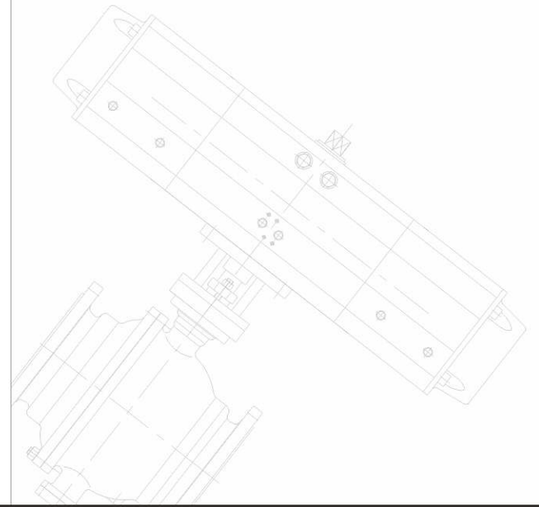
浙江中德自控科技股份有限公司

Zhejiang Zhongde Automatic Control Science And Technology Joint Stock Co., Ltd.

气动多段式装车球阀

Pneumatic Multi-section Loading Ball Valve

通过了ISO9001质量体系认证
通过API6D/609产品认证
通过API6FA/607防火认证
通过国家特种设备制造许可“压力管道元件”TS认证
通过CE安全认证
通过HSE认证
通过SIL 产品功能安全认证
通过ISO 15848逸散性认证
中国著名品牌



中德科技
ZHONGDE TECHNOLOGY

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企业概述

浙江中德自控科技股份有限公司(原中德机械集团有限公司)是集研发、生产、销售、服务于一体的专业控制阀制造商。自1992年创立以来， 中德致力于发展切断阀专业领域技术，使我们始终处在国内切断阀领域的技术领先地位。在我们二十多年的发展历程中，中德人专业、聚焦、坚持不懈来打造切断阀品牌，其中气\电液动高性能蝶阀、高性能球阀、高温耐磨球阀、高温蝶阀、快速切断闸阀等产品广泛应用于石油、化工、天然气、煤化工等高端领域，并获得了众多用户朋友的高度信任。

中德集团现已拥有专业阀门研究中心和一流的生产平台，并通过了ISO9001：质量体系认证，美国石油学会API6D/609产品认证、API6FA/607防火认证，特种设备压力管道制造许可“TS认证”。是中国石化、中石油、中海油、中化、神华、煤化工等领域的一级供应商。先后被评为“中国著名品牌”，“省级星火示范企业”，“国家高新技术企业”，“省明星企业”，连续五年被工行评为“AAA信用企业”。

“客户的满意我们视之为生命”为此中德在国内建立了十二个直销和服务网络，在服务市场的广度和深度上都具有独创性。我们能满足您的需求， 我们给您提供“安全、可靠、省心”产品的同时，我们的产品价值永远大于产品价格。无论您在那里，我们具有丰富经验和专业知识的团队,都能给你提供“认真、负责、快速”的优质服务。我们坚守“一个电话，一天内到达，一次性成功”的服务承诺。

“以人为本，以德兴业”是中德企业文化的核心， 是中德人做人做事的标准，中德人将以“以诚会友，以德待友”来衬托我们过硬的产品质量和一流的服务。中德人厚积薄发，再立潮头，全力打造国家高端切断阀先进制造企业，致力于加快我国切断阀的国产化应用进程，以更好地实现顾客满意度的最大化，中德愿与您精诚合作，共创美好的明天!

BRIEF INTRODUCTION

Zhejiang Zhongde Automatic Control Technology Co., Ltd. (formerly known as Zhongde Machinery Group Co., Ltd.) is a professional control valve manufacturer integrating research, development, production, sale and service. Since its establishment in 1992, Zhongde has been devoted to developing specialized technologies of shut–off valves, keeping us always at the leading position in Chinese shut–off valve industry. During more than twenty years of development, Zhongde personnel are building the brand of shut–off valves with specialization, concentration and perseverance. The products such as high performance butterfly valves, high performance ball valves, high temperature anti–wear ball valves, high temperature butterfly valves and quick shut–off gate valves with pneumatic, electric and electro–hydraulic driving are widely applied in petroleum, chemical industry, natural gas, coal chemical industry and other high–end fields, receiving deep trust from users.

Now Zhongde Group has set up the professional valve research and development center and first–class production platforms. It has successively obtained the ISO9001: quality system certification, API6D/609 product certification, API6FA/607 fire safety certification and special equipment (pressure pipes) manufacturing license TS certification. It is a first–tier supplier of SINOPEC, CNPC, CNOOC, CHEMCHINA, Shenhua Group, coal chemical industry and other fields. It has been successively awarded such honors as “China Famous Brand”, “Spark Model Enterprise in Zhejiang Province”, “National High–tech Enterprise”, “Star Enterprise in Zhejiang Province”, and has been approved as a “Class AAA Creditable Enterprise” by the Industrial and Commercial Bank of China for five years in succession.

“Customer satisfaction is regarded as our life”. For this, Zhongde has established 12 sales and service networks, which are creative both in breadth and depth of serving the markets. We can meet your demands. We will provide you with safe, reliable and trustworthy products and the value of our products is much higher than their price. Wherever you are, our team will offer serious, responsible, fast and high quality services to you with their rich experience and professional knowledge. We always keep our service promise of “one telephone, arrival within one day and success in one step”.

“Human oriented, booming business by morals” is the core idea of Zhongde Enterprise, and the standard followed by Zhongde personnel in conducting themselves and handling affairs. Zhongde personnel will offer high product quality and top–ranking services with the attitude of “meeting friends with sincerity, treating friends with morals”. Accumulating profoundly and working ceaselessly and unremittingly, Zhongde personnel are making all efforts to create an advanced manufacturing enterprise of high–end shut–off valves in China, accelerate the process of localization of shut–off valves and realize maximized customer satisfaction. Zhongde hopes to cooperate with you faithfully and create a brilliant future together!

气动多段式装车球阀
Pneumatic Multi-section Loading Ball Valve

ZhonDde 中德科技

概要

气动多段式装车球阀是一种能实现一次开/关、两次开/关、三次开/关动作的切断球阀，是我公司最新研制的多段控制阀。它克服了传统的两段阀控制复杂、价格高等缺点。本产品附件简单，只采用两只或者三只电磁阀，也可在执行器控制回路采用快速排气与节流装置，使多段式球阀获得了非常好的开关特性，具有一段开阀和一段关阀速度缓慢的特点，管道中液体变化平稳不会因冲击产生水锤而使易燃液体发生爆炸，亦不会应冲击而使系统中流量计、压力表等仪表损坏。它广泛适用石化、油库装车等部门的过程自动控制系统中对输送管道中气体、液体的切断和泄放以及自动调节系统中。

Summary

The pneumatic multi-section loading ball valve is a kind of shut-off ball valve that can realize one on/off, two on/off and three on/off actions. It is the latest multi-section control valve developed by our company. It overcomes the shortcomings of complex control and high price of traditional two-section valves. The accessories of this product are simple. It only uses two or three solenoid valves, or it can use quick exhaust and throttling devices at the actuator control loop to enable the multi-section ball valve to have excellent on-off characteristic and the feature of low-speed one-section valve opening and one-section valve closing. The steady change of liquid in the pipeline will not cause the flammable liquid to explode due to water hammer generated by impact. The instruments such as flow meter and pressure gauge in the system will not be damaged due to impact. It is widely used in the process automatic control system of petrochemical industry, oil depot loading and other sectors for shut-off and discharging of gas and liquid in the conveying pipeline as well as in automatic control systems.

特点

- 可实现阀门一段开二段关、二段开二段关、三段开三段关等多位置动作控制功能；
- 开关阀的速度可调；
- 开阀关阀大小开度可调；
- 自动、手动均可使用；
- 可实现断气/断电阀门安全复位（FC/FO）；
- 满足API 607防火和API 6D防静电要求。

Features

- Can realize valve multi-position action control functions such as one-section on two-section off, two-section on two-section off and three-section on three-section off
- Adjustable speed of on-off valve
- Adjustable valve opening and closing size and degree
- Both automatic and manual operations are available
- Can realize air failure/power failure valve safe reset (FC/FO)
- Meets API 607 fireproof and API 6D antistatic requirements

图1 气动多段式装车球阀
Figure 1 Pneumatic Multi-section Loading Ball Valve

主要技术参数

电源电压：DC.24V 110V， AC.220V 110V；
公称压力：150lb；300lb；
气源压力：350KPa～700Kpa；
额定行程：0～27°～90°（0~30%~100%）或0～27°～54°～90°（0~30%~60%~100%），且中间开度可调；
控制精度：±1.5°（气动两段式执行机构）；
±3°（气动单作用执行机构带微动开关）
流通能力：见表1
流量特性：多段阀开、关特性各动作开关特性见图2
检验与试验：按ANSI B16.104或API 598
使用温度：软密封-40°～+300°，硬密封-40°～+450°；
环境温度：-40°～+80°；
阀体材料：A216-WCB，A351-CF8，A351-CF8M（按客户要求）

Main technical parameters

Power voltage: DC.24V 110V, AC.220V 110V;
Nominal pressure: 150lb; 300lb;
Air supply pressure: 350KPa～700Kpa;
Rated travel: 0～27°～90°（0~30%~100%）or 0～27°～54°～90°（0~30%~60%~100%), and adjustable middle opening;
Control precision: ±1.5°(pneumatic two-section actuator);
±3°（pneumatic single acting actuator with micro switch)
Flow capacity: See table 1
Flow characteristic: See figure 2 for multi-section valve on-off characteristic and action switch characteristic
Inspection and testing: according to ANSI B16.104 or API 598
Working temperature: soft seal -40°～+300°, hard seal -40°～+450°;
Ambient temperature: -40°～+80°;
Body material: A216-WCB, A351-CF8, A351-CF8M (according to customer requirements)

表1 Table1

公称通径 Nominal diameter DN(mm)	25	32	40	50	65	80	100	125	150	200	250
额定流量系数 Rated flow Coefficient Kv	72	105	170	223	350	510	940	1450	2230	3610	5000

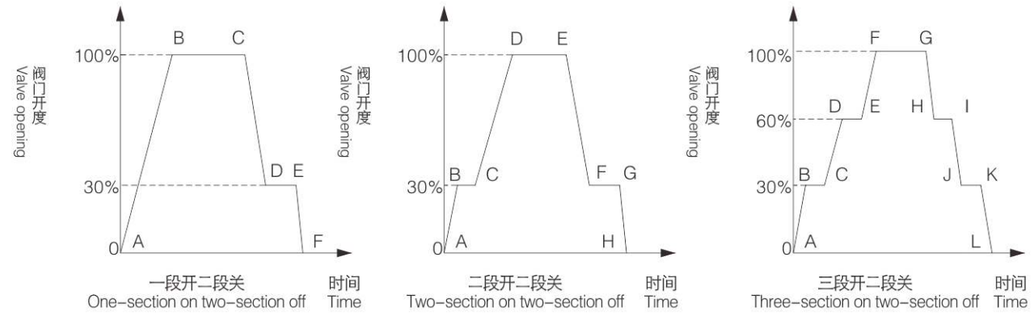


图2 流量开关特性曲线图
Figure 2 flow switch characteristic curve

图3 阀门构造、主要零部件分解图

Body construction and exploded view of main parts

气动多段式装车球阀分为两种结构：气动两段式执行机构控制和气动单作用执行机构带微动开关控制。

The pneumatic multi-section loading ball valves have two kinds of structures: pneumatic two-section actuator control and pneumatic single acting actuator with micro switch control

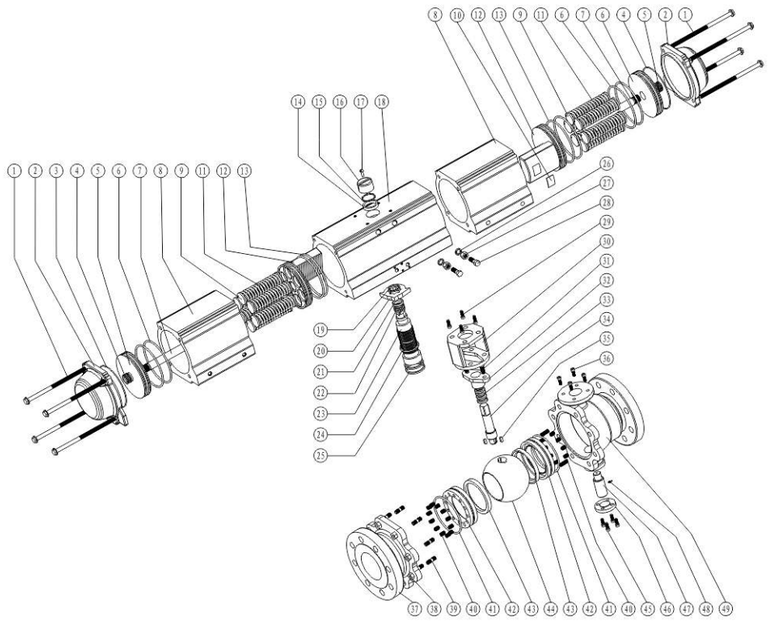


图3 气动两段式执行机构控制阀零部件分解图
Exploded view of parts of pneumatic two-section actuator control valve

1	端盖螺栓 End cover bolt	10	导向轴瓦 Guide bush	19	推力轴承 Thrust bearing	28	调节螺钉 Adjusting screw	37	阀盖 Bonnet	46	端盖 End cover
2	端盖 End cover	11	弹簧 Spring	20	调节凸轮 Adjusting cam	29	内六角螺钉 Inner hexagon screw	38	螺帽 Screw cap	47	固定轴 Fixed shaft
3	O形圈 O ring	12	内活塞 Inner piston	21	轴承 Bearing	30	支架 Yoke	39	双头螺栓 Stud	48	防静电装置 Antistatic device
4	圆螺母 Round nut	13	O形圈 O ring	22	O形圈 O ring	31	双头螺栓 Stud	40	弹簧 Spring	49	阀体 Body
5	外活塞 Outer piston	14	轴用上垫圈 Upper washer for shaft	23	输出轴 Output shaft	32	填料压板 Packing plate	41	O型圈 O ring		
6	O形圈 O ring	15	轴用弹性挡圈 Elastic retainer ring for shaft	24	轴承 Bearing	33	填料 Packing	42	阀座 Seat		
7	活塞杆 Piston rod	16	圆头螺钉 Round head screw	25	O形圈 O ring	34	阀杆 Stem	43	密封圈 Seal ring		
8	副缸体 Auxiliary cylinder	17	卡扣 Buckle	26	垫片 Gasket	35	键 Key	44	球体 Ball		
9	弹簧套筒 Spring bushing	18	主缸体 Main cylinder	27	螺帽 Screw cap	36	内六角螺钉 Inner hexagon screw	45	内六角螺钉 Inner hexagon screw		

阀门控制原理

Valve control principle

1、气动两段式执行机构控制

气动两段式装车球阀主要由气动两段式执行机构、球阀部件、控制元件等三部件组成。

该产品中的气动两段式执行机构是一种全新的气动执行器，可实现阀门一段开二段关、二段开一段关、二段开二段关等多位置动作控制。

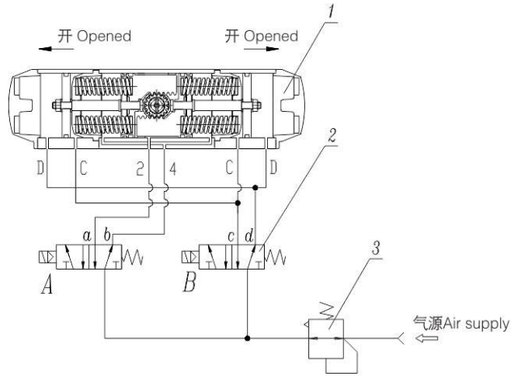
该两段式执行机构控制系统不仅在实现了原有两段执行器的所有功能，还在结构上有了较大的改善，用两个电磁阀即可实现所有的控制功能。减少了成本，减轻了安装调试的难度。同时，执行机构本身为单作用，能够满足气源故障要求，不需另配附件。阀门中间开度是根据执行机构内部辅助活塞杆的长短来控制的，可任意调节(如20%、30%、50%)。

Pneumatic two-section actuator control

The pneumatic two-section loading ball valve is mainly composed of three parts such as pneumatic two-section actuator, ball valve parts and control elements.

The pneumatic two-section actuator in this product is a brand-new pneumatic actuator, which can realize multi-position action control such as one-section on two-section off, two-section on one-section off and two-section on two-section off.

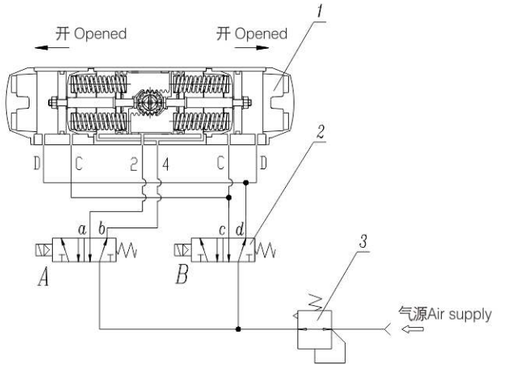
Not only has the two-section actuator control system realized all functions of previous two-section actuators, it also has great improvements in the structure. All control functions are realized by using two solenoid valves, so as to reduce costs and lower the installation and commissioning difficulty. Meanwhile, the actuator itself is of single acting type, so it can meet the air supply failure requirements without the need of using additional accessories. The valve middle opening is controlled through the length of the auxiliary piston rod inside the actuator and can be freely adjusted (such as 20%, 30%, 50%).



阀门状态 Valve status	电磁阀A Solenoid valve A		电磁阀B Solenoid valve B	
	a	b	c	d
全开 Fully open	✓	○	✓	○
关70% Closed 70%	✓	○	○	✓
全开 Fully open	○	✓	○	✓

✓：供气　○：排气

图4 一段开两段关控制原理图
One-section on two-section off control schematic diagram



阀门状态 Valve status	电磁阀A Solenoid valve A		电磁阀B Solenoid valve B	
	a	b	c	d
开30% open 30%	✓	○	○	✓
全开 Fully open	✓	○	✓	○
关70% Closed 70%	✓	○	○	✓
全开 Fully open	○	✓	○	✓

✓：供气　○：排气

图5 两段开两段关控制原理图
Two-section on two-section off control schematic diagram

其工作原理如下：

1.1、单作用一段开两段关阀控制原理：该控制系统由气动单作用多段式执行机构1、两只两位五通单电控电磁阀2和过滤减压器3组成。(见图4)

1.1、单作用一段开两段关阀控制原理：该控制系统由气动单作用多段式执行机构1、两只两位五通单电控电磁阀2和过滤减压器3组成。(见图4)

1.1.1.当(A)、(B)电磁阀均接受电信号时，(B)电磁阀换向，此时电磁阀(A)a口与电磁阀(B)c口供气，(A)b口和(C)d口排气。气缸2口和C口在压力作用　　下，使阀门开度为全开。

1.1.2.当阀门需换向第一段关时，(A)电磁阀接受电信号，(B)电磁阀断信号换向；此时(A)电磁阀a口与(B)电磁阀d口供气，(A)b口和(B)c口排气。气缸D口在压力作用下，使左右活塞向中间移动直到活塞杆机械限位止。此时阀门关闭于70%。

1.1.3.阀门需换全关时，(A)、(B)电磁阀断信号，此时(A)电磁阀b口与(B)电磁阀d口供气，(A)a口和(B)c口排气。气缸4口进气，在压力作用下使活塞向中间移动至阀门全关。

1.2、 单作用两段开两段关阀控制原理：该控制系统同样由气动单作用两段式执行机构、两个两位五通单电控电磁阀2和过滤减压器3组成。(见图5)

1.2.1. 当(A)电磁阀接受“启动”信号时，电磁阀(A)a口与电磁阀(B)d口供气，(A)b口和(B)c口排气。相应的气缸2口和D口进气，4口和C口排气。气缸在2口压力作用下，使中间两活塞向左右移动；由于D口处气压反作用力，使中间活塞运动到活塞杆机械限位台阶(30%)处停止，此时阀门开度为30%。

The working principle is shown as follows.

1.1. Single acting one–section on two–section off valve control principle: The control system is composed of pneumatic single acting multi–section actuator 1, two two–position five–way single electric control solenoid valves 2 and filter regulator 3 (see figure 4).

1.1. Single acting one–section on two–section off valve control principle: The control system is composed of pneumatic single acting multi–section actuator 1, two two–position five–way single electric control solenoid valves 2 and filter regulator 3 (see figure 4).

1.1.1. When the solenoid valves (A), (B) receive the electric signal, the solenoid valve (B) changes the direction. At the time, the solenoid valve port (A)a and the solenoid valve port (B)c supply the air, and the ports (A)b and (C)d discharge the air. Under the pressure, the cylinder ports 2 and C enable the valve opening to be full opening.

1.1.2. When the valve needs direction change for closing the first section, the solenoid valve (A) receives the electric signal, the solenoid valve (B) cuts off the signal and changes the direction. At the time, the port a of solenoid valve (A) and the port d of solenoid valve (B) supply the air, and the ports (A)b and (B)c discharge the air. Under the pressure, the cylinder port D makes the left and right pistons move to the middle until they reach the piston rod mechanical limit. At the time, the valve is closed at 70%.

1.1.3. When the valve needs to change to full closing, the solenoid valves (A), (B) cut off the signal. At the time, the port b of solenoid valve (A) and the port d of solenoid valve (B) supply the air, and the ports (A)a and (B)c discharge the air. The cylinder port 4 takes in the air and under the pressure, it makes the piston move to the middle until the valve is fully closed.

1.2. Single acting two–section on two–section off valve control principle: The control system is composed of pneumatic single acting two–section actuator, two two–position five–way single electric control solenoid valves 2 and filter regulator 3 (see figure 5).

1.2.1. When the solenoid valve (A) receives the “start” signal, the solenoid valve port (A)a and the solenoid valve port (B)d supply the air, and the ports (A)b and (B)c discharge the air. The corresponding cylinder ports 2 and D take in the air and the ports 4 and C discharge the air. Under the pressure, the cylinder port 2 makes the two pistons in the middle move leftwards and rightwards. Due to the pressure reacting force at the port D, the middle piston moves to the piston rod mechanical limit step (30%) and stops. At the time, the valve opening is 30%.

其工作原理如下：

1.2.2. 当(A)、(B)电磁阀均接受电信号时，(B)电磁阀换向，此时电磁阀(A)a口与电磁阀(B) C口供气，(A)b口和(C)d口排气。气缸2口和C口在压力作用下，使阀门开度为全开。

1.2.3.当阀门需换向第一段关时，(A)电磁阀接受电信号，(B)电磁阀断信号换向；此时(A)电磁阀a口与(B)电磁阀d口供气，(A)b口和(B)c口排气。气缸D口在压力作用下，使左右活塞向中间移动直到活塞杆机械限位止。此时阀门关闭于70%。

1.2.4.阀门需换全关时，(A)、(B)电磁阀断信号，此时(A)电磁阀b口与(B)电磁阀d口供气，(A)a口和(B)c口排气。气缸4口进气，在压力作用下使活塞向中间移动至阀门全关。

1.3、 当气源与信号发生故障时，阀门在执行器弹簧力作用下，来实现阀门故障要求。无需增加附件，方便可靠，节约成本。(见图6)

1.4、 本执行器集单作用和双作用于一体。当执行器不带弹簧时，执行机构为双作用，气源故障时可实现阀门保持原位。

The working principle is shown as follows.

1.2.2. When the solenoid valves (A), (B) receive the electric signal, the solenoid valve B changes the direction. At the time, the solenoid valve port (A)a and the solenoid valve port (B)c supply the air, and the ports (A)b and (C)d discharge the air. Under the pressure, the cylinder ports 2 and C enable the valve opening to be full opening.

1.2.3. When the valve needs direction change for closing the first section, the solenoid valve (A) receives the electric signal, the solenoid valve (B) cuts off the signal and changes the direction. At the time, the port a of solenoid valve (A) and the port d of solenoid valve (B) supply the air, and the ports (A)b and (B)c discharge the air. Under the pressure, the cylinder port D makes the left and right pistons move to the middle until they reach the piston rod mechanical limit. At the time, the valve is closed at 70%.

1.2.4. When the valve needs to change to full closing, the solenoid valves (A), (B) cut off the signal. At the time, the port b of solenoid valve (A) and the port d of solenoid valve (B) supply the air, and the ports (A)a and (B)c discharge the air. The cylinder port 4 takes in the air and under the pressure, it makes the piston move to the middle until the valve is fully closed.

1.3. In case of air supply and signal failure, the valve will realize the valve failure requirements under the action of the actuator spring force. It is convenient, reliable and cost–effective, without the need of adding accessories (see figure 6).

1.4. The actuator integrates single acting and double acting functions. When the actuator is not provided with spring, the actuator is of double acting type, and it can realize the purpose of keeping the valve at its original position in case of air supply failure.

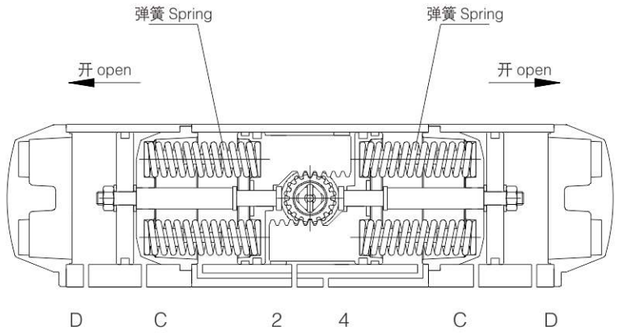


图6 单作用两段式执行机构结构示意图
Figure 6 Structure schematic diagram of single acting two–section actuator

气动单作用执行机构带微动开关控制

多段式控制球阀由气动单作用弹簧复位式执行机构、球阀部件、控制元件等三大部门组成。

其工作原理如下：

2.1、两段式控制执行机构由一个直动式二位三通、一个直动式二位二通电磁阀、一个可调式压力开关和一个限位开关来控制。控制原理图见图7。二 位二通电磁阀为常通型，二个电磁阀串联。其中二位二通电磁阀与限位开关电源线串联。其原理是通过限位开关的开启或闭和来控制二位二通电磁阀，从而实现阀门多种控制。见表2电磁阀控制原理逻辑图。当两个电磁阀同时断电或气源故障时，阀门在执行机构弹簧力作用下实现FC或FO。

Pneumatic single acting actuator with micro switch control

The multi–section control ball valve is composed of three parts such as single acting spring return actuator, ball valve parts and control elements.

The working principle is shown as follows:

2.1. The two–section control actuator is controlled through a direct–acting two–position three–way solenoid valve, a direct–acting two–position two–way solenoid valve, an adjustable pressure switch and a limit switch. See figure 7 for the control schematic diagram. The two–position two–way solenoid valve is of normal open type. The two solenoid valves are connected in series. The power cords of two–position two–way solenoid valve and limit switch are connected in series. The principle is that the two–position two–way solenoid valve is controlled through turning on or off the limit switch, so as to realize multiple controls of the valve. See table 2 for the control principle logic diagram of solenoid valve. When the two solenoid valves are powered off or have air supply failure simultaneously, the valve will realize FC or FO under the action of the actuator spring force.

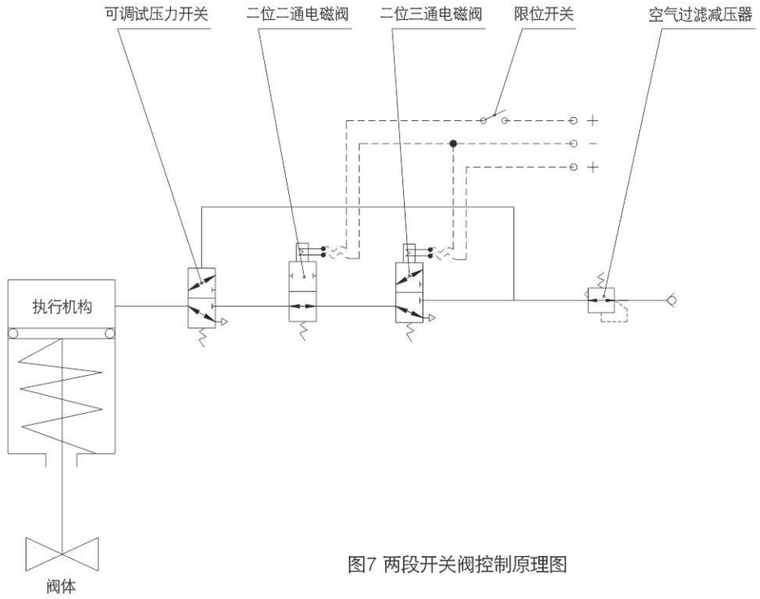


图7 两段开关阀控制原理图

表2 两段开关阀控制电磁阀逻辑说明 Table2 Two–section on–off valve and control solenoid valve logic description

阀门开度 Valve opening	二位二通电磁阀A Two–position two–way solenoid valve A	二位三通电磁阀C Two–position three–way solenoid valve C	备注 Remark
0%	0	0	阀门原始处于关闭状态，电磁阀A、C未带电。 The valve is originally at the closing status, and the solenoid valves A, C are not powered on
30%	1	1	电磁阀A、C通电，但电磁阀A未励磁，阀门开始向“开”方向动作。当运行至30%时，限位开关闭合，电磁阀A励磁，阀门保持阀位30%。 The solenoid valves A, C are powered on, but the solenoid A is not excited, and the valve starts to act towards the “opening” direction. When it runs to 30%, the limit switch is closed, the solenoid valve A is excited, and the valve maintains the valve position 30%.
100%	0	1	电磁阀A断电，电磁阀C通电，阀门继续开动作，同时限位开关断开，直至阀门全开。 The solenoid valve A is powered off, the solenoid valve C is powered on, the valve continues the opening action and the limit switch is cut off until the valve is fully opened.
30%	1	0	电磁阀A通电，电磁阀C断电，阀门开始向“关”方向动作。运行至30%时，限位开关闭合，电磁阀A励磁，阀门保持阀位30%。 The solenoid valve A is powered on, the solenoid valve C is powered off, and the valve starts to act towards the “closing” direction. When it runs to 30%, the limit switch is closed, the solenoid valve A is excited, and the valve maintains the valve position 30%.
0%	0	0	电磁阀A、C断电，阀门继续关动作，直至阀门全关。 The solenoid valves A, C are powered off, and the valve continues the closing action until it is fully closed.

说明：电磁阀A和限位开关A常开（N.O）触点串联。
Note: The solenoid valve A and limit switch A normally open (N.O) contacts are connected in series.

阀门控制原理

2.2、三段式控制：
控制元件由一个直动式二位三通、两个直动式二位二通电磁阀和两个限位开关、气源过滤减压器组成。控制原理图见图8。
二位二通电磁阀为常通型。其中两个二位二通电磁阀分别与限位开关串联。其原理是通过限位开关的启闭来控制二位二通电磁阀是否励磁，从而实现阀门多种控制。见表3电磁阀控制原理逻辑图。电磁阀A和限位开关A控制阀门30%的开度，电磁阀B和限位开关B控制阀门60%的开度，具体开度可通过调整限位开关来进行控制。当电磁阀同时断电或气源故障时，阀门在执行机构弹簧力作用下实现FC或FO。图中所示为三段式控制原理，如果减配二位二通电磁阀B和限位开关B，即变成两段式控制。具体配置根据用户需要。

Valve control principle

2.2. Three–section control:
The control element is composed of one direct–acting two–position three–way solenoid valve, two direct–acting two–position two–way solenoid valves and two limit switches, as well as air supply filter regulator. See figure 8 for the control schematic diagram.
The two–position two–way solenoid valve is of normal open type. The two two–position two–way solenoid valves are connected with the limit switch in series. The principle is that the two–position two–way solenoid valve is controlled to be excited or not through turning on or off the limit switch, so as to realize multiple controls of the valve. See table 3 for the control principle logic diagram of solenoid valve. The solenoid valve A and limit switch A control valve 30% opening, and the solenoid valve B and limit switch B control valve 60% opening. The detailed opening can be controlled through adjusting the limit switch. When the solenoid valves are powered off or have air supply failure simultaneously, the valve will realize FC or FO under the action of the actuator spring force. The figure shows the three–section control principle. If the configuration is reduced to be two–position two–way solenoid valve B and limit switch B, it will change into two–section control. The detailed configuration shall depend on user requirements.

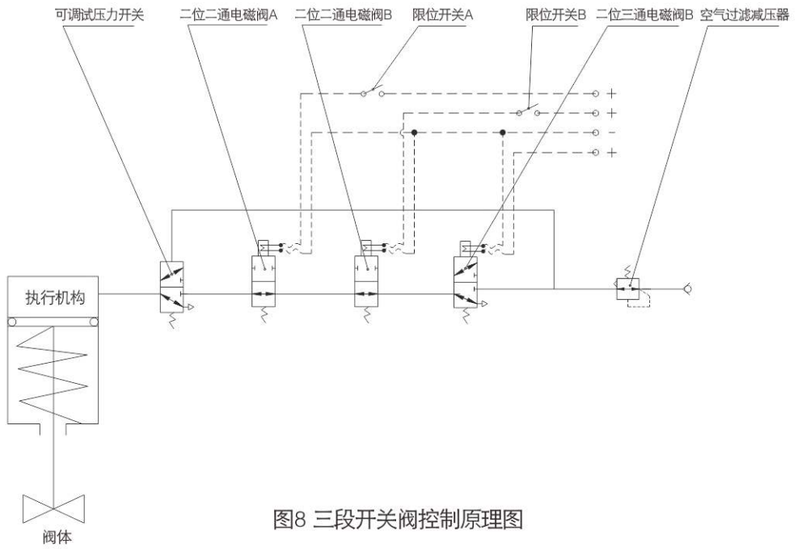


图8 三段开关阀控制原理图

表3 三段开关阀控制电磁阀逻辑说明 Table3 Three–section on–off valve and control solenoid valve logic description

阀门开度 Valve opening	二位二通电磁阀A Two–position two–way solenoid valve A	二位二通电磁阀C Two–position two–way solenoid valve C	二位三通电磁阀C Two–position three–way solenoid valve C	备注 Remark
0%	0	0	0	阀门原始处于关闭状态，电磁阀A、B、C未带电。 The valve is originally at the closing status, and the solenoid valves A, C are not powered on
30%	1	0	1	电磁阀A、C通电，阀门开始向"开"方向动作，运行30%时，限位开关A闭合，电磁阀A励磁，阀门保持阀位30%。 The solenoid valves A, C are powered on, and the valve starts to act towards the “opening” direction. When it runs to 30%, the limit switch A is closed, the solenoid valve A is excited, and the valve maintains the valve position 30%.
60%	0	1	1	电磁阀A断电，电磁阀B、C通电，阀门继续开动作。运行至60%时，限位开关B闭合，电磁阀B励磁，阀门保持阀位60%。 The solenoid valve A is powered off, the solenoid valves B, C are powered on, and the valve continues the opening action. When it runs to 60%, the limit switch B is closed, the solenoid valve B is excited, and the valve maintains the valve position 60%.
100%	0	0	1	电磁阀A、B断电，电磁阀C通电，阀门继续开动作，直至阀门全开。 The solenoid valves A, B are powered off, the solenoid valve C is powered on, and the valve continues the opening action until it is fully opened.
60%	0	1	0	电磁阀A、C断电，电磁阀B通电，阀门开始向"关"方向动作。运行至60%时，限位开关B闭合，电磁阀B励磁，阀门保持阀位60%。 The solenoid valves A, C are powered off, the solenoid valve B is powered on, and the valve starts to act towards the “closing” direction. When it runs to 60%, the limit switch B is closed, the solenoid valve B is excited, and the valve maintains the valve position 60%.
30%	1	0	0	电磁阀B、C断电，电磁阀A通电，阀门继续关动作。运行至30%时，限位开关A闭合，电磁阀A励磁，阀门保持阀位30%。 The solenoid valves B, C are powered off, the solenoid valve A is powered on, and the valve continues the closing action. When it runs to 30%, the limit switch A is closed, the solenoid valve A is excited, and the valve maintains the valve position 30%.
0%	0	0	0	电磁阀A、B、C断电，阀门继续关动作，直至阀门全关。 The solenoid valves A, B, C are powered off, and the continues the closing action until it is fully closed.

说明：电磁阀A和限位开关A常开（N.O）触点串联。
Note: The solenoid valve A and limit switch A normally open (N.O) contacts are connected in series.

阀门外型及连接尺寸 Valve outline and connection dimensions

5.1 气动两段式执行机构控制球阀外型及连接尺寸（见图9及表4~5）
Outline and connection dimensions of pneumatic two-section actuator control ball valve (see figure 9 and table 4~5)

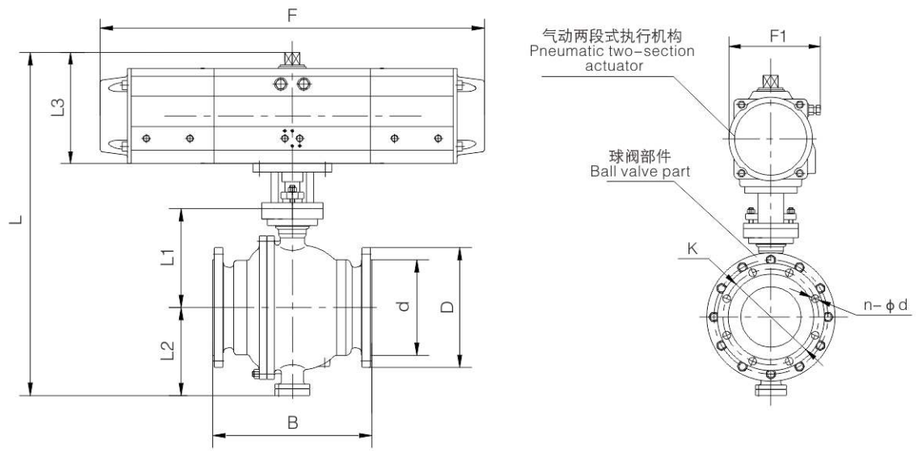


图9 气动两段式执行机构控制球阀外型尺寸图
Outline dimensions diagram of pneumatic two-section actuator control ball valve

表4（法兰标准：ANSI B16.5 RF）Table4 Flange standard：ANSI B16.5 RF 单位 Unit：mm

产品型号 Product model	压力等级 Pressure class	口径 Size	连接尺寸 Connection dimensions				外型尺寸 Outline dimensions							重量kg Weight
			D	K	d	N-Φd	L	L1	L2	L3	F	F1	B	
ZSA/B/C	150LB	2"	Φ150	Φ120.5	Φ92	4-Φ19	532	120	100	207	777	172	178	56
		3"	Φ190	Φ152.5	Φ127	4-Φ19	615	150	132	207	777	172	203	72
		4"	Φ230	Φ190.5	Φ157	8-Φ19	676	170	155	226	822	187	229	103
		6"	Φ280	Φ241	Φ216	8-Φ22	845	210	190	295	1015	222	394	205
		8"	Φ345	Φ298.5	Φ270	8-Φ22	1000	265	230	350	1265	262	457	326

表5（法兰标准：ANSI B16.5 RF）Table5 Flange standard：ANSI B16.5 RF 单位 Unit：mm

产品型号 Product model	压力等级 Pressure class	口径 Size	连接尺寸 Connection dimensions				外型尺寸 Outline dimensions							重量kg Weight
			D	K	d	N-Φd	L	L1	L2	L3	F	F1	B	
ZSA/B/C	300LB	2"	Φ165	Φ127	Φ92	8-Φ19	582	130	110	207	777	172	216	68
		3"	Φ210	Φ168.5	Φ127	8-Φ22	686	165	145	226	822	187	283	96
		4"	Φ255	Φ200	Φ157	8-Φ22	795	190	165	295	1015	222	305	172
		6"	Φ320	Φ270	Φ216	12-Φ22	970	260	210	350	1265	262	403	315
		8"	Φ380	Φ330	Φ270	12-Φ25	1090	290	250	380	1400	330	502	482

5.2 气动单作用执行机构带微动开关控制球阀外型及连接尺寸（见图10和表6~7）
Outline and connection dimensions of pneumatic single acting actuator with micro switch control ball valve (see figure 10 and table 6~7)

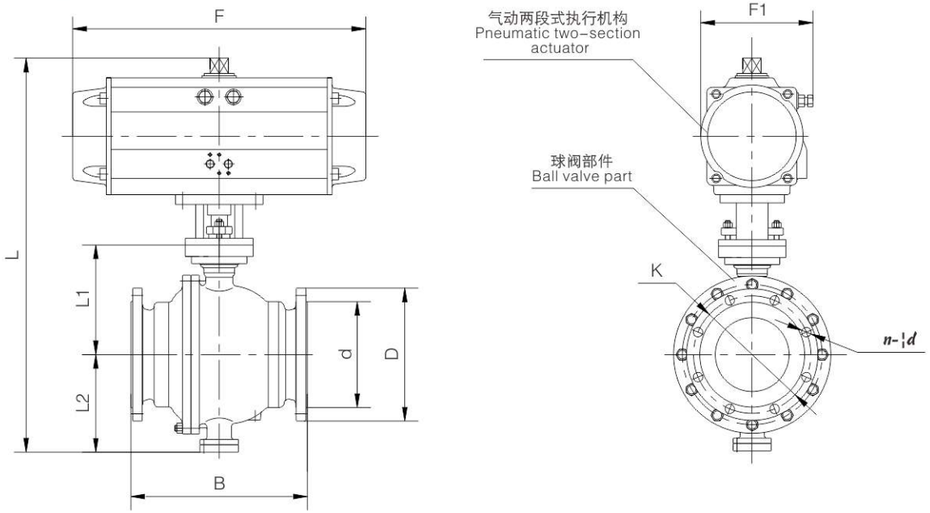


图10 气动单作用执行机构带微动开关控制球阀外型尺寸图
Outline dimensions diagram of pneumatic single acting actuator with micro switch control ball valve

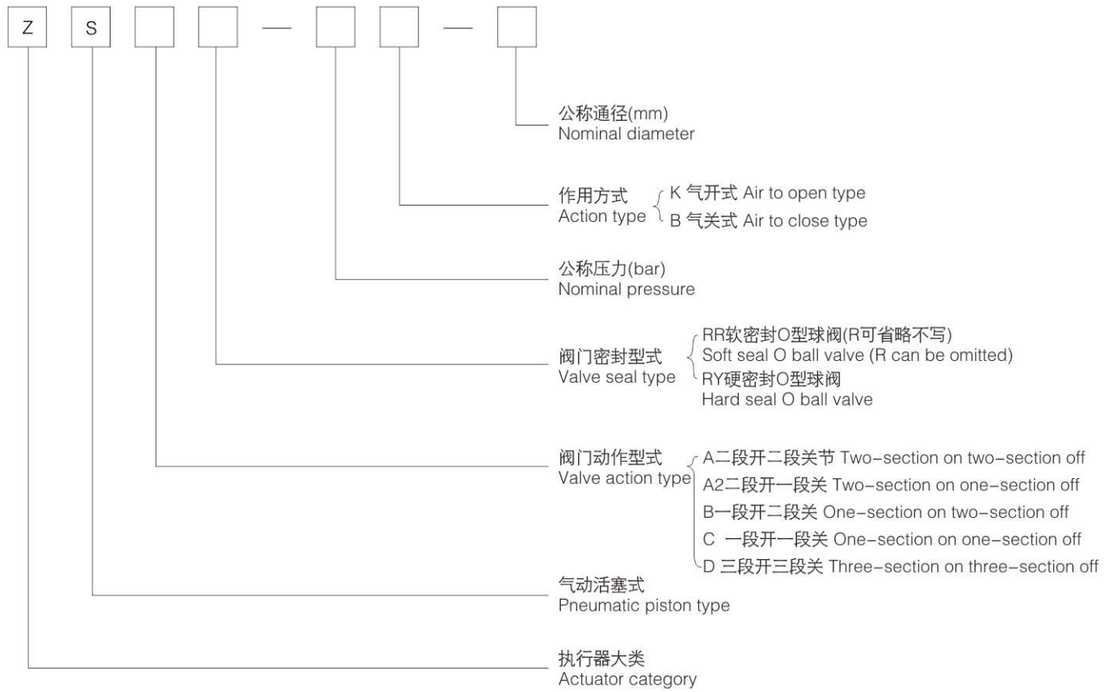
表6（法兰标准：ANSI B16.5 RF）Table6 Flange standard：ANSI B16.5 RF 单位 Unit：mm

产品型号 Product model	压力等级 Pressure class	口径 Size	连接尺寸 Connection dimensions				外型尺寸 Outline dimensions							重量kg Weight
			D	K	d	N-Φd	L	L1	L2	L3	F	F1	B	
ZSA/B/C/D	150LB	2"	Φ150	Φ120.5	Φ92	4-Φ19	532	120	100	207	409	172	178	36
		3"	Φ190	Φ152.5	Φ127	4-Φ19	615	150	132	226	438	187	203	57
		4"	Φ230	Φ190.5	Φ157	8-Φ19	676	170	155	226	438	187	229	82
		6"	Φ280	Φ241	Φ216	8-Φ22	845	210	190	295	543	222	394	175
		8"	Φ345	Φ298.5	Φ270	8-Φ22	1000	265	230	350	633	262	457	273

表7（法兰标准：ANSI B16.5 RF）Table6 Flange standard：ANSI B16.5 RF 单位 Unit：mm

产品型号 Product model	压力等级 Pressure class	口径 Size	连接尺寸 Connection dimensions				外型尺寸 Outline dimensions							重量kg Weight
			D	K	d	N-Φd	L	L1	L2	L3	F	F1	B	
ZSA/B/C/D	300LB	2"	Φ165	Φ127	Φ92	8-Φ19	582	130	110	207	438	172	216	45
		3"	Φ210	Φ168.5	Φ127	8-Φ22	686	165	145	226	438	187	283	70
		4"	Φ255	Φ200	Φ157	8-Φ22	795	190	165	295	487	222	305	128
		6"	Φ320	Φ270	Φ216	12Φ22	970	260	210	350	633	262	403	248
		8"	Φ380	Φ330	Φ270	12-Φ25	1090	290	250	380	728	330	502	406

型号编制 Model establishment



示例：
ZSAR-20K-50
表示气动二段开二段关O型软密封球阀，公称压力为CL150，通电阀开，故障阀关，公称通径为DN50(mm)。
ZSBRY-50B-100
表示气动一段开二段关O型硬密封球阀，公称压力为CL300，通电阀关，故障阀开，公称通径为DN100（mm）。
ZSDRY-20K-50
表示气动三段开三段关O型硬密封球阀，公称压力为CL150，通电阀开，故障阀关，公称通径为DN50(mm)。

For example:
ZSAR-20K-50
Indicating pneumatic two-section on two-section off soft seal O ball valve, nominal pressure CL150, power-on valve on, failure valve off, nominal diameter DN50(mm)
ZSBRY-50B-100
Indicating pneumatic one-section on two-section off hard seal O ball valve, nominal pressure CL300, power-on valve off, failure valve on, nominal diameter DN100(mm)
ZSDRY-20K-50
Indicating pneumatic three-section on three-section off hard seal O ball valve, nominal pressure CL150, power-on valve on, failure valve off, nominal diameter DN50(mm)

正确操作

1. 阀门在出厂时已经过必要性的性能测试，且按订单要求进行了整定，用户一般可直接安装使用。
2. 使用手轮操作时,先将气缸内的残余气体通过电磁阀（或控制元件）排空(在气缸内有残余气体的情况下)。
3. 双作用气缸先将执行器的平衡阀打开，然后将转换手柄置于"手动"位置，使蜗杆与蜗轮处于完全吻合状态。用手轮操作时请勿用力过大（不可借用其他的外力工具）。

特别提示:

带手动操作机构的阀门在弹簧复位（关闭阀门）或是气动开启（关闭）阀门过程中，任何一个开度都不能使用"自动手动"切换。

4. 操作时，请参照执行器上铭牌指示。
5. 对于单作用执行机构，在撤卸气缸时，一定要使用专用工具。

配管安装位置

1、球阀可在水平或垂直管道上安装，使用前应对管道及压缩空气管路进行吹扫，彻底清洗管路和阀内腔污物、焊渣、润滑油脂等异物。
2、由于选配执行机构的关系，请在订货时一定要注明安装位置。

维护与保养

1. 正常检查：每年进行一次，检查各管接着部分有无漏气，应换O型密封圈或有关螺钉，检查空气的净化情况，排除过滤器中冷凝水，检查各螺纹连接部有无松动。
2. 输出轴上的轴承、手操机构切换轴上的轴承等转动部位每三个月或半年加一次足够的润滑油脂。
3. 检修时应检查并清洗缸套及活塞，如发现O型密封圈有损坏或老化时应及时更换，装配时应在气缸壁和密封圈沟槽内涂滑油，并注意缓慢将活塞推入气缸，以免损坏O型密封圈。
4. 气源压力应在0.35～0.7MPa（G）范围内，气源应经除尘、脱水等净化处理。

Correct operation

1. The valve has undergone necessary performance tests before leaving the factory, and setting has been made according to order requirements, so users can install and use it directly.
2. When using the operating mechanism for operation, first empty the residual gas in the cylinder through the solenoid valve (or control element) (in case there is residual gas in the cylinder).
3. For the double acting cylinder, first open the balancing valve of the actuator, turn the change-over handle to the "manual" position to make the worm and worm gear fully fit with each other. Do not use excessive force when operating the handwheel (other tools shall not be used).

Special hint:

For the valve with manual operating mechanism, during spring return (closing the valve) or pneumatic valve opening (closing), any opening cannot be switched through using "automatic-manual".

4. During operation, please refer to the indication on the nameplate of the actuator.
5. For single acting actuators, please use special tools when removing the cylinder.

Pipe installation position

1. The ball valve can be installed on horizontal or vertical pipe. Before the use, please scavenge the pipe and compressed air pipe to thoroughly clean away foreign matters such as dirty things, welding slag, lubricating grease, etc. in the pipes and valve cavity.
2. As the selection of actuator shall be taken into consideration, please specify the installation position when placing orders.

Maintenance and servicing

1. Normal check: Carry out normal check once every year to check if there is any gas leakage at the connecting parts, and replace the O rings or relevant bolts if there is any. Check the air cleanliness. Eliminate condensate in the filter. Check if the connecting parts of all threads are loose.
2. The bearings on the output shaft and the bearings on the change-over shaft of the manual operating mechanism and other moving parts shall be added with sufficient lubricating grease once every three or six months.
3. During maintenance, please check and clean the cylinder cover and piston. If it is found that the O rings are damaged or age, please replace them in time. During assembly, please spread lubricating grease on the cylinder wall and inside the groove of seal rings. Notice that the piston shall be slowly pushed into the cylinder. Otherwise, the O rings may be damaged.
4. The air supply pressure shall be within the range of 0.35～0.7MPa(G). The air supply shall be subjected to dust removing and dehydrating treatment.

订货须知

当您订货时，请明确注明以下各项内容：

1、阀门口径及阀内孔径
2、阀体规格及连接形式
3、阀体材质及阀内件材质
4、阀门特性及阀芯形式
5、阀盖形式
6、执行机构型号是否配手操及气源压力
7、阀门动作（气源故障要求）
8、是否要带电磁阀、控制箱、空气过滤减压阀等
9、是否要除油、除水、无铜等特殊规格
10、配管尺寸、管壁厚（入口侧、出口侧）
11、流体的名称、状态（液、气、蒸汽等）
12、常用流量及最大、最小流量
13、流体压力及压差（全开、全闭时）
14、流体的温度、比重或密度
15、流体的粘度、有无浆料、闪蒸
16、其他特殊要求

Ordering notes

When placing orders, please specify the following items:

1. Valve size and valve bore
2. Body specification and type of connection
3. Body material and trim material
4. Valve characteristic and valve plug form
5. Bonnet form
6. Actuator model and shall it be provided with manual operating mechanism and air supply pressure
7. Valve action (air supply failure requirement)
8. Shall it be provided with positioner, solenoid valve, Air set, etc.
9. Are products of special specifications such as oil removing, water removing and copper–free needed
10. Tube size, tube wall thickness (inlet side, outlet side)
11. Fluid name and status (liquid, gas, steam, etc.)
12. Common flow and maximum and minimum flow
13. Fluid pressure and differential pressure (during full opening and full closing)
14. Fluid temperature, specific gravity or density
15. Fluid viscosity, containing slurry or not, flash evaporation
16. Is it used for high pressure and high temperature applications
17. Other special requirements

质量控制

质量

中德集团全体员工对质量至上的全面认同是产品质量的最佳保证，“以人为本，以德兴业”是中德企业文化的核心，因此，集团公司创立了一个从最初客户询价到产品发货，并最终到产品的售后服务的整个过程的质量文化体系。

工程设计

中德集团至1992年成立至今，拥有几十年阀门领域的工程设计经验，且不断进行技术革新。对于客户的要求，中德的设计人员会分析客户的需求，提供最优的解决方案并设计出满意客户标准的产品。产品设计满足ASME/ANSI、API、GB等不同标准的要求。

客户服务

“客户的满意我们视之为生命”是公司的宗旨。为此，中德公司在国内建立了12个直销和服务网络，在为客户提供“安全、可靠、省心”产品的同时，也使中德产品价值永远大于产品价格的理念深入客户，中德集团追求的是长期的客户关系，打造百年民族企业的信念。

Quality control

Quality

The unanimous recognition of quality first by all staff members of Zhongde Group is the guarantee of product quality. “Human oriented, booming business by morals” is the core idea of Zhongde Enterprise. Therefore, the Group has established a quality culture system that includes customer inquiry, delivery and after–sales service.

Engineering design

Since its establishment in 1992 till now, Zhongde Group has several decades of experience in engineering design in the valve industry, and is continuously carrying out technical upgrading. According to customer requirements, the designers of Zhongde will analyze these demands, offer the best solutions and design products that meet customer standards. The product design meets the requirements in different standards such as ASME/ANSI, API, GB, etc.

Customer service

It is the principle of our company that “customer satisfaction is regarded as our life”. For this, Zhongde has established 12 sales and service networks in China. While providing customers with safe, reliable and trustworthy products, we are spreading the concept that the value of our products is much higher than their price into the mind of every customer. Holding the belief of building a national enterprise of a hundred years, Zhongde Group is seeking long–term relationship with customers.