

USER'S MANUAL

VX Series

HANYOUNG NUX

21st AUGUST, 2018

Be sure to read the "Safety information" before using the product, and use the product correctly

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Notice

◆ Product introduction

Thank you for purchasing Hanyoung Nux products.

This user's manual explains the functions of the product, precautions, how to install and use it.

Please read the user's manual carefully beforehand. In addition, please make it available for the end user and keep it where you can view it any time.

◆ Notice

This manual is intended for those who have a basic understanding of the basic principles of electrical and electronic equipment, knowledge of the equipment (system) to which this product applies, and knowledge of computers and communication.

◆ Safety information

The following safety information are intended to prevent unforeseen hazards or damages in advance by using the product safely and correctly.

The alerts are classified into "Danger", "Warning" and "Caution", with the following meaning:

⚠ This symbol is intended to alert the user about situations or operations that can cause danger. Please read this symbol carefully and follow the instructions to avoid danger.

⚠ Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury

⚠ Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury

 Indicates a potentially hazardous situation which, if not avoided, may result in minor injury or property 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 VAC, 0.5 A).
- 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 shocks, 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, railways, combustion devices, safety devices, crime/disaster prevention equipment etc.) install double safety devices and prevent accidents. Failure to do so may result in fire, personnel 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.

INSTALLATION

- do not use it outdoors.
- use it in the ambient temperature and humidity ranges indicated 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.
- use it in places with elevation below 2000 m.
- Installation Category II.

USAGE

- 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 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 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 filter. 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.
- Tightly twisting the power cables is effective against noise.
- If the alarm function is not set correctly, it will not be output in case of abnormal 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, etc.) is 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: set the proportional cycle to at least 20 sec.
 - * 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 use a delay relay together.
- If 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.
- If you connect the USB loader to another device using a USB cable, additional input errors may occur depending on the target device to which the cable is connected (it is recommended not to use it for control/monitoring).

◆ **Quality assurance**

- ✓ We do not assume any warranty or liability with respect to this product, except as stipulated in our quality assurance conditions
- ✓ We are not responsible for any direct or indirect damages suffered by users or third parties due to unforeseeable defects or natural disasters.

◆ Quality assurance conditions of this product

- ✓ The warranty period of this product is one year from its date of purchase. This product will be repaired free of charge in the event of malfunction occurring under normal use conditions set forth in this manual.
- ✓ Repairs due to breakdown occurring after the expiration of the warranty period of the product will be charged according to the standard determined by the company.
- ✓ In the following cases, even if the breakdowns occur within the warranty period, they will be charged
 - Breakdowns due to user's fault
 - Breakdowns due to natural disaster
 - - Breakdowns due to movements after installation
 - Breakdowns due to arbitrary product change or damage
 - Breakdowns due to power supply abnormality (such as power instability)
 - If A/S is required due to breakdowns, please contact the place of purchase, or our sales department

◆ Symbols

✓ Abbreviation symbols

| Abbreviation | Name |
|--------------|-----------------------|
| PV | Process value |
| SV | Set value |
| AT | Auto-tuning |
| REM | Remote set value |
| RET | Retransmission output |
| SUB1 | SUB1 output |
| SUB2 | SUB2 output |
| SUB3 | SUB3 output |
| SUB4 | SUB4 output |
| HBA1 | Heater break alarm 1 |
| HBA2 | Heater break alarm 2 |
| CT1 | Current transformer 1 |
| CT2 | Current transformer 2 |
| LBA | Loop break alarm |
| EU | Engineering unit |
| EUS | Engineering unit span |

Product introduction

◆ Features

- High visibility: Wide viewing angle negative LCD
- Good readability: Displayable characters displayed by using 14 segment PV display window (11-segment SV value and 7-segment MV value)
- Reduced panel space: temperature controller depth 63 mm
- Improved durability of the operation keys: plastic key applied
- Improved input accuracy: 0.2% (K type, PT100Ω, room temperature)
- Fast sampling: 50 ms sampling
- Superior control algorithm: 2 DOF PID control
- Front function key: RUN/STOP, AT, manual/automatic output switching, lock on/off functions
- Flexible operability: parameter up/down moving structure implemented
- Easy setting: connect loader communication and set parameter batch
- Various options
 - Thermocouple, RTD, analog input
 - Standard control, heating and cooling control
 - Lamp control
 - 4 PID groups, 4 SV settings
 - Several alarm functions and high capacity relay (5A, 220VAC)
 - Loop break alarm (LBA), heater break alarm (HBA)
 - Retransmission output (RET), digital input (DI), remote input (REM)
 - RS485 communication (PC-Link, PC-Link Sum, Modbus ASCII, Modbus RTU)

◆ Suffix code

| Model (Code) | | | | | | | | | | | | Content |
|-----------------------------|----------------------------|--------------------------|--------------------------|--------------------------|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|--------------------------|--|
| (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | |
| VX | <input type="checkbox"/> - | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> - | <input type="checkbox"/> | <input type="checkbox"/> | LCD Digital Temperature Controller |
| Size | 2 | | | | | | | | | | | 48(W) × 96(H) × 63(D) mm |
| | 4 | | | | | | | | | | | 48(W) × 48(H) × 63(D) mm |
| | 7 | | | | | | | | | | | 72(W) × 72(H) × 63(D) mm |
| | 9 | | | | | | | | | | | 96(W) × 96(H) × 63(D) mm |
| Sensor | | U | | | | | | | | | | Universal input |
| OUT 1 (control output 1) | | | M | | | | | | | | | Relay output |
| | | | S | | | | | | | | | Voltage pulse output (voltage pulse output for SSR drive) |
| | | | C | | | | | | | | | Current output (4 ~ 20 mA output for SCR drive) |
| OUT 2 (control output 2) | | | N | | | | | | | | | None |
| | | | M | | | | | | | | | Relay output |
| Power | | | A | | | | | | | | | 100 - 240 VAC, 50 / 60 Hz |
| Option | Sub output | | | A1 | | | | | | | | 1 relay output (VX4 basic option) |
| | A2 | | | | | | | | | 2 relay outputs (VX2,7,9 basic option) | | |
| | A3 | | | | | | | | | 3 relay outputs (*1,*2) | | |
| | A4 | | | | | | | | | 4 relay outputs (*2) | | |
| | Communication | | | | | | | | | | | None |
| | C | | | | | | | | | RS-485 communication 1 contact | | |
| | Retransmission output | | | | | | | | | | | None |
| | T | | | | | | | | | Retransmission output (4 ~ 20 mA) 1 contact | | |
| | Digital input (DI) | | | | | | | | | | | None |

| | | | |
|------------------------------|----|--|--|
| | D2 | | 2 digital inputs (DI 1 ~ 2) |
| | D4 | | 4 digital inputs (DI 1 ~ 4) |
| | | | None |
| Current detection input (CT) | H1 | | Current detection input (CT) 1 contact |
| | H2 | | Current detection input (CT) 2 contact |
| | | | None |
| Remote input (REM) | R | | Remote input (4 ~ 20 mA or 1 ~ 5 V) 1 contact |

- ✓ Please refer to our website for orderable codes.
- ✓ * 1) Not available for VX4. However, when OUT2 is selected as 'M', SUB3 can be used according to the parameter setting.
- ✓ * 2) You can select from VX2, 7, 9 (VX4 is excluded)

- Orderable codes (VX4)

- ✓ Order code order

- Codes from (1) to (6)

| Index | (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | Suffix code |
|-------|-------|------|--------------|------|------|-------|------------|---------------|----------------|-----|------|--------------|-------------|
| No | Model | Size | Input sensor | OUT1 | OUT2 | POWER | Sub output | Communication | Retransmission | DI | CT | Remote input | |
| 1 | VX | 4 | U | S | A | A | A | A | A | A | A | A | VX4-UMNA- |
| 2 | | | | | | | | | | | | | A1□□□□□ |
| 3 | | | | | | | | | | | | | VX4-UMNA- |
| 4 | | | | | | | | | | | | | A2□□□□□ |
| 5 | | | | | | | | | | | | | VX4-UMMA- |
| 6 | | | | | | | | | | | | | A1□□□□□ |
| 7 | | | | | | | | | | | | | VX4-UMMA- |
| 8 | | | | | | | | | | | | | A2□□□□□ |
| 9 | | | | | | | | | | | | | VX4-USNA- |
| 10 | | | | | | | | | | | | | A1□□□□□ |
| 11 | | | | | | | | | | | | | VX4-USNA- |
| 12 | | | | | | | | | | | | | A2□□□□□ |

- Codes from (7) to (11)

| Index No | (0) Model | (1) Size | (2) Input sensor | (3) OUT1 | (4) OUT2 | (5) POWER | (6) Sub output | (7) Communication | (8) Retransmission | (9) DI | (10) CT | (11) Remote input | Suffix code |
|-------------|--------------|-------------|---------------------|-------------|-------------|--------------|-------------------|----------------------|-----------------------|-----------|------------|----------------------|-----------------|
| 1 | | | | | | | | | | | | - | VX4-□□□□□-□ |
| 2 | | | | | | | | | | | | R | VX4-□□□□□-□R |
| 3 | | | | | | | | | | | | H1 | VX4-□□□□□-□H1 |
| 4 | | | | | | | | | | | | H2 | VX4-□□□□□-□H2 |
| 5 | | | | | | | | | | | | - | VX4-□□□□□-□D2 |
| 6 | | | | | | | | | | | | H1 | VX4-□□□□□-□D2H1 |
| 7 | | | | | | | | | | | | H2 | VX4-□□□□□-□D2H2 |
| 8 | | | | | | | | | | | | D4 | VX4-□□□□□-□D4 |
| 9 | | | | | | | | | | | | T | VX4-□□□□□-□T |
| 10 | | | | | | | | | | | | - | VX4-□□□□□-□TR |
| 11 | | | | | | | | | | | | - | VX4-□□□□□-□C |
| 12 | | | | | | | | | | | | R | VX4-□□□□□-□CR |
| 13 | | | | | | | | | | | | H1 | VX4-□□□□□-□CH1 |
| 14 | | | | | | | | | | | | H2 | VX4-□□□□□-□CH2 |
| 15 | | | | | | | | | | | | D2 | VX4-□□□□□-□CD2 |
| 16 | | | | | | | | | | | | T | VX4-□□□□□-□CT |
| 17 | | | | | | | | | | | | - | VX4-□□□□□-□CTR |

✓

◆ Product specifications

| Classification | | VX2 | VX4 | VX7 | VX9 |
|----------------|--------------------------------|---|--------------|--------------|---------------|
| Input | Thermocouple type | K, J, E, T, R, B, S, L, N, U, W, PLII | | | |
| | Reference contact compensation | ±1.5 °C (within -10~50 °C) | | | |
| | RTD type | JPT100, PT100 | | | |
| | Allowable line resistance | Each 3 wire within 10Ω (but the resistance among 3 lines should be same) | | | |
| | DC voltage / current | 1~5 V (4~20 mA), 0~5 V, 0~10 V, 0~50 mV, 0~100 mV | | | |
| | Sampling cycle | 50 ms | | | |
| Control output | Relay output | • Rated switching capacity :5A 250 VAC, 5 A 30 VDC • Max. switching power : 750 VA, 90 W • Max. switching voltage : 250 VAC, 110 VDC • Max. switching current : 5 A • Mechanical life : 20 million times (at 180 CPM) | | | |
| | SSR output | Voltage pulse output, 12 V ± 1 VDC (load resistance min. 600 Ω) | | | |
| | (SCR output) | Linear current output, load resistance: max. 600 Ω ± 0.2% of FS ± 1 digit | | | |
| Control | type | ON/OFF, PID control, 2DOF PID control | | | |
| | Output operation | Reverse action, direct action | | | |
| Display part | Display method | Wide viewing angle LCD | | | |
| | PV character (H * W) mm | (20.5 x 6.9) | (15.2 x 6.8) | (19.8 x 9.3) | (29.0 x 13.6) |
| | SV character (H * W) mm | (12.8 x 5.9) | (7.4 x 3.9) | (10.2 x 4.9) | (15.0 x 7.2) |
| | MV character (H * W) mm | (9.3 x 4.4) | - | (7.5 x 3.3) | (11.0 x 4.8) |

| | | |
|------------|--------------------------|--|
| Memory | Non-volatile memory life | EEPROM unlocked: when setting E2P.L: OFF in G.SET group (EEPROM life: 1 million times write guaranteed) / EEPROM locked: when setting E2P.L: ON in G.SET group - store in RAM |
| | | UMS 2.0 |
| USB loader | Communication method | UMS 2.0 |
| | Protocol | <ul style="list-style-type: none"> • Protocol : PC-LINK • Baudrate : 38400 bps • Start bit : 1 bit • Data bit : 8bit • Parity bit : None • Stop bit : 1bit |
| | Communication distance | Max. 5 m |
| Option | Alarm (Relay) output | 1~ 4 contacts, rated switching capacity: 5A 250 VAC, 5 A 30 VDC |
| | DI | 2 contacts or 4 contacts |
| | Retransmission output | Linear current output, load resistance: max. $600 \Omega \pm 0.2\%$ of FS ± 1 digit |
| | Remote input | 1 input, 4 ~ 20 mA (1 ~ 5 V) |
| | Current detection input | 1 contact or 2 contacts |
| | Communication method | EIA RS485 standard, 2-wire half-duplex |
| | Max. connections | 31 (address setting 1~99 available) |
| | Communication sequence | No sequence |
| | Communication distance | Within 1.2 km |
| | Baud Rate | 4800, 9600, 14400, 19200, 38400, 57600 BPS |

| | | | | | | |
|----------|--|--|-----------------|-----------------|--|--|
| | Start bit | 1 bit | | | | |
| | Data length | 7 or 8 bit | | | | |
| | Parity bit | NONE, EVEN, ODD | | | | |
| | Stop bit | 1 or 2 bit | | | | |
| | Protocol | PC-LINK STD, PC-LINK SUM, MODBUS-ASCII, MODBUS-RTU | | | | |
| | Response time | Actual response time= processing time+(response time X 50 ms) | | | | |
| Power | Power voltage | 100 - 240 VAC, 50 / 60 Hz | | | | |
| | Voltage fluctuation rate | $\pm 10\%$ of power voltage | | | | |
| | Insulation resistance | Min. 20 MΩ, 500 VDC | | | | |
| | Dielectric strength | 3,000 VAC. 50/60 Hz for 1 minute (between 1st and 2nd terminal) | | | | |
| | Power consumption | Max. 8.5 VA | Max. 8.5 VA | To be announced | | |
| | Ambient temperature & humidity | -10 ~ 50 °C, 35 ~ 85 % RH (without condensation) | | | | |
| | Storage temperature | -25 ~ 65 °C | | | | |
| Approval |    | | To be announced | To be announced | | |
| | <ul style="list-style-type: none"> ■ Electrostatic discharge (ESD) : KN61000-4-2 ■ EFT(RS) : KN61000-4-3 ■ SURGE : KN61000-4-5 ■ Conductivity RF(CS) : KN61000-4-6 | | | | | |
| | IP66 (product front) | To be announced | To be announced | To be announced | | |
| | Weight (g) | 202 | 120 | To be announced | | |
| | | | | To be announced | | |

- Input specifications (TC and RTD)

| Classification | Type | No | Display | Temperature range | | Tolerance |
|----------------|--------|----|---------|-------------------|-------------|------------------------------------|
| | | | | (°C) | (°F) | |
| Thermocouple | K | 1 | K0 | -200 ~ 1370 | -328 ~ 2498 | $\pm 0.2\%$ of FS ± 1 digit |
| | | 2 | K1 | -100.0 ~ 500.0 | -148 ~ 932 | |
| | J | 3 | J0 | -200 ~ 1200 | -328 ~ 2192 | |
| | | 4 | J1 | -199.9 ~ 900.0 | -328 ~ 1652 | |
| | E | 5 | E1 | '-199.9 ~ 900.0 | -328 ~ 1652 | |
| | T | 6 | T1 | -199.9 ~ 400.0 | -328 ~ 752 | |
| | R | 7 | R0 | 0 ~ 1700 | 32 ~ 3092 | |
| | B | 8 | B0 | 100 ~ 1800 | 212 ~ 3272 | |
| | S | 9 | S0 | 0 ~ 1700 | 32 ~ 3092 | |
| | L | 10 | L1 | -199.9 ~ 900.0 | -328 ~ 1652 | |
| | N | 11 | N0 | -200 ~ 1300 | -328 ~ 2372 | |
| | U | 12 | U1 | -199.9 ~ 400.0 | -328 ~ 752 | |
| | W | 13 | W0 | 0 ~ 2300 | 32 ~ 4172 | |
| | PLII | 14 | PL0 | 0 ~ 1300 | 32 ~ 2372 | |
| RTD | JPt100 | 20 | JPt0 | -200 ~ 500 | -328 ~ 932 | $\pm 0.2\%$ of FS ± 1 digit |
| | | 21 | JPt1 | -199.9 ~ 500.0 | -328 ~ 932 | |
| | Pt100 | 22 | Pt0 | -200 ~ 640 | -328 ~ 1184 | |
| | | 23 | Pt1 | -199.9 ~ 640.0 | -328 ~ 1184 | |

- Input specifications (DC current and voltage)

| Classification | Type | No | Display | Scale range | Tolerance |
|---------------------|-----------|----|---------|--------------|--|
| Direct current | 4 ~ 20mA | 30 | 1-5V | -1999 ~ 9999 | $\pm 0.2\% \text{ of FS}$ $\pm 1 \text{ digit}$ |
| (VDC / mV DC) | 1 ~ 5V | 30 | 1-5V | | |
| | 0 ~ 5V | 31 | 5V | | |
| | 0 ~ 10V | 32 | 10V | | |
| | 0 ~ 50mV | 33 | 0.05V | | |
| | 0 ~ 100mV | 34 | 0.1V | | |

※ When direct current is used, it is recommended to connect 250Ω (0.1% or less, high precision) resistor in parallel to the outside of the terminal. Please note that the 250Ω (1%) resistor included with the product is not a precision resistor.

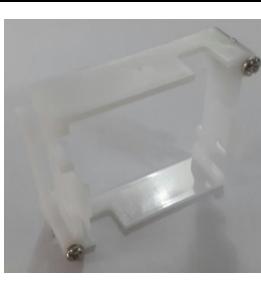
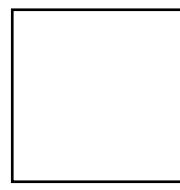
- Input specifications (remote input)

| Input | TYPE | Scale range | Tolerance |
|----------------|-----------|-----------------------------|--|
| Direct current | 4 ~ 20 mA | Same as input setting range | $\pm 0.2\% \text{ of F.S} \pm 1 \text{ digit}$ |
| Direct voltage | 1 ~ 5 V | | |

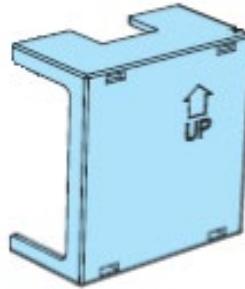
※ When direct current is used, it is recommended to connect 250Ω (0.1% or less, high precision) resistor in parallel to the outside of the terminal. Please note that the 250Ω (1%) resistor included with the product is not a precision resistor.

◆ Components

- Basic components

| Main body | Bracket | Instruction manual | Rubber packing | 250 Ω resistor (1 or 2 EA depending on the option) |
|---|---|---|---|---|
|  |  |  |  |  |

- Components sold separately

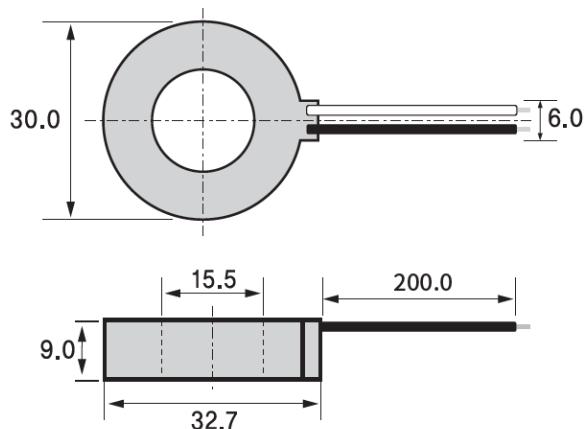
| USB Loader Cable (NMC-UM210) | Current detector (CT) (CT-70) | Protective cover | |
|---|---|--|--|
|  |  |  | For VX2 : TC2A-COV For VX4 : TC4A-COV For VX7 : TC7A-COV For VX9 : TC9A-COV |

✓ USB Loader Cable ※ sold separately (NMC-UM210) USB2.0 Mini 5PIN Cable

- USB2.0 Mini 5 pin Cable

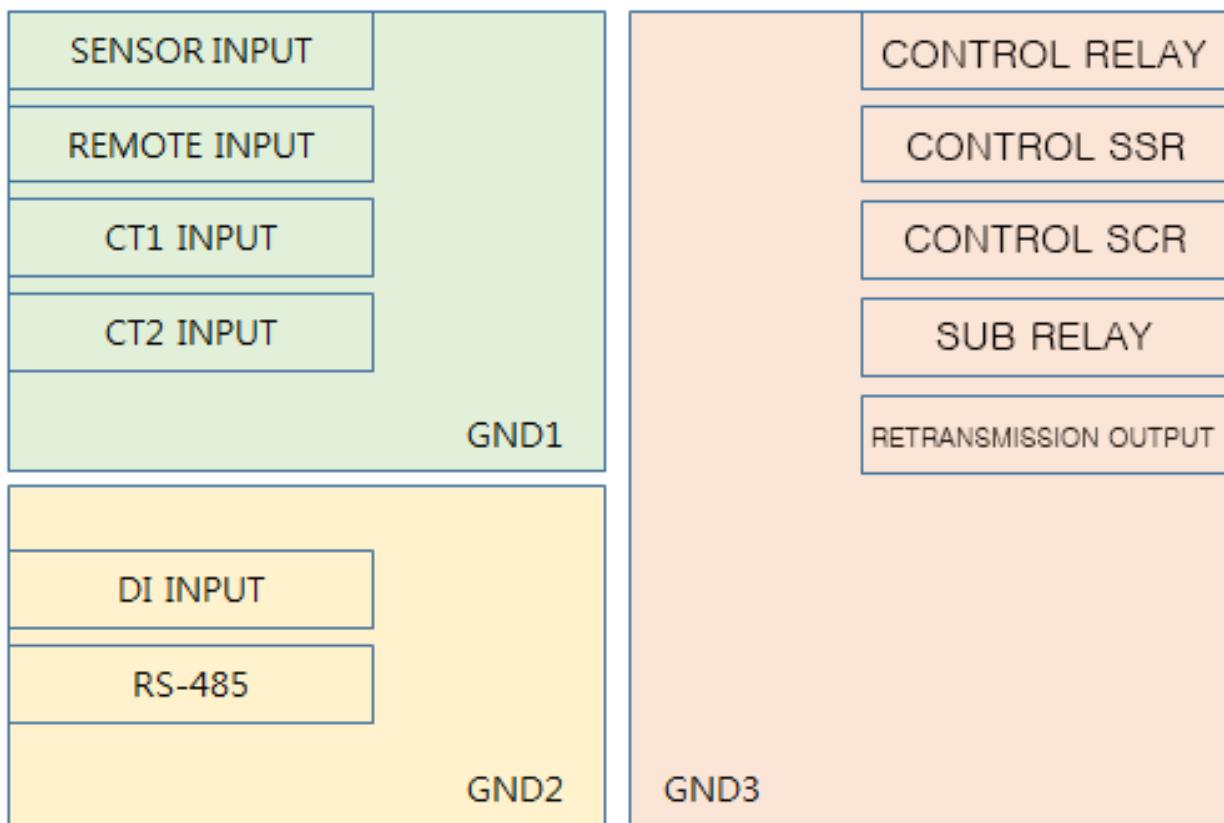


- ✓ Current detector ✕ sold separately (CT-70), available with HBA option (1000:1, min. 50 A)
 - Current ratio 1000: 1, current detection range 0.0 ~ 50.0 A



- ✓ Protective cover ✕ sold separately (TC2A-COV, TC4A-COV, TC7A-COV, TC9A-COV)
 - For VX2: TC2A-COV
 - For VX4: TC4A-COV
 - For VX7: TC7A-COV
 - For VX9: TC9A-COV

◆ Insulation block diagrams

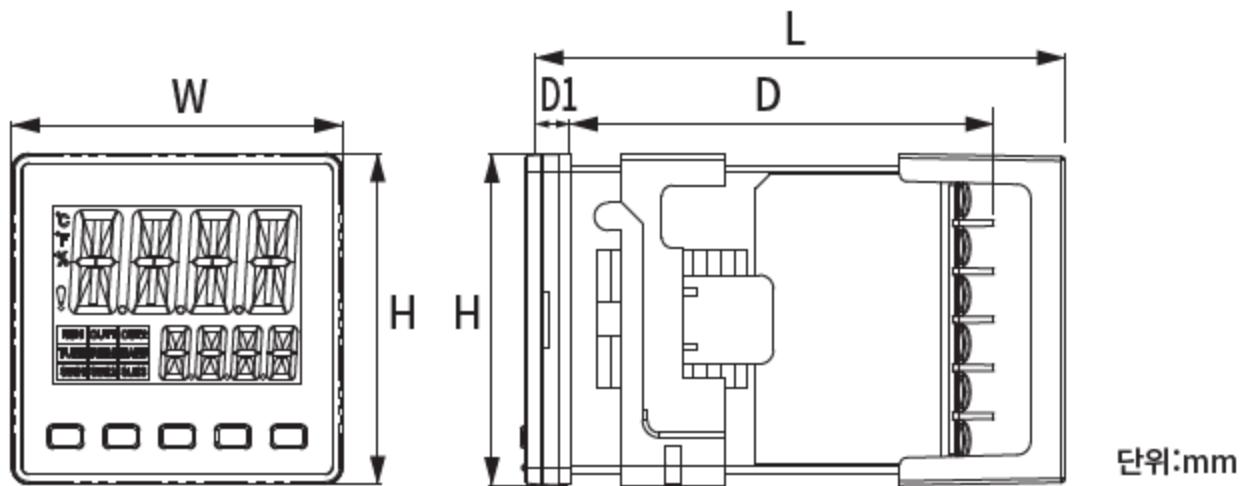


◆ Connection diagrams

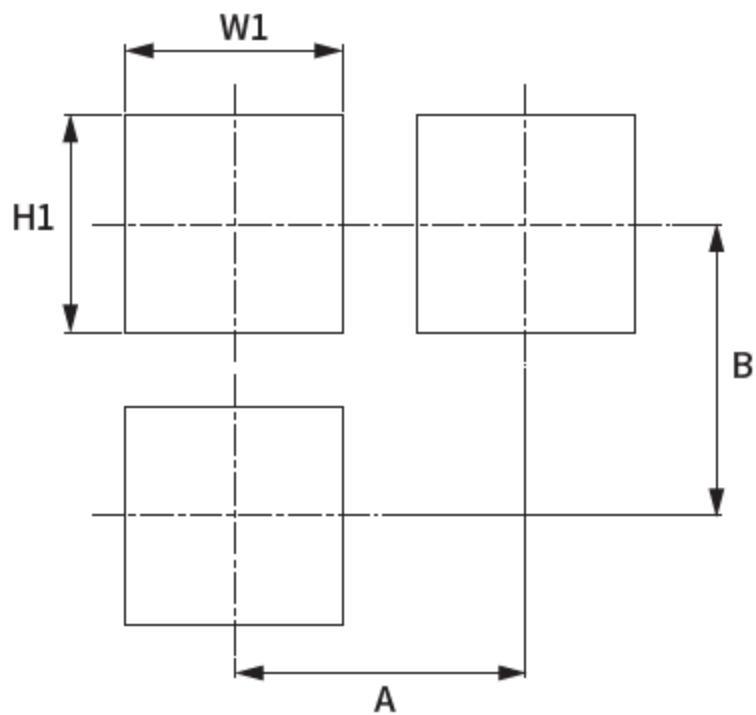
| | |
|---|---|
| VX4 | VX7 |
| <p>This diagram shows the connection for the VX4 module. It includes two analog input channels (A and B) with ranges from -10V to +10V. Each channel has a shunt resistor (10kΩ) and a bridge rectifier. The outputs are connected to a 12-bit ADC. There are four digital inputs (DI1, DI2, DI3, DI4) and four digital outputs (OUT1, OUT2). OUT1 is an SCR/SSR/RLY output. OUT2 is a standard RLY output. DI1 and DI2 are connected to a 12-bit ADC. DI3 and DI4 are connected to a 12-bit ADC. A REM signal is also present.</p> | <p>This diagram shows the connection for the VX7 module. It includes four analog input channels (A, B, C, D) with ranges from -10V to +10V. Each channel has a shunt resistor (10kΩ) and a bridge rectifier. The outputs are connected to a 12-bit ADC. There are four digital inputs (DI1, DI2, DI3, DI4) and four digital outputs (OUT1, OUT2). OUT1 is an SCR/SSR/RLY output. OUT2 is a standard RLY output. DI1 and DI2 are connected to a 12-bit ADC. DI3 and DI4 are connected to a 12-bit ADC. A REM signal is also present.</p> |
| VX2 | VX9 |
| <p>This diagram shows the connection for the VX2 module. It includes four analog input channels (A, B, C, D) with ranges from -10V to +10V. Each channel has a shunt resistor (10kΩ) and a bridge rectifier. The outputs are connected to a 12-bit ADC. There are eight digital inputs (DI1 through DI8) and eight digital outputs (OUT1 through OUT8). OUT1 and OUT2 are RLY outputs. OUT3 through OUT8 are SCR/SSR/RLY outputs. DI1 through DI4 are connected to a 12-bit ADC. DI5 through DI8 are connected to a 12-bit ADC. A REM signal is also present.</p> | <p>This diagram shows the connection for the VX9 module. It includes eight analog input channels (A through H) with ranges from -10V to +10V. Each channel has a shunt resistor (10kΩ) and a bridge rectifier. The outputs are connected to a 12-bit ADC. There are eight digital inputs (DI1 through DI8) and eight digital outputs (OUT1 through OUT8). OUT1 and OUT2 are RLY outputs. OUT3 through OUT8 are SCR/SSR/RLY outputs. DI1 through DI4 are connected to a 12-bit ADC. DI5 through DI8 are connected to a 12-bit ADC. A REM signal is also present.</p> |

◆ Part names and dimensions

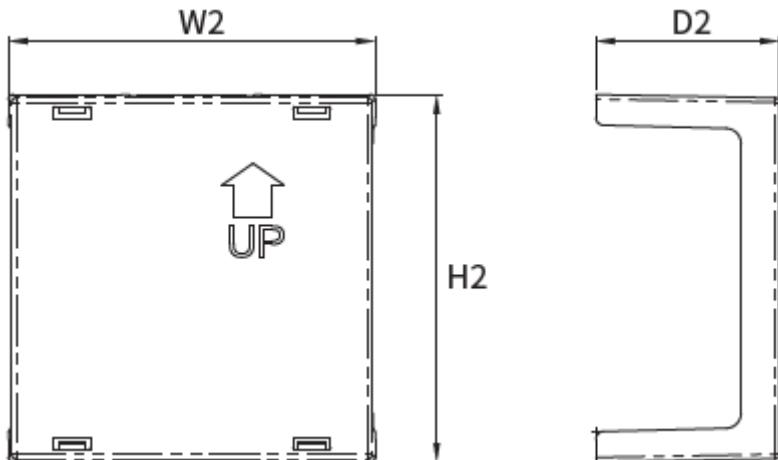
- ✓ Product dimensions



- ✓ Panel cutout



✓ Protective cover dimensions



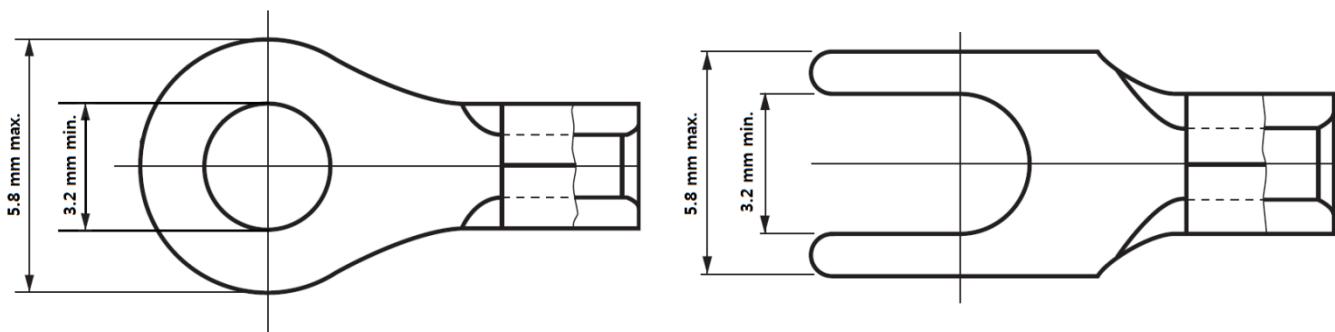
Unit: mm

| Classification | Type | VX2 | VX4 | VX7 | VX9 |
|--------------------|--------|-------|------|-------|-------|
| Product dimensions | W | 48.0 | 48.0 | 72.0 | 96.0 |
| | H | 96.0 | 48.0 | 72.0 | 96.0 |
| | D | 63.0 | 63.0 | 63.0 | 63.0 |
| | D1 | 5.5 | 5.0 | 5.5 | 5.5 |
| | L | 78.4 | 78.4 | 78.4 | 78.4 |
| Panel cutout | W1 *1) | 45.0 | 45.0 | 69.0 | 93.0 |
| | H1 *1) | 93.0 | 45.0 | 69.0 | 93.0 |
| | A | 70.0 | 60.0 | 83.0 | 117.0 |
| | B *2) | 122.0 | 60.0 | 100.0 | 117.0 |
| Protective cover | W2 | 48.4 | 48.0 | 71.8 | 96.0 |
| | H2 | 94.4 | 48.1 | 71.8 | 96.0 |
| | D2 | 26.9 | 24.0 | 26.9 | 26.9 |

* 1) +0.5 mm tolerance applied

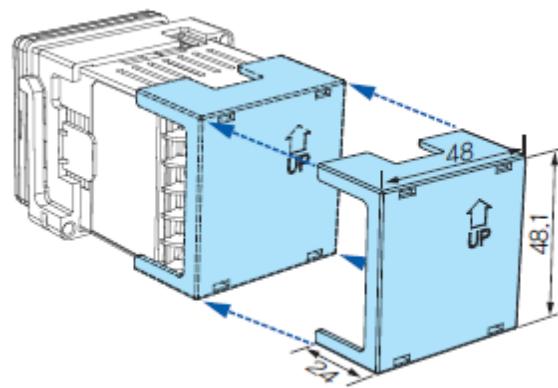
* 2) 100.0 mm applied when using USB Loader cable in VX4

✓ Terminals



◆ Assembly drawings

- ✓ Protective covers



- ✓ Bracket

| VX4 | VX2, VX7, VX9 |
|---|---|
| A side-view diagram of the VX4 unit. A grey bracket is attached to the left side panel, extending downwards. A large black arrow points towards the bracket, indicating its installation direction. | A front-view diagram of the VX2, VX7, and VX9 units. Each unit has a grey bracket attached to its top panel, extending upwards. Large black arrows point towards the brackets, indicating their installation direction. |

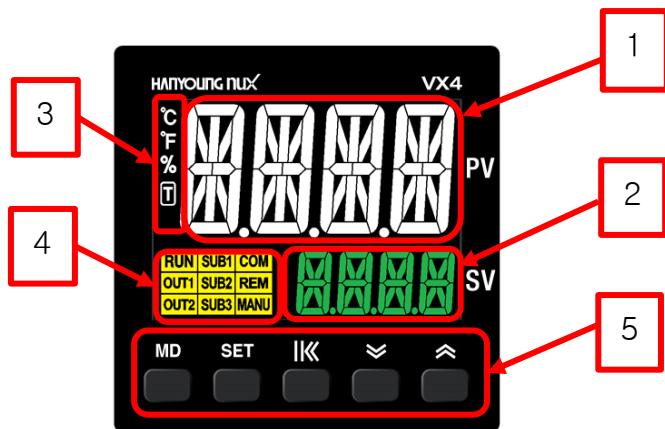
◆ Front design

- Icons and buttons
- ✓ LCD Icon description

| No. | Segment | | Description |
|-----|------------|---------------------------|---|
| 1 | PV | Present value | Displays PV value in operating mode |
| | | | Displays parameter name in menu mode |
| 2 | SV (or MV) | Set value or output value | Displays SV or control output value in operating mode |
| | | | Displays parameter set value in menu mode |
| 3 | °C °F % | Unit | Displays °C, °F, %, or no unit depending on the value set on unit. |
| | T | TUNING | Blinking during auto tuning |
| 4 | RUN | RUN or STOP status | Turns on during control |
| | OUT1 | Output 1 status | Control output 1 blinks proportionally to 0 ~ 100%) |
| | OUT2 | Output 2 status | Control output 2 blinks proportionally to 0 ~ 100%) |
| | COM | Communication status | Turns on for 0.5 sec. during communication (turns on for 2 sec. during communication error) |
| | REM | Remote input activation | Turns on when remote input is set |
| | MANU | Manual output status | Turns on when manual output is set |
| | SUB1 | Sub output 1 status | Turns on when sub output 1 is ON |
| | SUB2 | Sub output 2 status | Turns on when sub output 2 is ON |
| | SUB3 | Sub output 3 status | Turns on when sub output 3 is ON |
| | SUB4 | Sub output 4 status | Turns on when sub output 4 is ON |

| | | | |
|---|-------------|---------------------|--|
| | TUNE | TUNING | Blinks for 1 sec. during Auto-Tuning |
| | LOCK | Lock | Turns on when lock is set) |
| 5 | MD | Mode button | Refer to "button function description" |
| | SET | Set button | |
| | IKK | R/S or SHIFT button | |
| | ▼ | Down button | |
| | ▲ | Up button | |

✓ VX4



- LCD Display (Character)

- ✓ PV 14-Segments character

- Number display (0~9)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- Alphabet display (A~Z)

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J |
| K | L | M | N | O | P | Q | R | S | T |
| K | L | M | N | O | P | Q | R | S | T |
| U | V | W | X | Y | Z | | | | |
| U | V | W | X | Y | Z | | | | |

- ✓ SV 11-Segments character

- Number display (0~9)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- Alphabet display (A~Z)

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| A | b | C | d | E | F | G | H | I | J |
| K | L | M | N | O | P | Q | R | S | T |
| K | L | M | N | O | P | Q | R | S | T |
| U | V | W | X | Y | Z | | | | |
| U | V | W | X | Y | Z | | | | |

✓ MV 7-Segments character

- Number display (0~9)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- Alphabet display (A~Z)

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| | | C | | | | | H | | |
| K | L | M | N | O | P | Q | R | S | T |
| | | | | O | | | | | |
| U | V | W | X | Y | Z | | | | |
| | | | | | | | | | |

- Button functions

- ✓ General button functions

| ✓ Button name | Key | Operating mode | | | | Menu mode | |
|---------------|---|-----------------------|----------------------|----|----------------------|------------------------------------|---|
| | | Control / monitoring | SV setting | MV | Manual MV | Group | Parameter |
| Mode |  | *1 | - | *1 | *2 | *2 | |
| Set |  | SV edit Mode shift | SV save | - | - | Edit parameter/move within group | Move to next parameter after saving value |
| Shift |  | | Digit position Shift | - | Digit position Shift | - | Digit position Shift |
| Down |  | | Decrease value | - | Decrease value | Shift among parameters/shift group | Decrease/change value |
| Up |  | | Increase value | - | Increase value | | Increase/change value |

* 1: When you click Mode key, the control output value is displayed. When you click mode key again, the SV value is displayed.

* 2: Refer to the Menu key description

✓ Function key description

| No | Hot Key | Content |
|----|--|--------------------------------|
| 1 | Press SET + IKK for 3 sec. | Lock / unlock |
| 2 | Press SET + ▼ for 3 sec. | Manual / automatic output mode |
| 3 | Press SET + ▲ for 3 sec. | Auto-tuning |
| 4 | Press IKK for 2 sec. | RUN / STOP |
| 5 | ▼ or ▲ | Release during alarm latch |

✓ Menu key description

| No | Combination Key | Content |
|----|---|---|
| 1 | Press MD for 1 sec. | Simplified menu (SIMPLE MMI) Go to operating mode in MENU entry mode |
| 2 | Press MD + SET for 1 sec. | Full menu (FULL MMI) |
| 3 | Press MD + IKK for 1 sec. | Basic menu (BASIC MMI) |

Product installation

WARNING

- ◆ **Precautions during installation**
- ◆ **Installation notes**

- ✓ To prevent electric shock or device breakdown, turn off the power before installing or removing the product.
- ✓ Please use this product after installing it to a panel, because there is a risk of electric shock.
- ✓ Do not install the product in any of the following places:
 - Places where a person may touch a terminal
 - Places directly exposed to mechanical vibrations or shocks
 - Places exposed to corrosive or flammable gases
 - Places with large temperature change
 - Places with excessively high or low temperatures
 - Places directly exposed to sunlight
 - Places highly influenced by electromagnetic waves
 - Places with high moisture levels
 - Places with flammable objects
 - Places with high presence of dust, salt, etc.

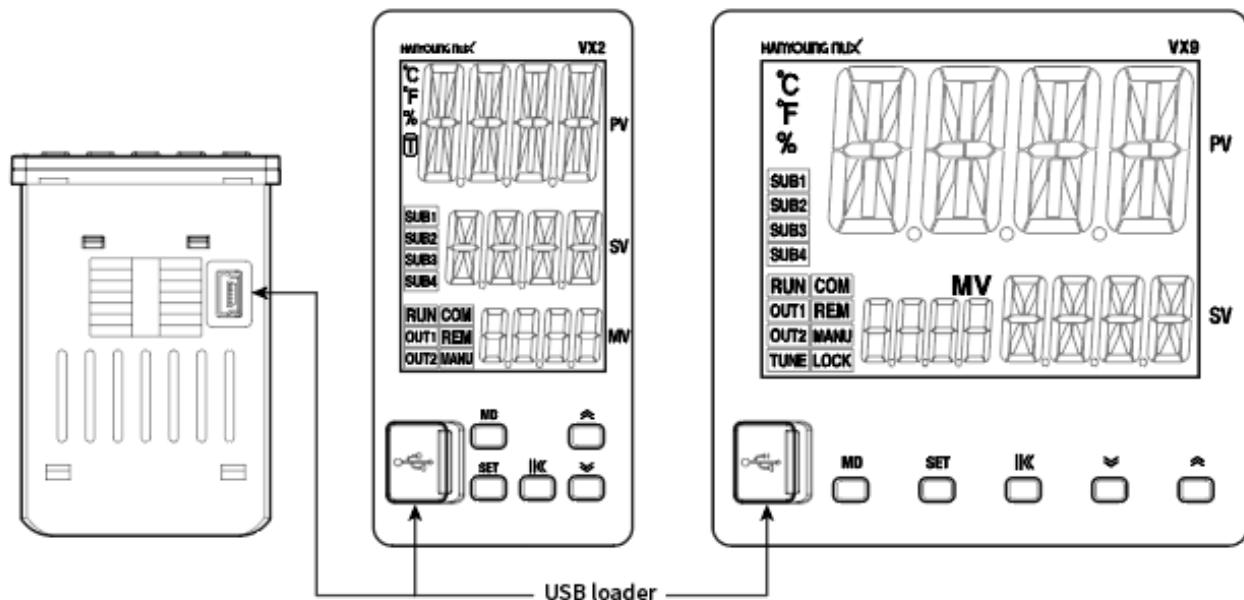
◆ USB Loader connection

The communication loader connection uses the communication loader cable (sold separately) to connect the PC and VX. The parameter setting/backup of the VX is possible through the Hanyoung Nux communication operation program (TCS).

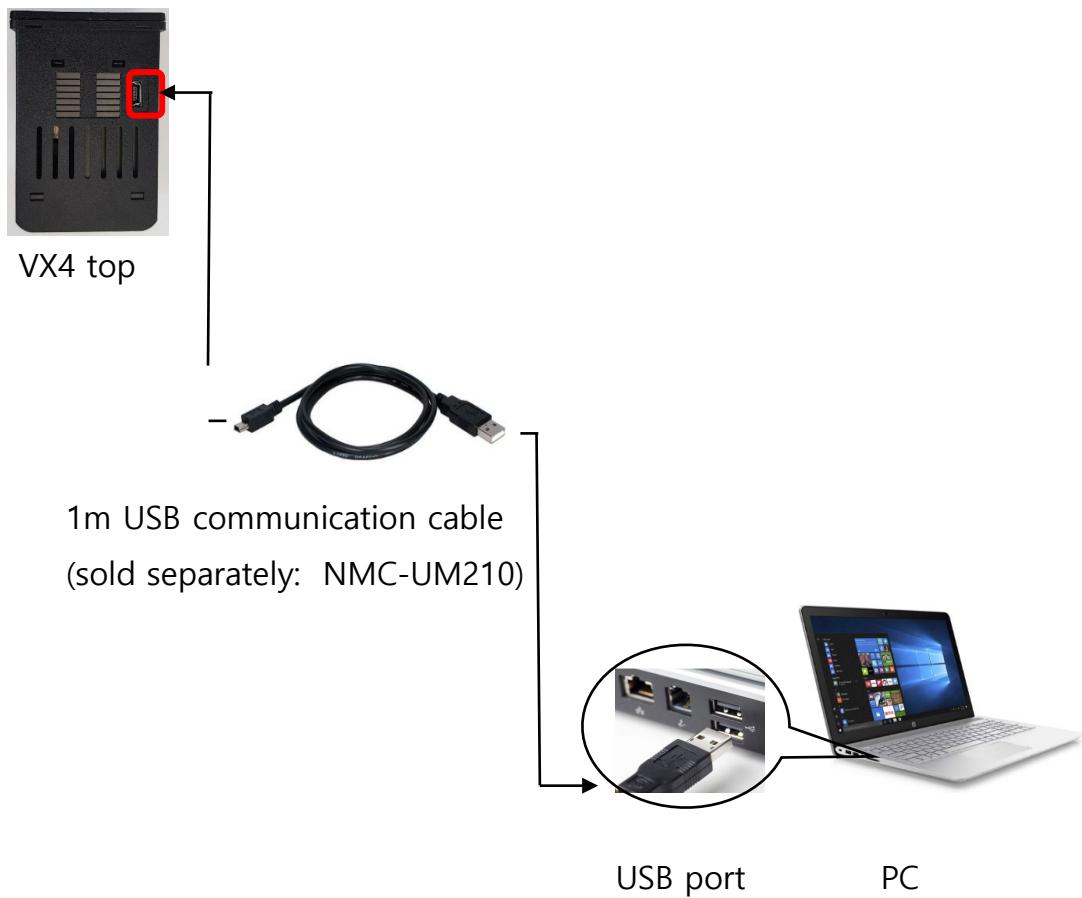
- ✓ Loader cable connection position

- VX4 (top view)
- VX2

- VX7, VX9

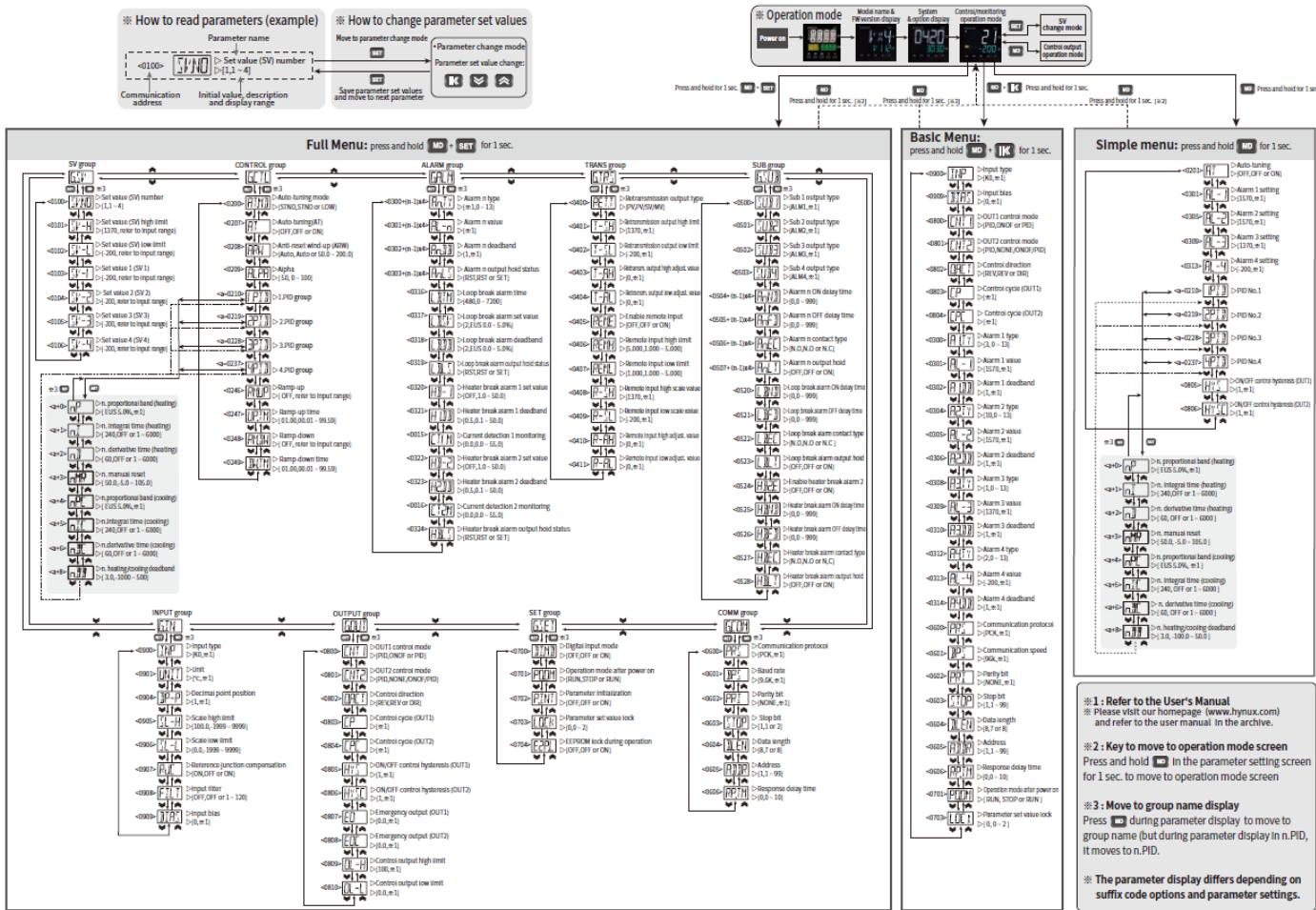


✓ Loader & PC USB Loader connection method



MMI and parameters

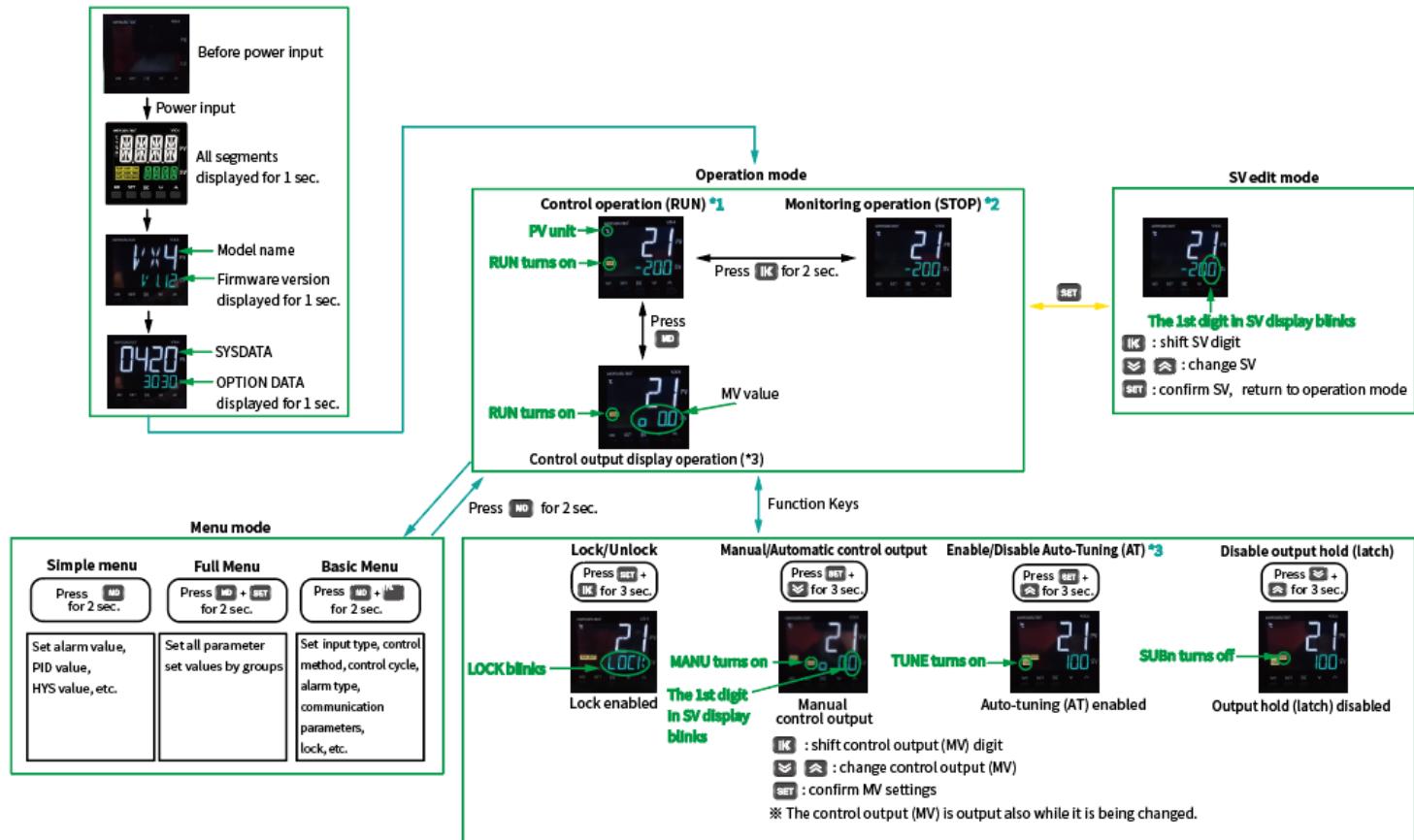
Parameter configuration



- ✓ There is a bigger picture on the back page.

◆ Full mode configuration

This unit has 4 operation / editing modes (control operation (RUN), monitoring operation (STOP), control output display operation, set value (SV) edit mode), 3 menu modes (simple menu, full menu, basic menu) and 5 function keys (auto-tuning enable / disable, manual / automatic control output switching, lock enable / disable, RUN / STOP switch, alarm latch release). Each operation / edit mode, menu mode, and function keys are moved as shown below.



*1: Temperature control, Sub output (Alarm, LBA, HBA, etc.), communication and other functions are normal operations during Run. The Auto-tuning (AT) can be executed only during Run.

*2: Sub output (Alarm etc.), communication and other functions except temperature control functions are normal operations during Stop. The Auto-tuning (AT) cannot be executed during Stop.

*3: The control output display allows the confirmation of the control output status currently operating. The Auto-tuning (AT) can be executed during control output display Run, and cannot be executed during control output display Stop.

*4: Alarm, LBA, HBA must be assigned to Sub n output (SUBn), and parameter output latch must be ON.

Note: If no key is pressed during 30 sec. In Menu mode, it returns to Run mode.

- ✓ How to switch between control operation (RUN) and monitoring operation (STOP)

- In monitoring operation (STOP), press  for 2 seconds to switch to control operation (RUN).

Monitoring operation (STOP)



Control operation (RUN)



Press  for 2 sec.

RUN turns on

- In the control operation (RUN), press  for 2 seconds to switch to monitoring operation (STOP).

Control operation (RUN)



Monitoring operation (STOP)



Press  for 2 sec.

RUN turns off

- ✓ How to change the set value (SV) by editing

- How to change set value (SV) Example) How to change from -200 °C to 100 °C

1. In the operation (RUN) or monitoring (STOP) operation mode, press 

to move to set value (SV) edit mode.

Control (RUN) /Monitoring (STOP) operation modes

Set value (SV) edit mode

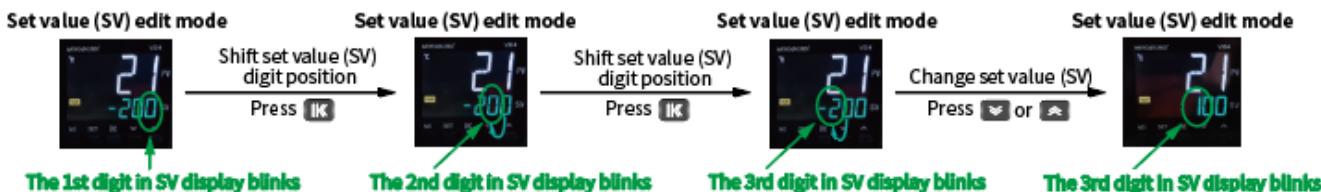


Shift to set value (SV)
edit mode
Press **SET**



The 1st digit in SV display blinks

- Change the set value (SV) to 100 with **IKK**, **▼**, **▲**.



- Save the set value (SV) and move to the control (RUN) or monitoring (STOP) operation mode with **SET**

Set value (SV) edit mode

Control (RUN) /Monitoring (STOP) operation modes



Shift to set value (SV) save
and operation mode
Press **SET**



The 3rd digit in SV display blinks

※ Precautions

- If you do not press **SET** after changing the set value (SV) in set value (SV) edit mode, the set value (SV) cannot be saved in the device.
- If no key is pressed for 30 seconds in the set value (SV) edit mode, it returns to operation mode.

✓ How to shift control output display operation mode

- In control operation (RUN), press **MD** to switch to control output display operation.

Control operation (RUN)



Control output display operation

Press **MD**



Control output value (MV)

- In control output display operation, press **MD** to switch to control operation (RUN).

| Classification | Setting to change |
|----------------|--|
| Suffix code | VX4-UMNA-A2C |
| Input | Thermocouple K type with decimal point (-100.0 ~ 500.0 °C) Bias : 0.0 °C (Default) |
| Output | PID control, reverse action Control cycle 30 sec. |
| Alarm | Alarm 1: Type = high deviation, Alarm value = 10.0 °C, deadband = 1.0 °C Alarm 1: Type = high absolute, Alarm value = 300.0 °C, deadband = 1.0 °C |
| Communication | Protocol: Modbus RTU Speed :19200 bps Parity bit : EVEN Stop bit : 1 bit Data length : 8 bit Address : 1 Response delay time: 0 msec |

Other

Operation mode after power supply = RUN

Lock Setting = None

Control output display operation



Press **MD**

Control operation (RUN)

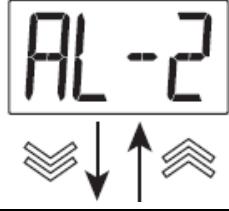
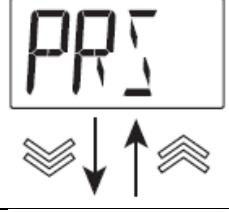
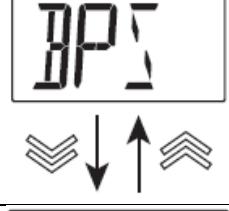
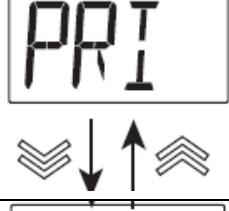
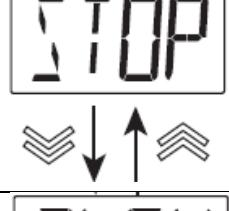
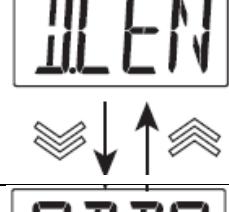
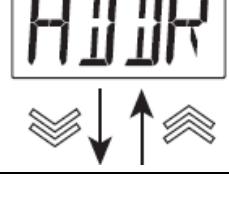


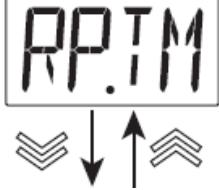
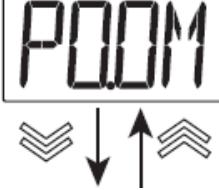
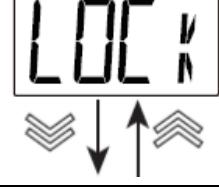
Control output value (MV)

- ✓ Setting example with basic menu mode

| | |
|--|--|
| | In operation mode, press MD + IK for more than 1 second to enter basic menu (MMI and parameters) |
| | Press SET to change parameters. After you press ▲ 'K1' will be displayed. After you press SET it will shift to the next parameter after saving |
| | After you press ▼ it will shift to the next parameter without changes (if set value is not '0.0', after pressing SET , use IK , ▼ , ▲ to set '0.0' and then press SET to save) |
| | After you press ▼ it will shift to the next parameter without changes (if set value is not 'PID', after pressing SET , use ▲ to set 'PID' and then press SET to save) |

| | |
|--|--|
| | This parameter is not displayed in VX4-UMNA-A2C |
| | After you press it will shift to the next parameter without changes (if set value is not 'REV', after pressing , use to set 'REV' and then press to save) |
| | Press to change parameters After you press , , '30' will be displayed. After you press it will shift to the next parameter after saving |
| | This parameter is not displayed in VX4-UMNA-A2C |
| | After you press it will shift to the next parameter without changes (If the set value is not '3', press , then use , , to set '3', then press to save). |
| | Press to change parameters After you press , , '10' will be displayed. After you press it will shift to the next parameter after saving |
| | After you press it will shift to the next parameter without changes (If the set value is not '1.0', press , then use , , to set '1.0', then press to save). |
| | Press to change parameters After you press , , '1' will be displayed. After you press it will shift to the next parameter after saving |

| | |
|---|--|
|  | <p>Press SET to change parameters After you press LL, ▼, ▲ '300.0' will be displayed. After you press SET it will shift to the next parameter after saving</p> |
|  | <p>After you press ▼ it will shift to the next parameter without changes (If the set value is not '1.0', press SET, then use LL, ▼, ▲ to set '1.0', then press SET to save).</p> |
|  | <p>Press SET to change parameters After you press ▼, ▲ 'RTU' will be displayed. After you press SET it will shift to the next parameter after saving</p> |
|  | <p>Press SET to change parameters After you press ▼, ▲ '19.2'K will be displayed. After you press SET it will shift to the next parameter after saving</p> |
|  | <p>Press SET to change parameters After you press ▼, ▲ 'EVEN' will be displayed. After you press SET it will shift to the next parameter after saving</p> |
|  | <p>After you press ▼ it will shift to the next parameter without changes (if set value is not '1', after pressing SET', use ▼ to set '1' and then press SET to save)</p> |
|  | <p>After you press ▼ it will shift to the next parameter without changes (if set value is not '8', after pressing SET', use ▼ to set '8' and then press SET to save)</p> |
|  | <p>After you press ▼ it will shift to the next parameter without changes (if set value is not '1', after pressing SET', use ▼ to set '1' and then press SET to save)</p> |

| | |
|---|--|
|  | <p>After you press  it will shift to the next parameter without changes (if set value is not '0', after pressing  , use  to set '0' and then press  to save)</p> |
|  | <p>After you press  it will shift to the next parameter without changes (If the set value is not 'RUN', press , then use ,  to save).</p> |
|  | <p>After you press  it will shift to the next parameter without changes (if set value is not '0', after pressing , use  to save).</p> |

◆ G.SV (SV Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|--|------|----------------------|----------------------|
| SV.NO | 1 ~ 4 | - | 1 | - . Always displayed |
| SV-H | *3) FR-L ~ FR-H *4) SL-L ~ SL-H (however, SV-L < SV-H) | *2) | *3) FR.H *4) SL.H | - . Always displayed |
| SV-L | | | *3) FR.H *4) SL.H | |
| SV-1 | SV-L ~ SV-H | *2) | SV-L | - . Always displayed |
| SV-2 | | | | |
| SV-3 | | | | |
| SV-4 | | | | |

*2) According to G.IN> UNIT

*3) TC, RTD

*4) DCA, DCV, DCmV

■ SV.NO (SV Number)

SV number can be set from 1 to 4, and it will be operated with selected SV.

There are different ways to select SV: by using SV.NO parameter, by DI input, and by REM selection. The priority order is DI input> REM> SV.NO.

The selected SV No. depends on the use of DI and REM.

When DI is not used, the SV no that is selected according to the SV.NO parameter is shown in the table below (when using REM, SV.NO selected in SV.NO parameter is ignored.)

| REM | SV.NO | | | |
|----------|-------|------|------|------|
| | 1 | 2 | 3 | 4 |
| Not used | SV-1 | SV-2 | SV-3 | SV-4 |
| In use | REM | REM | REM | REM |

When DI is used, the SV no. selected according to SV.NO selected by DI. is shown in the table below (when using DI, SV.NO selected in SV.NO parameter is ignored.)

| REM | SV.NO selected by DI | | | |
|----------|----------------------|------|------|------|
| | 1 | 2 | 3 | 4 |
| Not used | SV-1 | SV-2 | SV-3 | SV-4 |
| In use | SV-1 | SV-2 | SV-3 | REM |

- SV-H (SV High Limit)
- SV-L (SV Low Limit)

The user can limit and prevent the setting of unintended SV with the high and low limit values of the SV setting.

The SV selections by SV.NO, DI, or REM are both limited.

The setting ranges of SV limit values are as follows, according to the type of input sensor.

TC, RTD : $FR-L \leq SV-L < SV-H \leq FR-H$

DCA, DCV, DCmV : $SL-L \leq SV-L < SV-H \leq SL-H$

- SV-1 (Set value 1)
- SV-2 (Set value 2)
- SV-3 (Set value 3)
- SV-4 (Set value 4)

SV-1, 2, 3 & 4 are the set values for controlling the device, which is greater than or equal to SV-L and less than or equal to SV-H. That is: $SV-L \leq SV-1 \text{ (or } SV-2, 3, 4\text{)} \leq SV-H$.

◆ G.CTL (Control Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|---|-----------------|---------------|---|
| AT.MD | STD, LOW | - | STD | - G.OUT>CNT1 = PID or CNT2 = PID |
| AT | OFF, ON | - | OFF | - G.OUT>CNT1 = PID or CNT2 = PID - During RUN state |
| ARW | Auto, (50.0~200.0) % | % | 50.0 | - G.OUT>CNT2 ≠ NONE |
| ALPA | 0 ~ 100 | - | 50 | - G.OUT>CNT1 = PID or CNT2 = PID |
| 1.PID | PID No 1 selection | | | - G.OUT>CNT1 = PID or CNT2 = PID |
| 1.P | *5) EUS (0.15~100.0) % *6) EUS (0.0~100.0) % | *2) | EUS 5.0 % | - G.OUT>CNT1 = PID |
| 1.I | OFF, 1~6000 | Time (seconds) | 240 | |
| 1.D | OFF, 1~6000 | Time (seconds) | 60 | |
| 1.MR | (-5.0~105.0) % | % | 50.0 | - G.OUT>CNT1 = PID - 1.I = OFF |
| 1.Pc | EUS (0.0~100.0) % | *2) | EUS 5.0 % | - G.OUT>CNT2 = PID |
| 1.Ic | OFF, 1~6000 | Time (sec.) | 240 | |
| 1.Dc | OFF, 1~6000 | Time (sec.) | 60 | |
| 1.DB | (-100.0~50.0) % | % | 3.0 | - G.OUT>CNT1 = PID or CNT2 = PID - G.OUT>CNT2 ≠ NONE |

| | | | | |
|-------|---|----------------|-----------|---|
| 2.PID | PID No 2 selection | | | - G.OUT>CNT1 = PID or CNT2 = PID |
| 2.P | *5) EUS (0.15~100.0) % *6) EUS (0.0~100.0) % | *2) | EUS 5.0 % | |
| 2.I | OFF, 1~6000 | Time (sec.) | 240 | - G.OUT>CNT1 = PID |
| 2.D | OFF, 1~6000 | Time (sec.) | 60 | |
| 2.MR | (-5.0~105.0) % | % | 50.0 | - G.OUT>CNT1 = PID - 2.I = OFF |
| 2.Pc | EUS (0.0~100.0) % | *2) | EUS 5.0 % | - G.OUT>CNT2 = PID |
| 2.Ic | OFF, 1~6000 | Time (sec.) | 240 | |
| 2.Dc | OFF, 1~6000 | Time (sec.) | 60 | |
| 2.DB | -100.0 ~ 50.0 | % | 3.0 | - G.OUT>CNT1 = PID or CNT2 = PID - G.OUT>CNT2 ≠ NONE |
| 3.PID | PID No 3 selection | | | - G.OUT>CNT1 = PID or CNT2 = PID |
| 3.P | *5) EUS (0.15~100.0) % *6) EUS (0.0~100.0) % | *2) | EUS 5.0 % | - G.OUT>CNT1 = PID |
| 3.I | OFF, 1~6000 | Time (sec.) | 240 | |
| 3.D | OFF, 1~6000 | Time (sec.) | 60 | |
| 3.MR | (-5.0~105.0) % | % | 50.0 | - G.OUT>CNT1 = PID - 3.I = OFF |
| 3.Pc | EUS (0.0~100.0) % | *2) | EUS 5.0 % | - G.OUT>CNT2 = PID |
| 3.Ic | OFF, 1~6000 | Time (sec.) | 240 | |

| | | | | |
|-------|---|----------------|-----------|---|
| 3.Dc | OFF, 1~6000 | Time (sec.) | 60 | |
| 3.DB | -100.0 ~ 50.0 | % | 3.0 | - G.OUT>CNT1 = PID or CNT2 = PID - G.OUT>CNT2 ≠ NONE |
| 4.PID | PID No 4 selection | | | - G.OUT>CNT1 = PID or CNT2 = PID |
| 4.P | *5) EUS (0.15~100.0) % *6) EUS (0.0~100.0) % | *2) | EUS 5.0 % | |
| 4.I | OFF, 1~6000 | Time (sec.) | 240 | - G.OUT>CNT1 = PID |
| 4.D | OFF, 1~6000 | Time (sec.) | 60 | |
| 4.MR | (-5.0~105.0) % | % | 50.0 | - G.OUT>CNT1 = PID - 4.I = OFF |
| 4.Pc | EUS (0.0~100.0) % | *2) | EUS 5.0% | |
| 4.Ic | OFF, 1~6000 | Time (sec.) | 240 | - G.OUT>CNT2 = PID |
| 4.Dc | OFF, 1~6000 | Time (sec.) | 60 | |
| 4.DB | -100.0 ~ 50.0 | % | 3.0 | - G.OUT>CNT1 = PID or CNT2 = PID - G.OUT>CNT2 ≠ NONE |
| RM.UP | OFF, EUS (0.0 %+1Digit)~100.0 % | *2) | OFF | - Always displayed |
| UP.TM | 00.01 ~ 99.59 | hh:mm | 01.00 | - G.SV>RM.UP ≠ OFF |
| RM.DW | OFF, EUS (0.0 %+1Digit)~100.0 % | *2) | OFF | - Always displayed |
| DW.TM | 00:01 ~ 99:59 | hh:mm | 01.00 | - G.SV>RM.DW ≠ OFF |

*2) According to G.IN> UNIT

*5) heating type

*6) heating/cooling type

◆ AT (Auto-Tuning)

The auto-tuning function automatically measures, computes the control system characteristics, and automatically sets the optimum proportional band (P), integral time (I), and derivative time(D) constants.

When auto-tuning starts, the control output is changed temporarily to ON/OFF control and the optimum PID constants are computed and set from those response data.

This method is called limit cycle.

The time required for AT depends greatly on the control target.

If AT is not terminated even if 24 hours have elapsed since AT started, AT is automatically canceled (terminated).

If the AT exceeds the maximum elapsed time, the control output will generate an emergency output, the '[T]' icon will keep blinking, and 'AT.E' will be displayed on the PV window.

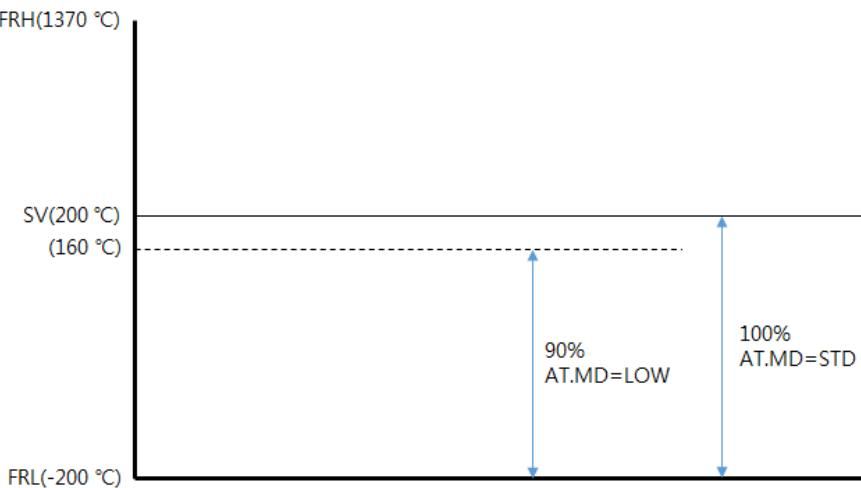
The SV value used for AT is used as the SV value of the number set for SV.NO and when the remote input (REM) is used, the remote input value is used as SV.

■ AT.MD (Auto-tuning mode)

There are two types of auto-tuning: standard type and low PV type.

- Standard type auto-tuning: auto-tuning based on set value (SV)
- Low PV type auto-tuning: auto-tuning based on a value 10% lower than set value (SV)

When low PV type auto-tuning is performed, the set SV is displayed on the device, and the actual operation executes the auto-tuning at SV-10%.



For example, if the SV is set to 200 ° C with TC K type sensor, and the low-PV type auto-tuning is performed, the SV displayed on the device is 200 ° C and the actual operation executes the auto-tuning at 160 ° C.

The calculation formula is as follows.

$$\text{SV of low PV type auto-tuning} = (\text{SV} - \text{FRL}) \times 0.9 - \text{FRL} = (200 - (-200)) \times 0.9 - \text{FRL} = 160$$

■ AT (Auto-tuning)

If AT is set to ON, or if 'SET' key and 'UP' key are pressed and held for more than 3 seconds in the operating state, auto-tuning starts (however, the device must be in the RUN state).

The AT sequence is as follows:

- 가. Select the SV number to execute AT (SV.NO) (SV.NO)
- 나. Set the corresponding SV value to the corresponding SV.NO.
- 다. Select from standard or low PV type in AT.MD.
- 라. Check if VX is in the RUN state (if it is not in RUN state, put it in RUN state).
- 마. AT execution methods:

- A. set AT parameter to ON in G.AT group
- B. Press and hold 'SET' key and 'UP' key for more than 3 seconds in operating state.

[When AT is executed, the AT display part in the front display window turns on]

- A. set AT parameter to OFF in G.AT group
- B. Press and hold 'MODE' key and 'UP' key for more than 3 seconds in operating state.

[When AT is terminated, the AT display part in the front display window turns off]

- AT execution (completion, cancel or forced termination after maximum time has elapsed)

If AT is completed normally, 'P', 'I', 'D' values are reset to the same PID number as SV.NO. However, 'P', 'I', and 'D' values are reset to PID No.4 when set as remote input .

The 'P', 'I', 'D' values are not changed if AT is cancelled or forcibly terminated during AT.

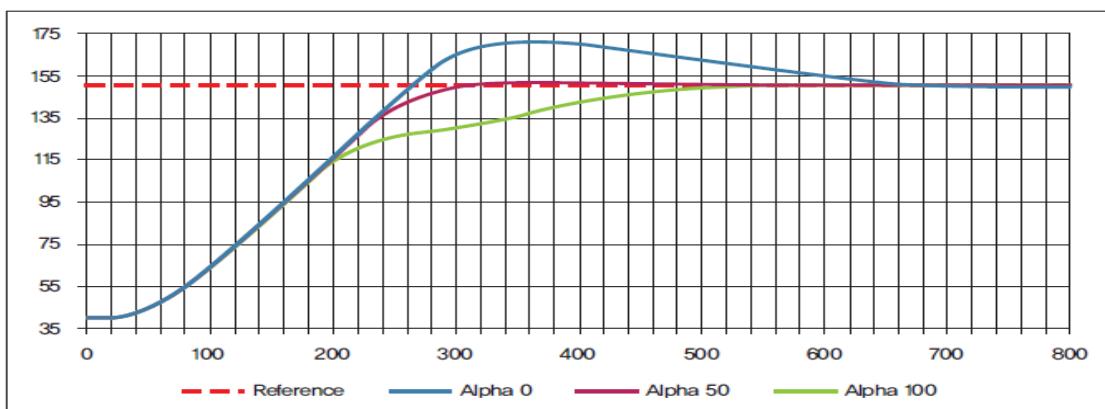
◆ PID (Proportional Band, Integral Time, Derivative Time)

■ ARW (Anti reset wind-up)

When the control output value reaches the limit value (OLH, OLL), it executes the ARW operation to prevent overintegration.

■ ALPA (Alpha)

The response in a typical closed loop control system can be broadly divided into response to set value change and response to disturbance, and the normal PID (one-degree-of-freedom) algorithm has the limitation, that it can only optimize one response for these two responses. To overcome this limitation, with the application of the two-degree-of-freedom PID algorithm, you can optimize the response to the set value change and obtain an appropriate response to disturbances.



[Picture. Control function according to Alpha]

The ALPHA parameter is used to adjust the response characteristics to the set value (SV) changes.

If ALPHA = 0%, it is the same as the normal PID control.

If ALPHA = 100%, it may take a long time to reach a normal state.

When the n.I parameter is set to 0 (OFF) in the G.CTL group, the ALPA value will be set to 0 internally in the program, the ALPA parameter will not be visible in G.GTL, and the MR parameter will be visible.

If the n.I parameter is not set to 0 (OFF) in the G.CTL group, the ALPA value will be reset internally to the previously set ALPA value, the MR parameter will not be visible in G.GTL, and the ALPA parameter will be visible.

■ n.PID (PID No n)

If N.PID is selected, the PID parameter of the corresponding PID number is displayed.

n.P, n.I, n.D values are heating PID parameters, and n.Pc, n.Ic, n.Dc are cooling PID parameters.

The cooling parameters are displayed when G.OUT> CNT2 is not NONE in products with OUT2 option.

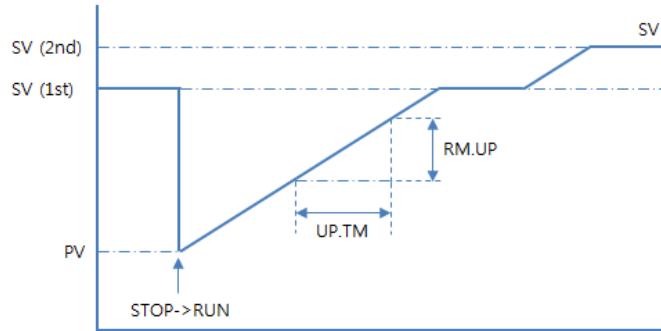
The PID coefficients are automatically set when the AT is completed, and can be set directly if the user already knows them. You can also modify the PID coefficients that are set automatically after AT.

◆ RAMP

When the ramp function is used, the SV changes with a gradient to increase or decrease during the set time.

Therefore, in order to set the ramp, the unit time and SV change amount per unit time should be set.

The RAMP Up or RAMP Down functions are applied when the SV value is changed when changing from STOP to RUN or during RUN. . When changing from STOP to RUN, SV starts from PV, and when SV is changed, it starts from current SV.



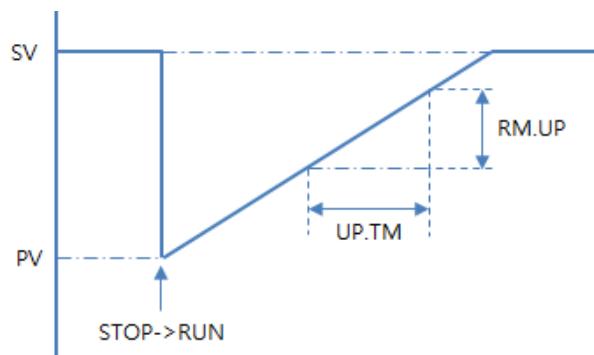
[Picture. RAMP UP example]

- RM.UP (Ramp Up)

Sets the SV variation amount per unit time (UP.TM).

- UP.TM (Ramp Up Time)

Sets unit time for SV variation amount (RM.UP).



[Picture. Ramp Up]

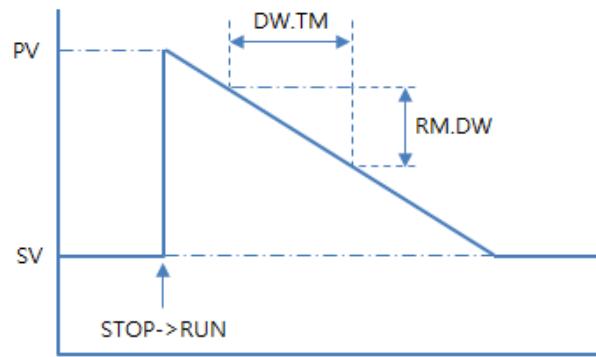
For example, if RM.UP is 60°C and UP.TM is 1 minute, the SV value has a Ramp Up of 1.0°C per second.

- RM.DW (Ramp Down)

Sets the SV variation amount per unit time (DW.TM).

- DW.TM (Ramp Down Time)

Sets the unit time for SV variation amount (RM.DW).



[Picture. RAMP Down]

For example, if RM.DW is 60°C and DW.TM is 1 minute, the SV value has a Ramp Down of 1.0°C per second.

◆ G.ALM (Alarm Group)

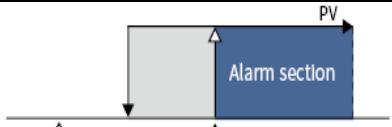
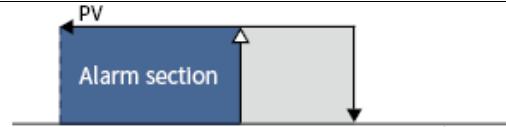
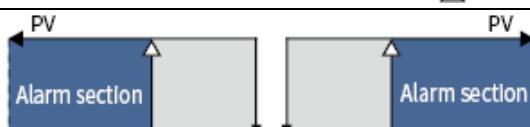
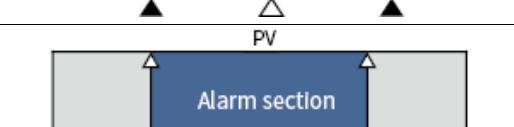
| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|--|------|---------------|---|
| A1.TY | 0 ~ 13 | - | 3 | - . G.SUB> SUBx = ALM1 |
| AL-1 | Absolute : EU (0.0~100.0) % Deviation : EUS (0.0~100.0) % | *2) | EUS 100.0 % | - . G.SUB> SUBx = ALM1 - . G.ALM> A1.TY ≠ OFF (0) |
| A1.DB | EUS (0.0~100.0) % | *2) | 1.0 °C | |
| A1.LS | RST, SET | - | RST | - . G.SUB> SUBx = ALM1 - . G.SUB> A1.LT = ON - . G.ALM> A1.TY ≠ OFF (0) |
| A2.TY | 0 ~ 13 | - | 10 | - . G.SUB> SUBx = ALM2 |
| AL-2 | Absolute : EU (0.0~100.0) % Deviation : EUS (0.0~100.0) % | *2) | EUS 100.0 % | - . G.SUB> SUBx = ALM2 - . G.ALM> A2.TY ≠ OFF (0) |
| A2.DB | EUS (0.0~100.0) % | *2) | 1.0 °C | |
| A2.LS | RST, SET | - | RST | - . G.SUB> SUBx = ALM2 - . G.SUB> A2.LT = ON - . G.ALM> A2.TY ≠ OFF (0) |
| A3.TY | 0 ~ 13 | - | 1 | - . G.SUB> SUBx = ALM3 |
| AL-3 | Absolute : EU (0.0~100.0) % Deviation : EUS (0.0~100.0) % | *2) | EU 100.0 % | - . G.SUB> SUBx = ALM3 - . G.ALM> A3.TY ≠ OFF (0) |
| A3.DB | EUS (0.0~100.0) % | *2) | 1.0 °C | |
| A3.LS | RST, SET | - | RST | - . G.SUB> SUBx = ALM3 - . G.SUB> A3.LT = ON - . G.ALM> A3.TY ≠ OFF (0) |

| | | | | |
|-------|--|----------------|------------|---|
| A4.TY | 0 ~ 13 | - | 2 | - . G.SUB> SUBx = ALM4 |
| AL-4 | Absolute : EU (0.0~100.0) % Deviation : EUS (0.0~100.0) % | *2) | EU 0.0 % | - . G.SUB> SUBx = ALM4 - . G.ALM> A4.TY ≠ OFF (0) |
| A4.DB | EUS (0.0~100.0) % | *2) | 1.0 °C | |
| A4.LS | RST, SET | - | RST | - . G.SUB> SUBx = ALM4 - . G.SUB> A4.LT = ON - . G.ALM> A4.TY ≠ OFF (0) |
| LB.TM | 0 ~ 7200 | Time (sec.) | 480 | - . G.SUB> SUBx = LBA |
| LB.SV | EUS (0.0~5.0) % | *2) | EUS 0.15 % | |
| LB.DB | EUS (0.0 % + 1 digit) ~ 5.0 % | *2) | EUS 0.15 % | |
| LB.LS | RST, SET | - | RST | - . G.SUB> SUBx = LBA - . G.SUB> LB.LT = ON |
| HB-1 | OFF, (1.0 ~ 50.0) A | Current (A) | OFF | - . G.SUB> SUBx = HBA |
| H1.DB | (0.1 ~ 50.0) A | | 0.5 | - . G.SUB> SUBx = HBA |
| CT1.M | (0.0 ~ 55.0) A | | - | - . G.ALM> HB-1 ≠ OFF |
| HB-2 | OFF, (1.0 ~ 50.0) A | | OFF | - . G.SUB> SUBx = HBA - . G.SUB> HB2.E = ON |
| H2.DB | (0.1 ~ 50.0) A | | 0.5 | - . G.SUB> SUBx = HBA - . G.SUB> HB2.E = ON |
| CT2.M | (0.0 ~ 55.0) A | | - | - . G.ALM> HB-2 ≠ OFF |
| HB.LS | RST, SET | - | RST | - . G.SUB> SUBx = HBA - . G.SUB> HB.LT = ON - . G.ALM> HB-1 ≠ OFF |

* 2) According to G.IN> UNIT

| Code | ALARM NAME | Absolute alarm | Deviation alarm |
|------|--|-----------------------|-----------------------|
| 0 | Alarm Off | | |
| 1 | High Absolute | <input type="radio"/> | |
| 2 | Low Absolute | <input type="radio"/> | |
| 3 | High Deviation | | <input type="radio"/> |
| 4 | Low Deviation | | <input type="radio"/> |
| 5 | High-Low Deviation | | <input type="radio"/> |
| 6 | High-Low Range | | <input type="radio"/> |
| 7 | High absolute with standby sequence | <input type="radio"/> | |
| 8 | Low absolute with standby sequence | <input type="radio"/> | |
| 9 | High deviation with standby sequence | | <input type="radio"/> |
| 10 | Low deviation with standby sequence | | <input type="radio"/> |
| 11 | High-Low deviation with standby sequence | | <input type="radio"/> |
| 12 | High-Low range with standby sequence | | <input type="radio"/> |
| 13 | Sensor error | <input type="radio"/> | |

[Alarm type and code]

| Code | Alarm type | Alarm operation | Absolute alarm | Deviation alarm |
|-----------|--|--|----------------|-----------------|
| 0 | Alarm off | | | |
| 1 (7) | High absolute High absolute with standby sequence |  | O | |
| 2 (8) | Low absolute Low absolute with standby sequence |  | O | |
| 3 (9) | High Deviation High Deviation with standby sequence |  | | O |
| 4 (10) | Low deviation Low deviation with standby sequence |  | O | |
| 5 (11) | High-Low Deviation High-Low Deviation with standby sequence |  | O | |
| 6 (12) | High-Low range High-Low range with standby sequence |  | O | |
| 13 | Sensor error | Burn-out | O | |

※ Gray part: Ax.DB,

△: SV set value,

▲: AL-x set value. The number indicated in parenthesis () has standby sequence

※ x indicates alarm number 1 ~ 4

[Alarm operation]

■ An.TY (Alarm No.n Type)

With An.TY, you can choose between 'Alarm off' and 13 alarm types listed in the 'Alarm type and code' table.

Each type is divided into absolute alarm and deviation alarm, and the setting range is displayed differently when AL-n is set.

'n' indicates alarm numbers 1 ~ 4. For alarm operation, please refer to the 'alarm operation' part.

■ AL-n (Alarm No.x Value)

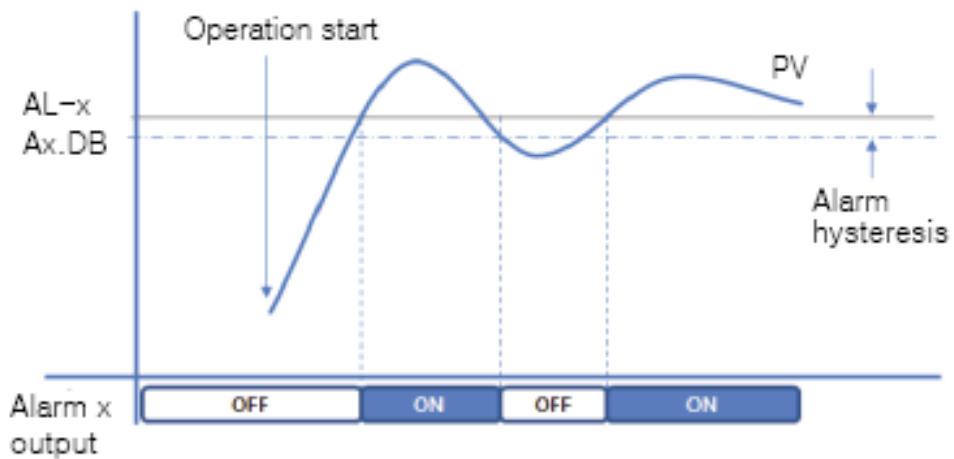
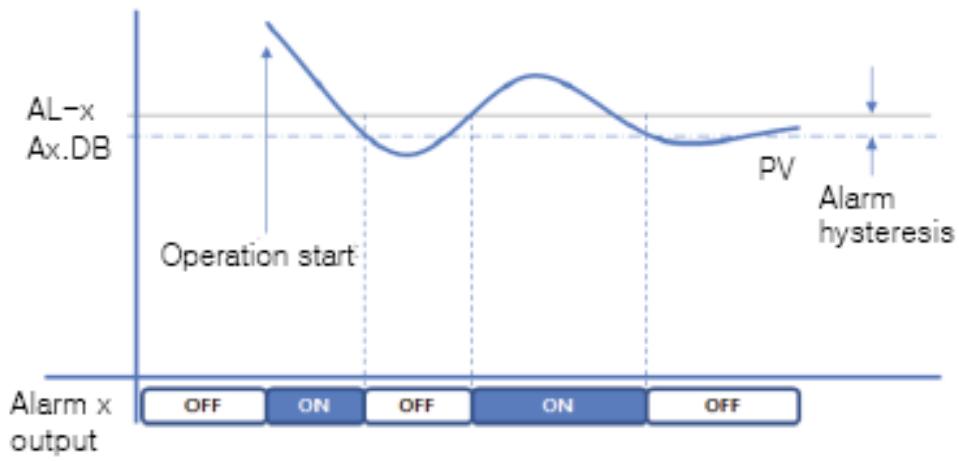
AL-x is the alarm setting value. When it is set as absolute alarm, the setting range is EU (0.0 ~ 100.0)%. When it is set as deviation alarm, the setting range is EUS (0.0 ~ 100.0)%.

For example, when TC K type sensor is set and the alarm type is set to high absolute (alarm code= 1), the setting range of AL-x is -200 °C ~ 1,370 °C. When the alarm type is set to high deviation (alarm code= 3), the setting range of AL-x is 0.0 °C ~ 1,570.0 °C.

■ An.DB (Alarm No.x Dead Band)

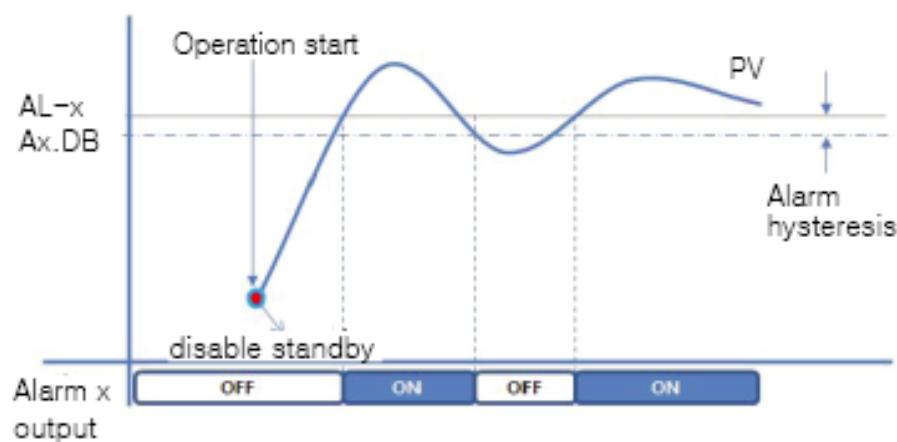
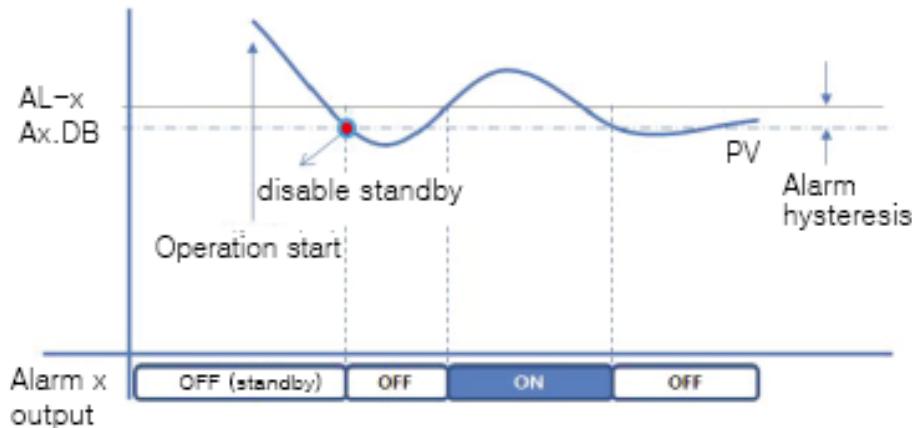
Ax.DB is the dead band to disable the alarm. An.DB setting range is set to EUS (0.0 ~ 100.0)% regardless of absolute alarm and deviation alarm.

The picture below 'alarm operation example (1)' shows an example of high absolute alarm of alarm number '1'.



[Picture. [Alarm operation example (1)]]

The picture below 'alarm operation example (2)' shows an example of high absolute alarm with standby sequence of alarm number '7'. In order not to generate the alarm at the start of operation, select the alarm setting number with the standby sequence.



[Picture. Alarm operation example (2)]

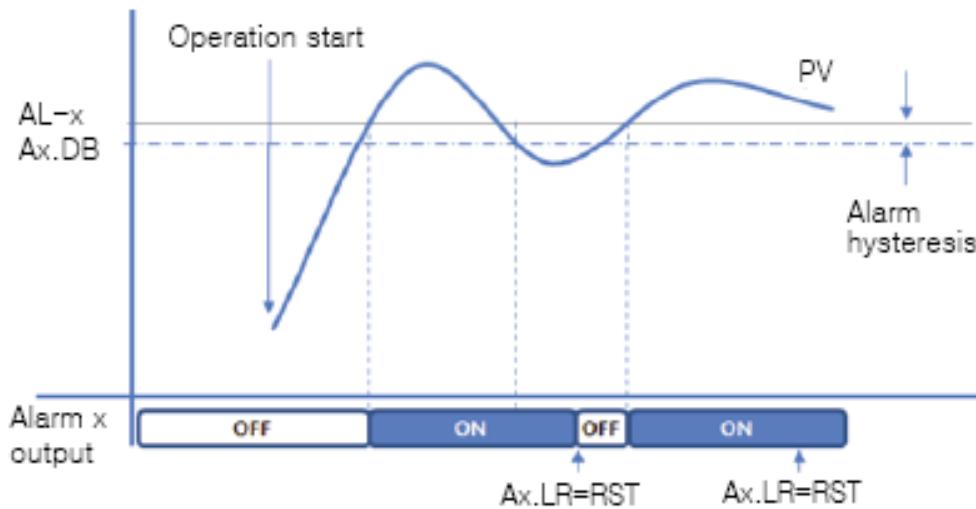
The operation of alarms with standby sequence is as follows: the first alarm ON condition is ignored when the alarm ON condition is satisfied at the time of setting change (such as power ON, change from STOP to RUN, SV change, alarm setting change). An alarm is triggered for an alarm ON condition that occurs after the alarm release condition has been set.

- Power OFF -> Power ON
- STOP -> RUN
- SV value change
- Alarm setting change

■ An.LS (Alarm No.x Latch Status)

An.LS is the alarm output latch function and can be used when G.SUB> A1.LT is set to ON.

If G.SUB> A1.LT is OFF, the alarm is automatically set to 'SET' or 'RST' (Reset) as shown in 'alarm operation example (1) or example (2)' above. However, to release the alarm when G.SUB> A1.LT is set to ON, the user must change Ax.LS to 'RST' after the alarm release condition is reached.



[Picture. Example of alarm operation when the latch function is activated]

If no alarm occurs, An.LS is in 'RST' state, and if alarm occurs, it is in 'SET' state. However, even if the alarm condition is released, the alarm condition is held and the alarm output is also generated. Therefore, to release the alarm, you must set An.LS to RST (while the alarm condition is released).

✓ How to release An.LS in latch state

When An.LS is set to 'SET', it can be released by selecting one of the following methods under the alarm release condition.

In G.ALM, change the An.LS parameter to 'RST'.

With DI4 option, An.LS is set to 'RST' when DI4 is turned ON.

Press Up or Down buttons on SV or MV display windows, in order to set An.LS to 'RST'. (cannot be used in SV setting window or MV setting window).

◆ LBA : Loop Break Alarm)

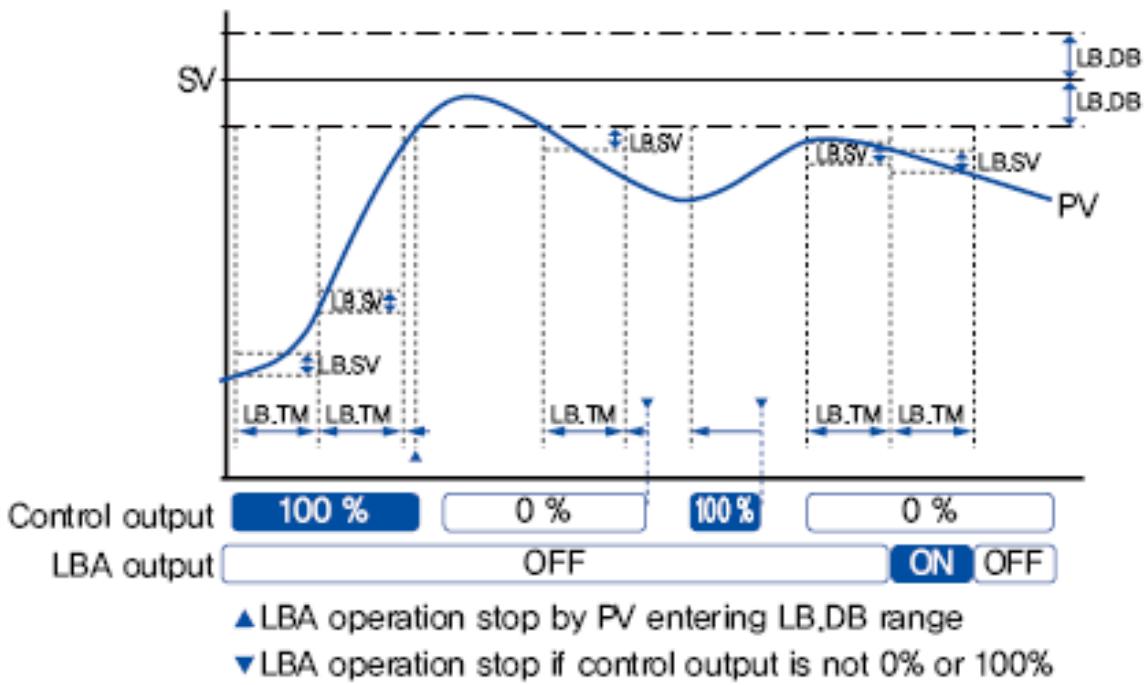
When the control output value by PID (or ON / OFF) operation reaches 0% or 100%, compares the variation amount of the deviation (SV-PV) with each set time of LB.TM, detects heater breaks, wiring errors, temperature sensor breaks and short circuit, output circuit abnormalities, etc. You can also set the LBA deadband (LB.DB) to avoid being affected by normal control loops.

When the control output value is 100% in the reverse action (heating control), the LBA output turns ON when the temperature does not rise above the LB.SV value within the LB.TM set time. Also, when the control output value is 0%, the LBA output turns ON when the temperature does not fall above the LB.SV value within the LB.TM setting time.

When the control output value is 100% in the direct action (cooling control), the LBA output turns ON when the temperature does not fall above the LB.SV value within the LB.TM set time. Also, when the control output value is 0 %, the LBA output turns ON when the temperature does not rise above the LB.SV value within the LB.TM set time.

In heating / cooling control, it operates only in reverse action.

- ✓ LBA is automatically released under the following conditions:
 - When control is in the STOP state
 - During Auto Tuning
 - When the deviation (SV-PV) is in the LB.DB range
 - When LBA is not set on sub output



[Picture. LBA operation example]

■ LB.TM (Loop Break Alarm Time)

The loop break detection time is usually set to about twice the value of PID coefficient 1. When auto-tuning is executed, the LB.TM value is automatically set to twice the LB.TM 1 value.

However, when ON / OFF control is used, LB.TM is not set automatically, so it must be input manually by the user.

■ LB.SV (Loop Break Alarm SV)

When the control output reaches 100% or 0%, an alarm is generated if the change of the temperature deviation after LB.TM time does not change by more than the loop break alarm SVLB.SV).

■ LB.DB (Loop Break Alarm Dead Band)

To prevent malfunctions of the loop break alarm during normal control, set the loop break alarm dead band. If PV enters the $SV \pm LB.DB$ area, the loop break detection is not executed and the generated loop break alarm is also disabled.

That is, LBA will only work if PV is less than $SV - LB.DB$ or if PV is greater than $SV + LB.DB$.

■ LB.LS (Loop Break Alarm Latch Status)

LB.LS is a Latch function of LBA output and can be used when G.SUB> LB.LT is set to ON. If there is no alarm, LB.LS is on RST state. If an alarm is generated, it is on SET state. However, even if the alarm condition is released, the alarm condition is maintained and the alarm output is also generated. Therefore, to release the alarm, you must set LB.LS to RST (while the alarm condition is released).

✓ How to release LB.LS in latch state

When LB.LS is set to 'SET', it can be released by selecting one of the following methods under the alarm release condition.

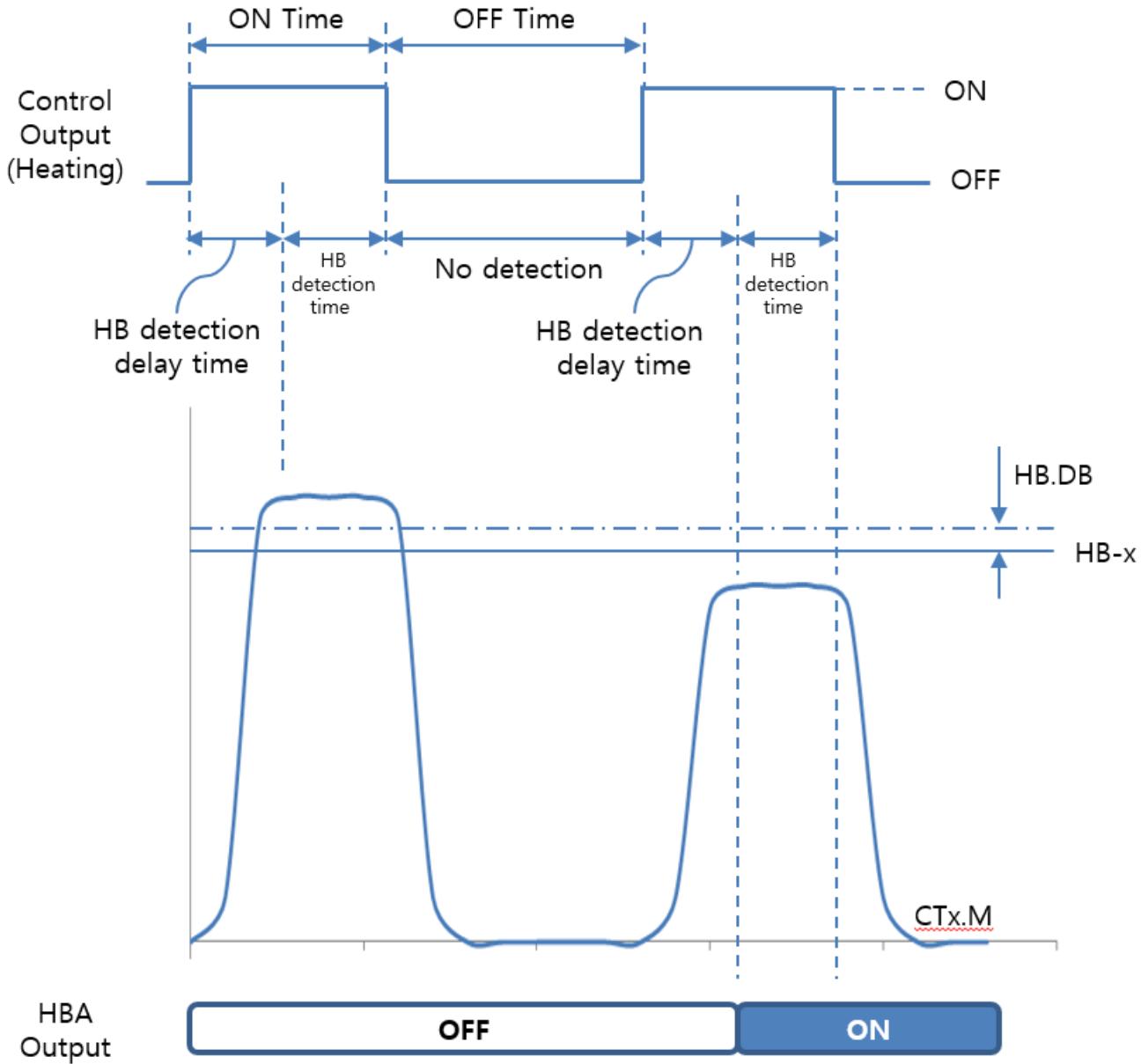
1. In G.ALM, change the LB.LS parameter to 'RST'.
2. With DI4 option, LB.LS is set to 'RST' when DI4 is turned ON.
3. Press Up or Down buttons on SV or MV display windows, in order to set LB.LS to 'RST'. (can not be used in SV setting window or MV setting window).

◆ HBA : Heater Break Alarm)

The HBA measures the current of the current detector (CT) connected to the heater (load) side, detects that the connected heater is not in a normal state, and generates an alarm.

The HBA can be used when at least one HBA is selected from the sub outputs.

- - Detects heater breaks and generates alarm immediately.
- - Please use the Hanyoung Nux specified current detector (CT)
- - It can not be used when controlling by phase angle control method using thyristors (SCR output)



[Picture. HBA detection example]

As shown in the above picture, the current value is monitored until the control output turns off from after the HB detection delay time, after the heating control output turns ON. An alarm is generated when the heater is considered abnormal.

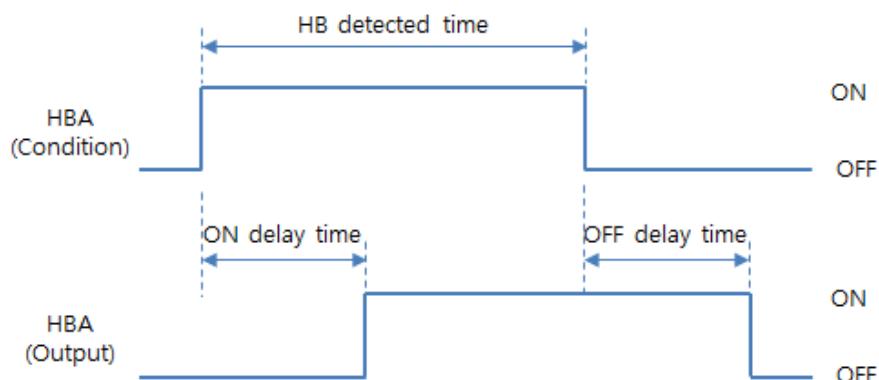
The generated alarm is held during the control output period time including the control output OFF time, and remains OFF until the control output turns ON and the HB detection time goes to normal range.

The HB detection delay time is about 500 ms to reach 95% or more of the actual input current.

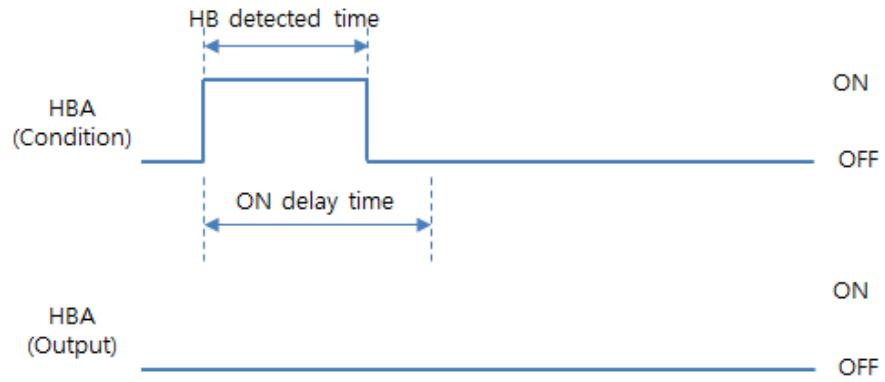
Therefore, according to the control output period, the HB detection can be performed only when the minimum control output amount that can detect HB is exceeded.

| Control output period (sec). | HB detection delay time (msec) | Minimum output amount (%) for HB detection |
|---------------------------------|-----------------------------------|---|
| 1 | 500 + 25 = 525 | 52.5 |
| 2 | | 26.3 |
| 3 | | 17.5 |
| 4 | | 13.1 |
| 5 | | 10.5 |
| 10 | | 5.3 |
| 15 | | 3.5 |
| 20 | | 2.6 |
| 25 | | 2.1 |
| 30 | | 1.8 |

※ The control output period is the set value of the CP parameter in G.OUT.



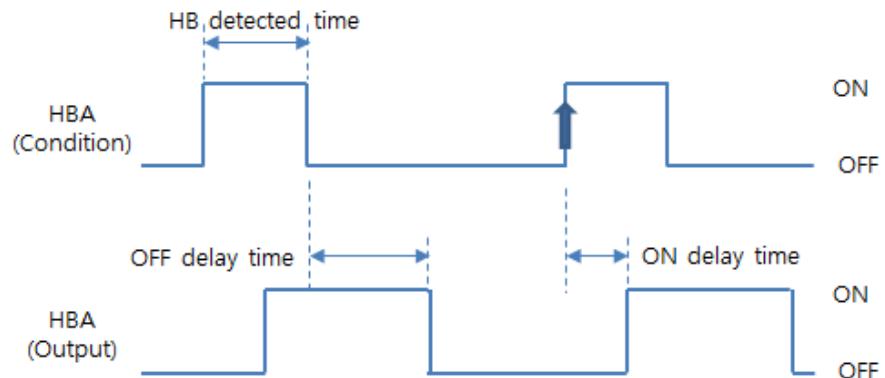
If HBA ON delay time is not set when an alarm condition occurs, the alarm output turns on immediately. If HBA ON delay time is set, alarm output turns on after delay time. Also, if the HBA OFF delay time is not set when the alarm condition is released, the alarm output turns off immediately. If HBA OFF delay time is set, the alarm output is OFF after the delay time.



However, if HB detection time is shorter than HBA ON delay time, the alarm is not generated.

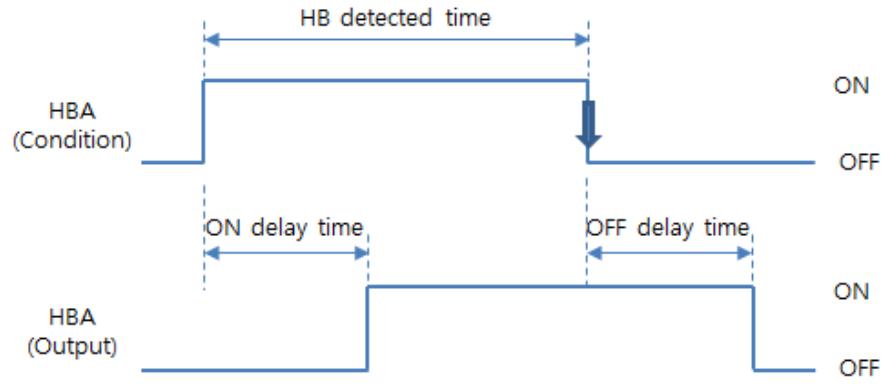
Normal or abnormal alarms may be generated depending on ON / OFF delay time during alarm generation and release.

When an alarm is generated, the alarm is normally output after ON delay time, when it is not during OFF delay.



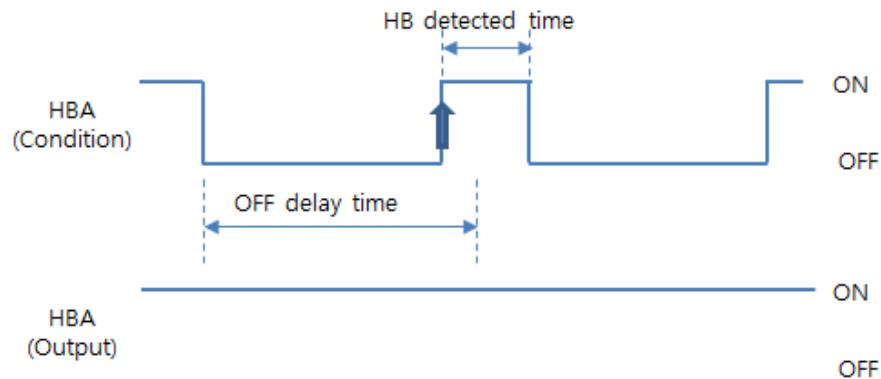
[Picture. When an alarm is generated, if it is not during OFF Delay (normal)]

When an alarm is released, the alarm is normally released after OFF delay time, when it is not during ON delay



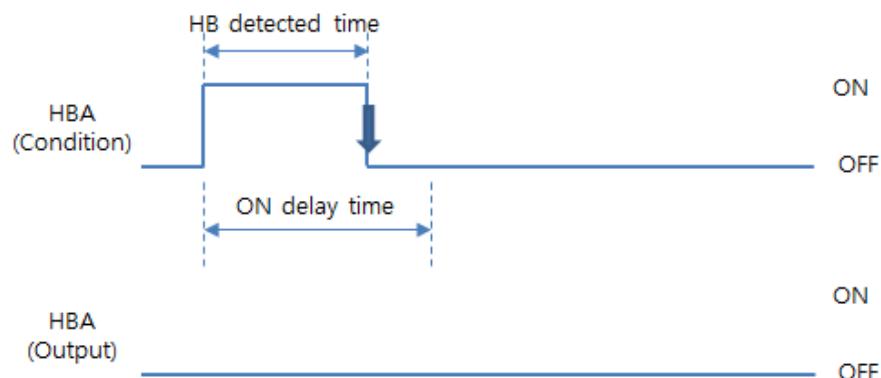
[Picture. When an alarm is released, if it is not during ON Delay (normal)]

When an alarm is generated, the alarm is output and not released, when it is during OFF delay.



[Picture. When alarm is set, if it is during OFF Delay (abnormal output ON)]

When an alarm is released, the alarm is not output, when it is during ON delay.



[Picture. When alarm is disabled, if it is during ON Delay (abnormal output OFF)]

When the latch function is not used, the generated alarm is OFF when the control output amount is 0% or less than the HB detection delay time.

An alarm is generated when the current measured during the HB detection time is less than the set current value (CTn.M <HB-n>), and is disabled when it is more than the deadband area (CTx.M> (HB-n + HB.DB)) .

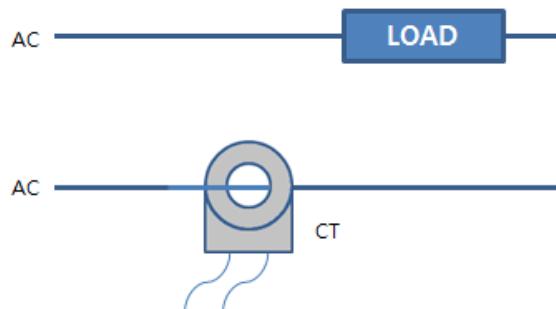
- HB-n (Heater Break No.n Current Value)

An alarm is generated when the current value, detected when the heating side control output is generated, is less than HB-n value.

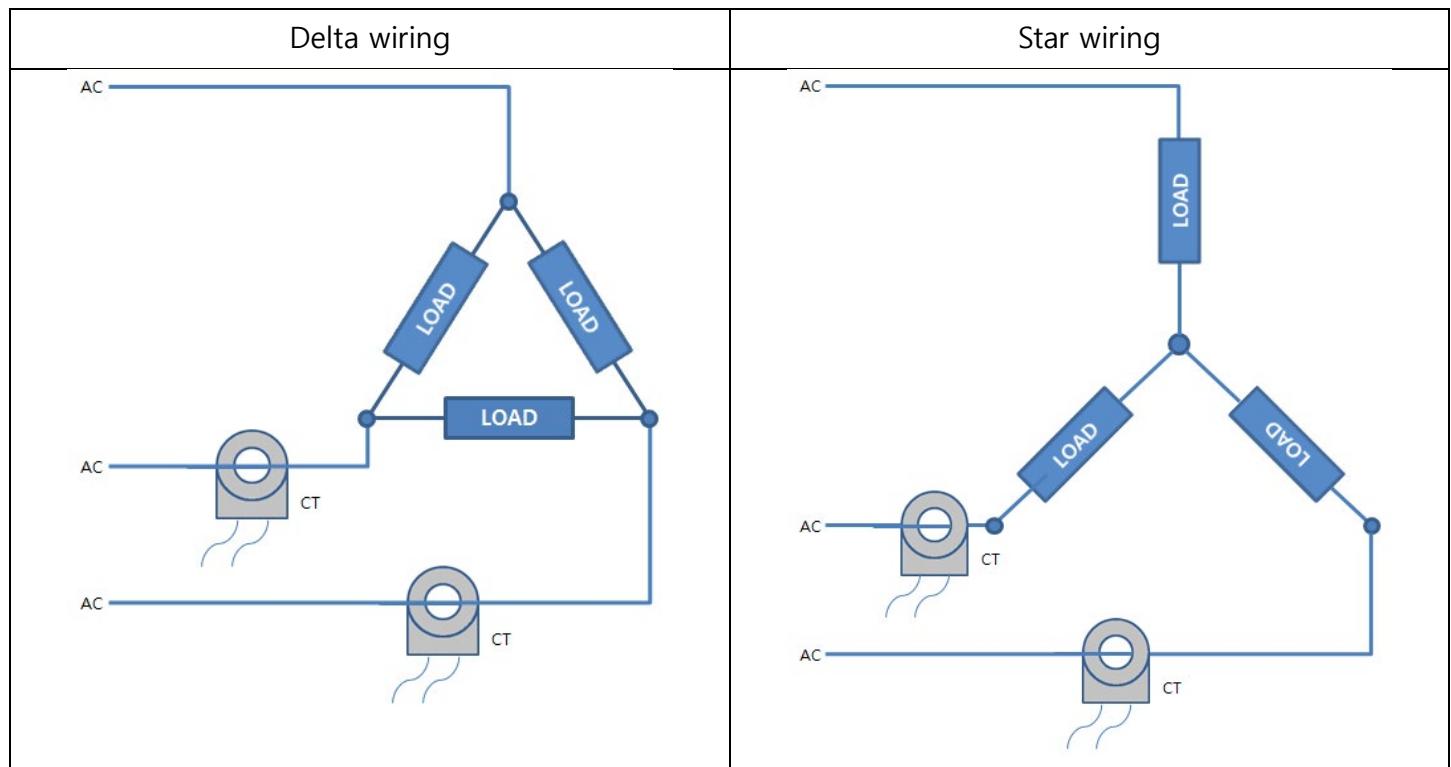
- HB.DB (Heater Break No.x Dead Band)

When HB-x or below current value is detected and an alarm is generated, the alarm will be released by detecting more than HB.DB value.

Single-Phase wiring example



Three-Phase wiring example



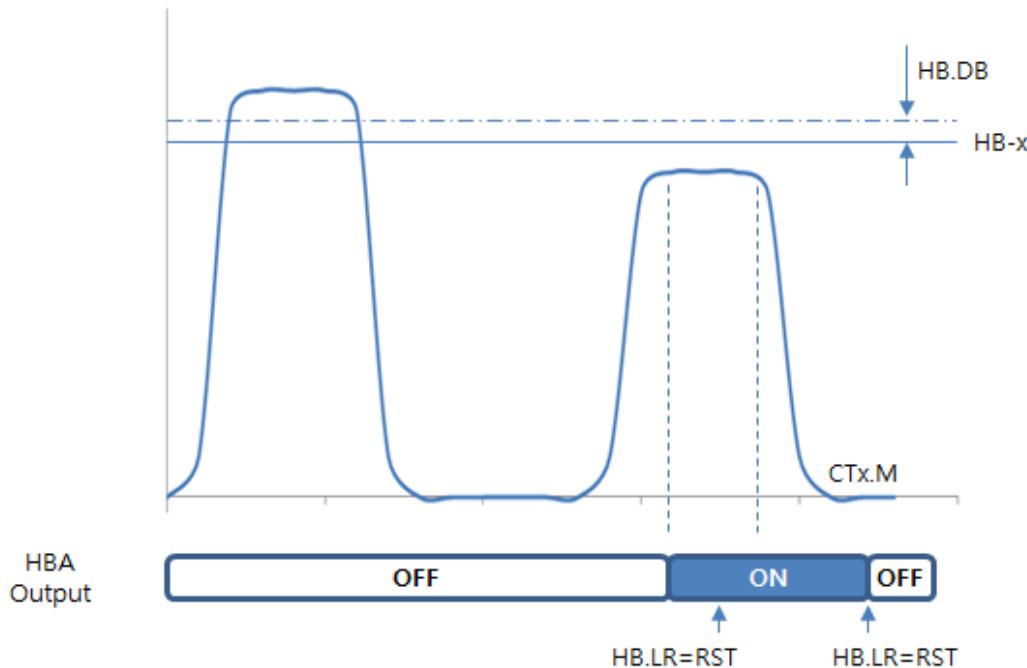
■ CTn.M (CT No.n Monitoring)

The value of input CT current is monitored and displayed.

■ HB.LS (Heater Break Alarm Latch Status)

The HBA alarm also has a latch function that can be used when G.SUB> HB.LT is ON.

If an alarm set on HB1 or HB2 is generated, the settings of HB.LS will change from RST to SET.



[Picture. HBA Latch Release]

At this time, the alarm is held until the user changes HB.LS to RST while the HBA alarm is released.

✓ How to release HB.LS latch state

When HB.LS is set to 'SET', it can be released by selecting one of the following methods under the alarm release condition.

1. In G.ALM, change the HB.LS parameter to 'RST'.
2. With DI4 option, HB.LS is set to 'RST' when DI4 is turned ON.
3. Press Up or Down buttons on SV or MV display windows, in order to set HB.LS to 'RST'. (can not be used in SV setting window or MV setting window).

◆ G.TRS (Transfer & Remote Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|--|--------------------------|--------------------------------------|---|
| RET.T | PV, SV, MV | - | PV | - For products with the RET option |
| T-SH | *3) FR.L ~ FR.H *4) SL.L ~ SL.H (however, TR-L < TR-H) | *2) | EU 100 % | - For products with the RET option - G.TRS>TR.MD = PV or SV |
| T-SL | | | EU 0 % | |
| T-AH | PV, SV : EUS (-5.0~5.0) % MV : EU (95.0~105.0) % | PV, SV : °C MV : % | PV, SV : EUS 0 % MV : EU 100 % | - For products with the RET option |
| T-AL | PV, SV : EUS (-5.0~5.0) % MV : EU (-5.0~5.0) % | | PV, SV : EUS 0 % MV : EU 0 % | |
| REM.E | OFF, ON | - | OFF | - For products with the RET option |
| REM.H | 1V ≤ R-VL < R-VH ≤ 5V | V | 5.000 | |
| REM.L | | | 1.000 | |
| R-SH | *3) FR.L ~ FR.H *4) SL.L ~ SL.H (however, R-SL < R-SH) | *2) | *3) FR.H *4) SL.H | |
| R-SL | | *2) | *3) FR.L *4) SL.H | |
| R-AH | EUS (-5.0 ~ 5.0) % | *2) | EUS 0.0 % | - For products with the RET option |
| R-AL | EUS (-5.0 ~ 5.0) % | | EUS 0.0 % | |

*2) According to G.IN> UNIT

*3) TC, RTD

*4) DCA, DCV, DCmV

◆ Retransmission output (RET)

■ Retransmission Type (RET.T)

Three modes of PV, SV and MV are supported for retransmission output.

The set mode value is proportional to the current output value of 4 ~ 20 mA.

■ T-SH (Retransmission Scale High)

■ T-SL (Retransmission Scale Low)

T-SH and T-SL are output ranges from 4 to 20 mA, and the setting range varies according to the input type.

For TC and RTD, the setting range is $FRL \leq T-SL < T-SH$.

For DCA, DCV, DCmV, the setting range is $SLL \leq T-SL < T-SH \leq SLH$.

For example, to output PV (0 ~ 1000 °C) with 4 ~ 20 mA using TC-K type sensor, set T-SH = 1000 and T-SL to 0.

■ T-AH (Retransmission Adjustment High)

■ T-AL (Retransmission Adjustment Low)

Since there is an error of the retransmission output (4 ~ 20 mA) of this product and an error of the input (4 ~ 20 mA) of the product that receives the input, the error may be expressed as the sum of the errors of the two products. Therefore, the error can be eliminated by calibrating the high and low limits of the output volume within ± 5.0% range each.

◆ Remote input (REM)

Analog signals from 4 to 20 mA (or 1 to 5 V) can be input from the equipment connected to this product and used as SV. For 4 ~ 20 mA input, when you connect 250 Ω resistor in parallel (we recommend resistor with max. 0.1% high-precision resistor), the high and low voltage input ranges of the remote input should be set to 1.000 ~ 5.000 V unit.

■ REM.E (Remote Input Enable)

For remote input products, you can use the remote input function by turning REM.E ON.

When REM.E is turned on, the value remotely input to the REM terminal is used as SV regardless of SV.NO of G.SV. (however, remote input SV is a data that exists only in RAM, so previous data will not be displayed during reset)

■ REM.H (Remote Input Voltage High)

■ REM.L (Remote Input Voltage Low)

Set the voltage range to be input by remote input (for more information, refer to the scale settings)

■ R-SH (Remote Input Scale High)

■ R-SL (Remote Input Scale Low)

Set the SV range corresponding to R-VH and R-VL.

For TC and RTD, the setting range is FRL \leq R-SL < R-SH \leq FRH.

For DCA, DCV, DCmV, the setting range is SLL \leq R-SL < R-SH \leq SLH.

■ R.AH (Remote Input Adjustment High)

■ R.AL (Remote Input Adjustment Low)

Since there is an error of the remote input (4 ~ 20 mA) of this product and an error of the output (4 ~ 20 mA) of the product that transfers, the error may be expressed as the sum of the errors of the two products. Therefore, the error can be eliminated by calibrating the high and low limits of the input volume within \pm 5.0% range each. The set value display unit is fixed at $^{\circ}$ C.

◆ G.SUB (Sub Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|--|-------------------|---------------|---|
| SUB1 | NONE ALM1, ALM2, ALM3, ALM4 HBA(Opt), LBA | - | ALM1 | - . For sub output options 1 to 4 |
| SUB2 | | | ALM2 | - . For sub output options 2 to 4 |
| SUB3 | | | ALM3 | - . For sub output options 3 to 4 VX4 exceptions - . When the OUT2 option is RLY - . G.OUT>CNT2 = NONE |
| SUB4 | | - | ALM4 | - . For sub output option 4 |
| A1.ND | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = ALM1 |
| A1.FD | 0 ~ 999 | Time (seconds) | 0 | |
| A1.EC | NO, NC | - | NO | |
| A1.LT | OFF, ON | - | OFF | |
| A2.ND | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = ALM2 |
| A2.FD | 0 ~ 999 | Time (seconds) | 0 | |
| A2.EC | NO, NC | - | NO | |
| A2.LT | OFF, ON | - | OFF | |
| A3.ND | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = ALM3 |
| A3.FD | 0 ~ 999 | Time (seconds) | 0 | |
| A3.EC | NO, NC | - | NO | |
| A3.LT | OFF, ON | - | OFF | |

| | | | | |
|-------|---------|-------------------|-----|-----------------------------------|
| A4.ND | 0 ~ 999 | Time (seconds) | 0 | |
| A4.FD | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = ALM4 |
| A4.EC | NO, NC | - | NO | |
| A4.LT | OFF, ON | - | OFF | |
| LB.ND | 0 ~ 999 | Time (seconds) | 0 | |
| LB.FD | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = LBA |
| LB.EC | NO, NC | - | NO | |
| LB.LT | OFF, ON | - | OFF | |
| HB2.E | OFF, ON | - | OFF | - . For models with CT option = 2 |
| HB.ND | 0 ~ 999 | Time (seconds) | 0 | |
| HB.FD | 0 ~ 999 | Time (seconds) | 0 | - . G.SUB>SUBx = HBA |
| HB.EC | NO, NC | - | NO | |
| HB.LT | OFF, ON | - | OFF | |

■ SUBn (Sub Output No.n Type)

The sub output can be used by connecting general alarm, heater break alarm and loop break alarm.

The number of the sub output indicates the output number of the hardware, and the connected alarm indicates software alarm. Therefore, when you connected with SUB1 = ALM3, it means that, if ALM3 alarm is generated , it will output through SUB1 terminal.

In the VX4, up to two sub outputs can be selected by suffix code. Up to three sub outputs can be used for models with relay output (M) as OUT2 by parameter setting.

- ✓ The usage is as follows

1. Set the CNT2 parameter of the G.OUT group to NONE.
2. Set the SUBn of the G.SUB group to ALM3.
3. Set the parameters related to alarm 3 of G.ALM group.

- An.ND (Alarm No.n Turn ON Delay Time)

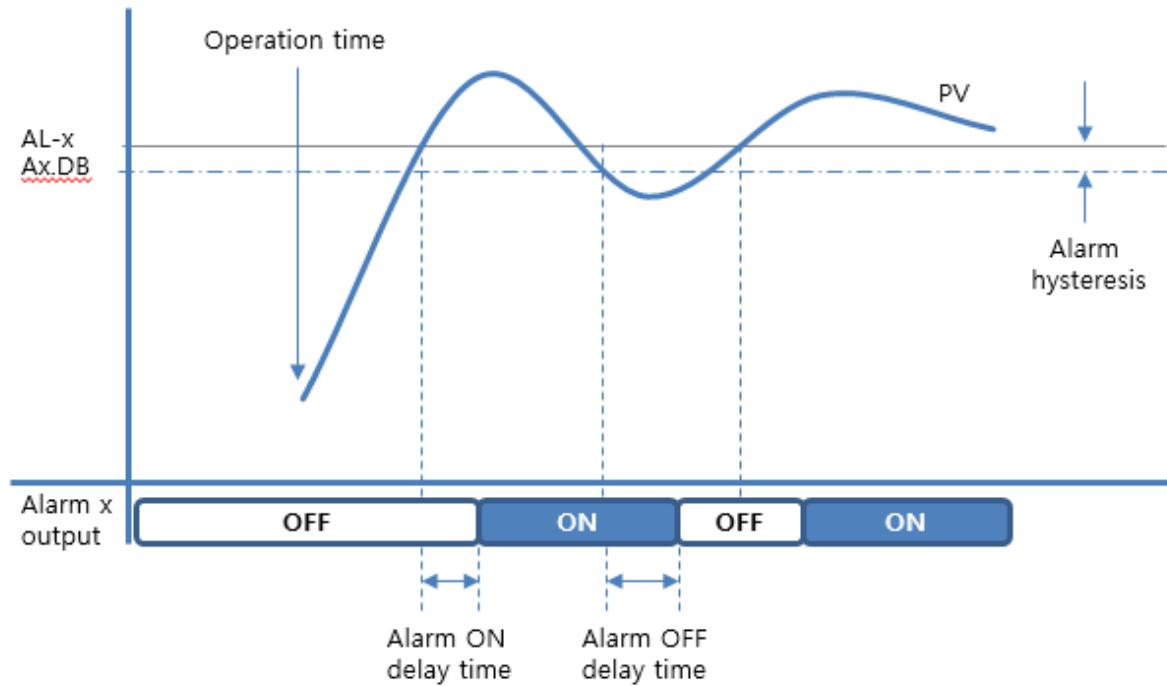
When an alarm condition occurs, the alarm output is output after the delay time by the time set in Ax.ND (however, if Ax.ND is 0, it is output immediately).

- An.FD (Alarm No.n Turn OFF Delay Time)

When the alarm condition is released after the alarm condition occurs, the alarm output is released after the delay time by the time set in An.FD. (however, if An.FD = 0 it is output immediately).

You can set the delay time for alarm output ON or OFF when alarm condition is generated or released.

After the alarm is generated as shown in the below picture, after Alarm (Alarm n. Turn on delay time), the alarm output is generated. After the alarm is released, after An.FD (Alarm n. Turn off delay time) the alarm output is released.



[Picture. Alarm operation example when ON/OFF Delay Time is set]

While the alarm OFF delay time is set, the Latch release function will not operate. Therefore, after the alarm releasing condition, the latch can be disabled after An.FD.

■ An.EC (Alarm No.n Electric Contact)

The sub output relay is A contact (NO: Normal Open) by hardware. However, you can use NO and NC by An.EC after power input.

If NO is selected, it is 'Open' in alarm releasing condition and 'Close' in alarm condition. Conversely, when NC is selected, it is 'Close' in alarm releasing condition and 'Open' in alarm condition.

■ An.LT (Alarm No.n Latch)

The latch function is used to hold the alarm output state.

When An.LT = ON, G.ALM>An.LR is automatically set to SET when Alarm No.n is an alarm condition.

At this time, G.ALM> Ax.LR holds SET and alarm output is not released even if Alarm No.n becomes an alarm releasing condition.

To release the alarm, the user must set forcibly G.ALM> Ax.LR to RST with the alarm releasing condition, and Alarm No.n alarm will be released.

- LB.ND (Loop Break Alarm ON Delay Time)

When an alarm condition occurs, the alarm output is output after the delay time by the time set in LB.ND (however, if LB.ND is 0, it is output immediately).

- LB.FD (Loop Break Alarm OFF Delay Time)

If an LBA alarm is generated and the control output is not 0% or 100%, or PV enters the LB.DB range, the LBA is released. At this time, if LB.FD is set to a value other than 00, it will be released after that time elapses.

- LB.EC (Loop Break Alarm Electric Contact)

The sub output relay is A contact (NO: Normal Open) by hardware. However, you can use NO and NC by LB.EC after power input.

If NO is selected, it is 'Open' in alarm releasing condition and 'Close' in alarm condition. Conversely, when NC is selected, it is 'Close' in alarm releasing condition and 'Open' in alarm condition.

- LB.LT (Loop Break Alarm Latch)

The latch function is used to hold the alarm output state. When LB.LT = ON, G.ALM>LB.LR is automatically set to SET when LBA is an alarm condition. At this time, G.ALM>LB.LR holds SET and alarm output is not released even if LBA becomes an alarm releasing condition. To release the alarm, the user must set forcibly G.ALM>LB.LR to RST with the alarm releasing condition, and LBA will be released.

- HB2.E (Heater Break Alarm No.2 Enable)

For models with HBA CT2, you can select whether to use channel 2 or not. To use channel 2, set HB2.E to ON.

- HB.ND (Heater Break Alarm Turn ON Delay Time)

When an HB alarm condition occurs, the alarm output is output after the delay time by the time set in HB.ND (however, if HB.ND is 0, it is output immediately).

- HB.FD (Heater Break Alarm Turn OFF Delay Time)

When the HB alarm condition is released after the alarm condition occurs, the alarm output is released after the delay time by the time set in HB.FD. (however, if HB.FD 0 0 it is output immediately).

- HB.EC (Heater Break Alarm Electric Contact)

The sub output relay is A contact (NO: Normal Open) by hardware. However, you can use NO and NC by HB.EC after power input.

If NO is selected, it is 'Open' in alarm releasing condition and 'Close' in alarm condition. Conversely, when NC is selected, it is 'Close' in alarm releasing condition and 'Open' in alarm condition.

- HB.LT (Heater Break Alarm Latch)

The latch function is used to hold the alarm output state.

When HB.LT = ON, G.ALM>HB.LR is automatically set to SET when HBA is an alarm condition. At this time, G.ALM>HB.LR holds SET and alarm output is not released even if HBA becomes an alarm releasing condition. To release the alarm, the user must set forcibly G.ALM>HB.LR to RST with the alarm releasing condition, and HBA will be released.

◆ G.COM (Communication Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|---|------|---------------|----------------------------------|
| PRS | PCK, PCKS, ASCII, RTU | - | PCK | -. For models with RS-485 option |
| BPS | 4.8K / 9.6K / 14.4K / 19.2K / 38.4K / 57.6K | BPS | 9.6K | |
| PRI | NONE, EVEN, ODD | bit | NONE | |
| STOP | 1 or 2 | bit | 1 | |
| D.LEN | 7 or 8 | bit | 8 | |
| ADDR | 1 ~ 99 | - | 1 | |
| RP.TM | 0 ~ 10 | time | 0 | |

Communication

Supports PC Link and Modbus protocols in 2-wire half-duplex mode of EIA RS-485 standard.

■ Protocol Select (PRS)

You can select from the following 4 protocols:

- PC Link without Checksum (PC Link STD)
- PC Link with Checksum (PC Link with SUM)
- Modbus ASCII
- Modbus RTU

Because PC Link without Checksum does not have Checksum, it cannot verify data integrity if data is distorted due to communication line noise, etc. However, PC Link with Checksum and Modbus ASCII / RTU can verify data integrity with Checksum, so it can be used more reliably. Therefore, we recommend not to use PC Link without Checksum except for testing.

■ BPS (Bit Per Sec.)

You can select from the following 6 communication speeds: 4800, 9600, 14400, 19200, 38400,

57600 bps

- PRI (Parity bit)

You can select from the following 3 parity bits: NONE, EVEN, ODD

- STOP (Stop bit)

You can select from the following 2 stop bits: 1 or 2 bit

- D.LEN (Data Length)

You can select from the following 2 data lengths: 7 or 8 bit

- ADDR (Address)

Communication addresses can be used from 1 to 99, but up to 31 devices can be connected.

- RP.TM (Response Delay Time)

The response delay time is the delay time from the handling of the received data to the start of transmission and is calculated as follows.

Response Delay Time = received data handling time + (set response delay time X 50 msec)

◆ G.SET (Setup Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|---------------|------|---------------|---------------------------|
| DI.MD | OFF/ ON | - | OFF | -. For DI optional models |
| PO.OM | STOP, RUN | - | STOP | -. Always displayed |
| P.INT | OFF, ON | - | OFF | -. Always displayed |
| Y/N | NO, YES | - | NO | -. G.SET>P.INT = ON |
| LOCK | 0 ~ 2 | - | 0 | -. Always displayed |
| E2P.L | OFF, ON | - | OFF | -. Always displayed |

■ DI.MD (Digital Input Mode Select)

DI is displayed on the optional product, and DI can be used to turn on DI.MD.

The DI options are divided into two DI options and four DI options, and the functions vary accordingly.

Please refer to the table below for details

✓ If DI is 2 EA (DI 1 & 2)

| Function | | DI 1 | DI 2 |
|----------|-------------|------|------|
| R/S | STOP | 0 | - |
| | RUN | 1 | - |
| SV | SV 1 | - | 0 |
| | SV 4 or REM | - | 1 |

✓ If DI is 4 EA (DI 1 ~ 4)

| Function | | DI 1 | DI 2 | DI 3 | DI 4 |
|----------|-------------|------|------|------|------|
| R/S | STOP | 0 | - | - | - |
| | RUN | 1 | - | - | - |
| SV | SV 1 | - | 0 | 0 | - |
| | SV 2 | - | 1 | 0 | - |
| | SV 3 | - | 0 | 1 | - |
| | SV 4 or REM | - | 1 | 1 | - |

| | | | | | |
|--------------|-------|---|---|---|---|
| ALM LATCH | RESET | - | - | - | 1 |
|--------------|-------|---|---|---|---|

■ PO.OM (Power ON Operation Mode)

You can select the start mode after the power is supplied.

Set PO.OM to RUN to be in control state with power ON, and PO.OM to STOP to be in monitoring state.

■ P.INT (Parameter Initialize)

It can be used when you want to change all the parameters set in the unit to the factory initial state.

Set P.INT to ON for factory initialization (however, a confirmation procedure is added to prevent initialization by user mistake.)

■ Y/N (Confirm)

Confirms again whether parameter initialization is performed with parameters displayed only when G.SET> P.INT is set to ON. If Y/N is set to Yes, all parameters of the instrument will be changed to the factory initial state. However, if Y/N is set to No, parameter initialization will be canceled.

With this parameter, you can prevent the initialization by user mistake.

■ LOCK (Lock)

Parameter group can be locked.

Locked groups are read-only and can only be read via communication.

If LOCK is 0, Lock is released. If LOCK is 1, all parameters except LOCK are locked.

If LOCK is 2, all parameters except LOCK and G.SV are locked

(when setting LOCK with SET and SHIFT buttons, LOCK is set to '2' and locked).

If you press the SET button to change the parameter set with the lock function, LOCK will blink. At this time, if you press the DOWN, UP or MD buttons, the LOCK indicator will disappear.

■ E2P.L (EEPROM Lock)

In general, data used for communication is stored in RAM and in EEPROM according to the properties. However, if the user needs to continue writing due to a communication bug or unavoidable communication, the life of the EEPROM must be kept in mind (in general, the life of the EEPROM limits writing to 1 million times)

In this case, if E2P.L is ON, all data written by communication will be stored in RAM only and will not be stored in EEPROM (however, LOCK and E2P.L are stored in EEPROM, so do not exceed EEPROM write life).

This use can prevent the EEPROM from exceeding its life, but it cannot hold existing data during reset. Therefore, when a situation such as a power reset occurs, data received via communication disappear from RAM and data stored in EEPROM are displayed in RAM.

It is recommended that this function to be used as a method to prevent the EEPROM from exceeding its lifetime with excessive write commands.

◆ G.OUT (Output Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|---|-------------------|---------------------|---|
| CNT1 | ONOF, PID | - | PID | - . Always displayed |
| CNT2 | NONE, ONOF, PID | - | PID | - . OUT2 option: RLY |
| O.ACT | REV, DIR | - | REV | - . G.OUT>CNT2 = NONE |
| CP | (1 ~ 1000) s | Time (seconds) | RLY : 20 SSR : 2 | - . When the OUT1 option is RLY or SSR - . G.OUT>CNT1 = PID |
| CPC | (1 ~ 1000) s | Time (seconds) | RLY : 20 SSR : 2 | - . When the OUT2 option is RLY - . G.OUT>CNT2 = PID |
| HYS | EUS (0.0~100.0) % | *2) | 1 | - . G.OUT>CNT1 = ONOF |
| HYSC | EUS (0.0~100.0) % | *2) | 1 | - . G.OUT>CNT2 = ONOF |
| EO | *5) (-5.0~105.0) % *6) (0.0~105.0) % | % | 0.0 | - . Always displayed |
| EOC | (0.0~105.0) % | % | 0.0 | - . G.OUT>CNT2 ≠ NONE |
| OL-H | *5) (-5.0~105.0) % *6) (0.0~105.0) % (however, OL-L < OL-H) | % | 100.0 | - . G.OUT>CNT1 = PID |
| OL-L | *5) (-5.0~105.0) % *6) (0.0~105.0) % (however, OL-L < OL-H) | % | 0.0 | - . G.OUT>CNT1 = PID or - . G.OUT>CNT2 = PID (at OUT2 = RLY) |

* 2) According to G.IN> UNIT

*5) heating type

*6) heating/cooling type

■ CNT1 (OUT1 Control mode)

The control output mode of OUT1 can be selected from ON / OFF or PID.

- CNT2 (OUT2 Control mode)

The control output mode of OUT2 can be selected from NONE, ON / OFF or PID.

- O.ACT (Output Action)

The operation in which the control amount increases when the deviation (PV - SV) is positive is referred to as a direct action, and the operation in which the control amount increases when the deviation is negative is referred to as a reverse action.

O.ACT = 1 (Direct)

O.ACT = 0 (Reverse)

You can select direct or reverse action only when OUT2 option is not available or G.OUT> CNT2 = NONE.

- CP (Control Period - Heating)

OUT1 is set when it is Relay or SSR by OUT1 (heating) control output period

- CPC (Control Period - Cooling)

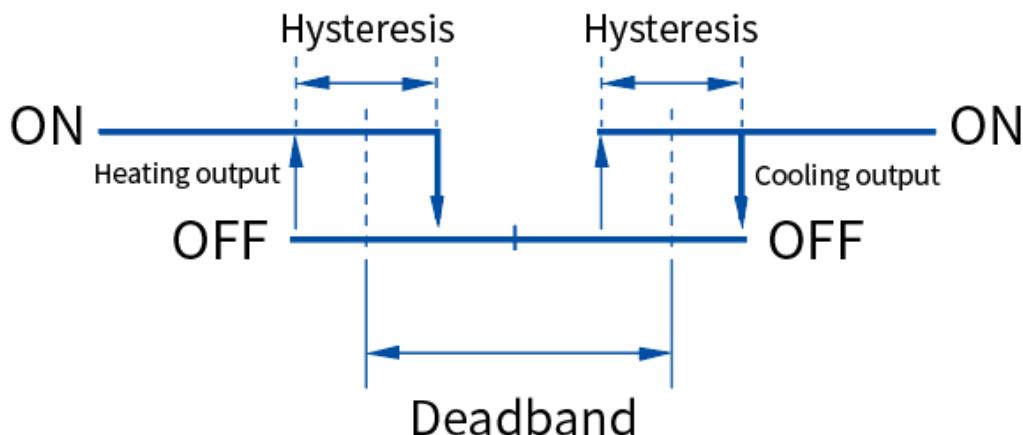
OUT2 is set when it is Relay by OUT2 (cooling) control output period.

- HYS (Hysteresis - Heating)

- HYSC (Hysteresis - Cooling)

In the heating control or heating / cooling control, the output dead band of the heating side and cooling sides can be set individually.

The deadband during heating / cooling ON / OFF control is as follows:



HYS and HYSC are displayed only when CNT1 and CNT2 are ON / OFF control respectively.

- EO (Emergency Output - Heating)
- EOC (Emergency Output - Cooling)

The output amount set during A / D error and BURN OUT (Preset Out) is output.

OUT1 outputs PRESET OUT by EO value (however, when OUT1 is ON / OFF control, EO = 0 or 100% is output). OUT2 outputs PRESET OUT by EOC value.

The output conditions of EO and EOC according to the conditions are as follows.

When using only CNT1 (CNT2 as NONE or models without OUT2 option), emergency output EO is generated as shown below according to ON / OFF and PID settings.

| Item | CNT1 | |
|----------|-----------------------|------------------|
| | ON/OFF | PID |
| EO range | EO = 0.0 % or 100.0 % | 0.0 ≤ EO ≤ 100.0 |

| | | |
|-----------|---------|--------------------------|
| MV output | MV = EO | OLL > EO (MV = 0.0 %) |
| | | OLH < EO (MV = OLH) |
| | | OLL ≤ EO ≤ OLH (MV = EO) |

When ON / OFF is set, OLL and OLH are not displayed, but OLL = 0.0 and OLH are set to 100.0.

EO can be set to 0.0 or 100.0.

At this time, if an emergency output condition occurs, MV (OUT1) is output with the value set in EO.

When PID is set, the setting range of OLL and OLH varies depending on the output type.

EO can be set from 0.0 or 100.0.

At this time, MV (OUT1) will be output as the above condition when the emergency output situation occurs.

When both CNT1 and CNT2 are used, EO and EOC are generated as follows.

When both CNT1 and CNT2 are ON / OFF, OLL and OLH are not displayed, but OLL is set to 0.0 and OLH is set to 100.0.

| Item | CNT1 | |
|-------------|--------------------------|--------------------------|
| | ON/OFF | PID |
| EO range | EO = 0.0 % or 100.0 % | 0.0 ≤ EO ≤ 100.0 |
| HOUT output | OLH < 100.0 (HOUT = 0.0) | OLH < EO (HOUT = OLH) |
| | HOUT = EO | 0 ≤ EO ≤ OLH (HOUT = EO) |

In ON / OFF, if OLH is set to a value less than 100, it will not operate even if EO value is set.

In ON / OFF, EO can be set to 0.0 or 100.0, and in PID, it can be set from 0.0 to 100.0.

At this time, if an emergency output condition occurs, HOUT(OUT1) is output with the value set in EO.

However, if OLH is set to a value less than 100, EO will not be output.

The output condition of PID is as shown in the above table.

| Item | CNT2 | |
|-------------|--------------------------|----------------------------|
| | ON/OFF | PID |
| EOC range | EOC = 0.0 % or 100.0 % | 0.0 ≤ EOC ≤ 100.0 |
| COUT output | OLL < 100.0 (COUT = 0.0) | OLH < EOC (COUT = OLH) |
| | COUT = EOC | 0 ≤ EOC ≤ OLH (COUT = EOC) |

In ON / OFF, if OLL is set to a value less than 100, it will not operate even if EOC value is set.

In ON / OFF, EOC can be set to 0.0 or 100.0, and in PID, it can be set from 0.0 to 100.0.

At this time, if an emergency output condition occurs, COUT(OUT2) is output with the value set in EOC.

However, if OLL is set to a value less than 100, EOC will not be output.

The output condition of PID is as shown in the above table.

- OL-H (Output Limit High)
- OL-L (Output Limit Low)

For models with only OUT1 or where G.OUT> CNT2 is NONE, OL-H is the output high limit and OL-L is the output low limit. The control output (MVOUT) is output under the following conditions:

(In case of SSR or RLY: $0.0 \% \leq OL-L \leq MVOUT \leq OL-H \leq 100.0 \%$)

(In case of SCR: $-5.0 \% \leq OL-L \leq MVOUT \leq OL-H \leq 105.0 \%$)

If G.OUT> CNT2 is not NONE in models with OUT2 option, OL-H is the heating output high limit value and OL-L is the cooling output high limit value.

The heating output is output under the following conditions: $(0.0 \% \leq H.OUT \leq OL-H)$

The cooling output is output under the following conditions: $(0.0 \% \leq C.OUT \leq OL-L)$

◆ G.IN (Input Group)

| Parameter | Setting range | Unit | Initial value | Display condition |
|-----------|---------------------------------------|-------------------|---------------|--|
| INP | K0 ~ 0.1V | - | K0 | - . Always displayed |
| UNIT | *3) °C, °F *4) °C, °F, %, no unit | - | °C | - . Always displayed |
| DP-P | 0 ~ 3 | - | 1 | - . When G.IN>INP = DCA, DCV, DCmV |
| SL-H | -1999 ~ 9999 (however, SLL < SL.H) | *2) | 100.0 | |
| SL-L | | *2) | 0.0 | |
| RJC | OFF, ON | - | ON | - . When G.IN>INP = TC - . TC : K0 ~ PLII |
| FILT | OFF, 1 ~ 120 | Time (seconds) | OFF | - . Always displayed |
| BIAS | EUS (-100.0~100.0) % | *2) | EUS 0.0 % | - . Always displayed |

* 2) According to G.IN> UNIT

*3) TC, RTD

*4) DCA, DCV, DCmV

■ INP (Input Type)

INP is a parameter for selecting the input type. Please refer to the 'Input type and range setting' table.

■ UNIT (Unit)

INP can be set to °C and °F in TC (Thermocouple) and RTD, and the value between two units is automatically converted. In DCA, DCV and DCmV, it can be set in ° C, ° F, %, " (no unit). Only the units are displayed but not converted.

- DP-P (Dot Point Position)

The parameters used in DCA, DCV and DCmV determine the dot points of the values set in the scales (SL-L, SL-H).

- SL-H (Scale High Limit)

DCA, DCV and DCmV are used as the high input range (refer to the 'Input type and range setting' table).

- SL-L (Scale Low Limit)

DCA, DCV and DCmV are used as the low input range. (refer to the 'Input type and range setting' table).

- RJC (Reference Junction Compensation)

If the temperature sensor is used as a thermocouple (TC), it basically compensates the reference junction temperature and displays the present value (PV). If the thermocouple input is input as the junction compensation value, set RJC to OFF. The RJC is then displayed as a non-inclusive value.

- FILT (Filter)

When noise is repeatedly applied to the present value (PV), this parameter is used to remove it.

Noise not only deteriorates the control characteristics, but also causes the output to increase suddenly. However, when the input filter (FL) is set largely, the actual measured value is expressed with delay.

- BIAS (Bias)

This parameter is set when the temperature calibration of the present value (PV) is required.

The present value is displayed as the sum of the present value before input calibration and the value set for input calibration.

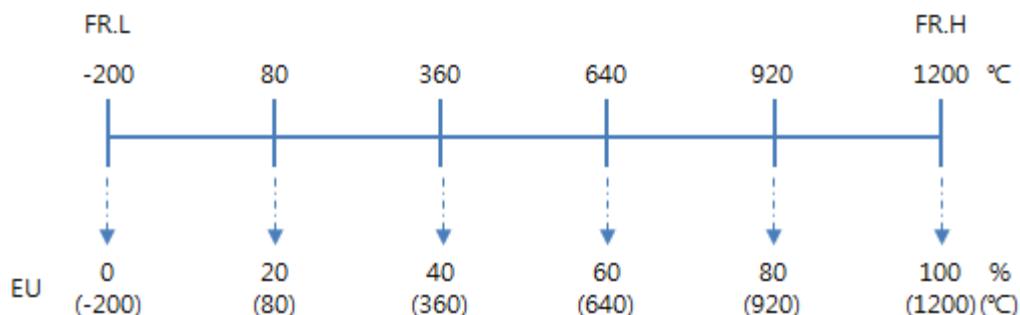
For your reference

◆ Term Descriptions

- ✓ FR.L: The temperature range is defined according to TC and RTD types in 'Input specifications', and the minimum value of this range is called FR.L (for example, for TC K type, FR.L is -200 degrees).
- ✓ FR.H: The temperature range is defined according to TC and RTD types in 'Input specifications', and the maximum value of this range is called FR.H. (for example, for TC K type, FR.H is 1370 degrees).
- ✓ SL.L: The scale range is defined according to direct current and direct voltage types in 'Input specifications', and the minimum value of this range is called SL.L (for example, for 1~5V type, SL.L is -1999 degrees).
- ✓ SL.H: The scale range is defined according to direct current and direct voltage types in 'Input specifications', and the maximum value of this range is called SL.H. (for example, for 1~5V type, SL.H is 9999 degrees).
- ✓ ※ FR.L and FR.H are unchangeable, SL.L and SL.H are changeable.

◆ Engineering Units

- ✓ EU: the value of the engineering unit according to the instrument range

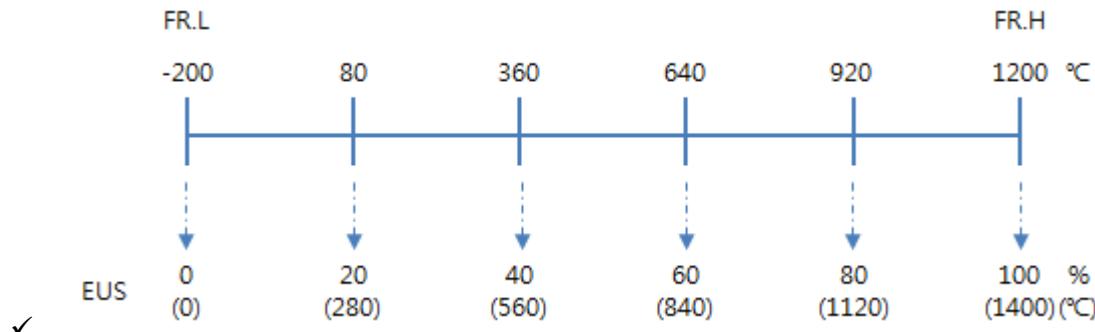


At the same conditions as in the above figure, the temperature corresponding to EU 40% can be calculated as follows.

$$\text{Value} = (\text{FRH} - \text{FRL}) \times \frac{\text{Rate}}{100} + \text{FRL} = (1200 - (-200)) \times \frac{40}{100} + (-200) = 360$$

That is, the temperature corresponding to EU 40% is 360 °C..

- ✓ EUS : the value of the engineering unit range according to the instrument span



At the same conditions as in the above figure, the temperature corresponding to EUS 40% can be calculated as follows.

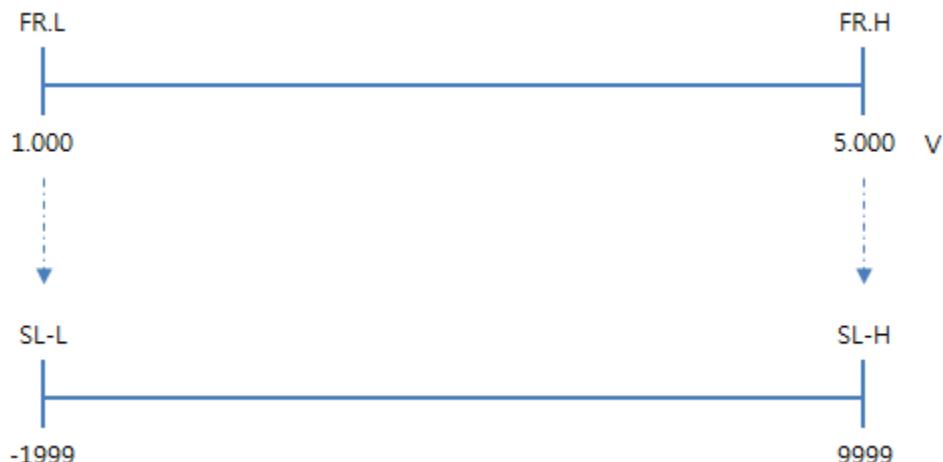
$$\text{Value} = (\text{FRH} - \text{FRL}) \times \frac{\text{Rate}}{100} = (1200 - (-200)) \times \frac{40}{100} = 560$$

That is, the temperature corresponding to EUS 40% is 560 °C.

◆ Scale change of DCA, DCV, DCmV

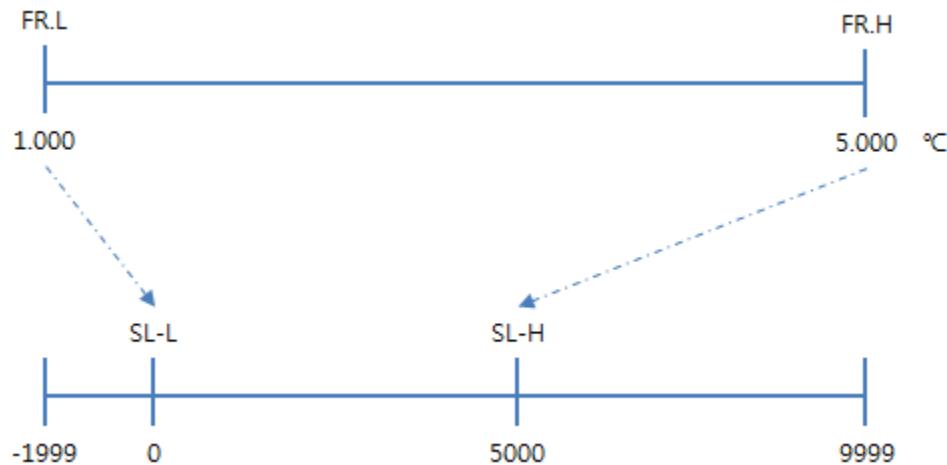
In case of analog input, it goes through scale which converts input voltage into display value.

In the example below, 1/5 V type is shown as an example. If there is no change in SL-L, SL-H values, it will be as shown in the picture below.



That is, -1999 is displayed during 1.000 V, and 9999 is displayed during 5.000 V.

If you change the values of SL-L, SL-H as shown below

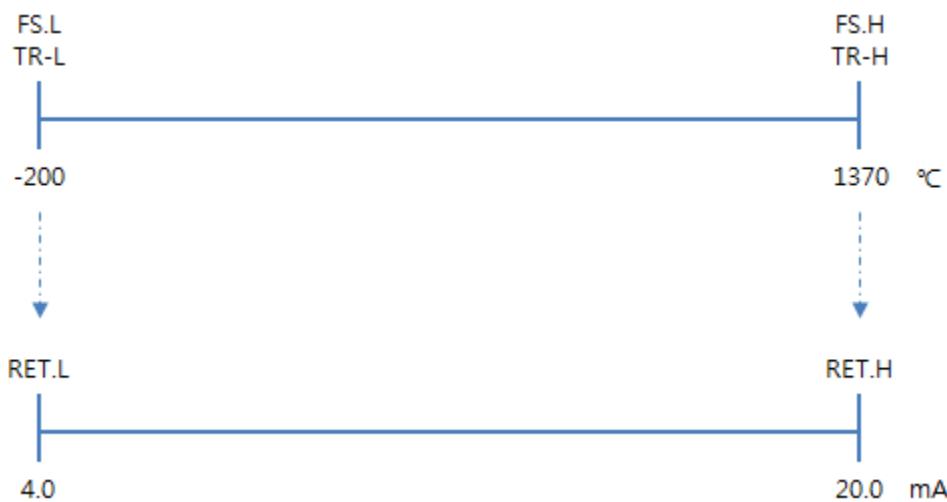


When it is 1.000 V, 0 is displayed. When it is 5.000 V, 5000 is displayed.

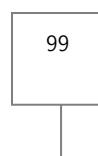
The remote input receives input in the same way.

◆ Changing the retransmission output range

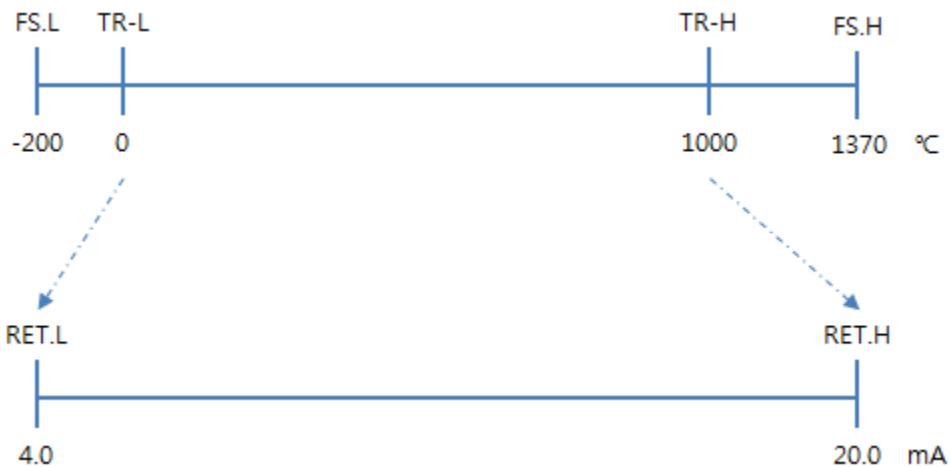
When TC or RTD is selected as the input sensor, FR.L, FR.H values are set to initial ranges according to input types. SL-L and SL-H values are set when selecting DCA, DCV and DCmV,. When FR.L and SL-L are called FSL (Full Scale Low), FR.H and SL-H are FSH (Full Scale High), the retransmission output range is as shown in the below picture. The following example shows TC K type.



If the retransmission output low limit value (TR-L) and high limit value (TR-H) value are not changed as shown in the figure above, the output is as shown in the picture.



That is, 4.0 mA is output at -200 ° C, and 20.0 mA is output at 1370 ° C.



If the retransmission output low limit value (TR-L) and high limit value (TR-H) value are changed as shown in the figure above, the output is as shown in the picture.

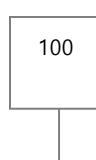
4.0 mA is output at 0 ° C, and 20.0 mA is output at 1000 ° C.

The formula is as follows.

$$\text{Output current (mA)} = \frac{(\text{Temp} - FRL) \times (RETH - RETL)}{(FRH - FRL)} + RETL$$

Therefore, the output current is 6.038 mA at 0 ° C before the retransmission output low limit value (TR-L) and high limit value (TR-H) change.

The output current is 4.0 mA at 0 ° C after the retransmission output low limit value (TR-L) and high limit value (TR-H) change.



◆ Error Message

| No | Display | Display name | Causes and measures |
|----|---------|--------------|--|
| 1 | SYSE | System Data | ✓ System data setting error (please contact us) |
| 2 | OPTE | Option Data | ✓ Option data setting error (please contact us) |
| 3 | E2PE | EEPROM | ✓ EEPROM error (please contact us) |
| 4 | ADCE | AD Converter | ✓ AD Converter error (please contact us) |
| 5 | CALE | Calibration | ✓ Calibration value setting error (please contact us) |
| 6 | RJCE | RJC | ✓ Reference junction compensation error (please contact us) |
| 7 | ATE | Auto Tuning | <ul style="list-style-type: none"> ✓ Auto-tuning maximum elapsed time (24h) exceeded - Check if the connected sensor and the set sensor are different. - When control output is 100%, output does not come out from output terminals (please contact us). - If the control output is generated from the instrument but the PV does not change (check the wiring state). - If the PV changes too slowly when the control output is 0% (check the wiring state or the system) - If there is no control output, enter the P, I, D values manually without running AT for systems where temperature is not likely to drop. |
| 8 | BOUT | Burn out | <ul style="list-style-type: none"> ✓ Check sensor wiring state (check for disconnections) ✓ Check the sensor setting state ✓ Input exceeds ± OVER |
| 9 | OVR | +Over | <ul style="list-style-type: none"> ✓ Check the sensor setting state ✓ When input is exceeded within +5% of sensor input |

| | | | |
|----|------|-------|---|
| | | | range. |
| 10 | -OLR | -Over | <ul style="list-style-type: none">✓ Check the sensor setting state✓ When input is exceeded within -5% of sensor input range. |

※ The error message is displayed on the PV display.

Communication

◆ Communication map

- Process (address 0 ~ 99)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|----------------|-------------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40001 | 9C41 | 0 | 0000 | CPV | Current temperature | RO | O |
| 40002 | 9C42 | 1 | 0001 | CSV | Current set temperature | RO | O |
| 40003 | 9C43 | 2 | 0002 | TSV | Final set temperature | RO | O |
| 40004 | 9C44 | 3 | 0003 | DP-P | Dot point | RO | O |
| 40005 | 9C45 | 4 | 0004 | UNIT | Unit | RO | O |
| 40006 | 9C46 | 5 | 0005 | MVOUT | Output amount | RO | O |
| 40007 | 9C47 | 6 | 0006 | OUT1 (Heat) | Heating output amount | RO | O |
| 40008 | 9C48 | 7 | 0007 | OUT2 (Cool) | Cooling output amount | RO | O |
| 40009 | 9C49 | 8 | 0008 | PID.NO | PID number | RO | O |
| 40010 | 9C4A | 9 | 0009 | SV.NO | SV number | RO | O |
| 40011 | 9C4B | 10 | 000A | NOW_STS | Current state | RO | O |
| 40012 | 9C4C | 11 | 000B | ERR_STS | Error status | RO | O |
| 40013 | 9C4D | 12 | 000C | SUB_STS | Sub output status | RO | O |
| 40014 | 9C4E | 13 | 000D | ALM_STS | Alarm status | RO | O |
| 40015 | 9C4F | 14 | 000E | DI_STS | DI status | RO | O |
| 40016 | 9C50 | 15 | 000F | CT1.M | CT1 current amount | RO | O |
| 40017 | 9C51 | 16 | 0010 | CT2.M | CT2 current amount | RO | O |
| 40018 | 9C52 | 17 | 0011 | R/S | Run/Stop | RO | O |
| 40019 | 9C53 | 18 | 0012 | AT | Auto-Tuning | RO | O |
| 40020 | 9C54 | 19 | 0013 | A/M | Auto/Manu | RO | O |

| | | | | | | | |
|-------|------|----|------|-------|-------------------------------|----|---|
| 40021 | 9C55 | 20 | 0014 | AL1.M | ALM1 monitoring | RO | O |
| 40022 | 9C56 | 21 | 0015 | AL2.M | ALM2 monitoring | RO | O |
| 40023 | 9C57 | 22 | 0016 | AL3.M | ALM3 monitoring | RO | O |
| 40024 | 9C58 | 23 | 0017 | AL4.M | ALM4 monitoring | RO | O |
| 40025 | 9C59 | 24 | 0018 | LBA.M | LBA monitoring | RO | O |
| 40026 | 9C5A | 25 | 0019 | HBA.M | HBA monitoring | RO | O |
| 40032 | 9C60 | 31 | 001F | A/M | Auto/Manu | RW | O |
| 40033 | 9C61 | 32 | 0020 | MV IN | Manual output amount input | RW | O |
| 40034 | 9C62 | 33 | 0021 | R/S | Run/Stop | RW | O |

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40042 | 9C6A | 41 | 0029 | SYS | System Data | RO | |
| 40043 | 9C6B | 42 | 002A | OPT | Option Data | RO | |
| 40044 | 9C6C | 43 | 002B | SP1 | Special Data (1) | RO | |
| 40045 | 9C6D | 44 | 002C | SP2 | Special Data (2) | RO | |
| 40046 | 9C6E | 45 | 002D | FWV | Firmware Version | RO | |

- G.SV (address 100 ~ 199)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|-----------------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40101 | 9CA5 | 100 | 0064 | SV.NO | Set value number selection | R/W | |
| 40102 | 9CA6 | 101 | 0065 | SV-H | SV setting high limit value | R/W | |
| 40103 | 9CA7 | 102 | 0066 | SV-L | SV setting low limit value | R/W | |
| 40104 | 9CA8 | 103 | 0067 | SV-1 | Set value 1 | R/W | |
| 40105 | 9CA9 | 104 | 0068 | SV-2 | Set value 2 | R/W | |
| 40106 | 9CAA | 105 | 0069 | SV-3 | Set value 3 | R/W | |

| | | | | | | | |
|-------|------|-----|------|------|-------------|-----|--|
| 40107 | 9CAB | 106 | 006A | SV-4 | Set value 4 | R/W | |
|-------|------|-----|------|------|-------------|-----|--|

- G.CTL (address 200 ~ 299)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|----------------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40201 | 9D09 | 200 | 00C8 | AT.MD | Auto-tuning mode | R/W | |
| 40202 | 9D0A | 207 | 00C9 | AT | Auto-tuning | R/W | O |
| 40205 | 9D0D | 208 | 00CC | ARW | Anti-reset Windup | R/W | |
| 40206 | 9D0E | 209 | 00CD | ALPA | Alpha | R/W | |
| - | - | - | - | PID.N | PID Number | R/W | O |
| 40211 | 9D13 | 210 | 00D2 | 1.P | Heating proportional band | R/W | |
| 40212 | 9D14 | 211 | 00D3 | 1.I | Heating integral time | R/W | |
| 40213 | 9D15 | 212 | 00D4 | 1.D | Heating derivative time | R/W | |
| 40214 | 9D16 | 213 | 00D5 | 1.MR | Manual reset | R/W | |
| 40215 | 9D17 | 214 | 00D6 | 1.Pc | Cooling proportional band | R/W | |
| 40216 | 9D18 | 215 | 00D7 | 1.Ic | Cooling integral time | R/W | |
| 40217 | 9D19 | 216 | 00D8 | 1.Dc | Cooling derivative time | R/W | |
| 40218 | 9D1A | 217 | 00D9 | - | - | - | |
| 40219 | 9D1B | 218 | 00DA | 1.DB | Heating / cooling deadband | R/W | |
| 40220 | 9D1C | 219 | 00DB | 2.P | Heating proportional band | R/W | |
| 40221 | 9D1D | 220 | 00DC | 2.I | Heating integral time | R/W | |
| 40222 | 9D1E | 221 | 00DD | 2.D | Heating derivative time | R/W | |
| 40223 | 9D1F | 222 | 00DE | 2.MR | Manual reset | R/W | |
| 40224 | 9D20 | 223 | 00DF | 2.Pc | Cooling proportional band | R/W | |
| 40225 | 9D21 | 224 | 00E0 | 2.Ic | Cooling integral time | R/W | |
| 40226 | 9D22 | 225 | 00E1 | 2.Dc | Cooling derivative time | R/W | |
| 40227 | 9D23 | 226 | 00E2 | - | - | - | |
| 40228 | 9D24 | 227 | 00E3 | 2.DB | Heating / cooling deadband | R/W | |

| | | | | | | | |
|-------|------|-----|------|-------|----------------------------|-----|--|
| 40229 | 9D25 | 228 | 00E4 | 3.P | Heating proportional band | R/W | |
| 40230 | 9D26 | 229 | 00E5 | 3.I | Heating integral time | R/W | |
| 40231 | 9D27 | 230 | 00E6 | 3.D | Heating derivative time | R/W | |
| 40232 | 9D28 | 231 | 00E7 | 3.MR | Manual reset | R/W | |
| 40233 | 9D29 | 232 | 00E8 | 3.Pc | Cooling proportional band | R/W | |
| 40234 | 9D2A | 233 | 00E9 | 3.Ic | Cooling integral time | R/W | |
| 40235 | 9D2B | 234 | 00EA | 3.Dc | Cooling derivative time | R/W | |
| 40236 | 9D2C | 235 | 00EB | - | - | - | |
| 40237 | 9D2D | 236 | 00EC | 3.DB | Heating / cooling deadband | R/W | |
| 40238 | 9D2E | 237 | 00ED | 4.P | Heating proportional band | R/W | |
| 40239 | 9D2F | 238 | 00EE | 4.I | Heating integral time | R/W | |
| 40240 | 9D30 | 239 | 00EF | 4.D | Heating derivative time | R/W | |
| 40241 | 9D31 | 240 | 00F0 | 4.MR | Manual reset | R/W | |
| 40242 | 9D32 | 241 | 00F1 | 4.Pc | Cooling proportional band | R/W | |
| 40243 | 9D33 | 242 | 00F2 | 4.Ic | Cooling integral time | R/W | |
| 40244 | 9D34 | 243 | 00F3 | 4.Dc | Cooling derivative time | R/W | |
| 40245 | 9D35 | 244 | 00F4 | - | - | - | |
| 40246 | 9D36 | 245 | 00F5 | 4.DB | Heating / cooling deadband | R/W | |
| 40247 | 9D37 | 246 | 00F6 | RM.UP | Ramp-up temperature | R/W | |
| 40248 | 9D38 | 247 | 00F7 | UP.TM | Ramp-up time | R/W | |
| 40249 | 9D39 | 248 | 00F8 | RM.DW | Ramp-down temperature | R/W | |
| 40250 | 9D3A | 249 | 00F9 | DW.TM | Ramp-down time | R/W | |

- G.ALM (address 300 ~ 399)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|-------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40301 | 9D6D | 300 | 012C | A1.TY | Alarm 1 type | R/W | |
| 40302 | 9D6E | 301 | 012D | AL-1 | Alarm 1 set value | R/W | |

| | | | | | | | |
|-------|------|-----|------|-------|--|-----|---|
| 40303 | 9D6F | 302 | 012E | A1.DB | Alarm 1 deadband | R/W | |
| 40304 | 9D70 | 303 | 012F | A1.LS | Alarm 1 output hold status | R/W | O |
| 40305 | 9D71 | 304 | 0130 | A2.TY | Alarm 2 type | R/W | |
| 40306 | 9D72 | 305 | 0131 | AL-2 | Alarm 2 set value | R/W | |
| 40307 | 9D73 | 306 | 0132 | A2.DB | Alarm 2 deadband | R/W | |
| 40308 | 9D74 | 307 | 0133 | A2.LS | Alarm 2 output hold status | R/W | O |
| 40309 | 9D75 | 308 | 0134 | A3.TY | Alarm 3 type | R/W | |
| 40310 | 9D76 | 309 | 0135 | AL-3 | Alarm 3 set value | R/W | |
| 40311 | 9D77 | 310 | 0136 | A3.DB | Alarm 3 deadband | R/W | |
| 40312 | 9D78 | 311 | 0137 | A3.LS | Alarm 3 output hold status | R/W | O |
| 40313 | 9D79 | 312 | 0138 | A4.TY | Alarm 4 type | R/W | |
| 40314 | 9D7A | 313 | 0139 | AL-4 | Alarm 4 set value | R/W | |
| 40315 | 9D7B | 314 | 013A | A4.DB | Alarm 4 deadband | R/W | |
| 40316 | 9D7C | 315 | 013B | A4.LS | Alarm 4 output hold status | R/W | O |
| 40317 | 9D7D | 316 | 013C | LB.TM | Loop Break Alarm Time | R/W | |
| 40318 | 9D7E | 317 | 013D | LB.SV | Loop Break Alarm Temperature | R/W | |
| 40319 | 9D7F | 318 | 013E | LB.DB | Loop Break Alarm Deadband | R/W | |
| 40320 | 9D80 | 319 | 013F | LB.LS | Loop Break Alarm Latch Status | R/W | O |
| 40321 | 9D81 | 320 | 0140 | HB-1 | Heater Break Alarm 1 current | R/W | |
| 40322 | 9D82 | 321 | 0141 | H1.DB | Heater Break Alarm 1 current deadband | R/W | |
| 40323 | 9D83 | 322 | 0142 | HB-2 | Heater Break Alarm 2 type | R/W | |
| 40324 | 9D84 | 323 | 0143 | H2.DB | Heater Break Alarm 2 current deadband | R/W | |
| 40325 | 9D85 | 324 | 0144 | HB.LS | Heater Break Alarm Latch Status | R/W | O |

- GTRS (address 400 ~ 499)

| Address | D-register | Parameter | R/W | |
|---------|------------|-----------|-----|--|
|---------|------------|-----------|-----|--|

| DEC | HEX | DEC | HEX | | | | RAM (Only) |
|-------|------|-----|------|-------|---|-----|---------------|
| 40401 | 9DD1 | 400 | 0190 | RET.T | Retransmission output type | R/W | |
| 40402 | 9DD2 | 401 | 0191 | RET.H | Retransmission output high scale value | R/W | |
| 40403 | 9DD3 | 402 | 0192 | RET.L | Retransmission output low scale value | R/W | |
| 40404 | 9DD4 | 403 | 0193 | T-AH | Retransmission output high adjust value | R/W | |
| 40405 | 9DD5 | 404 | 0194 | T-AL | Retransmission output low adjust value | R/W | |
| 40406 | 9DD6 | 405 | 0195 | REM.E | Remote input selection | R/W | |
| 40407 | 9DD7 | 406 | 0196 | REM.H | Remote input high voltage setting | R/W | |
| 40408 | 9DD8 | 407 | 0197 | REM.L | Remote input low voltage setting | R/W | |
| 40409 | 9DD9 | 408 | 0198 | R-SH | Remote input high scale value | R/W | |
| 40410 | 9DDA | 409 | 0199 | R-SL | Remote input low scale value | R/W | |
| 40411 | 9DDB | 410 | 019A | R-AH | Remote input adjust high value | R/W | |
| 40412 | 9DDC | 411 | 019B | R-AL | Remote input adjust low value | R/W | |

- G.SUB (address 500 ~ 599)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40501 | 9E35 | 500 | 01F4 | SUB1 | SUB1 output type | R/W | |
| 40502 | 9E36 | 501 | 01F5 | SUB2 | SUB2 output type | R/W | |
| 40503 | 9E37 | 502 | 01F6 | SUB3 | SUB3 output type | R/W | |
| 40504 | 9E38 | 503 | 01F7 | SUB4 | SUB4 output type | R/W | |

| | | | | | | | |
|-------|------|-----|------|-------|-------------------------------------|-----|--|
| 40505 | 9E39 | 504 | 01F8 | A1.ND | Alarm 1 On Delay Time | R/W | |
| 40506 | 9E3A | 505 | 01F9 | A1.FD | Alarm 1 Off Delay Time | R/W | |
| 40507 | 9E3B | 506 | 01FA | A1.EC | Alarm 1 contact type | R/W | |
| 40508 | 9E3C | 507 | 01FB | A1.LT | Alarm 1 output lock | R/W | |
| 40509 | 9E3D | 508 | 01FC | A2.ND | Alarm 2 On Delay Time | R/W | |
| 40510 | 9E3E | 509 | 01FD | A2.FD | Alarm 2 Off Delay Time | R/W | |
| 40511 | 9E3F | 510 | 01FE | A2.EC | Alarm 2 contact type | R/W | |
| 40512 | 9E40 | 511 | 01FF | A2.LT | Alarm 2 output lock | R/W | |
| 40513 | 9E41 | 512 | 0200 | A3.ND | Alarm 3 On Delay Time | R/W | |
| 40514 | 9E42 | 513 | 0201 | A3.FD | Alarm 3 Off Delay Time | R/W | |
| 40515 | 9E43 | 514 | 0202 | A3.EC | Alarm 3 contact type | R/W | |
| 40516 | 9E44 | 515 | 0203 | A3.LT | Alarm 3 output lock | R/W | |
| 40517 | 9E45 | 516 | 0204 | A4.ND | Alarm 4 On Delay Time | R/W | |
| 40518 | 9E46 | 517 | 0205 | A4.FD | Alarm 4 Off Delay Time | R/W | |
| 40519 | 9E47 | 518 | 0206 | A4.EC | Alarm 4 contact type | R/W | |
| 40520 | 9E48 | 519 | 0207 | A4.LT | Alarm 4 output lock | R/W | |
| 40521 | 9E49 | 520 | 0208 | LB.ND | Loop Break Alarm On Delay | R/W | |
| 40522 | 9E4A | 521 | 0209 | LB.FD | Loop Break Alarm Off Delay | R/W | |
| 40523 | 9E4B | 522 | 020A | LB.EC | Loop Break Alarm Electric Contact | R/W | |
| 40524 | 9E4C | 523 | 020B | LB.LT | Loop Break Alarm Latch | R/W | |
| 40525 | 9E4D | 524 | 020C | HB2.E | Heater Break Alarm Enable | R/W | |
| 40526 | 9E4E | 525 | 020D | HB.ND | Heater Break Alarm On Delay | R/W | |
| 40527 | 9E4F | 526 | 020E | HB.FD | Heater Break Alarm Off Delay | R/W | |
| 40528 | 9E50 | 527 | 020F | HB.EC | Heater Break Alarm Electric Contact | R/W | |
| 40529 | 9E51 | 528 | 0210 | HB.LT | Heater Break Alarm Latch | R/W | |

- G.COM (address 600 ~ 699)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|---------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40601 | 9E99 | 600 | 0258 | PRS | Protocol | R/W | |
| 40602 | 9E9A | 601 | 0259 | BPS | Baud Rate | R/W | |
| 40603 | 9E9B | 602 | 025A | PRI | Parity bit | R/W | |
| 40604 | 9E9C | 603 | 025B | STOP | Stop bit | R/W | |
| 40605 | 9E9D | 604 | 025C | D.LEN | Data length | R/W | |
| 40606 | 9E9E | 605 | 025D | ADDR | Address | R/W | |
| 40607 | 9E9F | 606 | 025E | RP.TM | Response delay time | R/W | |

- G.SET (address 700 ~ 799)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|-------------------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40701 | 9EFD | 700 | 02BC | DI.MD | DI mode | R/W | |
| 40702 | 9EFE | 701 | 02BD | PO.OM | Operation Mode after Power On | R/W | |
| 40703 | 9EFF | 702 | 02BE | P.INT | Parameter Initialization | R/W | O |
| 40704 | 9F00 | 703 | 02BF | LOCK | Setting Lock | R/W | |
| 40705 | 9F01 | 704 | 02C0 | E2P.L | EEPROM Lock | R/W | |

- G.OUT (address 800 ~ 899)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|-------------------------------|-----|---------------|
| DEC | HEX | DEC | HEX | | | | |
| 40801 | 9F61 | 800 | 0320 | CNT1 | OUT1 Output Control Selection | R/W | |
| 40802 | 9F62 | 801 | 0321 | CNT2 | OUT2 Output Control Selection | R/W | |
| 40803 | 9F63 | 802 | 0322 | O.ACT | Direct/Reverse Output Action | R/W | |
| 40804 | 9F64 | 803 | 0323 | CP | Heating Control Period | R/W | |

| | | | | | | | |
|-------|------|-----|------|------|--------------------------|-----|--|
| 40805 | 9F65 | 804 | 0324 | CPC | Cooling Control Period | R/W | |
| 40806 | 9F66 | 805 | 0325 | HYS | Hysteresis | R/W | |
| 40807 | 9F67 | 806 | 0326 | HYSC | Hysteresis (Cooling) | R/W | |
| 40808 | 9F68 | 807 | 0327 | EO | Heating emergency output | R/W | |
| 40809 | 9F69 | 808 | 0328 | EOC | Cooling emergency output | R/W | |
| 40810 | 9F6A | 809 | 0329 | OL-H | Output High Limit | R/W | |
| 40811 | 9F6B | 810 | 0330 | OL-L | Output Low Limit | R/W | |

- G.IN (address 900 ~ 999)

| Address | | D-register | | Parameter | | | R/W | RAM (Only) |
|---------|------|------------|------|-----------|---------------------------------|--|-----|---------------|
| DEC | HEX | DEC | HEX | | | | | |
| 40901 | 9FC5 | 900 | 0384 | INP | Input Type selection | | R/W | |
| 40902 | 9FC6 | 901 | 0385 | UNIT | Unit selection | | R/W | |
| 40905 | 9FC9 | 904 | 0388 | DP-P | Dot Point Position Selection | | R/W | |
| 40906 | 9FCA | 905 | 0389 | SL-H | Scale High Limit | | R/W | |
| 40907 | 9FCB | 906 | 038A | SL-L | Scale Low Limit | | R/W | |
| 40908 | 9FCC | 907 | 038B | RJC | Reference Junction Compensation | | R/W | |
| 40909 | 9FCD | 908 | 038C | FILT | Input Display Value Filter | | R/W | |
| 40910 | 9FCE | 909 | 038D | BIAS | PV Bias | | R/W | |

- USER MAP SETTING (address 721 ~ 740)

| Address | | D-register | | Parameter | | | R/W | Default |
|---------|------|------------|------|-----------|--|--------------|-----|---------|
| DEC | HEX | DEC | HEX | | | | | |
| 40722 | 9F12 | 721 | 02D1 | UMS 01 | | 1st User map | R/W | 0 |
| 40723 | 9F13 | 722 | 02D2 | UMS 02 | | 2nd User map | R/W | 1 |
| 40724 | 9F14 | 723 | 02D3 | UMS 03 | | 3rd User map | R/W | 2 |

| | | | | | | | |
|-------|------|-----|------|--------|---------------|-----|----|
| 40725 | 9F15 | 724 | 02D4 | UMS 04 | 4th User map | R/W | 3 |
| 40726 | 9F16 | 725 | 02D5 | UMS 05 | 5th User map | R/W | 4 |
| 40727 | 9F17 | 726 | 02D6 | UMS 06 | 6th User map | R/W | 5 |
| 40728 | 9F18 | 727 | 02D7 | UMS 07 | 7th User map | R/W | 6 |
| 40729 | 9F19 | 728 | 02D8 | UMS 08 | 8th User map | R/W | 7 |
| 40730 | 9F1A | 729 | 02D9 | UMS 09 | 9th User map | R/W | 8 |
| 40731 | 9F1B | 730 | 02DA | UMS 10 | 10th User map | R/W | 9 |
| 40732 | 9F1C | 731 | 02DB | UMS 11 | 11th User map | R/W | 10 |
| 40733 | 9F1D | 732 | 02DC | UMS 12 | 12th User map | R/W | 11 |
| 40734 | 9F1E | 733 | 02DD | UMS 13 | 13th User map | R/W | 12 |
| 40735 | 9F1F | 734 | 02DE | UMS 14 | 14th User map | R/W | 13 |
| 40736 | 9F20 | 735 | 02DF | UMS 15 | 15th User map | R/W | 14 |
| 40737 | 9F21 | 736 | 02E0 | UMS 16 | 16th User map | R/W | 15 |
| 40738 | 9F22 | 737 | 02E1 | UMS 17 | 17th User map | R/W | 16 |
| 40739 | 9F23 | 738 | 02E2 | UMS 18 | 18th User map | R/W | 17 |
| 40740 | 9F24 | 739 | 02E3 | UMS 19 | 19th User map | R/W | 18 |
| 40741 | 9F25 | 740 | 02E4 | UMS 20 | 20th User map | R/W | 19 |

- USER DATA (address 1200 ~ 1219)

| Address | | D-register | | Parameter | | R/W | RAM (Only) |
|---------|------|------------|------|--------------|---------------|-----|-------------------------------|
| DEC | HEX | DEC | HEX | | | | |
| 41201 | A0F1 | 1200 | 04B0 | USER_DATA 01 | 1st User Data | R/W | Depends on setting data |
| 41202 | A0F2 | 1201 | 04B1 | USER_DATA 02 | 2nd User Data | R/W | |
| 41203 | A0F3 | 1202 | 04B2 | USER_DATA 03 | 3rd User Data | R/W | |
| 41204 | A0F4 | 1203 | 04B3 | USER_DATA 04 | 4th User Data | R/W | |
| 41205 | A0F5 | 1204 | 04B4 | USER_DATA 05 | 5th User Data | R/W | |
| 41206 | A0F6 | 1205 | 04B5 | USER_DATA 06 | 6th User Data | R/W | |
| 41207 | A0F7 | 1206 | 04B6 | USER_DATA 07 | 7th User Data | R/W | |
| 41208 | A0F8 | 1207 | 04B7 | USER_DATA 08 | 8th User Data | R/W | |

| | | | | | | |
|-------|------|------|------|--------------|----------------|-----|
| 41209 | A0F9 | 1208 | 04B8 | USER_DATA 09 | 9th User Data | R/W |
| 41210 | A0FA | 1209 | 04B9 | USER_DATA 10 | 10th User Data | R/W |
| 41211 | A0FB | 1210 | 04BA | USER_DATA 11 | 11th User Data | R/W |
| 41212 | A0FC | 1211 | 04BB | USER_DATA 12 | 12th User Data | R/W |
| 41213 | A0FD | 1212 | 04BC | USER_DATA 13 | 13th User Data | R/W |
| 41214 | A0FE | 1213 | 04BD | USER_DATA 14 | 14th User Data | R/W |
| 41215 | A0FF | 1214 | 04BE | USER_DATA 15 | 15th User Data | R/W |
| 41216 | A100 | 1215 | 04BF | USER_DATA 16 | 16th User Data | R/W |
| 41217 | A101 | 1216 | 04C0 | USER_DATA 17 | 17th User Data | R/W |
| 41218 | A102 | 1217 | 04C1 | USER_DATA 18 | 18th User Data | R/W |
| 41219 | A103 | 1218 | 04C2 | USER_DATA 19 | 19th User Data | R/W |
| 41220 | A104 | 1219 | 04C3 | USER_DATA 20 | 20th User Data | R/W |

The user map can be read and written at the addresses 1200 ~ 1219 by mapping the desired data to addresses 721 ~ 740. The data to be connected to addresses 721 ~ 740 are the values of data D-register at the addresses 0 ~ 999. For example, when you want to connect addresses 1200 (0=NPV), 1201 address (1=NSV), 1202 (5=MVOUT), 1203 (207=AT), 1204 (210=1.P), 1205 (211=1.C), 1206 (212=1.D), set the user map as follows.

| Address | | D-register | | Parameter | | Address | | D-register | |
|---------|------|------------|------|------------|-------|---------|------|-------------|------|
| DEC | HEX | DEC | HEX | | | DEC | HEX | DEC | HEX |
| 40722 | 9F12 | 721 | 02D1 | 0 | NPV | 41201 | A0F1 | 1200 | 04B0 |
| 40723 | 9F13 | 722 | 02D2 | 1 | NSV | 41202 | A0F2 | 1201 | 04B1 |
| 40724 | 9F14 | 723 | 02D3 | 5 | MVOUT | 41203 | A0F3 | 1202 | 04B2 |
| 40725 | 9F15 | 724 | 02D4 | 207 | AT | 41204 | A0F4 | 1203 | 04B3 |
| 40726 | 9F16 | 725 | 02D5 | 210 | 1.P | 41205 | A0F5 | 1204 | 04B4 |
| 40727 | 9F17 | 726 | 02D6 | 211 | 1.I | 41206 | A0F6 | 1205 | 04B5 |
| 40728 | 9F18 | 727 | 02D7 | 212 | 1.D | 41207 | A0F7 | 1206 | 04B6 |

The user map set in this way can be read / written using the addresses 1200 ~ 1206.

◆ BIT Information

| Bit | NOW_STS | ERR_STS | SUB_STS | ALM_STS | DI_STS |
|-----|-----------|----------|----------|---------|--------|
| 15 | | SYS.Err | | | |
| 14 | | OPT.Err | | | |
| 13 | | E2P.Err | | | |
| 12 | | ADC.Err | | | |
| 11 | | CAL.Err | | | |
| 10 | | RJC.Err | | HBA.M | |
| 9 | | AT.Err | | LBA.M | |
| 8 | | COMM.Err | | | |
| 7 | LOCK | B.OUT | | | |
| 6 | | +OVER | | | |
| 5 | STD/HC | -OVER | | | |
| 4 | RAMP | | | | |
| 3 | REM | | SUB4 OUT | AL4.M | DI4 IN |
| 2 | Auto/Manu | | SUB3 OUT | AL3.M | DI3 IN |
| 1 | AT | | SUB2 OUT | AL2.M | DI2 IN |
| 0 | RUN/STOP | | SUB1 OUT | AL1.M | DI1 IN |

- Now STS (Now Status) description

| Bit | Description (0) | Description (1) |
|------------|------------------------|--------------------------------|
| 15 | | |
| 14 | | |
| 13 | | |
| 12 | | |
| 11 | | |
| 10 | | |
| 9 | | |
| 8 | | |
| 7 | No lock | Lock set |
| 6 | | |
| 5 | STD (heating control) | HC (heating / cooling control) |
| 4 | RAMP non-use | RAMP use |
| 3 | SV.NO use | REM use |
| 2 | AUTO OUTPUT | MANUAL OUTPUT |
| 1 | Normal | Running AT |
| 0 | STOP (monitoring) | RUN |

- ERR_STS (Error Status) description

| Bit | Description (0) | Description (1) |
|------------|------------------------|------------------------|
| 15 | | System Code Error |
| 14 | | Option Code Error |
| 13 | | EEPROM Error |
| 12 | | ADC Error |
| 11 | | Calibration Error |
| 10 | | RJC Error |
| 9 | Normal | |

| | | |
|---|--|---------------------|
| 9 | | Auto Tuning Error |
| 8 | | Communication Error |
| 7 | | Burn Out |
| 6 | | PV value +OVER |
| 5 | | PV value -OVER |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 | | |
| 0 | | |

- SUB_STS (Sub Output Status) description

| Bit | Description (0) | Description (1) |
|-----|-----------------|------------------------|
| 15 | | |
| 14 | | |
| 13 | | |
| 12 | | |
| 11 | | |
| 10 | | |
| 9 | | |
| 8 | | |
| 7 | | |
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | SUB4 OUTPUT generation |
| 2 | | SUB3 OUTPUT generation |

| | | |
|---|--|------------------------|
| 1 | | SUB2 OUTPUT generation |
| 0 | | SUB1 OUTPUT generation |

- ALM_STS (Alarm Status) description

| Bit | Description (0) | Description (1) |
|-----|-----------------|-----------------|
| 15 | Normal | |
| 14 | | |
| 13 | | |
| 12 | | |
| 11 | | |
| 10 | | HBA generation |
| 9 | | LBA generation |
| 8 | | |
| 7 | | |
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | HBA generation |
| 2 | | LBA generation |
| 1 | | HBA generation |
| 0 | | LBA generation |

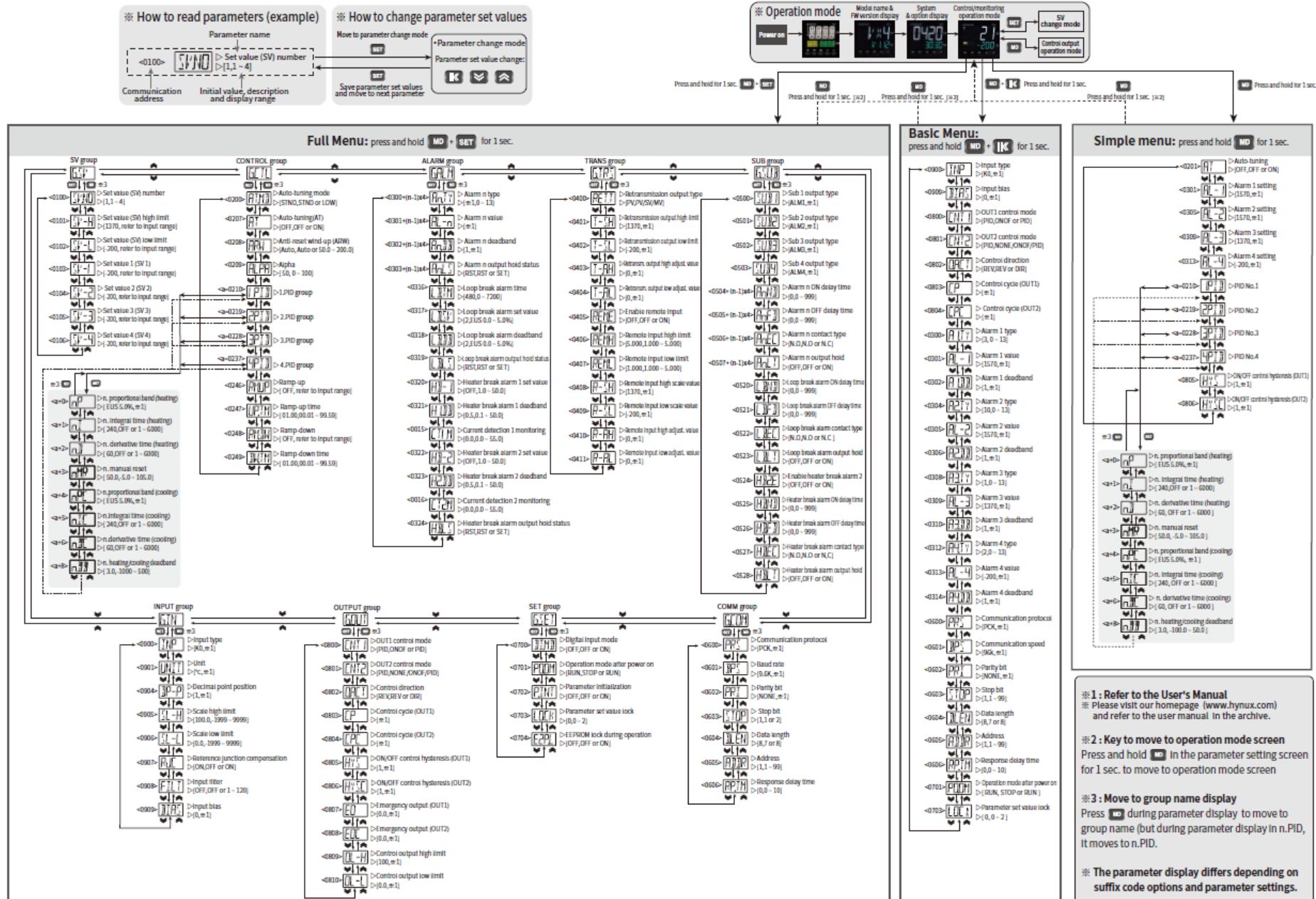
- DI_STS (Digital Input Status) description

| Bit | Description (0) | Description (1) |
|-----|-----------------|-----------------|
| 15 | Normal | |
| 14 | | |

| | | |
|----|--|--------|
| 13 | | |
| 12 | | |
| 11 | | |
| 10 | | |
| 9 | | |
| 8 | | |
| 7 | | |
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | DI4 IN |
| 2 | | DI3 IN |
| 1 | | DI2 IN |
| 0 | | DI1 IN |

MMI Structure

I Parameter configuration



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