# General Specifications

## Model UT35
## Digital Indicating Controller

*The UT35 is a new, microprocessor-based digital indicating controller with ± 0.2% indicating accuracy and a sampling rate of 200 ms.*

*The UT35 family includes three types: general digital controllers, heating/cooling dual output digital controllers, and cryogenic digital controllers. The standard functions include one, four or eight setpoints, each with its own PID set, and setpoint selection on the front panel or by remote contact.*

*The controller is suited for diversified applications since it has all popular control actions including time proportional PID (relay or voltage pulse outputs), continuous output PID (4 to 20 mA or 1 to 5 V DC outputs), position proportional PID (2 relays and slide wire feedback), and three position control (2 relays). Digital communications and analog retransmission, along with external control functions, ratio control and square root extraction, and timed program operation, are available as options.*


## STANDARD SPECIFICATIONS

### Input

**Standard Range:** Multi-range system (A range can be selected in each input group.)
**Input Sampling Period:** 200 ms
**Input Resistance:**
Thermocouple input ..... 1 MΩ or more
Voltage input ..... Approx. 1 MΩ
Current input ..... Approx. 250 Ω
**Permissible Signal Source Resistance:**
Thermocouple ..... 250 Ω or less
Voltage ..... 2 kΩ or less
**Permissible Leadwire Resistance:**
RTD input ..... 10 Ω or less/wire
**Permissible Input Voltage:**
Thermocouple, DC voltage and current input ±10 V or less
**Noise Rejection Ratio:**
Normal mode ..... 60 dB (50/60 Hz)
Common mode ..... 140 dB (50/60 Hz)
**Filter:** 0 to 120 seconds (First order lag, 0 is assigned to OFF)
**Measured Input Compensation:** −5% to 5% of F.S.
**Thermocouple Standards:** IEC/DIN (U and L)/JIS
**RTD Standards:** IEC/DIN/JIS '89 Pt100, JPt100

### Display Function

**Display Contents:** Process variable, Setpoint/Parameters, Status lamps (8)
**Process Variable Display:** 4 digits, 7 segment LEDs (red)
**Setpoint/Parameter Display:** 3 digits + 4 digits, 7 segment LEDs (red)
**Deviation Monitor:** Green lamp lights within ±1.0% of F.S.
(±) deviation (orange) lamp lights when ±1.0% of F.S. is exceeded.

## CONTROL SPECIFICATIONS

- **Settable Range**
  **Process Input:** Within ranges
  **Target Value (setpoint):** 0 to 100% of the range
  **Setpoint High and Low Limits:** 0 to 100% of the range
  **Proportional Band (P):** 0, 0.1 to 999.9% (0 means ON/OFF control.)
  **Integral Time (I):** 0, 1 to 6000 seconds (0 means integral action OFF.)
  **Derivative Time (D):** 0, 1 to 6000 seconds (0 means derivative action OFF.)
- **Input Resolution**
  **Thermocouple Input:** 1°C or 0.1°C (1°F or 0.1°F)
  **RTD Input:** 0.1°C (1°F)
  **Cryogenic RTD:** 0.1K
- **Target Value (SP) Setting Selection**
  **Number of Selectable Setpoints:** 1, 4 or 8
  **Number of PID Settings:** 1, 4 or 8
  **Target Setpoint Selection:** With SET key on the front panel or volt-free remote contact (BCD)
  (Remote contact rating: 12 V DC or more 10 mA or more)

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| Input type | Type of input (range) | | | | Range code |
|---|---|---|---|---|---|
| Thermocouple/mV group | | R | 0 to 1700°C | 32 to 3100°F | 100 |
| | | S | 0 to 1700°C | 32 to 3100°F | 110 |
| | | B | 0 to 1800°C | 32 to 3300°F | 120 |
| | | K | −200 to 1200°C | −300 to 2300°F | 131 |
| | | K | −199.9 to 200.0°C | −300 to 400°F | 132 |
| | | E | −199.9 to 800.0°C | −300 to 1500°F | 141 |
| | | J | −199.9 to 800.0°C | −300 to 1500°F | 150 |
| | DIN | L | −199.9 to 800.0°C | −300 to 1500°F | 151 |
| | | T | −199.9 to 200.0°C | −300 to 400°F | 160 |
| | | T | 0.0 to 400.0°C | 32 to 750°F | 161 |
| | DIN | U | −199.9 to 200.0°C | −300 to 400°F | 165 |
| | | U | 0.0 to 400.0°C | 32 to 750°F | 166 |
| | | N | 0 to 1300°C | 32 to 2400°F | 170 |
| | | W | 0 to 2300°C | 32 to 4200°F | 180 |
| | | 0 to 10mV | | | 000 |
| | | −10 to 10mV | | | 001 |
| | | 0 to 100mV | | | 010 |
| DC voltage (V) and DC current (mA) group | | 0 to 1V | −1999 to 9999 Scaling available (Decimal point position can be changed.) | | 020 |
| | | −1 to 1V | | | 021 |
| | | 0 to 5V | | | 030 |
| | | 1 to 5V | | | 031 |
| | | 0 to 10V | | | 040 |
| | | 4 to 20mA | | | 050 |
| RTD group * | JPt100 (JIS '89) | −199.9 to 500.0°C | | −300 to 1000°F | 200 |
| | Pt100Ω (DIN/JIS '89) | −199.9 to 500.0°C | | −300 to 1000°F | 201 |
| | Pt-CO (Note 1) | 0.0 to 300.0K | | − | 250 |

* RTD = Resistance Temperature Detector

(Note 1)
- Applicable only to cryogenic type controllers.
- For Pt-Co RTS input, use the YOKOGAWA J263•B sensor. Other manufacturers' sensors cannot be combined with the controller.

## OUTPUT SPECIFICATIONS

**Control Action:**

Time proportional PID (relay output)
Time proportional PID (voltage pulse output for driving an external SSR)
Continuous output PID (4 to 20mA DC output, or 1 to 5V DC output)
Position-proportional PID (relay outputs for driving motor operated valves)
Heating/cooling PID (relay output, voltage pulse output, continuous current or voltage output)
Dead band: −10 to 10% selectable
Three position-control (relay output)
Neutral zone: 1 to 10% selectable

**Output:**

Relay Output: Contact rating 250V AC, 3A (resistive load)
Voltage Pulse Output: ON voltage Approx. 12V DC OFF voltage 0.1V DC or less (Load resistance 1kΩ or more)
4 to 20mA Output: Load resistance 600Ω or less
Accuracy ±0.3% of F.S.
1 to 5V DC Output: Load resistance 1kΩ or more
Accuracy ±0.3% of F.S.
Output Updating Period: 200ms (4 to 20mA DC output type, 1 to 5V DC output type, and Position proportional PID output type)
Cycle Time: 1 to 100 seconds (relay output, voltage pulse output)

Output High or Low Limit: 0 to 100% (time proportional)
−5 to 105% (continuous output PID)
Output Action Selection: Direct/reverse selectable
Automatic/Manual Transfer: Balanceless bumpless
Output Velocity Limit: 0, 1 to 100%/second (0 means OFF)

**(For position proportional type)**
Feedback Resistance: 100 Ω to 2.5 kΩ (Not required to specify)
Position Proportional Input Resolution: 0.1% (display)
Dead Band: 1 to 10% (of position signal span)

**Other Functions:** Auto-tuning (Not available for heating/cooling type)
Key lock, Thermocouple burnout detection
Process input and control output circuits are isolated from each other.

## Alarm Functions

**Setting Contents:** Process variable high and low limits, deviation high and low limits (selectable for each point)
**Alarm Value:** 0 to 100% of the set range
**Number of Alarms:** 2
**Output:** Relay Output (a "make" contact)
Contact Rating; 250 V AC, 0.3 A (resistive load)
**Display:** LED lamps on the front panel
**Maximum Hysteresis Error:** 0 to 5% of the set range

## Basic Functions

**Measurement Accuracy:**

| Input type | Input | Accuracy |
|---|---|---|
| Thermocouple JIS, ANSI, DIN) | R<br>S<br>B *1 | ±0.25% of F.S. ±1 digit *5 |
| | K<br>E<br>J<br>L (DIN)<br>T *2<br>U (DIN) *2<br>N<br>W | ±0.2% of F.S. ±1 digit *5 |
| RTD (DIN, JIS) | Pt100Ω *3 | ±0.2% of F.S. ±1 digit |
| RTS (Cryogenic) | Pt-CO | ±0.25% of F.S. ±1 digit |
| V, mV | V, mV *4 DC | ±0.2 of F.S. ±1 digit |
| mA | 4 to 20mA DC | ±0.2% of F.S. ±1 digit |

digit is the minimum unit of indication.

*1 0 to 400°C: ±5%
*2 Below 0°C: ±0.3% of F.S. ±1 digit
*3 0 to 100°C: ±0.3% of F.S. ±1 digit
0 to 200°C
−50 to 150°C: ±0.25% of F.S. ±1 digit
−100 to 100°C
*4 0 to 10mV DC: ±0.3% of F.S. ±1 digit
*5 Reference junction error is not included.

**Insulation Resistance:** 20 MΩ or more at 500 V DC between each terminal and ground
**Withstand Voltage:** 1500 V AC for 1 minute between power terminals and ground
1000 V AC for 1 minute between input terminals and ground
1500 V AC for 1 minute between output terminals and ground
**Supply Voltage:** 90 to 250 V AC (Universal power supply)
**Supply Frequency:** 50/60 Hz common
**Power Consumption:** Approx. 12 VA
**Memory Preservation:** Non-volatile memory

## Normal Operating Conditions

(Operating conditions so that the controller properly operates continuously at the specified accuracy.)
**Ambient Temperature:** 0 to 50°C
**Ambient Humidity:** 20 to 90% R.H.
**Reference Junction Temperature Compensation Error (in the range 0 to 50°C):**
R, S, B, W: ±1°C
K, E, J, L, T, U, N: ±0.5°C
**Magnetic Field:** 400 AT/m or less
**Warm-Up Time:** 30 minutes or more

## Effect of Operating Conditions

**Effect of Ambient Temperature:** Input stability ±1 μV/°C or ±0.01%/°C (whichever greater) or less
Output stability (continuous output) ±0.05%/°C or less
**Effect of Supply Voltage Change:** Input stability ±1 μV/10% or ±0.01%/10% (whichever greater) or less
Output stability (continuous output) ±0.05%/10% or less

## Construction

**Mounting:** Panel flush mount
**Case:** Resin mold
**Weight:** Approx. 1 kg
**External Dimensions:** 96×96×180 mm

## Transport and Storage Conditions

**Temperature:** −25 to 70°C
**Humidity:** 5 to 95% R.H. (No condensing)

# OPTION SPECIFICATIONS

Codes in the box [ ] show the option codes.

**(1) Terminals for Remote Mode Selection [EX1] or [EX2]**
- Auto/Man remote contact selection: [EX1]
- Run/Stop remote contact selection: [EX2]
Remote contact rating: 12 V DC or more, 10 mA or more

(Note) See the option code combination table.

**(2) Retransmission Output [RET1] or [RET2]**
Output signal: 4 to 20 mA DC [RET1]
Output signal: 1 to 5 V DC [RET2]

- Process variable (PV), setpoint (SP) and output value (OP) are output with a linearized signal.
- Retransmission output of PV and SP can be scaled.
  Load resistance: 600 Ω or less (4 to 20 mA DC)
  1 kΩ or more (1 to 5 V DC)
  Accuracy: ±0.3% of F.S.

(Note 1) Retransmission output circuit and control output circuits are not isolated in the controller.
(Note 2) See the option code combination table.

**(3) Remote Setpoint Input (Isolated) [RSP]**
(The measuring input circuit and remote setpoint circuit are isolated in the controller.)
Remote setpoint input signal: 4 to 20 mA DC
(Changeable to 1 to 5 V DC input with an internal switch)
Receiving resistance: 1 MΩ (1 to 5 V DC)
250 Ω (4 to 20 mA DC)
Remote to local transfer: Bumpless tracking (remote setpoint unchanged) or without tracking (transfer to preset local setpoint)
Remote setpoint indicating accuracy: ±0.3% of F.S. ±1 digit

(Note) See the option code combination table.

**(4) Setting Ratio, Bias, or Square Root Extraction to Remote Input [PMSR]**
Ratio setting range: 0.000 to 9.999 : 1
Bias setting range: −105 to 105%
Low cut setting range in square root extraction: 0 to 5% of F.S.

(Note 1) This includes the optional [RSP] function.
(Note 2) See the option code combination table.

**(5) Remote/Local Remote Contact Selection Terminals [RLEX]**
Remote contact rating: 12 V DC or more, 10 mA DC or more

(Note 1) This includes the optional [RSP] function.
(Note 2) See the option code combination table.

**(6) PV Input Square Root Extraction [PVSR]**
Low cut setting range in square root extraction: 0 to 5% of F.S.

**(7) Automatic Target Setpoint Transfer [SPEX]**
Setting retention time: 0 to 9999 minutes or seconds (for each setpoint)
Retention time end status output: One point (open collector)
Remote contact rating: 12 V DC, 10 mA or less

(Note 1) When [SPEX] is selected, do not use the remote contact SP transfer terminals for standard function.
(Note 2) When [SPEX] is selected, the [RLEX] function is also included. However, the remote setpoint input [RSP] input function is not included.
(Note 3) See the option code combination table.

**(8) Communication Interface [RS232] or [RS422]**

(Note) See the option code combination table.

**(9) Special Thermocouple Input [STC]**
- This option should be applied to the thermocouple input (code "1" for suffix codes) model only. Thus, it cannot be specified for cryogenic types.
- When [STC] is specified, the three types of inputs in table 1 are added to the standard input ranges.

**Table 1**

| Thermocouple type | Measurement range | | Accuracy | Meter range code |
|---|---|---|---|---|
| PR20-40 | 0 to 1900°C | 32 to 3400°F | * ±0.5% of F.S. ±1 digit | 190 |
| Platinum 2 | 0 to 1390°C | 32 to 2500°F | ±0.2% of F.S. ±1 digit | 191 |
| $W_{97}Re_3$-$W_{75}Re_{25}$ | 0 to 2000°C | 32 to 3600°F | ±0.2% of F.S. ±1 digit | 192 |

* The range 0 to 800°C (32 to 1500°F) is not in the accuracy guarantee.

- **Option Code Combination Table (Mark x shows that those cannot be specified together.)**

| | EX1 | EX2 | RET1 | RET2 | RSP | RMSR | RLEX | PVSR | SPEX | RS232 | RS422 | STC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EX1 | | | | | | | | | | × | × | |
| EX2 | | | | | | | | | | × | × | |
| RET1 | | | | × | | | | | | | | |
| RET2 | | | × | | | | | | | | | |
| RSP | | | | | | × | × | | × | | | |
| RMSR | | | | | × | | | | × | | | |
| RLEX | | | | | × | | | | × | × | × | |
| PVSR | | | | | | | | | | | | |
| SPEX | | | | | × | × | × | | | × | × | |
| RS232 | × | × | | | | | × | | × | | × | |
| RS422 | × | × | | | | | × | | × | × | | |
| STC | | | | | | | | | | | | |

## MODEL AND SUFFIX CODES

- **General Digital Indicating Controller**

| Model | Suffix code | Description |
|---|---|---|
| UT35 | ..... | Digital Indicating Controller |
| | -A..... | Standard model (General type) |
| Number of internal setpoints | ①..... | One setpoint |
| | 4..... | Four setpoints |
| | 8..... | Eight setpoints |
| Input type | 1..... | Thermocouple/DC voltage (mV) |
| | 2..... | RTD (Pt100 Ω) |
| | ③..... | DC voltage (V) or current |
| Control action | 10 ..... | Time proportional PID (relay output) |
| | 20 ..... | Time proportional PID (voltage pulse output) |
| | 30 ..... | Continuous output PID (4 to 20mA DC) |
| | 40 ..... | Continuous output PID (1 to 5 V DC) ← 0-10V DC |
| | 50 ..... | Position proportional PID (relay output) |
| | 60 ..... | Three position (relay output) |
| Alarm contacts | N ..... | Without contacts |
| | 1..... | With contacts (2 points) |
| Style code | *A .... | Style A |
| Option codes/ □/□ | | Designate each option code. |

## ● Heating/Cooling type Digital Indicating Controller

| Model | Suffix code | Description |
|---|---|---|
| UT35 | ..... | Digital Indicating Controller |
| | -B..... | Heating/cooling type |
| Number of internal setpoints | 1..... | One setpoint |
| | 4..... | Four setpoints |
| | 8..... | Eight setpoints |
| Input type | 1..... | Thermocouple/DC voltage (mV) |
| | 2..... | RTD (Pt100Ω) |
| | 3..... | DC voltage (V) or current |
| Control action (Heating side) | 1..... | Time proportional PID (relay output) |
| | 2..... | Time proportional PID (voltage pulse output) |
| | 3..... | Continuous output PID (4 to 20mA DC) |
| | 4..... | Continuous output PID (1 to 5V DC) |
| Control action (Cooling side) | 1..... | Time proportional PID (relay output) |
| | 2..... | Time proportional PID (voltage pulse output) |
| | 3..... | Continuous output PID (4 to 20mA DC) |
| | 4..... | Continuous output PID (1 to 5V DC) |
| Alarm contacts | N ..... | Without contacts |
| | 1..... | With contacts (2 points) |
| Style code | *A . | Style A |
| Option codes/□/□ | | Designate each option code. |

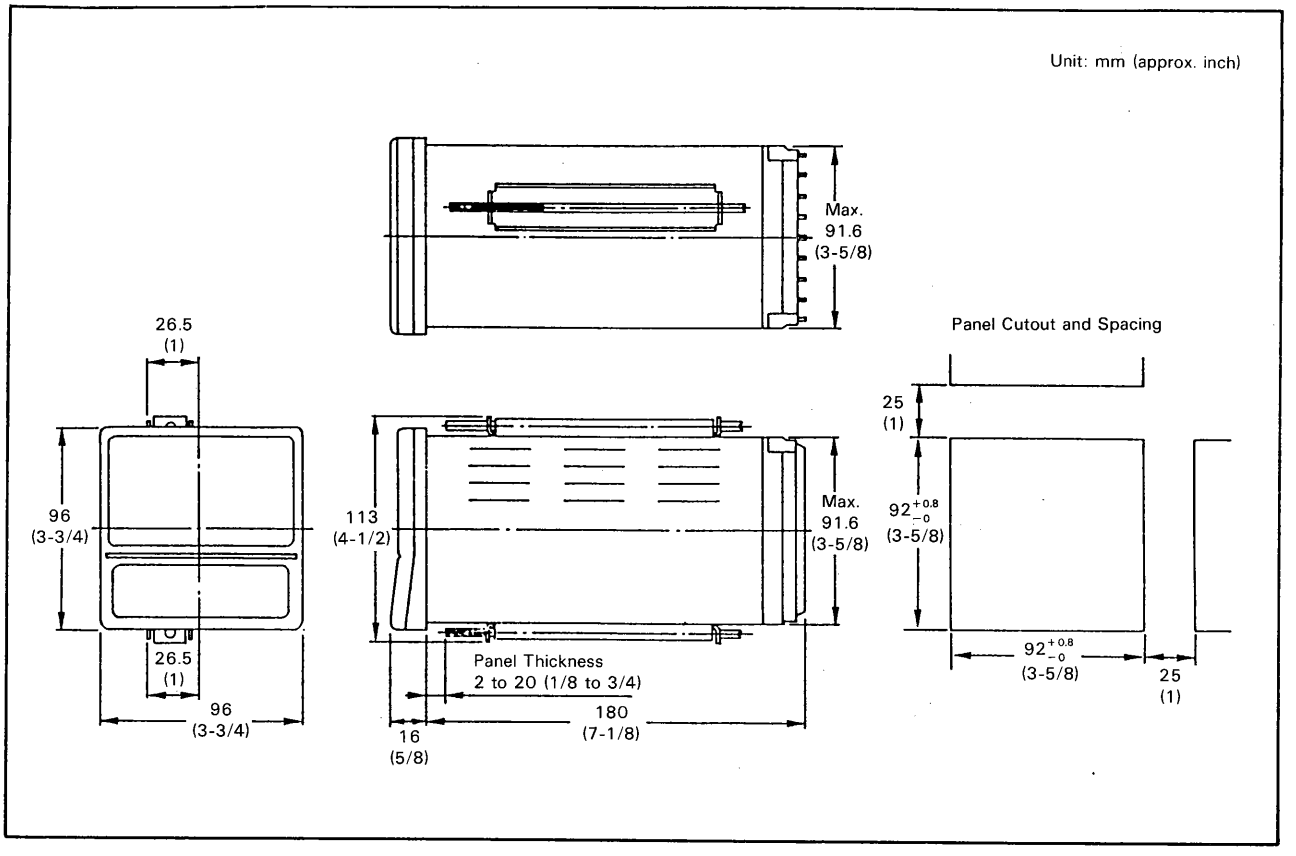
## ● Cryogenic Digital Indicating Controller

| Model | Suffix code | Description |
|---|---|---|
| UT35 | ..... | Digital Indicating Controller |
| | -C..... | Cryogenic type |
| Number of internal setpoints | 1..... | One setpoint |
| | 4..... | Four setpoints |
| | 8..... | Eight setpoints |
| Input type | 4..... | RTD (Pt-Co)(J263•B) |
| Control action | 10 ..... | Time proportional PID (relay output) |
| | 20 ..... | Time proportional PID (voltage pulse output) |
| | 30 ..... | Continuous output PID (4 to 20mA DC) |
| | 40 ..... | Continuous output PID (1 to 5V DC) |
| Alarm contacts | N ..... | Without contacts |
| | 1..... | With contacts (2 points) |
| Style code | *A .... | Style A |
| Option codes/□/□ | | Designate each option code |

### Items to be Specified When Ordering

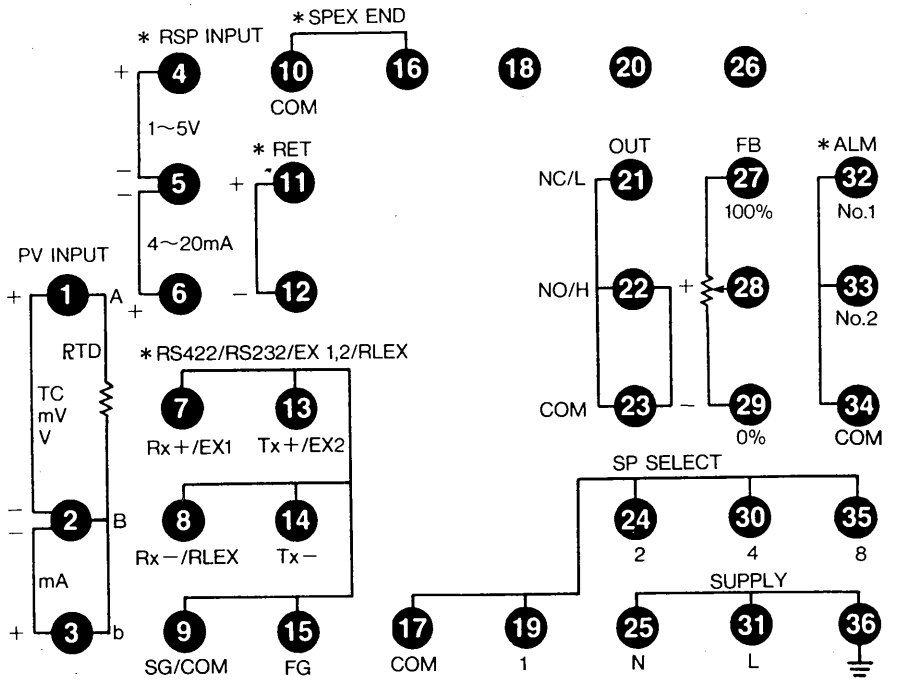
(1) Model and suffix codes
(2) Option codes
(3) Range code No. (If desired)
(Note) If the meter range code is not specified, the controller is delivered with the range code set to K type thermocouple (−199.9 to 200°C, range code No.132) for thermocouple/mV input group; to the range code No.200 for RTD input group; and to range code No.031 for DC current and voltage input group.

## EXTERNAL DIMENSIONS



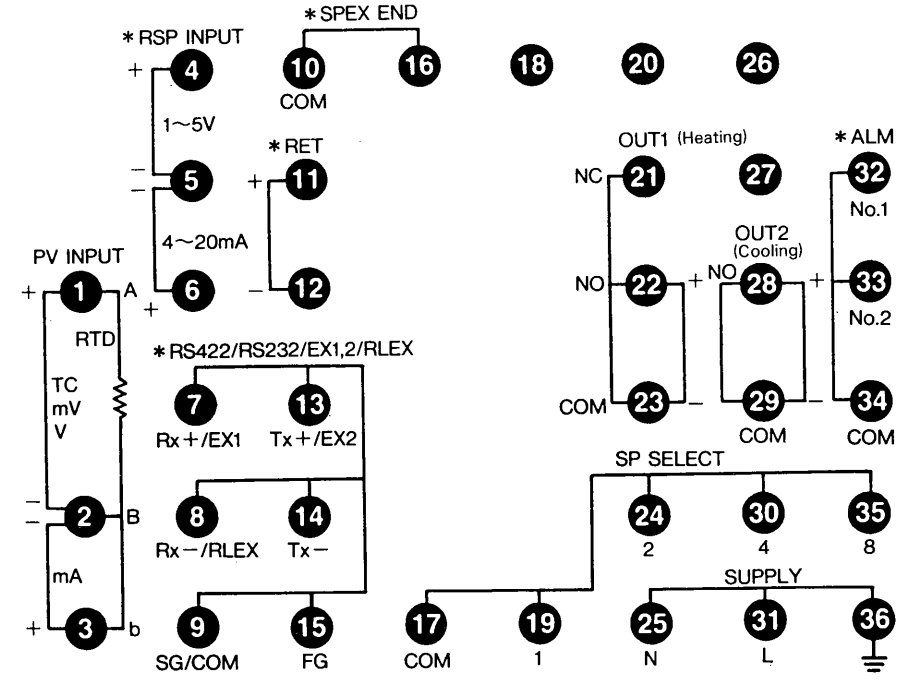
# TERMINAL ARRANGEMENT

## ■ General and cryogenic types




Mark * shows the option terminals.

## ■ Heating/cooling type




Mark * shows the option terminals.



Subject to change without notice.
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