WESTLOCK CONTROLS

ICOT DIGITAL POSITIONERS

INTRINSICALLY SAFE, NON-INCENDIVE - NEC/CEC/ATEX/IEC/INMETRO

Advanced positioners equipped with HART®, FOUNDATION Fieldbus™, and Profibus PA™ protocols to deliver enhanced diagnostics with actionable insights to keep your plant running.

FEATURES AND BENEFITS

- Engineered resin enclosure is robust yet lightweight with exceptional chemical, UV and impact resistance.
- Robust frictionless spool valve manifold meticulously tested to endure 2 billion cycles of operation.
- Non-contact position sensing via Hall effect sensor. Eliminates the need for drive arms, linkages and increases overall resolution, accuracy and reliability.
- Remote mount capability ideal for high vibration or extreme environments.
- Intelligent auto-calibration to commission valve in minutes.
- 3-button interface and local LCD display for easy calibration and range of on-site diagnostic information.
- Easy configuration of split range and reverse acting operation.
- Easy access to wiring terminal connectors.
- Valve speed adjustable via user control.
- Available with optional dry contact limit switches.
- 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.
- Optional 4-20 mA position feedback transmitter - HART version only.
- Fully compatible with AMS™ software and DTM.

GENERAL APPLICATION

By providing modulating valve position control, the ICoT range of digital positioners deliver reliable and effective control for both rotary and linear action valves.

TECHNICAL DATA

Enclosures

5000 Series	Engineered Resin

Communication Protocol

5300	HART®
5400	FOUNDATION Fieldbus™
5500	Profibus PA™

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AGENCY APPROVALS

Non-Incendive	
Area classification (NEC 500/CEC)	
All models	Class I, Division 2, Groups A, B, C & D; T4 Class II & III, Division 2, Groups F & G;T4
Enclosure standards	
All models	Type 4
Increased Safety	
Area classification (INMETRO only)	
5300 models	Ex ec IIC T4 Gc
Enclosure standards (IEC)	
All models	IP 66
Intrinsically Safe	
Area classification (NEC 500)	
All models	Class I, Division 1, Groups A, B, C, D; T4 Class II & III, Division 1, Groups E, F & G; T4
Area classification (CEC)	
All models	Class I, Division 1, Groups A, B, C, D; T4 Zone 0 Ex ia IIC T4 Ga Class II & III, Division 1, Groups E, F & G; T4
Enclosure Standards	
All models	Type 4
Area classification (ATEX/IEC)	
All models	Ex II 1G Ex ia IIC T4 Ga
Enclosure standards (IEC)	IP66

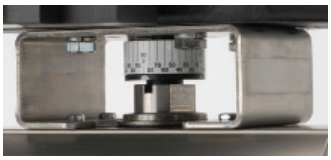
ICoT on a typical Linear Diaphragm Valve

Traditional ICoT Beacon

MAXIMUM RELIABILITY

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.

The ICoT boasts a robust spool valve manifold engineered for durability, rated for up to an impressive two billion cycles of operation. This innovative spool valve frictionless design ensures unparalleled reliability in valve control applications, minimizing wear and tear even under demanding conditions.



NAMUR style Beacon
Easily accommodates large stroke valves, such as knife gates

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

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
Pipe mount ICoT with remote and cable set

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.

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Advanced Spool Valve
The ICoT 5000 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 5300 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.

System Calibration
ICoT digital 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 and 5400 series offer the option of HART® or FOUNDATION Fieldbus™ respectively, with the 5500 suitable for Profibus PA.

Intuitive Diagnostics
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:

Err3= Low input pressure
or clogged filter
Err6= Calibration error

Westlock Controls
ICot HART Rev 1.02.00
25.5°C
R %PS 56.4 %SP 56.4
12.0mA ERR3

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 5300 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.

Westlock Controls
ICot HART Rev 1.02.00
25.5°C
R %PS 56.4 %SP 56.4
12.0mA ACAL

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.

5300 Series HART® Protocol
The ICoT 5300 series positioner responds to HART® commands for ease of calibration and provides intelligence for the control valve through a microprocessor-based diagnostic system utilizing the HART® protocol.

5400 Series FOUNDATION Fieldbus™ Protocol
The ICoT 5400 series features the FOUNDATION Fieldbus™ communication protocol, is an industry proven international standard (IEC 61158) 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 Series Profibus PA™ Protocol

The ICoT 5500 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 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 positioners, Westlock provides GSD (General Station Description) containing key device data as well as EDD (Electronic Device Description) and DTM (Device Type Manager).

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

Proven, Interoperable Solutions
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 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 (HART):
  -EDD (also available at http://www.hartcomm.org in the Product Catalog - or https://www.fieldcommgroup.org/)
  - DTM (also available at http://www.fdtgroup.org in the Product Catalog – Certified DTM's catalog)
- ICoT 5400 (Foundation Fieldbus)
  - EDD (also available at www.fieldbus.org or https://www.fieldcommgroup.org/)
- ICoT 5500 (Profibus PA)
  - EDD

Additional Features & Benefits
The ICoT 5300, 5400, and 5500 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 (FF) and 5500 (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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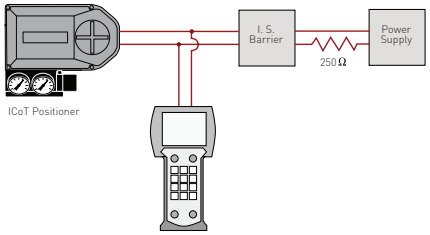
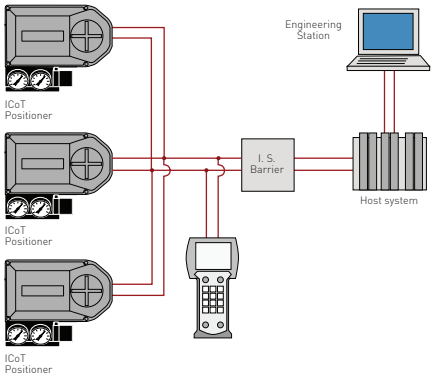
HAND-HELD TERMINALS

Model 5300
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.

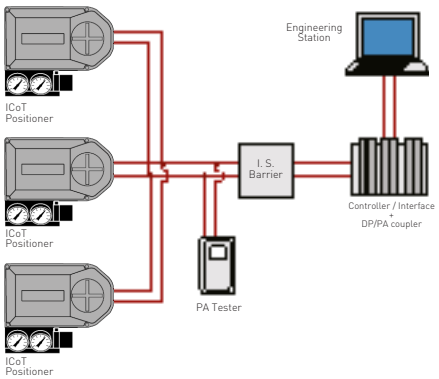
A standard hand-held HART® Communicator is available for making field operations as uniform as possible. Communication is accomplished by superimposing a high frequency signal on top of the 4-20 mA output signal. This allows simultaneous communication and output without comprising loop integrity.



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



Model 5500
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.



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TECHNICAL SPECIFICATIONS

Electrical	**5300**	**5400**	**5500**
Input signal	4-20 mA	Two wire FOUNDATION Fieldbus™	Two wire Profibus PA™
Minimum voltage	9.0 V DC	9.0 V DC	9.0 V DC
Maximum voltage	30.0 V DC	32.0 V DC	32.0 V DC
Impedence	450 ohms at 20 mA	N/A	N/A
Reverse polarity protection	Yes	Polarity insensitive	Polarity insensitive
Pneumatic	**5300/5400/5500**		
Supply pressure*	15 to 45 psi (low pressure option) 40 to 120 psi (high pressure option)		
Output flow rate	8.0 scfm @ 25 psi 16.2 scfm @ 90 psi		
Air consumption	0.03 scfm @ 20 psi (low) 0.08 scfm @ 90 psi (high)		
High flow option	40 scfm @ 90 psig supply		
	10% to 90% non-condensing		
Technical	**5300/5400/5500**		
Linearity	± 0.5% Rotary ± 1.0% Linear (for travel under 1.25")		
Valve travel	Rotary: Minimum 45°, Maximum 95°		
	Linear: Minimum 0.25", Maximum 48"		
Hysteresis	0.2% of span		
Repeatability	0.2% of span		
Environmental	**5300/5400/5500**		
Operating temperature	-40°F to +185°F [-40°C to +85°C]		
Thermal coefficient	3% / 100°C		
Mechanical	**5300/5400/5500**		
Connections	Pneumatic: ¼" BSP (F) (⅜" BSP (F) for High Flow version) (NPT optional)		
	Electrical: M20, ½" NPT (F) optional		
Materials of construction	Enclosure:	Nylon, glass filled	
	Cover gasket:	Silicone	
	Pneumatic manifold:	Aluminum anodized die cast zinc	
	Pneumatic seals: NBR		
Weight	3.27 Kg (7.2 pounds)		
Optional features	**5300/5400/5500**		
Airset	Filter regulator combo with 5 micron filter element		
Limit switches	Two SPST hermetically sealed switches (rated for 2 A at 24 V DC)		
	5300		
Feedback transmitter	4-20 mA output (loop powered)		

* As required by actuator for proper control

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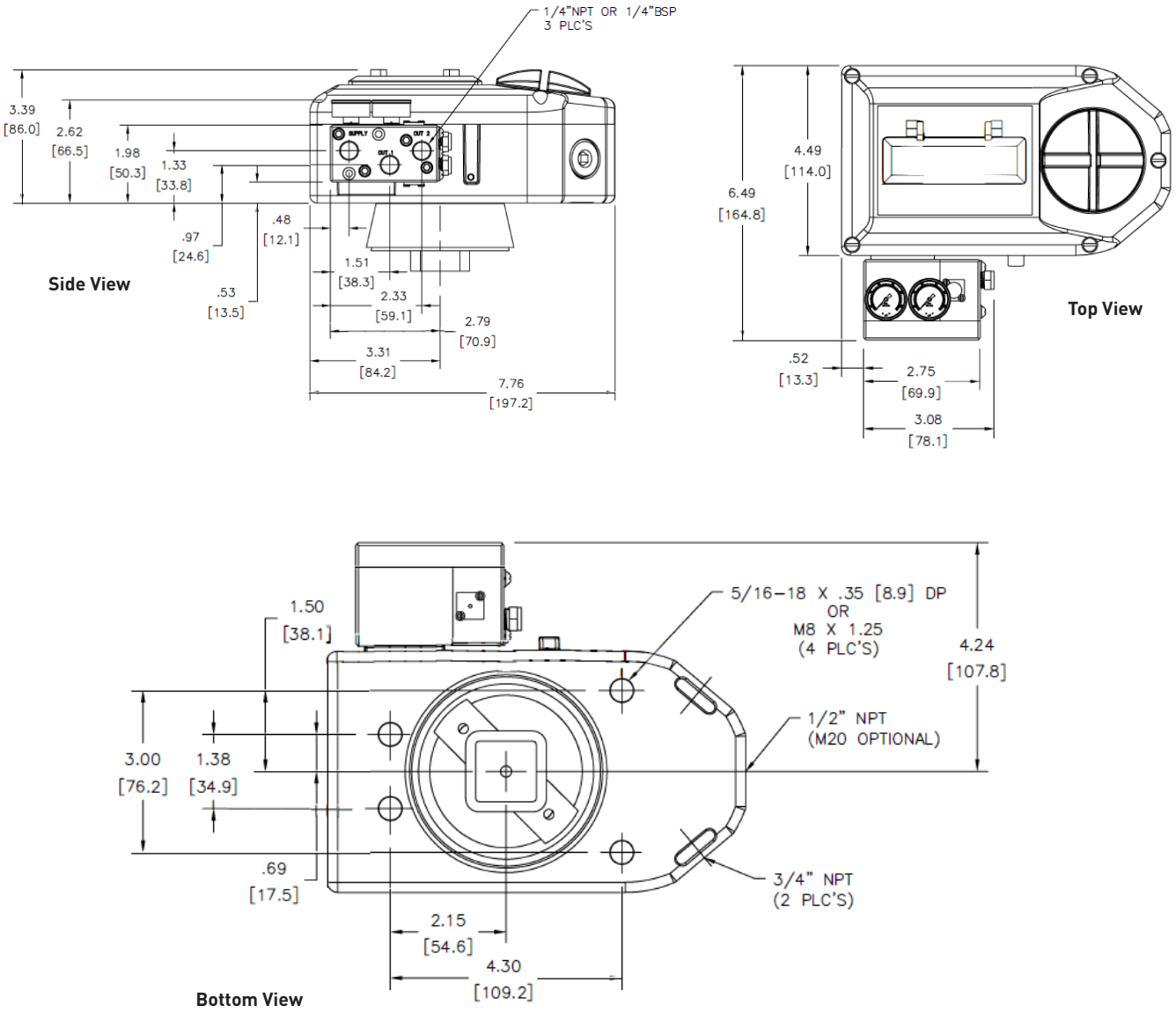
DIMENSIONS: ROTARY CONTROL

Dimensions in inches, metric dimension (mm) in parentheses
Note: Product shown is standard flow variant



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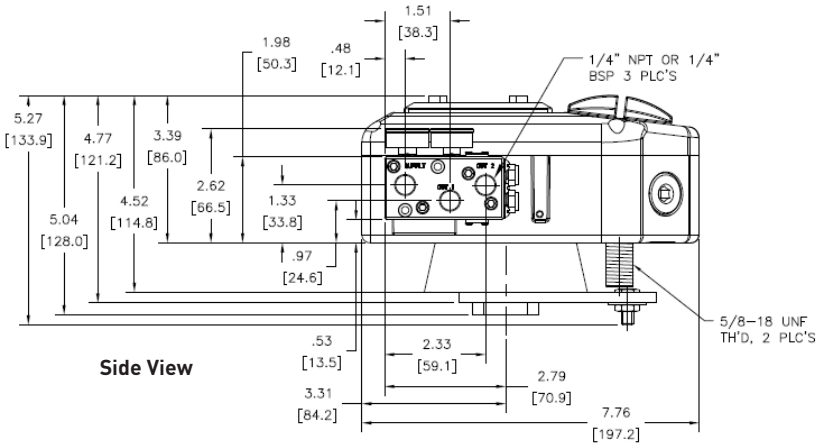
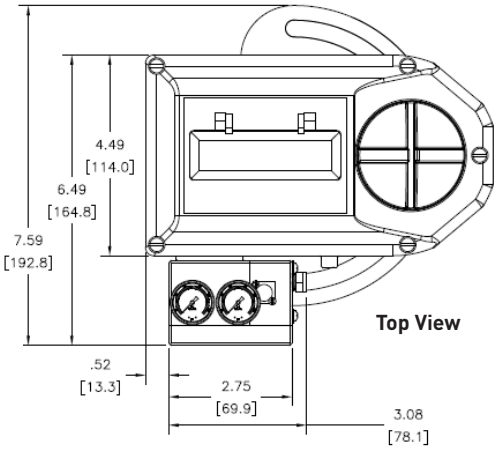
DIMENSIONS: ROTARY CONTROL WITH SWITCHES

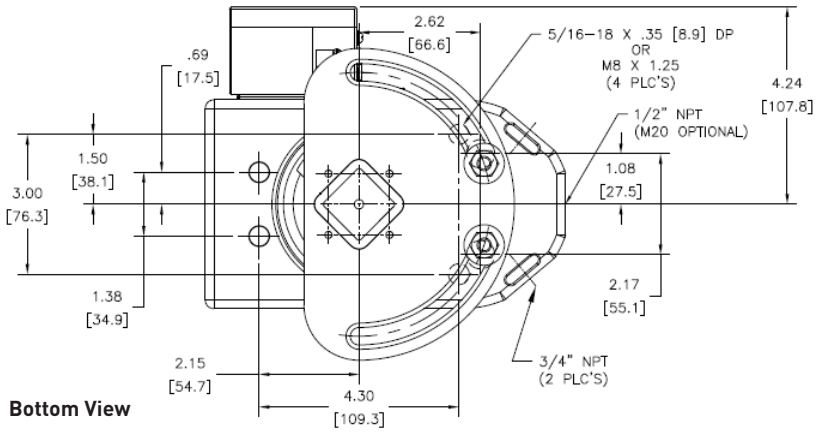
Dimensions in inches, metric dimension (mm) in parentheses
Note: Product shown is standard flow variant



Side View



Top View



Bottom View

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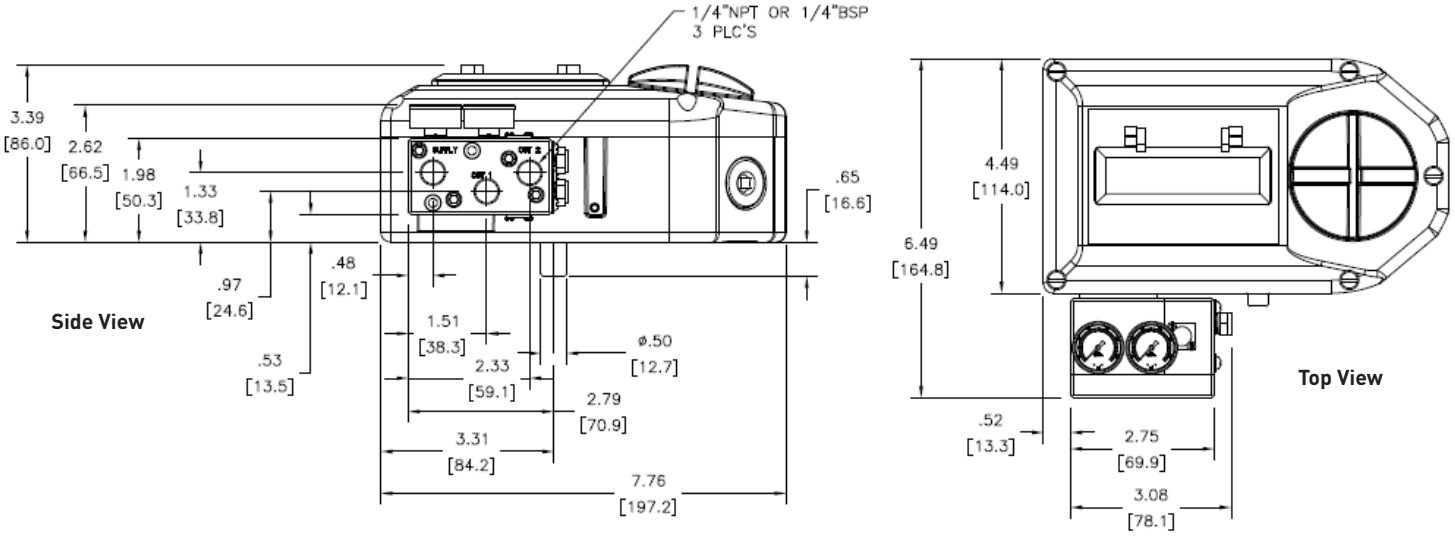
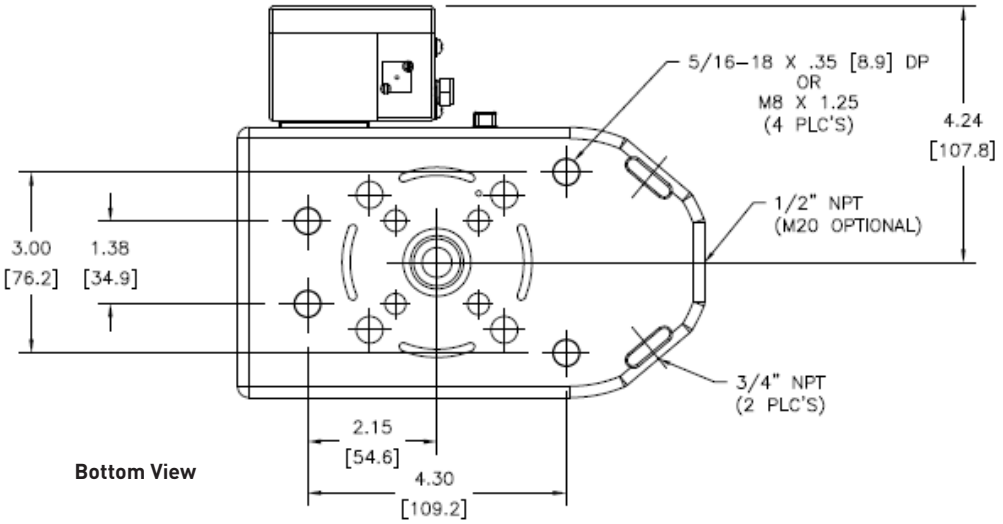
DIMENSIONS: LINEAR CONTROL

Dimensions in inches, metric dimension (mm) in parentheses
Note: Product shown is standard flow variant





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Base Model

- 53 4-20mA Digital Positioner with HART® enabled
- 54 Digital Positioner with FOUNDATION Fieldbus™ enabled
- 55 Digital Positioner with Profibus PA™ enabled

Actuator Type

- 1 Linear*
- 3 Rotary

Mounting Style

- 0 Standard Mount
- 5 Remote Mount **(ICoT mounted remote from actuator)**
- 7 NAMUR Mount
- 8 Direct Mount to Keystone (MRP/79U/89U)

Hazardous Rating

- NI Non-Incendive - NEC/CEC
- IS Intrinsically Safe - NEC/CEC
- AI Intrinsically Safe - ATEX/IECEx
- MI Intrinsically Safe - INMETRO
- MN Non-Incendive - INMETRO

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) (40 SCFM at 90 psi)

Calibration/Communication

- B 3-Button On-board Keypad & HART® Protocol (Series 53 Only)
- 4 3-Button On-board Keypad & FOUNDATION Fieldbus™ Protocol (Series 54 Only)
- P 3-Button On-board Keypad & Profibus PA™ Protocol (Series 55 Only)

Conduit Entry

- A One ½" NPT (F)
- B One M20 (F)

Limit Switch Options

- 0 None
- 2 Two SPST hermetically sealed

Position Transmitter Output

- A None
- B 4-20 mA transmitter (Series 53 Only)

Pneumatic Connections

- N ¼" NPT (3/8" NPT with High Flow option)
- B ¼" BSP (3/8" BSP with High Flow option)
- F ¼" NPT with filter-regulator assembly (3/8" NPT with High Flow option)

53	3	0	NI	E	H	B	A	0	B	F	= Model number **5330NIEHBA0BF**

OG-10029 rA

NOTES:
*Linear valve stroke and fail position must be specified at time of quotation.
(Magnet assy. included up to 2-1/2" stroke at no charge)

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