



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 μ V/ $^{\circ}$ C for all inputs except mA
-3.0 μ V/ $^{\circ}$ C for mA input

- sensor lead resistance effect: thermocouples: 0.2 μ V/ 1 Ω ;
Pt100 3-wire: 2.6 $^{\circ}$ C/1 Ω
of resistance difference of two leads
Pt100 2-wire: 2.6 $^{\circ}$ C/1 Ω
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 $^{\circ}$ C	Input impedance
J	-120 $^{\circ}$ C...1000 $^{\circ}$ C (-184 $^{\circ}$ F...1832 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
K	-200 $^{\circ}$ C...1370 $^{\circ}$ C (-328 $^{\circ}$ F...2498 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
T	-250 $^{\circ}$ C...400 $^{\circ}$ C (-418 $^{\circ}$ F...752 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
E	-100 $^{\circ}$ C...900 $^{\circ}$ C (-148 $^{\circ}$ F...1652 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
B	0 $^{\circ}$ C...1800 $^{\circ}$ C (32 $^{\circ}$ F...3272 $^{\circ}$ F)	\pm 2 $^{\circ}$ C (200 $^{\circ}$ C...1800 $^{\circ}$ C)	2.2 M Ω
R	0 $^{\circ}$ C...1767.8 $^{\circ}$ C (32 $^{\circ}$ F...3214 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
S	0 $^{\circ}$ C ...1767.8 $^{\circ}$ C (32 $^{\circ}$ F...3214 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
N	-250 $^{\circ}$ C...1300 $^{\circ}$ C (-418 $^{\circ}$ F...2372 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
L	-200 $^{\circ}$ C...900 $^{\circ}$ C (-328 $^{\circ}$ F...1652 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	2.2 M Ω
Pt100 (DIN)	-210 $^{\circ}$ C...700 $^{\circ}$ C (-346 $^{\circ}$ F...1292 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	1.3 k Ω
Pt100 (JIS)	-200 $^{\circ}$ C...600 $^{\circ}$ C (-328 $^{\circ}$ F...1112 $^{\circ}$ F)	\pm 2 $^{\circ}$ C	1.3 k Ω
mV	-8 mV...70 mV	\pm 0.05 %	2.2 M Ω
mA	-3 mA...27 mA	\pm 0.05 %	70.5 Ω
V	-1.3 V...11.5 V	\pm 0.05 %	302 k Ω

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 μ V/ $^{\circ}$ C for all inputs except mA input
- 3.0 μ V/ $^{\circ}$ C for mA input

Common Mode Rejection Ratio (CMRR): 120dB

Normal Mode Rejection Ratio (NMRR): 55dB

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 ^{+0.5} x 92 ^{+0.5}	255 g
RE42:	48 x 96 x 80	45 ^{+0.5} x 92 ^{+0.5}	220 g
RE43:	50.7 x 50.7 x 88.5	45 ^{+0.5} x 45 ^{+0.5}	150 g
RE44:	50 x 26.5 x 110.5	45 ^{+0.5} x 22.2 ^{+0.5}	120 g

Protection grade ensured by the casing:

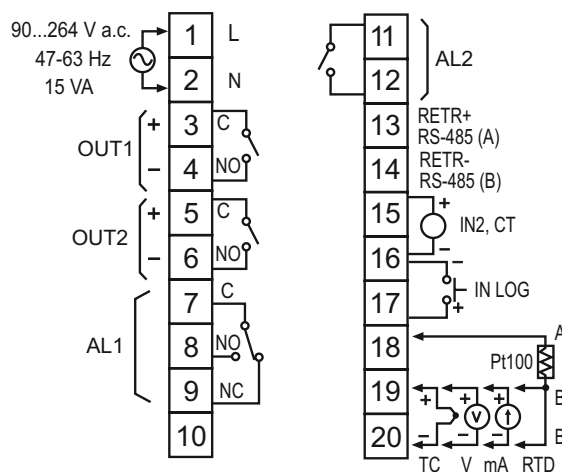
- IP65 acc. to EN 60529

Safety requirements acc. to EN 61010-1

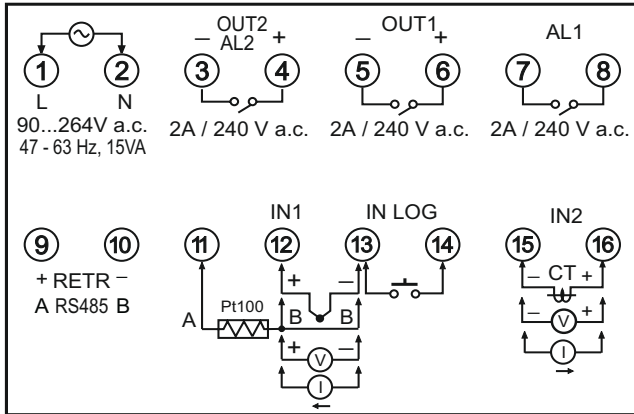
- installation category: II

Electromagnetic compatibility:

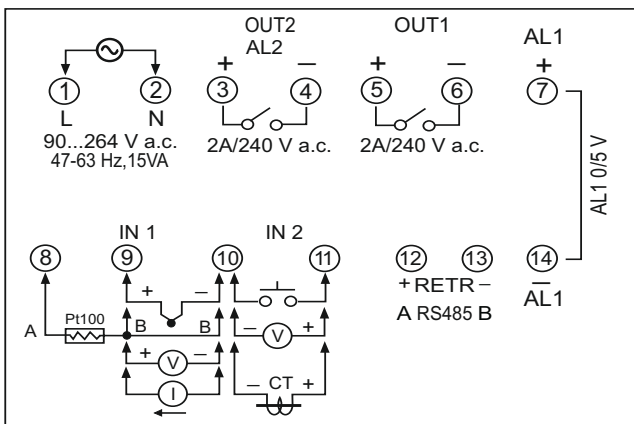
- noise immunity acc. to EN 61000-6-2
- noise emissions acc. to EN 61000-6-4



Terminal strip RE41, RE42



Terminal strip RE43



Terminal strip RE44

Ordering code

Controller RE43	X	X	X	X	X	X	X
Supply: 90...264 V a.c. 4 11...26 V a.c./d.c. 5							
Inputs: input 1: 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 input 2: extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA input 3: logic input 1							
Output 1: 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							
Output 2/ Alarm 2: 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							
Alarm 1: changeover relay 2 A 1							
Interface: none 0 RS-485 1 analog retransmission 0/4...20 mA 3 analog retransmission 0...10 V 5							
Acceptance tests: 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
Supply: 90...264 V a.c. 4 11...26 V a.c./d.c. 5								
Inputs: input 1: 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 input 2: extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA input 3: logic input 1								
Output 1: 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								
Output 2: 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								
Alarm 1: changeover relay 2 A 1								
Alarm 2: relay 2 A 1								
Interface: none 0 RS-485 1 analog retransmission 0/4...20 mA 3 analog retransmission 0...10 V 5								
Acceptance tests: 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 RE44	X	X	X	X	X	X	X
Supply: 90...264 V a.c. 4 11...26 V a.c./d.c. 5							
Inputs: input 1: 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 input 2: extrenal current transformer*; analog: 0...1/5/10 V, 0/4...20 mA, logic input.....1							
Output 1: 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							
Output 2/ Alarm 2: 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							
Alarm 1: logic voltage 0/5 V..... 1							
Interface: none 0 RS-485 1 analog retransmission 0/4...20 mA 3 analog retransmission 0...10 V 5							
Acceptance tests: without extra quality requirements 8 with an extra quality inspection certificate 7							

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

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