

# ECO 11

## Mini controller & indicator

Indicator, signaller, or two-point controller

Output sense selectable direct/inverse

Accurate control behaviour with 250 ms scanning cycle

High-precision universal input

Auto/manual switchover w/W2 from front panel

Up to three switching outputs (control output & alarms)

Output function selectable as control or alarm

RS 485 with Modbus RTU protocol

Front panel protection mode IP 66

economy line

### GENERAL

Due to its extremely compact dimensions, the ECO 11 can be installed even in the smallest machines. Its universal input and up to three switching outputs enable the controller to be adapted perfectly to the most varied automation tasks.

The unit is configurable as a signaller or PID two-point controller with inverse (heating) or direct (cooling) characteristic.

### SAFE OPERATION

The unit is operated by means of just 3 front-panel keys that provide access to the following levels:

- Operation (standard)
- Parameter adjustment
- Configuration
- Calibration

The extended Operating Level enables both setpoints and the alarms to be adjusted, provided that the level has been enabled.

### DISPLAYS

During normal operation, the large 4-digit LED display (red or green) ensures easy reading of the process value. In the Parameter Level, the display alternates between the parameter name and its value, whereby the scroll key is used to call the different parameters sequentially for adjustment.

In addition, 3 indicator LEDs show the following operating conditions by means of On, Off, or Blinking:

#### Red LED (control deviation)

Process value < setpoint : Off  
Process value = setpoint : On  
Process value > setpoint : Blinking

#### Yellow LED (operating mode)

Normal operation : Off  
Parameter Level selected : On  
Configuration Level selected : Blinking

#### Red LED (alarm)

Blinks with an active alarm.

#### Fault display

Exceeded measuring range and sensor fault are indicated.

#### Options

Optionally, either a serial RS 485 interface (Modbus RTU) or an additional relay (Alarm 2; Output 3) can be fitted.

### UNIVERSAL INPUT

The input is configurable for all conventional signal and sensor types. With thermocouple or Pt 100 input, the resolution can be selected with or without decimals. Apart from °C, the display can be changed to °F or to linear engineering units.

Current and voltage inputs are scalable in the range -1999...9999, with up to 3 decimals (999,9...9,999).

The setpoint limits are adjustable within the measuring ranges.

In case of a sensor fault, the control outputs are switched off (0% output).

#### Offset

For the purpose of measurement correction, a constant value can be added to the measurement signal.

### CONTROLLER FUNCTIONS

Either PID, PD, PI or P behaviour is configurable.

#### Self-tuning function

The start-up tuning function (manual advance tuning) determines the best PID parameters by means of a 100% step change of the output, either at the push of a button (operating menu) or automatically at power-up (EasyTune; manual adjustment of control parameters is disabled).

#### Setpoint

Apart from the main setpoint SP1, a second setpoint SP2 can be adjusted and selected from the front.

#### Operating sense

The operating sense for heating can be switched from 'inverse' (Heating) to 'direct' (Cooling).

### CONFIGURABLE ALARM OUTPUTS

Both alarm outputs work in the normally de-energized mode: Alarm relays or logic signals are energized in case of an alarm, and the corresponding red LED blinks.

Alarm functions are configurable as absolute or relative measurement value alarms (min. or max.) or bandwidth alarm (symmetrical to setpoint).

## INTERFACE (OPTION)

The following parameters can be read/written via the digital RS 485 interface (Modbus RTU):

**Read:** Alarm status, process value, effective setpoint, output value, control deviation.

**Write:** Start of tuning function, limit values, setpoints, control parameters, decimal point, measured value correction.

## GALVANIC ISOLATION

The universal input is galvanically isolated from the power supply. Output 1 (logic) is not isolated from the input.

## TECHNICAL DATA

### UNIVERSAL INPUT

#### Scanning cycle

250 ms

#### Digital input filter

0...100 s, adjustable in steps of 1 s.

#### Input resolution

Approx. 14 bits

#### Input resistance

mA DC: 47 k $\Omega$   
Thermocouples, mV: >10 M $\Omega$

## MEASURING RANGES

### Thermocouples

Types: see table

#### Characteristic

Temperature-linear

#### Sensor monitoring

Response time: 2 s  
Controller outputs are switched off (output value 0%).

#### Measurement error

0,1% of measuring range  $\pm$  1 digit  
(Types J and T: 0,25 %)

#### Linearization

Error: < 0,2  $^{\circ}$ C (typically 0,05  $^{\circ}$ C)  
Without decimals: <  $\pm$ 0,5  $^{\circ}$ C

#### Cold-junction compensation

<  $\pm$ 0,7  $^{\circ}$ C at reference conditions.

#### Resistance thermometer

Sensor: Pt 100

## Thermocouples

Type		Measuring range		Resolution
Fe-CuNi	J	-200...1200 $^{\circ}$ C	-328...2192 $^{\circ}$ F	1 K
Fe-CuNi	J	-128,8...537,7 $^{\circ}$ C	-199,9...999,9 $^{\circ}$ F	0,1 K
SNiCr-Ni	K	-240...1373 $^{\circ}$ C	-400...2503 $^{\circ}$ F	1 K
NiCr-Ni	K	-128,8...537,7 $^{\circ}$ C	-199,9...999,9 $^{\circ}$ F	0,1 K
PtRh-Pt 10%	S	0...1762 $^{\circ}$ C	32...3204 $^{\circ}$ F	1 K
PtRh-Pt 13%	R	0...1759 $^{\circ}$ C	32...3198 $^{\circ}$ F	1 K
PtRh-Pt 6%	B	100...1824 $^{\circ}$ C	211...3315 $^{\circ}$ F	1 K
Cu-CuNi	T	-240...400 $^{\circ}$ C	-400...752 $^{\circ}$ F	1 K
Cu-CuNi	T	-128,8...400 $^{\circ}$ C	-199,9...752,0 $^{\circ}$ F	0,1 K
Nicrosil/Nisil	N	0...1399 $^{\circ}$ C	32...2551 $^{\circ}$ F	1 K

#### Measuring ranges

-128,8 ... 537,7  $^{\circ}$ C (-199,9 ... 999,9  $^{\circ}$ F)  
-199 ... 800  $^{\circ}$ C (-328 ... 1472  $^{\circ}$ F)  
Resolution: 0,1 K or 1 K

#### Characteristic: temperature-linear

#### Connecting principle: three-wire

#### Sensor current: approx. 150 $\mu$ A

#### Sensor monitoring

Acts on sensor break and short circuit. Controller outputs are switched off (output value 0%), and Min alarm is triggered.  
Response time: 2 s

#### Measurement error

<  $\pm$ 0,1% of measuring range  $\pm$  1 digit.

#### Linearization error

< 0,2 $^{\circ}$ C (typically 0,05  $^{\circ}$ C)  
Without decimals: <  $\pm$ 0,5  $^{\circ}$ C

#### Lead resistance effect

< 0,5% of measurement error with  
50  $\Omega$ /lead

### Current and voltage

#### Measuring ranges

0...20 mA, 4...20 mA,

0...50 mV, 10...50 mV,

#### Scaling: -1.999...9.999

#### Resolution: 1 digit

#### Characteristic: linear

#### Measurement error

0,1% of measuring range  $\pm$  1 digit

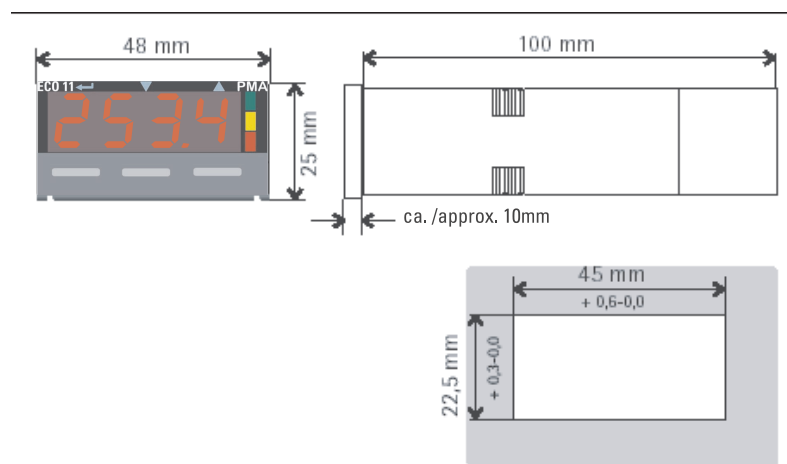
#### Break monitoring

Not with 0...20 mA!  
Response time: 2 s  
Controller outputs are switched off (output value 0%).  
Max alarm is triggered with mA input.  
Min alarm is triggered with mV input.

#### Measurement error

0,1% of measuring range  $\pm$  1 digit.

### Overall dimensions (in mm)



## OUTPUTS

### Types:

1 x relay / 1 x logic; optionally 1 additional relay (Output 3)

### Relays

Contact type: potential-free, normally open

Contact rating:

Max. 2 A / 240 VAC, resistive load,  
Min. 100 mA, 5 V AC/DC:

Electrical service life: 500.000 switching cycles at max. contact rating.

- If the relays operate external contactors, these must be fitted with RC snubber circuits to prevent excessive switch-off voltage peaks.

### Logic output

Load: >10 V with 20 mA into >500 Ω load

## POWER SUPPLY

### AC voltage

Voltage: 90...264 VAC

Frequency: 50/60 Hz

Power consumption: 7,5 VA

### Universal supply

Voltage: 12...24 VAC, 50/60 Hz and  
12...30 VDC

Power consumption: 7,5 VA or 4 W

## CONTROL BEHAVIOUR

### Proportional band

Pb = 0,5...999,9 % of measuring range

### Working point: 0...100 %

### Integral action time:

1 s...99 min 59 s...OFF

### Derivative action time:

0...99 min 59 s

### Switching duty cycle

0,5 s (only logic output); 1, 2, 4, up to  
512 s

### Hysteresis (only signaller)

0,1...19 % of measuring range

### Operating sense

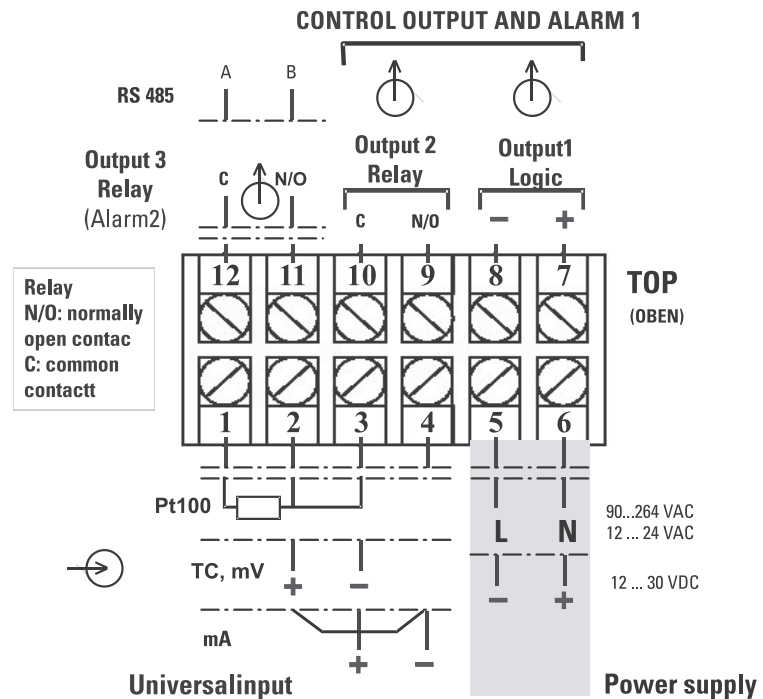
Inverse ('heating') or direct ('cooling')

Output response on sensor break or control loop error: controller outputs switched off.

### Setpoint functions

*Second setpoint:* selectable (switch-over via control input)

## Connecting diagram



### Self-tuning function

Method: configurable

### Manual preconfiguration

Pulse method during start-up with 100 % output signal. If the attempt is successful, the PID parameters become effective automatically.

Condition:  $(x-w) > 5\%$  of measuring range.

### Automatic preconfiguration

Pulse method after power up.

Automatic self-tuning

Tuning attempt at setpoint (1 cycle)

Start condition:  $(x-w) > 0,15\%$  of measuring range

**Scanning cycle: 250 ms**

## ALARMS

See text for a description of the functions. Quantity: 2 (min / max)

## COMMUNICATION

Interface: RS 485

Protocol: Modbus RTU

Controller addresses: 1...255

Transmission speed: 1200...19.200 bits/s

Galvanic isolation: between inputs/outputs, and power supply

## ENVIRONMENTAL CONDITIONS

Operating temperature: 0...55 °C

Relative humidity: 20...95 %, no condensation

Storage temperature: -20...+80 °C

Reference conditions  
(for specified accuracy)

Ambient temperature: 20 °C  $\pm$  2 °C

Humidity: 60...70 % rH

Supply voltage: 100...240 VAC, 50 Hz  $\pm$  1%

Source impedance (TC): < 10 Ω

Lead resistance (Pt 100): < 0,1 Ω

## TESTS

### Electrical safety

According to DIN EN 61 010-1

Over-voltage category II

Contamination degree 2

Working voltage range 240 VAC

### Electromagnetic compatibility

According to EN 61 326

## GENERAL

### Housing

Front dimensions: 48 x 24 mm  
(1/32 DIN)

Mounting depth: 100 mm

Front panel cutout: 45 x 22 mm

### Protection mode

Front: IP 66

### Electrical connections

Screw terminals for max. 1,5 mm<sup>2</sup>

**Weight:** approx. 120 g

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Function	
Indicator	00
Indicator + Alarm 1 (Relay)	01
Indicator + Alarm 1 (Logic)	02
Controller (Relay) + Alarm 1 Logic	12
Controller (Logic) + Alarm 1 (Relay)	21
Options	
Without	0
Alarm 2 Output 3; not with Function = 00)	1
RS 485 interface	2
Supply voltage & display colour	
90 - 264 VAC, display green	0
90 - 264 VAC, display red	1
24 VUC, display green	2
24 VUC, display red	3



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