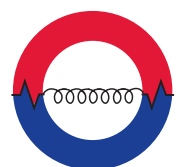


# Precision Storage Vessels



## OIL / GAS FIRED WATER HEATERS



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# Oil / Gas Fired Water Heaters

Direct Oil / Gas Fired water heaters are the best solution where fuel fired hot water system can be used. Wide range output can be achieved in this water heaters. Fully automatic burners are used for safe operation.

## Storage Calorifier

Storage calorifiers are sized to meet the peak demand period with recovery periods varying from one to four hours.

## Advantages

- Efficiency is maintained throughout the range of load. Even at part load all energy is converted into heat.
- Space requirements are minimum. Separate boiler not required.
- Installation is simplified.
- The calorifier can be installed with minimum electric load.
- Maintenance is kept to a minimum.
- Low nox burners are used.
- Fuel efficient burners are used.
- Diesel oil, Natural Gas, LPG and Propane can be used.
- Can also be used with solar or heat pump system where oil or gas fired system can be considered as a backup.

## Standards

ASME Code construction:- All tanks are constructed in accordance with ASME code section IV Stamped and labeled for 125 PSI (8.6 BAR) as Standard.

Precision also design Oil/Gas calorifiers as per British Standard BS 853:1996, BS 5500:1997 or in accordance with Art 3.3 of the European Directive EEC/97/23 for pressure equipment.

HW	O/G	30	PC	V	1000 L
Hot Water	Oil / Gas	KW	Shell Material	Configuration	Capacity
HW	O	Input	PC-Precision Coat	V-Vertical H-Horizontal	Litres

Eg: HWO30PCV1000L



# Vessel Lining

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## Precision Coat

Precision coat is a polymerized coating which is applied to all internal surfaces of the tank. Tank surfaces are first sandblasted and cleaned to a white metal finish and then precision coat is applied uniformly. The tanks are then forced cured at 95°C to form a glossy lining unaffected by thermal shock from -6°C to 80°C. Precision coat is approved by US department of agriculture and with NSF/61 certification for drinking water.

## Standard - Shells

Steel SA516 Gr-70  
Coating FDA approved Precision coat material



# Heating Section

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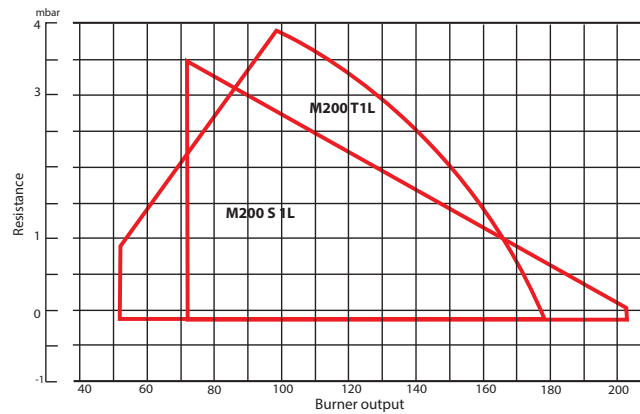
Water heaters are fitted with removable type fire tube heat exchanger. These heat exchangers are made of carbon steel tubes and coated with specially formulated coating material to withstand high temperature.

## Burner

Mono block pressure jet fully automatic oil / gas fired burners are used to heat the water. Depend on recovery, burners can be selected either on / off type or full modulation type. Burners will be highly fuel efficient and with low nox capabilities.

## Oil Fired Burner





## Technical features

- Energy Saving and compatible with environmental requirements
- Quiet in operation and designed for easy maintenance
- Reliable and trouble - free
- Designed and approved in accordance with the European Standard EN267
- Suitable for high resistance boilers
- Industry standard components easily available
- Designed for on / off and high/low operation
- Plug-in contact facilities the installation
- With hydraulic air adjustment
- Fuel - Light distillate oil Class D (1.5-5.5 cSt@40°C)

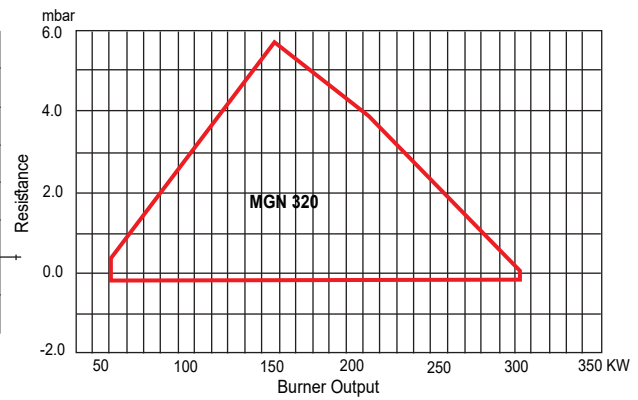
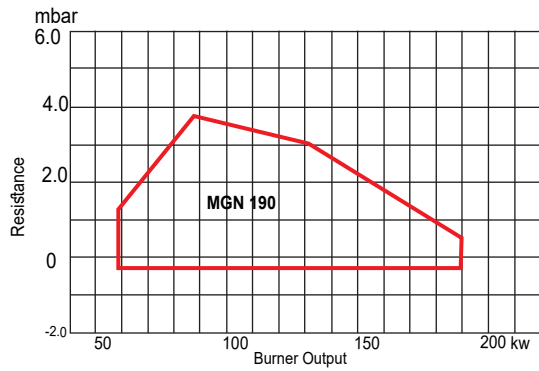
## Gas Fired Burner



## Technical Features

- Energy saving and compatible with environmental requirements
- Quiet in operation and designed for easy maintenance
- Designed and approved in accordance with the European Standard EN676
- Plug - in contact facilities the installation
- Hinged flange
- Designed for one stage, two stage, or modulating operation
- Available for natural gas, LPG, town gas, biogas





## Removable Type Heat Exchanger

Heat Exchanger section is made of seamless carbon steel sheet and coated with specially formulated lining material to withstand high temperatures. Heating surface area is more.

Header Chest of the heat exchanger will be internally lined with refractory to withstand high flue gas temperatures. Header chest will be externally insulated with Rockwool mattress and clad with GI sheet painted.

## Control Panels

Control panels are manufactured in house. All the wiring of panel and components are to IEE (Current Edition) Standard.



## Following Controls and Fittings are available in the panel

- Isolator
- Safety Door Inlet Lock
- Indicators
- Power On
- High Temperature alarm ( Optional )
- Low Water Level Alarm ( Optional )
- Operating Temperature Indication
- Hi limit Temperature Indication
- High temperature fault
- Low Water fault

## Specifying Oil/ Gas Fired Storage Calorifiers

High capacity water heaters shall be model HWO with ----- litre storage capacity rated at ----- kW with ----- volts ----- phase, fired with oil or gas. Heaters are to be insulated and jacketed for vertical / horizontal installations. The water heater tank shall be constructed in accordance with ASME Boiler and pressure vessel code requirements stamped and registered with the national Board of Boilers and Pressure vessel inspectors or to BS standard. The tank shall have 150Psi (10 bar) design pressure.

All tanks shall be lined with precision coat. Manufacturer approved certificate, confirming quality assurance to be provided along with the heaters. A manhole shall be provided as per standards. Each tank shall be furnished with magnesium anodes to protect against corrosion.

Water Heaters to be fitted with removable type fire tube heat exchangers. Heat exchangers should be manufactured with seamless tubes. Heat exchangers should be coated with specially formulated precision coat.

Water heaters should be fitted with fuel efficient low nox burners fired either with oil or gas.

The water heaters to be fitted with factory fitted shell mounted pre-wired control panel with Isolator, Safety Door Inter Lock, Test/On/Auto switches, Illuminating Indication for power on, High Temperature fault, Low Water Fault, Thermostatic control shall comprise of a thermostatic switch for operating and high limit. Temperature display, low water cut out to be mounted on the shell.

The control panel should have 3 volt free contacts to give signals for Low Water /Power On/Off/Temperature and for external alarm.

The water heater to be fitted with low water cutoff system to avoid the burner from starting without water.

The tank to be fully lagged with 50mm thick Rockwool mattress and clad with G.I sheets painted with two coat gloss blue paint.

The tank shall be fitted with screwed/flanged connection. The water heaters shall be factory mounted, wired and tested.



## Selection & Sizing

### Maximum Demand Rates (litres/hour) @60°C

Sl. No.	Description	Apart ment house	Club	Gymnasium	Hospital	Hotel	Industrial Pant	Office Building	Private Residence	School	YMCA
1	Basin, Private Lavatory	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
2	Basin, Public Lavatory	15	23	30	23	30	45.5	23	-	57	30
3	Bathtub	76	76	114	76	76	-	-	76	-	114
4	Dishwasher	57	190-570	-	190-570	190-760	76-380	-	57	76-380	76-380
5	Foot basin	11	11	46	11	11	46	-	11	11	46
6	Kitchen sink	38	76	-	76	114	76	76	38	76	76
7	Laundry, Stationary tub	76	106	-	106	106	-	-	76	-	106
8	Pandry sink	19	38	-	38	38	-	38	19	38	38
9	Shower	114	568	850	284	284	850	114	114	850	850
10	Service sink	76	76	-	76	114	76	76	57	76	76
11	Hydrotherapeutic shower				1520						
12	Hubbard bath				2270						
13	Leg bath				380						
14	Arm bath				130						
15	Sitz bath				114						
16	Continuous flow bath				625						
17	Circular wash sink				76	76	114	76		114	
18	Semicircular wash sink				38	38	57	38		57	
	Demand Factor	0.3	0.3	0.4	0.25	0.25	0.4	0.3	0.3	0.4	0.4
	Storage Factor	1.25	0.9	1	0.6	0.8	1	2	0.7	1	1

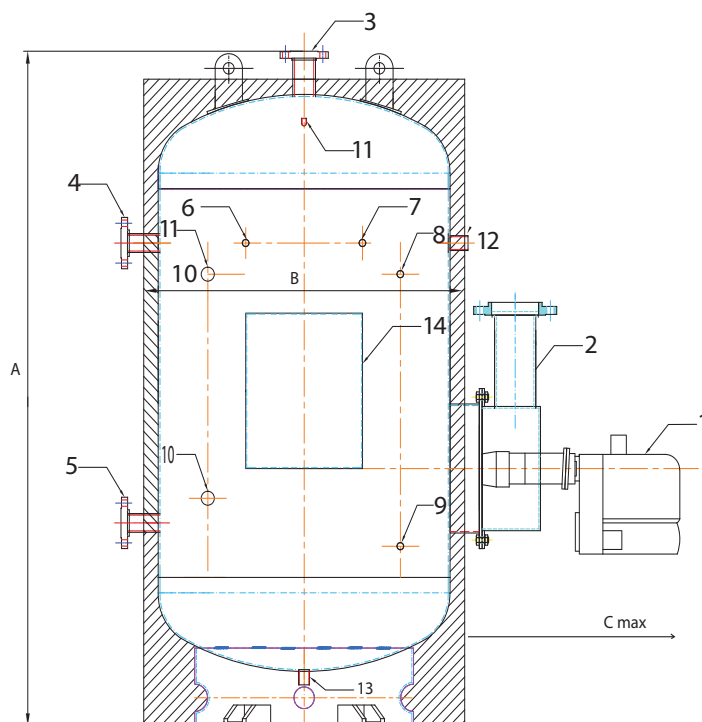
Courtesy: Ashrae

Example:- Determine heater and storage tank size for an apartment building from a number of fixtures.

## Solution

60 Lavatories	x	2	7.6	l/h	=	456 l/h
30 Bathtubs	x	20	76	l/h	=	2280 l/h
30 Showers	x	30	114	l/h	=	3420 l/h
60 Kitchen sinks	x	10	38	l/h	=	2280 l/h
15 Laundry tubs	x	20	76	l/h	=	1140 l/h
Possible maximum demand					=	9776 l/h
Proable Maximum demand	=			9576 x 0.30	=	2873 l/h
Heater or coil capacity					=	2873 l/h
Storage tank capacity	=			2873 x 1.25	=	3591 l/h

## Sizes and Dimensions



**ELEVATION**

## Description

1. Burner
2. Flue outlet
3. Secondary outlet
4. Secondary Return
5. Cold feed
6. Thermometer
7. Pressure gauge
8. High limit Thermostat
9. Operating Thermostat
10. Magnesium Anode
11. Safety Valve
12. Low water cutoff
13. Drain
14. Control Panel

## HWO DIMENSIONAL DATA

Model No.	Capacity Litres	Dimensions in mm				Connections			Weights kgs
		A	B	C (max)	D (max)	in /Out	DRAIN	RETURN	
HWO	500	1830	760	1200	125	1½ "	1 "	1½ "	300
HWO	1000	2225	950	1200	125	2 "	1 "	2 "	500
HWO	2000	2385	1270	1200	125	2 "	1 "	2 "	677
HWO	3000	2930	1360	1200	125	2½ "	1¼ "	2½ "	1050
HWO	4000	3025	1550	1200	125	2½ "	1¼ "	2½ "	1235
HWO	5000	3100	1700	1700	150	3 "	1¼ "	2½ "	1400
HWO	6000	3600	1700	1700	150	3 "	1¼ "	3 "	1550
HWO	7000	4100	1700	1900	150	3 "	1¼ "	3 "	1710
HWO	8000	4600	1700	1900	200	3 "	1¼ "	3 "	1900
HWO	9000	5100	1700	2000	200	3 "	1¼ "	3 "	2050
HWO	10000	5600	1700	2000	200	3 "	1¼ "	3 "	2210

\* Pressures available upto 20 bar (300psi).

\* Capacities available upto 30,000 litres.

\* Specified weights are for 7 bar Design pressure & 10.5 bar Test Pressure.

\* Alternate sizes available.

\* Please consult Factory.





# Accessories

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## Temperature Sensor

Each water heater will be fitted with 2 nos of Temperature sensor. One will be dedicated for sensing operating temperature and the other will be set of high limit temperature

## Pressure Gauge

Water heater will be fitted with pressure gauge. Pressure Gauge will indicate the pressure inside the water heater.



## Thermometer

The thermometer is located near the top of a storage calorifier to measure the temperature of water reaching the outlet.



## Safety Valve

All calorifiers should be fitted with a safety valve to protect the cylinder against over-pressure due to malfunction of controls or incorrect operation.



## Inspection Opening

Each water heater will be fitted with a 400 mm dia manhole for access of internals, without disturbing the heat exchanger.

## Temperature Controllers

Temperature Controller are of on / off type with 3 digit single display in deg C / deg FC which takes input from Rtd Cpt 100 signals with field selectable controll output (relay or SSR).



## Anodes

Magnesium anodes are supplied as standard to water properties. Magnesium anodes help to protect cylinders. The life of the magnesium anode depends on the quality of the water and regular checks should be made to establish a service period.



## Insulation

Adequate thermal insulation is essential to prevent unnecessary heat losses from storage calorifiers which may be standing for many hours at working temperature. Standard factory-fitted insulation consists of 50mm thick Fiber glass wool mattress or 50mm thick rock wool sheets. which is closely fitted to the shell and encased 1mm thick G.I sheets with one coat of redoxide primer and two coats of gloss paint.

## Low Water Level Switch

Low water cut off probe type is fitted as standard for all water heaters. The risk of switching on the heaters when they are not covered by water damages the heat exchanger and lining of the tank.

## High Limit Cut Out

All fired water heaters is fitted with a high temperature cut out as standard. This acts as and immediate monitor of overheating. It will be fitted with a manual reset button so that the heater will continue to operate from the high limit switch if the control thermostat is malfunctioning.

# Water Quality

All water contain dissolved substances A large proportion of these dissolved substances are generally calcium and magnesium carbonates and sulphates. The concentration of these salts in the water define the hardness of the water. Greater their concentration harder the water, smaller their concentration softer the water.

Generally, water which can be considered as slightly hard to moderately hard we must consider the effects on the immersion heaters and other components within the calorifier shell.

For more details please consult your water treatment SPECIALIST.

# Useful Conversions

## Electrical Data

$$\text{Amps (3 Phase)} = \frac{\text{kW} \times 1000}{\text{Volts} \times 1.732}$$

$$\text{Amps (1 Phase)} = \frac{\text{kW} \times 1000}{\text{Volts}}$$

## Btu/hr Requirement

$$\begin{aligned} \text{Btu / hr Output} &= \text{GPM} \times 60 \text{ min/hr} \times 8.33 \text{ lb/gal} \times \text{Temp.Rise} \\ \text{Btu / hr Input} &= \frac{\text{GPM} \times 60 \text{ min/hr} \times 8.33 \text{ lb/gal} \times \text{Temp.Rise}}{\% \text{ Efficiency}} \end{aligned}$$



## Efficiency of Heat Transfer

$$\% \text{ Efficiency} = \frac{\text{GPH} \times 8.33 \text{ lb/gal} \times \text{Temp. Rise}}{\text{Btu/hr Input}}$$

## Recovery - Electric

$$\text{GPH} = \frac{\text{kW Input} \times 3412 \text{ Btu/kW} \times \% \text{ Efficiency}}{8.33 \text{ lb/gal} \times \text{Temp. Rise}}$$

## Temperature Rise

$$\text{Temp. Rise} = \frac{\text{Btu/hr Input} \times \% \text{ Efficiency}}{\text{GPM} \times 60 \text{ min/hr} \times 8.33 \text{ lb/gal}}$$

## Heat - Up Time

$$\text{Time in hours} = \frac{\text{GPH} \times 8.33 \text{ lb/gal} \times \text{Temp. Rise}}{\text{Btu/hr Input} \times \% \text{ Efficiency}}$$

### % Hot Water Required to provide Mixed Water at a lower Temperature

$$\% \text{ of the Hot water required in mixture} = \frac{\text{Temp. Mixed Water } F - \text{Temp. Cold Water } F}{\text{Temp. Mixed Hot } F - \text{Temp. Cold Water } F}$$

$$\text{KW} = \frac{m \times C_p \times \Delta T}{860 \times \text{No. of Hours}}$$

## Determination of Gas Volume for the Installation

Specifications on natural gas, town gas and bio gas vary. For more exact information please contact the gas distributor.

Gas quality	Net calorific Value		
	KWh/Nm <sup>3</sup>	kJ/Nm <sup>3</sup>	kcal/ Nm <sup>3</sup>
Natural gas	10.3	37144	8865
Propane	26.0	93647	22350
Butane	34.3	123571	29492
Town Gas	4.9	17653	4213
Bio gas	7.0	25219	6019

### Example How to Calculate the Gas Volume (Natural Gas)

V = Gas volume Nm<sup>3</sup>/h

Q = Boiler output 120 kW

H<sub>u</sub> = Calorific value of the gas A.37 144 kJ/Nm<sup>3</sup>, B. 10.3 kWh/Nm<sup>3</sup>

η

$$\text{Ex.A} \quad V = \frac{Q \cdot 3600}{H_u \cdot \eta} = \frac{120 \cdot 3600}{37144 \cdot 0.90} = 12.9 \text{ Nm}^3/\text{h}$$

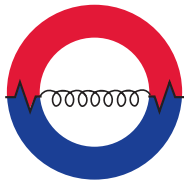
$$\text{Ex.B} \quad V = \frac{120}{10.3 \cdot 0.90} = 12.9 \text{ Nm}^3/\text{h}$$



# RANGE OF PRODUCTS

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- ★ HEAT EXCHANGER PACKAGE
- ★ AIR RECEIVER
- ★ STEAM ACCUMULATORS
- ★ INDIRECT HEATED STORAGE CALORIFIERS
- ★ FEED TANKS & CONDENSATE RECEIVERS
- ★ BLOWDOWN VESSEL
- ★ ELECTRIC WATER HEATERS
- ★ BUFFER VESSELS
- ★ AIR SEPARATORS
- ★ CHILLED WATER BUFFER TANKS
- ★ EXPANSION VESSELS

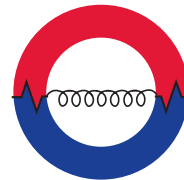


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