kdScientific

# Model 330 Series

## Users Manual

Publicaiton 5600-005-REV-D

# WEEE/RoHS Compliance Statement

**EU Directives WEEE and RoHS**

To Our Valued Customers:

We are committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for our products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive – Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of our products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. We will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.

- **Do Not Dispose Product with Municipal Waste**
- **Special Collection/Disposal Required**

# *KDS Model 330 Series*

## Contents

# *KDS Model 330 Series*

## Specifications

| | |
|---|---|
| Model | Model 330 |
| Syringe size | 10 ml Popper 5127 |
| Electrical Rating | US model 115 V~, 0.25 A<br>CE model 230 V~, 0.16 A |
| Fuse | 5 x 20 mm, 250 V~, Slow Blow, 0.25 A |
| Voltage operating range | US model 110-120 V~, 50/60 Hz<br>CE model 200-240 V~, 50/60 Hz |
| Drive mechanism | Microprocessor controlled stepper motor<br>1/2 - 1/16 microstepping, driving a leadscrew through a belt and pulley drive mechanism |
| Pusher advance per microstep | (1/16 step) - 0.165 micron (or .0000064 inch) |
| Volume per microstep | (1/16) with 60 ml BD syringe - 0.0919 µl |
| Max stepping rate | 1600 (1/2 step) /sec |
| Min step rate | 1 (1/16 step) /120 secs |
| Linear Travel Rate | Min: 4.95 x$10^{-4}$ cm/hr<br>Max: 12.67 cm/min |
| Flowrate range | 2.757 µl/hr to 70.56 ml/min (60 ml syringe) |
| Nominal linear force | 35 lb |
| Dimensions | 23 x 7.5 x 5.5 in (58 x 19 x 14 cm) |
| Weight | 16 lb (7.5 kg) |
| **Atmospheric Specifications** | |
| Temperature | 5˚C - 40˚C (41˚F - 104˚F) |
| Humidity | 20% - 80% RH |
| Mode of Operation | Continuous |
| Classification | Class I |
| Pollution Degree | 2 |
| Installation Category | II |
| Output | N/A |
| Physiological Effects | N/A |
| Cooling Conditions | No special considerations |
| Mechanical Stability | No special considerations |
| Protective Packaging | No special considerations |
| Earth Terminals | No External connections required |
| Removable Protective Means | N/A |
| Supplier Name | KD Scientific Inc. |
| Address | 84 October Hill Road, Holliston, MA 01746-1388 |

## General Safety Summary

Please read the following safety precautions to ensure proper use of your syringe pump. To avoid potential hazards and product damage, use this product only as instructed in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

***To Prevent Hazard or Injury:***

**USE PROPER POWER SUPPLY**
The pump is supplied with an approved power supply and line cord.

**USE PROPER LINE CORD**
Use only the line cord shipped with the product and make sure line cord is certified for country of use.

**GROUND PRODUCT**
This product is grounded through the grounding conductor of the power cord. To avoid electric shock, use only approved line cord with the product and insure it is connected to earth ground.

**MAKE PROPER CONNECTIONS**
Make sure all conections are made properly and securely.

**ORIENT EQUIPMENT PROPERLY**
Do not position the equipment such that it is difficult to reach the disconnecting device.

**OBSERVE ALL TERMINAL RATINGS**
Review the operating manual to learn the ratings on all connections.

**AVOID EXPOSED CIRCUITRY**
Do not touch any electric circuitry inside the product.

**DO NOT OPERATE WITH SUSPECTED FAILURES**
If damage is suspected on or to the product do not operate the product. Contact qualified service personnel to perform inspection.

**AVOID PINCH HAZARD**
A pinch hazard may exist between the Pusher Block and End Blocks. Avoid placing fingers between these points while the pump is running.

**OBSERVE ALL WARNING LABELS ON PRODUCT**
Read all labels on product to ensure proper usage.

*CAUTION*
*Refer to Manual*

*Protective Ground*
*Terminal*

**CAUTION**
This pump is not registered with the FDA and is not for clinical use on human or veterinary patients. It is intended for research use only.

**CAUTION**
**FOR RESEARCH USE ONLY**
**NOT FOR CLINICAL**
**USE ON PATIENTS**

# *KDS Model 330 Series*

## Features

The model KDS330 is designed for emulsifying proteins in viscous fluids. This pump retains the software features of the infusion/withdrawal syringe pump, KDS210. For emulsion making, the Continuous mode is selected and the pump is specifically designed for a 10 ml glass syringe and **emulsion needle**.

Operation of the pumps is simplified by using a keypad to select features from a menu on the alphanumeric LCD display.

All control functions are performed automatically by the pump microcontroller and are based on the syringe diameter and linear motion of the pusher block to deliver a known volume. After entering the syringe diameter, either directly or from a table in memory, a dispense volume and flow rate can be entered, and then all calibration and control functions are performed by the pump automatically.

***1) Syringe identification***

**Look up Table**
The pump contains a table of standard syringes arranged by manufacturer, material and size. Once the syringe is identified in the table the pump automatically enters the appropriate diameter.

**Direct Entry**
If the syringe used is not included in the table, the internal diameter of the syringe barrel can be measured in millimeters and entered directly from the keypad.

***2) Mode of operation - Continuous operation***

This mode is used in emulsion making. The pump cycles from infusion to withdrawal continuously. The volume is identical in infuse and withdrawal directions (the modes listed below are available but are not needed for emulsion making).

**Infusion**
Rate and volume settings: pump infuses to the set volume and stops.
Rate setting only: pump runs until manually stopped or stalls.

**Withdrawal**
Rate and volume settings similar to above.

**Infusion/Withdrawal**
Infusion automatically followed by withdrawal. Rate and volume settings can be made independently for infusion and withdrawal.

**Withdrawal/Infusion**
Withdrawal immediately followed by infusion. Separate settings for rate and volume can be made for withdrawal and infusion.

## Features (Continued)

***3) Volume***

In "Continuous" mode a target volume must be entered. The pump displays an initial volume of zero and increases as the dispense proceeds to the target volume. The target volume can be reviewed or changed as the pump continues to operate

[In other modes the infusion and withdrawal volumes can be set independently.]

***4) Flow Rate***

In "Continous" mode only one flowrate is entered and the pump cycles back and forth at this rate.

[In other available modes, the infusion rate and, where applicable, the withdrawal rate can be set independently and can be changed while the pump is running. After the operating mode selection is made the program will prompt only for the relevant rates associated with that mode.]

***5) Stall Detection***

The motor is monitored by an optical encoder to confirm the programmed movement. If the back pressure increases due to jamming or flow restriction then the motor may stall. Stall detection by the encoder results in a pump shutdown. The display will read "Stalled". The Stall message can be cleared with the Select key.

***6) Power Disruption***

When power is returned after a temporary power disruption the pump can be programmed to resume operation or remain stopped. However, if a dispense volume is set then the pump always remains stopped.

***7) Non-volatile Memory***

All operational settings are stored in non-volatile memory for convenience, and are used to set the pump when first switched on.

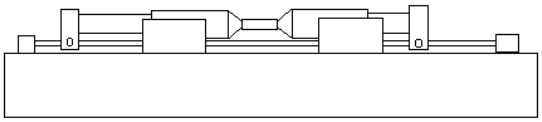
***8) Selection of Rate and Volume Units***

Units of volume (µl or ml) and flowrate (µl/ml per min/hr) can be changed if required.

## Operating Instructions

**POWER SWITCH**
The power switch is located on the left corner of the rear panel.

**SYRINGE LOADING**



To simplify syringe loading the pusher block can be disengaged from the leadscrew by pressing the brass button and manually moved along the guide rods. Alternately, the Fast forward, Fast reverse feature can be used (press Run and Arrow key simultaneously).

One syringe is filled only slightly to remove any air in the"dead stop" volume of the syringe. The second syringe is filled with fluid mixture and any air is expelled. The emulsion needle is attached to this second syringe and any air bubbles are expelled from the emulsion needle. The first syringe is then attached to the opposite opening of the emulsion needle, creating a closed system with the two syringes apposed, and containing fluid devoid of air pockets. The two clamps on the syringe blocks should be rotated and the syringe barrels placed in the "V" of the syringe holders. With the syringes in place the retaining clamps can be rotated and tightened down on the barrel to hold it securely in place.

Release the pusher block mechanism and slide the block along the guide rods until the syringe plunger fits securely in the pusher block.

**MENU FEATURES**
When the pump is first turned on the LCD will display the most recent Rate or Volume setting. Pressing **select** repeatedly will always return the display to the main menu.
The main menu consists of seven variables, three of which are displayed at all times. The center variable pulses to indicate that this option can be reviewed or changed.
The menu acts as a continuous loop and the **arrow keys**, ← → are used to move around the loop. Press the **select** key to select the variable to be changed.

← → DIA ← → TABLE ← → RATE ← → VOL ← → MODE ← → RS232C ← → PWR UP ← →

## Operating Instructions (Continued)

### KEYPAD FUNCTIONS

A keypad is used for selection of features from the displayed menu and numerical entries.

| KEYPAD | |
|---|---|
| ← → | These keys move the displayed menu left and right respectively. |
| **select** | Used to select the highlighted menu feature (flashing). |
| **enter** | The numerical parameters of the feature selected are set, then enter places all the settings in memory ready for operation. All settings are stored in non-volatile memory and will be used next time the pump is operated. |
| **0 - 9, .** | Numerical and decimal entry keys. |
| **run/stop** | Starts and stops the motor. Acts as a pause during a dispense. |

### FAST FORWARD, FAST REVERSE

Keys run and → or ← pressed simultaneously causes the pump to run at maximum speed. This feature can be used for loading, purging and reversing out of a stall condition.

### SYRINGE DIAMETER ENTRY

The pump is designed for use with Popper & Sons 10ml glass syringes with metal Luer lock tip ( p/n 5128) in conjunction with a micro-emulsifying needle, 18g x 2.875" (p/n 7973).

The pump must be calibrated by identifying the internal diameter of the syringe used. Once entered this data is stored in non-volatile memory and need be modified only when a different syringe is used.

***Table***

Use the **arrow** keys to move TABLE to the center of the display and press select to **select** this feature. The display now reads abbreviated names of syringe manufacturers and the type of syringe (plastic or glass).

Use the **arrow** and **select** keys to scroll through the list and select the manufacturers name of the syringe used.

The display now lists the size of syringe. Again, use the **arrow** and **select** keys to identify and enter the syringe used.

***Diameter***

If the syringe used is not listed in the table of syringes then the internal diameter of the syringe must be measured and entered directly. Scroll through the main menu and select **DIA**.

The display now prompts for entry of the syringe barrel internal diameter measured in ***millimeters***. Enter by using the numerical keys and **enter**.

**Note:** If the diameter is changed the volume and rate settings are set to zero.

## Operating Instructions (Continued)

**MODE SELECTION**

Select MODE from the main menu and then scroll through the options displayed and select the mode required – **Continuous**

**Continuous**

The pump first infuses and then withdraws, and then cycles continuously. Only one volume setting for infusion and withdrawal is permitted.

The menu now prompts for volume and rate settings relevant to the mode selected.

**VOLUME SETTING**

Volume can be reached directly from the main menu or will be prompted after mode selection.

Volume prompt: Vol.: 00.00ml >

1) Enter target volume from the numerical keypad.
2) If the units and value displayed are correct, **enter**.

The underlined display, or pulsing display segment, indicates that this parameter can be changed. The arrow symbol signifies direction of travel (< indicates withdrawal) and pulses when the pump is running.

**Note:** When dispensing, the displayed volume increments in units of the last significant figure of the volume entered. Therefore, to increment by .01 the volume should be set at 1.00. If the volume is set at 1.000 then the volume increments in units .001.

**Note:** Volume setting = 0.0

a) Infusion or Withdrawal modes.
Volume = 0 is interpreted as no volume and the pump will run until manually stopped or a stall occurs. The LCD will display the rate setting.

b) In continuous mode a volume setting must be entered. If no volume is entered the display returns to the mode selection menu to select the appropriate mode.

c) Unit setting

prompt: Vol.: 00.00 ml <

The units displayed can be changed if required.

1) Use the → arrow key to move the pulsing indicator to the units displayed.
2) Continue to use the → arrow key to scroll through the possible units.
3) The ← arrow key will move the active display back to the numerical value.
4) When the correct value and units are displayed press **enter**.

Possible units are: µl and ml microliter and milliliter

## Operating Instructions (Continued)

**RATE SETTING**
Display reads: Rate 00.01 ml/h >

1) Enter the flowrate value required with the numerical keypad
2) If necessary, change the units using the → key to move to and scroll through the possible units.
3) When the displayed settings are correct press **enter**.

**Note:** If the number entered exceeds the maximum flow rate possible then the pump displays the maximum feasible rate. To continue enter a rate smaller than the maximum.

**Note:** To check the maximum possible rate enter 9's to the required decimal position. For example, enter 99.9 and the maximum displayed is 12.3 whereas, if 99.99 is entered, then the maximum displayed is 12.34.

**POWER UP run or stop**
This option is only applicable when ***no dispense volume*** is selected. When power returns after an interruption the pump can resume operation (select RUN) or remain stopped (select STOP).

If the pump resumes operation the rate display will flash to indicate that a power interruption has occurred. Press **select** to clear the display to resume normal operation.

**RUN/STOP**
After all settings are made the pump can be started or stopped by a single press of the **run/stop** key. During a volume dispense the **stop** acts as a "pause" and **run** will resume the dispense.

**CHANGE OR REVIEW VOLUME SETTING WHILE RUNNING**
While the pump continues to run press select to return to the main menu. Scroll through the menu and select Volume to display the set dispense volume.

a) **No volume change**

Press **select**. The display returns to the incrementing display volume.

b) **Volume change**

1) Make the changes with the numerical keypad and **enter**.
2) The display moves to RATE, permitting a change if required. Use the numerical keypad and enter to make changes (or leave unchanged). The pump immediately changes to the new flowrate, if changed, and the volume continues to increment, uninterrupted by the review process, to the target dispense volume, and will stop automatically when completed.

**Note:** If the volume is changed to a volume smaller than the volume already accumulated then the pump will stop as soon as the new, smaller target volume is entered.

## Operating Instructions (Continued)

**CLEARING A STALL CONDITION**

Should a stall occur the pump motor is stopped to prevent damage.

To clear the display press **select**.

To move the stalled mechanism use the **fast forward** or **fast reverse** to move the pusher block. Using the fast forward or fast reverse feature is not only the most simple way to deal with the stall, it also reduces potential damage to the cam mechanism which releases the halfnut from the leadscrew. Alternatively, depress button on pusher block.

**NV RAM FAILURE**

If the settings in the non-volatile memory become corrupted the display will read "NV Ram Failure" and the pump will not operate.

To recover from this condition the pump must be powered down and then turned on again. The pump will be re-initialized to the default settings and can now be programmed as normal.

The "NV Ram Failure" message can also be cleared by pressing select and programming a new flow rate. The pump should then be turned off and on to save the settings.

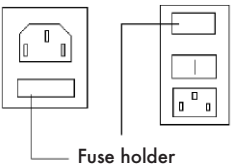
## Fuses

The fuses are located, in the power entry module on the rear panel. The linecord must be removed first to gain access to the fuse holder.

**Fuse** 5 x 20 mm, 250V~ slow blow, 0.25 A

## Voltage Selector (CE version only)

If it is necessary to change the input voltage selection, disconnect the line cord from the entry module on the rear panel. Use a flat bladed screwdriver to open the Fuse Holder access door. Remove the Fuse Holder, flip over, and reinstall. Close the access door. The new input voltage selection should be visible through the door window. Intall a proper line cord certified for the country of use.



## Maintenance

Maintenance is required only for the moving mechanical parts, which should be kept clean and lubricated. Occasionally, a small amount of light machine oil should be applied to the guide rods and a small amount of grease or oil to the leadscrew.

Solvents of any type should never be used to clean the pump. A mild detergent solution may be used to clean the keypad.

## Standard Table of Syringe Diameters

**(1) "Air-Tite "All Plastic**

| | |
|---|---|
| 1cc | 4.70mm |
| 2.5 | 9.70 |
| 5.0 | 12.48 |
| 10 | 15.89 |
| 20 | 20.00 |
| 30 | 22.50 |
| 50 | 28.90 |

**(2) Becton Dickinson**

Interim, WW design, Plastipak

| | |
|---|---|
| 1cc | 4.70mm |
| 3 | 8.59 |
| 5 | 11.99 |
| 10 | 14.48 |
| 20 | 19.05 |
| 30 | 21.59 |
| 60 | 26.60 |

**(3) Becton Dickson**

Glass - all types

| | |
|---|---|
| 0.5cc | 4.64mm |
| 1 | 4.64 |
| 2.5 | 8.66 |
| 5 | 11.86 |
| 10 | 14.34 |
| 20 | 19.13 |
| 30 | 22.70 |
| 60 | 28.60 |

**(4) Hamilton**

1000-Series Gastight

| | |
|---|---|
| 10µl | 0.46mm |
| 25 | 0.73 |
| 50 | 1.03 |
| 100 | 1.46 |
| 250 | 2.30 |
| 500 | 3.26 |
| 1ml | 4.61mm |
| 2.5 | 7.28 |
| 5 | 10.30 |
| 10 | 14.57 |
| 25 | 23.03 |
| 50 | 32.57 |

**(5) Popper & Sons, Inc.**

Perfektum glass

| | |
|---|---|
| 0.25ml | 3.45mm |
| 0.5 | 3.45 |
| 1 | 4.50 |
| 2 | 8.92 |
| 3 | 8.99 |
| 5 | 11.70 |
| 10 | 14.70 |
| 20 | 19.58 |
| 30 | 22.70 |
| 50 | 29.00 |

**(6) Ranfac**

| | |
|---|---|
| 2cc | 9.12mm |
| 5 | 12.34 |
| 10 | 14.55 |
| 20 | 19.86 |
| 30 | 23.20 |
| 50 | 27.60 |

**(7) Scientific Glass Engineering**

SGE

| | |
|---|---|
| 25µl | 0.73mm |
| 50 | 1.03 |
| 100 | 1.46 |
| 250 | 2.30 |
| 500 | 3.26 |
| 1ml | 4.61mm |
| 2.5 | 7.28 |
| 5 | 10.30 |
| 10 | 14.57 |

**(8) Sherwood - Monojet Plastic**

| | |
|---|---|
| 1cc | 4.65mm |
| 3 | 8.94 |
| 6 | 12.70 |
| 12 | 15.90 |
| 20 | 20.40 |
| 35 | 23.80 |
| 50 | 26.60 |

**(9) Terumo**

| | |
|---|---|
| 1cc | 4.73mm |
| 3 | 9.00 |
| 5 | 13.04 |
| 10 | 15.79 |
| 20 | 20.18 |
| 30 | 23.36 |
| 60 | 29.45 |

**(10) Unimetrics**

Series 9000

| | |
|---|---|
| 10µl | 0.46mm |
| 25 | 0.73 |
| 50 | 1.03 |
| 100 | 1.46 |
| 250 | 2.30 |
| 500 | 3.26 |
| 1000 | 4.61 |

## Japanese Table of Syringe Diameters (Available in Japanese Models)

**(1) "Air-Tite "All Plastic**

| | |
|---|---|
| 1cc | 4.70mm |
| 2.5 | 9.70 |
| 5.0 | 12.48 |
| 10 | 15.89 |
| 20 | 20.00 |
| 30 | 22.50 |
| 50 | 28.90 |

**(2) Becton Dickinson**

Interim, WW design, Plastipak

| | |
|---|---|
| 1cc | 4.70mm |
| 3 | 8.59 |
| 5 | 11.99 |
| 10 | 14.48 |
| 20 | 19.05 |
| 30 | 21.59 |
| 60 | 26.60 |

**(3) Becton Dickson**

Glass - all types

| | |
|---|---|
| 0.5cc | 4.64mm |
| 1 | 4.64 |
| 2.5 | 8.66 |
| 5 | 11.86 |
| 10 | 14.34 |
| 20 | 19.13 |
| 30 | 22.70 |
| 60 | 28.60 |

**(4) Hamilton**

1000-Series Gastight

| | |
|---|---|
| 10µl | 0.46mm |
| 25 | 0.73 |
| 50 | 1.03 |
| 100 | 1.46 |
| 250 | 2.30 |
| 500 | 3.26 |
| 1ml | 4.61mm |
| 2.5 | 7.28 |
| 5 | 10.30 |
| 10 | 14.57 |
| 25 | 23.03 |
| 50 | 32.57 |

**(5) JMC Air-Tite pls**

| | |
|---|---|
| 1ml | 4.66mm |
| 2 | 6.90 |
| 2.5 | 9.10 |
| 5 | 12.62 |
| 10 | 14.34 |
| 20 | 19.68 |
| 30 | 22.44 |
| 50 | 28.80 |
| 100 | 36.68 |

**(6) Nippro**

| | |
|---|---|
| 1ml long | 4.75mm |
| 1ml short | 6.61 |
| 3 | 9.53 |
| 5 | 12.96 |
| 10 | 15.78 |
| 20 | 20.07 |
| 30 | 23.17 |
| 50 | 29.13 |

**(7) Hoshi**

| | |
|---|---|
| 1ml sm | 4.80mm |
| 1ml lg | 6.70 |
| 2mm sm | 6.70 |
| 2ml lg | 9.20 |
| 3 | 10.30 |
| 5 | 12.20 |
| 10 | 15.00 |
| 20 | 19.00 |
| 30 | 22.50 |
| 50 | 25.50 |
| 100 | 34.00 |

**(8) Natsume**

| | |
|---|---|
| 0.25ml | 2.60mm |
| 0.50 | 3.20 |
| 1 | 4.30 |
| 2 | 6.30 |
| 3 | 7.30 |
| 5 | 9.50 |

**(9) Top**

| | |
|---|---|
| 1ml | 4.70mm |
| 2 | 6.40 |
| 3 | 9.30 |
| 6 | 13.10 |
| 12 | 15.40 |
| 25 | 21.00 |
| 30 | 23.00 |
| 50 | 29.00 |

**(10) Terumo**

| | |
|---|---|
| 1ml | 4.73mm |
| 3 | 9.00 |
| 5 | 13.04 |
| 10 | 15.79 |
| 20 | 20.18 |
| 30 | 23.36 |
| 60 | 29.45 |

**(11) Terumo Japan**

| | |
|---|---|
| 1ml sm | 4.73mm |
| 1ml lg | 6.50 |
| 3 | 8.95 |
| 5 | 13.00 |
| 10 | 15.80 |
| 20 | 20.15 |
| 30 | 23.10 |
| 50 | 29.10 |

## Standard Minimum and Maximum Flow Rates

| Syringe size | Diameter* | Minimum | Maximum |
|---|---|---|---|
| 10 µl | 0.46 mm | 0.001 µl/hr | 21.10 µl/min |
| 25 µl | 0.73 mm | 0.003 µl/hr | 53.15 µl/min |
| 50 µl | 1.03 mm | 0.005 µl/hr | 105.8 µl/min |
| 100 µl | 1.46 mm | 0.009 µl/hr | 212.6 µl/min |
| 250 µl | 2.3 mm | 0.021 µl/hr | 527.6 µl/min |
| 500 µl | 3.26 mm | 0.042 µl/hr | 1060 µl/min |
| 1 ml | 4.61 mm | 0.083 µl/hr | 2119 µl/min |
| 2.5 ml | 7.28 mm | 0.207 µl/hr | 5286 µl/min |
| 3 ml | 8.59 mm | 0.288 µl/hr | 7360 µl/min |
| 5 ml | 10.3 mm | 0.414 µl/hr | 634 ml/hr |
| 10 ml | 14.70 mm | 0.842 µl/hr | 1293 ml/hr |
| 20 ml | 19.05 mm | 1.414 µl/hr | 2171 ml/hr |
| 30 ml | 21.59 mm | 1.817 µl/hr | 2789 ml/hr |
| 50 ml | 28.9 mm | 3.277 µl/hr | 4998 ml/hr |
| 60 ml | 26.6 mm | 2.757 µl/hr | 4234 ml/hr |
| 100 ml | 34.9 mm | 4.746 µl/hr | 7289 ml/hr |
| 140 ml | 38.4 mm | 5.746 µl/hr | 8824 ml/hr |

Syringes from different manufacturers can have slightly different limits.

**Note:** *This is a reference diameter used to calculate the flow rate. The specific diameter should be entered for your syringe type.

## Japanese Minimum and Maximum Flow Rates

**(Available in Japanese Models)**

| Syringe size | Diameter* | Minimum | Maximum |
|---|---|---|---|
| 10 µl | 0.46 mm | 0.001 µl/hr | 21.10 µl/min |
| 25 µl | 0.73 mm | 0.003 µl/hr | 53.15 µl/min |
| 50 µl | 1.03 mm | 0.005 µl/hr | 105.8 µl/min |
| 100 µl | 1.46 mm | 0.009 µl/hr | 212.6 µl/min |
| 250 µl | 2.3 mm | 0.021 µl/hr | 527.6 µl/min |
| 500 µl | 3.26 mm | 0.042 µl/hr | 1060 µl/min |
| 1 ml | 4.7 mm | 0.087 µl/hr | 2703 µl/min |
| 2.5 ml | 9.1 mm | 0.323 µl/hr | 6259 µl/min |
| 3 ml | 9.3 mm | 0.337 µl/hr | 8626 µl/min |
| 5 ml | 12.62 mm | 0.7 µl/hr | 953 ml/hr |
| 10 ml | 14.34 mm | 0.802 µl/hr | 1230 ml/hr |
| 20 ml | 19.68 mm | 1.51 µl/hr | 2317 ml/hr |
| 30 ml | 22.44 mm | 1.963 µl/hr | 3013 ml/hr |
| 50 ml | 28.8 mm | 3.232 µl/hr | 4963 ml/hr |
| 60 ml | 36.68 mm | 5.243 µl/hr | 8051 ml/hr |

Syringes from different manufacturers can have slightly different limits.

**Note:** *This is a reference diameter used to calculate the flow rate. The specific diameter should be entered for your syringe type.

## Limited Warranty

KD Scientific Inc. warrants to the first consumer purchaser, for a period of one year from the date of purchase that this unit, when shipped in its original container, will be free from defective workmanship and materials and agree that it will, at its option, either repair or replace the defective unit.

This warranty does not extend to misuse, neglect or abuse, normal wear and tear, accident, modification or unauthorised repair.

**KD Scientific will not be liable or in any way responsible for any incidental or consequential economic or property damage.** Some States do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

**There are no implied warranties of merchantability, or fitness for a particular use, or of any other nature.** Some atates do not allow this limitation on implied warranty, so the above limitation may not apply to you.

If a defect arises within the warranty period contact KD Scientific Inc., (see address below).

The customer is responsible for shipping charges and must first obtain a Return Material Authorization number (RMA) before the unit will be accepted. If a replacement unit is issued it is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

**Note: This pump is not registered with the FDA and is not for clinical use on human beings.**

Syringe pumps are manufactured by:

**KD Scientific Inc.,**

84 October Hill Road

Holliston, MA 01746

Phone: 508.429.6809 Fax: 508.893.0160

E-mail: info@kdscientific.com

Web: www.kdscientific.com

kdScientific

# WEEE/RoHS Compliance Statement

EU Directives WEEE and RoHS

To Our Valued Customers:

We are committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for our products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive – Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of our products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. We will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.

- **Do Not Dispose Product with Municipal Waste.**
- **Special Collection/Disposal Required.**