# Animal Hemodynamic Overview

## System Highlights


## Record and analyze accurate and sensitive animal hemodynamics for basic through to translational research

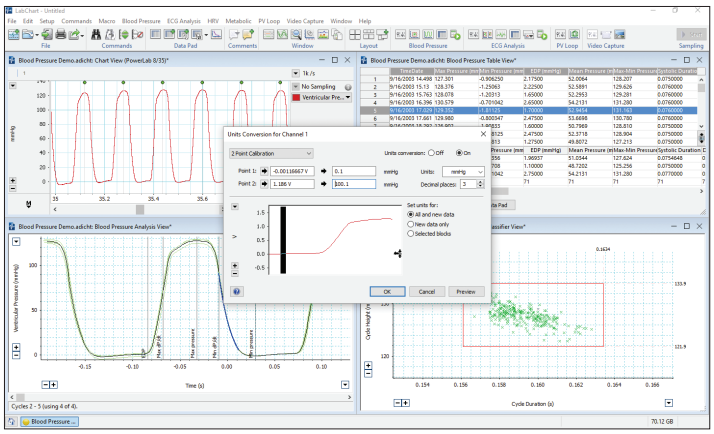
With the ability to integrate data streams from blood flow, NIBP, isolated heart, arterial pressure, ventricular pressure and volume, laser doppler flow, electrophysiology and more, our systems can evolve as your experiments do – ensuring quality results wherever your research takes you.

### Hemodynamics

Whether used for basic biological investigation or disease focused research, high-fidelity hemodynamics data coupled with specialized analysis tools leads to powerful results in diverse and multidisciplinary applications.

### Flexible Data Acquisition

ADInstruments systems provide an integrated solution to advance life science research. With the combination of LabChart analysis software and a PowerLab data acquisition unit you have the flexibility to collect and synchronize a wide range of signals for analysis. We also offer a range of LabChart compatible solutions able to stream directly in LabChart.



***Right:*** *Invasive Blood Pressure studies in LabChart*

### LabChart for Animal Hemodynamics

- PV Loop Module
- Blood Pressure Module
- CODA® Monitor Device Enabler
- Cyclic Measurements
- Peak Analysis
- Channel Calculations Integral

### Software and Hardware Connectivity

LabChart

LabChart LIGHTNING

PowerLab + C Series Interfaces

ADInstruments is the exclusive global distributor of Millar's gold standard Mikro-Tip™ pressure and pv catheters and associated hardware. By combining these highly sensitive, minimally invasive catheters with PowerLab for data acquisition and LabChart for data analysis, you can be sure of clear and accurate results.
To learn more, visit adinstruments.com/partners/millar

# Ventricular Pressure Volume (PV)

Changes in ventricular function for normal and diseased conditions can be analyzed using ventricular pressure volume (PV) loops, which are generated by plotting real-time left and right ventricular volume during a complete cardiac cycle.

**Typical studies:**

- Systolic and diastolic dysfunction
- Pulmonary hypertension
- Cardiac hypertrophy
- Cardiac failure
- Cardiovascular remodelling and vascular occlusions
- Pharmacology / Toxicology studies
- Surgical interventions
- Ischemia / Reperfusion studies
- Cardiac resynchronization therapy
- Phenotyping

## MPVS Duo Foundation System

LARGE ANIMALS | RATS | MICE

The MPVS Duo Foundation System is configured for measuring left or right ventricular pressure (LVP) and volume in small to large animals. A variety of MPVS Duo-compatible pressure-volume (PV) catheters (purchased separately) are available for all animals larger than 16 g for high-quality, reproducible data.

**Each system includes:**

• PowerLab C • C Series Instrument Interface • LabChart Pro (with the PV Loop Module for automated calculation of systolic and diastolic pressures, stroke volume, CO and more)
• Millar MPVS Duo Pressure-Volume System


+ select your choice of Millar Mikro-Tip® Pressure-Volume Catheters

# Invasive Blood Pressure

The ability to measure continuous arterial and vascular pressure signals directly at the source through invasive blood pressure recordings provides a high level of data accuracy and sensitivity to support your cardiovascular research. Ideal for beat-to-beat monitoring of acute cardiovascular measurements, invasive pressure recordings also allow for assessment of time variance and dynamics of change in data over time.

**Typical studies:**

- Pulmonary hypertension
- Acute or chronic cardiovascular monitoring
- Tumor research
- Hypertrophy, cardiomyopathy, infarction, and other disease models
- Systemic circulation or ventricular studies
- Intracranial studies

## Mikro-Tip™ BP Foundation System

The Mikro-Tip™ BP Foundation System provides gold standard measurement of systolic and diastolic blood pressure in small to large animals. Choose from a wide range of Mikro-Tip™ pressure catheters that allow you to place the sensor in an artery or heart to measure blood pressure directly.

**Each system includes:**

• C Series Front End Interface • Bridge Amp • LabChart Pro software
• Applicable interface cables


PowerLab COMPATIBLE


+ select your choice of Millar Mikro-Tip™ Pressure Catheters

LARGE ANIMALS | RATS | MICE

### Fluid-filled blood pressure transducers

An alternative option to determine mean arterial and venous blood pressure in small and large animals. Disposable or reusable fluid-filled polyethylene pressure transducers are used with ADInstruments Bridge Amps (single, quad or octal) or the electrically isolated BP Amp that provides BP readings in mmHg.



# Non-Invasive Blood Pressure

Non-invasive blood pressure (NIBP) recording allows you to capture intermittent blood pressure data in awake or anaesthetized rats or mice over long sampling periods easily and unobtrusively with a high standard of care.

**Typical Studies:**

- Drug screening
- Surgical Monitoring
- Hyper / Hypotension
- Nephrology
- Phenotyping
- Sepsis and Toxicology
- Endocrinology
- Obesity

## Rodent NIBP CODA® Monitor Sets

ADInstruments Rodent NIBP CODA® Monitor Sets are a streamlined solution using the precision of Kent Scientific's Volume Pressure Recording (VPR) technology to accurately and reliably measure NIBP. Data is streamed directly from the CODA® Monitor into LabChart, automatically detecting systolic, diastolic, mean blood pressure and heart rate.

## CODA® Sets Overview

**ADInstruments CODA® Monitor** *(Controller)*

**CODA® Rodent Cuff Kit** *(Includes Occlusion Cuffs and VPR Cuff Sensors)*

**2 x Rodent NIBP CODA® RightTemp Sensors**

**Far Infrared Warming Pad**

LabChart

**LabChart 8 for Windows** *(Required, sold separately)*

**CODA® Monitor Device Enabler Software**

**Infrared Thermometer with LaserSight**

**Set Accessories** *(sold separately)*

Sets can be expanded with additional tail cuffs to cater to different animal sizes and species (mouse or rat).

For studies on conscious animals, specialized cylindrical rodent holders featuring an adjustable nose piece are also available to safely secure animals during experimentation.

## Non-Invasive Pulse Tonometer

Designed for non-invasive recording of pulse pressure wave contours, this hand-held wand probe is equipped with a Millar Mikro-Tip™ pressure sensor at the tip. The high frequency response ensures accurate reproduction of pulsatile waveforms.

# Telemetry Pressure

The ability to measure continuous and chronic arterial, venous and vascular pressure signals directly at the source through telemetry provides a greater level of data accuracy and sensitivity to support your research. Kaha Sciences small animal telemetry solutions from ADInstruments combine wireless power and state of the art solid-state sensor technology from Millar to allow high fidelity, accurate, and repeatable pressure recordings.

KAHA SCIENCES

**Typical Studies:**

- Chronic cardiovascular monitoring
- Cardiovascular dysfunction
- Intracranial studies
- Autonomic function
- Arrhythmia
- Arterial and ventricular pressures

### Rat Telemetry System Setup

Record pressure data with confidence, from systolic and diastolic through to cardiac output from BP and dP/dt calculations from LVP. Data transmission range up to 5 m with telemeter battery back-up and in vivo recharging. Cohousing feature for two animals in one cage or two implants in one animal (>350 g).

### Rat Pressure Telemeter Options*

- Pressure
- Dual Pressure
- Pressure and Biopotential
- Sympathetic Nerve Activity and Pressure

**More rat telemeter options are available*

### Standard Setup Example


### Standard Setup Includes:

- One telemeter and one SmartPad per animal
- One Configurator System per lab
- PowerLab data acquisition system
- LabChart 8 or LabChart Lightning

# Invasive Blood Flow

**Typical Studies:**

- Systolic and diastolic dysfunction
- Pulmonary hypertension
- Cardiac hypertrophy
- Cardiac failure
- Cardiovascular remodelling and vascular occlusions
- Pharmacology / Toxicology studies
- Transgenic manipulation
- Ischemia / Reperfusion studies
- Tissue perfusion studies
- Cardiac resynchronization therapy
- Surgical interventions

## Blood Flow Meter

Invasive blood flow meters, designed for mice up to large animals, allow you to perform accurate and precise fluid flow measurements in or around blood vessels - even with atypical animal models, such as fish. With different sensors, these devices can also be used for measuring volume flow in other non-aerated liquids including saline and buffer solutions.


**Blood Flow Meter:** Single channel laser Doppler flow meter to measure blood cell perfusion in the microvasculature of tissues and organs.

## Transonic Flow Systems

By pairing state-of-the-art ultrasound transit-time technology from Transonic with LabChart and PowerLab, you can reliably record volume flow rates, relative flow rate changes, and chronic volume flow with high resolution and low offset.


PowerLab COMPATIBLE

### Main System Components

**Microcirculation Flowprobes 0.5 and 0.7 mm:** For acute flow measurements in small vessels. Their larger body and increased robustness makes them ideal for mouse studies.

**Perivascular Flowprobes 1 and 1.5 mm:** For small acute or chronic applications that require a larger probe head for robustness.


**Transonic Perivascular and Tubing Flowmeters:** Two or three channel consoles. Use with suitable flowprobes or flowsensors (sold separately) to measure blood flow.

*PS Nanoprobes*

**Perivascular Flowprobes 0.5 - 20 mm:** PS series flowprobes offer the greatest diversity of customizable features for different animal models (mice and larger animals). Our range includes miniaturized versions (nanoprobes - 0.5 and 1.5 mm) that are scaled to fit mouse anatomy, measuring flow < 1 mL / min.

**Cardiac Output Flowprobes 8 - 36 mm:** PAU or COnfidence flowprobes for acute and chronic measurements of cardiac output in large animals.


**Clamp-on Flowsensors 3 - 32 mm OD:** These flowsensors “clamp on” to most flexible laboratory and extracorporeal tubing, perfect for quick, repeatable process testing that is applied to multiple circuits without flow interruption.


**Inline Flowsensor 25 mm ID:** Designed for flexibility in studies where tubing requirements are subject to change. Sensors splice into lab tubing and accurately measure fluid flow.

### Maximize your potential

ADInstruments global training and support systems mean that there is always help at hand to support you with your endeavours and help you learn ‘best practices’ to move your research forward faster.

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