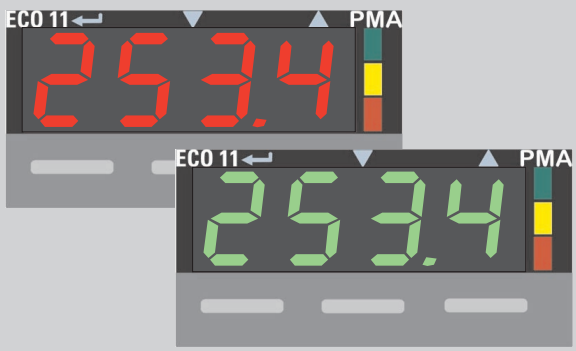
ECO 11

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 kΩ
Thermocouples, mV: >10 MΩ

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 ± 1 digit
(Types J and T: 0,25 %)

Linearization
Error: < 0,2 °C (typically 0,05 °C)
Without decimals: < ±0,5 °C

Cold-junction compensation
< ±0,7 °C at reference conditions.

Resistance thermometer
Sensor: Pt 100

Thermocouples

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

Measuring ranges
-128,8 … 537,7 °C (-199,9 … 999,9 °F)
-199 … 800 °C (-328 … 1472 °F)
Resolution: 0,1 K or 1 K

Characteristic: temperature-linear

Connecting principle: three-wire

Sensor current: approx. 150 µA

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
< ±0,1% of measuring range ± 1 digit.

Linearization error
< 0,2°C (typically 0,05 °C)
Without decimals: <±0,5 °C

Lead resistance effect
< 0,5% of measurement error with 50 Ω/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

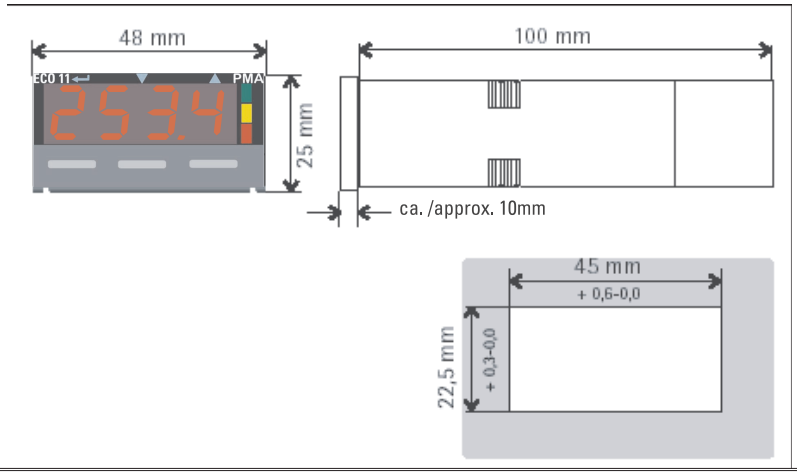
Characteristic: linear

Measurement error
0,1% of measuring range ± 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 ± 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

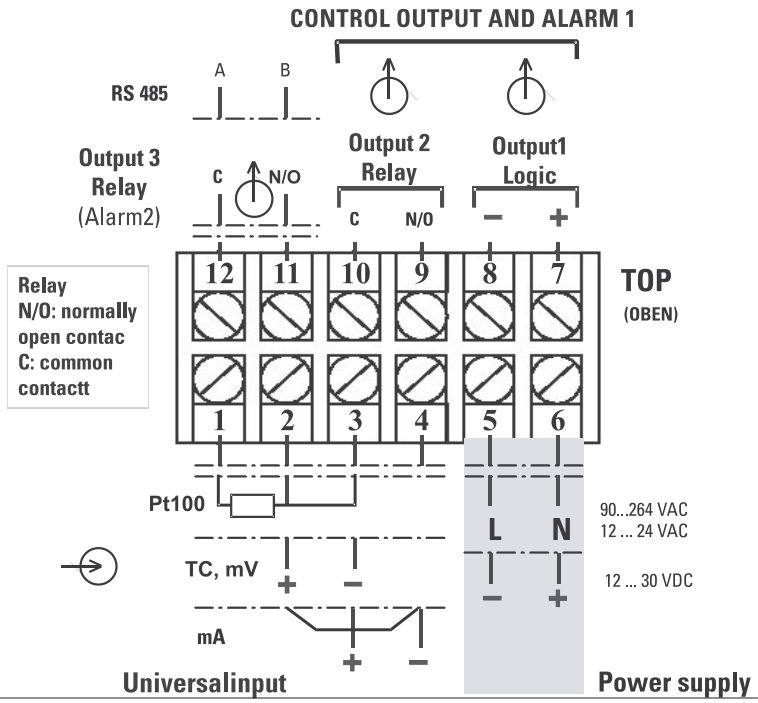
Inverse ('heating') or direct ('cooling')

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

Setpoint functions

Second setpoint: selectable (switchover 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 ±2 °C
Humidity: 60...70 % rH
Supply voltage: 100...240 VAC, 50 Hz ± 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 mm²

Weight: approx. 120 g

Ordering code

ECO11 - [ ][ ][ ]0 - 000

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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