Pressure & Vacuum Measurement Solutions

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# Series 901P

## MICROPIRANI™ / PIEZO LOADLOCK TRANSDUCER

Designed specifically for the loadlock environment, the Series 901 Plus (901P) Loadlock Transducer (LLT) combines Piezo and MicroPirani™ sensor technologies. The combined output provides significantly higher accuracy, stability, repeatability and a faster response time than conventional thermal conductivity gauges.

## Features & Benefits

- Functionality of three sensors in a single transducer for space savings and wide measurement range
- Ultra compact design
- Accurate absolute pressure measurement from 1,000 to $10^{-5}$ Torr
- Gas independent absolute pressure measurement from 50 to 1,000 Torr
- Accurate atmospheric pressure reading, independent of gas type and barometric pressure changes
- Fast, accurate and repeatable pressure measurements reduces process cycle time
- Mountable in any orientation for ease of installation; no loss of measurement accuracy
- Optional integrated touch-screen display available for local pressure indication, etc.
- MicroPirani™ solid state sensor is resistant to damage from air inrush or vibration
- Three setpoints with fast response time for reliable process control (optional)
- Ease of operation via analog output and digital communication
- Setup, diagnostic and operation software available
- Alternate analog output and electrical connectors available to match other vendors' gauges and facilitate an easy upgrade
- CE marked, compliant with EMC Directive 2004/108/EC

## Applications

The 901P has been specifically designed for pressure measurement within a vacuum loadlock. It has the capability to replace multiple pressure measurement devices on a loadlock with its absolute pressure measurement from atmosphere to $10^{-5}$ Torr and atmospheric switching capabilities. Subsequently OEM's can reduce costs with a simplified loadlock design. The 901P can be used on loadlocks or any vacuum chamber requiring both absolute pressure measurement and atmospheric switching capabilities.

Compared to gauges used in traditional loadlock designs, the 901P accurate atmospheric pressure measurement can improve loadlock performance by faster cycle times and prevent contamination of loadlock with atmospheric air.

# Description

The 901P combines both absolute and differential pressure measurement technologies to provide superior performance and functionality. The 901P provides patented, gas independent absolute pressure measurement from 50 -1000 Torr with increased accuracy over thermal conductivity sensors.

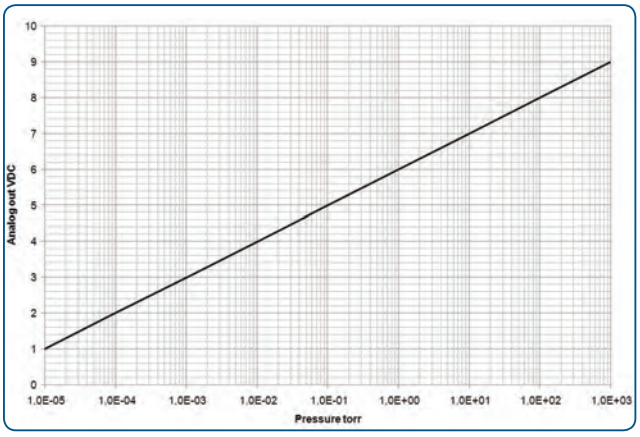
Unlike traditional Pirani gauges, the sensor element in the MicroPirani™ is made of a one millimeter square silicon chip, allowing the measurements to be made in a very small volume. As a result of the MicroPirani™ technology, the 901P can read pressures down to $10^{-5}$ Torr, two decades below a standard Pirani sensor. The sensor design minimizes the effects of convection, subsequently the 901P can be mounted in any orientation without compromising accuracy.

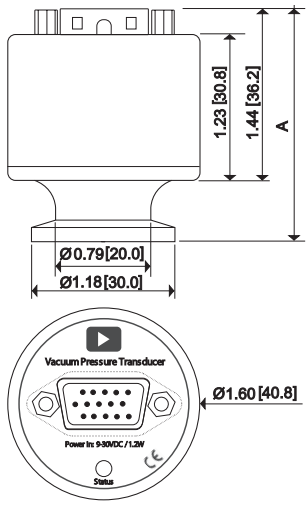
The Piezo is a differential pressure sensor, ensuring correct atmospheric pressure measurement under varying barometric pressure conditions. Piezo technology is a direct pressure reading, allowing the measurement to be gas independent. The Piezo sensor measures from -760 to +760 Torr relative to atmospheric pressure.

The 901P has RS232 or RS485 digital communication interface for setup of transducer parameters and to provide real time pressure measurement.

The 901P also has an analog pressure output of 1VDC/ decade that can be interfaced to external analog equipment for pressure readout or control. Other analog outputs and curves can be selected via the digital user interface. A secondary optional analog output is used to provide the differential pressure measurement.

The 901P has up to three mechanical relays which can be used for process control, for example interlocking isolation valves and vacuum pumps. Each set point can be assigned either to the differential piezo measurement or the combined absolute MicroPirani™/Piezo measurement. The 901P compact design significantly reduces the amount of space occupied by a vacuum gauge. This is particularly appealing to system designers and allows for a more compact vacuum system.



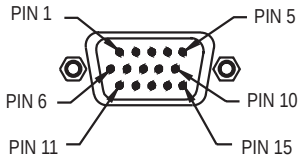




| Flange | A |
|---|---|
| NW 16 KF | 1.93 (49.1) |
| NW 25 KF | 2.00 (50.9) |
| 1/8" NPT-M | 3.50 (89.0) |
| 8 (1/2") VCR®-F [1] | 3.24 (82.4) |
| 4 (1/4") VCR®-F [1] | 3.20 (81.4) |
| CF 1.33" | 2.30 (58.5) |
| NW 16 KF ext | 2.58 (65.6) |

*(1) VCR Fittings*

## Dimensional Drawing —

*Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).*




| | |
|---|---|
| 1 - RS485 (-)/RS232 transmit | 9 - Relay #1 NC |
| 2 - RS485 (+)/RS232 receive | 10 - Relay #2 NC |
| 3 - Power (+) | 11 - Relay #2 Common |
| 4 - Power (-) | 12 - Relay #2 NO |
| 5 - Analog Output (+) abs. | 13 - Relay #3 NC (or analog output diff) |
| 6 - Analog Output (-) | 14 - Relay #3 Common |
| 7 - Relay #1 NO | 15 - Relay #3 NO |
| 8 - Relay #1 Common | |

## PinOuts —

*Three (3) set point relays and dual Aout*

# Specifications

| | |
|---|---|
| **Sensor** | |
| Type 1 | MicroPirani™ (MEMS Thermal Conductivity) |
| Type 2 | Piezo differential (MEMS diaphragm) |
| **Measuring Range** | |
| Absolute | 1.0 x $10^{-5}$ Torr to 1500 Torr |
| Differential | -760 to +760 Torr |
| **Set Point Range** | |
| Absolute | 5.0 x $10^{-4}$ Torr to 1000 Torr |
| Differential | -760 to +100 Torr |
| **Calibration Gas** | Air, Argon, Helium, Nitrogen, $H_2$, $H_2O$ vapor, $CO_2$, Xenon, Neon |
| **Operating Temperature Range** | 0° to 40°C (32° to 104°F) |
| **Maximum Bakeout Temperature** | 85°C (185°F), non-operating |
| **Digital Communication** | RS485 / RS232 (4800 to 230400 Baud) |
| Controls | Zero adjust, span adjust, analog output, pressure units, baud rate, address, factory default, set point functions: value, hysteresis, direction, enable, transducer status, switch, LED test |
| Status | Absolute and differential pressure reading, units, set point, operating time, transducer temperature, user tag, model, device type, serial number, firmware and hardware versions, part number, manufacturer |
| **Analog Output (Absolute Pressure)** | 1 to 9 VDC, 1 VDC/decade, 100Ω maximum output impedance |
| **Analog Output Resolution** | 16 bit |
| **Optional Analog Output 2 (Piezo Differential)** | 5 VDC = 0 Torr, 1 VDC/decade |
| **Analog Output 2 Resolution** | 12 bit |
| **Relays (Optional)** | 901P - 3 relays SPDT |
| Relay Contact Rating | 1 A @ 30VAC/DC, resistive |
| Relay Response | 100 msec maximum |
| **Power Requirements** | 9 to 30 VDC, < 1.2 watts max |
| **MicroPirani** | |
| Accuracy[2] | 5 x $10^{-4}$ to 1 x $10^{-3}$ Torr ±10% of reading<br>1 x $10^{-3}$ to 100 Torr ±5% of reading<br>100 Torr to Atm ±25% of reading |
| Repeatability[2] | 1 x $10^{-3}$ to 100 Torr ±2% of reading |
| **Piezo Differential** | |
| Accuracy Piezo[2] | -10 to +10 Torr ±10% of reading<br>-100 to -10 Torr ±8% of reading<br>-760 to -100 Torr ±1% of reading<br>+10 to 100 Torr ±5% of reading |
| Repeatability[2] | -760 to +10 Torr ±1% of reading |
| Zero Stability[2] | ±0.1% of Full Scale (F.S. = 760 Torr) |
| **Overpressure Limit** | 1500 Torr (Absolute) |
| **Installation Orientation** | Any |
| **Internal Volume (KF16)** | 2.8 $cm^3$ |
| **Materials Exposed to Vacuum** | Silicon, $SiO_2$, $Si_3N_4$, gold, low outgassing epoxy resin, 304 stainless steel, Viton® |
| **Electronic Casing and Flange** | 304 stainless steel |
| **Weight (with KF 16 Flange)** | 170 g |
| **CE Certification** | EMC Directive 2004/108/EC |

*[2] Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment.*

# Ordering Information

| Transducer Model | Code |
|---|---|
| 901P Loadlock | 901P- |
| **Flange** | |
| KF16 | 1 |
| KF25 | 2 |
| 1/8" NPT-M | 3 |
| VCR4-F | 4 |
| VCR8-F | 5 |
| CF1.33 | 6 |
| KF16 extended | 8 |
| **Interface** | |
| RS232 / Analog | 1 |
| RS485 / Analog | 2 |
| **Analog Out** | |
| Standard MKS | 0 |
| **Connector Relays** | |
| SUBD 15pinHD male/no relay | 2 |
| SUBD 15pinHD male/3 relays | 3 |
| SUBD 15pinHD male/3 relays/Dual Aout (piezo differential) | 4 |
| SUBD 15pinHD male/3 relays/Dual Aout (Absolute) | 5 |
| **Enclosure** | |
| Standard/Viton sealing | 0 |
| Standard/Viton sealing/display | 4 |

**Ordering Code Example:** 901P-11030 = KF16, RS232, standard analog output, Sub D 15 pin HD male, 3 relays, Viton.

**Analog Output**
The 901P has a standard 15 pin HD SUBD connector and an analog output voltage pressure signal of 1VDC/decade. It can also emulate analog voltage outputs from a variety of other vacuum transducers. The emulation feature can be used to upgrade and replace other vendors' gauges in OEM applications without changing system software. Contact MKS technical support for details.

## PDR900 Power Supply & Display


The PDR900 power supply and readout unit is a stand alone, single channel controller for use with the Series 900 digital vacuum transducers. It can be used as a stand-alone power supply readout unit or as a tool for configuration, calibration and diagnostics of system integrated transducers in OEM applications.

## 901P with Display


The optional integrated touch-screen display is user configurable; the user can change pressure units, orientation and has access to set point parameters as well as gas type. The display also indicates the status of the available set point relays. Displayed pressure reading from individual sensors or combined reading can be seen from >5 meters away on the high contrast display.

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