

## REACTOR TYPE FURNACES

### Vertical Operation or Horizontal Operation - Remote Control - Single Zone

### Maximum Continuous Operation Temperature 1750 °C

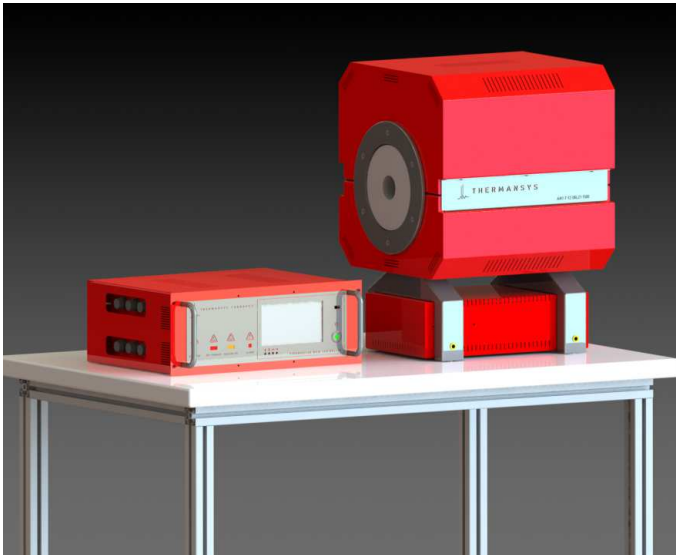
Model families: **RCT-AM2-T-1700/1800**

### Description.

Being able to reach heat up rates as high as **60 °C per minute**, reach operating temperature of **1800 °C** and maintain it at **1750 °C continuously**, **RCT-AM2-T-1700** and **RCT-AM2-T-1800** models families represents a truly powerful ultrahigh temperature tubular heating device.

Constructed using lightweight insulation and powered from high quality Molybdenum Disilicide (MoSi<sub>2</sub>) elements, selected from KANTHAL SUPER<sup>®</sup> heating systems programs, these families are ideal choices for reliable, very accurate and uniform temperature control processes up to **1750 °C continuously**.

Offered as single zone models and designed in two configurations, for horizontal or for vertical operation using an appropriate stand can be used continuously or intermittently with no restriction.



*Model shown RCT-AM2H-T\_D6L20-1700/1800 for Horizontal operation only.*



*Model shown RCT-AM2V-T\_D9L32-1700/1800 for Vertical operation only*

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<sup>®</sup> MoSi<sub>2</sub> resistors driven by THERMANSYS<sup>®</sup> PCC control platform are not affected by thermal shock and can withstand very high element power loads thereby provide a heating solution for extremely fast temperature ramping processes insure furnace long life operation up to 1750 °C continuous operation.
- Extremely 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.
- PID control. 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.
- 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 2.0** 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-AM2H/V-T-1700** or **1800** 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.
- 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).
- USB client B type and RJ45 port for connection to PC.



19 inch Standard rack design (6U)

### PYROMODULAR- Modules Palette

*Each Pyromodular Main Controller can be connected with one or all of the following optional modules:*

#### **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.*

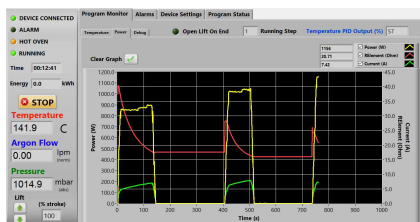
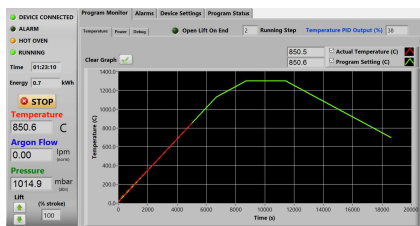
**PM – Vacuum Rough** *(up to  $10^{-3}$  torr) and High (up to  $10^{-7}$  torr) complete vacuum systems.*

*For detailed information and ordering please contact our sales team.”*

### 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:

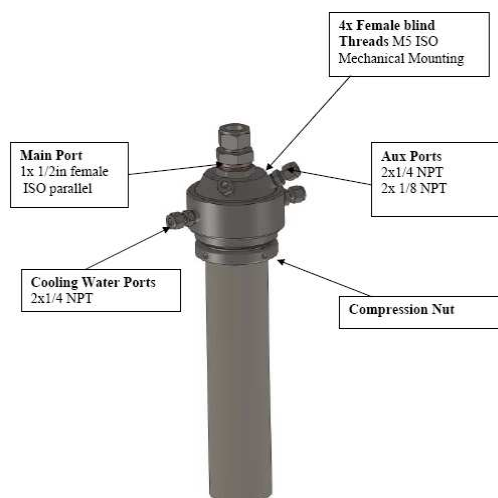
- Quick setting of a single ramp rate to a set point -run on timer function.
- Set-point programming with up to 15 heating/cooling ramp and constant temperature programming steps – graphical inspection of programming.
- Storage and reload of unlimited number of distinct programs.
- Real time chart illustrating 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 or auto-tuning.
- Virtual keyboard, alarm and event message tab.
- Watchdog over temperature limiter monitor/configuration.
- Gas flow and pressure, gas analyzers signals, monitoring and control interface pages activated if corresponding PM modules are enabled.
- Versions running at Microsoft® Windows are available for control by a PC through USB port.



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**End Gas Sealing Flanges and Manifolds.**

THERMANSYS® is providing work-tube End Gas Sealing Flanges for vacuum or pressure conditions.

These flanges are provided with Main Port 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 and is removable. Up to four peripheral threads are available serving as ports for instrumentation mounting (e.g thermocouples, pressure sensors).

Versions with Clamp Flange (CF) port design provide quick-open loading port and optionally a quartz sight window.

THERMANSYS® End Gas Sealing Flanges are supplied for work tubes diameters from 1'' to 3''. Their design allows use with tubes having diameter tolerance  $\pm 10\%$ .

Standard versions material of construction is Stainless Steel ASME 304. Optionally for corrosive applications Stainless Steel ASME 316 is available and Aluminum for a light weight solution (recommended for thin wall Quartz tube reactors).

**Work-tubes.**

Several work tube materials to choose from:

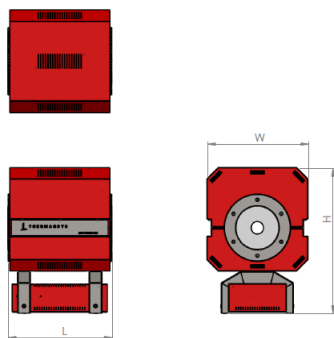
- Dense ceramic Alumina work-tubes for the highest temperature applications.
- Quartz work-tubes for maximum chemical inertia and for aggressive environments to work under vacuum or low pressure conditions up to 1100 °C continuously.
- KANTHAL® APM™/APMT metallic (FeCrAl based) work-tubes to serve under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

**Mounting Stands.**

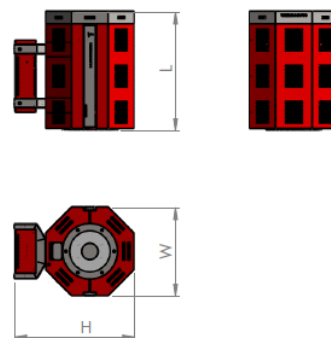
Assembled and constructed using BOSCH-REXROTH® structural profile systems these stands provide the ideal solution for vertical furnace stand alone positioning plus reactor and instrumentation mounting. Using the commercially available accessories, tubing and cable routing is easy and professionally accomplished. 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"*

*Please contact our sales team for detailed information and ordering on our Tube Furnace Accessories optional equipment.*

**Technical Drawings.**

Drawing 1. RCT-AM2H-T-....-1700/1800 Furnace



Drawing 2. RCT-AM2V-T-....-1700/1800 Furnace

**Specifications and Ordering Information.**

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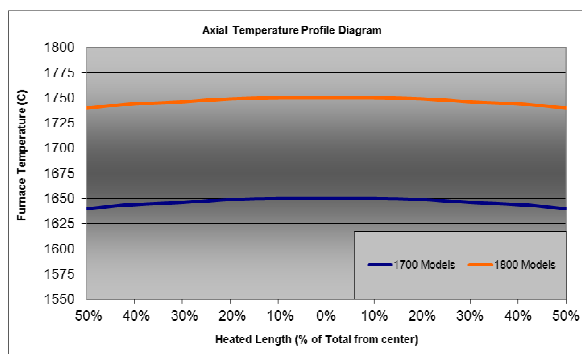
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- Maximum continuous temperature:
  - 1650°C for RCT-AM2H/V-T-1700 Models
  - 1750°C for RCT-AM2H/V-T-1800 Models
- Operating Power: 208 /240VAC – 50/60Hz.
- B type embedded thermocouples. Two in depended thermocouples for controller and over-temperature limiter
- Operation mounting orientation:
  - Horizontal for RCT-AM2H-T-1700/1800 Models
  - Vertical for RCT-AM2V-T-1700/1800 Models
- Temperature control accuracy  $\pm 1$  °C.
- Heating/cooling rate 0.1-50 °C/min, setting resolution 0.1
- Exposed resistors type.
- Single zone configuration models.
- Thermocouple inputs: 3 chan. - B, E, J, K, N, R, S, T type  
-software configurable.



Curves presented are simulated indicative data and are valid for 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-AM2H-T-1700/1800 Models for Horizontal Operation**

Model Part Number	Max. Cont. Temp. °C x Heat up time* min	Furnace I.D. mm x Heated length mm	Uniform Temp. length mm $\pm 1$ °C approx. **	Furnace external dim. WxHxL mm see drawing 1	Nominal Max. Power (W)
RCT-AM2H-T-...					
_D2/L12-1700/1800	1650/1750 x 90	20x120	80	422x612x400	1400
_D4/L12-1700/1800	1650/1750 x 90	40x120	60	442x632x400	1600
_D6/L12-1700/1800	1650/1750 x 90	60x120	50	462x652x400	1800
_D6/L20-1700/1800	1650/1750 x 90	60x200	70	462x652x480	2200
_D6/L28-1700/1800	1650/1750 x 90	60x280	80	462x652x560	3800
_D9/L28-1700/1800	1650/1750 x 90	90x280	80	492x682x560	5400
_D9/L32-1700/1800	1650/1750 x 90	90x320	100	492x682x600	6400

**TABLE1. RCT-AM2V-T-1700/1800 Models for Vertical Operation**

Model Part Number	Max. Cont. Temp. °C x Heat up time* min	Furnace I.D. mm x Heated length mm	Uniform Temp. length mm $\pm 1$ °C approx. **	Furnace external dim. WxHxL mm see drawing 1	Nominal Max. Power (W)
RCT-AM2V-T-...					
_D2/L12-1700/1800	1650/1750 x 90	20x120	80	420x540x460	1400
_D4/L12-1700/1800	1650/1750 x 90	40x120	60	440x560x460	1600
_D6/L12-1700/1800	1650/1750 x 90	60x120	80	460x580x460	2000
_D6/L20-1700/1800	1650/1750 x 90	60x200	160	460x580x540	2200
_D6/L28-1700/1800	1650/1750 x 90	60x280	240	460x580x620	3800
_D9/L28-1700/1800	1650/1750 x 90	90x280	240	490x600x620	5400
_D9/L32-1700/1800	1650/1750 x 90	90x320	280	490x600x660	6400

\* Furnace working with no load and both ends closed

\*\* Simulated indicative data. Valid for 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.

**NOTE:** All models with Nominal Max. Power higher than 4200W are supplied with a 19in rack console with wheels housing PYROMODULAR system and another 4-6 U 19in box containing furnace transformers.

#### Ordering Example:

RCT-AM2H-T\_D6/L20-1800: This Part Number includes one horizontal operation furnace with maximum continuous operation temperature 1750 °C having 60mm internal diameter, 200mm heated 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-AM2H-T\_D6/L20-1800\_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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