

# $\pi$ PC - PC90

Integrated Pressure Controller for Closed Loop Pressure Measurement and Control of Process Critical Applications



The  $\pi$ PC is a critical process control instrument in the MKS line of digital control, web-enabled products, providing the latest in pressure measurement and control technology necessary to meet the process demands of the semiconductor and other leading edge process industries.

The  $\pi$ PC Pressure Controller provides pressure measurement and control of process critical pressures utilizing MKS Instruments' industry leading Baratron capacitance manometer technology. The  $\pi$ PC is available with a Full Scale pressure from as low as 1000 torr up to 100 psia. Baratron capacitance manometers - well-known for their percent of Reading accuracy, stability and resolution - provide precise measurements at lower pressures and over a wider dynamic range than strain gage transducers.

The  $\pi$ PC Pressure Controller is a self-contained, compact, closed-loop electronic pressure control system designed for a wide range of pressure and flow conditions. It contains a capacitance manometer, normally closed or normally open control valve and closed-loop control electronics. The  $\pi$ PC is available in either an upstream or downstream pressure control configuration making it well suited for controlling process chamber backpressure or process gas delivery pressure. With either digital (DeviceNet or RS-485) or analog I/O and its Ethernet setup and diagnostics capabilities, the  $\pi$ PC is easily integrated into the process tool.

## Product Features

- Digital control loop provides rapid response to set point independent of gas flow rate minimizing process cycle time
- Complete, compact pressure control package minimizes cost and space requirements
- Straightforward configuration, tuning and diagnostics through its Ethernet interface utilizing a standard web browser
- Bright LED 4 digit display (DeviceNet only) provides easy viewing of process pressure, Full Scale, temperature and Ethernet IP address

*\*Protected under the following U.S. patent: No. 6,810,308 or International Patents and Patents pending.*



## Key Benefits

- Integral Baratron® Capacitance Manometer technology
- Metal-sealed, cleanroom manufactured for critical high purity application needs
- 1-1/8" wide body for semiconductor applications
- Fast response to set point with minimal overshoot
- Two alarm trip points for process limit control (Analog only)

Performance		
Pressure Type		Absolute
Pressure Full Scale Ranges		1000 Torr, 2000 Torr, 100 Psia
Transducer Overpressure Limit		2x Full Scale for all ranges
Maximum Differential Pressure		45 psid
Burst Pressure		1500 psig
Orifice Full Scale Ranges <sup>1</sup>		50, 200, 1000, 5000, 10000, 20000, 30000, 50000 (sccm)
Control Modes		Upstream or Downstream
Pressure Measurement Accuracy <sup>2</sup>		±1.0% of Reading
Temperature Coefficients	Zero Span	<ul style="list-style-type: none"> <li>±0.02% of Full Scale /°C</li> <li>±0.04% of Reading /°C</li> </ul>
Pressure Readout Units		(For all Torr Full Scale ranges) Torr, kPa; (For psi Full Scale Range) psi, kPa
Pressure Resolution		0.1 Torr for 0 to 100 Torr, 1 Torr for >100 Torr, 0.1 psi for 0 to 100 psi
Pressure Control Accuracy <sup>2</sup>		±0.2% of Full Scale (<10% Full Scale); ±1.0% of Reading (≥10% Full Scale)
Control Range		>2 to 100% of Full Scale
Typical Response Time <sup>3</sup>		<1.0 second
Temperature Display Range		0 to 100°C
Temperature Readout Units		°C
Temperature Accuracy		±2°C
Temperature Resolution		0.1°C
Operating Temperature Range		10° to 50°C (50° to 122°F)
Storage Temperature Range		-20° to 80°C (-4° to 176°F)
Storage Humidity Range		0 to 95% Relative Humidity, non-condensing
Mechanical		
Fittings		Swagelok 4 VCR Male, 1-1/8" surface mount (C-seal, W-seal)
Valve Options	Type Seat Material	<ul style="list-style-type: none"> <li>Normally Closed or Normally Open</li> <li>PTFE (Teflon) or Sapphire (Metal)</li> </ul>
Display		4 digits for value, 4 characters for unit (DeviceNet only)
Leak Integrity	External (scc/sec He) Through closed valve	<ul style="list-style-type: none"> <li>&lt;1 x 10<sup>-10</sup></li> <li>&lt;1.0% of orifice Full Scale (Nitrogen at 25 psig on inlet to atmosphere)</li> </ul>
Wetted Materials	Standard Optional (Valve Seat)	<ul style="list-style-type: none"> <li>316L S.S. VAR (equivalent to 316 S.S. SCQ for semiconductor quality), 316 S.S., Elgiloy, KM-45, Inconel® 718, 825 Incoloy®</li> <li>PTFE (Teflon) or Sapphire (Metal)</li> </ul>
Surface Finish		5 μinches, average Ra
Weight		<3 lbs (1.36 kg)
Electrical Analog I/O		
Input Power Required		+15 to +24 VDC (@ <4 watts)
Pressure Set Point		0 to 10 VDC (Default), 0 to 5 VDC (User Switchable)
Command/Output Signal		0 to 10 VDC (Default), 0 to 5 VDC (User Switchable)
Valve Test Point Signal		0 to 5 VDC
Trip Points	Rated Current State Hysteresis Status LEDs	<ul style="list-style-type: none"> <li>Two open collector transistors, adjustable from 0 to 100% of Full Scale</li> <li>30VDC / 250mA</li> <li>On, above, or below trip point</li> <li>3% of Full Scale (factory set)</li> <li>Red when the transistor is on</li> </ul>
Output Impedance		<1 Ω
Connector		15-pin Type "D" Male

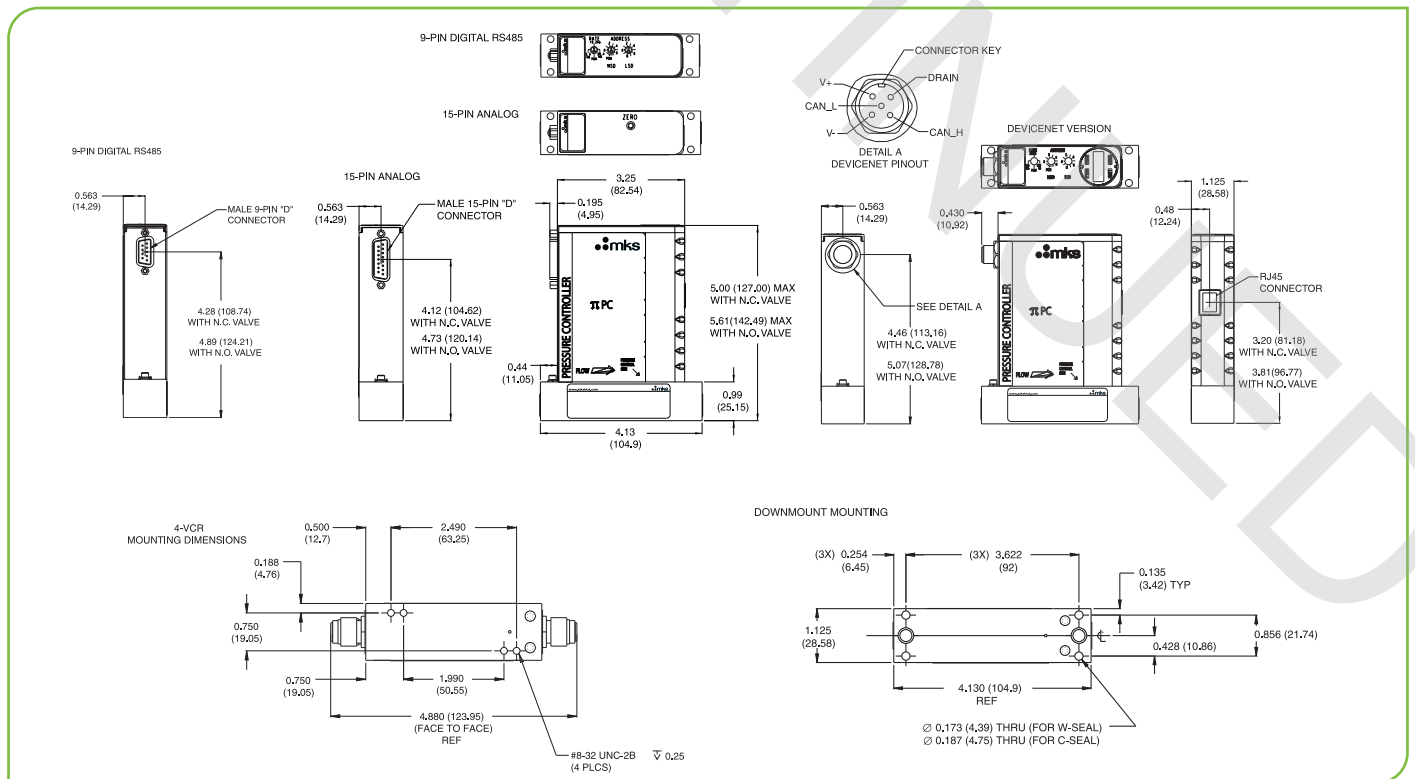
Digital I/O	DeviceNet	RS485 w/Analog Pressure Out
<b>Input Power Required</b>	+11 to +25 VDC per DeviceNet specification (@ <3.5 watts)	+15 to +24 VDC (@ < 4 watts)
<b>Connector</b>	5 pin microconnector (DeviceNet)	9 pin Type D male
<b>Data Rate Switch</b>	4 positions: 125, 250, 500K (Default), PGM (programmable over the network)	3 positions: 9.6, 19.2, 38.4K (Default)
<b>Data Rate/Network Length</b>	<ul style="list-style-type: none"> <li>Data rate (user selectable)</li> <li>125 Kbps, 500 meters (1,640 feet)</li> <li>250 Kbps, 250 meters (820 feet)</li> <li>500 Kbps, 100 meters (328 feet)</li> </ul>	<ul style="list-style-type: none"> <li>Data rate (user selectable)</li> <li>9.6 Kbps, 1200 meters (4,000 feet)</li> <li>19.2 Kbps, 1200 meters (4,000 feet)</li> <li>38.4 Kbps, 1200 meters (4,000 feet)</li> </ul>
<b>Mac ID Switches</b>	2 switches, 10 positions; 0,0 to 6,3 are hardware ID numbers; 7,0 to 9,9 are software ID numbers; (6,4 to 6,9 are unused and, if selected will default to hardware ID number 6,3)	2 switches, 10 positions; 0,0 to 9,9. Available MAC ID's are 3,2 to 9,9.
<b>Network Size</b>	Up to 64 nodes	Up to 32 nodes
<b>Network Topology</b>	Linear (trunkline/dropline) power and signal on same network cable	Master/slave
<b>Visual Communication Indicators</b>	<ul style="list-style-type: none"> <li>LED network status (green/red)</li> <li>LED module status (green/red)</li> <li>Scrolling LED displays (πPC Type, Pressure Full Scale, IP address)</li> <li>Push-Button Display toggles between (Pressure in Torr &amp; kPa or psi &amp; kPa, Temperature and Scrolling display)</li> </ul>	<ul style="list-style-type: none"> <li>LED network status (green/red)</li> <li>LED module status (green/red)</li> </ul>

<sup>1</sup> Orifice Full Scale ranges are Nominal Full Scale flow rates for Nitrogen with 15 Psig on the inlet and atmosphere on the outlet side.

<sup>2</sup> Accuracy includes linearity, hysteresis, and repeatability.

<sup>3</sup> Typical response time is excluding system time constant.

Note: The PC90 Control Valves should not be used for positive shutoff. Where positive shutoff is required, a separate valve should be installed. When selecting the location of an external shutoff valve, consideration should be given to the maximum pressure rating of the internal transducer and to the possibility that leakage across the internal valve over time can build up and result in a sudden surge of gas.



Dimensional Drawing — Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

Ordering Code Example: PCA012PHB5DT	Code	Configuration
<b>Model</b>		
PC90 $\pi$ Pressure Controller	PCA	PCA
<b>Pressure Reading</b>		
Absolute	0	0
<b>Pressure Range Full Scale</b>		
1000 Torr (mmHg) 2000 Torr (mmHg) 100 psi	13T 23T 12P	12P
<b>Fittings (compatible with)</b>		
Swagelok 4 VCR male C-Seal W-Seal (1.125")	R C H	H
<b>Electrical Connector</b>		
RS-485 (9 pin D) (No Display) DeviceNet 15 Pin D (Analog I/O) (No Display)	5 6 B	B
<b>Valve Orifice # (See Note)</b>		
A (50 sccm) #1 (200 sccm) #2 (1000 sccm) #3 (5000 sccm) #4 (10000 sccm) #5 (20000 sccm) #6 (30000 sccm) #7 (50000 sccm)	A 1 2 3 4 5 6 7	5
<b>Pressure Control</b>		
Upstream Downstream	U D	D
<b>Valve Seal Material/Operation</b>		
Metal/NC ( $\leq 5000$ sccm orifice only) Teflon/NO ( $\leq 30000$ sccm orifice only) Teflon/NC	M P T	T
<b>Firmware DeviceNet Version Only</b>		
Unless otherwise specified, MKS will ship firmware revision current to date	20	20

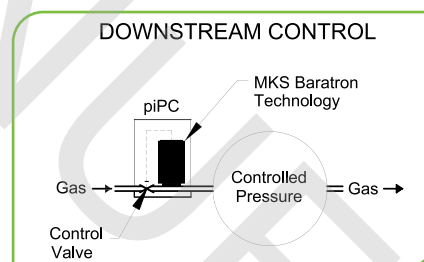
NOTE: To determine appropriate valve orifice, see MKS Application Note #01/06: Pressure Controller - Valve Orifice Selection Guide available at [www.mksinst.com](http://www.mksinst.com).

#### Analog 15-pin D male Pinouts

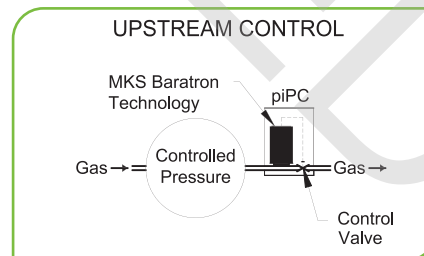
Pin Number	Signal Description
Pin 1	Valve Test Point
Pin 2	Pressure Signal Output
Pin 3	Valve Close
Pin 4	Valve Open
Pin 5	Power Supply Common Ground
Pin 6	No Connection
Pin 7	+15 to +24 VDC
Pin 8	Set Point Input
Pin 9	No Connection
Pin 10	Optional Input
Pin 11	Signal Common
Pin 12	Signal Common
Pin 13	Trip Point A
Pin 14	Trip Point B
Pin 15	Chassis Ground

#### RS-485 9-pin D male Pinouts

Pin Number	Signal Description
Pin 1	Pressure Signal Output
Pin 2	Signal Common
Pin 3	+15 to +24 VDC
Pin 4	Power Supply Common Ground
Pin 5	No Connection
Pin 6	RS-485 Return
Pin 7	RS-485 +
Pin 8	RS-485 -
Pin 9	Shield



Downstream Controller Configuration



Upstream Controller Configuration