

# LCU 032

Process Temperature Controller

INSTRUCTION MANUAL

Thank you for the purchase of this LOVE CONTROLS product.  
Please read this manual carefully.





# LCU 032

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Built-in Fuzzy function “ The Smallest Temperature Controller ”



Model : LCU032

## Features

- |                          |                                     |
|--------------------------|-------------------------------------|
| Fuzzy                    | Output Limits                       |
| Alarm Output             | IP65 front facia                    |
| Input Correction         | Interface (RS485)                   |
| / Selectable             | Heating / Cooling                   |
| Universal Input - Output | Auto Tuning (Standard, Low PV type) |

**LOVE CONTROLS**







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Before using, please read this (SAFETY INFORMATION) and then use this controller.  
 It is most important that the instructions in this manual are followed when using this instrument.  
 Please keep this manual for future reference.  
 Precautions are classified in WARNING and CAUTION.

|  |   |
|--|---|
|  WARNING | There is a possibility of death or heavy injury when handling in wrong way.     |
|  CAUTION | There is a possibility of injury or physical damage when handling in wrong way. |

## WARNING

### Caution on wiring

Use an external protection circuit if a fault in the control loop could possibly lead to a serious problem.

### Power supply

A fuse is fitted inside the instrument. (Fuse rating 250V, 1A)

Use a rated voltage to prevent damage or trouble.

To avoid electrical shock or damage, do not turn ON the power until the wiring is completed.

### Prohibit use in gas atmosphere

Do not use it at a place exposed to combustible or explosive gas.

### Handling of unit

To avoid malfunction, electrical shock or fire, this unit must not be disassembled or repaired.

Do not touch the terminals to avoid electrical shock or malfunction.

### Caution on maintenance

Turn OFF the power before mounting or removing the instrument.

To ensure continuous and safe operation of the instrument, periodical maintenance is recommended. Some parts are limited in life.

The warranty period is 1 year only if using in the correct way.

## CAUTION

### Caution on handling

Do not install the instrument under any of the following conditions.

The ambient temperature exceeds 0 ~ 50

The ambient humidity exceeds 20 ~ 90%RH.

A place where temperature changes suddenly or icing occurs.

A place exposed to corrosive gas or combustible gas.

Vibration or shock is likely to be transmitted to the instrument.

A place exposed to water, oil, chemicals, steam, sunlight.

A place exposed to much dust, salt or iron.

A place with much inductive disturbance, static electricity, magnetism noise.

A place where heat such as radiant heat stays.

## Installation

Attach the brackets ( 2 units ) on the fixed halls and tighten with a screwdriver.  
Fixing torque is about 14.7N. cm (1.5kg.cm) (Care should be taken not to tighten forcedly.)

### Caution on terminal connections

Use a compensating cable with thermocouple.

For R.T.D input use a cable which is a small lead wire resistance and without resistance difference to 3wires.

If the wiring has noise, use the following step: connect a surge absorber to the conductor coil side if the conductors are connected to the load output, such as the relay contact output.

Use an insulating transformer with a noise filter when the power supply has much noise.

Noise filter should be mounted on a panel which has been earthed and the wiring between the noise filter output and the instrument power terminals should be shorten.

It is effective to use a twisted cable for power supply against noise.

The heater power supply and the instrument power supply should be connected using the same power supply when a heater break alarm.

Time for preparation of contact output is required at power ON. When the output signal is used for an external interlock circuit, connect a delay relay.

### Other

Do not use organic solvents such as alcohol, benzine when cleaning. (Use neutral detergent)

### Caution on key operation / trouble

If alarm function is not set correctly, alarm output can not be operated at a trouble.

Be sure to check the alarm operation.

If the input cable is disconnected, the display shows " *boUt* ".

When replacing the sensor, please turn OFF the power supply.

## CAUTION

### For connection

To avoid inductive noise to input wires separate from the power and output wires.

Keep input wires away from output wires and use shielded wires.

### For load circuit connection

Use an extra relay when the frequency of operation is rather high. In this case, SSR output type is Recommended.

- Electromagnetic switch : Proportional cycle time is Min. 30sec
- SSR : Proportional cycle time is Min. 1 sec
- Contact output life : Mechanical : Min. 10 million times (no load)  
Electrical : Min. 100 thousand times (rated load)
- SSR drive pulse voltage, DC 4~20mA are not insulated with internal circuit.  
Use non-grounded sensor to R.T.D and thermocouple.

### For waterproof (Waterproof type)

The instrument has IP65. Use rubber packing when installing the instrument to panel.

Please attach the rubber in correct way.

## 2

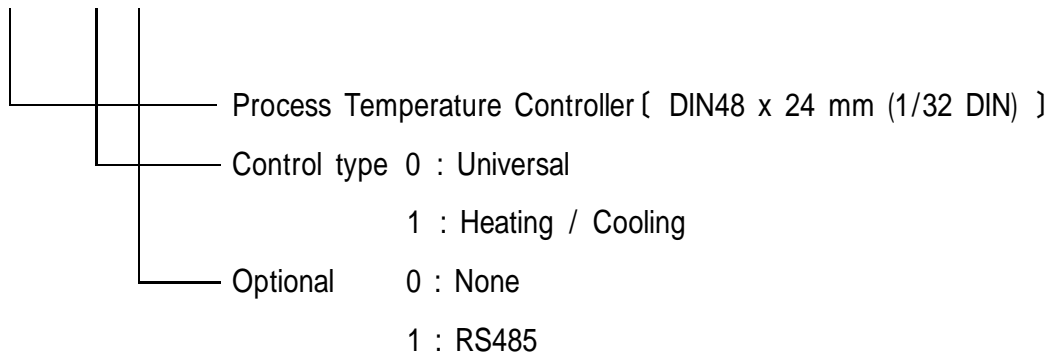
## INSTRUCTION

This instrument has process-value (PV) and set-value (SV) each 4 digits with 7 segment FND. This instrument is divided universal type and heating-cooling type and each setting items has 10 groups. Function and feature : Group P.I.D, Universal-input (19 types), Universal-output (Relay, SSR, Current), Local input, Remote input, External contact input, Ramp function, Auto-tuning 2 types (standard type, low PV type), Retransmission, Communication (RS485 /422), Power supply for sensor, 20 types of alarm, Sampling cycle 250ms,  $\pm 0.5\%$  of FS high accuracy.

## 3

## MODEL & SUFFIX CODE

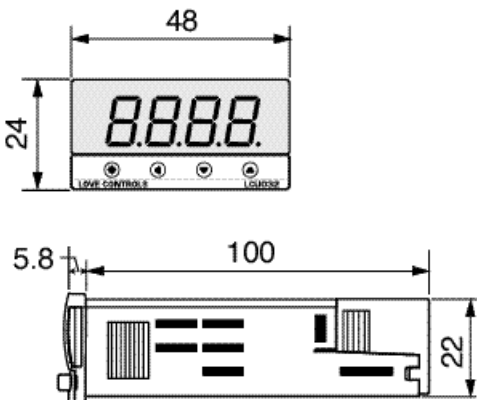
LCU032 - 〇〇



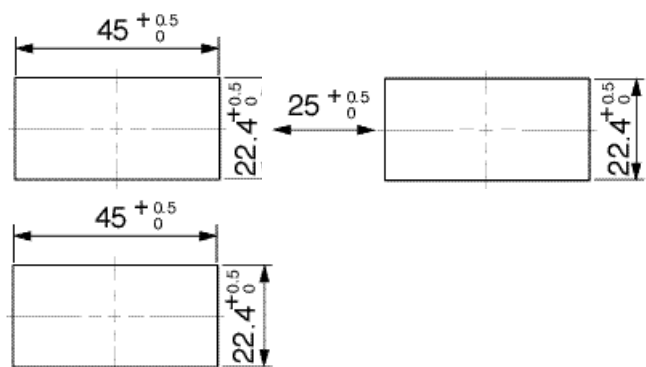
## 4

## DIMENSIONS & PANEL CUTOUT

### 1) Dimensions



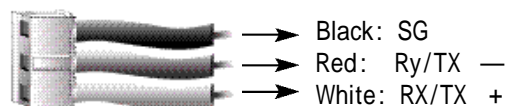
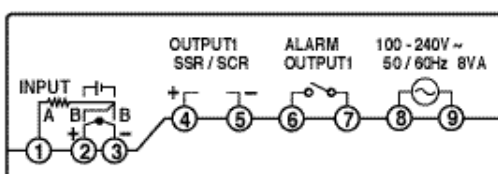
### Panel cutout



(Unit: mm)

### 2) Terminal Arrangement

Model: LCU032





## 1) Input signal Input code

| Input type (Input signal)    |                | Input code | Range ( )   | Range( )     | Accuracy                | Remarks  |
|------------------------------|----------------|------------|---|--------------|-------------------------|--|
| Thermocouple<br>(T.C)        | K ㉑ 2          | 1          | -200~1370   | -300~2500    | ±0.5% of F.S<br>±1digit | ㉑ 1 0~400 :<br>±10% of F.S±1digit<br>㉑ 2 0 and below :<br>±1.0% of F.S±1digit<br>㉑ 3 -150.0~150.0 range :<br>±1.0% of F.S±1digit |
|                              | K ㉑ 2          | 2          | -199.9~999.9  | 0~2300       |                         |  |
|                              | J ㉑ 2          | 3          | -199.9~999.9  | -300~2300    |                         |  |
|                              | E ㉑ 2          | 4          | -199.9~999.9  | -300~1800    |                         |  |
|                              | T ㉑ 2          | 5          | -199.9~400.0  | -300~750     |                         |  |
|                              | R ㉑ 2          | 6          | 0~1700  | 32~3100      | ±0.8% of F.S<br>±1digit |  |
|                              | B ㉑ 1          | 7          | 0~1800  | 32~3300      |                         |  |
|                              | S              | 8          | 0~1700  | 32~3100      | ±0.5% of F.S ±1digit    |  |
|                              | L ㉑ 2          | 9          | -199.9~900.0  | -300~1300    |                         |  |
|                              | N              | 10         | -200~1300   | -300~2400    | ±1.0% of F.S ±1digit    |  |
|                              | U ㉑ 2          | 11         | -199.9~400.0  | -300~750     |                         |  |
|                              | W              | 12         | 0~2300  | 32~4200      | ±0.5% of F.S<br>±1digit |  |
|                              | Platinel       | 13         | 0~1390  | 32~2500      |                         |  |
| R.T.D                        | JPt100 ㉑ 3     | 20         | -199.9~500.0  | -199.9~999.9 | ±0.5% of F.S<br>±1digit |  |
|                              | Pt100 ㉑ 3      | 21         | -199.9~640.0  | -300~1180    |                         |  |
| Direct voltage<br>(VDC/mVDC) | 1.000~5.000V   | 30         | 1.000~5.000V  |              | ±0.5% of F.S<br>±1digit |  |
|                              | -10.00~20.00mV | 32         | -10.00~20.00mV  |              |                         |  |
|                              | 0.0~100.0mV    | 33         | 0.0~100.0mV   |              |                         |  |
| Direct current<br>(mA)       | DC 4~20mA      | 30         | When using current input,<br>use the resistor 250 ±0.1%<br>on input terminal. |              |                         |  |

## 2) Type of control output

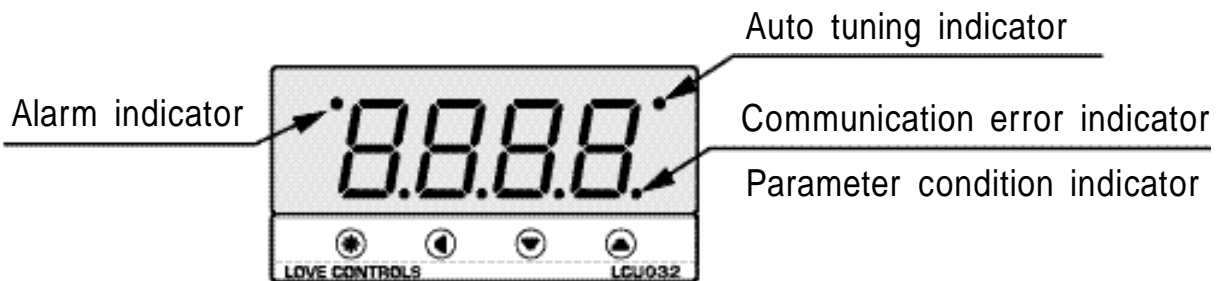
## Output type (Universal type)

| Spec.                                   | OT | OUT 1                   |                      |
|---|----|-------------------------|----------------------|
|   |    | Terminal no. -          | Terminal no. -       |
| LCU032-0<br>(Universal)<br>Output (0~3) | 0  | ON / OFF control output |                      |
|   | 1  | Alarm Output            | Retransmission (RET) |
|   | 2  | Alarm output            | SSR (Voltage pulse)  |
|   | 3  | Relay control output    | SCR (4-20mA DC)      |
|   |    |                         | Retransmission (RET) |

## Output type (Heating / Cooling type)

| Spec.   | OT | OUT 1 (Heating)     | OUT 1 (Cooling) |
|---|----|---------------------|-----------------|
|   |    | Terminal no. —      | Terminal no. —  |
| LCU032-1<br>(Heating • Cooling)<br>Output (4~5) | 4  | SSR (Voltage pulse) | Relay           |
|   | 5  | SCR (4-20mA DC)     | Relay           |

## 1) Description of functions



## 2) Description

| Key                | Description   |
|--------------------|---|
| <br>SET            | <p>In 「Operation Screen」, Setting Value Modifying Screen, Output Amount Indication screen, and Indication Value Indication Screen are called up in turn each time  key is pressed.</p> <p>In Setting Value Modifying Screen, setting value indication mark and setting value are shown in turn.</p> <p>Setting value is shown while  key is pressed. Modify setting value by using   or  key while  key is pressed.</p> <p>Used when entering control group in display level Setting Mode.</p> <p>Use  key to move from one parameter to another in each group.</p> |
| <br>UP<br><br>DOWN | <p>Press  and  key at the same time for 3 seconds or more to enter Display Level setting Screen in 「Operation Screen」.</p> <p>Press  and  key at the same time for 3 seconds or more to enter 「Operation Screen」 from 「Menu Screen」.</p> <p>Press  key to increase parameter value ; and  key to decrease it.</p>   |
| <br>SHIFT          | <p>Used to modify the cipher of the number to be set.<br/>           (Press  while  is pressed.)</p>  |

| LED                      | Description                                |
|--------------------------|--|
| ALARM                    | Lighting during alarm.                     |
| AUTO TUNING              | Flashing during auto-tuning.               |
| PARAMETER VALUE CHANGING | Flashing when parameter value is modified. |

LCU032 Temperature Controller has three screens: “ Operation Screen ”, “ Menu Screen ”, and “ Group Indication Level Selection Screen. ”

Menu Screen is composed of each group; therefore, concerned parameters can be grasped at a glance. It is the simplest and safest design for users.

Parameters should be set in the order of “ Input Group    Output Group    Other Group. ”

Input Group and Output Group must be set first since the parameters affect other groups.

This Controller ’s Group Indication Level Mode ( **LEHL** ) has three levels from Level 1 to Level 3.


















Level 1 is composed of the groups which users frequently modify and check during operation.

Level 2 adds enhanced features for more convenient use of the Controller to Level 1.

Level 3 adds the groups for setting the Controller to Level 2; and is composed of the parameters which are set only one time in the first setting.



- The above-mentioned items do not apply to indicator.
- Groups Shown Per Display (DISP)


| DISP | GROUP INDICATION LEVEL                               |
|------|--|
| 1    | G.CTL  |
| 2    | G.CTL, G.AT, G.PID, G.ALM, G.TRN, G.COM              |
| 3    | G.CTL, G.AT, G.PID, G.ALM, G.TRN, G.COM, G.OUT, G.IN |

|  |  |
|--|--|
| Power ON                                   | When power is input, it enters 「Operation Screen」 and shows indication value only.   |
| Display Indication value and Output amount | In the screen with indication value shown, setting mode and setting value are called up in turn when  key is pressed. If in this status you keep pressing  key, only setting value is shown thus setting value can be Modified. While keep pressing  key, if you move cipher by using  key, modify setting value as desired by using  or  key, and release  key, setting is done as modified and output amount is shown. Setting value is shown if  key is pressed again.  |
| Enter Menu screen from operation screen    | If in Operation Screen you press  and  key at the same time for 3 seconds or more, “ DISP ” and “ 3 ” are called up in turn; and you are entered into Menu Screen.   |
| Enter Group                                | When “ DISP ” and “ 3 ” are called up in turn, you can enter Control Group by pressing  key. You should first enter Input Group using  or  key and pressing  key. Then setting mark and setting value are called up in turn. Set input parameter using  or  key while pressing  key. In Input Group mode, set each parameters of Output Group by using  or  key; then set other group parameters. Input Group and Output Group must be set first since then affect other groups. Press  key to move to the group with desired item. At this time, group name is shown without being replaced by something else. |
| Move from one group to another             | Use  or  key to move from one group to another. When entered into a group by using  key, setting mark and setting value are called up in turn. Modifying method is the same with setting value modifying method of operation screen.  |
| Enter Operation screen from Menu screen    | In 「 menu screen », if you press  and  key at the same time for 3 seconds or more, you will enter 「 Operation Screen ».  |

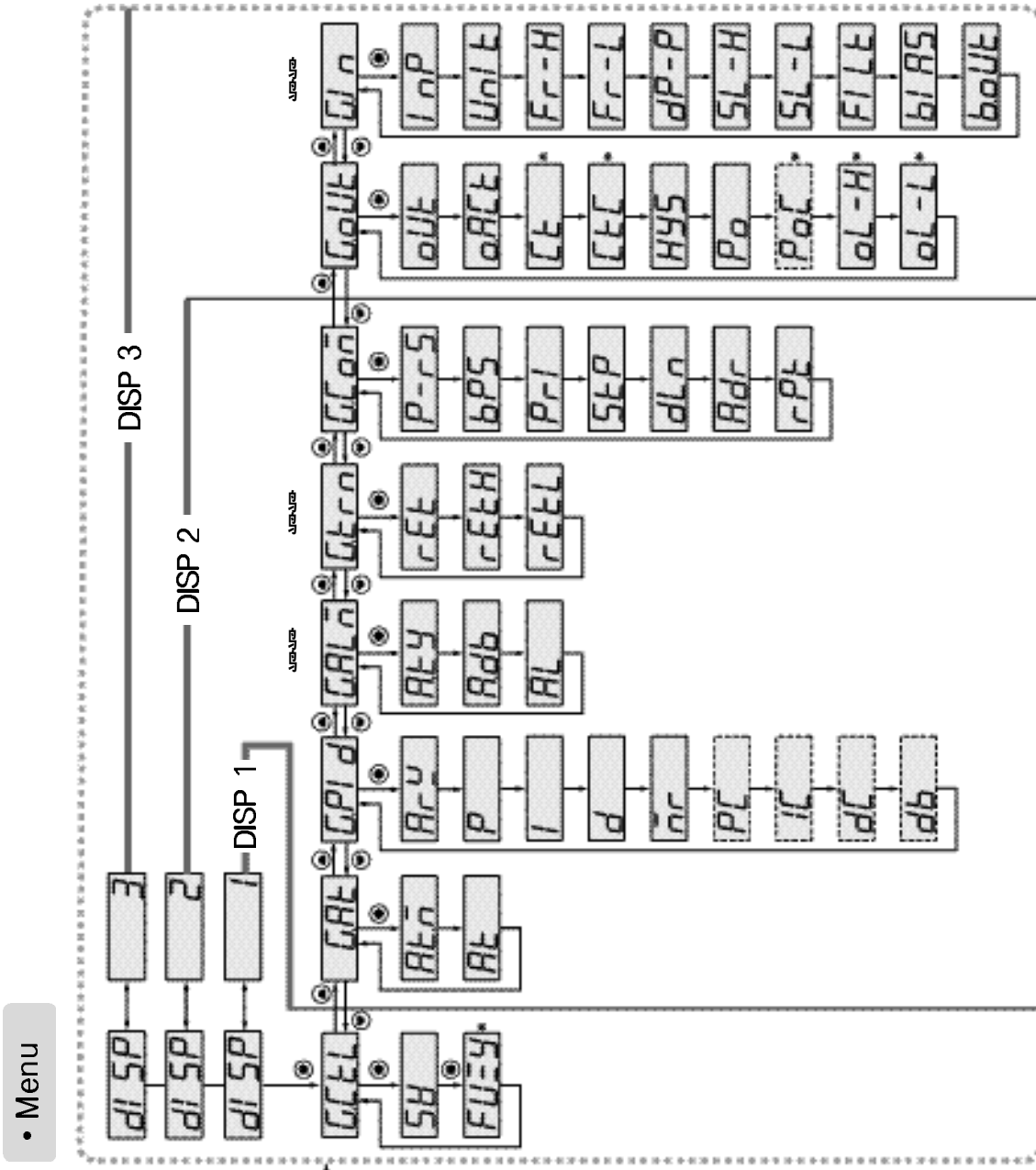
#### For instance

You wish to make FUZZY ON status when it 's OFF now.

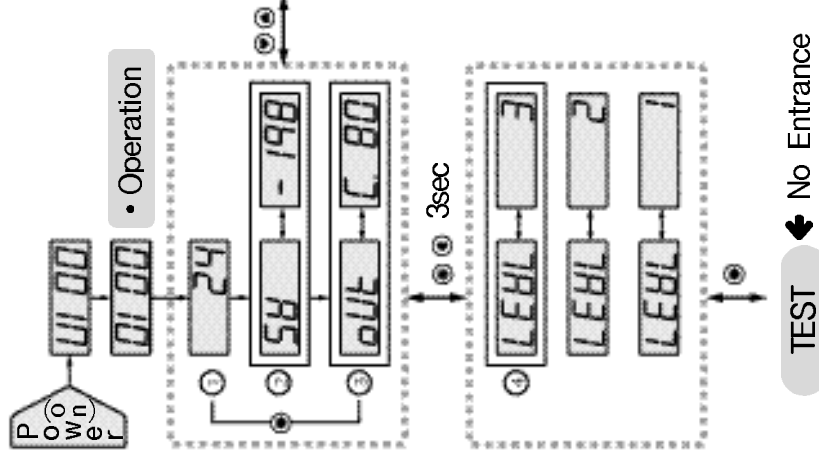
First press  key in Control Group (G.CTL), then “ SV ” and “ OFF ” will be called up in turn. Keep pressing  key, then only “ OFF ” will be shown.

While pressing it, press  key to set “ ON ”, then “ FUZZY ” and “ ON ” will be called up in turn.

■ Setting items and Parameter



<Process Temperature Controller>



- G.ALM
- G.TRN
- O.ACT
- HYS is
- [---]: Indicated when heating/cooling type
- \* : not indicated when ON-OFF control
- \*\* : Indicated when Indicator mode


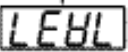
## SETTING AND DISPLAY LEVEL ( )

This controller has 3 different levels of setting, there by restricting operator access if so desired. The following describes these levels;

Level 1: Access available to setting and displaying only up Group #3 (Group Set value)

Level 2: Access available to setting and displaying only up Group #9 (Group Communication)


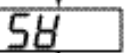
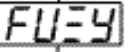
Level 3: Access available to setting and displaying of all Groups.

| Signal   | Name          | Description | Condition | Initial value |
|--|---------------|-------------|-----------|---------------|
| <br> | Display Level | 1~3         | Always    | 3             |
|  | Setting Level | 0~3         | Always    | 3             |

## CONTROL GROUP ( )

Set SV for temperature control.


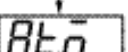
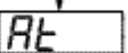
Fuzzy function is selectable (Fuzzy function is operating in the PID control.)

| Signal  | Name                     | Description                  | Condition   | Initial value |
|---|--------------------------|------------------------------|-------------|---------------|
| <br><br> | Control group display    | Operation set a control mode | —           | —             |
|   | Set SV                   | EU (0.0~100.0%)              | Always      | EU(0.0%)      |
|   | Fuzzy function selection | OFF, ON                      | PID control | OFF           |

## AUTO TUNING GROUP ( )

This controller has two type of auto tuning a STD (Standard type) and Low PV type (SV-10%).

Auto tuning is starting when auto tuning selection is 「ON」.

| Signal  | Name              | Description           | Condition | Initial value |
|---|-------------------|-----------------------|-----------|---------------|
| <br><br> | Auto tuning group | Indicates Auto tuning | —         | —             |
|   | Auto tuning type  | STD / LOW PV ( 1 )    | ABS       | STD           |
|   | Auto tuning start | OFF, ON               | ABS       | OFF           |

1: Starting auto tuning at SV-10% of Max. range

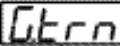

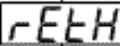
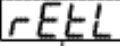
PID GROUP (  $\overline{GPI d}$  )

| Signal             | Name                              | Description                      | Condition     | Initial value |
|--------------------|-----------------------------------|----------------------------------|---------------|---------------|
| $\overline{GPI d}$ | P.I.D group                       | Set P.I.D mode                   | —             | —             |
| $\overline{ARU}$   | ANTI-RESET WIND-UP                | AUTO or 50.0 ~ 200.0%            | P.I.D control | Auto          |
| $\overline{P}$     | Proportional band                 | 0.1 ~ 999.9%                     | P.I.D control | 5.0%          |
| $\overline{I}$     | Integral time                     | OFF, 1 ~ 6000 sec                | P.I.D control | 240 sec       |
| $\overline{d}$     | Derivative time                   | OFF, 1 ~ 6000 sec                | P.I.D control | 60 sec        |
| $\overline{nr}$    | Manual Reset                      | -5.0 ~ 105.0%                    | 1=0           | 50.0%         |
| $\overline{PL}$    | Proportional band of cooling side | 0.0 (ON/OFF control), 0.1~999.9% | P.I.D & HC    | 5.0%          |
| $\overline{IL}$    | Integral time of cooling side     | OFF, 1 ~ 6000 sec                | P.I.D & HC    | 240 sec       |
| $\overline{dL}$    | Derivative time of cooling side   | OFF, 1 ~ 6000 sec                | P.I.D & HC    | 60 sec        |
| $\overline{db}$    | Hysteresis of heating / cooling   | -100.0 ~ 50.0%                   | P.I.D & HC    | 3.0%          |

ALARM GROUP (  $\overline{GALn}$  )


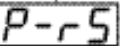

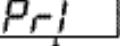
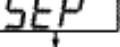
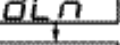
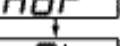
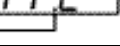
| Signal            | Name               | Description  | Condition  | Initial value |
|-------------------|--------------------|--|------------|---------------|
| $\overline{GALn}$ | Alarm group        | Set alarm mode   | —          | —             |
| $\overline{ALY}$  | Type of alarm      | OFF, 1 ~ 20 (PH, PL, DH, DL, DV)<br>‡ Refer to "Alarm type and code" | OUT=1 or 2 | 1             |
| $\overline{Rdb}$  | Dead band of alarm | EUS (0.0 ~ 100.0%)   | OUT=1 or 2 | EUS(0.5%)     |
| $\overline{AL}$   | Set value of alarm | PV alarm, Deviation alarm<br>EU (-100.0 ~ 100.0%)                    | OUT=1 or 2 | EU(100.0%)    |

## RETRANSMISSION GROUP ( )

| Signal   | Name                         | Description                      | Condition                 | Initial value              |
|--|------------------------------|----------------------------------|---------------------------|----------------------------|
| <br><br><br> | Retransmission group         | Set retransmission               | Reference                 | —                          |
|  | Retransmission output type   | PV, SV, MV                       | OUT=0,3                   | 1                          |
|  | High limit of retransmission | T/C, RTD: RH~RL<br>mV, V : SH~SL | OUT=0,3 &<br>RET = 1 or 2 | T/C, RTD: RH<br>mV, V : SH |
|  | Low limit of retransmission  | (Notice) RET.H > RET.L           |                           | T/C, RTD: RL<br>mV, V : SL |

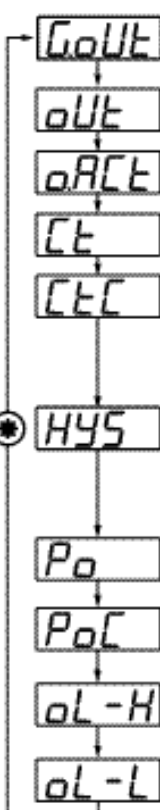
Reference : Retransmission group display is only shown if you choose Output 0, 3.

## COMMUNICATION GROUP ( )

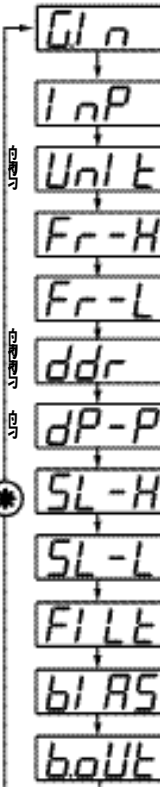
| Signal  | Name                  | Description  | Condition | Initial value |
|---|-----------------------|--|-----------|---------------|
| <br><br><br><br><br><br><br> | Communication group   | Set communication mode                                 | —         | —             |
|   | RS485, RS422 protocol | PC LINK: 0, PC LINK + SUM: 1                           | Optional  | 0             |
|   | Communication rate    | 600 : 0 , 1200 : 1 , 2400 : 2 ,<br>4800 : 3 , 9600 : 4 | Optional  | 4             |
|   | Parity check          | NONE(0), EVEN(1), ODD(2)                               | Optional  | 0             |
|   | STOP BIT              | 1, 2   | Optional  | 1             |
|   | DATA LENGTH           | 7 or 8 Bit   | Optional  | 8             |
|   | ADDRESS               | 1 ~ 99 , Maximum 31 devices                            | Optional  | 1             |
|   | RESPONSE TIME         | 0 ~ 10<br>Handling time + Response time x 10mS         | Optional  | 0             |



## OUTPUT GROUP ( **CoUt** )

| Signal  | Name   | Description   | Condition         | Initial value     |
|---|--|---|-------------------|-------------------|
|  CoUt | Output group                                 | Output type and mode selection                          | —                 | —                 |
| oUt   | Output selection                             | 0 ~ 5   | Condition display | 1                 |
| oRct  | Direct / Reverse                             | REV: Reverse, DIR: Direct                               | OUT=0~3           | REV               |
| Ct  | Cycle time 1                                 | 1 ~ 1000 sec  | OUT=1,3,4,5       | 30 sec            |
| CtC   | Cycle time of Cooling side                   | 1 ~ 1000 sec  | OUT=4             | 30 sec            |
| HYS   | Hysteresis of ON / OFF control               | EUS(0.0~100.0%)   | ON/OFF<br>(OUT=0) | EUS(0.5%)         |
|   | Hysteresis of Heating • Cooling type         | 0.0 ~ 10.0%   | HC(OUT=4,5)       | 0.5%              |
| Pa  | Output volume when input disconnection(OUT1) | -5.0 ~ 105.0%<br>Heating • Cooling type:0.0~105.0%      | Always            | 0.0%              |
| PaL   | Output volume when input disconnection(OUT2) | 0.0 ~ 105.0%  | HC(OUT=4,5)       | 0.0%              |
| oL-H  | Maximum value of output                      | OL+1Digit ~ 105.0%<br>Heating • Cooling type:0 ~ 105.0% | PID(OUT=1~5)      | 100.0%            |
| oL-L  | Minimum value of output                      | -5.0% ~ OH-1Digit<br>Heating • Cooling type:0~105.0%    | PID(OUT=1~5)      | 0.0%<br>HC:100.0% |

## INPUT GROUP ( **Gl n** )

| Signal   | Name                    | Description  | Condition | Initial value |
|--|-------------------------|--|-----------|---------------|
|  Gl n | Input group             | set input type and mode  | —         | —             |
| InP  | Input signal selection  | refer to input signal and range  | Always    | Type K (1)    |
| Unit   | Unit                    | /  | T/C, RTD  |               |
| Fr-H   | High limit              | Refer to input signal and range<br>(Notice:FR-H > FR-L)                            | Always    | 1370          |
| Fr-L   | Low limit               |  | Always    | -200          |
| ddr  | Display condition of SV | 0: Display from Low value to High value<br>1: Display from High value to Low value | ABS       | 0             |
| dP-P   | Decimal point           | 0 ~ 2  | mV, V     | 1             |
| SL-H   | Maximum on scale        | -1999 ~ 9999<br>(Notice:SL-H > SL-L)<br>Decimal point : according to DP-P          | mV, V     | 100.0         |
| SL-L   | Minimum on scale        |  |           | 0.0           |
| FILE   | PV filter               | OFF, 1 ~ 120 sec.  | Always    | OFF           |
| biAS   | PV bias                 | -100.0~100.0%  | Always    | EUS (0.0%)    |
| boUt   | Burn-out                | OFF, UP, DOWN  | Always    | UP            |

身 : Display only when you choose Voltage, Current input (30,32,33)

身身身 : Display only in Indicator / Voltage input.

身身 : Display only in Temperature input mode.

## 1) INPUT

|  |   |
|--|---|
| Input  | Thermocouple: K, J, E, T, R, S, B, L, N, U, WRe 5-26, PL-<br>R.T.D: Pt 100 , KPt 100<br>Direct voltage: 1~5V, -10~20mV, 0~100mV (Free scale type)   |
| Sampling time                                  | 250mS   |
| Input resolution                               | Below decimal point of measurement range  |
| Input impedance                                | T/C and mV input: 1M min., DC V: 1M   |
| Lead wire tolerable resistance                 | R.T.D: 10 max. / wire   |
| Input tolerable voltage                        | $\pm 10V$ (T/C, R.T.D, Voltage: mV DC)<br>$\pm 20V$ (Voltage: V DC)   |
| Noise removal rate                             | NMRR(normal mode): 40dB min.<br>CMRR(common mode): 120dB min. (50/60Hz $\pm 1\%$ )  |
| Standard                                       | T/C, R.T.D: KS, IEC, DIN  |
| Standard junction temp. compensation tolerance | $\pm 1.5$ (15~35 ), $\pm 2.0$ (0~50 )   |
| Burn-out                                       | T/C: OFF, Up/Down scale selectable<br>R.T.D: OFF, Up/Down scale selectable (Detection current: 50nA)  |
| Accuracy                                       | $\pm 0.5\%$ (Full scale)  |
| Input range                                    | Refer to "Input signal and Measurement range "<br>T/C and R.T.D are changeable within range of input signal and measurement range.<br>Voltage: Min. voltage and max. voltage are available within range of measurement.<br>Scaling available. |

## 2) OUTPUT

ALARM ( Terminal no. - )

|                      |  |
|----------------------|--|
| Relay contact output | Contact capacity: 240VAC 1A, 30V DC 1A(resistive load)<br>Contact: 1a<br>Output points: Refer to "Terminal Arrangement " |
|----------------------|--|

RETRANSMISSION OUTPUT ( Terminal no. - )

|                |   |
|----------------|---|
| Current output | Current output range: 4~20mA DC<br>Resistive load: 600 max.<br>Accuracy: $\pm 0.5\%$ of max. scale (4~20mA range)<br>Resolution: Approx. 3,000<br>Output ripple: 0.3% (P-P)max. of scale (150Hz)<br>Sampling: 250mS |
|----------------|---|

## CONTROL OUTPUT

|                          |  |
|--------------------------|--|
| Relay contact output     | <p>Contact capacity: 240VAC 1A, 30VDC 1A (resistive load)<br/>         Contact: 1a<br/>         Output operation: P.I.D control, ON/OFF<br/>         Proportional cycle: 1~1,000 sec.<br/>         Output limit: 0.0~100.0% range, higher limit(OH) or lower limit(OL) selectable<br/>         ON/OFF hysteresis: 0~100%(Full scale)<br/>         Time resolution: 0.1% or 10mS</p>  |
| SSR drive voltage output | <p>ON voltage: 24VDC min.(resistive load 600 min., 30mA limit when short)<br/>         OFF voltage: 0.1VDC max.<br/>         Proportional cycle: 1~1,000 sec.<br/>         Output operation: P.I.D control<br/>         Output limit: 0.0~100.0% range, higher limit(OH) or lower limit(OL) selectable<br/>         Time resolution: 0.1% or 10mS</p>  |
| Current output           | <p>Current output range: 4~20mA DC<br/>         Resistive load: 600 max.<br/>         Accuracy: <math>\pm 0.5\%</math> of full scale (4~20mA range), Resolution: Approx. 3,000<br/>         Output ripple: 0.3%(P-P) of max. scale (150Hz)<br/>         Sampling time: 250mS<br/>         Output operation: P.I.D control<br/>         Output limit: -5.0~105.0% range, higher limit(OH) or lower limit(OL) selectable</p> |

## 3) POWER SUPPLY

|                       |   |
|-----------------------|---|
| Power supply          | 100~240VAC(90~264VAC)   |
| Frequency             | 50/60Hz   |
| Power consumption     | 6.0W max., 10VA max.  |
| Insulation resistance | <p>Between primary terminal and secondary terminal : DC 500V, 20M min.<br/>         Between primary terminal and ground : DC 500V, 20M min.<br/>         Between ground and secondary terminal : DC 500V, 20M min.</p>                              |
| Dielectric strength   | <p>Between primary terminal and secondary terminal : 2,300VAC 50/60Hz for 1 min.<br/>         Between primary terminal and ground : 2,300VAC 50/60Hz for 1 min.<br/>         Between F · G and secondary terminal : 1,500VAC 50/60Hz for 1 min.</p> |

#### 4) FUNCTION

|                       |  |
|-----------------------|--|
| Measurement input     | Input correction (Bias): -100.0~100.0% for instrument range<br>Scaling : According to SH, SL of measurement range<br>Filter : OFF, 1~120 sec.  |
| Control               | 3 settings (SV1, SV2 and SV3) and P.I.D setting each<br>Auto tuning : According to set value (Standard type, Low PV type)<br>Proportional Band : 0.1~999.9% (Max. range), 0.0~999.9% (When heating · cooling control)<br>Integral Time : OFF, 1~6000 sec.<br>Derivative Time : OFF, 1~6000 sec.<br>ON/OFF control: By selecting output code (OT)“ 0 ”<br>P.I.D selection : Zone PID/Segment PID selectable<br>Manual Reset : -5.0~105.0% of output (valid when I=OFF)<br>Direct / Reverse action : Changeable by parameter<br>Preset output limit : -5.0~105.0% of output value, 0.0~105.0% when heating, cooling control<br>ON/OFF hysteresis (HYS): 0.0~100.0% of instrument range (valid when ON/OFF control)<br>Heating-Cooling hysteresis : -100.0~50.0% of output value<br>A.R.W(Anti Reset Wind-up): AUTO, 50.0~200.0%<br>Fuzzy : Selection ON/OFF by parameter |
| Retransmission output | Signal : Process value(PV), Set value(SV), Output value(MV)<br>Scaling : PV, SV  |
| Alarm output          | Set point : 1 Point (1a)<br>Multi-alarm : High/Low process alarm, High/Low deviation alarm, Hold function of alarm, Heater break alarm (H.B.A)<br>Setting range : Process alarm ..... 0~100% of instrument range<br>Deviation alarm ..... -100~100% of instrument range<br>Alarm hysteresis : 0.0~100.0% of instrument range   |

#### 5) OPERATING ENVIRONMENT

|                                  |  |
|----------------------------------|--|
| Installation environment         | Continuous vibration (5~14Hz) : Forward width 1.2mm max.<br>(4~150Hz) : 4.9m/s <sup>2</sup> (0.5G) max.<br>Vibration : 14.7m/s <sup>2</sup> (1.5G), 15 sec. max. (each 3 direction)<br>Shock : 147m/s <sup>2</sup> (15G), 11msec max. (6 direction each 3 times)<br>Panel cutout: Page 7 |
| Normal operation condition       | Ambient temperature : 0~50<br>Ambient humidity : 20~90%RH (no condensation)<br>Influence of magnetic : 400AT/m max.<br>Warm-up time: 30 min. min.  |
| Influence of ambient temperature | T/C, Voltage input : $\pm 1 \mu V$ / or $\pm 0.01\%$ / of max. range<br>R.T.D input : $\pm 0.05$ / max.<br>Analog output : $\pm 0.05\%$ / max. (continuous output)   |

## 6) STORAGE CONDITION

|                     |                              |
|---------------------|------------------------------|
| Storage temperature | -25~70                       |
| Storage humidity    | 5~95%RH (no condensation)    |
| Shock               | 1m max. in packing condition |

## 7) STRUCTURE

| MODEL  | EXTERNAL DIMENSION   | PROTECTION        | WEIGHT | MATERIAL           |
|--------|----------------------|-------------------|--------|--------------------|
| LCU032 | 48(W)×26(H)×100(D)mm | IP 65 front facia | 94g    | Plastic case (ABS) |

## 8) SAFETY AND EMC STANDARD





















|                 |   |
|-----------------|---|
| Safety standard | UL 508 (Approval expected)<br>CSA 1010 (Approval expected)<br>EN 61010 (Under inspecting) |
| EMC             | EMI, EMS (Under inspecting)   |

## 9) INTERFACE

|                        |  |
|------------------------|--|
| Standard               | EIA RS485  |
| Communication address  | 0~31, 1~99 setting available                                       |
| Communication method   | 2 wire half duplex or 4 wire half duplex                           |
| Synchronization        | Start-stop synchronous mode  |
| Communication sequence | None   |
| Communication distance | 1.2Km max.   |
| Communication speed    | 600, 1200, 2400, 4800, 9600 BPS (Speed is changeable by parameter) |
| Start bit              | 1 BIT  |
| Data bit               | 7 or 8 BIT   |
| Parity bit             | None, even numbers, odd numbers                                    |
| Stop bit               | 1 or 2 BIT   |
| Communication protocol | PC LINK WITHOUT SUM(0), PC LINK WITH SUM(1)                        |
| Response time          | Reception treatment time + (Response time × 10mS)                  |

- It is not available to use alarm function when you choose output code 0, 3.
- (Notice) : Display lamp will be ON when output OFF in inverted type.

Hysteresis  ( : Set point ,  $\blacktriangle$  Minus Alarm set point , : Alarm set point )

| Code NO. | Alarm type  | Function   |
|----------|---|--|
| 1        | High absolute value                               |    |
| 2        | Low absolute value                                |    |
| 3        | High deviation value                              |    |
| 4        | Low deviation value                               |    |
| 5        | High deviation value (inverted)                   |    |
| 6        | Low deviation value (inverted)                    |    |
| 7        | High · Low deviation value                        |   |
| 8        | High · Low band                                   |  |
| 9        | High absolute (inverted)                          |  |
| 10       | Low absolute (inverted)                           |  |
| 11       | High absolute with hold function                  |  |
| 12       | Low absolute with hold function                   |  |
| 13       | High deviation with hold function                 |  |
| 14       | Low deviation with hold function                  |  |
| 15       | High deviation with hold function (inverted)      |  |
| 16       | Low deviation with hold function (inverted)       |  |
| 17       | High · Low deviation with hold function           |  |
| 18       | High · Low band with hold function                |  |
| 19       | High absolute value with hold function (inverted) |  |
| 20       | Low absolute value with hold function (inverted)  |  |

MEMO

LOVE CONTROLS



## **LOVE CONTROLS**

a Division of Dwyer Instruments, Incorporated  
PO Box 338 Michigan City, IN 46361-0338  
(800) 828-4588 (219) 879-8000 FAX (219) 872-9057  
[www.love-controls.com](http://www.love-controls.com)