KITZ

KELMO® EX Series

Electric Actuators for Ball and Butterfly Valves

KITZ CORPORATION

Next-Generation Electric Actuator

Realization of Upgraded General-Purpose Actuators

EX SERIES

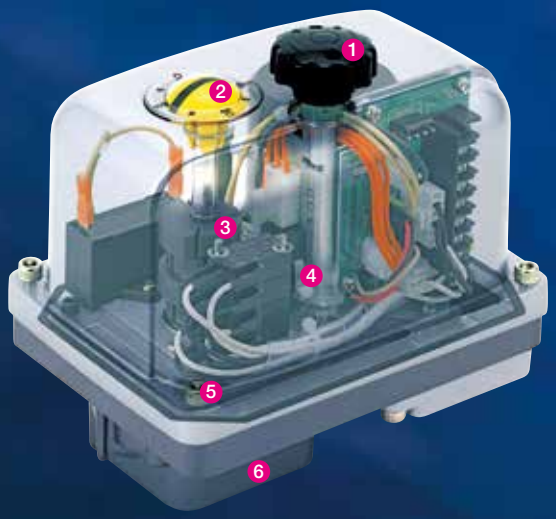
Modularization and implementation of common parts have brought significant advantages to EX series.

Better cost performance
Compared with other equivalent actuators, the EX series are superior in terms of specification and performance.

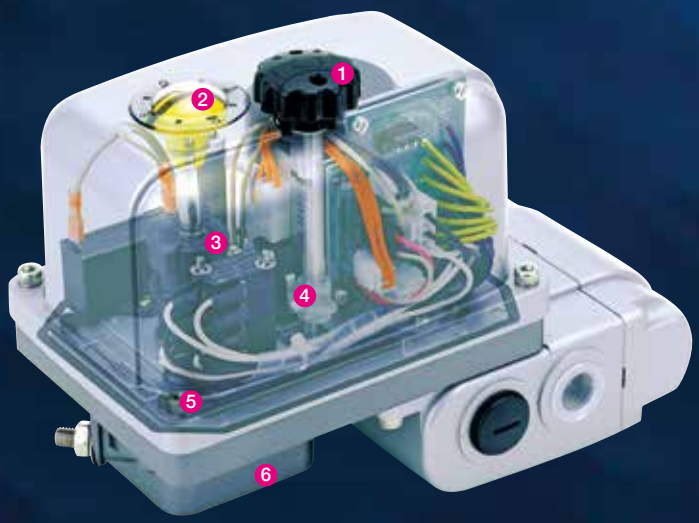
Instant option availability
EX series can be used in various applications by simply replacing module parts and exchangeable extension circuit boards easily.

Improvement in operability and maintenance

Simplicity
In addition to the module consutrcution and implementation of common parts. Highly visible position indicator and manual handle contributes simple and quick maintenance.



EXH: High-speed actuator for ball valves



EXS: Standard-speed actuator for butterfly and/or ball valves

Manual override
Actuator can be manually operated by using easy-to-use round handle. Using hexagonal wrenches together, operation will be easier.

Position indicator
Actuators are equipped with highly visible position indicator with transparent cover as standard.

Precision adjustable cam / Standard auxiliary limit switch
Cams can be adjusted to precise positions. In addition to two standard limit switches, two auxiliary limit switches will be provided. Which enables users to select output signal with no-voltage. Two more auxiliary limit switches or potentiometer can be added as option. For requirements of the minutes load current less than 50mA, special limit switches are available.

Interlock switch
Interlock switches shuts off power supply when pulled up, which ensures safe manual operation. Manual mode is indicated by output signal with voltage.

Stainless steel exterior bolting
All bolts used on the outside of the actuator are made of stainless steel. Combined with fall-off-proof bolts, actuator features high durability and reliability suitable for long service life.

Implementation of incribed planetary gear
Incribed planetary gear is used in the output reduction gear system. Pleantary gear will enable achievement of high reduction ratio with compact design.

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High-speed Actuator for Ball Valves
Suitable for valve opening/closing operations which requires high output torque at high speed.

EXS

Low-speed Actuator for Butterfly Valves
Suitable for valve opening/closing operations which requires high output torque at low speed. Actuator is equipped with self-locking device on the output shaft. Special type for ball valve is available.

EXCN • EXD

Proportional Control Actuators for Butterfly Valves
Standard type employs propotional control for valve opening/closing operations. Can be used to upgrade butterfly valve.
*Can be installed to Lambda-Port Valve.

Product code

EX □ □□□ – □

Actuator size
1 : Type 1 (for only EXH/EXH_D)
2 : Type 2
3 : Type 3
4 : Type 4 (except EXH12D)
5 : Type 5 (except EHX_D)

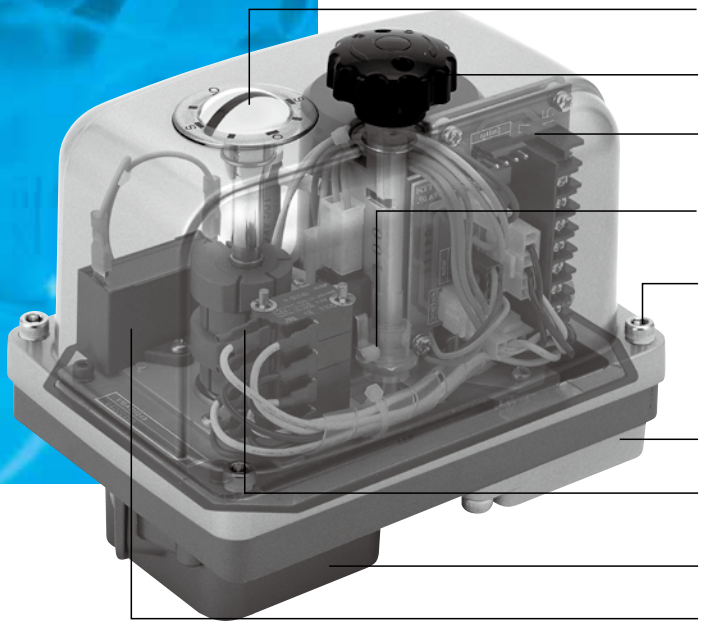
Power supply
100 : AC100V
200 : AC200V
12D : DC12V
24D : DC24V
100D : DC100V

Type
H : High speed actuator for ball valves
S : Low speed actuator for butterfly valves
CN : Proportional control actuator for butterfly & lambda port valves
D : Proportional control actuator for butterfly & lambda port valves

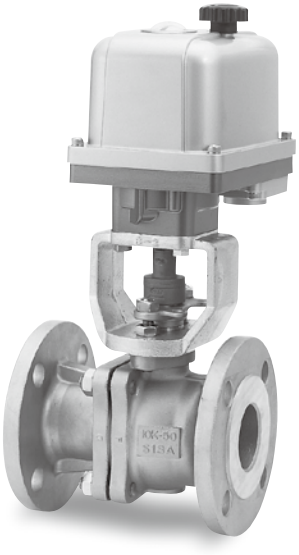
Series
EX : Electric actuator with planetary reduction gear

EXH
EX SERIES

High-Speed Actuators for Ball Valves ensuing stable, high-speed valve operation at all times.

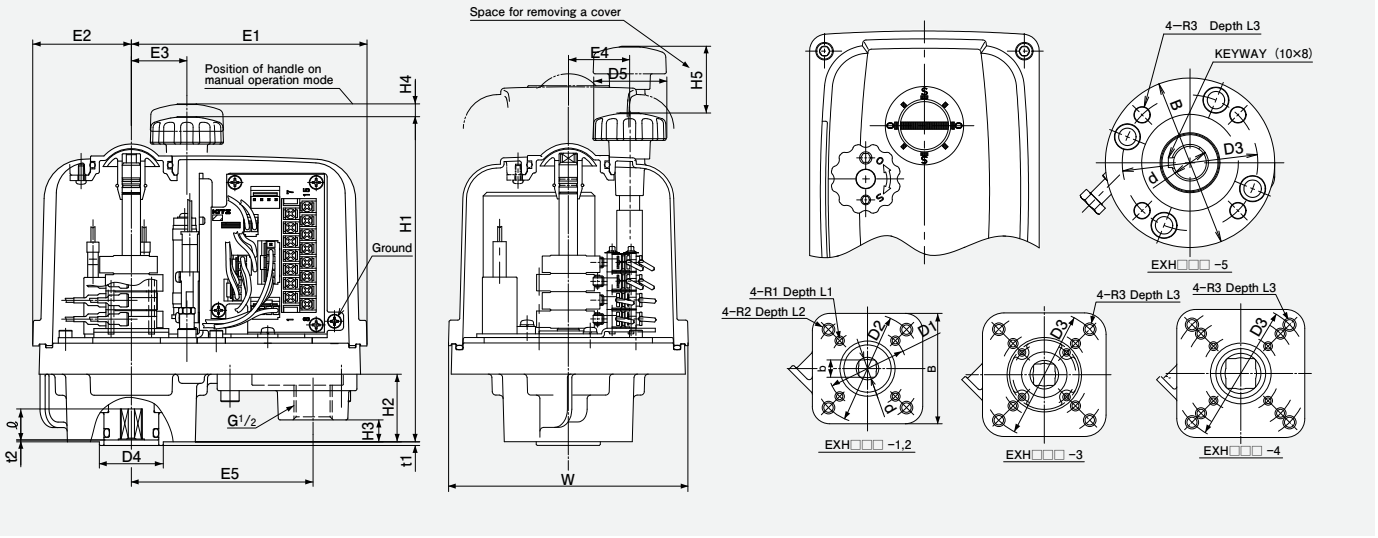


EXH Series are high-speed electric actuators for ball valves.



- Cyclo speed reducer employed.
- Stepless adjustment limit cam and no-voltage contact SW are equipped as standard.
- With interlock switch.
- External terminal box allows actuator to be connected to cables without removing the cover and to extend the actuator functions using optional circuit boards.

Dimensions



unit : mm

Type	E1	E2	E3	E4	E5	W	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	ℓ	t1	t2	R1×L1	R2×L2	R3×L3
EXH□□□-1	129	54	30.4	33.5	99.5	131	181	37	12	10	107.5	50	70	—	35	40	12.1	9	70	16	2	1	M6×10	M8×13	—
EXH□□□-2	129	54	30.4	33.5	99.5	131	181	37	12	10	107.5	50	70	—	35	40	14.3	11	70	16	2	1	M6×10	M8×13	—
EXH□□□-3	152	69	45.1	42	123	158	206.5	44	19	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6×10	M8×13	M10×16.5
EXH□□□-4	168	73	51.3	50	138.5	188	276	78	53	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8×12	M10×15	M12×18
EXH□□□-5	168	73	51.3	50	138.5	188	357	159	134	10	153	—	—	140	100	60	38	—	175	65	3	—	—	—	M16×24

*The dimension of the EXH with an external terminal box will change.

Type EXH: Standard Design specifications

High-speed type for ball valves

Actuator size		Type 1	Type 2	Type 3	Type 4	Type 5
Actuators type		EXH100/200-1	EXH100/200-2	EXH100/200-3	EXH100/200-4	EXH100/200-5
Power supply		100/200 V AC ±10% 50/60 Hz				
Rated current (A)*1	100 V AC	0.65	0.65	1.2	2.8	2.8
	200 V AC	0.35	0.35	0.6	1.5	1.5
Valve closing time (s)*2	EXH 50 Hz	Approx. 9	Approx. 14	Approx. 21	Approx. 28	Approx. 49
	EXH 60 Hz	Approx. 8	Approx. 12	Approx. 17	Approx. 23	Approx. 41
Rated output torque (N·m)		9.8	49	196	588	1000
Motor output (rating) (W)	50 Hz	13	13	26	72	72
	60 Hz	16	16	31	85	85
Power consumption (W)	50 Hz	65	65	120	280	280
	60 Hz	65	65	120	270	270
Overload protection		Build-in thermal protector (Activated at 120˚C)				
Rotation direction		Counterclockwise to open / Clockwise to close (Viewed from top)				
Duty factor (%ED)		Maximum 30% ED at 20˚C				
Limit switch*3		2 each for opening / closing (2 position switches and 2 signal switches with no voltage)				
Switch contact Capacity		250 VAC 2 A (Resistance load)				
Service environment		Indoor/Outdoor (No underwater / No direct sunlight)				
Waterproof and dustproof		Equivalent to IP 67				
Space heater capacity (W)		15				
Heater power consumption (W)		2.5/2.9 (at 100/200V)			4	
Ambient temperature		-10˚C to +50˚C				
Insulation class		JIS C4003 Class E				
Insulation strength		1 min. / 1500 V AC or 1 sec. / 1800 V AC				
Insulation resistance		100 MΩ minimum at 500 V DC				
Mounting position		Vertical to horizontal (No upside down installation)				
Lubricant		Grease				
Conduit ports	EXH	One G1/2				
Electric wiring		M3 terminal board				
Mechanical stopper	EXH	Build-in stopper for opening / closing				
Manual operation		Operate by pulling up and turing the handle located on upper part of the cover. During manual operaton, switch off power supply with built-in interlocking switch to motor/space heater.				
Automated operation		Pressing handle down to restore electric operation.				
Mounting flange		ISO 5211				
Painting color		Metallic silver cover / Metallic dark grey case / Frosted black handle				
Actuator mass (kg)*4	EXH	Approx. 4.4		Approx. 7.3	Approx. 12.3	Approx. 20.0

*1 When selecting a relay to drive an actuator, please make sure to consider an actuator is a motor (inductive load). Service life of contacts may be degraded extremely by an influence of transient rush current in excess of rated current. For inductive load, please confirm specification, durability data, etc issued by relay manufacturer.
*2 Open/Close time of single actuator in operation with no-load. Time for implemented use on a valve will be longer between 3% to 10%
*3 When using the minutes load current less than 50mA, please select gold contact option.
*4 Net mass of an actuator.
Note* Siloxane gas may be generated from silicone resin. Please avoid installation in siloxane gas atmosphere. Siloxane gas may cause contact failure of micro switches in the actuator.

<Optional specifications>

(1) Power supply

AC/Hz	50Hz	60Hz
100V	● (±10%)	● (±10%)
110V	○ (±10%)	○ (±10%)
115V	○ (+5% /-10%)	○ (±10%)
120V	×	○ (+5% /-10%)
200V	● (±10%)	● (±10%)
220V	○ (±10%)	○ (±10%)
230V	○ (±10%)	○ (+5% /-10%)
240V	○ (+5% /-10%)	×

Note: ● Standard
○ Optionally available
× Not available
(---) Allowable voltage fluctuation

(2) Signal limit switches (OLS1/SLS1) (No voltage)
Gold cladding for micro load current less than 50mA

(3) Auxiliary limit switch (OLS2,SLS2) (No voltage)
-Two more additional signal limit switches (No voltage)
-Gold cladding for micro load current less than 50mA

(4) Potentiometer: 135Ω or 500Ω

(5) Electric Conduit port

Size	Number of port
G1/2 (Standard)	1
G3/4	1
NPT1/2	1
NPT3/4	1
M20	1

(6) Terminal box build-in relay

(6-1) Electric Conduit ports

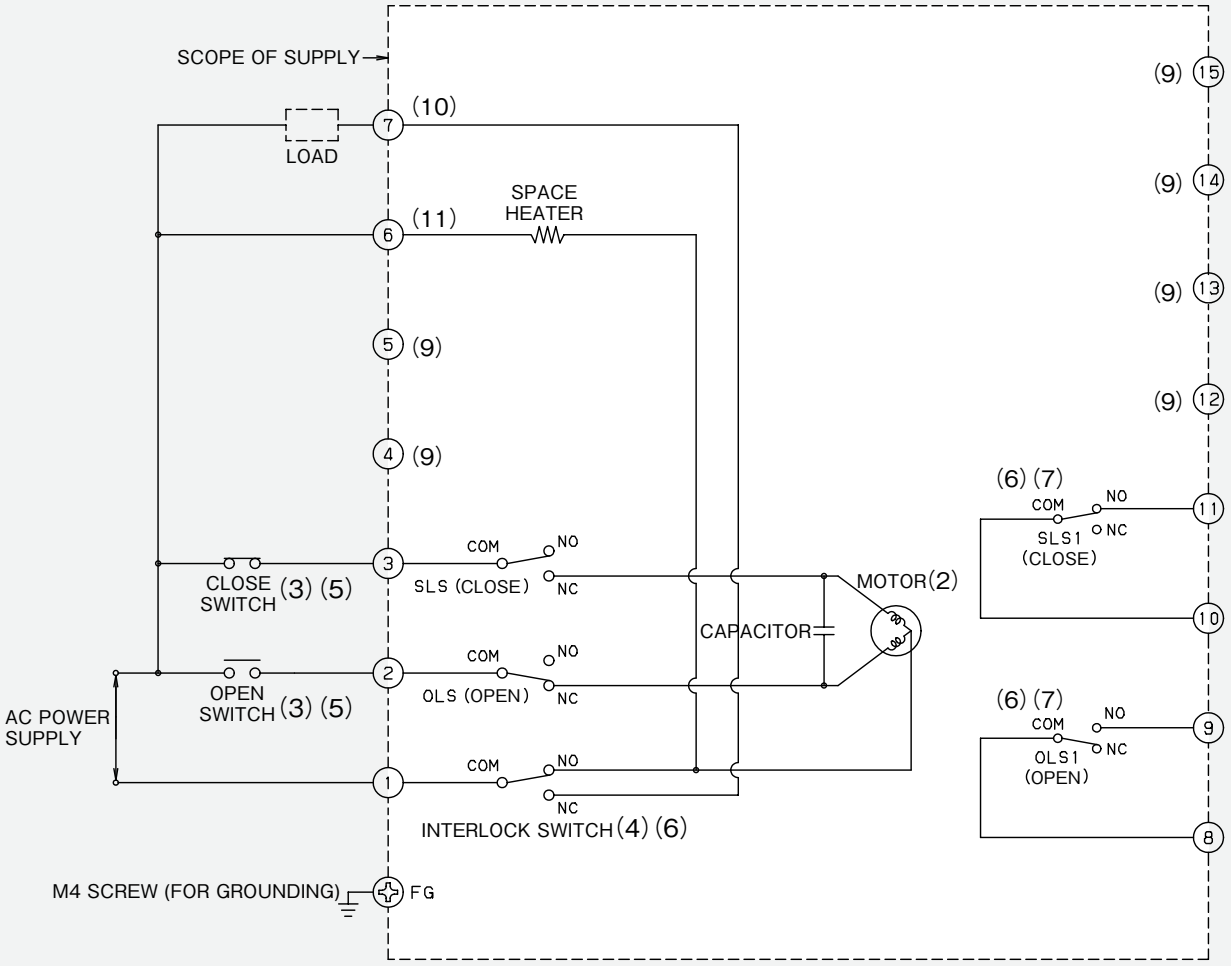
Size	Number of port
G1/2	2
G3/4	1
NPT1/2	2
NPT3/4	1
M20	1

(6-2) R/I converter unit build-in potentiometer (1kΩ)

(6-3) Speed control unit

(6-4) Available to change to Voltage signal switches (OLS1/SLS1)

Circuit Diagram (Standard)



Note

(1) OLS : OPEN LIMIT SWTICH
SLS : CLOSE LIMIT SWTICH
OLS1 : OPEN LIMIT SWTICH (NON-VOLTAGE FULL OPEN SIGNAL)
SLS1 : CLOSE LIMIT SWTICH (NON-VOLTAGE FULL CLOSE SIGNAL)

(2) THERMALLY PROTECTED MOTOR

(3) Do not reverse operation until the motor stops at fully open or fully closed position. Install individual switches for both open and closed positions, if the motor needs to be reversed in the middle of operation. Set one second or longer interval between operations, when motor is not energized. Do not turn on the switches, for both open and close, at the same time.

(4) Interlock switch is turned to NC position during manual mode or when the cover is removed. It will turn off the motor and space heater.

(5) Do not operate more than one actuator, use relays or other electronic devices such as solenoid valve in parallel to one switch.

(6) Capacity of limit switch (LS) contact : AC250V2A (Resistance load). This capacity is set to allow the limit switch to be continuously energized without damaging the components.

(7) When using the minutes load current less than 50mA, please select gold contact option.

(8) The above diagram indicates this valve is in closed position.

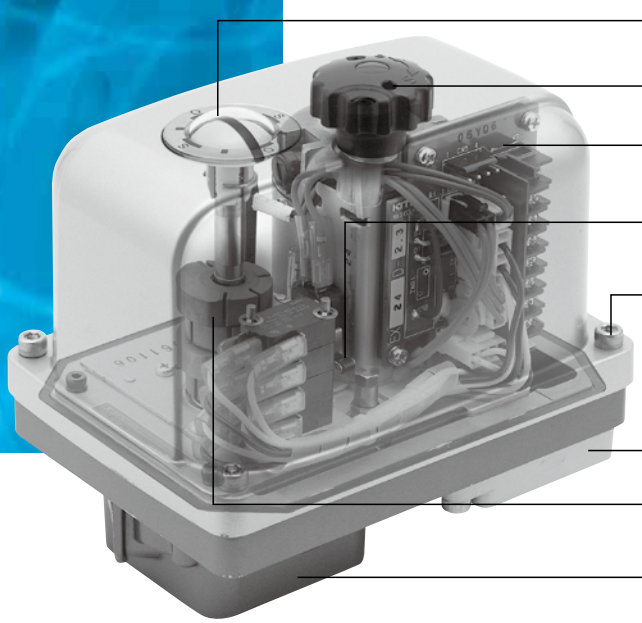
(9) Use of Terminal Nos. 4, 5 and 12 to 15 are prohibited. (Beware of miswiring!!)

(10) In case operating by manual handle or removing housing cover, power supply is applied to Terminal 7 and detects manual override is in progress.

(11) Terminal No. 6, space heater, is internal dew condensation prevented. Please connect, when use in high temperature and high humidity environment

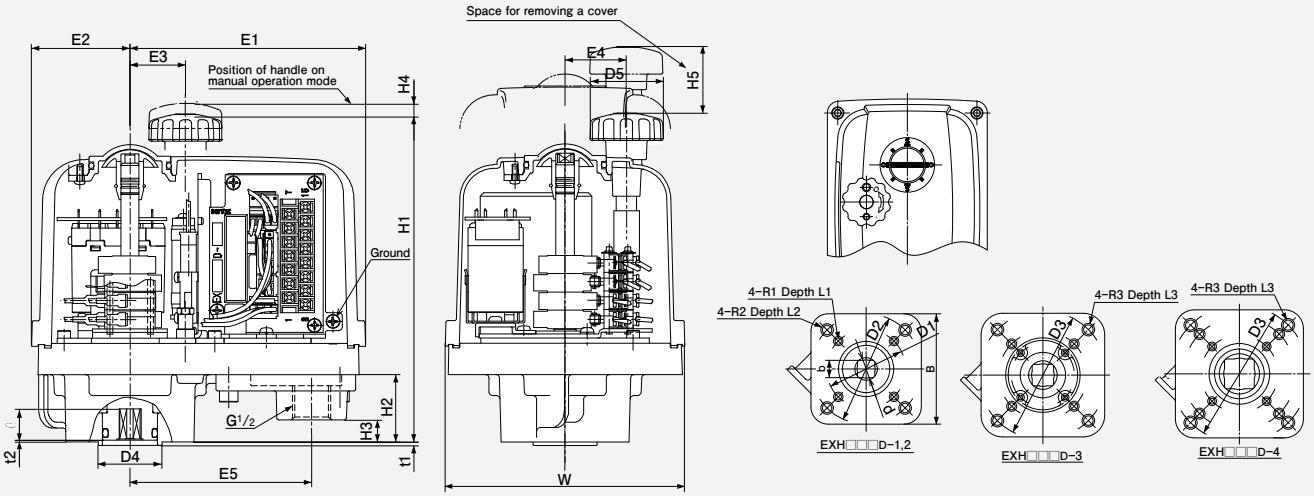
EXH_D
EX SERIES

High-speed Actuator for Ball Valves and DC power supply.



- Cyclo speed reducer employed.
- Stepless adjustment limit switch cam and no-voltage contact SW are equipped as standard.
- With interlock switch.
- For DC power supply 12V, 24V, 100V.
- Build-in overcurrent protector

Dimensions



unit : mm

Type	E1	E2	E3	E4	E5	W	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	ℓ	t1	t2	R1×L1	R2×L2	R3×L3
EXH□□□D-1	129	54	30.4	33.5	99.5	131	181	37	12	10	107.5	50	70	—	35	40	12.1	9	70	16	2	1	M6×10	M8×13	—
EXH□□□D-2	129	54	30.4	33.5	99.5	131	181	37	12	10	107.5	50	70	—	35	40	14.3	11	70	16	2	1	M6×10	M8×13	—
EXH□□□D-3	152	69	45.1	42	123	158	206.5	44	19	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6×10	M8×13	M10×16.5
EXH□□□D-4	168	73	51.3	50	138.5	188	276	78	53	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8×12	M10×15	M12×18

Type EXH_D: Standard Design specifications

High-speed type for ball valves

Actuator size		Type 1	Type 2	Type 3	Type 4
Actuators type		EXH □□□ D-1	EXH □□□ D-2	EXH □□□ D-3	EXH □□□ D-4
Power supply		DC12V・DC24V・DC100V			
Load current (A)*1	DC12V	2.0	3.0	3.5	-
	DC24V	1.0	1.5	2.0	4.0
	DC100V	0.3	0.5	0.7	1.0
Valve closing time (s)*2		Approx. 6	Approx. 6	Approx. 21	Approx. 29
Rated output torque (N・m)		9.8	49	196	588
Motor output (rating) (W)		13	13	14	46
Power consumption (W)		30	50	70	130
Overload protection		Overcurrent protector			
Rotation direction		Counterclockwise to open / Clockwise to close (Viewed from top)			
Duty factor (%ED)		Maximum 30 % ED at 20℃			
Position limit switch		2 each for opening / closing (2 position switches and 2 signal switches with no voltage)			
Switch contact voltage		125V DC 0.6A (Resistance load)			
Service environment		Indoor/Outdoor (No underwater / No direct sunlight)			
Waterproof and dustproof		Equivalent to IP 67			
Space heater volume (W)		15			
Heater power consumption (W)		2.5			4.0
Ambient temperature		-10℃ to + 50℃			
Insulation class		JIS C4003 Class A		JIS C4003 Class E	
Insulation strength		1 min. / 1000 V AC or 1 sec. / 1200 V AC			
Insulation resistance		100 MΩ minimum at 500 V DC			
Mounting position		Vertical to horizontal (No upside down installation)			
Lubricant		Grease			
Conduit ports *3		One G1/2			
Electric wiring		M3 terminal board			
Mechanical stopper		Build-in stopper for opening / closing			
Manual operation		Operate by pulling up and turing the handle located on upper part of the cover. During manual operaton, switch off power supply with built-in interlocking switch to motor/space heater.			
Automated operation		Pressing handle down to restore electric operation.			
Mounting flange		ISO 5211			
Painting color		Metallic silver cover / Metallic dark grey case / Frosted black handle			
Actuator mass (kg) *4		Approx. 4.4		Approx. 7.3	Approx. 12.3

*1 When selecting a relay to drive an actuator, please make sure to consider an actuator is a motor (inductive load). Service life of contacts may be degraded extremely by an influence of transient rush current in excess of rated current. For inductive load, please confirm specification, durability data, etc issued by relay manufacturer.
*2 Open/Close time of single actuator in operation with no-load. Maximum 50% will reduce by load variation of valve (size, fluid pressure and others).
*3 When using the minutes load current less than 50mA, please select gold contact option.
*4 Net mass of an actuator.
Note* Siloxane gas may be generated from silicone resin. Please avoid installation in siloxane gas atmosphere. Siloxane gas may cause contact failure of micro switches in the actuator.

<Optional specifications>

(1) Signal limit switches (OLS1/SLS1) (No voltage)
Gold cladding for micro load current less than 50mA

(2) Auxiliary limit switch (OLS2,SLS2) (No voltage)
-Two more additional signal limit switches (No voltage)
-Gold cladding for micro load current less than 50mA

(3) Potentiometer: 135Ω or 500Ω

(4) Electric Conduit port

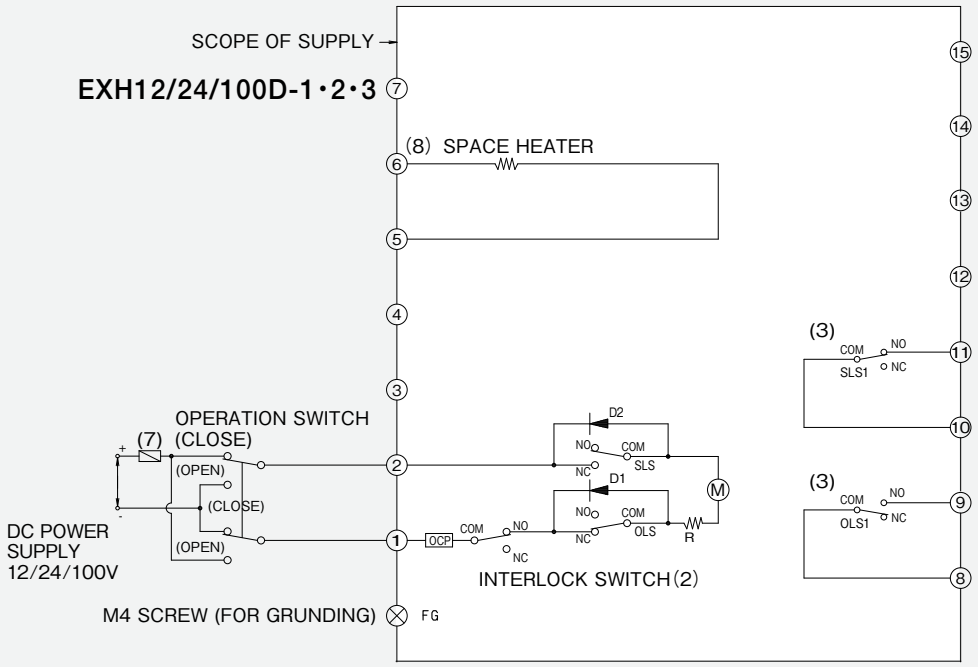
Size	Number of port
G1/2 (Standard)	1
G3/4	1
NPT1/2	1
NPT3/4	1
M20	1

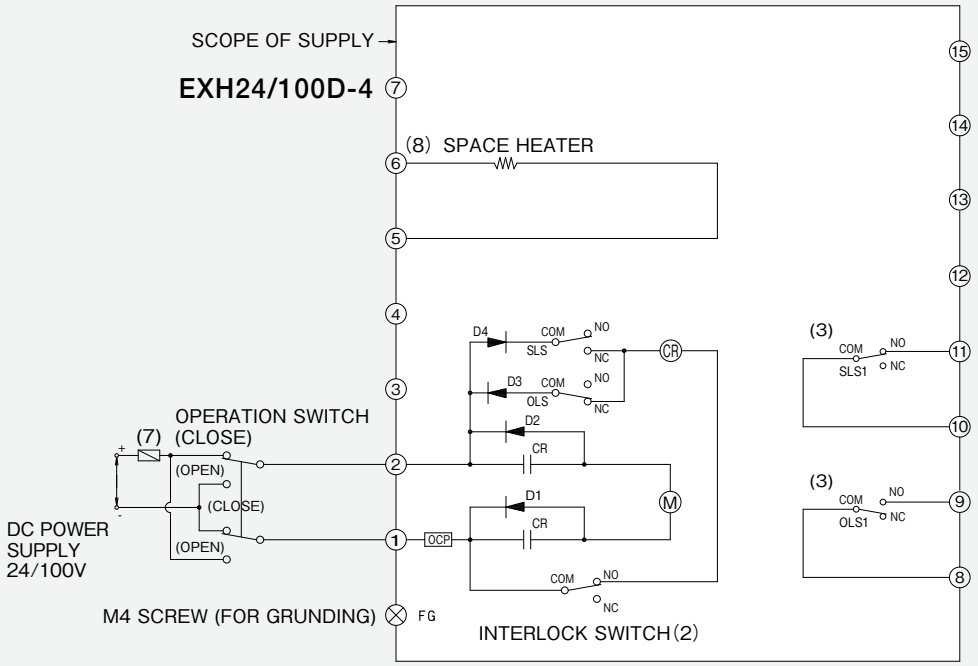
(5) Terminal box build-in relay

(5-1) Electric Conduit ports

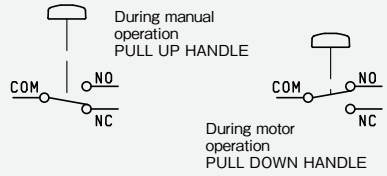
Size	Number of port
G1/2	2
G3/4	1
NPT1/2	2
NPT3/4	1
M20	1

Circuit Diagram (Standard)





EXPLANATION OF INTERLOCK SWITCH OPERATION



Note

(1) OLS :OPEN LIMIT SWTICH
SLS :CLOSE LIMIT SWTICH
OLS1 :OPEN LIMIT SWTICH (NON-VOLTAGE FULL OPEN SIGNAL)
SLS1 :CLOSE LIMIT SWTICH (NON-VOLTAGE FULL CLOSE SIGNAL)
OCP :OVER CURRENT PROTECTION DEVICE
D1 to D4 :DIODE
R :RESISTOR (ONLY EXH12/24/100D-1)
CR :RELAY
M :DC MOTOR

(2) Interlock switch is turned to NC position during manual mode or when the cover is removed. It will turn off the motor and space heater.

(3) Allowable contact load of LS (Resistance Load): DC125V 0.6A Please consult KITZ representative if considering to usse under micro load.

(4) The above diagram indicates this valve is in closed position.

(5) Use of Terminal Nos. 3, 4, 5 and 12 to 15 are prohibited. (Beware of miswiring!!)

(6) This actuator is intended for On/Off control. Please use this product for two position conttrol in fully open and fully closed position.

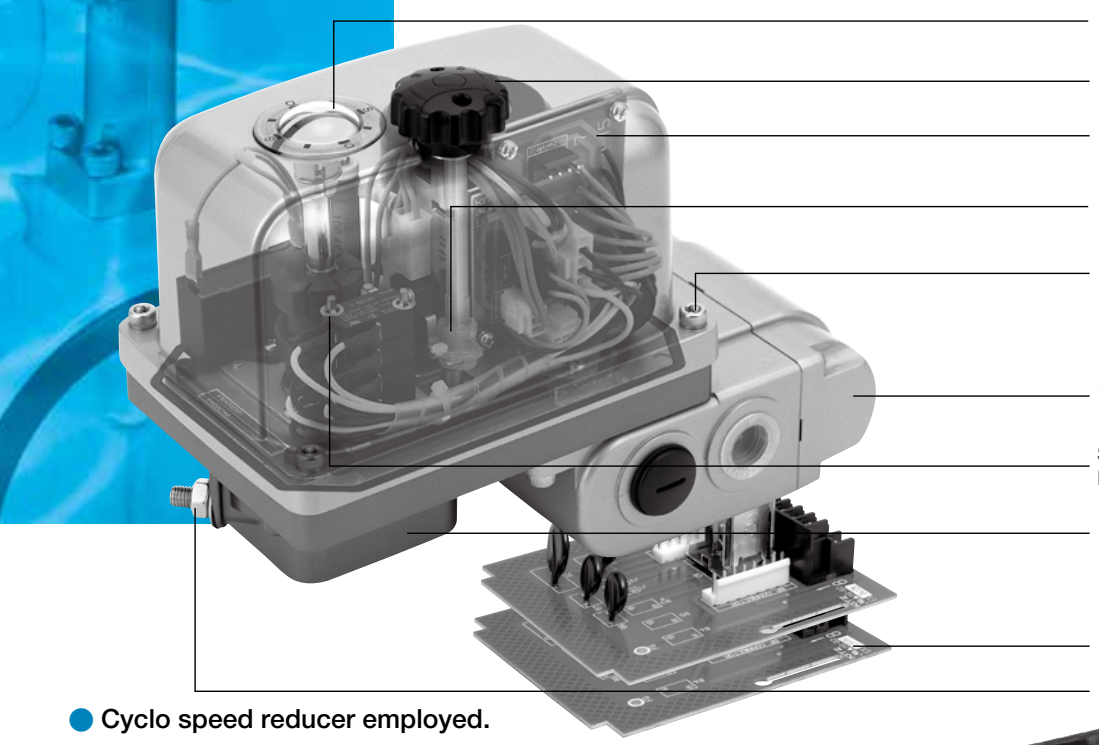
(7) Be sure to connect circuit breaker for actuator protection.

(8) Please connect wire when using heater (No polarity)

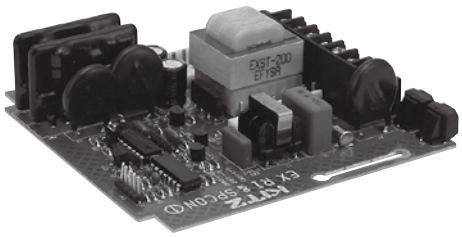
(9) When using the minutes load current less than 50mA, please select gold contact option.

EXS
EX SERIES

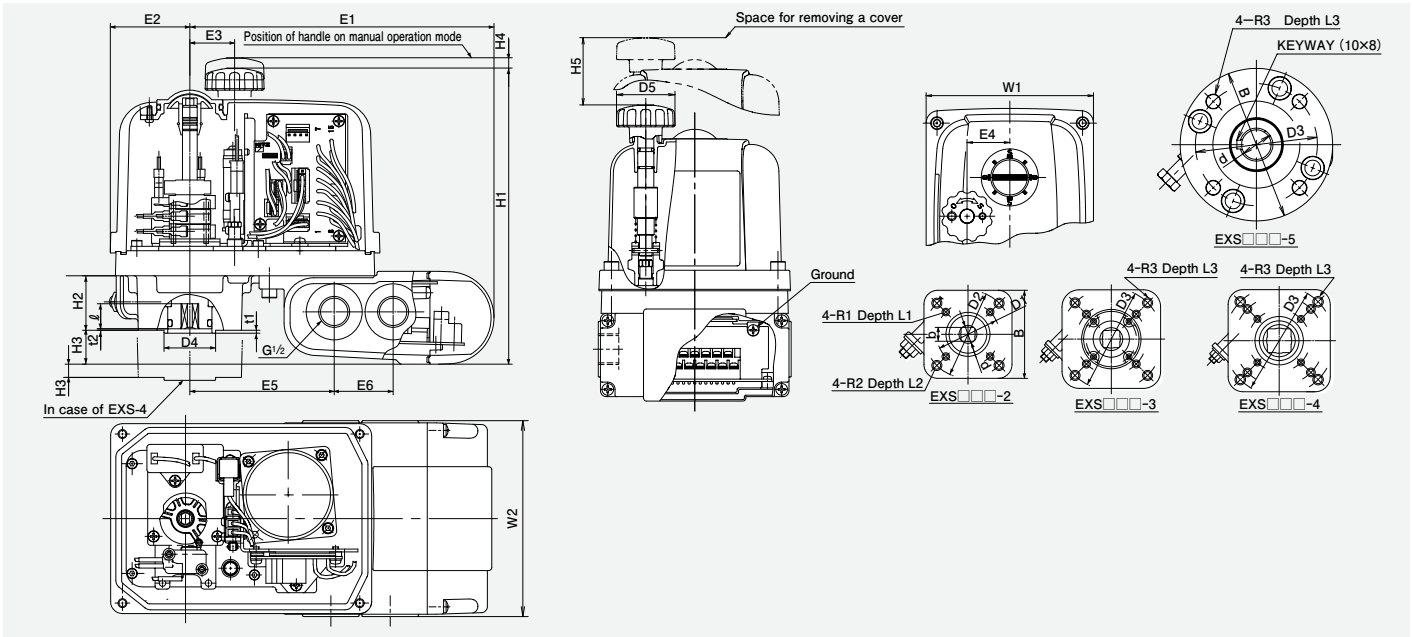
Low-speed Actuator for Butterfly Valves
High output torque at low speed. Output shaft is equipped with a self-locking device.



- Cyclo speed reducer employed.
- Stepless adjustment limit switch cam and no-voltage contact SW are equipped as standard.
- With interlock switch.
- Self-locking device provided
- Speed controller and R/I converter board available optionally
  With a simple change to inside external terminal box, enables speed control and R/I conversion.



Dimensions



unit : mm

Type	E1	E2	E3	E4	E5	E6	W1	W2	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	ℓ	t1	t2	R1×L1	R2×L2	R3×L3
EXS□□□-2	206.5	54	30.4	33.5	98	40	131	132	204	37	23	10	107.5	50	70	—	35	40	14.3	11	70	16	2	1	M6×10	M8×13	—
EXS□□□-3	230	69	45.1	42	121.5	40	158	132	222.5	44	16	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6×10	M8×13	M10×16.5
EXS□□□-4	245.5	73	51.3	50	137	40	188	132	258	78	18	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8×12	M10×15	M12×18
EXS□□□-5	245.5	73	51.3	50	137	40	188	132	258	159	99	10	153	—	—	140	100	60	38	—	175	65	3	—	—	—	M16×24

Type EXS: Standard Design specifications

High-speed type for ball valves

Actuator size		Type 2	Type 3	Type 4	Type 5
Actuators type		EXS100/200-2	EXS100/200-3	EXS100/200-4	EXS100/200-5
Power supply		100/200 V AC ±10% 50/60 Hz			
Rated current (A)*1	100 V AC	0.65	1.2	2.8	2.8
	200 V AC	0.35	0.6	1.5	1.5
Valve closing time (s)*2	EXS 50 Hz	Approx. 25	Approx. 35	Approx. 49	Approx. 49
	EXS 60 Hz	Approx. 21	Approx. 30	Approx. 41	Approx. 41
Rated output torque (N·m)		49	196	588	1000
Motor output (rating) (W)	50 Hz	13	26	72	72
	60 Hz	16	31	85	85
Power consumption (W)	50 Hz	65	120	280	280
	60 Hz	65	120	270	270
Overload protection		Build-in thermal protector (Activated at 120℃)			
Rotation direction		Counterclockwise to open / Clockwise to close (Viewed from top)			
Duty factor (ED)		Maximum 30% ED at 20℃			
Limit switch *3		2 each for opening / closing (2 position switches and 2 signal switches with no voltage)			
Switch contact Capacity		250 VAC 2 A (Resistance load)			
Service environment		Indoor/Outdoor (No underwater / No direct sunlight)			
Waterproof and dustproof		Equivalent to IP 67			
Space heater capacity (W)		15			
Heater power consumption (W)		2.5/2.9 (at 100/200V)		4	
Ambient temperature		-10℃ to +50℃			
Insulation class		JIS C4003 Class E			
Insulation strength		1 min. / 1500 V AC or 1 sec. / 1800 V AC			
Insulation resistance		100 MΩ minimum at 500 V DC			
Mounting position		Vertical to horizontal (No upside down installation)			
Lubricant		Grease			
Conduit ports	EXS	Two G1/2			
Electric wiring		M3 terminal board			
Mechanical stopper	EXS	Build-in stopper for opening /Build-in adjustable stopper for closing			
Manual operation		Operate by pulling up and turing the handle located on upper part of the cover. During manual operaton, switch off power supply with built-in interlocking switch to motor/space heater.			
Automated operation		Pressing handle down to restore electric operation.			
Mounting flange		ISO 5211			
Painting color		Metallic silver cover / Metallic dark grey case / Frosted black handle			
Actuator mass (kg) *4	EXS	Approx. 5.1	Approx. 8.0	Approx. 13.0	Approx. 20.7

*1 When selecting a relay to drive an actuator, please make sure to consider an actuator is a motor (inductive load). Service life of contacts may be degraded extremely by an influence of transient rush current in excess of rated current. For inductive load, please confirm specification, durability data, etc issued by relay manufacturer.
*2 Open/Close time of single actuator in operation with no-load. Time for implemented use on a valve will be longer between 3% to 10%
*3 When using the minutes load current less than 50mA, please select gold contact option.
*4 Net mass of an actuator.
Note* Siloxane gas may be generated from silicone resin. Please avoid installation in siloxane gas atmosphere. Siloxane gas may cause contact failure of micro switches in the actuator.

<Optional specifications>

(1) Power supply

AC/Hz	50Hz	60Hz
100V	● (±10%)	● (±10%)
110V	○ (±10%)	○ (±10%)
115V	○ (+5% /-10%)	○ (±10%)
120V	×	○ (+5% /-10%)
200V	● (±10%)	● (±10%)
220V	○ (±10%)	○ (±10%)
230V	○ (±10%)	○ (+5% /-10%)
240V	○ (+5% /-10%)	×

Note: ● Standard
○ Optionally available
× Not available
(---) Allowable voltage fluctuation

(2) Signal limit switches (OLS1/SLS1) (No voltage)
Gold cladding for micro load current less than 50mA

(3) Auxiliary limit switch (OLS2,SLS2) (No voltage)
-Two more additional signal limit switches (No voltage)
-Gold cladding for micro load current less than 50mA

(4) Potentiometer: 135Ω or 500Ω

(5) Electric Conduit port

Size	Number of port
G1/2 (Standard)	1
G3/4	1
NPT1/2	1
NPT3/4	1
M20	1

(6) Terminal box build-in relay

(6-1) Electric Conduit ports

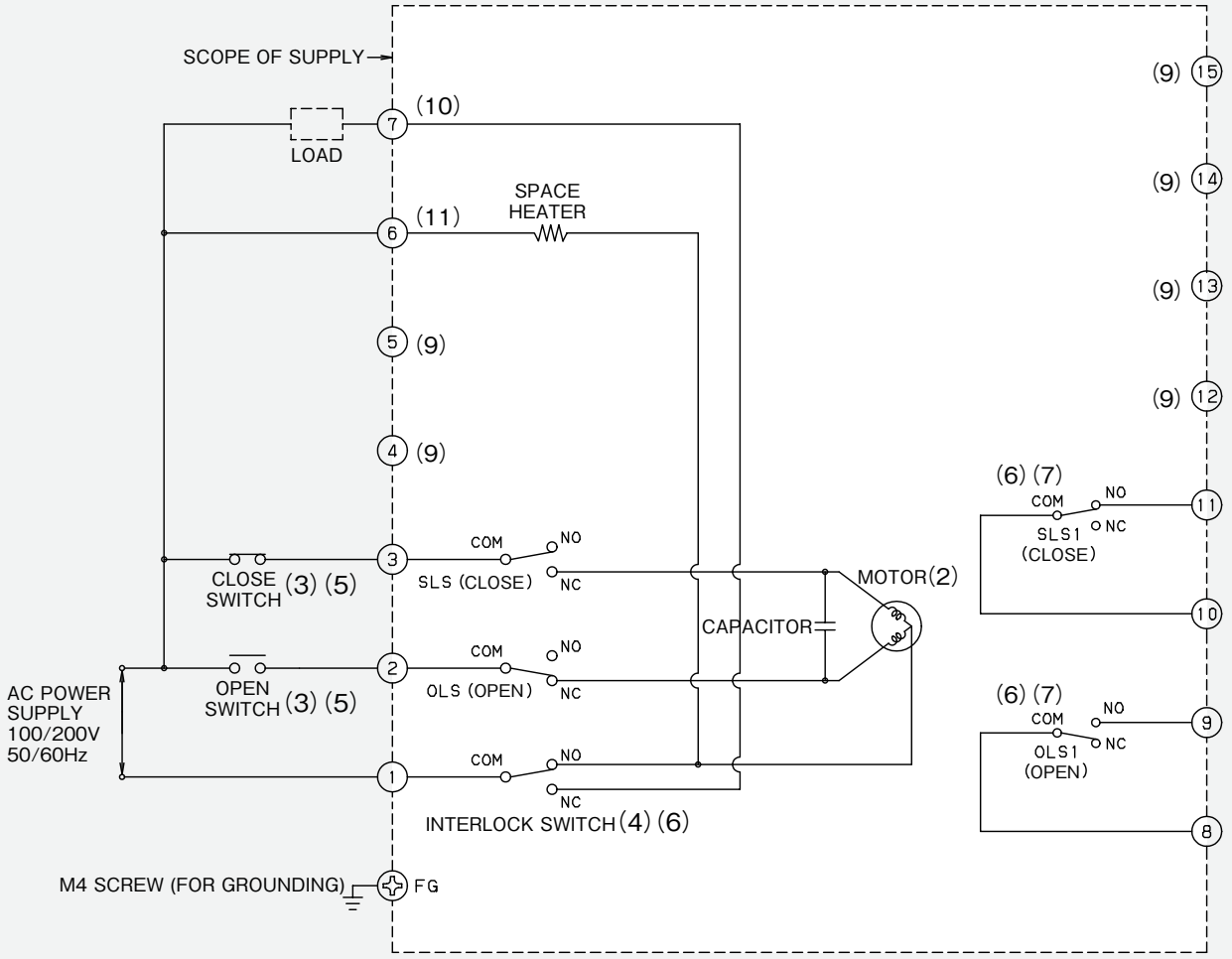
Size	Number of port
G1/2(Standard)	2
G3/4	1
NPT1/2	2
NPT3/4	1
M20	1

(6-2) R/I converter unit build-in potentiometer (1kΩ)

(6-3) Speed control unit

(6-4) Available to change to Voltage signal switches (OLS1/SLS1)

Circuit Diagram (Standard)



Note

(1) OLS : OPEN LIMIT SWTICH
SLS : CLOSE LIMIT SWTICH
OLS1 : OPEN LIMIT SWTICH (NON-VOLTAGE FULL OPEN SIGNAL)
SLS1 : CLOSE LIMIT SWTICH (NON-VOLTAGE FULL CLOSE SIGNAL)

(2) THERMALLY PROTECTED MOTOR

(3) Do not reverse operation until the motor stops at fully open or fully closed position. Install individual switches for both open and closed positions, if the motor needs to be reversed in the middle of operation. Set one second or longer interval between operations, when motor is not energized. Do not turn on the switches, for both open and close, at the same time.

(4) Interlock switch is turned to NC position during manual mode or when the cover is removed. It will turn off the motor and space heater.

(5) Do not operate more than one actuator, use relays or other electronic devices such as solenoid valve in parallel to one switch.

(6) Capacity of limit switch (LS) contact : AC250V2A (Resistance load). This capacity is set to allow the limit switch to be continuously energized without damaging the components.

(7) When using the minutes load current less than 50mA, please select gold contact option.

(8) The above diagram indicates this valve is in closed position.

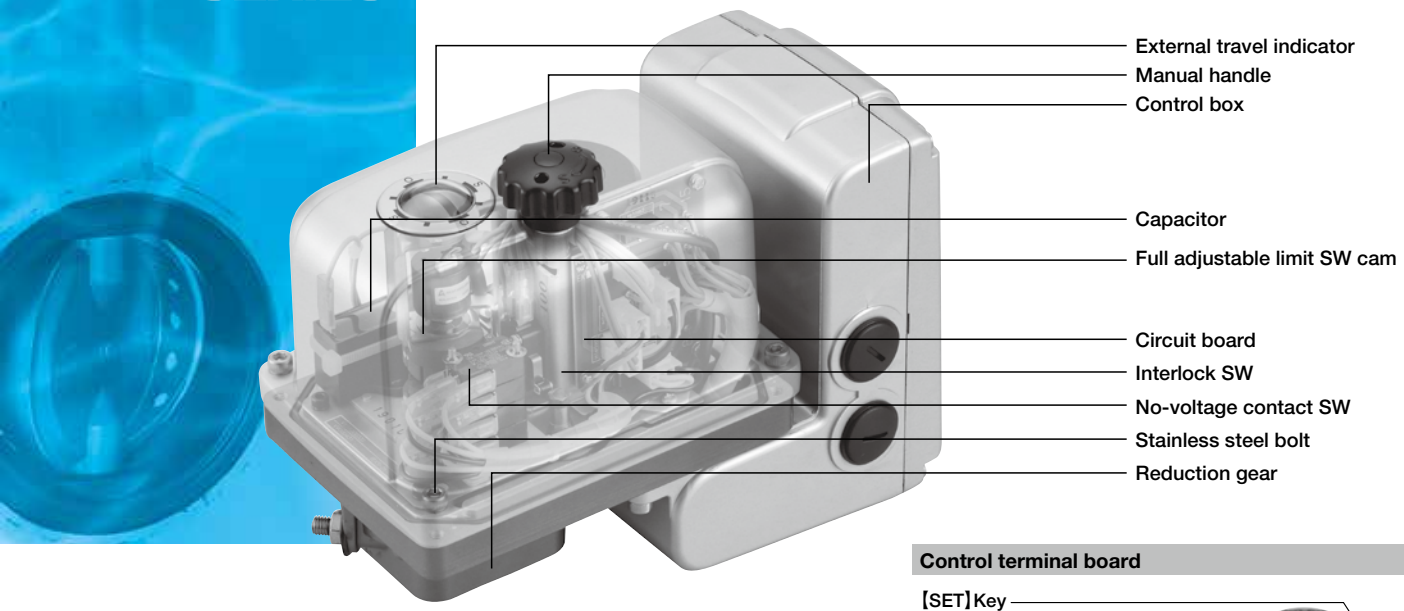
(9) Use of Terminal Nos. 4, 5 and 12 to 15 are prohibited. (Beware of miswiring!!)

(10) In case operating by manual handle or removing housing cover, power supply is applied to Terminal 7 and detects manual override is in progress.

(11) Terminal No. 6, space heater, is internal dew condensation prevented. Please connect, when use in high temperature and high humidity environment

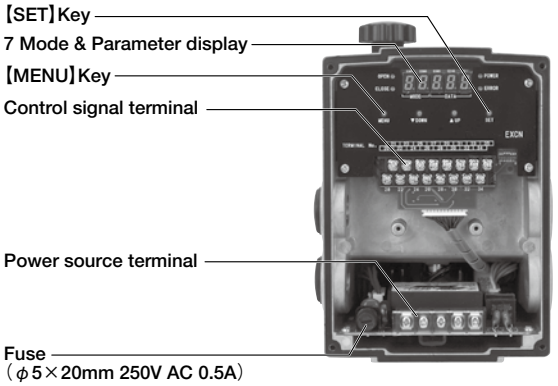
EXCN
EX SERIES

Proportional Control Actuator
Easy-to-use actuator based on the EXS family of actuator

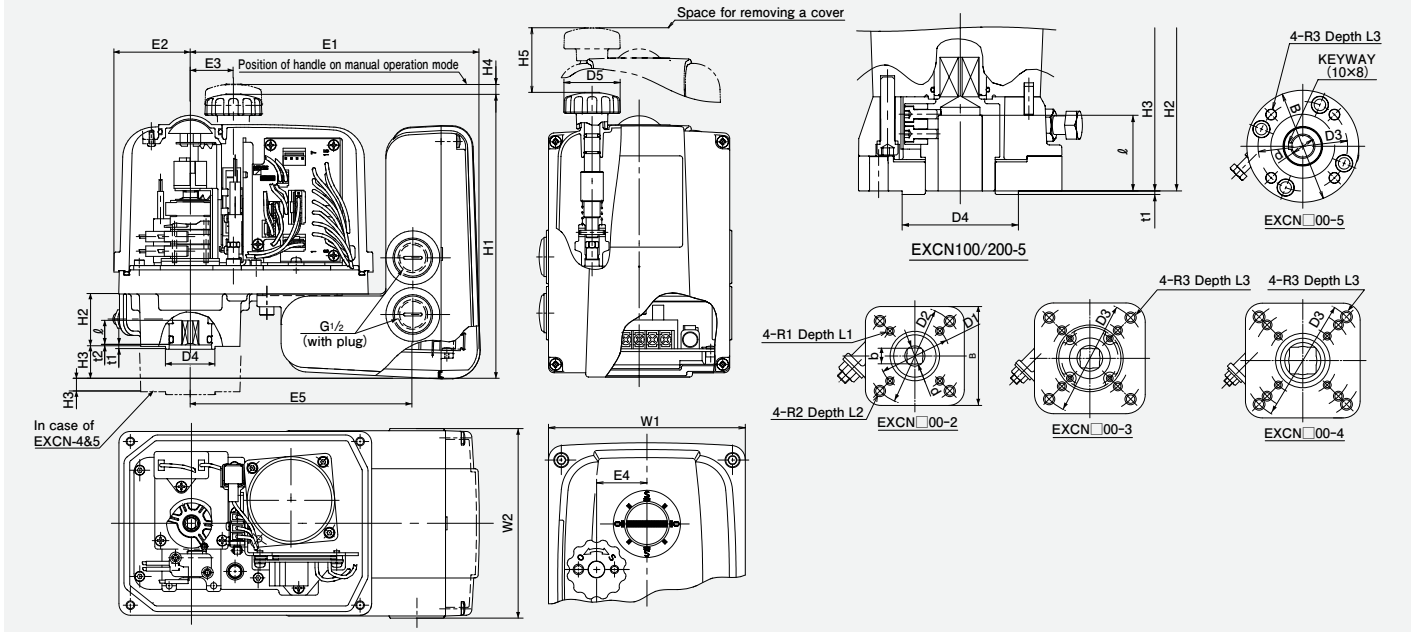


- Local operation is possible via operation panel
- Open/Close operation is possible by external contact command
- Built-in speed controller
- Equipped with open degree (%) and numeric display function
- Input signal DC4～20mA (Standard)
  Optional: DC0～5V/DC1～5V/DC0～10V/DC2～10V/0～135Ω
- Improvement of workability compared with conventional type
- Improved reliability by adopting contactless open degree sensor

Control terminal board



Dimensions



unit : mm

Type	E1	E2	E3	E4	E5	W1	W2	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	ℓ	t1	t2	R1×L1	R2×L2	R3×L3
EXCN□00-2	205.5	54	30.4	33.5	157	131	132	204	37	23	10	107.5	50	70	—	35	40	14.3	11	70	16	2	1	M6×10	M8×13	—
EXCN□00-3	229	69	45.1	42	180.5	158	132	222.5	44	16	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6×10	M8×13	M10×16.5
EXCN□00-4	244.5	73	51.3	50	196	188	132	258	78	18	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8×12	M10×15	M12×18
EXCN□00-5	244.5	73	51.3	50	196	188	132	258	159	99	10	153	—	—	140	100	60	38	—	175	65	3	—	—	—	M16×24

Type EXCN: Standard Design specifications

Proportional control valve actuator

Actuator size		Type 2	Type 3	Type 4	Type 5
Actuators type		EXCN100/200-2	EXCN100/200-3	EXCN100/200-4	EXCN100/200-5
Power supply		100/200 V AC ±10% 50/60 Hz			
Rated current (A)*1	100 V AC	0.65	1.2	2.8	2.8
	200 V AC	0.35	0.6	1.5	1.5
Standby current (A)		0.2			
Valve closing time (s)*2	50 Hz	Approx. 25	Approx. 35	Approx. 49	Approx. 49
	60 Hz	Approx. 21	Approx. 30	Approx. 41	Approx. 41
Rated output torque (N･m)		49	196	588	1000
Motor output (rating) (W)		16	31	85	85
Power consumption (W)	50 Hz	65	120	280	280
	60 Hz	65	120	270	270
Overload protection		Build-in thermal protector (Activated at 120℃)			
Rotation direction		Counterclockwise to open / Clockwise to close (Viewed from top)			
Duty factor (% ED)		Maximum 30 % ED at 20℃			
Limit switch*3 Switch contact Capacity		2 each for opening / closing (2 position switches and 2 signal switches with no voltage) Contact capacity: 30V DC 3A (Resistance load)			
Service environment		Indoor / Outdoor (No underwater / No direct sunlight)			
Waterproof and dustproof		Equivalent to IP 67			
Space heater capacity (W)		15			
Heater power consumption (W)		2.5/2.9 (at 100/200V)		4	
Control of motor drive mode		Direct or reverse (Switchable: Shipment preset for reverse mode)			
Movement range		0 ～ 90℃ (Reverse rotation)			
Input signal		DC4～20mA (Standard), Option DC0～5V/DC1～5V/DC0～10V/DC2～10V/0～135Ω			
Input impedance		250Ω@DC4～20mA, 20kΩ@DC0～5V/DC1～5V/DC0～10V/DC2～10V, 20kΩ (DC5V supply) @0～135Ω			
Position transmitter signal		DC4～20mA ±0.5mA (Maximum allowable load 300Ω)			
For input signal of cutoff		Fully closed・Hold・Fully Open (Switchable: Preset at stop mode for shipment)			
Motor linearity		±1.0% F.S. (Unloaded actuator output shaft)			
Dead band		±0.5% ～ ±4.0% F.S. (Adjustable)			
Resolution		1/200			
Input signal tuning range		Zero: -15% ～ +70% F.S./ Gain: +30% ～ 300% F.S.			
Ambient temperature		-10℃ to +50℃			
Insulation class		JIS C4003 Class E			
Insulation strength		Max.10mA leakage current with 1 min.@1500 V AC or 1 sec.@1800 V AC			
Insulation resistance		100 MΩ minimum at 500 V DC			
Mounting position		Vertical to horizontal (No upside down installation)			
Lubricant		Grease			
Conduit ports		Two G1/2 on the left side of control box. Option; One G3/4 or Two G3/4			
Mechanical stopper		Fixed opening stopper・Adjustable closing stopper			
Manual operation		Operate by pulling up and turing the handle located on upper part of the cover. During manual operaton, switch off power supply with built-in interlocking switch to motor/space heater.			
Automated operation		Pushing handle down to restore electric operation.			
Mounting flange		ISO 5211			
Painting color		Metallic silver cover / Metallic dark grey case / Frosted black handle			
Actuator mass (kg)*4		Approx. 6.0	Approx. 8.8	Approx. 14.7	Approx. 21.7

*1 When selecting a relay to drive an actuator, please make sure to consider an actuator is a motor (inductive load). Service life of contacts may be degraded extremely by an influence of transient rush current in excess of rated current. For inductive load, please confirm specification, durability data, etc issued by relay manufacturer.
*2 Open/Close time of single actuator in operation with no-load. Time for implemented use on a valve will be longer between 3% to 10%
*3 When using the minutes load current less than 50mA, please select gold contact option.
*4 Net mass of an actuator.
Note* Siloxane gas may be generated from silicone resin. Please avoid installation in siloxane gas atmosphere. Siloxane gas may cause contact failure of micro switches in the actuator.

<Optional specifications>

(1) Power supply

AC/Hz	50Hz	60Hz
100V	● (±10%)	● (±10%)
110V	○ (±10%)	○ (±10%)
115V	○ (+5% /-10%)	○ (±10%)
120V	×	○ (+5% /-10%)
200V	● (±10%)	● (±10%)
220V	○ (±10%)	○ (±10%)
230V	○ (±10%)	○ (+5% /-10%)
240V	○ (+5% /-10%)	×

Note: ● Standard
○ Optionally available
× Not available
(---) Allowable voltage fluctuation

(2) Electric Conduit port

Size	Number of port
G1/2	● 2
G3/4	○ 2

(3) Operation

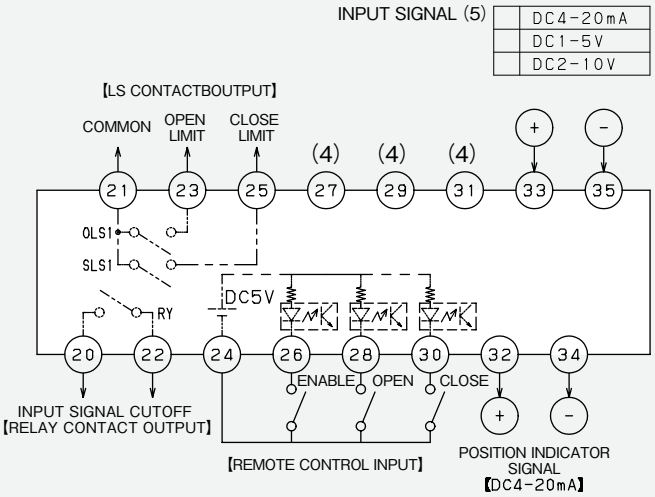
	Proportional
Reverse drive	●
Direct drive	○

(4) Input signal

DC4～20mA	●
DC1～5V	○
0～135Ω	○
DC0～5V	○
DC0～10V	○
DC2～10V	○

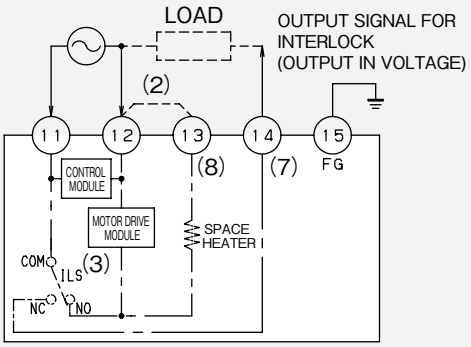
Circuit Diagram (Standard)

TERMINAL BLOCK 16P (M3 SCREW TERMINAL) FOR CONTROL SIGNAL



TERMINAL BLOCK 5P (M4 SCREW TERMINAL) FOR POWER SUPPLY

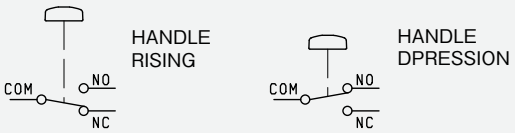
POWER SUPPLY VOLTAGE AC100/200V 50/60Hz



Allowable load for each contact

Output signal	Type	Output voltage/ current	Allowable E load	Note
Open/Close limit signal	Micro switch contact	Dry contact	3A 30V (DC)	Turned on in fully open or fully closed position
Alarm signal in case of input signal cutoff	Relay contact	Dry contact	3A 30V (DC)	Turned on when input signal drops to approx. 2.8mA or smaller
Position indicator signal	—	DC4-20mA	300Ω or under	Fully closed: 4mA～Fully open: 20mA
Interlock output signal	Micro switch contact	AC power supply	3A 250V (AC)	Pull up the handle for manual operation

EXPLANATION OF AN INTELOCK SWITCH OF OPERATION

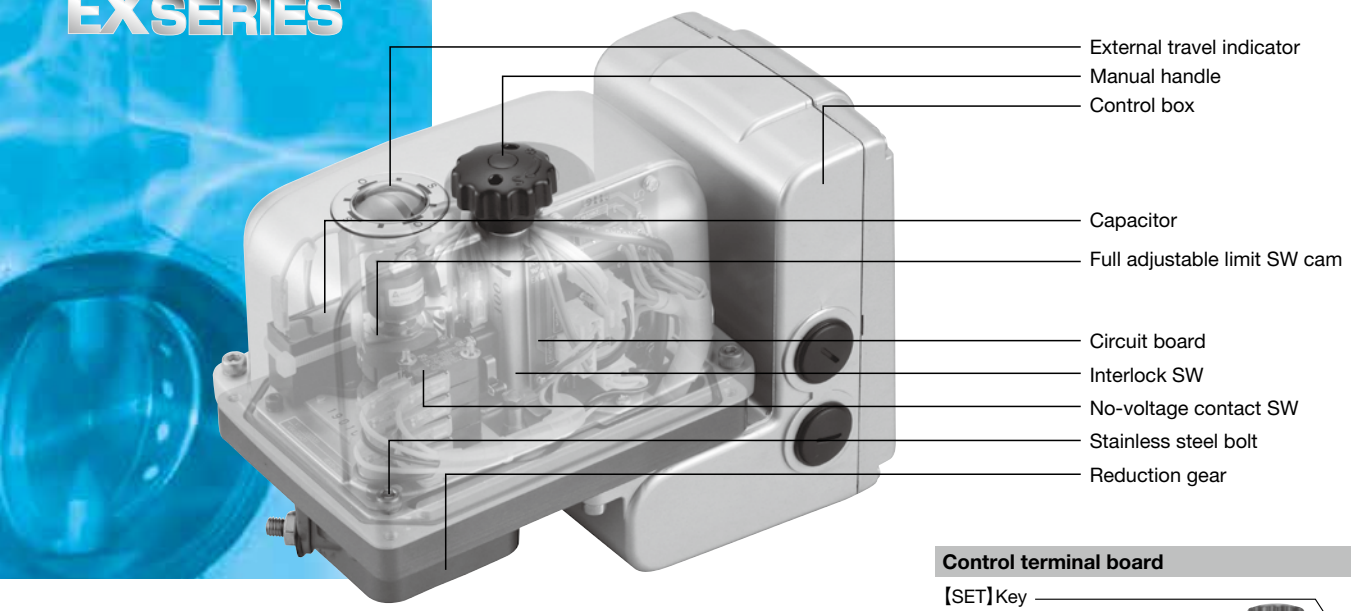


Note

(1) OLS1 :OPEN LIMIT SWTICH (NON-VOLTAGE FULL OPEN SIGNAL)
SLS1 :CLOSE LIMIT SWTICH (NON-VOLTAGE FULL CLOSE SIGNAL)
ILS :INTERLOCK SWITCH (PULL UP THE HANDLE FOR MANUAL OPERATION)
RY :RELAY FOR AN ALARM ACTIVATED ON LOSS OF INPUT SIGNAL
(2) Space heater will be turned on when two terminals are connected. (Two terminals are already connected prior to the shipment)
(3) Motor and space heater will be cut off during manual operation or when the cover is removed.
(4) Use of Terminal Nos. 27, 29 and 31 are prohibited. (Beware of miswiring!!)
(5) Standard input control signal is current (DC4-20mA~20mA). When voltage of DC1-5V or DC2-10V is used for input control signal, settings on terminal board needs to be changed.
(6) Contacts have sufficient output allowable load to secure soundness of internal parts while being continuously energized.
(7) In case pulling up manual handle or removing housing cover, power supply is applied to Terminal No. 14 and will detect it is in manual override.
(8) Terminal No. 13 is to prevent internal dew condensation. Please connect, when used under high temperature and high humidity.

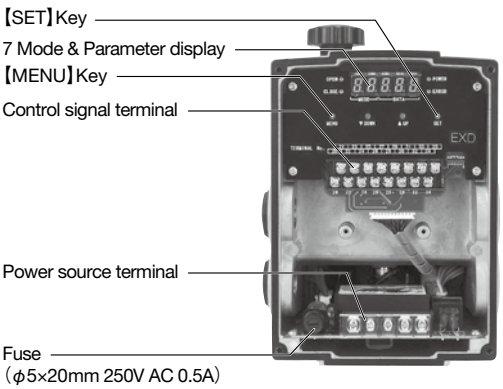
EXD
EX SERIES

Proportional Control Actuator

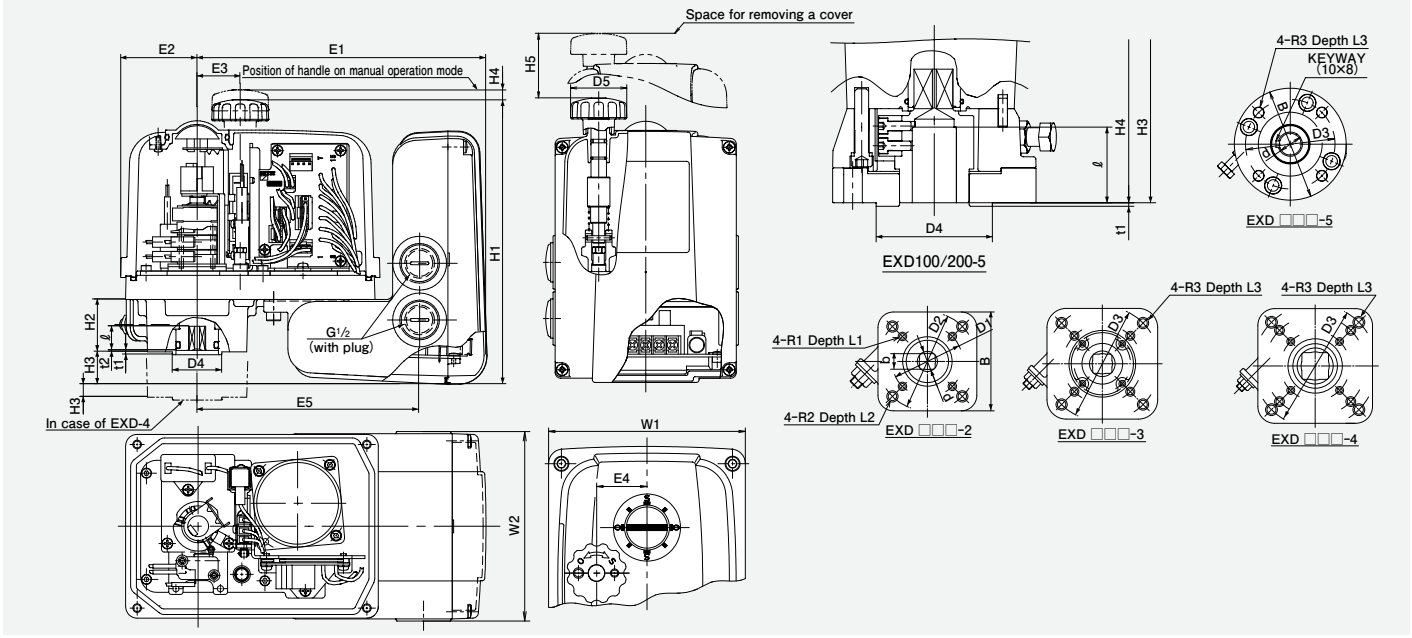


- Possible to change flow characteristics of valve
- Possible to substitute 3-way valve by connecting two valves
- Open/Close operation is possible by external contact command
- Availability of Open/Close command with external contact points
- Built-in speed controller
- Equipped with open degree (%) and numeric display function
- Input signal DC4～20mA (Standard)
  Optional:DC0～5V/DC1～5V/DC0～10V/DC2～10V/0～135Ω
- Improved reliability by adopting contactless open degree sensor

Control terminal board



Dimensions



unit : mm

Type	E1	E2	E3	E4	E5	W1	W2	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	ℓ	t1	t2	R1×L1	R2×L2	R3×L3
EXD□□□-2	205.5	54	30.4	33.5	157	131	132	204	37	23	10	107.5	50	70	—	35	40	14.3	11	70	16	2	1	M6×10	M8×13	—
EXD□□□-3	229	69	45.1	42	180.5	158	132	222.5	44	16	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6×10	M8×13	M10×16.5
EXD□□□-4	244.5	73	51.3	50	196	188	132	258	78	18	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8×12	M10×15	M12×18
EXD□□□-5	244.5	73	51.3	50	196	188	132	258	159	99	10	153	—	—	140	100	60	38	—	175	65	3	—	—	—	M16×24

Type EXD: Standard Design specifications

Proportional control valve actuator

Actuator size		Type 2	Type 3	Type 4	Type 5
Actuators type		EXD100/200-2	EXD100/200-3	EXD100/200-4	EXD100/200-5
Power supply		100/200 V AC ±10% 50/60 Hz			
Rated current (A)*1	100 V AC	0.65	1.2	2.8	2.8
	200 V AC	0.35	0.6	1.5	1.5
Standby current (A)		0.2			
Valve closing time (s)*2	50 Hz	Approx. 25	Approx. 35	Approx. 49	Approx. 49
	60 Hz	Approx. 21	Approx. 30	Approx. 41	Approx. 41
Rated output torque (N·m)		49	196	588	1000
Motor output (rating) (W)		16	31	85	85
Power consumption (W)	50 Hz	65	120	280	280
	60 Hz	65	120	270	270
Overload protection		Build-in thermal protector (Activated at 120℃)			
Rotation direction		Counterclockwise to open / Clockwise to close (Viewed from top)			
Duty factor (% ED)		Maximum 30 % ED at 20℃			
Limit switch *3 Switch contact Capacity		2 each for opening / closing (2 position switches and 2 signal switches with no voltage) Contact capacity: 30V DC 3A (Resistance load)			
Service environment		Indoor / Outdoor (No underwater / No direct sunlight)			
Waterproof and dustproof		Equivalent to IP 67			
Space heater capacity (W)		15			
Heater power consumption (W)		2.5/2.9 (at 100/200V)		4	
Control of motor drive mode		Direct or reverse (Switchable: Shipment preset for reverse mode)			
Movement range		0 ～ 90℃ (Reverse rotation)			
Input signal		DC4～20mA (Standard), Option DC0～5V/DC1～5V/DC0～10V/DC2～10V/0～135Ω			
Input impedance		250Ω@DC4～20mA, 20kΩ@DC0～5V/DC1～5V/DC0～10V/DC2～10V, 20kΩ (DC5V supply) @0～135Ω			
Position transmitter signal		DC4～20mA ±0.5mA (Maximum allowable load 300Ω)			
For input signal of cutoff		Fully closed・Hold・Fully Open (Switchable: Preset at stop mode for shipment)			
Motor linearity		±1.0%F.S. (Unloaded actuator output shaft)			
Dead band		±0.5%～ ±4.0% F.S. (Adjustable)			
Resolution		1/200			
Input signal tuning range		Zero: -15% ～ +70% F.S. / Gain: +30% ～ 300% F.S.			
Ambient temperature		-10℃ to +50℃			
Insulation class		JIS C4003 Class E			
Insulation strength		Max.10mA leakage current with 1 min.@1500 V AC or 1 sec.@1800 V AC			
Insulation resistance		100 MΩ minimum at 500 V DC			
Mounting position		Vertical to horizontal (No upside down installation)			
Lubricant		Grease			
Conduit ports		Two G1/2			
Mechanical stopper		Fixed opening stopper・Adjustable closing stopper			
Manual operation		Operate by pulling up and turing the handle located on upper part of the cover. During manual operaton, switch off power supply with built-in interlocking switch to motor/space heater.			
Automated operation		Pushing handle down to restore electric operation.			
Mounting flange		ISO 5211			
Painting color		Metallic silver cover / Metallic dark grey case / Frosted black handle			
Actuator mass (kg) *4		Approx. 6.0	Approx. 8.8	Approx. 14.7	Approx. 21.7

*1 When selecting a relay to drive an actuator, please make sure to consider an actuator is a motor (inductive load). Service life of contacts may be degraded extremely by an influence of transient rush current in excess of rated current. For inductive load, please confirm specification, durability data, etc issued by relay manufacturer.
*2 Open/Close time of single actuator in operation with no-load. Time for implemented use on a valve will be longer between 3% to 10%
*3 When using the minutes load current less than 50mA, please select gold contact option.
*4 Net mass of an actuator.
Note* Siloxane gas may be generated from silicone resin. Please avoid installation in siloxane gas atmosphere. Siloxane gas may cause contact failure of micro switches in the actuator.

<Optional specifications>

(1) Power supply

AC/Hz	50Hz	60Hz
100V	● (±10%)	● (±10%)
110V	○ (±10%)	○ (±10%)
115V	○ (+5% /-10%)	○ (±10%)
120V	×	○ (+5% /-10%)
200V	● (±10%)	● (±10%)
220V	○ (±10%)	○ (±10%)
230V	○ (±10%)	○ (+5% /-10%)
240V	○ (+5% /-10%)	×

Note: ● Standard
○ Optionally available
× Not available
(---) Allowable voltage fluctuation

(2) Electric Conduit port

Size	Number of port
G1/2	● 2
G3/4	○ 2

(3) Operation

	Proportional	Linear
Reverse drive	●	○
Direct drive	○	○

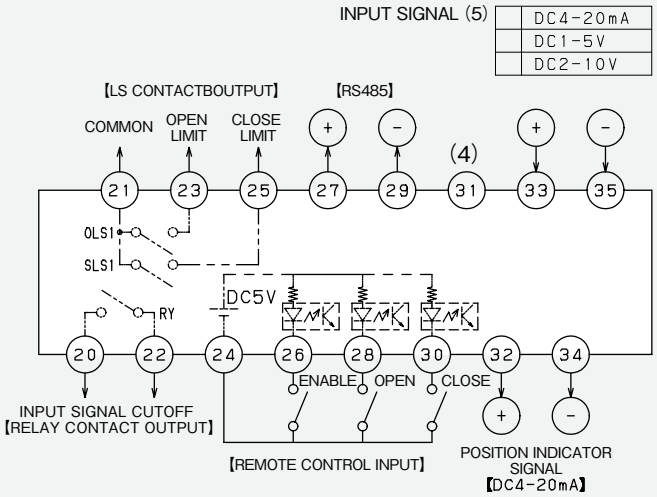
(4) Input signal

DC4～20mA	●
DC1～5V	○
0～135Ω	○
DC0～5V	○
DC0～10V	○
DC2～10V	○

(5) RS485 communication
Slab control/Split range control
(Synchronous control)

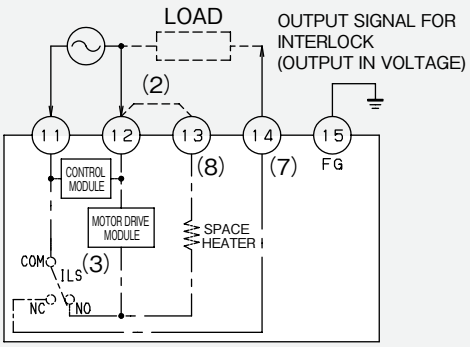
Circuit Diagram (Standard)

TERMINAL BLOCK 16P (M3 SCREW TERMINAL) FOR CONTROL SIGNAL



TERMINAL BLOCK 5P (M4 SCREW TERMINAL) FOR POWER SUPPLY

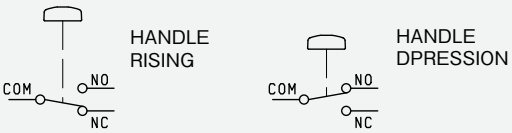
POWER SUPPLY VOLTAGE AC100/200V 50/60Hz



Allowable load for each contact

Output signal	Type	Output voltage/ current	Allowable E load	Note
Open/Close limit signal	Micro switch contact	Dry contact	3A 30V (DC)	Turned on in fully open or fully closed position
Alarm signal in case of input signal cutoff	Relay contact	Dry contact	3A 30V (DC)	Turned on when input signal drops to approx. 2.8mA or smaller
Position indicator signal	—	DC4-20mA	300Ω or under	Fully closed: 4mA~Fully open: 20mA
Interlock output signal	Micro switch contact	AC power supply	3A 250V (AC)	Pull up the handle for manual operation

EXPLANATION OF AN INTELOCK SWITCH OF OPERATION



Note

(1) OLS1 : OPEN LIMIT SWTICH (NON-VOLTAGE FULL OPEN SIGNAL)
SLS1 : CLOSE LIMIT SWTICH (NON-VOLTAGE FULL CLOSE SIGNAL)
ILS : INTERLOCK SWITCH (TURNED ON BY PULLING UP MANUAL OPERATION HANDLE)
RY : RELAY FOR AN ALARM ACTIVATED ON LOSS OF INPUT SIGNAL
(2) Space heater will be turned on when two terminals are connected. (Two terminals are already connected prior to the shipment)
(3) Motor and space heater will be cut off during manual operation or when the cover is removed.
(4) Use of Terminal No. 31 is prohibited. (Beware of miswiring!!)
(5) Standard input control signal is current (DC4-20mA~20mA). When voltage of DC1-5V or DC2-10V is used for input control signal, settings on terminal board needs to be changed.
(6) Contacts have sufficient output allowable load to secure soundness of internal parts while being continuously energized.
(7) In case pulling up manual handle or removing housing cover, power supply is applied to Terminal No. 14 and will detect it is in manual override.
(8) Terminal No. 13 is to prevent internal dew condensation. Please connect, when used under high temperature and high humidity.

Actuator Sizing

● Sizing Conditions: Ball Valves

Service Condition	Fluid	Clean Fluid	Highly Viscous Fluid *2	Foreign Particles Included *3
Fluid type	Water, Lubricant	Standard sizing	◎	◎
	Air, gas, or steam: 0.7 MPa or lower	Standard sizing	◎	◎
	Solvents *1	◎	◎	◎
	Vacuum or oil-free service	◎	◎	◎
Service temperature	Service temperature shall be limited by seat material of the valve			

* Contact KITZ for actuator sizing, where mark ◎ is indicated.
*1 Solvents, such as kerosene, naphtha or alcohol.
*2 Viscosity ranges from 10000 to 50000 CP.
*3 Inclusion of powder and slurry.

● Sizing Conditions: Butterfly Valves

Fluid type	Smooth fluid (clean water, lubricant, etc.)
Velocity (liquid)	3 m/s or slower

*Contact KITZ for advice under the following conditions:
·Service conditions not mentioed the above.
·Valve operation is interrupted for more than three months.

Type/Bore	Shell Materials	Class	Connection	Size / Product Code	mm	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400
					inch	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14	16
Ball valve/Full bore	Cast iron	JIS 10K	Threaded	10FCT																		
			Flanged	10FCTB												EXH-4 EXH_D-4		★	★	EXH-5		
	Ductile iron			10STBF														★				
	Stainless steel		Threaded	10UT																		
	Stainless steel /Carbon steel	Class 150	Flanged	150UTDZ			EXH-1 EXH_D-1				EXH-2 EXH_D-2		EXH-3 EXH_D-3									
		Class 150		150SCTDZ																		
		JIS 10K		10UTDZ												EXH-4 EXH_D-4		☆				
		JIS 10K		10SCTDZ																		
		Class 300		300UTDZ														☆				
		Class 300		300SCTDZ																		
		JIS 20K		20UTDZ														☆				
		JIS 20K		20SCTDZ																		
Ball valve /Full bore three way	Stainless steel	JIS 10K	Flanged	10UTB4T(L)A Note1			EXH-2 EXH_D-2				EXH-3 EXH_D-3			EXH-4 EXH_D-4								
Ball valve /Full bore PFA lining				10UTBLN			EXH-1 EXH_D-1				EXH-2 EXH_D-2		EXH-3 EXH_D-3									
Butterfly valve	Aluminum	JIS 10K	Wafer	10XJME Note2							EXS-2					EXS-3			EXS-4			
		JIS 10K		10XJSME Note2																		
	Ductile iron			10DJ								EXS-2 EXCN-2 EXD-2				EXS-3 EXCN-3 EXD-3			EXS-4 EXCN-4 EXD-4	EXS-5 EXCN-5 EXD-5		
	Ductile iron	JIS 16K・20K BS PN16		16DJ, PN16DJ・20DJ																		
	Stainless steel	JIS 10K		10UB													EXS-4 EXCN-4 EXD-4					
		JIS 16K		16UB																		
Throttrol	Ductile iron	JIS 10K・20K		10/20HRDJUE								EXCN-2 EXD-2			EXCN-3 EXD-3			EXCN-4 EXD-4	EXCN-5 EXD-5			
Lambda Port	Stainless steel	JIS 10K	Flanged	10UVC/UVCT					EXCN-2 EXD-2		EXCN-2 EXD-2	EXCN-3 EXD-3			EXCN-4 EXD-4							

★ Maximum differential pressure: 0.5 MPa ☆ Maximum differential pressure: 1.0MPa
(Note 1) Consult KITZ when actuator is mounted on to a three-way ball valve, as flow direction form is limited.
(Note 2) Consult KITZ when actuator is mounted on to a manual operated valve, as special parts are required for mounting actuator.

Dimensions of flange

Actuator		ISO Flange	Diameter of Raised Face	Axis Side Length	Axis Depth
EXH-1 EXH_D-1	—	F05 + F07	35	□9	16
EXH-2 EXH_D-2	EXS-2 EXCN-2 EXD-2	F05 + F07	35	□11	16
EXH-3 EXH_D-3	EXS-3 EXCN-3 EXD-3	F05 + F07 + F10	55	□17	25
EXH-4 EXH_D-4	EXS-4 EXCN-4 EXD-4	F07 + F10 + F12	55	□27	34
EXH-5	EXS-5 EXCN-5 EXD-5	F14	100	ϕ38 key way (10×8)	65

Instructions to selecting control valve

1. Instructions to selecting control valve

Please consider the following for valve selection.

■ Select appropriate valve size by calculating valve flow coefficient (Cv)

■ Select valve from differential pressure which is appropriate for control.

■ Please calculate Cv based on calculation formula as per Table-1 of FCI. However, in case of 'liquid chocked flow, flushing flow, laminar flow, transitional flow, mixed phase flow and valve with reducers', Table-1 is not applicable. Please refer to ISA-S-75.01-1985(R1995) or JIS B2005-2-1: 2005 or consult KITZ.

(If appropriate valve size is not selected, it may not be controlled.)

2. Calculating formula based on FCI (Fluid Control Institute) of valve flow coefficient

■ No critical state ($\Delta p \leqq 0.5 p_1$) Table-1

	Volume flow	Mass flow
Liquid	$Cv = 11.6Q\sqrt{\frac{G_f}{p}}$	$Cv = \frac{11.6W}{\sqrt{p\ G_f}}$
Gas (specific gravity)	$Cv = \frac{V}{2.78}\sqrt{\frac{G_g\ T_1}{p(p_1+p_2)}}$	$Cv = \frac{4730W}{\sqrt{p(p_1+p_2)G_{gp}}}$
Saturated vapor	–	$Cv = \frac{7260W}{\sqrt{p(p_1+p_2)}}$
Superheated vapor	–	$Cv = \frac{7260W(1+0.0013T_{SH})}{\sqrt{p(p_1+p_2)}}$

■ Critical state ($\Delta p \geqq 0.5 p_1$) Table-1

	Volume flow	Mass flow
Liquid	Consult KITZ	Consult KITZ
Gas (specific gravity)	$Cv = \frac{V}{2.43}\frac{\sqrt{G_g\ T_1}}{p_1}$	$Cv = \frac{5435W}{p_1\sqrt{G_{gp}}}$
Saturated vapor	–	$Cv = \frac{8340W}{p_1}$
Superheated vapor	–	$Cv = \frac{8340W(1+0.0013T_{SH})}{p_1}$

■ Nomenclature

Cv : Valve flow coefficient (Cv)
V : Gas volume flow quantity (Nm^3/h)
p_1 : Absolute static pressure on valve upstream (kPa abs)
Δp : Different pressure between in & out of valve (kPa)
G_g : Gas specific gravity of the normal condition for the air of the normal condition (Air=1)
T_{SH} : Degree of superheat vapor (℃)
Q : Liquid flow volume (m^3/h)
W : Liquid mass flow (t/h)
p_2 : Absolute static pressure on valve downstream (kPa abs)
G_f : Liquid specific gravity of normal condition for water of normal condition (water=1)
G_{gp} : Gaseous density in use state (Air=1) (kg/m^3)
T_1 : Absolute temperature of valve upstream (K)

3. Allowable control differential pressure and ratio by each valve type

Please refer to below table and if service conditions does not meet, please consult KITZ.

	Nominal size	Allowable control differential pressure (kPa) ※1		Allowable differential pressure ratio ※2	Remarks
		Liquid	Gas		
Ductile iron Butterfly valve (DJ series)	50A～200A	200	100	0.30	They are not suitable for steam service due to soft seat.
	250A～300A	150	100	0.25	
	350A～600A	100	–	0.20	
Ductile iron Butterfly valve (Throttrol)	50A～200A	300	–	0.35	
	250A～300A	250	–	0.30	
	350A～500A	200	–	0.25	

Note

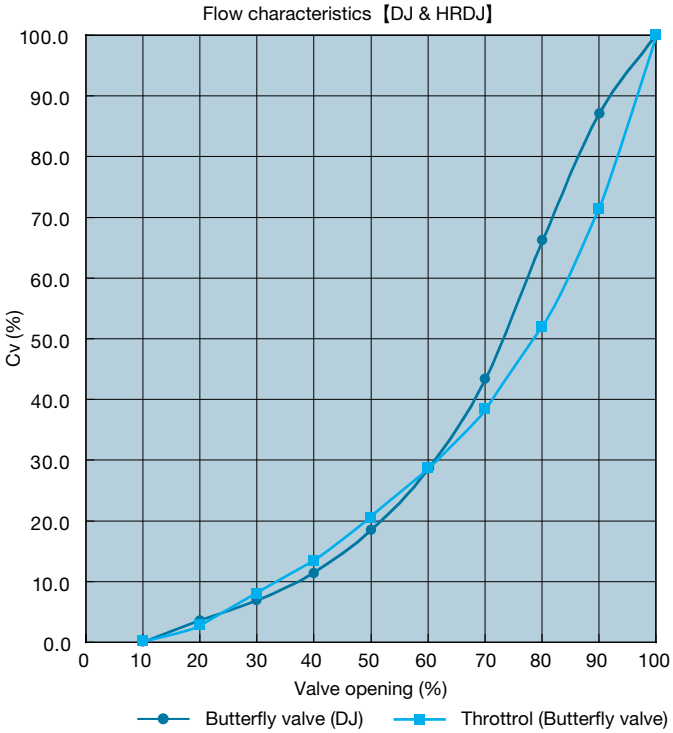
※1 : Control differential pressure ($\Delta p = p_1 - p_2$)

※2 : Differential pressure ratio = $\Delta p / p_1$

4. Valve flow characteristics

Valve flow characteristics are different by each valve type. The chart below shows representative flow characteristics.

■ Butterfly valves (Nominal size : 150A)



Precautions

⚠CAUTION

- Be sure to follow the instructions in the operation manual when handling actuator in this catalog.
- Handle the product with care to avoid falling or dropping. Avoid any mechanical impact.
- When in storage, the area product is stored must be dust-free, low humidity and well ventilated.
- DO NOT remove protective cover until installation.
- DO NOT apply excessive load or step on the product, which may damage the product or cause personal injury.
- Allow sufficient room for manual operation or to remove actuator cover when the valve is installed in a pipeline.
- If the actuator is exposed to sunlight or rainwater while in service, use appropriate protection for trouble-free operation. In addition, use insulation boards for the heat generated from the equipment around the actuator.
- Take appropriate measures against possibilities of damage by briny atmosphere or snow, if freezing is expected.
- Avoid installing the valve where the actuator may be affected by vibration caused by other equipment such as pumps or engines.
- Before installation, clean the connecting pipes to remove any foreign objects such as sand, dust, or welding spatters.
- When screwing threaded valves to pipes, apply spanner to ends of the valves on the side of connecting pipe being inserted.
- For flanged valves, tighten bolts on the end flanges alternately in star pattern to ensure proper fastening of flanges.
- The actuator should not be mounted downward in any piping orientation.
- Flush the pipeline to remove foreign particles from the pipes.
- If cast iron or cast carbon steel valves are used in the water line, be aware that rust may develop in the valves. Pay extra attention when selecting a valves and protection from rust.
- Connect cables correctly in accordance with circuit diagram.
- Make sure to use terminal base when connecting cables.
- After connecting cables, to ensure installation, please conduct installation resistance test.
- To ensure housing is securely sealed with sealing materials such as O-rings to prevent dust or water from entering the housing.
- DO NOT try to simultaneously operate two or more actuators using only one operating switch. Other electrical equipment should not also be operated at the same time with one operation switch.
- Ensure that the space heater is always activated to keep the interior of the actuator warm to protect against condensation, which may result in operational malfunction.
- Ensure that the actuator is powered off when operating manually.
- Allow at least 1-s interval when the direction of operation is reversed. Failure to follow this instruction may result in operation malfunction.
- If materials containing silicon are in the environment, contact failure may occur due to generation of silicone gas. Also, DO NOT use the product in an environment containing siloxane gas.
- DO NOT use silicon-containing materials (electric wire, filler, and adhesive) when wiring because it may result in a contact failure due to the generation of siloxane gas.
- DO NOT conduct any unauthorized modifications. Such modifications may result in operation failure or accidents. KITZ shall not be responsible for any troubles or accidents caused by improper use of the products.
- Refer to our catalogs for more details of valves.
- Cautions in this catalog does not cover entire scope of conceivable use of the product. Please obtain applicable operation manuals and follow the warnings and cautions for safe use of the product.

⚠WARNING

- This product is not designated for explosion-proof locations. DO NOT use the product in any flammable or corrosive gaseous environment. Further, DO NOT use the product for handling inflammable fluid.
- DO NOT disassemble the actuator while energized.
- DO NOT put your fingers or insert any foreign objects in the valve core before or during valve operation.

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Read the instruction manual carefully before use.

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A chrysanthemum-handle is a symbol of KITZ,
the brand of valve reliability

ISO 9001 certified since 1989

KITZ

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