Digital temperature controller

#### INSTRUCTION MANUAL

Thank you for purchasing Hanyoung Nux products. Please read the instruction manual carefully before using this product, and use the product correctly Also, please keep this instruction manual where you can view it any time

#### HANYOUNGNUX CO.,LTD

HANYOUNG NUX

28, Gilpa-ro 71beon-gil, Michuhol-gu, Incheon, Korea TEL : +82-32-876-4697 http://www.hanyoungnux.com

MA0601KE240102

#### Safety information

Please read the safety information carefully before the use, and use the product correctly.

The alerts declared in the manual are classified into 'DANGER', 'WARNING' and 'CAUTION' based on its importance

| $\triangle$ | DANGER  | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury          |
|-------------|---------|--|
| $\triangle$ | WARNING | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury         |
| $\triangle$ | CAUTION | Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or properties damage |

#### ♠ DANGER

The input/output terminals are subject to electric shock risk.

Never let the input/output terminals come in contact with your body or conductive substances.

# **⚠** WARNING

- If there is a possibility of a serious accident due to malfunction or abnormality of this product, install an appropriate protection circuit on the outside.
- Since this product is not equipped with a power switch and fuse, install them separately on the outside (fuse rating: 250 Va.c., 0.5 A).

  Please supply the rated power voltage, in order to prevent product benefits one or malfunctions.

- install them separately on the outside (tuse rating. 2-Du Va.c., u.S. ph. Please supply) the rated power voltage, in order to prevent product breakdowns or malfunctions.

  The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.

  To prevent electric shocks and malfunctions, do not supply power until the wiring is completed.

  The product does not have an explosion-proof structure, so avoid using it in places with flammable or explosive gases.

  Never disassemble, modify, process, improve or repair this product, as it may cause abnormal operations, electric shocks or fires.

  Please disassemble the product after turning OFF the power. Failure to do so may result in electric shock, product abnormal operations or malfunctions.

  Any use of the product other than those specified by the manufacturer may result in personal injury or property damage.

  Please use this product after installing it to a panel, because there is a risk of electric shock.

  When used in equipment with a high risk of personal injury or property damage (examples: medical devices, nuclear control, ships, aircrafts, vehicles, rallways, combustion devices, safety devices and prevent accidents. Failure to do so may result in fire, personnal accident or property damage.

### ⚠ CAUTION

- The contents of this manual may be changed without prior notification.
   Please make sure that the product specifications are the same as you
- ordered.

  Please make sure that there are no damages or product abnormalities occurred during shipment.

  Use this product in the following environments:

- Do not use outdoors.

   use it in the ambient temperature and humidity ranges indicated in the instruction manual.
- in the instruction manual use it in locations where corrosive gases (especially harmful gases, ammonia, etc.) and flammable gases are not generated. use it in places where vibrations and impacts are not directly applied to product body.

  use it in places without liquids, oils, chemicals, steam, dust, salt, iron, etc. (pollution degree 1 or 2).

  avoid places where large inductive interference, static electricity, magnetic noise are generated.

  avoid places with heat accumulation caused by direct sunlight, radiant heat, etc.

- avoid places with neat accumulation. radiant heat, etc. use it in places with elevation below 2000 m. Power input and relay output wires are at least 75 °C of heat resistance and, use copper wires from 18 AWG to 24 AWG.

# CAUTION

- Please do not wipe the product with organic solvents such as alcohol, benzene, etc. (wipe it with neutral detergents).
- When water enters, short circuit or fire may occur, so please
- inspect the product carefully.

   For thermocouple input, use the predetermined compensating

- For thermocouple input, use the predetermined compensating cable (temperature errors occur when using ordinary cable).

  For RTD input, use a cable with small lead wire resistance and without resistance difference among 3 wires (temperature errors occur if the resistance value among 3 wires (temperature errors occur if the resistance value among 3 wires is different).

  Use the input signal line away from power line and load line to avoid the influence of inductive noise.

  Input signal line and output signal line should be separated from each other. If separation is not possible, use shield wires for input signal line.

  Use a non-grounded sensor for thermocouple (using a grounded sensor may cause malfunctions to the device due to short circuits).

  When there is a lot of noise from the power, we recommend to use insulation transformer and noise lifter. Please install the noise filter to a grounded panel or structure, etc. and make the wiring of noise filter output and product power supply terminal as short as possible.

- possible.

  "Iightly twisting the power cables is effective against noise.

  If the alarm function is not set correctly, it will not be output in
  case of ahomand operation, so please check it before operation.

  When replacing the sensor, be sure to turn off the power.

   Use an extra relay when the frequency of operation
  such as proportional operation, chec's high, because connecting
  the load to the output relay rating without any room shortens the
  service life. In this case, SSR drive output type is recommended.

  "When using electromagnetic switch's set the proportional cycle
  to at least 20 sec.

  "When using SSR's set the proportional cycle to at least 1 sec.

  Do not wire anything to unused terminals.

- When using SSR: set the proportional cycle to at least 1 sec.

  Do not wire anything to unused terminals.

  Please wire correctly, after checking the polarity of the terminals.

  When you install this product to a panel, please use switches or circuit breakers compliant with IEC60947-1 or IEC60947-3.

  Please install switches or circuit breakers at close distance for user convenience.

  Please specify on the panel that, since switches or circuit breakers are installed, if the switches or circuit breakers are activated, the power will be cut off.

  We recommend regular maintenance for the continuous safe use of this product.

  Some components of this product may have a lifespan or deteriorate over time.

  The warranty period of this product, is 1 year, including its accessories, under normal conditions of use.

- The preparation period of the contact output is required during power supply. If used as a signal to external interlock circuit, etc. please uses

  The preparation period of the contact output is required during power supply. If used as a signal to external interlock circuit, etc. please uses delay relay together
- of the user changes the product in case of malfunctions, the operation may be different due to set parameters differences even if the model name is the same. So, please check the compatibility.
- before using the temperature controller, there may be a temperature deviation between the PV value of the temperature controller and the actual temperature, so please use the product
- after calibrating the temperature deviation.
  The write life of non-volatile memory (EEPROM) is one million times. When configuring the system, please make sure that the number of times that data are written to non-volatile memory does not exceed one million times.

# Suffix code

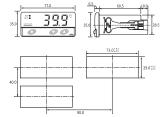
| Model Code           |   | ide |                             | Description  |   |  |
|----------------------|---|-----|-----------------------------|--|---|--|
| BR6-                 |   |     |                             | Digital temperature controller                                 |   |  |
| Control method       | F |     |                             |  | ON / OFF, Proportional control (selection with parameter) |  |
| Input N              |   |     |                             | Our dedicated sensor (TH-540N) **Thermistor (NTC)              |   |  |
| Control output S C   |   |     | Relay output (RELAY output) |  |   |  |
|                      |   | S   |                             | Voltage pulse output (Voltage pulse output for SSR drive )     |   |  |
|                      |   |     |                             | Electric current output (4-20 mA current output for SCR drive) |   |  |
| Power supply voltage |   | P3  | 10 - 24 V d.c.              |  |   |  |
|                      |   | P4  | 100 - 240 V a.c. 50/60 Hz   |  |   |  |
|                      |   |     |                             |  |   |  |

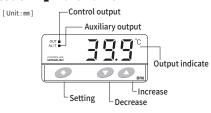
# Specification

| Input sensor             | Company exclusive sensor (TH-540N) % Thermistor (NTC)                             |   |  |  |  |  |
|--------------------------|---|---|--|--|--|--|
| Input range              | -40.0 ~ 90.0 °C   |   |  |  |  |  |
| Display accuracy         | $\pm1\%$ of FS $\pm1$ Digit   |   |  |  |  |  |
|                          | Relay output  | Contact composition: 1 c, 250 V a.c., 5 A (Resistance load) |  |  |  |  |
| Control output           | Voltage Pulse<br>Output   | 10 - 15 V d.c. (load resistance 500 Ω or more)              |  |  |  |  |
|                          | Electric current<br>Output  | 4-20 mA d.c. (load resistance 500 Ω or less)                |  |  |  |  |
| Auxiliary/Defrost        | Relay   | Contact composition: 1 c, 250 V a.c., 5 A (Resistive load)  |  |  |  |  |
| Control operation        | Selection of reverse action (heating)/<br>direct action (cooling) with parameters |   |  |  |  |  |
| Setting method           | Digital method by setting, increasing and decreasing keys                         |   |  |  |  |  |
| Other function           |   | Deforsting timer, Alarm function                            |  |  |  |  |
| Ambient temperature      | 0 ~ 50 °C   |   |  |  |  |  |
| Resistance between wires | Below 10 Ω for each wire  |   |  |  |  |  |
| Ambient humidity         |   | 35 ~ 85 % RH (with no condenssation)                        |  |  |  |  |
| Weight                   | 110 g   |   |  |  |  |  |

| -      | AC power supply voltage | 100 - 240V~ 50/60Hz    |
|--------|-------------------------|------------------------|
| ad)    | DC power supply voltage | 10 - 24V , Class2      |
| 1)     | voltage<br>change rate  | ±10% of supply voltage |
|        | AC power consumption    | 10.0 VA or less        |
|        | DC power consumption    | 2.0 VA or less         |
|        | Approval                | CE                     |
| $\neg$ |                         |                        |

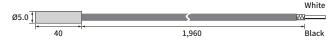
#### Dimension and panel cutout Part name





#### ■ Sensor(Thermistor/NTC)

| Name   | Sensory type | Range(°C)    | Accuracy | Remark  |
|--------|--------------|--------------|----------|---|
| TH540N | Thermistor   | -40.0 ~ 90.0 | ± 1.5 ℃  | Max $\pm$ 3.5 °C temperature deviation may be happen ( $\pm$ 1.5 °C sensor deviation & $\pm$ 2 °C controller deviation) |



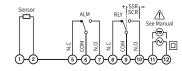
- ※ BR6 applies only to this sensor.

   ※ Extension of sensor length or modification will cause malfunction.

# **■ Control method for temperature** ■ Connection diagram

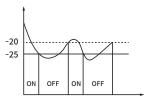
■ Heating/cooling control selection

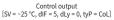


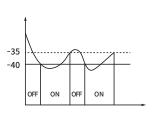


#### ■ Cooling control(ON/OFF)

• PV > SV → Control output "ON" / PV < SV → control output "OFF"



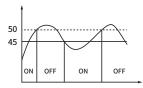




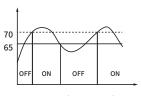
Auxiliary Output (Low limit alarm) [AtS = -40, AdF = 5, AdL = 0, SAo = 0]

#### ■ Heating control(ON/OFF)

PV > SV → Control output "OFF" / PV < SV → Control output "ON"</li>

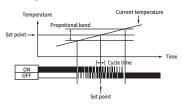


Control output [SV = 50 °C, dIF = 5, dLy = 0, tyP = HEt]



Auxiliary Output (Low limit alarm) [AtS = 70, AdF = 5, AdL = 0, SAo = 0]

# Proportional control



• Manipulated variable (output size) of set value operates by proportioning to deviation and this is known as proportional control. Also variation range of manipulated variable from 0 − 100 % is known as the proportional band. Therefore, when proportional band is less than the current temperature, the manipulated variable becomes 100 % and when PB is more than the current temperature, the manipulated variable becomes 0 % and when set value and current temperature becomes same, the manipulated variable becomes 50 %.

### Delay Timer Setting

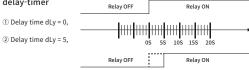
• Press 🚯 key continuously for 3 sec, and then, press key 🚯 until getting " 🚉 📙 🖁 ". change a set point by 🔕 √ key, and preservation it by 

key

key

 $\bullet [ \ \square \vdash \ \square \vdash \ ] \to [ \ \ \square \vdash \ \vdash \ ] \to [ \ \ \square \vdash \ \square \vdash \ ] \ (0 \sim 240 \ sec)$ 

■ Operating description by delay-timer

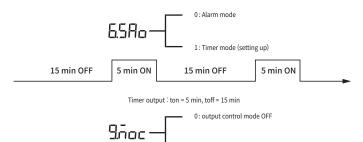


1: output control mode ON

\*\* In case of Delay Time = 0, Relay is immediately ON when output signal is generating. In case of delay time = 5, Relay is ON after 5 sec. when output signal is generating. In the interval of 5 sec, the output indicator is flickering during delay timer operation. After the delay time, the output indicator lights as the relay is on.
\*\* Delay operation is executed only in ON/OFF control.

# Auxiliary output(Timer-mode) set and operating description

• It is possible to use timer-mode as defrosting function in case of freezer.



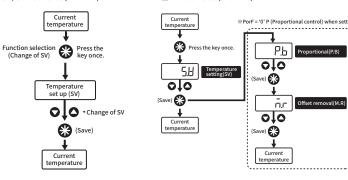
- When using MOC '1', control output will be OFF automatically as timer is ON
- If using MOC function, you can effectively use timer output as a defrosting function.
   When auxiliary output is timer mode, time unit is selective between "sec" or "min".

#### Set mode for normal users

■ ON/OFF control (ProF:1)

#### ■ PID control (ProF:0)

• A : 1 °C display mode (trSL = 1) • B : 0.1 °C display mode(trSL = 0)



|  | Item | Description               | Setting range         | Default | Unit |
|--|------|---------------------------|-----------------------|---------|------|
|  | SV   | Set value                 | TSL (min) ~ TSH (max) | 25.0    |      |
|  | Pb   | Proportional band setting | A:6~60                | 20.0    | °C   |
|  |      |                           | B:6.0~60.0            | 20.0    |      |
|  | Mr   | Remove offset             | 0~100                 | 50      | %    |

# ■ Engineer setting mode

• A: 1 °C display mode (trSL = 1)

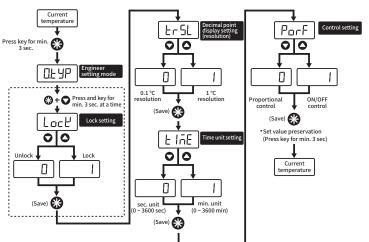
| Current temperature         | 4. Higher limit of setting range                       |
|-----------------------------|--|
| (Press key for min. 3 sec.) |  |
| Ĭ                           | (Save)   |
| 0. Control method setting   | Ĭ  |
|                             | 5. Lower limit of setting range                        |
| (Initial set value display) | 00   |
| Cool                        | ٥  |
| 00                          | (Save)   |
| Cooling Heating mode        | <u> </u>   |
|                             | 6. Auxiliary output selection                          |
| COOL HEAL                   | 00   |
| Default : Cool              |  |
| (Save)                      | • Alarm setting menu Timer setting menu                |
| ,, <b>(3</b>                |  |
| 1. Deviation setting        | 7. Alarm temperature Control 7. ON time setting        |
| 00                          | 00 00  |
| ↓<br>•                      | l  |
| (Save)                      | (Save) 🛞 (Save) 🛞                                      |
| <u></u>                     | 8. Variation setting for                               |
| 2. Delay time setting       | 8. Variation setting for alarm 8. OFF time setting     |
| olo                         | ၂ ၀၂၀ ၀၂၀  |
| (Save)                      | (Save) (Save)  |
|                             | ↓ ↓  |
| 3. Input compensation       | 9. Delay time setting for alarm 9. output control mode |
| o[o                         | 00 00  |
| (Save)                      | (Save) (Save)  |
|                             |  |
|                             |  |

|                        | mode(trSL   |                              |         |      |  |  |  |
|------------------------|---|------------------------------|---------|------|--|--|--|
| Item                   | Description   | Setting range                | Default | Unit |  |  |  |
| 0.typ                  | Control method setting  | Cool/Heat                    | Cool    | -    |  |  |  |
| 1.dlF                  | Deviation setting   | A:1~50,B:0.2~50.0            | 1.0     | °C   |  |  |  |
| 2.dLy                  | Delay time setting  | 0 ~ 240                      | 0       | Sec  |  |  |  |
| 3.rST                  | land annualis   | A: −30 ~30                   |         |      |  |  |  |
| 3.131                  | Input compensation  | B: −30.0 ~30.0               | 0.0     |      |  |  |  |
| 4.tSH                  | Higher limit of setting range   | A: TSL (min) ~ 90            | 00.0    | °C   |  |  |  |
| 4.1311                 | righer timit of setting range   | B: TSL (min) ~ 90.0          | 90.0    | °C   |  |  |  |
| 5.tSL                  | Lower limit of setting range  | A∶−40 ~ TSH (max)            | -40.0   |      |  |  |  |
| 5.tSL                  |   | B : −40.0 ~ TSH (max)        |         |      |  |  |  |
| 6.SAo                  | Selection of auxillary output   | 0 : Alarm setting            | - 0     | ı    |  |  |  |
| 6.5A0                  | function  | 1 : Timer setting            |         |      |  |  |  |
| Menu of setting alarm  |   |                              |         |      |  |  |  |
| 7.AtS                  | Setting alarm temperature   | A: −40 ~ 90, B: −40.0 ~ 90.0 | -40.0   | °C   |  |  |  |
| 8.AdF                  | Deviation settings<br>for the alarm                                       | A: 1~ 50, B: 0.2 ~ 50.0      | 1.0     | C    |  |  |  |
| 9.AdL                  | Delay time setting for alarm  | 0 ~ 240                      | 0       | Sec  |  |  |  |
| Menu for timer setting |   |                              |         |      |  |  |  |
| 7.ton                  | On time setting   | 0 ~ 3600                     | 1       | *1   |  |  |  |
| 8.toF                  | Off time setting  | 0 ~ 3600                     | 3       | *1   |  |  |  |
| 9.Moc                  | output control mode 0: output control mode OFF, 1: output control mode ON |                              |         | -    |  |  |  |

%1: when time = 0 in administrator setting mode, it is Sec. when time = 1 in administrator setting mode, it is Min.

### Administrator setting mode

■ Set Value lock function and decimal point function



| Item | Description                         | Setting value                       | Setting range   | Default | Unit    |   |                                      |   |
|------|-------------------------------------|-------------------------------------|---|---------|---------|---|--------------------------------------|---|
| Lock | Laskastina                          | 0                                   | Unlock, engineer set up available                       | - 0     |         |   |                                      |   |
| LOCK | Lock setting                        | 1 Lock, engineer set up unavailable | Lock, engineer set up unavailable                       |         |         |   |                                      |   |
| trSL | Decimal<br>point display<br>setting | 0                                   | Decimal point display (0.1 °C)                          | 0       |         |   |                                      |   |
| USL  |                                     |                                     |   |         |         |   |                                      |   |
| Time | Time unit setting                   | 0                                   | Timer: second setting (0 ~ 3600 sec)                    | 1       | _       |   |                                      |   |
| Time |                                     | setting                             | setting   | setting | setting | 1 | Timer: minute setting (0 ~ 3600 min) | 1 |
| ProF | Control<br>setting                  | Control                             | Proportional control (P.B / M.R value set up available) |         |         |   |                                      |   |
| Prof |                                     | 1                                   | ON/OFF control  | 1       |         |   |                                      |   |