ICOT SMART POSITIONERS
INTRINSICALLY SAFE, EXPLOSIONPROOF - ATEX/IEC/INMETRO

Smart positioners for both spring-return and double-acting actuators on rotary and linear valves. Available with HART®, FOUNDATION Fieldbus™ and Profibus PA™ protocols.

FEATURES

• 3-button interface and graphical LCD for easy calibration and information display.
• Easy configuration of split range and reverse acting operation.
• Easy access to wiring terminal connectors.
• Non-contact valve position measurement via Hall effect sensor. Eliminates the need for drive arms, linkages and increases overall resolution, accuracy and reliability.
• Advanced auto-calibration.
• Valve speed adjustable via user control.
• Available with optional dry contact limit switches.
• Optional 4-20 mA position feedback transmitter - HART® version only.
• High-flow spool valve option for larger actuator/valves. Eliminates the need for volume boosters in some applications.
• Highly visible position indicator for rotary applications.
• Easily accommodates large stroke valves, such as knife gates.
• Fully compatible with AMS™ software and DTM.
• Rugged aluminum and stainless steel enclosures for maximum protection - 6000 series.
• Engineered resin enclosure is robust yet lightweight with exceptional chemical, UV and impact resistance - 5000 series.

TECHNICAL DATA

| Enclosures | 5000 series | Engineered resin |
|            | 6000 series | Aluminum        |
|            |            | Stainless steel |

| Communication protocol | 5200 | None |
|                        | 5300/6300 | HART® |
|                        | 5400/6400 | FOUNDATION Fieldbus™ |
|                        | 5500/6500 | Profibus PA™ |

GENERAL APPLICATION

By providing modulating valve position control, the ICOT range of smart digital positioners deliver reliable and effective control for both rotary and linear action valves.
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INTRINSICALLY SAFE, EXPLOSIONPROOF - ATEX/IEC/INMETRO

AGENCY APPROVALS

<table>
<thead>
<tr>
<th>Intrinsically safe</th>
<th>Area classification (ATEX/IEC/INMETRO)</th>
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<tbody>
<tr>
<td>5000 series</td>
<td>Ex ia IIC T4</td>
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<tr>
<td>Enclosure standards (IEC)</td>
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<table>
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<tr>
<th>Explosionproof</th>
<th>Area classification (ATEX/IEC/INMETRO)</th>
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<tr>
<td>6000 series</td>
<td>Ex d IIB T5</td>
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<tr>
<td></td>
<td>Ex d IIIC T85°C; II 2 D</td>
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<td></td>
<td>Ex d IIB IIIC T85°C</td>
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<tr>
<td>Enclosure standards (IEC)</td>
<td>IP65</td>
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</table>

NON-CONTACT POSITION FEEDBACK

Unlike conventional positioners, the ICoT feeds back accurate valve position without the need for linkages, levers and rotary or linear seals. Position sensing is performed by a non-contact sensor, employing Hall effect magnetic principles. This enables the use of advanced control strategies where knowledge of valve position is used in predictive and other algorithms.

ROTARY CONTROL

There is no hysteresis within the positioner. This feature allows extremely accurate tracking of the control signal to within 0.1 mA. The non-contact position sensor is embedded within the ICoT housing. An external magnetic module, attached to the output shaft of the actuator and housed in the beacon assembly, rotates about this sensor. An analog-to-digital converter interfaces between the sensor and a microprocessor. It rotates about this sensor generating position signal which is linearized to improve accuracy and linearity of the controlled position commanded by the instrument signal.

LINEAR CONTROL

The ICoT proximity positioner provides more reliable measurement of valve stem position. A static slide-by actuation assembly, attached to the valve stem, is the only moving part. Output updating takes place twenty times per second.

ICoT is a fully digital positioner allowing for multiple control algorithms leading to better controllability for a large range of actuators and enables a wide range of diagnostic information to be generated.

REMOTE MOUNT CAPABILITY

The ICoT has the ability to be mounted remotely (up to 50 feet) from the device it is controlling (Please consult about greater distances). This allows the positioner to be isolated if the control valve is located in either a high vibration or extremely corrosive environment.
Negligible bleed
The ICoT 5000/6000 series positioner is designed to consume the least possible amount of control air at steady state. This means lower process air consumption and reduced demand on instrument air compressors. To increase reliability, the ICoT employs a patented lapped spool and floating sleeve design. This balanced construction relies on an air bearing which eliminates any metal-to-metal contact and results in a mean time between failures (MTBF) of 1,666,666.7 hours or 333.3 years.

Integrated position transmitter
The ICoT 5200/5300 and 6300 series are available with an integrated 4-20 mA position feedback transmitter. This cost-effective feature eliminates the need to buy externally mounted devices when knowledge of valve position is required remotely.

AutoCal intelligent calibration, local keypad
ICoT intelligent positioners are equipped with a 3-button keypad for performing on-site electronic calibration. System calibration is performed easily, requiring only minutes to accomplish. It offers the operator a choice of linear, quick-opening or equal percentage modes. Split range and reverse acting operation are also configured simply. The AutoCal feature allows simple zero and span adjustments as well as PID and transducer calibration. The 5300/6300 and 5400/6400 series offer the option of a HART® or FOUNDATION Fieldbus™ respectively, with the 5500/6500 suitable for Probus PA.

On-board sensors/error detection
The ICoT positioner has the capability to constantly monitor its own operation. If an error or failure condition occurs, it will be displayed on the local LCD. If the positioner is supplied with a HART® interface, the error codes will be displayed on a hand-held terminal or PC maintenance station as shown below:

The alarm conditions and additional diagnostic capabilities are provided through a number of sensor elements in the transducer. A pressure switch detects low air pressure entering the positioner. In conjunction with a supply pressure switch, it can be identified whether this is caused by a restricted filter or a genuine low supply pressure condition. A 0-100% position feedback transmitter is available integrated within the electronics of the ICoT 5200 and 5300/6300 series positioners.

Local LCD display
The local LCD display provides a range of on-site diagnostic information. While the valve is being controlled by the positioner and the error signal is NOT zero, the displayed information will show both setpoint and position as a percentage. The range of values displayed is from 0.0% (fully closed) to 100% (fully open). The resolution displayed is in 0.1% increments although internal calculations are maintained more precisely.

PID control
The ICoT uses proportional, integral and derivative functions, making it a true PID servo system. By combining intelligence based on present, past and the prediction of future events, the ICoT’s controller is able to minimize errors and provide a precise control response.

Autotuning
Tuning, or setting of the PID functions, is carried out automatically by the microprocessor within the ICoT. This eliminates complex and time-consuming manual procedures.

5400/6400 series FOUNDATION Fieldbus™ protocol
The ICoT 5400/6400 series features the FOUNDATION Fieldbus™ communication protocol, is an industry proven international standard (IEC 61518) designed for use in the process industry. Its features include multi-drop capabilities (as many as 32 devices per segment), extended trunk length, and single loop integrity. It also offers control in the field, power and communications on a shielded twisted pair network and compatibility with intrinsically safe networks.

A key feature of the FF protocol is the ability to select where control of the process is situated – in the host, in the field or in various combinations of both locations.

5500/6500 series Profibus PA™ protocol
The ICoT 5500/6500 series features the Profibus PA™ communication protocol. Similarly to the Foundation Fieldbus devices, Profibus PA™ (Process Automation) physical layer confirms to the IEC61158-2 international industry proven standard allowing for multi-drop communication to 32 devices per segment and extended trunk length. ICoT 5500/6500 is an intrinsically safe positioner utilizing single, twisted pair shielded cable for power and communication. Functional advantages include transmission reliability, self-test functions, diagnostic, distributed intelligence, local and remote auto-calibration. To simplify integration of ICoT 5500/6500 positioners Westlock provides GSD (General Station Description) containing key device data as well as EDD (Electronic Device Description) and DTM (Device Type Manager).
**ICOT SMART POSITIONERS**

**INTRINSICALLY SAFE, EXPLOSIONPROOF - ATEX/IEC/INMETRO**

**ICOT 5300/6300, 5400/6400 AND 5500/6500 SERIES INTELLIGENT POSITIONERS WITH HART®, FOUNDATION FIELDBUS™ AND PROFIBUS PA NETWORK CAPABILITIES**

**Proven, Interoperable solutions even in the Harshest Environments**

The ICOT positioner series has been successfully used for more than 15 years in many challenging and diverse applications in industries such as, Oil and Gas, Chemical, Power, Pulp and Paper and Sugar and Ethanol. Although it has a proven track record, Westlock is constantly improving the ICOT line of positioners. Recent developments have enhanced the ICOT electronics robustness and performance even when submitted to vibration and EMI. In the mechanical arena, an explosion proof solution and stainless steel housing option is now available. Software upgrades ensure the ICOT series is up to date with the most recently released industry standards, like the FF’s ITK 6.0.1 (one of the first in the market) and the new 5500/6500 series is now compatible with the Profibus PA protocol.

Our goal is to provide the ICOT user with a truly open, independent and interoperable solution able to interface with different host system brands and vendors.

In order to support the integration of ICOT positioners in to the user’s host system of choice, you can download all the necessary HART®, Fieldbus Foundation or Profibus files from our website. Please visit www.westlockcontrols.com to find:

- **ICOT 5300/6300 (HART):**
  - EDD (also available at http://www.hartcomm.org in the Product Catalog - Wired Products menu)
  - DTM (available also at http://www.fdtgroup.org in the Product Catalog – Certified DTM’s catalog)
- **ICOT 5400/6400 (Foundation Fieldbus):**
  - EDD (available at www.fieldbus.org in the End User Resources – Registered Products)
- **ICOT 5500/6500 (Profibus PA):**

**Additional features and benefits**

The ICOT 5300/6300, 5400/6400 and 5500/6500 series provide intelligence to the control valve through microprocessor-based systems using the HART®, FOUNDATION Fieldbus™ and Profibus PA protocols respectively. These offer additional benefits in intelligent calibration, control and on-line diagnostics.

**Intelligent calibration**

Accurate measurement of valve stem position, input signal, actuator pressure, cycle time and cycle count data are recorded during normal operation, providing information for control valve signature generation. The positioner has a local LCD display which indicates valve position, set-point in percentage open, calibration status, alarms status and, for the 5400/6400 (FF) and 5500/6500 (PA), whether the ICOT is in local or fieldbus control.

**Intelligent control**

Control valves are the most maintenance-intensive components commonly used in instrumentation and control systems. Internal parameter sensing within the valve positioner gives early warning of the need for maintenance.

**On-line diagnostics**

The ICOT possesses the capability to predict rather than react to valve maintenance needs. Operating personnel gain a real time perspective on the state of control at the valve, including a view of operating integrity and emerging alert conditions. Timely information about each control valve’s condition is quickly made available to the plant’s production and maintenance engineers.

The principal advantage of online diagnostics is the ability to detect deviations from established patterns of behavior as they occur under actual operating conditions. The ICOT positioner’s diagnostic capability observes the following parameters:

- Valve position vs. input signal.
- Actuator pressure vs. valve position.
- Airset filter outlet pressure.
- Confirmation of principal operating pressures within the positioner.
- Pressure generation within packing gland area.
- These enable the following to be diagnosed:
  - ‘Stick-slip’ detection.
  - Excessive static position error.
  - Low air supply pressure.
  - Clogged air supply filter.
  - Restricted transducer nozzle.
  - Transducer diaphragm air leak.
  - Non-functioning spool valve.
  - Calibration error
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HAND-HELD TERMINALS

Model 5300/6300
A single 4-20 mA ICOT positioner with up to two master devices may be connected to each HART® loop. The primary master is generally a management system or a PC while the secondary unit can be a handheld terminal or laptop computer.

A standard hand-held HART® Communicator is available for making field operations as uniform as possible. Communication is accomplished by superimposing a high frequency signal on top of the 4-20 mA output signal. This allows simultaneous communication and output without comprising loop integrity.

Model 5400/6400
Foundation Fieldbus compatible hand held terminals (like the Rosemount Field Communicator) can communicate with the ICOT 5400/6400 series smart positioners via the FF protocol.

Model 5500/6500
Similar to the Fieldbus Foundation, a Profibus PA tester, like the MTL FBT6-PA, can be used in hazardous areas. Several testers and bus analyzers are also available to be used directly from the DP network in the safe area.
## TECHNICAL SPECIFICATIONS

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<thead>
<tr>
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<th>5200/5300</th>
<th>5400</th>
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<tr>
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<tr>
<td>Input signal</td>
<td>4-20 mA</td>
<td>Two wire FOUNDATION Fieldbus™</td>
<td>Two wire Proﬁbus PA™</td>
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<tr>
<td>Minimum voltage</td>
<td>9.0 V DC</td>
<td>9.0 V DC</td>
<td>9.0 V DC</td>
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<tr>
<td>Maximum voltage</td>
<td>30.0 V DC</td>
<td>32.0 V DC</td>
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<td>Impedence</td>
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<td>N/A</td>
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<tr>
<td>Reverse polarity protection</td>
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<td>Polarity insensitive</td>
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<td><strong>Pneumatic</strong></td>
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<tr>
<td>Supply pressure*</td>
<td>15 to 45 psi (low pressure option)</td>
<td>40 to 120 psi (high pressure option)</td>
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<tr>
<td>Output flow rate</td>
<td>8.0 scfm @ 25 psi</td>
<td>16.2 scfm @ 90 psi</td>
<td></td>
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<tr>
<td>Air consumption</td>
<td>0.03 scfm @ 20 psi (low)</td>
<td>0.08 scfm @ 90 psi (high)</td>
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<tr>
<td>High flow option</td>
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<td></td>
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<tr>
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<td>± 1.0% Linear (for travel under 1.25&quot;)</td>
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<tr>
<td>Valve travel</td>
<td>Rotary: Minimum 45°, Maximum 95°</td>
<td>Linear: Minimum 0.25&quot;, Maximum 48&quot;</td>
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<tr>
<td>Hysteresis</td>
<td>0.2% of span</td>
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<tr>
<td>Repeatability</td>
<td>0.2% of span</td>
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<tr>
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<td><strong>Mechanical</strong></td>
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<tr>
<td>Connections</td>
<td>Pneumatic: ¼&quot; BSP (F) (⅜&quot; BSP (F) for High Flow version) (NPT optional)</td>
<td>Electrical: M20, ½&quot; NPT (F) optional</td>
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</tr>
<tr>
<td>Materials of construction</td>
<td>Enclosure: Nylon, glass filled</td>
<td>Cover gasket: Silicone</td>
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<tr>
<td></td>
<td>Pneumatic manifold: Aluminum anodized die cast zinc</td>
<td>Pneumatic seals: NBR</td>
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<tr>
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<td><strong>Optional features</strong></td>
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<tr>
<td>Airset</td>
<td>Filter regulator combo with 5 micron filter element</td>
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<tr>
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<td>Two SPST hermetically sealed switches (rated for 2 A at 24 V DC)</td>
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<tr>
<td>Feedback transmitter</td>
<td>4-20 mA output (loop powered)</td>
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* As required by actuator for proper control
ICOT 5000 SMART POSITIONERS
INTRINSICALLY SAFE - ATEX/IEC/INMETRO

DIMENSIONS – ROTARY CONTROL

Dimensions in inches, metric dimension (mm) in parentheses

Note: Product shown is standard flow variant

DIMENSIONS – ROTARY CONTROL WITH SWITCHES

Dimensions in inches, metric dimension (mm) in parentheses

Note: Product shown is standard flow variant
ICOT 5000 SMART POSITIONERS
INTRINSICALLY SAFE - ATEX/IEC/INMETRO

DIMENSIONS – LINEAR CONTROL

Dimensions in inches, metric dimension (mm) in parentheses

Note: Product shown is standard flow variant
# ICOT 5000 SMART POSITIONERS
## SELECTION GUIDE

### Base model
- **52**: Intelligent positioner
- **53**: Intelligent positioner with HART® capability
- **54**: FOUNDATION Fieldbus™ positioner
- **55**: Profibus PA™ positioner

### Actuator type
- **1**: Linear (Free magnet assembly include up to 2½” stroke, for strokes > 2½”, contact your sales representative)
- **3**: Rotary

### Mounting style
- **0**: Direct mount (ICoT mounted on actuator)
- **5**: Remote mount (ICoT mounted remote from actuator)
- **7**: NAMUR mount (order with stainless NAMUR mounting kit separately)
- **8**: ModMount (for Keystone MRP and 79U actuators only; supplied with mounting kit)

### Hazardous rating
- **AI**: Intrinsically Safe - ATEX EX ia IIC T4 approved
- **II**: Intrinsically Safe - IEC Ex ia IIC T4 approved

### Housing material
- **E**: Engineered resin

### Supply pressure
- **H**: High pressure (40 - 120 psi)
- **L**: Low pressure (15 - 45 psi)
- **V**: High flow (40 - 120 psi for larger actuators)
- **S**: Super high flow (40 - 120 psi, 5.5 Cv)

### Calibration/communication
- **K**: Via 3-Button on-board keypad (Series 52 only)
- **B**: 3-Button on-board keypad and Hart protocol (Series 53 only)
- **F**: 3-Button on-board keypad and Fieldbus protocol (Series 54 only)

### Conduit entry
- **A**: One ½” NPT (F)
- **B**: One M20 (F)

### Limit switch options
- **0**: None
- **2**: Two SPST hermetically sealed (Mounting style 0 only)

### Position transmitter output
- **A**: None
- **B**: 4-20 mA transmitter (Series 52 and 53 only)

### Pneumatic connections
- **N**: ¼” NPT (¼” NPT with high flow option)
- **B**: ⅜” BSP (⅜” BSP with high flow option)
- **F**: ¼” NPT with filter-regulator assembly (¼” NPT with high flow option)

## NOTES
1. Please contact your sales office for guidance on selecting the best possible combination for your control and monitoring requirements.
2. See Hazardous area classification technical bulletin for further information on global standards.
## Technical Specifications

### Electrical

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<th>6300</th>
<th>6400</th>
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<tr>
<td>Input signal</td>
<td>4-20 mA</td>
<td>Two wire FOUNDATION Fieldbus™</td>
<td>Two wire Proibus PA™</td>
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<tr>
<td>Minimum voltage</td>
<td>9.0 V DC</td>
<td>9.0 V DC</td>
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<tr>
<td>Maximum voltage</td>
<td>30.0 V DC</td>
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<td>Impedance</td>
<td>450 ohms at 20 mA</td>
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<td>Reverse polarity protection</td>
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<td>Polarity insensitive</td>
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### Pneumatic

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<td>10% to 99% non-condensing</td>
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### Technical

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<td>Valve travel</td>
<td>Rotary: Minimum 45°, Maximum 95°</td>
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<tr>
<td></td>
<td>Linear: Minimum 0.25”, Maximum 48”</td>
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<tr>
<td>Hysteresis</td>
<td>0.2% of span</td>
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<tr>
<td>Repeatability</td>
<td>0.2% of span</td>
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### Environmental

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<tr>
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<tr>
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### Mechanical

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<tr>
<td>Connections</td>
<td>Pneumatic: ¼” NPT (F) (⅜” NPT (F) for High Flow version)</td>
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<tr>
<td></td>
<td>Electrical: ½” NPT (F) (M20 optional)</td>
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<td>Materials of construction</td>
<td>Enclosure: Aluminum</td>
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<td>Stainless steel</td>
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<td>Cover gasket: Silicone</td>
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<tr>
<td></td>
<td>Pneumatic manifold: Anodized aluminum and 316 stainless steel</td>
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<td></td>
<td>Pneumatic seals: NBR</td>
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<tr>
<td>Weight</td>
<td>7.2 pounds</td>
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### Optional features

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<tr>
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<tr>
<td>Airset</td>
<td>Filter regulator combo with 5 micron filter element</td>
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<tr>
<td>Limit switches</td>
<td>Two SPST hermetically sealed switches (rated for 2 A at 24 V DC)</td>
</tr>
</tbody>
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### Notes

- As required by actuator for proper control.

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*Image of a positioner*
ICOT 6000 SERIES POSITIONERS
EXPLOSIONPROOF – ATEX/IEC/INMETRO

DIMENSIONS – ROTARY CONTROL / LINEAR CONTROL

Dimensions in inches, metric dimension (mm) in parentheses

Notes: Product shown is standard flow variant
ICOT 6000 SERIES POSITIONERS
SELECTION GUIDE

Base model
63 Intelligent positioner with HART® Capability
64 FOUNDATION Fieldbus™ positioner
65 Probus PA™ positioner

Actuator type
1 Linear (Free magnet assy. included up to 2-1/2" stroke length, stroke lengths over 2-1/2" please consult with your sales representative)
3 Rotary NOTE: Linear valve stroke length and fail position must be specified at time of quotation.

Mounting style
0 Direct mount [lCoT mounted on actuator]
5 Remote mount, aluminum housing [lCoT mounted remote from actuator]
6 Remote mount, stainless steel 316 housing [lCoT mounted remote from actuator]

Hazardous rating
XP Explosion proof - Class I, Div 1, Class 1, Zone 1 - AExd/Exd North America
AX Flame proof - ATEX EX D IIB T5 approved
IX Flame proof - IECEx EX D IIB T5 approved
MP Explosion proof - INMETRO Ex d IIC T6 Gb
MI Intrinsically Safe INMETRO Ex ia IIC T4 Gb
MN Non-sparking INMETRO Ex nA II T4

Housing material
A Aluminum ‘copper free’
S Stainless Steel 316

Supply pressure
H STD flow high pressure [40 - 120 psi]
L LSTD flow low pressure [15 - 45 psi]
V High flow [40 - 120 psi, for larger actuators]

Calibration/communication (external calibration standard)
B 3-Button on-board keypad & Hart protocol (Series 63 only)
F 3-Button on-board keypad and Fieldbus protocol (Series 64/65)

Conduit entry
A ½” NPT [F]
B M20 [F]

Limit switch options
0 None

Position transmitter output
A None
B 4-20 mA transmitter (Series 63 only)
C Discrete output (Alarm/PST/SOB Series 64/65 only)

Pneumatic connections
N ¼” NPT [¼” NPT with high flow option]
B ⅜” BSP [⅜” BSP with high flow option]
F ¼” NPT w/ filter-regulator assembly [¼” NPT with high flow option]

Model number 6330XPAB0B0FM

NOTES
1. Please contact your sales office for guidance on selecting the best possible combination for your control and monitoring requirements.
2. See Hazardous area classification technical bulletin for further information on global standards.

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