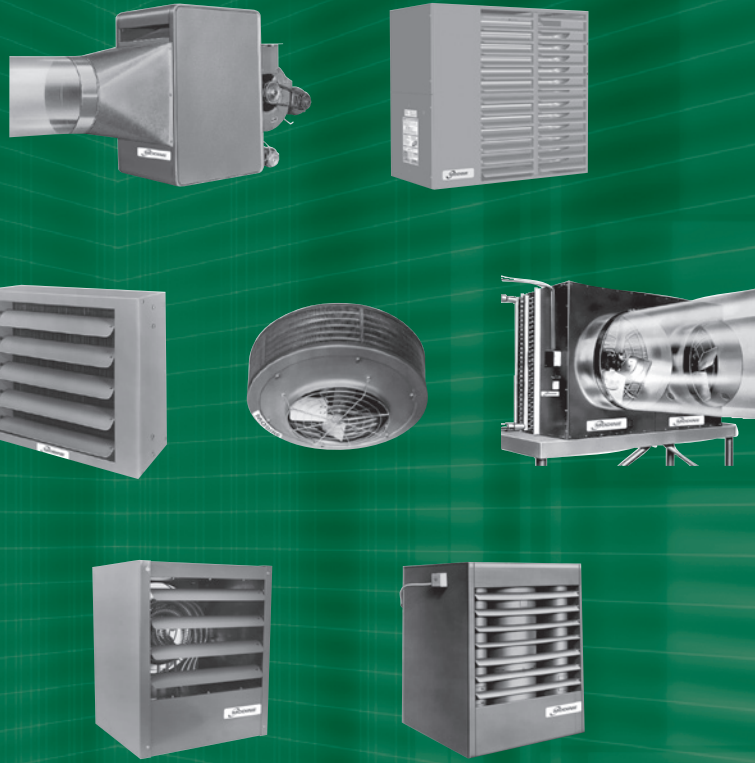


Heating Solutions for Greenhouses





Modine separated combustion unit heaters with stainless steel heat exchangers resist corrosion.



At 93% thermal efficiency, the Modine Effinity⁹³ is North America's most efficient and complete unit heater line and an ideal solution for offering greenhouse operators substantial savings on their fuel costs.

Separated Combustion is Best for Harsh Environments

Greenhouse environments can present unique challenges for heating equipment. Certain chemicals introduced into the combustion process can cause component corrosion. Also, airtight poly and acrylic coverings increase humidity levels and cause a shortage of combustion air.

The separated combustion, gas-fired unit heater is a common solution. Combustion air is drawn from outside the greenhouse, eliminating any concern of inadequate combustion air, and reducing or eliminating any chemical or humidity problem. The gas controls are located in a sealed compartment for maximum protection.

Healthier Plant Growth with Air Circulation

The gentle air movement provided by Modine heaters, when properly located, is effective in discouraging mold and fungal diseases which damage crops. Water left on foliage after sprinkling is quickly absorbed by the warmed air before it can do any harm. One grower stated that, largely due to this air movement, he was able to finish approximately 25% more pots per bench during rainy, foggy weather.

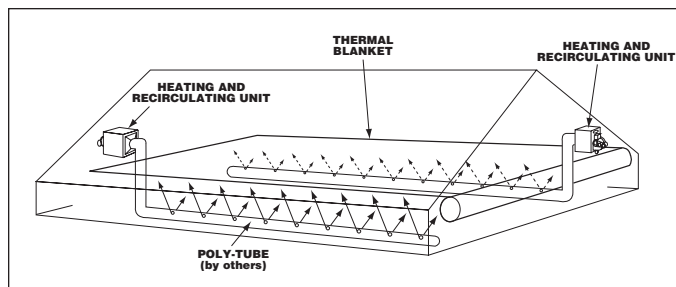
This air movement can be provided by operating the unit heater fans continuously while the thermostats independently control the heat.

Even Temperatures for Uniform Growth

Modine unit heaters are able to maintain remarkably even and uniform temperatures at bench or ground level – from wall to wall. This is immediately visible by noticing the uniform crop height in a Modine heated greenhouse.

By supplying heat from above, Modine units permit the soil to remain cooler than the surrounding air for healthier plant development.

In greenhouses where tall vine crops such as tomatoes are grown, users have demonstrated the ability of a properly designed Modine installation, utilizing the right diffusers, to provide desirable warmed air circulation between the vines and to maintain even and uniform temperatures which are critical at the setting stage.



Blower unit heaters with discharge transitions can be used with polytube and turning elbows to economically heat under thermal blankets or under growing benches to save on fuel costs.

Safer Environment for Plant Growth

Plants flourish when using a heating method that does not exhaust combustion gasses into the space. Because ethylene and other products of combustion such as carbon monoxide and water vapor can be harmful to greenhouse crops and a nuisance to greenhouse operations, un-vented gas-fired heating equipment requires additional air changes to prevent build-up, which increases a grower's equipment and operating costs. By venting harmful products of combustion outside the greenhouse the plant yield is increased resulting in increased revenue.

Supplementary Heating

In houses where owners prefer to retain existing pipe coil radiation, Modine unit heaters are frequently added to eliminate cold spots, thus supplying both supplementary heat and warmed air circulation.

Unlike the sluggish response of pipe coil or masses of cast iron radiation to thermostatic control, Modine unit heaters respond almost instantly to the changing demands of sensitive automatic temperature controls. Sudden demands for heat caused by clouds, variations in solar effect, quick changes in wind direction or outside temperatures are rapidly accommodated.



HD

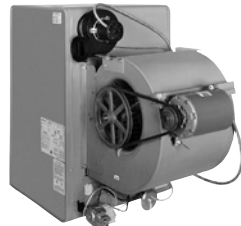


PDP

Ideal for greenhouse heating, the power vented HD and PDP models are available in 13 different sizes to accommodate a full range of greenhouse heating applications. Operation can be automatic or manual. Heaters can be equipped for operation on natural or propane gas.



HDB



BDP

The HDB and BDP are designed for both heating and ventilating. They may be used with polytubes to heat overhead or under-the-bench (refer to literature 10-204, latest revision). Operate quietly and efficiently against static pressures up to 0.5" W.C. and within a temperature rise range of 40° to 70°F.



See catalog 6-189 for complete details.

Table 3.1 - Propeller Unit Model HD and PDP General Performance Data

	Model HD Sizes						Model PDP Sizes							
	30	45	60	75	100	125	150	175	200	250	300	350	400	
Btu/Hr Input	30,000	45,000	60,000	75,000	100,000	125,000	150,000	175,000	200,000	250,000	300,000	350,000	400,000	
Btu/Hr Output	24,000	36,000	48,000	60,000	80,000	100,000	120,000	140,000	160,000	200,000	240,000	280,000	320,000	
Air Temp. Rise (°F)	44	46	45	48	50	47	51	51	52	50	50	53	54	
Max. Mounting Height (Ft.) ①	10	10	12	14	12	16	16	17	15	19	21	20	19	
Heat Throw (Ft.) (@ Max Mtg Ht) ①	25	27	36	38	42	56	55	59	51	67	74	70	69	

Table 3.2 - Blower Unit Model HDB and BDP General Performance Data

	Model HDB Sizes				Model BDP Sizes							
	60	75	100	125	150	175	200	250	300	350	400	
Btu/Hr Input	60,000	75,000	100,000	125,000	150,000	175,000	200,000	250,000	300,000	350,000	400,000	
Btu/Hr Output	48,000	60,000	80,000	100,000	120,000	140,000	160,000	200,000	240,000	280,000	320,000	
Air Temp. Rise (°F)	40-70	40-70	35-65	45-75	40-70	40-70	40-70	40-70	40-70	40-70	40-70	
Max. Mounting Height (Ft.) ①	7-13	7-16	8-19	8-17	14	15	13	16	18	19	19	
Heat Throw (Ft.) (@ Max Mtg Ht) ①	20-45	24-57	27-68	27-59	49	52	47	58	64	67	68	

① Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (In Canada see rating plate.)
Reduction of ratings requires use of a high altitude kit.

② Data taken at 55°F air temperature rise. At 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.

⚠ WARNING

Do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

Gas-Fired Unit Heater Solutions		
Product Type	Application	Page
Power Vented	Good	3
Separated Combustion	Better	4
High Efficiency Condensing	Best	5



HDS



HDC



PTS/BTS

The separated combustion, gas-fired unit heater is a common sense solution to unique heating challenges presented by the greenhouse environment. The separated combustion models draw combustion air from outside of the greenhouse to ensure that the unit will always have plenty of fresh, clean air to breathe. This fresh-air supply reduces common concerns about dusty, dirty, humid or chemical laden applications. In addition, by drawing the combustion air from the outside, the overall heating efficiency is increased. Also, the combination gas control and the automatic retry ignition control are housed in a sealed compartment which means maximum protection for these two critical components.

The blower version of the separated combustion unit offers all the unique features of the propeller unit and is ideal for both heating and ventilating. This unit can be used with polytubes to heat overhead or under-the bench and operates quietly and efficiently against static pressures up to 0.7" W.C. within a temperature rise range of 40° to 70°F.



See catalog 6-175 for complete details.

Table 4.1 - Propeller Unit Model HDS and PTS General Performance Data

	Model HDS Sizes						Model PTS Sizes						
	30	45	60	75	100	125	150	175	200	250	300	350	400
Btu/Hr Input ①	30,000	45,000	60,000	75,000	100,000	125,000	150,000	175,000	200,000	250,000	300,000	350,000	400,000
Btu/Hr Output ①	24,000	36,000	48,000	60,000	80,000	100,000	120,000	140,000	160,000	200,000	240,000	280,000	320,000
Air Temp. Rise (°F)	44	46	45	48	50	47	53	48	50	47	50	50	51
Max. Mounting Height (Ft.) ②	10	10	12	14	12	16	15	14	15	18	19	18	21
Heat Throw (Ft.) @ Max Mtg Ht ②	25	27	36	38	42	56	51	50	54	62	69	65	74

Table 4.2 - Blower Unit Model HDC and BTS General Performance Data

	Model HDC Sizes				Model BTS Sizes						
	60	75	100	125	150	175	200	250	300	350	400
Btu/Hr Input ①	60,000	75,000	100,000	125,000	150,000	175,000	200,000	250,000	300,000	350,000	400,000
Btu/Hr Output ①	48,000	60,000	80,000	100,000	120,000	140,000	160,000	200,000	240,000	280,000	320,000
Air Temp. Rise (°F)	40-70	40-70	35-65	45-75	40-70	40-70	40-70	40-70	40-70	40-70	40-70
Max. Mounting Height (Ft.) ②	7-13	7-16	8-19	8-17	9-21	8-18	9-21	10-22	11-26	11-26	13-29
Heat Throw (Ft.) @ Max Mtg Ht ②	20-45	24-57	27-68	27-59	33-75	28-65	32-74	34-78	40-94	39-90	44-102

① Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (In Canada see rating plate.) Reduction of ratings requires use of a high altitude kit.

② Data taken at 55°F air temperature rise. At 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.

WARNING

Do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

Gas-Fired Unit Heater Solutions		
Product Type	Application	Page
Power Vented	Good	3
Separated Combustion	Better	4
High Efficiency Condensing	Best	5

At 93% thermal efficiency for all model sizes, Modine's Effinity⁹³ condensing unit heater features the highest efficiency available in North America for commercial gas-fired unit heaters. This industry leading efficiency is a result of the coupling of our Conservicore™ secondary heat exchanger technology with our robust tubular primary heat exchanger design. The Conservicore™ technology features a secondary recuperative heat exchanger fabricated from AL29-4C® stainless steel. This material is superior to other lower grades of stainless steel and aluminum, resulting in outstanding ability to withstand the corrosive environment of condensing gas fired equipment.

Available in six model sizes with input ranges from 135,000 to 310,000 Btu/Hr, Modine offers application flexibility unmatched in the industry. The separated combustion units draw combustion air from outside to ensure that the unit will always have plenty of fresh, clean air for combustion while increasing the overall heating efficiency. Venting material to be used is PVC, an extremely cost effective vent system.

Figure 5.1 - Effinity⁹³ (Model PTC)

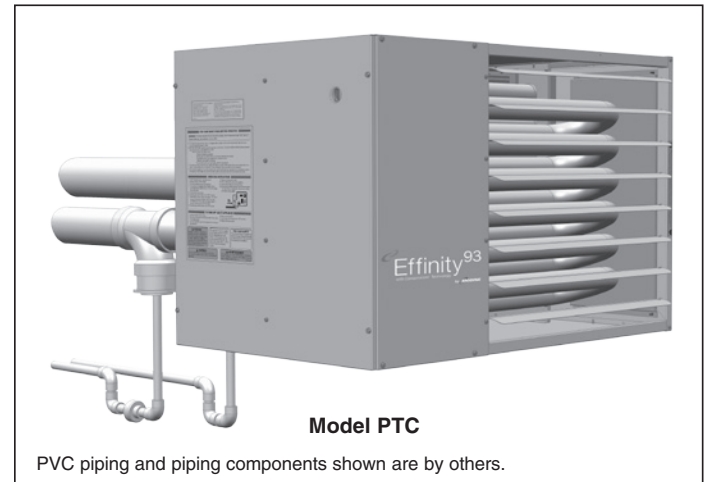


Table 5.1 - Estimated Annual Fuel Cost Savings Using the Effinity⁹³ Condensing Unit Heater

		Estimated Annual Savings Against Other Equipment ① ②			
		Gravity Vented		Power Vented	
Design Heat Load (Btu/Hr):		120,000	280,000	120,000	280,000
Annual Heat Load Hours (refer to Figure 5.2)	500	\$306	\$713	\$136	\$318
	1000	\$611	\$1,427	\$273	\$637
	1500	\$917	\$2,140	\$409	\$955
	2000	\$1,223	\$2,853	\$546	\$1,274
	2500	\$1,529	\$3,567	\$682	\$1,592
	3000	\$1,834	\$4,280	\$819	\$1,911
	3500	\$2,140	\$4,993	\$955	\$2,229

① Based on a natural gas rate of \$1.10/Therm. Actual realized savings can vary significantly based on a number of changing factors including, but not limited to, fuel prices, climate, building use or construction, etc.
 ② Compares 93% efficient against 65% seasonal efficient gravity vented and 78% seasonal efficient power vented.

Figure 5.2 - U.S. Average Heat Load Hours Map

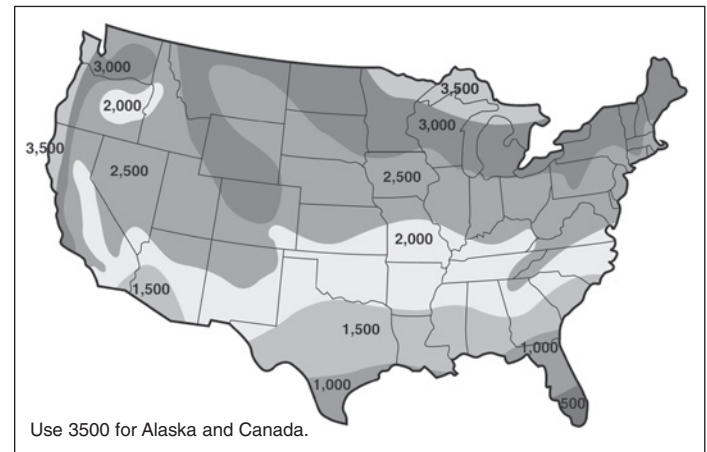


Table 5.2 - Propeller Unit Heater Model PTC General Performance Data

	Model PTC Sizes					
	135	155	180	215	260	310
Btu/Hr Input ①	135,000	155,000	180,000	215,000	260,000	310,000
Btu/Hr Output ①	125,550	144,150	167,400	199,950	241,800	288,300
Condensate Production (Gal./Hr.)	1.0	1.1	1.3	1.6	1.9	2.3
Entering Airflow (CFM) @ 70°F ②	2160	2510	3020	3865	4585	5400
Air Temp. Rise (°F)	54	53	51	48	49	49
Max. Mounting Height (Ft.) ②	14	17	15	17	20	19
Heat Throw (Ft.) @ Max Mtg Ht	51	59	53	60	70	67

① Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (In Canada see rating plate.) Reduction of ratings requires use of a high altitude kit.
 ② Data taken at 55°F air temperature rise. At 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.

! WARNING

Do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

Gas-Fired Unit Heater Solutions		
Product Type	Application	Page
Power Vented	Good	3
Separated Combustion	Better	4
High Efficiency Condensing	Best	5

STEAM AND HOT WATER UNIT HEATERS



HSB

Proven for greenhouse, industrial and commercial application. Has adjustable horizontal air deflector blades. Vertical deflector blades are optionally available for complete directional control. Horizontal units available with top/bottom (model HSB) or side inlet/outlet (model HC) piping connections.



V/VN

Verticals are designed for overhead and out-of-the-way mounting. Four deflector types are available for various air distribution patterns... from high, jet-like beam to low, broad, gentle cone. V models have copper tubes, VN models have cupro-nickel tubes.



See catalog 1-150 for complete details.

Table 6.1 - Horizontal Type (60°F Entering Air)

Model No.	Cfm	STEAM		HOT WATER	
		2 lbs.		200°F in 180°F out	
		Btu/hr	Final Air °F	Btu/hr	Final Air °F
HSB/HC 18	340	18,000	107	12,600	93
HSB/HC 24	370	24,000	119	16,200	100
HSB/HC 33	630	33,000	108	21,700	91
HSB/HC 47	730	47,000	119	30,900	98
HSB/HC 63	1120	63,000	111	45,600	97
HSB/HC 86	1340	86,000	118	60,200	101
HSB/HC 108	2010	108,000	109	83,700	98
HSB/HC 121	1775	121,000	122	93,000	107
HSB/HC 165	3240	165,000	106	130,900	96
HSB/HC 193	2900	193,000	121	143,000	105
HSB/HC 258	4560	258,000	111	201,900	100
HSB/HC 290	4590	290,000	117	228,600	105
HSB/HC 340	5130	340,000	120	271,100	108

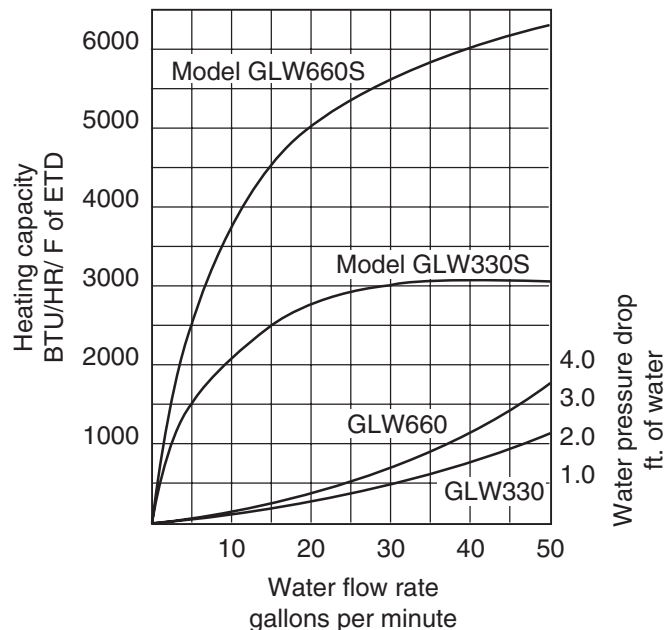
Table 6.2 - Vertical Type (60°F Entering Air)

Model No.	Cfm	STEAM		HOT WATER	
		2 lbs.		200°F in 180°F out	
		Btu/hr	Final Air °F	Btu/hr	Final Air °F
V/VN 42	950	42,000	103	30,100	90
V/VN 59	1155	59,000	111	42,600	96
V/VN 78	1590	78,000	109	57,000	95
V/VN 95	1665	95,000	118	69,300	101
V/VN 139	2660	139,000	112	106,600	99
V/VN 161	2945	161,000	115	123,200	101
V/VN 193	3500	193,000	116	147,200	101
V/VN 212	3610	212,000	120	161,700	104
V/VN 247	4820	247,000	111	188,700	98
V/VN 279	5460	279,000	111	212,600	98
V/VN 333	5980	333,000	116	260,100	102
V/VN 385	7680	385,000	110	302,100	98
V/VN 500	10,390	500,000	108	391,700	96
V/VN 610	11,750	610,000	112	450,400	97
V/VN 952	12,170	952,000	139	721,600	120



Low-Temperature GLW Applications

The Modine Type GLW units were specifically designed to heat greenhouses with low-temperature water. They can be successfully used in applications in which waste or reject heat from steam-electric power plants, refineries, pumping stations, distilleries and other industrial or processing plants can be utilized for heating. The ever-increasing cost of fossil fuel is turning the feasibility of utilizing reject heat as a source to heat greenhouses into a reality. Modine's type GLW units can help make it a reality.



ELECTRIC AND OIL FIRED UNIT HEATERS



Horizontal air delivery type HER – Recommended for lower-ceiling applications. Electric unit heaters have lower installation costs and are easier to install, requiring no venting, piping, valves, traps, etc.



Vertical air delivery type VE – Recommended for higher-ceiling applications. Electric unit heaters provide flexibility for use as permanent, temporary, supplemental or standby heating units.



Power-Throw horizontal high velocity air delivery type PTE – Recommended for hard-to-heat areas requiring higher air-velocity and greater heat throw. Also suggested for frequently opened doorways. One can be used to replace up to three smaller horizontal delivery units.



See catalog 2-116 for complete details.

Table 7.1 - Horizontal Model HER and PTE General Performance Data

	Model	Heating Capacity				Air Data ①			
		High Stage		Low Stage		Airflow (CFM) ②	Temp Rise (°F)	Heat Throw (ft.)	Maximum Mounting Height (ft.)
		kW	Btu/hr	kW	Btu/hr				
Horizontal Delivery	HER 50	5	17,100	n/a	n/a	530	30	14	8
	HER 75	7.5	25,600	n/a	n/a	530	45	14	8
	HER100	10	34,100	n/a	n/a	830	38	20	9
	HER125	12.5	42,700	n/a	n/a	830	48	20	10
	HER150	15	51,200	n/a	n/a	830	57	20	10
	HER200	20	68,200	n/a	n/a	1300	49	25	11
	HER250	25	85,300	n/a	n/a	1300	61	25	12
	PTE300	30	102,400	15	51,200	2575	40	75	17
	PTE400	40	136,500	20	68,200	2575	54	60	15
	PTE500	50	170,600	25	85,300	2575	70	45	14

① Airflow shown is at 70° ambient and heating at full rated capacity.
 ② For HER, airflow CFM is for inlet. For PTE and VE, airflow CFM is outlet.

Table 7.2 - Vertical Model VE General Performance Data

	Model	Heating Capacity				Air Data ①	
		High Stage		Low Stage		Airflow (CFM) ②	Temp Rise (°F)
		kW	Btu/hr	kW	Btu/hr		
Vertical Delivery	VE 50	5	17,100	n/a	n/a	800	21
	VE 75	7.5	25,600	n/a	n/a	800	31
	VE 100	10	34,100	n/a	n/a	940	36
	VE 150	15	51,200	n/a	n/a	1340	38
	VE 200	19	64,800	n/a	n/a	1600	41
	VE 250	25	85,300	n/a	n/a	1600	55
	VE 300	30	102,400	15	51,200	2575	40
	VE 400	40	136,500	20	68,200	2575	54
	VE 500	50	170,600	25	85,300	2575	70

① Airflow shown is at 70° ambient and heating at full rated capacity.
 ② For HER, airflow CFM is for inlet. For PTE and VE, airflow CFM is outlet.

OIL-FIRED UNIT HEATERS



Modine oil-fired unit heaters have a direct-driven propeller fan designed for horizontal delivery of heated air. They are built of time-tested and field-proven components all properly combined into a single compact unit for high efficiency operation. Designed for overhead suspension, all models are pre-wired, fire-tested, and U.L. listed. Utilizing fuel oil grades No. 1 or 2, they provide effective heat throw with automatic operation. Operation is quiet and safe. They are easy to install and service.



See catalog 4-112 for complete details.

Table 7.3 - Performance Data

Model	Input Btu/hr	Input Gph	Output Btu/hr	Cfm @ 70°F	Temp Rise °F	Max* MTG Ht.	Heat Throw
POR100	119,000	.75	100,000	1890	49	12'	39'
POR145	175,000	1.10	145,000	2400	56	13.5'	50'
POR185	231,000	1.65	185,000	3200	54	12'	51'

* Deflector blades pitched 45° toward the floor (heated air)
 Mounting height is measured from floor to bottom of unit.

INDOOR AIR SOLUTIONS

The Modine brand has been the industry standard since Arthur B. Modine invented and patented the first lightweight, suspended hydronic unit heater in 1923.

No other manufacturer can provide the combined application flexibility, technical expertise and fast delivery found at Modine.

Consult your local Modine distributor for help in solving your indoor air problems.

Products from Modine are designed to provide indoor air-comfort solutions for commercial, institutional and industrial applications. Whatever your heating, ventilating and cooling requirements, Modine has the product to satisfy your needs, including:

- Gas-fired unit heaters
- Gas-fired duct furnaces
- Gas-fired high-intensity infrared heaters
- Gas-fired low-intensity infrared heaters
- Steam/hot water unit heaters
- Steam/hot water cabinet unit heaters
- Steam/hot water commercial fin tube radiation
- Oil-fired unit heaters
- Electric unit heaters
- Indoor gravity and power vented single and multiple duct furnace make-up air units
- Indoor separated combustion single and multiple duct furnace make-up air units
- Outdoor single and multiple duct furnace make-up air units
- Direct-fired make-up air units
- R410 DX split system air conditioning and heat pump ceiling cassettes
- Chilled water ceiling cassettes

With burner capacities up to 7,862,000 Btu/hr and air-handling capacities as high as 60,000 CFM, Modine products are compatible with every fuel type, including:

- **Natural or Propane Gas • Steam/Hot Water • Oil • Electric**

Specific catalogs and computer-generated heat-loss calculations are available for each product. Catalogs 75-136 and 75-137 provide details on all Modine HVAC equipment.

Distributed By:



**Commercial Products Group
Modine Manufacturing Company**

1500 DeKoven Avenue
Racine, Wisconsin 53403-2552

Phone: 1.800.828.4328 (HEAT)

Fax: 1.800.204.6011

www.modine.com

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