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Agilent
Trusted Answers

Agilent 4UHV Ion Pump Controller

For Ultra High Vacuum



For Ultra High Vacuum

Agilent 4UHV Ion Pump Controller

The state-of-the-art Agilent 4UHV ion pump controller operates up to four pumps simultaneously and independently.
The 4UHV starts and controls ion pumps of any type (Diode, Noble Diode, StarCell) and size (from 10 to 1000 L/s). A large four-line LCD display allows simultaneous reading of individual pump voltage, current, and pressure. The variable voltage feature ensures optimum pumping speed and pressure reading throughout the operating pressure range. Built-in setpoints, remote operation and RS-232/485 computer interface; Profibus and Ethernet are standard.
A Fast Response version of the 4UHV controller is also available.

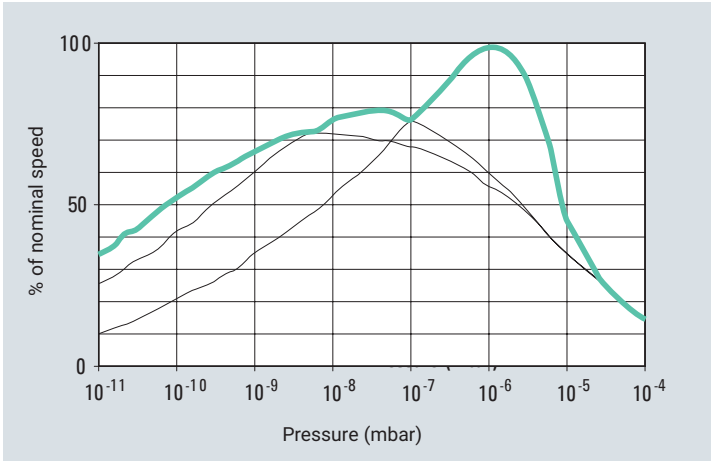


Ion Pump Leadership
Since the invention of the VacIon Pump in 1957, all of the major innovations in UHV have come from Agilent Technologies (formerly Varian Vacuum)

Optimized pumping speed

The 4UHV will select the right operating voltage to optimize the pumping speed of your ion pumps. By applying high voltage in accordance with operating pressure, pumping speed performance is improved.
This is because the energy with which the ion bombards the cathode is the nominal applied HV, reduced by the space charge effect due to the electron cloud present in the ion pump cell. Since the space charge effect is pressure related, a variable HV is applied to maintain optimum bombardment energy, resulting in the best possible pumping performance at any pressure (see graph below).

Pumping Speed vs Pressure at different voltages



Agilent 4UHV Features



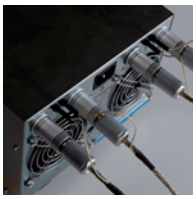
Versatility

The 4UHV is available in different configurations, in order to independently power, control, and monitor any combination of multiple pumps of different sizes , from one to four pumps , from 10 to 1000 L/s. For each number of pumps to be operated, several options are available:
- 200 W for a single pump
- 2 x 80 W or 2 x 200 W for two pumps
- 2 x 80 + 200 W for three pumps
- 4 x 80 W for four pumps



Intelligence

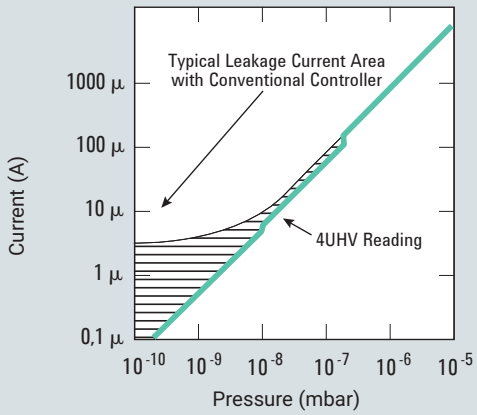
To access the unit, you can use analog or RS-232/485 ports.
The controller uses the same protocol as our other intelligent vacuum devices (TwisTorr turbo pump controller and inverter driven scroll and rotary vane pumps), giving you fast, convenient access to all elements of the vacuum system. Profibus and Ethernet communications, and Fast Response version are available as standard.



Pressure reading

The 4UHV is preprogrammed to automatically convert current reading of any Vaclon Plus pump into pressure. Thanks to its ability to detect ion current as low as 10 nA, it allows pressure measurement in the 10-10 mbar range. To ensure reliable pressure reading down to the UHV region, the 4UHV optimizes the applied high voltage as a function of pressure. As a result, the leakage current of the ion pump is eliminated, thereby providing more accurate pressure readings (see the curve on the right).

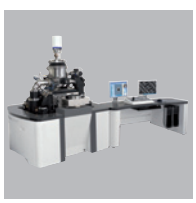
Typical Current vs Pressure Curve





Safety

To protect you against high voltage, the cable is equipped with an interlock system, which immediately shuts down the high voltage when the plug is removed from the pump. The protect mode limits the current to protect the pump and the controller.



Low noise

For Scanning Electron Microscopes (SEM) applications especially, the remaining AC component of the HV output is reduced to a minimum. It is much lower than in any other existing unit, eliminating the need for extra filters in many cases.

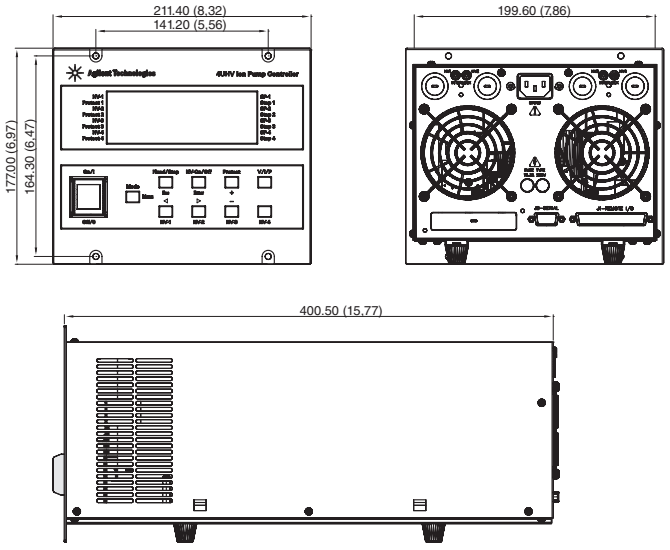
Technical Specifications

	4UHV standard	4UHV Fast Response
Input voltage	100-240 Vac (±10%)	100-240 Vac (±10%)
Input frequency	50-60 Hz	50-60 Hz
Dimensions	400.5 x 211.4 x 177.0 mm (l x w x h)	400.5 x 211.4 x 177.0 mm (l x w x h)
Display	4 rows with 20 characters	4 rows with 20 characters
Available configurations	1 x 200W, 2 x 200W, 2 x 80W, 4 x 80W, 1 x 200W + 2 x 80W	1 x 200W, 2 x 200W, 2 x 80W, 4 x 80W, 1 x 200W + 2 x 80W
Minimum configuration	One HV card with 200 W or 2x80 W	One HV card with 200 W or 2x80 W
Output voltage (open circuit)	3.5 and 7 kV	3.5 and 7 kV
Output current (short circuit)	40 mA for 80 W channel 100 mA for 200 W channel	40 mA for 80 W channel 100 mA for 200 W channel
Modes of operation	Local / Serial / Remote	Local / Serial / Remote
Front panel readings	Voltage, Pressure, Current, Status	Voltage, Pressure, Current, Status
Safety marks	CE, C_CSA_US	CE, C_CSA_US
Current measurement range	10 nA to 100 mA	10 nA to 100 mA
Input signals	On/Off; Protect; Step Mode	On/Off; Protect; Step Mode
Output signals	Analog Out; NC setpoint; NO Set-point	Analog Out; NC setpoint; NO Set-point
HV connector	Fischer Type 105	Fischer Type 105
Output power maximum	400 W	400 W
Communications	RS232/485 standard, Profibus, Ethernet	RS232/485 standard, Profibus, Ethernet
Relay and analog output response time	1 s typical (*)	20 ms typical (*) (**)
Relay	4 relays configurable	Only one for each channel
Analog Output	4 relays configurable	Only one for each channel

(*) test performed with a step load from 100nA to 1mA and setpoint set to 1µA

(**) Warning: Electrical discharges may occur inside the ion pump. To achieve 20ms response time filtering on the relay and on the analog output has been reduced. If, by chance, those discharges last more than 20ms, the controller could activate the relay and generate false positive (due to discharges and not to real pressure increase).

Outline Drawing



Dimensions: millimeters [inches]

Ordering Information

Description	Part Number 4UHV	Part Number 4UHV Fast Response
4UHV Controller 1x200W Negative	9299010	9299010M1000
4UHV Controller 1x200W Positive	9299011	9299011M1000
4UHV Controller 2X80W Negative	9299200	9299200M1000
4UHV Controller 2X80W Positive	9299201	9299201M1000
4UHV Controller 2x200W Negative	9299020	9299020M1000
4UHV Controller 2x200W Positive	9299021	9299021M1000
4UHV Controller 1x200W Positive & 1x200W Negative	9299022	9299022M1000
4UHV Controller 4X80W Negative	9299400	9299400M1000
4UHV Controller 4X80W Positive	9299401	9299401M1000
4UHV Controller 2x80W Positive & 2x80W Negative	9299402	9299402M1000
4UHV Controller 2x80W Negative & 1X200W Negative	9299210	9299210M1000
4UHV Controller 2x80W Positive & 1x200W Positive	9299211	9299211M1000
4UHV Controller 2x80W Positive & 1x200W Negative	9299212	9299212M1000
4UHV Controller 2x80W Negative & 1X200W Positive	9299213	9299213M1000
4UHV Controller 1x200W Negative, Ethernet	7299010	7299010M1000
4UHV Controller 1x200W Positive, Ethernet	7299011	7299011M1000
4UHV Controller 2X80W Negative, Ethernet	7299200	7299200M1000
4UHV Controller 2X80W Positive, Ethernet	7299201	7299201M1000
4UHV Controller 2x200W Negative, Ethernet	7299020	7299020M1000
4UHV Controller 2x200W Positive, Ethernet	7299021	7299021M1000
4UHV Controller 1x200W Positive & 1x200W Negative, Ethernet	7299022	7299022M1000
4UHV Controller 4X80W Negative, Ethernet	7299400	7299400M1000
4UHV Controller 4X80W Positive, Ethernet	7299401	7299401M1000
4UHV Controller 2x80W Positive & 2x80W Negative, Ethernet	7299402	7299402M1000
4UHV Controller 2x80W Negative & 1X200W Negative, Ethernet	7299210	7299210M1000
4UHV Controller 2x80W Positive & 1x200W Positive, Ethernet	7299211	7299211M1000
4UHV Controller 2x80W Positive & 1x200W Negative, Ethernet	7299212	7299212M1000
4UHV Controller 2x80W Negative & 1X200W Positive, Ethernet	7299213	7299213M1000
4UHV Controller 1x200W Negative, Profibus	8299010	8299010M1000
4UHV Controller 1x200W Positive, Profibus	8299011	8299011M1000
4UHV Controller 2X80W Negative, Profibus	8299200	8299200M1000
4UHV Controller 2X80W Positive, Profibus	8299201	8299201M1000
4UHV Controller 2x200W Negative, Profibus	8299020	8299020M1000
4UHV Controller 2x200W Positive, Profibus	8299021	8299021M1000
4UHV Controller 1x200W Positive & 1x200W Negative, Profibus	8299022	8299022M1000
4UHV Controller 4X80W Negative, Profibus	8299400	8299400M1000
4UHV Controller 4X80W Positive, Profibus	8299401	8299401M1000
4UHV Controller 2x80W Positive & 2x80W Negative, Profibus	8299402	8299402M1000
4UHV Controller 2x80W Negative & 1X200W Negative, Profibus	8299210	8299210M1000
4UHV Controller 2x80W Positive & 1x200W Positive, Profibus	8299211	8299211M1000
4UHV Controller 2x80W Positive & 1x200W Negative, Profibus	8299212	8299212M1000
4UHV Controller 2x80W Negative & 1X200W Positive, Profibus	8299213	8299213M1000

Accessories and Cables *

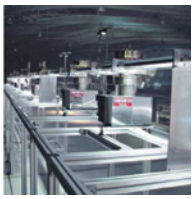
HV bakeable cable, radiation resistant, 4 m (13 ft.), with Interlock	9290705
HV bakeable cable, radiation resistant, 7 m (23 ft.), with Interlock	9290707
HV bakeable cable, radiation resistant, 10 m (33 ft.), with Interlock	9290708
HV bakeable cable, radiation resistant, 20 m (66 ft.), with Interlock	9290709
Rack adapter 19”	9290064
Mains cable NEMA Plug, 3 m (10 ft.)	9699958
Mains cable European Plug, 3 m (10 ft.)	9699957

(*) The unit does not include the power cable, please order the cable separately.



How much power do I need for my ion pumps?

Power requirements depend on the pump size and starting pressure; the larger the pump and higher the starting pressure, the higher the power consumption. The large size Ion Pump 500 L/s, for example, can be easily started with 200 W up to 10^{-5} mbar, while a medium size pump (75 L/s) needs less than 80 W to be started at the same pressure, and 80 W are sufficient to operate a 500 L/s in the typical ion pump operating range (below 2 x 10^{-6} mbar).



Why was the higher power rating necessary in the past?

In the past, ion pumps were started with the aid of sorption pumps, able to reach 10-4 mbar only. As a consequence, much larger and more powerful ion pumps controller were needed. Starting at such high pressures shortened the life of the ion pumps (1 minute of operation at 10^{-4} mbar is equivalent to two months at 10^{-9} mbar). Today's oil-free turbo pumps, backed by oil-free primary pumps, achieve lower pressures, reducing the starting pressure of the ion pump. This reduces the maximum power requirement of the ion pump controller and extends the lifetime of the ion pump.



Negative or positive?

The requirement of negative or positive potential depends on the pumping element installed in the ion pump. Diode style elements (Diode and Noble Diode) need positive voltages, while Triode style elements (old style Triode and StarCell) need negative voltages for operation.



Is a fast response version available?

In addition to the standard 4UHV version, the new 4UHV Ion Pump Controller Fast Response can be used whenever the output signal is crucial to trigger a fast response in the acquisition process and/or to trigger an action (i.e. close a valve when a sudden pressure increase is detected).

Agilent 4UHV Ion Pump Controller

Learn more:

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© Agilent Technologies, Inc. 2018
Published July 15, 2018
5994-0751ENGB

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