MICROGEN™

Heat Recovery Systems for Micro Turbines

UNIFIN INTERNATIONAL

www.unifin.com

Heat Recovery system for Micro Turbines

micoGen™ is the ideal system to increase the efficiency and economic payback of Micro Turbine Generation through Waste Heat Recovery. The micoGen™ Combined Heat & Power system reduces the need for costly design engineering, leaving only application and installation issues, which often only requires plumbing and licensing. The units have been designed for maximum flexibility, so by varying flow and inlet fluid temperature, a wide variety of needs can be met for hot water or glycol supply. At times when Waste Heat Recovery is not required, the exhausts can be automatically diverted around the exchanger, allowing continued electrical output. micoGen™ was designed in conjunction with the Micro Turbine Industry, to provide minimal performance impact on the Micro Turbine.

Ducting from Micro Turbine
Standard Carbon Steel exhaust ducting. Stainless steel option available. Insulation option available.

Extruded Aluminum finned Tubing
Durable extruded aluminum finned tube suitable for up to 1200° F-exhaust gas. Copper tubes complete with stainless headers suitable for Potable water. ASME 'UM' code vessel stamped.

Electro-mechanical control
Durable 24V DC actuator with limit switch position detection for 'fail-safe' operation. Power supply and unit located away from main heat source for reliable operation.

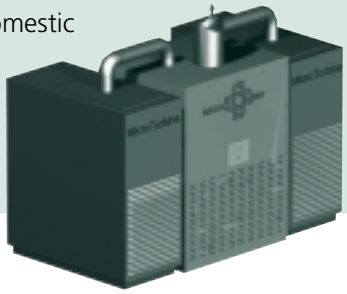
Exhaust Gas Divertor
Controls the micro turbine exhaust gas flow direction, allowing for heat recovery or direct exit out of micoGen unit.

Digital Control
The 'brains' of micoGen is a simple to use weatherproof interface. Water outlet temperature control and multiple visual alarms make micoGen a simple product to operate.

Water Pump
Comes standard with every micoGen. All the piping and pump materials are suitable for potable water. Required power supply is also included.

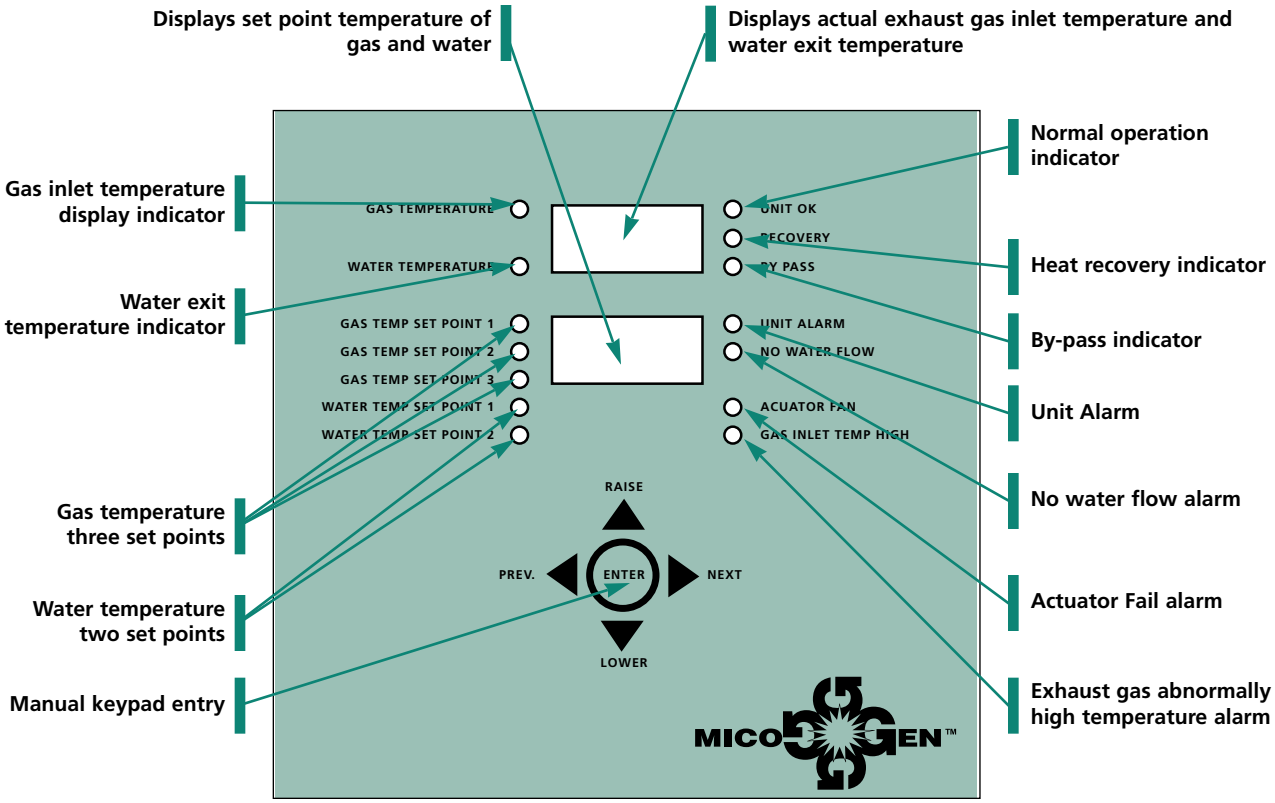
micoGen Flexibility

micoGen can be used for water & glycol heating, central building heating, potable domestic hot water, closed loop desiccant drying for dehumidification and other industrial process heating.



One micoGen can recover heat from multiple micro turbine units. Each unit is weatherproof, insulated for 'Touch-Safe' operation and includes fork truck slots for easy lifting.

micoGen™ systems are designed to be fully self contained and ready for installation



MicoGen's digital controller monitors gas and water temperatures to assure safe efficient operation

- Monitors water flow to prevent overheating
- Temperature set points for accurate control
- Turbine status input
- Auto/Manual start

Operating set points

MicoGen comes with adjustable set point operating temperatures. The following examples are factory default settings.

Exhaust gas temperature has three set points.

1. 480F set point for recovery system by-pass
2. 400F continuous turbine operation set point
3. 600F high temperature for by-pass protection

Water outlet temperature has two set points.

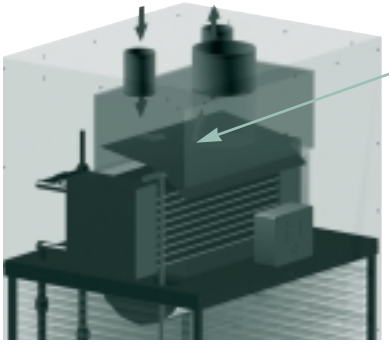
1. 200F water outlet limit for by-pass protection
2. 100F water outlet continuous heat recovery

Standard Model Includes:

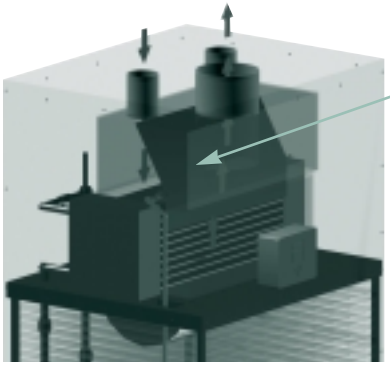
- Heat Exchanger
- Water Pump
- Divertor & Electric Actuator
- Electrical controller & Power Supply
- Carbon Steel Dip Pan
- Insulated Outer Enclosure
- Components suitable for Potable Water

Options Available:

- Ducting from turbine to micoGen - Carbon Steel or Stainless Steel
- Insulation for duct
- Stainless Steel Drip Pan
- Alternate Pump flows
- Condensate Alarm System
- Variable Water Flow Control System



Exhaust Gas Divertor Closed



Exhaust Gas Divertor Open

Exhaust Gas Divertor operation

Each micoGen comes complete with a hot gas divertor. The divertor is operated by micoGen's digital control system in accordance with preset data points. When heat recovery is required the flap will circulate hot gas through the heat exchanger. When heat recovery is not required the flap closes allowing the hot gas to bypass out of the unit. This design allows micoGen to protect the heat recovery components from the full heat of the turbine exhaust, while still maintaining full electrical generation from the micro turbine.

UNIFIN INTERNATIONAL INC.
1030 Clarke Side Road
London, Ontario, Canada
N6A 4P4

Call toll free 1-800-567-5707
Email: unifin@kochind.com
www.unifin.com

MODEL # MG1-C1

Model for Single Capstone 330 Turbine

Control/System Power Supply
1=110V / 1PH / 60Hz
2=220V / 1PH / 50Hz
3=220V / 1PH / 60Hz

Drip Pan
C-Carbon Steel
S-Stainless Steel

M G 1 - C 1 P 1 - 1 1 C

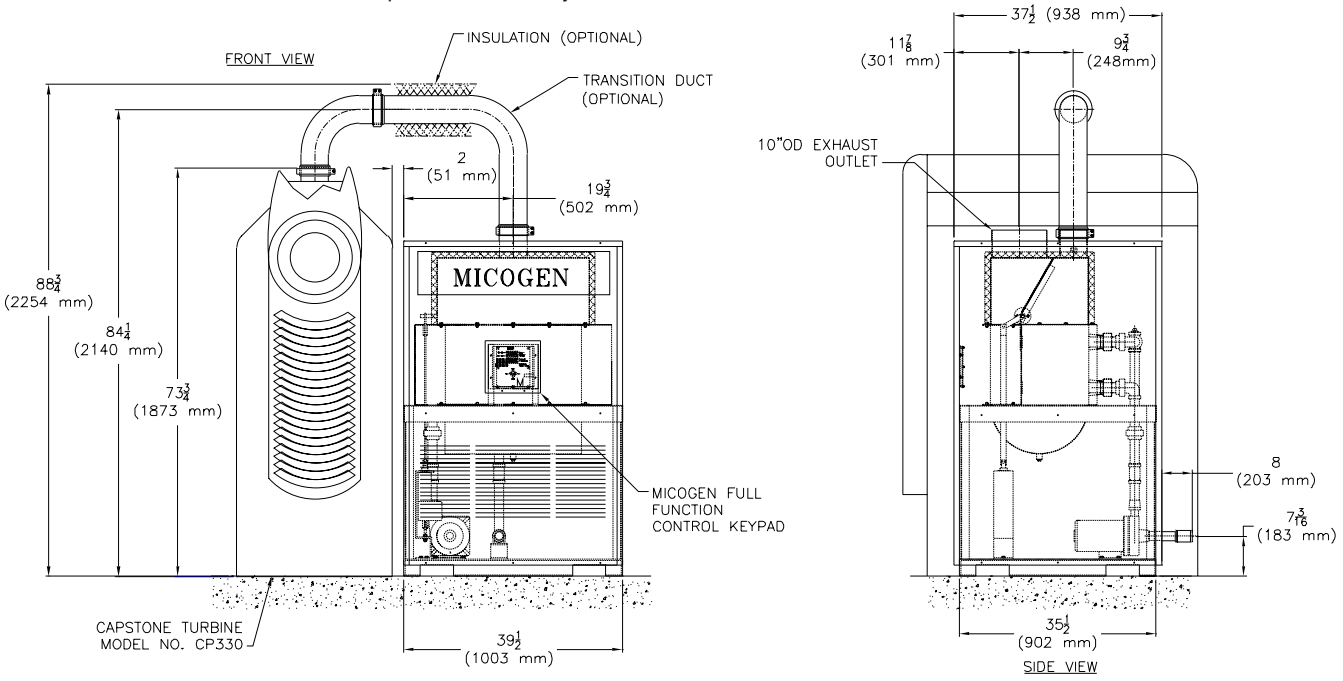
Application
P = Potable Water
N = Non-Potable Water
G = Glycol
H = High Temperature Potable Water
J = High Temperature Non-Potable Water

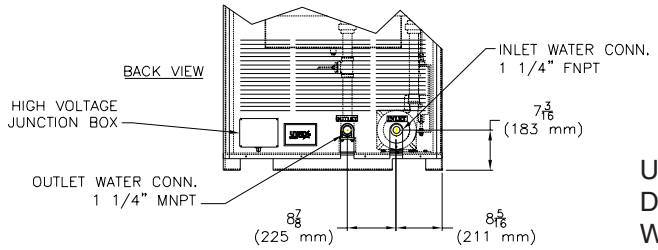
Pump Power Supply
1=110V / 1PH / 60Hz
2=220V / 1PH / 50Hz
3=220V / 1PH / 60Hz

Pump Model
0 = No Pump
1 = Type "1"
2 = Type "2"

Optional Components

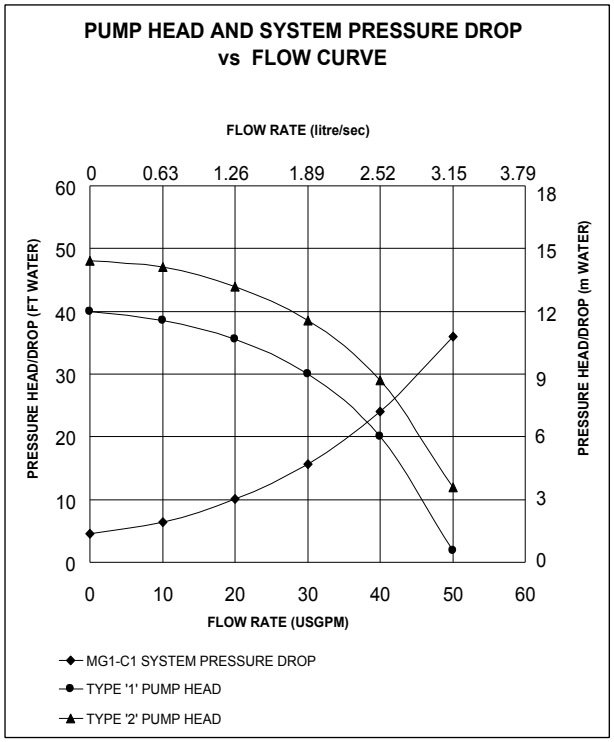
Aluminized Carbon Steel Ducting	MG1-C1DA
Stainless Steel Ducting	MG1-C1DS
Ducting Insulation	MG1-C1DI
Water Temperature Control System	MG1-C1WH

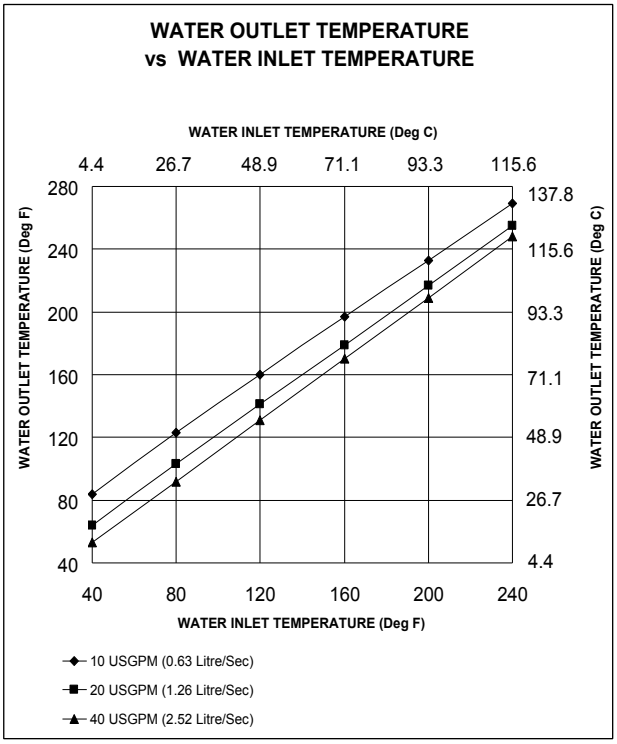


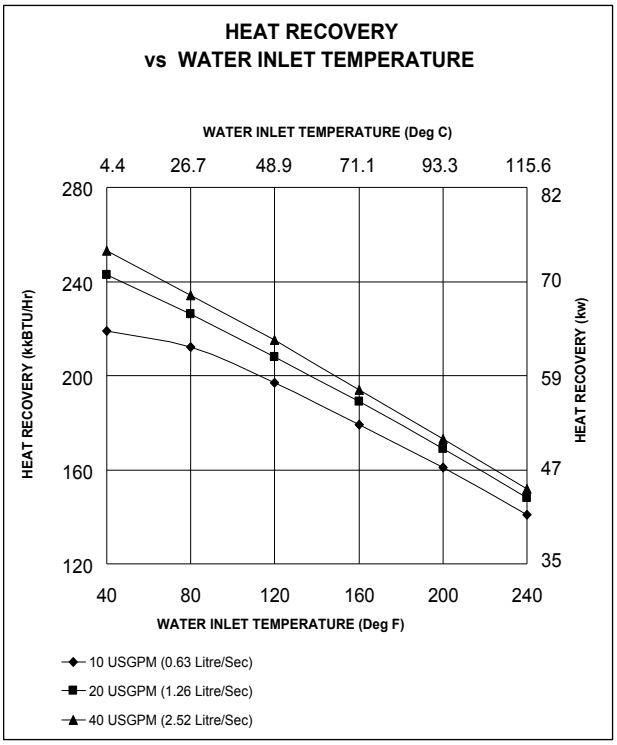


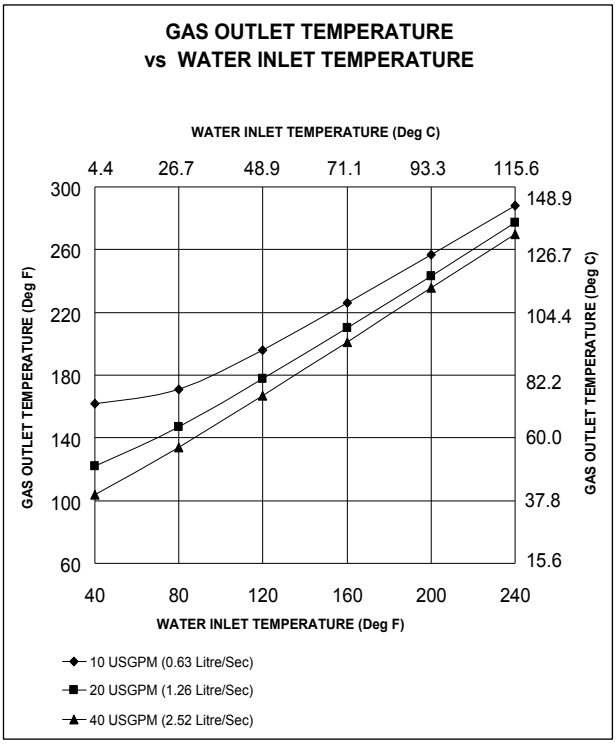
Unit Weight: 810 lbs. (368 KG)
Ducting Weight: 40 lbs. (18 KG)
Water Volume: 5 US Gal. (18.5 Litre)

Specifications For Micogen Model MG1-C1









Power Consumption (Controls and Pump)

110V / 1ph / 60Hz 10 Amps Maximum Running
230V / 1ph / 60Hz 5 Amps Maximum Running
220V / 1ph / 50Hz 5 Amps Maximum Running

Design Limits

Maximum Inlet Water Temperature:	200°F (93°C) Standard Design
	270°F (132°C) High Temperature Fluid Option
Maximum Outlet Water Temperature:	200°F (93°C) Standard Design
	300°F (149°C) High Temperature Fluid Option
Maximum Water Flow:	70 USGPM (4.42 litre/sec)
Maximum Water Pressure:	150 PSIG (10 BAR)
Maximum Inlet Gas Temperature:	600°F (316°C)
Minimum Exit Gas Temperature:	135°F (57°C) (Must Avoid Condensing)
Maximum Gas Side Pressure Drop:	3.00 in wg (76 mm aq)

Construction:

Tubes:	Stainless Steel 304
Fins:	Extruded Aluminum
Headers:	Stainless Steel 304
Casing Components:	Carbon Steel
Air Seals:	Stainless Steel
Potable Water Design:	All Wetted Components Suitable for Potable Water
Non-Potable Water Design:	Some Wetted Components may be Carbon Steel

Turbine Design Conditions (Capstone Model CP-330)

Exhaust Gas Temperature: 522°F (272°C)
Exhaust Gas Flow: 2415 Lbs/Hr (1096 KG/Hr)

1030 Clarke Road, Box 5395, Station B, London, ON Canada N6A 4P4
Tel: (519) 451-0230 or 800-567-5707 Fax: (519) 451-1732
email: unifin@kochind.com www.unifin.com

Design subject to change, performance based on published tubine data

MODEL # MG2-C1

Model for Two Capstone 330 Turbine

Control/System Power Supply
1=110V / 1PH / 60Hz
2=220V / 1PH / 50Hz
3=220V / 1PH / 60Hz

Drip Pan
C-Carbon Steel
S-Stainless Steel

M G 2 - C 1 P 2 - 1 1 C

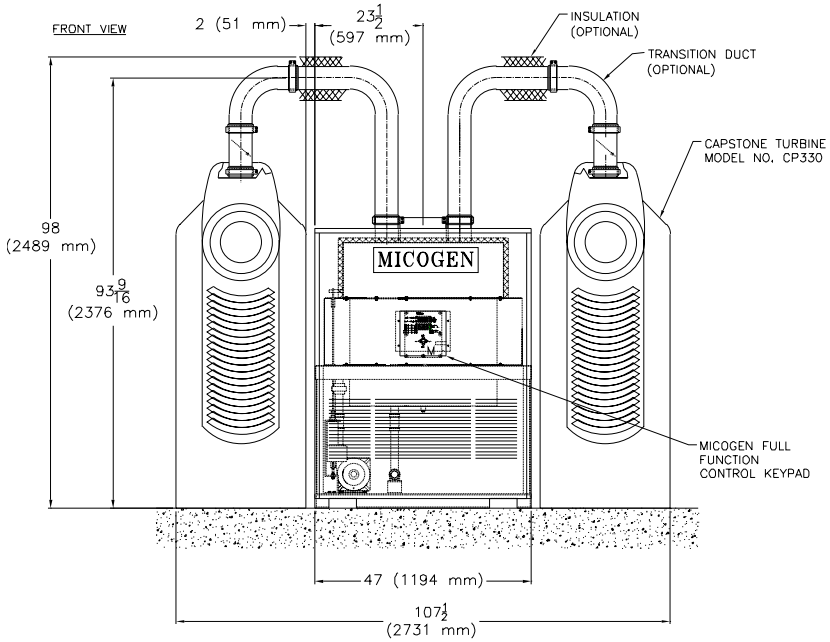
Application
P = Potable Water
N = Non-Potable Water
G = Glycol
H = High Temperature Potable Water
J = High Temperature Non-Potable Water

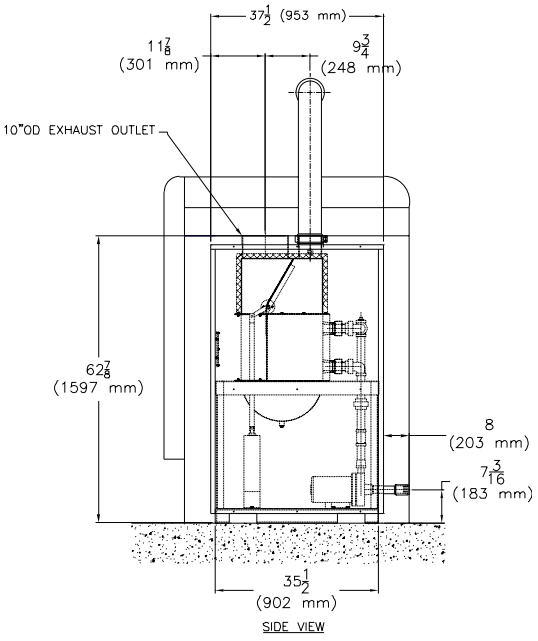
Pump Power Supply
1=110V / 1PH / 60Hz
2=220V / 1PH / 50Hz
3=220V / 1PH / 60Hz

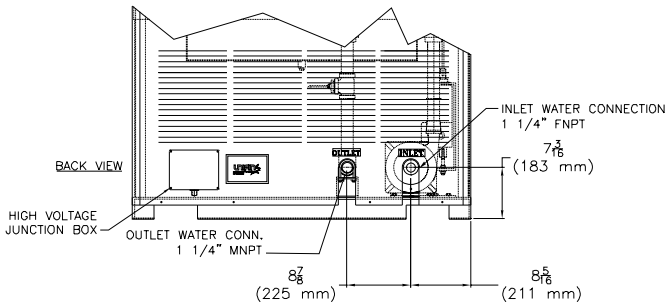
Pump Model
0 = No Pump
1 = Type "1"
2 = Type "2"

Optional Components

Aluminized Carbon Steel Ducting	MG2-C1DA
Stainless Steel Ducting	MG2-C1DS
Ducting Insulation	MG2-C1DI
Water Temperature Control System	MG2C1WH

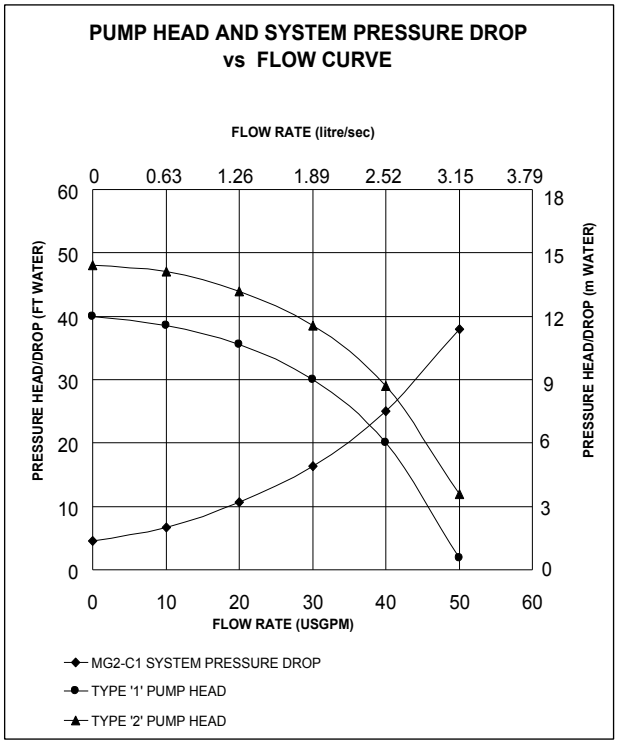


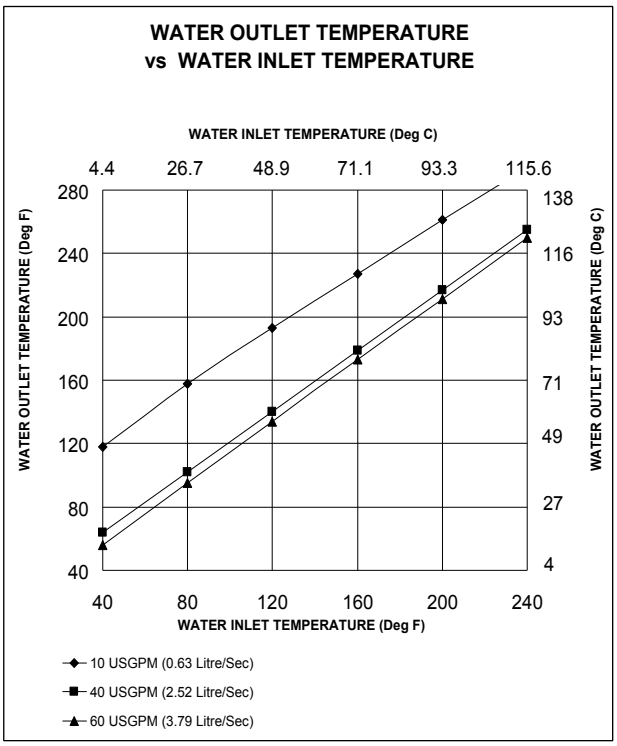


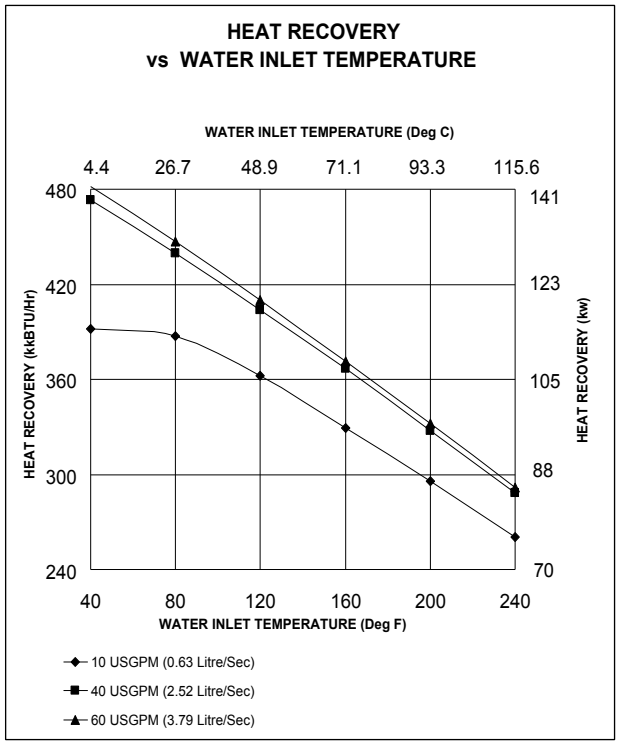


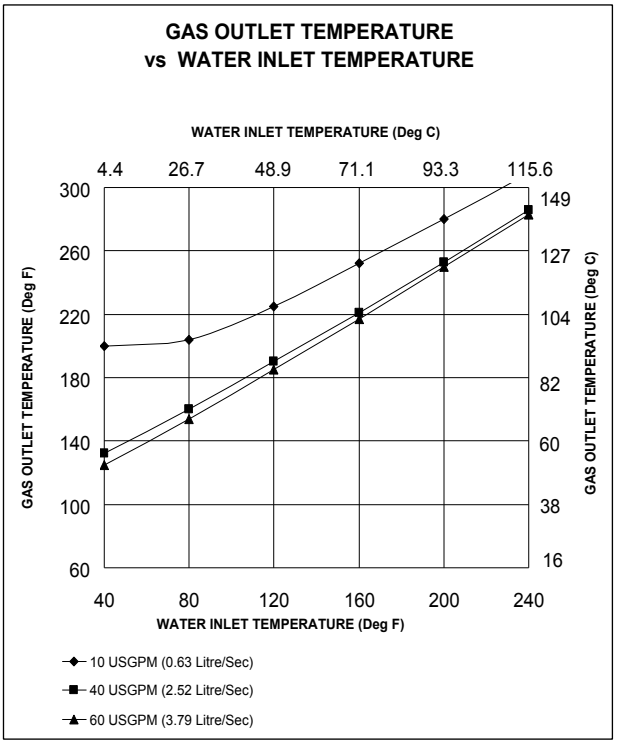
Unit Weight: 890 lbs. (404 KG)
Ducting Weight: 100 lbs. (45 KG)
Water Volume: 7 US Gal. (27 Litre)

Specifications For Micogen Model MG2-C1









Power Consumption (Controls and Pump)

110V / 1ph / 60Hz 10 Amps Maximum Running
230V / 1ph / 60Hz 5 Amps Maximum Running
220V / 1ph / 50Hz 5 Amps Maximum Running

Design Limits

Maximum Inlet Water Temperature:	200°F (93°C) Standard Design
	270°F (132°C) High Temperature Fluid Option
Maximum Outlet Water Temperature:	200°F (93°C) Standard Design
	300°F (149°C) High Temperature Fluid Option
Maximum Water Flow:	80 USGPM (5.05 litre/sec)
Maximum Water Pressure:	150 PSIG (10 BAR)
Maximum Inlet Gas Temperature:	600°F (316°C)
Minimum Exit Gas Temperature:	135°F (57°C) (Must Avoid Condensing)
Maximum Gas Side Pressure Drop:	3.50 in wg (89 mm aq)

Construction:

Tubes:	Stainless Steel 304
Fins:	Extruded Aluminum
Headers:	Stainless Steel 304
Casing Components:	Carbon Steel
Air Seals:	Stainless Steel
Potable Water Design:	All Wetted Components Suitable for Potable Water
Non-Potable Water Design:	Some Wetted Components may be Carbon Steel

Turbine Design Conditions (Capstone Model CP-330)

Exhaust Gas Temperature: 522°F (272°C)
Exhaust Gas Flow: 2415 Lbs/Hr (1096 KG/Hr)(Per Turbine)

1030 Clarke Road, Box 5395, Station B, London, ON Canada N6A 4P4
Tel: (519) 451-0230 or 800-567-5707 Fax: (519) 451-1732
email: unifin@kochind.com www.unifin.com

Design subject to change, performance based on published tubine data

MODEL # MG4-C1

Model for Four Capstone 330 Turbines

Control/System Power Supply
1=110V / 1PH / 60Hz
2=220V / 1PH / 50Hz
3=220V / 1PH / 60Hz

Drip Pan
C-Carbon Steel
S-Stainless Steel

M G 4 - C 1 P 4 - 7 1 C

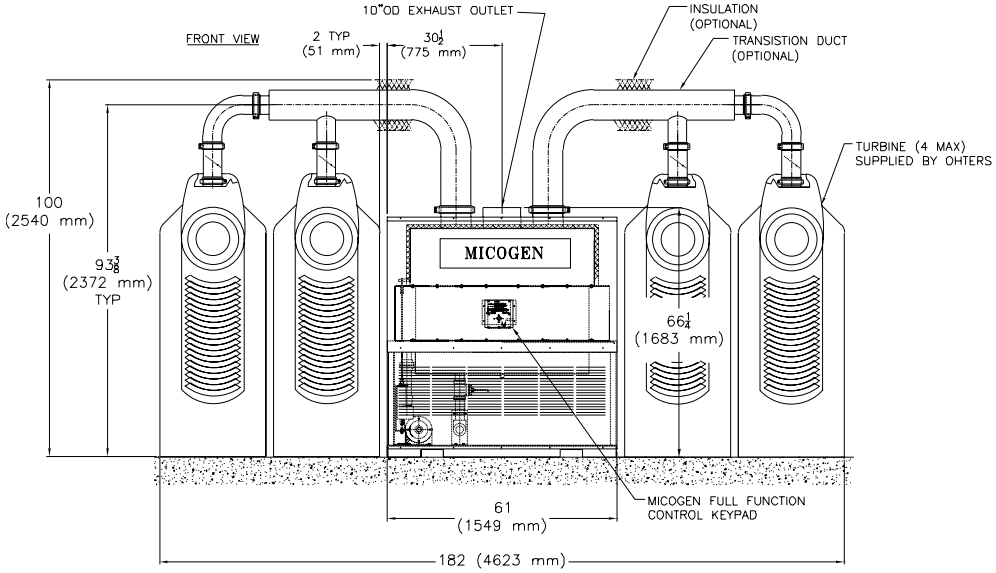
Application
P = Potable Water
N = Non-Potable Water
G = Glycol
H = High Temperature Potable Water
J = High Temperature Non-Potable Water

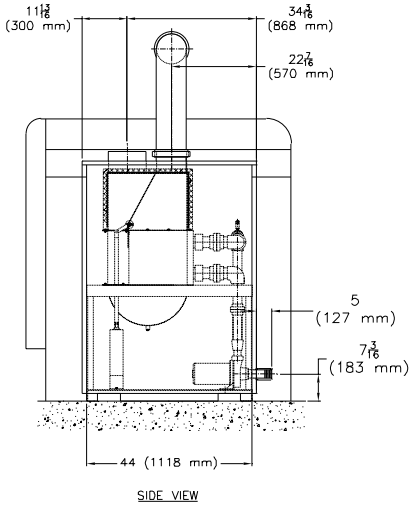
Pump Power Supply
6=460V / 3PH / 50Hz
7=460V / 3PH / 60Hz

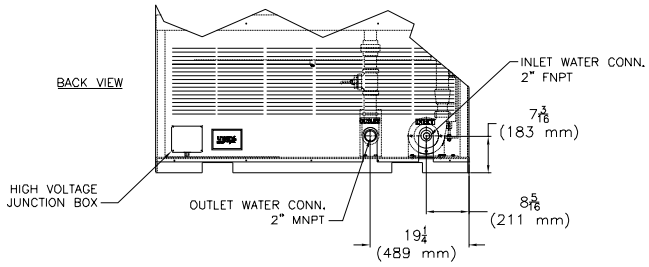
Pump Model
0 = No Pump
4 = Type "4"

Optional Components

Aluminized Carbon Steel Ducting	MG4-C1DA
Stainless Steel Ducting	MG4-C1DS
Ducting Insulation	MG4-C1DI
Water Temperature Control System	MG4-C1WH

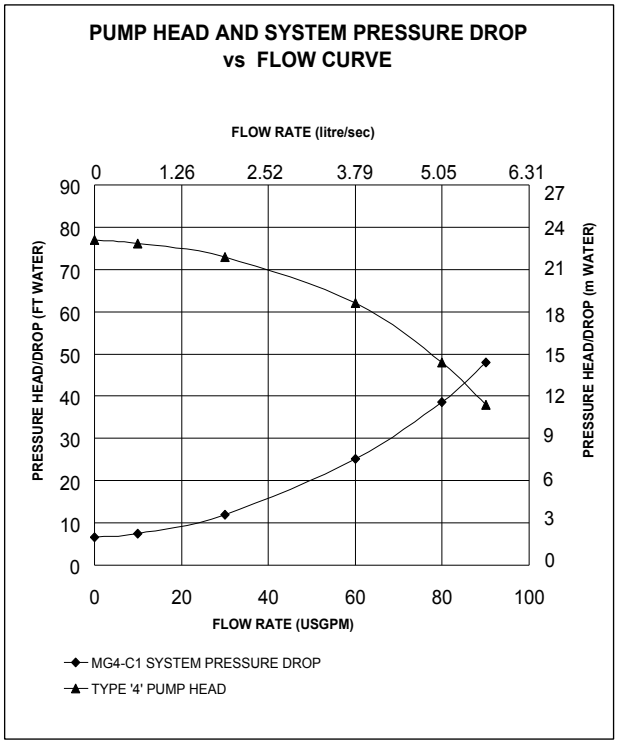


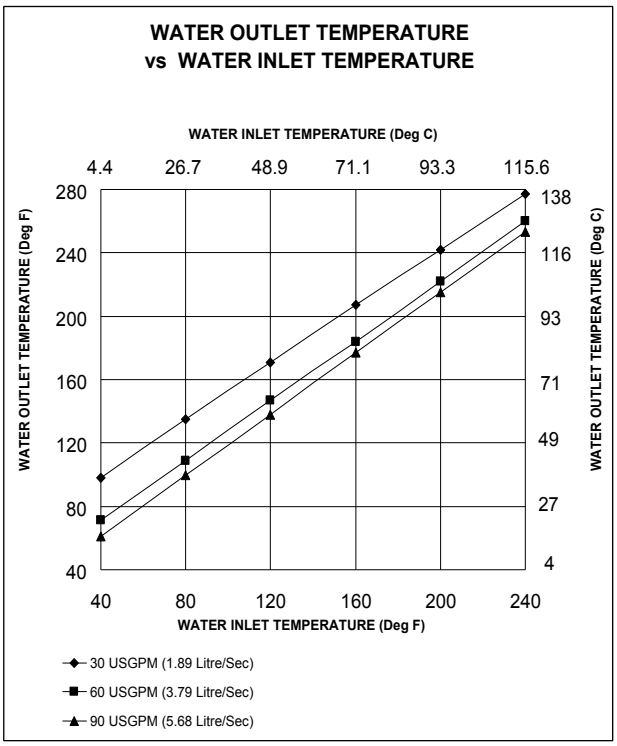


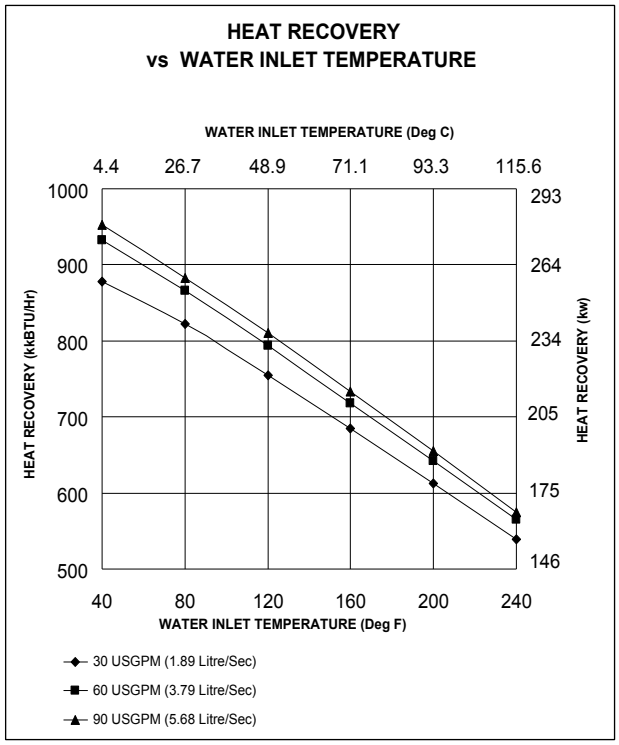


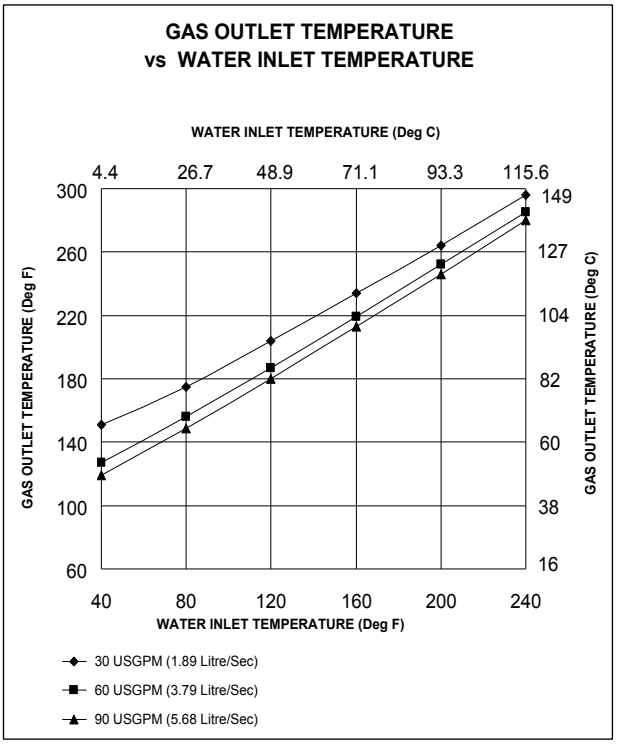
Unit Weight: 1190 lbs. (540 KG)
Ducting Weight: 200 lbs. (91 KG)
Water Volume: 9 US Gal. (34 Litre)

Specifications For Micogen Model MG4-C1









Power Consumption (Controls Only)

110V / 1ph / 60Hz 2 Amps Maximum Running
230V / 1ph / 60Hz 1 Amps Maximum Running
220V / 1ph / 50Hz 1 Amps Maximum Running

Power Consumption (Pump Only)

460V / 3ph / 60Hz 3.5 Amps Maximum Running
460V / 3ph / 50Hz 3.5 Amps Maximum Running

Design Limits

Maximum Inlet Water Temperature:	200°F (93°C) Standard Design
	270°F (132°C) High Temperature Fluid Option
Maximum Outlet Water Temperature:	200°F (93°C) Standard Design
	300°F (149°C) High Temperature Fluid Option
Maximum Water Flow:	90 USGPM (5.68 litre/sec)
Maximum Water Pressure:	150 PSIG (10 BAR)
Maximum Inlet Gas Temperature:	600°F (316°C)
Minimum Exit Gas Temperature:	135°F (57°C) (Must Avoid Condensing)
Maximum Gas Side Pressure Drop:	4.00 in wg (102 mm aq)

Construction:

Tubes:	Stainless Steel 304
Fins:	Extruded Aluminum
Headers:	Stainless Steel 304
Casing Components:	Carbon Steel
Air Seals:	Stainless Steel
Potable Water Design:	All Wetted Components Suitable for Potable Water
Non-Potable Water Design:	Some Wetted Components may be Carbon Steel

Turbine Design Conditions (Capstone Model CP-330)

Exhaust Gas Temperature: 522°F (272°C)
Exhaust Gas Flow: 2415 Lbs/Hr (1096 KG/Hr)(Per Turbine)

Design subject to change, performance based on published tubine data

1030 Clarke Road, Box 5395, Station B, London, ON Canada N6A 4P4
Tel: (519) 451-0230 or 800-567-5707 Fax: (519) 451-1732
email: unifin@kochind.com www.unifin.com