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ELECTRIC INTELLIGENT ACTUATOR
ELECTRIC VALVES

AOX-M
Electric Actuator

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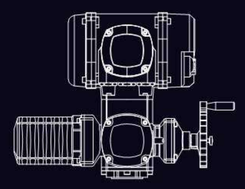

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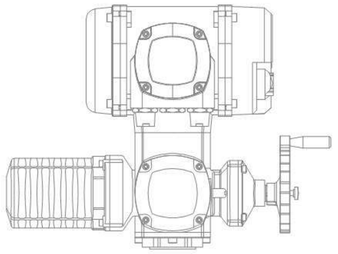

AOX-M
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AOX was founded in 1997. With decades of profound understanding of products and rich industrial application experience, rigorous manufacturing process and modular precision design, AOX provides the most professional automatic control products and solutions for various severe working conditions (such as military, nuclear and other fields). Whether in harsh environments or under various operating requirements specified by users, AOX actuators can not only meet high safety standards, but also prove the reliability and robust design of their products.

AOX has always focused on the modular design of products. The diversified components ensure that the products can be assembled according to customer needs, and provide various customized products to meet customer needs.

Field Case

Electric Power

Petroleum

Chemical industry

Water treatment

Food field

Metallurgy

Honors and qualifications

First tier supplier of CNPC
Sinopec Supplier
National Specialized and Innovative Small Giants
National Intellectual Property Advantage Enterprise
National high-tech enterprises
National Technological Innovation Fund for Small and Medium sized Enterprises
National Torch Plan Industrialization Demonstration Project
Provincial High tech Enterprise Research and Development Center
Provincial science and technology new products
Provincial Science and Technology Progress Award
Provincial patent demonstration enterprise
AAA Credit Enterprise
WenZhou specialized, special and new key supporting enterprises
WenZhou Famous Brand Products
EU CE certification
DNVGL certification
CCS certification
ATEX certification
SIL3 certification
CCC certification
ISO9001 / ISO14001 / ISO45001

Product Overview

The "AOX-M" series is used to operate valves that rotate 360° in multiple revolutions, such as gate valves and globe valves. Combined linear thrust unit, base and inflection arm, gearbox and other mechanical components control other types of valves, such as butterfly valves, ball valves, dampers, baffle valves, plug valves, louver valves, etc.

Description

- Torque range: Direct mounting:30-1000Nm,with gearbox:100Nm~500KNm
- Ex db Ⅱ C T5 Gb/Ex tb ⅢC T100℃ explosion-proof housing available (ATEX type optional)
- Certification:CCC, ATEX, CU–TR, EAC, CE, SIL3, WF2
- Basic control mode:
  - — ON-OFF MODEL
  - — MODULATING MODEL
  - — CONTINUOUS MODELING MODEL
- Different control types are available according to customer requirements:
  - — ON-OFF TYPE
  - — LIGHT INDICATING TYPE(LCU)
  - — NON-INVASIVE INTEGRATED TYPE (SRCU)
  - — INTELLIGENT TYPE (ICU)
  - — FIELDBUS TYPE(ICU+SINGLE/DOUBLE CARD+ FIELDBUS NAME)
- Solutions for special applications:
  - — Split type
  - — Crutch arm bracket
  - — Internet of Things

Certificate of Compliance

SIL
Functional Safety Certificate

中国国家强制性产品认证证书

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Working Environment

Sealing protection ---------- Conforms to GB/4208-2017 standard, IP67 (standard, all connection surfaces are set with O-ring seal) protection level, available Optional IP68 (double O-rings are set on all connecting surfaces).

Explosion protection level---------- According to GB/3836, IEC, CU-TR standard, Exd design. ATEX, CCC certification, meet all potential in explosive environments (such as oil, gas, chemical, power, metallurgy and the emerging gas industry, etc.).

Anti-corrosion protection ---------- Is anodized and polyester powder coated, standard color is AOX grey (similar to RAL7039), corrosion resistant Strong corrosion resistance, suitable for working conditions such as industrial corrosive environment (chemical, alumina plant) or marine corrosive environment (offshore/sea).

Ambient temperature---------- Standard:
ON-OFF TYPE (-30 ℃~+75 ℃)
INTELLIGENT TYPE,NON-INVASIVE INTEGRATED TYPE (-25℃~+70℃)
LIGHT INDICATING TYPE (-25℃~+70℃)
Low temperature:
ON-OFF TYPE (-60℃~+70℃)
INTELLIGENT TYPE,NON-INVASIVE INTEGRATED TYPE (-60℃~+70℃)
LIGHT INDICATING TYPE (-60℃~+70℃)

Basic Control Methods

According to EN 15714-2 standard, to meet different application conditions and designs, there are three basic control methods as follows

Type I On-Off type

The actuator drives the valve from fully open to fully closed or fully closed to fully open.

Type II Modulating Type

The actuator sometimes needs to drive the valve to any position (fully open, midway position and fully closed).

Type III Continuous Modulating Type

The actuator frequently drives the valve to any position between fully open and fully closed.

For continuously adjustable actuators, the number of starts allowed and the load conditions are additionally referenced to the characteristics.

The on-off type or modulating type is selected according to the different mechanical loads of the actuator. Therefore, each actuator type can be used in various operating modes.

		On-Off type	Modulating Type	Continuous Modulating Type
	Working mode	S2-15min/30min	S4-25%~50%	S4-75%~100%
Applicable control functions	Model Name			
	Fieldbus Type	ICU+Modbus/Profibus/Hart		Continuous Modulating Type
	Intelligent Type	ICU		Continuous Modulating Type
	Non-Intrusive Intelligent Type	SRCU	SRCU	/
	Light indicating type	LCU	/	/
	General Type	On-Off type	/	/

Note: the number "1" after the model represents the voltage AC 1ph; "2" stands for voltage AC 3ph; "3" represents voltage DC, such as SRCU2 (AC 3ph Non-Invasive Integrated Type)

Control Functions

AOX actuators can be integrated into any automation system and it is advisable to choose an actuator with more than non-intrusive integrated functions during the product selection phase, thus saving a lot of time in project planning, installation and documentation required to select external controls. AOX offers a wide range of control functions, so customers can choose the best solution for their needs.

Intelligent Type (ICU)

The ICU control system has comprehensive configuration capabilities for all actuator control functions and supports many different fieldbus controls.

LCD display

- Digital display of opening percentage, accurate to 0.1%
- Valve position can still be displayed locally when the power is off (optional)
- Fault self-diagnosis function display, such as: valve position error,torque overload, motor overheating, etc.

Non-Intrusive commissioning

- Infrared remote control: convenient for remote operation and setting various functions
- The menu can be set through the field control knob, remote control and Bluetooth (optional)

Electronic torque (Optional)

- Torque range adjustable, display running torque, percentage form display

Absolute encoder

- No battery support, high precision recording of valve position

ESD function

- In case of emergency, the ESD signal can override any on-site or remote signal (according to the parameter setting) to force the actuator to close or open the valve.

Fieldbus control (Optional)

- Many different fieldbus systems, such as Profibus, Modbus, Hart, FF,etc

Non-Invasive Integrated Type (SRCU)

When the application requires adaptive control function, configurable user interface or intelligent diagnostic function requirements , the choice of non-invasive integrated function will be the perfect solution.

LCD display

- Chinese/English switch(optional), Digital display of opening percentage
- Valve position can still be displayed locally when the power is off(optional)
- Fault self-diagnosis function display, such as: valve position error, torque overload, motor overheating, etc.

Non-Intrusive commissioning

- Infrared remote control(Optional): convenient for remote operation and setting various functions
- Menu setting by field control knob or remote control

Electronic torque(Optional)

- Torque range adjustable, display running torque, percentage form display

Absolute encoder

- No battery support, high precision recording of valve position

Status indicator

- Full Open
- Full Close

Light indicating type(LCU)

The LCU function meets basic intelligent design requirements and customized features.

When the actuator is powered on, it can be operated via the local control knob.

The lights are used as visual signals to indicate the status of the actuator and are clearly visible even from a distance.

Local operation/Local control

- Operation: The selector switch can be locked in all three positions LOCAL-OFF-REMOTE
- On and off knobs

Status indicator

- Power supply
- Status display
- Integrated fault signal
- Full Open
- Full Close

ON-OFF Type

Position indicator

- The visual position indicator provides a clear indication of the current valve position. The indicator is mechanically connected to the valve spindle.

The torque sensor

- Once the torque is set, the ejector rod compresses the spring and the switch trips.
- Because this unique system is mechanically frictionless and can achieve excellent accuracy and repeatability, the equipment can operate reliably for a long time without the support of accessories, such as batteries.

In addition to the above functions, if you have other needs, please contact us.

Simple and Clear Operation Mode

AOX pays special attention to the development of user friendly interfaces. For intelligent type(ICU), a clear and intuitive user interface makes it easier to store and retrieve actuator data.

1 LCD

The LCD interface is designed according to the user's vision and operation habits, and is displayed in plain text, with Chinese/English available for users to choose.

2 Status indicator

The indicator light is used as a visual signal to display the status information of the actuator, and it can be freely programmed and configured according to requirements. Even if viewed from a distance, the ignition of the LED indicator light is clear and recognizable.

3 Selection of control mode

The local control knob (LOCALISTOP/REMOTE) installed on the local operation device can be used to set the remote operation (remote control) or local operation [local control] mode.

4 Operation and parameter setting

According to the selected switch position, the local control knob (LC/LO) can be used to start electric actuator operation, status request, menu navigation and other functions.

5 Display of valve position

Even if viewed from a distance, the valve position can still be clearly seen through the crystal display interface of super large liquid.

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5
At Rest
66.6%
B76 Remote C22

6
At Rest
12.0%
C12 Remote C22

7
Alarm Record
Enter?

8
Limit Setting:
Enter?

9
MOT. OverThermal
52.6%
B69 Local C22

10
Input Senior
Password:
0**

6 Display of operating commands/set points

The operation command and set point sent by DCS system can be displayed through LCD display interface.

7 Display of diagnosis/monitoring

During equipment operation, environmental conditions and operation status are continuously monitored. When the allowable range is exceeded, such as operation time, the intelligent control unit (ICU) will generate a warning signal.

8 Non intrusive setting

The actuator equipped with a high intelligent control unit can be set through the local control knob or remote controller without opening the actuator end cover.

9 Fault display

In case of any fault, the fault cause can be inquired through the LCD interface.

10 Password protectio

The intelligent (ICU) has perfect 3-level password protection, which can authorize different customers or operators separately to prevent actuator failures caused by wrong parameters.

All parameter settings of the device do not require any other setting tools.

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Product Characteristics

1 Terminal box

The terminal box with double sealing protection design also ensures the sealing integrity of the electrical parts inside the electric device when the terminal box cover is opened for field wiring.

2 Motor

Specially designed motors with high starting torque allow frequent opening of valves from the fully closed position. The motors developed by AOX-M meet this basic requirement. In addition to the normally used 3-phase AC motors, single-phase AC motors and DC motors are available separately for the AOX-M series actuators. The use of special voltages should be determined in advance by communication with our technical service staff.

3 Valve control

Eliminates the traditional potentiometer test valve position and uses magnetic induction absolute encoder to improve position accuracy and to record valve position accurately and reliably without batteries when the actuator is powered down.

4 Infrared Setting

Through the sealed indicator window, all settings and diagnostics of the actuator can be performed without opening the electrical box cover in the field and exposing the internal control circuitry.

5 Local control

The field control switch and latching field/stop/remote selector are magnetic switches without a through shaft, controlled by the internal reed of the actuator, ensuring the actuator is sealed against moisture.

6 Manual operation

The multi-turn actuator can be operated with a handwheel during test runs or in emergency conditions. Manual operation is initiated by disconnecting the motor from the actuator by operating the red changeover handle. Because of the self-locking turbine separation between the motor and the operating shaft, it is easy to switch to manual operation even when the actuator is operating at its maximum torque value. After starting the motor, manual operation is automatically disengaged. The handwheel does not operate while the motor operation is being performed. (With clutch diagram).

7 Valve connection standards

Mounting flange in accordance with EN ISO 5210 or DIN 3210 A wide selection of output kit types is available. So it can be applied to different types of valves.

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Valve Drive Connections

The mechanical interface of the valves has been standardized. For the AOX-M series multi-turn actuators, flange dimensions and output drive types are in accordance with EN ISO 5210 or DIN 3210.

1 Flange and hollow shaft
The hollow shaft transmits the torque to the output drive sleeve by means of an internal spline. As standard, the output flange is machined with a locating boss.

2 Output drive sleeve with external spline
Flexible solution for all output drive types. For B1, B2, B3 or B4 output drive types, the bore of the sleeve is machined to the appropriate size. For any of the following output drive types, the output drive bushings only serve as a connection.

3 Output drive bushing A bracket
The actuator operates with the stem in a non-rotating raised or lowered condition. The stem nut with mounting flange and axial bearing are assembled as a single unit, suitable to withstand thrust/tension forces.

4 Planetary gear reducer
The torque of the motor is amplified by the planetary gearbox, and a small power motor can be selected to achieve a large torque output. The high speed of the motor is converted to the low speed required by the actuator, and the reduction ratio is an exact positive integer.

The partial rotary actuator is connected to the valve in accordance with EN ISO 5211. As with the output drive bushings of the AOX-M series multi-turn actuators, the actuators are supplied with a splined bush for torque transmission.

1 Flange and output shaft
The output shaft transmits the torque to the splined bushing via an internal spline. The output flange is machined with a locating boss in accordance with EN ISO 5211.

5 Keyway bore
According to EN ISO 5211, the spline bushings can be machined with 1, 2, 3 or 4 keyways. The keyway complies with DIN 6885, part 1. Please contact AOX if special dimensions are required for the keyway.

6 Solid spline bushings
Standard equipment. Bore machining will be done at the valve manufacturer or on site upon specific request.

7 Square bore
According to EN ISO5211 standard.

8 Double flat face bore
According to EN ISO5211 standard.

If you have special size requirements, please contact us.

Bus Control

Reducing cost is the most critical factor for the wide application of fieldbus technology. In addition, the use of serial communication to control field devices and actuators in process automation is considered to be the most innovative way. The benefit improvement of the factory, such as remote parameter setting or factory asset management, cannot be achieved without fieldbus technology. AOX series electric actuators equipped with field bus interface have the most advanced technical level in the world.

AOX Fieldbus Device

Many different fieldbus systems have been widely used, and the accuracy of parameter setting is constantly being improved at a local level or in a specific field application. AOX series electric actuators are widely used in various process automation control fields around the world, and have established their application status in all field bus industries.

- Profibus DP
- Modbus RTU
- HART
- FF

In a word, AOX equipment has the communication ability to connect other binary and analog input signals to the field bus.

Communication - Bus

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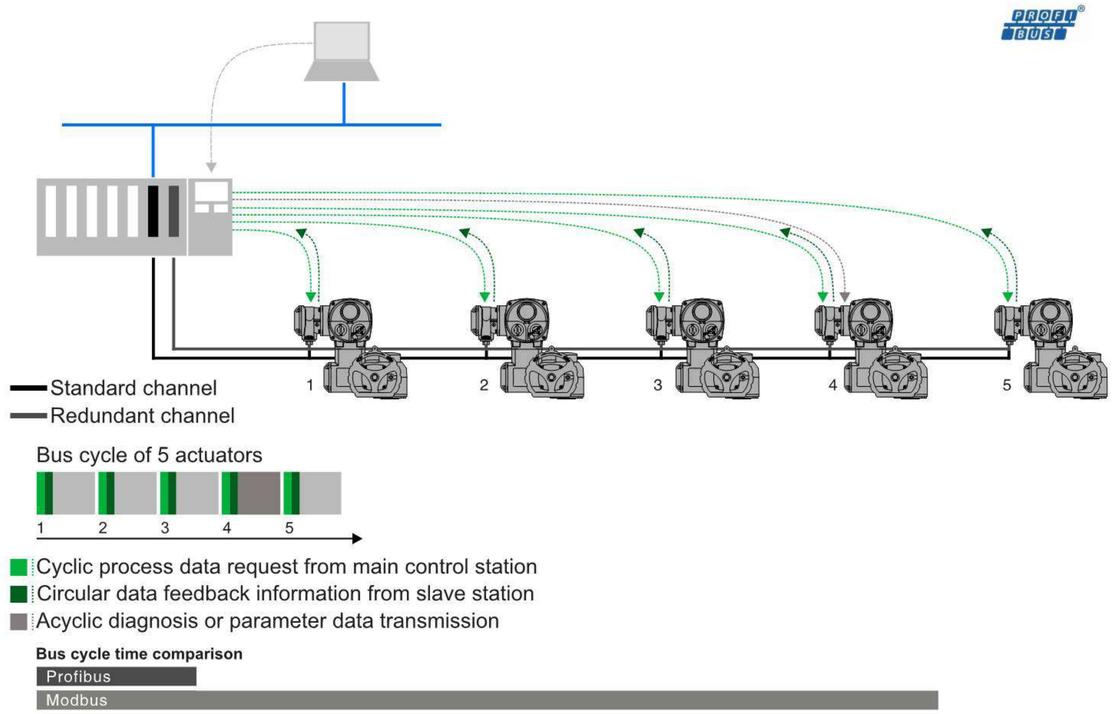
Profibus DP Protocol

Profibus is a perfect version of field bus: Profibus PA is used in the field of process control, and Profinet is a new generation of automation bus standard for data transmission based on Ethernet and Prfibus DP, mainly used in plant power plants and automation equipment. Due to its simple and durable physical layer (RS-485) and different versions of DP-VO (fast cycle deterministic data exchange), DP-V1 (acyclic access to equipment parameters and diagnostic data) and DP-V2 (more functions such as time stamping or redundancy), Profibus Dp is the most ideal solution for modern chemical plant automation.

- Conform to international standard IEC 61158/61784 (CPF3)
- Large installed capacity
- Standardized integration in DCS (FDT, EDD)
- Wide range of equipment selection
- Typical application environment: power plant, sewage treatment, water purification, tank farm



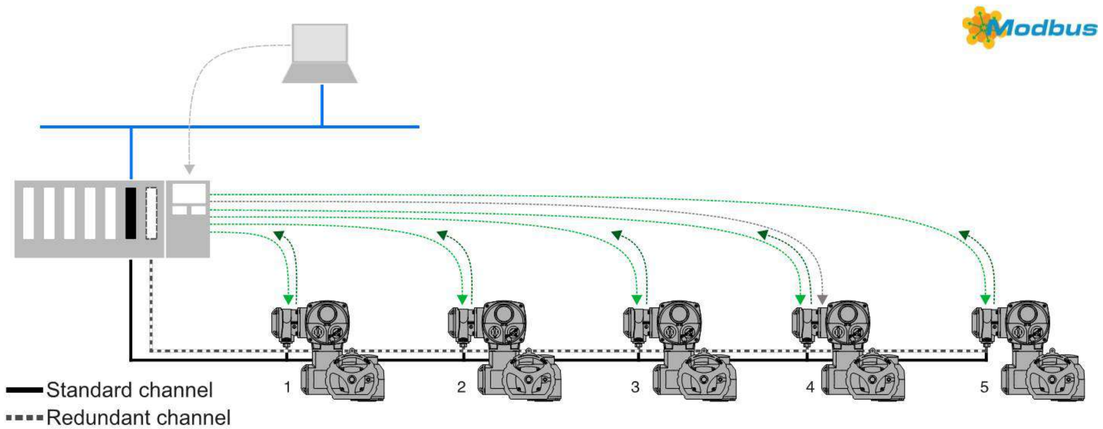
Modbus RTU Protocol

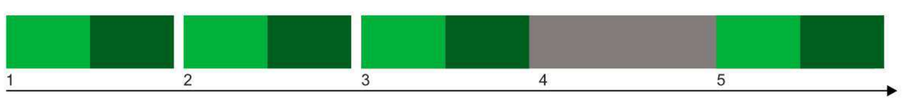
Compared with other field bus technologies, Modbus is a relatively simple but powerful field bus protocol. It can provide all services required by factory automation, such as simple binary information, analog information, equipment parameter information or diagnostic data exchange.
In the field of industrial automation, simple and stable RS-485 physical links are often used. Based on this physical link, Modbus supports multiple transmission modes, such as Modbus RTU or Modbus ASCII. The Ethernet based Modbus TCPIP version is often deployed to the vertically integrated host automation system.

- International standard IEC 61158/61784 (CPF15)
- Simple protocol
- Global promotion and application
- Communication sufficient to complete multiple simple automation tasks
- Typical application environment: water treatment and sewage treatment, pump station, tank farm

AOX-M Series Actuator Configured With Modbus RTU

- Fast data exchange
  (up to 115,2 kbit/s - corresponding to approx. 20 ms/actuator)
- The cable length can reach about 10 km
  (1200 m without repeater between two actuators)
- Up to 247 field devices can be connected
- Available: redundant linetype topology
- Optional: data is transmitted through optical fiber cable





Cyclic process data request from main control station
Circular data feedback information from slave station
Acyclic diagnosis or parameter data transmission

Bus cycle time comparison

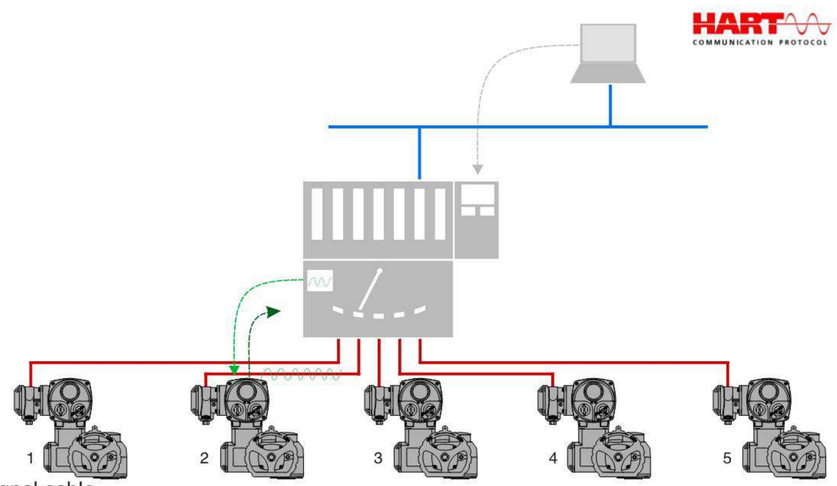
HART Protocol

HART uses 4-20mA standard signal to complete analog data transmission. HART communication is to superimpose digital signal on analog signal.
Advantages: HART protocol realizes synchronous transmission of digital signal and analog signal, that is, digital signal communication is completed in the existing 4-20mA analog system, and process parameters and diagnostic data can be easily read from field equipment at any time.
HART is designed based on the principle of master control station slave station, providing multiple instructions for data transmission. The traditional 4-20mA point-to-point wiring mode is usually used.

- International standard IEC 61158/61784 (CPF9)
- Global promotion and application
- Large installed capacity
- Standardized integration in DCS (FDT, EDD)
- Wide range of equipment selection

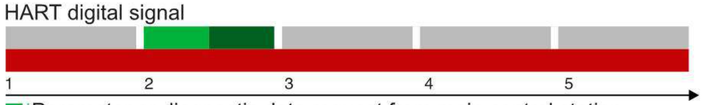
AOX-M Series Actuators Configured With HART Protocol

- 4-20 mA HART analog signals are used to transmit setpoint signals or signals are alternately transmitted actual
- The position signal transmits process parameters and diagnostic data through HART digital communicatio
- Digital communication of each actuator is about 500 ms
- Communication with DCS via EDDL
- Cable length can reach about 3 km



Traditional 4-20mA signal cable
HART digital signal

HART digital signal



Parameter or diagnostic data request from main control station
Feedback information of parameters or diagnostic data sent from the slave station
Analog process signal

Product Specifications

General specifications	
Torque range	・Direct installation: 30-1000Nm ・With gearbox: 100Nm~500KNm ・Larger or quick opening optional AOX-M-Z series
Shell material	Hard aluminum alloy, Ductile iron
Position indicator	Even in case of power failure, the valve position dial can display continuous position changes
Tightness	
External corrosion protection	Paint system
	・Polyester powder coating conforms to GBT 18593-2001 standard ・Optional protection for highly corrosive condition
	・Screws are all stainless steel screws
Travel/limit	
Trave	⩾360°
Limit switch	2×Open/Close, SPDT, 250V AC 10A
Auxiliary limit switch	2×Open/Close, SPDT, 250V AC 10A
Torque switch	On/Off,SPDT, 250V AC 10A
Mechanical specifications	
Self locking device	Worm gear and worm mechanism provide self-locking
Output flange	The bottom installation dimension shall conform to ISO5210 international standard
output shaft	The output shaft drive sleeve can be disassembled and machined for adaptability. Can be installed vertically or horizontally
Seismic performance	X YZ10g, 0.2~34 Hz, 30 minutes
lubrication	Shell special motor oil
Manual operation	Mechanical clutch mechanism
Handwheel	Reliable, labor-saving, small size
Electrical specifications	
Motor power supply	Standard: 380V AC 3Phase, 50/60Hz,±10%
	Optional: 440V AC 3Phase, 220V AC 1Phase,50/60Hz,±10%
Electric machinery	Squirrel cage asynchronous motor, insulation class H
Failsafe/Operating Temperature	Built in thermal protection, open/close 120 ℃± 5 ℃
Heater	30W(220V AC) Anti condensation
Cable entry	Double sealed 3 cable entry (NPT 3/4 ", NPT 1", NPT 1-1/2 "optional)
EC Directive	
Conformity with EC Directives	The actuator meets the following requirements
	・2014/30/EU Electromagnetic Compatibility ・2014/35/EU Low Voltage
	The following harmonized standards:
	・General emission standard for industrial environment EN 61000-6-44 ・Rotating electrical machine standard EN 60034-1
	・General anti-interference standard for industrial environment EN 61000-6-4

Standard Parameters

Model	Output torque	Speed	Shaft diameter	Motor (H)	Rated current（A）50Hz	Flange	Weight
	N·M	RPM	mm	W	380V AC	ISO5210	Kg
AOX-M-007	70 70	45 90	Φ28	400 400	2.23 2.66	F10	24
AOX-M-010	120 120	35 70	Φ28	600 600	2.33 3.56	F10	32
AOX-M-020	300 300	34 67	Φ40	1100 1100	4.22 6.95	F14	65
AOX-M-050	450 450	34 67	Φ40	1100 1500	9.58 12.23	F14	65
AOX-M-060	600 600	34 67	Φ55	3000 4000	13.86 16.26	F16	103
AOX-M-080	800 800	34 67	Φ55	3000 4000	17.87 24.31	F16	103
AOX-M-100	1000	34	Φ55	4000	18.68	F16	103

The above time is the regular time of the actuator. If you need special time, please contact our company.

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Additional Mechanical Components

Other types of valves can be controlled by combining the AOX-M series multi-turn electric actuator with the following mechanical components.

The linear thrust unit can be configured to form a direct stroke actuator for regulating valves, etc.

- Thrust: 10 ~ 160 KN
- Stroke: 16 ~ 100 mm（other strokes can be customized）
- Speed: 3.4 ~ 7.5 mm/S（according to stroke)）

By configuring partial rotary gearbox, it can constitute a large torque partial rotary actuator, which is suitable for butterfly valve, ball valve plug valve, etc.

- Torque: 0.2 ~ 1000 KNm
- Speed: 0.2 ~ 43r/min

By configuring the multi-turn gearbox, it can form a multi-turn actuator with large output torque, which is suitable for gate valve, globe valve, etc.

- Torque: 0.1~100 KNm
- Speed: 2 ~ 600s

By configuring the inflection arm gearbox, it can constitute an inflection arm actuator, which is suitable for dampers, stall valves and butterfly valves, etc.

- Torque: 0.2 ~ 1000 KNm
- Speed: 0.2 ~ 43r/min

Solutions for special applications

Split type
The control unit with control function can be individually split-mounted when the valve is installed in a location that is difficult for personnel to access or where there is extreme vibration or ambient temperature. The cable length between the actuator and the control unit can be up to 100m, and the split can be easily reinforced or relocated at any time.

Free adjustment of the mounting position
The optimum mounting position can be adjusted to avoid upside down displays, inoperability, uneven cable sealing of the control unit, etc. The appropriate position can be easily selected.
Adjustment of the control unit components per 90° rotation is possible: between the control unit and the actuator, between the local control interface and the control unit, and between the electrical connection and the control unit. The electrical connections make it easier to adjust the installation position in the field.