NANOCON
AUTOMATIC LIQUID TEMP. REGULATOR

OIL COOLER

User Manual

Applicable Type

- CIL 301E
- CIL 501E
- CIL 751E
- CIL 1101E
- CIL 1501E
- CIL 2201E



Thank you for purchasing our product.

This User Manual is for your maintenance supervisor or service representative's reference. Please review the contents to know the correct way to use the product. Please place this document in an accessible location for easy access.

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1. Overall Safety Please read this.

In this chapter, safety instructions are depicted in order to prevent risk of danger and property damage to customers and others who use the product.

The meaning of the below symbols found in the manual are as follows.



HAZARD: Excessively hazardous situation that will result in death or serious injury.



WARNING: Hazardous situation that can possibly cause death or serious injury.



CAUTION: Hazardous situation that could cause injury or physical damage.

1-1 Hazard



Mandatory

〈Transporting & Moving〉

When moving the product using the transportation hook, use a secure method to ensure that the main body stays balanced during transportation.

When moving the product using a fork lift, make sure to insert the rake all the way in so that it protrudes out of the main body and then transport in stable state.



Forbidden

〈Wiring Works〉

The input power line and signal line connection shall be conducted by a person in charge of maintenance inspection or manufacturing service (someone who has expert knowledge).

For the input power line and signal line, use wiring material that can accommodate the designated voltage and current specified in the specification sheet.

Make sure to connect the protective grounding wire to the input power line.

Make sure that the power is shut-off before doing wiring works.



Mandatory

〈Operation and Maintenance Inspection〉

Do not spray water directly on the unit while cleaning.

Do not put screws, fuse or tools on the top cover. The items may fall through the vent holes causing a dangerous situation. Use correct capacity fuse.

When opening the control box for maintenance & inspection, turn off the power supply. After shutting-off the power, wait a few minutes until the high voltage charger is discharged.

HAZARD



〈Do not use other than as specified〉

Do not use other than as specified in the specification and catalog.

Mandatory

1-2 Recommended

HAZARD



〈Transporting or Moving〉

If RESERVER TANK is attached, it is forbidden to transport with liquid inside.

〈During Installation〉

When installing the equipment, secure completely with bolts.

Forbidden



〈Transporting and Maintenance Works〉

Stop operation immediately if an error occurs.

When opening the main body cover for maintenance & inspection works, make sure to stop the operation.

After removing the main body cover, be careful not to touch the wiring surface of the fan, refrigeration circuit and the surface of the refrigeration compressor.

Do not touch the surface of the heater casing.

If the refrigerant gas leaks from the refrigeration circuit, it may cause bodily harm, so maintain sufficient ventilation inside the factory.

Forbidden



Mandatory

1-3 Caution



〈Transporting and Moving〉

If the main body is equipped with wheels (Castor) and moving by using these wheels, check the road surface condition in the direction of travel and provide sufficient safety measures to avoid the equipment falling over.

〈Power〉

If the equipment will not be operated for a long period of time, turn off the power. In case of stopping the equipment due to emergency, always remember to turn off the input power line.

Mandatory

WARNING



Forbidden

〈Installation Environment〉

Use is forbidden in environments that are outside the temperature and humidity range specified in the specification. Installation is forbidden in areas where regulations are placed or removed, oil mists have formed or there is liquid in the surrounding area.



Mandatory

〈Operation and Maintenance & Inspection〉

Do not place objects in front of intake/exhaust valves that may interfere with operation.
Hot air is expelled from the exhaust valve during operation so do not get close to it with face or other bodily parts.
If there is oil or water leak causing spillage around the floor, be careful to not slip.
Clean the air filter periodically. Refer to <7-2 Inspecting and Cleaning the Parts>



Usage

〈Usage〉

The C I L series is used for adjusting the temperature of clean oil.
(ex, spindle cooling, working fluid cooling, lubricating oil temperature control, ball-screw cooling, linear motor cooling) so do not use where chips or foreign materials can get in. (Coolant use, electric discharge machine liquid use).

2. General Information

Ambient Conditions ·Liquid Used

2-1 Ambient Conditions

(1) This product has a built-in refrigeration unit so there is a limit to setting the oil temperature range.
Please use within range depicted in Diagram. 2-1.
(2) Operating humidity range is 20～90%RH and should not cause condensation.
(3) Use in areas below 1,000m above sea level.

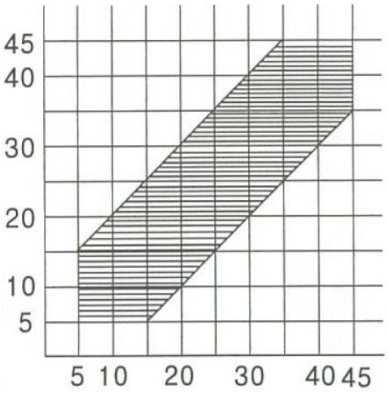


Diagram 2-1. Operating Temperature Range

2-2 Liquid Used

(1) This product is a temperature control device for mineral based working oil and lubricating oil.
It cannot be used with cutting oil (liquid), grinding oil (liquid), kerosene, gasoline, chemical products, and food liquids.
(2) About viscosity
Use liquids within the range specified in Diagram 2-2.

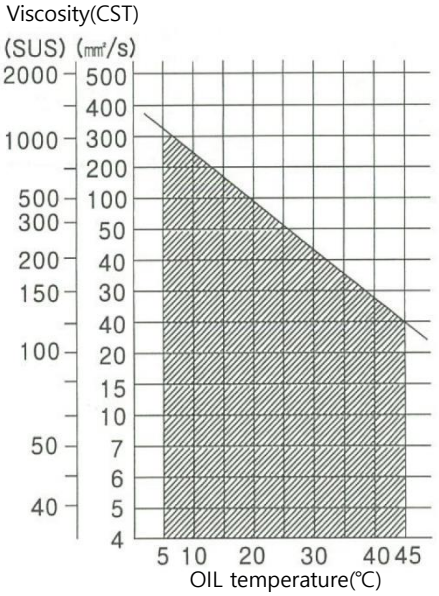


Diagram 2-2.Oil viscosity change following change in surrounding temperature

HAZARD	
Mandatory	Serious failure may occur if correct fluid is not used. If non-recommended fluids are used, free A/S is not provided. Use correct fluid.

(3) About the oil viscosity and NANOCON
In order to increase heat exchange efficiency, use low viscosity oil. (VG02-10 recommended). When high viscosity oil is used, refrigeration capability decreases. (especially during winter [less than 5℃ room temperature]), the viscosity increases). When intake resistance increases, noise can occur from oil pump.

CAUTION

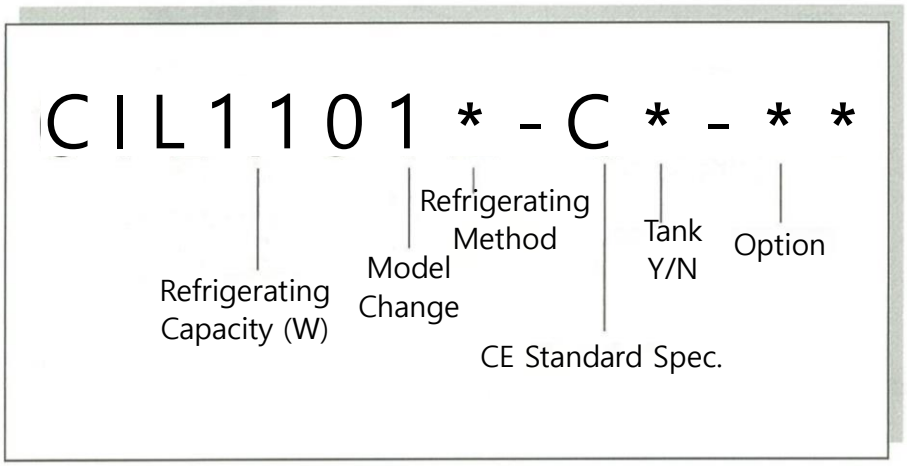
Mandatory

This equipment uses environmentally friendly refrigerant in the refrigeration circuit so when disposing, please contact a refrigerant handling/collection company or contact us to return the used refrigerant for disposal.

3. Type and Spec.

·Fluid used ·Spec. ·Exterior

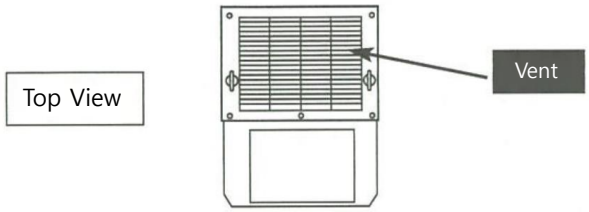
3-1 Type code



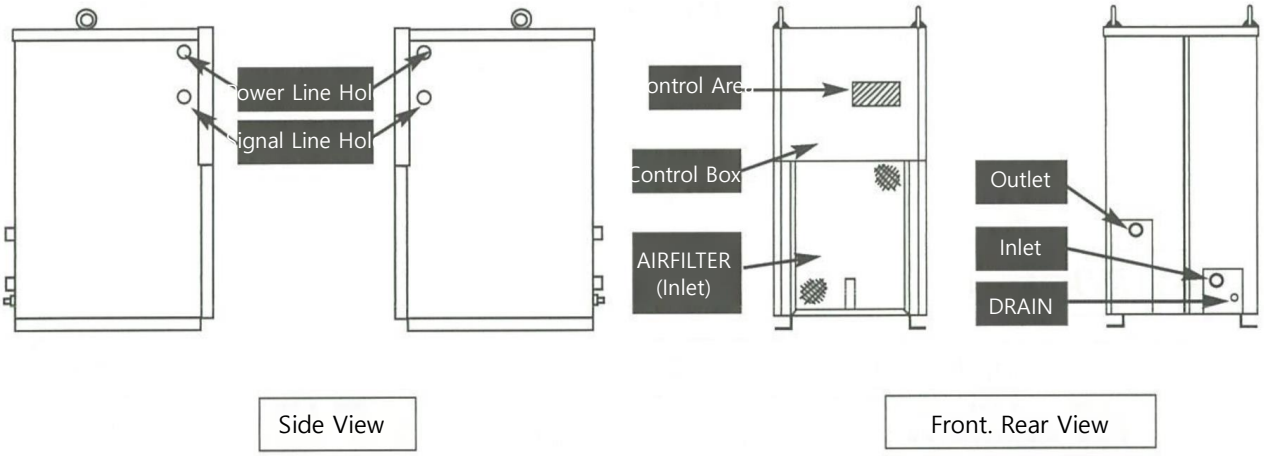
3-2 Specification

	CIL301A*	CIL501A*	CIL751A*	CIL1101A*	CIL1501A*	CIL2201A*	CIL3800A*
External dimension (W*D*H)	350 x 450 x 675	350 x 450 x 675	350 x 450 x 825	380 x 475 x 935	445 x 510 x 950	570 x 575 x 1130	730 x 870 x 1455
Ambient Temp.	STANDARD : 5 ~ 45℃ / OPTION : H ⇒ High temp. use (5~50℃)						
External Color	STANDARD : BLACK / OPTION : To be discussed						
Refrigerating Power (60 / 50 Hz)	1160 / 1390 W	1520 / 1800 W	2900 / 3480 W	3820 / 4500 W	4830 / 5810 W	8820 / 10500 W	13600 / 16300 W
Refrigerating Capacity	560W	670W	1050W	1340W	2100W	3180W	5460W
Refrigerant	R-410A					R-407C	
Condenser	STANDARD : Air Cooled ALUMINUM CONDENSER / OPTION : Air Cooled CU PIPE+ALUMINUM PIN CONDENSER						
Fan Motor	100W	100W	200W	100W x 2	100W x 2	200W x 2	200W x 2
Cooling Device	Constant Flow Forced Circulating Type						
Circulating Flow	12.6 / 15.1(L/min)		18/ 21.6(L/min)	24.3 / 29.1(L/min)	30 / 36(L/min)	39 / 46.8(L/min)	78 / 93.6(L/min)
Max Op. Pressure	0.5 Mpa (approx. 5kgf/㎠)				0.7 / 0.55 Mpa	0.6 / 0.45Mpa	0.6 / 0.45 Mpa
Temp. Precision	±0.1℃ ~ 0.2℃ (Excessive variance not included)						
Power	STANDARD : AC200V 50/60Hz, AC220V 60Hz / OPTION : To be discussed						
Max Power	6.5A / 2.5KWA	8.0A / 3.1KVA	14.0A / 5.4KVA	15.0A / 5.8KVA	19.0A / 7.3KVA	22.0A / 8.4KVA	27A / 10.4KVA
Temp. Controller	Digital Type PID Controller						

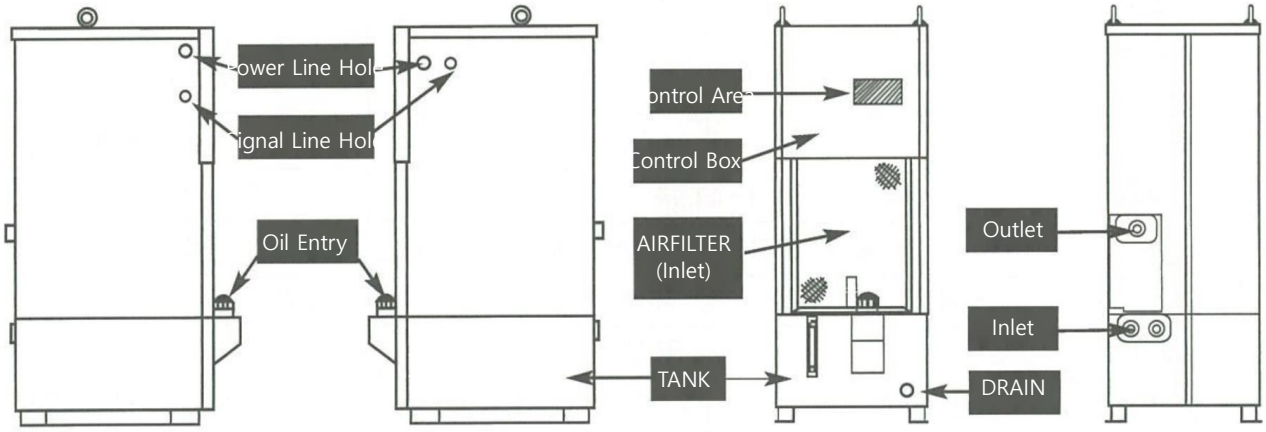
3-3 Exterior



☐ **TANK Detachable Type**



☐ **TANK Integrated Type**



4. Installation Method

·Location ·Piping ·Oiling ·Wiring

4-1 Location

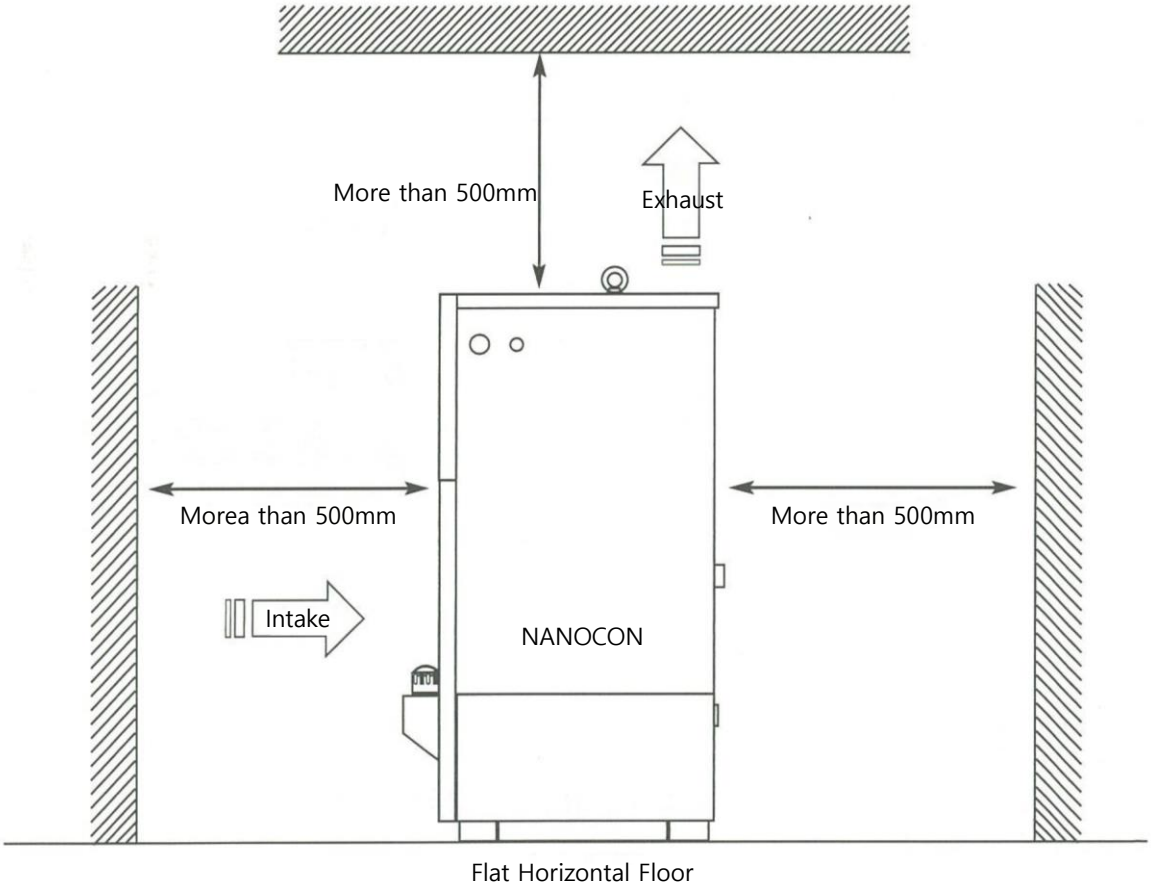
(1) Install in a location where it is not exposed to direct sunlight and on a flat horizontal place without vibration.

(2) This product intakes air from the inlet of the condenser.
Please make sure low temperature clean air can be supplied as possible.

(3) Ensure that the air intake/exhaust area of the product has at least 500mm of space from the intake/exhaust points considering the cooling capacity and the maintenance & inspection.

(4) Install in a location that has good ventilation and low humidity.

(5) Install where exhaust air will not circulate and re-enter through the intake area.



CAUTION

Mandatory

When transporting or moving, make sure there are no inclinations to the left/right or front/back of more than 40 degrees. If it tilts by more than 1 degree past its limit, it may cause the equipment to malfunction. Also avoid strong impact or vibration as this can cause the gas (refrigerant) to leak.

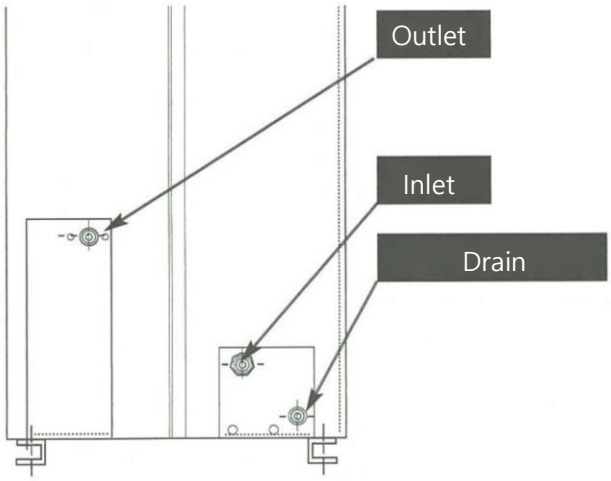
4-2 Piping Connection

This equipment has a built-in TROCHOID gear pump.
When connecting the piping, take caution of the following.

(1) Use piping, hose with same size and thickness specified in Table 4-1 for connection piping diameter.
(2) Suction pressure must be -0.3MPa or less and the discharge pressure should be 0.3 to 5 MPa or less.
(3) Attach suction filter with 100~150 mesh at inlet side. (For tank type, it is built-in during assembly)
(4) Before start-up, check whether priming water has been injected (if it is not a submersible pump) and if there is any leak in the piping.
(5) After start-up, check if piping has become loose and whether air has mixed in.

Table 4-1 Piping Diameter

Type		CIL301	CIL501	CIL751	CIL1101	CIL1501	CIL2201	CIL3801
Piping Diameter	Inlet Piping	RC 1/2"	RC 1/2"	RC 3/4"			RC 1"	
	Outlet Piping	RC 1/2"			RC 3/4"		RC 1"	



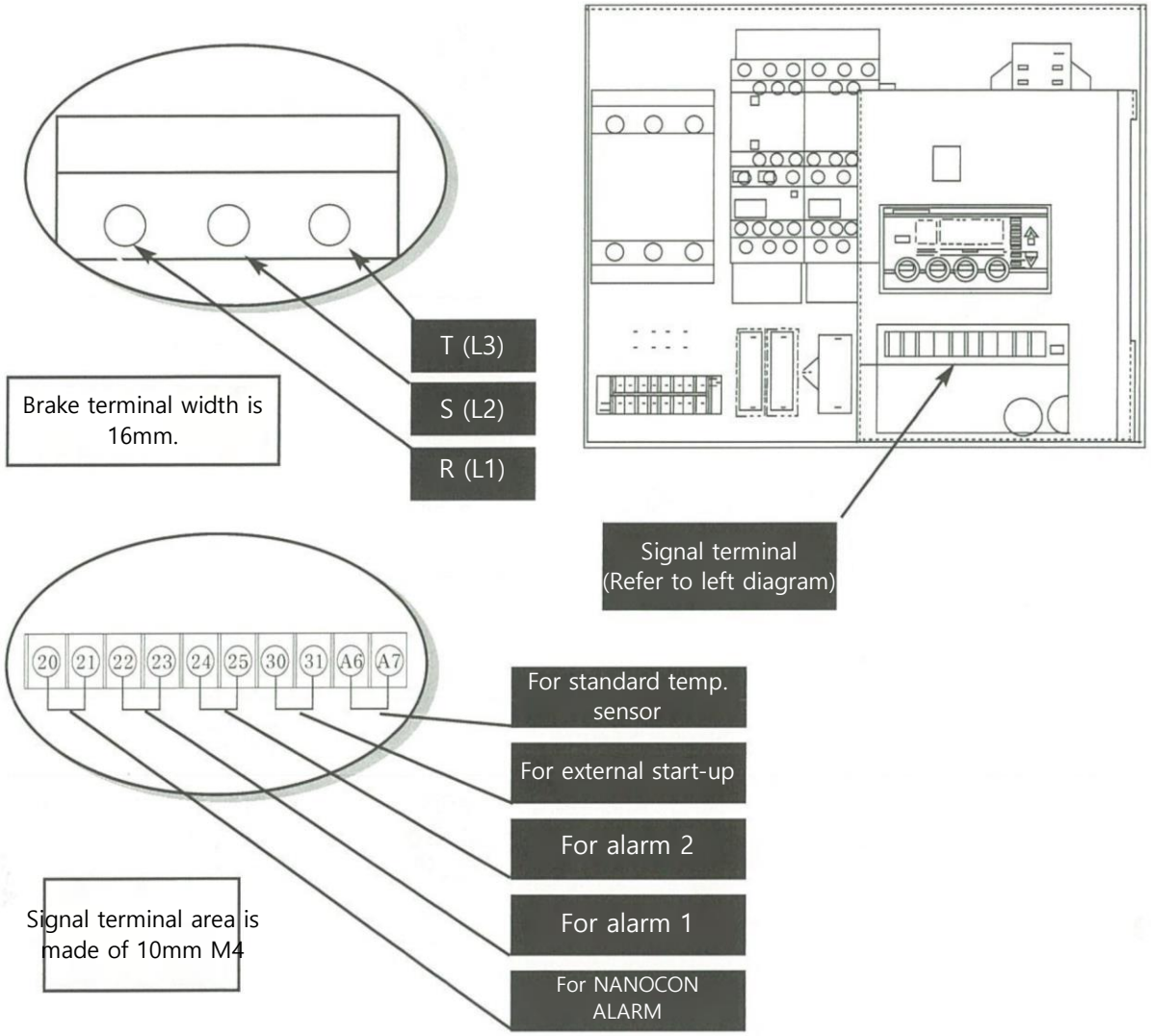
4-3 Oiling

Supply oil from the oil entry point of the product up to the regulated oil level. (If there is no tank, this is not applicable). Refer to Table 4-2 for Oil Supply Amount.

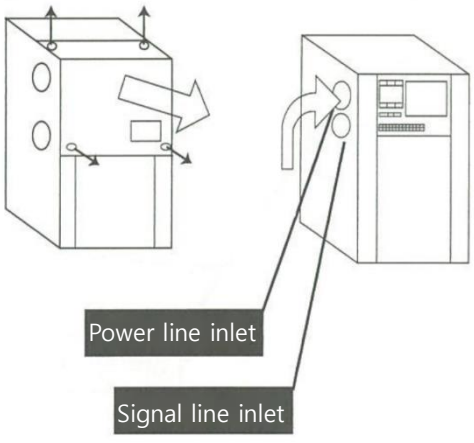
Table 4-2 Reference Oil Supply Amount

Type	CIL301	CIL501	CIL751	CIL1101	CIL1501	CIL2201	CIL3801
Reservoir oil amount [L] for max. fluid surface (H Level)	20	20	CT : 20 DT : 40	40	60	120	175
Inside cooler oil amount [L]	0.5		1		1.5	2	2.5

4-4 Wiring Connection



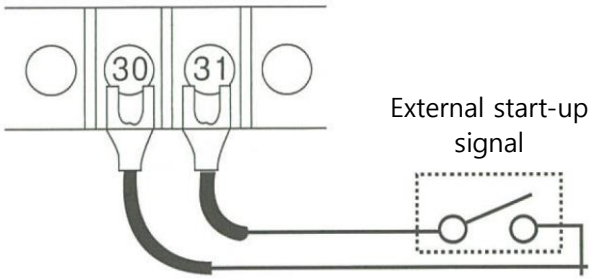
(1) Power connection



1) Remove the main body control box cover, and check the location of the power line.
2) Determine the power capacity by referring to the specification table.
3) From the power inlet, connect the Earth line through the connection hole.
4) Connect the power lines R(L1), S(L2), T(L3) to the breaker lines R(L1), S(L2), T(L3).

● The equipment has a negative-phase function so that if the lines are mixed up while power is supplied, the control panel will show nothing. Make sure that the order of each of the R(L1), S(L2), T(L3) phases of the 3-phase power supply have not changed before connecting.
[As an OPTION, there is an alarm (ALPH) function in case of negative-phase connecting]

(2) When starting-up by external signal, connect the starting signal to the external start-up purpose terminal block.
When the terminals are connected, operation starts.



(3) Connecting to alarm output contact
When connecting to alarm output contact, connect to signal terminal block. For details of the alarm, refer to the "Alarm Setting Method".

(4) Standard temperature sensor attachment (OPTION) is attached with "R1/8 screw attachment".
Insert through the machine side to install. (bed or column)
Connect the wiring from the inlet at the left side of the equipment to the terminal block.
Refer to the circuit diagram to check the line numbers of the terminal block.

The standard temperature sensor is not attached as a standard specification.

CAUTION

Mandatory

Single-pole single-throw operating S/W or operating prompt with albeit contact minimum adaptive load is as below. It shall satisfy DC24V, 20mA.

CAUTION

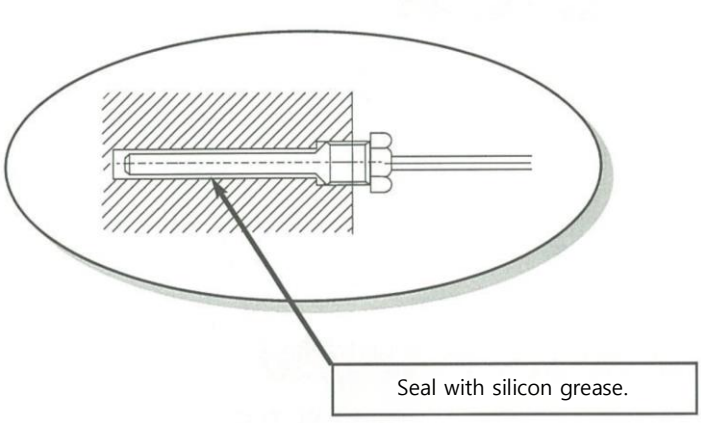
Mandatory

Contact capacity shall be as follows.
Resistance DC30V, 3A minimum adaptive load is as below. It shall satisfy DC10V, 5mA. When connecting to inductive load, always use SURGEKILLER at the same time.

CAUTION

Mandatory

Please take sufficient caution to avoid the sensor lines getting in contact with noise or direct sunlight.
When sealing with silicon, make sure no air is trapped inside.



4-5 Time Chart

After power supply, signal is outputted after 1 second

Alarm (NANOCON main alarm)

Operation Status	Set Value		Power OFF	Power ON	In operation	Operation Stop	Error	RESET
Normal [Closed]	00	ON						
		OFF						
Normal [Open]	01	ON						
		OFF						
In operation [Closed]	10	ON						
		OFF						
In operation [Open]	11	ON						
		OFF						

CAUTION

Mandatory

When applying alarm signals to company's products, please set the timer to more than 1 second.

After power supply, signal is outputted after 1 second

Alarm 1, 2

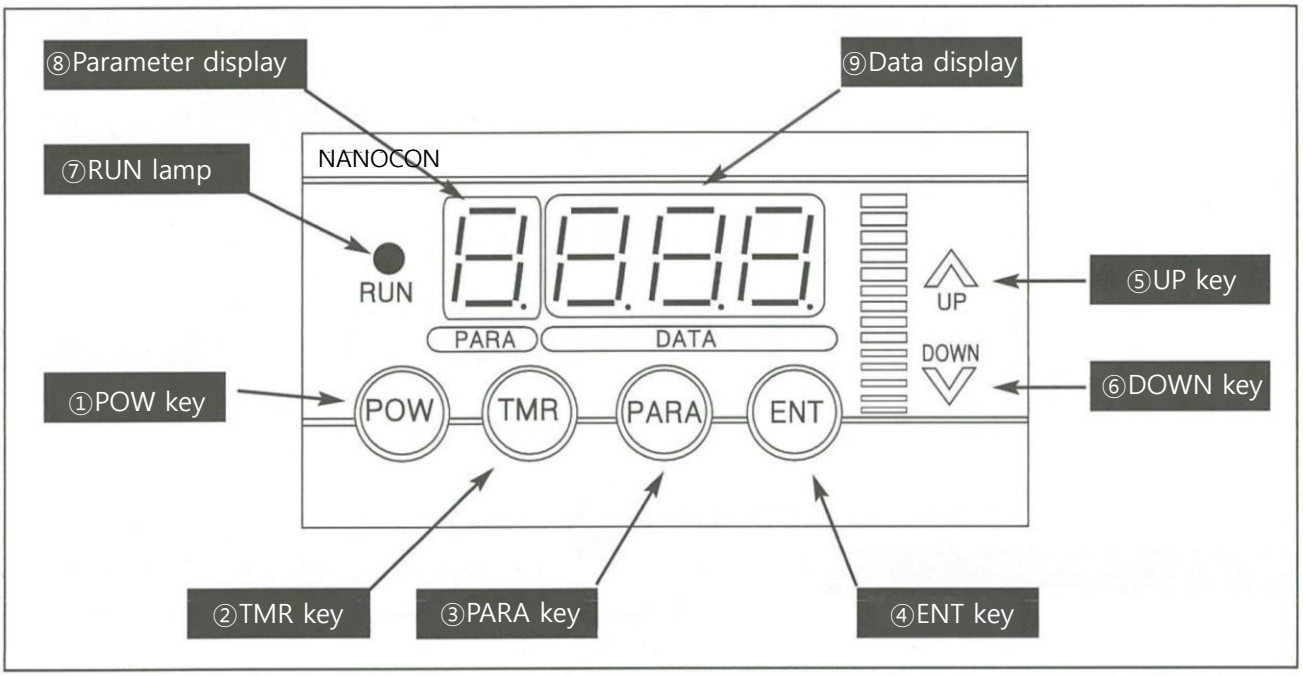
Operation Status	Set Value		Power OFF	Alarm			Alarm 1.2 Error		
				Power ON	Op. Start	Op. Stop	Power ON	Op. Start	Op. Stop
ON when upper limit alarm setting has error	001	ON							
		OFF							
ON when lower limit alarm setting has error	010	ON							
		OFF							
ON when outside upper/lower limit alarm setting	011	ON							
		OFF							
ON when FIL clean alarm set time is exceeded	100	ON							
		OFF							
OFF when lower than upper limit alarm setting	101	ON							
		OFF							
OFF when lower than lower limit alarm setting	110	ON							
		OFF							
OFF when outside upper/lower alarm setting	111	ON							
		OFF							
Not used	000								

Signal output 2 seconds after power supply

5. Controller Operating Method

·PANEL ·Parameter setting ·Start-up ·Maintenance

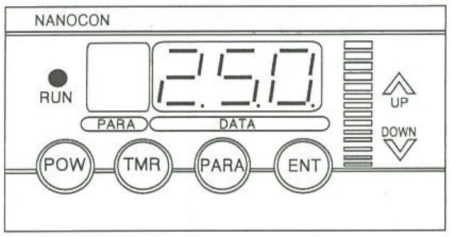
5-1 Control Panel Details

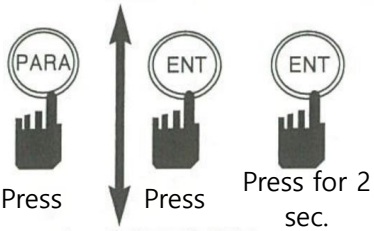


Keys	Main Function	Special Function
① POW	Power ON / OFF (Start / Stop) key	
② TMR	Start-up timer setting key Set parameter Press key to go back to previous stage Refreshes 1 item at a time	Hold down for 2 seconds to change to reserve function
③ PARA	Parameter setting key Press key to go to next stage Refreshes 1 item at a time	
④ ENT	Displays current temperature For saving entry data Hold down for 2 seconds to save changed data	For changing control mode (For displaying fluid temperature, hold down for 2 seconds.)
⑤ UP	Data setting key Press key to raise the setting data value.	
⑥ DOWN	Data setting key Press key to lower the setting data value.	
⑦ RUN lamp	Lights-up during operation, turns off during alarm or operation stop.	
⑧ Parameter Display	Red LED During parameter display, data number is displayed	
⑨ Data display	Green LED Displays current oil temperature and other data.	

5-2 Parameter Setting Method

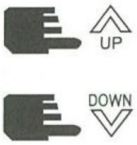
Displays current oil temperature



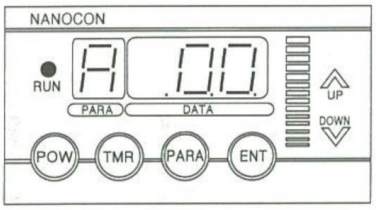


Press Press Press for 2 sec.

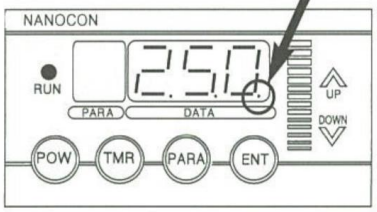
[rotation (return) (save)]



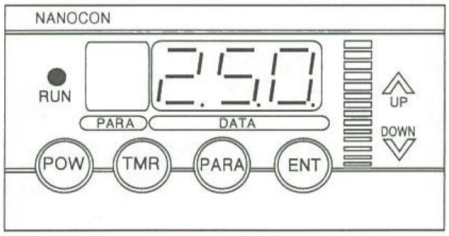
Press together for 1 sec.



[user parameter change/confirmation display]
※ Press for 2 sec.
(Data will not change if pressed for short time)

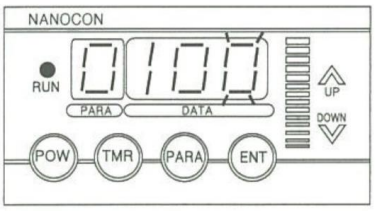


[key lock]
Far right bottom round segment lights-up





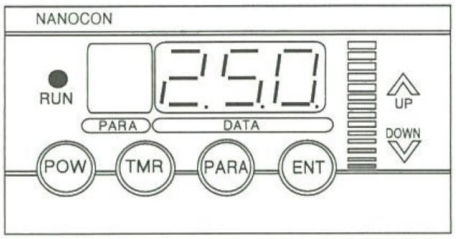
Press for 2 sec. rotation, (save)

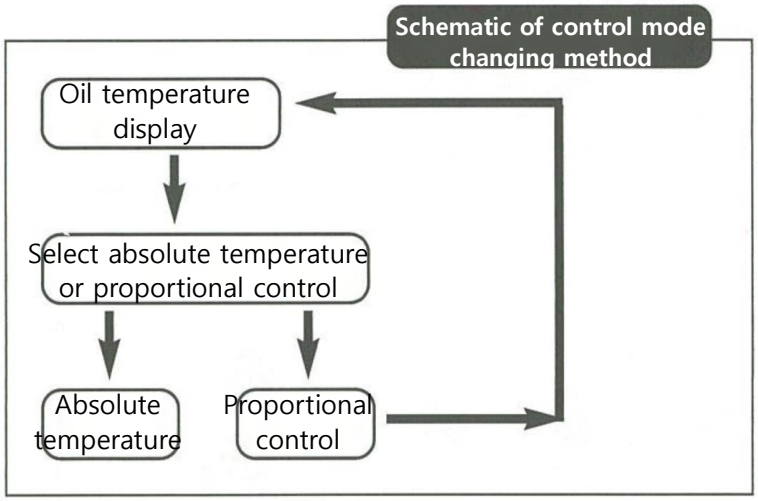


[Control mode change screen]
Far right segment flickers
Data does not change if pressed for short time

① **Current oil temperature display**

When power is supplied, the current oil temperature is displayed.



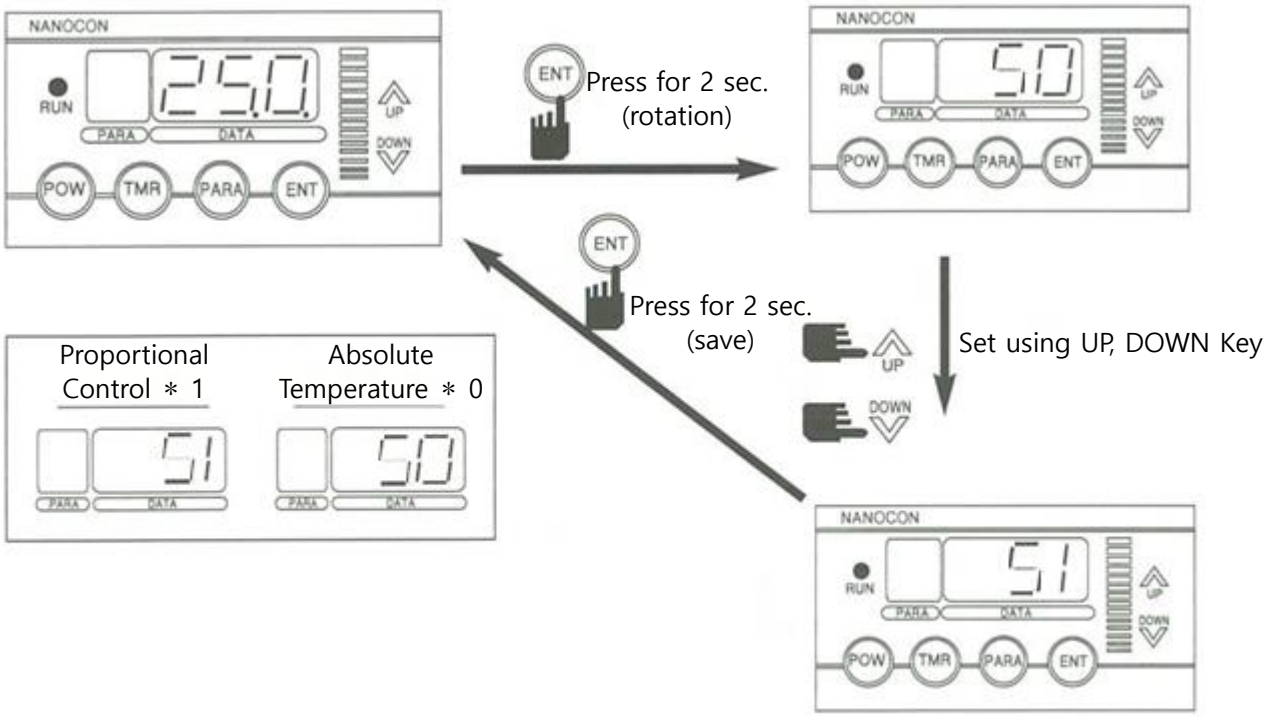


② **Changing to Absolute Temperature, Proportional Control**

Press the【ENT】key for 2 seconds.

When the far right segment flickers, hit【UP】【DOWN】key to change the values.

Press the【ENT】key for 2 seconds to go back to temperature display and exit.



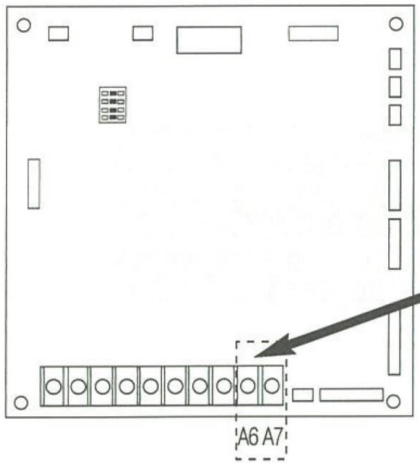
③ Changing from room temperature proportional control to gas temperature proportional control

a. Stop operation.

b. Replace the room temperature sensor connected to the terminal block of the board with the inside the manufacturing machine. By starting the operation, it is changed to gas temperature proportional control.

CAUTION

When changing from room temperature proportional control to gas temperature proportional control, a separate sensor needs to be purchased.



Replace existing temp. detecting sensor, terminal block and sensor.

Room temp. sensor -> Gas tuning sensor
Or
Gas tuning sensor -> Room temp. sensor

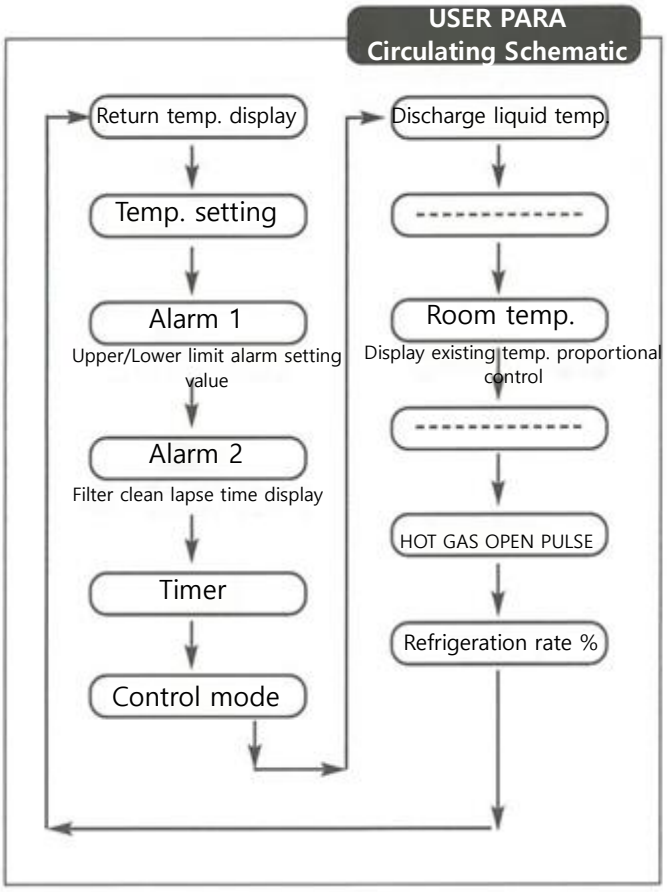
③ Changing the USER parameter

By pressing the【PARA】key at the current temperature display, the display changes as shown on the right.

Press the【TMR】key and display changes in reverse order.

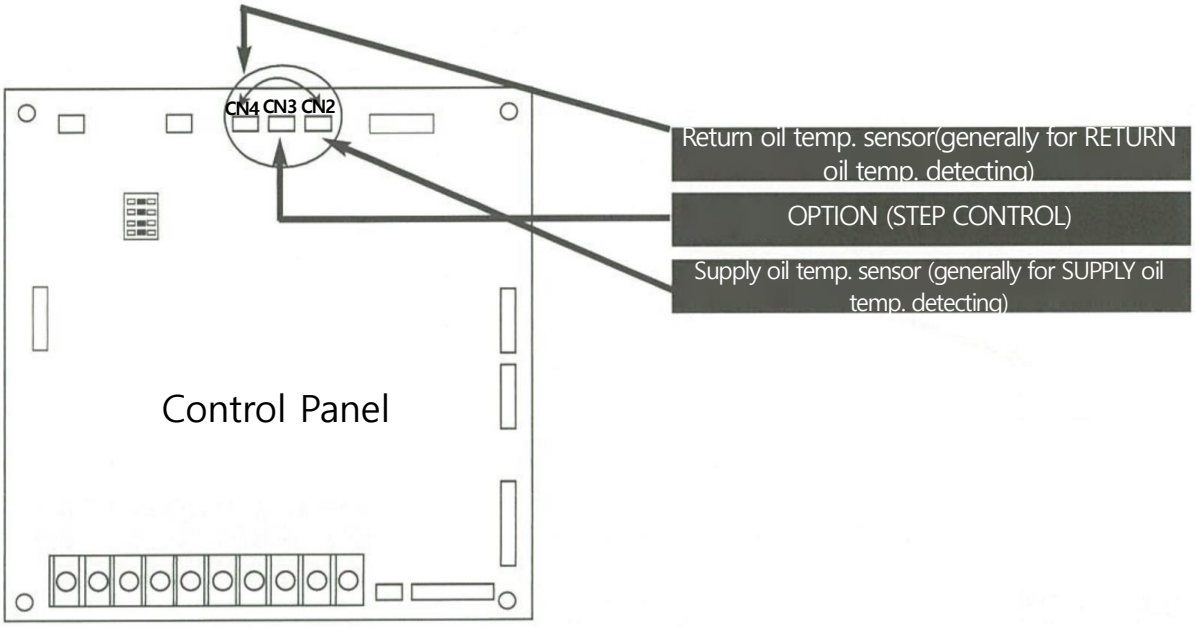
.

● Depending on the common parameter setting, the display of the USER parameter will change.



⑤ Changing RETURN temperature and SUPPLY temperature control

1. Stop operation and turn power off.
2. Open the FRONT COVER and from the control panel control sensors, switch the return oil temperature sensor CN2(A4.A5) and supply oil temperature sensor CN4(A8.A9) connections the other way around.
3. Selecting the controls for absolute temperature and proportional control are the same.



※ The object to control is based on the sensor connected to the Main Board CN2 connector.

When the CN2 connection sensor is the RETURN liquid temperature sensor --- Control the RETURN liquid temperature.

When the CN2 connection sensor is the SUPPLY liquid temperature sensor --- Control the SUPPLY liquid temperature.

Setting room temperature

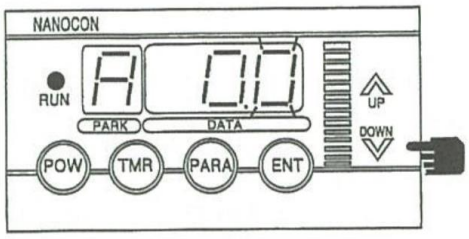
1) In case of temperature proportional control

PARA display shows「A」and the far right LED blinks.

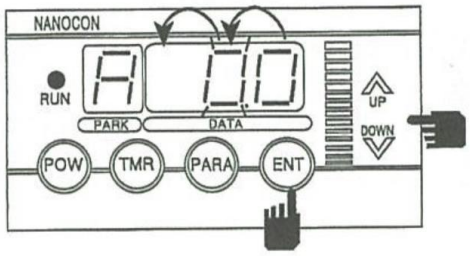
Set using【UP】【DOW】keys or,

press【E N T】key and the blinking L E D changes digits, so shift to the target decimal point, then

press the【U P】【DOWN】keys to adjust setting.



or

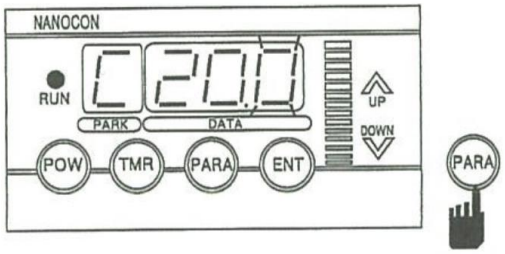


Setting range can be set within -9.9 -+9.9℃ at 0.1 ℃ intervals.

Press the【ENT】for 2 seconds to store data and the current liquid temperature is displayed.

CAUTION

Factory setting is set to room temperature proportional control type「A.0.0」and absolute temperature type「C 20.0」.



Press

2) In case of absolute temperature type

In the PARA display,「C」is displayed.

Like proportional control, decimal places can be changed by【U P 】【D O W N 】keys, to change the target temperature.

Setting range can be from 5.0～45.0℃ at 0.1 ℃ intervals.

Press the【ENT】key for 2 seconds to store the data and, the current liquid temperature is displayed.

3) Before setting the Alarms 1 and 2

Before setting the Alarms 1 and 2 with USER parameter, it is necessary to first select the type of alarm from the shared parameters. Alarm types are as the below table. Please refer to "Changing Shared Parameters" for the setting method.

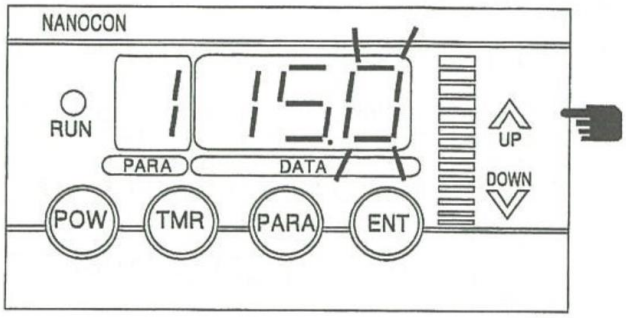
Alarm Type	Set Value	Alarm Type	Set Value
None	0 0 0	F I L cleaning alarm(ON when exceeds set time)	1 0 0
Upper limit alarm(ON when above set value)	0 0 1	Upper limit alarm (OFF when above set value)	1 0 1
Lower limit alarm(ON when below set value)	0 1 0	Lower limit alarm (OFF when below set value)	1 1 0
Upper/Lower limit alarm (ON when outside set value)	0 1 1	Upper/Lower limit alarm (OFF when outside set value)	1 1 1

4) Setting Alarm 1

「1」 is displayed in PARA display and far right LED blinks.

Use【UP】【DOWN】key to move setting values or hit the【E N T】key to move the blinking LED cursor to desired decimal place.

Press【U P】【DOWN】key to control setting value.



Setting range will vary by the type of alarm so please refer to below table.

Press the【ENT】key for 2 seconds to save the data and displays the current fluid temperature.

(Releasing the F I L Clean Alarm follows the same method)

CAUTION

Alarm 1 factory setting is set to upper/lower limit and Alarm 2 is set to FIL Clean alarm

■ User PARAMETER DATA display

1) Setting data display

Hit the【P A R A】key and the following 9 items are displayed.

Data cannot be changed after control mode so press the【E N T】key for 2 seconds to go back to displaying the current fluid temperature.

PARA Display	Meaning	Description	Other (marks)
	Control Mode	Displays current control mode	Displays in all control mode
3	OHS.	Displays SUPPLY oil temperature	Displays in all control mode
	-	-	-
5	Standard Temperature	Room temperature is displayed for proportional control type only	Control mode (01)

Changing the Control Mode

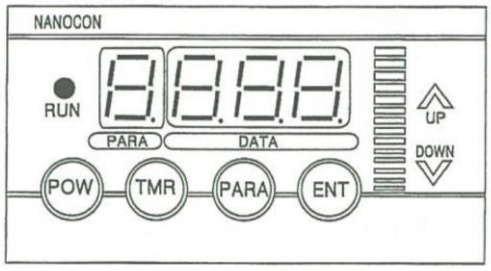
Press the【E N T】key for 2 seconds to change to control mode. When setting is complete, press the【E N T】key for 2 seconds.

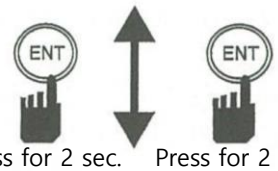
CAUTION

Factory setting is set to absolute temperature or proportional control type.

If control mode has been changed, reset the control before re-starting.

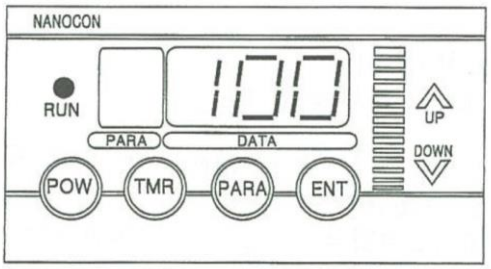
Display	Control Mode
00	ON / OFF Absolute temp.
01	ON / OFF Proportional control





Press for 2 sec. (Initiate)

Press for 2 sec. (Renew)



6. Operating Method

·Operation
·Confirmation ·Stopping

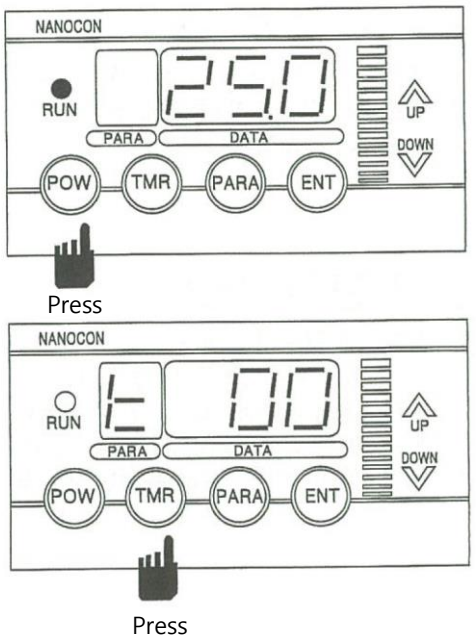
6-1 Operation

(1) Operation by external activation signal

When the signal line connection following chapter 4 - 4(2) is connected, the RUN lamp lights up in the controller and operation starts.

(2) Manual operation by POW KEY

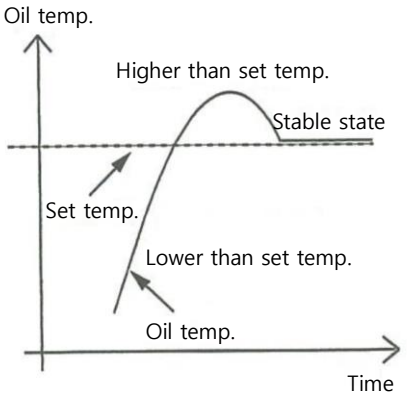
Press the【POW】key in control panel and the RUN lamp lights up in the controller and operation starts.



6-2 Confirmation

(1) Movement during operation

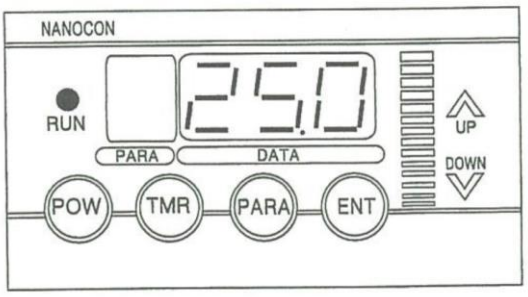
When the equipment begins operation, the oil pump operates circulating the oil. If the oil temperature is under -0.5℃, refrigeration does not operate. If heater is attached, heat to 「Set temp. – parameter value (normally -0.2℃」. When the oil temperature exceeds the set temperature of -0.5℃ due to mechanical heat or heat from the heater, the refrigeration starts operation and through the ON/OFF control, the oil temperature is kept at ±1℃ of the set temperature.



(2) Confirm the status of operation by monitoring through the control panel.

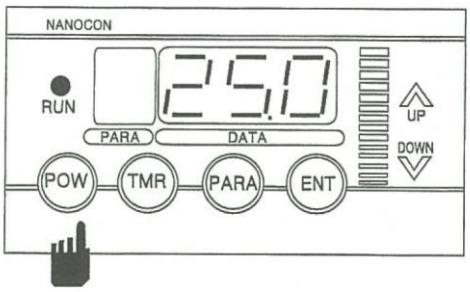
When power is supplied, the current oil temperature is displayed in the control panel. Please check the oil temperature setting (gas or room temperature for proportional control type) in stable state.

Additionally check if alarm or temperature error has not occurred.



6-3 Stopping

(1) Stopping through external activation signal.
When signal is cut-off, the【RUN】lamp goes off and the equipment stops.



(2) Stopping through POW S/W
Press the【POW】S/W from the control PANEL and the controller 【RUN】 lamp goes off and the Nanocon is stopped.

3) POWER LOCK
In order to prevent any damage to the User due to arbitrary operation of the POW button, the "POWER LOCK" function is activated as initial factory setting.

6-4 Caution During Operation

(1) Do not inset tools or hands inside vent equipment.
(2) Do not place screws, fuse or tools on the top cover of this equipment.
There is danger of these items falling inside through vent holes.
(3) Do not place objects that will obstruct the ventilation equipment.
(4) Hot air is expelled from the ventilation during operation so do not put your face or other bodily parts in front of it.
(5) Do not step on the equipment to move up.
(6) Do not arbitrarily open the cover or disassemble the equipment during operation.

7. Maintenance · Inspection

·Caution ·Cleaning the parts ·Long-term non-operation

7-1 Caution During Maintenance and Inspection

(1) When opening the control box cover for maintenance & inspection, turn the power off.

(2) Inspection during operation should be accompanied by a person who has expert knowledge.

7-2 Inspecting and Cleaning the Parts

(1) AIR FILTER cleaning

The AIR FILTER acts to filter out foreign matter and dust that is sucked in from the front. Therefore if there is foreign matter, dust or oil mist build-up in the AIR FILTER, the cooling capacity will decrease making normal operation impossible. Always conduct inspection before beginning operation and clean the equipment when the FIL cleaning indicator appears. After finishing the cleaning, press and hold ENT key for 2 seconds to reset. It is recommended to clean the equipment at least once a month for long term error-free use. (Depending on the operating condition, maintain flexibly)

(2) CONDENSER cleaning

When cleaning the AIR FILTER, remove the dust attached to the condenser FIN with an AIR GUN or (soft) brush. Make sure the FIN is not crushed or damaged during cleaning. Additionally, pay special attention to metal brushes and similar materials that can damage the FIN because it can affect the service life/performance of the equipment.

(3)RESERVER TANK cleaning

DRAIN fluid in the RESERVE TANK twice a year, remove foreign matter and replenish with clean fluid.

(4) Level Gauge cleaning (Tank attachment type)

Check whether the level gauge of the TANK is always maintained at the H Level at the start of operation every day.

(5) Inspecting the piping

Make sure to check for any fluid leakage in the piping that connects the Nanocon to the machine tool at the start of operation every day. If there is leakage, contact your maintenance supervisor or the service representative of the manufacturer for repair so that there is no leakage.

CAUTION

Forbidden

Do not spray water on the equipment when cleaning.
Risk of electric shock and cause of malfunction.

7-3 Caution During Long-Term Non-Operation

(1) Always turn power off.

(2) Do not allow foreign matter, dust, or water to go inside the equipment.

(3) Do not allow oil mist, foreign matter, or dust to accumulate on the surface of the condenser.

(4) Make sure to remove any oil inside this equipment.

8. Trouble Shooting

·In case of alarm ·Malfunction without alarm

8-1 In Case of Alarm

■ In case of error (Stop the equipment, shut-off power supply and remove the problem then re-start)

■ Error related to oil circuit (Recovery by POW button)

Lamp light status		Description	Cause	Counter Measure • Action
RUN	Display			
●	AL 01	•PUMP protection device F1(OL1) operation	•PUMP motor overload	• Reduce the piping pressure loss of the oil circuit. •Check if oil circuit is not jammed by valves or other material. • Check if the oil viscosity is too high. •Check if there is damage to motor or pump bearing.

■ Error related to refrigeration circuit (Recovery by POW button)

Lamp light status		Description	Cause	Counter Measure • Action
RUN	Display			
●	AL 02	•COMP protection device F2(OL2) thermal protector S40(THP) operation	• Refrigeration condenser dome temperature or motor coil temperature rise due to overload	•Check if temperature load is too high causing oil temperature to rise •Insufficient refrigerant •Replace refrigeration compressor
		•Refrigeration circuit pressure S/W S50 (GPS) operation	•Refrigeration circuit pressure error due to insufficient condensing capacity or refrigeration circuit overload	•Improve suction/exhaust ventilation condition. •Reduce condenser suction temperature. •Eliminate dust in condenser and air filter •Check if FAN is rotating

■ Error related to heater (Recovery by POW button)

Lamp light status		Description	Cause	Counter Measure • Action
RUN	Display			
●	AL 04	•Heater protecting temperature SW S42、S43 (HTS1, 2) is attached (For heater attached models only)	•Heater line is shorted •Heater main body surface temperature over heating	•Check for any short circuiting of heater wiring •Is there sufficient oil inside the heater room •Check if the circulating oil amount is not extremely small •Check if the surface of the heater main body has carbonized components of oil attached.

●: Light-off ○:Light-on

■ Error related to circulating oil circuit (Recovery by POW button)

Lamp light status		Description	Cause	Counter Measure • Action
RUN	Display			
●	AL05	•Spindle protecting fluid pressure switch (S60) in operation (For models with attachment only)	•When the outlet piping pressure is less than 1 bar •Insufficient oil inside tank	•Check if there is insufficient oil •Is the pump motor operating normally? •Replenish oil inside tank

■ Error related to sensor (Recovery by POW button)

Lamp light status		Description	Cause	Counter Measure • Action
RUN	RUN			
●	AL61	Error with RETURN oil temperature sensor	Oil temperature sensor disconnection, oil temperature sensor contact fault	•Check if sensor is disconnected •Check if there is connector contact fault. •Replace with new sensor
	AL62	Error with SUPPLY oil temperature sensor		
	AL63	Error with standard temperature sensor	Gas tuning sensor disconnection	

• Warning (Check the cause of the problem and repair it so that error does not occur)

Status	Description	Cause	Counter Measure • Action
"H" and current fluid temp. blinks	Temperature warning	Control fluid temp. is higher than set temperature + upper limit alarm setting.	•Check the upper limit alarm setting. •Check if refrigerant (gas) is leaking
"45" blinks		Control fluid temp. is higher than 45°C.	•Check if refrigerant (gas) is leaking.
"L" and current fluid temp. blinks		Control fluid temp. is lower than set temperature – lower limit alarm setting	•Check lower limit alarm setting
"5" blinks		Control fluid temp. is lower than 5°C	•Check if indoor temp. is less than 5C. •Reselect product type
"FIL" blinks	Filter cleaning time Common parameter 「9」 (initial setting: 999 hours)	Time to clean the filter	•Clean filter and remove dust •Press ENT key for 2 seconds to RESET

8-2 Malfunction Without Alarm

■ Depending on the malfunction or error, shut-off the power supply, remove the problem and then re-start operation.

Malfunction • Error	Cause	Counter Measure • Action
Does not operate at all	① Abnormal power supply	· Check the voltage of each of R, S, T terminals inside the control box with TESTER.
	② PCB power board fuse F902 is disconnected	· Inspect F902 inside control box and replace if disconnected.
	③ Wiring connection contact fault or disconnection	· Check each wiring connection for any contact fault or disconnection.
	④ Thermal protector S40(THP) operates then automatically recovers.	· Turn the breaker to OFF once
	⑤ Power is connected to negative-phase.	· Change the phase order of the power supply
PUMP noise is loud	Large resistance in oil circuit suction piping. Pump is sucking air. Pump is broken.	· Change piping to a wider diameter · Change piping to a shorter length · Is the oil being used a suitable oil? · Refer to "2. General caution 2-2" for operating oil. · Inspect the relief valve or replace it · Check if any air is being sucked in from gaps.
Oil temperature control error	Oil temperature controller or temperature sensor is broken	· Replace with new item. · Adjust parameter.
Insufficient refrigerant capacity	① Load is too large	· Product needs to be reselected
	② Fluid return amount decrease	· If the oil return circulation amount decreases, the amount of heat exchange with objects to be cooled decreases that can cause no refrigeration.
	③ Insufficient refrigerant, refrigerant leak.	· Refrigerating capacity may decrease due to insufficient refrigerant without protecting device operating.
	④ PULSE vibrating valve malfunction	· By-pass valve or expansion valve for PULSE valve may be malfunctioning so replace them

9. After Service

·Contact point ·When contacting

9-1 Contact Point

In case of any malfunction or unreasonable problems (equipment problems), please contact us below:

- **Address : 62-12, Bonsan-ro 269beon-gil, Jinyeong-eup, Gimhae-si, Gyeongsangnam-do, Republic of Korea**
- **Phone : 055-716-1099**
- **FAX : 055-716-1098**

Service representative contact details

Main contact: Park, Sang-Un, Manager / HP : 010-9324-7076

Sub contact: Kim, Seul-Gi, Assistant Manager / HP : 010-4592-0991

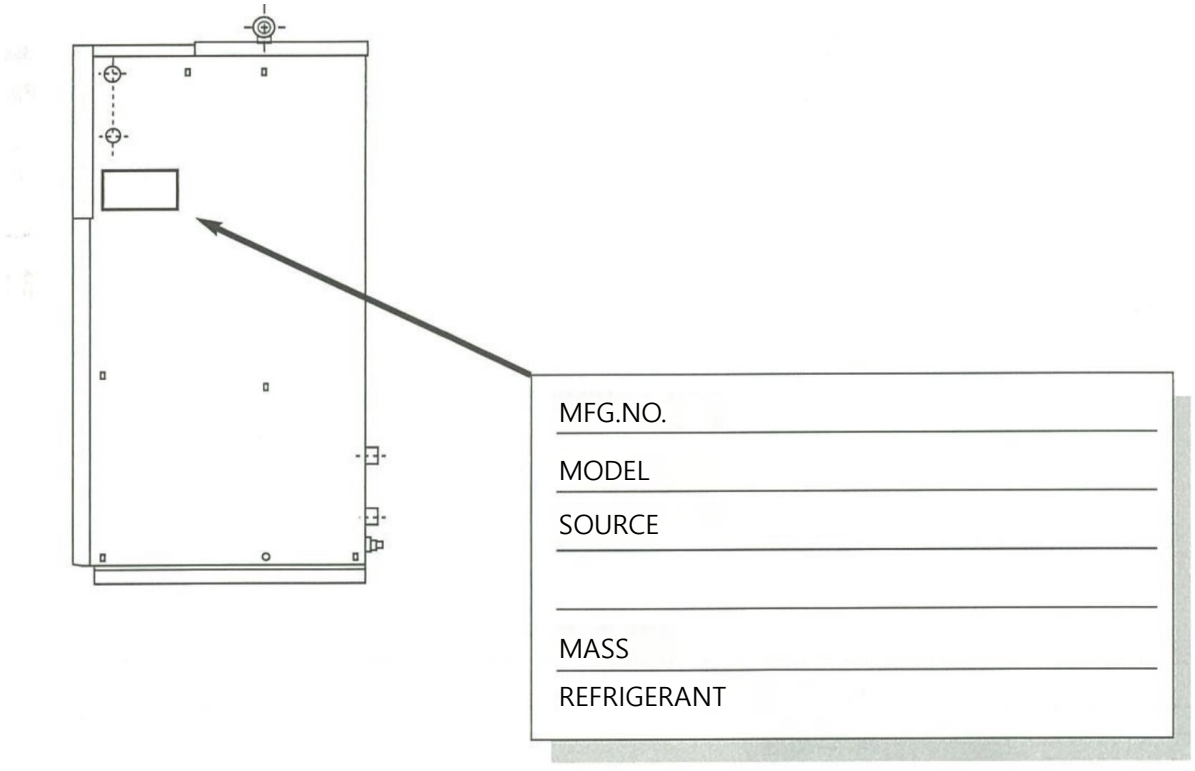
9-2 When Contacting

When contacting us, please attach pictures of the「Equipment MFG, LABEL on the side of the equipment and photos of the problem」.

E-mail

[**cooler@kwangrim.com**]

When filling out the form, please attach the equipment「name plate」or refer to the manual.



Form to Input Malfunction or Unreasonable Problems (Equipment Problems)

●Customer name:
●Address:
●Phone:
●FAX :
●Mail :
●Contact person:
●Purchase date: Year Month Day

Malfunctioning point (In detail if possible)	Type of alarm ( )
	Description:

Installation location (Insert a simple picture showing the location.)