Programmable Controller RT390

- **Extremely flexible – unlimited range of applications**
- **User-programmable structure by ready-made blocks**
- **Powerful self-testing capabilities**
- **May be used as pH and RH controller**
- **Wide range of control algorithms and alarm types**
- **Bumpless Auto/Manual change-over**
- **Up to 5 inputs and 5 outputs**
- **Digital interface for network operation**

RT390 is a compact microprocessor-based controller with user programmable internal structure and very wide range of application. It can be equipped with up to 3 analog and 2 discrete inputs and up to 3 relays and 2 analog outputs and can accept a whole variety of input signals including temperature, relative humidity, flow, pressure, pH, etc. Electromechanical relays, solid-state relays, or current or voltage analog outputs may be installed as control, alarm, or limit comparators. Each relay output may be programmed as time or frequency proportional or as a simple ON/OFF. The 3 analog inputs available allow special applications like positioning control, cascade controllers, pH control (with temperature compensation), etc. The internal structure consists of up to 15 functional blocks. Each functional block may calculate one of the 24 standard functions. Custom defined functions may be added. Bumpless auto/manual changeover is another feature. Network functions and hierarchical control are available with serial interface installed. Keyboard locking is possible by connection of a switch to one of the digital inputs.

Technical specifications

Analog inputs	*(up to 3 inputs)*
Pt100; 3-wire	-200...200 (850) °C
Pt500; 3-wire	-200...200 (850) °C
Pt1000; 3-wire	-200...200 (850) °C
Cu53; 3-wire	0...180 °C
Cu100; 3-wire	-200...200 °C
Ni100; 3-wire	-60...200 °C
Other RTD	min. -200...max. 850 °C
Thermocouple "B"	200...1820 °C
Thermocouple "D"	400...2300 °C
Thermocouple "E"	-270...1000 °C
Thermocouple "J"	-210...1200 °C
Thermocouple "K"	-270...1370 °C
Thermocouple "L"	-200...900 °C
Thermocouple "L - GOST "	-200...900 °C
Thermocouple "N"	-270...1300 °C
Thermocouple "R"	-50...1700 °C
Thermocouple "S"	-50...1700 °C
Thermocouple "T"	-270...400 °C
Thermocouple "U"	-200...600 °C
Other thermocouple	up to 2000 °C
Linear voltage (Rin ≥ 1 GΩ) [1,2]	0...2 V, 0...5 V, or 0...10 V
Custom linear voltage [1,2]	0...max. 10 V
Linear current (Rin ≤ 10 Ω) [1,2]	0(4)...20 mA
Custom linear current [1,2]	0...max. 50 mA
Linear resistive [1]	0...Rp ≥ 50 Ω
Linear potentiometer [1]	0...Rp ≥ 5 kΩ
pH input (Rin ≥ 10 TΩ)	0.00...14.00 pH
ORP input (Rin ≥ 10 TΩ)	-1000...+1000 mV
Sub-range selection	programmable
Digital inputs	*(up to 2 inputs)*
Input signal type	contact, TTL, NPN, or PNP
Limitations	Uin. max. ≤ 40 VDC
Functions	programmable, in combination with certain blocks
Relay outputs	*(up to 3 outputs)*
Relay electromechanical	5A/250V w/ NO contact
Solid state relay	1A/250VAC
MOS gate	0.1A/60V, optically isolated
Output for external SSR	5…24 V, 30 mA
Output function	ON/OFF, time-proportional, or frequency-proportional [3]
Control algorithms and alarm limits	programmable, according to selected block types
Set point	within input range limits

Analog outputs	*(up to 2 outputs)*
Current output	0(4)...20 mA DC ($R_{LOAD} \leq 400\ \Omega$)
Voltage output	0...2/ 5/ 10 VDC ($R_{LOAD} \geq 2/ 5/ 10\ k\Omega$)
Other on request	max. 20 mA or 10 V
Output function	retransmission / control
Output range	user-programmable
Digital interface	
Output type	RS232 or RS485
Output function	network, operator station, or hierarchical control
Accuracy	
Measurement error	0.4% from span
Temperature drift	0.005% from span for 1 °C
Calibration	automatic software
Cold junction compensation	automatic hardware
Power supply	
Mains supply voltage	230 VAC or 115 VAC
SMPS voltage	90…250 VAC/DC
Isolated low voltage	12…24 VAC/DC or 24 VAC
Non-isolated low voltage	12…24 VAC/DC
Consumption	max. 3 VA
Indication and controls	
Digital display	4 LCD or LED indicators, 13 mm with programmable decimal point
LEDs	3 LEDs for relay output state, LED for auto/manual mode
Keyboard	4 membrane keys
Operating conditions	
Operating temperature	-10...65 °C
Operating humidity	0...85 %RH
Storage temperature	-20...65 °C
Storage humidity	0...95 %RH, non-condensing
Design and materials	
Case material	plastic
Mounting	in 93x45 mm panel cut-out
Wiring	screw terminals
Dimensions	96x48(front)x125 mm
Mounting depth	120 mm
Weight	max. 350 g
Protection, front/terminals	IP54 / IP20

[1] The correspondence (mapping) of the input signal with displayed value ranges is user programmable.
[2] Provides 12...24 VDC / 30 mA supply for external transmitter on one of the linear voltage or current outputs
[3] Three types of frequency proportional outputs are available (user programmable).

Programmable structure blocks

PID	industrial PID with anti-windup integration (4 parameters)
ON/OFF controller	ON/OFF control (1 parameter)
ON/OFF duplex controller	ON/OFF duplex (heating/cooling) control (3 parameters)
Positioning control	2-speed positioning control for motorized valves (4 parameters)
Control error calculation	compares set point and measured value (1 parameter)
Constant	constant value (1 parameter)
Adder	adds 2 signals
Gain	multiplies input signal by a constant (1 parameter)
Attenuator	divides input signal by a constant (1 parameter)
Multiplier	multiplies the values of the 2 input signals
Divider	divides the values of the 2 input signals
Linear transformation (mapping)	translates input signal range X1…X2 into output range Y1…Y2 (4 parameters)
Low pass filter	3rd order Butterworth low pass filter (no ripple step response) (4 parameters)
Saturation	limits output signal between lower and upper limits (2 parameters)
Dead band	output signal is zero when input is within the dead band (1 parameter)
"Window" type alarm	output is active while input is within alarm limits (2 parameters)
Inverted "window" type alarm	output is active while input is outside alarm limits (2 parameters)
High limit alarm	output is active while input above alarm limit (1 parameter)
Low limit alarm	output is active while input below alarm limit (1 parameter)
Timer	generates a pulse depending on input signal (2 parameters)
Generator	controlled pulse generator (4 parameters)
Time controlled multiplexer	switches 1 of the 2 input signals to the output at time intervals (2 parameters)
Discrete input controlled multiplexer	switches 1 of the 2 input signals to the output controlled by a discrete input
Very long period PWM output	forms PWM signal with time period of up to 9999 s (3 parameters)
Selectable constant (set-point unit)	outputs one of 4 selected constants; controlled by the state of 2 discrete inputs
RH measurement by "wet" and "dry" bulb method	forms signal proportional to RH value from 2 temperature inputs
PID with 2 inputs	PID module with 2 inputs (input #1 - PV, input #2 - SP)

Ordering code RT390 - G1.G2.G5G5G5.G6'6"G6'6"G6'6".G7G7.G9'9".G11G11

Code	Feature or option		Code values
G1	Power supply		**A** - 230 VAC, **B** - 115 VAC, **C** - 90…250 V, **P** - 12…24 V, non-isolated, **Q** - 12…24 V, isolated, **R** - 24 VAC
G2	Display		**A** - LCD, **C** - LED
G5	Relay output		**X** - none, **A** - relay NO, **J** - for external SSR, **M** - isolated MOS gate
G6'	Input signal		**X** - none, **B** - thermoresistance, **C** - thermocouple, **D** - linear, **Z** - other on request
G6"	Sensor	RTD	**D** - Pt100, **F** - Pt500, **G** - Pt1000, **H** - Cu53, **K** - Cu100, **M** - Ni100, **Z** - other
		T/C	**B** - "B", **D** - "D", **E** - "E", **J** - "J", **K** - "K", **L** - "L" , **M** - "L-GOST", **N** - "N", **R** - "R", **S** - "S", **T** - "T", **U** - "U", **Z** - other
		linear	**B** - 0...20 mA, **C** - 4...20 mA, **H** - 0...2 V, **I** - 0...5 V, **K** - 0...10 V, **L** - resistive, 0...Rp, **M** - potentiometer, 0...Rp, **N** - pH, **O** - ORP, **Z** - other
G7	Discrete input		**X** - none, **A** - contact, **E** - NPN, **F** - PNP, **G** - TTL
G9'	Serial interface		**X** - none, **A** - RS232, **B** - RS485
G9"	Protocol		**B** - RT390, **D** - RT390 for "PolyMonitor"
G11	Analog output		**X** - none, **E** - 0…20 mA, **F** - 4…20 mA, **H** - 0…2 V, **I** - 0...5 V, **K** - 0...10 V, **Z** - other on request