FIRST FLOW CONTROL SOLUTION

FFC Intelligent
Electric Actuator

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PROVIDING PROFESSIONAL CONTROL VALVE SYSTEM SOLUTIONS

Version 8.7

OVERVIEW

Resumo

FFC IS A SUB-BRAND OF MATERIAL PIONEER INC. (ESTABLISHED IN 1903) IN THE UNITED STATES.

FFC FOCUSES ON THE FIELD OF FLUID CONTROL FOR OIL, WATER, GAS AND OTHER FLUIDS. RELYING ON MPI'S ALGORITHMIC ADVANTAGES IN THE FIELDS OF MATERIALS, POWER AND CONTROL, IT TAKES A SERVICE LIFE MORE THAN TWICE THAT OF THE INDUSTRY'S BS EN15714-2 STANDARD AS ITS ENTERPRISE STANDARD TO CREATE DURABLE, RELIABLE, HIGH-PRECISION, ENERGY-SAVING AND HIGHLY INTELLIGENT ACTUATORS.

ONE CENTER: TIANJIN R&D AND OPERATION CENTER (NATIONAL-LEVEL HIGH-TECH);
THREE FACTORIES: JIANGXI CHINA, THE UNITED STATES, AND GERMANY (UNDER PREPARATION);
NETWORK ACROSS FIVE CONTINENTS: THE UNITED STATES, BRAZIL, ARGENTINA, GERMANY, POLAND, THE NETHERLANDS, SINGAPORE, INDONESIA, DUBAI, ANGOLA (CONTINUOUSLY EXPANDING).

INHERITING THE GREAT VISION OF ITS PARENT COMPANY TO PROMOTE HUMAN INNOVATION AND PROGRESS AND BUILD A BETTER WORLD, FFC IS COMMITTED TO MAKING HIGH-QUALITY PRODUCTS. IT INTEGRATES R&D, MANUFACTURING, SALES AND AFTER-SALES SERVICE TO BUILD ITSELF INTO A CROSS-DISCIPLINARY, TECHNOLOGY-INTENSIVE AND HIGH-END FLUID CONTROL TECHNOLOGY BRAND IN THE FIELD OF ELECTRIC ACTUATORS.

PRECISE INTELLIGENT CONTROL, ENERGY-SAVING AND RELIABLE — LEADING THE WORLD IN THE NEW DECADE!

CONTENTS

01.Brand Overview

● Application Fields

FFC electric actuators can be widely applied in industries such as oil and gas, chemical industry, electric power, biology, medical care, shipbuilding, water utilities, steel, cement, and papermaking.

● Leading design concept in the industry

Applying the first principles, it has broken through the traditional design framework of nearly 20 years and led the new trend of the industry. By integrating more advanced intelligent management concepts, it has greatly improved the operating efficiency and safety of equipment.

● Heavy Industry-Grade Electric Actuator

Taking a service life more than twice that of the BS EN15714-2 industry standard as its enterprise standard, FFC has collaborated with leading heavy industry precision reducer manufacturers from Germany and Japan to research and develop cross-level technological applications, creating extremely reliable products.

● Diversified product series

- EFX-D Multi-turn Electric Actuator Power Frequency Series
- EFX-Q Quarter-turn Electric Actuator Power Frequency Series
- EFX-D Multi-turn Electric Actuator Variable Frequency Series
- EFX-Q Quarter-turn Electric Actuator Variable Frequency Series

● Steward-style After-sales Service

The after-sales service team possesses extensive professional knowledge and experience, enabling them to resolve various issues quickly and accurately. Whenever and wherever users encounter problems, the after-sales service team responds promptly and provides timely assistance and support.

02.Caracteristicas do produto

Global Market Positioning: Top 1%
Features: Durable, Precise, High Reliability, Intelligent, Energy-Efficient

● Industrial Design

The brand-new industrial design shape represents the product's uniqueness, innovation, and strong vitality.

● Excellent Protection

Self-owned foundry controls the shell quality from the source; Protection: IP68, Explosion-proof: Ex d IIC T6.

● Human-Computer Interaction (HCI)

The UI display is concise, with simple operation and easy debugging. The actual valve position can also be displayed even when the power is off.

● Transmission Design

Supported by heavy industry reducer technology, the service life achieves a breakthrough;Scientific structural design ensures higher energy efficiency.

● Ultimate Performance

Precision reducer-level accuracy control;High-efficiency motor: powerful and stable, low temperature rise, adaptable to harsh working conditions;

● Intelligent Advancement

It supports multi-country IoT connectivity, Bluetooth, data download, exclusive OTA updates, one-click auto-tuning via APP, fault early warning, and high/low temperature resistance design.

03.Vantagens do produto

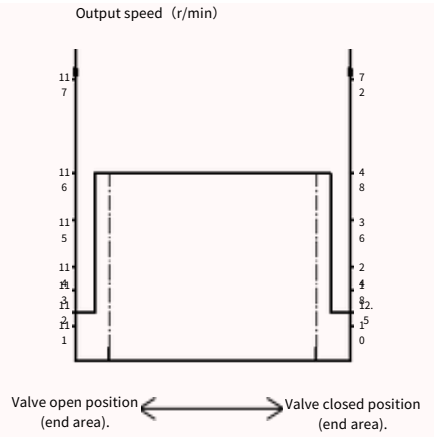
3-1 The permanent magnet synchronous motor (PMSM) precisely controls the output speed, torque and position, and has numerous advantages.

● Soft Start and Soft Stop

Effectively mitigates the impact of the motor on the valve and extends the service life. Meanwhile.

● Intelligent Torque

During the valve opening and closing process, when fluctuations in valve torque occur, the output torque is precisely controlled within the set range.



● Protect the Motor

It is equipped with multiple protection mechanisms such as temperature, voltage, and current protection, reducing the risk of motor damage.

● High-Precision Control

Precise speed loop and position loop control for servo motors, meeting the requirements of harsh operating conditions

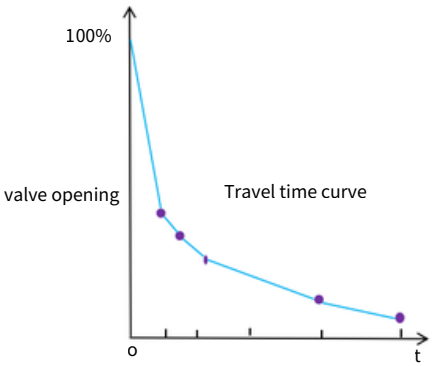
The valve will move into the open and closed positions at a preset low speed while maintaining the set maximum torque, enabling smooth opening and closing to reduce impact on the valve.

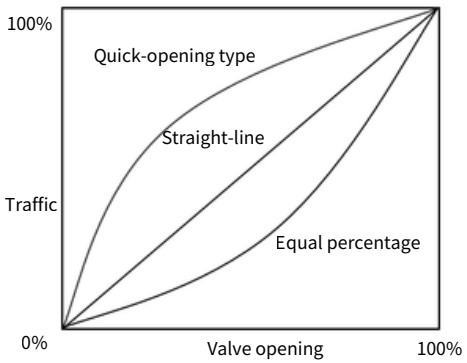
03.Vantagens do produto

3-2 Precise control of valve interval flow to meet production process requirements.

Set the actuator to stepped output speed to adjust the valve's interval flow and meet the production process requirements.

During normal operation, the actuator controls the output speed through changes in the predefined 4-20mA analog input signal.





04.Overview of the Design Scheme

The EFX series intelligent actuator is composed of a motor, a reducer, and a control module. It is professionally used for valve automation, and its appearance adopts a "minimalist" design.

● 4-1 Product Design Life (Exceeding the Requirements of the BS EN 15714-2 Standard)

Product type	Load Rating（CLASS）	Load(N.m)	FFCProduct life	Design standard
Multi-turn (EFX-D)	A/B	⩽700	15000times of cycles	BSEN15714-2 ISO5210 ISO5211 IEC 60034-1 ISO22153
	A/B	701-2500	10000times of cycles	
	C	⩽700	1800000times of starts	
	C	701-2500	1200000times of starts	
Part-turn (EFX-Q)	A/B	⩽2000	20000times of cycles	
	A/B	2001-4000	10000times of cycles	
	A/B	4001-32000	5000times of cycles	
	C	⩽1000	1800000times of starts	
	C	1001-4000	1200000times of starts	
	C	4001-32000	50000times of starts	

● 4-2 Load type

The load requirements in BS EN15714-2 standard are applicable to electric actuator products.

Actuator model	Load rating	FFC Rated Load	Design standard
EFX-D（On-Off）	A/B	60t/h，S2-15Min	BSEN15714-2 ISO5210 ISO5211 IEC 60034-1 ISO22153
EFX-D（Modulating）	C	1200t/h，S4-50%	
EFX-Q（On-Off）	A/B	600t/h，S2-15Min	
EFX-Q（Modulating）	C	1200t/h，S4-50%	

(1) BS EN15714-2 defines the requirements for load, cycles and start-up times.
(2) The load is limited by model, torque, speed and voltage.

● 4-3 Vibration, shock and noise (ISO3945)

Vibration	All vibrations accumulate less than 1g RMS in the frequency range of 10 to 1,000 Hz.
Impact	5g peak acceleration.
Earthquake resistance	If operation is required during and after vibration, the frequency range is 1 to 50 Hz and the acceleration is 2g.
Noise	After individual testing, the noise generated at a distance of 1 meter from the actuator does not exceed 70 dB(A).

The above parameters refer to the parameters at the connection interface of the actuator. It should be noted that vibration can be accumulated. Therefore, long-term exposure to high-level vibration may reduce the service life of the actuator. If there is frequent vibration on site, we recommend changing the direct-connected actuator to a base-type connecting rod connection.

(CONTINUED)

04.Overview of the Design Scheme

● 4-4 Sealing and Protection of the Product

The sealing protection of the EFX series electric actuators complies with the EN 60529 standard. The standard sealing protection rating is IP66/67 (IP68 is optional). IP68 means continuous immersion in water at a depth of 10 meters for up to 72 hours, and 10 operations can be performed during the immersion period.

● 4-5 Corrosion resistance of product casing

All external connectors of the equipment are made of stainless steel, and the outer casing is finished with a painting process. Its anti-corrosion performance meets the requirements of EN ISO 12944-2.

Environmental Classification	Corrosivity Classification of EN ISO 12944 - 2 Standard	anti-corrosion grade	film thickness
There is permanent condensation phenomenon in the long term and in heavily polluted industrial areas.	C5-I	KS	140μm
High salinity, permanent condensation phenomenon in the long term and heavily polluted coastal and offshore areas.	C5-M	KS	140μm

● 4-6 Operating temperature

The EFX series electric actuators are suitable for operation within the following temperature range (for explosion-proof products, refer to the operating temperature limits for protective performance in relevant hazardous areas specified in 4.4). For applications where the temperature is outside this range, please contact FFC technical personnel. The actuators shall be stored in a dry environment at a temperature of -60 to 80 °C before installation.

Actuator type	Standard temperature 1	Low temperature option 1
EFX-D multi-turn actuator	-25 to +80 °C	-60 to +80 °C
EFX-Q quarter-turn actuator	-25 to +80 °C	-60 to +80 °C

04.Overview of the Design Scheme

● 4-7 Valve/actuator interface

Valve type	Actuator series	Area	Standard	Code
Multi-turn actuator	EFX-D	Global	ISO 5210	"F"
Multi-turn actuator	EFX-D	China	JB2920	“Frame size”
Part-turn actuator	EFX-Q	Global	ISO 5211	"F"

If the customer has non-standard sizes, please contact the FFC technicians.

● 4-8 Altitude at which the product is installed

The installation position of the actuator can be up to 2000 meters. Since the higher the installation position, the worse the insulation performance of the air. In high-altitude areas, the maximum allowable voltage drop needs to be considered.

Installation altitude（m）	Voltage drop coefficient	Permissible operating voltage（VAC）
2000	1	460+15%
3000	0.88	405+15%
4000	0.77	355+15%

The FFC actuator can operate safely at an altitude of 4000 meters using three-phase electricity of 400VAC (-15%).

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04.Overview of the Design Scheme

The housing design of the EFX series electric actuators exceeds the highest standards of industry explosion-proof type tests, delivering ultimate reliability for explosive environments.

● 4-9 Multi-Turn Series Explosion-Proof Rating

ATEX CERTIFICATION	II 2G Ex db IIB T4 Gb / II 2D Ex tb IIIC T130°C Db IP68 Ta: −20⋯+70°C (Optional: −40⋯+70°C)
	II 2G Ex db IIC T4 Gb / II 2D Ex tb IIIC T130°C Db IP68 Ta: −20⋯+70°C (Optional: −40⋯+70°C)
	II 2G Ex db IIC T6 Gb / II 2D Ex tb IIIC T80°C Db IP68 Ta: −20⋯+40°C (Optional: −40⋯+40°C)

● 4-10 Explosion-Proof Rating Parameter Table for Quarter-Turn Actuators

ATEX CERTIFICATION	II 2G Ex db IIB T4 Gb / II 2D Ex tb IIIC T130°C Db IP68 Ta: −20⋯+70°C (Optional: −40⋯+70°C)
	II 2G Ex db IIC T4 Gb / II 2D Ex tb IIIC T130°C Db IP68 Ta: −20⋯+70°C (Optional: −40⋯+70°C)
	II 2G Ex db IIC T6 Gb / II 2D Ex tb IIIC T80°C Db IP68 Ta: −20⋯+40°C (Optional: −40⋯+40°C)

04.Overview of the Design Scheme

● 4-11 Manual operation

The manual operation parameters of FFC actuators comply with the standard EN12570.

Parameters of manual operation（EN12570）					
Model	Handwheel diameter (mm)	Optional handwheel (mm)	Maximum operating force（N）	Standard value FS(N)	Manual acceleration speed ratio
EFX-D15	ϕ200	ϕ320	330	700	1:4
EFX-D30	ϕ200	ϕ320	530	800	1:4
EFX-D40	ϕ200	ϕ320	280	700	1:1
EFX-D60	ϕ200	ϕ320	280	700	1:1
EFX-D120	ϕ200	ϕ320	280	700	1:1
EFX-D250	ϕ200	ϕ320	280	700	1:1
EFX-Q(05-50)	ϕ160	无	160	600	1:1
EFX-Q(60-120)	ϕ200	无	300	700	1:1

Note:

1. For the EFX-D, switching to manual operation is only allowed after the motor has stopped running, which maximizes the safety of operators.
2. The EFX-Q does not require switching between manual and electric operation.
3. The manual operation of some EFX-D specifications is designed with a 1:4 speed-up ratio.

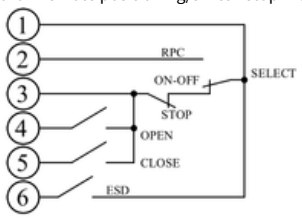
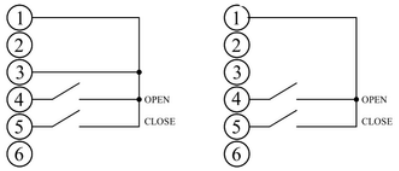
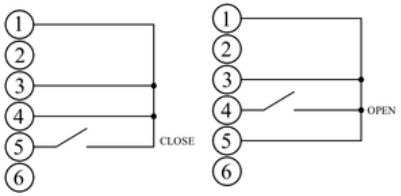
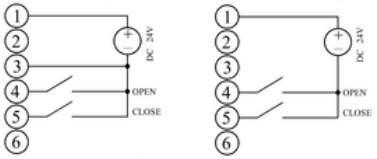
05.Desempenho tecnico

● Technical parameters of EFX variable frequency actuator

Torque range	EFX-D:30-3000N.m; EFX-Q:50-1200N.m	
rotational speed	The rotational speed is adjustable（Refer to the selection parameters in 7.1）	
ambient temperature	-25℃~80℃，or -60℃~+80℃	
Noise level	Less than 70 dB within 1 meter	
Size of the incoming - line port	Multi-turn actuator：3*M25，1*M40；Quarter-turn actuator：4*M25（NPT can be customized）	
Protection Grade	IP67，or IP68 (*Definition of IP68: No leakage within 72 hours at a depth of 10 meters underwater)	
Connection size	ISO5210 (Thrust type or torque type.)， ISO5211	
Motor Specifications	Standard class F motor with thermal protector at 135℃	
Working system	On-off type	S2~15min, no more than 60 starts per hour
	Modulating type	S4-50%, No more than 1200 triggers per hour at most
Applicable voltage	220VAC~380VAC(430VAC~660VAC,DC24V-DC96V customizable)	
Input signal	On-off type	Passive switch quantity control, active 24V DC switch quantity control
	Modulating type	Analog control (4-20mA), bus control (PROFIBUS DP, MODBUS RTU)
Signal feedback output	On-off type	The relay outputs passive switch quantity signals for open in place, close in place, and remote
	Modulating type	The relay outputs passive switch quantity signals for open in place, close in place, remote, and analog signal (4-20mA)
Fault signal	On-off type	Power phase loss、Over-torque protection、Motor over-temperature protection、Signal loss protection、Valve jamming protection、Instantaneous reverse protection、Comprehensive fault alarm
	Modulating type	Power phase loss、Over-torque protection、Motor over-temperature protection、Signal loss protection、Valve jamming protection、Instantaneous reverse protection、Comprehensive fault alarm

06.Funcoes de controle

● 6-1 Control wiring method (terminal numbers are virtual numbers)

Common terminal Remote positioning control (RPC) selection or bus control. Remote switching quantity (ON-OFF) control selection or stop (STOP). Open the valve(OPEN) Close the valve(CLOSE) ESD input	standard Remote positioning/switch stop mode 
Switch Control Mode In the ON-OFF operation mode, self-locking or non-self-locking can be selected.	Self locking No self-locking  When there is self-locking operation, the reverse direction switch closes and stops running, and then moves in the opposite direction.
In the switching control mode and in the switching quantity operation mode, opening/closing the valve has priority	Valve closing priority Valve opening priority 
External supply DC 24V	Self locking No self-locking  When there is self-locking operation, the reverse direction switch closes and stops running, and then moves in the opposite direction.

Notice: 1. Remote positioning control can be remote current 4-20mA positioning mode or fieldbus control.

2. For remote control using 4-20mA analog quantity, please short-circuit terminals “1” and “2”.

CONTROL FUNCTION

06.Funcoes de controle

● 6-2 Fieldbus control

Modbus is the most widely adopted bus communication protocol today, and it features the following characteristics:

- Open international standard.
- High reliability and standardized communication.
- Simple connection and easy configuration.

Modbus®

The FFC bus control system (Modbus) uses two-wire RS485 serial port communication. It can provide a simple and reliable control strategy for automatic valve control.

The FFC Bus Control System (Profibus) has been certified by the PNO-authorized testing laboratory (ITEI, Beijing, China) and complies with the technical specifications of IEC 61158 and EN50170. The system supports the DPV1 and DPV0 protocols.

PROFIBUS®

The DP bus module is installed in the sealed electrical control cavity of the electric actuator. After factory delivery, parameter setting and adjustment are realized through the RS485 serial port.

Baud rate	Maximum segment length	Maximum bus length
9.6K	1200m	10000m
19.2K	1200m	10000m
93.75K	1200m	10000m
187.5K	1000m	10000m
500K	400m	4000m
1500K	200m	2000m

The Relationship between Baud Rate and Distance

The Profibus-DP master station can control the electric actuators equipped with DP modules to perform actions such as valve opening, valve closing, stopping, and ESD operations.

07.Parametros de selecao

● 7-1Selection Range of EFX-D Single-unit Multi-turn (Actuators).

For selections not listed in the table, please contact official channels (Y: Available / N: Not Available)

Model	Torque(N.m)	Speed(r/m)										PW
		24	36	48	60	72	96	120	144	192	VF	
符合EN15714-2工作制的执行机构：CLASS A和CLASS B （出厂默认30%）												
EFX-D15	30-250	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D30	150-450	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D40	200-800	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D60	350-900	N	N	N	Y	Y	Y	Y	Y	Y	N	3 P
EFX-D120	550-1200	Y	Y	Y	N	Y	Y	N	Y	Y	N	3 P
EFX-D250	1000-3000	Y	Y	Y	N	Y	Y	N	Y	Y	N	3 P
符合EN15714-2工作制的执行机构：CLASS C （出厂默认50%）												
EFX-D15	30-150	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D30	150-300	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D40	200-800	Y	Y	Y	N	Y	Y	N	Y	Y	Y	1/3 P
EFX-D60	350-900	N	N	N	Y	Y	Y	Y	Y	Y	N	3 P
EFX-D120	550-1200	Y	Y	Y	N	Y	Y	N	Y	Y	N	3 P
EFX-D250	1000-3000	Y	Y	Y	N	Y	Y	N	Y	Y	N	3 P

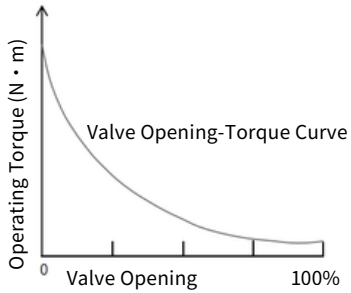
07.Parametros de selecao

● 7-2 EFX-D Combined Type Multi-turn

For selections not listed in the table, please contact official channels (Y: Available / N: Not Available)

Model	GearBox	Torque OC（NM）	Torque MO（NM）	Speed（r/m）	VF	PW
EFX-D15-15-72	GD-0-D	400	320	18	Y	1/3 P
EFX-D30-25-72	GD-1-D	600	480	18	Y	1/3 P
EFX-D30-25-72	GD-2-D	900	720	18	Y	1/3 P
EFX-D30-25-72	GD-3-D	1200	960	18	Y	1/3 P
EFX-D40-40-72	GD-35-D	1800	1440	18	Y	1/3 P
EFX-D60-90-60	GD-35-D	2500	2000	15	N	3 P
EFX-D60-90-60	GD-4-D	4000	3200	10	N	3 P
EFX-D120-120-36	GD-4-D	6000	4800	6	N	3 P
EFX-D250-135-48	GD-5-D	8000	6400	7	N	3 P
EFX-D250-180-36	GD-6-D	10000	8000	5	N	3 P
EFX-D250-300-24	GD-7-D	18500	14800	6.5	N	3 P

When actually selecting and matching a valve, the valve torque should be 0.7 times the rated torque of the actuator. The maximum operating torque will be at least 0.7 times smaller than the calculated value. Moreover, the maximum torque of the valve only reaches its peak within a small area near the open/close positions (as shown in the figure), which also complies with the requirements of the EN12570 standard. FFC can provide customers with handwheels of larger diameters.



07.Parametros de selecao

● 7-3 EFX-Q Single-body Type Quarter-turn Selection Range

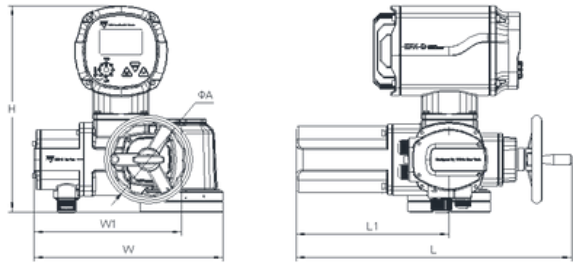
Model number	Torque range (N.m)	Parameter setting						
		Optional over-torque value N.m (adjustable at any time)					Stroke interval (°)	Time S（90°）
Actuators conforming to BS EN15714-2 operating duty: CLASS A and CLASS B								
EFX-Q(05-50)	50-500	100	200	300	400	500	0-270	5-30
EFX-Q(60-120)	600-1200	600	700	800	1000	1200	0-270	5-30
Actuator conforming to BS EN15714-2 operating duty: CLASS C								
EFX-Q(05-50)	50-350	70	150	250	300	350	0-270	5-30
EFX-Q(60-120)	400-850	400	500	550	700	850	0-270	5-30
The stroke and time of the FFC quarter-turn actuator can be set (the factory default stroke is 90°)								

● 7-4 EFX-D Combined Type Quarter-turn/Linear Stroke Selection Range

Electric actuator	Two-stage reducer	Whole machine category	Torque range	Applied valve
EFX-D	Direct-connected quarter-turn reducer	Quarter-turn	1600-350000(N.m)	Butterfly valve, ball valve.
	Base-mounted quarter-turn reducer	Quarter-turn	1600-350000(N.m)	Damper baffle.
	Linear thruster	Linear stroke	3000-100000(N)	Control valve

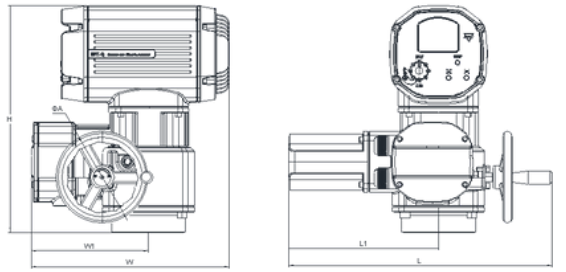
08.Dimensões gerais

● 8-1 EFX-D multi-turn electric actuator outline dimensions



Model	L	L1	W	W1	H	ϕA	Weight
EFX-D15	610	310	415	335	470	200	41Kg
EFX-D30	640	340	428	335	470	200	57Kg
EFX-D40	656	367	462	350	494	200	65kg
EFX-D60	710	400	448	335	510	200	78Kg
EFX-D120	737	435	500	362	512	200	87Kg
EFX-D250	858	496	600	480	566	200	140Kg

● 8-2 EFX-Q quarter-turn electric actuator outline dimensions

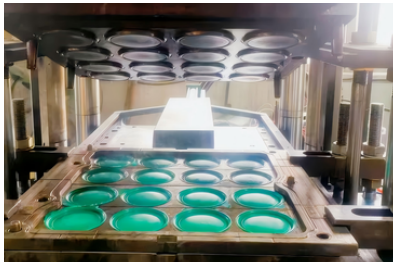


Model	L	L1	W	W1	H	ϕA
EFX-Q(05-50)	445	253	335	198	385	160
EFX-Q(60-120)	468	257	347	211	436	200

09.Garantia de processo

The company has a complete industrial chain of processes including precision casting, copper-aluminum alloy forging, zinc-aluminum alloy die casting, aluminum alloy gravity casting, injection molding, rubber seal molding, sheet metal stamping, and CNC machining. It realizes the independent processing of all important components of electric actuators.

● Main production processes



Precision casting　　Copper-aluminum alloy forging　　CNC machining

Precision casting　　Aluminum alloy gravity casting

10.Garantia de qualidade

● 10-1 Quality control

Assembly and testing: Conduct assembly and testing of various industrial products, with an assembly capacity of 200K sets per year. Possessing multiple testing equipments to strictly control product quality. The base has a complete industrial chain process and complete testing equipments, providing production capacity and quality control guarantees for the production of actuators.

● 10-2 Warranty and after-sales service

The warranty period of the electric actuator is 1 year. In case of failure during the warranty period, please contact the after-sales department of our unit. The after-sales engineer will respond within 2 hours to help quickly solve the problem.

Design details of EFX-D

1. Frequency conversion control, intelligent slow start and stop.
2. Large-sized color screen design with long-distance visibility.
3. Motor with Class F insulation, powerful yet gentle.
4. Manual acceleration design for convenient customer debugging of valves.
5. Double-sealed structure wiring cavity for more reliable moistureproof performance.
6. The material is copper alloy worm gear, which is hardened.

1. Large-sized color screen design with long-distance visibility.

2. Motor with Class F insulation, powerful yet gentle.

3. Double-sealed structure wiring cavity for more reliable moistureproof performance.

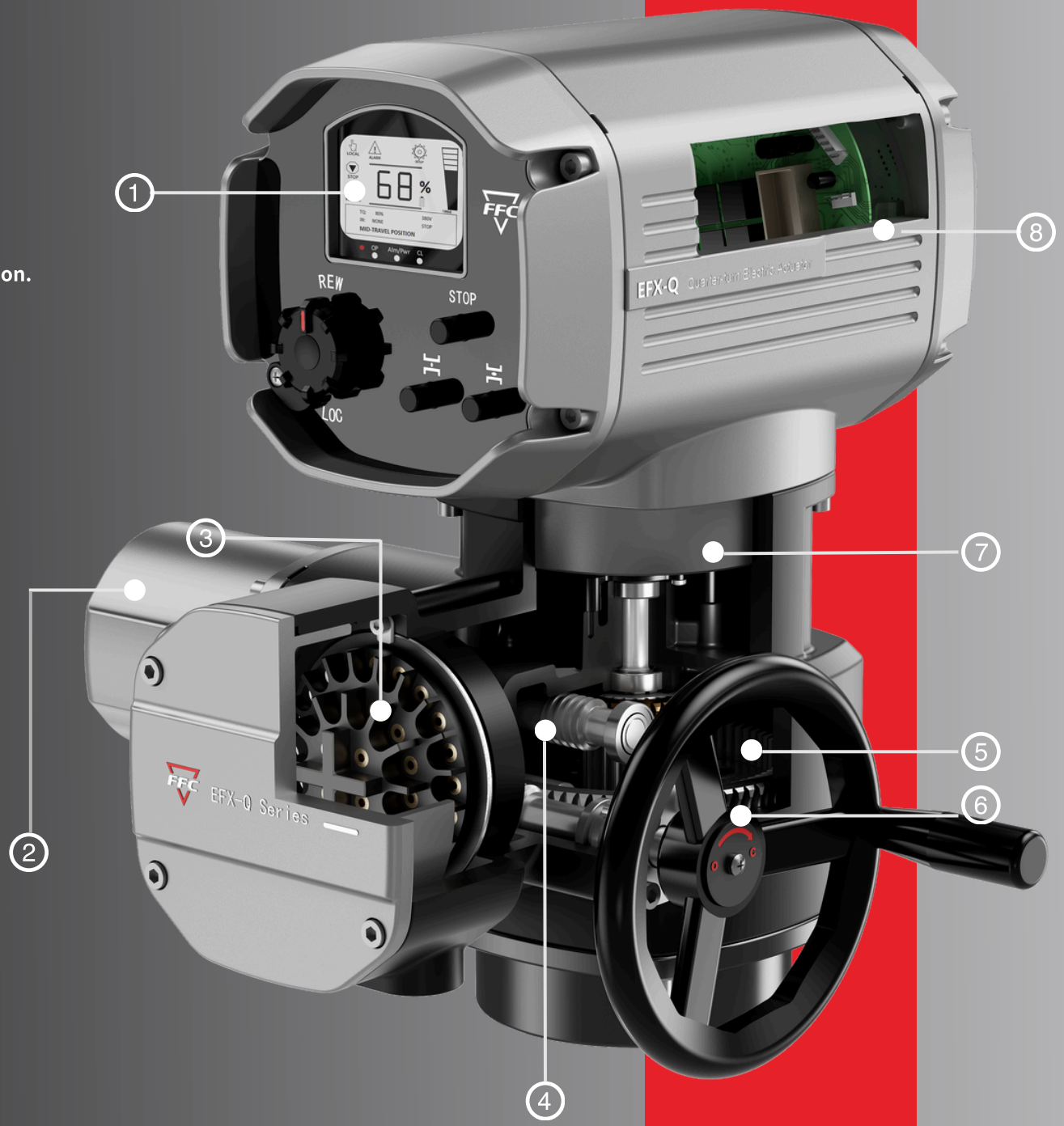
4. The full stroke time and torque is adjustable.

5. There is no need to switch between manual and electric operation.

6. Classic planetary structure, small volume, large output torque.

7. II 2G Ex db IIC T6 Gb / II 2D Ex tb IIIC T80°C Db.

8. Optional variable frequency intelligent control for precise opening degree matching.



Design details of EFX-Q