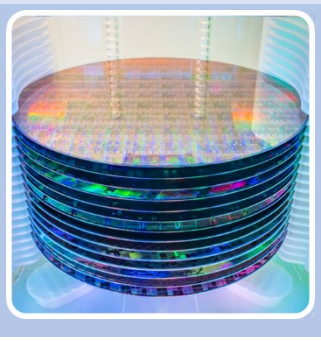
VPM-17 TriCAP™ ATM Vacuum Transducer

Heat-loss Pirani, capacitance diaphragm, piezo diaphragm, and atmospheric switch combination gauge with 1.0E-6 to 1333 mbar measuring range.

Benefits & Features

- **Ultra-wide measuring range of 9 decades from 1.0E-6 to 1333 mbar**
- **6 decades gas independent measurement from 5.0E-3 to 1333 mbar**
- **Precision atmospheric switch function**
- **Automatically zero adjustment of capacitance diaphragm gauge**
- **Easy configuration with USB programmer**
- **0-10 VDC programmable voltage output**
- **Digital RS-232 or RS-485 interface**
- **Optional Ceramic or Parylene sensor protection for corrosive applications**
- **Optional solid-state setpoint relay for external controlling**
- **Drop-in replacement for MKS 901P and other vendors' vacuum gauges**



Typical applications

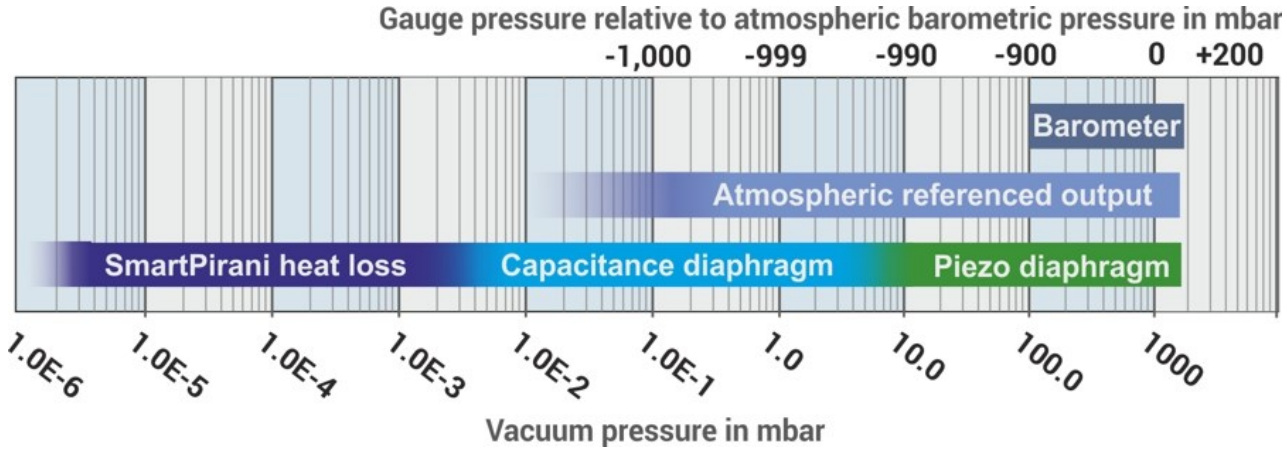
- **Loadlock Control**
- **Semiconductor Processing**
- **PVD Coating**
- **Analytical Instrumentation**
- **Vacuum Furnaces**
- **Medical Instrumentation**
- **Space Simulation**

Product Datasheet

SENS4

Multi-sensor solution with Atmospheric Switching function

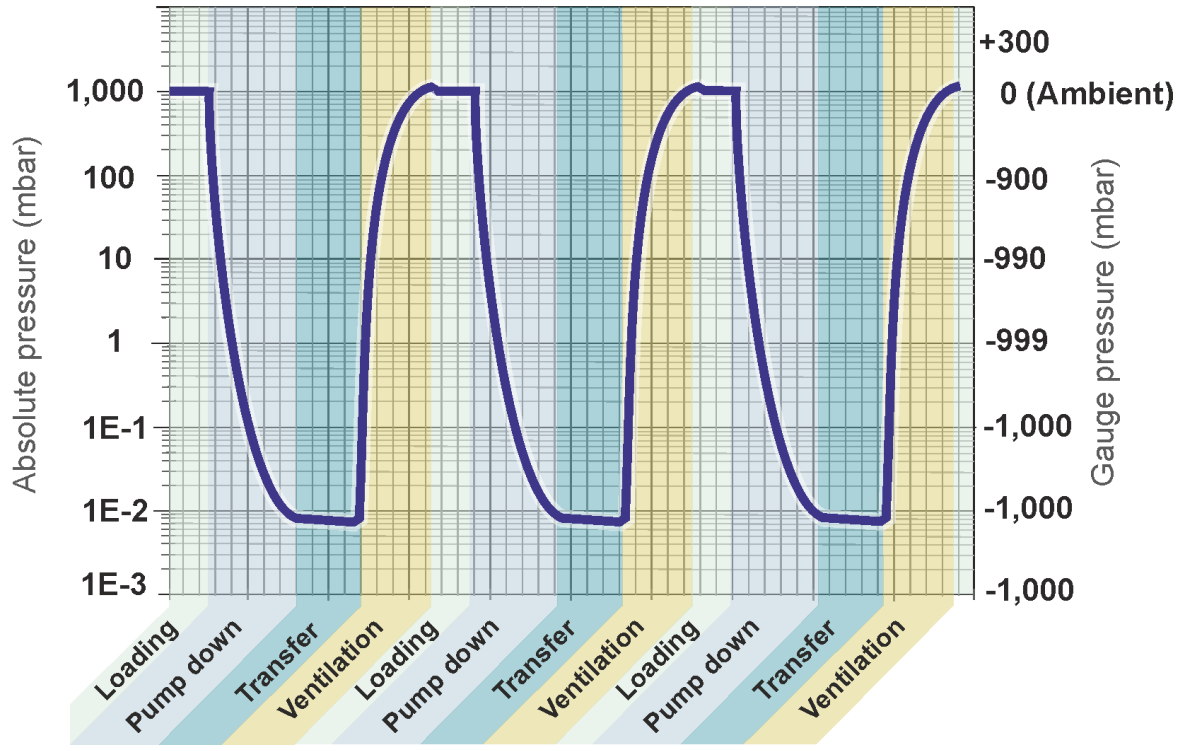
The VPM-17 TriCAP™ ATM transducer redefines vacuum measurement as a comprehensive, all-in-one solution for diverse applications. Unlike conventional vacuum gauges, it offers a cost-effective, gas-independent measurement range from 5.0E-3 to 1333 mbar, with MEMS Pirani heat-loss measurement extending down to 1E-6 mbar.



In environments where gas composition or type fluctuates, traditional gas-dependent Pirani gauges can result in measurement inaccuracies. The TriCAP™ ATM transducer integrates a high-precision capacitance diaphragm gauge (CDG) sensor, eliminating gas dependency and ensuring reliable measurements, even as gas properties change.

Beyond vacuum measurement, the VPM-17 also supports pressure measurement relative to atmospheric pressure, enabling precise control of vacuum system venting cycle.

A load-lock is a vacuum chamber designed to transfer devices, such as semiconductor wafers, from ambient air pressure to a vacuum processing chamber. It typically cycles between atmospheric pressure and the required vacuum level necessary for wafer transfer. Precise pressure control within the load-lock is essential to prevent ambient air and particulate contamination, ensuring both the chamber and wafers remain uncontaminated.



Enabling use in Demanding Applications

The VPM-17 is designed not only for clean nitrogen-vented load-lock applications in the semiconductor industry but also for environments containing particulates and aggressive media. For applications where sensors may be exposed to corrosive or reactive gases, the TriCAP™ is available with a conformal protective coating, providing an effective barrier.

To enhance durability, the TriCAP™ transducer series now offers an optional ceramic or Parylene protective barrier, shielding sensor materials from corrosion and oxidation.

Ceramic is highly corrosion-resistant and has a proven track record as a reliable material for vacuum sensor diaphragms in capacitance diaphragm gauges.
Parylene, a unique hydrophobic polymer with exceptional corrosion resistance, is specifically designed for medical applications such as lyophilization and sterilization.

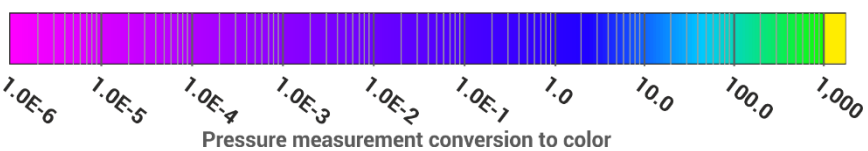
In vacuum processes where sensors are at risk of damage from particulates, TriCAP™ transducers can be equipped with a protective baffle, acting as a barrier against macroscopic particles. With these advanced protective options, the TriCAP™ transducers are well-prepared to withstand demanding vacuum environments.

Other Vendor Compatibility

The drop-in replacement vacuum transducers are designed with connector pin-out compatibility, enabling seamless replacement of other vendor gauges without change of cabling.
Additionally, these transducers emulate the analog output scaling and range of equivalent products from other manufacturers.
Moreover, Sens4 transducers have the capability to emulate the digital serial communication protocol, facilitating easy installation without requiring adjustments to the communication software of the vacuum equipment. This digital protocol emulation ensures compatibility with power supply and controller display units from different vendors.

RGB LED for Pressure Indication

The TriCAP™ ATM offers a novel method for visually ascertaining the measured pressure using a multi-color LED that seamlessly transitions through colors across the pressure range. This selectable visual feature offers a cost-effective alternative to integrated displays, offering a basic representation of the measured pressure. Additionally, it serves as a distinct visual indicator, warning users if the vacuum system is pressurized beyond ambient pressure.



Pressure measurement conversion to color

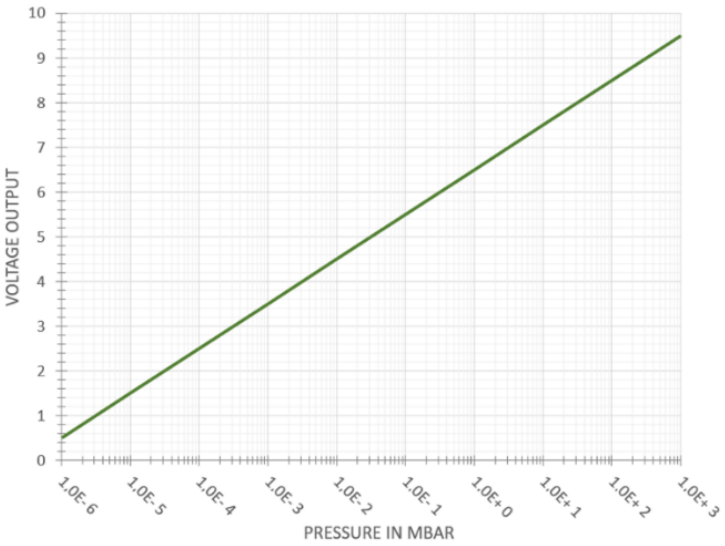
Measure and Control Advanced Vacuum Processes

The VPM-17 TriCAP™ ATM is engineered for best-in-class measurement and control of vacuum gas pressure. Several output options are providing more than just a pressure measurement signal.

Analog Voltage Output

The analog output provides a voltage signal for external pressure readout or controls.
The VPM-17 comes with a default voltage output signal of 1VDC/decade for mbar, Torr, or Pascal. Additionally, it provides the flexibility for user configuration or can be preconfigured with a diverse range of analog output options, allowing for seamless replacement of gauges from various vendors.

An optional secondary analog output is also available for applications where both the full-range absolute measuring range and the measurement relative to the atmosphere need to be monitored simultaneously.



Digital Interface

The RS-232 and RS-485 serial interfaces facilitate the transfer of measurement data without being affected by signal degradation over extended cable lengths or interference from electrical noise.
The digital interface enables diagnostics, predictive maintenance, service, calibration, setpoint configuration, analog output scaling and acquisition of real-time vacuum pressure measurements for on-screen visualization.

Reliable and Robust Setpoint Relay Control

The three independent solid-state switch relays can be used to externally control pumps, valves, safety interlock circuits, and other equipment. The primary control function involves on/off regulation with a programmable setpoint and hysteresis value.
In comparison to electro-mechanical relays, solid-state relays offer enhanced reliability and faster switching times. They also provide arc-free contacts and generate no electromagnetic interference (EMI) during contact switching. The SmartPirani™ relays are built for durability and hold UL listing, CSA recognition, and EN/IEC 60950-1 certification. This ensures maximum confidence when employing them to oversee critical vacuum processes and high-cycle load-lock applications.

Temperature Measurement

The VPM-17 TriCAP™ is designed for measuring pressure, yet it additionally provides a temperature measurement signal on the vacuum side. This temperature data can be utilized for monitoring and diagnosing vacuum processes, and access to this information is available through the digital interface.

Customized Settings

The VPM-17 transducer is available with a tailored customized configuration out of the box to align with application needs, ensuring compatibility with specific equipment installations. For customized products, a distinct part number will be assigned, streamlining future reordering for convenience and simplicity. Our team of experienced vacuum professionals are always available to discuss and explore customized options and possibilities for even the most demanding applications.

Typical Applications

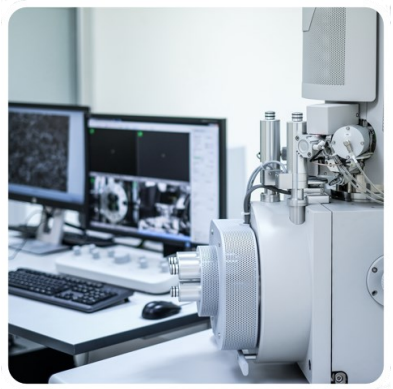
The TriCAP™ is designed for reliable measurement and control of advanced vacuum processes and is suitable for a wide range of applications in industry and science. The wide selection of VPM-17 configurations is available to meet different requirements in various applications.

Semiconductor Industry

The VPM-17 transducer offers a superior atmospheric switching function in combination with vacuum measurement that enables accurate control of load-lock pressure independent of ambient pressure changes due to alterations in weather conditions or altitude.

The vacuum measurement capability is typically used in the load-lock application for determining that an adequate vacuum level is achieved, allowing the wafer to be transferred to the transfer chamber.

The ceramic corrosion resistant sensor option enables use in fore-lines and other areas where residuals of corrosive process gases can be present.



Analytical Instrumentation

Mass spectrometers and scanning electron microscopes are types of analytical equipment that use vacuum gauges to determine safe operation of an ion source. In these applications samples need to be transferred from ambient pressure to the vacuum system for analyzing. The VPM-17 SmartPirani, with its ultra-wide range, can be employed to provide a signal when an adequate vacuum pressure is present for initiating the analysis process, and the measurement relative to atmospheric pressure can be used for regulating the venting of the sample load-lock.

Physical Vapor Deposition

Physical vapor deposition (PVD) processes for coating materials finds widespread use across various industries, including solar, medical, automotive, tooling, optics, and packaging. The SmartPirani™ can be equipped with a user-cleanable integrated particulate baffle system, specifically tailored for PVD applications. This baffle system is engineered to block particulates effectively, ensuring high vacuum gas conductance and preventing particulate clogging. The innovative baffle feature not only extends the time between service intervals but also enhances equipment uptime. Additionally, in specific PVD applications, the extended range of the MEMS SmartPirani™ obviates the need for cold cathode vacuum gauges for base pressure verification.

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Technical Data

Specifications	
Measuring range in mbar	1×10^{-6} to 1333 mbar (7.5×10^{-7} to 1000 Torr)
Measuring principle 1×10^{-6} to 1×10^{-3} mbar	MEMS Pirani thermal conductivity
Measuring principle 1×10^{-3} to 4.99×10^{-3}mbar	Blended MEMS Pirani / CDG reading
Measuring principle 5×10^{-3} to 3.99 mbar	Capacitance diaphragm gauge (CDG)
Measuring principle 4 to 6 mbar	Blended MEMS Piezo / CDG)
Measuring principle 6 to 1333 mbar	MEMS piezo resistive diaphragm
Accuracy 1×10^{-5} to 9.99×10^{-5} mbar	25% of reading
Accuracy 1×10^{-4} to 9.99×10^{-3} mbar	5% of reading
Accuracy 1×10^{-2} to 800 mbar	0.5% of reading
Accuracy 800 to 1099 mbar	0.25% of reading
Accuracy 1100 to 1333 mbar	0.5% reading
Hysteresis 1×10^{-3} to 10 mbar (ISO19685:2017)	1%
Hysteresis 10 to 1333 mbar (ISO19685:2017)	0.1%
Barometric measurement range	300 to1200 mbar
Barometric accuracy	+/- 0.5 mbar
Atmospheric referenced pressure output range	-1333 to + 1333 mbar
Vacuum temperature sensor range	-20 to + 85°C
Vacuum temperature sensor accuracy	+/- 1.5 °C
Transducer temperature sensor range	-20 to + 85°C
Transducer temperature sensor accuracy	+/- 1.5 °C
Analog output resolution	16 bit (150 µV)
Analog output update rate	124 Hz
Response time (ISO 19685:2017)	<20 ms
Temperature compensation	+10 to +50 °C
Solid state relay set point range	5×10^{-6} to 1333 mbar (3.75×10^{-6} to 1000 Torr)
Solid state relay contact rating	50 V, 100 mA_{rms} / mA_{DC}
Solid state relay contact endurance	Unlimited (no mechanical wear)
Solid state relay approvals	UL Recognized: File E76270 CSA Certified: Certificate 1175739 EN/IEC 60950-1 Certified
Environment conditions	
Operating ambient temperature	-20 to +50 °C
Media temperature	-20 to +50 °C
Storage ambient temperature	-40 to +80 °C
Bake-out temperature (non-operating)	+80 °C
Maximum media pressure(3)	4 bar absolute
Mounting position	Arbitrary
Protection rating, EN 60529/A2:2013	IP40
Humidity, IEC 68-2-38	98%, non-condensing
Power supply	
Supply voltage	12-30 VDC
Power consumption	350 mW (max)
Reverse polarity protection	Yes
Overvoltage protection	Yes
Internal fuse	100 mA (thermal recoverable)
Materials	
Enclosure	SS 1.4307 / AISI 304L / Aluminum 6061
Vacuum Process flange (media wetted)	SS 1.4401 / AISI 316
Vacuum exposed materials (media wetted) Standard version	316 Stainless steel, Kovar, glass, silicon, nickel, aluminum, SiO_2, Si_3N_4, gold, Viton®, low out-gassing epoxy resin, solder, RO4305, vitreous silica
Vacuum exposed materials (media wetted) Parylene protected version	316 Stainless steel, Viton®, Parylene
Vacuum exposed materials (media wetted) Ceramic protected version	316 Stainless steel, Viton®, Aluminum oxide ceramic (Al_2O_3)
Process leak tightness	$<1\cdot10^{-9}$ mbar·l/s
Approvals	
CE	EMC directive 2014/30/EU
RoHS compliance	Directive EU 2015/863

(1) Accuracy specifications are typical values at stable temperature after zero adjustment.
(2) Viton® is a trademark of THE CHEMOURS COMPANY FC, LLC
(3) Overpressure limits only applicable when using fittings rated to the specified pressure.

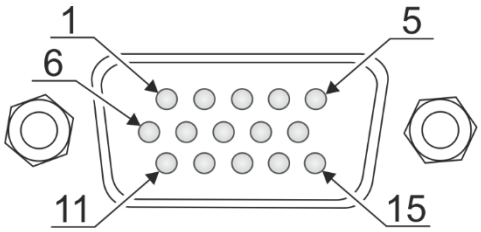
Specifications are subject to change without further notice.

Connector Pin outs

15 Pin HD D-sub RS-232 / RS-485

Pin	Description
1	RS-232 Transmit / RS-485 (-)
2	RS-232 Receive / RS-485 (+)
3	Supply voltage 12-30 VDC
4	Supply voltage – (return)
5	Analog voltage signal +
6	Analog voltage signal – (return)
7	Relay 1 NO (normally open contact) (4)
8	Relay 1 Common (1)
9	Relay 1 NC (normally closed contact) (4)
10	Relay 2 NC (normally closed contact) (4)
11	Relay 2 Common (1)
12	Relay 2 NO (normally open contact) (4)
13	Relay 3 NC (normally open close) (4) or analog out 2 (5)
14	Relay 3 Common (1)
15	Relay 3 NO (normally open contact) (4)

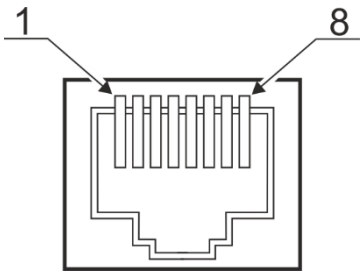
(4) Optional relay
(5) Optional secondary analog voltage output



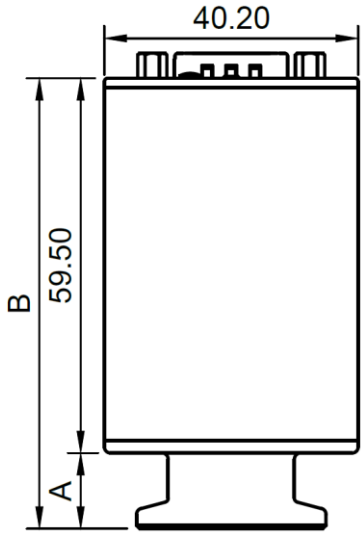
8 Pin RJ45 / 8P8C

Pin	Description
1	Supply voltage 12-30 VDC
2	Supply voltage – (return)
3	Analog pressure voltage signal +
4	Identification resistor
5	Analog pressure voltage signal – (return)
6	Relay 2 NO (normally open contact)(7)
7	Relay 1 NO (normally open contact)(7)
8	Relay COMMON(7)

(1) Optional relay



Dimensions



Flange type	A [mm]	B [mm]	A [inch.]	B [inch.]
DN16KF (P/N: VDM-5-1…)	12.00	71.50	0.47	2.81
DN25KF (P/N: VDM-5-2…)	12.00	71.50	0.47	2.81
VCR4[1] (P/N: VDM-5-4…)	28.50	88.00	1.12	3.46
VCR8[1] (P/N: VDM-5-5…)	30.80	90.30	1.21	3.56
1/8” NPT (P/N: VDM-5-3…)	37.00	65.00	1.45	2.56
DN16CF (P/N: VDM-5-6…)	21.83	81.33	0.86	3.20

DN16KF flange / D-SUB Connector

DN25KF flange / D-SUB Connector

VCR4F flange / D-SUB Connector

VCR8F flange / D-SUB Connector

1/8” NPT flange / D-SUB Connector

DN16CF flange / D-SUB Connector

DN16KF Extended flange / D-SUB Connector

Order Guide

VPM-17-	1	0	1	0	1	2	3	2

Vacuum flange

DN16KF	1	0
DN25KF	2	0
NPT 1/8"	3	0
VCR4	4	0
VCR8	5	0
DN16KF Extended	8	0
DN16CF Rotateble	6	0
DN16KF with light baffle	1	1
DN16KF with heavy duty baffle	1	2
DN25KF with light baffle	2	1
DN25KF with heavy duty baffle	2	2
DN16KF, Ceramic protected sensors	1	3
DN25KF, Ceramic protected sensors	2	3
NPT 1/8", Ceramic protected sensors	3	3
VCR4 female, Ceramic protected sensors	4	3
VCR8 female, Ceramic protected sensors	5	3
DN16CF rotateble, Ceramic	6	3
DN16KF Extended, Ceramic	8	3
DN16KF with light baffle, Ceramic	1	4
DN16KF with heavy duty baffle, Ceramic	1	5
DN25KF with light baffle, Ceramic	2	4
DN25KF with heavy duty baffle, Ceramic	2	5
DN16KF, Parylene protected sensors	1	6
DN25KF, Parylene protected sensors	2	6
NPT 1/8", Parylene protected sensors	3	6
VCR4 female, Parylene protected sensors	4	6
VCR8 female, Parylene protected sensors	5	6
DN16CF rotateble Parylene protected sensor	6	6
DN16KF Extended, Parylene protected sensc	8	6
DN16KF with light baffle, Parylene	1	7
DN16KF with heavy duty baffle, Parylene	1	8
DN25KF with light baffle, Parylene	2	7
DN25KF with heavy duty baffle, Parylene	2	8

Digital interface

RS-232 / S4-Connect™	1
RS-485 / S4-Connect™	2
S4-Connect™ (RJ45/FCC68 and Hirschmann)	3

Analog Output

0.5 - 9.5 (1 V/dec)	0	1
1.0-9 VDC 1 VDC/Dec (MKS 901P/925/910)	0	2
0.375 to 5.659 VDC (MKS GP275)	0	3
0.5V DC (MKS 523)	0	4
1.9-10 VDC (Inficon PSG55x, Leybold TTR91)	0	5
1.5-8.5 VDC (Pfeiffer TPR260/27x/28x)	0	6
1.9-9.1VDC (Edwards APG100XLC)	0	7
1.9-9.1VDC (Edwards APG100XM)	0	8
2-10VDC (Edwards APG-L)	0	9
0-10 VDC 0.1Torr FS Capacitance manometer	1	0
0-10 VDC 1 Torr FS Capacitance manometer	1	1
0-10 VDC 10 Torr FS Capacitance manometer	1	2
0-10 VDC 100 Torr Capacitance manometer	1	3
0-10 VDC 1000 Torr Capacitance manometer	1	4
2.0-8.6 VDC (MPG400/Pfeiffer PKR251, PKR261)	1	5
0.61-10.2 VDC (Leybold TTR101N)	3	5
1.8-8.6 VDC (Pfeiffer PKR251)	3	6
0-10VDC 0.1 mbar FS Capacitance manometer	5	0
0-10VDC 1 mbar FS Capacitance manometer	5	1
0-10VDC 2 mbar FS Capacitance manometer	5	2
0-10VDC 5 mbar FS Capacitance manometer	5	3
0-10VDC 10 mbar FS Capacitance manometer	5	4
0-10VDC 20 mbar FS Capacitance manometer	5	5
0-10VDC 50 mbar FS Capacitance manometer	5	6
0-10VDC 100 mbar FS Capacitance manometer	5	7
0-10VDC 200 mbar FS Capacitance manometer	5	8
0-10VDC 500 mbar FS Capacitance manometer	6	9
0-10VDC 1100 mbar Capacitance manometer	6	0
0-10VDC 1000 mbar Capacitance manometer	6	1

Other analog outputs are availeble on request

Connection

2	15 pin HD D-sub male
3	15 pin HD D-Sub male / dual analog out
7	8 pin RJ45 / FCC68, ID Res 27K
8	8 pin RJ45 / FCC68, ID Res 36K
9	8 pin RJ45 / FCC68, ID Res 43K

Setpoints

0	None
1	1x Solid State Relay
2	2x Solid State Relays
3	3x Solid State Relays

Unit

1	torr
2	mbar
3	Pascal

Online Order & RFQ

Our popular VPM-17 configurations are readily available in our online store for quick and hassle-free ordering.

Visit our online product configurator for request for quote for the comprehensive VPM-17 product offering.

➢ Go to VPM-17 Product Page

Accessories

RS-232 / RS-485 to USB converter with wall plug power supply

USB-to-Serial converter for VPM-17 TriCAP transducers with wall plug power supply.

Part number	Description
PRG-WPRS2-15DS-01	RS-232 to USB, 15 pin HD D-sub, Power supply (90-230VAC)
PRG-WPRS4-15DS-01	RS-485 to USB, 15 pin HD D-sub, Power supply (90-230VAC)

Other Vacuum Measurement Products

The Sens4 vacuum transducer product range offers the market's most advanced multi-sensor transducers for use in a wide selection of industrial and scientific vacuum applications.

TrueVac™ Controller

The TrueVAC™ Vacuum Controller is an advanced, versatile instrument designed for precise monitoring and control of vacuum systems across a wide range of industrial and scientific applications. With its high-resolution digital display and intuitive interface, TrueVAC offers real-time vacuum measurement and control, allowing users to efficiently manage processes and maintain optimal conditions.

VPM-15 TriCAP™ Transducer

The VPM-15 TriCAP™ transducer is pin and output compatible with the VPM-5. The VPM-15 has an additional CDG (Capacitance Diaphragm Gauge) sensor to provide the gas independent measuring from 5.0E-3 to 1333 mbar that can be an advantage in applications where gas composition or type can change.

For demanding applications, the VPM-15 TriCAP™ is available with corrosion resistant ceramic or Parylene coated sensors.

VPM-7 for Load-lock Control

The VPM-7 SmartPirani™ ATM is designed for load-lock pressure control and enable accurate control of vacuum system venting. It provides flexible interface and several control options including high-resolution analog output with emulation curves for other vendors vacuum gauges, 3 independent solid-state relays and digital RS-232 or RS-485 interface.

About

Sens4 is a Danish technology company that develops, manufactures, markets, and distributes vacuum, pressure, and temperature measuring equipment for industrial and scientific applications worldwide. Our mission is to provide compelling product solutions that fit our customers' needs and enable them to efficiently measure and control advanced processes around the world.

Learn more about Sens4 on: **sens4.com**

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