



Ultra Low CRYO Freezer Service Manual

CRYO 170 & CRYO 230



This service manual applies to the following model.

Model:

CRYO 170

CRYO 230

Operating power and frequency:

3 phase 380V 50/60Hzz

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1 . For safety

- Ask a store or an authorized expert for installation. Any defect due to self-installation causes leakage, electric shock and a fire.
- Install sure-footedly where it can fully stand weight. In case of insufficient strength or imperfect fixing, cause an injury due to the inversion / fall of the product.
- Do the earth work. Do not have an earth line connected to the earth line of gas pipe, water pipe, lightning rod or telephone. Imperfect earth causes electric shock. (D type earth by an electrician is required)
- Use an exclusive consent for power, and do not connect a power cord midway or avoid starburst wiring. Such causes electric shock, heating or a fire.
- Do not use it outside. Using in a place subject to raindrops causes short circuit / electric shock.
- Do not install in a place subject to high humidity or where the product is easy to wet. Such causes short circuit / electric shock under deteriorated insulation.
- Do not spray water directly to the product or wash it in water. Such causes short / electric shock.
- Do not touch electrical parts such as power plug, etc. with a wet hand. Also, do not do switch operation. Such causes electric shock.
- Do not damage, work, bend, pull or tie power cord. Putting or sticking a heavy thing damages power cord and causes electric shock or a fire.
- Check whether or not a power plug has dust regularly and plug in firmly. Dusty one or
- In case a short circuit breaker works, consult with a store or an authorized expert. Forced power restoration causes electric shock / a fire.
- Do not hang onto a door or climb up on a shelf. Such will cause injury or short circuit / electric shock due to a door falling out or product inversion.
- Do not put volatile / flammable substance in a freezer. Such causes explosion or a fire.
- Do not put acid or alkali in a freezer. Such will cause a breakdown.
- It must not be disassembled, repaired or converted by any person other than the party concerned of the company. Wound due to abnormal operation or defect in repair cause electric shock or a fire.
- Where the product has anomalies, stop operation and pull out a power plug or cut off original power. Keeping operation with anomalies causes electric shock or a fire.
- Consult with a store or an authorized expert for shifting. Installation defect causes leakage / Electric shock / a fire.
- In case of suspending the use of the product and storing it, avoid where a baby plays and have a door not to be sealed up. Otherwise, an accident such as a locked up baby may be caused.
- Ask an expert for disposal. Negligence causes an accident such as a locked up baby.

- Using where the ambient temperature is beyond +5°C~ +30°C causes a breakdown.
- This product doesn't have a function of heating the inside of a freezer, so won't operate where the ambient temperature is lower than the setting temperature.
- Do not use strong combustible spray such as lacquer paint or volatile / flammable chemical and those similar to such near the product. It will be flammable by switch flame, etc. and causes ignition.
- In case of gas leakage near the product, first close the original valve of gas and ventilate. Do not touch the product or an outlet with a hand to prevent flammable explosion.
- Grab a power plug and pull it out. Pulling out a cord will cause partial disconnection and heating/ignition.
- Upon reoperation after stopping the operation, ensure to have min. 10 min time interval. Immediate reoperation will lay a burden on a freezer, which causes a breakdown.
- Do not operate / stop the product by pulling out or plugging in a power plug. Such causes electric shock or short.
- Do not use as equipment for a vehicle / a vessel.
- Check the operation of a short circuit breaker regularly. In case of using a broken short circuit breaker, it won't work under short circuit and causes electric shock.
- Do not put a thing or a container with water on the product. They may fall down to inflict an injury or spilled water deteriorates the insulation of electric parts, which causes short circuit.
- Do not put a hand in a machine room. A rotating fan at a high speed may cause burn or injury.
- Do not climb up on the product or load a thing on it. An injury may be caused by
- In case of not using for a long time, pull out a power plug from an outlet for safety. Dust may cause heating / ignition.
- When moving the product, be extra careful of inversion. Such may cause an injury.
- When moving the product, pull out a power plug from an outlet and move carefully not to damage a power cord. Damaged cord may cause electric shock / a fire.
- When moving the product, take out the keeping. Fall may cause an injury.
- Upon moving or shifting, be careful not to tip the product. Such may cause a breakdown.
- Upon moving or shifting, separate a hose from LN2 cylinder.
- For 30 min after moving or shifting, do not turn on the power. In case of stopping for more than 3 hours, turn on the power after min. 48 hours with an open door. Such may cause a breakdown.
- In case of checking the inside of a machine room, make sure to turn off the power of a main body, pull out a power plug from an outlet and open the cover of a machine room.
- In case of maintaining (repairing) LN2 auxiliary cooling system, close the valve of LN2 cylinder connected to a hose in advance.
- In case LN2 auxiliary cooling system ran, it's possible that the installation place of a main body is full of N2 gas. Ventilate the installation place thoroughly and check the safety of oxygen density, etc. before entering.
- As to LN2 handling, abide by the instruction / cautions of LN2 cylinder installation high- pressure gas expert.

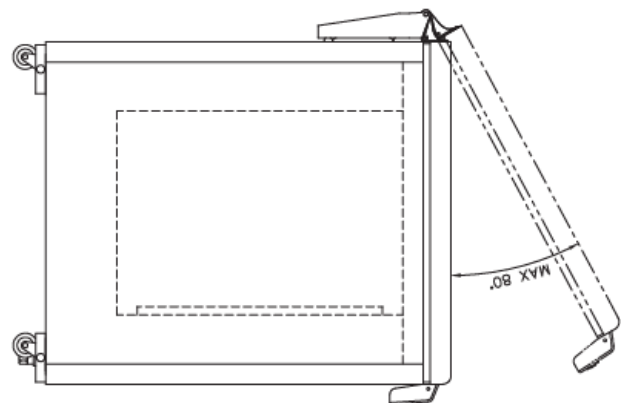
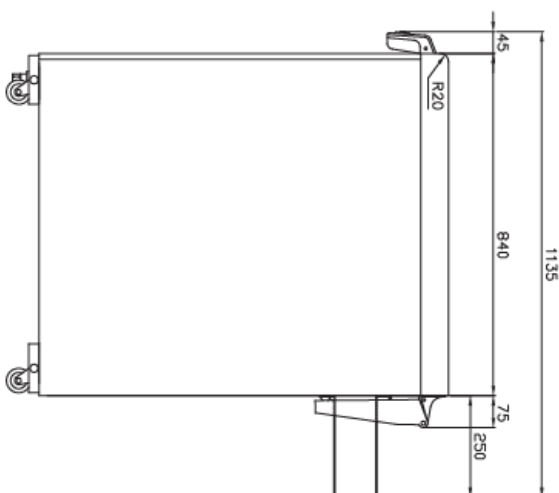
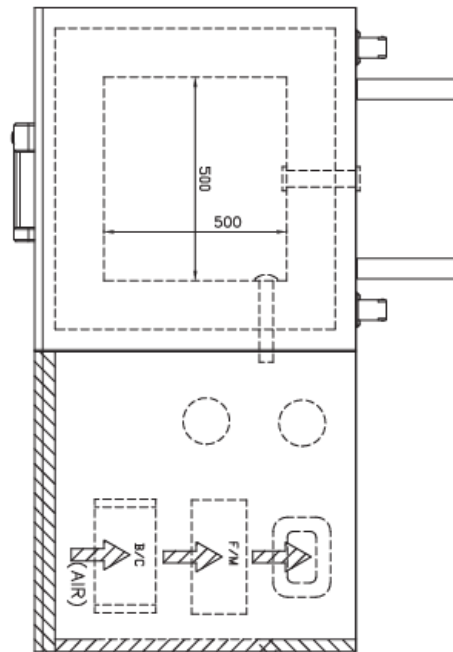
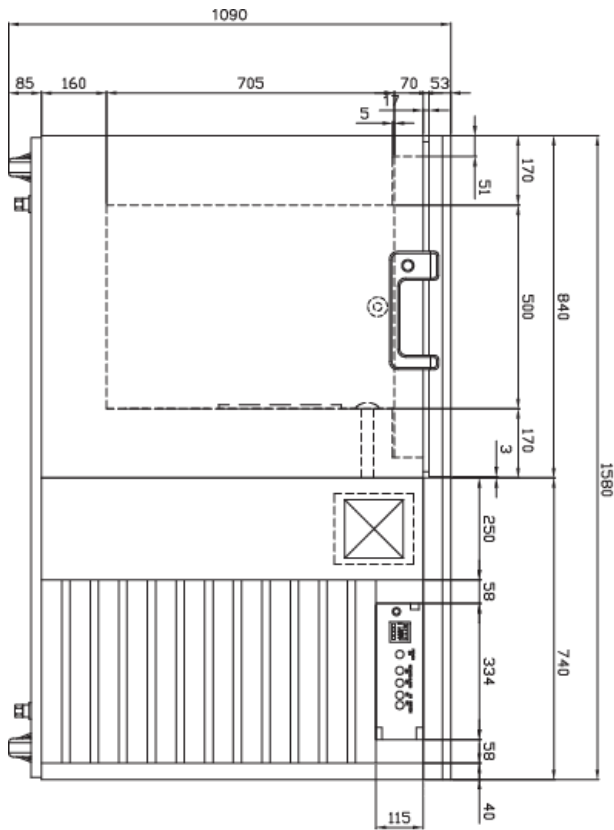
2. Specifications

Name	of product Freeze Ultra Low Temp Chamber(-150°C) double cooling system	
Type	CRYO 170	CRYO 230
Coling function	-140°C ~ -150°C	
Content Approx	Approx. 173L	Approx. 236L
Inner dimension	W1420 × D840+300 × H1090mm	W1600 × D840+300 × H1090mm
Inner dimension	W500×D500×H695mm	W680×D500×H695mm
Exterior	Electronic galvanized Sheet(acrylic coating)	
Interior	Stainless steel sheet	
Insulator	Rigid foam polyurethane	
Inner cover	Polystyrene resin 1 sheet	Polystyrene resin 2 sheet
Compressor	1500W×2	
Cooler	Pipe on sheet	
Condenser	Pinless bolck condensor	
Refrigerant	Mixture refrigerant (HFC)	
Radiant Value	4968KJ/h	4968KJ/h
Power	3Ø 380V ~ 415V 50Hz	
Operation current	3,5A	3,5A
Rated Power consumption	1380W	1380W
Suggested power capacity	20A sole	
Power cord · plug	Refer to the picture below (P. 9)	
Thermostat	Digital temperature indicating controller	
Temperature alarm · blackout alarm	Boozer alarm upon blackout and temperature increase (upon +15°C increase from the set temperature), battery charging type 2.5V(48 hour operation), including an alarm signal output iack (zero voltage A contact)	
Double cooling system anomalies alarm	Lamp (red) light on upon electric anomalies of a cooker	
Fan motor anomalies alarm	Lamp (red) light on , boozer alarm upon fan motor anomalies	
Automatic cooling auxiliary device	Responding to LN2(pressurized cylinder)	
Weight	Approx. 337Kg	Approx. 350Kg
Components, etc.	Key - 2types (2 each), 4 casters, 2 adjusters, access port rear 1 small (φ20mm)	

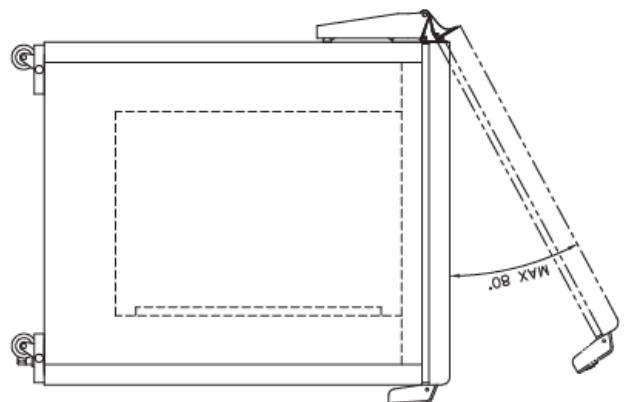
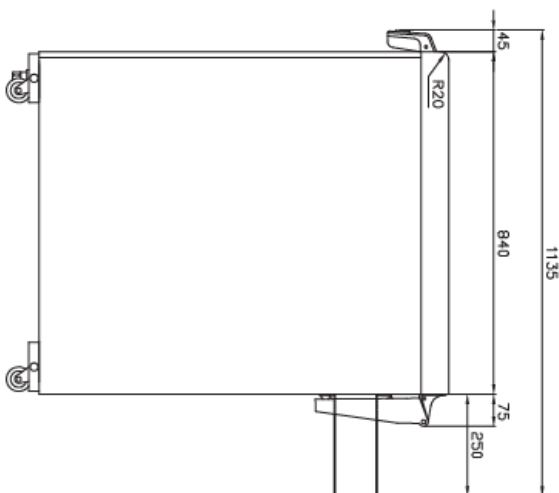
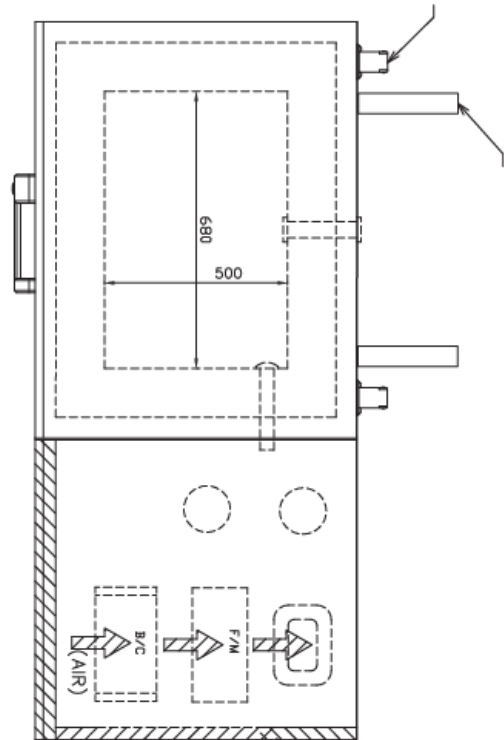
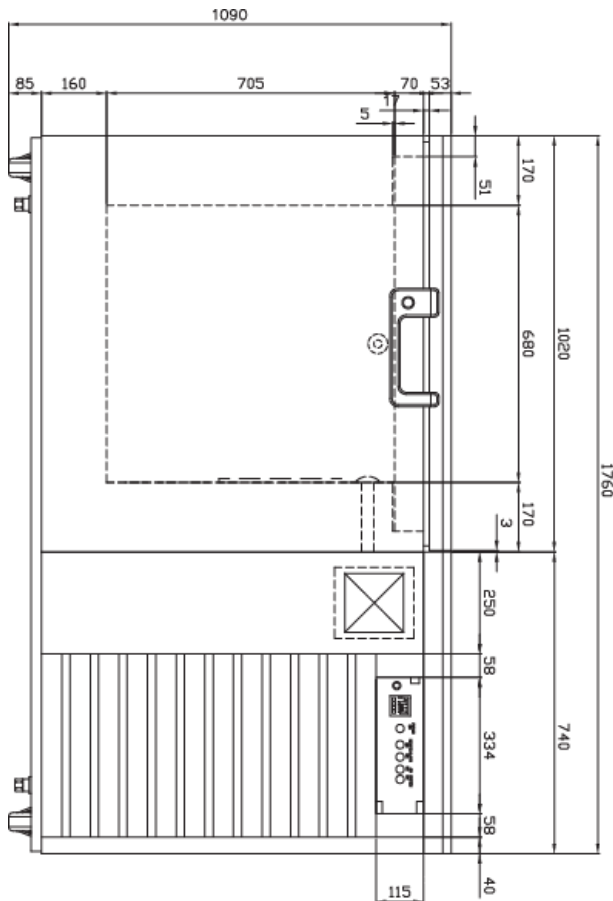
- (Note)
1. The cooling function of the above specifications is under the ambient temperature of +30°C, without a load.
 2. Operation current, power consumption are recorded under the ambient temperature of +30°C, lowest temperature, zero load, stable condition
 3. This specification is subject to change without prior notice for improvement.

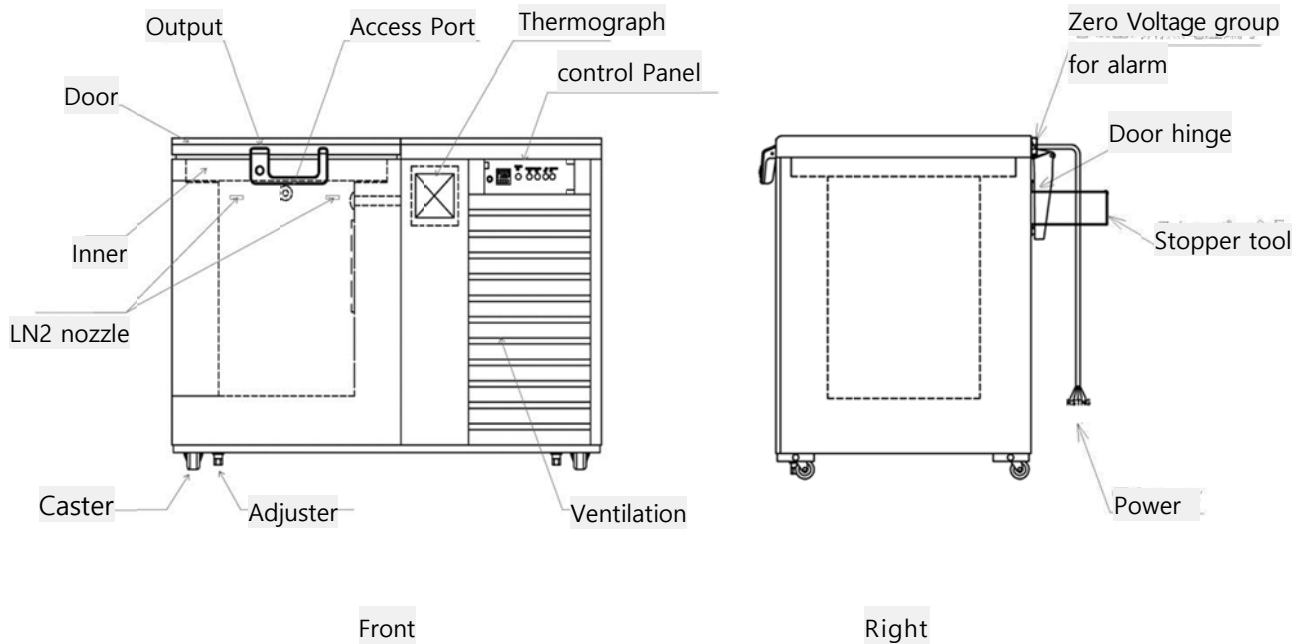
3 . Exterior dimensions and name of each part

CRYO 170



CRYO 230





Door • Door knob :

A doorknob is a pulling type, so pull the knob and then open the door up. Also, the knob has a cylinder padlock, so the door can be locked.

Inner cover:

Ensure to set before operation in order to decrease leaked chilly air or maintain insulation.

Control panel:

Do various controls such as power ON/OFF, temperature display, temperature adjustment, alarm control, etc.

Thermograph:

Records the inner temperature of a freezer. (Inner sensor of a freezer: Pt1000Ω)

Ventilation gallery:

Radiating is in the condenser of a machine room. As it radiates by absorbing the air with an air-cooling fan, do not block the front of a ventilation gallery and the rear of a main body with a wall, etc.

External output jack for alarm:

2P jack is on the rear of a main body. Alarm signal can go off from this jack with contact output.

Access port:

An access port is on the rear of a main body leading to the inside of a freezer. The gauge is $\phi 20$ with a rubber stopper. It is a thru hole used when it is necessary to draw wiring for temperature measurement, etc.

Stopper tool:

Able to secure min space necessary for the ventilation of a machine room by contacting this tool to the rear wall. (Approx. 25cm)

Adjuster:

Turn left to extend and turn right to contract. The width of adjustment is approx. 15mm. Upon installation, extend an adjuster and check whether the main body is firm.

4 . Cooling faulty signs and checks

4-1. Capillary clogging due to oil (oil clogging) signs and countermeasure

As to our One Compressor system, there is no capillary clogging due to oil except for a special occasion.

※ The special occasion is when operating a compressor suddenly where a lot of cooling oil is transferred to a pipe by the heavy shake of a compressor in case the product falls down upon moving or transporting the product.

Signs:

A lot of oil in a pipe forms an oil film, oil loses density because of evaporative latent heat of refrigerant and adheres to a capillary wall and hinders the flow of refrigerant. As a result, cooling function is deteriorated or lost.

Countermeasure:

Where a user thinks that cooling oil of a compressor got into a pipe, run a freezer after approx. 48 hours. Where a user thinks that there is oil clogging after operation, cut off the power of a freezer, open the door of a freezer and turn on the power again after min. 48 hours.

Where it is not possible to wait for 48 hours, warm the inside of a freezer with a hair dryer, etc. raise

the inner temperature of a freezer to room temperature and then turn on the power. (Making the inside of a freezer to a room temperature is related to the oil density)

Where it still occurs again, try 2-3 times with the same method.

Where it does not solve even after the above measure, a user shall clean the cycle of a cooling pipe.

How to clean a refrigerant pipe and fill a refrigerant

Our products adopt the mixture refrigerant of 「EP-88」 「R-14」 「methane」 「argon」.

This product uses a combustible refrigerant, so a user shall be careful as emitting a refrigerant indoors has a risk of a fire and suffocation. 。

Cleaning of low pressure (main body) side (capillary, evaporator)

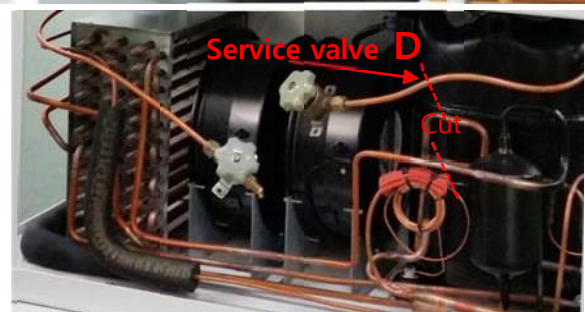
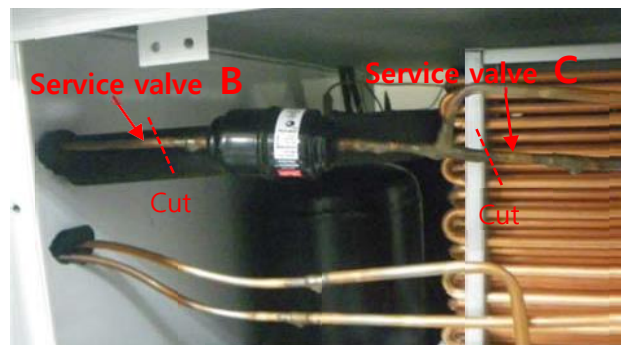
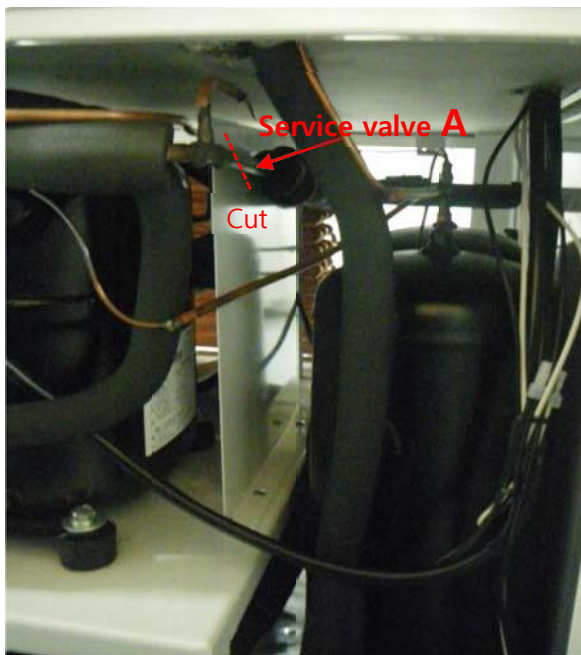
- ① Connect a manifold gauge to a high pressure, low-pressure service pipe and collect refrigerant.
- ② Cut off an induction pipe of a compressor and install a service valve (A) in an induction pipe of a main body.
- ③ Cut off pipes on both ends of a filter dryer and disassemble a filter dryer. Install a service valve (B) in a high-pressure pipe of a main body and a service valve (C) in a pipe of a compressor.
- ④ With the high-pressure service valve (B) open, fill liquid refrigerant R-290(propane) from low pressure service valve (A). (approx. 30~60 secs)

- ⑤ Inject nitrogen in low-pressure service valve (A) at the pressure of 15Kg/cm². (approx. 1~3 min)
- ⑥ Check if all R290 (propane) nitrogen in a pipe is discharged from high pressure service valve (B).
- ⑦ Repeat ④~⑥ for 3~5 times.
- ⑧ As there is a possibility of moisture congelation in a pipe due to the difference of a pipe inner temperature and the air temperature, be careful not to have air get into a pipe. Close the service valve (A), (B).

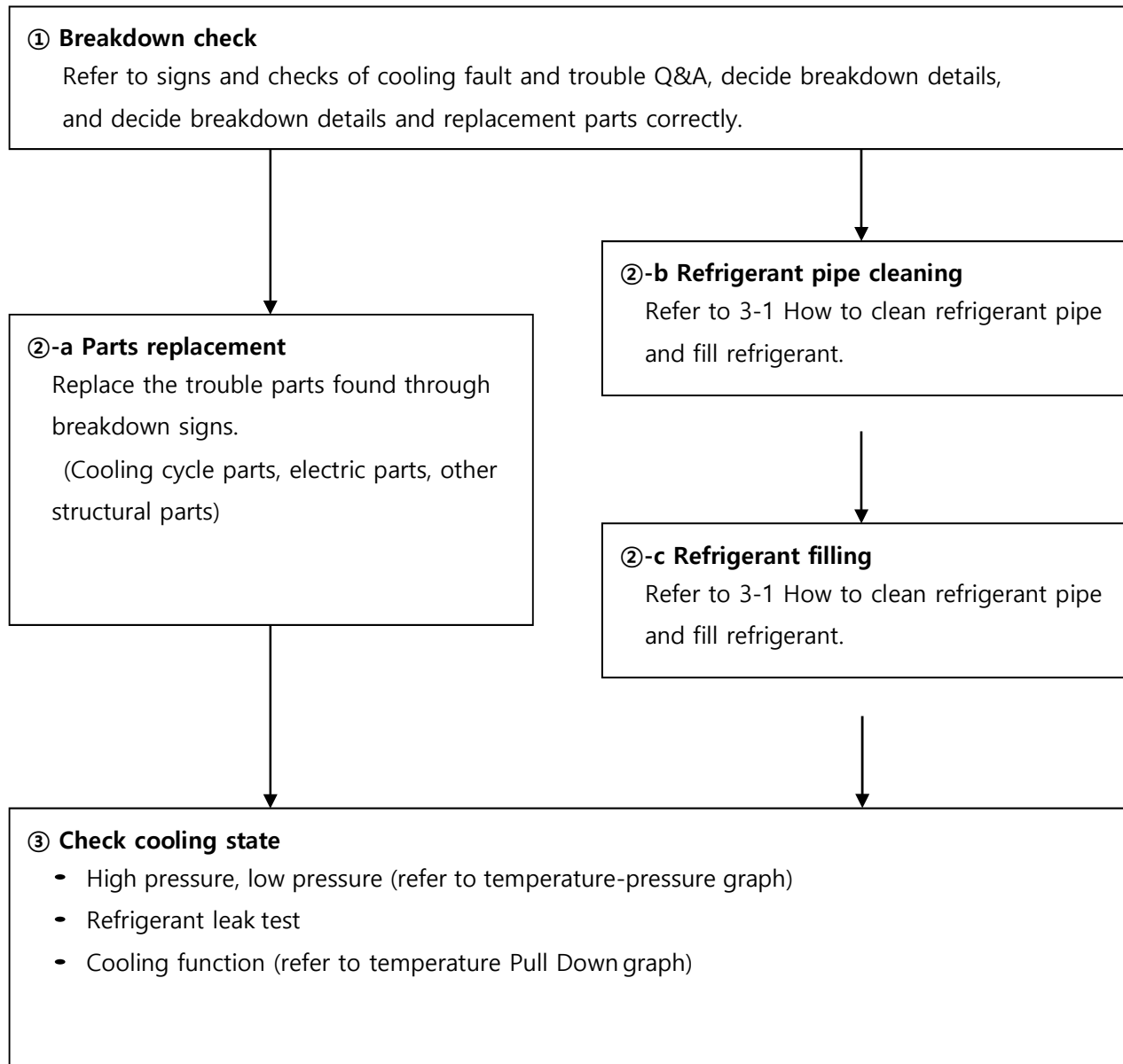
Cleaning of high pressure (inside machine room, pipe) side (block condenser)

- ⑨ Cut off the pipe between an oil separator and a block condenser, and install a service valve (D) in the pipe of a block condenser.
- ⑩ With a service valve (C) open, inject nitrogen from the service valve (D) of a block condenser at the pressure of 15Kg/cm² for cleaning.
- ⑪ After cleaning is done, as there is a possibility of moisture congelation in a pipe due to the difference of a pipe inner temperature and the air temperature, be careful not to have air get into a pipe. Close the service valve(C), (D).
- ⑫ After cleaning, separate the service valve of a cut pipe (4 spots) and connect a pipe in its original condition. Ensure to replace a filter dryer with a new one.

Filling of refrigerant: (supplement: refer to 「about refrigerant and filling volume upon repair」)



4-2. Order of repair work



Trouble Q&A

Question	Answer
1. A freezer doesn't cool at all (Temperature display is not on)	Check the power source as: - 1) Is the power plug pulled out? 2) Is the breaker switch off? 3) Is power is out? 4) Is the power on/off switch of a main body off?
(Temperature display is on)	Check inside of a machine room immediately since there's a possibility of machine anomalies
2. A freezer cools but not enough. (The temperature doesn't come down to a set temperature)	1) Is the product installation indoor temperature (ambient temperature) too high? This product is designed to perform the fixed cooling capacity under +30°C of the ambient temperature. It's desirable that the ambient temperature maintains +20~25°C and if the ambient temperature is more than +30°C such as in summer, cooling capacity declines. Maintain a proper ambient temperature. 2) Is the product installed close to a wall? Upon installation, no clearance causes radiating fault, so there is a case of not performing cooling capacity enough. Secure min. 25 cm for the rear, 10 cm for both sides, and 120 cm for ceiling as clearance. 3) Faulty fan motor leads to faulty cooling. (Refer to Q5-2) 4) Contaminated radiator with dust or clogged gallery cause faulty cooling. Clean radiator, gallery

	5) Didn't you put too many things of room temperature in a freezer? In this case, the inner temperature of a freezer rises temporarily and a temperature alarm may not go off depending upon the storage volume. In that case, check the temperature change with 1-2 hours' time interval. In case of storing a lot of substance, which does not simply coagulate even under the freezing point such as Cold Storage Packs, there are cases that it won't freeze up even after running more than 24 hours. It is because load is excessively greater than the cooling capacity of the product. Such use causes a breakdown.
3. Covered with frost	It is not rare when there are frequent door open/close and high humidity. If frost is too much and serious, check as follows. 1) Check if there is a gap between door lute and main body with a door closed. If yes, frost forms by air with moisture getting into a freezer. If this frost is left as it is, it will increase more and closing the door gets worse, which will then cause frost again: vicious circle. In this case, turn off the power first, have frost melt completely and wipe moisture with dry towel thoroughly. Also, in case of removing frost while the power is on, use the frost removal spatula, etc. Refrain from removing frost with a sharp tool. If using a sharp tool, the evaporator or a refrigerant pipe is damaged, which may lead to gas leakage. 2) Check if there is any dented lute part due to frost forming around a door. If yes, mend the dented lute part using a hair dryer, etc. If it will not be mended smoothly, replace a lute or a door.

4. A door doesn't open	Sometimes a door doesn't open when a user tries to open again right after closing it. It is because warm air getting into a freezer when a door is open cools rapidly and contracts, and the pressure in a freezer declines temporarily. Namely, the phenomenon of a door being dragged and sticking to a freezer (sound pressure state). Open a door after a while.
5. Strange sound comes out of a machine room	1) Check if there is any foreign substance inside a machine room. There are cases when noise comes out because of a foreign substance stuck in radiating fan motor such as paper, vinyl, etc. In that case, ensure to turn off the power and remove the foreign substance. 2) In case of scratchy sound, vibrating sound, check inside the machine room; confirm the cause and actions accordingly.
6. There's a difference between the displayed temperature on a main body and that of a separate sensor	As this product adopts natural convection type, the temperature inside of a freezer differs depending upon a point where a temperature is measured. In addition, even at the same point, temperature changes constantly. That's from the difference of sensor type, sampling cycle, etc.
7. Does it reset automatically after blackout?	This product automatically resets after blackout if the switch remains as in operation No special control with a controller, etc. is required.
8. Where the main body display temperature shows 「----」	The main body temperature sensor inside a freezer has a short circuit. In that case, the main body display temperature shows 「 ---- 」 because of consecutive operation. Replace a sensor.

9. Main body display temperature is lower than set temperature (excessive cooling)	Faulty controller. Replace it.
10. Chart of the thermograph is not transferred. No record on a chart.	Refer to the user manual of a manufacturer
11. An automatic cooling auxiliary device does not operate even when the main body display temperature rises.	1) Check if [AL-1] and [BACKUP SYSTEM] on a control panel are ON. As the automatic cooling auxiliary device works with an alarm device, it does not work if [AL-1] is off. 2) Check if a main body door is open. If the main lid is open during the operation of LN2, the spray will stop, caused to the door switch, located on the rear main body.
12. Alarm goes off and alarm light is on	1) Freezer temperature rise 2) Fan motor anomalies: Where the main fan motor has faulty rotation, or stops due to the weak axis of a radiating fan motor, an auxiliary fan motor will run and keep cooling function. Replace a faulty fan motor immediately. The thermostat switch mounted on the front of the block condenser will reactivate any fan motor anomaly. (P.60) 3) Freezer overload: Where a freezer does not run due to a certain cause, a thermal relay of an electromagnetic switch for a freezer will run. Check the inside of a machine room, a freezer. If there is an anomaly in a freezer, a user may start operation again by pressing the switch of a thermal relay.

6 . Digital thermostat (supplement: TTM-004_MA manual)

Name of model: TTM-004R-A-Z223 (our special-order specifications)

TOHO ELECTRONICS. INC. Product HP address:

<http://www.toho-inc.com/item/TTM004PAB.html>

6-1. Parameter setting table

SET 1

PV	SV
_InP	10
_PuG	1.00 (automatic setting)
_PuS	Random figure
_PdF	1.0
_ dP	0
_ Fu	0
_ LoC	3

SET 2

PV	SV
_SLH	-50
_SLL	-180
_ nd	rUn
_Cnt	020
_dlr	1
_nul	100
_ C1	1
_CP1	0

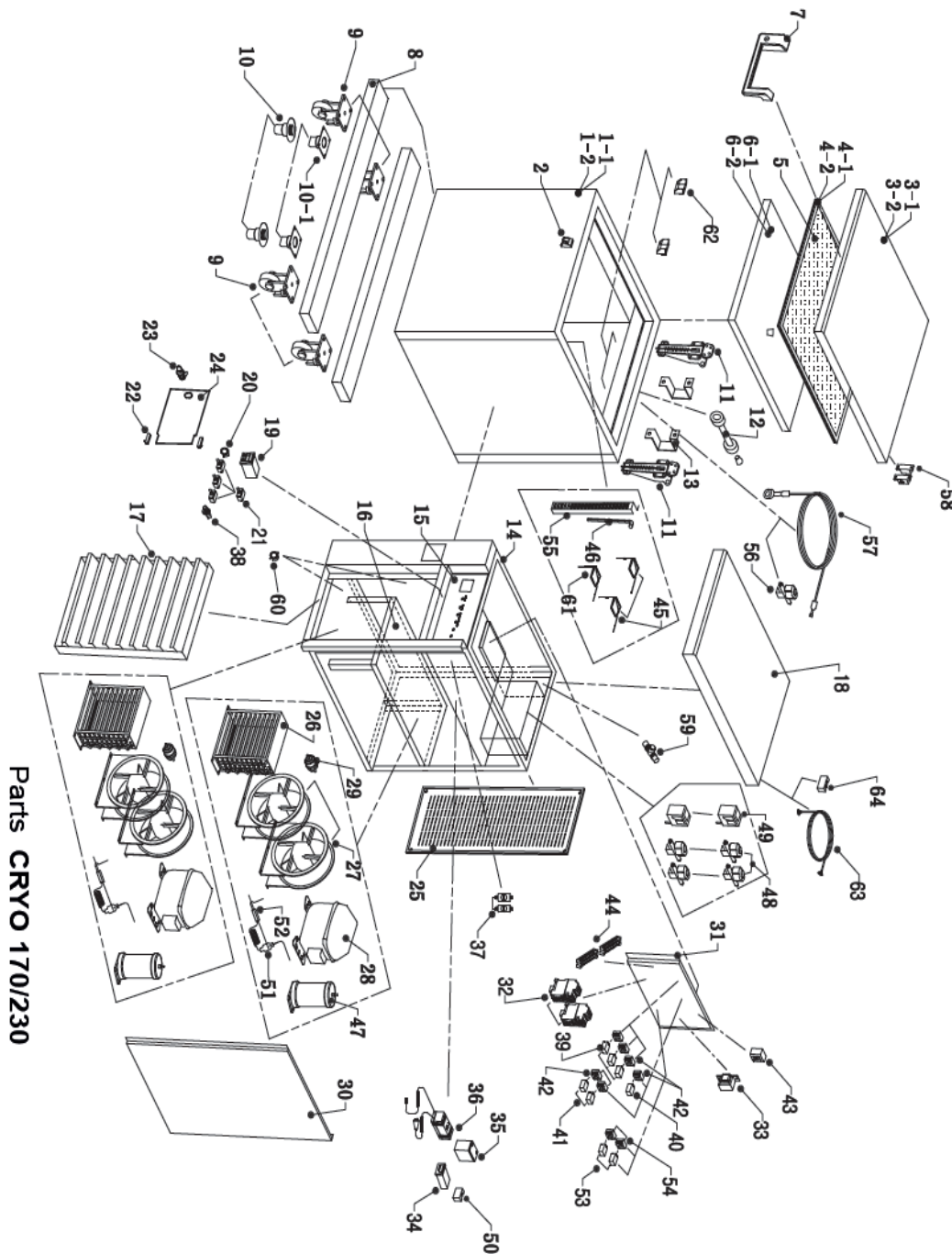
SET 3

PV	SV
_EIF	02
_EIH	15
_EIC	0
_EIt	0
_Elb	00
_EIP	1

SET 7

PV	SV
_tno	0

7. Component block diagram and component number



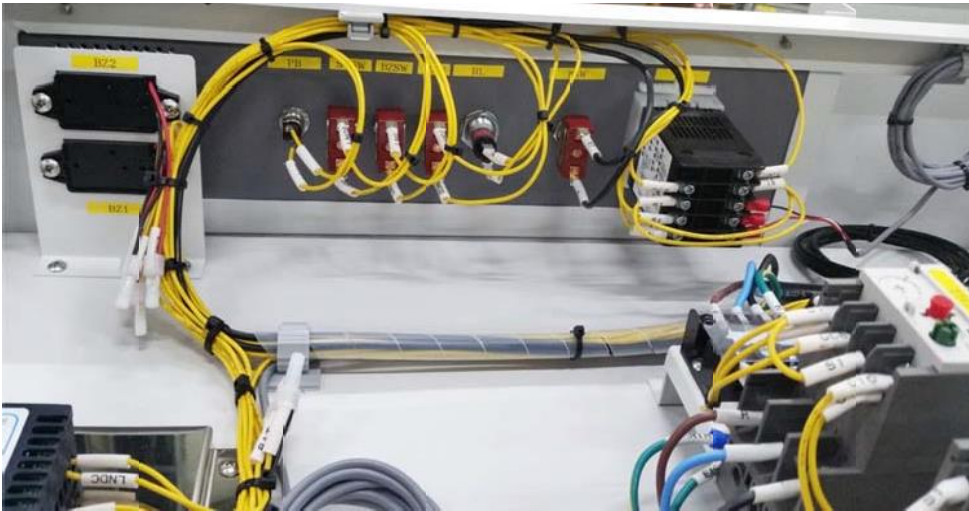
Parts CRYO 170/230

Pos. no.	Code no.	Part
1		Cabinet
2		Handle catch (included handle)
3	5052142-01	Outer lid (door) CRYO 230
4	5052144-01	Gasket CRYO 230
5		Lid inner liner (included outer liner)
6	5052146-02	Sub lid CRYO 230 (set of 2 pcs.)
7	5051063-01	Handle
8	5031203-01	Caster frame
9	5031254-01	Caster frame - front
9.1	5053028-01	Caster
10	5032014-01	Adjuster bolt - After march 2015
10	5032015-01	Adjuster bolt - Before march 2015
11	5031204-01	Hinge
12	5031205-01	Access port ø50
13	5031206-01	Spacer
14	5031207-01	Machine room frame
15	5043015-01	Control panel
16	5031208-01	Machine room stand
17	5010044-01	Ventilator
18	5031209-01	Top cover
19	5040034-01	Temperature controller TTM004-RA-Z223
20	5019142-01	Lamp ø16 AC/220V
21	5019143-01	Switch WJT-2210S
22	5031210-01	Hinge for control panel cover
23	5051064-01	Lock & Key (set)
24	5030093-01	Control panel cover
25	5031211-01	Back cover
26	5071045-01	Block condenser
27	5010045-01	Fan motor UF25GC23BTH
27.1	5031232-01	Fan motor bracket
28	5070114-01	Compressor TS370J1N (CRYO 230-0)
28	5070129-01	Compressor YS-480J2N (CRYO 230)
29	5079030-01	Dryer DML032S
30	5031212-01	Side cover
31	5031213-01	Panel for electric parts
32	5032016-01	Magnet S/W
33	5019144-01	Transformer 50VA
34	5040035-01	Controller (for LN2) FOX-2P1-D
35	5044013-01	Battery NPH5-12V

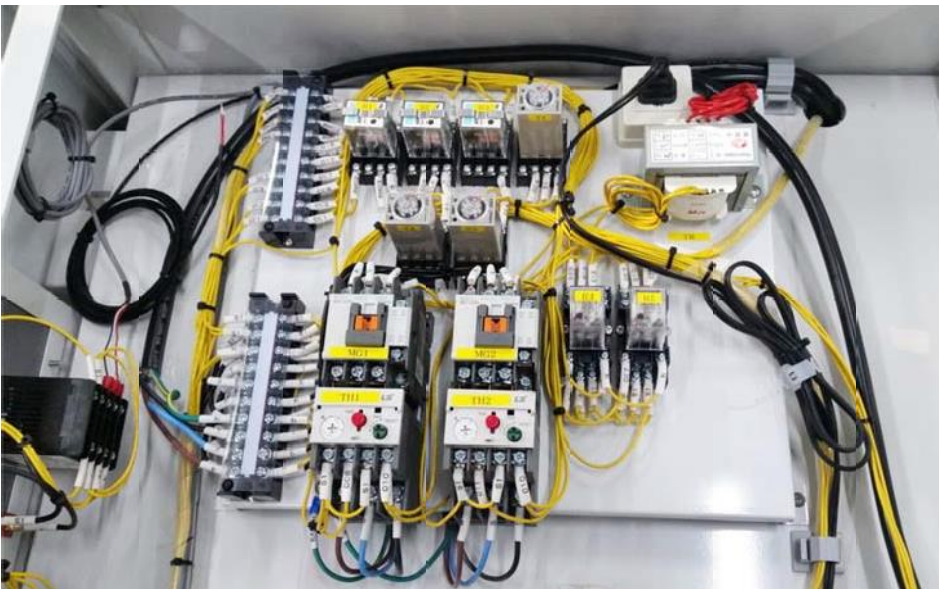
Pos. no.	Code no.	Part
44	5019150-01	Terminal Stand 20A*10P
45	5042026-01	Sensor PT-100
46	5031214-01	Sensor pipe cover ø9.52 L-220mm
47	5031215-01	Expansion tank 6" * 500mm
48	5019152-01	Solenoid valve EVR-2S
49	5019153-01	Pressure switch SNC-C130
50	5019154-01	Terminal stand 20A*2P
51	5074018-01	Oil separator HFOS-076
51.1	5074019-01	Oil separator assembly
52	5074016-01	Heat exchanger L-120mm
53	5019155-01	Relay 4C 220V, SZR-MY4-N1
54	5019156-01	Relay socket 4C SZX-SMF-14N
55	5070115-01	Sensor cover 500*54*0.8t
56	5019157-01	Solenoid valve (for LN2) 8263G240LT DC12
57	5019158-01	Wire hose (for LN2) 3M
58	5019159-01	Door limit switch (for LN2) GLS-S1
59	5019160-01	Check valve (for LN2) 125-R
60	5019161-01	Thermostat switch 70R
61	5042027-01	Sensor for recorder PT-1000
62	5019162-01	LN2 Injection cover (for LN2) SUS 1.0t
63	5019163-01	Power cable plug 4C 2.5S (AC/220V)
64	5019194-01	Terminal Stand 20A*3P
65	DAI 0937	Chart recorder
-		Refrigerant EP88 →R14→CH4→Ar

8 . Composition unit of electrical parts and wiring number.

Control panel



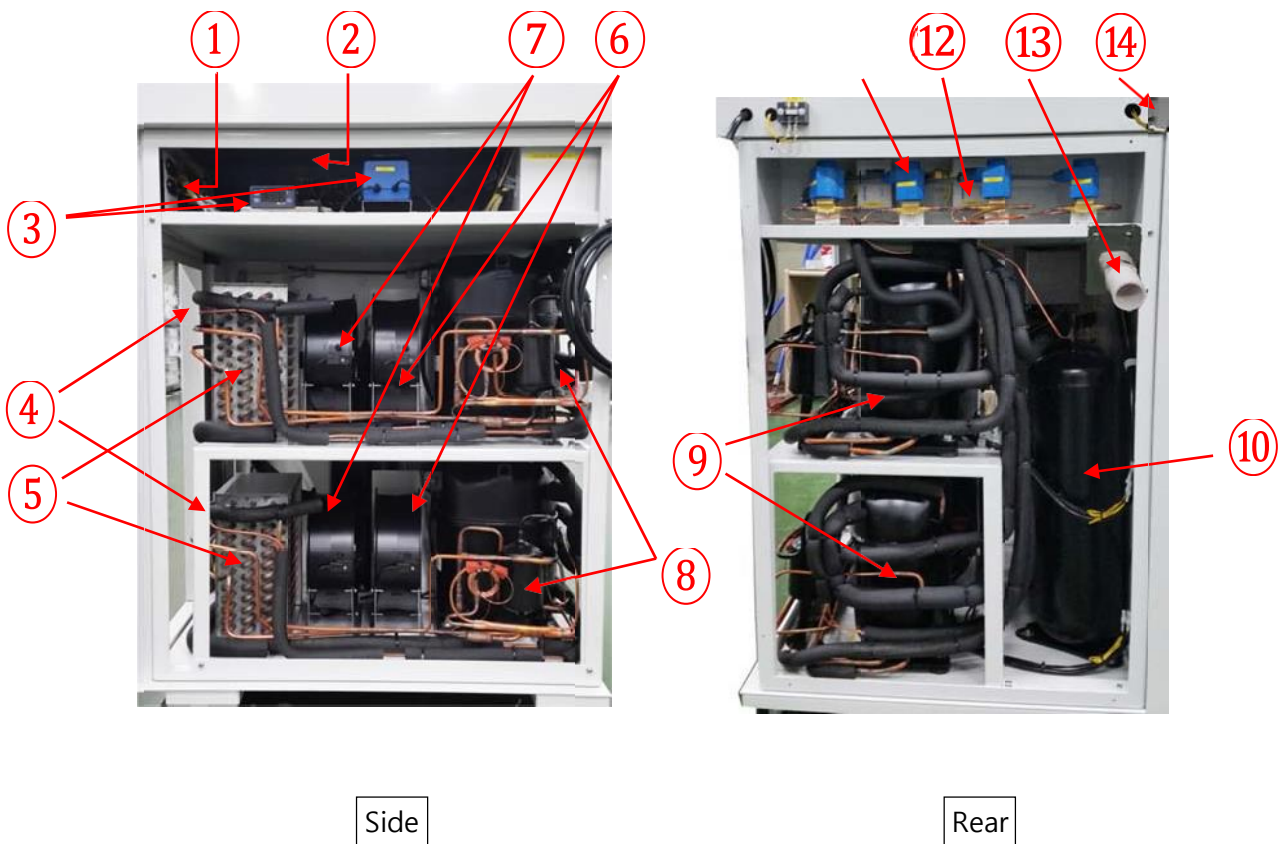
Main electric apparatus panel



Auxiliary cooling device (LN2)

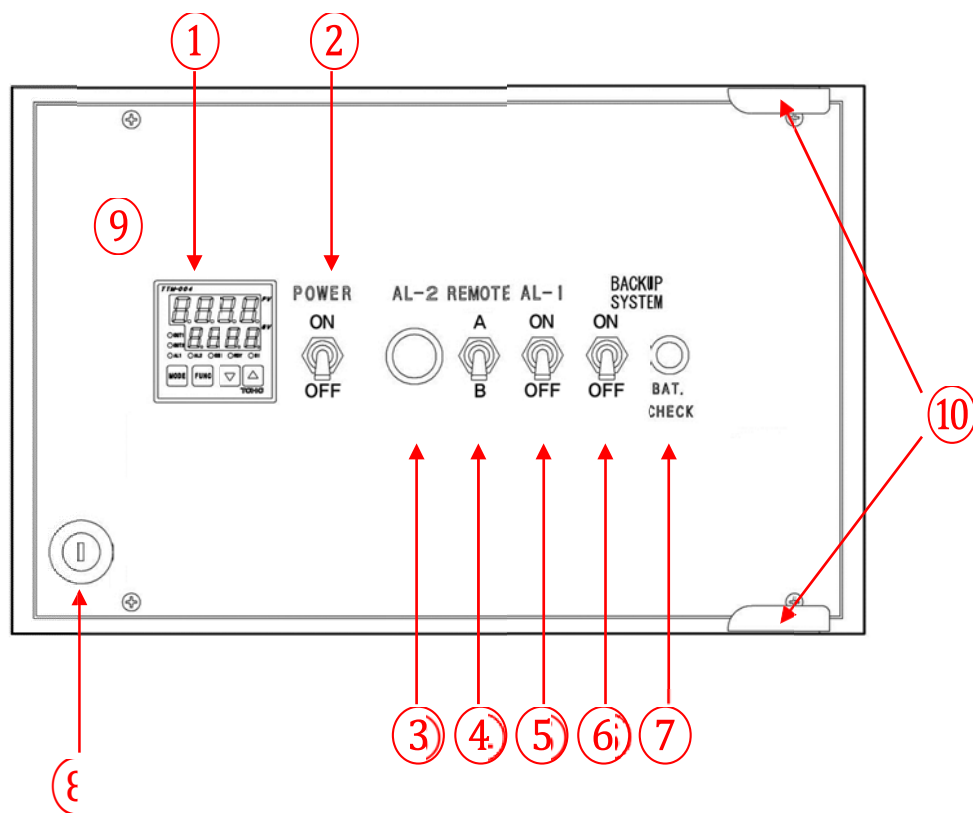


9. Component arrangement of the machine room



Component list	
NO	Name of component (parts)
1	Control unit
2	Main electric apparatus unit
3	LN2 auxiliary cooling device unit
4	Dryer filter
5	Block condenser (heat exchanger)
6	Radiating fan motor (main)
7	Radiating fan motor (backup)
8	Oil separator
9	Compressor
10	Expansion tank
11	Magnetic valve
12	Pressure switch
13	N2 exhaust port
14	LN2 spray stop door switch

10. Composition of a control unit

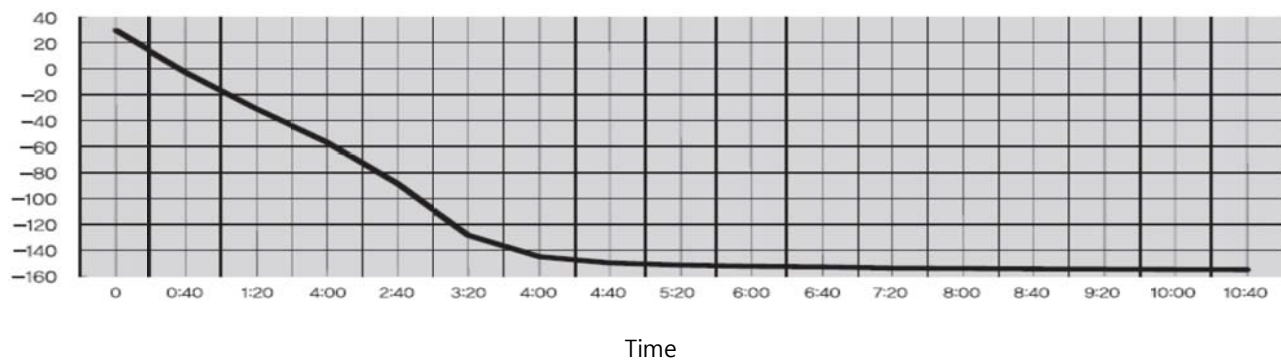


Component list	
NO	Name of component (parts)명
1	Temperature controller
2	Power switch (POWER)
3	Alarm lamp (AL-2)
4	External alarm switch (REMOTE)
5	Alarm switch (AL-1)
6	A uxiliary cooling switch (LN2)
7	Battery check button (BAT. CHECK)
8	Key cylinder
9	Acryl door
10	Acryl door hinge

11. Test data

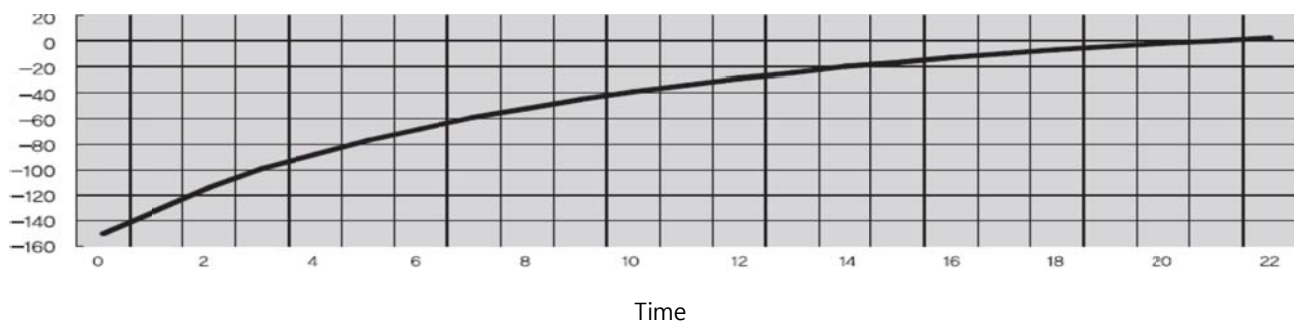
Pull down data CRYO 170, 230

Temperature(°C)

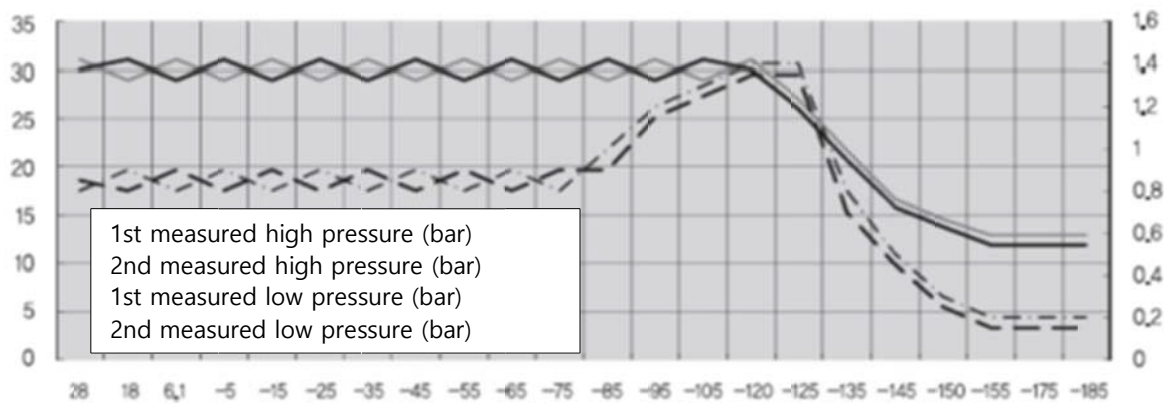


Pull up data CRYO 170, 230

Temperature(°C)



Temperature-pressure data CRYO 170, 230

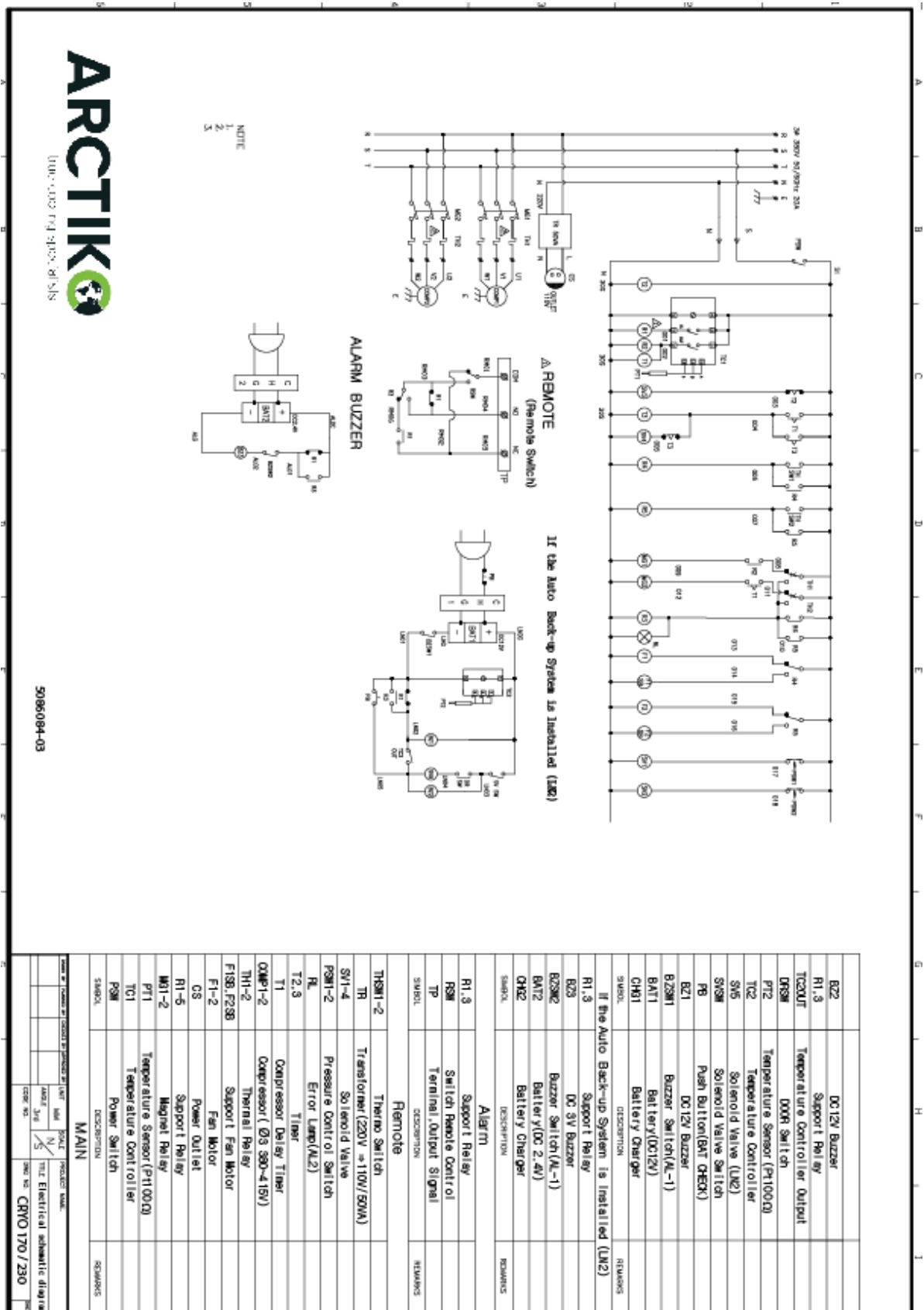


high pressure(bar)

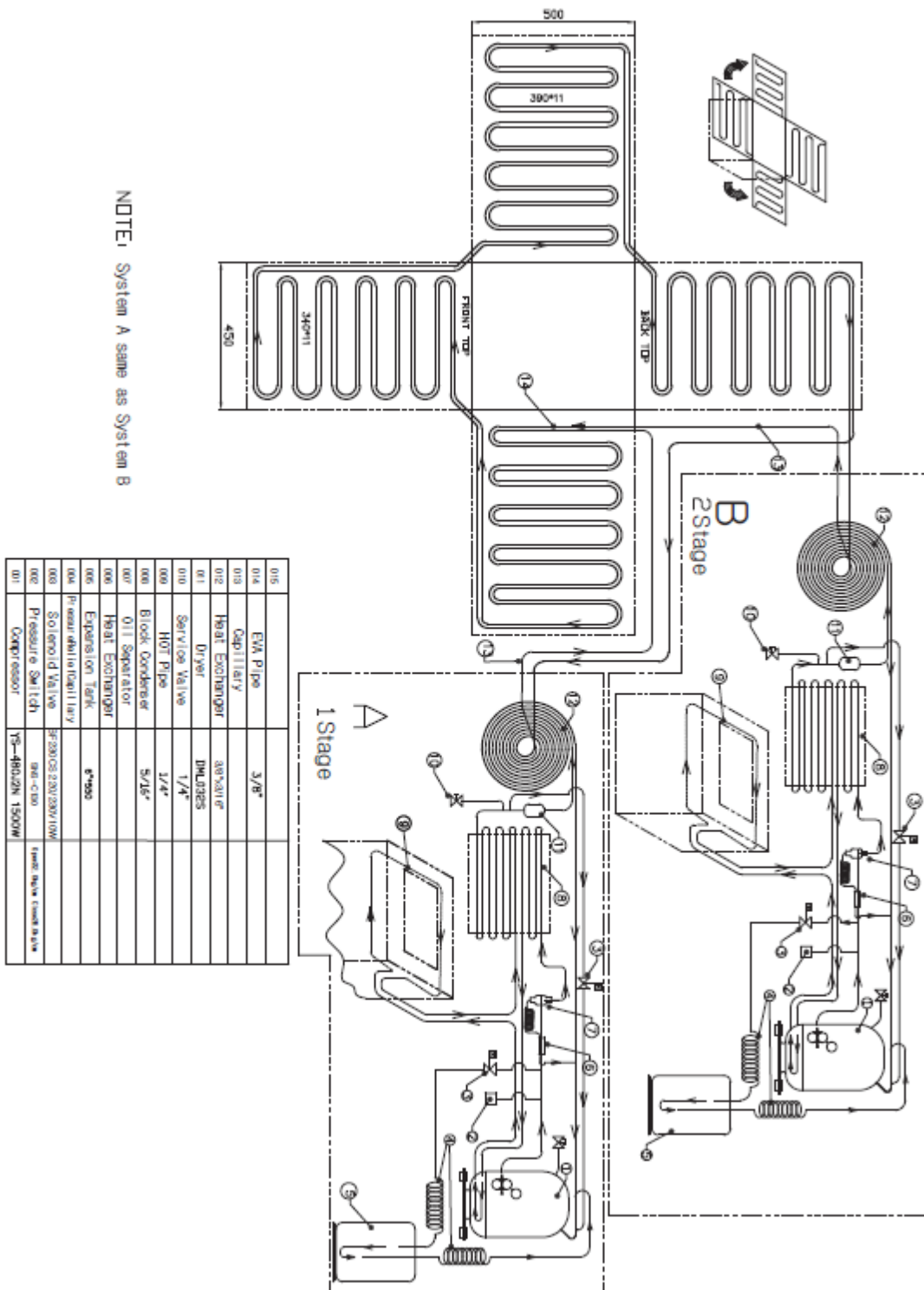
temperature (°C)

low pressure(bar)

12. Electrical schematic diagram



13. Refrigerant flow diagram



14. Automatic cooling auxiliary device (LN2)

14-1. Outline of an automatic auxiliary cooling device

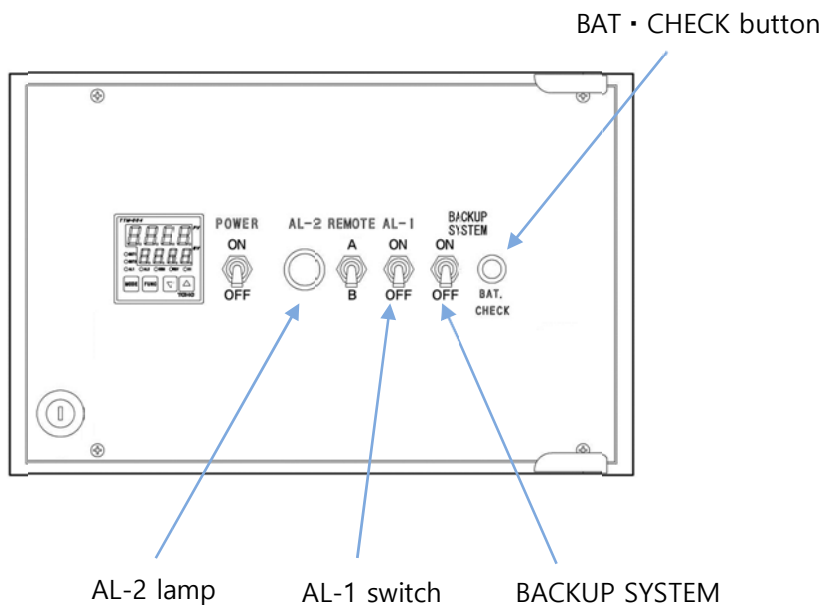
The product of -150°C has an automatic cooling auxiliary device as standard.

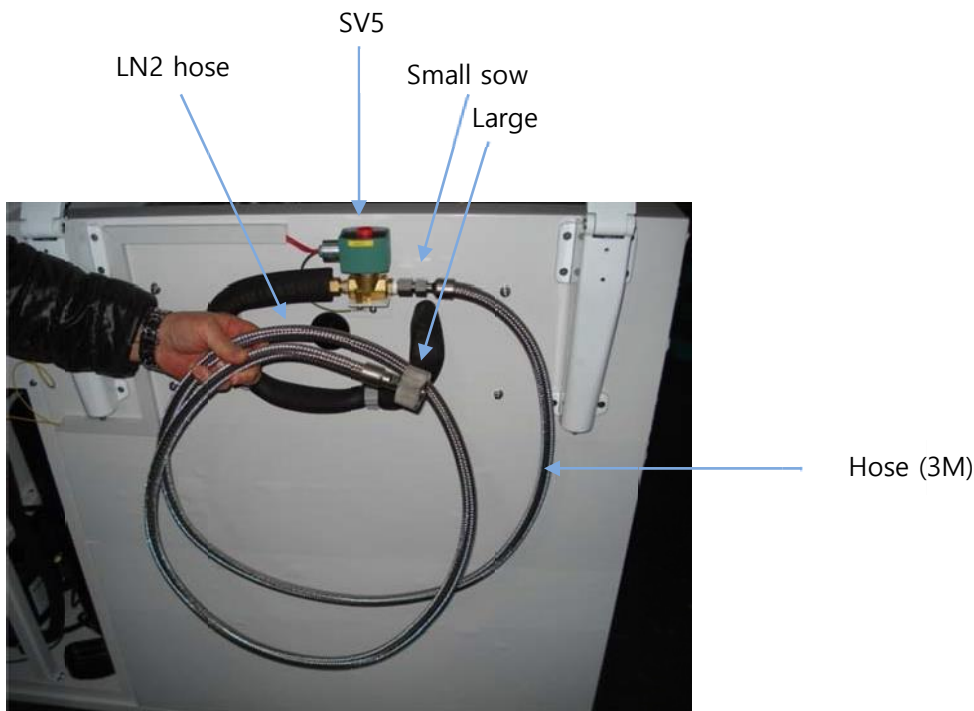
As to an automatic cooling auxiliary device, the inner temperature of the freezer rises, the magnetic valve connected to LN2 cylinder opens when the temperature reaches -130°C, an alarm buzzer goes off and at the same time, LN2 sprays from 2 nozzles of a freezer.

The inner temperature of a freezer while LN2 sprays intermittently keeps around -125°C~-135°C.

a . Installation of LN2 cylinder and hose connection

- A pressurized nitrogen cylinder is used for a LN2 cylinder.
- Turn off AL-1 switch, REMOTE switch, and BACKUP SYSTEM switch on a control panel.
- Connect the sow block on the end of the automatic cooling auxiliary device hose (3M) to the magnetic valve (SV5) and clap up firmly with a spanner not to have a leakage. Then, connect to the block on the end of the hose to a cylinder.
- If an user opens a liquid purge valve of a cylinder, LN2 fills up to a magnetic valve (SV5) via the hose of an automatic cooling auxiliary device.





- The temperature under which an automatic cooling auxiliary device operates is set as -130°C . When the inner temperature of a freezer reaches a setting temperature, a magnetic valve opens and LN2 sprays into a freezer.



Ask LN2 cylinder installation work to a high-pressure gas expert.

If there is garbage or metal powder in a connecting hose or connecting metal, a magnetic valve is clogged and LN2 is leaked or a magnetic valve becomes defective. Ask a high-pressure gas expert to be extra careful of garbage or metal powder for installation.

b . Operation check

- When the connection to the cylinder is done, start operation and cool the inner temperature of the freezer down below -130°C .
- If the inner temperature of a freezer reaches below -130°C , turn on AL-1 switch and BACKUP SYSTEM switch.
- To check LN2 spray, turn on BACKUP SYSTEM switch and check if LN2 sprays only while BAT?CHECK button is pressed.
- If an user opens the door upon LN2 spray, spray stops temporarily as per the operation of Door Limit Switch on the rear door, and if a door is closed, spray starts again.



Ensure to use a cylinder stand for cylinder installation, or use after fixing the cylinder firmly. Otherwise, a user may be injured by a fall or an unexpected accident may occur because of cut connecting hose and scattered LN2.



The power of an automatic cooling auxiliary device uses a chargeable battery (Lead storage battery). The life of a battery is approximately 3 years. Inquire of a store where a user bought it for replacement.



Install it where sufficient ventilation is possible. Ensure to ventilate since there's a risk of hypoxia or gas poisoning due to N2 gas discharge while an automatic cooling auxiliary device is running.

In addition, even when an auxiliary cooling device is not running, N2 evaporation gas is generated. Always ventilate the installation place.

C . Common use of alarm boozzer, alarm lamp

The alarm boozzer and the alarm lamp of the product with an automatic cooling auxiliary device use the alarm in common as 5-type alarm system.

【Alarm boozzer going off, where a lamp is on】

- ① Inner temperature anomalies of a freezer (setting temperature above +15°C) The inner temperature of the freezer rises while running by +15°C or above than the setting temperature.

Eg: Where the set inner temperature of a freezer is -150°C, an alarm boozzer goes off at -135°C (alarm boozzer 1)

- ② Freezer overload

Where the thermal relay of an electron switch for a freezer runs and a freezer does not start, AL-2 lamp (red) is on.

- ③ Fan motor anomalies

Where a fan motor lacks rotation or stops, alarm boozzer 1 goes off and AL-2 lamp (red) is on.

- ④ The Automatic cooling auxiliary device runs (anomalies of freezer inner temperature above -130°C)

If the inner temperature of a freezer is above -130°C while BACKUP SYSTEM switch is on, an alarm boozzer goes off (where LN2 cylinder is correctly connected, LN2 sprays into a freezer.)

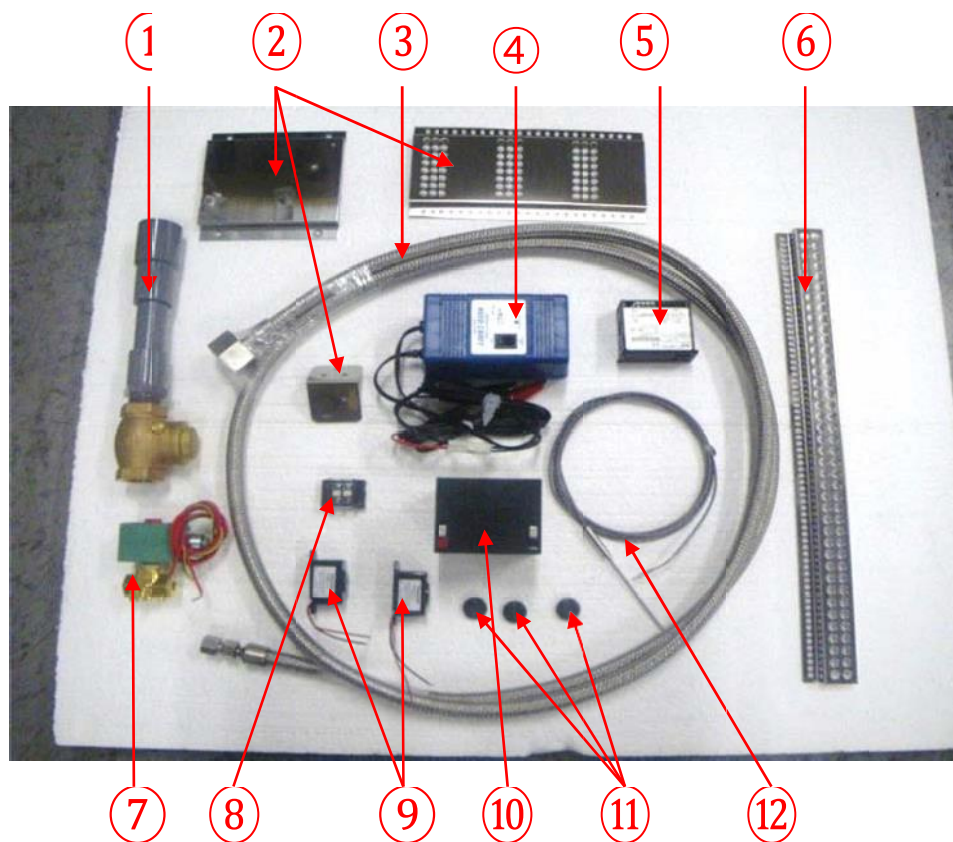
- ⑤ Blackout alarm

Alarm boozzer goes off where the power is down while AL-1 switch is on



If an alarm boozzer or an alarm lamp goes off,, inquire of the service center immediately.

14-2. Composition and list of components



Component list	
NO	Name of component (parts)
1	Back-water valve for exhaust
2	Each platform
3	Connecting hose
4	Charger
5	controller
6	Sensor cover SUS
7	Magnetic valve for LN2
8	2P terminal block
9	Buzzer for 12V x 2
10	12V battery
11	Rubber bush x 3
12	sensor Pt-100Ω

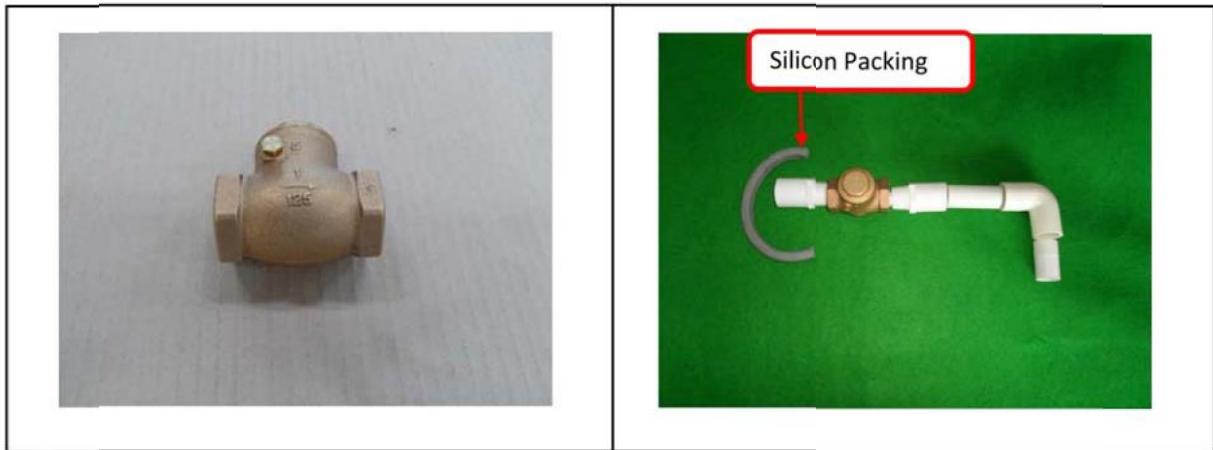


List of component (parts)	
NO	Name of component (parts)
13	Switch for LN2
14	Push button
15	Binding band
16	NK cramp
17	Flexible tube

14-3. Component placement and installation procedure

LN2 System

1. Assembly of Parts of LN2 Exhaust Pipe



Check Valve-A

Connection of Check Valve and PVC Exhaust Pipe-B



Check Valve(Ass'y)-C

1) Method and sequence of assembly of LN2 Exhaust Pipe

A=Prepare a Check Valve. (Norm:125R)

B=Connect the Check Valve and the PVC Pipe as in the picture. Use Teflon tape for the PVC socket part.

Fix the PVC Pipe with glue. Finish a Silicone Packing outside the Machine Room.

C=Complete the assembly, and check if the direction of flow of LN2 gas is correct.

LN2 System

2. Assembly of Main Frame of LN2 Exhaust Pipe



Assembly of Main Frame of Exhaust Pipe-A

Heat Conservation of Exhaust Pipe-B



Work of Packing of Protruding Part of Exhaust Pipe-C

1) Method and sequence of assembly of LN2 Pipe

A=Assemble the connection of the PVC Exhaust Pipe with glue.

B=Conserve heat in the PVC Exhaust Pipe by using black insulation material, and the heat conservation prevent dew condensation when LN2 is sprayed.

C=Cut as needed to cover the exhaust pipe protrusions with scissors.

※Remove the Cap of the Exhaust Opening and the insulation material in the PVC before assembly.

LN2 System

3. Solenoid Valve Assembly



Solenoid Valve Bracket-A



Assembly of Main Frame of Bracket-B



Solenoid Valve-C



Solenoid Valve(Ass'y)-D

1) Method and sequence of assembly of Solenoid Valve

A=Inspect the caliber and the norm of the Bracket Hole of the Solenoid Valve.

(Check the norm of the hole processed on the Main Frame.)

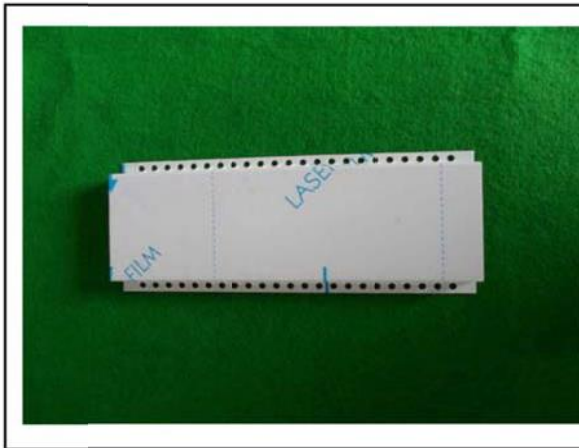
B=Avoid making a scratch when attaching the Bracket.

C=Check the norm of the Solenoid Valve. (Norm: 8263G240LT DC12V)

D=Prevent the Bolt from loosening when fixing the Solenoid Valve.

LN2 System

4. Battery and Charger Assembly



Battery Plate-A



Charger(Battery)-B



Battery-C



Charger+Battery(Ass'y)-D

1) Method and sequence of assembly of Battery and Charger

A=Inspect the norm and deburring of the Support.

B=Check the norm of the Charger. (Norm: P1210TR)

C=Check the norm of the Battery. (Norm: NPH5-12V)

D=Fix the Battery and the Charger by using a Wiring Tie.

LN2 System

5. Controller and Terminal Block Assembly



Plate-A



Control-B



Terminal Block(2p)-C



Control+Terminal Block(Ass'y)-D

1) Method and sequence of assembly of Controller and Terminal Block

A=Inspect the norm and deburring of the Support. (A part mounting hole is processed.)

B=Check the norm of the Controller. (Norm: FOX-2P1-D)

C=Check the norm of the Terminal Block. (Norm: 20A*2P)

D=Fix the Controller by using a Wiring Tie.

LN2 System

6. Assembly of Wiring of Charger and Controller

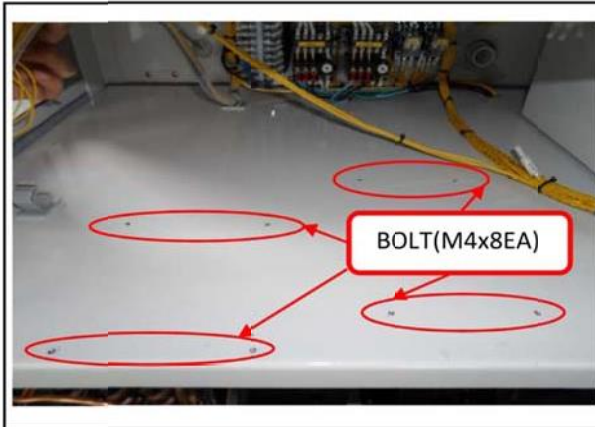


Plate-A



Charger+Battery(Ass'y)-B



Control(Ass'y)-C



Control+Charger(Ass'y)-D

1) Method and sequence of assembly of wiring of Controller and Charger

A=Inspect the norm of the Support. (A part mounting hole is processed.)

B=Prevent the directions of the Charger and the Battery from being changed.

(Refer to the assembly of 4-D.)

C=The normal direction of the Controller is the side direction as in the picture.

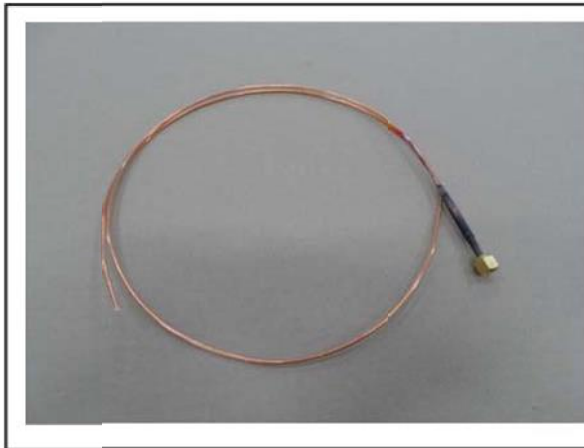
(Refer to the assembly of 5-D.)

D=Fix the Controller and the Charger, and perform wiring with the Wiring Diagram as the standard.

(The Wiring Diagram is attached.)

LN2 System

7. S/V and Capillary Assembly



Capillary Ass'y-A



S/V+Capillary Ass'y-B



S/V+Capillary Ass'y-C

1) Method and sequence of assembly of the S/V and the Capillary

A=Prepare two Capillaries (around 1.0*1.5M), insert them into the 1/4" Pipe, insert a nut, and perform welding.(Parts of A are provided as assemblies.)

B=Before inserting the Capillary in the inward direction, process the hole into which the Capillary will be inserted with a long rod of around $\phi 2 \times 300\text{mm}$. After installing the Capillary, fill the hole with silicone.
(The hole into which the Capillary will be inserted is processed.)

C=After the work of B, finish by using lagging materials for preventing dew condensation of the Capillary.

LN2 System

8. LN2 Gas Spray Cover Assembly



Capillary Cover-A

Assembly of Main Frame of Cover-B



Capillary Cover Ass'y-C

1) Method and sequence of assembly of LN2 Spray Cover

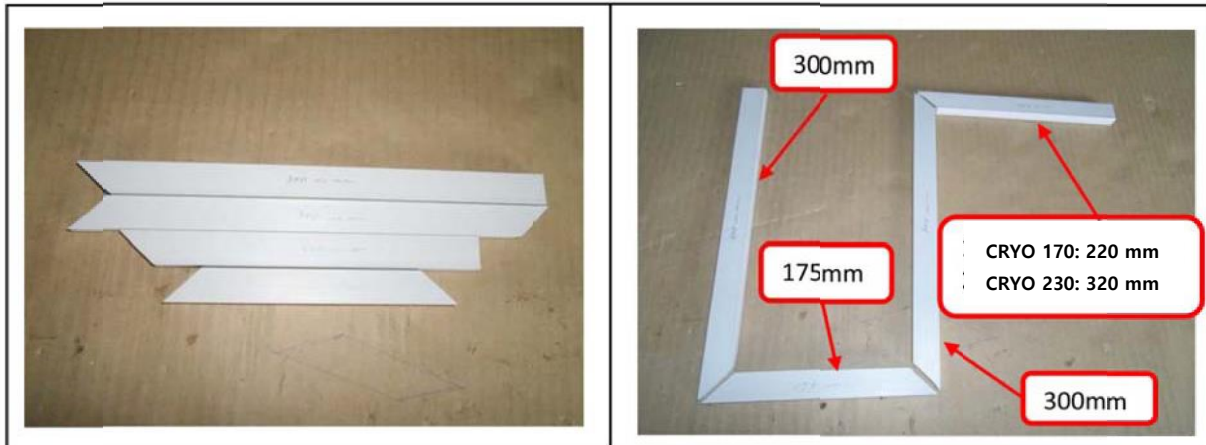
A=Check the norm and deburring of the Spray Cover.

B=When assembling the Cover, avoid making a scratch. Also, let the Capillary face inward.

C=Assembly by checking if the Cover touches the Capillary.

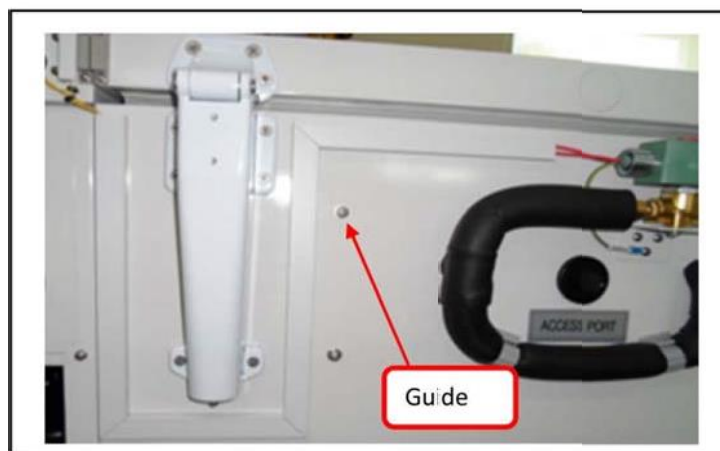
LN2 System

9. LN2 Wiring Cover Assembly



PVC Mold-A

PVC Mold-B



PVC Mold Ass'y-C

1) Method and sequence of assembly of LN2 Wiring Cover

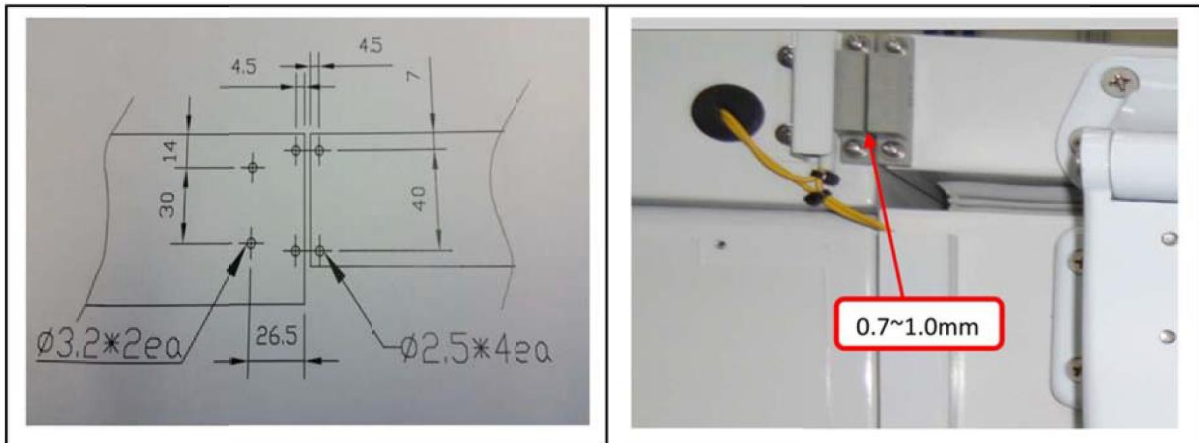
A=Prevent pollution on the surface when cutting the Mold.

B=Pay attention to the norm and the angle when cutting the Mold. (Refer to the picture for the norm (the external diameter).)

C=When attaching the Mold, keep it horizontal and vertical, and secure a space for the position for attaching a Rear Surface Guide.

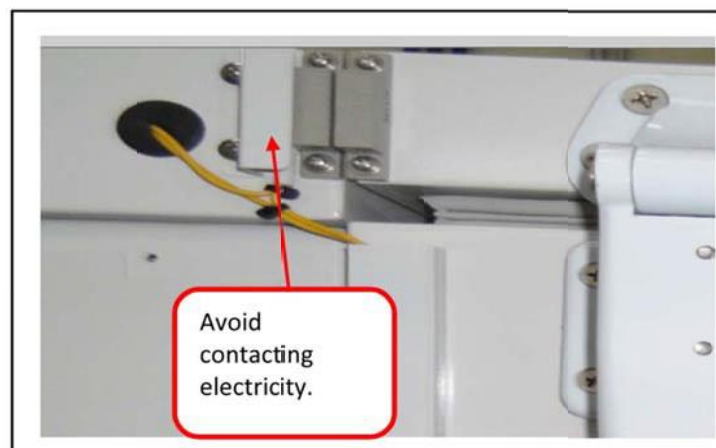
LN2 System

10. Door Remit Switch Assembly



Door Remit Switch-A

Door Remit Switch-B



Door Remit Switch Ass'y-C

1) Method and sequence of assembly of Door Remit Switch

A=When processing the Remit Fixing Hole, pay attention as the space is narrow. (When the Hole is first processed, it will be damaged when the corner is welded. Thus, process it manually after welding.)

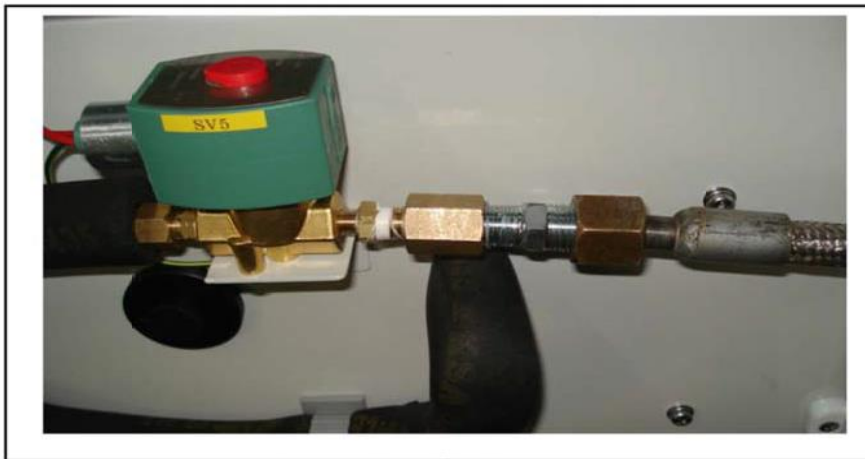
B=Keep the interval of the Remit Switch to be 0.7-1.0 mm.

(If the interval is made to be 1.0 mm or greater, the Switch may not work.)

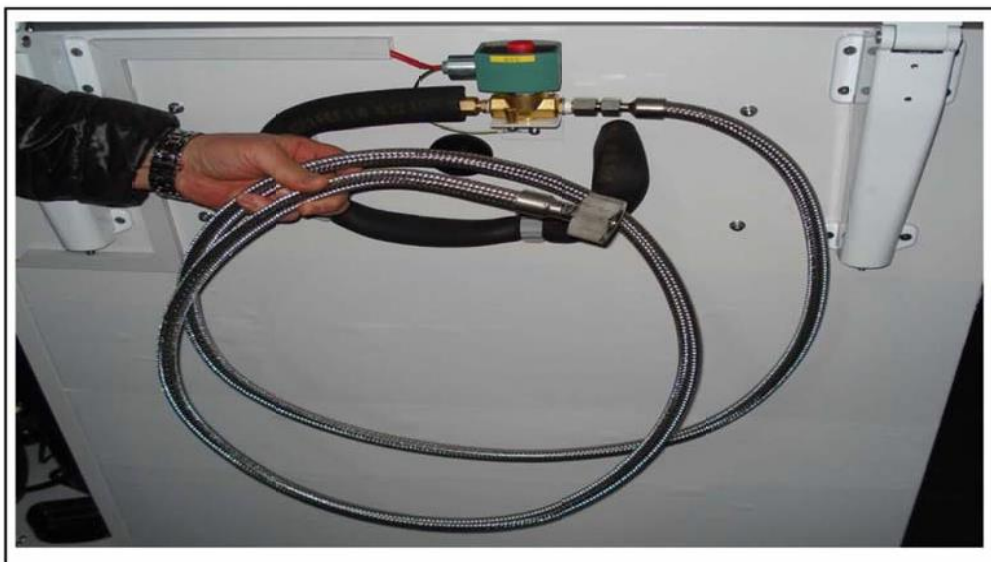
C=When assembling the Remit Cover, avoid contacting the Wiring Terminal.

LN2 System

11. LN2 Hose Assembly



Connection of Wire Hose-A



Wire Hose Ass'y-B

1) Method and sequence of assembly of Wire Hose

A=Connect the Wire Hose by using Teflon tape for no gas to leak.

B=Assemble and use the Wire Hose as in the picture. The Hose is not one of supplied goods.

※ Instructions about LN2 System

- 1) Use the LN2 System by turning ON the switch of the Charger.
- 2) It takes five hours or longer to charge the Battery. Use the Battery by sufficiently charging it.
- 3) Use a pressurizing liquid nitrogen bomb as the bomb for LN2.
- 4) The operating temperature of the LN2 is -130°C .
- 5) For the products with the LN2 System, it is always required to ventilate the indoor space. Pay attention as there is a risk of suffocation due to automatic discharge of nitrogen in a place with no ventilation.

Version 1.4(2012.10.04)



CONOTEC®
Digital Temperature
Controller
CONOTEC CO., LTD. www.conotec.co.kr
Operating Manual



1 Caution

1 Safety and Hazard Instructions

• Please read the operating manual thoroughly before using the device into operation.

• We will not assume any responsibility for damage to assets or persons caused by improper handling or failure to observe the safety instructions or hazard warnings.

• For safety and servicing reasons, unauthorized conversion and/or modification of the device is not permitted.

• Do not exceed the maximum permissible current - in case of short-circuit, use a connection of suitable power.

• The device must be adequately protected from water and dust as per the application and must be accessible via the use of appropriate tools.

• The device must not be exposed to extreme temperatures, sunlight, strong vibrations or high levels of humidity.

• Operation or installation is not permitted under unfavorable ambient conditions such as wetness or excessive induction loads or solvents, especially high-frequency noise.

• Avoid operation or installation close to high-frequency fields such as welding devices, sewing machines, wireless transmitter, radio systems, SCOT controller, etc.

• Do not install the sensor cable nearby signal cable, power cable, RS-485 cable.

• Fix the sensor cable with the sensor cable's bracket, however do not make it too much longer.

• Please use the sensor cable without any cutting or fusing.

• The device is not a toy and should be kept away from children.

• Installation work must only be carried out by suitably qualified personnel who are familiar with the hazards involved and with the relevant regulations.

• You shouldn't tinkler with anything or the product may not be opened or disassembled unless you know what you're doing. Please ask us about this questioning.

2 Composition

Model	Sensor	Temperature	Size(mm)	Output	Function
FOX-2P1	PT1000	+199.9°C ~ +400.0°C	77(Wx)35(Hx)40(D)	Relay	1 relay, controlling
FOX-2P2	PT1000	+199.9°C ~ +400.0°C	77(Wx)35(Hx)40(D)	Relay	1 relay, 1 relay, 1 relay, 1 relay
FOX-2P1-L	PT1000	+199.9°C ~ +400.0°C	77(Wx)35(Hx)40(D)	Relay	1 relay, 1 relay, 1 relay, 1 relay
FOX-2P2-L	PT1000	+199.9°C ~ +400.0°C	77(Wx)35(Hx)40(D)	Relay	1 relay, 1 relay, 1 relay, 1 relay

3 Part name



4 Setting temperature & programs

The present temperature shall be displayed after turning on of the power supply.

If **SET** key is pressed softly, **SET** letter will be showed and then, if **UP** key is pressed again, setting temperature will be flicked.

Press **DOWN** key to change the set values.

If **SET** key is pressed again, **SET** letter shall be showed and the setting temperature value shall be saved and the present temperature shall be displayed.

Setting programs

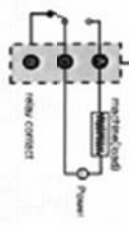
If **SET** key is pressed for more than 5 seconds, the program mode will be proceeded as following sequences:

HSP->XLSF->STPF->XOL->XDR->XOCH->...

The setting value of each mode should be changed by pressing **UP** key and then press **DOWN** key to move to next mode.

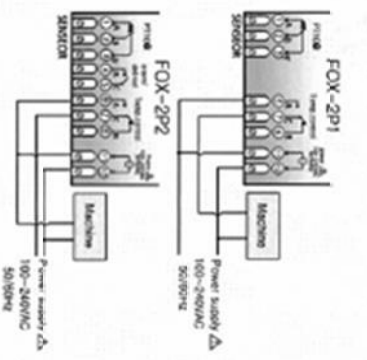
The set or programming mode is terminated, if you press the **DOWN** key for more than 2 seconds, parameter(set values) are saved after showing **SET** letter or return to the present temperature automatically after 10 seconds.

5 Relay junction



※ Relay contact capacity - less than 250VAC 2A

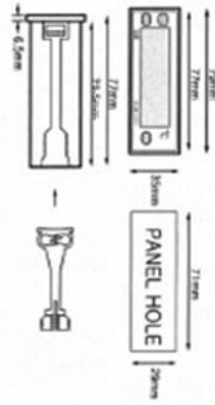
6 Connection



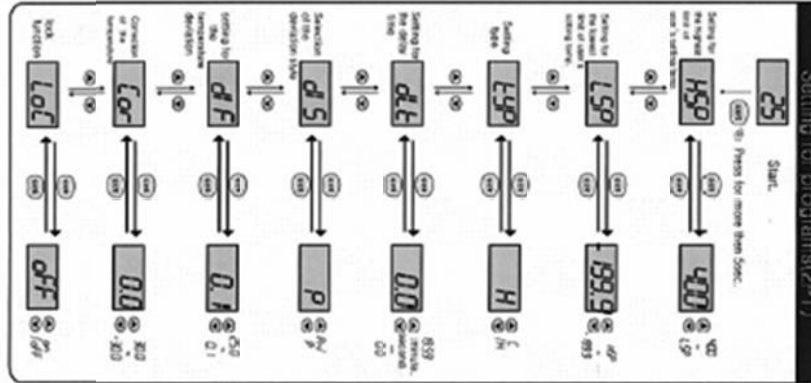
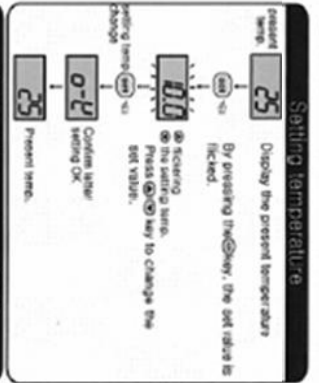
7 Temp.range&set value within observe

Function	Set value within observe	Function	Set value within observe
HSP	400	REL	1.0
LSP	-199.9	HP	400
LSP	H	LP	-199.9
dL	0.0	USP	0.0
dS	P	SEU	0.0
dF	1.0	dEP	0.0
Cor	0.0	dFL	4
LoC	0.0	oL	0
oL2	Pro	oL	0.00
REL	0.0	dL	0.00

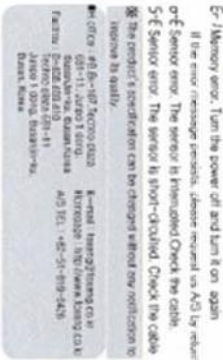
8 Dimension



9 Sequence



13. Controller Instruction Manual-2



14-4. Digital controller for LN2

※ About the handling and connection of a controller (Product of CONOTEC, FOX-2P1-D),
download the user manual from the website of a manufacturer as follows.

http://www.foxeng.co.kr/upload/pty3/1373874551_0.pdf

Parameter setting table

Setting temperature	-130°C
HSP	-50
LSP	-180
TYP	C
DLT	0.00
DIS	P
DIF	1.0
COR	0.0
LOC	OFF

※ Refer to the user manual of a manufacturer for how to control / operate.

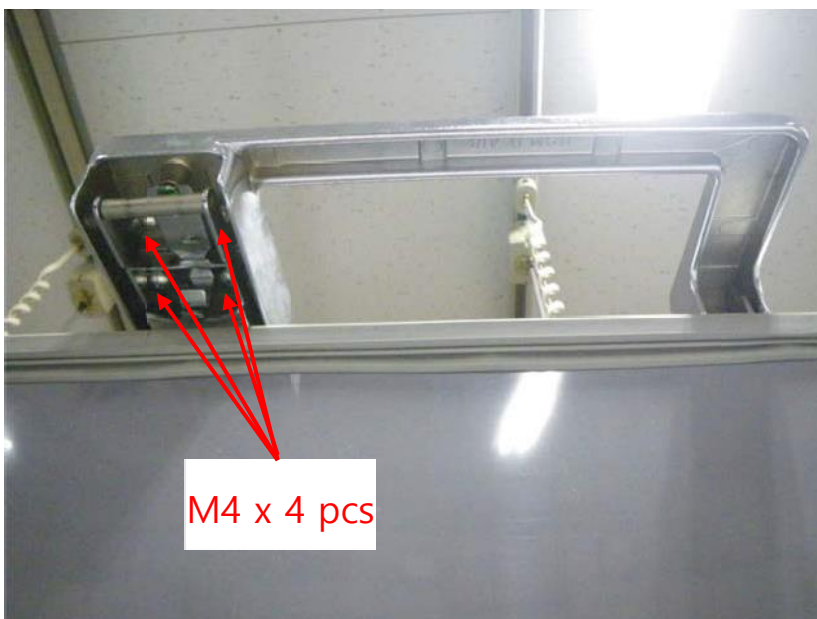
15. Detachment of exterior components

15-1. Door handle

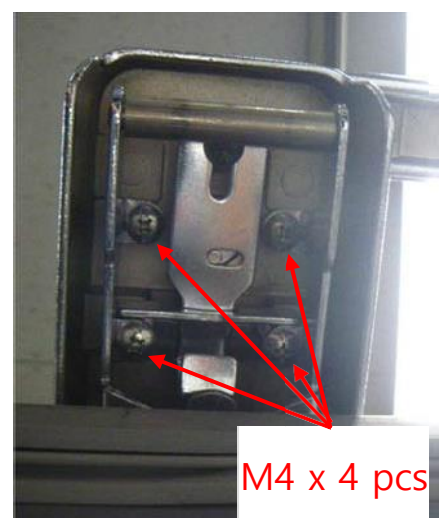
- ① Release a handle part



When opening the door and lifting the door handle



Enlarged photo



Detached handle



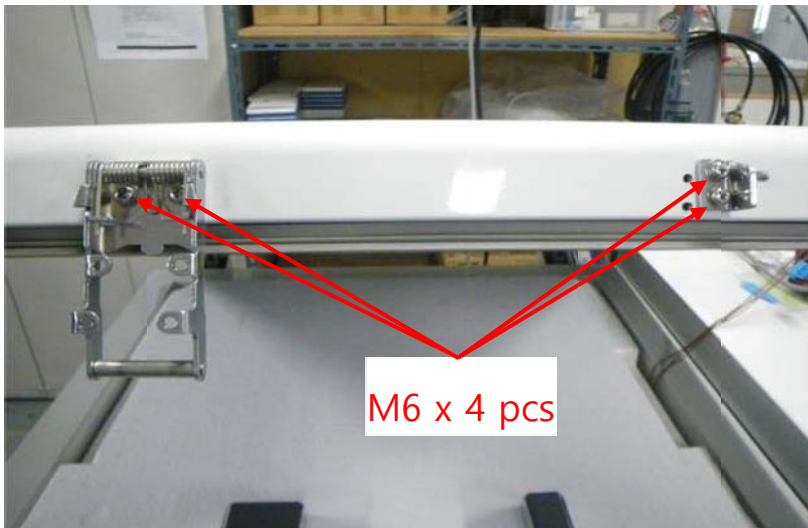
Enlarged photo left handle



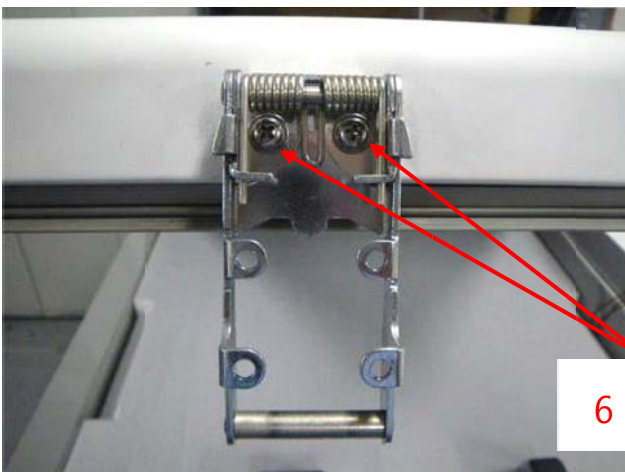
Enlarged photo right



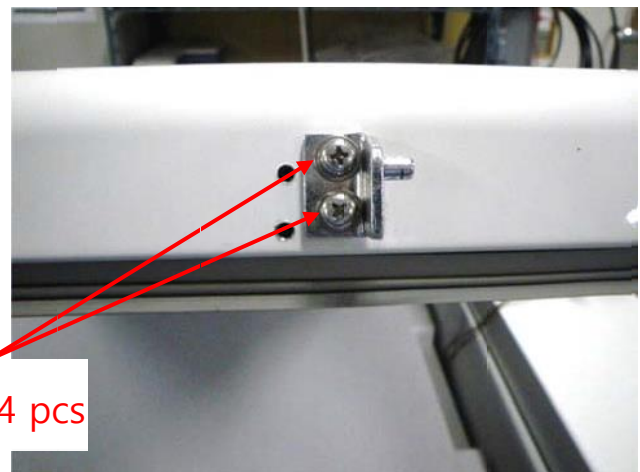
② Release the handle fastening base



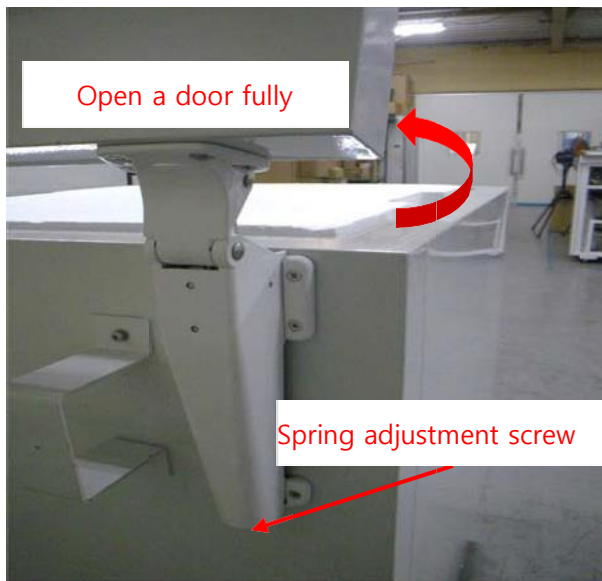
Enlarged photo left fastening



Enlarged photo right fastening



Rotate a spring rotating adjustment screw 4-5 times to the left

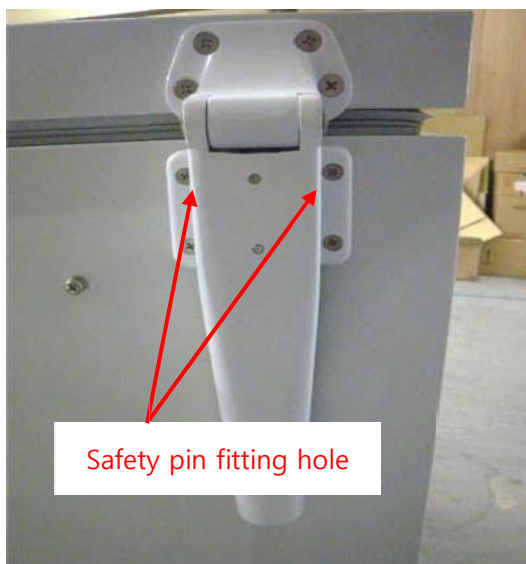


② Pin a safety pin in a hinge

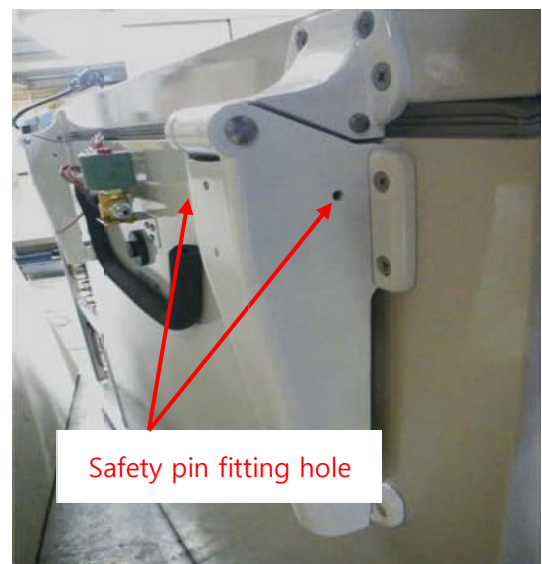
※ Leave a safety pin as pinned even when discarding an old hinge. Never unpin!

If a user unpins a safety pin carelessly, the hinge may spring up and cause an injury.

Front hinge



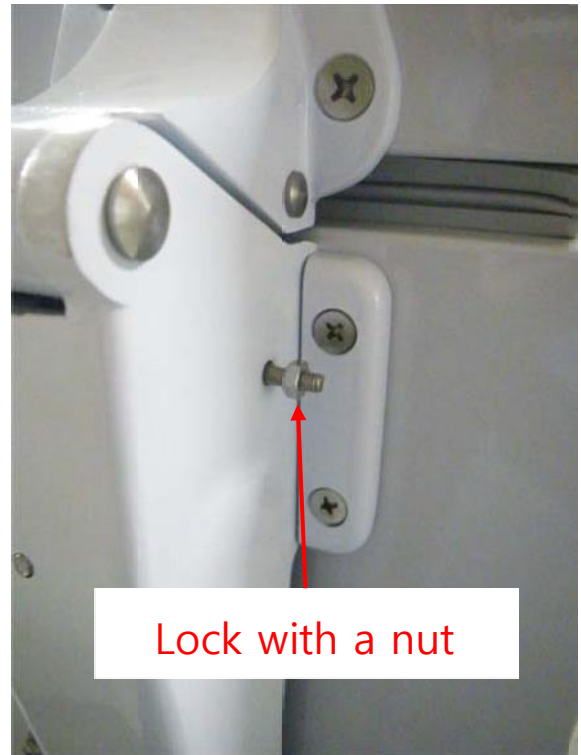
Side hinge



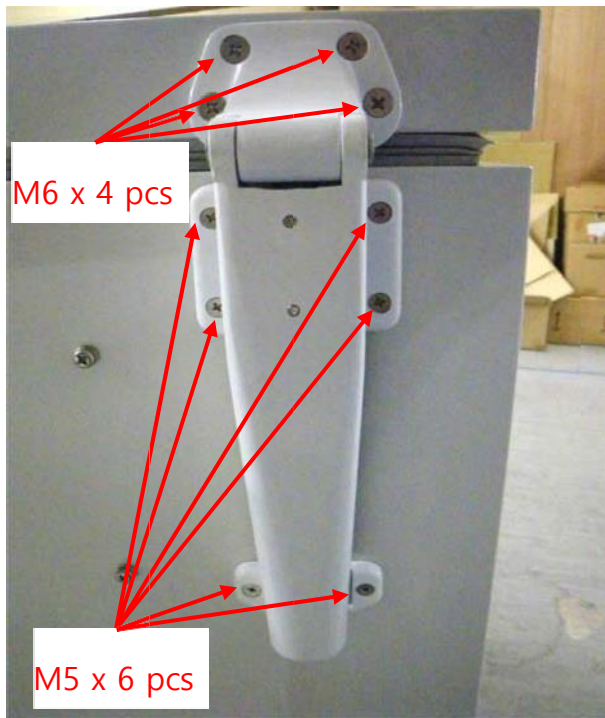
Safety pin M4 x 65mm length or longer, M4 nut (M4 x 70mm length used in the picture)



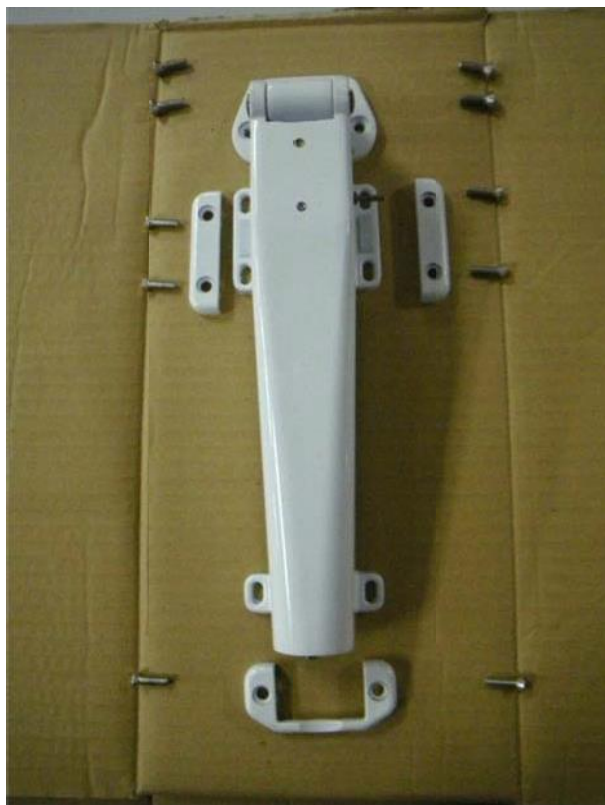
After fitting a safety pin



③ Release the hinge



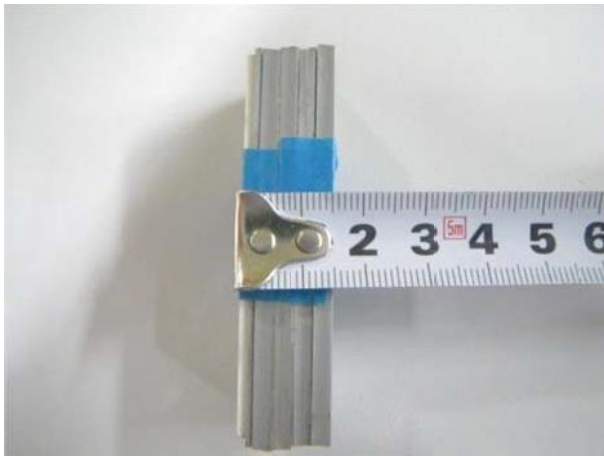
Released



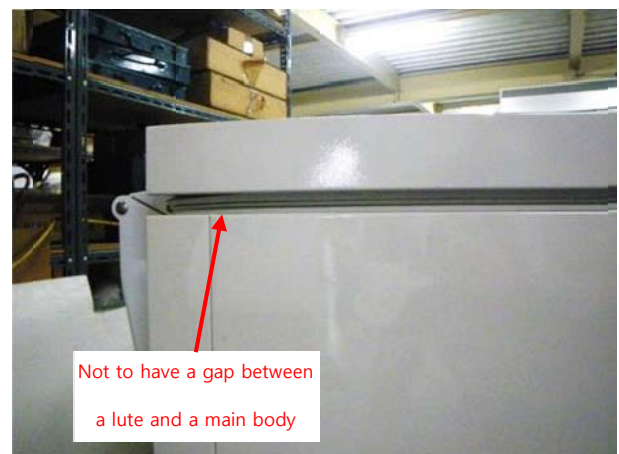
Screw hole on the main



- ④ Insert a jig of 15mm high between the main body and the door



- ⑤ Attach the new hinge



- ⑥ Pull out a safety pin and open/close a door many times to check if it has any abnormal sound

In case of abnormal sound, it may be because the attachment angle of the hinge was bent from side to side for installation.

Fit a safety pin and a jig again and then attach a hinge correctly.

⑦ Adjust the strength of a hinge spring.

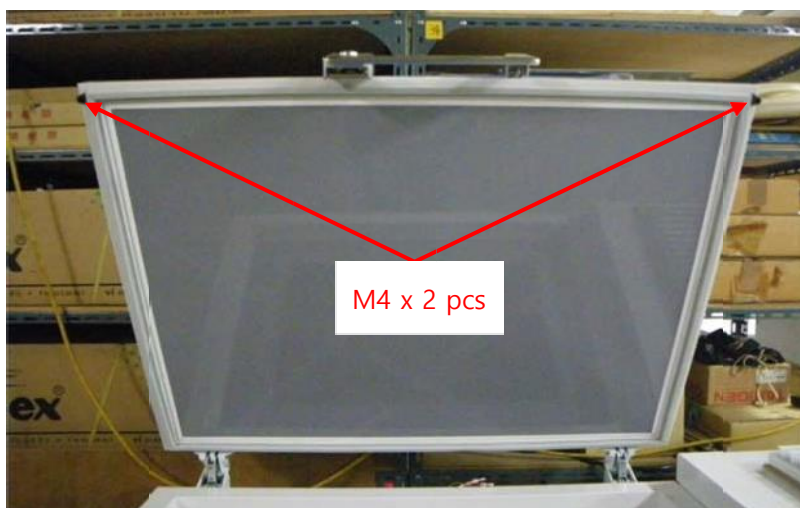
Turn the spring rotating adjustment screw to the right, and adjust the strength of left and right hinges as the same.

If the hinge spring is too strong, the door may spring up too strongly, which can be very dangerous.



15-3. Door gasket

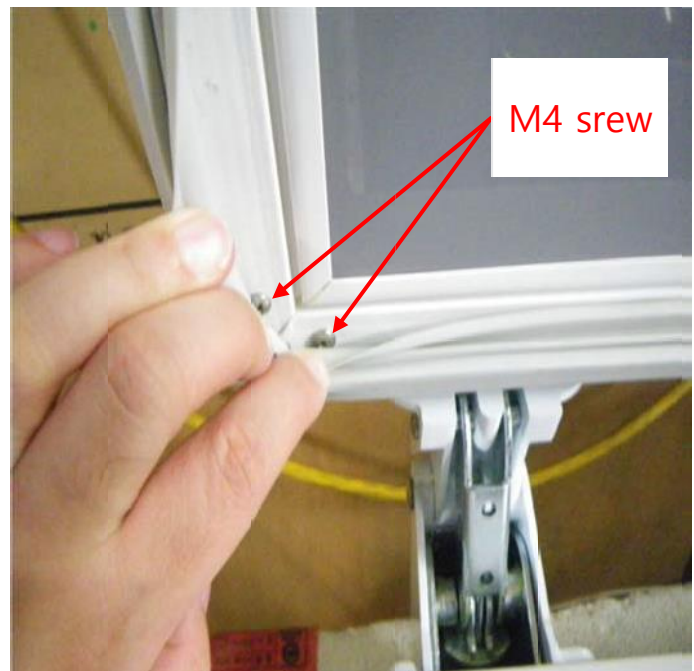
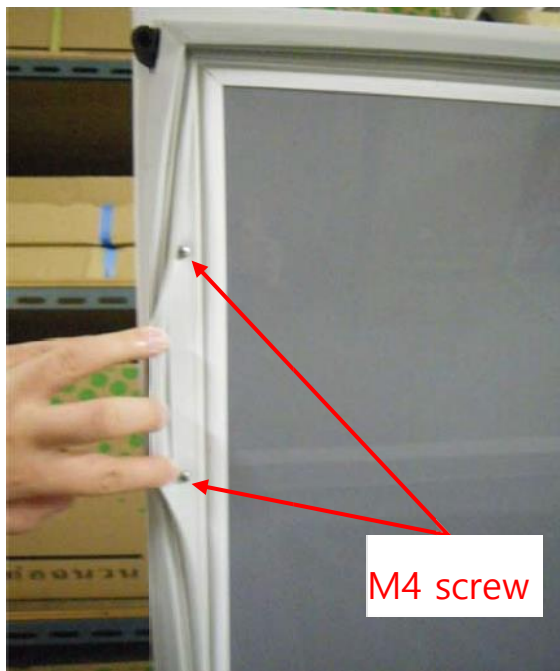
① Remove the door gasket dent proof stopper



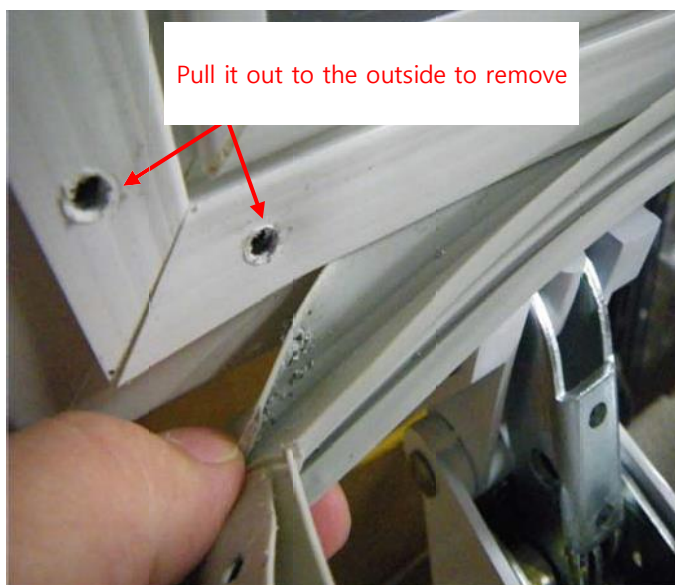
② Release a screw

CRYO 170 . . . M4 x 28 pcs

CRYO 230 . . . M4 x 38 pcs



③ Remove a door gasket



- ④ Insert a new lute



- ⑤ Fix the door gasket with a screw and insert the door gasket dent proof stopper

15-4. Machine room cover (side, rear)

- ① Detach the rear cover



② Detach the side cover



After detaching the machine room cover



15-5. Machine room front gallery



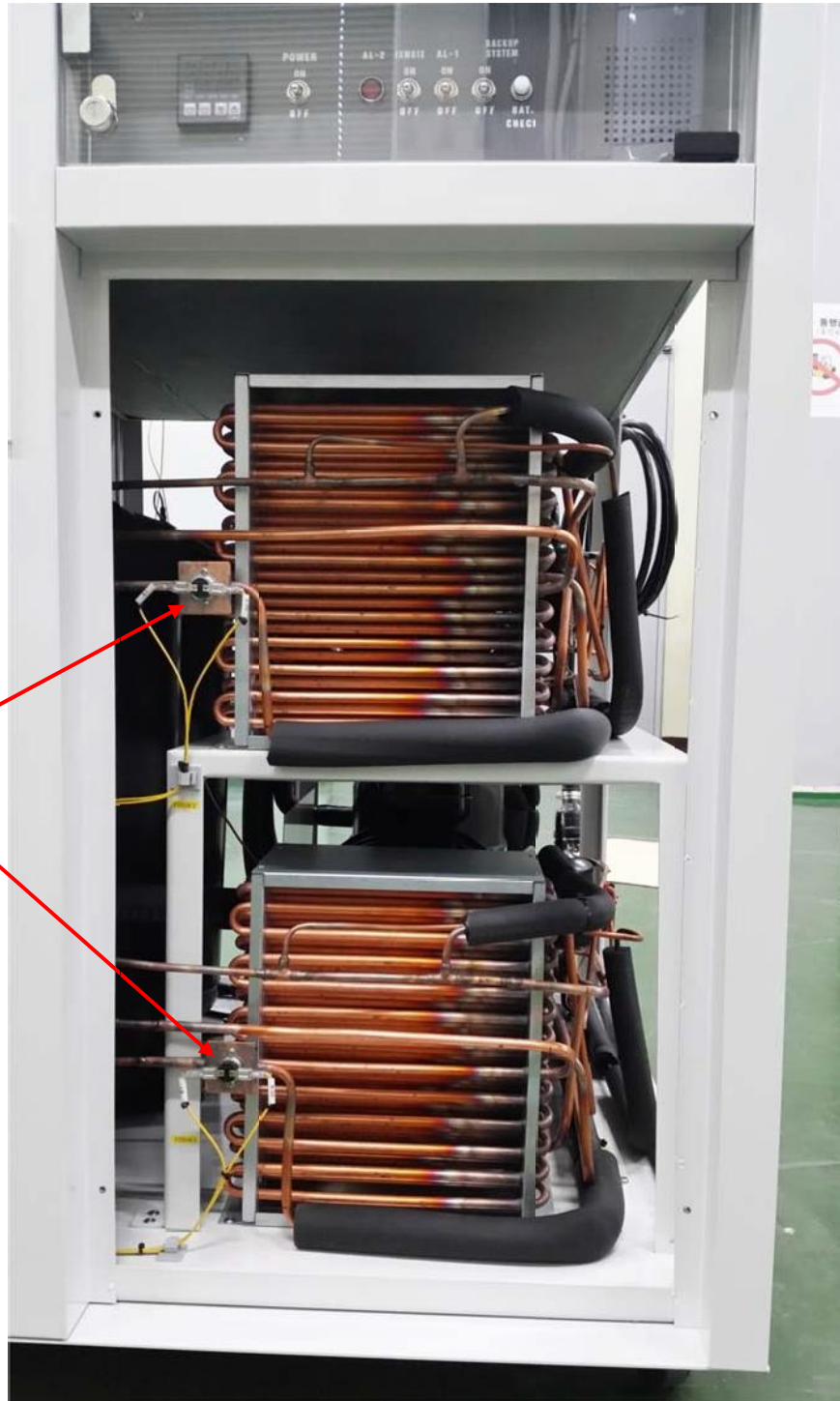
Enlarged upper screw part



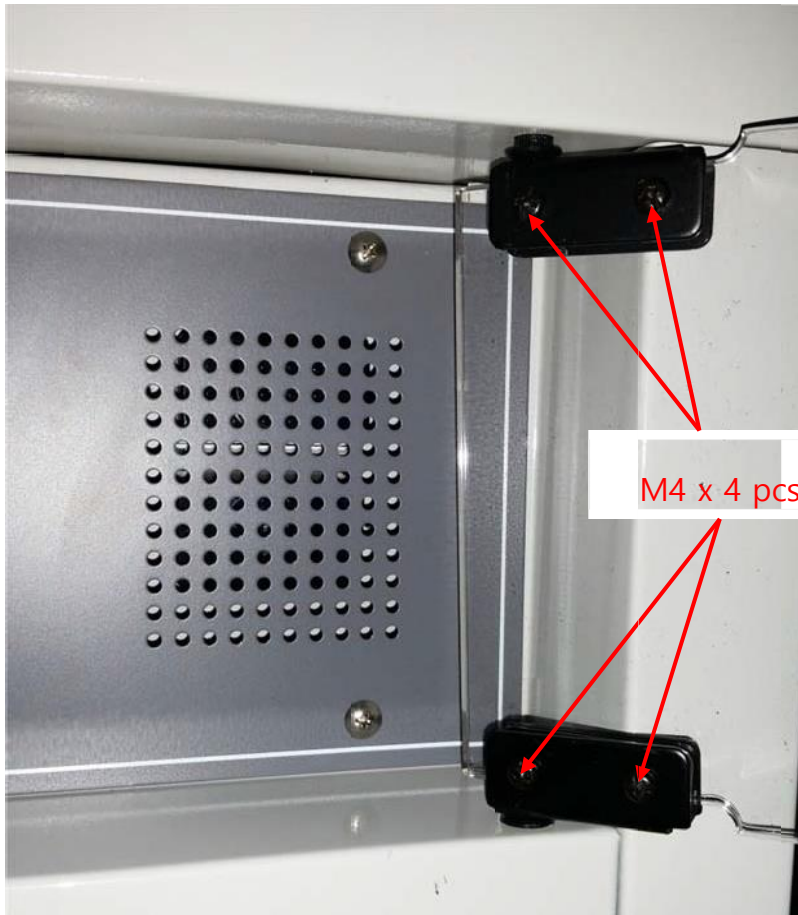
Enlarged lower screw part

After detaching the front gallery

Fan motor
Thermostat Switch



15-6. Acryl door



After detaching an acryl door



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