kdScientific

Syringe Pumps and Dispensers

So Advanced,
They're Simple

www.kdscientific.com

COMPANY OVERVIEW

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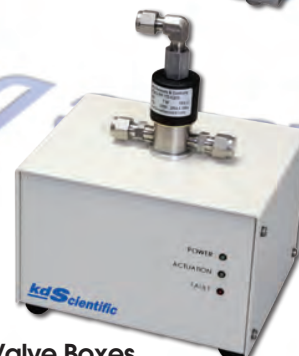
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The KD Scientific Advantage

Recognized Worldwide...

KD Scientific syringe pumps are the #1 choice of life science and industrial researchers for their:

- High performance accuracy and precision
- Easy-to-use interface for simple operation
- Rugged design for long-life and reliability
- Anti-vibration technology eliminating operational noise
- Stall detection and alarms
- Superior engineering design without fans, eliminates thermal and environmental contamination for higher reliability and operation
- Considerability for your applications:
  - *Single, double, four, ten syringes*
  - *Infuse or infuse/withdraw or push pull*
  - *Programmable and advanced programmable*
  - *Specialized systems*
  - *OEM models*
  - *High pressure*
- Broad flow rate range from high to low
- World-wide support when you need it

KD Scientific pumps are acknowledged as the industry's highest valued solution for delivering precise and smooth flow. KD Scientific is recognized worldwide for quality and reliability at an economical price and has the broadest line of syringe pumps to meet your specific application. KD Scientific is committed to delivering the highest level of customer satisfaction, as well as technical support for all their products.
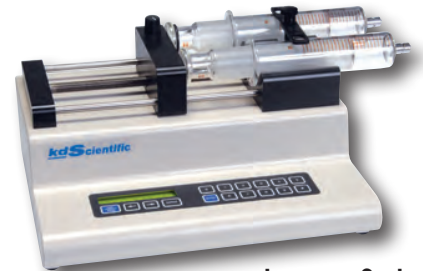
**Legacy Series,
see pages 28-35**
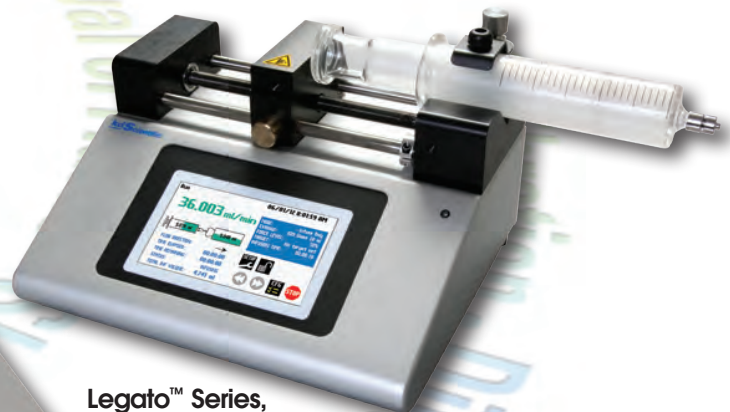
**Legato™ Series,
see pages 4-27**

COMPANY OVERVIEW

The following is an extensive list of application areas in which syringe pumps are utilized. The superior performance of KD Scientific syringe pumps has made them prominent in publications for their outstanding performance, smooth flow and rugged design. Bibliographies and publications are available at:

www.kdscientific.com

Extensive Applications

Electrospinning

Microfluidics

Electrospray

Mass Spec

- Calibration
- Diluting
- Dispensing
- Dosing
- Emulsification
- Fluid Transfer
- Infusion of Fluids
- Mixing
- Perfusion
- Timed Delivery
- Withdrawal of Fluids
- Slow Infusion
- Volumetric Dispensing
- MS Calibration
- Microfluidics/Microfluidic Channel Injections
- Surface Plasma Resonance
- Biotech Research and Development
- Drug Discovery
- Neuroscience
- Organic Synthesis
- Aerosol Injection/Nebulization
- Agriculture
- Animal Drug/Nutrient Injections
- Automotive Research
- Cell Injections

Continuous Flow

- Chemical Development
- Pilot Plant Reactor Dosing
- Continuous Flow
- Dye Dilution
- Dye/Isotope Injection
- Electrospinning
- Emulsion Polymerization
- Entomology
- Epoxy & Adhesive Dispensing
- Geological Sampling
- Isotope Injections
- Liquid Chromatography Injections
- Metered Dispensing
- Microdialysis
- Micro-Filtration
- Perfusion
- Pharmaceutical Development
- Polymer Research
- Post Column Addition
- Electrospray (ESI-MS)
- HPLC Mass Spec
- Lock Mass Infusion/Calibration
- MALDI-TOF Matrix Addition
- Nano Flow Rates
- Precision Mass Spec
- Capillary Electrophoresis

Drug Infusions

Maldi-TOF

Organic Synthesis

- Cell Manipulation
- Cell Patterning
- Cell Separation
- Chemical Binding Coefficients
- Chemical Gradient Formation
- Enzyme Reaction Kinetics
- Flow Cytometry
- Fluid Viscosity
- Immunoassays
- Reactor Injections
- Toxicology Studies
- Viscosity/Viscometer Systems
- Weather Research
- Flow Chemistry
- Reagent Addition
- Thermogravimetric Analysis
- Humidity Tests
- Water Moisture Tests
- Catalyst Addition
- Homogenizers
- Organic Synthesis
- Auto Titrator

Emulsifier

Legato SERIES

The Legato™ product line is the latest generation of syringe pumps. The Legato™ series offers unparalleled ease of use through the high resolution color touch screen user interface. The full touch screen interface enables the user to quickly create configurations and recall them for easy use. The 4.3" TFT color display with touch pad interface presents all the pump operating parameters on one easy to view run screen.

Legato™ Series: The Newest

- Displays more information simultaneously
- Easy to use and set up different configurations
- Intuitive Graphic Interface and Touch Screen
- International Icons, make it easy to use in any language
- Alarm Indication and Messages
- Pump Diagnostic/Information
- USB Interface
- Graphic Software to configure and monitor the pumps

Legato 100 Series

Legato 200 Series

Legato's Design Advantages

In today's economic environment, multiple users with different experiments are using the same pump. The next generation of pump has to meet these demands. The pump's role in the experiment now changes more readily with multiple users using one pump and multiple tests being done with a single pump.

- Programs need to be stored & easily recalled
- Users want the flexibility of changing syringe mechanisms in the field: going from large to small syringes, or from 2 to 10 syringes
- Better flow performance and repeatability with measurements down to nl/hour
- Stronger syringe clamping at higher pressures -not just simple spring clamping

Engineered to Meet Global Regulatory Compliance

Worldwide use of the pumps and changing regulatory compliance meant redesigning the unit to meet these new standards including lead free boards. The new Legato™ is a pump that will meet worldwide regulations.

WEEE   C E   ETL INTERTEK c us LISTED   Underwriters Laboratories

RoHS   CB Scheme

Benchmark for Ease of Use

Optimize Bench Space

The Legato™ Series optimizes the bench space in your lab. For limited laboratory space the Legato™ series can be placed on its side to reduce the footprint by 4 Times. The display orientation changes automatically with the Legato™ Series.

Horizontal Orientation

Vertical Orientation Display Rotates 90°

Intuitive Run Screen

Combining multiple parameters simultaneously with internationally recognizable icons allow the Legato™ Series to provide a new level of intuitive syringe pump operation.

Graphic indication of the syringes filling indicating the volume

Flow Rate is easy to read

All Program settings are indicated on the display

Current time and date is shown (Legato™ 200 Series only)

Run   03/18/16 5:17:32 PM

300 nl/min

| 24.9454 ml | 25.0546 ml |

MODE: Infuse/Withdraw
SYRINGE: Air-Tite, 50 ml
FORCE LEVEL: 50%
TARGET: 50 ml
INFUSION TIME: 99:99:99
WITHDRAWAL TIME: 00:00:30

FLOW DIRECTION: →
TIME ELAPSED: 00:00:16
TIME REMAINING: CONTINUOUS
STATUS: INFUSION PAUSED
TOTAL INF VOLUME: 25.0546 ml

SETUP   [unlock]   RESET

CFG   RUN

Total Volume Delivered

Current status of the Pump

Total Remaining Time of the Program

Total Elapsed Time of the Program

Flow Direction with arrow indicator

Dead Volume can be quickly eliminated with a fast forward feature

The pusher block can also be released with a fast reverse feature

Legato™ SERIES

The Legato's proven syringe mechanism design is easy to use and securely holds the syringes for smooth flow performance.

A Rugged Design, Maximum

- One touch quick release pusher block is easy to use and is always engaged.

- Advanced mechanical syringe mechanism incorporates a dual purpose, syringe clamp for large syringes, >30 ml, or simply flip the syringe clamp to hold smaller syringes, <30 ml to 0.5 µl.

- Rubber pads retain syringe in place preventing accidental breakage of glass syringes.

- Curved syringe clamp design securely retains syringes, eliminating slippage of the syringe under high force applications with viscous fluids.

- Adjustable linear force, ensures the right force is applied for the various syringe sizes.

Quick Release Pusher Block
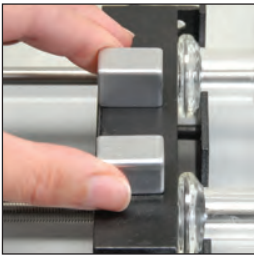
No Stick Metal Guide Rods

Transparent Cover and sealed to Protect Display

Clamp Flips Multi-Size Syringes

Quick Release Pusher Block

Spill Dams to Contain Leaks

Legato® 200 Series

SETUP
ENTR
RUN
DELAY
STOP
Easy-to-Use Graphic Icons
CFG

Durable Construction with Welded Metal Chassis

Legato® 100 Series

Performance and Reliability

Less Vibration & Deformation

The welded steel chassis out-performs the conventional plastic chassis. The chassis provides a rigid platform without deformation under high pressure. Operation of the pump is quieter and there is less vibration transferred to the syringes because of this unique design.

Conventional Pump

Optimal EMI/RFI Shielding with Welded Steel Chassis

The superior design of the full metal chassis provides noise isolation and anti-vibration features for increased reliability. All syringe racks are hardened rolled steel and will not deform with pressure.

Chemically Resistive Anti-Glare Cover

Protection of the display is through a transparent anti-glare cover. The spill dam is designed to prevent fluids from ingressing into the sealed display.
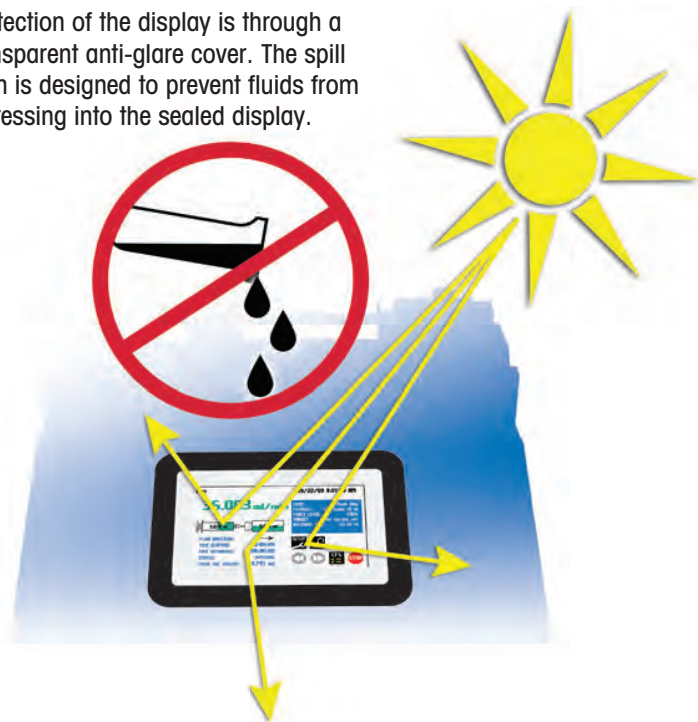
Legato™ SERIES

No other syringe pump performs like the Legato™ Series. It offers a broad flow rate range along with superior accuracy and repeatability.

Advanced KDS Mechanical

Legato's Superior Flow Performance

Flow performance is optimized with a small step angle microstepping motor that drives a precision lead screw and pusher block. Advanced micro-stepping techniques are employed to further reduce the step angle to eliminate flow pulsation. Legato's 200 Series accuracy is +/- 0.35% and has 0.05% reproducibility. A wide dynamic flow range from 3.06 pl/min to 215.803 ml/min can be programmed into the pump. The Legato 100 Series has 0.5% accuracy and 0.05% reproducibility. Additionally, flow rates are user selectable with engineering units from ml, μl, nl, pl, and hours, minutes and seconds. The Legato 180 is the ultimate picoliter pump and is ideal for microfluidic applications.

Design for Superior Flow Performance

Legato™ 100
v e r s u s
Conventional Syringe Pumps

- **Legato™ 100, 101, 110, 111** (blue)
- **Conventional Pumps** (purple, cyan, red)

Legato™ 100

Flow Rate (1µ/min) vs Time Elapsed (sec), 250 µl Syringe
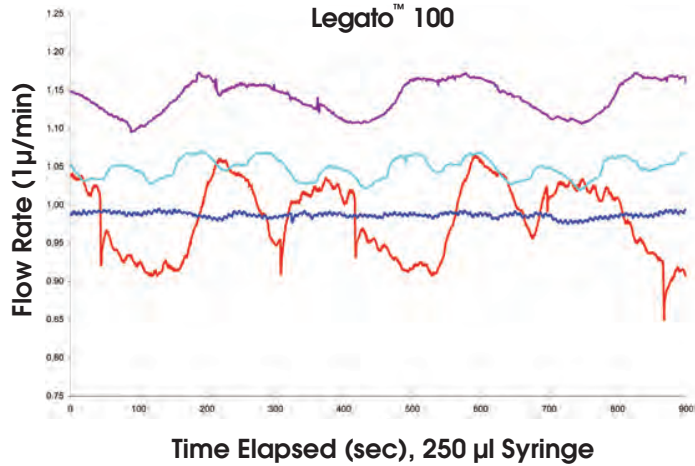
Legato™ 180/185
v e r s u s
Conventional Syringe Pumps

- **Legato™ 180/185** (blue)
- **Conventional Pumps** (purple, cyan, red)

Legato™ 180/185

Flow Rate (1µ/min) vs Time Elapsed (sec), 250 µl Syringe
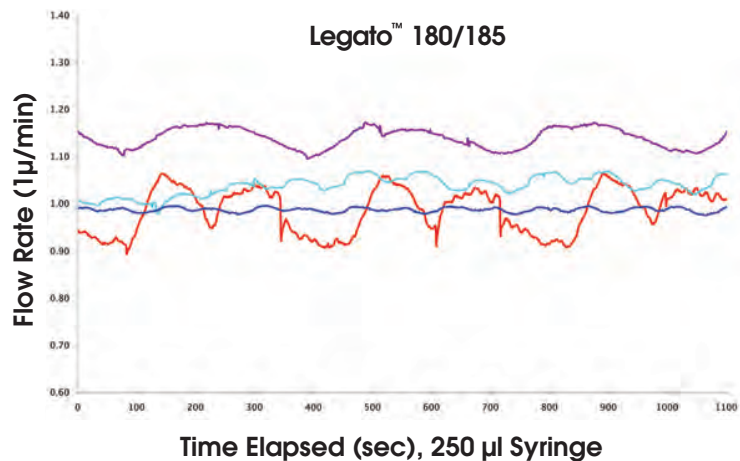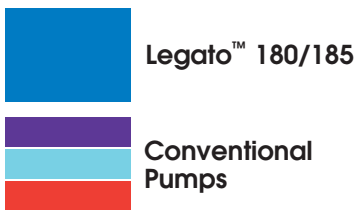
Legato™ 200
v e r s u s
Conventional Syringe Pump

- **Legato™ 200, 210, 210P, 270, 270P** (blue)
- **Conventional Pumps** (purple, cyan, red)

Legato™ 200

Flow Rate (1µ/min) vs Time Elapsed (sec) 250 µl Syringe

Legato™ SERIES
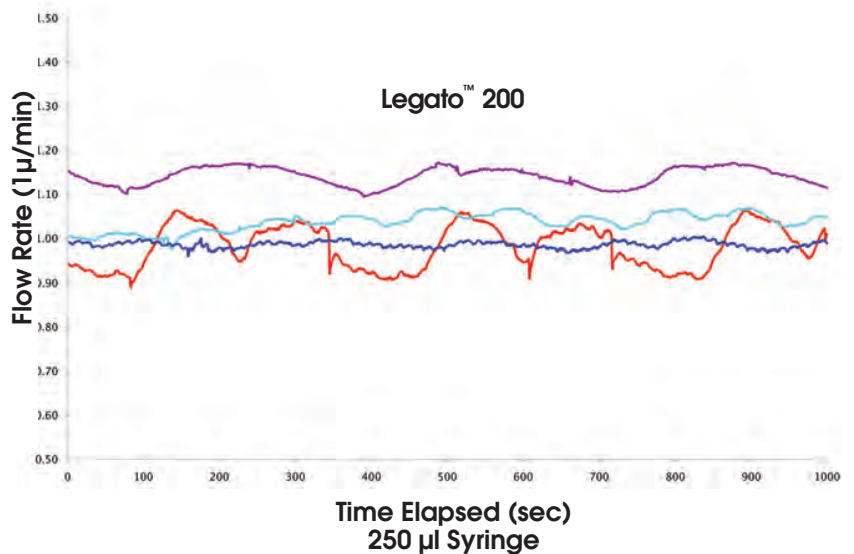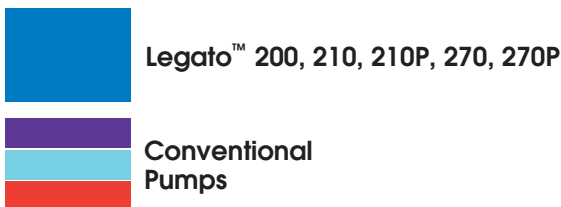
Legato™ is quick to configure; an easy to use screen shows all the parameters in one display. In four quick steps….

1 Select the Mode

2 Select the Syringe Size and Type

3 Select the Flow Rate

4 Select the Total Volume to be delivered or select the Total Time

A Fast Experimental Setup

Configuration   03/18/16 5:17:09 PM

MODE	Infuse Only
SYRINGE	KDS Glass 10.00 ml
RATES	I : 75 nl/min
TARGET	Volume 20 nl

SETUP | DELAY | RUN

The interface Configuration Screen with simultaneous display of parameters makes experimental setup and execution as simple as a touch of the screen.

Step 1: Mode Selection

Depending on the model of pump, the unit can be configured to:

- Infuse Only
- Withdraw Only
- Infuse/Withdraw
- Infuse/Withdraw Continuous
- Withdraw/Infuse
- Withdraw/Infuse Continuous
- Define Your Own Custom Programs/Recipes

| MODE | Infusion Only |

Mode Selection   03/18/16 5:20:07 PM

- New Program
- Infuse Only
- Withdraw Only
- Infuse/Withdraw
- Withdraw/Infuse
- EMULSIFY Program
- KD_SCIENTIFIC Program

SETUP | FILE | ENTR

Step 2: Wide Range of Syringes

Most manufacturers' syringes, from 0.5 μl to 140 ml. Any type of syringe including glass, plastic and stainless steel syringes.

| SYRINGE | KDS Glass 10.00ml |

Syringe Selection   03/18/16 5:20:36 PM

- Custom Syringe
- Hamilton 1000 Glass
- Hamilton 1700 Glass
- Hamilton 7000 Glass
- Hoshi
- ILS Glass
- KDS Glass

PAGE ↑ | LINE ↑ | LINE ↓ | PAGE ↓ | BACK | ENTR

and Execution

Step 3: Wide Flow Rate Range

Minimum and Maximum flow shown for each size of syringe.

RATE I : 36.003 ml/min

Set Infuse Rate   03/18/16 5:22:34 PM

Infuse Rate   75   nl/min

7 8 9   ↑ MAX 36.0035 ml/min
4 5 6
1 2 3   69.34 nl/min
. 0 ⌫   MIN ↓

BACK X   ENTR ✓
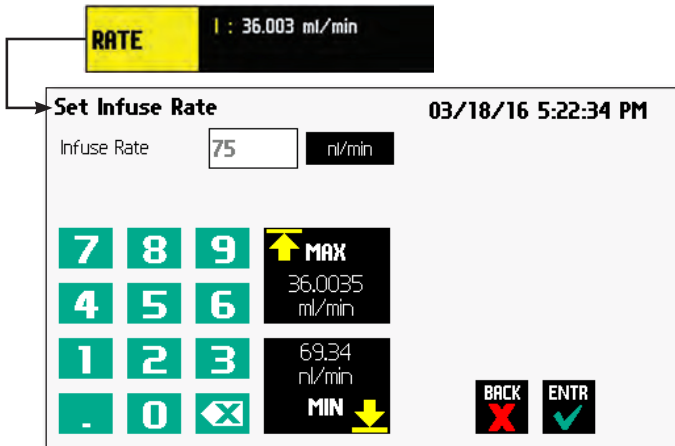
Step 4: Selectable Target Volume & Time

Select the total volume from nl to ml. Units are selectable - or for infuse only, select the time.

TARGET Volume 5 ml

Set Target Volume or Time   03/18/16 5:23:03 PM

● Volume   500_   ul
● Time   0   secs

7 8 9   ↑ MAX 10 ml
4 5 6
1 2 3
. 0 ⌫

BACK X   ENTR ✓

* All screens shown for the Legato™ 200 Series
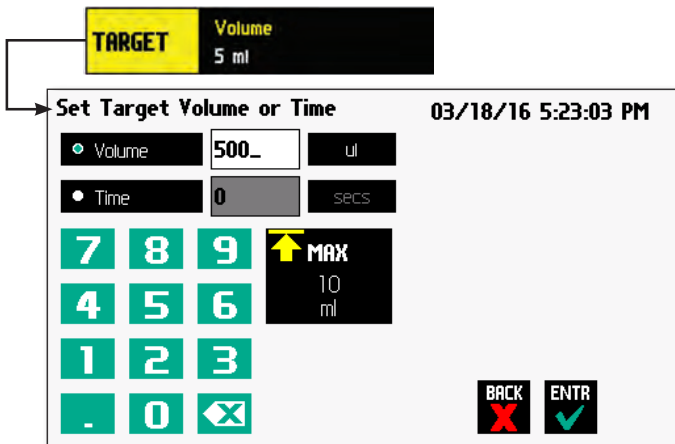
Setup is Easy with Diagnostics and Pump Information

Select the parameters for the configuration and display the pump information. The Diagnostic Pump Information screen shows:

- The pump's parameters, including the calibration and maintenance dates.

- Messages indicating when it is time to recalibrate the unit or when it is time for regular maintenance.

- Pump software version, calibration & lubrication intervals.

Pump Information   03/18/16 5:23:28 PM

Model Type   Programmable
Software Version   3.0.2
Program Steps Available   1009
Calibration Due Date   03/18/17
Maintenance Due   100 hours
Pump Address   0

Calibration Reset   Maintenance Reset

BACK X   ENTR ✓
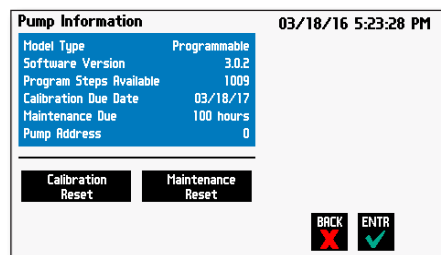
(Legato™ 200 Series Shown)

Notifications and Error Messages

Notifications and error messages are displayed for the user to acknowledge, eliminating any guesswork about problems.

Set Infuse Rate   03/18/16 5:24:11 PM

Infuse Rate   50_   nl/min

7 8 9   ↑ MAX 36.0035 ml/min   ERROR 210-Infuse rate out of range.
4 5 6
1 2 3   69.34 nl/min   PRESS TO CLEAR ERROR
. 0 ⌫   MIN ↓

BACK X   ENTR ✓
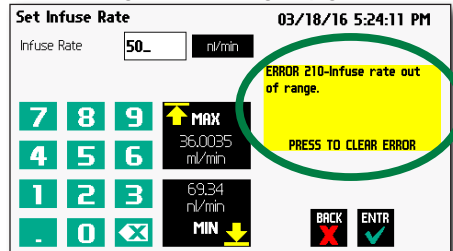
Legato™ Features 5 Different Alarms:

The pump's alarm configurability includes alarms for near-end of run (user selectable), completion of run, power-up, keypad clicks, stall detection and calibration reminder.

- **End of Run**
- **Near End of Run**
- **Power Fail**
- **Stalled Condition**
- **Calibration Reminder** (Only available on the Legato™ 200 Series)

Audible Alarms   03/18/16 5:24:44 PM

End of Run   Power Fail
✓ Stall   Keypad Clicks
                  ✓ Calibration Reminder
Near End of Run   75%
Mute All

BACK X   ENTR ✓

Legato™ SERIES

Multiple users can use the programmable pump saving their specific configurations and recalling them with a touch of a button. Also, different tests can be setup and stored for quick operation. The Multi-step program models offer maximum flexibility and capability for configuring and running different programs/recipes.

Simple Configurations for

Configure Custom Programs Quickly

Standard profiles make custom programs easy to setup. If more complexity is needed the user can select from advanced preprogrammed functions including:

- **Constant Rate**
- **Ramp**
- **Stepped** (Legato 200 Series Only)
- **Pulse** (Legato 200 Series Only)
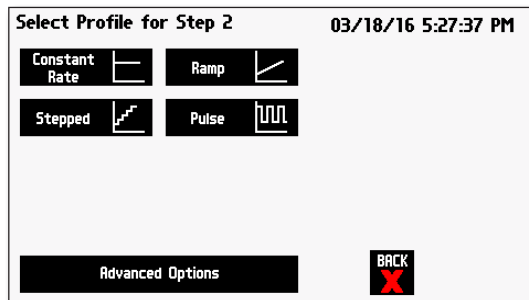
Pre-defined profiles for easy configuration.

- Easy retrieval of multiple programs with labels.

- Easy flow configuration with predefined functions such as ramp, constant rate, pulse, link, start, stop, and elapsed time.

- Control the programs through real and relative clock

- Legato 200 Series Programmable has up to 40 programs of 20 steps each that can be configured and stored in the unit; quickly recalling programs with the touch of a button.

- Legato 110, 111, 180 & 185 have 2 programs with 50 steps each.

- Identify programs with a 15-character alphanumeric name for easy identification. Store custom programs on the computer and download at future dates.

- Start and stop programs with real time clock or using elapsed time (Real time clock with the Legato 200 Series only)

CONSTANT RATE

Flow Rate / Time I Volume

RAMP RATE

Flow Rate / Time

STEPPED RATE (Legato 200 Series only)

Steps

Flow Rate / Time I Volume

PULSE FLOW (Legato 200 Series only)

Pulses

Flow Rate / Time I Volume

Linking and activating steps is easy with:
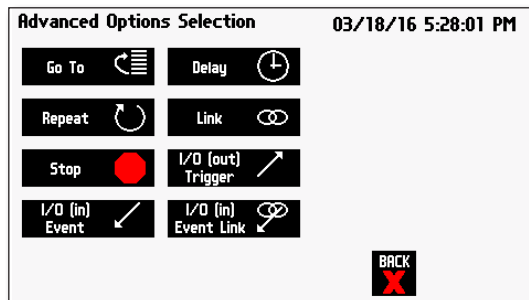
Trigger programs with pre-defined options.

- Go-To statements*
- Time Delays
- Repeating steps
- Linking different programs*
- Stopping the pump
- Triggering external devices using TTL output
- Accepting an event input, such as a user touch or motor stall or TTL input
- In addition, events can trigger the pump to withdraw or infuse

*Note: Only available with Legato 200 Series.
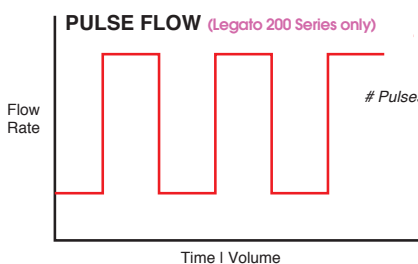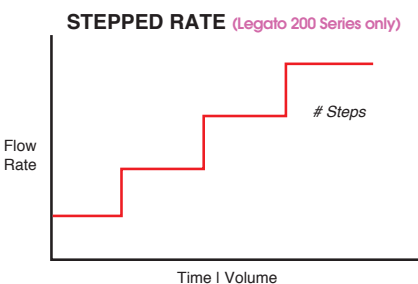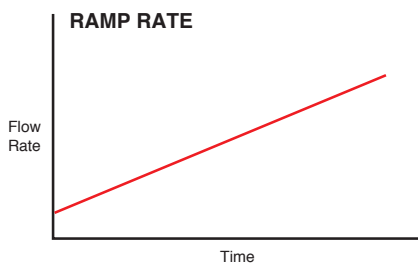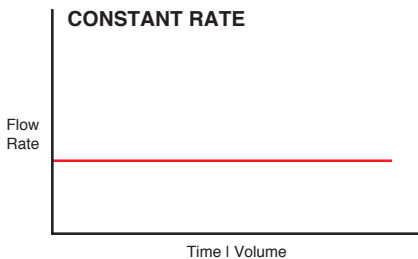
Routine & Complex Applications
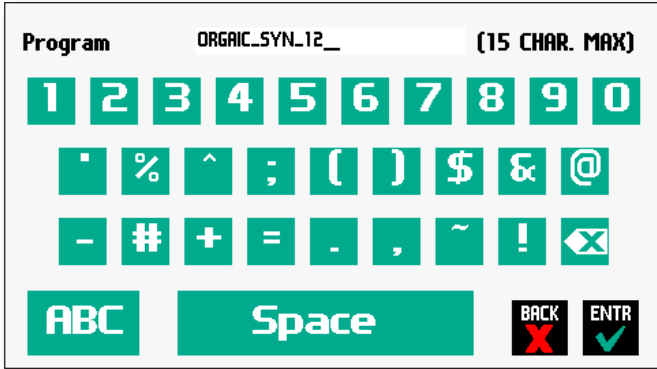
Unique labeling for each program.

NAME: ORGANIC SYN 12

Infuse for 10 minutes at 2 pl/hr. Stop, then toggle Pump 2 to start infusing and pump at 8 pl/hr for 50 minutes.

Organic Syn 12 - Pump 1
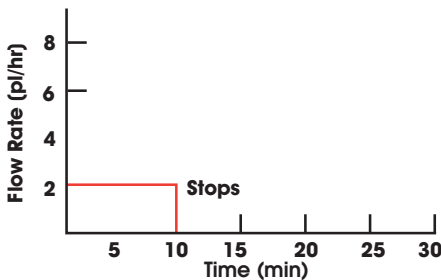
Organic Syn 12 - Pump 2
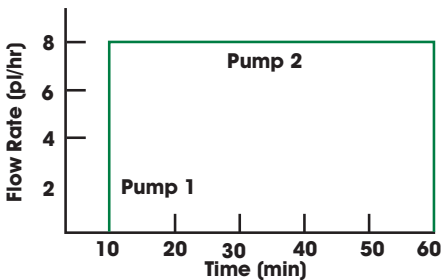
RECIPE NAME: DRUG 8302

Start on December 30 at 12:00 pm. Infuse at 1 nl/min for 2 hours every day at 12:00 pm for 2 days. Then stop.

Drug 8302 - Day 1
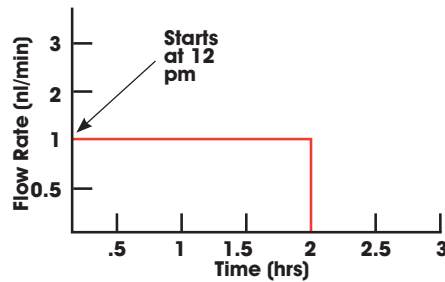
Drug 8302 - Day 2
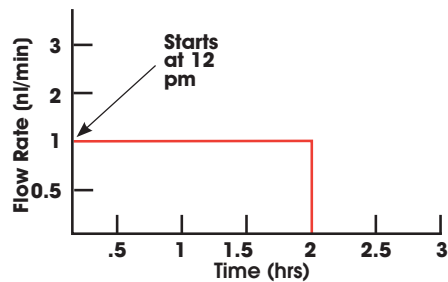
RECIPE NAME: NUTRIENT A #6

A test begins at 4 pm and runs at a flow rate of 5 μl/hr for 1 hour then goes to 10 μl/hr for 30 minutes. Waits for the user to press the display then continues for 1 more hour ramping from 5 μl/hr to 25 μl/hr.

Nutrient A #6
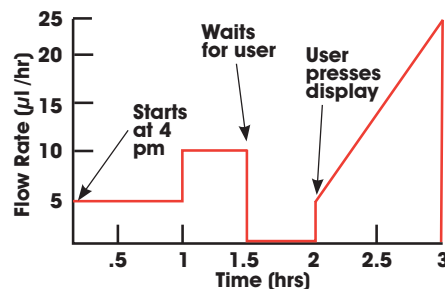
Easy external connections to a computer or other control devices are through USB interface or RS-232 (9 pin Dsub). Simple ASCII commands make communication with the pump easy. For direct control of the pump the user can use the I/O interface (15 pin Dsub). Pump direction can be changed. Trigger input & output external events such as a process parameter is available. The footswitch input will allow the control of the pump through an external device. The unit also has an output for run indication allowing connection to a remote light.

The Legato's Versatility is

In Communication — Multi Pump Mode of Operation

The pumps are versatile and can be interconnected through the RS-485 interface. All Legato™ models can be mixed and matched in the daisy chain offering maximum flexibility. Up to 99 pumps can be linked together through the RS-485 interface. This interface is easy to use and each pump has its own unique pump address.
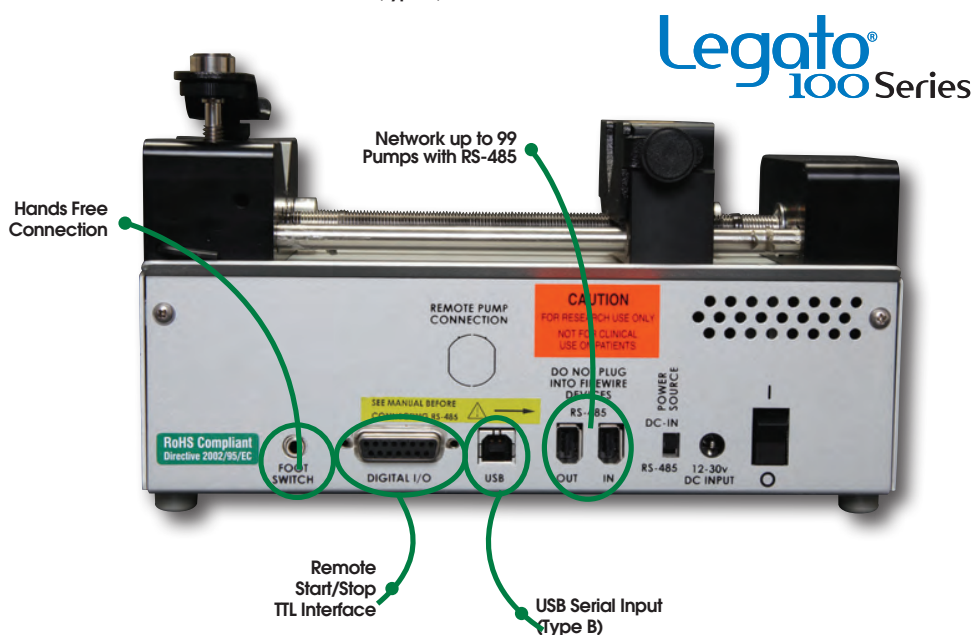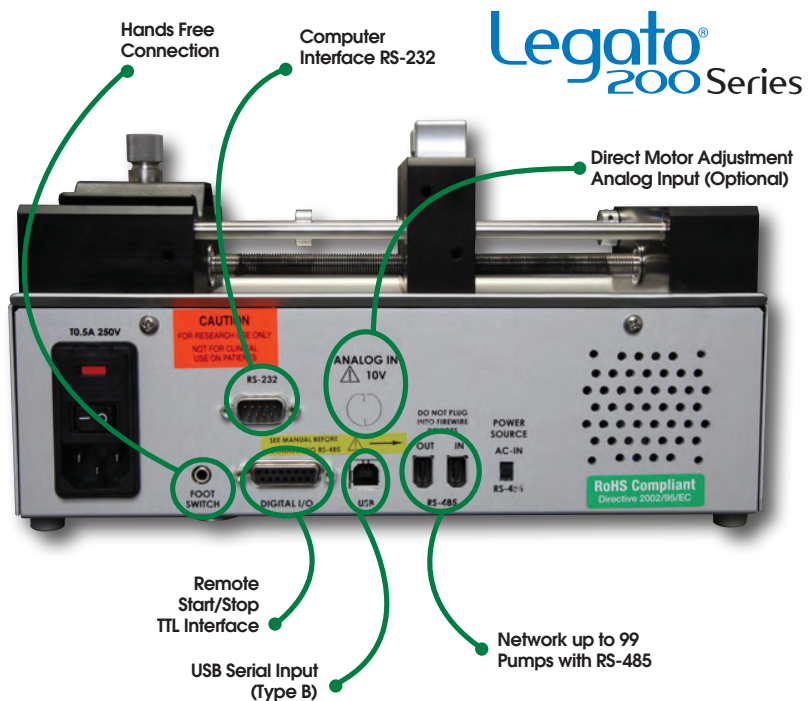
Second to None

Ensure the consistency and accuracy of programs with the ability to:

- *export programs to a PC*
- *export a program to another pump*
- *duplicate programs*
- *append one program to another*
- *rename programs*
- *delete programs*

Multiple tests are easy to run and control, as well as gradients, by linking up to 99 pumps together through the RS-485 interface. This interface is easy to use and each pump can be assigned its own unique pump address.

Multi-Pump Program Transfer
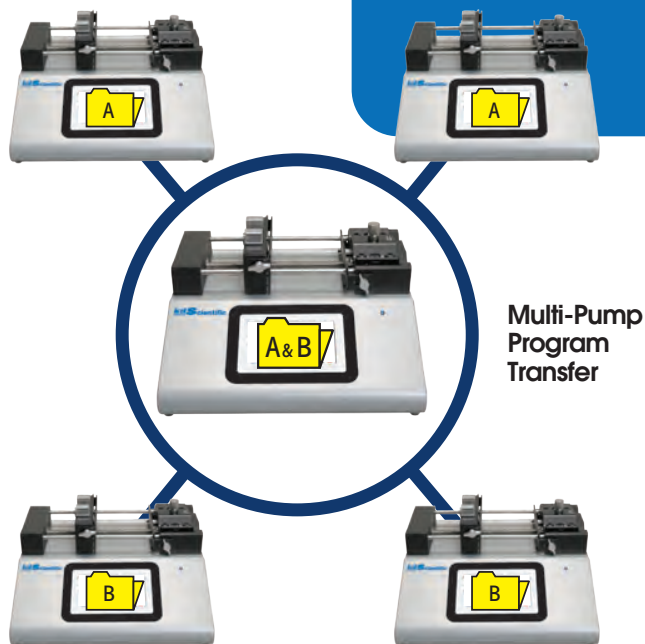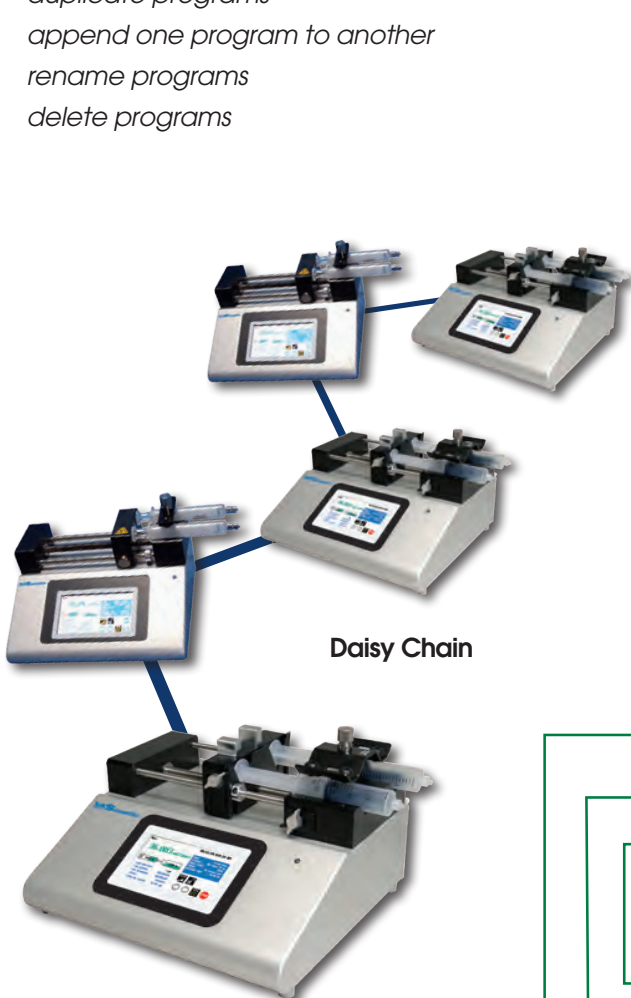
Daisy Chain

The Legato™ Series pumps permit the daisy chaining up to 99 pumps. To facilitate operation in these modes, the Legato™ Series application software includes a variety of commands designed to simplify the export/import of programs between the pump and external devices.

Mix and Match Legato™ 100 Series and 200 Series.

Transfer programs to a computer (Legato 210P, 270P, 110, 111 & 180)

Rename Recipes

Store Configurations for easy recall

Program File Options — 1_PROGRAM — 11/01/15 1:30:35 PM

Save As | Append
Rename Program | Delete Program
Export Program to PC
Export Program to Pump | Pump 1
BACK

Manipulate programs quickly.

Ensure pump to pump program consistency

Attach a configuration to another configuration

Delete configuration

Legato™ SERIES

The Legato™ 200 Series offers three basic pump models ensuring the right pump for your application.

- Infuse Only
- Infuse and Withdraw
- Continuos Push/Pull

The infuse and withdraw and push/pull pumps are available in a pro-grammable version for maximum flexibility and capability. Each of the basic models works with one syringe or two and can be reconfigured in the field to use multiple syringes.

A Variety of Legato™ 200 S

Legato™ 200
Infuse Only Syringe Pump

Legato™ 200
Dual Syringe Infusion Pump

Infuse Only Syringe Pump. Accommodates 2 syringes 0.5 μl to 140 ml. User definable flow rates with selectable target volumes or time values to control the total infusion volume.

Legato™ 210 & 210P
Dual Syringe Infuse/Withdraw Pump & Multi-step Programming

Accommodates 2 syringes 0.5 μl to 140 ml. This unit supports infuse only, withdraw only, infuse/withdraw, withdraw/infuse and continuous mode. User defined flow rates with selectable target volumes.

The Legato™ 210P features multi-step programming with user defined configurations/programs of up to 1000 steps. Up to 40 programs of 25 steps each can be stored in memory.

Legato™ 270 & 270P
Continuous Syringe Pump & Multi-step Programming

Push/Pull Syringe Pump. Accommodates 2 syringes 0.5 μl to 140 ml for infusion and 2 syringes for withdrawal. This model supports infusion and withdrawal simultaneously at user defined flow rates and with selectable target volumes to control the total volume pumped. It also supports infuse only, withdraw only, infuse/withdraw, withdraw/infuse and continuous mode.

The Legato™ 270P Push/Pull Pump features multi-step programming with 40 custom programs of up to 25 steps each. Multiple programs can be stored in memory.

Legato™ 210 & 210P
Infuse/Withdraw Syringe Pump

Legato™ 270 & 270P
Continuous Push/Pull Syringe Pump

Note: Syringe mechanism expands for full syringe stroke length.

Series to Meet Your Needs

Modular syringe racks can be purchased to create a multichannel syringe pump.

- **Up to six 10 ml syringe rack**

- **Up to four 140 ml syringe rack**

- **Microliter syringe rack**

Two options are available for the Legato™ Series. The analog input option which allows the analog control of the motor speed. By applying a 10 VDC max to the circuit, the motor speed can be varied. The second option is for an internal fan. These will be factory installed.

Small Syringe Multi-Rack 6/10
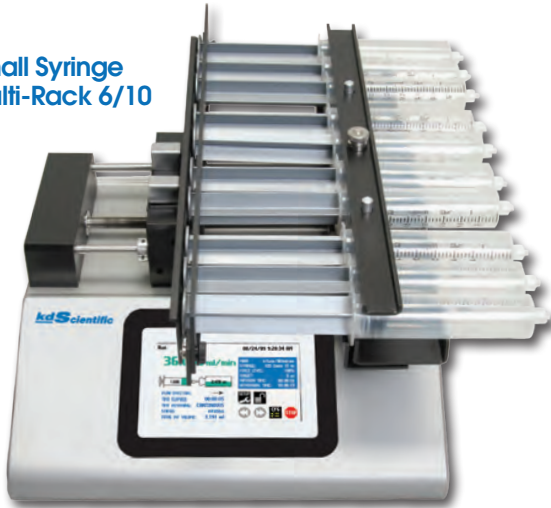
Large Plastic Syringe Multi-Rack 4 x 140 ml

Microliter Syringe Rack

Small Syringe Multi-Rack
Option (78-8300)

The Small Syringe Multi-Rack option will accommodate up to six 30 to 60 ml syringes or up to ten 0.5 μl to 20 ml syringes. The rack will work with the Legato™ 200, Legato™ 210 or Legato™ 210P.

- **Infuse/Withdraw 6/10 Multi-Rack**
- **Six 30 to 60 ml plastic syringes or ten 0.5 µl to 20 ml syringes**
- **Can be sold for Infuse Only as well**

Large Syringe Multi-Rack
Option (78-8301)

The Large Syringe Multi-Rack option will accommodate up to four 60 to 140 ml plastic syringes. The field installable rack will work with the Legato™ 200, Legato™ 210 or Legato™ 210P.

- **Infuse/Withdraw 4 x 140 Multi-Rack**
- **Four 60 to 140 ml plastic syringes**
- **Can be sold for Infuse Only as well**

Microliter Syringe Multi-Rack
Option (78-8302)

The Microliter Syringe Multi-Rack Option will accommodate up to four 0.5 μl to 10 ml syringes. The field installable rack will work with the Legato™ 200, Legato™ 210 or Legato™ 210P.

- **Infuse/Withdraw Microliter Rack**
- **Four 0.5 µl to 10 ml syringes**
- **Can be sold for Infuse Only as well**

Legato™ SERIES

A Variety of Legato™ 100 S

The Legato™ 100 series is the latest generation of pumps from KD Scientific. This 100 series incorporates many of the features in the Legato™ 200 series including a touch screen graphic interface. The run screen has all the pump parameters, as well as, the pumps current running conditions including instantaneous flow rate, elapsed time, time remaining and total volume dispensed. Set up is easy using the icon driven software. Engineering units can be changed for the flow rate and volume dispensed. This is truly the next generation of entry level pumps.
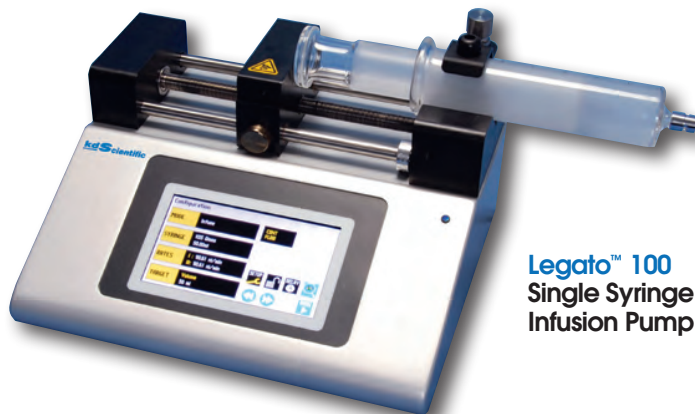
Legato™ 100
Single Syringe Infusion Pump

Legato™ 100
Single Syringe Infusion Pump

Entry level pump in the Legato series. This basic pump offers the same easy to use touch screen configuration and pump "run" screen as the more advanced Legato™ 200. This pump is ideal for electrospinning, nutrient feeding, mass spec calibration and other applications where a single syringe is used.

- **Single syringe 0.5 µl to 60 ml**
- **Wide flow range up to 88 ml/min**
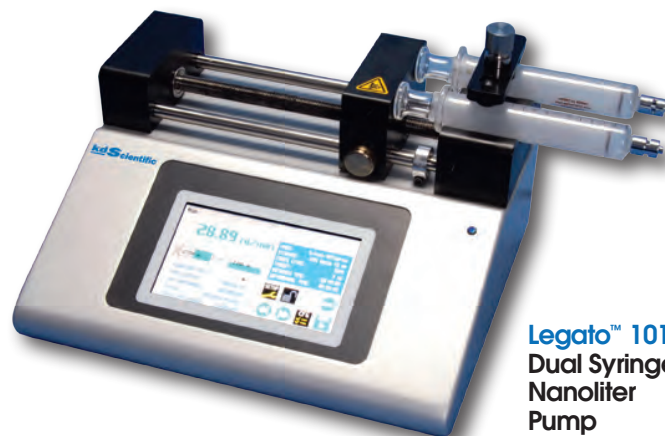
Legato™ 101
Dual Syringe Nanoliter Pump

Legato™ 101
Dual Syringe Nanoliter Pump

This infusion only pump is ideal for surface plasma resonance, organic synthesis, and other applications where dual syringes are required with small volumes under 10 ml.
- **Two syringes 0.5 µl to 10 ml**
- **Minimum flow rate 1.26 pl/min for a 0.5 µl syringe**

Legato™ 110
Single Syringe Infusion/Withdraw Pump

The Legato™ 110 is based on the Legato 100. It offers infuse/withdraw flow control and programmability for up to two multi-step programs of 50 steps each. This pump is ideal for more complex multi-step dosing and has multi-mode operation including infusion only, withdrawal only, infusion and withdrawal and withdrawal/infusion modes.

- **Single Syringe 0.5 µl to 60 ml**
- **Two Multi-step Programs**
- **Multi- mode operation**

Legato™ 110
Single Syringe Infuse/Withdraw Pump

Series to Meet Your Needs

The Legato 111/130/180/185 offer the smoothest flow of all the Legato Pumps. They all have multi-mode capability; including infusion only, withdraw only, infusion/withdrawal, withdrawal/infusion. They can be continuously operated repeating the infusion/withdrawal or the withdrawal/infusion modes.

Legato™ 111
Dual Syringe Nanoliter Infuse/Withdraw Pump

The Legato 111 is based on the Legato 101 and is enhanced with multi-mode capability like the Legato 110 and multi-step programming.

- Two syringes 0.5 µl to 10 ml
- Minimum flow rate 1.26 pl/min for a 0.5 µl syringe
- Two Multi-step Programs
- Multi-mode Operation

Legato™ 111
Dual Syringe Nanoliter Infuse/Withdraw Pump

Legato™ 130
Single Syringe Nanoliter Infusion/Withdraw Pump

The Legato™ 130 works exclusively with micro syringes from 0.5 µl to 1000 µl. It has a remote pump head which can be placed close to the experiment to eliminate dead volume with long tubing. The remote pump head makes it ideal for use with a micromanipulator, stereotaxic and other clamping devices.

The syringe plunger can be tightly secured with a movable mounting screw, eliminating any movement of the syringe. The new fixed cable with the remote head to the controller ensures the pump head and the controller are secure.

- Remote Pump head
- 0.5 µl to 1000 µl syringes
- Minimum flow 3.66 pl/min (0.5 µl syringe)
- Maximum flow 3.818 ml/min (1000 µl syringe)
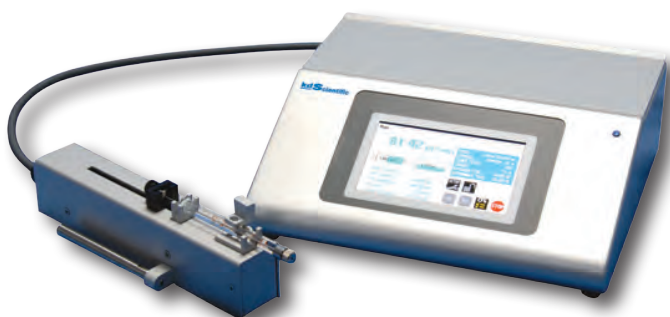
Legato™ 130
Single Syringe Nanoliter Infuse/Withdraw Pump

Legato™ 180 & 185
Single & Dual Syringe Picoliter Infuse/Withdraw Pump

This pump is the ultimate in precision flow delivery. It offers the most stable flow delivery of all the Legato products. The Legato™ 180 & 185 have a finer lead screw and a different pulley ratio from the Legato 101/111. The Legato™ 180 & 185 offer multi-mode capability and 2 multi-step programs, each with 50 steps. The Legato™ 180 & 185 are the ideal pumps for flow chemistry and small volume infusions or withdrawals of <10 ml.

- Legato™ 185: One Syringe 0.5 µl to 60 ml
- Legato™ 180: Two Syringes 0.5 µl to 10 ml
- Minimum flow rate 0.540 pl/min for a 0.5 µl syringe
- +/-0.35% Accuracy
- Two Multi-step Programs
- Multi-mode Operation

Legato™ 180 & 185
Single & Dual Syringe Picoliter Infuse/Withdraw Pump

Legato™ Series Specifications

Legato™ SERIES

	Infuse Only				
Legato Model	**Legato 100**	**Legato 101**	**Legato 200**	**Legato 110**	**Legato 111**
Order code	**78-8100**	**78-8101**	**78-8200**	**78-8110**	**78-8111**
Mode	Infuse Only	Infuse Only	Infuse Only	Infuse/Withdraw	Infuse/Withdraw
# Syringes	One	Two	Two	One	Two
Syringe Size	0.5 µl to 60 ml	0.5 µl to 10 ml	0.5 µl to 140 ml	0.5 µl to 60 ml	0.5 µl to 10 ml
User Interface	Touchscreen	Touchscreen	Touchscreen	Touchscreen	Touchscreen
Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display
Accuracy	+/-0.5%	+/-0.5%	+/-0.35%	+/-0.5%	+/-0.5%
Repeatability	+/-0.05%	+/-0.05%	+/-0.05%	+/-0.05%	+/-0.05%
Linear Force	30 lbs/13.6kg	30 lbs/13.6kg	75 lbs (34 kg)	30 lbs/13.6kg	30 lbs/13.6kg
Force Adjustment	Yes	Yes	Yes	Yes	Yes
Minimum Flow Rate 0.5 µl Syringe	1.26 pl/min	1.26 pl/min	3.06 pl/min	1.26 pl/min	1.26 pl/min
Maximum Flow Rate 10 ml Syringe	25.99 ml/min	25.99 ml/min	31.190 ml/min	25.99 ml/min	25.99 ml/min
Maximum Flow Rate 60 ml Syringe	88.28 ml/min	-	105 ml/min	88.28 ml/min	N/A
Drive Motor	0.9" Stepper Motor	0.9" Stepper Motor	1.8" Stepper Motor	0.9" Stepper Motor	0.9" Stepper Motor
Microprocessor Motor Drive Control	1/16 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping
# microsteps/one revolution of lead screw	15360	15360	6400	15360	15360
Advance per Microstep	0.069 µm/µstep	0.069 µm/µstep	0.1656 µm/µstep	0.069 µm/µstep	0.069 µm/µstep
Minimum Step Rate	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep
Maximum Step Rate	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep
Pusher Travel Rate					
Minimum	0.15 µm/min	0.15 µm/min	0.36 µm/min	0.15 µm/min	0.15 µm/min
Maximum	159 mm/min	159 mm/min	190.8 mm/min	159 mm/min	159 mm/min
Multi-step Programming	N/A	N/A	N/A	2 Programs/50 steps each	2 Programs/50 steps each
Constant Rate				Yes	Yes
Ramp				Yes	Yes
Pulsed				No	No
Stepped				No	No
Program Export/Import				Yes	Yes
Pusher Block Stall Detection	Yes	Yes	Yes	Yes	Yes
Computer Interface	USB	USB	USB/RS-232	USB	USB
TTL	Yes	Yes	Yes	Yes	Yes
Networking	RS-485	RS-485	RS-485	RS-485	RS-485
Real Time Clock	No	No	Yes	No	No
External Triggers	One	One	Two	One	One
Analog Input	No	No	No	No	No
Footswitch Interface	Yes	Yes	Yes	Yes	Yes
Maintenance Reminder	Yes	Yes	Yes	Yes	Yes
Calibration Reminder	No	No	Yes	No	No
Password Lock	Yes	Yes	Yes	Yes	Yes
Audible Alarm Indication	Yes	Yes	Yes	Yes	Yes
Display Rotation	Automatic	Automatic	Automatic	Automatic	Automatic
Multisyringe Rack Accessories	No	No	Yes	No	No
Run LED	Blue	Blue	Blue	Blue	Blue
Power	12-32 VDC	12-32 VDC	100/240 VAC 50/60 Hz	12-32 VDC	12-32 VDC
Weight	2.66 kg/5.9 lbs	2.66 kg/5.9 lbs	4.9 kg/10.75 lbs	2.66 kg/5.9 lbs	2.66 kg/5.9 lbs
Dimensions, H x W x L (in)	9 x 7.5 x 5	9 x 7.5 x 5	6.5 x 10 x 11	9 x 7.5 x 5	9 x 7.5 x 5
Dimensions, H x W x L (cm)	22.6 x 19.05 x 12.7	22.6 x 19.05 x 12.7	16.5 x 25.4 x 27.94	22.6 x 19.05 x 12.7	22.6 x 19.05 x 12.7
Certifications					
CE, ETL, UL, CSA, CB Scheme	Yes	Yes	Yes	Yes	Yes
EN 61010, EN 61326	Yes	Yes	Yes	Yes	Yes
WEEE, EU RoHS	Compliant	Compliant	Compliant	Compliant	Compliant

Infuse/ Withdraw Pumps				Continuous Cycle Pump	
Legato 180/185	**Legato 130**	**Legato 210**	**Legato 210P**	**Legato 270**	**Legato 270P**
78-8180/78-8180SGL	**78-8130**	**78-8210**	**788212**	**78-8270**	**78-8272**
Infuse/Withdraw	Infuse/Withdraw	Infuse/Withdraw	Infuse/Withdraw	Infuse/Withdraw/Continuous	Infuse/Withdraw/Continuous
Two/One	One	Two	Two	Two and Two (Four total)	Two and Two (Four total)
0.5 µl to 10 ml/0.5 ul to 60 ml	0.5 µl to 1 ml	0.5 µl to 140 ml	0.5 µl to 140 ml	0.5 µl to 140 ml	0.5 µl to 140 ml
Touchscreen	Touchscreen	Touchscreen	Touchscreen	Touchscreen	Touchscreen
4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display	4.3" QVGA Display
+/-0.35%	+/-0.5%	+/-0.35%	+/-0.35%	+/-0.35%	+/-0.35%
+/-0.05%	+/-.05%	+/-0.05%	+/-0.05%	+/-0.05%	+/-0.05%
30 lbs/13.6kg	11 lbs/5kg	75 lbs (34 kg)	75 lbs (34 kg)	75 lbs (34 kg)	75 lbs (34 kg)
Yes	Yes	Yes	Yes	Yes	Yes
0.540 pl/min	3.66 pl/min	3.06 pl/min	3.06 pl/min	3.06 pl/min	3.06 pl/min
11.7 ml/min	3.818 ml/min (1ml syringe)	31.190 ml/min	31.190 ml/min	31.190 ml/min	31.190 ml/min
39 ml/min	N/A	105 ml/min	105 ml/min	105 ml/min	105 ml/min
0.9" Stepper Motor	1.8" Stepper Motor	1.8" Stepper Motor	1.8" Stepper Motor	1.8" Stepper Motor	1.8" Stepper Motor
1/16 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping
20480	3200	6400	6400	6400	6400
0.031 µm/µstep	0.198 µm/µstep	0.1656 µm/µstep	0.1656 µm/µstep	0.1656 µm/µstep	0.1656 µm/µstep
27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep
26 µsec/µstep	52 µsec/µstep	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep
0.02 µm/min	0.433 µm/min	0.36 µm/min	0.36 µm/min	0.36 µm/min	0.36 µm/min
71.55 mm/min	228.97 mm/min	190.8 mm/min	190.8 mm/min	190.8 mm/min	190.8 mm/min
2 Programs/50 steps each	2 Programs/50 steps each	1 Program/100 steps	40 Programs/25 steps	1 Program/100 steps	40 Programs/25 steps
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
No	No	Yes	Yes	Yes	Yes
No	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
USB	USB	USB/RS-232	USB/RS-232	USB/RS-232	USB/RS-232
Yes	Yes	Yes	Yes	Yes	Yes
RS-485	RS-485	RS-485	RS-485	RS-485	RS-485
No	No	Yes	Yes	Yes	Yes
One	One	Two	Two	Two	Two
No	No	Yes (option)	Yes (option)	Yes (option)	Yes (option)
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
No	No	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Automatic	Automatic	Automatic	Automatic	Automatic	Automatic
No	No	Yes	Yes	No	No
Green	Blue	Blue	Blue	Blue	Blue
12-32 VDC	12-32 VDC	100/240 VAC 50/60 Hz	100/240 VAC 50/60 Hz	100/240 VAC 50/60 Hz	100/240 VAC 50/60 Hz
2.66 kg/5.9 lbs	2.05 kg/4.32 lbs	4.9 kg/10.75 lbs	4.9 kg/10.75 lbs	4.9 kg/10.75 lbs	4.9 kg/10.75 lbs
9 x 7.5 x 5	9 x 7.5 x 3.67	6.5 x 10 x 11	6.5 x 10 x 11	6.5 x 10 x 11	6.5 x 10 x 11
22.6 x 19.05 x 12.7	22.6 x 19.05 x 9.32	16.5 x 25.4 x 27.94	16.5 x 25.4 x 27.94	16.5 x 25.4 x 27.94	16.5 x 25.4 x 27.94
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Compliant	Compliant	Compliant	Compliant	Compliant	Compliant

ADAGIO® SOFTWARE

The Adagio® Graphic Software adds a new dimension to pump control. Issue manual pump commands or run the pumps automatically with multistep programs. Works with the entire Legato™ 200 and 100 pump series. Adagio® Pump Software – Enhances the Legato™ Pumps Use.

Adagio® will allow you to configure the pump through the software as well as operate one or multiple pumps. Programs can be executed as a tabular data drive spreadsheet or as a graphical. Control up to 50 pumps with the Legato 200 series and up to 20 pumps with the Legato 100 series. Pumps can be mixed or matched.

Adagio® has been designed to maximize the use of the pumps functions and features and does not require knowledge of software programming.
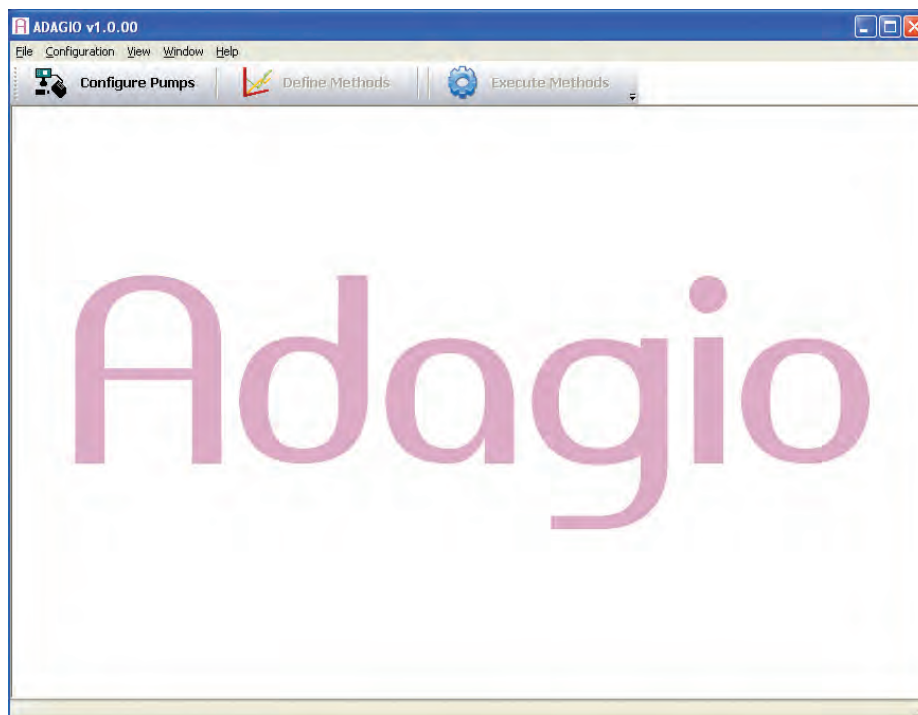
Adagio's versatile functionality will allow you to:

- Track multiple pumps by serial number and unique name
- Data log and store program information
- Store multiple programs by name
- Define and execute programs in the Adagio® Software
- Independent Manual Pump Control Program
- Graphic Interface or Tabular data interface
- Automatic pump communicator program
- Start/Stop/Reset programs in multiple pumps
- View pumps flow profile in multiple windows

Minimum computer requirements include:

- 2 Ghz Pentium processor or higher
- 512 MB of RAM (2 GB recommended)
- Windows XP SP3 or Vista (XP recommended)
- Free RS-232 or USB 2.0 ports
- Microsoft Excel 97 or higher.

Adagio® Syringe Pump Software

Adagio® is easy-to-use with a Automatic Configuration Assistant

Assign a unique pump name

List Sortable by Column

Launch Pump Configuration Assistant

Select Pump to edit previously defined pump

Delete configured pump

Auto detection of pump status

Pump Configuration

Pump Configuration

Legend
- ● Pump ready
- ○ Pump off line
- ● Wrong pump detected

| Add new... | Edit... | Delete |

Pump Name	Pump Model	Serial Number	Communication
Legato 210	LEGATO 210 Infuse/Withdraw		COM9 [0]

| Refresh | Pump control | Accept | Cancel |

Identify the communication port

Enter the pumps serial number

Identify the pump model

Launch manual pump control

Updates status of the pumps

Ignore changes made to the list of pump

Close Pump configurations and store defined pump list

ADAGIO®
SOFTWARE

Define the Pump Configuration

Connect the pumps to the computer.

Auto Checks the Pump Model & Identification
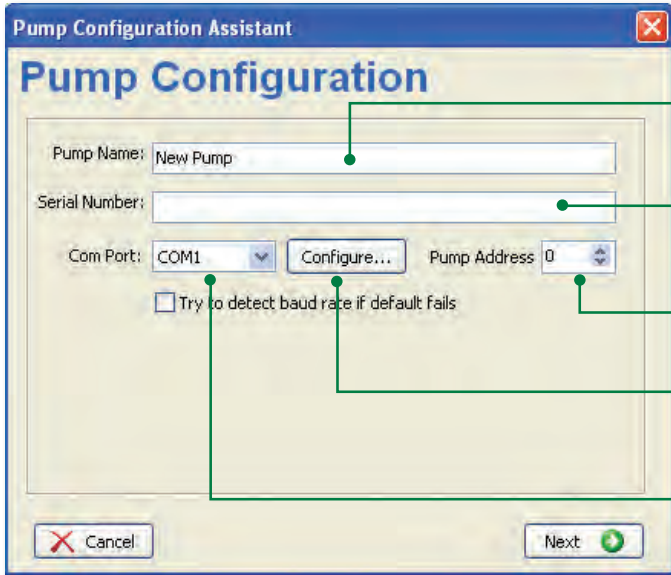
Enter A Unique Name

Enter Pump Serial Number

Legato Pump Address

Enter Communication Port Baud Rate

Lists All Available Communication Ports
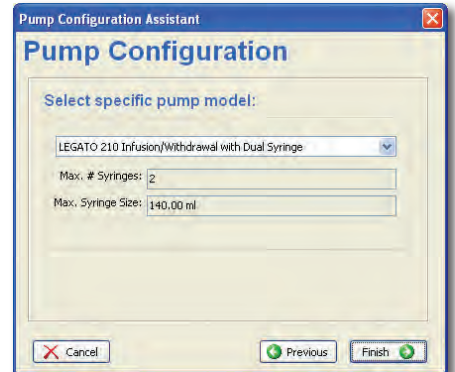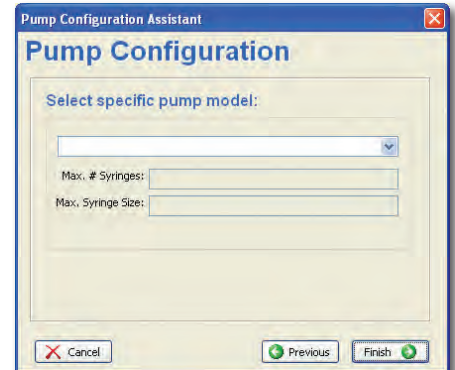
Quick & Easy Manual Pump Control

The manual pump control tool allows easy direct control of the pump.
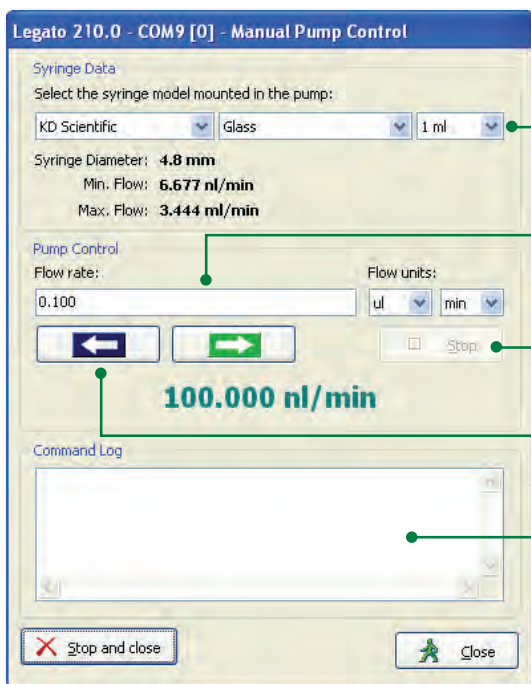
Select Syringe Type & Size

Define Flow Rate

Stop Pump

Select Flow Direction

Time Stamped Log of Commands

Easily Accessible Programs List

Manage programs easily. Programs are stored in a list and can be easily retrieved.

Unique program name up to 255 characters

Sortable by columns

Duplicate Programs

Total Volume Infused

Date Program last modified

Methods Definition

Method Name	Pump Model	# of Steps	Total Duration	Total Volume	Modified
Program 1	LEGATO 210	2	00:33:20	0.000 pl	8/3/2010
Ramp	LEGATO 210	1	00:13:19	13.317 ul	8/3/2010

Add new...   Edit...   Copy...   Delete

Close

Program Duration

Total Number of Program Step

Identifies Legato Model

Edit Existing Programs

Program Definition

Easily configure multiple steps in the programs by dragging the cursor or in table format

Pump Duration Meter

Flow Rate Zoom In & Out

Two different program displays (Graph or Table)

Select Syringe Type and Size

Select a pump

Name the Program

Method Setup - [Program 1]

Method name: Program 1

Modified Date: Created Date: Method description:

Loop properties: Enable loop

Pump model: LEGATO 210 Infusion/Withdrawal with Dual Syringe

From Step 1
To Step 2
Iterations 1000

of Syringes: 1   Syringe model: Becton Dickinson   Plasti-pak   50 ml | 2

Flow units: ml   min

Max. flow rate: 105.730 ml/min
Min. flow rate: 204.958 ml/min

Graph View   Spreadsheet View

Flow rate (ml/min)   Method Flow Tracker

Infuse

Withdraw

100   50   0   -50   -100

INFUSE

WITHDRAW

00:00:01.000   00:00:01.500   00:00:02.000   00:00:02.500   00:00:03.000
Time (hh:mm:ss)

Time: 00:00:00   Flow: 0.000 pl/hr   Duration: 00:00:01   Volume: -333.300 ul   Acc.Vol.: -250.000 ul

Accept   Cancel

Loop steps

Describe the Program

Maximum and Minimum flow indicator for syringe size

Start flow marker

Time Zoom In & Out

Indicates information where the cursor is pointed

Spreadsheet View to See Program in a Table Format

Enter Parameters in a table format

Flow Direction

Start and End Flow Rate

Program Name

Total Volume

Step Volume

Adding Step is Easy

Manually enter the step information or drag and drop the duration marker on the graph.

Accumulated Time
Accumulated Volume

Selectable Step Volume

Start/End Flow Rate

Duration of the Step

Multiple Pump Control

Start/Stop/Pause programs from the method execution display.

Pump Name

Program Name

Control individual or all pumps simultaneously

Current Pump Status

Total Program Duration

Program Progress (0 to 100%)

Elapsed Program Time

Current Flow Rate with Pump Direction

Monitor One or More Pumps

Multiple programs can be opened at the same time. The programs progression is tracked and can be stored in a file for later access.
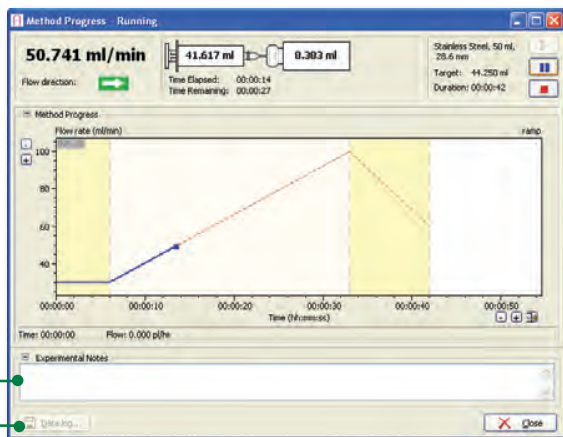
Log the data to a file. *.bmp, *.xls or *.txt

Add a comment to the test

Data Logging

Data can be stored in a file. Selectable formats include *.bmp, *.xls or *.txt. Comments in the text can be manually entered and will be stored in the data file.

Pump parameters are stored as well as an event record table.

Pump Parameters

- Start time
- Name of the program executed
- Pump, rack and syringe models used
- Total duration of the program execution (in format hh:mm:ss)
- Total volume infused (accumulated positive flows)
- Total volume withdrawn (accumulated negative flows)
- Total volume disposed by the program (difference between infused and withdrawn)
- Flow units considered

ADAGIO®
SOFTWARE

LEGACY SERIES

The KDS Legacy Series

The Legacy series is the foundation for all KD Scientific Pumps. The Legacy pumps are acknowledged as the industry's highest valued solution for delivering precise and smooth flow in research, pilot plants and production applications. Simple and easy to use, these pumps are the favorite of research scientists and engineers. They use the KDS 100/KDS 200 syringe pumps more than any other for the their outstanding reliability and performance. The KDS 100 series pumps give customers the most cost effective solution for infusing fluids. Alternatively, the KDS 200/KDS 400 series give the customer advanced features with RS232 and TTL interfaces. All KDS 200/KDS 400 series pumps can be daisy chained together to create a pumping network.

Simple Syringe Installation, Quick Release Drive Nut

Prevent Syringe Damage–Guide Rod Clamp

Power Failure Indication

Easy to Read Backlit LCD

Durable Construction Welded Seams

Pump Direction Displayed

Automatic Shutoff Volume Dispense Mode

Fast Set-up, Built-in Syringe Size Table

Rapid Adjustments, Fast Forward/Reverse
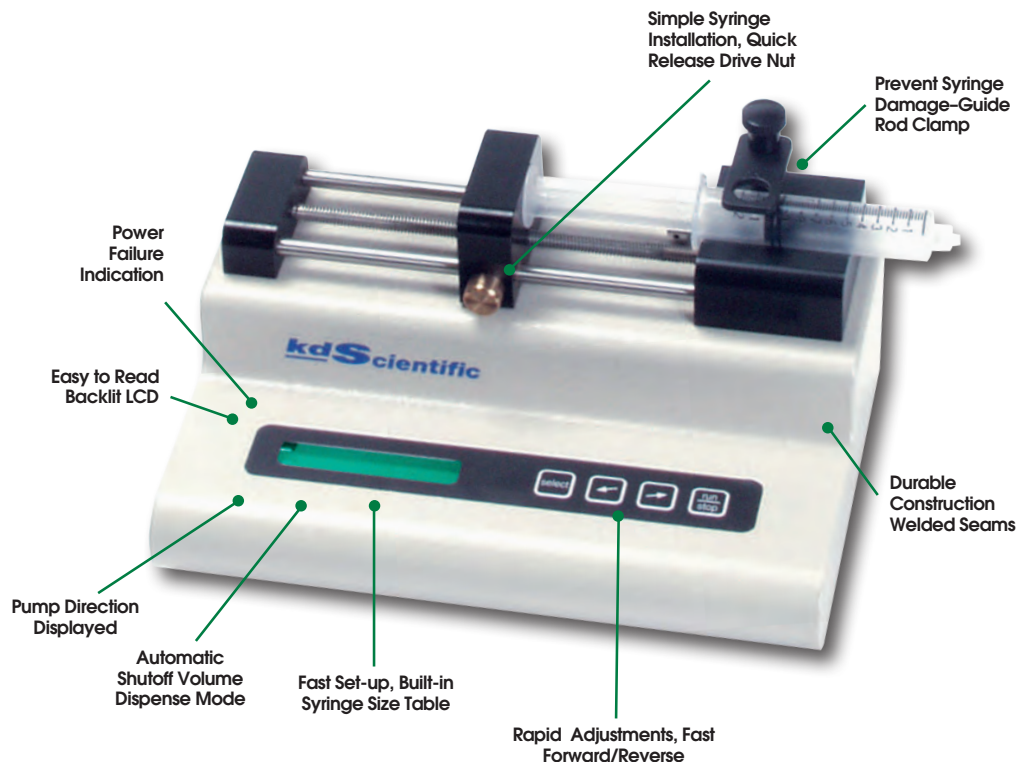
General Features Available on ALL Legacy pumps:

- Vibration Elimination System
- Flow Direction Indicator
- Fast Forward/Reverse
- Antisiphon Clamp (I/W Models only)
- CE Approved Model 100 series are ETL listed and conforms to ANSI/UL Standard 61010-1:2004 2ND ED. Certified to CAN/CSA STD C22.2NO.61010.1:2004 2ND ED
- Power Recovery Diagnostics
- Optional Foot Pedal Interface
- NIST Certificate Option
- Alarm Option
- CE Approved Models

Basic Programming

- Syringe Library
- Flow Rate Selection
- Volume Dispense Mode
- Direct Entry Syringe Diameter

Standard on KDS 200/KDS 400 Pumps

- Daisy Chain Connection
- RS232
- TTL
- Foot Switch Interface Standard
- Stall Detection
- Numeric Keypad
- Engineering Unit Selection

Expanded Capabilities

Network Multiple Pumps

Network up to 100 Pumps–Mix and Match any KDS 200/400 Series Pump!

All KDS 200/400 series pumps can be networked together. Each pump has a unique address to control its rate and volume remotely from a computer. Pump start/stop activation can be easily controlled. National Instruments certified Labview™ drivers are available at no charge.

Advanced Programmable Pumps

Keypad programmable option now available with all KDS 200/KDS 400 Series syringe pumps. Lets you program right from the keypad with software program on computer.

Simply follow a few menu-driven prompts and in just minutes you can customize a program to: control the pump from seconds to days, change flow rates, pause, ramp rates up or down automatically, control outputs and respond to external TTL signals.

Unlike other programmable pumps, there's no need to enter time increments or decrements between start and end flow rates. KDS pumps provide a smooth, linear transition automatically.

A program is divided into eight variable time periods called steps. A step can be up to 12 hours long and may be changed without affecting other steps.

Each step offers these options:

1. Time duration, from one second up to 12 hours
2. Travel direction – Infuse or withdraw (where available)
3. Beginning flow rate (µl/hr to ml/min range)
4. End flow rate (µl/hr to ml/min range)
5. Pause – Waits for an external trigger to start
6. Status of output TTL pins
7. Loop option – Loops back to any previous step and repeats the intermediate steps. Two separate loops available.
8. Set the count in the loop cycle. Steps may be repeated up to 100 times.
9. Program stored in non volatile memory.
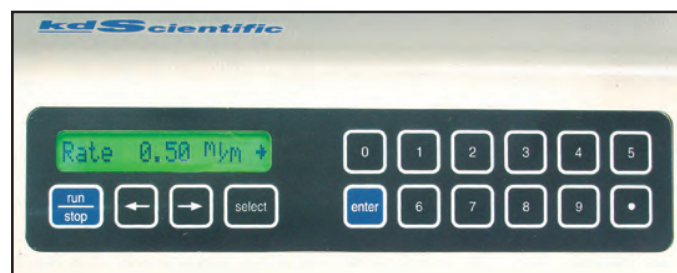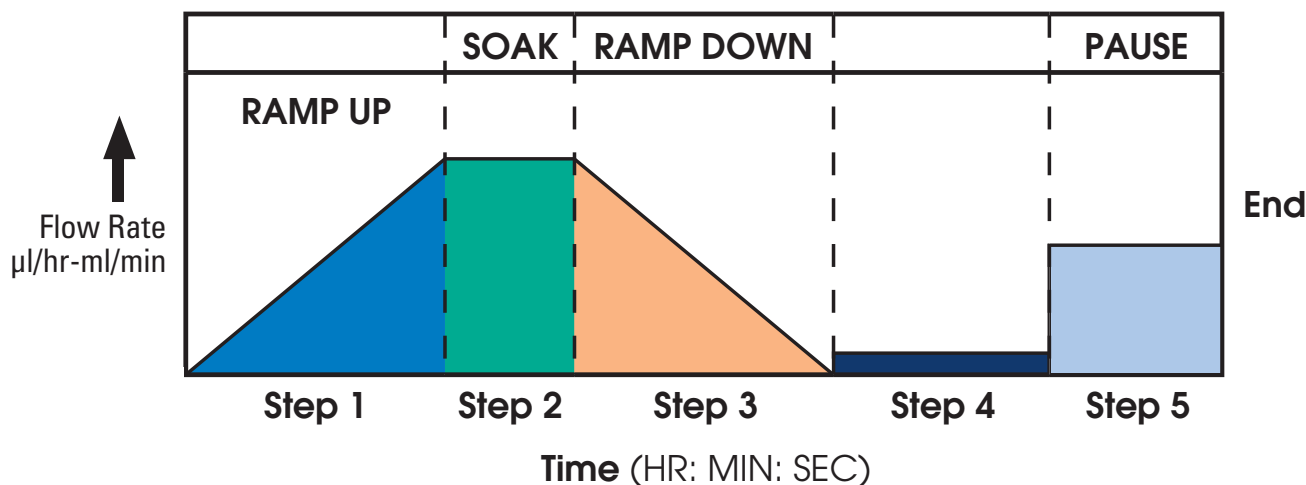
KD Scientific infusion pumps are ideal for delivering accurate and precise amounts of fluids for a multitude of applications, including injection of calibrant into a mass spectrometer or reaction chamber, long term drug delivery to animals and general infusion applications.

Infusion Pumps

KDS 100
Single-Syringe Infusion Pump
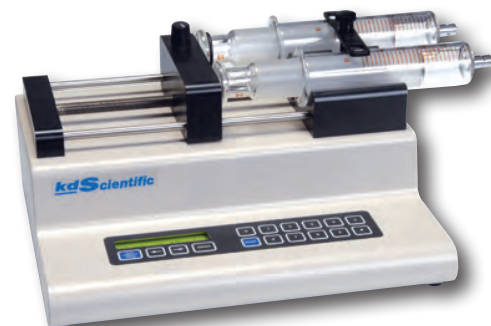
KDS 200
Two-Syringe Infusion Pump

KDS 101
Two-Syringe Nanoliter Pump

KDS 220
Multi-Syringe Infusion Pump
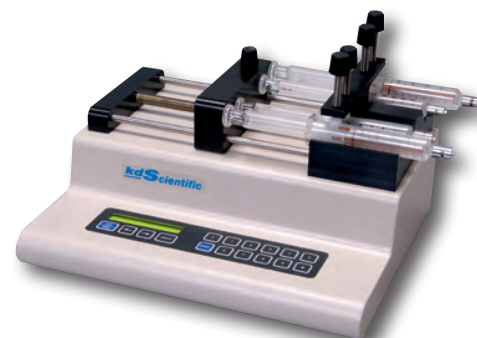
KDS 250
Four-Syringe Microliter Infusion Pump

KDS 100
Single-Syringe Infusion Pump

This economical Single Syringe Infusion Pump combines precision flow with outstanding ease-of-use and exceptional durability.

- Single syringe 10 µl to 60 ml
- Wide flow range up to 423 ml/hr (60 ml syringe)

KDS 101
Two-Syringe Nanoliter Pump

The KDS 101 Two-Syringe Nanoliter Pump is ideal for microdialysis and similar applications which require virtually pulseless flow at very low flow rates.

- Holds 2 syringes, 10 µl to 10 ml each
- Minimum flow 0.001 µl/min (10 µl syringe)

KDS 200
Two-Syringe Infusion Pump

This feature-laden Two-Syringe Infusion Pump combines a broad speed range and holds a wide range of syringe sizes to meet the requirements of virtually any laboratory application.

- Minimum flow 0.001 µl/hr with 10 µl syringe
- Holds one or two syringes, 10 µl to 140 ml each

KDS 220
Multi-Syringe Infusion Pump

KDS 220 Multi-Syringe Infusion Pump is ideal for applications requiring multiple syringes. This pump has been modified to hold up to 10 syringes.

- Multiple syringe holder:
  - One to ten syringes, 10 µl to 10 ml
  - One to six syringes, 20 ml to 60 ml
  - One to four syringes, 100 ml to 140 ml

KDS 250
Four-Syringe Microliter Infusion Pump

Each syringe can be sized differently and is clamped independently.

- Multiple syringe holder
  - Four syringes, 10 µl to 10 ml each
- Separate clamping accommodates various sizes
- Syringes may be positioned independently for sequential dispensing by the pusher block.

LEGACY SERIES

Infusion/Withdrawal Pumps

Infuse and withdraw capabilities provide maximum flexibility for varied applications. This feature permits applications, such as automatic withdrawal of samples and unattended filling of syringes at very low flow rates. The unique KDS 310 offers a remote pump head, which is perfect when space is limited. The small size and exceptional low flow rate capability allows direct mounting of the KDS 310 on a stereotaxic manipulator without the need for long narrow tubing which is both difficult to use and requires larger volumes of valuable fluids.

KDS 210
Two-Syringe Infusion/Withdrawal Pump
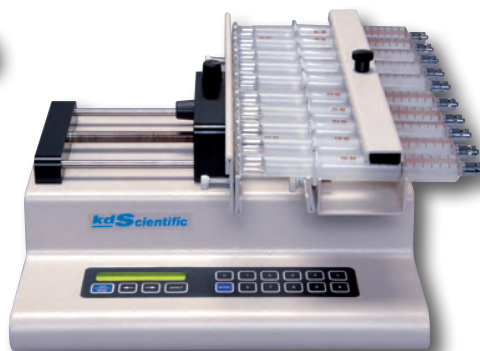
KDS 230
Multi-Syringe Infusion/ Withdrawal Pump

KDS 310
Single Syringe Nanoliter Pump
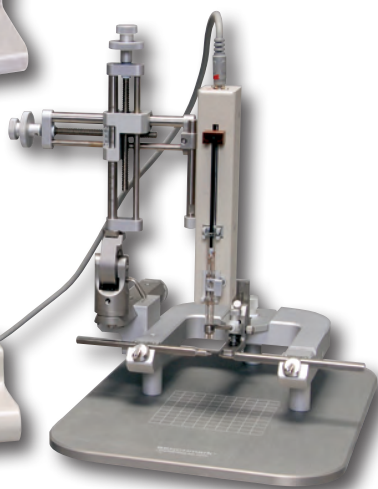
Note: Stereotaxic frame for illustration only.

KDS 230
Multi-Syringe Infusion/Withdrawal Pump

Ideal for applications requiring multiple syringes, the KDS 230 is an adaptation of the KDS 210. The pump has been modified to hold up to 10 syringes.

- **Multiple syringe holder:**
  – One to ten syringes, 10 µl to 10 ml
  – One to six syringes, 20 ml to 60 ml
  – One to four syringes, 100 ml to 140 ml
- **Multiple mode selection:**
  – Infusion, Withdrawal, Infusion then withdrawal, Withdrawal then Infusion, Continuous Cycle

KDS 210
Two-Syringe Infusion/Withdrawal Pump

The KDS 210 offers you more advanced features than any other infusion/ withdrawal pump in its price range- including five operating modes plus independent rate and volume settings for both infusion and withdrawal.

- **Holds two syringes, 10 µl to 140 ml each**
- **Multiple mode selection:**
  – Infusion, Withdrawal, Infusion then withdrawal, Withdrawal then Infusion, Continuous Cycle

KDS 310 Plus
Single-Syringe Nanoliter Pump

The KDS 310 Plus Single-Syringe Nanoliter Pump is used exclusively with micro syringes. Small size, remote pump head and a rugged mounting arm make it ideal for use with a micromanipulator, stereotaxic frame and other clamping devices.

- **Mini size pump**
- **Remote pump head**
- **0.5 µl to 250 µl syringe**
- **Minimum flow of 0.001 µl/min (0.5 µl syringe)**

KD Scientific specialty pumps are engineered to meet the demands of specific applications. These pumps use the basic design of our standard pumps but are modified to provide specific functionality for any application.

The Legacy Series fits your

KDS 120
Two-Syringe Push-Pull Pump
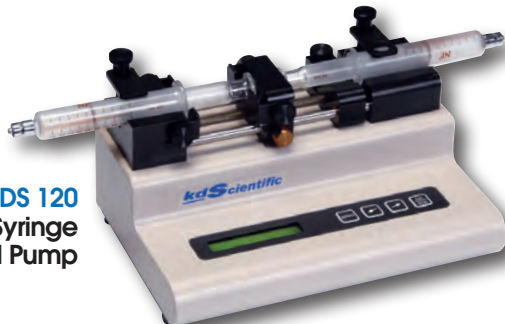
KDS 260
Four-Syringe Push-Pull Pump

KDS 270
Continuous Cycle Syringe Pump

KDS 410
High Pressure Syringe Pump
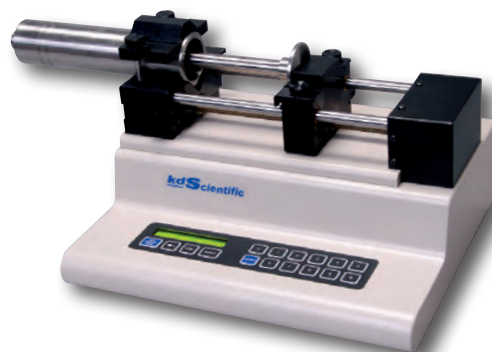
KDS 120
Two-Syringe Nanoliter Push-Pull Pump

This pump provides simultaneous infusion and withdrawal at the same rate with opposing syringes on the same drive screw. The Push/Pull mode is designed for one cycle only.

- **Holds two syringes 10 µl to 10 ml each**
- **Minimum flow 0.1 µl/hr (10 µl syringe)**

KDS 260
Four-Syringe Push-Pull Pump

This KDS 260 pump provides simultaneous infusion and withdrawal with opposing syringes on a single drive. This is a single cycle pump (due to brackets).

Note: When not used in push/pull mode, the pump has all the features of KDS 210

- **Holds up to four syringes, 10 µl to 60 ml each. With large syringes, the full volume may not be usable.**

KDS 270
Continuous Cycle Syringe Pump

The KDS 270 can hold up to four syringes and can cycle continuously back and forth in a push-pull action. As two syringes are infusing, two syringes are withdrawing at the same rate. At the end of the set volume the direction is automatically reversed and the next cycle begins. With the use of 3-way valves, the pump can empty and refill syringes for a continuous dispense.

- **Holds four syringes, 10 µl to 60 ml each. With large syringes the full volume may not be useable. (60 ml syringe - 40 ml useable, 30 ml syringe - full)**

KDS 410
High Pressure Syringe Pump

The KDS 410 is ideal for delivering fluid to reactors in chemical applications or for working with viscous fluids. The robust design ensures the syringe is kept level during delivery of the fluid. The KDS 410 more than doubles the linear force available in the KDS 200 series.

- **Single syringe 10 µl to 140 ml**
- **Minimum flow 0.001 µl/hr with a 10 µl syringe**
- **> 100 lbs (45 kg) linear force**

Everyday Applications

The KDS 100 series has been modified with new hardware and software features for specific applications. Integrating multiple pumps in a system allows the individual pumps to interact with other ones. This will provide a system linked together based on information from one pump being transferred to another.

In addition, new features have been added to the KDS 100 Series including a new remote interface or an LED on the pump to indicate it is running. Contact KD Scientific for more information on other requirements you have for your specific applications.

KDS 520
Volume Dispense System

KDS 510
Dual Rate Pump System

KDS 100Y*
With Remote Operation

KDS 100L
With LED Indication

Footswitch sold separately

*
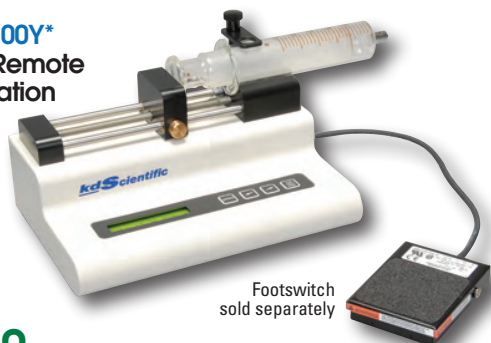
KDS 520

Volume Dispense System

Sequential volume dispensing is easy with the new volume dispensing system. The system includes two KDS 100 pumps and the cable to link the pumps together. Set the same or different volume[s] in pump A and B; pump A will dispense the predetermined volume and start pump B automatically. Pump A and B can have unique flow rates. The two pumps can also be operated as standard independent KDS 100's.

KDS 510

Dual Rate Pump System

Activate two KDS 100 pumps simultaneously with one push of the start key. Set each pump with a different flow rate and the pumps will infuse at the same time. The system includes two KDS 100 pumps and the cable to link the pumps together. The two pumps can also be operated as standard independent KDS 100's.

KDS 100Y

with Remote Operation

A new version of the rugged KDS 100 can now be remotely triggered with a footswitch or external switch. Starting and stopping dispense or infusion can be automated or remotely activated.

Also Available: 101Y, 120Y, 310Y

KDS 100L

with LED Indication

The KDS 100 is now available with an optional LED to indicate the pump is on or running. This feature is ideal to get a quick indication if the pump is dispensing, especially if multiple pumps are in operation.

Legacy Series Specifications

Legacy Model	Infuse Only Pumps						
	KDS 100	KDS 100L	KDS 100Y	KDS 101	KDS 200	KDS 220	KDS 250
Order Code 110 VAC	78-0100	78-0100ZZ	78-0100Y	78-0101	78-0200	78-0220	78-0250
Order Code 220 VAC with CE Mark	78-9100	78-9100ZZ	78-9100Y	78-9101	78-9200	78-9220	78-9250
Mode	Infuse	Infuse	Infuse	Infuse	Infuse	Infuse	Infuse
# Syringes	One	One	One	Two	Two	10 Maximum	Four
Syringe Size	10 µl to 60 ml	10 µl to 60 ml	10 µl to 60 ml	10 µl to 10 ml	10 µl to 140 ml	10 µl to 10 ml (up to 10)	10 µl to 10 ml
						40 ml to 60 ml (up to 6)	
						100 ml to 140 ml (up to 4)	
User Interface	Keypad	Keypad	Keypad	Keypad	Keypad with numerics	Keypad with numerics	Keypad with numerics
Display	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD
Accuracy	+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%
Repeatability	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%
Linear Force	20 lb/9 kg	20 lb/9 kg	20 lb/9 kg	40 lb/18 kg	40 lb/18 kg	40 lb/18 kg	40 lb/18 kg
Force Adjustment	-	-	-	-	-	-	-
Minimum Flow Rate 10 µl syringe	0.1 µl/hr	0.1 µl/hr	0.1 µl/hr	0.001 µl/min	0.001 µl/hr	0.001 µl/hr	0.001 µl/hr
Maximum Flow Rate 10 ml syringe	127 ml/hr	127 ml/hr	127 ml/hr	0.351 ml/min	1270 ml/hr	1270 ml/hr	1270 ml/hr
Maximum Flow Rate 60 ml syringe	423 ml/hr	423 ml/hr	423 ml/hr	-	4235 ml/hr	4235 ml/hr	-
Maximum Flow Rate 140 ml syringe	-	-	-	-	8824 ml/hr	8824 ml/hr	-
Drive Motor	7.5' Stepper Motor	7.5' Stepper Motor	7.5' Stepper Motor	7.5' Stepper Motor	1.8' Stepper Motor	1.8' Stepper Motor	1.8' Stepper Motor
Motor Gearbox	25:1	25:1	25:1	150:1	N/A	N/A	N/A
Microprocessor Motor Drive Control	1/2 microstepping	1/2 microstepping	1/2 microstepping	1/2 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping
# microsteps/one revolution of lead screw	2400	2400	2400	14400	6400	6400	6400
Advance per Microstep	0.529 µm	0.529 µm	0.529 µm	0.088 µm	0.1654 µm	0.1654 µm	0.1654 µm
Minimum Step Rate	30 sec/µstep	30 sec/µstep	30 sec/µstep	30 sec/µstep	120 sec/µstep	120 sec/µstep	120 sec/µstep
Maximum Step Rate	0.0025 sec/µstep	0.0025 sec/µstep	0.0025 sec/µstep	0.0025 sec/µstep	0.000625 sec/µstep	0.000625 sec/µstep	0.000625 sec/µstep
Pusher Travel Rate							
Minimum	0.10583 µm/min	0.10583 µm/min	0.10583 µm/min	0.001767 µm/min	0.10583 µm/min	0.10583 µm/min	0.10583 µm/min
Maximum	12700 µm/min	12700 µm/min	12700 µm/min	2033 µm/min	126900 µm/min	126900 µm/min	126900 µm/min
Multi-step Programming	No	No	No	No	Programmable Model	Programmable Model	Programmable Model
Pusher Block Stall Detection	No	No	No	No	Yes	Yes	Yes
Computer Interface	No	No	No	No	RS-232	RS-232	RS-232
TTL	No	No	No	No	Yes	Yes	Yes
Networking (Daisy-chain)	No	No	No	No	Yes	Yes	Yes
Audible Alarm Indication							
End of Run	Optional	Yes	Optional	Optional	Optional	Optional	Optional
Run LED	No	Yes	No	No	No	No	No
Power Domestic	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz
Power CE and International	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz
Weight	4.5 lb/2 kg	4.5 lb/2 kg	4.5 lb/2 kg	4.5 lb/2 kg	9.5 lb/4 kg	9.5 lb/4 kg	9.5 lb/4 kg
Dimensions (in)	9 X 6 x 5	9 X 6 x 5	9 X 6 x 5	9 X 6 x 5	11 x 9 x 5.5	11 x 9 x 5.5	11 x 9 x 5.5
Dimensions (cm)	23 x 15.25 x 13	23 x 15.25 x 13	23 x 15.25 x 13	23 x 15.25 x 13	28 x 23.5 x 14	28 x 23.5 x 14	28 x 23.5 x 14
Certifications							
CE, ETL, UL, CSA, CB Scheme	CE Model	CE Model	CE Model	CE Model	CE Only (no ETL)	CE Only (no ETL)	CE Only (no ETL)
EN 61010, EN 61326							
WEEE (just WEEE - not RoHS)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
Programmable Model	N/A	N/A	N/A	N/A	KDS 200P	KDS 220P	KDS 250P
Order Code 110 VAC					78-0202	78-0222	78-0252
Order Code 220 VAC with CE Mark					78-9202	78-9222	78-9252

LEGACY SERIES

Infuse/Withdraw Pumps		Push/Pull Pumps		Continuous Pump	High Pressure Pump	Remote Injector Pump
KDS 210	KDS 230	KDS 120	KDS 260	KDS 270	KDS 410	KDS 310 Plus
78-0210	78-0230	78-0120	78-0260	78-0270	78-0410	78-0311
78-9210	78-9230	78-9120	78-9260	78-9270	78-9410	78-9311
Infuse/Withdraw	Infuse/Withdraw	Push/Pull	Push/Pull	Infuse/Withdraw/Continuous	Infuse/Withdraw	Infuse/Withdraw
Two	10 Maximum	One and One	Two and Two	Two and Two (Four total)	One	One
10 µl to 140 ml	10 µl to 10 ml (up to 10)	10 µl 10 ml	10 µl to 60 ml	10 µl to 60 ml (up to 4)	10 µl to 140 ml	0.5 µl to 250 µl
	40 ml to 60 ml (up to 6)					
	100 ml to 140 ml (up to 4)					
Keypad with numerics	Keypad with numerics	Keypad	Keypad with numerics	Keypad with numerics	Keypad with numerics	Keypad
Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD	Backlit LCD
+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%	+/-<1%
+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%	+/-0.1%
40 lb/18 kg	40 lb/18 kg	20 lb/9 kg	40 lb/18 kg	40 lb/18 kg	>100 lb/45 kg	2 lb/ 0.9kg
-	-	-	-	-		
0.001 µl/hr	0.001 µl/hr	0.1 µl/hr	0.001 µl/hr	0.001 µl/hr		145.6 µl/min (100 µl syr)
1270 ml/hr	1270 ml/hr	127 ml/hr	1270 ml/hr	1270 ml/hr	1270 ml/hr	-
4235 ml/hr	4235 ml/hr	423 ml/hr	4235 ml/hr	4235 ml/hr	4235 ml/hr	-
8824 ml/hr	8824 ml/hr	-	8824 ml/hr	8824 ml/hr	8824 ml/hr	-
1.8' Stepper Motor	1.8' Stepper Motor	7.5' Stepper Motor	1.8' Stepper Motor	1.8' Stepper Motor	1.8' Stepper Motor	-
n/a	n/a	25:1	N/A	N/A	N/A	N/A
1/16 microstepping	1/16 microstepping	1/2 microstepping	1/16 microstepping	1/16 microstepping	1/16 microstepping	
6400	6400	2400	6400	6400	6400	-
0.1654 µm	0.1654 µm	0.529 µm	0.1654 µm	0.1654 µm	0.1654 µm	1.58 µm
120 sec/µstep	120 sec/µstep	30 sec/µstep	120 sec/µstep	120 sec/µstep	120 sec/µstep	-
0.000625 sec/µstep	0.000625 sec/µstep	0.0025 sec/µstep	0.000625 sec/µstep	0.000625 sec/µstep	0.000625 sec/µstep	-
						-
0.10583 µm/min	0.10583 µm/min	0.10583 µm/min	0.10583 µm/min	0.10583 µm/min	0.10583 µm/min	-
126900 µm/min	126900 µm/min	12700 µm/min	126900 µm/min	126900 µm/min	126900 µm/min	-
Programmable Model	Programmable Model	No	Programmable Model	Programmable Model	Programmable Model	No
Yes	Yes	No	Yes	Yes	Yes	No
RS-232	RS-232	No	RS-232	RS-232	RS-232	No
Yes	Yes	No	Yes	Yes	Yes	No
Yes	Yes	No	Yes	Yes	Yes	No
Optional	Optional	Optional	Optional	Optional	Optional	Optional
No	No	No	No	No	No	No
100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz	100 ~ 120 VAC 50/60Hz
200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz	200 ~ 240 VAC, 50/60Hz
9.5 lb/4 kg	9.5 lb/4 kg	4.5 lb/2 kg	9.5 lb/4 kg	9.5 lb/4 kg	14.1 lb/6.4 kg	4.5 lb/2 kg
11 x 9 x 5.5	11 x 9 x 5.5	9 X 6 x 5	11 x 9 x 5.5	11 x 9 x 5.5	6 x 11 x 9.5	7 X 1.7 x 2
28 x 23.5 x 14	28 x 23.5 x 14	23 x 15.25 x 13	28 x 23.5 x 14	28 x 23.5 x 14	15 x 28 x 24	17.8 x 4.4 x 5.1
CE Only (no ETL)	CE Only (no ETL)	CE Model	CE Only (no ETL)	CE Only (no ETL)	CE Only (no ETL)	CE Model
Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
KDS 210P	KDS 230P	N/A	KDS 260P	KDS 270P	KDS 410 P	
78-0212	78-0232		78-0262	78-0272	78-0412	
78-9212	78-9232		78-9262	78-9272	78-9412	

Pump customization is now easier with the new KDS OEM modules. Integrate these modules into your systems or work with our KDS engineering staff to design different syringe mechanisms or controllers. KDS offers the technology and engineering expertise to meet your demanding applications.

Specialty Pumps for Custom & Unique Applications

KD Scientific can customize modules to meet your application requirements. With our technical expertise in syringe pump design, we can meet even the most demanding applications at an affordable price. OEM pumps can be modified with different mechanisms and configurations. The basic models are shown below:

Microliter & Milliliter Syringe Pump Modules are Highly Precise

- Constant Current Drive offers more consistent force delivery over the entire dynamic flow rate range.
- Independent infuse and withdraw limit switches
- Emergency stop switch at pump
- Start/stop at pump
- Encoder for stall detection
- Power and run LED on the PC Board
- Supports external run LED
- Network multiple pumps

- Pump setting retained in NVRAM
- Adjustable force control
- Easily mounts to panel openings
- Customizable syringe mechanisms available
- Customizable chassis designs available
- Lead Free Design, RoHS compliant
- CE approved
- Advanced microstepping techniques

KDS 900

Customizable μl OEM Module

(KDS 910 features are similar)

- 0.5 μl to 1 ml syringe
- Minimum flow rate 0.001 μl/hr (0.5 μl syringe)
- < ±0.35% Accuracy
- Maximum flow rate 1.330 ml/min (1 ml syringe)
- RS-232 Interface
- Linear Force 7 lbs

<div style="text-align:left">SPECIALTY PRODUCTS</div>

Withdraw Bracket
Secure Syringe Clamp
Robust Motor
Stall Detection Optical Encoder
12-30 VDC Power
RS-232 Connection
Prevents Plunger Withdrawal (limit switch)
Digital I/O
• Run Indicator
• Run/Stop
Indicates End of Travel (limit switch)
Power-On LED
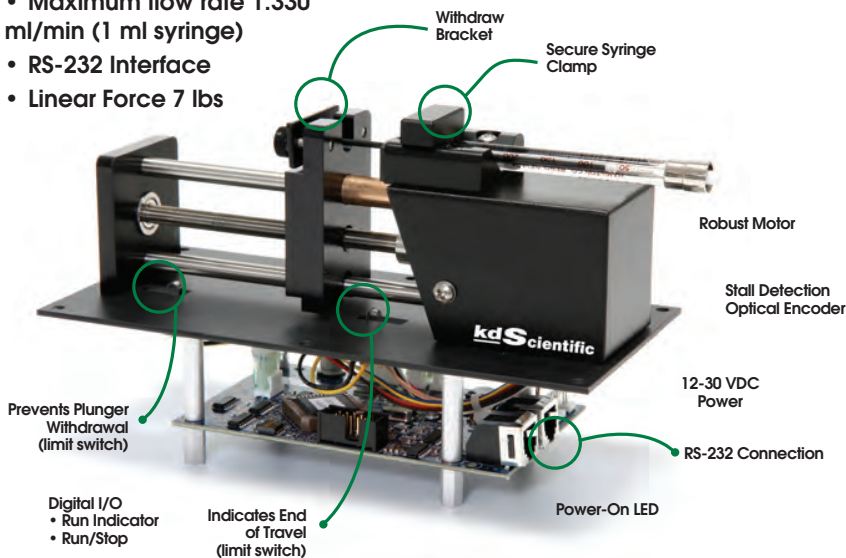
Legato™ OEM 950

Single Syringe Infuse/Withdraw OEM Module

Based on the Legato™ 100 series syringe pump design, the Legato™ 950 is ideal for applications interfacing to a computer. Accommodates syringes 0.5 μl to 60 ml. User definable flow rates with selectable target volume or time values to control the total infusion volume.

- ± 0.5% Accuracy
- 0.5 μl to 60 ml syringes
- Continuous mode of operation
- Programmable with ASCII commands
- Encoder stall detection
- USB Interface
- TTL Interface
- Customizable syringe mechanisms available
- Customizable chassis designs available
- Advanced microstepping techniques
- Linear force 30 lbs (13.6 kg)
- CE, CB Scheme, EU RoHS compliant

KDS 910

Customizable Milliliter OEM Module

- 0.5 μl to 50/60 ml syringes
- Minimum flow rate 0.001 μl/hr (0.5 μl syringe)
- < ±0.35% Accuracy
- Maximum flow rate 44.28 ml/min (50/60 ml syringe)
- RS-232 Interface
- Linear Force 25 lbs
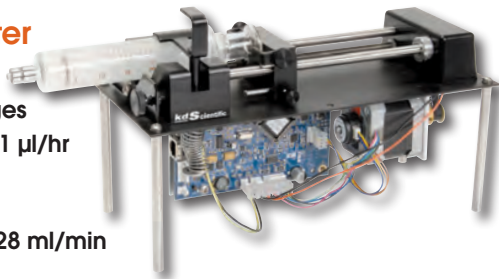
Specialty Pumps
Gemini 88 Plus

Gemini 88 Plus

Key Features

- Two independently controlled syringe pumps in one instrument
- High accuracy ±0.25%
- Accommodates syringe sizes 0.5µ to 60 ml
- Smooth flow down to 1.02 pl/min (syringe dependent)

The Gemini 88 Plus is a leap forward in syringe pump capability. The Gemini 88 Plus has two independent pumping channels controlled by an intuitive touch screen interface.

Graphical User Interface

The intuitive Gemini 88 Plus graphical user interface controlled with a large 7" LCD color touchscreen display allows quick and easy setup. The display run screen presents the user with all key dispensing parameters in real time. Syringe tables containing all major syringe manufacturers allow simple selection of any compatible syringe size. Audible Alarms, Adjustable Force and Screen Lock are all features that are available with a touch of the screen.

Advanced Connectivity

The Gemini 88 Plus comes standard with USB and RS-232 for PC communication and RS-485 for pump-to-pump communication. An entire suite of ASCII commands is available to control the pump remotely with a PC. The pump contains a footswitch input and digital input/output for each independent pumping channel.

Pump Channel 1 & 2 Footswitch Connections *(Footswitch sold separately)*

Pump Channel 1 & 2 Digital I/O Connections

RS-232 Serial Input

RS-485 Pump-to-Pump Communication Ports

USB Serial Input

DC Input *(Power Supply included)*

Main Power SwitcAh

Current Operating Condition

Mode Status, Syringe Size/Type, Dispense Time and Volume, Flow Rates and Force Settings

Real-Time Graphical Syringe Status Channel 2

Real-Time Graphical Syringe Status Channel 1

Run/Stop Channel 1

Reset Counters Channel 1

Return to Condition Selection Screen

System Settings

Screen Lock/ Unlock

Fast Forward/ Fast Reverse

Run/Stop Channel 2

Run/Stop Channels 1 and 2

Reset Counters Channel 2

Gemini 88 Plus Syringe Selection Screen

KD Scientific syringe pumps are for research purposes only. Not for use on humans.

Specialty Pumps

Independent Condition

Independent Condition allows the Gemini 88 Plus to operate as two separate syringe pumps named P1 & P2. Each syringe will operate independently with different syringe types, size, force, target (volume or time, mode dependent).
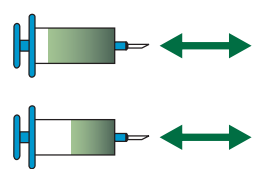
	Mode	Syringe	Rate	Target Volume/ TIme
P1	Infuse, Withdraw, Infuse/Withdraw, Withdraw/Infuse	Any size/type 0.5 µl - 60 ml	Any within syringe capability	Any (Mode Dependent)
P2	Infuse, Withdraw, Infuse/Withdraw, Withdraw/Infuse	Any size/type 0.5 µl - 60 ml	Any within syringe capability	Same as P1

Reciprocating Condition

In reciprocating condition, both syringe channels move in opposite directions at the same rate using the same syringe size and type.When combined with a valve box, the reciprocating condition can provide the continuous fluidic delivery of a peristaltic pump with the accurate, low flow rates provided by a syringe pump.
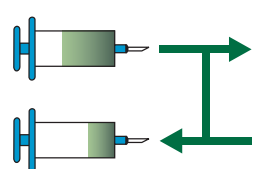
	Mode	Syringe	Rate	Target Volume/ TIme
P1	Infuse/Withdraw, Withdraw/Infuse	Any size/type 0.5 µl - 60 ml	Any within syringe capability	Any
P2	Opposite of P1	Same as P1	Same as P1	Same as P1

Twin Condition

Twin Condition allows both syringes to operate in the same mode using the exact same syringe type, syringe size, force, target (volume or time) and flow rate settings. The pump also allows the user to combine both flows for higher speed and volume infusion applications.
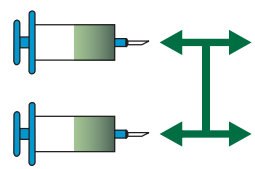
	Mode	Syringe	Rate	Target Volume/ TIme
P1	Infuse, Withdraw, Infuse/Withdraw, Withdraw/Infuse	Any size/type 0.5 µl - 60 ml	Any within syringe capability	Any (Mode Dependent)
P2	Same as P1	Same as P1	Same as P1	Same as P1

Specifications

Type	Microprocessor dual independent infuse/withdraw/ continuous syringe pump
Accuracy	±0.25%
Reproducability	±0.05%
Syringe	
Type	Glass, plastic, and stainless steel
Size Minimum	0.5 µl (0.103 mm minimum inner diameter)
Size Maximum	60 ml (32.573 mm maximum inner diameter)
Flow Rate	
Minimum	1.02 pl/min (0.5 µl syringe, 0.103 mm inner diameter)
Maximum	106 ml/min (60 ml syringe, 32.572 mm diameter)
Display	7" color display with touch screen
Connectors:	
USB	Type B
RS-232	9-pin D-sub connector
RS-485	IEEE-1394, 6 pos for pump-pump communication

TTL Input/Output	Two 15-pin D-sub connectors, one for each pump mechanism
Footswitch	Two phonojack inputs, one for each pump mechanism
Average Linear Force	70 lbs (31.75 kg) at 100% force setting up to a flow rate of 90 ml/min using up to a 60 ml syringe with a 32.573 mm inner diameter. 50 lbs (22.6 kg) at 100% force setting for flow rates 90 ml/min to 106 ml/min using the same syringe.
Power Supply	Input 100-240 VAC, 50/60 Hz, Output 30 V 1.66 A 50 W
Weight	21 lbs (9.09 kg)
Dimensions (L x D x H)	11 x 15 x 8" (28 x 39 x 21 cm)
Classification	Class I
Pollution	Degree 1
Installation	Category 2
Regulatory Certifications	CE, ETL (UL & CSA), CB Scheme, Eu RoHS, WEEE

Order No.	Description
78-8088	Gemini88 Plus Dual Independent Syringe Pump

Order No.	Description
78-0225	Footswitch (with phone plug)

Specialty Pumps

Legato™ 380
Emulsifier/Homogenizer

The **NEW** Legato™ 380 emulsifying system is based on the Legato™ Series of syringe pumps. It utilizes a modified Legato™ 210P and Legato™ 270P. All the standard features of the Legato™ products are still available, but a custom emulsification program has been added to the software. This program is only available with the Legato™ 380 system. The Legato™ 210P and Legato 270P can also be used as stand alone syringe pumps.

The emulsifiying system mimics the same action as in manually pushing fluid back and forth between syringes, but does it automatically. You select the volume and the emulsifying rate. The pumps will automatically move the fluid back and forth between the syringes for a user determined time or number of cycles.

- Eliminate fatigue associated with manual emulsification
- Automatically move solutions between two syringes
- Multiple functionality – use as independent syringe pump units
- Selectable emulsifying rates
- Selectable volumes
- Adjustable duration – Enter the number of cycles or the total time
- Adjustable force makes it ideal for viscous fluids – up to 75 lbs (34 kg) of linear force
- Flexible syringe sizes and types
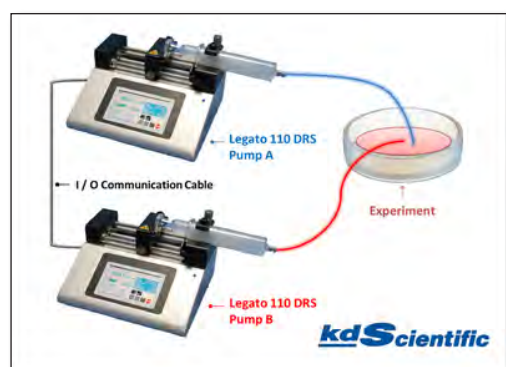
KDS Legato™ 110 DRS*
Dual Rate System

The new Legato™ 110 Dual Rate Syringe Pump System (Legato 110 DRS) offers researchers complete flexibility to start two pumps simultaneously for delivery of two independent flow rates. The pumps are synchronized through a special input/output cable included with the system. The new Legato 110 DRS comes complete with two programmable infuse / withdraw syringe pumps along with an input / output communications cable to synchronously operate the pumps.

This innovative syringe pump system allows the user to easily configure two different pumps with independent flow rates using the built in multistep programming and input / output signal communication. All control is set through the innovative Legato touch screen user interface. No external programming or computer is required.

Both syringe pumps in the system have a wide flow rate range from 1.28 pl/min to 88.28 ml/min. Each pump can be individually set for whatever the experiment requires.

Any type of syringe can be used in the unit including stainless steel, plastic or glass. The syringes are held in place by KD Scientific's new clamping mechanism designed to hold the syringes securely in place.

Syringes from 0.5 ul to 60 ml can be used. The Legato 110 Dual Rate Syringe Pump System has an accuracy of +/-0.5% and a reproducibility of +/- 0.05%.

*Please see pages 18 and 20 for Legato 110 syringe pump specifications

Specialty Product Specifications

| Description	KDS 900	KDS 910	Legato 950	Gemini 88 Plus	Legato 380
Model (110 VAC/220 VAC/CE MARKED 220 VAC)	Microliter OEM	Milliliter OEM	Legato OEM	Dual Independent	Emulsifier
Order Code	78-2900	78-2910	78-8950	78-8088	78-8380
Mode	Infuse/Withdraw	Infuse/Withdraw	Infusion/Withdraw	Infuse/Withdraw/Continuous	Infuse/Withdraw/ Push-Pull Emulsify
# syringes	One	One	One	Two Independent mechanisms	Four
Syringe Size	0.5 µl to 1 ml max	0.5 µl to 60 ml	0.5 µl to 60 ml	0.5 µl to 60 ml	0.5 µl to 140 ml
User Interface	Computer	Computer	Computer	Touch Screen	Touch Screen
Display	n/a	n/a	n/a	7" WQVGA Color Display	4.3 QVGA
Accuracy	+/-<0.35%	+/-<0.35%	+/-<0.5%	+/- 0.25 %	+/-<0.35%
Repeatability	+/-0.1%	+/-0.1%	+/-0.05%	+/-0.05%	+/-0.05%
Linear Force (Max)	7 lbs Peak Min Adjustable	25 lbs Peak Min Adjustable	13.6 kg (30 lbs) @ 100% Force Selection	70 lbs/31.75 kg (1.02 pl/min to 90 ml/min) 50 lbs/22.6 kg (90 ml/min to 106 ml/min)	34 kg (75 lbs) @ 100% Force Selection
Minimum Flow Rate (10 µl syringe)	216 pl/hr	216 pl/hr	28.26 pl/min	1.02 pl/min	-
Maximum Flow Rate (10 ml syringe)	1330 µl/min (1 ml syringe)	13.286 ml/min	25.99 ml/min	20 ml/min	31.190 ml/min
Maximum Flow Rate (60 ml syringe)	-	44.283 ml/min	88.28 ml/min	106 ml/min	105 ml/min
Maximum Flow Rate (140 ml syringe)	-	-	-	N/A	220.97 ml/min
Drive Motor	0.9° Stepper Motor	0.9° Stepper Motor	0.9° Stepper Motor	0.9° Stepper Motor	1.8° Stepper Motor
Microprocessor Motor Drive Control	1/4 and 1/16 Microstepping	1/4 and 1/16 Microstepping	1/16 Microstepping	1/16 microstepping	1/16 Microstepping
# Microsteps/One Revolution of Lead Screw	-	-	15,360	19,200	6,400
Advance per Microstep	-	-	-	0.055118 µm/µstep	0.1656 µm/µstep
Minimum Step Rate	3.8 sec/µstep	3.8 sec/µstep	27.5 sec/µstep	27.5 sec/µstep	27.5 sec/µstep
Maximum Step Rate	250 µsec/µstep	250 µsec/µstep	26 µsec/µstep	26 µsec/µstep	26 µsec/µstep
Pusher Travel Rate					
Minimum	1.3 µm/min	1.3 µm/min	0.15 µm/min	0.1225 µm/min	0.36 µm/min
Maximum	83.4 mm/min	83.4 mm/min	159 mm/min	127.2 mm/min	190.80 mm/min
Multi-step Programming	No	No	No	No	Custom Emulsifying Program
Constant Rate	-	-	-	-	Yes
Ramp	-	-	-	-	Yes
Pulsed	-	-	-	-	Yes
Stepped	-	-	-	-	Yes
Program Export/Import	No	No	No	-	Yes
Pusher Block Stall Detection	No	Yes	Yes	Yes	Yes
Computer Interface	RS-232	RS-232	USB	USB	USB/RS-232
TTL	No	No	Yes	Yes	Yes
Networking	Yes	Yes	RS-485	RS-485	RS-485
Real Time Clock	No	No	No	Yes	Yes
External Triggers	No	No	One	Yes	Two
Analog Output	No	No	No	No	Yes (optional)
Footswitch Interface	Yes	Yes	Yes	Yes	Yes
Maintenance Reminder	No	No	Yes	Yes	Yes
Calibration Reminder	No	No	Yes	Yes	Yes
Password Lock	No	No	Yes	Yes	Yes
Audible Alarm Indication	-	-	-	Yes	Yes
End of Run	-	-	Optional	Yes	Yes
Near end of run	-	-	-	Yes	Yes
Stall detection	-	-	-	Yes	Yes
Power-up	-	-	-	Yes	Yes
Keypad Clicks	-	-	-	Yes	Yes
Calibration Reminder	-	-	-	Yes	Yes
Display Rotation	N/A	N/A	No	No	Automatic
Multisyringe Rack Accessories	No	No	No	No	No
Run LED	No	No	No	No	Yes
Power Domestic	12 to 30 VDC 0.5 A max	12 to 30 VDC 0.5 A max	12-32 VDC	100/240 VAC 50/60 Hz	100/240 VAC 50/60 Hz
Power CE and International	-	-	-	100/240 VAC 50/60 Hz	100/240 VAC 50/60 Hz
Weight	0.8 kg (1.8 lbs)	1.23 kg (2.72 lbs)	3.62 kg (8 lbs)	21 lbs (9.09kg)	9.8 kg (21.5 lbs) each
Dimensions (in)	7.25 x 3.63 x 4.5	9 x 6 x 5	6 x 4 x 9.5	8 x 15 x 11	Dependent on syringe size
Dimensions (cm)	18.4 x 9.2 x 11.4	23 x 15.25 x 13	15.25 x 10.16 x 24.13	21 x 39 x 28	Dependent on syringe size
Certifications	-	-	-	-	-
CE, ETL, UL, CSA, CB Scheme	CE	CE	Yes	Yes	Yes
EN 61010, EN 61326	-	-	Yes	Yes	Yes
WEEE, RoHS	Compliant	Compliant	Yes	Yes	Yes

The Centrifan™

Quick and Easy Small Volume Evaporation
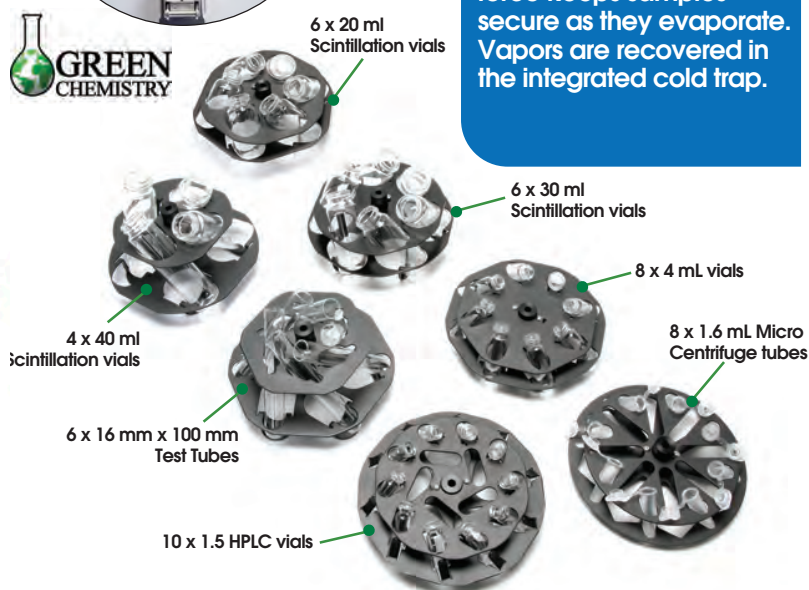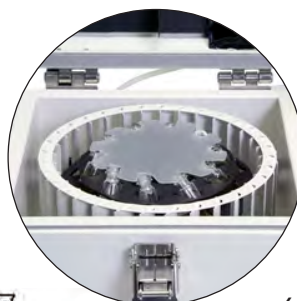
KD Scientifics' Centrifan™ is a novel lab scale evaporator that enables drying of solutions.

This easy to use evaporator has a small footprint, saving precious lab space. The Centrifan™ internally generates gas flow to accelerate sample evaporation. No external vacuum pump is required for operation. Just close the lid and centrifugal force keeps samples secure as they evaporate. Vapors are recovered in the integrated cold trap.

GREEN CHEMISTRY

6 x 20 ml Scintillation vials

6 x 30 ml Scintillation vials

8 x 4 mL vials

8 x 1.6 mL Micro Centrifuge tubes

4 x 40 ml Scintillation vials

6 x 16 mm x 100 mm Test Tubes

10 x 1.5 HPLC vials

kdScientific
Centrifan PE

Features and Benefits

- **Very Efficient** – uses new self generating "blow down technology"
- **Easy-to-Use** – no monitoring
- **Quick to Set-up** – put the samples in and close the cover
- **Green Chemistry** – vapor is collected, low power, low noise
- **Small Footprint** – ideal for limited bench space
- **Dry Directly in Vials** – no transfer from flask to vials
- **No Vacuum Pump** – no cross contamination from bumping
- **Cost Effective**

Applications

- **Organic Compound Evaporation**
- **Fraction Collecting from Flash L/C**
- **Sample Prep**
- **Cold Room Evaporator**
- **Toxic Compounds**
- **Radio labeled compounds**
- **Dichloromethane • Chloroform**
- **DMSO • Oil Polymers**
- **Medicinal and Synthetic Chemistry**
- **Protein Purification Evaporation**
- **Lyophilization • Dissolved Minerals**
- **Crystal Growth**

CENTRIFAN™ EVAPORATOR

Centrifan™ (continued)

Vacuum-Free, Closed System Drying

The Centrifan™ has a spinning rotor with fan blades that generate a high flow rate of drying gas which is directed onto the surface of the solvent in the scintillation vials. The rotor generates centrifugal force to keep 100% of the solute pressed in the scintillation vials, thus preventing compound loss and cross contamination. Solvent vapors from the trapped volume of gas are continuously flowed through a secondary loop with a dry ice cold trap to prevent release of toxic fumes. The unit may be purged of air with a nitrogen bleed to perform oxygen-free drying.

Reduces Operator Time for Rotary Evaporation

The Centrifan™ can be used to efficiently dry the last 10 mL of product solution in a 20 mL scintillation vial with confidence and unattended operation. After transferring the 10 mL aliquot from the rotorvap round-bottom flask to the scintillation vial, the operator simply places the sample in the rotor of the Centrifan™ and closes the lid to start the unit. The solution in the scintillation vial dries securely in the Centrifan™ without further monitoring and frees lab workers for other tasks.

- Speeds compound finishing into 20 mL vials from a rotorvap
- Allows risk-free drying and storage of final solution in convenient scintillation vials
- Enables completely unattended operation
- Frees lab associates for other tasks
- Increases overall evaporation pro-productivity

Compact, Portable

With a small 8 in. x 12 in. (20.32 cm x 30.48 cm) footprint and only 18 in. (45.72 cm) high, the Centrifan™ is self-contained, requires little bench or hood space, and will even fit in a hotcell.

Eliminate Sample Drying Risk while Freeing Operator Time

The Centrifan™ employs a novel, recirculating evaporation technique that reuses a captured volume of gas and generates its own gas flow to efficiently evaporate samples in standard 20 mL scintillation vials. The technique eliminates the need for a vacuum pump or a large supply of blow down gas, significantly reducing cost, complexity, noise, and maintenance compared to rotary evaporators, vacuum centrifuges, and conventional blow-down equipment. Because it operates without vacuum, the Centrifan™ eliminates the potential for cross contamination and sample loss caused by solvent bumping.

Completely self contained, no vacuum pump!

Efficient recirculating sealed Kapton heater

Solvent vapor proof powder coat lid and fan

Epoxy encapsulates PTC temperature sensor

Solvent proof stainless steel liner

Splitter creates air flow to dry solvent (not shown)

Powder coat finish

Small footprint

Automatic timer or manual on/off control (optional)

Flexible cold trap interfaces external chiller, dry ice or water ice

Optimize solvent recovery with cold trap models

Oxygen free drying with nitrogen (fittings included)

Green Solvent Recovery

Quick stopping electronic brake of motor

Low power, low noise, 1200 RPM, 72 G

Adjustable temperature setpoint up to 55°C

kdScientific
Centrifan PE

CENTRIFAN™ EVAPORATOR

Centrifan™ (continued)

Evaporation Technology you should know about

Possible Problems with Common Evaporation Systems	Vacuum Centrifuge	Rotary Evaporator	Nitrogen Blowdown	Freeze Dryer	Centrifan™ Advantages
Sample loss from bumping caused by vacuum	X	X		X	No vacuum pump eliminates bumping
Cross-contamination from splashing	X		X		Centrifugal force prevents splashing
Dry sample blown from vial; lost and contaminated			X		Centrifugal force ensures material retention
Sample lost from bumping when vacuum slow and sample melts				X	No vacuum pump eliminates bumping
Must freeze sample before loading				X	No pre-freeze required
Safety issues concerning glassware under vacuum		X		X	No vacuum, eliminates safety concern
No recovery of volatile extract compounds	X	X	X	X	Condenses all recirculating vapor
Solvent vapor lost through vacuum pump or vent	X	X	X	X	Closed green system condenses all vapor
Vacuum pump noise degrades lab work environment	X	X		X	Makes no noise
System complexity requires maintenance vigilance	X	X		X	One moving part 3-year warranty
Evaporator down because of vacuum pump rebuild	X	X		X	No vacuum pump minimizes maintenance
Consumes large quantities of electricity or drying gas	X	X	X	X	Low power and minimal inert gas usage
Relative speed of evaporation (MeOH, AcN, Ether)	3	1	3	4	4
Relative speed of evaporation (Water, DMF, DMSO)	3	3	1	3	2

Specifications

Temp Controller Range	Ambient to 55°C
Ambient Temperature	2°C to 40°C
Cold Finger Capacity	1 L non-freezing liquid plus dry ice nuggets
Power Requirements	115/230 VAC 50-60 Hz 200 watts
Fuse Ratings	3 A (115 V and 230 V) fast acting, 5 mm x 20 mm
Dimensions	12" (30.5 cm) w x 8" (20.3 cm) d x 18" (45.7 cm) h

Drying Rates for Typical Solvents in 20 mL Vials*

Solvent	Total Volume	Temp. in Rotor	Time to Dry °C
Methanol	6 X 10 mL	40	60 min
Water	6 X 5 mL	40	3 hrs
Hexane	6 X 10 mL	40	15 min
Acetone	6 X 10 mL	40	35 min
Isopropyl Alcohol	6 X 10 mL	40	70 min
DMSO	6 X 1 mL	40	12 hrs
Methylene Chloride	6 X 10 mL	40	25 min
AcN/H20 (70/30)	6 X 10 mL	40	3 hrs

*Evaporation rates were obtained with ethanol and dry ice in the cold trap.

Step 1: Specify a Centrifan™ Model

Item No.	Model	Description
78-0070	Centrifan PE-T	Includes cold trap and timer 115 VAC
78-0071	Centrifan PE	Includes cold trap 115 VAC
78-0072	Centrifan Lite	No cold trap 115 VAC, vent to a hood or use with aqueous solutions
78-1070	Centrifan PE-T	Includes cold trap and timer 230 VAC
78-1071	Centrifan PE	Includes cold trap 230 VAC
78-1072	Centrifan Lite	No cold Trap 230 VAC, vent to a hood or use with aqueous solutions

Step 2: Specify a Rotor (Includes one splitter)

78-8400	Rotor 6 x 20 mL Scintillation Vials
78-8401	Rotor 8 x 1.6 mL Micro Centrifuge Tubes
78-8402	Rotor 6 x 16 mm x 100 mm Test Tubes
78-8403	Rotor 8 x 4 mL vials (1 dram)
78-8404	Rotor 6 x 30 mL Scintillation Vials
78-8405	Rotor 4 x 40 mL Scintillation Vials
78-8406	Rotor 10 x 1.5 mL HPLC Vials

Step 3: Spare Splitters

78-8408	5 pack splitters 6 x 20 mL Scintillation Vials
78-8409	100 pk splitters 6 x 20 mL Scintillation Vials
78-8410	1 pk splitter 8 x 1.6 mL micro Centrifuge Vials
78-8411	1 pk splitter 6 x 16 mm x 100 mm Test Tubes
78-8412	1 pk splitter 8 x 4 mL vials (1 dram)
78-8414	1 pk splitter 6 x 30 mL Scintillation Vials
78-8415	1 pk splitter 4 x 40 mL Scintillation Vials
78-8416	1 pk splitter 10 x 1.5 mL HPLC Vials

Step 4: Accessories

78-8417	Conversion Kit, Add Cold Trap to Centrifan PE - Lite
78-8418	Cold Trap Centrifan PE (replacement glassware)
78-8419	Circulator Coil and Tubing (provides extended concentration time with chilled Concentrator, water bath must be supplied.
78-8421	Flask, round 500 ml, 35/20 socket joint
78-8422	Flask, round 100 ml, 35/20 socket joint
78-8423	Adapter Kit, Cold Trap Socket to 20 ml Scintillation Vial (low loss distillate collection)
78-8424	Clamp pinch, locking, 35/20 Socket Joint

CENTRIFAN™ EVAPORATOR

The NEW KD Scientific Allegro™ Peristaltic Pump System allows maintenance free, continuous flow pumping of various liquids. The fluid contacts only the inside surface of the tubing, negating concern for valves, O-rings or seals that might be incompatible with the fluid being pumped.

Allegro Pumps™

The innovative Allegro™ Peristaltic Pump System can dispense in forward or reverse direction, be programmed for your specific flow profile or just dispense at the touch of the screen. All parameters are clearly displayed on the touch screen display for easy viewing.

Allegro™ I Peristaltic Pump System

- One channel pump head
- Flow rates up to 1500 ml/min
- Accepts tubing ID sizes 0.8 mm (0.03 in) - 8.0 mm (0.32 in)
- Compatible with Masterflex® L/S® 13, L/S® 14, L/S® 16, L/S® 25, L/S® 17 and L/S® 18 tubing

Allegro™ II Peristaltic Pump System

- Two channel pump head
- Two simultaneous individual flows or one combined flow
- Flow rates up to 720 ml/min with combined channels
- Accepts tubing ID sizes 0.8 mm (0.03 in) - 4.8 mm (0.19 in)
- Compatible with Masterflex® L/S® 13, L/S® 14, L/S® 16 and L/S® 25 tubing

Allegro™ III Peristaltic Pump System

- Two single channel pump heads
- Two simultaneous individual flows or one combined flow
- Flow rates up to 2000 ml/min with combined channels
- Accepts tubing ID sizes 0.8 mm (0.03 in) - 8.0 mm (0.32 in)
- Compatible with Masterflex® L/S® 13, L/S® 14, L/S® 16, L/S® 25, L/S® 17 and L/S® 18 tubing
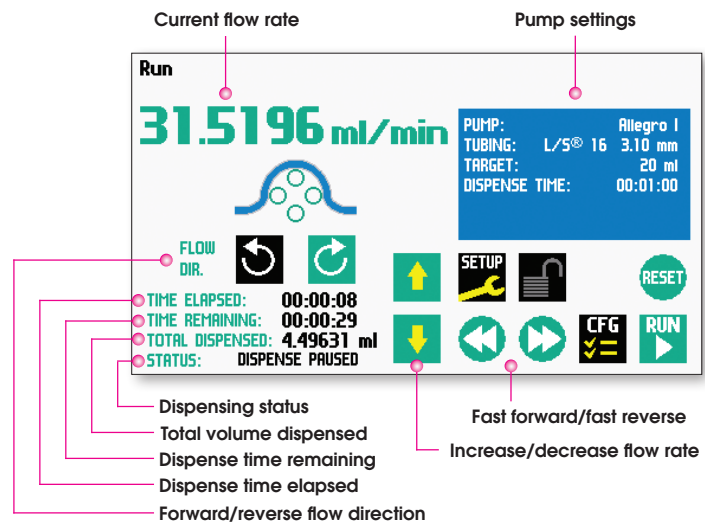
Simple Setup

for Routine & Complex Applications

Intuitive Touch Screen

The Allegro™ touch display run screen presents the user with all key dispensing parameters in real time.

Flow rate, flow direction, dispense status, total dispensed volume and tubing selection parameters are clearly presented on the high resolution touch screen display.

- Intuitive graphical interface and touch screen
- Flow rate and key parameters clearly displayed
- Internationally recognized icons
- All program settings are indicated on the touch screen
- Alarm indication and messages
- Pump diagnostic/information
- Display rotates with horizontal/ vertical orientation

Current flow rate

Pump settings

Run

31.5196 ml/min

FLOW DIR.

PUMP: Allegro I
TUBING: L/S® 16 3.10 mm
TARGET: 20 ml
DISPENSE TIME: 00:01:00

SETUP

RESET

TIME ELAPSED: 00:00:08
TIME REMAINING: 00:00:29
TOTAL DISPENSED: 4.49631 ml
STATUS: DISPENSE PAUSED

CFG

RUN

Dispensing status
Total volume dispensed
Dispense time remaining
Dispense time elapsed
Forward/reverse flow direction

Fast forward/fast reverse
Increase/decrease flow rate

Tubing Size Selection

Std. Tubing

L/S® 16	3.1 mm
	3.2 mm
	4 mm
L/S® 25	4.8 mm
L/S® 17	6.4 mm
L/S® 18	7.9 mm

1

PAGE ↑
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BACK ✗ ENTR ✓

Tubing tables for quick tubing setup

Horizontal orientation

Vertical orientation
(Display rotates 90°)

Calibration

Reset Calibration
to default setting

Enter Volume Delivered
106.8 ml Entered

NOTICE-Calibration Complete

PRESS TO CLEAR MESSAGE

Tubing : 7.9 mm L/S® 18
Rate : 750 ml/min
Volume : 106.68 ml

ENTR ✓ RUN ▶

Tubing calibration procedure for precise accuracy

Simple Tubing Setup and Calibration

Tubing tables allow simple selection of any compatible tubing size. Masterflex® L/S® tubing selections are also available along with the ability to enter customer tubing sizes.

Automatic tubing break-in procedures allow the user to prepare tubing for operation. Simply insert tubing into the pump head and select the appropriate tubing break-in procedure. The Allegro™ Peristaltic Pump System does the rest.

ALLEGRO

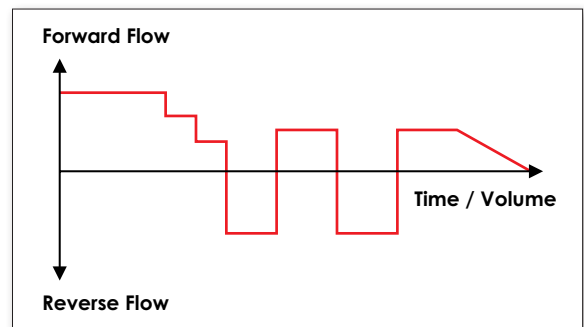# Advanced Capabilities with Simple Configuration

User Configurable Multi-Step Operation

The Allegro™ Peristaltic Pump System contains advanced features developed to allow quick setup of complex tasks.
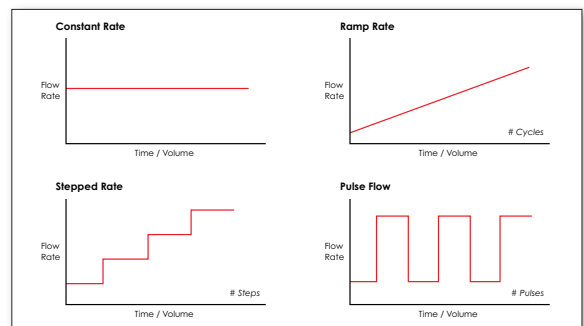
Multiple users can benefit from the Allegro™ programmable multi-step operation by saving their specific configurations and recalling them with the touch of a button.

Programmable multi-step operation makes application programs easy to set up. The user can select from advanced operational profiles including constant rate, ramp, stepped and pulse.

- **Store multiple programs**
- **Easy program retrieval**
- **Simple flow configuration**
- **Predefined operational profiles**
- **Identify programs with alphanumeric labels**
- **Trigger pumps using programmable TTL port**
- **Export programs to a computer or another pump**
- **Advanced profile features: constant rate, ramp, s tepped and pulsed flow**

Trigger process steps with pre-defined options

Pump head/drive connection | DC/RS-485 power switch source
Digital input/output port | DC power input

Foot switch input | USB port | RS-485 ports | Power switch

Multiple step operations is easy to configure

Pump operation profiles for all applications

Connectivity & Communication

The Allegro™ Peristaltic Pump System can easily accept commands or signals from external processes to control the pump. The unit offers USB, ideal for sending and receiving pump control commands. The Allegro™ can also be networked using RS-485. The digital I/O port can be used to send or receive remote signals from a contact or switch. An optional footswitch can be attached for start/stop external control.

- **Communicate with commands or signals**
- **Control Allegro™ with external process or controller**
- **Remote start/stop footswitch capability**

External Process
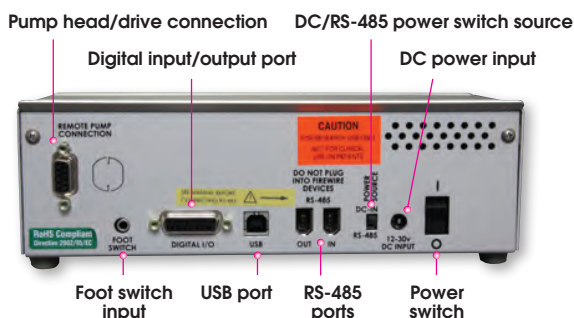
The Allegro™ I, II & III are available as complete systems. An optional footswitch for remote start/stop, TTL communication cable for synchronous control and other accessories are available. Tubing is sold separately.

Allegro™ System Ordering Information

Order #	Product Name	Description
System		
78-5501	Allegro™ I Peristaltic Pump System	Single channel, Masterflex® Pump Head, drive and controller
78-5502	Allegro™ II Peristaltic Pump System	Dual channel, Masterflex® Pump Head, drive and controller
78-5503	Allegro™ III Peristaltic Pump System	Two, single channel, Masterflex® Pump Head, drive and controller
Accessories		
78-0225	Allegro™ Footswitch	Footswitch with phono jack plug for Allegro™ I, II, & III
78-5531	Allegro™ I to III Conversion Kit	Single channel, thin wall tubing head and hardware
78-5542	Allegro™ Stacking Base	Allows two Allegro™ head/drive units to be vertically stacked
78-8355	TTL Communication Cable	Connects two Allegro™ controllers for programmable control

Allegro™ Flow Rates

Tubing Size	Tubing ID	Maximum Flow Rate
Allegra™ I		
LS® 13	0.8 mm (0.03 in)	15 ml/min
LS® 14	0.6 mm (0.06 in)	60 ml/min
LS® 16	3.1 mm (0.12 in)	240 ml/min
LS® 25	4.8 mm (0.19 in)	520 ml/min
LS® 17	6.4 mm (0.25 in)	960 ml/min
LS® 18	7.9 mm (0.31 in)	1500 ml/min
Allegra™ II		
LS® 13	0.8 mm (0.03 in)	10 ml/min
LS® 14	0.6 mm (0.06 in)	40 ml/min
LS® 16	3.1 mm (0.12 in)	160 ml/min
LS® 25	4.8 mm (0.19 in)	360 ml/min
Allegra™ III		
LS® 13	0.8 mm (0.03 in)	10 ml/min
LS® 14	1.6 mm (0.06 in)	40 ml/min
LS® 16	3.1 mm (0.12 in)	160 ml/min
LS® 25	4.8 mm (0.19 in)	360 ml/min
LS® 17	6.4 mm (0.25 in)	640 ml/min
LS® 18	7.9 mm (0.31 in)	1000 ml/min

Tubing Ordering Information

Order #	Tubing Size	Tubing ID	Description
C-Flex® Ultra			

Characteristics
C-Flex® Ultra is a transparent tubing comprised of a silicone like material with the chemical compatibility of Tygon®.
Formulation: Thermoplastic elastomer. Styrene-ethylene-butylene modified block copolymer with silicon oil.
Application Compatibility
Acids: Good • Alkalies: Good • Organic Solvents: No • Viscous Fluids: Fair Sterile Fluids: Excellent

Order #	Tubing Size	Tubing ID	Description
78-5601	L/S® 14	1.6 mm (0.06 in)	7.6 m (25 ft)/pk
78-5602	L/S® 16	3.1 mm (0.12 in)	7.6 m (25 ft)/pk
78-5603	L/S® 25	4.8 mm (0.19 in)	7.6 m (25 ft)/pk
78-5604	L/S® 17	6.4 mm (0.25 in)	7.6 m (25 ft)/pk
78-5605	L/S® 18	7.9 mm (0.31 in)	7.6 m (25 ft)/pk

FDA Viton®

Characteristics
FDA Viton® is an opaque, black tubing perfect for food applications where FDA compliance is required. Resistant to corrosives, solvents and oils at elevated temperatures.
Formulation: Thermal set rubber. Viton® B (67% fluorine).
Application Compatibility
Acids: Excellent • Alkalies: Excellent • Organic Solvents: Test First Viscous Fluids: Good Sterile Fluids: Fair

Order #	Tubing Size	Tubing ID	Description
78-5606	L/S® 13	0.8 mm (0.03 in)	7.6 m (25 ft)/pk
78-5607	L/S® 14	1.6 mm (0.06 in)	7.6 m (25 ft)/pk
78-5608	L/S® 16	3.1 mm (0.12 in)	7.6 m (25 ft)/pk
78-5609	L/S® 25	4.8 mm (0.19 in)	7.6 m (25 ft)/pk
78-5610	L/S® 17	6.4 mm (0.25 in)	7.6 m (25 ft)/pk
78-5611	L/S® 18	7.9 mm (0.31 in)	7.6 m (25 ft)/pk

Tygon® ELFL

Characteristics
Tygon® ELFL is a clear tubing with long life and broad chemical resistance.
Formulation: Thermoplastic. PVC based material with plasticizer. Firm transparent material.
Application Compatibility
Acids: Good • Alkalies: Good • Organic Solvents: No • Viscous Fluids: Excellent Sterile Fluids: Good

Order #	Tubing Size	Tubing ID	Description
78-5612	L/S® 13	0.8 mm (0.03 in)	7.6 m (25 ft)/pk
78-5613	L/S® 14	1.6 mm (0.06 in)	7.6 m (25 ft)/pk
78-5614	L/S® 16	3.1 mm (0.12 in)	7.6 m (25 ft)/pk
78-5615	L/S® 25	4.8 mm (0.19 in)	7.6 m (25 ft)/pk
78-5616	L/S® 17	6.4 mm (0.25 in)	7.6 m (25 ft)/pk
78-5617	L/S® 18	7.9 mm (0.31 in)	7.6 m (25 ft)/pk

Tygon® E-Food

Characteristics
Tygon® E-FOOD is a clear tubing designed especially for food products. The bore is smooth and the tubing is non-toxic.
Formulation: Thermoplastic. PVC based material with plasticizer. Firm transparent material.
Application Compatibility
Acids: Good • Alkalies: Good • Organic Solvents: No • Viscous Fluids: Excellent Sterile Fluids: Fair

Order #	Tubing Size	Tubing ID	Description
78-5618	L/S® 13	0.8 mm (0.03 in)	15.2 m (50 ft)/pk
78-5619	L/S® 14	1.6 mm (0.06 in)	15.2 m (50 ft)/pk
78-5620	L/S® 16	3.1 mm (0.12 in)	15.2 m (50 ft)/pk
78-5621	L/S® 25	4.8 mm (0.19 in)	15.2 m (50 ft)/pk
78-5622	L/S® 17	6.4 mm (0.25 in)	15.2 m (50 ft)/pk
78-5623	L/S® 18	7.9 mm (0.31 in)	15.2 m (50 ft)/pk

ALLEGRO

Premier Steel Syringes

Stainless Steel Syringes

Premium Line of Stainless Steel Syringes

- **Compatible with Most Syringe Pumps**
- **Eliminate Hazards of Glass Syringe Breakage**
- **Adaptable to Luer Lock or Swagelok™ Fittings**
- **Rugged Construction #316 Stainless Steel**
- **Reuseable - Fully Autoclavable**
- **Resistance to Most Chemicals**

20 ml

50 ml

100 ml

2.5 ml

8 ml

A premier line of stainless steel syringes is now offered by KD Scientific. Rugged stainless steel syringes are an ideal solution when the pressures and the force are high, completely eliminating the problem of breaking glass syringes.

S tainless steel offers good resistance to most aggressive liquids. Wetted parts are #316 stainless steel and Viton or Perfluoroelastomer. Syringes are available in 2.5, 8, 20, 50 and 100 ml sizes with removable, replaceable tips. Genuine SWAGELOK™ syringe to tube fittings are available in 1/16, 1/8 and 1/4 inch sizes. A luer lock end fitting is also available. Tips are interchangeable with all syringes from 20 to 100 ml in size.

Syringe	Fitting	L3 in (mm)
2.5 to 8 ml	1/16	0.74 (18.8)
2.5 to 8 ml	1/8	0.91 (23.1)
20 to 200 ml	1/16	0.67 (17.0)
20 to 200 ml	1/8	0.84 (21.3)
20 to 200 ml	1/4	0.94 (23.9)
20 to 200 ml	Luer	1.34 (34.0)
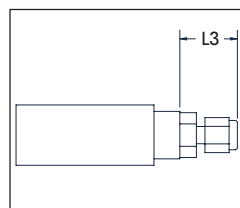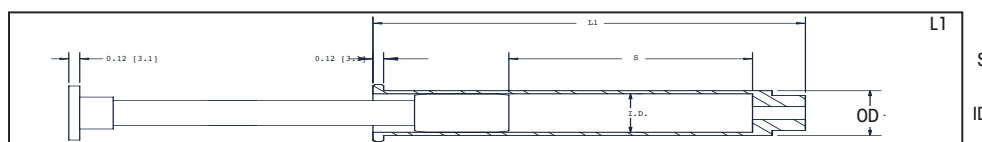
Specifications

Volume	2.5 ml		8 ml		20 ml		50 ml		100 ml	
Dimensions:	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
Overall Length of Barrel - (L1)	6.64	(168.7)	6.73	(170.8)	4.73	(120.0)	5.49	(139.3)	6.73	(170.9)
Stroke - (S)	5.41	(137.4)	4.42	(112.4)	2.74	(69.6)	3.06	(77.83)	4.12	(104.5)
Outside Diameter - (OD)	0.50	(12.7)	0.50	(12.7)	0.88	(22.2)	1.25	(31.8)	1.50	(38.1)
Inside Diameter - (ID)	0.191	(4.85)	0.375	(9.525)	0.753	(19.13)	1.126	(28.60)	1.374	(34.90)
Maximum Test Pressure	9000 psi		4000 psi		1500 psi		1500 psi		1500 psi	
Working Pressure	7000 psi		1500 psi		700 psi		700 psi		700 psi	
O-Ring Material Standard	Perfluoroelastomer		Perfluoroelastomer		Viton		Viton		Viton	
O-Ring Specials (optional)	N/A		N/A		Perfluoroelastomer		Perfluoroelastomer		Perfluoroelastomer	
Order Code Syringe with Swagelok™ 1/16"	78-0801		78-0802		78-0803		78-0804		78-0805	
Order Code Syringe with Swagelok™ 1/8"	N/A		78-0807		78-0808		78-0809		78-0810	
Order Code Syringe with Swagelok™ 1/4"	N/A		N/A		78-0812		78-0813		78-0814	
Order Code Syringe with Luer Lock	N/A		N/A		78-0816		78-0817		78-0818	

Glass Syringes

Premium Line of Glass Syringes

- **Easy to clean and maintain**
- **Accurate dispensing**
- **Reusable**
- **Economical**
- **Durable**
- **Chemically resistant**
- **Resistant to thermal shock**

50 ml

30 ml

20 ml

10 ml

5 ml

2 ml
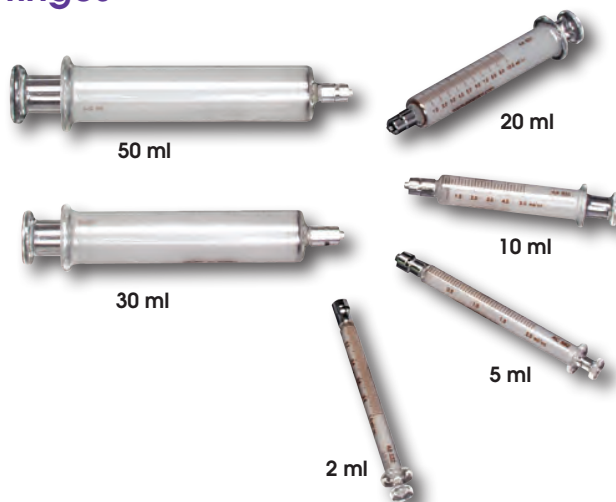
KD Scientific offers a new line of glass syringes to meet scientific applications in the laboratory environment. Over ten different sizes of glass syringes ranging from 1.0 ml to 50 ml are available.

All syringes are made from heat resistant borosilicate glass. The material and construction are resistant to breakage from shock and sudden temperature changes. They are all annealed and tested until free of internal strain to withstand repeated washing.

Specifications

Min. Order Qty.	6	6	6	6	6	6	6
Volume*	1.0 ml	2.0 ml	5.0 ml	10.0 ml	20.0 ml	30.0 ml	50.0 ml
Barrel Inside Diameter (mm)	4.80 ±0.10	6.45 ±0.10	12.60 ±0.10	15.15 ±0.15	20.40 ±0.20	22.9 ±0.20	27.45 ±0.20
Piston Outside Diameter (in)	0.189 ±0.004	0.254 ±0.004	0.496 ±0.004	0.596 ±0.006	0.80 3 ±0.008	0.902 ±0.008	1.081 ±0.008
Barrel Diameter Outside (mm) D1	8.30 ±0.20	9.95 ±0.20	15.4 ±0.30	18.35 ±0.35	24.20 ±0.40	27.30 ±0.40	32.35 ±0.55
Barrel Diameter Outside (in) D1	0.327 ±0.008	0.392 ±0.008	0.606 ±0.012	0.722 ±0.014	0.953 ±0.016	1.075 ±0.016	1.274 ±0.022
Barrel Collar Diameter (mm) D2	14.95 ±0.50	16.40 ±0.50	22.25 ±0.75	26.20 ±0.75	33.25 ±0.75	37.55 ±0.75	44.00 ±0.75
Barrel Collar Diameter (in) D2	0.589 ±0.020	0.646 ±0.020	0.876 ±0.030	1.031 ±0.030	1.309 ±0.030	1.478 ±0.030	1.732 ±0.030
Piston Collar Diameter (mm) D	11.5 ±0.50	12.25 ±0.75	17.25 ±0.55	19.95 ±0.60	24.65 ±0.65	27.95 ±0.65	34.05 ±0.65
Piston Collar Diameter (in) D3	0.453 ±0.020	0.482 ±0.030	0.679 ±0.022	0.785 ±0.024	0.97 ±0.026	1.10 ±0.026	1.341 ±0.026
Length (mm) L	115.00 ±0.50	115.00 ±0.50	105.00 ±0.50	128.50 ±0.50	145.50 ±0.50	163.00 ±0.50	178.00 ±0.50
Length (in) L	4.528 ±0.020	4.528 ±0.020	4.134 ±0.020	5.059 ±0.020	5.728 ±0.020	6.417 ±0.020	7.008 ±0.020
Major Gradations (ml)	0.20	0.50	1.0	1.0	5.0	5.0	10
Minor Gradations (ml)	0.02	0.05	0.20	0.20	1.0	1.0	2.0
Order Code	**78-0871**	**78-0872**	**78-0873**	**78-0874**	**78-0875**	**78-0876**	**78-0877**
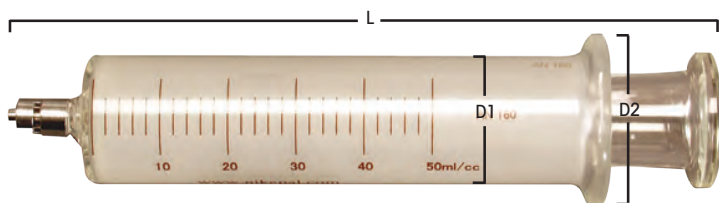
Glass Properties

Volume	*±1.5% of rated volume
Expansion Coefficient	52 x 10-7/˚C
Density	2.36 g/cm3 ±0.03 g/cm3
Modulus of Elasticity	64 x 103 N/m2
Water Resistance	First Class
Acid Resistance	First Class
Alkali Resistance	First Class
Softening Point	785˚C
Melting Temperature	1260˚C
Strain Point	525˚C
Annealing Point	570˚C
Hardness	7
Color	Clear

KD Scientific offers a selection of Hamilton® microliter and specialty syringes. Please visit our website or contact our technical support department for the latest offerings.

State-of-the-Art GASTIGHT® Syringes

Premium Line of GASTIGHT® Syringes

Hamilton syringes are considered the industry standard for precision fluid delivery. KD Scientific offers a selection of these precision syringes which, when combined with our syringe pumps, offer fluid delivery with unparalleled accuracy and precision.

The syringes are designed with reinforced syringe plungers, syringe barrels, and are GASTIGHT® syringes with syringe volumes from 50 μl to 100 ml.

All Hamilton™ glass syringes are autoclavable when disassembled.

1000 Series GASTIGHT® Syringes

Item No.	Description
72-1831	1 ml PTFE LUER LOCK
72-1832	2.5 ml PTFE LUER LOCK
72-1833	5 ml PTFE LUER LOCK
72-1834	10 ml PTFE LUER LOCK
72-1835	25 ml PTFE LUER LOCK
72-1836	50 ml PTFE LUER LOCK
72-1837	100 ml PTFE LUER LOCK

### 1700 Series GASTIGHT® Syringes

Item No.	Description
72-1781	50 μl PTFE LUER LOCK
72-1782	100 μl PTFE LUER LOCK
72-1783	250 μl PTFE LUER LOCK
72-1784	500 μl PTFE LUER LOCK

GASTIGHT® is a registered trademark of the Hamilton Company.

SYRINGES & ACCESSORIES

Cost Effective Plastic Syringes

Premium Line of Plastic Syringes

- **Sterile Packed and Disposable**
- **Compatible with Most Syringe Pumps**
- **Disposable Substitute for Glass Syringes**
- **No Silicone Lubricant or Rubber**
- **Economical**

50 cc

30 cc

3 cc

20 cc

5 cc

10 cc
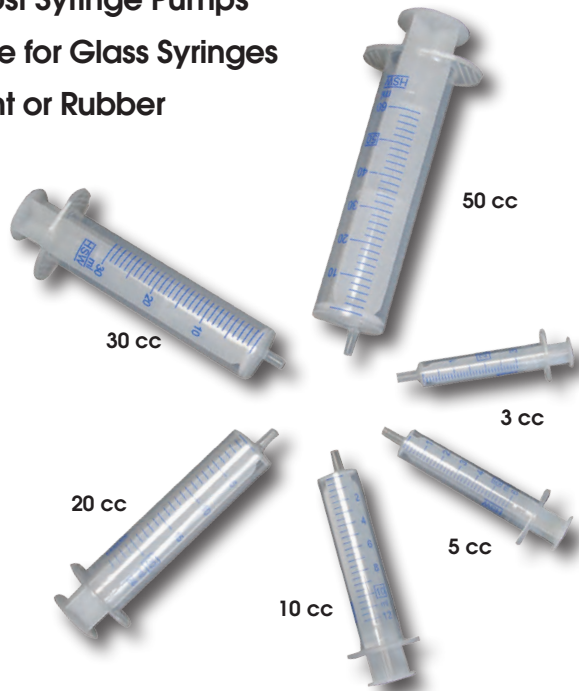
K D Scientific offers a new line of disposable Plastic Sterile Syringes for all scientific applications. Available in sizes ranging from 3 ml to 50 ml with Luer Lock (LL) or Luer Slip (LS) Tip. Norm-ject syringes are the ideal solution for any situation. Their unique two-part system is latex free and contains no silicone lubricant or rubber.

O ur syringes are made from laboratory grade polypropylene and polyethylene. There is no rubber tip on the plunger making them more chemically resistant than rubber tipped syringes. These unique plastic syringes have a positive safety stop to prevent accidental spills.

Specifications

Luer Lock (Pkg. of 25)

Volume (cc)	3	5	10	20	30	50
Total Length (mm)	74.9	87	98.5	115.1	132.5	150.0
Length of Cylinder (mm)	65.1	73.8	85.3	102.4	105.2	120.3
Outside Diameter (mm)	10.8	13.7	17.3	21.55	24.1	30.9
Inside Diameter (mm)	9.65	12.45	15.9	20.05	22.9	29.2
Nozzle Configuration	Centric	Centric	Centric	Centric	Centric	Centric
Order Code	**78-0851**	**78-0852**	**78-0853**	**78-0854**	**78-0855**	**78-0856**

Dose saver design with 0.025 low dead space plug on the piston to minimize waste.
The 5 cc has graduations to 6 cc, 10ml has graduations to 12 cc, 20 cc has graduations to 24 cc and 50 cc has graduations to 60 cc.

Slip Lock (Pkg. of 25)

Volume (cc)	1	3	5	10	20	30	50
Total Length (mm)	94.8	74.9	87	98.5	115.1	132.5	150.0
Length of Cylinder (mm)	84.7	65.1	73.8	85.3	102.4	105.2	120.3
Outside Diameter (mm)	6.4	10.8	13.7	17.3	21.55	24.1	30.9
Inside Diameter (mm)	4.69	9.65	12.45	15.9	20.05	22.9	29.2
Nozzle Configuration	Tuberculin	Centric	Centric	Eccentric	Eccentric	Eccentric	Eccentric
Order Code	**78-0850**	**78-0857**	**78-0858**	**78-0859**	**78-0860**	**78-0861**	**78-0862**

The 5 cc has graduations to 6 cc, 10ml has graduations to 12 cc, 20 cc has graduations to 24 cc and 50 cc has graduations to 60 cc.
Total length is piston thumb rest to syringe tip on an assembled syringe. Cylinder Length is cylinder only, finger grip to tip. The barrel is polypropylene, piston is high density polyethylene.

Valve Boxes

For Legacy and Legato™ Series Syringe Pumps

Low Pressure

< 25 psi (1.7 bar)

- Pinch valves
- C-flex tubing supplied
- 1/16" ID x 1/8" OD

Medium Pressure

< 100 psi (6.8 bar)

- PTFE valves
- All wetted parts PTFE
- 3 port (1/4-28 with 1/16" OD tube fittings for plastic tubing

High Pressure

< 200 psi (13.8 bar)

- 303 stainless steel
- Wetted seals perfluoroelastomer and PTFE
- 3 port (1/8" NTP with 1/4" OD swagelok fitting for stainless steel tubing (not supplied)

KD Scientific offers two types of valve boxes; autofill and continuous. The autofill valve has a single valve, which is used to reload the syringe once it is empty or partially empty. This type of valve box will work with any infusion/withdrawal pump. Each syringe must have its own valve box. The continuous valve box has 2 valves mounted. The continuous valve box can be used with the push/pull pumps and our continuous flow pumps or a continuous flow setup using 2 separate pumps to create continuous flow. As one syringe is filling, the other syringe is dispensing.

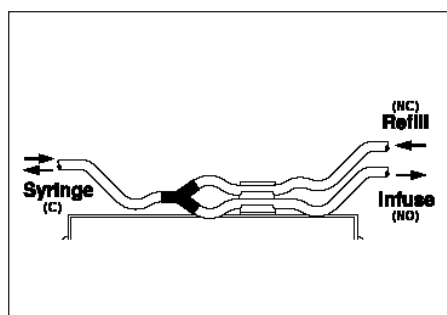Example of Medium Pressure. Autofill valve box with Legato 110 Barb Connection Kit (78-8349)
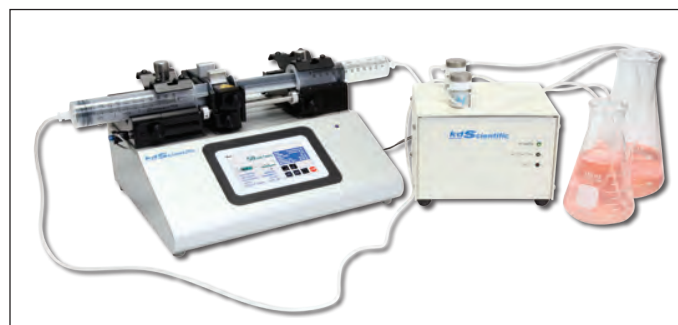
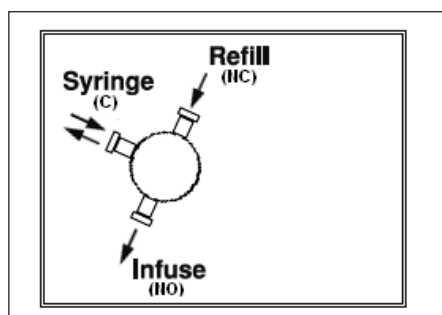Example of Medium Pressure Continuous Valve Box with Legato 270 Barb Kit (78-8351)

Valve Boxes (continued)
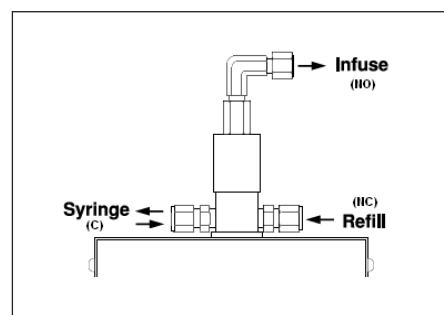
Valve Box Diagrams

Auto Fill Valve Boxes: Single Valve - Commonly used to reload syringe once it is empty or partially empty.
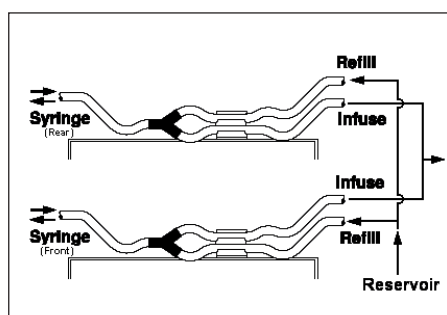

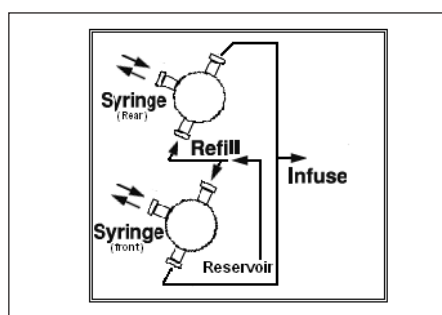Low Pressure Auto Fill

Medium Pressure Auto Fill
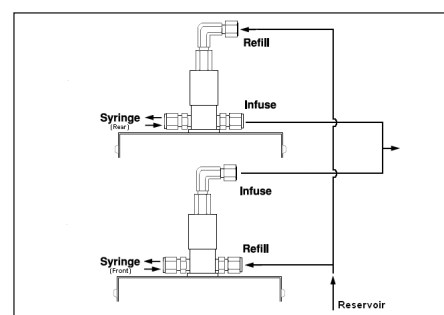

High Pressure Auto Fill

Continuous Delivery Valve Boxes: Dual mounted valves - Commonly used with a Legato 270 Continuous Pump or KDS 270.

Low Pressure Continuous

Medium Pressure Continuous


High Pressure Continuous

Item No.	Description
Standard Version	
78-8333	Auto Fill Valve Box, Low Pressure
78-8336	Auto Fill Valve Box, Medium Pressure
78-8338	Auto Fill Valve Box, High Pressure
78-8332	Continuous Delivery Valve Box, Low Pressure
78-8335	Continuous Delivery Valve Box, Medium Pressure
78-8337	Continuous Delivery Valve Box, High Pressure

Item No.	Description
Valve Kits	
78-8345	Low Pressure Auto Fill Kit
78-8346	Low Pressure Continuous Delivery Kit - (2x autofill kit)
78-8347	Medium Pressure Nut / Ferrule Auto Fill Kit Nut PEEK 1/16, 1/4-28 (3 pcs), Ferrule, flangeless 1/16 (3 pcs) & PTFE tubing (5 ft)
78-8348	Medium Pressure Nut / Ferrule Continuous Delivery Kit - (2x autofill kit)
78-8349	Medium Pressure Barb Auto Fill Kit Barb 1/16 (3 pcs) & C-flex tubing (10 ft)
78-8351	Medium Pressure Luer Auto Fill Kit Female to male luer lock 1/4-28 (1 pc), Male to female luer lock 1/4-28 (2 pcs)
78-8352	Medium Pressure Luer Continuous Delivery Kit - (2x autofill kit)
78-8353	Medium Pressure Barb Continuous Delivery Kit - (2x autofill kit)

Accessories
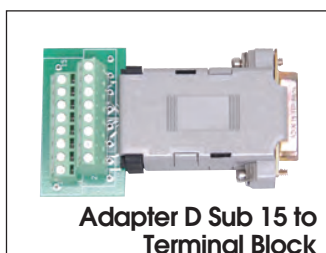
Adapter D Sub 15 to Terminal Block
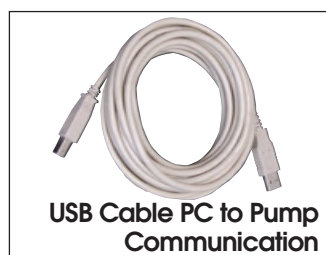

Adapter Digital I/O (15 pin to 9 pin)

Adapter for 25 ml, 50 ml, 100 ml Hamilton Gastight Syringe

Footswitch with Phono Jack Plug

Lubricant SuperLube, 1 cc

Replacement Battery

USB Cable PC to Pump Communication

RS-232 Cable (9 pin d-sub), 2 m

RS-485 Pump to Pump Communication

Line Cord UK

Line Cord US 115 V

Item No.	Description
78-8000	Adagio Software **(A)**
78-0223	RS-232 Cable with RJ11 **(B)**
78-0393	Daisy Chain Cable **(B,D)**
78-0392	Footswitch **(D)**
78-0338	Spare Emulsifier Needles for Legato 380
78-0394	RS-232 Cable **(D)**
78-8354	BNC Connector Cable for Analog Out **(G)**
78-8339	RS-485 Adapter Cable **(A)**
78-8303	Anti-Siphon Kit **(F,G)**
78-8325	Anti-Siphon Kit **(E)**
78-8304	RS-485 Pump to Pump Communication, 0.5 m (1.6 ft) **(A)**
78-8305	RS-485 Pump to Pump Communication, 2 m (6.6 ft) **(A)**
78-8306	USB Cable PC to Pump Communication, 2 m (6.6 ft) **(A)**
78-8307	USB Cable PC to Pump Communication, 5 m (16.4 ft) **(A)**
78-8308	RS-232 Cable (9 pin d-sub), 2 m (6.6 ft) **(A)**
78-8309	Line Cord US, 115 VAC **(A,B,C)**
78-8310	Line Cord European **(A,B,C)**
78-8311	Line Cord UK **(A,B,C)**
78-8312	Adapter Digital I/O (15 pin to 9 pin) **(A)**
78-8313	Adapter D Sub 15 to Terminal Block **(A)**
78-0225	Footswitch with Phono Jack Plug **(A,C)**
78-0224	Footswitch with Phono Jack Plug **(B)**
78-8314	Adapter for 25 ml, 50 ml, 100 ml Hamilton Gastight Syringe
78-8315	Hex Key
78-8316	Lubricant SuperLube, 1 cc
78-8324	Protective Shield for display **(A)**
78-8326	Line Cord with Power Supply, 115V **(E)**
78-8327	Line Cord with Power Supply, European **(E)**
78-8328	Line Cord with Power Supply, UK **(E)**
78-8329	Upgrade Infuse Only to Infuse/Withdrawal **(E)**
78-8317	Upgrade Infuse Only to Infuse/Withdraw **(F)**
78-8318	Upgrade Infuse/Withdraw Only to Programmable **(F)**
78-8319	Upgrade Infuse/Withdraw to Programmable **(F)**

Optional

FN	Internal Fan Option **(F,G)**
AI	Analog Control Input Option (0 to 10 VDC)* **(G)**
5146037	Replacement Fuse **(A)**
5155288	Replacement Battery **(F)**

* Only available with 78-8212, 78-8272, 78-8210, 78-8270

A Compatible with Legato
B Compatible with Legacy
C Compatible with KDS 310, KDS 100Y
D Compatible with Gemini 88
E Compatible with Legato 100 Series
F Compatible with Legato 200 Series
G Compatible with Legato 200 Series Programmable Option

KD Scientific Offers a Wide Range of Products to Meet Different Applications

We can assist you with selecting a Syringe Pump or a Centrifan™.

Simply fill out the questionnaire below and fax it to 1-508-893-0160
or send us the answers in an email to info@kdscientific.com

Syringe Pump Questionnaire

1. **How many syringes will you use?** _____

2. **What is the size of syringe(s)?**_____

3. **Do you want to**:

    Infuse only_____

    Withdraw only _____

    Infuse/withdraw _____

    Withdraw/Infuse _____

    Multi-step Programming _____

4. **Is there any back pressure in your application or are you dispensing into ambient?**

    Indicate Backpressure _____

5. **Required flow rate?** _____

6. **Volume to be dispensed?** _____

7. **Computer Interface:**

    LabView Software _____ KDS Adagio Software _____
    Custom Software _____

8. **Please describe your application?**

9. **Describe any special requirements in your applications?**
    _____

10. **How many pumps do you need?**_____

11. **Do you need syringes?** _____
    Plastic (indicate size and quantity) _____

    Glass (indicate size and quantity _____
    Stainless Steel (indicate size and quantity) _____

12. **Next step:**
    ❏ Send quote

    ❏ Contact me via email

    ❏ Contact me via phone

Centrifan™ Questionnaire

1. **What is volume of sample to evaporate ?** _____

2. **What type of container is currently used**?

    Microcentrifuge tube _____

    Scintillation vial _____

    HPLC Vial_____

    Other _____

3. **How many samples are run/processed at the same time?** _____

4. **What are the solvent(s)?**_____
    _____
    _____

5. **Would you like to condense the vapors in a cold trap?** ❏ Yes ❏ No

6. **Do you need oxygen free drying?** ❏ Yes ❏ No

7. **Do you need timer to stop the drying process?** ❏ Yes ❏ No

8. **Do you want auto shut off?** ❏ Yes ❏ No

9. **Next Step:**
    ❏ Send quote

    ❏ Contact me via email

    ❏ Contact me via phone

Name _____
Title _____
Company/Organization _____

Address _____
City _____
State _____
Zip _____
Country _____

Email _____
Phone _____
Fax _____

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