



ACVF 系列电动轴流式调节阀

ACVF Series Electric Axial Control Valve

申请两项中国专利 Chinese Patent : 201520310010.5、 201510244758.4

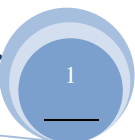


1. 产品简介

调节阀的研制是油气管道关键阀门国产化的重点课题之一，为解决现存传统调节阀技术的不足，如使用中常有卡死、振动、噪音较大、驱动力矩大、可靠性较低、寿命较短、密封填料易漏等现象。我公司开发出一种全新结构的分体轴流式调节阀，抛开了常用调节阀球型的

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阀体结构、“S”型流道的束缚，吸取了套筒调节阀的优点，使套筒与阀芯在阀体内腔顺流道放置，流体在通过调节阀的过程中流向基本不发生改变，顺管道方向轴向流动，减小流道流阻，压损小，提高了单位面积上的流通能力，大大降低了噪声和紊流的形成。The development of this control valve is one of the state key made-in- China Innovation subjects in oil - gas pipeline industry. It is a solution to solve problems of conventional valve technology such as machine block, high vibration and noise, large drive torque, low reliability, short service life, and leakage of sealing, etc. We have developed a new structure of split type axial-flow control valve, which replace usual ball body structure of control valve, get rid of restriction of the "S" type flow pass, and adopt advantages of the sleeve valve so that the sleeve and spool is placed in side of valve body's cavity in the flow direction. The fluid through the flow control valve does not change direction, which can reduce the flow resistance from flow orifice and pressure loss, increase the flow capacity and greatly reduces noise and flow turbulence.

本公司轴流式调节阀套筒顺管道流向安装结构，其优点：(1) 使阀芯在套筒内轴向动作，阀芯设计为压力平衡式结构，抵消因节流口前后压差引起的不平衡力，从而改善了常规阀口径不能做大，压差不大的约束。(2) 在阀体内腔设置流线阀芯套，疏导流体的流速及流束，使管道流体分布均匀，压力均衡，介质在阀的控制过程中流向基本不发生大的转变。(3) 使介质在阀内轴向顺环形流道流动，流体在阀体内的流向转变很小，能量损失较少。整体铸造圆桶结构更加适应了承压容器的受力要求，承压性能好。

该轴流式调节阀调节精度高，调节范围大，使用寿命长，可广泛应用于石油、天然气、

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化工、电力、冶金等行业。

The advantages of axial- flow valve

- (1) The valve spool moves within the sleeve in axial way, and the spool is designed as balance structure, which offset the imbalance caused by pressure differences both before and after the orifice. It can enlarge the size of orifice and pressure difference.
- (2) The linear valve sleeve can improve the flow rate of fluid and enable fluid well distributed within pipes .The medium normally would not change the direction in controlling process.
- (3) The medium in the orifice moves in the annular flow way, which achieves small changes of flow direction as well as low energy loss. The whole cast drum structure is up to the force requirement with better pressure performance.

The axial- flow control valve is with high precision, wide adjustment range, long service life, and it can be widely used in petroleum, natural gas, chemicals, power, metallurgy and other industries.

2. 型号说明

例 E.G : (K) ACVF-900Class	字母含义说明 Mode Explanation
K	类型代号 ("K"表示抗硫 ; "G"表示高温 ; "D"表示低温) K= Anti- sulfur ;G =High Temperature ;D= Low Temperature

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A	轴流式 Axial Type
CV	调节 (控制) 阀 Control Valve
F	分体式 Split Type
900Class	公称压力等级代号 PN Mode



3. 主要技术参数 Main Parameter

压力等级	ANSI 150CL ~ 900CL (1.6MPa ~ 16.0MPa)
公称通径	NPS 2" ~ 20"(DN50 ~ DN500)
使用温度	-46°C ~ +130°C
适用介质	油品、净化天然气、一般含硫天然气 (H ₂ S+CO ₂ ≤8mol%)、高含硫天然气 (H ₂ S+CO ₂ ≤21mol%)、城市煤气等。
传动方式	电动、蜗杆蜗轮传动
执行规范	设计制造：GB/T 17213、IEC 60534 结构长度：ANSI B16.10、GB/T12221 法兰连接：ANSI B16.5、JB/T79-94 (可按用户订货指定法兰标准生产) 检验和测试：JB/T 7387、GB/T17213、MSS-SP-61、ANSI/FCI 70-2 抗硫阀：NACE MR 0175 设计制造。
泄漏等级	优于 FCI 70-2 标准第IV级要求
流量特性	等百分比特性
调节阀的开度	10% ~ 90%
噪 音	距离阀门下游 1m 处的噪音≤85dBA

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Part	Material
Pressure Classes	1.6-16.0MPa; 150CLASS-900CLASS, 10000PSI
Diameter	DN50-DN500; NPS 2" - 20" ;
Work Temperature	-46°C ~ 130°C; L range -20°C ~ -200°C
Medium	Oil, purified natural gas, sulfur gas (H ₂ S+CO ₂ ≤8mol%) , high sour gas(H ₂ S+CO ₂ ≤21mol%) , City gas
Standard	Design : GB/T 17213, IEC60534 ;Structure Length :ANSI B16.10, GB/T 12221 ; Flange: ANSI B16.5, JB/T79-94 ; Test And Inspection : JB/T 7387, GB/T172213, MSS-SP-61、 ANSI/FCI 70-2
Leakage Rating	> IV , FCI 70-2
Drive	Electric, Worm Gear
Flow Character	%
Open rating of Regulating valve	10% ~ 90%
dBA	≤85dBA at 1 m away from downstream of valve



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4. 工作原理 Work Principle

ACVF 轴流式调节阀执行器、阀杆、转向套、连接臂、阀芯共同组成曲臂连杆传动机构。阀杆在执行器驱动下作 0-90°角行程运动，在曲臂连杆传动机构作用下，阀芯在阀套内作左、右轴向运动，对阀门下游流量或压力进行调节。阀体由阀外体和阀内体构成，是一完整的铸造体，阀的内外体之间有一轴向对称流道，流体在阀门内沿轴向流动，流阻小、流通能力大、噪声低。ACVF axial-flow control valve adopts the ram-driven mechanism comprised by actuator, valve stem, steering sleeve, arm and valve spool. The valve do the 0-90 ° rotary movement driven by actuator and the stem do the left -to -right axial movement driven by ram to control the flow rate and pressure in the downstream of valve . The integrated valve body is consist of external body and internal body, Between which there is an axial orifice and the fluid moves inside of orifice with low flow resistance, high flow capacity and low noise.

4.1 关闭状态：阀芯硬密封端面紧压在阀座的端面上形成一道硬质密封副，同时与镶嵌阀芯套和阀座之间的软密封橡胶垫组成软密封副。硬软双质密封副保证了气体介质零泄漏。

4.1 Turn-Off Status: Hard seal face of spool contact one end face of the valve seat which as hard seal; while the rubber gasket between valve sleeve and valve seat forms the soft seal. Both hard and soft sealing can ensure zero leakage of gaseous medium.

4.2 缓压状态：阀芯下端设置有缓压轴，阀芯离开阀座时有一段缓压空行程，在阀芯处于小开度时，由缓压轴先节流，再由阀芯端面与阀芯套节流，分级降压避免小开度形成高速流体对密封面和节流面的冲刷。

4.2 Pressure Relief State: The finale at the bottom end of spool makes the spool stay in an idle

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travel stroke when spool is off with valve seat. When the spool is in a small opening, the finale would firstly throttle fluid, and then let the end of spool and sleeve continue the throttling. The multiple depressurizing can prevent the high-speed fluid from eroding the seal face and throttling face.

4.3 调节控制状态：根据下游流量或压力需求情况，在执行器驱动下，阀芯在阀套内左右轴向移动，对下游流量或压力进行平衡。阀套窗口为等百分比设计，流量小时，流量变化小，流量大时，则流量变化大，在不同开度上，具有相同的调节精度。

4.3 Control Status: According to the downstream flow or pressure demand, the valve sleeve moves in left- to- right axial way within valve sleeve driven by the actuator. The valve sleeve is designed in the ratio principle, i.e. when flow rate is small, the ratio change is in small scale, and when flow rate is large, and the ratio change is in large scale. Different opening is with different control accuracy.

5. 性能特点 Performance Feature

ACVF 轴流式调节阀采用分体式结构，阀座、阀芯等内件由阀体中间装入，避免了一体式结构阀座由法兰内孔装入，并由丝圈固定对流道直径的减弱。阀芯运动方式采用曲臂连杆结构，易于安装、维修。ACVF axial-flow control valve adopts the split -type structure, and the internals such as valve seat, spools, etc. are placed from the middle part of valve body instead of from the orifice of flange. The weakened orifice diameter is fixed by loop and the movement of spool is driven by ram structure, which is easy for installation and maintenance.

5.1 零泄漏级密封：阀芯、阀座采用硬软双质密封副，节流部位与密封面完全分开，减小了气

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流对密封面的冲刷，满足高压气、液介质“零泄漏”。即使在最恶劣的工作条件下，调节阀都能在全压力范围内保持关闭严密。在要求调节阀必须维持 100%严密关断的应用场合，密封系统的可靠性具有无与伦比的记录，即使在超期使用也能做到这一点。该特性与执行机构的种类无关。

5.1 Zero Leakage Seal: The valve spool and valve seat adopt hard and soft seals, and the throttling part and seal face are totally separated, which reduces the erosion to the seal face, meet the high-pressure gas and zero leakage. Even under the most severe operating conditions, the control valve, within the whole pressure range, can keep itself at the close status. When valve remain 100% shut-off, the record of sealing system is unprecedented. This feature is irrelevant with type of actuator.

5.2 压力平衡：调节阀阀芯为平衡式结构，阀芯上开设腰型孔，阀芯左右端压力平衡。启闭力矩小，开启、调节轻便灵活。操作力矩完全与阀门两端的压力无关，与传统调节阀相比，同等规格选用扭矩较小的执行机构便可满足。

5.2 Pressure Balance: it adopts a balanced spool valve structure, and the hole in the spool can keep the pressure well balanced at both end of the spool. It features with small torque and flexible open and control. The torque to open valve is irrelevant with pressure at both ends of valves. Compared to the conventional control valve in the same parameter, smaller torque of actuator for valve can be chosen to meet requirement.

5.3 结构紧凑：对于同样的应用场合，同一尺寸的阀门，该调节阀比传统的调节阀结构更紧凑、执行机构更小，这对于重量和尺寸要求严格的项目是非常重要的。轴流式调节阀与角形

调节阀相比，它可以使配管布置更简化。轴向式设计不仅使结构更紧凑，而且使噪音更低，并减小流体对管道的冲蚀。

5.3 Compact Structure: the control valve in same size for the same application is with more compact structure than conventional valve and it is with smaller actuator, which is an important indicator regarding weight and size requirements for the project. Compared with Angular control valve, the Axial-flow control valve allows more simplified piping arrangement, lower noise and flow erosion.

5.4 自动除渣功能：缓压轴的设计，在开启和关闭的瞬间对密封面进行清扫除渣，避免密封面划伤，使用寿命长。

5.4 Auto Clean function: The design of relief finale makes the seal face cleaned automatically in the moment of opening and closing .It avoids scratches with longer service life.

6. 主要结构 The main structure

该调节阀主要构成部件：左阀体、右阀体、阀盖、阀杆、导向套、转向套、连接臂、阀芯、阀芯套、阀芯密封调节套、阀座。

The main valve components: left valve body, right valve body, bonnet, stem, guide sleeve, swerving sleeve, connecting arm, spool, valve sleeve, regulating sleeve of sealing spool , valve seat.

6.1 轴流式：介质在阀门内部具有流线型并均匀对称的自由流通过径，降低了流体局部高速流、紊流、喷射流等的冲击，提高了阀门的稳定性，噪声低，并最大限度提高了单位面积的流通能力。

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6.1 Axial Flow: The medium inside of the valve has a symmetrical free flow orifice and alleviate the impact from the local high-speed fluid, turbulence, spraying, etc. It improves the valve stability, reduces the noise, and maximizes the flow capacity per unit area.

6.2 全平衡阀芯：阀芯安装在阀套内部，阀芯和调节套上设置通孔，使阀芯左右侧始终压力平衡，操作力矩小。

6.2 Well-balanced spool: The spool is installed inside of the sleeve; the hole at spool and adjustment sleeve makes the pressure balanced at both left end and right end of spool to have a small operating torque.

6.3 连杆传动机构：连杆机构表面经渗氮硬化处理，具有较高的耐磨性、耐腐蚀性。连接机构为90°角行程，使阀芯左右移动迅速，调节灵敏。

6.3: Ram drive mechanism: after the nitriding treatment, the surface of ram is with high wear resistance and corrosion resistance. The ram mechanism owns a 90 ° travel stroke, and makes the spool moving from left to right at a high-precision regulation.

6.4 全流通面积：阀体为左右阀体对夹式结构，阀座由阀体内部安装，完全能保证法兰内孔面积为全通径，避免了阀座由法兰内孔装入而降低流道直径。

6.4 Full circulation area: The body is the clam structure with left valve body and right valve body. the valve seat is installed inside of valve body, instead of installed from inner orifice of flange ,which could ensure that the area of inner orifice is full bore and is not narrowed .

6.5 密封零泄漏：阀座上设置软密封垫，阀芯阀座密封面堆焊硬质合金，形成硬软双质密封。

阀芯后端设置密封调节套，阀门组装好后进行微调，使阀芯完全贴合阀座密封面，实现密封零泄漏。

6.5 zero leakage seal: The soft gasket is used on the valve seat, and the hard alloy is welded to the sealing face of valve spool and valve set, which forms both hard and soft seal. There is seal-regulating sleeve at rear end of the valve spool, by which valve could have slight adjustment after assembly and achieve zero leakage when spool is well contacted with sealing face of valve seat .

6.6 阀芯设置缓压轴：避免关闭瞬间颗粒杂质卡在密封面造成密封副损坏。

6.6 Relief finale of spool: Avoid the damage of sealing face when instant close makes the sealing face blocked by the impurities.

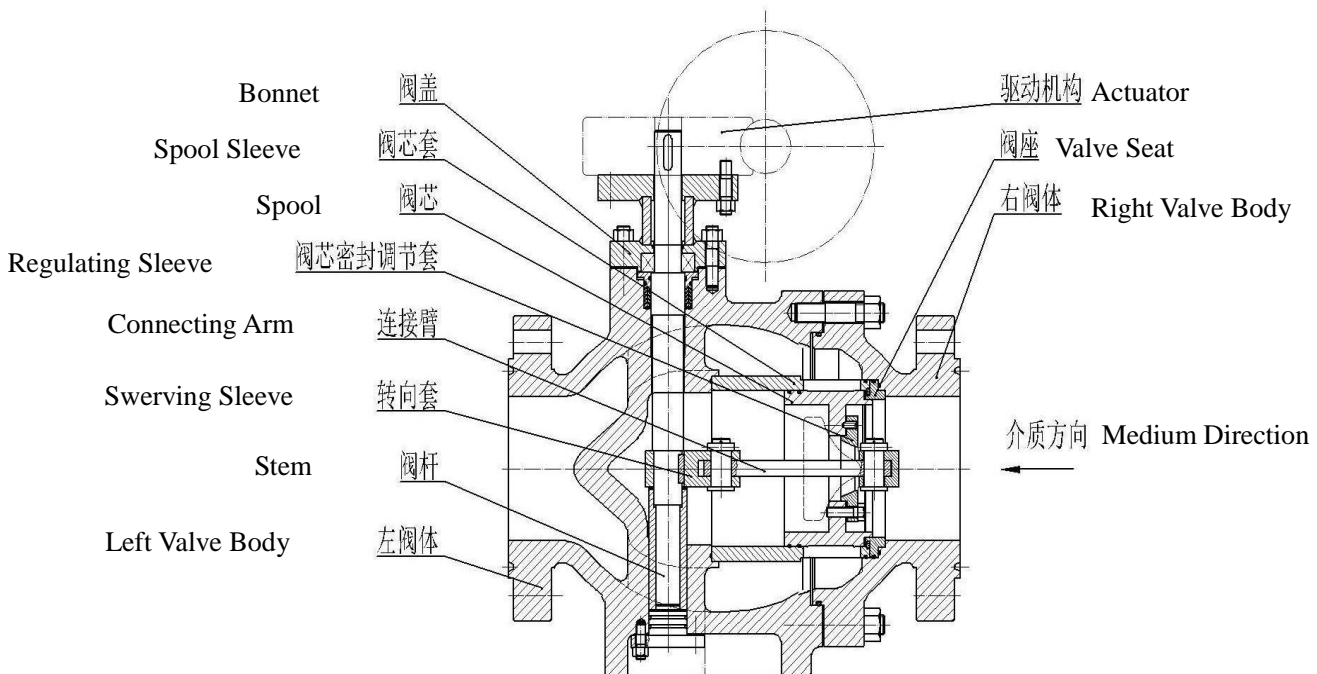


图1 ACVF 轴流式调节阀结构示意图

7. 安装尺寸 Installation Dimension

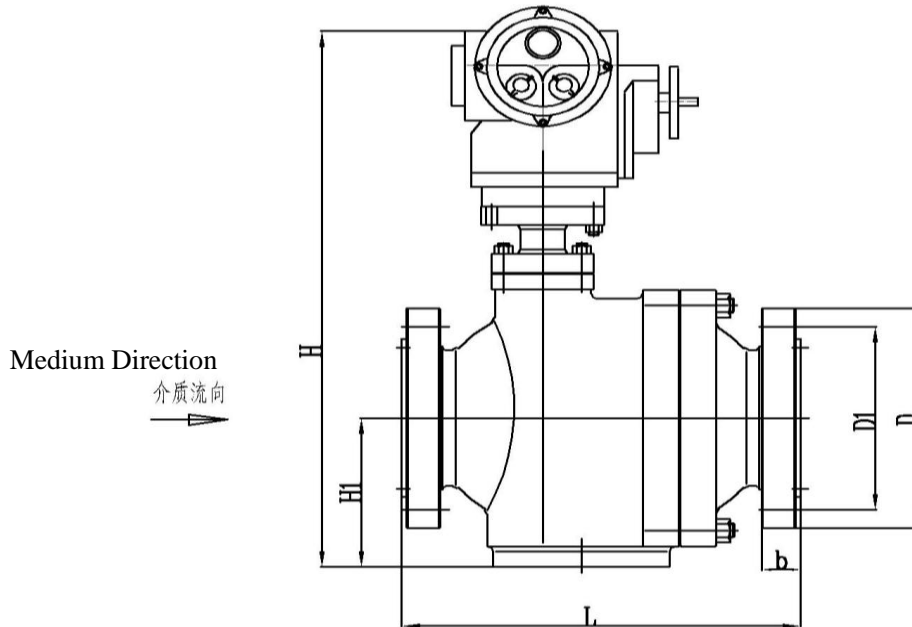


图 2 ACVF 轴流式调节阀安装外形图

Drawing 2 As-Built Drawing of ACVF Axial-Flow Control Valve

★注：本公司 ACVF 轴流式调节阀具体选型结构尺寸请联系我们，最终以技术确认图纸为准。 Note: Please contact us if you choose specific mode and dimension. Final technical drawing prevails.

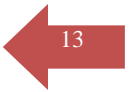
8. 主要部件材料 Material of Main Spare Parts

部件名称 Name	材料名称 Material
阀体 Valve Body	ASTM A216 WCB、WCC ; ASTM A352 LCB、LCC

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阀盖 Bonnet	ASTM A216 WCB、WCC ; ASTM A352 LCB、LCC , 20#、ASTM A105、ASTM A350 LF2
调整堵头 End Cap	不锈钢 Stainless Steel
导向套 Guide Sleeve	不锈钢 Stainless Steel
阀杆 Stem	不锈钢 Stainless Steel
导向套垫 Gasket of guide sleeve	不锈钢 Stainless Steel
转向套 Guide sleeve	不锈钢 Stainless Steel
轴销 Dowel	不锈钢 Stainless Steel
轴销螺母 Dowel Nut	不锈钢 Stainless Steel
填料 Padding	聚四氟乙烯 PTFE
阀芯套 Spool Sleeve	不锈钢 Stainless Steel
阀芯 Spool	不锈钢+硬质合金 Stainless Steel+ Hard alloy
软密封垫 Gasket of soft seal	丁腈橡胶/氟橡胶 Nitrile rubber +Viton rubber
阀芯密封调节套 Seal regulating Sleeve	不锈钢 Stainless Steel
连接臂 Connection Arm	不锈钢 Stainless Steel
阀座 Valve Seat	不锈钢+硬质合金 Stainless Steel+ Hard



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alloy

9. 订货须知 用户订货时请提供以下技术参数

Ordering Note : Customer needs to offer the following parameter:

- (1) 产品型号规格 (公称压力 PN、公称通径 DN) ; Mode and specification (nominal pressure PN, nominal diameter DN)
- (2) 工作介质及组成成份 ; Work medium and compositions;
- (3) 实际流量 (Nm³/h 或 Nm³/d)、阀门进口压力 P1、出口压力 P2 ; Actual Flow (Nm³/h 或 Nm³/d)、 Inlet pressure P1 ,Outlet pressure P2 ;
- (4) 工作温度 , 包括介质和环境温度 ; Work Temperature, incl. medium and ambience temperatures.
- (5) 其它特殊要求 (包括电动执行机构)。 Other specific requirement (incl. electric actuator)