THERMANSYS®

REACTOR TYPE FURNACES
Universal mounting - Split Tube - Remote Control – SiC Resistors
Model family: **RCT-AS1-O-1500**

Description.

RCT-AS1-O-1500 models family designed to offer a **flexible solution** for the majority of applications involving controlled atmosphere tubular reactors heating, up to **1500˚C continuously.** The hinged construction offer convenience to the reactor installation and setting up access and provide a solution in situations where reactor is permanently connected to the processes manifold where furnace could literately wrapped around it.
Utilizing the unique high density Kanthal SiC resistors this furnaces have superior performance in terms or resistance to oxidation highly extending the workable life of your investment. All SiC heating resistors will increase in resistance over time at elevated temperatures. Due to the unique nature of the high density Kanthal SiC resistors this effect is severally suppressed. Moreover, **Thermansys PPC** (Power Consistent Control) platform automatically compensate aging effect enabling direct power control, instead of conventional control strategies, assuring that the furnace performance will remain unchanged without the need of any operator action or periodical check through the entire life of the equipment.
Offered only as a single zone model will give repeatable and reliable results with many years of workable life operating horizontally on its feet or vertically using an appropriate stand.

Model shown RCT-AS1-T_D5L30-1500.

Based on accurate true rms Volt/Ampere measurements that our **PYROMODULAR** system enables, and on the **PCC** management platform these furnaces have optimum performance in terms of Power Factor and EMC standards compliance. Focusing our control management on the specific resistor properties the workable life of the heater is significantly extended without partially sacrifice the extremely fast heating rates that can provide, using conservative control techniques.

Key features.

- Best available quality KANTHAL® helical cut SiC resistors driven by THERMANSYS® PCC control platform insure furnace long life operation up to 1500˚C continuous operation.
- Low mass vacuum formed thermal insulation enables high output available for the load and fast heat up rates while significantly contributes to energy savings under daily thermal cycling.
- Control strategy focusing in high power factor for all workable temperature areas insures compliance with EMC (Electro-Magnetic Compatibility) standards.
- Vertical and horizontal mounting flexibility covers different present and future laboratory needs.
- Accurate and uniform temperature profiles.
- Modern double wall construction keeps external surfaces temperature low, emphasizing in operator safety. Internal skin is exclusively made from stainless steel to enhance durability.
- Ergonomic design with no protruding edges, bolts or other features combines stainless steel parts with painted finish parts for an improved esthetic result.
- PID control constantly conforms to various load needs.
- Deterministic over-temperature limiter with manual reset, in accordance with EN 60519-2 to protect the oven and load.

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PYROMODULAR System at a Glance.

Operated through the specially developed **PYROLOGISM** software and equipped with a touch screen computer **PYROMODULAR** is a state of the art control, monitoring and data acquisition **system**. Taking advantage of the optional expanding capabilities of this system the user can not only just control the furnace but create a fully instrumented and totally integrated high temperature reactor system.

PYROMODULAR Main Controller.

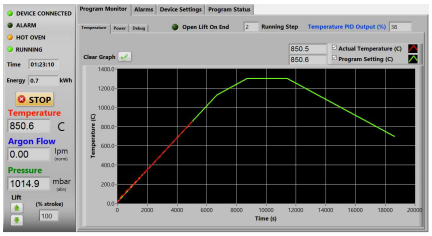
Each **RCT-AS1-O-1500** furnace is equipped as a standard with the **PYROMODULAR Main Controller** that enables:

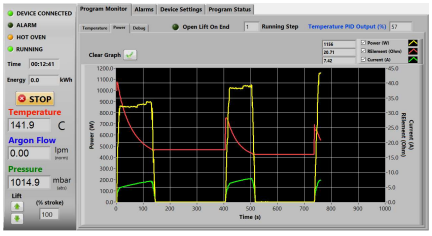
- Touch Screen Computer running user friendly operator **PYROLOGISM 2.0** software human-machine interface.
- Single or three heating zones models remote closed loop control and power circuits.
- 3 user process thermocouple inputs available (B, E, J, K, N, R, S, T type- software configurable).
- Power and true rms Current measuring circuits for each heating zone(s).
- Heater failure, open control thermocouple detection alarms and interlocks. Alarms and events front panel led array.
- Stand alone over-temperature limiter (Watchdog) with manual reset in accordance with EN 60519-2 to protect the oven and load for each heat zone(s). Overrides main controller and cut off heater power if user adjustable high limit is reached.
- Alarm event output (dry contact 3A/250V AC/DC).
- RJ45 port for connection to PC.

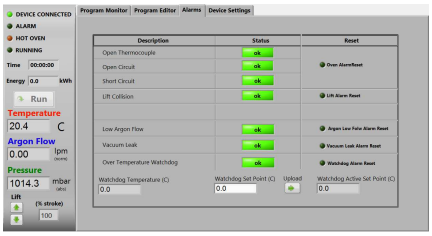
PYROMODULAR- Modules Palette

PM – Gas Flow and Pressure
Gas flow control manifold with Mass Flow Meters and Controllers for process gas control.
PM – Gas Analyzers *In line low cost embedded IR analyzers.*
PM – Vacuum *Rough (up to 10^{-3} torr) and High (up to 10^{-7} torr) complete vacuum systems.*

*For detailed information and ordering please refer to our corresponding Technical Bulletin "**Pyromodular System**"*







PYROLOGISM 2.0 control and monitoring software.

Having in mind user's convenience and daily work facilitation, Thermansys® design and develop a special windows architecture software providing a friendly human machine interface solution with advanced features:

- Quick setting of a single ramp rate to a set point -run on timer function.
- Set-point programming with up to 15 ramp and constant temperature programming steps – graphical inspection of programming.
- Storage and reload of unlimited number of distinct programs.
- Real time chart illustrating control temperature(s), running set point(s) and user process temperatures with dynamic zoom.
- Real time true-rms Current (A), Voltage (V) and Power (W) measurements.
- Real time actual Power (W) and totalized Energy (kWh) chart.
- Saves all data on local memory.
- Tools for manual PID tuning and auto-tuning.
- Dynamic Help function tool, virtual keyboard, alarm and event message bar.
- Watchdog over temperature limiter monitor/configuration page.
- Gas flow and pressure, gas analyzers signals, monitoring and control interface pages activated if corresponding PM modules are enabled.
- Versions running at Microsoft® Windows or Linux operation systems are available for total remote control by a PC through Ethernet RJ45 port.
- Remotely monitoring and control through network connection.

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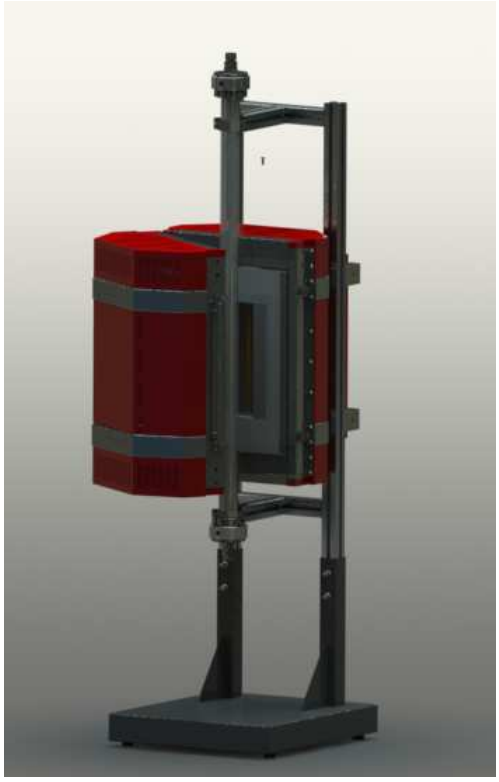


Model shown RCT-AS1-O_D5L30-1500 with optional mounting stand and Alumina work-tube.

Accessories Available.

Work-tubes.

Several work tube materials to choose from:

- Dense ceramic Alumina work-tubes for the highest temperature applications.
- Quartz work-tubes for maximum chemical inertia and for aggressive environments to work under vacuum or low pressure conditions up to 1100 ˚C continuously.
- KANTHAL® APM™/APMT metallic (FeCrAl based) work-tubes to serve under vacuum or pressure up to 1250 ˚C.

End Gas Sealing Flanges and Manifolds.

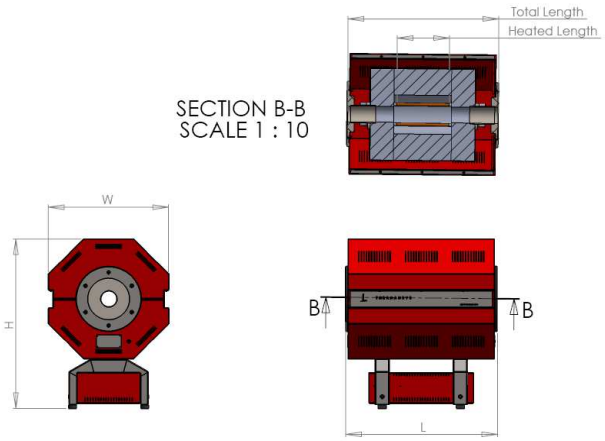
THERMANSYS® is providing work-tube End Gas Sealing Flanges for vacuum or pressure conditions. These flanges are provided either with hydraulic thread port or with Clamp Flange (CF) port for gases inlet/outlet- connection to the tubing network. Cooling fluid recirculation compartment is standard. Also available, flanges assembled with manifolds having ports for instrumentation mounting (e.g thermocouples, pressure sensors), quick-open loading port and quartz sight window.

*For detailed information and ordering please refer to our corresponding Technical Bulletin "**Reactor Type Furnaces Accessories**"*

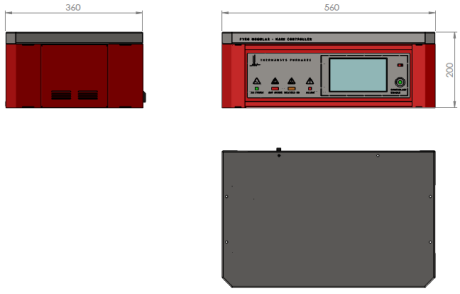
Mounting Stands.

Assembled and constructed using BOSCH-REXROTH® structural profile systems these stands provide the ideal solution for vertical furnace stand alone positioning plus reactor and instrumentation mounting. Using the commercially available accessories, tubing and cable routing is easy and professionally accomplished. Stands with electronically actuated furnace move-up and down provide a solution for heating zone moving along the reactor length.
*For detailed information and ordering please refer to our Technical Bulletin "**Reactor Type Furnaces–Mounting Stands**"*

Technical Drawings.



Drawing 1. RCT-AS1-O-....-1500 Furnace



Drawing 2. PYRO MODYLAR Main Controller

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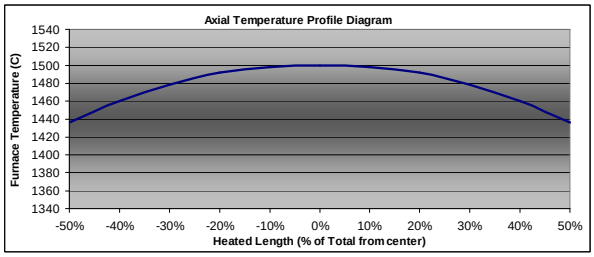
Specifications and Ordering Information.

- Maximum continuous temperature 1500 ˚C.
- Operating Power: 208 /240VAC – 50/60Hz.
- R type embedded thermocouples.
- Mounting orientation: Horizontal, and vertical.
- Temperature control accuracy ±1 ˚C.
- Exposed resistors type.
- Single heating zone configuration models.
- Each zone is equipped with two independed thermocouples for controller and over-temperature limiter feedback.
- Thermocouple inputs:
  3 chan. - B, E, J, K, N, R, S, T type -software configurable
  24 bit A/D conversion, 0-45°C cold junction compensated
  Typical accuracy ±0.2% f.s @ 25 , resolution 0.1 °C



Curves presented are simulated indicative data and are valid for common set-point for all heating zones, dense alumina process reactor fit to furnace diameter and with both ends plugged. Actual performance may vary depending on orientation, load mass and placement, reactor size and process gas flow existence

CE Certified. Compliant with **Low Voltage Directive 2006/95/EC** (harmonized referenced standard EN 61010-1: 2001 and EN 61010-2-010:2003) and **EMC Directive 2004/108/EC** (harmonized referenced standard EN 61326-1:2006). *Produced in **GREECE** following **ISO 9001:2008 quality management system** and **ISO 14001:2004 environmental management system.***

TABLE1. RCT-AS1-O-1500 Models

Model Part Number RCT-AS1-O-…	Max. Cont. Temp. ˚C x Heat up time* min	Furnace I.D. mm x Heated length mm x Total length mm	Uniform Temp. length mm ± 10 ˚C approx. **	Furnace external dim. WxHxL mm *see drawing 1*	Nominal Max. Power (W)
_D5/L20-1500	1500 x 65	50x200x380	100	450x652x580	1800
_D5/L30-1500	1500 x 65	50x300x480	150	450x652x680	2700
_D5/L60-1500	1500 x 65	50x600x780	300	450x652x980	5000
_D8/L40-1500	1500 x 65	80x400x480	200	480x682x780	4800
_D8/L60-1500	1500 x 65	80x600x780	300	480x682x980	7500

* *Furnace working with no load and both ends closed*

** *Simulated indicative data. Valid for common set-point for all heating zones, dense alumina process reactor fit to furnace diameter and with both ends plugged. Actual performance may vary depending on orientation, load mass and placement, reactor size and process gas flow existence.*

IMPORTANT ORDERING NOTES:

- Models Part Number listed in Tables 1 and 2 concern complete turn key systems with PYROMODULAR main controller included.
  Ordering Example:
  RCT-AS1-O_D5/L20-1500: This Part Number includes one RCT-AS1-O-1500 family furnace having 50mm internal diameter, 200mm heated zone length and one PYROMODULAR Main Controller.
- To order only the furnace add at the end of the part number the suffix “Single”, e.g. RCT-AS1-O_ D5/L20-1500**_Single.**
- Optional furnace accessories or mounding stands are ordered separately according to the respective data sheet ordering information.
- Additional PYROMODULAR Modules are ordered separately according to the respective data sheet ordering information.

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