
KITZ

Operation Manual

For

KITZ EX Series Electric Valve Actuators

Thank you for having chosen KITZ products.

For safe and trouble-free use of the product, ensure to carefully read all instructions of this manual before handling of the product. Keep this manual in a convenient place for easy access of all valve operating personnel.

NOTES TO USERS

- ◆ This manual provides users with the instructions on correct use of KITZ EX Series electric valve actuators. Ensure to carefully read all the items of this manual before handling, storage, installation, operation and maintenance of the product.
- ◆ This manual covers the normal use of the product as a general guide to users, but does not necessarily cover all possible conditions or situations that may be caused to users while using the product. If technical assistance beyond the scope of this manual is required, users are recommended to contact KITZ Corporation or the distributors in their locations.
- ◆ Numerical limits and procedures of operation, maintenance and inspection provided in this manual are specified in consideration of safe and trouble-free operation of the product. It is forbidden to use the product in any condition that may exceed such numerical limits or conflict with such procedures.
- ◆ Drawings, tables, photographs and illustrations of the product in this manual provide users with only the basic information. Ask KITZ Corporation or the distributors for detailed assembly drawings of the products, if needed.
- ◆ Any information provided in this manual is subject to from-time-to-time change without notice for error rectification, product discontinuation, design modification, or any other causes that KITZ Corporation considers necessary.

SAFETY CAUTIONS

This manual calls users' careful attention to the dangers and hazards that may be caused to personnel or properties during handling, storage, installation, operation or maintenance of the product. Such dangers and hazards are specifically highlighted in the operation manual with either one of the following marks.



WARNING

A warning indicates a potentially hazardous condition that may result in serious injury or death of personnel, if such a warning is ignored.



CAUTION

A caution indicates a potentially hazardous condition that may result in minor injury to personnel or damage to properties, if such a caution is ignored.

If any item of this manual is not strictly followed by users, KITZ Corporation shall have no responsibility for any resulting accident or failure of the product.

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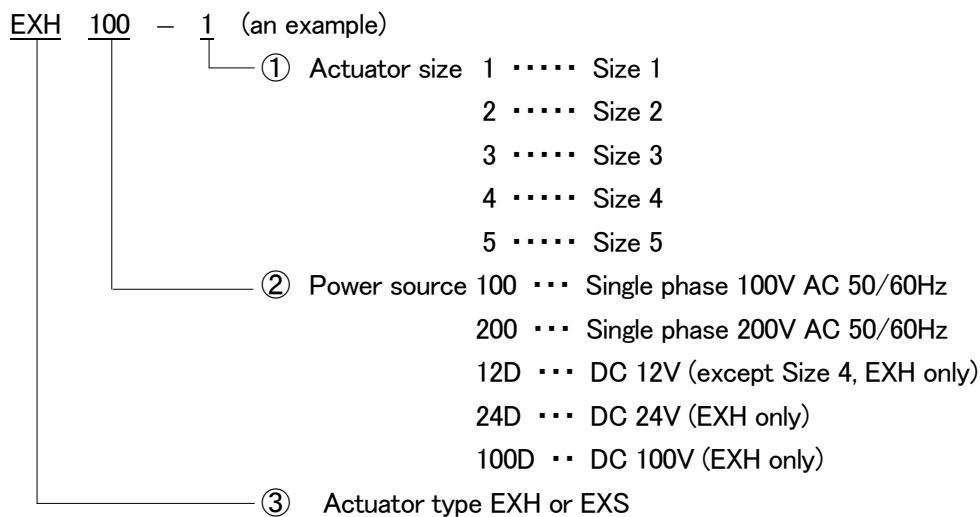
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1. Product Features

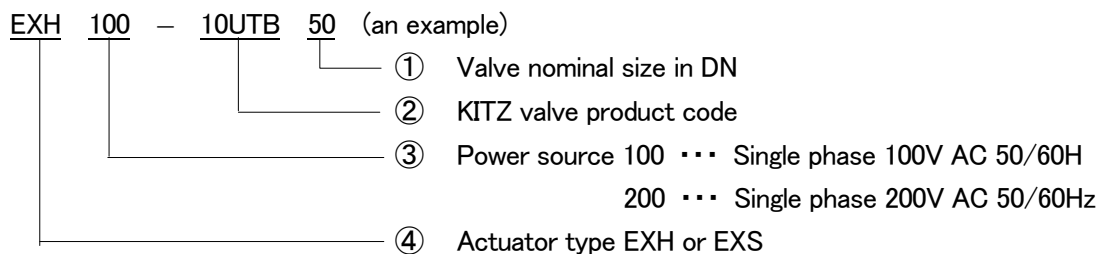
Mechanisms of KITZ EX Series electric actuators are assembled in durable die-cast aluminum housings, and equipped with planetary reduction gears. They are provided with output torque characteristics suitable for operation of KITZ ball valves or butterfly valves, depending on users' choice of either one of the following product types:

- Type EXH actuators provided with higher operation speed and sufficient output torque, for operation of KITZ ball valves specified in this manual. No self-locking mechanism is provided.
- Type EXS actuators provided with lower operation speed, sufficient output torque and self-locking provision, for standard operation of KITZ butterfly valves specified in this manual. Also they can be used for operation of KITZ ball valves specified in this manual. Ask KITZ Corporation for the optional availability of Type EXS actuated ball valves.

2. Product Coding of Actuators



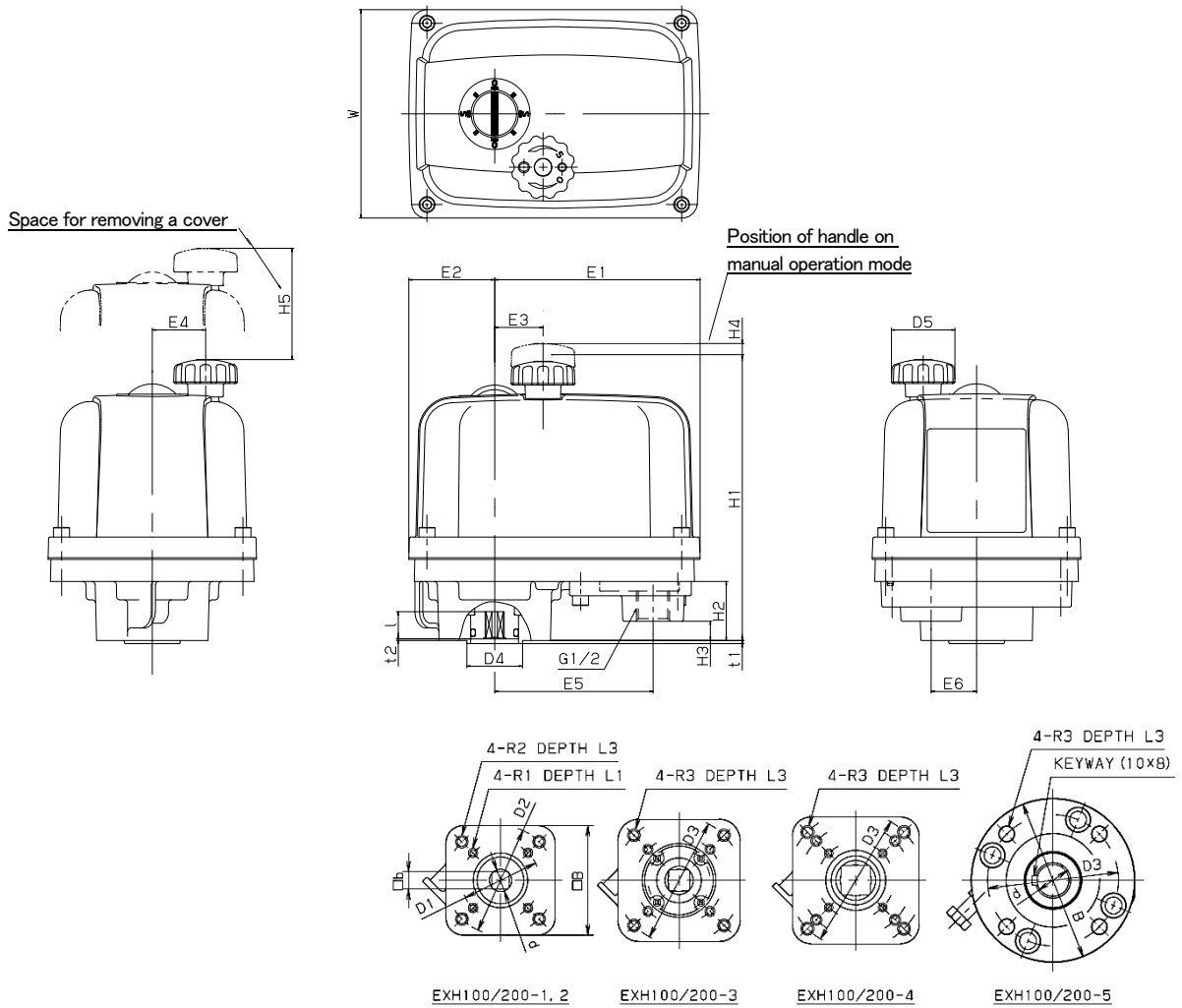
3. Product Coding of Actuated Valves



4. External Dimensions and Names of Parts and Components

4.1 External Dimensions

EXH

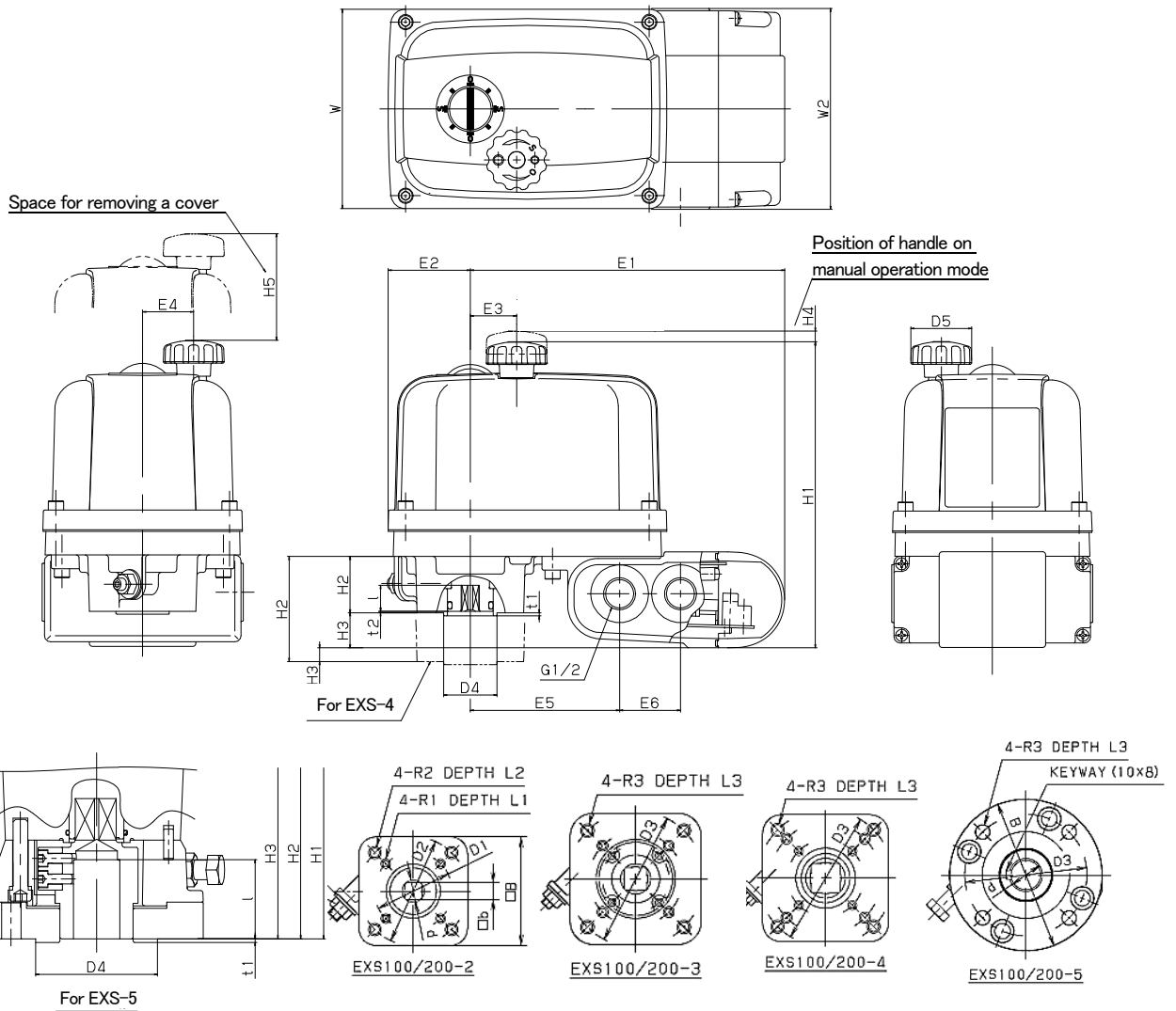


DIMENSIONS

UNIT: mm

TYPE & SIZE	E1	E2	E3	E4	E5	E6	w	H1	H2	H3	H4	H5	D1	D2	D3	D4	D5	d	b	B	l	t1	t2	R1xL1	R2xL2	R3xL3
EXH100/200-1	129	54	30.4	33.5	99.5	28.5	131	181	37	12	10	107.5	50	70	-	35	40	12.1	9	70	16	2	1	M6x10	M8x13	-
EXH100/200-2	129	54	30.4	33.5	99.5	28.5	131	181	37	12	10	107.5	50	70	-	35	40	14.3	11	70	16	2	1	M6x10	M8x13	-
EXH100/200-3	152	69	45.1	42	123	28.5	158	206.5	44	19	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6x10	M8x13	M10x16.5
EXH100/200-4	168	73	51.3	50	138.5	28.5	188	276	78	53	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8x12	M10x15	M12x18
EXH100/200-5	168	73	51.3	50	138.5	28.5	188	357	159	134	10	153	-	-	140	100	60	38	-	175	65	3	-	-	-	M16x24

EXS



DIMENSIONS

UNIT: mm

SIZE	E1	E2	E3	E4	E5	E6	W1	W2	H1	H2	H3	H4	H5	H6	D1	D2	D3	D4	D5	d	b	B	l	t1	t2	R1xL1	R2xL2	R3xL3
2TYPE	206.5	54	30.4	33.5	98	40	131	132	181	204	37	23	10	107.5	50	70	-	35	40	14.3	11	70	16	2	1	M6x10	M8x13	-
3TYPE	230	69	45.1	42	121.5	40	158	132	206.5	222.5	44	16	10	117.5	50	70	102	55	60	22.7	17	98	25	2	1	M6x10	M8x13	M10x16.5
4TYPE	245.5	73	51.3	50	137	40	188	132	276	258	78	18	10	153	70	102	125	55	60	36.5	27	116	34	2	1	M8x12	M10x15	M12x18
5TYPE	245.5	73	51.3	50	137	40	188	132	357	258	159	99	10	153	-	-	140	100	60	38	-	175	65	3	-	-	-	M16x24

4.2 Type EXH: Names of parts and components

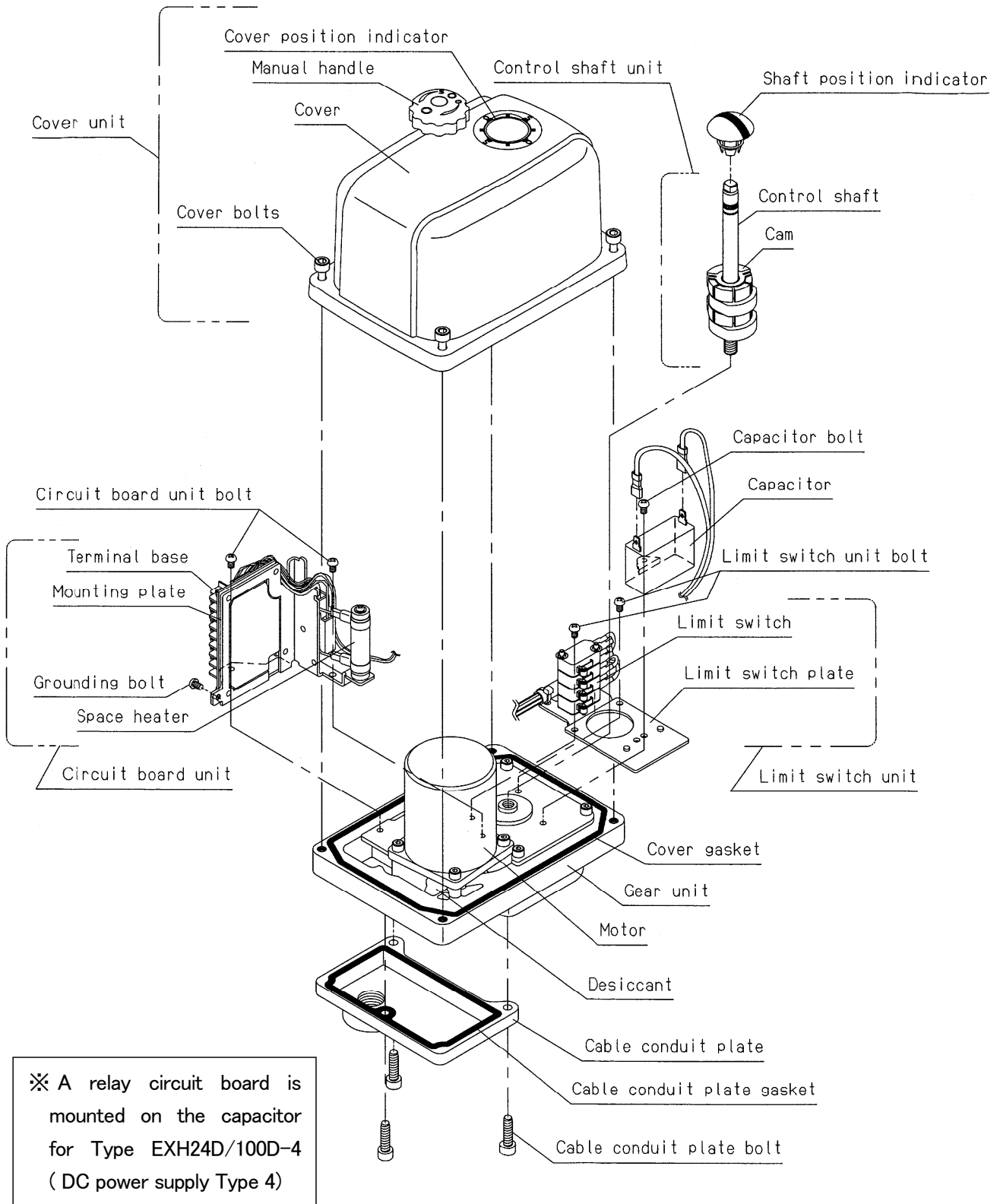


Fig. 1

4.3 Type EXS: Names of parts and components

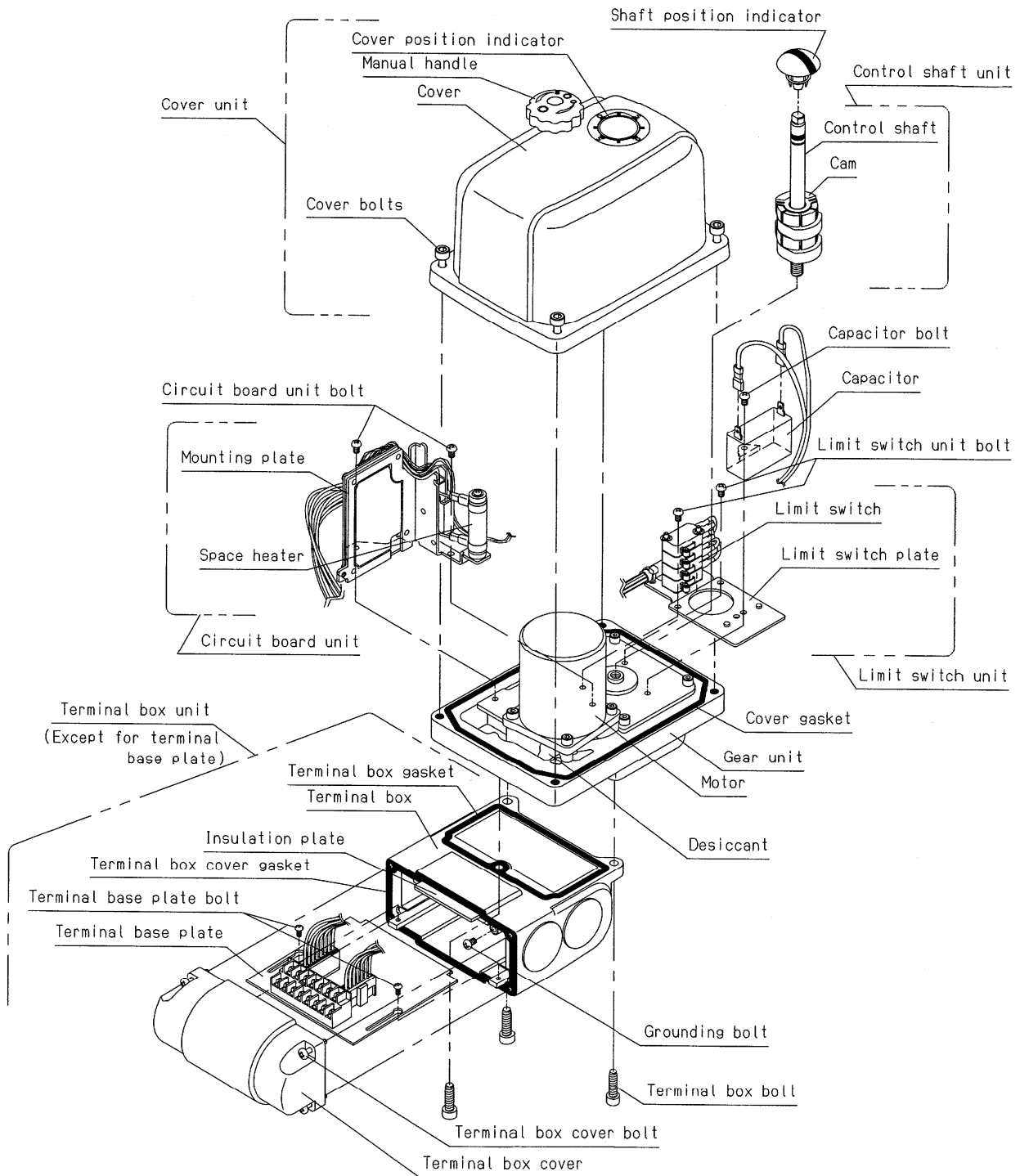


Fig. 2

4.4 Type EXS / EXS size: Names of parts and components

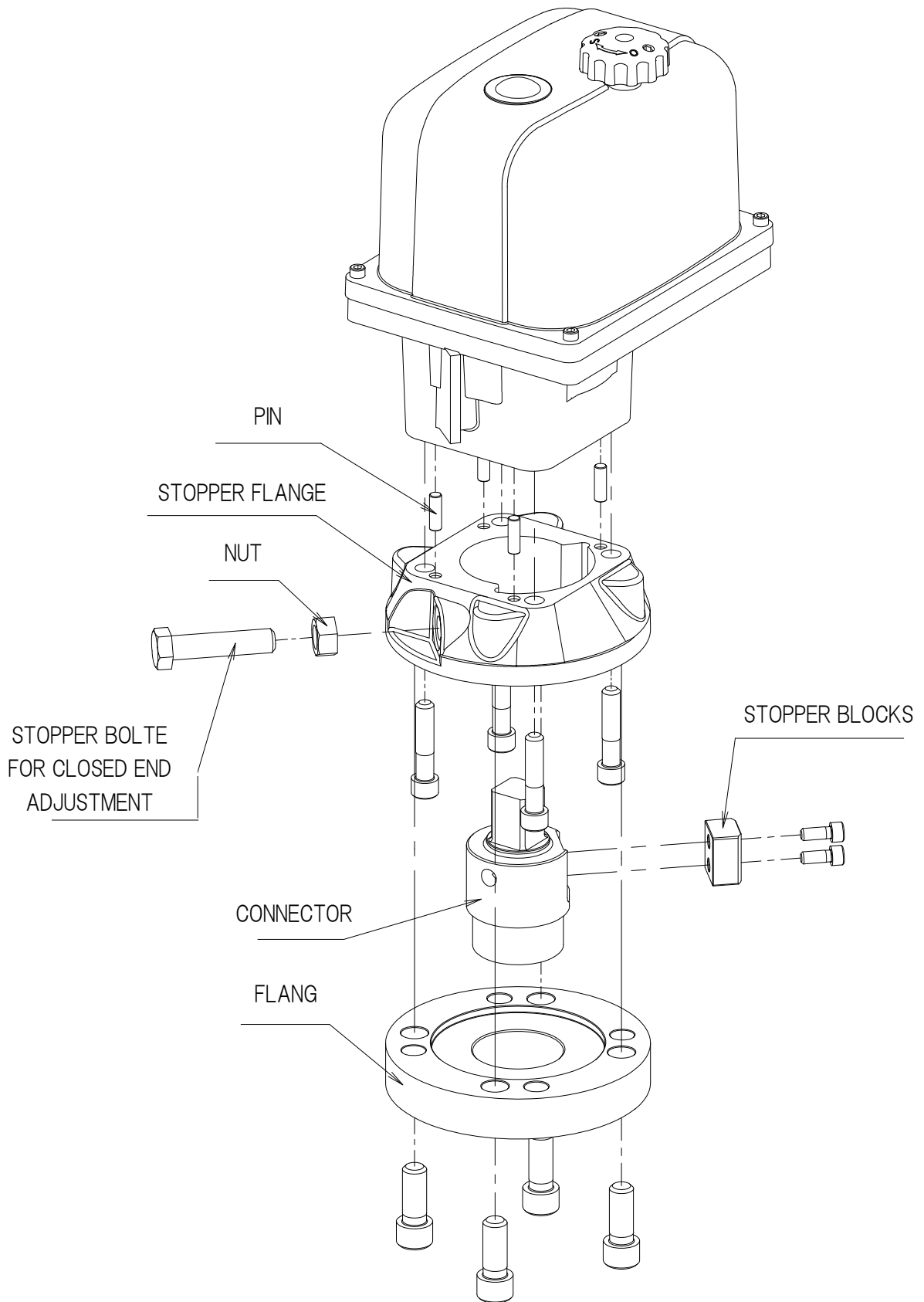


Fig. 3

5. Design Specifications

5.1 Type EXH (Alternating current power supply type): Design specifications

Table 1

Actuator size	Type 1		Type 2		Type 3		Type 4		Type 5		
Actuator type	EXH100-1	EXH200-1	EXH100-2	EXH200-2	EXH100-3	EXH200-3	EXH100-4	EXH200-4	EXH100-5	EXH200-5	
Power supply	100/200V AC $\pm 10\%$ 50/60Hz										
Rated current(A) ※1	0.65	0.35	0.65	0.35	1.2	0.6	2.8	1.5	2.8	1.5	
90° operation time (second) ※2	50Hz	9		14		21		28		49	
	60Hz	8		12		17		23		41	
Rated output torque	9.8N·m (100kgf·cm)		49N·m (500kgf·cm)		196N·m (2000kgf·cm)		588N·m (6000kgf·cm)		1000N·m (10204kgf·cm)		
Motor output (W)	16				31		85				
Power consumption (W)	65				120		280	270	280	270	
Overload protection	Built-in thermal protector (Activated at 120°C)										
Rotating direction	Counterclockwise to open/Clockwise to close (Viewed from top)										
Duty factor	30%ED										
Limit switch ※3	2 each for opening / closing (2 position limit switches and 2 signal limit switches)										
Switch contact capacity	250V AC 2A least resistance load										
Service environment	Indoor / outdoor (No water immersion/No exposure to sunlight)										
Water-proof/dust-proof	Equivalent to IP67										
Heater capacity	15 W										
Heater power consumption	2.5W @ 100V or 2.9 W @ 200V (Size 1~3)						4 W				
Ambient temperature	-10°C ~ +50°C										
Insulation class	JIS C4003 Class E										
Insulation strength	1 min./ 1500V AC or 1 sec./ 1800V AC										
Insulation resistance	100M Ω minimum / 500V DC (Meg ohm meter)										
Mounting orientation	Vertical to horizontal (No downward orientation)										
Lubrication	Grease										
Conduit port	One G1/2										
Electric wiring	M3 terminal board										
Mechanical stopper	Built-in stoppers for opening / closing (+7° each adjustment)										
Manual operation	Pulling up and turning a handle, while the motor is switched off with a built-in interlocking switch.										
Automated operation	Pushing down a handle to restore electric operation										
Valve mounting flange	ISO 5211										
Painting color	Metallic silver cover / Metallic dark grey case / Frosted black handle										
Actuator mass (Kg) ※4	4.4		4.4		7.3		12.3		20		

※1 : At the moment of start-up operation, actuator motors are loaded with an inrush current of approximately tenfold rated current. Switch contact capacities of all electric devices connected with actuators must be provided with a sufficient margin to absorb such a high current.

※2 : Valve closing times are calculated for actuators not being assembled with valves. Add 3% to 10% to the listed lengths of closing time for the actuators assembled with valves.

※3 : If the load current is 50mA or smaller, contact KITZ Corporation for supply of optional auxiliary limit switches provided with gold contacts.

※4 : Weight per actuator

Note 1. Hold actuators in stop-position at least one second, before starting reverse operation. Too quick reversal of operation may cause malfunction or failure of actuators.

Note 2. DO NOT drive two or more actuators with a single switch. DO NOT operate relays or solenoid valves in parallel with a single switch.

Note 3. Maintenance of actuators may become a critical issue, if actuated valves are too frequently cycled, or limit switches are too frequently turned on and off.

5.2 Type EXS: Design specifications

Table 2

Actuator size	Type 2		Type 3		Type 4		Type 5	
Actuator type	EXS100-2	EXS200-2	EXS100-3	EXS200-3	EXS100-4	EXS200-4	EXS100-5	EXS200-5
Power supply	100/200V AC $\pm 10\%$ 50/60Hz							
Rated current(A) ※1	0.65	0.35	1.2	0.6	2.8	1.5	2.8	1.5
90° operation time (second) ※2	50Hz	25		35		49		49
	60Hz	21		30		41		41
Rated output torque	49N·m (500kgf·cm)		196N·m (2000kgf·cm)		588N·m (6000kgf·cm)		1000N·m (6000kgf·cm)	
Motor output (W)	16		31		85		85	
Power consumption (W)	65		120		280	270	280	270
Overload protection	Built-in thermal protector (Activated at 120°C)							
Rotating direction	Counterclockwise to open/Clockwise to close (Viewed from top)							
Duty factor	30%ED							
Limit switch ※3	2 each for opening / closing (2 position limit switches and 2 signal limit switches)							
Switch contact capacity	250V AC 2A least resistance load							
Service environment	Indoor / outdoor (No water immersion/No exposure to sunlight)							
Water-proof/dust-proof	Equivalent to IP67							
Heater capacity	15 W							
Heater power consumption	2.5W @ 100V or 2.9 W @ 200V (Size 2,3)				4 W			
Ambient temperature	-10°C ~ +50°C							
Insulation class	JIS C4003 Class E							
Insulation strength	1 min./ 1500V AC or 1 sec./ 1800V AC							
Insulation resistance	100M Ω minimum / 500V DC (Meg ohm meter)							
Mounting orientation	Vertical to horizontal (No downward orientation)							
Lubrication	Grease							
Conduit port	Two G1/2							
Electric wiring	M3 terminal board							
Mechanical stopper	A built-in stopper for opening (+7° adjustment) and an adjustable stopper bolt for closing							
Manual operation	Pulling up and turning a handle, while the motor is switched off with a built-in interlocking switch .							
Automated operation	Pushing down a handle to restore electric operation							
Valve mounting flange	ISO 5211							
Painting color	Metallic silver cover / Metallic dark grey case / Frosted black handle							
Actuator mass (Kg) ※4	5.1		8.0		13		21	

※1 : At the moment of start-up operation, actuator motors are loaded with an inrush current of approximately tenfold rated current. Switch contact capacities of all electric devices connected with actuators must be provided with a sufficient margin to absorb such a high current.

※2 : Valve closing times are calculated for actuators not being assembled with valves. Add 3% to 10% to the listed lengths of closing time for the actuators assembled with valves.

※3 : If the load current is 50mA or smaller, contact KITZ Corporation for supply of optional auxiliary limit switches provided with gold contacts.

※4 : Weight per actuator

Note 1. Hold actuators in stop-position at least one second, before starting reverse operation. Too quick reversal of operation may cause malfunction or failure of actuators.

Note 2. DO NOT drive two or more actuators with a single switch. DO NOT operate relays or solenoid valves in parallel with a single switch.

Note 3. Maintenance of actuators may become a critical issue, if actuated valves are too frequently cycled, or limit switches are too frequently turned on and off.

5.3 Type EXH (DC power supply type): Design specifications

Table 3

Actuator size	Type 1			Type 2			Type 3			Type 4	
Actuator type	EXH12D-1	EXH24D-1	EXH100D-1	EXH12D-2	EXH24D-2	EXH100D-2	EXH12D-3	EXH24D-3	EXH100D-3	EXH24D-4	EXH100D-4
Power supply	DC14V	DC24V	DC100V	DC14V	DC24V	DC100V	DC14V	DC24V	DC100V	DC24V	DC100V
Rated current(A) ※1	2.0	1.0	0.3	3.0	1.5	0.5	3.5	2.0	0.7	4.0	1.0
90° operation time(second) ※2	6			6			21			29	
Rated output torque	9.8N·m (100kgf·cm)			49N·m (500kgf·cm)			196N·m (2000kgf·cm)			588N·m (10204kgf·cm)	
Motor output (W)	13						14			46	
Power consumption (W)	30			50			50			130	
Overload protection	Excess current protection device										
Rotating direction	Counterclockwise to open/Clockwise to close (Viewed from top)										
Duty factor	30%ED										
Limit switch ※3	2 each for opening / closing (2 position limit switches and 2 signal limit switches)										
Switch contact capacity	14V DC 16A, 30 DC 6A, 125V DC 0.6A least resistance load										
Service environment	Indoor / outdoor (No water immersion/No exposure to sunlight)										
Water-proof/dust-proof	Equivalent to IP67										
Heater capacity	15 W										
Heater power consumption	2.6W (Size 1~3)									4 W	
Ambient temperature	-10°C~+50°C										
Insulation class	JIS C4003 Class A						JIS C4003 Class E				
Insulation strength	1 min./ 1000V AC or 1 sec./ 1200V AC										
Insulation resistance	100MΩ minimum / 500V DC (Meg ohm meter)										
Mounting orientation	Vertical to horizontal (No downward orientation)										
Lubrication	Grease										
Conduit port	One G1/2										
Electric wiring	M3 terminal board										
Mechanical stopper	Built-in stoppers for opening / closing (+7° each adjustment)										
Manual operation	Pulling up and turning a handle, while the motor is switched off with a built-in interlocking switch.										
Automated operation	Pushing down a handle to restore electric operation										
Valve mounting flange	ISO 5211										
Painting color	Metallic silver cover / Metallic dark grey case / Frosted black handle										
Actuator mass (Kg) ※4	4.4			4.4			7.3			12.5	

※1 : At the moment of start-up operation, actuator motors are loaded with an inrush current of approximately tenfold rated current. Switch contact capacities of all electric devices connected with actuators must be provided with a sufficient margin to absorb such a high current.

※2 : Valve closing times may become longer or shorter by some 50% depending on the condition of the load such as valve size and fluid pressure.

※3 : If the load current is 50mA or smaller, contact KITZ Corporation for supply of optional auxiliary limit switches provided with gold contacts.

※4 : Weight per actuator

Note 1. Hold actuators in stop-position at least one second, before starting reverse operation. Too quick reversal of operation may cause malfunction or failure of actuators.

Note 2. Maintenance of the actuator may be required in case limit switches are frequently turned on and off due to frequent opening and closing of the actuated valve.

Note 3. Check that the correct power supply is provided. Application of voltage other than specified may damage a motor and cause malfunction of an actuator.

Note 4. This actuator is designed only for on-off operation of valves. DO NOT use it to stop valves at an intermediate position.

6. Product Identification Plate

6.1 Actuators are provided with product identification plates, which show product specifications, service conditions and circuit diagrams. Refer to Fig. 4 for an example.

<Product identification plate for AC power supply type>

<Product identification plate for DC power supply type>

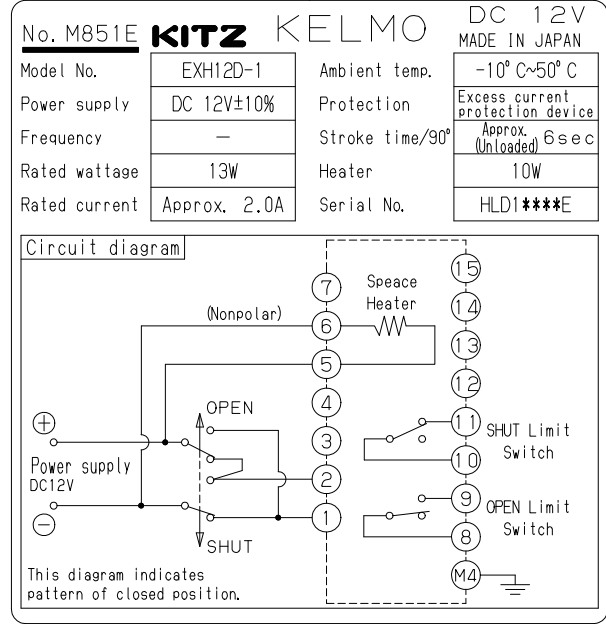
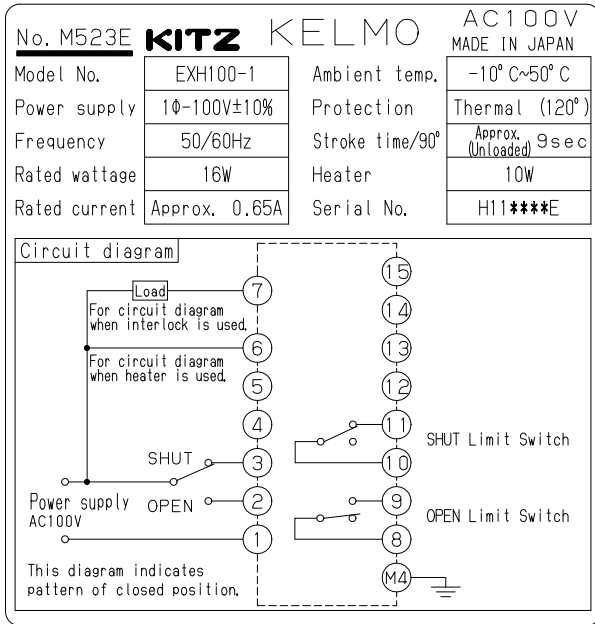


Fig. 4 Product Identification Plate

6.2 Actuators are also provided with caution plates, which give warnings and cautions for safe and trouble-free handling of actuators in the field. Refer to Fig. 5 for an example.

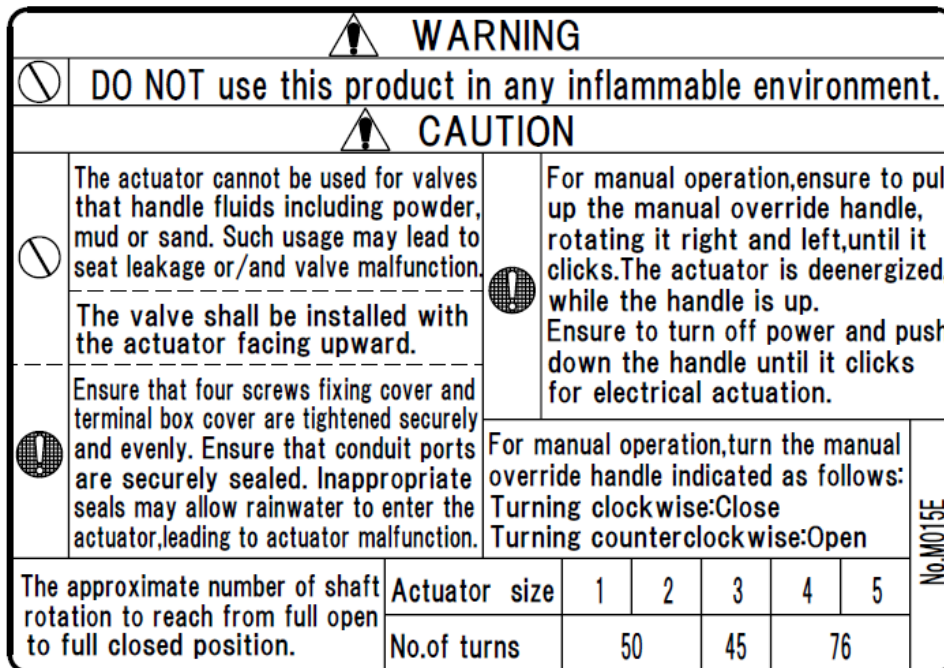


Fig. 5 Caution plate

7. Actuator Operation Principle

7.1 Actuator Operation Principles for Type EXH (AC power supply type)

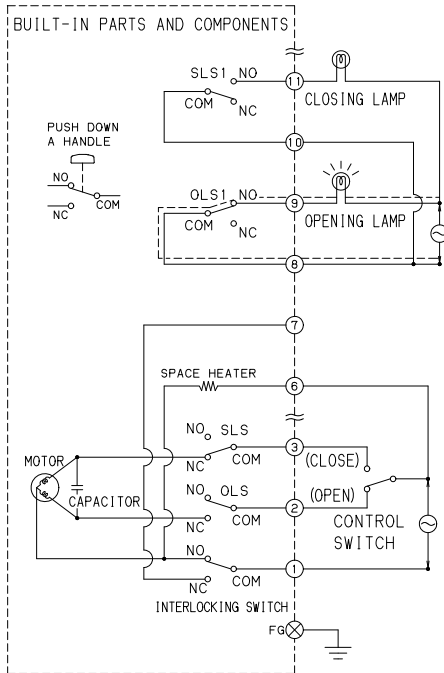


Fig. 6

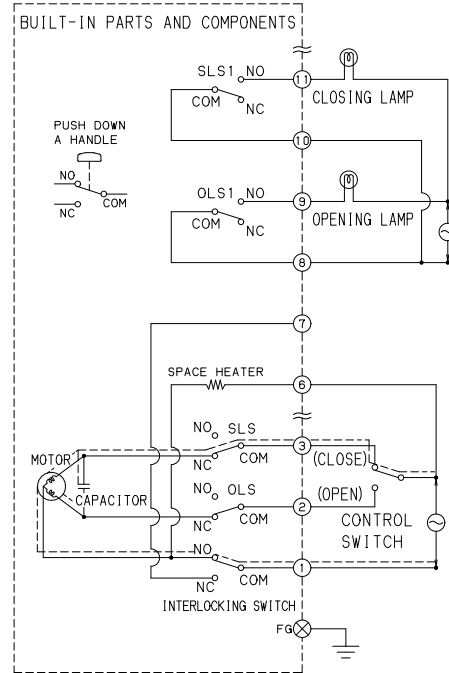


Fig. 7

(1) From the condition as shown in Fig.5, switch the operation switch to the closing side and pass a current ① through ③ to activate the circuit as follows: ①→interlock switch→motor→SLS→③. Then the valve will rotate clockwise being viewed from the top of the actuator housing cover (Fig. 7)

(2) The actuator shaft rotates and the closing cam breaks NC contact of SLS to stop the motor drive. At the same time, a circuit contacts between ⑩ and ⑪ of SLS1 limit switch to light a closing indicator lamp. (Fig.8)

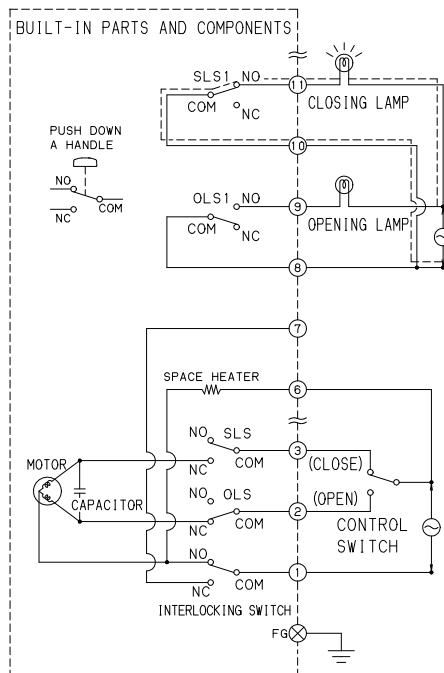


Fig. 8

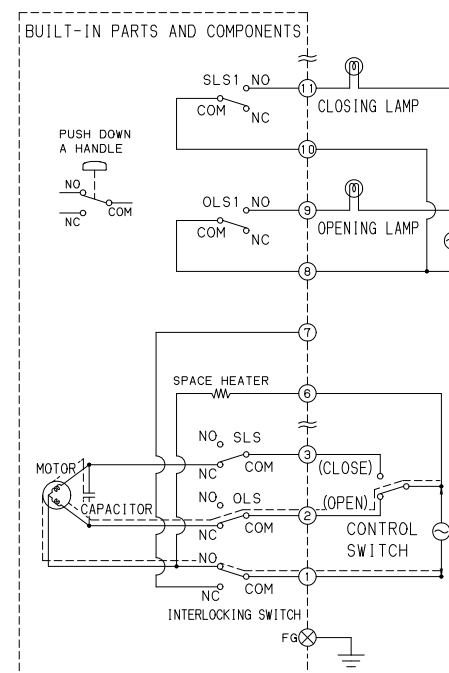


Fig. 9

(3) From the condition as shown in Fig.7, switch the operation switch to the opening side and pass a current ① through ② to activate the circuit as follows: ①→interlock switch→motor→OLS→②. Then the valve will rotate counterclockwise being views from the top of the actuator housing cover. (Fig. 9)

(4) The actuator shaft rotates and the opening cam breaks NC contact of OLS to stop the motor drive. At the same time, a circuit contacts between ⑧ and ⑨ of OLS1 limit switch to light an opening indicator lamp. (Fig.7)

7.2 Actuator Operation Principles for Type EXH (DC power supply type) Size 1, 2 & 3

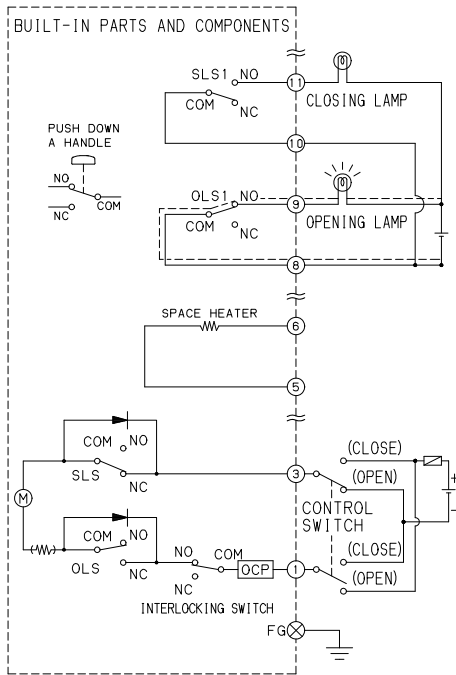


Fig. 10

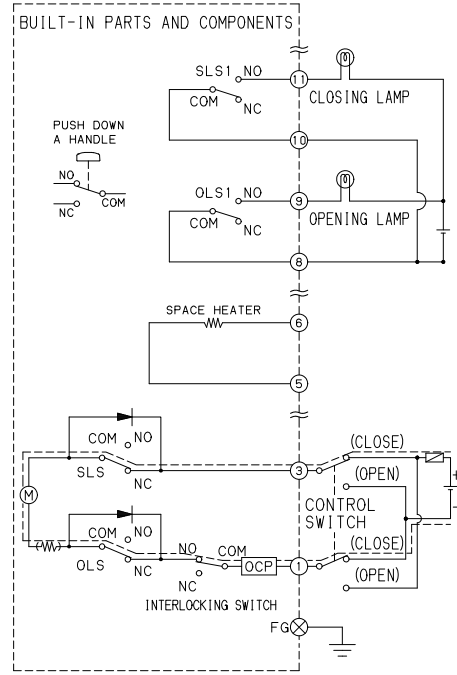


Fig. 11

(1) From the condition as shown in Fig.9, switch the operation switch to the closing side and pass a current ②(+)
through ①(-) to activate the circuit as follows: ②→SLS→motor→diode(OLS)→interlock switch→①. Then
the valve will rotate clockwise being viewed from the top
of the actuator housing cover (Fig. 11)

(2) The actuator shaft rotates and the closing cam breaks
NC contact of SLS to stop the motor drive. At the
same time, a circuit contacts between ⑩ and ⑪
of SLS1 limit switch to light a closing indicator lamp.
(Fig.12)

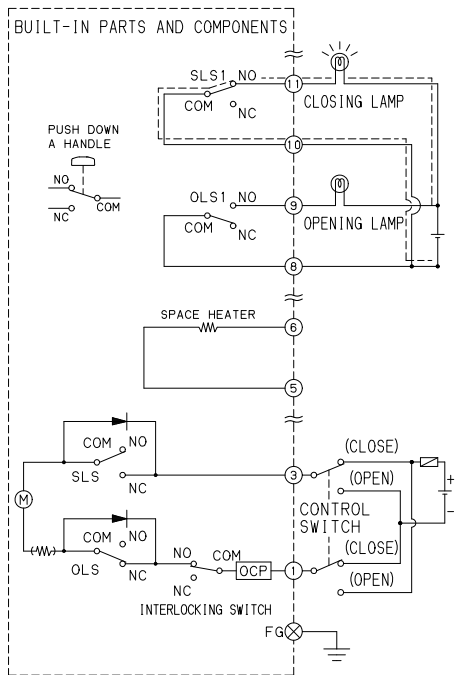


Fig. 12

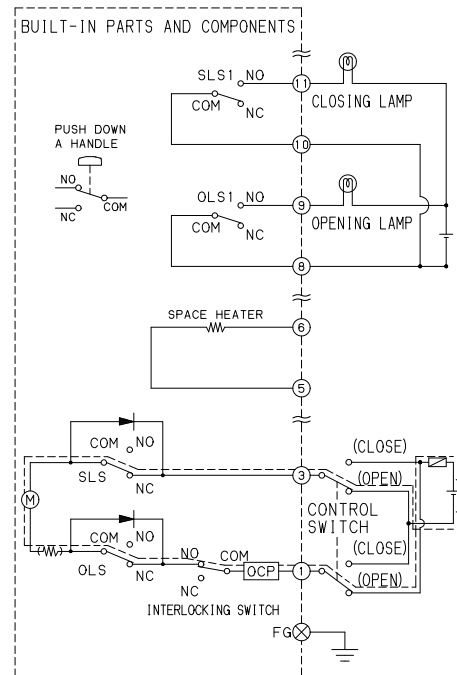


Fig. 13

(3) From the condition as shown in Fig.11 switch the
operation switch to the opening side and pass a current
①(+)
through ②(-) to activate the circuit as follows:
①→interlock switch→OLS→motor→diode (SLS)→②.
Then the valve will rotate counterclockwise being views
from the top of the actuator housing cover. (Fig. 13)

(4) The actuator shaft rotates and the opening cam
breaks NC contact of OLS to stop the motor drive. At
the same time, a circuit contacts between ⑧ and ⑨
of OLS1 limit switch to light an opening indicator lamp.
(Fig.10)

7.3 Actuator Operation Principles for Type EXH (DC power supply type) Size 4

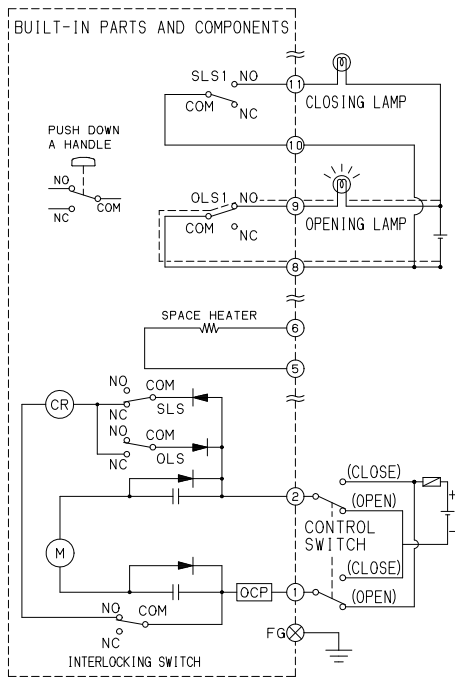


Fig. 14

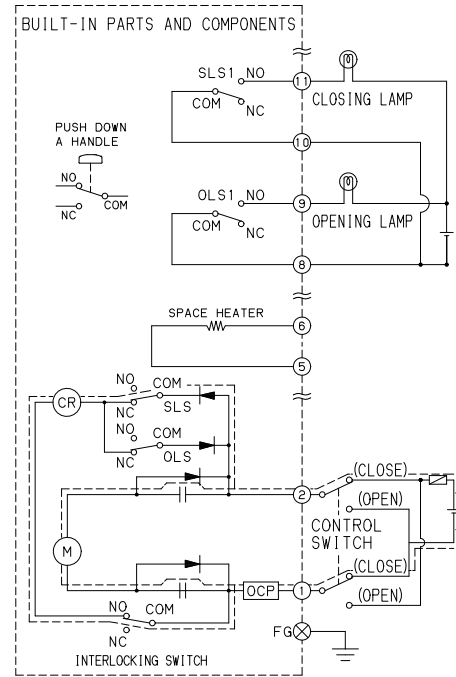


Fig. 15

(1) From the condition as shown in Fig. 13, switch the operation switch to the closing side, and pass a current ②(+), through ①(-) to have the relay coil energized. Then the circuit is activated as follows: ② → relay contact → motor → relay contact → ①. Then the valve will rotate clockwise being viewed from the top of the actuator housing cover. (Fig. 15)

(2) The actuator shaft rotates and the closing cam breaks NC contact of SLS to stop the motor drive. At the same time, a circuit contacts between ⑩ and ⑪ of SLS1 limit switch to light a closing indicator lamp. (Fig. 16)

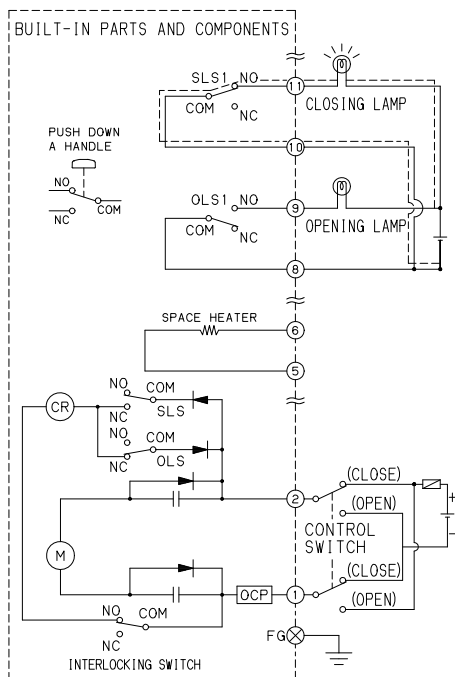


Fig. 16

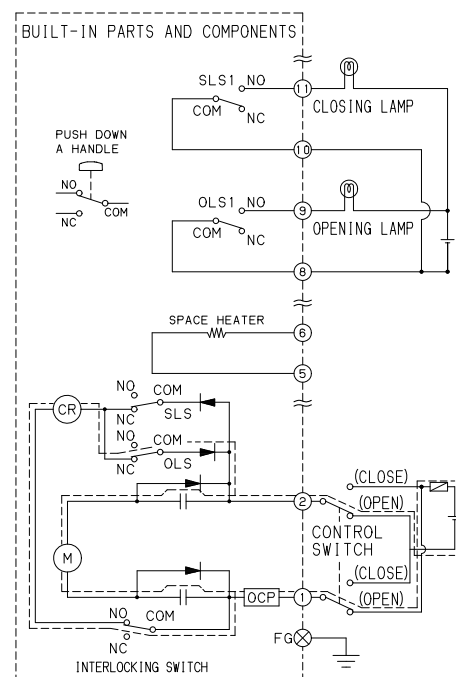


Fig. 17

(3) From the condition as shown in Fig. 15, switch the operation switch to the opening side, and pass a current ①(+), through ②(-) to have the relay coil energized. Then the circuit is activated as follows: ① → relay contact → motor → relay contact → ②. Then the valve will rotate counterclockwise being viewed from the top of the actuator housing cover. (Fig. 17)





(4) The actuator shaft rotates and the opening cam breaks NC contact of OLS limit switch to stop the motor drive. At the same time, a circuit contacts between ⑧ and ⑨ of OLS1 limit switch to light an opening indicator lamp. (Fig. 14)

8. Service Environment

- 8.1 Use actuators in the environment where the ambient temperature does not exceed the range of -10°C to $+50^{\circ}\text{C}$.
- 8.2 DO NOT install actuators in any explosive or corrosive environment.
- 8.3 For outdoor service, actuators must not be directly exposed to the sunlight or continuous splash of water.
- 8.4 Protect actuators appropriately in an environment where salt, snow or freezing may affect functions.
- 8.5 Around actuators, keep a sufficient room to ease maintenance or manual operation.
- 8.6 Where actuators are exposed to radiant heat, take protective measures such as installation of covers or shelters.
- 8.7 Mount actuators on valves in an orientation to position actuators vertically to or at least in parallel to the ground. Facing them downward to the ground is not recommended.
- 8.8 DO NOT install actuators where nearby facilities such as pumps and engines generate vibration.
- 8.9 A contact failure may occur due to the generation of siloxane gas when there is a material that contains silicone in the surrounding environment. DO NOT use the product in the siloxane gas environment.

9. Storage and Handling





- 9.1 Store actuators and valves indoor in dust-free and corrosion-free environment where the relative humidity is 80% or lower and there is no concern of direct exposure to the sunlight and rainwater.
- 9.2 DO NOT unpack actuators and valves until you are ready to install them on pipes.
- 9.3 Overloading actuators and valves must be prevented. DO NOT fall them on the ground. DO NOT place any other objects on them. DO NOT step on them.
- 9.4 Handle packed or unpacked actuators carefully with both hands. DO NOT handle them by holding manual handles of actuators.
- 9.5 Fix actuated valves securely, for example, with wooden frames, when handling them with forklifts or trolleys. For handling actuated valves with chain hoists, fix them firmly with ropes. DO NOT hang actuators or valve-actuator mounting brackets with ropes.

 CAUTION	
	<ul style="list-style-type: none"> ● Actuators and valves are individually packed and all openings and connections are sealed for dust prevention. DO NOT remove protectors until you are ready to install them on pipes. DO NOT forget to remove protectors on installation. ● DO NOT handle actuated valves holding actuator handles. Actuators may turn or fall down and cause injuries to the personnel. ● DO NOT hang actuated valves holding actuator handles with ropes. It may cause damage of handles. ● Disassembly or modification of actuators is forbidden, except the provisions of this manual.
	<ul style="list-style-type: none"> ● Store actuators or valves in clean, dry, corrosion-free environment to keep them rust-free and prevent their malfunction or failure.
	<ul style="list-style-type: none"> ● Carefully handle actuators or valves packed particularly in cardboard cases, since the cases might have become very fragile due to moisture and other causes. ● DO NOT fall down actuators or actuated valves on the ground. It may cause damages to them.

10. Valve and Actuator Opening Positions Set for Shipment

- 10.1 KITZ actuated ball valves are shipped with the balls set fully open.
- 10.2 KITZ actuated butterfly valves are shipped with the disc slightly open, except KITZ 10UB and 16UB butterfly valves shipped with discs fully closed.
- 10.3 All actuators are set for fully closed position for shipment. Refer to Appendix 1 of this manual.

11. Mounting Actuators on Valves

 WARNING		 CAUTION	
	<ul style="list-style-type: none"> ● DO NOT put your hand or tool into the bore of a valve when adjusting opening or closing angle of an actuated valve. Accidental actuation of the valve may injure your hand or tool. 		<ul style="list-style-type: none"> ● Ensure to adjust the opening or closing angle of an actuated valve, before installation on pipes.

11.1 Mounting Type EXH actuators on KITZ ball valves.

11.1.1 General mounting instructions

Follow the procedure given below. Required actuator mounting kits are detailed in Appendix 2 of this manual. The exact dimensions and details of the mounting structure are given in relevant KITZ product assembly drawings.

- ① An actuator must be mounted on a ball valve before installation on pipes. If the valve has already been installed on pipes, dismantle it to mount an actuator.
- ②-(a) If a ball valve is for 2-way flow, it must be fully open before mounting an actuator. Check a double D stem head of a valve to confirm that it is fully open. All actuators have been set for fully open position for shipment. Refer to Appendix 1 of this manual on the opening and closing positions of actuators set for shipment.
- ②-(b) If a ball valve is provided with L-port or T-port for 3-way flow, its flow path must be set for piping to either FORM 1, 2, 3 or 4, depending on the planned service condition of the valve (See Sub-section 11.1.4 and 11.1.6 of this manual). Here, before mounting an actuator, FORM of a valve must be set for the flow path set for an actuator. All actuators are shipped with the circuits temporarily set for fully open position, which means the flow path FORM 1 in case of 3-way ball valves. Refer to Appendix 1 of this manual on the opening and closing positions of actuators set for shipment. Check a groove on a stem head of a valve to confirm that the flow direction is correctly set.
- ③ Remove a snap ring [48] and a stopper [49]. These parts are not needed anymore for an actuated valve.
- ④ Loosen headed gland bolts [36] and remove a gland flange [7A]. These headed gland bolts are not needed anymore for an actuated valve.
- ⑤ Assemble an actuation gland [7B] on top of gland packing.
- ⑥ Thread stud gland bolts [36] into an actuator mounting flange on top of a valve body until one or two threads project from the bottom of the flange.
- ⑦ Assemble an actuator mounting bracket [93] on an actuator mounting flange through stud gland bolt [36] and tighten it with gland nuts [34B].

- ⑧ Assemble a gland flange [7A] over a stem and stud gland bolts [36], and temporarily tighten it with gland nuts [34A].
- ⑨ Insert a stem-shaft connector [92] into a double D stem head.
- ⑩ Alternately and evenly tighten gland nuts [34B] with the torque specified in Table 4.
- ⑪ If a spacer [155] is supplied as a part of the relevant mounting kit, assemble it on top of a bracket [93].
- ⑫ Mount an actuator on top of a bracket [93] so that a terminal box may face to the side of the valve body marked [KITZ]. Fix an actuator securely with spring washers [145] and headed bolts [94]. Check that an actuator and a valve are set for fully opening for 2-way flow, or that their flow paths for 3-way flow are set for the same FORM selected from Sub-section 11.1.4 and 11.1.6 of this manual.
- ⑬ After having correctly mounted an actuator on a valve, make an adjustment of valve opening position, following Section 13 of this manual.

Tightening torques of gland nuts [34A] Table 4

Ball valves			Nominal valve diameter (DN)								
2-way	2-seat	Full bore	10	15/20	25/32	40/50	65/80	100/125	150	200	250
3-way		Reduced bore	—	—	—	50	80/100	125/150	200	—	300
3-way	4-seat	Full bore	—	—	15/20/25	—	40/50	65/80	100	—	—
		Reduced bore	—	—	—	—	—	—	125	—	—
Tightening torque (N-m)			6~8	6~8	9~12	15~18	24~26	41~45	49~53	54~59	79~84

11.1.2 Mounting EXH actuators on KITZ 2-way ball valves

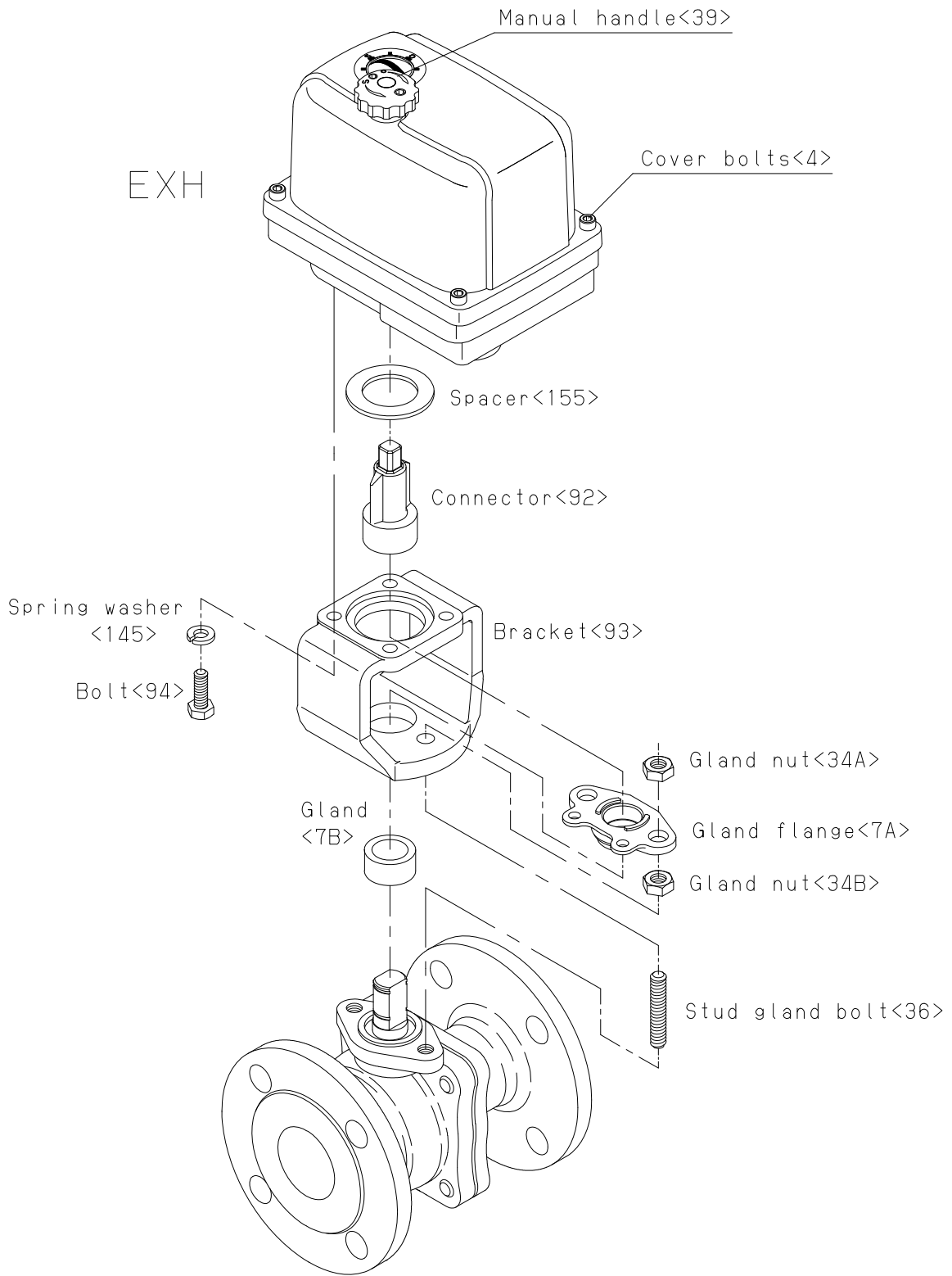


Fig. 18

11.1.3 Mounting EXH actuators on KITZ 3-way 2-seat ball valves

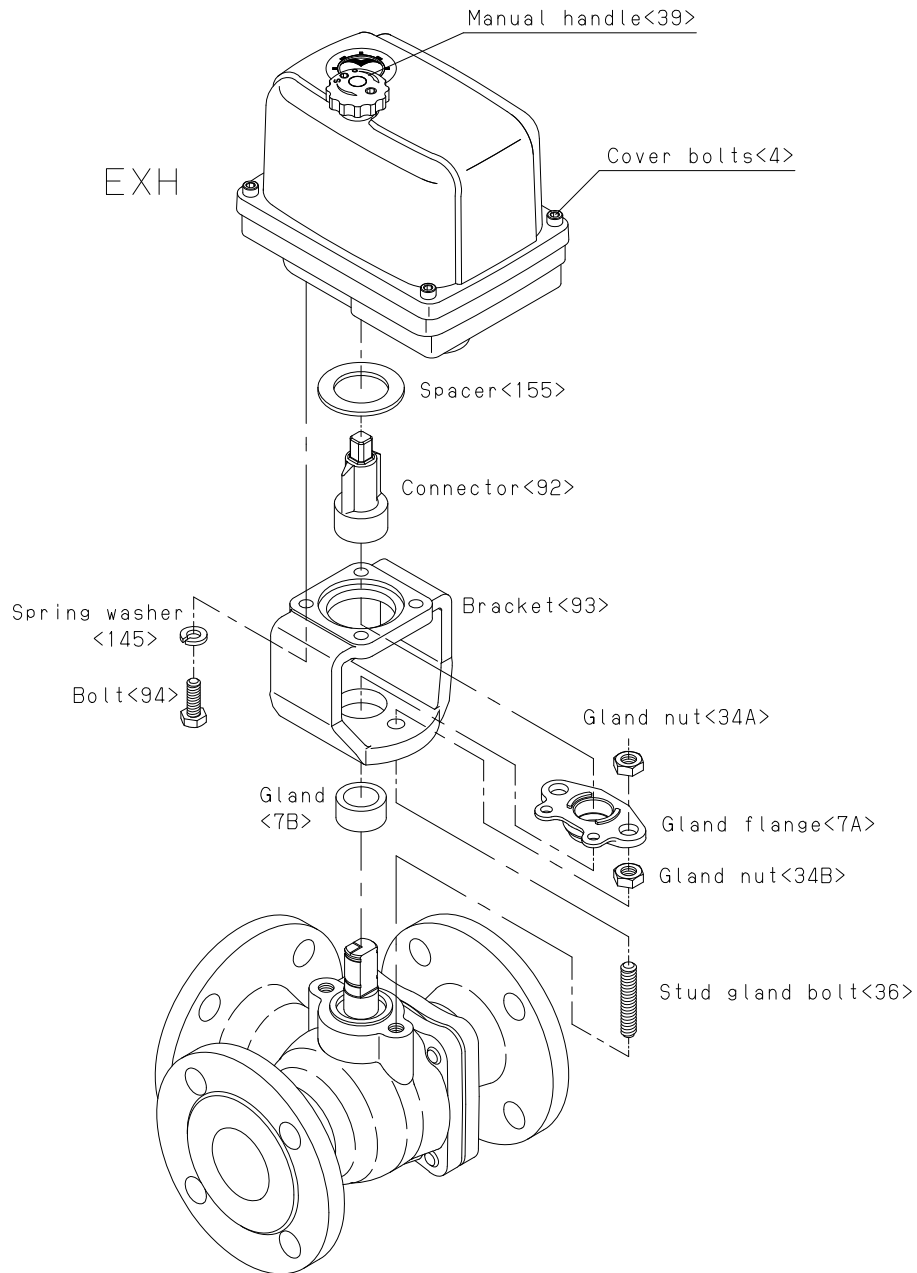
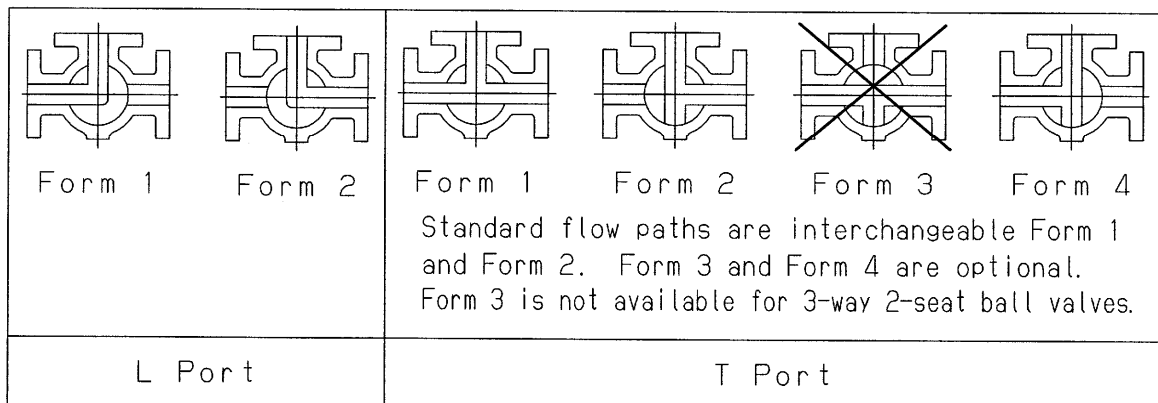


Fig. 19

11.1.4 Setting flow paths for KITZ 3-way 2-seat ball valves



11.1.5 Mounting EXH actuator on KITZ 3-way 4-seat ball valves

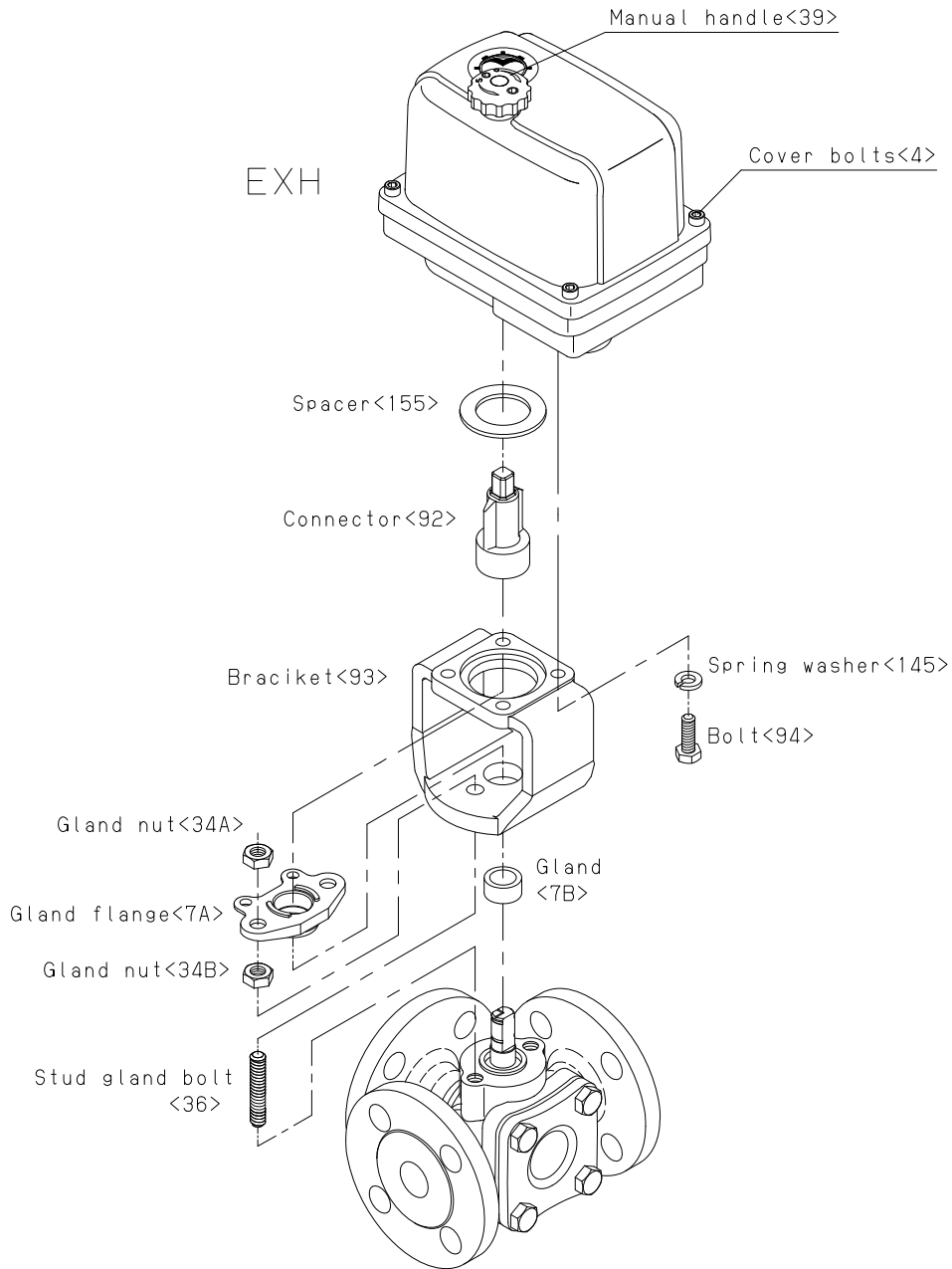
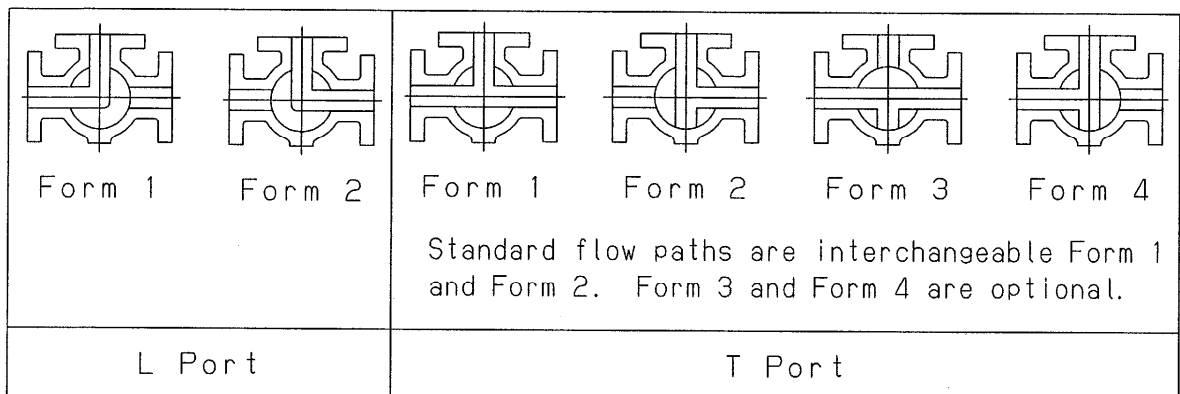


Fig. 20

11.1.6 Setting flow paths for KITZ 3-way 4-seat ball valves



11.2 Mounting Type EXS actuators on KITZ butterfly valves

11.2.1 General mounting instructions

Follow the procedures given below and in each sub-clause of this section. Required actuator mounting kits are detailed in Appendix 3 through 6 of this manual, depending on the type of KITZ butterfly valves you have chosen. The exact dimensions and details of the mounting structure are given in relevant KITZ product assembly drawings.

- ① An actuator must be mounted on a butterfly valve not installed on pipes. If the valve has been installed on pipes, dismantle it before mounting an actuator.
- ② A butterfly valve must be fully closed before mounting an actuator, referring to Fig. 29 and Table 6 provided in Section 13 of this manual. Check that the valve is fully closed by visual inspection of the position of a valve disc.
- ③ Dismantle a manual valve operator such as a gear or a lever from the stem of a valve and prepare an actuator mounting kit specified in either Appendix 3, 4, 5 or 6.

11.2.2 Mounting Type EXS actuators on KITZ 10XJME, 10XJSME, 10DJ, 16DJ, and 20DJ butterfly valves (Fig. 21)

- ① Check that the female connection provided on the bottom of an actuator housing (a gear unit) does fit the stem head of a valve. For some sizes of valves, a connector [92] is required for coupling of a valve stem and an actuator shaft.
- ② For KITZ 10XJME and 10XJSME butterfly valves, mount an actuator on a valve, ensuring that a terminal box faces to the right side of the valve body marked [K]. Wherever needed, a stem-to-shaft connector [92] must be inserted onto the valve stem.
- ③ For KITZ 10DJ, 16DJ, and 20DJ butterfly valves, mount an actuator on a valve, ensuring that a terminal box faces to the same side of the valve body marked [KITZ].
- ④ For KITZ 10XJME (size 40~300A), 10XJSME (size 40~100A), 10DJ, 16DJ, and 20DJ butterfly valves, insert the female connection of an actuator onto a stem head and tighten them on an actuator mounting flange with spring washers [145] and set bolts [99]. Care must be taken so that the female connection and the stem head may be concentrically fixed.
- ⑤ For KITZ 10XJSME (size 125A, 150A, and 200A) butterfly valves, thread set bolts [99A] into an actuator mounting flange, insert the female connection of an actuator onto a stem head and tighten them with spring washers [145B] and hexagon nuts [99B]. Care must be taken so that the female connection and the stem head may be concentrically fixed.
- ⑥ After having correctly mounted an actuator on a valve, make an adjustment of valve opening position, following Section 13 of this manual.

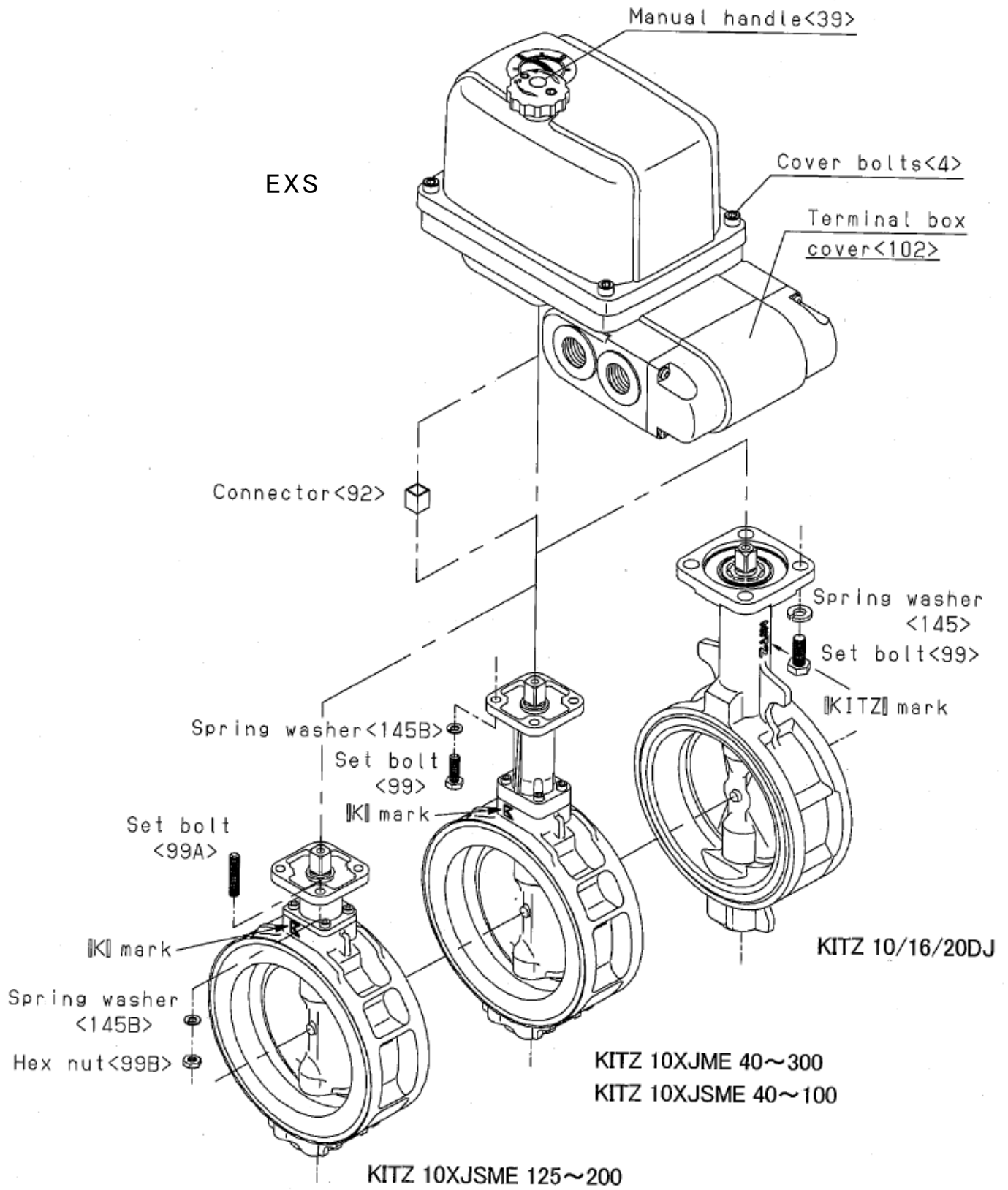
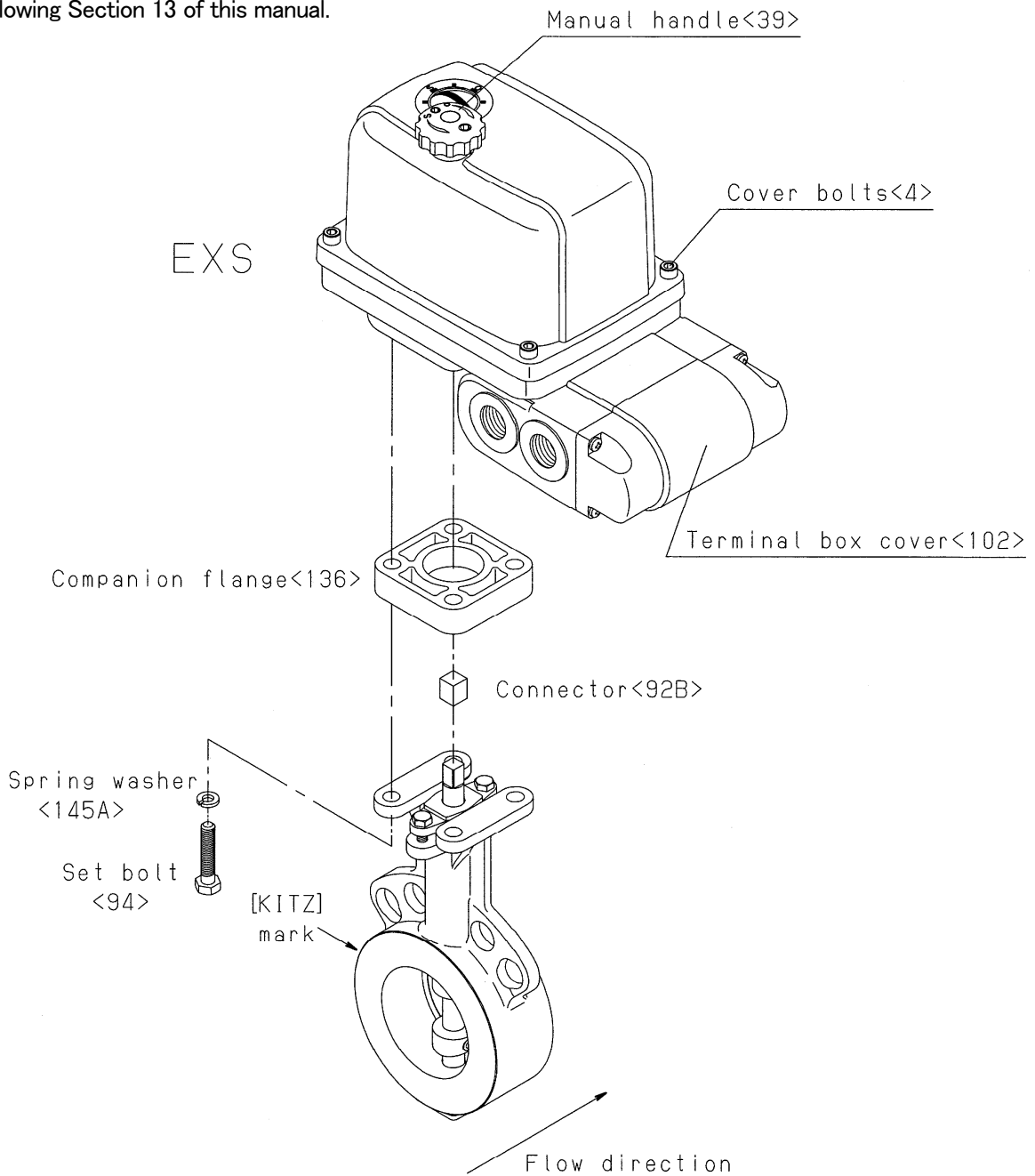


Fig. 21

11.2.3 Mounting Type EXS actuators on Size DN50 and DN65 of KITZ 10UB and 16UB butterfly valves.
(Fig.22)

- ① Check that the female connection provided on the bottom of an actuator housing (a gear unit) does fit the stem head of a valve. A connector [92B] is required for coupling of a valve stem and an actuator shaft.
- ② Inserting a companion flange [136] between an actuator and a valve, mount an actuator on a valve and securely tighten them with spring washers [145B] and set bolts [94], ensuring that a terminal box faces to the opposite side of the valve body marked [KITZ].
- ③ After having correctly mounted an actuator on a valve, make an adjustment of valve opening position, following Section 13 of this manual.



Size DN50/DN65 of KITZ 10UB/16UB
Fig. 22

11.2.4 Mounting Type EXS actuators on Size DN80 to DN200 of KITZ 10UB and 16UB butterfly valves (Fig.23)

- ① Thread hexagon bolts [99A] into an actuator mounting bracket [93] and tighten them with spring washers [145B] and hexagon nuts [99B].
- ② Assemble a stem-to-shaft connector [92A] onto the stem head of a valve. For Size DN125, DN150 and DN200, a key groove is provided on a side of the stem head. Fit a key [60] to the stem head before assembling the connector.
- ③ Put a spacer [155] onto a bracket [93].
- ④ Mount an actuator on the top flange of a bracket, and tighten them with spring washers [145A] and hexagon bolts [94], ensuring that a terminal box faces to the opposite side of the valve body marked [KITZ]. Check again that an actuator and a valve are set for fully closed position.
- ⑤ After having correctly mounted an actuator on a valve, make an adjustment of valve opening position, following Section 13 of this manual.

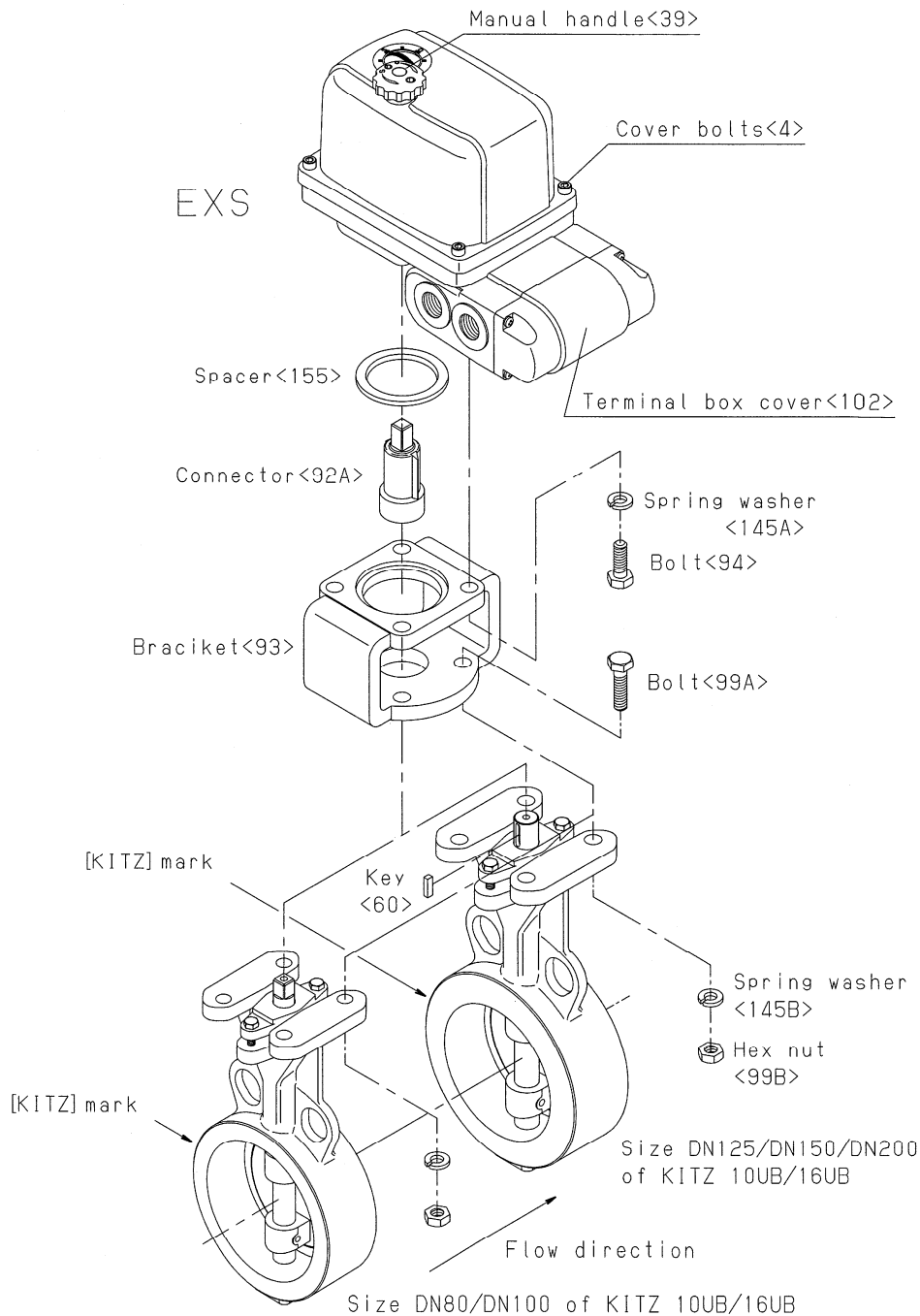


Fig.23



12. Manual Operation




A manual handle is equipped on top of an actuator housing as the standard design. With this provision, actuators can be manually operated for pressure tests of piping systems or when actuators are accidentally de-energized.

Follow the instructions shown below when the actuator is manually operated.

For EXH, operate the actuator manually while confirming the valve opening position by the position indicator.

For EXS, operate the actuator manually until the drive shaft lightly contacts the stopper.

 WARNING	
	<ul style="list-style-type: none"> ● Ensure to switch off an actuator for manual operation. Manual operation of energized actuators may cause injuries to the personnel or damages to the equipment.

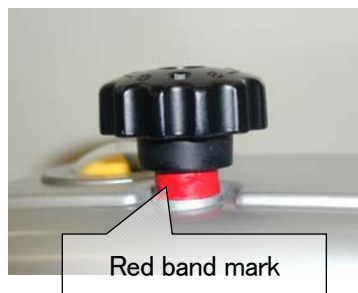
 CAUTION	
	<ul style="list-style-type: none"> ● Built-in stoppers are provided in an actuator. Discontinue manual operation of an actuator at the moment when a manual handle contacts a stopper and you feel rotation of the handle being disturbed. If you still try to continue manual operation, a safety mechanism built-in a handle gets activated for protection of internal parts of an actuator and the handle will rotate idle. Once the safety mechanism has been activated, the handle cannot be used anymore, and must be replaced, according to Section 14 of this manual.
	<ul style="list-style-type: none"> ● Actuators cannot be electrically operated, if they are set to manual operation mode. Restore electric operation mode according to the instructions given below. ● Remove spanners and other tools used for manual operation, before switching on an actuator for electric operation. ● Ensure that a cover is evenly fixed on a housing. Otherwise, operation of an interlocking switch becomes unstable and electric operation of actuators is disturbed.



① This is a manual handle sitting on top of a housing cover during electric operation of an actuator. The handle does not rotate together with an actuator shaft during automatic operation mode.



② Switch off an actuator before manual operation. An interlocking switch is built in an actuator only for the purpose of operational safety, but not for switching on or off an actuator.



③ Pull up a handle, while turning right and left, till a red band mark appears on top of a housing cover.



③ Manual operation of actuators by hand:

Discontinue actuator operation at the moment when a handle contacts a built-in stopper and you feel rotation of the handle being disturbed. If you still try to continue manual operation, a safety mechanism built in the handle gets activated for protection of internal parts of an actuator and the handle will rotate idle. Once the safety mechanism has been activated, the handle cannot be used anymore, and must be replaced according to Section 14 of this manual.

To close a valve, turn a handle clockwise. To open a valve, turn a handle counterclockwise. To fully close or open a valve, a handle must be turned as many times as listed below:

About 50 turns for Type EXH-1

About 50 turns for Type EXH-2 / Type EXS-2

About 45 turns for Type EXH-3 / Type EXS-3

About 76 turns for Type EXH-4 / Type EXS-4

About 76 turns for Type EXH-5 / Type EXS-5

④ MANUAL operation of actuators with a hexagon spanner:

Handles are provided with hexagon holes in the following different sizes for use of hexagon spanners to manually operate actuators:

Type EXH-1 & 2 and Type EXS-2:

4mm for M5 or 5mm for M6

Type EXH-3 , 4 & 5 and Type EXS-3 , 4 & 5 :

5mm for M6 or 6mm for M8



Put a spanner into a hole till it contacts the bottom, and turn it slowly. Discontinue actuator operation at the moment when a handle contacts a built-in stopper and you feel rotation of the handle being disturbed. If you still try to continue manual operation, a safety mechanism built in the handle gets activated for protection of internal parts of an actuator and the handle will rotate idle. Once the safety mechanism has been activated, the handle cannot be used anymore, and must be replaced according to Section 14 of this manual.



⑤ To restore electric operation of an actuator, push a handle down till it clicks and switch on an actuator. Ensure that a cover is evenly fixed to a housing. Otherwise, operation of an interlocking switch becomes unstable and disturbs smooth operation of actuators.

13. Adjusting Valve Opening and Closing Positions

13.1 The standard types of EX Series actuators are provided with two signal limit switches (OLS1 and SLS2) and two position limit switches (OLS and SLS) as shown in Fig.24.

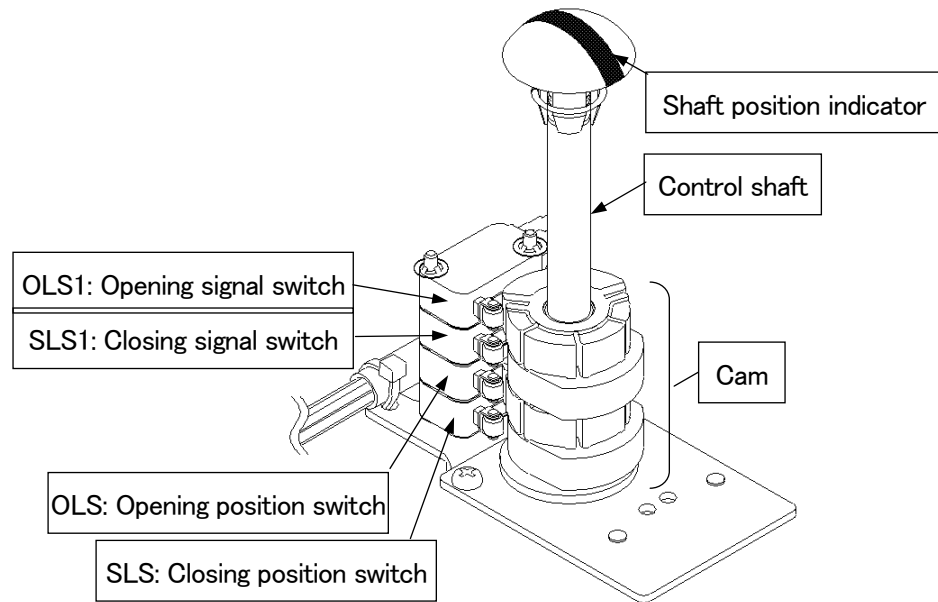


Fig. 24

13.2 Adjust the valve opening positions, according to the instructions given below.

- ① Pull up a handle, while turning right and left, for manual operation mode where a manual gear (hexagonal) and a manual handle shaft (dodecagonal) are securely engaged each other (Fig. 25 and Fig. 26).

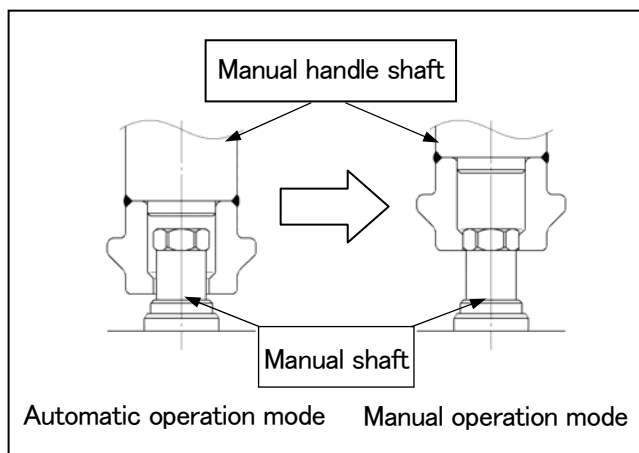


Fig. 25

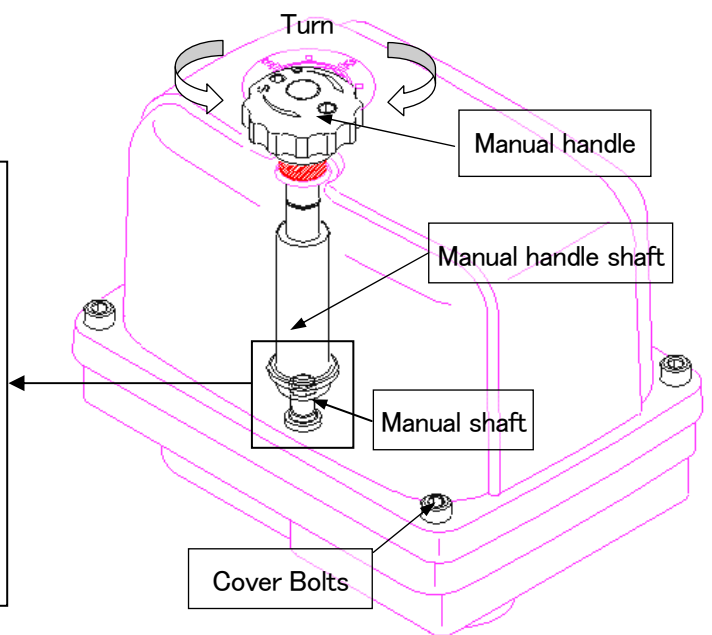


Fig. 26

② -(a) General instructions:

As the first step, manually close a valve so that a ball of a 2-way ball valve or a disc of a butterfly valve may be positioned as shown in Fig.28 or Fig.29 respectively. For 3-way ball valves, however, manually move balls clockwise, viewing from the top. If L-port valves have been set to FORM 1, this will reset the flow path to FORM 2. In the case of T-port valves, this will reset the flow paths from FORM 1 to 2, FORM 2 to 3, FORM 3 to 4 and FORM 4 to 1. What you must do is, therefore, simply to turn 3-way ball valves clockwise manually, viewing from the top, before making adjustment of the closing position.

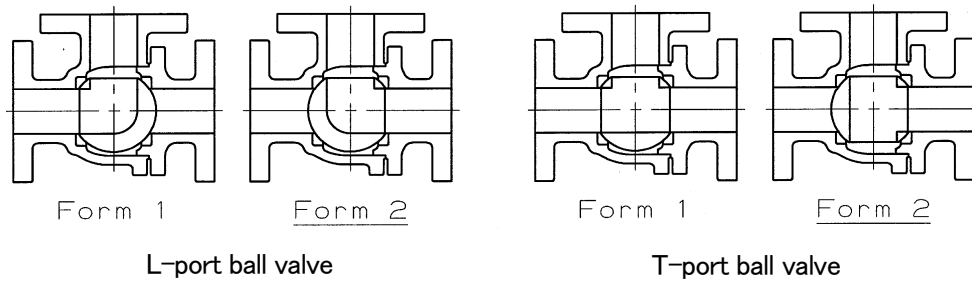


Fig. 27

③ -(b) For closing ball valves:

When close 2-way ball valves, the dimension [l] mm must be manually adjusted to satisfy the length specified in Table 5. This results in setting valves slightly open from the fully closed position. The dimension [l] mm is virtually the width of contact of the ball seat to the ball surface of a fully closed valve. In case of 3-way ball valves, the ball position must be manually adjusted so that the ball bore and the valve bore may become concentric each other. Make this adjustment by observing the valve interior through the right-hand flanged end opening in Fig. 29.

Table 5

Nominal size (DN)		l (mm)
Full bore	Reduced bore	
10·15·20	—	5
25·32·40	50	5.5
50	—	6
65	80	7
80	100	8
100	125	10
125·150	150·200	13
200	250	21
250	300	27

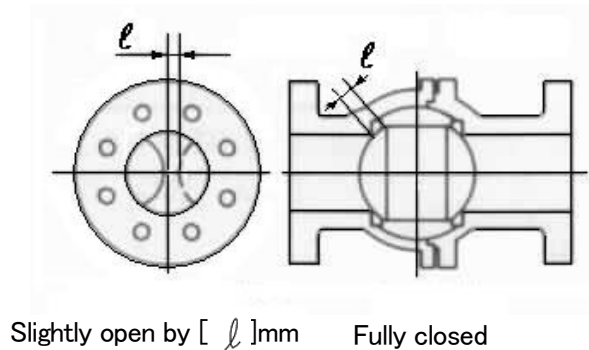


Fig. 28

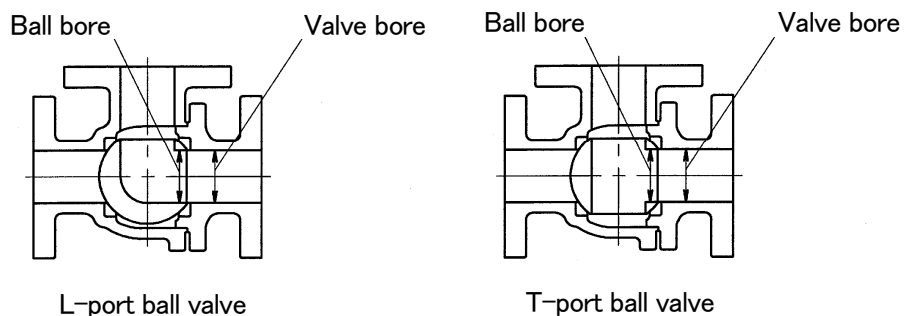


Fig. 29

②-(c) Closing butterfly valves:

For KITZ XJ Series and DJ Series butterfly valves, manually adjust the disc position so that the dimension [A less B] in Fig. 30 satisfies the requirement specified in Table 6. In case of KITZ UB Series butterfly valves, manually adjust the disc position so that the dimension [A less B] in Fig.30 satisfies the requirement specified in Table 7, paying an attention so that the disc may not contact a stopper provided in the valve body.

Table 6 XJ/DJ

Nominal size (DN)	A less B [mm]		
	10XJ	10DJ	16/20DJ
40	2~3	—	
50	2~3	2~3	
65	2~3	3~4	
80	4~6	3~4	
100	9~11	4~5	
125	11~13	4~5	
150	12~14	5~6	
200	12~14	5~7	
250	20~22	18~20	※
300	24~26	18~20	※

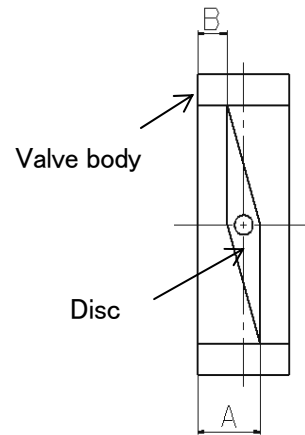


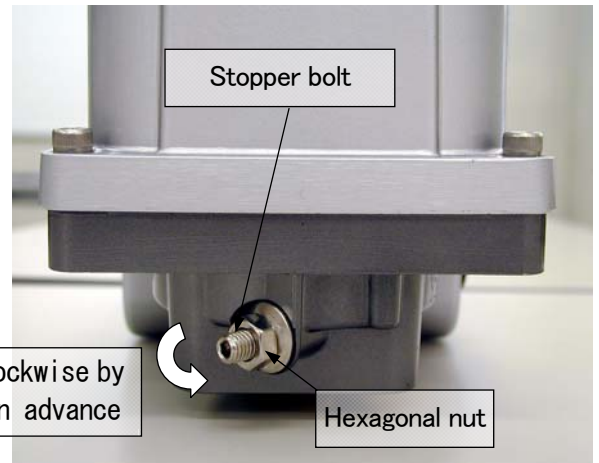
Fig. 30

※ Contact KITZ Corporation for information on Size DN250 and DN300.

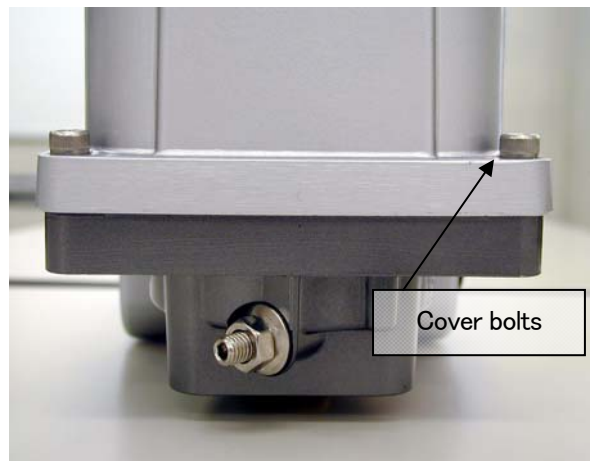
Table 7 10/16UB

Nominal size (DN)	A less B
All sizes	0

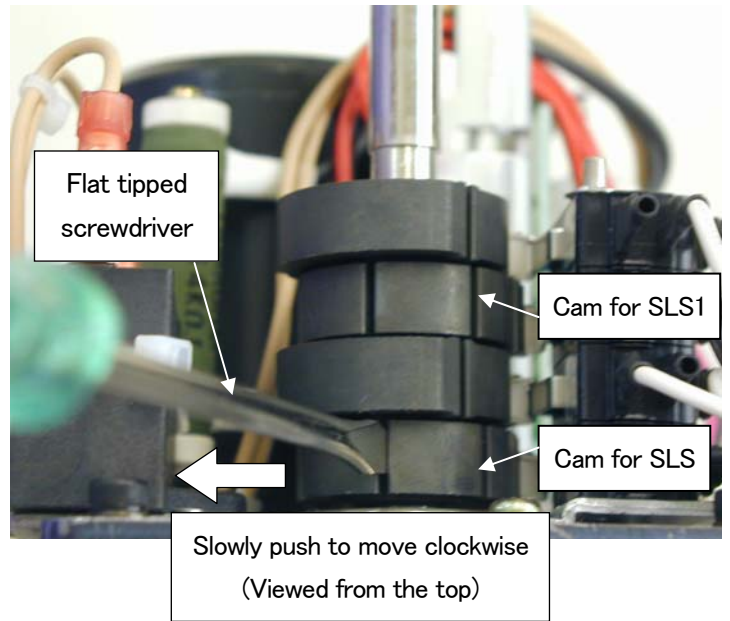
③ For Type EXS actuators, loosen a stopper bolt used for adjustment of closing position counterclockwise by 2 turns in advance, before manually closing.



④ Loosen cover bolts to remove a housing cover. Cover bolts are fall-off proof.



- ⑤ Adjust the positions of SLS and SLS1 limit switches. Securely insert a 0.7mm to 0.8mm flat tipped screwdriver into a slit of a limit switch cam and slowly push it to move clockwise for adjustment. As shown in Fig.30, this makes the cam rotate also clockwise (viewed from the top), contact a limit switch and stop. DO NOT turn it reversely, as it may loosen a control shaft of an actuator.



Note: Check that a valve is fully closed, adjust SLS position and finally adjust SLS1 so that SLS1 may make a closing signal just before SLS being switched on.

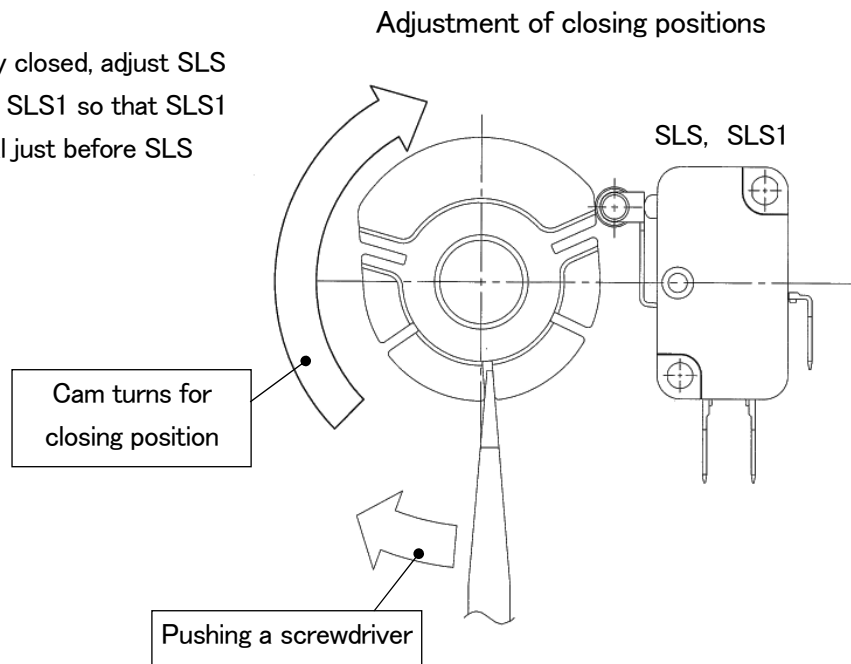







Fig. 31

 CAUTION	
	<ul style="list-style-type: none"> ● Ensure to insert a screwdriver securely into the slit of a cam and push it slowly to move clockwise. Unsecured insertion of a screwdriver into the slit or too quick turn of a screwdriver may damage the screwdriver and limit switch cams. ● Ensure to turn cams only clockwise, being viewed from the top of an actuator. Counterclockwise turn loosens control shaft of an actuator and results in stopping actuator drive at an incorrect position.

⑥ For Type EXS actuators, turn a closing stopper bolt thoroughly until it dose not turn anymore. Then loosen it by a half or a full reverse turn, and tighten it with a locking nut. Recommended tightening torques are 7 to 9N.m for M8 nut used for Type EXS-2 and EXS-3, 14 to 16N.m for M10 nut used for Type EXS-4, and 57 to 71N.m for M16 nut used for Type EXH-5 and EXS-5.

 CAUTION	
	<ul style="list-style-type: none"> ● Take care that an adjustable closing stopper bolt may not contact SLS before it gets activated. Driving an actuator while the closing stopper bolt remains in contact with the closing position limit switch may damage a reduction gear mechanism. ● Tightening the locking nut too much may damage rubber gaskets of seal washers. DO NOT apply tightening torques higher than those specified in ⑥ of this sub-section.
	<ul style="list-style-type: none"> ● For KITZ butterfly valves except UB Series, the design provision causes a valve to finish closing operation just before a shaft position indicator points the fully closed position.

⑦ For adjustment of the opening position, first of all, get a manual handle shaft engaged with a manual gear, while pushing down a handle (Fig.32), assemble a housing cover with a gear unit temporarily with cover bolts.

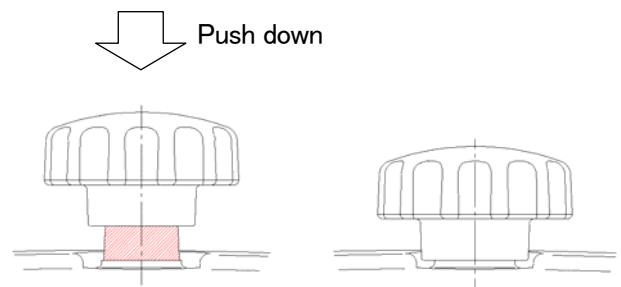
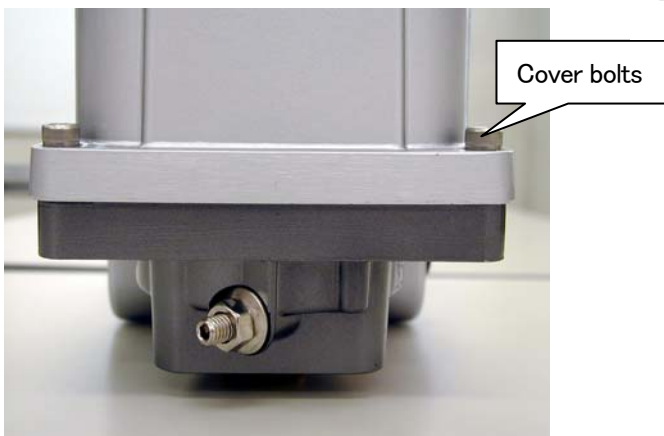


Fig. 32



- ⑧ Manually set a valve to the fully opened position, according to the procedures given in ③ , ④ and ⑤ of Section 12 of this manual. Adjust the fully opened position of ball valves to set a ball bore and a valve bore concentrically, referring to Fig.33 for 2-way ball valves or Fig. 34 for 3-way ball valves. In the case of Fig. 33, visually check the valve interior through the left-hand flanged end opening.

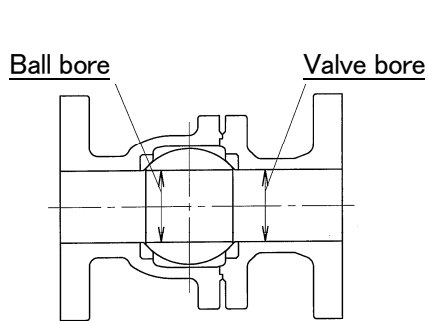


Fig. 33

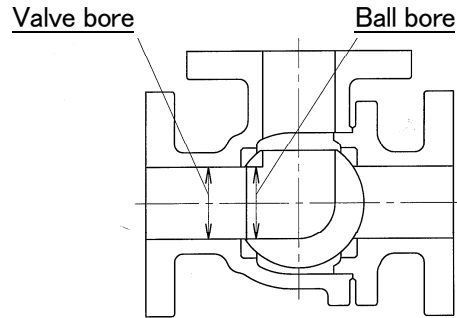


Fig. 34

The fully opened position of butterfly valves must be adjusted to set the disc and flow path parallel as shown in Fig.35.

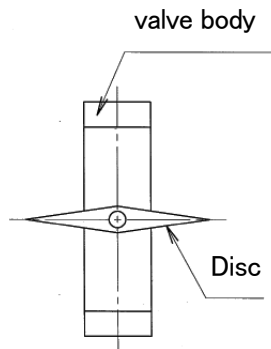
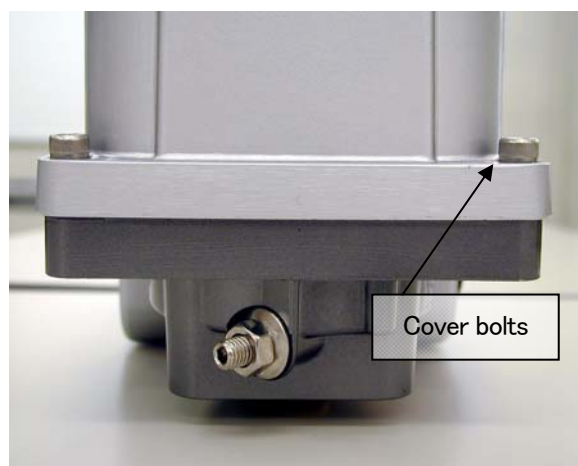


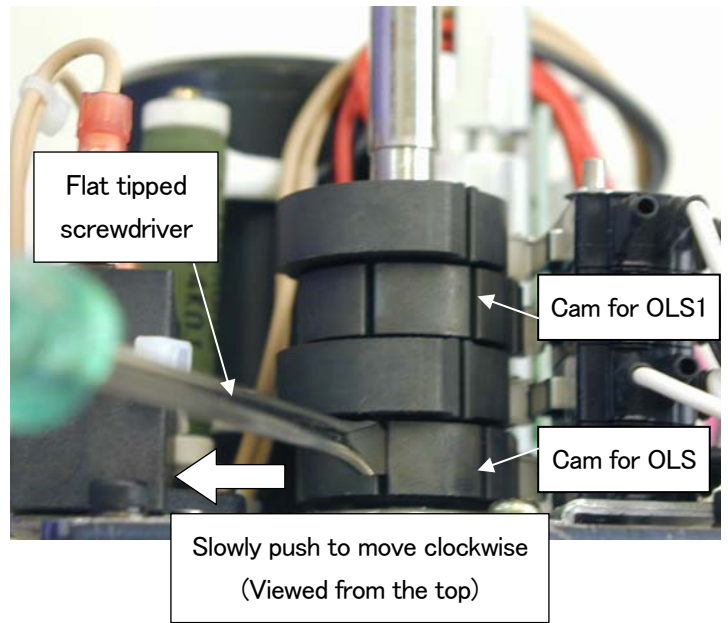
Fig. 35

- ⑨ Loosen cover bolts and remove a housing cover.



- ⑩ Adjust the positions of OLS and OLS1 limit switches. Securely insert a 0.7mm to 0.8mm flat tipped screwdriver into a slit of a limit switch cam and slowly push it to move clockwise for adjustment. As shown in Fig.36, this makes the cam rotate counterclockwise (viewed from the top), contact a limit switch and stop. DO NOT turn it reversely, as it may loosen a control shaft of an actuator.

Note: Check that a valve is fully opened, adjust OLS position and finally adjust OLS1 so that OLS1 may make an opening signal just before OLS being switched on.



Adjustment of opening positions

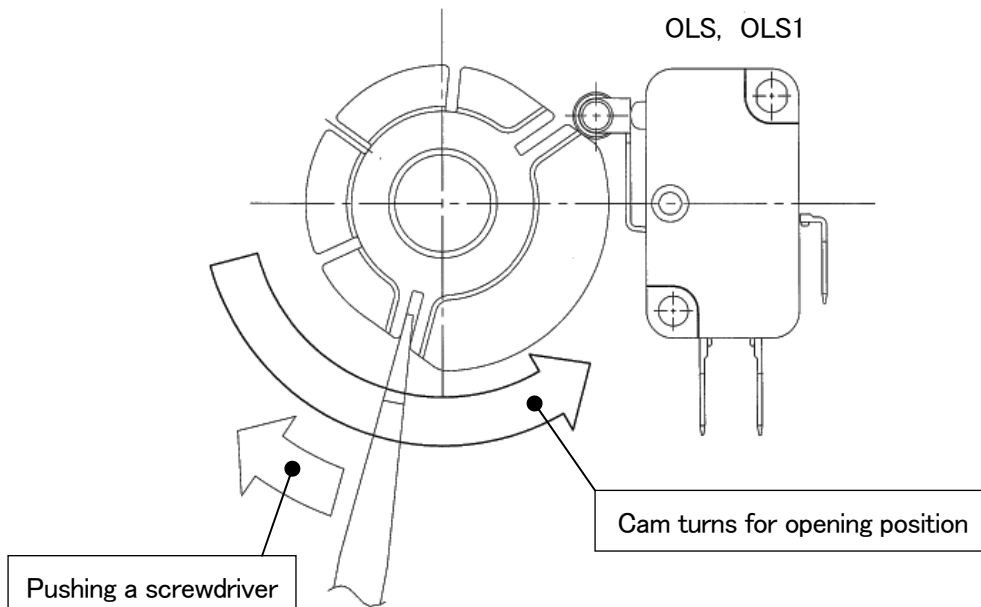


Fig. 36

- ⑪ Adjust a shaft position indicator so that its indication matches that of a cover position indicator (Fig.37 and Fig.38), using a guide mark provided in a control shaft to ease coupling with a shaft position indicator (Fig.39).

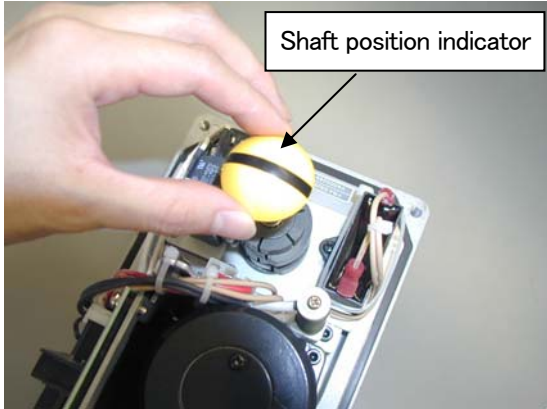


Fig. 37

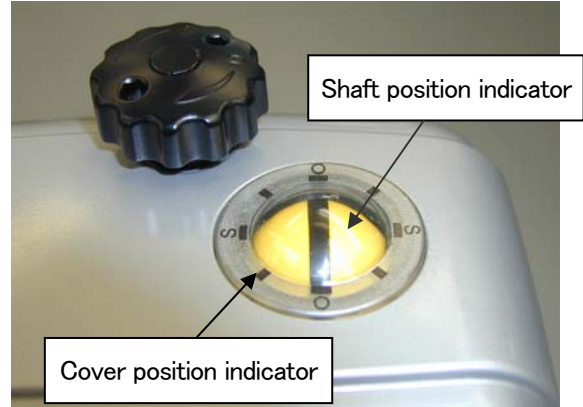


Fig. 38

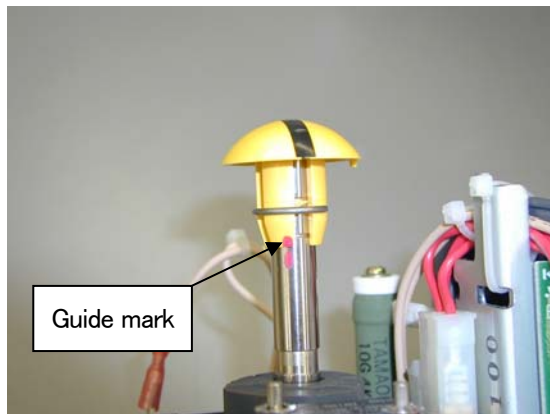


Fig. 39

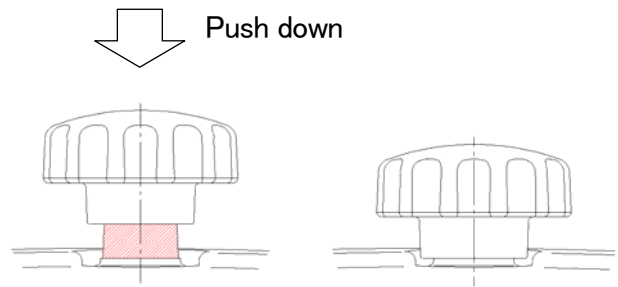
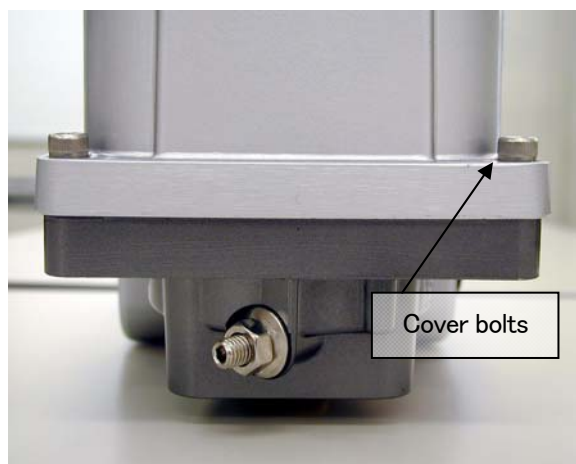


Fig. 40

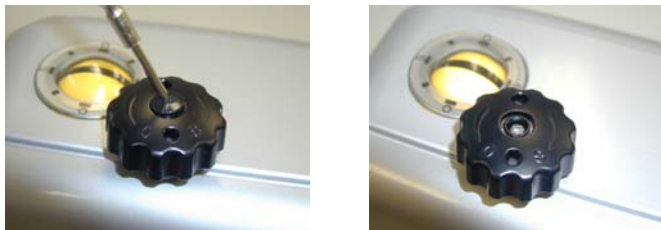
- ⑫ Assemble a housing cover on a gear unit, ensuring that a manual operation shaft and a manual gear are fully engaged while pushing down a handle (Fig. 39), and securely tighten it with cover bolts. The recommended tightening torque is 4.7 to 6.0 N·m.



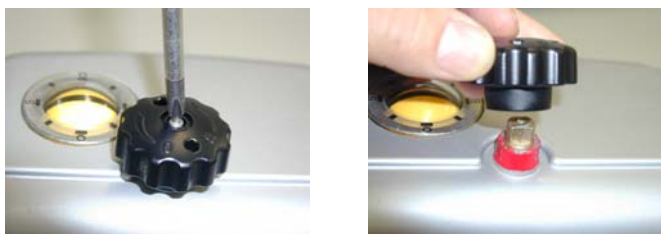
⚠ CAUTION	
!	<ul style="list-style-type: none"> ● If a housing cover is assembled with a gear unit while a handle kept pulled up, engagement of a manual operation shaft and a manual gear may not be checked, and moreover manual operation mechanism may be damaged. Ensure to push down a handle, check the proper engagement of a manual operation shaft and a manual gear and then tighten cover bolts. ● Tighten cover bolts evenly with the equal torque. Uneven bolt tightening may cause intrusion of water into the actuator interior and result in short circuit or rusting corrosion. Also it may make activation of interlocking switches unstable, and electric operation of actuators may fail.

14. Replacing Manual Handles

- ① Break the cap of a manual handle with a sharply edged tool and disclose the head of an inside pan headed set screw (M3 x8).



- ② Unthread the screw and a spring washer, and remove the handle.



- ③ Assemble a new manual handle which is provided with 4 convexes in a cross. Fix 2 wider convexes onto a manual operation shaft.



- ④ Tighten a handle and handle operation shaft with a set screw with the recommended torque of 0.8N-m, and fit a new cap on the handle.



15. Electric wiring

15.1 Prepare necessary tools and parts such as:

- ① A Phillips (cross headed) screwdriver (for wiring on terminal bases and assembly of a terminal box cover)
- ② A hexagon spanner, M6 with 5mm shorter diameter (for assembly of a housing cover)
- ③ Electric cables of 0.75mm² cross-section
- ④ Crimping terminals (such as round terminals of 1.25mm² nominal cross-section and 3mm stud)
- ⑤ Other wiring tools

15.2 General wiring instructions:

- ① Ensure to make correct wiring, according to a wiring diagram shown in an identification plate attached to the side of an actuator housing.
- ② Use a cable tie cable system or a conduit system for a cable conduit port. Seal the system securely so that water may not intrude through wire covers or conduit threads.
- ③ Housing covers and terminal box covers are sealed with gaskets. Care must be taken to keep them clean, and not to cause scratches on them. Refer to Sub-section 13-2-① and 13-2-③ for removal of a housing cover.

15.3 Wiring instructions on Type EXH actuators:

Remove a housing cover, pull cables through a cable conduit port and fix them securely on a built-in terminal base. Refer to Sub-section 13-2-① and 13-2-③ on removal of a housing cover. On re-assembly of the cover on the gear unit, ensure to tighten it evenly. An unevenly fixed housing cover may make activation of an interlocking switch unstable, and electric operation of an actuator may fail.

15.4 Wiring instructions on Type EXS actuators:

Remove a terminal box cover, pull cables through a cable conduit port and fix them securely on a built-in terminal base. If removal of a terminal box cover is found difficult, loosen cover locking bolts (which are fall-proof), insert the tip of a flat headed screwdriver into a groove provided on a cover, and move it right and left. Care, however, must be taken then so that the tip of a screwdriver may not be pushed through the groove too strongly, as it may scratch the sealed contact faces of a terminal box and a cover.

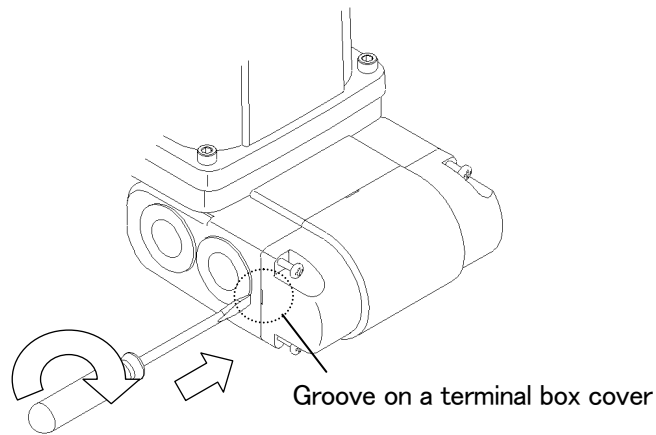





Fig. 41

 CAUTION	
	<ul style="list-style-type: none"> ● The rubber gasket for sealing may come off when the terminal box cover is removed. In this case, reinstall the gasket securely in the groove on the terminal box cover before attaching the terminal box cover. Improper installation of the gasket or installation without the gasket may result in a significant reduction in the sealing performance and a breakdown of the internal terminal base or electric leakage. ● Evenly tighten the bolts on the terminal box cover. Uneven tightening may cause the intrusion of water into the actuator resulting in a breakdown or electric leakage.
	<ul style="list-style-type: none"> ● DO NOT use any materials that contain silicone (electric cables, filling materials, adhesives, etc.) when performing wiring work. It may cause a contact failure due to the generation of siloxane gas.



16. Trial Operation

- 16.1 Check that the power supply voltage is correct and electric wiring has been correctly done.
- 16.2 Manually set a valve to an intermediate position prior to electric operation.
- 16.3 Switch on an actuator for opening or closing operation, and check if a valve begins to be driven to the preset position.
- 16.4 Check that, when an actuator is switched on for opening operation, a valve stops its travel at the fully opened position with an output opening signal, and vice versa.
- 16.5 If an actuator must be locked at the fully opened or closed position, immediately switch off the power supply, and repeat the procedures required for adjustment of valve opening angle, according to the provisions of Section 13 of this manual.

17. Maintenance and Inspection

The following checks and inspections must be carried out during operation of actuators to maintain safe and trouble-free operation of the equipment and facilities. To prevent accidental mishaps, frequent checks and inspections are recommended, depending on field service conditions and significance level of actuated valves,

- ◇ Operating conditions of valves and actuators in general
- ◇ Leakage of line fluid through valve stem areas
- ◇ Generation of unusual noises from valves and actuators during operation
- ◇ Vibration of valves and actuators during operation
- ◇ Loosened bolts and nuts
- ◇ Measurement of insulation resistance of cable conduits of actuators
- ◇ Conditions of cover position indicators

 CAUTION	
	<ul style="list-style-type: none"> ● Foreign materials got stuck to valve seats may result in generation of unusual noise. Ensure to remove such materials immediately. Otherwise this will damage valve seats to cause fluid leakage, or disturb valve operation. ● Unusual vibrations of valves and actuators may also cause failure or malfunction of actuated valves. Support the piping firmly to protect such vibrations. ● DC power source type actuators adopt a brush motor. If they are not used for a prolonged period, insulating coating will be deposited between the brush and the commutator, which may cause actuators to fail to start up at worst. Make sure to conduct an operation check when reactivating actuators after a long period of storage. Regularly, at least more than once a month, conduct an operation check after resuming the operation.

18. Trouble Shooting

Detected troubles	Conditions to check	Items to inspect	Prescription
No actuator operation	Actuator are switched on?	Power switch	Switch on actuators
		Fuse	Check voltage, actuator wiring and control circuits
	Correct power source voltage?	Power source voltage	Apply the correct voltage Ask thorough inspection in case of excessive voltage applied
	Manual handles firmly pushed in?	Manual handles	Push down a handle to hide the red guide mark
	Wiring is correct?	Wiring to actuators	Correct wiring
	Cables are connected?	Insulation resistance	No immediate solution in case of insulation failure ※
	Too high valve operating torque?	Pressure, temperature, kind of fluid or stuck foreign materials	Rectify service conditions Eliminate causes for higher torques
	Cams are adjusted correctly?	Switched operational positions and valve operation range	Adjust cams correctly
	Too high operation frequency?	Operational frequency	Reduce the time duty factor to 30% maximum
	Internal insulation is effective?	Insulation resistance	Retighten set bolts for housing covers and terminal box covers No immediate solution in case of insulation failure ※
Cover bolts are tightened evenly?	Cover bolts	Retighten cover bolts evenly	
Motor brush life (DC type)	Motor (Need to be replaced)	Operate with appropriate voltage and operational frequency.	
Unusual actuator operation	Connection not in parallel?	Control circuits	Rectify parallel operation
	Too quick change of operation?	Control circuits	Wait for one second or longer before re-starting operation
	Too high valve operating torque?	Pressure, temperature, kind of fluid or stuck foreign materials	Rectify service conditions Eliminate causes for higher torques
Circuit breaker activated	Wiring is correct?	Wiring to actuators	Correct wiring
	Cables are connected?	Insulation resistance	No immediate solution in case of insulation failure ※
	No water intrusion?	Insulation resistance	Retighten set bolts for housing covers and terminal box covers
			Check conditions of gaskets No immediate solution in case of insulation failure ※
	Valve is fully open?	Limit switch operation condition	Readjust limit switches
Out of alignment of opening indicator		Adjust marking positions	
Stem and connector condition		Replace them if deformed.	
Actuators overheated	Correct power source voltage?	Power source voltage	Apply the correct voltage Ask thorough inspection in case of excessive voltage applied
	Too high operation frequency?	Operational frequency	Reduce the time duty factor to 30% maximum
	Too high fluid temperature?	Pressure, temperature, kind of fluid or stuck foreign materials	Rectify service conditions Eliminate causes for higher torques
	Too high or low ambient temperature?	Ambient temperature	Correct service temperatures
	Duplicated power supply for opening/closing?	Wiring conditions and control circuits	Check no duplicated power supply for opening/closing at an intermediate position for possible rectification
Abnormal noise	There is a possibility that inner parts have been worn away. Contact the distributor or contact a nearby KITZ service office.		

※Note. Due to a potential risk of short circuits, contact to KITZ Corporation or its distributors is recommended for technical solutions wherever possible, or for replacement of actuators.

19. Notes to users

- 19.1 This manual covers the normal use of KITZ EX Series electric valve actuators as a general guide to users, but does not necessarily cover all possible conditions or situations that may be caused to users while they use the product. If technical assistance beyond the scope of this manual is required, users are recommended to contact KITZ Corporation or the distributors in their locations.
- 19.2 Drawings, tables, photographs and illustrations of the product in this manual provide users with only the basic information. Ask KITZ Corporation or the distributors for detailed assembly drawings of the products, if needed.
- 19.3 Numerical limits and procedures of operation, maintenance and inspection provided in this manual are specified in consideration of safe trouble-free operation of the product. It is forbidden to use the product in any condition that may exceed such numerical limits or conflict with such procedures.

20. Product Warranty

Failed or damaged products shall be repaired or replaced at no cost to users, if the failure or damage occurred within 12 months after pilot operation, but not exceeding 18 months after shipment from KITZ factories, and the following conditions are satisfied:

- (1) The product has been correctly handled, stored, installed, operated and maintained according to this manual within the scope of design specifications and service conditions of the product.
- (2) Failure or damage of the product has not been caused as a result of the user's incorrect operation or lack of care.
- (3) The product has not been damaged due to an act of God or a natural disaster.
- (4) The product has not been modified by any party other than KITZ Corporation or its authorized modification shops.
- (5) The product function and performance has not been deteriorated by aging.

21. Emergency Call for Technical Assistance

Should users need to contact KITZ Corporation, its distributors or its authorized service shops on technical problems of the products, they are recommended to inform the following:

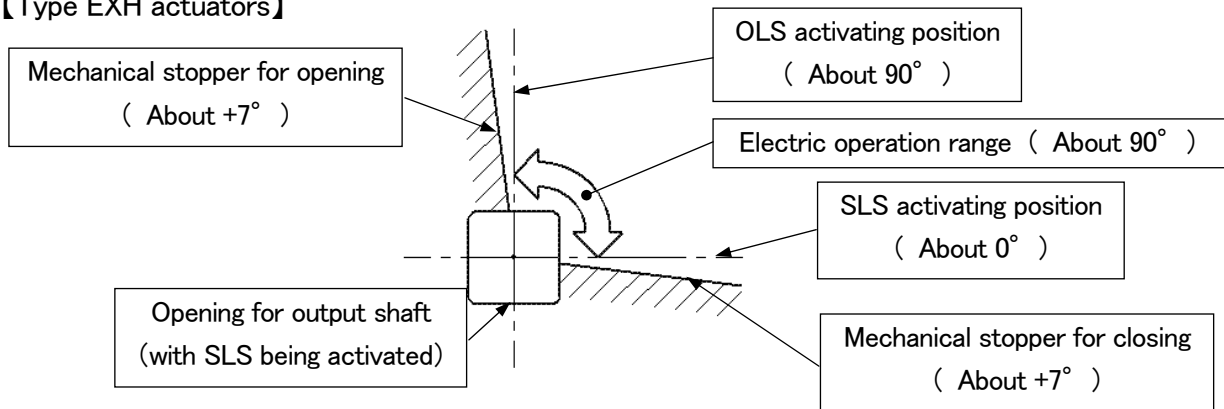
- ◆ KITZ product code and size
- ◆ In-site service conditions such as the kind and conditions of the fluid, the line pressure range and cycles, and the line temperature range and cycles
- ◆ Frequency of operation and any other functional conditions
- ◆ Environmental conditions for piping installation
- ◆ Source of supply
- ◆ Arrival date of shipment and date of pilot operation

Appendix 1.

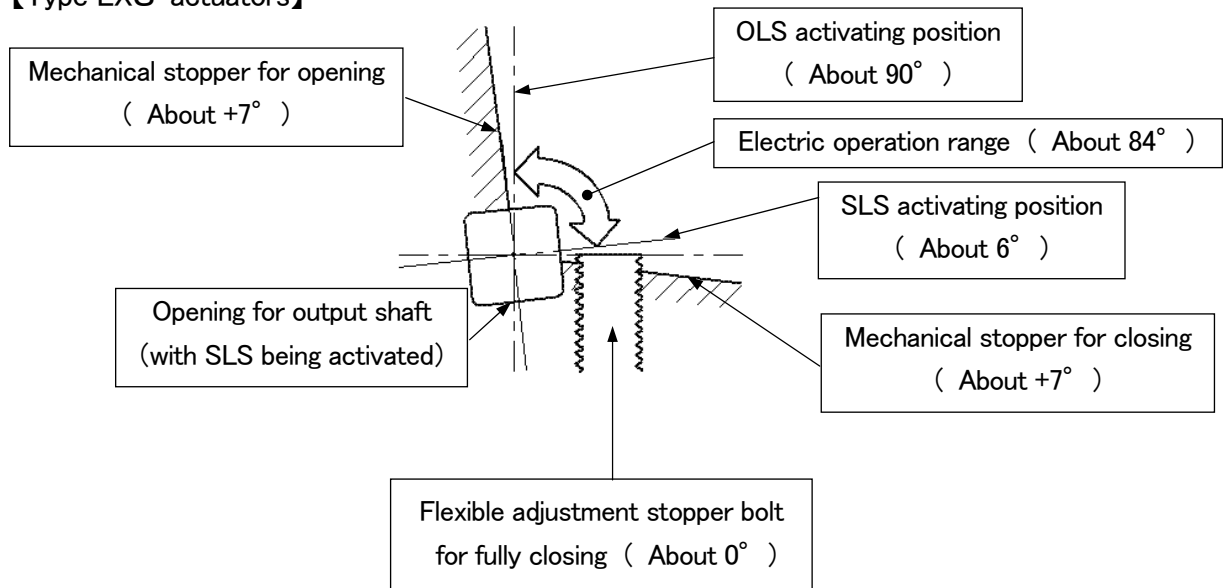
Actuator Opening and Closing Positions Set for Shipment

Operating positions of KITZ EX Series electric valve actuators are set as shown in the following illustrations (being viewed from the top of an actuator), when they are shipped without valves. All actuators are set for fully closed position for shipment.

【Type EXH actuators】



【Type EXS actuators】



Fully opening or closing of valves are activated with OLS or SLS position limit switches respectively. At the moment limit switches are turned off, an electric circuit to the motor is broken and actuators stop operation. OLS 1 or SLS 1 signal limit switches are adjusted to get activated just before OLS or SLS position limit switches turned on.

Appendix 2. Actuator Mounting Kits for KITZ Ball Valves

Actuators: KITZ Type EXH electric actuators/KITZ F Series pneumatic actuators

Ball valves: JIS Class 10K/20K and ASME Class 150/300 KITZ steel and iron ball valves

< Product code numbers >

Actuator type / size and valve size in DN	KITZ valve product code	Nominal pressure			Kit product name / code	Mounting kit														Connector for Type FAS Product code		
		10K Cl.150 Cl.300	10K 20K Cl.150 Cl.300	10K		Parts and components																
		UT(M) UTB(M) FCT FCTB STBF SCTB UTB2L FCTB2L FCTB2T	UTR(M) FCTR SCTR UTR2L UTR2T FCTR2L FCTR2T	UTB4TA(M) UTR4TA(M)		Connector for Double-D stem head <92> (SCS13A) Product code	Bracket <93> (FCD450-10) Product code	Actuation gland <7B> (SUS304) Product code	BN kit product name / code	BN kit								Spacer <155> Product code	Product code			
										BN kit Parts and components												
										Hexagon bolt + Spring washer for actuators <94> x4 (SUS304)		Threaded bolts and nuts for glands <36><34A><34B> x2 (ASTM B8,8)		Heavy hexagon set bolt for valves <99> x1 (SUS304)		Hexagon bolt for valves <99> x1 (SUS304)						x1 (SS400)
Size	Product code	Size	Product code	Size	Product code	Size	Product code	※2)	※3)	for												
FA(S)-1 EXH-1	---	10 ※1)	---	---	TBSET 10 08B6-A010-30	EX100-1 10 4242-0708-70	B-0,1 10 4311-2402-20	B-10UTB10 3832-1208-60	2.4TSET 10 5805-0606-60	M6 × 16	72A0-6016-60	M6 × 35	7010-6035-71	---	---	---	---	---	---	---		
	---	15 20	---	---	TBSET 15 08B6-A010-40	EX100-1 15,20 4242-0823-70	B-0,1 15,20 4311-2403-20	B-10UTB20 3832-1404-60	2.4TSET 15 5805-0607-60	↓	↓	M6 × 40	7010-6040-71	---	---	---	---	---	---	---		
	---	25 32	---	15	TBSET 25 08B6-A010-60	EX100-1 25 4242-1030-70	B-0,1 25,32 4311-3009-20	B-10UTB25 3832-1702-60	2.4TSET 25 5805-0803-60	↓	↓	M8 × 50	7010-8050-71	---	---	---	---	---	---	---		
	FA(S)-2 EXH-2	---	15 20	---	---	TBSET(1U) 15 08B6-A020-40	EX100-2 15,20 4242-0824-70	EX-2 15,20 4311-2411-20	B-10UTB20 3832-1404-60	TBSET(1U) 15 5805-0613-60	M8 × 20	72A0-8020-60	M6 × 40	7010-6040-71	---	---	---	---	---	---	---	
		FAS-3	25 32	---	15,20,25	TBSET(1U) 25 08B6-A020-60	EX100-2 25,32 4242-1031-70	EX-2 25,32 4311-3021-20	B-10UTB25 3832-1702-60	TBSET(1U) 25 5805-0811-60	↓	↓	M8 × 50	7010-8050-71	---	---	---	---	---	□13*□11 AB84-4402-G0	FAS-3	
	FA(S)-3	---	40 50	50 65	---	TBSET40 08B6-A010-80	EX100-2 40,50 4242-1449-70	B-2 50 4311-3304-20	EK100-10UTB50 3832-2302-60	2.4TSET 50 5805-1004-60	↓	↓	M10 × 60	7011-0060-71	---	---	---	---	---	D-3 40,50 4341-3501-40	---	
		---	40 50	50 65	---	TBSETFA40 08B6-A030-80	FA3 40,50 4242-1455-70	↓	↓	↓	↓	↓	↓	↓	---	---	---	---	---	↓	---	
	FA(S)-4 EXH-3	---	65 80	80 100	40 50	TBSET65 08B6-A011-00	EX100-3 65,80 4242-1756-70	B-3 80 4311-4111-20	EK100-10UTB80 3832-2902-60	2.4TSET 80 5805-1208-60	↓	↓	M12 × 70	7011-2070-71	M12 × 30	7111-2D01-60	---	---	---	D-4 4341-5501-40	---	
		---	100	125	65	TBSET100 08B6-A011-20	EX100-3 100 4242-2359-70	B-3 100 4311-5112-20	EK100-10UTB100 3832-3702-60	2.4TSET 100 5805-1611-60	↓	↓	M16 × 85	7011-6085-71	M16 × 35	7111-6D02-60	---	---	---	↓	---	
	FA(S)-5 FA(S)-6	---	65 80	100	40 50	TBSET(1U)65 08B6-A021-00	EX100-4 65,80 4242-1757-70	B-4 65,80 4311-4132-20	EK100-10UTB80 3832-2902-60	2.4TSET(1U) 80 5805-1209-60	M12 × 30	72A1-2030-60	M12 × 70	7011-2070-71	M12 × 30	7111-2D01-60	---	---	---	55 × 85 × 5.5 4341-5505-40	---	
		---	100	125	65	TBSET(1U)100 08B6-A021-20	EX100-4 100,125 4242-2360-70	B-4 125 4311-5113-20	EK100-10UTB100 3832-3702-60	2.4TSET(1U) 100 5805-1615-60	↓	↓	M16 × 85	7011-6085-71	M16 × 35	7111-6D02-60	---	---	---	↓	---	
	EXH-4	---	125	150	80	TBSET125 08B6-A011-30	↓	↓	↓	2.4TSET 125 5805-1612-60	↓	↓	↓	↓	↓	↓	M16 × 35	7111-6035-60	↓	---	---	
---		150	200	100,125	TBSET150 08B6-A011-40	EX100-4 150 4242-2736-70	B-4 150 4311-5905-M0	EK100-10UTB150 3832-4302-60	2.4TSET 150 5805-1613-60	↓	↓	M16 × 95	7011-6095-71	↓	↓	↓	↓	↓	↓	---	---	
FA(S)-6 EXH-4	---	200	---	150	TBSET200 08B6-A011-50	EX100-4 200 4242-2737-70	EX-4 200 4311-6731-20	EK100-10UTB200 3832-5201-60	TBSET(1U) 200 5805-1629-60	↓	↓	↓	↓	M16 × 40	7111-6D03-60	M16 × 40	7111-6040-60	↓	---	---		

※1) Only for DN10 of KITZ 10UT and 10FCT

※2) Zinc plated Ep-Fe/Zn 5/CM 2 (MFZn II -C)

※3) Connectors for Type FAS are not included in mounting kits.

[Note. JIS material designations are given in parentheses, except ASTM B8.]

Appendix 3. Actuator Mounting Kits for KITZ 10XJSME Butterfly Valves

Actuators: KITZ Type EXS electric actuators/KITZ F Series pneumatic actuators

< Product code numbers >

KITZ valve product code	Actuator type / size	Valve size in DN	Kit product name / code	Mounting kit															Size	Q' ty	Product code AB84-	
				BN kit product name / code	BN kit												Connector <92> (SUS304)					
					Parts and components									Size	Q' ty	Product code						
					Hexagon stop bolts <94> (SUS304)			Hexagon bolt + Spring washer <94><145B> (SUS304)			Spring washers <145B> (SUS304)						Hexagon nuts <95> (SUS304)					
Size	Q' ty	Product code 7740-	Size	Q' ty	Product code	Nominal size	Q' ty	Product code 8120-	Nominal size	Q' ty	Product code 7410-											
10XJSME	FA(S)-1	40,50※	F05SET 50 08B6-A040-90	F05-XJDJ 5805-0612-30	---	---	---	M6*16	4	72A0-0616-60	---	---	---	---	---	---	---	---				
	FA(S)-2	40,50,65※	F05SET 65 08B6-A041-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□11*□9	1	4301-G0			
	EXS-2	80,100※	F05SET 100 08B6-A041-20	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---			
	FA(S)-3	40,50,65※	80,100※	F05SET(1U) 65 08B6-A051-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□13*□9	1	4401-G0		
				F05SET(1U) 80 08B6-A051-10	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□13*□11	1	4402-G0		
		125,150	F07XJSSET 125 08B6-A121-30	F07-XJS 5805-0809-30	M8*35	4	8035-60	---	---	---	8	4	8200-60	8	4	8000-60	---	---	---			
	FA(S)-4	80,100※	125,150	F05XJSET(1U) 100 08B6-A071-20	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-0618-60	---	---	---	---	---	---	□17*□11	1	4501-G0		
				F07XJSSET 150 08B6-A121-40	F07-XJS 5805-0809-30	M8*35	4	8035-60	---	---	---	8	4	8200-60	8	4	8000-60	□17*□13	1	4502-G0		
		200	F07XJSSET 200 08B6-A121-50	↓	↓	↓	↓	---	---	---	↓	↓	↓	↓	↓	↓	↓	□17*□15.5	1	4503-G0		
	FA(S)-5	125,150	200	F07XJSSET(1U) 150 08B6-A131-40	↓	↓	↓	↓	---	---	---	↓	↓	↓	↓	↓	↓	↓	↓	□27*□13	1	4601-G0
				F07XJSSET(1U) 200 08B6-A131-50	↓	↓	↓	↓	---	---	---	↓	↓	↓	↓	↓	↓	↓	↓	↓	□27*□15.5	1
		250	F10XJSET 250 08B6-A091-60	F10-XJ 5805-1013-30	---	---	---	M10*30	4	72A1-0030-60	---	---	---	---	---	---	---	□27*□24	1	4603-G0		
	FA(S)-6	150	200	F07XJSSET(1U) 150 08B6-A131-40	F07-XJS 5805-0809-30	M8*35	4	8035-60	---	---	---	8	4	8200-60	8	4	8000-60	□27*□13	1	4601-G0		
				F07XJSSET(1U) 200 08B6-A131-50	↓	↓	↓	↓	---	---	---	↓	↓	↓	↓	↓	↓	↓	↓	↓	□27*□15.5	1
		EXS-4	250	F10XJSSET 250 08B6-A091-60	F10-XJ 5805-1013-30	---	---	---	M10*30	4	72A1-0030-60	---	---	---	---	---	---	□27*□24	1	4603-G0		
				300	↓	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	↓	↓	↓	

※ Set parts of size from 40A to 100A is butterfly valve that is concluded with actuator by 4 bolts.

When butterfly valve is concluded with actuator by 2 bolts, inquire separately due to be different from set parts.

[Note. JIS material designations are given in parentheses, except ASTM B8.]

Appendix 4. Actuator Mounting Kits for KITZ 10XJME Butterfly Valves

Actuators: KITZ Type EXS electric actuators/KITZ F Series pneumatic actuators

< Product code numbers >

KITZ valve product code	Actuator type / size	Valve size in DN	Kit product name / code	Mounting kit														Long neck supporter kits for KITZ XJ Series ※1)				
				BN kit											Connector <92> (SUS304)							
				BN kit product name / code	Parts and components						Size	Q' ty	Product code AB84-	supporter kits for KITZ XJ Series (SUS304) x 2	Hexagon bolt + spring washer (SUS304) For actuators x 4							
					Hexagon stop bolts <94> (SUS304)			Hexagon bolt + Spring washer <94><145B> (SUS304)								Spring washer <145B> (SUS304)			Hexagon nuts <95> (SUS304)			
Size	Q' ty	Product code 7740-	Size	Q' ty	Product code	Size	Q' ty	Product code 8120-	Size	Q' ty	Product code 7410-	Size	Q' ty	Product code								
10XJME	FA(S)-1	40,50	F05SET 50 08B6-A040-90	F05-XJDJ 5805-0612-30	---	---	---	M6*16	4	72A0-6016-60	---	---	---	---	---	---	---	---	---	---	---	---
	FA(S)-2	40,50,65	F05SET 65 08B6-A041-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□11*□9	1	4301-G0	---	---	
	EXS-2	80,100	F05SET 100 08B6-A041-20	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---	---	---
	FA(S)-3	40,50,65	F05SET(1U) 65 08B6-A051-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□13*□9	1	4401-G0	---	---	
		80,100	F05SET(1U) 80 08B6-A051-10	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□13*□11	1	4402-G0	---	---	
		125,150	F07SET 125 08B6-A061-30	F07-XJDJ 5805-0810-30	---	---	---	M8*20	4	72A0-8020-60	---	---	---	---	---	---	---	---	---	---	---	---
	FA(S)-4	80,100	F05XJSET(1U) 100 08B6-A071-20	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-6018-60	---	---	---	---	---	---	□17*□11	1	4501-G0	※2) 5834-0603-50	M10*20 72A1-0020-60	
		125,150	F07SET 150 08B6-A061-40	F07-XJDJ 5805-0810-30	---	---	---	M8*20	4	72A0-8020-60	---	---	---	---	---	---	□17*□13	1	4502-G0	---	---	
		200	F07SET 200 08B6A061-50	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□17*□15.5	1	4503-G0	---	---	
	FA(S)-5	125,150	F07SET(1U) 150 08B6-A081-40	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□27*□13	1	4601-G0	---	---	
		200	F07SET(1U) 200 08B6-A081-50	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□27*□15.5	1	4602-G0	---	---	
		250	F10XJSET 250 08B6-A091-60	F10-XJ 5805-1013-30	---	---	---	M10*30	4	72A1-0030-60	---	---	---	---	---	---	□27*□24	1	4603-G0	---	---	
	FA(S)-6	150	F07SET(1U) 150 08B6-A081-40	F07-XJDJ 5805-0810-30	---	---	---	M8*20	4	72A0-8020-60	---	---	---	---	---	---	□27*□13	1	4601-G0	---	---	
		200	F07SET(1U) 200 08B6-A081-50	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□27*□15.5	1	4602-G0	5834-0803-50	M12*25 72A1-2025-60	
		250	F10XJSET 250 08B6-A091-60	F10-XJ 5805-1013-30	---	---	---	M10*30	4	72A1-0030-60	---	---	---	---	---	---	□27*□24	1	4603-G0	---	---	
		300	↓	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	↓	↓	↓	---	---	

※1) Long neck supporter kits are not included in mounting kits. Actuated XJ Series requiring long neck supporters are: FAS-4+10XJME80, FAS-4+10XJME100, FAS-6+10XJME200, EXS100/200+10XJME80, EXS-100/200-3+10XJME100

※2) Use 5834-0604-50 as the product code of long neck supporter for XJME DN80.

[Note. JIS material designations are given in parentheses, except ASTM B8.]

Appendix 5. Actuator Mounting Kits for KITZ 10DJ/16DJ Butterfly Valves

Actuators: KITZ Type EXS electric actuators/KITZ F Series pneumatic actuators

< Product code numbers >

KITZ valve product code	Actuator type / size	Valve size in DN	Kit product name / code	Mounting kit														Connector <92> (SUS304)		
				BN kit																
				BN kit product name / code	Parts and components												Size	Q' ty	Product code AB84-	
					Hexagon stop bolts <94> (SUS304)			Hexagon bolt + Spring washer <94><145B> (SUS304)			Spring washer <145B> (SUS304)			Hexagon nuts <95> (SUS304)						
Size	Q' ty	Product code 7740-	Size	Q' ty	Product code	Size	Q' ty	Product code 8120-	Size	Q' ty	Product code 7410-									
10/16DJ	FA(S)-1	40,50,65	F05DJSET 50 08B6-A340-90	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-6018-60	---	---	---	---	---	---	---	---	---	
	FA(S)-2	40,50,65	F05DJSET 65 08B6-A341-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□11*□9	1	4301-G0	
	EXS-2	80,100	F07SET 100 08B6-A061-20	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	---	---	---
	FA(S)-3	40,50,65	F05DJSET(1U) 65 08B6-A351-10	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-6018-60	---	---	---	---	---	---	---	□13*□9	1	4401-G0
		80,100	F07SET(1U) 80 08B6-A081-10	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	□13*□11	1	4402-G0
		125,150	F07DJSET 125 08B6-A361-30	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---
	FA(S)-4	80,100	F07SET(1U) 100 08B6-A081-20	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	□17*□11	1	4501-G0
		125,150	F07DJSET 150 08B6-A361-40	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	□17*□13	1	4502-G0
		200	F10SET 200 08B6-A191-50	F10-DJ 5805-1014-30	---	---	---	M10*25	4	72A1-0025-60	---	---	---	---	---	---	---	□17*□15.5	1	4503-G0
	FA(S)-5	125,150	F07DJSET(1U) 150 08B6-A371-40	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	□27*□13	1	4601-G0
		200	F10SET(1U) 200 08B6-A141-50	F10-DJ 5805-1014-30	---	---	---	M10*25	4	72A1-0025-60	---	---	---	---	---	---	---	□27*□15.5	1	4602-G0
		250	F12DJSET 250 08B6-A201-60	F12-DJ 5805-1216-30	---	---	---	M12*40	4	72A1-2040-60	---	---	---	---	---	---	---	□27*□24	1	4603-G0
	FA(S)-6	150	F07DJSET(1U) 150 08B6-A371-40	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	□27*□13	1	4601-G0
		200	F10SET(1U) 200 08B6-A141-50	F10-DJ 5805-1014-30	---	---	---	M10*25	4	72A1-0025-60	---	---	---	---	---	---	---	□27*□15.5	1	4602-G0
		250 300 ※3	F12DJSET 250 08B6-A201-60	F12-DJ 5805-1216-30	---	---	---	M12*40	4	72A1-2040-60	---	---	---	---	---	---	---	□27*□24	1	4603-G0
300		F12DJSET(N) 300 08B6-A201-71	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---	
(PH)□□DJ 150DJ 200DJ 250DJ	FA(S)-5,6 EXS-4	250	F10XJSET 250 08B6-A091-60	F10-XJ 5805-1013-30	---	---	---	M10*30	4	72A1-0030-60	---	---	---	---	---	---	□27*□24	1	4603-G0	
		300	F10DJSET 300 08B6-A151-70	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---

※3) Molded seat only. (nonstandard)

[Note. JIS material designations are given in parentheses, except ASTM B8.]

Appendix 6. Actuator Mounting Kits for KITZ 20DJ Butterfly Valves

Actuators: KITZ Type EXS electric actuators/KITZ F Series pneumatic actuators

<Product code numbers >

KITZ valve product code	Actuator type / size	Valve size in DN	Kit product name / code	Mounting kit															Connector <92> (SUS304)	Size	Q' ty	Product code AB84-
				BN kit product name / code	BN kit																	
					Parts and components																	
					Hexagon stop bolts <94> (SUS304)			Hexagon bolt + Spring washer <94><145B> (SUS304)			Spring washer <145B> (SUS304)			Hexagon nuts <95> (SUS304)								
Size	Q' ty	Product code 7740-	Size	Q' ty	Product code	Size	Q' ty	Product code 8120-	Size	Q' ty	Product code 7410-											
20DJ	FA-1	50	F05DJSET 50 08B6-A340-90	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-6018-60	---	---	---	---	---	---	---	---	---			
	FA(S)-2	50,65	F05DJSET 65 08B6-A341-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□11*□9	1	4301-G0			
	EXS-2	80,100	F07SET 100 08B6-A061-20	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	---	---	---		
	FAS-3	65	F05DJSET(1U) 65 08B6-A351-00	F05-DJ 5805-0616-30	---	---	---	M6*18	4	72A0-6018-60	---	---	---	---	---	---	---	□13*□9	1	4401-G0		
		80	F07SET(1U) 80 08B6-A081-10	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	□13*□11	1	4402-G0		
	FA-314	125	F07SET 125 08B6-A361-30	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---		
	FA(S)-4	100	F07SET(1U) 100 08B6-A081-20	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	□17*□11	1	4501-G0		
		125,150	F0714DJSET 150 08B6-A381-40	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	□17*□14	1	4403-G0		
	EXS-3	200	F1017SET 200 08B6-A411-50	F10-DJ 5805-1014-30	---	---	---	M10*25	4	72A1-0025-60	---	---	---	---	---	---	---	---	---	---		
		FA(S)-5	125,150	F0714DJSET(1U) 150 08B6-A401-40	F07-DJ 5805-0819-30	---	---	---	M8*22	4	72A0-8022-60	---	---	---	---	---	---	---	□27*□14	1	4605-G0	
	200		F1017SET(1U) 200 08B6-A391-50	F10-DJ 5805-1014-30	---	---	---	M10*25	4	72A1-0025-60	---	---	---	---	---	---	---	□27*□17	1	4604-G0		
	FA(S)-6	200	↓	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	□27*□17	1	4604-G0		
		EXS-4	250	F12DJSET 250 08B6-A201-60	F12-DJ 5805-1216-30	---	---	---	M12*40	4	72A1-2040-60	---	---	---	---	---	---	□27*□24	1	4603-G0		
			300	F12DJSET(N) 300 08B6-A201-71	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	---	---	---	---	

※) 3 Setting type seat structure is used for size 300A. (nonstandard)

Appendix 7. Actuator Mounting Kits for KITZ 10UB/16UB Butterfly Valves

Actuators: KITZ Type EXS electric actuators/KITZ F Series pneumatic actuators

< Product code numbers >

KITZ valve product code	Actuator type / size	Valve size in DN	Kit product name / code	Mounting kit																		
				BN kit product name / code	BN kit												Connector <92> (SCS13A+ SUS304) ※4		Coupling flange (SCS13A) Q' ty 1 Product code	Bracket (FCD450-10) Q' ty 1 Product code	Spacer (SS400) Q' ty 4 Product code	
					Parts and components												Q' ty 1					
					Hexagon bolt <94> (SUS304)			Hexagon bolt + Spring washer <94><145B> (SUS304)			Spring washer <145B> (SUS304)			Hexagon nuts <95> (SUS304)			Q' ty 1					
Size	Q' ty	Product code 7111-	Size	Q' ty	Product code	Nominal size	Q' ty	Product code 8121-	Size	Q' ty	Product code 7411-	Size	Product code									
10UB	FA-2 EXS-2	50,65	UBSET 65 08B6-A161-00	F,EX-UB 50,65 5805-0812-30	---	---	---	M8*40	4	72A0-8040-60	---	---	---	---	---	---	□11*□9	AB84-4301-G0	F,EX-UB 50,65 4321-3510-70	---	---	
	FA(S)-3	50,65	FUBSET 65 08B6-A181-00	↓	---	---	---	↓	↓	↓	---	---	---	---	---	---	□13*□9	AB84-4401-G0	↓	---	---	
		80	FUBSET 80 08B6-A181-10	F-UB 80 5805-0813-30	M10*40	4	0040-60	M8*25	4	72A0-8025-60	10	4	0200-60	M10	4	0000-60	FA-UB80	4243-1230-70	---	PDC92(B-2) 4311-3601-20	D-3 4341-3501-40	
	FA-4 EXS-3	65	UBSET(1U) 65 08B6-A171-00	F,EX-UB 50,65 5805-0812-30	---	---	---	M8*40	4	72A0-8040-60	---	---	---	---	---	---	---	□17*□9	4243-0922-70	F,EX-UB 50,65 4321-3510-70	---	---
		80,100	UBSET 100 08B6-A161-20	F,EX-UB 80,100 5805-1015-30	M10*40	4	0040-60	M10*30	4	72A1-0030-60	10	4	0200-60	M10	4	0000-60	EX-3 UB80,100	4243-1228-70	---	PDC92(B-3) 4311-4001-20	D-4 4341-5501-40	
		125	UBSET 125 08B6-A161-30	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	EX-3 UB125	4244-2013-70	---	↓	↓	
	FA(S)-5	80,100	FUBSET 100 08B6-A181-20	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	FA-UB100	4243-1231-70	---	PDC92(B-4) 4311-5807-20	FA-6,EX-4 4341-5505-40	
		125,150	UBSET 150 08B6-A161-40	F,EX-UB 125,150 5805-1213-30	↓	↓	↓	M12*30	4	72A1-2030-60	↓	↓	↓	↓	↓	↓	EX-4 UB125,150	4244-2014-70	---	↓	↓	
		200	UBSET 200 08B6-A161-50	F,EX-UB 200 5805-1214-30	M12*45	4	2045-60	M12*35	4	72A1-2035-60	12	4	2200-60	M12	4	2000-60	EX-4 UB200	4244-2704-70	---	PDC120(B-4) 4311-4501-20	↓	
	FA-6	125,150	UBSET 150 08B6-A161-40	F,EX-UB 125,150 5805-1213-30	M10*40	4	0040-60	M12*30	4	72A1-2030-60	10	4	0200-60	M10	4	0000-60	EX-4 UB125,150	4244-2014-70	---	PDC92(B-4) 4311-5807-20	↓	
	EXS-4	200	UBSET 200 08B6-A161-50	F,EX-UB 200 5805-1214-30	M12*45	4	2045-60	M12*35	4	72A1-2035-60	12	4	2200-60	M12	4	2000-60	EX-4 UB200	4244-2704-70	---	PDC120(B-4) 4311-4501-20	↓	

※4) SUS304 for □11*□9, □13*□9, □17*□9.

[Note. JIS material designations are given in parentheses, except ASTM B8.]