



EK3 Series Electric Actuator Operation Instructions





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Operation Instructions

Contents

I	General
II	Model Representation
III	Structure Design of Standard Type & Explosion-proof Type
IV	Work Environment & Main Parameters
V	Outline & Connection Size
VI	Structure & Working Principle
VII	Electrical Control Diagram & Electrical Components
VIII	Remote Control Terminal Wiring
IX	Testing Instructions
X	Installation & Disassembling
XI	Maintenance
XII	Errors & Solutions
XIII	Order Notice



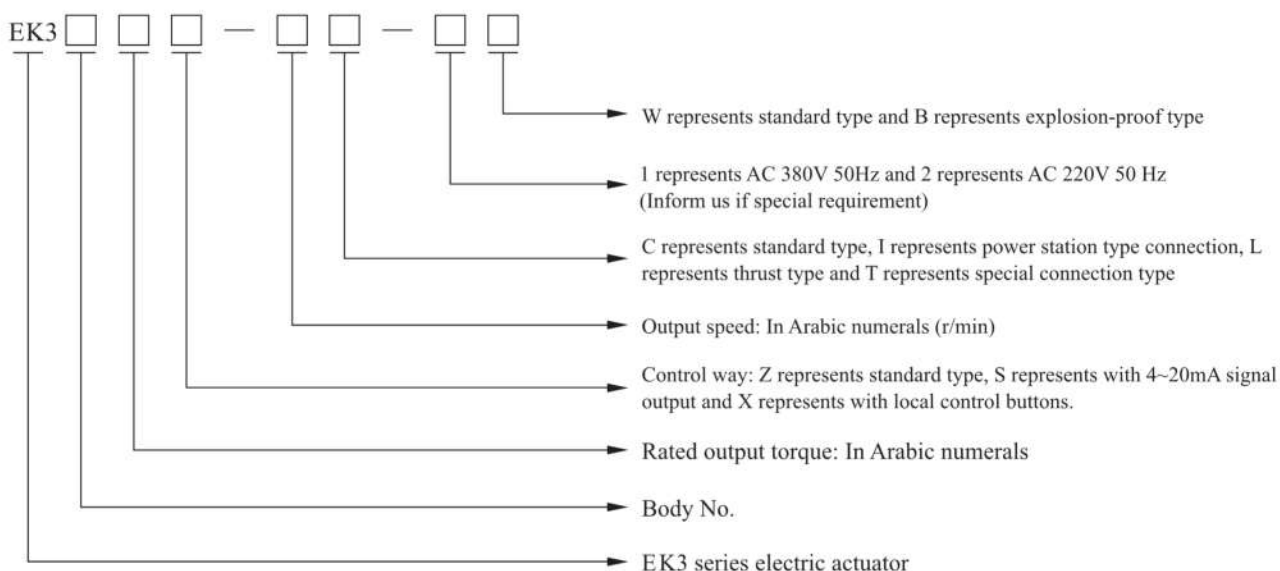


EK3Series Electric Actuator Operation Instructions

I General

A new generation EK3 series multi-turn electric actuators are suitable for linear travel valves which are the essential drives for opening、closing or adjusting valves, such as gate valve、globe valve etc, and also have remote-control, centralized-control or self-control device on valves. The product has multi-function、stable performance、advanced control system, small size, light weight, easy maintenance and simple operation etc advantages. The actuators are popular and widely applied in the oil, chemicals, electric power, metallurgy, recycled paper, water treatment and other industries. Multi-turn electric actuators are divided into standard type and explosion-proof type.

II Model Representation



For example EK3210XS-18C-1W

EK32 means actuator is multi-turn type, No 2 body, output torque is 100 N.m, with local control buttons and 4-20mA output signal, output speed 18 r/min, standard connection and power AC 380V 50 Hz.

III Structrel Design of Standard Type & Explosion-proof Type

- 1.The performance of this product conforms to the stipulation of JB/T8528-1997 《General Valve Electric Actuator Technical Conditions》 ; Its explosion-proof performance conforms to the stipulations of 6B3836 .1-2000 《Electrical Apparatus for Explosive Gas Atmospheres Part1 : General Requirements》 ,GB3836.2-2000 《Electrical Apparatus for Explosive Gas Atmosphere's Part 2 : the explosion-proof type "d"》 explosion-proof enclosures and JB/T8529-1997 《Explosion-proof valve Electric Actuator Technical Conditions》 .
- 2.Surrounding Mediums: The outdoors type is used for environment free of combustible, explosive and corrosive mediums; The explosion-proof type includes d I and d II BT4; d I is for non- working surface of coal mining; and d II BT4 can be applied for the environment II A 、 II B T1-T4 where the explosive gases mixture meets the requirements.



IV Work Environment & Main Parameters

1. Power: AC 380V(±5%) Special AC220V(±5%)
2. Frequency: 50 Hz(±0.4%)
3. Ambient Humidity: ≤95% (when 25℃)
4. Height: ≤1000m
5. Ambient Temperature: -20℃~+60℃
6. Ingress Protection: IP65
7. Explosion-proof type: Exd II BT4
8. Work Duty: 10 minutes;
9. Motor insulation F level

Form 1 EK3 Series Electric Actuator Model Specifications

Model	Torque (N.m)	Max Stem Diameter (mm)	Manual Ratio	AC380V			AC220V			Approx Weight (kg)
				Output Speed (r/min)	Power (KW)	Current (A)	Output Speed (r/min)	Power (KW)	Current (A)	
EK3110	100	28	1:1	18	0.25	1.7	18	0.25	3.0	25
EK3115	150	28	1:1	18	0.37	2.5	18	0.37	4.0	25
EK3220	200	40	1:1	18/24	0.37/0.55	2.5/3.5	18	0.55	5.5	30
EK3230	300	40	1:1	18/24	0.55/0.75	3.5/5.5	18	0.75	7.0	31
EK3345	450	48	1:1	18/24	0.75/1.1	5.5/6.3				60
EK3360	600	48	1:1	18/24	1.1/1.5	6.3/8.0				61
EK3490	900	60	1:1	18/24	1.5/2.2	8.0/10				105
EK3412	1200	60	1:1	18/24	2.2/3.0	10/11				107
EK3518	1800	70	21.5:1	24	4.0	12				195
EK3525	2500	70	21.5:1	24	5.5	15				197
EK3635	3500	75	22.5:1	18	7.5	19				303
EK3650	5000	75	22.5:1	18	11	23				305
EK3780	8000	80	67.5:1	18	11	23				484
EK3710	10000	100	67.5:1	18	13	29				488

Notes:

1. With rated voltage, stall motor current and rated current ratio is 7, and the value of allowance is ensure value 20%
2. We supply the electric actuators of other rotational speeds according to the uses' requirements: 12/18/24/30/36/42/48/60(r/min) etc.

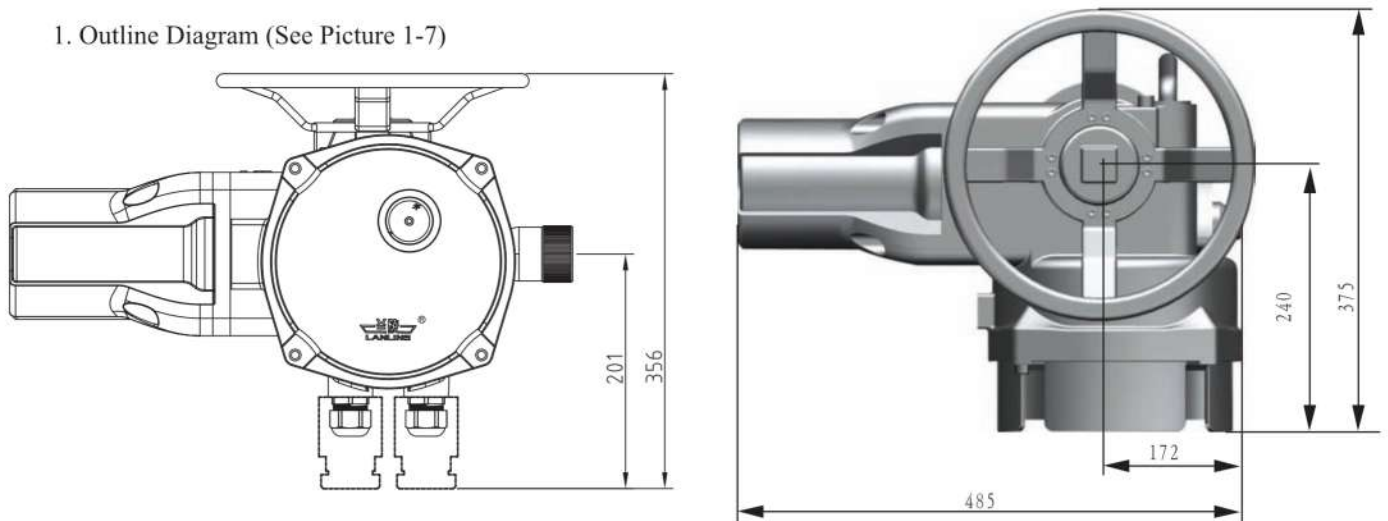




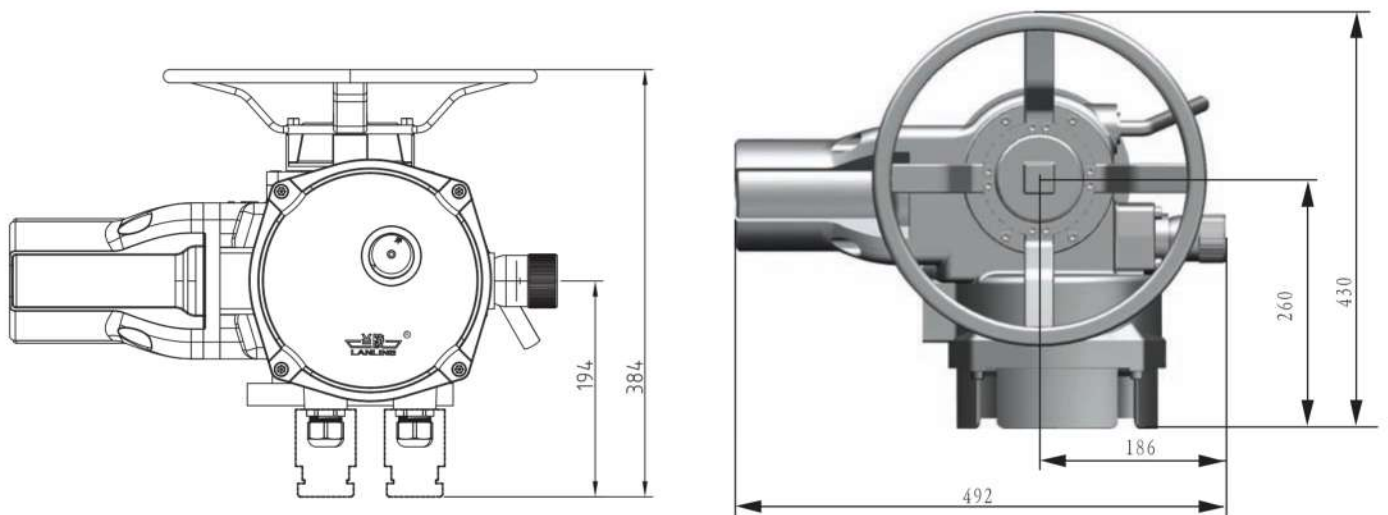
EK3Series Electric Actuator Operation Instructions

V Outline & Connection Size

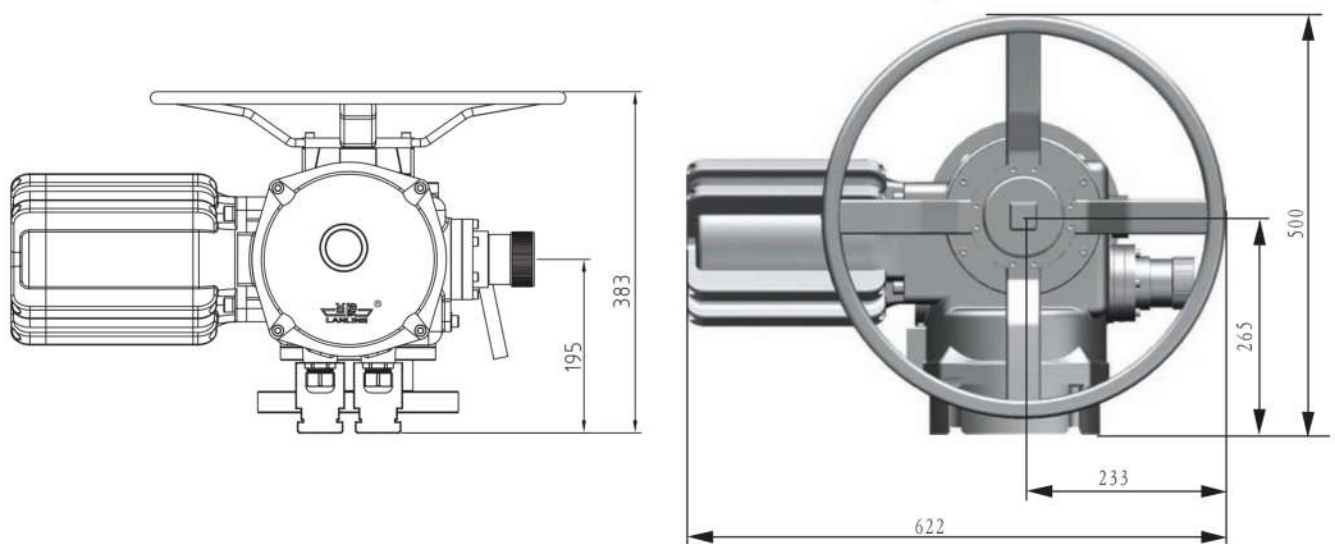
1. Outline Diagram (See Picture 1-7)



Picture 1 EK 3110—3115 Electric Actuator Outline Diagram

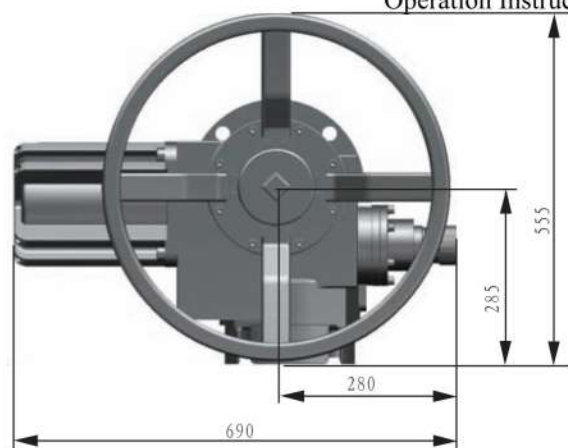
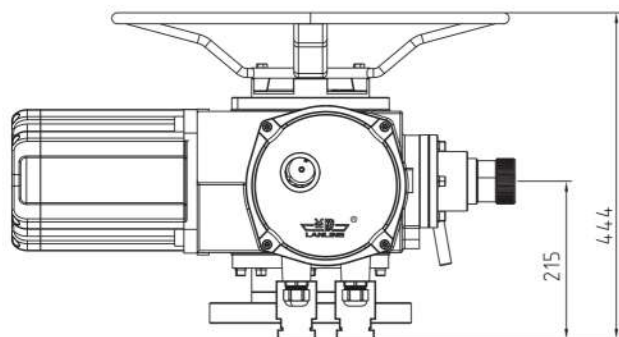


Picture 2 EK 3220—3230 Electric Actuator Outline Diagram

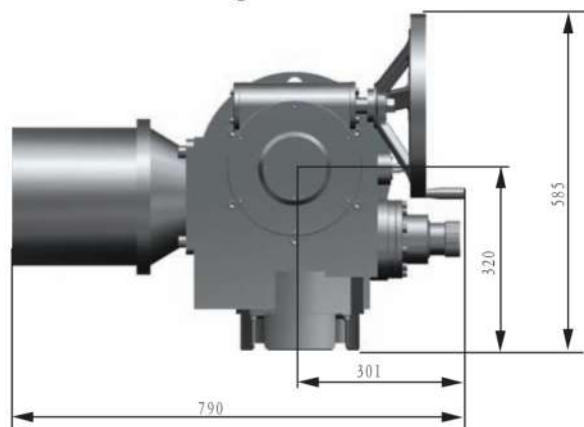
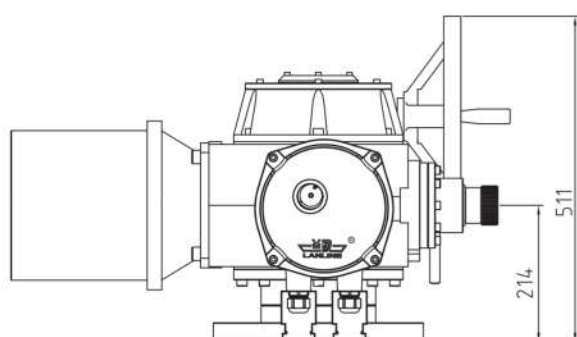


Picture 3 EK 3345—3360 Electric Actuator Outline Diagram

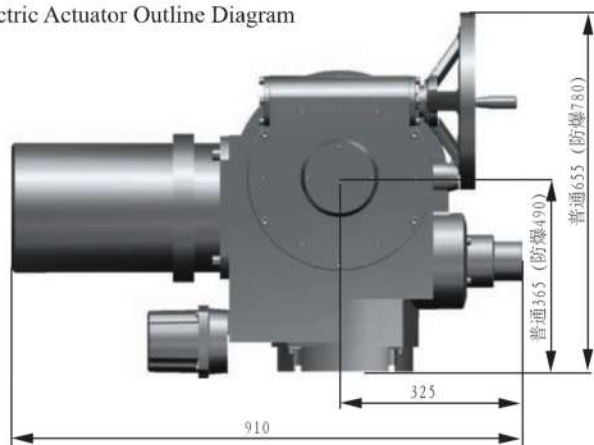
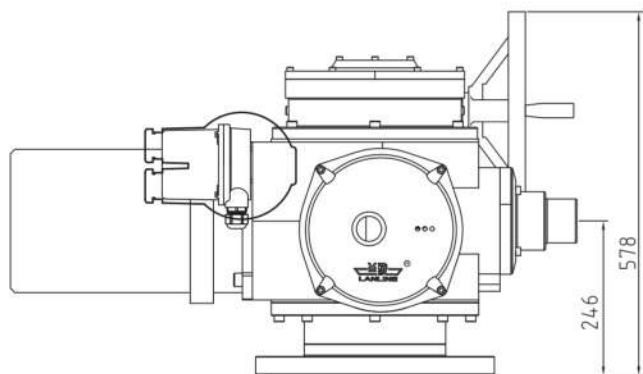




Picture 4 EK 3490—3412 Electric Actuator Outline Diagram



Picture 5 EK 3518—3525 Electric Actuator Outline Diagram



Picture 6 EK 3635—3650 Electric Actuator Outline Diagram

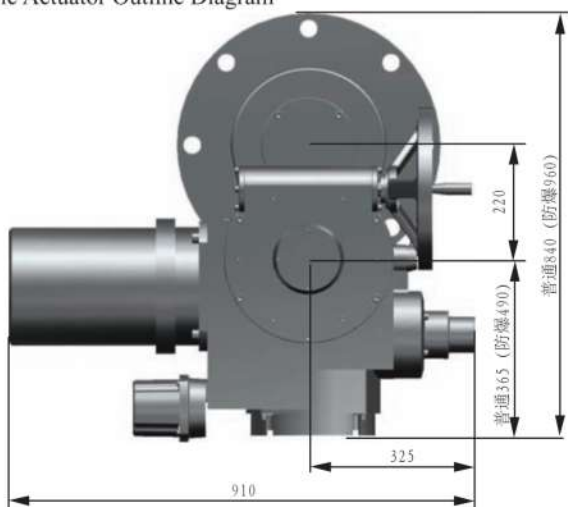
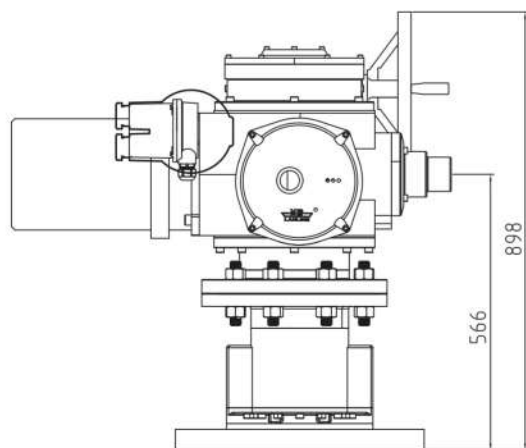


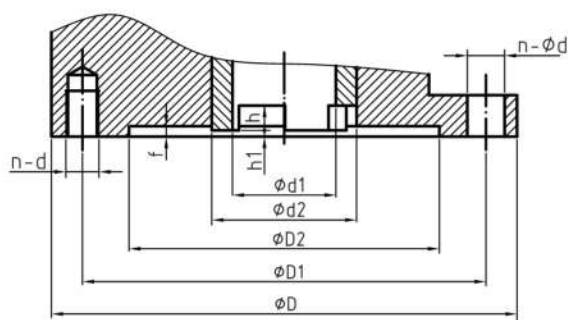
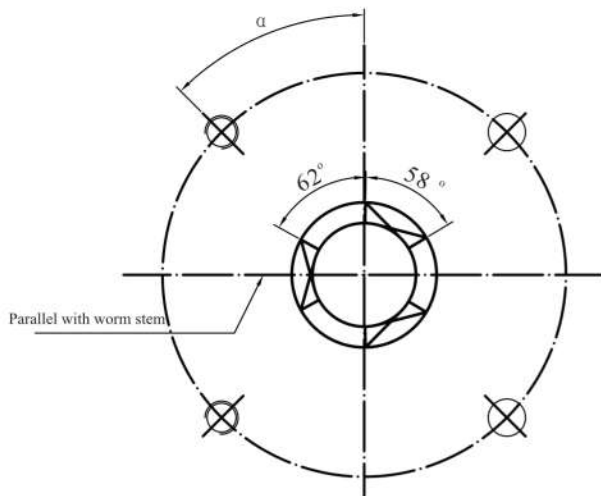
图7 EK3780-37100电动执行器外形尺寸图



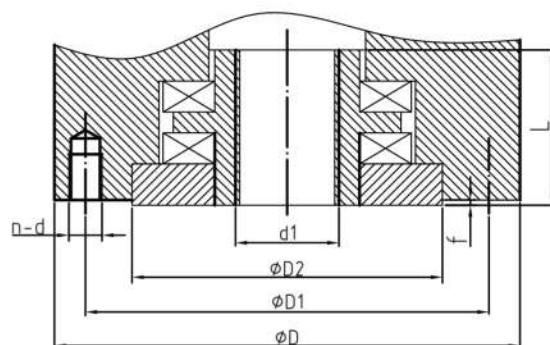
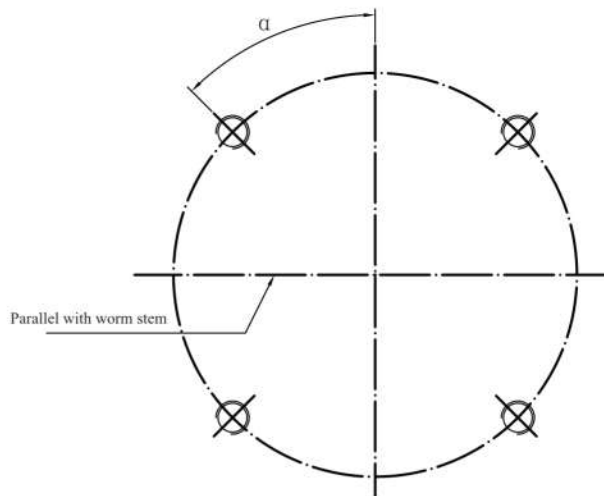
EK3Series Electric Actuator Operation Instructions

2. Connection with Valves (See Picture 8-9 & Form 2)

There are two types of connection ways with valves: torque type and thrust type. Torque type connection standard is JB/2920, and thrust type connection standard is JB12221.



Picture 8 Torque Type Connection Size Diagram



Picture 9 Thrust Type Connection Size Diagram

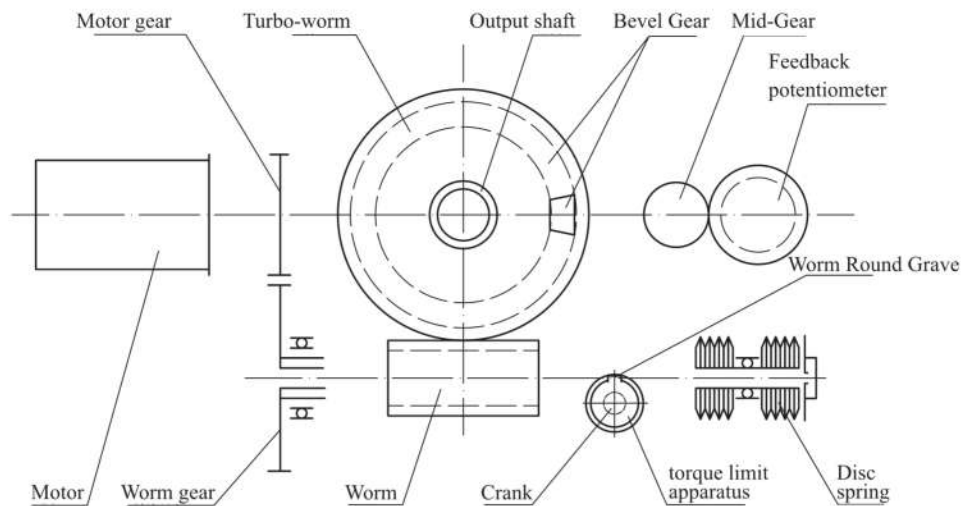
Form 2 Connection Size

Model	Torque Type JB2920												Thrust Type JB12221									
	Flange No	D	D1	D2 (H9)	h1	f	h	d1	d2	d	n	α	Flange No	D	D1	D2 (f8)	f	d1 max	d	L	n	α
EK3110/3115	2	145	120	90	2	4	8	30	45	M10	4	45°	F10	125	102	70	4	T28	M10	51	4	45°
	2 I	115	95	75			6	26	39	M8			F14	175	140	100	4	T36	M16	64		
EK3220/3230	3	185	160	125			10	42	58	M12			F16	210	165	130		T44	M20	79		
	3 I	145	120	90			8	30	45	M10			F25	300	254	200		T60	M16	88	8	22.5°
EK3345/3360	4	225	195	150	3	5	12	50	72	φ18	8	22.5°	F30	350	298	230		T70	M20	128		
EK3490/3412	5	275	235	180			14	62	82	φ22			F35	415	356	260		T80	M30	138		
	5 I	230	195	150			12	50	72	φ18												
EK3518/3525	6	330	285	220			16	72	98	φ26												
EK3635/3650	7	380	340	280	3	8	20	80	118	φ22	8	22.5°										
EK3780	8	430	380	300			25	83	128	φ26												
EK3710	9	510	450	360			30	103	158	φ33												

Notes: Torque type flange number with "I" is power station flange size, and without "I" is normal flange size.

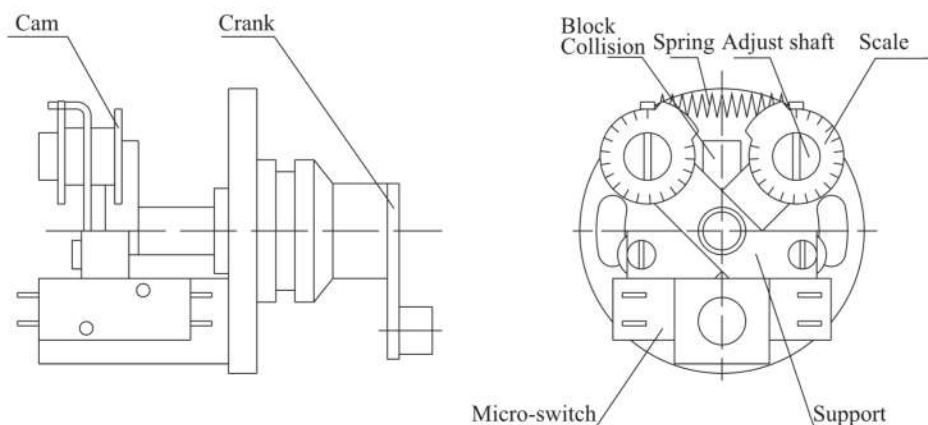
VI Structure & Working Principle

1. EK3 electric actuators consist of motor, speed reducer, torque limit apparatus, encoder, manual- electric shift organization, hand wheel and electrical components. Standard type utilizes round pilot and o-ring seal; explosion –proof type has the same of seal design with standard type. It is added with explosion –proof cover and adopts the explosion-proof wiring box method. The transmission theory see picture 10.



Picture 10 Working Principle Diagram

1. Motor Standard type uses YDF and explosion-proof uses YBDF.
2. Speed Reducer: Speed reducer is consisted of a pair of spur gears and worm gear unit .The motive force of the motor transfers to the output by speed reducer shaft.
3. Torque Limit Apparatus: Torque control apparatus is a commonly used part for the whole series. When a certain amount of torque is applied to the output shaft, the worm will rotate and move to drive the crank which in turn causes the block collision to press the cam and raise the support will lift until the micro switch disconnects the power source and stops the motor so as to control the output and protect the valve. Check picture 7 with structure.
4. Motor Working Theory: Motor gear rotates with worm gear by motor rotating. Then worm leads worm gear rotating, output shaft led by clutch rotating finally. Electric operation is always priority. Bevel gear is rotating while output shaft is working both at manual and electric operation. Meanwhile check the change of valve position by valve encoder.

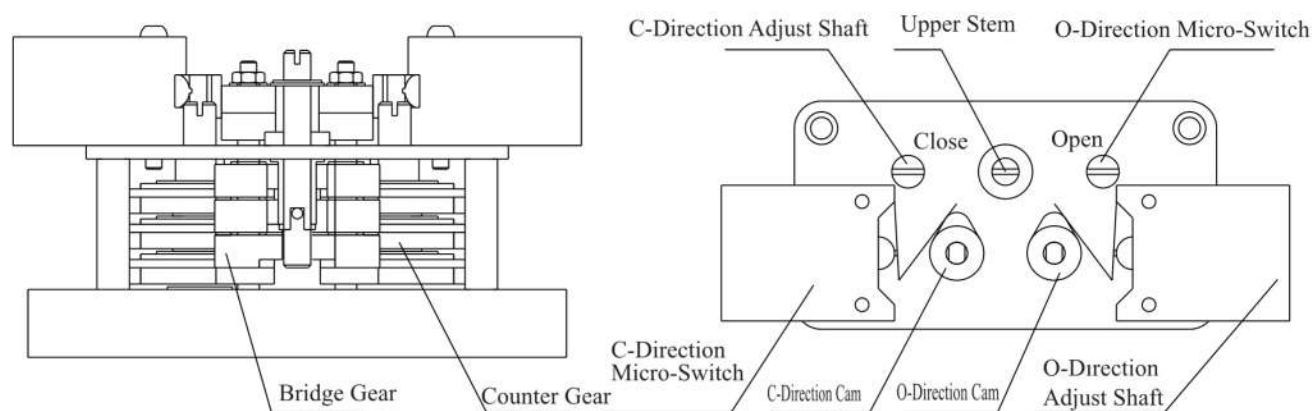


Picture 11 Torque Limit Diagram



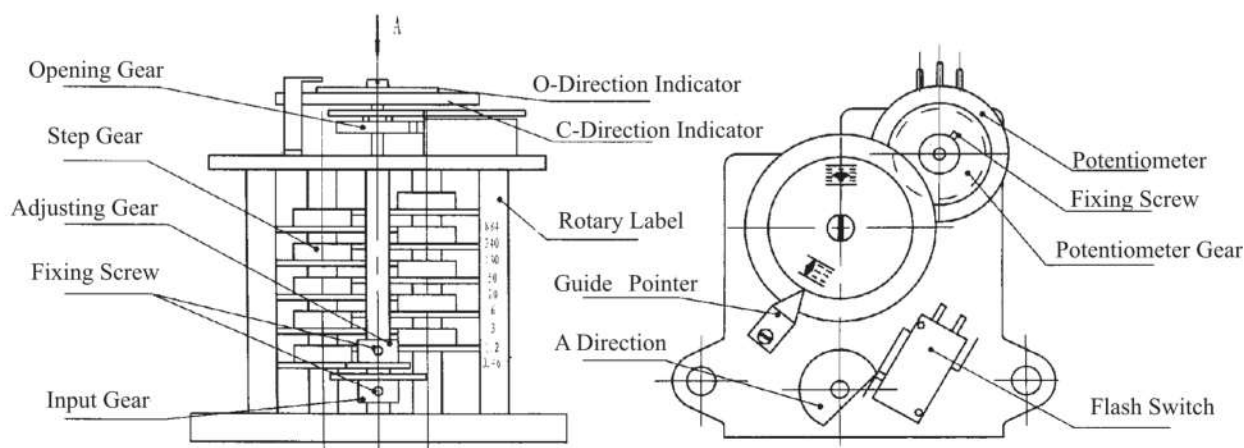
EK3Series Electric Actuator Operation Instructions

5. Travel Control Apparatus: It uses metric principle with high precision control. See picture 12 with its structure. The work theory is: There are one big bevel gear and small bevel gear inside of the reducer box ($Z=8$), and they move with counter-apparatus. If the counter-apparatus has been set as valve open or close position, the cam will rotate 90° when counter-apparatus rotates to preset position, and then micro-switch moves so as the power will be cut off. Then motor stops and control the actuator.



Picture 12 Travel Control Apparatus

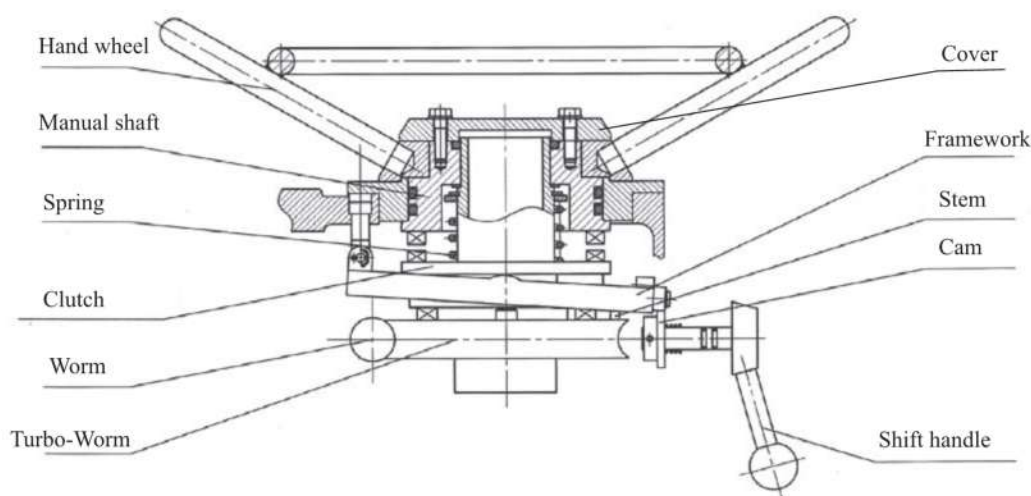
6. Position Indicator: It is general components, see picture 13 with its structure. There are one micro-switch and one cam inside of the position indicator, when actuator works, rotating cam makes micro-switch moves, and the frequency is output shaft rotating one time or twice.



Picture 13 Position Indicator



7. Manual-Electric Switch Organization: Semi-automatic shift function and its structure see picture 10. It consists of switch handle, cam, vertical bar, framework, idle clutch, pressed spring, manual axis, hand wheel and etc. When operating by hand wheel, first push the switch hand to the manual operation direction, cam will rotate following the handle, which rises the framework on the surface of the cam, and makes the support shaft of the framework move along the axial, meanwhile the idle clutch will be upped and press the spring. When push to a certain position, the idle clutch is off the worm gear meshing with hand wheel, which make the force of hand wheel transfer to the output shaft by the idle clutch that is manually state. When the framework is elevated to a certain position, the vertical bar installed on the framework uprights on the worm face, support the framework to avoid the idle clutch falling, the handle can be stopped, then operate by hand wheel. When the worm drives following the motor, the vertical posts will fall down, the idle clutch moves rapidly to the Worm under the force of the pressed spring, Meshing with the worm wheel, with hand wheel torn off and the state has become electric model.



Picture 14 Manual Operation Diagram

VII Electrical Control Diagram & Electrical Components

Electrical control theory of standard type and explosion-proof type are the same, see picture 15, more details as follow:

1. This diagram is designed according to China Ministry of Electric Power <95 Typical Design>, and meets the need of varies of control circuit. Picture 15 (b) is about position indicator wiring, for reference to users.
2. Using shut-torque TSC controls valve, and keep the self-maintain circuit of close button SC1 connected with A41; Using shut-travel LSC1 controls valve, and keep the self-maintain circuit connected with A42 when shut-torque TSC as protected.
3. Remote position indicator offers a mutative resistance as valve position changing to users by potentiometers, picture 15(b) for reference.
4. Remote position indicator and position indicator with lights can not be offered as the same time, but it can be used with control box lights as the same time.
5. Remote lights indicator can be parallel connected with A19, N, A49 directly.

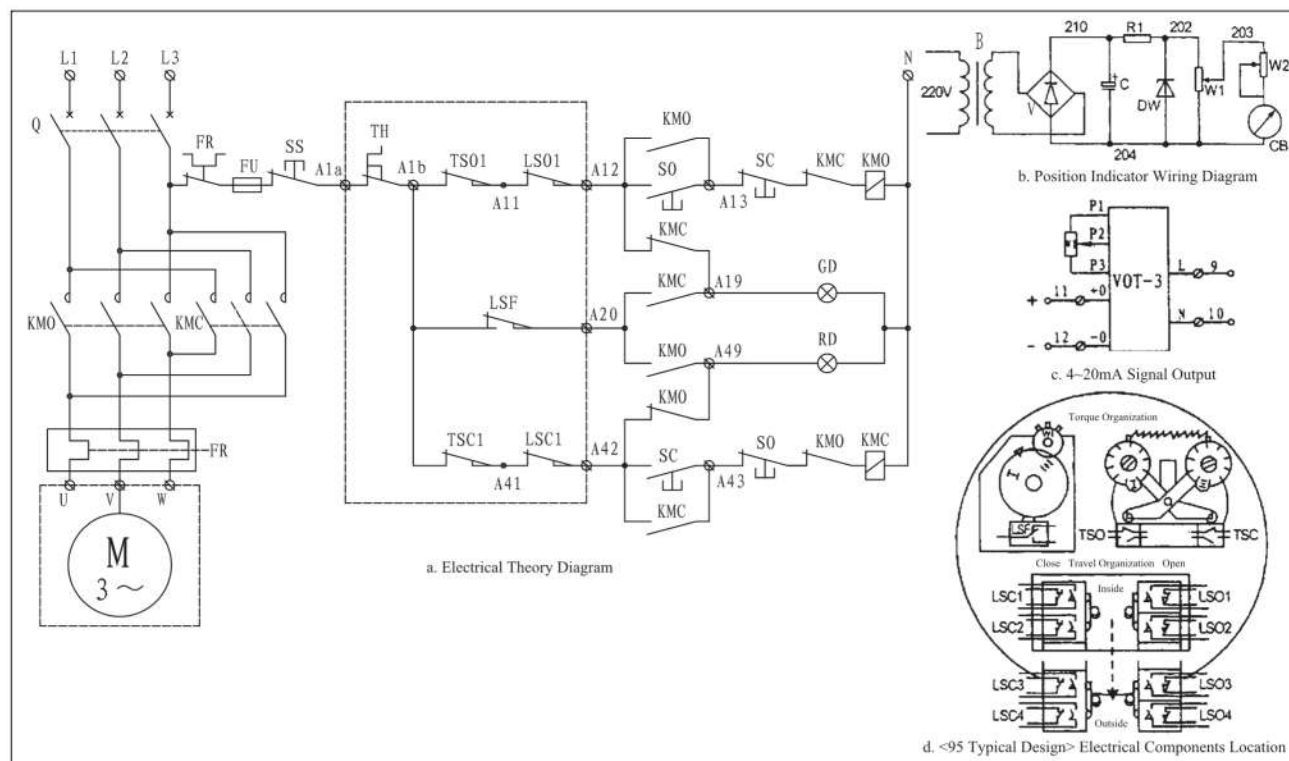
The design offers to users varies control points, and it can be set four units micro-switches maximum on travel control apparatus. Normally we offer products with open & close two micro-switches. Electrical Components inside of actuator see picture 15(b).





EK3Series Electric Actuator

Operation Instructions



Picture 15 Electrical Control Diagram

Form 3 (Standard Type & Explosion-proof Type) Electrical Components

CODE	Name	Model	Qty
KMO, KMC	AC Contacts	CJX2 series	2
FR	Thermal Relay	JR16B	1
LFS	Flash Switch	V—157	1
LSO, LSC	Travel Switch	MK2-1	2
SO, SC	Button	LA11-A11D	2
TSO, TSC	Torque Switch	WK3—1	2
TH	Thermal Switch	T11	1
FU	Fuse	BLX—1	1
CB	Position Indicator	1—10mA	1
W1	Potentiometers	WX14—12-1K	1
RH	Heat Resistance	RX20-25	1
W2	Potentiometers	WX10—2. 2K	1
M	Motor	YDF/YBDF	1
B	Transformer	220V/9V/6V	1
C	Electrolytic Capacitor	220/ μ F, 10V	1
RD, GD	Indicator Lights	ND3 of NDL3	2
VOT	Valve Position Transmitter	VOT-3	1
V	Diode	2CP10	1
Q	Air-Break Switch	DZ47 series	1





IX Testing Instructions

After motor device combines with valve, it does work right after adjusting the torque limit, travel limit and position indicator. Before adjusting, make sure that loose the potentiometer of position indicator. (Loose the fixing screw of the gear on potentiometer in case that it's damaged.) Finally check the rotational direction of motor and the control lines for avoiding out of control.

1. The adjustment of torque limit control apparatus (See picture 7)

It has been preset according to clients' order and normally there is no need to reset again.

2. The adjustment of travel limit control apparatus (See picture 8)

3. The adjustment of fully-close position

3.1 Shut the valve to "fully-close" position by hand wheel

3.2 Press the upper stem with screwdriver and rotate it in 90° then stop.

3.3 Rotate adjusting shaft following close direction until close-direction cam moves.

3.4 Rotate the upper stem to original position.

4. The adjustment of fully-open position

4.1 Open the valve to "fully-open" position by hand wheel

4.2 Press the upper stem with screwdriver and rotate it in 90° then stop.

4.3 Rotate adjusting shaft following open direction until open-direction cam moves.

4.4 Rotate the upper stem to original position.

5. The adjustment of position indicator (See picture 9)

Adjust local position indicator and remote potentiometer after adjusting torque limit and travel limit, and break off the gear of potentiometer before adjusting. Do as following:

5.1 Adjust gear to certain position

5.2 Close valve electrically or manually

5.3 Keep the guide pointer in the same line with close-direction symbol

5.4 Rotate the potentiometer shaft in counter clockwise direction to terminal position then fasten the screws on potentiometer gear.

5.5 Open valve electrically or manually to fully-open position, keep the close-direction indicator still and rotate position indicator making the guide pointer in the same line with open-direction symbol.

5.6 Check flash lights when operate valve electrically, the red light on when valve opens and the red light continuous on when valve in fully-open position; the green light on when valve closes and the green light continuous on when valve in fully-close position

X Installation & Disassembling

1. Installation with Valves

1.1 The motor should be horizontal and the cover of electric compartment is recommended to be horizontal or vertical so as to be convenient for lubrication、wiring、maintenance and manual operation. And the hand wheel must not be installed vertically downward.

1.2 Installation space should be enough for checking and disassembling.

1.3 The axial clearance of the installment and jaw linkage is not less than 1~2 mm.

1.4 For rising stem valve, check if the length of stem extension conforms to the length of stem cap.

1.5 When installing、disassembling and adjusting, explosion proof surface and sealing parts must not be damaged, and must be coated with antirust agent.

1.6 When disassembling of actuator is needed, turn hand wheel several rotations to make valve at a little opened position.



2.Installation with Pipes

The valve combined with actuator must be hung and installed with pipes, and the hanging position must be valve instead of actuator, especially the hand wheel. Make sure the valve in a steady position before hanging or it may fall down with actuator.

XI Maintenance

Keep the actuator in a cool and dry place if it's not able to be installed immediately. If the actuator is installed but without wiring, please use PTFE metal seal to cover the entrance of cable.

XII Errors & Solutions

No	Problems	Reasons	Solutions
1	Motor doesn't work	①Power circuit off ②Trouble with control circuit; ③ Travel limit or torque limit out of control	① Check power supply; ② Remove circuit problem ; ③ Remove the problem of the travel limit or torque limit;
2	The rotational direction of output shaft doesn't follow the rules	Phase of power is not in order	Exchange any two power cords
3	Motor is overheated	①Too long continue operating ; ②Motor doesn't match the actuator; ③One phase is off ;	①Stop operating to make it cool ②Check matching state ③Check power circuit ;
4	Motor stops running during operation	①Actuator is over-loaded ②Valve is in trouble;	①Enlarge torque setting ; ②Check valve ;
5	Motor doesn't stop or lamp doesn't light when valve reaches preset position	①Travel limit or torque limit is out of control ② Travel limit is not proper set;	①Check travel limit and torque limit ②Reset travel limit
6	Remote position signal is unavailable	①Remote position potentiometer fails ②Fixing screw on potentiometer loosen	①Check and replace the potentiometer; ②Fasten the screw

XIII Order Notice

- 1.The products model、 torque (close or open) must be specified, or we provide our own products if there's no requirement.
2. You must describe clearly if the actuator works in explosive environment and it must meet the requirement of explosion-proof standard rule of our instruction
- 3.Please specify the connection dimension standard, stem diameter and extension length clearly .If the connection dimension is different from user's guide, please contact us for solutions;
- 4.Clockwise rotation of hand wheel means closing the valve. Please specify if you need it working contrarily.
5. We also supply electric actuator of other speeds according to the customer's requirements.

WARNING

All the technical data and the information herein are subject to change without prior notice.

Please do read this instruction carefully before using the products of our company.

1. Unnecessary loss or accident will be avoided if you follow the rules of instruction and use the products correctly.
2. Before installation actuators should be stored in clean and dry room. If actuator are placed outdoors, they should be off-ground and avoid moisture and rain.
3. The minimum strength of screw connected to valve is 8.8 level.
4. When manual operation, handle of manual-electric shift should be pushed or pulled in the arrow direction. If it couldn't be pushed down, turn hand wheel while push the handle. After declutching, hand wheel can be operated. Generally hand wheel and output shaft rotate in the same direction. They turn clockwise when closing and counter clockwise when opening. The handle shift will return to original position automatically when device is operated electrically. Be sure not to pull back forcibly or the actuator will be damaged.
5. The stem jacket or stuffy lid on the devices should be tightened. When repairing or maintaining, the device top should be covered

to prevent dust, sand or other objects into the cavity which causes the stem and stem nut damaged.

6. Forbid opening the electric covers and sealed parts on rainy days outdoors.
7. Keep the LCD windows away from hard objects.
8. In explosive environments any trial or adjustment of electric operation with cover removed from electric box is forbidden. Cut power off firstly.
9. When installing, disassembling or adjusting, explosion-proof surface and sealed parts must not be damaged. After re-installing, cover of electric compartment, motor and other sealed parts must be tightened and fastened for avoiding moisture and rain.
10. Actuator of our company is specialized one for valve, which is short-term work duty. The maximum continuing work time should not be over the mark number on label.
11. Check and maintain the valve at regular intervals when it doesn't operate frequently. Checking it round 10 minutes each time and once per month is suggested.

