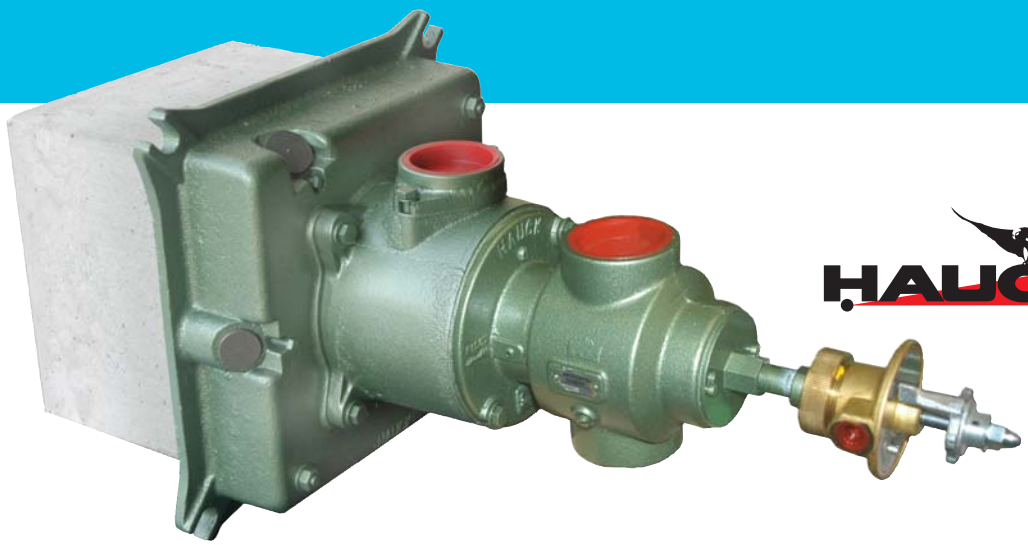
NMC

Nozzle Mix Gas/Oil Combination Burners

NMC-1
Edition 10-08



- Burns most gaseous fuels and No. 2 oil
- Sealed-in capability
- Stable flame over entire operating range
- Preheated air to 800°F (425°C)
- Gas pilot ignition
- Wide turndown
- Low maintenance

www.hauckburner.com

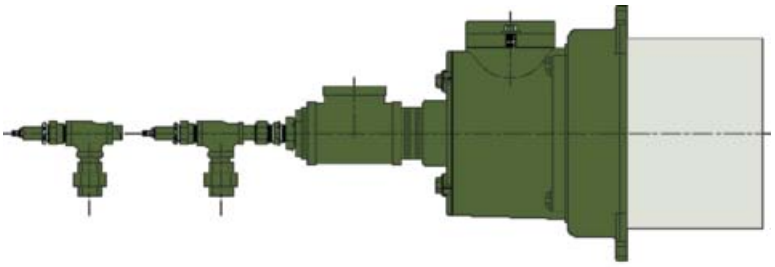
Hauck's NMC nozzle mix gas/oil combination burners are designed for applications requiring a general purpose, long life, low maintenance burner.

Operation. Combustion air and fuel are channeled into the burner nozzle separately, permitting wide turndown. Since the burner nozzle is sealed into the refractory tile, all combustion air is supplied through the burner. The NM series burners couple a uniform flame front with flame stability over the entire operating range.

NM burners are available for preheated air operation up to 800°F (425°C) for high temperature furnace applications. Atomizing air is maintained at ambient conditions during preheated air operation.

The burners can be controlled manually or automatically. Automatic control normally employs a ratio regulator for each control zone or burner to maintain air-fuel ratio. An alternate system uses control valves in each of the fuel and air lines, linking the valves to a single motor controller.

Use of the NM in recuperative systems results in an economical approach to energy savings.



Gas Pilot Ignited NMC Burner

Construction. With no moving parts, the burner is virtually maintenance free. Parts subject to heat are constructed of either heat resistant cast iron or stainless steel. Special refractory materials and jacketed tiles can be supplied upon request.

Mounting. The burner, mounting plate and refractory tile are shipped as an assembled unit. The burner can be mounted to fire in horizontal or vertical down position. The air connection can be rotated to any of three other positions.

Each NM burner is equipped with companion flanges on the main air connections to permit easy burner installation and removal and allow the mounting of an orifice plate for reduced air flows, if required.

Ignition. The burner mounting plate includes a port for the gas pilot ignition system. The pilot is required for initial burner ignition only and is not required to maintain ignition.

Flame Supervision. The NM mounting plate is provided with a port for monitoring the pilot and main flame using a UV scanner or other suitable device.

For additional information on this product, visit our website at:

www.hauckburner.com

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NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED
AMBIENT AIR MODELS

ON RATIO GAS	NMC BURNERS NO.	AIR PRESSURE 4 oz. AIR CFM	4 oz. BTU CAP IN 1000 BTU/hr	6 oz. AIR CFM	6 oz. BTU CAP IN 1000 BTU/hr	8 oz. AIR CFM	8 oz. BTU CAP IN 1000 BTU/hr	12 oz. AIR CFM	12 oz. BTU CAP IN 1000 BTU/hr	16 oz. AIR CFM	16 oz. BTU CAP IN 1000 BTU/hr	20 oz. AIR CFM	20 oz. BTU CAP IN 1000 BTU/hr	24 oz. AIR CFM	24 oz. BTU CAP IN 1000 BTU/hr
	210	35.5	193	43.4	237	50.2	278	62.6	341	72.1	393	81.1	442	88.8	484
	215	70	382	86	469	99	540	121	660	140	764	157	856	172	938
	220	132	720	161	878	186	1015	228	1244	263	1435	294	1604	322	1757
	230	272	1484	333	1817	385	2100	471	2569	544	2968	608	3317	666	3633
	240	413	2253	505	2755	583	3180	714	3895	825	4500	922	5030	1011	5515
	260	780	4255	955	5210	1103	6017	1351	7370	1560	8510	1744	9514	1911	10425

Table 1.

ON RATIO OIL	NMC BURNER NO.	AIR PRESSURE 4 oz. PRI AIR CFM @ 16 oz.	4 oz. SEC AIR CFM	4 oz. BTU CAP IN 1000 BTU/hr	4 oz. OIL CAP GPH	8 oz. PRI AIR CFM @ 16 oz.	8 oz. SEC AIR CFM	8 oz. BTU CAP IN 1000 BTU/hr	8 oz. OIL CAP GPH	16 oz. PRI AIR CFM @ 16 oz.	16 oz. SEC AIR CFM	16 oz. BTU CAP IN 1000 BTU/hr	16 oz. OIL CAP GPH	20 oz. PRI AIR CFM @ 20 oz.	20 oz. SEC AIR CFM	20 oz. BTU CAP IN 1000 BTU/hr	20 oz. OIL CAP GPH	24 oz. PRI AIR CFM @ 24 oz.	24 oz. SEC AIR CFM	24 oz. BTU CAP IN 1000 BTU/hr	24 oz. OIL CAP GPH
	210	7.2	38.4	228	1.65	7.2	54	306	2.21	7.2	72	396	2.86	8.0	81	445	3.22	8.8	89	489	3.54
	215	14.3	70	422	3.0	14.3	99	567	4.1	14.3	140	773	5.6	16.0	157	865	6.3	17.5	172	948	6.9
	220	28.3	132	802	5.8	28.3	186	1072	7.8	28.3	263	1458	10.6	31.6	294	1628	11.8	34.7	322	1785	12.9
	230	57	272	1645	11.9	57	385	2210	16.0	57	544	3005	21.8	64	608	3360	24.3	70	666	3680	26.7
	240	76	413	2445	17.7	76	583	3295	23.9	76	825	4505	32.6	85	922	5035	36.3	93	1011	5520	40.6
	260	148	780	4640	33.6	148	1103	6255	45.3	148	1560	8540	61.9	165	1744	9545	69.2	181	1911	10460	75.8

Table 2.

NOTES FOR TABLES 1 AND 2:

1- Fuel Capacity based on 138,000 BTU/gal oil and 20% excess air. Natural gas 1040 BTU/Cu Ft. with 10% excess air.
2- Air pressure is "total pressure" measured 6 pipe diameters from burner.
3- Oil Pressure should be at least 5-10 psig at the burner and 30-50 psig upstream of the oil ratio regulator.
4- Natural gas pressure required at the burner is 6" w.c. for capacities listed at 16 oz. air pressure.
5- When firing on gas only, the primary air must be used along with the secondary air and must be set at 4" w.c. minimum.
6- When firing on oil only, the primary air must be set as specified in Table 2.

GAS - MAXIMUM % EXCESS AIR

NMC BURNER NO.	AIR PRESSURE 4 oz	8 oz	16 oz
210	735	1080	748
215	600	600	600
220	600	600	600
230	600	600	600
240	200	300	400
260	400	600	400

Table 3.

OIL - MAXIMUM % EXCESS AIR

NMC BURNER NO.	AIR PRESSURE 4 oz	8 oz	16 oz
210	180	292	307
215	200	250	350
220	100	170	350
230	100	250	400
240	100	350	400
260	400	500	500

Table 4.

PREHEATED AIR MODELS

(Air Flow @ 16 osig)

NMC BURNER NO.	ITEM	SECONDARY AIR TEMP., °F 100	400	650	800	EXCESS AIR, % GAS	OIL
	Primary air, scfm (cold)	7.2	7.2	7.2	7.2		
	Secondary air, scfm	72	58	51	48		
H210	Natural gas capacity, scfh	392	316	278	261	200	30
	Oil Capacity, gph @ 20% excess air	2.6	2.1	1.8	1.7		
	Primary air, scfm	14.3	14.3	14.3	14.3		
	Secondary air, scfm	140	113	99	93		
H215	Natural gas capacity, scfh	854	645	570	537	200	100
	Oil Capacity, gph	5.7	4.7	4.2	4.0		
	Primary air, scfm	28.3	28.3	28.3	28.3		
	Secondary air, scfm	263	212	187	175		
H220	Natural gas capacity, scfh	1614	1214	1074	1010	200	100
	Oil Capacity, gph	10.7	8.9	7.9	7.5		
	Primary air, scfm	57	57	57	57		
	Secondary air, scfm	544	439	386	363		
H230	Natural gas capacity, scfh	3330	2510	2219	2088	200	150
	Oil Capacity, gph	22.2	18.3	16.3	15.5		
	Primary air, scfm	76	76	76	76		
	Secondary air, scfm	825	666	586	550		
H240	Natural gas capacity, scfh	4992	3793	3352	3152	150	150
	Oil Capacity, gph	33.2	27.3	24.4	23.1		
	Primary air, scfm	148	148	148	148		
	Secondary air, scfm	1560	1259	1108	1040		
H260	Natural gas capacity, scfh	9463	7178	6343	5966	150	200
	Oil Capacity, gph	63.0	51.9	46.3	43.8		

CAPACITY TABLE AND APPLICATION NOTES

1. Fuel capacity based on light oil at 138,000 Btu/gal and natural gas at 1040 Btu/cu ft.
2. Natural gas flows shown for 10% excess air, 6"wc inlet pressure. Oil flow capacities computed for 20% excess air.
3. Primary air scfm shown at 16 osig pressure for oil atomization on all model. Set primary air at 1 osig when firing models H210 through H260 on gas.
4. Primary air flow stated at ambient temperature at 16 osig. Do not heat primary air.
5. Combustion air capacities at 16 osi total pressure. Air flows at lower pressures proportional to $\sqrt{P/16}$. Air flows at intermediate temperatures proportional to $\sqrt{\frac{860}{T_h+460}}$ times the flow at 400°F.
6. Include sensible heat of preheated air when computing total burner heat output. Sensible heat Btu/hr = scfm x 1.11 x ΔT(°F).
7. Maximum % excess air limits (approximate) shown for 16 osig secondary air pressure.
8. Turndown on gas approx. 8:1 at 400°F, 7:1 at 800°F; turndown on oil approx. 4:1.
9. To size pipe for preheated air, compute acfm = scfm ($\frac{T+460}{520}$).
10. When supervising flame, provide approximately 16 osig ambient purge air (1-1/2 – 2 cfm) to standardl scanner purge assembly.
11. Flame lengths are shown in Hauck Application Sheet GJ58.
12. When sizing blower, consider application and operation so as to prevent overloading the blower motor at ambient scfm.

ALL MODELS:
See burner selection data, Hauck sheet NMC-4, Supplemental Data

BURNER SELECTION

The capacities shown in Hauck sheet NMC-2 should be used when selecting the burner size required for applications demanding maximum Btu release. The Btu capacities are based on 10% excess air (slightly oxidizing condition for optimum performance). The turndown requirement may affect the burner selection in that a higher air pressure generally affords a greater turndown. The limits of turndown are also affected by the limits of the control system. With a ratio control system, a turndown range of 10:1 on gas and 5:1 in oil is normal. Under favorable conditions and depending on application environment, an even wider range of turndown is possible. The NMC burner can be used on applications where firing on "excess fuel" is required (up to 25% for oil and 100% for gas). Applications of this type require that the burner be fired into a chamber in which sufficient oxygen exists to complete combustion.

CONSTANT EXCESS AIR SYSTEM

In this system, the air-gas ratio is held constant as the Btu/hr is varied. The temperature of the products of combustion entering the furnace remain constant.

BURNER SELECTION. To select a burner using a constant excess air system, proceed as follows:

1. Determine the % of excess air, using Figure 3, required for the desired temperature of the products of combustion.
2. Determine the Btu requirement of burner.
3. Calculate the air requirements of the burner using the following formula:
   $\frac{\text{BTU} \times (\%\ \text{excess air} + 100)}{600{,}000} = \text{CFM air through burner}$
4. Select a burner from Table 1 which has the air capacities calculated in step 3.
5. Determine the excess air ability of the selected burner using Table 3 or Table 4. If the excess air ability is insufficient or greatly exceeded, select the next larger or smaller burner, as required.

VARIABLE EXCESS AIR SYSTEM

In this system the burner is selected for it's "on ratio" capacity, turndown is obtained by keeping the air fully on and reducing only the fuel input.

BURNER SELECTION. To select a burner using a variable excess air system, proceed as follows:

1. Determine the required minimum and maximum Btu/hr input and minimum temperature of the products of combustion.
2. Select, from Table 1, the burner size and air pressure necessary to satisfy the maximum Btu/hr requirement.
3. Determine the excess air ability of the selected burner using Table 3 or Table 4.
4. Calculate the minimum Btu/hr rating of the selected burner using the following formula:
   $\text{Minimum Btu/hr} = \frac{\text{Air CFM rating of burner} \times 600{,}000}{\%\ \text{excess air rating of burner} + 100}$
5. Determine the minimum temperature of the products of combustion from Figure 3. If either the minimum capacity or minimum temperature is less than required, the burner selection is correct. If not, repeat the process with a larger or smaller burner as required.

EFFECTS OF EXCESS AIR

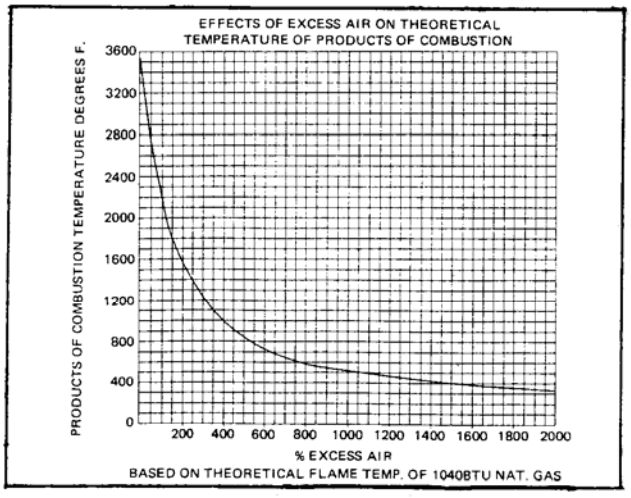


Fig. 3 – Chart No. GY834

TO USE CHART–Determine maximum temperature at which combustion gases are to enter furnace. Follow that temperature line horizontally from scale on the left until it intersects curve; then drop vertically down to read % excess air required at bottom.

NM NOZZLE MIX BURNERS
FLAME LENGTHS

This sheet provides approximate flame length and diameter for Hauck NM Nozzle Mix Burners. These guidelines are furnished to aid in the proper selection of a NM burner for a specific furnace application.

Flame length will vary depending upon actual operating conditions. A *shorter* flame can be expected with higher temperature furnace and a faster burning gas. A *longer* flame can be expected with less excess air in the furnace, slower burning gas, and very high draft (parallel flow).

Size	Fuel	Capacity Btu/hr	Flame Length	Flame Diameter
NM210	Oil	371,000	1.5 Ft	6"
NM210	Gas	365,000	1.5 Ft	6"
NM215	Oil	722,000	3.0 Ft	7"
NM215	Gas	764,000	3.0 Ft	6"
NM220	Oil	1,458,000	3.5 Ft	10"
NM220	Gas	1,435,000	3.5 Ft	9"
NM230	Oil	3,005,000	5.0 Ft	12"
NM230	Gas	2,968,000	4.5 Ft	12"
NM240	Oil	4,505,000	6.5 Ft	15"
NM240	Gas	4,500,000	5.5 Ft	14"
NMC260	Oil	8,540,000	9.5 Ft	21"
NMC260	Gas	8,510,000	7.5 Ft	18"
NMG260	Gas	8,510,000	9.0 Ft	26"

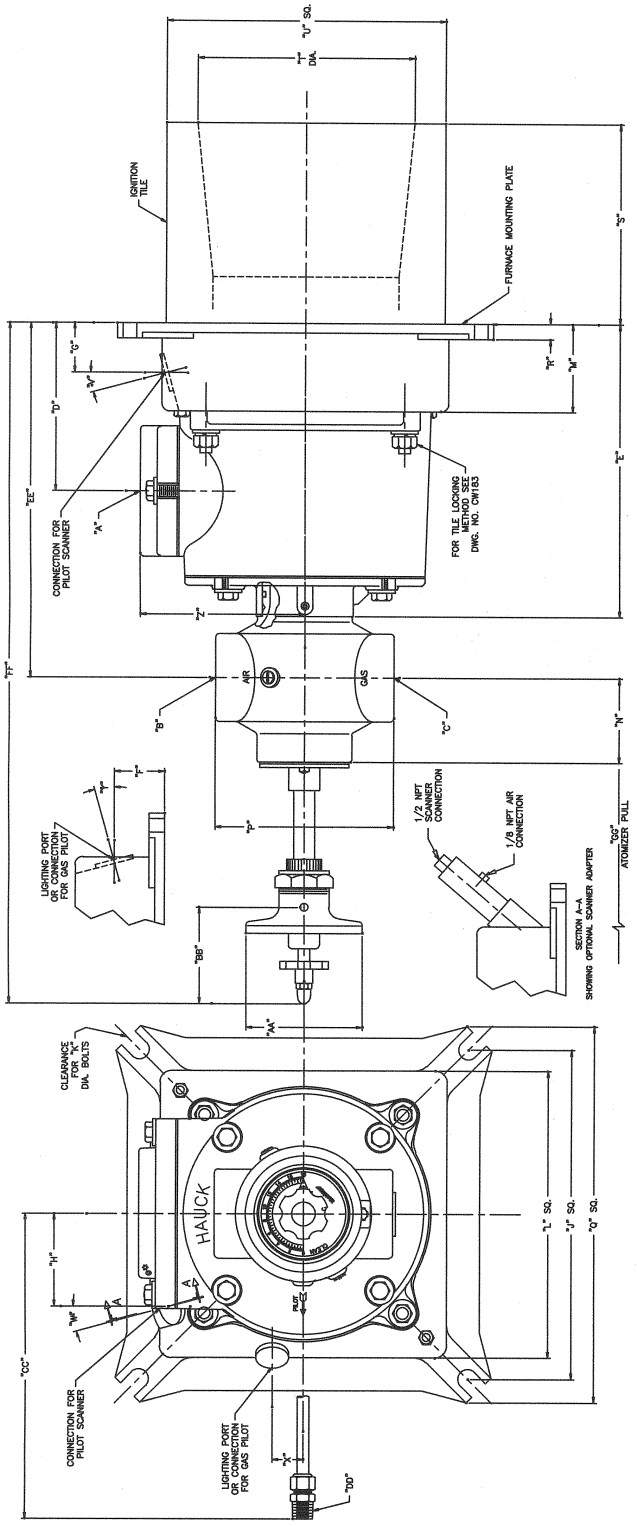
NOTE

Combustion air capacities at 16 osi total pressure
Gas capacity based on 10% excess air
Oil capacity based on 20% excess air

Flame lengths measured at stoichiometric burner operation
Flame length (estimate) at 24 osig; add 20%
Flame length (estimate) at 8 osig; subtract 15%

Flame lengths were measured in Hauck's laboratory furnace using natural gas, No. 2 oil and room air in a cold (ambient temperature) furnace and medium draft conditions (0-.2" wc). Excess air was available in the furnace although burner ratio conditions were as stated above.

NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED
NM210 – NM240



BURNER NO.	DIMENSIONS IN INCHES																																	
	AIR INLET NPT	AIR INLET NPT	GAS INLET NPT																															
	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"J"	"K"	"L"	"M"	"N"	"P"	"Q"	"R"	"S"	"T"	"U"	"V"	"W"	"X"	"Y"	"Z"	"AA"	"BB"	"CC"	"DD"	"EE"	"FF"	"GG"
NMC 210B	1	1	1	4 3/8	7 1/16	1 9/16	1 13/16	1 3/4	7 3/8	3/8	6 3/4	2 3/4	2 3/8	4 3/8	8 5/8	7/16	5	4	6	30°	15°	0	30°	3 11/16	3 1/16	3 1/8	20	3/8	8 5/8	19 1/4	16 7/16
NMC 215B	1 1/2	1	1	4 5/8	7 9/16	1 1/2	2	1 7/8	9	3/8	8 1/4	2 3/4	2 3/8	4 3/8	10 1/4	1/2	5	4 5/16	7 1/2	30°	13°	0	30°	3 1/2	3 1/16	3 1/8	20	3/8	9 3/8	19 7/8	16 1/2
NMC 220B	2	2	2	4 7/8	8 1/8	1 13/16	1 7/8	2 3/4	10 5/8	5/8	9 7/8	2 3/4	2 3/4	5 3/4	12 1/8	1/2	6 1/2	5 1/2	9	40°	15°	0	47°	4 1/8	3 1/16	3 1/8	20	3/8	10 1/8	21 1/8	17 1/16
NMC 230B	3	2	2	5 1/2	9 11/16	1 13/16	1 7/8	2 3/4	10 5/8	5/8	9 7/8	2 3/4	2 3/4	5 3/4	12 1/8	1/2	6 1/2	7	9	40°	15°	0	47°	5 5/16	3 1/16	3 1/8	20	3/8	11 9/16	21 5/16	18 1/16
NMC 240C	4	2 1/2	2 1/2	8 7/8	14 7/16	2 5/16	1 1/4	3 1/4	17 1/4	5/8	16	3 1/16	3 3/16	7 1/16	19 3/4	5/8	11 5/16	9 1/2	14 3/4	39°	0°	1	56°	7 5/8	3 1/16	3 1/8	20	3/8	17	29 13/16	25 1/8

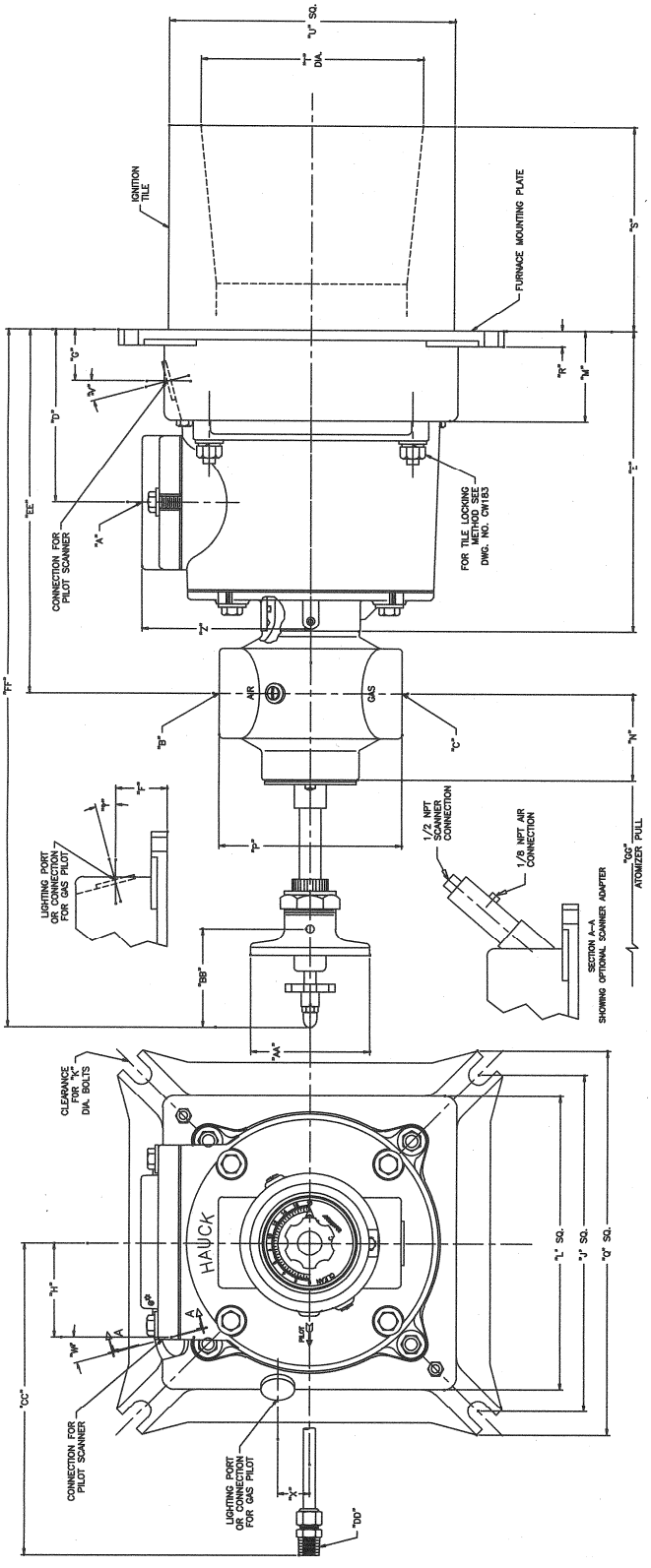
Y2466
(NOT TO SCALE)

* ALL PRESSURE TAPS 1/8" NPT
NO PRESSURE TAP ON AIR INLET FLANGE ON NMG 210, 215 & 220

(See Reverse Side For Metric Dimensions)

METRIC DIMENSIONS

NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED
NM210 – NM240

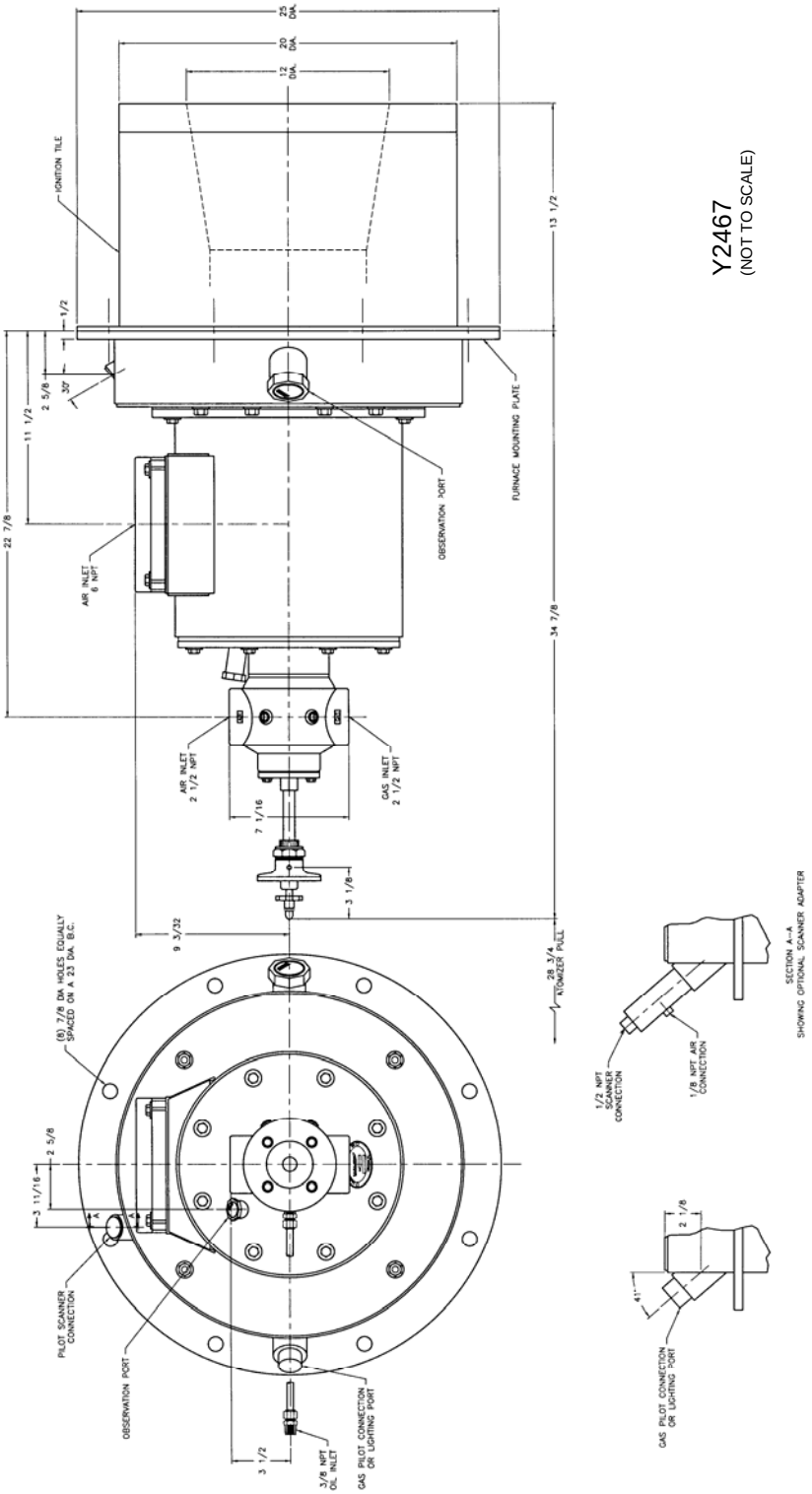


BURNER NO.	AIR INLET NPT	AIR INLET NPT	GAS INLET NPT	DIMENSIONS IN MILLIMETERS																												
	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"J"	"K"	"L"	"M"	"N"	"P"	"Q"	"R"	"S"	"T"	"U"	"V"	"W"	"X"	"Y"	"Z"	"AA"	"BB"	"CC"	"DD"	"EE"	"FF"	"GG"
NMC 210B	1	1	1	111	179	40	46	44	187	10	171	70	60	111	219	11	127	102	152	30°	15°	0	30°	94	78	79	508	3/8	219	489	418
NMC 215B	1 1/2	1	1	117	192	38	51	48	229	10	210	70	60	111	280	13	127	110	191	30°	13°	0	30°	89	78	79	508	3/8	238	505	419
NMC 220B	2	2	2	124	206	46	48	70	270	16	251	70	70	146	308	13	165	140	229	40°	15°	0	47°	105	78	79	508	3/8	257	537	433
NMC 230B	3	2	2	140	246	46	48	70	270	16	251	70	70	146	308	13	165	178	229	40°	15°	0	47°	135	78	79	508	3/8	294	541	459
NMC 240C	4	2 1/2	2 1/2	225	357	59	32	83	438	16	406	78	81	179	502	16	287	241	375	39°	0°	1	58°	194	78	79	508	3/8	432	757	638

Y2466 METRIC
(NOT TO SCALE)

* ALL PRESSURE TAPS 1/8" NPT
NO PRESSURE TAP ON AIR INLET FLANGE ON NMG 210, 215 & 220

NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED
NMC260



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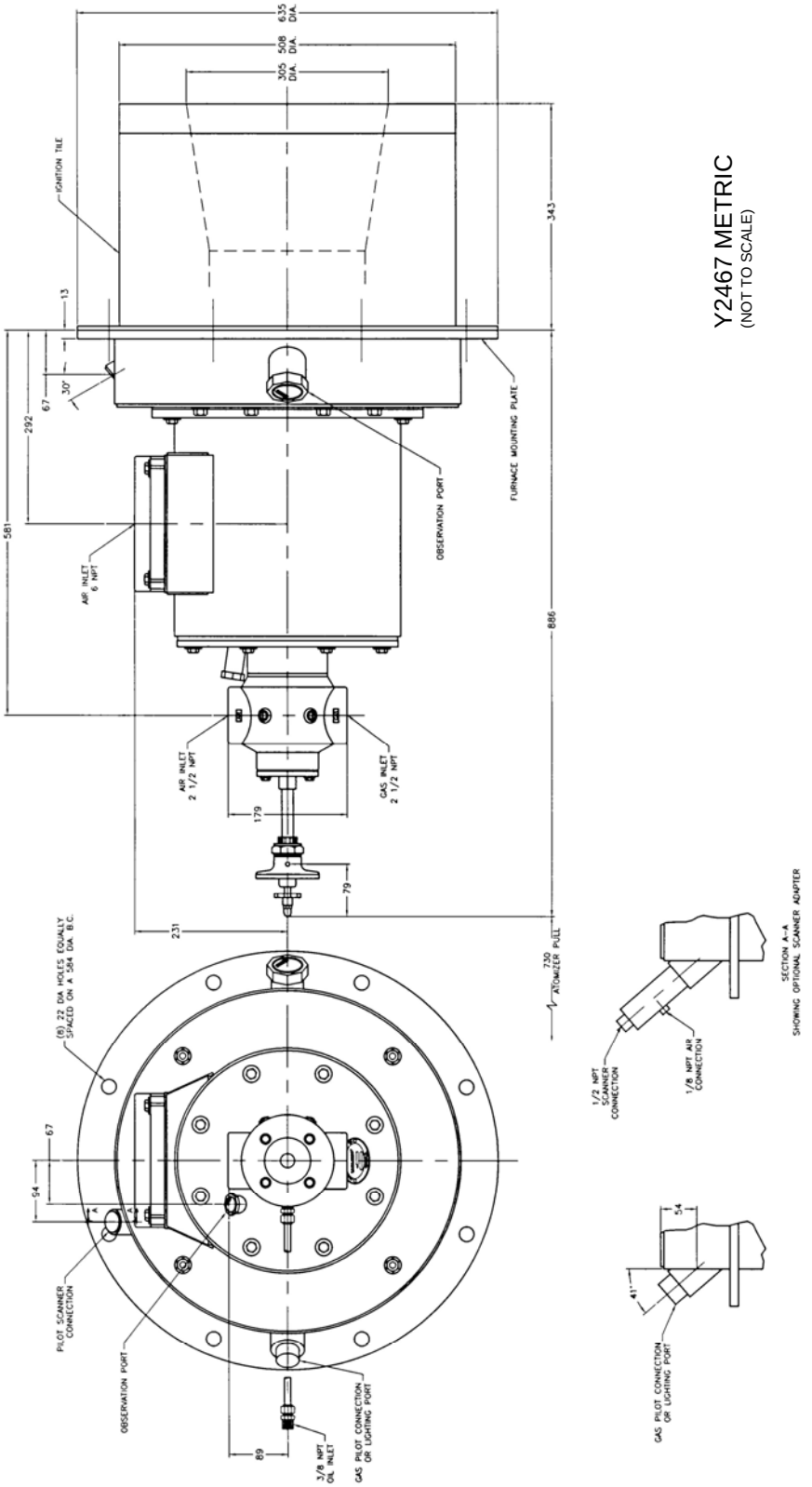
(See Reverse Side For Metric Dimensions)

METRIC DIMENSIONS

NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED
NMC260

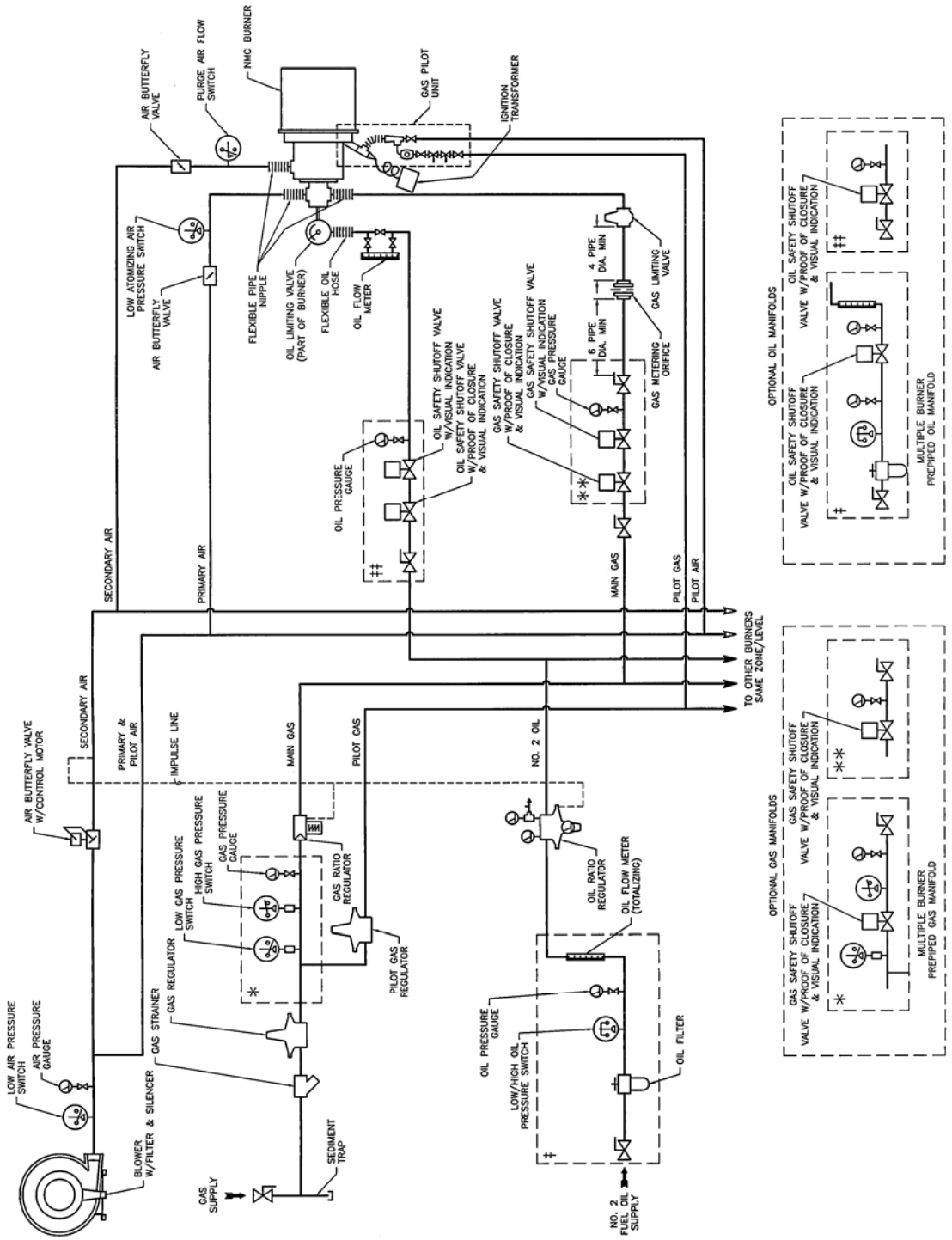


Y2467 METRIC
(NOT TO SCALE)

NOTE:
1. ALL DIMENSIONS ARE IN MM.

NMC NOZZLE MIX BURNERS
COMBINATION FUEL FIRED

TYPICAL MULTIPLE BURNER SYSTEM
RATIO CONTROL



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(NOT TO SCALE)

NOTES:
1. OIL RATIO REGULATOR OUTLET CAN NOT BE LOCATED MORE THAN 6" (152MM) LOWER AND NEVER HIGHER THAN THE CENTER LINE OF THE BURNER OIL VALVE FOR HORIZONTALLY MOUNTED BURNERS. OIL RATIO REGULATOR MUST BE MOUNTED WITHIN 20' (6M) OF LESS OF THE OIL BURNERS. IF BURNERS IN THE ZONE ARE MOUNTED AT DIFFERENT ELEVATIONS, ADDITIONAL OIL RATIO REGULATORS ARE REQUIRED (CONSULT HAUCK).
2. OPTIONAL GAS MANIFOLDS CAN BE UTILIZED FOR MULTIPLE BURNERS FIRING INTO A COMMON HEATING CHAMBER, HOWEVER, SPECIAL FEATURES ARE REQUIRED IN THE ASSOCIATED CONTROL SYSTEM (SEE HAUCK APPLICATION SHEET GJ76).

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