Panasonic

Service Manual Ultra-Low Temperature Freezer

KM-DU73Y1E
KM-DU53Y1E

Panasonic Healthcare Co., Ltd.
Biomedical Business Unit

SM9910284

Effective models

This service manual is effective for following models.

Model name	Product code	Voltage and Frequency	
KM-DU73Y1E KM-DU53Y1E	903 036 54 903 037 54	230/240V	50Hz

Contents

Specifications

■Structural specifications

Item	KM-DU73Y1E	KM-DU53Y1E
Name	Ultra-low Temperature Freezer	
External dimensions	W1010 × D870 × H1990 (mm)	W770 × D870 × H1990 (mm)
Internal dimensions	W870 × D600 × H1400 (mm)	W630 × D600 × H1400 (mm)
Effective capacity	728 L	526 L
Exterior	Painted steel	
Interior	Painted steel	
Outer door	Painted steel	
Inner door	2doors, ABS resin panel with stainless frame	
Shelf	Stainless steel, 3 shelves (adjustable) Inner dimension; W848 x D533 (mm) Load; 50 kg/shelf	Stainless steel, 3 shelves (adjustable) Inner dimension; W608 x D533 (mm) Load; 50 kg/shelf
Access port	17 mm diameter, 2 locations (back x 1, bottom x 1)	
Insulation	Vacuum insulation panel + Rigid polyurethane foamed-in place	
Compressor	High stage side; Hermetic type, Output; 750 W Low stage side; Hermetic type, Output; 750 W	
Evaporator	High stage side; Cascade type, Low stage side; Tube on sheet type	
Condenser	High stage side; Fin and tube type, Low stage side; Shell and tube type	
Refrigerant	High stage side; R-290 (flammable), Low stage side; R-170 (flammable)	
Temperature controller	Micro processor control system	
Temperature display	Digital display	
Thermal sensor	Platinum resistance (Pt 1000Ω)	
Alarm	High temp. alarm, Low temp. alarm, Power failure alarm, Door alarm, Filter alarm	
Remote alarm contact	Allowable contact capacity: DC 30 V, 2 A	
Power source	AC 230 V/240 V, 50 Hz	
Battery	Nickel-metal-hydride battery, DC 6 V, 1100 mAh, Auto-recharge (5HR-AAC)	
Weight	334 kg	291 kg
Accessories	1 set of key, 1 scraper, 1 stick for air intake port cleaning	
Optional component	Temperature recorder (MTR-G85C)* + Recorder sensor cover (KM-DUP01SF1) Temperature recorder (MTR-85H) + Recorder fixing (MDF-S3085) + Recorder sensor cover (KM-DUP01SF1) Recording paper (RP-85: MTR-85H, RP-G85: MTR-G85C) Ink pen (DF-38FP: MTR-85H, PG-R: MTR-G85C) Inventory rack (IR-220U, IR-224U) Interface board (MTR-480), Data acquisition system (MTR-5000), Backup cooling kit (CVK-UB2): LCO_2 Small inner door (MDF-7ID for KM-DU73Y1)	

■Control specifications

Item	KM-DU73Y1E	KM-DU53Y1E
Temperature controller	Micro processor control system Temperature setting range : -50℃~-90℃ (Unit : 1℃), Non-volatile memory	
Thermal sensor	Platinum resistance (Pt 1000Ω)	
Temperature display	Green LED digital display (Unit : 1℃)	
High temp. alarm	When chamber temp. reaches to set temp.+5℃~+40℃ (Factory default; +10℃), high temp. alarm emits. ALARM lamp blinks, audible alarm sounds intermittently after 15min. Remote alarm contact ; Normal Open, Normal Close Allowable contact capacity; Max. DC30V, 2A Contact activates in reverse after 15min.	
Low temp. alarm	When chamber temp. reaches to set temp.-5℃~-40℃ (Factory default; -10℃), high temp. alarm emits. ALARM lamp blinks, audible alarm sounds intermittently after 15min. Remote alarm contact ; Normal Open, Normal Close Allowable contact capacity; Max. DC30V, 2A Contact activates in reverse after 15min.	
Door alarm	When a door leaves open, DOOR lamp illuminates and alarm sounds intermittently after delay time (Factory default : 2min, 0~15min changeable)	
Filter alarm	When a temp. in filter sensor reaches to XX℃, FILTER lamp illuminates and audible alarm sounds intermittently.	
Power failure alarm	When a power is interrupted, ALARM lamp blinks, audible alarm sounds intermittently and remote alarm contact outputs.	
Remote alarm	Remote alarm terminal 3P; Max. DC30V、2A N.C.-COM, N.O.-COM When temp. alarm or power failure alarm emits, or when sensor is failed, remote alarm contact activates in reverse.	
Notice of battery life	When battery accumulation time reaches to approx. 3years, BATTERY lamp illuminates.	
Notice of fan motor life	When fan motor accumulation time reaches to approx. 6years, BATTERY lamp blinks.	
STATUS function	Status-1: When a temperature in AT sensor is lower than 0℃ or higher than +35℃, it diagnoses that the ambient temperature is abnormal.	
	Status-3: When a running rate of compressor L is higher than 95%, it diagnoses that unit is in overloaded operation.	
Lamps and keys on control panel	Lamp (red) : ALARM, DOOR Lamp (orange) : FILTER, BATTERY, STATUS Buzzer stop key : BUZZER Alarm test key : ALARM TEST Status key : STATUS Set key : SET Digit shift key : ⏩ Numerical value key : ⏫	
Key Lock	Press ⏩ key for 5 seconds to display Key Lock mode. L0 : Key Lock is OFF L1 : Key Lock is ON	
Compressor protection	Cascade sensor : lower than -34℃, compressor L turns on Cascade sensor : higher than -12℃, compressor L turns off Filter sensor : higher than +55℃, compressor H and L turn off, alarm lamp blinks, E10 and chamber temp. display alternately, buzzer sounds intermittently, remote alarm output. Overload relay	
Start delay	Delay time of starting unit can be set (cannot set H side and L side individually), setting range : 3~15min (unit : 1min)	

■Performance specifications

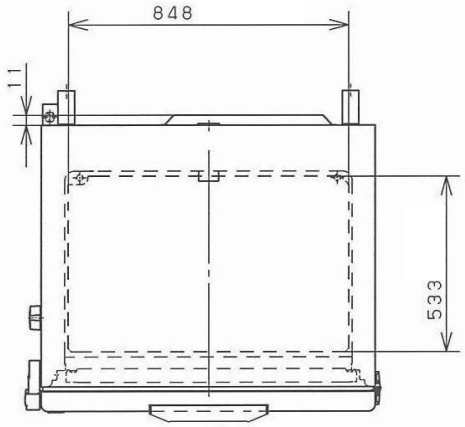
Item	KM-DU73Y1E	KM-DU53Y1E
Cooling performance	-86°C at the center of the chamber (ambient temperature; 30°C, no load)*	
Temperature control range	-50°C to -86°C (ambient temperature; 30°C, no load)	
Power source	AC 230 V/240 V, 50 Hz	
Rated power consumption	790 W/820 W	700 W/740 W
Noise level	52 dB [A] (background noise; 20 dB)	
Maximum pressure	2.90 MPa	

Note：*** Maximum cooling performance.**

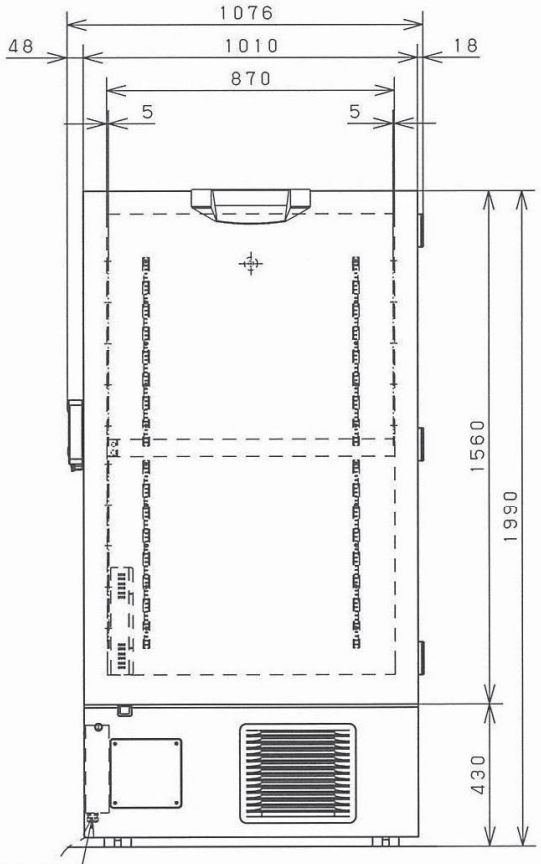
The chamber temp. can be reached at –86°C at ambient temp. 30°C with no load.

Dimensions

KM-DU73Y1E



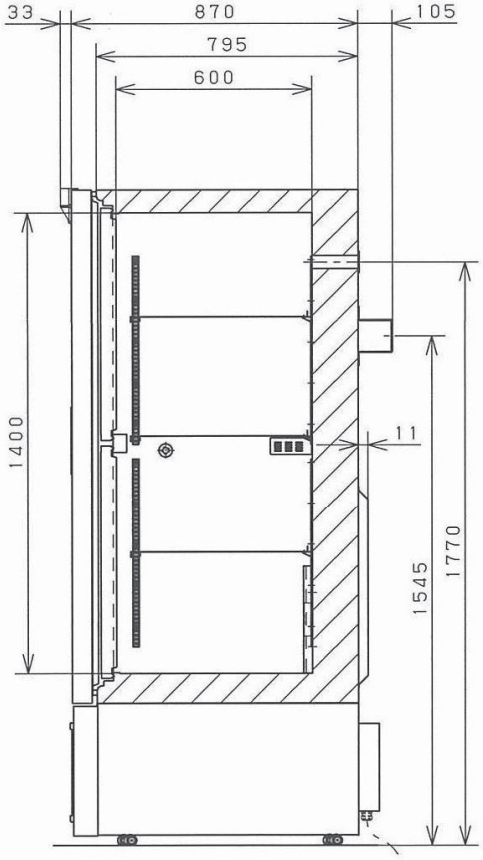
Top view



Power code

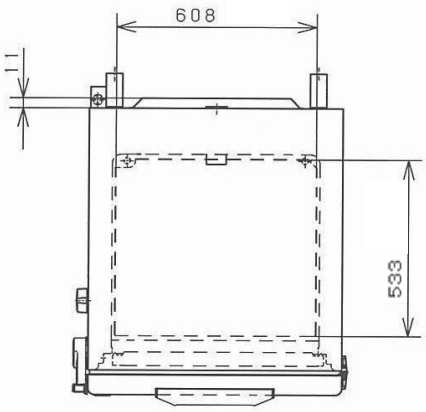
(Back side)

Front view

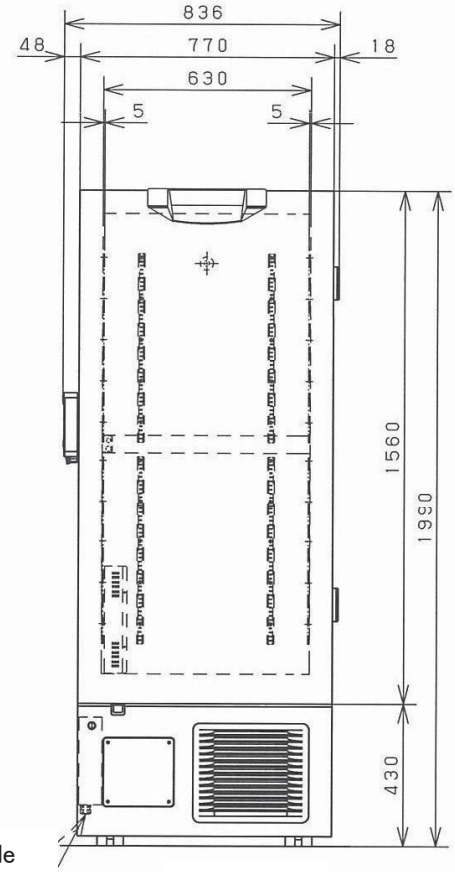


Side view

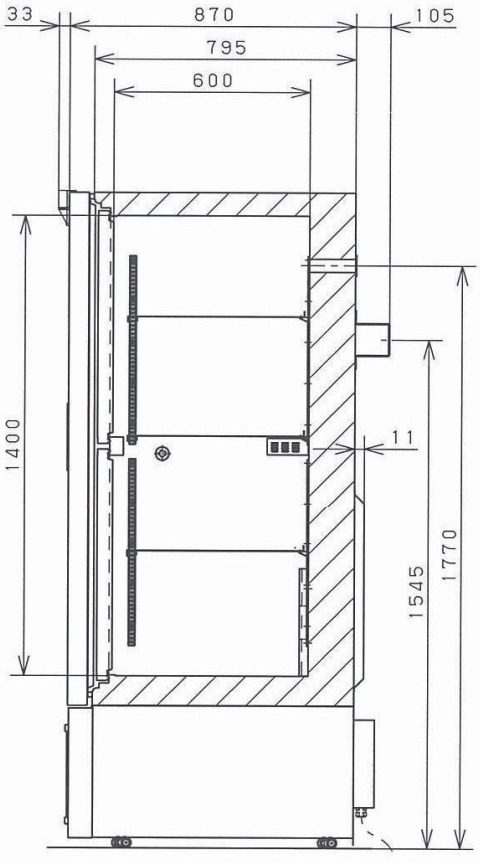
KM-DU53Y1E



Top view



Front view



Side view

Power code
(Back side)

Cooling unit parts

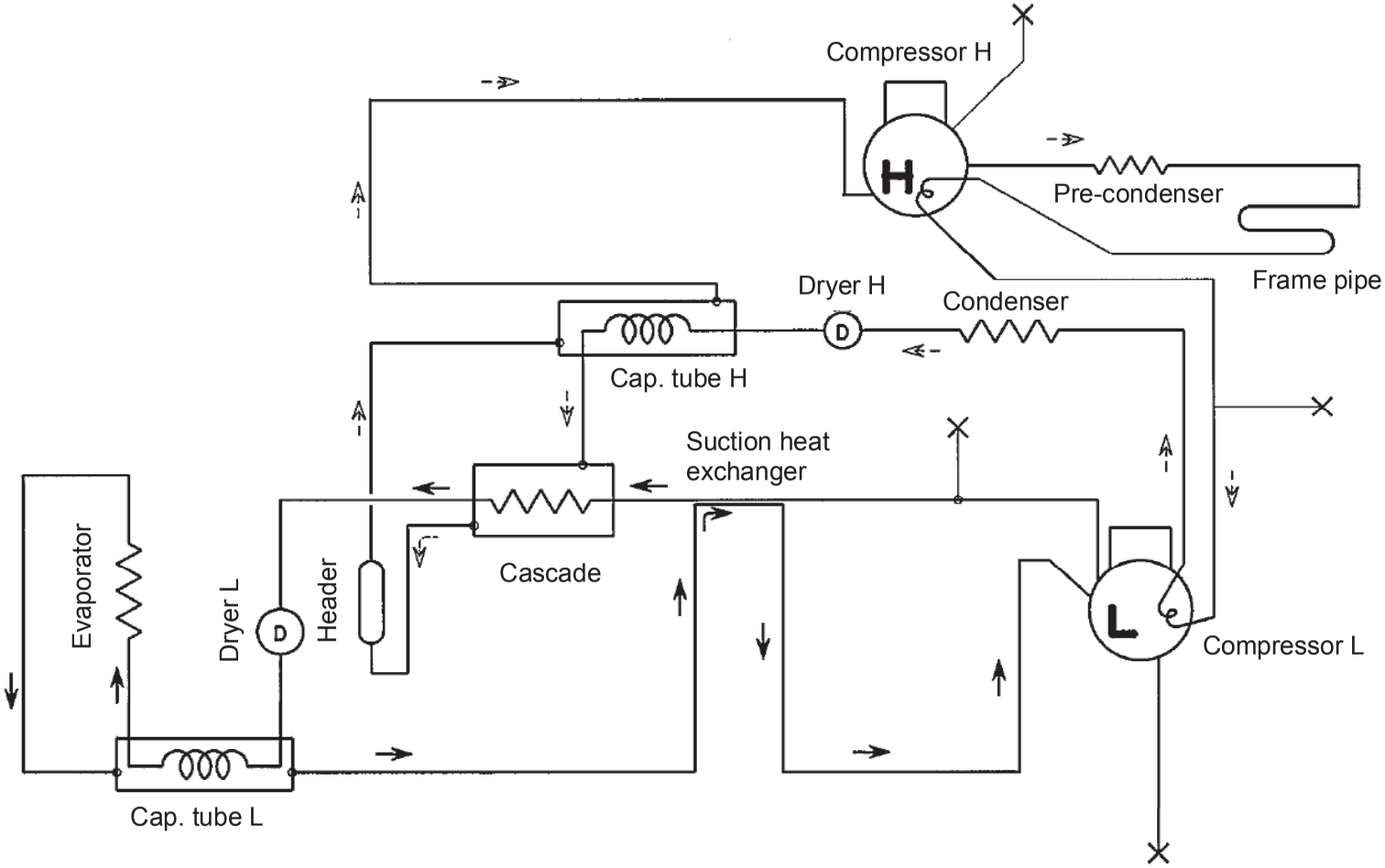
KM-DU73Y1E/KM-DU53Y1E

Item	Specifications			
	H side		L side	
Compressor				
Type	KS240J1NS-4A1			
Code	7FB-0-M101-011-05			
Rating	230/240V, 50Hz			
Refrigerant oil	Ze-NIUSL22SA, Charged q'ty 850cc			
Cooling system	Forced air cooling（partially）and oil cooler			
Starting relay	AMVL-300TA			
Overload relay	NA-172-LTXL917HX			
Starting capacitor	160μF/250VAC x 2			
Running capacitor	15μF/400VAC			
Condenser			Cascade condenser	
Type	Fin and tube		Coil pipe φ6.35	
Condenser	12 columns x 2 lines, P5.0mm Fin 50pcs		-----	
Pre-condenser	W 250mm (1 column is 6 lines)		-----	
Frame pipe	φ6.35		-----	
Evaporator	Cascade condenser		Tube on sheet φ7.94	
Type	Shell and tube φ80		-----	
Accumulator	φ38		-----	
Capillary	KM-DU73Y1E	KM-DU53Y1E	KM-DU73Y1E	KM-DU53Y1E
Resistance PSI・kg/cm^2	78PSI	111PSI	4.0kgf/cm^2	5.0kgf/cm^2
Length	3000mm	2000mm	2000mm	2000mm
Outer diameter	φ2.4mm	φ2.0mm	φ1.8mm	φ1.8mm
Inner diameter	φ1.2mm	Φ0.9mm	φ0.9mm	φ0.65mm
Refrigerant	R290, Charged q'ty 135g		R170, Charged q'ty 90g n-Pentane 13.0g (12.4%wt)	
Dryer	4AXH-9, Charged q'ty 18g		4AXH-9, Charged q'ty 55g	
Condensing fan	Material : ABS, 4 blades, φ230mm		-----	
Condensing fan motor	SV4-11AB5P (440VAC, 1.0μF, with running capacitor)		-----	
Thermostat, etc	Thermistor, 502AT (for cascade condenser)		PT1000Ω	
Heater	-----		Capillary heater, 12W x 2P	

Refrigeration circuit

KM-DU73Y1E/KM-DU53Y1E

H side →
L side →



Components on PCB

CN11
#1-#3 : Temp. sensor

CN8
#1-#2 : Battery

CN1
#1-#3 : Switching power supply

CN7
#1-#2 : Door switch
#5-#6 : AT sensor
#7-#8 : Filter sensor
#9-#10 : Cascade sensor

CN2
MTR-480C(option)

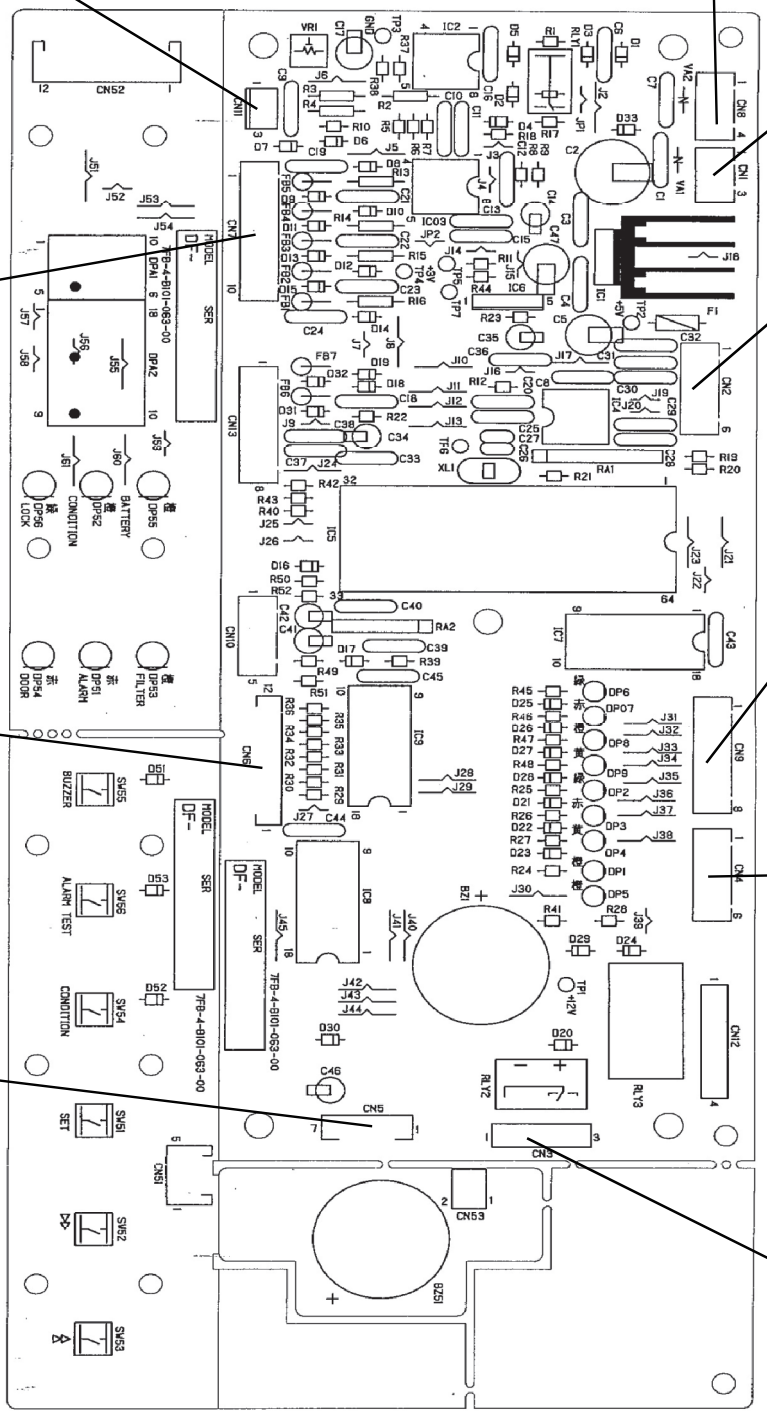
CN9
#1-#2 : H. Comp relay

CN6
Display PCB

CN4
#1-#2 : L. Comp relay
#3-#4 : Heater relay
#5-#6 : Fan relay

CN5
#1-#5 : Switch PCB
#6-#7 : Buzzer

CN3
Remote alarm terminal
#1 : COM.
#2 : N.O.
#3 : N.C.



Connections on PCB

The following shows the connections of connectors on the Temp. controller PCB.

Connector	Connects to	Usage
CN1	Switching power supply	To supply the power to PCB.
CN2	Network interface	To connect to MTR-480（option）
CN3	Remote alarm terminal #1: COM. #2: N.O. #3: N.C.	Remote alarm contact outputs. In normal condition, open for #1-#2 and closed for #1-#3.
CN4	#1-#2：L Comp relay #3-#4：Heater relay #5-#6：Fan relay	To control compressor L ON/OFF (12VDC) To supply the power to Cap. tube heater (12VDC) To operate fan
CN5	#1-#5: Switch PCB #6-#7: Buzzer	To connect to each switch
CN6	Display PCB	To connect to each LED
CN7	#1-#2: Door switch #5-#6: AT sensor #7-#8: Filter sensor #9-#10: Cascade sensor	To control the door switch To detect the ambient temperature To detect the temperature in condenser outlet pipe. To detect the temperature in cascade.
CN8	#1-#2: Battery（#1:6V　#2:Battery switch）	To supply the power during power failure
CN9	#1-#2: H. Comp. relay	To control compressor H ON/OFF (12VDC)
CN10	Unused	
CN11	#1, #3: Temp. sensor	To detect the internal temperature.

Electrical Parts

KM-DU73Y1E		230/240VAC, 50Hz
Compressor	Type	KS240J1NS-4A1 (Toshiba 750W)
	Code	7FB-0-M101-011-05
	Rated voltage	AC230/240V 50HZ
	Winding resistance (Main)	2.7Ω(AT20℃)
	(Aux)	4.9Ω(AT20℃)
Running capacitor	Rating	400VAC, 15μF
Electric capacitor	Rating	250VAC, 160μF
Starting relay	Type	AMVL-300TA
	Rating	AC300V, 50/60Hz
Magnet relay	Type	SK12A-P10
	Rating	Coil, AC240V, 50Hz
Thermal relay	Type	TK12-009
	Rating	shutdown, 9~13A
Overload relay	Type	NA-172-LTXL917HX
	Rating	AC220-240V, 21A, 50Hz
Fan motor	Type	SV4-11AB5P
	Rating	AC220-240V, 10W
	Thermal fuse	141℃
	Running capacitor	0.8μF
Temperature relay	Type	AJM5211F
	Rating	20A, AC250V, coil : DC12V
Relay	Type	G2R-1A-T
	Rating	AC250VAC, 10A
Temperature sensor	Type	THC-663
	Rating	1000kΩ
AT sensor	Type	502AT
	Rating	5kΩ(A.T.25℃)
Filter sensor	Type	502AT
	Rating	5kΩ(A.T.25℃)
Cascade sensor	Type	502AT
	Rating	5kΩ(A.T.25℃)
Capi. tube heater	Rating	AC230V, 11.2W
Power switch	Type	WR-11KLE
	Rating	15A, 250VAC (IP67 water proof type)
Door switch	Type	SDKNA20700
	Rating	5V
Battery switch	Type	SLE6A2-5
	Rating	4A, 250VAC
Battery	Type	5HR-AAC
	Rating	6V, 1100mAh
PCB assembly	Type	DF-77VH
Switching power supply	Type	LDA10F-12
	Rating	DC12V, 0.9A
Power spply code	Rating	16A, 250VAC (K3)

Specifications of sensor

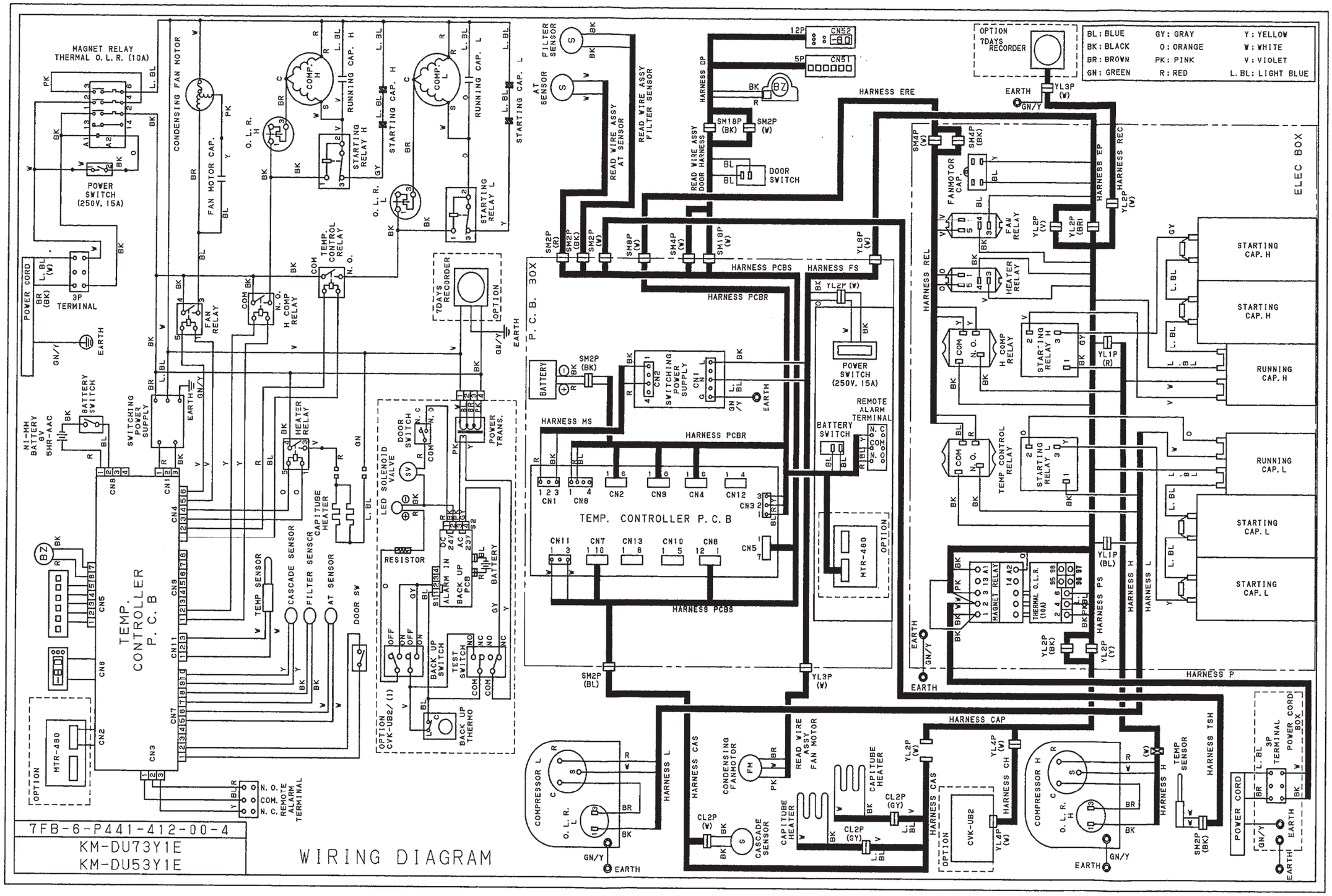
The following shows the temperature in thermal sensor (502AT-1) and its resistance value.

Temp. (C)	Resistance Value (kΩ)	Temp. (C)	Resistance Value (kΩ)	Temp. (C)	Resistance Value (kΩ)	Temp. (C)	Resistance Value (kΩ)
−50	154.5	−36	71.80	−22	35.65	0	13.29
−49	145.9	−35	68.15	−21	33.99	5	10.80
−48	137.8	−34	64.71	−20	32.43	10	8.84
−47	130.2	−33	61.48	−19	30.92	15	7.20
−46	123.1	−32	58.43	−18	29.50	20	6.01
−45	116.5	−31	55.55	−17	28.14	25	5.00
−44	110.2	−30	52.84	−16	26.87	30	4.17
−43	104.4	−29	50.23	−15	25.65	35	3.50
−42	98.87	−28	47.77	−14	24.51	40	2.96
−41	93.70	−27	45.45	−13	23.42	45	2.51
−40	88.85	−26	43.26	−12	22.39	50	2.13
−39	84.18	−25	41.19	−11	21.41	55	1.82
−38	79.80	−24	39.24	−10	20.48	60	1.56
−37	75.67	−23	37.39	−5	16.43	65	1.35

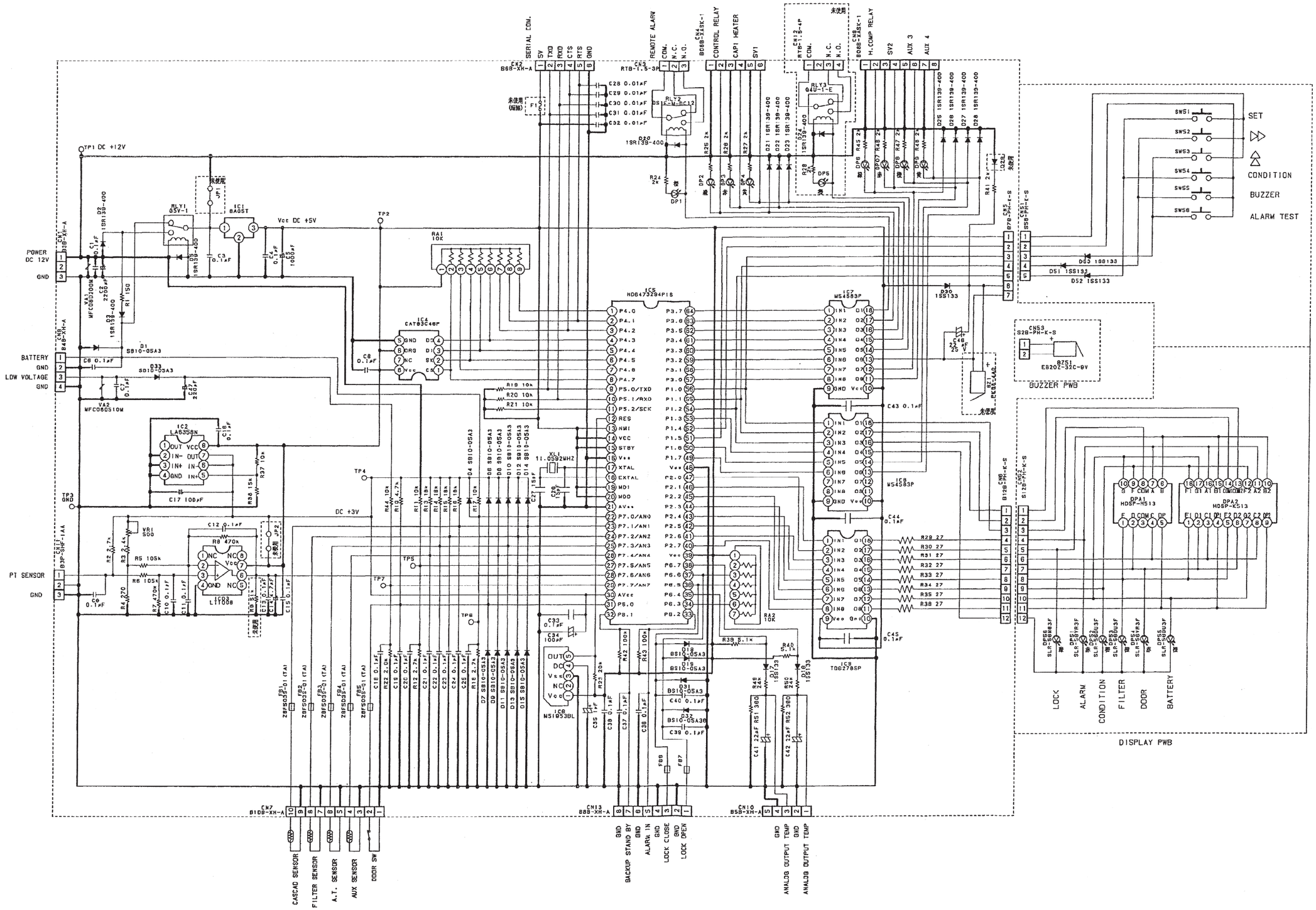
The following shows the temperature in thermal sensor (PT1000Ω) and its resistance value.

Temp. (C)	Resistance Value (Ω)	Temp. (C)	Resistance Value (Ω)	Temp. (C)	Resistance Value (Ω)
−140	450.83	−70	729.99	0	1000.0
−130	491.47	−60	769.02	10	1038.0
−120	531.83	−50	807.87	20	1076.0
−110	571.92	−40	846.58	30	1113.8
−100	611.76	−30	885.13	40	1151.4
−90	651.38	−20	923.55	50	1189.0
−80	690.78	−10	961.84	60	1226.4

Wiring diagram



Circuit diagram



Control specifications

1. Key and Switch

BUZZER : In alarm condition, audible alarm silences when this key is pressed.
Remote alarm activates and message is not eliminated.
When a power failure is occurred (battery back-up), press this key to show a chamber temperature for 5 seconds.

ALARM TEST : When this key is pressed, unit steps into Alarm Test mode with ALARM lamp blinks, intermittent buzzer beeps, digital LED goes off and remote alarm activates.
After approx. 90seconds elapse, unit returns to normal condition. (Auto Return function)
If Alarm Test is performed when a battery switch is in off position, "E09" blinks on the display.

SET : Press this key once to activate setting mode with 2nd digit in LED blinks.
Press this key again to store a value to be changed.

STATUS : If this key is pressed during STATUS lamp illuminates, status code ('--- 1' and '---3') is displayed.


(Digit shift key) A blinking digit can change among 1st digit ~ 3rd digit with every time press this key.
If this key is pressed for 5 seconds when a chamber temperature is displayed, Key Lock activates with "L_0" is displayed.


(Numerical value shift key) A blinking digit can increase one by one every time press this key.
If this key is pressed for 5 seconds when a chamber temperature is displayed. Function mode activates with "F00" is displayed.

2. Temperature control

Setting range : -50℃~-90℃
Display range : -180~50
Setting procedure : Press SET key and set the required value with ▲▲ key and ▶▶ key.
Press SET key to store the value to be changed.
Cannot change the value during key rock.
Unacceptable setting range : If a value which is out of setting range is input and SET key is pressed, its change is not accepted with error sound, then setting mode is continued.

3. Key Lock mode

Setting range : 0 (Unlock), 1 (Lock)
Setting procedure: In chamber temperature display, press ▶▶ key for 5 seconds to step to Key Lock mode. ("L_0" or "L_1" is displayed. Factory default: L_0)
Change the value with ▲▲ key and press SET key to store the value in the non-volatile memory.

4. Function mode

Setting range : 00~50
Display range : 00~59
00, 16, 23, 33~40, 44~49, 51~59 are unused.
Setting procedure : In chamber temperature display, press ▲▲ key for 5 seconds to step to function mode (F00 is displayed).
Change the blinking 1st digit to desired function code with ▲▲ key and ▶▶ key.
Press SET key to be function code available. Press SET key at 00 and 16, return to chamber temperature display.

Unacceptable setting range : If a value which is out of setting range is input and SET key is pressed, its change is not accepted with error sound, then setting mode is continued.

5. Error codes

E01: Temp. sensor is open circuited
E02: Temp. sensor is short circuited
E03: Cascade sensor is open circuited
E04: Cascade sensor is short circuited
E05: Filter sensor is open circuited
E06: Filter sensor is short circuited
E07: AT sensor is open circuited
E08: AT sensor is short circuited
E09: Battery switch is in off position
E10: Compressor temperature is abnormal

(1) Temp. sensor

Open circuit (E01): When a temperature in temp. sensor is higher than 50℃, E01 and 50℃ are displayed alternately and audible alarm sounds intermittently and remote alarm contact activates.
Compressor is forcibly running.
Press BUZZER key to silence audible alarm.

Short circuit (E02): When a temperature in temp. sensor is lower than -170℃, E02 and -170℃~ -180℃ are displayed alternately and audible alarm sounds intermittently and remote alarm contact activates.
Compressor is forcibly running.
Press BUZZER key to silence audible alarm.

(2) Cascade sensor

Open circuit (E03): When a temperature in cascade sensor is lower than -65℃, E03 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
Press BUZZER key to silence audible alarm.
In E03, cycle running by cascade sensor does not work and timer is only controlled (L comp. is ON : 3 minutes after H comp. start when start up and after 3 minutes when in cycle)

Short circuit (E04): When a temperature in cascade sensor is higher than 60℃, E04 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
Press BUZZER key to silence audible alarm.
In E04, cycle running by cascade sensor does not work and timer is only controlled (L comp. is ON : 3 minutes after H comp. start when start up and after 3 minutes when in cycle)

(3) Filter sensor

Open circuit (E05): When a temperature in filter sensor is lower than -60℃, E05 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
Press BUZZER key to silence audible alarm.
In E05, comp. protection by filter sensor does not work and become normal operation.

Short circuit (E06): When a temperature in filter sensor is higher than 60℃, E06 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
Press BUZZER key to silence audible alarm.
In E06, comp. protection by filter sensor does not work and become normal operation, but H and L comp. stop for the time being because it once go through abnormal temperature range (E10).

(4) AT sensor

Open circuit (E07): When a temperature in AT sensor is lower than -60℃, E07 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
In the case of AT sensor error, doing warm up operation when L comp. start regardless of ambient temperature.
Press BUZZER key to silence audible alarm.

Short circuit(E08): When a temperature in AT sensor is higher than 60℃, E08 and chamber temperature are displayed alternately, audible alarm sounds intermittently and remote alarm contact activates.
In the case of AT sensor error, doing warm up operation when L comp. start regardless of ambient temperature.
Press BUZZER key to silence audible alarm

(5) Battery SW is in off position (E09): If you press ALARM TEST key when battery switch is in off position or battery is unconnected, E09 is displayed. It does not appear in normal state.

(6)Compressor abnormal temperature (E10): When a temperature in filter sensor is higher than 55℃, E10 and chamber temperature are displayed alternately and high side compressor is forcibly turned off to notify compressor temperature is abnormal or fan motor is locked.
Press BUZZER key to silence audible alarm.
When the temperature in filter sensor subtracts AT is equal or lower than 10℃, compressor turns on.

(7) Error code priority

No.1: Cascade sensor error (E03, E04) … L Compressor is only timer control
No.2: Filter sensor error (E05, E06) … Compressor protection is uncontrollable
No.3: Abnormal compressor temp.(E10) … Compressor temporary turns off
No.4: Temp. sensor error (E01, E02) … Compressor is forcibly turned on
No.5: AT sensor error (E07, E08)

6. Warning function

High temp. alarm : When chamber temperature is equal or higher than set temperature + high temp. alarm set temperature +1, ALARM lamp and LED blink, audible alarm sounds intermittently after 10 minutes delay, and remote alarm activates.
When chamber temperature is equal or lower than set temperature, ALARM lamp and LED go off, audible alarm silences, and remote alarm turns off.
When BUZZER key is pressed, audible alarm silences, but remote alarm output does not turn off.

Low temp. alarm : When chamber temperature is equal or lower than set temperature - low temp. alarm set temperature -1, ALARM lamp and LED blink, audible alarm sounds intermittently after 10 minutes delay, and remote alarm activates.
When chamber temperature is equal or higher than set temperature, ALARM lamp and LED go off, audible alarm silences, and remote alarm turns off.
When BUZZER key is pressed, audible alarm silences, but remote alarm output does not turn off.

Door alarm (model code 001,002) When an outer door leaves open, DP54 (red lamp) illuminates. Audible alarm sounds intermittently after 1~15 minutes (Factory default: 2 minutes) elapse. Audible alarm does not activate simultaneously with remote alarm.
Press BUZZER key to silence audible alarm.(No Ring Back)
Only correspond to model code 001, 002.

Power failure alarm : If a power interrupts for 3 seconds when battery switch is in on-position, ALARM lamp blinks, audible alarm sounds intermittently and remote alarm activates.
When a power returns within 3 seconds since the power interrupt, microprocessor resets and unit will start operation in default settings. At the time remote alarm will not activate.
Press BUZZER key to silence audible alarm, but remote alarm does not turn off.
Remote alarm should activate until chamber temperature is stable after the power returns from power failure.
When a power interrupts, press BUZZER key to see chamber temperature for 5 seconds.

Clogged filter detection: If the temperature in filter sensor is higher than 50℃, filter is judged to be clogged, then FILTER lamp blinks and audible alarm sounds intermittently.
When the temperature in filter sensor is lower than 45℃, it is judged to be dissolved, then FILTER lamp and audible alarm turn off.
Compressor protection is also detected by filter sensor, so if it is fulfilled the condition of compressor protection (E10:mentioning in following), compressor protection has priority.

7. STATUS

(1) STATUS lamp (DP52:orange) illuminates in the following conditions;

STATUS 1: When an ambient temperature is higher than 35.0℃, or lower than 0℃, '----1' is displayed.

STATUS 3: When running rate is higher than 95%, '---3' is displayed.

(2) Display of STATUS code

(Ex.1) Every STATUS codes are displayed in the following order when both STATUS occur simultaneously.

' ------' => '--- 1' => '--- 3' => '---1' …

(Ex. 2) If there is no STATUS notice, previous code is displayed. (display interval is about 3 seconds)

' ------' => '--- 1' => '--- 1' => '--- 3' => '---1' …

(Note)
When all of STATUS codes are eliminated or 90 seconds elapse, unit returns to chamber temperature display automatically.

8. Running rate

Running rate = (ON time / (ON time + OFF time)) x 100%

Condition to start measure running rate:

It regards as 'cycle start' when a compressor turns on after it turned off once chamber temperature was lower than set temperature.
Running rate should be measured after 2 hours elapse then.

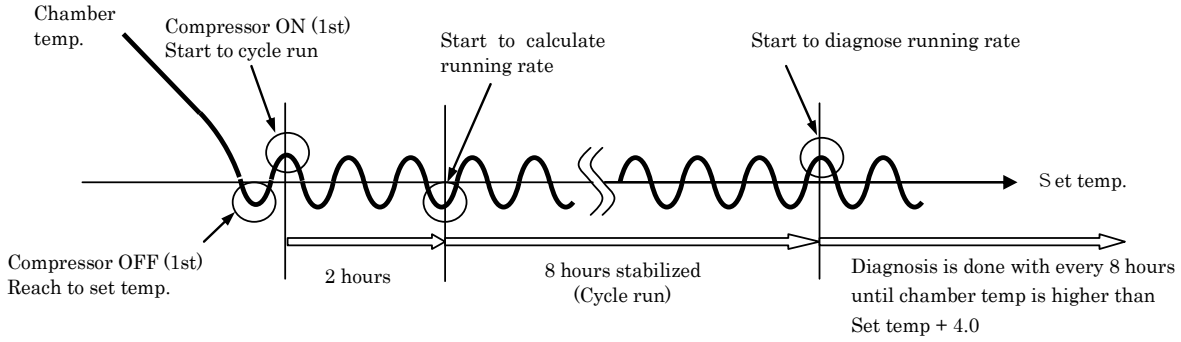
ON time (Min.) = The time until P3.1 in IC5 first reaches from LOW to HIGH
OFF time (Min.) = The time until P3.1 in IC5 reaches from HIGH to LOW

Condition to calculate running rate:

ON time	OFF time	Running rate
= 0	= 0	Impossible to calculate (0%)
> 0	= 0	
= 0	> 0	
> 0	> 0	0 ~ 100%

Note) Running rate cannot be measured when a chamber temperature is higher than set temperature + 4.0℃.
Wait until a chamber temperature is stabled.

Diagnosed value of overload running rate: Step to F20 and input '000'.



Diagnosed running rate
=(-(Set temp.)X0.9)+((ATX0.9-4.5℃))-((Set temp.+85℃) / 10))
You can know running status by the calculation for diagnosed running rate.
Diagnosis is done by comparing running rate for 8 hours operation after 2 hours elapses since unit started cycle operation, with diagnosed running rate.
(Diagnosed running rate – running rate) < 0 … Normal (DP52 goes off)
(Diagnosed running rate – running rate) ≧0 … Overload operation (DP52 illuminates)
222 = Running rate cannot be obtained by calculation. (DP52 goes off)
Diagnosis is done in every 8 hours.

9. Other function

Auto Return : If there are not any key operations for 90 seconds in setting mode, Key Lock mode and Function mode, unit automatically returns to chamber temperature display. When it automatically returns, the unsettled data does not reflect. (Note : Auto return does not work in F09 and F10)

Ring Back : To prevent someone except for an operator pressing BUZZER key when a unit is in alarming condition, audible alarm sounds again after predetermined setting time elapses even if BUZZER key is pressed to silence audible alarm. Setting time can be changed in F25 (refer to 10. Function mode).

Line Test Function

F09: Function test for manufacturing inspection
Make compressor continuously running in regardless of setting temperature.

F10: Program running for manufacturing inspection (for measuring chamber temperature in each setting value).
Setting temperature change

Time : 18H → 3H → 86H → back to 3H
Temp. :-120℃ → -80℃ → -120℃

Change F05 compressor delayed time to 3 minutes (in non-volatile memory). Also, electricity period of capillary heater change to 12 hours only in F10 running (period change is necessary to check cap. heater electricity by line test).

F11: Display check for manufacturing inspection (for wiring inspection)
Display LED (7 seg. + dot) and each lamp are all blinked.

Display of sensor temperatures :

F12: Temperature in temp. sensor
(Ex. -80.2℃ → Displayed as '80.2')

F13: Temperature in cascade sensor
(Ex. 67℃ → Displayed as '067')

F14: Temperature in filter sensor
(Ex. 67℃ → Displayed as '067')

F15: Temperature in AT sensor
(Ex. 30℃ → Displayed as '030')

Battery accumulation time :

F03: Battery accumulation time is displayed.
(Ex. Accumulated 2years and 6months → Displayed as '02.5')
When '02.8' is shown on the display, BATTERY lamp illuminates to notify battery replacement.

<Reset of battery accumulation time>
Step to F06 and input '**409**'. Press SET key to change accumulation time to '00.0'. BATTERY lamp goes off.

Condensing fan motor accumulation time :

F32: Condensing fan motor accumulation time is displayed.
(Ex. Accumulated 5years and 6months → Displayed as '05.5')
When condensing fan motor accumulation time reaches to 5.6 years, BATTERY lamp blinks to notify fan motor replacement.

<Reset of battery accumulation time>
Step to F06 and input '**419**'. Press SET key to change accumulation time to '00.0'. BATTERY lamp goes off.

Capillary heater forcibly ON/OFF :

F18: When you input '000' in F18, compressor turns off and capillary heater forcibly turns on.
When you input '000' during capillary heater turns on, it comes to end to turn capillary heater on.
When you input '001', capillary heater never turns on, but compressor turns off in every 18 hours.

ROM version :

F30: ROM version is displayed (Ex. Ver. 1.00 → Displayed as "1.00")

10. Function mode

F00	Display of chamber temperature (Unused)
F01	Setting of high temperature alarm
F02	Setting of low temperature alarm
F03	Display of battery accumulation time
F04	Setting of door alarm delay time
F05	Setting of compressor delay time
F06	Setting of service code, Reset of accumulation time
F07*	Temperature sensor Zero Adjustment
F08*	Cascade sensor Zero Adjustment
F09*	Compressor continuous running mode … Factory test mode (Unused)
F10*	Program running mode … Factory test mode (Unused)
F11*	PCB test mode : LED all blink … Factory test mode (Unused)
F12*	Display of temperature in temp. sensor
F13*	Display of temperature in cascade sensor
F14*	Display of temperature in comp. sensor
F15*	Display of temperature in AT sensor
F16*	Display of chamber temperature (Unused)
F17*	Model code setting (Initialization of non-volatile ROM and memory)
F18*	Capillary heater is forcibly turned on/off
F19*	Setting of capillary heater ON time … Factory use
F20*	Setting of diagnosed value of overload running rate … Factory use
F21	Communication ID set
F22	Communication mode set
F23 *	Wait for function input code : buzzer sound come out
F24	Remote alarm terminal output
F25	Setting of Ring Back time
F26 *	Display of actual operation rate
F27 *	Display of diagnosed value of overload running rate
F28 *	Display of delay time of permission for measuring running rate (2 hrs timer)
F29 *	Display of delay time of permission for measuring running rate (8 hrs timer)
F30 *	ROM version is displayed
F31 *	Setting of filter alarm
F32	Display of condensing fan motor accumulation time
F33~F40	Wait for function input code : buzzer sound come out
F44~F49	Wait for function input code : buzzer sound come out
F50	Setting of alarm delay time
F51~F59	Wait for function input code : buzzer sound come out

Input service code '384' in F06 prior to use function codes which are marked with *.
To cancel service code, input "000" in F06 or turn the power off.

Setting procedure: In chamber temperature display, press ⏫ key for 5 seconds to display "F00".
Input Function code by pressing ⏫ key and ⏭ key.
Press SET key to be function mode available.

F00: <Purpose> Simply passing through if entered by mistake.
<Operation> Press SET key in "F00" to return to chamber temperature display.

F01: <Purpose> Setting of high temperature alarm
<Operation> Input F01 and press SET key to display "010" (Factory default).
Setting range is '005~040'.
Change a value by pressing ⏫ key.
Press SET key to store the value and to return to chamber temperature display.

F02: <Purpose> Setting of low temperature alarm
<Operation> Input F02 and press SET key to display "-10" (Factory default).
Setting range is "-05"~"-40". Change a value by pressing ⏫ key.
Press SET key to store the value and to return to chamber temperature display.

F03: <Purpose> Display of battery accumulation time
<Operation> Input F03 and press SET key to display alternately F03 with “00.0” (in case battery used for 36days or less).
Press SET key to return to chamber temperature display.

F04: <Purpose> Setting of door alarm delay time (model code 001, 002)
<Operation> Press SET key in “F04” to display ‘002’ (Factory default).
setting range is ‘000’~’015’.
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

F05: <Purpose> Compressor turns on with delay when a power is supplied or a power returns from a power failure.
<Operation> Input “F05” and press SET key to display ‘003’ (Factory default).
Setting range is ‘003’~’015’. (Unit: Minute)
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

F06: <Purpose> Input of service code. Reset of accumulation time
<Operation> Input F06 and press SET key to display ‘000’ (Factory default).
Set service code to “384” by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

<Reset of battery accumulation time>
Input service code ‘384’ in F06.
Input ‘409’ to reset battery accmulation time and to return to chamber temperature display. (Service code is cancelled)

<Reset of condensing fan motor accumulation time>
Input service code ‘384’ in F06.
Input ‘419’ to reset fan motor accumulation time and to return to chamber temperature display. (Service code is cancelled)

<Cancel> Input F06 again and press SET key to display ‘384’.
Change to ‘000’ by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.
Turn a power off then on to change a value to ‘000’, but it is not stored in non-volatile memory.
Note) Service code ‘384’ is stored in non-volatile memory during battery back-up.

F07: <Purpose> To match a temperature in temp. sensor with 1/2H air temperature
<Operation> Input service code in F06 prior to use this mode.
Input F07 and press SET key to display ‘00.0’ (Factory default).
Setting range is ‘-4.9’~’04.9’.
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

F08: <Purpose> To calibrate a temperature in cascade sensor
<Operation> Input service code in F06 prior to use this mode.
Input F08 and press SET key to display ‘00.0’ (Factory default).
Setting range is ‘-9.9’~’09.9’.
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

F12: <Purpose> To display a temperature in temp. sensor
<Operation> Input service code in F06 prior to use this mode.
Input F12 and press SET key to display alternately F12 and “XX.X” (chamber temperature). Press SET key to return to chamber temperature display. 3 digits indication. Minus “-“ is not indicated.
Ex) “-79.5℃” → Indicated as “79.5”

F13: <Purpose> To display a temperature in cascade sensor
<Operation> Input service code in F06 prior to use this mode.
Input F13 and press SET key to display alternately F13 and “XX.X” (present temperature in cascade sensor). Press SET key to return to chamber temperature display.

F14: <Purpose> To display a temperature in filter sensor
<Operation> Input service code in F06 prior to use this mode.
Input F14 and press SET key to display alternately F14 and “XX.X” (present temperature in filter sensor). Press SET key to return to chamber temperature display.

F15: <Purpose> To display a temperature of AT sensor
<Operation> Input service code in F06 prior to use this mode.
Input F15 and press SET key to display alternately F15 and “XX.X” (present temperature in AT sensor). Press SET key to return to chamber temperature display.

F16: <Purpose> Unused
<Operation> Press SET key in “F16” to return to chamber temperature display.
If service code is not inputted in F06, buzzer sound comes out.

F17: <Purpose> Initialization of non-volatile memory. Model code change
<Operation> Service code should be input in F06 prior to use this mode.
Input F17 and press SET key to display ‘00X’.
Change a value(001~003) by pressing ⏫ key and ⏩ key.
Press SET key to store and return to chamber temperature display.
When model code is changed, non-volatile memory is initialized.
001 : KM-DU73Y1
002 : KM-DU53Y1

F18: <Purpose> Setting of capillary heater ON/OFF time
<Operation> Service code should be input in F06 prior to use this mode.
Input F18 and Press SET key to display ‘000’ (Factory default).
Change to alternative value ‘000’ or ‘001’ by press ⏫ key and ⏩ key.
Press SET key to store the value and return to chamber temperature display.
000: Capillary heater is forcibly turned on when it turns off
Capillary heater is forcibly turned off when it turns on
001: Capillary heater forcible operation is ineffective

F21: <Purpose> Setting of serial communication ID
<Operation> Input F21 and press SET key to display ‘000’ (Factory default).
Setting range is ‘001’ ~ ‘255” by pressing ⏫ key and ⏩ key.
Press SET key to return to chamber temperature display.

F22: <Purpose> Setting of serial communication mode
<Operation> input F22 and press SET key to display '000' (Factory default)
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and return to chamber temperature display.
Control mode (the 3rd digit)
0: Local (initial)
1: Remote
Baud rate (the 2nd digit)
0: 2400bps (initial)
1: 4800bps
2: 9600bps

Note) Setting value cannot be changed at control panel if control mode is set to 'Remote'.

F23: <Purpose> Unused
<Operation> Press SET key in "F16" to return to chamber temperature display.
If service code is not inputted in F06, buzzer sound comes out.

F24: <Purpose> Linkage between remote alarm and buzzer
<Operation> Input F24 and Press SET key to display '000' (Factory default).
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and return to chamber temperature display.
000: Remote alarm does not link with buzzer
001: Remote alarm links with buzzer

F25: <Purpose> Setting of Ring Back time
<Operation> Input F25 and press SET key to display "030" (Factory default).
Setting range is '000'~'060'.
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

000: Not Ring Back
010: 10 minutes
020: 20 minutes
030: 30 minutes
040: 40 minutes
050: 50 minutes
060: 60 minutes

F26: <Purpose> Display of running rate (Unit: %)
<Operation> Service code should be input in F06 prior to use this mode.
Input F26 and press SET key to display alternately F26 with "XXX" (Present running rate).
Press SET key to return to chamber temperature display.

F27: <Purpose> Display of diagnosed value for overload running rate
<Operation> Service code should be input in F06 prior to use this mode.
Input F27 and press SET key to display alternately F27 with "XXX" (present diagnosed value of overload running rate).
'000' is displayed before it accumulates 480 minutes in 8H timer.
Factory default is '095' which is the fixed, except in case diagnosed value is obtained from calculation in F20.
Press SET key to return to chamber temperature display.

F28: <Purpose> Display of delay time to start measuring running rate
(2hrs timer; 000~120 min)
<Operation> Service code should be input in F06 prior to use this mode.
Input F28 and press SET key to display alternately F28 with 'xxx' (present count value for delay time to start measuring running rate).
Press SET key to return to chamber temperature display.
When a delay time expires (a value reaches to '120'), unit will start measuring running rate.

F29: <Purpose> Display of delay time to start diagnosing running rate
(8hrs timer; 000~480 min)
<Operation> Service code should be input in F06 prior to use this mode.
Input F29 and press SET key to display alternately F29 with 'xxx' (present count value for delay time to start diagnosing running rate).
Press SET key to return to chamber temperature display.
8hours timer start counting after 2hours timer expires.
When a delay time expires (a value reaches to '480'), unit will start diagnosing running rate.

F30: <Purpose> ROM version is displayed
<Operation> Service code should be input in F06 prior to use this mode.
Input F30 and press SET key to display alternately F30 with "X.XX" (present ROM version).
Press SET key to return to chamber temperature display.

F31: <Purpose> Setting of buzzer during filter alarm occurs
<Operation> Service code should be input in F06 prior to use this mode.
Input F31 and press SET key to display "001" (Factory default).
Change to alternative value '000' or '001' by ⏫ key and ⏩ key.
Press SET key to revert to chamber temperature display.

000: Buzzer OFF / 001: Buzzer ON

F32: <Purpose> Display of accumulation time of condensing fan motor
<Operation> Service code should be input in F06 prior to use this mode.
Input F32 and press SET key to display alternately F32 with '00.0' (00.0 is displayed within 36 days from first use).
Press SET key to return to chamber temperature display.

F33~40: <Purpose> Unused
<Operation> Buzzer sounds. Setting input is not accepted, even if service code is already inputted in F06.

F44~49: <Purpose> Unused
<Operation> Buzzer sounds. Setting input is not accepted, even if service code is already inputted in F06.

F50: <Purpose> Setting of alarm delay time
<Operation> Input F50 and press SET key to display '015' (Factory default).
Setting range is '000'~'015'.
Change a value by pressing ⏫ key and ⏩ key.
Press SET key to store the value and to return to chamber temperature display.

F51~59: <Purpose> Unused
<Operation> Buzzer sounds. Setting input is not accepted, even if service code is already inputted in F06.

11. L side compressor start up operation

(1) Condition of peak cut operation

When L side compressor starts up, it impresses voltage in a short term repeatedly to warm up in order to prevent over rising of pressure. Start up operation repeat 40 seconds ON and 3 minutes OFF twice.

Model	Number of times short term impress voltage	Impress voltage time	Interval
KM-DU73Y1E KM-DU53Y1E	2 times	40 seconds	3 minutes

(2) OFF time counting of L side compressor

There is a risk of over rising of pressure at restart if L side compressor stops for a long time by setting value change or power failure. Therefore, counting OFF time and if the OFF time is more than 120 minutes, doing peak cut operation at restart. OFF time counting starts from L side compressor stop or power failure alarm occurs.

Condition of peak cut operation again is OFF time of L side compressor become equal or longer than 120 minutes.

* Note: OFF time counting is valid when unit power is ON or battery switch is ON during power failure and micro computer operates. Therefore, counting does not work during unit power is OFF and carry out power return before power failure alarm after micro computer reset by instant power failure.

(3) Peak cut operation after reset

Comparing chamber temp.(PV) and setting temp.(SV), then if PV is equal or lower than SV+10℃, it judges instant or short term power failure and cuts peak cut operation of L side compressor (judges peak cut operation is not necessary).

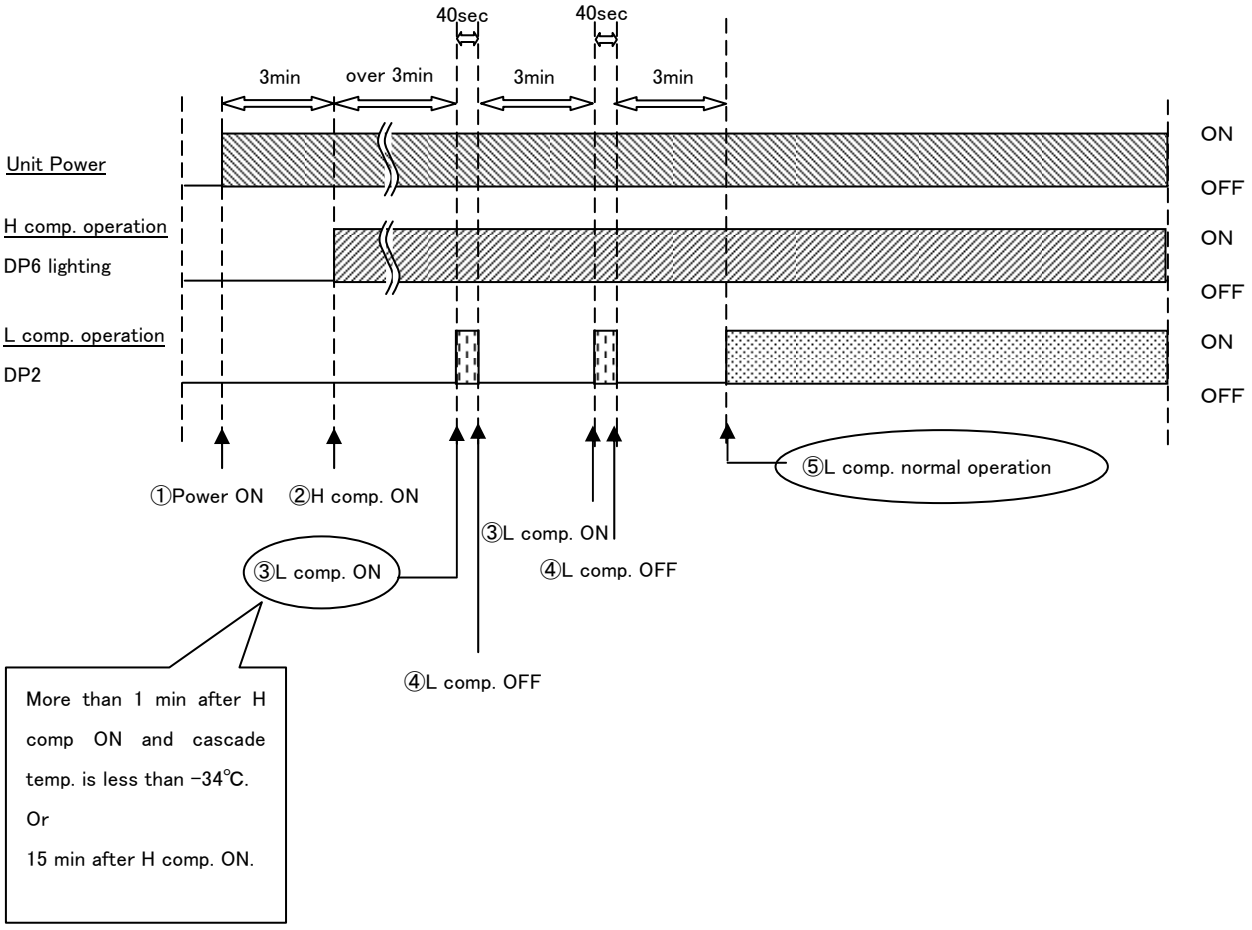
However, PV used here is not filtered data (TEMO0.PV), it is raw data of PT sensor resistance (TEMP0.PVFIL).

In this case, it immediately changes over cycle condition, then if it fulfills one of the following condition after 1 minute of delay time passed and H side compressor operates, L side compressor start operation.

1. Cascade temp. is lower than -34℃
2. After 3 minutes (cycle running) or 15 minutes (initial operation) after H side compressor running.

(4) Start up operation timing chart of L side compressor
L side compressor start up operation is based on following timing.

1. Unit power ON
2. H compressor ON after finishing compressor delay time.
3. If H compressor is running over 3 minutes and cascade temp.(C.T.) is equal or lower than -34℃, L compressor starts. (If H comp. is running over 15 minutes, L comp. is also starts)
4. L compressor is OFF after about 40 seconds of L compressor running. After about 3minutes, restart.
5. After doing No.3. and No.4 twice, change over normal L compressor operation.



12. Compressor control (differential) value

Compressor H:

Turns on when a chamber temperature is set temperature -0.4℃.

Compressor L:

1) Turns on when compressor H turns on and a temperature in cascade sensor is -34℃.

2) Turns on after 3 minutes elapse since compressor H turned on

Compressor H, L:

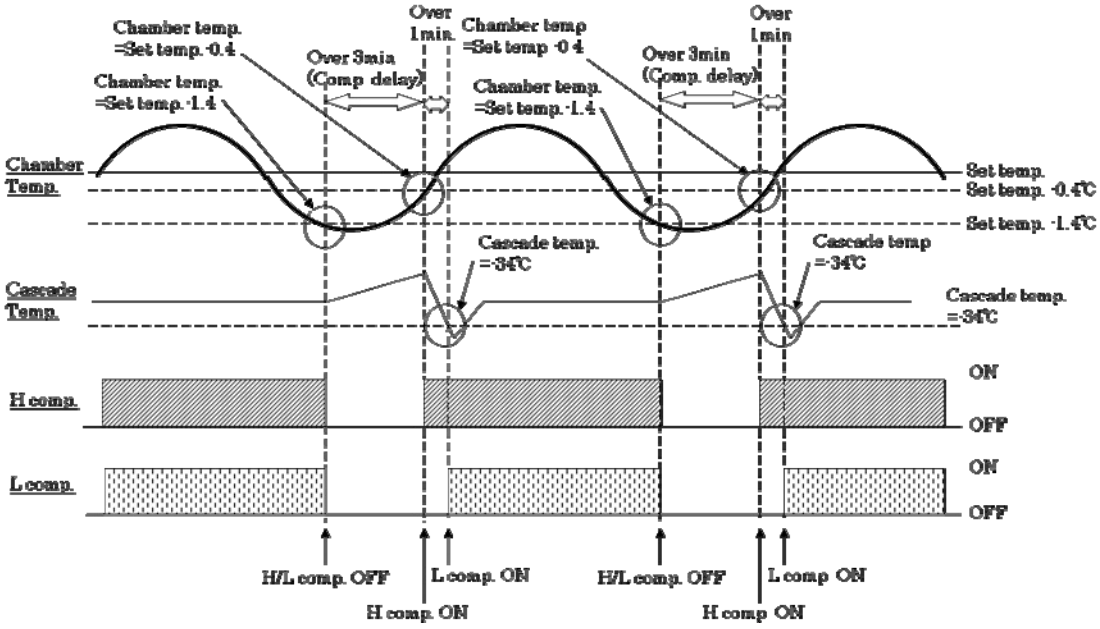
Turns off when a chamber temperature is set temperature -1.4℃

Interval:

1 minute *

* 'Interval' means that a period one of compressor either H or L turns on after another one was turned on.

Note) Compressor L does not turn on until 1 minute elapses since compressor H turned on, if a temperature in cascade sensor is lower than -34℃.



Compressor H protection:

Compressor H turns off to prevent it from being warmed up that is caused by fan motor locked.

Filter sensor temperature:

Compressor H turns off when a temperature in filter sensor is higher than 55℃. It will turn on again when the filter sensor temperature is lower than ambient temperature +10℃.

13. Delay time

Compressor delay time (Factory default: 3 minutes)

When a compressor H/L is turned off during cycle operation, it has a delay time to start the compressor again. Delay time can be set in F05.

Temperature alarm delay time (Factory default: 15 minutes)

When high or low temperature alarm is triggered, buzzer and remote alarm activate with the delay time. Delay time can be set in F50.

* Note) ALARM lamp illuminates and indication is given without delay.

Door alarm delay time (Factory default: 2 minutes)

When an outer door is open, audible alarm sounds with the delay time.

Delay time can be set in F04.

Power failure alarm delay time (3 seconds fixed)

When a power is failed, power failure alarm is triggered with 3 seconds of delay.

Delay time cannot be changed.

14. Prevention for oil logging in capillary (Factory default: capillary heater is disconnected)

Purpose:

Capillary heater which attached with capillary is powered by turning both High and Low side compressor off regularly to prevent oil logging in capillary.

Operation:

Both High and Low side compressor are turned off, while a capillary heater relay (CN4: 3-4) is turned on. DP3 (red lamp) is lit.

Frequency:

8 minutes in every 18 hours (Setting time are changeable in F19)

Timing of operation:

(1) 9 seconds after both High and Low side compressor are turned off during cycle operation.
(2) Both High and Low side compressor are forcibly turned off if they keep running for 60 minutes or more after they were ordered to turn off.

Operation of capillary heater:

Capillary heater is forcibly ON/OFF controlled in F18.

15. Sensor offset

Offset value:

(1) Temperature sensor: -1.7℃(Changeable in F07)
(2) Cascade sensor: +/-0.0℃ (Changeable in F08)
(3) Filter sensor: +/-0.0℃
(4) AT sensor: +/-0.0℃

16. Remote alarm terminal

Operation:

When an alarm is occurred, remote alarm contact (RLY2) switches the position.

	CN3	
	1 – 2 (N.O.)	1 – 3 (N.C.)
Normal	Open	Close
In alarm	Close	Open

17. Operation and setting after a power is reset

Settings when a power is supplied (Power on reset)

Alarms: OFF
Compressors: OFF
Remote alarm: OFF
Timers: Reset
2H timer, 8H timer: 0 (Reset)
Peak cut operation: ON
Counting of compressor L OFF period: Reset
Setting data: Read by non-volatile memory

Momentary power failure:

When a chamber temperature is lower than set temperature+10℃, unit is regarded as 'Momentary power failure'.

Settings after unit returns from power failure:

Alarms: OFF
Compressors: OFF
Remote alarm: ON
Timers: Reset
2H timer, 8H timer: 0 (Reset)
Warming up operation: OFF
Counting of compressor L OFF period: Reset
Setting data: Read by non-volatile memory

18. Lamp operation

<Display PCB>

DP51: Red lamp
Blink : In alarm conditions

DP52: Green lamp
Lighting : In STATUS mode

DP53: Orange lamp
Lighting : In filter alarm

DP54: Red lamp
Lighting : Door leaves open

DP55: Orange lamp
Lighting : Battery accumulation time is reached to 2.8 years
Blinks : Fan motor accumulation time is reached to 5.6 years

<Control PCB>

DP1: Orange lamp
Goes off : High/low temp. alarm (15min. delay), sensor error, power failure
Lighting : Not in alarm condition

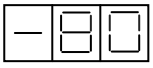
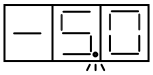
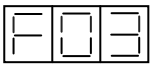
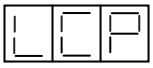
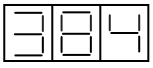
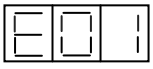
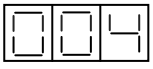
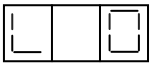
DP2: Green lamp
Goes off : Compressor L turns off. (normal condition)
Lighting : Compressor L turns on.

DP3: Red lamp
Goes off : Capillary heater turns off. (normal condition)
Lighting : Capillary heater turns on.

DP4: Yellow lamp
Goes off : Fan motor turns off.
Lighting : Fan motor turns on.

DP6: Green lamp
Goes off : Compressor H turns off. (normal condition)
Lighting : Compressor H turns on.

19. Examples of display

Chamber temp.	-79.5℃		Decimal point of chamber temp.	-80.0	
Set temp.	-80.0℃		Sensor offset	-5.0	
Function	F03		Operation monitoring	LCP	
Service code	384		Error	E01	
Set value	004		Accumulation time	8H timer 135	
Key Lock	L_0				

20. Buzzer tone:

Alarms (except door alarm)	Intermittent tone
Key operation	Click tone
Set value memory	Click tone
Out of settable range	Continuous tone (1 second)
Door alarm	Intermittent tone with shorter than other alarms

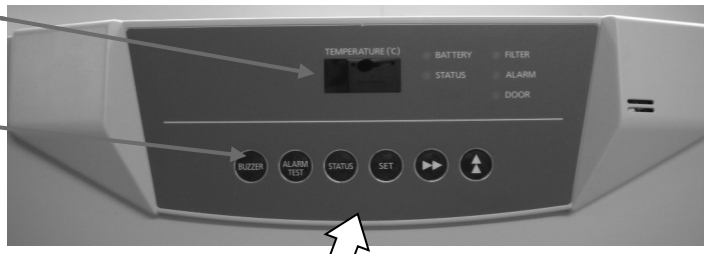
Parts Layout

KM-DU73Y1E/KM-DU53Y1E

* Photo is KM-DU73Y1E.

Display

Control Panel



Latch : close

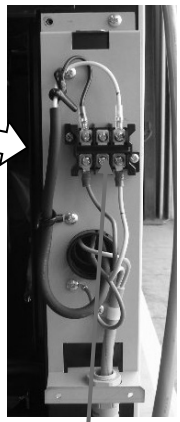
Latch : open

Filter

AT Sensor

＜Back bottom

Power supply

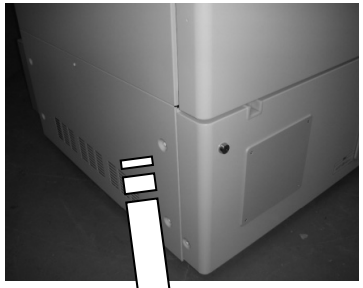


Compressor (L)

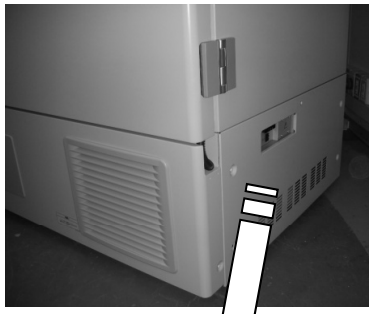
Compressor (H)

3P terminal

Right side bottom



Left side bottom



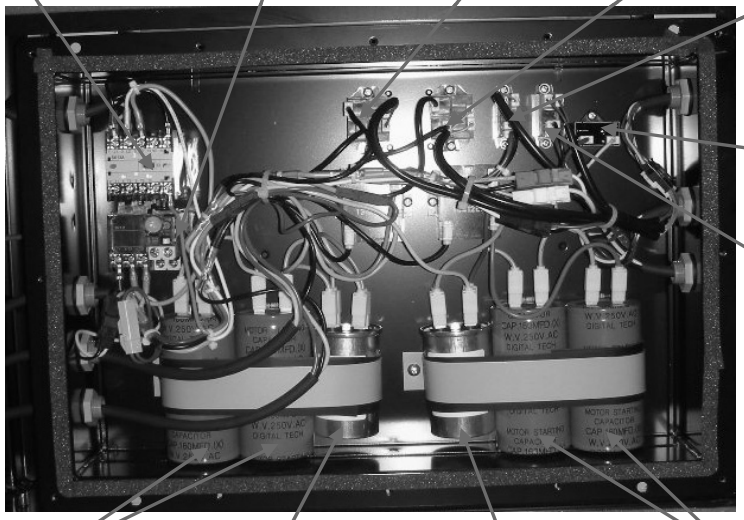
Magnet relay (for power supply)

Thermal relay (for power supply)

Power relay (L)

Power relay (H)

Heater relay



Switching power supply

Fan motor capacitor

Fan relay

Starting capacitor (L)

Running capacitor (L)

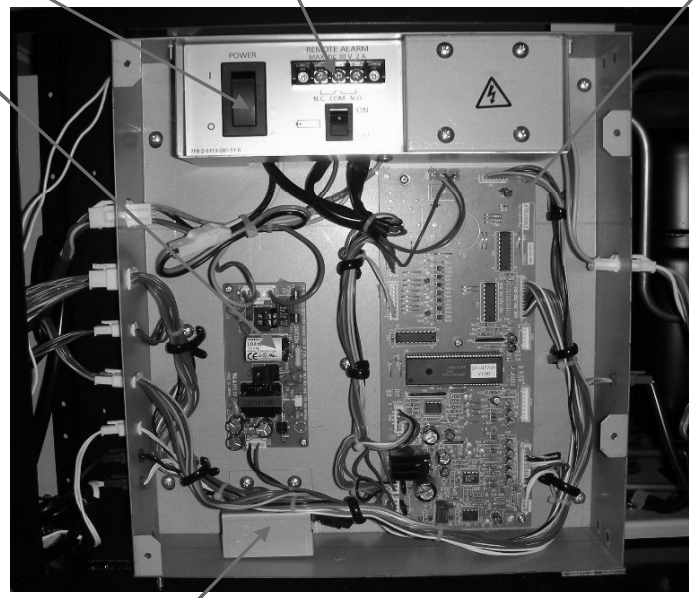
Running capacitor (H)

Starting capacitor (H)

Power switch

Remote alarm terminal

Main PCB



Battery

Repairing unit/Enclosing

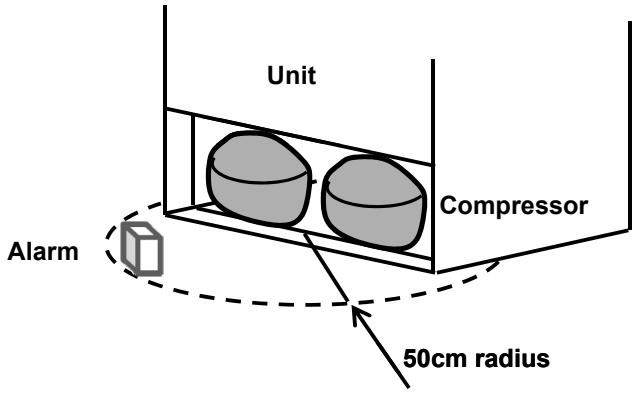
1. Equipment

①Refrigerant cylinder
②Alarm
③Detector
④Gauge manifold（for both R290・R170）
⑤Long hose（more than 10m）
⑥Explosion-proof vacuum pump
⑦Electronic measurement scale
⑧Charge hose x 4pcs
⑨Nitrogen cylinder
⑩Piercing tool x 2pcs
⑪Service valve x 1pc
⑫Dehydrator x 1pc
⑬Connector x 1set
⑭Pinch pliers x 2pcs
⑮Leather gloves
⑯Goggles
⑰n-pentane
⑱Pentane cylinder
⑲Pentane dryer

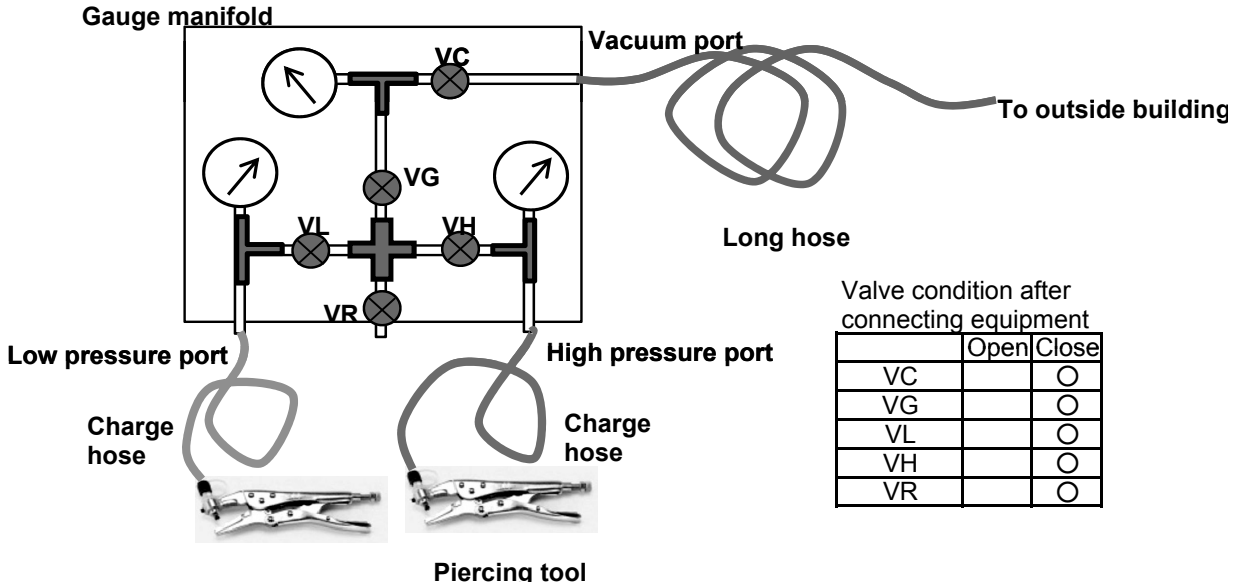
2. Procedure

Caution :
Make sure that electric unit power off and non-smoking around working space.

① Secure working space
Move the unit to working space and open doors/windows. Set alarm on the **floor** within **a 50cm radius** of the unit.
Notice : Detector must be ON during working.



② Equipment connection
Connect piercing tool x 2pcs, charge hose x 2pcs, gauge manifold and long hose like below and take other side of long hose to outside building.



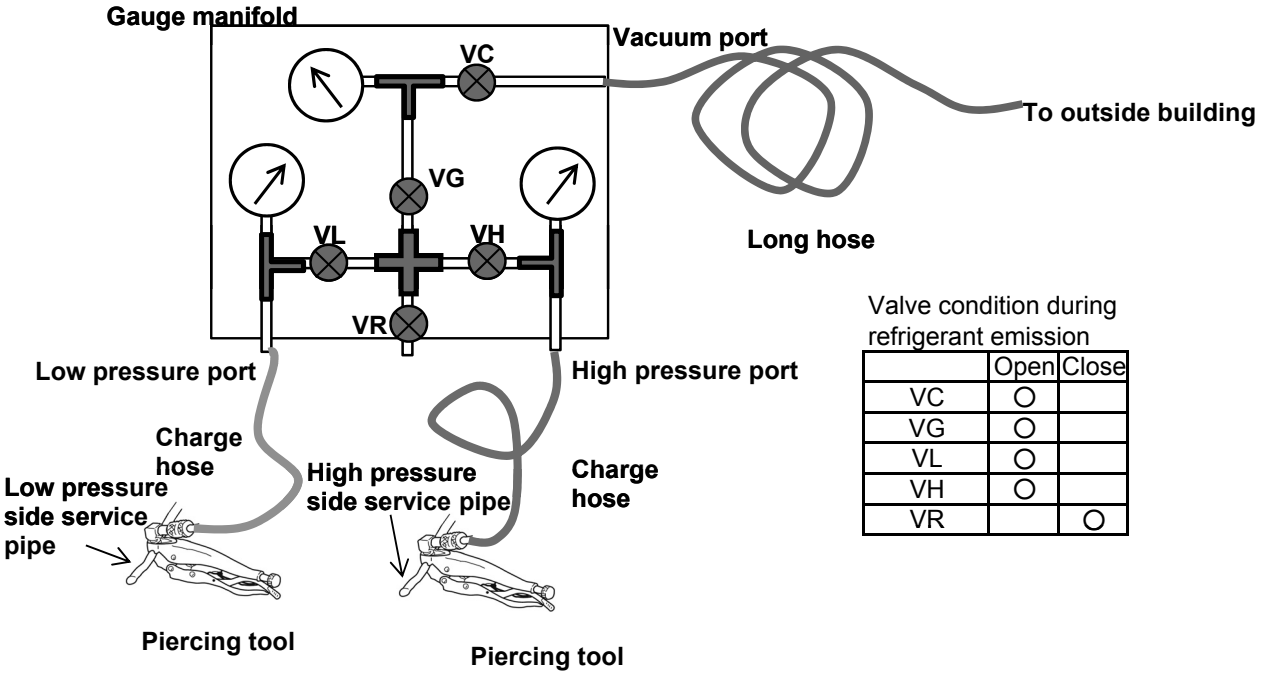
Valve condition after connecting equipment

	Open	Close
VC		○
VG		○
VL		○
VH		○
VR		○

③ Emitting refrigerant

※Wearing leather gloves and goggles.
※Confirm that there is anything possibly flammable outside building such as electric tool, etc.

Set piercing tool to high/low pressure service pipe, then open valves of gauge manifold (except VR) and emit refrigerant from long hose to outside building.



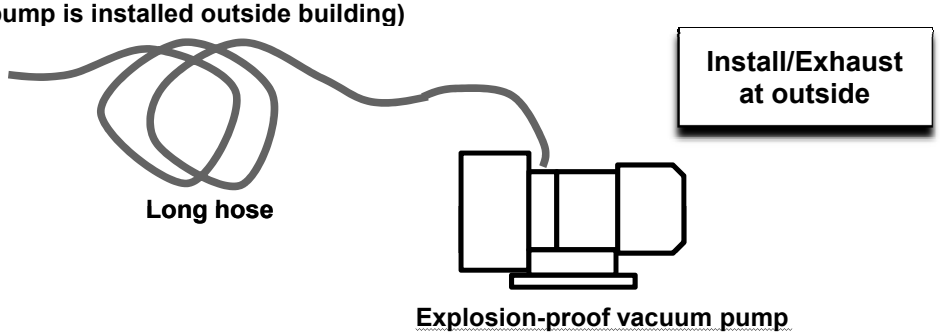
Valve condition during refrigerant emission

	Open	Close
VC	○	
VG	○	
VL	○	
VH	○	
VR		○

④ Vacuum exhaust of unit circuit

Since refrigerant is melted into oil, connect **explosion-proof vacuum pump** to one side of long hose that is at outside and carrying out vacuum exhaust for about 5 minutes.

(※Vacuum pump is installed outside building)



⑤ Nitrogen blow

After vacuum exhaust, take off piercing tool from H/L pressure pipe and cut the end of both pipe by pipe cutter. Then, carrying out nitrogen blow into circuit for about 30 seconds.
(Nitrogen replacement : secondary pressure should be 0.5～0.7MPa)

Notice : Above procedures must be carried out because there is possibility that the refrigerant burns by welding machine fire.

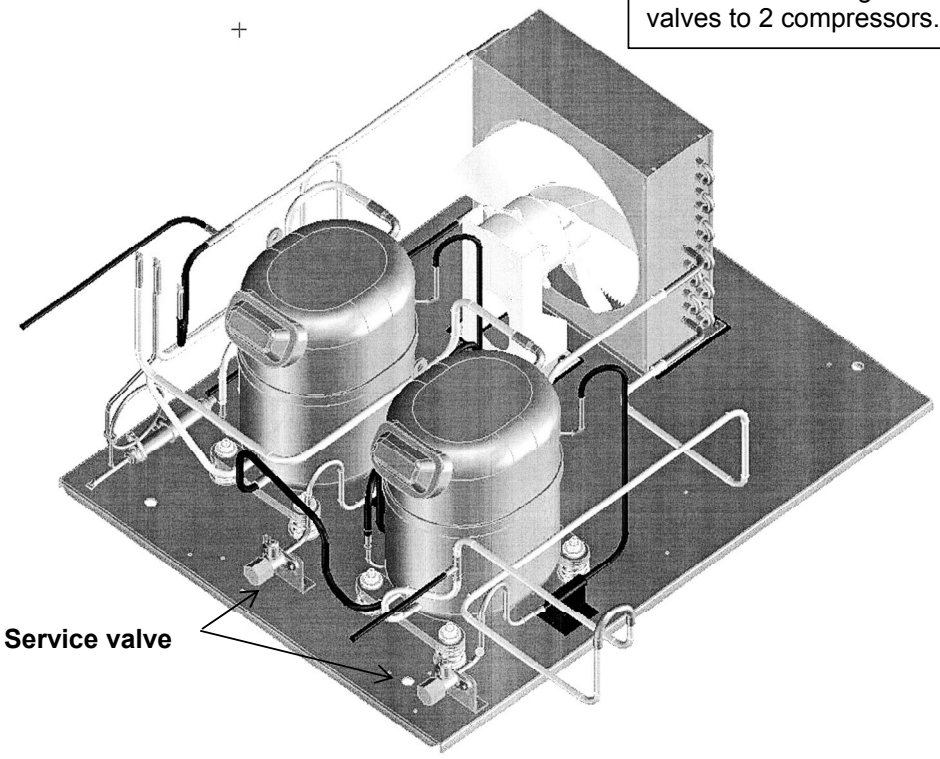
After completing above process, welding machine can be used. Continue to repairing.

※ During parts change, follow each parts change procedures.
※ Removed refrigerant circuit parts should be placed away from fire and working space. (If it is loaded into the car, non-smoking and try to ventilate)

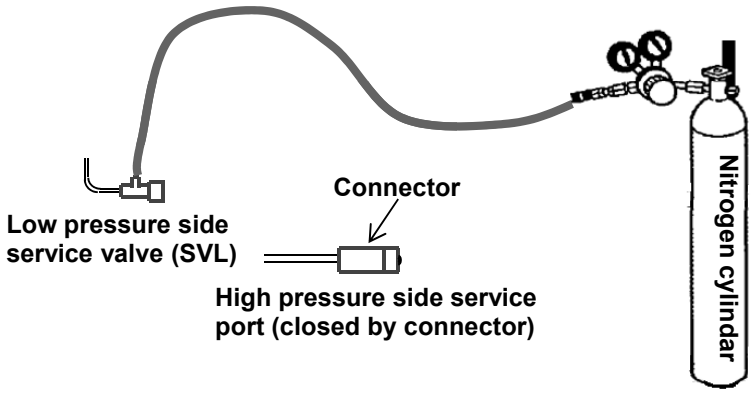
After repair completion

⑥ Installation of low pressure side service valve and dehydrator replacement
Replace low pressure side service pipe (compressor installation) before installing service valve.
After that, install service valve to low pressure side service pipe.
At the time of repairing refrigerant circuit, dehydrator must be replaced.

In case of installing service valves to 2 compressors.



⑦ Leak check
Closing high pressure side service port by connector, then connect nitorgen cylindar to low pressure side service valve (SVL) and checking leakage of whole unit circuit.
(Nitrogen cylindar secondary side pressure : 0.5～0.7MPa)

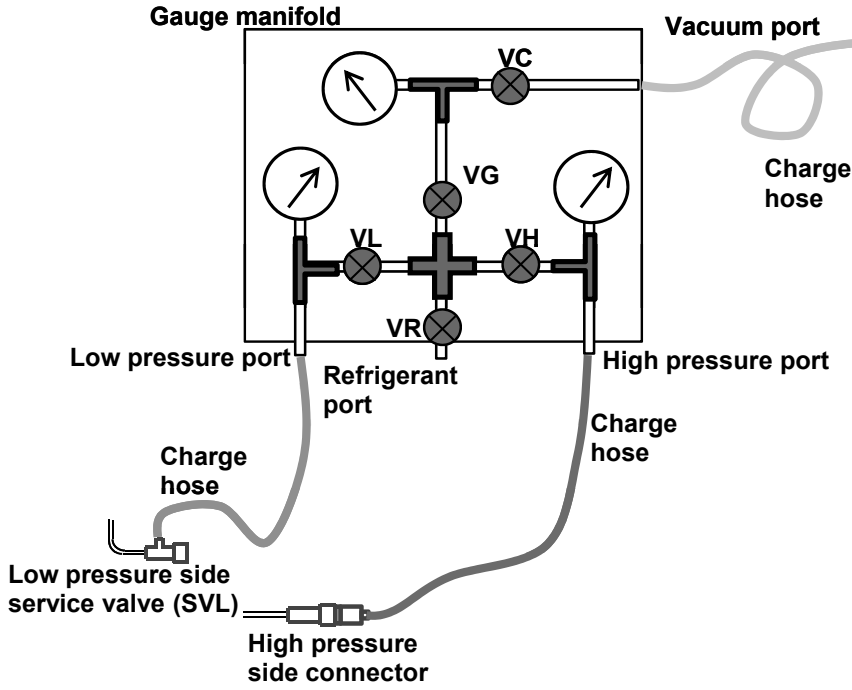


Valve condition during leak check

	Open	Close
SVL	O	

⑧ Vacuum exhaust Ⅰ

After releasing nitrogen, carry out vacuum exhaust for enclosing refrigerant.
Keep opening low pressure side service valve and connect charge hose. Install connector to high pressure side service valve and connect unit, gauge manifold and refrigerant cylinder using hose. (all valves are open except the main tap of refrigerant cylinder)
Required time : using 300L/minutes vacuum pump, more than about 4 hours.

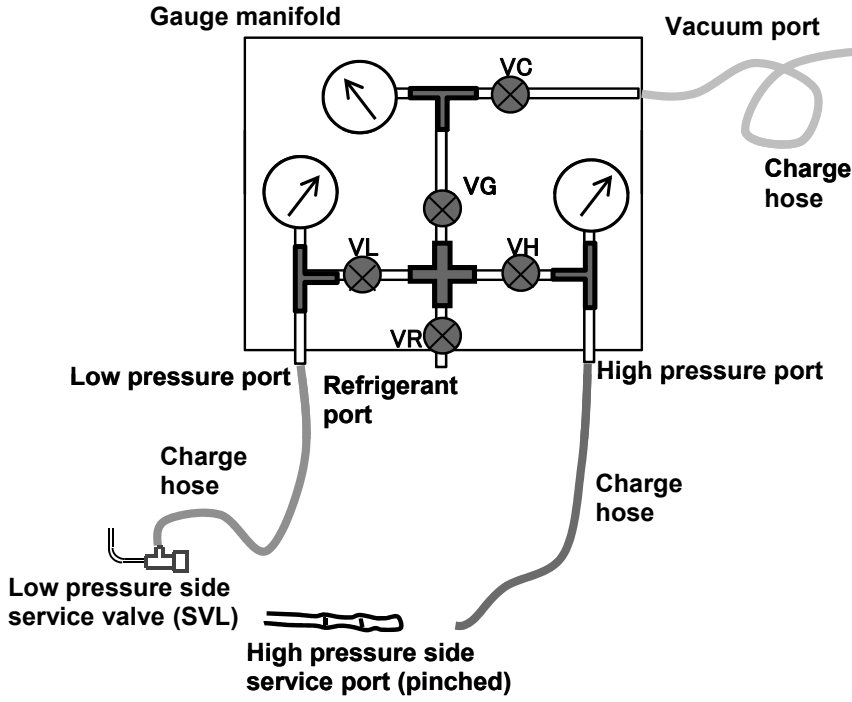


Valve condition of Vacuum exhaust Ⅰ

	Open	Close
VC	○	
VG	○	
VL	○	
VH	○	

⑨ Sealing high pressure side service port

Close VH valve and install pinch pliers to high pressure side service pipe, then tighten.
Take off connector and squeeze it by pliers, then seal it by welding machine.



Valve condition after sealing service port

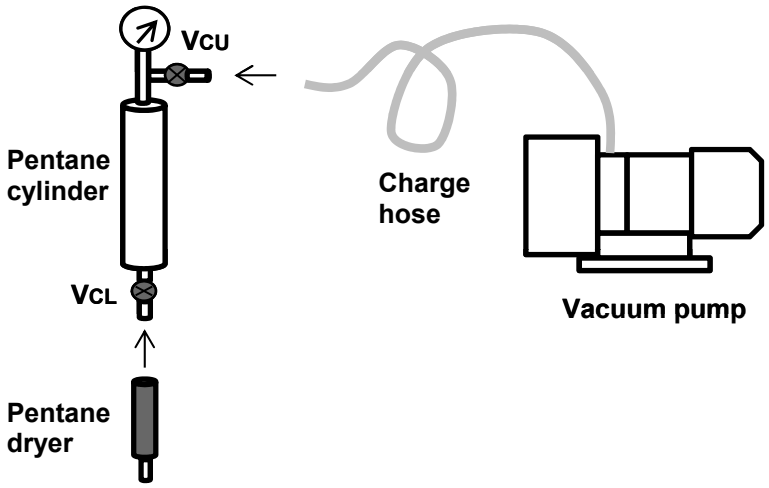
	Open	Close
VC		○
VG	○	
VL	○	
VH		○
VR		○
SVL	○	

⑩ Enclosing n-pentane

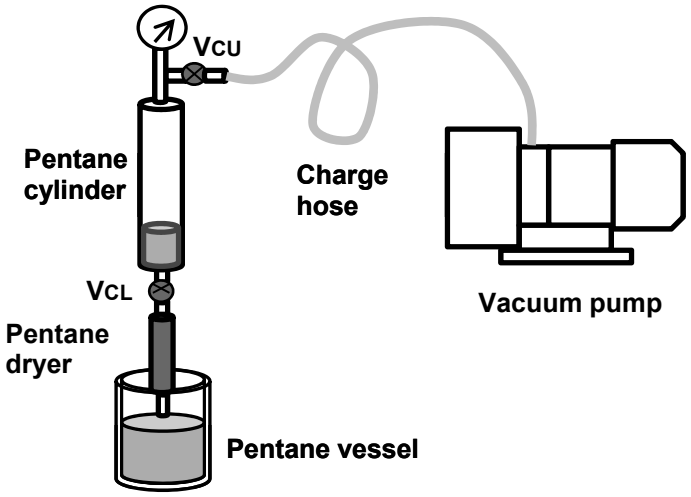
This is constructed by gathering pentane and enclosing pentane to circuit.

● **Gathering pentane**

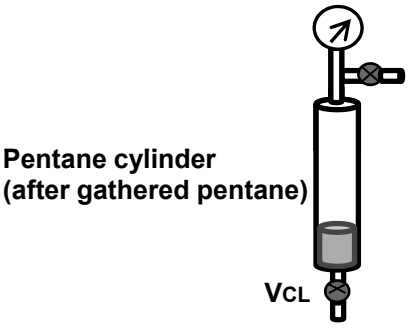
1) Install pentane dryer to VCL valve of pentane cylinder.
2) Connect VCU valve and Vacuum pump with charge hose.
※VCU should be "close" and VCL should be "open" condition at this time.



3) After start running vacuum pump, soak the tip of pentane dryer to pentane.
Open VCU slowly, pentane is absorbed into cylinder.

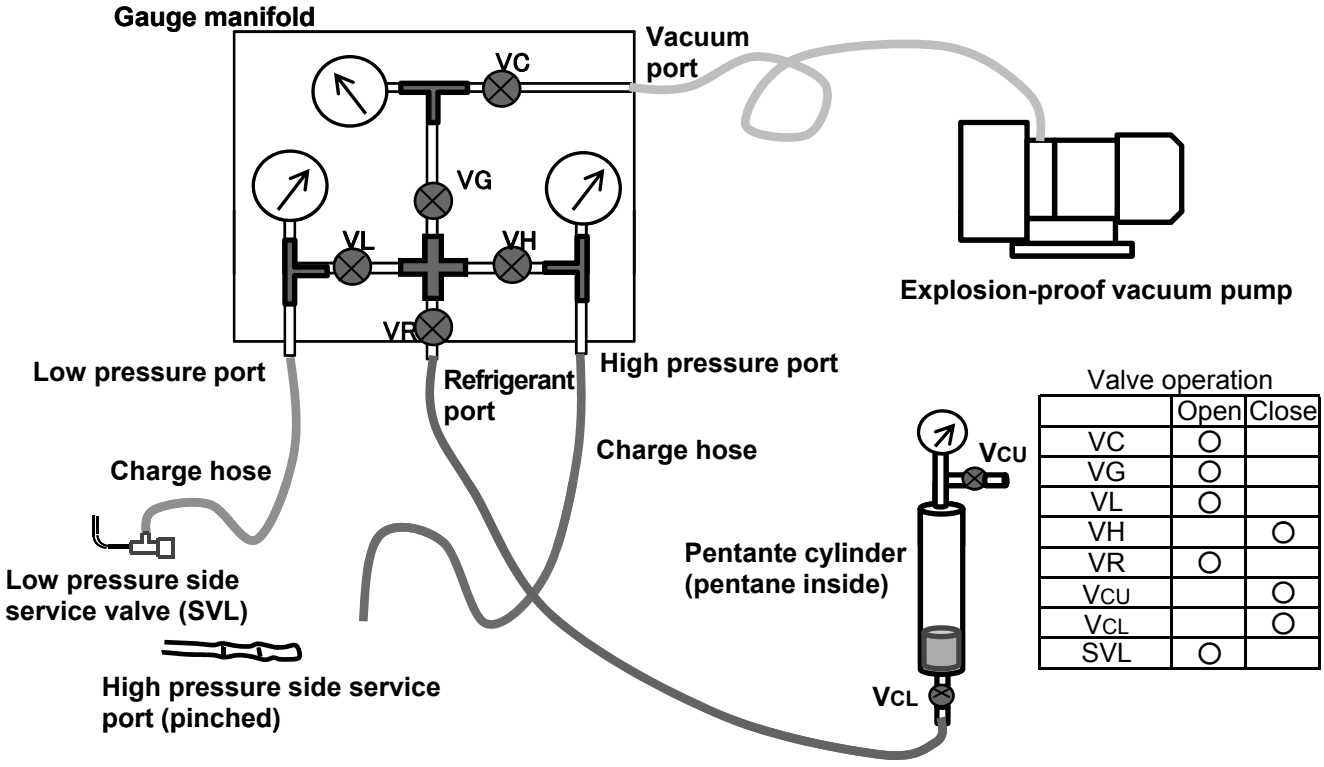


4) After regulated amount of pentane is absorbed into cylinder, close VCU to finish absorpt
5) Stop vacuum pump and take off chargehose from VCU.
Take off pentane dryer from VCL.



● **Enclosing pentane to circuit**

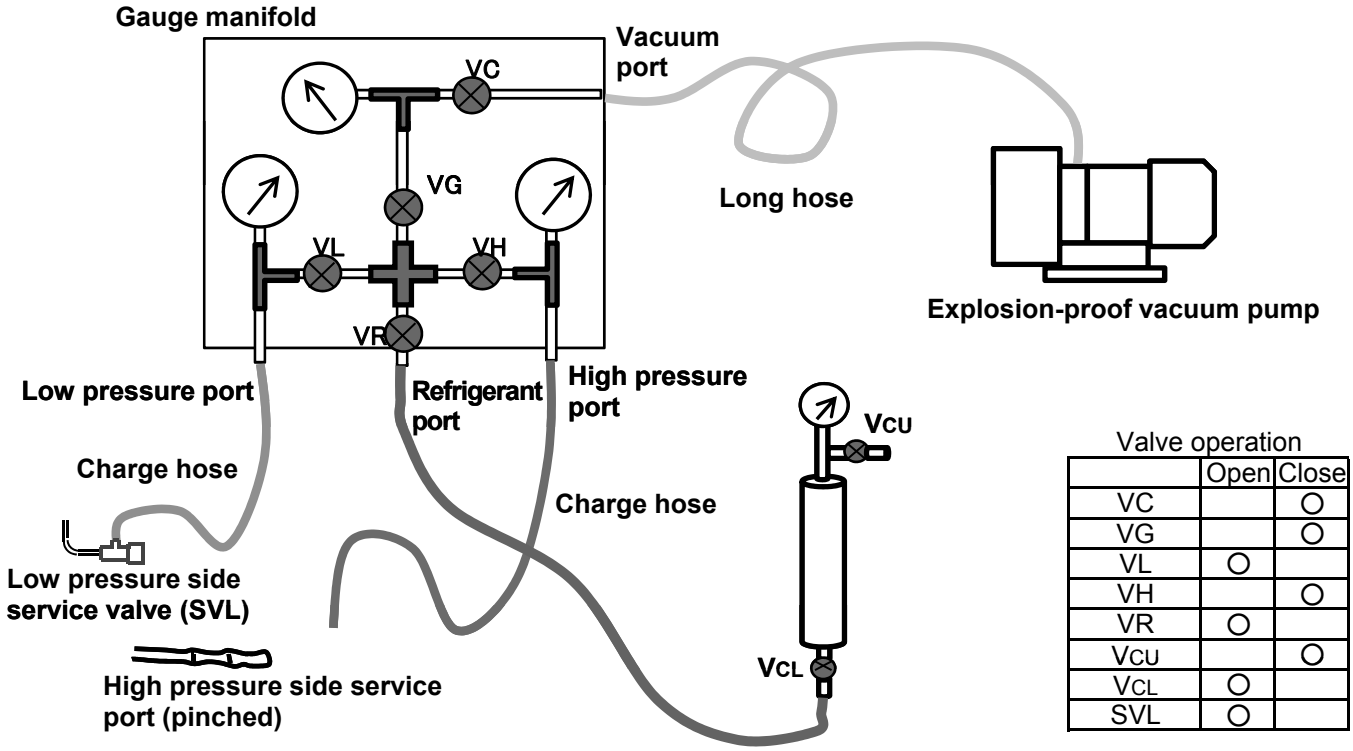
1) With VR close, connect VCL valve of pentane cylinder and refrigerant port of gauge manifold with charge hose.
2) With VC close, connect vacuum port of gauge manifold and vacuum pump with charge hose.
3) After start running vacuum pump, open VC and VR valve.



Valve operation

	Open	Close
VC	○	
VG	○	
VL	○	
VH		○
VR	○	
VCU		○
VCL		○
SVL	○	

4) After closing VC and VG valve, open VCL valve to absorb pentane to circuit.



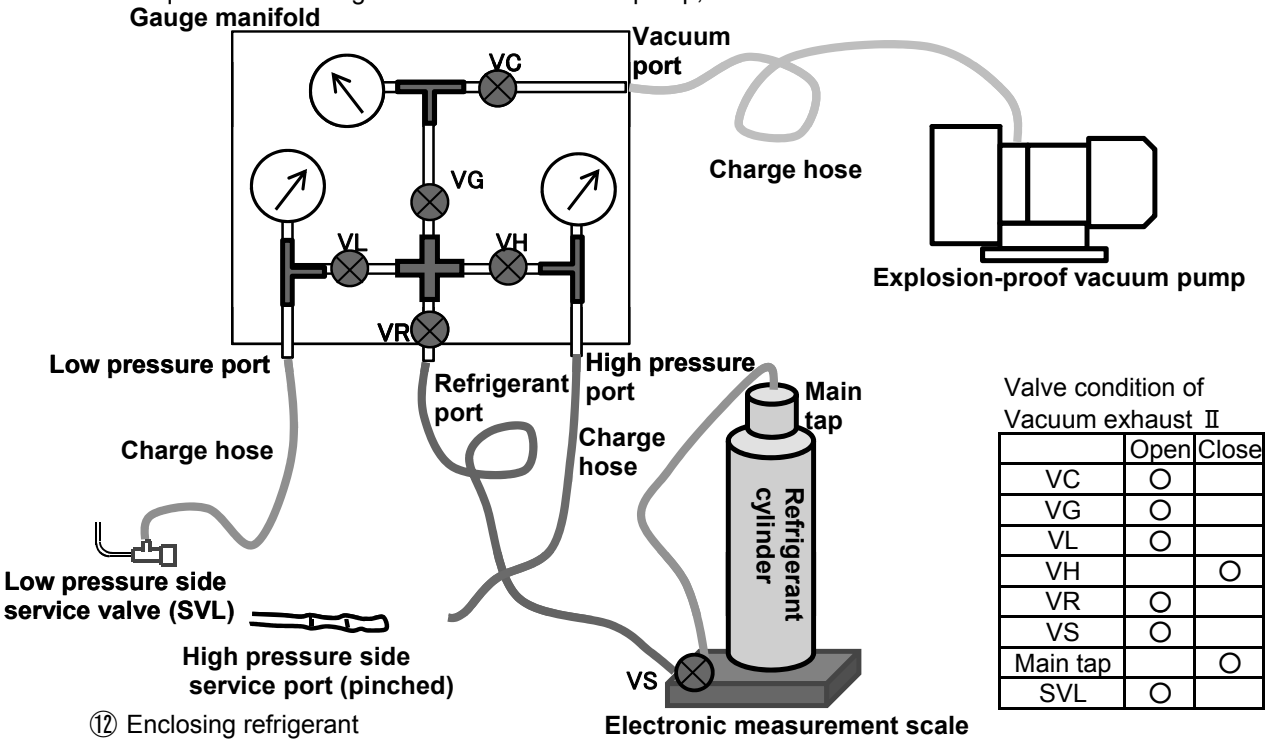
Valve operation

	Open	Close
VC		○
VG		○
VL	○	
VH		○
VR	○	
VCU		○
VCL	○	
SVL	○	

⑪ Vacuum exhaust Ⅱ

Continue vacuum exhaust. Take off pentane cylinder from chrage hose and connect refrigerant cylinder.

Required time : using 300L/minuites vacuum pump, more than about 30 minutes.



Valve condition of Vacuum exhaust Ⅱ

	Open	Close
VC	○	
VG	○	
VL	○	
VH		○
VR	○	
VS	○	
Main tap		○
SVL	○	

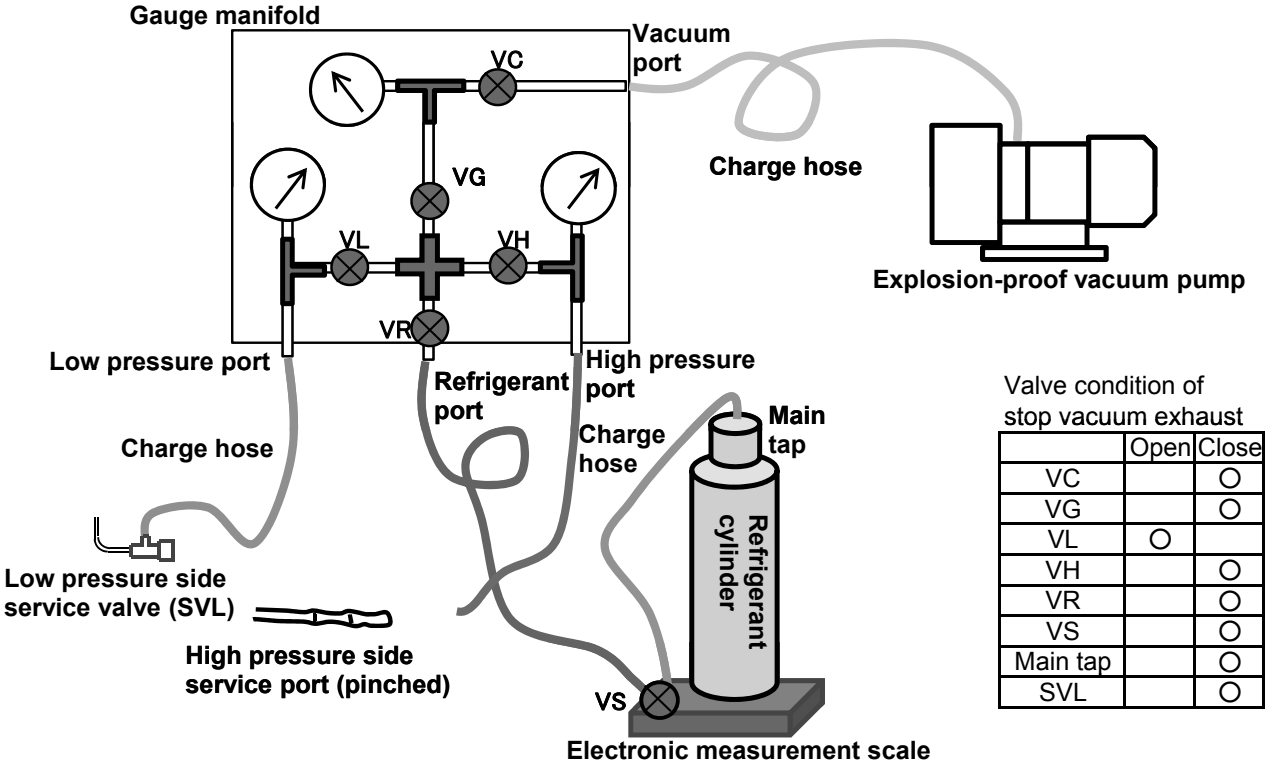
⑫ Enclosing refrigerant

※Wearing leather gloves and goggles.

1) Stop vacuum exhaust

Before stopping vacuum pump, close valves by following order.

VC→VG→SVL→VR→VS



Valve condition of stop vacuum exhaust

	Open	Close
VC		○
VG		○
VL	○	
VH		○
VR		○
VS		○
Main tap		○
SVL		○

2) Preparation for enclosing
(a) Open valves by following order.
Main tap→VS→VR

When the value of electric measurement scale become stable…
(b) Reset value of electric measurement scale (display 0)

Valve condition of preparation for enclosing

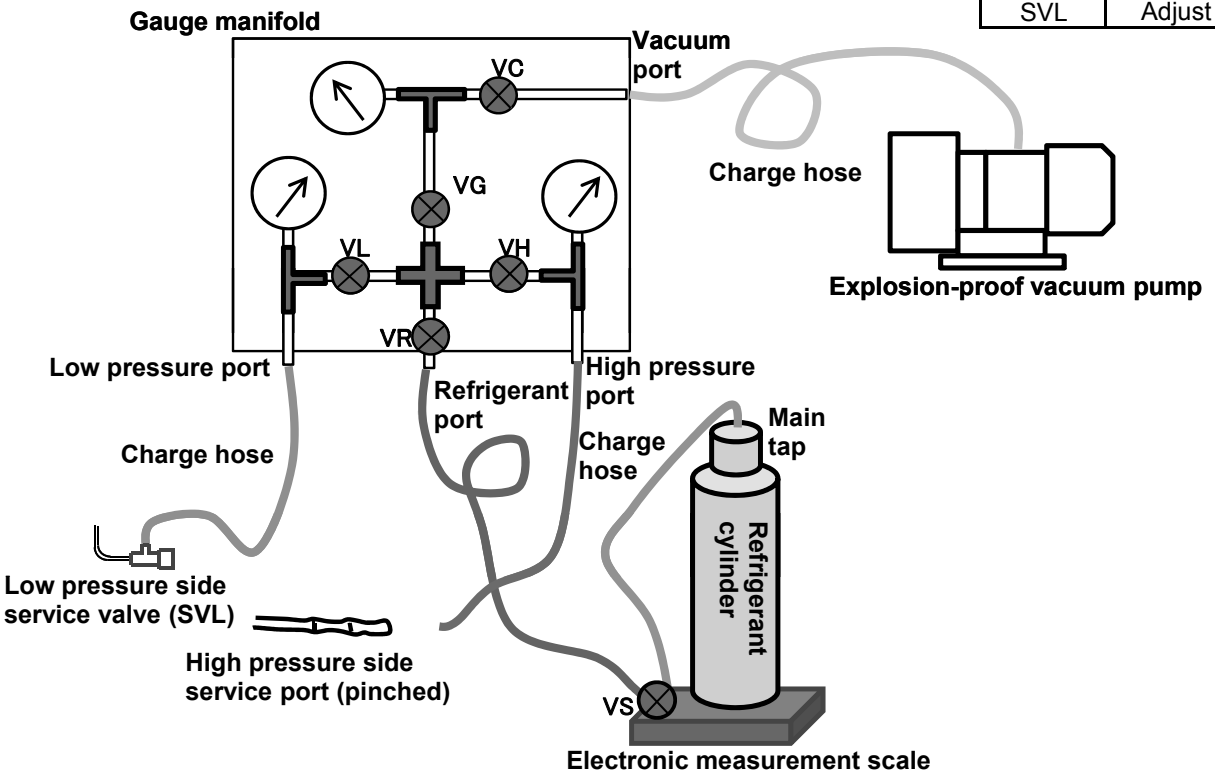
	Open	Close
VC		○
VG		○
VL	○	
VH		○
VR	○	
VS	○	
Main tap	○	
SVL		○

3) Start enclosing
Now start enclosing to unit
(a) Open low pressure side service valve (SVL) slowly and check if the value of electric measurement scale increase slowly.

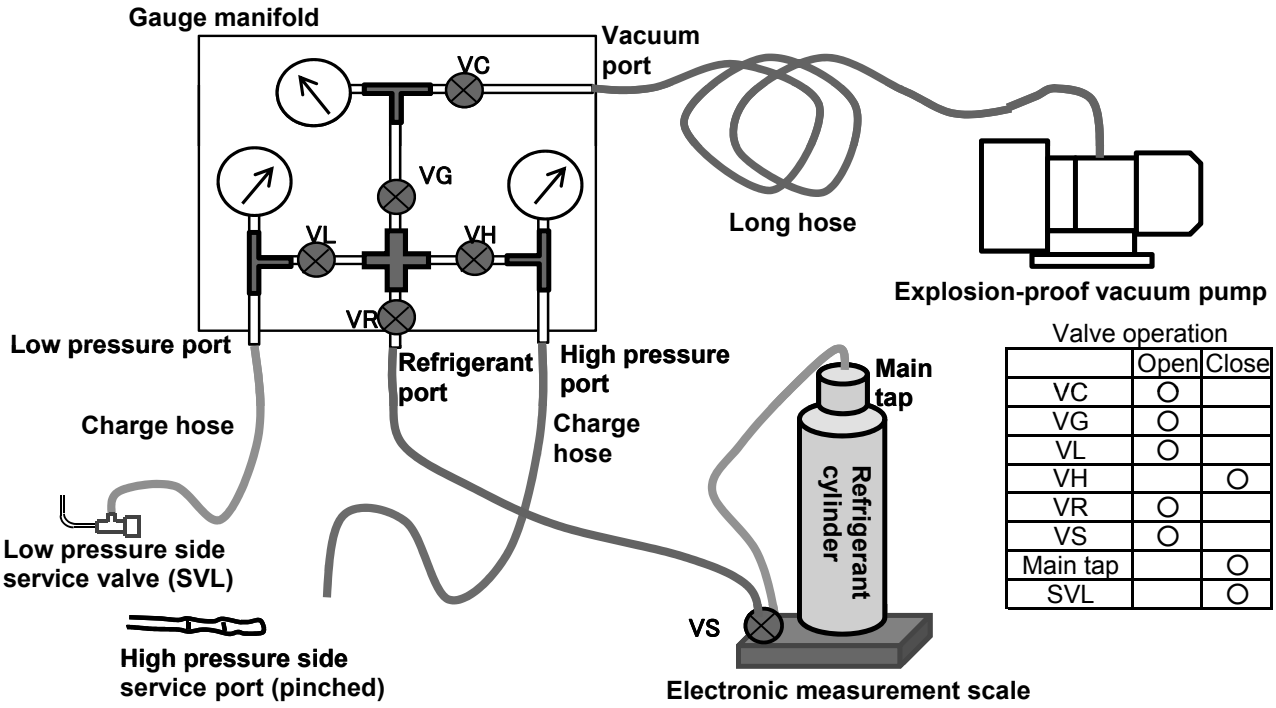
(b) When the value is close to required value, start closing SVL slowly.
(Pay attention that there is time lag between closing action of SVL and display of electric measurement scale value)

Valve condition of after start enclosing

	Oepn	Close
VC		○
VG		○
VL	○	
VH		○
VR	○	
VS	○	
Main tap	○	
SVL	Adjust	



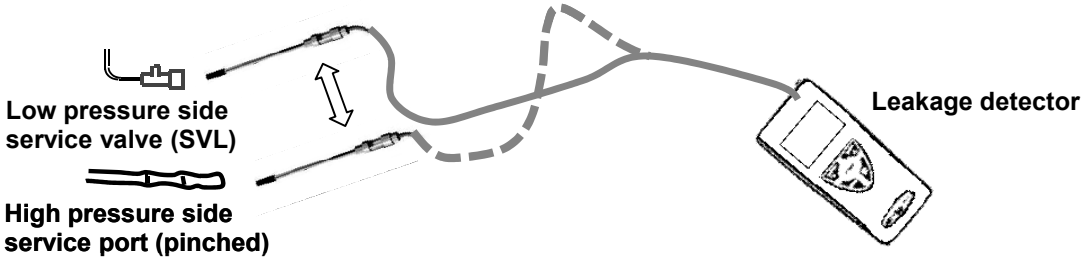
4) Stop enclosing
(a) Close low pressure side service valve (SVL) by wrench.
(record final amount of charging)
(b) Close main tap of refrigerant cylinder.
(c) Replace charge hose for vacuum port to long hose and take other side to outside building.
(d) Open valves (VC, VG, VL, VR, VS) to release residual refrigerant of hose and gauge manifold to outside.
※ Take enough time for releasing residual refrigerant.
(Connect long hose and explosion-proof vacuum pump to gauge manifold and release to outside)
(e) After completion of releasing refrigerant, take off charge hose from high/low pressure valve.



Valve operation

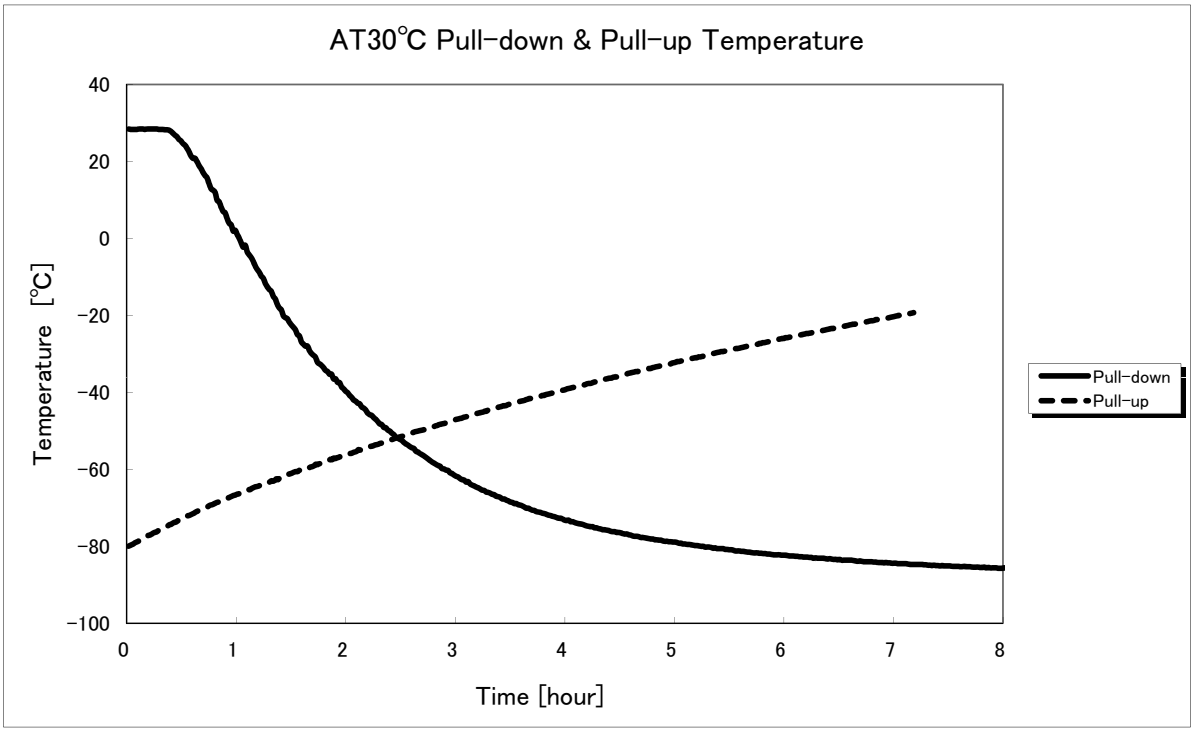
	Open	Close
VC	○	
VG	○	
VL	○	
VH		○
VR	○	
VS	○	
Main tap		○
SVL		○

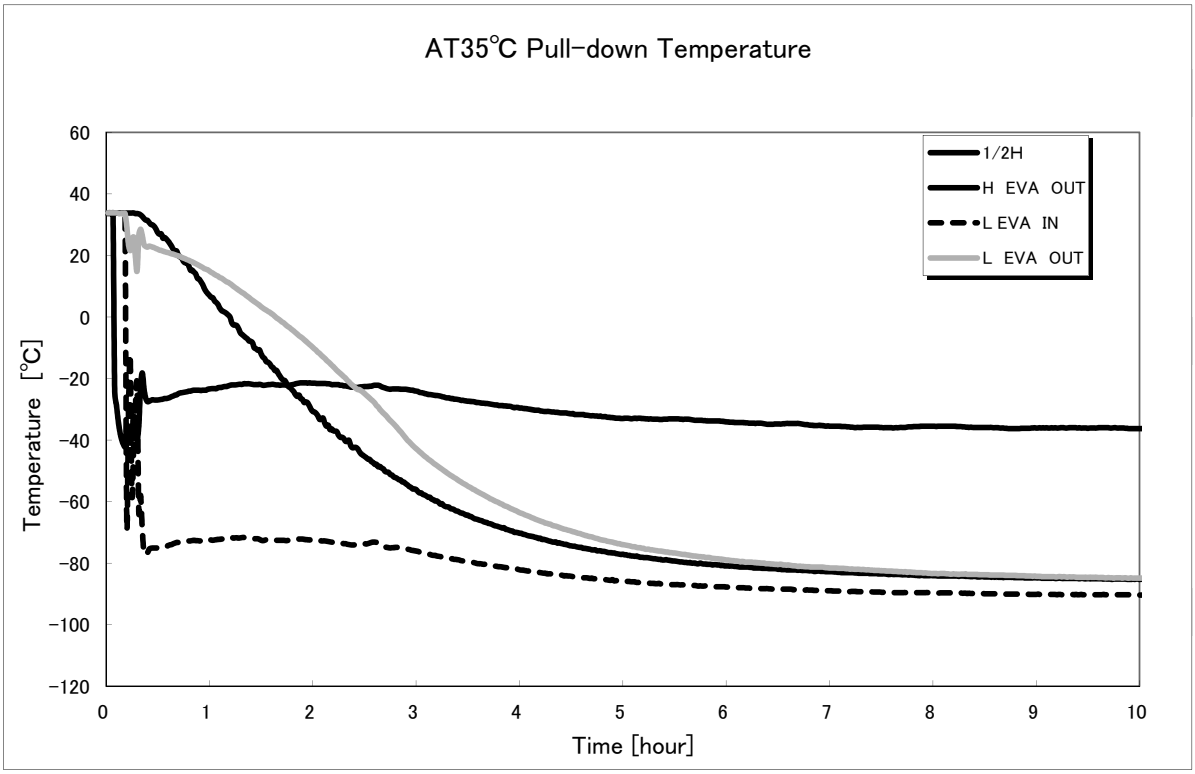
⑬ Gas leak check
Check leakage about low pressure side service valve after taking off charge hose using detector.
Then, check leakage about welding part of high pressure side service port and any other part that welded during repair.
If there is nothing wrong, install the cap to low pressure side service valve.

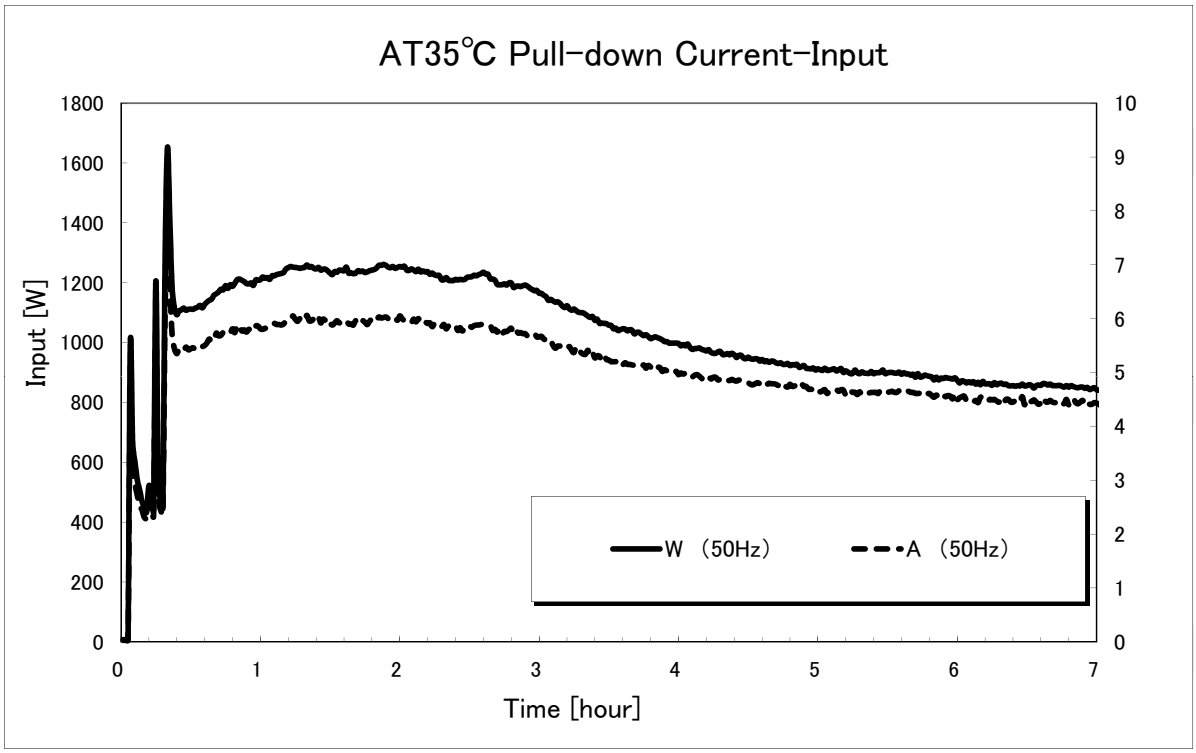


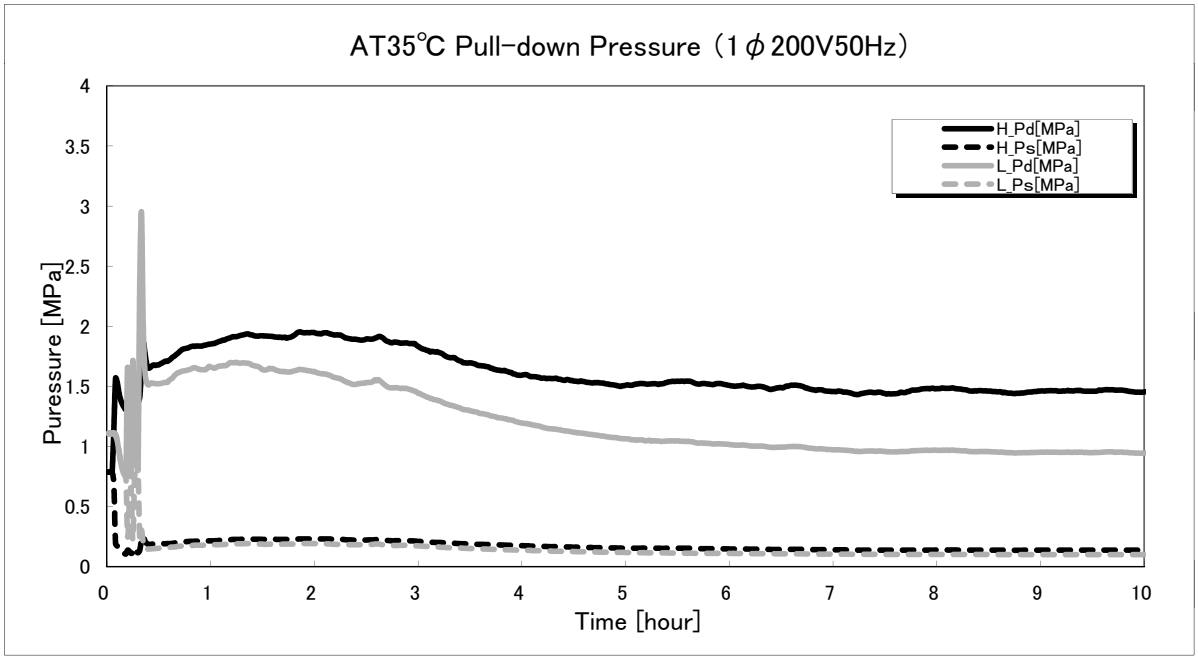
Test Data

KM-DU73Y1E

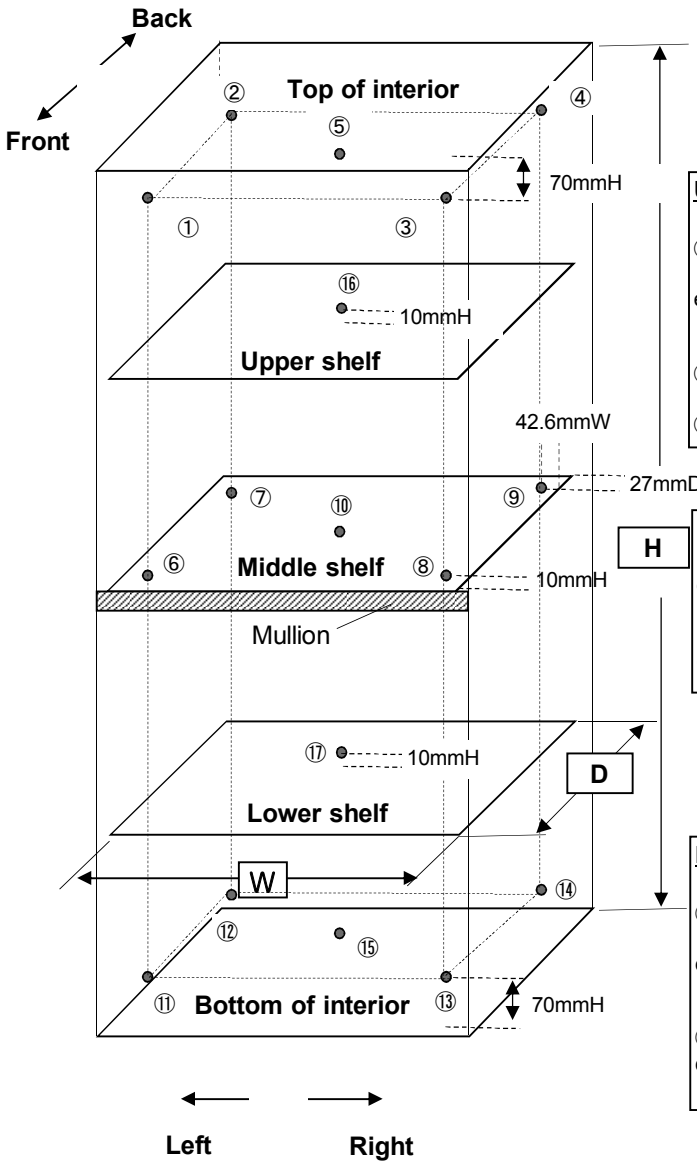





AT35℃ Pull-down Current-Input
Input [W]
Time [hour]
W （50Hz）
A （50Hz）


AT35℃ Pull-down Pressure（1φ200V50Hz）
Puressure [MPa]
Time [hour]
H_Pd[MPa]
H_Ps[MPa]
L_Pd[MPa]
L_Ps[MPa]

Temperature uniformity - 17points measuring



Upper area measuring points

①~④: 70mm(H) from the top of interior
27mm(D) and 42.6mm(W) from each
corners on Middle shelf.

⑤: 65mm(H) from the top of interior, centre

⑯: 10mm(H) from the upper shelf, centre

Middle area measuring points

⑥~⑨: 10mm(H), 27mm(D), 42.6mm(W) from each corner on the middle shelf

⑩: 10mm(H) from the middle shelf, centre

Bottom area measuring points

⑪~⑭: 70mm(H) from the bottom of interior
27mm(D) and 42.6mm(W) from each
corner on the middle shelf

⑮ 65mm(H) from the bottom of interior, centre

KM-DU73Y Internal Temperature Uniformity (Reference Data)

＜Conditions＞

Ambient temperature: 20/30℃
Load: Unloaded

＜Distribution data＞
Temperature of the cycle in each area (SV=-80℃、air temperature)

Unit:℃

			Ambient temperature 20℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	-75.7	-80.6	-78.2	±2.5	-75.5	-80.8	-78.2	±2.7
②		Left back	-78.3	-83.5	-80.9	±2.6	-78.2	-83.7	-81.0	±2.8
③		Right front	-74.8	-79.6	-77.2	±2.4	-74.7	-79.8	-77.3	±2.6
④		Right back	-78.0	-83.0	-80.5	±2.5	-77.9	-83.2	-80.6	±2.7
⑤		Center	-78.4	-83.1	-80.8	±2.3	-78.2	-83.4	-80.8	±2.6
⑥	Middle area	Left front	-78.1	-79.9	-79.0	±0.9	-78.1	-80.0	-79.1	±1.0
⑦		Left back	-79.5	-81.9	-80.7	±1.2	-79.6	-82.0	-80.8	±1.2
⑧		Right front	-78.0	-79.6	-78.8	±0.8	-78.2	-79.7	-79.0	±0.8
⑨		Right back	-79.0	-81.3	-80.2	±1.2	-79.2	-81.4	-80.3	±1.1
⑩		Center	-79.2	-80.2	-79.7	±0.5	-79.3	-80.3	-79.8	±0.5
⑪	Bottom area	Left front	-77.0	-80.2	-78.6	±1.6	-77.1	-80.7	-78.9	±1.8
⑫		Left back	-77.8	-80.9	-79.4	±1.6	-77.8	-81.2	-79.5	±1.7
⑬		Right front	-75.7	-78.8	-77.3	±1.6	-75.9	-78.9	-77.4	±1.5
⑭		Right back	-77.4	-80.5	-79.0	±1.6	-77.5	-80.8	-79.2	±1.7
⑮		Center	-78.2	-80.8	-79.5	±1.3	-78.3	-81.2	-79.8	±1.5
⑯	Center of Upper shelf		-79.3	-80.3	-79.8	±0.5	-79.3	-80.3	-79.8	±0.5
⑰	Center of Lower shelf		-79.8	-80.7	-80.3	±0.5	-80.0	-80.9	-80.5	±0.5
Average			-	-	-79.4	-	-	-	-79.5	-

Unit:℃

			Ambient temperature 30℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	-75.3	-80.4	-77.9	±2.6	-74.5	-80.5	-77.5	±3.0
②		Left back	-78.1	-83.5	-80.8	±2.7	-77.4	-83.5	-80.5	±3.1
③		Right front	-74.2	-79.6	-76.9	±2.7	-73.6	-79.6	-76.6	±3.0
④		Right back	-77.8	-83.2	-80.5	±2.7	-77.1	-83.1	-80.1	±3.0
⑤		Center	-78.0	-83.1	-80.6	±2.6	-77.5	-83.2	-80.4	±2.9
⑥	Middle area	Left front	-78.3	-80.3	-79.3	±1.0	-77.0	-80.2	-78.6	±1.6
⑦		Left back	-79.7	-82.2	-81.0	±1.3	-78.3	-82.2	-80.3	±2.0
⑧		Right front	-78.5	-80.1	-79.3	±0.8	-77.3	-80.1	-78.7	±1.4
⑨		Right back	-79.5	-81.6	-80.6	±1.1	-78.1	-81.7	-79.9	±1.8
⑩		Center	-79.6	-80.7	-80.2	±0.6	-78.6	-80.7	-79.7	±1.1
⑪	Bottom area	Left front	-78.2	-82.6	-80.4	±2.2	-77.6	-82.6	-80.1	±2.5
⑫		Left back	-78.6	-82.4	-80.5	±1.9	-77.7	-82.3	-80.0	±2.3
⑬		Right front	-76.8	-80.6	-78.7	±1.9	-76.3	-80.3	-78.3	±2.0
⑭		Right back	-78.3	-82.1	-80.2	±1.9	-77.8	-81.9	-79.9	±2.1
⑮		Center	-79.3	-82.9	-81.1	±1.8	-78.6	-82.8	-80.7	±2.1
⑯	Center of Upper shelf		-79.4	-80.4	-79.9	±0.5	-78.4	-80.5	-79.5	±1.1
⑰	Center of Lower shelf		-80.6	-81.6	-81.1	±0.5	-79.7	-81.6	-80.7	±0.9
Average			-	-	-79.9	-	-	-	-79.5	-

Note:This data does not represent a guarantee of product performance.

＜Amount of power consumption＞
Amount of power consumption when driving at cycle

(SV=-80℃)
Unit:kWh/day

	Ambient temperature 20℃		Ambient temperature 30℃	
	50Hz	60Hz	50Hz	60Hz
230V	10.85	-	13.80	-

Note:This data does not represent a guarantee of product performance.

＜Distribution data＞
Temperature of the cycle in each area (SV=−70℃、air temperature)

Unit:℃

			Ambient temperature 20℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	−66.4	−72.3	−69.4	±3.0	−66.1	−72.5	−69.3	±3.2
②		Left back	−69.0	−75.4	−72.2	±3.2	−68.9	−75.6	−72.3	±3.3
③		Right front	−65.9	−70.9	−68.4	±2.5	−65.7	−70.9	−68.3	±2.6
④		Right back	−68.6	−74.7	−71.7	±3.1	−68.5	−74.8	−71.7	±3.2
⑤		Center	−69.0	−75.0	−72.0	±3.0	−68.8	−74.9	−71.9	±3.1
⑥	Middle area	Left front	−67.6	−69.6	−68.6	±1.0	−67.5	−69.5	−68.5	±1.0
⑦		Left back	−69.6	−72.6	−71.1	±1.5	−69.5	−72.6	−71.1	±1.6
⑧		Right front	−67.4	−69.3	−68.4	±0.9	−67.4	−69.1	−68.3	±0.8
⑨		Right back	−69.0	−71.5	−70.3	±1.3	−69.1	−71.6	−70.4	±1.3
⑩		Center	−68.7	−70.1	−69.4	±0.7	−68.7	−70.1	−69.4	±0.7
⑪	Bottom area	Left front	−64.5	−67.1	−65.8	±1.3	−64.5	−67.0	−65.8	±1.3
⑫		Left back	−65.9	−68.5	−67.2	±1.3	−65.9	−68.6	−67.3	±1.3
⑬		Right front	−63.4	−66.1	−64.8	±1.4	−63.4	−65.9	−64.7	±1.3
⑭		Right back	−64.6	−67.8	−66.2	±1.6	−64.5	−67.8	−66.2	±1.7
⑮		Center	−65.8	−68.3	−67.1	±1.3	−65.7	−68.3	−67.0	±1.3
⑯	Center of Upper shelf		−69.8	−71.1	−70.5	±0.6	−69.8	−71.1	−70.5	±0.6
⑰	Center of Lower shelf		−68.0	−69.4	−68.7	±0.7	−68.0	−69.3	−68.7	±0.6
Average			−	−	−68.8	−	−	−	−68.8	−

Unit:℃

			Ambient temperature 30℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	−66.5	−73.0	−69.8	±3.3	−66.3	−73.0	−69.7	±3.4
②		Left back	−69.3	−76.0	−72.7	±3.4	−69.2	−76.1	−72.7	±3.5
③		Right front	−65.8	−71.6	−68.7	±2.9	−65.7	−71.5	−68.6	±2.9
④		Right back	−68.9	−75.3	−72.1	±3.2	−68.9	−75.4	−72.2	±3.3
⑤		Center	−69.2	−75.5	−72.4	±3.2	−69.2	−75.5	−72.4	±3.2
⑥	Middle area	Left front	−68.6	−70.9	−69.8	±1.2	−68.5	−70.7	−69.6	±1.1
⑦		Left back	−70.4	−73.7	−72.1	±1.7	−70.4	−73.7	−72.1	±1.7
⑧		Right front	−68.7	−70.8	−69.8	±1.1	−68.7	−70.5	−69.6	±0.9
⑨		Right back	−70.1	−73.0	−71.6	±1.5	−70.2	−72.9	−71.6	±1.4
⑩		Center	−69.9	−71.6	−70.8	±0.8	−69.9	−71.3	−70.6	±0.7
⑪	Bottom area	Left front	−66.4	−69.3	−67.9	±1.5	−66.4	−69.4	−67.9	±1.5
⑫		Left back	−67.5	−70.6	−69.1	±1.6	−67.6	−70.8	−69.2	±1.6
⑬		Right front	−65.0	−68.3	−66.7	±1.7	−65.0	−68.3	−66.7	±1.7
⑭		Right back	−66.4	−70.0	−68.2	±1.8	−66.4	−70.1	−68.3	±1.8
⑮		Center	−67.6	−70.5	−69.1	±1.5	−67.6	−70.7	−69.2	±1.6
⑯	Center of Upper shelf		−70.6	−72.0	−71.3	±0.7	−70.4	−71.9	−71.2	±0.8
⑰	Center of Lower shelf		−69.7	−71.2	−70.5	±0.8	−69.8	−71.1	−70.5	±0.6
Average			−	−	−70.1	−	−	−	−70.1	−

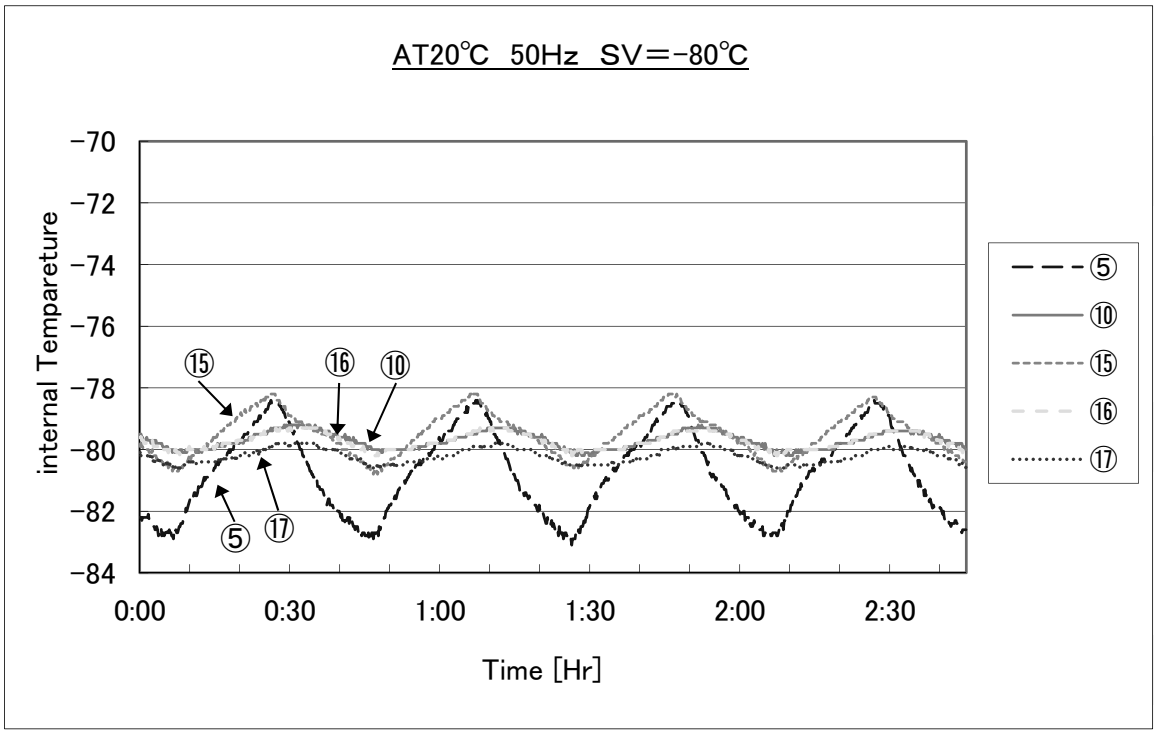
Note:This data does not represent a guarantee of product performance.

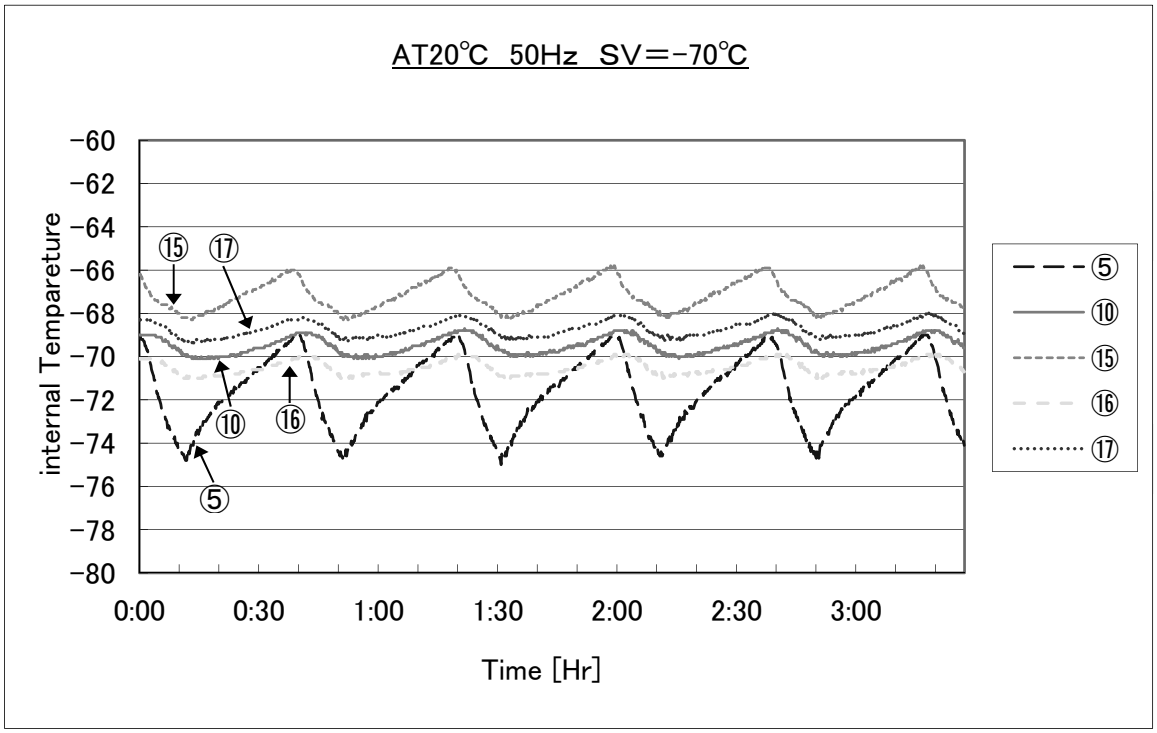
＜Amount of power consumption＞
Amount of power consumption when driving at cycle

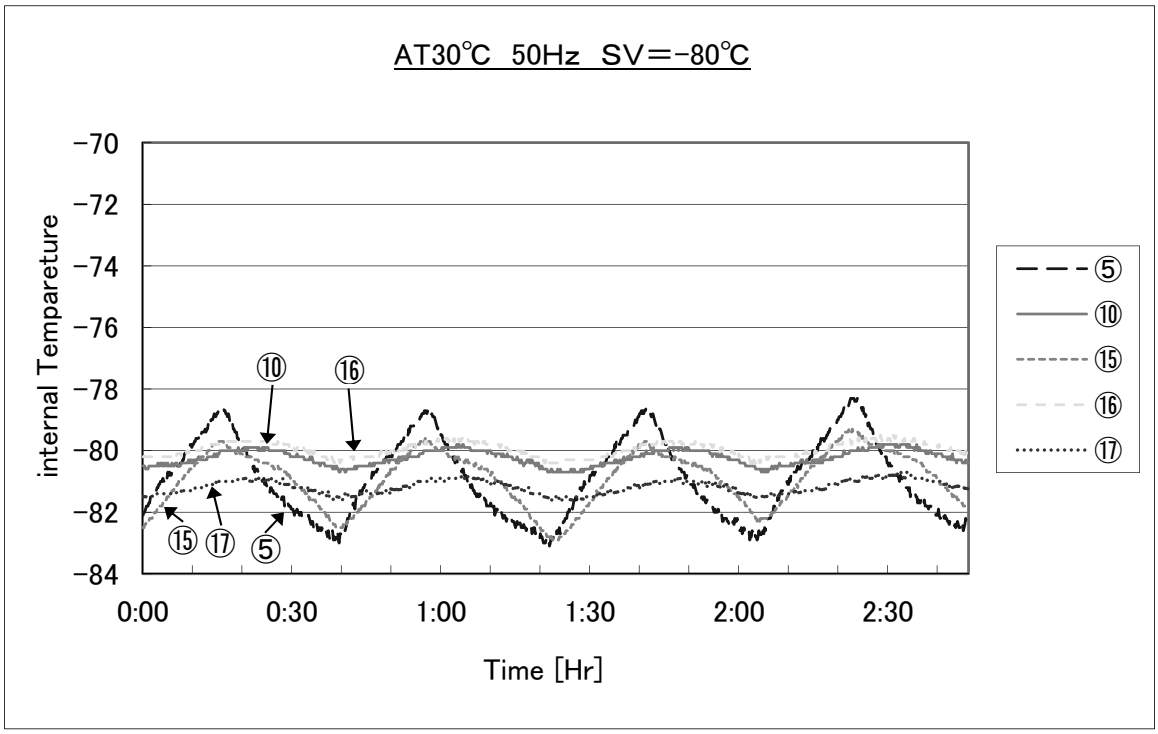
(SV=−70℃)
Unit:kWh/day

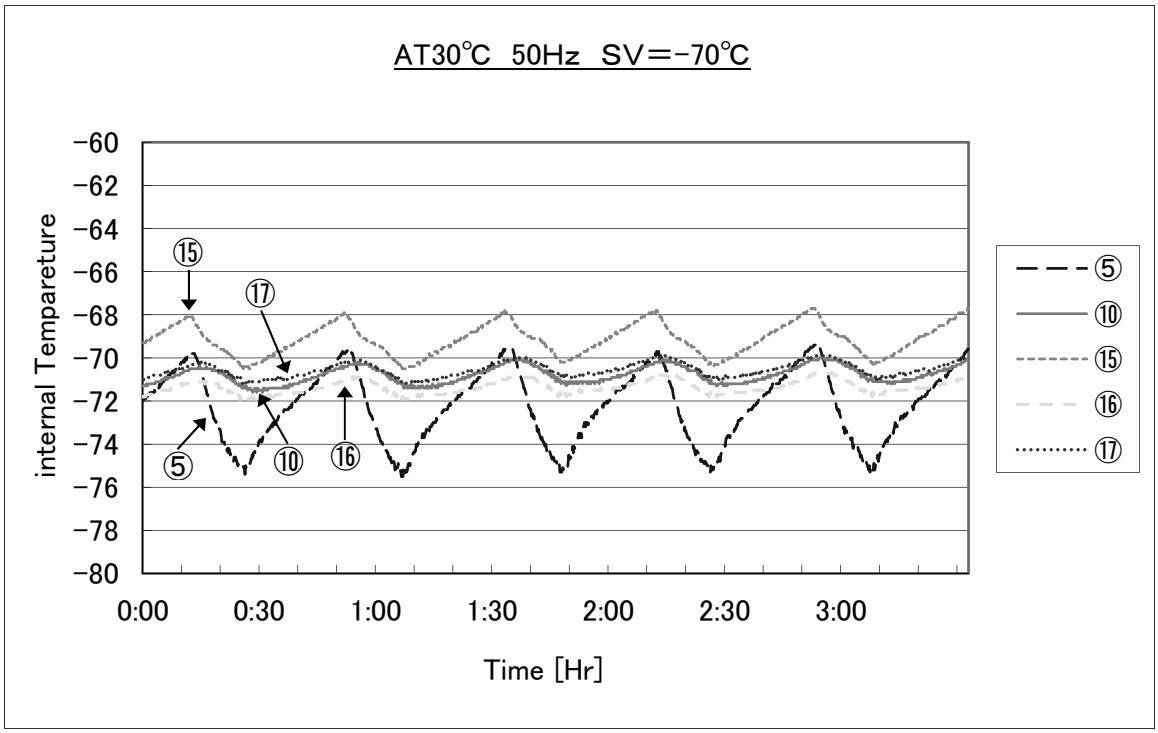
	Ambient temperature 20℃		Ambient temperature 30℃	
	50Hz	60Hz	50Hz	60Hz
230V	8.10	−	9.97	−

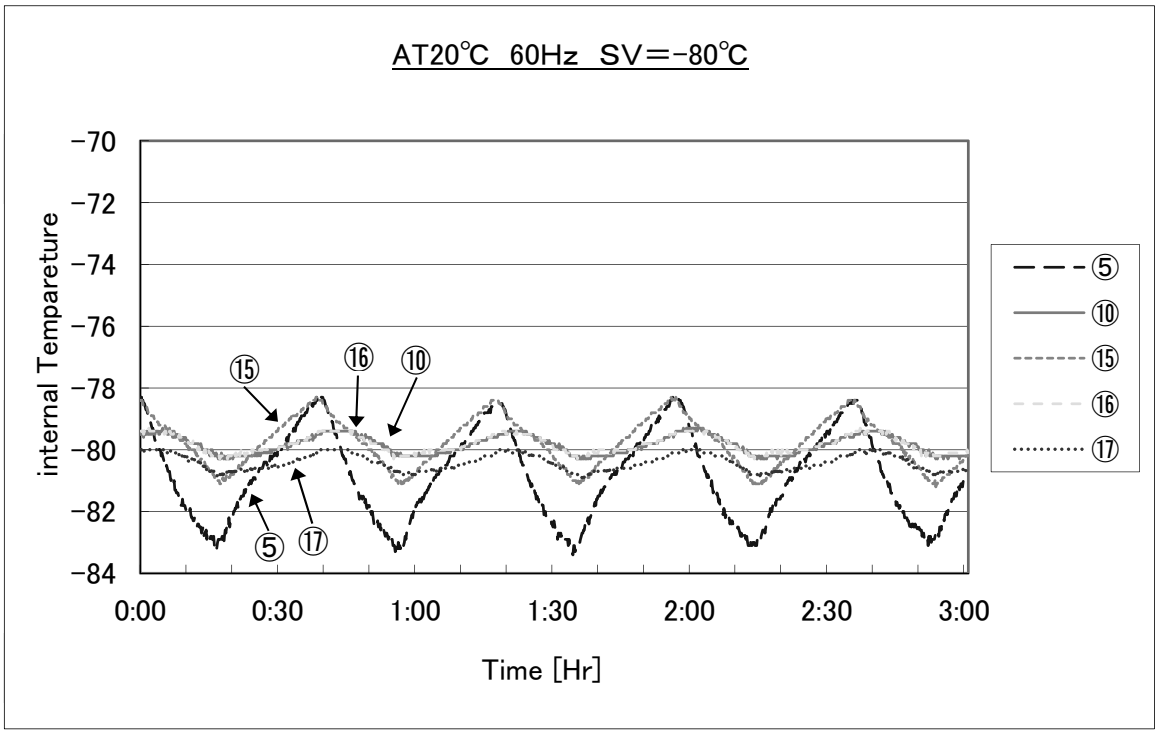
Note:This data does not represent a guarantee of product performance.

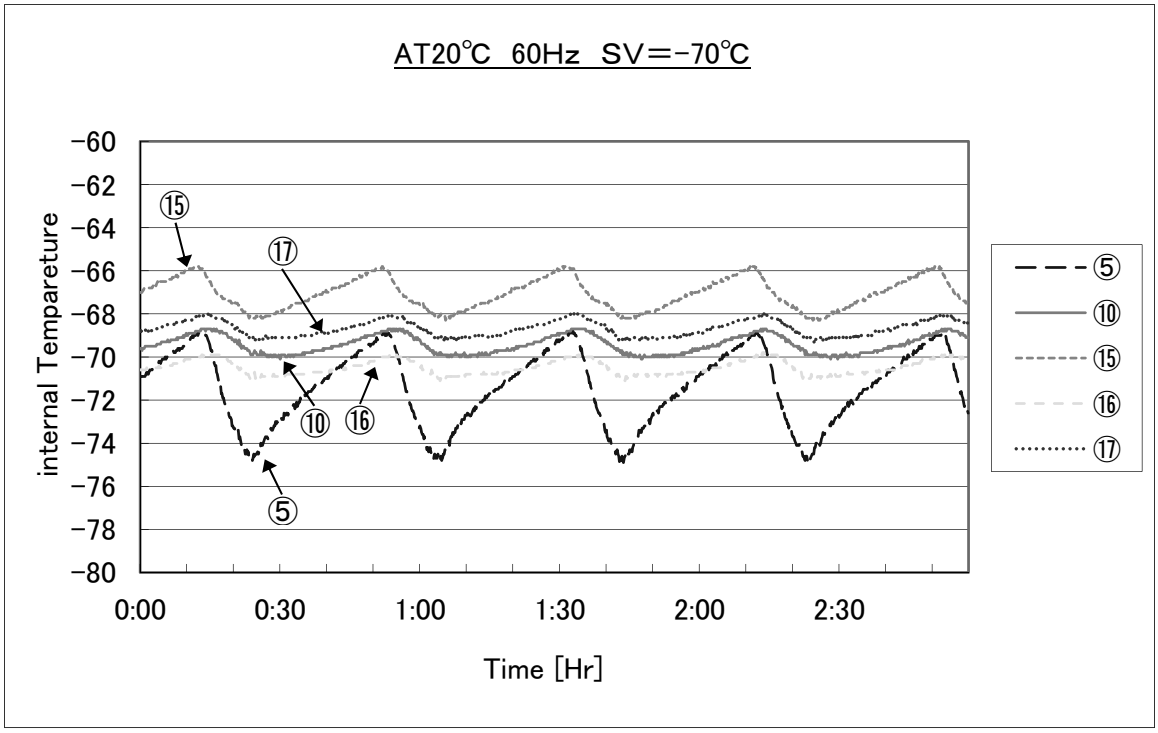

AT20℃ 50Hz SV＝-80℃
internal Tempareture
-70
-72
-74
-76
-78
-80
-82
-84
0:00
0:30
1:00
1:30
2:00
2:30
Time [Hr]
⑮
⑯
⑩
⑤
⑰
⑤
⑩
⑮
⑯
⑰

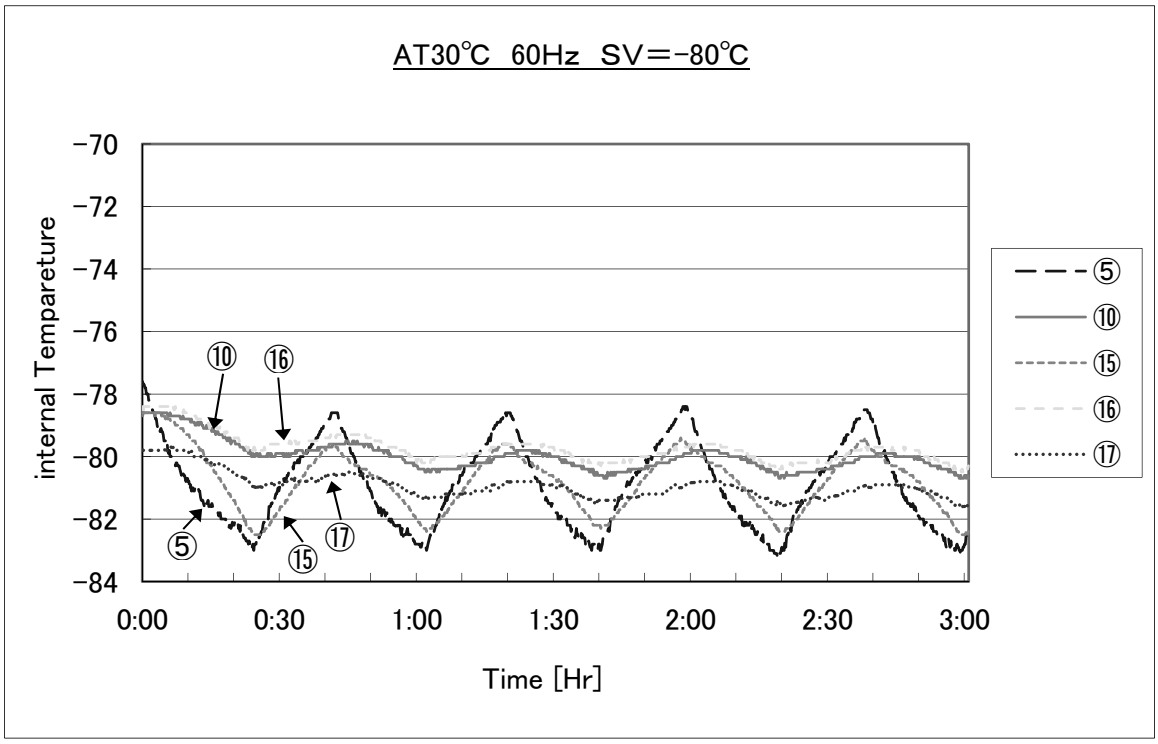

AT20℃ 50Hz SV＝-70℃
internal Tempareture
-60
-62
-64
-66
-68
-70
-72
-74
-76
-78
-80
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time [Hr]
⑮
⑰
⑩
⑯
⑤
⑤
⑩
⑮
⑯
⑰

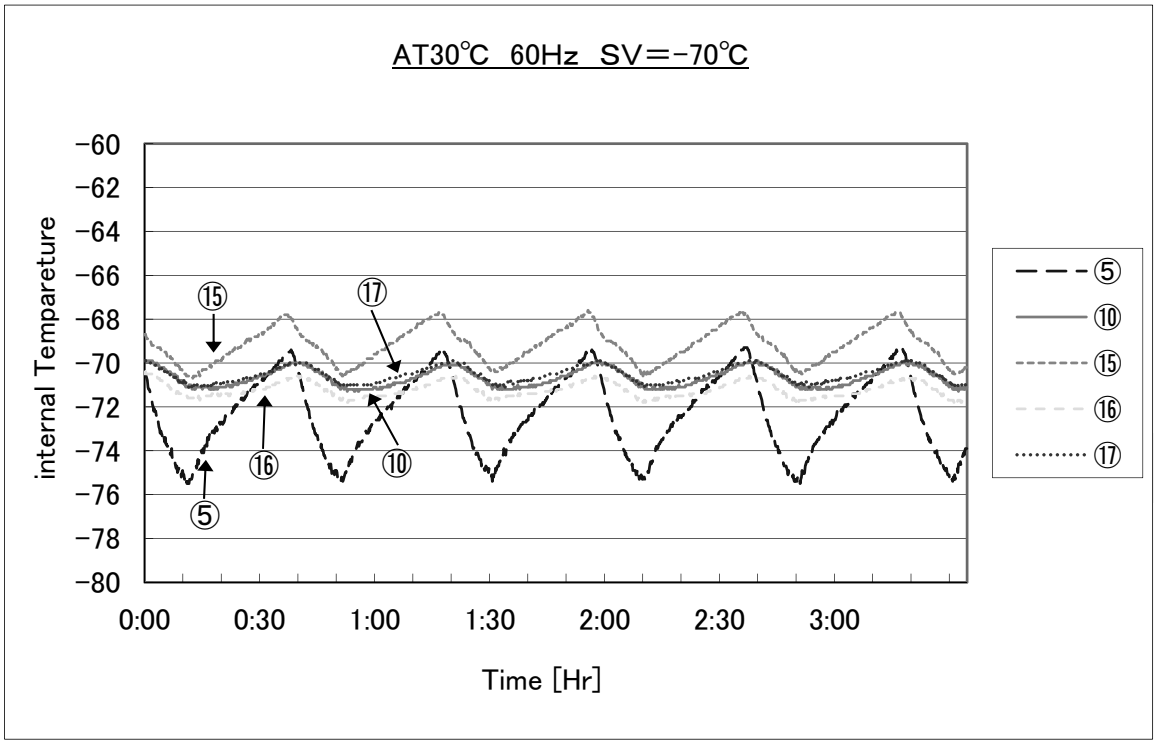

AT30℃ 50Hz SV=-80℃
internal Temparature
-70
-72
-74
-76
-78
-80
-82
-84
0:00
0:30
1:00
1:30
2:00
2:30
Time [Hr]
⑤
⑩
⑮
⑯
⑰


AT30℃ 50Hz SV=-70℃
internal Temparature
-60
-62
-64
-66
-68
-70
-72
-74
-76
-78
-80
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time [Hr]
⑤
⑩
⑮
⑯
⑰

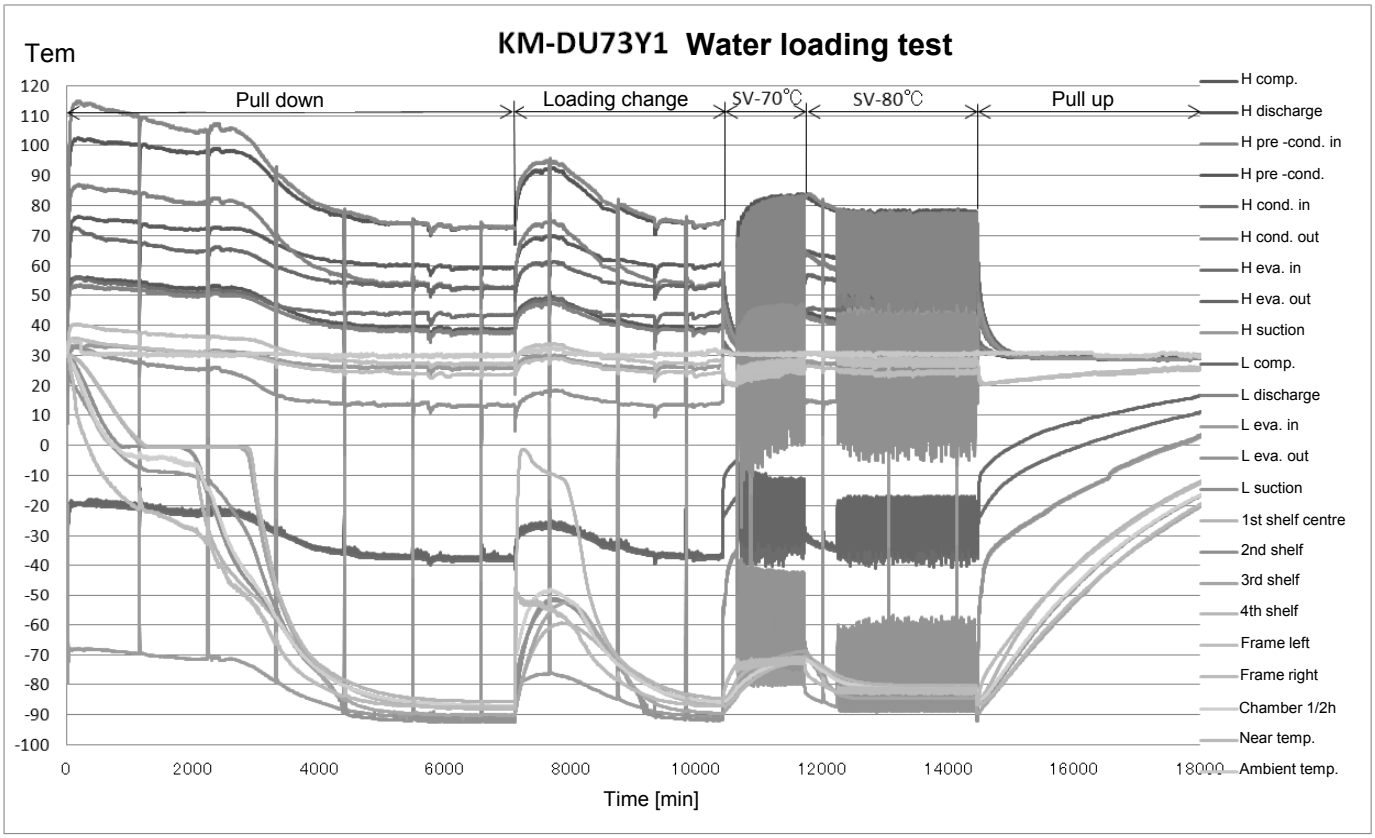

AT20℃ 60Hz SV=-80℃
internal Tempareture
-70
-72
-74
-76
-78
-80
-82
-84
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time [Hr]
⑮
⑯
⑩
⑤
⑰
⑤
⑩
⑮
⑯
⑰

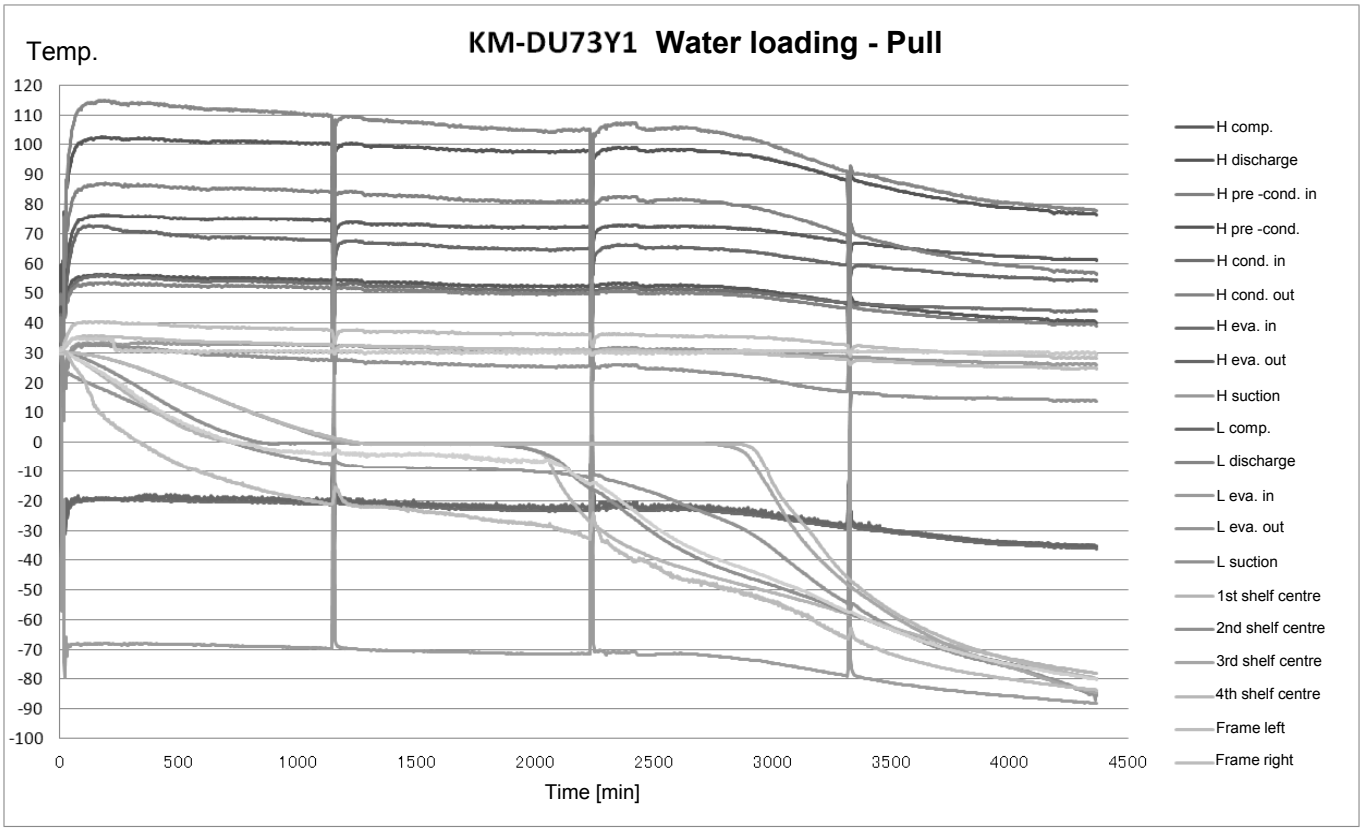

AT20℃ 60Hz SV=-70℃
internal Tempareture
-60
-62
-64
-66
-68
-70
-72
-74
-76
-78
-80
0:00
0:30
1:00
1:30
2:00
2:30
Time [Hr]
⑮
⑰
⑩
⑯
⑤
⑤
⑩
⑮
⑯
⑰

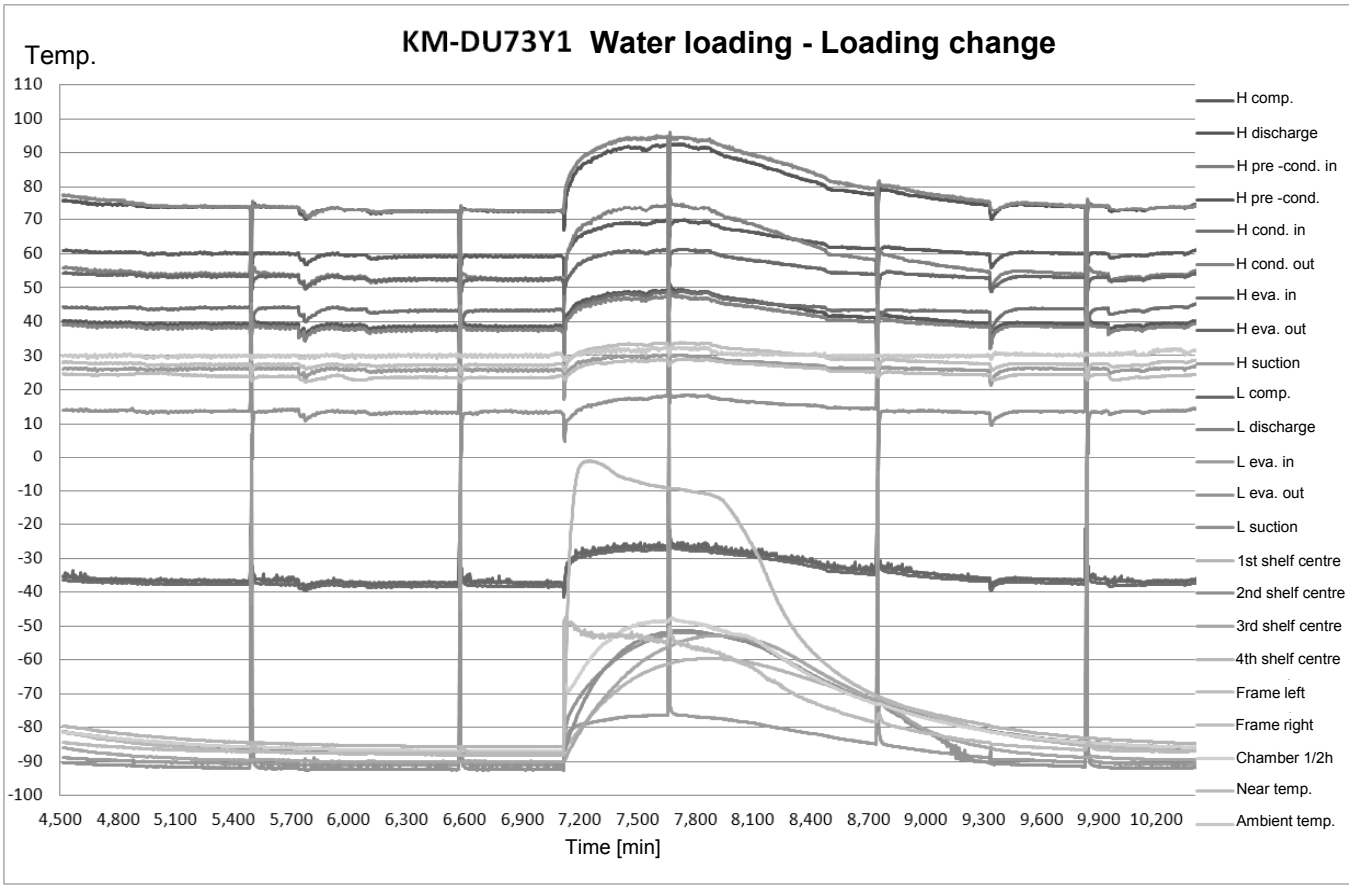

AT30℃ 60Hz SV＝-80℃
internal Tempareture
-70
-72
-74
-76
-78
-80
-82
-84
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time [Hr]
⑩
⑯
⑤
⑮
⑰
⑤
⑩
⑮
⑯
⑰

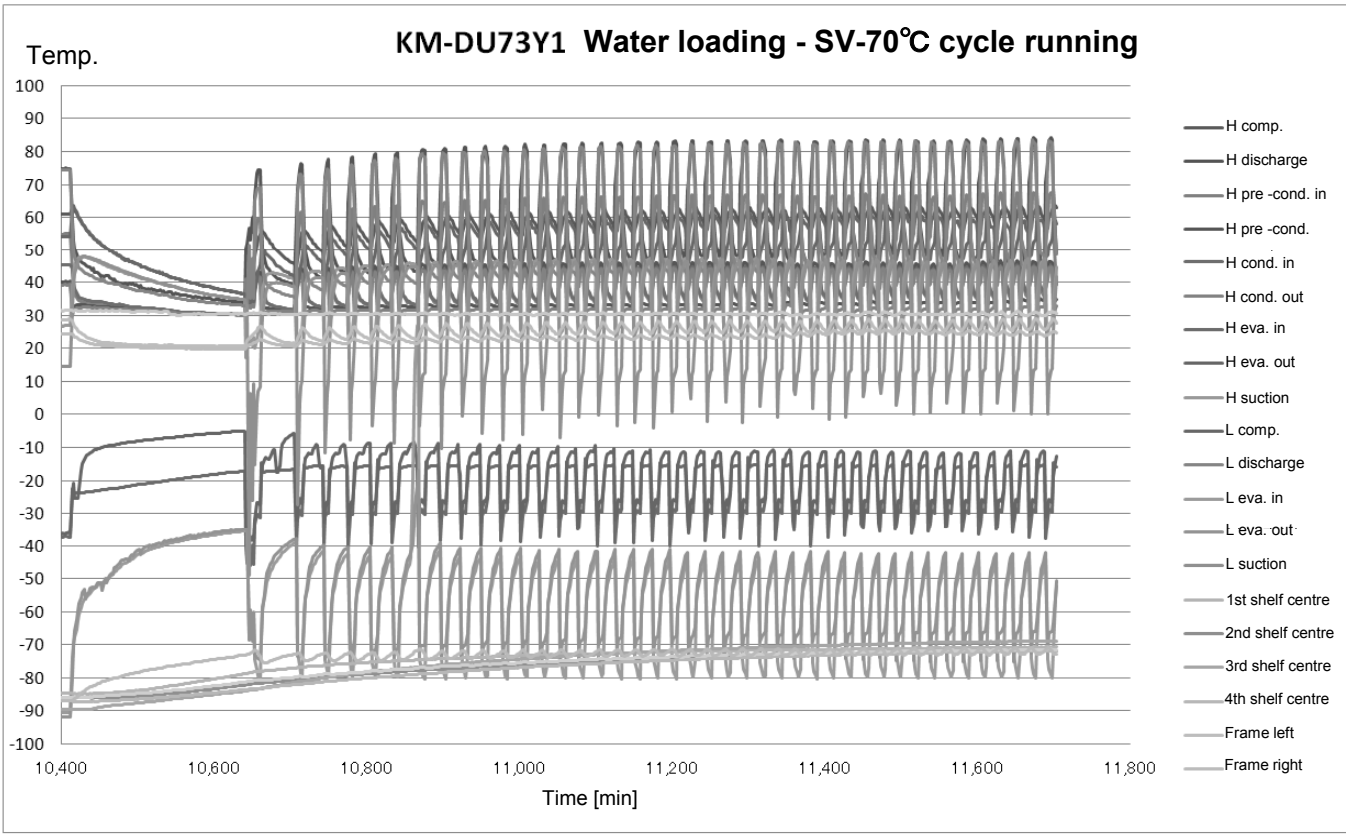

AT30℃ 60Hz SV＝-70℃
internal Tempareture
-60
-62
-64
-66
-68
-70
-72
-74
-76
-78
-80
0:00
0:30
1:00
1:30
2:00
2:30
3:00
Time [Hr]
⑮
⑰
⑯
⑩
⑤
⑤
⑩
⑮
⑯
⑰

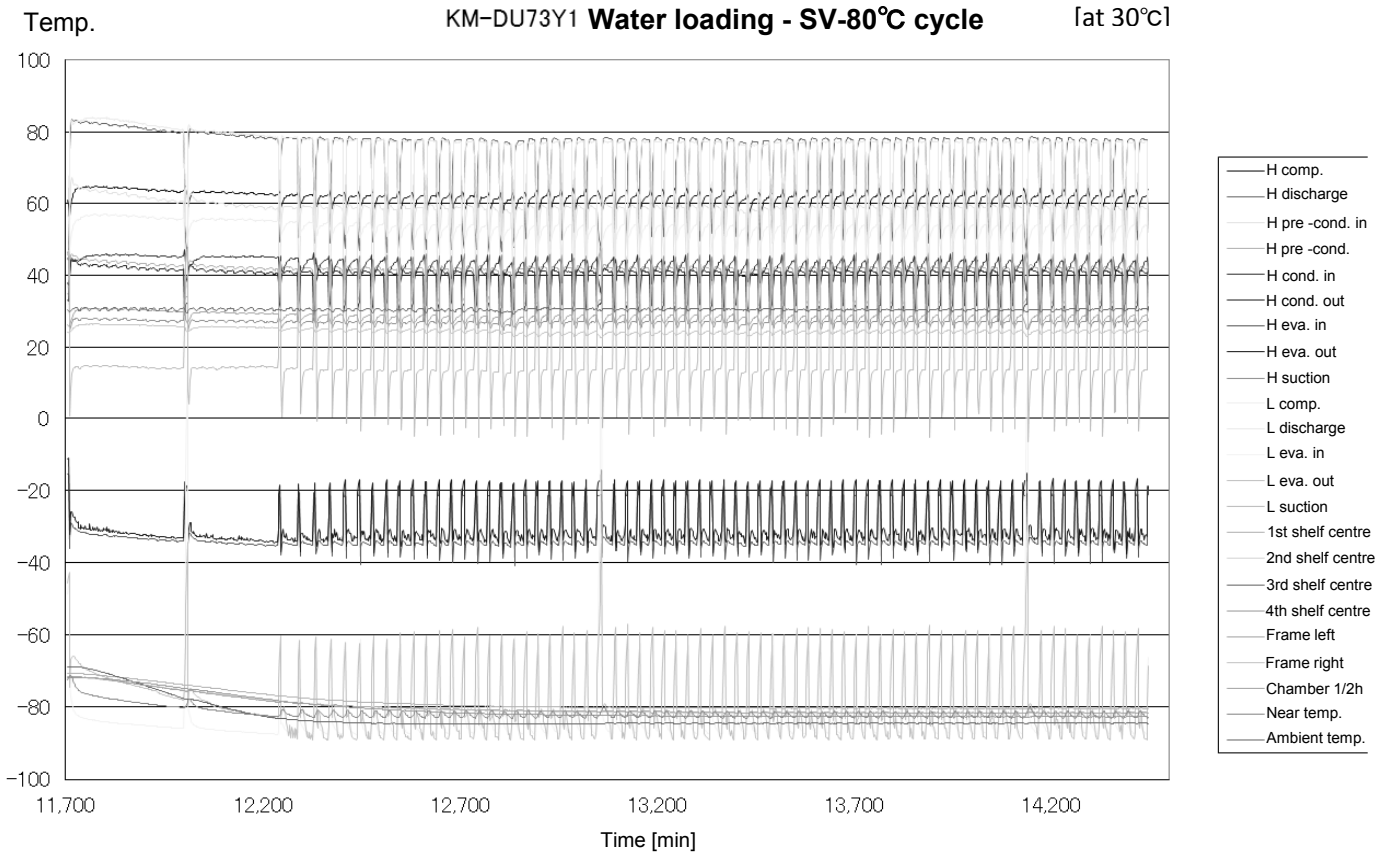
Water loading test

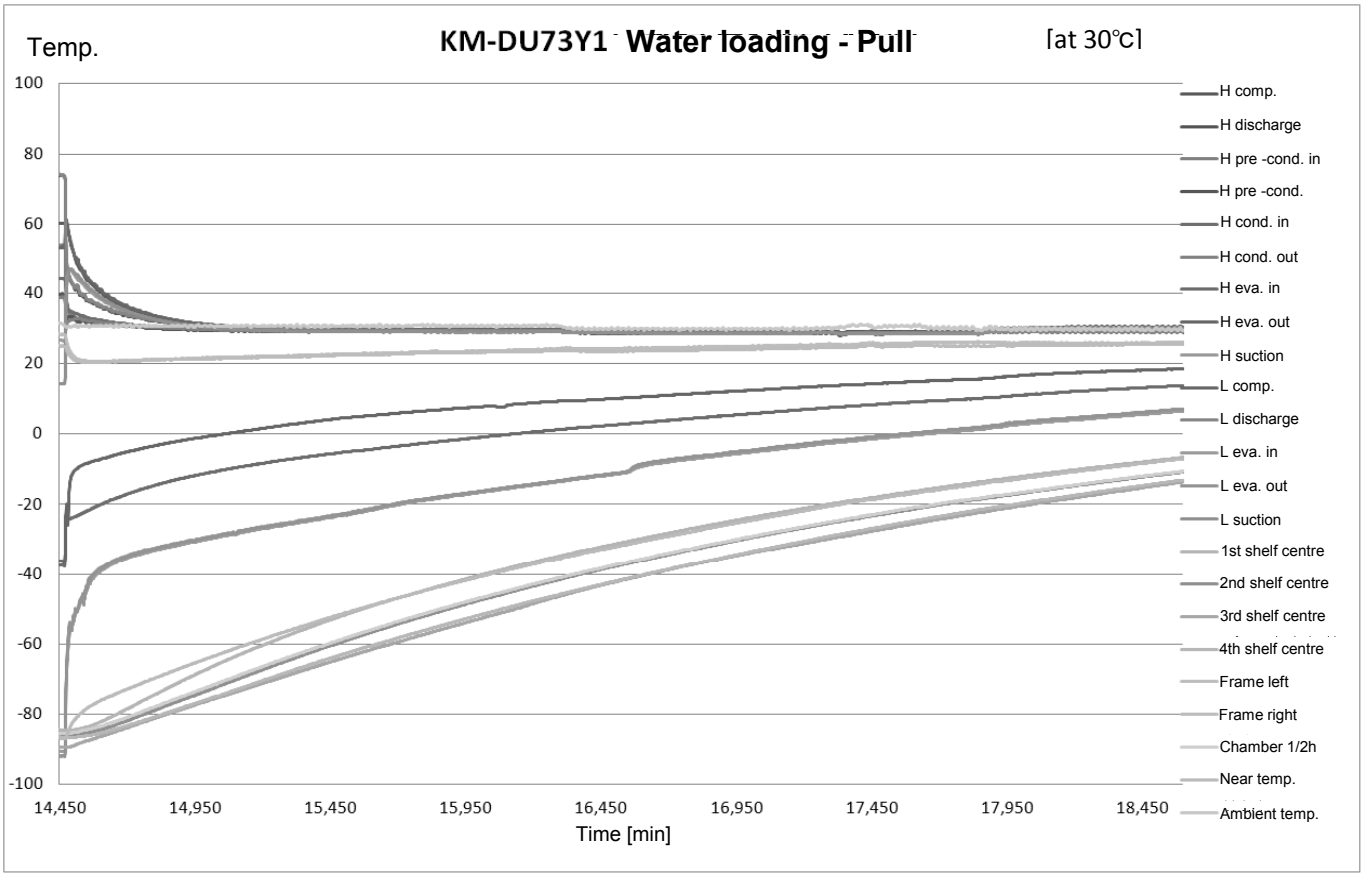




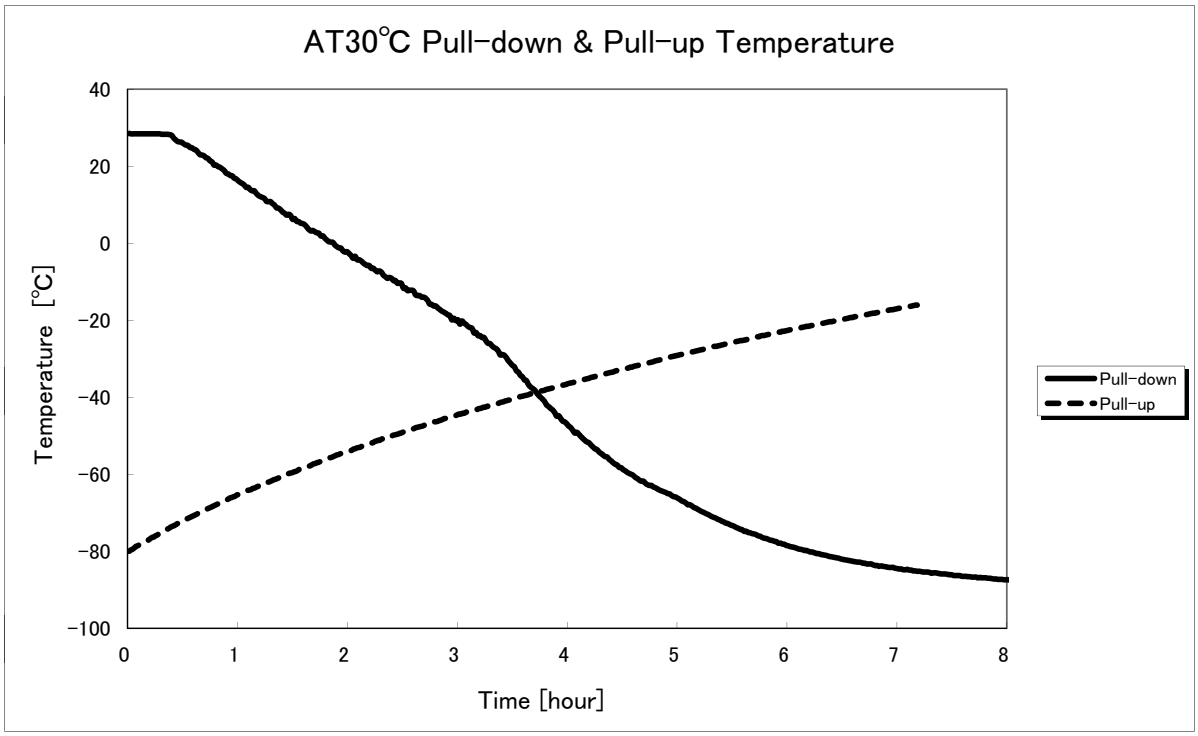

KM-DU73Y1 Water loading - Loading change
Temp.
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
4,500 4,800 5,100 5,400 5,700 6,000 6,300 6,600 6,900 7,200 7,500 7,800 8,100 8,400 8,700 9,000 9,300 9,600 9,900 10,200
Time [min]
H comp.
H discharge
H pre -cond. in
H pre -cond.
H cond. in
H cond. out
H eva. in
H eva. out
H suction
L comp.
L discharge
L eva. in
L eva. out
L suction
1st shelf centre
2nd shelf centre
3rd shelf centre
4th shelf centre
Frame left
Frame right
Chamber 1/2h
Near temp.
Ambient temp.

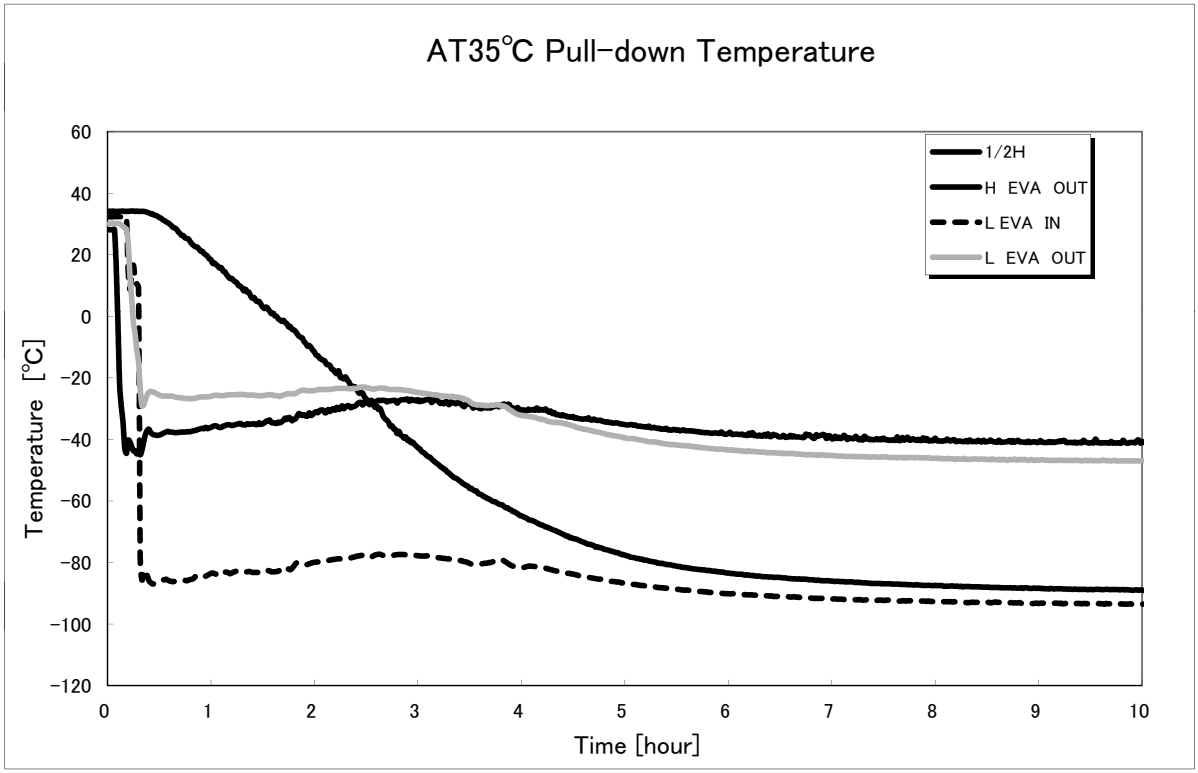

KM-DU73Y1 Water loading - SV-70℃ cycle running
Temp.
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
10,400 10,600 10,800 11,000 11,200 11,400 11,600 11,800
Time [min]
H comp.
H discharge
H pre -cond. in
H pre -cond.
H cond. in
H cond. out
H eva. in
H eva. out
H suction
L comp.
L discharge
L eva. in
L eva. out
L suction
1st shelf centre
2nd shelf centre
3rd shelf centre
4th shelf centre
Frame left
Frame right

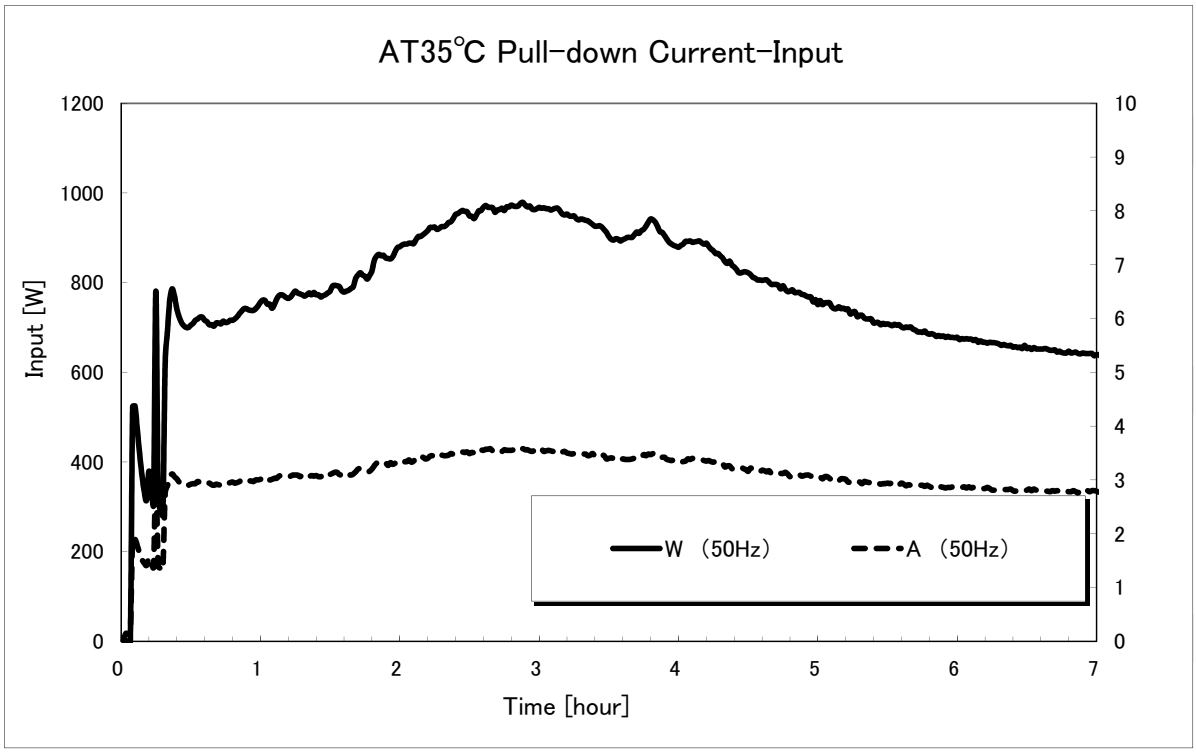

Temp.
KM-DU73Y1 Water loading - SV-80℃ cycle
[at 30℃]
100
80
60
40
20
0
-20
-40
-60
-80
-100
11,700
12,200
12,700
13,200
13,700
14,200
Time [min]
H comp.
H discharge
H pre -cond. in
H pre -cond.
H cond. in
H cond. out
H eva. in
H eva. out
H suction
L comp.
L discharge
L eva. in
L eva. out
L suction
1st shelf centre
2nd shelf centre
3rd shelf centre
4th shelf centre
Frame left
Frame right
Chamber 1/2h
Near temp.
Ambient temp.

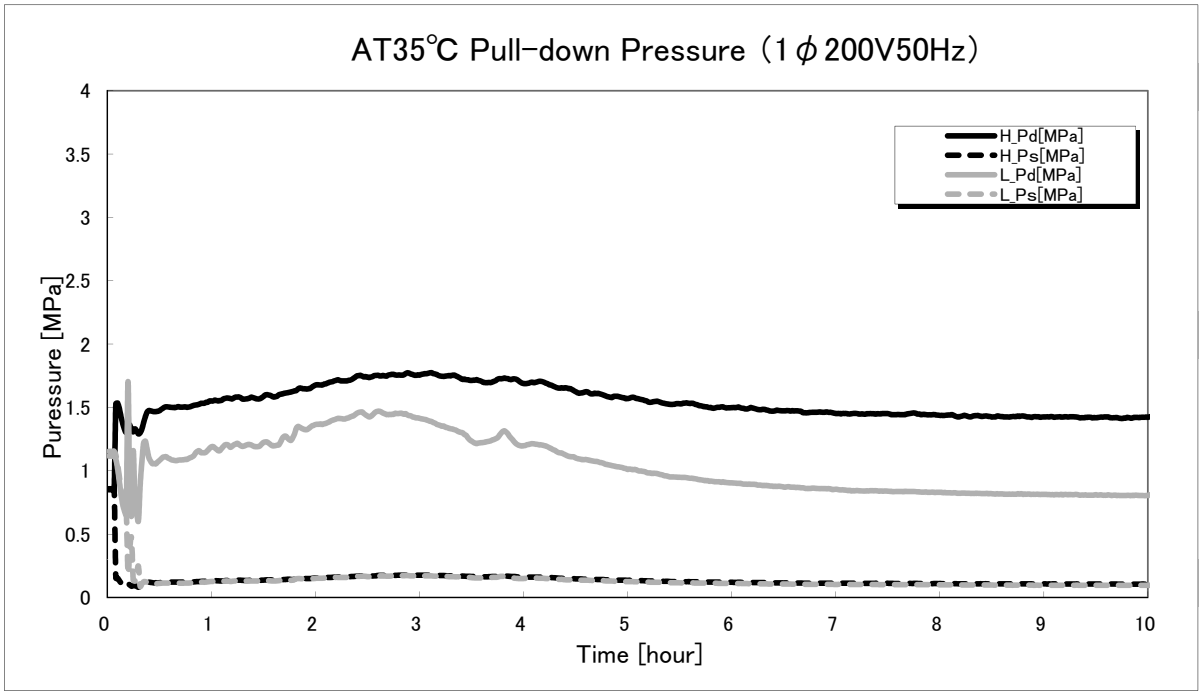

Temp.
KM-DU73Y1 Water loading - Pull
[at 30℃]
100
80
60
40
20
0
-20
-40
-60
-80
-100
14,450
14,950
15,450
15,950
16,450
16,950
17,450
17,950
18,450
Time [min]
H comp.
H discharge
H pre -cond. in
H pre -cond.
H cond. in
H cond. out
H eva. in
H eva. out
H suction
L comp.
L discharge
L eva. in
L eva. out
L suction
1st shelf centre
2nd shelf centre
3rd shelf centre
4th shelf centre
Frame left
Frame right
Chamber 1/2h
Near temp.
Ambient temp.

KM-DU53Y1E

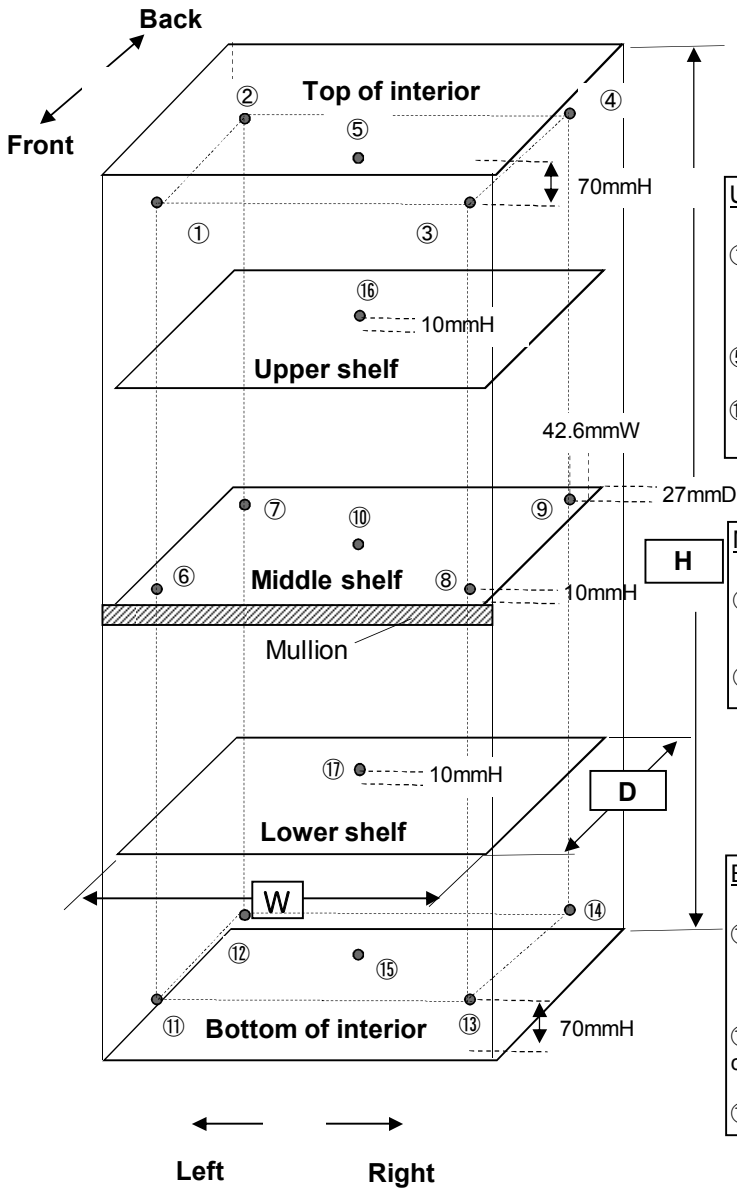

AT30℃ Pull-down & Pull-up Temperature
Temperature [℃]
40
20
0
-20
-40
-60
-80
-100
0
1
2
3
4
5
6
7
8
Time [hour]
Pull-down
Pull-up


AT35℃ Pull-down Temperature
Temperature [℃]
60
40
20
0
-20
-40
-60
-80
-100
-120
0
1
2
3
4
5
6
7
8
9
10
Time [hour]
1/2H
H EVA OUT
L EVA IN
L EVA OUT


AT35℃ Pull-down Current-Input
Input [W]
Time [hour]
W （50Hz）
A （50Hz）


AT35℃ Pull-down Pressure（1φ200V50Hz）
Puressure [MPa]
Time [hour]
H_Pd[MPa]
H_Ps[MPa]
L_Pd[MPa]
L_Ps[MPa]

Temperature uniformity - 17points measuring



Upper area measuring points

①~④: 70mm(H) from the top of interior
27mm(D) and 42.6mm(W) from each corners on Middle shelf.

⑤: 65mm(H) from the top of interior, centre

⑯: 10mm(H) from the upper shelf, centre

Middle area measuring points

⑥~⑨: 10mm(H), 27mm(D), 42.6mm(W) from each corner on the middle shelf

⑩: 10mm(H) from the middle shelf, centre

Bottom area measuring points

⑪~⑭: 70mm(H) from the bottom of interior
27mm(D) and 42.6mm(W) from each corner on the middle shelf

⑮ 65mm(H) from the bottom of interior, centre

⑰: 10mm(H) from the lower shelf, centre

KM-DU53Y Internal Temperature Uniformity (Reference Data)

＜Conditions＞

Ambient temperature: 20/30℃
Load: Unloaded

＜Distribution data＞
Temperature of the cycle in each area (SV=-80℃、air temperature)

Unit:℃

			Ambient temperature 20℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	-77.1	-82.5	-79.8	±2.7	-77.4	-83.0	-80.2	±2.8
②		Left back	-75.4	-80.3	-77.9	±2.5	-75.7	-80.7	-78.2	±2.5
③		Right front	-74.7	-80.6	-77.7	±3.0	-74.9	-81.0	-78.0	±3.1
④		Right back	-77.0	-82.4	-79.7	±2.7	-77.2	-82.7	-80.0	±2.8
⑤		Center	-76.3	-80.6	-78.5	±2.2	-76.6	-81.0	-78.8	±2.2
⑥	Middle area	Left front	-76.4	-78.5	-77.5	±1.1	-76.8	-79.0	-77.9	±1.1
⑦		Left back	-78.5	-81.2	-79.9	±1.4	-78.7	-81.6	-80.2	±1.5
⑧		Right front	-76.8	-79.2	-78.0	±1.2	-77.1	-79.6	-78.4	±1.3
⑨		Right back	-79.4	-82.0	-80.7	±1.3	-79.6	-82.3	-81.0	±1.4
⑩		Center	-78.2	-80.1	-79.2	±0.9	-78.5	-80.4	-79.5	±1.0
⑪	Bottom area	Left front	-75.5	-78.3	-76.9	±1.4	-76.1	-79.5	-77.8	±1.7
⑫		Left back	-76.3	-79.8	-78.1	±1.8	-76.6	-80.7	-78.7	±2.1
⑬		Right front	-75.5	-78.2	-76.9	±1.4	-76.0	-79.0	-77.5	±1.5
⑭		Right back	-76.3	-79.7	-78.0	±1.7	-76.7	-80.4	-78.6	±1.9
⑮		Center	-77.3	-79.8	-78.6	±1.3	-77.7	-80.5	-79.1	±1.4
⑯	Center of Upper shelf		-78.8	-80.0	-79.4	±0.6	-78.8	-80.2	-79.5	±0.7
⑰	Center of Lower shelf		-78.3	-79.6	-79.0	±0.6	-78.5	-80.0	-79.3	±0.8
Average			-	-	-78.5	-	-	-	-79.0	-

Unit:℃

			Ambient temperature 30℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	-76.9	-82.5	-79.7	±2.8	-76.9	-82.8	-79.9	±3.0
②		Left back	-75.2	-80.2	-77.7	±2.5	-75.1	-80.5	-77.8	±2.7
③		Right front	-74.4	-80.4	-77.4	±3.0	-74.4	-80.7	-77.6	±3.2
④		Right back	-76.9	-82.2	-79.6	±2.7	-76.9	-82.5	-79.7	±2.8
⑤		Center	-76.4	-80.5	-78.5	±2.1	-76.4	-80.7	-78.6	±2.2
⑥	Middle area	Left front	-76.6	-78.4	-77.5	±0.9	-76.8	-78.8	-77.8	±1.0
⑦		Left back	-78.5	-81.1	-79.8	±1.3	-78.7	-81.4	-80.1	±1.4
⑧		Right front	-76.9	-79.1	-78.0	±1.1	-77.1	-79.5	-78.3	±1.2
⑨		Right back	-79.5	-82.1	-80.8	±1.3	-79.7	-82.3	-81.0	±1.3
⑩		Center	-78.3	-80.2	-79.3	±1.0	-78.5	-80.4	-79.5	±1.0
⑪	Bottom area	Left front	-76.0	-79.3	-77.7	±1.7	-76.3	-80.0	-78.2	±1.9
⑫		Left back	-76.6	-80.5	-78.6	±2.0	-76.8	-81.1	-79.0	±2.2
⑬		Right front	-75.9	-78.7	-77.3	±1.4	-76.2	-79.4	-77.8	±1.6
⑭		Right back	-76.7	-80.3	-78.5	±1.8	-77.0	-80.8	-78.9	±1.9
⑮		Center	-77.7	-80.3	-79.0	±1.3	-78.0	-81.0	-79.5	±1.5
⑯	Center of Upper shelf		-78.8	-80.0	-79.4	±0.6	-78.9	-80.1	-79.5	±0.6
⑰	Center of Lower shelf		-78.5	-79.8	-79.2	±0.6	-78.8	-80.2	-79.5	±0.7
Average			-	-	-78.7	-	-	-	-79.0	-

Note:This data does not represent a guarantee of product performance.

＜Amount of power consumption＞
Amount of power consumption when driving at cycle

(SV=-80℃)

1φ230V　　Unit:kWh/day

	Ambient temperature 20℃		Ambient temperature 30℃	
	50Hz	60Hz	50Hz	60Hz
230V	9.12	-	11.46	-

Note:This data does not represent a guarantee of product performance.

＜Distribution data＞
Temperature of the cycle in each area (SV=−70℃、air temperature)

Unit:℃

			Ambient temperature 20℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	−68.3	−75.1	−71.7	±3.4	−68.7	−75.9	−72.3	±3.6
②		Left back	−66.6	−72.6	−69.6	±3.0	−66.8	−73.1	−70.0	±3.2
③		Right front	−66.1	−73.0	−69.6	±3.5	−66.3	−73.7	−70.0	±3.7
④		Right back	−68.1	−74.6	−71.4	±3.3	−68.4	−75.7	−72.1	±3.7
⑤		Center	−67.4	−72.7	−70.1	±2.7	−67.6	−73.4	−70.5	±2.9
⑥	Middle area	Left front	−66.0	−68.4	−67.2	±1.2	−65.9	−68.5	−67.2	±1.3
⑦		Left back	−68.7	−72.3	−70.5	±1.8	−68.9	−72.6	−70.8	±1.8
⑧		Right front	−66.1	−68.9	−67.5	±1.4	−66.1	−69.1	−67.6	±1.5
⑨		Right back	−69.4	−72.8	−71.1	±1.7	−69.5	−73.2	−71.4	±1.9
⑩		Center	−68.0	−70.5	−69.3	±1.3	−68.2	−70.9	−69.6	±1.4
⑪	Bottom area	Left front	−63.0	−65.5	−64.3	±1.3	−62.4	−65.3	−63.9	±1.5
⑫		Left back	−64.7	−67.7	−66.2	±1.5	−64.3	−67.4	−65.9	±1.6
⑬		Right front	−62.7	−65.0	−63.9	±1.2	−62.0	−64.7	−63.4	±1.4
⑭		Right back	−63.3	−66.7	−65.0	±1.7	−62.5	−66.2	−64.4	±1.9
⑮		Center	−64.4	−66.8	−65.6	±1.2	−63.8	−66.5	−65.2	±1.4
⑯	Center of Upper shelf		−69.7	−71.3	−70.5	±0.8	−70.0	−71.8	−70.9	±0.9
⑰	Center of Lower shelf		−66.2	−68.0	−67.1	±0.9	−65.6	−67.7	−66.7	±1.1
Average			−	−	−68.2	−	−	−	−68.3	−

Unit:℃

			Ambient temperature 30℃							
			50Hz				60Hz			
			Maximum	Minimum	Middle of cycle	Differential	Maximum	Minimum	Middle of cycle	Differential
①	Upper area	Left front	−67.8	−74.8	−71.3	±3.5	−67.6	−75.7	−71.7	±4.1
②		Left back	−66.0	−72.0	−69.0	±3.0	−65.5	−72.8	−69.2	±3.7
③		Right front	−65.5	−72.6	−69.1	±3.6	−65.2	−73.5	−69.4	±4.2
④		Right back	−67.7	−74.6	−71.2	±3.5	−67.4	−75.7	−71.6	±4.2
⑤		Center	−66.9	−72.5	−69.7	±2.8	−66.9	−73.3	−70.1	±3.2
⑥	Middle area	Left front	−65.6	−68.2	−66.9	±1.3	−65.7	−68.8	−67.3	±1.6
⑦		Left back	−68.5	−72.2	−70.4	±1.9	−68.5	−72.7	−70.6	±2.1
⑧		Right front	−65.9	−68.8	−67.4	±1.5	−65.8	−69.4	−67.6	±1.8
⑨		Right back	−69.2	−72.8	−71.0	±1.8	−69.3	−73.3	−71.3	±2.0
⑩		Center	−67.9	−70.3	−69.1	±1.2	−67.9	−70.8	−69.4	±1.5
⑪	Bottom area	Left front	−62.5	−65.5	−64.0	±1.5	−62.0	−66.5	−64.3	±2.3
⑫		Left back	−64.3	−67.9	−66.1	±1.8	−63.9	−68.5	−66.2	±2.3
⑬		Right front	−62.3	−65.3	−63.8	±1.5	−61.8	−66.2	−64.0	±2.2
⑭		Right back	−62.9	−67.0	−65.0	±2.1	−62.3	−67.6	−65.0	±2.7
⑮		Center	−64.1	−67.1	−65.6	±1.5	−63.5	−68.0	−65.8	±2.3
⑯	Center of Upper shelf		−69.5	−71.2	−70.4	±0.9	−69.5	−71.7	−70.6	±1.1
⑰	Center of Lower shelf		−66.0	−68.2	−67.1	±1.1	−65.5	−69.0	−67.3	±1.8
Average			−	−	−68.0	−	−	−	−68.3	−

Note:This data does not represent a guarantee of product performance.

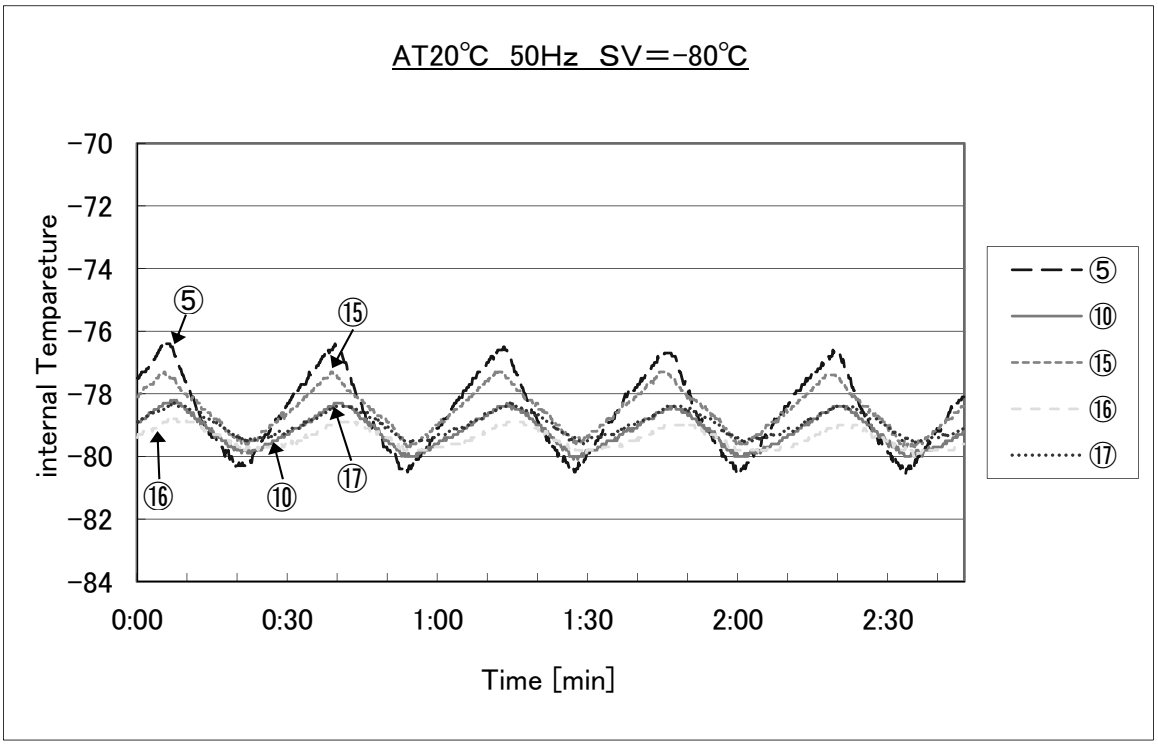
＜Amount of power consumption＞
Amount of power consumption when driving at cycle

(SV=−70℃)

1φ230−240V　　Unit:kWh/day

	Ambient temperature 20℃		Ambient temperature 30℃	
	50Hz	60Hz	50Hz	60Hz
230V	6.81	−	8.71	−

Note:This data does not represent a guarantee of product performance.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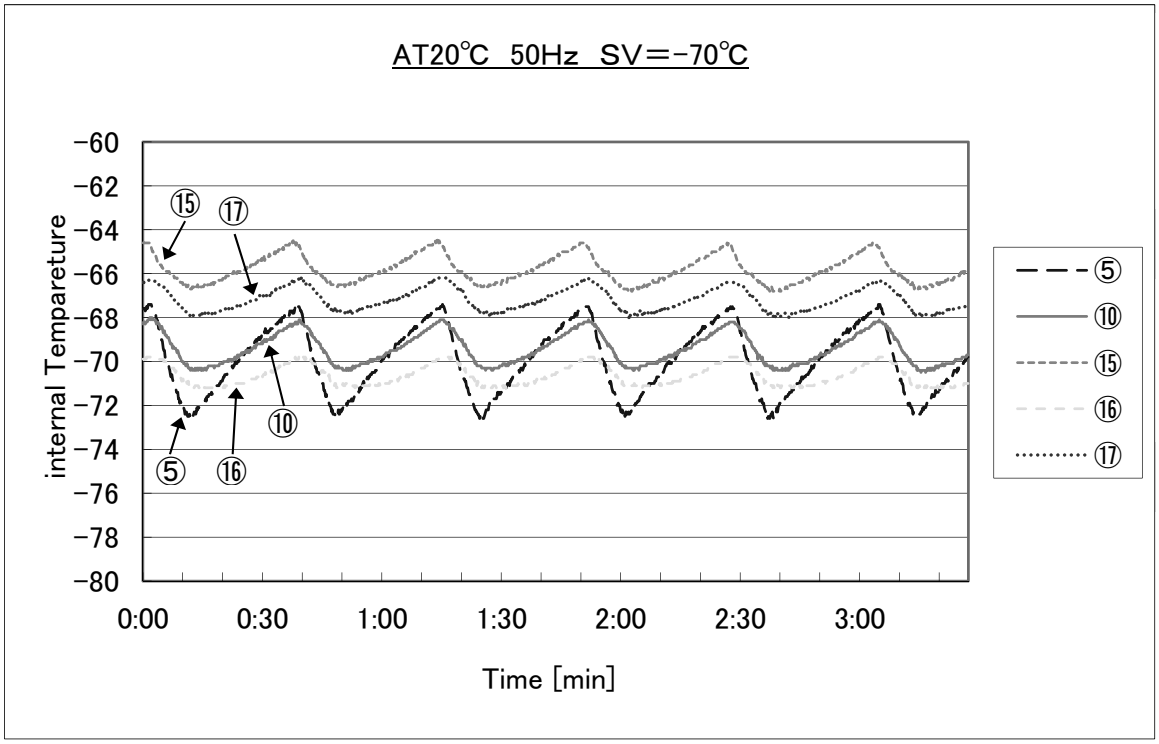
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Time [min]
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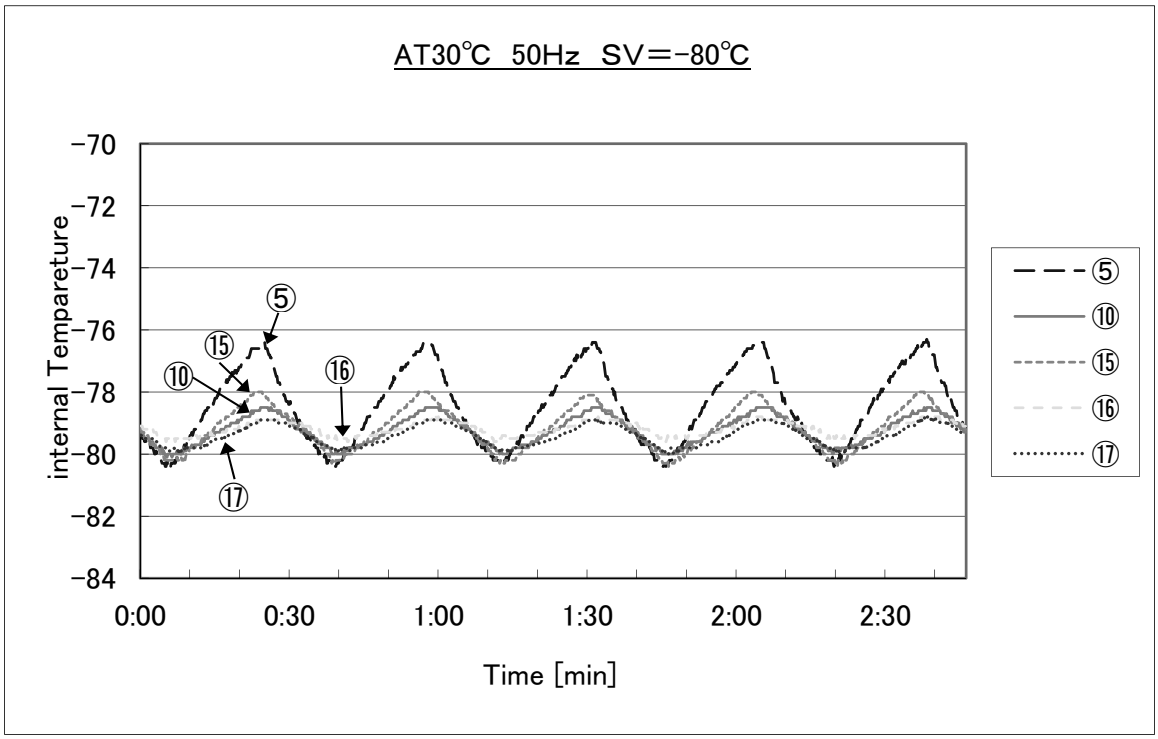
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internal Tempareture
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-72
-74
-76
-78
-80
-82
-84
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2:00
2:30
Time [min]
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⑩
⑮
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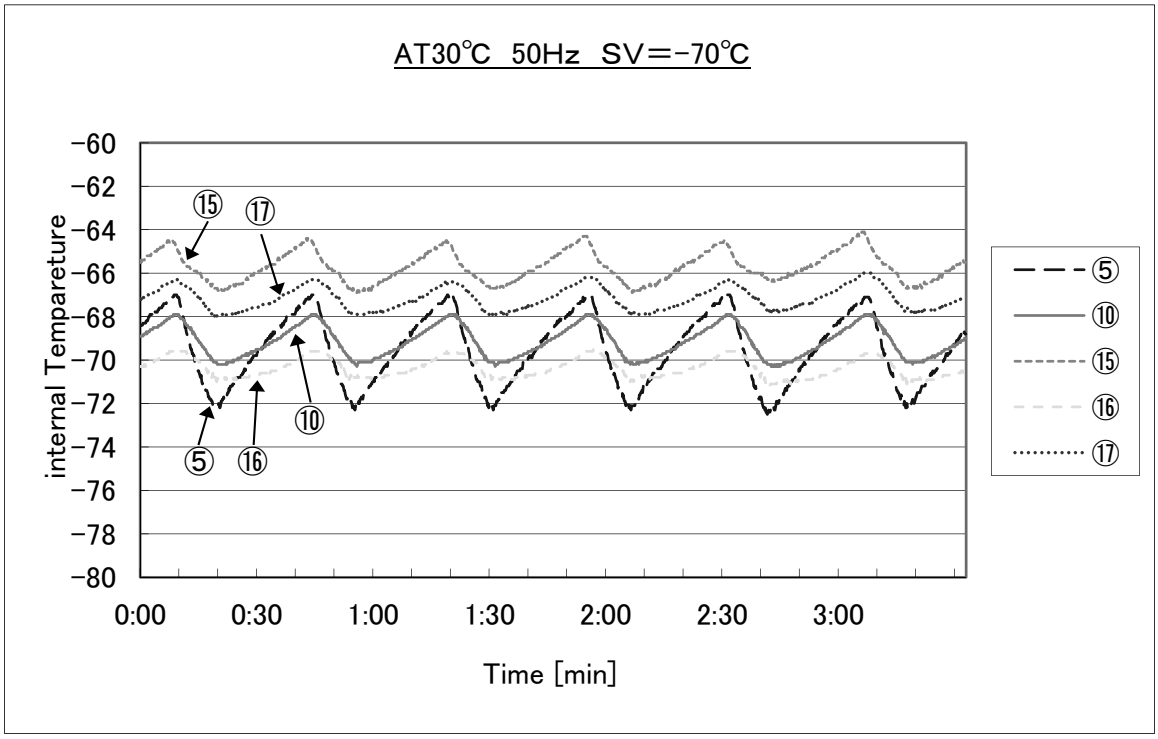
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Time [min]
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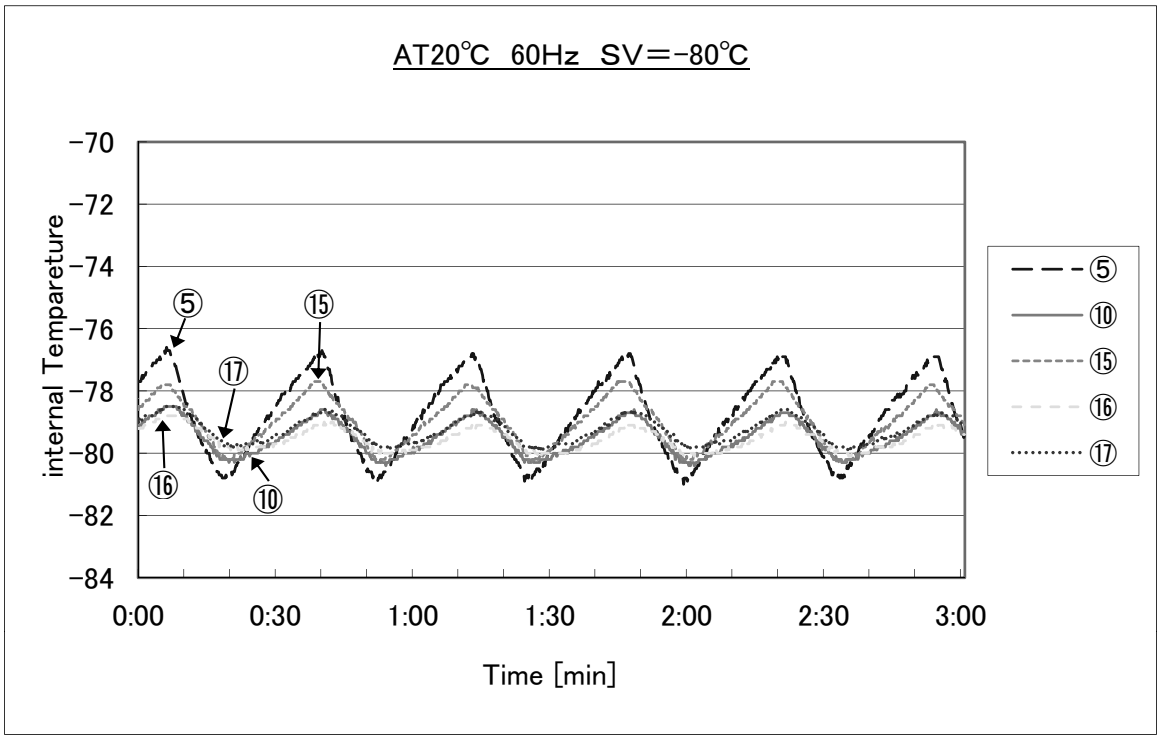
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Time [min]
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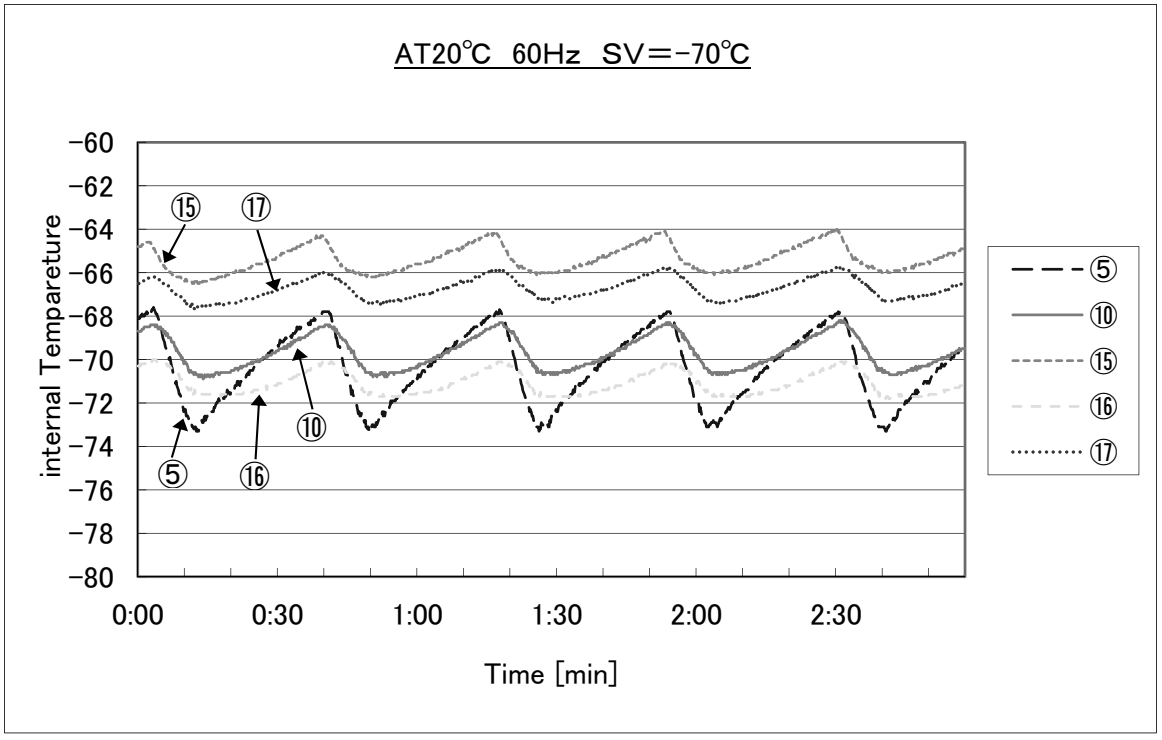
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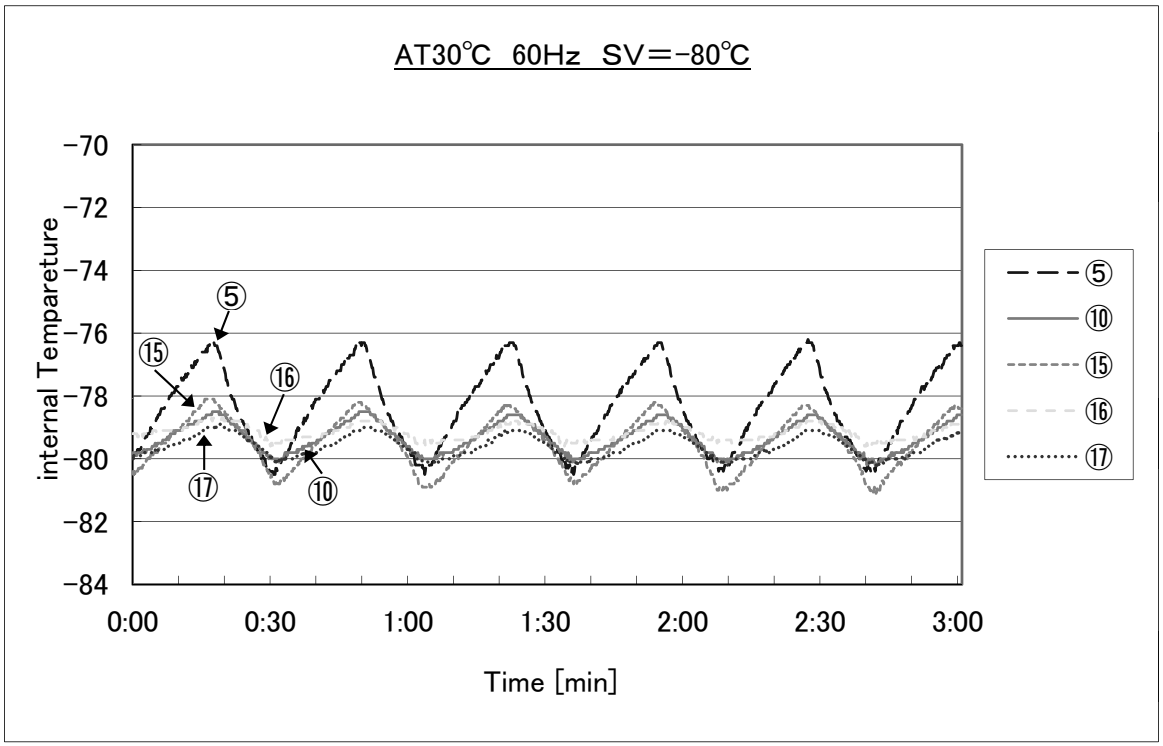
⑮
⑯
⑰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Time [min]
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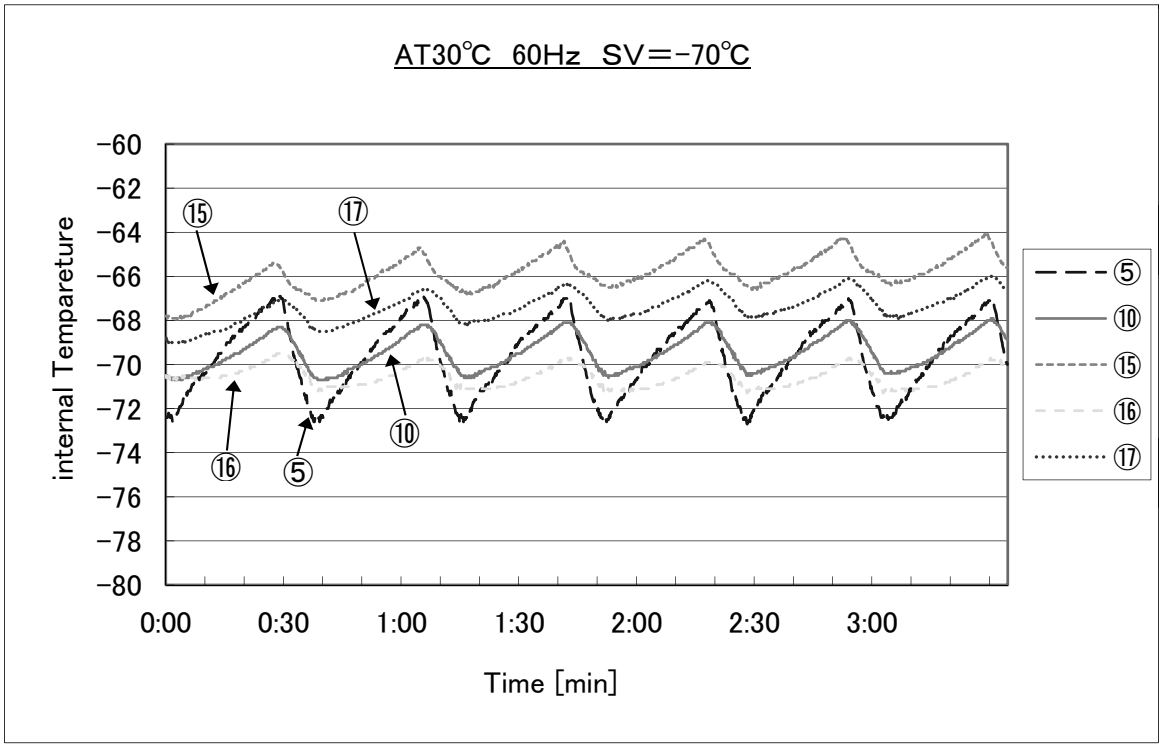
AT30℃ 60Hz SV＝-70℃
internal Tempareture
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1:00
1:30
2:00
2:30
3:00
Time [min]
⑤
⑩
⑮
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⑰

Instruction manual

・This section is extracted and printed from Instruction Manual.

・If you find out “Refer to page ●●” in them, this page means not page in Service manual but page in the lower corner of each page in the extract from Instruction Manual.
This page number is not corresponded with serial number in Service manual.

・**Please note the extracted Instruction Manual which corresponds to the initial unit production, so the contents may be revised in future.**

Panasonic

Operating Instructions

Ultra-Low Temperature Freezer

KM-DU73Y1
KM-DU53Y1

KM-DU73Y1

Please read these instructions carefully before using this product, and save this operating instructions for future use.

See page 42 for model number.

CONTENTS

INTRODUCTION

■ Read this operating instructions carefully before using the appliance and follow the instructions for safety operation.

■ Our company never guarantee any safety if the appliance is used for any objects other than intended use or used by any procedures other than those mentioned in this operating instructions.

■ Keep this operating instructions in an adequate place to refer to it as necessary.

■ The contents of the operating instructions will be subjected to change without notice due to the improvement of performance or functions.

■ Contact our sales representative or agent if any page of the operating instructions is lost or page order is incorrect.

■ Contact our sales representative or agent if any point in this operating instructions is unclear or if there are any inaccuracies.

■ No part of this operating instructions may be reproduced in any form without the expressed written permission of our company.

⚠CAUTION
Our company guarantees the product under certain warranty conditions. Our company in no way shall be responsible for any loss of content or damage of content.

PRECAUTIONS FOR SAFE OPERATION

It is imperative that the user complies with this operating instructions as it contains important safety advice.

Items and procedures are described so that you can use this unit correctly and safely. If the precautions advised are followed, this will prevent possible injury to the user and any other person.

Precautions are illustrated in the following way:

⚠WARNING

Failure to observe WARNING signs could result in a hazard to personnel possibly resulting in serious injury or death.

⚠CAUTION

Failure to observe CAUTION signs could result in injury to personnel and damage to the unit and associated property.

Symbol shows;

△ this symbol means caution.

⃠ this symbol means an action is prohibited.

● this symbol means an instruction must be followed.

Be sure to keep this operating instructions in a place accessible to users of this unit.

Some warning and/or caution labels are attached on the unit. Following shows the description of such labels.

NOTE:

As with any equipment that uses CO_2 gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to ensure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

PRECAUTIONS FOR SAFE OPERATION

⚠WARNING

Do not use the unit outdoors. Current leakage or electric shock may result if the unit is exposed to rain water.

Only qualified engineers or service personnel should install the unit. The installation by unqualified personnel may cause electric shock or fire.

Install the unit on a sturdy floor and take an adequate precaution to prevent the unit from turning over. If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.

Never install the unit in a humid place or a place where it is likely to be splashed by water. Deterioration of the insulation may result which could cause current leakage or electric shock.

Never install the unit in a flammable or volatile location. This may cause explosion or fire.

Never install the unit where acid or corrosive gases are present as current leakage or electric shock may result due to corrosion.

Always ground (earth) the unit to prevent electric shock. If the power supply outlet is not grounded, it will be necessary to install a ground by qualified engineers.

Never ground the unit through a gas pipe, water main, telephone line or lightning rod. Such grounding may cause electric shock in the case of an incomplete circuit.

Connect the unit to a power source as indicated on the rating label attached to the unit. Use of any other voltage or frequency other than that on the rating label may cause fire or electric shock.

Never store volatile or flammable substances in this unit if the container cannot be sealed. These may cause explosion or fire.

Do not insert metal objects such as a pin or a wire into any vent, gap or any outlet on the unit. This may cause electric shock or injury by accidental contact with moving parts.

Use this unit in safe area when treating the poison, harmful or radiate articles. Improper use may cause bad effect on your health or environment.

Turn off the power switch (if provided) and disconnect the power supply to the unit prior to any repair or maintenance of the unit in order to prevent electric shock or injury.

Do not touch any electrical parts (such as power supply plug) or operate switches with a wet hand. This may cause electric shock.

PRECAUTIONS FOR SAFE OPERATION

⚠WARNING

Ensure you do not inhale or consume medication or aerosols from around the unit at the time of maintenance. These may be harmful to your health.

Never splash water directly onto the unit as this may cause electric shock or short circuit.

Never put containers with liquid on the unit as this may cause electric shock or short circuit when the liquid is spilled.

Never bind, process, or step on the power supply cord, or never damage or break the power supply plug. A broken supply cord or plug may cause fire or electric shock.

Do not use the supply cord if its plug is loose. Such supply cord may cause fire or electric shock.

Never disassemble, repair, or modify the unit yourself. Any such work carried out by an unauthorized person may result in fire, or electric shock or injury due to a malfunction.

Disconnect the power supply plug if there is something wrong with the unit. Continued abnormal operation may cause electric shock or fire.

When removing the plug from the power supply outlet, grip the power supply plug, not the cord. Pulling the cord may result in electric shock or fire by short circuit.

Disconnect the power supply plug before moving the unit. Take care not to damage the power cord. A damaged cord may cause electric shock or fire.

Disconnect the power plug when the unit is not used for long periods. Keeping the connection may cause electric shock, current leakage, or fire due to the deterioration of insulation.

If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors cannot be closed completely with a key.**

The disposal of the unit should be accomplished by appropriate personnel. Remove doors to prevent accidents such as suffocation.

Do not put the packing plastic bag within reach of children as suffocation may result.

Flammable and explosive product. This product contains flammable refrigerant. Do not damage or break the pipework.

This product contains flammable refrigerant. Well ventilate the room to prevent refrigerant accumulation.

PRECAUTIONS FOR SAFE OPERATION

⚠CAUTION

This unit must be plug into a dedicated circuit protected by branch circuit breaker.

Use a dedicated power source as indicated on the rating label attached to the unit. A multiple-tap may cause fire resulting from abnormal heating.

Connect the power supply plug to the power source firmly after removing the dust on the plug. A dusty plug or improper insertion may cause a heat or ignition.

Never store corrosive substances such as acid or alkali in this unit if the container cannot be sealed. These may cause corrosion of inner components or electric parts.

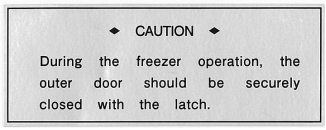
Check the setting when starting up of operation after power failure or turning off of power switch. The stored items may be damaged due to the change of setting.

Be careful not to tip over the unit during movement to prevent damage or injury.

Prepare a safety check sheet (copy the last page) when you request any repair or maintenance for the safety of service personnel.

LABELS ON THE UNIT

Warning safety labels applied to the ultra-low temperature freezer
Users are advised to avoid accidents by carefully reading the warnings and cautions contained on warning labels at key locations on the interior and exterior of the ultra-low temperature freezer.

Possible Danger	**Warning/Caution Type** Location of Danger	Warning/Caution Label	Description of Danger
Personal injury	**Hazardous Latch** Latch		Dangerous to put a hand.
Personal injury	**Frostbite and frost** Interior		Frostbite and frost caution label.
Personal injury	**Flammable and explosive product** Interior		Flammable refrigerant label.
Sample damage	**Chamber temperature** Interior		Forgets to close a door and latch.
Sample damage	**Chamber temperature** Interior		Rise in temperature is prevented.
Personal injury	**Negative pressure release** Interior		Door cannot open.

SYMBOLS ON THE UNIT

The symbols are attached to the ultra-low temperature freezer. The following table describes the symbols.

	This symbol is attached to covers that access high-voltage electrical components to prevent electric shock. Only a qualified engineer or service personnel should be allowed to open these covers.
	This symbol indicates that caution is required. Refer to product documentation for details.
	This symbol indicates an earth.
	This symbol means “ON” for a power switch.
	This symbol means “OFF” for a power switch.

ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe at least under the following conditions (based on the IEC 61010-1):

■ Indoor use;

■ Altitude up to 2000 m;

■ Ambient temperature 5°C to 40°C;

■ Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C;

■ Mains supply voltage fluctuations up to ±10% of the nominal voltage;

■ Transient overvoltages up to the levels of OVERVOLTAGE CATEGORY II;

■ Temporary OVERVOLTAGES occurring on the mains supply;

■ Applicable pollution degree of the intended environment (POLUTION DEGREE 2 in most cases)

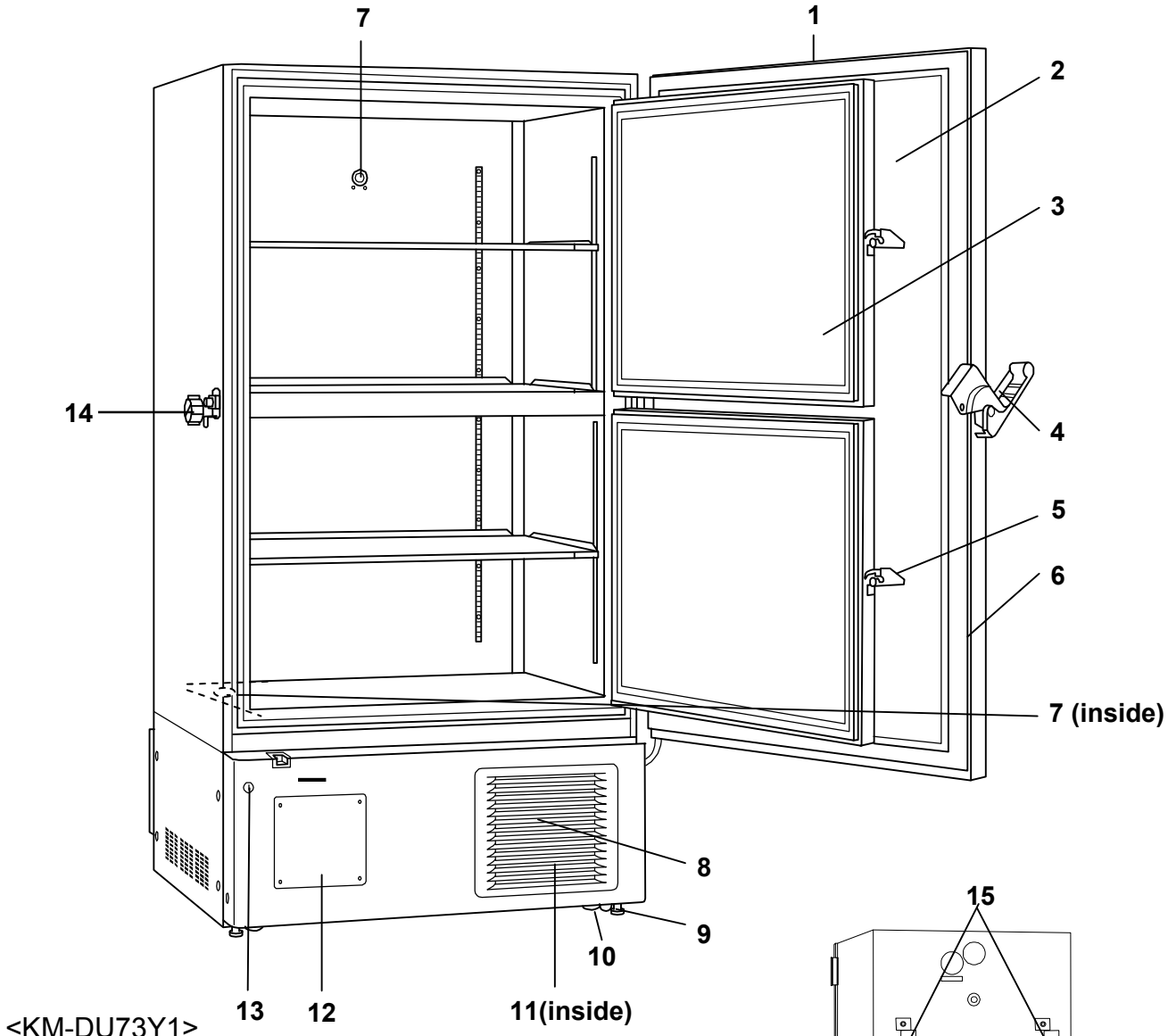
INTENDED USE AND PRECAUTIONS

This equipment is designed for low temperature storage of human cells, organs, plasma and DNAs.

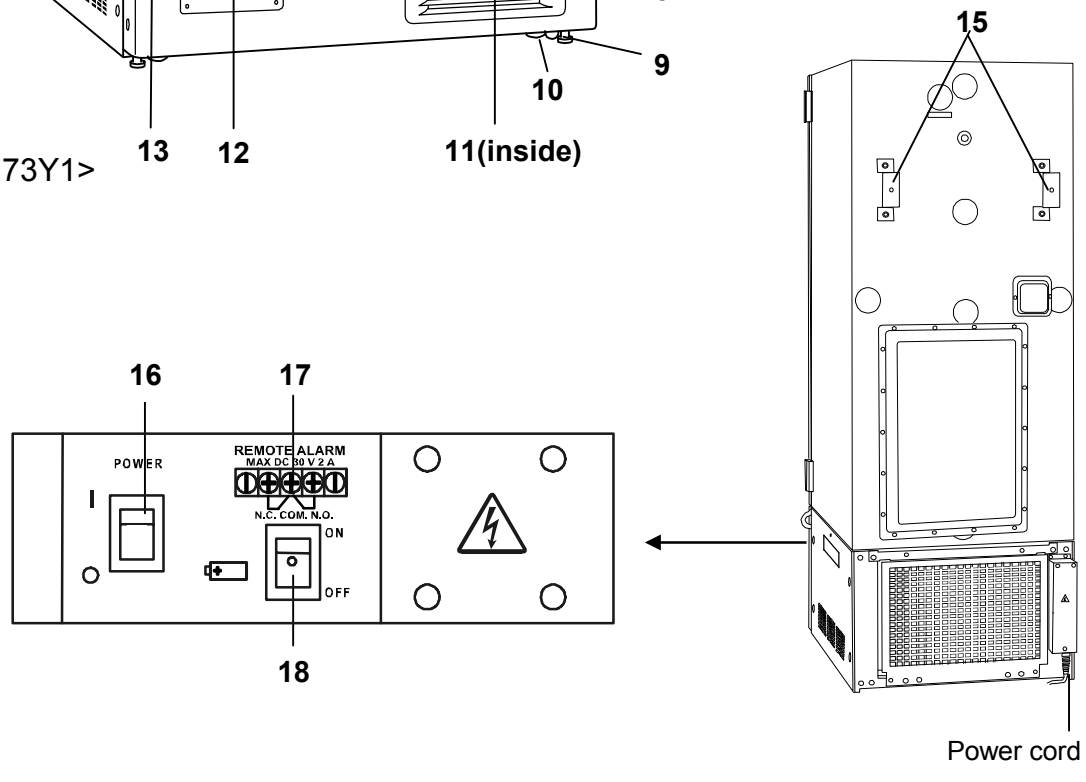
■ The effective storage period depends on the sample condition and storage temperature. It is necessary to determine the storage temperature and period suitable for the purpose.

■ For the live cells, the lower storage temperature should be required for long term storage. It is recommended to store the live cells at -130℃ or lower.

FREEZER COMPONENTS



<KM-DU73Y1>



Rear side

FREEZER COMPONENTS

1. Control panel (on the upper front of the outer door): The current chamber temperature or set temperature is displayed. See page 11 for details.

2. Outer door: To open the outer door, grip the outer door latch. On closing, lock the outer door latch completely.

3. Inner door: The operation of the inner door should be quick to minimize the temperature rise in chamber. Lock the inner door latch completely when the inner door is closed. The inner door is removable for cleaning or defrosting. See page 24 “Routine maintenance”.

4. Outer door latch: Always lock the outer door latch when the outer door is closed. A padlock is also available.

5. Inner door latch: Always lock the inner door latch when the inner door is closed.

6. Magnetic door gasket: This provides a tight door seal and prevents cold air leak. Keep clean.

7. Access port (rear and bottom): This is used for leading a cable and sensor of a measuring equipment, or nozzle of backup cooling kit to chamber.
Replace the cap and insulation after using the access port. Improper replacement may cause poor cooling or condensation around the outside of access port.

8. Air intake vent (grille): Do not block this vent to keep the proper cooling performance.

9. Leveling foot: The height of the freezer can be adjusted by this screw type leveling foot. Keep the unit in level at the installation.

10. Caster: 4 casters are provided to facilitate moving of the cabinet. For the installation, adjust the leveling feet so that the front 2 casters cannot contact with the floor.

11. Condenser filter (behind the grille): This filter prevents the dust from accumulating on the condenser. The dusty condenser filter may cause failure of refrigerating device. Clean the condenser filter once a month. See page 23 “Routine maintenance” for the cleaning.

12. Space for temperature recorder: A temperature recorder (optional component) can be attached here. See page 33“ Temperature recorder (Option)”.

13. Keyhole: Turn counterclockwise to 180^{o} with a key and the outer door is securely locked.

14. Air intake port: Used for open the outer door immediately after closing the outer door. See page 20 for details.

15. Fixture (on back side): 2 fixtures are provided as spacers between the cabinet and wall and also serve as hooks to fix the unit. See page 13 “Installation”.

16. Power switch: This is for turning ON/OFF the power to the unit.

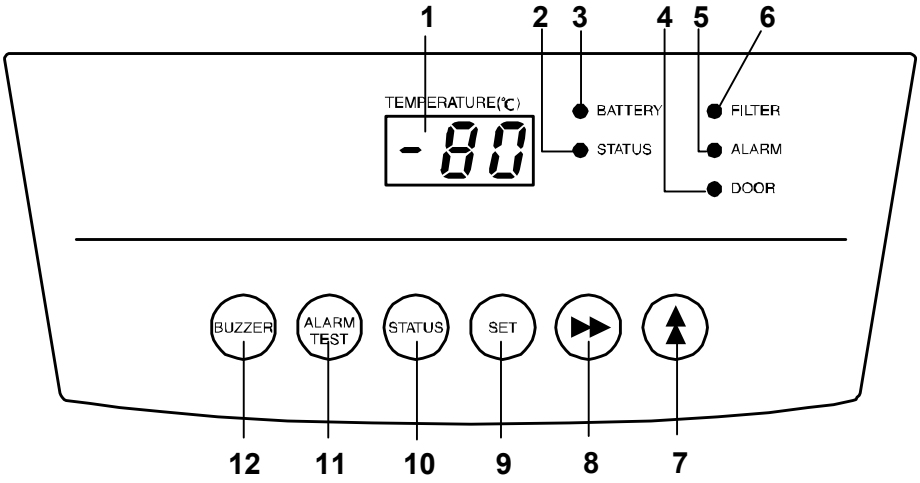
17. Remote alarm terminal: This is used to notice an alarm condition of the unit to remote location. Refer to page 20 “Remote alarm terminal”.

18. Battery switch: This is a switch for a battery for power failure alarm. Normally, turn on this switch. Be sure to turn off this switch if the freezer is not in operating for the long period (over one month).

NOTE:
3 shelves are packaged at the bottom of the chamber. Set the shelves on the shelf stoppers at the standard location firmly. The upward edge should be upside.
Refer to page 40 for the attachment of shelf stopper when changing the location of shelf stopper.

FREEZER COMPONENTS

Control panel



1. Digital temperature indicator: This indicator shows the present chamber temperature or set temperature. An error code will be displayed when the self diagnostic function detects any abnormality.

2. Status monitor lamp (STATUS): This lamp lights when environmental condition or status gets worse or the unit is out of normal operation. Refer to page 21 for details.

3. Battery check lamp (BATTERY): This lamp lights to recommend the battery replacement (3 years after power switch on). This lamp blinks to recommend the fan motor replacement (6 years after power switch on). For the replacement, consult our sales representative or agent.

4. Door check lamp (DOOR): This lamp lights when the outer door is open.

5. Alarm lamp (ALARM): This lamp is flashed during alarm condition.

6. Filter check lamp (FILTER): This lamp lights when the excessive dust is accumulated on the condenser filter. When this lamp lights, clean the condenser filter following the procedure on page 23.

7. Numerical value shift key (▲▲): Pressing this key in the setting mode causes the numerical value to shift. “ON-OFF” of key lock can be selected by pressing this key in the key lock setting mode. By pressing this key for more than 5 seconds in the temperature display mode leads setting mode for alarm temperature, alarm resume time ,compressor delay time and door alarm delay time. Refer to page 16, 17,18 and 19 for details respectively.

8. Digit shift key (▶▶): Pressing this key in the setting mode causes the changeable digit to shift. Key lock setting mode is led by pressing this key for more than 5 seconds in the temperature display mode. Refer to page 15 for details.

9. Set key (SET): Chamber temperature setting mode is led by pressing this key and the changeable digit blinks. By pressing this key again, the setting is memorized.

10. Status key (STATUS): By pressing this key in the event of the status monitor lamp is ON, the status code is displayed on the digital temperature indicator. This key is not effective when the freezer is running normally. See page 21 for details.

11. Alarm test key (ALARM TEST): To check the alarm system during freezer operation. Pressing this key with the battery switch ON gets the alarm lamp to flash, the remote alarm to operate, and the buzzer to sound.

12. Buzzer stop key (BUZZER): To silence the audible alarm under alarm condition, press this key. The remote alarm is not canceled. For the remote alarm, refer to page 20.

INSTALLATION SITE

To operate this unit properly and to obtain maximum performance, install the unit in a location with the following conditions:

■ A location not subjected to direct sunlight

Do not install the unit under direct sunlight. Installation in a location subjected to direct sunlight cannot obtain the intended performance.

■ A location with adequate ventilation

Leave at least 10 cm around the unit for ventilation. Poor ventilation will result in a reduction of the performance and consequently the failure. Keep at least 30 cm at the left side for cleaning the air intake port.

■ A location away from heat generating sources

Avoid installing the unit near heat-emitting appliances such as a heater or a boiler etc. Heat can decrease the intended performance of the unit.

■ A location with little temperature change

Install the unit under stable ambient temperature. The allowable ambient temperature is between +5 and +30^{o}C.

■ A location with a sturdy and level floor

Always install the unit on a sturdy and level floor. The uneven floor or tilted installation may cause failure or injury. Install the unit in stable condition to avoid the vibration or noise. Unstable condition may cause vibration or noise.

⚠ WARNING

Install the unit on a sturdy floor. If the floor is not strong enough or the installation site is not adequate, this may result in injury from the unit falling or tipping over.

Select a level and sturdy floor for installation. This precaution will prevent the unit from tipping. Improper installation may result in water spillage or injury from the unit tipping over.

■ A location not prone to high humidity

Install the unit in the ambient of 80% R.H. or less humidity. Installation under high humidity may cause current leakage or electric shock.

⚠ WARNING

Do not use the unit outdoors. Current leakage or electric shock may result if the unit is exposed to rain water.

Never install the unit in a humid place or a place where it is likely to be splashed by water. Deterioration of the insulation may result which could cause current leakage or electric shock.

■ A location without flammable or corrosive gas

Never install the unit in a flammable or volatile location. This may cause explosion or fire or may result in the current leakage or electric shock by the corrosion of the electrical components.

■ A location without the possibility of anything fall

Avoid installing the unit in the location where anything can fall down onto the unit. This may cause the breakdown or failure of the unit.

INSTALLATION

1. Removing the packaging materials and tapes

Remove all transportation packaging materials and tapes. Open the doors and ventilate the unit. If the outside panels are dirty, clean them with a diluted neutral dishwashing detergent. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) After the cleaning with the diluted detergent, always wipe it off with a wet cloth. Then wipe off the panels with a dry cloth.

Note:

Remove the cable tie banding the power supply cord. Prolonged banding may cause the corrosion of the cord coating.

2. Adjusting the leveling foot

Extend the leveling feet by rotating them as shown in Fig. 1 to contact them to the floor. Ensure the unit is level.

3. Fixing the unit

Two fixtures are attached to the rear of the frame. Fix the frame to the wall with these fixtures and rope or chain. (Fig. 2)

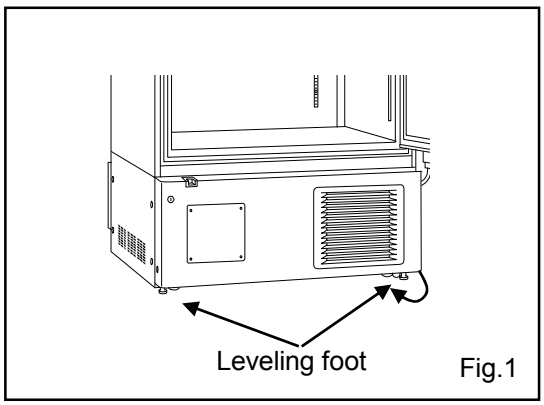


Fig.1

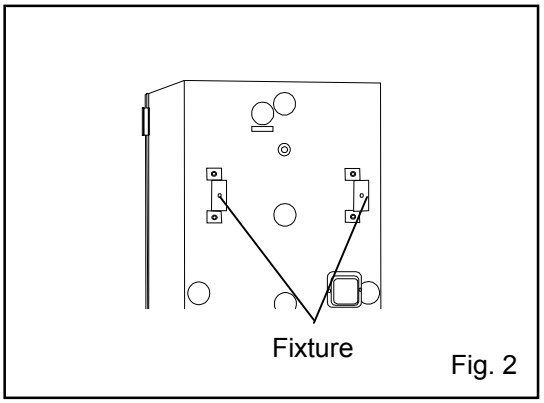


Fig. 2

4. Setting the shelves

3 shelves are packaged at the bottom of the chamber. Set the shelves on the shelf stoppers at the standard location firmly. The upward edge should be upside.

5. Ground (earth)

The ground (earth) is for preventing the electric shock in the case of the electrical insulation is somehow degraded. Always ground the unit at the time of installation.

⚠WARNING

Use a power supply outlet with ground (earth) to prevent electric shock. If the power supply outlet is not grounded, it is necessary to install a ground by qualified engineers.

Never ground the unit through a gas pipe, water main, telephone line or lightning rod. Such grounding may cause electric shock in the case of an incomplete circuit.

6. Installing the earth leakage breakers

This product is to connect a earth leakage breaker to the power supply side of the product.

Contact our sales representative or agent at the time of installation of the earth leakage breaker.

START-UP OF UNIT

Follow the procedures for the initial and consequent operations of the unit.

1. Turn off the switch of the backup cooling kit (optional component) if it is installed. And check the battery switch is off.

2. Connect the power cord to the dedicated outlet having appropriate rating with the chamber empty, and turn on the power switch on the freezer.

3. Turn on the battery switch.

4. Set the chamber temperature to the desired temperature. At the initial start-up, the alarm lamp (ALARM) blinks until the chamber temperature reaches the desired temperature. The alarm lamp (ALARM) is off when the chamber temperature reaches around the set temperature.

5. Check that the chamber temperature reaches the desired temperature.

6. Turn on the switch of the backup cooling kit (optional component) if it is installed.

7. Check that the alarm lamp blinks and the buzzer sounds by pressing the alarm test key (ALARM TEST). The remote alarm is also operated.
Note: The alarm lamp (ALARM) blinks and E09 is displayed when pressing the alarm test key (ALARM TEST) with the battery switch off.

8. After confirming the above, you can put articles into the chamber in a small batch to prevent the temperature rise.

9. Push the test switch to check the operation of backup cooling kit (option goods) when it is equipped.

NOTE:
Do not put too many warm articles in the chamber. The temperature rise may cause the damage to the articles in the chamber.

⚠ WARNING
Fix the shelves securely. Incomplete installation may cause injury or damage.

Operation after power failure
The set value is memorized by nonvolatile memory. Accordingly, the freezer resumes the operation with setting before power failure.
When the freezer is recovered from power failure with the chamber temperature higher than the preset temperature, then the high temperature alarm is activated and the buzzer sounds and the remote alarm is also activated. Push the buzzer stop key (BUZZER) to silence buzzer and take appropriate actions if needed.

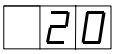
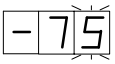
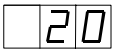
⚠WARNING
When this product operates at the first start-up or after no use for long period, the built-in battery capacity may be lowered or completely zero because of discharge of the battery. After installation the product, the freezer should operate for more than 3 days (72 hours) to charge the battery.

CHAMBER TEMPERATURE SETTING

Table 1 shows the basic procedure for setting the chamber temperature. Perform key operations in the sequence indicated in the table. The example in the table is based on the assumption that the desired temperature is -75°C.

Note: The chamber temperature is set to -80°C at the factory.

Table 1. Basic operation sequence (Example: Chamber temperature -75°C)

	Description of operation	Key operated	Indication after operation
1	Turn the power switch ON.	----	The current chamber temperature is displayed. 
2	Press set key.	SET	The second digit is flashed. 
3	Set to -75 with the numerical value shift key and digit shift key.	▲▲	When pressed, the figure of settable digit changes.
		▶▶	When pressed, the settable digit is shifted. 
4	Press set key.	SET	Set temperature is memorized and the current chamber temperature is displayed. 

Note:

• Although the value of the chamber temperature setting can range from -50°C to -90°C, the guaranteed temperature is -86°C when there is no load at the ambient temperature of 30°C.

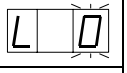
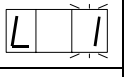
• The temperature set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

KEY LOCK FUNCTION

This unit is provided with the key lock function. When the key lock is ON, change of temperature setting through the key pad is not available. The key lock is set in OFF at the factory.

Display	Mode	Function
L 0	Key lock is OFF	Enable to change of temperature setting
L 1	Key lock is ON	Disable to change of temperature setting

Table 2. Procedure for key lock setting (change from key lock OFF to key lock ON)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press digit shift key for 5 seconds.	▶▶	The first digit is flashed. 
3	Press numerical value shift key and scroll the figure to 1.	▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The key lock is set to ON. The current chamber temperature is displayed. 

• The key lock set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

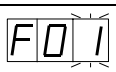
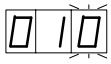
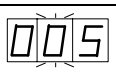
ALARM TEMPERATURE SETTING

This unit is provided with the high and low temperature alarm and the temperature at which the alarm is activated is changeable.
The setting range of alarm temperature is between the chamber temperature ±5°C and ±40°C.

The following procedure shows the setting of alarm temperature according to the condition below:
High temperature alarm: activates at the temperature 5°C higher than the set temperature
Low temperature alarm: activates at the temperature 5°C lower than the set temperature

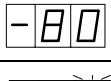
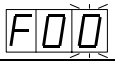
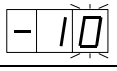
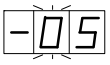
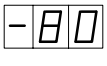
Note: The alarm temperature is set 10°C higher than the set temperature at the factory.

Table 3. Procedure for setting high temperature alarm

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press numerical value shift key for about 5 seconds.	▲▲	The first digit is flashed. 
3	Press numerical value shift key and scroll the figure to 1.	▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The current setting is displayed and the first digit is flashed. 
5	Scroll the figure to 005 by using digit shift key and numerical value shift key	▲▲	When pressed, the figure of settable digit changes.
		▶▶	When pressed, the changeable digit is shifted. 
6	Press set key.	SET	Alarm temperature is memorized and the current chamber temperature is displayed. 

Note: The alarm temperature is set 10°C lower than the set temperature at the factory.

Table 4. Procedure for setting low temperature alarm

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press numerical value shift key for about 5 seconds.	▲▲	The first digit is flashed. 
3	Press numerical value shift key and scroll the figure to 2.	▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The current setting is displayed and the first digit is flashed. 
5	Scroll the figure to -05 by using digit shift key and numerical value shift key	▲▲	When pressed, the figure of settable digit changes.
		▶▶	When pressed, the changeable digit is shifted. 
6	Press set key.	SET	Alarm temperature is memorized and the current chamber temperature is displayed. 

• The alarm temperature set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

SETTING OF ALARM RESUME TIME

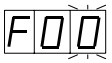
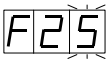
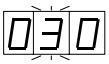
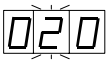
The alarm buzzer is silenced by pressing alarm buzzer stop key (BUZZER) on the control panel during alarm condition.

The buzzer will be activated again after certain suspension if the alarm condition is continued. The suspension time can be set by following the procedure shown in the Table 5 below.

The example in the table is based on the assumption that the desired duration is 20 minutes.

Note: The duration is set in 30 minutes at the factory.

Table 5. Setting procedure for alarm resume time (change from 30 minutes to 20 minutes)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press numerical value shift key for 5 seconds.	▲▲	The first digit is flashed. 
3	Set the figure to F25 with the digit shift key and numerical value shift key.	▶▶	The settable digit is shifted.
		▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The current resume time is displayed. The second digit is flashed. 
5	Scroll the figure to 020 with the numerical value shift key.	▲▲	When pressed, the figure of settable digit changes. 
6	Press set key.	SET	The setting is memorized and the current chamber temperature is displayed. 

• The settable alarm resume time is 10, 20, 30, 40, 50, or 60 minutes (The setting is 010, 020, 030, 040, 050, or 060). The buzzer would not resume if the resume time is set in 000.

• It is recommended to set the alarm resume time when the freezer is not under alarm condition. The setting during alarm condition is effective on the next alarm condition.

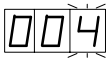
• The alarm resume time set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

SETTING OF COMPRESSOR DELAY TIME

The delay time of compressor can be changed to reduce the load on the power line and to facilitate the start-up (reset) of the freezer after power failure.

The example in the table 6 is based on the assumption that the delay time is changed to 4 minutes.
Note: The delay time is set in 3 minutes at the factory.

Table 6. Changing procedure for delay time (change from 3 minutes to 4 minutes)

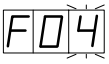
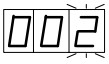
	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press numerical value shift key for 5 seconds.	▲▲	The first digit is flashed. 
3	Set the figure to F05 with the numerical value shift key.	▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The current delay time is displayed. The first digit is flashed. 
5	Set the figure to 004 with the numerical value shift key.	▲▲	When pressed, the figure of the first digit changes. 
6	Press set key.	SET	The delay time is memorized and the current chamber temperature is displayed. 

• The setting range of the delay time is 3 minutes to 15 minutes. Chamber temperature may not fall down if the delay time is set in 5 minutes or more depending on the installation environment.
• The compressor delay time set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

SETTING OF DOOR ALARM DELAY TIME

The door check lamp lights when the outer door is open and the buzzer is activated with 2 minutes delay. The delay time is changeable.
Follow the procedure in table 7 below to change the setting of delay time. The procedure assumes that the delay time is changed from 2 minutes to 3 minutes.
Note: The delay time is set in 2 minutes at the factory.

Table 7. Changing procedure for delay time (change from 2 minutes to 3 minutes)

	Description of operation	Key operated	Indication after operation
1		----	The current chamber temperature is displayed. 
2	Press numerical value shift key for 5 seconds.	▲▲	The first digit is flashed. 
3	Set the figure to F04 with the numerical value shift key.	▲▲	When pressed, the figure of settable digit changes. 
4	Press set key.	SET	The current delay time is displayed. The first digit is flashed. 
5	Set the figure to 003 with the numerical value shift key.	▲▲	When pressed, the figure of the first digit changes. 
6	Press set key.	SET	The delay time is memorized and the current chamber temperature is displayed. 

Note:
• The setting range for delay time is between 0 and 15 minutes. The alarm buzzer sounds soon when the delay time set in 0.
• The door alarm delay time set mode returns to the temperature display mode automatically when 90 seconds has passed without any key operation.

REMOTE ALARM TERMINAL

The terminal of the remote alarm is installed at the lower right side of the unit. The alarm is outputted from this terminal. Contact capacity is DC 30 V, 2 A.
Contact output:

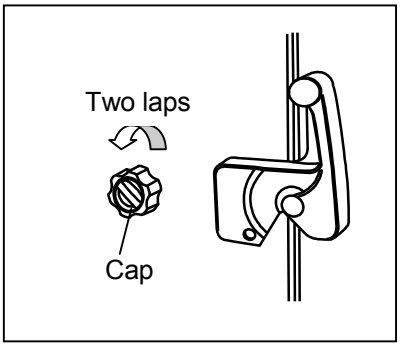
	between COM. and N.O.	between COM. and N.C.
At normal	Open	Close
At abnormal	Close	Open

Note:
• The buzzer is silenced by pressing buzzer stop key (BUZZER) on the control panel during alarm condition. (A remote alarm is continuing the operation.)
The buzzer will be activated again after certain suspension if the alarm condition is continued.
• The alarm is actuated when the power cord is disconnected from the outlet or the power switch is OFF.

Use a twisted sealed wire for the connection.
Type UL2343, UL2448, UL2464, UL2552, UL 2623
Length: 30 m max.

AIR INTAKE PORT

When the outer door is closed and opened soon, the outer door sometimes does not open.
The warm air which went into the chamber is cooled down rapidly, and this is because air inside the chamber contracted.
Follow the procedure below when the outer door is closed and opened soon:



1. Turn the cap on the left side counterclockwise about two laps. (Or remove the cap.)
2. Allow about twenty seconds before open the outer door.
3. Close (or replace) the cap when the door operation is completed.

The outer door may not open in the above method when there are frost and ice in the air intake port. In that case, open the cap and check the frost inside the air intake port. Remove the frost inside the air intake port with the enclosed "stick for air intake port cleaning" when the excessive frost is built in the air intake port. Clean the air intake port every month even when there is no frost in the air intake port. Refer to page 25 for the cleaning.

⚠ CAUTION
For removing the frost in the air intake port, do not use a tool with sharp edge such as a knife or a screw driver.
Replace the cap when the air intake port is not used. Improper replacement may cause rise of chamber temperature or condensation around the air intake port.

MONITOR OF FREEZER STATUS

The freezer has a function to monitor the running status of the unit as shown in table 8 below. This is to notice the running status getting worse (not failure).

1. The status monitor lamp (STATUS) is lit when one of the running status shown in table 8 is detected.
2. The S code (--1 or --3) is displayed on the digital temperature indicator by pressing the status key (STATUS) when the status monitor lamp (STATUS) is lit.
3. Pressing the status key (STATUS) again returns to current chamber temperature on the digital temperature indicator. (The indication returns to the chamber temperature display automatically when no key is operated for 90 seconds.)

Table 8. Monitor of running status

Kind of function	Status	Indication	If this status continues	Remedy
Notice of abnormal ambient temperature	When the ambient temp. is over approx. 35°C or lower than about 0°C.	Status lamp (STATUS) lights. "--1" is displayed.	Decrease of cooling performance or durability of refrigerating circuit.	Examination is air-conditioning of installation site.
Notice of overload condition	When the running rate of refrigerating circuit is higher than usual.	Status lamp (STATUS) lights. "--3" is displayed.	Decrease of cooling performance or durability of refrigerating circuit.	1. This is likely to happen when a large amount of materials is stored. Put articles in the chamber in a small batch. 2. Check ambient temp., voltage, and sealing of outer/inner door.

Note:
• The S code displayed on the digital temperature indicator is changed every few seconds if two status shown in the above table are detected at the same time. (--1 ⇒ --3 ⇒ --1 repeated)
• The monitoring function does not trigger a buzzer or conduct a safety operation.
• In the case of multiple indication of S code, follow the remedy for each status.
• The status monitor lamp (STATUS) may be lit under normal running condition when the optional small inner door (MDF-7ID) is installed because of less cooling performance. In this case, adjust the air conditioning so that the ambient temperature is around 23°C, or set the chamber temperature 10°C higher than the current setting.

ALARMS & SAFETY FUNCTIONS

This unit has the alarms and safety functions shown in Table 9, and also self diagnostic functions.

Table 9 Alarms & safety functions

Alarm & Safety	Situation	Indication	Buzzer	Safety operation
High temperature alarm	If the chamber temperature is higher than the temperature at which the high temperature alarm is activated.	Alarm lamp is flashed. Digital temperature indicator is flashed.	Intermittent tone with about 15 minutes delay.	Remote alarm with about 15 minutes delay.
Low temperature alarm	If the chamber temperature is lower than the temperature at which the low temperature alarm is activated.			
Power failure alarm	When it is a power failure. When the power to the unit is disconnected.	Alarm lamp is flashed.	Intermittent tone	Remote alarm.
Door alarm	When the outer door is open over the preset time.	Door check lamp lights.	Intermittent tone with about 2 minutes delay	-----
Filter alarm	When the condenser filter is clogged.	Filter check lamp lights.	Intermittent tone	-----
Battery check	When about 3 years has passed with power switch ON.	Battery check lamp lights.	-----	-----
Fan motor check	When about 6 years has passed with power switch ON.	Battery check lamp blinks.	-----	-----
Auto-return	When there is no key pressing in each setting mode for 90 seconds.	Chamber temperature is displayed.	-----	Finishing of each setting mode.
Key lock	When the key lock is ON.	-----	-----	Change of setting is disable.
Sensor abnormality	If the thermal sensor is disconnected.	Alarm lamp is flashed. E01 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm. Unit keeps continuous running.
	If the thermal sensor is short-circuited.	Alarm lamp is flashed. E02 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm. Unit keeps continuous running.
	If the cascade sensor is disconnected.	Alarm lamp is flashed. E03 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
	If the cascade sensor is short circuited.	Alarm lamp is flashed. E04 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
	If the filter sensor is disconnected.	Alarm lamp is flashed. E05 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
	If the filter sensor is short-circuited.	Alarm lamp is flashed. E06 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
	If the ambient temperature sensor is disconnected.	Alarm lamp is flashed. E07 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
	If the ambient temperature sensor is short-circuited.	Alarm lamp is flashed. E08 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm.
Battery switch check	When the battery switch is OFF during alarm test.	Alarm lamp is flashed. E09 is flashed.	-----	-----
Condenser temp. abnormality	When the fan motor has broken down	E10 and chamber temp. are displayed alternately.	Intermittent tone	Remote alarm. Compressor of high stage side stops.

Note:

• When the operation is started in high ambient temperature, the filter check lamp is sometimes lit. In this case, the lamp is off automatically when the ambient temperature is getting lower.

• The freezer resumes the operation after power failure with the temperature setting before power failure as the chamber temperature setting and alarm temperature setting are memorized in the nonvolatile memory.

• The battery for power failure alarm is an article for consumption. It is recommended that the battery will be replaced about every 3 years. Contact our sales representative or agent at the time of replacement of the battery.

• Fan motor is expendable supplies. Replace it for about every 6 years. Contact our sales representative or agent at the time of replacement of fan motor.

• The chamber temperature is displayed for 5 seconds by pressing buzzer stop key (BUZZER) during power failure alarm. Then the buzzer is silenced. The alarm lamp keeps flashing.

ROUTINE MAINTENANCE

⚠WARNING

Always disconnect the power supply to the unit prior to any repair or maintenance of the unit in order to prevent electric shock or injury.

Ensure you do not inhale or consume medication or aerosols from around the unit at the time of maintenance. These may be harmful to your health.

Cleaning of cabinet

- Clean the unit once a month. Regular cleaning keeps the unit looking new.
- Use a dry cloth to wipe off small amounts of dirt on the outside and inside of the unit and all accessories.

If the outside panels are dirty, clean them with a diluted neutral dishwashing detergent.. (Undiluted detergent can damage the plastic components. For the dilution, refer to the instruction of the detergent.) After the cleaning with the diluted detergent, always wipe it off with a wet cloth. Then wipe off the cabinet or accessories with a dry cloth.

- Never pour water onto or into the unit. Doing so can damage the electric insulation and cause failure.
- The compressor and other mechanical part are completely sealed. This unit requires absolutely no lubrication.

Note: Always replace the inner attachments removed for the cleaning to keep the intended performance.

Cleaning of condenser filter

This unit is provided with the filter check lamp on the control panel. Clean the condenser filter when this lamp lights. Clean the condenser filter once a month even if the check lamp is not on since a clogged filter may cause shorter compressor life as well as the poor cooling.
Clean the condenser filter by the procedure below.

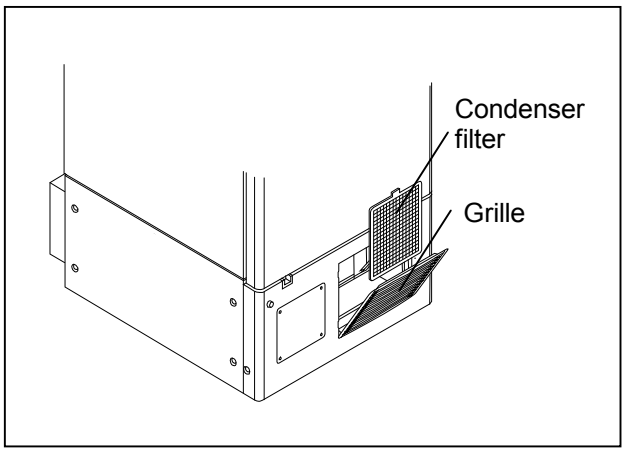
1. Open the grille by pulling it to you as shown in the figure.

2. Take out the condenser filter.

3. Wash the condenser filter with water.

4. Replace the condenser filter and the grille. (Set the handle of the condenser filter at the front.)

5. Check that the filter check lamp is off in the event the filter check lamp was ON.



⚠WARNING

Do not touch the condenser directly when the condenser filter is removed for cleaning. This may cause injury by hot surface.

ROUTINE MAINTENANCE

Defrosting of inside wall

The frost is built at the upper portion of the chamber and inner door. The excessive frost possibly make some gap between the cabinet and the magnetic door gasket, which may cause poor cooling. Remove the frost on the inner door with a scraper enclosed with the unit. Following shows the procedure for removing the chamber frost.

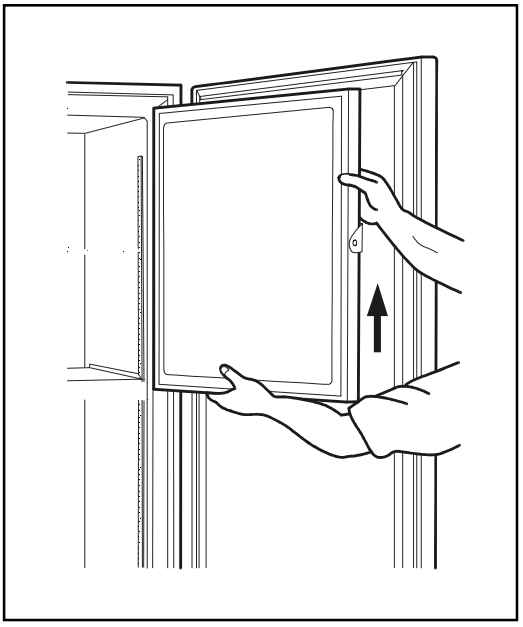
Note: For removing the frost, do not use a tool with sharp edge such as a knife or a screw driver.

1. Turn off the backup cooling kit if applicable.

2. Take out and transfer all the contents to another freezer or a container which is refrigerated by liquid carbon dioxide or dry ice.

3. Turn off the power switch and battery switch of the freezer.

4. Open the outer door and inner door. Remove the inner door by lifting up as shown in the figure.



5. Leave the freezer as it is.

6. The water accumulated on the bottom of the chamber should be wiped up with a dry cloth.

7. After cleaning the chamber and inner door, replace the inner door and start up the unit according to the procedure on page 14.

8. Put back the articles into the sufficiently cooled freezer compartment.

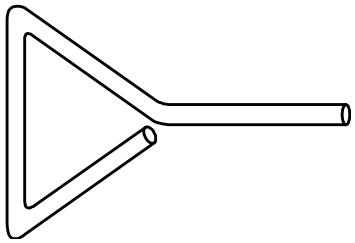
9. Turn on the backup cooling kit if it is provided.

ROUTINE MAINTENANCE

Cleaning of air intake port

To open the outer door, the cap on the left side is turned counterclockwise to take the air. Therefore, the frost is easy to be settled around the air intake port or in it. Clean the air intake port depending on the conditions below:

Condition	Remedy
When the frost and ice can be seen in the air intake port.	Remove the frost and ice with the stick for air intake port cleaning.
The outer door cannot be opened even if the cap on the air intake port is removed.	Remove the frost and ice with the stick for air intake port cleaning.
The frost and ice are built in the chamber.	Remove the frost and ice with the enclosed scraper.



Stick for air intake port cleaning (Accessory)

⚠ CAUTION

For removing the frost in the air intake port, do not use a tool with sharp edge such as a knife or a screw driver.

CALIBRATION

During running operation, the following service works must be performed;

・ Perform temperature calibration at least once a year.

Contact our sales representative or agent.

TROUBLE SHOOTING

If the unit malfunctions, check out the following before calling for service.

Malfunction	Check/Remedy
The chamber is not cooled at all	▪ The circuit breaker of power source is active. ▪ The voltage is too low (In this case, call an electrician). ▪ The power is not supplied. ▪ The breaker is free. ▪ The large amount of articles (load) is stored in the chamber at one time.
The cooling is poor	▪ The ambient temperature is too high. ▪ The inner door latch is not closed completely. The outer door is not closed firmly. (The frost or ice between the cabinet and the magnetic door gasket possibly prevents door seal.) ▪ The air intake vent is blocked. ▪ The condenser filter is clogged. Always clean the condenser filter when the filter check lamp is lit. ▪ The outer door is not shut tightly. ▪ The inner door is not installed correctly. ▪ The set temperature in the controller is not set properly. ▪ The freezer is in the direct sunlight. ▪ There is any heating source near the freezer. ▪ A rubber cap and insulation are not set correctly on the access port. ▪ You put too many unfrozen articles into the chamber.
Alarm test key cannot actuate the alarm	▪ The alarm is activated only when the power switch is ON. ▪ When only the buzzer or only the alarm is actuated by the alarm test key, the unactuated part is out of order, and must be replaced.

Note:

If the malfunction is not eliminated after checking the above items, or the malfunction is not shown in the above table, contact our sales representative or agent.

DISPOSAL OF UNIT

⚠WARNING

If the unit is to be stored unused in an unsupervised area for an extended period, **ensure that children do not have access and that doors are locked completely with a key.**

The disposal of the unit should be accomplished by appropriate personnel. Always remove doors to prevent accidents such as suffocation.

⚠WARNING

Flammable and explosive product. This product contains flammable refrigerant. Be sure to follow the below instructions when servicing or recycling.

・Well ventilate the room to prevent refrigerant accumulation.
・Keep fire away when the refrigerant is contained in the product.
・Do not damage or break the pipework.

Recycle of battery

The unit contains a rechargeable battery. The battery is recyclable. At the end of it's useful life, check with you local solid officials option or proper disposal.

＊Label indication is obliged to comply with Taiwanese battery regulation.

Decontamination of unit

Before disposing a ultra low temperature freezer with biohazardous danger, decontaminate the ultra low temperature freezer to the extent possible by the user.

DISPOSAL OF UNIT

(English)
FOR EU USERS
The symbol mark and recycling systems described below apply to EU countries and do not apply to countries in other areas of the world.

Your Panasonic product is designed and manufactured with high quality materials and components which can be recycled and/or reused.

The symbol mark means that electrical and electronic equipment, batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.

Note:
If a chemical symbol is printed beneath the symbol mark, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows: Hg: mercury, Cd: cadmium, Pb: lead

In the European Union there are separate collection systems for used electrical and electronic equipment, batteries and accumulators.
Please, dispose of them correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!

(German)
Für EU-Staaten
Das Symbol und das erwähnte Wiederverwertungssystem gelten nur für die Länder der EU und nicht für andere Länder oder Gebiete in der Welt.

Die Produkte von Panasonic werden aus hochwertigen Materialien und Komponenten gefertigt, die sich wieder verwenden lassen.

Das Symbol bedeutet, dass elektrische oder elektronische Geräte, Batterien und Akkus am Ende ihrer Lebensdauer nicht im Haushaltmüll entsorgt werden dürfen.

Hinweis:
Ein chemisches Zeichen unter dem Symbol bedeutet, dass die Batterie bzw. der Akku Schwermetalle in gewissen Konzentrationen enthält. Die Metalle werden wie folgt bezeichnet: Hg: Quecksilber, Cd: Kadmium, Pb: Blei

In der Europäischen Union gibt es separate Sammelstellen für elektrische und elektronische Geräte, Batterien und Akkus.
Entsorgen Sie solche Geräte bitte richtig in der kommunalen Sammelstelle bzw. im Recyclingzentrum.

Helfen Sie mit, die Umwelt in der wir leben, zu schützen.

DISPOSAL OF UNIT

(French)
POUR LES UTILISATEURS DE UE
Le symbole et les systèmes de recyclage évoqués ci-dessous s'appliquent uniquement aux pays de UE.

Votre produit Panasonic est conçu et fabriqué avec des composants et des matériaux de hautes qualités qui peuvent être recyclés et/ou réutilisés.

Le symbole signifie que les équipements électriques et électroniques, les batteries et les accumulateurs ne doivent pas être mis au rebut avec les déchets domestiques à l'issue de leur durée de vie.

Remarque:
Si un symbole chimique est imprimé sous le symbole, le symbole chimique indique que la batterie ou l'accumulateur contient une certaine concentration de métaux lourds. Les métaux sont indiqués de la manière suivante: Hg: mercure, Cd: cadmium, Pb: plomb.

Il existe différents systèmes de collecte pour les équipements électriques et électroniques, les batteries et les accumulateurs usagés au sein de l'Union européenne.
Veuillez mettre les équipements au rebut de manière correcte, auprès de votre centre de recyclage/de collecte des déchets local.

Aidez-nous à préserver l'environnement dans lequel nous vivons!

Les machines ou appareils électriques et électroniques contiennent fréquemment des matières qui, si elles sont traitées ou éliminées de manière inappropriée, peuvent s’avérer potentiellement dangereuses pour la santé humaine et pour l’environnement.
Cependant, ces matières sont nécessaires au bon fonctionnement de votre appareil ou de votre machine. Pour cette raison, il vous est demandé de ne pas vous débarrasser de votre appareil ou machine usagé avec vos ordures ménagères.

(Spanish)
PARA USUARIOS DE LA UNION EUROPEA
El símbolo y los sistemas de reciclado descriptos a continuación se aplican para países de la Unión Europea y no se aplica para países en otras áreas del mundo.

Su producto Panasonic fue diseñado y fabricado con materiales de alta calidad y componentes que pueden ser reciclados y/o vueltos a usar.

El símbolo significa que los equipos eléctricos y electrónicos, baterías y acumuladores, al final de su vida útil, debe ser desechados separadamente de sus residuos domiciliarios.

Nota:
Si hay un símbolo químico impreso debajo del símbolo, este símbolo químico significa que la batería o acumulador contiene una cierta concentración de un metal pesado. Esto es indicado de la siguiente manera: Hg: mercurio, Cd: cadmio, Pb: plomo

En la Unión Europea hay sistemas de recolección separados para equipos eléctricos y electrónicos, baterías y acumuladores usados.
Por favor, disponga de ellos correctamente en el centro de recolección de residuos/reciclado de la comunidad de su localidad.

Por favor, ayúdenos a proteger el medio ambiente en que vivimos!

DISPOSAL OF UNIT

(Portuguese)
PARA UTILIZADORES DA UE
O símbolo e os sistemas de reciclagem descritos abaixo aplicam-se aos países da UE e não se aplicam aos países noutras áreas do mundo.

O seu produto Panasonic foi concebido e fabricado com materiais e componentes de elevada qualidade que podem ser reciclados e/ou reutilizados.

O símbolo significa que o equipamento eléctrico e electrónico, baterias e acumuladores, em final de vida, não devem ser deitados fora juntamente com o lixo doméstico.

Atenção:
Se estiver impresso um símbolo químico debaixo do símbolo de , este símbolo químico significa que a bateria ou acumulador contém um metal pesado numa determinada concentração. Estará indicado da seguinte forma: Hg: mercúrio, Cd: cádmio, Pb: chumbo

Na União Europeia existem sistemas de recolha separados para equipamento eléctrico e electrónico, baterias e acumuladores.
Por favor, entregue-os no seu centro de reciclagem/recolha de lixo local.

Por favor, ajude-nos a conservar o ambiente!

(Italian)
PER UTENTI UE
Il simbolo e i sistemi di riciclaggio descritti di seguito si applicano esclusivamente ai paesi dell'UE.

Questo prodotto Panasonic è stato progettato e realizzato con materiali e componenti di elevata qualità che possono essere riciclati e/o riutilizzati.

Il simbolo di riciclaggio mostrato di seguito indica che i dispositivi elettrici ed elettronici, le batterie e gli accumulatori, una volta esauriti, devono essere smaltiti separatamente rispetto ai rifiuti domestici.

Nota:
Se sotto il simbolo di riciclaggio appare un simbolo chimico, esso sta ad indicare che la batteria o l'accumulatore contengono metalli pesanti a determinate concentrazioni. Questo viene specificato come segue: Hg: mercurio, Cd: cadmio, Pb: piombo.

Nell'Unione europea esistono diversi sistemi per la raccolta dei rifiuti speciali quali i dispositivi elettrici ed elettronici, le batterie e gli accumulatori.
Si raccomanda di provvedere allo smaltimento di tali rifiuti secondo quanto previsto dalle normative vigenti in materia.

Aiutaci a conservare l'ambiente!

DISPOSAL OF UNIT

(Dutch)
VOOR GEBRUIKERS IN DE EU
Het symbool en de recycleersystemen die hieronder beschreven worden, zijn van toepassing op de landen in de EU en zijn niet van toepassing op landen in andere delen van de wereld.

Uw Panasonic product is ontworpen en gemaakt met materialen en onderdelen van hoge kwaliteit, die gerecycleerd en opnieuw gebruikt kunnen worden.

Het symbool betekent dat elektrische en elektronische apparatuur, batterijen en accu's aan het eind van hun leven apart van uw huisafval weggegooid moeten worden.

Let op:
Indien een chemisch symbool afgedrukt staat onder het symbool, betekent dit chemisch symbool dat de batterij of accu een zwaar metaal met een bepaalde concentratie bevat. Dit wordt als volgt aangegeven: Hg: kwik, Cd: cadmium, Pb: lood

In de Europese Unie zijn afzonderlijke inzamelingssystemen voor gebruikte elektrische en elektronische apparatuur, batterijen en accu's.
Wilt u deze op de juiste manier weggooien bij uw plaatselijk afvalinzameling-/recyclingcentrum in uw buurt?

Help ons het milieu waarin wij leven in stand te houden!

(Swedish)
FÖR ANVÄNDARE INOM EU
Den symbolmärkning och de återvinningssystem som beskrivs här nedan gäller länder inom EU och gäller inte länder i någon annan del av världen.

Din Panasonic-produkt har konstruerats och tillverkats med delar och material av hög kvalitet, som kan återvinnas och/eller återanvändas.

Symbolmärkningen innebär att elektrisk och elektronisk utrustning, batterier och ackumulatorer, vid slutet av deras livslängd, inte får slängas som hushållsavfall utan skall slängas separat.

Observera:
Om en kemisk symbol finns tryckt under denna symbolmärkning, betyder denna kemiska symbol att batteriet eller ackumulatorn innehåller en tungmetall med en viss koncentration. Detta indikeras på följande sätt: Hg: kvicksilver, Cd: kadmium, Pb: bly

I den Europeiska Unionen finns det separata uppsamlingssystem för använd elektrisk och elektronisk utrustning, batterier och ackumulatorer.
Gör dig av med sådana saker på rätt sätt på den speciella lokala platsen för återsamling/återanvändning.

Hjälp oss att bevara den miljö vi lever i!

DISPOSAL OF BATTERY

Location of a nickel-metal-hydride battery

This unit is provided a nickel-metal-hydride battery for the power failure warning device. The battery is located in the electrical box inside the cover on the lower right side. (Fig. 1)

The high voltage components are enclosed in the electrical box. The cover should be removed by a qualified engineer or a service personnel only to prevent the electric shock.

Disposal of nickel-metal-hydride battery

1. Turn off the power switch and battery switch, then disconnect the power supply plug.

2. As shown in the Fig. 1, remove 5 screws fixing the side cover with a screw driver and remove the side cover.

3. Remove 4 screws fixing the electrical box cover with a screw driver. (Fig. 2)

4. Disconnect the battery connector and remove 2 screws fixing the battery mounting plate. (Fig. 3)

5. Take out the battery (Fig. 4).

6. Follow the procedure for recycling or proper disposal.

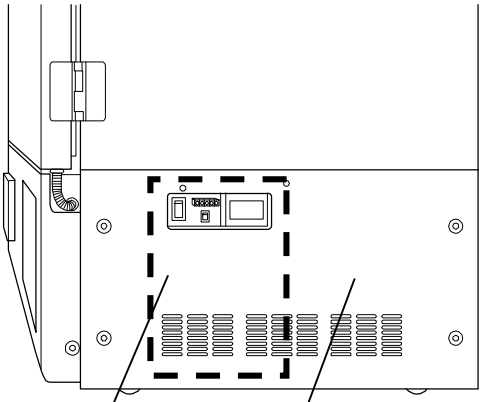


Fig. 1

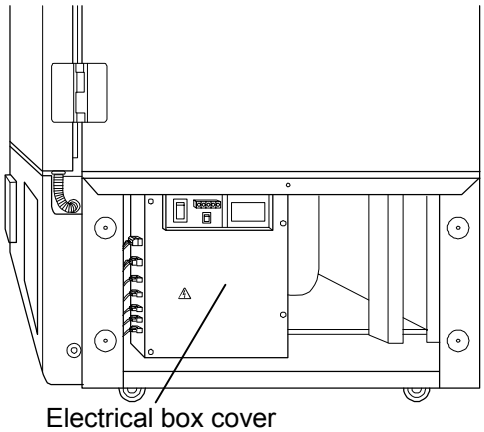


Fig. 2

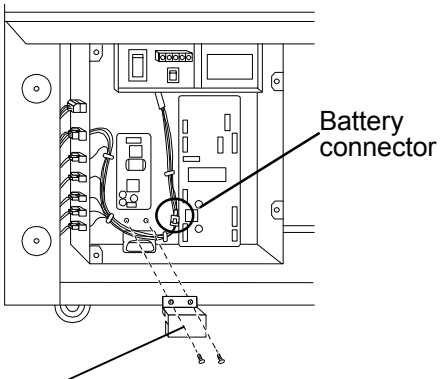


Fig. 3

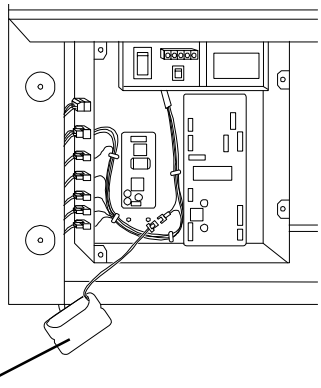


Fig. 4

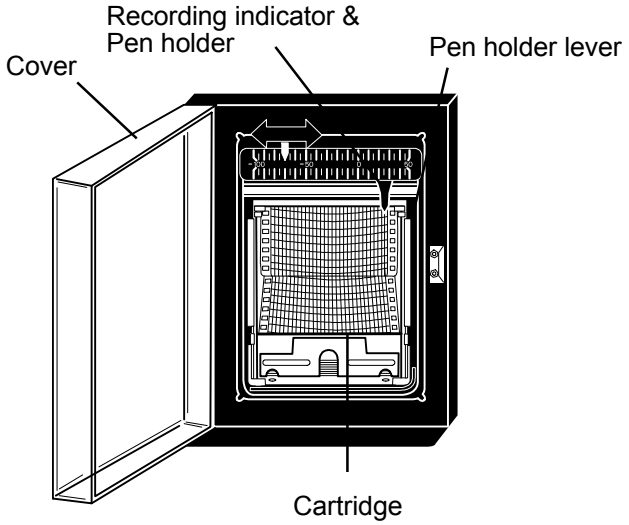
TEMPERATURE RECORDER (OPTION)

⚠WARNING

Always disconnect the power supply to the unit prior to attachment of a temperature recorder in order to prevent electric shock or injury.

A temperature recorder is available for the freezer as an optional component. The type of the temperature recorder is MTR-G85C and MTR-85H. For the attachment, the recorder fixing and recorder sensor cover is necessary. Contact our sales representative or agent for the installation of a temperature recorder.

Setting of MTR-85H



<Setting of recording paper>

1. Open the cover and let down the pen holder lever. With this operation, the pen point is apart from the recording paper.

2. Pull the cartridge out of the mounted position as shown in Fig. 1 and Fig. 2.

3. Set a new recording paper in place on the rear bottom of the cartridge. Set the hole on the recording paper in the cog of the recording paper driving assembly and feed the recording paper in the direction of the arrow by driving the cog wheel. (Fig. 3)

4. Adjust the recording paper properly according to the marking of date and time.

5. To replace the cartridge to the recorder, insert it horizontally first with the slot of the cartridge on the projection on the recorder and then set up the cartridge vertically.

6. Lift up the pen holder lever and close the cover.

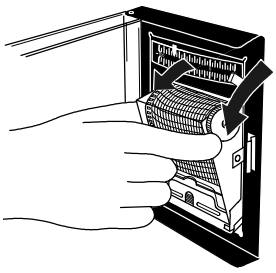


Fig. 1

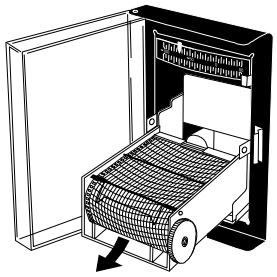


Fig. 2

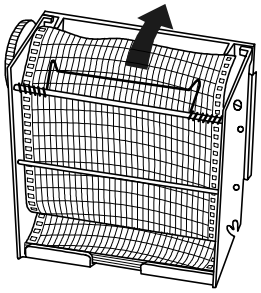


Fig. 3

TEMPERATURE RECORDER (OPTION)

<Replacement of dry cell>

Note :
This temperature recorder is designed for the manganese dry cell and the alkaline dry cell.
Do not use a rechargeable battery because the initial voltage of such battery is low. The rechargeable battery may cause the malfunction of recorder or shorten the battery life significantly.

1. Open the cover and let down the pen holder lever. With this operation, the pen point is apart from the recording paper.

2. Pull the cartridge out of the mounted position as shown in Fig. 1 and Fig. 2.

3. Open the case cover of dry cell at the left bottom (Fig. 3). Set a dry cell in the case with its minus pole positioned backward.

4. Close the case cover and replace the cartridge.

5. Lift up the pen holder lever and close the cover.

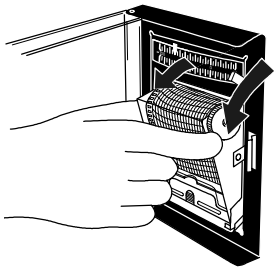


Fig. 1

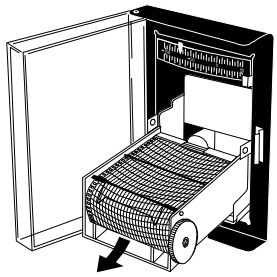


Fig. 2

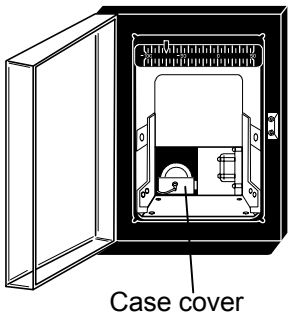


Fig. 3

<Setting of ink pen>

1. Open the cover and let down the pen holder lever. With this operation, the pen point is apart from the recording paper.

2. Pull the cartridge out of the mounted position as shown in Fig. 1 and Fig. 2.

3. Set a ink pen in the pen holder properly keeping the pen holder with the left hand. (Fig. 4)
Improper setting will result in inaccurate temperature recording.

4. Replace the cartridge and lift up the pen holder lever, and close the cover.

5. Check that the pen tip contacts with the recording paper properly.

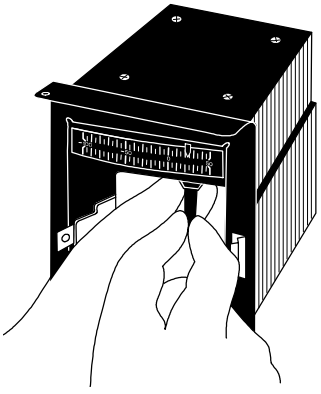
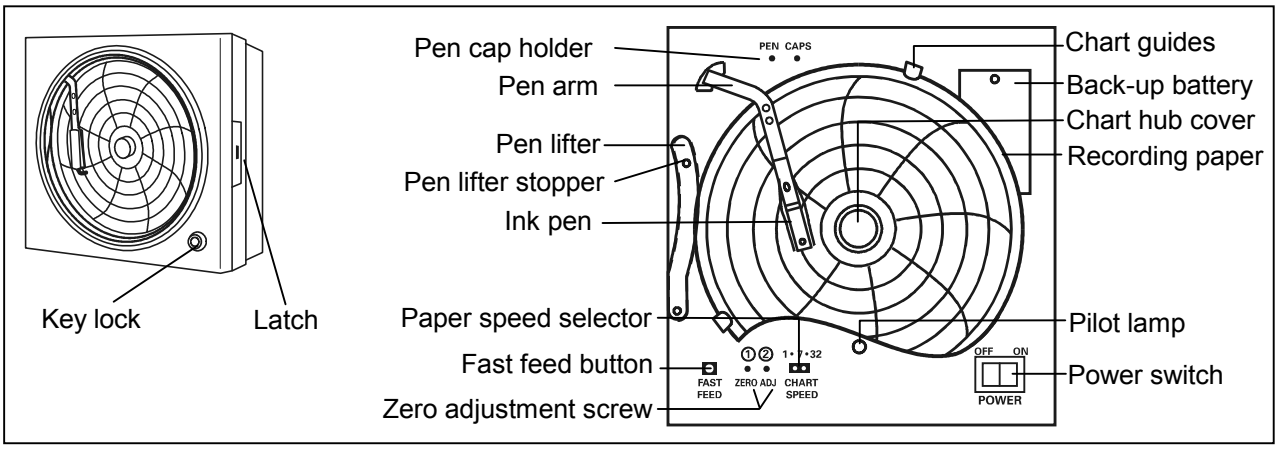


Fig. 4

TEMPERATURE RECORDER (OPTION)

Setting of MTR-G85C



Loading the ink pen:

1. Slightly raise the end of the pen lifter and remove from the pen lifter stopper. Then rotate clockwise as shown in Fig. 1.

2. Remove the ink pen from the bag and remove its cap. The cap can be conveniently kept on the cap holder located at the upper left corner.

3. Press both sides of the pen arm as indicated by the arrows to open the head clamp at A and B. (See to Fig. 2 illustration 1)

4. Position the ink pen so that the guide pins fit into the guide holes on the pen arm. (See to Fig. 2 illustration 2)

5. Press the two sides of the head clamp as indicated by the arrows to secure the ink pen. (See to Fig. 2 illustration 3) From the side view, the cartridge should fit perfectly on the arm. Confirm that the pen arm is attached to both sides of the ink pen.

6. After loading the ink pen, return the pen lifter to the original position. Confirm that the pen lifter has securely entered the pen lifter stopper.

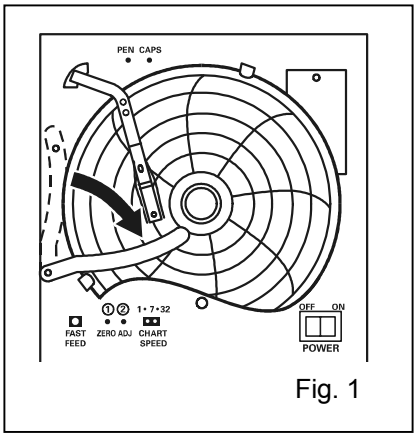


Fig. 1

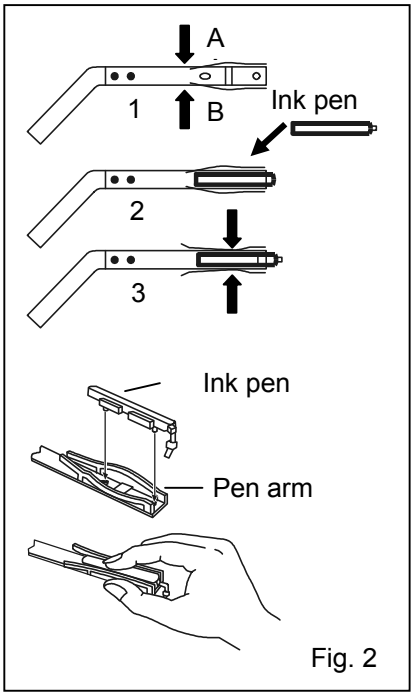


Fig. 2

TEMPERATURE RECORDER (OPTION)

Starting recording and setting the time:

Turn the power switch ON. The ink pen will move inward on the circular recording paper and stop temporarily at the 0% position (equivalent to the 40°C line). Then the ink pen will move to the position which indicates the measured temperature. (Fig.3)

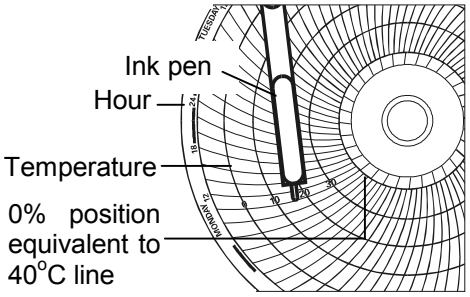


Fig. 3

Time setting Method:

Place the recording paper at a position slightly in front of the desired time (the recording paper is rotated to the left). Set the time by using the fast feed button to quickly rotate the recording paper.

The fast feed button can be used to accurately set the time.

When the recording paper speed is set to 32 days:

The center of the recording paper is divided into 32 equal sections. The lines extending from these lines serve as the 32-day time scale. (Fig.4)

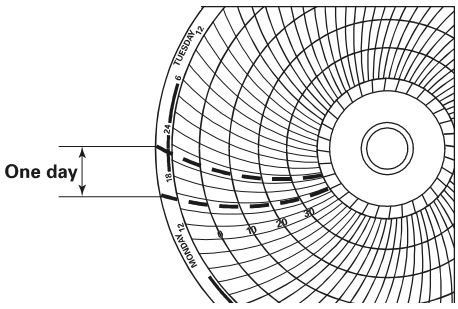


Fig. 4

Stopping recording:

1. Turn OFF the power switch.

2. When recording is stopped for a prescribed period, place the caps back on the ink pens to prevent the ink from evaporating.

Replacing the recording paper:

1. Slightly raise the end of the pen lifter and remove from the pen lifter stopper. Then rotate the pen lifter clockwise until the pen tip rests on the pen lifter.

2. Remove the chart hub cover, and then replace the recording paper.

3. Place the chart hub cover. Confirm that the new recording paper is inside of the chart guides.

4. Set the correct time.

TEMPERATURE RECORDER (OPTION)

Installation of MTR-G85C and MTR-85H

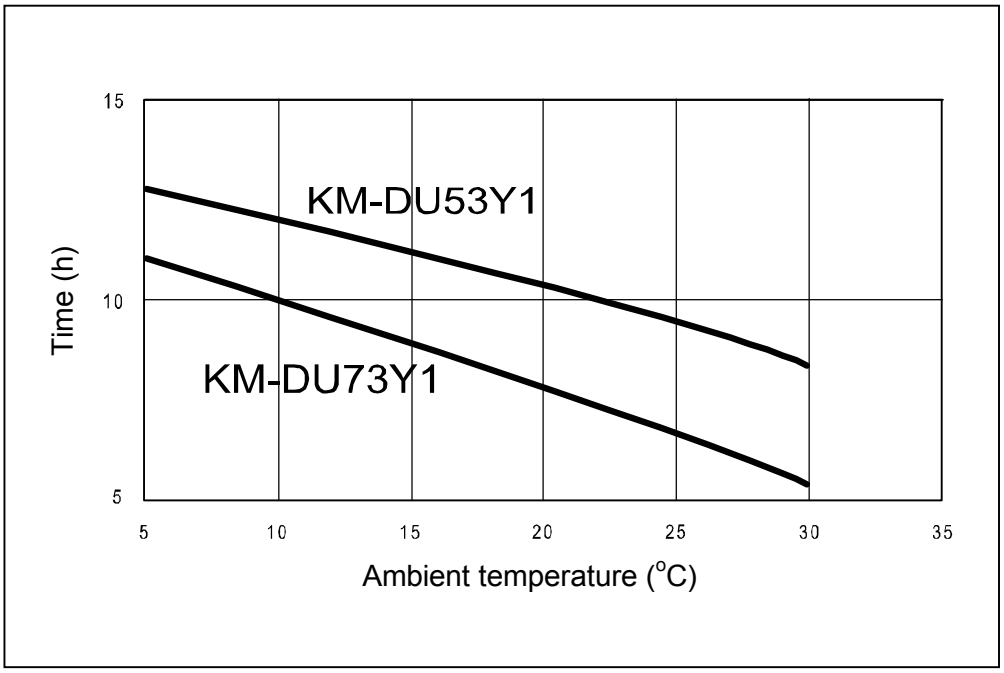
A temperature recorders is available for the freezer as the optional component. The type of the temperature recorder is MTR-85H or MTR-G85C. For the attachment, optional component is necessary as follows.

Temperature recorder	Recorder fixing	Recorder sensor cover
MTR-85H	MDF-S3085	KM-DUP01SF1
MTR-G85C	-----	KM-DUP01SF1

Contact our sales representative or agent for the installation of a temperature recorder.

BACKUP COOLING KIT (OPTION)

Following shows the time to keep chamber temperature at -70°C by using an optional backup cooling kit. Keep a liquefied CO_2 cylinder at ambient temperature lower than 31°C.



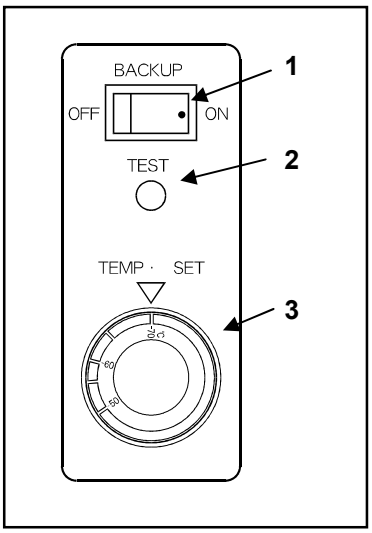
• The above data is the experiment value which uses liquid CO_2 30L. (no-load)

BACKUP COOLING KIT (OPTION)

⚠ WARNING

As with any equipment that uses CO_2 gas, there is a likelihood of oxygen depletion in the vicinity of the equipment. It is important that you assess the work site to endure there is suitable and sufficient ventilation. If restricted ventilation is suspected, then other methods of ensuring a safe environment must be considered. These may include atmosphere monitoring and warning devices.

This freezer can be provided with a backup cooling kit (CVK-UB2) which is available as an optional component. For the installation, refer to the instruction manual enclosed with the backup cooling kit. Contact our sales representative or agent for the installation of a backup cooling kit.

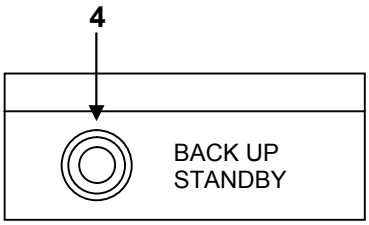


1. Switch of backup cooling kit (BACKUP)
When turning on the backup cooling kit, the backup standby lamp is brightened. This means that the backup cooling kit is ready. To stop the operation of the backup cooling kit, turn off this switch.

2. Test switch (TEST)
This switch is for checking the operation of backup cooling kit. Pressing this switch is resulted in the release of liquid carbon dioxide under any chamber temperature.

3. Temperature setting knob (TEMP. SET)
With this knob, set the temperature at which the backup cooling kit is operated. The effective set temperature range is between -50°C and -70°C.

Note:
Do not set the temperature setting knob to the temperature lower than -70°C to avoid the early consumption of CO_2 gas resulting from continuous injection.



Door switch box

4. Backup standby lamp (BACK UP STANDBY)
A backup standby lamp is turned on when the switch of backup cooling kit is on.

SMALL INNER DOOR (OPTION)

For KM-DU73Y1, the small inner door (MDF-7ID) is available as an optional component. The small inner door is suitable for standard shelf location.
For the installation, contact our sales representative or agent.

Note:
The cooling performance on the page 42 cannot be obtained when the small inner door (MDF-7ID) is installed.
Cooling performance : -82°C at the center of the chamber (ambient temperature; 30°C, no load)
An optional inventory rack IR-224U cannot be used when the small inner door is installed.

INTERFACE BOARD (OPTION)

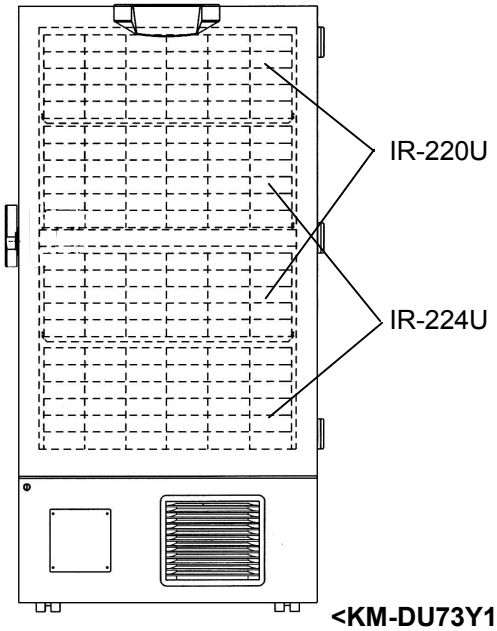
Installation of MTR-480

Contact our sales representative or agent for the installation of an interface board.

Note:
∗ When a data transmitting function to the personal computer is done, an interface board (MTR-480) and communication cable of 9 pin Dsub cross type for RS232C are necessary.

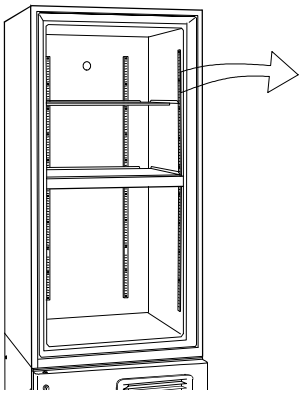
INVENTORY RACK (OPTION)

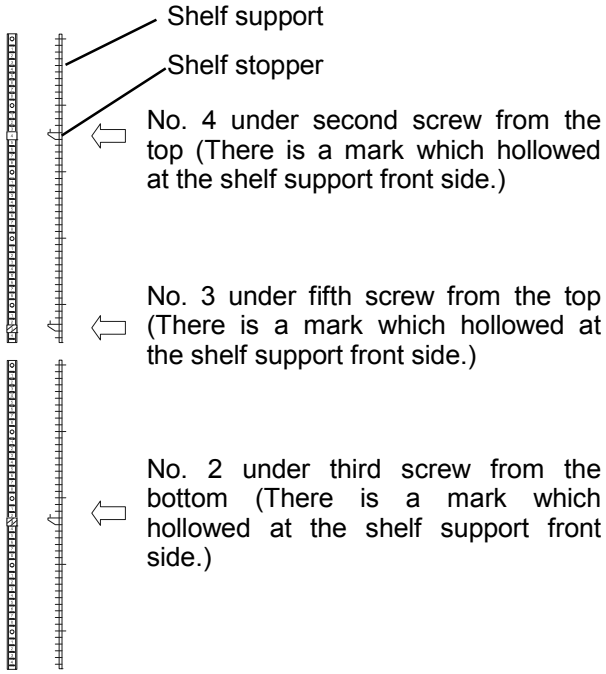
The optional inventory racks (IR-220U, IR-224U) are useful to store the precious materials in the chamber effectively. When the racks are used, it is necessary to adjust the height of the shelves. Set the shelf stopper as shown in the figure below.



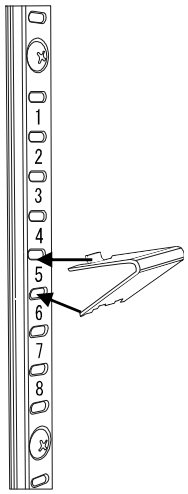
<KM-DU73Y1>

NOTE :
Only inventory rack IR-220U can be applied when the small inner door (MDF-7ID) is installed.





<Attachment of shelf stopper>



1. Insert the upper side.
2. Push-in the lower side

⚠ WARNING
Fix the shelves securely. And store the inventory racks securely.
Incomplete installation may cause injury or damage.

SPECIFICATIONS

Product name	Ultra-Low Temperature Freezer KM-DU73Y1	Ultra-Low Temperature Freezer KM-DU53Y1
Medical purpose	Storage of cells, organs, DNA, plasma.	
External dimensions	W1010 mm x D870 mm x H1990 mm	W770 mm x D870 mm x H1990 mm
Internal dimensions	W870 mm x D600 mm x H1400 mm	W630 mm x D600 mm x H1400 mm
Effective capacity	728 L	526 L
Exterior	Painted steel	
Interior	Painted steel	
Outer door	Painted steel	
Inner door	ABS resin panel with stainless frame, 2 doors	
Shelf	Stainless steel, 3 shelves (adjustable) Inner dimension; W848 mm x D533 mm Load; 50 kg/shelf	Stainless steel, 3 shelves (adjustable) Inner dimension; W608 mm x D533 mm Load; 50 kg/shelf
Access port	17 mm diameter, 2 locations (back x 1, bottom x 1)	
Insulation	Vacuum insulation panel + Rigid polyurethane foamed-in place	
Compressor	High stage side; Hermetic type, Output; 750 W Low stage side; Hermetic type, Output; 750 W	
Evaporator	High stage side; Cascade type, Low stage side; Tube on sheet type	
Condenser	High stage side; Fin and tube type, Low stage side; Shell and tube type	
Refrigerant	High stage side; R-290, Low stage side; R-170	
Temperature controller	Microcomputer control system	
Temperature display	Digital display	
Thermal sensor	Platinum resistance (Pt 1000Ω)	
Alarm	High temp. alarm, Low temp. alarm, Power failure alarm, Door alarm, Filter alarm	
Remote alarm contact	Allowable contact capacity: DC 30 V, 2 A	
Battery	Nickel-metal-hydride battery, DC 6 V, 1100 mAh, Auto-recharge (5HR-AAC)	
Accessories	1 set of key, 1 scraper, 1 stick for air intake port cleaning	
Weight	334 kg	291 kg
Optional component	Temperature recorder (MTR-G85C)* + Recorder sensor cover (KM-DUP01SF1) Temperature recorder (MTR-85H) + Recorder fixing (MDF-S3085) + Recorder sensor cover (KM-DUP01SF1) Recording paper (RP-85: MTR-85H, RP-G85: MTR-G85C) Ink pen (DF-38FP: MTR-85H, PG-R: MTR-G85C) Inventory rack (IR-220U, IR-224U) Interface board (MTR-480) Data acquisition system (MTR-5000) Backup cooling kit (CVK-UB2): LCO_2 Small inner door (MDF-7ID for KM-DU73Y1)	

Note:

• Design or specifications will be subject to change without notice.

• Refer to the updated catalog when ordering an optional component.

*: Power source of the temperature recorder shall be 220 V.

• When a data transmitting function to the personal computer is done, an interface board MTR-480 (option) and communication cable of 9 pin Dsub cross type for RS232C are necessary.

PERFORMANCE

Product name	Ultra-Low Temperature Freezer KM-DU73Y1	Ultra-Low Temperature Freezer KM-DU53Y1
Model number	KM-DU73Y1E	KM-DU53Y1E
Cooling performance	-86°C at the center of the chamber (ambient temperature; 30°C, no load)*	
Temperature control range	-50°C to -86°C (ambient temperature; 30°C, no load)	
Power source	AC 230 V/240 V, 50 Hz	AC 230 V/240 V, 50 Hz
Rated power consumption	790 W/820 W	700 W/740 W
Noise level	52 dB [A] (background noise; 20 dB)	
Maximum pressure	2.90 MPa	

Note：***: Maximum cooling performance.**

The chamber temp. reaches -86°C at ambient temp. of 30°C with noload.

⚠ CAUTION

Please fill in this form before servicing.
Hand over this form to the service engineer to keep for his and your safety.

Safety check sheet

1. Freezer contents : ☐Yes ☐No
   Risk of infection: ☐Yes ☐No
   Risk of toxicity: ☐Yes ☐No
   Risk from radioactive sources: ☐Yes ☐No

   (List all potentially hazardous materials that have been stored in this unit.)
   Notes :

2. Contamination of the unit
   Unit interior ☐Yes ☐No
   No contamination ☐Yes ☐No
   Decontaminated ☐Yes ☐No
   Contaminated ☐Yes ☐No
   Others:

3. Instructions for safe repair/maintenance of the unit
   a) The unit is safe to work on ☐Yes ☐No
   b) There is some danger (see below) ☐Yes ☐No
   Procedure to be adhered to in order to reduce safety risk indicated in b) below.

Date :
Signature :
Address, Division :
Telephone :

Product name:	Model:	Serial number:	Date of installation:
Ultra-Low Temperature Freezer			

Please decontaminate the unit yourself before calling the service engineer.