

# MEMS Pirani & Piezo Diaphragm Gauge

Analog output with either RS232 or RS485 interface

PPG550



## Product Identification

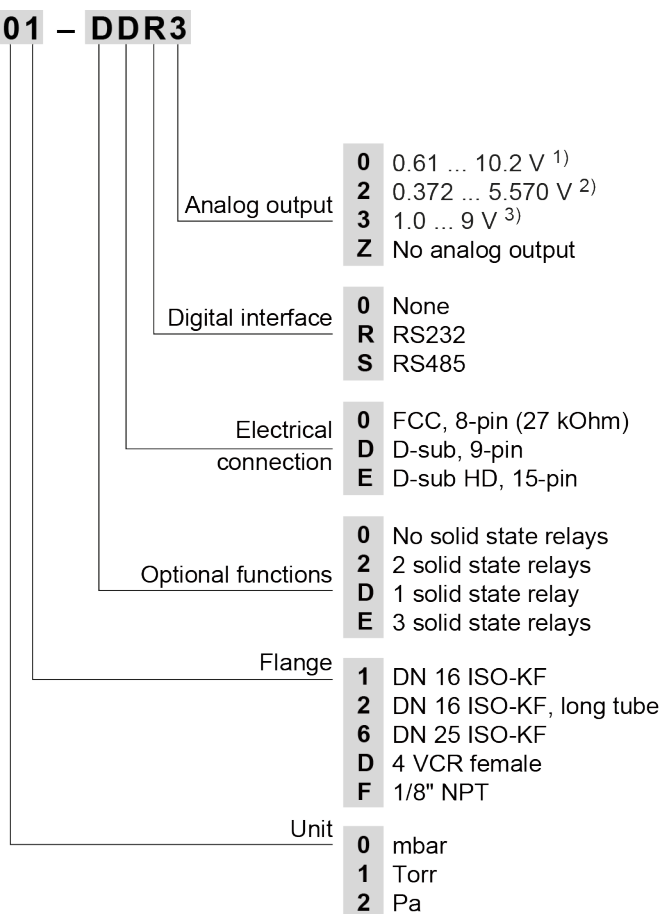
In all communications with INFICON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

|                             |                                                                                    |
|-----------------------------|------------------------------------------------------------------------------------|
| INFICON AG, LI-9496 Balzers |                                                                                    |
| Model: .....                |  |
| PN: .....                   |                                                                                    |
| SN: .....                   |                                                                                    |
| Supply: ..... VDC ..... mW  |                                                                                    |

## Validity

This document applies to products with the following part numbers:

### 3PPM – 001 – DDR3



<sup>1)</sup> INFICON PCG55x / PSG55x, Leybold TTR 101N

<sup>2)</sup> GP / MKS 275

<sup>3)</sup> MKS 910 / 925 / 901P

The part number (PN) can be taken from the product nameplate.

If not indicated otherwise in the legends, the illustrations in this document correspond to gauge with part number 3PPM-001-DDR3. They apply to the other gauges by analogy.

## Intended Use

The MEMS Pirani & Piezo Diaphragm Gauge PPG550 has been designed for vacuum measurement of gases in the pressure range of  $1 \times 10^{-6}$  ... 1333 mbar. It must not be used for measuring flammable or combustible gases in mixtures containing oxidants (e.g. atmospheric oxygen) within the explosion range.

## Functional Principle

The PPG gauge is a combination gauge consisting of a MEMS Pirani sensor and a MEMS Piezo diaphragm sensor. Both sensors are constantly active.

At low pressures, only the signal of the MEMS Pirani sensor is used for pressure measurement; at high pressures, only the signal of the MEMS Piezo diaphragm sensor. To determine the output signal in the intermediate range, both signals are used proportionally to the pressure.

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For cross-references within this document, the symbol (→  XY) is used, for cross-references to further documents and data sources, the symbol (→  [Z]).

# 1 Safety

## 1.1 Symbols Used



### DANGER

Information on preventing any kind of physical injury.



### WARNING

Information on preventing extensive equipment and environmental damage.



### Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.



Notice

## 1.2 Personnel Qualifications



### Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

## 1.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.  
Consider possible reactions between the materials (→ 7) and the process media.  
Consider possible reactions of the process media (e.g. explosion) due to the heat generated by the product.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

## 1.4 Liability and Warranty

INFICON assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

The end-user assumes the responsibility in conjunction with the process media used.

Gauge failures due to contamination are not covered by the warranty.

## 2 Technical Data

|                       |                                                                                                                                                                                                                                                                                                                      |                                                                                            |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Measurement principle | Pressure range                                                                                                                                                                                                                                                                                                       |                                                                                            |
|                       | 2 ... 1333 mbar                                                                                                                                                                                                                                                                                                      | MEMS Piezo resistive diaphragm                                                             |
|                       | 1.5 ... 2 mbar                                                                                                                                                                                                                                                                                                       | crossover range                                                                            |
|                       | $1 \times 10^{-6}$ ... 1.5 mbar                                                                                                                                                                                                                                                                                      | MEMS Pirani thermal conductivity                                                           |
| Measuring range       | Range (N <sub>2</sub> )                                                                                                                                                                                                                                                                                              | $1 \times 10^{-6}$ ... 1333 mbar                                                           |
|                       | Accuracy <sup>1)</sup>                                                                                                                                                                                                                                                                                               |                                                                                            |
|                       | 1100 ... 1333 mbar                                                                                                                                                                                                                                                                                                   | 0.5% of reading                                                                            |
|                       | 800 ... 1099 mbar                                                                                                                                                                                                                                                                                                    | 0.25% of reading                                                                           |
|                       | 100 ... 800 mbar                                                                                                                                                                                                                                                                                                     | 0.5% of reading                                                                            |
|                       | 2 ... 99.9 mbar                                                                                                                                                                                                                                                                                                      | 1% of reading                                                                              |
|                       | $1 \times 10^{-4}$ ... 1.99 mbar                                                                                                                                                                                                                                                                                     | 5% of reading                                                                              |
|                       | $1 \times 10^{-5}$ ... $9.99 \times 10^{-5}$ mbar                                                                                                                                                                                                                                                                    | 25% of reading                                                                             |
|                       | Hysteresis                                                                                                                                                                                                                                                                                                           |                                                                                            |
|                       | 10 ... 1333 mbar                                                                                                                                                                                                                                                                                                     | 0.1% of reading                                                                            |
|                       | $1 \times 10^{-3}$ ... 10 mbar                                                                                                                                                                                                                                                                                       | 1% of reading                                                                              |
|                       | Analog output resolution                                                                                                                                                                                                                                                                                             | 16 bit (150 $\mu$ V)                                                                       |
| Solid state relay     | Analog output update rate                                                                                                                                                                                                                                                                                            | 124 Hz                                                                                     |
|                       | Response time (ISO 19685:2017)                                                                                                                                                                                                                                                                                       | <20 ms                                                                                     |
|                       | Temperature compensation                                                                                                                                                                                                                                                                                             | +10 ... +50 °C                                                                             |
|                       | Temperature measurement absolute accuracy                                                                                                                                                                                                                                                                            | $\pm 1.5$ °C (0 ... +80 °C)                                                                |
|                       | Gas type dependence                                                                                                                                                                                                                                                                                                  | →  13 |
|                       | Set point range                                                                                                                                                                                                                                                                                                      | $5 \times 10^{-6}$ ... 1333 mbar                                                           |
|                       | Contact rating                                                                                                                                                                                                                                                                                                       | 50 V, 100 mA <sub>rms</sub> / mA (dc)                                                      |
|                       | Contact on resistance                                                                                                                                                                                                                                                                                                | <35 $\Omega$                                                                               |
|                       | Contact endurance                                                                                                                                                                                                                                                                                                    | Unlimited (no mechanical wear)                                                             |
|                       |  Do not exceed maximum load rating of 250 mA, 50 V (dc) / V (ac) 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. |                                                                                            |
| Analog output         | 3PPM-xxx-xxx0                                                                                                                                                                                                                                                                                                        | 0.61 ... 10.2 V                                                                            |
|                       | 3PPM-xxx-xxx2                                                                                                                                                                                                                                                                                                        | 0.375 ... 5.570 V                                                                          |
|                       | 3PPM-xxx-xxx3                                                                                                                                                                                                                                                                                                        | 1.0 ... 9 V                                                                                |
|                       | 3PPM-xxx-xxxZ                                                                                                                                                                                                                                                                                                        | no analog signal                                                                           |
|                       | Error signal                                                                                                                                                                                                                                                                                                         | →  13 |

<sup>1)</sup> Accuracy and repeatability specifications are typical values measured at ambient temperature in Nitrogen atmosphere after zero adjustment.

## Power supply



### DANGER

The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded extra-low voltage (PELV) according to EN 60204-1. The connection to the gauge has to be fused).

|                                             |                                                     |
|---------------------------------------------|-----------------------------------------------------|
| Supply voltage at the gauge                 | +12 ... +30 V (dc)<br>ripple max. 1 V <sub>pp</sub> |
| Power consumption                           | ≤350 mW                                             |
| Internal fuse                               | 100 mA (thermal recoverable)                        |
| Reverse polarity and overvoltage protection | yes                                                 |

## Sensor cable connection

|                       |                                           |
|-----------------------|-------------------------------------------|
| Electrical connection | FCC 68, 8-pin                             |
| 3PPM-0xx-x0xx         | D-sub, 9-pin, male                        |
| 3PPM-0xx-xDxx         | D-sub HD, 15-pin, male                    |
| 3PPM-0xx-xExx         | shielded, 0.14 mm <sup>2</sup> /conductor |
| Sensor cable          | ≤100 m                                    |
| Cable length          | ≤15 m                                     |
| RS232C operation      | ≤1200 m                                   |
| RS485 operation       |                                           |

## RS232C/RS485 interface

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
| Data rate   | 9600 Baud (default)                                                    |
| Data format | binary<br>8 data bits<br>one stop bit<br>no parity bit<br>no handshake |

For further information on the RS232C / RS485 interface →  15

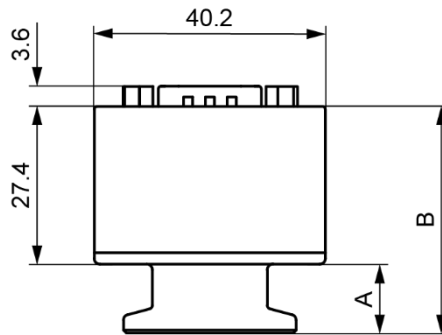
## Materials used

|                             |                                                                                                                                                          |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Materials exposed to vacuum |                                                                                                                                                          |
| Housing                     | SS 1.4307, AISI 304L, Al 6061                                                                                                                            |
| Flange                      | SS 1.4307, AISI 304L                                                                                                                                     |
| Further parts               | AISI 304L, Kovar, glass, silicon, nickel, Al, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , gold, FPM, low out-gassing epoxy resin, solder, RO4305 |
| Pressure max.               | 10 bar (absolute)                                                                                                                                        |

## Ambiance

|                                                                   |                                       |
|-------------------------------------------------------------------|---------------------------------------|
| Admissible temperatures                                           |                                       |
| Storage                                                           | -40 ... +120 °C                       |
| Operation                                                         | -20 ... +50 °C                        |
| Bakeout                                                           | +120 °C (non operating)               |
| Relative humidity (IEC 68-2-38)<br>(year's mean / during 60 days) | 98%, non-condensing                   |
| Use                                                               | indoors only<br>altitude up to 2000 m |
| Mounting orientation                                              | any                                   |
| Degree of protection                                              | IP 40                                 |

## Dimensions [mm]



|                         | A<br>[mm] | B<br>[mm] |
|-------------------------|-----------|-----------|
| DN 16 ISO-KF            | 12        | 39.4      |
| DN 16 ISO-KF, long tube | 29        | 56.4      |
| DN 25 ISO-KF            | 12        | 39.4      |
| 4 VCR female            | 37.5      | 64.9      |
| 1/8" NPT                | 37.0      | 64.4      |

## Weight

|                         |        |
|-------------------------|--------|
| DN 16 ISO-KF            | ≈136 g |
| DN 16 ISO-KF, long tube | ≈154 g |
| DN 25 ISO-KF            | ≈155 g |
| 4 VCR female            | ≈158 g |
| 1/8" NPT                | ≈139 g |

## 2.1 Output Signal vs. Pressure (1.0 ... 9 V)

1V (dc) / decade (MKS 901P/925/910)

Unit Torr: 1.00 ... 8.95 V (dc)

Unit Pa and mbar: 1.12 ... 9.08 V (dc)

## 2.2 Output Signal vs. Pressure (0.372 ... 5.75 V)

0.372 ... 5.75 V (dc) (MKS GP275)

## 2.3 Output Signal vs. Pressure (0.61 ... 10.2 V)

$$p = 10^{0.778(U-c)} \Leftrightarrow U = c + 1.286 \log_{10} p$$

valid in the range  $5 \times 10^{-5} \text{ mbar} < p < 1333 \text{ mbar}$

| U   | p      | c     | U   | p       | c     |
|-----|--------|-------|-----|---------|-------|
| [V] | [mbar] | 6.143 | [V] | [mTorr] | 2.448 |
| [V] | [μbar] | 2.287 | [V] | [Pa]    | 3.572 |
| [V] | [Torr] | 6.304 | [V] | [kPa]   | 7.429 |

where  
 p pressure  
 U output signal  
 c constant (pressure unit dependent)

## 2.4 Other Analog Output Options

Configuration and list of analog output options → 17.



## 3 Installation



### DANGER

Leaking process media

High-intensity mechanical, chemical or thermal impacts can cause leaks in the measuring sensor. Process media can thus leak and possibly cause hazards, if overpressure is in the vacuum system.

- Avoid high-intensity mechanical, chemical or thermal impacts and overpressure in the vacuum system.
- Take appropriate measures (e.g. shut off gas supply, extraction, leak test) to avoid hazards or damage due to leaking process media.

### 3.1 Vacuum Connection



### DANGER

Overpressure in the vacuum system >1 bar

Injury caused by released parts and harm caused by escaping process gases can result if clamps are opened while the vacuum system is pressurized.

Do not open any clamps while the vacuum system is pressurized. Use the type of clamps which are suited to overpressure.



### DANGER

Overpressure in the vacuum system >2.5 bar

KF flange connections with elastomer seals (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.

Use O-rings provided with an outer centering ring.



### DANGER

The gauge must be electrically connected to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:

- VCR and NPT connections fulfill this requirement
- For gauges with a KF vacuum connection, use a conductive metallic clamping ring.



### Caution

Vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.


**Caution**



**Dirt sensitive area**

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

 Mount the gauge so that no vibrations occur. The gauge may be mounted in any orientation. To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position and consider using a seal with centering ring and filter. If adjustment should be possible after the gauge has been installed, be sure to install it so that the buttons can be accessed with a pin.

## Procedure

Remove the protective lid and connect the product to the vacuum system.



Keep the protective lid.

## 3.2 Power Connection

 Make sure the vacuum connection is properly made.


**DANGER**



The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded extra-low voltage (PELV) according to EN 60204-1. The connection to the gauge has to be fused.

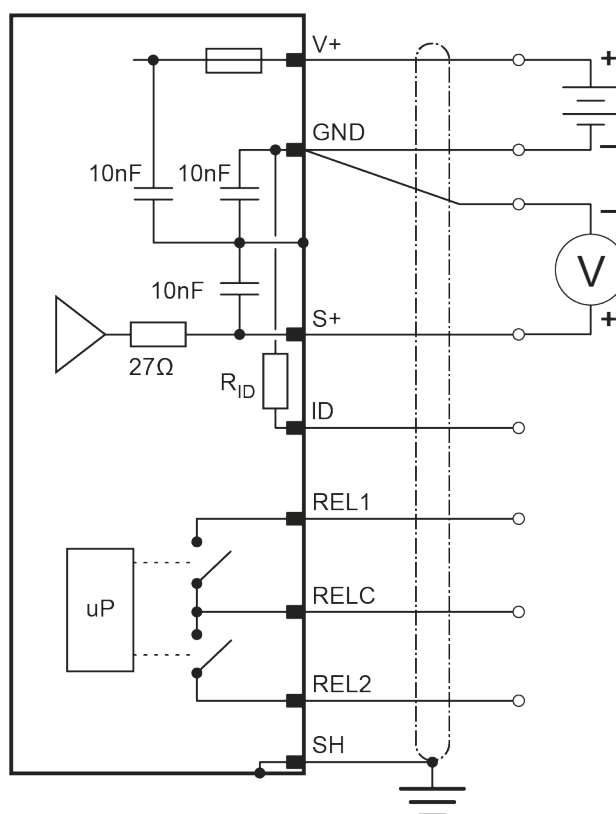
 Ground loops, differences of potential, or EMC problems may affect the measurement signal. For optimum signal quality, please do observe the following notes:

- Connect the cable shield to ground on one side via the connector housing. Do not connect the other side of the shield.
- Connect the supply common with protective ground directly at the power supply.
- Use differential measurement input (signal common and supply common conducted separately).
- Potential difference between supply common and housing  $\leq 18$  V (overvoltage protection).

 Do not exceed maximum load rating of 250 mA, 50 V (dc) / V (ac) 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.

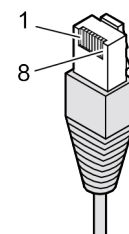
### 3.2.1 FCC 68 Connector

If no sensor cable is available, make one according to the following diagram.  
Connect the sensor cable.



#### Pin assignment

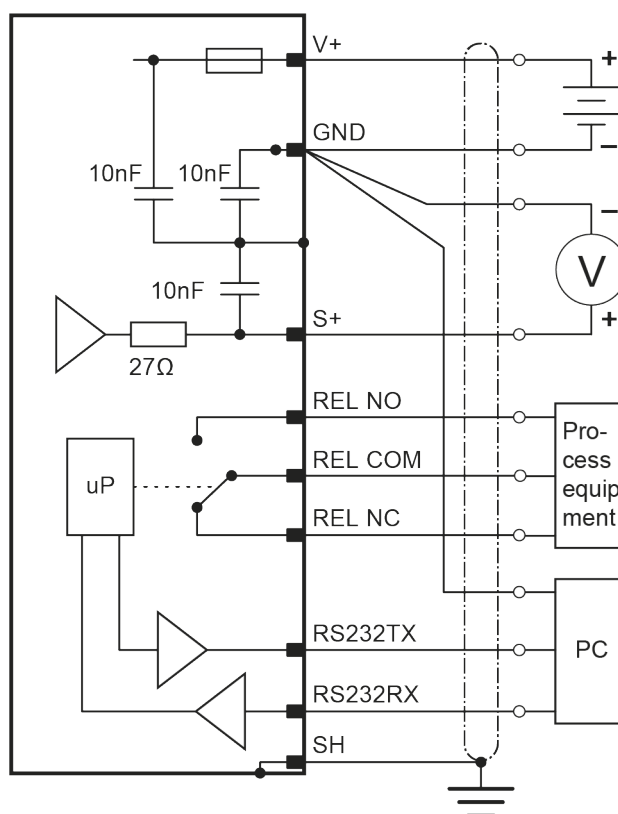
| Pin | Symbol | Description                     |
|-----|--------|---------------------------------|
| 1   | V+     | Supply voltage 12 ... 30 V (dc) |
| 2   | GND    | Supply common, GND              |
| 3   | S+     | Measurement signal              |
| 4   | ID     | Gauge identification            |
| 5   | GND    | Signal common                   |
| 6   | REL2   | Relay SP2, closing contact      |
| 7   | REL1   | Relay SP1, closing contact      |
| 8   | RELC   | Relay 1 and 2 common            |



FCC 68  
8-pin  
connector

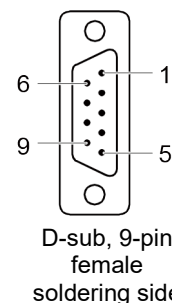
### 3.2.2 D-sub Connector

If no sensor cable is available, make one according to the following diagram.  
Connect the sensor cable.



9-pin

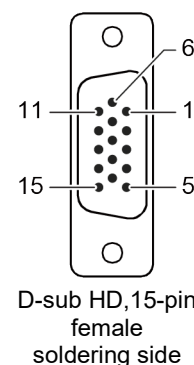
| Pin | Symbol   | Description                              |
|-----|----------|------------------------------------------|
| 1   | REL NO   | Relay 1 NO (normally open contact) (*)   |
| 2   | REL NC   | Relay 1 NC (normally closed contact) (*) |
| 3   | V+       | Supply voltage 12 ... 30 V (dc)          |
| 4   | GND      | Supply common                            |
| 5   | S+       | Measurement signal                       |
| 6   | REL COM  | Relay 1 Common (*)                       |
| 7   | RS232TX  | RS232 Transmit / RS485 (-)               |
| 8   | GND      | Signal common                            |
| 9   | RS-232RX | RS232 Receive / RS485 (+)                |



(\*) Optional relay

15-pin HD

| Pin | Symbol   | Description                              |
|-----|----------|------------------------------------------|
| 1   | RS232TX  | RS232 Transmit / RS485 (-)               |
| 2   | RS-232RX | RS232 Receive / RS485 (+)                |
| 3   | V+       | Supply voltage 12 ... 30 V (dc)          |
| 4   | GND      | Supply common                            |
| 5   | S+       | Measurement signal                       |
| 6   | GND      | Signal common                            |
| 7   | REL NO   | Relay 1 NO (normally open contact) (*)   |
| 8   | REL COM  | Relay 1 Common (*)                       |
| 9   | REL NC   | Relay 1 NC (normally closed contact) (*) |
| 10  | REL NC   | Relay 2 NC (normally closed contact) (*) |
| 11  | REL COM  | Relay 2 Common (*)                       |
| 12  | REL NO   | Relay 2 NO (normally open contact) (*)   |
| 13  | REL NC   | Relay 3 NC (normally closed contact) (*) |
| 14  | REL COM  | Relay 3 Common (*)                       |
| 15  | REL NO   | Relay 3 NO (normally open contact) (*)   |



(\*) Optional relay

## 4 Operation

When the supply voltage is applied, the measurement signal is available at the connector.

Allow a stabilization period of at least 1 minute. It is advisable to operate the gauge continuously, irrespective of the pressure.

The gauge is factory calibrated. Due to long time operation or contamination, a zero drift could occur. Periodically check the zero and adjust it if necessary. In addition, we recommend performing a zero and ATM calibration after each reinstallation (adjusting the gauge → 23).

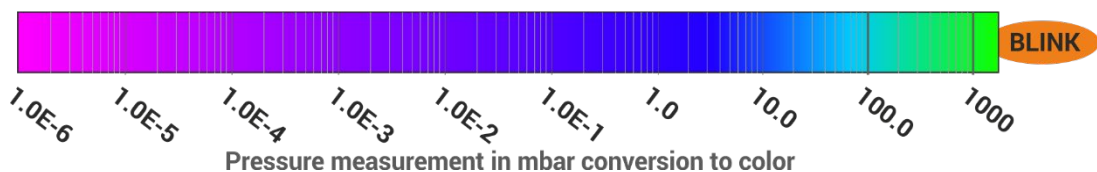
Status LED



|                                                |                                                                                   |                                                 |
|------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------|
| Startup sequence                               |  | 0.5 sec purple followed by 4 sec. pulsing green |
| Normal standard operation                      |  | Solid green                                     |
| Overpressure indication (in Dynamic Mode only) |  | Flashing Orange (5 Hz)                          |
| Sensor fail stage                              |  | Flashing red (5 Hz)                             |

LED for pressure indication (Dynamic mode)

A multi-color LED indicates the measured pressure by changing the color. The dynamic LED can be enabled via the digital interface. Refer to page 19 for LED configuration.



Gas type dependence

| Pressure range                  | Measurement principle                    | Gas type dependence                             |
|---------------------------------|------------------------------------------|-------------------------------------------------|
| 2 ... 1333 mbar                 | MEMS Piezo sensor                        | independent of gas type, no correction required |
| 1.5 ... 2 mbar                  | MEMS Piezo sensor and MEMS Pirani sensor | crossover range                                 |
| $1 \times 10^{-6}$ ... 1.5 mbar | MEMS Pirani sensor                       | proportional to pressure <sup>2)</sup>          |

<sup>2)</sup> The pressure reading applies to N<sub>2</sub>. For other gases, it has to be converted.

## 4.1 Switching Functions SP1, SP2, SP3

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

The switching functions can be set to any pressure within the measurement range of the gauge. A solid state relay is provided for each switching function.

The current threshold setting

- is output at the measurement signal output instead of the pressure signal and can be measured with a voltmeter
- can be read / written via the RS232 or RS 485 interface.

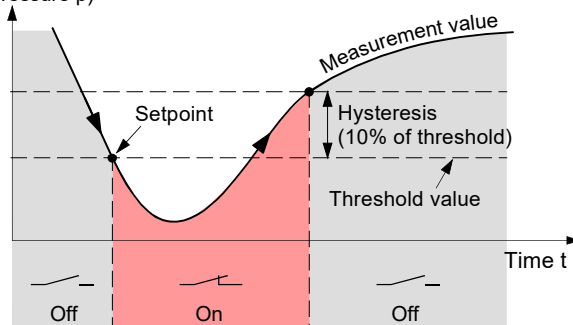
Source for setpoint, switching characteristics and hysteresis

### Low Trip Point (default)

The source for setpoint (pressure or temperature), the switching characteristics and the hysteresis of each set point can be programmed (→ 22).

If the pressure or the temperature in the vacuum system is lower than the setpoint, the corresponding LED is lit solid and the corresponding relay is closed.

Measurement signal  
(Pressure p)



The setpoints are factory disabled and therefore do not switch (enable setpoints (→ 22)).

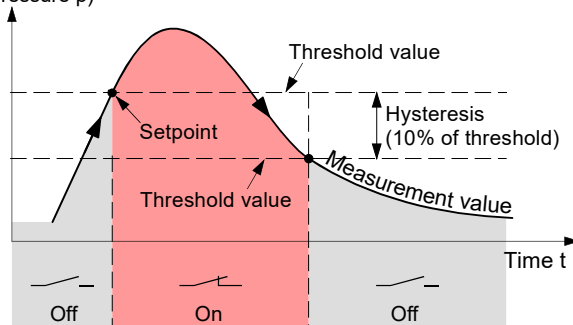


If the temperature measurement is selected as the source, the automatically calculated hysteresis values will be  $-1\text{ }^{\circ}\text{C} / +1\text{ }^{\circ}\text{C}$  instead of  $-10\% / +10\%$ .

### High Trip Point

If the pressure or the temperature in the vacuum system is higher than the setpoint, the corresponding LED is lit solid and the corresponding relay is closed.

Measurement signal  
(Pressure p)



The setpoints are factory disabled and therefore do not switch (enable setpoints (→ 22)).



If the temperature measurement is selected as the source, the automatically calculated hysteresis values will be  $-1\text{ }^{\circ}\text{C} / +1\text{ }^{\circ}\text{C}$  instead of  $-10\% / +10\%$ .

## 4.2 RS232 / RS485 Interface

The built-in RS232 / RS485 interface allows transmission of digital measurement data and instrument conditions as well as the setting of instrument parameters.

Communication is based on an ASCII protocol that includes a start character, device address, command or query and an end character for termination.



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.

For multiple parameter commands or queries each parameter is separated by a comma (ASCII: 2C Hex).

**@<device address><command or query><? or !><parameter(s)>\**

|                  |                             |
|------------------|-----------------------------|
| Start character: | <b>@</b>                    |
| Device Address:  | <b>001-253</b>              |
| Command:         | <b>see List of Commands</b> |
| Query or set:    | <b>? or !</b>               |
| Parameter(s):    | <b>parameter(s)</b>         |
| End character:   | <b>\</b>                    |

Example of sending a single parameter query to the transducer

Query pressure from MEMS Pirani sensor:

Send: **@254P?MP\**  
Reply: **@ACK1.23E-5\**

Example of sending a multi parameter 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\**

## 4.2.1 List of Commands

| Command | Description                          | Query | Set | Valid input parameter                                                                               | Page |
|---------|--------------------------------------|-------|-----|-----------------------------------------------------------------------------------------------------|------|
| ADR     | Device address                       | •     | •   | 1-3 digits (range 001-253)                                                                          | 16   |
| AOUT    | Analog output configuration          | •     | •   | <STD / 0-99>                                                                                        | 17   |
| AO      | Linear analog output                 | •     | •   | <Output1&2>, <LOW PRESSURE VALUE>, <HIGH PRESSURE VALUE>, <LOW VOLTAGE VALUE>, <HIGH VOLTAGE VALUE> | 18   |
| BAUD    | Set baud rate                        | •     | •   | <4800 / 9600 / 19200 / 38400 / 57600 / 115200> (default 9600)                                       | 19   |
| BTN     | Enable/disable push-button           | •     | •   | <ON>, <OFF>                                                                                         | 19   |
| FAIL    | Sensor failure handling              | •     | •   | <WORKING / ZERO >                                                                                   | 19   |
| FD      | Factory default                      | •     | •   | <ADR / BAUD / GT / SP / U / (NONE)>                                                                 | 24   |
| FS      | Pirani / Piezo full-scale adjustment | •     | •   | <PRESSURE VALUE / CLEAR>                                                                            | 23   |
| FV      | Firmware version                     | •     | -   |                                                                                                     | 23   |
| GT      | Gas type                             | •     | •   | <NITROGEN / HELIUM / ARGON / AIR>                                                                   |      |
| LED     | LED behavior                         | •     | •   | <SOLID>, <DYNAMIC>, <ANALOG>                                                                        | 19   |
| MF      | Manufacturer                         | •     | -   |                                                                                                     |      |
| MD      | Model name                           | •     | -   |                                                                                                     |      |
| P       | Pressure measurement                 | •     |     | <CMB / MP / PZ / (none)>                                                                            | 19   |
| PN      | Part number                          | •     | -   |                                                                                                     | 23   |
| Q       | Quick query                          | •     | •   | <PZ>, <PIR>, <CMB5>, <TMP>, <SP>                                                                    | 20   |
| SN      | Serial number                        | •     | -   |                                                                                                     | 23   |
| SP      | Setpoint settings                    | •     | -   |                                                                                                     | 22   |
| SPD     | Setpoint direction <sup>1)</sup>     | •     | •   | <SETPOINT #>, <ABOVE / BELOW>                                                                       | 22   |
| SPE     | Setpoint enable <sup>1)</sup>        | •     | •   | <SETPOINT #>, <OFF / ON>                                                                            | 22   |
| SPH     | Setpoint hysteresis <sup>1)</sup>    | •     | •   | <SETPOINT #>, <PRESSURE VALUE>                                                                      | 22   |
| SPV     | Setpoint value <sup>1)</sup>         | •     | •   | <SETPOINT #>, <PRESSURE VALUE>                                                                      | 22   |
| SPR     | Setpoint relay status <sup>1)</sup>  | •     |     | <SETPOINT #>                                                                                        | 22   |
| SPS     | Setpoint source <sup>1)</sup>        | •     | •   | <SETPOINT #>, <P / T>                                                                               | 22   |
| STAT    | Statistics                           | •     | •   | <P / T / (none) / CLEAR (Set only)>                                                                 | 21   |
| T       | Vacuum sensor temperature            | •     | -   |                                                                                                     | 20   |
| U       | Pressure unit                        | •     | •   | (<PARAMETER>), <MBAR / PASCAL / TORR> or <CELSIUS / FAHRENHEIT / KELVIN>                            | 20   |
| VAC     | Pirani Zero adjustment               | •     | •   | No input or <PRESSURE VALUE>                                                                        | 23   |

<sup>1)</sup> Setpoint solid-state relay is optional and is not relevant for all part numbers.



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.

### 4.2.1.1 ADR - Address Device

The sensor 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 PPG550 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 PPG550 at once. The sensor 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.

### 4.2.1.2 AOUT – Analog Output

PPG550 will be delivered with ordered analog output, however, the analog output can be configured to emulate a collection of other equipment via the AOUT command:

|        | Vendor                 | Transducer model               | Output                           |
|--------|------------------------|--------------------------------|----------------------------------|
| LINEAR | INFICON                | -                              | Programmable linear              |
| 0      | MKS                    | 901P, 910, 925                 | 1 V (dc)/decade (1 ... 9 V (dc)) |
| 1      | Edwards                | APG-L                          | 1.99 ... 10 V (dc)               |
| 2      | Edwards                | APG-100                        | 2.00 ... 9.00 V (dc)             |
| 3      | Edwards                | WRG                            | 2.75 ... 10.00 V (dc)            |
| 4      | INFICON<br>Leybold     | PSG500<br>TTR91                | 1.547 ... 10.00 V (dc)           |
| 5      | INFICON<br>Pfeiffer    | MPG400<br>PKR251               | 2.07 ... 8.603 V (dc)            |
| 6      | INFICON<br>MKS         | BPG400<br>999 Quattro          | 1.843 ... 10.00 V (dc)           |
| 7      | MKS Granville Phillips | 275                            | 0.372 ... 5.570 V (dc)           |
| 8      | MKS HPS                | Moducell 325                   | 0.2509 ... 3.2398 V (dc)         |
| 9      | MKS HPS                | Moducell 325 x3                | 0.753 ... 9.719 V (dc)           |
| 10     | MKS                    | Baratron® 0.1 Torr             | 0 ... 10.00 V (dc)               |
| 11     | MKS                    | Baratron® 1 Torr               | 0 ... 10.00 V (dc)               |
| 12     | MKS                    | Baratron® 10 Torr              | 0 ... 10.00 V (dc)               |
| 13     | MKS                    | Baratron® 100 Torr             | 0 ... 10.00 V (dc)               |
| 14     | MKS                    | Baratron® 1000 Torr            | 0 ... 10.00 V (dc)               |
| 15     | MKS                    | 901P piezo differential output | 1 V (dc)/decade                  |
| 16     | Edwards                | AIM-S / - SL                   | 2.5 ... 10.00 V (dc)             |
| 17     | Edwards                | AIM-X / XL                     | 3.286 ... 9.799 V (dc)           |
| 18     | Pfeiffer               | IKR251                         | 2.324 ... 8.500 V (dc)           |
| 19     | Pfeiffer               | TPR 265 / 280                  | 2.199 ... 8.625 V (dc)           |
| 20     | Hastings               | HPM-2002-OBE special           | 5.00 ... 9.995 V (dc)            |
| 21     | Edwards                | DV6M                           | 2.00 ... 10.00 V (dc)            |
| 22     | Edwards                | APG-M                          | 2.00 ... 10.00 V (dc)            |
| 23     | MKS Granville Phillips | GP275 (0-9.0 VDC)              | 0 ... 8.80 V (dc)                |
| 24     | Thyracont              | MT 241.1                       | 0.41 ... 9.99 V (dc)             |
| 25     | MKS Granville Phillips | (0-375.6VDC)                   | 0.375 ... 5.614 V (dc)           |
| 26     | Edwards                | APG100-LC                      | 2.00 ... 10.00 V (dc)            |
| 27     | Edwards                | APG100M                        | 2.00 ... 10.00 V (dc)            |
| 28     | MKS                    | 907                            | 0.387 ... 5.666 V (dc)           |
| 29     | Alcatel                | K6080                          | 0.40 ... 10.00 V (dc)            |
| 30     | INFICON                | PEG100                         | 2.186 ... 10.166 V (dc)          |
| 31     | Varian                 | Eysys                          | 1.00 ... 8.00 V (dc)             |
| 32     | Alcatel                | TA111                          | 0.10 ... 9.20 V (dc)             |
| 33     | MKS                    | 685                            | 1.00 ... 7.00 V (dc)             |
| 34     | MKS                    | 901P special 2VDC/decade       | 1.00 ... 9.00 V (dc)             |
| 35     | Pfeiffer               | TTR 101                        | 0.61 ... 10.2 V (dc)             |
| 50     | MKS/INFICON            | 0.1 mbar F.S. (linear)         | 0 ... 10.00 V (dc)               |
| 51     | MKS/INFICON            | 1 mbar F.S. (linear)           | 0 ... 10.00 V (dc)               |
| 52     | MKS/INFICON            | 2 mbar F.S. (linear)           | 0 ... 10.00 V (dc)               |
| 53     | MKS/INFICON            | 5 mbar F.S. (linear)           | 0 ... 10.00 V (dc)               |

|    |             |                         |                    |
|----|-------------|-------------------------|--------------------|
| 54 | MKS/INFICON | 10 mbar F.S. (linear)   | 0 ... 10.00 V (dc) |
| 55 | MKS/INFICON | 20 mbar F.S. (linear)   | 0 ... 10.00 V (dc) |
| 56 | MKS/INFICON | 50 mbar F.S. (linear)   | 0 ... 10.00 V (dc) |
| 57 | MKS/INFICON | 100 mbar F.S. (linear)  | 0 ... 10.00 V (dc) |
| 58 | MKS/INFICON | 200 mbar F.S. (linear)  | 0 ... 10.00 V (dc) |
| 59 | MKS/INFICON | 500 mbar F.S. (linear)  | 0 ... 10.00 V (dc) |
| 60 | MKS/INFICON | 1000 mbar F.S. (linear) | 0 ... 10.00 V (dc) |
| 61 | MKS/INFICON | 1100 mbar F.S. (linear) | 0 ... 10.00 V (dc) |

#### Example

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

Send: **@254AOUT!10\**

Reply: **@253ACK10\**

The PPG50 is available with a hardware optional secondary analog output. The output can be configured to the same output curves as the primary analog output.

#### Example

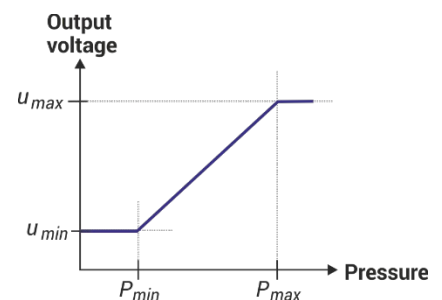
Change the Analog output emulation to Pfeiffer TTR 101 analog output:

Send: **@254AOUT!2,35\**

Reply: **@253ACK2,35\**

### 4.2.1.3 AO – Linear Analog Output

When selecting Aout to "Linear" the analog output configuration can be user configured to any linear scaling within the PPG550 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.

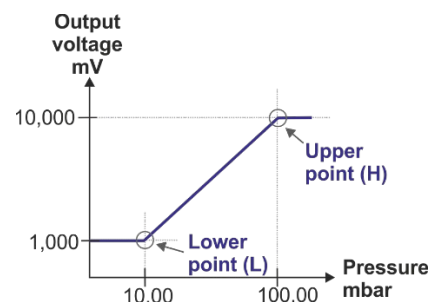
Command syntax: **AO!<Output1&2>, <LOW PRESSURE VALUE>,<HIGH PRESSURE VALUE>,<LOW VOLTAGE VALUE>,<HIGH VOLTAGE VALUE>**

#### Example

Configure the analog 1 output linear expression between 1 V (dc) @ 10 mbar and 10 V (dc) @ 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\**



#### 4.2.1.4 BAUD – Baud Rate

The PPG550 supports the following baud rates: 4800, 9600, 19000, 38400, 57600, 115200. Note that whenever the baud rate is changed, the PPG550 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 115200:

Send: **@254BAUD!115200\**

Reply: **@253ACK115200\**

#### 4.2.1.5 BTN – Button Enable

Enable or disable the feature to perform Pirani zero-adjustments via the PPG550 push-button.

##### Example

Disable the push-button:

Send: **@254BTN!OFF\**

Reply: **@253ACKOFF\**

#### 4.2.1.6 LED – LED Behavior

The PPG550's LED can be programmed to work in three different ways during normal operation. See "Status LED" section for more details.

| Parameter | Description                                               |
|-----------|-----------------------------------------------------------|
| SOLID     | The LED is solid green. (Factory default)                 |
| DYNAMIC   | The LED changes color to reflect the measured pressure.   |
| ANALOG    | The LED changes color to reflect the 0-10V analog output. |

##### Example

Have the LED change color as a function of the measured pressure:

Send: **@254LED!DYNAMIC\**

Reply: **@253ACKDYNAMIC\**

#### 4.2.1.7 FAIL – Failure Handling

The PPG550 can be configured to handle sensor failure in two different ways:

- Switch the Combined Pressure output (P? or P?CMB) and Analog Output to only use the working sensor, i.e. if the Piezo sensor is malfunctioning, the combined output is only based on the Vacuum Pirani and vice versa.
- Set both the Combined Pressure output and the Analog Output to zero in case of sensor errors to signal an error condition.

| Parameter | Description                                                                   |
|-----------|-------------------------------------------------------------------------------|
| WORKING   | Base Combined Pressure output and Analog Output on working sensor only.       |
| FAIL      | Set Combined Pressure output and Analog Output to 0 in case of sensor errors. |

##### Example

Have the Combined Pressure output and Analog Output go to zero if a sensor is malfunctioning:

Send: **@254FAIL!ZERO\**

Reply: **@253ACKZERO\**

#### 4.2.1.8 P – Pressure Measurement Handling

The digital pressure measurement can be accessed using the RS-232/485 serial digital interface.

Reading the digital combined pressure value

Send: **@254P?\**

Reply: **@ACK1013.12\**

Reading the digital Piezo pressure

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

Reading the digital MEMS Pirani pressure

Send: **@254P?MP\**  
Reply: **@ACK1.23E-3\**

#### 4.2.1.9 Q – Quick Data Acquisitions

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,SP,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\**

| Parameter | Description                   |
|-----------|-------------------------------|
| PZ        | Piezo pressure measurement    |
| PIR       | Pirani pressure measurement   |
| CMB       | Combined pressure measurement |
| 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.

#### 4.2.1.10 T – Temperature Measurement

The PPG550 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  $\pm 1$  °C.

Reading the temperature

Send: **@254T?\**  
Reply: **@ACK25.22\**

#### 4.2.1.11 U – Unit

The PPG550 can be configured to three different pressure units and three different temperature units. If no explicit parameter (pressure, temperature) is defined, pressure is assumed.



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.

| Pressure unit |        |      |
|---------------|--------|------|
| mbar          | Pascal | Torr |

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

|                                        |                                                                   |
|----------------------------------------|-------------------------------------------------------------------|
| Setting pressure unit to mbar          | Send: <b>@254U!P,MBAR\</b><br>Reply: <b>@ACKMBAR\</b>             |
| Setting pressure unit to Pascal        | Send: <b>@254U!PASCAL\</b><br>Reply: <b>@ACKPASCAL\</b>           |
| Setting temperature unit to Fahrenheit | Send: <b>@254U!T,FAHRENHEIT\</b><br>Reply: <b>@ACKFAHRENHEIT\</b> |
| Reading current temperature unit       | Send: <b>@254U?T\</b><br>Reply: <b>@ACKFAHRENHEIT\</b>            |

#### 4.2.1.12 STAT – Statistics

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:<br>Send: <b>@254STAT?\</b><br>Reply: <b>@254ACKSTAT&lt;cr&gt;</b><br><b>MIN : 5.6104E+00&lt;cr&gt;</b><br><b>MAX : 1.0159E+03&lt;cr&gt;</b><br><b>HOURS : 37\</b> |
| Reading the temperature statistics | Send: <b>@254STAT?T\</b><br>Reply: <b>@254ACKSTAT&lt;cr&gt;</b><br><b>MIN : 2.345E+01&lt;cr&gt;</b><br><b>MAX : 3.123E+01&lt;cr&gt;</b><br><b>HOURS : 37\</b>                                                    |
| Clearing the statistics            | Parameter is left out, so pressure is assumed:<br>Send: <b>@254STAT!CLEAR\</b><br>Reply: <b>@254ACKCLEAR\</b>                                                                                                    |

#### 4.2.1.13 SPx – Setpoints



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.

SP - Setpoint status

**@254SP? \**

(This step is not mandatory.) Print an overview of all setpoint settings. If no setpoints have previously been defined, a PPG550 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>
\
```

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>
\
```

SPS- Setpoint source

**@254SPS!1,P \**

Assign pressure measurement as the source for Setpoint 1.

SPD - Setpoint direction

**@254SPD!1,ABOVE \**

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%.

SPV - Setpoint value

**@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%).

SPH - Setpoint hysteresis

**@254SPH!1,500 \**

Set the Hysteresis value for Setpoint 1 to 500.

SPE - Setpoint enable

**@254SPE!1,ON \**

Enable Setpoint 1.

SPR - Setpoint relay status

**@254SPR?1 \**

Get the current status of the Setpoint 1 relay.

| Parameter | 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                | –                              |

#### 4.2.1.14 SN – Serial Number

Serial number of the PPG550.

Send: **@254SN?\**

Reply: **@ACK191230123456;**

#### 4.2.1.15 PN – Part Number

Part number of the PPG550.

Send: **@254PN?\**

Reply: **@ACKPPG550-123456;**

#### 4.2.1.16 MF – Manufacturer identity

Manufacturer identity.

Send: **@254MF?\**

Reply: **@ACKINFICON;**

#### 4.2.1.17 FV– Firmware Version

Firmware version of the PPG550.

Send: **@254FV?\**

Reply: **@ACK1.00;**

#### 4.2.1.18 VAC – Pirani Zero Adjustment

Pirani zero adjustment at a pressure below 1.00E-6 mbar

Evacuate the transducer to a vacuum pressure below 1.00E-6 mbar.

Send: **@254VAC!\**

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-5 mbar:

Pirani zero adjustment at known reference pressure

Following command example will perform a zero adjustment at e.g. 5.00E-5 mbar:

Send: **@254VAC!5.00E-5\**

Reply: **@254ACK<value>\**

#### 4.2.1.19 FS – Full Scale Adjustment

Piezo sensor full-scale adjustment

Obtain the actual atmospheric pressure (e.g. 1013.1 mbar) from a reference gauge

Send: **@254FS!PZ,1013.1\**

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 ... 1100 mbar (300 ... 825 Torr).

Pirani sensor full-scale adjustment

Obtain the actual pressure (e.g. 11.2 mbar) from a reference gauge:

Send: **@254FS!MP,11.2\**

Reply: **@254ACK<value>\**

#### Pirani sensor full-scale adjustment by Piezo sensor

The Pirani sensor can also be full-scale adjusted by use of the internal Piezo sensor as reference.  
Expose the sensor flange to a Nitrogen pressure between 1 and 20 mbar.

Send: **@254FS!MP\**

Reply: **@254ACK<value>\**

#### 4.2.1.20 FD – Factory Default

This command will reset all user settings to factory default, including setpoint settings, pressure unit and user-adjustment of zero point and full-scale. If the PPG550 is delivered with a special user configuration, the factory default command will reset to the original user configuration as delivered.

Send: **@254FD\**

Reply: **@ACKFD\**

#### Factory default settings

| 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:

##### Analog output configuration

Send: **@254FD!AOC\**

Reply: **@ACKFD\**

##### Gas type

Send: **@254FD!GT\**

Reply: **@ACKFD\**

##### Device address

Send: **@254FD!ADR\**

Reply: **@ACKFD\**

##### Baud rate

Send: **@254FD!BAUD\**

Reply: **@ACKFD\**

##### Setpoints

Send: **@254FD!SP\**

Reply: **@ACKFD\**

##### Unit

Send: **@254FD!U\**

Reply: **@ACKFD\**

##### Pirani zero adjustment

Send: **@254FD!VAC\**

Reply: **@ACKFD\**



### 4.3 RS232 / RS485 MKS Compatibility

The PPG550 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:

**@<device address><command or query><? or !><parameter(s)>;FF**

|                  |                             |
|------------------|-----------------------------|
| Start character: | <b>@</b>                    |
| Device Address:  | <b>001-253</b>              |
| Command:         | <b>see List of Commands</b> |
| Query or set:    | <b>? or !</b>               |
| Parameter(s):    | <b>parameter(s)</b>         |
| End character:   | <b>;FF</b>                  |

Example of sending a command

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 gauge, e.g. mbar):

Send: **@254SP1!1.23E-4;FF**

Reply: **@ACK1.23E-4;FF**

The PPG550 supports following  
900 series commands

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

## 5 Deinstallation



### DANGER

#### Contaminated parts

Contaminated parts can be detrimental to health and environment. Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



### Caution

#### Vacuum component

Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



### Caution

#### Dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

### Procedure

- 1 Vent the vacuum system.
- 2 Put the gauge out of operation.
- 3 Disconnect the sensor cable.
- 4 Remove the gauge from the vacuum system and install the protective lid.

## 6 Maintenance, Repair



Gauge failures due to contamination are not covered by the warranty.

INFICON assumes no liability and the warranty becomes null and void if any repair work is carried out by the end-user or third parties.

### 6.1 Zero Adjustment Pirani Sensor



The zero can be adjusted via

- the button on the gauge,
- the RS232 / RS485 interface (→ 23).

For adjusting the zero, operate the gauge under the same constant ambient conditions and in the same mounting orientation as normally.

The gauge is adjusted to default values. However, it can also be adjusted to other pressure values, if the exact pressure value is known (reference measurement).

1

If you are using a seal with centering ring and filter, check that they are clean or replace them if necessary.

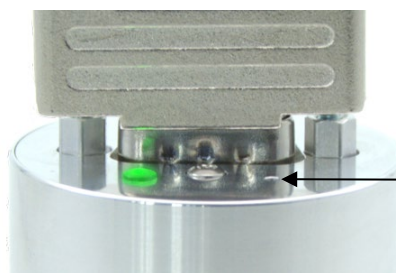
2

Evacuate the vacuum system to  $<1 \times 10^{-6}$  mbar and wait at least 2 minutes.

If the recommended pressure cannot be achieved the Pirani zero should be adjusted at a known reference pressure via the RS232 / 485 interface (→ 23).

3

Press the button with a pin (max.  $\varnothing 1.5$  mm) for 2 seconds and the zero adjustment is carried out.



Press button for 2 seconds



The LED blinks green if the zero was successful or red if the zero has failed. In the latter case repeat steps 1-3.

### 6.2 Zero Adjustment Piezo Sensor

The Piezo sensor is automatically zero-adjusted, whenever the pressure measured by the Pirani is lower than  $1 \times 10^{-2}$  mbar.

### 6.3 Full Scale Adjustment Piezo Sensor

The full scale can be adjusted via the RS232 / 485 interface (→ 23).

The command "FSIPZ" allows to adjust the full scale at a known reference pressure within the pressure range 400 ... 1100 mbar.

## 6.4 Full Scale Adjustment Pirani Sensor

The full scale can be adjusted via the RS232 / 485 interface (→ 23).

The command "FS!MP" allows to adjust the full scale

- at a known reference pressure
- by use of the internal Piezo sensor as reference

## 7 Returning the Product



### WARNING

Forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or biological hazard) can be detrimental to health and environment.

Products returned to INFICON should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination (form under "[www.inficon.com](http://www.inficon.com)").

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

## 8 Disposal


**DANGER**



Contaminated parts

Contaminated parts can be detrimental to health and environment. Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.


**WARNING**



Substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment. Dispose of such substances in accordance with the relevant local regulations.

### Separating the components

After disassembling the product, separate its components according to the following criteria:

#### Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

#### Other components

Such components must be separated according to their materials and recycled.

## EU Declaration of Conformity



We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the following directives:

- 2014/30/EU, OJ L 96/79, 29.3.2014  
(EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011  
(RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

**MEMS Pirani & Piezo Diaphragm Gauge**  
**PPG550**

Standards

Harmonized and international/national standards and specifications:

- EN 61326-1:2013; Group 1, Class B  
(EMC requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-2-3:2013  
(EMC: Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning )

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

12 July 2022

12 July 2022




Dr. Christian Riesch  
Head of Development

Marco Kern  
Product Manager

## UKCA Declaration of Conformity



We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the following regulations:

- S.I. 2016/1091  
(EMC Regulations; The Electromagnetic Compatibility Regulations 2016)
- S.I. 2012/3032  
(RoHS Regulations; The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012)

### Product

**MEMS Pirani & Piezo Diaphragm Gauge  
PPG550**

### Standards

Harmonized and international/national standards and specifications:

- EN 61326-1:2013; Group 1, Class B  
(EMC requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-2-3:2013  
(EMC: Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning )

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INFICON AG, Alte Landstraße 6, LI-9496 Balzers

12 July 2022



Dr. Christian Riesch  
Head of Development

12 July 2022



Marco Kern  
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Notes

Original: English



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