# CHRONOS DIGITAL POSITIONER

0

CHRONOS IDP7000 DIGITAL POSITIONER

A

6







 $\bigcirc$ 



#### etup... ibration. Equal percent Custom uning) tion⊧ Autocalibration Language Characterization **Quick Setup**

The Chronos IDP7600 positioners are digitalto-pneumatic instruments with microprocessed technology that use the HART® protocol to allow remote communication.

The two-wire power supply, made by the control loop, contributes significantly to the reduction of wiring costs.

The advanced technology of the two-stage relay and microprocessor allows the positioner provides high response level and accurate control. The Chronos IDP7600 provides a local PID loop with ultrafast loop execution time: lower process variability means higher quality of final product and increased productivity.

The reability, intuitive use and quick setup/calibration make the Chronos IDP7600 the more practical and advanced HART<sup>®</sup> positioner of the market.

#### Local Interface

The interface of Chronos IDP7600 positioner consists of LCD display with large size, which has illuminated background to allows easy viewing of messages even in dimly lit areas of the plant.

A trio of bright LED in green, yellow and red complements the information on the display and allows the functioning alerts are seen even at a distance.

The information can seen locally at a glance and are presented in plain language, which does not require decoding.

Virtually all menu items can be accessed through the four buttons of the interface, with the main cover of the positioner closed, and without the need for a portable calibrator or personal computer.



Chronos



### **Features and Benefits**

- Easy two-wire connectivity from the control system speeds installation
- "Quick Set Up" and "Autotune" features allow fast device and system connectivity and valve configuration/ tuning, reducing start-up time
- Using the local interface/buttons for configuration maintains the device classification, eliminates configurators/ computers
- A configurable 4-20mA output functions as a position transmitter, eliminating other standalone devices
- Two configurable digital outputs may function as valve limit switches (full open/full close), eliminating need for standalone devices
- One configurable digital input may functions to switch valve control from remote to local.
- Bright, backlit graphic LCD allows reading even in dimly lit areas, saving time and reducing errors
- Green/Yelow/Red LED's quickly indicate device status
- A wide selection of device hazardous classification options match location classifications
- Auto or manual gain adjustment allows the user to speed up/slow down control valve to match the loop
- A two-stage relay allows fast response to large signal changes and precise response to small ones
- Single-acting or double-acting mode allows actuator selection flexibility without additional manifolds
- Multilingual capability (English, French, German, Italian, Portuguese, Spanish)
- Upgradeable firmware allows the latest improvements to be uploaded and used
- "Tight Shutoff" Option temporarily improves shutoff in leaking valves
- Modular design isolates pneumatic from electric componentry, and also allows easy subassy modules replacement

#### Diagnostic

VSI Controls Chronos positioner valve Diagnostic software offering includes 3 different diagnostic levels having increasing capabilities:

- ⇒ Standard Diagnostic: monitoring a single (or few) variable, on-line diagnostic, no alarms management. Standard DTM software.
- ⇒ Advanced Diagnostic: monitoring multiple variables, on-line and off-line diagnostic, alarms management. Standard DTM software.
- ⇒ Performance Based Diagnostic: Advanced DTM software and Valve Data logger hardware.

## Advanced Diagnostic

Advanced diagnostic adds to the Standard the capability to perform diagnostic also off-line, and involves dynamic parameters (Hysteresis, Valve friction...).

During off-line Diagnostic the positioner communicates the parameters value to the DTM sw: it has been set considering the specific application, and a set of parameters can generate a warning or an alarm, depending on valve and plant type. As the first step in offline diagnosis, after the plant is shut down a step response test could be done to detect whether the dynamic characteristics of the control valve have deteriorated:

- **ON-OFF step:** this test is conducted by a positioner so that the control valve travels from the fully closed position to the fully open position. It can detect slow valve operation or a failure that prevents valve complete travel from 0 to 100%. This kind of phenomenon indicates possible galling in the sliding parts or a drop in supply air pressure.
- **25% steps:** in this test the set point is changed in steps with 25% stroke amplitude. At each step, judgments are made concerning step response parameter data such as the deviation, settling time, and overshoot. If these parameters have become larger, the control performance has probably deteriorated because friction has increased.
- Valve Signature: focuses on deterioration of the static characteristics of the control valve. This test is done as the control valve slowly travels from the fully closed to the fully open position, and then slowly returns to the fully closed position. With this test is possible to detect problems related to seating force, friction (of sealing components as packing or balancing rings) or stick-slip phenomena.

With Advanced Diagnostic no alarms management is possible (positioners do not have internal clock). Offline diagnostic can be done only occasionally, when there is plant shut down. On-line diagnostic on dynamic parameters is not possible, because positioners have a limited amount of storable data.

## Chronos Digital Positioner

#### Standard Diagnostic

Standard diagnostic is based on data acquired and stored on totalizers internal to the positioner. The diagnostic is made on-line, and involves static parameters, like:

- **Hours in service:** positioner and valve hours in service have a direct link with the possible deterioration of the valve
- **Stem reversal:** number of changes of direction of the stem has a direct link with sliding components wear.
- **Cumulative valve travel:** the total travel made by a control valve has a direct link with the possible deterioration of the valve
- Valve full open and full close time: typically a full close time could mean no wear of control valve internal parts. In case of high pressure control valve with heavy process fluid (for example: boiler feed water valves) however, a great time with valve closed could mean possible wear by erosion of valve seat and plug on sealing surfaces
- Valve stroke: control valves with a large stroke or with a high cycle count could be problematic for the point of view of fluid leakage from worn packing or due to actuator failure (especially with diaphragm actuators).

All these data are automatically stored by the positioner, and they can be viewed by the user by means of DTM SW: using these data some predictive analysis can be done comparing actual data with the estimated time life of critical components indicated by the valve manufacturer.

No dynamic behaviors are considered, and no alarms management is possible (positioners do not have internal clock).







#### **Performance Based Diagnostic**

**Performance Based Diagnostic** is achieved by means of **Advanced DTM Software** and a **Valve Data Logger Hardware**. Data Logger does not impact on the HW of DCS: it is a standalone device, installed in the Marshalling cabinet. It does not interfere with the DCS or with the control loop: it has the function to store on-line data. The sampling frequency it is much higher than those of common diagnostic SW.

Typical Online diagnosis are:

- Live monitoring: capture intermittent control valve issue.
- Alarms management: Data Logger is able to record and store data in a SD card, thus allowing it to record the alarm history (event and related date).
- On-line valve friction (affected by real working conditions).
- Valve signature.
- Key Performance Indicators.
- Valve maintenance messages.
- Cloud connect for condition based valve maintenance evaluation. Recorded data can be uploaded by the Final User in a cloud based archive, and VSI Controls technicians could help Customer in the Diagnostic Analysis of control valves.

#### Alarms management

**Stick-slip phenomena:** if repeated stopping and slipping of the valve stem occur, it is likely that the stem is not sliding smoothly because of a problem such as excessive friction with the packing. Excessive friction on the packing rings means that the possibility of structural failure of the gland packing is raising.

**Close position error:** if a control valve's zero travel diagnosis shows minus direction alarms, there is a high probability that the valve plug and seat ring are damaged, due to fluid erosion. Valve leakage capability is drastically reduced, as well as control accuracy given by the valve plug.

**Low air supply pressure:** a supply pressure alarm for a control valve indicates that the pressure of the air supplied to the positioner is lower than expected. Leak checks for the supply piping near the valve are recommended. Also, if there is a positioner air circuit alarm, the internal air circuit may be clogged due to dirty supply air.

#### TECHNICAL SPECIFICATIONS AND CONSTRUCTION MATERIALS

## Chronos Digital Positioner

Communication Protocol	HART <sup>®</sup> , version 7	Operating Humidity	0 to 95% U.R., noncondensing
Power Supply	Two-wire, loop powered, 4-20 mA, protected against reverse polarity	Housing / Enclosure	Anodized aluminum, low- copper, polyester painting (standard)
Input Signal	4-20 mA (3.8 mA min.)		300 series stainless steel
Compliance Voltage	10.4 Vcc @ 20 mA (typical)	Internal Parts	Aluminum and 300 series stainless steel
Effective Resistance	520 Ω @ 20 mA (typical)		
Characterization	Linear, equal percent or customized, with characterizable curve from 21 points freely configurable	Soft Goods	Buna-N, Silicone
		Hazardous Area Certifications	Explosion proof, flameproof, non-incendive - IECx / ATEX / INMETRO
Mounting Types	Linear actuators Rotary actuators	Enclosing Rating	IP66
		Electrical Connections	1/2″-14 NPT (standard)
Strokes	Linear: 10.2 to 304 mm (0.4 to 12 inches) Rotary: 0 to 90°		M20 x 1.5 (optional)
		Pneumatic Connections	1/4" - 18 NPT 1/8" - 27 NPT (pressure
Pneumatic Supply	Instrument air according to ANSI/ISA 7.0.01 <sup>(1)</sup> / Nitrogen		gauges)
		Weights	Aluminum version: 4.4 kg (9.6 lbs.)
Supply Pressure	2.1 to 8.3 barg (30 to 120 psig)		Stainless steel version: 9.4 kg (20.6 lbs)
Operating Temperature	-20 to 75°C (-4 to 167°F)	Dimensions	22x 15 x 17 cm. (8.4 x 5.7 x 6.5 in.)

<sup>(1)</sup> Dew point should be at least 10°C (18°F) below the ambient temperature, the amount of oil should not exceed one part per million (1 ppm) and particle size should be less than 5 microns

PERFORMANCE DATA				
Air Delivery	22.5 Nm3/h @ 4.1 bar (14 SCFM @ 60 psig)	Linearity	< 0,8% F.S. (Linear actuators) < 0.5% F.S. (Rotary actuators)	
Steady State Air Consumption	Typical 0.63 Nm3/h @ 4.1 Bar (0.39 SCFM @ 60 psig)	Temperature Effects	± 0.08% F.S./°C (± 0.04% F.S./°F)	
Deadband	< 0.2% F.S.(1)	Maximum Shock	4g (5 to 15 Hz) / 2g (15 to 2000 Hz)	
Repeatability	< 0.05% F.S.	Influence of Mounting Orientation	Negligible	

<sup>11</sup> Dew point should be at least 10°C (18°F) below the ambient temperature, the amount of oil should not exceed one part per million [1 ppm] and particle size should be less than 5 microns



## Chronos Digital Positioner

The information and specification contained in this bulletin are considered accurate. However, they are provided only for information purposes and should not be considered as certified. VSI Controls products are continuously improved and upgraded and the specification, dimensions and information contained herein are subject to change without notice. For further information or to confirm these presented here, contact your VSI Controls representative. The specific instructions for installation, operation and maintenance of the Chronos Digital Positioner are provided in the Maintenance Bulletin.



VSI Controls<sup>™</sup> S.r.l. with a sole shareholder subject to direction and coordination activity of PETROLVALVES S.p.A.

Registered Office and HQ Via Locatelli, 5, 20124 Milano, Italy

WorldWide presence through the Companies of the Group: Italy - Uk - The Netherlands -Norway - Usa - Brazil - Singapore -Australia - Russia - Kazakhstan