Design and Application Details

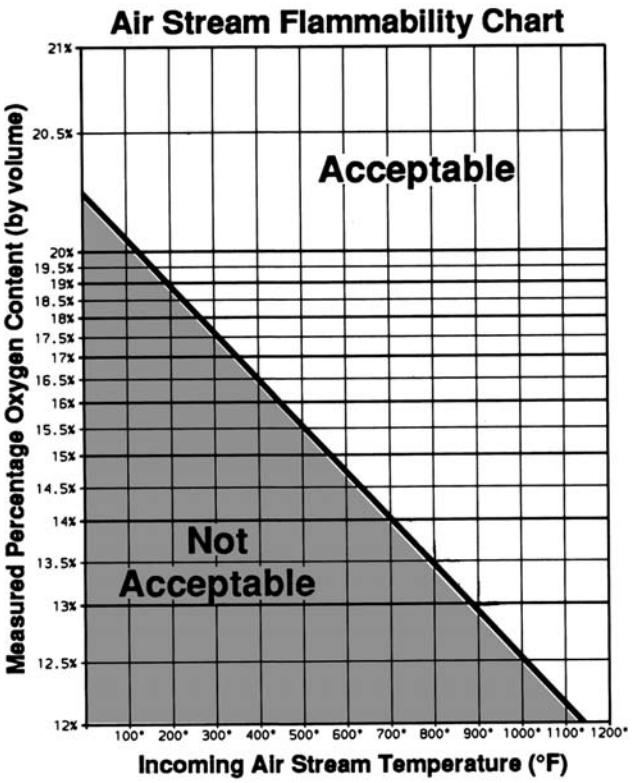
Determine air stream flammability limits and/or minimum oxygen content levels.

Since oxygen content within the effluent is critical to the flammability range of any raw gas type burner, it also directly affects the maximum capacity (Btu/hr) of a Circular INCINO-PAK® Burner.

The chart (below) graphically relates the incoming air stream temperatures (°F) and the measured percentage of oxygen remaining in this effluent.

Any combination of temperature and oxygen level falling above the raw gas firing diagonal line should support combustion with a raw gas Circular INCINO-PAK® Burner system.

CAUTION: Combinations of incoming temperatures and measured percent of oxygen falling **below** the diagonal line **are not acceptable applications for the raw gas Circular INCINO-PAK® Burner.** Alternate choices may be selected from Maxon catalog sections 4200 and/or 5700.



Profiling for higher temperature applications

When calculating profile dimensions for Circular INCINO-PAK® Burner systems in applications with higher inlet air temperatures, greater temperature rises, and/or variable air stream volumes, the effluent with elevated temperatures and densities must be considered.

Burner Design Parameters

Temperature limits:

Maximum Temperatures	Inlet	1200°F (649°C)
	Outlet	1700°F (927°C)

Burner net free areas:

4M size	110 square inches
8M size	170 square inches

Calculating Circular INCINO-PAK® Burner capacity requirements in effluent air streams:

Sample calculations for designing a raw gas Circular INCINO-PAK® Burner system for a thermal fuel incinerator (with 16+% oxygen level) are provided on the following page.

To calculate heat requirements, you must know:

_____ SCFM of effluent air stream

_____ °F inlet air temperature

_____ °F outlet air temperature

Performance Selection Data

Design procedure and calculation example *(continued)*

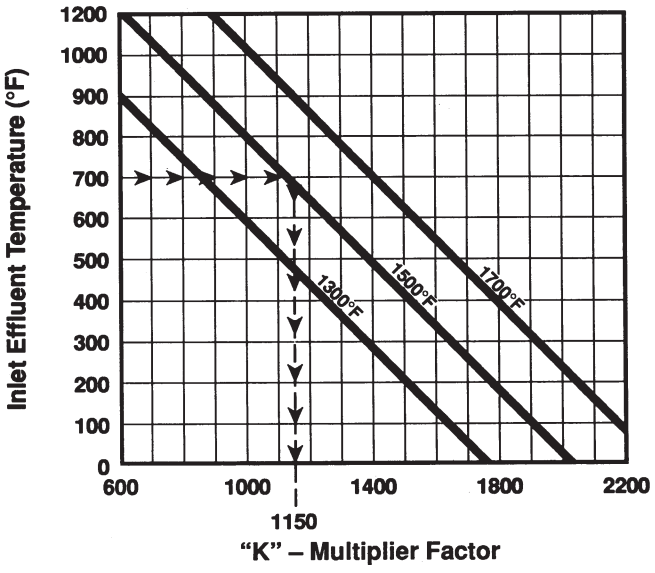
General Selection Procedure

1. **Determine available oxygen level in air stream to be heated.**
   For a raw gas application, we will use 16+% oxygen level.
2. **Determine the SCFM of air through the incinerator. Include any variations in this flow.**
   For our calculations, we will use a constant volume air fan of 5000 SCFM.
3. **Determine inlet temperature of effluent to Circular INCINO-PAK® Burner.**
   We will use inlet temperature of 700°F.
4. **Determine outlet or discharge temperatures from the incinerator.**
   For our example, we will design for 1500°F.
5. **Calculate maximum total heat required.**

Btu/hr = SCFM x "K"
(from step 2) (from chart below)

Multiply SCFM of air by multiplier (K), which combines hypothetical available heat and a 1.08 composite air heating factor to give the value in Btu required being "gross heating value" of fuel. Since multiplier (K) varies with inlet and discharge air temperature, the various factors are graphically shown below:

For 1300°F, 1500°F and 1700°F discharge temperatures



$$\text{Evolvement of "K"} = \left(\frac{\text{CFH gas}}{\text{SCFM air}}\right) \times 1000$$

Enter chart at 700°F inlet temperature line (from step 3); follow across to intersect the 1500°F discharge temperature sloped line, then drop straight down to read the "K" multiplier factor of 1150.

Therefore, the maximum heat input required:

Btu/hr = 5000 SCFM x 1150 = 5,750,000

Calculating Circular INCINO-PAK® Burner profile opening:

6. "Net" profile opening calculations:

$$\textbf{Net Area (in}^2\textbf{)} = \frac{\textbf{ACFH}}{\textbf{1655 x "K" x } \sqrt{\dfrac{\textbf{inches wc drop}}{\textbf{specific gravity}}}}$$

$$\textbf{ACFH} = \text{SCFM} \times \left(\frac{460 + \text{inlet temp.}}{460 + \text{ambient temp.}}\right) \times 60 \text{ min/hr}$$

"K" = 0.78 orifice coefficient for Circular INCINO-PAK® Burner profile opening

Inches wc drop = desired pressure drop (see optimum range on page 5755)

$$\textbf{Specific gravity} = 1.0 \times \left(\frac{460 + \text{ambient temp.}}{460 + \text{inlet temp.}}\right)$$

7. "Gross" opening calculations:

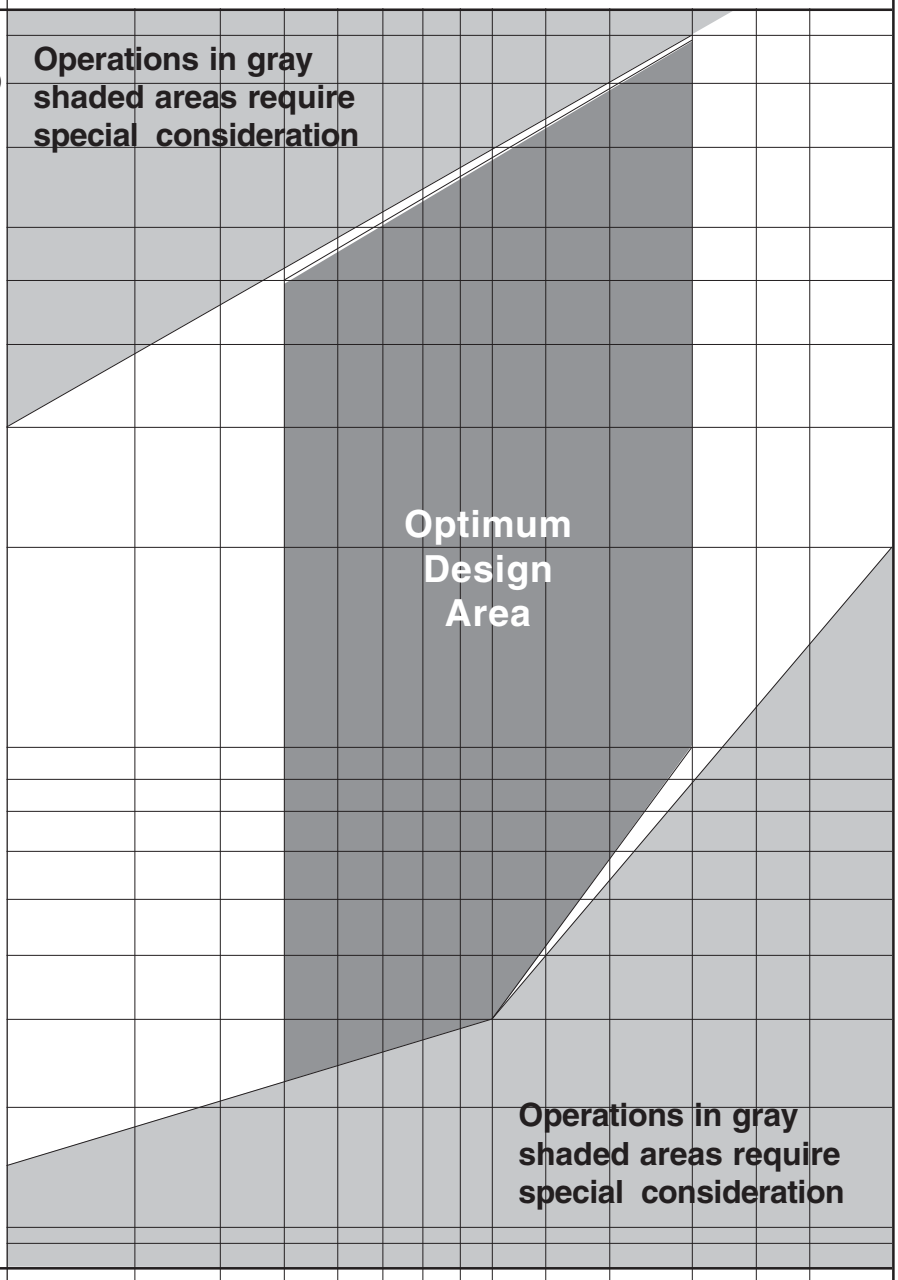
Gross opening =
net area (from step 6) + (425.6 in² (approx. area of extension sleeve blockage) – burner net free area (from chart pg. 5753))

$$\textbf{Radius} = \sqrt{\frac{\text{Gross opening}}{3.14}}$$

Diameter = 2 x radius

Performance Selection Data

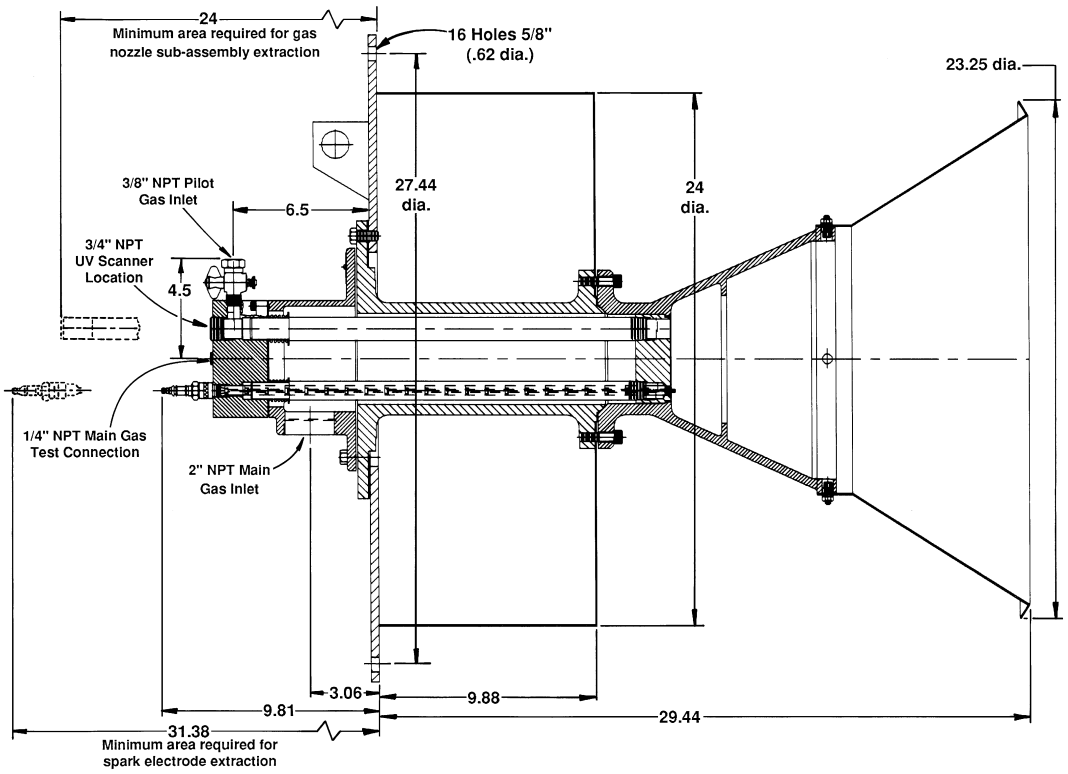
Required natural gas inlet pressures (in inches wc) for capacities shown	Capacities (Btu/hr)	
	4M	8M
18" wc	6,000,000	12,000,000
12.5" wc	5,000,000	10,000,000
8" wc	4,000,000	8,000,000
4.5" wc	3,000,000	6,000,000
3.2" wc	2,500,000	5,000,000
2" wc	2,000,000	4,000,000
1.125" wc	1,500,000	3,000,000
0.5" wc	1,000,000	2,000,000
0.125" wc	500,000	1,000,000
	450,000	900,000
0.08" wc	400,000	800,000
	350,000	700,000
	300,000	600,000
0.03" wc	250,000	500,000
	200,000	400,000
	150,000	300,000
0.005" wc	100,000	200,000
	50,000	100,000



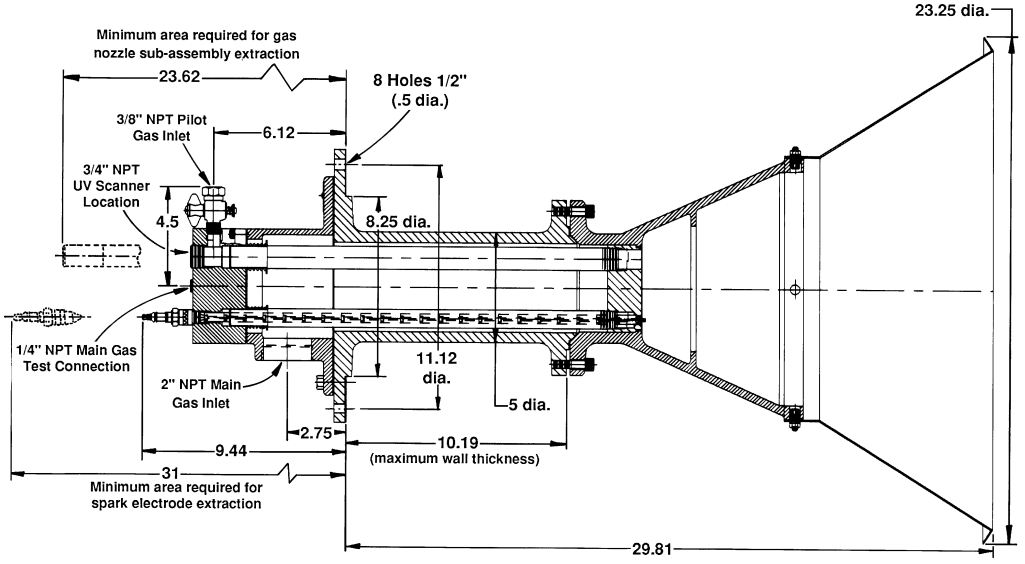
Duct static pressure drop through profile plate (inches wc)	0.2	0.3	0.4	0.5	0.7	0.9	1.0	1.2	1.5	2.0	2.5	3.0	4.0	
Approximate air stream velocities (SFPM)	1500	1750	2000	2500	3000	3500	4500	5500						

Envelope Dimensions (in inches)

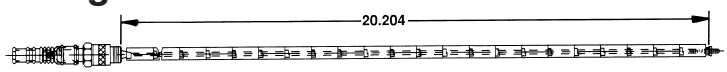
Series "G" Circular INCINO-PAK® Burner with wall mounting plug



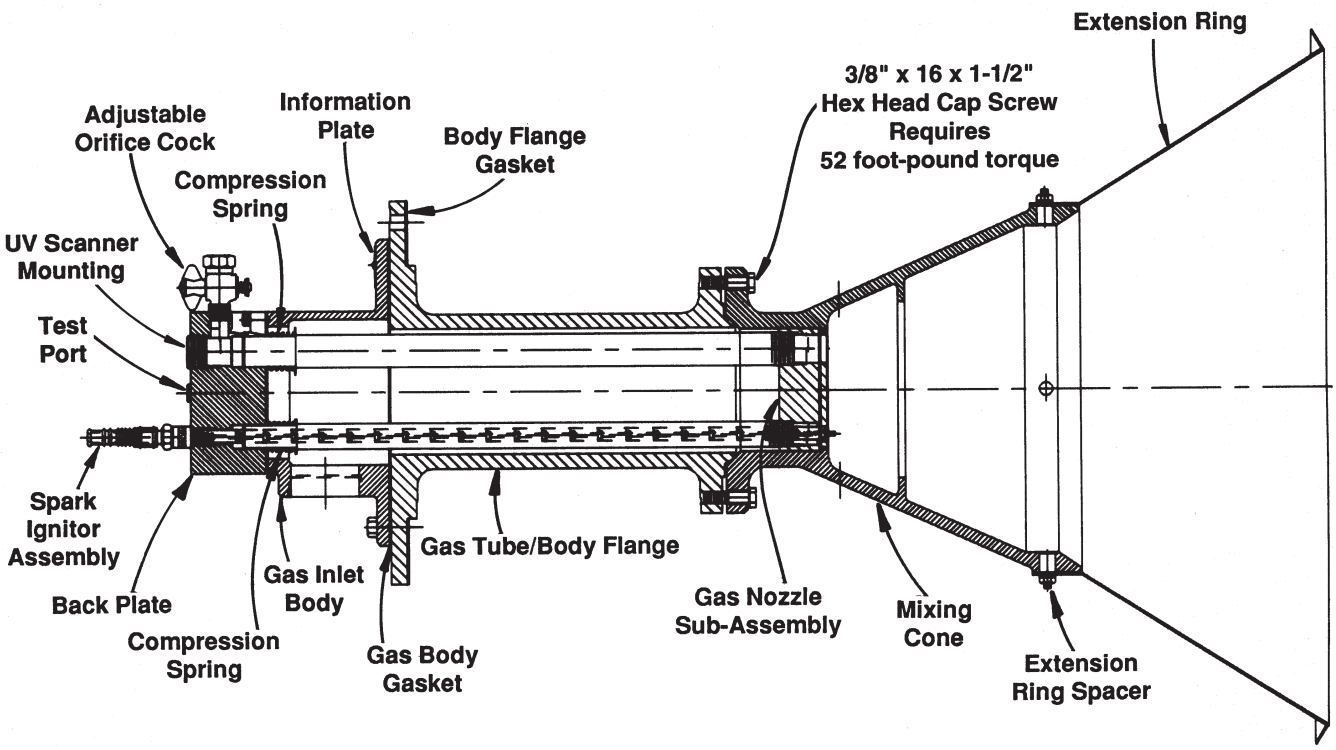
Series "G" Circular INCINO-PAK® Burner for through-wall mounting



Spark Ignitor



Component Identification



Suggested spare parts

– Spark ignitor assembly
– Extension ring

To order parts for an existing Circular INCINO-PAK® Burner assembly, list:

1. Name(s) or part(s) from above illustration
2. Quantity of each required
3. Burner nameplate information:
   - size and series number of burner
   - designation
   - if available, serial number of Maxon fuel shut-off valve in-line to burner (This serial number is on Maxon valve's nameplate.)

Nameplate

Notes