Process controller
Setpoint programmer
1/16 DIN - 48 x 48 mm
gamma\textit{due®} series M 5 line

Advanced features, customizable and process adaptable
High speed data acquisition and signal management.
Efficient information transfer to the supervisor.
Ability to adapt itself to changing process conditions.
The most sophisticated 48 x 48 of the gamma\textit{due®} series is user-friendly due to easy and customizable procedures.
The outputs (analogue, time proportioning or valve control) are freely addressable to the different functions like control, alarm or retransmission.

The programmable Setpoint and the memory chip help the M 5 line achieve mini process controller status.

ASCON spa
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http://www.ascon.it e-mail info@ascon.it
<table>
<thead>
<tr>
<th>Your needs</th>
<th>Our solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>High speed data acquisition and signal management</td>
<td>Sampling time: 100ms measure update time: 50 ms</td>
</tr>
<tr>
<td>Use of different actuators</td>
<td>Analogue output, heat/cool (linear, water, oil), valve control output with potentiometer position feedback</td>
</tr>
<tr>
<td>Process with time variable characteristic</td>
<td>Initial and automatic calculation of the right control parameters</td>
</tr>
<tr>
<td>Alarm signalling and diagnostic</td>
<td>4 alarms addressable to one or more outputs, latching/blocking, absolute or deviation thresholds, loop break alarm, heater break alarm by current transformer input</td>
</tr>
<tr>
<td>Interfacing with other devices</td>
<td>Serial communications at 19200 baud Modbus/J bus protocol, analogue retransmission output and Remote Setpoints</td>
</tr>
<tr>
<td>Temperature profile</td>
<td>1 program with 16 segments, 2 stored Setpoints</td>
</tr>
<tr>
<td>Safe and reproducible configuration and parameter settings</td>
<td>Memory chip for data transfer and storing, configuration and parameterisation software</td>
</tr>
<tr>
<td>Quick learning</td>
<td>Every model has the same operating method</td>
</tr>
<tr>
<td>Ergonomic compatibility with other devices</td>
<td>Two colours: beige or dark grey front panels</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>IP65 front panel protection (indoor, dust and water protection)</td>
</tr>
<tr>
<td>Easy to use</td>
<td>Ergonomic keypad, clear and comprehensive display</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>Universal input signals, linear as well as non-linear</td>
<td>Configurable input (TC, RTD, mA, Volt and ∆T, infrared sensor, “custom” linearisation)</td>
</tr>
<tr>
<td>Reliability and safety</td>
<td>CE compatibility, ASCON is ISO 9001 certified, 3 years warranty</td>
</tr>
<tr>
<td>Technical support</td>
<td>Technical application assistance from ASCON sales and after sales service</td>
</tr>
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</table>

### Resources

<table>
<thead>
<tr>
<th>Main universal input</th>
<th>Memory Chip</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
<td>Data Copy/Data Store (option)</td>
</tr>
<tr>
<td>AUX</td>
<td></td>
</tr>
<tr>
<td>Two digital inputs</td>
<td></td>
</tr>
<tr>
<td>IL1, IL2</td>
<td></td>
</tr>
</tbody>
</table>

### Operating mode

<table>
<thead>
<tr>
<th>Control</th>
<th>Alarms</th>
<th>Retransmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV/SP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Single action</td>
<td>OP1</td>
<td>OP2</td>
</tr>
<tr>
<td>2 Single action</td>
<td>OP4</td>
<td>OP1</td>
</tr>
<tr>
<td>3 Double action</td>
<td>OP1</td>
<td>OP2</td>
</tr>
<tr>
<td>4 Double action</td>
<td>OP1</td>
<td>OP4</td>
</tr>
<tr>
<td>5 Double action</td>
<td>OP4</td>
<td>OP2</td>
</tr>
<tr>
<td>6 Valve</td>
<td>OP1</td>
<td>OP2</td>
</tr>
</tbody>
</table>

### Tuning

- One shot
- Auto tuning
- Adaptive
## Technical data

### Features at env. 25°C

- **Total configurability**: Operating modes
  - 1 loop with single/double output
  - 1 loop as the latter with the addition of the Setpoint programmer

### Control modes

#### Algorithm
- PID with overshoot control or ON-OFF
- PID with valve algorithm, for controlling motorised valves

#### Proport. band (P)
- 0.1...999.9%

#### Integral time (I)
- 1...9999 s
- User enabled/disabled

#### Derivative time (D)
- 0.1...999.9 s

#### Manual reset
- 0...100% output
- User enabled/disabled

#### Cycle time
- 0.2...30 s
- Time prop. control

#### Hysteresis
- 0.1...5%
- ON-OFF control

#### Dead band
- 0...5.0%

#### Cool Proport. band
- 0.1...999.9%

#### Cool Integral time
- 1...9999 s
- User enabled/disabled

#### Cool Der. time
- 0.1...999.9 s

#### Cool cycle time
- 0.2...30 s

#### Motor travel time
- 15...600 s

#### Motor min. step
- 0.1...5.0%
- Motorised valves

### Common characteristics

- **PV input** (for signal ranges see table 1)
  - A/D converter with resolution of 160.000 points
  - Update measurement time: 50 ms
  - Sampling time (max. update time of the output adjustable): 0.1...10.0 s configurable
  - Input shift: 60...+60 digit
  - Input filter with enable/disable: 0.1...999.9 s

#### Accuracy
- 0.25% ± 1 digits for temperature sensors
- 0.1% ± 1 digits (for mA and mV)
- Between 100...240 Vac the error is minimal

#### Resistance thermometer (for ∆T: R1+R2 must be <320Ω)
- Pt100Ω at 0°C (IEC 751)
- °C/°F selectable
- Max. wire res.: 20Ω (3 wires)

#### Thermocouple
- °C/°F selectable
- Internal cold junction compensation
- Max. wire res.: 150Ω
- Sensitivity <2µV/°C

#### DC input (current)
- 0/4...20mA
- Rj = 30Ω
- Engineering units
- Decim. point conf.

#### DC input (voltage)
- 0...50 mV
- Rj = 10MΩ
- 1...5/0...5/0...10V
- Rj = 300kΩ
- Ratio from -9.99...+99.99
- Local + Remote Setpoint

#### Remote Setpoint
- Not isolated
- 0.1%
- Bias in engineering units and z range

#### CT current transformer
- max. span 50 or 100 mA
- hdw selectable
- Display from 10 to 200 A resolution of 1A with alarm threshold (Heater break alarm)

#### Potentiometer
- 100Ω...10kΩ supply: 300mV
- Position feedback measurement

#### Digital inputs
- 2 logic
  - The closure of the external contact produces any of the following actions
  - Auto/M ann mode change
  - Local/Remote Setpoint mode change
  - Stored Setpoints activation
  - Keypad lock
  - Measure hold
  - slopes inhibit.
  - Start, stop, hold of a program (only with Setpoint programmer)

#### Control output (analogue)
- Single or double channel, direct or reverse action
- Minimum limit 0...100.0% (OP1 heat)
- Maximum limit 0...100.0% (OP1 heat), -100.0...0% (OP2 cool)

### Table 1: PV input

<table>
<thead>
<tr>
<th>Input type</th>
<th>Scale range</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD Pt100Ω at 0°C</td>
<td>-200...600 °C</td>
</tr>
<tr>
<td></td>
<td>-328...1112 °F</td>
</tr>
<tr>
<td></td>
<td>-99.9...572.0 °F</td>
</tr>
<tr>
<td>RTD 2xPt100Ω at 0°C for ∆T</td>
<td>-50.0...50.0 °C</td>
</tr>
<tr>
<td></td>
<td>-58.0...122.0 °F</td>
</tr>
<tr>
<td>T/C type L</td>
<td>0...600 °C</td>
</tr>
<tr>
<td>Fe-Const.</td>
<td>32...1112 °F</td>
</tr>
<tr>
<td>T/C type J</td>
<td>0...600 °C</td>
</tr>
<tr>
<td>Fe-Cu 45% Ni</td>
<td>32...1112 °F</td>
</tr>
<tr>
<td>T/C type T</td>
<td>-200...400 °C</td>
</tr>
<tr>
<td>Cu - CuNi</td>
<td>-328...752 °F</td>
</tr>
<tr>
<td>T/C type K</td>
<td>0...1200 °C</td>
</tr>
<tr>
<td>Cromel Alumel</td>
<td>32...2912 °F</td>
</tr>
<tr>
<td>T/C type R</td>
<td>0...1600 °C</td>
</tr>
<tr>
<td>Pt13%Rh-Pt</td>
<td>32...2912 °F</td>
</tr>
<tr>
<td>T/C type S</td>
<td>0...1600 °C</td>
</tr>
<tr>
<td>Pt10%Rh-Pt</td>
<td>32...2912 °F</td>
</tr>
<tr>
<td>Q/4... 20 mA, 0...50 mV Q/1... 5 V, 0...10 V</td>
<td>Configurable engineering units mA, mV, bar, psi, Rh, ph</td>
</tr>
<tr>
<td>mV Custom scale</td>
<td>On request</td>
</tr>
</tbody>
</table>

### Additional features

- **Table 1**
  - PV input
  - On request
## Technical data

### Control output
- **Maximum slope**: 0.01…99.99%/s up and down
- **Safety value**: -100…100%. User enabled/disabled
- **Time proportioning**: 2 Relays SPST NO, 2A/250Vac resistive loads
- **Triacs**: 2A/250Vac resistive loads
- **SSR drive**: 0…22Vac, 20mA max. (for static switches)
- **Galvanic isolation**: 500Vac/1min
- **Resolution**: 12 bit (0.025%)
- **Accuracy**: 0.1%
- **Short circuit protection**:

### Analogue output (optional)
- **Current**: 0/4…20mA max. 750Ω/10V max.
- **Voltage**: 0…1/5/10V 500Ω/20mA max.
- **Retransmission of PV or SP**

### Analogue output OP4 (optional)
- **Current**: 0/4…20mA max. 750Ω/10V max.
- **Voltage**: 0…1/5/10V 500Ω/20mA max.
- **Retransmission of PV or SP**

### Alarms
- **Action**:
  - **Active high**:
    - Deviation threshold:
    - Band threshold:
    - Absolute threshold:
    - Whole range
  - **Active low**:
    - Heater Break detection
    - Loop Break Alarm
  - **Special functions**:
    - Activation inhibit (blocking)
    - Acknowledge (latching)
    - Related to the program (optional) (OP3)

### Setpoint
- **Ramp up and down**, with slope in digit/s, digit/minute or digit/hour between 0.0…10.0% of the range
- **High and low limits**
- **Time programmable (optional)**

### Programmable Setpoint (optional)
- **1 program, 16 segments** (linal and 1 end)
- **From 1 to 9999 cycles** or continuous cycling (OFF)
- **Time values in seconds, minutes and hours**
- **Start, stop, hold, etc. activated from the keypad, digital input and serial comm.s**

### Tuning
- **Adaptive tune self-learning, not intrusive, analysis of the process response to disturbances and continuous calculation of the PID parameters** (not available with the Setpoint Programmer option)

### Auto/Mannual station
- **Integrated in the controller, bumpless**
- **Operated from keypad, digital inputs and serial communications**

### Serial comm.s (optional)
- **RS 485 isolated, Modbus/Jbus**
  - **1,200, 2,400, 4,800, 9,600, 19,200 bit/s, 2 wires**

### Auxil. supply
- **18Vdc ±20%, 30mA max. for transmitters (2, 3, 4 wires)**

### 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: -100…+100%. User enabled/disabled
- **Parameters**:
  - Parameters and configuration data are stored in a non volatile memory for an unlimited time. They are organised in functionally homogeneous groups, as: visible and changeable, visible and not changeable, not visible
- **Access protection**:
  - Password to access the configuration data and the parameter protection menu
- **Power supply**:
  - 100…240Vac (-15…+10%) 50/60Hz or 24Vdc (-15…+25%), Power consumption 3W max.
- **General characteristics**
  - **Electromagnetic compatibility UL and cUL Approval**
  - **Protection EN60529 (IEC 529)**
  - **Dimensions**

### Electrical wirings
- **Serial communications RS485**
- **PV input**
- **Options**
  - **Analogue or SSR drive**
  - **Resistance thermometer**
  - **Analogue**
  - **Potentiometer input**
  - **CT input**
  - **Digital inputs**

### Dimensions

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**Technical data**

**Features at env. 25°C**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>M x. slope</td>
<td>0.01…99.99%/s up and down</td>
</tr>
<tr>
<td>Safety value</td>
<td>-100…100%. User enabled/disabled</td>
</tr>
<tr>
<td>Time proportioning</td>
<td>2 Relays SPST NO, 2A/250Vac resistive loads</td>
</tr>
<tr>
<td>Triacs</td>
<td>2A/250Vac resistive loads</td>
</tr>
<tr>
<td>SSR drive</td>
<td>0…22Vac, 20mA max. (for static switches)</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>500Vac/1min</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (0.025%)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.1%</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td></td>
</tr>
</tbody>
</table>

**Alarms**

<table>
<thead>
<tr>
<th>Action</th>
<th>Type</th>
<th>Deviation threshold</th>
<th>Band threshold</th>
<th>Absolute threshold</th>
<th>Whole range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active high</td>
<td>Deviation threshold</td>
<td>± range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active low</td>
<td>Band threshold</td>
<td>0… range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special functions</td>
<td>Absolute threshold</td>
<td>Whole range</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Setpoint**

| Ramp up and down, with slope in digit/s, digit/minute or digit/hour between 0.0…10.0% of the range |
| High and low limits |
| Local plus 2 stored Setpoints |
| Only Remote |
| Local and Remote |
| Remote with trim |
| Time programmable (optional) |

**Programmable Setpoint (optional)**

| 1 program, 16 segments (linal and 1 end) |
| From 1 to 9999 cycles or continuous cycling (OFF) |
| Time values in seconds, minutes and hours |
| Start, stop, hold, etc. activated from the keypad, digital input and serial comm.s |

**Tuning**

| One shot tune-step response method for calculating the PID terms parameters |
| Adaptive tune self-learning, not intrusive, analysis of the process response to disturbances and continuous calculation of the PID parameters (not available with the Setpoint Programmer option) |

**Auto/Mannual station**

| Integrated in the controller, bumpless |
| Operated from keypad, digital inputs and serial communications |

**Serial comm.s (optional)**

| RS 485 isolated, Modbus/Jbus |
| **1,200, 2,400, 4,800, 9,600, 19,200 bit/s, 2 wires** |

**Auxil. supply**

| 18Vdc ±20%, 30mA max. for transmitters (2, 3, 4 wires) |

**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: -100…+100%. User enabled/disabled |
| Parameters | Parameters and configuration data are stored in a non volatile memory for an unlimited time. They are organised in functionally homogeneous groups, as: visible and changeable, visible and not changeable, not visible |
| Access protection | Password to access the configuration data and the parameter protection menu |
| Power supply | 100…240Vac (-15…+10%) 50/60Hz or 24Vdc (-15…+25%), Power consumption 3W max. |

**General characteristics**

| Electromagnetic compatibility UL and cUL Approval |
| Protection EN60529 (IEC 529) |
| IP65 front panel |
| Dimensions | 1/2u DIN - 48 x 48, depth 150 mm, weight 230 g approx. |

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**Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 mm</td>
<td>1.89 in.</td>
</tr>
<tr>
<td>50 mm</td>
<td>1.97 in.</td>
</tr>
<tr>
<td>51 mm</td>
<td>2.01 in.</td>
</tr>
<tr>
<td>65 mm</td>
<td>2.56 in.</td>
</tr>
<tr>
<td>78 mm</td>
<td>3.07 in.</td>
</tr>
<tr>
<td>150 mm</td>
<td>5.91 in.</td>
</tr>
<tr>
<td>20 mm</td>
<td>0.79 in. max.</td>
</tr>
</tbody>
</table>
Two methods of tuning are available:
- **Auto-Tuning** "one shot"
- **Adaptive-Tuning** continuous and self-teaching

The Auto-Tuning method works best on the step response basis. When activated it modifies the output value and, in a short time, calculates the PID parameters. The new algorithm is operational immediately. The main advantages of this method are fast calculation and quick implementation.

If the Adaptive-Tuning is not requested, the controller can be fitted with a Setpoint programmer option. A profile of up to 16 segments can be programmed. Number of cycles as well as the max. allowed deviation can be configured. The time base can be selected from seconds, minutes and hours. Run, Hold and Stop functions can be performed by means the front keypad or by external commands.

The ASCON self teaching Adaptive-Tuning waits for process change to recalculate the new PID parameters. The new PID calculation does not influence the control output, avoiding any disturbance. The PID optimisation is done only when necessary (e.g. Setpoint changes or process disturbances like load changes). No action by the operator is required. The operating mode of Adaptive-Tuning is safe and user friendly. It tests the process response after a disturbance, it memorises the intensity and frequency of the reaction, then the Adaptive-Tuning checks the new information with its statistical data base. The correct PID algorithm is then ready to implement. This tuning is ideal for non-linear processes where the PID parameters must be adapted to changing conditions.

The Fast view is a password protected review procedure of the 10 most useful parameters. The combination of a luminous and comprehensive display and the ergonomic keypad allows the immediate access to the Fast View.

The Memory chip makes possible a fast and safe transfer of data related to the configuration and all parameters. With a simple operation, the information can be stored and copied to the memory chip. The procedure can be protected by a password.

Configuration software

A software tool is available to improve both the configuration and the parameterization. All the data can be stored to file. It is also possible to down-load the linearisation of the "custom" input by using the polynomial's coefficients.
### Ordering codes

<table>
<thead>
<tr>
<th>Model:</th>
<th>Power supply</th>
<th>Outputs</th>
<th>Serial comm.s</th>
<th>Options</th>
<th>Setpoint</th>
<th>Instr. handbook</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Power supply
- 100...240 Vac (-15...+10%)
- 24 Vac (-25...+12%) or 24 Vdc (-15...+25%)

#### Outputs OP1 (OP2)
- Relay-Relay
- Relay-Triac
- Triac-Relay
- Triac-Triac

#### Serial comm.s Options
- None
- Auxiliary Feedback potentiometer
- Auxiliary Remote Setpoint
- Current Transformer
- SSR drive/Analogue
- SSR drive/Analogue + Remote Setpoint

#### RS 485 Modbus/Jbus protocol
- None
- Feedback potentiometer
- Remote Setpoint
- Current Transformer
- SSR drive/Analogue auxiliary output

#### Setpoint Programmer
- Not fitted
- Fitted (adaptive-tuning not available)

#### Instruction handbook
- Italian-English (std)
- French-English
- German-English
- Spanish-English

#### Front case colour
- Dark (std)
- Beige

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If not differently specified the controller will be supplied with standard version

**Model: M5 3100-0000**