VARIAN

vacuum technologies

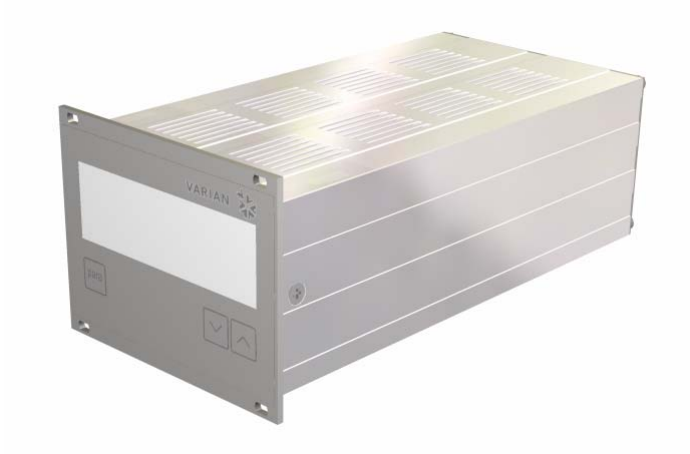
CE

FRG Control Unit

INSTRUCTION MANUAL

Manual No. tqnb01e1
Revision --
November 2008

FRG Control Unit



Warranty

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

Warranty Replacement and Adjustment

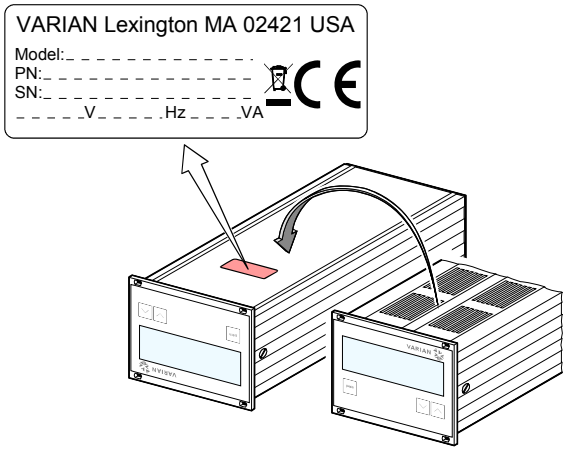
All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, not withstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller's determination with regard thereto shall be final.

If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at Customer's expense; in addition, a charge for testing and examination may be made on Products so returned.

3/1/00

Product Identification

In all communications with VARIAN, 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 number FRG700CNTR1.

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

This document is based on firmware number 302-564--.

If your unit does not work as described in this document, please check that it is equipped with the above firmware version (→ 🗎 42).

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

All dimensions are indicated in mm.

Intended Use

The FRG Control Unit is used together with VARIAN gauges for total pressure measurement. All products must be operated in accordance with their respective Operating Manuals.

Scope of Delivery

1× Single-Channel Controller
1× Power cord
1× Rubber bar
2× Rubber feet
4× Collar screws
4× Plastic sleeves

Contents

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

1 Safety

1.1 Symbols Used

Symbols for residual risks

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.

Further symbols


The lamp/display is lit.


The lamp/display flashes.


The lamp/display is dark.

Press the key (example: 'para' key).


Do not press any key

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

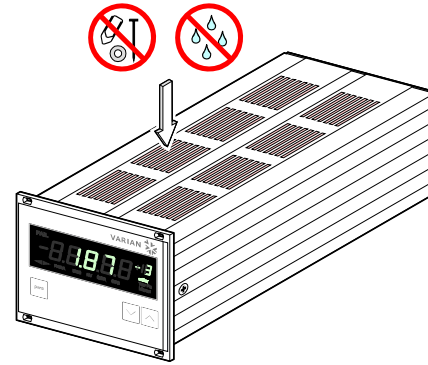
Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.

DANGER

DANGER: mains voltage

Contact with live parts is extremely hazardous when any objects are introduced or any liquids penetrate into the unit.

Make sure no objects enter through the louvers and no liquids penetrate into the equipment.



Communicate the safety instructions to all other users.

2 Technical Data

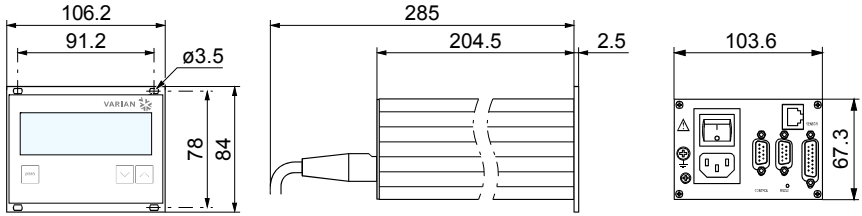
Mains specifications	Voltage	90 … 250 VAC
	Frequency	50 … 60 Hz
	Power consumption	≤30 VA
	Overvoltage category	II
	Protection class	1
	Connection	European appliance connector IEC 320 C14
Ambient conditions	Temperature	
	storage	–20 … +60 °C
	operation	+ 5 … +50 °C
	Relative humidity	≤80% up to +31 °C, decreasing to 50% at +40 °C
	Use	indoors only max. altitude 2000 m NN
	Pollution degree	II
	Protection type	IP30
Compatible gauges	Number	1
	Cold cathode/Pirani	FRG (FRG-700)
Gauge connections	Number	2 (parallel)
		Caution Do not connect more than one gauge at the same time.
	SENSOR connector	15-pole D-Sub, female RJ45 (FCC68), female (pin assignment → 🗎 24)
Operation	Front panel	via 3 keys
	HOST (remote control)	via RS232C interface

Measurement values	Measurement ranges	depending on gauge (→ 🕮 [1])
	Measurement error	
	gain error	≤0.02% FSr
	offset error	≤0.05% FSr
	Measurement rate	
	analog	100 / s
	Display rate	10 / s
	Filter time constant	
	slow	750 ms (f_g = 0.2 Hz)
	normal (nor)	150 ms (f_g = 1 Hz)
	fast	20 ms (f_g = 8 Hz)
	Pressure units	mbar, Pa, Torr, Micron
	Correction factor	for logarithmic gauges 0.10 … 10.00
	A/D converters	resolution >0.001% FSr
Gauge supply	Voltage	+24 VDC ±5%
	Current	750 mA
	Power consumption	18 W
	Fuse protection	900 mA with PTC element, self-resetting after turning the FRG Control Unit off or disconnecting the gauge
Switching function	Number	1
	Reaction delay	≤10 ms if switching threshold close to measurement value (for larger differences consider filter time constant).
	Adjustment range	depending on gauge (→ 🕮 [1])
	Hysteresis	≥1% FSr for linear gauges ≥10% of measurement value for logarithmic gauges

Switching function relay	Contact type	floating changeover contact
	Load max.	125 VAC, 60 W (ohmic) 110 VDC, 2 A, 60 W (ohmic)
		STOP DANGER
		For benchtop use, max. 30 VAC or 60 VDC may be connected.
	Service life mechanic electric	 10^8 cycles 10^5 cycles (at maximum load)
	Contact positions	→ 🗎 25
	CONTROL connector	9-pole D-Sub, male (pin assignment → 🗎 25)
Error signal	Number	1
	Reaction time	≤20 ms
Error signal relay	Contact type	floating normally open contact
	Load max.	125 VAC, 60 W (ohmic) 110 VDC, 2 A, 60 W (ohmic)
		STOP DANGER
		For benchtop use, max. 30 VAC or 60 VDC may be connected.
	Service life mechanic electric	 10^8 cycles 10^5 cycles (at maximum load)
	Contact positions	→ 🗎 25
	CONTROL connector	9-pole D-Sub, male (pin assignment → 🗎 25)
Analog output	Number	1
	Voltage range	0 … +10 V
	Internal resistance	660 Ω
	Measurement signal vs. pressure	depending on gauge (→ 🕮 [1])
	CONTROL connector	9-pole D-Sub, male (pin assignment → 🗎 25)

Interface	Standard	RS232C
	Protocol	ACK/NAK, ASCII with 3-character mnemonics, bi-directional data flow, 8 data bits, no parity bit, 1 stop bit
	RS232C	only TXD and RXD used
	Transmission rate	9600, 19200, 38400 baud
	RS232 connector	9-pole D-Sub, female (pin assignment → 🗎 26)

Dimensions [mm]



Use	For incorporation into a rack or control panel or as desk-top unit
Weight	0.85 kg

3 Installation

3.1 Personnel

Skilled personnel

The unit may only be installed by persons who have suitable technical training and the necessary experience.

3.2 Installation, Setup

The FRG Control Unit is suited for incorporation into a 19" rack or a control panel or for use as desk-top unit.

DANGER

DANGER: damaged product

Putting a damaged product into operation can be extremely hazardous.

In case of visible damages, make sure the product is not put into operation.

3.2.1 Rack Installation

The FRG Control Unit is designed for installation into a 19" rack chassis adapter according to DIN 41 494. For this purpose, four collar screws and plastic sleeves are supplied with it.

DANGER

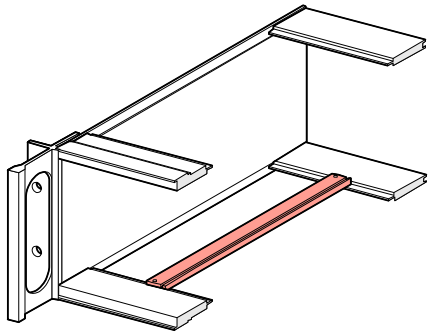
DANGER: protection class of the rack

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. the EN 60204-1 regulations for switching cabinets.

Take appropriate measures for the rack to meet the specifications of the protection class.

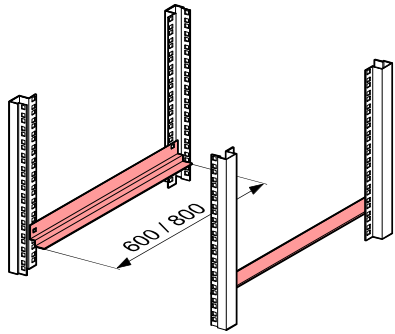
Guide rail

In order to reduce the mechanical strain on the front panel of the FRG Control Unit, preferably equip the rack chassis adapter with a guide rail.

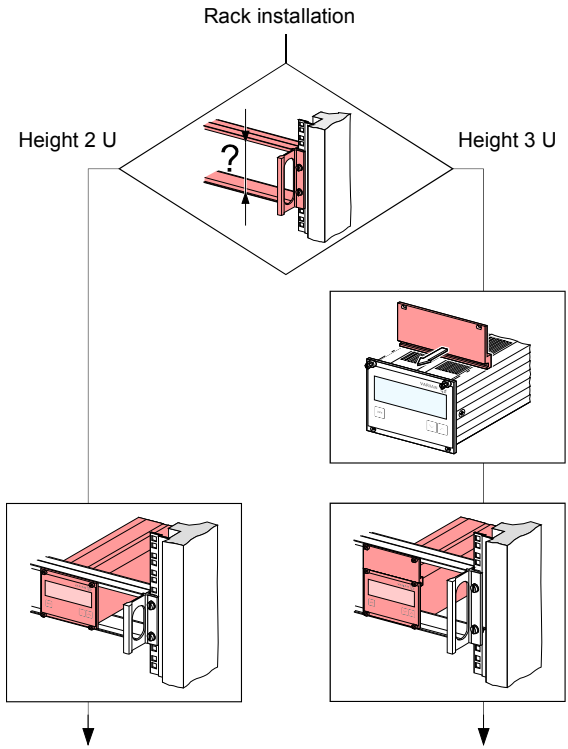


Slide rails

For safe and easy installation of heavy rack chassis adapters, preferably equip the rack frame with slide rails.



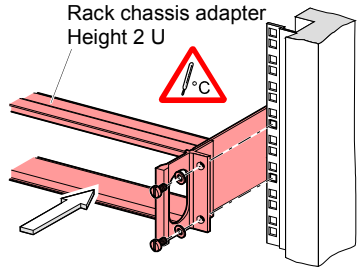
Mounting height



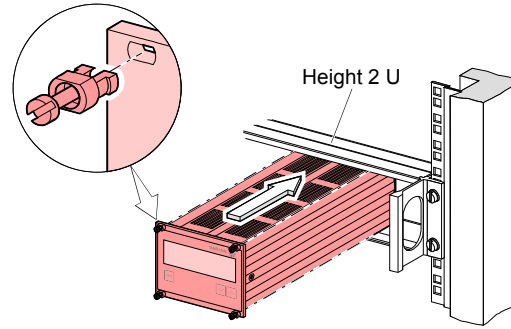
Height 2 U rack chassis adapter

❶ Secure the rack chassis adapter in the rack frame.

The admissible maximum ambient temperature (→ 10) must not be exceeded neither the air circulation obstructed.



❷ Slide the FRG Control Unit into the adapter …



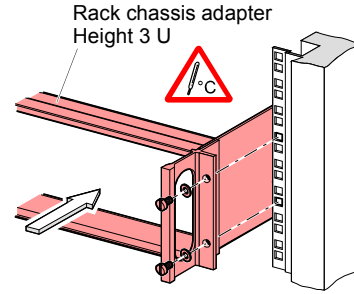
… and fasten the FRG Control Unit to the rack chassis adapter using the screws supplied with it.

Height 3 U rack chassis adapter

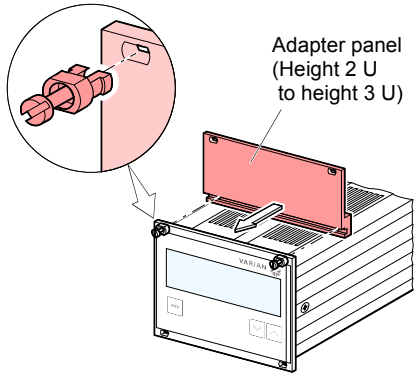
For incorporation into a 19" rack chassis adapter, height 3, an adapter panel (incl. two collar screws and plastic sleeves) is available (→ 🗎 68).

❶ Secure the rack adapter in the rack frame.

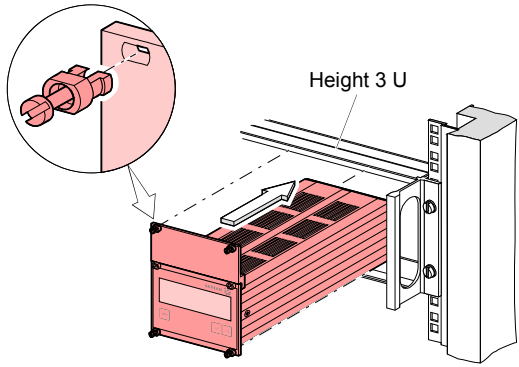
The admissible maximum ambient temperature (→ 🗎 10) must not be exceeded neither the air circulation obstructed.



❷ Mount the adapter panel as upper extension to the front panel of the FRG Control Unit using the screws supplied with the adapter panel.



❸ Slide the FRG Control Unit into the rack chassis adapter …



…and fasten the adapter panel to the rack chassis adapter using the screws supplied with the FRG Control Unit.

3.2.2 Installation in a Control Panel

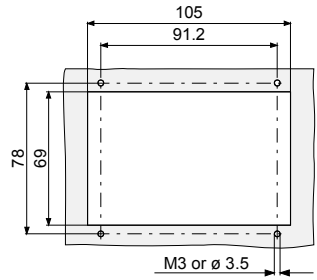
DANGER

DANGER: protection class of the control panel

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection against foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures for the control panel to meet the specifications of the protection class.

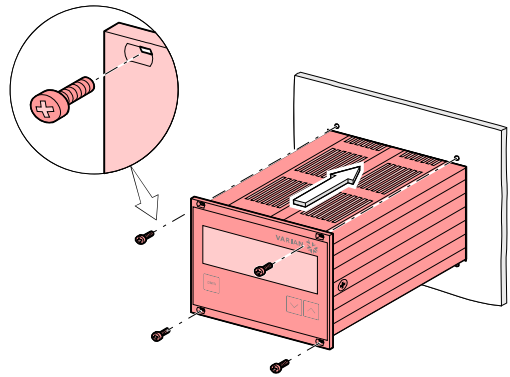
For mounting the FRG Control Unit into a control panel, the following cut-out is required:



The admissible maximum ambient temperature (→ 10) must not be exceeded neither the air circulation obstructed.

For reducing the mechanical strain on the front panel, preferably support the unit.

❶ Slide the FRG Control Unit into the cut-out of the control panel …

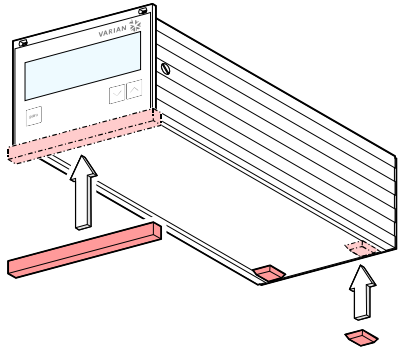


… and secure it with four M3 or equivalent screws.

3.2.3 Use as Desk-Top Unit

The FRG Control Unit is also suited for use as desk-top unit. For this purpose, two self-adhesive rubber feet as well as a slip-on rubber bar are supplied with it.

❶ Stick the two supplied rubber feet to the rear part of the bottom plate …



… and slip the supplied rubber bar onto the bottom edge of the front panel.

Select a location where the admissible maximum ambient temperature (→ 10) is not exceeded (e.g. due to sun irradiation).

3.3 Mains Power Connector

DANGER

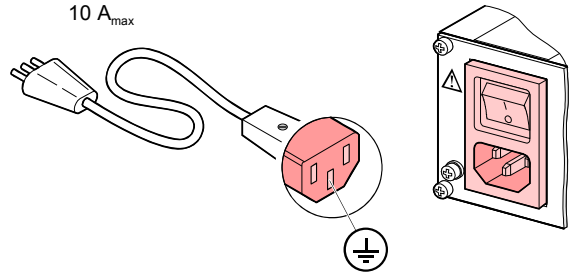
DANGER: line voltage

Incorrectly grounded products can be extremely hazardous in the event of a fault.

Use only a 3-conductor power cable ($3 \times 1.5\ mm^2$) with protective ground. The power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.

The unit is supplied with a 2.5 m power cord. If the mains cable is not compatible with your system, use your own, suitable cable with protective ground.

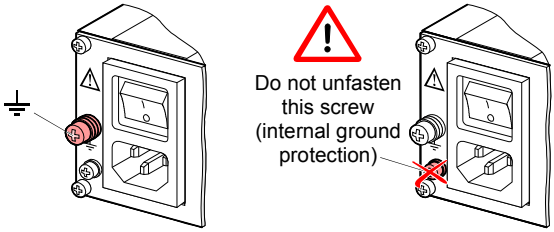
The socket must be fuse-protected with $10\ A_{max}$



If the unit is installed in a switch cabinet, the mains voltage should be supplied and turned on via a central power distributor.

Grounding

On the rear of the unit, there is a screw which can be used to connect the unit to ground, e.g. using the grounding of the pumping station.



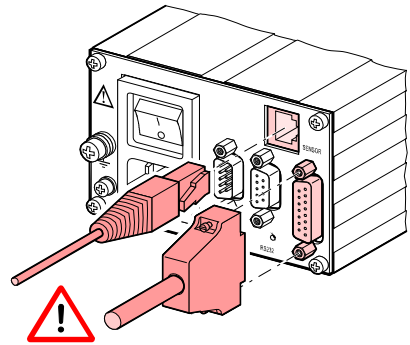
3.4 SENSOR Connector

The FRG Control Unit is equipped with two different gauge connectors.

Caution

Caution: one channel measurement unit

Connecting more than one gauge at the same time may lead to gauge destruction.



1 only at once

Make sure that there is never more than one gauge connected to the FRG Control Unit at the same time.

Connect the gauge to one of the two SENSOR connectors on the rear of the unit. Use a screened 1:1 cable (electromagnetic compatibility). Make sure the gauge is compatible (→ 10).

DANGER

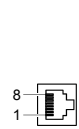
DANGER: protective low voltage

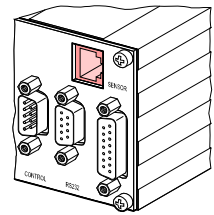
According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

If you are using the FRG Control Unit as desk-top unit, you may only connect a protective low voltage (SELV-E acc. to EN 61010).

Pin assignment
SENSOR

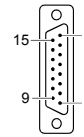
Pin assignment of the 8-pole RJ45 appliance connector:

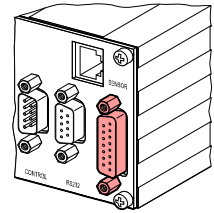




Pin	Signal	
4	Identification	
1	Supply	+24 VDC
2	Supply common	GND
3	Signal input	(Measurement signal+)
5	Signal common	(Measurement signal–)
6	Status	
7	HV_L	
8	HV_H	

Pin assignment of the female 15-pole D-Sub appliance connector:





Pin	Signal	
10	Identification	
8	Supply for Hot Cathode Gauges	
11	Supply for Capacitance Diaphragm Gauges	
5	Supply common	GND
2	Signal input	(Measurement signal+)
12	Signal common	(Measurement signal–)
3	Status	
1	Emission status	
7	Degas	
4	HV_H	
13	RXD	
14	TXD	
15	Screening = chassis	
6, 9	not connected	

3.5 CONTROL Connector

This connector allows to read the measurement signal, to evaluate state of the floating switching function and error contacts.

Connect the peripheral components to the CONTROL connector on the rear of the unit. Use a shielded cable (electromagnetic compatibility).

DANGER

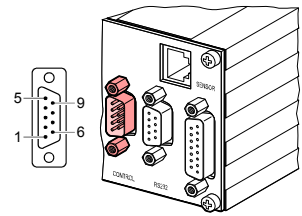
DANGER: protective low voltage

According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

If you are using the FRG Control Unit as desk-top unit, you may only connect a protective low voltage (SELV-E acc. to EN 61010).

Pin assignment
Contact positions
CONTROL

Pin assignment of the male 9-pole D-Sub appliance connector:



Pin	Signal
1 7	Analog output 0 … +10 VDC Chassis = GND
5	HV_H on +24 V off 0 V The control over this signal is placed superior to the key operation.
4 3 2	Pressure below threshold Pressure above threshold or power supply turned off
9 8	Error signal No error Error or power supply turned off
6 7	Supply for relays with higher switching power +24 VDC, 200 mA Chassis = GND Fuse-protected at 300 mA with PTC element, self-resetting after power off or pulling the CONTROL connector. Meets the requirements of a grounded protective extra low voltage (SELV-E according to EN 61010).

3.6 RS232 Interface Connector

The RS232C interface allows for operating the FRG Control Unit via a HOST or terminal. It can also be used for updating the firmware (→ 🗎 72).

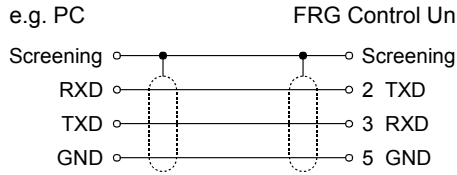
Connect the serial interface to the RS232 connector on the rear of the unit using your own, screened (electromagnetic compatibility) cable.

DANGER

DANGER: protective low voltage

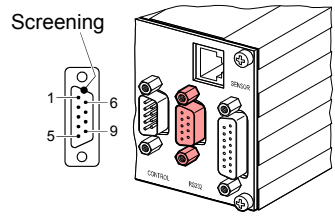
According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

If you are using the FRG Control Unit as desk-top unit, you may only connect a protective low voltage (SELV-E acc. to EN 61010).



(Minimum configuration)

Pin assignment RS232



Pin assignment of the female 9-pole D-Sub appliance connector:

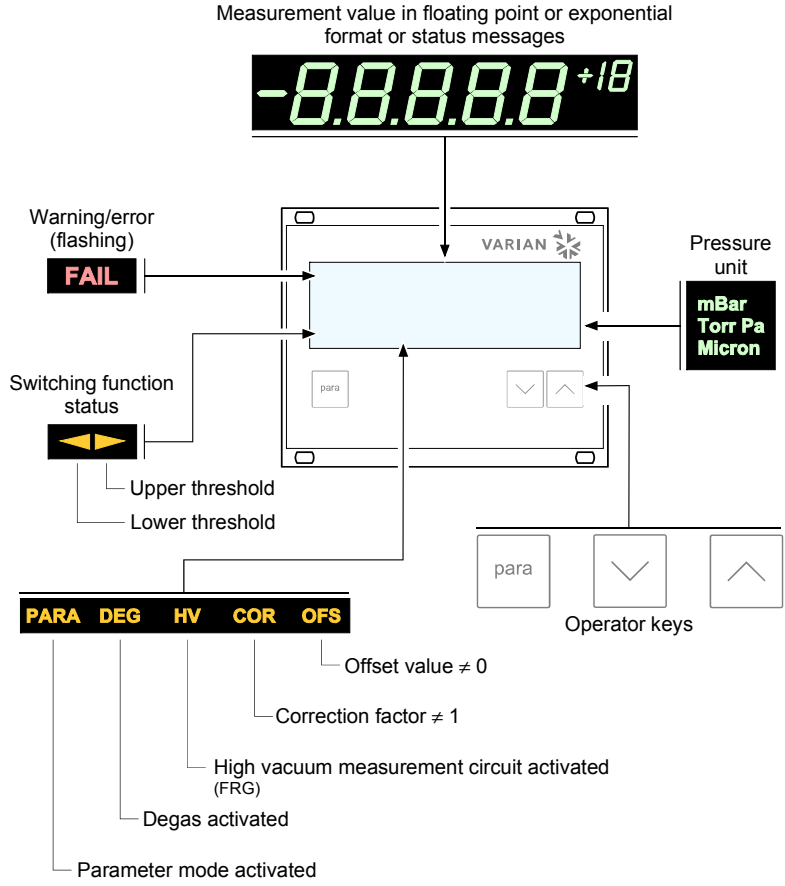
Pin	Signal
2	TXD
3	RXD
5	GND
6	DSR
8	CTS
9	GND

Pin	Signal
1	not connected
4	not connected
7	not connected

Chassis = screening

4 Operation

4.1 Front Panel



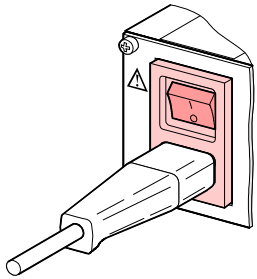
4.2 Turning the FRG Control Unit On and Off

Make sure the FRG Control Unit is correctly installed and the specifications in the Technical Data are met.

Turning the FRG Control Unit on

The power switch is on the rear of the unit.

Turn the FRG Control Unit on with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).



After power on, the FRG Control Unit …

- automatically performs a self-test
- identifies the connected gauge
- activates the parameters that were in effect before the last power off
- switches to the Measurement mode
- adapts the parameters if required (if another gauge was previously connected).

Turning the FRG Control Unit off

Turn the FRG Control Unit off with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

Wait at least 10 s before turning the FRG Control Unit on again in order for it to correctly initialize itself.

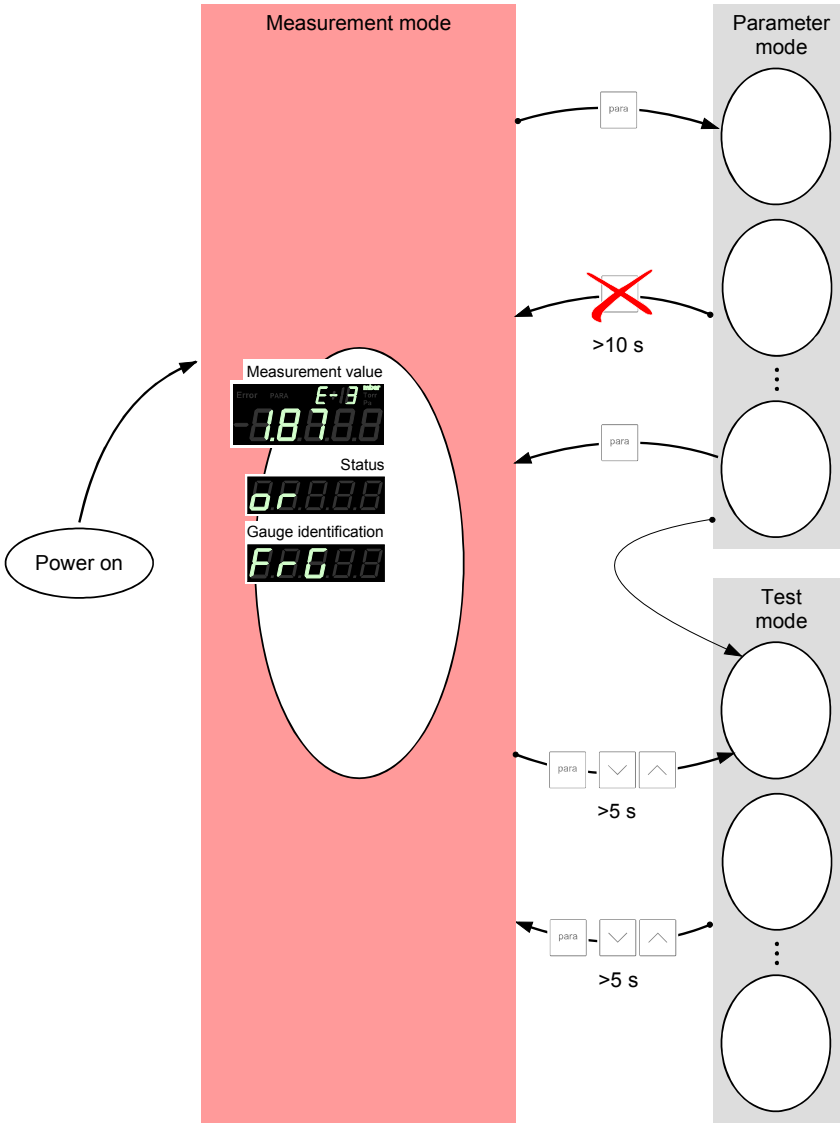
4.3 Operating Modes

The FRG Control Unit works in the following operating modes:

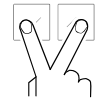
- Measurement mode
  for displaying measurement values or status messages (→ 30)
- Parameter mode
  for entering or displaying parameters (→ 32)
- Test mode
  for running internal test programs (→ 40)
- Program transfer mode
  for updating the firmware (→ 72)

4.4 Measurement Mode

The Measurement mode is the standard operating mode of the FRG Control Unit. Measurement values and status messages as well as the gauge identification are displayed in this mode.



Displaying the gauge identification



⇨ Press keys >0.5 s:
The type of the connected gauge is automatically identified and displayed for 5 s:

Cold cathode/Pirani gauge
(FRG-700)

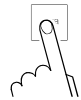
No gauge connected
(no Sensor)

Connected gauge cannot be identified (no Identifier)

Getting to the Parameter mode

→ 🗎 32

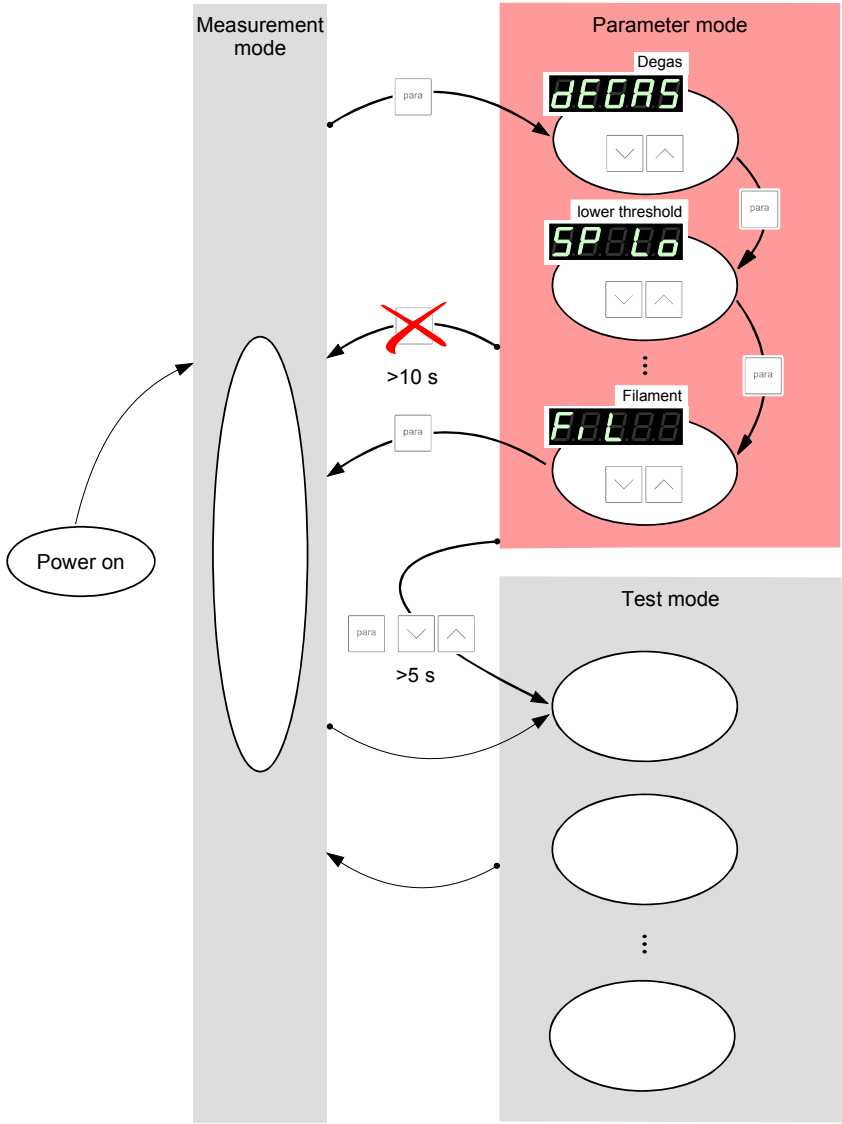
Getting to the Test mode



Press keys >5 s
(→ 🗎 40)

4.5 Parameter Mode

The Parameter mode is used for displaying, editing and entering parameter values.



Selecting a parameter

⇨ The name of the parameter

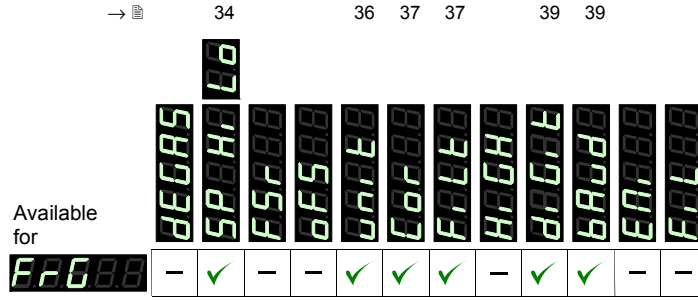
e.g.: 

Degas

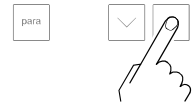
is displayed as long as the key is pressed or at least for 2 s.

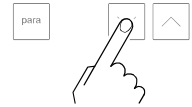
Afterwards, the currently valid parameter value is displayed.

Some parameters are not available for all gauge types. They are only displayed if available.



Editing the parameter value





⇨ Press key <1 s:
The value is increased/ decreased by 1 increment.

Press key >1 s:
The value is increased/ decreased continuously.

Modifications of parameters come into effect immediately and are stored automatically. Exceptions are mentioned under the corresponding parameters.

Loading the default parameters

⇨ Press keys >5 s:
All user-defined parameters are restored to their default values (→ 🗎 71).

Loading of the default parameter settings is irreversible.

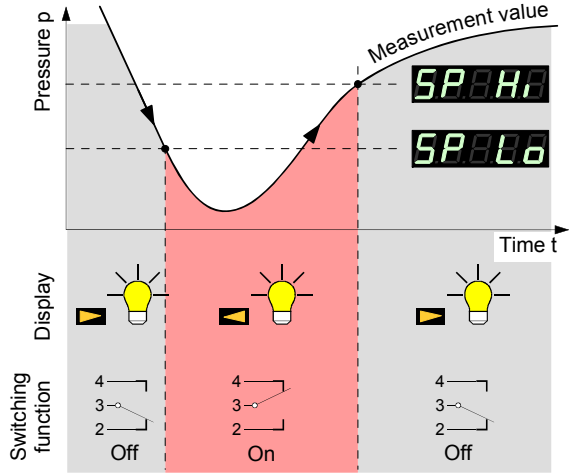
Getting to the Test mode

Press keys >5 s
(→ 🗎 40)

4.5.1 Parameters

Lower/upper switching threshold

The FRG Control Unit has a switching function with two adjustable thresholds. The status of the switching function is displayed on the front panel (→ 🗎 27) and can be evaluated via the floating contact at the CONTROL connector (→ 🗎 24).



	Value
	The lower switching threshold (Setpoint low) defines the pressure at which the switching function is activated when the pressure is dropping.
e.g.: 	⇨ gauge dependent (→ table). If another gauge type is connected, the FRG Control Unit automatically adjusts the switching threshold if required.

	lower threshold limit 	upper threshold limit 
	5×10^{-9}	1×10^{3}

all values in mbar, Cor = 1

The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. If the value of the minimum hysteresis drops below these values, the upper threshold is automatically adjusted. This prevents unstable states.

	Value
	The upper switching threshold (Setpoint high) defines the pressure at which the switching function is deactivated when the pressure is rising.
e.g.: 	⇨ gauge dependent (→ table). If another gauge type is connected, the FRG Control Unit automatically adjusts the threshold if required.

	lower threshold limit SP.Hi	upper threshold limit SP.Hi
FrC..	+10% lower threshold	1×10^3

all values in mbar, Cor = 1

The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. This prevents unstable states.

Pressure unit

Unit of measured values, thresholds etc.. See Appendix (→ 🗎 70) for conversion.

	Value	
unit		
bAr	⇨ mbar/bar	mBar Torr Pa Micron
torr	⇨ Torr (only available if Torr lock is not activated i.e. Torr is not suppressed → 🗎 43)	mBar **Torr** Pa Micron
PASC	⇨ Pascal	mBar Torr **Pa** Micron
uC	⇨ Micron (=mTorr)	mBar Torr Pa **Micron**

When selecting Micron, above 99000 Micron the readout automatically changes over to Torr. When the pressure drops below 90 Torr the instrument automatically switches back to Micron.

Correction factor

The correction factor allows the measured value to be calibrated for other gases than N_2 (→ 🖹 🕮 [1]). Only for pressures <1×10^{-2} mbar.

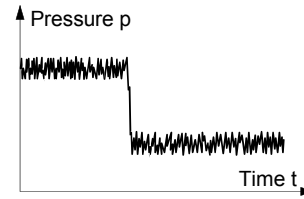
	Value
	
e.g.: 	⇨ No correction 
e.g.: 	⇨ Measurement value corrected by a factor of 0.10 … 10.00 

Measurement value filter

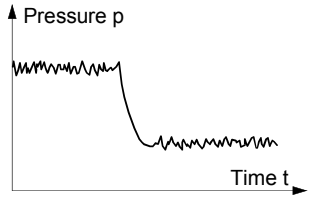
The measurement value filter permits a better evaluation of unstable or disturbed measuring signals.

The filter affects:

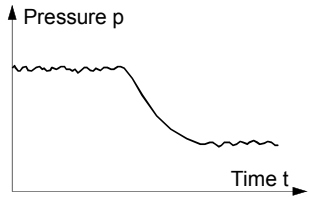
- ☑ the displayed measurement value
- ☐ the analog output
- ☐ the digitally transmitted measurement value of hot cathode gauges

	Value
	
	⇨ Fast: The FRG Control Unit responds quickly to fluctuations in measured values. As a result, it will be more sensitive to disturbed measurement signals. 

⇨ Normal:
Good relationship between response and sensitivity of the display and the switching functions to changes in the measured values.



⇨ Slow:
The FRG Control Unit does not respond to small changes in measured values. As a result, it will respond more slowly to changes in the measured values.



Display resolution (digits)

Display resolution of measured values.

	Value
	
	⇨ Display • rounded to one decimal digit • or two integrals
	⇨ Display • rounded to two decimal digits • or three integrals

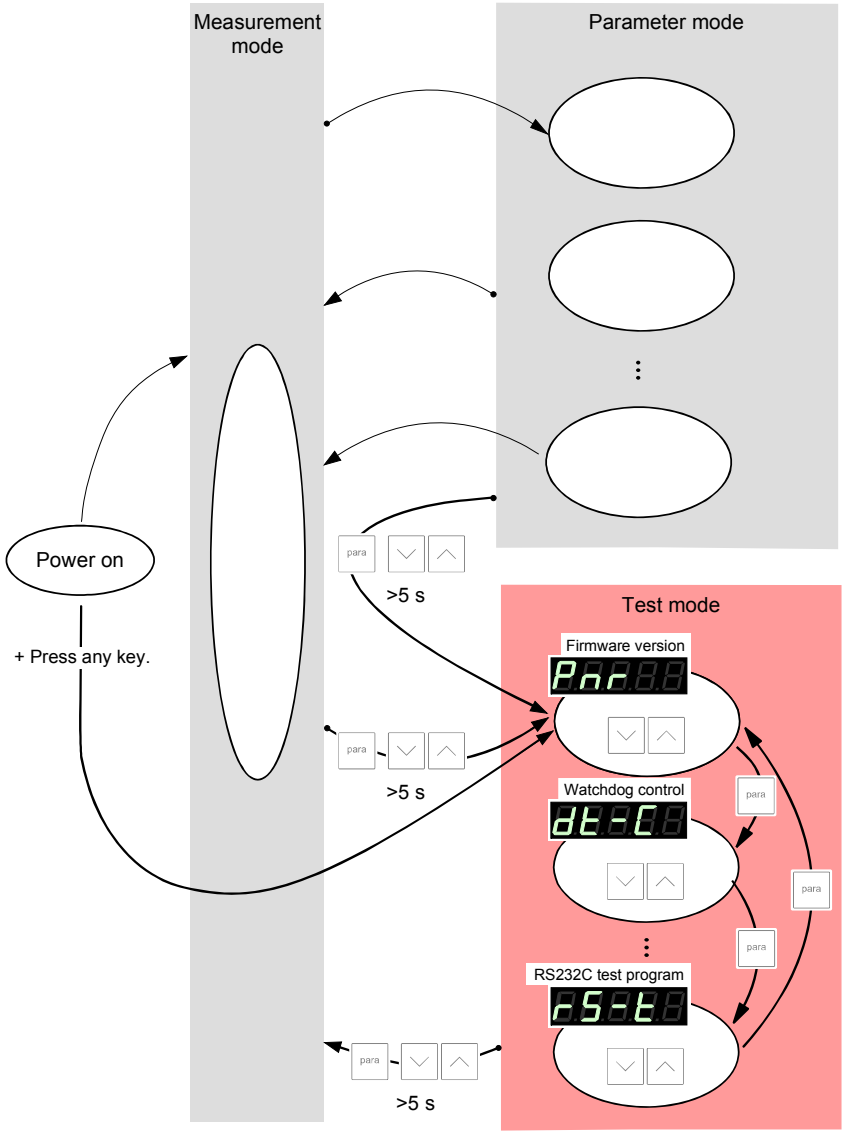
Transmission rate

Transmission rate of the RS232C interface.

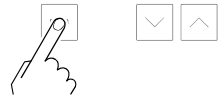
	Value
	
e.g.: 	⇨ 9600 baud 19200 baud 38400 baud

4.6 Test Mode

The Test mode is used for displaying, editing and entering special parameter values for testing the FRG Control Unit.



Selecting a parameter

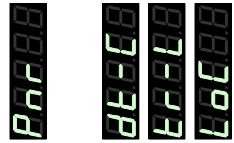


⇨ The name of the parameter

e.g.: 
Firmware version

is displayed.

→ 42

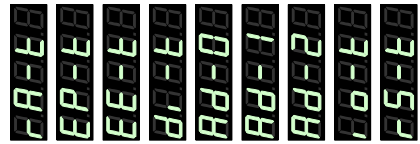


42 43

The name of the parameter is displayed as long as the key is pressed or at least for 2 s.

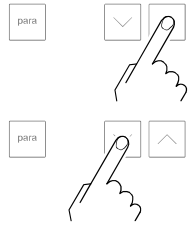
The firmware version is continuously displayed.

→ 43 44 44 45 45 46 46 47 47



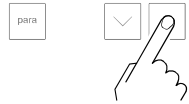
The name of the test program is displayed until it is started.

Modifying a parameter



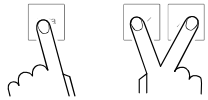
⇨ Increase/decrease the value by the defined increments.

Starting the test program



⇨ Start test program.

Changing to the Measurement mode



Press keys >5 s
(→ 🗎 30)
or
turn the unit off, wait for 10 s and then turn it on again.

4.6.1 Parameters

Firmware version

The firmware version (program version) is displayed.

	Version
	
	⇨ The two parts of the firmware number are displayed alternately.
	

The last character indicates the modification index (-, A … Z). Please mention this index when contacting VARIAN in the event of a fault.

Watchdog control

Behavior of the system control (watchdog) in the event of an error.

	Setting
	
	⇨ The system automatically acknowledges error messages of the watchdog after 2 s.
	⇨ Error messages of the watchdog have to be acknowledged by the operator.

Torr lock

The pressure unit Torr can be suppressed in the corresponding parameter setting  (→ 🗎 36).

	Setting
	
	⇨ Pressure unit Torr available.
	⇨ Pressure unit Torr not available.

Parameter setup lock

This parameter affects the parameter mode. When the lock is activated, the user can inspect but not modify parameter values.

	Setting
	
	⇨ Parameters can be inspected and modified
	⇨ Parameters can be inspected only.

4.6.2 Test Programs

RAM test

Test of the main memory.

	Test sequence
	The test runs automatically one time:
	⇨ Test in process (very briefly).
	⇨ Test finished, no error found.
	⇨ Test finished, error(s) found. The FAIL lamp flashes.

EPROM test

Test of the program memory.

	Test sequence
	The test runs automatically one time:
	⇨ Test in process
	⇨ Test finished, no error found. After the test, a four-digit checksum (hexadecimal format) is displayed.
	⇨ Test finished, error(s) found. After the test, a four-digit checksum (hexadecimal format) is displayed. The FAIL lamp flashes.

EEPROM test

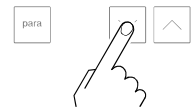
Test of the parameter memory.

	Test sequence
	The test runs automatically one time:
	⇨ Test in process (very briefly).
	⇨ Test finished, no error found.
	⇨ Test finished, error(s) found. The FAIL lamp flashes.

Display test

Test of the display.

	Test sequence
	The test runs automatically one time [1]:
	⇨ First, all display elements are lit at the same time, ...
	⇨ ... and then, each element is lit individually.

1) 

⇨ Stop the test sequence and activate one element after another by pressing the key once per element.

A/D converter test 0

Test of channel 0 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 24)).

The measurement value filter affects the applied voltage. If the signal input is open, the FRG Control Unit displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
	
e.g.: 	⇨ Positive portion of the measurement signal in Volt

A/D converter test 1

Test of channel 1 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 24)).

The measurement value filter affects the applied voltage. If the signal input is open, the FRG Control Unit displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
	
e.g.: 	⇨ Negative portion of the measurement signal in Volt.

A/D converter test 2

Test of channel 2 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 24)).

The measurement value filter affects the applied voltage. If the signal input is open, the FRG Control Unit displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
	
e.g.: 	⇨ Gauge identification voltage
	⇨ No gauge connected

I/O test

Test of the two relays of the FRG Control Unit. The program tests their switching function.

Caution

Caution: The relays switch irrespective of the pressure

Starting a test program may cause unwanted effects in connected control systems.

Disconnect all sensor cables and control system lines to ensure that no control commands or messages are triggered by mistake.

The relays switch on and off cyclically. The switching operations are indicated optically and can be heard.

The contacts are connected to the CONTROL connector on the rear of the housing (→ 24). Check the switching function with an ohmmeter.

	Test sequence
	The test runs automatically one time:
	⇨ both relays deactivated
	⇨ switching function relay
	⇨ switching function relay
	⇨ error relay
	⇨ error relay

RS232C test

Test of the RS232C interface. The FRG Control Unit repeats each sign transmitted by the communicating HOST.

The data transferred from/to the FRG Control Unit can be displayed by the computer only (→ Section 5).

	Test sequence
	The test runs automatically.

5 Communication (Serial Interface)

5.1 RS232C Interface

The serial interface is used for communication between the FRG Control Unit and a computer. A terminal can be connected for test purposes.

When the FRG Control Unit is put into operation, it starts transmitting measured values in intervals of 1 s. As soon as the first character is transferred to the FRG Control Unit, the automatic transmission of measured values stops. After the necessary inquiries or parameter modifications have been made, the transmission of measured values can be started again with the **COM** command (→ 🗎 54).

Connection diagram, connection cable

Pin assignment of the 9-pin D-Sub connector and RS232 cable → 🗎 26.

5.1.1 Data Transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

Data format

1 start bit
8 data bits
No parity bit
1 stop bit
No hardware handshake

Definitions

The following abbreviations and symbols are used:

Symbol	Meaning	Dec	Hex
HOST	Computer or terminal		
[...]	Optional elements		
ASCII	American Standard Code for Information Interchange		
<ETX>	END OF TEXT (CTRL C) Reset the interface	3	03
<CR>	CARRIAGE RETURN Go to beginning of the line	13	0D
<LF>	LINE FEED Advance by one line	10	0A
<ENQ>	ENQUIRY Request for data transmission	5	05
<ACK>	ACKNOWLEDGE Positive report signal	6	06
<NAK>	NEGATIVE ACKNOWLEDGE Negative report signal	21	15

"Transmit": Data transfer from HOST to FRG Control Unit

"Receive": Data transfer from FRG Control Unit to HOST

Format of pressure values

For pressure values, the following format is used:

```
sx.xxxxEsxx
 | |    | └── Exponent
 | |    └──── Sign exponent
 | └─────────── Mantissa
 └──────────── Sign mantissa
```

Flow Control

After each ASCII string, the HOST must wait for a report signal (<ACK><CR><LF> or <NAK> <CR><LF>).

The input buffer of the HOST must have a capacity of at least 25 bytes.

5.1.2 Communication Protocol

Transmission format

Messages are transmitted to the FRG Control Unit as ASCII strings in the form of mnemonics and parameters. All mnemonics comprise three ASCII characters.

Spaces are ignored. <ETX> (CTRL C) clears the input buffer in the FRG Control Unit.

The input is terminated by <CR> or <LF> or <CR><LF> ("end of message"), and evaluation in the FRG Control Unit is subsequently started.

The tables starting on 🗎 52 are applicable to the mnemonics and parameters. The maximum number of digits, the data formats and admissible value ranges are also specified there.

Transmission protocol

HOST FRG Control Unit	Explanation
Mnemonics [and parameters] ——————>	Receives message with "end of message"
<CR>[<LF>] ——————>	
<—————— <ACK><CR><LF>	Positive acknowledgment of a received message

Reception format

When requested with a mnemonic instruction, the FRG Control Unit transmits the measurement data or parameters as ASCII strings to the HOST.

<ENQ> must be transmitted to request the transmission of an ASCII string. Additional strings, according to the last selected mnemonic, are read out by repetitive transmission of <ENQ>.

If <ENQ> is received without a valid request, the ERROR word is transmitted.

Reception protocol

HOST FRG Control Unit	Explanation
Mnemonics [and parameters] ———> <CR>[<LF>] ———>	Receives message with "end of message"
<——- <ACK><CR><LF>	Positive acknowledgment of a received message
<ENQ> ———>	Requests to transmit
<——— Measurement values or parameters <——— <CR><LF>	Transmits data with "end of message"
:	:
<ENQ> ———>	Requests to transmit
<——— Measurement values or parameters <——— <CR><LF>	Transmits data with "end of message"

Error processing

All strings received are verified in the FRG Control Unit. If an error is detected, a negative acknowledgment <NAK> is output. The appropriate flag is set in the ERROR word. Errors can be decoded when the ERROR word is read.

Error recognition protocol

HOST FRG Control Unit	Explanation
Mnemonics [and parameters] ———> <CR>[<LF>] ———>	Receives message with "end of message"
***** Transmission or programming error *****	
<——— <NAK><CR><LF>	Negative acknowledgment of a received message
Mnemonics [and parameters] ———> <CR>[<LF>] ———>	Receives message with "end of message"
<——- <ACK><CR><LF>	Positive acknowledgment of a received message

5.2 Mnemonics

5.2.1 Measurement Mode

Measurement data

Transmit: **PR1** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x,sx.xxxxEsxx <CR><LF>

- Measurement value [1] [in current pressure unit]
- Status, x =
  - 0 –> Measurement data okay
  - 1 –> Underrange
  - 2 –> Overrange
  - 3 –> Sensor error
  - 4 –> Sensor off (BAG, PEG)
  - 5 –> No sensor
  - 6 –> Identification error
  - 7 –> Error BAG, BPG, HPG, BCG

[1] The 3rd and 4th decimal are always 0, except for the CDG gauge.

Continuous output of measured values (RS232)

Transmit: **COM** [,x] <CR>[<LF>]

└ Mode x = 0 –> 100 ms
1 –> 1 s (default)
2 –> 1 min.

Receive: <ACK><CR><LF>

<ACK> is immediately followed by the continuous output of the measured value in the desired interval.

Receive: x,sx.xxxxEsxx y <CR><LF>

Measured value [1)] with pressure unit

└ Status, x =
0 –> Measurement data okay
1 –> Underrange
2 –> Overrange
3 –> Sensor error
4 –> Sensor off (BAG, PEG)
5 –> No sensor
6 –> Identification error
7 –> Error BAG, BPG, HPG, BCG

[1)] The 3rd and 4th decimal are always 0, except for the CDG gauge.

Gauge identification

Transmit: **TID** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Identification, x =
FRG (Cold cathode/Pirani)
noSEn (no Sensor)
noid (no identification)

Error status

Transmit: **ERR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxxx <CR><LF>

x =
- 0000 –> No error
- 1000 –> Controller error (See display on front panel)
- 0100 –> NO, HWR No hardware
- 0010 –> PAR, Inadmissible parameter
- 0001 –> SYN, Syntax error

The ERROR word is cancelled when read out. If the error persists, it is immediately set again.

Reset

Transmit: **RES** [,x] <CR>[<LF>]

x = 1 –> Reset

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x,[x]x,... <CR><LF>

List of all present error messages

xx =
- 0 –> No error
- 1 –> Watchdog has responded
- 2 –> Task fail error
- 5 –> EPROM error
- 6 –> RAM error
- 7 –> EEPROM error
- 9 –> DISPLAY error
- 10 –> A/D converter error
- 11 –> Sensor error (e.g. filament rupture, no supply)
- 12 –> Sensor identification error

5.2.2 Parameter Mode

Threshold value setting, allocation

Transmit: **SP1** [,x.xxEsx,x.xxEsx] <CR>[<LF>]

- Upper threshold [1] [in current pressure unit] (default = depending on gauge)
- Lower threshold [1] [in current pressure unit] (default = depending on gauge)

[1] Values can be entered in any format. They are internally converted into the floating point format.

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x.xxxxEsxx,x.xxxxEsxx <CR><LF>

- Upper threshold [in current pressure unit]
- Lower threshold [in current pressure unit]

Switching function status

Transmit: **SPS** <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x <CR><LF>

- Switching function x = 0 –> off, 1 –> on

Offset correction

Transmit: **OFS** [,x,x.xxxEsx] <CR>[<LF>]

- Offset [1] [in current pressure unit] (default = 0.000E0)
- Mode, x =
  - 0 –> Off (default) No offset value needs to be entered.
  - 1 –> On If no offset value has been entered, the previously defined offset value is taken over.
  - 2 –> Auto (offset measurement) No offset value needs to be entered.

[1] Values can be entered in any format. They are internally converted into the floating point format.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x,sx.xxxxEsxx <CR><LF>

- Offset [in current pressure unit]
- Mode

Measurement unit

Transmit: **UNI** [,x] <CR>[<LF>]

- x = 0 –> mbar/bar (default)
  1 –> Torr
  2 –> Pascal
  3 –> Micron

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

- Measurement unit

Correction factor

Transmit: **COR** [,[x]x.xxx] <CR>[<LF>]
└ 0.100 … 10.000
(default = 1.000)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x.xxx <CR><LF>
└ Correction factor

Number of digits in the display

Transmit: **DCD** [,x] <CR>[<LF>]
└ x = 2 –> 2 digits (default)
3 –> 3 digits

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>
└ Number of digits

Measurement value filter

Transmit: **FIL** [,x] <CR>[<LF>]
└ x = 0 –> fast
1 –> medium (default)
2 –> slow

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>
└ Filter time constant

Transmission rate

Transmit: **BAU** [,x] <CR>[<LF>]

x = 0 –> 9600 baud (default)
1 –> 19200 baud
2 –> 38400 baud

As soon as the new baud rate has been entered, the report signal is transmitted at the new transmission rate.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

x = Transmission rate

Save parameters to EEPROM

Transmit: **SAV** [,x] <CR>[<LF>]

x = 0 –> Save default parameters
1 –> Save user parameters

Receive: <ACK><CR><LF>

5.2.3 Test Mode

(For service specialists)

Firmware version

Transmit: **PNR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxx-xxx-x <CR><LF>

-x = Modification index
(-- = original version)

Firmware number

Watchdog control

Transmit: **WDT** [,x] <CR>[<LF>]

└ x = 0 –> Manual error acknowledgement
1 –> Automatic error acknowledgement [1] (default)

[1] If the watchdog has responded, the error is automatically acknowledged and cancelled after 2 s.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Watchdog control

Torr lock

Transmit: **TLC** [,x] <CR>[<LF>]

└ x = 0 –> off (default)
1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Torr lock status

Parameter setup lock

Transmit: **LOC** [,x] <CR>[<LF>]

└ x = 0 –> off (default)
1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Parameter setup lock status

RAM test

Transmit: **TRA** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration <1 s)

Receive: xxxx <CR><LF>
└ ERROR word

EPROM test

Transmit: **TEP** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration ≈10 s)

Receive: xxxx,xxxx <CR><LF>
└ Check sum (hex)
└ ERROR word

EEPROM test

Transmit: **TEE** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration <1 s)

Do not keep repeating the test (EEPROM life).

Receive: xxxx <CR><LF>
└ ERROR word

Display test

Transmit: **TDI** [,x] <CR>[<LF>]
└ x = 0 –> Stops the test – display according to current operating mode (default)
1 –> Starts the test – all LEDs on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>
└ Display test status

ADC test

Transmit: **TAD** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x.xxxx, x.xxxx, x.xxxx <CR><LF>

- ADC channel 2 Gauge identification [0.0000 … 5.0000 V]
- ADC channel 1 Measurement signal (negative portion) [0.0000 … 5.0000 V]
- ADC channel 0 Measurement signal (positive portion) [0.0000 … 11.0000 V]

I/O test

Transmit: **TIO** [,x] <CR>[<LF>]

x =
- 0 –> Stops the test (default)
- 1 –> Setpoint relay off, error relay off
- 2 –> Setpoint relay on, error relay off
- 3 –> Setpoint relay off, error relay on
- 4 –> Setpoint relay on, error relay on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

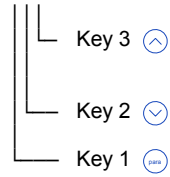
- I/O test status

Operator key test

Transmit: **TKB** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxx <CR><LF>



x = 0 –> Not pushed
1 –> Pushed

RS232 test

Transmit: **TRS** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (repeats each character, test is interrupted with <CTRL> C).

5.2.4 Example

"Transmit (T)" and "Receive (R)" are related to the host.

T: **TID** <CR> [<LF>]	Request for gauge identification
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: PSG <CR> <LF>	Gauge identification
T: **SP1** <CR> [<LF>]	Request for parameters of switching function (setpoint)
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 1.0000E-09,9.0000E-07 <CR> <LF>	Thresholds
T: **SP1**,6.80E-3,9.80E-3 <CR> [<LF>]	Modification of threshold values of switching function (setpoint)
R: <ACK> <CR> <LF>	Positive acknowledgement
T: **FOL**,2 <CR> [<LF>]	Modification of filter time constant (syntax error)
R: <NAK> <CR> <LF>	Negative acknowledgement
T: <ENQ>	Request for data transmission
R: 0001 <CR> <LF>	ERROR word
T: **FIL**,2 <CR> [<LF>]	Modification of filter time constant
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 2 <CR> <LF>	Filter time constant
T: **PR1** <CR> [<LF>]	Request for measurement data
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <ENQ>	Request for data transmission
R: 0,8.3400E-03 <CR> <LF>	Status and pressure
T: <ENQ>	Request for data transmission
R: 1,8.0000E-04 <CR> <LF>	Status and pressure

6 Maintenance

The product requires no maintenance.

Cleaning the FRG Control Unit

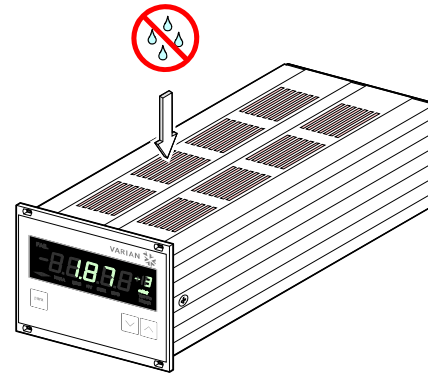
For cleaning the outside of the FRG Control Unit, a slightly moist cloth will usually do. Do not use any aggressive or scouring cleaning agents.

STOP DANGER

DANGER: mains voltage

Contact with live parts is extremely hazardous when liquids penetrate into the unit.

Make sure no liquids penetrate into the equipment.



7 Troubleshooting

Error indication

and the error relay opens (→ 🗎 25).

Error messages

	Possible cause and remedy/ acknowledgement
	Parameter setup lock activated (→ 🗎 43).

	Possible cause and remedy/ acknowledgement
	Interruption or instability in sensor line or connector (Sensor error). ⇨ Acknowledge with the para key. If the problem persists, noSEn or HArd is displayed

	Possible cause and remedy/ acknowledgement
	The FRG Control Unit has been turned on too fast after power off. ⇨ Acknowledge with the para key [1].
	The watchdog has tripped because of a severe electric disturbance or an operating system error. ⇨ Acknowledge with the para key [1].

[1] If the watchdog is set to AUtO, the FRG Control Unit acknowledges the message automatically after 2 s (→ 🗎 42).

	Possible cause and remedy/ acknowledgement
	Main memory (RAM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Program memory (EPROM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Parameter memory (EEPROM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Display driver error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	A/D converter error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Operating system (Task Fail) error. ⇨ Acknowledge with the para key.

Technical support

If the problem persists after the message has been acknowledged for several times and/or the gauge has been exchanged, please contact your local VARIAN service center.

8 Repair

Return defective products to your local VARIAN service center for repair.

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

9 Accessories

	Ordering number
Adapter panel for installation into a 19" rack chassis adapter, height 3 U	FRG700ADPT

10 Storage

Caution

Caution: electronic component

Inappropriate storage (static electricity, humidity etc.) can damage electronic components.

Store the product in a bag or container. Observe the corresponding specifications in the technical data (→ 10).

11 Disposal

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:

Non-electronic components

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

Electronic components

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

Appendix

A: Conversion Tables

Weights

		kg	lb	slug	oz
kg		1	2.205	68.522×10^{-3}	35.274
lb		0.454	1	31.081×10^{-3}	16
slug		14.594	32.174	1	514.785
oz		28.349×10^{-3}	62.5×10^{-3}	1.943×10^{-3}	1

Pressures

	N/m^2, Pa	bar	mbar	Torr	at
N/m^2, Pa	1	10×10^{-6}	10×10^{-3}	7.5×10^{-3}	9.869×10^{-6}
bar	100×10^{3}	1	10^{3}	750.062	0.987
mbar	100	10^{-3}	1	750.062×10^{-3}	0.987×10^{-3}
Torr	133.322	1.333×10^{-3}	1.333	1	1.316×10^{-3}
at	101.325×10^{3}	1.013	1.013×10^{3}	760	1

Pressure units used in the vacuum technology

	mbar	Pascal	Torr	mmWs	psi
mbar	1	100	750.062×10^{-3}	10.2	14.504×10^{-3}
Pascal	10×10^{-3}	1	7.5×10^{-3}	0.102	0.145×10^{-3}
Torr	1.333	133.322	1	13.595	19.337×10^{-3}
mmWs	9.81×10^{-2}	9.81	7.356×10^{-2}	1	1.422×10^{-3}
psi	68.948	6.895×10^{3}	51.715	703	1

Linear measures

		mm	m	inch	ft
mm		1	10^{-3}	39.37×10^{-3}	3.281×10^{-3}
m		10^{3}	1	39.37	3.281
inch		25.4	25.4×10^{-3}	1	8.333×10^{-2}
ft		304.8	0.305	12	1

Temperature

		Kelvin	Celsius	Fahrenheit
Kelvin		1	°C+273.15	(°F+459.67)×5/9
Celsius		K-273.15	1	5/9×°F-17.778
Fahrenheit		9/5×K-459.67	9/5×(°C+17.778)	1

B: Default Parameters

The following values are activated when the default parameters are loaded (→ 🗎 34):

	Default	User	
	oFF		
	5×10^{-4} mbar		
	1×10^{3} mbar		
	1000 Torr		
	oFF		
	mbar		
	1.00		
	nor		
	oFF		
	2 digits		
	9600		
	Auto		
	oFF		
	oFF		
	Auto		
	Auto		

C: Firmware Update

If your FRG Control Unit firmware needs updating, e.g. for implementing a new gauge type, please contact your local VARIAN service center.

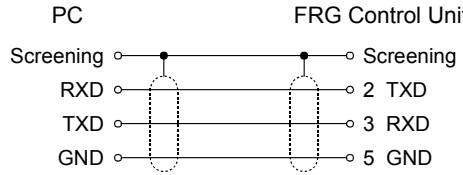
User parameters

Most of the settings you may have defined in the Parameter and Test mode will not be affected by a firmware update. To be sure, note your parameter settings before upgrading the firmware (→ 🗎 71).

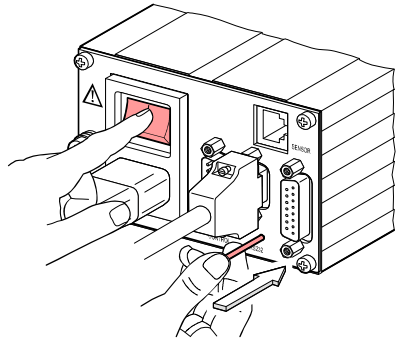
Preparing the FRG Control Unit for a program transfer

❶ Turn the FRG Control Unit off

❷ Connect the FRG Control Unit with the serial COM1 (COM2) interface of your PC via a 9-pole D-Sub extension cable (the firmware of the FRG Control Unit cannot be loaded from a Mac).



❸ With a pin (ø<2 mm) depress the switch behind the rear panel and turn the FRG Control Unit on.

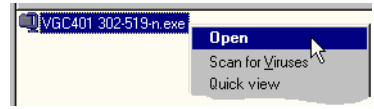


After power on, the display remains dark.

Program transfer

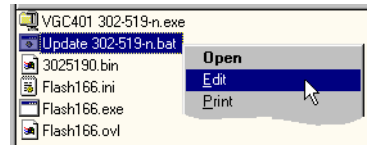
In the following instructions, the index `-n` is used instead of the actual index.

❶ Unpack the self extracting file *.exe or the packed file *.zip.



❷ If you have not connected the FRG Control Unit to the COM1 interface:

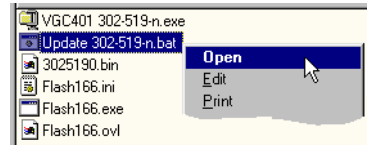
Open the batch file `Update 302-564-n.bat`, …



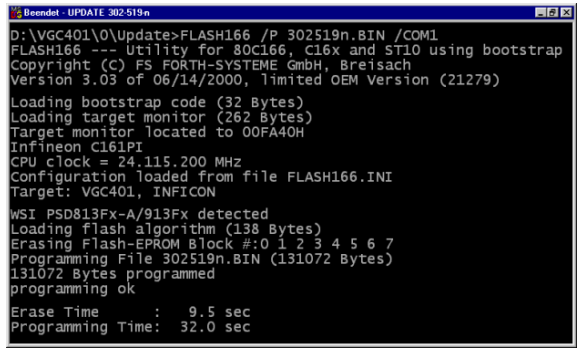
… edit the interface …

… and save the new setting.

❸ Start batch file `Update 302-564-n.bat`.



⇨ The new firmware is transmitted to the FRG Control Unit.



Starting the FRG Control Unit with the updated firmware

If the program transfer was successful, quit the Update mode by turning the FRG Control Unit off.

Wait at least 10 s before turning the FRG Control Unit on again in order for it to correctly initialize itself.

✓ The FRG Control Unit is now ready for operation. To be sure, check that the current parameter settings are identical with the previously defined settings (→ 🗎 71).

D: Literature

🕮 [1] www.varianinc.com
Instruction Manual
Inverted Magnetron Pirani Gauge
FRG-700
tqna48e1
VARIAN Vacuum Technologies
MA, 02421 USA

E: Index

EC Declaration of Conformity

CE

We, VARIAN, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electrical equipment designed for use within certain voltage limits 2006/95/EC and the Directive relating to electromagnetic compatibility 89/336/EEC.

Product

FRG Control Unit

Part number

FRG700CNTR1

Standards

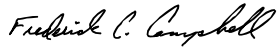
Harmonized and international/national standards and specifications:

- EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 50081-1 (EMC: generic emission standard)
- EN 50082-2 (EMC: generic immunity standard)

Signatures

Varian Vacuum Technologies, USA

9 December 2008



Frederick C. Campbell
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Notes

Notes

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