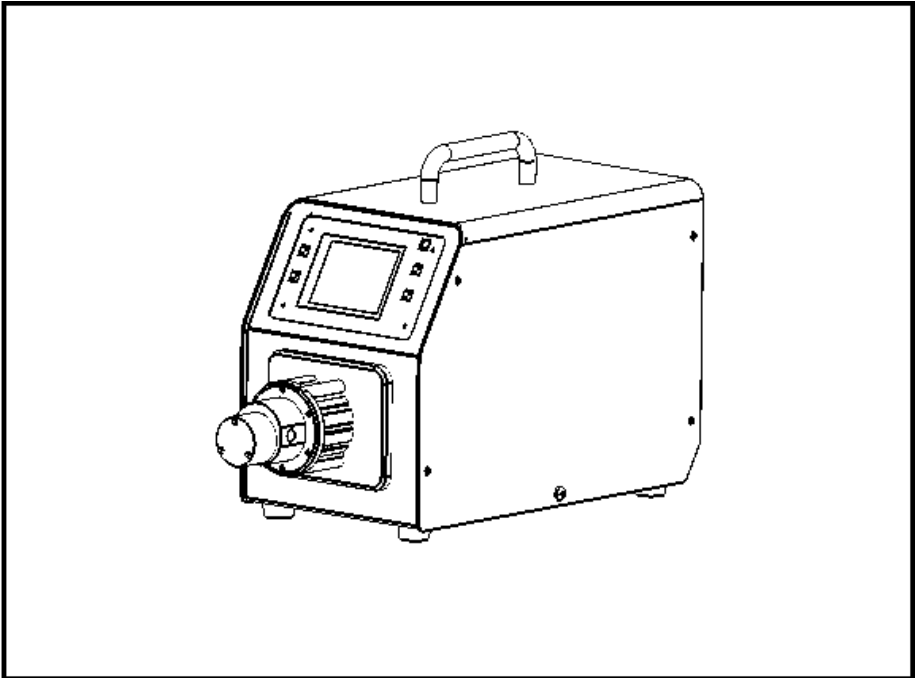


CT3000F Intelligent Dispensing Gear Pump Operation Manual



Create Flow

Safety Cautions



Danger: Please use the correct AC power voltage source shown on the sticker attached on the equipment to avoid any damage. Please don't open the case. It may cause malfunction or electric shock.

For maintenance, please contact the manufacturer or distributor directly.



Danger: To install or remove pump head, please turn off the power supply first. The flange of the pump head must be handled carefully. Please don't use pliers to clamp it. It may cause inner core displacement, or even permanent damage of the pump.

Warning: Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.

Warning: Remove power from the pump before attempting any maintenance or any cleaning operation is started.

Warning: Remove power from the pump before connecting or disconnecting the external control device or communication interface.

Warning: The pump is provided with a grounded plug, it must be well-grounded at all times.

Warning: This product is not designed for, nor intended for use in patient connected applications; including, but not limited to, medical and dental use.

Warning: Avoid any foreign bodies, including sealant or Teflon tape if they are used to seal the tubing, to get into the pump. Only remove the two covers on the pump head when installing connector or tubing,

Warning: It is strongly recommended that when using the pump, especially for the entrance, tubing size should be corresponding to the competency of pump to avoid cavitation which are caused by inadequate fluid for abnormal wear. In any case the pressure between the inlet and outlet shall not exceed 20 bar / 290 psi.

Warning: it is strongly recommended to add a filter to the inlet of the pump to filter out the particles bigger than 10 μm , to avoid the internal components to wear and tear abnormally. The filter surface area should be large enough to avoid pressure loss in the loop. It is also important to regularly check the filter to make sure it works effectively. If a vacuum gauge is installed after the filter, when the vacuum increases more than 0.1 bar, the filter needs to be cleaned or replaced.

Warning: Gear pump can only transfer liquid in one direction.

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1 Introduction

CT3000F is a high performance and low noise micro gear pump. The brushless servo motor, stainless steel magnetic drive pump head can transfer fluid continuously and smoothly. The color LCD touch screen provides intuitive and clear display. The working modes are suitable for different lab use. With standard MODBUS RS485 interface, the pump is easy to be controlled by external device, such as computer, human machine interface or PLC.

CT3000F provides speed range from 50 to 3000 rpm, with 1 rpm resolution.

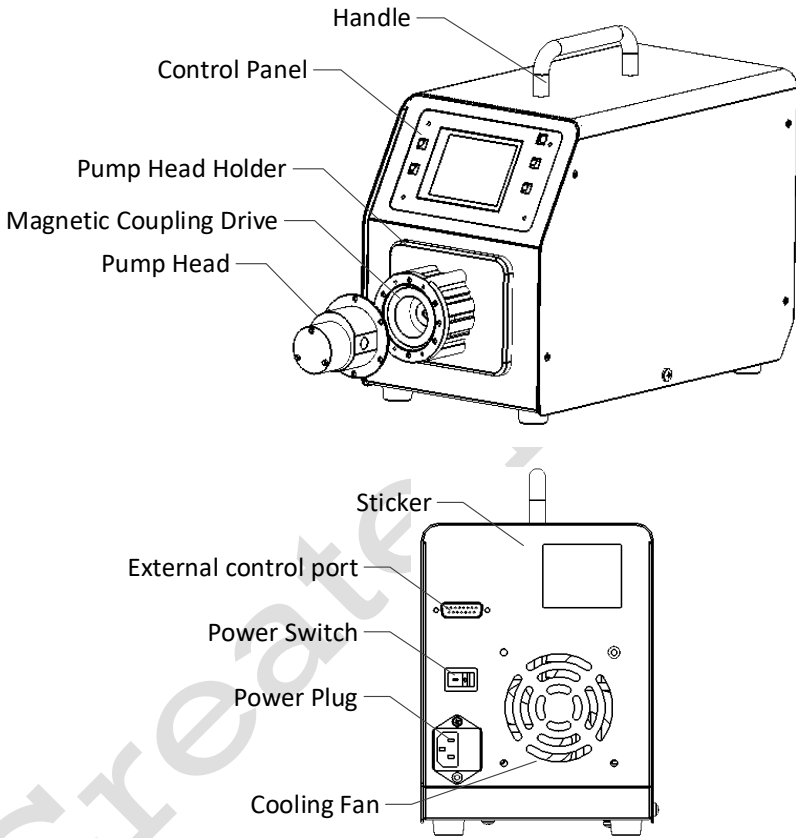
2 Function and Features

- 1) Work with variable pump heads
- 2) Suitable for high viscous and pressure liquid transfer
- 3) No pulse, low noise
- 4) Magnetic coupling drive, easy to maintain
- 5) Brushless servo drive, high efficiency, maintenance free
- 6) Color LCD display, touch screen
- 7) Display and control flow rate
- 8) Variable working modes
- 9) Flow calibration wizard for accuracy
- 10) Intelligent temperature control
- 11) External signal controls start/stop/dispensing; external analog signal adjusts speed
- 12) RS485 MODBUS interface
- 13) Stainless steel case
- 14) Switching power supply, 85~260VAC/50~60Hz

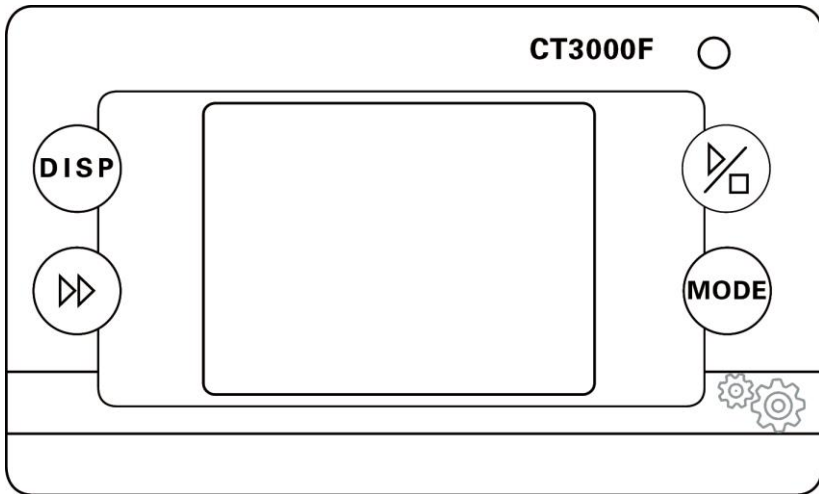
3 Components and Connectors

Create Flow

CT3000F Intelligent Dispensing Gear Pump



4 Display Panel and Operating Keypads



4.1 Keypad



Start/stop. Push to start or stop the pump.



Display key. Change display mode.

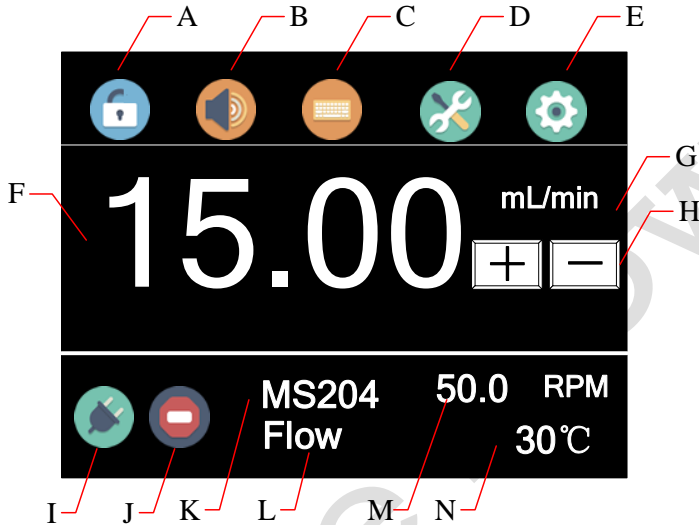


Full speed. Switch between the full speed and normal status.




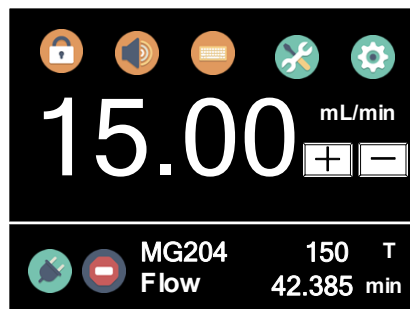
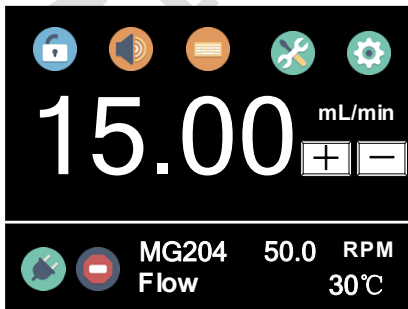
Working mode. When the pump is not running, use this key to change the working mode.

4.2 Touch screen display



4.2.1 A – Keyboard lock

Press the icon  to lock/unlock the keypad. When the keyboard is locked, user can't modify the control mode and system parameters.



4.2.2 B – Mute button

Press the icon to turn on/off the tone.




Tone on

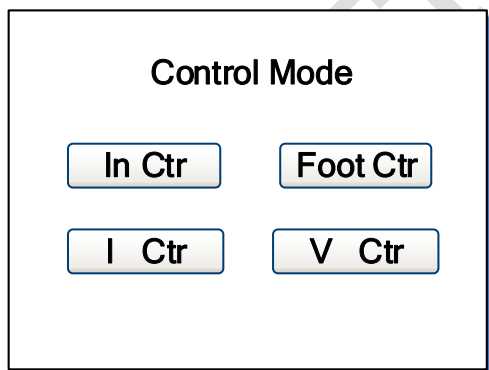


Tone off

4.2.3 C – Control mode



Press the  icon to enter the Control Mode window. There are four control modes available as shown below.



In Ctr – Internal control mode. The operation of the pump is controlled by the buttons and touch screen.

Foot Ctr – Footswitch control mode. Footswitch controls start/up, other parameters is controlled by buttons and touch screen.

I Ctr – Current control mode. The flow rate is controlled by external 4~20mA analog current signal. External voltage signal controls start/stop. The buttons don't work.

V Ctr – Voltage control mode. The flow rate is controlled by external 0~5V or 0~10V analog voltage signal. External voltage signal controls start/stop. The buttons don't work

CT3000F Intelligent Dispensing Gear Pump



Internal Control
Mode



Footswitch
Control Mode




Current Control
Mode



Voltage Control
Mode

4.2.4 D – Quick Parameters setting

Press the icon  to enter the quick setting interface to reset the accumulated liquid volume and the times. For fluid volume distribution mode, time distribution mode and copy distribution mode, there are five groups of preset data, press the **Up** key and **Next** key to select. The setting on the main screen will change.


Quick Change Para	
TotalVols	<input type="button" value="Clr"/>
TotalTimes	<input type="button" value="Clr"/>
<input type="button" value="Return"/>	

Flow Rate Mode

Quick Change Para		
TotalVols	<input type="button" value="Clr"/>	
TotalTimes	<input type="button" value="Clr"/>	
NO1	5.000 mL 001.0 S	
	6.000 mL/min 1 T	
<input type="button" value="Up"/>	<input type="button" value="Next"/>	<input type="button" value="Return"/>

Other Modes

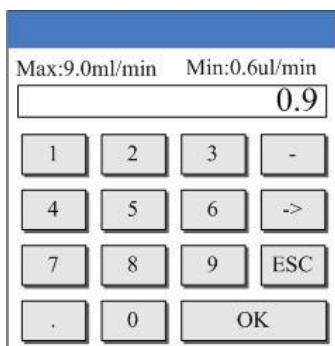
4.2.5 E – System Settings

Press the icon  to enter the System Settings menu, then change the parameters shown on the screen.

Create Flow.

4.2.6 F – Flow rate Settings

In normal operation, it shows the current flow rate. When the pump is not running, press it to input desired value in the pop-up window. Please pay attention to the range of the value and flow rate unit.





A screenshot of a flow rate settings pop-up window. At the top, it displays 'Max:9.0ml/min' and 'Min:0.6ul/min'. Below this is a text input field containing the value '0.9'. The input field is followed by a numeric keypad with buttons for digits 1-9, a decimal point, and 0. There are also buttons for a minus sign, a right arrow, an ESC key, and an OK button.

4.2.7 G – Flow rate unit

Show the current flow rate unit. When the pump is not running, press it to change the unit. The allowed unit could be $\mu\text{L}/\text{min}$, mL/min .

4.2.8 H – Fine adjustment button

When the pump is running, press the fine adjustment button to adjust the flow rate in real-time. Press the  button or  button momentarily to increase or decrease the flow rate slowly. Pressing and holding the buttons will change the value quickly.

4.2.9 I – Communication status

Shows the current RS485 communication status.



means communication is connected;



means it's disconnected.

4.2.10 J – Running status

When the pump stops, it shows . When it's running, it will change to an .

CT3000F Intelligent Dispensing Gear Pump

animated icon as shown below.



4.2.11 K – Pump head model

Shows the current configured pump head model. For example, MS204 means MS204 pump head.

4.2.12 L – Working mode

Displays the current working mode, such as Flow mode, Volume mode, Time or Copy mode.


4.2.13 M – Speed or cumulative times

Displays current speed or accumulated dispensing times. The display can be switched by pressing the MODE key. If the speed is greater than the maximum speed, it will show U_Over flow; if the speed is lower than the minimum speed, it will D_Over flow. The cumulative number of the times can be reset on the Quick Setting menu.

4.2.14 N – Internal temperature or cumulative fluid volume

Shows the temperature inside the drive or all volume that the pump has transferred. The accumulated fluid volume can be reset on the Quick Setting menu.

4.3 System parameters

When the pump is not running, press the icon  to enter the system menu.

Create Flow.



4.3.1 Wizard – Set general parameters as shown below

Common Para

PumpHead Remote

Language Comm

IrDA OtherSetup

Return

Pump Head – Choose the model of the installed pump head.

Pump Head Setup
Choose the pump head

MG204

MG204

MG209

MG213

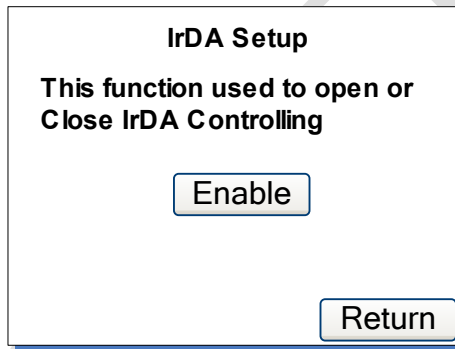
End

CT3000F Intelligent Dispensing Gear Pump

- **Language** – Choose display language, Chinese or English



- **IrDA** – Turn on/off the infrared control.



- **Remote** – External control mode

Choose **ELECTRIC** control or **PULSE** control. When it's set to **ELECTRIC** mode, the pump state will change when the switch is closed or open. It's designed for a maintained switch. When it's set to **PULSE** mode, the pump state will change when user closes then opens the switch once. It's designed for a normally open momentary switch.

Create Flow.

Electric Select

Setup out controlling use pulse
or electric

- **Comm** – Communications Settings. To set the RS485 communication baud rate, transmission mode and change the communication address. To change the address, click the address number on the screen, then input the value in the pop-up window. Restart the pump to apply the settings.

Baud (bps)

4800 9600

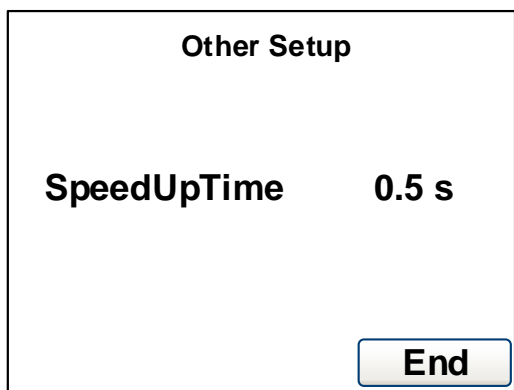
19200 38400

Mode: **Pump NO: 1**

Computr

PLC

- **Other Setup** – Set the time that the pump will use to reach the full speed from the start.

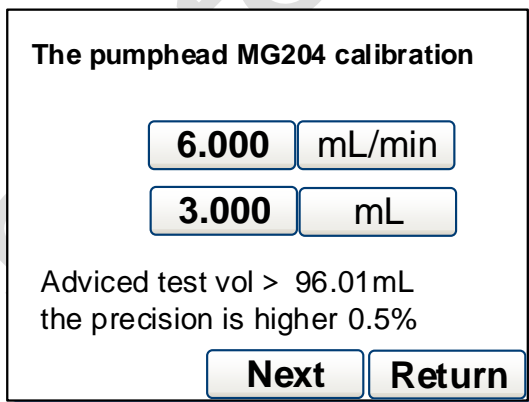


4.3.2 Calibrte – Calibrate flow rate

By measuring the weight or volume of the transferred fluid, to make the value on the display match the actual fluid volume.

Note: To display flow rate accurately, the calibration is absolutely necessary.

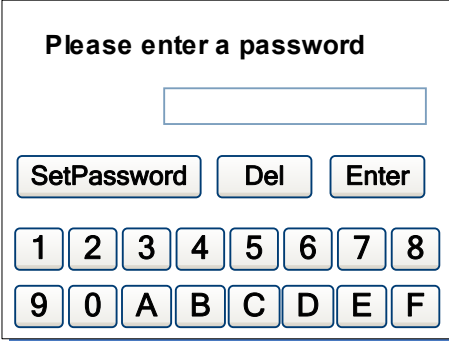
For more information, please see section [6.4](#).



4.3.3 Setup – Set a password to lock the parameter settings.

Create Flow.

It will prevent user from changing parameters accidentally. The default password is empty.



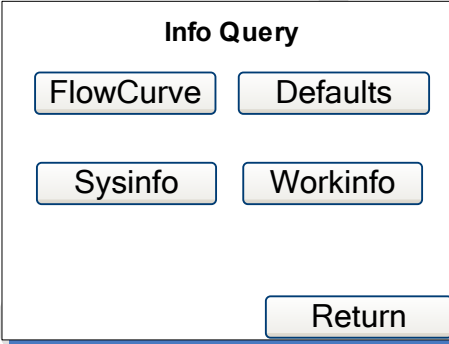
Please enter a password

SetPassword Del Enter

1 2 3 4 5 6 7 8

9 0 A B C D E F

4.3.4 Message – information about the pump



Info Query

FlowCurve Defaults

Sysinfo Workinfo

Return

- **Flowcurve** – To show the flow curve of the pump head
- **Sysinfo** – To display software version, memory size, operating temperature, etc.

CT3000F Intelligent Dispensing Gear Pump

System info

Soft ver: V1.0 2015-01
Hardware: 16M FLASH
Speed: 1RPM±0.5%
TEMP: 32°C

Return

- **Work info** – To display the device boot time, total running time and the number of times to boot up the pump.

Work Info

Open time: 0 D 9 H 58 M
Run time: 0 D 1 H 25 M
SN: D4MM6F

Return

- **Defaults** – To reset the pump to factory settings. Restart the pump to apply the settings.

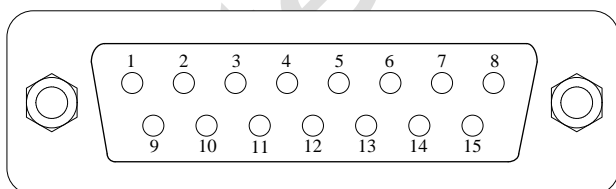
Create Flow.



4.3.5 Explain – Information about the manufacturer.

4.3.6 Return – To return the main display screen.

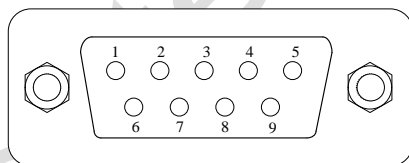
5 External Control Interface



DB15	Mark	Note
1	ADC_W	Positive of external analog input
2	B	Communication interface, B pole of RS485
3	A	Communication interface, A pole of RS485
4	+12V_W	External 12V input
5	DAC	Analog voltage output
6		

CT3000F Intelligent Dispensing Gear Pump

7		
8	COM	Ground of external power
9	AGND	Negative of analog signal input
10	+12V	Positive of internal +12V power source
11	GND	Ground of Internal power source
12		
13	RS-W	External start/stop signal input terminal
14		
15	RS	External start/stop signal output terminal (to show the run or start state, same voltage as external power source)



DB9 pin	Mark	Note
1		
2	RXD	Receive data
3	TXD	Send data
4		
5	GND	Signal ground
6		
7		
8		

6 Operation Instructions

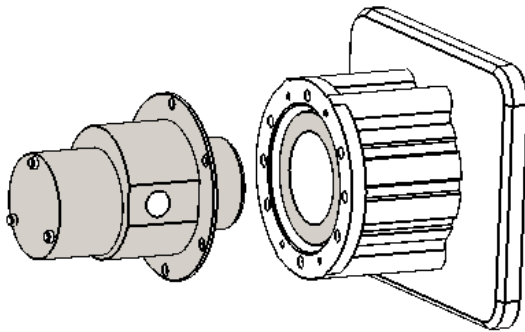
6.1 Before operation

- 1) Please check the packing slip to make sure nothing is wrong or damaged in the package. If there's problem, please contact the manufacturer or distributor.
- 2) Read through the instruction.
- 3) There should be more than 200 mm space for the back of the pump when it's running.

6.2 Install pump head and tubing

6.2.1 Install pump head

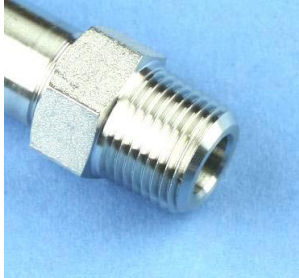
- 1) Put the pump head into the pump head holder, keep the entrance horizontal.
- 2) Align the pump head and bracket mounting holes. Use provided M3x8 mm stainless steel screws and nuts to tighten pump head on the bracket.



CT3000F Intelligent Dispensing Gear Pump

6.2.2 Install tubing

- 1) Screw 1/8NPT threaded stainless steel or plastic joints on the pump head. Please pay attention that the internal and external thread is in good shape and there's no residue left.



Good



Defective

- 2) Wrap two layers Teflon tape clockwise on the threads. Make sure there will be no tape entering the inner part of the pump.



- 3) Tighten the nut with a torque wrench on the pump. Please note don't use excessive force to strip the threads.

Create Flow.

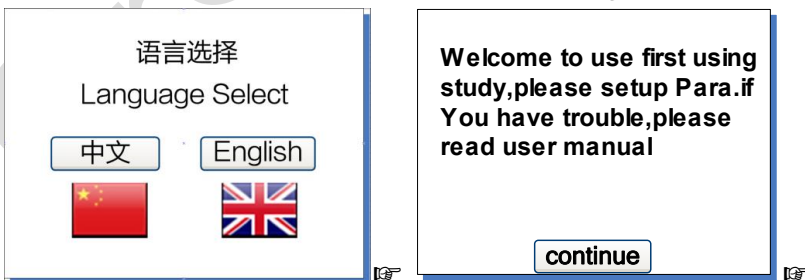


6.2.3 Connect power supply

The voltage of the power supply should be marked on the sticker of the pump. Please make sure to use the right power source for the pump.

6.3 Use the wizard for the first time run

To use the pump at the first time or after the factory default setting restored, the system will let user choose the operating language. Then it will show the welcome screen. The next step is to choose the model number of the pump head installed. The system would run in sequence, pump head selection -> working mode setting -> calibration. User can set the parameters and operation mode according to the requirement. The information will be saved and it does not to be done again.



CT3000F Intelligent Dispensing Gear Pump

<p>Pump Head Setup Choose the pump head</p> <p>MG204 <input type="button" value="v"/> MG204 <input type="button" value="v"/> MG209 <input type="button" value="v"/> MG213 <input type="button" value="v"/></p> <p><input type="button" value="End"/></p>	<p>Work Mode</p> <p><input type="button" value="FLOW"/> <input type="button" value="VOL"/></p> <p><input type="button" value="TIME"/> <input type="button" value="COPY"/></p> <p>You can use wizard, the system will recommend the best parameters</p>
---	---

The pumphead MG204 calibration


Advised test vol > 3.000mL
the precision is higher 0.5%

6.4 Flow rate calibration


The calibration is must be done when

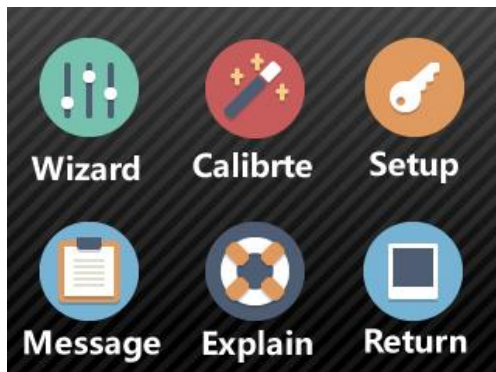
- pump head is changed
- the tubing is replaced
- same kind of liquid transferred with dual pump heads
- the tubing is reinstalled
- works continuously for a very long time

How to calibrate

- 1) Install pump head and tubing first.
- 2) In the **Common Para** (see [4.3.1](#)) window, set the model number of the installed pump head.
- 3) In the flow rate window, press full key  to make tubing full of liquid.

Create Flow.

- 4) When the pump is not running, press System Settings icon , then select the **Calibrte** icon.



- 5) In the calibration wizard window, system should show the current calibration of tubing type, flow rate and fluid volume.

The pumphead MG204 calibration

<input type="text" value="6.000"/>	<input type="text" value="mL/min"/>
<input type="text" value="3.000"/>	<input type="text" value="mL"/>

Advised test vol > 96.01 mL
the precision is higher 0.5%

<input type="button" value="Next"/>	<input type="button" value="Return"/>
-------------------------------------	---------------------------------------

The value 6.000 mL/min shown on the picture above is the flow rate need to calibrate. 3.000 mL is the volume need to test. The values or the unit can be changed directly when you press the button. Press the **Next** button to enter the calibration window, or press the **Return** button to exit the wizard to the **System settings** windows.

Note: The fluid volume should not be less than the value that the system recommended.

CT3000F Intelligent Dispensing Gear Pump


6) Test window shown as below.

Press runstop key to test, then input the data

Test1	0.000	mL
Test2	0.000	mL
Test3	0.000	mL

Prev **Next** **Return**

Please make sure the tubing is filled with fluid, then press the

start/stop button , the pump will start to transfer fluid, wait for the pump to stop testing, use a scale or measuring cup to measure the volume of the transferred fluid. Repeat the above steps couple more times, and enter the result of the Test1, Test 2 and test 3 in the test window. Please pay attention to the unit to make sure it's correct. Press **Next** to enter **Correction Calculation** window.

If you want to modify the test flow rate and liquid volume, press **Prev** button to the reset the values.

Note: If there's an accident during the process of the test, please press **start/stop** button to stop the test.

Input one set or multiple sets of testing data to the pump, the system will calculate the average value automatically.

- 7) The system will calculate the correction testing result, and also display the original reference value. If the difference between the two values are too high, please check the following.
- Volume measurement
 - The volume unit

Create Flow.

- The model of the pump head
- Liquid level gap.
- If no problem found, press the End button to save the new value. Or press Prev to test again. Or, press Return to exit without saving the new value and return to the System settings window.

Analyse and calculate	
AverageVol	100.0 mL
Cal scale	6.400000
re.scale	6.400000
Old scale	6.400000

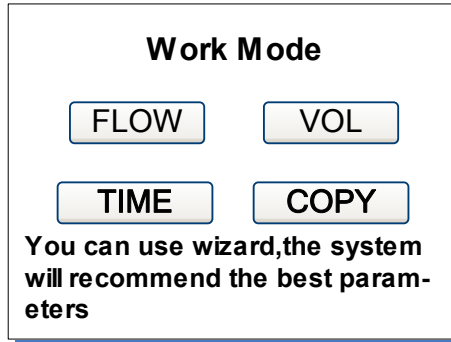
If there is no data input to the system, the window below will show. Please press Prev to test again or just press Return.

Analyse and calculate	
NO data, press 'Prev' or 'Return'	

6.5 Working mode

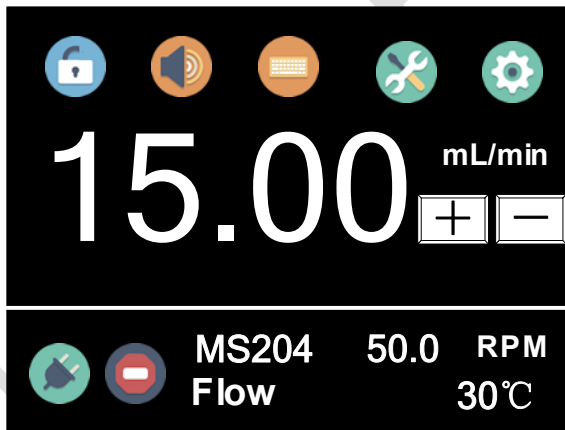
When the pump is not running, press **MODE** key to enter the **Work Mode** window as shown below.

CT3000F Intelligent Dispensing Gear Pump



- **FLOW – Flow mode**

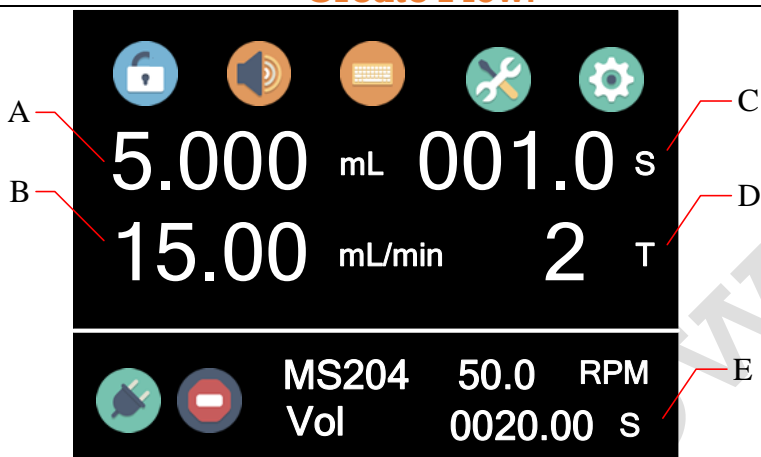
Pump will be running according to the set flow rate, and record the total fluid volume



- **VOL – Volume dispensing mode**

Set the fluid volume and flow rate, pump will calculate the dispensing time automatically

Create Flow.



A – Dispensing fluid volume, unit option: μL , mL or L

B – Dispensing flow rate, unit option ($\mu\text{L}/\text{min}$ or mL/min)

C – Interval time. The time between the dispensing.

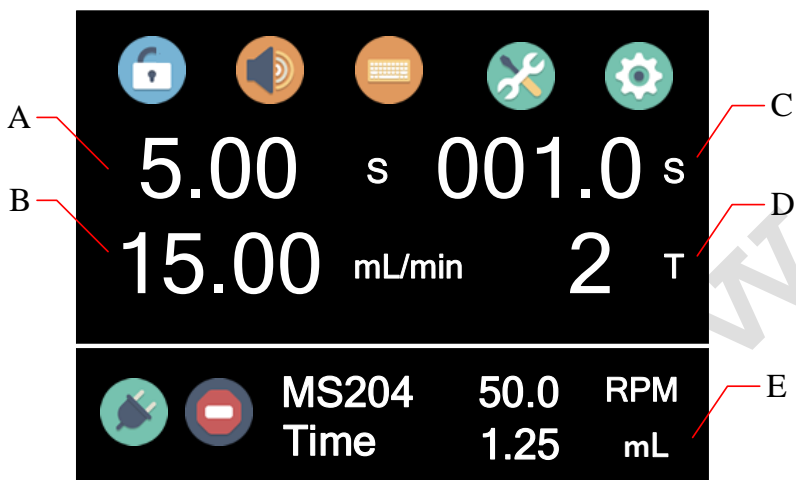
D – Dispensing times. When the dispensing times is zero, the pump will run until the **Start/Stop** button is pressed. When the dispensing times is set to 1, the pump will run only once. The interval setting is invalid. When the dispensing time is more than 1, the pump will run the set number of times then stop.

E – Dispensing time. According to the fluid volume and time, the dispensing time is calculated automatically.

- **TIME – Time dispensing mode**

Set the dispensing time and flow rate, the pump will calculate the fluid volume automatically.

CT3000F Intelligent Dispensing Gear Pump



A – Dispensing required time.

B – Dispensing flow volume, unit option: μ L, mL or L.

C – Interval time. The time between the dispensing.

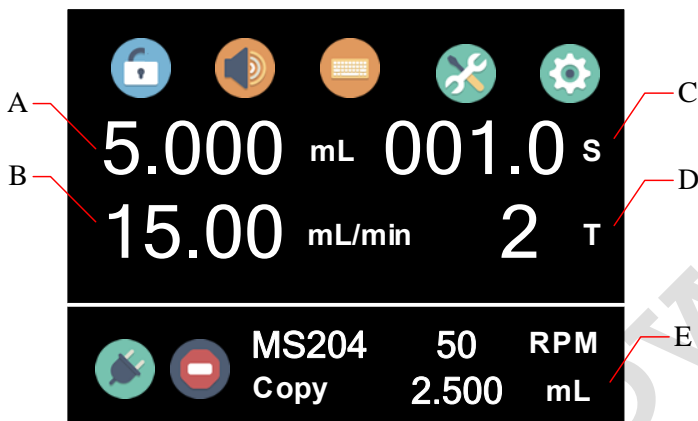
D – Dispensing times. When the dispensing times is zero, the pump will run until the **Start/Stop** button is pressed. When the dispensing times is set to 1, the pump will run only once. The interval setting is invalid. When the dispensing time is more than 1, the pump will run the set number of times then stop.

E – Dispensing volume. According to time and flow accumulate to estimate dispensing liquid volume.

- **COPY – Copy dispensing mode**

Set up total fluid volume and dispensing times, the pump automatically calculate the volume for each dispensing.

Create Flow.



A – Total dispensing volume, unit option: μL , mL or L

B – Dispensing flow volume, unit option: $\mu\text{L}/\text{min}$, mL/min

C – The time between the dispensing.

D – Dispensing times.

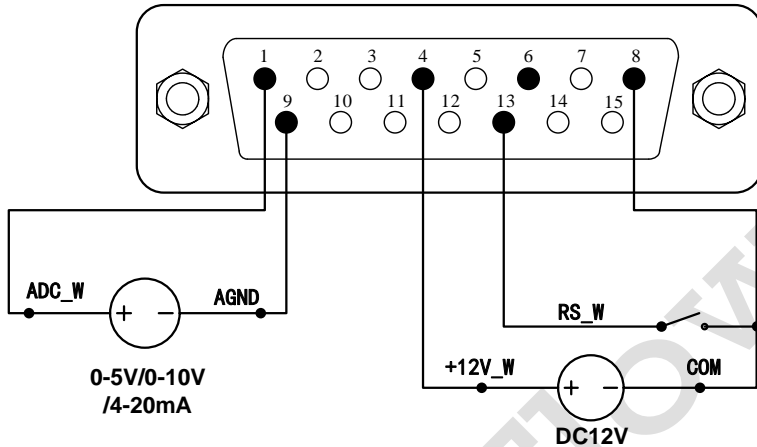
E – Each dispensing volume. Calculated according to the total fluid volume and dispensing times.


6.6 External control mode


In this control mode, the external analog input controls the speed, external voltage signal controls Start/Stop. The front panel buttons are disabled.

- 1) When power is off, connect the external signal as shown below, and connected DB15 connector to the DB15 port at the back of pump.

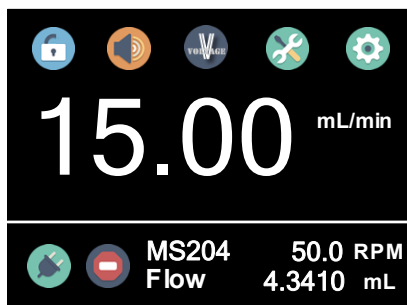
CT3000F Intelligent Dispensing Gear Pump



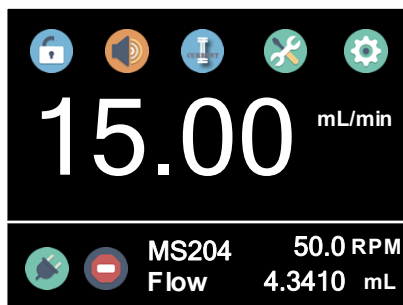
- 2) When the power is on, the touch screen will display the main control interface.
- 3) Press the **Control mode** (see [4.2.3](#)) icon, choose voltage mode 

or current mode . **Please note** the control signal type (0–5V, 0–10V or 4/20mA) needs to be preset by the manufacturer, and only connect the right signal to the communication port. When the **Remote**(External control mode, see [4.3.1](#)) is set to **Electric**, if the external RS_W switch is closed and the analog control signal is provided, the rotating speed of the pump will change according to the value of the analog control signal. When the RS_W switch is open, pump will stop working.


- 4) When the **Remote** (External control mode, see [4.3.1](#)) is set to **Pulse**, the RS_W should be a momentary switch. When the external switch RS_W is pushed then released once, if the analog control signal is provided, the rotating speed of the pump will change according to the value of the analog control signal. When the external switch RS_W is pushed then released one time again, the pump will stop working.



Voltage mode



Current mode

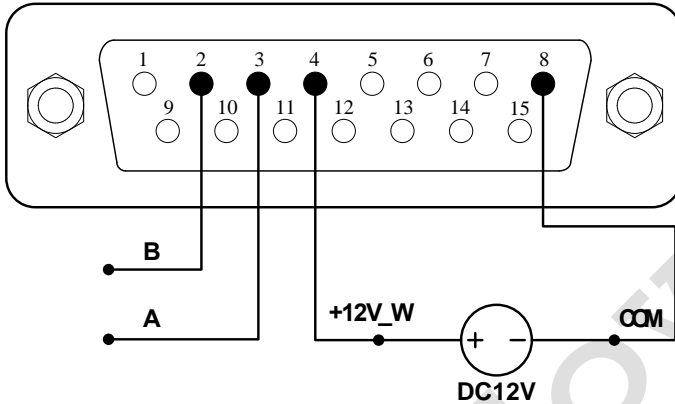
 **Caution:** if you want to use external 24V DC power control pump start/stop, a 1.5 K resistor is needed between the **pin 13 and the switch RS_W**, otherwise it will damage the internal circuit of the pump.

6.7 Communication mode

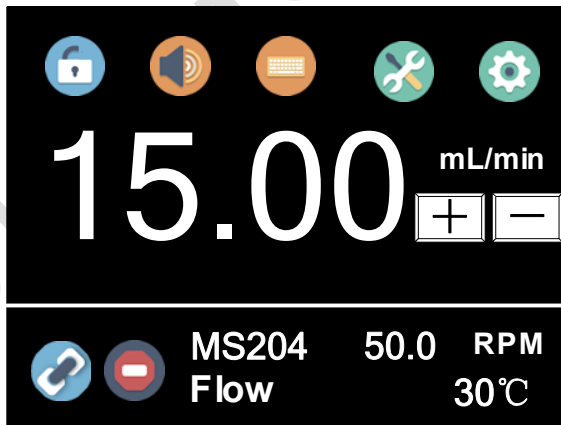
The RS485 interface supports standard MODBUS protocol. The pump can be controlled by external device via the communication port. Please refer to the Communication Instruction manual for the parameters and their addresses.

- 1) When the power is off, wire the DB15 connector as shown below, and connected it to the DB15 port at the back of pump.

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- 5) Turn on the power switch, the touch screen will display main control interface
- 6) When the **control mode** is set to **In Ctr** (Internal control mode), and the **Communication Status** icon shows it's connected, that means communication is ready. Otherwise, please check the connection and settings.

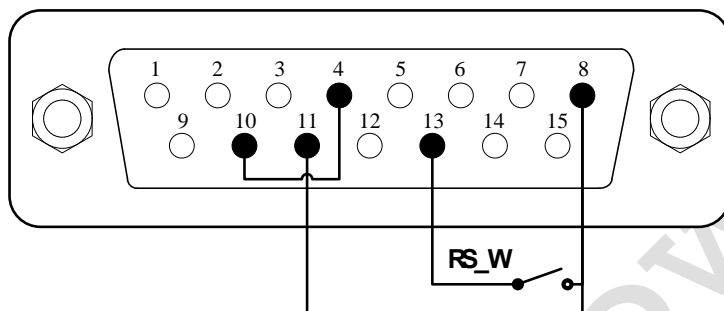


6.8 Footswitch mode

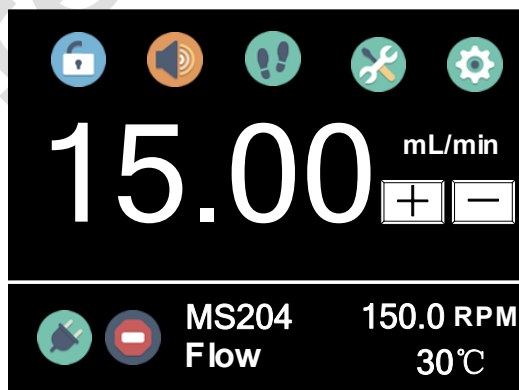
- 1) When the power is off, wire the DB15 connector as shown below, and

Create Flow.

connected it to the DB15 port at the back of pump.



- 2) Turn on the power, the touch screen will display the main control interface
- 3) When the control mode is set to In Ctr (Internal control mode) and the Work Mode is set to volume, time or copy mode, the pump will start to work if the foot switch is closed.
- 4) In footswitch mode, if the External Control is set to Electric, when the foot switch is closed, the pump will start to work; when the foot switch is open, the pump will stop.
- 5) In footswitch mode, if the External Control is set to Pulse, when the foot switch is closed then open, the pump will start to work; the switch is closed then open again, the pump will stop.



7 Maintenance

7.1 Warranty

The product comes with one year labor and parts warranty. The limited warranty does not cover any damage that is caused by improper usage and handling.

7.2 Regular Maintenance

- 1) Always check the tubing and connections to make sure there's no leakage.
- 2) If a filter is used, check and replace it regularly.
- 3) When tubing is not installed, cover the inlet and outlet of the pump head by a sealing plug.

7.3 Malfunction Solutions

NO	Malfunction	Description	Solution
1	Hardware	No display	<ol style="list-style-type: none">1. Check the power cord2. Check the fuse is. If it was blown, replace it with a 3A slow-blow fuse3. Check the internal power cord connection inside the pump.4. Check the wire connection between the LCD panel and the main control board.
2	Hardware	Motor does not work	<ol style="list-style-type: none">1. Check the indicator of the driver board.2. Check the wire connection between the motor and the driver board.

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			<p>3. Check the wire connection between the driver and the main board.</p> <p>4. Check the voltage shown on the sticker attached on the pump.</p>
3	Hardware	Motor is trembling	<p>1. Check the wire connection between the motor and the driver board.</p> <p>2. The motor is overloaded. Check the mechanical connection.</p>
4	Hardware	Keypad does not work	<p>1. Check the wire connection between keypad and the main board.</p> <p>2. Check the key if it's broken.</p>
5	Hardware	External control does not work	<p>1. Check the wiring of the connector.</p> <p>2. Check if the external control power voltage is provided.</p> <p>3. Check the connections of the external control board.</p>
6	Hardware	RS485 does not work	<p>1. Check the wiring of the connector.</p> <p>2. Check if the external control power voltage is provided.</p> <p>3. Check the connections of the communication board.</p>
7	Software	External control does not work	Check the settings for the external control mode.
8	Software	Dispensing volume is not correct	Run calibration
9	Software	RS485 does not work right	<p>1. Check if the display shows the communication is ready.</p> <p>2. Reset the address of the pump.</p>

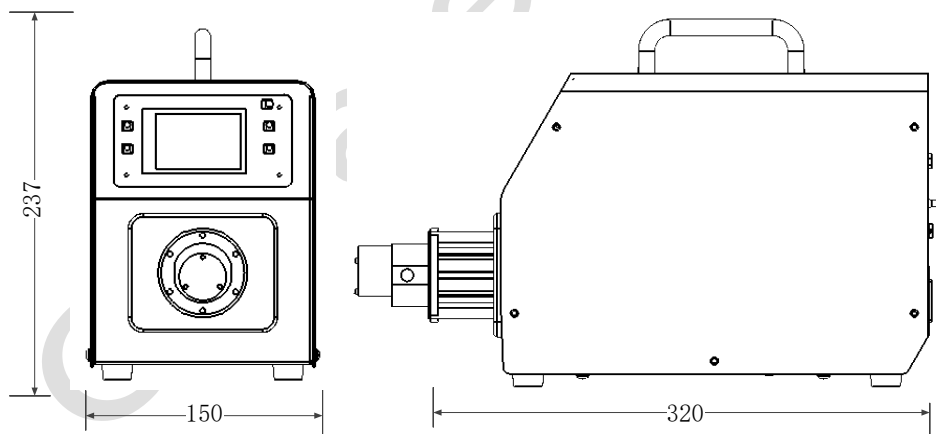
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			3. Check whether on the bus there are two pumps using the same address
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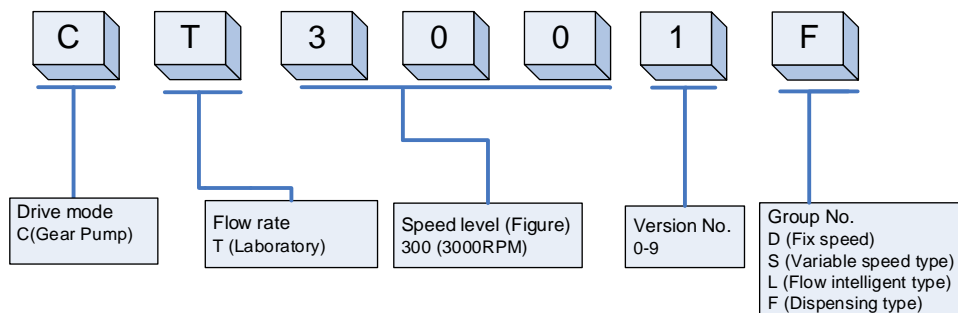
If the problem can't be solved, please contact the manufacturer or distributor.

8 Dimensions



9 Naming rule

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10 Specifications

Suitable Pump Heads	MS204,MS209,MS213
Main function	Keypad to control start/stop, full speed, memory (power-off memory); Footswitch/external voltage signal to control start/ stop, with physical isolation. Optional external control signal 5V, 12V or 24V. Optional external analog control signal 0–5V, 0–10V or 4–20 mA to control speed; Fluid transfer, volume dispensing, time dispensing, copy dispensing.
Communication	RS485, standard Modbus protocol
Display	True color touch screen

11 Main Features

CT3000F Intelligent Dispensing Gear Pump

Flow rate range	15–2700 mL/min
Rotating Speed range	50–3000 rpm
Speed resolution	1 rpm/min, accuracy: 0.5%
Dispensing time	0.1–99.99 seconds
Interval time	0.1–999.9 seconds
Dispensing times	0–999
Control	Keypad + Touch screen, external signals
Display	65565 LCD
Power supply	AC 90~264V 50Hz/60Hz
Power consumption	< 150W
Working environment	Working temperature: 5~40 °C Relative humidity <80%
Dimensions	320x237x150mm
Weight	3.5kg
IP rating	IP31

12 Suitable Pump Heads

Pump model	head	Gear material	Outlet pressure (MPa)	Flow rate (mL/min)	Fluid temperature (°C)
MS204XD0PT0000		PEEK	1.4	15-900	-45~120
MS204XD0TT0000		PEEK	0.9	30-1800	-45~120
MS209XD0PT0000		PEEK	0.8	45-2700	-45~120
MS209XD0TT0000		PTFE	1.4	15-900	-45~50

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MS213XD0PT00 000	PTFE	0.9	30-1800	-45~50
MS213XD0TT000 00	PTFE	0.8	45-2700	-45~50

Create Flow

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