Изолированные системы перфузии для органов

Описание

По вопросам продаж и поддержки обращайтесь:

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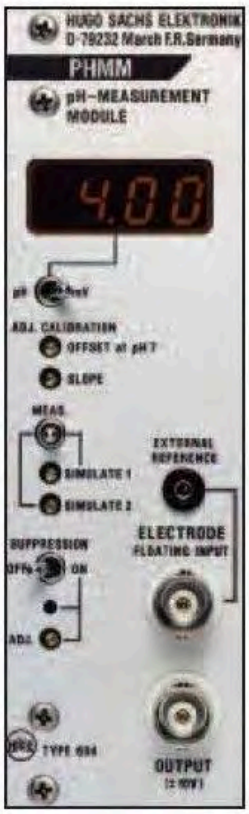
pH Control Option for IPL-1 and IPL-2

This option controls and regulates the pH in the buffer solution by carefully bubbling it with CO_2. Delivery of CO_2 maintains pH when the system is not deoxygenated with a N_2 /CO_2 gas mixture.

Item No.	Description
73-4308	pH Control Unit for IPL-1 System
73-4282	pH Control Option to IPL-2 Core System, 230 V



DETAILS

This option controls and regulates the pH in the buffer solution by carefully bubbling it with CO_2. Delivery of CO_2 maintains pH when the system is not deoxygenated with a N_2/CO_2 gas mixture.

The pH is controlled by a feedback system which regulates CO_2 gas bubbling into a dedicated small volume reservoir for minimizing foaming of perfusate. The pH is measured with a pH sensor. The pH control module (pHCM) allows setting to a desired pH, e.g. to 7.4.

A certain amount of CO_2 is necessary to hold the pH constant in a physiological range. For example, in order to keep the pH in a buffer solution at 7.4 (e.g. in a Krebs-Henseleit buffer), 5% CO_2 is necessary. If the measured pH is above this value (e.g. 7.4), a small valve opens so that CO_2 from a tank goes to a frit in the reservoir. The CO_2 changes the pH to a lower value. As soon the pH of 7.4 is reached the CO_2 valve is closed. This acts in a closed loop and regulates the pH by bubbling with CO_2. This is only necessary for perfusates which are CO_2-dependent buffered.

Note: Available by special order for IPL-4. Please inquire.

Features & Benefits

- Minimizes foaming of perfusates due to minimal gassing of 100% gas to maintain pH

Included Items

pH Control Unit for IPL-1 (73-4308) includes:	
Item #	**Product Name**
69-0072	Foodtrode™ Protein Resistant pH Electrode
69-0075	Protelyte™ Reference Electrolyte Solution, 100 ml
69-0077	Electrode Connecting Cable, BNC to AS7, 1 m (3.3 ft)
73-1784	BNC-BNC Connecting Cable
	PLUGSYS pH Measurement Module (pHMM)
	PLUGSYS pH Control Module (pHCM)
N/A	Modified Cover to 0.5 L Reservoir

pH Control Unit for IPL-2, 230 V (73-4282) includes:		**pH Control Unit for IPL-2, 115 V (73-4283) includes:**	
Item #	**Product Name**	**Item #**	**Product Name**
73-2269	Jacketed Glass Container for Isolated Lung*	73-2269	Jacketed Glass Container for Isolated Lung*
-	Reglo Peristaltic (Roller) Pump	-	Reglo Peristaltic (Roller) Pump
73-0155	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White	73-0155	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White
69-0072	Foodtrode™ Protein Resistant pH Electrode	69-0072	Foodtrode™ Protein Resistant pH Electrode

69-0075	Protelyte™ Reference Electrolyte Solution, 100 ml	69-0075	Protelyte™ Reference Electrolyte Solution, 100 ml
69-0077	Electrode Connecting Cable, BNC to AS7, 1 m (3.3 ft)	69-0077	Electrode Connecting Cable, BNC to AS7, 1 m (3.3 ft)
73-1784	BNC-BNC Connecting Cable	73-1784	BNC-BNC Connecting Cable
	PLUGSYS pH Measurement Module (pHMM)		PLUGSYS pH Measurement Module (pHMM)
	PLUGSYS pH Control Module (pHCM)		PLUGSYS pH Control Module (pHCM)
73-2811	Mixer for IPL-2 Buffer Reservoir	73-2811	Mixer for IPL-2 Buffer Reservoir

* With overflow to maintain constant perfusion solution level.

PLUGSYS modules use a total of 4 slot units. Magnetic stirrer and stirbar sold separately.

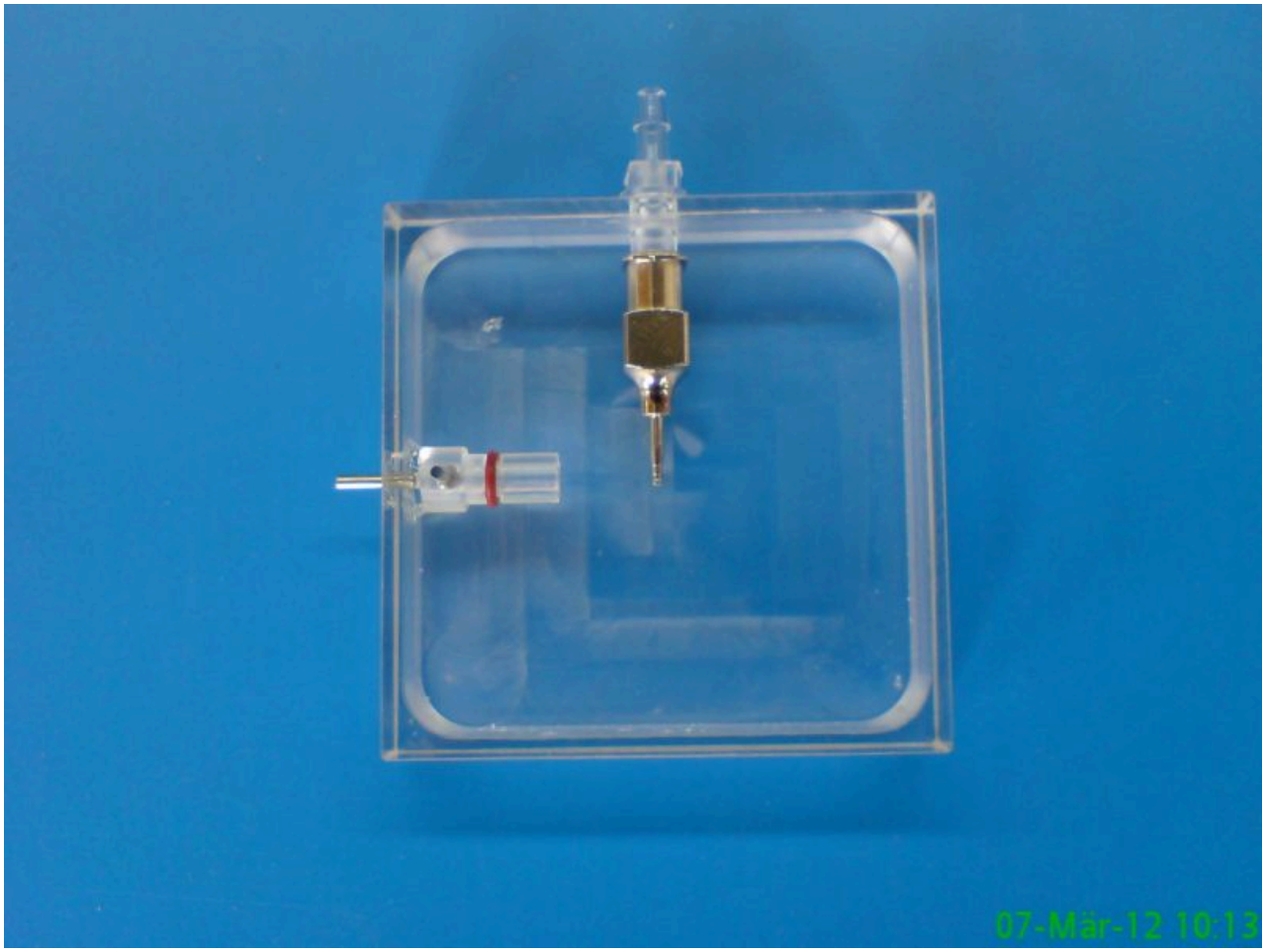
Small Preparation Dishes for Mouse Heart

The small preparation dish is used as a tool for isolated mouse heart cannulation, ideal to fix the mouse heart on the aortic cannula under a microscope.

There are three preparation dishes avalable for mouse heart:

- 73-0129: for only
- 73-4327: for and
- 73-4464: for Luer taper cannulae only such as

Item No.	Description
73-0129	Small Preparation Dish for Mouse Hearts on IH-SR with link for IH-SR cannula
73-4327	Small Preparation Dish for Mouse Hearts with male taper for conical Luer cannula and straight taper for IH-SR cannulae
73-4464	Small Preparation Dish for Mouse Hearts with male taper for conical Luer cannula. Used for UP100IH, PSCI, Easycell



DETAILS

Due to the small diameter of the aorta of the mouse heart, it can often be challenging to accomplish a quick cannulation. If the process takes too long, the heart becomes ischemically compromised and must be discarded or risk confounding any experimental data.

The small preparation dish is used as a tool for isolated mouse heart cannulation, ideal to fix the mouse heart on the aortic cannula under a microscope.

There are three preparation dishes avalable for mouse heart:

- 73-0129: for only
- 73-4327: for Luer taper and
- 73-4464: for Luer taper cannulae only such as

The preparation dish is placed on ice and filled with 4°C cold perfusion solution in order to keep metabolic function and ischemia low. It is designed with a very thin base so that when placed on an ice bath the perfusate in the dish will be dramatically cooled resulting in cardioprotective hypothermia.

The mouse cannula is held stable in the dish while the heart is mounted. An inlet port on the dish serves as the attachment point for a syringe filled with cold buffer that is used to fill the tube and the cannula bubble free and to carefully flush the blood from the heart. Over-pressurizing the heart is prevented by a

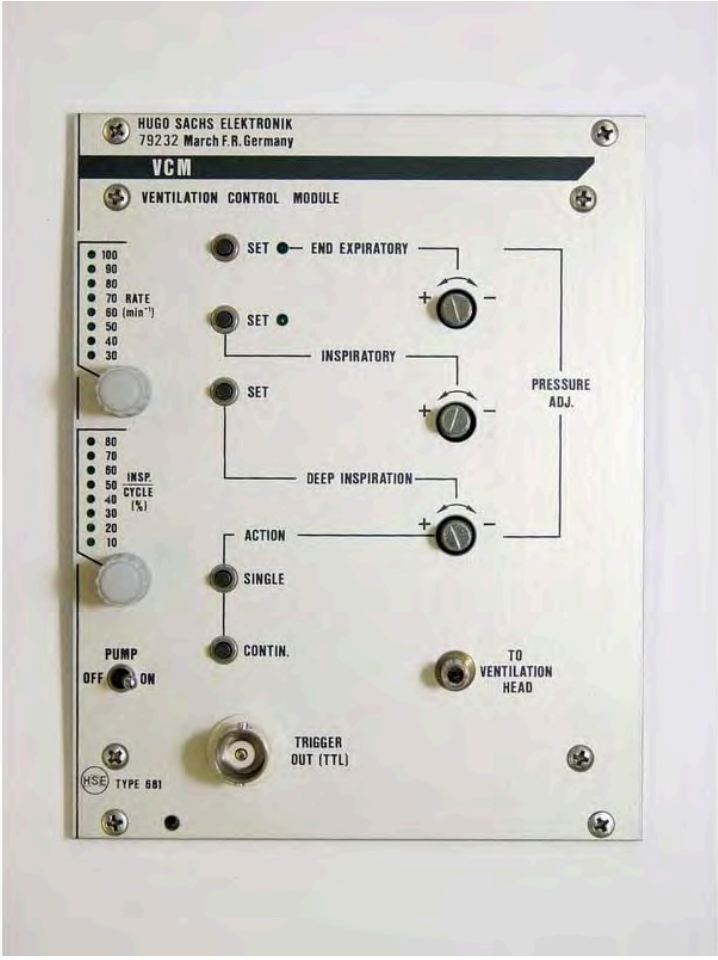
pressure relief port just prior to the aortic cannula.

Once the heart is secured onto the cannula with suture and flushed, it can be removed from the preparation dish and mounted onto the perfusion system.

Ventilation Options for IPL-2

For a functional IPL-2 unit the core system requires a suitable ventilation system. For only positive ventilation a rat ventilator can be used (e.g., VentElite or the Small Animal Ventilator, Type 683). If positive and sub-atmospheric ventilation is needed, a special Ventilation Control Module (VCM) is required.

Item No.	Description
73-4279	Negative Pressure Ventilation Control Option with Pump for IPL-1 and IPL-2
73-4280	Negative Pressure Ventilation Control Option with Pressure Regulator for IPL-2
73-3635	Adapter for Positive Pressure Ventilation on IPL-2
73-3448	Alternative Gas Supply for IPL-2, including needle valve



DETAILS

For a functional IPL-2 unit the core system requires a suitable ventilation system. For only positive ventilation a rat ventilator can be used (e.g., VentElite or the Small Animal Ventilator, Type 683). If positive and sub-atmospheric ventilation is needed, a special Ventilation Control Module (VCM) is required.

Positive and Sub-Atmospheric (Negative) Pressure Ventilation with Ventilation Control Module (VCM)

- Used to control the ventilation of the isolated lung preparation. Allows for the physiological negative pressure ventilation of the lung and positive ventilation during preparation.
- 30 to 100 breaths per minute.
- I:E ratio can be set between 10 and 90% in 10% steps.
- End-inspiratory, end-expiratory, sigh, positive and negative pressures can be individually set.
- The TCM Timer Counter Module allows periodic sigh (hyperinflation) breaths to minimize edema formation.
- The Pressure-Free Gas Supply Adapter (73-2789) is only included with 73-4293 but can be added to 73-4279 when alternative gases need to be delivered during negative pressure ventilation.

- The adapter is used to supply the trachea with a ga smixture different from room air during negative ventilation.It includes a needle valve to adjust gas flow.

Negative Pressure Ventilation Control Option with Pump for IPL-1 and IPL-2 (73-4279) includes: *Utilizes 6 slot units*		**Negative PressureVentilation Control Option with Pressure Regulator for IPL-1 and IPL-2 (73-4280) includes:** *Utilizes 6 slot units*	
Item #	**Product Name**	**Item #**	**Product Name**
	PLUGSYS Ventilation Control Module with Integral Pump(VCM-P)		PLUGSYS Ventilation Control Module with Regulator(VCM-R)*
	PLUGSYS Time Counter Module (TCM)		PLUGSYS Time Counter Module (TCM)
N/A	See above	**73-3448**	Pressure-Free Gas SupplyAdapter for Alternative Gas Supply**

** Negative pressure ventilation with a pressure regulator (73-4280) built into the VCM-R requires a pressurized gas supply from a tank or house air in the range of 2 to 8 bar (29 to 116 PSI).*

*** The Pressure-Free Gas Supply Adapter (73-3448) is only for use during sub-atmospheric pressure ventilation with either the VCM-P or VCM-R and is used to supply alternative gas mixtures to the lungs.*

Positive Pressure Ventilation Only

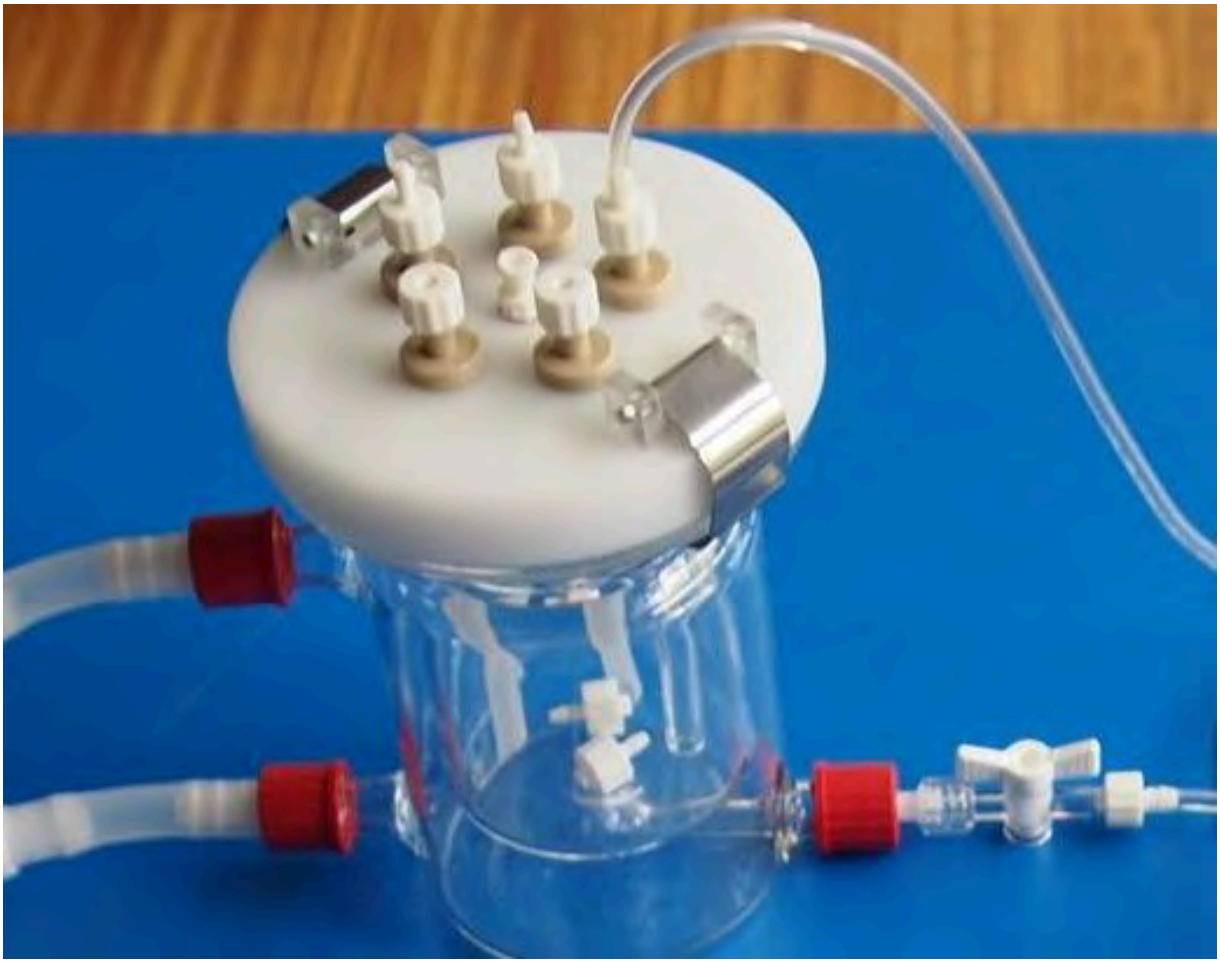
If only positive pressure ventilation will be used, choose the option below. This adapter is used with the Small Animal Ventilator, Type 683 or the VentElite. It has a side port to measure the tracheal airway pressure during positive ventilation.

Positive PressureVentilation Option,230 V (73-4305) includes:	
Item #	**Product Name**
73-3635	Adapter for Positive Pressure Ventilation on IPL-2

Sealed Water-Jacketed Glass Buffer Reservoirs

For long term ex vivo organ perfusion or acute perfusion that requires sterile perfusion conditions

Item No.	Description
73-4734	Sealed Water-Jacketed Glass Reservoir, 2 L, with Tubing Oxygenator
73-4808	Sealed Water-Jacketed Glass Reservoir, 220 ml, with Tubing Oxygenator
73-4954	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 2 L , without Tubing Oxygenator
73-4952	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 220 ml, without Tubing Oxygenator
73-5221	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 1L , without Tubing Oxygenator



DETAILS

Sealed water-jacketed glass reservoirs are intended for long term perfusion or acute perfusion that requires sterile perfusion conditions. The sealed lid prevents room air that may contain bacterial, fungi, viruses, etc. from entering the reservoir. A small gas flow (O_2/CO_2) is passed through the reservoir. Since there is a slight pressure in the reservoir, the clean gas (from the tank) will avoid room air from coming into contact with the perfusion solution. The gas exits through small filters on top of the reservoir.

- Available in 220 ml, 1L and 2L sizes, with or without tubing oxygenator.
- All sealed water-jacketed reservoirs include an outlet for the perfusate and an inlet for reperfusion.
- Access to the inner chamber is made through swabbable female Luer locks. Any male Luer or Luer lock or Tuohy adapter can be directly connected to these access ports mounted at the top of the reservoir.
- Sterile air filters allow gas exchange with the environment for pressure compensation inside to outside.

SPECIFICATIONS

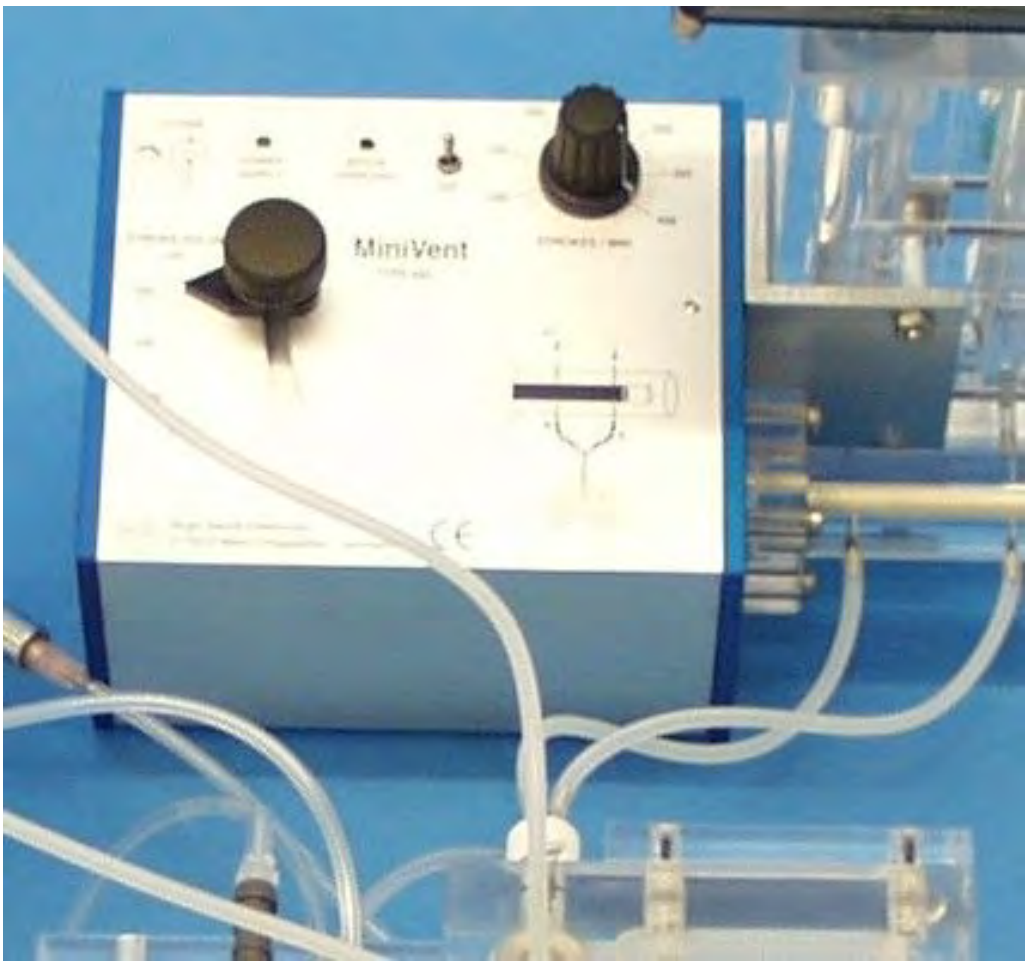
Specs for Sealed Water jacketed Glass reservoirs

		ID	OD	Height	Working depth
73-4734	Sealed Water-Jacketed Glass Reservoir, 2 L, with Tubing Oxygenator	110mm	160mm	300mm	230mm
73-4808	Sealed Water-Jacketed Glass Reservoir, 220 ml, with Tubing Oxygenator	60mm	110mm	135mm	90mm
73-4954	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 2 L , without Tubing Oxygenator	110mm	160mm	300mm	230mm
73-4052	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 220 ml, without Tubing Oxygenator	60mm	110mm	135mm	90mm
73-5221	Sealed Water-Jacketed Glass Reservoir with Autoclavable Lid, 1 L, without Tubing Oxygenator	110mm	160mm	120mm	65mm

Ventilation Options for IPL-1

For a functional unit the core system requires a suitable ventilation system. For only positive ventilation a mouse ventilator can be used. If positive and sub-atmospheric pressure ventilation are required, the Ventilation Control Module must be purchased.

Item No.	Description
73-4279	Negative Pressure Ventilation Control Option with Pump for IPL-1 and IPL-2
73-4293	Negative Pressure Ventilation Control Option with Pressure Regulator for IPL-1 and IPL-2
73-2789	IPL-1 Gas Inlet Adapter, including needle valve
73-2919	Multi-Gas Inlet Adapter and stand to connect Aerosol Nebulizer and MicroVent, MiniVent or MidiVent



DETAILS

For a functional unit the core system requires a suitable ventilation system. For only positive ventilation a mouse ventilator can be used. If positive and sub-atmospheric pressure ventilation are required, the Ventilation Control Module must be purchased.

Positive and Sub-Atmospheric (Negative) Pressure Ventilation with Ventilation Control Module (VCM)

- Used to control the ventilation of the isolated lung preparation. Allows for the physiological negative pressure ventilation of the lung and positive ventilation during preparation.
- 30 to 100 breaths per minute.
- I:E ratio can be set between 10 and 90% in 10% steps.
- End-inspiratory, end-expiratory, sigh, positive and negative pressures can be individually set.
- The TCM Timer Counter Module allows periodic sigh (hyperinflation) breaths to minimize edema formation.
- An adapter to supply the trachea with a gas mixture different than room air during negative ventilation can be added.

Negative Pressure Ventilation Control Option with Pump for IPL-1 (73-4279) includes: *Utilizes 6 slot units*		**Negative PressureVentilation Control Option with Pressure Regulator for IPL-1 (73-4293) includes:** *Utilizes 6 slot units*	
Item #	**Product Name**	**Item #**	**Product Name**
	PLUGSYS Ventilation Control Module with Integral Pump(VCM-P)		PLUGSYS Ventilation Control Module with Regulator(VCM-R)*
	PLUGSYS Time Counter Module (TCM)		PLUGSYS Time Counter Module (TCM)
N/A	See above	**73-2789**	Pressure-Free Gas SupplyAdapter for Alternative GasSupply**

** Negative pressure ventilation with a pressure regulator (73-4293) built into the VCM-R requires a pressurized gas supply from a tank or house air in the range of 2 to 8 bar (29 to 116 PSI).*

*** The Pressure-Free Gas Supply Adapter (73-2789) is only for use during sub-atmospheric pressure ventilation with either the VCM-P or VCM-Rand is used to supply alternative gas mixtures to the lungs.*

Positive Pressure Ventilation Only

If only positive pressure ventilation will be used, choose an option below.

- Ventilation rate from 60 to 400 breaths per minute.
- Stroke volume 30 to 350 µl, simple adjustment while running.
- Compact size allows positioning close to system for minimal system volume.

Positive PressureVentilation Option, 230 V (73-4305) includes:		**Positive PressureVentilation Option, 115 V (73-4306) includes**:	
Item #	**Product Name**	**Item #**	**Product Name**
	Mouse Ventilator MiniVent Type 845, 230 V		Mouse Ventilator MinVent Type 845, 115 V
73-2792	Y-Adapter to Connect External Respirator to IPL-1	**73-2792**	Y-Adapter to Connect External Respirator to IPL-1

Perfusion Systems for Cell Isolation (PSCI) from Heart, Liver and Other Organs

The Perfusion System for Cell Isolation (PSCI) is specially designed for harvesting individual cells from isolated organs such as mouse, rat or guinea pig heart, liver and other organs. Individual cells are released from the cellular structure of the tissue through perfusion with an enzyme solution and are then flushed out.

Adaptations for heart, in situ, and ex vivo perfusion require specific additional equipment.

Images show complete functional systems.

Easily compare our Cell Isolation Systems.

Item No.	Description
73-3672	Perfusion System Base Unit for Cell Isolation from Rodent Hearts (PSCI-RH)
73-3639	Perfusion System Base Unit for Cell Isolation from Rodent Organs (PSCI-R)

DETAILS

The Perfusion System for Cell Isolation (PSCI) is specially designed for harvesting individual cells from isolated organs such as mouse, rat or guinea pig heart, liver and other organs. The system features low deadspace volume dual stainless steel warming coil circuits for blanching and enzymatic solutions.

Cell Isolation from Liver and Other Organs

Cardiomyocyte Isolation

As noted in the Item listing, you may purchase the base unit alone and add additional required items (see below).

Cell Isolation from Liver and Other Organs

Features & Benefits

- Allows cell isolation from mouse, rat and guinea pig organs by enzymatic disintegration
- System allows in-situ or ex vivo perfusion (OP-table or moist chamber additionally required)
- Specifically engineered dual perfusion system for blood cell flush and enzymatic disintegration

- Dedicated setup for cardiomyocyte isolation (see cardiomyocyte isolation)

Applications

- Harvesting individual cells from mouse, rat or guinea pig isolated organs

Base units include:

Plexiglass stand, double heat exchanger, switching valve, protease reservoir and holder for pressure transducer. System volume: <5 ml.

Additional equipment required:

Thermocirculator, peristaltic pump, reservoir, cannulae and others depending on version and application, transducers, monitoring system setup using the PLUGSYS Amplifier System. In-situ perfusion requires an operating table.

Adaptation for Ex Vivo Perfusion

The PSCI can be adapted for ex vivo perfusion by adding a jacketed moist chamber and appropriate cannula for the organ of interest.

Adaptation for In Situ Perfusion

The PSCI can be adapted for in situ perfusion by adding an operating table and appropriate cannula for the organ of interest.

Adaptation for Cardiomyocyte Isolation

See details below.

Setup and Operation

The system has two separate perfusion circuits and a specialized stopcock which allows the organ to be easily switched between the two circuits. The first circuit is filled with organ blanching perfusion solution and is used in the initial phase of the isolation process to flush out the blood cells from the organ. For the second phase, the system is switched to the second circuit which is filled with an enzyme solution for disintegration.

In the standard PSCI system, perfusion is performed under constant flow conditions. A peristaltic pump (purchased separately) is used to adjust the flow to a rate appropriate for the organ of interest. The system itself can handle flow rates of up to 100 ml/min, depending on the specific configuration. A pressure transducer and amplifier can easily be added to a set up to monitor perfusion pressure. Furthermore, the system can be upgraded to constant pressure perfusion with the addition of the SCP controller.

The easy to use system is designed to be as compact and user friendly as possible. Components that come in contact with perfusion solutions are alcohol resistant so that the perfusion circuits can be filled with alcohol to clean and sterilize after use.

Cardiomyocyte Isolation

The heart version of the PSCI includes a jacketed heart chamber mounted on a movable platform. A slow gas flow into this chamber creates a positive pressure inside the heart chamber minimizing ingress of bacteria during operation.

Features & Benefits

- Dual perfusion system for blood cell flushing and enzymatic digestion
- Compatible with disinfection using ethanol
- Positive pressure gas flow in heart chamber and reservoir prevent bacterial contamination
- Low priming volume < 5ml conserves protease solution and minimizes temperature loss through tubing.
- Multi-purpose system can be fitted for use with other organs (e.g. in situ or ex vivo hepatocyte isolation from rat or mouse liver)

Applications

- Cardiomyocyte isolation
- Monitoring perfusion pressure
- Monitoring coronary flow (requires SCP Servo Control addition)

Complete Functional Systems

Configured setup for mouse, rat, guinea pig heart Cardiomyocyte Isolation		**Configured setup for mouse, rat, guinea pig cell isolation of other organs**	
73-3672 [a]	Perfusion System Base Unit for Cell Isolation from Rodent Hearts (PSCI-RH)	73-3639[a]	Perfusion System Base Unit for Cell Isolation from Rodent Organs (PSCI-R)
or	TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 220 V TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 120 V	or	TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 220 V TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 120 V
75-1004	Reglo Peristaltic (Roller) Pump	75-1004	Reglo Peristaltic (Roller) Pump
	Jacketed Glass Reservoir for Buffer Solution, with Frit, 0.5 L		Jacketed Glass Reservoir for Buffer Solution, with Frit, 0.5 L
	Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves		Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves
	3-Stop Tygon® E-Lab Tubing, 0.95 mm ID, 12/pack, White/Black		3-Stop Tygon® E-Lab Tubing, 0.95 mm ID, 12/pack, White/Black
	3-Stop Tygon® E-Lab Tubing, 0.95 mm ID, 12/pack, White/Black		3-Stop Tygon® E-Lab Tubing, 0.95 mm ID, 12/pack, White/Black

73-2798	AORTIC CANNULA 1. 0mm WITH LUER TAPER for mouse hearts	73-3776	OP.TABLE SIZE 5HT, TYPE 872H WITH TRIPOD STAND AND HEATING WITH POWER SUPPLY 115-230 VAC
73-2868	AORTIC CANNULA 2.0mm WITH LUER TAPER for small rat hearts	73-3309[b]	CANNULA WITH BASKET AND SIDE PORT, OD 1.0mm, ID=0.7mm
73-2869	AORTIC CANNULA 2.3mm WITH LUER TAPER for rat hearts	73-3308[b]	CANNULA WITH BASKET OD= 1.0mm, ID=0.7mm
73-2871	AORTIC CANNULA 3mm WITH LUER TAPER for large rat hearts or guinea pig hearts	73-3311[b]	CANNULA WITH BASKET AND SIDE PORT, OD=1.3mm, ID=1mm
73-2872	AORTIC CANNULA 4mm WITH LUER TAPER for large guinea pig hearts or small rabbit hearts	73-3310[b]	CANNULA WITH BASKET, DIAMETER 1.3mm

a. Both base units include Plexiglass stand, double exchanger, switching valve, protease reservoir and holder for pressure transducer.

b. Other In Situ perfusion cannula sizes available

Optional Additions for Accurate Control of Perfusion Pressure or Flow

Addition for perfusion pressure measurement to PSCI: Add PLUGSYS Minicase, Type 609; TAM-D; APT300

Addition for constant pressure perfusion to PSCI: In addition to above, add , Servo Controller for Perfusion (SCP)

Setup & Operation

The PSCI can be operated in either single pass or recirculating constant flow perfusion at rates up to 100 ml/min. As noted above, upgrade options are available for pressure monitoring or constant pressure perfusion.

The apparatus is so designed that the individual steps required for preparing the cells can proceed as simply and clearly as possible. With two separate perfusion circuits, the organ can be switched between clearing buffer for removal of blood cells and collagenase buffer for organ digestion by means of a custom, precision-milled changeover stopcock; saving valuable time and solution.

Common additions to the PSCI include perfusion pressure measurement and constant pressure perfusion. These options allow for optimized perfusion of the heart, further maximizing cell yield and viability by ensuring non-damaging physiological perfusion conditions. The components wetted by the perfusion solutions are made from alcohol-resistant materials so that the apparatus can be filled with ethanol for sterilization/disinfection should your experiment require prolonged incubation time where bacterial contamination would be problematic.

SPECIFICATIONS

Heat Exchanger Inside Diameter	2.0 mm

Maximum Flow Rate	100 ml/min
Prime Volume	<5 ml
System Volume	<3.0 ml
Dimensions, W x D x H	600 x 400 x 570 mm
Weight	8 kg

Perfusion Occlusion Option for IPL-2

Perfusion occlusion option for IPL-2 for double or individual occlusion:

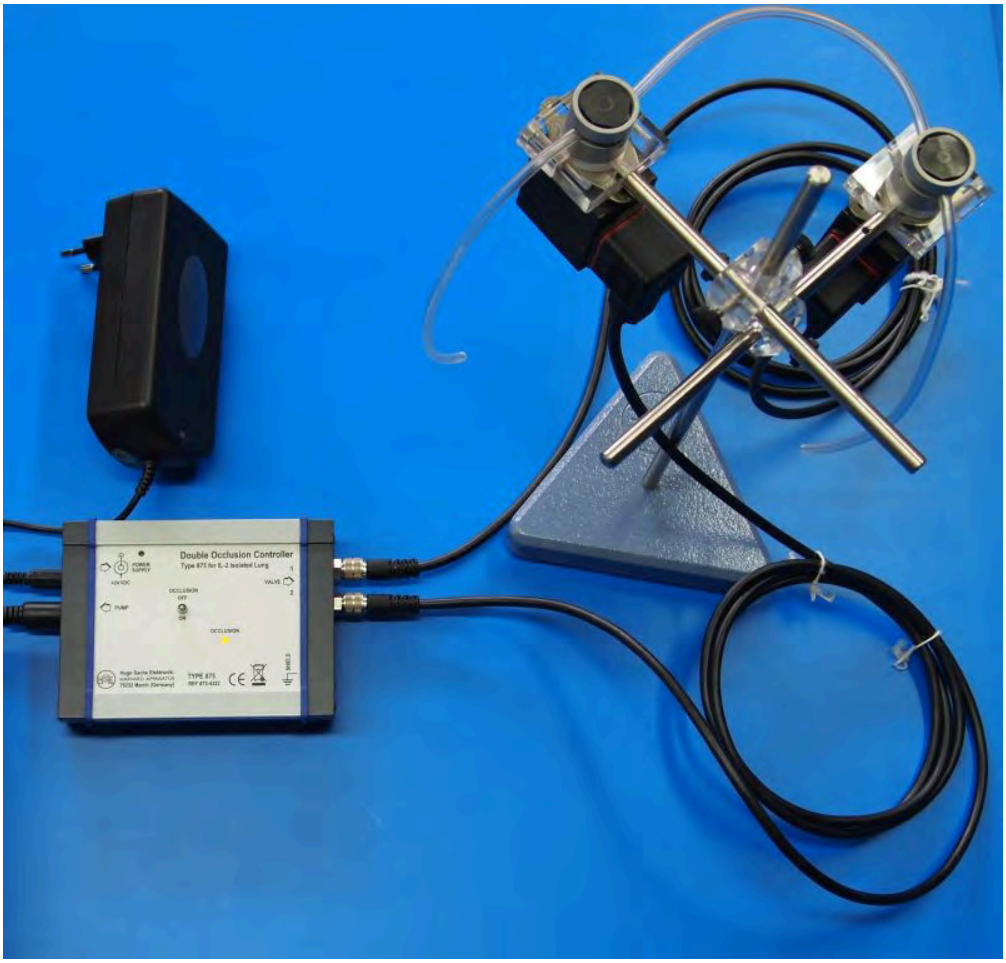
Allows double occlusion for:

- Measurement of segmental vascular resistances (precapillary and post-capillary resistance)
- Measurement of microvascular pressure

Allows individual arterial and venous occlusion for:

- Determination of large and small artery resistances
- Determination of large and small vein resistances
- Determination of vascular compliance

Item No.	Description
73-4322	Perfusion Occlusion System Option to Core IPL-2 System



DETAILS

Perfusion occlusion option for IPL-2 for double or individual occlusion:

Allows double occlusion for:

- Measurement of segmental vascular resistances (precapillary and post-capillary resistance)
- Measurement of microvascular pressure

Allows individual arterial and venous occlusion for:

- Determination of large and small artery resistances
- Determination of large and small vein resistances
- Determination of vascular compliance

The Double Occlusion System for the isolated Lung size 2 (IPL-2) has been designed to simultaneously pinch off the inflow and outflow to the lung (Double Occlusion) using two magnet pinch valves. The Inflow is the tube to the pulmonary artery, the Outflow is the tube of the cannula in the left atrium.

The Double Occlusion for Isolated Lungs is a special technique in order to prove evidence about the pulmonary vascular resistance or respectively segmental vascular resistance. For this purpose the pulmonary arterial inflow and venous outflow is simultaneously stopped using the two magnet valves. In

parallel the pulmonary arterial pressure (Pa) and venous pressure (Pv) are measured.

After a period of a few seconds the two pressures equalize. The resulting ”clamp” pressure (Pc) is measured.

The segmental vascular Resistance is a result of:

Rpre = (Pa - Pc) / Flow

Rpost = (Pc - Pv) / Flow

The flow rate value before the Occlusion is used as Flow.

Includes:

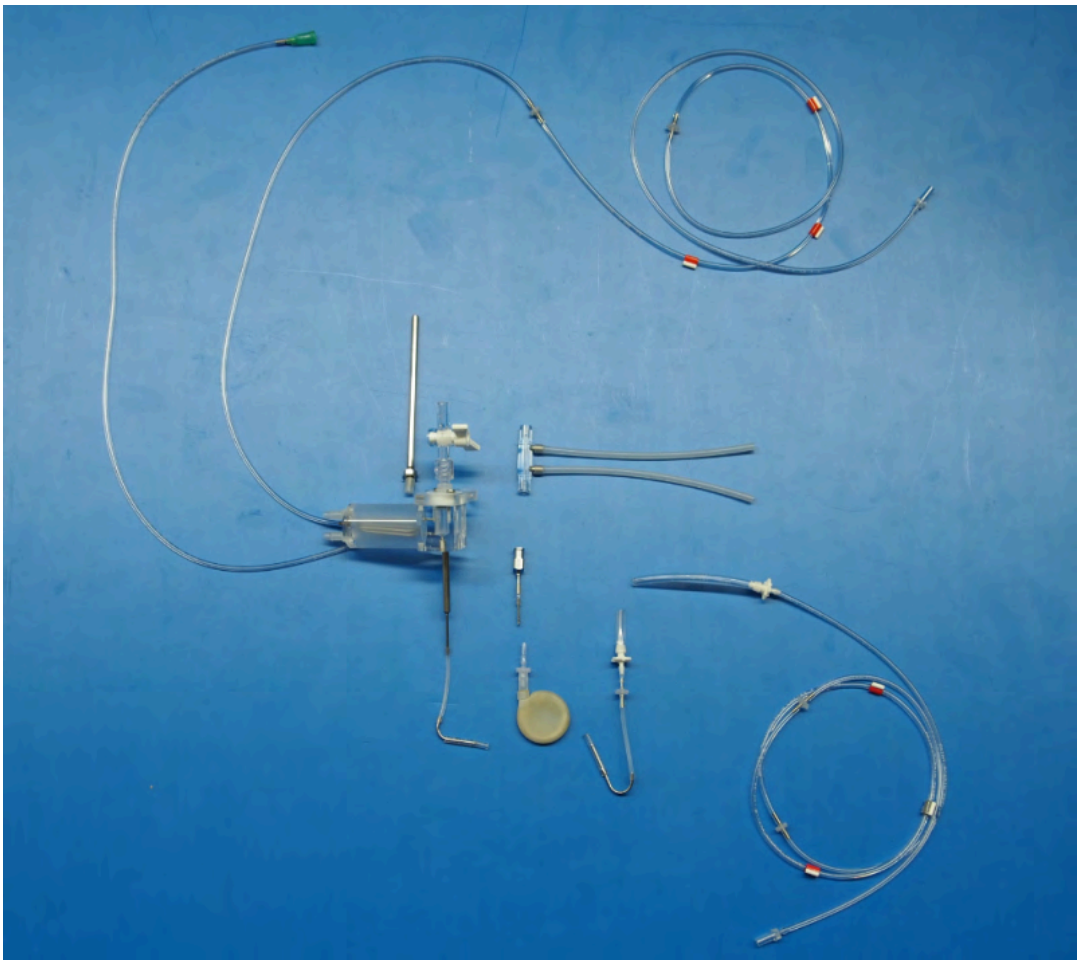
- Stand
- Two pinch valves
- Controller for perfusion occlusion

Note: The peristaltic pump with external ON/OFF control is required.

Addition to Perfuse Mouse Lungs on IPL-2 Systems

Add this option to run mouse perfused lung experiments on an IPL-2 system

Item No.	Description
73-4108	Addition to Perfuse Mouse Lungs on IPL-2 System



DETAILS

Add this option to run mouse perfused lung experiments on an IPL-2 system

Includes:

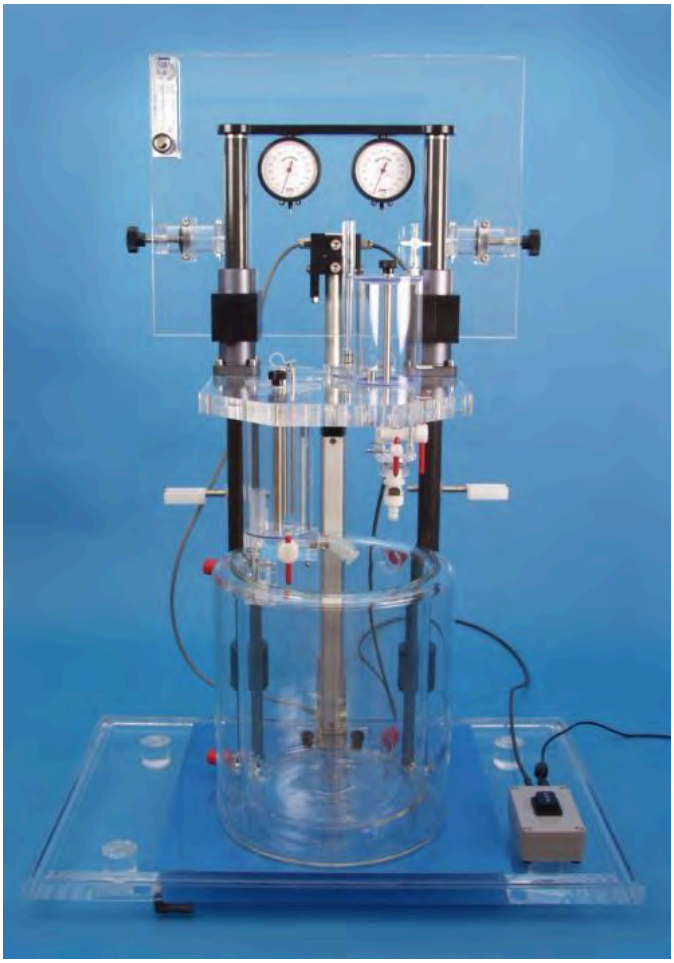
- Small low-volume heat exchanger
- Mouse pneumotachometer
- Tracheal, pulmonary and venous cannulae for mouse
- Pump tubing AME 09 (73-1825) and AME 014 (73-0126)
- All necessary tubing with tube adapters

IH-9 Langendorff and Working Heart Systems for Isolated Mini Pig or Small Domestic Pig Heart

The IH-9 system is a tabletop isolated heart perfusion system developed for small pigs with a body weight up to about 20 kg. It can also be used for rabbit or mini pig models. The IH-9 offers ultimate perfusion stability and real physiological conditions for longer, more relevant recordings with fewer artifacts.

Each IH-9 system is quoted to meet the specific requirements of the researcher. Additional components are required for a fully functional system. Add the Working Heart Option to upgrade to a working heart system.

Item No.	Description
73-4965	Base Unit for IH-9T, Tabletop Version
73-4966	IH-9 Working Heart Option



DETAILS

The IH-9 system is a tabletop isolated heart perfusion system developed for small pigs with a body weight up to about 20 kg. It can also be used for rabbit or mini pig models. The IH-9 offers ultimate perfusion stability and real physiological conditions for longer, more relevant recordings with fewer artifacts.

The modular nature of the IH-9 allows the system to evolve along with your research. Our Langendorff system can easily be upgraded to full working heart system. Both Langendorff and working heart modes allow a choice of measurement capabilities with dedicated packages available for specialized applications, such as measurement and analysis of multiple ECG and MAP signals. Perfusion of such larger hearts also creates the opportunity for detailed study of cardioplegia solutions and reperfusion after cardioplegia. Infarct studies with reperfusion and many other studies similar as on smaller hearts are possible.

Advanced System Design
Applications
Features & Benefits
Measured Signals & Calculated Parameters

Required Core items
Additional Components
Specialized Applications and Upgrades

Advanced System Design

The IH-9 utilizes the proven architecture and functional principle of our smaller IH-5 system but is engineered for the increased flow produced by these larger species. The system can be operated in any one of the three modes: retrograde Langendorff perfusion under constant pressure, retrograde Langendorff perfusion under constant flow, and real ejecting working heart. The IH-9 allows standard hemodynamic as well as ischemia-reperfusion studies using saline or erythrocyte-containing perfusion solutions or real blood (heparinized). Saline perfusions will not be optimal as the O_2 transport in saline solution is not sufficient enough for these large organs.

The key part of the system is the unique aortic block, which is mounted on the cover of the heart chamber. In the working heart setup, the preload reservoir is also mounted on the bottom of the cover and consequently in the heart chamber. All other components are mounted on the main heart cover chamber, except for the pumps, the oxygenator, the thermostatic circulator and the PLUGSYS amplifier system.

The large Windkessel acts as bubble trap and damping reservoir in retrograde Langendorff perfusion and mimics the compliance of the aorta in ejecting working heart perfusions. Special attention has been made to ensure that all critical connecting tubing are short, thus avoiding any cooling to ambient temperature through a temperature gradient and any system generated flow resistances.

A large threaded spindle syringes on the right sets aortic pressure in retrograde Langendorff perfusion or the afterload pressure in ejecting working heart. The second threaded spindle syringe on the left side sets the preload pressure (left atrium pressure) in working ejecting heart perfusions. The patented membrane system where these syringes are connected avoids high bouncing water columns. Thus the measured pressure waves mimic in vivo pressures situation as near as possible.

The large 6 L heart chamber also acts as reservoir to keep blood or perfusion solution volume as small as possible. Perfusate that contains erythrocytes is oxygenated by a special membrane oxygenator. The connection to the heart is made through interchangeable aortic cannulae and atrial cannulae in the working heart extension. The entire setup is on a platform with an electrical-driven lift that moves the platform up and down. The complete platform with the attached heart can be lowered with the lift so that the heart hangs in the heated jacketed heart chamber to get better temperature conditions for the heart.

The system can accommodate hearts with aorta diameters from 5 to 12 mm. For retrograde perfusion, perfusion pressure may be up to 300 mmHg and perfusion flow up to 500 ml/min. In working heart mode, the special flow resistance and compliance chamber closely mimics the in vivo afterload. Aortic flow up to 1,500 ml/min is possible.

Applications

- Study of myogene autoregulation with the addition of ultrasonic flow measurement (TTFM-2 and suitable flow probe)
- Testing inotropic substances
- Testing of lusitrope substances

- Testing of vasoactive substances
- Cardiac rhythm tests
- Ischemia/hypoxia studies
- Refractory period studies
- Ischemia/reperfusion injury studies
- Cardioplegia studies
- Cardiac preconditioning
- Cardiovascular screening performance
- Electrophysiology studies (ECG, Monophasic Action Potentials)
- Phenotyping of transgenic animals
- Drug compound screening
- Toxicology studies
- Biochemical tests
- Heart transplantation models
- In-depth hemodynamic applications including study of cardiac flow, LVP and pressure-volume relationships

In addition, in working heart mode:

- Real-time measurement of aortic and atrial flow
- Intracardial left ventricular pressure (LVP) measurement
- Pressure-volume measurement
- High atrial pressure-induced disease state simulation

Features & Benefits

Langendorff Mode

- Low flow resistance and dead space volume, minimize perfusion artifacts
- Compact system does not require high water columns
- Suitable for hearts from hypertensive animals (perfusion pressure up to 300 mmHg is possible)
- Constant pressure or constant flow in one unit
- Unique integrated aortic block
  - Bubble trap located immediately above the aortic cannula
  - Integrated flow probe option for accurate real-time flow measurement
  - Integrated stopcock to control perfusion flow and simulate ischemic conditions
- Drug injection pathway built directly into aortic perfusate stream

- Temperature and oxygen loss minimal
- Easily upgraded to a working heart system
- Modular system grows with your applications
- System specific electrodes and holders for precise measurements
- All electrodes, catheters etc. are placed around the heart to have easy and direct access

Working Heart Mode (in addition to all Langendorff features)

- Optimized atrium cannulating conditions
- Easy to switch from the Langendorff mode to the working heart mode and back
- Physiological flow resistance and minimal dead space volume
- Short atrial fill time (low flow resistance) resulting in optimal ventricle filling
- Built in port for insertion of a catheter transducer for left ventricular pressure or pressure-volume measurement
- Mimic physiologic atrial and arterial pressure and flow patterns
- Compact aortic block
  - Exclusive patented Membrane Afterload System and compliance chamber, mimic physiological cardiac afterload and avoid damage to heart valves that occurs with water column-based systems
  - Integrated flow probe option for accurate real-time aortic flow measurement
- Real constant preload system
  - Mimics physiologic atrial pressure patterns
  - Reduced stress on mitral valve caused by the pump
  - Preload pressure independent of the atrial flow
- Real time coronary flow measurement (option)
  - Coronary flow can be measured directly by cannulation of the pulmonary artery

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Measured Signals and Calculated Parameters

The following signals are recorded as raw data in retrograde Langendorff perfusion:

- Isovolumetric left ventricular pressure (balloon method)
- Aortic (perfusion) pressure
- Coronary flow*

The following parameters are calculated from the raw data (using the):

- dLVP/dt, dLVP/dt Max, dLVP/dt Min, Contractility Index
- Systolic and diastolic LVP
- Heart rate
- Mean perfusion pressure

- Mean perfusion Flow*
- Coronary resistance*

* This parameter is based on indirect flow measurement with the SCP controller or direct ultrasound flow measurement with the .

Required Core Items

Each IH-9 system is quoted to meet the specific requirements of the researcher. The Item Listing is representative of components that are required to build a 230 V or 115 V core Langendorff retrograde perfusion system to work under constant pressure or constant flow. All items are purchased separately. Additional components are required for a fully functional system. Add the Working Heart Option to upgrade to a working heart system.

The IH-9 Base Unit (73-4965), tabletop version, includes:

Plexiglas stand, aortic block with Windkessel and bubble trap, adjustable artificial flow resistance for adjusting the aortic pressure with pressure gauge and manometer, jacketed heart chamber (volume 5 L) with electrical lift, filter, tubing and connections, set of aortic cannulae (OD = 5 to 12 mm*). Expandable to working heart. Note: The heart chamber acts as reservoir.

The Working Heart Option (73-4966) includes:

Left atrium cannulating system consisting of preload reservoir (capacity 0.3 L), movable atrium connection adapter, set of left atrial cannulae (OD = 5 to 12mm*), aortic flow rate up to 1.5 l/min. Additional components required to complete a setup. Please inquire.

*Replacement cannulae can be purchased separately.

Additional Components

Oxygenator

An oxygenator is necessary for oxygenating and warming the perfusion solution (blood). Hugo-Sachs does not supply an oxygenator suitable for the IH-9 system. Researchers can readily use available clinical oxygenators, such as the Medtronic Affinity NT Oxygenator.

Amplifier

An amplifier system is required for the various pressures and flow, ECG and MAP measurement, etc. See .

ISOHEART Data Acquisition Software and Associated Hardware

provides real-time evaluation of a wide range of signals and classical cardiovascular parameters. Option available for flow proportional drug addition using a syringe pump.

Note: Ponemah Data Acquisition & Analysis Software from DSI, a Harvard Bioscience Company is also suitable.

Specialized Applications & Upgrades

Please contact technical support for assistance in adding specialized applications or to upgrade an IH-9 Langendorff system to a working heart.

- Working Heart Option
- Cardioplegia Option
- Direct Coronary and Aortic Flow Measurement
- Intracardial Left Ventricular Pressure (LVP) Measurement
- Pressure-Volume (PV) Loop Measurement (requires Ponemah or PowerLab hardware and software)
- Increased Preload Pressure
- Perfusate Oxygenation of Foaming Media
- Temperature Measurement
- Perfusion Solution Monitoring
- Coronary Effluent Collection
- Drug Addition
- Perfusate Filtration
- Pacing
- Single-Lead ECG and MAP Measurement
- Multi-Lead ECG and MAP Measurement

Fiber Optic Perfusion Solution Monitoring (PreSens)

PreSens fiber optic minisensors and space-saving digital-phase transmitters for precise and stable temperature-compensated measurement of pO_2, pCO_2 and pH in ex vivo organ perfusion systems.

These high performance systems can be used for discrete rapid checks or continuous measurements, even in multi-day perfusion studies.

- State-of-the-art system provides unprecedented performance and precision.
- Temperature compensation ensures accurate measurements even in environments or experiments with temperature variations.
- Sterile, beta-irradiated flow-through cells.

Item No.	Description
73-5041	OXY-1 SMA Single-Channel Fiber Optic Oxygen Transmitter
73-5044	Flow-Through Cell for Oxygen, oxygen-sensitive coating, 0 to 100% O2 (0 to 760 mmHg), beta irradiated
73-5042	pH-1 SMA Single-Channel Fiber Optic pH Transmitter
73-5045	Flow-Through Cell for pH, pH sensitive coating, pH 5.5 to 8.5, beta irradiated
73-5043	CO2-1 SMA Single-Channel Fiber Optic CO2 Transmitter
73-5046	Flow-Through Cell for pCO2, 1 to 25% CO2 (8 to 180 mmHg), beta irradiated
73-4941	Polymer Optical Fiber for use with fiber optic minisensors O2, pH, CO2
73-5047	Pt100 Temperature Probe for temperature compensation
73-5048	2CSB Analog Output Extension

Item No.	Description
73-5083	Presens Adapter Kit. Replacement fittings package for fiber optic pO2, pCO2 or pH measurement. Includes all necessary adapters, Luer connectors, T-pieces and tubing.
73-0126	3-Stop Tygon® E-Lab Tubing, ID 1.22 mm, 12/pack, Red/Grey
73-5261	MULTI-CHANNEL FIBER OPTIC TRANSMITTER FOR O2, CO2 AND PH

DETAILS

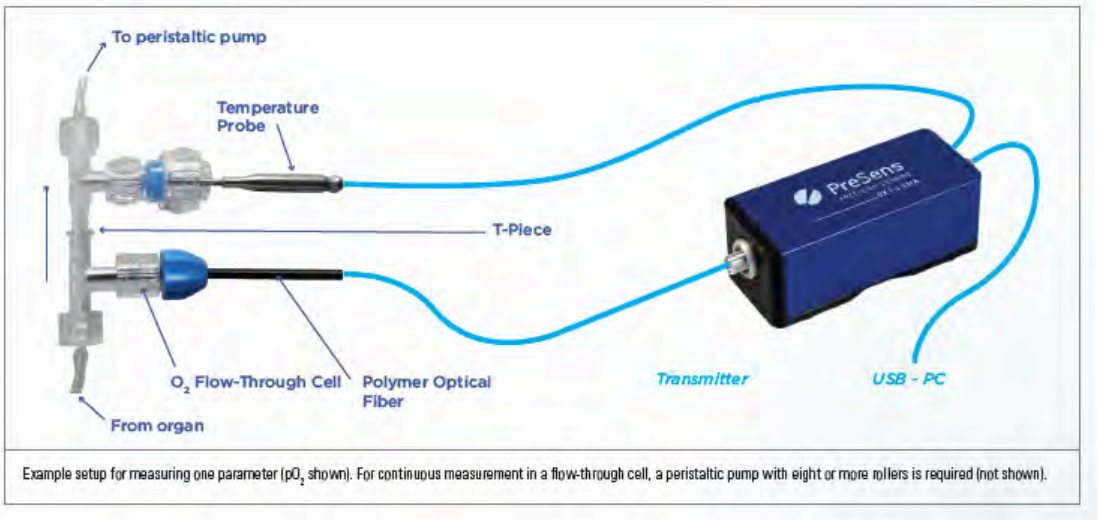
Precise and stable temperature-compensated measurement of pO_2, pCO_2 and pH in ex vivo organ perfusion systems is now possible using PreSens fiber optic minisensors and space-saving digital-phase transmitters. These high performance systems can be used for discrete rapid checks or continuous measurements, even in multi-day perfusion studies.

Features

- State-of-the-art system provides unprecedented performance and precision.
- Temperature compensation ensures accurate measurements even in environments or experiments with temperature variations.
- Sterile, beta-irradiated flow-through cells.

Easy to Set Up, Easy to Use

Simply add the flow-through cell for the parameter you wish to measure with a T-piece to your perfusion line and connect to the associated transmitter with a polymer optical fiber. Connect a Pt100 temperature probe for temperature compensation and temperature measurement. Then connect the transmitter to a PC using the included USB cable to record and view data via Measurement Studio 2 Software.



Example setup for measuring one parameter (pO_2 shown). For continuous measurement in a flow-through cell, a peristaltic pump with eight or more rollers is required (not shown).

Multiple Measurements

To measure two or three parameters simultaneously, add the flow-through cells in series to the measuring channel in a bypass*, ending the sequence with a Pt100 temperature probe. Connect the appropriate transmitter to the sensor using a polymer optical fiber. The USB port on each transmitter connects to the PC.

For a multi-channel system only one Pt100 temperature probe is required. It is recommended to have the temperature probe at the end of the sequence of flow-through cells (after the sensors) so that no air bubbles are trapped.

**For perfusion studies with continuous flow rates below 2 ml/min the sensors can be placed directly inline of the afferent or efferent cannulae. For perfusion flow rates above 2 ml/min or for non-continuous flow rates (e.g., constant pressure perfusion) a bypass or side stream flow line must be created with a fluid T-connection and a peristaltic pump drawing perfusate through the sensor(s) at a continuous rate ideally between 1 to 2 ml/min.*

System Components

Flow-Through Cells

PreSens flow-through cells are parameter specific fiber optic sensors (pO_2, pCO_2 and/or pH) that interface between the solution and the polymer optical fiber. They feature a water-tight connection fo rthe optical fiber and Luer lock connector sfor easy interconnection to the fluid circuit. The three parameters can be measured continuously in a bypass circuit with the addition of an appropriate peristaltic pump to the setup.

Include: Fiber optic transmitter, USB mini cable, and PC recording software for single- and multi-channel devices and all necessary tubing to secrue POF into flow-through cell.

PreSens Measurement Studio 2 Software

The PreSens Measurement Studio 2 Software is included with all transmitters (pO_2, pCO_2 and pH) and records parameter values from one or more PreSens transmitters through a USB connected Windows® 7 or 10 OS-based computer. Data management for sensors, measurement files and users, as well as export of files into .csv format, can be accomplished easily with just a few clicks. The intuitive measurement control facilitates precise measurements with multiple devices simultaneously.

Pt100 Temperature Probe for Temperature Compensation

The Pt100 temperature sensor is integrated into any single- or multi-channel flow-through circuit and connected to any one of the transmitters. Solution temperature affects the measured values of pO_2, pCO_2 and pH. To accurately measure these parameters, especially during chronic perfusion studies, it is important that solution temperature be measured simultaneously. The Studio 2 software records the temperature and calculates the compensated values in real time.

Cable length 5 M, length of temperature probe 40 mm, OD 1.9 mm. Includes connectors and fittings to insert probe into perfusion circuit.

Single-Channel Fiber Optic Transmitters

PreSens transmitters convert an optical signal (light) into a digital value which is recorded using the Measurement Studio 2 Software that is included with all transmitters. These transmitters can be assembled in a few easy steps and are extremely space-saving. Because the devices are powered via USB, no additional power connections, cables or adapters are required.

Polymer Optical Fiber

The polymer optical fiber transfers excitation light to the sensor and the sensor response back to the transmitter.

Analog Output Extension

This extension allows continuous, simultaneous recording of PreSens measured values, in addition to other significant values, using any DataAcquisition System (DAQ) such as HSE ISOHEART and PULMODYN, ADI PowerLab or DSI PoNeMah.

The analog output extension is connected via USB to the PC. All the digital values (pO_2, pCO_2, pH,temperature) which are taken from the PreSens transmitters and displayed in the Measurement Studio 2 software, can be sent to the analog output extension. An external DAQ System synchronizes recording of pO_2, pCO_2 and pH together with all other collected signals such as pressures, flows, ECG, etc., to one time scale, for easier evaluation of experiment results.

Each analog converter outputs two user-selectable signals to an external DAQ, or other device, for two software selectable parameters. Two analog output extensions can be used simultaneously if you require 3 to 4 analog representations (outputs) of the measured parameters. Includes USB-RS485-RJ 4-4 cable.

PreSens Adapter Kit

This is a replacement fittings package for fiber optic pO_2, pCO_2 or pH measurement. Includes all necessary adapters, Luer connectors, T-pieces and tubing.

IH-5 Core System Options

Additions to the IH-5 Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready configurations.

Options must be selected for a functional unit.

Item No.	Description
73-2806	PLUGSYS Servo Controller for Perfusion (SCP)
73-4435	Perfusion Pressure Control with Starling Resistor for IH-5
73-4399	Additions to the IH-5 Core System for Rat/Guinea Pig Hearts
73-4400	Additions to the IH-5 Core System for Rabbit Hearts
73-4402	Heart Chamber for IH-5 Core System for Electrophysiology

DETAILS

Additions to the IH-5 Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready functional units

An IH-5 Langendorff functional unit requires the addition of core options to the selected core system (either 73-4397 or 73-4398). Specifically, the core system requires the addition of:

- Perfusion pressure controllers (SCP or Starling Resistor)
- Species-specific addition (includes cannulae and balloons)
- Application-appropriate heart chamber

The core option and species-specific addition selected depend on:

- If you want a Langendorff Only configuration or a Working Heart-Ready Langendorff configuration.
  - The Langendorff Only configuration can easily be modified to a Langendorff Working Heart-Ready configuration in the future.
  - Researchers who know they will be upgrading to working ejecting heart in the future often start with the Langendorff Working Heart-Ready configuration.
- The species to be studied, i.e., rat, guinea pig or rabbit

Core System Options

Langendorff Only Configuration (Add these core options to 73-4397 or 73-4398)	**Langendorff Working Heart-Ready Configuration*** (Add these core options to 73-4397 or 73-4398)
Species Specific Addition (choose one or both) • Rat/Guinea Pig Hearts (73-4399) • Rabbit Hearts (73-4400)	Species Specific Addition (choose one or both) • Rat/Guinea Pig Hearts (73-4399) • Rabbit Hearts (73-4400)
SCP PLUGSYS Servo Controller Module () for constant pressure perfusion and flow control	Starling Resistor for IH-5 (73-4435) for perfusion pressure control in Langendorff mode or afterload control in working heart mode
Heart Chamber (choose one) • 73-4401 for Cardiovascular Studies • 73-4402 for Electrophysiology Studies**	Heart Chamber (choose one) • 73-4401 for Cardiovascular Studies • 73-4402 for Electrophysiology Studies**

**Coronary flow measurement in this case is only possible by using an ultrasonic transit time TTFM-2 flowmeter with flow probe.*

***Choose this option if you intend to use the multi-ECG ring and/or circularMAP ring, as it requires a larger heart chamber.*

Perfusion Pressure Controllers

PLUGSYS Servo Controller for Perfusion (SCPP Module ()

The SCP constant pressure/flow controller maintains perfusion either at constant pressure or at constant flow using a peristaltic pump. The SCP controller modulates the flow generated by the perfusion pump based ona perfusion pressure feedback loop. The controller also provides an accurate, low-cost way to indirectly measure coronary flow. It provides accurate control of perfusion flow rate or pressure, even at very low flow rates. The SCP calculates flow rate from pump speed,eliminating the need for an expensive flowmeter. It is required for Langendorff Only configurations.

- Allows operation in constant pressure or constant flow with simple switch
- Provides accurate control of perfusion pressure or flow, even at very low flow rates
- Flexible perfusion circuit setup adjustes to suit individual perfusion conditions

Additional measured signals/calculated parameters:

- Indirect coronary flow measurement
- Calculation of coronary resistance

STARLING-IH5 Perfusion Pressure Controller with Starling Resistor (73-4345)

The perfusion pressure controller with Starling resistor provides constantpressure perfusion of the heart in Langendorff mode and acts as an afterloadsystem in the working heart mode. It uses a Teflon membrane flow resistor,manometer and pressure syringe to create a pressure-controlled valve in

theaortic block. It is required for a Langendorff Working Heart-Ready configuration.If coronary flow measurement is required, the use of the PLUGSYS ultrasonic transittime flow measurement module (TTFM-2) and flow probe will be required, as the SCPcontroller cannot make that measurement.

- Uses Teflon membrane flow resistor, manometer and pressure syringe to create a pressure-controlled valve in the aortic block.
- Mechanical device that does not provide flow information and does not alter the pump flow rate.
  - Flow rate is set high on the pump and only the flow that generates the set perfusion pressure is delivered to the heart while the remainder exits via the valve and returns to the reservoir.
- Must choose direct coronary flow measurement to capture coronary flow data.

Additional measured signal/calculated parameters:

- Coronary flow data (add species-specific Flow Measurement Option)

Includes:

- Aortic block base unit with flange-mounted adjustable flow resistance
- Pressure syringe with mounting bracket
- Manometer

Species Specific Options

	Additions to IH-5 Core System for Rat and Guinea Pig Hearts (73-4399) includes:		**Additions to IH-5 Core System for Rabbit Hearts (73-4400) includes:**
			Aortic Cannula for Rabbit Hearts to IH-5, OD 2.3 mm, set of 3, OD 3.0, 4.0 and 5.0 mm
	2-Stop Tygon® E-LabTubing, 2.06 mm ID, 12/pack, Purple/Purple		2-Stop Tygon® E-Lab Tubing,2.79 mm ID, 12/pack, Purple/White
	Tubing Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves		Tubing Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves
	Reservoir Jacketed for Buller Solution, with Frit and Bottom Drain, 2 L		Reservoir Jacketed for Buffer Solution, with Frit, 6 L
73-4463	Balloon Kit for Rat/Guinea Pig Hearts to IH-5 Core System, includes 10 balloons, size 5 (0.1 ml volume), spindle set and holder		Balloon Kit for Rabbit Hearts for IH-5, includes 5 balloons, size 12 (1.3 ml volume), 5 balloons, size 13 (1.6 ml volume), spindle set and holder

Cannulae for Isolated Perfused Lung System for Mouse (IPL-1)

Mouse cannulae for trachea, pulmonary artery and left atrium for use with the IPL-1 System

Item No.	Description
73-4181	Tracheal Cannula for Mouse, ID 1.0 mm, OD 1.3 mm, L 20 mm for IPL-1
73-0723	Pulmonary Artery Cannula for Mouse, Stainless Steel, ID 1.0 mm, OD 1.3/1.6 mm, L 28 mm for IPL-1
73-0724	Atrial Cannula for Mouse, ID 1.0 mm, OD 1.6 mm, L 24 mm for IPL-1

DETAILS

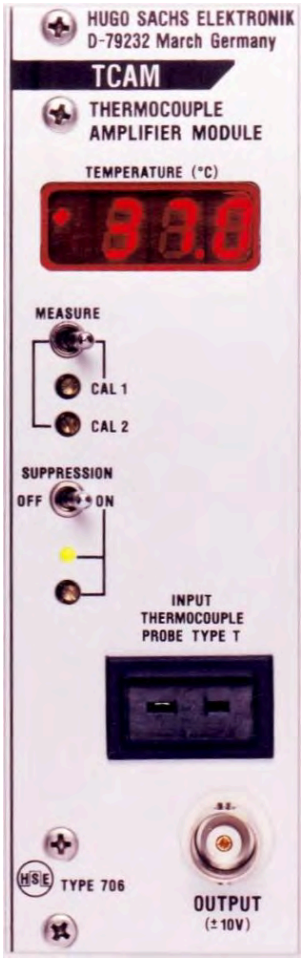
Mouse cannulae for trachea, pulmonary artery and left atrium for use with the IPL-1 System

Temperature Measurement Option for All Isolated Organ Systems

Perfusate temperature can be measured in one of two ways: with the PLUGSYS Thermocouple Amplifier Module (TCAM) or using a handheld thermometer with a digital readout. The perfusate temperature is measured by inserting a thermocouple probe directly into the perfusion line (into the tubing.)

All IPL systems are accurately thermostated. Temperature measurement is only necessary on studies using different temperatures, such as transplantation studies.

Item No.	Description
73-1792	Thermocouple Amplifier Module (TCAM)
73-4945	Handheld Thermometer for Thermocouple Probes
52-1732	Copper Constantan Thermocouple Flexible Implantable Probe, 0.6 mm Tip Diameter
73-4193	Tuohy Borst Adapter



DETAILS

Perfusate temperature can be measured in one of two ways: with the or using a handheld thermometer with a digital readout. The perfusate temperature is measured by inserting a thermocouple probe directly into the perfusion line (into the tubing.)

- Temperature Measurement with (73-1792) provides an analog output to record temperature changes with any .
- Temperature Measurement with a Handheld Thermometer (73-4945) provides measurement on a digital display.

Choose either of the options above and add:

- Copper Constantan Thermocouple Flexible Implantable Probe ()
- Extension Cable for Thermocouples, 6 ft (73-1911)
- Tuohy Borst Adapter for inserting tip catheter, small temperature probe or PE catheter into left ventricle via aortic cannula (73-4193)

SPECIFICATIONS

Specifications	52-1732
Accuracy Metric	0.1
Lead Length English	3
Lead Length Metric	0.9
Probe Wire Isolation	Isolated
Shaft Diameter (Teflon sheathed) English	0.025
Shaft Diameter (Teflon sheathed) Metric	0.64
Sterilization	by gas (ETO) or Cidex
Thermocouple Wire Material	Proprietary Copper Constantan
Time Constant	0.1

Windkessel

Windkessel for absorption of pulsation caused by roller pump

Item No.	Description
73-2068	Windkessel for Absorption of Pulsation Caused by Roller Pump
73-3717	Windkessel System for SCP Module or Stand-Alone Windkessel

DETAILS

Windkessel (73-2068) for absorption of pulsation caused by roller pump, volume approximately 30 ml with 3 Luer connections, holder and mounting material. For use with SCP module or as stand-alone Windkessel, 73-3717 includes rod mount assembly (8 mm maximum)

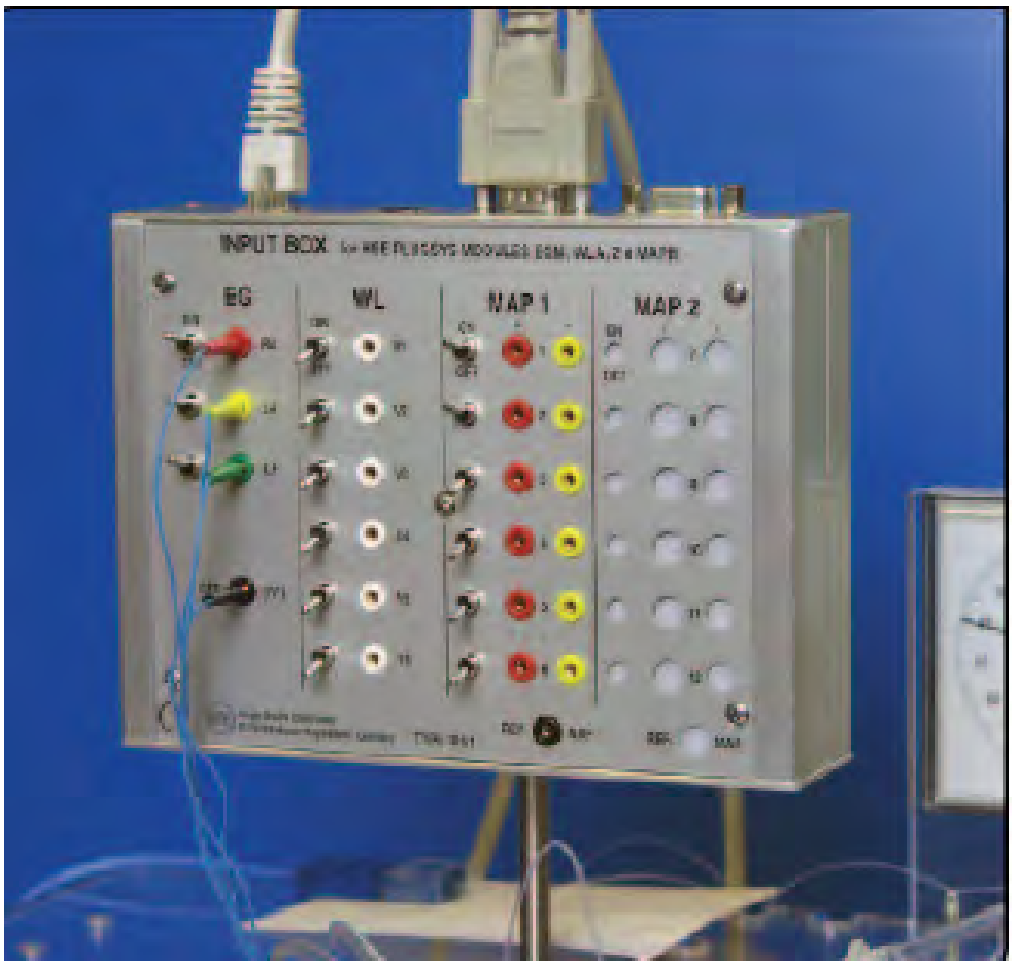
Input Boxes for Multi-ECG and Multi-MAP Measurements on IH-5

Input Boxes for multi-ECG and multi-MAP measurements for use with the PLUGSYS EGM, WLA and MAPM modules. Multi-lead MAP and ECG options available with circular MAP holder included.

If you already have a circular MAP holder or the necessary input box, any items can be also purchased separately. Please see Item Listing.

See Full Description for details on the appropriate input box for your ECG and MAP measurements.

Item No.	Description
73-1789	Input Box for up to 12 ECG Channels (no MAP), for PLUGSYS EGM and WLA Modules, with Connection Cables
73-1787	Input Box for up to 6 MAP Channels, for 1 PLUGSYS MAPM Module, with Connection Cables



DETAILS

Input Boxes for multi-ECG and multi-MAP measurements for use with the PLUGSYS EGM, WLA and MAPM modules. Multi-lead MAP and ECG options available with circular MAP holder included.

If you already have a circular MAP holder or the necessary input box, any items can be also purchased separately. Please see Item Listing.

If you are just setting up for multi-lead ECG and/or MAP measurements, the input boxes in the table below are recommended.

Option	Input Box Description	Includes	Compatible Configurations**
73-1789	Up to 12 ECG (No MAP)	Provides 4 labeled and color-coded 2 mm input sockets for EINTHOVEN Leads (I, II, III, avL, avR, aVF) and 6 labeled 2 mm input sockets for WILSON chest leads (V1-V6), cables to EGM and WLA modules are included.	IH5-6LEAD or IH5-12LEAD

73-4438	Up to 6 MAP	Includes Input Box for one MAPM Module for 6 differential MAP inputs (73-1787),Circular Map Holder* (73-0551) and MAPM connection cable	IH5-MAP3 or IH5-MAP6
73-4439	Up to 12 MAP	Includes Input Box for two MAPM Modules (73-1788) for 12 (2 x 6) differential MAP inputs, Circular Map Holder (73-0551) and MAPM conntection cables	IH5-MAP3 and IH5-MAP6
73-4440	Up to 12 ECG, up to 6 MAP	Includes Input Box for EGM, WLA and one MAPM Modules for 4 + 6 ECG and 6 differential MAP inputs (73-1790), Circular Map Holder (73-0551) and connection cables to EGM, WLA and MAPM modules	IH5-12LEAD and IH5-MAP 6
73-4441	Up to 12 ECG, up to 12 MAP	Includes Input Box for EGM, WML and two MAPM Modules for 4 + 6 ECG and 12 (2 x 6) differential MAP inputs (73-1791), Circular Map Holder (73-0551) and connection cables to EGM, WLA and MAPM modules	IH5-12LEAD, IH5-MAP6 and IH5-MAP3

* The Circular Map Holder allows circular mounting on the isolated heart system.

** Please see **Multi-Lead ECG and MAP Measurement Options for IH-5 Langendorff or Working Heart** for descriptions of these configurations.

Cannulae for Isolated Perfused Lung System for Rat and Guinea Pig (IPL-2)

Cannulae for trachea, pulmonary artery and left atrium for use with the IPL-2 System

Item No.	Description
73-3384	Trachael Cannula, OD 2.0 mm, L 14 mm, for IPL-2, no Luer Connection
73-3557	Trachael Cannula, OD 2.5 mm, L 17 mm, for IPL-2, no Luer Connection
73-3556	Trachael Cannula, OD 3.0 mm, L 20 mm, for IPL-2, no Luer Connection
73-3555	Trachael Cannula for IL-2 Lung, OD 3.5 mm, L 24 mm
73-0711	Large Pulmonary Artery Cannula for Rat, Tube Diameter 2.0 mm, Head Diameter, 2.5 mm for IPL-2
73-0712	Left Arial Cannula for Rat, D 4.0 mm, for IPL-2

DETAILS

Cannulae for trachea, pulmonary artery and left atrium for use with the IPL-2 System with rat and guinea pig lung.

Pacing Option for IH-SR Langendorff and Working Heart

For addition of pacing to functional IH-SR Langendorff and Working Heart systems. For small rodent hearts (mouse, rat and guinea pig).

Item No.	Description
73-4024	Pacing Option for IH-SR, 230 V
73-4345	Pacing Option for IH-SR, 115 V

DETAILS

For addition of pacing to functional IH-SR Langendorff and Working Heart systems. For small rodent hearts (mouse, rat and guinea pig).

The pacing option provides electrical stimulation to isolated small rodent hearts in functional Langendorff or Working Heart IH-SR system to ensure a stable or constant heart rate. This is useful when studying, for example, cardiac contractile function.

This option is also useful for the study of specific stimulation patterns, allowing stimulation to be switched on and off as required.

Pacing Option, 115 V, for Small Rodents (73-4345) includes:		**Pacing Option, 230 V, for Small Rodents (73-4024) includes:**	
	Stimulator C, 115 V		Stimulator C, 230 V
	Small Coaxial Stimulation Electrode Set		Small Coaxial Stimulation Electrode Set

Single-Lead ECG and MAP Measurement for IH-SR and IH-5 Langendorff or Working Heart

For single-lead ECG and MAP measurements on functional IH-SR or IH-5 Langendorff or working heart systems. ECG and MAP are recorded to be analyzed together.

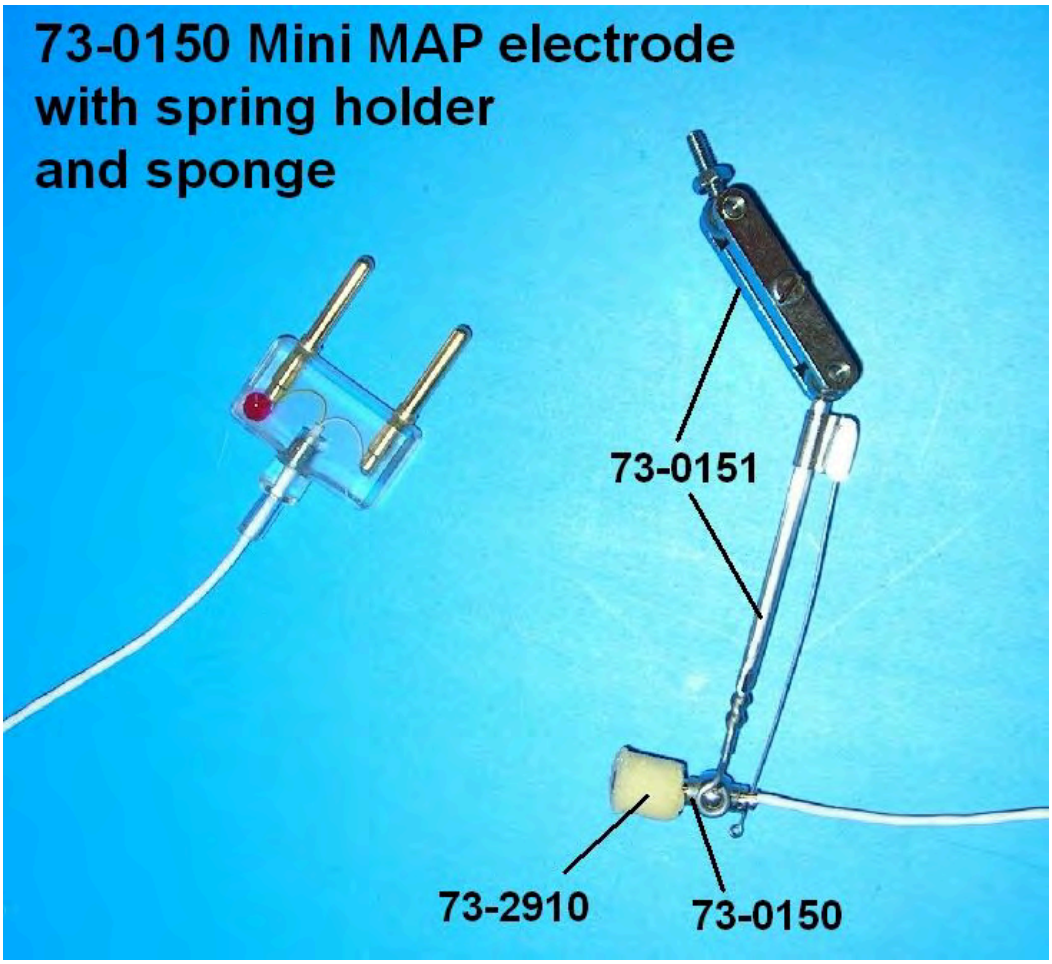
The Monophasic Action Potential (MAP) electrodes work based on the principle of Franz et al whereby firm, stable contact of the MAP electrode results in a high-quality MAP. MAP recording has been utilized in cardiac physiology for decades as it allows regional assessment of the electrophysiological state of the intact heart.

For addiitonal options available for the IH-5 system, please see .

Note: Images shown are representative.

Item No.	Description
73-4025	Measurement of Single Epicardial Monophasic Action Potential on Mouse Heart Option
73-4421	Measurement of Single Epicardial Monophasic Action Potential on Rat, Guinea Pig or Rabbit Heart Option
73-4422	Measurement of ECG Lead II on Any IH System Option
73-0150	Mini MAP-Tip Electrode for Rat, Guinea Pig and Rabbit
73-0151	Holder for MAP Electrode for IH-SR System
73-2910	Sponges for MAP Epicardial Probe
73-2989	MAP Electrode Opposite Holder to Maintain Rat or Guinea Pig Heart in Position on IH-SR
73-3840	Micro Map-Tip Electrode for Mouse

Item No.	Description
73-3858	MAP Electrode Opposite Holder to Maintain Mouse Heart in Position on IH-SR
73-0200	Contact ECG Electrode, Silver Chloride Pellet
73-0174	Mini Ball Joint Holder, Eye-Eye, 23 mm long, pkg of 1
73-0177	Mini Ball Joint Holder, Eye-Ball, 23 mm long, pkg of 1



DETAILS

For single-lead ECG and MAP measurements on functional IH-SR or IH-5 systems, one ECG lead is combined with one MAP electrode.

The Monophasic Action Potential (MAP) electrodes work based on the principle of Franz et al* whereby firm, stable contact of the MAP electrode results in a high-quality MAP. MAP recording has been utilized in cardiac physiology for decades as it allows regional assessment of the electrophysiological state of the intact heart.

For additional options available for the IH-5 system, please see .

* *Franz MR, Burkhoff D, Spurgeon H, Weisfeldt ML, Lakatta EG (1986). In vitro validation of a new cardiac catheter technique for recording monophasic action potentials.* Eur Heart J *, 7: 34-41.*

Features & Benefits

- Mini monophasic action potential electrodes for epicardial and endocardial recording, with dedicated holders
- Precision MAP electrodes with dedicated holders allow easy positioning on the heart
- Small electrodes allow multiple ECG and MAP signals to be recorded even on mouse hearts
- Mini ECG electrodes with dedicated holders
- Flexible ECG electrodes follow the heartbeat, dedicated holders allow easy positioning on the heart
- Optimized coaxial pacing electrode
- Reduced stray fields from the pacing electrode for more accurate recordings

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Applications

MAP recording is essential to researchers who study:

- Atrial fibrillation
- Arrhythmias
- Anti-arrhythmic drugs
- Ischemia
- Depolarization and repolarization cycles
- Activation time
- Mechanisms of action of various drugs

Options

For the addition of MAP recording to your functional isolated perfused heart system, we have a number of options:

Option	Measurement	Species	System Compatibility	Included Items

73-4025	Single Epicardial MAP	Mouse	IH-SR	Micro MAP-tip electrode (73-3840) Link for Higher Load Capacity, for Two Arms with 5 mm Mini Balls (73-0564) MAP Opposite Holder to Maintain Mouse Heart in Position (73-3858) Connection Cable for MAP Electrode to BPA Amplifier (73-0152) PLUGSYS Biopotential Amplifier (BPA) Module ()
73-4026	Single Epicardial MAP	Rat, Guinea Pig	IH-SR	Mini MAP-tip electrode (73-0150) Holder for MAP Electrode for IH-SR System (73-0151) MAP Opposite Holder to Maintain Rat or Guinea Pig Heart in Position (73-2989) Connection Cable for MAP Electrode to BPA Amplifier (73-0152) PLUGSYS Biopotential Amplifier (BPA) Module ()
73-4421	Single Epicardial MAP	Rat, Guinea Pig, Rabbit	IH-5	Mini MAP Tip Electrode (73-0150) Link for Higher Load Capacity, for Two Arms with 5 mm Mini Balls (73-0564) Mini Ball Joint Holder (73-0563) Holders for MAP Electrode for Precise Placement and Stabilization (73-0151) Large Opposite Holder (Spoon) for Larger Hearts for IH-5 (73-3755) PLUGSYS Biopotential Amplifier (BPA) Module () Connection Cable for MAP Electrode to BPA Amplifier (73-0152)
73-4027	Single Endocardial MAP	Rat, Guinea Pig, Rabbit	IH-SR, IH-5	Intracardial MAP-tip electrode with Holders (73-3715) Connection Cable for MAP Electrode to BPA Amplifier (73-0152) PLUGSYS Biopotential Amplifier (BPA) Module)
73-4422	ECG Lead II	Mouse to Rabbit	IH-SR, IH-5	Two Contact ECG Electrodes (73-0200) Mini Ball Joint Holder System for Universal IH-System Mounting ECG Amplifier Connection Cable

MAP Electrodes

The MAP electrodes required for each application, species and system are included in the options above.

Micro MAP-Tip Electrode (73-3840) for single epicardial MAP on IH-SR with mouse heart includes the electrode, spring wire and pack of sponges, as well a 2 mm male connector. The MAP electrode opposite holder (73-3858) needs to be attached with a certain pressure to the heart on the opposite side to hold the heart in position.

Mini MAP-Tip Electrode (73-0150) for single epicardial MAP on IH-SR (rat, guinea pig heart) or IH-5 (rat, guinea pig, rabbit heart) comes with two male connectors and includes one pack of sponges. The MAP electrode opposite holder (73-2989) holds the rat or guinea pig heart in place at a certain pressure.

MAP Electrode for Intracardial MAP (73-3715) for endocardial MAP on IH-SR or IH-5 (rat, guinea pig, rabbit heart) includes necessary holders.

For more details about these packages, please contact Technical Support.

SPECIFICATIONS

Specifications	73-0174	73-0177
Ball Joint Holder Length	23 mm	23 mm

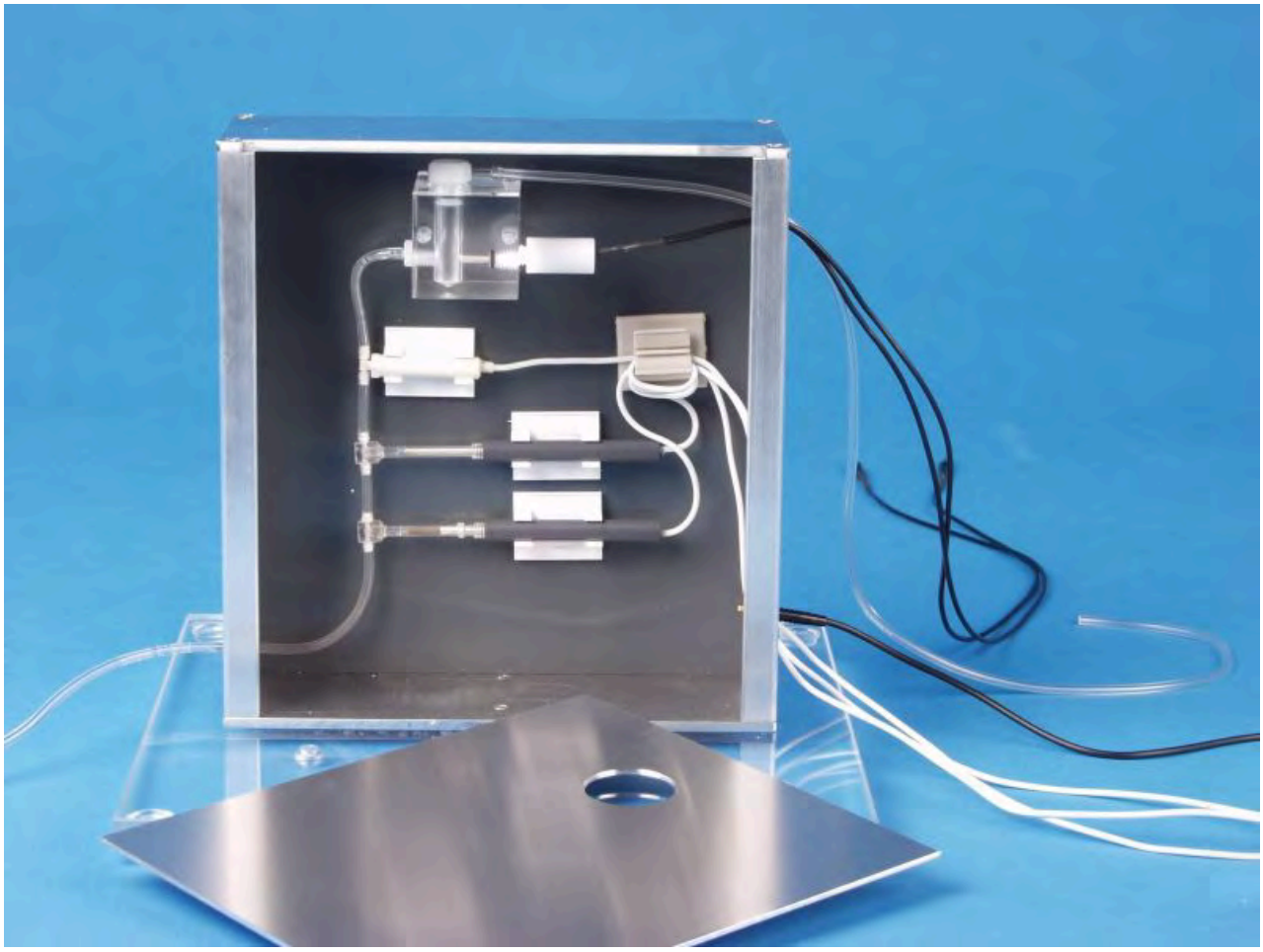
Perfusion Solution Electrochemical Monitoring for All Isolated Organ Systems

This option permits precise continuous monitoring and measurement of three key parameters, pO_2, pH and pCO_2, in liquid media or perfusate.

Monitoring is accomplished using ion-sensitive, chemosensor-based, flow-through electrodes.The electrodes require a dedicated pulsation-free peristaltic pump to deliver a constant flow of perfusate through the electrode at flow rates in the range of 0.5 to 2 ml/min. Because of the high impedance of these sensors, screening or shielding of the measuring circuit is required to protect against electrostatic discharges and other electrical disturbances.

Item No.	Description
73-4029	pO2 Measurement Sensor and Amplifier for 73-4287 and 73-4304
73-4031	pCO2 Measurement Sensor and Amplifier for 73-4287 and 73-4304
73-4030	pH Measurement Sensor and Amplifier for 73-4287 and 73-4304
73-4195	Microelectrode Shielding Case for Three Electrodes (pH, pO2, pCO2)
73-0207	Mounting Plate for Three-Electrode Shielding Case
73-4196	Microelectrode Shielding Case for Single Electrode (pO2 or pCO2)
73-3000	Mounting Base for Single Electrode Shielding Case Sensors for pO2 Measurement
73-4189	Oxygen Flow-Through Electrode, 1/16" Fittings

Item No.	Description
73-4191	CO2 Flow Through Electrode, 1/16€⊠ Fittings Sensors (for pH Measurement)
73-4197	pH Mini Flow Through Electrode Set, 1/16" fittings. Includes: flow through electrode, solid state
73-2998	Leak Free pH Flow Through Reference Electrode Set for Millivolt Adapter and pHMM Module Amplifiers & Adapters
73-0215	pH Measurement Module (pHMM)



DETAILS

This option permits precise continuous monitoring and measurement of three key parameters, pO_2, pH and pCO_2 in liquid media or perfusate. Monitoring is accomplished using ion-sensitive, chemosensor-based, flow-through electrodes. The electrodes require a dedicated pulsation-free peristaltic pump to deliver a constant flow of perfusate through the electrode at flow rates in the range of 0.5 to 2 ml/min.

Because of the high impedance of these sensors, screening or shielding of the measuring circuit is required to protect against electrostatic discharges and other electrical disturbances.

Continuous measuring pH, pO_2 and pCO_2 of the perfusion solution in an isolated organ system allows the user to control these parameters over the course of the experiment. It is especially important to monitor these parameters throughout the course of drug studies as any change in these values indicates a significant effect of the drug being tested.

Components can be purchased separately or you can choose an electrochemical monitoring system plus the sensor/amplifier packages you need. (Specifically, combine 73-4287 or 73-4304 with 73-4029, 73-4030 and/or 73-4031.)

Applications

- Measurement of organ O_2 consumption, CO_2 production and/or pH changes

Features & Benefits

- Enables continuous measurement of pH, pO_2, and pCO_2 in perfusate
- Smooth side stream flow through electrodes with use of peristaltic pump
- Noise-free design (when used with the Shielding Case)
- Measure parameters in the reservoir (pre-organ) and in the effluent (post-organ) allowing measurement of O_2 exchange, CO_2 production and pH change

Included Items

Perfusion Solution Electrochemical Monitoring Systems

Part #	Description	Included Items
73-4287	Monitoring System, 230 V	• 73-4195 Microelectrode Shielding Case for Three Electrodes (pH, pO_2, pCO_2) • 73-0207 Mounting Plate for Three-Electrode Shielding Case • REGLO Peristaltic Pump • 73-0126 3-stop Collared Tygon® E-Lab Tubing, 1.22 mm ID, max flow 8.8 ml/min, pkg. of 12

73-4304	Monitoring System, 115V	• 73-4195 Microelectrode Shielding Case for Three Electrodes (pH, pO_2, pCO_2) • 73-0207 Mounting Plate for Three-Electrode Shielding Case • REGLO Peristaltic Pump • 73-0126 3-stop Collared Tygon® E-Lab Tubing, 1.22 mm ID, max flow 8.8 ml/min, pkg. of 12

Measurement Sensors and Amplifiers

Part #	Description	Included Items
73-4029	pO_2 Measurement Sensor and Amplifier	• 73-4189 Mini Flow-Through O_2 Electrode, 1/16" Fittings, for use with OPPM • 73-0210 PLUGSYS Oxygen Partial Pressure Module (OPPM)
73-4030	pH Measurement Sensor and Amplifier	• 73-4190 pH Flow Through Electrode, 1/16" Fittings • 73-2998 Leak Free pH Flow Through Reference Electrode Set • 73-0215 PLUGSYS pH Measurement Module (pHMM)
73-4031	pCO_2 Measurement Sensor and Amplifier	• 73-4191 CO_2 Flow Through Electrode, 1/16" Fittings Sensors for pH Measurement • 73-0212 PLUGSYS Electrometer Module (EMM)

Additional Items If Not Purchasing a System

- Dedicated peristaltic (roller) pump and appropriate pump tubing (73-0206)

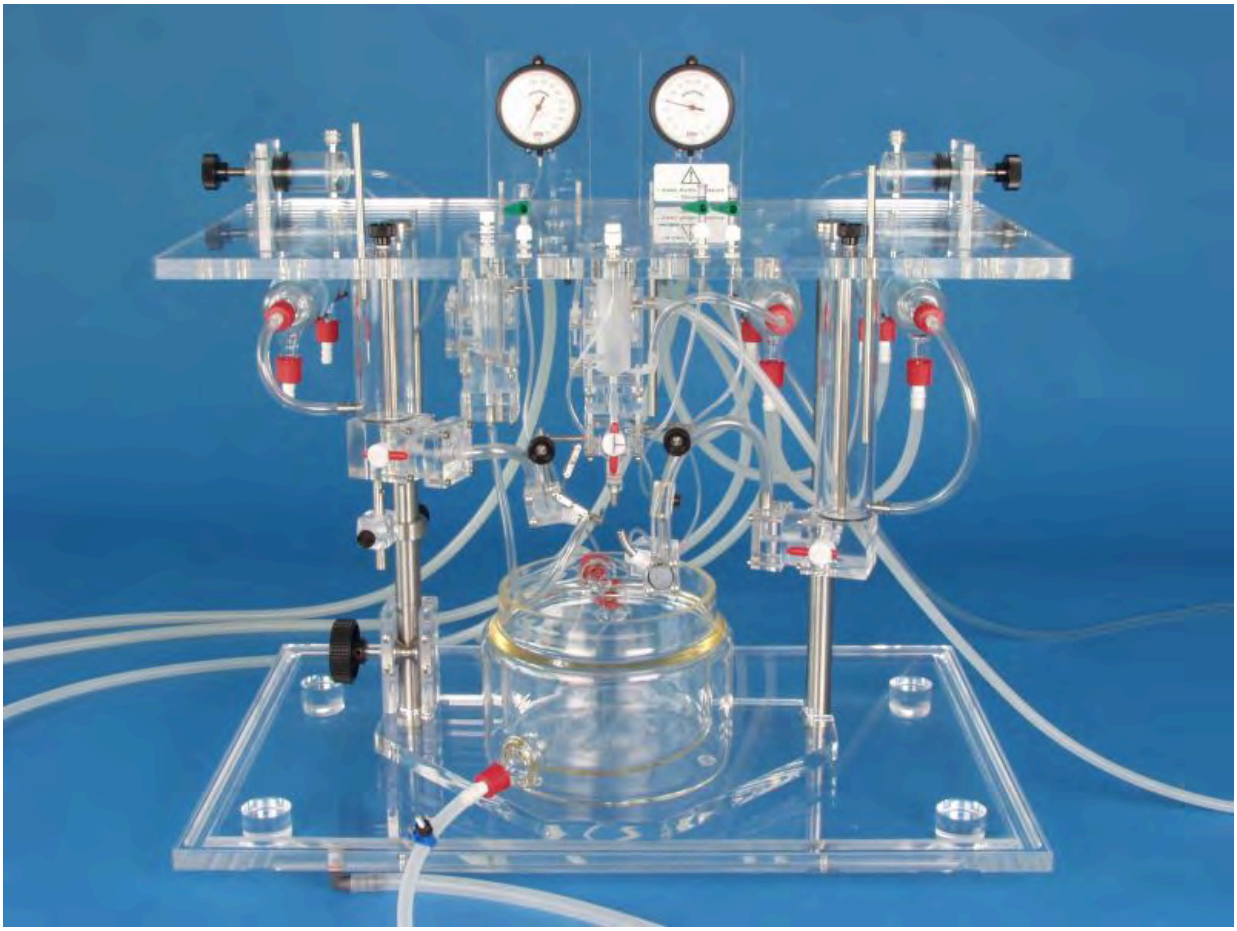
Note: Various microelectrodes and associated components are available. Not all options listed. Please contact us to discuss your application so that we can assist you with the best possible solution.

IH5-BI Biventricular Working Heart System for Rat, Guinea Pig and Rabbit

IH-BI Biventricular Working Heart System for rat, guinea pig and rabbit provides a valuable tool for the researcher who wants to study whole-heart cardiac function.

The Biventricular Isolated Working Heart perfusion system utilizes patented flow resistance and compliance chambers to faithfully mimic the in vivo cardiac preloads and afterloads for both normal and diseased states in medium to large models (rat, guinea pig, rabbit). The exclusive features of the system create the most physiological isolated heart environment closely resembling the actual resistance of the peripheral vasculature while allowing the entire heart to work as it does in vivo, setting a new standard for isolated heart research.

Item No.	Description
73-4450	Rat/Guinea Pig Biventricular Cannula Set
73-4451	Rabbit Biventricular Cannula Set



DETAILS

The IH-5 Langendorff system can be upgraded to the Biventricular Working Heart System (IH5-BI). For use with rat, guinea pig and rabbit hearts, it is a valuable tool for the researcher who wants tostudy whole heart cardiac function.

The complete system contains all the primary equipment you need to accomplish the basic biventricular working heart experiment, only requiring the addition of species-specific cannulae. Many options are available for the IH5-BI system to extend its capabilities.

Advanced System Design
Features & Benefits
Applications
Measured Signals & Calculated Parameters
Included items
Species-Specific Options
Specialized Applications & Upgrades

Advanced System Design

The IH5-BI System utilizes patented flow resistance and compliance chambers to faithfully mimic the in vivo cardiac preloads and afterloads for both normal and diseased states in medium to large rodent models. The exclusive features of the system create a physiological isolated heart environment that closely resembles the actual resistance of the peripheral vasculature while allowing the entire heart to work as it does in vivo.This IH5-BI allows for in-depth ex vivo studies of the effects of pulmonary artery hypertension (PAH), hypertrophy (RVH), COPD, ARCV, emphysema and a variety of other diseases characterized by pulmonary vascular dysfunctionand right heart pathophysiology. It allows measurement of a wide range of cardiovascular parameters with unsurpassed fidelity, such as single ECG Lead II and single epicardial monophasic action potential (MAP). Integration of high fidelity pressure-volume catheters for right and left ventricle pressure-volume loop measurement is also available.

Learn about the differences between Working (Ejecting) Heart and Biventricular Working Heart.

Features & Benefits

- Combines the advantages of an isolated organ preparation with in situ-like perfusion features
- Allows assessment of external heart work under adjustable load for both right and left heart
- Allows a more comprehensive monitoring of functional parameters, the calculation of the external heart work and mechanical efficiency, and the highest sensitivity for various experimental manipulation in ex vivo isolated heart preparations
- Allows rapid and easy switching between biventricular working heart, left working heart and Langendorff modes
- All of the same features and benefits of the IH-5—compact, no high water columns, low resistance laminar flow paths and low system volume

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Applications

- All applications for the standard
- Calcium homeostasis
- Drug effects on right heart electrophysiology and contractility
- Ischemia/reperfusion effects on right heart
- Effects of right ventricular hypertrophy on cardiac function

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Measured Signals and Calculated Parameters

The following signals can be recorded:

- Left atrial preload pressure (left ventricular filling pressure)
- Right atrial preload pressure (right ventricular filling pressure)
- Afterload pressure (aortic pressure for calculation of systolic and diastolic pressure)
- Right ventricular afterload (pulmonary artery pressure)
- Left ventricular pressure or pressure volume loops

- Right ventricular pressure or pressure volume loops
- Cardiac output (left atrial flow), aortic, right atrial flow
- Coronary flow (subtraction of aortic flow from CO or by subtraction of right atrial flow from pulmonary artery flow)

Included Items

IH5-BI Core System, Basic, 230 V (73-4420) includes:		**IH5-BI Core System, Basic, 115 V (73-4419) includes:**	
Item #	**Product Name**	**Item #**	**Product Name**
73-4238	Biventricular Working Heart Base Unit	73-4238	Biventricular Working Heart Base Unit
73-3611	Heart Chamber, JacketedGlass Vessel, ID = 145 mm,with Bottom Drain	73-3611	Heart Chamber, JacketedGlass Vessel, ID = 145 mm,with Bottom Drain
	TC120 Thermocirculator, with 5 L stainless steel bath and lid, 220 V		TC120 Thermocirculator, with 5 L stainless steel bath and lid, 120 V
73-0116	Peristaltic Pump MCP-SB2, 230 VAC	73-0115	Peristaltic Pump MCP-SB2, 115 VAC
	Ecoline Peristaltic Pump, VC-MS/CA8-6, 8 Channels, 230 VAC, 50 Hz		Ecoline Peristaltic Pump, VC-MS/CA8-6, 8 Channels,115 VAC, 60 Hz
	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White		3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White
	Jacketed Glass Reservoir for Buffer Solution, with Frit, 6 L		Jacketed Glass Reservoir for Buffer Solution, with Frit, 6 L
	PLUGSYS Case, Type 603		PLUGSYS Case, Type 603
	PLUGSYS Transducer Amplifier Module (TAM-D)		PLUGSYS Transducer Amplifier Module (TAM-D)
	Blood Pressure Transducer (APT300)		Blood Pressure Transducer (APT300)
	Blood Pressure Transducer (P75) for PLUGSYS Module		Blood Pressure Transducer (P75) for PLUGSYS Module
	PLUGSYS Transducer Amplifier Module (TAM-A), 2 included		PLUGSYS Transducer Amplifier Module (TAM-A), 2 included

The IH5-BI Base Unit (73-4238) includes:

Plexiglass stand, aorta link unit with Windkessel, adjustable artificial flow resistance for adjusting the aortic afterload pressure (with pressure gauge), preheating coil for Langendorff mode, holder for pressure transducers (aortic/perfusion pressure), tubing for in situ preparation with adapter. Also included are a left atrium cannulating system with preload reservoir and preheating coil, movable atrium connection adapter and holder for P75 (preload pressure),a column for right atrium cannulation, movable right atrium connection adapter, holder for P75 (right atrium pressure), and a right ventricle afterload system (simulates lung resistance). All cannulae must be ordered separately and depends on your animal model.

Peristaltic Pumps included are special packages suited for use with the IH-5:

73-0115 includes:

MC Pump Drive (73-3029), SB Pump Head (73-3040), 2 V Tube Bed Set (73-3045)

73-0116 includes:

MC Pump Drive (73-3026), SB Pump Head (73-3040), 2 V Tube Bed Set (73-3045)

Required Species-Specific Additions

For a functional unit the IH5-BI Core Systems require one of these species-specific cannula sets:

Rat/Guinea Pig Biventricular Cannula Set (73-4450) includes:

- Aortic Cannula Set for rat/guinea pig hearts, 2.5 mm OD and 3.0 mm OD
- Left Atrium Cannula, 2.3 mm OD
- Right Atrium Cannula, 2.3 mm OD
- Pulmonary Artery Cannula Set, 2.5 mm OD plus Mini-Ball Joint Mounting Kit

Rabbit Biventricular Cannula Set (73-4451) includes:

- Aortic Cannula for rabbit hearts, 3.0, 4.0 and 5.0 mm OD
- Left Atrium Cannula, 2.3 mm OD
- Right Atrium Cannula, 2.3 mm OD
- Pulmonary Artery Cannula Set, 2.5 mm OD plus Mini-Ball Joint Mounting Kit

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Specialized Applications & Upgrades

All options compatible with the are compatible with the IH5-BI Biventricular Working HeartSystem, excluding Multi-ECG and Multi-MAP.

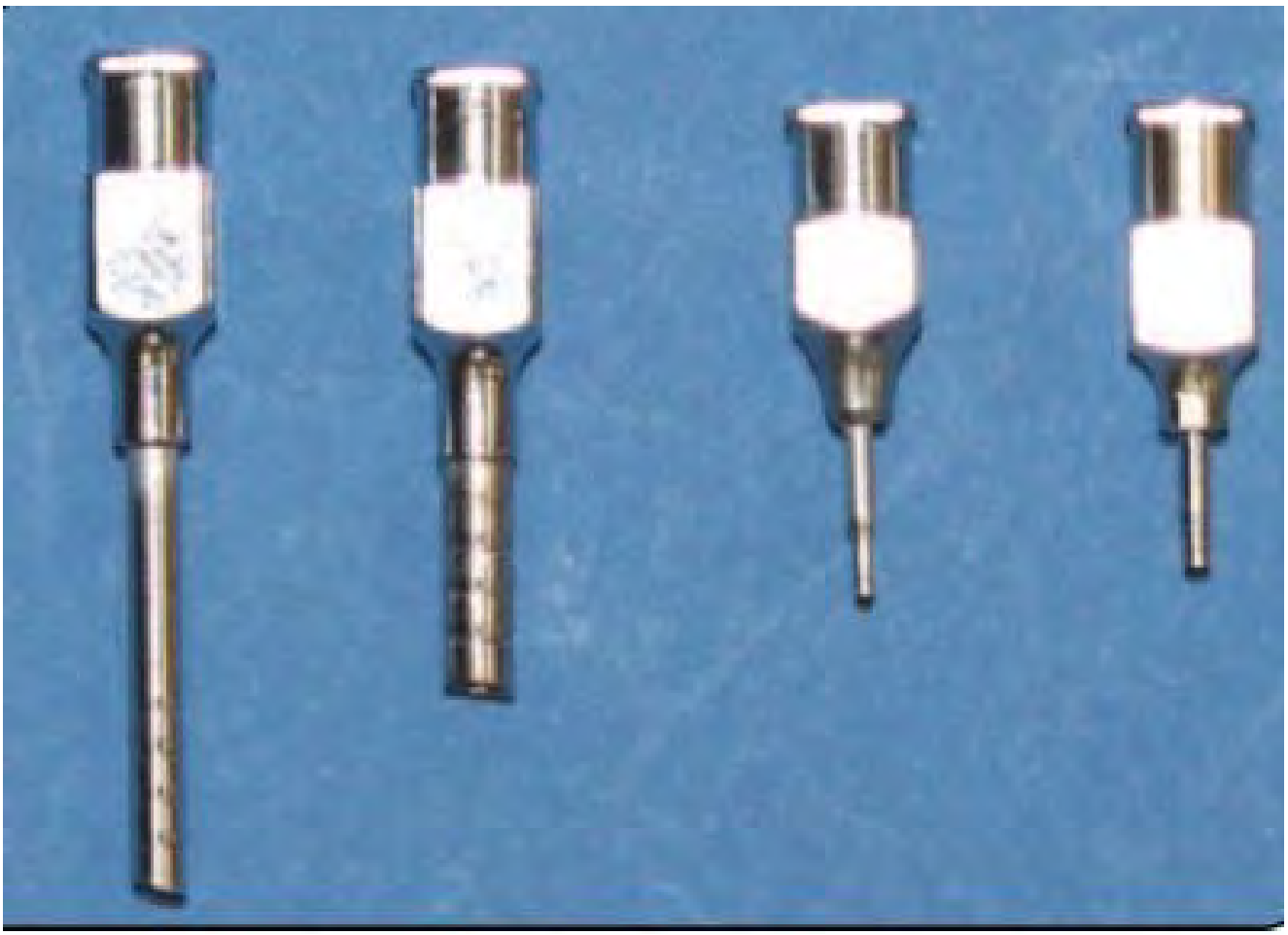
Aortic Cannulae with Luer Fitting for UP100-IH, PSCI or EasyCell System

For cannulating isolated heart aorta to mount specifically on the UP100-IH, PSCI and EasyCell Systems. Sizes for mouse, small rat, rat, and guinea pig.

Classical tapered female LUER connection.

We also offer special for mouse heart cannulation.

Item No.	Description
73-2798	Aortic Metal Cannula with Luer Taper for Mice to UP100-IH, PSCI or EasyCell, OD 1.0 mm
73-2800	Aortic Metal Cannula with Luer Taper for Mice to UP100-IH, PSCI or EasyCell, OD 1.3 mm
73-3337	Aortic Metal Cannula with Luer Taper for Small Rat to UP100-IH, PSCI or EasyCell, OD 1.8 mm
73-2868	Aortic Metal Cannula with Luer Taper for Small Rat to UP100-IH, PSCI or EasyCell, OD 2.0 mm
73-2869	Aortic Metal Cannula with Luer Taper for Small Rat to UP100-IH, PSCI or EasyCell, OD 2.3 mm
73-2870	Aortic Metal Cannula with Luer Taper for Rat to UP100-IH, PSCI or EasyCell, OD 2.5 mm
73-2871	Aortic Metal Cannula with Luer Taper for Rat/Guinea Pig to UP100-IH, PSCI or EasyCell, OD 3.0 mm
73-2872	Aortic Metal Cannula with Luer Taper for Rat/Guinea Pig to UP100-IH, PSCI or EasyCell, OD 4.0 mm



DETAILS

These specialty cannulae are designed for cannulating isolated heart aorta to mount specifically on the UP100-IH, PSCI and EasyCell Systems. Sizes for mouse, small rat, rat, and guinea pig.

Classical tapered female LUER connection.

Increased Preload Pressure Option for IH-SR and IH-5 Working Heart

Choose this option when you need to create left atrial preload pressures that are greater than 11 mmHg.

The Gottlieb Valve allows you to create preload pressures outside of the standard physiological range (up to 30 mmHg) in order to simulate a disease state.

Item No.	Description
73-0158	Gottlieb Valve for Increased Preload Pressure in Working Heart (IHSR-GOTT)

DETAILS

Choose this option when you need to create left atrial preload pressures that are greater than 11 mmHg.

The addition of the Gottlieb Valve allows you to create preload pressures outside of the standard physiological range in order to simulate a disease state.

Preload pressure can be increased up to 30 mmHg.

Pulmonary Artery Cannulating Options for IH-SR and IH-5 (for Effluent Collection)

Cannulating options for effluent collection from an IH-SR or IH-5 functional system for metabolic studies, sampling the effluent for analysis, or for continuous pO_2, pH, pCO_2 measurements.

Item No.	Description
73-4395	Cannulating Option for Rat or Guinea Pig Pulmonary Artery for IH-SR
73-4396	Cannulating Option for Mouse Right Ventricle for IH-SR
73-0206	Cannulating Option for Rat or Guinea Pig Pulmonary Artery for IH-5
73-0517	Cannulating Option for Rabbit Pulmonary Artery for IH-5

DETAILS

These cannulating systems are used to sample coronary effluent for further analysis on your own equipment, for metabolic studies, or for pO_2, pH, and pCO_2 measurements.

On rat, guinea pig and rabbit hearts the coronary effluent is sampled via cannulation through the pulmonary artery. On mouse hearts the pulmonary artery cannot be cannulated, therefore a small polyethylene catheter is placed directly into the right ventricle.

Item #	Description
73-4395	**Cannulating Option for Rat or Guinea Pig Pulmonary Artery for IH-SR or IH-5 Systems** includes bent cannula for pulmonary artery, mini ball joint holder, link for higher loading capacity, mini ball and Tygon® tubing. For rat and guinea pig heart only. Cannot be used with mouse heart due to the small size of the pulmonary artery.
73-4396	**Cannulating Option for Mouse Right Ventricle for IH-SR** includes two mini holders, mini ball with thread, ball to hold PE catheter and PE tubing. On mice hearts the pulmonary artery cannot be cannulated; therefore a small PE catheter is placed into the right ventricle.
73-0206	**Cannulating Option for Rat or Guinea Pig Pulmonary Artery for IH-5,** OD = 2.5 mm

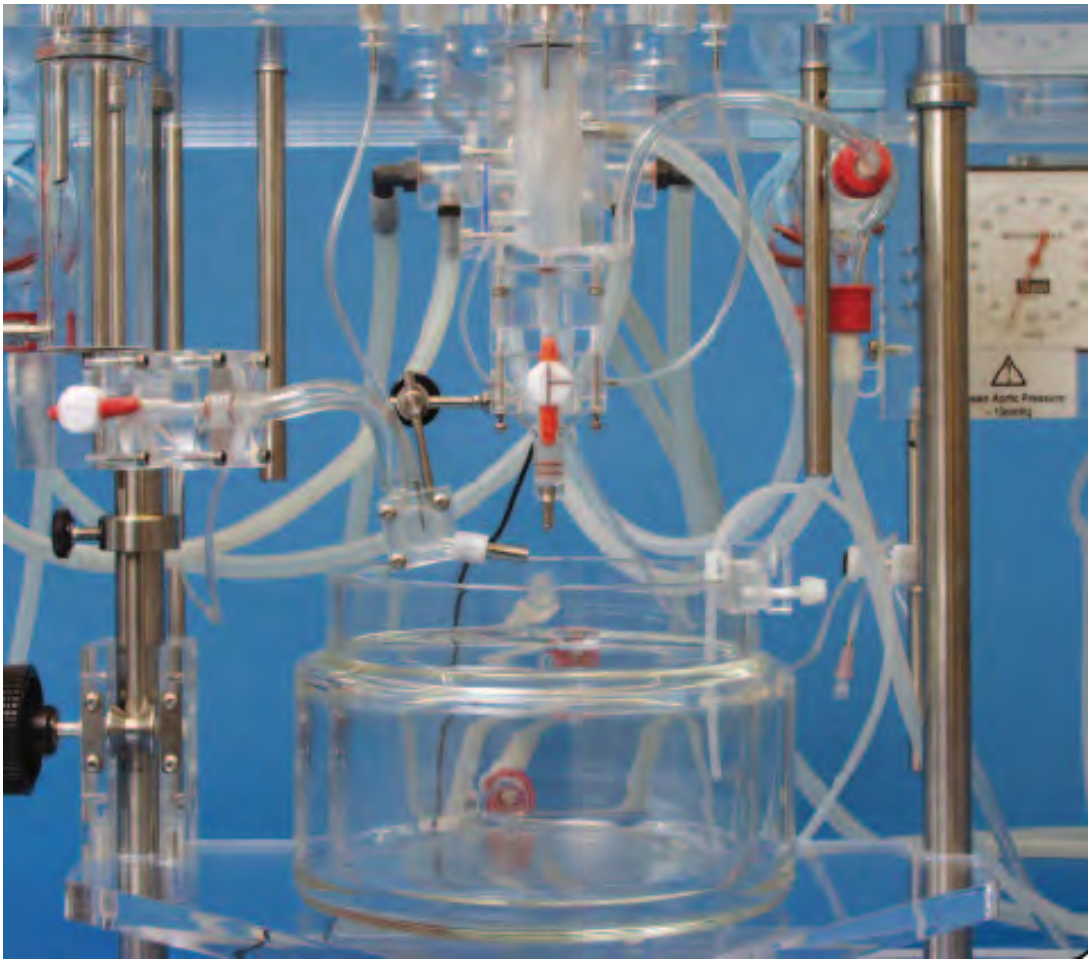
73-0517	**Cannulating System for Rabbit Pulmonary Artery on IH-5** includes 4.0 mm OD bent cannula with holder and perspex block clamp.

Working Heart Upgrade for IH-5 Core System

The IH-5 Langendorff System can be upgraded to a fully-ejecting working heart model for physiological cardiovascular studies, e.g., cardiac function and metabolism. The upgrade allows rapid and easy switching between working heart (ejecting heart) and Langendorff modes.

To upgrade an IH-5 Langendorff Core System to an IH-5 Working Heart System, add a Working Heart Upgrade and one of the species-specific atrial cannulae. To measure flow, a TTFM-2 flowmeter and species-suitable flow probe are also required.

Item No.	Description
73-4412	Working Heart Upgrade to IH-5 Core System, 230 V



DETAILS

The IH-5 Langendorff System can be upgraded to a fully-ejecting working heart model for physiological cardiovascular studies, e.g., cardiac function and metabolism. The upgrade allows rapid and easy switching between working heart (ejecting heart) and Langendorff modes.

To upgrade an IH-5 Langendorff Core System to an IH-5 Working Heart System, add a Working Heart Upgrade and one of the species-specific atrial cannulae. To measure flow, a TTFM-2 flowmeter and species-suitable flow probe are also required.

Researchers who know they will be upgrading to working ejecting heart in the future typically start with a configuration. However, a configuration can easily be modified to a Langendorff Working Heart-Ready configuration. Please contact our technical team for help!

Features & Benefits

- Fully-ejecting working heart model for physiological cardiovascular studies, e.g. cardiac function and metabolism
- Allows rapid and easy switching between working heart (ejecting heart) and Langendorff modes.

Applications

- Real-time measurement of atrial and aortic flow (add species-appropriate flow probes and PLUGSYS TTFM-2 Flowmeter module)
- Intracardial left ventricular pressure (LVP) measurement (add)
- Pressure-volume measurement (add)
- High atrial pressure-induced disease state simulation (add)

Measured Signals & Calculated Parameters

All parameters of standard Langendorff plus the following signals can be recorded:

- Preload (left atrial preload / ventricular filling pressure)
- Afterload (determining the diastolic and systolic aortic pressure)
- Left ventricular pressure or pressure-volume loops

- Cardiac output (atrial flow), aortic and coronatry flow (either Direct of by subtraction of CO-Aortic Flow)

Included Items

IH5-WH, Working Heart Upgrade, 230 V (73-4412) includes:		IH5-WH Working Heart Upgrade, 115 V (73-4411) includes:	
73-3064	Working Heart Option to IH-5 Core System*	73-3064	Working Heart Option to IH-5 Core System*
73-0020	Blood Pressure Transducer P75 for PLUGSYS Module	73-0020	Blood Pressure Transducer P75 for PLUGSYS Module
73-0065	PLUGSYS Transducer Amplifier Module (TAM-A)	73-0065	PLUGSYS Transducer Amplifier Module (TAM-A)
73-0116	Peristaltic Pump MCP-SB2, 230 V	73-0115	Peristaltic Pump MCP-SB2, 115 V

The Working Heart Option (73-3064) includes:

Left atrium cannulating system with preload reservoir and preheating coil, movable atrium connection adapter and holder for P75 (preload pressure)

Peristaltic Pumps included are special packages suited for use with the IH-5:

73-0115 includes:

MC Pump Drive (73-3029), SB Pump Head (73-3040), 2 V Tube Bed Set (73-3045)

73-0116 includes:

MC Pump Drive (73-3026), SB Pump Head (73-3040), 2 V Tube Bed Set (73-3045)

Atrial Cannulae (Required, Purchase Separately)

Complete the Working Heart upgrade by choosing the appropriate species-specific addition:

73-4413 Working Heart Left Atrial Cannula for Rat/Guinea Pig Hearts, 2.3 mm OD

73-4414 Working Heart Left Atrial Cannula for Rabbit Hearts, 6.0 mm OD

Specialized Applications & Upgrades

Flow measurement can be accomplished in an IH-SR unit using two methods:

- Indirect measurement by controlling the pump sped of a roller pump (SCP controller)
- Direct measurement with Ultrasound Transit Time Technic (TTFM-2 module)

Easily allows introduction of a tip pressure catheter directly into the left ventricle via the adapter port and the aorta, rather than via apical puncture.

Easily allows introduction of a pressure-volume loop catheter directly into the left ventricle via an adapter port and the aorta.

Choose this option when you need to create left atrial preload pressures higher than 11 mmHg. (Gottlieb Valve).

Pulmonary artery cannulae, preparation dish and effluent funnel for collectionof effluent from the coronaries for metabolic studies, further analysis, or for continuous pO2,pH, or pCO2 measurements.

For oxygenation of buffer solution supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives.

For filtration of recirculated perfusate.

Measure perfusate temperature in any isolated perfused organ system. Since the system is well thermostated, temperature measurement is only necessary when specific temperature studies with special temperature protocols are being performed, e.g. cooling or transplantation studies.

Permits precise continuous or intermittent measurement in liquid media or perfusate of three key parameters: pO_2, pH and pCO_2.

These options for drug addition can be added to any isolated organ system where flow is measured or calculated and a drug must be added in a certain ratio.

For addition of pacing to functional IH-SR or IH-5 Langendorff and Working HeartSystems. For small rodent hearts (mouse, rat and guinea pig).

For single-lead ECG and MAP on functional IH-5 systems, one ECG lead is combined with one MAP electrode.

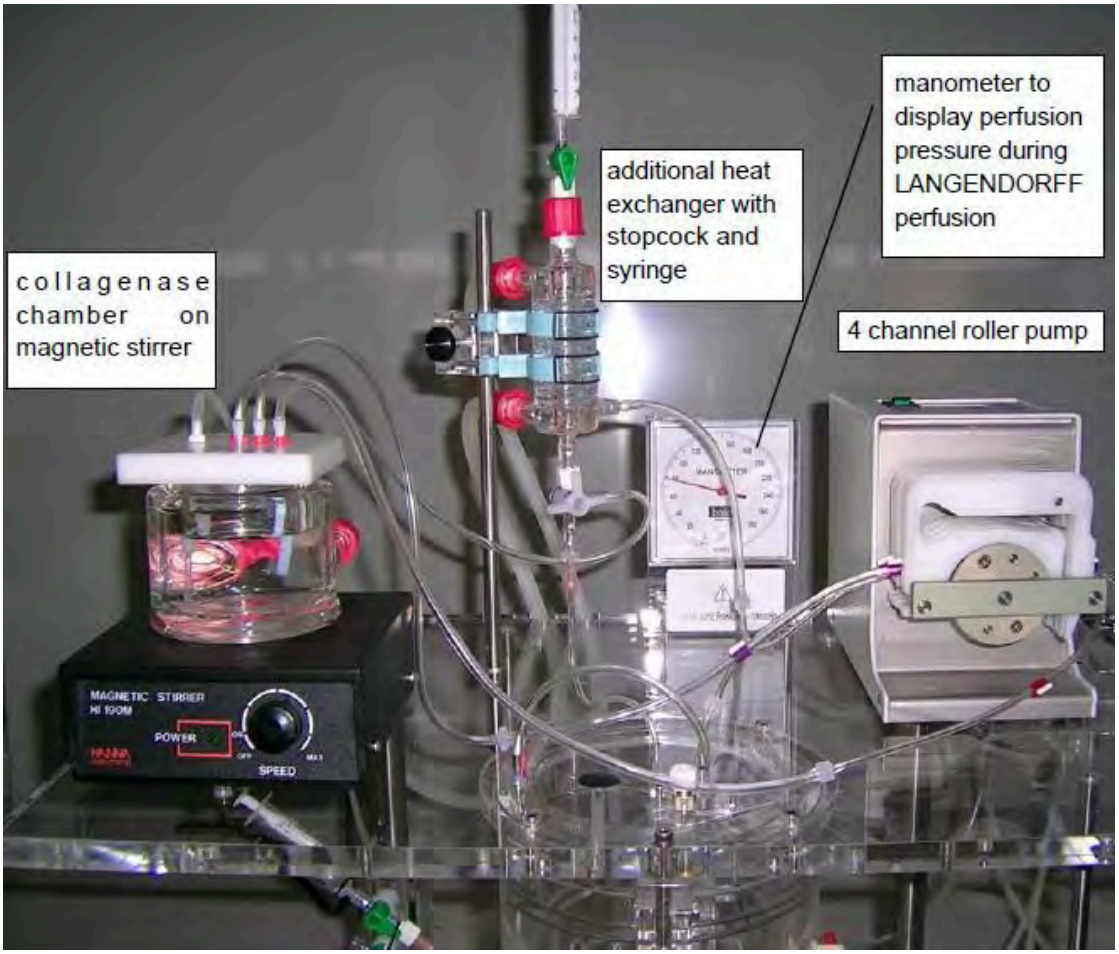
For multi-lead ECG and MAP measurements on functional IH-5 Langendorff or workingheart systems, up to 12 ECG leads are combined with up to 8 MAP electrodes formeasurement on rat, guinea pig or rabbit hearts.

Cell Isolation Upgrade for UP-100IH or IH-SR

Add this upgrade to a functional UP100-IH or IH-SR system for cell isolation/cell extraction applications.

Includes protease reservoir, heat exchanger, pump tubing, effluent funnel and all necessary tubing with Luer adapters. Choice of 230 or 115 VAC.

Item No.	Description
73-3981	Option for Cell Extraction for IH-SR, 230 V



DETAILS

Add this upgrade to a functional UP-100IH or IH-SR system for cell isolation/cell extraction applications.

Upgrade Options

Cell Extraction Option, 230 VAC (73-3981) includes:		**Cell Extraction Option, 115 VAC (73-4354) includes:**	
tem #	**Description**	**tem #**	**Description**
	Magnetic stirrer with ABS Cover, 230 VAC		Magnetic stirrer with ABS Cover, 115 VAC
73-5057	Heat Exchanger**	73-5057	Heat Exchanger**
72-2693	3-way Stopcock (200 PSI) FLL/FLL Male, Luer slip (Pack of 25)	72-2693	3-way Stopcock (200 PSI) FLL/FLL Male, Luer slip (Pack of 25)
72-8327	1-Way Stopcock (Pack of 25)	72-8327	1-Way Stopcock (Pack of 25)
	Jacketed Glass Reservoir for Buffer Solution, with Cover, 100 ml		Jacketed Glass Reservoir for Buffer Solution, with Cover, 100 ml
73-3329	Effluent Funnel for Isolated Heart System IH-SR	73-3329	Effluent Funnel for Isolated Heart System IH-SR
73-1866	Tygon® OD=2.86, ID=1.14 (R43010), 1 meter	73-1866	Tygon® OD=2.86, ID=1.14 (R43010), 1 meter
73-1836	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White	73-1836	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White
73-0155	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White	73-0155	3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White

* Magnetic stirrers with stainless steel cover also available.

** Heat Exchanger (73-5057)includes glass heat exchanger, holder, mounting rod, tubing and connectors.

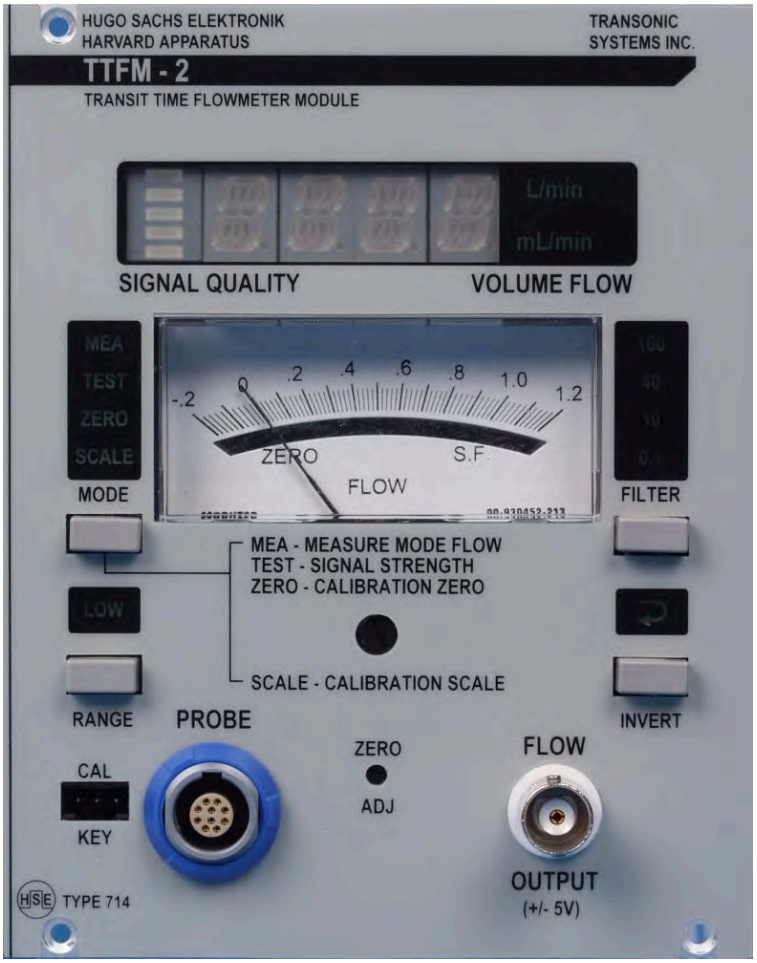
Flow Measurement Options for UP-100IH, IH-SR and IH-5 in Langendorff and Working Heart Modes

Flow measurement can be accomplished in a functional IH system using two methods:

- Indirect measurement by controlling the pump speed of a roller pump ()
- Direct measurement with ultrasound transit time technique ()

Required components are included in the or Core Systems and the selected or Core Systems Options. Species-specific flow probes and adapters are also required.

Item No.	Description
73-2806	PLUGSYS Servo Controller for Perfusion (SCP)
73-4617	Transit Time Flowmeter Module (TTFM-2)
73-3554	Adapter for 73-4668 1RB Flow Probe for IH-SR
73-2819	Adapter for 73-4644 2SB Flow Probe for IH-SR
73-2820	Adapter for 73-4647 2.5SB Flow Probe for IH-SR
73-3071	Adapter for 73-4647 F2.5SB Flow Probe for IH-5
73-3069	Adapter for 73-4652 4SB Flow Probe for IH-5



DETAILS

Flow measurement can be accomplished in a functional IH system using two methods:

- Indirect measurement by controlling the pump speed of a roller pump ()
- Direct measurement with Ultrasound Transit Time Technic ()

Applications

- Accurate coronary flow measurement on drug studies
- Studies on coronary resistance changes (pre and post ischemia)
- Myogene autoregulation (reactive hyperemia)

Constant Pressure/Flow Control

If you do "Langendorff only", the (SCP) is used in combination with a roller pump to perfuse the heart in constant pressure mode. The SCP module calculates the coronary flow from the pump speed of the roller pump (indirect flow measurement). The PLUGSYS TAM-D module amplifies the measured perfusion

pressure signal and outputs it to the data acquisition system. Both the roller pump and the TAM-D are included in the IH-SR and IH-5 Core Systems.

- Allows perfusion under constant pressure or constant flow (direct switchable)
- Provides accurate control of perfusion pressure or flow, even at very low flow rates
- Indirect coronary flow measurement from pump speed

Direct Flow Measurement with Ultrasound Transit Time Flowmeter

The module, in combination with a Starling Pressure Controller, provides real and accurate transit time flow measurement in ml/min for direct coronary flow measurement in retrograde Langendorff mode or aortic flow measurement in working ejecting heart. In addition, species-specific flow probes and adapters are required.

Features & Benefits

- Accurate ultrasonic transit time direct flow measurement
- Unique integration of flow probe into perfusion path
- Laminar flow lines improve accuracy of flow measurement
- Thermal properties of Perspex adapter reduce temperature loss
- Increased system flexibility by allowing the study of Myogene Autoregulation (Reactive Hyperemia)
- Indirect flow measurement can typically follow increasing flow rates but often lags behind decreasing flow rates

The table below specifies the flow probe and adapter to be used for each type of isolated heart system (IH-SR, IH-5 or UP-100IH) for the indicated application. *It is extremely important to order the correct probe and adapter pair. If ordering online, please select carefully from the item listing or contact technical support for assistance.*

Type of Measurement/Species	Required Probe and Adapter
Direct Flow Measurement/Mouse with IH-SR Application: Coronary flow measurement in retrograde Langendorff mode or aortic flow measurement in working heart.	**73-4668** MA1PRB Flow Probe for TTFM-2 **73-3554** Adapter for 73-4668 1RB Flow Probe for IH-SR (flow probe is embedded into this adapter)
Direct Flow Measurement/Rat with IH-SR Application: Coronary flow measurement in retrograde Langendorff mode or aortic flow measurement in working heart.	**73-4644** MA2PSB Flow Probe for TTFM-2 **73-2819** Adapter for 73-4644 2SB Flow Probe for IH-SR (flow probe is embedded into this adapter)
Direct Flow Measurement/Rat and Guinea Pig with IH-5 Application: Coronary flow measurement in retrograde Langendorff mode or aortic flow measurement in working heart.	**73-4647** MA2.5PSB Flow Probe for TTFM-2 or TS420 Module **73-3071** Adapter for 73-4647 F2.5SB Flow Probe for IH-5

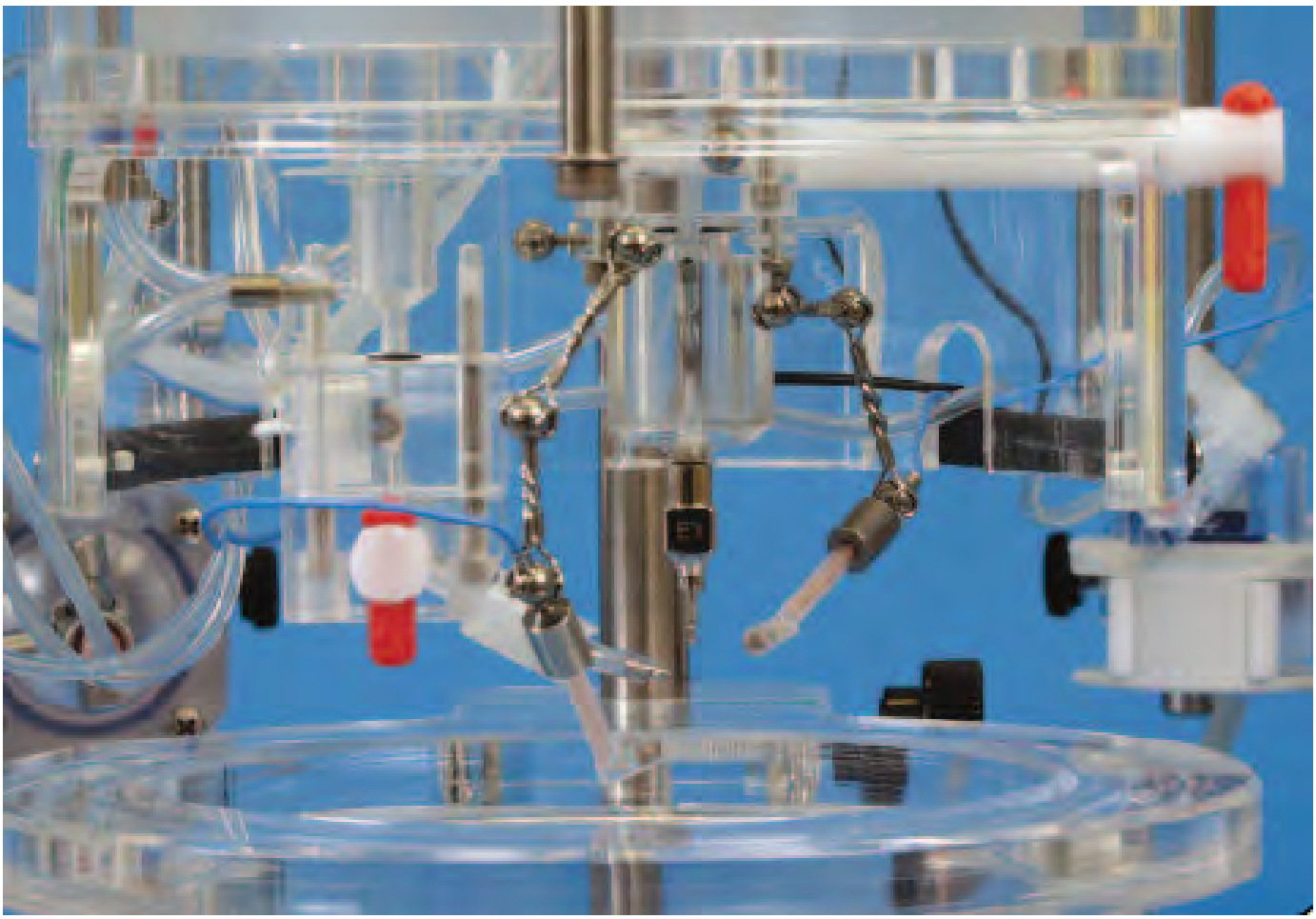
Direct Flow Measurement/Rabbit with IH-5 Application: Coronary flow measurement in retrograde Langendorff mode or aortic flow measurement in working heart.	**73-4652** MA4PSB Flow Probe for TTFM-2 or TS420 Module **73-3069** Adapter for 73-4652 4SB Flow Probe for IH-5
Cardiac Output Measurement, Working Heart/Mouse with IH-SR Application: Flow measurement into left atrium in Working Heart mode	**73-4668** MA1PRB Flow Probe for TTFM-2 **73-3554** Adapter for 73-4668 1RB Flow Probe for IH-SR (flow probe is embedded into this adapter)
Cardiac Output Measurement, Working Heart/Rat with IH-SR Application: Flow measurement into left atrium in Working Heart mode	**73-4647** MA2.5PSB Flow Probe for TTFM-2 **73-2820** Adapter for 73-4647 2.5SB Flow Probe for IH-SR (flow probe is embedded into this adapter)
Cardiac Output Measurement, Working Heart/Rat and Guinea Pig with IH-5 Application: Flow measurement into left atrium in Working Heart mode	**73-4647** MA2.5PSB Flow Probe for TTFM-2 or TS420 module **73-3071** Adapter 73-4647 2.5SB Flow Probe 2.5SB for IH-5
Cardiac Output Measurement, Working Heart, Rabbit with IH-5 Application: Flow measurement into left atrium in Working Heart mode	**73-4652** MA4PSB Flow Probe for TTFM-2 or TS420 Module **73-3069** Adapter for 73-4652 4SB Flow Probe for IH-5

Working Heart Upgrade for IH-SR Core System

The IH-SR Langendorff System can be upgraded to a fully-ejecting working heart system (according to Neely) for physiological cardiovascular studies, e.g., cardiac function and metabolism. The upgrade allows rapid and easy switching between working heart and Langendorff modes.

To upgrade our IH-SR Langendorff Core System to an IH-SR Working Heart System, add a Working Heart Upgrade and species-specific atrial cannulae. To measure flow, a TTFM-2 flowmeter and species-suitable flow probe are also required. Many other options are available for specialized applications.

Item No.	Description
73-4033	Working Heart Left Atrial Cannula for Mouse Heart, 1.3 mm OD
73-4034	Working Heart Left Atrial Cannula for Rat and Guinea Pig Heart, 2.3 mm OD



DETAILS

The IH-SR Langendorff System can be upgraded to a fully-ejecting working heart system (according to Neely) for physiological cardiovascular studies, e.g., cardiac function and metabolism. The upgrade allows rapid and easy switching between working heart and Langendorff modes.

To upgrade our IH-SR Langendorff Core System to an IH-SR Working Heart System, add a Working Heart Upgrade and species-specific atrial cannulae.To measure flow, a TTFM-2 flowmeter and species-suitable flow probe are also required. Many other options are available for specialized applications.

Features & Benefits

- Optimized atrial cannulating conditions—true aortic flow and pressure signals (no bouncing afterload)

- Short atrial fill time (low flow resistance)—optimal ventricle filling
- Low resistance and dead space volume
- Minimal temperature and oxygen loss
- Unique vascular afterload system using a membrane—optimal vascular system including compliance simulation
- Physiological atrial and arterial pressure waveform—avoids non-physiological pressure wave; no dynamic pressure effects or altered coronary flow
- Read constant preload system—preload pressure independent of the atrial flow; no stress on mitral valve
- Low aortic cannula flow resistance—possible to insert a Millar transducer for LVP or LVP/Volume measurement
- No liquid pressure column as afterload—less stress on valves
- All electrodes, catheters and probes are fully enclosed in the unique closed jacketed chamber—easy, direct access to the heart and to maintain physiological conditions while performing the experiments.

Applications

- Real-time flow (cardiac output) measurement (add species-appropriate flow probes and PLUGSYS TTFM-2 Flowmeter module)
- Left ventricular pressure (LVP) measurement (add)
- Pressure-volume measurement (add)
- High blood pressure-induced disease state simulation (add)

Measured Signals & Calculated Parameters

All parameters of standard Langendorff plus the following signals can be recorded:

- Preload (left atrial preload/ventricular filling pressure)
- Afterload (determining the diastolic and systolic aortic pressure)
- Intracardial left ventricular pressure or pressure-volume loops
- Atrial, aortic and coronary flow (calculated from atrial and aortic flow)

Included Items

	Working Heart Upgrade, 230 V (73-4347) includes:		**Working Heart Upgrade, 115 V (73-4349) includes:**
73-2818	Working Heart Option to IH-SR Core System	73-2818	Working Heart Option to IH-SR Core System

	Ecoline VC-MS/CA8-6, 230 VAC		Ecoline VC-MS/CA8-6, 115 VAC
	3-Stop Tygon® E-Lab Tubing, 2.54 mm ID, 12/pack, Purple/Orange		3-Stop Tygon® E-Lab Tubing, 2.54 mm ID, 12/pack, Purple/Orange
	3-Stop Tygon® E-Lab Tubing, 3.17 mm ID, 12/pack, Black/White		3-Stop Tygon® E-Lab Tubing, 3.17 mm ID, 12/pack, Black/White
	Blood Pressure Transducer P75 for PLUGSYS Module		Blood Pressure Transducer P75 for PLUGSYS Module
	PLUGSYS Transducer Amplifier Module (TAM-A)		PLUGSYS Transducer Amplifier Module (TAM-A)
	Jacketed Reservoir for Buffer Solution with Frit, 2 L		Jacketed Reservoir for Buffer Solution with Frit, 2 L
	Tube Set for Jacketed Buller Reservoir with Fluid Line Shutoff Valves		Tube Set for Jacketed Buller Reservoir with Fluid Line Shutoff Valves

The Working Heart Option (73-2818) includes:

Left atrium cannulating system consisting of preload reservoir (capacity 2 to 7 ml), movable atrium connection adapter, and holder for P75 pressure transducer for preload measurement. Atrial cannulae must be ordered separately.

Atrial Cannulae (Required, Purchase Separately)

Complete the Working Heart upgrade by choosing the appropriate species-specific addition:

- 73-4033 Working Heart Left Atrial Cannula for Mouse Heart, 1.3 mm OD
- 73-4034 Working Heart Left Atrial Cannula for Rat and Guinea Pig Heart, 2.3 mm OD

Specialized Applications & Upgrades

Flow measurement can be accomplished in an IH-SR unit using two methods:

- Indirect measurement by controlling the pump sped of a roller pump (SCP controller)
- Direct measurement with Ultrasound Transit Time Technic (TTFM-2 module)

Easily allows introduction of a tip pressure catheter directly into the left ventricle via the adapter port and the aorta, rather than via apical puncture.

Easily allows introduction of a pressure-volume loop catheter directly into the left ventricle via an adapter port and the aorta.

Choose this option when you need to create left atrial preload pressures higher than 11 mmHg. (Gottlieb Valve).

Pulmonary artery cannulae, preparation dish and effluent funnel for collectionof effluent from the coronaries for metabolic studies, further analysis, or for continuous pO2,pH, or pCO2 measurements.

For oxygenation of buffer solution supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives.

For filtration of recirculated perfusate.

Measure perfusate temperature in any isolated perfused organ system. Since the system is well thermostated, temperature measurement is only necessary when specific temperature studies with special temperature protocols are being performed, e.g. cooling or transplantation studies.

Permits precise continuous or intermittent measurement in liquid media or perfusate of three key parameters: pO_2, pH and pCO_2.

These options for drug addition can be added to any isolated organ system where flow is measured or calculated and a drug must be added in a certain ratio.

Add this upgrade to a working IH-SR system for cell isolation/cell extraction applications.

For addition of pacing to functional IH-SR or IH-5 Langendorff and Working HeartSystems. For small rodent hearts (mouse, rat and guinea pig).

For single-lead ECG and MAP on functional IH-5 systems, one ECG lead is combined with one MAP electrode.

IH-SR Core System Options

Additions to the IH-SR Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready configurations.

Options must be selected for a functional unit.

Item No.	Description
73-4019	Additions to IH-SR Basic System for Mouse Hearts
73-4020	Additions to IH-SR Basic System for Rat Hearts
73-4346	Perfusion Pressure Control with Starling Resistor for IH-SR
73-2806	PLUGSYS Servo Controller for Perfusion (SCP)

DETAILS

Additions to the IH-SR Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready functional units

An IH-SR Langendorff functional unit requires the addition of core options to the selected core system (either 73-4343 or 73-4344). Specifically, the core system requires the addition of:

- Perfusion pressure controllers (SCP or Starling Resistor)
- Species-specific addition (includes cannulae and balloons)

The core option and species-specific addition selected depend on:

- If you want a Langendorff Only configuration or a Working Heart-Ready Langendorff configuration.
  - The Langendorff Only configuration can easily be modified to a Langendorff Working Heart-Ready configuration in the future.
  - Researchers who know they will be upgrading to working ejecting heart in the future often start with the Langendorff Working Heart-Ready configuration.
- The species to be studied, i.e., mouse, rat or guinea pig

Core System Options

Langendorff Only Configuration (Add these core options to)	**Langendorff Working Heart-Ready Configuration*** (Add these core options to)
Species Specific Addition (choose one or both) • Mouse Hearts (73-4019) • Rat/Guinea Pig Hearts (73-4020)	Species Specific Addition (choose one or both) • Mouse Hearts (73-4019) • Rat/Guinea Pig Hearts (73-4020)
SCP PLUGSYS Servo Controller Module () for constant pressure perfusion and flow control	Starling Resistor for IH-SR (73-4346) for perfusion pressure control in Langendorff mode or afterload control in working heart mode

**Coronary flow measurement in this case is only possible by using an TTFM-2 flowmeter with flow probe.*

Perfusion Pressure Controllers

PLUGSYS Servo Controller for Perfusion (SCP) Module ()

The SCP constant pressure/flow controller maintains perfusion either at constant pressure or at constant flow using a peristaltic pump. It provides accurate control of perfusion flow rate or pressure, even at very low flow rates. The SCP controller modulates the flow generated by the perfusion pump based on a perfusion pressure feedback loop. The controller also provides an accurate, low-cost way to indirectly measure coronary flow. The SCP calculates flow rate from pump speed, eliminating the need for an expensive flowmeter. It is required for Langendorff Only configurations.

- Allows operation in constant pressure or constant flow with simple switch
- Provides accurate control of perfusion pressure or flow, even at very low flow rates
- Flexible perfusion circuit setup adjustes to suit individual perfusion conditions

Additional measured signals/calculated parameters:

- Indirect coronary flow measurement
- Calculation of coronary resistance

Additional items required:

- PC-based data acquisition system

Starling Resistor for Perfusion Pressure Controller (73-4346)

The perfusion pressure controller with Starling resistor provides constant pressure perfusion of the heart in Langendorff mode and acts as an afterload system in the working heart mode. It uses a Teflon membrane flow resistor, manometer and pressure syringe to create a pressure-controlled valve in the aortic block. It is required for a Langendorff Working Heart-Ready configuration. If coronary flow measurement is required, the use of the PLUGSYS ultrasonic transit time flow measurement module (TTFM-2) and flow probe will be required, as the SCP controller cannot make that measurement.

- Uses Teflon membrane flow resistor, manometer and pressure syringe to create a pressure-controlled valve in the aortic block.

- Mechanical device that does not provide flow information and does not alter the pump flow rate.
  - Flow rate is set high on the pump and only the flow that generates the set perfusion pressure is delivered to the heart while the remainder exits via the valve and returns to the reservoir.
- Must choose direct coronary flow measurement to capture coronary flow data.

Additional measured signal/calculated parameters:

- Coronary flow data (add Flow Measurement Optioin)

Includes:

- Aortic block base unit with flange-mounted adjustable flow resistance
- Pressure syringe with mounting bracket
- Manometer

Species Specific Options

Additions to IH-SR Core System for Mouse Hearts (73-4019) includes:		**Additions to IH-SR Core System for Rat/Guinea Pig Hearts (73-4020) includes:**	
Item #	**Product Name**	**Item #**	**Product Name**
	Aortic Cannula for Mouse Heart to IH-SR, OD 1.0 mm		Aortic Cannula for Rat Heart to IH-SR, OD 2.3 mm
			Aortic Cannula for Rat/Guinea Pig Heart to IH-SR, OD 3.0 mm
	3-Stop Tygon® E-Lab Tubing, 1.22 mm ID, 12/pack, Red/Grey		3-Stop Tygon® E-Lab Tubing, 2.79 mm ID, 12/pack, Purple/White
	Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves		Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves
	Reservoir Jacketed for Buller Solution, with Frit, 1 L		Reservoir Jacketed for Buffer Solution, with Frit, 2 L
73-0143	Mini Balloon Kit for Mouse Heart for IH-SR	73-2813	Balloon Kit for Rat Heart for IH-SR
	Mouse/Neonatal Rat Ventricular Balloon Assembly Kit for Isovolumetric Contractile Force Measurements		

IH-SR Core System for Isolated Small Rodent Heart

The IH-SR Langendorff Core System is the starting point for all isolated perfused heart experiments on small rodents such as mouse, rat and guinea pig in the Langendorff retrograde perfusion mode.

The core Langendorff system can be easily upgraded to a any time later.

Because of its larger heart chamber, this system is well-suited for applications that require ECG and MAP recordings in addition to LVP and pacing. The fully closing heart chamber allows for precise temperature control, making it the optimal choice for mouse heart perfusion.

Please Note: A fully functional IH-SR system requires the addition of and other components. Other options and upgrades enable specific measurements or applications.

Item No.	Description
73-5257	IH-SR Spare Parts Kit; Kit of Tubing, O-Rings and Related Accessories For System Preventative Maintenance

DETAILS

The IH-SR Langendorff Core System is the starting point for all isolated perfused heart experiments on small rodents such as mouse, rat and guinea pig in the Langendorff retrograde perfusion mode.

The Core System contains all the primary equipment you need to accomplish the basic Langendorff experiment. A fully functional IH-SR Langendorff System additionally requires the selection of and other components including:

- Method of constant pressure perfusion
- Species-specific additions (cannulae, buffer reservoirs and balloons)
- Desired data acquisition system

The IH-SR Langendorff Core System can be upgraded to a fully ejecting (according to Neely), accommodating aortic flows up to 60 ml/min. Other options enable additional measurement and application-specific capabilities.

Advanced System Design
Features & Benefits
Applications
Measured Signals & Calculated Parameters
Included items

Additional Requirements for a Functional Langendorff Unit
Additional Components
Specialized Applications & Upgrades

Advanced System Design

Advanced design provides ease-of-use and exceptional stability of measurements while maintaining the flexibility to upgrade to more advanced capabilities.

IH series systems do not use high water-columns to achieve a constant pressure and rely on instead other safer methods (Starling resistor or feedback-based perfusion controller) that keep every portion of your system within easy reach.

The aortic block is fully enclosed in the water-jacketed upper and lower IH-SR heart chamber and precision milled from thermally stable Perspex. This design allows for precise temperature control and stability, making it the optimal choice for mouse heart perfusion. Because of its larger heart chamber, this system is well-suited for applications that require ECG and MAP recordings in addition to LVP and pacing.

Features & Benefits

- Langendorff and optional working heart perfusion in a single system
- Compact design with no high water columns—optimized individually for mouse, rat or guinea pig
- Constant pressure or constant flow perfusion in one unit—easily switch between the two modes without changes in tubing setup
- Suitable for hearts from hypertensive rats (perfusion pressures up to 300 mmHg are possible)
- Unique integrated small volume aortic block with built-in bubble trap (immediately above the aortic cannula) and Windkessel
- Large fully-heated, closed heart chamber—important to maintain heart temperature
  - Natural physiological environment for the isolated heart
  - Hearts are kept alive for hours in a very stable physiologic environment
- All electrodes, catheters and probes are fully enclosed in the unique closed jacketed chamber—easy, direct access to the heart and to maintain physiological conditions while performing the experiments
- Low dead space volume—fluid injection pathway directly on top of the aortic cannula into aortic stream
- Different cannula sizes available—all metal, no fragile glass cannulae
- Cannula resistance is optimized according to Hagen-Poiseuilles physical law
- Proprietary mini-holders—allow easy and stress-free positioning of electrodes, catheters and probes

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Applications

- Study of myogene autoregulation with the addition of
- Testing with inotropic substances
- Testing of lusitrope substances

- Testing of vasoactive substances
- Cardiac rhythm tests
- Ischemia/hypoxia studies
- Refractory period studies
- Ischemia/reperfusion injury studies
- Cardioplegia studies
- Cardiac preconditioning
- Cardiovascular screening performance
- Electrophysiology studies
- Phenotyping of transgenic animals
- Drug compound screening
- Toxicology studies
- Biochemical tests

Measured Signals and Calculated Parameters

The following signals are recorded as raw data in retrograde Langendorff perfusion:

- Isovolumetric left ventricular pressure (LVP) with balloon method
- Aortic (perfusion) pressure
- Coronary flow*

The following parameters are calculated from the raw data (using the):

- dLVP/dt, dLVP/dt Max, dLVP/dt Min, contractility index
- Systolic and diastolic LVP
- Heart rate
- Mean perfusion pressure
- Mean perfusion flow*
- Coronary resistance*

* This parameter is based on indirect flow measurement with the SCP controller or direct ultrasound flow measurement with the .

Included Items

Included items are representative of a typical IH-SR Core System. Individual components can be customized to your needs.

IH-SR Core System, Basic, 230 V (73-4343) includes:	**IH-SR Core System, Basic, 115 V (73-4344) includes:**

73-4991	IH-SR Base Unit for Small Rodent Hearts (Up to 800 g)	73-4991	IH-SR Base Unit for Small Rodent Hearts (Up to 800 g)
	Thermostatic Circulator TC120-ST5, Bath Volume 5 L, 230 V/50 Hz		Thermostatic Circulator TC120-ST5, Bath Volume 5 L, 115 V/60 Hz
-	REGLO Peristaltic Pump	-	REGLO Peristaltic Pump
	PLUGSYS Case, Type 603		PLUGSYS Case, Type 603
	PLUGSYS Transducer Amplifier Module (TAM-D)		PLUGSYS Transducer Amplifier Module (TAM-D)
	PLUGSYS Transducer Amplifier Module (TAM-A) (Does not include balloon)		PLUGSYS Transducer Amplifier Module (TAM-A) (Does not include balloon)
	APT300 Pressure Transducers (2 included)		APT300 Pressure Transducers (2 included)
	Holder for APT300 Transducer, 8 mm Rod, Length 75 mm		Holder for APT300 Transducer, 8 mm Rod, Length 75 mm
	Perspex Block Clamp to mount transducer onto rod (up to 9 mm OD)		Perspex Block Clamp to mount transducer onto rod (up to 9 mm OD)

The IH-SR Base Unit (73-4991) includes:

Plexiglas stand, aortic block with aorta link unit with Windkessel, heat exchanger, jacketed heart chamber, needle valve for adjusting gas flow, holder for transducer for perfusion pressure, tubings. Aortic cannula and buffer reservoir must be ordered separately.

For a functional unit, must be added.

Additional Requirements for a Functional Langendorff Unit

An IH-SR Langendorff basic functional unit requires the addition of to the selected Core System (either 73-4343 or 73-4344); specifically, the addition of a perfusion pressure controllers (SCP module or Starling resistor) and a species-specific addition.

Additional Components

Please contact our technical team for help.

Provides real-time evaluation of a wide range of signals and classical cardiovascular parameters.

Note: Ponemah Data Acquisition & Analysis Software from DSI,a Harvard Bioscience Company is also suitable.

Used to warm and maintain temperature of the perfusate.

Used in conjunction with a peristaltic pump to deliver warmed perfusate to the target organ and to aerate the perfusate with O_2 and CO_2.

Specialized Applications & Upgrades

Options for required additions to the IH-SR Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready configurations.

The IH-SR Langendorff Core System is prepared for according to Neely later on. To upgrade an IH-SR Lagendorff Core System to a IH-SR Working Heart System, add the Working Heart Upgrade and one of the species-specific additions. Researchers who know they will be upgrading to working ejecting heart in the future may start with a . If you intend to measure coronary flow, you need a . (SCP cannot be used for Working Heart.)

A can easily be modified to a Langendorff Working Heart-Ready configuration. Please contact our technical team for help!

Coronary flow measurement can be accomplished in an IH-SR unit using two methods:

- Indirect measurement by controlling the pump speed of a peristaltic pump (SCP controller)
- Direct measurement with Ultrasound Transit Time Technic (TTFM-2 module)

Pulmonary artery cannulae, preparation dish and effluent funnel for collection of effluent from the coronaries for metabolic studies, further analysis, or forcontinuous pO_2, pH, or pCO_2 measurements.

For oxygenation of buffer solution supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives.

For filtration of recirculated perfusate.

Measure perfusate temperature in any isolated perfused organ system. Since the system is well thermostated, temperature measurement is only necessary when specific temperature studies with special temperature protocols are being performed, e.g. cooling or transplantation studies.

Permits precise continuous or intermittent measurement in liquid media or perfusate of three key parameters: pO_2, pH and pCO_2.

These options for drug addition can be added to any isolated organ system where flow is measured or calculated and a drug must be added in a certain ratio.

Add this upgrade to a working IH-SR system for cell isolation/cell extraction applications.

For addition of pacing to functional IH-SR or IH-5 Langendorff and Working Heart Systems. For small rodent hearts (mouse, rat and guinea pig).

For single-lead ECG and MAP on functional IH-5 systems, one ECG lead is combined with one MAP electrode.

IH-5 Core System for Isolated Rat, Guinea Pig and Rabbit Heart

The IH-5 Langendorff Core System is the starting point for all isolated perfused heart experiments for rodent models (rat, guinea pig) in the Langendorff retrograde perfusion mode.

The core Langendorff system can be easily upgraded to a any time later.

Please Note: A fully functional IH-5 system requires the addition of and other components. Other options and upgrades enable specific measurements or applications. Upgrades can also be modified to meet your specific needs.

Item No.	Description
73-4398	IH-5 Core System for Isolated Rat, Guinea Pig or Rabbit Heart, 230 VAC
73-5258	IH-5 Spare Parts Kit; Kit of Tubing, O-Rings and Related Accessories For System Preventative Maintenance

DETAILS

The IH-5 Langendorff Core System is the starting point for all isolated perfused heart experiments for medium-sized rodents (rat, guinea pig and rabbit) in the Langendorff retrograde perfusion mode.

The Core System contains all the primary equipment to accomplish the basic Langendorff experiment. A fully functional IH-5 Langendorff System requires the addition of and other components including:

- Method of constant pressure perfusion
- Species-specific additions (cannulae, buffer reservoirs and balloons)
- Heart chamber
- Desired data acquisition system

The modular nature of the IH-5 allows the system to evolve along with your research. Our Langendorff System can easily be upgraded to a full according to Neely, accommodating aortic flows up to 500 ml/min or to a where both sides of the heart eject fluid as in vivo. Other options add additional measurement and application capabilities, such as multi-channel ECG and MAP cardiac electrophysiology applications.

Advanced System Design

The IH-5 utilizes the architecture of the ground-breaking IH-SR to set the standard for isolated heart perfusion in rabbits, adult guinea pigs, or adult rats. Engineered for the increased flow produced by these species (up to 500 mL/min), the IH-5 offers ultimate perfusion stability and real physiological conditions for longer, more relevant recordings with fewer artifacts. This compact platform has been optimized to create in situ-like perfusion features, delivering a considerably higher sensitivity for various experimental manipulation while maintaining the advantages of an ex vivo preparation. Like the IH-SR, the IH-5 System does not utilize high water columns but creates a constant pressure perfusion setup using a pressure feedback pump controller, resulting in a compact system fully within your reach.

If the aortic block with the Starling resistor (working heart ready) is used for Langendorff applications, the aortic perfusion pressure is defined by the setting of the membrane pressure in the Starling resistor. By setting a defined threshold pressure at the Starling resistor, the system works under constant pressure. By increasing the threshold pressure to a super-maximal pressure (300 mmHg),the system works under constant flow. The complete aortic block is mounted on acompact acrylic stand.

The IH-5 utilizes convenient switches that allow you to easily change from constant flow to constant pressure perfusion, Langendorff to working heart,and between two different perfusion solutions.

Features & Benefits

- Compact design, no high water columns—optimized individually for rabbit, rat or guinea pig
- Easily upgraded to a working (ejecting) heart system or biventricular working heart system—special flow resistance and compliance chamber closely mimics the in vivo afterload
- Constant pressure or constant flow perfusion in one unit—easily switch between the two modes
- Suitable for hearts from hypertensive animals—perfusion pressures up to 300 mmHg are possible
- Fast and easy changes of perfusion pressure (within seconds)
- Continuous measurement of heart mechanics (contractility), bioelectrical signals (ECG, MAP) and perfusate characteristics (pCO_2, pO_2, pH)
- Unique integrated small volume aortic block with built-in bubble trap and Windkessel chamber
- Natural physiological environment for isolated heart with large heated chamber
- Continuous measurement of heart mechanics (contractility), bioelectrical signals (ECG, MAP) and perfusate characteristics (pCO_2, pO_2,pH)
- Unique cannula design, available in different sizes, all metal, no fragile glass cannulae

- Cannula resistance is optimized according to Hagen-Poiseuilles Physical Law
- Proprietary mini holders allow easy and stress-free access to hold electrodes and catheters in position
- Drug injection pathway built directly into aortic perfusate stream

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Applications

- Study of myogene autoregulation with the addition of the
- Testing with inotropic substances
- Testing of lusitrope substances
- Testing of vasoactive substances
- Cardiac rhythm tests
- Ischemia/hypoxia studies
- Refractory period studies
- Ischemia/reperfusion injury studies
- Cardioplegia studies
- Cardiac preconditioning
- Cardiovascular screening performance
- Electrophysiology studies
- Phenotyping of transgenic animals
- Drug compound screening
- Toxicology studies
- Biochemical tests

Measured Signals and Calculated Parameters

The following signals are recorded as raw data in retrograde Langendorff perfusion:

- Isovolumetric left ventricular pressure (LVP) with balloon
- Aortic (perfusion) pressure
- Coronary flow*

The following parameters are calculated from the raw data (using the):

- dLVP/dt, dLVP/dt Max, dLVP/dt Min, contractility index
- Systolic and diastolic LVP
- Heart rate
- Mean perfusion pressure

- Mean perfusion flow*
- Coronary resistance*

* This parameter is based on indirect flow measurement with the SCP controller or direct ultrasonic flow measurement with the TTFM-2 flowmeter and suitable flow probe.

Included Items

IH-5 Core System, Basic, 230 V (73-4398) includes:		**IH-5 Core System, Basic, 115 V (73-4397) includes:**	
73-4996	IH-5 Base Unit*	73-4996	IH-5 Base Unit*
	Thermostatic Circulator TC120-ST5, Bath Volume 5 L, 230 V/50 Hz		Thermostatic Circulator TC120-ST5, Bath Volume 5 L, 115 V/60 Hz
	Harvard Peristaltic Pump P230		Harvard Peristaltic Pump P230
	PLUGSYS Case, Type 603		PLUGSYS Case, Type 603
	PLUGSYS Transducer Amplifier Module (TAM-D)		PLUGSYS Transducer Amplifier Module (TAM-D)
	PLUGSYS Transducer Amplifier Module (TAM-A) (Does not include balloon)		PLUGSYS Transducer Amplifier Module (TAM-A) (Does not include balloon)
	APT300 Pressure Transducers (2 included)		APT300 Pressure Transducers (2 included)
73-3871	Holder for APT300 Transducer for IH-5	73-3871	Holder for APT300 Transducer for IH-5

The IH-5 Base Unit (73-4996) includes:

Plexiglas stand, aortic block with aorta link unit with Windkessel, heat exchanger, jacketed heart chamber, needle valve for adjusting gas flow, holder for transducer for perfusion pressure, tubings. Aortic cannula and buffer reservoir must be ordered separately.

For a functional unit, must be added.

Additional Requirements for a Functional Langendorff Unit

An IH-SR Langendorff basic functional unit requires the addition of to the selected core system (either 73-4397 or 73-4398). Specifically, the core system requires the addition of a selection a perfusion pressure controllers (SCP or Starling),a species-specific options, and an application-appropriate heart chamber.

Additional Components

Please contact our technical team for help.

Specialized Applications & Upgrades

Options for required additions to the IH-5 Core System for species-specific Langendorff Only or Langendorff Working Heart-Ready configurations.

The IH-5 Langendorff Core System is prepared for upgrade to a working ejecting heart according to Neely later on. To upgrade an IH-5 Lagendorff Core System to a IH-5 Working Heart System, add the . Researchers who know they will be upgrading to working ejecting heart in the future may start with a . If you intend to measure coronary flow, you need a . (SCP cannot be used for Working Heart.)

A can easily be modified to a Langendorff Working Heart-Ready configuration. Please contact our technical team for help!

Coronary flow measurement can be accomplished in an IH-SR unit using two methods:

- Indirect measurement by controlling the pump speed of a peristaltic pump (SCP controller)
- Direct measurement with Ultrasound Transit Time Technique (TTFM-2 module)

Pulmonary artery cannulae, preparation dish and effluent funnel for collection of effluent from the coronaries for metabolic studies, further analysis, or for continuous pO2, pH, or pCO2 measurements.

For oxygenation of buffer solution supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives**.**

For filtration of recirculated perfusate.

Measure perfusate temperature in any isolated perfused organ system. Since the system is well thermostated, temperature measurement is only necessary when specific temperature studies with special temperature protocols, e.g. cooling or transplantation studies, are being performed.

Permits precise continuous or intermittent measurement in liquid media or perfusate of three key parameters: pO2, pH and pCO2

For accurate drug addition using a syringe pump. Additional option for flow controlled drug addition, where flow is measured (or calculated) and a drug must be added in a certain ratio.

For addition of pacing to functional IH-SR or IH-5 Langendorff and Working HeartSystems. For small rodent hearts (mouse, rat and guinea pig).

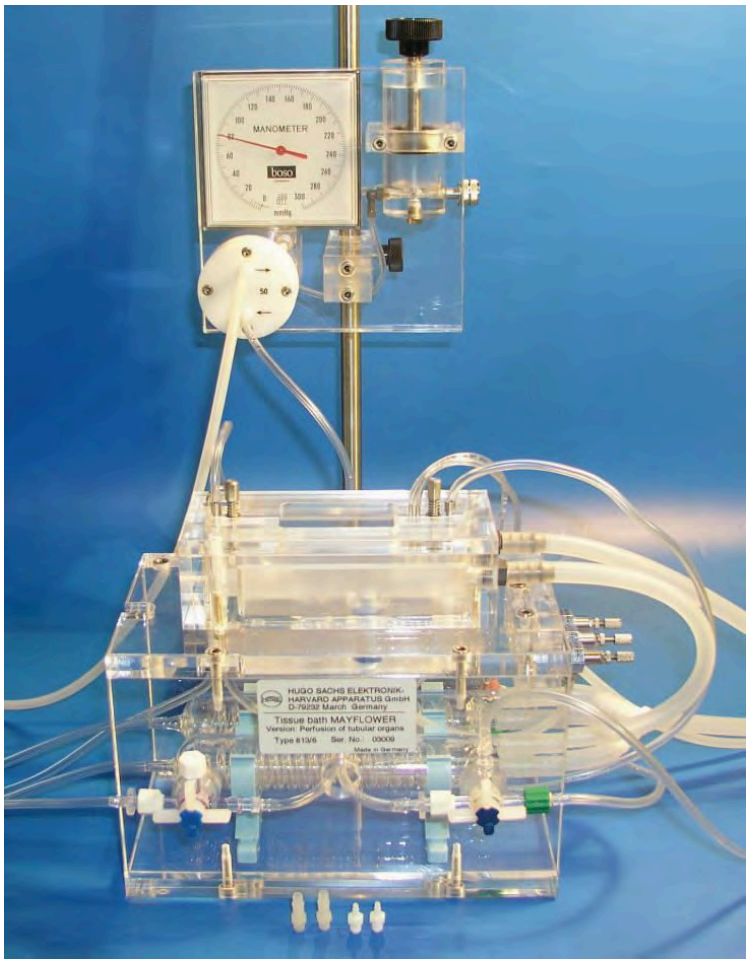
For single-lead ECG and MAP on functional IH-SR or IH-5 systems, one ECG lead can be measured in combination with MAP electrodes.

For multi-lead ECG and MAP measurements on functional IH-5 Langendorff or working heart systems, up to 12 ECG leads are combined with up to 8 MAP electrodes for measurement on rat, guinea pig or rabbit hearts.

Perfusion Bath for Tubular Organs (PBTO)

Designed for studying intraluminal perfused tubular organs such as trachea, atrial or venous blood vessels, intestines and vas deferens

Item No.	Description
73-2158	Horizontal Tissue Bath (PBTO) for Perfusion of Tubular Organs
73-2044	Device for Adjustment of Afterload Pressure of 0 to 30 cmH20 (0.23 mmHg)
73-2333	Device for Adjustment of Afterload Pressure of 0 to 300 mmHg



DETAILS

The Perfusion Bath for Tubular Organs (PBTO) has been designed for studying intraluminal perfused tubular organs such as trachea, atrial or venous blood vessels, intestines and vas deferens. Individual solutions can be used for intraluminal perfusion and extraluminal superfusion. Maximum tissue length is 55 mm.

Features & Benefits

- Accommodates individual solutions for intraluminal perfusions and extraluminal superfusion
- Controlled perfusion pressure

Applications

- Intraluminal perfusion of tubular organs (trachea, blood vessels, intestines)
- Testing circular-action musculature, vascular tone and stents in isolated vessels

Included and Required Components

Included items: Plexiglass chassis, organ chamber with adjustable organ holder with connection cannulas, preheating coils for extraluminal and intraluminal perfusates, four different interchangeable cannulae with diameters of 1.5, 2.5, 3 and 4 mm. For smaller vessels customized stainless steel cannulae can be made on request. For micro-vessels, glass capillary pipettes pulled to the required diameter can be connected to the adapter cannulae using a silicone tube collar.

Additional equipment required: Thermocirculator, reservoir, peristaltic pumps, transducer, monitoring system setup using the PLUGSYS Amplifier System. Recording and evaluation of the signals uses BDAS or LabChart software.

Note: Two peristaltic pumps are required for the PBTO, one for intraluminal constant flow and a second for extraluminal superfusion.

Operation & Setup

Two peristaltic pumps are required, one for intraluminal constant flow perfusion and the second for extraluminal superfusion. The intraluminal perfusion pressure is generated by an adjustable afterload control system. A differential pressure transducer is used to measure the intraluminal pressure difference at the proximal and distal end of the organ.

The tissue bath is a jacketed Plexiglas bath. The holder for the cannulae can be removed from the main bath for the cannulation of the segment of tubular organs. The cannulae are fixed on sliding holders to adjust to organs of different lengths, up to 50 mm. The intraluminal pressure is controlled by one of two afterload systems available: one for low pressure applications (0 to 30 mmHg) and the second for high pressure applications (0 to 300 mmHg).

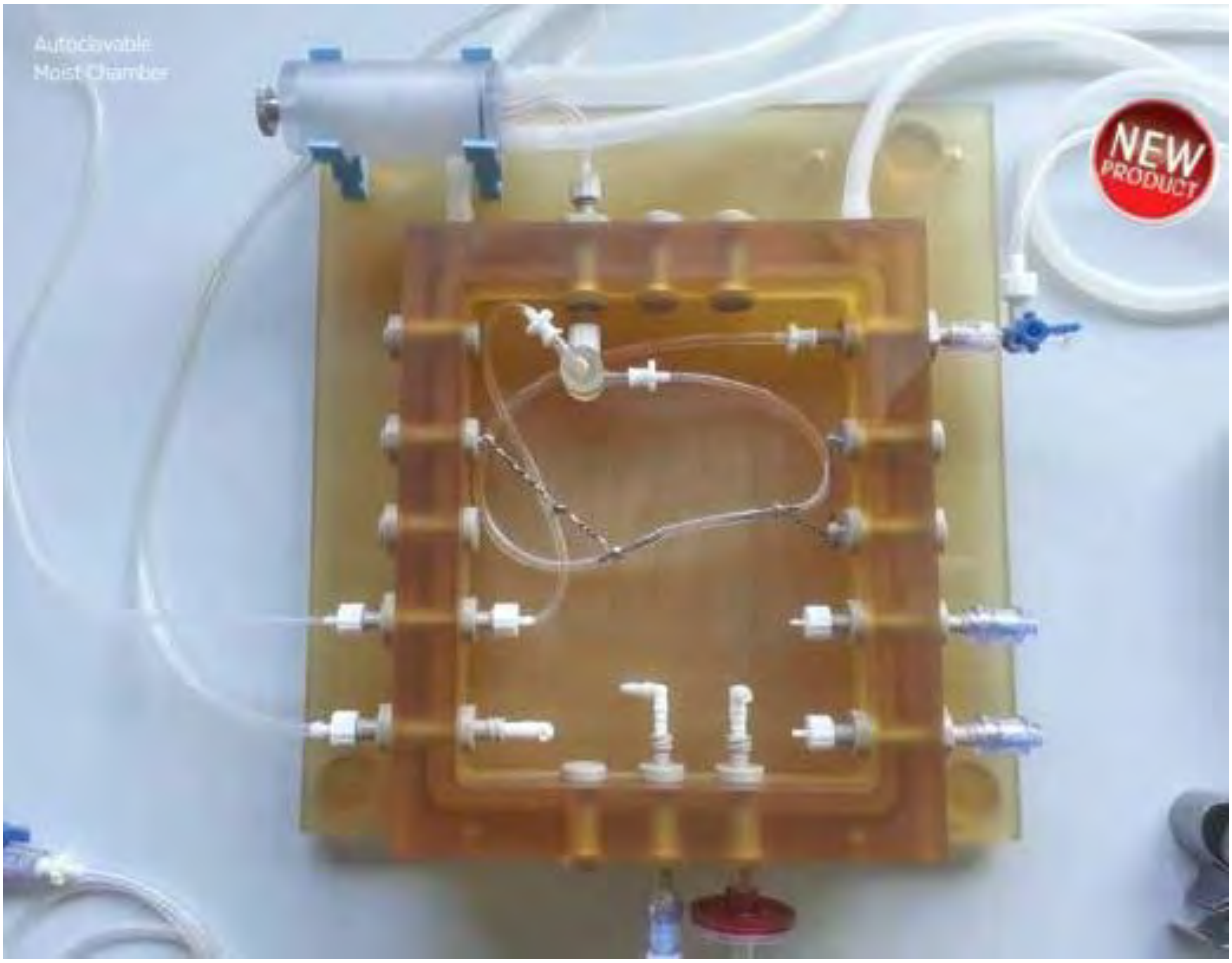
SPECIFICATIONS

Bath Volume	30 ml
Maximum Vessel Length	50 mm
Inner Bath Dimensions (L x W x H)	100 x 20 x 20 mm
Outer Bath Diminsions (L x W x H)	200 x 120 x 200 mm

Autoclavable Moist Chamber

The autoclavable rodent abdominal organ perfusion chamber is part of our complete systems for the perfusion of rodent isolated organs such as kidney, liver or mesenteric bed from mice, rats or guinea pigs. Designed to perfuse such isolated organs under optimized sterile and physiological conditions, making this chamber suitable for long term perfusion studies over days and weeks. See our for more details.

Item No.	Description
73-4733	Autoclavable Moist Chamber
73-4734	Sealed Water-Jacketed Glass Reservoir, 2 L, with Tubing Oxygenator
73-4808	Sealed Water-Jacketed Glass Reservoir, 220 ml, with Tubing Oxygenator



DETAILS

Like the standard , the **Autoclavable Moist Chambe**r is intended for perfusion of isolated organs of small animals such as kidney, liver or mesenteric bed of mice, rats or guinea pigs. It has been designed to perfuse such isolated organs under optimized sterile and physiological conditions, making this chamber suitable for long term perfusion studies over days and weeks.

Features & Benefits
Applications
Included and Required Components
Operation & Setup

Features & Benefits

- Interchangeable connecting parts for the 16 openings around the chamber allows you to customize the chamber to suit your needs
- Built-in bubble trap
- Optional perfusate reservoir and oxygenator
- Multiple cannulae sizes available to suit a variety of applications

- Each perfusion line is equipped with an independent heat exchanger
- Long term perfusion studies possible, over days and weeks

Applications

- Long term drug studies on ex vivo liver, kidney, and other abdominal organs
- Regenerative tissue engineering studies involving decellularization and recellularization with stem cells lasting up to weeks
- Organ transplantation studies
- Sheep ovary and uterus transplantation studies

Included and Required Components

Included items: Jacketed moist chamber, jacketed lid, tubing heat exchanger and bubble trap for a single perfusion

Additional equipment required: Thermocirculator, cannulae, holders, peristaltic pump, transducers, monitoring system setup. Recording and evaluation of the signals uses BDAS or LabChart software. For constant pressure perfusion, the SCP and TAM-D modules, along with PLUGSYS housing, are needed in addition to the peristaltic pump.

Operation & Setup

While utilizing the optimized design of the standard Moist Chamber, the Autoclavable Moist Chamber has additional features to help ensure sterility. The chamber is completely sealed. All accesses are made over swabable Luer female connections or tuohy adapters. Sterile air filters allow gas exchange with the environment for pressure compensation inside to outside. Sterile low flow gas exchange inside the is chamber possible. The system is made entirely of autoclavable materials. In addition, the cover is mounted on the chamber and secured with four metal clamps to avoid unexpected opening and contamination of the chamber.

SPECIFICATIONS

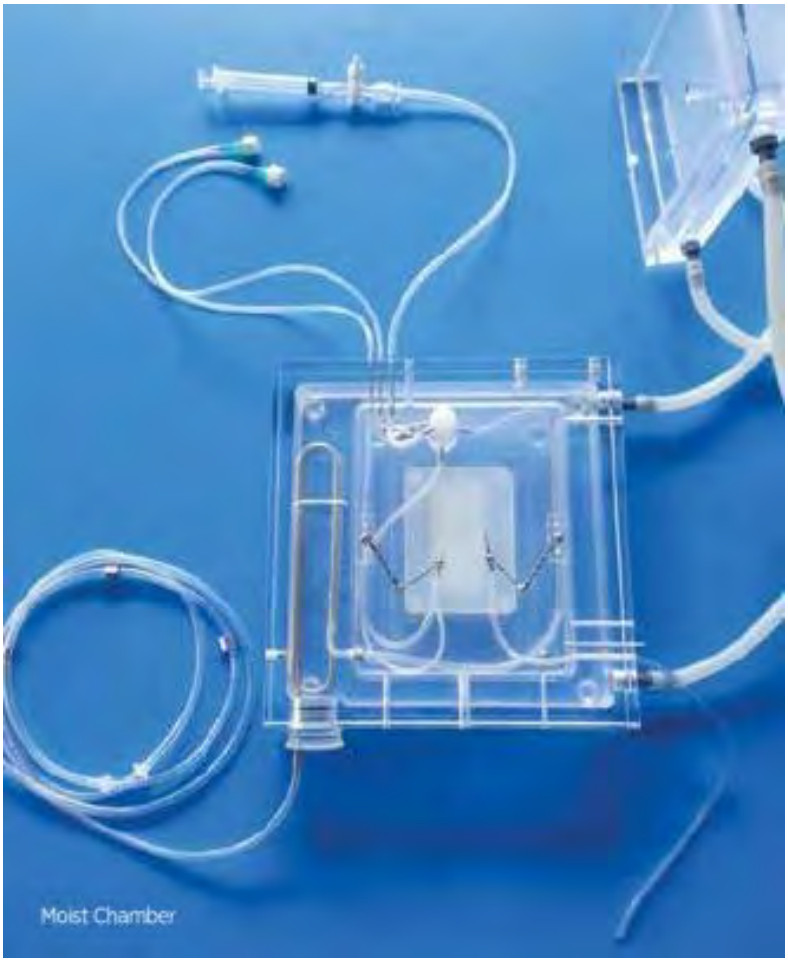
Inside Dimensions (L x W x H)	110 x 140 x 35 mm
Outer Dimensions (L x W x H)	200 x 250 x 75 mm with cover
Base Plate	260 x 245 x 16 mm
Overall Height without Lid	55 mm
Overall Height with Lid	85 mm

Moist Chamber

Very flexible and useful standard jacketed and fully heated chamber for ex-vivio perfusion of most abdominal organs from typical rodent models.

This temperature-controlled moist chamber with metal tube heat exchanger is intended for perfusion of isolated organs of small experimental animals such as kidney, liver or mesenteric bed of mice, rats or guinea pigs. It has been designed to perfuse thesd isolated organs under best physiological temperatured conditions. Organ perfusion of a few hours to one day are possible. For long term perfusions choose the fully airtight .

Item No.	Description
73-2901	Moist Chamber with Metal Tube Heat Exchanger
73-3692	Bubble Trap for Flow Rate up to approx. 50 ml/min. Volume 1.6 ml
73-3094	Stainless Steel Mesh Electrode



DETAILS

Very flexible and useful standard jacketed and fully heated chamber for ex-vivio perfusion of most abdominal organs from typical rodent models.

This temperature-controlled Moist Chamber with metal tube heat exchanger is intended for perfusion of isolated organs of small experimental animals such as kidney, liver or mesenteric bed of mice, rats or guinea pigs. It has been designed to perfuse thesd isolated organs under best physiological temperatured conditions. Organ perfusion of a few hours to one day are possible. For long term perfusions choose the fully airtight .

The organs in the chamber can be perfused under constant pressure or constant flow. This temperature-controlled Moist Chamber can be used in combination with other HSE perfusion systems (e.g.) or as stand alone chamber with the .

Features & Benefits
Applications
Special Application: The Rat Mesenteric Bed
Working System Requirements
Included and Required Components
Operations & Setup

Features & Benefits

- Superior temperature control of perfusate and organ
- Precise positioning of cannulae and measurement probes
- Compact and easy to use
- Compatible with a variety of accessories, making it suitable for a wide range of applications
- Provides a complete perfusion system when combined with the UP-100 or a perfusion control system with pressure and flow regulation

Applications

- Rodent isolated organ perfusion—liver, kidney, pancreas, mesenteric bed
- Investigation of the tone of small blood vessels under the effect of vasoactive substances
- Biochemistry—studying metabolic processes
- Drug studies—testing of vasodilative drugs, testing of side effects of any drug
- Transplantation studies and studies on preservation solutions

Special Application: The Rat Mesenteric Bed

The key part of the perfusion system for the rat mesenteric bed is the moist chamber. The mesenteric tissue is placed into the moist chamber on a stainless steel mesh (replaces the silicone plate) which also acts as anode during electrical stimulation.

Working System Requirements

In order to work, the moist chamber requires the following additonal items:

- A thermostated circulation waterbath, capacity approximately 3 to 5 liter, distilled water and algal growth inhibitor, e.g.ThermCleanr
- A carbogen source for aeration. Either a central supply or a carbogen cylinder with a pressure reducing valve
- A reservoir for the perfusate, possibly with a gas frit for aeration
- A bubble trap which is placed into the chamber, directly in front of the perfused organ
- A pump, usually a roller pump, with the required output
- An adapted cannulae set, depending of perfused organ and size

Additionally we recommend for the accurate measurement of the perfusion pressure:

- A pressure transducer for measuring the perfusion pressure, e.g. an APT300 or P75 transducer
- A bridge amplifier (e.g. HSE TAM-A or TAM-D) to amplify the signal and to make it suitable for a PC based recording system (e.g. HSE BDAS Software)
- Measurement of additional parameters (e.g. perfusion flow, pH, pCO2, temperature) may be useful depending on the particular application involved in the experiment.

Included and Required Components

Included items: Jacketed moist chamber with metal tube heat exchanger, jacketed cover and silicone plate**,** and two miniholder arms to hold and fix the perfusion cannulae

Additional equipment required: Thermocirculator, bubble trap, cannulae, holders, peristaltic pump, transducers, monitoring system setup. Recording and evaluation of the signals uses BDAS or LabChart software. For constant pressure perfusion the SCP and TAM-D modules, along with PLUGSYS housing, are needed in addition to the peristaltic pump.

Operation & Setup

In its most basic configuration, the Moist Chamber consists of a suitably deep (110 x 40 x 35 mm) organ chamber and cover. Both components are double-walled and water-jacketed to provide a stable temperature-controlled environment within the organ chamber. The perfusate is warmed by passage through a built-in heat exchanger.

A bubble trap should be used in the perfusate path immediately before contact with the organ. The 73-3692 bubble trap is placed in the moist chamber or on an operating table in front of the perfused organ. The 73-2780 bubble trap is used with a 1.5. RB flow probe () and requires the .

Inside the chamber, a flexible silicone platform acts as a rest for fixation (aided by the use of fixing pins when necessary) of the organ. Anchors for our Mini Ball Joint positioning system and precision arterial and venous cannulae are pre-drilled on both sides of the organ. In addition, several measurement and sample ports are provided for easy access to the inner chamber, even with the cover in place, making the chamber suitable for collecting a wide range of physiological data.

This Moist Chamber can be part of a simple constant flow perfusion system. Used as such, a water-jacketed buffer reservoir, peristaltic pump and appropriate cannulae are used to complete the perfusion circuit, while a thermocirculator feeds the water-jacketed components to maintain the thermostating circuit. The Moist Chamber can also be used in conjunction with the UP-100 or a perfusion control system to allow for constant pressure perfusion.

SPECIFICATIONS

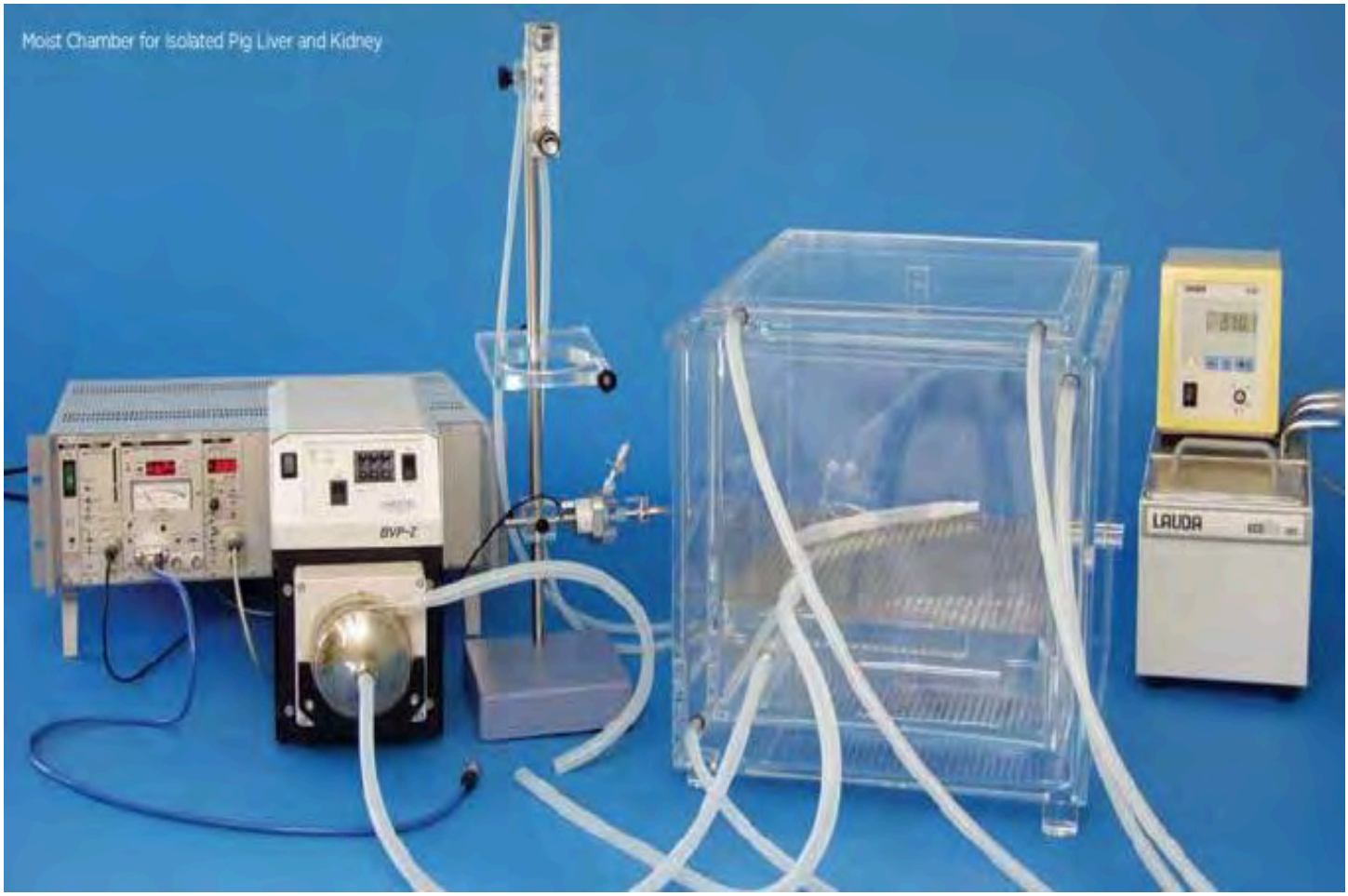
Inside Dimensions (L x W x H)	110 x 140 x 35 mm
Outer Dimensions (L x W x H)	200 x 200 x 75 mm with cover
Priming Volume	18 - 20 ml (dependent on length of tubing used)

Abdominal Organ Chambers for Large Animal Liver or Kidney

Flexible and useful standard jacketed and fully heated chamber for ex-vivio perfusion of most abdominal organs from large animal models. For perfusion studies with pig liver or pig kidney, such as transplantation studies, xenotransplantation studies, pharmacological research with blood or erythrocyte-containing perfusate.

This chamber has been designed to perfuse the above mentioned isolated organs under best physiological temperatured conditions. Organ perfusion of a few hours to one day are possible.

Item No.	Description
73-5298	MEDIUM ANIMAL ORGAN PERFUSION CHAMBER JACKETED TOP AND BASE, INNER CHAMBER DIMENSIONS 270 X 340 X 180 MM
73-5299	LARGE ANIMAL ORGAN PERFUSION CHAMBER JACKETED TOP AND BASE, INNER CHAMBER DIMENSIONS 370 X 340 X 190 MM
73-5123	XLARGE ANIMAL ORGAN PERFUSION CHAMBER JACKETED TOP AND BASE, INNER CHAMBER DIMENSIONS 550 X 340 X 210 MM



DETAILS

Flexible and useful standard jacketed and fully heated chamber for ex-vivio perfusion of most abdominal organs from large animal models. For perfusion studies with pig liver or pig kidney, such as transplantation studies, xenotransplantation studies, pharmacological research with blood or erythrocyte-containing perfusate.

This chamber has been designed to perfuse the above mentioned isolated organs under best physiological temperatured conditions. Organ perfusion of a few hours to one day are possible.

Features & Benefits
Applications
Application Examples
Included and Required Components

Features & Benefits

- Jacketed heated chamber maintains physiological temperature conditions
- Allows for constant flow or pressure perfusion in a single system
- Ability to expand set up to monitor and record pressure, flow, pH, pO_2, pCO_2 and temperature

- Compatible with a variety of accessories, making it suitable for a wide range of applications
- Provides a complete perfusion system when combined with a perfusion control system with pressure and flow regulation

Applications

- For use in physiological or pharmacological researchfor the perfusion of a pig liver or kidney with blood or erythrocyte-containing perfusate
- For liver or kidney transplantation studies
- For liver or kidney xenotransplantation studies

Application Examples

Plg Liver

The pig liver to be perfused is placed in a moist, thermostated chamber (inside dimensions: 400 x 300 x 180 mm) and perfused with blood or erythrocyte-containing perfusate under constant-flow conditions via the portal vein. A centrifugal pump with a gentle action on blood is used to reduce hemolysis. Since this type of pump does not supply a constant flow or pressure, the constant flow is maintained by an electronic controller (SCP).

Pig Kidney

For the kidney, instead of the liver chamber, a smaller chamber (inside dimensions 260 x 200 x 210 mm) is used. The kidney is mainly perfused at constant pressure, which is also controlled by an SCP controller module.

Application Example

The pig liver (or pig kidney) to be perfused is placed in the moistened, thermostated chamber and perfused with blood through the portal vein under
constant-flow conditions. (In case of a pig kidney the renal artery and renal vein are used to cannulate and constant pressure perfusion has to be used.)

A centrifugal pump with a gentle action on blood is employed and required to reduce hemolysis. It is controlled by an electronic controller (SCP) so that the apparatus can be operated under constant-flow conditions or under constant-pressure conditions. Flow control requires that the flow is measured by means of a flow probe and a flowmeter (TTFM-2).

The perfusion pressure should also be measured to monitor the experiment. This requires a pressure transducer (P75 or APT300) and a bridge amplifier (TAM).

A suitable oxygenator is necessary for oxygenating and warming the blood. It can be of a type used in human medicine, e.g. METRONIC, CARMEDIA, AFFINITY NT or similar. Due to law regulations we are not allowed to sell such types of oxygenators, they must be purchsed by the user.

Included and Required Components

Included items: Jacketed plexiglass chamber with connections for perfusion tubes, jacketed cover, tubing for thermostatic circulation, tubing for perfusion

Additional equipment required: Thermocirculator, pump with analog control*, Servo Controlled Perfusion System (SCP), measurement system for flow and pressure, oxygenator with heat exchanger, e.g. Terumo, Capiox SX10® or Medtronic MinimaxPlus PRF®, monitoring system setup using the PLUGSYS Amplifier System. Recording and evaluation of the signals uses BDAS orLabChart software.

** For blood we recommend a Pump Drive BVP-ZX with centrifugal pump head.*

SPECIFICATIONS

Inside Dimensions (L x W x H)	Liver: 346 x 300 x 210 mm Kidney: 260 x 200 x 210 mm
Outer Box Dimensions (L x W x H)	Liver: 480 x 380 x 210 mm Kidney: 340 x 270 x 250 mm
Lower Compartment (L x W x H) (Reservoir for blood)	Liver: 346 x 300 x 80 mm (Volume 9.6 L) Kidney: 260 x 200 x 60 mm (Volume 3.12 L)
Upper Compartment (L x W x H) (Receives the organ)	Liver: 346 x 300 x 210 mm Kidney: 260 x 200 x 120 mm

Aortic Cannulae for IH-5 or IH5-BI System

For cannulating isolated heart aorta to mount specifically on the IH-5 or IH5-BI System. Sizes for rat, guinea pig and rabbit.

These cannulae have a straight bore fitting only to the IH-5 aortic block. They are not compatible with Luer fittings.

Item No.	Description
73-0719	Aortic Cannula for Rabbit Heart to IH-5, OD 2.3 mm, set of 3, OD 3.0, 4.0 and 5.0 mm
73-3072	Aortic Cannula for Rat/ Guinea Pig Heart to IH-5, set of 2, OD 3.0 and 2.5 m
73-3065	Aortic Metal Cannula for Rat/Guinea Pig to IH-5, 2.0 mm
73-2875	Aortic Metal Cannula for Rat/Guinea Pig to IH-5, OD 2.5 mm
73-2876	Aortic Metal Cannula for Rat/Rabbit to IH-5, OD 3.0 mm
73-2877	Aortic Metal Cannula for Rat/Rabbit to IH-5, OD 3.5 mm
73-2878	Aortic Metal Cannula for Rabbit to IH-5, OD 4.0 mm
73-2879	Aortic Metal Cannula for Rabbit to IH-5, OD 5.0 mm
73-2880	Left Atrium Cannula for Rabbit to IH-5, OD 6.0 mm

DETAILS

These special cannulae are designed for cannulating isolated heart aorta to mount specifically on the IH-5 or IH5-BI System. Sizes for rat, guinea pig and rabbit.

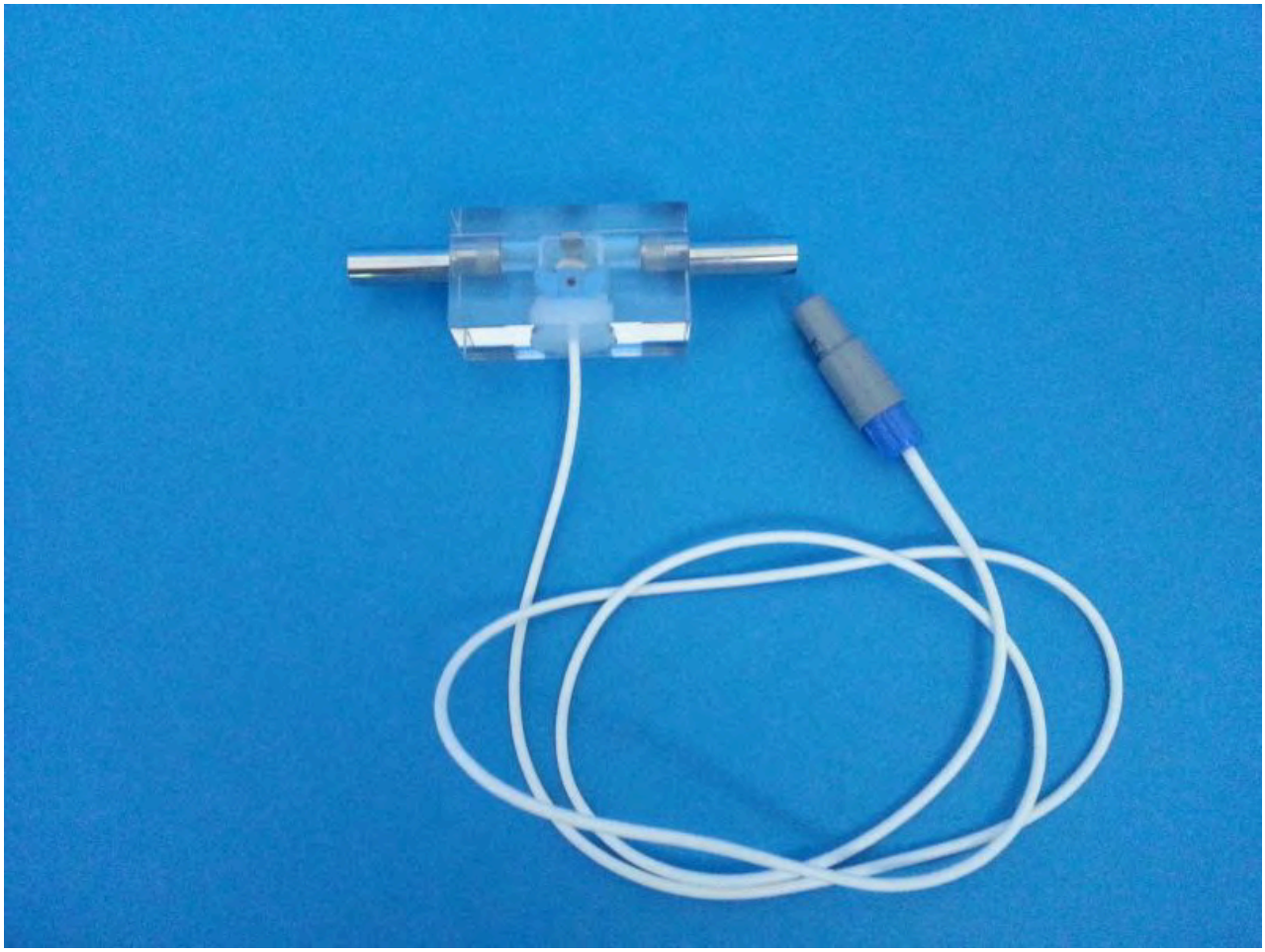
These cannulae have a straight bore fitting only to the IH-5 aortic block. They are not compatible with Luer fittings.

Extracorporeal In-Line Flow Probes for TTFM-2 Flowmeter Modules

Extracorporeal in-line flow probes monitor perfusion flow on isolated organs and are built into the perfusion lines (tubing). For use with .

These extracorporeal in-line probes are available in sizes from 1.0 to 8.0 mm. All in-line flow probes are cannulated and options are available for a larger range of species.

Item No.	Description
73-4753	Inline Flow Probe, type 1N for TTFM-2. cannulated, 1 mm ID
73-4754	Inline Flow Probe, type 2N for TTFM-2, cannulated, 2 mm ID
73-4755	Inline Flow Probe, type 4N for TTFM-2, cannulated, 4 mm ID
73-4946	Inline Flow Probe, type 6N for TTFM-2, cannulated, 6 mm ID
73-4947	Inline Flow Probe, type 8N for TTFM-2. cannulated, 8 mm ID
73-5131	Inline Flow Probe, type 12N for TTFM-2. Cannulated, 12 mm ID
73-5233	Inline Flow Probe, type 16N for TTFM-2. Cannulated, 16 mm ID



DETAILS

Extracorporeal in-line flow probes monitor perfusion flow on isolated organs. For use with in isolated organ systems such as abdominal organs or lungs, or for any application where a flow in a tube must be measured.

These probes are embedded into a perspex holder which has two ports. There are installed into an in-line tubing. These probes are available in sizes from 1.0 to 8.0 mm. All in-line flow probes are cannulated, and options are available for a range of species.

SPECIFICATIONS

		Resolution	Low Flow	Normal	Max Flow	Zero Offset	Absolute Accuracy	Relative accuracy

Part No	Model	ml/min	1V output in ml/min	1V output in ml/min	5V output in ml/min	ml/min	% of reading	%
73-4753	1N	0.05	5	20	100	±0.2	±10	±2
73-4754	2N	0.1	25	100	500	±1	±10	±2
73-4755	4N	0.8	100	400	2L	±4	±10	±2
73-4946	6N	2.0	250	1L	5L	±10	±10	±2
73-4947	8N	4.0	500	2L	10L	±20	±10	±2
73-5131	12N	8.0	1L	4L	20L	±40	±10	±2
73-5233	16N	20	2.5L	10L	50L	±100	±10	±2

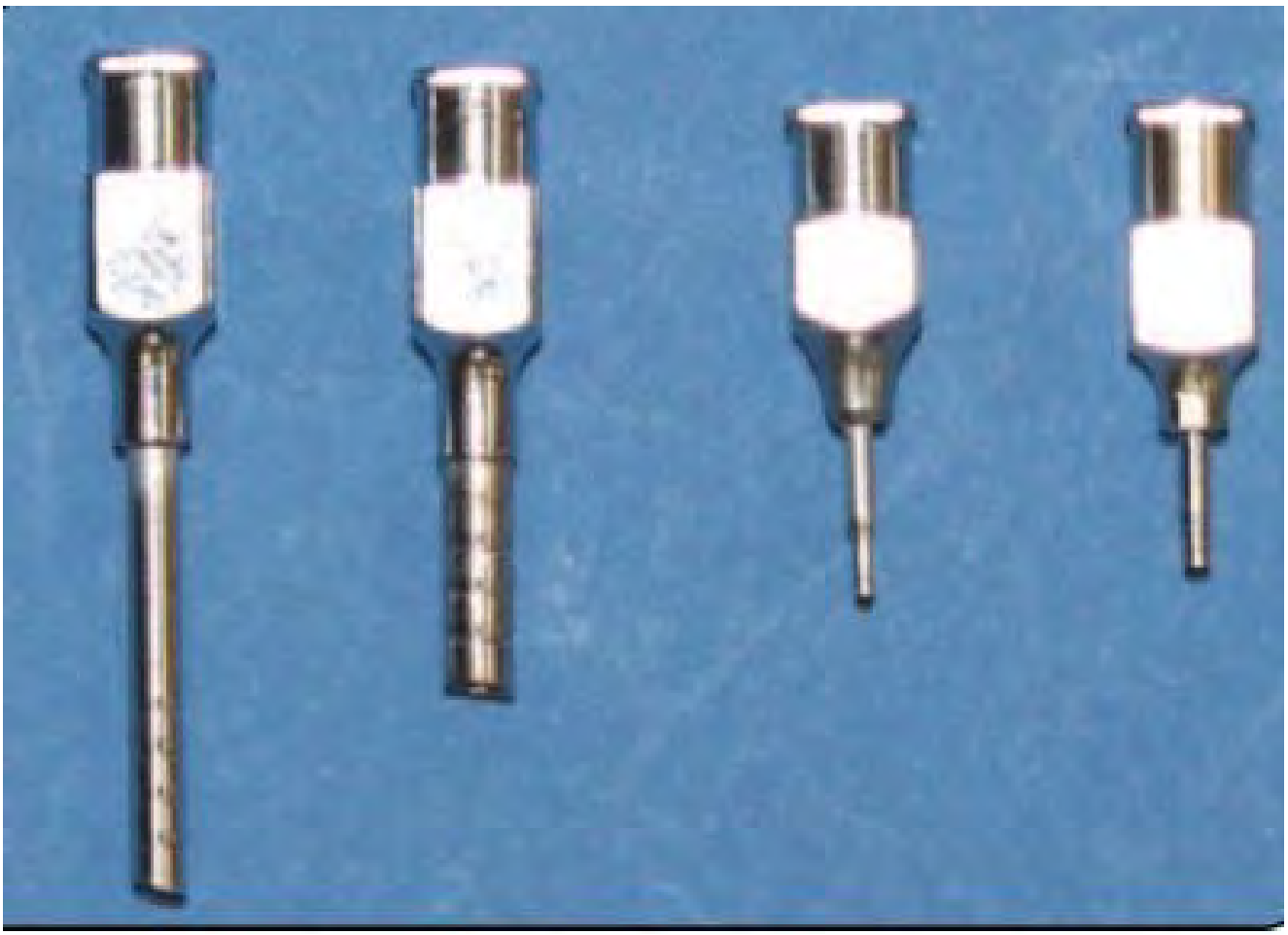
Aortic Cannulae for IH-SR System

For cannulating isolated heart aorta to mount specifically on the IH-SR System. Sizes for mouse, rat and guinea pig.

These cannulae have a straight bore fitting only to the IH-SR aortic block. They are not compatible with Luer fittings.

We also offer special for mouse heart cannulation.

Item No.	Description
73-2816	Aortic Cannula for Mouse Heart to IH-SR, OD 1.0 mm
73-2857	Aortic Cannula for Mouse/Rat Heart to IH-SR, OD 1.3 mm
73-2858	Aortic Cannula for Rat Heart to IH-SR, OD 1.5 mm
73-2859	Aortic Cannula for Rat/Guinea Pig Heart to IH-SR, OD 1.8 mm
73-2860	Aortic Cannula for Rat/Guinea Pig Heart to IH-SR, OD 2.0 mm
73-2814	Aortic Cannula for Rat Heart to IH-SR, OD 2.3 mm
73-2861	Aortic Cannula for Rat Heart to IH-SR, OD 2.5 mm
73-2862	Aortic Cannula for Rat/Guinea Pig Heart to IH-SR, OD 3.0 mm



DETAILS

These special cannulae are designed for cannulating isolated heart aorta to mount specifically on the IH-SR System. Sizes for mouse, rat and guinea pig.

These cannulae have a straight bore fitting only to the IH-SR aortic block. They are not compatible with Luer fittings.

Fiber (Membrane) Oxygenators & Holders

The fiber (or membrane) oxygenator is an alternative to glass frit or bulb oxygenators. This oxygenator is used for blood, blood/perfusate mix, or perfusate that contains protein (to prevent foaming).

Item No.	Description
73-3757	Fiber (Membrane) Oxygenator Type D150, pkg. of 1
73-3762	Fiber (Membrane) Oxygenator Type D150, pkg. of 5
73-4993	Fiber (Membrane) Oxygenator Type DP07HE, pkg. of 1
73-4995	Fiber (Membrane) Oxygenator Type DP07HE, pkg. of 5
73-3061	Holder for Oxygenators for UP-100 and IH-SR
73-3058	Stand Alone Holder for Fiber (Membrane) Oxygenators with Needle Valve
73-3759	Mounting Kit for D150 Fiber Oxygenator on Holder
73-3760	Mounting Kit for DP07HE or D200 Fiber Oxygenators on Holder
73-3765	Connection Kit for Fiber Oxygenator, consisting of 5 sets of tubing connectors for perfusate and gas to the oxygenator

DETAILS

The fiber (or membrane) oxygenator is an alternative to glass frit or bulb oxygenators. This oxygenator is used for blood, blood/perfusate mix, or perfusate that contains protein (to prevent foaming).

Oxygenator holders are available separately. Mounting rods are not included. Mounting kits are specific for either the D150 or DP07HE
oxygenator. They include two ring clamps to hold the oxygenator, tubing adapters, and silicone and Tygon® tubing.

Features

- Hollow fiber oxygenator in two sizes D150 or DP07HE
- MediSulfone® membrane material
- 18/49 ml total priming volume
- 0.22/0.7 m^2 active oxygenating surface area
- Can be used 3 to 10 times
- Available in individual units or in packages of five
- Selection of different holders available

SPECIFICATIONS

	D150	**DP07HE**
Effective Surface Area	0.25 m^2 (2,500 cm^2)	0.7 m^2 (7,000 cm^2)
Internal Diameter	250 µm	200 µm
Outer Diameter	28 mm	43 mm
Wall Thickness	50 µm	30 µm
Effective Fiber Length	140 mm	140 mm
Number of Fibers	2,500	9,300
Fiber Material	MediSulfone Polysulfone, 50,000 Da	High Flux PUREMA
Ultrafiltration Rate	5.5 ml/h/mmHg	32 ml/h/mmHg
Maximum Pressure	500 mmHg	600 mmHg transmembrane pressure
Sterilization	ETO sterlized	ETO sterilized
Priming Volume	19 ml	49 ml
Weight	63 g	140 g
Housing Material	Polycarbonate	Polycarbonate
Full Length	180 mm	180 mm

Moist Chamber with Edema Balance

Moist chamber with built-in organ weighing system

Item No.	Description
73-3685	Moist Chamber with Edema Balance (MCWEB), Rat
73-4528	Moist Chamber with Edema Balance (MCWEB), Mouse

DETAILS

This system is comprised of a with a built-in organ weighing system. The jacketed chamber maintains a warm and moist environment for the organ.

Features & Benefits
Applications
Included and Required Components
Operations & Setup

Features & Benefits

- Dual perfusion system—vascular and intraluminal intestinal
- Built-in balance for edema evaluation and organ weight measurement

Applications

- Rodent isolated intestine perfusion
- Microvascular permeability studies
- Simultaneous study of vascular, luminal and lymphatic flows
- Arterial, venous and intraluminal pressures and bowel weight
- Septic multi-organ failure studies in gastrointestinal area

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Included and Required Components

Included items: Moist chamber with cannulae and mini holders for mesenteric artery, portal vein, ileum inflow and ileum outflow, balance (requires TAM-D amplifier), cannulating block (can be removed from chamber for surgery)

Additional equipment required: TAM-D and housing (for inflow/outflow balance), thermocirculator, peristaltic pump, transducers, monitoring system setup. Recording and evaluation of the signals uses BDAS or LabChart software. For constant pressure perfusion, the SCP and TAM-D modules, along with PLUGSYS housing, are needed in addition to the peristaltic pump.

Operation & Setup

The chamber has been configured for studying the edema evolution in a perfused intestine with attached mesenteric bed using two separate perfusion lines for simultaneous vascular and intraluminal perfusion. The chamber is supplied with a movable cannulation block including all the required heating coils and bubble traps. This block acts also as holder for the tubing and cannulae. It can be placed near the animal for easy in situ preparation. After surgery, the block with the preparation is moved and fixed on the chamber. This ensures continuous perfusion during the entire duration of surgery and reduced risk of embolism or ischemia.

Small Animal Cannulae

Designed for atraumatic cannulation of isolated organs

Item No.	Description
73-3308	Cannula with Basket, OD 1.0 mm, ID 0.7 mm
73-3309	Cannula with Basket and Side Port OD 1.0 mm, ID 0.7 mm
73-3310	Cannula with Basket, OD 1.3 mm, ID 1.0 mm
73-3311	Cannula with Basket and Side Port OD 1.3 mm, ID 1.0 mm
73-3312	Cannula with Basket, OD 2.0 mm, ID 1.5 mm
73-3313	Cannula with Basket and Side Port OD 2.0 mm, ID 1.5 mm
73-3314	Cannula with Basket, OD 2.3 mm, ID 1.9 mm
73-3315	Cannula with Basket and Side Port OD 2.3 mm, ID 1.9 mm

DETAILS

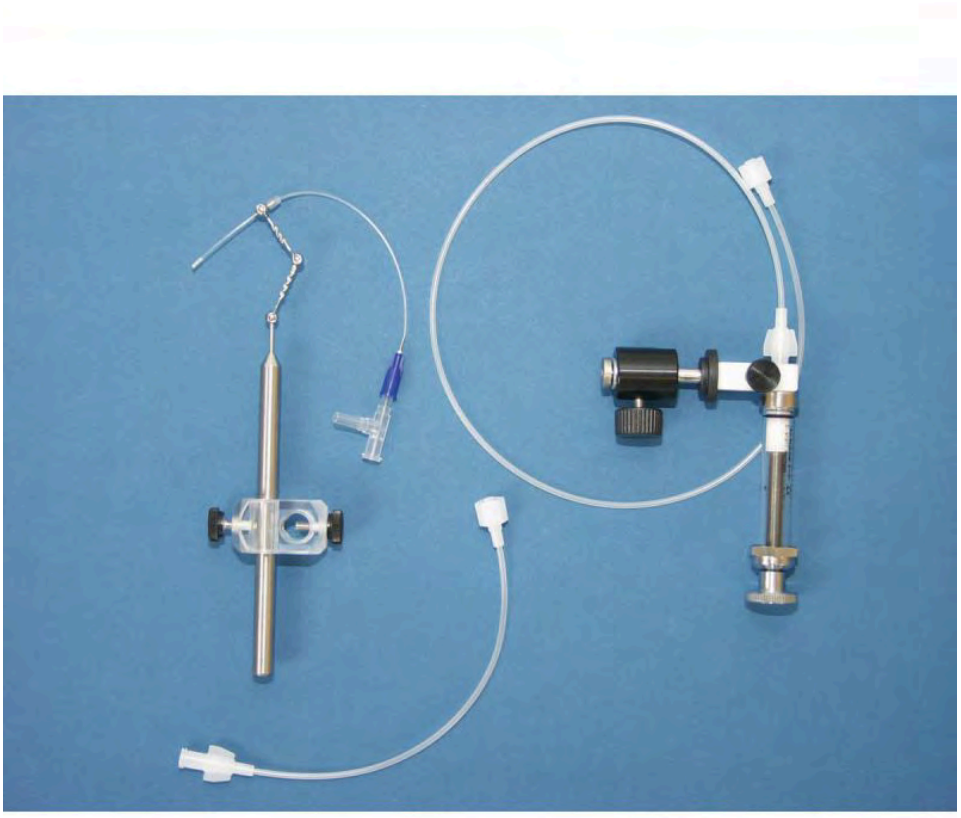
These specialized cannulae were designed for atraumatic cannulation of isolated organs. The cannulae are equipped with a basket-like tip to avoid any occlusion of the vessel during preparation and throughout the experiment. Multiple sizes are available depending on the species and the need for a side port for pressure measurement during drug delivery.

When choosing cannulae, it is important to ensure that outflow cannulae are always larger than inflow cannuale. Doing so will reduce flow resistance and help to avoid back pressure in the organ.

Mouse Universal Left Ventricular Pressure (LVP) Kits

This kit includes a PE catheter for connecting the balloon to the pressure transducer, cannula, T-piece, holder for balloon catheter with 2 mini ball joint holders, plexiglass block clamp and bar with ball, and spindle syringe.

Item No.	Description
73-0331	Universal Mini Balloon Kit for Left Ventricular Pressure (LVP) on Isolated Mice Hearts



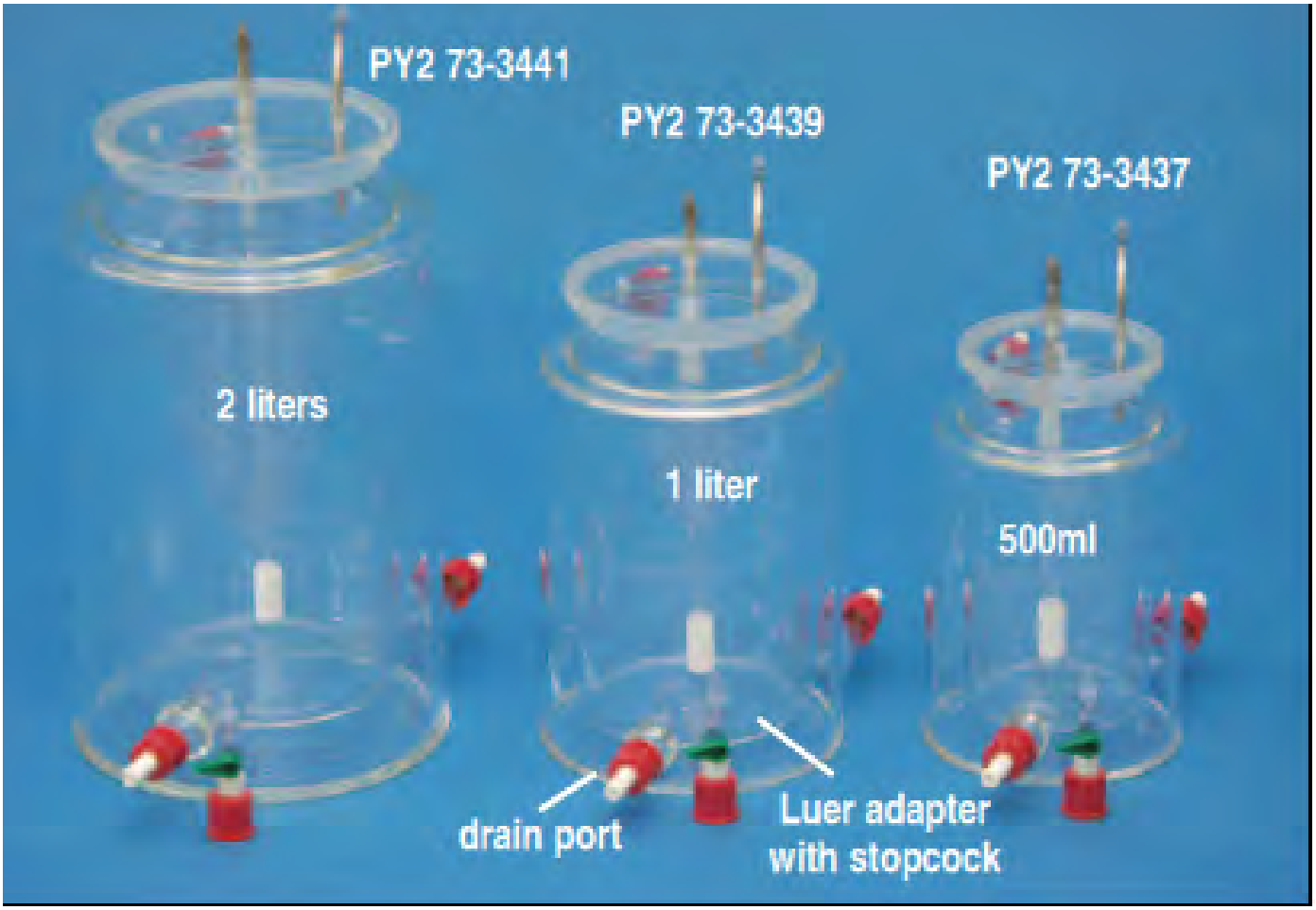
DETAILS

This kit includes a PE catheter for connecting the balloon to the pressure transducer, cannula, T-piece, holder for balloon catheter with 2 mini ball joint holders, plexiglass block clamp and bar with ball, and spindle syringe.

Jacketed Glass Reservoirs with Bottom Drain

Jacketed glass reservoirs for gravity supply systems or for use with a pump; heated by a water thermocirculator

Item No.	Description
73-3441	Jacketed Reservoir for Buffer Solution with Frit and Bottom Drain, 2.0 L
73-3439	Jacketed Reservoir for Buffer Solution with Frit and Bottom Drain, 1.0 L
73-3437	Jacketed Reservoir for Buffer Solution with Frit and Bottom Drain, 0.5 L
73-3566	Frit for 2.0 L Jacketed Buffer Reservoir
73-3565	Frit for 1.0 L Jacketed Buffer Reservoir, L = 150 mm
73-3455	Tube Set for Jacketed Buffer Reservoir
73-3456	Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves



DETAILS

These glass reservoirs have a bottom drain. They are for gravity supply systems or for use with a pump. The reservoirs are heated by a water thermocirculator.

For aeration of perfusate, they are supplied with a large gas frit. The outlet is the drain port at the bottom. It can be directly connected to a 5 mm ID tubing or via a LUER adapter to the stopcock. A return flow can be connected to the short stainless steel tube via a LUER connector. Pictured tubing connections are included with each reservoir.

Tubing sets must bepurchased separately.

Balloon Sample Kits

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3341	Balloon Sample Kit for Isovolumetric Contractile Force Measurements, 2 each of sizes 3 through 10, pkg of 16
73-3342	Rat/Guinea Pig Balloon Sample Kit for Isovolumetric Contractile Force Measurements, 5 each of sizes 3 through 6, pkg of 20
73-3343	Rabbit Balloon Sample Kit for Isovolumetric Contractile Force Measurements, 5 each of sizes 7 through 10, pkg of 20

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3341	73-3342	73-3343
Package	16	20	20
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders

Mouse/Neonatal Rat Balloon Assembly Kit

Used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. Latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. All the components to make these balloons are included in a covenient kit.

This kit for Mouse Ventricular Ballons includes the tools and procedure to assemble balloons for isovolumetric left ventricular pressure measurement in the isolated perfused mouse heart. The kit consists of a stand with two holders and crocodile clamps, hex screwdriver modified for balloon forming, syringe, scissor, cling wrap and PE tubing.

Item No.	Description
73-2787	Mouse/Neonatal Rat Ventricular Balloon Assembly Kit for Isovolumetric Contractile Force Measurements

DETAILS

Latex Balloons are traditionally used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. Latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. All the components to make these balloons are included in a convenient kit.

- Simple means to produce balloons for LVP measurement in isolated mice heart
- Easy to use

This kit for Mouse Ventricular Ballons includes the tools and procedure to assemble balloons for isovolumetric left ventricular pressure measurement in the isolated perfused mouse heart. The kit consists of a stand with two holders and crocodile clamps, hex screwdriver modified for balloon forming, syringe, scissor, cling wrap and PE tubing.

SPECIFICATIONS

Specifications	73-2787
Body Weight (kg)	0.02 to 0.1

Specifications **73-2787**

Package	1
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders
Species	Mouse/Neonatal Rat

Dog/Pig/Sheep Balloons (20 to 40 kg)

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3494	Dog/Pig/Sheep Balloons for Isovolumetric Contractile Force Measurements, Up to 20 kg, Size 24, pkg of 10
73-3495	Dog/Pig/Sheep Balloons for Isovolumetric Contractile Force Measurements, Up to 40 kg, Size 30, pkg of 10

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3494	73-3495
Balloon Dimensions (D x L) Metric	24 x 32 mm	30 x 40 mm
Balloon Size No.	24	30
Balloon Volume **	10 ml	20 ml
Body Weight (kg)	up to 20	up to 40
Footnote **	Volume unloaded	Volume unloaded
Package	10	10
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders
Species	Dog/Pig/Sheep	Dog/Pig/Sheep

Rabbit Universal Left Ventricular Pressure (LVP) Kits

This kit includes a steel catheter 1464 LL4, 5 balloons No. 12 and 5 balloons No. 13, spindle syringe for sensitive filling of balloons to adjust preload (balloon pressure), including holder with ball joints.

Item No.	Description
73-0323	Universal Balloon Kit for Rabbit Hearts

DETAILS

This kit includes a steel catheter 1464 LL4, 5 balloons No. 12 and 5 balloons No. 13, spindle syringe for sensitive filling of balloons to adjust preload (balloon pressure), including holder with ball joints.

TC120 Series Heated Circulating Baths, Stainless Steel

High precision temperature control from 0 to 120°C in a programmable heated thermocirculator with stainless steel bath. The powerful pump makes these circulators ideal for both routine and sensitive procedures.

Features Include:

- Digital control unit with four digit display
- Rotor dial for simple temperature setting
- Low liquid protection
- Over temperature cut out
- Visual alarm

These TC120 Thermocirculators are supplied complete with the thermocirculator itself, stainless steel bath and lid.

The TC120 Series is also available complete with a plastic bath rather than a stainless steel bath. Those options can be found . Other bath sizes are available. Please contact Technical Services for more information.

Item No.	Description
73-4545	TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 120 V
73-4544	TC120 Thermocirculator, complete with 5 L stainless steel bath and lid, 220 V
72-4933	Replacement Lid for 5 L Stainless Steel Water Bath

DETAILS

These easily programmable thermocirculators allow for high precision temperature control. The powerful pump makes these circulators ideal for both routine and sensitive procedures.

Features Include:

- Digital control unit with four digit display
- Rotor dial for simple temperature setting
- Low liquid protection
- Over temperature cut out
- Integral pump- max flow rate 16 L/min
- Visual alarm

Operation at low temperatures

Accessory cooling is required for controlled operation at or below ambient temperature. The minimum working temperature without accessory cooling depends on the size of the bath. The small baths, P5 and ST5, have a minimum working temperature of approximately 10°C above ambient without a lid

and 15°C above ambient with a lid. Other bath sizes can be used at a temperature of 5°C above ambient

These TC120 Thermocirculators are supplied complete with the thermocirculator itself, stainless steel bath and lid.

The TC120 Series is also available complete with a plastic bath rather than a stainless steel bath. Those options can be found . Other bath sizes are available. Please contact Technical Services for more information.

SPECIFICATIONS

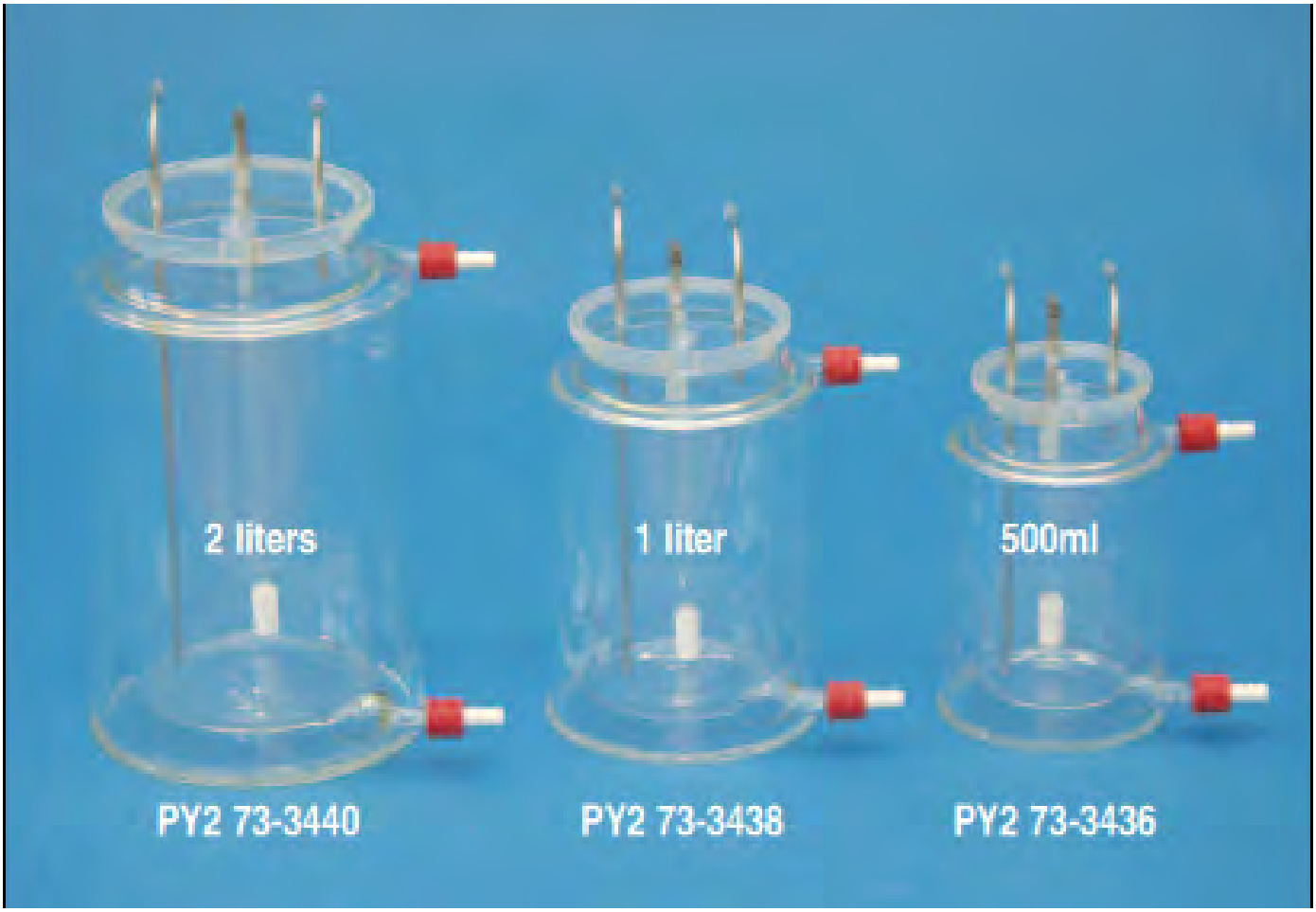
Item	**73-4545**	**73-4544**	**75-1601**	**75-1603**
Temperature range	0°C - 120°C	0°C - 120°C	0 °C - 120°C	0 °C - 120°C
Stability @ 70 °C	± 0.05	± 0.05	± 0.05	± 0.05
Uniformity @ 70°C	± 0.1	± 0.1	± 0.1	± 0.1
Safety (overtemp.)	Adjustable cut-out	Adjustable cut-out	Adjustable cut-out	Adjustable cut-out
Working area (D x W)	150 x 150 mm	150 x 150 mm	205 x 300 mm	205 x 300 mm
Min/max liquid depth	85 / 140 mm	85 / 140 mm	85 / 140 mm	85 / 140 mm
Inner tank dimensions	300 x 150 x 150 mm	300 x 150 x 150 mm	325 x 300 x 150 mm	325 x 300 x 150 mm
Timer function	1 min - 99 hrs 59 min	1 min - 99 hrs 59 min	1 min - 99 hrs 59 min	1 min - 99 hrs 59 min

Jacketed Glass Reservoirs

Jacketed glass reservoirs for use with a pump to hold buffer or enzyme solutions. Heated by a water thermocirculator.

For each reservoir added, a tube set is required for incorporation of the reservoir(s) into the thermostatic circuit, with the exception of the 6 L size.

Item No.	Description
73-3440	Jacketed Glass Reservoir for Buffer Solution, with Frit, 2 L
73-3438	Jacketed Glass Reservoir for Buffer Solution, with Frit, 1 L
73-3436	Jacketed Glass Reservoir for Buffer Solution, with Frit, 0.5 L
73-0322	Jacketed Glass Reservoir for Buffer Solution, with Frit, 6 L
73-3496	Jacketed Glass Reservoir for Buffer Solution, with Cover, 100 ml
73-3455	Tube Set for Jacketed Buffer Reservoir
73-3456	Tube Set for Jacketed Buffer Reservoir with Fluid Line Shutoff Valves



DETAILS

These glass reservoirs are for use with a pump. They are heated by a water thermocirculator.

To connect to the thermocirculator, 5 mm ID tubing is necessary. For aeration of perfusate a large gas frit is included. The pump is connected to the longer stainless steel suction tube via a LUER connector and tubing. A return flow can be connected to the short stainless steel tube with the included LUER Slip connector. Pictured tubing connections are included with each reservoir.

Tubing sets must be purchased separately.

ecocool Refrigerated Circulating Baths

Powerful cooling and heating in an eco-friendly bath. Up to 80% energy savings compared to standard compressor units. The two models offered come as complete kits with hosing, clips and connectors.

- Temperature range -20°C to 100°C or -25°C to 150°C (model dependent)
- Active cooling through whole temperature range
- Thermostat and chiller work simultaneously, eliminating the danger of overheating or freezing
- Single front switch for user convenience

Item No.	Description
75-0314	ECOCOOL 150R US 110V THERMOCIRCULATOR
75-0315	ECOCOOL 100R US 110V THERMOCIRCULATOR
75-1653	LABWISE® CONTROL SOFTWARE FOR ECOCOOL 150/TX150/TXF200 THERMOCIRCULATORs, INCLUDES USB & RS232 CABLE

DETAILS

ecocool Refrigerated Circulating Baths

Consisting of two models, both ecocool models are supplied assembled as ready to use kits, complete with accessory hosing, clips and connectors as standard.

- Choice of two models, temperature range -30°C to 150°C (model dependent)
- 3 year warranty
- Active cooling through the whole temperature range
- True energy saving of up to 80% against standard compressor units
- Thermostat and chiller work in harmony, neither will operate alone, eliminating any danger of overheating or freezing
- Single front switch for user convenience
- Modern, sleek, attractive design

Labwise™ control and analysis software

Labwise™ is a powerful and convenient software package for programming, controlling and recording key parameters of the ecocool 150R via a PC.

- Full control of set-up, multi-segment programming and data logging for heating and cooling
- Real-time status windows with graphic display including zooming and scaling
- Operates in combination with Grant Optima™ TX150, TXF200 and ecocool 150R™ series baths and circulators
- Enables easy control of relays and remote switching devices, including multiple segments

SPECIFICATIONS

		ecocool 100R	ecocool 150R
Temperature range	°C	-20 to 100	-30 to 150
Temperature stability	±°C	0.05	0.02
Refrigerant		R290	R290
Flow rate (max)	L/min	17	14 - 22 (adjustable)
Pump pressure (max)	mbar	250	530
Tank volume	L	4.5	5.5
Working Area (d x w)	mm	120 x 150	120 x 150
Min/Max liquid level	mm	105/140	160/190
Calibration points		2	5
Cooling power (typical) W	@ 20°C	250	450
	@ 0°C	200	350
	@ -10°C	100	300
	@ -20°C	50	200

Programs		-	1 x 30 segments via Labwise™
Communication interface		-	USB
Temperature probe socket		-	6 pin mini DIN
Display		4 digit LED	Full colour QVGA TFT
Languages		-	5 (EN, FR, DE, IT, ES)
Timer		1 min to 99 hrs 59 mins	1 min to 99 hrs 59 mins
Temperature presets		3	3
Alarms		High	High and low
Electrical power (max) W	120V/230V	2160/2070 (60/50 Hz)	2280/2760 (60/50 Hz)
Safety		Adjustable over temperature cut-out	Adjustable over temperature cut-out
Ready to use kits		Assembled and supplied with standard tubing, insulation, clips and connectors	Assembled and supplied with standard tubing, insulation, clips and connectors

Cat/Dog Balloons (3.5 to 4.0 kg)

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3487	Cat/Dog Balloons for Isovolumetric Contractile Force Measurements, 3.5 kg, Size 15, pkg of 10
73-3490	Cat/Dog Balloons for Isovolumetric Contractile Force Measurements, 3.5 to 4.0 kg, Size 16, pkg of 10
73-3491	Cat/Dog Balloons for Isovolumetric Contractile Force Measurements, 3.5 to 4.0 kg, Size 17, pkg of 10
73-3492	Cat/Dog Balloons for Isovolumetric Contractile Force Measurements, 3.5 to 4.0 kg, Size 18, pkg of 10
73-3493	Cat/Dog Balloons for Isovolumetric Contractile Force Measurements, 4.0 kg, Size 19, pkg of 10

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3487	73-3490	73-3491	73-3492	73-3493
Balloon Dimensions (D x L) Metric	15 x 20 mm	16 x 22 mm	17.2 x 23 mm	18 x 24 mm	19 x 25 mm
Balloon Size No.	15	16	17	18	19
Balloon Volume **	2.4 ml	3.0 ml	3.5 ml	4.0 ml	5.0 ml
Body Weight (kg)	3.5	3.5 to 4.0	3.5 to 4.0	3.5 to 4.0	4.0
Footnote **	Volume unloaded	Volume unloaded	Volume unloaded	Volume unloaded	Volume unloaded
Package	10	10	10	10	10

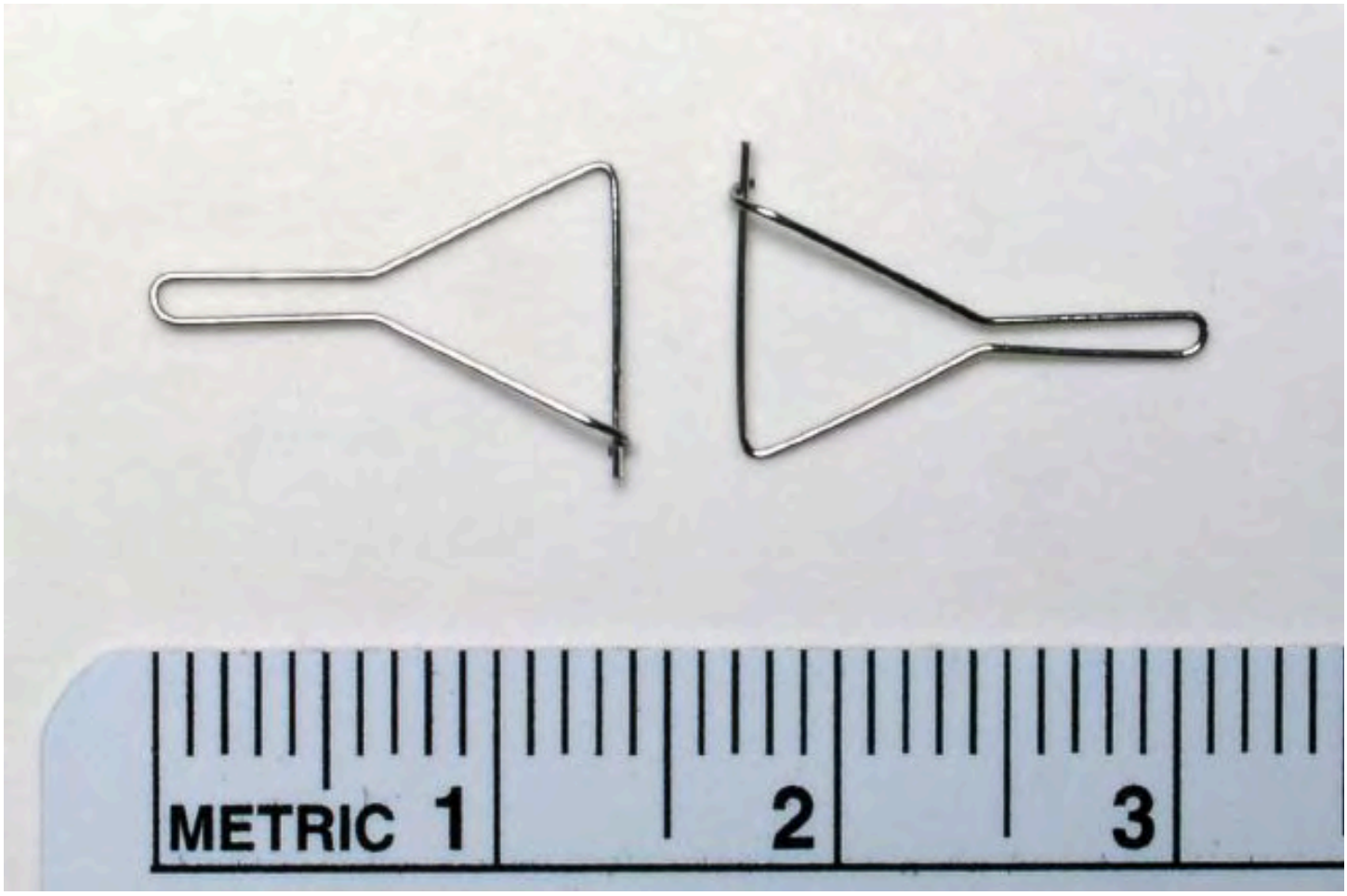
Specifications	73-3487	73-3490	73-3491	73-3492	73-3493
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tis Clips/Tissue Holders
Species	Cat/Dog	Cat/Dog	Cat/Dog	Cat/Dog	Cat/Dog

Holder for Vessel Segments

These Triangular Holders are used for holding vessel segments. One pair is required per vessel segment.

They are constructed from stainless steel wire. The maximum vessel segment length is 8 mm (0.3 in).

Item No.	Description
73-2259	Triangular Holder for Vessel Segments, stainless steel wire, 0.3 mm wire diameter, 1.4 mm clip length, 1 pair



DETAILS

These Triangular Holders are used for holding vessel segments. One pair is required per vessel segment.

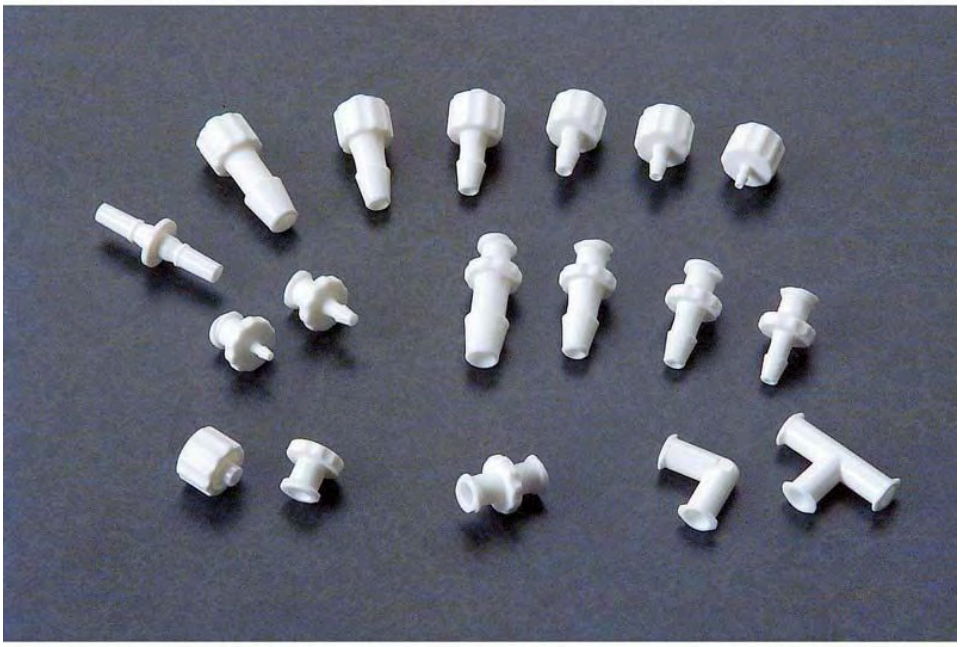
They are constructed from stainless steel wire. The maximum vessel segment length is 8 mm (0.3 in).

Luer to Tube Connector Kits

The Luer Connector Kits contain a selection of Luer fittings to interconnect Luer connectors (e.g. syringes, stopcocks and needles) with one another and with tubing. These kits are available in white nylon (WN), polypropylene (PP) and Kynar® (KY), a chemically resistant autoclavable plastic.

The Male Luer Taper kits contain various MLT fittings to barbed connectors as well as MLT to MLT fittings.

Item No.	Description
72-1406	Luer Connector Kit, White Nylon
72-1407	Luer Connector Kit, Polypropylene
72-1408	Luer Connector Kit, Kynar
72-2739	Male Luer Taper Kit, Polypropylene
72-2740	Male Luer Taper Kit, Polycarbonate



DETAILS

The Luer Connector Kits contain a selection of Luer fittings to interconnect luer connectors (e.g. syringes, stopcocks and needles) with one another and with tubing. These kits are available in white nylon (WN), polypropylene (PP) and Kynar® (KY), a chemically resistant autoclavable plastic.

Fittings include: Luer to Barb, Male Luer Lock (MLL) and Female Luer Lock (FLL) to barbed connector (barb sizes: 1/16, 3/32, 1/8, 5/32, 3/16, 1/4 inch ID). Luer to Luer Connectors: MLT (Male Luer Taper) to MLT, RMLL (Rotating Male Luer Lock) to RMLL, FLL to FLL, FLL to FLL elbow, 3 x FLL 'T' connector, FLL to MLT and both MLL and FLL caps.

The Male Luer Taper kits contain various MLT fittings to barbed connectors as well as MLT to MLT fittings. The kit also contains color coded rotating luer lock rings that securely snap onto the MLT side of each connector.

Each kit is supplied in a convenient box. All kit components are also sold separately with convenient bin reorder part numbers located inside each kit lid. Parts included in each kit are also listed below.

Kit Components

White Nylon Luer Connector Kit (72-1406)
Polypropylene Luer Connector Kit (72-1407)
Kynar® Luer Connection Kit (72-1408)
White Nylon Male Luer Taper Kit (72-2738)
Polypropylene Male Luer Taper Kit (72-2739)
Polycarbonate Male Luer Taper Kit (72-2740)

White Nylon Luer Connector Kit (72-1406)

Item #	Products	Tube ID	Material
72-1406	**White Nylon Luer Connector Kit includes:**		
72-1418	Barbed Connector	FLL to 1/16 in	White Nylon
72-1419	Barbed Connector	FLL to 3/32 in	White Nylon
72-1420	Barbed Connector	FLL to 1/8 in	White Nylon
72-1421	Barbed Connector	FLL to 5/32 in	White Nylon
72-1422	Barbed Connector	FLL to 3/16 in	White Nylon
72-1423	Barbed Connector	FLL to 1/4 in	White Nylon
72-1424	Barbed Connector	MLL to 1/16 in	White Nylon
72-1425	Barbed Connector	MLL to 3/32 in	White Nylon
72-1426	Barbed Connector	MLL to 1/8 in	White Nylon
72-1427	Barbed Connector	MLL to 5/32 in	White Nylon
72-1428	Barbed Connector	MLL to 3/16 in	White Nylon
72-1429	Barbed Connector	MLL to 1/4 in	White Nylon
72-1430	Cap Connector	MLL	White Nylon
72-1431	Cap Connector	FLL	White Nylon
72-2735	Coupler with Threaded FLL Connection	FLL to MLL	White Nylon
72-1433	Connector	MLT to MLT	White Nylon
72-1434	Connector	FLL to FLL	White Nylon
72-1435	Elbow Connector	FLL to FLL	White Nylon
72-1436	T Connector	3-Way FLL	White Nylon

Polypropylene Luer Connector Kit (72-1407)

Item #	Products	Tube ID	Material
72-1407	**Polypropylene Luer Connector Kit includes:**		
72-1437	Barbed Connector	FLL to 1/16 in	Polypropylene

72-1438	Barbed Connector	FLL to 3/32 in	Polypropylene
72-1439	Barbed Connector	FLL to 1/8 in	Polypropylene
72-1440	Barbed Connector	FLL to 5/32 in	Polypropylene
72-1441	Barbed Connector	FLL to 3/16 in	Polypropylene
72-1442	Barbed Connector	FLL to 1/4 in	Polypropylene
72-1443	Barbed Connector	MLL to 1/16 in	Polypropylene
72-1444	Barbed Connector	MLL to 3/32 in	Polypropylene
72-1445	Barbed Connector	MLL to 1/8 in	Polypropylene
72-1446	Barbed Connector	MLL to 5/32 in	Polypropylene
72-1447	Barbed Connector	MLL to 3/16 in	Polypropylene
72-1448	Barbed Connector	MLL to 1/4 in	Polypropylene
72-1449	Cap Connector	MLL	Polypropylene
72-1450	Cap Connector	FLL	Polypropylene
72-2736	Coupler with Threaded FLL Connection	FLL to MLL	Polypropylene
72-1452	Connector	MLT to MLT	Polypropylene
72-1453	Connector	FLL to FLL	Polypropylene
72-1454	Elbow Connector	FLL to FLL	Polypropylene
72-1455	T Connector	3-Way FLL	Polypropylene

Kynar® Luer Connection Kit (72-1408)

Item #	**Products**	**Tube ID**	**Material**
72-1408	**Kynar® Luer Connector Kit includes:**		
72-1456	Barbed Connector	FLL to 1/16 in	Kynar®
72-1457	Barbed Connector	FLL to 3/32 in	Kynar®
72-1458	Barbed Connector	FLL to 1/8 in	Kynar®
72-1462	Barbed Connector	MLL to 1/16 in	Kynar®
72-1464	Barbed Connector	MLL to 1/8 in	Kynar®
72-1465	Barbed Connector	MLL to 5/32 in	Kynar®
72-1466	Barbed Connector	MLL to 3/16 in	Kynar®
72-1467	Barbed Connector	MLL to 1/4 in	Kynar®
72-1468	Cap Connector	MLL	Kynar®

72-1469	Cap Connector	FLL	Kynar®
72-2737	Coupler with Threaded FLL Connection	FLL to MLL	Kynar®
72-1471	Connector	MLT to MLT	Kynar®
72-1472	Connector	FLL to FLL	Kynar®

White Nylon Male Luer Taper Kit (72-2738)

Item #	Products	Tube ID	Material
72-2738	**White Nylon Male Luer Taper Kit includes:**		
72-2731	Snap Luer Lock Ring	Male	Red Nylon
72-2732	Snap Luer Lock Ring	Male	Green Nylon
72-2733	Snap Luer Lock Ring	Male	Polypropylene
72-2695	Barbed Connector (Rotating)	MLT to 1/16 in	White Nylon
72-2696	Barbed Connector (Rotating)	MLT to 3/32 in	White Nylon
72-2741	Luer Coupler	Male	White Nylon
72-2697	Barbed Connector (Rotating)	MLT to 1/8 in	White Nylon
72-2698	Barbed Connector (Rotating)	MLT to 5/32 in	White Nylon
72-2699	Barbed Connector (Rotating)	MLL to 3/16 in	White Nylon
72-2700	Barbed Connector (Rotating)	MLT to 1/4 in	White Nylon
72-2701	Barbed Connector (Stationary)	MLT to 1/16 in	White Nylon
72-2747	T Connector	FLL/MLT/MLT	White Nylon
72-2702	Barbed Connector (Stationary)	MLT to 3/32 in	White Nylon
72-2703	Barbed Connector (Stationary)	MLT to 1/8 in	White Nylon
72-2704	Barbed Connector (Stationary)	MLT to 5/32 in	White Nylon
72-2705	Barbed Connector (Stationary)	MLT to 3/16 in	White Nylon
72-2706	Barbed Connector (Stationary)	MLT to 1/4 in	White Nylon
72-2744	T Connector	FLL/MLT/FLL	White Nylon

Note: Barbed Connectors (Rotating) allow the tube to be rotated on the size specified connector. Barbed Connectors (Stationary) have two stoppers on the size specified connecetor to hold the tube in place.

Polypropylene Male Luer Taper Kit (72-2739)

Item #	Products	Tube ID	Material
72-2739	**Polypropylene Male Luer Taper Kit includes:**		
72-2731	Snap Luer Lock Ring	Male	Red Nylon

72-2732	Snap Luer Lock Ring	Male	Green Nylon
72-2733	Snap Luer Lock Ring	Male	Polypropylene
72-2707	Barbed Connector (Rotating)	MLT to 1/16 in	Polypropylene
72-2708	Barbed Connector (Rotating)	MLT to 3/32 in	Polypropylene
72-2742	Luer Coupler	Male	Polypropylene
72-2709	Barbed Connector (Rotating)	MLT to 1/8 in	Polypropylene
72-2710	Barbed Connector (Rotating)	MLT to 5/32 in	Polypropylene
72-2711	Barbed Connector (Rotating)	MLL to 3/16 in	Polypropylene
72-2712	Barbed Connector (Rotating)	MLT to 1/4 in	Polypropylene
72-2713	Barbed Connector (Stationary)	MLT to 1/16 in	Polypropylene
72-2748	T Connector	FLL/MLT/MLT	Polypropylene
72-2714	Barbed Connector (Stationary)	MLT to 3/32 in	Polypropylene
72-2715	Barbed Connector (Stationary)	MLT to 1/8 in	Polypropylene
72-2716	Barbed Connector (Stationary)	MLT to 5/32 in	Polypropylene
72-2717	Barbed Connector (Stationary)	MLT to 3/16 in	Polypropylene
72-2718	Barbed Connector (Stationary)	MLT to 1/4 in	Polypropylene
72-2745	T Connector	FLL/MLT/FLL	Polypropylene

Note: Barbed Connectors (Rotating) allow the tube to be rotated on the size specified connector. Barbed Connectors (Stationary) have two stoppers on the size specified connector to hold the tube in place.

Polycarbonate Male Luer Taper Kit (72-2740)

Item #	**Products**	**Tube ID**	**Material**
72-2740	**Polycarbonate Male Luer Taper Kit includes:**		
72-2731	Snap Luer Lock Ring	Male	Red Nylon
72-2732	Snap Luer Lock Ring	Male	Green Nylon
72-2734	Snap Luer Lock Ring	Male	Polycarbonate
72-2719	Barbed Connector (Rotating)	MLT to 1/16 in	Polycarbonate
72-2720	Barbed Connector (Rotating)	MLT to 3/32 in	Polycarbonate
72-2743	Luer Coupler	Male	Polycarbonate
72-2721	Barbed Connector (Rotating)	MLT to 1/8 in	Polycarbonate
72-2722	Barbed Connector (Rotating)	MLT to 5/32 in	Polycarbonate
72-2723	Barbed Connector (Rotating)	MLL to 3/16 in	Polycarbonate
72-2724	Barbed Connector (Rotating)	MLT to 1/4 in	Polycarbonate

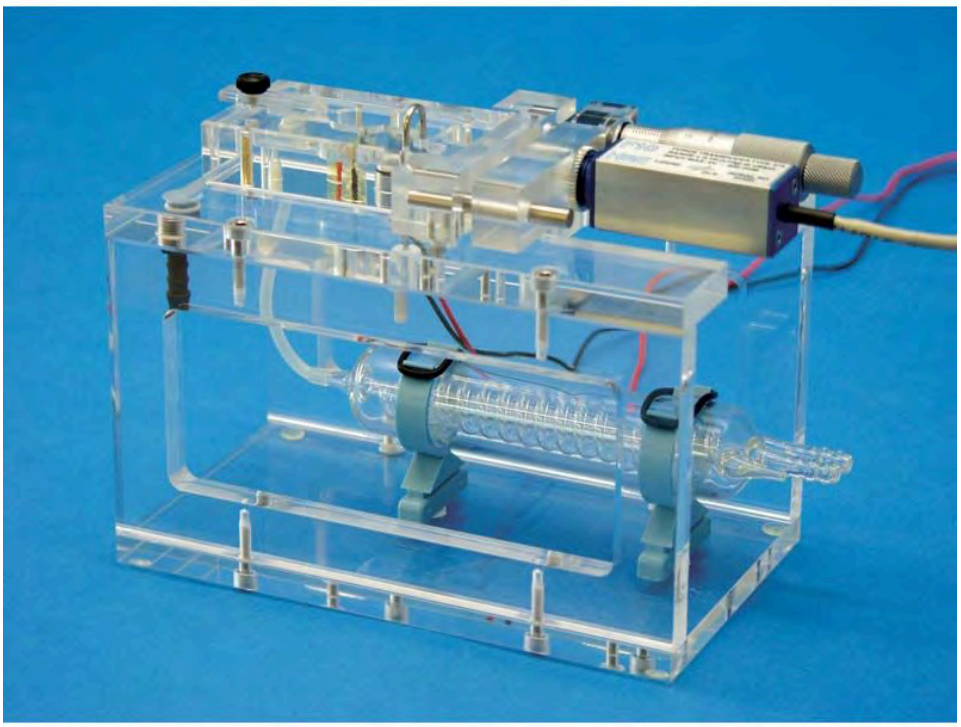
72-2725	Barbed Connector (Stationary)	MLT to 1/16 in	Polycarbonate
72-2749	T Connector	FLL/MLT/MLT	Polycarbonate
72-2726	Barbed Connector (Stationary)	MLT to 3/32 in	Polycarbonate
72-2727	Barbed Connector (Stationary)	MLT to 1/8 in	Polycarbonate
72-2728	Barbed Connector (Stationary)	MLT to 5/32 in	Polycarbonate
72-2729	Barbed Connector (Stationary)	MLT to 3/16 in	Polycarbonate
72-2730	Barbed Connector (Stationary)	MLT to 1/4 in	Polycarbonate
72-2746	T Connector	FLL/MLT/FLL	Polycarbonate

Note: Barbed Connectors (Rotating) allow the tube to be rotated on the size specified connector. Barbed Connectors (Stationary) have two stoppers on the size specified connector to hold the tube in place.

Mayflower Horizontal Tissue Bath System

For isometric contraction force measurements on small muscle preparations (urethra, papillary muscle, cavernous body), vascular rings, or tracheal rings.

Item No.	Description
73-2155	Mayflower Small Volume Horizontal Tissue Bath, Flow Through System
73-3600	Mayflower Small Volume Horizontal Tissue Bath, "Fully Thermostated Bath Top" Incubation System
73-2671	Tissue Holder with Hooks for Small Muscle Preparations for Mayflower Bath, 1 Set
73-3708	Tissue Holder for Mouse Vascular Rings, 0.2 mm Wire Diameter, for Mayflower Tissue Bath, 1 Set
73-3452	Tissue Holder for Mouse Vascular or Tracheal Rings, 0.3 mm Wire Diameter, for Mayflower Bath 1 Set
73-2673	Spring Clip Tissue Holder for Mayflower Bath, 1 Set
73-3087	Platin Field Electrode for Mayflower Tissue Bath and Steiert Tissue Bath, Set of 2 (Option, not included)
73-3474	Jacketed Bath for Mayflower System
73-3016	Distribution Unit for Gas for Mayflower Tissue Bath System, 1 Channel, 2 Needle Valves



DETAILS

The Mayflower Tissue Bath is a horizontal tissue chamber for isometric contraction force measurements on small muscle preparations (urethra, papillary muscle, cavernous body), vascular rings, or tracheal rings. It has an integrated transducer holder for connecting an .

Features & Benefits

- Horizontal tissue bath for isometric contraction measurements using a force transducer (FT20)
- Can be used as a flow-through or closed-loop system

- Possibility of electrical stimulation
- Exchangeable holders depending on tissue used (for vascular or tracheal rings, for strips)

Applications

Contractile force measurements on small muscle preparations (urethra, papillary muscle, cavernous body), vascular rings, or tracheal rings

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Set Up & Operation

The modular concept of this apparatus offers a wide range of different arrangements to meet individual requirements regarding bath geometry, tissue holders and stimulation electrodes. The horizontal arrangement of the tissue and the open top provide ideal conditions for preparation and experimentation.

The various parts of the apparatus are made mainly from Plexiglas or stainless steel and are therefore inert and corrosion-resistant. The solution flows in from a roller pump and passes through a heat exchanger, the outflow is under suction through a suction tube with height adjustment by the same pump. A frit for aeration is located in the tissue chamber. Two connection sockets for the stimulation electrodes are located on either side of the tissue chamber.

Basic Equipment & Available Models

The basic equipment includes a plexiglass (acrylate) support chassis with a movable mounting platform for preload adjustment through a micrometer screw. This platform receives the tissue chamber and acts as holder for the FT20 force transducer. The acrylate support also includes a glass heat exchanger for pre-heating of the perfusate solution. (See image) This acrylate support is included with both the Flow-Through System (73-2155) and the Incubation System (73-3600).

Flow-Through System (73-2155)

Includes support chassis as described above, the tissue standard bath chamber, glass heat exchanger (4 ml) and tissue holder with hooks for strips (73-2671). Maximum bath volume 5 ml, depending on filling height. This is a flow-through bath.

The tissue chamber is carved out of an acrylate block and placed on the support stand. The chamber is completely open at the top and has a small bath volume of 3 to 5 ml. This chamber includes the tissue holder, the connections for electrical stimulation electrodes, a frit for aeration and a draw-off tube with height adjustment to set the bath volume. As it is not jacketed, continuous flow through the chamber is required.

Incubation System (73-3600)

Includes support chassis as described above, the jacketed tissue bath chamber and the tissue holder with hooks for strips (73-2671). Maximum bath volume 5 ml, depending on filling height.

The tissue chamber is jacketed. The bottom of the chamber is made of a Teflon-coated stainless steel plate to optimize the temperature stability of the solution. A additional small stainless steel heat exchanger is also built in to avoid temperature fluctuation. The incubation chamber can also be used as a flow-through superfusion chamber. The superfusion chamber cannot be used for incubation.

Other Components

Electrical Stimulation Electrodes

The stimulation electrodes can be of different types:

- Coaxial electrode for contact stimulation (stainless steel). If point stimulation is required, a Miniature Coaxial Stimulation Electrode is installed using our Mini Ball Joint Positioning System. The electrode can therefore precisely and easily be placed.
- Two-plate electrodes for field stimulation (platinum or Ag/AgCl)
- Flexible platinum wires for direct contact with the tissue

Tissue Holders

Four different tissue holders are available. Tissue holders can be exchanged. The holders consist of two parts, a fixed part positioning the tissue inside the bath and the part transmitting the contractile force to the transducer.

Jacketed Bath

Replacement for non-jacketed standard bath in 73-2155 for incubation applications. Does not require continuous flow through. Included warming coil and aeration frit. Can be equipped with electrodes for field stimulation. Important: Requires the 73-2155 Mayflower mainframe.

Additional Equipment Required

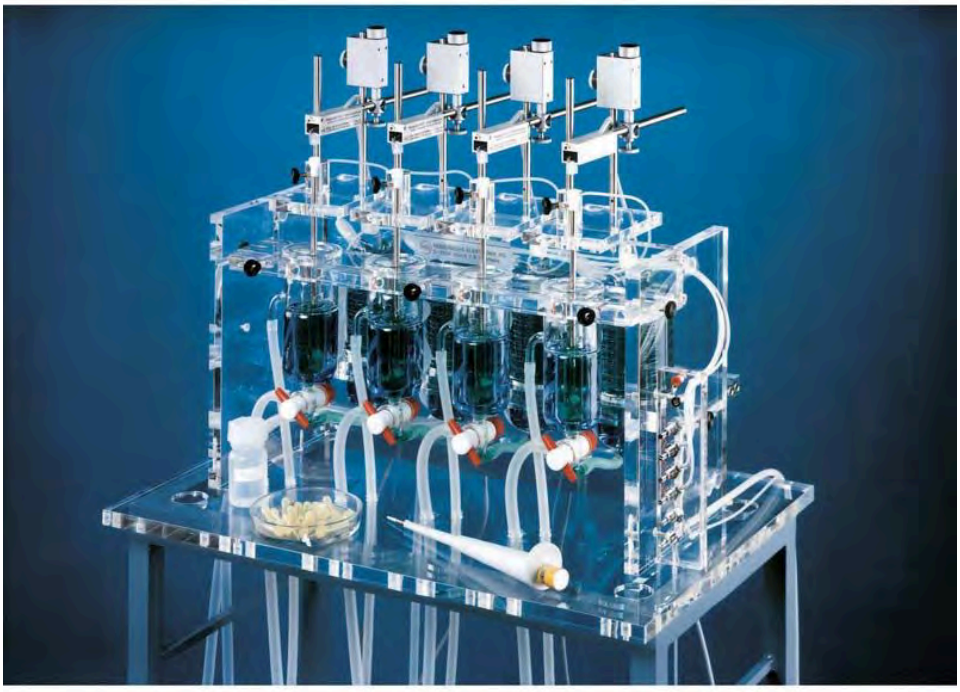
Multi-channel roller pump for the perfusate circuit**,** thermocirculator for keeping the perfusate solution at constant temperature, FT20 Force Tranducer

Note: *The Mayflower Tissue Bath is especially designed for and it is not possible to modify the Transducer Holder to suit other transducer models.*

Schuler Vertical Tissue Bath System

The Schuler tissue bath system is our most advanced and feature rich tissue bath system used for the study of force or displacement from a wide variety of tissue preparations such as: atria, papillary muscle (without potential recording), and skeletal and smooth muscle (intestine, bladder, uterus). Isolated intact blood vessels and nerve-muscle preparation experiments are also possible but require the use of special holders.

Item No.	Description
73-2001	Plexiglass Stand for 4-Position Schuler Organ Bath
73-2193	Heat Exchanger for Schuler Organ Bath



DETAILS

The Schuler tissue bath system is our most advanced and feature-rich tissue bath system used for the study of force or displacement from a wide variety of tissue preparations such as: atria, papillary muscle (without potential recording), and skeletal and smooth muscle (intestine, bladder, uterus). Isolated intact blood vessels and nerve-muscle preparation experiments are also possible but require the use of special holders.

Features & Benefits

- Single or 4-channel tissue bath
- 5, 10, 20 and 50 ml tissue vessels available
- Multiple choice of tissue holder to adapt to any application
- Software for data acquisition and control
- Two flush modes: overflow and drain/refill
- Software for data acquisition
- Wide range of force or displacement transducers available

Applications

- Smooth muscles
- Heart muscles
- Skeletal muscles
- Rings, strips

Design

The rigid construction and ergonomic design of the Schuler Bath allows for rapid tissue mounting and adjustment to minimize tissue drying and hypoxia.Tissue bath volumes of 5, 10, 20 and 50 ml are available along with bath and tissue specific holders. Tissue supports are available for rings, strips andspecialty applications, with or without platinum plate field stimulation electrodes. All tissue holders include an integrated oxygenating frit at the back of the holder to minimize disruption of force and displacement due to bath oxygenation. A selection of force and displacement transducers is available

which are mounted to Vernier positioners. The Vernier micropositioner permits precise adjustment of the preload (pre-stretch) on force transducers,or setting a suitable zero within the range of the displacement transducer.

Please contact technical support for assistance in chosing an appropriate bath and holder for your application.

Set Up & Operation

Positioning of the tissue is greatly simplified by the integrated platform carrying the tissue holder, the micropositioner and the transducer; the platform can be raised so that the tissue holder comes out of the glass vessel to provide ready access to the tissue. The flushing solution is warmed by flow-through heat exchangers mounted on the Plexiglas Base. A central connection for gas addition is provided. Six needle valves provide individual adjustment of the gas flow to the four tissue vessels as well as the handy preparation dish and the solution reservoir.

Electrical Stimulation of isolated tissue requires the use of tissue holders with stimulation electrodes of the appropriate volume and a suitable stimulator which has a separate output for each tissue and also produces stimulus trains for stimulating smooth muscle. The amplitude on each stimulus output should be individually adjustable for each tissue.

System Components

Systems are available as individual components or complete turn-key solutions. Accessories include, tissue preparation dishes, buffer reservoirs, wide range of tissue supports, transducers (force and displacement) amplifiers, multi-channel stand alone or programmable stimulators, thermocirculator and all required tubing and connectors.

Additional Equipment Required

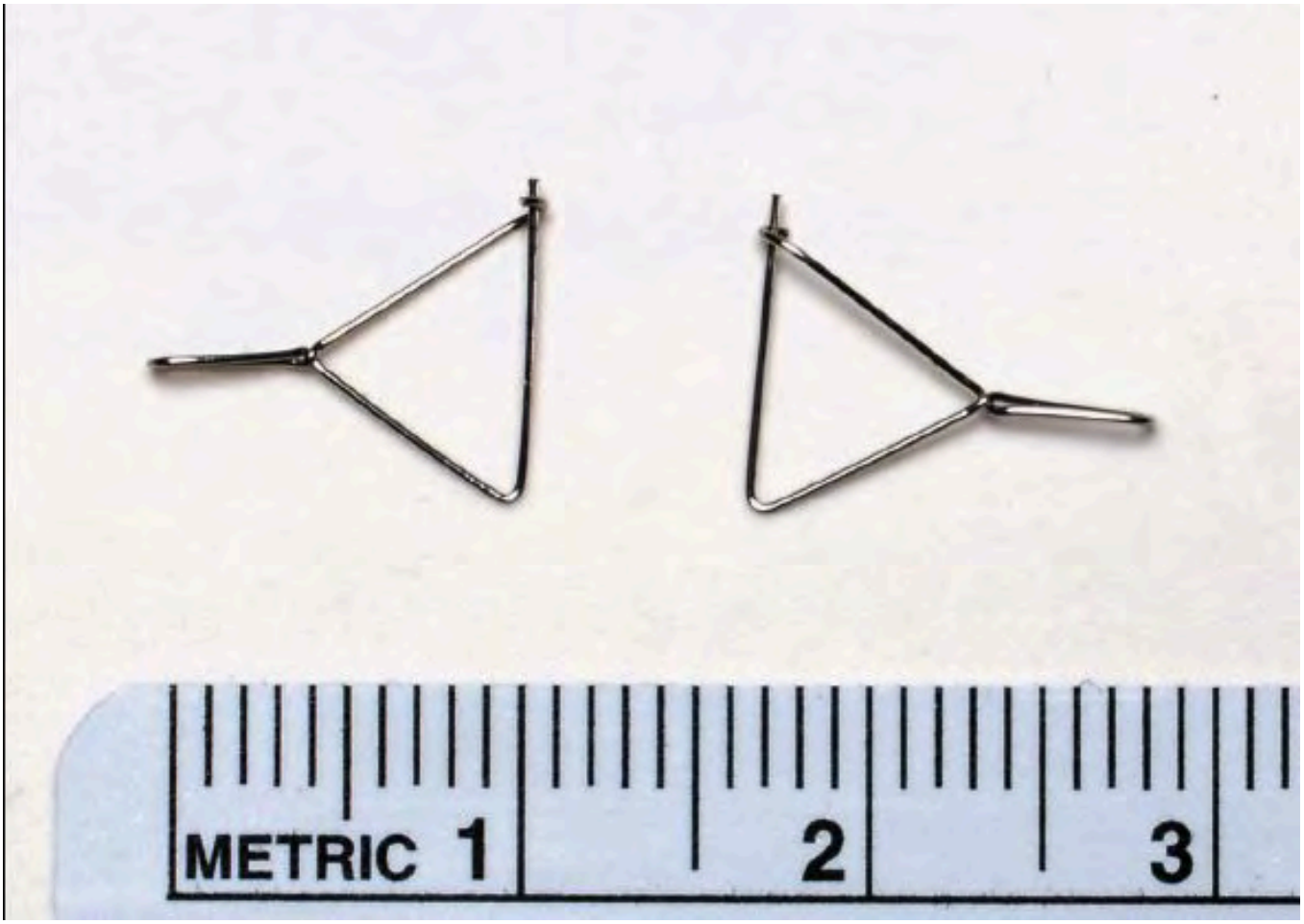
Thermociculator, a reservoir for the solution,transducers, monitoring system setup using the PLUGSYS Amplifier System. The HSE-DAQ Software Package ACAD, is used to record and export force and displacement measurements. Optional software and hardware modules are available for computer-controlled field stimulation, tissue pretension using electronically controlled Vernier positioners and tissue bath flushing. In case of electrical stimulation a multiple output stimulator is required.

Holder for Vessel Segments, Twisted 90 degrees

This triangular holder is used for holding vessel segments. One pair is required per vessel segment. The bottom triangle is twisted to hold the tissue at 90° from top holder.

It is constructed from stainless steel wire which is 0.3 mm in diameter. The maximum vessel segment length is 8 mm (0.3 in).

Item No.	Description
73-3096	Triangular Holder for Vessel Segments, Lower Triangle Twisted by 90°, stainless steel wire, 0.3 mm wire diameter, 1 pair



DETAILS

This triangular holder is used for holding vessel segments. One pair is required per vessel segment. The bottom triangle is twisted to hold the tissue at 90° from top holder.

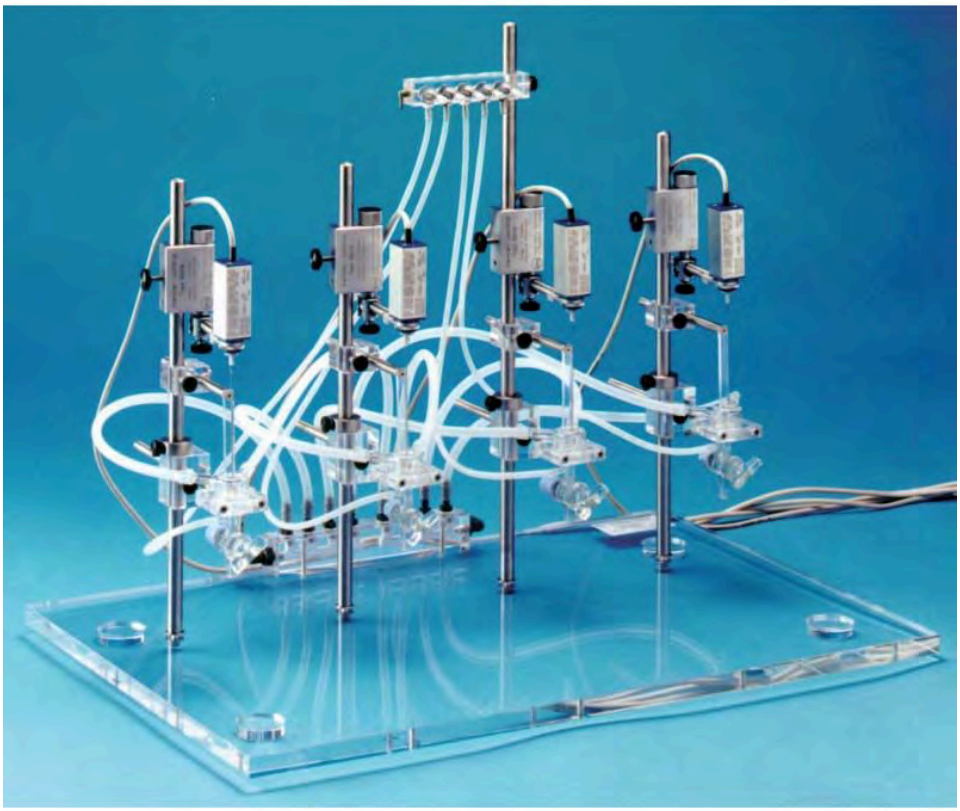
It is constructed from stainless steel wire which is 0.3 mm in diameter. The maximum vessel segment length is 8 mm (0.3 in).

Graz Tissue Bath System

Flexible tissue bath system suitable for many standard pharmacological experiments to measure smooth and skeletal muscle contractions, from small isolated vascular rings to larger tissue vessels and other muscle preparations.

Item No.	Description
73-2369	Graz Tissue Bath Basic Unit, 4-Position
73-2273	Graz Glass Tissue Bath, 2 ml Vessel, Jacketed with Frit and Stopcock, 15 mm ID, 15 mm Deep
73-2275	Graz Glass Tissue Bath, 5 ml Vessel, Jacketed with Frit and Stopcock, 15 mm ID, 33 mm Deep
73-2271	Graz Glass Tissue Bath, 10 ml Vessel, Jacketed with Frit and Stopcock, 20 mm ID, 35 mm Deep
73-2276	Graz Glass Tissue Bath, 20 ml Vessel, Jacketed with Frit and Stopcock, 20 mm ID, 68 mm Deep
73-0561	Holder for 2 or 5 ml Graz Glass Tissue Bath
73-0560	Holder for 10 or 20 ml Graz Glass Tissue Bath
73-3532	Core Tissue Holder with Field Stimulation Electrodes for 2 or 5 ml Graz Tissue Bath
73-3533	Core Tissue Holder with Field Stimulation Electrodes for 10 or 20 ml Graz Tissue Bath
73-3531	Core Tissue Holder without Electrical Stimulation for Graz Tissue Bath
73-0559	Mounting Material for Graz Tissue Vessel and Tissue Holder

Item No.	Description
73-3534	Support Set for Muscle Strips to Graz Core Tissue Holder, Wire Diameter 0.5 mm
73-3537	Support Set for Vessel or Tracheal Rings to Graz Core Tissue Holder, Wire Diameter 0.3 mm (Max Ring Length 6 mm)
73-3535	Support Set for Vessel or Tracheal Rings to Graz Core Tissue Holder, Wire Diameter 0.5 mm (Max Ring Length 11 mm)
73-3536	Support Set for Vessel or Tracheal Rings to Graz Core Tissue Holder, Wire Diameter 0.5 mm (Max Ring Length 6 mm)
73-2117	Gas Distribution Block for Bubbling for Graz Tissue Bath and Others



DETAILS

The flexible Graz Tissue Bath System can be used for many standard pharmacological experiments to measure smooth and skeletal muscle contractions. The muscle contractions produced can be measured either as forces (isometrically) or as displacements (isotonically).

Features & Benefits

- Simple, clear, 4-channel arrangement or single bath unit
- Rigid, stable construction—essential for measuring small contraction forces
- Contractions can be measured isometrically or isotonically
- Interchangeable tissue baths: 2, 5, 10 or 20 ml
- Experiments with minimum test substance quantities are possible using small tissue vessels
- Adaptable to different tissue preparations using suitable type of tissue support
- Tissue holders with integral field stimulating electrode available
- Simple to operate, easy to clean

Applications

- Suitable for most standard pharmacological experiments
- Designed for vascular rings but suitable for most standard pharmacological experiments
- Permits experiments on smooth muscle, cardiac (atria), skeletal muscles preparations, vascular rings

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This apparatus was developed for experiments on small isolated vascular rings (1 to 2 mm diameter) with special attention to a low incubation volume of the medium.The smallest tissue bath available has a volume of 2 ml. Larger tissue baths of 5, 10 or 20 ml are available for larger vessels and other muscle preparations. These baths can also be used for experiments on papillary muscle or isolated atria (e.g. guinea-pig), with provision for electrical stimulation.

All systems are comprised of a basic unit plus selected tissue baths (2 ml to 20 ml), tissue holders and tissue supports are mounted on the rods of the basic unit. System components are described below:

System Components

Basic Unit: Plexiglass plate with four vertical rods for mounting, including distribution block for connecting thermostatic circulator. Dimensions: 40 x 60 x 35 cm

Tissue Baths (Vessels): jacketed, 2, 5, 10, or 20 ml with frit and stop cock for flushing**.** The perfusion solution is aerated by glass frits fused into the vessel bottom. A needle valves is provided for each tissue vessel to permit accurate adjustment of the gas flow.

Tissue Supports: comprised of (1) core tissue holders (with or without field stimulation electrodes) and (2) tissue support sets.

- **Core Tissue Holder**: two types of core holder are available with or without field stimulation electrodes. The field stimulation electrodes are two parallel platinum plates of 15 x 5 mm separated by 11 mm for the 10 or 20 ml tissue vessels or 12 x 5 mm and separated by 6 mm for the 2 and 5 ml glassware.
- **Support Set:** consists of the anchor for the tissue, mounted on the core holder and the connecting wire to the transducer. The anchors can be easily interchanged to adapt to the current experiment.
  - Support set for muscle strips (see Fig. 1), hook, connection wire from muscle strip to force transducer,wire diameter 0.5 mm
  - Support set for vessel and tracheal rings (see Fig 2), including connection wire from tissue to force transducer, wire diameter 0.3 mm fixed pin length 6 mm for very small vessels.Support set for vessel and tracheal rings including connection wire from tissue to force transducer,with 0.5 mm diameter fixed pin length 11 mm. (Can only be used with 10 or 20 ml vessels and cannot be used with core support with electrical stimulation).
- **Mounting Material:** block clamps (for 1 position) and stopper ring
- **Gas Distribution Block**: includes five needle valves for exact adjustment of gas flow

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Additional Equipment Required

Thermociculator, a reservoir for the solution, isometric force or displacement transducer*, monitoring system setup using the PLUGSYS Amplifier System, Recording and Evaluation of the signals using ACAD software, in case of electrical stimulation a multiple output stimulator is required

**For contraction force*: *isometric force transducers, or or force displacement transducers are suitable. For displacement measurements*: .*

SPECIFICATIONS

Graz Tissue Bath Port Sizes & Recommended Tubing

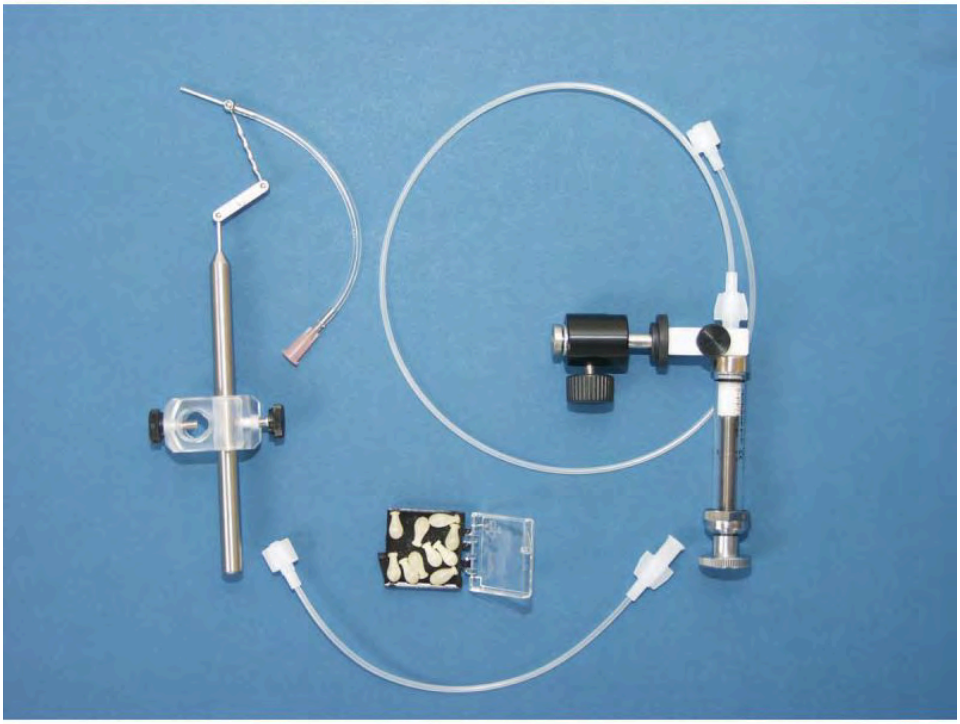
Bath Size	Gas Inlet OD	WJ Port OD	Drain Port OD
2	0.157"	0.265"	0.33"
5	0.157"	0.265"	0.33"
10	0.157"	0.265"	0.33"
20	0.157"	0.265"	0.33"
Fractional Equivalent	5/32"	9/32"	11/32"

Rec. Tubing Size	Tygon R-3603	Silicone	Silicone
Cat. #	72-1021	72-1086	72-1091

Rat/Guinea Pig Universal Left Ventricular Pressure (LVP) Kits with Mini Ball Joint Holders

This kit includes a ball-joint holder, LL2-IHSR, 10 balloons No. 5 (0.1 ml), blunt Luer cannula, plexiglass block clamp and bar with ball, spindle syringe with LECTROCATH catheter for sensitive filling of balloons to adjust end diastolic preload (balloon pressure), including holder with ball joints for spindle syringe.

Item No.	Description
73-3560	Universal Balloon Kit V.2 for Rat/Guinea Pig Hearts



DETAILS

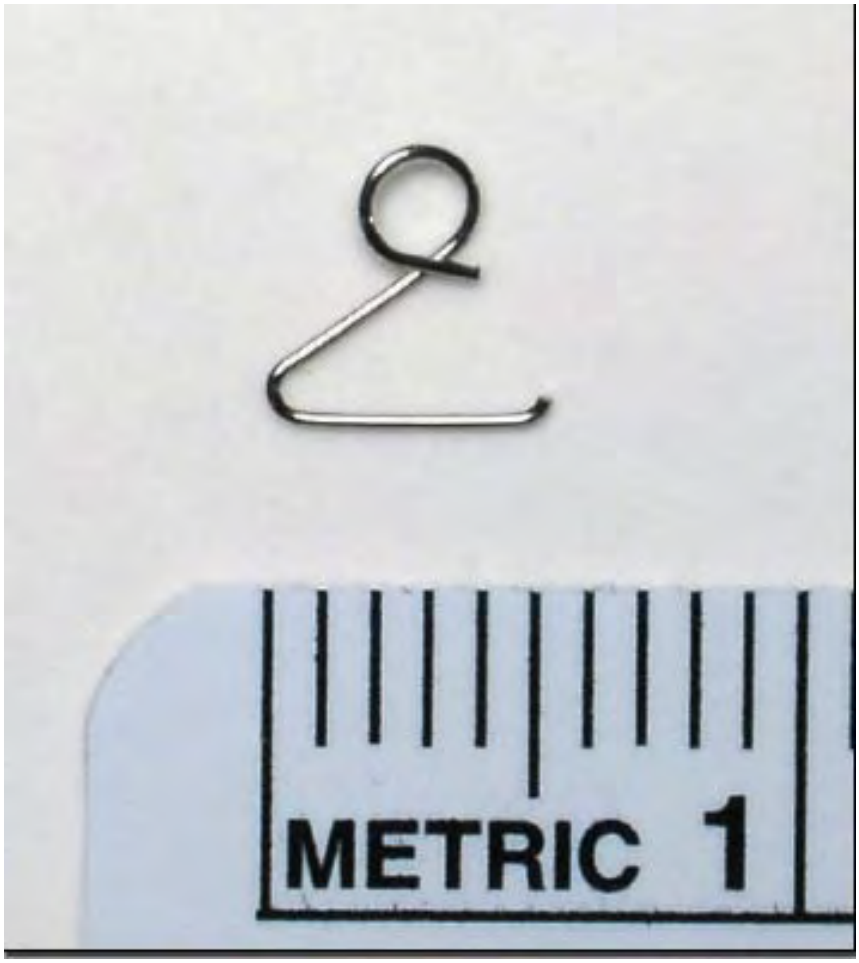
This kit includes a ball-joint holder, LL2-IHSR, 10 balloons No. 5 (0.1 ml), blunt Luer cannula, plexiglass block clamp and bar with ball, spindle syringe with LECTROCATH catheter for sensitive filling of balloons to adjust end diastolic preload (balloon pressure), including holder with ball joints for spindle syringe.

Triangular Hooks

These Triangular Hooks are used to support tissue rings for cylindrical vessel segments and tracheal rings. They are constructed from stainless steel wire which is 0.3 mm in diameter.

- Three sizes available for tissue rings
- Ideal for cylindrical vessel segments and tracheal rings
- Holder for vessel segments up to 8 mm (0.3 in) in length

Item No.	Description
73-2257	Triangular Hook Size 0, Hook Width 5.0 mm, Height 5.4 mm, Loop 2.0 mm
73-2249	Triangular Hook Size 1, Hook Width 8.0 mm, Height 9.0 mm, Loop 2.5 mm
73-2258	Triangular Hook Size 2, Hook Width 12.0 mm, Height 11.0 mm, Loop 3.0 mm



DETAILS

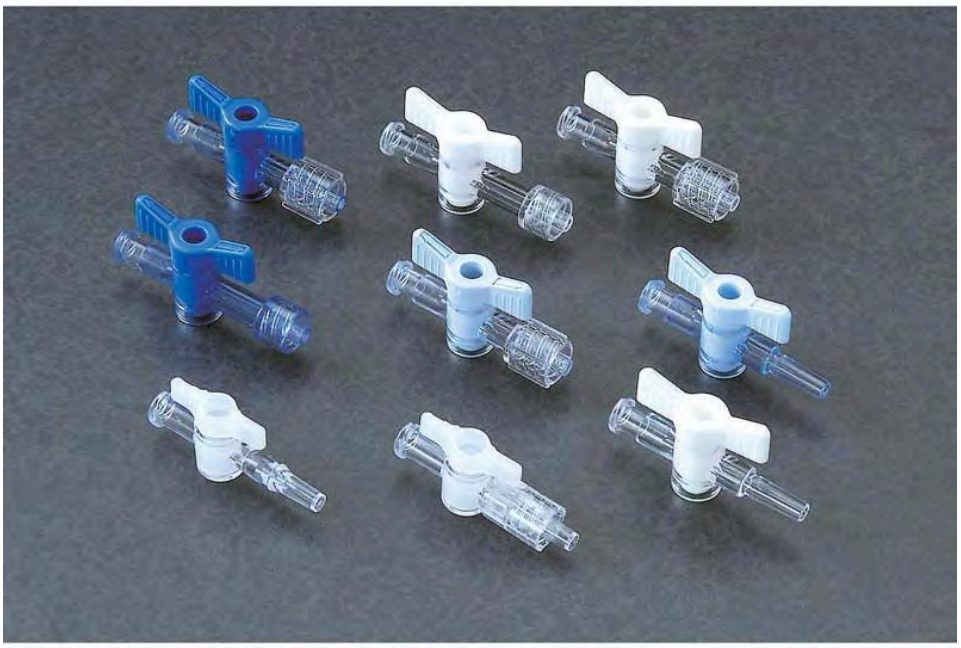
These Triangular Hooks are used to support tissue rings for cylindrical vessel segments and tracheal rings. They are constructed from stainless steel wire which is 0.3 mm in diameter.

- Three sizes available for tissue rings
- Ideal for cylindrical vessel segments and tracheal rings
- Holder for vessel segments up to 8 mm (0.3 in) in length

Luer Stopcock Kit

This kit includes a collection of 1-, 3- and 4-way stopcocks. Fittings include MLL (male luer lock), FLL (female luer lock), MLT (male luer taper) and barbed tubing connectors. Some stopcocks have high pressure capabilities. This kit is supplied in a convenient box. Kit components are also sold individually.

Item No.	Description
72-1664	Luer Stopcock Kit



DETAILS

This kit includes a collection of 1-, 3- and 4-way stopcocks. Fittings include MLL (male luer lock), FLL (female luer lock), MLT (male luer taper) and barbed tubing connectors. Some stopcocks have high pressure capabilities. This kit is supplied in a convenient box. Kit components are also sold individually.

Luer Stopcock Kit (72-1664)

Item #	**Product**
72-1664	**Luer Stopcock Kit includes:**
72-8327	1-Way Stopcock (200 psi), FLL/Male Luer Slip
72-2647	1-Way Stopcock (500 psi), FLL/MLL (Non-Rotating)
72-2648	3-Way Stopcock (1050 psi), FLL/FLL/MLL (Rotating)
72-2650	1-Way Stopcock (1050 psi), FLL/MLL (Non-Rotating)
72-8326	1-Way Stopcock (200 psi), FLL/MLL (Rotating)
72-8335	4-Way Stopcock, FLL/FLL/Male Luer Slip
72-2693	3-Way Stopcock (200 psi), FLL/Male Luer Slip
72-2654	4-Way Stopcock, FLL/FLL/MLL (Rotating)
72-2655	1-Way Stopcock (1050 psi), FLL/MLL (Rotating)
72-2656	3-Way Stopcock, FLL/FLL/MLL (Rotating)
72-2657	1-Way Stopcock (500 psi), FLL/MLL (Rotating)
72-2658	3-Way Stopcock (1050 psi), FLL/FLL/MLL (Non-Rotating)
72-2659	3-Way Stopcock, FLL/FLL/FLL
72-2660	3-Way Stopcock (500 psi), FLL/FLL/MLL (Non-Rotating)
72-2661	4-Way Stopcock, FLL/FLL/MLL (Rotating)
72-2662	3-Way Stopcock (200 psi), FLL/FLL/MLL (Rotating)
72-2663	1-Way Stopcock, FLL/MLL (Rotating)
72-9473	3-Way Stopcock (130 psi), FLL/FLL/MLL (Non-Rotating)

Stainless Steel Catheters Used in Measuring Left Ventricular Pressure (LVP) by Isovolumetric Contractile Force

These stainless steel catheters are used in measuring left ventricular pressure (LVP) by the isovolumetric contractile force method. Each catheter ends in a metal luer hub for easy connection to the pressure transducer. The balloon end of the catheter has several scored marks for catching the suture, preventing the balloon from slipping off the catheter. These catheters can be sterilized.

Item No.	Description
73-0183	Stainless Steel Catheter for measuring Left Ventricular Pressure (LVP) by Isovolumetric Contractile Force, Balloon Size 3 or 4
73-0184	Stainless Steel Catheter for measuring Left Ventricular Pressure (LVP) by Isovolumetric Contractile Force, Balloon Size 5 to 10
73-2897	Stainless Steel Catheter for measuring Left Ventricular Pressure (LVP) by Isovolumetric Contractile Force,Balloon Size 12 to 18
73-2898	Stainless Steel Catheter for measuring Left Ventricular Pressure (LVP) by Isovolumetric Contractile Force,Balloon Size 19 to 30

DETAILS

These stainless steel catheters are used in measuring left ventricular pressure (LVP) by the isovolumetric contractile force method. Each catheter ends in a metal luer hub for easy connection to the pressure transducer. The balloon end of the catheter has several scored marks for catching the suture, preventing the balloon from slipping off the catheter. These catheters can be sterilized.

SPECIFICATIONS

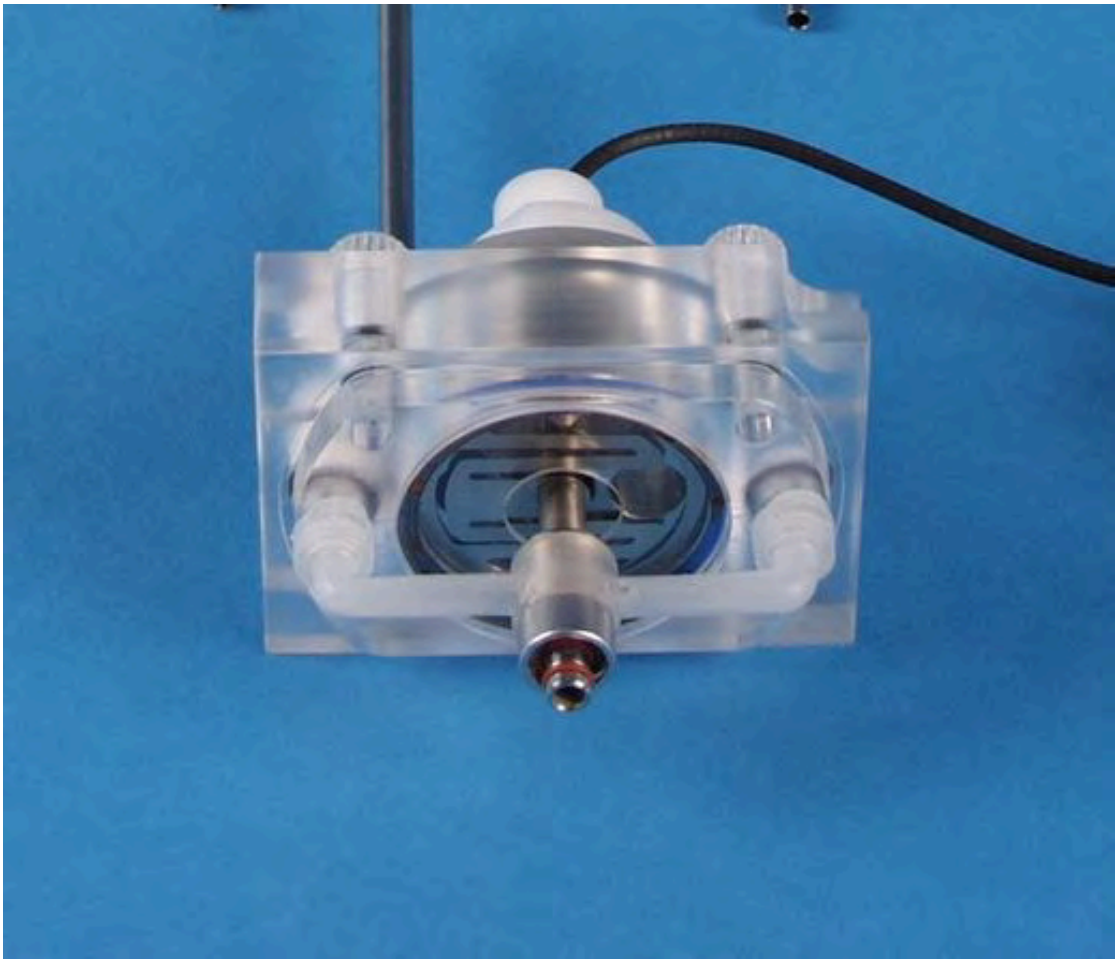
Specifications	**73-0183**	**73-0184**	**73-2897**	**73-2898**
For Balloon	Size 3 or 4	Size 5 to 10	Size 12 to 18	Size 19 to 30
Package	1	1	1	1
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders

Lung Weight Measurement (Edema Balance) Option for IPL-2 or IPL-4

The weight measurement-edema balance option can be added to an IPL-2 or IPL-4 core system for mouse, rat, guinea pig or rabbit lungs. It requires the the 73-4626 PLUGSYS EdemaBalance Module (EBM), which includes the sensor.

- Continuously monitor and measure edema formation over time.
- Raw data is weight; calculated value is weight change over time (dW/dT).
- Assess vascular permeability by calculating the filtration coefficient derived from weight changes induced by increasing and decreasing perfusion pressure.
- Range of ±10 or ±22 g; displacement 23 m/gm.
- Measure changes of less than 20 mg.

Item No.	Description
73-4626	EBM Edema Balance Module (EBM) with Sensor
73-4604	HSE Weight Measurement System V.2 without Sensor for IPL-2, Range 0 to 22 g, Rat or Guinea Pig Lungs
73-4710	HSE Weight Measurement System V.2 without Sensor for IPL-2, Range 0 to 10 g, for Mouse Lungs
73-4709	HSE Weight Measurement System V.2 without Sensor for IPL-4, Range 0 to 80 g, for Rabbit Lungs



DETAILS

The weight measurement-edema balance option can be added to an IPL-2 or IPL-4 core system for mouse, rat, guinea pig or rabbit lungs. It requires the the 73-4626 PLUGSYS EdemaBalance Module (EBM), which includes the sensor.

- Continuously monitor and measure edema formation over time.
- Raw data is weight; calculated value is weight change over time (dW/dT).
- Assess vascular permeability by calculating the filtration coefficient derived from weight changes induced by increasing and decreasing perfusion pressure.
- Range of ±10 or ±22 g; displacement 23 m/gm.
- Measure changes of less than 20 mg.

Includes: HSE Weight Measurement Transducer integrated into an alternativelung chamber cover (lid). EBM module must be purchased separately.

SPECIFICATIONS

	73-4604	73-4710	73-4709
Measurement Range	0 to 22 g	0 to 10 g	0 to 80 g
Resolution	20 mg	20 mg	

Lab Stand with Rectangular Base Plate

Rugged laboratory stand with stainless steel upright rod and heavy rectangular base plate. The stainless steel rod is mounted at one end of the base. It is threaded and may be removed if desired.

Item No.	Description
73-0499	Lab Stand with Rectangular Base Plate, 12 mm Rod Length

DETAILS

Rugged laboratory stand with stainless steel upright rod and heavy rectangular base plate is useful for many applications. The stainless steel rod is mounted at one end of the base. It is threaded and may

be removed if desired.

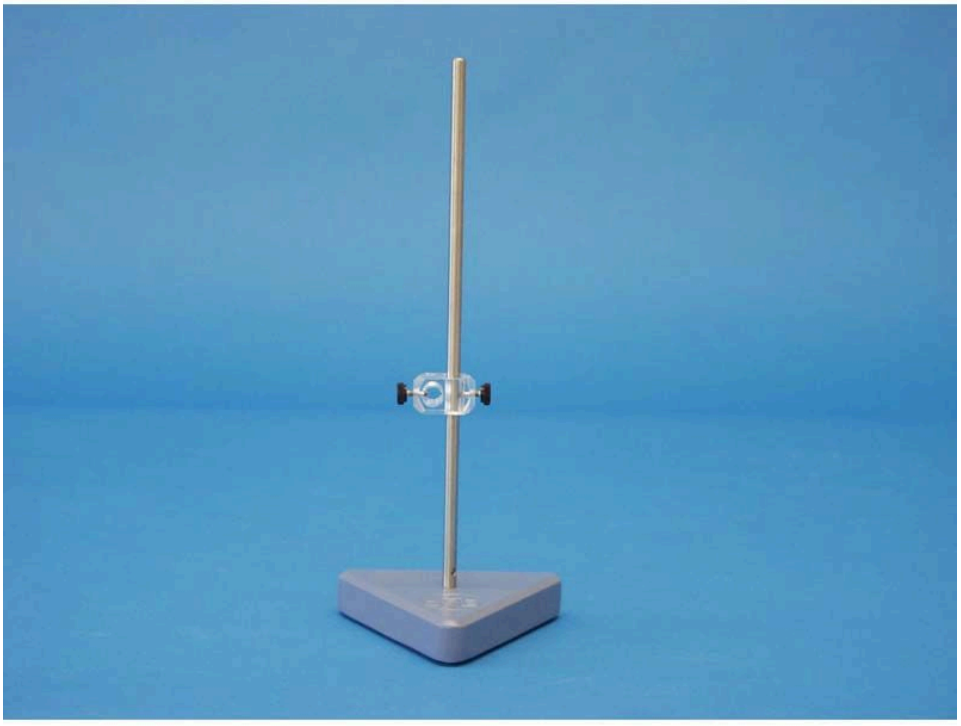
SPECIFICATIONS

Specifications	73-0499
Base Plate Dimensions (H x W x L)	15 x 15 x 4 cm (5.9 x 5.9 x 1.6 in)
Rod Diameter	12 mm (0.5 in)
Rod Length	51 cm (20 in)
Rod Length Metric	
Weight	6.75 kg (14.9 lb)

Lab Stand with Triangular Base Plate

Rugged laboratory stand with stainless steel upright rod and triangular base plate

Item No.	Description
73-0500	Lab Stand with Triangular Base Plate, 30 cm Rod Length (one block clamp included)
73-4140	Lab Stand with Triangular Base Plate, 160 mm Rod Length, (one block clamp included)
73-0566	Plexiglass Block Clamp for mounting 73-0562 Bar onto Lab Stand



DETAILS

This rugged laboratory stand with stainless steel upright rod and triangular base plate is useful for many applications. The stainless steel rod is mounted at the center of the base. It is threaded and may be removed if desired.

A useful Acrylate Block Clamp is supplied with the base. Additional Clamps may be purchased separately. The Clamp has large thumbscrews that allow for easy tightening of the clamp in the desired location.

Aerosol Nebulizer

The Aerosol Nebulizer is a jet nebulizer ideal for nebulizing drugs sensitive to ultrasonic cavitation and higher temperatures.

- Low particle sizes (100% of the nebulized particles are below 10 µm on fluids with a viscosity like a saline solution)
- No solution warming required
- Aerosol is automatically transported by compressed air
- Connecting block required to attach Nebulizer to HSE-HA single/double chamber plethysmograph or mouse plethysmograph
- Multigas Inlet Adapter (73-2919) required for use with MicroVent, MiniVent or MidiVent
- Available with Multi-Gas Adapter Kit for Chamber/Box use

Item No.	Description
73-1963	Aerosol Nebulizer
73-3433	Aerosol Nebulizer with Multi-Gas Adapter Kit and stand to use with Chamber/Box Use
73-2919	Multi-Gas Inlet Adapter and stand to connect Aerosol Nebulizer and MicroVent, MiniVent or MidiVent
73-3300	Aerosol Nebulizer Connection Kit for Pressure Regulator (1.5 to 2 bar, 22 to 30 PSI). Includes quick connector (shut off) and 2m pressure tube (ID 2mm, OD 3mm)

DETAILS

The Aerosol Nebulizer is a jet nebulizer ideal for nebulizing drugs sensitive to ultrasonic cavitation and higher temperatures.

- Low particle sizes (100% of the nebulized particles are below 10 µm on fluids with a viscosity like a saline solution)
- No solution warming required
- Aerosol is automatically transported by compressed air
- Connecting block required to attach Nebulizer to HSE-HA single/double chamber plethysmograph or mouse plethysmograph
- Multigas Inlet Adapter (73-2919) required for use with MicroVent, MiniVent, or MidiVent
- Available with Multi-Gas Adapter Kit for Chamber/Box use

This aerosol jet nebulizer requires an operating pressure of approximately 1.5 bar (22 psi) from a compressed air source. All of the particles generated by the jet nebulizer are 10 µm or less in size with 60% of the particles being 2.5 µm or less. A special connecting block is used to attach the nebulizer to the HSE-HA single and double chamber plethysmographs and are configured in a number of respiratory mechanics applications.

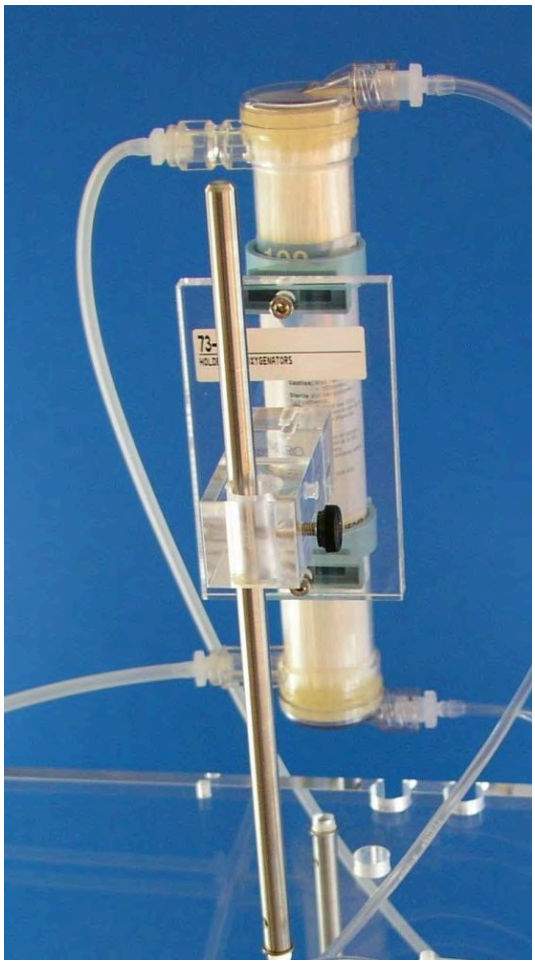
SPECIFICATIONS

Particle Size, µm	% Nebulized		Particle Size Range in Band, µm	% of Total Particles in Band
10.5	100		13.6 to 10.5	0
8.19	99.7		10.5 to 8.19	0.2
6.37	98.0		8.19 to 6.37	1.7
4.97	92.2		6.37 to 4.97	5.8
3.88	80.9		4.97 to 3.88	11.3
3.04	68.3		3.88 to 3.04	12.6
2.40	61.5		3.04 to 2.40	6.8
1.90	57.7		2.40 to 1.90	3.8
1.52	54.5		1.90 to 1.52	3.2
1.22	52.0		1.52 to 1.22	2.5

Oxygenating System Options for IH-SR, IH-5 and UP-100IH (for Foaming Solutions)

Choose this option if you are using buffer supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives.

Item No.	Description
73-4449	Oxygenating System Option for IH-SR and UP-100IH
73-5024	Oxygenating System Option for IH-5



DETAILS

Choose this option if you are using buffer supplemented with albumin, fatty acids, washed erythrocytes, or other foaming additives that result in foaming solutions.

For adapting the fiber oxygenator type for use with the IH-SR, IH-5 or UP-100IH. An R120144 glass oxygenator (73-2042) can also use used.

Features of Fiber Oxygenators

- MediSulfone membrane material
- Priming volume 18 ml (D150) or 49 ml (DP07HE)
- Active oxygenating surface area 0.22 m^2 (D150) or 0.7 m^2 (DP07HE)
- Can be used 3 to 10 times

Options:

Oxygenating System for IH-SR and UP-100IH (73-4449) includes:	Oxygenating System for IH-5 (73-5024) includes:
Fiber Oxygenator Type D150, pkg. of 5	Fiber Oxygenator Type DP07HE, pkg. of 5
Holder for Oxygenators	Holder for Oxygenators
Mounting Kit for D150 Fiber Oxygenator	Mounting Kit for DP07HE Fiber Oxygenator
Connection Kit for D150 or DP07HE Fiber Oxygenator (containing five sets of tubing connectors)	Connection Kit for D150 or DP07HE Fiber Oxygenator (containing five sets of tubing connectors)

Perfusate Filtration Option for All Isolated Organ Systems

This option (73-4423) enables filtration of recirculated perfusate in any isolated organ system.

Includes:

- In-line holder for disc particle filter (73-2091), diameter = 47 mm
- Polypropylene particle filter, 45 µm (73-2093), diameter = 47 mm (pack of 100)

Replacement inline holder, 45 µm particle filters are available. Other filter types and sizes are also available. (See Item Listing.)

Item No.	Description
73-4423	Addition of Filtration of Recirculated Perfusate (All Isolated Organ Systems)
73-2091	Inline Holder for Disc Particle Filters, D = 47 mm
73-2093	Polypropylene Particle Filters, 45 µm, D = 47 mm, pkg. of 100
73-2047	Polypropylene Particle Filters, 25 µm, D = 47 mm, pkg. of 100
73-4956	Nylon Particle Filters, 10 µm, D = 47 mm, pkg. of 100

DETAILS

This option (73-4423) enables filtration of recirculated perfusate in any isolated organ system. Includes:

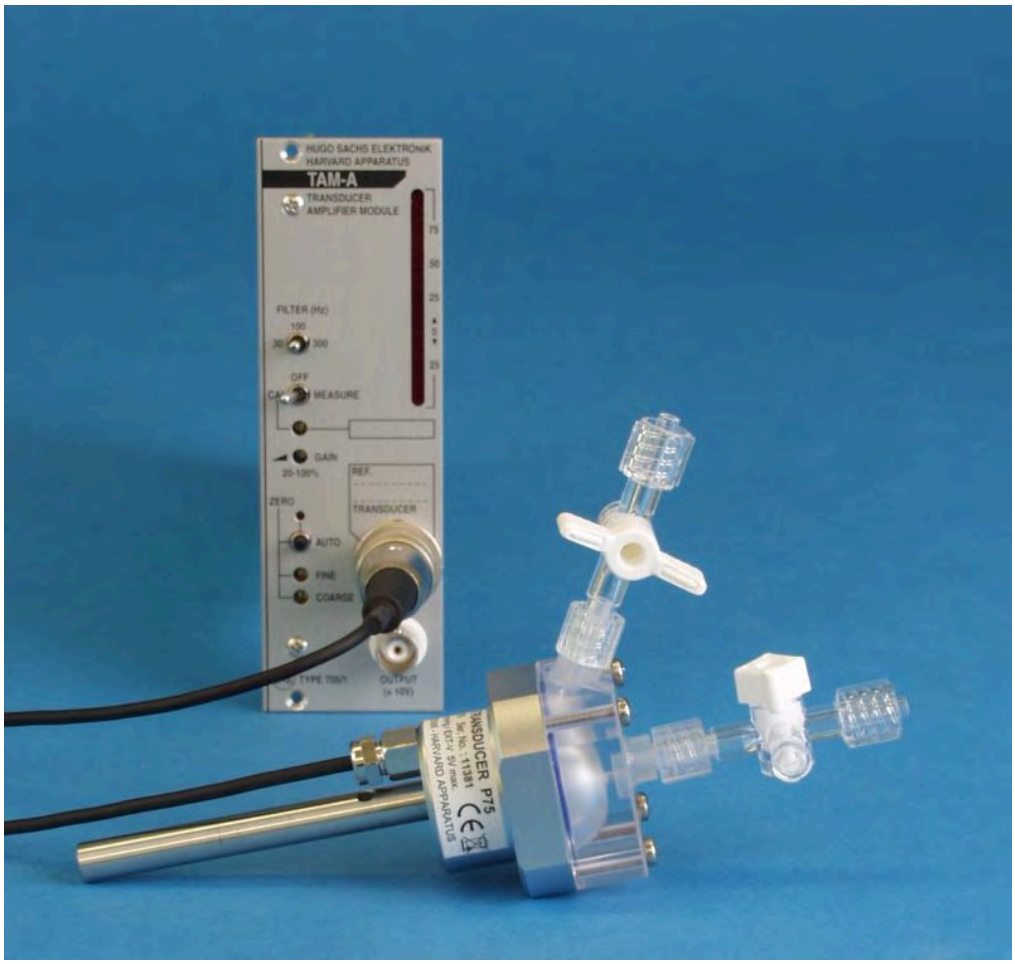
- In-line holder for disc particle filter (73-2091), diameter = 47 mm
- Polypropylene particle filter, 45 µm (73-2093), diameter = 47 mm (pack of 100)

Replacement inline holder, 45 µm particle filters are available. Other filter types and sizes are also available. (See Item Listing.)

Venous Pressure Measurement Option for all IPL Systems

This option provides a venous pressure transducer and amplifier for venous pressure measurement in an isolated perfused lung system. Amplifier module requires suitable PLUGSYS housing.

Item No.	Description
73-4295	Venous Pressure Measurement Option for all IPL Systems



DETAILS

This option provides a venous pressure transducer and amplifier for venous pressure measurement in an isolated perfused lung system. Amplifier module requires suitable PLUGSYS housing.

Included Items

Item #	Product Name
	P75 Blood Pressure Transducer
	PLUGSYS Transducer Amplifier Module (TAM-A)
73-0566	Perspex Block Clamp
N/A	Suitable tubing and T-piece to connect P75 to venous outflow tubing

Harvard Apparatus Peristaltic Pump P-70

TheHarvard Apparatus Peristaltic Pump P-70 offers unparalleled accuracy, reproducibility, and ease of use. P-70 drive provides flow rates from 0.001 to 70 ml/min

The Harvard Apparatus Peristaltic Pump consists of a control unit, a motor drive, a tubing cassette and some sample tubing.

Other benefits include:

- The ability to separate the motor drive from the controller to facilitate use and save space in incubators and fume hoods
- A library of tubing sizes is stored in the pump's memory minimizing set up time
- Custom tubing can be used allowing complete flexibility
- A full range of interchangeable motor drives to allow for economical ease of use over a broad flow rate range.

A complete range of programmable functions allow the pump to be easily adapted to a wide range of dispensing applications. The pump has pre-programmed flow profiles for:

- Constant Flow
- Flow Ramps
- Pulsatile Flow
- Concentration Based Fluid Delivery

Item No.	Description
70-7000	Harvard Apparatus Peristaltic Pump P-70 (Complete System; Control Box & P-70 Motor Drive)
70-7003	Replacement P-70 Motor Drive, 8 Rollers, 5 Channels
72-0604	Replacement Cartridge/Cassette for P-70
70-7006	Replacement Standard Control Box for P Series Motor Drives

DETAILS

TheHarvard Apparatus Peristaltic Pump P-70 offers unparalleled accuracy, reproducibility, and ease of use. P-70 drive provides flow rates from 0.001 to 70 ml/min

Features

- LCD color touch screen with intuitive icon interface for unparalleled ease-of-use
- Remote design ideal for work inside incubators and fume hoods
- Interchangeable pump heads
- A library of tubing sizes stored in the pump's memory minimizes setup time
- Custom tubing can be used allowing complete flexibility
- Single channel or combined channel mode for setting flow rate
- Pump mode—runs continuously at a set flow rate
- Timed dispense—dispenses for a fixed time at a set flow rate
- Volume dispense—dispenses a fixed volume

- Footswitch control
- Analog control
- Bidirectional delivery
- CE, ETL (UL, CSA), WEEE, EU RoHS and CB Scheme Approved
- 2-year warranty

Benefits

- The ability to separate the motor drive from the controller to facilitate use and save space in incubators and fume hoods
- A library of tubing sizes is stored in the pump's memory minimizing set up time
- Custom tubing can be used allowing complete flexibility
- A full range of interchangeable motor drives to allow for economical ease of use over a broad flow rate range.

The Harvard Apparatus Peristaltic Pump consists of a control unit, a motor drive, a tubing cassette and some sample tubing. The pump can deliver solutions over a range of flow rates from 0.001 to 1,500 ml/min depending on the motor drive used. Choose from three interchangeable motor drives. The motor drive modules provide flow over the following ranges:

- P-70 drive provides flow rates from 0.001 to 70 ml/min
- P-230 drive provides flow rates from 0.001 to 230 ml/min
- P-1500 drive provides flow rates from 0.01 to 1,500 ml/min

A complete range of programmable functions allow the pump to be easily adapted to a wide range of dispensing applications. The pump has pre-programmed flow profiles for:

- Constant Flow
- Flow Ramps
- Pulsatile Flow
- Concentration Based Fluid Delivery

In addition to the flow profiles, the pump has advanced user options that permit the pump to be controlled by a PC from its USB inputs as well as a range of options such as:

- Remote initiated start/stop times
- Communication with external devices through 15-pin I/O
- Constant pressure through BNC

All settings can easily be saved as user generated methods in the pump's memory. The method can be easily recalled and run very quickly, saving researchers valuable time. Connectivity to a wide range of external input or output devices is easily accomplished. A constant pressure mode may be utilized in conjunction with a pressure transducer. The pump will automatically rotate at the proper RPM for the tube selection and flow rate chosen. To further increase the accuracy, Harvard Apparatus Peristaltic Pumps offer a rapid calibration routine to further optimize flow accuracy by entering a measured volume of fluid collected.

SPECIFICATIONS

Item #	70-0000
Description	Pump with P-70 Motor Drive
Type	8 rollers, 5 channels
Accuracy	±1.0%
Back Pressure	15 psi
Computer Interface	USB Type 'B'
Control Box Dimensions, H x W x D	20.7 x 13 x 9.6 cm (8.13 x 5.13 x 3.75 in)
Pump Head Dimensions, H x W x D	11.5 x 25.4 x 11.8 cm (4.5 x 10 x 4.63 in)
Max RPM	229
Flow Rate Range (Min. to Max.)	0.001 mL/min to 70 mL/min
Power	100 to 250 VAC, 50/60 Hz
Protection Rating	IP23
Pump Configuration	Remote
Pump Voltage	30 VDC, 1.67A
Pump to Pump	IEEE 1394
Reversible Flow	Yes
TTL Connector	15-pin D-sub
Tubing ID	0.13 to 2.79 mm (0.005 to 0.110 in)
Weight	4.7 kg (10.5 lb)

Barbed Connector Kits

Barbed Connector Kits in three size ranges

Item No.	Description
72-1409	Barbed Connector Kit, Small, Nylon
72-1410	Barbed Connector Kit, Small, Polypropylene
72-1412	Barbed Connector Kit, Medium, Nylon
72-1413	Barbed Connector Kit, Medium, Polypropylene
72-1414	Barbed Connector Kit, Medium, Kynar®
72-1415	Barbed Connector Kit, Large, Nylon
72-1416	Barbed Connector Kit, Large, Polypropylene

DETAILS

These kits allow you to customize or expand the functionality and species range of your perfusion system. Many researchers add a compound of interest to a second or even a third reservoir rather than use a syringe pump for drug additions. Also common is the use of the system for multiple species, which requires that different tube sets be adapted to the existing tubing. (The connectors and stopcocks required to accomplish this expansion are not included with base systems.)

These barbed connector kits come in three different size ranges:

- Small fittings for 1/16, 3/32 and 1/8 inch ID tubing (10 pieces of each component)
- Medium fittings for 1/4, 5/16, 3/8 inch ID tubing (10 pieces of each component)
- Large fittings 1/2 and 5/8 inch ID tubing (5 pieces of each component)

Kit components include tube to tube connectors, tube to tube reducing adapters, Y-, T- and L-connectors and Y-, T- and L-reducing adapters and tubing plugs. Connectors join tubing of similar size while reducing adapters join tubing of different sizes.

Small Black Nylon Barbed Connector Kit (72-1409)
Small Polypropolenene Barbed Connector Kit (72-1410)
Small Kynar® Barbed Connector Kit (72-1411)

Medium Black Nylon Barbed Connector Kit (72-1412)
Medium Poloypropylene Barbed Connector Kit (72-1413)
Medium Kynar Barbed Connector Kit (72-1414)
Large Black Nylon Barbed Connector Kit (72-1415)
Large Polypropylene Barbed Connector Kit (72-1416)
Large Kynar® Barbed Connector Kit (72-1417)

Item #	Products	Tube ID	Material
72-1409	**Small Black Nylon Barbed Connector Kit includes:**		
72-1475	Barbed Connector	1/16 to 1/16 in	Black Nylon
72-1476	Barbed Connector	3/32 to 3/32 in	Black Nylon
72-1477	Barbed Connector	1/8 to 1/8 in	Black Nylon
72-1478	Barbed Connector	1/16 to 3/32 in	Black Nylon
72-1479	Barbed Connector	1/16 to 1/8 in	Black Nylon
72-1480	Barbed Connector	3/32 to 1/8 in	Black Nylon
72-1481	L Barbed Connector	1/16 to 1/16 in	Black Nylon
72-1482	L Barbed Connector	3/32 to 3/32 in	Black Nylon
72-1483	L Barbed Connector	1/8 to 1/8 in	Black Nylon
72-1486	L Barbed Connector	3/32 to 1/8 in	Black Nylon
72-1487	T Barbed Connector	1/16 to 1/16 in	Black Nylon
72-1488	T Barbed Connector	3/32 to 3/32 in	Black Nylon
72-1489	T Barbed Connector	1/8 to 1/8 in	Black Nylon
72-1491	T Barbed Connector	1/16 to 1/8 in	Black Nylon
72-1492	T Barbed Connector	3/32 to 1/8 in	Black Nylon
72-1493	Y Barbed Connector	1/16 to 1/16 in	Black Nylon
72-1494	Y Barbed Connector	3/32 to 3/32 in	Black Nylon
72-1495	Y Barbed Connector	1/8 to 1/8 in	Black Nylon
72-1498	Barbed Plug Connector	1/8 in	Black Nylon

Item #	Products	Tube ID	Material
72-1410	**Small Polypropylene Barbed Connector Kit includes:**		
72-1499	Barbed Connector	1/16 to 1/16 in	Polypropylene
72-1500	Barbed Connector	3/32 to 3/32 in	Polypropylene
72-1501	Barbed Connector	1/8 to 1/8 in	Polypropylene
72-1502	Barbed Connector	1/16 to 3/32 in	Polypropylene
72-1503	Barbed Connector	1/16 to 1/8 in	Polypropylene
72-1504	Barbed Connector	3/32 to 1/8 in	Polypropylene
72-1505	L Barbed Connector	1/16 to 1/16 in	Polypropylene
72-1506	L Barbed Connector	3/32 to 3/32 in	Polypropylene
72-1507	L Barbed Connector	1/8 to 1/8 in	Polypropylene

72-1508	L Barbed Connector	1/16 to 3/32 in	Polypropylene
72-1509	L Barbed Connector	1/16 to 1/8 in	Polypropylene
72-1510	L Barbed Connector	3/32 to 1/8 in	Polypropylene
72-1511	T Barbed Connector	1/16 to 1/16 in	Polypropylene
72-1512	T Barbed Connector	3/32 to 3/32 in	Polypropylene
72-1513	T Barbed Connector	1/8 to 1/8 in	Polypropylene
72-1514	T Barbed Connector	1/16 to 3/32 in	Polypropylene
72-1515	T Barbed Connector	1/16 to 1/8 in	Polypropylene
72-1516	T Barbed Connector	3/32 to 1/8 in	Polypropylene
72-1517	Y Barbed Connector	1/16 to 1/16 in	Polypropylene
72-1518	Y Barbed Connector	3/32 to 3/32 in	Polypropylene
72-1519	Y Barbed Connector	1/8 to 1/8 in	Polypropylene
72-1520	Barbed Plug Connector	1/16 in	Polypropylene
72-1521	Barbed Plug Connector	3/32 in	Polypropylene
72-1522	Barbed Plug Connector	1/8 in	Polypropylene

Item #	**Products**	**Tube ID**	**Material**
72-1411	**Small Kynar® Barbed Connector Kit includes:**		
72-1523	Barbed Connector	1/16 to 1/16 in	Kynar®
72-1524	Barbed Connector	3/32 to 3/32 in	Kynar®
72-1525	Barbed Connector	1/8 to 1/8 in	Kynar®
72-1526	Barbed Connector	1/16 to 3/32 in	Kynar®
72-1527	Barbed Connector	1/16 to 1/8 in	Kynar®
72-1528	Barbed Connector	3/32 to 1/8 in	Kynar®
72-1530	L Barbed Connector	3/32 to 3/32 in	Kynar®
72-1531	L Barbed Connector	1/8 to 1/8 in	Kynar®
72-1533	L Barbed Connector	1/16 to 1/8 in	Kynar®
72-1535	T Barbed Connector	1/16 to 1/16 in	Kynar®
72-1536	T Barbed Connector	3/32 to 3/32 in	Kynar®
72-1537	T Barbed Connector	1/8 to 1/8 in	Kynar®
72-1539	T Barbed Connector	1/16 to 1/8 in	Kynar®
72-1540	T Barbed Connector	3/32 to 1/8 in	Kynar®
72-1541	Y Barbed Connector	1/16 to 1/16 in	Kynar®
72-1542	Y Barbed Connector	3/32 to 3/32 in	Kynar®
72-1543	Y Barbed Connector	1/8 to 1/8 in	Kynar®

Item #	**Products**	**Tube ID**	**Material**
72-1412	**Medium Black Nylon Barbed Connector Kit includes:**		

72-1547	Barbed Connector	1/4 to 1/4 in	Black Nylon
72-1548	Barbed Connector	5/16 to 5/16 in	Black Nylon
72-1549	Barbed Connector	3/8 to 3/8 in	Black Nylon
72-1550	Barbed Connector	1/4 to 5/16 in	Black Nylon
72-1551	Barbed Connector	1/4 to 3/8 in	Black Nylon
72-1552	Barbed Connector	5/16 to 3/8 in	Black Nylon
72-1553	L Barbed Connector	1/4 to 1/4 in	Black Nylon
72-1554	L Barbed Connector	5/16 to 5/16 in	Black Nylon
72-1555	L Barbed Connector	3/8 to 3/8 in	Black Nylon
72-1556	T Barbed Connector	1/4 to 1/4 in	Black Nylon
72-1557	T Barbed Connector	5/16 to 5/16 in	Black Nylon
72-1558	Y Barbed Connector	3/8 to 3/8 in	Black Nylon
72-1559	Y Barbed Connector	1/4 to 1/4 in	Black Nylon
72-1560	Y Barbed Connector	3/8 to 3/8 in	Black Nylon

Item #	**Products**	**Tube ID**	**Material**
72-1413	**Medium Polypropylene Barbed Connector Kit includes:**		
72-1561	Barbed Connector	1/4 to 1/4 in	Polypropylene
72-1562	Barbed Connector	5/16 to 5/16 in	Polypropylene
72-1563	Barbed Connector	3/8 to 3/8 in	Polypropylene
72-1564	Barbed Connector	1/4 to 5/16 in	Polypropylene
72-1565	Barbed Connector	1/4 to 3/8 in	Polypropylene
72-1566	Barbed Connector	5/16 to 3/8 in	Polypropylene
72-1567	L Barbed Connector	1/4 to 1/4 in	Polypropylene
72-1568	L Barbed Connector	5/16 to 5/16 in	Polypropylene
72-1569	L Barbed Connector	3/8 to 3/8 in	Polypropylene
72-1570	T Barbed Connector	1/4 to 1/4 in	Polypropylene
72-1571	T Barbed Connector	5/16 to 5/16 in	Polypropylene
72-1572	T Barbed Connector	3/8 to 3/8 in	Polypropylene
72-1573	Y Barbed Connector	1/4 to 1/4 in	Polypropylene
72-1574	Y Barbed Connector	3/8 to 3/8 in	Polypropylene

Item #	**Products**	**Tube ID**	**Material**
72-1414	**Medium Kynar® Barbed Connector Kit includes:**		
72-1575	Barbed Connector	1/4 to 1/4 in	Kynar®
72-1576	Barbed Connector	5/16 to 5/16 in	Kynar®
72-1577	Barbed Connector	3/8 to 3/8 in	Kynar®
72-1578	Barbed Connector	1/4 to 5/16 in	Kynar®

72-1579	Barbed Connector	1/4 to 8/8 in	Kynar®
72-1580	Barbed Connector	5/16 to 3/8 in	Kynar®
72-1581	L Barbed Connector	1/4 to 1/4 in	Kynar®
72-1582	L Barbed Connector	5/16 to 5/16 in	Kynar®
72-1583	L Barbed Connector	3/8 to 3/8 in	Kynar®
72-1584	T Barbed Connector	1/4 to 1/4 in	Kynar®
72-1585	T Barbed Connector	5/16 to 5/16 in	Kynar®
72-1586	T Barbed Connector	3/8 to 3/8 in	Kynar®
72-1587	Y Barbed Connector	1/4 to 1/4 in	Kynar®
72-1588	Y Barbed Connector	3/8 to 3/8 in	Kynar®

Item #	**Products**	**Tube ID**	**Material**
72-1415	**Large Black Nylon Barbed Connector Kit includes:**		
72-1589	Barbed Connector	1/2 to 1/2 in	Black Nylon
72-1590	Barbed Connector	5/8 to 5/8 in	Black Nylon
72-1591	L Barbed Connector	1/2 to 1/2 in	Black Nylon
72-1592	L Barbed Connector	5/8 to 5/8 in	Black Nylon
72-1593	T Barbed Connector	1/2 to 1/2 in	Black Nylon
72-1594	T Barbed Connector	5/8 to 5/8 in	Black Nylon
72-1595	Y Barbed Connector	1/2 to 5/8 in	Black Nylon
72-1596	Y Barbed Connector	1/2 to 1/2 in	Black Nylon

Item #	**Products**	**Tube ID**	**Material**
72-1416	**Large Polypropylene Barbed Connector Kit**		
72-1597	Barbed Connector	1/2 to 1/2 in	Polypropylene
72-1598	Barbed Connector	5/8 to 5/8 in	Polypropylene
72-1599	L Barbed Connector	1/2 to 1/2 in	Polypropylene
72-1600	L Barbed Connector	5/8 to 5/8 in	Polypropylene
72-1601	T Barbed Connector	1/2 to 1/2 in	Polypropylene
72-1602	T Barbed Connector	5/8 to 5/8 in	Polypropylene
72-1603	Y Barbed Connector	1/2 to 5/8 in	Polypropylene
72-1604	Y Barbed Connector	1/2 to 1/2 in	Polypropylene

Item #	**Products**	**Tube ID**	**Material**
72-1417	**Large Kynar® Barbed Connector Kit**		
72-1605	Barbed Connector	1/2 to 1/2 in	Kynar®
72-1606	Barbed Connector	5/8 to 5/8 in	Kynar®
72-1607	L Barbed Connector	1/2 to 1/2 in	Kynar®

72-1608	L Barbed Connector	5/8 to 5/8 in	Kynar®
72-1609	T Barbed Connector	1/2 to 1/2 in	Kynar®
72-1610	T Barbed Connector	5/8 to 5/8 in	Kynar®
72-1611	Y Barbed Connector	1/2 to 5/8 in	Kynar®
72-1612	Y Barbed Connector	1/2 to 1/2 in	Kynar®

Centrifugal Pump

The centrifugal pump is specifically designed for pumping blood and/or erythrocyte suspension solutions in the physiological or pharmacological laboratory.

A complete setup consists of the digital pump drive with centrifugal head mounting plate (73-5157) and a centrifugal pump head (73-5173). The pump head is hermetically sealed. Flow rates are up to 10 L/min. The perfusion circuit resistance will limit the flow rate that can be achieved. See the pressure flow graph for more details. A priming circuit is supplied with the pump along with an instruction manual for care and use. The pump can be coupled with an Pressure Transducer, Transducer Amplifier, Pump Controller, housing and Controller Connection Cable to perform constant pressure perfusion.refer to the details section for the list of parts required. Please contact us for assistance configuring your perfusion setup.

Item No.	Description
73-5157	Centrifugal PUMP DRIVE, 110V – 240 VAC
73-5173	CENTRIFUGAL PUMP HEAD AP40
72-4621	Tygon® E-3603 Tubing, 15.2 m (50 ft) Length, 9.5 mm (3/8 in) ID, 12.7 mm (1/2 in) OD
73-4759	CONNECTION CABLE SCP to 25 PIN D-SUB (DB-25) FOR MFLX L/S, L/S DIGITAL, REGLO and HSE CENTRIFUGAL PUMP DRIVES

DETAILS

The centrifugal pump is specifically designed for pumping blood and/or erythrocyte suspension solutions in the physiological or pharmacological laboratory.

A complete setup consists of the digital pump drive with centrifugal head mounting plate (73-5157) and a centrifugal pump head (73-5173). The pump head is hermetically sealed. Flow rates are up to 10 L/min. The perfusion circuit resistance will limit the flow rate that can be achieved. See the pressure flow graph for more details. A priming circuit is supplied with the pump along with an instruction manual for care and use. The pump can be coupled with an Pressure Transducer, Transducer Amplifier, Pump Controller, housing and Controller Connection Cable to perform constant pressure perfusion. Please contact us for assistance configuring your perfusion setup.

The drive is very robust and suitable for continuous speed selection operation.

The HSE/HA Large Centrifugal Pump can be outfitted to perform constant pressure perfusion using the following items. Please contact us for assistance.

Constant Perfusion Pressure Option

73-3862	APT300 Pressure Transducer for PLUGSYS Modules (73-0065, 73-1793) or CTA Compact Transducer Ampllifier (73-4457)
73-3869	Holder for APT300 Transducer, 8 mm Rod, Length 75 mm
73-0500	Lab Stand with Triangular Base Plate, 30 cm Rod Length (one block clamp included)
73-4479	Manual Pressure Calibrator, Range 0-300 mmHg
73-1793	Transducer Amplifier Module (TAM-D)
73-2806	PLUGSYS Servo Controller for Perfusion (SCP)
Plus one of three amplifier cases below	
73-1523	PLUGSYS Case, Type 609
73-1521	PLUGSYS Case, Type 601
73-0045	PLUGSYS Case, Type 603

SPECIFICATIONS

Technical data

- Speed range: 36 - 3600 rpm
- Flow rate and pressure: depending on pump head (see diagram chapter 6.1)
- External control: via analogue interface 0...10V or 0...5V
- Supply: wide range power supply 115 V - 230 V (50/60 Hz)
- Fuses: 1 x 3.15 A T (slow blow)
- Operating conditions: normal laboratory environment temperature +5 to +40°C rel. humidity 80% max.
- Dimensions (drive): 10.5 in × 8 in × 8 in (267 × 203 × 203 mm)
- Weight: 15.5 lb (7.0 kg)
- Enclosure Rating: IP 33 per IEC 60529
- CE conformity:
  - Conforms to ANSI/UL Std 61010-1

    Certified to CAN/CSA Std C22.2 No. 61010-1.

    This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

    (For CE Mark): EN61010-1 (EU Low Voltage Directive) and EN61326 (EU EMC Directive)

Rabbit/Cat Balloons (1.7 to 3.0 kg)

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3485	Rabbit/Cat Balloons for Isovolumetric Contractile Force Measurements, 1.7 kg, Size 10, pkg of 10
73-3486	Rabbit/Cat Balloons for Isovolumetric Contractile Force Measurements, 2.2 kg, Size 12, pkg of 10
73-3489	Rabbit/Cat Balloons for Isovolumetric Contractile Force Measurements, 3.0 kg, Size 14, pkg of 10

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3485	73-3486	73-3489
Balloon Dimensions (D x L) Metric	10 x 14 mm	12 x 17 mm	14 x 19 mm
Balloon Size No.	10	12	14
Balloon Volume **	0.7 ml	1.3 ml	1.9 ml
Body Weight (kg)	1.7	2.2	3.0
Footnote **	Volume unloaded	Volume unloaded	Volume unloaded
Package	10	10	10
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders
Species	Rabbit/Cat	Rabbit/Cat	Rabbit/Cat

Long Loop Clip

Long Loop Clip, 0.3 mm diameter stainless steel wire, 16 mm overall length, 2 mm jaw diameter. It is similar to the Long Jaw Clip 73-3340, but is finer in dimensions.

Item No.	Description
73-0577	Long Loop Clip, stainless steel wire, 0.3 mm wire diameter, 16 mm clip length, 2 mm jaw diameter, pkg of 1

DETAILS

The Long Loop Clip is constructed from stainless steel wire which is 0.3 mm in diameter. The overall length of the clip is 16 mm. The jaw diameter is 2 mm.

It is similar to the Long Jaw Clip 73-3340, but is finer in dimensions.

Long Jaw Clip

Longer 0.7 x 5 mm jaws, 0.5 mm diameter stainless steel wire, 18 mm overall length

Item No.	Description
73-3340	Long Jaw Clip, stainless steel wire, 0.5 mm wire diameter, 18 mm clip length

DETAILS

This Long Jaw Clip has longer jaws. The jaw size is 0.7 x 5 mm. The Long Jaw Clip is constructed from stainless steel wire which is 0.5 mm in diameter. The overall length of the clip is 18 mm.

Pointed Jaw Clip

Pointed jaws and side loops for simple operation, 0.5 mm diameter stainless steel wire, 14 mm overall length.
Extra fine version also available.

Item No.	Description
73-0574	Pointed Jaw Clip, stainless steel wire, 0.5 mm wire diameter, 14 mm clip length, pkg of 1
73-3563	Extra Fine Pointed Jaw Clip, stainless steel wire, 0.4 mm wire diameter, 10 mm clip length, pkg of 1

DETAILS

This clip features pointed jaws and side loops for simple operation. The Pointed Jaw Clip is constructed from stainless steel wire which is 0.5 mm in diameter. The overall length of the clip is 14 mm. An Extra Fine Pointed Jaw Clip is also available. It is constructed from stainless steel wire which is 0.4 mm in diameter. The overall length of the clip is 10 mm.

Long Flat Jaw Clip

Long flat jaws and side loops for simple operation, 0.5 mm in diameter stainless steel wire,18 mm overall length, 0.5 x 5 mm jaw size.

Item No.	Description
73-0575	Long Flat Jaw Clip, stainless steel wire, 0.5 mm wire diameter, 18 mm clip length, pkg of 1

DETAILS

This clip features long flat jaws and side loops for simple operation. The Long Flat Jaw Clip is constructed from stainless steel wire which is 0.5 mm in diameter. The overall length of the clip is 18 mm. The jaw size is 0.5 x 5 mm.

Mini Ball Joint Holders (Eye-Eye, Eye-Ball, or Ball-Ball)

Linking elements in various sizes for length extension and positioning for cannulae, probes and sensors. Ideal for use on small operating tables and especially inside small organ chambers where space is extremely limited.

Item No.	Description
73-0174	Mini Ball Joint Holder, Eye-Eye, 23 mm long, pkg of 1
73-0175	Mini Ball Joint Holder, Eye-Eye, 42 mm long, pkg of 1
73-0176	Mini Ball Joint Holder, Eye-Ball, 18 mm long, pkg of 1
73-0177	Mini Ball Joint Holder, Eye-Ball, 23 mm long, pkg of 1
73-3321	Mini Ball Joint Holder, Eye-Ball, 35 mm long, pkg of 1
73-0563	Mini Ball Joint Holder, Ball-Ball, 18 mm long, pkg of 1

DETAILS

Mini Ball Joint Holders are linking elements in various sizes for length extension and positioning for cannulae, probes and sensors. Mini ball joint holders are ideal for use on small operating tables and especially inside small organ chambers where space is extremely limited.

Options include:

- 5 mm mini ball on one end of the arm and eye to receive a 5 mm mini ball at the other end.
- 5 mm mini balls on both ends of the arm.
- Eye both ends of the arm to receive 5 mm mini balls at both ends

Applications of Mini Ball Joint Holders

Mini ball joint holders are ideal for use on small operating tables and especially inside small organ chambers where space is extremely limited. There are complete kits available for measuring isovolumetric LVP balloon pressure in mice hearts, ECG detection from mice hearts and stimulation of mice hearts. Other possibilities are: mounting of small flow probes on open chest experiments in mice or rats, mounting of cannulas on small isolated organs like liver, kidney, lung, and hearts. Many other applications are possible.

SPECIFICATIONS

Specifications	73-0174	73-0175	73-0176	73-0177	73-3321	73-0563
Ball Joint Holder Length	23 mm	42 mm	18 mm	23 mm	35 mm	18 mm

Serre Fine Tip Closing Clip

Tip closing jaws for securing tissues, 0.5 mm diameter stainless steel wire, 17 mm overall clip length, 3 mm jaw

Item No.	Description
73-3339	Serre Fine Tip Closing Clip, stainless steel wire, 0.5 mm wire diameter, 17 mm clip length, 3 mm jaw, pkg of 1

DETAILS

This Serre Fine Tip Closing Clip features tip closing jaws for securing tissues. It is constructed from stainless steel wire which is 0.5 mm in diameter. The jaw measures 3 mm. The overall length of the clip is 17 mm.

High Load Linking Elements (for use with Mini Ball Joint Holders)

Provides very stable positioning with a high amount of tension when used with Mini Ball Joint Holders. Able to hold more weight then the other Linking Elements such as Eye-Eye or Ball-Eye.

Item No.	Description
73-0564	Link for Higher Loading Capacity, for Two Arms with 5 mm Mini Balls, pkg of 1

DETAILS

High Load Linking Elements provide very stable positioning with a high amount of tension when used with Mini Ball Joint Holders. They receive 5 mm Mini Balls for length extension and increased positioning possibilities. A screwdriver is required to change the position of the attached Mini Ball arms. These linking elements are able to hold more weight then the other Linking Elements such as Eye-Eye or Ball-Eye. Used with 73-0176, 73-0177 and 73-0563.

Applications of Mini Ball Joint Holders

Mini ball joint holders are ideal for use on small operating tables and especially inside small organ chambers where space is extremely limited. There are complete kits available for measuring isovolumetric LVP balloon pressure in mice hearts, ECG detection from mice hearts and stimulation of mice hearts. Other possibilities are: mounting of small flow probes on open chest experiments in mice or rats, mounting of cannulas on small isolated organs like liver, kidney, lung, and hearts. Many other applications are possible.

SPECIFICATIONS

Specifications	73-0564
Ball Joint Holder Length	23 mm

Organ Hook

The Organ Hook Clip has a pointed hook that permits easy mounting of organs. It is constructed from stainless steel wire which is 0.5 mm in diameter.

The overall length of the hook is 7.5 mm.

Item No.	Description
73-0578	Organ Hook, stainless steel wire, 0.5 mm wire diameter, 7.5 mm hook length, pkg of 1

DETAILS

The Organ Hook Clip has a pointed hook that permits easy mounting of organs. It is constructed from stainless steel wire which is 0.5 mm in diameter.

The overall length of the hook is 7.5 mm.

Perfusate Deoxygenation Option for IPL-1, IPL-2 and IPL-4

Add this option to IPL-1, IPL-2 and IPL-4 to deoxygenate blood or buffers containing proteins (e.g. albumin) or erythrocytes.

Item No.	Description
73-4290	Deoxygenation Unit for IPL-2 System

DETAILS

Add this option to IPL-1, IPL-2 and IPL-4 to deoxygenate blood or buffers containing proteins (e.g. albumin) or erythrocytes. For detailed information about the Fiber Oxygenators, .

Features & Benefits

- 19 ml priming volume (IPL-1 and IPL-2) or 54 ml priming volume (IPL-4)
- MediSulfone membrane materials with 0.25 m^2 (IPL-1 and IPL-2) or 0.6 m^2 (IPL-4) deoxygenating surface area

Included Items

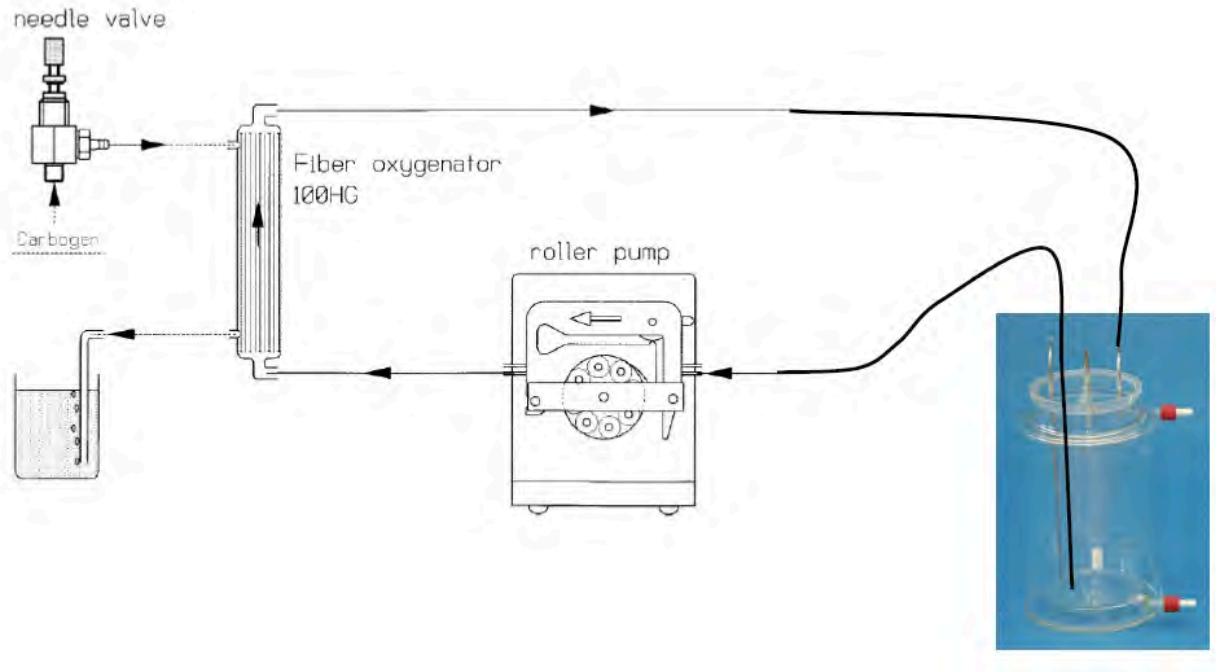
IPL-1 (73-4307) and IPL-2 (73-4290)

Item #	**Product Name**
	Fiber Oxygenator, Type D150, Pkg. of 5
	Connection Kit for D150 Fiber Oxygenator
	Mounting Kit for D150 Fiber Oxygenator on Holders
	Stand-Alone Oxygenator Holder
	Stand with Triangular Base and Block Clamp

IPL-4 (73-4311)

Item #	Product Name
	Fiber Oxygenator, Type DP07HE, Pkg. of 5
	Connection Kit for Fiber Oxygenator
	Mounting Kit for Fiber Oxygenator on Holders
	Stand-Alone Oxygenator Holder
	Stand with Triangular Base and Block Clamp

Oxygenator Set Up



SPECIFICATIONS

	D150	**DP07HE**
Effective Surface Area	0.25 m^2 (2,500 cm^2)	0.7 m^2 (7,000 cm^2)
Internal Diameter	250 µm	200 µm
Outer Diameter	28 mm	43 mm
Wall Thickness	50 µm	30 µm
Effective Fiber Length	140 mm	140 mm
Number of Fibers	2,500	9,300
Fiber Material	MediSulfone Polysulfone, 50,000 Da	High Flux PUREMA
Ultrafiltration Rate	5.5 ml/h/mmHg	32 ml/h/mmHg
Maximum Pressure	500 mmHg	600 mmHg transmembrane pressure
Sterilization	ETO sterlized	ETO sterilized
Priming Volume	19 ml	49 ml
Weight	63 g	140 g
Housing Material	Polycarbonate	Polycarbonate
Full Length	180 mm	180 mm

REGLO Digital Peristaltic Pump 1

REGLO Digital Programmable Peristaltic Pumps offer versatile dispensing functions and provide reproducible, accurate results and take up very little bench-space. They are available in either 2 or 4 channels and with either 6, 8, or 12 pump rollers.

This pump features a dispense mode with variable flow rates and also dispenses by volume or time intervals. The digital readout facilitates programming and the snap-on MS/CA Click 'n' Go Cassettes makes this pump very easy to use.

A can be purchased separately.

Item No.	Description
73-3054	MS/CA Pressure Lever Cassette Cartridge, 3-Stop, POM-C

DETAILS

REGLO Digital Programmable Peristaltic Pumps offer versatile dispensing functions and provide reproducible, accurate results and take up very little bench-space. They are available in either 2 or 4 channels and with either 6, 8, or 12 pump rollers. This pump features a dispense mode with variable flow rates and also dispenses by volume or time intervals. The digital readout facilitates programming and the snap-on MS/CA Click 'n' Go Cassettes makes this pump very easy to use.

Features

- Dispensing Mode Flow Rates from 0.002 to 68 ml/min
- Snap-on MS/CA Click ‘n’ Go Cassettes
- RS-232 interface
- Adjust and calibrate dispensing volumes in ml and flow rates in ml/min for accurate and reproducible results
- Easy to use with pre-programmed flow-rates for all available tube sizes
- Dispensing by volume, time or intervals for each unique application
- Overload protection and indicator automatically stops pump to prevent damage
- Display readout: speed in 1%-steps and flow rate in ml/min

- Motor and ventilation permit 24-hour continuous operation
- Ease of use and a clear function display are the special features of these small pumps

A can be purchased separately.

Rat/Guinea Pig Balloons (100 to 700 g)

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3478	Rat/Guinea Pig Balloons for Isovolumetric Contractile Force Measurements, 100 to 200 g, Size 3, pkg of 10
73-3479	Rat/Guinea Pig Balloons for Isovolumetric Contractile Force Measurements, 300 to 400 g, Size 4, pkg of 10
73-3480	Rat/Guinea Pig Balloons for Isovolumetric Contractile Force Measurements, 500 g, Size 5, pkg of 10
73-3481	Rat/Guinea Pig Balloons for Isovolumetric Contractile Force Measurements, 700 g, Size 6, pkg of 10

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3478	73-3479	73-3480	73-3481
Balloon Dimensions (D x L) Metric	3 x 7 mm	4 x 8 mm	5 x 9 mm	6 x 10 mm

Specifications	73-3478	73-3479	73-3480	73-3481
Balloon Size No.	3	4	5	6
Balloon Volume **	0.03 ml	0.06 ml	0.1 ml	0.2 ml
Body Weight (kg)	0.1 to 0.2	0.3 to 0.4	0.5	0.7
Footnote **	Volume unloaded	Volume unloaded	Volume unloaded	Volume unloaded
Package	10	10	10	10
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders
Species	Rat/Guinea Pig	Rat/Guinea Pig	Rat/Guinea Pig	Rat/Guinea Pig

Large Guinea Pig/Rabbit Balloons (1.0 to 1.5 kg)

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

Item No.	Description
73-3482	Large Guinea Pig/Rabbit Balloons for Isovolumetric Contractile Force Measurements, 1.0 kg, Size 7, pkg of 10
73-3483	Large Guinea Pig/Rabbit Balloons for Isovolumetric Contractile Force Measurements, 1.2 kg, Size 8, pkg of 10
73-3484	Large Guinea Pig/Rabbit Balloons for Isovolumetric Contractile Force Measurements, 1.5 kg, Size 9, pkg of 10

DETAILS

Latex Balloons are used for measuring isovolumetric contractile forces in the left ventricle of isolated perfused hearts. These latex balloons are available in several different sizes to be used with hearts from rats up to pigs. Review the table to select the right size balloon for your application.

These latex balloons are not suitable for mice hearts due to the rigidity of the latex material. A technique using cling-film allows you to create small balloons which can be used for such small hearts. If you are

working with mice, please order the Mouse Ventricular Balloon Kit BS4 73-2787.

These Latex Balloons are sold in packages of 10 balloons. There are also convenient sample kits available that contain a selection of various sized balloons. Stainless steel catheters and Syringes are also available.

SPECIFICATIONS

Specifications	73-3482	73-3483	73-3484
Balloon Dimensions (D x L) Metric	7 x 11 mm	8 x 12 ml	9 x 13 mm
Balloon Size No.	7	8	9
Balloon Volume **	.03 ml	0.4 ml	0.5 ml
Body Weight (kg)	1	1.2	1.5
Footnote **	Volume unloaded	Volume unloaded	Volume unloaded
Package	10	10	10
Product Family	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders	Balloon Catheters/Catheters/Tissue Clips/Tissue Holders
Species	Large Guinea Pig/Rabbit	Large Guinea Pig/Rabbit	Large Guinea Pig/Rabbit

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