Precision Electronic Services, Inc.

DPC7000 Series Intelligent Valve Positioner

Product Description V2.0

HART COMMUNICATION PROTOCOL

Precision Electronic Services, Inc

Introduction

The DPC7000 series intelligent valve positioner is a richly functional and new generation of positioning device of control valve, which is richly functional and mounted in the linear or rotary stroke pneumatic actuator. It has innovative industrial design, modular internal structure, advanced and reliable controlling technologies and incomparable price performance, so it is widely used in the petroleum, chemical, power, metallurgy, and light industry and so on fields of automatic control systems, and also enjoys a high reputation.

DPC7000 is a kind of intelligent electric/pneumatic valve positoner on the basis of microprocessor technology; therefore, it can well overcome the friction and the unbalanced force on the spool. We can improve the response speed of valve, and make a fast and accurate position. Not only it can take place of the traditional electric/pneumatic valve positioner, but also it can be connected directly to the HART protocol network, and make it possible to exchange the information between the field parameter setting and the controlling system of PC computer.

Structure

The positioner consists of:

- shell and bonnet
- junction box
- control assembly with LCD and operation key
- position sensor feedback components
- pneumatic valve group
- pressure gauge module

Technical Characteristics

Any needed mounting position

Easy operating

Three key action button, for configuration parameters or field operation

Optionally manual or automatic initialization

Clear and intuitive LCD interface

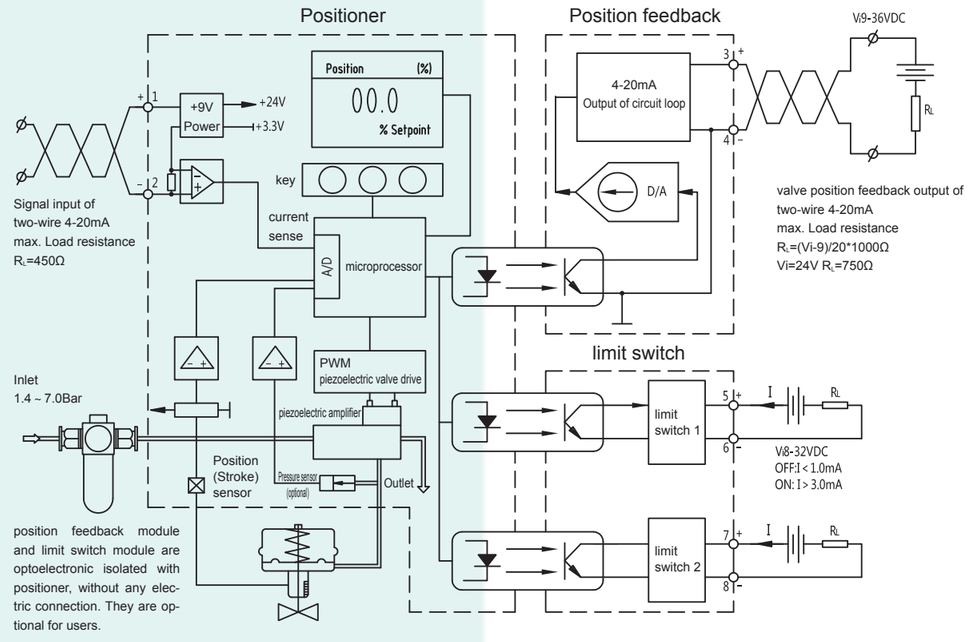
Configurable tight shut-off function

Long- term preservation of all parameters in the EEPROM

Multiple fault diagnosis and alarm functions

Optional communication and feedback functions

Lightening protection feature



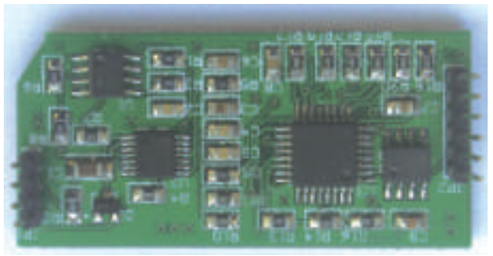
Working Principle

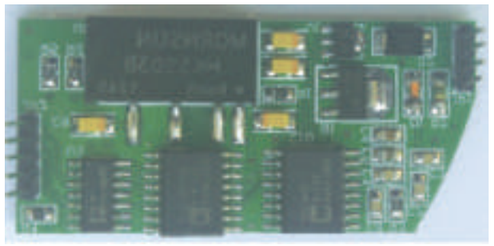
DPC7000 is a kind of field instrument with microprocessor, on the condition of electricity-air theory; it can adjust and control the pneumatic actuator.

The actual value of set point and position of actuator make a comparison in microprocessor. If the deviation is detected by microprocessor, the control algorithm will urge the pneumatic module to act in the intelligent positioner.

The air flows into the air chamber of the actuator and discharges in opposite direction. The pneumatic module adjusts the air flow.

Linear or rotary displacement is detected by sensor.





Circuit Board Components

The circuit board components consist of three parts: main control module, communication module and feedback module. The main control module is the standard installation, and the communication and feedback module are up to the users' options.

Technical Analysis

Piezoelectric Valve Technology

The pilot valve plates work under the piezoelectric ceramic, when the sheet is without voltage, the inlet 1 of compressed air will be closed, and the outlet 2 will be connected to the large pore 3 without any output pressure. When the sheet is with voltage, because of the material proprieties of piezoelectric ceramic, the sheet will produce a bending of dozens of microns, and then the large pore 3 will be closed, and the compressed air will flow from the pore 1 to pore 2, so as to output the pneumatic signal. The piezoelectric valve has the following features:

Safety and reliable, without self-heating phenomenon

Ultra low loss of power, switching power: 0.014mV

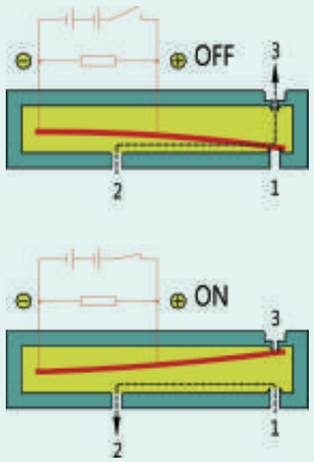
High-dynamic response speed, and the switching time is only 2ms, so the PWM adjustment is available.

Ultra long service life without any mechanical wear

No magnetic effects

Well seismic performance

Therefore, by using the structural characteristics of pilot piezoelectric plates, the intelligent valve positioner with the combining application of the piezoelectric technology and modern electronic technology can accurately control the position, rapidly response, and service for a long time.



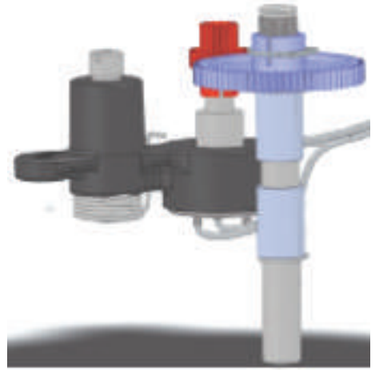
Shell and Bonnet

The shell, bonnet and the junction box are made of die- casting aluminum materials, and they are completely machined with only one time of fixation in the CNC machine center, so it can ensure the air tightness and accuracy requirement of the shell.

Control Circuit Board

The fully integrated circuits are applied in the control components, and all the electric components are welded by the PCB automatic welding technology.

The COG liquid crystal of ULP 128 X 64 lattice is applied in the LCD, so more information will be displayed.



Feedback Accuracy

Precision conductive plastic potentiometer can eliminate the gear backlash through the elastic reeds, in order to ensure the feedback resolution.

Pneumatic Assembly

The main body of DPC7000 positioner is using the linear and rotary stroke in common, and you can switch the linear and rotary stroke with each other with easy operation.

Model Generalization

The main body of DPC7000 positioner is using the linear and rotary stroke in common, and you can switch the linear and rotary stroke with each other with easy operation.

Field Operation

The parameters setting and operation of positioner, and the automatic/manual switch are controlled by three keys. You can read the set and feedback value of the positioner in the display. The actuator in the manual mode can be adjusted across the range. The manual operation has locking options, so it can keep the non-staff from operating casually.

Automatic Initialization

Using the "Automatic Initialization" menu, the intelligent valve positioner can rapidly match the valve and adjust the relevant parameter by the auto- start function. In the process of the automatic initialization, the microprocessor will take optimizing control according to the following data:

- zero point
- Max stroke
- positioning time of valve
- positioning speed of actuator
- dynamic parameter
- direction of air to open and air to close

Monitoring Function

The DPC7000 has intelligent monitoring function, and the program can monitor the current status and parameter of the actuator and valve at any time, and then make a comparison with the defined limiting value. If it surpasses the limiting value, the positioner will display the diagnostic information. The monitoring function can attentively monitor the following measurement and monitoring:

- stroke accumulation
- the changing times of stroke direction
- alarm counting
- dead zone
- limit position of valve
- service hours

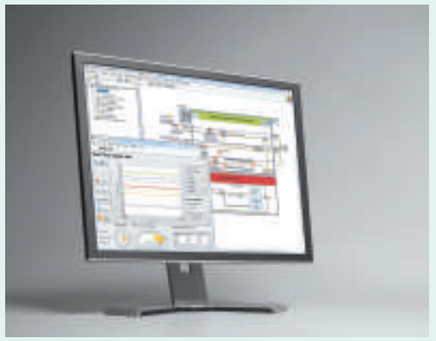
Performance Diagnosis

The working performance diagnosis of positioner and actuator can be realized by the bus communication device or the HART configuration software.
The main items:

- error/warning/normal indications
- performance test of IP amplifier
- diagnosis of deviation of the stroke
- function test of control circuit board
- analysis of on-line friction and dead zone
- trend of friction and dead zone
- diagnosis of seat wear
- Pressure testing of total travel and data analysis
- Spring and elastic coefficient measure of actuator
- Actual seat fastening force testing
- Dynamic analysis of step response
- Dynamic error band and data analysis

.....

Part of the diagnoses only can be preceded when the valve is mounted in the piping, and these diagnoses respectively check for set point and control rate by the way of dynamic and static, and display the dynamic curve by the way of diagram form with PC software. The parameters of positioner and actuator are to be accessed and diagnosed.



Easy Operation

After the correct installation of the embedded automatic initialization program, starting this program can automatically calibrate and adjust the operating parameters, it is quick and easy.

HART Communication

Using the 475 model HART communicating device, you can calibrate, set and self-diagnose easily.

Lightening Protection Characteristics

The discharge circuit for lightening protection is set in the DPC7000, so it can keep the positioner from damage caused by lightening stroke.

Specifications

Available Configuration

For linear stroke actuator
For 90°rotary actuator
The DPC7000 series positioner can be mounted onto other actuators which conform to the VDI/VDE3845 and 3847 standard, if mounting the frame, please contact the manufacturer.

Index of Air Source

Air pressure: 0.14~0.7 Mpa
Leakage rate: < 0.6L/H
Air consumption in steady state: < 36 L/H

Stroke Range

Linear stroke: 10~100 mm
Rotary stroke: 30~120°

Accuracy

Dead zone: 0.1~10% continuous adjustment
Linearity: 0.5% FS
Sensitivity: 0.1% FS
Resilience: 0.2% FS

Working Environment

Ambient temperature: -30~80 ℃
Ambient humidity: 5~95% RH
Anti-seismic performance: 15~150 Hz/2g
IP grade: Exd IP 65, Normal IP66
Ex grade: Exd IIB T6
Exd IIC T6
Exia IIB T6

Input and Output Signal

Signal of analog value：4~20mA DC; 4~12mA or 12~20mA split control

Min. Input voltage: non- HART 8.5 V, HART 9.0 V
Max. Output voltage: 30 VDC
Min. operating current: 3.6mA (if the current is lower than this value, the screen of positioner will become darker or the CPU will be reset)
Communication mode: HART communication protocol, FF bus, PROFIBUS-PA bus
Times of failure-free operations of piezoelectric valve: > 2 billion times
Output characteristics curve: linear, equal percent (1:25, 1:30, 1:40, 1:50), quick-opening, user-defined curve
Feedback current output: 4~20mA DC

Lightening Protection Feature

Voltage protection level: line-line: < 60 V, less than 4ns

Line-ground: <800V, less than 20ns

Discharge current: 10KV (8/20 S waveform)

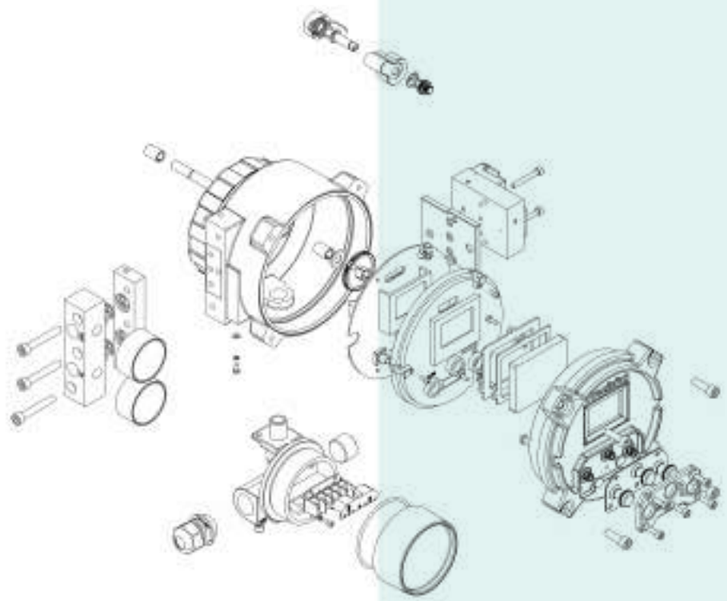
Configuration Operation

Self-turning: automatic calibration of zero-point, the full scale position, minimum pulse width

Self-diagnosis: Diagnose the faults of mounting error in the process, such as the potentiometer position, locked-rotor, leakage

Local operation: three buttons on the front panel, for local setting and operating the valves.

Interal Components



Display Mode

LCD：128 x 64 resolution COG liquid crystal, dimension 23 x 26mm

Pressure gauge display: 2 or 3 standard gauges to display the air pressure of inlet and outlet

Size

179.5 x 217 x 12mm

Order Guide

Product Options	DPC7000	□	□	□-	□	□	□-	□	□	□
Operating method	linear stroke rotary stroke	L R								
Mode of action	single action double action		1 2							
Ex	Exd ⅡB T6 Exd ⅡC T6 Exia ⅡB T6 Normal IP66			F C A W						
Communication	None HART FF PROFIBUS-PA				0 H F P					
Position feedback	None 4-20mA current output					0 F				
Lightening protection function	None With						O L			
Power port	m20×1.5 1/2NPT							M N		
Air source port	G1/4 1/4NPT								G N	
Mounting bracket	none With									0 M