



## RE41, RE42, RE43, RE44 PID-Fuzzy Logic Controllers

The RE4x series process controllers are distinguished by the innovative PID & Fuzzy Logic algorithm. This allows the setpoint to be reached in the shortest time with a minimum overshoot during warm-up or during external interference. The variety of built-in functions enables the use of these controllers in demanding control processes.

### Features:

- sampling rate (5 times/second),
- two menu configurations - basic and extended,
- configurable user menu,
- pump control,
- PID control + fuzzy-logic,
- control of the difference of signals from two inputs,
- self-tuning,
- sleep function,
- soft start,
- universal input,
- analog input for standard signals and current transformers
- binary input for changing the function of the controller and SP switching,
- programmable digital filter,
- hardware and software security before changing settings,
- alarm for breaking the control loop,
- heater burnout alarm,
- sensor break detection,
- interface RS-485,
- analog retransmission,
- power supply of object converters,
- a large variety of control outputs.

### TECHNICAL DATA

- Power** 90...264 V a.c., 47...63 Hz,  
15 VA, 7 W max  
11...26 V a.c./d.c., 15 VA, 7 W max
- Input 1**
- resolution: 18 bits
  - sampling rate: 0.2 s
  - maximum rating: -2 V d.c. min,  
12 V d.c. max (max.1 minute  
for mA input)
  - temperature effect: -1.5  $\mu$  V/°C for all inputs except mA  
-3.0  $\mu$  V/°C for mA input
  - sensor lead resistance effect: thermocouples: 0.2  $\mu$ V/ 1  $\Omega$ ;  
Pt100 3-wire: 2.6°C/1  $\Omega$   
of resistance difference of two leads  
Pt100 2-wire: 2.6°C/1  $\Omega$   
of resistance sum of two leads
  - burn-out current: 200 nA

- Sensor break detection: sensor open for TC, RTD and mV inputs  
below 1 mA for 4-20 mA input,  
below 0.25V for 1 - 5 V input,  
unavailable for other inputs.
- Sensor Break Responding Time :  
Within 4 seconds for TC, RTD and mV inputs,  
0.1 second for 4-20 mA and 1 - 5 V inputs.

Type	Range	Accuracy for 25°C	Input impedance
J	-120°C...1000°C (-184°F...1832°F)	± 2°C	2.2 M $\Omega$
K	-200°C...1370°C (-328°F...2498°F)	± 2°C	2.2 M $\Omega$
T	-250°C...400°C (-418°F...752°F)	± 2°C	2.2 M $\Omega$
E	-100°C...900°C (-148°F...1652°F)	± 2°C	2.2 M $\Omega$
B	0°C...1800°C (32°F...3272°F)	± 2°C (200°C...1800°C)	2.2 M $\Omega$
R	0°C...1767.8°C (32°F...3214°F)	± 2°C	2.2 M $\Omega$
S	0°C ...1767,8°C (32°F...3214°F)	± 2°C	2.2 M $\Omega$
N	-250°C...1300°C (-418°F...2372°F)	± 2°C	2.2 M $\Omega$
L	-200°C...900°C (-328°F...1652°F)	± 2°C	2.2 M $\Omega$
Pt100 (DIN)	-210°C...700°C (-346°F...1292°F)	± 2°C	1.3 k $\Omega$
Pt100 (JIS)	-200°C...600°C (-328°F...1112°F)	± 2°C	1.3 k $\Omega$
mV	-8 mV...70 mV	± 0.05 %	2.2 M $\Omega$
mA	-3 mA...27 mA	± 0.05 %	70.5 $\Omega$
V	-1.3 V...11.5 V	± 0.05 %	302 k $\Omega$

### Input 2

- resolution 18 bit
- sampling rate 0.6 s
- maximum rating -2 V d.c. min, 12 V d.c. max
- temperature effect - 1.5  $\mu$  V/°C for all inputs except mA input  
- 3.0  $\mu$  V/°C for mA input

Common Mode Rejection Ratio ( CMRR ): 120dB

Normal Mode Rejection Ratio ( NMRR ): 55dB

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## Sensor Break Detection :

- Below 1 mA for 4-20 mA input,
- below 0.25V for 1 - 5V input,
- unavailable for other inputs.

Sensor Break Responding Time : 0.5 second

Type	Range	Accuracy for 25 °C	Input Impedance
Current transformer*	0...50.0 A	±2 % of Reading ±0.2 A	302 K Ω
mA	- 3 mA...27mA	±0.05 %	$70.5\Omega + \frac{0.8V}{\text{input current}}$
V	-1.3V...11.5V	±0.05 %	302 K Ω

\* ordered separately

## Input 3 - logic input

- logic low: -10 V minimum; 0.8 V maximum
- logic high: 2 V minimum; 10 V maximum
- external pull-down resistance: 400 kΩ maksimum
- External pull-up Resistance: 1.5 MΩ minimum

## Output 1 / Output 2

- relay rating: 2 A/240 V a.c., life cycles 200 000 for resistive load
- pulsed voltage: Source Voltage 5 V, current limiting resistance 66 Ω
- linear output characteristics

Type	Zero Tolerance	Span Tolerance	Load Capacity
4...20 mA	3.8...4 mA	20...21 mA	500 Ω max
0...20mA	0 mA	20...21 mA	500 Ω max
0...10 V	0 V	10...10.5 V	10 kΩ min

## Linear Output

- resolution: 15 bits
- output regulation: 0.1 s (stable to 99.9%)
- isolation breakdown voltage: 1000 V a.c.
- temperature effect: ±0.0025 % of range/°C

## Triac (SSR) Output

- rating: 1 A/ 240 V a.c.
- inrush current: 20 A for 1 cycle
- min. load current: 50 mA rms
- max. Off-state leakage: 3 mA rms
- max. On-state voltage: 1.5 V rms
- insulation resistance: 1000 MW min. at 500 V d.c.
- dielectric strength: 2500 V a.c. for 1 minute

## DC Voltage Supply Characteristics (Installed at Output 2 )

Type	Tolerance	Max.Output Current	Ripple Voltage	Isolation Barier
20 V	±0.5 V	25 mA	0.2 V p-p	500 Va.c.

## Alarm 1 / Alarm 2

- Alarm 1 relay: changeover relay for RE41 and RE42  
NO relay for RE43  
logic output 0/5 V for RE44  
relay 2A/240 V a.c.,  
life cycles 200 000 for resistive load
- Alarm 2 relay: relay 2A/240 V a.c.,  
life cycles 200 000 for resistive load

## Serial interface

- interface: RS-485
- protocol: Modbus Protocol RTU mode
- address: 1...247
- baud rate: 0.3...38.4 kbit/s
- data bits: 7 or 8 bits
- parity bit: none, even or odd
- stop bit: 1 or 2 bits
- communication buffer: 50 bytes

## Analog Retransmission

- output signal: 4...20 mA, 0...20 mA, 0...10 V
- resolution: 15 bits
- accuracy: ±0.05 % of range ±0.0025 % / °C
- load resistance: 500 Ω max.- for current output,  
10 kΩ min.- for voltage output
- output settling time: 0.1 s (stable to 99,9%)
- isolation breakdown voltage: 1000 V a.c.
- temperature effect: ±0.0025% of range /°C
- saturation high: 22.2 mA (or 11.1V)

## Reference conditions and rated operating conditions:

- operating temperature: -10...50 °C
- storage temperature: -40...+60 °C
- humidity: < 90 % (non-condensing)

	Dimensions (mm)	Mounting hole	Weight
RE41:	96 x 96 x 65	92 <sup>+0.5</sup> x 92 <sup>+0.5</sup>	255 g
RE42:	48 x 96 x 80	45 <sup>+0.5</sup> x 92 <sup>+0.5</sup>	220 g
RE43:	50.7 x 50.7 x 88.5	45 <sup>+0.5</sup> x 45 <sup>+0.5</sup>	150 g
RE44:	50 x 26.5 x 110.5	45 <sup>+0.5</sup> x 22.2 <sup>+0.5</sup>	120 g

## Protection grade ensured by the casing:

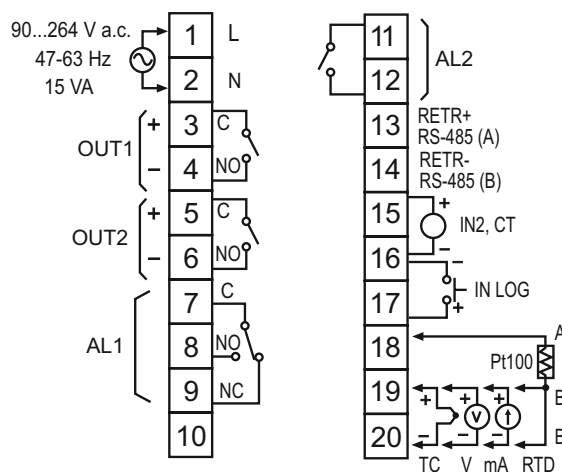
- IP65 acc. to EN 60529

## Safety requirements acc. to EN 61010-1

- installation category: II

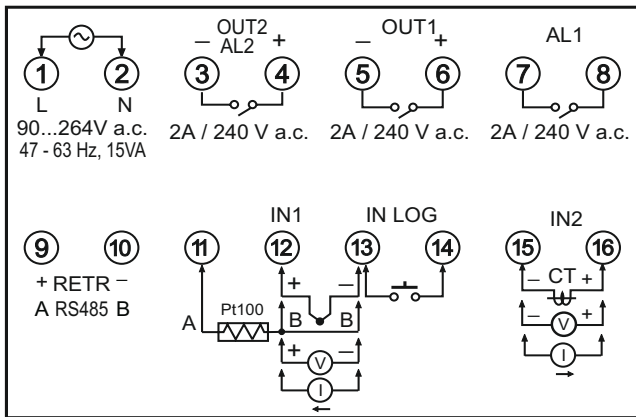
## Electromagnetic compatibility:

- noise immunity acc. to EN 61000-6-2
- noise emissions acc. to EN 61000-6-4

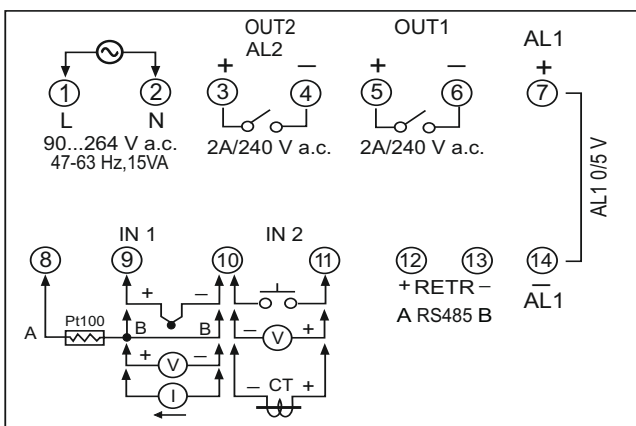


Terminal strip RE41, RE42

# RE41, RE42, RE43, RE44 -PID-Fuzzy Logic Controllers



Terminal strip RE43



Terminal strip RE44

## Ordering code

Controller RE43	X	X	X	X	X	X	X
<b>Supply:</b> 90...264 V a.c. .... 4 11...26 V a.c./d.c. .... 5							
<b>Inputs:</b> <b>input 1:</b> universal - termocouples: J, K, T, E, B, R, S, N, L; Pt100 DIN; Pt100 JIS; analog: 0...1/5/10 V, 0/4...20 mA <b>input 2:</b> extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA <b>input 3:</b> logic input ..... 1							
<b>Output 1:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1A/240V a.c. .... 6							
<b>Output 2/ Alarm 2:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1 A/240 V a.c. .... 6 isolated supply for object transducers 20 V/25 mA ..... 7							
<b>Alarm 1:</b> changeover relay 2 A ..... 1							
<b>Interface:</b> none ..... 0 RS-485 ..... 1 analog retransmission 0/4...20 mA ..... 3 analog retransmission 0...10 V ..... 5							
<b>Acceptance tests:</b> without extra quality requirements ..... 8 with an extra quality inspection certificate ..... 7							

\* current transformer must be ordered separately (ordering code LH000-0903-130-966)

## Ordering code

Controller RE41, RE42	X	X	X	X	X	X	X	X
<b>Supply:</b> 90...264 V a.c. .... 4 11...26 V a.c./d.c. .... 5								
<b>Inputs:</b> <b>input 1:</b> universal - termocouples: J, K, T, E, B, R, S, N, L; Pt100 DIN; Pt100 JIS; analog: 0...1/5/10 V, 0/4...20 mA <b>input 2:</b> extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA <b>input 3:</b> logic input ..... 1								
<b>Output 1:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1A/240V a.c. .... 6								
<b>Output 2:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1 A/240 V a.c. .... 6 isolated supply for object transducers 20 V/25 mA ..... 7								
<b>Alarm 1:</b> changeover relay 2 A ..... 1								
<b>Alarm 2:</b> relay 2 A ..... 1								
<b>Interface:</b> none ..... 0 RS-485 ..... 1 analog retransmission 0/4...20 mA ..... 3 analog retransmission 0...10 V ..... 5								
<b>Acceptance tests:</b> without extra quality requirements ..... 8 with an extra quality inspection certificate ..... 7								

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## Ordering code

Controller RE44	X	X	X	X	X	X	X
<b>Supply:</b> 90...264 V a.c. .... 4 11...26 V a.c./d.c. .... 5							
<b>Inputs:</b> <b>input 1:</b> universal - termocouples: J, K, T, E, B, R, S, N, L; Pt100 DIN; Pt100 JIS; analog: 0...1/5/10 V, 0/4...20 mA <b>input 2:</b> extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA, logic input.....1							
<b>Output 1:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1A/240V a.c. .... 6							
<b>Output 2/ Alarm 2:</b> relay 2A ..... 1 voltage 0/5 V for SSR ..... 2 analog isolated 0/4...20 mA ..... 3 analog isolated 0...10 V ..... 5 triac 1 A/240 V a.c. .... 6 isolated supply for object transducers 20 V/25 mA ..... 7							
<b>Alarm 1:</b> logic voltage 0/5 V ..... 1							
<b>Interface:</b> none ..... 0 RS-485 ..... 1 analog retransmission 0/4...20 mA ..... 3 analog retransmission 0...10 V ..... 5							
<b>Acceptance tests:</b> without extra quality requirements ..... 8 with an extra quality inspection certificate ..... 7							

\* current transformer must be ordered separately (ordering code LH000-0903-130-966)