

Program Fluid Control System

PMD-D35

Instruction manual

Installation / maintenance

※For how to use the PMD-APP, please check the separate 'PMD-APP Manual.'

※The following instruction manuals are saved on the USB memory that comes with this device.

- "Screen Transition" screen map and details
- "Making NORMAL Program" Touch panel operation steps
- "Making TTL Program" Touch panel operation steps



Before use

Thank you for purchasing the Tokai hit product.

This manual describes how to install and maintenance the system.
Please read this manual carefully before using the system.

Please refer to the other manuals for PC software, functions, screen transition and program creation.

※ The following manual (printed) is separated from this manual.

1. PMD-APP • • • PC software operation

※ The following manuals are saved in the USB memory included in the system.

1. Screen transition • • • Screen map and
detailed screen explanation
2. NORMAL Program • • • Touch panel creation procedure
3. TTL Program • • • Touch panel creation procedure

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For Safe and Comfortable Use

About symbols and indications
These warnings enable safe and correct usage, and prevent dangerous situations. Please follow them at all times.

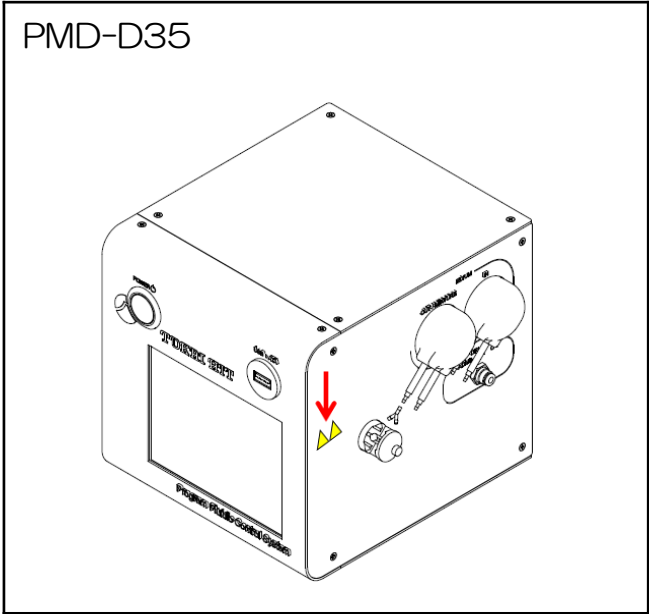
Symbol meaning

 WARNING	Indicates a hazardous which could result serious injury.
 CAUTION	Indicates a situation which could result slight injury.
CAUTION	Indicates a situation which could damage the equipment or other apparatus.
NOTE	Point of attention

Indication meaning

	Injury or damage to equipment is possible
	Must not be done
	Must be done
	High temperature possible
	Electric shock possible
	Information

Position of indication



For Safe and Comfortable Use

To all users

- ❗ This device is to be used by researchers doing cultivation observations in a laboratory. It cannot be used at home.
- ❗ Do not take the equipment apart. This results in damage.

When shipping

- ❗ Please treat this precision instrument with care. Impacting it is forbidden.
- ⊘ Do not put any heavy things on the box.
- ⊘ Do not turn the box upside down.
- ⊘⚡ Do not let the unit moisten.

Regarding the environment for usage and storage

- ⚠ Do not use this equipment in the below conditions.

Flammable or corrosive gas or oil mist that can damage electrical insulation

Intense vibration or impact

High voltage power lines, inductive interference

Place where dew drops are present or with direct sunlight

Place with much dust

Points to pay attention when installing to a microscope

- ❗ When installing PMD to the chamber, drive condenser up. There is a risk that the condenser hits and breaks the top glass.
- ❗ Avoid stress on wires and tubes connected to the chamber.

For Safe and Comfortable Use

-  Connect the perfusion lids and the controller with supplied tube firmly. Using another tube causes breakage and escape of gas. If the tube is not fastened well, there is a risk that it comes off.
-  Do not bend the silicon tubes. If they are plugged, the gas cannot be adequately supplied to the chamber.
-  Use only the specified electricity and cables. If other cables are used, this might result in electric shocks. Using a non-specified voltage might result in equipment damage.

When using the equipment

-   Do not handle the equipment with wet hands. It might cause damage to electric equipment.
-  Please pay attention to the following items in order to suppress focus drift during long-term imaging.
 - Use in a stable room at room temperature of 20 to 28°C.
 - Don't let the wind hit the Tube Heater
-   Do not place anything around the power outlet so that the power plug can be pulled out in an emergency.

For Safe and Comfortable Use

Storage

-   Turn off power supply while performing maintenance,
-  Clean device with soft cloth using small amount of diluted neutral detergent. Do not use organic solvents.
-  Do not wash the equipment with water.
-  After use, clean the inside of the tube and SUS pipe with alcohol before storing.
-  Do not use volatile materials such as benzene or thinner for cleaning. Use of such materials will discolor and/or damage key device surfaces.
-  It is important to read this Instruction Manual before using the equipment. If it is used in manner other than specified in this manual, safety cannot be assured and it may result in damage to the equipment which will not be covered under warranty. Please follow the instructions.

Summary

This equipment is a fluid control system for research which has the following characteristics.

Maintain long-term health of living cells with nutrition supply and drug stimulation close to the biological environment

Automate flow rate and duration, timing of drug delivery with program operation.

There are 449 patterns of programming by combining Perfusion, Media Exchange, Drug delivery and Mixing.

Improve repetition accuracy of media exchange by programming standby time.

Cooperation system is possible by cooperation with external equipment using TTL signal.

Eliminate dependency on personal skills with pipetting and increase repeatability of an experiment.

1 Components

1.1 Components

Name of Components	Qty
Controller (PMD-D35)	1
Container for Medium Exchange	1
Container Stand	1
Continuous Perfusion Container	1
Tube Heater	1 or 2(※1)
Tube Set	1 (※2)
Dish Attachment (UNIV2- for 35mm dish x 2pc)	1
D35 Perfusion lid	1
USB flash drive	1
Power Cable	1

※1

PMD-D35 • • • Tube Heater 1
(MEDIUM IN、 DRUG、 MEDIUM OUT_ Minimum)

※2

Depending on the model, the contents of the tube set are different.
PMD-D35 • • • ①Controller⇔Tube Heater(φ 3×1 L=2000mm)
②Tube Heater⇔ D35Perfusion Lid (φ 3×1 L=1000mm 4本)
③Controller⇔ D35Perfusion Lid (φ 3×1 L=2000mm)

2 Specifications

2.1 Specifications

			PMD-D35 (1CH)
Basic	Control		Tube Pump, Diaphragm Pump
	Setting		Touch panel or PC
Program	Step action	Continuous perfusion	0.04~0.1mℓ /min
		Medium exchange	Maximum 10 times
		Drug administration	20μℓ ~
		Mixing	Maximum 10 times
	PRIMING		0~99sec(Resolution 1sec)
	TTL input		More than 20msec (one shot) ※1
	TT input		20~1000msec (one shot)
	Program repeat		Maximum 14 times
Heater	Temperature control		PWM Control
	Increments		0.1℃ by digital switches
	Temperature setting range		10℃~60℃
	Controllable temperature range		Ambient + 5℃~50℃
	Accuracy ※Heater outlet		Within ± 0.3℃ of water temperature after passing through the heater with respect to the set temperature ※2
	Sensor		Pt100
Power source			100 V ~ 240 V AC ±10% 50/60Hz
Maximum power consumption			120W

※1. Set to 0V when there is no TTL input (when LOW). TTL may be detected at about 0.4V.

※2. The system is calibrated under the following conditions.
Room temperature: 25℃
Liquid used: Water
Number of channels used: 1 channel
Flow velocity: 2.5 ml / min
Measurement point: Water temperature immediately after being discharged from the SUS pipe

2 Specifications

Power Code

For use in areas with 100V-120V power	Use only Power Cable described below: detachable cord set, 3-conductor grounding at 125V, AC125V7A minimum, listed in UL. In case of using with extension cord, use only Power Cable with PE (Protective Earth) wire.
For use in areas with 220V-240V power	Use only 3-pole Power Cable, with plug and outlet complying with EU/EN standards in EU territory. Class 1 equipment must be connected to PE (Protective Earth) terminal. In case of using with extension cord, use only Power Cable with PE (Protective Earth) wire.

Use Conditions

Location	Indoor
Temperature	20°C ~ 28°C
Relative Humidity	35% ~ 85%
Altitude	Up to 2000 m maximum
Environmental Conditions	Installation category II of IEC664, Pollution degree 2

Safety Measures

Fuse	250 V AC T10.0AL Replace with same fuse only.
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Storage Conditions

Temperature	-10 ~ 50°C
Relative Humidity	5 ~ 70%RH (no condensation)
Altitude	Up to 2000m maximum

3 System information

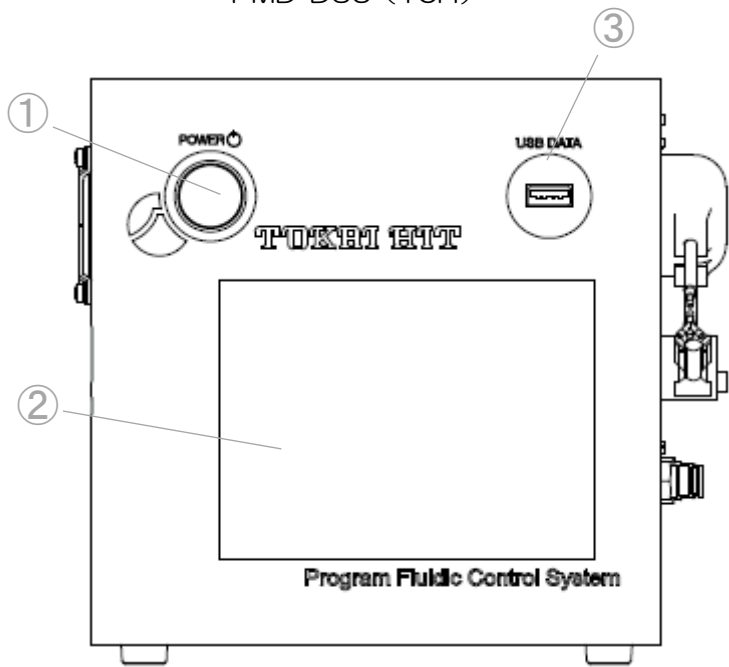
3.1 Controller

Model	Dimensions	Weight
PMD-D35	W175 x D195 x H175 mm	3.2 kg

Front panel

The image is shown for reference only.

PMD-D35 (1CH)

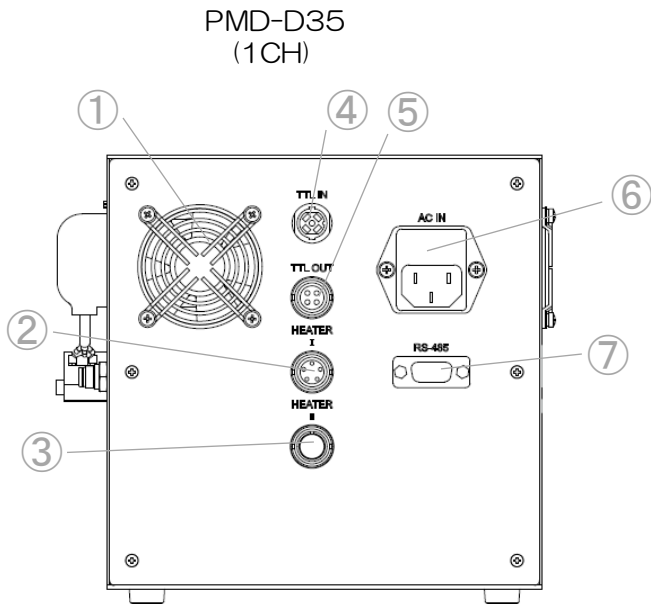


No.	Name	Role	Note
①	Main Switch	Power ON/OFF	In case of emergency stop, turn off the device power.
②	Touch Panel	Setting and indication	
③	USB Port	Install USB memory	Program data saved in a USB memory can be used.

3 System information

Back panel

The image is shown for reference only.



No.	Name	Role	Note
①	DC Fan	Control air flow inside the controller to suppress temperature rise.	
②	HEATER I	Connect Tube Heater	Temperature control of medium/drag. The temperature setting varies depending on the flow rate. (※1)
③	HEATER II		
④	TTL IN	Input TTL signal (5V)	Operate program by receiving TTL signal from external device as a trigger.
⑤	TTL OUT	Output TTL signal (5V)	Output TTL signal from the controller.
⑥	Power cable connection	Connect the power cable	
⑦	RS-485(D-sub9pin)	Connect D-sub9pin extension cable	Connect the controller to PC(※2)

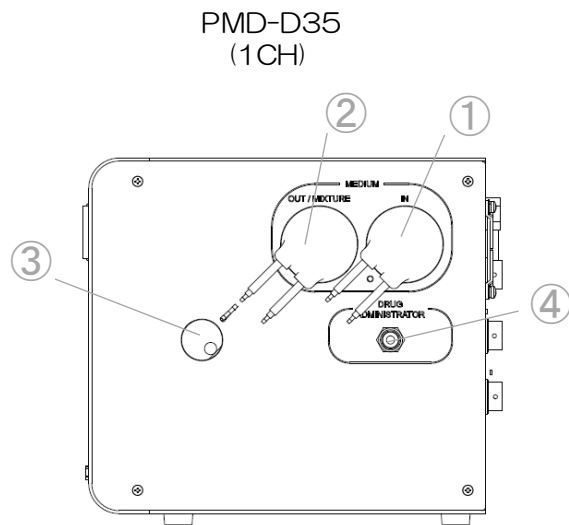
※1
HEATER II is an option.
The temperature setting according to the flow rate is saved in the attached USB.Refer to P.9 of the “NORMAL Program Creation” instruction manual.

※2
Connect the controller to PC with D-sub9pin extension cable +RS-485⇄USB conversion cable. (PC control by PMD-APP is not possible.)

3 System information

Right panel

The image is shown for reference only.



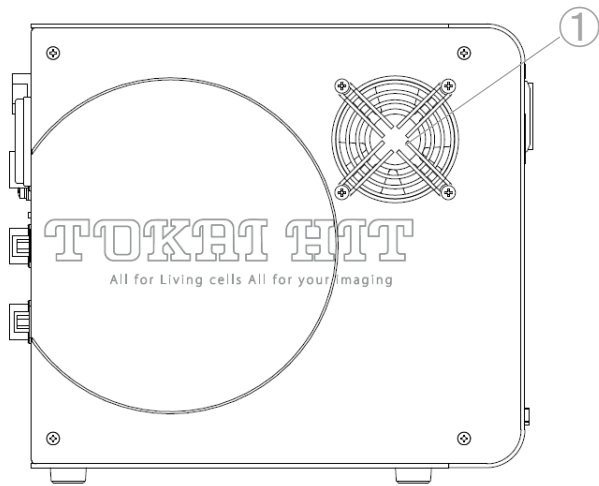
No.	Name	Role	Note
①	Tube Pump (Perfusion IN)	Supply media to the dish	
②	Tube Pump (Perfusion OUT/Mixing)	Waste medium from the dish Mix in the dish	
③	Pinch Valve	Perfusion OUT Switching Maximum/Minimum	Only $\Phi 3 \times 1$ tubes can be installed.
④	Drag Administration ($\phi 4 \times 2$)	Administer drag to the dish	

3 System information

Left panel

The image is shown for reference only.

PMD-D35 (1CH)



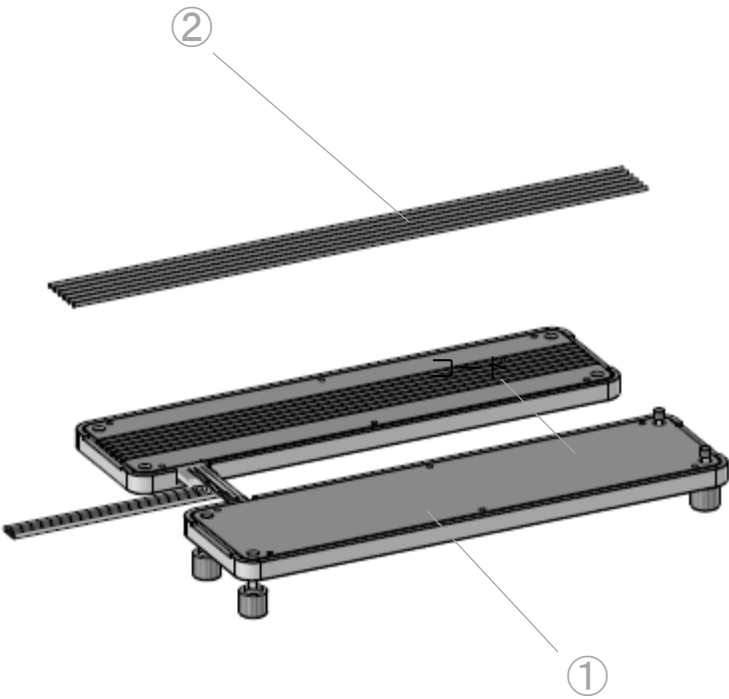
No.	Name	Role	Note
①	DC fan	Control air flow inside the controller to suppress temperature rise.	

 Please do not block the DC fan by putting objects in front of the fan. Temperature inside the controller may rise and malfunction may occur.

3 System information

3.2 Tube Heater

The image is shown for reference only.

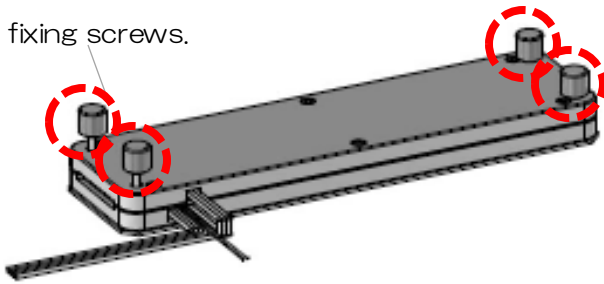


No.	Name	Role	Note
①	Heater	Adjust temperature of drag from low flow to high flow	
②	SUS pipes	Heating drug	Φ1.3 ×0.9 L=180mm

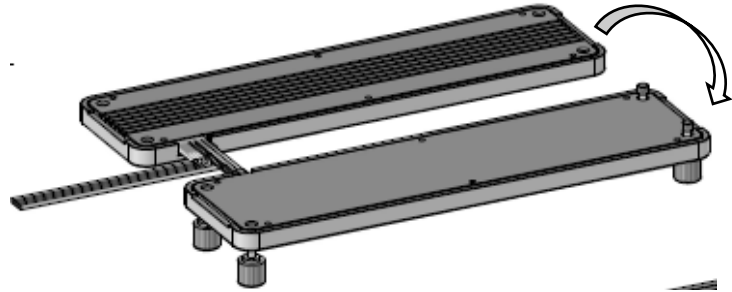
3 System information

<How to use Tube Heater>

① Loosen fixing screws.



② Open the Heater.

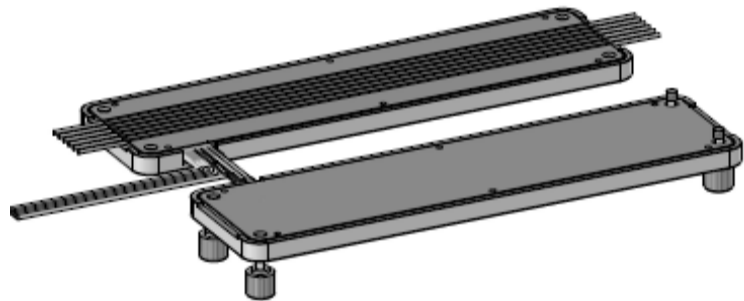


③ Autoclave SUS pipes.

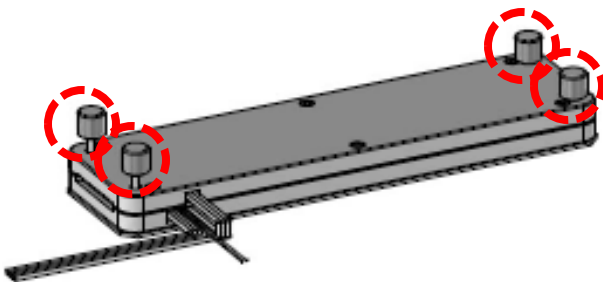


Only SUS pipes can be autoclaved

④ Arrange SUS pipes in the slits of the socket.



⑤ Tighten fixing screws.



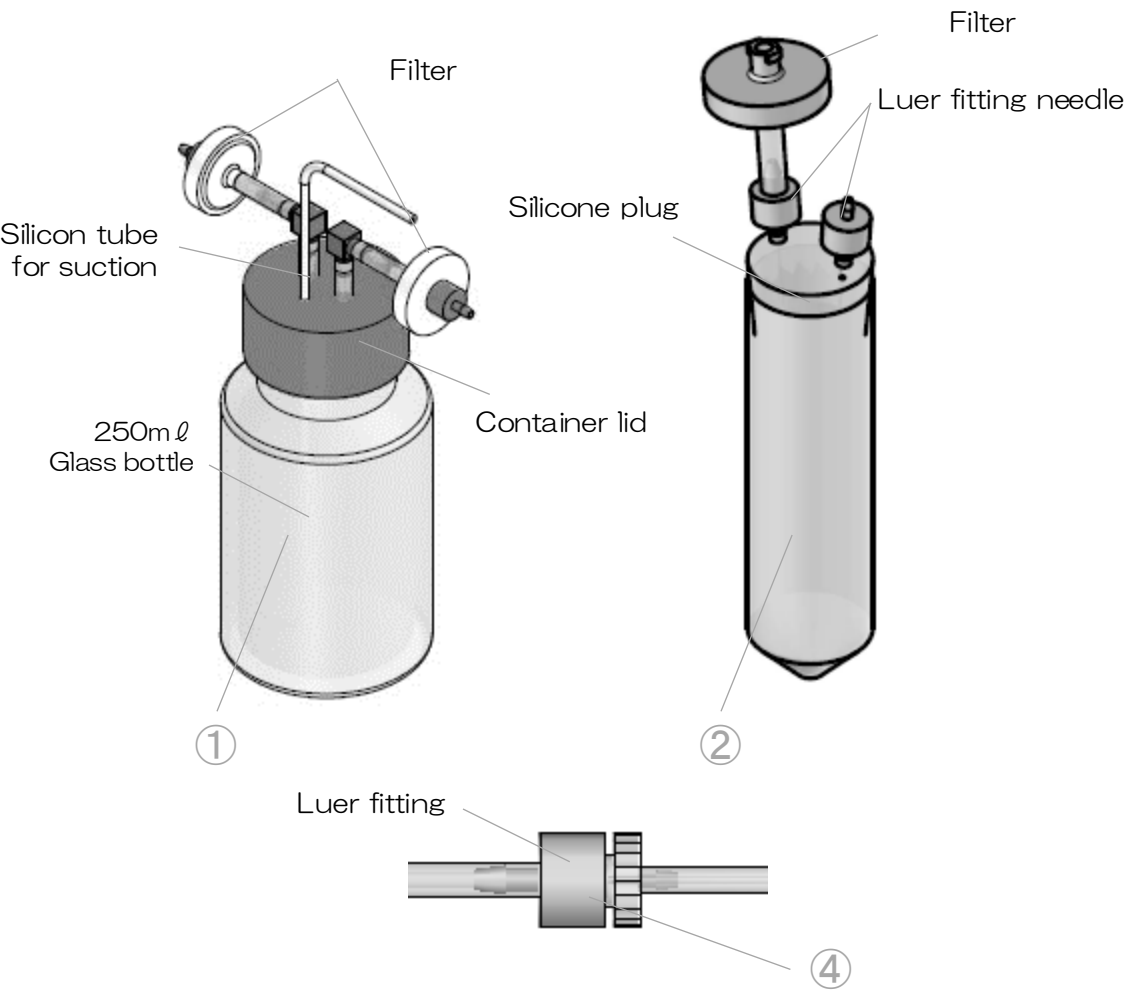
3 System information

3.3 Container

The image is shown for reference only.

<For long term Large capacity >

<For short term Small capacity>



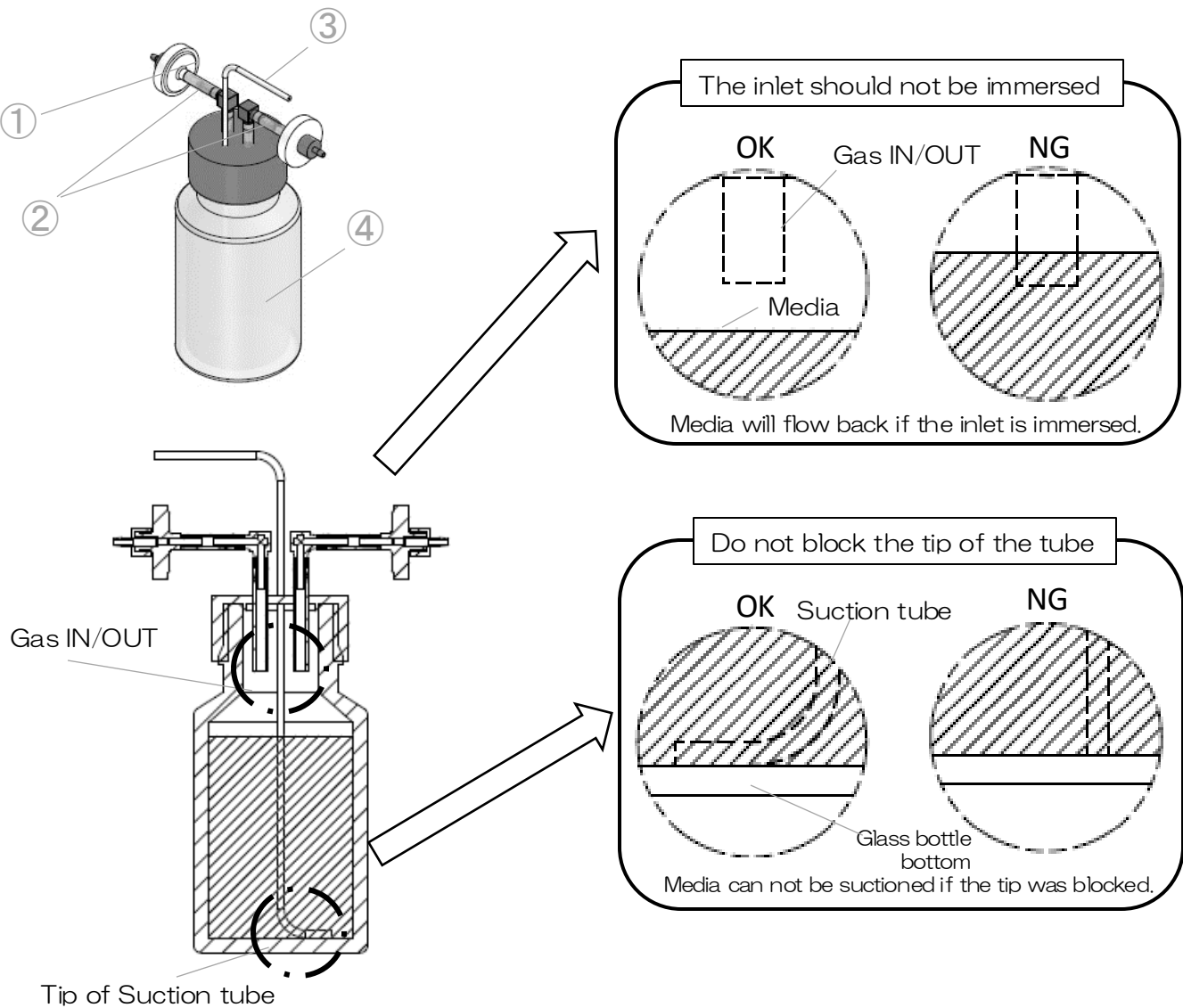
No.	Name	Role	Note
①	Media bottle	Contain high-capacity media	Suitable for PERFUSION
②	Syringe bottle	Contain quantitative or small amount of media Contain drug-containing medium	Suitable for CHANGE
③	Drug administration container	Luer fitting for drug administration	Pour drug into the female side with a pipette

! Only Glass bottle, Silicone plug, SUS needle, are autoclavable.

3 System information

<How to set Media bottle>

CO2 gas can be controlled in the glass bottle to stabilize the pH of the medium.
With a large capacity of 250 ml, it is suitable for continuous perfusion.
* For long-term, we recommend media bottle.



No.	Name	Specification	Note
①	Filter	Pore diameter : 0.22 μ m × Outer diameter : ϕ 25mm	Disposable
②	Silicone tube	ϕ 6×4 L=50mm	Disposable
③	Gas barrier tube	ϕ 3×1 L=①1500mm	Disposable
④	Perfusion container	250ml(Body outside diameter : ϕ 70mm H=142mm)	Autoclavable

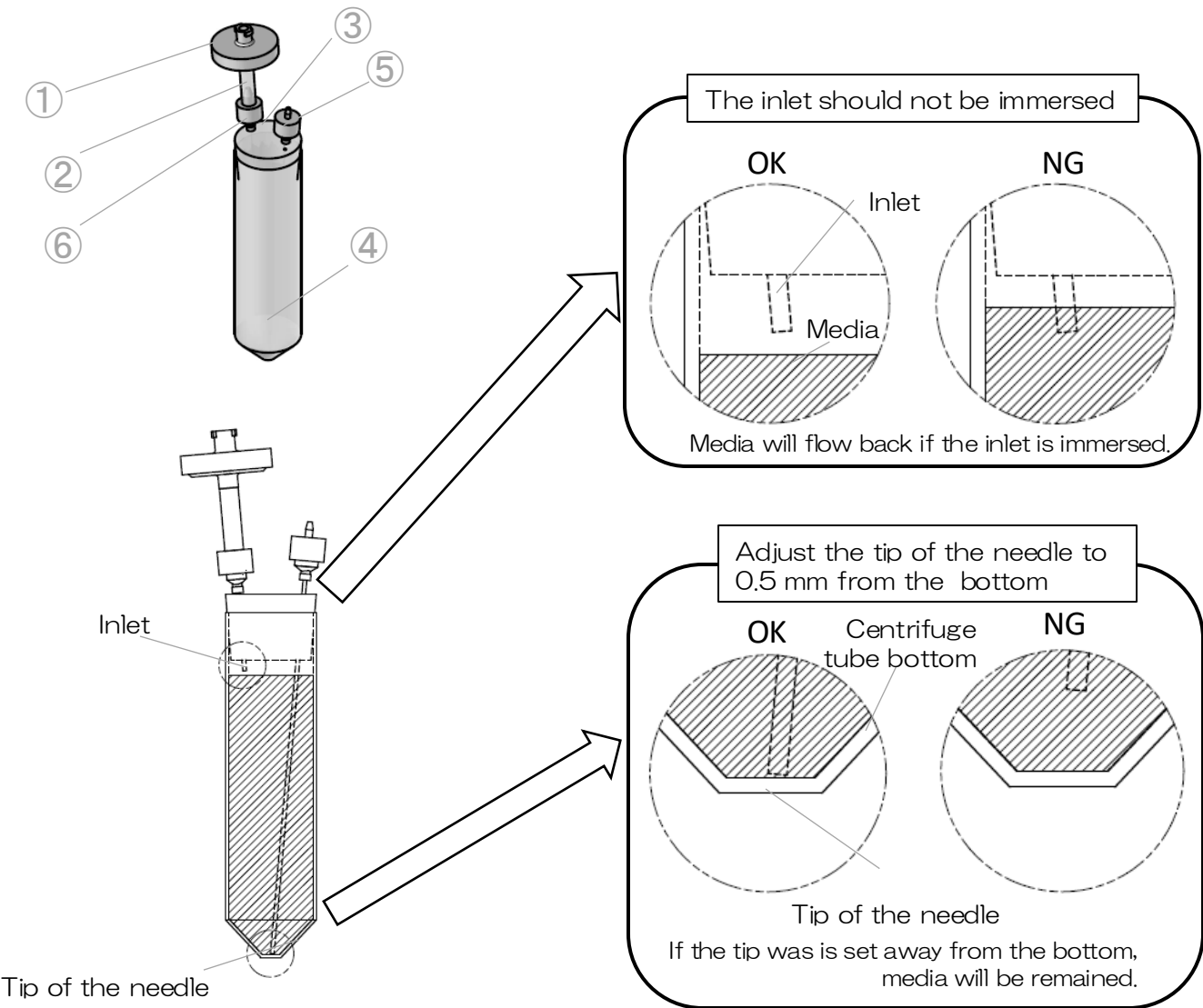


Only Glass bottle is autoclavable.
Please remove the lid before autoclave.

3 System information

<How to set Syringe bottle>

With a small volume of 50 ml or less, it is suitable for short-time experiments.
* For long-term, we recommend media bottle.



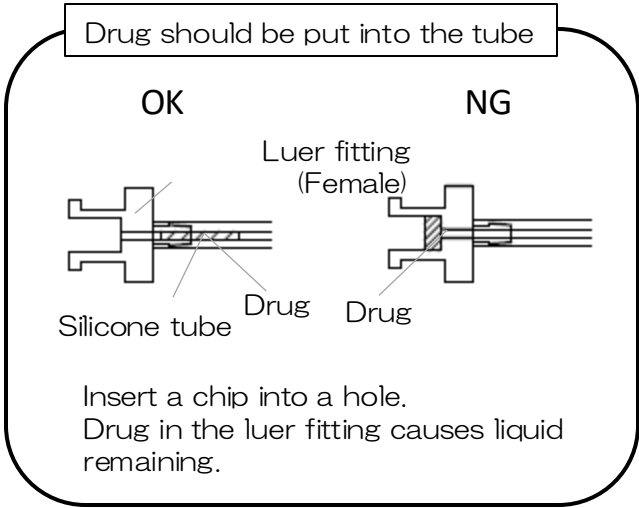
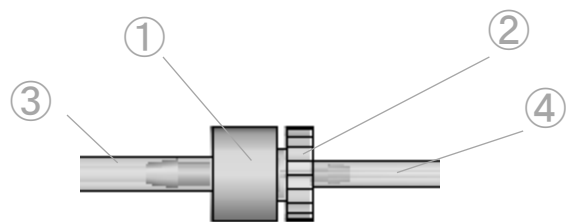
No.	Name	Specification	Note
①	Filter	Pore diameter : 0.22 μ m × Outer diameter : ϕ 25mm	Disposable
②	Silicone tube	ϕ 6 × 4 L=40mm	Disposable
③	Silicone plug SUS needle×2	50ml syringe	Autoclavable
④	50ml centrifuge tube	50ml syringe(Without piston)	Disposable
⑤	Luer fitting	Male ϕ 1.6mm	Please replace regularly.
⑥	Luer fitting	Male ϕ 4.0mm	Please replace regularly.



Silicone plug, SUS needle and Luer fitting are Autoclavable.

3 System information

< Installation of drug administration container >



No.	Name	Specification	Note
①	Luer fitting	Male ϕ 2.5mm	Please replace regularly.
②	Luer fitting	Female ϕ 1.6mm	Please replace regularly.
③	Vinyl tube	ϕ 4×2 L=50mm	Please replace regularly.
④	Silicone tube	ϕ 3×1 3 Flat tube L=2000mm	Disposable

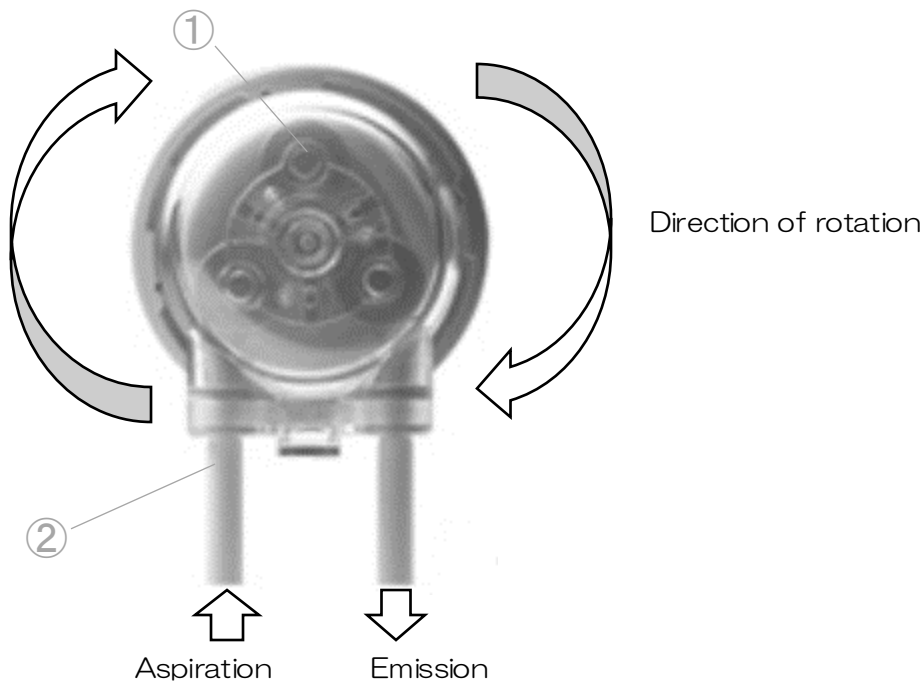


Luer fitting is autoclavable.

3 System information

3.4 Tube Pump

The medium in the tube can be sent by squeezing the PharMed tube attached to the pump head.

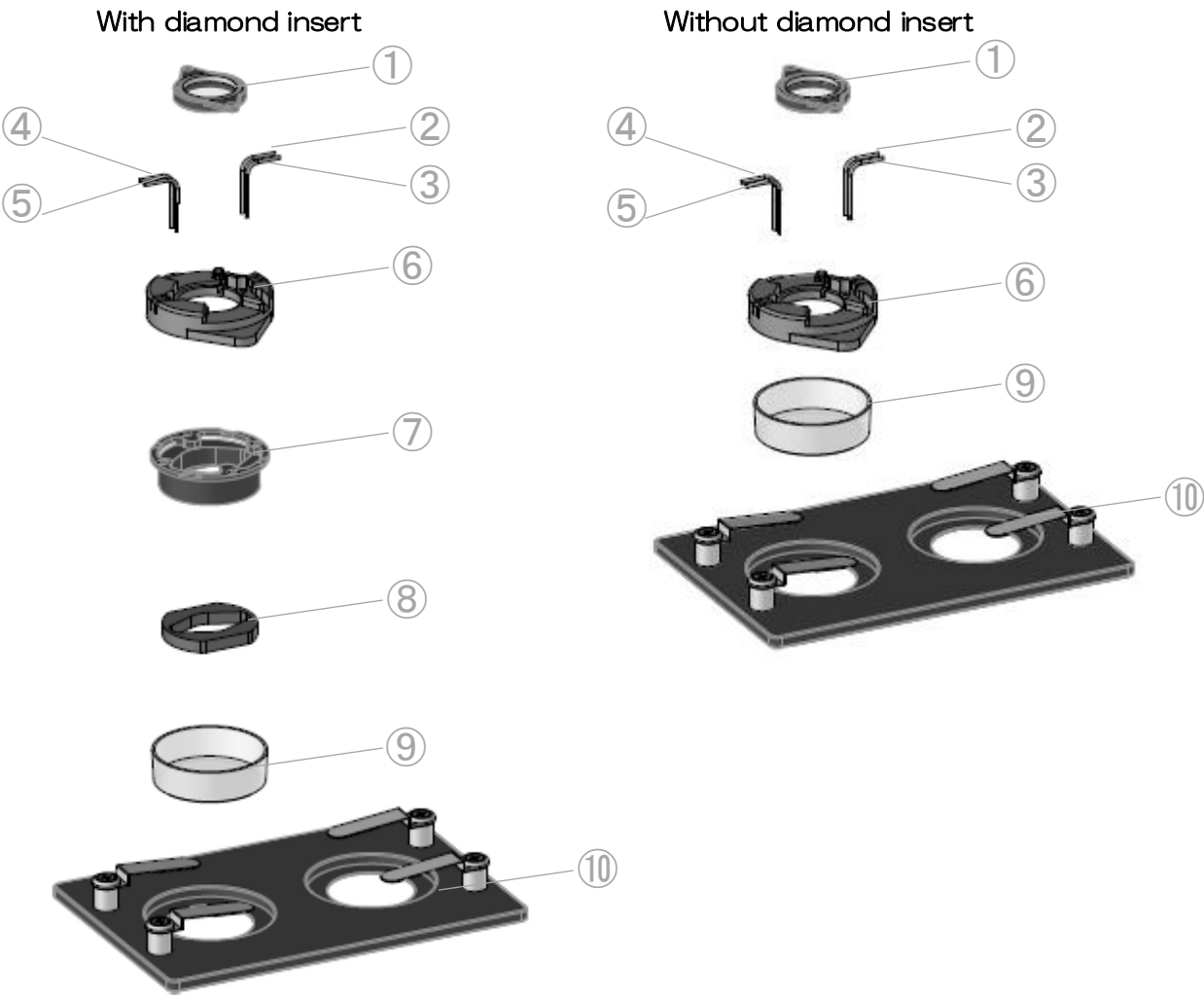


No.	Name	Specification	Note
①	Pump head	WELCO For WPM2	Autoclave per pump head.
②	PharMed tube	IN . . . Outer diameter $\phi 3$ × Inner diameter $\phi 1$ OUT . . . Outer diameter 4 × Inner diameter $\phi 2$	

3 System information

3.5 Perfusion Lid and Attachments

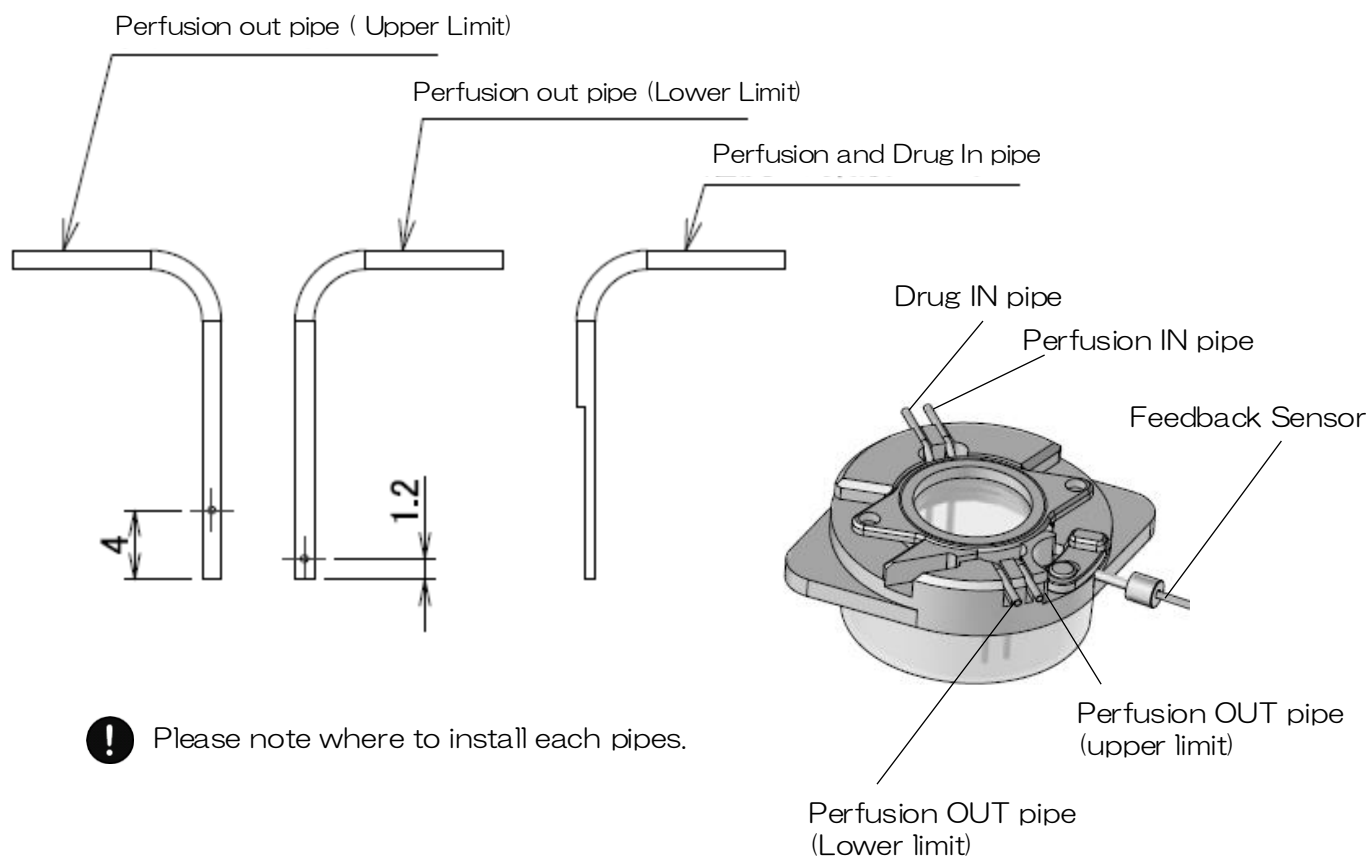
Please use diamond insert when you use less amount of medium.
The image is shown for reference only.



No.	Name	Role	Note
①	Administration Lid	Remove the administration lid and access with a pipette	Please install the administration lid normally
②	Perfusion OUT pipe (Maximum)	Determine maximum limit for continuous perfusion and medium change	Autoclavable
③	Perfusion OUT pipe (Minimum)	Determine minimum limit for medium change	
④	Perfusion IN pipe	Supply medium	
⑤	Drag IN pipe	Supply drag	
⑥	Dish fixing lid	Fixing the dish, pipe and sensor	
⑦	Diamond insert fixing	Prevent leakage of diamond insert	Disposable
⑧	Diamond insert	Diamond shaped flow path	
⑨	35mm dish	Culture vessel	
⑩	Attachment	Set in the Stage Top Incubator	Depending on the model

3 System information

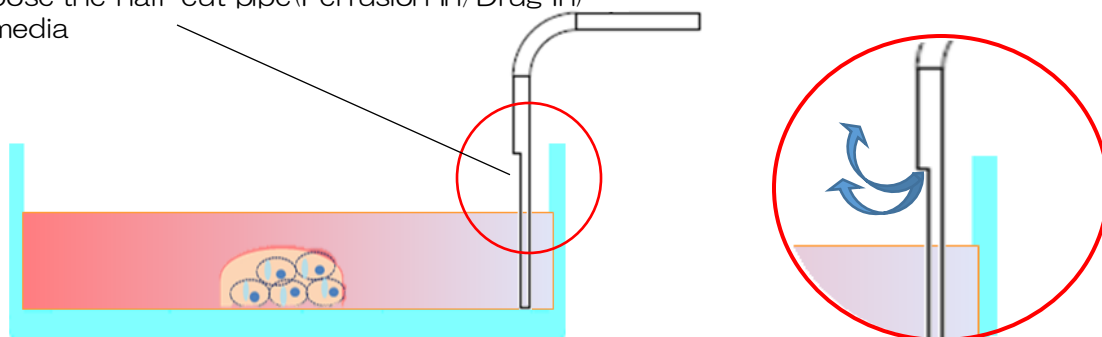
< Types of SUS pipes >



❗ Please note where to install each pipes.

<How to adjust the height of pipes (Perfusion in/Drug in)>

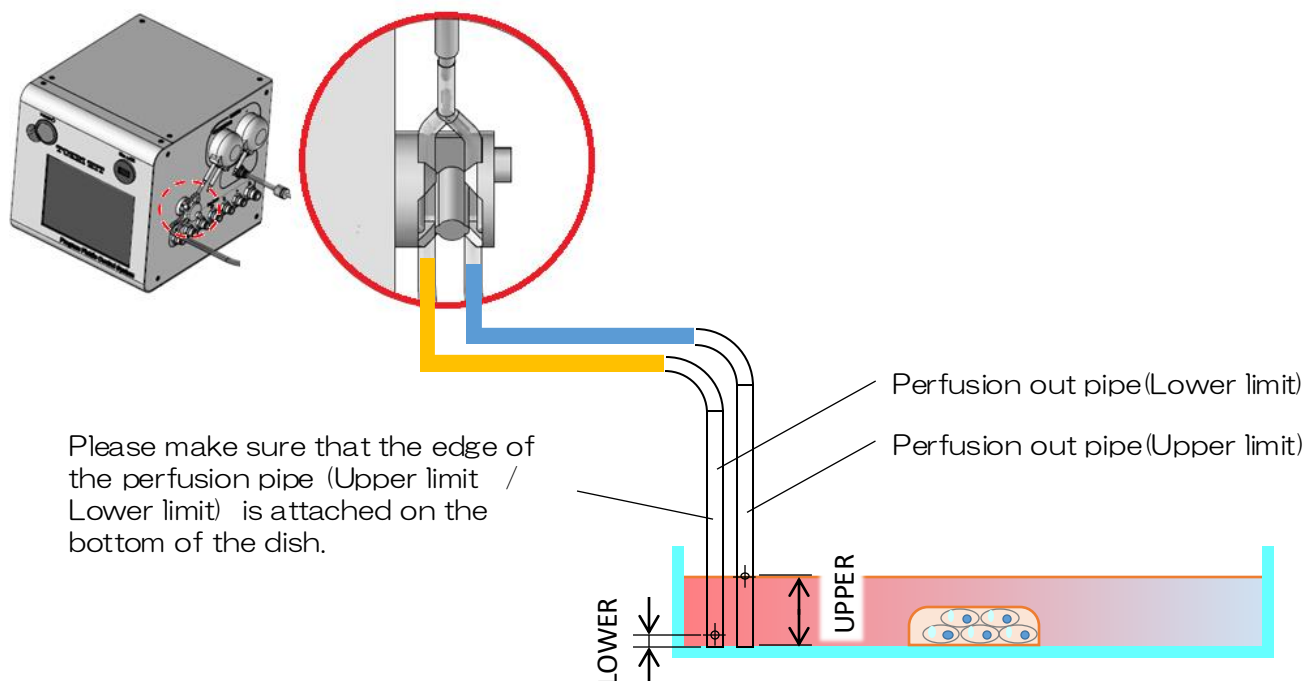
Please expose the half-cut pipe(Perfusion In/Drug In) from the media



❗ The area of half-cut in the pipe is soaked in the media, a little bit bubble can be generated.

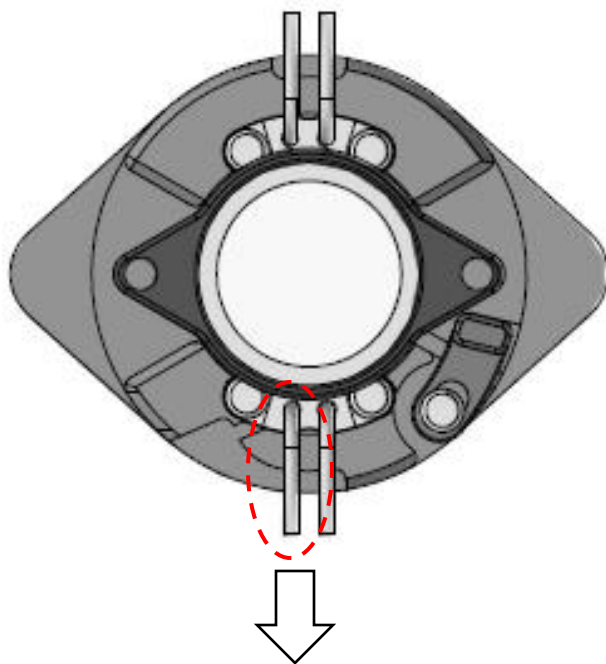
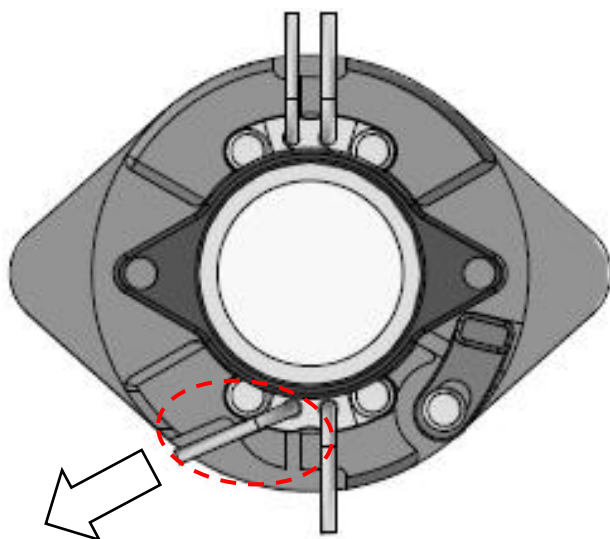
3 System information

<How to adjust the height of pipes(Perfusion out (Upper limit)/(Lower limit) >



With Diamond insert

Without Diamond insert

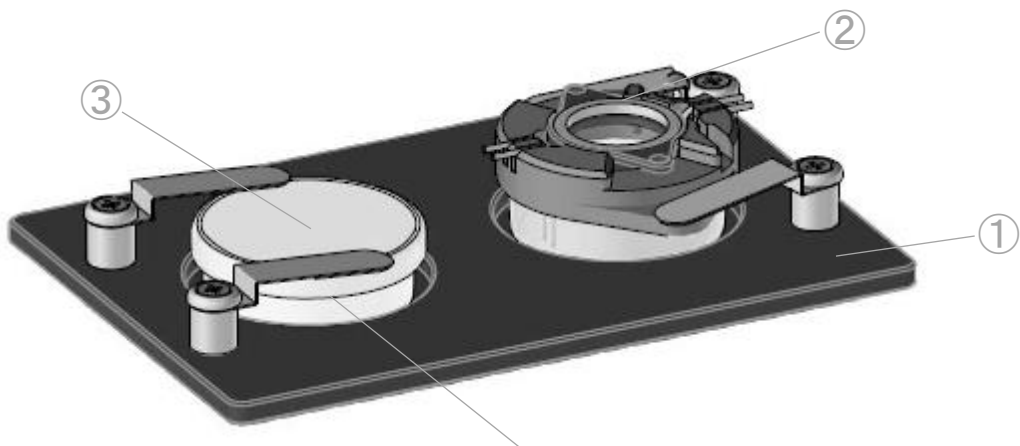


Please move the pipe about 33° , when you mix the media with diamond insert. The media is overflowed if you use it normally.

3 System information

<How to install the attachment>

The image is shown for reference only.



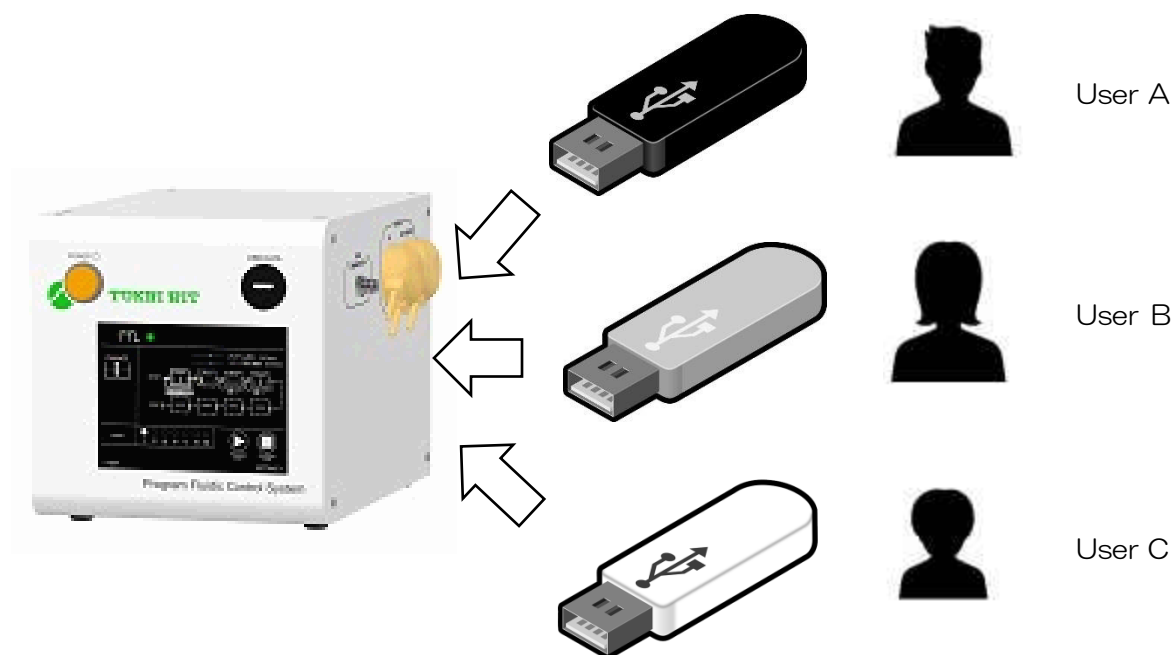
Please put on the empty dish if you do not use it.

No.	Name	Description	Remarks
①	Attachment	PMD-UNIV2	Attachment for 2 dish ※depends on the model, it will be for 1 dish
②	Perfusion Lid	For 35mm dish	Autoclavable
③	35mm Dish	Plastic Dish Cover Glass Dish(Less than Φ14mm)	Disposable

3 System information

3.6 USB

Switch program list by changing USB (Program data can be saved on USB)
Each program list is shown by depending on the user's USB memory.
It also prevents accidental editing by other users.

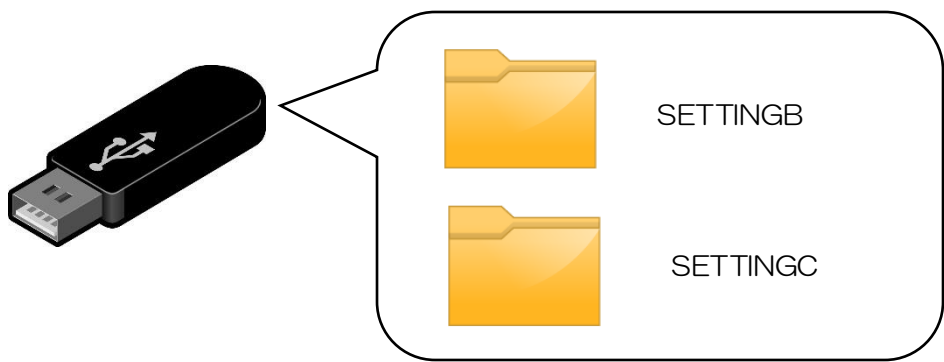


- ! USB is necessary to use the system.
- ! Do not remove USB during using the system. Data can be corrupted.

3 System information

Back up of USB

When you install a new USB to the USB port of the device, a program file and a CSV file are automatically created. Periodically back up the two files.
※You can replace the USB memory by copying the two files to another USB memory.



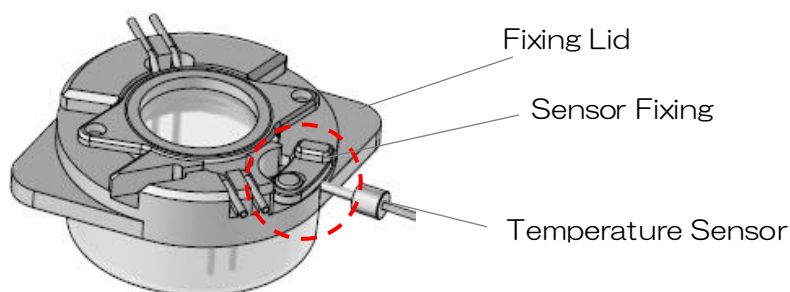
! This system has USB1.1 host interface to be connected the USB memory. It corresponds to USB standard memory of USB mass storage class, but it does not guarantee connection with all devices.
Here is a list of USB memory that is checking the operation.

Manufacturer	Model	Capacity
BUFFALO	RUF3-K16GB-WH	16GB
BUFFALO	RUF3-WBE32G WH	32GB
BUFFALO	RUF3-KSE16GA BK	16GB
ELECOM	MF-TKU3032GBK	32GB
ELECOM	MF-SLU3016GGY	16GB
I-O DATA	U3-PSH	16GB

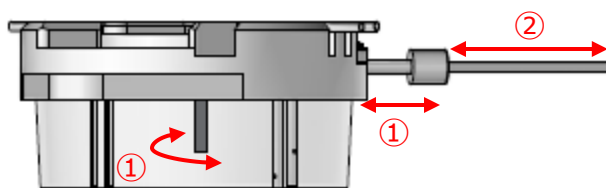
3 System information

3.7 Temperature Sensor (sold separately)

Set Feedback Sensor to Fixing Lid.

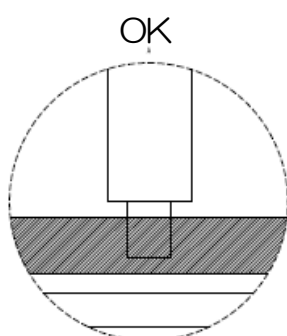
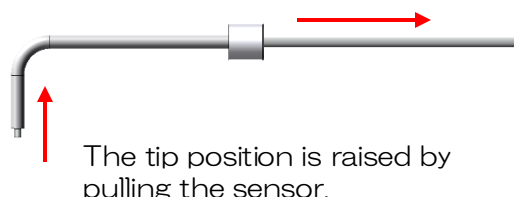
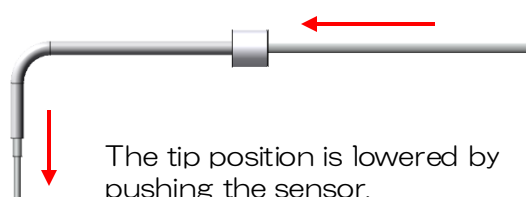


Set Feedback Sensor so that the tip is dipped properly into media in the vessel.

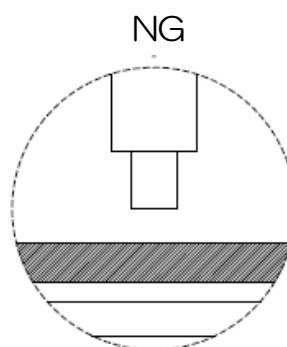


① Adjust the position and angle of the pipe.

② Adjust the height of the sensor tip.



The sensor tip is dipped into media.



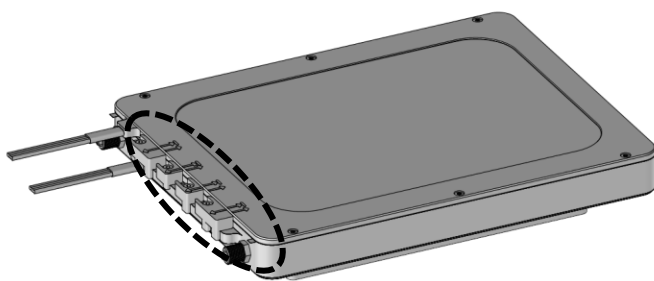
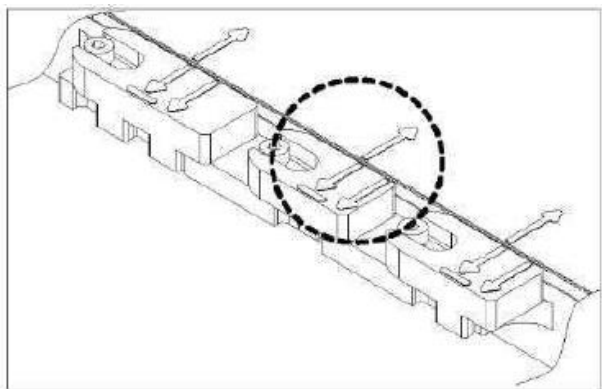
The sensor tip is not dipped into media.

3 System information

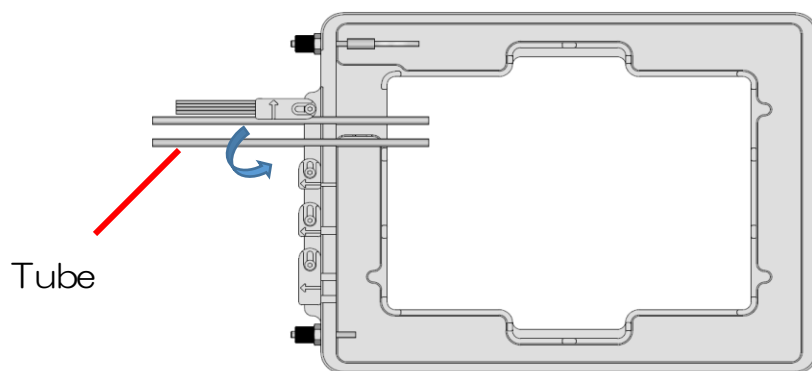
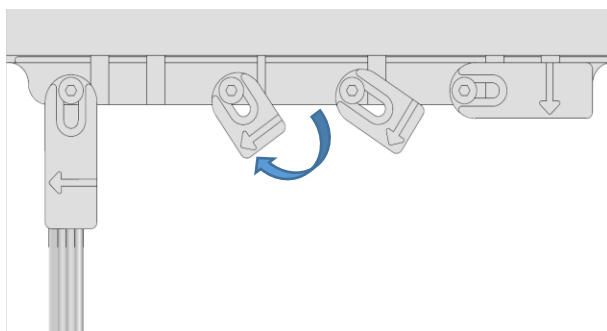
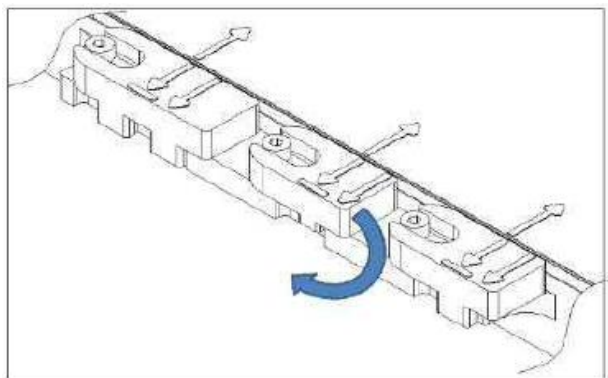
3.8 Chamber (sold separately)

Attach Fixing Blocks properly according to use/non-use of Feedback Sensor and tubes.

1. Align the arrow of the fixed block to .



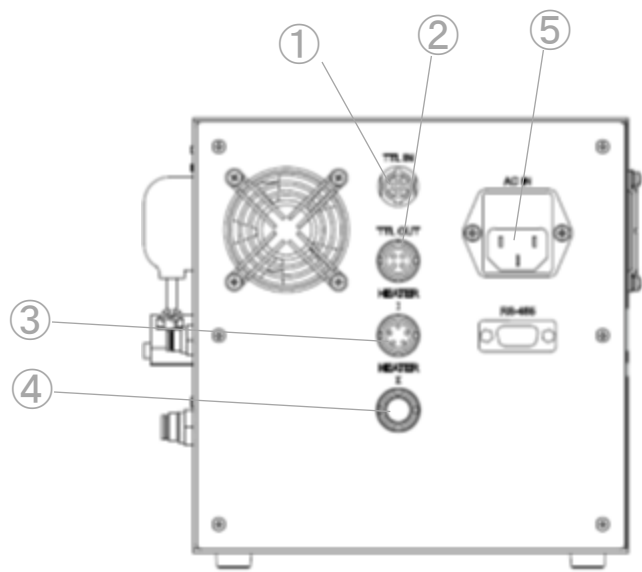
2. Turn the block to be used outward and place the tubes.



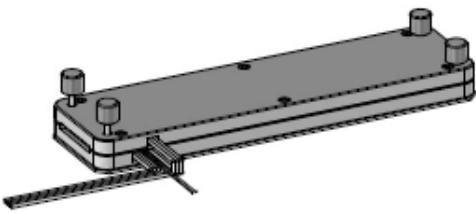
3. Put the block back and fix the tube.

4 Connection

4.1 Controller



①TTL IN ← PC Cable



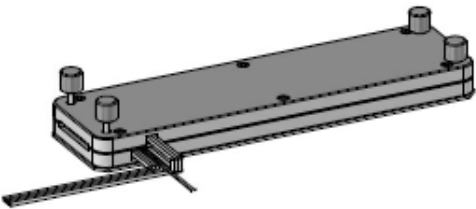
④Tube Heater II (Optional)



②TTL OUT → PC Cable(2 types)



⑤ Power cable



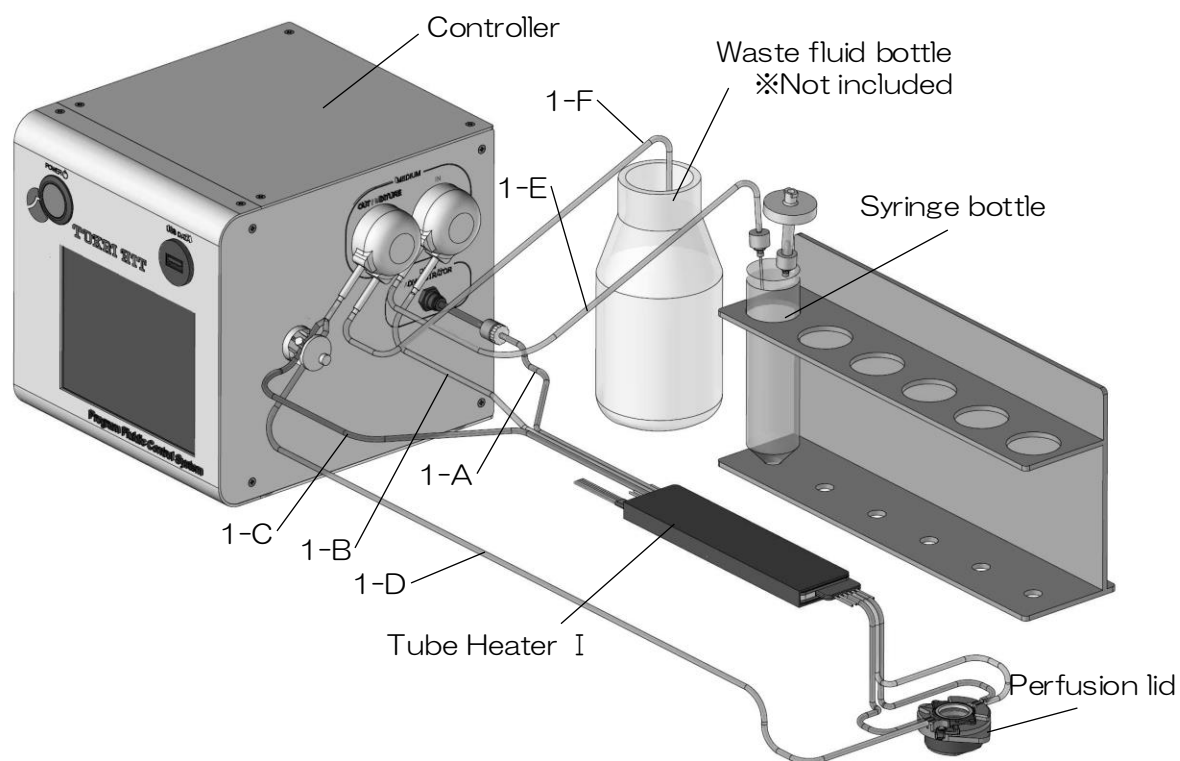
③Tube Heater I

4 Connection

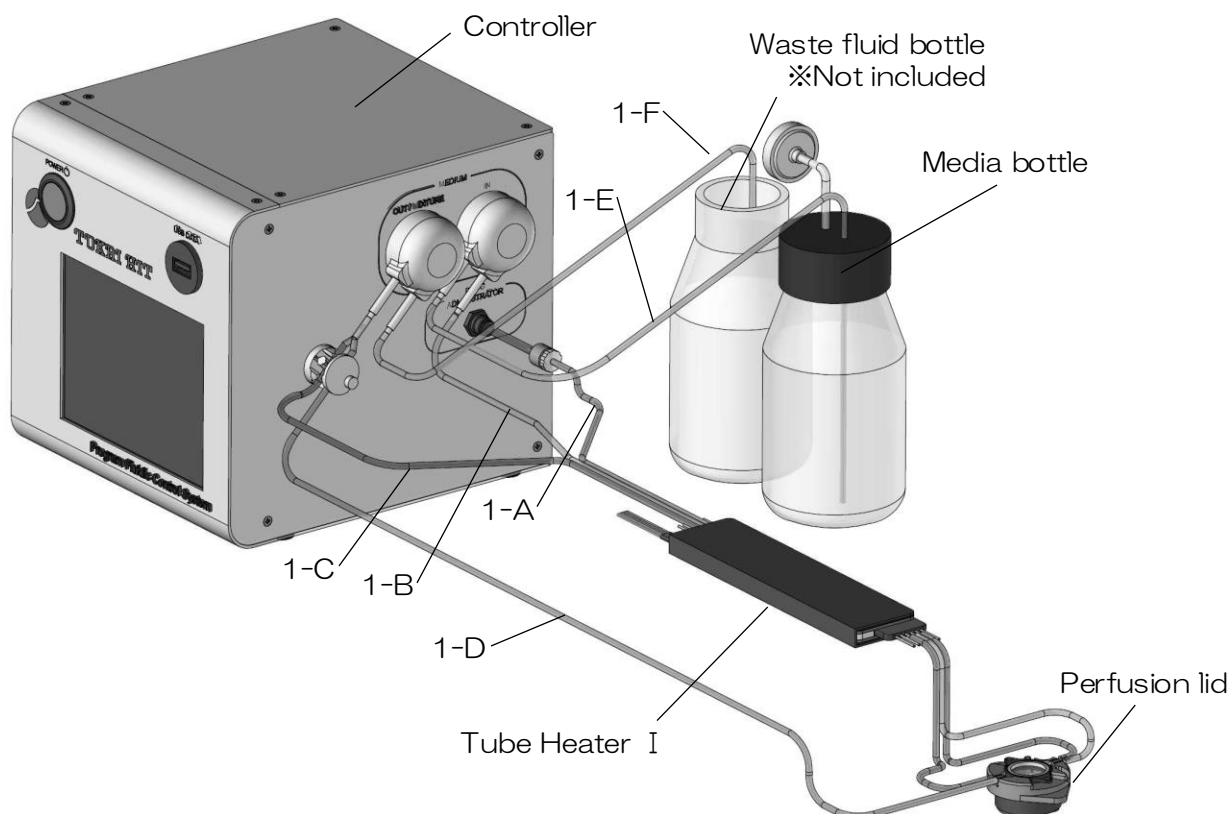
4.2 Tube

The image is shown for reference only.

<Medium container setting>



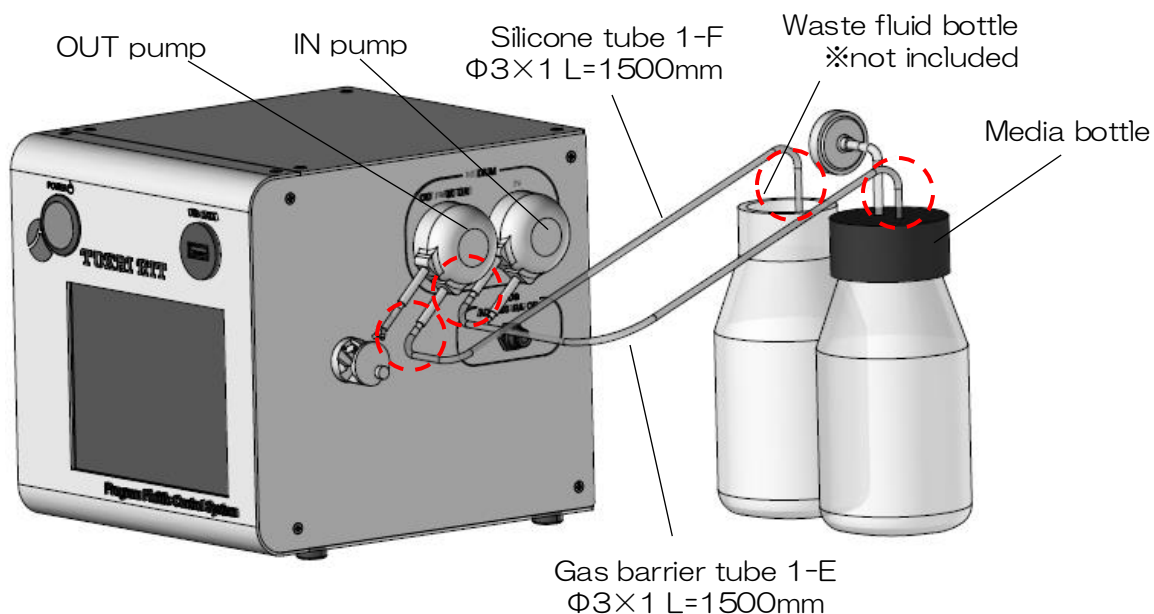
<Perfusion container setting>



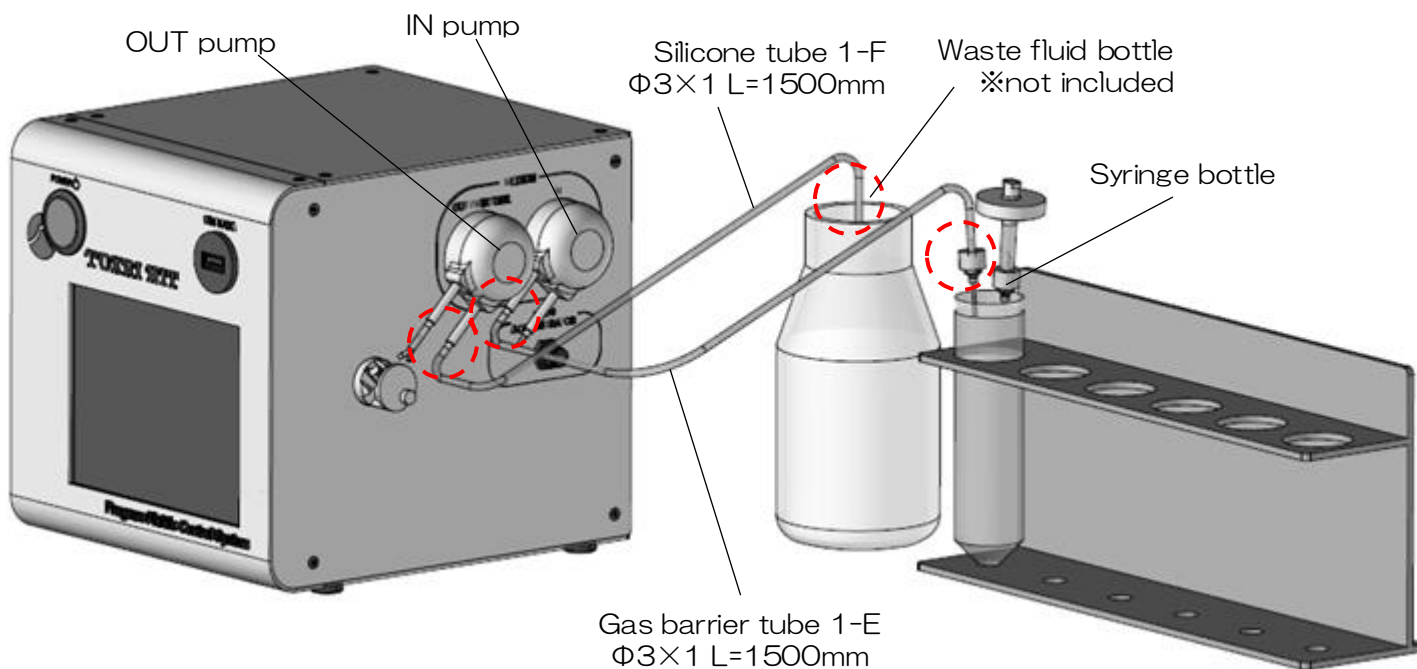
4 Connection

<How to connect tube>

For Continuous media exchange setup



General Media exchange setup (exchange media one a day)

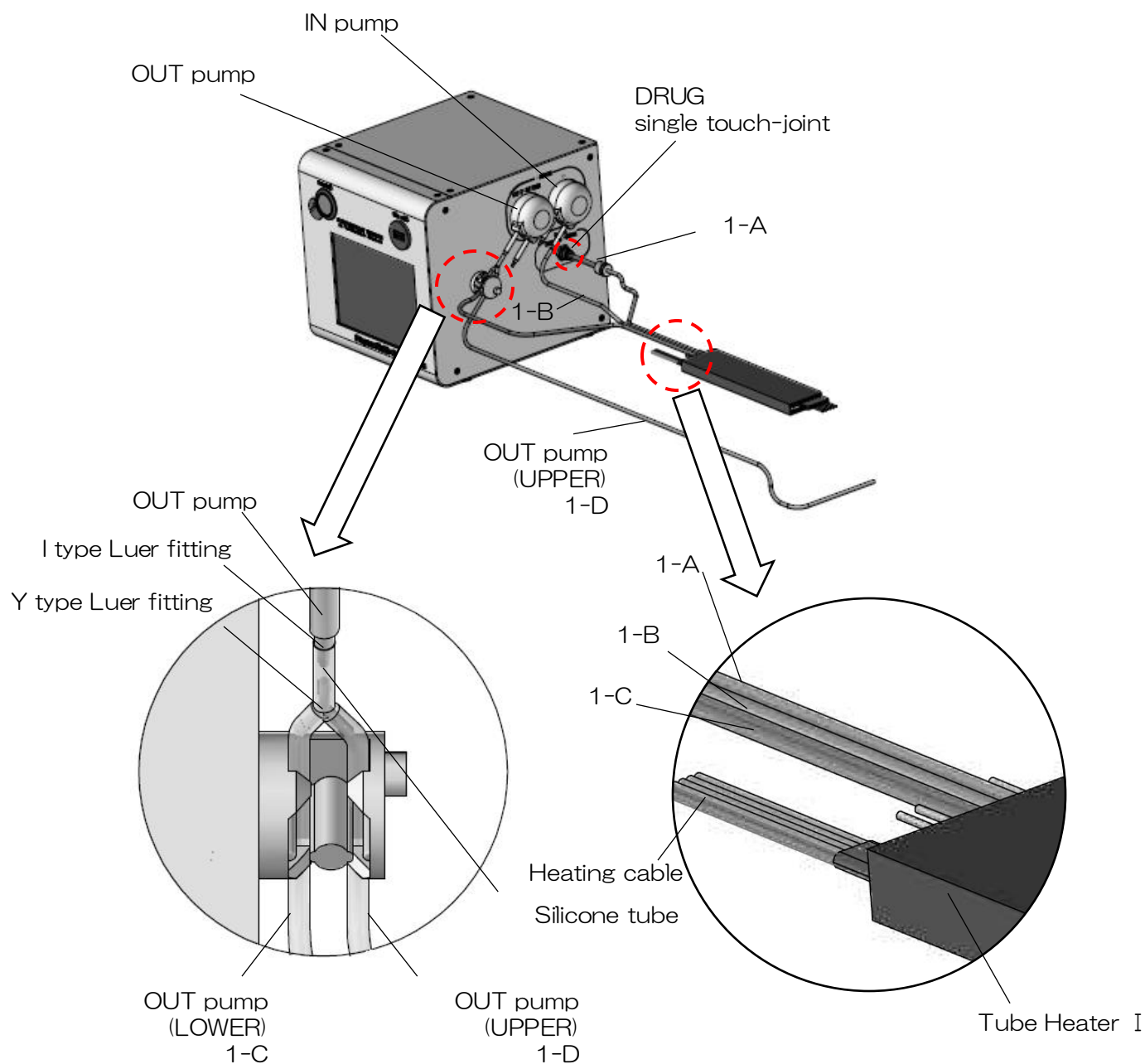


- ① Connect PUMP (IN) and Media Bottle or syringe bottle by $\Phi 3 \times 1$ Gas barrier tube 1-E (included).
- ② Connect PUMP (OUT) and Waste fluid bottle by $\Phi 3 \times 1$ silicone tube 1-F.



The gas barrier tube may become clogged if it is bent for a long time.

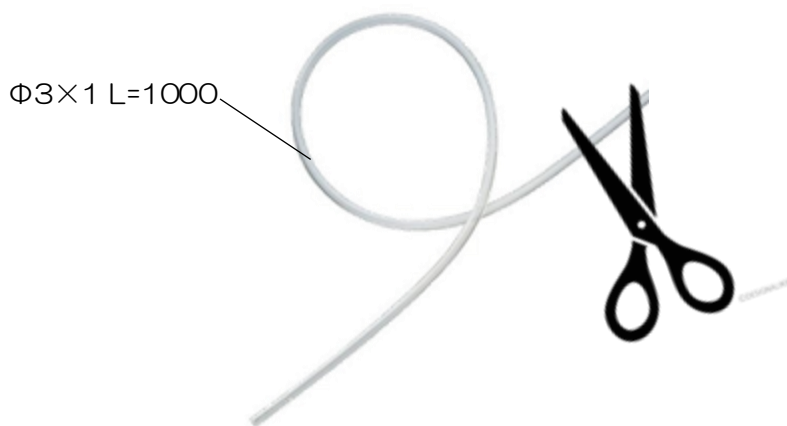
4 Connection



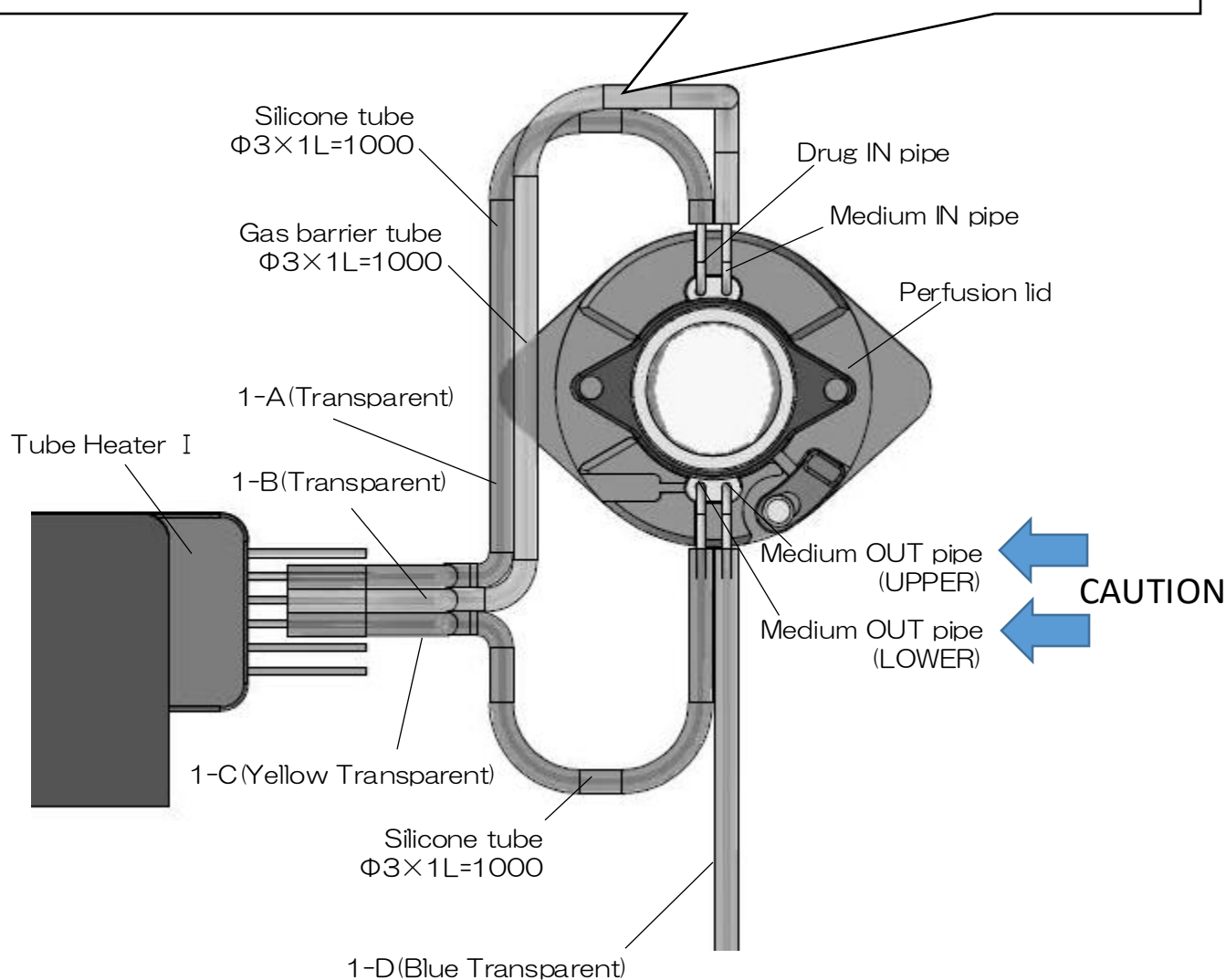
③Connect each tubing according to the image. (match the name of tubing properly).

* Especially connecting MEIDUM OUT TUBE (LOWER) and (UPPER) other way round, the medium may dry out during the experiment.

4 Connection



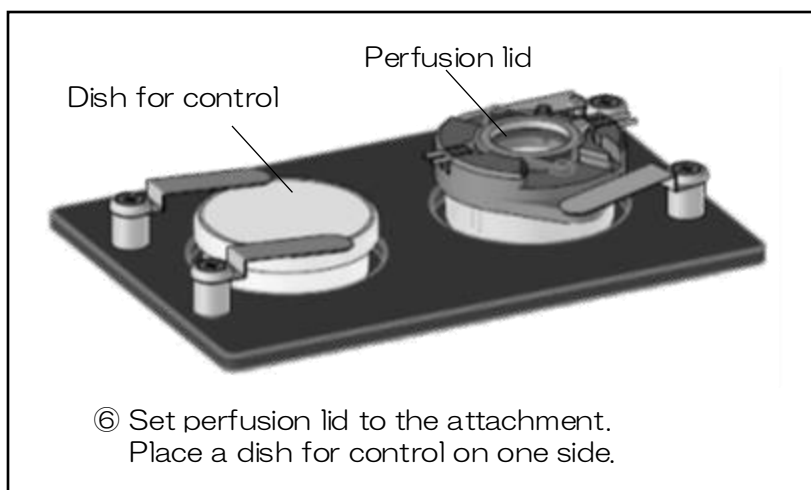
- ④ Cut the 1-A to 1-C tubes of Tube Heater to Perfusion lid to any length between 500 and 1000 mm.



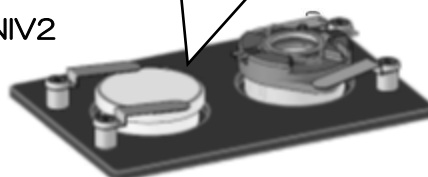
- ⑤ Connect Tube Heater I and Perfusion lid with $\phi 3 \times 1$ tube.

! Extra Caution: do not connect 1-D (UPPER) and 1-C (LOWER) other way round. This will result overflow of the media and damage the system.

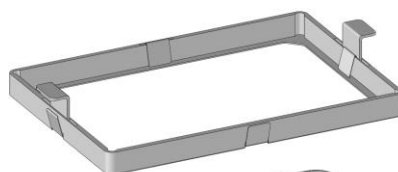
4 Connection



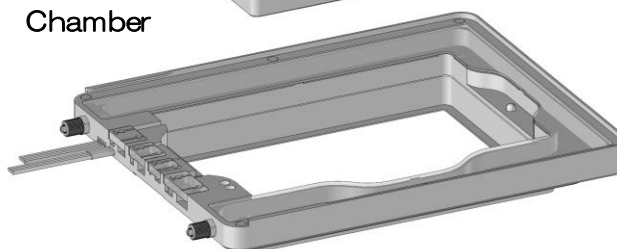
PMD-UNIV2



ATX-W



Chamber



⑦ Set the attachment to the chamber.

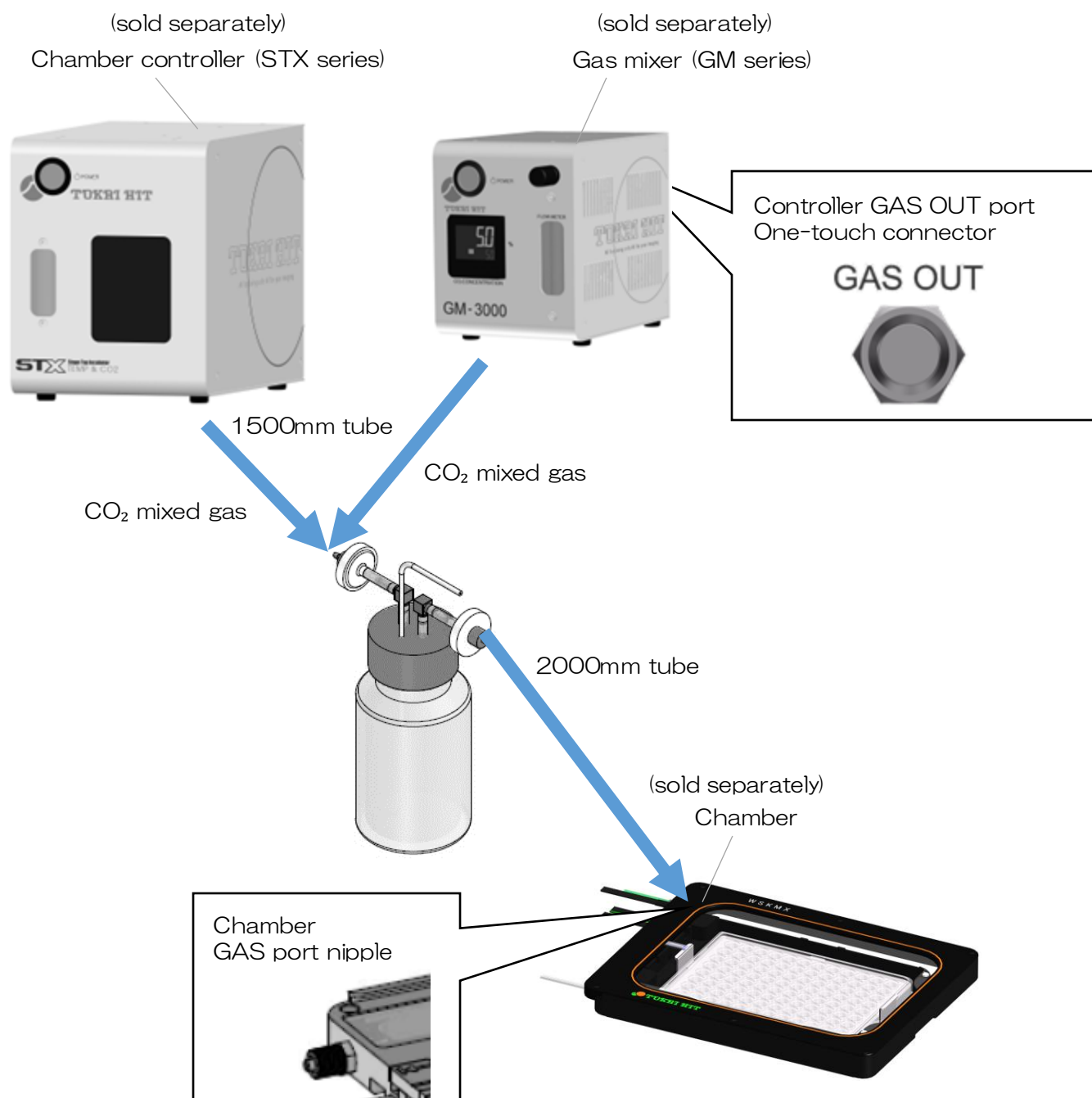
4 Connection

4.3 Gas

When using the Media bottle, the pH of the media can be stabilized by controlling the CO₂ inside the bottle.

By connecting our Chamber controller or gas mixer to the chamber, the gas can be controlled inside the bottle and chamber.

Connect GAS OUT port of the controller and GAS port of the chamber.

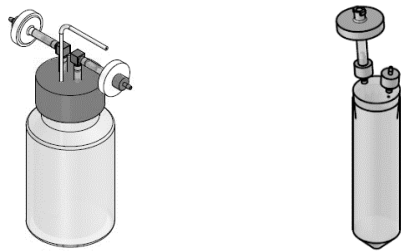


5 Maintenance

5.1 Flushing Tube and SUS Pipe

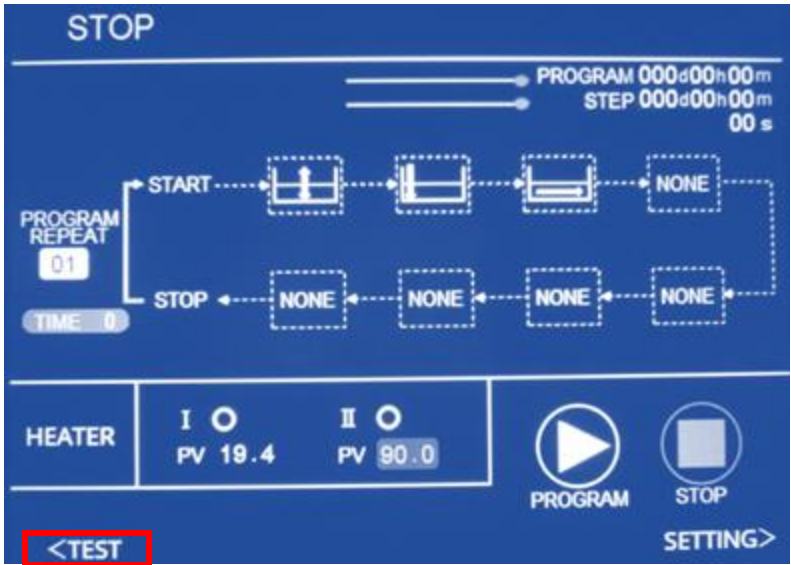
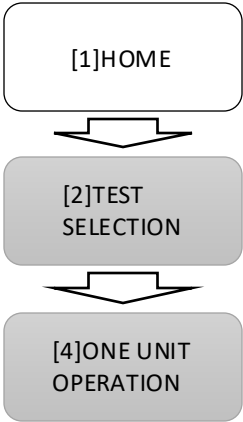
Please flash them after using. It can prevent clogging of tubes and SUS pipes.
If clogging occurs, it will have a big influence on control, so please do flushing.
※ Parts that contact with the media are recommended to be disposable

- ① Put the media into the using bottle→Exchange to the about 50ml alcohol

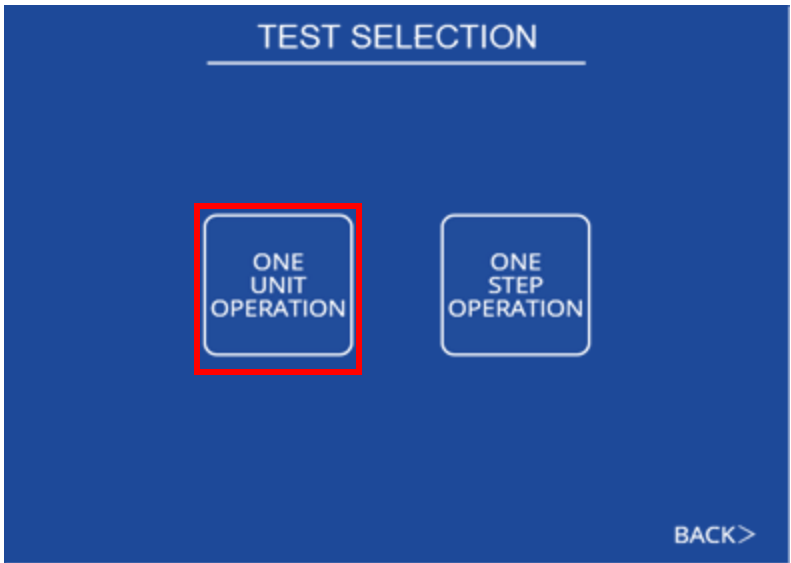


- ② Press TEST

Screen transition

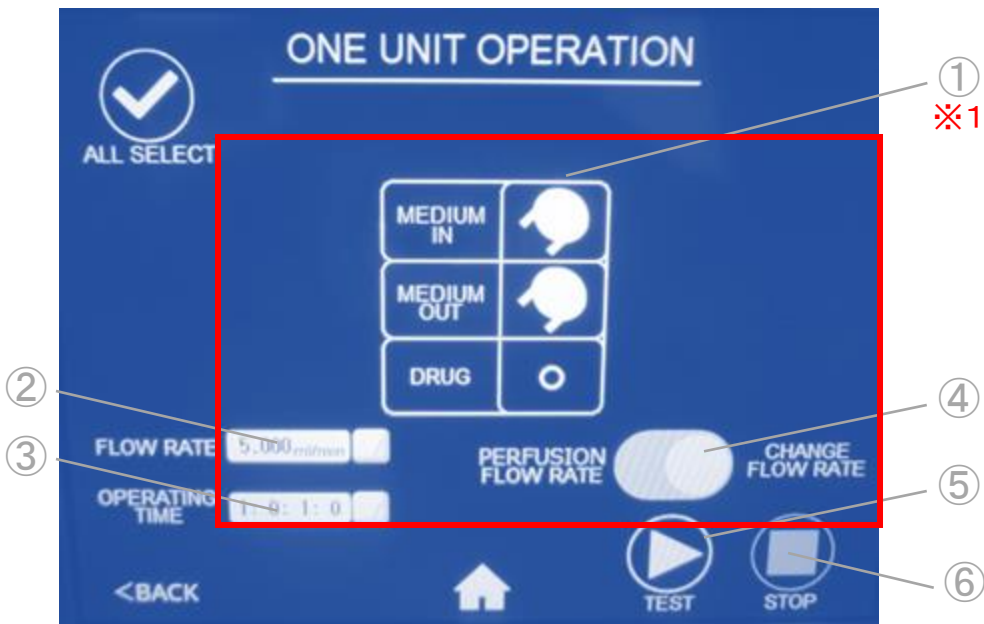
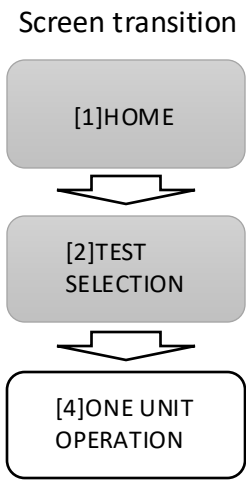


- ③ Press [4]ONE UNIT OPERATION.



5 Maintenance

④ In [4]ONE UNIT OPERATION, press the TEST button for the IN/OUT pump.



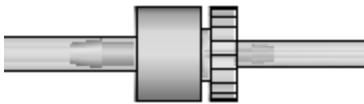
No.	Name	Setting contents
①	Pump selection button	Select Perfusion IN and Perfusion OUT ※Drug Delivery is not selected at this time.
②	Flow rate	Set at 5.0 ml/min.
③	Operating time	Set at 20 min.
④	Switching action switch	Select EXCHANGE FLOW RATE.
⑤	TEST START button	Start TEST operation after selecting ①～④.
⑥	TEST STOP button	Stop TEST operation. This Operation is valid only during TEST operation.

※1 Set ①～④ and then start TEST with ⑤.

⑤ After confirming that no liquid remains in the tube, click ⑥.
If there is residual liquid, repeat steps ② and ⑤ to prevent liquid residue.

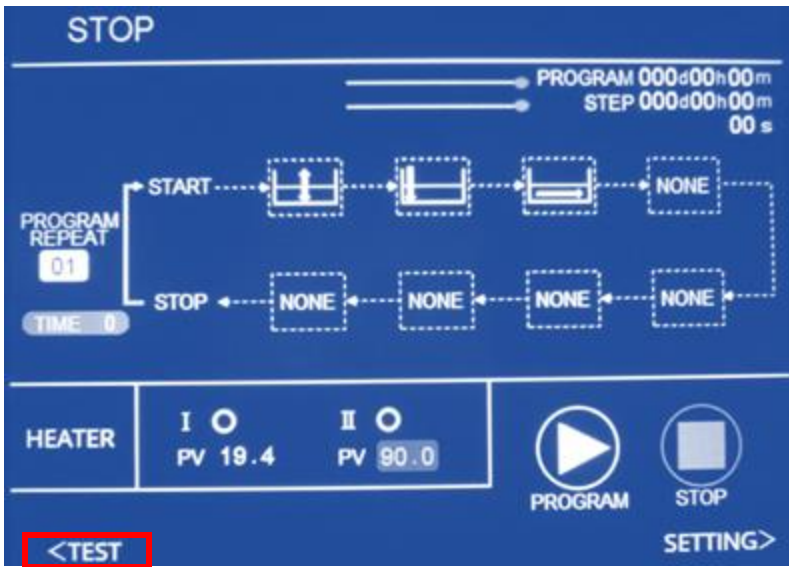
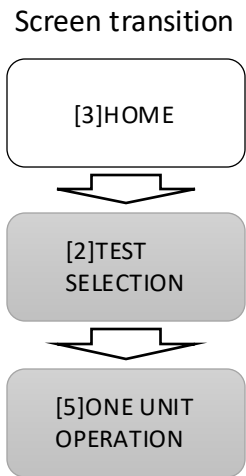
5 Maintenance

⑥ Add approximately 1 ml of alcohol with a pipette to the tube for drug delivery.

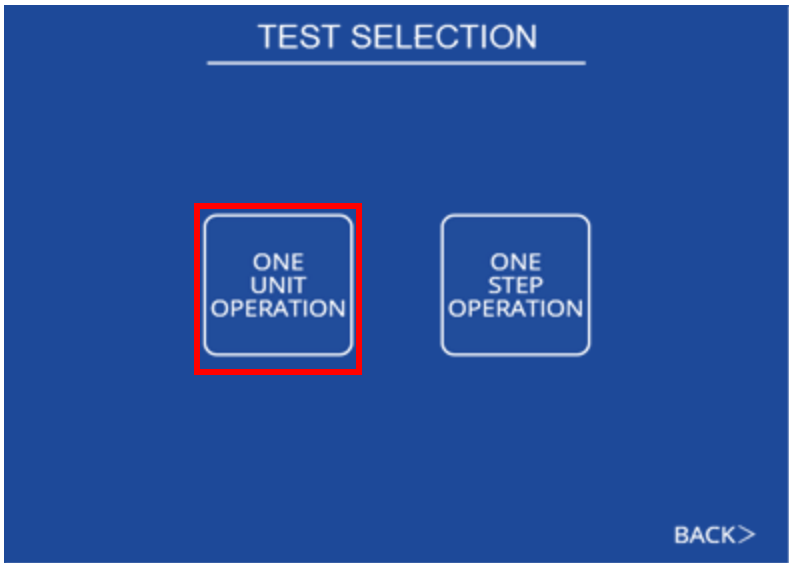


※ If you put alcohol too much at once, there is a possibility that the liquid will not flow.

⑦ Press TEST.



⑧ Press ONE UNIT OPERATION.



5 Maintenance

⑨ Operate test of DRUG pump at [4]ONE UNIT OPERATION.

Screen transition

[1]HOME

↓

[2]TEST SELECTION

↓

[4]ONE UNIT OPERATION

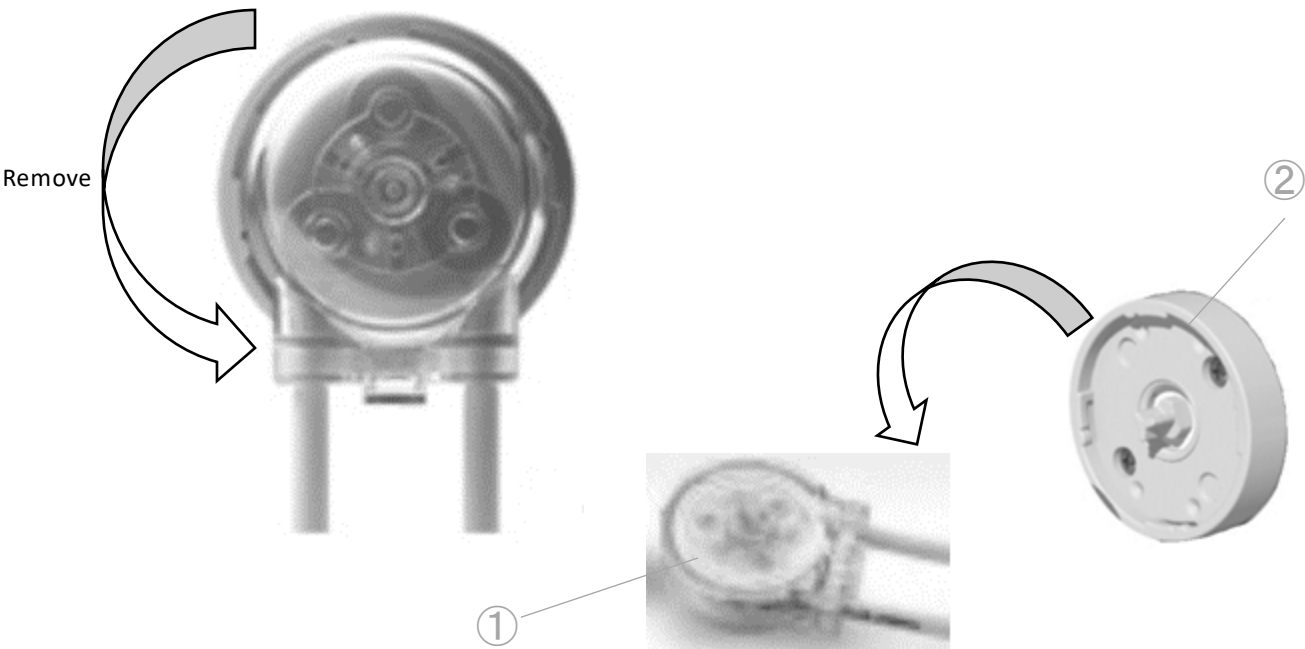
No.	Name	Setting contents
①	Pump Selection Button	Select DRUG.
②	Flow rate setting	Set at 0.9 ml/min.
③	Operation time	Set at 1min.
④	TEST START button	Start TEST operation after selecting ①~③.

- ※1 Set ①~③ and then start TEST with ④.
- ⑤ Confirm that no liquid remains in the tube.
If there is residual liquid, repeat steps ② and ④ to prevent liquid residue.

5 Maintenance

5.2 Replacement PharMed tube in Tube Pump

Can separate the pump head and the stepping motor.
You can replace the PharMed tube of the part to be squeezed.



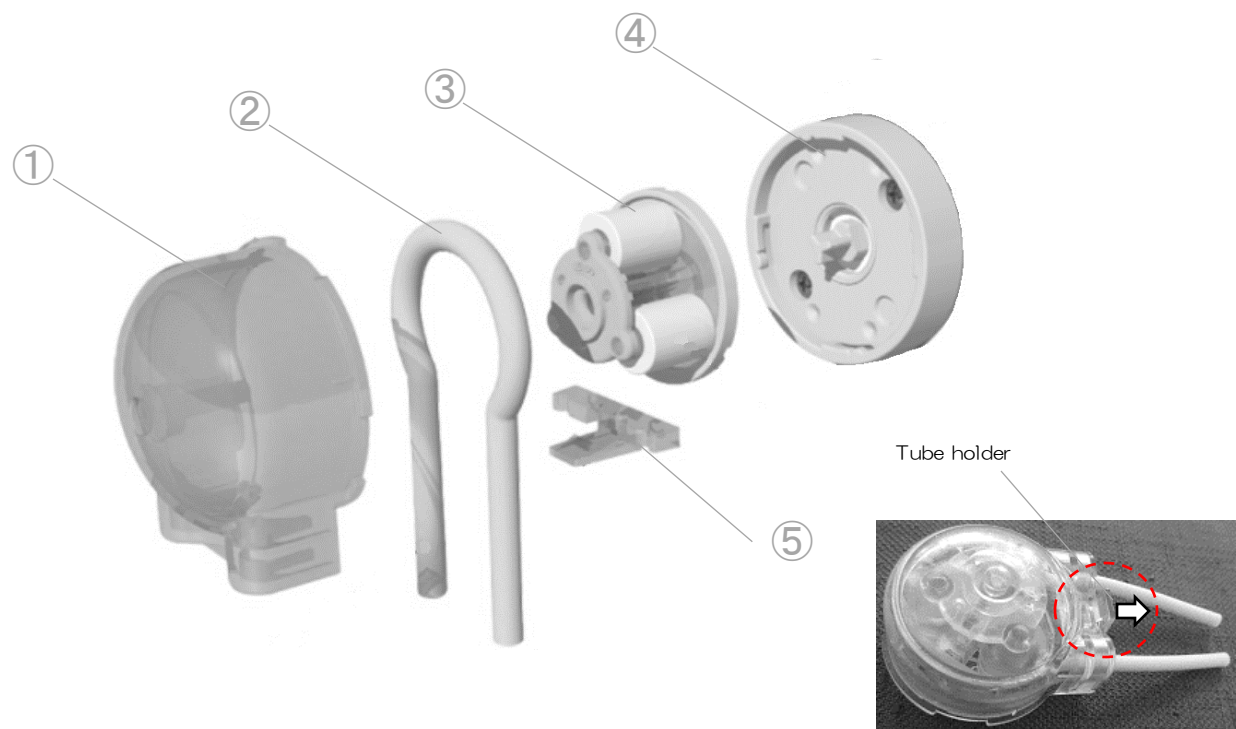
① Turn the pump cassette in counterclockwise direction to remove the pump head.

No.	Name	Specification	Note
①	Pump cassette	for WELCO WPM2	be autoclave with pump head.
②	Stepping motor	WELCO WPM2	

! The autoclave endurance count of the pump cassette is about 30 times .

5 Maintenance

It is possible to replace the PharMed tube built into the pump head.

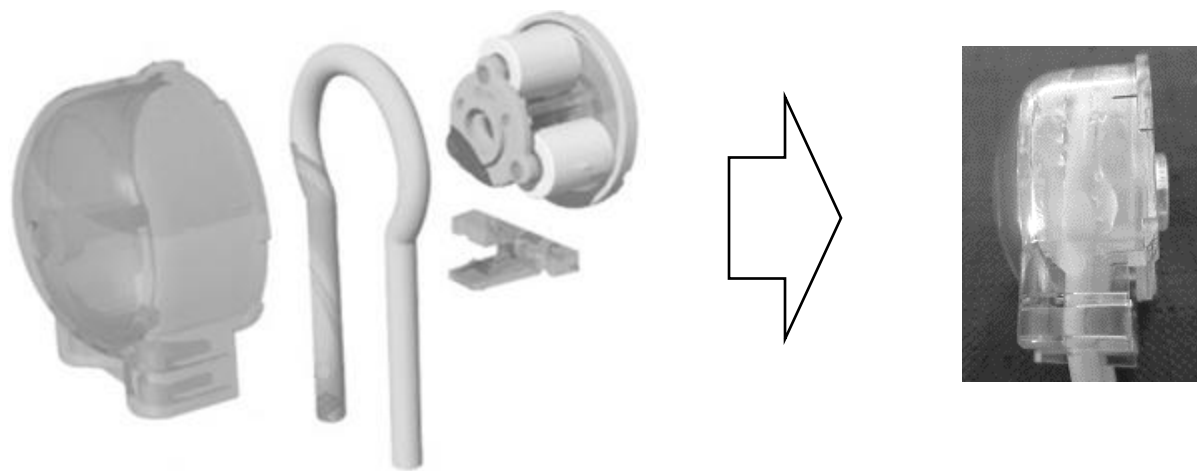


②Remove the tube holder and disassemble the pump cassette.
Depending on the location of use, replace it with a new PharMed tube of the specified thickness.

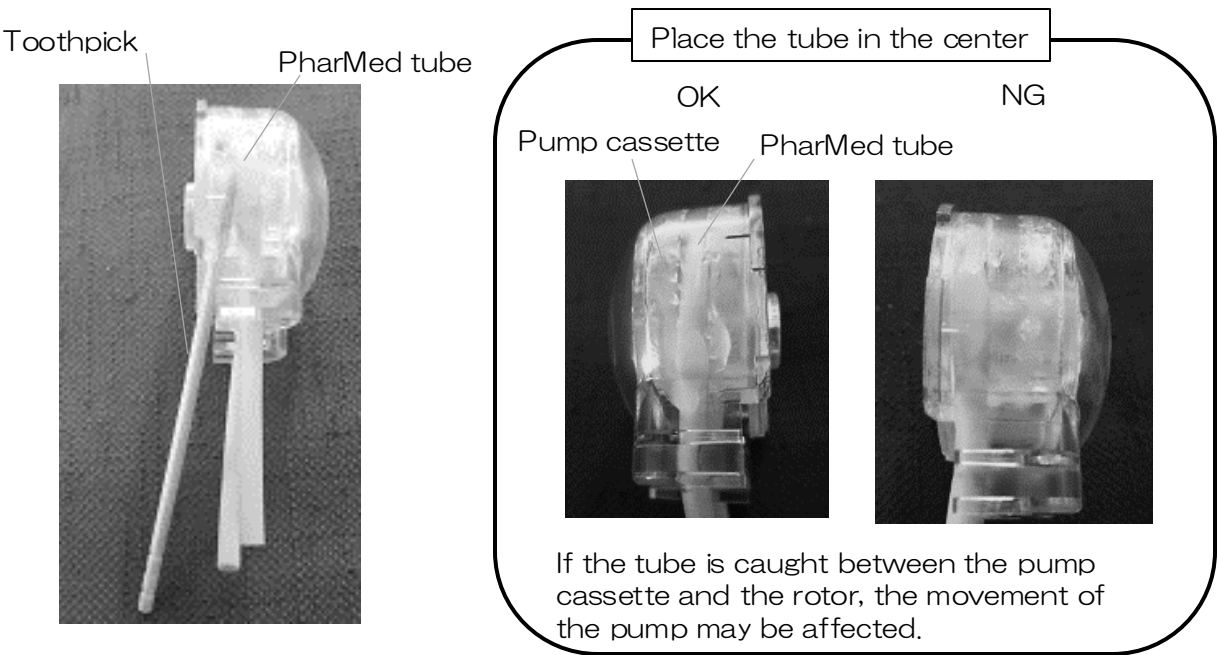
No.	Name	Specification	Note
①	Cover	For WELCO WPM2	It is possible to autoclave
②	PharMed tube	IN・・・Φ3×1 L=140mm OUT・・・Φ4×2 L=140mm	Disposable Names ※It is possible to autoclave
③	Rotor	WELCO WPM2	It is possible to autoclave
④	Stepping motor		
⑤	Tube holder		It is possible to autoclave

5 Maintenance

is possible to replace the PharMed tube built into the pump head.



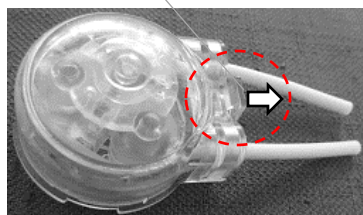
③ Fit the pump cassette.



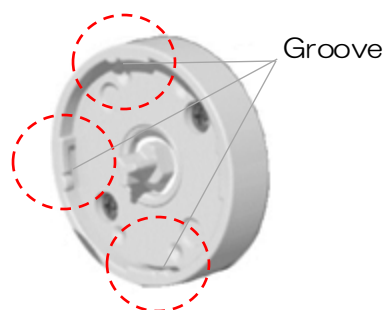
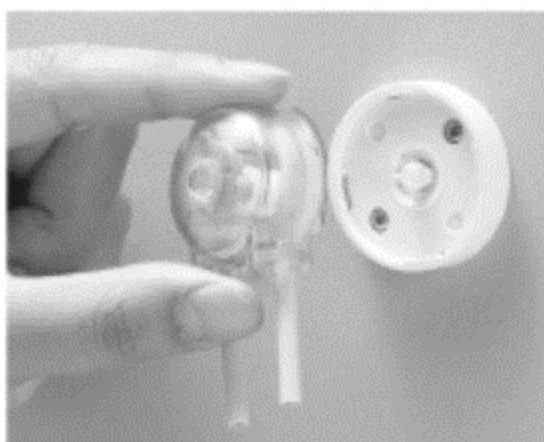
④ Correct the deviation of the PharMed tube with a toothpick etc.

5 Maintenance

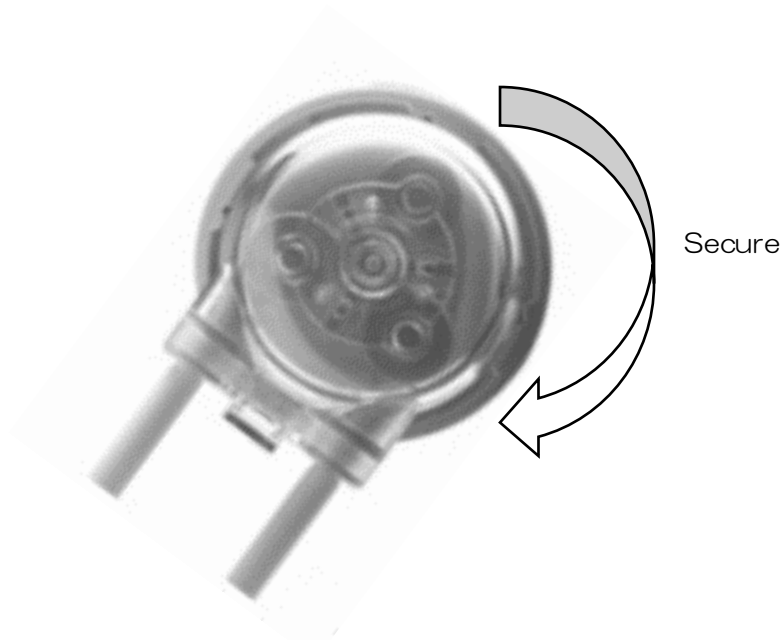
Tube holder



- ⑤ Attach the tube holder to the cassette.



- ⑥ Fits into the groove of the stepping motor.



- ⑦ Turn it clockwise toward the pump cassette and fix it.
※Turning it has a sense of being fixed.

5 Maintenance

5.3 Autoclave Compatible Parts List

Although it is possible to handle autoclave, when deterioration of material occurs, we recommend exchanging for new parts.

Name	Model	Note
D35Perfusion lid	PMD-D35D SUS pipe Diamond insert	Autoclave is possible with SUS Pipe attached.
Silicone tube Gas barrier tube	PMD-FTUBE3(Gas barrier tube) PMD-STUBE3(Transparent Silicone tube) PMD-STUBE3Y(Yellow transparent Silicone tube) PMD-STUBE3B(Blue transparent Silicone tube)	Outer diameter $\phi 3$ × Inner diameter $\phi 1 \quad 100\text{m}$
Pump head	PMD-IN(Outer diameter $\phi 3$ ×Inner diameter $\phi 1$) PMD-OUT(Outer diameter $\phi 3$ ×Inner diameter $\phi 2$)	Autoclave is possible with pump head in engagement.
SUS pipe of Tube Heater	PMD-TUBE-SUS	Outer diameter $\phi 1.3$ × Inner diameter $\phi 0.9 \times L180\text{mm}$
Silicone plug of media bottle	PMD-CAP	Silicone stopper and SUS needle can be autoclaved. Lure fitting and filters are not supported with autoclave
Media bottle	PMD-BOTTLE-SET	Please remove the lid of the glass bottle before autoclave.

5 Maintenance

5.4 Disposal Parts List

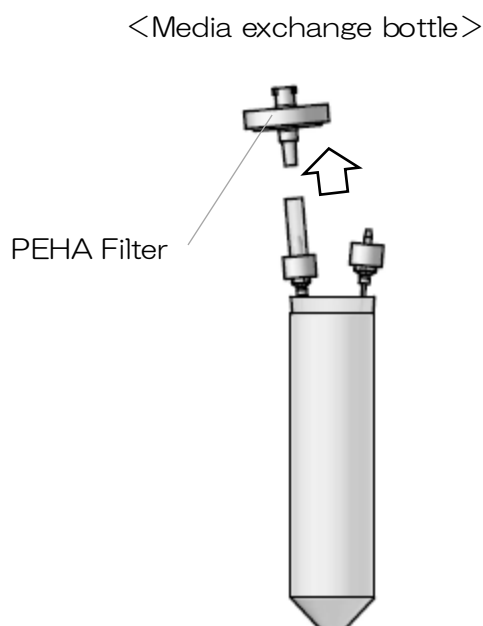
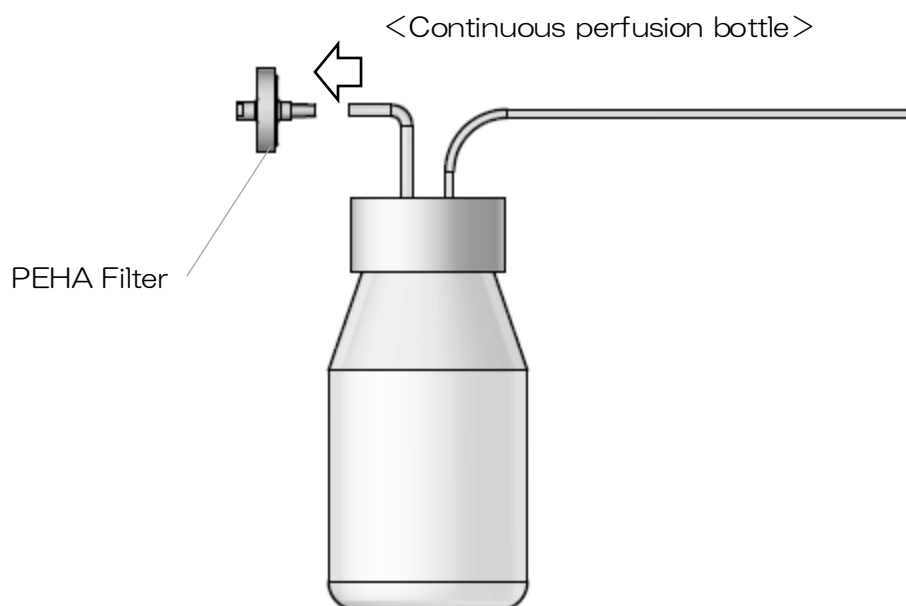
We recommend to use disposal part to touch with media

Name		Model
Tube Heater	SUS pipe (6 pcs)	PMD-TH-SUS
Media bottle	Air Filter (50 pcs)	PMD-BOTTLE-AF
	Luer fitting	VFL406
Media bottle	Centrifuge tube (25 pcs)	PMD-CT
	Silicone plug (Plug + Needle)	PMD-CAP
	Luer fitting	VRM106
		VRM406
D35 Perfusion lid	Cover glass (5 pcs)	PMD-D35-CG
	SUS pipe(3 types 4pcs)	PMD-D35-SUS
	Diamond insert	PMD-DIA
PMD-D35 Tube Set	Tube Set	PMD-TUBE-SET
	φ3×1Gas barrier tube(50m)	PMD-TUBE-PTFE
	Tube φ3×1Silicone tube(100mTransparent)	PMD-STUBE3
	Tube φ3×1Silicone tube(100m Yellow transparent)	PMD-STUBE3Y
	Tube φ3×1Silicone tube(100m Blue transparent)	PMD-STUBE3B
	Vinyl tube (100m)	PMD-TUBE-B
	Luer fitting	VPI116
		VPI126
		VPY106
		VRM106
		VRF106
Tube Pump Cassette (IN)	Cassette set	WPM2-P1-C
	PharMed tube(7.5m)	PMD-FTUBE-IN
Tube Pump Cassette (OUT)	Cassette set	WPM2-P2-C
	PharMed tube(7.5m)	PMD-FTUBE-OUT

5 Maintenance

5.5 Filter Exchange

PEHA filter prevents contamination of the air that enters the bottle. When root clogging occurs, liquidity decreases, so we recommend periodic replacement. It can be replaced by pulling it out from the silicon tube.

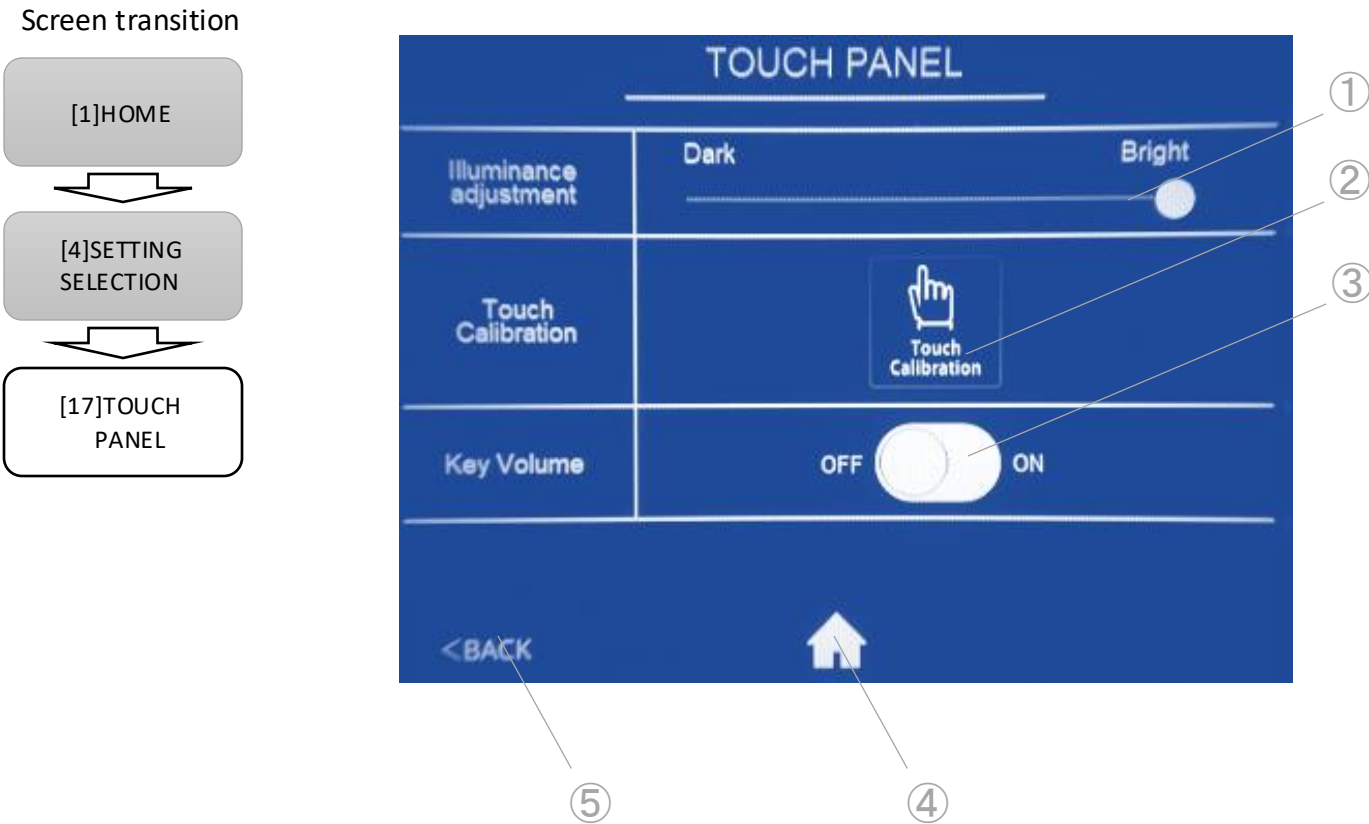


! Immediate replacement is necessary when accidentally flowing the medium to the PEHA filter.

5 Maintenance

5.6 Sensitivity Maintenance of Touch Panel

You can change touch panel settings.

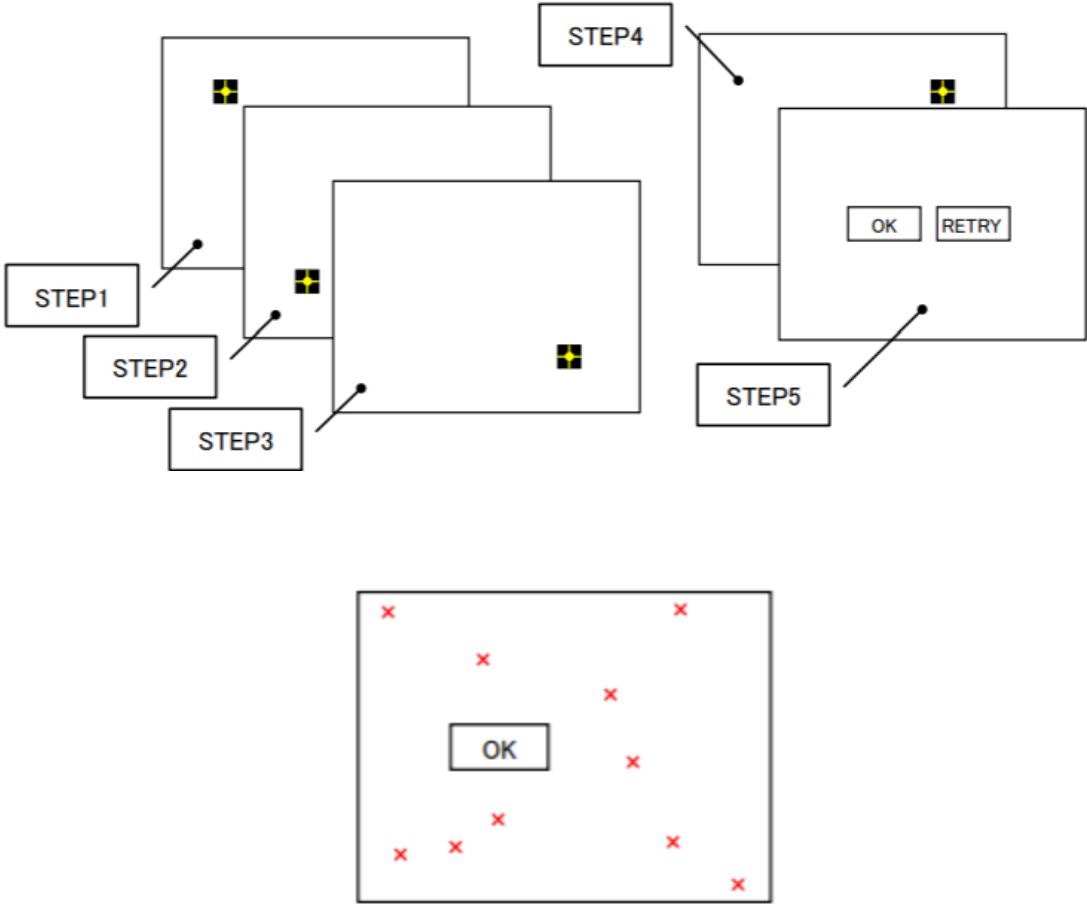


No.	Name	Specification	Note
①	Illuminance adjustment seek bar	Brightness adjustment of touch panel	Maximum brightness when shipped
②	Calibration	Calibration of touch panel	If you feel that you can not Press the place you want, carry out the correction of the touch panel.
③	Operation volume	ON/OFF for operation sound	OFF at the time of shipment
④	HOME button	Page transition	To [3]HOME
⑤	BACK button	Page transition	To the previous page

5 Maintenance

Calibration

If you feel that you can not Press the place you want, carry out the correction of the touch panel.
Repeat the STEP operation of the display 5 times and press OK to complete.



When you touch the touch panel, a cross mark is placed at the touched position.
Press the OK button to return to the original screen.

6 Trouble Shooting

6.1 Trouble Shooting

Problems	Solutions
When The liquid volume of the medium changes	The balance of IN / OUT may be broken. ①Confirm that the tube of the IN / OUT pump is not biased ②Confirm flow speed setting and operation time of IN / OUT pump ③Confirm clogging of perfusion lid SUS pipe ※If the problem do not improve even after confirming ① to ②, please make fine adjustment with USER SHIFT.
When the pump is out of step	It is possible to overload the pump. ①Check the pipe diameter of the PharMed tube that is attached to the pump head. IN . . . Outer diameter $\phi 3 \times$ Inner diameter $\phi 1$ 、 OUT . . . outer diameter $\phi 4 \times$ Inner diameter $\phi 2$ ②Degradation of the PharMed tube attached to the pump head. ③Grease out of pump head ※If symptoms are not improved even after confirming ① to ③, please contact your distributor or us.
When tube heater temperature does not rise	Heater connection abnormality is considered. ①Confirm that the heater cable is properly connected to the connection part. ②If the pump is not in operation, the set temperature will be STANDBY. Confirm that the set temperature of STANDBY is at an arbitrary temperature. ③Confirm that the wind of the air conditioner and etc. does not hit the heater directly. ※Even if you confirm ① to ③, if the problems are not improved, there is a possibility that the heater wire is disconnected / contact defective. In that case please contact our distributor or us.
When the temperature inside the dish decreases / rises	The temperature regulation of the medium by the tube heater has a large flow rate dependence. Therefore, when performing continuous perfusion or medium exchange at different flow rates, please set the temperature of each HEATER while measuring the temperature of the media in the dish at the main use flow rate.
Even if TTL signal is input but TTL program does not operate	Timing or problems of TTL signal reception may be considered. ①Check the setting as to whether the TTL signal is 5 V, 20 msec or more. ②The STEP operation other than PERFUSION switches to the TTL program after the operation is completed. ※If problems are not improved even after confirming ① to ②, please contact sales agent or us.
The medium drips out during exchange of medium	Although it controls the lower limit water level, when suctioning too much, some media may drip due to surface tension. ①Check the operation time of OUT. ②Check the installation of the upper and lower limit tubes. ※If problems are not improved even after confirming ① to ②, please contact sales agent or us.

6 Trouble Shooting

Problem	Solution
When the Bubble occurred with MIXTURE	The IN / OUT setting may be the cause. ① Check IN / OUT operation time. ② Confirmation of attachment of connecting part of tube. ※ If the problem do not improve even after confirming ① to ②, please make fine adjustment with USER SHIFT.
When the flow speed of IN / OUT is different from the reference value of indication	Although we adjust the flow rate at the time of our shipment, errors in the flow rate are caused by the viscosity of the media, the individual difference of the tube, and the handling of the tube. Please refer the displayed value as reference value. Fine adjustment of flow speed is possible with USER SHIFT.
Different flow rate than before	Clogging of tube or SUS pipe may have occurred. ① Flush tube and SUS pipe with alcohol ② Change tube and SUS pipe ※ If the problem do not improve even after confirming ① to ②, please make fine adjustment with USER SHIFT.
The alarm lamp on the HOME screen turns into a red lamp	Communication malfunction has occurred. Communication is always done in the equipment, but if you perform STOP operation with bad timing, the red lamp may be displayed rarely. Red lamp + alarm sound continues to sound → Control error has occurred. Red lamp + momentary alarm tone → If the alarm sound is , automatic restoration has been done, there is no problem with control. ① In the STOP state, turn the power ON / OFF. ※ If the symptoms are not improved even if you do ①, please check the display number displayed on the upper right of the HOME screen at the time of occurrence and contact your sales representative or us.

6 Trouble Shooting

6.2 FAQ

About container, tube, and operation

Questions	Answer
Do I need to wash the tubes every day?	Disposable is the basis. Tube set is sold separately.
Are the vessels exclusive?	It can be used with commercially available 35 mm dish. Use the 35mm dish perfusion lid for PMD to a commercially available 35 mm dish.
What kind of work is “MIXING” ?	Using perfusion OUT (lower limit) pipe, repeat suction → supply. You have seen work sucking and vomiting with the pipette using the user, but it will do the same work.
Why do you do “MIXING” on the OUT side?	The IN side has been devised so as not to generate bubbles and it can not be sucked. There is also a purpose to keep the IN side clean.
What is the mechanism to suppress the change in the amount of medium?	The amount of liquid is controlled by making 2 OUT side.

6 Trouble Shooting

About drug delivery

Question	Answer
Is the drug delivery automatic?	Regarding drug delivery, delivery timing can be programmed. However, with regard to the amount of liquid to be delivered, it is necessary to accurately measure the amount of drug with a pipette or the like. Then inject it into the fitting part, and when the administration timing comes, take the form extruded with air.
Why can not drug delivery be completely automatic?	Perfusion · Medium exchanging, mixing uses a Peristaltic pump, but a trace amount of drug for carrying out drug delivery is difficult to control with a Peristaltic pump, so we adopt a pushing method with air.
Does not bubble when drug delivery?	The pipe on the IN side has been devised to make foaming less likely to occur. Measures to suppress the pulsation of the pump are also taken together.

About USB

Question	Answer
Is the USB memory stick and the touch pen included when purchasing?	Each one is attached. Please prepare by user for additional purchase. We do not sell it.
How much program can be saved to USB memory? What is the data amount of one program?	The amount will vary depending on the program. The actual saved data is a list of numbers, so it's about a few kilobytes in size. If it is a product that is usually sold in the market of 2 GB or more, it can be stored in a sufficient amount.
Which company's USB memory is suitable?	Manufacturers that are checking the operation are BUFFALO, ELECOM, I-O DATA. Furthermore, as with using on a PC, it may not be usable due to compatibility problems. ※Please refer the P28 for the USB list.

6 Trouble Shooting

About cooperation · TTL signal

Question	Answer
Can PMD work with a microscope?	Cooperation is possible using the TTL signal.
What kind of signal is output for TTL signal?	Output signal is monotonous one shot output only. Complex signals can not be output, so you can not control directly by outputting to a camera, for example. Just informing about the timing. The output signal can be adjusted from 20 msec to 1000 msec (1 second).
What action will be taken after receiving the TTL signal?	A program that starts after TTL reception is assembled, a normal program is started until reception, and a program for TTL signal is started by a method that interrupts when receiving. You can select the operation after the TTL signal program has finished.

About equipment

Question	Answer
What shape is the TTL signal cable?	It is a coaxial cable. It outputs at 5V.
Can I program on my computer?	It is impossible. Operate with the front touch panel and set up the program.
Can I upgrade the version for calcium after purchasing PMD-D35?	It is impossible. Since it will be a separate product, if you want to consider with calcium imaging, we will announce you again at PMD-D35CA.

7 Authorized Representative

EU Authorized Representative:

Authorized Representative Service, 77 Camden Street,
Lower Dublin, D02 XE80, Ireland

For Technical product questions or service requirements,
please contact Tokai Hit.

solution@tokaihit.com

Tokai Hit Customer Support

Please contact our support team with following information.

1. Description of inquiry or problem
 - Inquiry of regarding usage
 - Details of malfunction or defect
 - Request of additional accessories and optional products
2. Serial Number
 - Six-digit number at the chamber cable or controller

Email : solution@tokaihit.com

Web : www.tokaihit.com

Warranty Policy

Please note your product information.

Model: _____ Serial Number: _____

Warranty Period: 3 years from the shipping date

Tokai Hit Co., Ltd. will provide the free repair service to the products with defects that happened under normal use for the warranty period stated above.

Note: The shipping fee will be charged for all free-repairs under warranty. Even within the warranty period, repairs will be charged in the following exceptional cases.

Exceptional cases

- Glass breakage.
- Damage to consumables.
- Failure or damage due to misuse, faulty repair, or remodeling.
- Failure or damage due to relocation, dropping, or intentional act.
- Failure or damage due to abnormal voltage, unspecified power supply (voltage, frequency), fire, water, lightening, and all other natural disasters.