

# Controller Indicator Transmitter

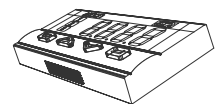
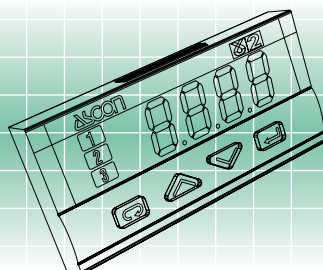
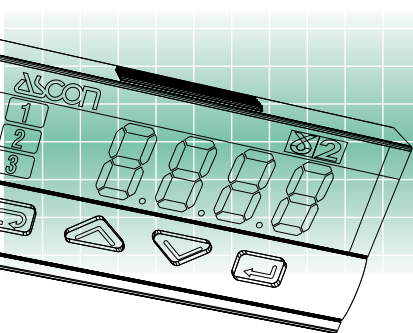
## 1/32 DIN - 48 x 24 mm

### gammadue® series C1 line

#### Small, easy and comprehensive

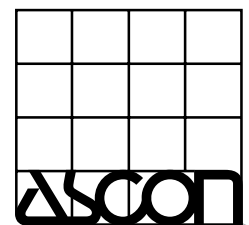
Easy configuration and simple operating method. The smallest line of the gammadue® series concentrates the functionality of the temperature controller-indicator-transmitter without losing the typical characteristics of more complex devices like: autotune, IP65 front panel protection, serial communications,

analogue retransmission output, custom linearisation, and transmitter power supply.



E

ISO 9001 Certified



**ASCON spa**

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# gammadue®

the right solution to your needs

| Your needs                                                               | Our solutions                                                                                 |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Restricted space and reduction of the instrumentation overall dimensions | 1/32 DIN - 48 x 24 Size                                                                       |
| Easy replacement and quick start-up                                      | Configuration by simple to use codes                                                          |
| Correct tuning for any condition                                         | Automatic selection between two different methods                                             |
| Conversion and retransmission of low level signals                       | Transmitter with isolated and analogue output                                                 |
| Contactless temperature measurements                                     | Indicator with infrared input ability                                                         |
| Alarm signalling                                                         | Absolute and deviation alarms                                                                 |
| Interfacing with other devices                                           | Serial communications at 9600 baud Modbus/Jbus protocol, analogue retransmission output       |
| Quick learning                                                           | Every model has the same operating method                                                     |
| Ergonomic compatibility with other devices                               | Two colours: beige or darkgrey front panels                                                   |
| Environmental protection                                                 | IP65 front panel protection (indoor, dust and water protection)                               |
| Easy to use                                                              | Ergonomic keypad, clear and comprehensive display                                             |
| Noise immunity                                                           | Electromagnetic compatibility                                                                 |
| Universal input signals, linear as well as non-linear                    | Configurable input (TC, RTD, mA, Volt and $\Delta T$ , infrared sensor, custom linearisation) |
| Reliability and safety                                                   | CE compatibility, ASCON is ISO 9001 certified, 3 years warranty                               |
| Technical support                                                        | Technical application assistance from ASCON sales and after sales service                     |

### Resources

**Main universal input**

5TC   Pti00    $\Delta T$    mA V   Custom  $\sqrt{\quad}$    **PV**

**Setpoint**

LOC

**Special functions**

**Modbus RS485**

Parameterisation  
Supervision (option)

**Fuzzy tuning with automatic selection**

One shot Auto tuning   One shot Natural Frequency

### Operating mode

|                          | Control | Alarms  | Retransmission |
|--------------------------|---------|---------|----------------|
|                          |         |         |                |
|                          |         |         | <b>PV</b>      |
| <b>0 Indication only</b> |         | OP1 OP2 | OP4            |
| <b>1 Single action</b>   |         | OP1     | OP2 OP4        |
| <b>2 Single action</b>   |         | OP2 OP1 | OP4            |

**OP1**

**OP2**

**OP4 (option)**

## Technical data

| Features at env. 25°C                    | Description                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                      |                                                                                                                     |                                                                                             |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Total configurability                    | From keypad or serial communications, the user selects:                                                                                                                                                                                                                                                                                        |                                                                                                                                                      |                                                                                                                     |                                                                                             |
|                                          | <ul style="list-style-type: none"> <li>- the type of input</li> <li>- the associated functions and the corresponding outputs</li> <li>- the type of control algorithm</li> <li>- the type of output and the safe conditions</li> <li>- the type and functionality of the alarms</li> <li>- the values of all the control parameters</li> </ul> |                                                                                                                                                      |                                                                                                                     |                                                                                             |
| PV input (for signal ranges see table 1) | Common characteristics                                                                                                                                                                                                                                                                                                                         | A/D converter with 50000 points<br>Update measurement time: 0.2s<br>Sampling time: 0.5s<br>Input shift: ±60 digits<br>Input filter: 1...30s (OFF= 0) |                                                                                                                     |                                                                                             |
|                                          | Accuracy                                                                                                                                                                                                                                                                                                                                       | 0.25% ±1 digit (T/C and RTD)<br>0.1% ±1digit (mA and mV)                                                                                             | Between 100...240Vac error is minimal                                                                               |                                                                                             |
|                                          | Resistance thermometer (for ΔT: R1+R2 must be <320Ω)                                                                                                                                                                                                                                                                                           | Pt100Ω at 0°C (IEC 751)<br>°C/°F selectable                                                                                                          | 2 or 3 wire connection                                                                                              | Line: 20Ω max. (3 wire)<br>Thermal drift<br>0.35°C/10°C env. T.<br><0.35°C/10Ω line resist. |
|                                          | Thermocouple                                                                                                                                                                                                                                                                                                                                   | L, J, T, K, S (IEC 584)<br>°C/°F selectable                                                                                                          | Internal cold junction compensation                                                                                 | Line: 150Ω max.<br>Thermal drift<br><2μV/°C env. T.<br><5μV/10Ω line resist.                |
|                                          | DC input (current)                                                                                                                                                                                                                                                                                                                             | 0/4...20mA with 2.5Ω ext. shunt<br>Rj > 10MΩ                                                                                                         | Engineering units, floating decimal point,<br>Low Range -999...9999<br>High Range -999...9999<br>100 digits minimum | Input drift:<br>< 0.1%/20°C env. T.                                                         |
|                                          | DC input (voltage)                                                                                                                                                                                                                                                                                                                             | 0/10...50mV<br>Rj >10MΩ                                                                                                                              |                                                                                                                     |                                                                                             |
| Operating modes                          | Indicator with 2 alarms                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                      | AL1 alarm                                                                                                           | AL2 alarm                                                                                   |
|                                          |                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      | OP1 - relay or triac                                                                                                | OP2 - SSR drive                                                                             |
|                                          | 1 PID loop or ON/OFF with 1 alarm                                                                                                                                                                                                                                                                                                              |                                                                                                                                                      | OP2 - SSR drive                                                                                                     | OP1 - relay or triac                                                                        |
|                                          |                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      | Control output                                                                                                      | AL2 alarm                                                                                   |
| Control mode                             | Algorithm                                                                                                                                                                                                                                                                                                                                      | PID with overshoot control or ON/OFF                                                                                                                 |                                                                                                                     |                                                                                             |
|                                          | Proport. band (P)                                                                                                                                                                                                                                                                                                                              | 0.5...999.9%                                                                                                                                         |                                                                                                                     |                                                                                             |
|                                          | Integral time (I)                                                                                                                                                                                                                                                                                                                              | 0.1...100.0 min                                                                                                                                      |                                                                                                                     |                                                                                             |
|                                          | Derivative time (D)                                                                                                                                                                                                                                                                                                                            | 0.01...10.00 min                                                                                                                                     |                                                                                                                     |                                                                                             |
|                                          | Cycle time                                                                                                                                                                                                                                                                                                                                     | 1...200 s                                                                                                                                            |                                                                                                                     |                                                                                             |
|                                          | Overshoot control                                                                                                                                                                                                                                                                                                                              | 0.01...1.00                                                                                                                                          |                                                                                                                     |                                                                                             |
|                                          | High limit                                                                                                                                                                                                                                                                                                                                     | 100.0...10.0%                                                                                                                                        |                                                                                                                     |                                                                                             |
|                                          | Hysteresis                                                                                                                                                                                                                                                                                                                                     | 0.1...10.0%                                                                                                                                          |                                                                                                                     |                                                                                             |
| OP1 output                               | SPST relay N.O., 2A/250V (4A/120Vac) for resistive load                                                                                                                                                                                                                                                                                        |                                                                                                                                                      |                                                                                                                     |                                                                                             |
|                                          | Triac, 2A/250Vac for contactor coil                                                                                                                                                                                                                                                                                                            |                                                                                                                                                      |                                                                                                                     |                                                                                             |
| OP2 output                               | SSR drive not isolated: 5Vdc, ± 10%, 30mA max.                                                                                                                                                                                                                                                                                                 |                                                                                                                                                      |                                                                                                                     |                                                                                             |
| AL1 alarm (indicator with 2 alarms)      | Hysteresis 0.1...10.0% range                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                      |                                                                                                                     |                                                                                             |
|                                          | Active high                                                                                                                                                                                                                                                                                                                                    | Absolute threshold, whole range                                                                                                                      |                                                                                                                     |                                                                                             |
| AL2 alarm                                | Hysteresis 0.1...10.0% range                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                      |                                                                                                                     |                                                                                             |
|                                          | Action                                                                                                                                                                                                                                                                                                                                         | Active high                                                                                                                                          | Action type                                                                                                         | Deviation threshold ± range                                                                 |
|                                          |                                                                                                                                                                                                                                                                                                                                                | Active low                                                                                                                                           |                                                                                                                     | Band threshold 0...range                                                                    |
|                                          |                                                                                                                                                                                                                                                                                                                                                | Special function                                                                                                                                     | Sensor break                                                                                                        |                                                                                             |
| Setpoint                                 | Up and down ramps                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                      | 0.1...999.9 digit/min (OFF = 0)                                                                                     |                                                                                             |
|                                          | Low limit                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                      | From low range to high limit                                                                                        |                                                                                             |
|                                          | High limit                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                      | From low limit to high range                                                                                        |                                                                                             |
| OP4 (option) PV retransmission output    | Galvanically isolated: 500Vac/1min<br>Resolution: 12bit (0.025%)<br>Accuracy: 0.1%                                                                                                                                                                                                                                                             |                                                                                                                                                      | Current output:<br>0/4...20mA 750Ω/15V max.                                                                         |                                                                                             |
| One-shot Fuzzy-Tuning                    | Depending on the process condition, the controller applies the best method                                                                                                                                                                                                                                                                     |                                                                                                                                                      | Step response                                                                                                       |                                                                                             |
|                                          |                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                      | Natural frequency                                                                                                   |                                                                                             |
| Ser. comm.s (opt.)                       | RS 485 isolated, Modbus/Jbus protocol 1200, 2400, 4800, 9600 bit/s, two wires                                                                                                                                                                                                                                                                  |                                                                                                                                                      |                                                                                                                     |                                                                                             |
| Aux. power supply (opt.)                 | +18Vdc ±20%, 30mA max. for external transmitter supply                                                                                                                                                                                                                                                                                         |                                                                                                                                                      |                                                                                                                     |                                                                                             |

| Input type                   | Scale range                    |    |
|------------------------------|--------------------------------|----|
| RTD<br>Pt100Ω at 0°C         | -99.9...300.0                  | °C |
|                              | -99.9...572.0                  | °F |
| T/C type L<br>Fe-Const.      | -200...600                     | °C |
|                              | -328...1112                    | °F |
| T/C type J<br>Fe-Cu 45% Ni   | 0...600                        | °C |
|                              | 32...1112                      | °F |
| T/C type T<br>Cu - CuNi      | -200...400                     | °C |
|                              | -328...752                     | °F |
| T/C type K<br>Chromel Alumel | 0...1200                       | °C |
|                              | 32...2192                      | °F |
| T/C type S<br>Pt10%Rh-Pt     | 0...1600                       | °C |
|                              | 32...2912                      | °F |
| 0/4...20 mA                  | Configurable engineering units |    |
| 0/10...50 mV                 | mA, mV, V, bar, psi, Rh, ph    |    |
| mV Custom scale              | On request                     |    |

Table 1: PV input

### Fuzzy Tuning

Two methods of tuning are available:

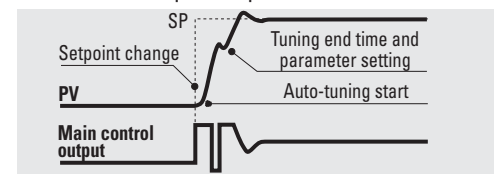
- **Auto-Tuning "one shot"**
- **Natural frequency "one shot"**

The **Fuzzy-Tuning** automatically selects one of the two methods which assure the best result for each condition.

The **Auto-Tuning** method works best on the step response basis.

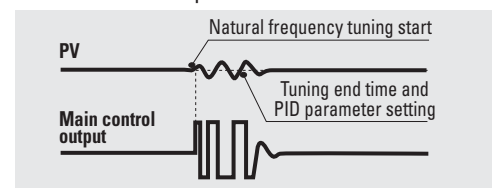
When activated, if a deviation exists between the Setpoint and process variable larger than 5% of scale range, the controller modifies the output value. Then, in a short time, it calculates the PID parameters and the new algorithm is operational immediately.

The main advantages of this method are fast calculation and quick implementation.



The **Natural frequency** method works best when the process variable is very near to the Setpoint. When activated, it causes a process oscillation around the Setpoint value.

The main advantage of this method is a reduced disturbance to the process.

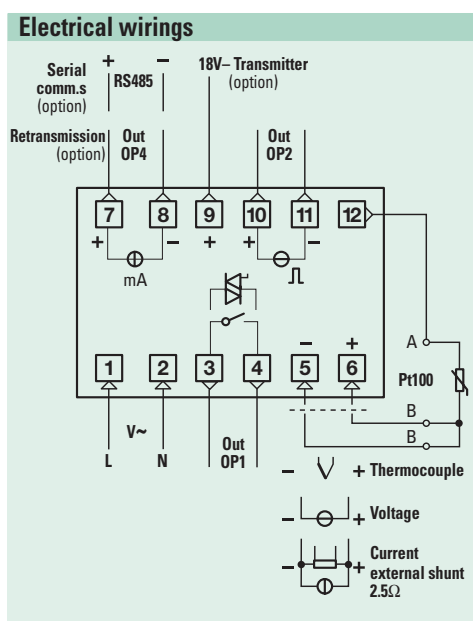


### Special functions

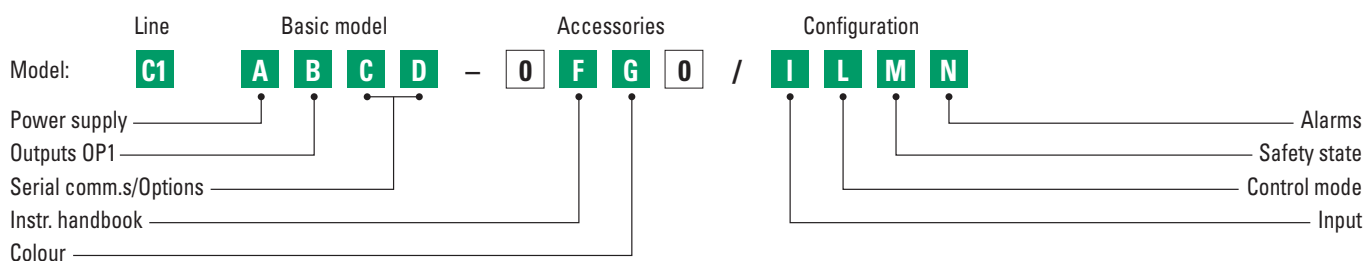
- **Keypad lock/unlock** function, to avoid incorrect operator actions
- **Outputs lock/unlock** function, at any moment it is possible to stop the control action, but not the process variable display, without switching-off the power supply.

## Technical data

| Features at env. 25°C   | Description                   |                                                                                                                                   |
|-------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Operational safety      | Measure input                 | Detection of out of range, short circuit or sensor break with automatic activation of the safety strategies and alerts on display |
|                         | Control output                | Safety value: 0...100% (user enabled/disabled)                                                                                    |
|                         | Parameters                    | A non volatile memory stores for unlimited time all the parameter and configuration values                                        |
|                         | Password                      | Configuration and parameterisation access are password protected                                                                  |
|                         | Power supply                  | 100...240Vac (-15...+10%) 50/60Hz or 24Vac (-25...+12%), 50/60Hz and 24Vdc (-15...+25%). Power consumption 3Va max.               |
| General characteristics | Safety                        | Compliance EN61010-1 (IEC 1010-1), installation class 2 (2.5kV), pollution class 2, class II instrument                           |
|                         | Electromagnetic compatibility | Compliance to the CE standards for industrial system and equipment                                                                |
|                         | Protection EN60529 (IEC 529)  | IP65 front panel                                                                                                                  |
|                         | UL and cUL Approval           | File E176452                                                                                                                      |
|                         | Overall dimensions            | $\frac{1}{32}$ DIN - 48 x 24, depth 120 mm, weight 100g approx.<br>Panel cut-out: $45^{+0.6} \times 22.2^{+0.3}$ mm               |



## Ordering codes



| Power supply                             | A |
|------------------------------------------|---|
| 100...240Vac (-15...+10%)                | 3 |
| 24Vac (-25...+12%) or 24Vdc (-15...+25%) | 5 |

| OP1 output | B |
|------------|---|
| Relay      | 0 |
| Triac      | 3 |

| Serial comm.s              | Options                                   | C | D |
|----------------------------|-------------------------------------------|---|---|
| Not fitted                 | None                                      | 0 | 0 |
|                            | Transmitter power supply                  | 0 | 6 |
|                            | Transmitter power supply + Retransmission | 0 | 7 |
| RS485 Modbus/JBus protocol | None                                      | 5 | 0 |
|                            | Transmitter power supply                  | 5 | 6 |

| Instruction handbook  | F |
|-----------------------|---|
| Italian-English (std) | 0 |
| French-English        | 1 |
| German-English        | 2 |
| Spanish-English       | 3 |

| Front case colour | G |
|-------------------|---|
| Dark (std)        | 0 |
| Beige             | 1 |

| Input type                  | Range scale                       | I |
|-----------------------------|-----------------------------------|---|
| RTD Pt100 IEC751            | -99.9...300.0 °C -99.9...572.0 °F | 0 |
| RTD Pt100 IEC751            | -200...600 °C -328...1112 °F      | 1 |
| TC L Fe-Const DIN43710      | 0...600 °C 32...1112 °F           | 2 |
| TC J Fe-Cu45% Ni IEC584     | 0...600 °C 32...1112 °F           | 3 |
| TC T Cu-CuNi                | -200...400 °C -328...752 °F       | 4 |
| TC K Chromel -Alumel IEC584 | 0...1200 °C 32...2192 °F          | 5 |
| TC S Pt10%Rh-Pt IEC584      | 0...1600 °C 32...2912 °F          | 6 |
| 0...50mV linear             | Engineering units                 | 7 |
| 10...50mV linear            | Engineering units                 | 8 |
| mV "Custom" scale           | On request                        | 9 |

| Output configuration | L                                 |
|----------------------|-----------------------------------|
| PID                  | Control OP1/alarm AL2 on OP2      |
|                      | Control OP2/alarm AL2 on OP1      |
| ON - OFF             | Control OP1/alarm AL2 on OP2      |
|                      | Control OP2/alarm AL2 on OP1      |
| Indicator with       | Alarm AL1 on OP1/alarm AL2 on OP2 |
| 2 alarms             | Alarm AL1 on OP2/alarm AL2 on OP1 |

| Type of control          | Safety | M |
|--------------------------|--------|---|
| Reverse (AL1 active low) | 0%     | 0 |
| Direct (AL1 active high) | 0%     | 1 |
| Reverse (AL1 active low) | 100%   | 2 |
| Direct (AL1 active high) | 100%   | 3 |

| AL2 type and function | N           |
|-----------------------|-------------|
| Disabled              | 0           |
| Sensor break          | 1           |
| Absolute              | Active high |
|                       | Active low  |
| Deviation             | Active high |
|                       | Active low  |
| Band                  | Active out  |
|                       | Active in   |

**If not differently specified the controller will be supplied with standard version**  
**Model: C1 3000-0000**