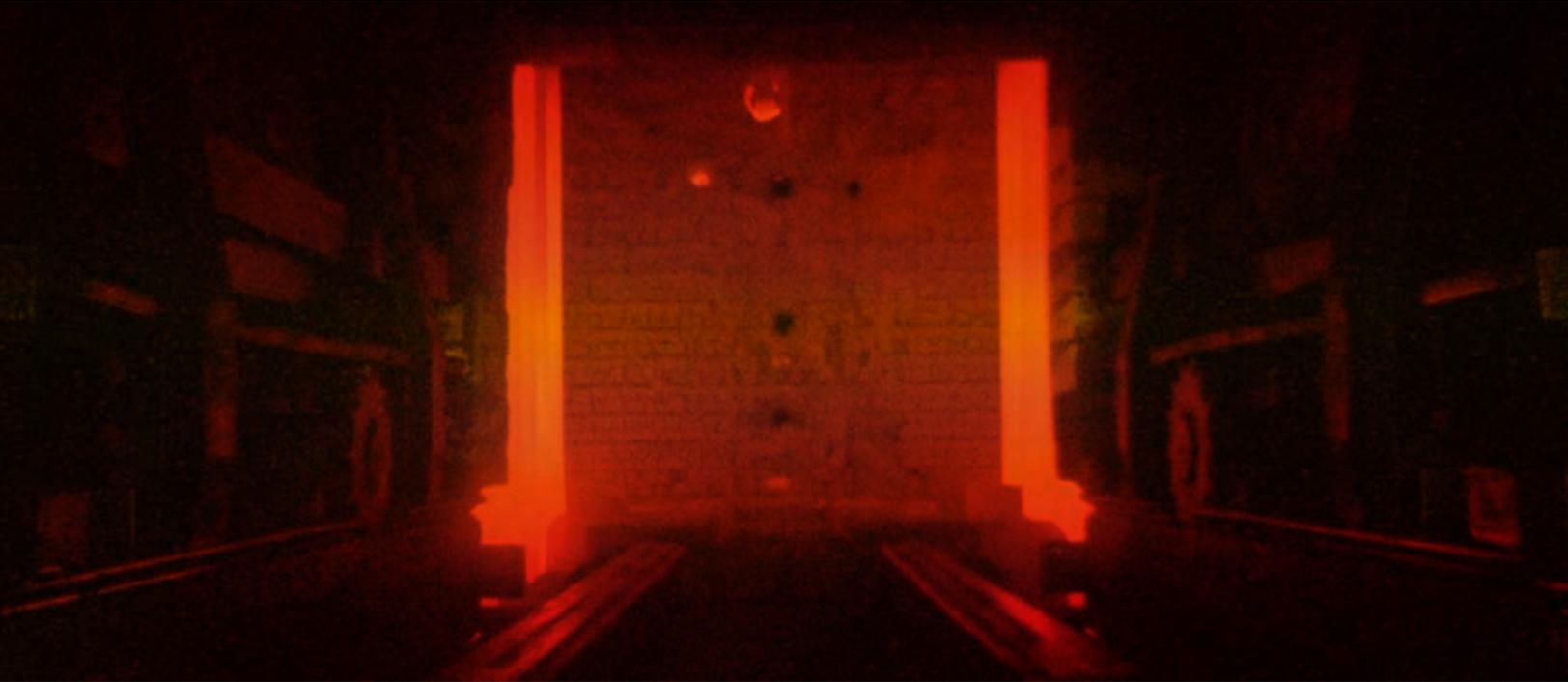


# ECOTHAL® SER Burner

## Technical Information



### High Efficiency

The ECOTHAL SER-burner system has a proven efficiency of 80%, which is 10–20% higher than conventional SER-systems. This is due to burner design, and the use of powder metallurgically produced high temperature materials allowing increased working temperature. This gives the customer the possibility both to increase productivity and to save fuel.

### Reduced NO<sub>x</sub> Emissions

ECOTHAL SER-burner is one of the cleanest recuperative radiant heater on the market. A very efficient combustion, together with FGR, (Flue Gas Recirculation), reduces CO and NO<sub>x</sub>. The system fulfills today's tightened environmental demands, and is well prepared for tomorrow's even stricter standards.

### Low Energy Costs

The high efficiency of ECOTHAL SER-burner system saves money by using less fuel to do the same job. In some cases, savings of up to 35% have been realized.

### Low Maintenance

ECOTHAL SER-burner is designed for reliability and a maintenance free operation. An all metallic burner means easy handling, with minimal risk of damage. KANTHAL PM tubes, (FeCrAl), need no internal cleaning or repositioning by rotation.

### Adaptable Design

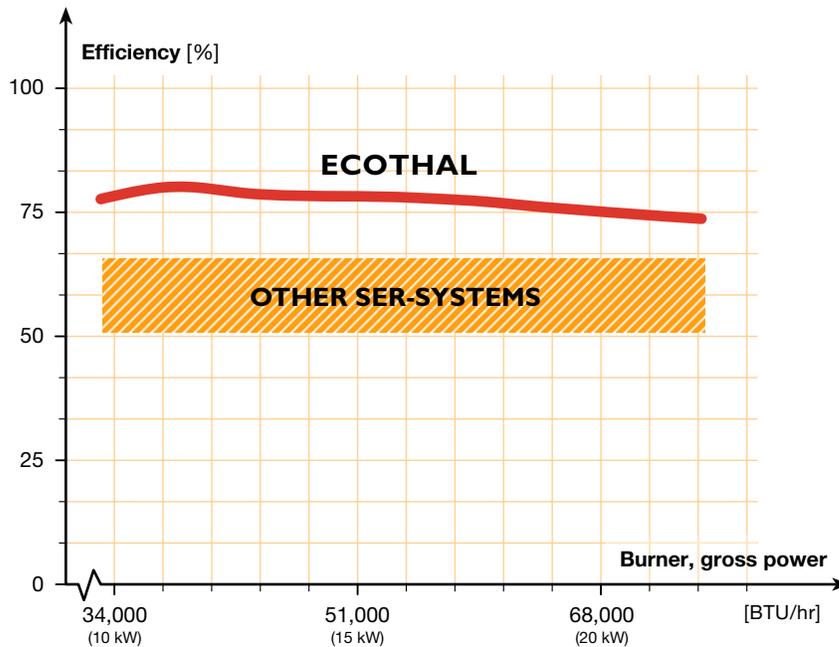
Due to the standardized and modular construction design, the ECOTHAL SER-burner system is easy to adapt to most furnace systems. It is possible to implement the latest burner technology in both new furnace designs, as well as a "bolt-on" system for upgrading existing furnace equipment. The burner is available with different surveillance and ignition systems, and can be used for both horizontal and vertical installation.



# Increased Burner Efficiency

ECOTHAL SER-burner (Single-Ended Recuperative) is designed for high efficiency, reliability and low emissions. This is possible by using advanced high temperature materials in combination with a burner design which creates favour-

able air/gas and exhaust flow. ECOTHAL high efficiency SER-systems offer efficiencies in excess of 80% and are highly cost effective compared with other recuperative systems on the market.



The diagram shows ECOTHAL's high efficiency.

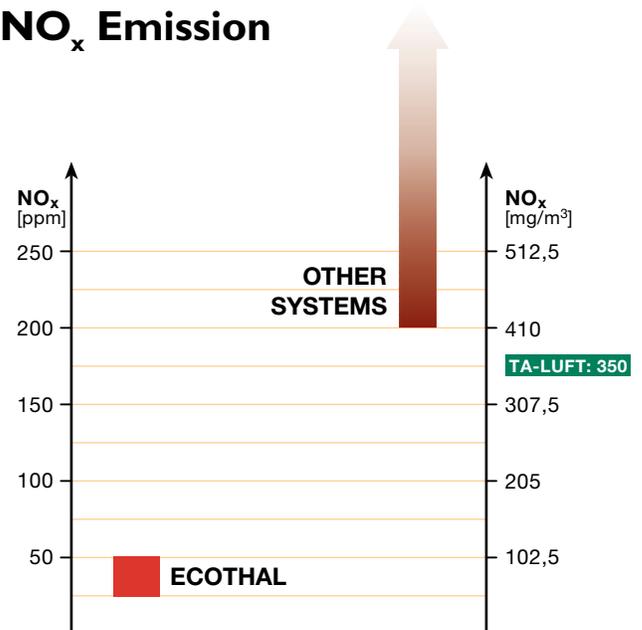
# A Break Through in Reduction of NO<sub>x</sub> Emission

ECOTHAL SER-burner is one of the cleanest recuperative radiant heaters on the market. The high efficiency also reduces emissions of carbon dioxide per energy unit produced. This gives you less pollution and greenhouse effect, lower costs and a lot of goodwill!

## Typical ECOTHAL values

Reference is Natural gas;

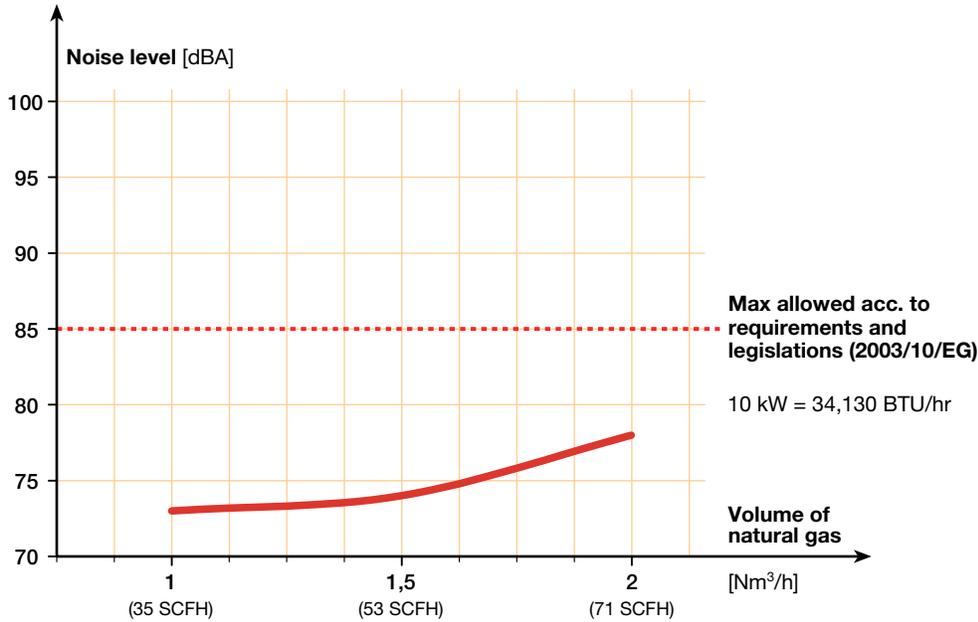
- Carbon dioxide 75 g/MJ
- Carbon monoxide ≈0 ppm
- Nitrous oxide <50 ppm (3% O<sub>2</sub>)
- Nitrous oxide 20 mg/MJ



Typical NO<sub>x</sub> emissions of different burner systems. ECOTHAL SER-burner is far below 350 mg/m<sup>3</sup>.

# Noise Level

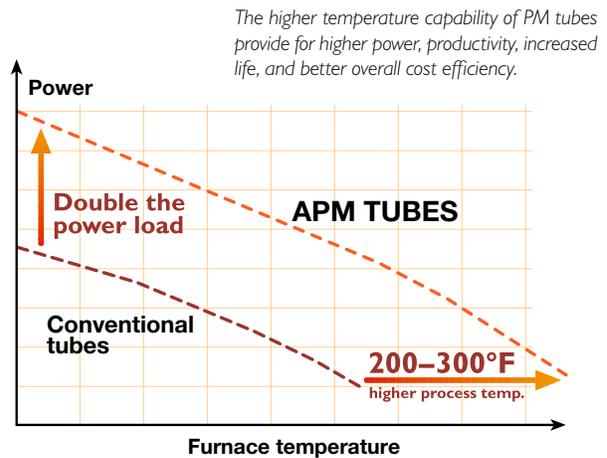
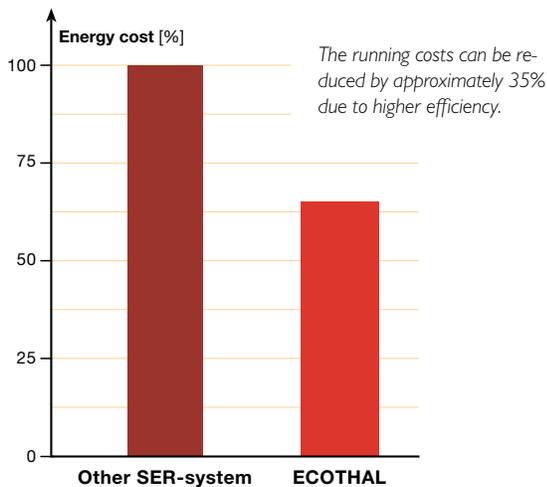
Noise level is reduced by optimized design combined with a silencer. Typical sound levels are below 85 dBA but levels of 75–80 dBA are achievable when required.



# Reduced Energy Costs

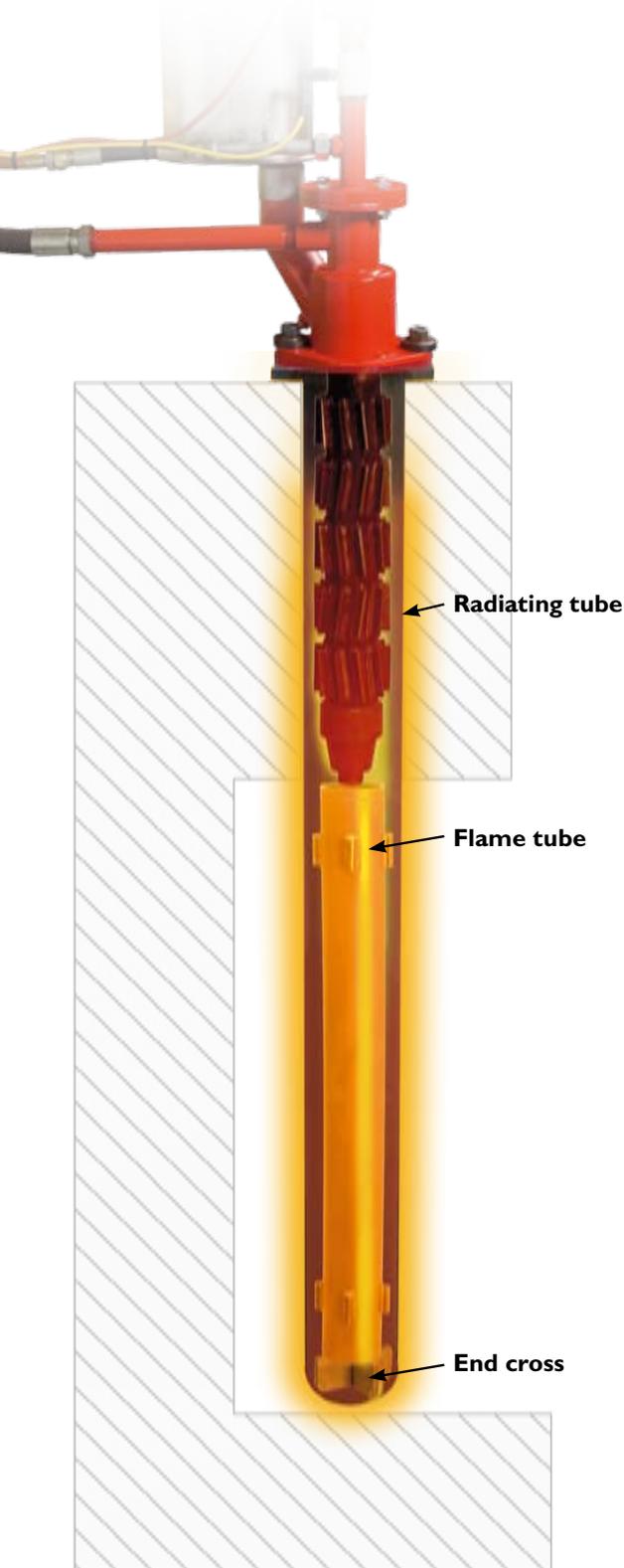
ECOTHAL SER-burner is one of the most efficient gas solution on the market. It increases productivity, reduces gas consumptions and emissions. This is the ultimate solution for achieving cost efficiency in production. The PM tubes used in the ECOTHAL SER-burner system

provides higher power, higher productivity, increased life and better overall cost efficiency. Upgrading from a conventional SER-burner to ECOTHAL SER-burner system can provide fuel cost savings of approx 35% due to the higher efficiency.



## Designed in Accordance with Customer Specifications

ECOTHAL SER-burner is easily adaptable to existing systems. With ECOTHAL it is possible to implement the latest burner technology in both new furnace designs as well as in upgrading of existing furnaces.



The ultimate ECOTHAL SER-burner model complete with UV-cell and ignition/supervision system to monitor and report malfunctions. This is a sophisticated control and regulation system, often demanded in larger industries. In most cases this upgrade requires a minor redesign of the electrical and gas supply system.

- Remodelling of gas and air distribution system (to fulfill EN 746-2)
- Adaption control system (to fulfill EN 746-2)
- Ignition/supervision channel in metal
- Ignition transformer
- Ignition cable
- UV-cell



The entry model incorporates a basic ignition by glow plug mounted in the exhaust outlet. High efficiency and verified low emissions are ensured by the Ecothal SER-burner design.

# ECOTHAL 4-20 Specifications

<b>Burner-type</b>	SER (Single Ended Recuperative)
<b>Fuel</b>	Natural gas
<b>Burner net power</b>	20,478 BTU/hr – 68,260 BTU/hr
<b>Radiating tube</b>	KANTHAL APM OD115/ID104 (4.5"/4.1")
<b>Flame tube</b>	KANTHAL APM OD75/ID66 (2.95"/2.6") Flame tube separated from burner, designed for FGR (Flue Gas Recirculation)
<b>End cross</b>	Height 5"–7" (125–175 mm)
<b>Excess of air</b>	Down to $\lambda$ 1.05
<b>NO<sub>x</sub>- outlet</b>	≤50 ppm, natural gas

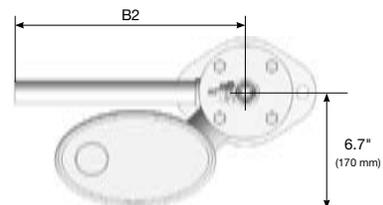
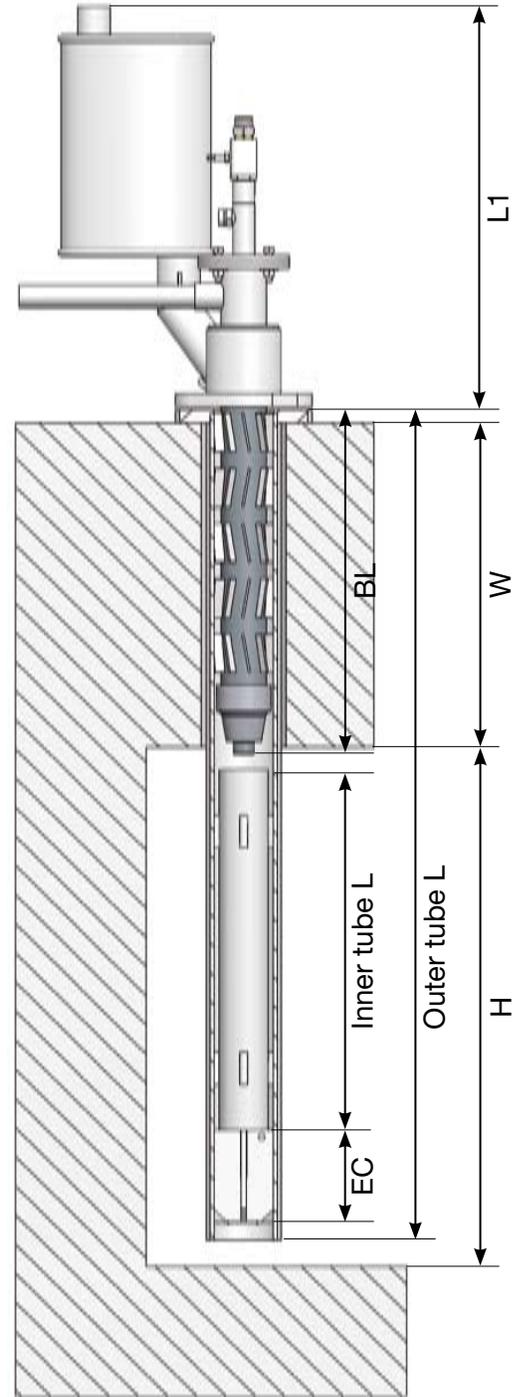
The ECOTHAL 4-20 SER-burner is the first introduction size in a family of burners intended for radiant tubes with outer diameter up to 8" (200 mm).

Part of the Maintenance Free System concept from Kanthal AB.

## Typical Installation



- Complete metal construction
- Separate flame tube – designed for FGR (Flue Gas Recirculation)
- Electric ignition and flame supervision (ionisation monitoring not possible with moving flame)
- The burners shown in the picture are of the type "Glowplug". By only exchanging the gas lance they are rebuilt into the UV-version. Note that performance is the same for all models



## Reliable and Easy to Upgrade

Kanthal provides you with great opportunities to obtain a cost effective heating solution in a very short time. The typical lead time for a total system is about 4–6 weeks.

We carry burner components, protection tubes, surveillance and regulation components in stock or in semi-manufactured form to ensure fast and reliable availability, just when you need it.

It typically takes about 2–3 days to upgrade a typical heat treatment furnace with ECOTHAL. We offer calculation, design and installation services upon request. We have standardized and systematized our heating solutions with the intent of simplifying things as much as possible for you as our customer.

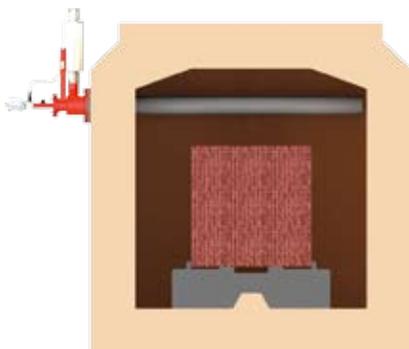
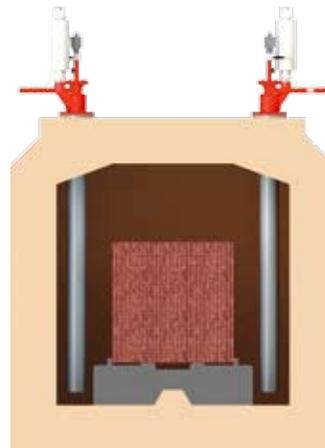
### Maintenance

ECOTHAL SER-burner is developed from established methods but optimized by applying the latest technology. A robust design, all metallic construction ensures reliable and virtually maintenance free operation.

The fully metallic design also means easy handling with no risk of damage. KANTHAL PM-tube system components dramatically reduce the need for turning and cleaning stops as compared to a conventional NiCr tube based system.

### Adaptable Design

ECOTHAL SER-burner is easily adaptable to existing systems. With ECOTHAL it is possible to implement the latest burner technology in both new furnace designs as well as in upgrading of existing furnaces.

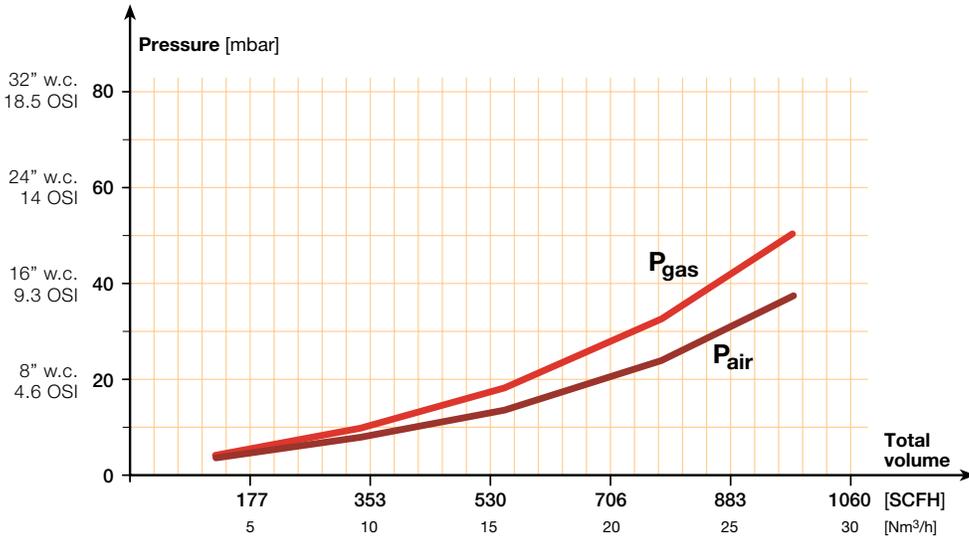


*The burner is produced according to customer specifications and available for horizontal or vertical installation. ECOTHAL SER-burner fits most standard systems.*



# Pressure Drop

ECOTHAL SER-burner is easily adaptable to existing systems

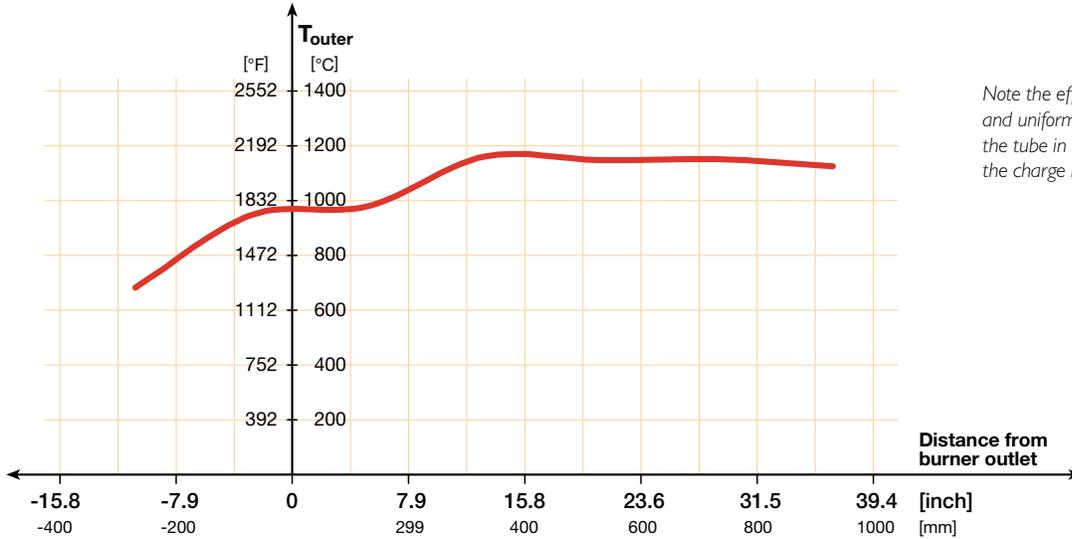


Overpressure at intake vs volume of natural gas and air.  
 $O_2 = 2\%$   
 (Central electrode)

35.31 SCFH ~ 3413 BTU/hr ~ 1 kW

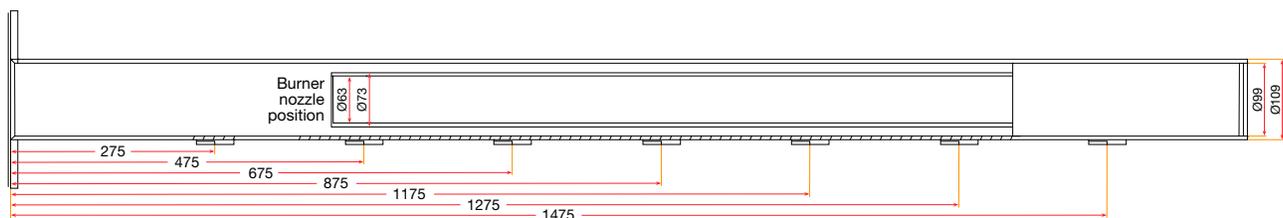
# Temperature Distribution

Temperature Distribution at 68,260 BTU/hr (20kW)



Note the effective heat recovery and uniform temperature along the tube in the position where the charge is.

Distance from burner outlet (mm)

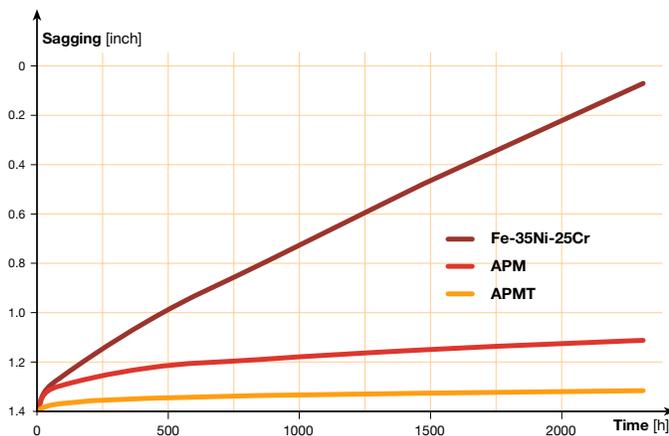


# KANTHAL APM/APMT

KANTHAL PM tubes, APM and APMT, are seamless and produced by extrusion. They are produced by an Advanced Powder Metallurgy process route and are dispersion strengthened. KANTHAL APM tubes are suitable for use in a wide range of temperatures and atmospheres, covering many applications and processes in various industries. KANTHAL APMT alloy, has the same excellent high temperature corrosion resistance as APM, but with even higher strength. This property can be beneficial in horizontal applications at the highest temperatures.

Typical Chemical Composition (wt%)				
	Fe	Cr	Al	Mo
APM	balance	22	5.8	-
APMT	balance	22	5.0	3.0

KANTHAL PM tubes are very form stable, resistant to bending and other forms of creep deformation. The tubes do not exhibit the same dramatic decrease in strength that FeNiCr tubes show at elevated temperatures. KANTHAL PM tubes will work well at temperatures up to 1250°C (2282°F). At this high temperature oxidation is still not a big concern; this is due to the oxide layer formed on the tube surface. Instead of conventional Chromium oxide, Cr<sub>2</sub>O<sub>3</sub>, the Kanthal alloys



Comparative sagging test at 1100°C (2012°F).

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form the much more stable aluminum oxide, Al<sub>2</sub>O<sub>3</sub>. The oxide is non-spalling, hence no scaling and no contamination of the heat treated goods and reduced risk of clogging up the burner.

Besides oxidation this aluminum oxide offers excellent corrosion resistance to carburizing and sulphidizing atmospheres. Kanthal alloys also outperform the FeNiCr-alloys in high carbon potential atmospheres, where coking, carbon build-up and metal dusting can be problematic.

KANTHAL PM radiant tubes are capable of far higher operating temperatures than FeNiCr-tubes. This allows system manufacturers and users to exploit the higher outputs of modern heating designs. It is possible to dissipate the same power input with fewer tubes or to utilize the loading potential for productivity increases.

At a furnace temperature of 1000°C (1832°F) a gas fired SER-system using KANTHAL PM tubes could operate with twice the power of a similar system that uses FeNiCr-tubes.

The tubes for SER-applications are supplied as ready to install tubes with flange and bottom welded to the outer tube and distance spacers to the inner tube. End crosses and other components are also manufactured from KANTHAL PM alloys.



Comparison of carbon build-up in a strand annealing furnace, NiCr at top and APM at the bottom.



Comparison of APMT tube versus Fe-35Ni-25Cr after 2300 hours at 1100°C (2012°F). The FeNiCr tube is severely contaminated with oxide flakes.

# KANTHAL

Kanthal – a Sandvik brand

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