ⅡSENS⁴

VPM-15 TriCAP™

Multi sensor vacuum transducer
1×10⁻⁶ to 1333 mbar / 7.5×10⁻⁷ to 1000 Torr
Ultra-wide range Pirani / capacitance / piezo transducer

Advantages

- **Ultra-wide measuring range of 9 decades**
- **6 decades of gas independent measurement from 5E-3 to 1333 mbar**
- **AutoZeroCAP™ provides automatic zeroing of capacitance manometer**
- **Reliable solid-state relays for control**
- **0-10 VDC programmable voltage output**
- **Digital interface**
- **Vacuum temperature sensor for diagnostics**
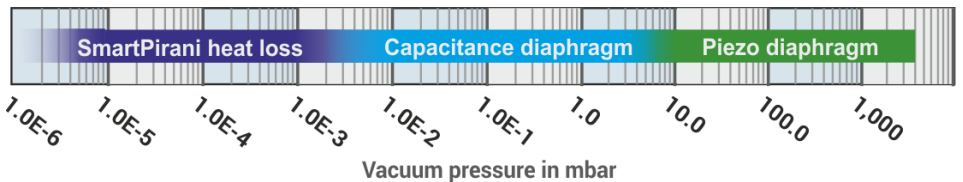- **RGB LED color pressure indicator**

Applications

- **PVD coating**
- **Freeze-drying end point detection**
- **Furnace heat treatment**
- **Pirani calibration**
- **Mass spectrometers**
- **Scanning electron microscopes**

| RoHS | 0-10 VDC | ON/OFF | RS-232 | RS-485 | S4-Connect |

The VPM-15 TriCAP™ transducer establishes new standards with an all-in-one wide range measurement solution for a wide selection of vacuum applications. It differentiates from any other vacuum gauges by offering an overall cost-effective gas independent measurement from 5.0E-3 to 1333 mbar in combination with measurement down to 1E-6 mbar by use of the heat-loss principle.

In vacuum applications where the gas composition or type can change, traditional gas dependent Pirani gauges will result in measurement deviation from the actual pressure. The TriCAP™ transducer uses a precision capacitance diaphragm gauge (CDG) sensor that eliminates the gas dependency and provides accurate measurements also when the gas properties change.

SmartPirani heat loss | Capacitance diaphragm | Piezo diaphragm

1.0E-6 1.0E-5 1.0E-4 1.0E-3 1.0E-2 1.0E-1 1.0 10.0 100.0 1,000

Vacuum pressure in mbar

The integrated heat-loss MEMS Pirani sensor extends the measuring range down to 1E-6 mbar and provides a novel automatic zero adjustment of the capacitance manometer that eliminates the common needs for manual zero adjustment of traditional capacitance diaphragm gauges.

✉ **sales@sens4.com**   🌐 **www.sens4.com**   📞 **+45 8844 7044**

Rethink vacuum gauging

The TriCAP™ is a novel true multi-sensor vacuum gauge and is the choice for superior performance upgrade of traditional Pirani gauge applications or a cost optimized all-in-one solution for applications where separate capacitance manometers and Pirani gauges are used.

Contamination containment

Particulate contamination can occur in applications like vacuum furnaces and physical vapor deposition systems. The optional baffle accessory can prevent such particles from reaching the sensor element and thereby extend the time between maintenance and overall lifetime of the product.

The baffle can be removed for contamination inspection, cleaning, or replacement.

Programmable settings and parameters

The transducer settings and parameters can be user-programmed to control vacuum system and application process parameters.

The digital RS-232 or RS-485 serial interface can be used for diagnostics, predictive maintenance, service, calibration, setpoint configuration, analog output scaling and acquisition of real-time vacuum pressure measurements for on-screen visualization.

The serial USB programmer in combination with the free, intuitive configuration software is a plug-and-play solution for transducer programming, real-time measurements, and diagnostics.
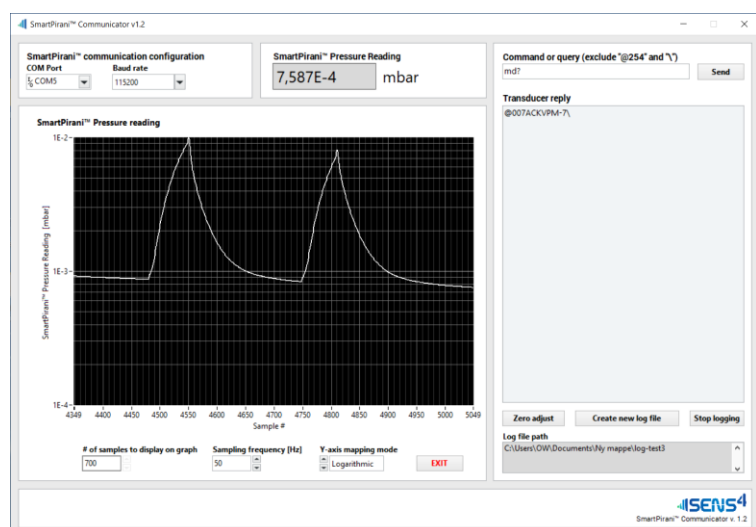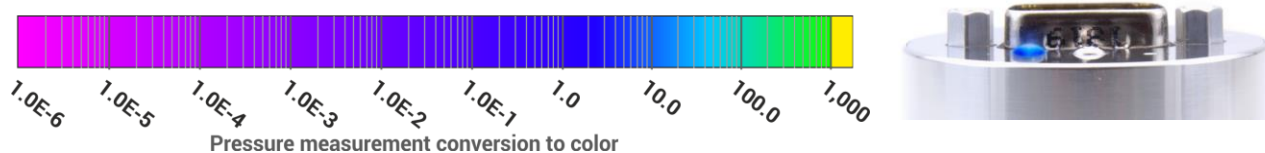
Reliable and robust pressure control

Several vacuum pressure parameters need to be accurately and reliably controlled in many vacuum applications. The TriCAP™ transducer has three independent solid-state switch relays that can be configured to control venting, the transfer chamber gate-valve, and the load-lock door. Compared to traditional electro-mechanical relays, the solid-state relays offer superior reliability and faster switching time while providing arc free contacts and generates no EMI (electromagnetic interference) when switching contacts. The TriCAP™ control relays are designed to last and are UL listed, CSA recognized, and EN/IEC 60950-1 certified for maximum confidence when used to control critical vacuum processes and high-cycle applications.

Analog voltage output

A wide selection of analog output scaling options to emulate other vendors' vacuum gauges and transducers is available. An optional secondary analog output enables external monitoring of both the full-range vacuum pressure and the pressure signal relative to atmospheric pressure.

RGB LED for pressure indication

The TriCAP™ introduces a new approach for visually determining the measured pressure by a multi-color LED that smoothly changes color throughout the pressure range. This selectable visual function is a low-cost alternative to integrated displays and provides a rough indication of the measured pressure. It also provides a clear visual warning if the vacuum system is pressurized above ambient pressure.

1.0E-6   1.0E-5   1.0E-4   1.0E-3   1.0E-2   1.0E-1   1.0   10.0   100.0   1.000

Pressure measurement conversion to color

Customized settings

The transducer can be delivered with a custom configuration to match specific application requirements. Examples of pre-configured options include measurement range, vacuum pressure unit, setpoint configuration and output signal scaling. Customized products will be assigned a unique part number for easy and simple future reordering.

Applications

The TriCAP™ transducer is designed for pressure measurement and control in vacuum applications that require wide-range measurement from atmosphere to high vacuum in combination with accurate control of gas backfilling of the vacuum system to atmospheric pressure. pressure.

PVD Coating equipment

Physical vapor deposition (PVD) coating processes are used in many applications like decorative, corrosion resistance, and hard coating.
During a common PVD process different gas types are used to form different coating properties and gas independent measurement are in general required to control or verify process pressure.

Vacuum drying end point detection

The unique combination of the gas dependent Pirani and gas independent Capacitance manometer enables detection of the water vapor level in vacuum drying applications by monitoring the difference between the two measurements.
The water vapor level detection function can be used to monitor the drying process and determine the end point.

Analytical applications

In mass spectrometers and scanning electron microscopes different types of gasses can be used to assist the analyzing process. The TriCAP™ can eliminate use of separate capacitance manometer for gas pressure control and the low range measurement capability can be used to provide a control signal for the analyzer ion source.

Technical data

Specifications	
Measuring range	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 [1]
Measuring principle 5.0×10^{-3} to 3.99 mbar	Capacitance diaphragm gauge (CDG)
Measuring principle 4 to 6 mbar	Blended MEMS Piezo / CDG [1]
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 1E-2 to 800 mbar	0.5% of reading
Accuracy 800 to 1099 mbar	0.25% of reading
Accuracy 1100 to 1200 mbar	0.5% reading
Vacuum temperature sensor range	-20 to + 85°C
Vacuum temperature sensor accuracy	+/- 1.5 °C
Analog output resolution	16 bit (150 µV)
Analog output update rate	124 Hz
Response time	<20 ms
Temperature compensation	+10 to +50 °C
Solid state relay set point range (absolute)	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	-20 to +80 °C
Bake-out temperature (non-operating)	+80 °C
Maximum media pressure	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)

(1) Blending range can be changed and application adapted via the digital interface.

Specifications are subject to change without further notice

Technical data

| Materials	
Enclosure	SS 1.4307 / AISI 304L / Aluminum 6061
Vacuum Process flange (media wetted)	SS 1.4307 / AISI 304L
Vacuum exposed materials (media wetted)	304 Stainless steel, Kovar, glass, silicon, nickel, aluminum, SiO_2, Si_3N_4, Al_2O_3, gold, Viton®, low out-gassing epoxy resin, solder, RO4305, vitreous silica
Process leak tightness	$<1 \cdot 10^{-9}$ mbar·l/s
Approvals	
CE	EMC directive 2014/30/EU
RoHS compliance	Directive EU 2015/863

Specifications are subject to change without further notice   Viton® is a trademark of THE CHEMOURS COMPANY FC, LLC

Dimensions (DN16KF flange)

All dimensions in mm.
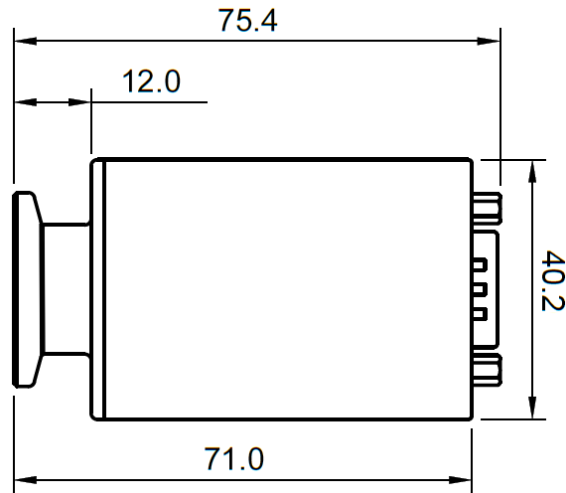
Connector pin outs

The TriCAP™ is available with four different connector types and offers pin compatibility with other vendors Pirani gauges. The TriCAP™ can be offered as an easy drop-in performance upgrade in existing Pirani gauge applications and installations.

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) [1]
8	Relay 1 Common [1]
9	Relay 1 NC (normally closed contact) [1]
10	Relay 2 NC (normally closed contact) [1]
11	Relay 2 Common [1]
12	Relay 2 NO (normally open contact) [1]
13	Relay 3 NC (normally closed contact) [1]
14	Relay 3 Common [1]
15	Relay 3 NO (normally open contact) [1]
	(1) Optional relay
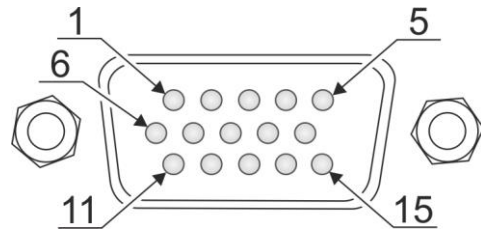
9 Pin D-sub RS-232 / RS-485

Pin	Description
1	Relay 1 NO (normally open contact)[1]
2	Relay 1 NC (normally closed contact) [1]
3	Supply voltage 12-30 VDC
4	Supply voltage – (return)
5	Analog voltage signal +
6	Relay 1 Common[1]
7	RS-232 Transmit / RS-485 (-)
8	Analog voltage signal – (return)
9	RS-232 Receive / RS-485 (+)
	(2) Optional relay
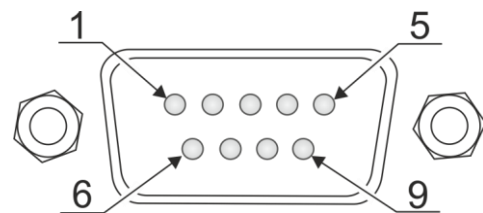
8 Pin RJ45 / 8P8C

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)[1]
7	Relay 1 NO (normally open contact)[1]
8	Relay COMMON

(1) Optional relay
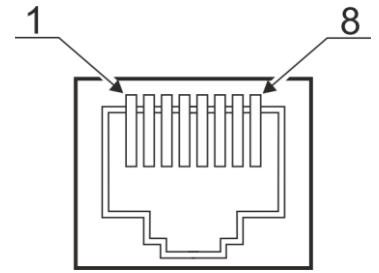
6 Pin Hirschmann connector

Pin	Description
1	Identification resistor (3K)
2	Analog voltage signal +
3	Analog voltage signal – (return)
4	Supply voltage 12-30 VDC
5	Supply voltage – (return)
6	Chassis
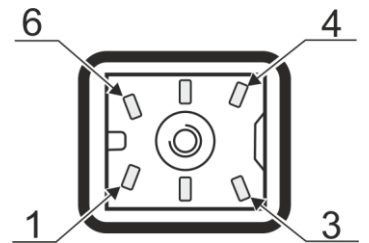
Order guide

VPM-15-	1	0	1	0	1	2	3	2

Vacuum flange

DN16KF	1	0
DN25KF	2	0
NPT 1/8"	3	0
VCR4	4	0
DN16KF Extended	8	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

Digital interface

RS-232 / S4-Connect™	1
RS-485 / S4-Connect ™	2
S4-Connect™	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
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

Other analog outputs are available on request

Connection

1	9 Pin D-sub male
2	15 pin HD D-sub male
3	15 pin HD D-Sub male / dual analog out
4	6 pin Hirschmann, ID res 3K
5	6 pin Hirschmann, ID res 5.1K
6	6 pin Hirschmann, ID res 9.1K/11.1K
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
3	3x Solid State Relays

Unit

1	torr
2	mbar
3	Pascal

Accessories

Programming device	
RS-232 to USB, 15 pin HD D-sub, Power supply (90-230VAC)	PRG-WPRS2-15DS-01
RS-485 to USB, 15 pin HD D-sub, Power supply (90-230VAC)	PRG-WPRS4-15DS-01
RS-232 USB programmer, 1.5 m cable	PRG-RS232-DS15 RS-232
RS-485 USB programmer, 1.5 m cable	PRG-RS485-DS15 RS-485
Calibration certificate	
Accredited calibration certificate from DAkkS lab.	CAL-VPM15-DAKSS
Cables	
15 pin HD D-sub female to 15 pin D-sub male with 3 m cable	CAB-F15DSM15DS-003
15 pin HD D-sub female to 15 pin D-sub male with 5 m cable	CAB-F15DSM15DS-005
15 pin HD D-sub female to 15 pin D-sub male with 10 m cable	CAB-F15DSM15DS-0105

TriCAP™ transducer with atmospheric switch

For applications where atmospheric switching functionality is required, like load-lock vacuum systems, the VPM-17 TriCAP™ ATM offers the same performance, features, and functions as the VPM-15, but with an additional precision atmospheric switch capability.

About

Sens4 develops, manufactures, markets, and distributes vacuum, pressure and temperature measuring equipment for industrial applications worldwide. Our products are designed, engineered, and manufactured in Denmark to the highest quality standards. Our mission is to continuously endeavor to provide customer centric state of the art measurement solutions.

Our passion | Your value™

Sens4 A/S | Ndr. Strandvej 119G | 3150 Hellebaek | Denmark

sales@sens4.com   www.sens4.com   +45 8844 7044