



VDM-5 DiCAP™

Programmable precision vacuum pressure transducer

Capacitance diaphragm and Piezo diaphragm

Voltage output

RS-232/RS-485 digital interface

Relay setpoints



OPM-VDM-5-01, Revision: 1, May 2026



Operating Manual

Our passion | Your value™



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General Information

Thank you for purchasing this Sens4 product. This operating manual contains important safety information, and we encourage you to read this manual and the quick start guide prior to installation and use of this product.

Symbols Used

The following symbols are used in this manual:



WARNING! Critical information to prevent dangerous situations that can result in serious injury or death.



CAUTION! Important information to prevent dangerous situations that can damage the device or auxiliary equipment.



ACTION! Requires action or attention.



INFORMATION: Important recommendations and information for efficient use and best practice.

Intended use

The VDM-5 vacuum transducer is intended for non-corrosive vacuum gas pressure measurement and control within the limits listed in the specifications on page 37. The device is designed for KF fittings or screw-in fittings mounting.

The device complies with EMC (Electro Magnetic Compatibility) class B immunity requirements for industrial environments.

Safety information

This product should be installed and operated by technically skilled or trained personnel only.



WARNING! This product is not intended for installation and use in the presence of flammable gases or other explosive environments.



WARNING! Ensure that the gases or liquids exposed to the wetted materials are compatible with the wetted materials described in the specifications table and the used sealing materials.



WARNING! The pressure rating of the sensor elements, connecting process fittings and sealing must comply with the maximum possible pressure in the application.
The CE marking on the device does not apply to the pressure equipment directive (PED) (2014/68/EU).



WARNING! Ensure that the process connection is tightened according to the recommended torque specification. Ensure that there are no leaks from the process connection before pressurizing the installation.



WARNING! Do not remove the transducer from the installation when the installation is evacuated, pressurized or contains hazardous fluids.

Disposal in the European Union

At the end-of-life of this product, it must be disposed according to the European Directive 2012/19/EU (WEEE). This product should not be mixed with general household waste.



WARNING! Ensure proper decontamination of the product before disposal if it has been exposed to humanly or environmentally hazardous materials during its use.



For proper treatment, recovery and recycling, please take this product to designated collection points. Please contact your local authority for further details of your nearest designated collection point.

Warranty

Sens4 warrants this product under normal use and service to be free from defects in materials and workmanship for a period of twenty-four (24) months from the date of the delivery.

Warranty does not cover mechanical damage, corrosive damage, physical contamination, deposition contamination, damage caused by shipping, normal wear and tear, incorrect use, misuse, incorrect installation or operation beyond the published design limits and specifications.

In case of warranty claim the customer should notify Sens4 immediately and no later than 3 weeks after the defect has been discovered. The warranty claim must specify the failure mode and other relevant information about the product defect and the application use. Sens4 can request return of a failed product for examination and root cause analysis that arises from a warranty claim. Sens4 will at its discretion credit, repair or replace the failed products that are accepted to be covered by warranty.

Warranty is void, regardless of the root cause of defect, if a product has been exposed to or contaminated with radioactive, chemical, biological or other harmful or dangerous substances.

Warranty does not apply to products that have been hardware modified, altered or dismantled by the customer or third party.

Software provided by Sens4 is supplied "as is" without warranty of any kind or guaranteed compatibility with customer IT systems and environment.

Returns

All returns to Sens4 must be authorized by Sens4 by issuing an RMA (Returned Material Authorization) prior to shipping. Contact Sens4 support to obtain an RMA number and fill out the form on page 36.

Sens4 will not accept return of products that have been exposed to or contaminated with radioactive, chemical, biological or any other harmful or dangerous substances.

Return of unpacked and unused products for credit requires written acceptance from Sens4 and will be subject to a handling fee.

Liability

The customer is solely responsible for determining the suitability and compatibility of the product for the customers application, environment and intended use. Sens4 is not liable for any claims arising from improper use, incorrect installation or use with gases or liquid not compatible with the media wetted materials described in the specifications table. To the extent permitted by law, Sens4 is not liable for incidental and consequential damages, including but not limited to loss of profits or revenue, overheads, loss of data, reinstallation costs, damage to other equipment or any incidental or consequential damages of any nature.

Sens4 has taken reasonable care to ensure that the content of its published information and specifications is accurate and up-to date. However, Sens4 does not guarantee or warrant that the content of the published information is error-free. Sens4 reserves the right to change its product specifications without prior notice.

Trade restrictions and export control (ECCN: 2B230 Dual-use product)

The DiCAP™ transducer is categorized as Dual-use product according ECCN: 2B230 and is subject to European Union and/or Danish trade and transfer laws and restrictions. In the event that the product is exported, transferred or in any way distributed to another country or territory than delivered to by Sens4, the recipient and/or customer is responsible for compliance to export restrictions, regulations or applicable law of Denmark, local law and/or the law of the European Union.

Diversion or transfer contrary to law of Denmark and/or law of the European Union is prohibited.

For export compliance questions consult your local authorities and/or Sens4 on email: info@sens4.com

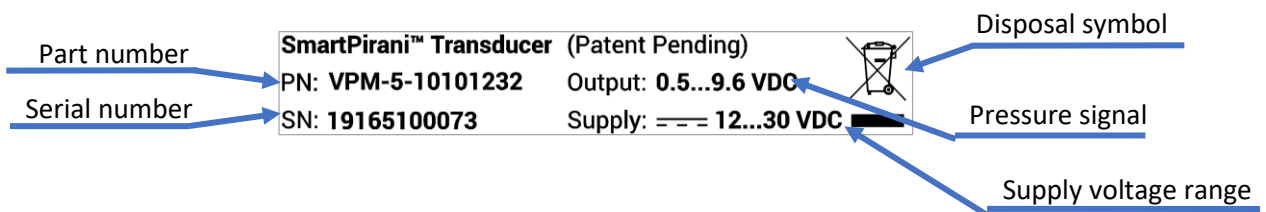
VDM-5 Vacuum Transducer

The VDM-5 is available with different electrical connections and vacuum fittings. The illustration below is an example of the VDM-5 with D-sub connector and DN16KF vacuum fitting.



Labeling

If the serial label should become unreadable, the serial- and part numbers are also stored in the internal non-volatile memory and can be read using the S4-Connect™ USB programmer and communicator. See page 28.



About the VDM-5 Vacuum Transducer

The VDM-5 DiCAP™ transducer offers a unique combination of two diaphragm sensors that provides a gas independent measurement from 5E-3 to 1333 mbar.



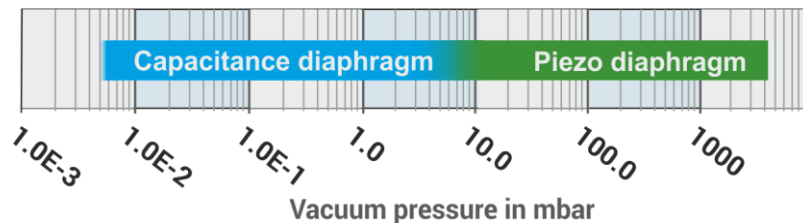
The piezo MEMS sensor consists of a diaphragm where one side of the diaphragm is exposed to the vacuum gas and the other side is exposed to a sealed reference vacuum. The applied pressure deflects the diaphragm and the deflection is converted to an electric signal.

The MEMS Pirani sensor is based on a resistive element deposited on an ultra-thin diaphragm suspended in the vacuum gas to measure. The diaphragm is permanently mechanically fixed and does not bend or move with changes in vacuum gas pressure. The resistive element is made of nickel that offers a high temperature coefficient. The vacuum gas pressure is determined by measurement of the pressure dependent heat-loss from a heated resistive element. The measurement of heat-loss is gas concentration and gas type dependent.

Measurement Performance

The VDM-5 DiCAP™ has established new performance standards and extended range for heat-loss Pirani gauges. It combines a MEMS diaphragm piezo sensor with heat-loss MEMS Pirani sensor.

The diaphragm sensor eliminates the well-known gas dependency in the rough vacuum range of thermal conductivity gauges. The Piezo offers precision performance comparable to more expensive capacitance manometers. This feature ensures more accurate control of vacuum system venting processes and can prevent over-pressurization of the vacuum system.



Part Numbers

The VDM-5 is available with different electrical connections and process fittings.

| VDM-5- | 1 | 0 | 1 | 0 | 1 | 2 | 3 | 2 | |
|--|---|---|---|---|---|---|---|---|--|
| Vacuum flange / sensor protection | | | | | | | | | Connection |
| DN16KF | 1 | 0 | | | | | | | 1 9 Pin D-sub male |
| DN25KF | 2 | 0 | | | | | | | 2 15 pin HD D-sub male |
| NPT 1/8" | 3 | 0 | | | | | | | 3 15 pin HD D-Sub male / dual analog out |
| VCR4 female | 4 | 0 | | | | | | | 4 6 pin Hirschmann, ID res 3K |
| VCR8 female | 5 | 0 | | | | | | | 5 6 pin Hirschmann, ID res 5.1K |
| DN16KF Extended | 8 | 0 | | | | | | | 6 6 pin Hirschmann, ID res 9.1K/11.1K |
| DN16KF with light baffle | 1 | 1 | | | | | | | 7 8 pin RJ45 / FCC68, ID Res 27K |
| DN16KF with heavy duty baffle | 1 | 2 | | | | | | | 8 8 pin RJ45 / FCC68, ID Res 36K |
| DN25KF with light baffle | 2 | 1 | | | | | | | 9 8 pin RJ45 / FCC68, ID Res 43K |
| DN25KF with heavy duty baffle | 2 | 2 | | | | | | | A 8 pin RJ45 / FCC68, ID Res 71K5 |
| 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 | 1 | 4 | | | | | | | |
| 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 sensors | 6 | 6 | | | | | | | |
| DN16KF Extended, Parylene protected sensors | 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 | | | | | | | | | Setpoints |
| RS-232 / S4-Connect™ (9 and 15 pin D-sub) | | | | | | | | | 0 None |
| RS-485 / S4-Connect™ (9 and 15 pin D-sub) | | | | | | | | | 1 1x Solid-State Relay (Only 9 pin D-sub) |
| S4-Connect™ (RJ45/FCC68 and Hirschmann) | | | | | | | | | 2 2x Solid State Relays (Only RJ45/FCC68) |
| | | | | | | | | | 3 3x Solid State Relays (Only 15 pin HD D-sub) |
| Analog Output | | | | | | | | | Unit |
| 0.5 - 9.5 (1 V/dec) | | | | | | | | | 1 torr |
| 1.0-9 VDC 1 VDC/Dec (MKS 901P/925/910) | | | | | | | | | 2 mbar |
| 0.375 to 5.659 VDC (MKS GP275) | | | | | | | | | 3 Pascal |
| 0.5V DC (MKS 523) | | | | | | | | | |
| 1.9-10 VDC (Inficon PSG55x, Leybold TTR91) | | | | | | | | | |
| 1.5-8.5 VDC (Pfeiffer TPR260/27x/28x) | | | | | | | | | |
| 1.9-9.1VDC (Edwards APG100XLC) | | | | | | | | | |
| 1.9-9.1VDC (Edwards APG100XM) | | | | | | | | | |
| 2-10VDC (Edwards APG-L) | | | | | | | | | |
| 0-10 VDC 0.1 Torr FS Capacitance manometer | | | | | | | | | |
| 0-10 VDC 1 Torr FS Capacitance manometer | | | | | | | | | |
| 0-10 VDC 10 Torr FS Capacitance manometer | | | | | | | | | |
| 0-10 VDC 100 Torr Capacitance manometer | | | | | | | | | |
| 0-10 VDC 1000 Torr Capacitance manometer | | | | | | | | | |
| 2.0-8.6 VDC (MPG400/Pfeiffer PKR251, PKR261) | | | | | | | | | |
| 0.61-10.2 VDC (Leybold TTR101N) | | | | | | | | | |
| 1.8-8.6 VDC (Pfeiffer PKR251) | | | | | | | | | |
| 0-10VDC 0.1 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 1 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 2 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 5 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 10 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 20 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 50 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 100 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 200 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 500 mbar FS Capacitance manometer | | | | | | | | | |
| 0-10VDC 1100 mbar Capacitance manometer | | | | | | | | | |
| 0-10VDC 1000 mbar Capacitance manometer | | | | | | | | | |

Configuration Accessories

When configuring the various digital and analog parameters of the VDM-5, three different categories of connectors can be used – as described in the following sections.

Neither of these connectors are included with the transducer and must be purchased separately.

USB-powered converter and programmer

The USB-powered converter and programmer provides direct USB communication and power from the PC.

The USB-powered programmer is compatible with VDM-5 transducers.



| Part number | Description |
|-----------------|---|
| PRG-RS2-DS15-UP | RS-232 USB programmer, 1.5 m cable, D-sub 15 pin, USB powered |
| PRG-RS4-DS15-UP | RS-485 USB programmer, 1.5 m cable, D-sub 15 pin, USB powered |
| PRG-RS2-DS9-UP | RS-232 USB programmer, 1.5 m cable, D-sub 9 pin, USB powered |
| PRG-RS4-DS9-UP | RS-485 USB programmer, 1.5 m cable, D-sub 9 pin, USB powered |

Wall plug-powered USB converter and programmer

The wall plug-powered variant includes either a USB-to-RS-232 or USB-to-RS-485 converter along with a 90-230 VAC wall plug power supply that enables powering of the transducer independently of a PC.

The wall plug power supply is compatible with VDM-5 transducers and MKS 901P, 902B, 910, 925, 971B, 972B and 974B.



| Part number | Description |
|-----------------|---|
| PRG-RS2-DS15-WP | RS-232 USB programmer, 1.5 m cable, D-sub 15 pin, wall plug-powered |
| PRG-RS4-DS15-WP | RS-485 USB programmer, 1.5 m cable, D-sub 15 pin, wall plug-powered |
| PRG-RS2-DS9-WP | RS-232 USB programmer, 1.5 m cable, D-sub 9 pin, wall plug-powered |
| PRG-RS4-DS9-WP | RS-485 USB programmer, 1.5 m cable, D-sub 9 pin, wall plug-powered |

S4-Connect Programmer

The S4-Connect communicates digitally via the power supply line, enabling configuration of products that would otherwise not have a standard digital interface like RS-232 or RS-485.

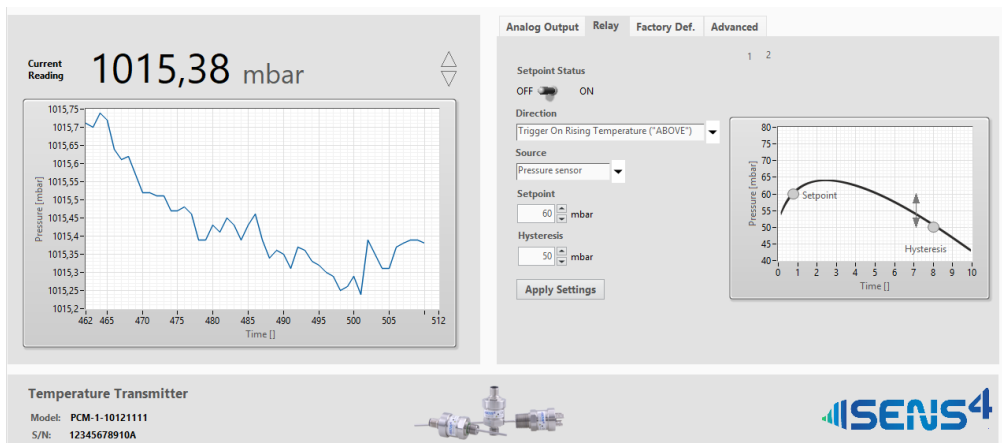


S4-Connect is available in four configurations:

| Part number | Description |
|-------------|---|
| PRG-S4-RJ45 | S4-Connect™ USB programmer, 1.5 m cable, RJ45, 8-pin |
| PRG-S4-HIR6 | S4-Connect™ USB programmer, 1.5 m cable, Hirschmann GO-6, 6-pin |

Software for configuration and on-screen measurement

The S4-Connect™ and RS-232/485 software is freeware and can be downloaded from the Sens4 website: <https://sens4.com/support/>



Calibration

The VDM-5 is delivered factory-calibrated with a calibration test report. An optional accredited calibration traceable to national standards can also be supplied with the VDM-5 transducer.



INFORMATION: The VDM-5 should be zero adjusted after first time installation. Zero offset on measurement can shift during transportation or if the mounting orientation is changed.

Mechanical Installation

The VDM-5 transducer is available with KF clamp fittings or screw-in fittings.



CAUTION! For screw-in fittings do not exceed tightening torque values.



CAUTION! Use gloves when handling vacuum fittings. Ensure that the O-ring and vacuum sealing surfaces are clean and free of scratches or other damages.

The VDM-5 transducer can be mounted horizontally or vertically without impact on accuracy or performance. A zero adjustment of the CDG is recommended when changing orientation of the transducer.

Application and Process Compliance

The standard VDM-5 DiCAP™ is intended for use with inert gases. For vacuum environments where exposure to corrosive or aggressive gases may occur, optional conformal protective ceramic or Parylene coatings are available.

Ceramic is highly corrosion resistant and is a well-proven material for vacuum sensor diaphragms used in capacitance diaphragm gauges.

Parylene is a unique polymer with excellent corrosion-resistant and hydrophobic properties. The Parylene barrier is designed for demanding applications, including medical processes such as lyophilization and sterilization.

In some vacuum processes, particulates can damage vacuum gauges. For these applications, the VDM-5 transducer is available with a protective baffle that acts as a barrier to macroscopic particles.

Combined with the available protective coating options, DiCAP™ transducers are well suited for operation in harsh and demanding vacuum environments.



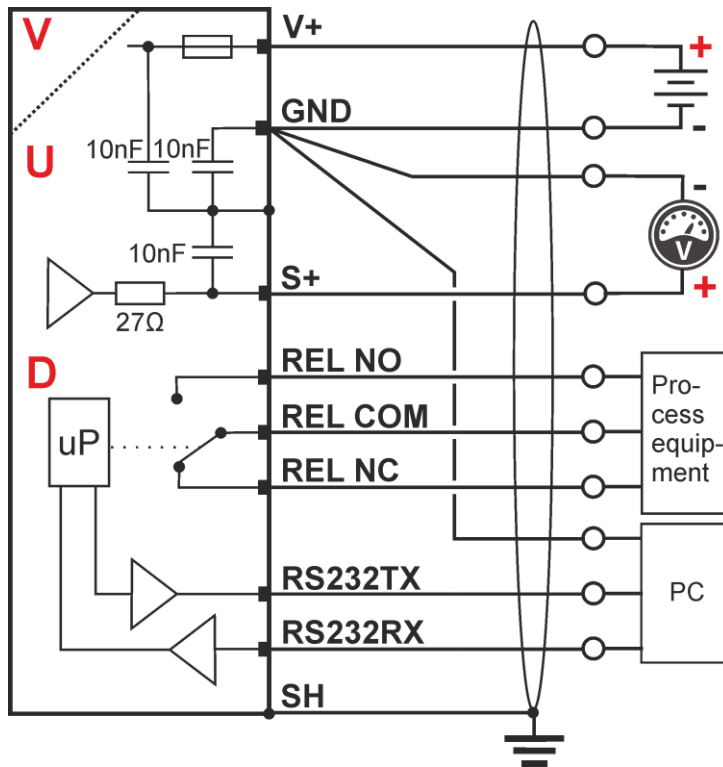
Electrical installation

The VDM-5 requires an external power supply supplying in the range 12-30 VDC. The external power supply shall be with safe isolation according to PELV (Protective Extra Low Voltage) requirements of EN60204-1. The transducer is protected against momentary overvoltage on the supply line. The internal 100 mA thermal fuse will limit current draw in case of overvoltage to limit overheating. Additionally, the transducer is protected against reverse polarity caused by incorrect wiring to the power supply.

The transducer electronics have a high level of immunity against external electromagnetic interference.

Electrical connection (D-sub)

The voltage output version provides a voltage signal proportional to the measured pressure.



The high resolution 16-bit voltage signal can be interfaced to a PLC, A/D converter, voltmeter or other readout devices.



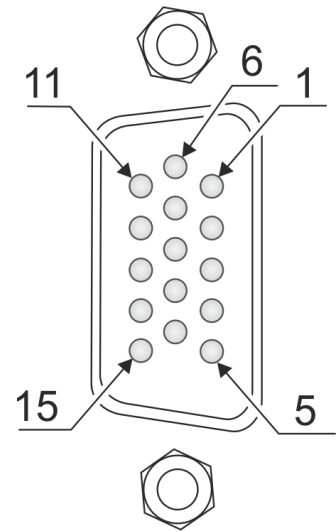
INFORMATION: It is recommended to use a differential input to measure the output signal that uses a separate signal return wire connected to the transducer connector. If power supply return and signal return share the same wire connection the voltage drop as function of supply current will cause a measurement deviation. In that case, the measurement deviation will increase with the cable length.

Connector pinout and cable wiring (0-10 VDC voltage output)

15-pin HD D-sub connector

| Pin | Symbol | Description |
|-----|---------|---|
| 1 | RS232TX | RS-232 Transmit / RS-485 (-) |
| 2 | RS232RX | RS-232 Receive / RS-485 (+) |
| 3 | V+ | Supply voltage 12-30 VDC |
| 4 | GND | Supply voltage - (return) |
| 5 | S+ | Analog voltage signal + |
| 6 | GND | Analog voltage signal - (return) |
| 7 | REL NO | Relay 1 NO (normally open contact) ⁽¹⁾ |
| 8 | REL COM | Relay 1 Common ⁽¹⁾ |
| 9 | REL NC | Relay 1 NC (normally closed contact) ⁽¹⁾ |
| 10 | REL NC | Relay 2 NC (normally closed contact) ⁽¹⁾ |
| 11 | REL COM | Relay 2 Common ⁽¹⁾ |
| 12 | REL NO | Relay 2 NO (normally open contact) ⁽¹⁾ |
| 13 | REL NC | Relay 3 NC (normally open contact) ⁽¹⁾ |
| 14 | REL COM | Relay 3 Common ⁽¹⁾ |
| 15 | REL NO | Relay 3 NO (normally open contact) ⁽¹⁾ |

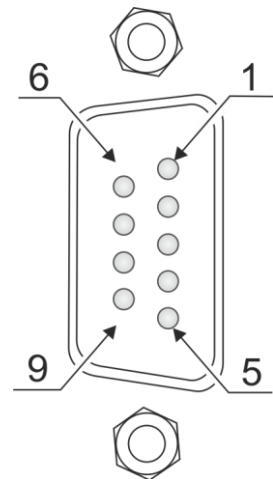
(1) Optional relay



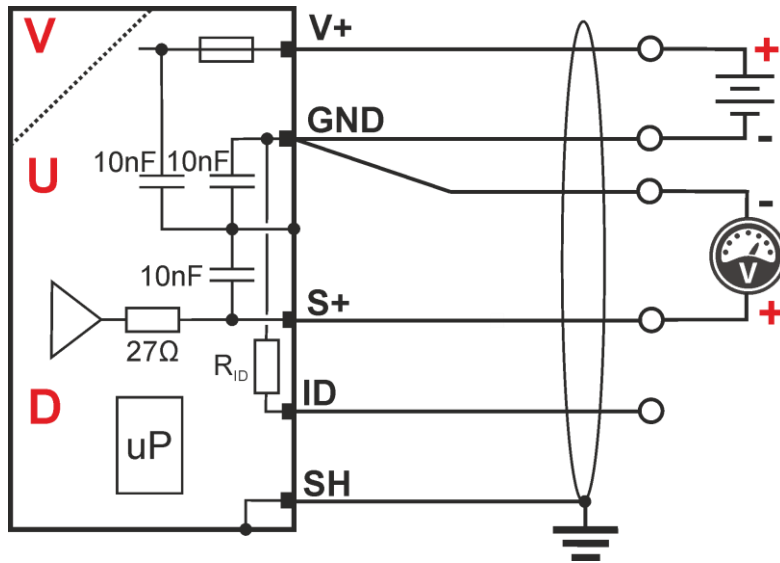
9-pin D-sub connector

| Pin | Symbol | Description |
|-----|----------|---|
| 1 | REL NO | Relay 1 NO (normally open contact) ⁽¹⁾ |
| 2 | REL NC | Relay 1 NC (normally closed contact) ⁽¹⁾ |
| 3 | V+ | Supply voltage 12-30 VDC |
| 4 | GND | Supply voltage - (return) |
| 5 | S+ | Analog voltage signal + |
| 6 | REL COM | Relay 1 Common ⁽¹⁾ |
| 7 | RS-232TX | RS-232 Transmit / RS-485 (-) |
| 8 | GND | Analog voltage signal - (return) |
| 9 | RS-232RX | RS-232 Receive / RS-485 (+) |

(1) Optional relay

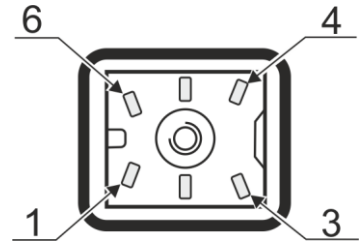


Electrical Connection (Hirschmann GO-6 connector)



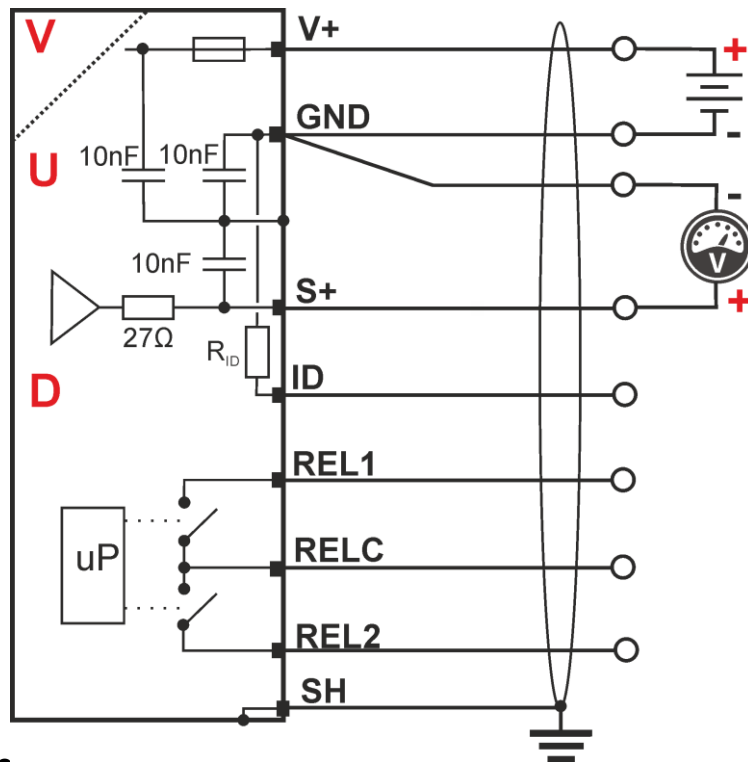
6-pin Hirschmann GO-6 connector

| Pin | Symbol | Description |
|-----|--------|----------------------------------|
| 1 | ID | Identification resistor (3K) |
| 2 | S+ | Analog voltage signal + |
| 3 | GND | Analog voltage signal - (return) |
| 4 | V+ | Supply voltage 12-30 VDC |
| 5 | GND | Supply voltage - (return) |
| 6 | CH | Chassis |



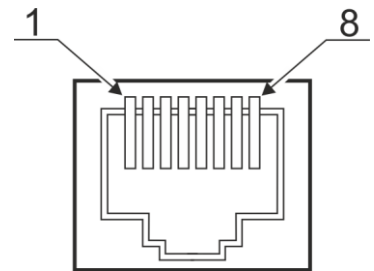
INFORMATION: It is recommended to use a differential input to measure the output signal that uses a separate signal return wire connected to the transducer connector. If power supply return and signal return share the same wire connection the voltage drop as function of supply current will cause a measurement deviation. In that case, the measurement deviation will increase with the cable length.

Electrical connection (RJ45/8P8C connector)



RJ45/8P8C connector

| Pin | Symbol | Description |
|-----|--------|--|
| 1 | V+ | Supply voltage 12-30 VDC |
| 2 | GND | Supply voltage - (return) |
| 3 | S+ | Analog pressure voltage signal + |
| 4 | ID | Identification resistor ⁽⁷⁾ |
| 5 | GND | Analog voltage signal - (return) |
| 6 | REL2 | Relay 2 Setpoint (closing contact) |
| 7 | REL1 | Relay 1 Setpoint (closing contact) |
| 8 | RELC | Relay 1 and 2 common |



(7) Identification resistor for RJ45/8P8C connector

The identification resistor is used by external equipment to identify the type of transducer. External equipment can be a display or a controller from another vendor. The VDM-5 is available with different ID resistors. The ID resistor is identified by the last digit in the part number:

| P/N | ID resistor value |
|-----|-------------------|
| 5 | 27 KΩ |
| 6 | 36 KΩ |
| 7 | 43 KΩ |



INFORMATION: It is recommended to use a differential input to measure the output signal that uses a separate signal return wire connected to the transducer connector. If power supply return and signal return share the same wire connection the voltage drop as function of supply current will cause a measurement deviation. In that case, the measurement deviation will increase with the cable length.

Status LED

The LED indicator signals the transducer status and can indicate following basic indications:

Startup sequence

- 0.5 sec purple followed by 4 sec. pulsing green

Normal standard operation

- Solid green

Overrange indication (in Dynamic Mode only)

- Flashing Orange (5 Hz)

S4-Connect mode

- Pulsing green

Sensor fail stage

- Flashing red (5 Hz)

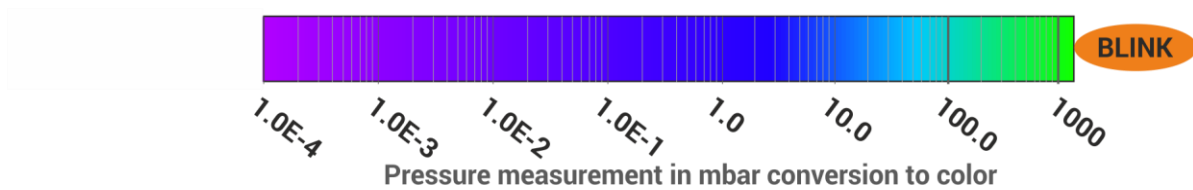


RGB LED for pressure indication (Dynamic mode)

The VDM-5 SmartPirani™ 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 visual indication of the measured pressure.

When the VDM-5 measures a pressure that exceeds its maximum measuring range of 1333 mbar (1000 Torr) the LED will blink orange.

The dynamic LED can be enabled via the digital interface. Refer to page for LED configuration.



Signal-to-Pressure Conversion (0-10 VDC voltage output)

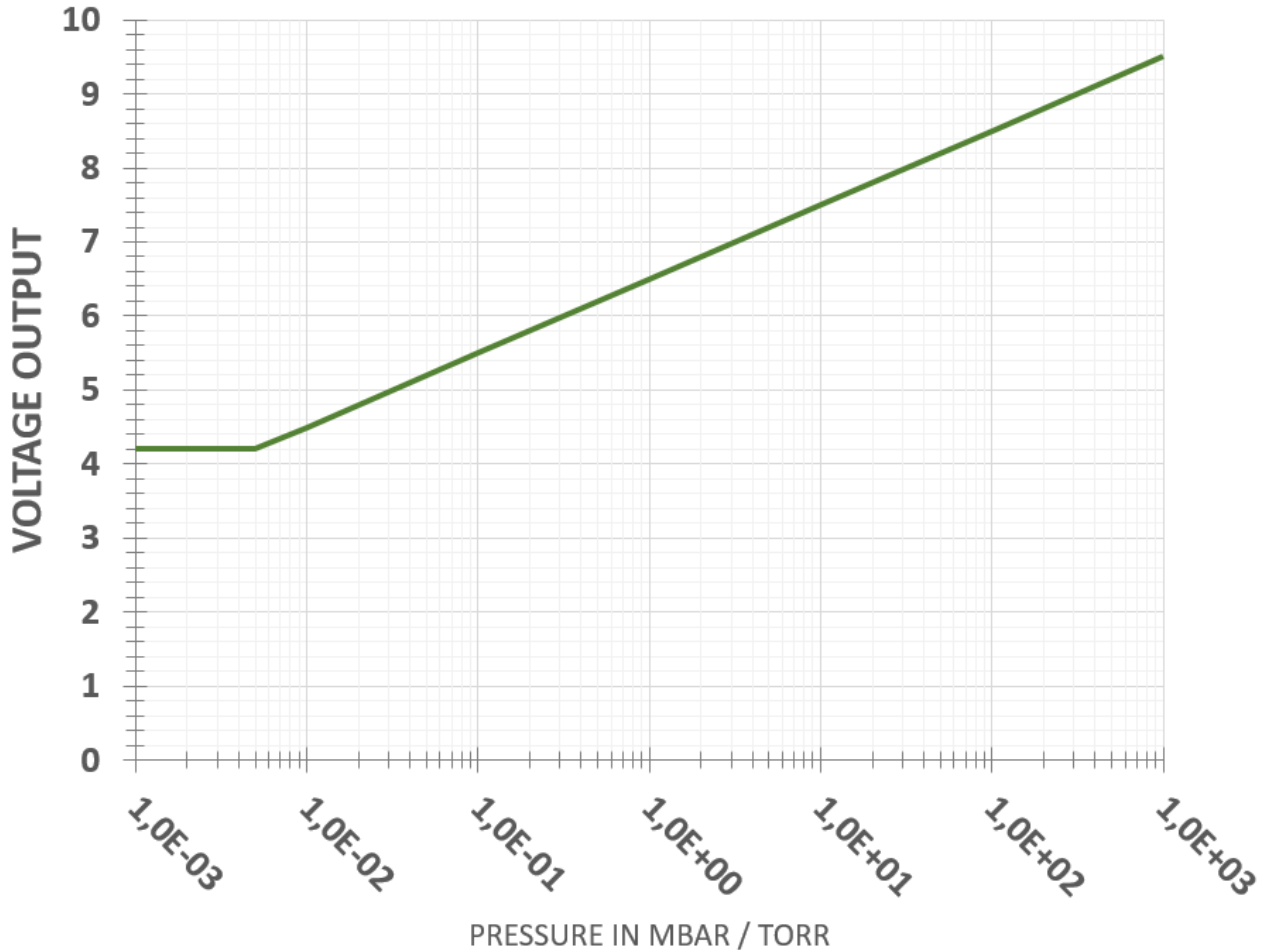
The transducer can provide a voltage output from 0-10 VDC and is available with different types of pre-configured output scaling.

In the VDM-5's standard configuration with a voltage output of 1 VDC/decade, the output is scaled according to the configured pressure unit, e.g. when mbar is selected the transducer will provide 1 VDC per decade mbar. Likewise, when the unit is changed to torr, the transducer will provide 1 VDC per decade torr. Finally, when the unit is changed to Pascal, the transducer will provide 1 VDC per decade Pascal.

The voltage signal u can be converted to pressure using the following linear expression:

Voltage to pressure conversion (mbar and torr): $P(u) = 10^{(u-6.5)}$

Voltage to pressure conversion (Pascal): $P(u) = 10^{(u-4.5)}$



Other Vendors Analog Output Emulation

The VDM-5 analog output emulation offers voltage output pressure scaling compatible with other vendors gauges. This feature enables drop-in replacement of gauges from other vendors. Configuration and list of analog output options can be found on page 17-18.

Digital vacuum pressure and temperature measurement

The real-time digital vacuum gas pressure value and vacuum gas temperature can be acquired through the digital interface. Refer to digital command set on page 16.

S4-Connect™ Communication



The S4-Connect™ USB programmer and communicator provides access from PC software via a USB interface to the digital core of the transducer. It is compatible with both 4-20 mA current output and 0-10 VDC voltage output transducers from Sens4.



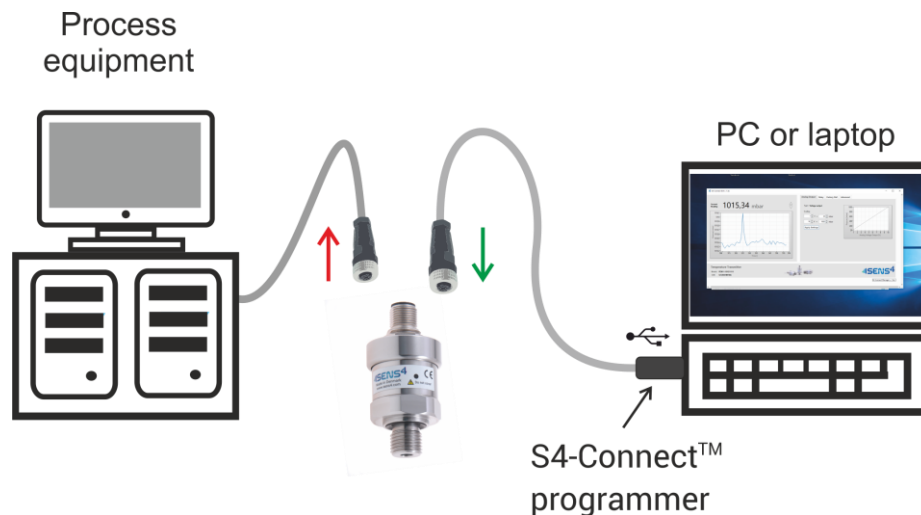
It is intended for configuration, calibration and setup of the unit, but it can also be used to acquire measurement data and perform diagnostics using a PC.

The S4-Connect™ interface enables easy and cost-optimized access to perform calibration, adjustments and individual configuration of the transducer product to fit the customer application and requirements.

During the power-up cycle the transducer will detect if there is a S4-Connect™ programmer connected and if so, the transducer will enter the S4-Connect™ service mode.



WARNING! The S4-Connect™ interface is not intended for digital communication between process equipment and the VDM-5 transducer unit. Disconnect the transducer from any external installation before enabling the S4-Connect™ service mode. During the S4-Connect™ service mode the analog voltage output or analog current output will be disabled, and the analog output will be used for digital communication between transducer and S4-Connect™ programmer.



Getting started:

1. Remove the electronics connection to the transducer so that it is disconnected from any process equipment.
2. Download the S4-Connect™ software from www.sens4.com and install the software. Alternatively, a standard serial terminal software can be used.
3. Connect the programmer to the PC and the S4-Connect™ software. The S4-Connect™ programmer will then enter a state where it searches for the transducer. During this period the LED on the programmer will alternate between green and blue.
4. Connect the transducer to the S4-Connect™ cable. The S4-Connect™ programmer's LED will turn solid green if a current output transducer is connected and solid blue if a voltage output transducer is connected.
5. When the S4-Connect™ programmer's LED turns solid blue or green, it's ready for communication.

S4-Connect USB programmer LED signals

The S4-Connect™ USB programmer has an LED indicator that provides the following signals:

- ● Alternating blue/green: Searching for transducer.
- Solid blue: Voltage output transducer connected.
- Solid green: Current output transducer connected.
- White strobe: Locate mode for S4-Connect™ programmer (see page 20).

USB-to-Serial Converter

The USB-to-Serial Converter is the quickest and simplest way to provide connectivity between an RS-232 or RS-485 capable Sens4 transducer and a computer or other compatible device.

Featuring a built-in switch-mode power supply, the converter eliminates the need for an external power supply.



USB-to-Serial Converter

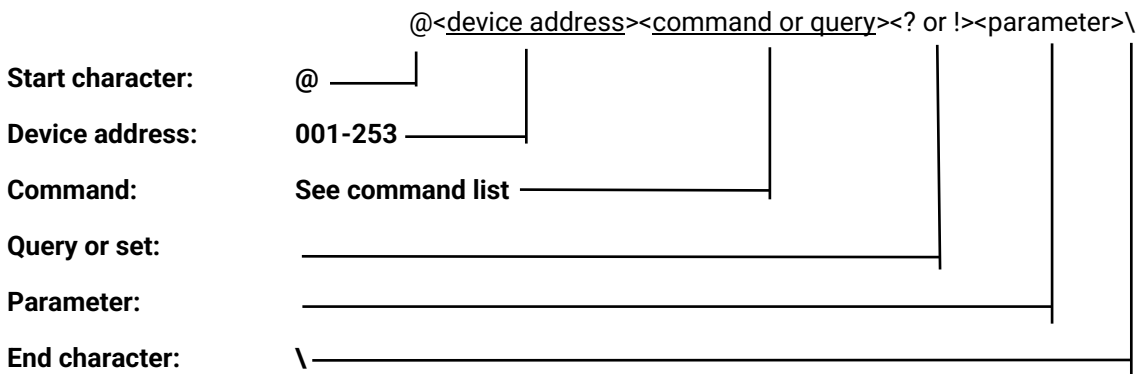
The USB-to-Serial Converter is the quickest and simplest way to provide connectivity between an RS-232 or RS-485 capable Sens4 transducer and a computer or other compatible device. The USB-to-Serial Converter is the preferred device for continuously acquiring of measurement data at high communication speed.

Featuring a built-in switch-mode power supply, the converter eliminates the need for an external power supply.



Digital Command Set

The VDM-5 is available with S4-Connect and either an RS-232 or an RS-485 serial interface. Communication is based on an ASCII protocol that includes a start character, device address, command or query and an end character for termination:



INFORMATION: Throughout this manual the signs <> are written for separation of command name and values and are for informational purposes only. These signs should not be entered in the actual command

Example of how to send a command to the transducer

Programming the Setpoint 1 value to 1.23E-4 (using the default unit setting of the transducer, i.e. mbar):

Send: @254SPV!1,1.24E-4\
 Reply: @ACK1.23E-4\
 \

The following table lists all commands supported by VDM-5. Each command is described in more detail below the table.

| Command | Description | Query | Set | Valid input parameter |
|---------|--------------------------------------|-------|-----|--|
| ADR | Device address | • | • | 1-3 digits (range 001-253) |
| AOUT | Analog output configuration | • | • | <STD / 0-39> |
| BAUD | Set baud rate | • | • | <4800 / 9600 / 19200 / 38400 / 57600 / 115200 / 230400> (default 9600) |
| FAIL | Sensor failure handling | • | • | <WORKING / ZERO > |
| FD | Factory default | • | • | <ADR / AO / BAUD / FS / SP / U / (NONE)> |
| FS | Piezo full-scale adjustment | • | • | <PRESSURE VALUE / CLEAR> |
| FV | Firmware version | • | - | - |
| FVD | Firmware compile time-stamp | • | - | - |
| MF | Manufacturer | • | - | - |
| MD | Model name | • | - | - |
| P | Pressure measurement | • | - | <CMB / CP / PZV / (NONE)> |
| PN | Part number | • | - | - |
| Q | Quick query | • | • | <PARAMETER 1>, <PAR. 2> ... <PAR. 5> |
| SN | Serial number | • | - | - |
| SP | Setpoint settings | • | - | - |
| SPD | Setpoint direction ⁽¹⁾ | • | • | <SETPOINT #>, <ABOVE / BELOW> |
| SPE | Setpoint enable ⁽¹⁾ | • | • | <SETPOINT #>, <OFF / ON> |
| SPH | Setpoint hysteresis ⁽¹⁾ | • | • | <SETPOINT #>, <PRESSURE VALUE> |
| SPV | Setpoint value ⁽¹⁾ | • | • | <SETPOINT #>, <PRESSURE VALUE> |
| SPR | Setpoint relay status ⁽¹⁾ | • | - | <SETPOINT #> |
| SPS | Setpoint source ⁽¹⁾ | • | • | <SETPOINT #>, <P / T> |
| STAT | Statistics | • | • | <P / T / (NONE) / CLEAR (Set only)> |
| T | Sensor temperature | • | - | <CP / PZV / (NONE)> |

| | | | | |
|-----|-------------------------------------|---|---|---|
| U | Pressure/Temperature Measuring Unit | • | • | <P>, <MBAR / PASCAL / TORR> or <T>, <CELSIUS / FAHRENHEIT / KELVIN> |
| UT | User Tag | • | | <USER TAG> |
| VAC | Zero adjustment | • | • | <(NONE) / CP / PZV, (NONE) / PRESSURE VALUE> |

General note: all valid input parameters written in *italics* are to be entered as a number. These numbers will vary with the type and model number of the transducer. Refer to the specific commands for details.

- (1) Setpoint solid-state relays are optional and are not relevant for all part numbers.

Device Address (ADR)

The VDM-5 has an addressable communication protocol, and so it will only accept commands or queries with the following addresses. All queries or commands sent to all other addresses are simply ignored.

| | |
|------------------|--|
| <device address> | Pre-configured to 253, this value may be changed at any time to anything in the range 1-253 using the ADR command. |
| 254 | This is the "global" address. The VDM-5 will always respond to commands or queries at address 254, regardless of the device address setting. |
| 255 | This is the broadcast address, which may be used for performing the same operation on multiple VDM-5s at once. The VDM-5 will not issue any replies to broadcast commands. Note that broadcasting requires a multidrop communication interface such as RS-485. |

Example: Change the device address from 253 (default) to 123 using the global address:

Send: @254ADR!123\

Reply: @253ACK123\

All replies after this one will begin with the new device address, 123.

Analog Output Configuration (AOUT)

VDM-5's default analog output is 0.5-9.5 V, 1V/decade, however, the analog output can be configured to emulate a collection of other equipment via the AOUT command:

| | Vendor or Type | Transducer model | Output |
|--------|------------------------|--------------------------------|------------------------------|
| STD | Sens4 | VPM-4, 5, 7, 15, 17 | 1 VDC/decade (0.5 – 9.5 VDC) |
| LINEAR | Sens4 | - | Programmable linear |
| 0 | MKS | 901P, 910, 925 | 1 VDC/decade (1-9VDC) |
| 1 | Edwards | APG-L | 1.99 - 10 VDC |
| 2 | Edwards | APG-100 | 2.00 – 9.00 VDC |
| 3 | Edwards | WRG | 2.75 – 10.00 VDC |
| 4 | Inficon Leybold | PSG500 TTR91 | 1.547 – 10.00 VDC |
| 5 | Inficon Pfeiffer | MPG400 PKR251 | 2.07 – 8.603 VDC |
| 6 | Inficon MKS | BPG400 999 Quattro | 1.843 – 10.00 VDC |
| 7 | MKS Granville Phillips | 275 | 0.372 – 5.570 VDC |
| 8 | MKS HPS | Moducell 325 | 0.2509 – 3.2398 VDC |
| 9 | MKS HPS | Moducell 325 x3 | 0.753 – 9.719 VDC |
| 10 | CDG | 0.1 Torr | 0 - 10.00 VDC |
| 11 | CDG | 1 Torr | 0 - 10.00 VDC |
| 12 | CDG | 10 Torr | 0 - 10.00 VDC |
| 13 | CDG | 100 Torr | 0 - 10.00 VDC |
| 14 | CDG | 1000 Torr | 0 - 10.00 VDC |
| 15 | MKS | 901P piezo differential output | 1 VDC/decade |
| 16 | Edwards | AIM-S / - SL | 2.5 – 10.00 VDC |
| 17 | Edwards | AIM-X / XL | 3.286 – 9.799 VDC |
| 18 | Pfeiffer | IKR251 | 2.324 – 8.500 VDC |

| | | | |
|----|------------------------|-------------------------------|--------------------|
| 19 | Pfeiffer | TPR 265 / 280 | 2.199 – 8.625 VDC |
| 20 | Hastings | HPM-2002-OBE special | 5.00 – 9.995 VDC |
| 21 | Edwards | DV6M | 2.00 – 10.00 VDC |
| 22 | Edwards | APG-M | 2.00 – 10.00 VDC |
| 23 | MKS Granville Phillips | GP275 (0-9.0 VDC) | 0 – 8.80 VDC |
| 24 | Thyracont | MT 241.1 | 0.41 – 9.99 VDC |
| 25 | MKS Granville Phillips | (0-375.6VDC) | 0.375 – 5.614 VDC |
| 26 | Edwards | APG100-LC | 2.00 – 10.00 VDC |
| 27 | Edwards | APG100M | 2.00 – 10.00 VDC |
| 28 | MKS | 907 | 0.387 – 5.666 VDC |
| 29 | Alcatel | K6080 | 0.40 – 10.00 VDC |
| 30 | Inficon | PEG100 | 2.186 – 10.166 VDC |
| 31 | Varian | Eysys | 1.00 – 8.00 VDC |
| 32 | Alcatel | TA111 | 0.10 – 9.20 VDC |
| 33 | MKS | 685 | 1.00 – 7.00 VDC |
| 34 | MKS | 901P special 2VDC/decade | 1.00 – 9.00 VDC |
| 35 | Pfeiffer | TTR 101 | 0.61 – 10.2 VDC |
| 50 | CDG | 0.1 mbar full scale (linear) | 0 - 10.00 VDC |
| 51 | CDG | 1 mbar full scale (linear) | 0 - 10.00 VDC |
| 52 | CDG | 2 mbar full scale (linear) | 0 - 10.00 VDC |
| 53 | CDG | 5 mbar full scale (linear) | 0 - 10.00 VDC |
| 54 | CDG | 10 mbar full scale (linear) | 0 - 10.00 VDC |
| 55 | CDG | 20 mbar full scale (linear) | 0 - 10.00 VDC |
| 56 | CDG | 50 mbar full scale (linear) | 0 - 10.00 VDC |
| 57 | CDG | 100 mbar full scale (linear) | 0 - 10.00 VDC |
| 58 | CDG | 200 mbar full scale (linear) | 0 - 10.00 VDC |
| 59 | CDG | 500 mbar full scale (linear) | 0 - 10.00 VDC |
| 60 | CDG | 1000 mbar full scale (linear) | 0 - 10.00 VDC |
| 61 | CDG | 1100 mbar full scale (linear) | 0 - 10.00 VDC |

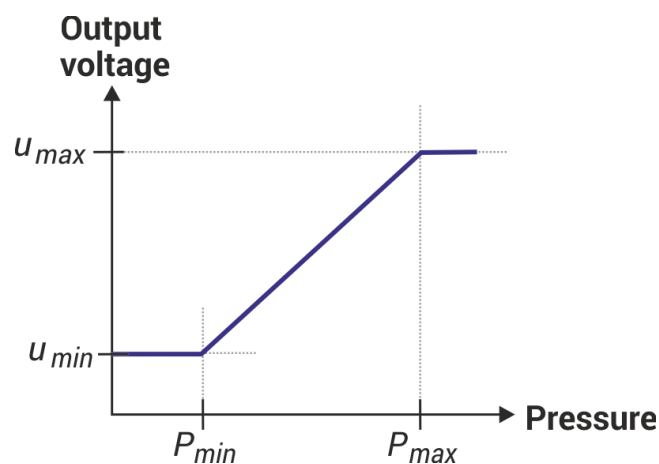
Example: Change the Analog output emulation to MKS Baratron 0-10VDC with 0.1 Torr full scale:

Send: @254AOUT!10\

Reply: @253ACK10\

Programmable linear analog output (AO)

When selecting Aout to “Linear” the analog output configuration can be user configured to any linear scaling within the VDM-5 measuring range and output limitation. This feature allows magnification of a specific pressure range.



Configuration of output:

When programming the voltage output scaling, the minimum and maximum output voltage must be entered in millivolt and the minimum and maximum pressure in transducer configured pressure unit.

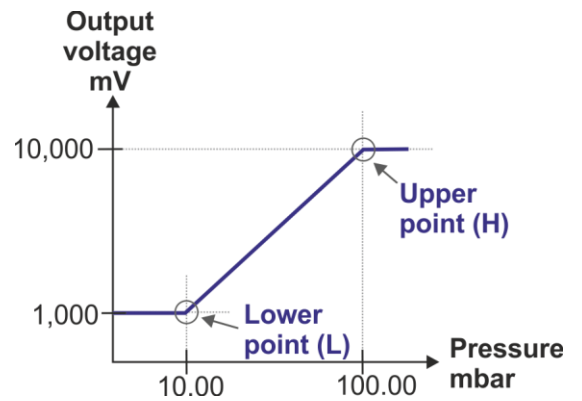
Command syntax:

AO!<Output1&2>, <LOW PRESSURE VALUE>,<HIGH PRESSURE VALUE>,<LOW VOLTAGE VALUE>,<HIGH VOLTAGE VALUE>

Example: Configure the analog 1 output linear expression between 1 VDC @ 10 mbar and 10 VDC @ 100 mbar.

Send: @254AO!1,10,1000,100,10000\

Reply: @253ACKAO
ANALOG OUT 1
#: PRESSURE, AOUT [mV]
L: +1.00E+01, 1000
H: +1.00E+02, 10000\



Set Baud Rate (BAUD)

The VDM-5 supports the following baud rates: 4800, 9600, 19.000, 38.400, 57.600, 115.200. Note that whenever the baud rate is changed, the VDM-5 will send an acknowledgement to the BAUD command using the old baud rate setting before switching to the new one.

Example: Change the baud rate to 115.200:

Send: @254BAUD!115200\

Reply: @253ACK115200\

Pressure Measurement (P)

The digital pressure measurement can be accessed using the S4-Connect™ programmer or RS-232/485 serial digital interface.

Reading the digital pressure value:

Send: **@254P?**
Reply: **@ACK1013.12**

Pressure measurement (P)

The digital pressure measurement can be accessed using the S4-Connect™ programmer or RS-232/485 serial digital interface.

Reading the full range combined pressure value:

Send: **@254P?**
Reply: **@ACK1.0131E+3**

Reading the Vacuum Piezo value:

Send: **@254P?PZV**
Reply: **@ACK2.345E+2**

Reading the Capacitance diaphragm pressure value:

Send: **@254P?CP**
Reply: **@ACK1.123E-1**

Quick Data Acquisitions (Q)

The quick data acquisition command provides all variable measurement data and setpoint status in one string.

Reading the quick data acquisition:

Send: **@254Q?**
Reply: **@ACK1.0000E-2,1.2300E-2,1.2300E-2,23.24,101**

Configuration of the quick data acquisition:

Send: **@254Q!PZ,PIR,CMB,SETP,TEMP**
Reply: **@ACK1.0000E-2,1.2300E-2,1.2300E-2,23.24,101**

Read the currently configured Q-configuration:

Send: **@254Q?CONFIG**
Reply: **@ACKPZ,PIR,CMB,SP,TEMP**

| Parameters | Description |
|------------|-------------------------------|
| PZV | Piezo pressure measurement |
| CMB | Combined pressure measurement |
| CP | Capacitance Diaphragm Sensor |
| TEMP | Temperature measurement |
| SP | Setpoint status |

Setpoint status

The setpoint status value provides a 3-digit value, where each digit represents the status of the setpoint relay 1, 2 and 3, respectively. Each digit may be 1=Energized relay, 0=De-energized relay, X=No relay installed.

Temperature Measurement (T)

The VDM-5 has a built-in high-resolution precision temperature sensor that provides a temperature measurement of the vacuum gas in degrees Celsius with a typical accuracy of better than ± 1 °C.

Reading the temperature:

Send: **@254T?**

Reply: **@ACK25.22**

Unit (U)

The VDM-5 can be configured to three different pressure units and three different temperature units. If no explicit parameter (pressure, temperature) is defined, pressure is assumed.

| Pressure unit | | |
|---------------|--------|------|
| mbar | Pascal | torr |

| Temperature unit | | |
|------------------|------------|--------|
| Celsius | Fahrenheit | Kelvin |

Setting pressure unit to Pascal:

Send: @254U!PASCAL\
Reply: @ACKPASCAL\

Setting pressure unit to mbar:

Send: @254U!P,MBAR\
Reply: @ACKMBAR\

Setting temperature unit to Fahrenheit:

Send: @254U!T,FAHRENHEIT\
Reply: @ACKFAHRENHEIT\

Reading current temperature unit:

Send: @254U?T\
Reply: @ACKFAHRENHEIT\



INFORMATION: All values related to pressures like setpoint values and full-scale must be entered in the current unit for the transducer. When changing unit all setpoint values are converted to the new unit and consequently setpoint functionality will remain intact when changing unit.

Statistics (STAT)

The statistics function logs the number of operation hours and the maximum and minimum measured pressure or temperature value. If no explicit parameter (pressure, temperature) is defined, pressure is assumed.

Reading the statistics (parameter is left out, so pressure is assumed):

Send: @254STAT?\
Reply: @254ACKSTAT<cr>
 MIN : 5.6104E+00<cr>
 MAX : 1.0159E+03<cr>
 HOURS : 37\

Reading the temperature statistics:

Send: @254STAT?T\
Reply: @254ACKSTAT<cr>
 MIN : 2.345E+01<cr>
 MAX : 3.123E+01<cr>
 HOURS : 37\

Clearing the statistics (parameter is left out, so pressure is assumed):

Send: **@254STAT!CLEAR**

Reply: **@254ACKCLEAR**

Switch Function (Optional)

The solid-state setpoint relay function can be used for controlling and surveillance by external equipment.

The three independent solid-state switch relays can be used for external control of pumps, valves, safety interlock circuits and other external equipment. The basic control uses on/off regulation with a programmable setpoint and hysteresis value. Each solid-state relay offers both normally closed and normally open contacts. Solid-state relays are a hardware option that must be specified when ordering the transducer.

Compared to electro-mechanical relays, the solid-state relays offer superior reliability and faster switching time while providing arc free contacts and generating no EMI (electromagnetic interference) when switching contacts.

The relays 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.

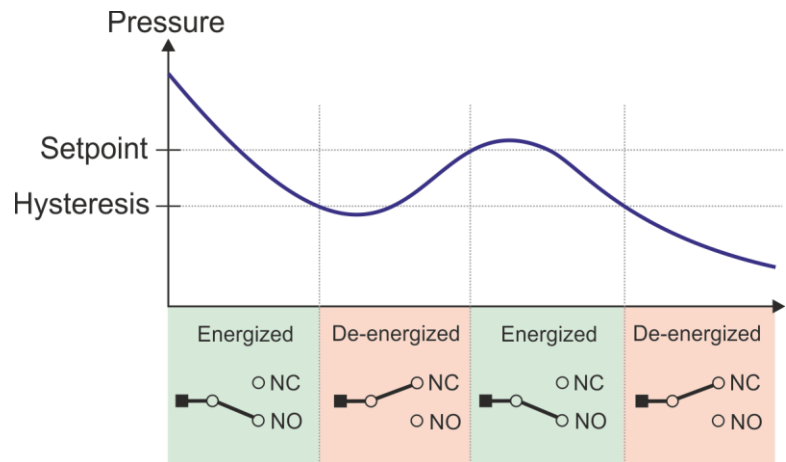
The relay switches are per default controlled by the pressure measurement but can also be configured to be controlled by the internal temperature sensor.

⚠ WARNING! Do not exceed maximum load rating of 250 mA, 50 VDC / VAC peak on relay contacts. Special precautions must be taken when driving an inductive load. Ensure that inrush peak current does not exceed relay contact ratings.

The switch can be configured to close the relay contact either above or below the setpoint value.

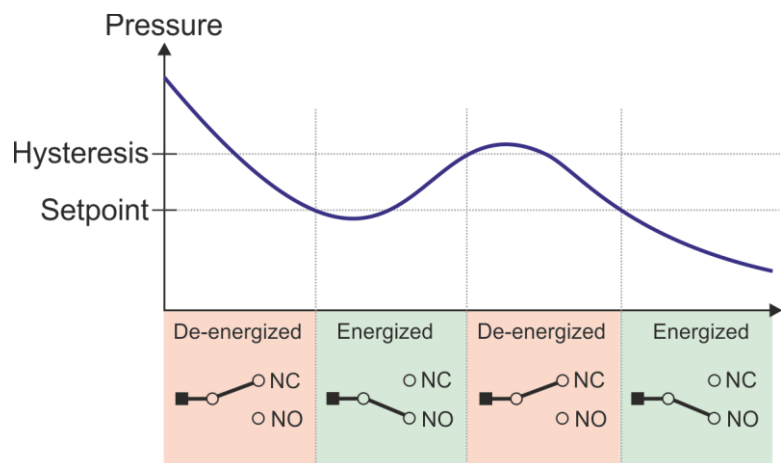
Above

When the switch direction is configured to above, the relay will remain energized (NO contact closed) until the hysteresis value is exceeded. Then it will change to de-energized (NC contact closed). The relay will energize (NO contact closed) again when the setpoint value is exceeded.



Below

When the switch direction is configured to below, the relay will remain de-energized (NC contact closed) until the hysteresis value is exceeded. Then it will change to energized (NO contact closed). The relay will de-energize (NC contact closed) again when the setpoint value is exceeded.



Configuration of Setpoint

Setpoints can be configured either via the S4-Connect™ software or the command protocol.



INFORMATION: All values related to pressures like setpoint values and full-scale must be entered in the current unit for the transducer. When changing unit all setpoint values are converted to the new unit and consequently setpoint functionality will remain intact when changing unit.

Command sequence example:

@254SP?\ (This step is not mandatory.) Print an overview of all setpoint settings. If no setpoints have previously been defined, a VDM-5 with three relays will produce the following overview.

```
#: ENABLE, ENERGIZED, SOURCE, DIRECTION, VALUE, HYSTERESIS<cr>
1: OFF, NO, PRES, ABOVE, +0.000E+00, +0.000E+00<cr>
2: OFF, NO, PRES, ABOVE, +0.000E+00, +0.000E+00<cr>
3: OFF, NO, PRES, ABOVE, +0.000E+00, +0.000E+00<cr>
\
```

@254SPS!1,P\
@254SPD!1,ABOVE\
Assign pressure measurement as the source for Setpoint 1. Configure the Setpoint 1 relay to be energized whenever the pressure reading is greater than the Setpoint 1 value. Whenever this value is changed, the corresponding Hysteresis value is automatically calculated to either -10% of the current setpoint value (when direction = ABOVE) or +10% of the current setpoint value (when direction = BELOW). If the temperature measurement is selected as the source, the automatically calculated Hysteresis values will be -1°C /+1°C instead of -10%/+10%.

@254SPV!1,600\
Set the value of Setpoint 1 to 600 and auto-calculate Hysteresis value. As the direction is set to ABOVE, the hysteresis value will be automatically set to 540 (the setpoint value -10%). Had the direction been BELOW, the hysteresis would have been automatically set to 660 (the setpoint value +10%).

@254SPH!1,500\
@254SPE!1,ON\
@254SPR?1\
Set the Hysteresis value for Setpoint 1 to 500. Enable Setpoint 1. Get the current status of the Setpoint 1 relay.

@254SP?\ (This step is not mandatory.) Print an overview of all setpoint settings to verify the new settings. If the unit is set to mbar and the pressure reading is above 600 – energizing the Setpoint 1 relay – the generated output would look like this:


```
#: ENABLE, ENERGIZED, SOURCE, DIRECTION, VALUE, HYSTERESIS<cr>
1: ON, YES, PRES, ABOVE, +6.000E+00, +5.000E+00<cr>
2: OFF, NO, PRES, ABOVE, +0.000E+00, +0.000E+00<cr>
3: OFF, NO, PRES, ABOVE, +0.000E+00, +0.000E+00<cr>
\
```

| Command | Description | Valid input |
|---------|---|--------------------------------|
| SPD | Setpoint Direction | <SETPOINT #>, <ABOVE, BELOW> |
| SPE | Setpoint Enable | <SETPOINT #>, <OFF/ON> |
| SPH | Setpoint Hysteresis | <SETPOINT #>, <PRESSURE VALUE> |
| SPV | Setpoint Value | <SETPOINT #>, <PRESSURE VALUE> |
| SPS | Setpoint Source (pressure or temperature) | <SETPOINT #>, <P/T> |
| SP | Read all setpoint settings | - |

Configuration of setpoint using VDM-5 configuration software

The screenshot displays the VDM-5 configuration software interface. On the left, a 'Current Reading' shows 1015,38 mbar. Below it is a line graph of Pressure [mbar] vs Time []. The right side features a configuration panel with tabs for 'Analog Output', 'Relay', 'Factory Def.', and 'Advanced'. The 'Advanced' tab is active, showing 'Setpoint Status' (OFF), 'Direction' (Trigger On Rising Temperature ("ABOVE")), 'Source' (Pressure sensor), 'Setpoint' (60 mbar), and 'Hysteresis' (50 mbar). An 'Apply Settings' button is at the bottom. A smaller graph on the right illustrates the setpoint and hysteresis on a pressure-time curve.

Temperature Transmitter
Model: PCM-1-10121111
S/N: 12345678910A



Pre-configuration of Setpoint values

The VDM-5 transducer can be delivered with custom defined setpoint values. Contact Sens4 sales team for more information.

Product Information and Identification

The VDM-5 has a serial number, product part number, manufacturer identity and firmware version programmed in its internal non-volatile memory.

Serial number:

Send: @254SN?\
Reply: @ACK191230123456;

Part number:

Send: @254PN?\
Reply: @ACKVDM-5-123456;

Manufacturer identity:

Send: @254MF?\
Reply: @ACKSENS4;

Firmware version:

Send: @254FV?\
Reply: @ACK1.00;

Maintenance

Maintenance is not required in many applications during the lifecycle of this product. The calibration may shift during the life-time and re-calibration by adjusting the zero point and full-scale value can be performed by the user.

The VDM-5 can be user configured, calibrated and tested using the S4-Connect™ USB adapter or RS-232/485 interface.

Adjustment of the Zero Offset Point

The VDM-5 has an active and individual temperature compensation to account for zero-point drift. In many applications, a user adjustment of the zero point is not required during the lifetime of the product.



INFORMATION: The VDM-5 should be zero adjusted after first time installation. Measurement zero offset can shift during transportation or if the mounting orientation of the transducer is changed.

If drift of the zero-point is observed, it can be adjusted using the S4-Connect™ USB programmer, RS-232 / RS-485 communication interface or by pressing the zero switch.

Zero-point adjustment procedure using digital interface

1. Evacuate the transducer to a vacuum pressure below 1.00E-6 mbar.
2. Send command: @254VAC!\
3. Reply: @254ACK<value>\

The reply <value> is the calculated offset pressure value as function of the factory default zero offset subtracted from the user offset adjustment.

If the recommended zero adjustment vacuum pressure cannot be achieved due to inadequate vacuum pumping capacity, the zero-point adjustment can be performed at a higher pressure by entering the actual pressure value measured by a reference transducer. Following command example will perform a zero adjustment at 5.00E-3 mbar:

1. Adjust the vacuum pressure to 5E-3 mbar
2. Send command: @254VAC!5.00E-3\
3. Reply: @254ACK5.00E-3\

Zero-point adjustment procedure using the zero switch

The VDM-5 can also be zero adjusted by pressing the zero adjustment switch using a tool with a maximum diameter of 1.5 mm.



1. Evacuate the transducer to a vacuum pressure below $1.00E-6$ mbar.
2. Press the zero switch for 2 seconds
3. The LED will strobe green after completion of zero adjustment or red if the transducer is not able to perform zero adjustment.

Piezo sensor zero adjustment

The Piezo sensor is automatically zero-adjusted, whenever the pressure measured by the Pirani is lower than $1.00E-2$ mbar ($7.50E-3$ Torr).

Adjustment of full-scale

Piezo sensor full-scale adjustment

The piezo sensor can be full-scale adjusted using the digital interface by the following procedure:

1. Expose the transducer flange to atmospheric ambient pressure
2. Obtain the actual atmospheric pressure (e.g. 1,013.1 mbar) from a reference gauge
3. Send the command: `@254FS!PZ,1013.1\`
3. Reply: `@254ACK<value>\`

The acknowledge value represents the scaling factor for the new piezo full-scale calibration. The full-scale adjustment can be executed in the pressure range 400-1,100 mbar (300-825 Torr).

Resetting to Factory Default

The Factory Default command will reset all user settings to factory default, including setpoint settings, pressure unit and user-adjustment of zero point and full-scale.

Sens4 offers pre-configuration of user parameters, and if the product is delivered with a special user configuration, the factory default command will reset to the original user configuration as delivered.

Reset to factory default:

Send: **@254FD!**

Reply: **@ACKFD**

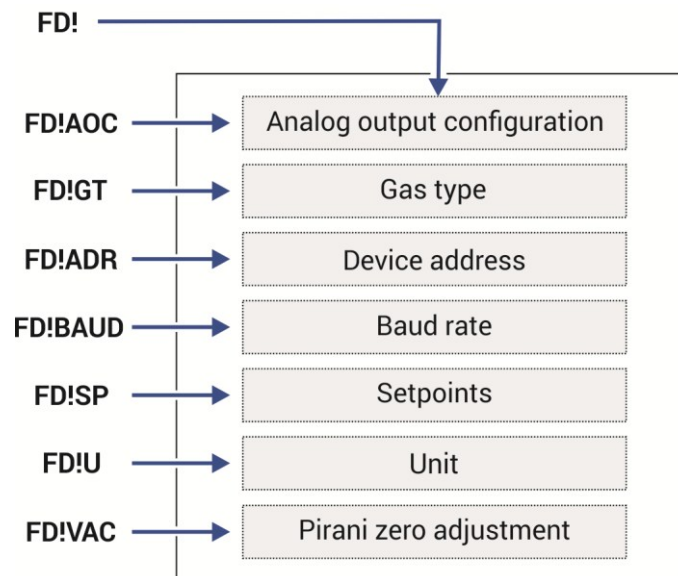
| Parameter | Value |
|-----------------------------|-----------------------|
| Vacuum zero adjustment | 0 |
| Full scale adjustment | 1 |
| Unit | As delivered |
| Baud rate | 9600 |
| Address | 253 |
| Analog output configuration | As delivered |
| Setpoint direction | Above or as delivered |
| Setpoint enable | OFF or as delivered |
| Setpoint hysteresis | As delivered |
| Setpoint value | As delivered |
| Setpoint source | Pressure |

Individual Reset to Factory Default

It is possible to reset only certain settings to their factory default values. This is done by adding an optional argument to the FD command. If the argument is left blank, all parameters will be reset to their default values.

Send: **@254FD!<ARGUMENT>**

Reply: **@ACKFD**



Reset to factory default using S4-Connect™ software

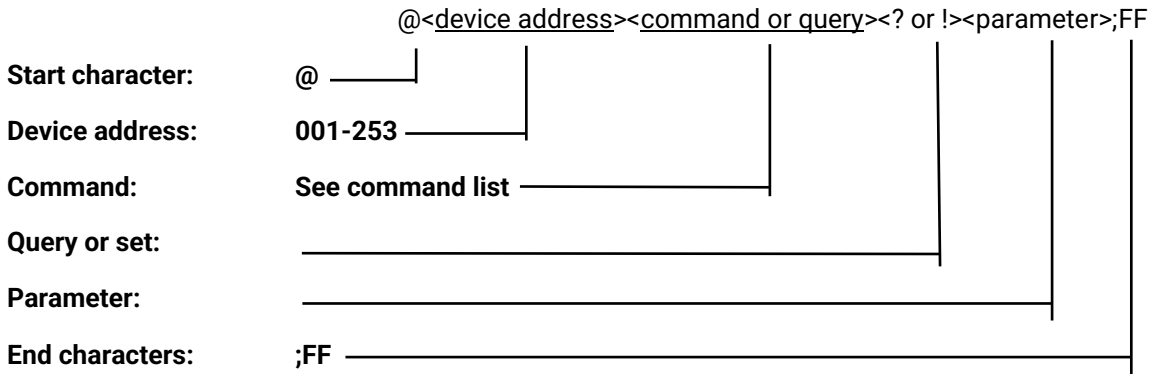
Go to the factory Def. tab and check the parameters to be reset and press the “Issue Factory Default” button.

The screenshot displays the S4-Connect software interface for a pressure transmitter. The top left shows the 'Current Reading' as 1015,38 mbar. Below this is a line graph titled 'Pressure [mbar]' vs 'Time []' showing a decreasing trend from approximately 1015,75 mbar at time 462 to 1015,25 mbar at time 512. The right side of the interface has four tabs: 'Analog Output', 'Relay', 'Factory Def.', and 'Advanced'. The 'Factory Def.' tab is active, showing a 'Select Items' section with the following options: 'All' (unchecked), 'Analog Output Scaling' (checked), 'Damping' (unchecked), 'Unit' (checked), 'Setpoint' (checked), 'Full-scale' (unchecked), and 'Zero Point' (unchecked). A button labeled 'Issue Factory Default' is located below these options. At the bottom left, the device is identified as a 'Temperature Transmitter' with Model: PCM-1-10121111 and S/N: 12345678910A. A small image of the transmitter is shown in the center, and the SENS4 logo is on the right.

900 Series Vacuum Transducer Compatibility

The VDM-5 offers pin, analog output and digital communication protocol compatibility with the 901P, 925 and 910 vacuum transducers from MKS Instruments.

When using the 900 series communication protocol, the communication is based on an ASCII protocol that includes a start character, device address, command or query and an end character for termination:



Example of how to send a command to the transducer using the 900 Series protocol

Programming a setpoint value of 1.23E-4 (using the default unit setting of the transducer, e.g. mbar):

Send: @254SP1!1.24E-4;FF
Reply: @ACK1.23E-4;FF

The VDM-5 supports following 900 Series commands:

| Command | Description | Query | Set | Valid input parameter |
|---------|---------------------------------|-------|-----|--|
| AD | Communication address | X | X | 3 digits (range 001-253) |
| AO1 | Analog output configuration | X | X | STD, 0-39 |
| BR | Set baud rate | X | X | 4800, 9600, 19200, 38400, 57600, 115200 (default 9600) |
| FD | Factory default | X | X | ADR,AOC,FS,U,SP,VAC,<NONE> |
| FS | Full-scale adjustment | X | X | |
| FV | Firmware version | X | | - |
| GT | Gas type | X | X | Nitrogen, Helium, Argon, Air |
| MF | Manufacturer | X | | - |
| MD | Model name | X | | - |
| PR1 | Pressure measurement (Pirani) | X | | - |
| PR2 | Pressure measurement (Piezo) | X | | - |
| PR3 | Pressure measurement (Combined) | X | | - |
| PN | Part number | X | | - |
| SP1 | Setpoint 1 value | X | X | <PRESSURE VALUE> |
| SD1 | Setpoint 1 direction | X | X | ABOVE, BELOW |
| EN1 | Setpoint 1 enable | X | X | OFF, ON |
| SH1 | Setpoint 1 hysteresis | X | X | <PRESSURE VALUE> |
| SP2 | Setpoint 2 value | X | X | <PRESSURE VALUE> |
| SD2 | Setpoint 2 direction | X | X | ABOVE, BELOW |
| EN2 | Setpoint 2 enable | X | X | OFF, ON |
| SH2 | Setpoint 2 hysteresis | X | X | <PRESSURE VALUE> |
| SP3 | Setpoint 3 value | X | X | <PRESSURE VALUE> |
| SD3 | Setpoint 3 direction | X | X | ABOVE, BELOW |
| EN3 | Setpoint 3 enable | X | X | OFF, ON |
| SH3 | Setpoint 3 hysteresis | X | X | <PRESSURE VALUE> |
| SN | Serial number | X | | - |
| TEM | Sensor temperature | X | | - |
| U | Pressure unit | X | X | MBAR, PASCAL, TORR |
| VAC | Pirani Zero adjustment | X | X | No input or <PRESSURE VALUE> |

Return

Before returning a product to Sens4 proper return forms and a return materials authorization (RMA) must be filled out. The RMA procedure can be found on: www.sens4.com/support



INFORMATION: Sens4 does not accept return of products without return materials authorization. Sens4 does not accept any return of products that have been exposed to or contaminated with radioactive, chemical, biological or other harmful or dangerous substances.

RMA – Return Material Authorization

This form should be filled out and enclosed with the package
Please contact Sens4 to obtain RMA # email: support@sens4.com



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

RMA#: _____ Date: _____

Company name _____

Address: _____

Contact name: _____

Phone: _____

Email: _____

Part number: _____ Serial number: _____

Reason for the return:

| | | | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------|
| Warranty Repair | Chargeable Repair | Exchange | Loan | Demo | Other | <i>If other, please list:</i> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | _____ |

Has the product been contaminated with or exposed to the following?

| | No | Yes | |
|--------------------------|--------------------------|--------------------------|--|
| Biological hazard | <input type="checkbox"/> | <input type="checkbox"/> | <i>If other, please list:</i> _____ |
| Radioactivity | <input type="checkbox"/> | <input type="checkbox"/> | |
| Toxic gases or materials | <input type="checkbox"/> | <input type="checkbox"/> | |
| Other harmful substances | <input type="checkbox"/> | <input type="checkbox"/> | |



If "yes" has been answered to any of the above questions please note that **Sens4 does not accept any return of products that have been exposed to or contaminated with radioactive, chemical, biological and other harmful or dangerous substances.**

For questions regarding our return policy please contact email: support@sens4.com

If the product is being returned for service repair, please describe failure mode and application:

Application: _____

Failure mode: _____

I, the undersigned, hereby acknowledge that the information provided on this form is legally binding and declare that the information supplied is accurate and adequate to judge any harmful contamination.

Date

Name

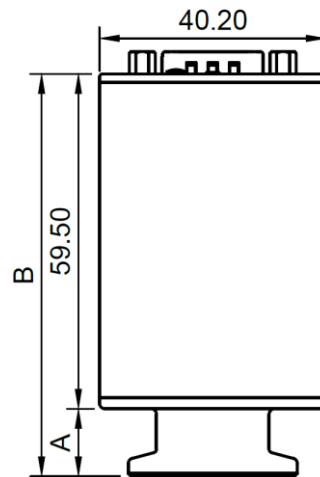
Signature

Specifications

| Specifications <i>Specifications</i> | |
|---|--|
| Measuring range in mbar | 5×10 ⁻³ to 1333 mbar (3.75×10 ⁻³ to 1000 Torr) |
| Measuring principle 5×10 ⁻³ to 3.99 mbar | Capacitance diaphragm gauge (CDG) |
| Measuring principle 4 to 5 mbar | Blended CDG / Piezo reading |
| Measuring principle 5 to 1333 mbar | MEMS piezo resistive diaphragm |
| Accuracy 5×10 ⁻² to 800 mbar | 0.5% of reading |
| Accuracy 800 to 1099 mbar | 0.25% of reading |
| Accuracy 1100 to 1200 mbar | 0.5% of reading |
| Accuracy 100 to 800 mbar | 0.5% of reading |
| Accuracy 800 to 1099 mbar | 0.25% of reading |
| Accuracy 1100 to 1200 mbar | 0.5% reading |
| Hysteresis 1×10 ⁻² to 10 mbar (ISO19685:2017) | 1% |
| Hysteresis 10 to 1200 mbar (ISO19685:2017) | 0.1% |
| 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 <i>Environment conditions</i> | |
| 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 ⁽⁹⁾ | 4 bar absolute |
| Mounting position | Arbitrary |
| Protection rating, EN 60529/A2:2013 | IP40 |
| Humidity, IEC 68-2-38 | 98%, non-condensing |
| Power supply <i>Power supply</i> | |
| Supply voltage | 12-30 VDC |
| Power consumption | 240 mW (max) |
| Reverse polarity protection | Yes |
| Overvoltage protection | Yes |
| Internal fuse | 100 mA (thermal recoverable) |
| Materials <i>Materials</i> | |
| Enclosure | SS 1.4401 / AISI 316 / Aluminum 6061 |
| Vacuum Process flange (media wetted) | SS 1.4401 / AISI 316 |
| Vacuum exposed materials (media wetted) Standard version | 316 Stainless steel, Viton®, silicon, vitreous silica, low out-gassing epoxy resin, solder, RO4305 |
| 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 ₂ O ₃) |
| Process leak tightness | <1·10 ⁻⁹ mbar·l/s |
| Approvals <i>Approvals</i> | |
| CE | EMC directive 2014/30/EU |
| RoHS compliance | Directive EU 2015/863 |
| REACH compliance | Directive 1907/2006/CE |

- (9) Accuracy and repeatability specifications are typical values measured at ambient temperature after zero adjustment.
- (10) Refer also to maximum pressure rating for the used fittings.

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 |



Accessories

S4-Connect™

USB programmer for transmitters and transducers



| Part number | Description |
|----------------|---|
| PRG-S4-15DS-01 | S4-Connect programmer USB, 15p HD D-sub connector |
| PRG-S4-9DS-01 | S4-Connect programmer USB, 9p D-sub connector |
| PRG-S4-RJ45-01 | S4-Connect programmer USB, 8p FCC68/RJ45 |
| PRG-S4-HM-01 | S4-Connect programmer USB, 6p Hirschmann |

RS232 / RS485 interface

USB-to-Serial converter for VDM-5 SmartPirani transducers

| Part number | Description |
|-----------------|--|
| PRG-RS2-15DS-01 | RS232 communicator USB, 15p HD D-sub connector |
| PRG-RS4-15DS-01 | RS485 communicator USB, 15p HD D-sub connector |
| PRG-RS2-9DS-01 | RS232 communicator USB, 9p D-sub connector |
| PRG-RS4-9DS-01 | RS485 communicator USB, 9p D-sub connector |

Cables

| Part number | Description |
|--------------------|---|
| CAB-F15DSM15DS-003 | 15 p HD D-sub female to 15 p D-sub male with 3 m cable |
| CAB-F15DSM15DS-005 | 15 p HD D-sub female to 15 p D-sub male with 5 m cable |
| CAB-F15DSM15DS-010 | 15 p HD D-sub female to 15 p D-sub male with 10 m cable |
| CAB-F15DSM15DS-003 | 9 p D-sub female to 15 p D-sub male with 3 m cable |
| CAB-F15DSM15DS-005 | 9 p D-sub female to 15 p D-sub male with 5 m cable |
| CAB-F15DSM15DS-010 | 9 p D-sub female to 15 p D-sub male with 10 m cable |

Declaration of Conformity

This declaration of conformity has been made in accordance with EN ISO/IEC 17050-1:2010

Manufacturer: Sens4 A/S
Address: Nordre Strandvej 119G
3150 Hellebaek
Denmark

We hereby declare under our sole responsibility that the following products:

Product description: Pressure Transducer
Product part number: VDM-5-xxxxxxx

Complies with the requirements of following relevant European Union harmonization directive:

Electromagnetic Compatibility (EMC) Directive 2014/30/EU
RoHS 3 Directive EU 2015/863

Conformity is assessed in accordance to the following standards:

| Reference: Date | Title |
|---|--|
| EN 61326-1:2021 | Product family standard, Measurement, control and laboratory equipment |
| EN 61326-2-3:2021 | Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning |
| EN 61000-3-2:2006 + A1:2009 and A2:2009 | Limits for harmonic current emissions |
| EN 61000-3-3:2008 | Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems |
| EN 63000:2018 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

Signed on behalf of: Sens4 A/S
Place of issue: Hellebaek, Denmark
Date of issue: May 16th, 2025
Signature:



Name, Title

Ole Wenzel, Chief Executive Officer

Document number: DOC-VDM-5-01, Revision: B

Contact and support

This product has been engineered and made in Denmark by:

Sens4 A/S
Nordre Strandvej 119G
3150 Hellebaek
Denmark

Phone: +45 88447044
Email: support@sens4.com

Website: www.sens4.com

Other featured Products from Sens4

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.

For more information visit:

www.sens4.com



Our passion | Your value™