

Vacuum Products Division

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RS232C

Serial Interface for Pirani Capacitance Diaphragm and Pirani Standard Gauges

PCG-750, PCG-752 PVG-550, PVG-552 Communications Protocol

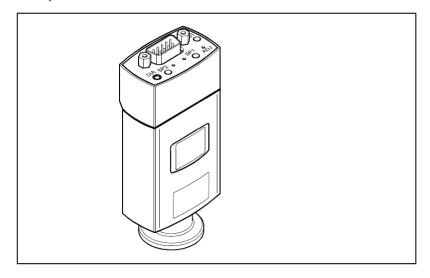
Manual No. TQRa78e1 Revision 3 March 2012

RS232C

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Serial Interface for Pirani Capacitance Diaphragm and Pirani Standard Gauges

PCG-750, PCG-752 PVG-550, PVG-552



General Information

The Serial Interface allows the communication of the digital Agilent Pirani Capacitance Diaphragm Gauges (PCG-750, PCG-752) and the digital Agilent Pirani Standard Gauges (PVG-550, PVG-552) with

- an Agilent Vacuum Gauge Controller (VGC series) or with
- another appropriate controller.

The RS232C or RS485C interface integrated in the gauge allows to digitally transmit measurement values and information on the gauge status as well as to make parameter settings.



Caution



Caution: data transmission errors

Any attempt to simultaneously operate the gauge via the serial interface and a fieldbus interface (Profibus) or the diagnostic port may result in incorrect data and data transmission errors.

Therefore, it is inadmissible to simultaneously operate the gauge via the RS232C and Profibus or diagnostic port.

Interface Protocol

The Serial Interface is used in Master-Slave mode. Without a corresponding request from the Master, the device does not transmit any data. Instructions to the gauge are transmitted via binary protocol.

Data format

- binary
- 8 data bits
- 1 stop bit
- no parity bit
- no handshake

RS232 address and transmission rate

The address of the RS232C interface need not be set. For the protocol 0 is always used. The transmission rate can be set as parameter ($\rightarrow \mathbb{B}$ 6).

Data Link Layer



The Data Link Layer uses the following terminology:

request (Req)

A request is an instruction (to read/or write) transmitted by the Master.

indication (Ind)

An indication means that the Slave (gauge) recognizes a request from the Master.

response (Rs)

A response is an answer from the Slave to the Master.

confirmation (Cf)

A confirmation is an acknowledgement of the response by the Master.

Protocol Frame

Every protocol layer of the communication protocol is represented in a protocol frame. The maximum length per frame is 64 byte. The data field of the data link layer consists of

- a command (Cmd)
- a parameter identifier (PID)
- · a data field (Data).

The command determines whether the data transmitted are read or write requests.

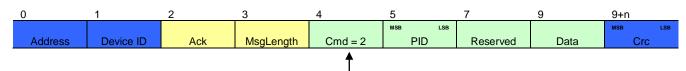
Command (Cmd)

There are four different command types:

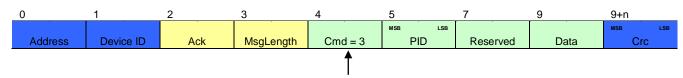
- Cmd 1 Read request from the Master
- Cmd 2 Read response from the gauge to a read request
- Cmd 3 Write request
- Cmd 4 Write response from the gauge to a write request
- · Cmd 1: Read request from the Master



• Cmd 2: Response from the gauge to a read request



· Cmd 3: Write request from a Master



• Cmd 4: Response from the gauge to a write request



Parameter Identifier (PID)

The parameter identifier (PID) addresses a defined parameter of the device.

Data field (Data)

The data field contains the data of a request. In the case of a write request it contains the data transmitted from the Master to the gauge, in the case of a read request it contains the data to be transmitted from the gauge to the Master. Data are transmitted in Big Endian.

Medium Access Layer

The medium access layer contains the following data fields:

- RS232 address (address is 0)
- Device ID (Master 0, PCG-7xx 2)
- Header with Ack and Message Length (all APDU data are counted: Cmd, PID, Reserved, Data)
- 16 bit CRC (example → 1 10)

Communication Error

If a communication error occurs during transmission the PID is set to 0xFFFF and an error byte is added.

Byte 0, errors

Error Code	Description			
1	Access error			
2	Value higher max. or lower min.			
3	Parameter not found			
4	Length error			
6	Memory access error			
7	Memory access timeout			

Protocol Description

The following parameters can be read via a serial interface.

Output pressure

PID	Name	Description	Factory setting	Min.	Max.	Туре
221	Pressure	Output pressure in integer format				Fixs32en20
222	Pressure	Pressure in vacuum chamber in Real format				Real32
265	ATM Pressure	Ambient pressure in real format				Real32
466	Differential Pressure	Differential pressure outside and inside vacuum chamber				Real32
		Changes the pressure unit of all Real32 pressures.				
		0 mbar				
		1 Torr				
		2 Pascal				
		3 micron				
224	Data Unit	4 Counts	0	0	4	Uint8

Error

PID	Name	Description	Factory setting	Min.	Max.	Туре
		0 No error				
		1 Timeout EEPROM memory access				
		2 EEPROM CRC error				
		3 EEPROM error				
		4 Pirani filament rupture				
		5 Wrong filament material				
		6 CDG diaphragm rupture				
		8 ATM outside specification limits				
228	Device Exception	11 Sensor does not match gauge	0			Uint8

General information

PID	Name	Description	Factory setting	Min.	Max.	Туре
		Write The sensor carries out a reset.				
103	Reset	Write The sensor resets all parameters to their factory settings.				
103	Run Hours	Operating hours [0.25 h]				Fixs32en2
207	Serial Number	Serial number			4294967295	Uint32
208	Product Name	Product name	PCG-750			String
209	Manufacturers Name	Name of manufacturer	Agilent			String
210	Manufacturers Model Number	Model number				String
218	Software Version	Software version				String
227	RS232 Baud Rate	9600, 19200, 38400, 57600	57600	9600	57600	Uint32
		Display orientation				
		0 Setting for flange in bottom position				
243	Display Direction	1 Setting for flange in top position	0	0	1	Uint8

Sensor details

Type Uint8 Fixs32en20 Fixs32en20
Fixs32en20
Fixs32en20
Fixs32en20
Uint8
Fixs32en20
Uint8
Uint8

(continued)

(concluded)

		(concluded)				
PID	Name	Description	Factory setting	Min.	Max.	Type
	ramo	No automatic CDG adjustment	Coung	141111.	iviax.	1,450
421	CDG Auto Zero Adjust*	Automatic CDG adjustment	1	0	1	Uint8
	- CD C / tate 20.0 / tajust	Executes a manual CDG sensor		<u> </u>	•	
		adjustment.				
		Set the value to "1" in order for the				
414	CDG Zero Adjust Flag*	adjustment to be executed.	0			Uint8
34000	CDG Full Scale*	CDG full scale	1500			Fixs32en20
	000 0	If the pressure exceeds this value the	.=			
34001	CDG Overrange Value*	measurement is invalid.	1500			Fixs32en20
34002	CDG Underrange Value*	If the pressure is below this value the measurement is invalid.	1			Fixs32en20
264	ATM Pressure*	Output pressure in integer format				Fixs32en20
265	ATM Pressure*	Output pressure in Real format				Real32
267	ATM Full Scale*	ATM fullscale value	1150			Fixs32en20
270	ATM Overrange Value*	Limit for determining the overrange status	1150			Fixs32en20
271	ATM Underrange Value*	Limit for determining the underrange status	150			Fixs32en20
		ATM sensor status				
		Bit 2 underrange exceeded				
		Bit 1 overrange				
274	ATM Status Extention*	Bit 0 exceeded reading invalid				Uint8
		Adjustment of atmospheric pressure sensor				
		Set the value to "1" in order for the adjustment to be executed.				
		The adjustment has to be carried out while				
		the vacuum chamber is at atmospheric pressure. When the atmospheric pressure				
		sensor is adjusted it has to indicate the				
		same pressure reading as the CDG pres-				
448	ATM Adjust Flag*	sure reading of the vacuum chamber at atmospheric pressure.	0			Uint8
770	/ trivi / tujust r lag	aunosphono pressure.	U			Unito

^{*} Parameter not available for PVG-55x devices.

Setpoints

OHIG						
PID	Name	Description	Factory setting	Min.	Max.	Туре
275	Setpoint 1 High Trip Point	Setpoint High Trip Point in mbar	1500	5.00E-04	1500	Fixs32en20
	Setpoint 1 High Trip Point	0 Off				
276	Enable	1 On	1	0	1	Uint8
277	Setpoint 1 Low Trip Point	Setpoint Low Trip Point in mbar	5.00E-05	5.00E-05	1500	Fixs32en20
	Setpoint 1 Low Trip Point	0 Off				
278	Enable	1 On	1	0	1	Uint8
279	Setpoint 1 Status	Status of Relay 1	0			Uint8
		Factor for ATM setpoint				
281	Setpoint 1 ATM Factor	The atmospheric pressure is multiplied by this factor and used as Setpoint 1. To activate the ATM mode select the Setpoint 1 mode.	1.1	0	3	Fixs32en20
282			1500	5.00E-04	1500	Fixs32en20
202	Setpoint 2 High Trip Point	Setpoint High Trip Point in mbar 0 Off	1300	3.00E-04	1300	FIXSSZEIIZU
283	Setpoint 2 High Trip Point Enable	1 On	1	0	1	Uint8
284	Setpoint 2 Low Trip Point	Setpoint Low Trip Point in mbar	5.00E-05	5.00E-05	1500	Fixs32en20
204		0 Off	J.00L-03	J.00L-03	1300	1 1835261120
285	Setpoint 2 Low Trip Point Enable	1 On	1	0	1	Uint8
286	Setpoint 2 Status	Status of Relay 1	0			Uint8
200	Corpoint 2 Glatas	Factor for the ATM setpoint				Onto
		The atmospheric pressure is multiplied by this factor and used as Setpoint 2. To activate the ATM mode select the				
288	Setpoint 2 ATM Factor	Setpoint 2 mode.	1.1	0	3	Fixs32en20
		 Setpoint mode Setpoint (Low / High Trip mMode) Setpoint (Low / High Trip mode). In addition, the setpoint adjustment buttons are disabled. The Low Trip Point is in ATM mode. The Low Trip Point is in ATM mode. In addition, the setpoint adjustment buttons are disabled. The High Trip Point is in ATM mode. The High Trip Point is in ATM mode. In addition, the setpoint adjustment buttons are disabled. 				
455	Setpoint 1 Mode	3/7 Reserved function	0	0	7	Uint8
400	octpoint i mode	Setpoint mode Setpoint (Low / High Trip mode) Setpoint (Low / High Trip mode). In addition, the setpoint adjustment buttons are disabled. The Low Trip Point is in ATM mode. The Low Trip Point is in ATM mode. In addition, the setpoint adjustment buttons are disabled. The High Trip Point is in ATM mode. The High Trip Point is in ATM mode. In addition, the setpoint adjustment buttons are disabled.		0	•	Onico
456	Setpoint 2 Mode	3/7 Reserved function	0	0	7	Uint8

(continued)

(concluded)

PID	Name	Description	Factory setting	Min.	Max.	Туре
457	High Trip Point 1 Hysteresis	Hysteresis High Trip Point 1 [mbar]	1.00E+01	5.00E-05	1500	Fixs32en20
458	Low Trip Point 1 Hysteresis	Hysteresis Low Trip Point 1 [mbar]	5.00E-05	5.00E-05	1500	Fixs32en20
459	High Trip Point 2 Hysteresis	Hysteresis High Trip Point 2 [mbar]	1.00E+01	5.00E-05	1500	Fixs32en20
460	Low Trip Point 2 Hysteresis	Hysteresis Low Trip Point 2 [mbar]	5.00E-05	5.00E-05	1500	Fixs32en20
461	Setpoint 1 Extended Status	Extended status of Setpoint 1 0 Not active 1 Low Trip Point active 2 High Trip Point active 3 High and Low Trip Point active	0			Uint8
462	Setpoint 2 Extended Status	Extended status of Setpoint 2 0 Not active 1 Low Trip Point active 2 High Trip Point active 3 High and Low Trip Point active	0			Uint8

Data Format

Fixs32enXX

To calculate the result from a Fixx32enXX value, multiply or divide it by a factor of $2^{\rm XX}$.

Example Fixs32en20

The hysteresis of the High Trip Point Setpoint 1 is to be set to 10 mbar. For this purpose 10 is multiplied by 2^{20} (Fixs32en20). The value 10485760 is therefore transmitted.

Examples

The following examples show how read and write requests are made.

Read request (reading a pressure)

The required parameter has PID 221.

From Master to PCG-7xx:

0	1	2	3	4	5	7	9	9+n
		, i	,	, in the second second	MSB LSB	, and the second		MSB LSB
Address	Device ID	Ack	MsgLength	Cmd	PID	Reserved	Data	Crc
0x00	0x00	0x00	0x05	0x01	0x00DD	0x0000	-	0xAB21

From PCG-7xx to Master:

0	1	2	3	4	5	7	9	9+n
		, i	·		MSB LSB	, i		MSB LSB
Address	Device ID	Ack	MsgLength	Cmd	PID	Reserved	Data	Crc
0x00	0x02	0x01	0x09	0x02	0x00DD	0x0000	0x375A05BF	0xD9BB

Write request (setting a unit)

The required parameter has PID 224. To set the unit to Torr, 1 must be written.

From Master to PCG-7xx:

0	1	2	3	4	5	7	9	9+n
		, i	, i	, in the second second	MSB LSB			MSB LSB
Address	Device ID	Ack	MsgLength	Cmd	PID	Reserved	Data	Crc
0x00	0x00	0x00	0x06	0x03	0x00E0	0x0000	0x01	0x346D

From PCG-7xx to Master:

0	1	2	3	4	5	7	9	9+n
		·		·	MSB LSB	·	·	MSB LSB
Address	Device ID	Ack	MsgLength	Cmd	PID	Reserved	Data	Crc
0x00	0x02	0x01	0x05	0x04	0x00E0	0x0000	-	0x94EA

Calculating CRC

The data packages are secured with CRC16 in Little Endian.

CRC polynominal 0x8408 CRC initial value 0xFFFF

CRC Example Code

To illustrate how the checksum can be calculated and verified, an example of a code is given below:

```
using System;
class Program
    static void Main()
    // the following test array is a valid pcg-7xx frame with crc16 at the end
    byte[] arr = new byte[] { 0x00, 0x00, 0x00, 0x05, 0x01, 0x00, 0xDD, 0x00, 0x00, 0xAB, 0x21};
    UInt16 crc;
    Boolean b;
    // Calculate the crc of the test array arr, of course without crc (therefore length minus 2)
    crc = Crc16.Create(arr, (Byte)(arr.Length - 2));
    // Check, if the test array has a correct crc at the end (it is correct, therefore the returnvalue is
    b = Crc16.Check(arr, (Byte)arr.Length);
}
public class Crc16
    // initial value for crc16
    public static UInt16 inital = 0xFFFF;
    // function to create a crc16
    public static UInt16 Create(Byte[] buffer, Byte length)
         UInt16 crc16 = new UInt16();
        UInt16 i = 0;
         // Initial Value for CRC calculation
         crc16 = Crc16.inital;
         while (i < length)
             crc16 = (UInt16)((Crc16.crc16Tab[(crc16 ^ buffer[i++]) & (Byte)0xFF]) ^ (crc16 >> 8));
         return crc16;
    }
    // function to check a buffer with a crc16 at the end
    public static Boolean Check(Byte[] buffer, Byte length)
         UInt16 crc16 = Crc16.inital;
        UInt16 i = 0;
         // calculate crc for the buffer without crc
         while (i < length)</pre>
             crc16 = (UInt16)((Crc16.crc16Tab[(crc16 ^ buffer[i++]) & (Byte)0xFF]) ^ (crc16 >> 8));
         if (crc16 == 0)
             return true;
         return false;
    // crc array
    public static UInt16[] crc16Tab =
         0x0000, 0x1189, 0x2312, 0x329B, 0x4624, 0x57AD, 0x6536, 0x74BF,
         0x8C48, 0x9DC1, 0xAF5A, 0xBED3, 0xCA6C, 0xDBE5, 0xE97E, 0xF8F7,
         0x1081, 0x0108, 0x3393, 0x221A, 0x56A5, 0x472C, 0x75B7, 0x643E,
         0x9CC9, 0x8D40, 0xBFDB, 0xAE52, 0xDAED, 0xCB64, 0xF9FF, 0xE876,
         0x2102, 0x308B, 0x0210, 0x1399, 0x6726, 0x76AF, 0x4434, 0x55BD,
         0xAD4A, 0xBCC3, 0x8E58, 0x9FD1, 0xEB6E, 0xFAE7, 0xC87C, 0xD9F5, 0x3183, 0x200A, 0x1291, 0x0318, 0x77A7, 0x662E, 0x54B5, 0x453C,
         0xBDCB, 0xAC42, 0x9ED9, 0x8F50, 0xFBEF, 0xEA66, 0xD8FD, 0xC974,
         0x4204, 0x538D, 0x6116, 0x709F, 0x0420, 0x15A9, 0x2732, 0x36BB, 0xCE4C, 0xDFC5, 0xED5E, 0xFCD7, 0x8868, 0x99E1, 0xAB7A, 0xBAF3,
         0x5285, 0x430C, 0x7197, 0x601E, 0x14A1, 0x0528, 0x37B3, 0x263A, 0xDECD, 0xCF44, 0xFDDF, 0xEC56, 0x98E9, 0x8960, 0xBBFB, 0xAA72,
```

```
0x6306, 0x728F, 0x4014, 0x519D, 0x2522, 0x34AB, 0x0630, 0x17B9,
    0xEF4E, 0xFEC7, 0xCC5C, 0xDDD5, 0xA96A, 0xB8E3, 0x8A78, 0x9BF1,
    0x7387, 0x620E, 0x5095, 0x411C, 0x35A3, 0x242A, 0x16B1, 0x0738,
    OxFFCF, OxEE46, OxDCDD, OxCD54, OxB9EB, OxA862, Ox9AF9, Ox8B70,
    0x8408, 0x9581, 0xA71A, 0xB693, 0xC22C, 0xD3A5, 0xE13E, 0xF0B7,
    0x0840, 0x19C9, 0x2B52, 0x3ADB, 0x4E64, 0x5FED, 0x6D76, 0x7CFF,
    0x9489, 0x8500, 0xB79B, 0xA612, 0xD2AD, 0xC324, 0xF1BF, 0xE036,
    0x18C1, 0x0948, 0x3BD3, 0x2A5A, 0x5EE5, 0x4F6C, 0x7DF7, 0x6C7E,
    0xA50A, 0xB483, 0x8618, 0x9791, 0xE32E, 0xF2A7, 0xC03C, 0xD1B5,
    0x2942, 0x38CB, 0x0A50, 0x1BD9, 0x6F66, 0x7EEF, 0x4C74, 0x5DFD,
    0xB58B, 0xA402, 0x9699, 0x8710, 0xF3AF, 0xE226, 0xD0BD, 0xC134,
    0x39C3, 0x284A, 0x1AD1, 0x0B58, 0x7FE7, 0x6E6E, 0x5CF5, 0x4D7C,
    0xC60C, 0xD785, 0xE51E, 0xF497, 0x8028, 0x91A1, 0xA33A, 0xB2B3, 0x4A44, 0x5BCD, 0x6956, 0x78DF, 0x0C60, 0x1DE9, 0x2F72, 0x3EFB,
    0xD68D, 0xC704, 0xF59F, 0xE416, 0x90A9, 0x8120, 0xB3BB, 0xA232,
    0x5AC5, 0x4B4C, 0x79D7, 0x685E, 0x1CE1, 0x0D68, 0x3FF3, 0x2E7A, 0xE70E, 0xF687, 0xC41C, 0xD595, 0xA12A, 0xB0A3, 0x8238, 0x93B1,
    0x6B46, 0x7ACF, 0x4854, 0x59DD, 0x2D62, 0x3CEB, 0x0E70, 0x1FF9,
    0xF78F, 0xE606, 0xD49D, 0xC514, 0xB1AB, 0xA022, 0x92B9, 0x8330, 0x7BC7, 0x6A4E, 0x58D5, 0x495C, 0x3DE3, 0x2C6A, 0x1EF1, 0x0F78
};
```

Notes



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/MALFUNCT	TON	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:	
- Mochanical Contact	 Overtemperature 	-Other:	Temp 2:	Purge flow:	
- Cooling defective	-Clogging		OPERATING TIN	ME:	

ION PUMPS/CONTROLLERS

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

LEAK DETECTORS

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

SCROLL AND ROTARY VANE PUMPS

- Doesn't reach vacuum	- Over temperature
- Pump seized	- Other

VALVES/COMPONENTS

- Main soal loak	- Bellows leak	
- Solenoid failure	- Damaged flange	
- Damaged scaling area	-Other	

INSTRUMENTS

- Gauge tube not working	- Display problem
- Communication failure	- Degas not working
- Error code on display	- 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.



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:	Fax:	
Customer Ship To:		Customer Bill To:		
-				
Europe only: VAT reg. Numb	ег.	USA/Canada only: Ta	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 or	e from each row and supply	Purchase Order if requesting a bil	lable service)	
		f (hard copy must be submitted wit	•	
		ment/Demo Calibration		
abcxclialigenepail	lopgradeloonsign	meno demo	jevaldationnetdin for credit	
4) HEALTH and SAFETY CERTIFI	CATION			
		CTS CONTAMINATED WITH BIOLO	GICAL OR EXPLOSIVE HAZARDS,	
RADIOACTIVE MATERIAL, OR MERCURY AT ITS FACILITY. Call Agilent Technologies to discuss alternatives if this requirement presents a problem.				
-		equirement presents a problem.		
The equipment listed above (o	-	i		
. —		toxic or hazardous materials. OR wing toxic or hazardous materials	If this hox is checked, the following	
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 DF	lammable Explosive	Biological Radioactive	
	riale. Include product name	, chemical name, and chemical sy	_	
LISC dil COXIG/ Ilazardous Illace	nais. Include product name	, chemical hame, and chemical sy	inpor or rormona.	
			osod, the customer will be held responsible for all	
exposure to texic or hazardous materi		r any narm or injury to Aguent employees as	well as to any third party occurring as a result of	
Print Name:	Authorized Sig	nature:	Date:	
5) FAILURE INFORMATION:				
Failure Mode (REQUIRED FIELD). See next page for sugges	tions of failure terms):		
Detailed Description of Malfunction: (Please provide the error message)				
Application (system and mode	<u>IF</u>			
I understand and agree to the	terms of Section 6. Page 3/	3.		
Print Name:		nature:	Date:	



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- Does not reach full speed	-Loak	-Upside-down	Temp 1:	Foreline Pressure:	
- Mechanical Contact	 Overtemperature 	-Other:	Temp 2:	Purge flow:	
- Cooling defective	-Clogging		OPERATING TIM	ME:	

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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.

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