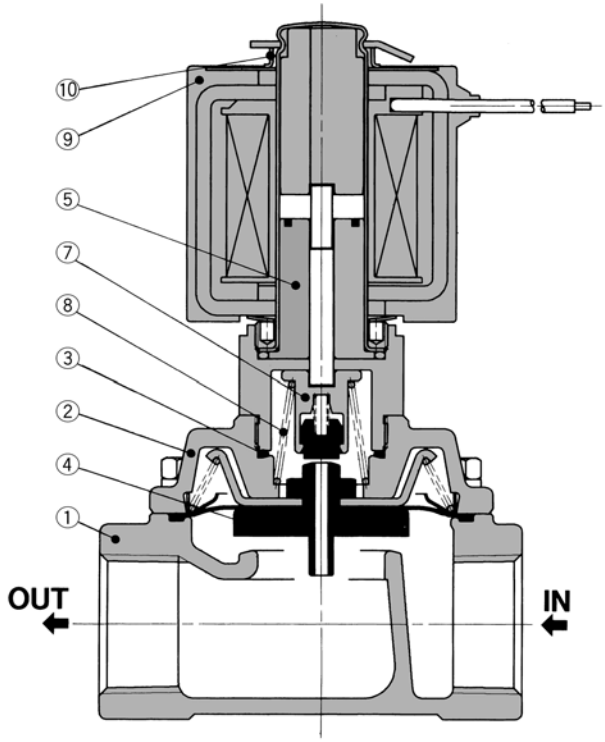
Model		K	N		P
N.C.	N.O.		N.C.	N.O.	
VXZ2230	VXZ2232	95	72	88	62
VXZ2240	VXZ2242	95	80	97	62
VXZ2350	VXZ2352	97	95	108.5	64
VXZ2360	VXZ2362	97	100	113.5	64

Construction

◀N.C.▶ Normally closed



▶N.O.◀ Normally open



Component Parts

No.	Description	Material	
		Standard	Option
①	Body	Brass/BC6	Stainless steel
②	Bonnet	Brass	Stainless steel
③	O ring	NBR	FPM/EPR
④	Diaphragm assembly	Stainless steel, NBR	Stainless steel, FPM/Stainless steel, EPR
⑤	Core ass'y	Stainless steel, Copper	Stainless steel, Silver

No.	Description	Material	
		Standard	Option
①	Armature ass'y	Stainless steel, NBR	Stainless steel, FPM/Stainless steel, EPR
②	Holder ass'y	POM, NBR	Stainless steel, FPM/Stainless steel, EPR
③	Return spring	Stainless steel	—
④	Coil ass'y	Class B, molded	Class H, molded
⑤	Colour	Stainless steel	—

Coil Assembly No.

VX021 — 002 | DBTZ — 01 — Q

Coil combination code
(See the table below.)

Solenoid No.

No.	Applicable valve model
002	**VXZ22□□**
003	**VXZ23□□**

Rated voltage

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

Note 1) The voltage codes of 01 to 08 when the suffix "0" is removed, are the same as the solenoid valve model codes.

∗ Din type only available

Applicable voltage for electrical option

Power supply	Voltage code	Surge suppressor	Light
AC	**01**	●	●
	02	●	●
	03	●	●
	04	●	●
	07	●	—
	08	●	—
DC	**05**	●	●
	06	●	—

Coil Combination Code

Grommet

Code	Insulation	Option
GB	Class B	—
GBS		With surge voltage suppressor
GH	Class H	—

Conduit

Code	Insulation	Option
CB	Class B	—
CBT		With terminal
CBTS		With terminal and surge suppressor
CBTL		With terminal and light
CBTZ		With terminal and light surge suppressor
CH	Class H	—
CHT		With terminal
CHTS		With terminal and surge suppressor
CHTL		With terminal and light
CHTZ		With terminal and light surge suppressor

DIN connector

Code	Insulation	Option
DB	Class B	—
DBT		With connector
DBTS		With connector and surge suppressor
DBTL		With connector and light
DBTZ		With connector and light surge suppressor

Detail Construction