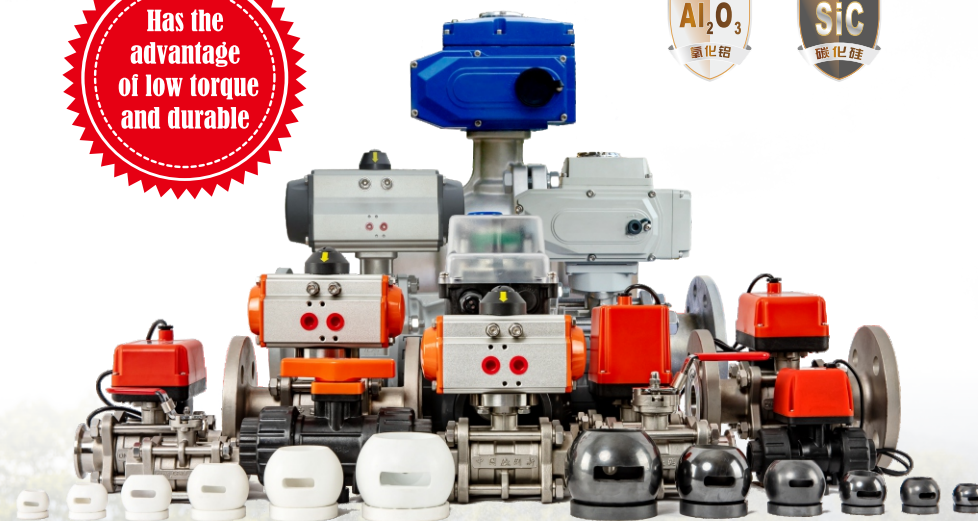




Application of Runjing Ceramic Hard Sealing Ball Valve

in Agriculture Intelligent Irrigation

Patent No.: ZL201320732225.7



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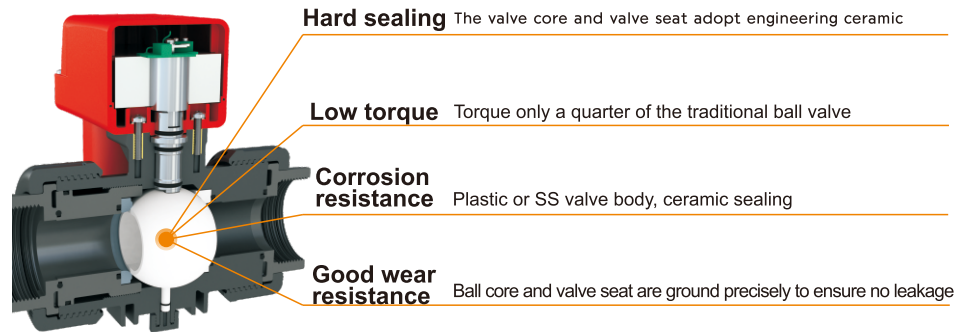
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Runxin Seventh Phase is used to expand the capacity of Runjing ceramic hard sealing ball valve and Runjing intelligent irrigation valve, which is expected to be completed and put into operation by the end of 2023.
(Runxin Seventh Phase Rendering)

Chapter 1: Preface

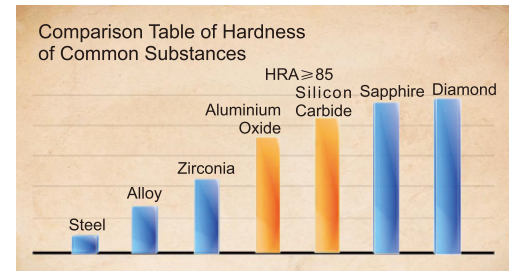
The so-called "ceramic hard sealing ball valve" is the ball valve whose ball core and valve seat are all made of special ceramic material with ultra-high hardness and good corrosion resistance. After precisely machining, it can keep the concave and convex spherical surface with high hardness fit and rotate relatively, achieving open and close function.



Chapter 2: Features of Runjing Ceramic Hard Sealing Ball Valve

1. Durability

The valve core and valve seat of Runjing ceramic hard sealing ball valve are made of corundum ceramic or silicon carbide, which are sintered at 1680°C or 2200°C ultra-high temperature, and the Rockwell hardness HRA can reach 85 or more. Its hardness rank only second to diamond and sapphire, and equivalent to tungsten-cobalt turning tool. It can be seen from the hardness table that its hardness is 7-9 times of steel. The precision machining of multiple processes makes the roundness of the ball core accurate to below 6 μm, fitting closely to valve seat and realizing open and close function by relative rotation.



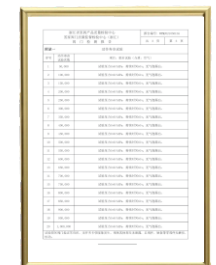
Hardness test: using special ceramic to scratch glass, the glass appears obvious scratches, the hardness of 95 alumina ceramic is much higher than that of glass.

Sealing test: after being wetted with water, the valve seat can be adhered to the valve core without falling off, indicating the fit between the valve core and the valve seat can almost reach the vacuum state.

The excellent durability of Runjing ceramic hard sealing ball valve has been certified by the National Quality Supervision and Inspection Center of Valve Products (Zhejiang). According to the test result, the Runjing ceramic hard sealing ball valve can realize no leakage for 1 minute after being opened and closed for 1 million times under a pressure of 6 bar.



Ball Valve Test Report



Application of Runjing Ceramic Hard Sealing Ball Valve in Agriculture Intelligent Irrigation

Due to the extremely high hardness of special ceramic, this is corrosion resistant materials, thus Runjing ceramic hard sealing ball valve is not afraid of the wear of particles in the medium, and have outstanding corrosion resistance, which is suitable for application in water and fertilizer integrated machine. (Water and fertilizer solution contain soluble solid particle with a certain concentration of acid and alkali, which requires the valve equipped in the equipment to be resistant to corrosion and wear. Traditional stainless steel ball valves are difficult to meet.)

Corrosion Resistance Table of Commonly Used Materials of Ball Core of Runxin Ceramic Hard Sealing Ball Valve

Media	Temperature	ZrO ₂	95Al ₂ O ₃	SiC	Si ₃ N ₄	SS304	SS316
20%HCL	60°C	A	A	A	B	C	C
20%HCL	95°C	A	A	A	C	—	—
90%H ₂ SO ₄	60°C	A	A	A	A	C	C
90%H ₂ SO ₄	95°C	A	A	A	B	C	C
60%H ₂ PO ₄	60°C	A	A	A	C	C	C
60%H ₂ PO ₄	95°C	A	A	A	C	C	C
10%HF	60°C	C	B	A	A	C	C
46%HF	95°C	C	C	A	C	—	—
60%HNO ₃	60°C	A	B	A	C	A	A
60%HNO ₃	95°C	A	C	A	C	B	B
30%NaOH	60°C	A	C	A	B	A	A
30%NaOH	95°C	B	C	A	C	A	B

Illustration:

A: <0.1mmg/cm²/day, indicate that the material has no corrosion or can be ignored in the medium, which is recommended to use.
B: 0.1~0.3 mmg/cm²/day, indicate that the material has slight corrosion or few corrosion in the medium, which is suitable to use.
C: >0.3 mmg/cm²/day, indicate that the material has medium corrosion or large corrosion in the medium, which is not recommended to use.

2. Low torque

The valve core and valve seat of Runjing ceramic hard sealing ball valve are pairwise machining into spherical geometry with high roundness and high finish. Due to the extremely small elastic deformation and excellent self-lubricating property of the special ceramic with high hardness, it has an extremely low torque value, which is only 1/10 of that of the traditional ball valve. It has the characteristics of "low torque", and its opening and closing are smooth. Even if it is not used for a long time, it will not be "stuck".

The "low torque" feature means that the power consumption for driving the valve to open and close is very low, which has laid a good foundation for remote control opening and closing operation and low power consumption operation under power shortage conditions (for example, the power consumption for opening and closing of DN25 electronic ball valve is only 0.0014 WH. There is no power consumption in standby mode, and the DC3.7V/2.5AH battery can drive the ball valve to open and close for about 5000 times), which can be driven by solar photovoltaic direct current.

Torque Test Table of Runjing Ceramic Hard Sealing Ball Valve

size		N·m	
DN	NPS	1.0MPa	1.6MPa
DN15	1/2"	1.0N·m	1.5N·m
DN20	3/4"	1.0N·m	1.5N·m
DN25	1"	1.7N·m	2.6N·m
DN32	1-1/4"	3.2N·m	4.9N·m

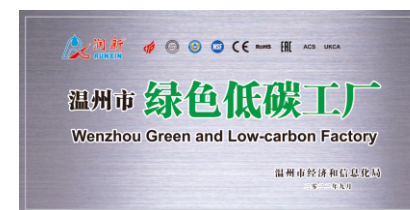
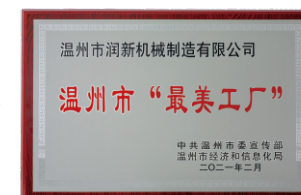
VS

Torque of Traditional Ball Valve from Other Brands

size		N·m	
DN	NPS	0.6MPa	1.6MPa
DN15	1/2"	15N·m	19N·m
DN20	3/4"	20N·m	30N·m
DN25	1"	20N·m	30N·m
DN32	1-1/4"	30N·m	50N·m

Chapter 3: Company Situation

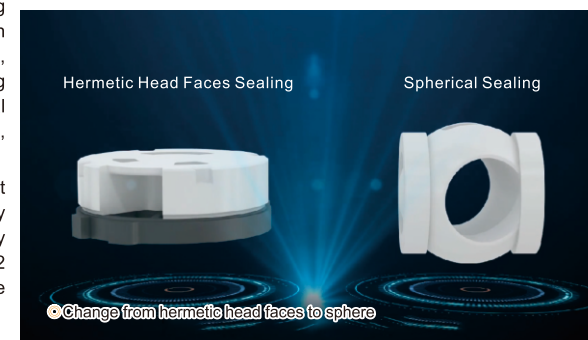
Wenzhou Runxin Manufacturing Machine Co., Ltd. was found in 2000, is the national new high-tech enterprise, National Specialized, Fined, Peculiar and Innovative "Little Giant" Enterprise, Zhejiang Hidden Champion Enterprise, Wenzhou First Batch of "The Most Beautiful Factories", Wenzhou Environmental Low Carbon Factory, Wenzhou Leading Industrial Enterprise. It has established Zhejiang Provincial Runxin Research Institute of Water Supplying Treatment Systems. It is Provincial Research and Development Center, Provincial Enterprise Technology Center, having obtained more than 110 patents in total.



More than a decade ago, Runxin company creatively applied ceramic hermetic head faces technology to the water treatment industry, developed a new structure of control valve (called "Runxin Valve") for water treatment system, and successively obtained invention patent authorization from 17 countries, such as the United States, the European Union, Russia and so on. As of October 2022, "Runxin Valve" has been exported to 140 countries and regions around the world, with a domestic market share of nearly 80%. Therefore, Runxin is also known as one of the world's top three professional manufacturers of control valve for water treatment systems.

Runjing ceramic hard sealing ball valve is technological achievement of extending from Runxin company's ceramic hermetic head faces sealing to spherical sealing, it has been applied in industry for many years, such as sewage treatment, printing and dyeing, photovoltaic, chemical industry, wet smelting, papermaking, lithium battery production,

biopharmaceuticals, fluid intelligent control and other fields. Its quality reliability and product applicability have been verified by users in 32 countries and regions around the world.



Application of Runjing Ceramic Hard Sealing Ball Valve in Agriculture Intelligent Irrigation

In 2021, Runxin company combined with Runjing ceramic hard sealing ball valve to produce a set of automatic water-saving irrigation system, which was applied to greening irrigation in factory with good results. But there was no urgency to do further perfection, development, popularization and application at that time.

This year, all parts of the country suffered from continuous high temperature weather above 40°C, drought warnings were issued in many places, horticultural plants were injured, and crop yields were reduced. In addition, after in-depth knowledge of the national agricultural irrigation plan, Runxin sensitively realized the necessity of the application of efficient automatic water-saving irrigation systems and broad market prospects.

The biggest water-saving should be in agricultural irrigation. According to the data, the agriculture water consumption in China will reach 364.43 billion cubic meters in 2021, occupying 61.5% of the total water consumption. In the "National High-standard Farmland Construction Plan (2021-2030)" issued by the Ministry of Agriculture and Rural Affairs, it is clearly stated that 80 billion square meters of high-standard farmland will be built within the planning period, and 7.3 billion square meters of newly added high-efficient water-saving irrigation task will be completed.

The development of efficient water-saving irrigation technology is an important basis for improving the construction of high-standard farmland and promoting agricultural production. It is also an important guarantee for the implementation of the General Secretary Mr. Xi Jinping's "prioritizing water conservation, balancing spatial distribution, taking systematic approaches, and giving full play to the roles of both government and market." in agricultural water-saving.

序号	指标	目标值	属性
1	高标准农田建设	到2022年累计建成高标准农田10亿亩	约束性
		到2025年累计建成高标准农田10.75亿亩	
		到2025年累计改造提升高标准农田1.05亿亩	
		到2030年累计建成高标准农田12亿亩	
2	高效节水灌溉建设	到2022年累计建成高效节水灌溉面积4亿亩	预期性
		2021-2030年新增高效节水灌溉面积1.1亿亩	
3	新增粮食综合生产能力	新增高标准农田亩均产能提高100公斤左右	预期性
4	新增建设高标准农田亩均节水率	改造提升高标准农田产能不低于当地高标准农田产能的平均水平	预期性
5	建成高标准农田上图入库覆盖率	10%以上	预期性
		100%	预期性

National High-standard Farmland Construction Plan (2021-2030)

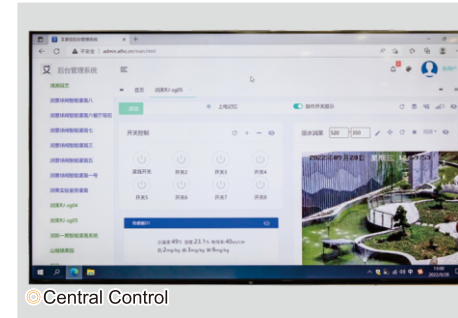
In order to meet the needs of agricultural irrigation, Runxin combined with information collection, photovoltaic power, remote control and other technologies, and finally formed a Runjing intelligent irrigation system with ceramic hard sealing ball valve (abbreviation "Runjing Intelligent Irrigation Valve").

Runjing intelligent irrigation valve is an efficient intelligent saving water irrigation system developed by Runxin which is consist of Runjing ceramic hard sealing ball valve, controller, temperature and humidity sensor, and photovoltaic power technology. It can achieve automatic irrigation according to soil humidity value and remotely controlled through the mobile phone/computer, access to modern digitization technology, and realize visual centralized and efficient management in the central control room. It also can choose pulse electronic ball valve or pulse pilot pneumatic/hydraulic ball valve, combined with the 4G controller of the IoT, through LORA gateway wireless networking to achieve long-distance communication, it can be remotely monitored by PC / mobile APP and can be programmed to realize the sequential opening and closing of each valve. It is suitable for municipal greening irrigation, greenhouse irrigation, agricultural irrigation, golf course irrigation and other occasions.



Showroom of Intelligent Irrigation Valve

Due to the high difficulty in machining ceramic valve core, ceramic hard sealing ball valves have not been widely used before. In recent years, Runxin company has made a major breakthrough in ceramic valve core processing technology, overcome the full set of technical problems of ceramic valve core in "forming → processing → sintering → grinding → finished products", and extended the product diameter to DN200, gradually realizing the mass production of ceramic valve core and ceramic hard sealing ball valve.



Central Control



Mobile Phone Remote Control



Bulk Production of DN100 Ball Valve



Ball Valve with Different Size



Ball Core with Different Size

Chapter 4: Models and Diameter

Runjing intelligent irrigation valve has five models, with the maximum diameter of DN200 (8 inches) ball valve, which are suitable for modern agricultural field irrigation and can meet the large flow needs in large areas of flowers, trees and crops' main and branch pipelines.

1. RJ-ZG01 Type

RJ-ZG01 type adopt time control (irrigation can be set at 5 time points per day), is applicable to the irrigation of tap water and pressurized water source. The standard configuration DN20 Runjing ceramic hard sealing ball valve is about 300 CNY.



2. RJ-ZG02 Type

RJ-ZG02 type can be used to remotely control single channel irrigation by mobile phone, is applicable to the irrigation of tap water and pressurized water source. It also can be equipped with water pump to be suitable for river water, well water, lake water and other water source. For the area with 600 square meter, control a DN20 (3/4") water way for irrigation as the standard configuration, the cost of each square meter is about 3 CNY. The actual cost varies according to the area and configuration.



3. RJ-ZG03 Type

RJ-ZG03 type can be used to remotely control 2-8 channels irrigation by mobile phone, equipped with water pump, which is suitable for irrigation of water source such as tap water, river water, well water and lake water.



4. RJ-ZG04 Type

RJ-ZG04 type is composed of solar panel, battery and Runjing intelligent irrigation valve, which can efficiently solve the problem of intelligent irrigation without electricity in farmland, garden, flower nursery and other places where there is no or lack electricity and have pressurized water resource (tap water, waterfall). Equipped with 60 watt solar panel which can support a 12V Runjing electronic ball valve to do continuous irrigation work for 60 hours after fully charged.



5. RJ-ZG05 Type

RJ-ZG05 type is composed of solar panel, battery, inverter, pump and Runjing ball valve intelligent irrigation valve, which can effectively solve the problem of getting water for irrigation from rivers, lakes and ponds in farmland, garden, flower nursery and other places without or without electricity in remote areas. Equipped with 500~1000 watts solar panel which can support 24V Runjing electronic ball valve to do continuous irrigation work for 4-6 hours with an average of 6 hours of sunshine per day.



Illustration: From ZG02 to ZG05 type, all of them can connect with 32 channels of LORA remote wireless ball valve.

Chapter 5: Application Case and Explanation

At present, Runjing intelligent irrigation valve has been applied in lots of municipal gardens irrigation and agricultural irrigation, including in People's Government of Wenzhou Lucheng District, Downtown Park, Wenzhou Academy of Agricultural Sciences, Wenzhou Qidu Future Urban Agricultural Park, it can solve common problems of plastic valve, such as easy to damage, complex operation and so on, it could greatly reduce labor intensity and maintenance planting costs, save water resources, help the intelligent transformation and development of agriculture, which has been praised.

Municipal Gardens Irrigation



Agricultural Irrigation



Wenzhou Academy of Agricultural Science



Qidu Research Base in Lucheng District of Wenzhou City



Wenzhou Xinhe Agricultural Technology Co., Ltd.



Orchard in Shanfu Town of Wenzhou City

Gardening Irrigation



Wenzhou Ouhai Liao Qingyuan Horticulture Company More than 2500 square meters of planting base



Wenzhou Ouhai Liao Qingyuan Horticulture Company More than 13333 square meters of planting base

Application Case of Runjing Solar Control Intelligent Irrigation Valve



Small Island in the Lake of Wenzhou Ma'anchi Park



Wenzhou Qidu Future Urban Agricultural Park



Wenzhou Runxin Company



Lishui Runlucky Company

Application of Runjing Ball Valve in Golf Course Irrigation



Wenzhou East Golf Course

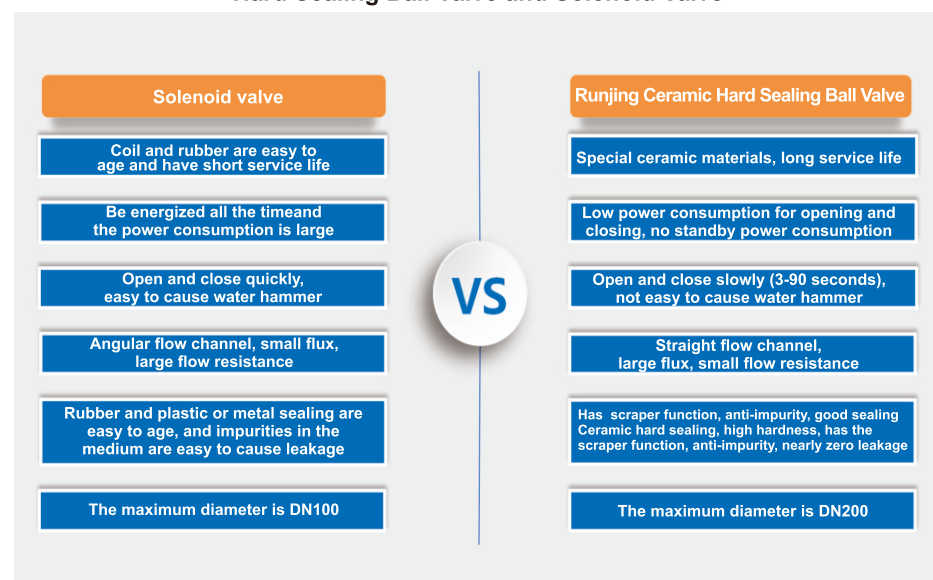
It has been put into use in the irrigation of Wenzhou East Golf Course, completely changing the problems of piston type and diaphragm type, such as inaccurate control of relief valves, aging of diaphragm rubber parts, piston jamming, blockage of pressure regulating components, failure of valve lead to tube explosion, etc. It not only operates stably, but also has accurate pressure relief and stabilization control, and is resistant to sediment wear and has a long service life.

Chapter 6: Differences and Substitutabilities among Runjing Ceramic Hard Sealing Ball Valve and Traditional Ball Valve and Solenoid Valve

Traditional plastic and metal ball valves use soft sealing pairs. Their structural characteristics decide that they cannot have both strong sealing performance and low torque value. They are easy to leakage, large torque, and the sealing surface is not resistant to corrosion and wear. Runjing ceramic hard sealing ball valves are featured with low torque, good wear and corrosion resistance, and durability, which can solve the above problems well.

There are also some problems in the use of solenoid valves, such as not durable, water hammer effect, water resistance, resistance to impurities, these problems are also solved by Runjing ceramic hard sealing ball valve.

Comparison between Runjing Ceramic Hard Sealing Ball Valve and Solenoid Valve



1. Durability and Service Power Consumption

The solenoid valve is composed of a solenoid coil and a solenoid core. When the coil is energized or powered off, the solenoid core is operated to realize fluid on and off.

The working principle of the solenoid valve requires the solenoid valve coil to be energized for a long time during normally open or normally closed state, with high service power consumption. At the same time, it will accelerate the aging and failure of the solenoid valve coil, causing the decay of its service life.

Runjing ceramic hard sealing ball valve has low opening and closing power consumption, no standby power consumption and long drive motor life. Its durability has been fully explained in the previous introduction. Runxin is looking for pipes, sprinklers and other accessories with high weather resistance and long service life, so as to provide customers with more stable and reasonable use effects.

2. Water Hammer Effect

The opening and closing action of the solenoid valve is completed instantaneously, so that each solenoid valve installation site will withstand the impact of water hammer.

Runjing ceramic hard sealing ball valve can be set opening and closing speed from 3 seconds to 90 seconds to effectively prevent water hammer impact, making the equipment more stable in operation and longer in service life.

3. Damage by Water

The solenoid valve's flow channel is bent, and the water pressure loss is large.

Runjing ceramic hard sealing ball valve is designed with direct flow channel with small flow resistance and almost no water pressure loss.

4. Sealing Reliability

The opening and closing parts of the solenoid valve are made of rubber, which is easy to be aging and failure, jamming, and leakage.

The materials of the opening and closing parts of Runjing ceramic hard sealing ball valves are special ceramics, which will not age and fail. After the matching and precision machining, the valve core and valve seat are almost completely vacuum bonded, the scraper effect during opening and closing makes it difficult for impurities to enter the sealing surface, nearly zero leakage.

5. Specification of Diameter

Solenoid valve maximum diameter is DN100 (4 inches).

At present, Runjing ceramic hard sealing ball valve maximum diameter is DN200 (8 inches), which can meet the needs of larger flow system.

Chapter 7: Market Outlook

In August 2022, a planting base of more than 2500 square meters of a gardening company in Wenzhou was installed with Runjing intelligent irrigation valve, after a period of use, they were very satisfied with the irrigation effect. In November, another nursery stock planting base of more than 13,333 square meters of this gardening company was also installed with Runjing intelligent irrigation valve, and it was connected to the central control room, which can clearly check the soil temperature and humidity, the opening and closing state of irrigation, the growth of nursery stocks, weather conditions and other information on the monitoring screen. The irrigation plan can be set through the background, and automatically open the ball valve at the specified time to start watering or close the ball valve to stop watering, can also be indoor real-time control, and irrigation can be remote control on or off manually in different group or areas.

Recently, the person in charge of this gardening company told us that in view of the need to install the Runjing intelligent irrigation valve, the layout of the planting base would have to be changed in futures, such as the same varieties of flowers in the same area, so that in addition to the sprinkler, 666.67 square meters of land only needs to spend several hundred CNY, which is cheap and economical.



Application of Runjing Ceramic Hard Sealing Ball Valve in Agriculture Intelligent Irrigation

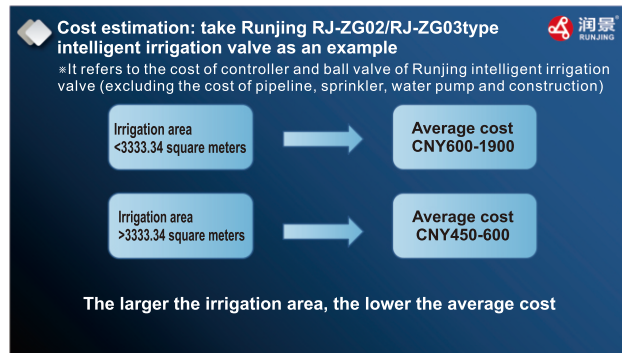
According to estimates, if there is power supply on site and the water source pressure is larger than 3bar, RJ-ZG02 or RJ-ZG03 type intelligent irrigation valve can be selected to realize remote control by computer or mobile phone and automatic irrigation by temperature and humidity sensor. Excluding pipeline, sprinkler and construction costs., the cost of the controller and ball valve of the Runjing irrigation valve is roughly calculated: When the irrigation area is less than 3333.34 square meters, the cost per 666.67 square meters is CNY600-1900; When the irrigation area is greater than 3333.34 square meters, the cost per 666.67 square meters CNY450-600.

If there is no power supply on site, have water source and the pressure is larger than 3bar, RJ-ZG04 type solar energy intelligent irrigation valve can be selected, compared with RJ-ZG02 or RJ-ZG03 type intelligent irrigation valve, the cost of the controller will increase by about CNY500, and for the irrigation area over 3333.34 square meters, the cost per 666.67 square meters will only increase by about CNY100.

If there is no power supply on site but there is intake water condition, RJ-ZG05 solar energy intelligent irrigation valve can be selected. The specific cost shall be calculated according to the intake water condition.

In addition, if use drip irrigation, the pipe cost per 666.67 square meters is CNY200-500 , labor cost is CNY300-800; If use spray irrigation, the cost of pipeline per 666.67 square meters is CNY300-800 , and the labor cost is CNY500-1000.

The actual price fluctuates according to different crops and site conditions on site, the larger the irrigation area, the lower the average cost per 666.67 square meters.



Runxin persist in "Let people could use healthy and safe water more conveniently and economically". Runjing intelligent irrigation valve changes the traditional way of earth canal water transmission and flood irrigation, which can carry out human-controlled precise irrigation and vigorously save water resources. Its economy also makes it possible to popularize and apply in agricultural production, overturns the traditional irrigation way, and makes water saving under the intelligent, automatic, and precise control, which can change the state of agricultural irrigation. It is of positive significance to the construction of a new socialist countryside, the revitalization of rural areas, and even the promotion of domestic demand and social development.

企业使命
让人们能够更方便、
地用上健康、安全的水。

Миссия компании:
Здоровая и чистая вода для всего мира! (俄文)
Missão da empresa:
permitir que as pessoas possam usar água saudável e segura de forma mais conveniente e econômica. (葡萄牙语)

Chapter 8: Market Promotion

Special ceramics refer to ceramics with special mechanical, physical or chemical properties. They have excellent performance and are used in various modern industries and advanced scientific fields. The raw materials used, and the required production technology are very different from ordinary ceramics.

Since its establishment 22 years ago, Runxin company has adhered to industry and innovation, and successfully formed the processing, production, and application of special ceramics into commercialization, marketization, and globalization. Runxin always has the spirit of historical optimism, never gives up under any conditions, and is full of confidence in the future development, which is the mentality that the whole world needs at present. A few days ago, foundation stone laying ceremony of ceramic hard sealing ball valve construction project with annual capability 500 thousand sets (Runxin Seventh Phase) has been held, and the construction will start immediately, is expected to be completed and put into production by the end of 2023, the annual output of ball valve will increase from 100,000 sets to 500,000 sets. In the severe economic situation, Runxin do not "lying flat", but made full use of the time to continue to expand the new plant, expand the scale of production, maintain profit and growth, showing perseverance and spirit.



If you are interested in intelligent irrigation ball valve, please feel free to contact us. Runxin will provide ceramic hard sealing ball valve, and installation technical training. Welcome to visit Wenzhou and come to Runxin!

