

Benchmark

Pulsatile Pump



PD-1100



Packed with high performance features in a small footprint, the PD-1100 Pulsatile Pump from BDC Labs is the new benchmark for simulating the most physiologically accurate hemodynamic conditions in vitro.

The PD-1100 Pulsatile Pump consists of the following key components: a Pulsatile Pump, Control Module, Data Acquisition System, and our Statys® PD control and monitoring software. The Pulsatile Pump and Control Module provide the fluid drive source for any cardiovascular flow loop. The Data Acquisition System communicates key information with the PD-1100 pump, as well as collects transducer information from pressure transducer(s), flow meter(s), temperature probe(s) and other sensors within the flow loop. The Statys® PD software provides a single interface that both controls the PD-1100 pump, and monitors the test environment through an array of optional transducers.

With the PD-1100's accurate and precise fluid control through the digital interface and signal communication, it also serves as the hydrodynamic driver for BDC's HDT-500 Pulse Duplicator for the real-time assessment of cardiac heart valves evaluated to ISO 5840.



PD-1100 Pulsatile Pump

Multiple applications...

Cardiac valve evaluation

Cardiac and endovascular simulation platforms
Aortic, peripheral, carotid, femoral, venous, and
pulmonary flow studies

LVAD evaluation

Particle image velocimetry (PIV) studies

Magnetic resonance imaging (MRI) studies

Coronary by-pass studies

Pulsatile fluid source for any vascular flow network

Veterinary cardiovascular flow studies

Venous valve studies

Cell culture/bioreactors

...one powerful pulsatile pump!

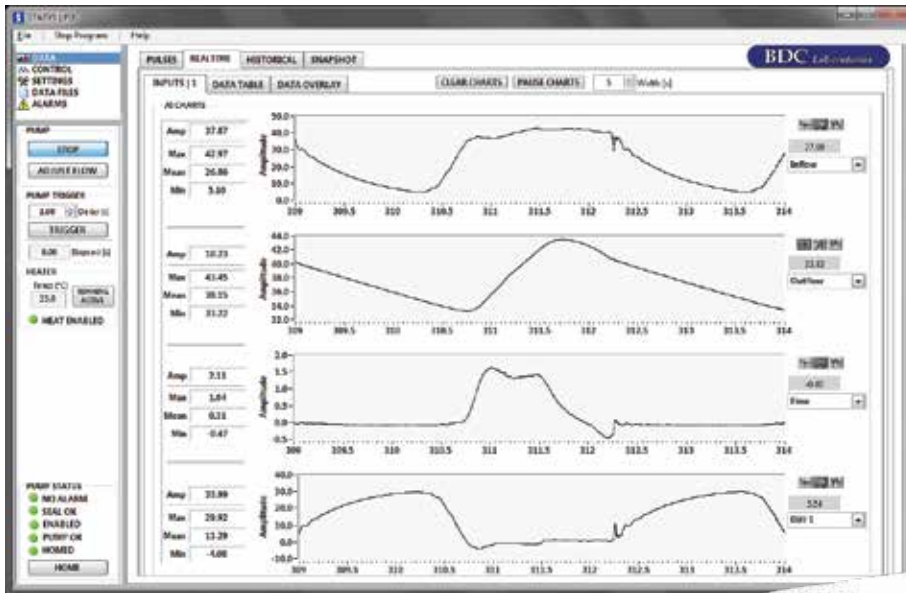


Key Benefits of the PD-1100

- Fully programmable pulsatile pump
- Excellent pulse duplicator
- Precise waveform control
- Precise digital platform provides high repeatability and reproducibility
- Three piston sizes offer optimized resolution across stroke volume ranges
- Actuator rated for 100% continuous duty cycles
- Full user control of excitation waveform
- Pump fluid isolated from test fluid, allowing user to run particulate studies (optional)
- Self-priming with pulsatile pump head

Statys combines intelligent functionality with operational simplicity

The Statys® PD software program not only makes set-up and running the PD-1100 easy, but it also provides a single-point for both the PD-1100 control, as well as monitoring of your test platform pressures, flow and temperature.



Key Software Highlights

- Real Time Data Capturing and Charting
- Integrated sinusoidal and arbitrary waveform control
- Data Monitoring of Multiple Transducers
- Data Logging (Optional)
- Valve Performance Calculations (Optional)
- Analog Signal Retransmission (Optional)
- Built-in System Safety features
- advanced alarm control (Optional)



Accessories

BDC offers specialized accessories that extend the capabilities and maximize the return on investment of your PD-1100 instrument.

Pulsatile Pump Head

The Pulsatile Pump Head enables the PD-1100 to function as a positive displacement pulsatile pump. Featuring a barbed inflow and outflow port, both with one-way valves, and self-priming performance, the Pulsatile Pump Head allows convenient inclusion into a fluid loop.

Heating Reservoir

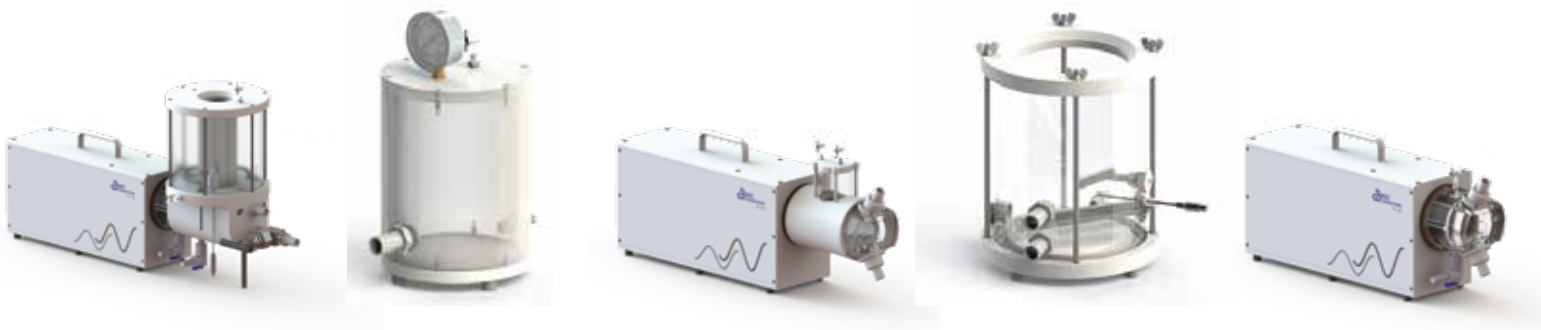
The Heating Reservoir allows the user to control the temperature of the test system fluid and provides a convenient system filling location. The Heating Reservoir features a heating element, inflow and outflow ports, a drain valve, temperature probe and safety switch.

Fluid Isolation Module

The Fluid Isolation Module serves to isolate the test solution from the pump fluid. This allows the user to run particles in the test solution without damaging the PD-1100 drive seals, as well as maintain the sterility of the test solution without needing to treat the PD-1100 driver assembly.

Compliance Chamber

The Compliance Chamber acts as a dampening element that allows the operator to tune the pressure pulse. The Chamber mimics the elasticity of the arteries in the vascular bed.



Hemodynamic Flow Conditioner

The Hemodynamic Flow Conditioner is an all-in-one addition to the PD-1100 that emulates the vascular bed. The Conditioner has integrated directional valves, a fluid reservoir, a compliance chamber, a heater and a resistance element.

Heart Function Emulator, HFE

The Heart Function Emulator is connected to the pulsatile flow pump and serves to emulate the contractile and resistive conditions of the heart, resulting in a more clinically relevant flow and pressure source for cardiac applications. The HFE consists of an impedance element and compliance chambers. The compliance volumes can be adjusted to tune the shape of the flow waveforms.

Diastolic Pressure Control

The Diastolic Pressure Control (patent pending) replaces the standard Pulsatile Pump Head outflow assembly with a tunable element that serves to control a cardiac flow network's diastolic filling pressure, resulting in a more clinically relevant pressure environment for prosthetic valve applications.

Small Piston

The Small Piston optimizes the PD-1100 for low flow applications up to 2 L/min.

Large Piston

The Large Piston optimizes the PD-1100 for high flow applications up to 25 L/min.

Software Options

The Statys PD Software is compatible with a number of optional software upgrades that are simple to use and add significantly to the functionality and productivity of the PD-1100.

Administrator Control Module

The Administrator Control Module provides a simplified data review and capture interface for functional testing of prosthetic valves. The user is presented with critical performance information in a go/no-go color coded environment and results are displayed to the operator and written to an external data file.

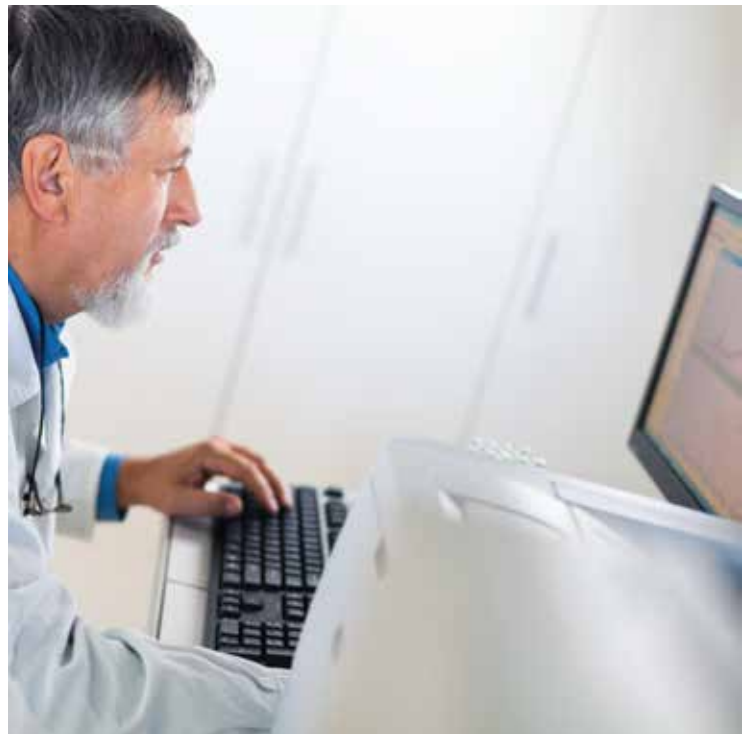
With the Administrator Control Module, the full functionality of the software is maintained but password protected. At software startup, only the Test Operator screen is shown. When the administrative password is entered, all available software controls are unlocked.

Hydrodynamic Testing Module

The Hydrodynamic Testing Module enables the user to perform real time analysis of valve functional performance based on the ISO 5840 requirements. The data is segregated into individual pulses and then analyzed based upon cursors indicating key events in the cardiac cycle.

Trigger Start/Stop

The Trigger Start/Stop allows the PD-1100 to start or stop running based upon a digital input signal. After receiving the digital input signal, the system can wait a specified delay period before reacting.



Production QA Software Package

Production testing of heart valves with the PD-1100 is now achieved with BDC's PQT-5000 Heart Valve Production Quality System.



Downsampling Data Logger

The Downsampling Data Logger allows the user to reduce the sampling rate and create a more manageable data file. This is advantageous when recording data at a high rate (e.g., 1 KHz) is not desired or when an experiment is carried out over a long period.

Multi-Mode Waveform Controller

The Multi-Mode Waveform Controller allows the user to easily switch between up to three user pre-defined run conditions (e.g., normal to an atrial fibrillation mode). When the operating mode is changed, the pump automatically changes from the current run condition to immediately start another predefined run condition.

Analog Retransmission Module

The Analog Retransmission Module feature allows the user to retransmit two system signals to a secondary measurement system. The user can choose the desired retransmission signals and the associated output scaling.

Bypass Mode

The Bypass Mode allows the user to transition from the running flow and beat rate to a Cardiopulmonary bypass condition (e.g., stopped-heart) by decreasing the flow rate over a given period of time.

Autonomous Run Module

The Autonomous Run Module allows the user to conduct extended duration tests in a controlled, monitored and documented environment when the operator is not attending the system (e.g., the PD-1100 system continues to run throughout the night). The package includes: historical plotting, alarm safety features and statistical data logging. The Down Sampling Data Logger option is also included with this package.

ECG Signal Module

When running the PD-1100 in conjunction with clinical equipment designed to operate with an ECG signal, the ECG Signal Module generates an actual ECG waveform to interface with the clinical equipment.

PD-1100 Specifications

Frequency	2 - 240 bpm
Test fluid	Water, PBS, blood analog
Stroke volume	0 – 300 ml
Flow rate	0 – 2 L/min, w/small piston 0-10 L/min, w/regular piston 0-25 L/min, w/large piston
Waveforms	Sinusoidal, arbitrary
Synchronization	TTL and analog
Triggering	TTL and analog
Regulatory compliance	Complies with all applicable European Union directives and standards for safety and EMC. CE marked.



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