

General Specifications

RIO4000 Sensor Model

RTD Measurement & Simulation Module for Use with YPC4000 & YPC 4010

The **RIO4000** is the RTD measure and simulate module for the Yokogawa **YPC 4000 Series Multi-Function Tester**. The module accurately measures or simulates the resistance of 22 different RTD sensor types with nominal resistance to 4000 ohms. 2-, 3-, and 4-wire RTDs are supported and RTD material may be platinum, copper, nickel or iron. Several alpha coefficients are supported per Table 1 on page 2. The module can simulate temperature to all conventional or smart RTD transmitters and signal conditioners including those utilizing pulsed excitation current.

The YPC converts measured resistance to a corresponding temperature value and displays the value in the user-selected temperature unit (°F, °C, °R or °K). Ohms can also be displayed for direct reading or troubleshooting assistance. Pt 100 RTDs are available from Yokogawa for use with the module. These 4-wire, DIN Class A probes come complete with handle, 5' coiled cable, and connector. Accessory connectors are available to connect to any RTD or RTD transmitter for temperature measurement or simulation needs. Simulations are supported through setup controls that allow the user to enter a specific temperature, a range of temperatures stepped through with manual or automatic advance or a temperature range with automatic ramping advance for a selected time period.



RIO4000 Sensor Module with Connected Pt 100 Probe

Field recalibration of the module is provided by the YPC's "Rcal" feature. "Rcal" can be used to re-calibrate the module alone or the module with dedicated RTD for "match set" accuracy. The module + RTD option provides the best possible measurement accuracy for the most demanding measurement applications.

The RIO4000 and a dedicated DIN Class A RTD makes an excellent temperature reference standard for comparison to RTDs installed in process applications. The RIO4000 and user cable provides convenient RTD measurement and simulation capability.

Certifications Available

- CE Mark (standard)
- NIST traceability certificate (standard)
- Intrinsically Safe, MET Laboratories per CSA C22.2 & UL Class I Division I (standard)



RIO4000 Sensor Module with Connected Pt 100 Probe

Specifications for RIO4000 Module

0-400Ω measurement accuracy: $\pm 0.01\%$ of R + 0.075Ω

0-400Ω simulation accuracy: See Table 2

400-4000Ω meas. accuracy: $\pm 0.01\%$ of R + 0.237Ω

400-4000Ω simulation accuracy: See Table 3

Temperature:

Effect: ≤ 0.001 ohm/°C

Storage: -40° F to 140° F (-40° C to 60° C)

Operating: 23° F to 122°F (-5° C to 50° C)

Mating Connector: Switchcraft #TA6FL

Pulsed excitation current support

Units: °F, °C, °R or °K, Ohms

Resolution: $\pm 0.1^\circ$ or $\pm 1^\circ$ for RTDs

Resistance range: 0 – 4000 ohms

Input impedance: > 10 megohms

Weight: 3 oz

Table 1: Supported RTD Materials / Nominal Resistance

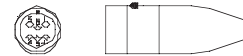
Material	R0	ALPHA	Rs (ID)	Temp Range (deg C)
Platinum	25.5	0.00392	17.8	-200 to +630° C
Platinum	98.129	0.00392	21.5	-200 to +600° C
Platinum	100	0.00385	100	-200 to +850° C
Platinum	100	0.00392	46.4	-200 to +630° C
Platinum	100	0.00391	56.2	-200 to +630° C
Platinum	100	0.00393	68.1	-200 to +962° C
Platinum	100	0.00389	82.5	-200 to +630° C
Platinum	200	0.00385	178	-200 to +630° C
Platinum	200	0.00392	215	-200 to +630° C
Platinum	470	0.00392	261	-200 to +630° C
Platinum	500	0.00392	316	-200 to +630° C
Platinum	500	0.00391	383	-200 to +630° C
Platinum	500	0.00385	464	-200 to +630° C
Platinum	1000	0.00385	1000	-200 to +630° C
Platinum	1000	0.00375	1210	- 50 to +500° C
Copper	9.035	0.00427	12.1	-100 to +260° C
Copper	100	0.00427	121	-100 to +260° C
Nickel	100	0.00618	31.6	- 60 to +160° C
Nickel	120	0.00672	147	- 80 to +260° C
Iron	604	0.00518	562	-100 to +200° C
Iron	908.4	0.00527	681	-100 to +200° C
Iron	1816.81	0.00527	1470	-100 to +200° C

The adjacent table lists the RTDs supported by the RIO4000 module and YPC 4000 Series. Materials, types and alpha coefficients are based on popular RTDs used in the field.

Yokogawa offers Pt 100 accessory probes that are automatically recognized by the RIO4000 module. No set up is necessary on the YPC. Users can configure their own reference RTDs similarly by using the accessory connector and Rs resistor (Probe ID resistor listed in adjacent table) to connect their RTD. This technique allows the module to automatically recognize the connected RTD and recall its characteristics. If no Rs resistor is used, a copper wire must be installed in its place. This causes an RTD selection menu to automatically appear on the YPC display, enabling the user to configure the YPC for use with any supported RTD type.

Accessories

P/N A900028-90200 connector solders to a customer's RTD wiring to facilitate connection to the RIO4000 module



P/N A900028-90500 general-purpose connector/cable to connect the RIO4000 module to RTD wires or transmitter terminals



P/N A900028-90201 Pt 100 RTD, DIN Class "A", 0.00385 alpha, 4 leads, 1/4" O.D., 304SS probe, 10" probe length, 3.5" handle and 5 ft coiled cable with connector for RPT4000 module



RIO4000 Accuracy Tables

Table 2: Accuracy for 0.00 to 400.00Ω

RTD Type	Alpha	Measure Range/Resolution	Measure Accuracy*	Simulate Range/Resolution	Simulate Accuracy
Pt 100Ω (DIN, IEC, JIS 1989)	.00385	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 850.0° C	± 0.4° C	600.0 to 850.0° C	± 0.6° C
Pt 100Ω	.00392, .00391, .00389	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 100Ω	.00393	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 850.0° C	± 0.4° C	600.0 to 850.0° C	± 0.6° C
		850.0 to 962.0° C	± 1.0° C	850.0 to 962.0° C	± 1.0° C
Cu 10 (Minco)	.004274	-100 to 260° C	± 2° C	-100 to 260° C	± 2° C
Cu 100	.004274	-100 to 260° C	± 1° C	-100 to 260° C	± 1° C
Ni 100	.00618	-60.0 to 160.0° C	± 0.1° C	-60.0 to 160.0° C	± 0.2° C
Ni 120 (Pure)	.006720	-80.0 to 260.0° C	± 0.1° C	-80.0 to 260.0° C	± 0.2° C
Ohms		0.00 to 400.00Ω	± 0.01% of R + 0.075Ω		

* Accuracy based on best 4-wire RTDs; For 2- and 3-wire RTDs add ± 0.1 °C to above statements

Table 3: Accuracy for 0.00 to 4000.00

RTD Type	Alpha	Measure Range/Resolution	Measure Accuracy*	Simulate Range/Resolution	Simulate Accuracy
Pt 200Ω (DIN, IEC)	0.00385, 0.00392	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 500Ω (DIN, IEC)	0.00385, 0.00391, 0.00392	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 1000Ω (DIN, IEC)	0.00385	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 1000Ω (DIN, IEC)	0.00375	-50.0 to 200.0° C	± 0.2° C	-50.0 to 200.0° C	± 0.3° C
		200.0 to 500.0° C	± 0.3° C	200.0 to 500.0° C	± 0.45° C
Fe 604	.00518	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Fe 908	.00527	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Fe 1816	.00527	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Ohms		0.0 to 4000.0Ω	± 0.01% of R + 0.237Ω		

* Accuracy based on best 4-wire RTDs; For 2- and 3-wire RTDs add ± 0.1 °C to above statements