DIGITAL EPIC-2
INTELLIGENT VALVE
POSITION TRANSMITTER
A TRULY GLOBAL MONITORING AND CONTROL CAPABILITY

Westlock Controls has a global reputation in providing innovative solutions for networking, monitoring and controlling process valves. Our focus on technology and supplying reliable products manufactured to the highest industry standards makes us a preferred choice with the world’s leading process companies and a trusted partner developing even better solutions for the future.

With increasing pressure to improve productivity and reduce maintenance downtime, stringent requirements are evolving within the process industry for reliable monitoring and control systems. We use emerging technologies to set next-generation standards and enhance our products’ process, maintenance and operational efficiencies. Westlock Controls products are used in all industrial area classifications from hazardous, including explosion proof and intrinsically safe, to non-hazardous for full weather protection or sanitary installations.

Since 2012 Westlock has been part of Pentair Valves & Controls, the name behind the world’s most comprehensive range of valves, actuators and associated flow control products.
INTELLIGENT, EFFECTIVE SAFETY VALVE CONTROL

THE ABILITY OF SAFETY VALVES TO PERFORM IN EMERGENCY SITUATIONS IS CRITICAL TO PROTECT PERSONNEL, EQUIPMENT AND THE ENVIRONMENT AGAINST RISK AND TO MAINTAIN THE MANDATORY SAFETY INTEGRITY LEVEL (SIL) FOR YOUR PLANT.

To guarantee performance, you must be certain that the valves and the equipment controlling these valves will perform when called upon.

EFFICIENT AND RELIABLE

Digital EPIC-2 is an intelligent valve position transmitter designed especially for safety valves. Its advanced diagnostics functions enable Emergency Shutdown (ESD), Partial Stroke Testing (PST), Solenoid Operated Valve Testing (SOVT) and Full Stroke Testing (FST) to be carried out efficiently and reliably, to ensure effective maintenance of your SIL up to level 3.

Combining a powerful state-of-the-art ARM® 32-bit microcontroller-based intelligent position transmitter with proven solenoid valve technology in a single, compact unit, its unique and smart diagnostics increase the safety, reliability and efficiency of plant operation simply and effectively.

Its sophisticated diagnostic functions lower the total cost of ownership by suggesting predictive maintenance of the valve under operation before it fails and interrupts the process, with intelligent alarms that pinpoint the root cause of problems, enabling you to ensure effective maintenance and operational integrity of your safety valves.

Its key features include:

- ARM® 32-bit microcontroller based smart position transmitter with 4-20mA position feedback
- Valve position measurement via non-contact local or remote mount magnetic sensor with no moving parts, providing high accuracy and reliability
- Choice of factory configured solenoid coil & valve in a single integrated solution or the ability to select a custom solenoid valve with a choice of Cv rating and coil voltage
- Password protected 3 button local user interface with high contrast graphic LCD and optional backlight
- Remote user interface using HART® 7 DD/FDT® DTM 1.2 for seamless integration into any control system or Safety Instrumented System (SiS)
- Easy configuration using guided setup wizard and auto calibration
- Emergency Shutdown (ESD) status and alarm
- Partial Stroke Testing (PST) and pressure profiling
- Solenoid Operated Valve Testing (SOVT)
- Full Stroke Testing (FST) and pressure profiling
- Intelligent alarm system
- Open/close soft limit switches

TECHNICAL SPECIFICATIONS

Input signal: 0-24 V analog
Output signal: 0-24 V digital

STROKE
Rotary: 45° to 110°
Linear: 0.5” to 36”

TEMPERATURE RANGE
Standard operational: -40°C to +85°C (-40°F to +185°F)
Optional: -60°C to +105°C (-76°F to +221°F)
LCD operation: -20°C to +70°C (-4°F to +158°F)

ENCLOSURES
Intrinsically safe: Engineered resin, aluminum, stainless steel
Explosion proof: Aluminum, stainless steel
A Safety Integrity Level (SIL) is a measure of performance required for a Safety Instrumented Function (SiF) within a Safety Instrumented System (SiS), which is used to prevent or limit hazardous events against people, equipment and the environment.

A SIL rating comprises two key elements: a Level of Risk for the process and a value of Probability of Failure on Demand per year (PFD) for the system.

LEVEL OF RISK

IEC EN 61508 sets out four levels of risk which are set against the likelihood of an event to define the SIL level applicable to a process. The possible consequences are defined as:

- **SIL 4**: Catastrophic community impact
  - Potential for fatalities in the community
- **SIL 3**: Employee and community impact
  - Potential for multiple fatalities
- **SIL 2**: Major property and production protection
  - Possible injury to employees
  - Potential for major serious injuries or one fatality
- **SIL 1**: Minor property and production protection
  - Potential for minor injuries

The SIL requirements for hardware safety integrity are based on a probabilistic analysis of the device. To achieve suitability for a given SIL, the device must meet targets for the maximum probability of dangerous failure and a minimum Safe Failure Fraction.

To achieve a SIL rating, each element of the system must have a PFD value which is calculated by taking the failure rate of the system under control (1/mean time between failures (MTBF)) multiplying by the test rate and dividing by two.

The individual values for each of the three elements of the SiS are added together and this figure is compared with the table set out in the standard.

**FUNCTIONAL SAFETY ASSESSMENT**

To achieve ‘suitability for use’, final control elements must have undergone Functional Safety Assessment, carried out by an independent third party and covering every aspect of a component’s design and engineering.

Westlock Controls’ design, manufacturing and management systems for Digital EPIC-2 and Falcon solenoid valves have been reviewed and audited and the complete safety lifecycle has been approved and certified by internationally-respected bodies TÜV and exida Consulting.

In no small part, certification relies on information provided by the manufacturer and this cannot always be verified. For Digital EPIC-2, detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) reports are available that detail all failure rates and failure modes, common cause factors for applications with redundant devices and the products’ expected lifetimes.

### SIL RATINGS

**Process risk matrix**

![SIL Ratings Diagram](image-url)

**Probability of Failure on Demand (PFD)**

<table>
<thead>
<tr>
<th>SIL</th>
<th>PFD</th>
<th>Risk reduction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIL 4</td>
<td>&gt;10⁻⁵ to &lt;10⁻⁴</td>
<td>100,000 to 10,000</td>
</tr>
<tr>
<td>SIL 3</td>
<td>&gt;10⁻⁴ to &lt;10⁻³</td>
<td>10,000 to 1,000</td>
</tr>
<tr>
<td>SIL 2</td>
<td>&gt;10⁻³ to &lt;10⁻²</td>
<td>1,000 to 100</td>
</tr>
<tr>
<td>SIL 1</td>
<td>&gt;10⁻² to &lt;10⁻¹</td>
<td>100 to 10</td>
</tr>
</tbody>
</table>
PARTIAL STROKE TESTING

Safety valves for emergency shutdown typically remain static for long periods and must be tested periodically to prove their functionality and maintain the SIL rating of the Safety Instrumented System. The most economical method is through Partial Stroke Testing (PST), whereby the valve is partially closed while in-line without interfering with the process. The same principle applies to fail-opened and vent valves.

PST won’t eliminate the need for mandatory full stroke tests (FST), which require a full plant shutdown, as it only ensures the valve will travel to the preset travel limit but doesn’t ensure it will move completely to its fail safe position. However, it can extend the time between FSTs considerably, with the potential for extensive cost savings.

Intelligent PST can also have major cost benefits in defining whether a failure in the system is a ‘safe failure’, which can be addressed during scheduled maintenance, or a ‘dangerous failure’, which demands immediate attention.

There are a number of options for PST, including:

<table>
<thead>
<tr>
<th>Partial Stroke Testing</th>
<th>Mechanical Jammers</th>
<th>Positioners</th>
<th>Transmitter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational Characteristics</strong></td>
<td><strong>x</strong></td>
<td><strong>x</strong></td>
<td><strong>x</strong></td>
</tr>
<tr>
<td>Manual System</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automated PST Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local or Remote PST Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No operator exposure to PST Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Operators not required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collects PST Data</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Collects FST Data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provides PST Diagnostic Information</td>
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<td></td>
<td></td>
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<tr>
<td>Provides FST Diagnostic information</td>
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</tr>
<tr>
<td>Provides Position Feedback &amp; Data under ESD</td>
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<td></td>
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<tr>
<td>No additional feedback device / switches required</td>
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<td></td>
<td></td>
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<tr>
<td>SOV full function test</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SOV Pulse Test</td>
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</table>

**MECHANICAL JAMMING OF THE VALVE VIA A STROKE LIMITER IN THE ACTUATOR OR VALVE**

A relatively inexpensive solution for smaller applications, this solution has the disadvantages that the ESD valve is unavailable during PST; it provides no diagnostics or position feedback and is labor intensive.

**THE ADDITION OF A CONVENTIONAL VALVE CONTROLLER TO THE ACTUATOR**

Offering a better balance of economy and functionality, this option has the limitation that it relies on complex technology with many hundreds of moving parts and the associated risks of failure. Its analog output creates masses of unnecessary data and, as it’s intrinsically-linked to its power supply, it requires an additional limit switch to prove the valve’s position reliably.

**THE ADDITION OF A TRANSMITTER-BASED VALVE CONTROLLER (POSITIONER) TO THE ACTUATOR**

The optimum solution for cost and functionality, with only 2 moving parts; an analog input only, with a digital output ensuring the data provided to the main control system is only that required and that it remains available even when the power is off.
Westlock Controls’ Digital EPIC-2 is a second generation, transmitter-based intelligent device that provides the ultimate in functionality at a realistic cost. Its state-of-the-art diagnostic functions include:

**PARTIAL STROKE TESTING (PST)**
During PST, the valve will travel to a preset travel limit within a preconfigured time period and move back to its original position. The Digital EPIC-2 will capture the PST signature and store it in its memory. Two PST signatures can be stored by the device, one of which was performed during commissioning of the valve and acts as a baseline to compare against future PST signature data. Any deviation on the maintenance PST from the baseline PST by a preset hysteresis limit triggers an alarm to indicate and identify the problem.

**EMERGENCY SHUTDOWN (ESD)**
The ESD feature of Digital EPIC-2 can be achieved by providing a 0-24V DC signal from the logic solver of the safety system to the device’s terminal block and will move the valve to fail safe position. The Digital EPIC-2 will still be alive during an ESD event and its internal intelligence enables the device to detect and capture the signature data when the valve moved during the event. The ESD status can be viewed on the device’s LCD and an alert will be generated on the HART DD® and DTM. The device will stay in this mode until the ESD event is cleared.

**SOLENOID OPERATED VALVE TESTING (SOVT)**
The solenoid valve is an important part of the safety system and its periodic testing is necessary to improve the reliability of overall system.

**FULL STROKE TESTING (FST)**
The FST function ensures the valve will move to its fail safe position completely. It enables different FST signatures to be stored in its memory from initial integration through to any movement during an ESD event. The commission signature acts as a baseline to compare future maintenance signatures. It can store 4 different maintenance signatures locking 2 for later analysis. Its smart alarm system continuously compares the new maintenance signature to the baseline, identifies any potential issue and isolates the root cause to report an alarm.

Digital EPIC-2 offers a unique diagnostic function to test the solenoid valve by de-energizing it and monitoring the drop in pressure without causing any valve movement.
The Digital ePiC-2 is powered through a 0-24V analog signal from the control system and provides 4-20mA position feedback and digital HART communication on the same signal. The safety function is provided from a 0-24V digital signal from the safety system to the Digital ePiC-2 to de-energize the valve during an emergency shutdown event.

A step by step guided setup wizard on a 64x128 graphic LCD and 3 buttons provides an easy way to configure, calibrate and operate the device locally. Alternatively, a remote HART® DD or FDT® DTM can be used to configure, calibrate and perform advanced diagnostics functions on the device.

**INDUSTRY LEADING TECHNOLOGY**

Within the enclosure is a powerful industry leading low power 32-bit ARM® microcontroller with one non-contact position sensor, two pressure sensors and one temperature sensor. The low power operation of the microcontroller keeps the device operating even at 3.6mA with HART® communication during an ESD event.

The Digital ePiC-2 can be mounted easily using NAMUR compatible mounting kits on linear or rotary actuators. The completely sealed & potted electronics are resistant to dirt & moisture and an expanded temperature range of -40°C to +85°C enhances the reliability of the device to work in harsh environments.

**INTERNATIONAL STANDARDS**

Digital ePiC-2 is approved to major international standards including:

- **Safety Integrity Level:** [IEC 61508-1+7:2010] - SIL3

**INTRINSICALLY SAFE**

- **NEC 500:**
  - Class I, Division 2; Groups A, B, C & D
  - Class II & III, Division 2; Groups F & G

- **ATEX/IEC:**
  - Ex II 1 G Ex ia IIC T4 Ta = -20°C to +60°C
  - Ex II 3 G Ex nA IIC T4 Ta = -20°C to +60°C

**EXPLOSION PROOF**

- **NEC 500:**
  - Class I, Division 1; Groups B, C & D
  - Class I, Division 2; Groups A, B, C & D
  - Class II, Division 1; Groups E, F & G

- **ATEX/IEC:**
  - Ex d IIB + H2
  - AEx d IIB + H2
  - EX nA IIC
  - AEx nA IIC

**INGRESS PROTECTION RATING**

**[BASE MODELS]**

Resin enclosure:
- IP65 / NEMA4/4X/6P

XP enclosure (aluminum/stainless steel):
- IP67/NEMA4/4X/6P

**NB:** Digital ePiC-2 is designed in accordance with criteria for NI, IS and XP applications. In some cases it requires the use of an agency approved barrier. For information on the barrier used by Westlock Controls to obtain the agency approvals listed above, appropriate network architecture and segment device limits, contact Westlock.
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VCPBR-03111-EN 14/11