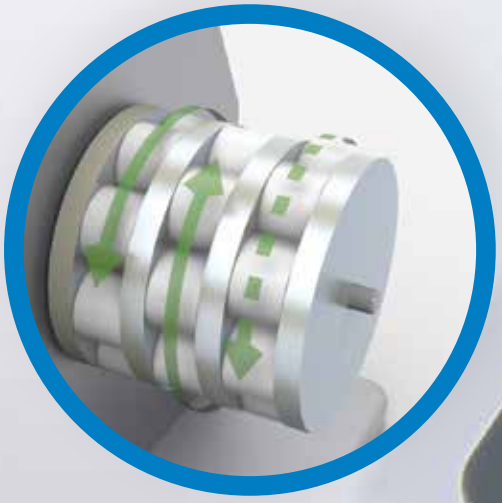
# Reglo ICC

## Operating Manual






Cole-Parmer®

# Reglo ICC Operating Manual

Download Pump Control Software:
www.ismatec.com

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We recommend that you read this operating manual carefully. When operating a pump, certain hazards cannot be excluded. Cole-Parmer is not liable for any damage resulting from the use of an ISMATEC® pump. Cole-Parmer is not responsible for the unsafe handling of chemicals.

# 1. Safety Precautions

ISMATEC® tubing pumps are designed for pumping and dispensing applications in laboratories and industry. As such it is assumed that Good Laboratory Practice (GLP) and the following recommendations will be observed.

***General Warning***

***Pinch Point Warning:***
*Do not place your fingers on or around the pump head.*

***Caution:***
*Risk of Electric Shock*

***Protective Earth:***
*(Ground)*

⚠ The pump must not be operated outside the designed operating and environmental conditions. In particular, it is the user's responsibility not to exceed the specified maximum differential pressure for the pump head.

⚠ The pump must not be used:

- For any medical applications.
- In explosion proof chambers or in the presence of flammable gases or fumes.

⚠ The pump must be switched OFF when pump heads, cassettes or tubing are inserted or changed.

⚠ The permeability of tubing depends on the material used and pressure conditions. Tubing can also become electro-statically charged. Please be aware of possible hazards when handling tubing in explosion-proof chambers.

⚠ Pump heads consist of rotating parts. Therefore, the pump must not be operated before the cassettes are fully seated on the pump head.

⚠ Do not manipulate the pump head before the pump is switched off and disconnected from the mains power supply.

⚠ Use extreme caution to ensure that no part of your body such as fingers, long hair, jewelry, or loose objects such as cables and tubing, etc. are near the pump head during operation.

⚠ Tubing can tear and burst during operation. The necessary safety measures based on the specific situation must be taken. When pumping corrosive media we recommend placing the pump in a collecting basin.

⚠ The pump should not come in contact with liquid.

⚠ Do not open or remove the housing while the pump is operating.

⚠ Service and repairs carried out by the customer or by third-party companies voids all warranties.

⚠ Appliance coupler of the power supply is used to disconnect the device from mains supply.

# 2. Warranty

We warrant the pump to be free of defects, provided they have been installed and operated correctly according to our operating instructions for a period of 2 years from date of purchase.

If production or material faults can be proven, the defective parts will be repaired or replaced free of charge at our discretion. A defective pump must be returned in the original ISMATEC® packaging or in packaging of equal quality. The duration of the warranty is not affected by making a claim for warranty service. Further claims are excluded. Shipping costs are charged to the customer.

**Our warranty becomes invalid in the case of:**

- Improper operation by the user, or if the pump is diverted from its proper use.
- Unauthorized modification or misuse by the user or by a third party.
- Improper site preparation and maintenance.
- Operation outside of the environmental and electrical specifications for the product.
- Use of third-party software, hardware, accessories, or consumables purchased by the user and which do not comply with our specifications.

# 3. Product

Reglo ICC is a peristaltic pump with independently controllable channels. The intended use for this pump is precise fluid dispensing at low flow rates up to 43 mL/min for fluid delivery applications.

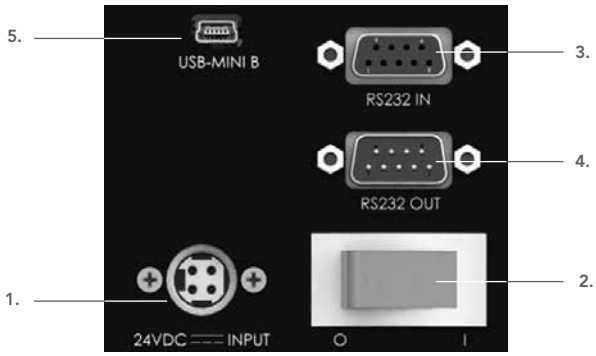
**Contents of the package:**

- Reglo ICC Pump (type as ordered)
- 1 power supply
- Cassettes
- 1 power cord with country specific plug
- Operating Manual

Please check the package and its contents for transport damage. If you find any signs of damage, please contact your local ISMATEC® representative immediately.

# 4. Rear Panel

1. 24 V DC power Inlet plug
2. On/Off Switch, circuit breaker
3. RS-232 In, DB9-female
4. RS-232 Out, DB9-male
5. USB 2.0, Mini-B




# 5. Main Voltage

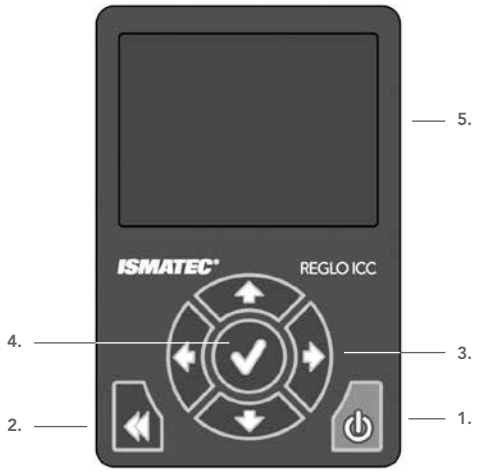
Use only the supplied power supply and cord for your Reglo ICC pump. DO NOT use any other substitutes or damage may occur! The power supply is designed to provide DC voltage for your Reglo ICC pump. It has built in circuit over current protection in the event the pump is overloaded or a malfunction occurs. The power supply is connected to the pump by a 4-pin power DIN snap and lock plug. Appliance coupler of the power supply is used to disconnect the device from the mains supply.

- Voltage 100–240VAC
- 50/60 Hz

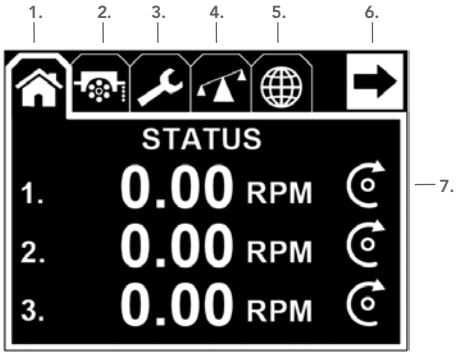
# 6. Pump Operation

## 6.1 Key Pad and Screen

1. Run/Stop Button
    a. Starts and stops the pump
    b. Interrupts and resumes a dispensing cycle
2. Reset Button
    a. Escape out of editing a parameter without changing
    b. Resets dispensing cycle when pump is paused
3. Directional Arrows
    a. Used to navigate screen and highlight selections
    b. Up, down, left, right
4. OK/Enter Button
    a. Press to edit parameter
    b. Saves edit to parameter once complete
5. LCD Display




## 6.2 Icons




1. STATUS Menu
2. PUMPING Menu
3. SETUP Menu
4. CALIBRATION Menu
5. GLOBAL SETTINGS Menu
6. Channel Number/Next Screen
7. Channel Rotation Direction

## 6.3 Changing Parameters

Changing parameters is done by moving the cursor around the LCD screen using the four directional arrows. The arrows are used to navigate the menus and change numeric values and pumping modes. Using the arrows, the cursor can be moved to any field to select or edit.

Once the cursor is in the field that you would like to select or edit, press the OK/Enter button. When highlighting numeric values, the cursor will highlight the entire value. Pressing OK/Enter will then allow the cursor to highlight only one digit for editing. Using the directional arrows up or down will increase or decrease the value and left and right will move the cursor to the next digit to be edited. Once the value is correct, press OK/Enter and the cursor will then highlight the entire value exiting the edit mode. When highlighting pumping modes, tubing ID, and language, the OK/Enter button will allow the parameter to be changed by toggling through a list using the directional arrows. Once the selection has been made, pressing the OK/Enter button will save the selection and exit the editing mode.

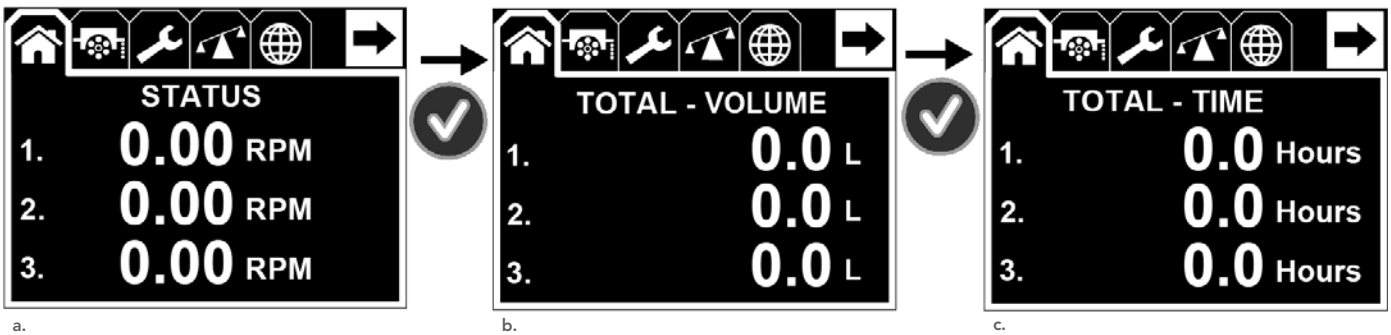
The Run/Stop button is used to start or stop all the channels. When the pump is idle, pressing the Run/Stop button will start pumping to the settings for each channel. When the pump is running, pressing the Run/Stop button will stop all channels. If a timed or repeating pumping mode is being used, pressing the Run/Stop button will pause the program. Pressing the Run/Stop button again will resume the program.

The Reset button is used to cancel editing or reset pumping modes. When a field has been selected for editing, pressing the Reset button will exit the editing mode and restore the original value. Also, when the pump is paused, pressing the Reset button will reset all the pumping modes back to their start point (number of cycles, time, volumes, etc.).

## 6.4 Menus

### 6.4.1 STATUS Menu

The STATUS Menu has three screens. The Status screen (a) displays the current pumping parameters for each channel. The unit displayed varies depending on the pumping mode selected. The Total Volume screen (b) displays the total volume that has been pumped since the last time it was reset. The Total Time screen (c) displays the total hours pumped for each channel since the last time it was reset. The time and volume can be reset by navigating to the desired value and pressing OK/Enter button. Highlighting the arrow in the upper right hand corner of the screen and pressing the OK/Enter button will toggle through the three status screens.

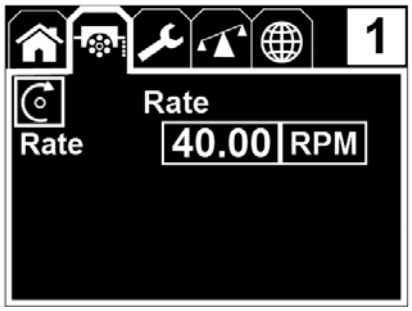



a. b. c.

### 6.4.2 PUMPING Menu

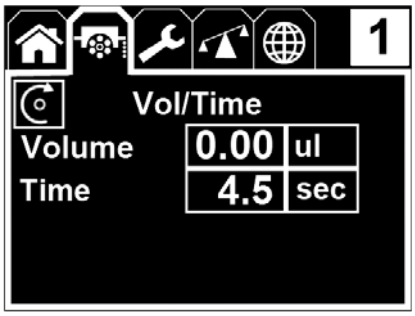

The PUMPING Menu allows you to set up the pumping parameters for all of the available channels. The channel number that is being programmed is indicated in the upper right hand corner. You can select the rotation direction, pumping mode, and values for each channel in the PUMPING menu.

#### 6.4.2.1 Flow Rate Mode



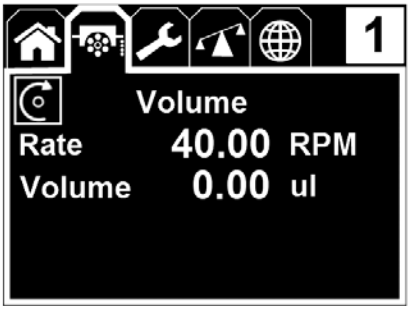

Flow Rate Mode provides a continuous operation at a set rate and direction. Adjustable parameters are rotation direction, flow rate, and flow rate units. Rotation direction can be selected as clockwise (CW) or counter-clockwise (CCW). Flow rate can be changed in the range specified by the selected unit and/or tubing inner diameter (ID) (see Section 6.4.3). Selectable flow rate units are RPM, µL/min, mL/min, and L/min. Flow rate and rotation direction can be changed during the operation as well.

#### 6.4.2.2 Volume Over Time Mode




Volume Over Time Mode allows the user to dispense a desired volume over a desired time. The pump will determine the speed of rotation by set volume and time. Adjustable parameters are rotation direction, volume, volume units, time, and time units. Rotation direction can be selected as CW or CCW. Combinations of time and volume can be set to any value as long as it is in the range of the pump's capabilities. If the time value entered is less than what the pump is capable of for desired volume, it will default to the shortest dispense time possible. Volume units selectable are µL, mL and L. Time units selectable are seconds, minutes, and hours. None of the parameters are changeable during pumping or when operation is paused. Dispensing program can be reset during operation by pressing the Reset button after pumping is paused.

#### 6.4.2.3 Volume Mode

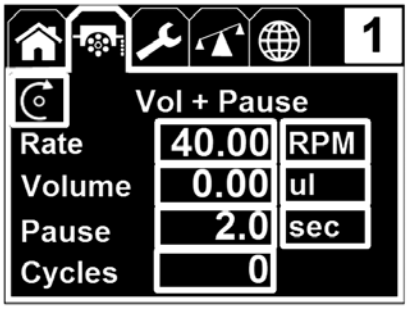



Volume Mode allows the user to dispense a set volume with a set flow rate. Adjustable parameters are rotation direction, flow rate, flow rate units, volume, and volume units. Rotation direction can be selected as CW or CCW. Flow rate can be changed in the range specified by the selected unit and/or tubing ID (see Section 6.4.3). Selectable flow rate units are RPM, µL/min, mL/min, and L/min. Selectable volume units are µL, mL, and L. Only flow rate can be changed during pumping or when the operation is paused. Dispensing program can be reset during operation by pressing the Reset button after pumping is paused.

### 6.4.2.4 Time Mode

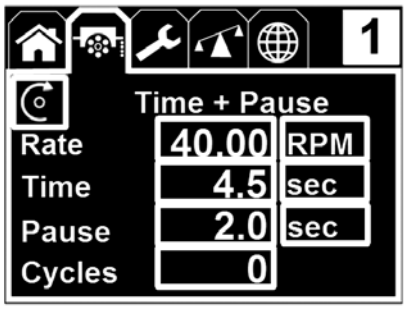

Time Mode allows the user to dispense for a set time duration with a set flow rate. Adjustable parameters are rotation direction, flow rate, flow rate units, time, and time units. Rotation direction can be selected as CW or CCW. Flow rate can be changed in the range specified by the selected unit and/or tubing ID (see Section 6.4.3). Selectable flow rate units are RPM, µL/min, mL/min, and L/min. Selectable time units are sec, min, and hours. Only flow rate can be changed during pumping or when the operation is paused. Dispensing program can be reset during operation by pressing the Reset button after pumping is paused.

### 6.4.2.5 Volume with Pause Mode



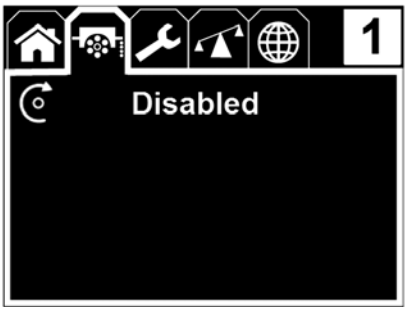

Volume with Pause Mode allows the user to dispense a set volume over multiple cycles. Adjustable parameters are rotation direction, flow rate, flow rate units, volume, volume units, pause time between cycles, pause time unit, and number of cycles. Rotation direction can be selected as CW or CCW. Flow rate can be changed in the range specified by the selected unit and/or tubing ID (see Section 6.4.3). Selectable flow rate units are RPM, µL/min, mL/min, and L/min. Selectable volume units are µL, mL, and L. Selectable pause time units are sec, min, and hours. Only flow rate can be changed during pumping or when the operation is paused. Dispensing program can be reset during operation by pressing the Reset button after pumping is paused.

### 6.4.2.6 Time with Pause Mode



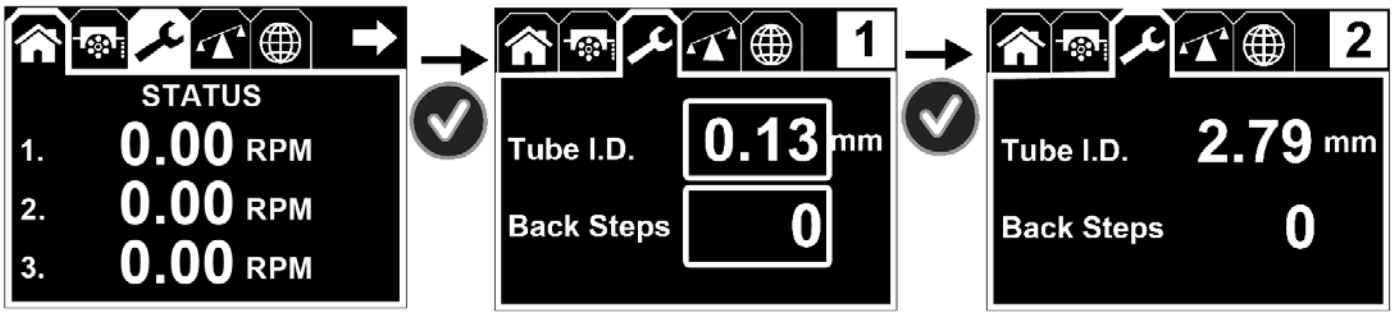

Time with Pause Mode allows the user to dispense for a set time duration over multiple cycles. Adjustable parameters are rotation direction, flow rate, flow rate units, time, time units, pause time between cycles, pause time unit, and number of cycles. Rotation direction can be selected as CW or CCW. Flow rate can be changed in the range specified by the selected unit and/or tubing ID (see Section 6.4.3). Selectable flow rate units are RPM, µL/min, mL/min, and L/min. Selectable time units are sec, min, and hours. Selectable pause time units are sec, min, and hours. Only flow rate can be changed during pumping or when the operation is paused. Dispensing program can be reset during operation by pressing the Reset button after pumping is paused.

### 6.4.2.7 Disabled Mode




Disabled Mode disables the selected channel for pumping. The channels that are not anticipated to pump any fluid should be set to this mode.

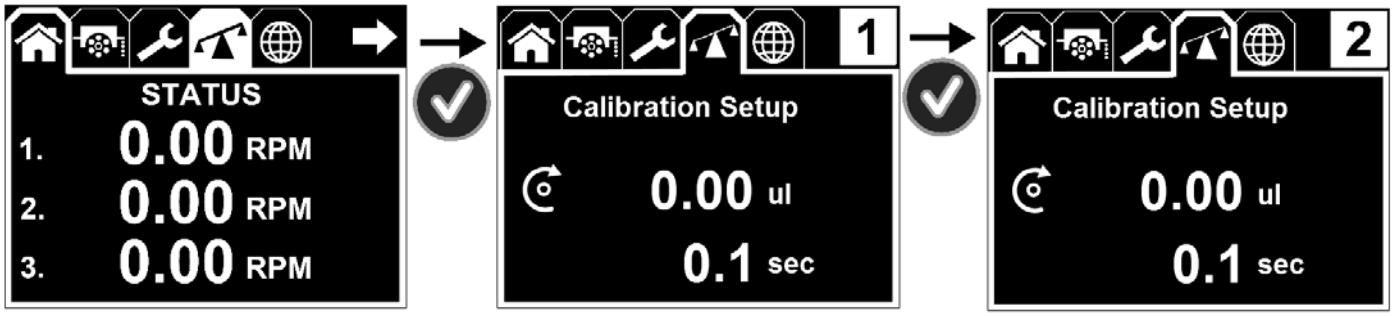
### 6.4.3 SETUP Menu




In the SETUP Menu the tubing ID is set by selecting the size of tubing being used in the highlighted channel selected in the upper right hand corner. The tubing ID is selected from the drop down menu. The number of roller backsteps for drip free dispensing can also be set between 0–100 (0 = Default Value).

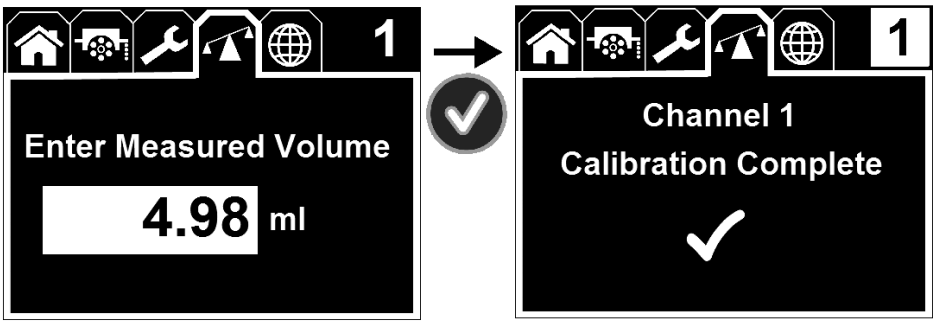
### 6.4.4 CALIBRATION Menu

In the CALIBRATION Menu each channel can be calibrated independently. The channel being calibrated is listed in the upper right hand corner.

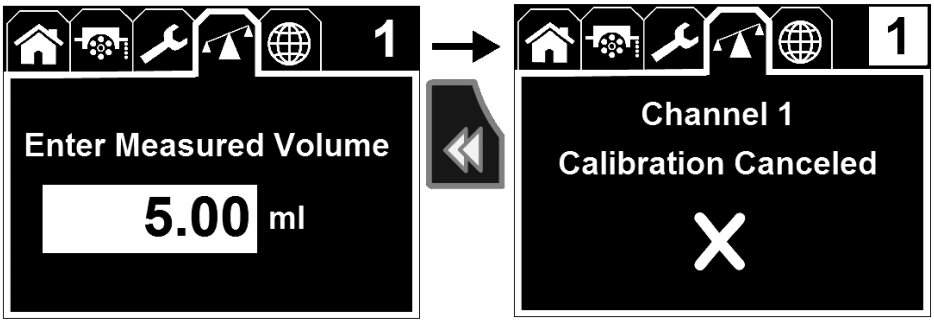



The Reglo ICC allows each channel to be set up and calibrated. This allows for maximum flexibility and optimum channel to channel precision. Prior to the calibration each channel must be configured for tubing ID, the number of backsteps that are desired for drip free dispensing, and calibration of that channel.


The Reglo ICC allows you to enter the volume of fluid to dispense for calibration, dispense time for the specified volume, and pumping direction. Once you have entered those values, dispense desired volume into a container. Measure the actual amount of the fluid by weight or volume and enter that value on the last screen to adjust the pump for your application. The calibration can be interrupted by pressing the Run/Stop button which will cancel the existing progress. New uninterrupted calibration run will be required in order to calibrate the channel properly. When adjusting the dispense time for calibration, if requested time is shorter than the pump's physical capabilities, the dispense time will automatically default to minimum achievable dispense time.



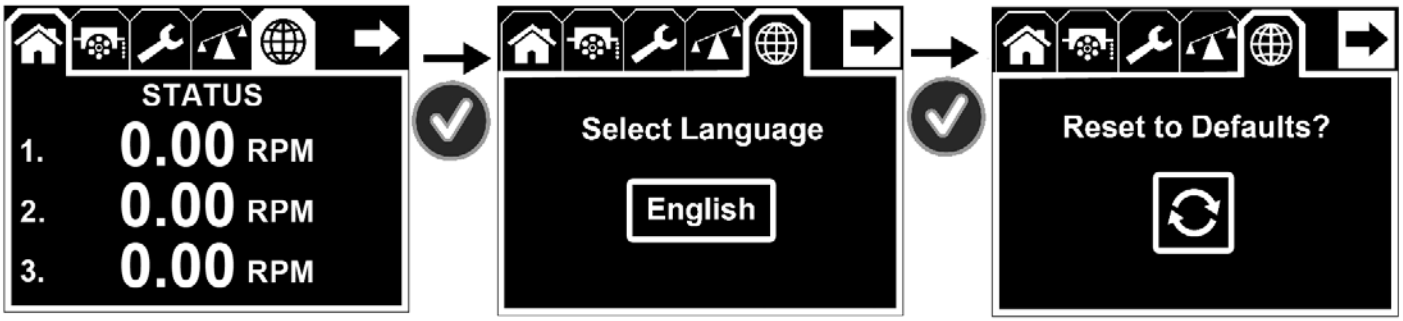

You can complete the calibration by pressing OK/Enter button following your measurement input. You will receive a message and checkmark once your calibration is successful.




You can cancel the calibration after the calibration run by pressing the Reset button. You will receive the message displaying that the calibration has been canceled.

### 6.4.5 GLOBAL SETTINGS Menu

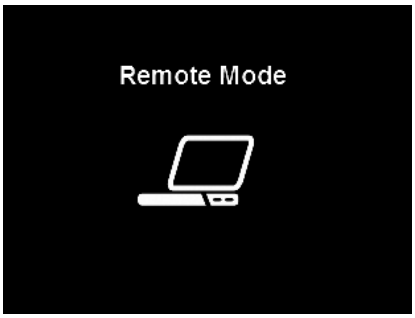
In the GLOBAL SETTINGS Menu the display language can be selected from English, French, Spanish, and German. The pump can also be reset to the factory defaults at this menu.




## 6.5 Installing Tubing

1. Switch the pump OFF.
2. Remove the cassette by slightly pressing the fixing-tongue and lifting it simultaneously.
3. Insert the 2-stop or 3-stop color-coded tubing with one stopper into the cassette.
4. Let the tubing hang down (prevents it from twisting).
5. Insert the tubing with the second stopper at the other end of the cassette.
6. Reinsert the cassette into the roller-head.
7. Make sure each cassette is positioned and aligned well between dedicated segments on the bars.
8. Turn the pump ON.
9. When the pump is idle, release all cassettes to maximize tubing life (beware of siphoning or back flow).

## 6.6 Information Screens




Indicates that the pump is being remotely controlled by a PC via USB connection.


Indicates that the internal temperature has exceeded a safe threshold and pumping will stop automatically to protect the pump. Turn the pump power switch OFF and check your parameters, differential pressure, and pump head for blockage. The pump will not operate in an overheated condition. Allow the pump to cool before turning the power switch back ON.

## 6.7 Differential Pressure

The Reglo ICC can be used for continuous duty at a maximum differential pressure of 1.0 bar (smaller tube sizes and/or lever type cassettes allow higher pressures).

## 6.8 When the Pump is Idle

When the pump is idle, we recommend releasing the tubing cassette from the pump head. Releasing the cassette on the right side is sufficient. This helps to protect the tubing from unnecessary strain and prolongs its service life. However, a siphoning effect can occur when the tubing cassette is released from the pump head. Use caution to prevent the fluid from flowing back to the reservoir.

# 7. Over Current Protection

The Reglo ICC features an external power supply that has overload protection as well as a combined circuit breaker and On/Off switch on the pump. There are NO replaceable fuses or service items inside the pump. This system is designed to disable power to the pump drive in case of excessive current to prevent damage. When an overload condition occurs, the pump will power down and it is recommend to immediately switch the pump OFF and unplug the pump from the wall. Before the pump is re-started, it is most important to check the reason for the overload (e.g. excess differential pressure etc.). Only when the cause of the overload has been detected and the failure corrected may the pump be started again. If the condition persists, contact an ISMATEC® technical support representative immediately.

# 8. Cassettes

Your Reglo ICC can use the MS/CA Click-n-Go® cassettes which accept "3-Stop" tubing. See Page 16 for more information. When using new tubing for the first time, depending on the tubing used (hardness and diameter), the pump may not be primed and can not deliver the liquid. If that is the case, we recommend you wet the tubing and run the pump with the tubing inserted for about 15 to 30 minutes.

## 8.1 Ordering Spare Parts

| Order Number | Material | Cassette |
|---|---|---|
| **IS3510A** | POM-C | MS/CA Click-n-Go® |
| **IS3610A** | PVDF | MS/CA Click-n-Go® |

## 8.2 Cassette Material

**POM-C Polyoxymethylene-Copolymer:**

- Good chemical resistance to many organic solvents and strong alkaline chemicals.
- Affected by strong acids and oxidizing substances.
- UV-stabilized and stable up to temperatures of 80 °C/176 °F (dry, continuous use) or 136 °C/277 °F (dry, for a short time).

**PVDF Polyvinylidene fluoride:**

- Very good chemical resistance to acids and most aliphatic, aromatic, and chlorinated solvents.
- Not suitable for long contact with esters, ketones, amines, and strong alkaline chemicals.
- Stable both to UV radiation and temperatures up to 110 °C/230 °F (continuous use) or 142 °C/288 °F (for a short time).

## 8.3 Pressure Lever Cassettes

- Note: Due to the configuration of the Reglo ICC Pump, the use of pressure lever cassettes is not recommended.

# 9. Repair

The Reglo ICC is designed for many years of trouble free service. The Reglo ICC does not have any fuses or adjustments inside the pump. If you wish to attempt any repairs after the warranty period, please contact your local ISMATEC® Distributor for parts.

# 10. Cleaning

When replacing the tubes and/or cassettes, the pump head should be wiped to avoid any debris or residue. The pump head can be cleaned with mild detergent water before and after duty cycles for extended life. The exterior of the pump can be gently wiped with IPA (Isopropyl Alcohol). Use a 50% mixture of IPA and water on a lint-free soft cloth to clean the LCD screen. Do not spray or pour any liquid on the LCD screen.

# 11. Disposal

Please retain packaging materials until the product warranty ends. Afterwards please discard packaging materials in an environmentally friendly manner according to local regulations. Once the useful life of the product has ended, please ensure proper disposal according to local laws. Plastic and electronic components should be disposed of at a recycling facility. Please refer to local regulations regarding proper disposal.

# 12. Technical Specifications

**Patent Pending**

**Drive:**

- Motor type: Stepper Motor

**Flow rate and speed:**

- Flow rate: 0.0002–35 mL/min
- Speed range: 0.1–100 rpm
- Digitally adjustable in steps of 0.01 rpm

**Differential pressure:**

- Max. 1.0 bar (14.5 psi)

**Remote control:**

- Via USB 2.0 or RS-232 digital interfaces

**Main power connection:**

- 100–240VAC / 50/60 Hz

**Power consumption:**

- Max. 30 W

**Operating conditions:**

- Temperature: +5 to 40 °C (41 to +104 °F)
- Rel. humidity max.: 80%
    - Non-condensing, at normal laboratory conditions
- Dimensions/Weight (D x W x H): 205 x 125 x 170 mm (8.1 x 5 x 6.7")
- Weight: 2.7 kg (6 lbs)

# 13. Tubing Size and Flow Rate Chart

| Rollers | | 8 | |
|---|---|---|---|
| RPM | | 1.0 | 100 |
| Tube ID | Order No | Flow Rates | mL/min. |
| | | min. | max. |
| 0.13 | SC0189T | 0.002 | 0.11 |
| 0.19 | SC0049T | 0.003 | 0.23 |
| 0.25 | SC0050T | 0.005 | 0.41 |
| 0.38 | SC0051T | 0.010 | 0.94 |
| 0.44 | SC0052T | 0.013 | 1.3 |
| 0.51 | SC0053T | 0.017 | 1.7 |
| 0.57 | SC0054T | 0.021 | 2.1 |
| 0.64 | SC0055T | 0.026 | 2.6 |
| 0.76 | SC0056T | 0.036 | 3.6 |
| 0.89 | SC0057T | 0.049 | 4.9 |
| 0.95 | SC0058T | 0.056 | 5.6 |
| 1.02 | SC0059T | 0.063 | 6.3 |
| 1.09 | SC0060T | 0.072 | 7.2 |
| 1.14 | SC0061T | 0.078 | 7.8 |
| 1.22 | SC0062T | 0.088 | 8.8 |
| 1.3 | SC0063T | 0.10 | 10 |
| 1.42 | SC0064T | 0.11 | 11 |
| 1.52 | SC0065T | 0.13 | 13 |
| 1.65 | SC0066T | 0.15 | 15 |
| 1.75 | SC0067T | 0.16 | 16 |
| 1.85 | SC0068T | 0.17 | 17 |
| 2.06 | SC0069T | 0.20 | 20 |
| 2.29 | SC0070T | 0.24 | 24 |
| 2.54 | SC0071T | 0.27 | 27 |
| 2.79 | SC0072T | 0.31 | 31 |
| 3.17 | SC0224T | 0.35 | 35 |

Cassettes for the ICC pumps are designed to work with stoppered tubing that fits the MS/CA Cassettes, commonly referred to as "3-Stop" tubing. Please visit our website or contact your local distributor for more information on available options.

# 14. Reglo ICC Serial Command Protocol

## 14.1 Overview

The Reglo Digital model pump supports a 9600 baud, 8 data bits, 1 stop bit, no parity, no flow control serial communication protocol for controlling the pump's operation, as well as setting and getting current pump configuration parameters. This section describes the protocol used with the Reglo ICC model pump.

The ICC protocol is backwards-compatible with existing controlling devices which use the Digital protocol. The PC pump-control software uses the protocol described in this document to control Reglo ICC pumps.

## 14.2 Physical Layer

The protocol described in this document may be used over USB or RS-232 to communicate with the Reglo ICC pump. The RS-232 link may be composed of:

- Multiple pumps which have been "daisy-chained" together to form a multi-drop RS-232 communications bus. Only one controlling device (i.e. PC) may be connected to this RS-232 bus.
- Individual channel control for one pump only

## 14.3 Message Format

All messages are composed of a string of printable ASCII characters. Each message is terminated with a carriage return or carriage return and line feed.

## 14.4 Addressing

The Reglo Digital protocol uses an addressing scheme where each pump is assigned a singular address. This addressing is designed to accommodate multiple pumps which have been "daisy-chained" to the same RS-232 bus.

The addressing scheme for the protocol described in the document is dependent on the physical layer used for communication. This arrangement allows for the same command definitions to be used for either RS-232 or USB.

When using RS-232 to control the pump in default mode, the addressing scheme of the Reglo Digital is preserved. The address fields in command messages are used to address individual pumps connected in a daisy chain. RS-232 can also be used to control the individual channels as the USB interface does in which case the address character is used to define the individual channel. Note that when pumps are connected in a daisy chain configuration for independent channel control, the individual channel control applies to all the pumps.

An example of RS232 commands to address individual channels follows:

- @2 Assign address 2 to the pump
- 2~1 Configures independent channel control, pump 2
- 1H Channel 1 start (all pumps in a daisy chain)
- 2S Channel 2 speed setting request returns channel 2 RPM value
- 2~ query channel status returns 1
- 2~0 returns pump to standard channel control
- 2~ query channel status returns 0
- 2H all channels start

When using USB to control the pump, the address fields in command messages are used to address individual pump channels. As each USB connection is a point-to-point link between the controlling device (PC) and the pump, there is no need to provide pump addressing in the communications protocol.

Some parameters apply only to each pump, and so individual channel addressing is not necessary. When using USB, an address must still be provided each of these messages, but this address will be ignored.

## 14.5 Definitions

The following symbols are used to represent ASCII characters in the messages defined in this document.

- [CR]—carriage return (0x0d)
- [LF]—line feed (0x0a)
- [SP]—space (0x20)
- [VB]—vertical bar, or "pipe" (0x7c)

## 14.6 Data Type Formats

The following data formats are used in the subsequent message definitions.

### 14.6.1 Boolean

- Width: 1
- Format: A single character indicating True or False.
  - 0 = False
  - 1 = True

### 14.6.2 Direction

- Width: 1
- Format: A single character indication direction.
  - J = Clockwise
  - K = Counter-clockwise

### 14.6.3 Discrete Type 1

- Width: 1 to 4
- Unit: 1
- Range: 0 to 9999
- Format: Up to four characters representing a discrete integer value in base 10. Unused digits are not returned.

### 14.6.4 Discrete Type 2

- Width: 4
- Units: 1
- Range: 0 to 9999
- Format: Four characters representing a discrete integer value in base 10. The value is right-justified. Unused digits to the left are zeros.

### 14.6.5 Discrete Type 3

- Width: 6
- Range: 0 to 999999
- Format: Six characters in base 10. The value is right-justified. Unused digits to the left are zeros.

### 14.6.6 Discrete Type 4

- Width: 10
- Range: 0 to 4294967295
- Format: Ten characters in base 10. The value is right-justified. Unused digits to the left are zeros.

### 14.6.7 Discrete Type 5

- Width: 3
- Range: 0 to 999
- Format: Three characters in base 10. The value is right-justified. Unused digits to the left are zeros.

### 14.6.8 Discrete Type 6

- Width: 5
- Range: 0 to 99999
- Format: Five characters in base 10. The value is right-justified. Unused digits to the left are zeros.

### 14.6.9 Fractional Type 1

- Width: Variable
- Format: XXXX.XX—The width of the integer portion of the value is variable. The decimal point and two digits to the right of the decimal point are always provided.

### 14.6.10 Volume Type 1

- Width: 7
- Units: mL
- Format: mmmmEse—Represents the scientific notation of m.mmm x 10se. For example, 1.200 x 10-2 is represented with 1200E-2. Note that the decimal point is inferred after the first character.
  - mmmm—4 character mantissa
  - E—"E" character
  - s—Sign for exponent (+ or -)
  - e—Single digit exponent

### 14.6.11 Time Type 1

- Width: 1 to 8
- Units: 0.1 second
- Range: 0 to 35,964,000 (0 to 999 hr)
- Format: Up to eight characters representing the time in 0 to 999 hours, with a resolution of 0.1 sec. Unused digits are not returned.

### 14.6.12 Time Type 2

- Width: 8
- Units: 0.1 second
- Range: 0 to 35,964,000 (0 to 999 hr)
- Format: Eight characters representing the time in 0 to 999 hours, with a resolution of 0.1 s. The value is right-justified. Unused digits to the left are filled with zeros.

### 14.6.13 String

- Width: Variable
- Range: 0 to 64 characters
- Format: The string is delimited by the delimiting character of the message type that it is contained in. For device command requests, this is [CR]. For data responses, this is [SP]. The string cannot contain these characters. Other printable ASCII characters are okay.

### 14.6.14 Language

- Width: 1
- Range: 0–3
- Format: A single numeric character representing a language as follows:
  - 0—English
  - 1—French
  - 2—Spanish
  - 3—German

# 15. Response Messages

Response messages are sent from the pump to the PC in response to request messages.

## 15.1 Status response

A status response message is the default response of the pump to most commands, indicating a success or failure of the command.

*Response Message: Status*

| | | |
|---|---|---|
| *Fields* | Status | |
| *Char Width* | *1* | |

- Status: A single ASCII character indicating the execution status of the requested command.
  - * (0x2a)—The command was executed successfully.
  - # (0x23)—The command was not executed successfully.
  - – (0x2d)—A negative response used for some commands, with different meanings for each. See individual direct-addressed command definitions for context.
  - + (0x2b)—A positive response used for some commands, with different meanings for each. See individual direct-addressed command definitions for context.

## 15.2 Data response

A data response is sent when parameter values must be provided in response to a request message. Each data response is composed of one or more data parameter values which are delimited by spaces.

*Response Message: Data*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Fields* | Data Parameter 1 | [SP] | Data Parameter 2 | [SP] | Data Parameter n | [CR] | [LF] |
| *Char. Width* | *Variable* | *1 (optional)* | *Variable (optional)* | *1 (optional)* | *Variable (optional)* | *1* | |

- Data Parameter N—A data value returned by the pump. The format of each data parameter is defined by the request message that a data response message is sent in response to. See each request message definition for the definition associated data response messages.

# 16. Request Messages

Request messages are sent from the PC to the pump. Every request message should be answered by a response message from the pump.

## 16.1 Set Pump Address

This is a specially formatted command used to set the address of each pump. By default, each pump uses address 1.

| @ | Addr | [CR] |
|---|---|---|

- @—The "@" character (ASCII 0x40).
- Addr—The new pump address (1–8).
- [CR]—A carriage return character.

**Response**
The response to this command is a **status response** message.

## 16.2 Device Command

A device command is addressed to an individual pump (or channel) to get or set particular pump (or channel) parameters.

*Response Message: Device Command*

| *Fields* | Addr | Command Code | Data Parameter 1 | [VB] | Data Parameter 2 | [VB] | ... | Data Parameter n | [CR] | [LF] |
|---|---|---|---|---|---|---|---|---|---|---|
| *Char. Width* | *1* | *Variable* | *Variable (optional)* | *1 (optional)* | *Variable (optional)* | *1* | | *Variable (optional)* | *1* | *1* |

- Addr: The address of a pump channel (1 to 4). For commands which interact with parameters on a per-pump (and not per-channel) basis, this field is ignored. The field must still be provided however. In this case the recommendation is to use a place holder address of 0. In legacy mode, this is a pump address (1 to 8).
- Command Type: A string, typically one or two characters that indicate the type of command.
- Data Parameters: Optional values which may be provided when setting a parameter value.
- [VB]–A single vertical bar or "pipe" character to delimit data parameters. If a single data parameter is provided, no VB delimiter is required.

## Direct-Addressed Command List

| Ref. # | Command | Function | Op | Response |
|---|---|---|---|---|
| 1.0 | | COMMUNICATIONS MANAGEMENT | | |
| 1.1 | ~ | Get an integer representing whether (1) or not (0) channel addressing is enabled. | Get | Boolean<br>1 = Channel addressing<br>2 = Legacy |
| 1.2 | ~ | Set whether channel messaging is enabled (1) or not enabled (0). | Set | Boolean |
| 1.3 | xE | Get an integer representing whether (1) or not (0) event messages are enabled. | Get | Boolean |
| 1.4 | xE | Set whether event messages are enabled (1) or not enabled (0). | Set | Boolean |
| 1.5 | x! | Get an integer representing the version of the serial protocol. | Get | Discrete Type 1 |
| 2.0 | | PUMP DRIVE | | |
| 2.1 | H | Start pump. | Set | *<br>- channel setting(s) are not correct or unachievable. |
| 2.2 | I | Stop pumping. | Set | * |
| 2.3 | xI | Pause pumping (STOP in RPM or flow rate mode). | Set | * |
| 2.4 | xD | Get pump direction. | Get | J (CW) or K(CCW) |
| 2.5 | J | Set rotation direction to clockwise. | Set | * |
| 2.6 | K | Set rotation direction to counter-clockwise. | Set | * |
| 2.7 | xe | Cause of " –" cannot run response = Parameter #1, Limiting value that was exceeded = Parameter #2 | Get | Parameter #1:<br>C = Cycle count of 0<br>R = Max flow rate exceeded or flow is set to 0<br>V = Max volume exceeded<br>Parameter #2: Limiting value:<br>C = Value is undefined<br>R = Max flow (mL/min)<br>V = Max vol (mL) |
| 3.0 | | OPERATIONAL MODES AND SETTINGS | | |
| 3.1 | xM | Get the current channel or pump mode. | | L = RPM<br>M = Flow Rate<br>O = Volume (at Rate)<br>G = Volume (over Time)<br>Q = Volume+Pause<br>N = Time<br>P = Time+Pause |
| 3.2 | L | Set pump/channel to **RPM** mode. | Set | * |
| 3.3 | M | Set pump/channel to **Flow Rate** mode. | Set | * |
| 3.4 | O | Set pump/channel to **Volume (at rate)** mode. | Set | * |
| 3.5 | G | Set pump/channel to **Volume (over time)** mode. | Set | *<br>- channel setting(s) are not correct or unachievable. |
| 3.6 | Q | Set pump/channel to **Volume + Pause** mode. | **Set** | * |
| 3.7 | N | Set pump/channel to **Time** mode. | Set | * |
| 3.8 | P | Set pump/channel to **Time + Pause** mode. | Set | * |
| 3.9 | xf | Get flow rate from RPM (S) or flow rate (f) when mode is not RPM or flow rate. | Get | Boolean<br>RPM = 0<br>Flow rate = 1 |
| 3.10 | xf | Set RPM flow rate not in RPM or flow rate mode Discrete Type 3. | Set | * |
| 3.11 | S | Gets the current speed setting in RPM. | Get | Fractional Type 1 |
| 3.12 | S | RPM mode flow rate setting (0.01 RPM) Discrete Type 3. | Set | * |
| 3.13 | f | Get current volume/time flow rate (mL/min). | Get | Volume Type 1 |
| 3.14 | f | Set RPM flow rate in volume/time mode (mL/min) Volume Type 2. | Set | Volume Type 2 |

| Ref. # | Command | Function | Op | Response |
|---|---|---|---|---|
| 3.0 | | OPERATIONAL MODES AND SETTINGS | | |
| 3.15 | v | Get the current setting for volume in mL. | Get | Volume Type 1 |
| 3.16 | v | Set the current setting for volume in mL. Volume Type 2. | Set | Volume Type 1 |
| 3.17 | xT | Get the current pump run time. | Get | Time Type 1 |
| 3.18 | xT | Set current pump run time using Time Type 2. | Set | * |
| 3.19 | xP | Get pumping pause time. | Get | Time Type 1 |
| 3.20 | xP | Set pumping pause time using Time Type 2. | Set | * |
| 3.21 | " | Get pump cycle count. | Get | Discrete Type 1 |
| 3.22 | " | Set pump cycle count Discrete Type 2. | Set | * |
| 3.23 | ? | Max flow rate achievable with current settings mL/min. | Get | Text |
| 3.24 | ! | Max flow rate achievable with current settings using calibration. | Get | Text |
| 3.25 | xv | Get time to dispense at a given volume at a given mL/min flow rate. Vol, Volume Type 2; flow rate, Volume Type 2. | Get | Time Type 1 (0.1 sec) |
| 3.26 | xw | Get time to dispense at a given volume at a given RPM. mL, Volume Type 2; flow rate, Discrete Type 3. | Get | Time Type 1 (0.1 sec) |
| 4.0 | | CONFIGURATION | | |
| 4.1 | + | Get the current tubing inside diameter in mm. 2 decimal places are returned. | Get | 4 characters including decimal (mm). |
| 4.2 | + | Set tubing inside diameter using Discrete Type 2. | Set | * |
| 4.3 | % | Get the current backsteps setting. | Get | Discrete Type 1 |
| 4.4 | % | Set the current backsteps setting using Discrete Type 2. | Set | * |
| 4.5 | 0 | Resets all user configurable data to default values. | Set | * |
| 5.0 | | CALIBRATION | | |
| 5.1 | xR | Get direction flow for calibration. | Get | DIRECTION, J = CW K = CCW |
| 5.2 | xR | Set direction flow for calibration J or K using DIRECTION format. | Set | * |
| 5.3 | xU | Get the target volume to pump for calibrating, mL. | Get | Volume Type 1 |
| 5.4 | xU | Set the target volume to pump for calibrating using Volume Type 2. | Set | Volume Type 1 |
| 5.5 | xV | Set actual volume measured during calibration, mL Volume Type 2. | Set | Volume Type 1 |
| 5.6 | xW | Get the current calibration time. | Get | Time Type 1 |
| 5.7 | xW | Set the current calibration time using Time Type 2. | Set | * |
| 5.8 | xX | Get the channel run time since last calibration. | Get | Time Type 2 |
| 5.9 | xY | Start calibration on a channel(s). | Set | * |
| 5.10 | xZ | Cancel calibration. | Set | * |
| 6.0 | | SYSTEM | | |
| 6.1 | ( | Returns the **pump firmware version**. | Get | Discrete Type 2 |
| 6.2 | xt | Change factory roller step volume for a particular roller count and tubing size using roller count (6,8,12), Discrete Type 1; index of the tubing diameter (see Table 1), Discrete Type 1; RSV. Volume Type 2. | Set | * |
| 6.3 | xs | Save set roller step settings. | Set | * |
| 6.4 | xu | Reset roller step volume table to defaults. | Set | * |
| 6.5 | xN | Set pump name for display under remote control–String. | Set | * |
| 6.6 | xS | Get pump serial number. | Get | String |
| 6.7 | xS | Set pump serial number–String. | Set | * |
| 6.8 | xL | Get the current pump language. | Get | Language |
| 6.9 | xL | Set current pump language–Language. | Set | * |
| 6.10 | xA | Get number of pump channels. | Get | Discrete Type 1 |
| 6.11 | xA | Configure number of pump channels. Discrete Type 2. | Set | * |
| 6.12 | xB | Get number of rollers for channel. | Get | Discrete Type 1 |

| Ref. # | Command | Function | Op | Response |
|---|---|---|---|---|
| 6.0 | | SYSTEM | | |
| 6.13 | xB | Set number of rollers for channel. Discrete Type 2. | | |
| 6.14 | xC | Get total number of revolutions since last reset. | Get | Discrete Type 4 |
| 6.15 | xG | Get channel total volume pumped since last reset, mL. | Get | Discrete Type 4 |
| 6.16 | xJ | Get total time pumped for a channel since last reset. | Get | * |
| 6.17 | A | Set control from the pump user interface. | Set | * |
| 6.18 | B | Disable pump user interface. | Set | * |
| 6.19 | D | Write numbers to the pump to display while under external control. –String (<17 characters). | Set | * |
| 6.20 | DA | Write letters to the pump to display while under external control –String(<17 characters). | Set | * |
| 6.21 | E | Returns whether the pump is currently running or not. | Get | + running<br>- stopped |
| 6.22 | # | Returns the following fields, each separated by a space:<br>**Pump model description:** A text field describing the model of pump. This description may contain spaces.<br>**Pump software version:** The version of software currently running in the pump.<br>**Pump head model type code:** A code describing the type of pump head installed. The first digit represents the number of channels for the pump, and the second 2 digits represent the number of rollers. XX if channels do not have the same number of rollers. | Get | String<br>Discrete Type 1<br>Discrete Type 1 |
| 6.23 | ) | Returns the **pump head model type code**–A 4 digit code indicating the ID number of the pump head. The first two digits represent the number of channels on the head, and the second 2 digits represent the number of rollers. | Get | Discrete Type 1 |
| 6.24 | ) | Sets the **pump head model type code** –An up-to 4 digit code setting the ID number of the pump head. The first two digits encode the number of channels on the head, the second two digits encode the number of rollers on the head. This command sets all roller counts to the same value. To individually set roller counts for each channel, use the non-legacy command designed for this operation. Discrete Type 2. | Set | * |
| 6.25 | V | Get the current setting for pump time in 1/10 second. | Get | Discrete Type 1 |
| 6.26 | V | Set the current setting for pump time in 1/10 second. Discrete Type 2. | Set | * |
| 6.27 | VM | Set the current run time setting for dispensing in minutes. Discrete Type 5. | Set | * |
| 6.28 | VH | Set the current run time setting for dispensing in hours. Discrete Type 5. | Set | * |
| 6.29 | U | Get the low order roller steps. The total number of roller steps which are dispensed during an operation is computed as:[(u*65536]+(U)]. | Get | Discrete Type 3 |
| 6.30 | U | Set the high order roller steps. Discrete Type 6. | Set | * |
| 6.31 | u | Get the high order roller steps. The total number of roller steps which are dispensed during an operation is computed as:[(u*65536]+(U)]. | Get | Discrete Type 3 |
| 6.32 | u | Set the high order roller steps. Discrete Type 6. | Set | * |
| 6.33 | r | Get the current roller step volume based on the current calibration, tubing diameter and roller count. If no calibration has been performed the default volume is returned. | Get | Volume Type 1-nl |
| 6.34 | r | Set the calibrated roller step volume to use for this pump or channel. This value is used as the calibrated value and is overwritten by subsequent calibrations and reset by changing tubing diameter. Volume Type 2. | Set | * |
| 6.35 | 000000 | Reset the pump to discard calibration data, use default roller step volume. | Set | * |
| 6.36 | T | Get the current setting for pause time in 1/10 second. | Get | Discrete Type 1 |
| 6.37 | T | Set the current setting for pause time in 1/10 second. Discrete Type 2. | Set | * |
| 6.38 | TM | Set the current setting for pause time in minutes. Discrete Type 5. | Set | * |
| 6.39 | TH | Set the current setting for pause time in hours. Discrete Type 5. | Set | * |
| 6.40 | : | Get the total volume dispensed since the last reset in µL, mL or liters. | Get | Parameter 1<br>String-decimals<br>Parameter 2<br>String-units |
| 6.41 | * | Saves the current pump settings values to memory. | Set | * |
| 6.42 | C | Get the current state of the foot switch. | Get | - open<br>+ grounded |

## 16.3 Tube Diameter Index

| Index | Tube Diameter (mm) |
|---|---|
| 0 | 0.13 |
| 1 | 0.19 |
| 2 | 0.25 |
| 3 | 0.38 |
| 4 | 0.44 |
| 5 | 0.51 |
| 6 | 0.57 |
| 7 | 0.64 |
| 8 | 0.76 |
| 9 | 0.89 |
| 10 | 0.95 |
| 11 | 1.02 |
| 12 | 1.09 |

| Index | Tube Diameter (mm) |
|---|---|
| 13 | 1.14 |
| 14 | 1.22 |
| 15 | 1.30 |
| 16 | 1.42 |
| 17 | 1.52 |
| 18 | 1.65 |
| 19 | 1.75 |
| 20 | 1.85 |
| 21 | 2.06 |
| 22 | 2.29 |
| 23 | 2.54 |
| 24 | 2.79 |
| 25 | 3.17 |

# 17. Event Messages

Event messages are asynchronous (unrequested) messages sent by the pump to the PC.

*Response Message: Device Command*

| *Fields* | Event Indicator | Event Code | Data Parameter 1 | [VB] | Data Parameter 2 | [VB] | ... | Data Parameter n | [CR] | [LF] |
|---|---|---|---|---|---|---|---|---|---|---|
| *Char Width* | *1* | *1* | *Variable (optional)* | *1 (optional)* | *Variable (optional)* | *1 (optional)* | | *Variable (optional)* | *1* | *1* |

- Event indicator: A single caret (^) character (ASCII 0x53) which identifies this message as an event message.
- Event code: A string which identifies a specific type of event.
- Data Parameter N—A data value associated with the event. There may be none or several of these. These will vary by event type.
- [VB]—A single vertical bar or "pipe" character to delimit data parameters.

## 17.1 Channel stop

This event message is generated when a pumping operation is complete due to the expiration of a time, volume or cycle counter. This event message is not generated when a stop command is sent to the pump.

- Event Code: **X**
- Data Parameter 1: Channel
  - Description: The channel that the stop event occurred on.
  - Range: 1–8
  - Format: A single character representing the channel number.
- Data Parameter 2: Cause
  - Description: The reason that the stop event occurred.
  - Format: A single character code representing the cause.
    - A—Pumping complete (expiration of timer or volume limit reached).
    - B—Calibration pumping complete.
    - 1—Manual (emergency) stop event (user presses stop button on the pump).
    - 2—Over temperature condition.
    - 3—Over current condition.

## 17.2 Channel status update

This event message is generated periodically for each channel when the pump is on to indicate that the pump is "alive" and responsive. It is also responsible for providing updates on the state of an in-progress pumping operation.

- Event Code: **U**
- Data Parameter 1: Channel
  - Description: The channel associated with this status update event message.
  - Range: 1–8
  - Format: A single character representing the channel number.
- Data Parameter 2: Status
  - Description: The current status of this channel.
  - Format: A single character representing the status.
    - A—Pumping
    - B—Paused between cycles
    - C—Stopped
    - D—Calibration pumping
    - E—Calibration pending (waiting for measured value to be entered)
- Data Parameter 3: Time remaining
  - Description: The time remaining in the current cycle. If pumping, this is the amount of pump time remaining. If paused, this is the amount of pause time remaining.
  - Units: seconds
  - Format: **Discrete Type 4**
- Data Parameter 4: Volume dispensed
  - Description: The volume which has already been dispensed in the current cycle.
  - Units: microliters (µL)
  - Format: **Discrete Type 4**
- Data Parameter 5: Cycles remaining
  - Description: The number of cycles left to pump. The current cycle is included in the count.
  - Format: **Discrete Type 2**

# 18. Examples

## 18.1 Communication Management

### 18.1.1 Get serial protocol version

| | |
|---|---|
| 0x![CR] | REQUEST |
| 2[CR][LF | RESPONSE |

The protocol version supported the type is version "2," the version defined in this document.

### 18.1.2 Event message enable

Get the current enable state of event messages.

| | |
|---|---|
| 0xE[CR] | REQUEST |
| 0[CR][LF] | RESPONSE |

Event messages are disabled.

Enable event messages.

| | |
|---|---|
| 0xE1[CR] | REQUEST |
| * | RESPONSE |

## 18.2 Pump Drive

### 18.2.1 Start pumping

Start pumping on channel 2:

| | |
|---|---|
| 2H[CR] | REQUEST |
| * | RESPONSE |

### 18.2.2 Stop pumping

Stop pumping on channel 3:

| | |
|---|---|
| 3I[CR] | REQUEST |
| * | RESPONSE |

### 18.2.3 Get direction

Get direction of channel 1:

| | |
|---|---|
| 1xD[CR] | REQUEST |
| K[CR][LF] | RESPONSE |

The direction of channel 1 is counter-clockwise.

### 18.2.4 Set direction

Set direction to clockwise:

| | |
|---|---|
| 1J[CR] | REQUEST |
| * | RESPONSE |

## 18.3 Modes and Settings

### 18.3.1 Operational pumping mode

Get the current mode of channel 1.

| | |
|---|---|
| 1xM[CR] | REQUEST |
| L[CR][LF] | RESPONSE |

The current mode of channel 1 is RPM.
Set the mode of channel 4 to Time.

| | |
|---|---|
| 4N[CR] | REQUEST |
| * | RESPONSE |

### 18.3.2 Pumping rate (drive speed)

Set drive speed of channel 2 to 123 RPM:

| | |
|---|---|
| 2S012300[CR] | REQUEST |
| * | RESPONSE |

Get the current drive speed of channel 4:

| | |
|---|---|
| 4S[CR] | REQUEST |
| 12.30[CR][LF] | RESPONSE |

The current drive speed of channel 4 is 12.3 RPM.

### 18.3.3 Pumping rate (volume/time)

Set pumping rate of channel 1 to 1.3 µL/min:

| | |
|---|---|
| 1f1300-3[CR] | REQUEST |
| 1300E-3[CR][LF] | RESPONSE |

Get current pumping rate of channel 4:

| | |
|---|---|
| 4f[CR] | REQUEST |
| 3250E+1[CR][LF] | RESPONSE |

The current pumping rate of channel 4 is 32.5 mL/min.

### 18.3.4 Volume

Set the volume of channel 4 to 300 mL:

| | |
|---|---|
| 4v3000+2[CR] | REQUEST |
| 3000E+2[CR][LF] | RESPONSE |

Get the volume of channel 2:

| | |
|---|---|
| 2v[CR] | REQUEST |
| 1300E-3[CR][LF] | RESPONSE |

The volume of channel 3 is 1.3 µL.

### 18.3.5 Run time

Set the run time of channel 1 to 150 seconds:

| | |
|---|---|
| 1xT00001500[CR] | REQUEST |
| * | RESPONSE |

Get the run time of channel 2:

| | |
|---|---|
| 2xT[CR] | REQUEST |
| 20[CR][LF] | RESPONSE |

The current run time of channel 2 is 20 seconds.

### 18.3.6 Pause time

Set the pause time of channel 1 to 1500 seconds:

| | |
|---|---|
| 1xP00001500[CR] | REQUEST |
| * | RESPONSE |

Get the pause time of channel 2:

| | |
|---|---|
| 2xP[CR] | REQUEST |
| 20[CR][LF] | RESPONSE |

The current pause time of channel 2 is 20 seconds.

### 18.3.7 Cycle Count

Set the cycle count of channel 1 to 23:

| | |
|---|---|
| 1"0023[CR] | REQUEST |
| * | RESPONSE |

Get the cycle count of channel 2:

| | |
|---|---|
| 2"[CR] | REQUEST |
| 20[CR][LF] | RESPONSE |

The cycle count of channel 2 is 20.

## 18.4 Configuration

### 18.4.1 Tubing Inside Diameter

Set the tubing diameter of channel 1 to 0.13 mm:

| | |
|---|---|
| 1+0013[CR] | REQUEST |
| * | RESPONSE |

Get the tubing diameter of channel 2:

| | |
|---|---|
| 2+CR] | REQUEST |
| 3.17[SP]mm[CR][LF] | RESPONSE |

The channel 2 tubing diameter is 3.17 mm.

### 18.4.2 Backsteps

Set the channel 1 backsteps to 0:

| | |
|---|---|
| 1%0000[CR] | REQUEST |
| * | RESPONSE |

Get the backsteps of channel 2:

| | |
|---|---|
| 2%CR] | REQUEST |
| 0[CR][LF] | RESPONSE |

The backstep setting for channel 2 is 0.

## 18.5 Calibration

### 18.5.1 Volume (target)

Set the target calibration volume for channel 4 to 100 mL.

| | |
|---|---|
| 4xU1000+2[CR] | REQUEST |
| 1000E+2[CR][LF] | RESPONSE |

Get the target calibration volume for channel 3.

| | |
|---|---|
| 3xU[CR] | REQUEST |
| 1000E+0[CR][LF] | RESPONSE |

The target calibration volume for channel 3 is 1 mL.

### 18.5.2 Volume (measured)

Set the measured calibration volume for channel 4 to 101 mL.

| | |
|---|---|
| 4xV1010+2[CR] | REQUEST |
| 1010E+2[CR][LF] | RESPONSE |

Get the measured calibration volume for channel 3.

| | |
|---|---|
| 3xV[CR] | REQUEST |
| 1020E+2[CR][LF] | RESPONSE |

The measured calibration volume for channel 3 is 102 mL.

### 18.5.3 Time

Set the calibration time for channel 1 to 30 seconds.

| | |
|---|---|
| 1xW00000030[CR] | REQUEST |
| * | RESPONSE |

Get the calibration time setting for channel 3.

| | |
|---|---|
| 3xW[CR] | REQUEST |
| 30[CR][LF] | RESPONSE |

The calibration time for channel 3 is 30 seconds.

### 18.5.4 Get time since last calibration

Get the time since channel 3 was last calibrated.

| | |
|---|---|
| 3xX[CR] | REQUEST |
| 03596400[CR][LF] | RESPONSE |

Channel 3 was last calibrated 3,596,400 seconds (999 hours) ago.

### 18.5.5 Start calibration

Start calibration on channel 2.

| | |
|---|---|
| 2xY[CR] | REQUEST |
| * | RESPONSE |

### 18.5.6 Cancel calibration in progress

Stop calibration on channel 2.

| | |
|---|---|
| 2xZ[CR] | REQUEST |
| * | RESPONSE |

## 18.6 System

### 18.6.1 Get pump firmware version

| | |
|---|---|
| 0([CR] | REQUEST |
| 0114[CR][LF] | RESPONSE |

The pump firmware version is 1.14.

### 18.6.2 Set pump's temporary display name

Set the pump's display name to "Reagent A."

| | |
|---|---|
| 0xNReagent A[CR] | REQUEST |
| * | RESPONSE |

### 18.6.3 Serial number

Set the pump's serial number to 12345ABC.

| | |
|---|---|
| 0xS[CR] | REQUEST |
| * | RESPONSE |

Get the pump's serial number.

| | |
|---|---|
| 0xS12345ABC[CR] | REQUEST |
| 12345ABC[CR][LF] | RESPONSE |

### 18.6.4 Language

Set the pump language to German.

| | |
|---|---|
| 0xL3[CR] | REQUEST |
| * | RESPONSE |

Get the current pump language setting.

| | |
|---|---|
| 0xL[CR] | REQUEST |
| 0[CR][LF] | RESPONSE |

The current pump language setting is English.

### 18.6.5 Channel count

Set the pump channel count to 4.

| | |
|---|---|
| 0xA0004[CR] | REQUEST |
| * | RESPONSE |

Get the pump channel count.

| | |
|---|---|
| 0xA[CR] | REQUEST |
| 3[CR][LF] | RESPONSE |

The pump channel count is 3.

---

### 18.6.6 Roller count

Set the roller count for channel 4 to 6 rollers.

| | |
|---|---|
| 4xB0006[CR] | REQUEST |
| * | RESPONSE |

Get the roller count for channel 1.

| | |
|---|---|
| 1xB[CR] | REQUEST |
| 12[CR][LF] | RESPONSE |

The roller count for channel 1 is 12.

---

### 18.6.7 Total Revolutions

Get the total revolutions for channel 3.

| | |
|---|---|
| 3xC[CR] | REQUEST |
| 0000001511[CR][LF] | RESPONSE |

The total revolution count for channel 3 is 1511.

---

### 18.6.8 Volume total

Get the total volume count for channel 3.

| | |
|---|---|
| 3xG[CR] | REQUEST |
| 0000001511[CR][LF] | RESPONSE |

The total volume count for channel 3 is 1511 mL.

---

### 18.6.9 Time total

Get the total pumping time count for channel 3.

| | |
|---|---|
| 3xJ[CR] | REQUEST |
| 0000001511[CR][LF] | RESPONSE |

The total pumping time count for channel 3 is 1511 seconds.

## 18.7 Events

### 18.7.1 Channel stop

^X2|A[CR][LF] EVENT

A pump complete event occurred on channel 2.

### 18.7.2 Channel status update

^U3|A|0000000000|0000100000|0000[CR][LF] EVENT

Channel 3 is currently pumping. This channel is probably in volume mode, as volume is the only provided field here. There are 100 mL left to pump in the operation.

# 19. Regulatory Information

## 19.1 Manufacturing Information

The Declaration of Conformity (DoC) includes the following information:

| Requirement | Content |
|---|---|
| Name and address of manufacturer | See EC Declaration of Conformity |
| Name and address of person responsible for Technical File | See EC Declaration of Conformity |
| Place and date of declaration | See EC Declaration of Conformity |
| Identity of person authorized to sign DoC | See EC Declaration of Conformity |

## 19.2 CE Conformity

This product complies with the European directives listed in the table below. A copy of the Declaration of Conformity is available on request by contacting ismatec.support@coleparmer.com.

| Directive | Title |
|---|---|
| 2006/95/EC | Low Voltage Directive (LVD) |
| 2004/108/EC | Electromagnetic Compatibility Directive (EMC) |
| 2011/65/EU | Restriction of the Use of Certain Hazardous Substances Directive (RoHS) |

## 19.3 International Standards

This product fulfills the requirements of the following standards:

| Standard | Symbol | Description |
|---|---|---|
| EN 61010-1, IEC 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1 | Intertek | Safety requirements for electrical equipment for measurement, control, and laboratory use. Conforms to UL Std 61010-1. Certified to CAN/CSA C22.2 Std No. 61010-1. |
| CAN/CSA-C22.2 No. 61010-1 | | Tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition including amendment 1or a later version of the same testing requirements. |
| 2002/96/EC | | EC Directive – Waste Electrical and Electronic Equipment (WEEE). |
| EN 61326-1, IEC 61326-1 | None | EMC emissions and immunity requirements for electrical equipment for measurement, control and laboratory use. |

## 19.4 CE Marking

The CE marking and the corresponding Declaration of Conformity is valid for the instrument when it is:

- Used as a stand-alone unit, or
- Connected to other CE marked instruments, or
- Connected to other products recommended or described in the user documentation, and
- Used in the same state as it was delivered from ISMATEC®, except for alterations described in the user documentation.

The Declaration of Conformity is valid only for systems that are marked with the CE-marking:

## 19.5 Connected equipment

Equipment connected to the Reglo ICC should meet the safety requirements of EN 61010-1/IEC 61010-1, or relevant harmonized standards. Within EU, connected equipment must be CE marked.

ISMATEC®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