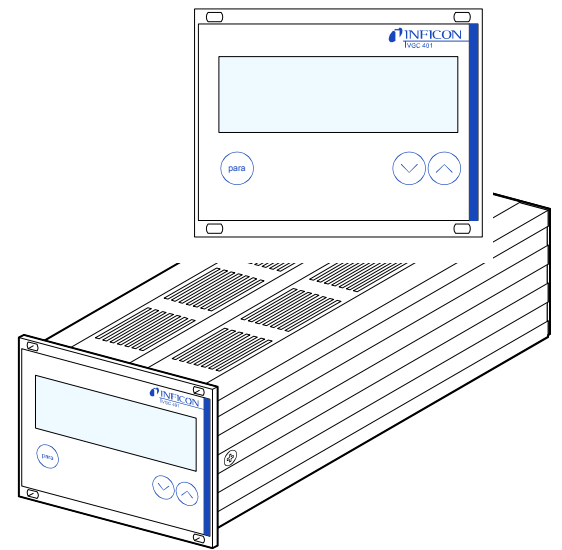


# Single-Channel Controller

## VGC401




## Product Identification

→  tinb01e1

## Validity

This document applies to products with product number 398-010.  
The product number can be taken from the product nameplate.

This document is based on firmware number 302-519-A.  
If your unit does not work as described in this document, please check that it is equipped with the above firmware version (→  12).



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

## Intended Use

The RS232C interface is used for operating the VGC401 via a computer or a terminal.

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

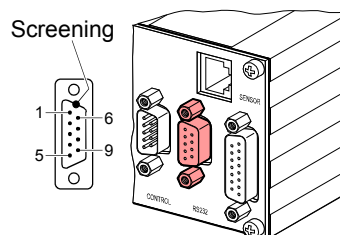
# 1 RS232C Interface

The serial interface is used for communication between the VGC401 and a computer. A terminal can be connected for test purposes.

When the VGC401 is put into operation, it starts transmitting measured values in intervals of 1 s. As soon as the first character is transferred to the VGC401, 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 (→ 7).

## 1.1 Connection Diagrams

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

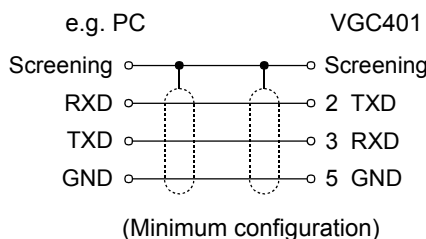


Pin	Signal	Pin	Signal
2	TXD	1	not connected
3	RXD	4	not connected
5	GND	7	not connected
6	DSR		
8	CTS		
9	GND		

Chassis = screening

## 1.2 Connection Cable

Use shielded cable only.



## 1.3 Data Transmission

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

Configuration of the interface → tinb01e1.

Data format

1 start bit, 8 data bits, no parity bit, 1 stop bit, no hardware handshake

### 1.3.1 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 VGC401

"Receive": Data transfer from VGC401 to HOST

### 1.3.2 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.

### 1.3.3 Communication Protocol

#### Transmission format

Messages are transmitted to the VGC401 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 VGC401.

The input is terminated by <CR> or <LF> or <CR><LF> ("end of message"), and evaluation in the VGC401 is subsequently started.

The tables in chapter 2 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	VGC401	Explanation
Mnemonics [and parameters] <CR>[<LF>]	—————> —————>	Receives message with "end of message"
<—————	<ACK><CR><LF>	Positive acknowledgment of a received message

#### Reception format

When requested with a mnemonic instruction, the VGC401 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	VGC401	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 data
<_____ Measurement values or parameters <_____ <CR><LF>		Transmits data with "end of message"
	:	:
<ENQ> _____>		Requests to transmit data
<_____ Measurement values or parameters <_____ <CR><LF>		Transmits data with "end of message"


### Error processing

All strings received are verified in the VGC401. 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	VGC401	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

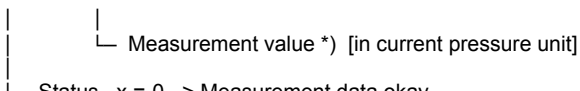
## 2 Mnemonics


		→ 
<b>BAU</b>	Baud rate	11
<b>COM</b>	Continuous mode	7
<b>COR</b>	Correction factor	11
<b>DGS</b>	BAG, BPG degas	9
<b>ERR</b>	Error status	8
<b>FIL</b>	Filter time constant	11
<b>FSR</b>	CDG full scale range	10
<b>HVC</b>	HV, EMI on/off	7
<b>ITR</b>	BAG, BPG, HPG data output	8
<b>LOC</b>	Parameter setup lock	12
<b>OFS</b>	Offset correction	10
<b>PNR</b>	Program number	12
<b>PR1</b>	Pressure measurement	7
<b>RES</b>	Reset	9
<b>SAV</b>	Save parameters to EEPROM	11
<b>SP1</b>	Setpoint	9
<b>SPS</b>	Setpoint status	10
<b>TAD</b>	A/D converter test	13
<b>TDI</b>	Display test	13
<b>TEE</b>	EEPROM test	13
<b>TEP</b>	EPROM test	13
<b>TID</b>	Sensor identification	8
<b>TIO</b>	I/O test	13
<b>TKB</b>	Keyboard test	14
<b>TLC</b>	Torr lock	12
<b>TRA</b>	RAM test	12
<b>TRS</b>	RS232 test	14
<b>UNI</b>	Pressure unit	11
<b>WDT</b>	Watchdog control	12

## 2.1 Measurement Mode

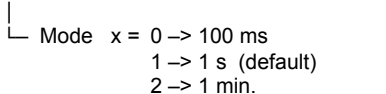
### Measurement data

Transmit: **PR1** <CR><LF> Pressure measurement  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: x,sx.xxxxEsxx <CR><LF>


  
 Measurement value \*) [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

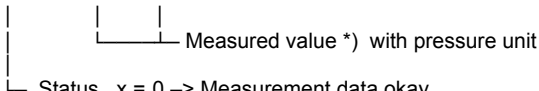
 \*) The 3<sup>rd</sup> and 4<sup>th</sup> decimal are always 0, except for the CDG gauge.


### Continuous output of measured values (RS232)

Transmit: **COM** [,x] <CR><LF> Continuous mode  
  
 Mode x = 0 → 100 ms  
           1 → 1 s (default)  
           2 → 1 min.

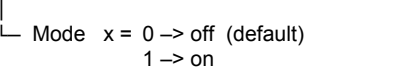
Receive: <ACK><CR><LF>  
 <ACK> is immediately followed by the continuous output of the measured value in the desired interval.

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



  
 Measured value \*) 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

 \*) The 3<sup>rd</sup> and 4<sup>th</sup> decimal are always 0, except for the CDG gauge.




### Activating/deactivating the HV circuit and EMI

Transmit: **HVC** [,x] <CR><LF> High vacuum on/off  
  
 Mode x = 0 → off (default)  
           1 → on

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

Receive: x <CR><LF>  
  
 Mode

## Data output BAG, BPG, HPG


Transmit: **ITR** <CR>[<LF>] BAG, BPG, HPG data output  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: xxx...xxx,y <CR><LF> for BAG  
     |           |  
     |           └─ Gauge status ERS y (→  BAG)  
     └─ Transmission string (17 character) (→  BAG)  
  
 xx,xx,xx,xx,xx,xx,xx,xx <CR><LF> for BPG, HPG  
     |  
     └─ Transmission string byte 0 ... 7 in hex format  
         (→  BPG, HPG)

## Gauge identification

Transmit: **TID** <CR>[<LF>] Sensor identification  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: x <CR><LF>  
     |  
     └─ Identification x = PSG (Pirani)  
           PCG (Pirani/Capacitive)  
           PEG (Cold cathode)  
           CDG (Capacitive)  
           BAG (Hot cathode)  
           BPG (Hot cathode/Pirani)  
           HPG (Hot cathode/Pirani)  
           noSEn (no SEnsor)  
           noid (no identification)

## Error status

Transmit: **ERR** <CR>[<LF>] Error status  
 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 set again.

## Reset

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

## 2.2 Parameter Mode

### Degas


Transmit: **DGS** [,x] <CR>[<LF>] Degas  
 |  
 └ x = 0 → off (default)  
 1 → on (3 min.)

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

Receive: x <CR><LF>  
 |  
 └ Degas status

### Threshold value setting, allocation

Transmit: **SP1** [,x.xxEsx,x.xxEsx] <CR>[<LF>] Setpoint  
 |  
 └ Upper threshold \*) [in current pressure unit] (default = depending on gauge)  
 └ Lower threshold \*) [in current pressure unit] (default = depending on gauge)

 \*) 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>] Setpoint status  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: x <CR><LF>  
 |  
 └─ Switching function x = 0 → off  
 1 → on

### Measurement range (F.S.) of capacitive gauges

The full scale value of the measurement range (Full Scale) of linear gauges has to be defined by the user; the full scale value of logarithmic gauges is automatically recognized.

Transmit: **FSR** [,x] <CR>[<LF>] Full scale range CDG  
 |  
 └─ Measurement range x = 0 → 0.01 mbar  
 1 → 0.01 Torr  
 2 → 0.02 Torr  
 3 → 0.05 Torr  
 4 → 0.10 mbar  
 5 → 0.10 Torr  
 6 → 0.25 Torr  
 7 → 0.50 Torr  
 8 → 1 mbar  
 9 → 1 Torr  
 10 → 2 Torr  
 11 → 10 mbar  
 12 → 10 Torr  
 13 → 100 mbar  
 14 → 100 Torr  
 15 → 1000 mbar  
 16 → 1100 mbar  
 17 → 1000 Torr  
 18 → 2 bar  
 19 → 5 bar  
 20 → 10 bar  
 21 → 50 bar

Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: x <CR><LF>  
 |  
 └─ Measurement range (F.S.)

### Offset correction

Transmit: **OFS** [,x,x.xxxEsx] <CR>[<LF>] Offset correction  
 |  
 └─ Offset \*) [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.

\*) 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> Measurement unit

└ 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> Correction factor

└ 0.100 ... 10.000 (default = 1.000)

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

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

└ Correction factor

Measurement value filter

Transmit: **FIL** [,x] <CR><LF> Filter time constant

└ 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> Baud rate

└ 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>

└ Transmission rate

Save parameters to EEPROM

Transmit: **SAV** [,x] <CR><LF> Save parameters to EEPROM

└ x = 0 → Save default parameters  
 1 → Save user parameters

Receive: <ACK><CR><LF>



### EPROM test

Transmit: **TEP** <CR>[<LF>] EPROM test  
 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>] EEPROM test  
 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>] Display test  
 |  
 | ┌ 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>] ADC test  
 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>] I/O test  
 |  
 | ┌ 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>] Keyboard test  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ>  
 Receive: xxx <CR><LF>

## RS232 test

Transmit: **TRS** <CR>[<LF>] RS232 test  
 Receive: <ACK><CR><LF>  
 Transmit: <ENQ> Starts the test (repeats each character, test is interrupted with <CTRL> C)

## 2.4 Example

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

T: <b>TID</b> <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: <b>SP1</b> <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: <b>SP1</b> ,6.80E-3,9.80E-3 <CR> [<LF>]	Modification of threshold values of switching function (setpoint)
R: <ACK> <CR> <LF>	Positive acknowledgement
T: <b>FOL</b> ,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: <b>FIL</b> ,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: <b>PR1</b> <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

Notes

Original: German tirb01d1-a (0306)



tirb01d1-a



LI-9496 Balzers  
Liechtenstein  
Tel +423 / 388 3111  
Fax +423 / 388 3700  
[reach.liechtenstein@inficon.com](mailto:reach.liechtenstein@inficon.com)

[www.inficon.com](http://www.inficon.com)