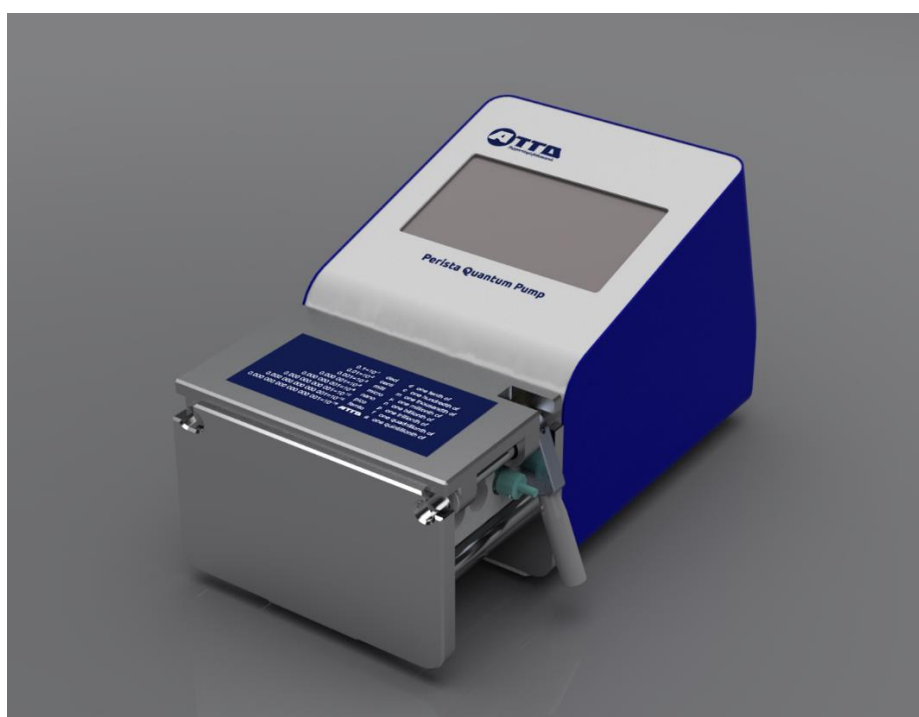

Instruction Manual

WSP-3300

PeristaQuantumPump



Edition 1.07 , May 16, 2023

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Introduction

Thank you for purchasing ATTO PeristaQuantumPump. This instruction manual is delivered to you so that you can make full use of the instrument.

Not only those of you who use this instrument for the first time, but also those who have used it before, should read this document carefully to understand the contents. Please keep it handy all the time to make its full use.

If you have any inquiries on your purchased product or the instruction manual, please feel free to contact us (refer to the back cover).

Safety Precautions

Correct operation is prerequisite in order to use this instrument safely. Please read through this instruction manual before use, and do not use the instrument until you fully understand the contents. How to use and the safety precautions listed on this manual are specific to usage of this particular instrument only. Never use the instrument for other purposes than those listed on this manual. Any other usages of this instrument than those listed on this manual would be strictly at your own responsibility.

The first-time user is asked to receive guidance from a person with correct knowledge and understand principle and method before use. Both the fresh users and experienced users keep this manual at hand for effective use. The only way to avoid electric shock and malfunction of the unit is to operate it correctly in accordance with this manual.

Feel free to contact us for any questions about principle of electrophoresis, operation, maintenance and inspection.

Safety Notation

The following signs are used on this instruction manual for your safe use and maintenance of the instrument. Please ensure your understanding of the meaning of these signs and follow each item correctly.

Symbol	Description
 Danger	This indicates that a high risk of human death or serious injury is likely occurring if handled incorrectly or by neglecting this indication.
 Warning	This indicates that human death or injury is possible if handled incorrectly or by neglecting this indication.
 Caution	This indicates that the risk of property damage is expected if mishandled or by neglecting this indication.
	This indicates information related to the important portion.
	This indicates some hint related to operation.
	This indicates prohibited activities.

Use Precautions

These are precaution items to prevent fire, electrical shock, other type of accident and failure. Please be sure to follow and understand these items.

 **Danger**

Grounding 	Never use this unit unless connecting the unit to the ground. There might be a risk of electrical shock or death. Please connect the power cable attached to this unit to the 3-pole ground outlet.
Power connection 	Please check visually if any deformation or corrosion exists on an electrode terminal or power plug, any blemish on the power cable, or any peel-off of the insulating sheath before actuating the unit. These might cause fire because of poor contact or electrical shock. In such a case, please contact us after stopping the use of the unit and unplugging the power plug from the outlet. Be sure to turn off the power switch, firmly hold the power plug itself, and unplug it without pulling the cable.
No wet hand 	Never operate the unit with wet hands. In addition, never touch the power plug or connecting terminal with wet hands. These can cause electrical shock or failure. Never use the unit in wet condition. These can cause electrical shock or failure.
Main body 	Never remove the top lid of the main body nor the rear panel. These can cause electrical shock or failure.
Fuse 	Please turn off the power switch and unplug the power cable when you replace the fuse. This can cause electrical shock.
Main body 	Never put foreign materials into the airflow orifice. This can cause an electrical shock or failure.
Maintenance 	Please quit using the unit immediately if anything abnormal happens during unit usage or if any abnormality/failure is suspected. Also, do not use the unit if you find any failure at inspection. These can cause electrical shocks or damage to the unit. Contact us if you detect any abnormality, trouble or failure.

 Warning

Installation location 	Please avoid installation on places such as a wobbling table, tilted location, or heavily vibrating place. Install the unit on horizontal places with safe and hard surfaces, such as a lab bench.
Main body 	This unit is not an explosion-proof structure. Install this unit away from any places with the possibility of exposure to fire or flammable gasses.
Migration 	Never move the unit during operation. Cords may get entangled, which might cause rollover. Or, cords may be damaged, which might cause fire or electrical shock. Please make sure to turn the unit power switch OFF, and pull out the power cable and all wiring cables before migration.
Carrying 	If you carry this unit, it may cause injury or equipment damage due to falling, so hold it firmly with both hands.
Maintenance 	Please be sure to turn the unit power switch OFF and pull out the power cable before performing maintenance and cleaning. These might cause electrical shock. Please ask us for periodical maintenance, inspection and calibration so as to maintain good performance and safety of the unit.
Disassemble prohibition 	Never disassemble or modify the unit. Adjustment and repair work of the product should be done by our service staff in charge. When adjustment or repair is required, please ask our company. Any accident caused by your disassembling or modification would be outside of our responsibility.
Fuse 	Never use other fuses than those specified by this manual or items written on the rear panel. Failure to follow instructions may cause fire at the time of failure.

Seal group 	Never peel off the Warning Seal. The seals indicate dangerous areas. If any seal comes off, please contact us.
Moving Parts 	There is a risk of injury. Please do not put your hands in moving parts.

 Caution

Power cable 	If the unit is used outside of Japan, please prepare a power cable complies with the standard of the country where the unit is used. Use of a non-standard power cable could cause excessive heat and/or fire. If you have any questions, inquire our sales agent or company.
Dew condensation 	When the unit is quickly moved from a low-temperature area (low- temp. room, cold outdoor, etc.,) to a high-temperature area (warm room, etc.,), there is possibility of [Condensation], i.e. moisture in the air becomes water drops. If condensation happens within the unit, some parts may short out. When the unit is moved from a low-temperature area to a high- temperature area, set the unit where there is plenty of ventilation and away from direct sunlight, and turn the unit power on AFTER the unit gets to the same temperature as the room temperature.
Pump posture 	Do not use the pump by tilting it down. Leakage due to tube wear will not be released to the outside and may cause a malfunction.
Leakage 	If liquid leaks, clean each part immediately. In particular, make sure that no dirt remains on the rollers.
Touch panel 	Do not splash the solution on the touch panel. It may cause a malfunction.

Tube presser 	Do not wash the tube presser with an organic solvent, but wipe it gently with a cloth coated with a neutral detergent. It may cause damage.
Tube 	The tube is a consumable item. After using it for a certain period of time, shift the squeezing position or replace it with a new tube. Also, if you use a tube other than the one provided by us, it may not meet the specifications.

 Notice

Seals 	Never peel off nameplate seals. These indicate important information for maintenance and control of the unit.
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Other Precautions

Application

The WSP-3300 Perista Quantum Pump can be used to deliver solutions or liquids containing fine solids. Please check the chemical resistance of the tube before use. Please note that it cannot be used for medical purposes..

Export

Export of specific work and cargo are controlled by Foreign Exchange Laws and Cabinet Order/Ministerial Orders of Foreign Trade Control Laws and those controls are applied to this unit.

Even if the unit is not applicable to the Cabinet Order, it is required to submit documents accordingly and if it is applicable, then obtain export license from the Ministry of Economy, Trade and Industry, and then submit the license to the customs office.

When you export our product, please confirm with your supplier or our customer service department in advance.

Trademarks and Copyright

You are hereby notified that any distribution, copying or forwarding of this manual is strictly prohibited without permission of ATTO Corporation. Information in this manual or specification of the product is subject to change without notice.

1 Overview

1.1 Purpose of Application

The Perista Quantum Pump is a product intended for the delivery of solutions. Please be sure to confirm in advance that the solution can actually be sent by referring to the chemical resistance table of the tube. Also, the attached standard tube is limited to use for research purposes. When using for the production of foods and pharmaceuticals, please use officially approved tubes. It cannot be used to send flammable gas or



or use in the presence of the person in charge of operations containing poisonous and deleterious substances.

2 Unpacking

2.1 Confirmation When Unpacking

Upon arrival of the product, please confirm whether the main body and accessories are packed correctly or if any defects exist.

In case there is any inadequacy, deficiency, etc., please inform your supplier or our company immediately.

Please perform your confirmation as above at the time of unpacking within one week upon arrival of the unit. Confirmation after more than one week may result in not receiving compensation for defects or missing articles.

2.2 Product Component

Main body

Product name	Quantity
WSP-3300 Perista Quantum Pump	1

Accessories

Product name	Quantity
Power cable	1
ATTO genuine standard tubing (olefin) Inner diameter 2 mm / Outer diameter 4 mm (With 95mm lure fitting)	3
ATTO genuine standard tubing (olefin) Inner diameter 2 mm / Outer diameter 4 mm (1 m)	1
WSP-3300 Perista Quantum Pump Instruction Manual	1

3 Name and Function of Each Part

3.1 Front Panel

① Touch panel

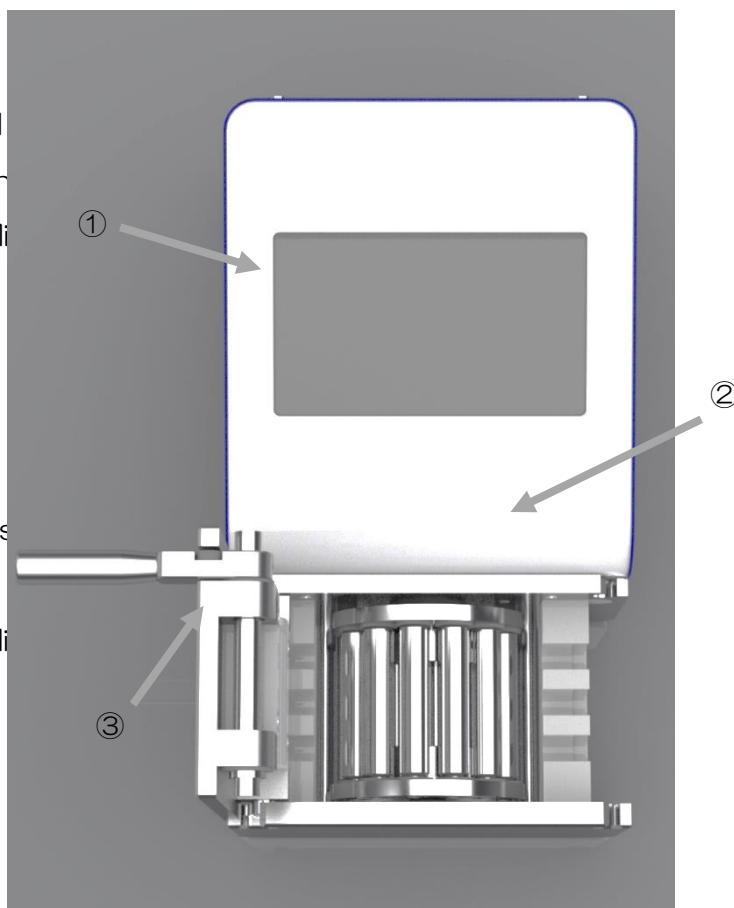
Touch the buttons and icons displayed on the touch panel to set the flow rate, flow rate setting, liquid feeding direction, liquid feeding flow rate, liquid feed time (remaining liquid feed time) and the liquid feed time displayed.

② Roller

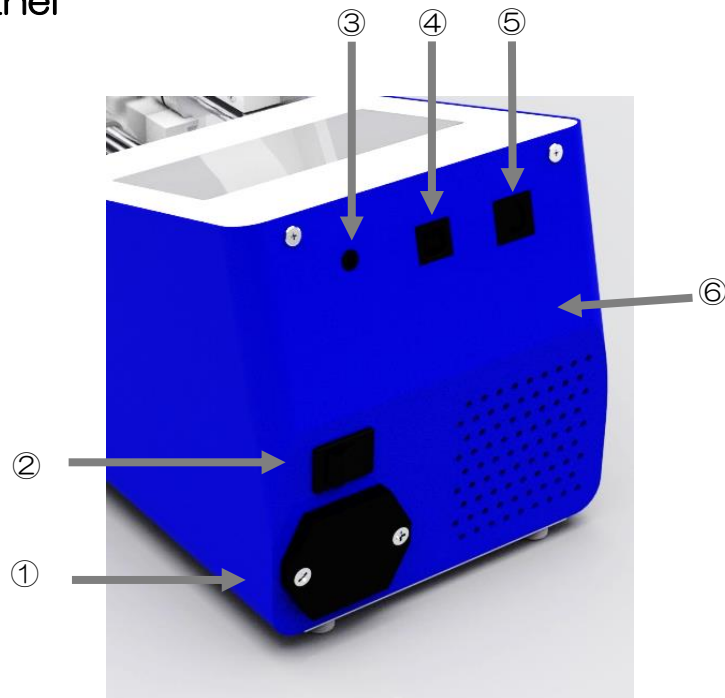
Twelve stainless steel (SUS304) rollers are arranged in a row to rotate the tube. Tubes with an inner diameter of 4 mm and an outer diameter of 6 mm can be set and sent at the same time.

③ Tube presser

The tube presser is a plate for evenly crushing the tube (The photo shows one end of the tube presser set).



3.2 Rear panel



① Power connector

Connect attached power cable.

A fuse is stored inside.



Caution

Double pole/neutral fusing

② Power switch

Power ON and OFF for Perista Quantum Pump.

③ Terminal for external flow sensor

Connection terminal for external flow sensor. (Under development).

④ USB terminal for external control

USB 2.0 standard cable can be used.

⑤ Foot switch terminal

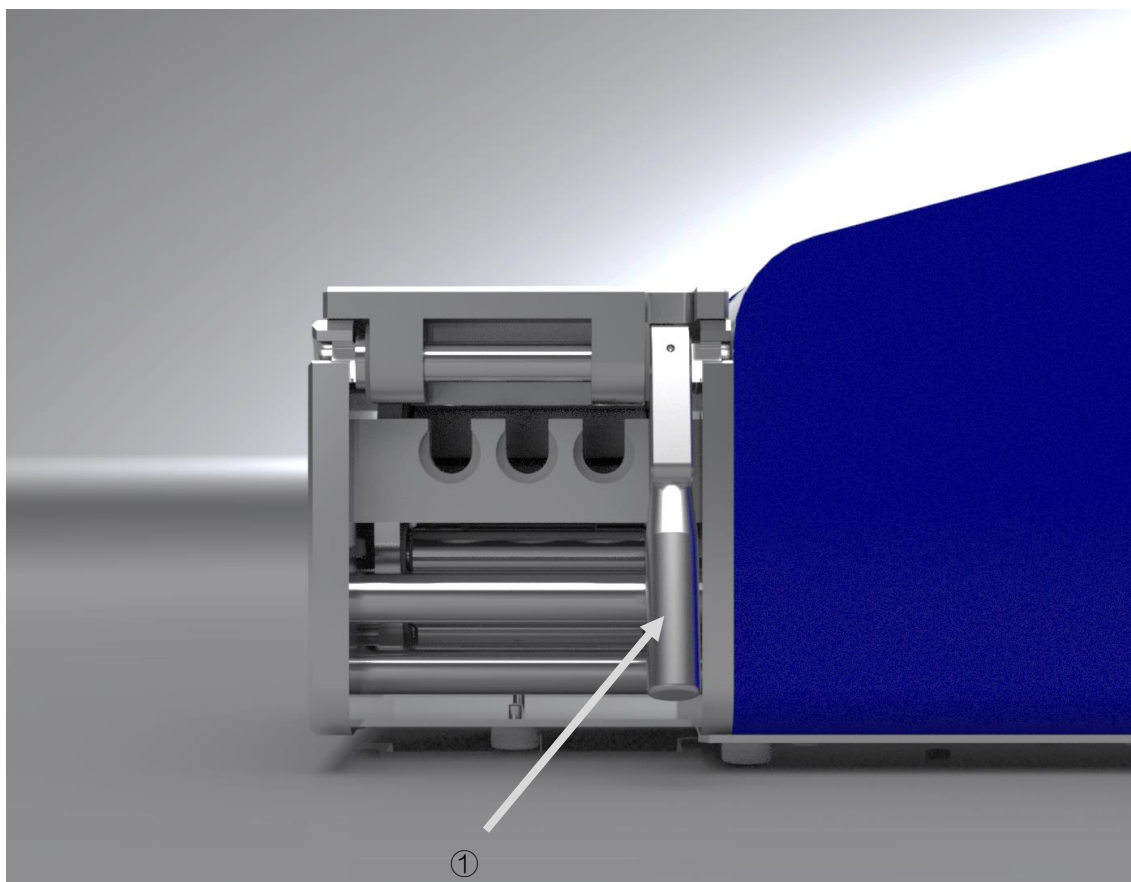
⑥ Nameplate

Model number, serial number, consumed power, input voltage, input frequency, company name, manufactured country of Perista Quantum Pump are typed.

3.3 Right Side

① Tube presser fixing handle

The handle crushes the set tube to secure the tube presser.



3.4 Option

Code No.	Product name
1221461	ATTO genuine standard tubing (olefin) Inner diameter 2mm / Outer diameter 4mm (with 95mm lure fitting)
1221463	ATTO genuine standard tubing (olefin) Inner diameter 4 mm / Outer diameter 6 mm (with 95 mm lure fitting)
1221462	ATTO genuine standard tubing (olefin) Inner diameter 2 mm / Outer diameter 4 mm (5 m)
1221464	ATTO genuine standard tubing (olefin) Inner diameter 4 mm / Outer diameter 6 mm (5 m)
1221470	Foot switch

4 Preparations

4.1 Installation Environment

Place of use	Indoor use only Location where direct sunlight is shut Contamination level 2 of the place of use
Temperature	4 - 40 °C
Humidity	Up to 90%RH, free from condensation

 Warning	Never install the unit in the atmosphere of flammable gases. This can cause explosion or fire since the unit is not of an explosion-proof structure. Install the unit in the environment where no flammable gas is contactable. Never install the unit in a corrosive gas atmosphere. This can cause conductor corrosion or bad connector contact in the product. This, in turn, may cause malfunction, trouble or fire. Never install the unit in an environment where a lot of dust and dirt exist. Dust and dirt will stick to the unit and can cause electrical shock, fire or other problems.
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 Caution	Never use the unit in areas where strong magnetic or electric field exists or where a lot of waveform distortion or noise exists. These might cause malfunction. Never install the unit where a direct sunlight hit, temperature suddenly varies or humidity is high. Never use it if condensation happens.
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4.2 Cable Connections

Power Cable Type

A cable attached to this device is a cable usable in Japan. Please prepare power cable that is applicable to the standard of the country where used.

The power connector of Perista Quantum Pump satisfies the following specification.

Standard	Shape
IEC 60320-C13, 125V 7A	

Power Cable Connection

Please confirm the power switch at the right-hand side of the main body is OFF before connecting the cable. The sign [o] means OFF.

Connect attached power cable to the power connector. Connect power plug to power outlet that has the ground terminal. Please insert the power plug firmly.

 Warning	Connect to power outlet with ground terminal. Never use PowerStation Ghibli I without ground connection. This can cause electrical shock and accident.
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 Caution	The power cable attached to PowerStation Ghibli I is for Japanese domestic use. Please use the power cable applicable to the standard of the country where it is used.
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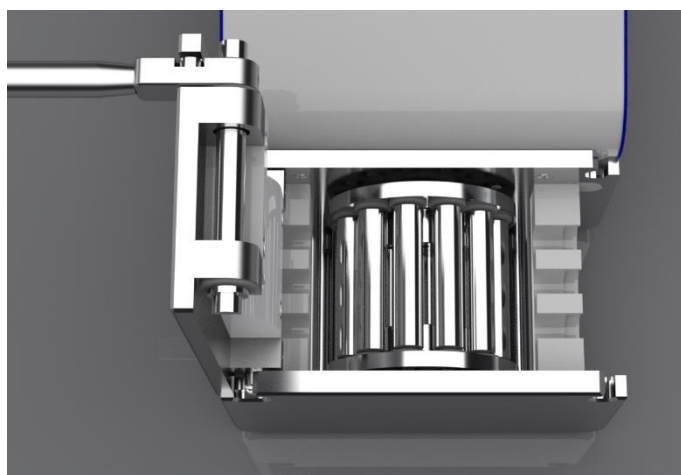
4.3 How to attach the tube

Raise the handle of the tube presser up until it is vertical, and while lifting the handle, raise the tube presser as shown in the figure (keep your hands on this). Remove the tube presser upward from this state.

① How to remove the tube presser

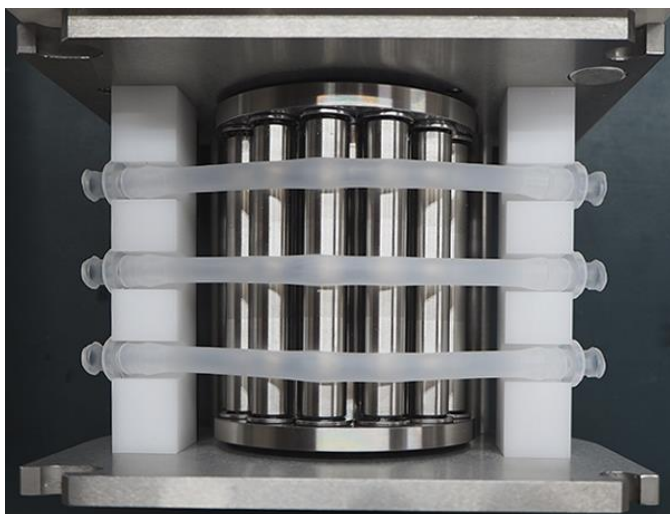


Stand the handle of the tube presser vertically.



Lift the handle up to remove the handle side of the tube presser. The other shaft can be removed by lifting the tube presser upright with the tube presser upright.

② How to install the standard tube



While stretching the standard tube, fix the connector part to the tube holder. The female connector has been removed for the sake of clarity, but please install the female connector first and then set it. If you want to use only one, set it wherever you like.

③ How to squeeze



Set the tube presser in the reverse order of removal, and then tilt the handle of the tube presser to the bottom as shown in the figure to fix it. The tube cannot be compressed properly except in this position.

5 Operations

5.1 Start up

Turn on the power switch on the back of the main unit. The power is on.

After the startup screen is displayed on the front panel, the unit starts with the continuous liquid supply mode selected. The mode used last.



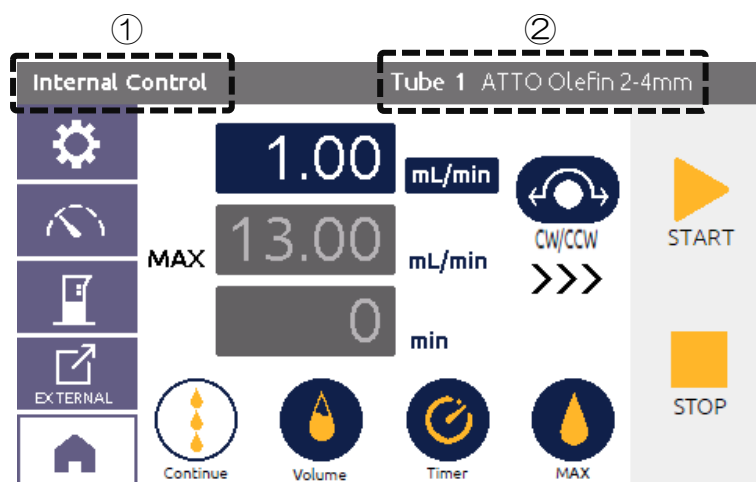
5.2 Operation of Screen

Tap the buttons on the screen with your finger to operate.

It can be operated even with your fingers with gloves, also operated with a thinner stick.

 Caution	Do not tap the screen with sharp tips. The screen may get scratched.
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5.3 Explanation of operation screen

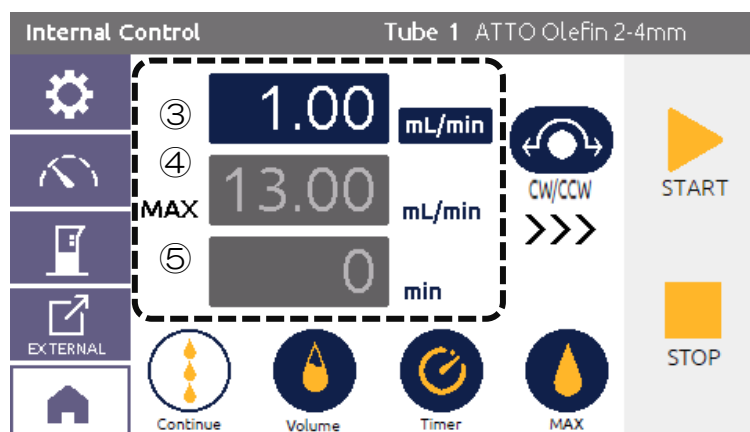


① Internal Control

Control by the main body. In the case of external control, "External Control" is displayed.

② Tube selection

The name of Tube1 (ATTO Olefin 2-4mm) registered in the main unit is selected.

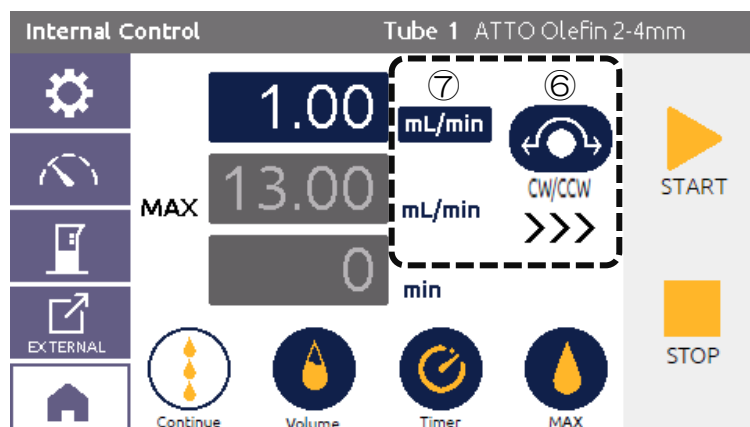


③ **Liquid flow rate setting unit** The flow rate for sending liquid is set to 1.00 mL / min.

④ **Maximum flow rate display** Displays the maximum flow rate of the tube used.

⑤ **Liquid transfer time display** Depending on the liquid feeding mode, the elapsed liquid feeding time, the remaining time until the liquid feeding is stopped, and the remaining capacity until the liquid feeding is stopped are displayed in this part.

⑥ Selection of liquid delivery direction



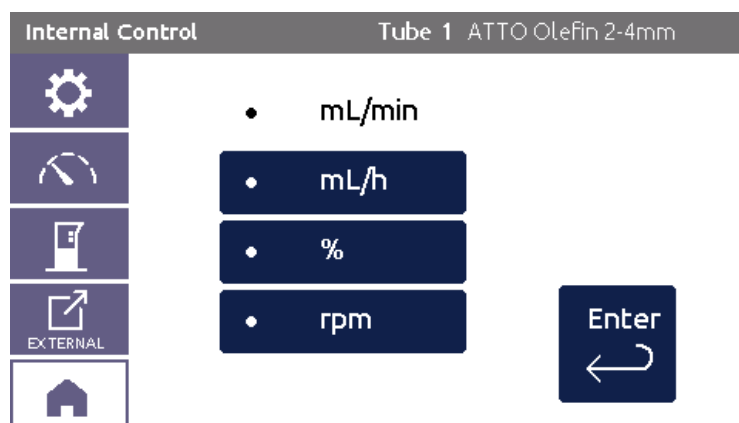
: Touch  to change the direction. At the same time, the direction of the START button also changes.

>>> Liquid delivery to the right

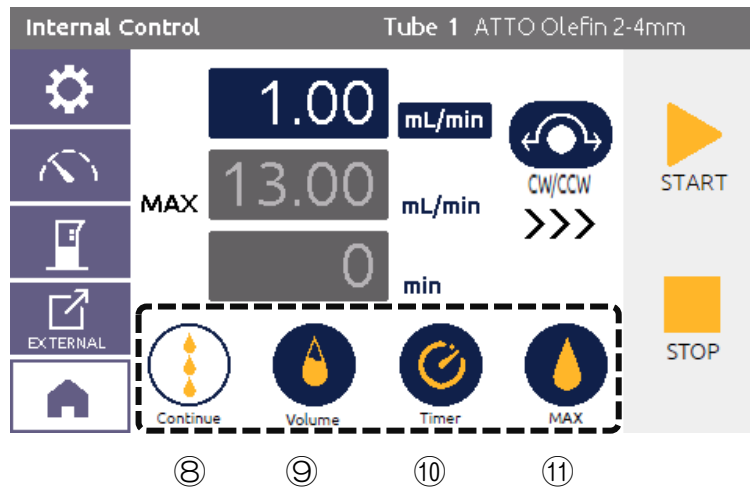
<<< Liquid delivery to the left

⑦ Flow rate unit switching

: Touch **mL/min** to select a unit



mL/min , mL/h , Maximum flow rate is 100%, rpm (maximum is 50 rpm).



⑧ Continuous liquid feeding mode

After START, continue liquid feeding until you touch the STOP button.

⑨ Capacity liquid transfer mode

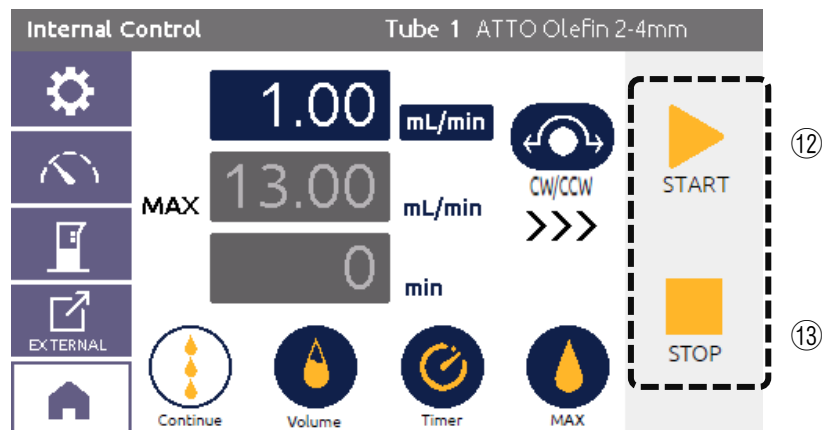
Continue feeding until the set capacity is reached.

⑩ Timer liquid feed mode

Continue feeding until the set time is reached.

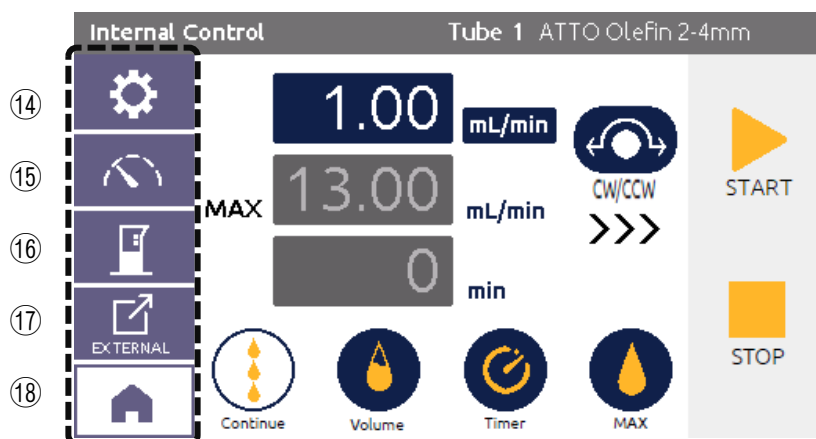
⑪ Maximum flow rate liquid feed mode

Send liquid at the maximum flow rate.



⑫ Start button

⑬ Stop button



⑭ Initial setting button

⑮ External flow meter use mode button

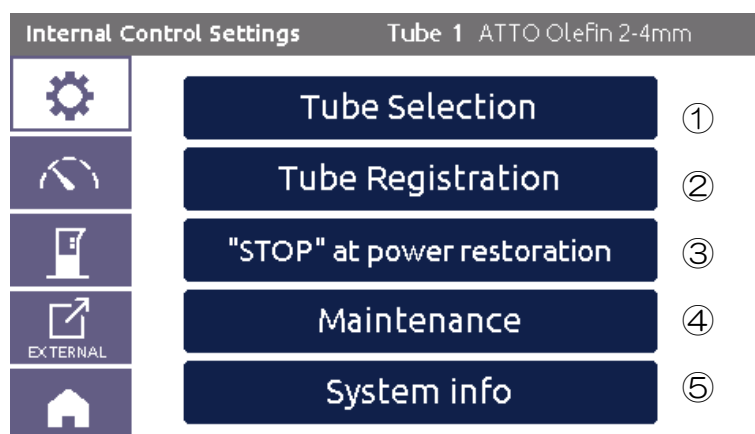
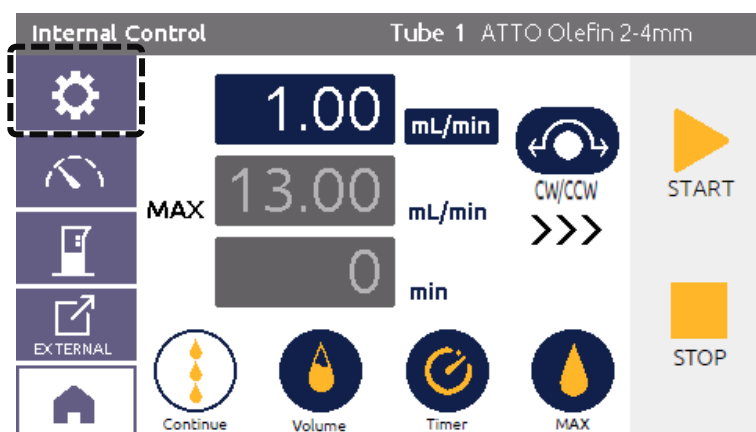
⑯ Flow rate calibration mode button

⑰ External control mode button

⑱ Home button

5.4 Initial setting

Change various settings and display information.



① Select the registered tube

Two types of Olefin tubes are registered at the time of shipment. For these registered tubes, the representative value of the maximum flow rate that can be sent is input in advance. The inner diameter of the tube varies slightly, so if you need to feed the liquid at the correct flow rate, calibrate the flow rate.

If **Internal Control Settings** Tube 1 ATTO Olefin 2-4mm TO Olefin 2-4mm" and "ATTO Olefin

4- **Tube Selection**

1. ATTO Olefin 2-4mm ▲

2. ATTO Olefin 4-6mm

3. OK

4.

5. ▼ a white background.

If

OK 1. ATTO Olefin 2-4mm ▲

2. ATTO Olefin 4-6mm

3. OK

4.

5. ▼

②

To **Internal Control Settings** Tube 1 ATTO Olefin 2-4mm save point.

To **Save Point**

1. ATTO Olefin 2-4mm ▲

2. ATTO Olefin 4-6mm

3. OK

4.

5. ▼

En

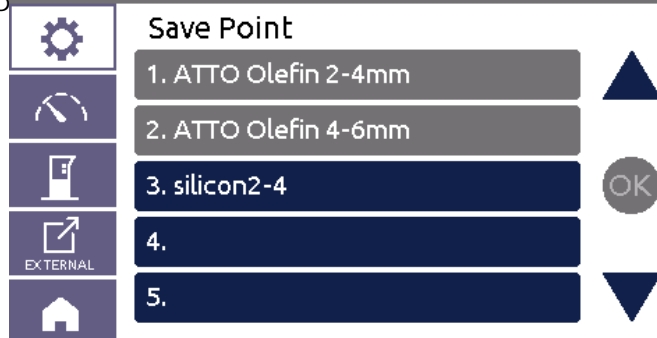
To OK Back

To

1	2	3	4	5	6	7	8	9	0	⌫
q	w	e	r	t	y	u	i	o	p	↵
a	s	d	f	g	h	j	k	l	↵	
A/a	z	x	c	v	b	n	m	,	.	
#	%	&	'			-	/	(	)	

e previous screen.

For Internal Control Settings Tube 1 ATTO Olefin 2-4mm touch “OK” to finish.

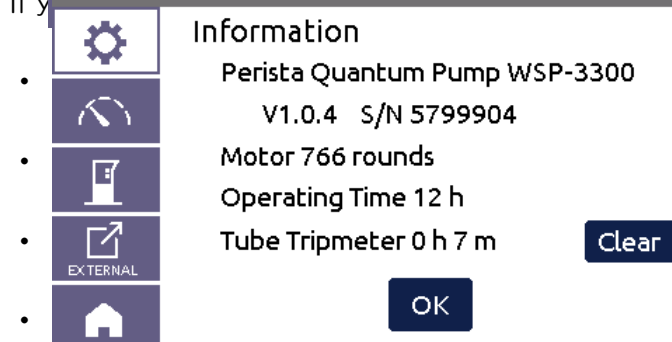


③ Pump operation setting after power failure recovery

If you touch the gear icon in the 'Internal Control Settings' menu, the 'Power Restoration' screen appears. On this screen, you can select the operation of the pump after power restoration. Select “STOP” if you want the pump to stop after power restoration, which is the stopped state after power restoration. If you want the pump to continue operation after power restoration, select “CONTINUE” if you want to continue operation. Touch “OK” to finish.

④

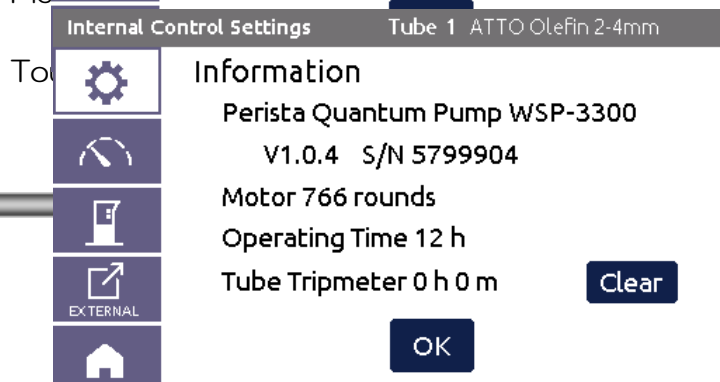
If you touch the gear icon in the 'Internal Control Settings' menu, the 'Information' screen appears.



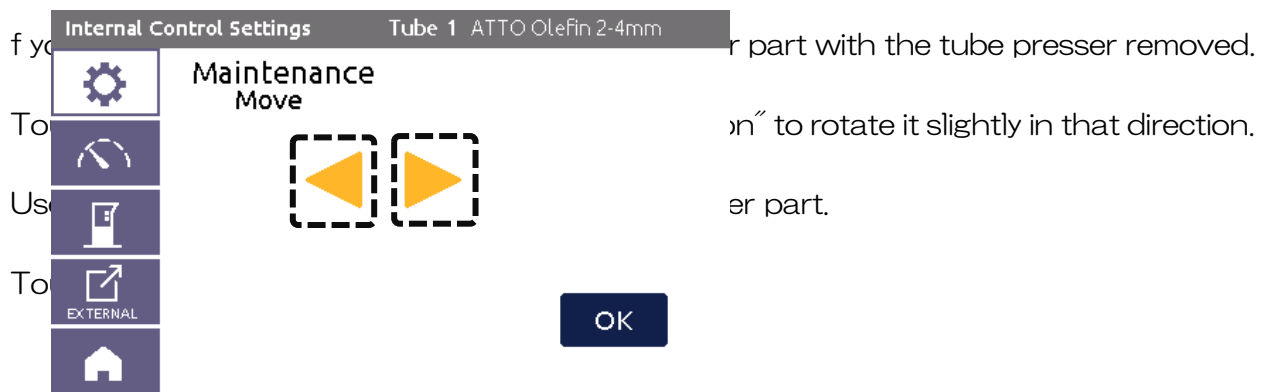
- Tube trip meter

When the tube trip meter is low (the low value is displayed on the operation screen) of the tube

trip meter, a low value will appear. Touch “OK” to clear the low value. Touch “Cancel” to replace the standard tube.



⑤ Maintenance



5.5 Flow calibration

Set a new registered tube and calibrate the flow rate if accurate flow rate is required. If you want to use a new tube that has not been registered, please register first. After setting the new ATTO standard olefin tube, the liquid feed will be stable if it is aged for 2 to 3 hours at the maximum rotation. Perform flow rate calibration after it stabilizes.

Internal Control

Tube 1 ATTO Olefin 2-4mm

①

1.00

mL/min

③

13.00

mL/min

②

CW/CCW

>>>

START

0

min

Internal Control Calibration

Tube 1 ATTO Olefin 2-4mm

④

mL/min

mL/h

%

④

rpm

Enter

Internal Control Calibration

Tube 1 ATTO Olefin 2-4mm

⑤

100

100

30

Actual

1

2

3

Del

4

5

6

7

8

9

Enter

0

.

h mode.

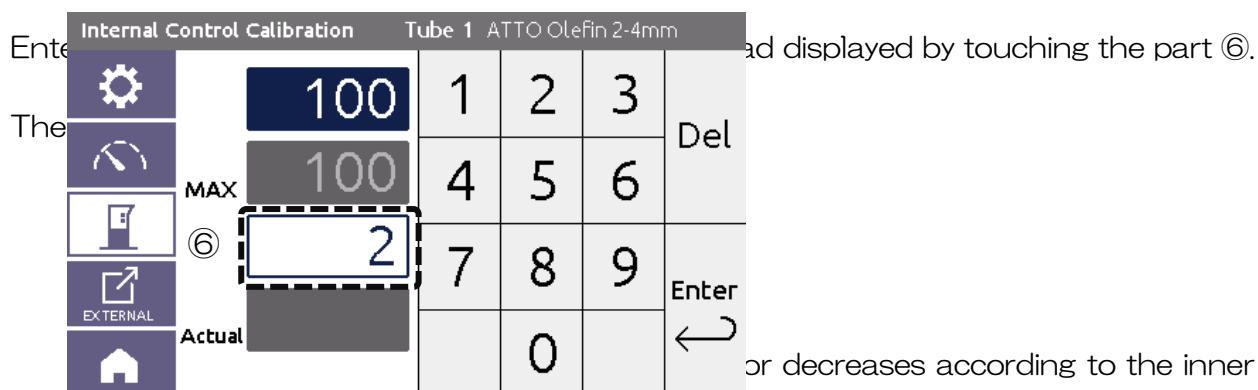
direction of liquid delivery.

u.

%".

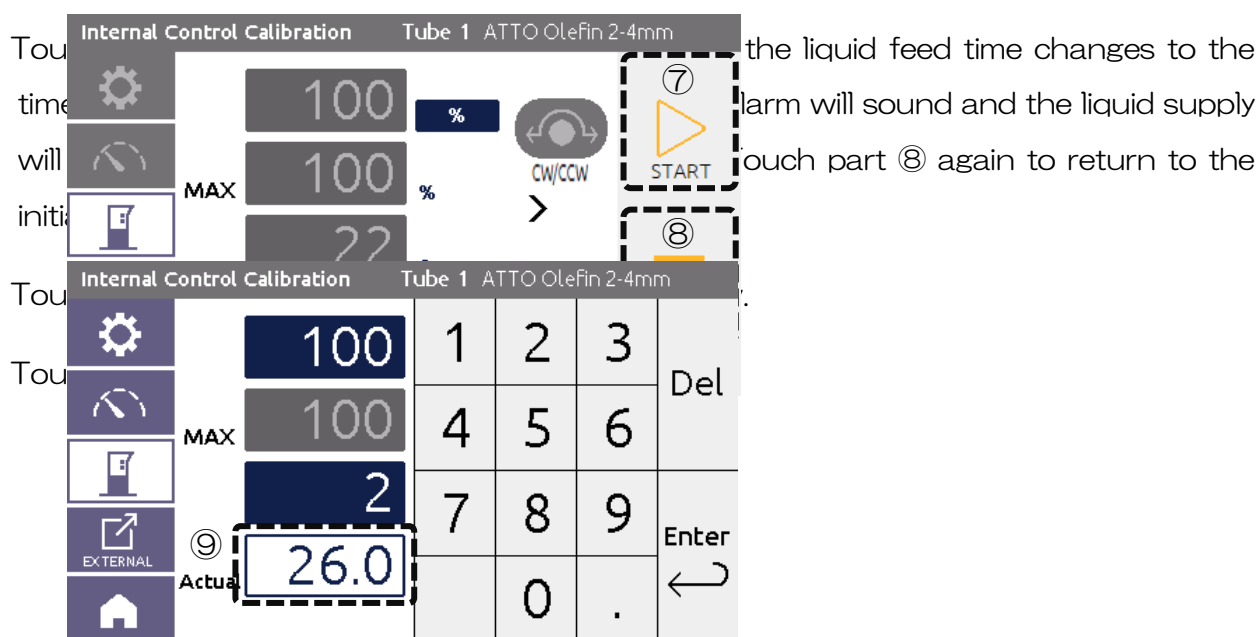
touch part ⑤ to enter the maximum

nt when calibrating.

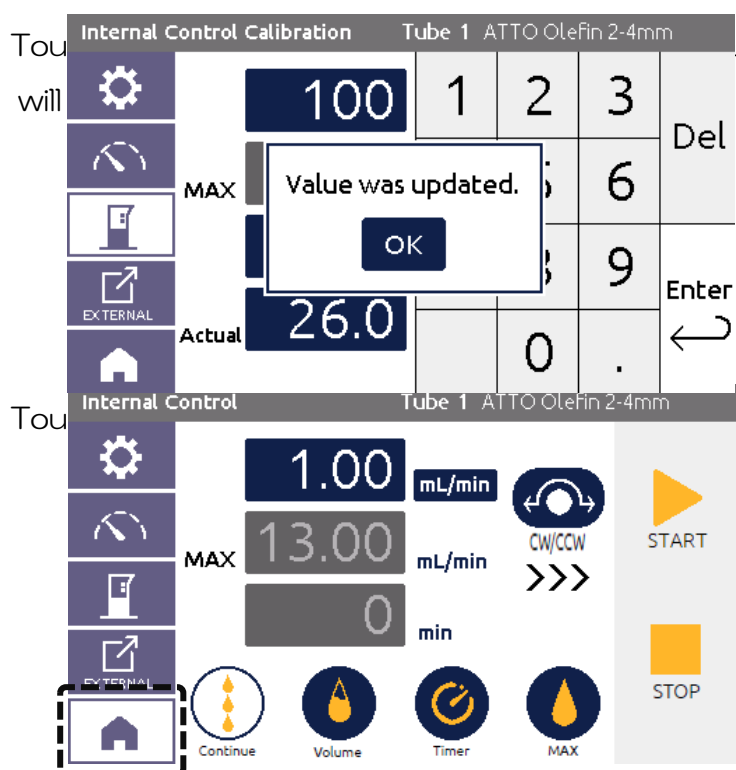


diameter of the tube. The flow rate varies depending on the tube material, but at maximum rotation, use 13 mL / min for a tube with an inner diameter of 2 mm and 35 mL / min for a tube with an inner diameter of 4 mm. Determine the liquid transfer time based on the flow rate.

*



Tou will value. If it is a newly registered tube, it



5.6 How to set the liquid feed (home screen)

Four types of liquid feeding modes can be selected from the screen displayed by touching the home button. The liquid feeding direction is common to all modes, but it can be changed after entering any mode. In addition, the flow rate display “mL / min” , “mL / h” , “%” or “rpm” can be freely changed.

① Continuous liquid feeding mode (Continue)



Set the liquid flow rate by referring to the maximum flow rate (MAX) that can be sent by the tube.

Check the liquid feeding direction and touch the “START” button. Liquid transfer starts and the elapsed time is displayed.

Liquid feeding continues until you touch the “STOP” button. The process differs depending on the number of touches.

“STOP” button once: Stops the liquid feeding while displaying the elapsed (liquid feeding) time. Touch the “START” button to restart the liquid supply and add the elapsed time.

“STOP” button twice: The elapsed (liquid feeding) time is cleared to 0.

When the liquid feeding time exceeds 9999min, the display changes to h.min.

② Capacity liquid transfer mode (Volume)



Set the liquid feed flow rate and liquid feed capacity by referring to the maximum flow rate (MAX) that can be sent by the tube.

Check the liquid feeding direction and touch the "START" button. Liquid feeding starts and the remaining liquid feeding capacity is displayed.

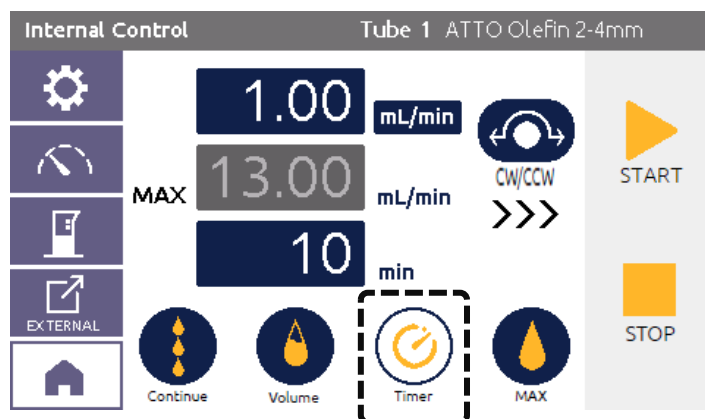
If you touch the "STOP" button on the way, the liquid supply will stop. The process differs depending on the number of touches.

"STOP" button once : Stops the liquid supply while displaying the remaining capacity. If you touch the "START" button, the liquid supply will resume and the remaining capacity display will continue. You can also change the remaining capacity at this time.

"STOP" button twice : Returns to the initial state.

When the liquid is sent by the set capacity, it will stop automatically. Touch the "STOP" button to return to the initial state.

③ Timer liquid feed mode (Timer)



Set the liquid feed flow rate and liquid feed time (unit is min only) with reference to the maximum flow rate (MAX) that can be sent with the tube.

Check the liquid feeding direction and touch the "START" button. The liquid transfer is started and the remaining time of the liquid transfer is displayed.

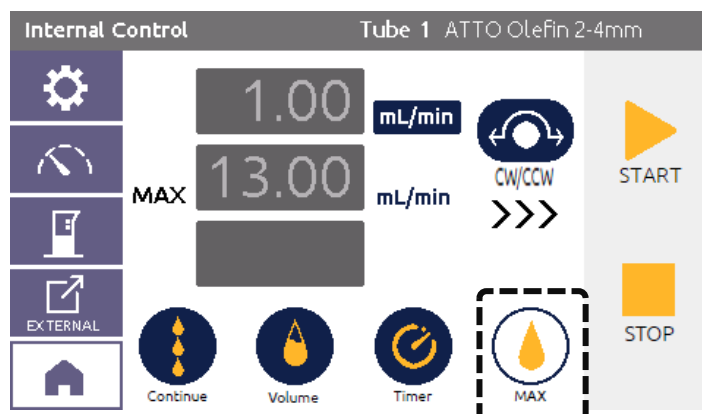
If you touch the "STOP" button on the way, the liquid supply will stop. The process differs depending on the number of touches.

"STOP" button once : Displays the remaining time Stop sending liquid while keeping it. If you touch the "START" button, the liquid supply will resume and the remaining time will continue to be displayed. You can also change the remaining time at this time.

"STOP" button twice : Returns to the initial state.

If the liquid is sent for the set time, it will stop automatically. Touch the "STOP" button to return to the initial state.

④ Maximum flow rate liquid feed mode (MAX)



This mode sends the liquid at the maximum flow rate regardless of the set flow rate.

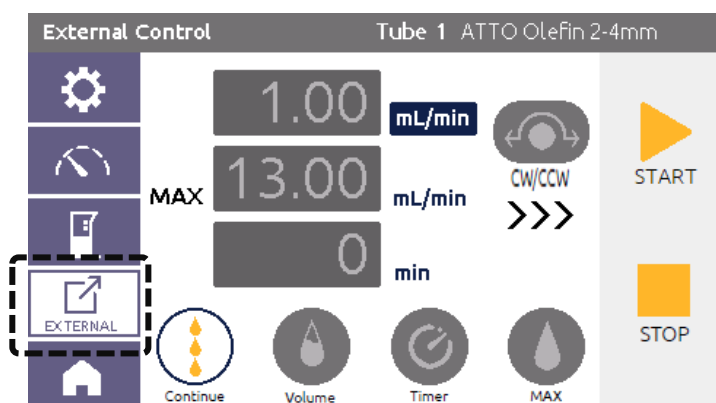
Check the liquid feeding direction and touch the “START” button.

Liquid transfer at the maximum flow rate starts.

If you touch the “STOP” button on the way, the liquid supply will stop.

5.7 External control

Touch the “EXTERNAL” button to select the external control mode and enable remote control from the outside.



① Remote control method

It communicates by USB serial and performs remote control. It works with Windows 10 standard driver. (Not compatible with Windows 7/8)

The port setting is / 9600bps / 8bit / no parity / stop bit 1 / no flow .

Send the line feed code in LF or CR + LF. The controller returns CR + LF.

The command is not case sensitive. Notation is capitalized.

The maximum communication buffer size is 64 bytes. Do not send more than 64 bytes of data in one transmission.

For continuous transmission, leave an interval of 10 ms or more.

② Send and receive

Returns a one-line response to a one-line command.

Returns NAK for blank lines.

Returns an error for commands that do not exist.

If an error is detected during operation, no error will be issued.

③ Notation of special characters

The carriage return line feed at the end of the line is CR + LF.

The delimiter is Tab.

④ Command

Command		
Type	Description	Function
Drive	RUN	Start the pump
	STP	Stop the pump
	C_W	Set the rotation direction clockwise.
	CCW	Set the rotation direction counterclockwise.
	SPD	Set the rotation speed (speed is a number from 1 to 10000)
	FLW	Set the flow rate (flow rate is a real number from 0.01 to the maximum of the tube).
	TMC	Clear the trip meter.
Information	MDL	Returns the model name.
	VER	Returns the firmware version.
	SNO	Returns the serial number.
	STS	Returns the status.
	MXF	Returns the maximum flow rate.
	MNF	Returns the minimum flow rate.
	***	The command does not exist.

① Drive commands are valid only in external mode.

RUN

Start the pump.

【Function】 Starts the pump. The external mode can be executed, only.

【Format】 RUNCRLF

【Return】

Status	Return data	
Correct	C	RUNCRLF
Error	E	RUNTabErrorCodeCRLF

【 Ex. 】 Command : RUNCRLF

Normal response : CTabRUNCRLF

Abnormal response : ETabRUNTabE11CRLF

STP

Stop the pump.

【Function】 Stop the pump. The external mode can be executed, only.

【Format】 STPCRLF

【Return】

Status	Return data	
Correct	C	STPCRLF
Error	E	STPTabErrorCodeCRLF

【 Ex. 】 Command : STPCRLF

Normal response : CTabSTPCRLF

Abnormal response : ETabSTPTabE11CRLF

C_W

Set the rotation direction clockwise.

【Function】 Set the rotation direction clockwise. The external mode can be executed, only.

【Format】 C_WCRLF

【Return】

Status	Return data	
Correct	C	C_WCRLF
Error	E	C_WTabErrorCodeCRLF

【 Ex. 】 Command : C_WCRLF

Normal response : CTabC_WCRLF

Abnormal response : ETabC_WTabE11CRLF

CCW

Set the rotation direction counterclockwise.

【Function】 Set the rotation direction counterclockwise. The external mode can be executed, only.

【Format】 CCWCRLF

【Return】

Status	Return data	
Correct	C	CCWCRLF
Error	E	CCWTabErrorCodeCRLF

【 Ex. 】 Command : CCWCRLF

Normal response : CTabCCWCRLF

Abnormal response : ETabCCWTabE11CRLF

SPD

Set the rotation speed.

【Function】 Set the rotation speed. The external mode can be executed, only.

【Format】

SPDTabnnnnnCRLF

Function		Set value	Note
nnnnn	Rotation speed	1~10000	0.01% at 1, 100% at 10000

【Return】

Status	Return data	
Correct	C	SPDCRLF
Error	E	SPDTabErrorCodeCRLF

【 Ex. 】 Command : SPDTab00110CRLF

Normal response : CTabSPDCRLF

Abnormal response : ETabSPDTabE11CRLF

FLW

Set the flow rate.

【Function】 Set the flow rate. The external mode can be executed, only.

【Format】

FLWTabff.ffCRLF

Function		Set value	Note Note
ff.ff	Flow rate	Depends on the tube	ff.ff mL/min

【Return】

Status	Return data	
Correct	C	FLWCRLF
Error	E	FLWTabErrorCodeCRLF

【 Ex. 】 Command : FLWTab09.90CRLF

Normal response : CTabSPDCRLF

Abnormal response : ETab FLWTabE31CRLF

TMC

Clear the trip meter.

【Function】 The usage time of the tube currently in use is returned. The external mode can be executed, only.

【Format】 TMC

【Return】

Status	Return data	
Correct	C	TMC
Error	E	TMC

【 Ex. 】 Command : TMC

Normal response : C

Abnormal response : E

MDL

Returns the model name and model number.

【Function】 Returns the model name and model number.

【Format】 MDL

【Return】

Status	Return data	
Correct	C	MDL

【 Ex. 】 Command : MDL

Return : C

VER

Returns the firmware version.

【Function】 Returns the firmware version.

【Format】 VERCRLF

【Return】

Status	Return data	
Correct	C	VERCRLF

【 Ex. 】 Command :

VERCRLF

Return :

CTabVERTab1.0.0CRLF

SNO

Returns the serial number of the device.

【Function】 Returns the serial number of the device.

【Format】 SNO CRLF

【Return】	Status	Return data	
	Correct	C	SNO CRLF

【 Ex. 】 Command : SNO CRLF

Return : C SNO 5700106 CRLF

STS

Returns the device setting information.

【Function】 Returns the device setting information.

【Format】 STS CRLF

【Return】	Status	Return data	
	Correct	C	STS xxx yyy SPD nnnnnn FLW ff.ff ZZZZhZZm CRLF
	Error	E	STS Error Code CRLF

【Status】	xxxx	Operation	RUN / STOP
	yyy	Direction	C_W / CCW
	nnnnnn	Rotational speed	00001 ~ 10000
	ff.ff	Flow rate	- (unit ml/min)
	zzzzhzzm	Trip meter	0000h01m ~ 9999h59m

【 Ex. 】 Command : STS CRLF

Normal response : C STS RUN C_W SPD 00220 FLW 09.09 1234h56m CRLF

Abnormal response : E STS E10 CRLF

MXF

Return the maximum flow rate.

【Function】 Returns the maximum flow rate of the currently selected tube. The external mode can be executed, only.

【Format】 MXFCRLF

【Return】

Status	Return data	
Correct	C	MXFTabff.ffCRLF

【Status】 ff.ff : Maximum flow rate - (unit ml/min)

【 Ex. 】 Command : MXFCRLF

Return : CTabMXFTab35.00CRLF

MNF

Return the minimum flow rate.

【Function】 Returns the minimum flow rate of the currently selected tube.

The external mode can be executed, only.

【Format】 MNFCRLF

【Return】

Status	Return data	
Correct	C	MNFTabff.ffCRLF

【Status】 ff.ff : Set flow rate - (unit ml/min)

【 Ex. 】 Command : MNFCRLF

Return : CTabMNFTab00.10CRLF

***	The command does not exist. (Irregular Command)
-----	---

【Function】 Responds when accepting a command that does not exist. The external mode can be executed, only.

【Format】 ***CRLF

【Return】	Status	Return data	
	Correct	C	
	Error	E	***TabErrorCodeCRLF

【Status】 *** : Non-existent command

【 Ex. 】 Command : BBBCRLF

Return : ETabBBBTabE01CRLF

5.8 ATTO genuine standard tubing (olefin)

A dedicated tube with an olefin connector developed for the Perista Quantum pump.

This tube can only be used for research purposes. If you want to feed the liquid at a stable flow rate, age it for about 2 hours at the maximum rotation of the Perista Quantum pump. However, this aging time is for water at 20°C.

Product name	ATTO genuine standard tubing(olefin) Inner diameter 2 mm, outer diameter 4 mm (with 95mm lure fitting)	ATTO genuine standard tubing(olefin) Inner diameter 4 mm, outer diameter 6 mm (with 95mm lure fitting)
Material	Olefin resin	Olefin resin
Inner diameter	2mm (Tolerance ± 0.1 mm)	4mm (Tolerance ± 0.1 mm)
Outer diameter	4mm	6mm
Thick	1mm (Tolerance ± 0.05 mm:Average)	1mm (Tolerance ± 0.05 mm:Average)
Length	95mm	95mm
Normal operating presser	0~0.2Mpa	0~0.1Mpa
Plosive presser	0.8Mpa up to	0.4Mpa up to
Operating temperature limit	4 ~ 40°C	4 ~ 40°C
Allowable bend radius	15mm(20°C)	30mm(20°C)
Maximum flow (representative value)	About 13mL/min	About 35mL/min
Minimum flow	Maximum flow / up to 1000	Maximum flow / up to 1000
Flow stability	up to setting flow rate $\pm 1\%$ / h (At constant temperature)	up to setting flow rate $\pm 1\%$ / h (At constant temperature)
Flow rate variations between standard tubings	About $\pm 5\%$	About $\pm 5\%$

5.9 Regarding disposal

When disposing of the tube, follow the laws and regulations of each local government as industrial waste.

5.10 Chemical resistance table

The criteria for this chemical resistance list are created under certain conditions. Therefore, depending on the actual usage environment, usage conditions, usage period, etc., even if the judgment standard is "O", it may not be suitable.

Please be sure to check under the actual usage conditions before using.

Unless otherwise specified, the aqueous solution concentration of the chemicals in the list is saturated.

The numbers in () indicate the concentration and test temperature. The blank test temperature is the maximum operating temperature of the hose.

This list is a chemical resistance list of materials and does not show the transmittance when the chemical is a gas. Do not use chemicals (active gas, etc.) that are dangerous if permeated.

Acrylonitrile	△	Chromic acid (2%, 70℃)	△	naphtha	△
Acetylene	○	Chromic acid (2%, 50℃)	△	naphthalene	△
Acetaldehyde	△	Chromic acid (10%, 70℃)	×	Ethylene dichloride	△
Acetone	○	Chromic acid (25%, 70℃)	×	Nitrobenzene	○
Aniline	○	Chlorosulfuric acid	×	Carbon disulfide	×
Flaxseed oil	○	Chloroform	△	Perchloroethylene	△
Amyl alcohol	△	Sodium silicate	○	Palmitic acid	○
Sulfurous acid	△	Kerosene (kerosene)	×	Picric acid	△
Sulfurous acid gas	△	Mineral oil	△	Arsenic acid	△
Sodium sulfite	△	Acetic acid (10%, 20℃)	○	Hydrazine	△
benzoic acid	○	Acetic acid (50%, 20℃)	○	Pyridine	○
Ammonia gas (cool)	△	Acetic acid (50%, 70℃)	×	Phenol	○
Ammonia gas (hot)	×	Acetic acid (100%, 20℃)	×	Aluminum gliding	○
Sulfur	○	Aluminum acetate	△	Hydrofluoric acid (10%, 20℃)	△
Carbon monoxide	○	Ethyl acetate	△	Hydrofluoric acid (20%, 20℃)	△
Isopropyl alcohol	○	Calcium acetate	○	Hydrofluoric acid (40%, 20℃)	△
Ethyl alcohol (ethanol)	○	Lead acetate	△	Boron boric acid	○
Ethyl ether (diethyl ether)	△	Salicylic acid	○	Fluorine	×
ethylene glycol	○	oxygen	△	Butyl alcohol (butanol)	○
Ethylene oxide	△	Sodium hypochlorite (5%, 20℃)	○	Furfural	×
Ethylenediamine	△	Sodium hypochlorite (5%, 70℃)	△	Hexane	△
Zinc chloride	○	Copper cyanide	○	Heptane	×
Aluminum chloride	○	Carbon tetrachloride	△	benzyl alcohol	△
Ammonium chloride	○	Cyclohexanol	○	Benzaldehyde	△
Potassium chloride	○	Cyclohexanone	△	Benzene (benzol)	△
Calcium chloride	○	Dibutyl phthalate	△	Borax	○
Ditin chloride	○	fatty acid	△	Boric acid	○
Mercury chloride	○	Dimethylformamide	△	Formaldehyde (40%, 20℃)	○
Ferric chloride	○	Hydrogen bromide (20%,	△	Maleic acid	○
Copper chloride	○	Hydrogen bromide (20%,	△	Water (24℃)	○
Nickel chloride	○	Hydrogen bromide (37%,	△	Akira	○
Barium chloride	○	Oxalic acid	○	methane	○
Magnesium chloride	○	bromine	△	Methyl alcohol (methanol)	○
Methyl chloride	○	Nitric acid (10%, 20℃)	○	Methyl isobutyl ketone (MIBK)	△
Hydrochloric acid (10%, 20 °C)	○	Nitric acid (10%, 70℃)	△	Methyl ethyl ketone (MEK)	△
Hydrochloric acid (20%, 20 °C)	○	Nitric acid (30%, 20℃)	○	Monochloroacetic acid	×
Hydrochloric acid (20%, 80	×	Nitric acid (30%, 70℃)	×	Tethyl acid	△
Hydrochloric acid (38%, 20 °C)	○	Nitric acid (61%, 20℃)	○	Sodium sulfide	△
Chlorine gas (dry)	△	Nitric acid (smoke, 20℃)	×	Hydrogen sulfide	○
Chlorine gas (wet)	△	Ammonium nitrate	△	Barium sulfide	△
aqua regia	△	Calcium nitrate	○	Sulfuric acid (10%, 20℃)	○
Ozone (gas 50ppm)	△	Potassium nitrate	○	Sulfuric acid (10%, 70℃)	×
oleic acid	○	silver nitrate	○	Sulfuric acid (30%, 20℃)	○
Seawater	○	Sodium nitrate	○	Sulfuric acid (30%, 70℃)	×
Perchloric acid	△	Lead nitrate	△	Sulfuric acid (98%, 20℃)	○
Hydrogen peroxide (5%, 20℃)	○	Salt	○	Sulfuric acid (smoke, 20℃)	×
Hydrogen peroxide (5%, 50)	○	mercury	○	Aluminum sulphate	○
Hydrogen peroxide (30%, 20℃)	○	Potassium hydroxide	△	Ammonium sulphate	○
Sodium peroxide	△	Magnesium hydroxide	△	Potassium sulphate	○
Caustic soda (10%, 20 °C)	○	Calcium hydroxide	△	Ferric sulfate	○
Caustic soda (30%, 20 °C)	○	Barium hydroxide	△	Copper sulphate	○
Caustic soda (30%, 70 °C)	△	hydrogen	○	Sodium sulfate (Glauber's	○
gasoline	×	Cellosolve	△	Nickel sulphate	△
Potassium permanganate (5%, 20	△	Carbonated	△	Barium sulphate	△
Formic acid (25%, 20 °C)	○	Ammonium carbonate	△	Magnesium sulfate	○
Formic acid (50%, 20 °C)	○	carbon dioxide gas	○	Phosphoric acid (30%, 80℃)	×
Formic acid (90%, 20 °C)	△	sodium carbonate	○	Phosphoric acid (50%, 20℃)	○
Xylene	△	sodium thiosulfate	○	Phosphoric acid (50%, 70℃)	○
citric acid	○	Decalin	△	Phosphoric acid (75%, 20℃)	○
glucose	○	Tetrahydrofuran	○	Phosphoric acid (85%, 80℃)	×
Glycerin	○	Natural gas	△	Ammonium phosphate	○
Cresol	△	Kerosene	×	Sodium phosphate	○
		toluene	△		

記号	意味
② ○	使用可
△	十分な確認が必要で
×	使用不可
③ -	データなし

6 Troubleshooting

If the problem cannot be solved after checking the contents described in this section, check the model and serial number printed on the label on the back of the device, and then contact our customer service center (see the back cover of this manual).

- (1) Make sure that power cable is correctly connected to the connector of the device and properly connected to the power outlet.
- (2) Remove a fuse from a fuse holder on the back of the equipment as below and check whether a fuse is not blown out. If it is blown out, please replace that fuse.

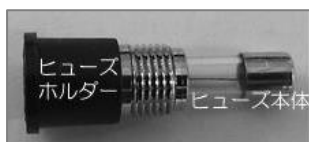


Caution

Double pole/neutral fusing



Insert a flat head screwdriver in the recess under powerconnector on the back of the unit, at white circles on the left picture. Turn it counterclockwise to pull out the holder at 2 different places.



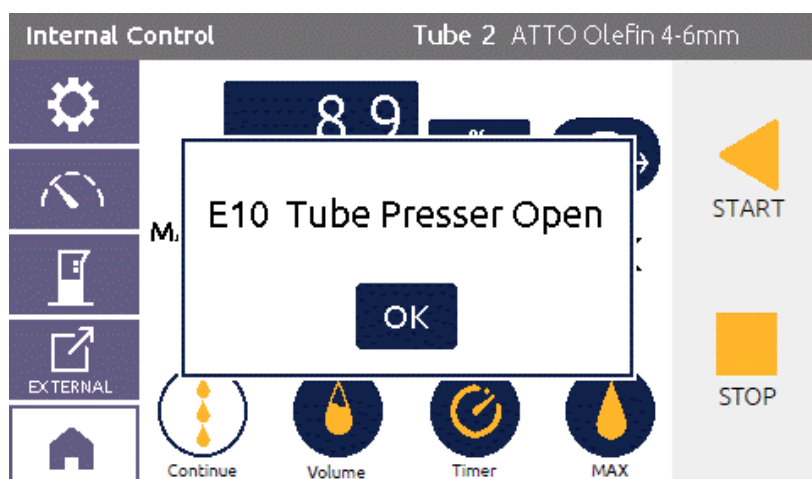
Check a fuse and if it's blown out, please replace and attach fuse holder to the inlet.

Fuse: 5.2 ϕ $\times$ 20 mm, 250V-5A-slow blow type x 2pcs.

6.1 Error indication

ペリスタクォンタムポンプが異常を検知した場合に、エラーを表示します。

エラー表示内容に従って対処してください。



Error #	Content	Correspondence
E01	Command Error	The command could not be received correctly. Check the command you sent in the command table.
E10	Tube Presser Open	The tube presser is open. Set the tube presser correctly.
E11	External Mode Error	External mode is not selected. Make sure you have selected the external mode.
E12	Starting Error	This is the case when the command cannot be received because the pump is operating. Please send the command after stopping the pump.
E21	Step Out Detected	Motor step-out was detected. Make sure the tube is not entangled in the rollers. If yes, set the tube correctly. In maintenance mode, check the rollers for solids. If yes, wipe off any deposits on the rollers.
E31	Over Flow	The set flow rate exceeds the maximum flow rate. Check the maximum flow rate. * In external mode, a command error will occur.
E32	Under Flow	The set flow rate is below the minimum flow rate. Check the minimum flow rate.
E90 E91 E92 E93	System Error	Some system error has been detected. Make a note of the error number, the pump turn off the power, and contact to ATTO.

6.2 Tube breakage

The tube will always break if used continuously for a long period of time.

When the tube breaks, the solution will flow out to the bottom of the main body depending on the position of the bottle containing the solution.

Be careful not to let the spilled solution flow into the outlet or place highly reactive substances in the vicinity.

For reference, the life of the tube during continuous use is about 30 days at maximum rotation.

However, the life of the tube varies greatly depending on the conditions, so be careful not to break the tube during operation.

7 Maintenance

7.1 Clearning

Check and clean the following dirt once a month.

 Warning	Please turn off the power switch and remove the power cable before cleaning the device.
--	---

Exterior surface

If outside of the devise gets dirty, wipe gently using a soft cloth with neutral detergent diluted with water.

Touch panel LCD

If a touch panel gets dirty, please wipe lightly with water or a paper towel containing 70% ethanol. If liquid such as water get on a device, please wipe it off immediately.

Tube presser

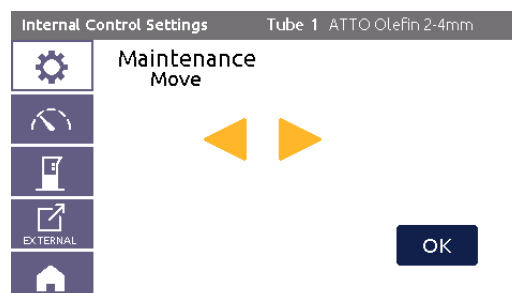
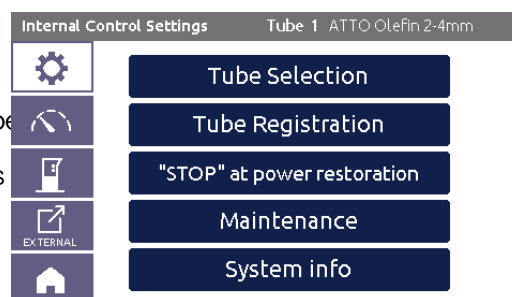
The tube presser has solid matter attached due to the wear of the tube. Wipe it off with a paper towel soaked in water.。

Roller

Solids adhere to the rollers due to wear of the tube. If the safety function will be turned off, so the rollers presser. Wipe off any solid matter on the rollers.

Power cable

Please check that a power cable is not scratched.



7.2 Check

Always check for tube breaks during operation. If there is a leak, immediately turn off the power and disconnect the power cable from the outlet.

Periodical maintenance and inspection prevent failure and accident in advance, and provide safe operation. To remain the performance, we recommend it depending on usage and time-of-use. If abnormality is found, don't use the instrument and contact our company. The contact information is mentioned on the back cover of this manual

7.3 Maintenance and Repair

Our products come with a repair service period of 7 years from the date of delivery. Therefore, if you wish to have your product repaired, you will need to request it within this period. However, please note that we generally do not accept repair requests for products that have been in use for more than 7 years.

Furthermore, we store parts for discontinued products for a duration of 7 years after production has ceased. Please be aware that even within the repair service period, there may be cases where repair is not possible due to a lack of available parts.

When repair is required, please send the unit back to ATTO or our distributor, in principle. If on-site repair is requested, travel expense will be required in addition to the repair cost.

7.4 Warranty

Please refer to the warranty card attached to the product for the warranty policy and warranty period.

8 Specification

8.1 Specification

Flow rate		Standard ATTO olefin tube, inner diameter 2 mm, outer diameter 4 mm (with 95 mm luer fitting), 0.01 to 13 mL / min Standard ATTO olefin tube, inner diameter 4 mm, outer diameter 6 mm (with 95 mm luer fitting), 0.01 to 35 mL / min
Variable flow rate range		0.005-50rpm (flow rate depends on tube)
Flow stability		± 1% / h (When using a standard ATTO olefin tube, inner diameter 2 mm, outer diameter 4 mm, after stable shipping.)
Number of channels		3ch
Tube life		2 weeks or more (When using a standard ATTO olefin tube with an inner diameter of 2 mm and an outer diameter of 4 mm.)
Discharge pressure		Maximum 3.5kg (0.35MPa) (When using a standard ATTO olefin tube with an inner diameter of 2 mm and an outer diameter of 4 mm.)
motor		Stepping motor
Number of rollers		12
Touch panel		4.3 inch LCD with the pressure sensitive Touch Panel
Setting	Liquid delivery	START/STOP
	Liquid delivery direction	CW/CCW
	Automatic stop function	Capacity, Time
	Flow calibration	Depends on the built-in timer and the measured liquid volume.
	Setting parameter	Tube type, Power failure processing
	Continuous flow rate display	Flow rate (mL / min, mL / h "depending on the tube")
		% With respect to maximum flow rate (0.1% to 100%) Rotation speed (0.01 to 50 RPM)
	Constant flow rate display	Actual flow rate (Internally set flow rate cannot be displayed while the actual flow rate is displayed.)
The timer is the remaining time or the remaining capacity.		
Flowmeter		Be developmenting
PC		"START, STOP, rotation speed (%), CW / CCW" via USB serial.
Foot switch		"ON-OFF control" via mini-DIN connector 4P
usage environment		4-40 °C, No condensation
Body material		AL・SUS・SPCC・POM
power supply		AC100－240V, 50－60Hz, 20VA
Dimensions , weight		130(W)×260(D)×135(H)mm, 5kg









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