Analog Black edition gas pumps

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BLACK EDITION MICRO PUMPS FROM XAVITECH
Xavitech’s Black edition is our pump model with the most functionality and flexibility. Our goal is for you to be able to use this micro pump in your new system or as a drop-in replacement in your existing system easily and conveniently.

GUARANTEED LIFETIME
• Small footprint
• Easy to install with vibration absorbing pump mountings
• Customized calibrations
• Silent mode
• Can operate on battery
• Choose the operating voltage between 3.3VDC – 24VDC

SELECT THE LIFETIME
At Xavitech you can choose between 3 different lifetimes:

Choose between:
10 000 hours (1-year warranty)
20 000 hours (2-year warranty)
+35 000 hours (3-year warranty)

ANALOG OR INTELLIGENT?
The Black edition pumps are divided into two categories; The Analog edition and the Intelligent edition. The analog edition comes with a 3-cable connection and allows for analog control and can be used with our AFC for easy experimenting.

The Intelligent edition has serial control and can be programmed by you. Use on of our adaptors (App, computer adaptor or FCU) for easy experimenting or use Arduino for example. See separate datasheet for more information.

All Black edition pumps can be custom calibrated, to a set flow for example, by us at the factory.

Examples of customized firmware:
• Set the flowrate to a specific value
• Silent mode

Contact us if you are wondering how the Black edition pump can best serve your system.
IMPORTANT NOTES

- Pump Flow: Flow is one-directional, it cannot be reversed
- Filters: To ensure lifetime, air filters should be used to prevent contaminations like dust to enter the pump
- Capacitor: Missing VCC capacitor can damage the pump on 24-volt variants. See the electronic interface section for capacitor suggestions
- Connections: Incorrect lead connection can damage the pump

Figure 1: General flow performance for Xavitech P1500 (left) and V1500 (right) pumps

Free flow: 1200 ml/min

Maximum vacuum: -150 mbar
Maximum pressure: 350 mbar

Flow can be calibrated to deliver a certain flow at a certain vacuum level. Ask us for more information.

Free flow: 1200 ml/min

Maximum vacuum: -350 mbar
Maximum pressure: 150 mbar
Xavitech provides several pre-calibrated standard models. For these models, the voltage and the maximum flow is calibrated to standard values. When buying a standard pump, you still have a few choices you can make. Choose voltage, connection and lifetime. And if you’re pumping aggressive gases you can choose Viton or Kalrez membranes. The chart below lists the standard pumps models that Xavitech can offer. But custom calibration is also an option, please contact Xavitech for more information.

### Standard Models (Part Number)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>VOLTAGE (V DC)</th>
<th>FREE FLOW (ml/min)</th>
<th>MAXIMUM PRESSURE/ MAXIMUM VACUUM (mbar)</th>
<th>CONNECTION INTERFACE</th>
<th>ANALOG FLOW CONTROL</th>
<th>SERIAL INTERFACE (RS-232)</th>
<th>LIFE TIME (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1500B3C12V</td>
<td>12</td>
<td>1200</td>
<td>350</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>10 000 - +35 000</td>
</tr>
<tr>
<td>P1500B3C24V</td>
<td>24</td>
<td>1200</td>
<td>350</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>10 000 - +35 000</td>
</tr>
<tr>
<td>V1500B3C12V</td>
<td>12</td>
<td>1200</td>
<td>-350</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>10 000 - +35 000</td>
</tr>
<tr>
<td>V1500B3C24V</td>
<td>24</td>
<td>1200</td>
<td>-350</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>10 000 - +35 000</td>
</tr>
</tbody>
</table>

### Control

Read more about how to control the pump flow with either analog signal or with serial interface and how to choose your custom calibration point in the respective sections down below.
**P/V1500 BLACK ANALOG PUMP**

**Electric interface**

**Interface Description**

**VCC (Supply Voltage)**

Each pump is calibrated to run at an input voltage from 5 to 24 V DC. The supply voltage can be customized for each customer’s need.

Maximum input voltage: Calibrated voltage + 0.5 V DC. The pump can be damaged otherwise.

Minimum input voltage: 5 V DC. However, the pump performance is reduced if the voltage is set lower than calibrated value. Xavitech recommends to always run the pump at the calibrated voltage.

Figure 3 shows in terms of current consumption a typical pump stroke cycle. Since the motor of Xavitech pumps is based on an electromagnet, a negative current will occur when the electromagnet is turned off. It is because of this current a capacitor is needed between VCC and GND.

If your system cannot handle this spike generated by the electromagnet, a Schottky diode (flyback diode) can be used instead of the capacitor.

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*Figure 2: Electronic interface*

*Figure 3: Typical pump cycle*
**I/O X**

This is a general I/O connected to an A/D converter of the microcontroller inside the pump.

The default functionality is frequency control:

- 0 – 0.05 V DC: Maximum frequency of the pump
- 0.06 – 2.75 V DC: Frequency control of the pump
- 2.75 – 2.85 V DC: Pump stops
- Max input voltage: 3.3 V DC (the pump can be damaged if exceeded)

Note that the frequency adjustment can only lower the frequency from the factory default frequency. Normally a pump is calibrated to have its maximum frequency (maximum flow) set as default at factory.

The use of I/O X can be customized for each customer’s need. I/O X can be an analog- or digital input or output. Please contact an Xavitech representative for more information.

**SWITCH THE PUMP ON AND OFF**

The Analog Xavitech pump can be turned on and off in two different ways:

1) Via the I/O X connector: Apply a voltage of at least 2.75 V DC (max 3.3 V DC) and the pump will stop. The pump will start within a few milliseconds (depending on what frequency the pump is calibrated in default) when a voltage lower than 2.75 V DC is applied. However, note that the internal microcontroller will still run so the pump will consume <10 mA.

2) Switch power on and off: Note that the power has to be switched off on the supply connector (see Figure 1) and that the capacitor has to be placed between the pump and the switch. This is because of the current that the electromagnet generates. The pump will be damaged if the switch is placed on the ground connector. The pump will in this case not consume any power, but the microcontroller will perform the start-up procedure which takes up to 3 s (depending on default pump frequency) when the power is turned on. During this time, the pump adjusts the stroke length to reach its calibrated length. The regulation adjusts the stroke length for every pump stroke thus it depends on the pump frequency.
CAPACITOR SPECIFICATIONS
Xavitech recommends using a capacitor parallel to the power supply (see Figure 2) to reduce the power spikes generated by the electromagnetic motor. For 24-volt pumps, a VCC capacitor is required to not damage the pump. See the recommended capacitors sizes below.

<table>
<thead>
<tr>
<th>Pump</th>
<th>Recommended capacitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1500/V1500 - 12 V</td>
<td>470 μF, 25 V</td>
</tr>
<tr>
<td>P1500/V1500 - 24 V</td>
<td>1000 μF, 35 V</td>
</tr>
</tbody>
</table>
The table below contains general parameters and model specific supply current data.

<table>
<thead>
<tr>
<th>Flow media</th>
<th>Air and other gasses (Ask for compatibility)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted parts</td>
<td>EPDM and PPS (Viton or Kalrez/Simris on request)*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible ambient temperature¹</td>
<td>0</td>
<td>-</td>
<td>55</td>
<td>°C</td>
</tr>
<tr>
<td>Permissible medium temperature²</td>
<td>23</td>
<td>-</td>
<td>55</td>
<td>°C</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>3.3</td>
<td>Cal V¹</td>
<td>Cal V¹ + 0.5</td>
<td>V</td>
</tr>
<tr>
<td>Serial logic levels</td>
<td>2.85</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>Serial baud rate</td>
<td>-</td>
<td>9600</td>
<td>-</td>
<td>baud</td>
</tr>
</tbody>
</table>

**P1500-12V**

- Average supply current (at max. free flow): 110 mA
- Average supply current (at max. pressure vacuum): 230 mA
- Peak supply current: 1500 mA
- Peak supply current with recommended capacitor: 500 mA

**P1500-24V**

- Average supply current (at max. free flow): 55 mA
- Average supply current (at max. pressure vacuum): 120 mA
- Peak supply current: 1000 mA
- Peak supply current with recommended capacitor: 350 mA

**V1500-12V**

- Average supply current (at max. free flow): 105 mA
- Average supply current (at max. pressure vacuum): 240 mA
- Peak supply current: 1500 mA
- Peak supply current with recommended capacitor: 500 mA

**V1500-24V**

- Average supply current (at max. free flow): 60 mA
- Average supply current (at max. pressure vacuum): 150 mA
- Peak supply current: 1000 mA
- Peak supply current with recommended capacitor: 350 mA

1 Viton or Kalrez/Simris can affect the flow specifications, ask for information
2 Extended temperature range can be approved
3 Calibrated Voltage
PERFORMANCE CHARTS
The charts show typical performance and are provided as a reference. Exact performance will differ between pump individuals.
P/V1500 ANALOG BLACK PUMP

BLACK EDITION P1500 AND V1500 WITH 3 OR 5 WIRE CONNECTION

<table>
<thead>
<tr>
<th>PUMP MODEL</th>
<th>V1500 AND P1500 BLACK EDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>3 or 5 wires</td>
</tr>
<tr>
<td>Drawing Scale</td>
<td>1:1</td>
</tr>
<tr>
<td>Dimension Tolerance</td>
<td>±0.5 mm</td>
</tr>
<tr>
<td>Pump Weight</td>
<td>108 ±2 g</td>
</tr>
<tr>
<td>Recommended Connectors</td>
<td>MOLEX 530470510 (Picoblade)</td>
</tr>
<tr>
<td>Recommended Tube Inner Diameter</td>
<td>2.8 - 3.8 mm (Material dependent)</td>
</tr>
</tbody>
</table>

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