Agilent Technologies

Vacuum Products Division

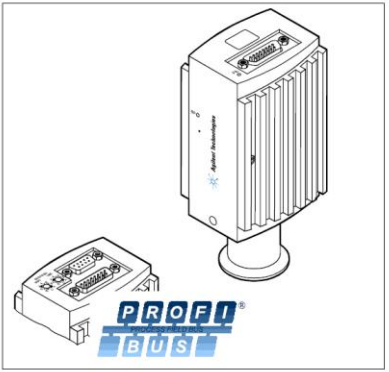
CE

Bayard-Alpert Pirani Gauge FRG-730

Short Operating Instructions

Manual No. TQMA72E1
Revision 5
March 2012

Bayard-Alpert Pirani Gauge
FRG-730



Declaration of Conformity
Konformitätserklärung
Déclaration de Conformité
Declaración de Conformidad
Verklaring de Overeenstemming
Dichiarazione di Conformità
一致性声明
適合宣言
적합성 선언

We
Wir
Nous
Nosotros
Wij
Noi
我们
私たち
우리는

Agilent Technologies

CE

Agilent Technologies
121 Hartwell Ave.
Lexington, MA 02421-3133 USA

declare under our sole responsibility that the product,
erklären, in alleiniger Verantwortung, daß dieses Produkt,
déclarons sous notre seule responsabilité que le produit,
declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilità, che il prodotto,
基于独立承担责任的原则，特声明
は、当社単独の責任の下、この宣言が該当する製品
당사의 책임하에

Bayard-Alpert Pirani Gauge FRG-730

to which this declaration relates is in conformity with the following standard(s) or other normative documents.
auf das sich diese Erklärung bezieht, mit der/den flogenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (auz) norme(s) ou au(x) document(s) normatif(s).
al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).
waamaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoodt.
a cui se riferisce questa dichiarazione è conforme alla/e sequente/l norma/o documento/l normativo/i.
符合以下标准或其它标准文档要求。
が、以下の規格またはその他の基準書類に適合することを宣言します。
이 선언과 관련한 제품이 다음의 표준과 기타 표준 문서를 준수한다는 것을 선언합니다.

- EN 61000 6 2:2005 (EMC: generic immunity standard)
- EN 61000 6 3:2001 (EMC: generic emission standard)
- EN 61010 1:2001 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326:1997 + A1:1998 + A2:2001 + A3:2003

(EMC requirements for electrical equipment for measurement, control and laboratory use)

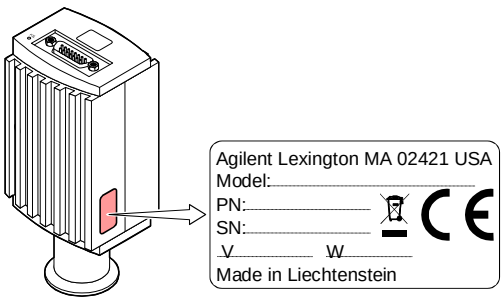
John Ehmann
Operations Manger
Agilent, Inc.
Vacuum products Division
Lexington, MA USA

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used, for cross-references to further documents, listed under literature, the symbol (→ 🕮 [Z]).

Product Identification

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



Validity

This document applies to products with part numbers

Without display and 1 switching function

FRG730KF25S	(DN 25 ISO-KF)
FRG730CF35S	(DN 40 CF-R)

With display and 1 switching function

FRG730KF25SD	(DN 25 ISO-KF)
FRG730CF35SD	(DN 40 CF-R)

With Profibus interface and 2 switching functions

FRG730KF25SP	(DN 25 ISO-KF)
FRG730CF35SP	(DN 40 CF-R)

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 the gauge with part number FRG730KF25SD. They apply to the other gauges by analogy.

We reserve the right to make technical changes without prior notice.

All dimensions in mm.

Intended Use

The FRG-730 gauge has been designed for vacuum measurement of gases in the pressure range of 5×10^{-10} … 1000 mbar.

It must not be used for measuring flammable or combustible gases in mixtures containing oxidants (e.g. atmospheric oxygen) within the explosion range.

The gauge can be operated in connection with an Agilent AGC-100 Vacuum Gauge Controller, an Agilent Turbo AG Rack Controller, or with another controller.

Functional Principle

Standard Gauge

Over the whole measuring range, the gauge has a continuous characteristic curve and its measuring signal is output as logarithm of the pressure.

The gauge functions with a Bayard-Alpert hot cathode ionization measurement system (for $p < 2.0\times10^{-2}$ mbar) and a Pirani measurement system (for $p > 5.5\times10^{-3}$ mbar). In the overlapping pressure range of 2.0×10^{-2} … 5.5×10^{-3} mbar, a mixed signal of the two measurement systems is output. The hot cathode is switched on by the Pirani measurement system only below the switching threshold of 2.4×10^{-2} mbar (to prevent filament burnout). It is switched off when the pressure exceeds 3.2×10^{-2} mbar.

FRG-730 sensors are equipped with two hot cathodes. The filaments are monitored by the gauge electronics. In case of a filament failure, the gauge will switch over to the second (undamaged) filament and continue to operate. Filament status is displayed on the gauge or can be read via the interfaces (RS232C or Profibus).

The gauge features an adjustable switching function (setpoint) (→ 🕮 [1] for full description).

Profibus Gauge

The Profibus gauge has a fieldbus interface that conforms to the Profibus DPV1 standard (→ 🕮 [5]). Two adjustable switching functions are integrated in the gauge. The corresponding relay contacts are available at the sensor cable connector.

The basic sensor and sensor electronics of the Profibus gauge are the same as in the standard FRG-730 (→ 🕮 [1], [2]).

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.

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 and the process media.

  Consider possible reactions (e.g. explosion) of the process media 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

Agilent 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 or wear and tear as well as expendable parts (e.g. filaments) are not covered by the warranty.

2 Technical Data

Measurement

Measurement range (air, O_2, CO, N_2)	5×10^{-10} … 1000 mbar continuous
Accuracy (after 10 min. stabilization)	15% of reading in the range 1×10^{-8} … 10^{-2} mbar
Repeatability (after 10 min. stabilization)	5% of reading in the range 1×10^{-8} … 10^{-2} mbar

Emission

Switching on threshold	2.4×10^{-2} mbar
Switching off threshold	3.2×10^{-2} mbar
Emission current	
$p \leq 7.2\times10^{-6}$ mbar	5 mA
7.2×10^{-6} mbar < p <3.2×10^{-2} mbar	25 µA
Emission current switching	
25 µA ⇒ 5 mA	7.2×10^{-6} mbar
5 mA ⇒ 25 µA	3.0×10^{-5} mbar

Filaments	
Number	2
Means of selection	Controlled by gauge (default) or via interfaces (→ 🕮 [1])
Settling time of measurement signal after filament change	<4s
Filament status	LED, relay contact
Emission control mode	
Automatic	Emission on/off automatically
Manual	Emission on/off by user via interfaces (→ 🕮 [1])

Degas

Current (p <7.2×10^{-6} mbar)	≈20 mA
Control input signal	0 V/+24 VDC, active high
Duration	<3 min. followed by automatic stop

In degas mode, the gauge keeps supplying pressure readings, the tolerances of which can be higher than during normal operation.
Degas acts only upon the active filament.

Output signal

Output signal (measuring signal)	0 … +10 V
Measuring range	+0.774 … +10 V (5×10^{-10} … 1000 mbar)
Voltage vs. pressure	logarithmic, 0.75 V/decade
Error signal (→ 🕮 [1])	
EEPROM error	≈+0.1 VDC
Hot cathode error	≈+0.3 VDC
Pirani error	≈+0.5 VDC
Minimum loaded impedance	10 kΩ

Identification

Gauge identification	42 kΩ between Pin 10 and Pin 5 on sensor cable connector

Switching Function

Number	
Standard gauge	1 (<SP>)
Profibus gauge	2 (<SP A, B>)
Adjustment range	1×10^{-9} … 100 mbar Setpoints adjustable via potentiometers, one floating, normally open relay contact per setpoint.
Hysteresis	10% of the threshold value
Relay contact	≤30 VDC, ≤0.5 ADC

RS232C Interface

Data rate	9600 Baud
Data format	binary, 8 data bits,1 stop bit no parity bit, no handshake
Connections	
Standard gauge	→ 🗎 21
Profibus gauge	→ 🗎 23
Further information → 🕮 [1].	

Profibus Interface
(Profibus gauges only)

Standard applied	→ 🕮 [5]
Communication protocol, Data format	→ 🕮 [2], [5]
Interface, physical	RS485
Data rate	≤12 MBaud, → 🕮 [2], [5]
Device address	00 … $7D_{hex}$ (0 … 125_{dec})
Connection	D-Sub, 9-pin, female, → 🗎 25
Cable	shielded, special Profibus cable, → 🕮 [3], [5]
Cable length, system wiring	according to Profibus specifications, → 🕮 [3], [5]

Display (part no. FRG730KF25SD and FRG730CF35SD only)

Display panel	LCD matrix, 32×16 pixels, with background light
Dimensions	17 mm × 12 mm
Pressure units	mbar (default), Torr, Pa
Changing the pressure units	via RS232C, → 🕮 [1]

Supply

GEFAHR

The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded extra low voltage (SELV). The connection to the gauge has to be fused. [1)]

Supply voltage at the gauge	+24 VDC (+20 … +28 VDC, Ripple ≤2 V_{pp}) [2)]
Power consumption	
Standard	≤0.5 A
Degas	≤0.8 A
Emission start (200 ms)	≤1.4 A
Fuse required [1)]	1.25 AT
Power consumption	
Standard gauge	≤18 W
Profibus gauge	≤18 W

1) Agilent controllers fulfill these requirements.

2) Consider the voltage drop as function of the sensor cable length.

Electrical Connection

Connection	D-Sub, 15-pin, male
Standard gauge	→ 🗎 21
Profibus gauge	→ 🗎 23
Sensor cable	shielded, number of conductors depending on the functions used
Cable length (24 VDC)	≤35 m (0.25 mm²/ conductor) ≤50 m (0.34 mm²/ conductor) ≤100 m (1.0 mm²/ conductor)
For RS232C operation	≤30 m
Grounding concept	
Standard gauge	→ 🗎 21
Profibus gauge	→ 🗎 23

Materials Exposed to Vacuum

Housing, supports, screens	stainless steel
Feedthroughs	NiFe, nickel plated
Insulator	glass
Cathode	iridium, yttrium oxide (Y_2O_3)
Cathode holder	molybdenum, platinum
Pirani element	tungsten, copper
Internal volume	
DN 25 ISO-KF	≈24 cm^3
DN 40 CF-R	≈34 cm^3
Admissible pressure max.	2 bar (absolute)

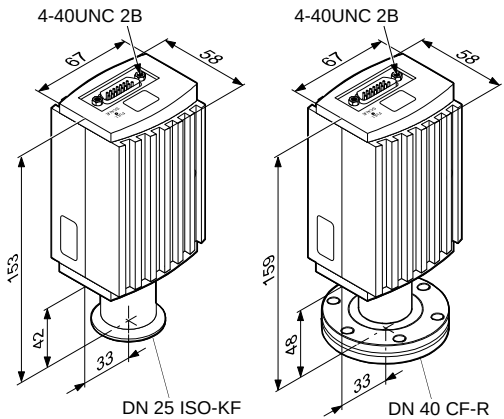
Ambient

Admissible temperatures	
Storage	–20 … +70 °C
Operation	0 … +50 °C
Bakeout	+80 °C [3]

[3] Flange temperature, horizontally mounted, without electronics.

Relative humidity	
year's mean	≤65% (no condensation)
during 60 days	≤85% (no condensation)
Use	indoors only altitude up to 2000 m NN
Mounting orientation	any
Degree of protection	IP 30

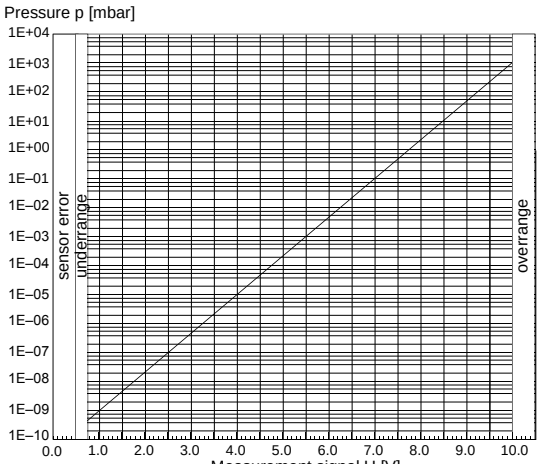
Dimensions [mm]



Weight

FRG730KF25S, FRG730KF25SD	≈450 g
FRG730CF35S, FRG730CF35SD	≈710 g
FRG730KF25SP	≈490 g
FRG730CF35SP	≈750 g

Measurement Signal vs. Pressure



$$p = 10^{(U-7.75)/0.75+c}$$

U	p	c
[V]	[mbar]	0
[V]	[Pa]	2
[V]	[Torr]	-0.125

where p pressure
U measurement signal
c constant (depending on pressure unit)

Gas Type Dependence

For gases other than air, the pressure reading in the range $p < 10^{-3}$ mbar can be converted by means of the following formula:

$$p_{eff} = C \times \text{pressure reading}$$

Gas type	Calibration factor C	Gas type	Calibration factor C
He	5.9	air, O_2, CO, N_2	1.0
Ne	4.1	H_2	2.4
Kr	0.5	Xe	0.4
Ar	0.8		

3 Installation

3.1 Vacuum Connection

DANGER

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

DANGER: line voltage

Products that are not professionally connected to ground can be extremely hazardous in the event of a fault.

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:

- CF connections fulfill this requirement.
- For gauges with KF connection, use a conductive metallic clamping ring.

Caution

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

Caution: dirt sensitive area

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

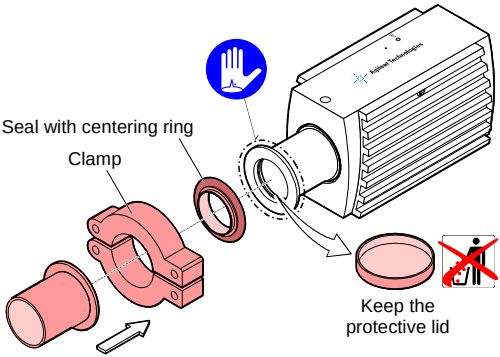
Always wear clean, lint-free gloves and use clean tools when working in this area.

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.

The gauge is supplied with a built-in grid. For potentially contaminating applications and to protect the electrodes against light and fast particles, installation of the optional baffle is recommended (→ 🕮 [1]).

Vacuum connection must be free of grease.

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

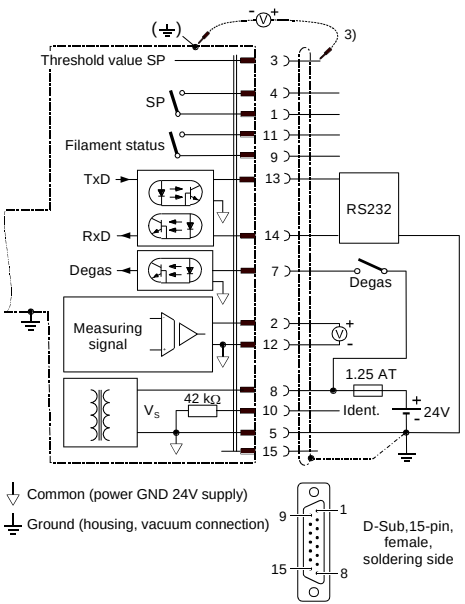


3.2 Power Connection

Make sure the vacuum connection is properly made (→ 🗎 18).

Standard Gauge

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

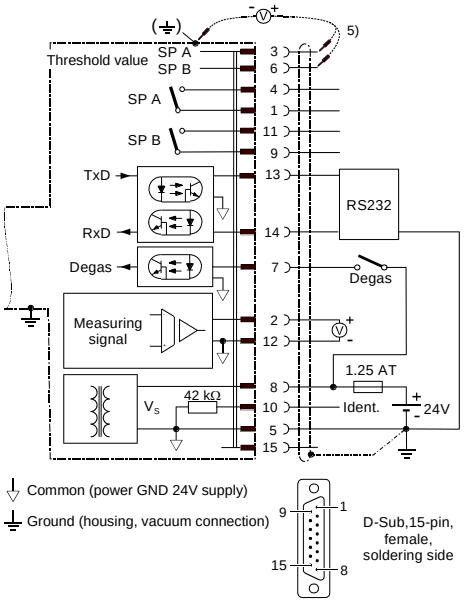


Pin	1	Relay switching function, common contact	
Pin	2	Signal output (measurement signal)	0 … +10 V
Pin	3	Threshold value switching function [4]	0 … +10 V
Pin	4	Relay switching function, working contact (n.o.)	
Pin	5	Supply common	0 V
Pin	6	Not connected	
Pin	7	Degas (active high)	0 V/+24 V
Pin	8	Supply (V_s)	+24 V
Pin	9	Relay filament status, common contact [5]	
Pin	10	Gauge identification	
Pin	11	Relay filament status, working contact (n.o.) [4]	
Pin	12	Signal common	
Pin	13	RS232C, TxD	
Pin	14	RS232C, RxD	
Pin	15	Do not connect	

[4] Do not connect pin 3 for normal operation of the gauge. This pin is reserved for the threshold setting of the switching function (→ 🗎 28).

[5] → 🗎 26.

Profibus Gauge



Pin 1	Relay switching function A, common contact	
Pin 2	Signal output (measurement signal)	0 … +10 V
Pin 3	Threshold (setpoint) A [6]	0 … +10 V
Pin 4	Relay switching function A, n.o. contact	
Pin 5	Supply common	0 V
Pin 6	Threshold (setpoint) B [6]	
Pin 7	Degas (active high)	0 V/+24 V
Pin 8	Supply (V_s)	+24 V
Pin 9	Relay switching function B, common contact	
Pin 10	Gauge identification	
Pin 11	Relay switching function B, n.o. contact	
Pin 12	Measuring signal common	
Pin 13	RS232C, TxD	
Pin 14	RS232C, RxD	
Pin 15	Do not connect	

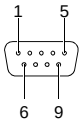
❷ Connect the sensor cable to the gauge.

❸ Secure the cable socket to the gauge with the lock screw and connect the sensor cable to the controller.

[6] Do not connect pin 3 and pin 6 for normal operation of the gauge. These pins are reserved for adjustment of the setpoint potentiometers (→ 🗎 28).

3.3 Profibus Cable Connection

❶ If no Profibus cable is available, make one according to the following indications:



D-Sub, 9-pin,
male, soldering side

Pin 1	Do not connect
Pin 2	Do not connect
Pin 3	RxD/TxD-P
Pin 4	CNTR-P [7]
Pin 5	DGND [8]
Pin 6	VP [7]
Pin 7	Do not connect
Pin 8	RxD/TxD-N
Pin 9	Do not connect

❷ Connect the Profibus cable to the gauge and secure the cable socket to the gauge with the lock screws.

---

[7] Only to be connected if an *optical link* module is used.

[8] Only required as line termination for devices at the ends of bus system (→ 🕮 [5]).

4 Operation

When the voltage is supplied, the measuring signal is available between pins 2 (+) and 12 (–) (Relationship Measuring Signal – Pressure → 🗎 16 and 🕮 [1]).

The Profibus gauge can also be operated via the corresponding fieldbus interface (Profibus) (→ 🕮 [1] for details and further functions).

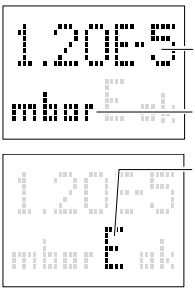
Allow for a stabilizing time of ≈10 minutes. Once the gauge has been switched on, permanently leave it on irrespective of the pressure.

4.1 Gas Type Dependence

The measurement value is gas dependent. The displayed reading applies to dry air, O_2, CO and N_2. For other gases, it has to be converted (→ 🗎 17 and 🕮 [1]).

4.2 Display

(part no. FRG730KF25SD and FRG730CF35SD only)



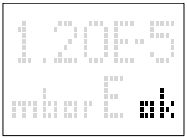
Pressure reading

Pressure unit

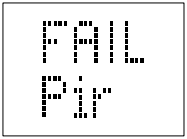
Function display

(non)	Pirani operation
E	Emission 25 µA
E.	Emission 5 mA
D	Degas

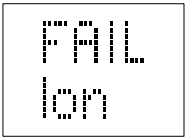
Error Display



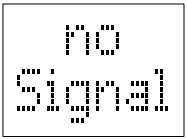
No error
(green background illumination)



Pirani sensor error
(red background illumination)

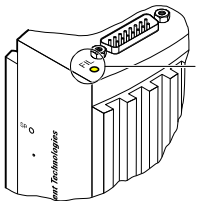


Bayard-Alpert sensor error
(red background illumination)



Internal data connection failure
(red background illumination)

4.3 Filament Status



Filament status	Emission	Status LED
–	Off	off
Both filaments okay	On	green
One filament broken	On	flashes green
Both filaments broken	On	red

A "Filament Status" relay contact is available at the sensor cable connector → "Power Connection" (pins 9 and 11).

Filament status	Relay contact
Both filaments okay	energized
One filament broken	deenergized
Both filaments broken	deenergized

4.4 Profibus Interface

(part no. FRG730KF25SP and FRG730CF35SP only)

Caution

Caution: data transmission errors

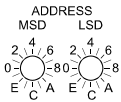
If the gauge is operated with the RS232 and Profibus interfaces at the same time, data transmission errors may occur.

The gauge must not be operated with the RS232 and the Profibus interfaces at the same time.

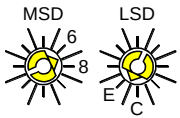
Operating Software

For operating the gauge via Profibus, prior installation of the gauge specific GSD file is required on the bus master side (controller, PLC). This file can be downloaded under www.agilent.com.

Note Address Setting



The node address (0 … 125_{dec}) is set in hexadecimal form (00 … $7D_{hex}$) via the "ADDRESS" switches.



Example: Node address = $7D_{hex}$:

Default address setting is $5C_{hex}$.

The node address is polled by the firmware when the gauge is switched on. If the setting deviates from the stored value, the new value is taken over into the NVRAM. If a value >125_{dec} (>$7D_{hex}$) is entered, the node address setting currently stored in the device remains valid but it can now be defined via Profibus ("Set slave Address", → 🕮 [2]).

4.5 Switching Function Standard Gauge

The standard gauges have a manually adjustable switching function with a normally open relay contact. The relay contact is accessible at the sensor cable connector (pins 1 and 4).

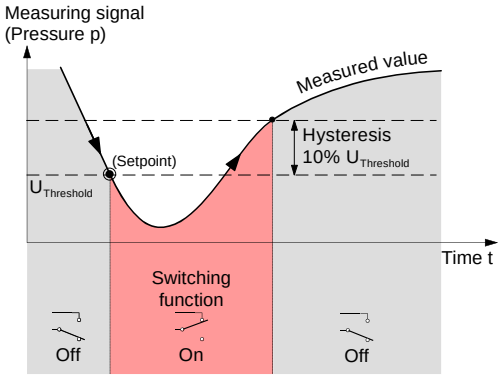
The threshold value of the switching function can be set within the pressure range 1×10^{-9} mbar … 100 mbar via a potentiometer "SETPOINT".

The following rule applies:

$$U_{Threshold} = 0.75 \times (\log p_{Setpoint} - c) + 7.75$$

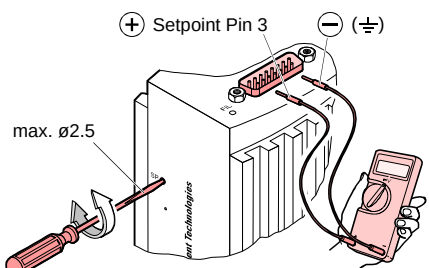
Where p pressure
U Threshold voltage [V]
c constant (pressure unit dependent)

p	c
[mbar]	0
[Pa]	2
[Torr]	-0.125



❶ Put the gauge into operation.

❷ Connect the **+** lead of a voltmeter to the threshold measurement point Pin 3 and its **–** lead to a grounded point (e.g. connector case or flange of the gauge).



❸ Using a screwdriver (max. ø2.5 mm), set the voltage (setpoint) to the desired value $U_{Threshold}$.

4.6 Switching Function Profibus Gauge

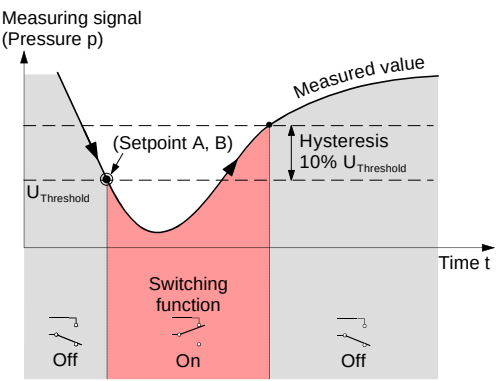
The Profibus gauges have two independent, manually adjustable switching functions. Each switching function has a floating, normally open relay contact. The relay contacts are accessible at the sensor cable connector (→ "Power Connection").The threshold values of switching functions A and B can be set within the pressure range 1×10^{-9} mbar … 100 mbar via potentiometers <SP A> and <SP B>.

The following rule applies:

$$U_{Threshold} = 0.75 \times (\log p_{Setpoint} - c) + 7.75$$

Where p pressure
U Threshold voltage [V]
c constant (pressure unit dependent)

p	c
[mbar]	0
[Pa]	2
[Torr]	-0.125

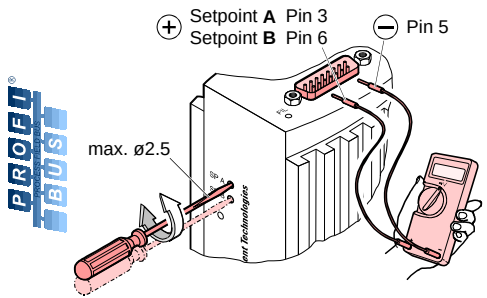


❶ Put the gauge into operation.

❷ Connect the **+** lead of a voltmeter to the threshold measurement point of the selected switching function (<SP A> Pin 3, <SP B> Pin 6) and its **–** lead to a ground contact nearby (e.g. grounded locking screw nut of connector or vacuum connection of the gauge).

The threshold voltages are referenced to ground (housing, vacuum connection), **not** to Pin 5 (common power GND 24 V supply).

The analog threshold voltage readings on pins 3 and 6 are only a guide line. Full accuracy can be achieved by reading the threshold voltage values via the fieldbus interface (→ 🕮 [2]).



❸ Using a screwdriver (max. ø2.5 mm), set the threshold of the selected switching function (SP A, SP B) to the desired value $U_{Threshold}$.

A functional check of the switching functions (On/Off) is only possible via fieldbus interface (→ 🕮 [2] or by measuring the relay contacts with a continuity checker / ohmmeter (→ "Power Connection", sensor cable connector).

5 Deinstallation

DANGER

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

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

Caution: dirt sensitive area

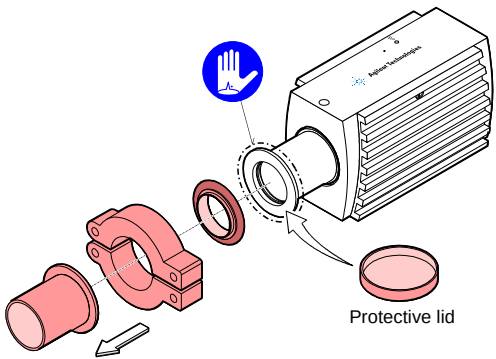
Touching the product or parts thereof with bare hands increases the desorption rate.

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

1. Vent the vacuum system.
2. Put the gauge out of operation.

❸ Unfasten the lock screws and unplug the cable socket (and also the interface cable at Profibus gauge).

❹ Remove the gauge from the vacuum system and put the protective lid in place.



6 Maintenance, Repair

In case of severe contamination or a malfunction, the sensor can be replaced (→ 🕮 [1]).

Gauge failures due to contamination or wear and tear as well as expendable parts (e.g. filaments) are not covered by the warranty.

6.1 Adjusting the Gauge

The gauge is factory calibrated. Due to use in different climatic conditions, different fitting positions, aging, contamination, or exchange of the sensor, a shift of the characteristic curve can occur and readjustment may become necessary. Only the Pirani measurement system can be adjusted.

Adjustment at Atmospheric Pressure

At the push of a button, the digital value and thus the analog output are adjusted electronically to +10 V at atmospheric pressure.

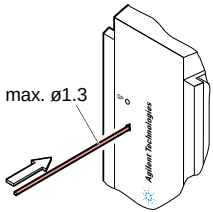
Adjustment is necessary if

- at atmospheric pressure, the output voltage is <+10 V
- the display reads < atmospheric pressure (if the gauge has a display)
- at atmosphere, the digital value at the RS232C interface is < atmospheric pressure
- at atmosphere, the digital value received by the bus controller of the fieldbus gauges (Profibus) is < atmospheric pressure
- when the vacuum system is vented, the digital value of the RS232C interface reaches its maximum before the measured pressure has reached atmosphere
- when the vacuum system is vented, the digital value received by the bus controller of the Profibus reaches its maximum before the measured pressure has reached atmosphere.

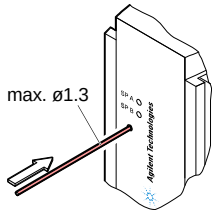
❶ Activate the gauge and operate it for ≈10 minutes at atmospheric pressure. If the gauge was operated within the Bayard-Alpert range, a cooling-down time of ≈30 minutes is to be expected (gauge temperature = ambient temperature).

❷ Press button with a pin (max. ø1.3 mm) for 1 s.

Standard gauge



Profibus gauge



Gauges with display will show the reading "1000 mbar".

Zero Point Adjustment

Zero point readjustments are carried out automatically during operation of the gauge, no manual adjustment is needed.

7 Returning the Product

WARNING

WARNING: forwarding contaminated products

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

Products returned to Agilent 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.

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

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

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.

Further Information

📖 [1] www.agilent.com
Operating Manual
Bayard-Alpert Pirani Gauge FRG-730
tqna72e1
Agilent Technologies, Lexington, MA 02421, USA

📖 [2] www.agilent.com
Communication Protocol
Profibus FRG-730
tqra73e1
Agilent Technologies, Lexington, MA 02421, USA

📖 [3] www.profibus.com
Profibus User Organization

📖 [4] www.profibus.com
Profibus Profile Guidelines
Part 1 - Identification & Maintenance Functions

📖 [5] IEC 61158 Type 3 elements: Industrial communication networks – Fieldbus specifications
IEC 61784: Industrial communication networks – Fieldbus profiles

📖 [6] www.agilent.com
Operating Manual
AGC-100 Vacuum Gauge Controller
tqnb15e1
Agilent Technologies, Lexington, MA 02421, USA

Vacuum Products Division
Instructions for returning products

Dear Customer:

Please follow these instructions whenever one of our products needs to be returned.

1) Complete the attached Request for Return form and send it to Agilent Technologies (see below), taking particular care to identify all products that have pumped or been exposed to any toxic or hazardous materials.

2) After evaluating the information, Agilent Technologies will provide you with a Return Authorization (RA) number via email or fax, as requested.
   Note: Depending on the type of return, a Purchase Order may be required at the time the Request for Return is submitted. We will quote any necessary services (evaluation, repair, special cleaning, eg).

3) Important steps for the shipment of returning product:
   - Remove all accessories from the core product (e.g. inlet screens, vent valves).
   - Prior to shipment, drain any oils or other liquids, purge or flush all gasses, and wipe off any excess residue.
   - If ordering an Advance Exchange product, please use the packaging from the Advance Exchange to return the defective product.
   - Seal the product in a plastic bag, and package product carefully to avoid damage in transit. You are responsible for loss or damage in transit.
   - Agilent Technologies is not responsible for returning customer provided packaging or containers.
   - Clearly label package with RA number. Using the shipping label provided will ensure the proper address and RA number are on the package. Packages shipped to Agilent without a RA clearly written on the outside cannot be accepted and will be returned.

4) Return only products for which the RA was issued.

5) Product being returned under a RA must be received within 15 business days.

6) Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information. Customer is responsible for freight charges on returning product.

7) Return shipments must comply with all applicable Shipping Regulations (IATA, DOT, etc.) and carrier requirements.

RETURN THE COMPLETED REQUEST FOR RETURN FORM TO YOUR NEAREST LOCATION:

EUROPE:	NORTH AMERICA:	PACIFIC RIM:
Fax: 00 39 011 9979 330		
Fax Free: 00 800 345 345 00	Fax: 1 781 860 9252	please visit our website for individual
Toll Free: 00 800 234 234 00	Toll Free: 800 882 7426, Option 3	office information
vpt-customercare@agilent.com	vpl-ra@agilent.com	http://www.agilent.com

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please read important policy information on Page 3 that applies to all returns.

1) CUSTOMER INFORMATION

Company Name:	**Contact Name:**
Tel: **Email:**	**Fax:**
Customer Ship To:	**Customer Bill To:**
Europe only: **VAT reg. Number:**	USA/Canada only: ☐ **Taxable** ☐ **Non-taxable**

2) PRODUCT IDENTIFICATION

Product Description	Agilent P/N	Agilent S/N	Original Purchasing Reference

3) TYPE OF RETURN (Choose one from each row and supply Purchase Order if requesting a billable service)

3A. ☐ Non-Billable ☐ Billable ➡ New PO # (hard copy must be submitted with this form):

3B. ☐ Exchange ☐ Repair ☐ Upgrade ☐ Consignment/Demo ☐ Calibration ☐ Evaluation ☐ Return for Credit

4) HEALTH and SAFETY CERTIFICATION

AGILENT TECHNOLOGIES CANNOT ACCEPT ANY PRODUCTS CONTAMINATED WITH BIOLOGICAL OR EXPLOSIVE HAZARDS, RADIOACTIVE MATERIAL, OR MERCURY AT ITS FACILITY.
Call Agilent Technologies to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

☐ **HAS NOT** pumped or been exposed to any toxic or hazardous materials. OR

☐ **HAS** pumped or been exposed to the following toxic or hazardous materials. If this box is checked, the following information must also be filled out. Check boxes for all materials to which product(s) pumped or was exposed:

☐ Toxic ☐ Corrosive ☐ Reactive ☐ Flammable ☐ Explosive ☐ Biological ☐ Radioactive

List all toxic/hazardous materials. Include product name, chemical name, and chemical symbol or formula:

_____

NOTE: If a product is received at Agilent which is contaminated with a toxic or hazardous material that was not disclosed, the customer will be held responsible for all costs incurred to ensure the safe handling of the product, and is liable for any harm or injury to Agilent employees as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

Print Name: **Authorized Signature:** ..... **Date:**

5) FAILURE INFORMATION:

Failure Mode (REQUIRED FIELD. See next page for suggestions of failure terms):
Detailed Description of Malfunction: (Please provide the error message)
Application (system and model):

I understand and agree to the terms of Section 6, Page 3/3.
Print Name: **Authorized Signature:** ..... **Date:**

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please use these Failure Mode to describe the concern about the product on Page 2.

TURBO PUMPS and TURBO CONTROLLERS

APPARENT DEFECT/MALFUNCTION		POSITION	PARAMETERS	
• Does not start	• Noise	• Vertical	Power:	Rotational Speed:
• Does not spin freely	• Vibrations	-Horizontal	Current:	Inlet Pressure:
• Does not reach full speed	-Leak	-Upside-down	Temp 1:	Foreline Pressure:
• Mechanical Contact	-Overtemperature	-Other:	Temp 2:	Purge flow:
• Cooling defective	-Clogging	_____	OPERATING TIME:	

ION PUMPS/CONTROLLERS

• Bad feedthrough	• Poor vacuum
• Vacuum leak	• High voltage problem
• Error code on display	• Other

VALVES/COMPONENTS

• Main seal leak	• Bellows leak
• Solenoid failure	• Damaged flange
• Damaged sealing area	-Other

LEAK DETECTORS

• Cannot calibrate	-No zero/high backround
• Vacuum system unstable	• Cannot reach test mode
• Failed to start	• Other

INSTRUMENTS

• Gauge tube not working	• Display problem
• Communication failure	• Degas not working
• Error code on display	• Other

SCROLL AND ROTARY VANE PUMPS

• Pump doesn't start	• Noisy pump (describe)
• Doesn't reach vacuum	• Over temperature
• Pump seized	• Other

DIFFUSION PUMPS

• Heater failure	• Electrical problem
• Doesn't reach vacuum	• Cooling coil damage
• Vacuum leak	• Other

Section 6) *ADDITIONAL TERMS*

Please read the terms and conditions below as they apply to all returns and are in addition to the Agilent Technologies Vacuum Product Division – Products and Services Terms of Sale.

- Customer is responsible for the freight charges for the returning product. Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.
- Customers receiving an Advance Exchange product agree to return the defective, rebuildable part to Agilent Technologies **within 15 business days**. Failure to do so, or returning a non-rebuildable part (crashed), will result in an invoice for the non-returned/non-rebuildable part.
- Returns for credit toward the purchase of new or refurbished Products are subject to prior Agilent approval and may incur a restocking fee. Please reference the original purchase order number.
- Units returned for evaluation will be evaluated, and a quote for repair will be issued. If you choose to have the unit repaired, the cost of the evaluation will be deducted from the final repair pricing. A Purchase Order for the final repair price should be issued within 3 weeks of quotation date. Units without a Purchase Order for repair will be returned to the customer, and the evaluation fee will be invoiced.
- A Special Cleaning fee will apply to all exposed products per Section 4 of this document.
- If requesting a calibration service, units must be functionally capable of being calibrated.

Service & Support

North America
Agilent Technologies
121 Hartwell Avenue
Lexington, MA 02421 USA
Tel.: +1 781 861 7200
Toll-Free: +1 800 882 7426
Fax: +1 781 860 5437
vpl-customerservice@agilent.com

Benelux
Agilent Technologies Netherlands B.V.
Herculesweg 8
4338 PL Middelburg The Netherlands
Tel: +31 118 671570
Fax: +31 118 671569
Toll free: 00 800 234 234 00

China
Agilent Technologies (China) Co.Ltd
No.3, Wang Jing Bei Lu,
Chao Yang District, Beijing,
100102 China Tel.: +86
(10) 6439 7888
Fax: +86 (10) 6439 1318
Toll-Free: 800 820 8266
vpc-customerservice@agilent.com

France
Agilent Technologies France
7 avenue des Tropiques
Z.A. de Courtaboeuf – B.P. 12
91941 Les Ulis cedex France
Tel.: +33 (0) 1 69 86 38 84
Fax: +33 (0) 1 69 86 29 88
Toll free: 00 800 234 234 00
vpf.sales@agilent.com

Germany & Austria
Agilent Technologies
Lyoner Str. 20
60 528 Frankfurt am Main Germany
Tel.: +49 69 6773 43 2230
Fax: +49 69 6773 43 2250
Toll free: 00 800 234 234 00

India
Agilent Technologies India Pvt. Ltd.
G01. Prime corporate Park,
230/231, Sahar Road,
Opp. Blue Dart Centre,
Andheri (East), Mumbai – 400 099 India
Tel: +91 22 30648287/ 8200
Fax: +91 22 30648250
Toll Free: 1800 113037
cag_india@agilent.com

Italy
Agilent Technologies Italia S.p.A.
via F.lli Varian 54
10040 Leini, (Torino) Italy
Tel.: +39 011 997 9111
Fax: +39 011 997 9350
Toll-Free: 00 800 234 234 00
vpt.sales@agilent.com
vpt-customerservice@agilent.com

Japan
Agilent Technologies Japan, Ltd.
8th Floor
Sumitomo Shibaura Building
4-16-36 Shibaura Minato-ku
Tokyo 108-0023 Japan
Tel.: +81 3 5232 1253
Toll-Free: 0120 655 040
Fax: +81 3 5232 1710
vpj-customerservice@agilent.com

Korea
Agilent Technologies Korea Ltd.
Shinsa 2nd Bldg. 2F
966-5 Daechi-dong
Kangnam-gu, Seoul Korea 135-280
Tel.: +82 2 3452 2455
Toll-Free: 080 222 2452
Fax: +82 2 3452 2451
vpk-customerservice@agilent.com

Singapore
Agilent Technologies Singapore Pte Ltd
No.1 Yishun Avenue 7 Singapore 768923
Tel: +65 6215 8045
Fax : +65 6754 0574
Toll-Free: 1 800 2762622
vps-customerservice@agilent.com

South East Asia
Agilent Technologies Sales Sdn Bhd
Unit 201, Level 2 uptown 2,
2 Jalan SS21/37, Damansara Uptown
47400 Petaling Jaya, Selangor, Malaysia
Tel : +603 7712 6106
Fax: +603 6733 8121
Toll-Free: 1 800 880 805
vps-customerservice@agilent.com

Taiwan
Agilent Technologies Taiwan Limited
20 Kao-Shuang Rd.,
Pin-Chen City, 324
Taoyuan Hsien, Taiwan, R.O.C.
Tel. +886 34959281
Toll Free: 0800 051 342
vpw-customerservice@agilent.com

UK & Ireland
Agilent Technologies UK Ltd
6 Mead Road
Oxford Industrial Park
Yarnton, Oxford OX5 1QU UK
Tel.: +44 (0) 1865 291570
Fax: +44 (0) 1865 291571
Toll free: 00 800 234 234 00
vpt-customerservice@agilent.com

Learn more:
www.agilent.com/chem/vacuum

08/2012 BRochs

Published in USA, October, 2011

Agilent Technologies

t qma72e1