

3610-Series Angular Travel Electronic Actuator

Operating Instruction Manual

KOSO CONTROL INSTRUMENT (ANSHAN) CO., LTD.

KOSO

Forward

This operating instruction manual is the guiding information for 3610-series electronic actuator, which can't be used in other types of machine.

Users who first use KOSO Full-electronic actuator must read this operating instruction manual carefully and for those who have used the actuator, the manual is also helpful to re-understand the knowledge and experience. Please read the manual carefully and apply it in the practice after full understanding.

It is suggested that the operating instruction manual be handed over to the operator and maintenance personnel after the equipment begins to function normally, who will conduct the operation and production according to the requirement of the instruction manual.

The operating instruction manual is mainly composed of the following contents: technical parameters, operating principle, acceptance, transport and storage, installation, functioning preparation and functioning, daily inspection and regular inspection, method for identification of malfunction and abnormality and measures. The company will continuously study and improve the design of electronic actuator. The contents of the operating instruction manual may be different from the details of products bought by users. For any doubt of the products bought or the contents of the operating instruction manual, please contact the company.

Functions and characteristics of 3610-series angular travel electronic actuator:

- ★The actuator has its servo functions with no demand for externally connected servo amplifier.
- ★Control modules of key parts adopt advanced mixed integrated circuit and be cast and solidified with resin with dampproof, shockproof ability and high reliability after aging treatment.
- ★Regulate zero point, travel and sensitivity with potentiometer, which is simple and feasible.
- ★Select any normal and reverse action with function switches and select three states of off signal (automatic locking, full open, full close).
- ★Actuating unit self-locked after power is off.
- ★Protection functions of 3610 series electronic actuator:
 - ①Overload protection unit: Type A and B of 3610 series actuator are optional and Type C and D are necessary. When the motor current is too great for valve locked or overload, the overload protection unit will act and shut off the motor power for



protection role. After the malfunction is removed, the actuator will operate normally again.

- ②Temperature protection: Temperature protection switch is installed in the motor. When the temperature in the motor exceeds the allowable temperature, the switch will act and automatically shut off the winding power so as to protect the motor from being burnt out.
- ③Moment switch protection: According to user's requirement, moment switch can be installed in the angular travel actuator, whose function is to apply a rated moment on the sealing face of valve after it is closed and at the same time to avoid the motor being stalled.

Safety Notes

For the safe acceptance, transport and storage, installation, functioning preparation and functioning, maintenance of the electric actuator, correct use and regular maintenance is necessary. Please read carefully the safety notes in the operating instruction manual and operate, use or work after full understanding.

The operating method and safety notes in the operating instruction manual are only limited to 3610-series actuator. If the methods of use or operation not mentioned in the operating instruction manual are adopted, user should be responsible for the safety.

There are safety-related “notes” which must be followed in the operating instruction manual. Words such as “Warning, Note” are marked in the article, under which there is explanation of the note.

Warning

Follow the notes, or severe accident which will result in personal casualty may occur.

Note

Follow the notes, or severe accident that the actuator is damaged or fails may occur.

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1. Technical Parameters

1.1 Meaning of product model

361	R	S	A	—	05	※	U	T	S	J
				Angular travel with base crank (optional)						
				Sign of space heater (optional)						
				Sign of angular travel moment switch (optional)						
				Overload protection unit (Type A and B optional, Type C and D necessary)						
				Optional sign						
				Denote output moment, see table (1.1) for detail						
				External dimensions, expressed by A, B ,C and D						
				S denotes common actuator, X denotes explosion-proof actuator						
				R is angular travel actuator						
				Serial number of design, 361 denotes 3610-series electronic actuator						

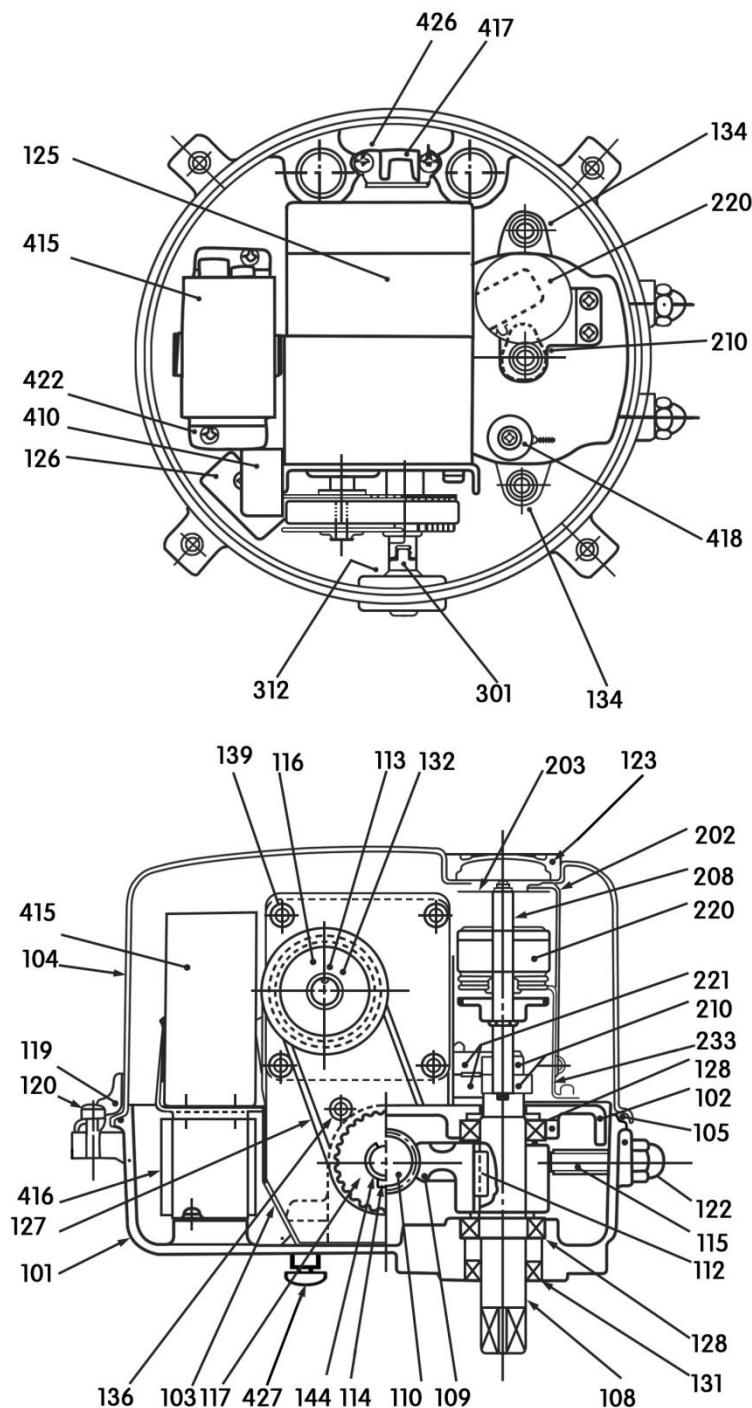
Note: Items before ※ must be marked in model selection and items after ※ are optional, which can be omitted when unnecessary, but their orders can't be inverted.

Table 1.1

Model	Output moment (N·M)	Duration action s/90°	Maximum rotating angle (degree)
361RSA-02	20	8.5	90
361RSA-05	50	17.0	
361 RSB RXB -10	100	18.0	
361 RSB RXB -20	200	36.0	
361 RSC RXC -30	300	24.0	
361 RSC RXC -50	500	42.0	
361 RSC RXC -60	600	48.0	
361 RSC RXC -80	800	63.0	
361 RSD RXD -100	1000	30.0	
361 RSD RXD -150	1500	42.0	
361 RSD RXD -160	1600	45.0	
361 RSD RXD -250	2500	68.0	

1.2 Structure

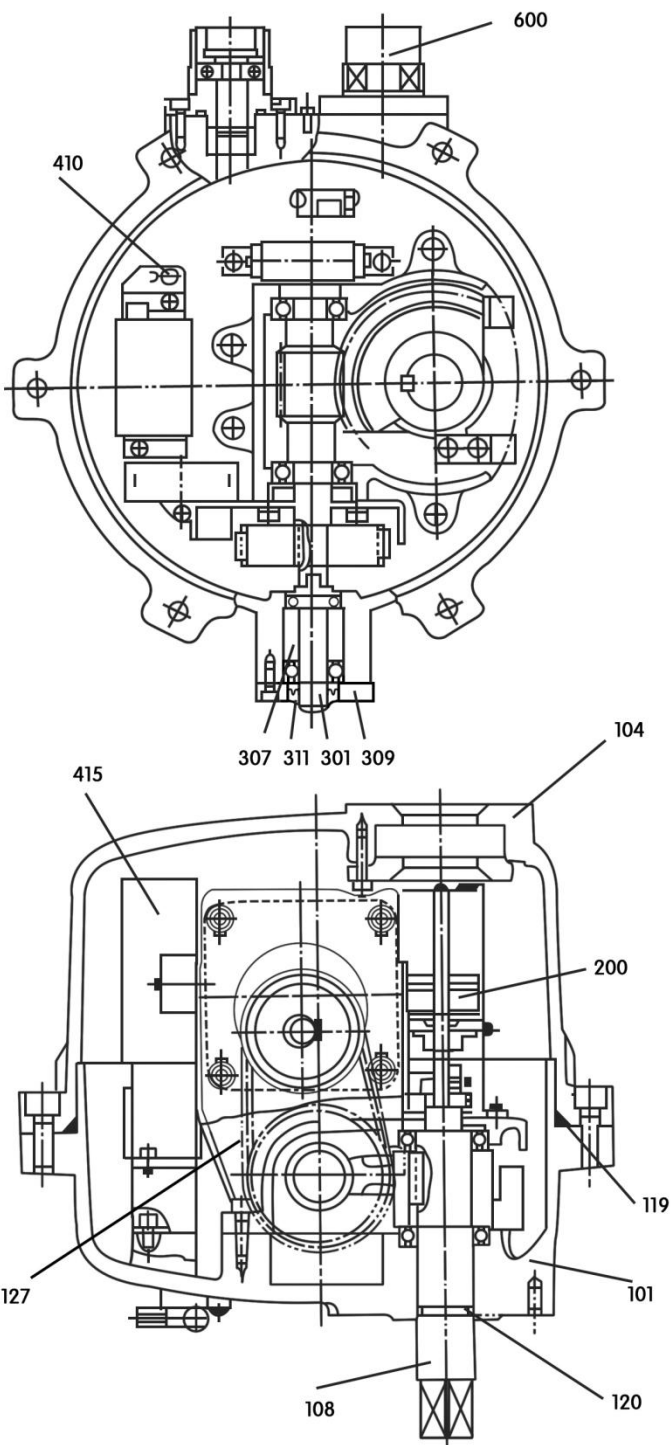
1.2.1 Structural diagram of common 361



SN	Name
101	Shell
102	Worm-gear case
103	Actuator rack
104	Cover
105	Cover lock ring
108	Output shaft
109	Worm gear
110	Worm
112	Key
113	Key
114	Key
115	Catch bolt
116	Driving wheel
117	Follower
119	Cover pressure plate
120	Cover bolt
122	Cap nut
123	Perspective window
125	Motor
126	Capacitance
127	Synchronous belt
128	Ball bearing
131	Shaft lock ring
132	Shaft retainer ring
134	Fastening bolt
136	Hexagon socket screw
139	Installation of motor bolt
144	Shaft E retainer ring
202	Opening indicator pointer
203	Opening indicator board
208	Feedback shaft
210	Cam
220	Potentiometer
221	Limit switch
233	Potentiometer rack
301	Manual shaft
312	Shaft E retainer ring
410	Throttle
415	Control module
416	Overload unit
417	Binding post
418	Space heater
422	Controller rack
426	Binding post rack
427	Wiring joint

Figure1.1

1.2.2 361普通型结构图 (1 of 1)
1.2.2 Structure diagram of explosion-proof 361



SN	Name
101	Shell
104	Cover
108	Output shaft
200	Potentiometer
301	Manual shaft
307	Lining
309	Manual shaft cap
311	Dustproof seal
410	Earthing screw
415	Control module
600	Wiring component
127	Synchronous belt
119	Cover lock ring
120	Shaft seal
127	Synchronous belt
600	Wiring component

Figure1.2

1.3 Main technical parameters

Table 1.2

Item Name		Content of parameter			
Control unit	Input signal	4-20mA d·c or 1-5V d·c			
	Output signal	4-20mA d·c (load resistance below 500Ω)			
	Dead zone	0.8-1.0% can be adjusted to 0.4%			
	Zero point adjustment	25%			
	Range adjustment	20-100%			
	Intrinsic error, return difference	1.0%			
	Open side, close side	Open side, close side			
	Opening detection	Precise conductive plastic potentiometer			
Power	Power supply	220V a·c -15% ~ +10% 50Hz			
	Drive motor	AC reversible single-phase gear head motor			
	Power of the whole machine	Model A	Model B	Model C	Model D
		50VA	150VA	220VA	350VA
Auxiliary unit	Overload protection unit	Type A and B optional, Type C and D necessary			
	Moment switch	Optional			
	Space heater	Optional, but not installed for explosion-proof model			
	Manual unit	Portable manual crank			
Condition for installation	Environmental temperature	Common without heater -20℃ ~ +60℃			
		Common with heater -35℃ ~ +60℃			
		Explosion-proof -10℃ ~ +60℃			
	Vibration allowable	Under 1.5G			
	Relative humidity	Under 95% for common model, 45-85% for explosion-proof model			
	Environmental gas	Noncorrosive gas			
	External wiring	Signal cable shielded and separated from power cord			
	Wiring port	Common A, B, C model 2-G1/2 "			
		Common D model and explosion-proof 2-G3/4 "			
	Protection grade	IP55\IP66(explosion-proof)			
	Explosion-proof grade	Exd II BT6 Gb			

1.4 Dimension for installation

1.4.1 Installation dimension diagram

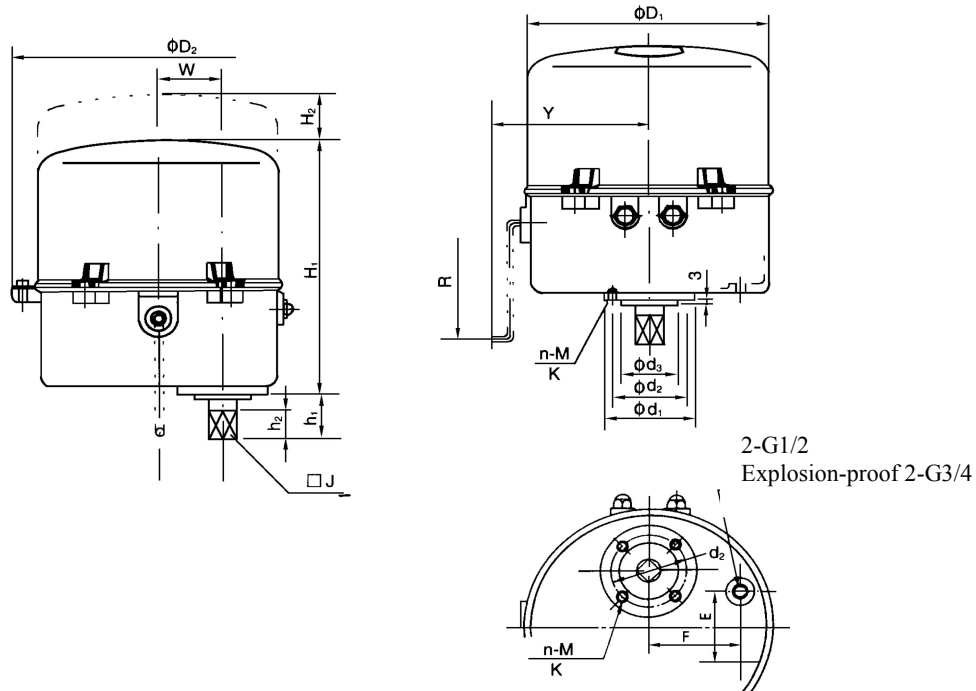


Figure 1.3

Table 1.3

Model	D1	D2	H1	H2	h1	h2	d1	d2	d3(f8)	□J	K	n	M	W	Y	R	E	F	Weight (kg)
361RSA	225	260	185	120	65	30	90	70	55	□16	12	4	M8	56	200	φ160	85	75	7
361RSB	255	290	225	155	65	30	90	70	55	□21	12	8	M8	68	225	φ320	85	90	12
361RXB	270	310	275	175	65	30	90	70	55	□21	12	4	M8	68	265	φ320	85	90	21
361RSC	335	380	335	165	85	35	125	102	70	□32	18	4	M10	80	260	φ320	85	132	42
361RXC	355	410	380	190	85	35	125	102	70	□32	18	4	M10	80	310	φ320	85	132	64
361RSD	470	520	390	120	85	50	210	165	85	□41	32	4	M20	65	365	400			150
361RXD	470	520	430	120	85	50	210	165	85	□41	32	4	M20	65	365	400			190

Note: In the table, H2 is the dimension necessary for removal of cover and R is the dimension for manual operation, which should be considered in the design of installation.

1.4.2 Installation method and dimension diagram of RSA, RSB, RXB models with base and crank

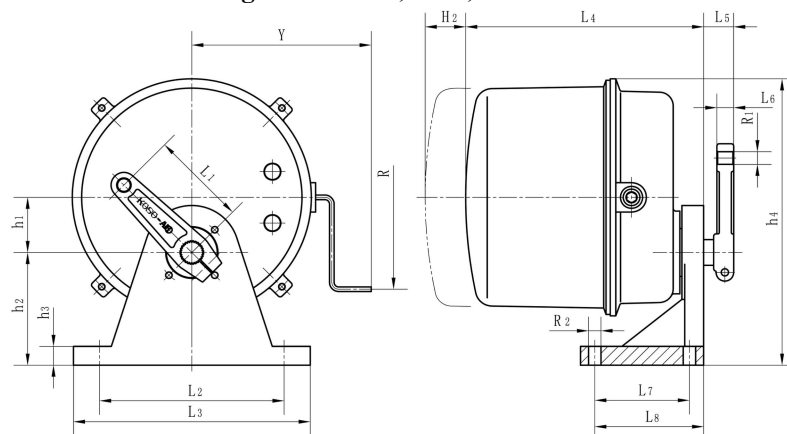


Figure 1.4

Table 1.4

Model	h ₁	h ₂	h ₃	h ₄	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	R	R ₁	R ₂	H ₂	Y	Weight (kg)
361RSA	56	120	15	289	100	220	250	200	50	21	100	130	φ 160	φ 16	4-φ 13	135	200	14
361RSB	68	120	15	316	120	220	250	240	50	21	100	130	φ 320	φ 16	4-φ 13	155	225	21
361RXB	68	120	15	350	120	220	250	275	50	21	100	130	φ 320	φ 16	4-φ 13	155	267	30

Note: In the table, H₂ is the dimension necessary for removal of cover and R is the dimension for manual operation, which should be considered in the design of installation.

1.4.3 Installation method and dimension diagram of RSC and RXC models with base and crank

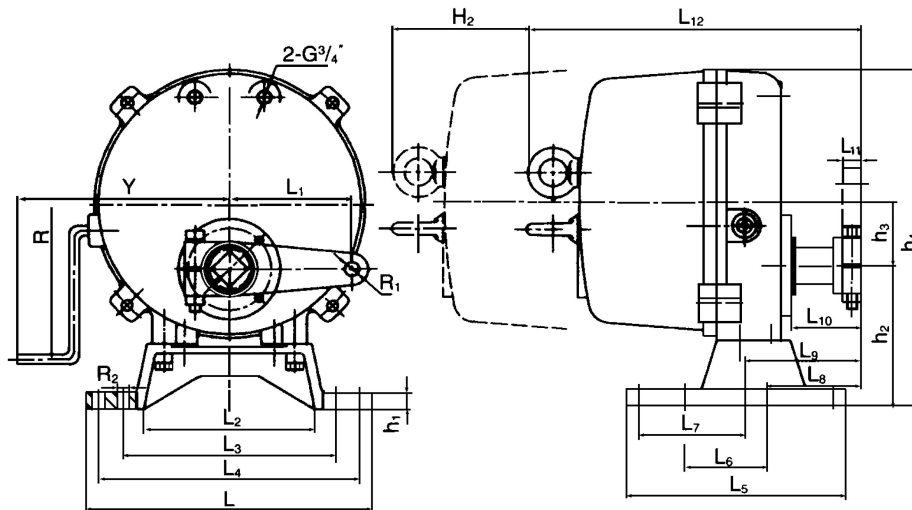


Figure 1.5

Table 1.5

Model	h ₁	h ₂	h ₃	h ₄	L	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀	L ₁₁	L ₁₂	L ₁₃	R	R ₁	R ₂	Y	H ₃	W (kg)
361RSC	20	170	80	418	350	150	210	210	320	267	100	130	115	142	85	23	412	238	φ 320	φ 18	12-φ 14	260	165	52
361RXC	20	170	80	478	350	150	210	210	320	267	100	130	115	142	85	23	450	238	φ 320	φ 18	12-φ 14	300	165	74

Note: L₃, L₆, L₈ are consistent with the installation dimension of DKJ-310. L₄, L₇, L₉ are consistent with the installation dimension of DKJ-410. In the table, H₂ is the dimension necessary for removal of cover and R is the dimension for manual operation, which should be considered in the design of installation.

1.4.4 Installation method and dimension diagram of RSD model with base and crank

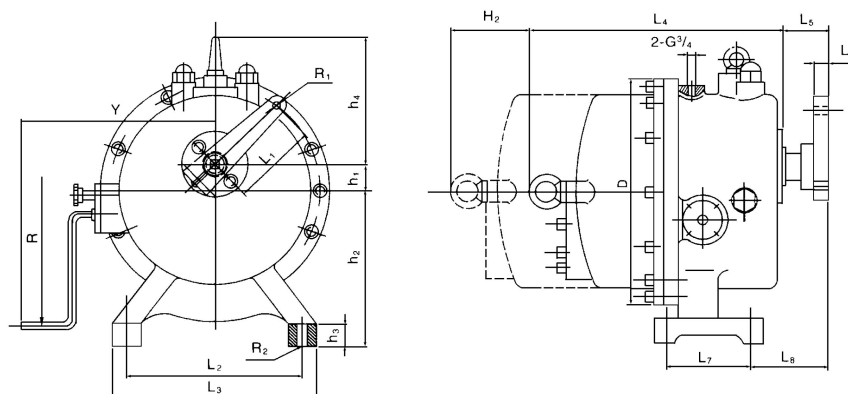


Figure 1.6

Table 1.6

Model	h ₁	h ₂	h ₃	h ₄	Y	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	R	R ₁	R ₂	H ₂	D	W (kg)
341RSD	65	305	45	310	365	170	390	464	390	85	25	180	121	φ 400	φ 20	12- φ 14	285	470	165
341RXD	65	305	30	310	365	170	390	464	390	85	25	180	121	φ 400	φ 20	12- φ 14	285	470	200

Note: In the table, H₂ is the dimension necessary for removal of cover and R is the dimension for manual operation, which should be considered in the design of installation.

2. Operating principle

3610-series electronic actuator is an electronic actuating mechanism which takes 220V single-phase AC power as the drive power and receives 4~20mA • c or 1~5 Vd • c input signal from computer, regulator or manipulator. The electronic control unit, which is made of integrated circuit, designed to be box-shape and cast and solidified with resin, is called control module and has its own servo functions.

After receiving the changed input signal 4~20mA • c (or 1~5 Vd • c) and comparing it with the opening signal from feedback unit and amplifying it, the control module drives and controls motor to eliminate their difference. The rotation of motor transmits the power through reducing mechanism to worm-wheel shaft to make it turn clockwise and anticlockwise and at the same time drive potentiometer turn through feedback unit. After the action of potentiometer is transformed into electric signal, it will be fed back to controller as opening signal. When the difference between input signal and opening signal is in the set sensitivity range, the motor stops rotating for the function of positioning and regulation.

3. Acceptance, transport and storage

3.1 Acceptance and transport

Warning

The actuator is a heavy object and the following notes should be observed when moved, or severe accidents of personal harm may occur.

- Elevating mechanism complying with the requirement should be used for unloading and transport according to the Law of Labor Safety & Health. It is not allowed to be under the lifted goods or operate the mechanism under the lifted goods.
- When the equipment is packaged in carton, if it is damped, the packaging intensity will drop, so pay special attention to the lifting when the carton is damped.
- Avoid sharp strike such as collision, falling, etc.

3. 2 Storage

- Store in the original package before the installation.
- Avoid storing in the following places:
 - (1) Place which is subject to rain
 - (2) High-temperature environment above 60°C
 - (3) Environment with thick dust
 - (4) Environment high humidity
- Avoid sharp strike such as collision, falling, etc.
- From opening the package for inspection to installation onto the valve, store in the package state when it is delivered.
- Do not take down the plug and cover plate of wiring port before the electric wiring construction.
- For storage after a period of use, the wiring port must have waterproof treatment.

4. Installation

⚠ Warning

- **Common actuator mustn't be installed in the place with explosive gas and erosive gas.**

⚠ Notes

- Do not take down the hood during the installation onto the valve.
- Do not take down the plug of wiring port after the installation onto the valve and before the wiring construction.
- Avoid sharp strike such as collision and falling during the installation, or malfunction may occur and readjustment is required.
- Do not install in the place where there is violent vibration and excessive load on the actuator.
- During the selection of space heater (optional), even under the allowable environmental temperature, if it is installed in the place subject to summer sunshine and with high-temperature radiation, proper shielding slab should be installed over and at the side of the actuator or insulating material be wound for protection.

4. 1 Installation conditions

4. 1. 1 Environment for installation

For the place where actuator is installed, the environmental temperature should be in the following range.

standard specification: -10~+60°C

with heater: -35~+60°C

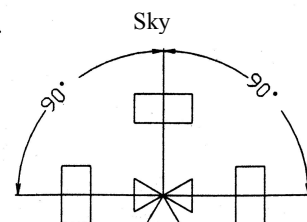


Figure 4.1

4.1.2 Space for installation and maintenance

Maintenance space for adjustment and inspection should be fully reserved. In addition, enough space should be reserved at the side of manual operating unit to facilitate manual operation.

4.1.3 Posture for installation

In principle, vertical installation should be adopted. The method shown in Figure (4.1) can be adopted only when necessary, but the wiring port of actuator should not be upward.

When the actuator may be subject to vibration and external force, bracket should be used for protection.

4.2 Wiring construction

⚠ Warning

- **To avoid electric shock, the wiring of power supply and signal must proceed when the power is off.**
- **As the surface temperature of space heater (optional) is high, do not touch it to avoid being scalded.**
- **The aim of selecting explosion-proof actuator is for safety and to achieve sealed separation effect between inside and outside of the actuator. It is important to strictly observe the requirement for wiring and closing cover.**

⚠ Notes

- To avoid the interference of power line, the signal line must adopt shielded cable and be connected independent of power line.
- While outdoors, don't disassemble hood and perform wiring in a rainy day. While indoors, don't operate if there is water around. If it rains during wiring, stop the operation and close the hood. Operation can't be conducted again until the inside of actuator fully dries. There will be a risk of electric shock and damaging the machine for operation in damp state.
- Ensure the power connected complies with the voltage and frequency on the nameplate of actuator.
- The power must be connected with the power terminal, or the control module may be damaged.
- The power connection should have enough capacity to ensure the rated and start current of actuator to flow through.
- Connection joint should be used to prevent the surrounding water and rain from entering through the wiring port.
- Sure to be grounded.

- Do not clamp the power line when cover the end cap, or there is a risk of over current and the machine may be damaged.
- Be sure to install the hood after the wiring construction.
- When manual unit is used, the power should be cut off.

4.2.1 Wiring construction of common actuator

The wire to the power supply, input and output signal and optional units should be introduced into the actuator through the wiring port. See figure (4.2) and words on the terminal wiring board to connect the terminals accurately.

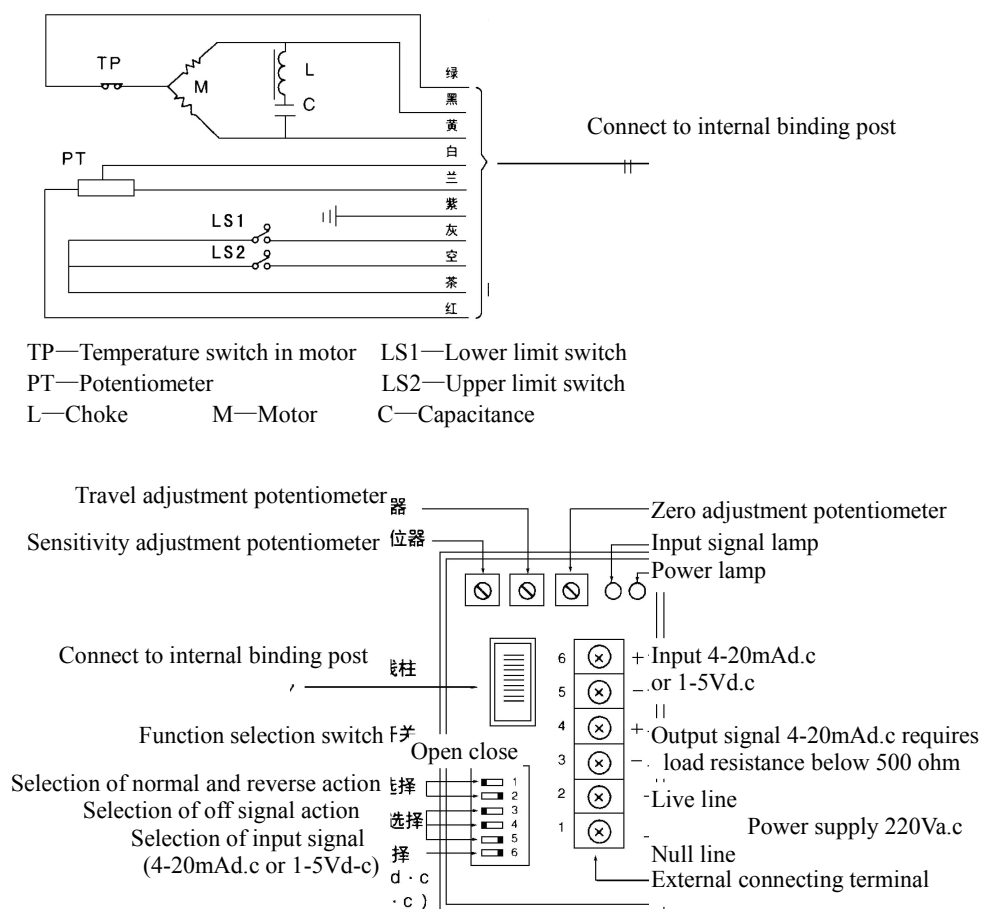


Figure 4.2

4.2.2 Wiring construction for explosion-proof actuator

The actuator leaves the factory in the state of lead not introduced, which is shown as follows. User should strictly observe the relevant stipulations in the GB50257-96 and GB3836.15-2000 standards while wiring.

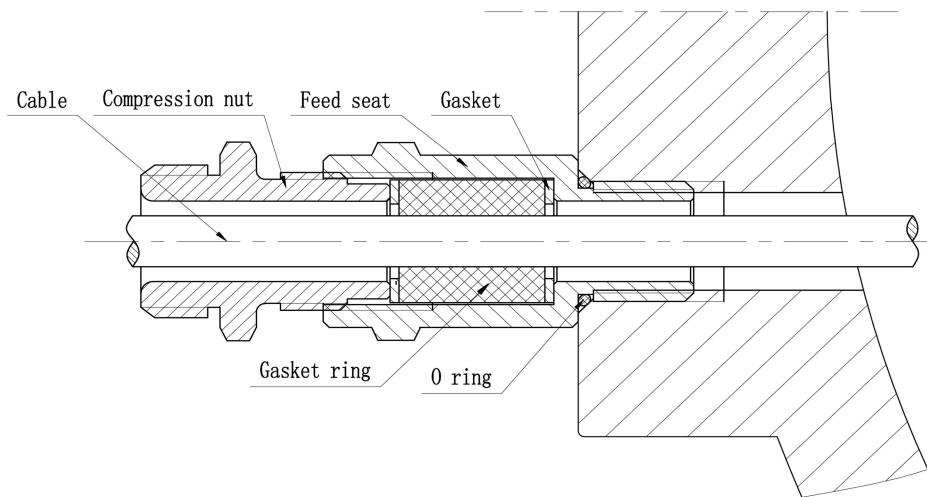


Fig.4.3 No lead-in

Table 4.1 List of matching gaskets and gasket rings (supplied accessories)

Gasket diameter D	φ10	φ11	φ12	φ13*
Gasket ring diameter d	φ9	φ10	φ11	φ12*

Note: * is supplied with the device and others are accessories.

Three-core power cord and four-core signal cable with shielding layer should be selected according to the requirement of explosion-proof standard during wiring. There should be metal jacket for flexible pipe outside, and the external thread of jacket joint is G3/4". The line is connected according to the following procedure.

- 1) Remove the seal sleeve and cable clamp.
- 2) Screw off the four M6 hexagon socket screws and remove the two seal covers.
- 3) Pull out the seal shaft and take out the lock ring and gasket.
- 4) Select the specification of lock ring and gasket according to the external diameter of cable: see table (4.1) to select the lock ring with the minimum clearance between the inside diameter of cushion rubber and the external diameter of cable.
- 5) Pull the power and signal cable through the seal sleeve and seal cover respectively into the actuator.
- 6) After appropriate length of cable into the actuator is reserved, fit the seal cover with M6 hexagon socket screw until the seal cover is closely against the actuator.
- 7) Fasten the cable clamp and seal sleeve.
- 8) Fasten the jacket joint of flexible pipe.
- 9) Connect the two red terminals in the accessories to the power cord with pliers and connect the four blue terminals in the accessories to the power cord.
- 10) Connect the power cord and signal cable to the terminals properly according to figure (4.2)

and letters on the terminal wiring board.

- 11) Put the cover on the shell upright, slightly strike with rubber hammer to fasten the cover screws alternatively and at the same time ensure the clearance between the cover and shell reduced evenly.

4.2.3 Role of each function selection switch

Switch on 1 and switch off 2: when input signal increases from $4\text{mA} \cdot c$ to $20\text{mA} \cdot c$, the output signal will change from $20\text{mA} \cdot c$ to $4\text{mA} \cdot c$;

Switch on 2 and switch off 1: when input signal increases from $4\text{mA} \cdot c$ to $20\text{mA} \cdot c$, the output signal will change from $4\text{mA} \cdot c$ to $20\text{mA} \cdot c$;

Switch off 3, 4 and switch on 5: when input signal is switched off, the output shaft stops at the original position;

Switch off 4, 5 and switch on 3: when input signal is switched off, the output shaft moves until LS2 upper limit switch acts;

Switch off 3, 5 and switch on 4: when input signal is switched off, the output shaft moves until LS1 lower limit switch acts;

Switch on 6: use $4 \sim 20\text{mA} \cdot c$ input signal;

4.3 Bracket mating table

The bracket and connecting sleeve for direct connection of angular travel actuator and butterfly valve are shown as follows. During design, model selection and installation, note: the associating butterfly valve in the table takes ZDRW—6K type electrically regulated electronic butterfly valve produced by Anshan Automatic Instrument (Group) Co. Ltd. as reference. While mating the valves, you should compute the required moment according to the allowable pressure difference of valve. It should be ensured that the output moment of actuator should be greater than the maximum moment required for opening and closing the valve. The caliber of associating butterfly valve in the table is only for reference.

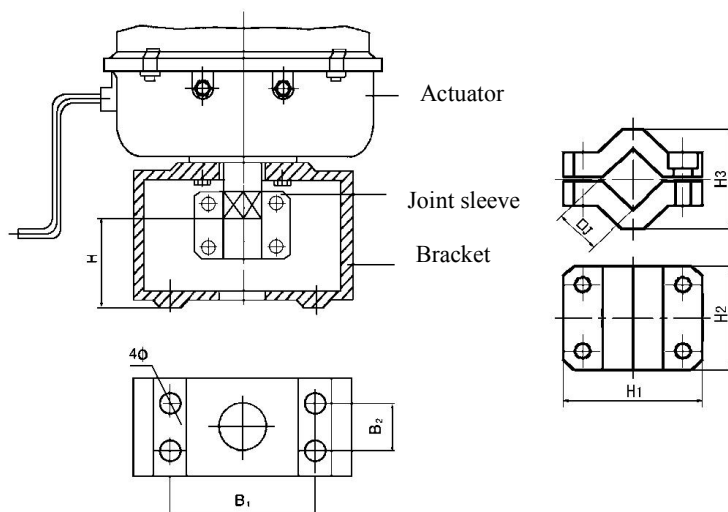


Figure 4.4

Table 4.2

Model	Caliber of butterfly valve	Code number of bracket	H	B1	B2	4 ϕ	H1	H2	H3	\square J
361RSA-05	50-100	RA1	62	75	34	12	50	45	38	16
361RSA-05	125-200	RB2	62	110	34	12	50	45	38	16
361RSB-10/20	125-200	RB2	62	110	34	12	64	50	48	21
361RSB-10/20	250-350	RB3	70	130	40	14	64	50	48	21
361RSC-30	250-350	RC3	70	130	40	14	90	65	67	32
361RSC-30/50/60/80	400-500	RC4	78	150	60	18	90	65	67	32
361RSD-100/150/160	550-1000						110	90	92	41

Note: If the dimension of valve \square J is less than that of wiring board, mat can be added. The bracket in the table is of standard model, which can be customized according to users.

5. Functioning debugging and functioning

The actuator and valve are connected by our company, which generally are not required to be adjusted. If only actuator is bought, the following principles should be observed for debugging during valve connection:

5.1 Installation of actuator

First based on the consideration on the installation direction, make the valve shaft and the output shaft of actuator keep synchronous, that is, the close position of valve corresponds to that of actuator (The actuator is at the close position while leaving the factory. Seen from above, the clockwise is close and anticlockwise is open).

5.2 Debugging of actuator

Note

- Check whether the wiring is correct according to relevant wiring diagram.
- Confirm the power supply connected is consistent with the voltage and frequency on the nameplate of actuator.
- The power supply must be connected with power terminals, or the controller will be damaged.
- Check the function selection state switch of the controller: when it leaves the factory, (1), (3) and (4) are set at left off position; (2), (5) and (6) are set at right on position.

Switch on 220V power supply and input 12mA d.c signal. When the signal gradually reduces to 4.0mA d.c, observe whether the output shaft of actuator drives the valve to close properly. If there is difference, please adjust according to the following method:

5.2.1 Zero point adjustment

Loosen the cam screws of lower limit switch to make them free state. Adjust zero point potentiometer with special small screwdriver: when potentiometer is turned anticlockwise, the output shaft will turn clockwise. Adjust repeatedly and determine the position of “zero point”. After the position of “zero point” is determined, reduce input signal to $3.8\text{mA} \cdot c$, adjust lower cam, slowly press cam clockwise against “LS1” switch until click sound is heard, fasten the cam screws to make the output shaft stop rotating in the range of

$3.7 - 3.9\text{mA} \cdot c$, which not only ensures the valve be closed but also plays the role of protecting the actuator.

5.2.2 Range adjustment

When input signal increases to $20.0\text{mA} \cdot c$, observe whether the valve opening is consistent with the given turn angle. If there is difference, adjust “travel” potentiometer with special small screwdriver. After the maximum opening turn angle of valve is confirmed, increase input signal to $20.2\text{mA} \cdot c$, slowly press the upper cam anticlockwise against “LS2” limit switch until click sound is heard, fasten the cam screws to make the output shaft stop rotating in the range of $20.0 - 20.5\text{mA} \cdot c$, which not only ensures the valve be fully opened but also plays the role of protecting the actuator.

5.2.3 Sensitivity adjustment

Sensitivity has been adjusted when the actuator leaves the factory, which generally need not be adjusted. If the motor has oscillatory occurrence during operation, regulate finely the sensitivity adjustment potentiometer shown in figure (4.6) anticlockwise to reduce the sensitivity.

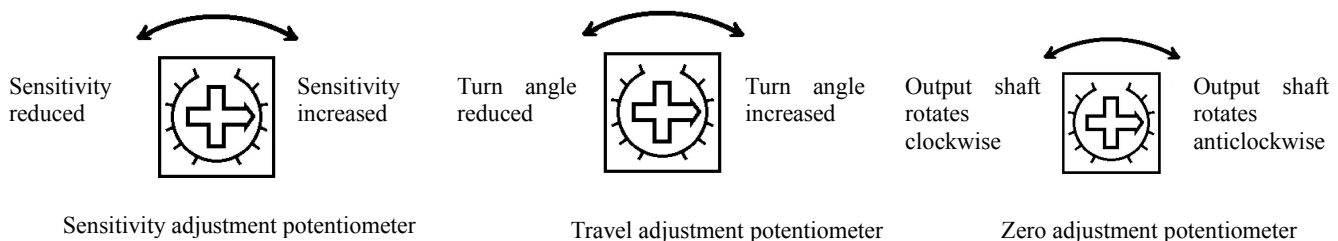


Figure 4.6

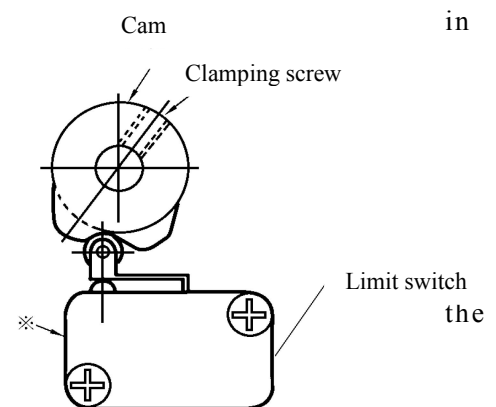


Figure 4.5

5. 3 Functioning

Warning

- **When adjustment and inspection is not required, close the connection hood.**
- **In addition, if the machine functions with the end cap open, there is a risk of being entangled into the machine or electric shock. It will result to electric leakage and damage when rain, surrounding liquid and dust enter the actuator.**

Note

- If there is smoke, noise and smell, cut off the power immediately and contact with our company.

5. 3. 1 Manual operation

Warning

- **Manual operation can proceed after the power and signal is cut off. If manual operation proceeds with the power and signal on, as it is reset to control position automatically, the manual handle rotates reversely as opposed to the operational direction and there is a big risk.**

If manual operation is required, operate with the associated manual crank. (Or operate with the inner hexagon spanner available on the market)

Insert the manual crank into the manual operating unit, if turning clockwise, the output shaft will turn to close direction (clockwise), and if turning anticlockwise, the output shaft will turn to open direction (anticlockwise).

6. Daily inspection and regular inspection

6.1 Daily inspection

⚠Note

● For daily inspection, the notes of Item 5 functioning debugging and functioning must be followed.

6.2 Regular inspection

⚠Note

• For regular inspection, notes of the following items must be followed: 4.2 Wiring construction 5. Functioning debugging and functioning.

6.2.1 1~2-year inspection and maintenance

The following items should be checked, confirmed, oiled and replaced.

Check whether the screws or bolts fastening each part and device are loose. If they are loose, fasten them.

Check whether the lock ring of output shaft, hood and manual operating shaft is aged. If the ring is aged, new lock ring should be replaced.

The gear of feedback part is filled with Mobil grease once about a year. Check whether there is abrasion to the gear and bearing cover during oil filling. If there is serious abrasion and great clearance, replace with new gear and bearing cover.

Remove the connector between motor and controller, and measure the dielectric resistance between leads as well as lead and shell with 500V megohmmeter (tester for dielectric resistance).

When the dielectric resistance is less than $10\text{M}\Omega$, replace with new motor.

7. Identification of malfunction and abnormity and measures

Table 7.1

Phenomenon of malfunction	Cause analysis	Troubleshooting
●Motor can't be started	<ul style="list-style-type: none"> ●Power is not connected ●Line broken or terminal is not connected well ●Voltage of the power inconsistent or too low ●Heat protector of motor acts ●Environmental temperature or use frequency too high ●Capacitor is damaged ●Input signal inconsistent ●Valve too tight and overloaded 	<ul style="list-style-type: none"> ●Connect the power ●Replace the power line and fasten the connection of terminal ●Check the voltage and adjust it to normal level with multimeter ●Lower the environmental temperature ●Lower the use frequency or sensitivity ●Replace capacitor ●Change to correct input signal ●Separate the actuator and valve, check the action of single unit of actuator, if the transmission part is normal, adjust the valve
●Stop while functioning	<ul style="list-style-type: none"> ●Heat protector of motor acts ●Environmental temperature or use frequency too high ●Valve too tight 	<ul style="list-style-type: none"> ●Lower the environmental temperature ●Lower the use frequency or sensitivity ●Separate the actuator and valve, check the action of single unit of actuator, if the transmission part is normal, adjust the valve
●Opening signal poor	<ul style="list-style-type: none"> ●Signal line broken or not connected well ●Poor contact of potentiometer 	<ul style="list-style-type: none"> ●Check loop and connection and adjust to normal level ●Replace potentiometer
●Motor stops not at the given position	<ul style="list-style-type: none"> ●Cam angle of motion limit switch inaccurate ●Poor contact of inching switch 	<ul style="list-style-type: none"> ●Readjust and fasten the screws of cam ●Replace inching switch
●Vibration	<ul style="list-style-type: none"> ●Sensitivity too high 	<ul style="list-style-type: none"> ●Adjust sensitivity
●Manual operation too heavy	<ul style="list-style-type: none"> ●Valve too tight 	<ul style="list-style-type: none"> ●Separate the actuator and valve, check the action of single unit of actuator, if the transmission part is normal, adjust the valve
●Valve base leakage	<ul style="list-style-type: none"> ●Output of actuator improper ●Clearance of valve core too great 	<ul style="list-style-type: none"> ●Adjust zero point ●Adjust the clearance of valve core or replace it

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