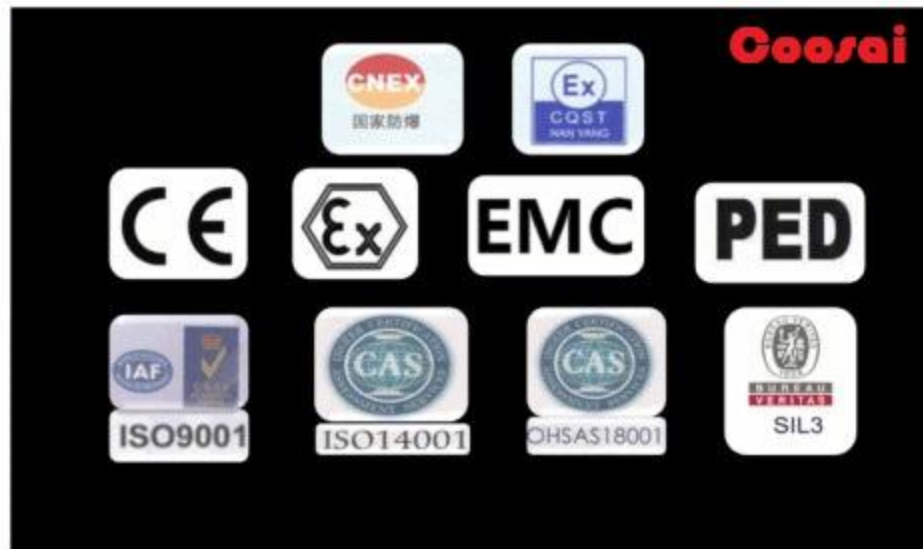


# Coosai Automation

We created the actuator which will be able to change the whole word  
– Parallel dual-guide scotch yoke box

High Quality & China Manufacture

The research and development, the manufacture



## Coosai Valve Group

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## ( Our values )

Indepent Design, Innovation, High Quality & China Manufacture.

## ( Goal Setting )

To be one of industrial leading manufacturers in pipeline auto-control enquipmental area.

## (Development Vision)

Let Coosai's product safely operated in each of customer's pipeline.



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## (Introduction) ↓

China Coosai Valve Group is a top class manufacturer of industrial valves and valve actuators. Coosai Valve Group is dedicated to offer complete solutions for gas&oil pipeline and well head. Coosai is specialized in Ball valves, Control Valves, Gate, globe and check valves. And also specialies in R& D, design and manufacturing various types of actuators for emergency shut down service, line break protection service and multifunction control module and control system.

Coosai Valve Group is concentrating on the research and development of DG series actuators which are widely applied in valves for oil and natural gas industry

Currently, DG Series actuators include 5 classes, 4 types, and about 20 models. Actuator products include: high /low pressure pneumatic actuator, hydraulic actuator, gas-oil actuator and electro-hydraulic. Range of torque output of Coosai actuator is 20Nm---550,000Nm.

Accompanied with actuators, we also provide electric line break detection system, control system of pneumatic/hydraulic actuator, hand pump, high pressure insulation joints and relative control modules. Moreover, we can customized design control system and module for special application as per customer's request, such as design and manufacturing big torque actuator with Quick Open/Close time no more than 3 seconds, even less than 1 second.

Coosai automation focuses on independently innovation and research and development in the technology and we have gotten more than 20 technical certificates with independent intellectual property rights, of which there are 3 certificates on invention patent.

Currently, Coosai automation are manufacturing multifunction test bench with allowable Max. Torque of 600,000 Nm, this ensures Coosai to provide customer with actuators for heavy duty applications.

Coosai automation independently innovated, researched and developed parallel dual guide scotch yoke box and electric line break detection system with monitoring function. All of these creations are world class level.

Coosai electro-hydraulic actuator, gas-oil actuators and high pressure emergency pneumatic actuators have got wide applications in China by the largest state owned companies, CNPC, SINOPEC and CNOOC,



**Production workshop**



**The production workshop**

The products are mainly used for emergency shut-off application in the transmission pipelines in Oil & Gas industry. As the series of product adopts gas supply directly from the pipeline, there is no need to consider using any external or other auxiliary power supply.

With features of stable and safe operation, reliable control and easy handling, using battery or solar power as power supply, DG Series actuator is suitable to be used in petrochemical, metallurgy, chemical, power, military, water treatment industries, etc. .



# (History) ↓

**In 2006** 2006: Basic research and project preparation of gas-oil actuator.

**In 2007** Jan., 2007: start doing research and development of mechanical design and electronic control unit of gas-oil actuator. Sep., 2007: First trial gas-oil actuator with electric line broken detection system was launched in China, meanwhile, start to consider developing Chinese Menu and Low Temperature application at -40℃, which includes normal operations of control unit and screen display in low temperature environment.

**In 2008** July, 2008: Got the first order. Sep., 2008: First gas-oil actuator with electric line broken detection system was delivered to the Customer. Oct., 2008: Installation and commission of gas-oil actuator in site (Till the moment, it has 5 years' successful operation in site.).

**In 2009** May, 2009: Gas-oil actuator with electric line broken detection system & Solar Power supply was produced and delivered to the Customer. Jun., 2009: Installation and commission of gas-oil actuator in site (Till the moment, it has 5 years' successful operation in site.).

**In 2012** Jun., 2012: New products Coosai's gas-oil actuator and PLPG2010 Smart type electric control unit with invention patent technology were launched.

**In 2013** 2013: Be issued with ISO9001 Certificate. The company formed its own corporate standard in design and manufacturing of pneumatic, hydraulic and Gas-oil actuators and was recorded in local Quality and Technical Supervision. In addition, a number of achievements got relative certificates tested and issued by the Third Party.

## ↓ The first generation product



## ← The second generation product

## ↓ The third generation product





## Core Competencies

Patented

序号	专利申请号	发明创造名称	申请日	专利类型	专利状态
1	2012103434145	一种双向的拨叉传动箱	2012年9月18日	发明专利	已经授权
2	2012103434145	一种双向的拨叉传动箱	2012年9月18日	世界发明专利 PCT	公示, 并已通过申请
3	2012101972980	一种具有分水除湿结构的整体型过滤连 接绝缘接头	2012年6月15日	发明专利	已经授权
4	2012101151989	一种万向操作并自锁的手动泵	2012年4月19日	发明专利	已经公示
5	2012201664129	一种可转动操作并同步自锁的手动泵	2012年4月19日	实用新型专利	已获得授权
6	2012201664097	一种万向操作并自锁的手动泵	2012年4月19日	实用新型专利	已获得授权
7	2012201664082	一种可多位操作自锁的手动泵	2012年4月19日	实用新型专利	已获得授权
8	2012202819305	一种全天候防水的防爆电磁阀	2012年6月15日	实用新型专利	已获得授权
9	201220281949X	一种具有均压结构的全天候防水防爆电 磁阀	2012年6月15日	实用新型专利	已获得授权
10	2012202819470	一种整体型过滤连接绝缘接头的分水除 湿结构	2012年6月15日	实用新型专利	已获得授权
11	2012202819485	一种具有分水除湿结构的整体型过滤连 接绝缘接头	2012年6月15日	实用新型专利	已获得授权
12	2012204724615	一种双向轴的拨叉传动执行器	2012年9月18日	实用新型专利	已获得授权
13	2012204723627	一种双向的拨叉传动箱	2012年9月18日	实用新型专利	已获得授权
14	201220472531.7	一种便于装配的拨叉传动滑块	2012年9月18日	实用新型专利	已获得授权
15	2012204723487	一种拨叉的传动滑块	2012年9月18日	实用新型专利	已获得授权
16	2012204722253	一种拨叉改进结构	2012年9月18日	实用新型专利	已获得授权
17	201230410580.3	手 泵	2012年8月29日	外观专利	已获得授权
18	201230410605.X	手动泵	2012年8月29日	外观专利	已获得授权
19	201230410599.8	拨叉箱体	2012年8月29日	外观专利	已获得授权
20	201230410642.2	电磁阀	2012年8月29日	外观专利	已获得授权
21	201230410603.0	控制阀	2012年8月29日	外观专利	已获得授权

## patent of invention

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08:17:12

United States Patent and Trademark Office

CLIFF PLC  
P.O. BOX 30066  
ALEXANDRIA, VA 22303-4660

INTERNATIONAL APPLICATION NO. 2012/081729

CONFIRMATION NO. 8963  
371 ACCEPTANCE LETTER

DATE MAILED: 04/23/2015

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.405

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.405), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE" OR "371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (b)(1) AND (b)(2) REQUIREMENTS HAS BEEN RECEIVED BY THE OFFICE. THIS DATE IS SHOWN BELOW. The filing date of the above identified application is the international filing date of the international application (Article 11(2) and 35 U.S.C. 302).

DATE OF RECEIPT OF 35 U.S.C.  
371(c)(1) AND (b)(2) REQUIREMENTS

The following items have been received:

- Indication of Small Entity Status
- Copy of the International Application filed on 03/03/2015
- Copy of the International Search Report filed on 03/03/2015
- Preliminary Amendments filed on 03/03/2015
- Information Disclosure Statements filed on 03/03/2015
- Inventor's Oath or Declaration filed on 03/03/2015
- Request for Immediate Examination filed on 03/03/2015
- U.S. Basic National Phase filed on 03/03/2015
- Priority Documents filed on 03/03/2015
- Power of Attorney filed on 03/03/2015
- Specification filed on 03/03/2015
- Claims filed on 03/03/2015
- Abstract filed on 03/03/2015
- Drawings filed on 03/03/2015
- Authorization to Permit Access filed on 03/03/2015
- Application Data Sheet (37 CFR 1.76) filed on 03/03/2015

page 1 of 2

PCT OF U.S.

## world invention patent

Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

Submission number: 3437706

PCT application number: PCT/CH2013/01729

EP application number: 13536263.7

Date of receipt: 05 April 2015

Receiving Office: European Patent Office, The Hague

Your reference: MUB15-1549EP

Applicant:

Country:

Documents submitted:

- package-data.xml
- application-body.xml
- SPECTRAMEPO-1.pdf MUB15-1549EP
- P-Translation.pdf (21 p.)
- ep-euro-pat.xml
- epf1200.pdf (4 p.)

Submitted by: CNH-Gerard Dossenn 21408

Method of submission: Online

Date and time receipt generated: 05 April 2015, 10:42 (CEST)

Message Digest: 58-37-7E-5D-5D-DC-1E-98-67-9D-87-83-6B-48-B2-5A-DE-64-A5-85

Correction by the EPO of errors in data instructions filed by eOLF  
Errors in data instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 153/02).

Acknowledgement of receipt - application number PCT/CH2013/01729 Page 1 of 2

Acknowledgement of receipt - application number PCT/CH2013/01729 Page 2 of 2

PCT OF EU.



## Manufacturer's standard

Have to formulate enterprise standards and quality and Technical Supervision Bureau for the record.

### Explosion-proof certification



### The ISO quality management system certification



### Test report



## Third party certification

### Certificate of honor

18001 : 2007 Certification



14001:2004 Certification



### Scientific achievements



### ECM certification





## (Technical Team) ↓



### Brief Introduction of Company's Founder

Mr. Wang ZhengQuan (R&D project leader, company founder) was graduated from Mechanical Engineering Department of Beijing Institute of Technology in July, 1991. From 1991 to 1994, worked in ZiGong High Pressure Valve Factory. After that, worked at Tyco Flow Control for 18 years, during this period, has offered installation, commissioning and maintenance jobs of valves and actuators used in various national key projects: West-East Gas Transmission, refined oil pipeline from Lanzhou to Chongqing, Southwest refined oil pipeline, Puguang main project Puguang II, as well as numerous petrochemical, power, metallurgy, water treatment, etc. With years of on-site engineering experience and industry background, Mr. Wang has a unique industry insight and experience in this area.

### Main Reference

In autumn of 2007, the first gas-oil actuator with electric line broken system was manufactured in China. From this viewpoint, Mr. Wang ZhengQuan is the First Person in China to realize such product locally manufacture.

First proposed and adopted Chinese menu and low temperature display technology, these features were unique in domestic and foreign valve industry at that time. Local manufacturing gas-oil actuator with electric line broken detection system makes dream of producing "intelligent gas-oil actuator" locally come true. And also broke a long-term monopoly in this area, which mainly offered by European, the United States and foreign manufacturers. For one project in Xinjiang, our product has been operated in good order for about 5 years, its good performance and reliability has been verified in site and won the customer's good evaluation.

At the end of 2012, DG series parallel, double-guide actuator with several patents and independent intellectual property rights was launched, it broke traditional structure of angle type actuator. Start from the basic design, and consider blending modern manufacturing processes, Mr. Wang restart manufacturing precedent of new generation of high performance, heavy-duty scotch yoke actuator. It belongs to an international initiative.

## (Introduction of Technical Team) ↓



In R&D department of the company, there are more than 20 peoples, most of which has very good experience in this area.

Turned to provide high-level service from common service, turned to provide total solution from a single product services. Through high-end manufacturing, to achieve technology transition and results conversion; through continuous innovation, to achieve technological breakthroughs and self-transcendence. In 2007, gas-oil actuator with electric line broken detection system was produced locally. Base on this, Mr. Wang continuously did research and development, in 2013, DG series parallel, double-guide actuators was launched. This new products will once again lead the manufacturing direction in high-level rotary actuator area in the future.



## Introduction of Products

Since the first locally produced gas-oil actuator with electric line broken detection unit was put into operation in 2008, Coosai continuously did research and development job in this area and wished to bring the customer more advanced product. In 2012, we designed and manufactured a new parallel, double-guide actuator with several invention patents and independent intellectual property rights.

DG Series actuators include 5 classes, 4 types, and about 20 models. During R&D stage, through several times of reforming and updating, we can offer customer with the world's unique and advanced dual-guide scotch yoke box, intrinsically safe and multifunctional hydraulic hand pumps, three unique control modules. With its great operation ability, intrinsic safety, high transmission efficiency, transmission rigidity, stability and reliability, Mikenson's new DG series actuator establishes the new standard of intelligent high-strength, general type scotch yoke actuator.

Coosai's DG series angle type actuators have 5 classes products to meet with various size and torque value of valves, and also have 4 types to meet with customer's different power source, process requirement and control requirement. Therefore, a total of 20 models of actuator specifications for your option, we believe you can find the most suitable one in Coosai's product range.



## Model Description



## Double Guide Pneumatic Actuator (LOW PRESSURE) (DGPA) Actuator Torque Summary (symmetric)

Torque Units: in (Nm)

NO.	Max operating torque	Pressure Actuator TYPE	3bar			4 bar			5 bar			6 bar			7 bar		
			0°	RUN	90°	0°	RUN	90°	0°	RUN	90°	0°	RUN	90°	0°	RUN	90°
1	5000	DGPA0.6s-135	451	315	451	601	420	601	752	525	752	902	630	902	1052	735	1052
2		DGPA0.6s-175	757	530	751	1009	707	1009	1262	883	1262	1514	1060	1514	1766	1237	1766
3		DGPA0.6s-235	1365	956	1365	1820	1275	1820	2275	1593	2275	2730	1912	2730	3185	2231	3185
4		DGPA0.6s-280	1940	1358	1940	2586	1811	2586	3233	2263	3233	3880	2716	3880	4527	3169	4527
5	13500	DGPA1.5s-240	1772	1100	1772	2360	1475	2360	2953	1838	2953	3544	2206	3544	4134	2574	4134
6		DGPA1.5s-280	2410	1501	2410	3205	2004	3205	4019	3077	4020	4823	3003	4823	5627	3509	5627
7		DGPA1.5s-335	3450	2150	3450	4603	2805	4603	5755	3582	5755	6904	4298	6904	8055	5011	8055
8		DGPA1.5s-385	4560	2838	4560	6079	3784	6079	7600	4731	7600	9119	5670	9119	10639	6115	10639
9		DGPA1.5s-490	7410	4610	7410	9850	6140	9850	12310	7670	12310						
10	70000	DGPA06s-385	8034	5001	8034	10711	6668	10711	13389	8355	13389	16067	10002	16067	18745	11669	18745
11		DGPA06s-490	13013	8001	13013	17351	10851	17351	21688	13501	21688	26025	19926	26025	30364	18963	30364
12		DGPA06s-600	19511	1261	19511	26015	16195	26015	32519	20245	32519	39063	24292	39063	45527	28340	45527
13		DGPA06s-685	25001	15642	25001	33415	20801	33415	41769	26001	41769	50563	31662	50563	56940	36349	56940
14	300000	DGPA25s-490	17937	11161	17937	23916	14889	23916	29895	22889	29895	35867	22312	35867	41890	21045	41890
15		DGPA25s-600	26844	16742	26844	35859	22322	35859	44824	27903	44824	53788	33467	53788	62790	39001	62790
16		DGPA25s-685	35054	21821	35054	46739	29095	46739	58435	44762	58435	70145	43690	70145	81745	50923	81745
17		DGPA25s-835	52011	32440	52011	69432	43225	69432	86890	54921	86890	104689	64823	104689	121583	93046	121583
18	550000	DGPA85s-600	40010	24914	40010	53478	33210	53478	66731	41530	66731	80150	49892	80150	93512	58210	93512
19		DGPA85s-685	52231	32590	52231	68630	42790	68630	870145	54121	870145	104411	6502	104411	121880	75830	121880
20		DGPA85s-980	106991	66592	106991	142559	109130	142559	178190	110931	178190	213809	133113	213809	252013	156710	252013

### Note:

All above mentioned data are output torque of single action pneumatic actuator. When using double-action pneumatic actuator, output torque value is twice times of single-action actuator's output torque value, but should never exceed Max. allowable operation torque of scotch yoke box.

Description of an integral DGPA actuator with parallel and double-guide scotch yoke includes 5 parts as follows:

1. DAPA means Mikenson's produced Parallel, Double Guide Pneumatic Actuator.

2. Model of double-guide scotch yoke is described as 03S(c), 06S(c). However, 03, 06, ... represents size/model of double-guide box, "S" means symmetrical scotch yoke and "C" means canted scotch yoke.

3. Number and diameter of cylinder could be described as "(2)-150"; If using single cylinder, then please omit additional content here.

4. If using spring return actuator, please add "S" behind diameter of cylinder; and if adopting double-action actuator, the no suffixed content will be given here.

5. If needing additional manual operation unit, please add "M" here.

For example, DGPA06S2-385-S-M means model of spring return actuator with parallel, symmetrical double-guide scotch yoke box is 06, diameter of cylinder is 385, actuator is assembled with dual pneumatic cylinders and manual operation unit.



## DGOA Series Gas-oil Actuator with Max ( Output Torque of 550000Nm)



### Features

Patented parallel, double-guide scotch yoke box provides angle type valve with bigger open torque.

Parallel, double-guide rod could withstand horizontal load and give support to the piston rod.

The bearing with composite structure provides a reliable and stable operation, and extending the life of the actuator.

Pistons bearing reduces the friction between the piston and cylinder wall, the cylinder can achieve self-lubricating effect.

The guide rod is produced with high strength and anti-corrosion coating. And this could reduce friction to a minimum value.

Cylinder wall is designer with features of high strength, anti-corrosion and reliability.

Design of internal guide rod brings about more compact cylinder structure.

Design of fully enclosed and weather-proof carbon steel body brings about rugged and reliable structure; internal coating will provide anti-corrosion feature.

External limit bolts may be adjusted in the full stroke range of  $90 \pm ?^\circ$

Based on low hysteresis and quick response, the actuator is also suitable to be used to operate control valve.

With various canted and symmetric type of scotch yoke, actuator could be used to operate different type of valve.

For offshore and high corrosion condition, special coating could be offered.

For sour gas condition, special designed actuator could be offered.

### Control Modules for option

Electric Line Broken Detection System-PLPG2010

Monitor of high/low pressure and shut-off control of high/low pressure

ESD shut-off, reset

Patial stroke test, online operate ball valve .

Special design of anti-misoperation, high pressure integrated module.

Integral insulation of control system, anti-cathodic protection

Limit switch provides indication of valve position.

Safety relief valve and filter regulator

Integral insulated filter pipe connector , online clean .

### Parameter

- 1、 Pressure of Gas Supply : 0.3-16MPaG
- 2、 Medium of Gas Supply: Air, N<sub>2</sub>, or non-sour gas (e.g: purified natural gas)
- 3、 Output Torque:  
Single Action: 1000-250000Nm /Double Action: 100-550000Nm
- 4、 Options: Hand pump , Hydraulic hand pump, and Hydraulic manual unit with independent test function.
- 5、 Applicable environment:  
Standard Temp.: -30~100°C ( -20~210°F )  
Optional Temp.: -55~150°C ( -65~300°F )
- 6、 Weather-proof: Ip68.
- 7、 Explosion-proof: Exd IIC T4/T6
- 8、 Weather-proof of Stainless steel control cabinet: IP65
- 9、 Connection of Communication: USB/RS232/485
- 11、 Power Supply: high energy battery, solar power, external power
- 12、 Application: 90° Angle stroke, emergency shut-off ball valve of transmission pipeline of natural gas, ESD shut-off valve.





## DGEHA Series Electric -hydraulic Actuator



### Compositions of Electric-hydraulic Actuator

Electric-hydraulic actuator includes 4 parts- actuator, control system, hydraulic station, control cabinet.

Pressure of hydraulic system: low pressure/10.5Mpa; middle pressure/21Mpa; high pressure/35.2Mpa

#### parameter

Output Torque: ~ 400,000N.M.

Medium: hydraulic oil or other non-flammable hydraulic fluid.

Environmental Temperature: -30°C ~ +100°C; for special temperature request, please consult with plant. For some special applications, actuator with quick open/close function will offer fast stroke time  $\leq 0.5S$ , which could be spring return type or double-action type.

Control valve is designed as high pressure and zero leakage.

Solenoid and other hydraulic control elements are intergated in circuit block to avoid leakage issue.

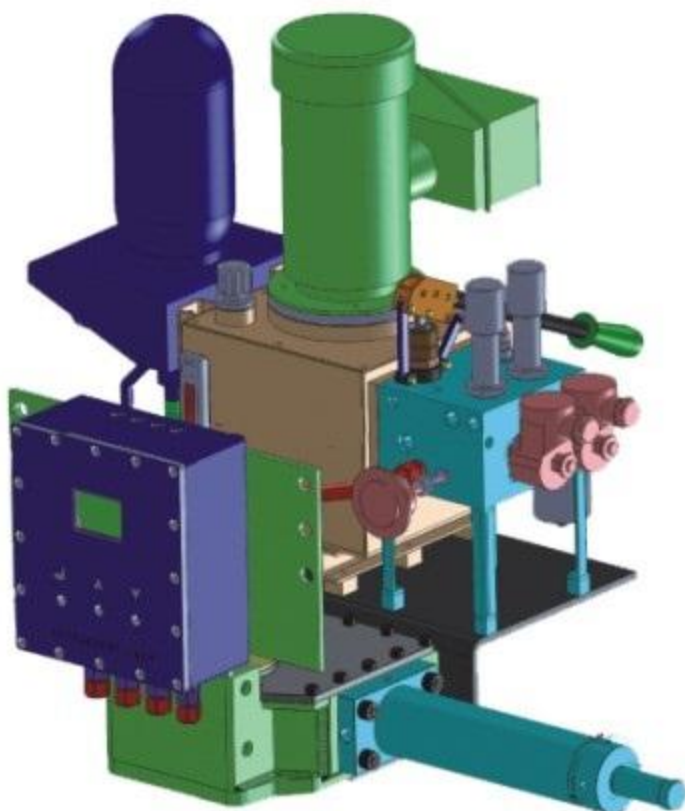
Material of hydraulic pipeline: stainless steel.

Material of control cabinet.

#### Quality Guarantee

We got ISO9001 Certificate. Each actuator will be produced in accordance with ISO9001's strict requirements.

Each actuator will be taken with various functional/performance tests before ex-works. At the time of delivery, actuator accompanied with relative test reports will be given to the customer.



### Typical Applications

#### Local and Remote Control, Emergency shut-off valve at Line Broken Condition

The system is used in long-distance oil and gas transmission pipeline with un-reliable/un-stable power supply. Hydraulic system is used accompanied with Line Broken Detection system, when pressure drop rate reaches the set value, line broken detection system will send signal to the actuator to close the valve timely. Combination use of electric pump and accumulator will reduce the hydraulic actuator's power requirement.

#### Local and Remote Control, power failure safety

When power failure occurs, actuator will close/open the valve per process's requirement.

#### Local and Remote Control, ratio adjustment

For precision control of flowrate, offer hydraulic proportional system to control the valve.

#### (Local and Remote Control, Servo adjustment)

For the valve with linear characteristic and accurate opening degree required, offer hydraulic Servo system to control the valve.

#### Hydraulic System with Solar Supply

Hydraulic system with solar supply is specially proposed to be used in site without power supply or/and gas supply, just like in long-distance oil and gas transmission pipeline.

#### Slow Close, Two-speed Control

The function is proposed to be used in water and oil transmission pipeline to avoid water hammer issue.



## ( DG(H/P)A Series High/Low pressure Pneumatic Actuator) ↓

DGPA Series Spring Return/Double-action Pneumatic Actuator: Max. Output Torque: 513450N. M. Type: On/Off, Modulating.

### Features

Parallel, double-guide scotch yoke box with patent design provides angle stroke valves with higher opening torque;

Parallel, dual-guide rod could withstand horizontal load and give support to piston rod ;

The bearing with composite structure provides a reliable and stable operation, and extending the life of the actuator ;

The guide rod is produced with high strength and anti-corrosion coating. And this could reduce friction to a minimum value ;

Cylinder wall is designed with features of high strength, anti-corrosion and reliability ;

Design of internal guide rod brings about more compact cylinder structure ;

Design of fully enclosed and weather-proof carbon steel body brings about rugged and reliable structure; internal coating will provide anti-corrosion feature ;

External limit bolts may be adjusted in the full stroke range of  $90 \pm 5^\circ$  ;

Based on low hysteresis and quick response, the actuator is also suitable to be used to operate control valve ;

With various canted and symmetric type of scotch yoke, actuator could be used to operate different type of valve ;

For offshore and high corrosion condition, special coating could be offered ;

For sour gas condition, special designed actuator could be offered.



### Optional Control Modules

Electric line broken detection system-PLPG2010 ;

Monitor of high/low pressure and shut-off control at high/low pressure ;

ESD shut-off and reset ;

Anti-misoperation handle, high pressure integrated module ;

Insulation of control system to prevent loss of cathodic protecting current ;

E/P positioner , position transmitter ;

Safety relief valve, filter regulator ;

Integral insulated filter connector, online clean .



### parameter

- 1、 Gas supply : Low pressure(0.3~1Mpa);High pressure(1.0~16Mpa).
- 2、 Medium: Air Nitrogen or Non-sour gas (e.g. purified natural gas).
- 3、 Output torque : spring return: 50~25000N.M , double-action: 100~550000N.M.
- 4、 Action mode : spring return, double-action.
- 5、 Options : Handwheel operation, hydraulic hand pump, hydraulic manual operation unit with independent test function.
- 6、 Environmental Temperature : Standard:  $-30 \sim 100^\circ\text{C}$  (  $-20 \sim 210^\circ\text{F}$  ) Option:  $-55 \sim 150^\circ\text{C}$  (  $-65 \sim 300^\circ\text{F}$  ) .
- 7、 Weather-proof Class: IP68.
- 8、 Explosion-proof Class: Exd IICT4/T6.
- 9、 Weather-proof Class of Control Box: IP65.
- 10、 Application: on/off, modulating, ESD, quick shut-off.
- 11、 Applicable valve type: ball valve, butterfly valve, plug valve , damper control unit and other 90 angle stroke valves.



## DGMP Series Self-actuated hydraulic Actuator



### Features

Parallel, dual-guide scotch yoke box with patent design provides angle stroke valves with higher opening torque.

Bearing in combination structure may provide reliable and stable operation, and extend the life of actuator.

Combination of oil tank, hydraulic pump and accumulator provides stable and reliable hydraulic power source. Not only does this method be used in general application field, but also it can be used in low reliable electricity field.

Pressure, flowrate, directional control valve and electrical control components constitute variety of hydraulic control systems to meet customer's requirements of different functions, explosion-proof class and weather-proof class.

With liquid's incompressible feature and system's zero leakage and high pressure holding features, hydraulic actuator has very high positioning feature.

Realize Fail to open/fail to close function at the time of power failure per customer's request.

Realize Quick open/Quick close function per customer's request.

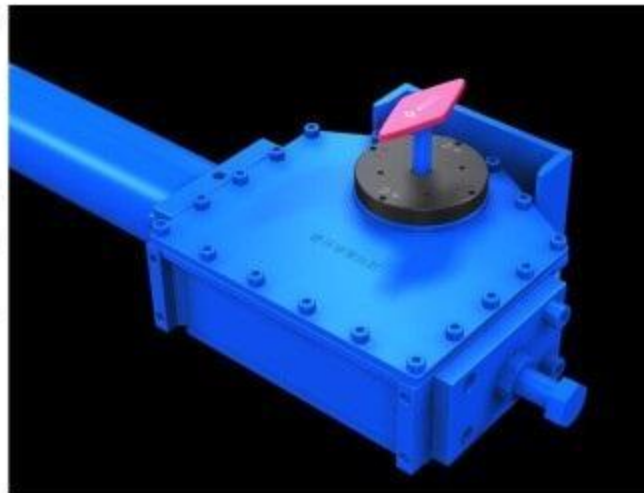
Optional medium: Non-flammable fluid may be used as medium in high-pressure and flammable filed (e.g.: water - glycol emulsion, etc.).

Provide symmetric /canted scotch yoke to the valve with different characteristics per customer's request.

External stroke adjustable bolt may offer accurate adjustment in stroke range of  $90 \pm 5^\circ$ .

### parameter

- 1、Gas Supply: 0.3~1MPaG
- 2、Medium: Air, N<sub>2</sub>, Non-sour gas (e.g.: purified natural gas)
- 3、Output Torque: Single action: 1000~250000Nm, Double action: 100~550000Nm.
- 4、Action mode: Single action, Double action.
- 5、Options: Handwheel operation, hydraulic hand pump, hydraulic manual operation unit with independent test function.
- 6、Standard: -30~100°C ( -20~210°F ) ; Option: -55~150°C ( -65~300°F )
- 7、Weather-proof Class: IP68
- 8、Explosion-proof Class: Exd IIC T4/T6
- 9、Weather-proof Class of Control Box: IP65
- 10、Application: on/off, modulating, ESD, quick shut-off.
- 11、Applicable valve type: ball valve, butterfly valve, plug valve, damper control unit and other 90 angle stroke valves.



### Provide several control modes to the customer per request

Customer may choose local control or remote control mode, and each of these control modes could be used together with electric line broken detection system.

### Typical Applications

Local control, remote control, emergency shut-off actuator at the time of line broken.



Be used for long distance transmission pipeline of oil & gas. When high pressure, low pressure, or pressure drop rate of pipeline reaches at set value, line broken detection system will send out signal to actuator to close the valve by using hydraulic system and line broken detection system. Combination using of electric operated hydraulic pump and accumulator offers high pressure holding function and helps reduce hydraulic actuator's requirement to the power.

Local control, remote control, safety of system at the time of power failure. Provide on/off function to the valve per process unit's requirement. When power failure occurs in system, actuator will close or open the valve per process request.





# Introduction of Parts

## Innovative design of Scotch yoke box (with Patent No. of 2012103434145)

Design of scotch yoke box adopts built-in parallel, double-guide shaft with brick pattern guide and full scotch yoke.

In conventional scotch yoke box, people often use simple design of parts in the drive mechanism, and this will bring pneumatic/hydraulic cylinder with violently shaking at the time of operation; when elongated output shaft extends cylinder end face and pushes the drive slider, the shaft is easy to get rigid deformation and subject to lateral force. For no fixed trajectory guide and drive slider, as the force is not in the geometric center, there will be couple loss, lower transmission efficiency occurred. And following features of actuator, such as smoothness of the output force, motion stability, operation reliability and integrated safety, will be also affected. In addition, connection way between the slider and cylinder's shaft decreases connection stiffness and assembly efficiency. The DG series scotch yoke box breaks through the traditional concept, and adopts Coosai's innovative design of built-in parallel, double-guide shaft with brick pattern guide and full scotch yoke.

The innovative design fixes trajectory of the slider, eliminates movement distortion of the piston shaft, reduces generation of heat and vibration at most degree, while avoiding transmission loss and subjecting to the lateral force. Theoretically the hydraulic cylinder (gas cylinder or spring cylinder) could realize 100% output without any loss. Transmission efficiency and smoothness of movement are greatly enhanced.

To enhance the torque of output shaft of scotch yoke, strength and rigidity of rotation of hub must be increased. Compared with the traditional design, DG series adopts full scotch yoke design. Based on improving force condition, the output shaft has more uniform force-bearing structure and lower processing distortion. Strength and transmission load are greatly improved at most of degree.

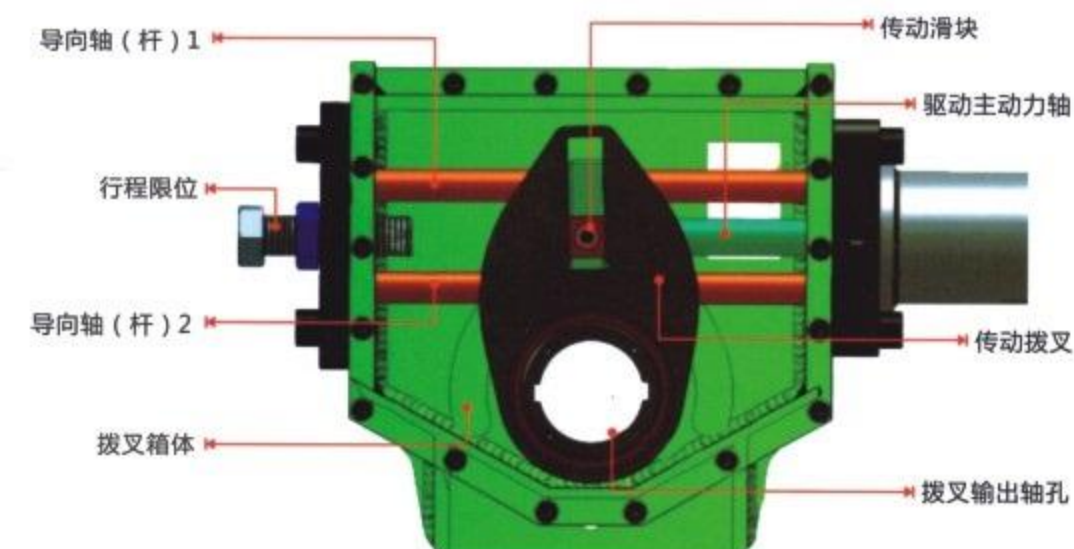
With special design of DG series parallel, double-guide scotch yoke box, we get improved transmission efficiency and better performance.

## 专利保护产品

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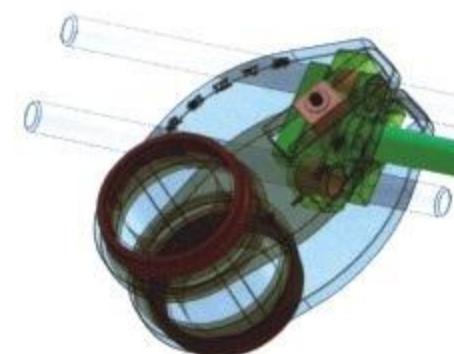
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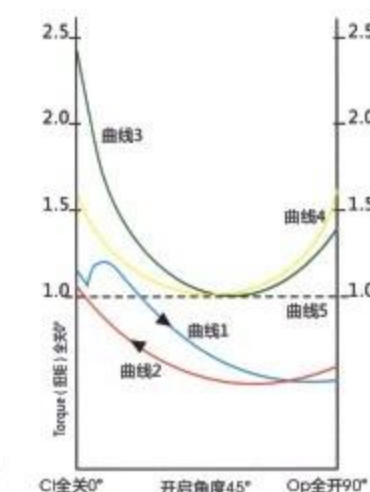
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不同形式拨叉执行器扭矩输出曲线图

备注：  
曲线1：阀门开启过程扭矩曲线  
曲线2：阀门关闭过程扭矩曲线  
曲线3：拨叉执行器实际扭矩曲线（非对称设计）  
曲线4：拨叉执行器实际扭矩曲线（对称型设计）  
曲线5：拨叉执行器实际扭矩曲线（恒定扭矩设计）



执行器输出角度 执行机构全行程转动角度范围为0°-90°，阀门开/关位置调节螺钉用于调节阀门全开、全关位置。



## Innovation Design of Hydraulic Hand Pump

The hydraulic hand pump with special design of universal operation and synchronous self-locking function is invented by us and owns patented technology and a number of independent intellectual property rights.

The handle can be rotated in 360 degree in horizontal plane.

The handle can be plugged into hand pump frame in three locations, which brings operator with more convenience to operate in site.

Piston of pump can realize synchronously self-locking of hand pump, which effectively protect plunger, and get better safety.

Integrated design of hydraulic hand pump helps saving operation space. Further more, as handle can be dis-assembled from the pump, this helps decreasing installation space and packing size, and brings obvious advantage in intensive pipeline layout environment.

Considering of various working conditions in site, and from viewpoint of intrinsic safety of system and convenience of operation, we put forward two new concepts - isolation test of system and universal operation during the design period.



**Special Functions' Design:** For control system with low failure rate design, at time of local operation and system functional test, output of actuator is completely forbidden.

we re-design hydraulic output circuit to keep actuator output disabled. When switching the system, we adopt a fully isolated loop, so as to realize switches between hydraulic manual operation and automatic operation.

### (Main Features)

For pipeline valve does not work in a long time, under the condition of no operating this valve, this function could provide online functional test to actuator and control each parameter of system.

In the initial production of abnormal pressure fluctuations, or at the time of pipeline pigging test, this function can effectively prevent emergency shutdown of trunk valve.

At the time of online service of pipeline valve, this function will effectively prohibit remote signal to operate the valve and avoid potential accident occurred.





## Electric Control Unit - PLPG2010



By using special manufacturing process, electronic monitoring system PLPG2010 could reach explosion-proof class of Exd IIC, weather-proof class of IP68 and has high-intensity electrical protective box. Display screen uses impact-resistant, high strength and explosion-proof class, while the control box housing can bear pressure bigger than 220psi. PLPG2010 is suitable for being used in all-weather condition, which includes outdoor, various temperature, vibration, flammable gases and other harsh environments. We confirm to provide customer with safe and reliable electric control unit.

We changed the installation mode and layout of parameter setting button, so as to improve the security and weather-proof class of the control box. We adopt non-embedded, anti-impact Hall buttons in PLPG2010, not only is mechanical life greatly extended, but also effectively prevent accidental misuse occurred, and improve the accuracy of parameter setting.

### Features:

micro-power motherboard, battery powered;

multiple power supply options, support for external power and solar power;

Use Chinese, English words to show functional menu and parameters in display screen, provide customer with more convenience in reading and management.

Colorful OLED display could be used in low temperature of  $-40^{\circ}\text{C}$  and all-weather condition; and it could be viewed in multi-angle.

When abnormal parameter is monitored, the screen will automatically show red alarm words to remind the operator.

Provide Curve/Graphic display: it can automatically analyze and generate pressure curve, and do trend analysis to event data. It can automatically record high/low pressure and pressure drop rate of pipeline, provide reference to set data value. When pressure drop rate of pipeline exceeds set value, it will automatically alarm. And this function provides remote control department with real-time monitoring. Provide hot-plugging USB interface with data communication of RS422/485. Local and remote control could use computer communication. High stable pressure sensor ensures pressure measurement and control accuracy to be 0.1%. Design of control buttons considers non-embedded, water-proof, explosion-proof and touch-proof. With all of these features, we provide customer with product in more safety and long service life. Design of electric system considers anti-surge and anti-electromagnetic interference. Adopt design in anti-cathodic protection: grounding circuit of control unit is independent and is separated/insulated from the actuator's electricity. Design of control box housing considers all-weather outdoor and explosion-proof conditions. Meanwhile, control unit and battery adopt design of independent explosion-proof box.



### Monitoring Parameters of PLPG2010

Environmental Temperature:  $-40\sim 80^{\circ}\text{C}$

Monitor Pressure:  $0\sim 300\text{Bar}$

Pressure Drop Rate:  $0.1\sim 20\text{bar/min}$

High/Low Pressure Set Value:  $0\sim 300\text{Bar}$

Period of Sampling: 1s/4s/8s/16s for option

Duration time of action:  $0\sim 150\text{S}$

Pressure Signal:  $4\sim 20\text{mA}$

Control Output: Solenoid:  $24\text{VDC}$

Time delay of action:  $0\sim 999\text{S}$

Interface: USB, RS485

Explosion-proof Class: ExdIICt6

Weather-proof Class: IP68

Control Accuracy: 0.5%

Battery Supply:  $2\times 3.6\text{V}$

Power Supply:  $12\text{V}/24\text{V DC}$



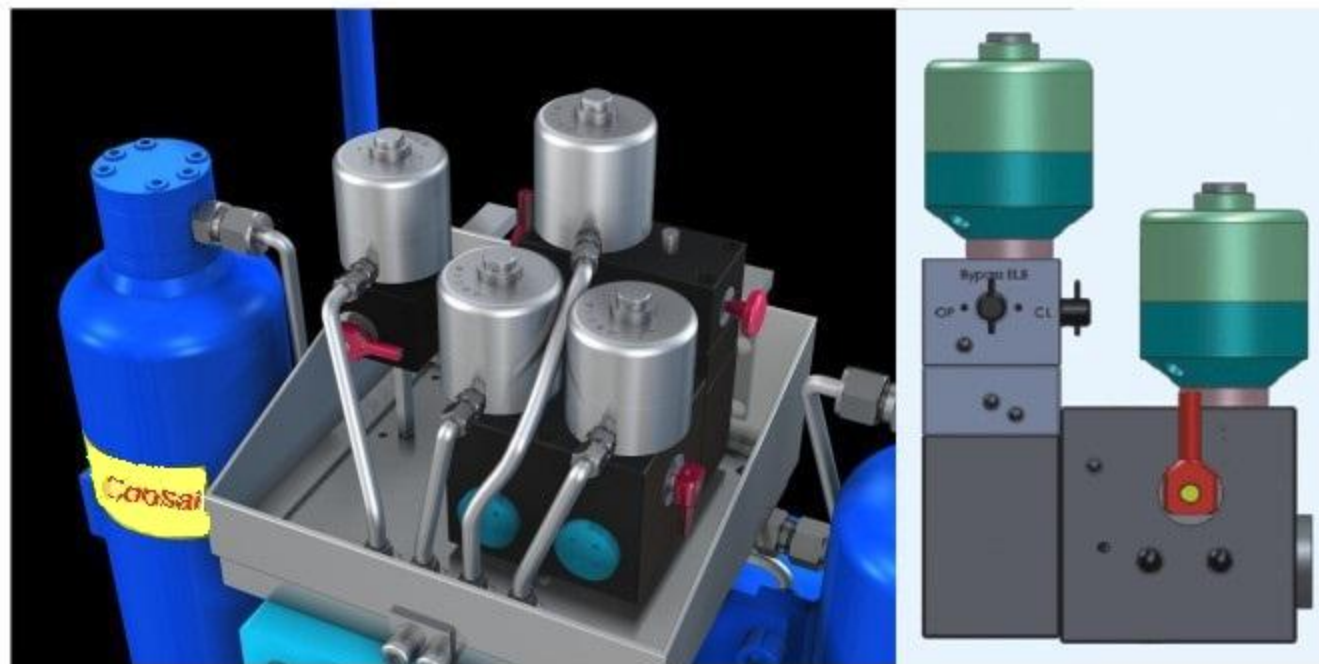


## Control Module and System

Coosai may provide pneumatic and hydraulic module and system in accordance with requirement of various standards. And also provide customized module per customer's special request. The control system uses lift type manifolds, and could meet bubble-tight requirement. For seat material, we use Teflon / PTFE to effectively prevent chemical corrosion and adhesion in a long time, to ensure the whole system could have a very long service life and high reliability under any circumstances.

Coosai provides control elements with features as follows: compact structure, high pressure, big flowrate, wide operating temperature range, control module without decompression. With integrated system and less pipeline, operational reliability of the system is greatly increased. And sealing function, dust resistance and corrosion resistance of system are greatly improved. Moreover, the overall protection of system is very high.

Control system can achieve a variety of functions: local manual open/close, remote control open/close, ultra-high pressure operation, ultra-low pressure operation, emergency shutdown valve when pressure drop exceeds set value, ESD(energized of de-energized) emergency shutdown (with a bypass function), remote and local partial stroke test.



↑ Pneumatic module

## Accessories

### Gas/hydraulic Conversion Tank

Medium in pneumatic system is isolated from the medium in hydraulic system. Through gas-hydraulic tank's conversion, gas realizes flexible transmission. As we know, advantage of compressed gas is easily stored, and advantages of liquid are good lubrication, smooth transmission, and easily control. Design of Gas-hydraulic actuator adopts both of mentioned advantages. Oil dipstick is installed on the top of tank, while filter and control valve are installed on the bottom of tank.

### Pressure limiting valve

With patented design, Coosai's pressure limiting valve ensures gas supply of actuators keeps/works in a safely set range. During design period, Coosai's engineers focus on safety-oriented in design, even if big pressure fluctuation occurs in gas supply pipeline, we may ensure Max. pressure of gas supply keeps in a safety range to get an allowable output torque, which prevents valve stem from being mechanically damaged. Control valve is used to reduce pressure of gas supply to a pre-set pressure value, so as to get decreased torque.

### Gas Connector

Integration of electrical insulation and gas source filtration and purification, separation and dehumidification.

Anti-Cathodic protection, so as to avoid loss of current.

On line clean.

### Pressure Sensor



↑ Take the joint



↑ Pressure limiting valve



## Advantages

Item	Compared Contents	Unique Design Features of Coosai's product
Design Features of Mechanical Part of Actuator	Scotch Yoke Box	1. Originality and uniqueness of Design: Design of DG Series with parallel, dual-guide scotch yoke is solely in the world. 2. DG Series won a Patent design with Patent No. of 201210343414. 3. In terms of improving force condition of scotch yoke, DG Series greatly increases transmission performance and efficiency. 4. Adopt structure design of full scotch yoke to get increased overall strength and even force. 5. Based on allogeneic isomorphic design concept, we adopt standardized configuration design of actuator, this makes product's function to be easily expanded and greatly improve maintenance.
	Hand pump	1. Originality and uniqueness of Design: This hand pump is designed to be an integrated, plug-style, multi-functional pump based on site condition. 2. Design of hand pump won a Patent design with Patent No. of 2012101151989. 3. Hand pump could be operated in whole 360 degree horizontal-round in site. 4. Hand pump could be operated by handle in three different positions to meet different space requirement in site and different force manner in site. 5. Hand pump could be used in venue demanding condition with more obvious advantages, just like used in aerospace, shipbuilding, offshore platforms and other small spaces.
	Switch between Manual and Auto Operation	1. Design and development are in accordance with site requirements, and technology has originality and uniqueness. 2. Has one invention patent and several other patents. 3. Local manual operation and remote operation are separated lonely and can do switch/change-over independently. With this feature, there is no accidents occurred and provide customer high safety. 4. Do online test to various functions and parameters without operating the valve.

Item	Compared Contents	Unique Design Features of Coosai's product
Solenoid	Control module	1. Control module is designed as intergrated, ductless structure in standard-offer. 2. Control module is designed as integral high-pressure module with great improvement of sealing performance and static air consumption. Gas supply could be offered by nitrogen gas station. 3. Control module is designed with features of big flowrate and anti-ice blocking. And it can be used in different gas supply and environment. 4. Control module can be used in a wider range of pressure, in the area of high pressure, there is no need to de-pressure in site with pressure $\leq 10\text{Mpa}$ . In the area of low pressure, control module could be operated in the site with pressure $\leq 0.5\text{Mpa}$ .
	Power Consumption	Low power consumption solenoid, working consumption $< 2.5\text{W}$ , working pressure $0 \sim 10\text{Mpa}$ , no need for decompress.
	Explosive-proof Class	Ip68, test parameters of waterproof shell :no leakage at Gas tightness test with pressure of $5\text{Mpa}$ , equivalent to 500 meters water deep.
Gas Connector	Anti-jam structure	Trim of solenoid is special designed, with its anti-jam & auto-balance structure, the solenoid offers much more reliability of operation.
	Integral type of electric insulation, filter and dehumidification of gas	1. Filter, purification, separation and dehumidification of gas supply are designed in integrated type. This design is originality and uniqueness. 2. Hold one invention patent with Patent No. of 2012101972980 and several other patents. 3. Electric insulation, anti-cathodic protection. 4. Online clean.



## Examples

Coosai's products are widely used for emergency shut-off and automatic protection of pipeline valves in Oil and Gas Industry, for example: our products have been successfully installed and used in projects which locate in Xinjiang, Inner Mongolia, Gansu, Hunan, He Longjiang and Sichuan province. Through several years' operations, our products got/won high evaluation and acceptance by customers.



## Service

Coosai offers customers a convenient sales service, which include installation, testing, commission and start-up for our actuators and control module/unit. Moreover, we may offer above mentioned service for other brand's products. We'll give fast response and solve complex issues for valves and actuators timely.

For Coosai, we have a production base and warehouse and also have an experienced service team, so as to give timely and professional service to the customer. We confirm we may provide 24 hours service response and technical support.

**Coosai will arrange experienced engineers to give customer considerate service.**



## Service and Testing



## Training and Maintenance





Pneumatic actuators

gas over oil actuator  
(pneumatic hydraulic actuators)





gas-over-oil actuator



hydraulic with ESD actuators