

# Scanivalve

MADE IN USA  
**MPS4000**

## Model **MPS4164** Miniature Analog Pressure Scanner

### Features

- New valve design provides "isolate-purge"
- On board sensor excitation
- 40kHz data output
- Double-isolated, ultra-stable pressure sensors
- Direct legacy compatibility with ZOC series scanners
- Removable input headers
- Upgradable to Ethernet MPS4264 standard

### General Description

The MPS4164 analog miniature pressure scanner is an extremely compact 64 channel pressure scanner. It has been designed from the ground up with size, accuracy and functionality in mind. Each MPS4164 module incorporates 64 individual silicon pressure sensors, calibration valving, a high-speed multiplexer (45kHz) and an instrumentation amplifier. Simply, it accepts up to 64 individual pneumatic pressure inputs and converts them to high level electronic signals. It boasts a small footprint, a rugged isolate-purge calibration valve, extremely stable and repeatable pressure sensors and a wealth of other innovative features.

The MPS4164 is designed around a core sensor pack that uses a custom packaged, ultra-stable sensor. Scanivalve engineers evaluated known causes of non-repeatability in piezoresistive pressure transducers. Designing a double isolation method of bonding the sensors to the base substrates (patent pending) minimizes the mechanical influences of assembly and thermal expansion. This process dramatically improves the stability and the resulting accuracy of the sensors.

A brand new valve has been designed that fully isolates the sensors from purge pressure and provides long term, maintenance free operation. Not only is the valve design an improvement over legacy products, but two different valve actuation options are available. The "standard" (CPx) actuation uses opposing 65psi control pressures



*MPS4164 Analog  
Pressure Scanner*

to shift the valve into whichever state is desired. The new "Normal Px" (NPx) option uses a spring to default the valve into measurement mode and 120psi to shift it into calibrate mode.

### Applications

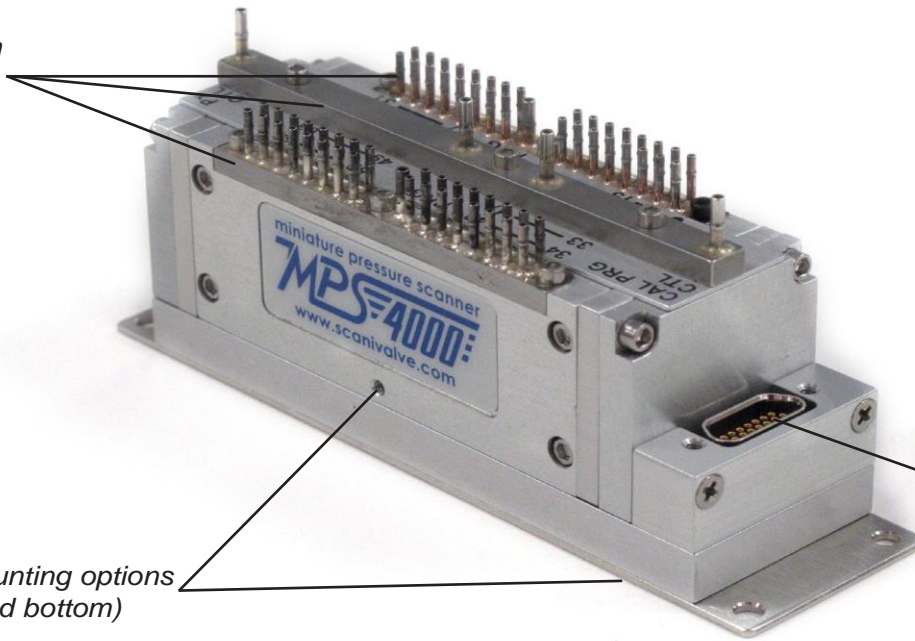
The MPS4164 electronic pressure scanning module is specifically designed for use in wind tunnel and flight tests where operational conditions are very space constrained and pressures do not exceed 50 psi. It is ideal for use inside small supersonic wind tunnel models.

The very low pressure ranges offered and small size also make it an ideal fit for wind engineering applications where the measurement pressures are very low. In high channel count systems, the lower cost-per channel makes it an affordable solution.

It may be mounted in any position so the pressure sensors may be close coupled to the pressure sources to be measured. Removable headers allow for easy installation and removal without breaking the pneumatic lines.

The MPS4164 module is designed to be used in conjunction with Scanivalve model ERAD4000 Remote A/D or model DSM4000 Digital Service Module. Each MPS4164 pressure scanner incorporates an embedded RTD to monitor the temperature of the pressure sensors. The ERAD4000 communicates via Ethernet. The DSM4000 communicates via Ethernet, RS-232, or ARINC 429.

Removable input headers  
(available with  
0.031" and  
0.042" tubes)



Multiple mounting options  
(side and bottom)

Analog  
Interface  
Connection

## Legacy Compatibility

The MPS4164 was designed specifically to replace the legacy ZOC series of pressure scanners. This MPS can directly replace a ZOC33 64-channel analog scanner. It can be a drop-in replacement for the ZOC33 or can be used to expand an existing ZOC33 system.

The electrical interface of the MPS4164 is exactly the same as a ZOC scanner. The electrical connector is the same meaning it operates using existing cabling and hardware infrastructure. Firmware in the DSM4000 and the ERAD4000 can be easily field-updated to support the MPS4164\*. An integrated TEDs ID chip in the MPS4164 supports automatic system configuration at system power-up.

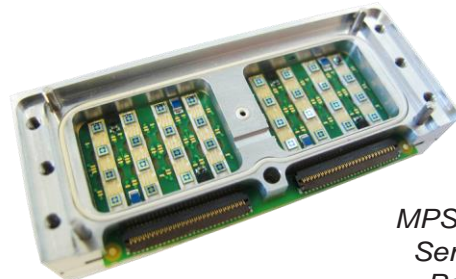
The pneumatic interface and valve logic of the MPS4164 is also the same as a ZOC scanner. In the "CPx" configuration, the MPS4164 operates 65psi control pressures with the same control logic as a ZOC33. This allows single logic operation in mixed ZOC/MPS4164 system.

While directly legacy compatible with the ZOC scanners, the MPS4164 offers many feature upgrades. Overall sensor performance is improved, the operating temperature is extended, the scanner is physically smaller and the MPS valve includes full "isolate-purge" functionality.

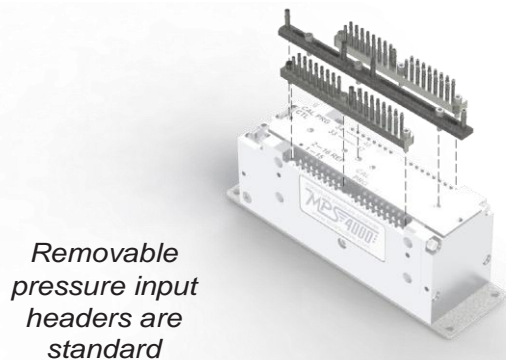
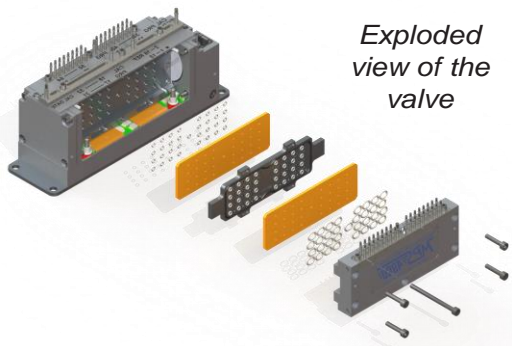
\*DSM4000 firmware V2.16 and ERAD4000 firmware V2.19 and later fully support MPS4164

## Improved sensors, Improved Accuracy

The primary focus of the MPS4164 was to improve the unit's overall accuracy across the entire temperature range. Scanivalve worked directly with a leading sensor designer to create a custom sensor package specifically for the MPS series of scanners. This design uses two layers of RTV to isolate the pressure sensor from mechanical influences like those caused by thermal expansion or assembly. Piezoresistive sensors also change greatly in span and zero over temperature so we placed eight individual RTDs in very close proximity to the sensors. Combined with the design placing the sensors in an aluminum housing in the center of the module to prevent rapid temperature changes, these RTDs allow us to accurately correct for any change in the sensor's behavior due to temperature.



MPS4164  
Sensor  
Pack



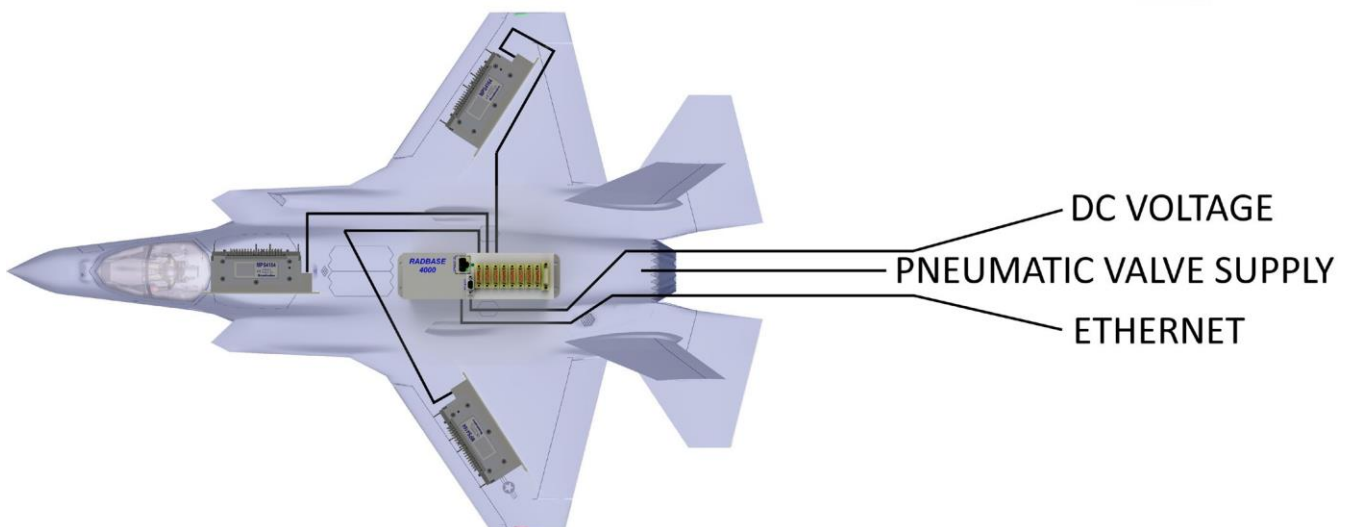
## Pneumatic Calibration Valve

The valve design is a sliding-type valve. An aluminum shuttle, populated with self-lubricating O-rings cycles back and forth between two positions to achieve each of the pneumatic states. The "bearing plate" between the sliding O-rings and the aluminum stationary portion of the valve is a proprietary compound that is extremely low friction. The O-rings are supported completely to prevent any deformation during a state change. The valve shuttle is supported on ball bearings to provide minimal friction and maximum support. This design allows for low actuation force and minimal "stiction" - meaning the actuation force does not noticeably increase after long periods of dormancy. Samples of the valve design were tested to over 1,000,000 cycles without maintenance.

Existing pressure scanners require outside pneumatic pressure as a force to switch the valve logic. In most applications, this "control pressure" must be continuously supplied to the scanner to maintain the desired valve state. The MPS4164 offers a unique option with a valve that defaults to the "measurement" mode, allowing sample pressures to be read without any outside pneumatic control pressure. This option, called "Normal Px," is another way the MPS4164 simplifies system architecture.

An optical valve position sensor has been integrated allowing the valve state to be queried with a simple software command.

## Example Wind Tunnel System Architecture



Shown using ERAD4000 mounted in the test article. Alternate system configuration uses DSM4000 installed under the test section or in the control room.

## Specifications (for MPS4164 version)

**Inputs (Px):** 0.042" [1.067mm] OD (standard)  
0.031" [.787mm] OD (optional)

**Inputs (Cal, Ref, CTL, Prg):** 0.063" [1.600mm] OD

**Full Scale Ranges:** 4 inH<sub>2</sub>O, 8 inH<sub>2</sub>O, 1psid, 5psid, 15psid  
[995.4Pa, 1990.7Pa, 6.89kPa, 34.5kPa, 103.4kPa]

**Accuracy:** 4 inH<sub>2</sub>O: 0.20%FS  
8 inH<sub>2</sub>O: 0.15%FS  
1psid: 0.08%FS  
5psid: 0.08%FS  
15psid: 0.08%FS

**Overpressure Capability:** 4 inH<sub>2</sub>O: 25x  
8 inH<sub>2</sub>O: 15x  
1psid: 10x  
5psid: 10x  
15psid: 5x

**Media Compatibility:** Gases compatible with silicon, silicone, aluminum, and Buna-N

**Maximum Reference Pressure:** 50 psig (345kPa)

**Maximum Environment Pressure:** 100 psia (690kPa absolute)

**Minimum Environment Pressure:** 0.5 psia (3.45kPa absolute)

**Shock & Vibration:** MIL-STD-810G, Category 24

**Scan Rate:** 40kHz (standalone)

**Power Requirements:** +15Vdc @ 120mA  
-15Vdc @ 30mA

**Control Pressure Requirements:** 65psi (CPx)  
120psi (NPx)

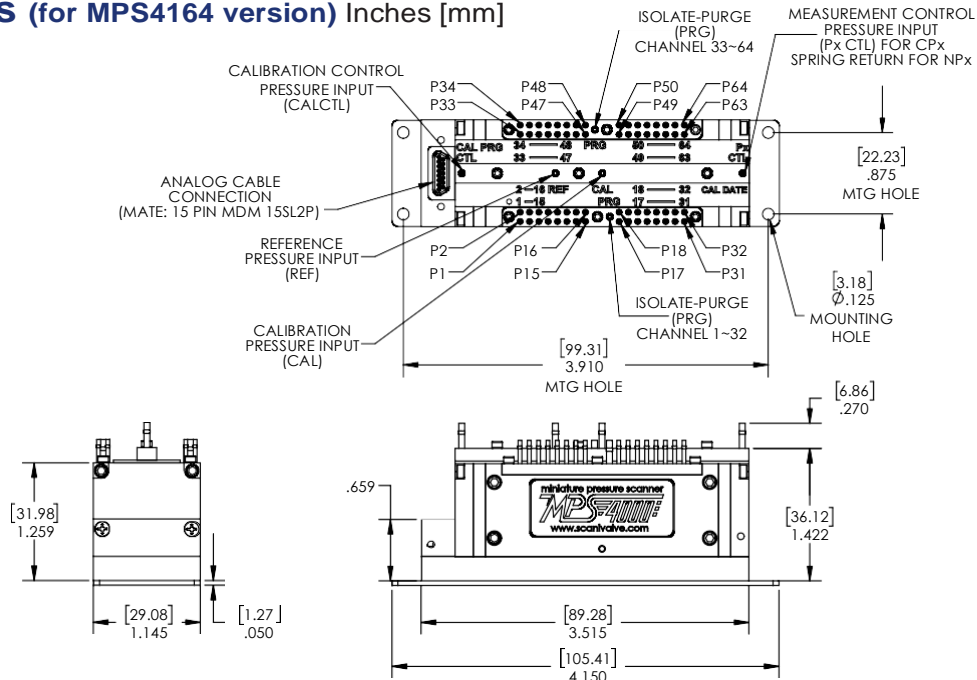
**Electrical Connector:** 15 pin MDM 15SL2P

**Weight:** 6.59oz [186.9g]

**Operating Temperature:** 0° to 70°C

**Storage Temperature:** 0° to 80°C

## Dimensions (for MPS4164 version) Inches [mm]



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