ISO9001、ISO14001、GB/T28001 体系认证企业
ISO9001, ISO14001, GB/T28001 enterprise management system certification
国家特种设备制造许可证号：TS2710413-2018
State special equipment manufacturing license number: TS2710413-2018

（K）GLTZ 型
高压差高精度笼式调压器
（K）GLTZ High Pressure-difference & High Accuracy Cage Type Pressure Regulator

四川长仪油气集输设备股份有限公司

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（K）GLTZ 型高压差高精度笼式调压器

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获三项中国专利 Received three Chinese patents：

ZL 201220367826.8、ZL200410040118.3、ZL200720079457.1

1. 产品简介 Brief Introduction of the Product

本产品是一种新型笼式调压器，主要用于天然气、煤气及其它气体输配系统的压力调节。其特点是不需外来能源，利用被调介质自身所具有的压能自动调节，达到压力或流量恒定的目的。该产品改变了传统调压器结构设计和调节原理，满足高压力、大通径调压器的工作条件，实现了安全截断和高精度调节双重功能。具有结构紧凑、调节稳定、精度高、密封零泄漏、噪声低、无泄漏、自动安全截断、使用寿命长等优良性能。通过长期的实际工况运行：完全满足油气田生产对高精度调压工艺的要求，技术性能达到进口产品的水平，能替代国外同类产品。

产品通过中国权威机构检测，各项性能指标符合标准规定。**经省级鉴定：**设计独特、结构新颖，具有调压精度高、截止密封可靠、膜片使用寿命长、自动安全截断功能。其独创的调节结构属国内首创，技术水平国内领先，主要技术指标达到国际同类产品先进水平。

This product is mainly used in transmission and distribution systems of natural gas, coal gas and other gases for pressure regulating. It has the special advantage that no other energy is needed. It can utilize the pressure energy of the carried gas for self-regulating to make the gas pressure or gas flux stable. This product has changed the traditional structural designs and regulating principles of pressure regulators, it can match the working condition of high pressure and great diameter regulator, and it is a new cage-type regulator with double function of safely cut-off and high-precision regulating. It has the excellent performances of compact structure, high precision of regulating, wide range of regulating, good stability, less noises, no leakage and long life-span. Through long term practice, it can totally satisfy the oil and gas field production with high precision pressure regulating level. Its technical performance has reached the level of imported regulators and it is considered to be the best replacement of the same regulator manufactured abroad.

The product has passed the evaluation by the state-level authority and each performance index conforms to the standard. The result of the provincial evaluation on the product is: unique design, structure novelty, high precision on pressure adjustment, reliable Cut-off seal, long service life of diaphragm, automatic safety flow cut,. Its original regulating structure is a domestic pioneer and the technology level is a lead in China. The key technical indexes reach international advanced stage of similar products.

◆ 获中国 2008 年度国家重点新产品 China National Key New Products in 2008

国 家 重 点 新 产 品

证 书

项目名称：（K）GLTZ-1.6～10.0型高压差高精度笼式调压器　项目编号：2009GRF00002

承担单位：乐山长仪阀门制造有限公司　发证时间：二〇〇八年十一月

有 效 期：三年

批准机关：科学技术部

中华人民共和国科学技术部

中华人民共和国环境保护部

中华人民共和国商务部

国家质量监督检验检疫总局

批准机关 Approval authority：

中华人民共和国科学技术部

The People's Republic of China Ministry of Science and Technology

中华人民共和国环境保护部

The People's Republic of China Ministry of Environmental Protection

中华人民共和国商务部

The People's Republic of China Ministry of Commerce

中华人民共和国国家质量监督检验检疫总局

The People's Republic of China General Administration of Quality Supervision, Inspection and Quarantine

◆ **应用典型工程 Typical Engineering Applications：**

- 中国四川的五大天然气矿区输气管道工程；

  Sichuan, China's five major natural gas pipeline project mining area;

- 中国长庆鄂尔多斯气田采气厂、长北气田工程；青海涩北气田工程；

  China Changqing Ordos Gas field Gas recovery Plant, Changbei gas field project; Qinghai Sebei gas field project;

- 中国石油青海油田天然气开发公司涩北气田；

  CNPC Qinghai Oilfield Company gas field gas development;

- 中国石油吉林油田油气工程；

  CNPC Jilin Oilfield Engineering;

- 中国石油西气东输增压站工程；

  CNPC “Western Gas Transported to East” booster station project;

- 中国川气东送管道工程。

  Sichuan Gas to East Pipeline Project, China.

◆ 本公司调压器产品在中国石油天然气公司、中国石化天然气公司所属的各个油田采油厂、油气处理站、泵站、中转站、集气站、天然气分输站广泛应用，精度高、密封零泄漏、性能优良、操作维护方便、安全可靠，保障了油气集输的安全生产，经济效果显著。

With high precision, zero leak rate, supreme quality, easy operation and maintenance, reliable and safe usage, our pressure regulators are widely adopted at the oil fields, oil and gas processing stations, pump stations, transfer stations, gas stations and natural gas distribution stations under China National Petroleum Corporation (CNPC) and China Petroleum & Chemical Corporation (SINOPEC). Our products have been ensuring a safe production with the collection and transferring of oil and gas, the economic effect is remarkable.

◆ 我们的 GLTZ 产品 PN6.3MPa，DN25、DN50，2008 年 3 月用于中国石化江汉油田分公司荆州分输站，实际使用工况参数：进口压力 2.5～3.2MPa，出口压力 0.05MPa，最大进出口压力比 P1=64P2。现场同时与国外同类调压器使用（详见附图），高压差调节稳定，出口稳压精度达到±2%，膜片承载能力高，使用寿命长，满足了油气田生产对高压差调压工艺的运行要求。

Our GLTZ products PN6.3MPa, DN25, DN50 were used at Jianghan Oilfield Company ,Sinopec on March, 2008.The actual working parameters: inlet pressure 2.5 ~ 3.2MPa, the outlet pressure 0.05MPa, the largest inlet and outlet pressure ratio P1 = 64P2.

Our regulators were used on-site with similar foreign regulators at the same time (see photo), pressure differential regulating stability, outlet pressure regulation accuracy of ± 2%, patch carrying capacity, long life, to meet the oil and gas production process of high pressure differential regulator operation requirements.

2. 主要技术参数/特性 Major Technical Parameters/Characteristics

公称压力 PN Nominal pressure	1.6～10.0MPa（ANSI 150Class～600Class）
公称通径 DN Nominal diameter	25～200mm （NPS 1″～8″）
使用温度 Applicable media temperature	-29℃～130℃
适用介质 Applicable media	净化天然气、一般含硫天然气（H_2S+CO_2≤8mol%）、液化石油气、城市煤气、空气等多种气体。 purified natural gas, sulfur gas（H_2S+CO_2≤8mol%）, city gas, etc.
执行标准 Executable standard	结构长度 Structure length： ANSI B16.10、GB/T12221 连接法兰 Flange connection：ANSI B16.5、GB/T9113、JB/T79、HG20592～20635 检验测试 Test： EN334、CJ274
特 性 Characteristic	◆ 若橡胶膜片损坏，能实现自动截断，确保下游用气设备的安全； If the rubber diaphragm is damaged，it can automatically disconnect so as to ensure the safety of downstream gas equipments. ◆ 具备过载和失压保护功能； Have overload and under-voltage protection function. ◆ 可在线维修，性能价格比高； Available online maintenance, so it is highly cost-effective. ◆ 精确的调压特性，压力设定简单、调压精确、关闭灵敏； Precise pressure regulating characteristics, the pressure is easy to set and accurately regulated, shut-off sensitive ◆ 进口压力范围 P1 Inlet pressure range P1：Max 7.6MPa （特殊可满足 9.5MPa/Special meet 9.5MPa）； ◆ 出口压力范围 P2 Outlet pressure range P2: 0.05-6.0MPa； ◆ 稳压精度 pressure stabilizing level：δP_2＜±3％； ◆ 关闭压力 Pb shut-off pressure Pb：≤1.10P_2。 ◆ 特殊设计可满足工况阀前稳压。 Special design can stabilize the upstream pressure under working condition
注：进出口压差较大时需采用两级或三级调压，详细设计我公司可根据用户提供的工况条件及参数，计算后提供解决方案。	

Note: The large the pressure difference between the outlet and inlet requires to use two or three pressure regulators, the detailed design of our company can provide the working conditions and parameters, calculated to provide solutions.

指挥阀弹簧号 Directing valve spring number	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ	Ⅵ
调节压力 P_2（MPa） Regulating pressure	$0.05\leq P_2<0.4$	$0.35\leq P_2<0.8$	$0.75\leq P_2<1.6$	$1.5\leq P_2<3.0$	$2.9\leq P_2<4.0$	$4.0\leq P_2<6.3$
稳压精度 δP% Pressure stabilizing Precision	±3	±3	±3	±3	±3	±3
关闭压力 Pb Shut-off pressure	$\leq 1.1P_2$	$\leq 1.1P_2$	$\leq 1.1P_2$	$\leq 1.1P_2$	$\leq 1.1P_2$	$\leq 1.15P_2$
最小压力差△P（MPa） Minimum pressure difference	0.03	0.03	0.03	0.05	0.05	0.05
最大进口压力 P_1（MPa） Maximum inlet pressure	0.8	1.6	2.5	4.0	6.3	8.0
膜头最大工作压力 P_0（MPa） Maximum operating pressure of the film	1.6	1.6	2.5	4.0	6.3	8.0

3. GLTZ 调压器与现有同类产品技术比较

Technical Comparison of CLTZ Regulators with the Existing Regulators of the Same Type.

目前，在燃气输配系统中采用的国内外自力式、轴流式和曲流式调压器，都是以橡胶薄膜作为传动装置。在工作时，利用上、下膜室压差克服弹簧密封比压力或弹簧复位作用而进行压力平衡调节，同时，橡胶薄膜还要满足膜垫通道口的截止密封和介质剪切力的作用。使压力调节范围和调节精度受到很大局限，使用寿命较短，特别是调节工作压力范围在 10.0MPa 压力级时，橡胶薄膜强度很难满足使用要求。

我公司 GLTZ 调压器通过对传统调节原理和结构的创新设计，克服了自力式、轴流式和曲流式调压器存在的不足。具有调压精度高、截止密封可靠、膜片使用寿命长和自动截断保护功能。比较说明如下：

Currently, within China or abroad, the rubber diaphragm is used as the driving device for the self-flow regulators, axial flow regulators and meandering flow regulators for the gas transmission and distribution systems. Under operation, the pressure difference created by the upper and lower diaphragm chamber will overcome the spring sealing pressure or the pressure generated by the spring reset, which is how the pressure balance is realized. At the meantime, the rubber diaphragm has to stand the cutting force created by the flowing media and the cut-off seal. All those factors will diminish the pressure regulating scope and accuracy and shorten the life span of the regulator as well. Especially when the adjustable working pressure is at 10.0 Mpa, the strength of the rubber diaphragm can hardly meet the application requirement.

Our company's CLTZ regulator is an innovative design based on the conversional regulating principles and structures; the short comes of self-balancing regulators, axial flow regulators, and meandering flow regulators are eliminated. It is characterized for its high regulating accuracy, reliable cut-off seal, long diaphragm life span and auto cut-off protection. Comparison as follows:

3.1 橡胶膜片作用不同：Function of The Rubber Diaphragm Is Different

传统调压器膜垫上开设有大量介质通道孔，介质由膜垫通道孔流出，橡胶膜片既作传动机构，又是执行机构，在主阀关闭时作截止密封作用，从而使橡胶膜片在介质通道孔受到密封剪切力，膜片易损坏。

我公司 GLTZ 调压器由主阀、指挥阀、稳压阀组成。主阀橡胶膜片为传动机构，执行机构是阀杆、阀芯、阀座。

① 膜垫上没有介质通道孔，橡胶膜片不作截止密封要求，避免了关闭时在密封通道孔所受到的密封剪切力。碟形膜垫内腔开有环形贮气槽，利于主阀开启，为橡胶膜片在不受介质冲刷的平衡气室中，实现传动功能，提供了基本工作条件，延长了橡胶膜片的使用寿命。

② 橡胶膜片传动工作时压差小，工作压差不受进出口压力变化影响（其值为复位弹簧力除以膜片有效面积），可满足高压力进出口压力调节功能，调节工作压力范围可达到 10.0MPa 压力级以上。

Traditional regulator membrane cushions has a large number of media access holes, medium flows out from the outflow channel pore in the membrane pad, the rubber diaphragm not only serves for transmission, it is also the executing agency, in the end when the main valve closed the diaphragm will serve its seal function. When the medium passes through the channel pore, and it will be easily damaged by the cutting force created.

Our GLTZ regulator consists of main valve, directing valve and regulator valve. Rubber diaphragm in the main valve is the driving device, the executing agency is the valve stem, valve spool and valve seat.

① No media channel pore on the membrane pad, rubber diaphragm is not required to be functioning as the cutting seal, then the cutting force at the channel pore will be avoided when the valve shuts.. The inner chamber of the disc membrane pad has a ring cavity gas storage slot, which will help to open the main valve. Under this condition, the rubber diaphragm will realize its drive function in a balanced air chamber without being washed by the medium through which its service life is extended.

② The pressure difference is minimized when the rubber diaphragm works as the driving media/transmission media. The working pressure difference is not affected by the changes of inlet and outlet pressure (its value is the effective diaphragm area divided by the reset force of the spring). It can meet the adjustment requirement under high inlet and outlet pressure, the adjustable working pressure can be higher than 10,0MPa.

3.2 主阀密封原理不同：Different Main Valve Sealing Principle

传统调压器由橡胶膜片作截止密封，介质直接冲刷在橡胶膜片上，介质通道孔容易被冲刷而变得不光滑。特别在大通径高压力下冲刷腐蚀更为严重，增加了膜片密封时的剪切力，膜片更易损坏而缩短使用寿命。据现场使用观察，大通径（DN≥150）此类调压器膜垫凸台处容易堆积硫化铁粉末和其它杂质，导致阀门关闭时膜片密封不严，产生泄漏现象。

我公司 GLTZ 调压器由主阀的阀杆、阀芯、阀座等部件执行启闭密封，阀芯阀座采用硬软双质密封副，硬密封堆焊 stellite 合金。在阀芯平衡孔作用下，阀芯上下端受力平衡，很小密封比压力即可实现密封零泄漏。

Traditional regulator adopts the rubber diaphragm for a cutoff sealing, the medium is flushed onto the diaphragm, and the channel pore becomes rough as a result of frequent flush. Particularly in large diameter with high pressure, the erosion-corrosion gets worse; an increase of cutting force on the diaphragm also damages the diaphragm and shortens its service life. According to on-site observation, large diameter (DN ≥ 150) regulator membrane convexity is easily built up with ferric sulfate powders and other impurities, then the diaphragm cannot be 100% percent sealed when the valve is closed, resulting in leakage.

A combination of the stem, valve spool and valve seat of the main valve performs opening and closing sealing, soft-sealing and hard-sealing applies to the valve spool and valve seat, stellite alloy overlaying welding is applied for the hard-sealing. Under the balanced effect of the balancing hole on the spool, zero leakage rate can be achieved with very little seal differential pressure.

3.3 安全截断保护功能：Safety Cut Off Protection

传统调压器采用橡胶膜片截止密封，橡胶薄膜一旦被损坏，自身不能有效截断，上下游窜压，不安全，没有安全截断保护功能。

我公司 GLTZ 调压器由于橡胶膜片只为传动机构，阀杆、阀芯、阀座执行启闭密封。若调节过程中橡胶膜片被损坏，上下气室相通，气室压力等于进口介质压力，主阀在复位弹簧力作用下自动截断关闭，起到安全保护作用。

Traditional regulator cut-off sealing with rubber diaphragm, once the rubber diaphragm is damaged, the medium can not be effectively cut off by the valve itself, the pressure will then fluctuate upstream and downstream. Without the safety cutoff protection function, it is unsafe to use..

Our GLTZ regulator’s rubber diaphragm is only for transmission purpose while a combination of the stem, valve spool and valve seat performs the opening and closing seal. If the rubber diaphragm is damaged during the regulating process, the upper chamber and lower chamber is still in mutuality, the pressure in the chamber will be the same to the inlet media pressure, Under the reset force of the spring, the main valve will automatically cut off,and closes to perform its safety protection.

3.4 我公司 GLTZ 调压器还具有以下突出技术效果：

Our GLTZ regulator also has the following outstanding technical effects:

① 主阀膜垫下气室与进口压力相通,压力平衡，气室介质不流动，避免了介质流动造成的紊流现象，使主阀膜垫上、下气室调节平衡时，稳定性好、波动小，调节精度高。

② 稳压阀能根据阀前压力变化和阀后流量变化，使主阀上膜室控制压力总是趋于阀后压力稳定方向变化。本公司通过试验，由计算机显示的压力特性和流量特性曲线，稳压精度高（δP_2 ＜±3％），关闭压力（$P_b \leq 1.10\ P_{2n}$）远小于传统调节器。产品整体结构简单，维修更换方便。

①The air chamber underneath the main valve membrane pad is connected with the inlet through which the pressure is balanced. The chamber medium does not flow and the turbulence caused by porous media flow will be avoided. So balanced aeration will be achieved by the upper and lower chambers asides membrane pad with good stability, little turbulence and high regulating accuracy.

② Voltage stabilizing valve can automatically change its pressure based on the valve front pressure change and valve back flow change, the upper chamber pressure of the main valve is subject to the stabilized tendency of the valve back pressure. Through the our trials and the pressure behavior & flow behavior curves displayed on the computer, the pressure holding accuracy is high ($\delta P2 <\pm 3\%$), closing pressure （$P_b \leq 1.10\ P_{2n}$） is much lower than traditional regulator Product structure is simple, easy for maintenance and replacement.

4. 工作原理 Working Principle ：

该高压差高精度笼式调压器为间接作用式，主阀与指挥阀、稳压阀、过载失压保护阀采用信号管接通，由指挥阀感测出口或进口被控压力信号并控制主阀的开启度变化；稳压阀消除进出口压力变化对调压的影响，使主阀膜室的控制压力向设定的压力趋于稳定。其工作过程为：

The large pressure-difference & high accuracy cage type pressure regulator is of indirect mechanism, The main valve, command valve and unloading pressure relief valve are connected with signal tubes, command valve senses entry or exit controlled pressure signal and control the opening degree of the main valve, pressure stabilizing valve eliminates the pressure regulating turbulance caused by pressure changes of valve inlet and outlet , so the control pressure in main valve's diaphragm chamber becomes stable towards the set pressure, its working process is:

4.1 在平衡状态时，主阀橡胶膜片上、下气室平衡，即主阀弹簧和进口压力 P_1 与控制气室压力 P_3 平衡。

When it in a state of equilibrium, the upper and lower air chamber asides the main valve's rubber diaphragm is balanced, in other words, the main valve spring and inlet pressure P_1 and the control air chamber pressure P_3 is balanced.

4.2 当出口处的负荷减少或入口压力 P_1 增加时，燃气出口压力 P_2 升高，作用在指挥器橡胶膜片

上的压力升高，破坏了和指挥器弹簧的平衡，使橡胶膜片带动阀杆向上移动，阀口开度减小。稳压阀阀口开度增大，主阀上膜室压力升高，压迫主阀阀芯下移，使阀口开度减小，流量减少，出口压力 P_2 降低，恢复到给定值。

When the load at valve outlet declines or valve inlet pressure P_1 increases, gas outlet pressure P_2 will increase, the pressure effective on the directing rubber membrane will increase, then its balance with director spring will be destroyed, the rubber diaphragm brings valve pole upwards, valve opening degree becomes smaller and voltage stabilizing valve opening degree increases, pressure in main valve upper air-chamber will increase, oppress main valve spool down and the valve opening degree will be decreased., With less flow going through, the outlet pressure P_2 will decline and back its setting value.

4.3 当出口处的负荷增加或入口压力 P_1 降低时，燃气出口压力 P_2 降低，作用在指挥器橡胶膜片上的压力也降低，同样破坏了和指挥器弹簧的平衡，使橡胶膜片带动阀杆向下移动，阀口开度增大。稳压阀阀口开度减小，主阀上膜室压力降低，主阀阀芯在下膜室压力作用下上移，使阀口开度增大，流量增加，出口压力 P_2 升高，恢复到给定值。

When the load at valve outlet increases or valve inlet pressure P_1 decreases, gas outlet pressure P_2 will decrease, the pressure effective on the directing rubber membrane will decrease, too, then its balance with director spring will still be destroyed, the rubber diaphragm brings valve pole downwards, valve opening degree becomes bigger and voltage stabilizing valve opening degree declines, pressure in main valve upper air-chamber will decrease, at the pressure of the lower chamber, main valve spool will be pushed up and the valve opening degree will increase., With more flow going through, the outlet pressure P_2 elevates and back its setting value.

4.4 当负荷增加或主阀膜片损坏，即出口压力高于或低于调压器正常工作压力范围时，介质压力与弹簧力平衡关系被破坏，在弹簧力作用下，过载失压保护阀切断指挥阀出口介质压力信号源，主阀切断关闭。

When the load is increased or main valve diaphragm was damaged, the outlet pressure will be either higher or lower than the normal pressure working range of the regulator, the balance between media pressure and spring force is destroyed, under the spring force, the signal source sent out by the media at the outlet of the commanding valve will be cut off by overload pressure relief protective valve, then the main valve will be cut off and shut.

不论用气量及入口压力（在规定的进口压力范围内）如何变化，本调压器可以通过指挥阀和稳压阀、过载失压保护阀的配合调节作用，因此该调压器和与其连接的管网是一个自调系统。

Regardless of gas volume and inlet pressure (within allowed inlet pressure range) change to what, the pressure regulator can maintain a stable outlet pressure through the combined regulating function of director valve, voltage stabilizing valve and overload pressure relief protection valve, therefore, this regulator shares the same self-regulating system with its pipeline network.

5. 性能特点 Performance Features：

5.1 膜片使用寿命长：为克服国内外调压器橡胶膜片使用寿命较短的不足，膜垫上不设介质通道孔，橡胶膜片不作截止密封要求， 避免了关闭时在密封通道孔所受到的密封剪切力，碟形膜垫内腔开有环形贮气槽，利于实现主阀开启，为橡胶膜片在不受介质冲刷的平衡气室中，实现传动功能，提供了基本工作条件，延长了橡胶膜片使用寿命。

Long life-span diaphragm: To avoidconquer the short life span of domestic and exported regulator diaphragms No media channel pore is drilled on the membrane pad, rubber diaphragm is not required to be functioning as the cutting seal, then the cutting force at the channel pore will be avoided when the valve shuts. The inner chamber of the disc membrane pad has a ring gas storage slot, which will help to open the main valve. Under this condition, the rubber diaphragm will realize its drive function in a balanced air chamber without being washed by the medium through which its service life is extended.

5.2 满足高压力、大通径压力调节：橡胶膜片传动工作时压差小，其值为复位弹簧力除以膜片有效面积，工作压差不受进出口压力变化影响，可满足高压力进出口压力调节功能，解决了高压力、大通径调压器国内生产难以满足使用要求的问题。

Meet the high-pressure, big diameter pressure regulate:, The differential pressure is small when the rubber diaphragm works for transmission, its value is the effective diaphragm area divided by the reset force of the spring. The differential working pressure is unaffected by the changes of inlet pressure and outlet pressure, it can regulate the high inlet and out pressure. The problems of the traditional high pressure & big diameter regulators are perfectly resolved with our regulator.

5.3 调压精度高：主阀膜垫下气室与进口压力相通平衡，调节工作压力时气室介质不流动，避免了介质流动造成的紊流现象，使主阀膜垫上气室与下气室调节平衡时，稳定性好、波动小，调节精度高。

High Regulating Accuracy: The air chamber underneath the main valve membrane pad is connected with the inlet through which the pressure is balanced. The chamber medium does not flow so the turbulence caused by porous media flow will be avoided. A balanced aeration will be achieved by the upper and lower chambers asides membrane pad with good stability, little turbulence and high regulating accuracy.

5.4 密封零泄漏：主阀阀芯、阀座采用硬软双质密封副，在阀芯平衡孔作用下，阀芯上下端受力平衡，很小密封比压力即可实现密封零泄漏。改变了国外产品利用橡胶膜片在膜垫凸台处密封易使硫化铁粉末粘堵产生的泄漏现象。

Zero seal leakage: main valve spool and valve seat apply hard-soft double sealing, under the effect of spool balance hole, the force onto the upper and lower parts of valve spool is balanced, so a small seal ratio pressure enables zero seal leak. It has avoided the rubber diaphragm sealing at the convexity point of the rubber pad in foreign regulators which often results in sticky ferric sulfate blockage and leakage phenomenon.

5.5 自动安全切断保护：主阀根据介质压力高低和使用要求，利用不同介质流向和结构特点分别

满足不同压力级别的压力调节，失压安全保护阀和指挥阀串联压力信号源实现过载、失压或主阀橡胶膜片损坏，主阀都能自动安全截断保护。

Auto Ssafety Ccut-off Pprotection: main valve is subject to medium pressure level and usage demand, , regulating under difference pressure levels will be met with the different media's flow direction and composite structures. Pressure relief safety protection valve and commander valve are interlocked with the pressure signal source through which any overload, pressure loss, or main valve rubber diaphragm damage will be detected. Upon the occurrences, the main valve will automatically cut off for self protection. ,

5.6 压力特性和流量特性优异：稳压阀能根据阀前压力变化和阀后流量变化，使主阀上膜室控制压力总是趋于阀后压力稳定方向变化。调节压力范围宽，稳压精度高，关闭压力远小于传统调节器。

Remarkable Pressure and Flow Characteristics: According to the upstream pressure change and downstream flow change, the pressure maintaining valve makes the controlled pressure of upper diaphragm chamber directional to the stabilized pressure tendency of the downstream pressure. Its pressure regulating range is wide and pressure stabilizing accuracy is high with its closing pressure much lower than traditional regulators.

6. 流通能力计算 Flow Capacity Calculation

（1） 当 $P_2 \le 0.5P_1$ 时：When $P_2 \le 0.5P_1$

$$C = \frac{Qn}{3365.1}\frac{\sqrt{\rho_n Z_1(273+t)}}{P_1}$$

（2） 当 $P_2 > 0.5P_1$ 时：When $P_2 > 0.5P_1$

$$C = \frac{Qn}{3874.9}\sqrt{\frac{\rho_n Z_1(273+t)}{(P_1-P_2)(P_1+P_2)}}$$

注解 Explanation：

C—调压器的流通能力 T/h；The flow capacity of pressure regulator

P_1 P_2—调压器前后的绝对压力 MPa；The absolute pressure of the regulator in front and back.

Qn—气体在标准状态下的流量 Nm^3/h；Gas flow capacity under standard condition

t—气体的流动温度℃；Gas flow temperature ℃.

ρn—气体在标准状态下的密度 Kg/Nm^3；Gas density under standard condition

Z_1—气体的压缩系数。Gas compression coefficient

流通能力 C 值及阀芯直径 Gas Flow Capacity (C) & Valve Spool diameter

公称通径 DN（mm）Nominal diameter	25				50			100			150		200
阀芯直径 dn（mm）Spool diameter	25	20	15	10	50	40	32	100	80	65	150	125	200
流通能力 C（T/h）Flow capacity	8	5	3.2	1	30	20	12	120	80	45	280	180	450
行程（mm）Course	16		10		21	15		40			50		60
膜头有效面积（cm^2）Diaphragm head effective area	40				100			280			580		1000

7. 型号说明 Model Explanation

（K）GLTZ —16～100（150Class～600Class）	字母含义说明 Explanation of the letters
K	类型代号（“K”表示抗硫） Model code（ K stands for anti-sulfur）
G	表示高压差高精度 stands for high pressure differential accuracy
L	表示笼式阀 stands for cage-type valve
T	表示调压器 stands for regulator
Z	表示自力式 stands for the self-regulating type
16～100（150Class～600Class）	公称压力等级代号 stands for nominal pressure level codes

8. 外形和连接尺寸 Product Shape and Connection Dimensions

8.1 结构见图 1、图 2 Structure shown in Figure 1, Figure 2

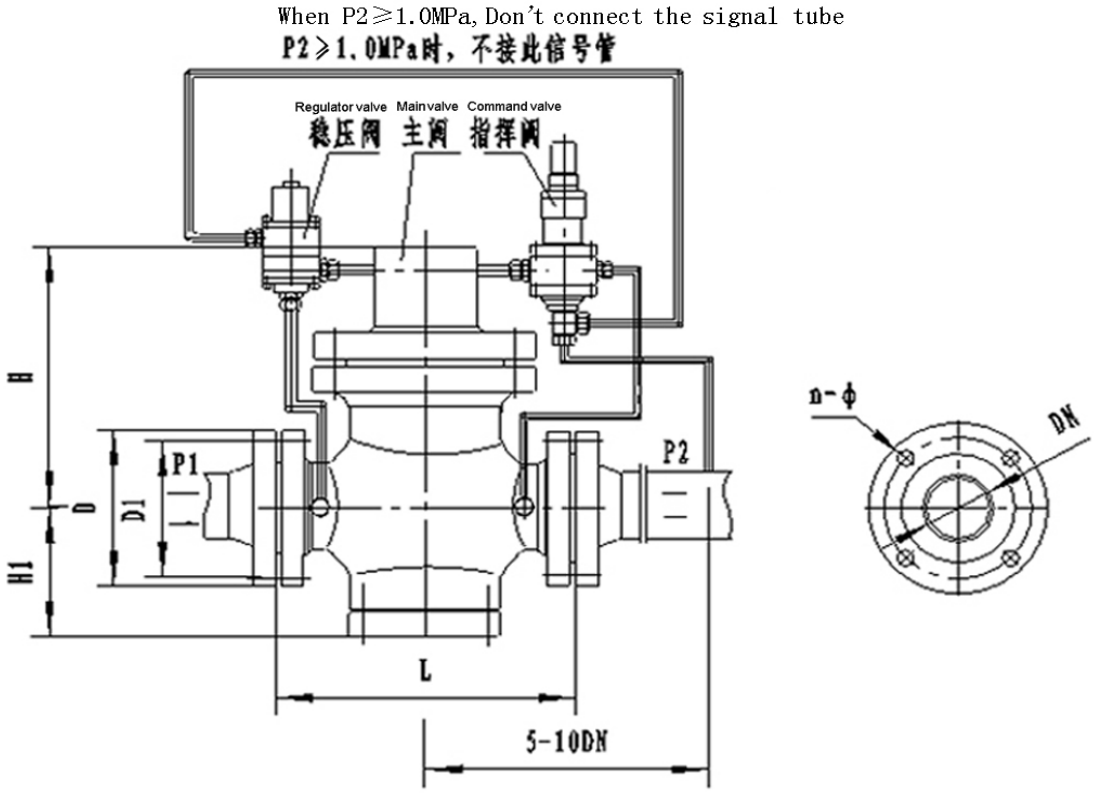

图 1. 阀后调压安装图

Figure 1. Downstream Pressure Regulating Installation Drawing

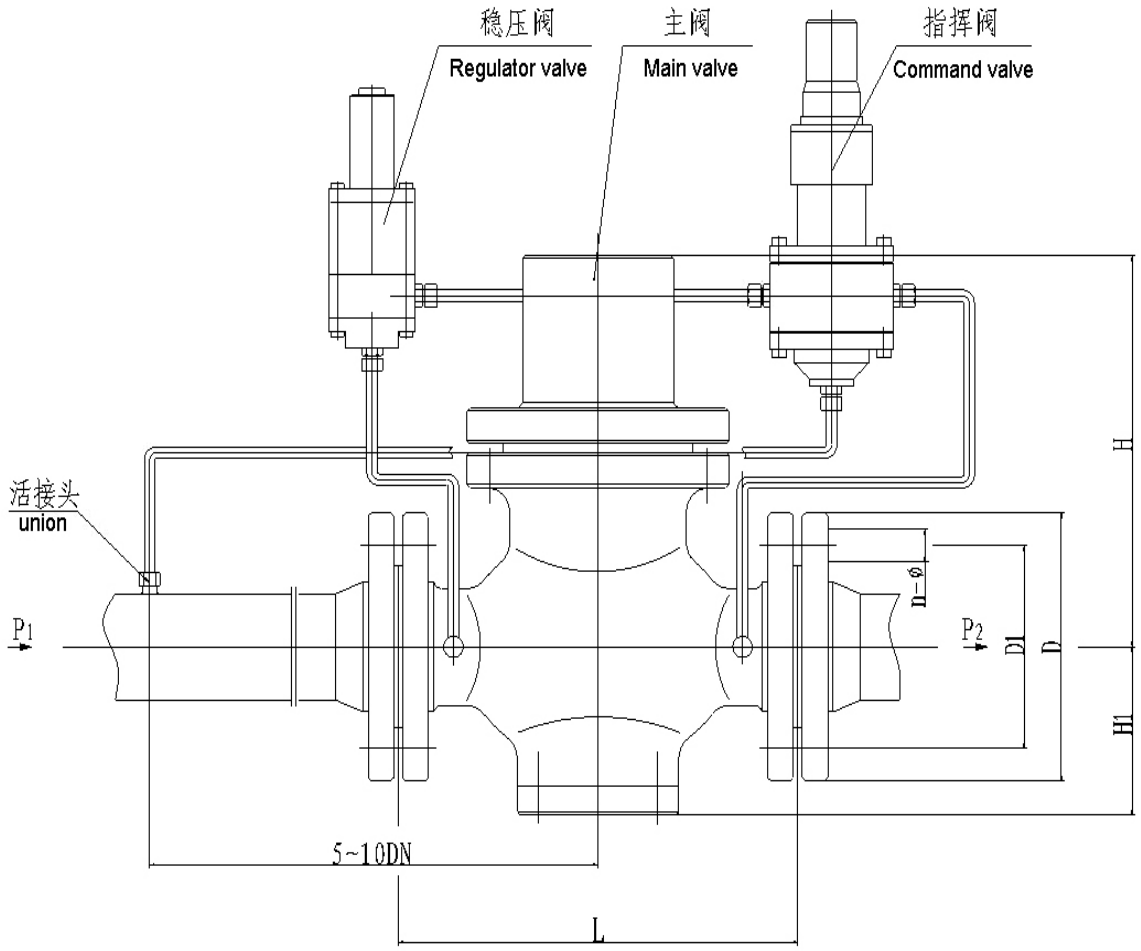

图 2. 阀前稳压安装图

Figure 2. Upstream Pressure Regulating Installation Drawing

8.2 安装尺寸见表 1～表 7（法兰标准及密封面型式可按用户订货要求）

For installation dimensions, please refer to Table 1～7 (Flange dimensions and sealing surface type can be changed according to special requirement of user)

表 Table 1　　(K)GLTZ-150Class　　ANSI 150Class

公称通径（DN）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm） Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
1	10	184	108	79.5	14	210	86	4-16	ANSI B16.5 RF
	15								
	20								
	25								
2	32	254	152	120.5	16	300	110	4-18	
	40								
	50								
3	50	298	190	152.5	19	359	127	8-18	
	65								
4	65	352	229	190.5	24	375	163	8-18	
	80								
	100								
6	125	451	279	241.5	26	450	220	8-22	
	150								
8	200	543	343	298.5	26	515	292	8-22	

表 Table 2　　(K)GLTZ-300Class　　ANSI 300Class

公称通径（DN）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm） Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
1	10	197	124	89	18	210	86	4-18	ANSI B16.5 RF
	15								
	20								
	25								
2	32	267	165	127	23	300	115	8-18	
	40								
	50								
3	50	318	210	168.5	29	359	127	8-22	
	65								
4	65	368	254	200	32	375	163	8-22	
	80								
	100								
6	125	473	318	270	37	450	220	12-22	
	150								
8	200	568	381	330	42	515	292	12-26	

表 Table 3　　(K)GLTZ-600Class　　ANSI 600Class

公称通径（DN）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm） Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
1	10	210	124	89	18	215	86	4-18	ANSI B16.5 RF
	15								
	20								
	25								
2	32	286	165	127	26	305	120	8-18	
	40								
	50								
3	50	337	210	168	32	359	127	8-22	
	65								
4	65	394	273	216	38	380	169	8-26	
	80								
	100								
6	125	508	356	292	48	465	230	12-30	
	150								
8	200	610	419	349	56	530	305	12-33	

表 Table 4　　(K)GLTZ-16　　PN1.6MPa

公称通径 DN（mm）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm）Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
25	10	216	115	85	14	210	86	4-14	JB/T79.1-94 （RF）
	15								
	20								
	25								
50	32	267	160	125	16	300	110	4-18	
	40								
	50								
80	50	356	195	160	20	359	127	8-18	
	65								
100	65	356	215	180	20	375	163	8-18	
	80								
	100								
150	125	480	280	240	24	450	220	8-23	
	150								
200	200	559	335	295	26	515	292	12-23	

表 Table 5　　(K) GLTZ-25　　PN2.5MPa

公称通径 DN（mm）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm）Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
25	10	**216**	115	85	16	210	86	4-14	JB/T79.1-94 （RF）
	15								
	20								
	25								
50	32	**267**	160	125	20	300	110	4-18	
	40								
	50								
80	50	**356**	195	160	22	359	127	8-18	
	65								
100	65	**406**	230	190	24	375	163	8-23	
	80								
	100								
150	125	**495**	300	250	30	450	220	8-25	
	150								
200	200	**600**	360	310	34	515	292	12-25	

表 Table 6　　(K) GLTZ-40　　PN4.0MPa

公称通径 DN（mm）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm）Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
25	10	**216**	115	85	16	210	86	4-14	JB/T79.2-94 （MF）
	15								
	20								
	25								
50	32	**267**	160	125	20	300	110	4-18	
	40								
	50								
80	50	**356**	195	160	22	359	127	8-18	
	65								
100	65	**406**	230	190	24	375	163	8-23	
	80								
	100								
150	125	**495**	300	250	30	450	220	8-25	
	150								
200	200	**600**	375	320	38	515	292	12-30	

表 Table 7　　(K)GLTZ-63　　PN6.3MPa

公称通径 DN（mm）	阀芯直径 dn（mm） Spool diameter	连接尺寸（mm）Flange Joint Dimension							法兰标准 Flange standard
		L	D	D1	b	H	H1	n-Φd	
25	10	**230**	135	100	22	215	86	4-18	JB/T79.2-94 （MF）
	15								
	20								
	25								
50	32	**267**	175	135	26	305	120	4-23	
	40								
	50								
80	50	**356**	210	170	30	363	129	8-23	
	65								
100	65	**406**	250	200	32	380	169	8-25	
	80								
	100								
150	125	**550**	340	280	38	465	230	8-34	
	150								
200	200	**650**	405	345	44	530	305	12-34	

9. 主要零部件材料 Main Parts Materials

零部件名称 name of part	材料名称 name of material
主阀体　Main valve body	铸 钢 cast steel：ASTM A216 WCB、WCC；ASTM A352 LCB、LCC 不锈钢 stainless steel：CF8、CF8M、CF3、CF3M 、304、304L、316、316L
指挥器 Director	不锈钢组合件　Stainless steel assembly
稳压阀 Pressure maintaining valve	不锈钢组合件　Stainless steel assembly
阀　芯 Valve spool	不锈钢+硬质合金　Stainless steel and hard alloy
阀　座 Valve seat	不锈钢+硬质合金　Stainless steel and hard alloy
弹　簧 Spring	弹簧钢/不锈钢　Spring steel/stainless steel
皮膜片 Rubber diaphragm	氟橡胶/丁腈橡胶　Fluorine rubber/Nitrile rubber
皮膜垫 Membrane cushion	不锈钢　Stainless steel
密封件 Sealing parts	氟橡胶/丁腈橡胶　Fluorine rubber/nitrile rubber

10. 安装、使用与维护 Installation, Operation and Maintenance

10.1 安装注意事项 Installation Notice

10.1.1 安装前应仔细查对调压器型号及调节范围等项是否与使用要求完全符合。

Before installation, the regulator model, regulating range and other related parameters must be carefully checked ensuring its usage requirement is fully met.

10.1.2 安装前应分别检查主调节阀、指挥阀、稳压阀、接头等是否完好，动作是否灵敏。

Before installation, joints of the main valve, command valve, pressure maintaining valve must be carefully checked ensuring all are ready for use with good flexibility.

10.1.3 对于较脏介质，调压器前应安装过滤器。

For dirty media, filter should be installed before regulator.

10.1.4 对不能停产的场合，为保证连续生产，应设置旁路。

For the non-shutdown working area, to ensure continuous production, a bypass valve should be available.

10.1.5 在调压器前、后应装设相应量程的压力表。

Before and after the regulator, a pressure gauge of correspondent measurement range should be installed.

10.1.6 应将前后的管道吹扫干净后，方能将调压器就位安装。

All the pipes before and after the regulator must be blown clean prior its installation.

10.1.7 环境温度较低时，为保证调压器正常工作，调压器信号管应考虑加设保温措施。

When the working environment temperature is low, to ensure a normal operation of the regulator, its signal tube should be considered for heat tracing.

10.1.8 安装方式：站场露天，室内扣箱式。室内安装应符合建筑防爆要求。调压器均应水平直立

安装。如图 3 和图 4 所示。

Installation methods:

There are mainly two types of installation: Station opening type and indoor box type. Indoor installation should comply with blast-proof construction requirement. The regulators should be all vertical-horizontally installed. Like fig.3 and fig.4.

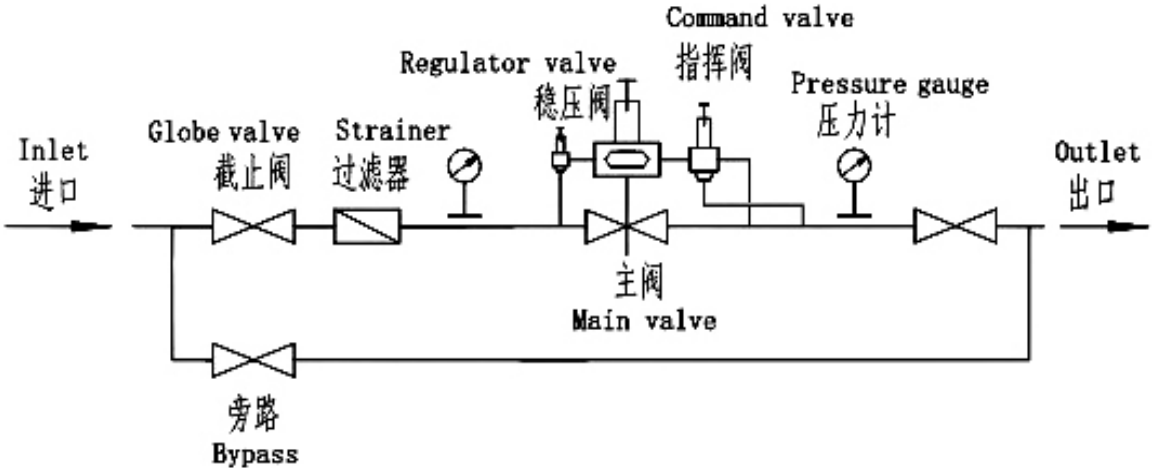

图 3. 调压器安装流程示意图（阀后调压）

Figure 3. Regulator installation process diagram（Downstream pressure regulating）

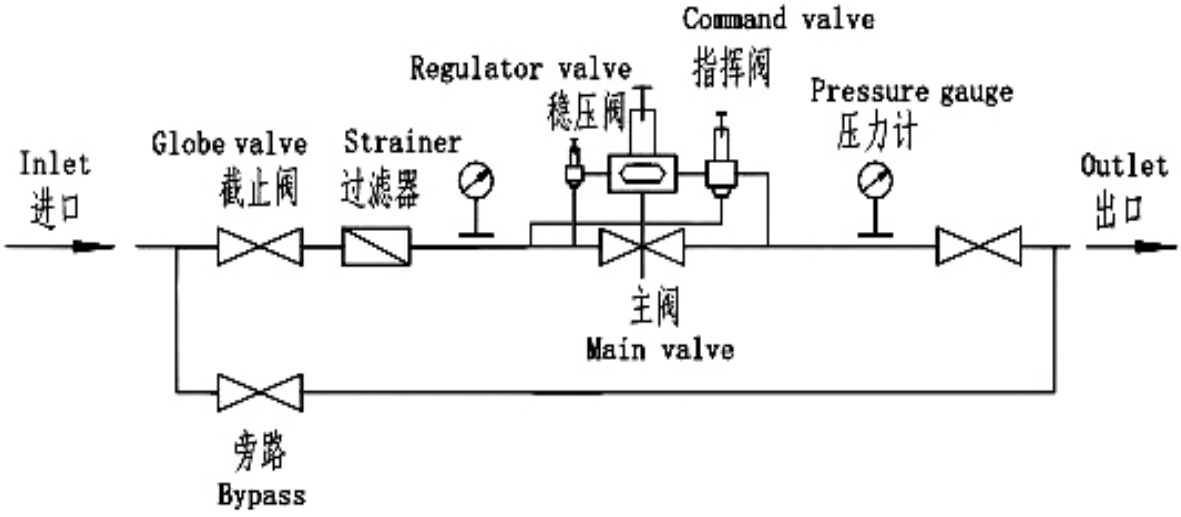

图 4. 调压器安装流程示意图（阀前稳压）

Figure 4. Regulator installation process diagram（Upstream pressure maintaining）

10.2 调压器的操作及维护 Operation and Maintenance

10.2.1 调压器的启动 Start-up

① 打开下游切断阀门后，缓慢打开上游切断阀门。

Open the downstream cut-off valve, and then slowly open the upstream cut-off valve.

② 打开指挥阀护罩，操作指挥阀调节螺杆，压力达到所需给定压力为止。调节过程中，稳压阀和指挥阀应相互配合调节，如果主阀出口压力波动较大（观察出口压力表），可调节稳压阀调节螺钉，直到合乎要求。（当出口压力 P2 波动大，说明稳压阀开度较小，可顺时针微调调节螺钉，使出口压力 P2 稳定；当流量增加，出口压力 P2 不能恒定或降低时，说明稳压阀开度较大，可逆时针微调调节螺钉，使出口压力 P2 恒定。）

Open command valve protecting cover, operate the adjustable screw thread of the command valve, till the pressure reaches the required set pressure. In the course of the adjustment, the command valve and pressure maintaining valve should be coordinately adjusted. , If big pressure variance is presence at the main valve outlet (observe the outlet pressure gauge),, adjust the screw of pressure maintaining valve till the pressure meets the requirement. (When the outlet pressure –P2 fluctuates drastically, it is an indicator that the opening degree of the pressure maintaining valve is too small, then the screw of PM valve can be slowly turned clockwise which will stabilize P2. On the other hand, if P2 cannot be maintained or declines, it indicates the PM valve opening degree is too great, then the screw can be slowly adjusted counterclockwise which will maintain P2.

③ 调压器工作稳定后戴上指挥阀护罩。

Command valve protecting cover should be put back on the regulator after it works stably.

④ 调节操作应细心，均匀缓慢。

Careful adjustment operation is a must with even and slow speed.

10.2.2 调压器停止运行 Regulator Stop Working

① 打开指挥阀护罩，缓慢松开指挥阀调节螺杆，使调压器停止工作。

Open the command valve protecting cover, slowly loosen the regulating screw of the command valve and stop the pressure regulator from working.

② 缓慢关闭主阀上游切断阀，如果保持生产则同时打开旁路阀控制生产。

Slowly close the cut-off valve at the upstream of the main valve. If continuous production is required, open the bypass valve.

③ 关闭主阀下游切断阀。如是检修可将管道内介质放空即可开始维修工作。

Close the cut-off valve at the downstream of the main valve. If maintenance is required, empty the medium in the pipe and maintenance work can be commenced.

11. 调压器故障及排除 Pressure Regulator Failure and Elimination：

调压器一般故障处理 The way to treat Regulator normal failure

异常现象 **Abnormal phenomena**	产生原因 **Cause**	消除方法 **Problem Elimination Methods**
给定压力逐渐偏低 Set pressure reduces gradually	①指挥阀喷嘴有污物，不通畅； Command valve nozzle is dirty and partially blocked	清洗指挥阀；Clean the command valve;
	②指挥阀膜片漏气； command valve diaphragm gas leak	换膜片；change the rubber diaphragm;

	③稳压阀开度过大。 PM valve overly opened	调节稳压阀开度。 Adjust the opening degree of PM valve
给定压力逐渐增大 Set pressure increases gradually	稳压阀阀口有污物 PM valve outlet is dirty	清洗稳压 Clean the dirt
调压不稳定 Pressure regulating unstable	① 稳压阀开度过小； PM valve's open degree too small	调节稳压阀开度； Adjust the opening degree of PM valve
	②指挥阀调节范围不对。 Command valve's regulating range incorrect	更换指挥阀的弹簧。 Change command valve spring.
调压不灵敏 Pressure regulating not sensitive enough	阀杆有卡、阻现象 valve screw is jammed or plugged	定期清洗 clean regularly
主阀造成直通现象 Short circuiting phenomenon in the main valve	①主阀内部密封面或密封部位有污物造成卡阻； Dirt build-up on the main valve sealing surface or at the sealing point causing jamming;	①拆卸清洗主阀阀芯、阀座密封面，去除污物，如有损坏需更换内件； Disassemble and clean the main valve spool, valve seat sealing surface remove the dirt, replace the inner parts if damaged;
	② 稳压阀阀口有污物堵塞； PM valve outlet plugged by dirt	②拆卸清洗稳压阀阀口； Disassemble and clean PM valve outlet
	③指挥阀下膜片被损坏； Rubber diaphragm underneath the command valve damaged	③更换指挥阀下膜片； Replace the rubber diaphragm
	④指挥阀引压信号管有污物堵塞不畅通或安装时被焊堵死了。 Pressure inducting signal tube of the command valve plugged with dirt or falsely welded and sealed during installation	④重新安装引压管，保证畅通。Reinstall the pressure inducting tube, ensuring it is unblocked
主阀不通或关闭 Main valve plugged or cannot be completely closed	①调压器主阀膜片损坏或主阀上膜室进了较多的水和油； Main valve diaphragm damaged or the upper diaphragm chamber of the main valve was entrenched with a considerable amount of water or oil	①更换膜片，或清洁主阀上膜室； Replacement diaphragm, or Clean the upper diaphragm chamber
	②指挥阀喷嘴口有污物堵死； Command valve nozzle is dirty and completely blocked	②拆卸清洗指挥阀喷嘴； Disassemble and clean command valve nozzle;
	③调压器主阀内部阀芯、阀杆和阀套上的平衡通气孔被污物堵死； The air balancing holes in the main valve spool, valve stem and valve pocket are completely blocked by dirt	③拆卸清洗主阀内部零件，疏通平衡孔。 Disassemble and clean the main valve internal parts, and unplug the balancing hole

12. 订货须知 Purchase Order Notice

12.1 用途、介质、型号；公称通径及压力等级;

Usage, media, model; nominal diameter and pressure level

12.2 进口压力 Inlet pressure：P1（P1 最大，P1 正常，P1 最小）（MPa）;

P_1（P_1 max，P_1 nom，P_1 min）;

12.3 出口压力 Outlet pressure：P2（MPa）

12.4 请用户告知产品是用于阀后调压还是阀前稳压。

The customer needs to advise whether the regulator is to be used for upstream pressure maintaining or downstream pressure regulating.

12.5 温度范围：包括介质温度和环境温度。

Range of temperature: include medium temperature and environment temperature.

12.6 如需协助选择主阀公称通径，除上述条件外，请给出下列参数。

If the customer requires our assistance in deciding the main valve's nominal diameter, please provide us with the following parameters besides the conditions above.

Qn—计算流量，Nm^3/h（Q 最大，Q 正常，Q 最小）

Calculated flow rate, Nm^3/h（Q max，Q nom，Q min）

Yn—标准状态下气体密度，Kg/ Nm^3，或告知何种气体及成分。

Gas density under standard condition, Kg/Nm^3，or advise the type of gas and its components.