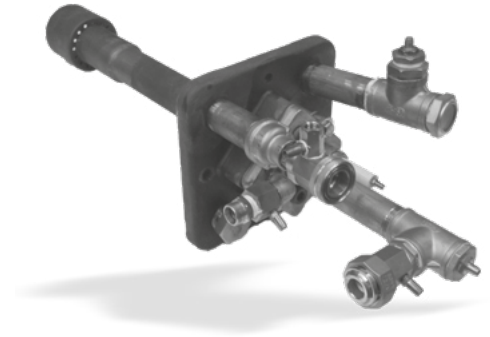


UNI-RAD[®], radiant tube burner

TECHNICAL INFORMATION

- Increased radiant tube alloy life
- Improved furnace temperature uniformity
- Use with many different metallic tube shapes
- Extremely reliable plasma type ignition
- With plug-in recuperator fuel savings ranging from 30–50 %
- Suitable for applications with hydrogen



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1 Application

The UNI-RAD radiant tube burner produces an extremely stable and luminous flame envelope profile that maximizes heat transfer throughout the radiant tube.

The UNIRAD burner system (burner + recuperator) has been developed and finetuned for use on typical W-shaped and U-shaped radiant tubes. It is applied primarily to heat treatment lines in the metals industry.

Each system is custom designed and built for the customer's specific application and technical requirements. For other radiant tube shapes (such as U-tubes), please contact HTS ETO.

The unique design of the Unirad burner allows it to operate over a large range of fuel gas inputs.

The Unirad burner can be fired on NG, LPG, LNG, COG. For other gas qualities, contact HTS ETO.

1.1 Ready for hydrogen



UNI-RAD burner is listed as 100 % H₂ capable and ready for all below H₂ thresholds: 50 %, 30 %, 10 %.

For more Information – see www.docuthek.com

1.2 Application examples

1.2.1 UNI-RAD with plug-in-recuperator

The UNI-RAD burner system consists of two major components: The UNI-RAD burner and the plug-in-recuperator.

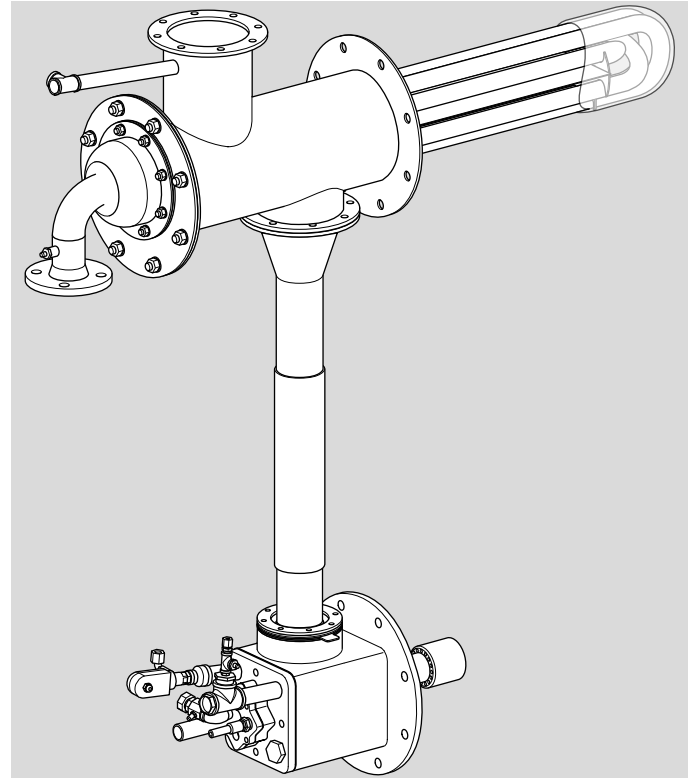
In this application the burner is used together with a four tube recuperator, which allows various settings of flue gas recirculation (FGR) and preheat of combustion air to the burner.



UNI-RAD system with plug-in-recuperator in a W-shaped radiant tube on a strip galvanising line

This combination of the UNI-RAD burner and the plug-in-recuperator allows:

- Fuel saving ranging from 30 to 50 %
- Increased radiant tube alloy life
- Improved furnace temperature uniformity



UNI-RAD + plug-in recuperator

The recuperator can be used on radiant tubes with an inner diameter ≥ 186 mm (7 inch).

Typical length of the radiant tube to allow for full flame development and efficiency is > 4 m (15.7 inch) for the capacity range (100–200 kW LHV).

The interconnection length between the two legs of the radiant tube needs to be larger than 600 mm (23.6 inch).

2 System Design

2.1 Burner model

Capacity

Stable burner operation is guaranteed for the range 100–200 kW lower heating value LHV (Hi).

2.2 Fuel type

The unique design of the Unirad burner allows it to operate over a large range of fuel gas inputs.

The Unirad burner can be fired with natural gas (NG), liquefied petroleum gas (LPG), coke oven gas (COG) and any mixture of nat gas with hydrogen , including 100 % H₂.

2.3 Control methodology

The recommended operation of Unirad burner is in ON/OFF mode. Modulation is possible within certain limits, contact HTS ETO.

Several advantages over modulation can be listed:

- better temperature distribution along radiant tube
- only on/off valves + fixed orifices required
- one-point adjustment (ease)
- probably better global efficiency

2.4 Flame supervision

Flame supervision can only be done with UV-scanners or IR-scanners (infrared).

2.5 Ignition system

Ignition of the Unirad burner is obtained through a plasma type high energy ignition, by providing a zone of ionized air enriched with a small quantity of combustion gas. No conventional spark plug is used, but parts of the burner cup provide the electrical path for the ignition spark. This gives the ignitor an extended life and extremely reliable ignition.

2.6 Combustion air system

2.7 Plug-in recuperator

Efficiency

The typical efficiency of burner and recuperator system is between 64 % and 70 % (Hi). The stack temperature at the outlet of the recuperator may vary in the range 640–750 °C (1184–1382 °F) at 3 % O₂.

NO_x/FGR

The emissions of NO_x are influenced by design and optimised by adapting the flue gas recirculation (FGR) rate. It may vary between 140 and 250 mg/m³ at 3 % O₂ and is function of several parameters, see page 8 (Interaction between parameters).

Combustion air preheat

The recuperator heats up the ambient combustion air using the convection of flue gasses with the recuperator as well as the radiation. The maximum preheat temperature is dependent on tube temperature, and is typically in the range 500–600 °C (932–1112 °F).

3 Certification

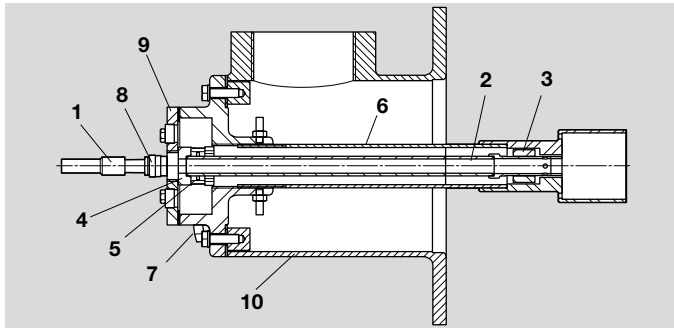
Certificates – see www.docuthek.com

Eurasian Customs Union

The logo for the Eurasian Customs Union, consisting of the letters 'EAC' in a bold, black, sans-serif font, centered within a light gray rectangular background.

The products UNI-RAD meet the technical specifications of the Eurasian Customs Union.

4 Function



Legend

- 1 Ceramic connector
- 2 Gas tube
- 3 Spider centering
- 4 Spider insulator
- 5 Centering insulator
- 6 Air tube
- 7 Observation glass
- 8 Spark igniter
- 9 Back plate
- 10 Burner housing

Burner is a nozzle mix system with an alloy inlet nozzle extending into the firing leg of the radiant tube.

Ignition of the Unirad burner is obtained through a plasma type high energy ignition, by providing a zone of ionized air enriched with a small quantity of combustion gas. No conventional spark plug is used, but parts of the burner cup provide the electrical path for the ignition spark. This gives the ignitor an extended life and extremely reliable ignition.

The major portion of the gas is admitted in a central core and this core is surrounded by the main combustion air supply which produces a long diffusion-type flame. This long flame uniformly heats the radiant tube, maximizing the radiant heat transfer. A small amount of constantly flowing air cools the inlet nozzles and keeps the tips free from carbon build-up.

5 Project planning information

The UNI-RAD burner system is a custom designed system package, including burner and plug-in recuperator, piping and burner control for the specific application.

Project specific valve trains and prewired burner control make these systems easy to install and start-up.

The following information is required to design a radiant tube burner system.

Based on these informations HTS ETO can propose a solution. Note, there is interaction between the tube characteristics and the technical data of the burner/recuperator system. See page 8 (Interaction between parameters).

General data and furnace specification

- Application/furnace
- Furnace temperature and / or radiant tube temperature (min. and max. control temperature, max. safety limit)
- Furnace width
- Height above sea level (AMSL)
- Number of burner units

Radiant tube (RT) data

- Type and material
- Inner and outer tube diameter
- Heated surface
- Center distance between tube legs
- Drawing showing dimensions

System design data

- Burner capacity max and turn-down ratio (min capacity)
- Fuel gas type and composition, calorific value
- Fuel gas pressure available in supply manifold

- Combustion air pressure available in supply manifold
- Pressure in flue gas collector (suction in case of push-pull operation)
- Emission requirements (NO_x, CO, etc)
- Efficiency requirements (flue gas stack temperature)

5.1 Interaction between parameters

There is strong interaction/interdependence between the tube characteristics and the burner/recuperator system. The recuperator is heating up the combustion air and mixing it with flue gas for the burner. Hence changing one parameter brings about change in different other parameters of the whole set. In the table below is illustrated what the impact is of a change of a parameter in the first column – without varying other parameters - on NO_x, stack temperature and efficiency.

| changing parameter | NO _x | Stack temp | efficiency |
|---|-----------------|------------|------------|
| Enlarging heated surface tube | decreasing | decreasing | increasing |
| Increasing flue gas recirculation (FGR) | decreasing | increasing | decreasing |
| Increasing air factor n | increasing | increasing | decreasing |
| Increasing capacity | increasing | increasing | decreasing |
| Increasing process/tube temperature | increasing | increasing | decreasing |

Each new application request needs to be studied, and tests may be required. The solution will be an optimisation of the different parameters to the desire of the customer.

6 Technical data

Gas supply pressure and air supply pressure each depend on the application and gas type.

Gas types:

The Unirad burner can be fired with natural gas (NG), liquefied petroleum gas (LPG), coke oven gas (COG) and any mixture of nat gas with hydrogen , including 100 % H₂.

Combustion air:

The air must be dry and clean in all temperature conditions and must not contain condensate.

Control type:

ON/OFF mode. Modulation is possible within certain limits, contact HTS ETO.

Flame control:

UV-scanners or IR-scanners.

Ignition:

Plasma type high energy ignition.

Capacity:

Stable burner operation is guaranteed for the range 100–200 kW lower heating value LHV (Hi).

Efficiency (burner and recuperator system):

Between 64 % and 70 % (Hi).

Temperature:

Stack temperature:

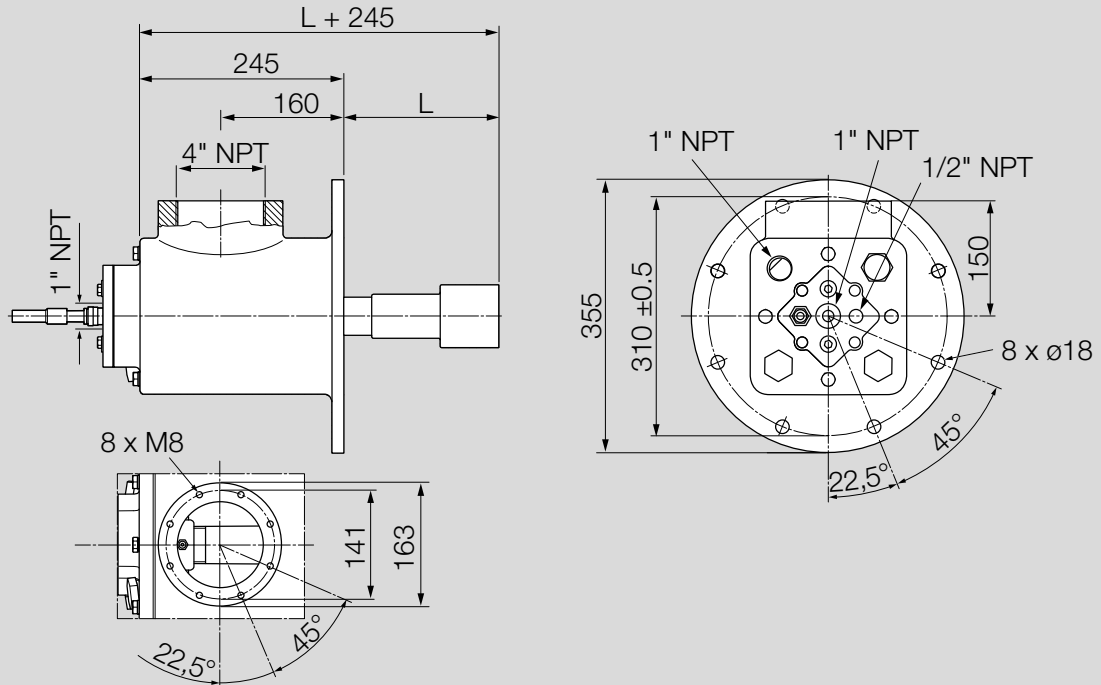
at the outlet of the recuperator may vary in the range 640–750 °C (1184–1382 °F) at 3 % O₂.

Preheat temperature (dependent on tube temperature):
max. 500–600 °C (932–1112 °F).

NOx (optimised by FGR):

Vary between 140 and 250 mg/m³ at 3 % O₂.

6.1 Dimensions



L is adaptable or chosen by customer.

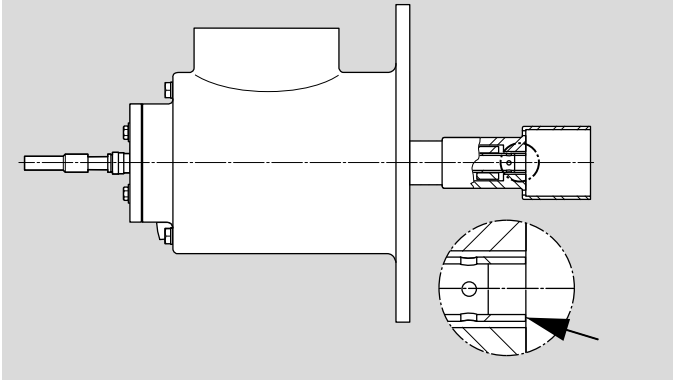
7 Converting units

See www.adlatus.org

8 Maintenance cycles

Twice per year, but if the media are highly contaminated, this interval should be reduced.

Notice when assembling the burner



The end of gas nozzle must be flush with the inner face of the burner tip.

9 Spare Parts

The web app PartDetective for selecting spare parts is available at www.adlatus.org.

For more information

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Eclipse, Exothermics, Hauck, Kromschröder and Maxon. To learn more about our products, visit ThermalSolutions.honeywell.com or contact your Honeywell Sales Engineer.

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