Lochinvar®

EC POWER

Greater savings in areas where electricity costs are high.

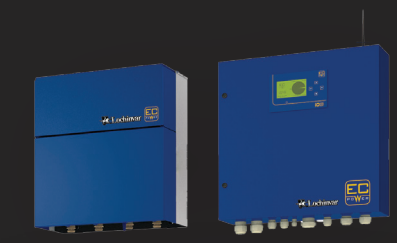
GROWING DEMAND FOR COGENERATION SOLUTIONS

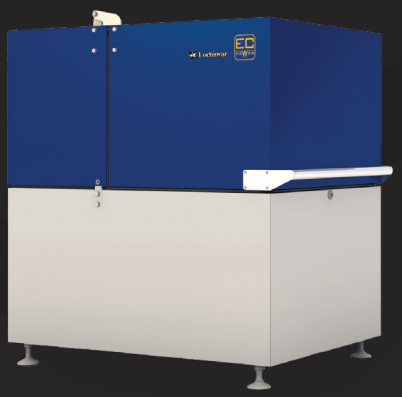
XRGI®25 MICRO COMBINED HEAT AND POWER APPLICATION GUIDE

THE NEXT GENERATION IS COGENERATION

Combined Heat and Power (CHP) technology—often called “cogeneration”—is a game changer for light commercial facilities across North America. Our new MicroCHP (‹50 kWh) solution gives you the high-efficiency water heating you’d expect from Lochinvar while simultaneously generating electricity as it heats. This means once it’s installed, you will see an instant drop in your electricity bill.

Our commitment to give you the broadest lineup of water heating solutions has led us to partner with EC POWER. As the #1 European producer of commercial MicroCHP systems where cogeneration technology is already widespread, EC POWER shares our value for providing the most reliable and efficient products possible.





INGENUITY YOU EXPECT FROM LOCHINVAR

Since MicroCHP is a relatively new technology in North America, its adoption is being driven by a company with the resources and know-how to introduce new products. At Lochinvar, we have what it takes to offer customers the benefits of both proven water heating technology and on-site electricity generation. With the ability to provide storage tanks, control units and everything else needed for easy installation, nobody brings the power of cogeneration together like Lochinvar.

MICROCHP FEATURES

1. EASY INSTALLATION
Lochinvar's MicroCHP is designed to be easily installed by most trained contractors, making a traditionally complex system much easier to install and service.

2. FULL SYSTEM COMPATIBILITY
Not only is Lochinvar providing a top-of-the-line MicroCHP, but also the additional storage tanks and control units to complete the system. Once installed, cogeneration systems like MicroCHP can achieve extraordinary conversion efficiencies of up to 93 percent.

OBJECTIVES

- Optimize operation and interaction between the Micro Combined Heat and Power “µCHP” and the heating system.
- Cost-effective integration of the µCHP into existing or new heating system(s).

INSTALLATION REQUIREMENTS

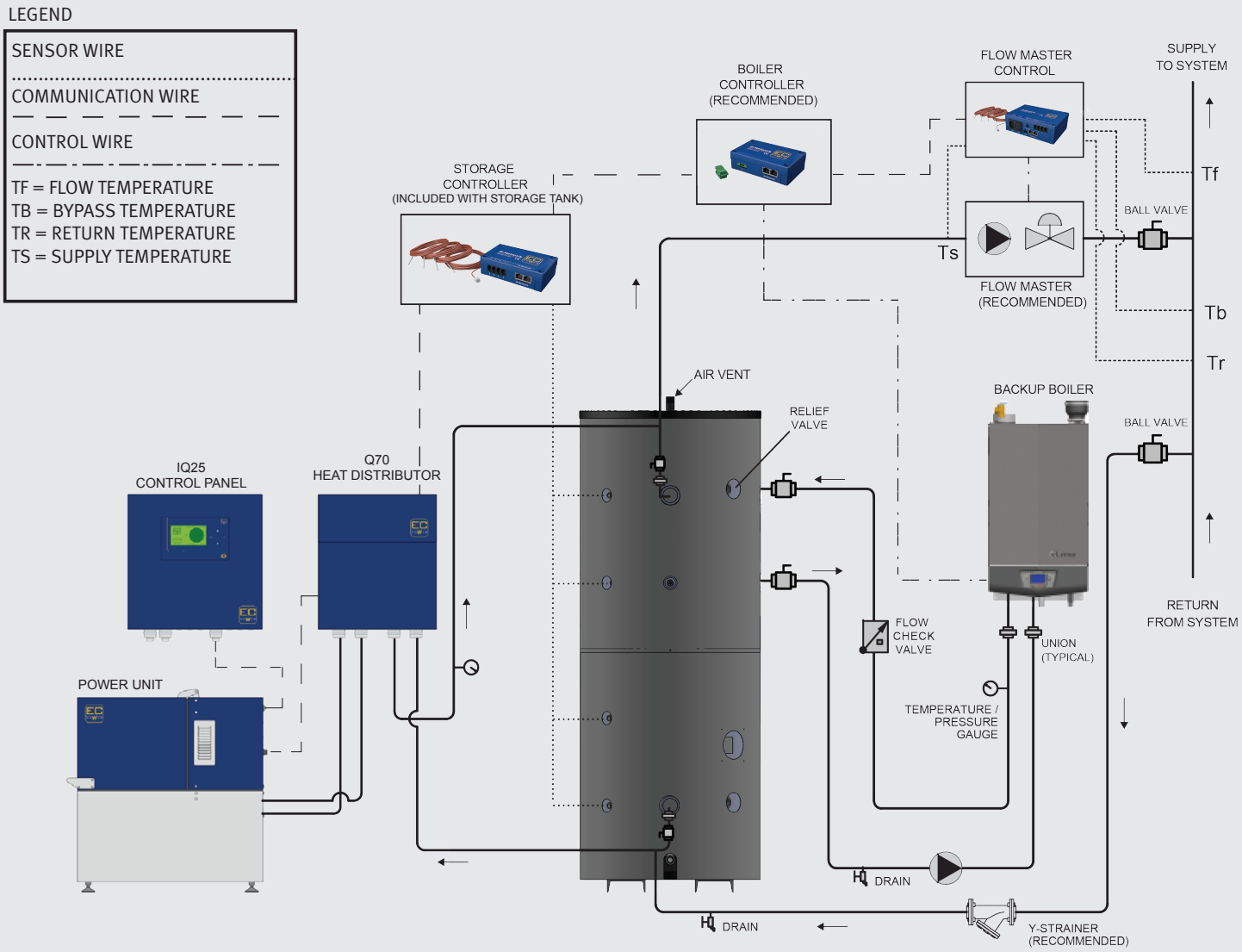
- Piping diagrams within this document are for reference only. Design and install any necessary hydronic, safety and control components in accordance with local regulations.
- Only install this system with storage tanks designed for µCHP (general use storage tanks are **not** designed to meet the needs of the µCHP system).
- High return temperatures can cause malfunctions. Avoid excessive flow in the µCHP system. Operate the heating system at the lowest possible return temperatures.
- Refer to the Installation and Operation manual for information on water and electrical connections.
- Proper hydronic integration (and prevention of short cycling) is necessary to comply with warranty conditions.

TECHNICAL DATA FOR THE XRGI®25

POWER UNIT	
Generator Output	24 kW (81,891 Btu/Hr.)
Generator Type	Asynchronous/ Induction
ENGINE	
Cylinder Qty.	4
Ignition	Distributorless/ Direct Fire
Combustion	Stoichiometric
Rotation Speed	1,850 RPM
EFFICIENCY	
Electrical - 100% Load	31% LHV / 28% HHV
Heat - 100% Load	62% LHV / 57% HHV
Overall - 100% Load	93% LHV / 85% HHV
iQ25 CONTROL PANEL	
Input	480 V / 3 PH / 60 Hz
480 Leg	3 Hot, 1 Neutral, 1 Ground
Input - Max Fuse	60 A
Output - 3 Ph	36 A / 24 kW
Short Circuit Current Rating (SCCR)	10 kA
Grid Connection	Direct
Protection Grade	54 IP
Q70 HEAT DISTRIBUTOR	
Input	208 V
208 Leg	2 Hot, 1 Ground
Input - Max Fuse	10 A
EXHAUST	
Diameter	3" (Adapter Included)
Material	UL1738 Approved
Max Length	150 ft. (45.7 m)
Max Temperature	250°F (121°C)

FUEL	
Input	262,000 Btu/Hr. (76.8 kW)
Type	Natural /Propane
Max Input (Static)	NAT/LP - 20 in. WC
Min Input (Static)	NAT - 4.5 in. WC / LP - 10 in. WC
Connection	3/4 in. NPT (Adapters Included)
HYDRONIC	
Piping - Unit Connection	1-1/4 in. BSP (Hoses Included)
Piping - System Connection	1-1/4 in. NPT (Adapters Included)
Max Outlet Temperature	185°F (85°C)
Max Return Temperature	167°F (75°C)
Output	163,000 Btu/Hr. (47.7 kW)
POWER (ENGINE) UNIT DIMENSIONS	
Width	29-1/2 in. (75 cm)
Height	44-1/8 In. (112 cm)
Length	46-1/8 in. (117 cm)
Weight (Wet)	1501 lbs. (681 kg)
IQ25 CONTROL PANEL DIMENSIONS	
Width	23-5/8 in. (60 cm)
Height	23-5/8 in. (60 cm)
Depth	8-3/4 in. (22 cm)
Weight	88 lbs. (40 kg)
Q70 HEAT DISTRIBUTOR DIMENSIONS	
Width	21-3/4 in. (55 cm)
Height	23-5/8 in. (60 cm)
Depth	11-5/8 in. (22 cm)
Weight	97 lbs. (44 kg)
ENVIRONMENT	
Max Ambient Temperature	95 °F (35 °C)
MAINTENANCE	
Interval - Run Hours	4,000 Hours

PIPING DIAGRAM:
HYDRONIC INSTALLATION



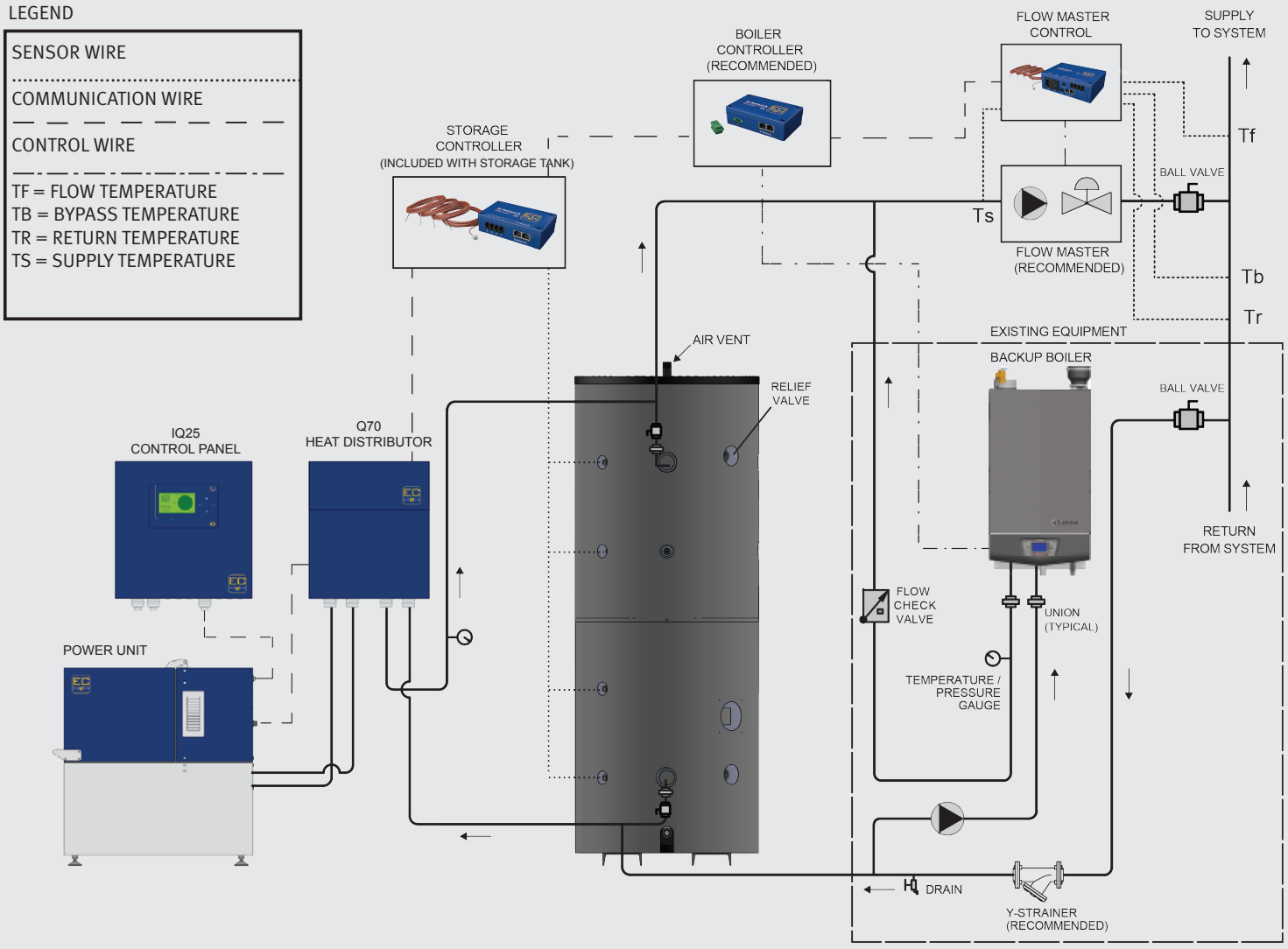
NOTES

Always set TF higher than the system set point in the control settings to give the MicroCHP priority over the heating system so the unit always supplies the base load heat.

Select the flow master size based on the discharge capacity required.

When utilizing more than one MicroCHP in the same system, use a minimum of two (2) storage controls with eight (8) temperature sensors.

PIPING DIAGRAM:
HYDRONIC RETROFIT



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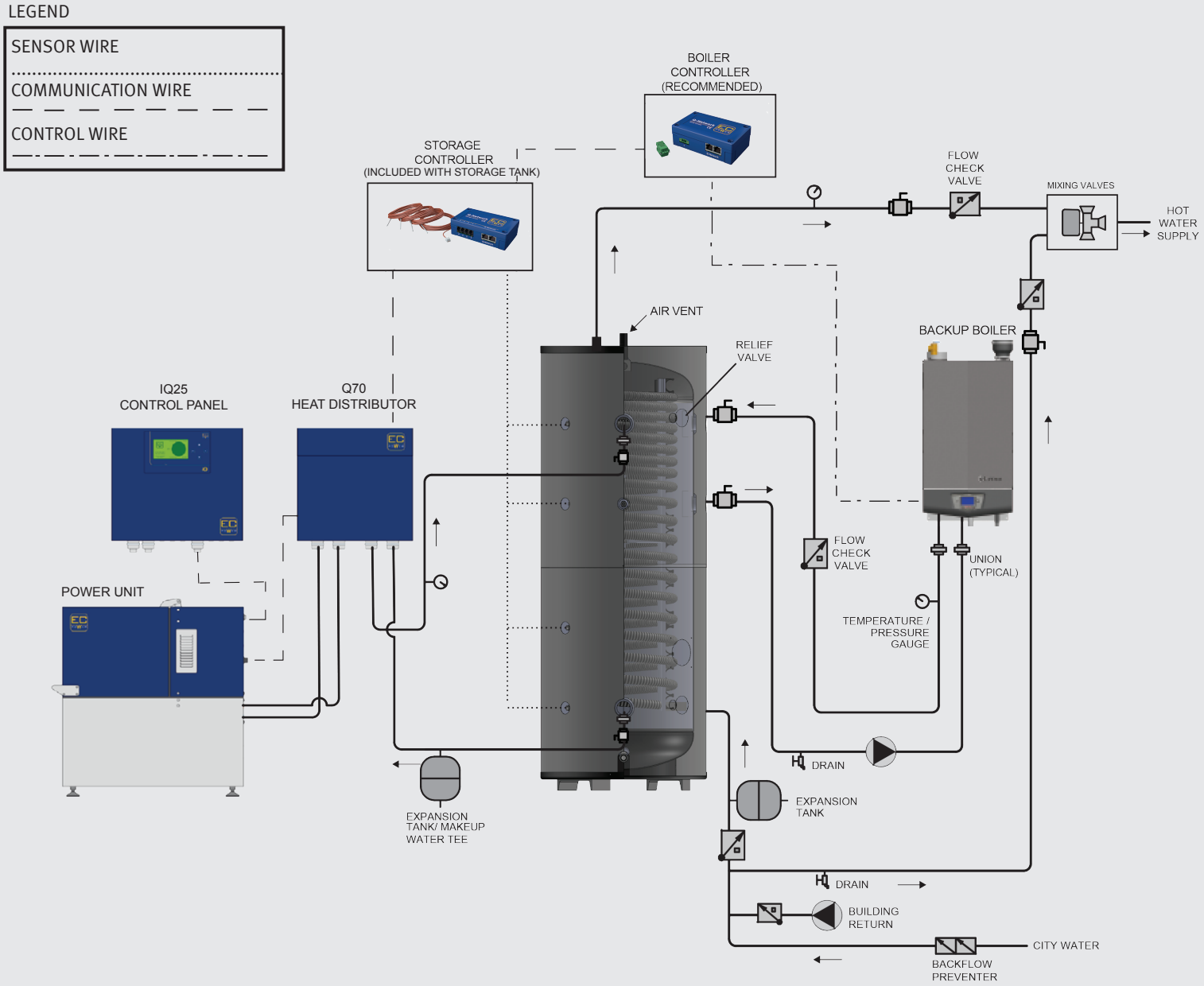
PIPING DIAGRAM:
DHW NEW INSTALLATION



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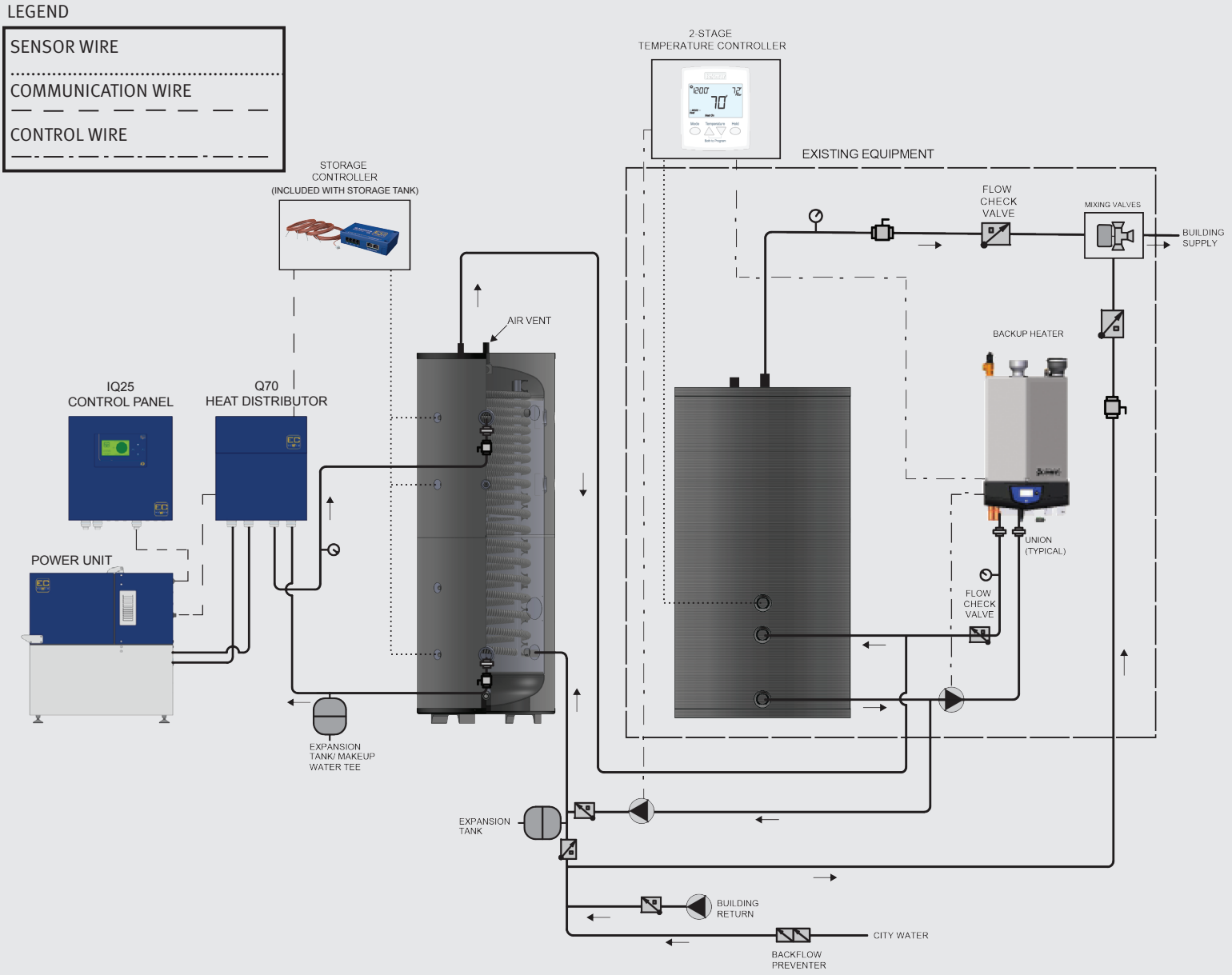
PIPING DIAGRAM:
DHW RETROFIT

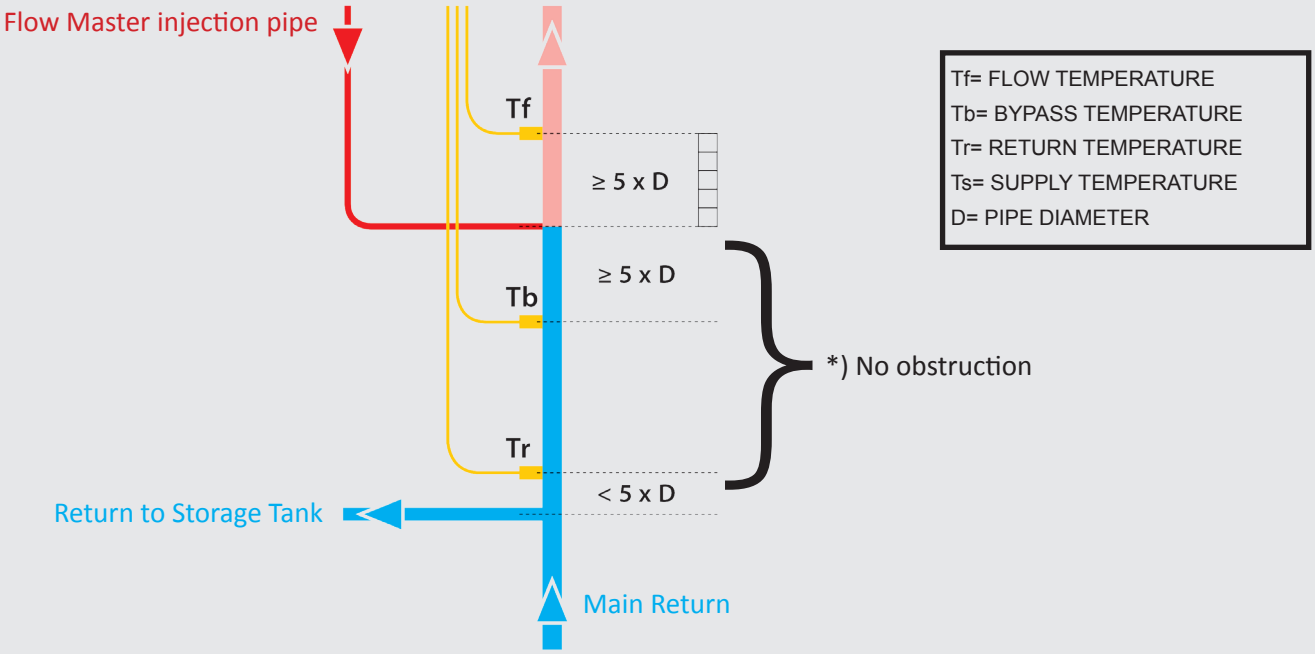


NOTES

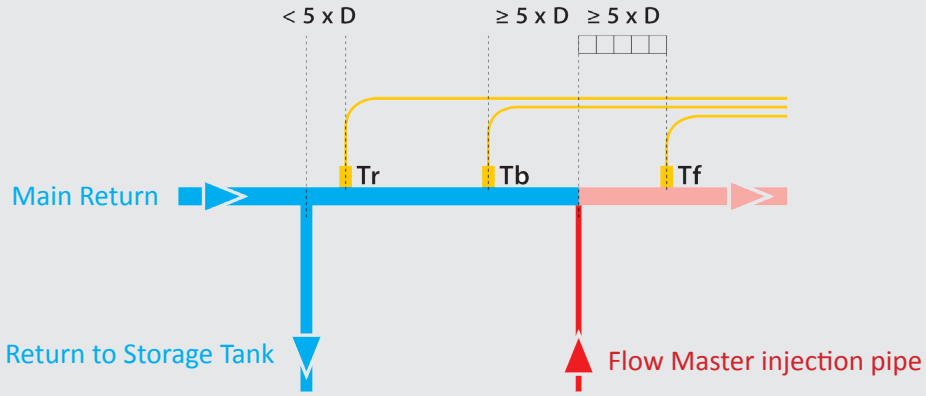
When utilizing more than one MicroCHP in the same system, use a minimum of two (2) storage controls with eight (8) temperature sensors.

FLOW MASTER SENSOR INSTALLATION GUIDE

INSTALLATION IN VERTICAL PIPEWORK (UPWARD FLOW):



INSTALLATION IN HORIZONTAL PIPEWORK (CONNECT TO UNDERSIDE OF MAIN):



CONSIDERATIONS

Ensure there are absolutely no obstructions to the flow between the Flow Master and Storage Tank. The Flow Master will automatically maintain the correct direction of flow between these connections. Back flow preventer's, check valves, strainers, etc., can cause restrictions.

Note the following when installing the temperature sensors.

· Install temperature sensors in bulb-wells to obtain accurate and faster readings.
· Ensure that the heating water in a vertical piping configurations flows upwards (ascending).
· Ensure that the temperature sensors (in bulb-wells) in horizontal piping configurations are fitted from above and the supply and return connections are fitted from below.
· Distance from Tf to the injection line of the µCHP/Storage Tank: **minimum of 5 x D** (pipe diameter).
· Distance from Tb to the injection line of the µCHP/Storage Tank: **minimum of 5 x D** (pipe diameter).
· Distance from Tr to the return line of the µCHP/Storage Tank: **maximum of 5 x D** (pipe diameter).

When installing the injection line from the Flow Master, ensure that the 185°F hot water injected from the µCHP is well mixed within the main flow of heating water and that there is no temperature stratification in the pipe (particularly at low flow rates).

FLOW MASTER CONTROL

Included with µCHP Flow Master
Part Number 100311125

HOW IT WORKS

The Flow Master Control is supplied with the Flow Master and regulates the delivery of heat from the µCHP to the system supply (via the Flow Master valve and variable speed pump) to maintain the required supply temperature Tf set on the IQ Control Panel. The Flow Master Control also protects the µCHP system from excessively high return temperatures, automatically prevents reverse flow between µCHP/Flow Master connections, and ensures minimal consumption of electricity by the pump.

The Flow Master maintains the set temperature at Tf by mixing 175-185°F water from the µCHP system into the supply system water. Variations in heat loads and flow rates are compensated for by the Flow Master valve operation and the pump speed; the supply temperature Tf is therefore maintained regardless of the heat load. The pump will stop if the Flow Master valve closes completely (i.e. no heat load).

Heat will be stored when consumption is less than µCHP's heat production. The µCHP will stop production when the heat storage is at capacity. During periods of peak demand, it will wait until there is sufficient cooling capacity in the heat storage before it restarts. During lower demand periods, the unit will wait until the minimum heat reserve has been reached before starting - none of this affects the steady supply from the Flow Master.

If the heat load is greater than the heat produced by the µCHP, the heat storage will discharge. When the storage has fully discharged, the temperature Ts at the Flow Master will fall and the Flow Master Control accordingly calculates a maximum supply temperature Tf as basis of control.

The Flow Master Control automatically adjusts to actual flow rates and return temperature conditions to achieve stable and precise control. Abrupt changes in supply loads and flow rates are compensated for by special functions to immediately recover and maintain steady control under all circumstances.

FLOW MASTER

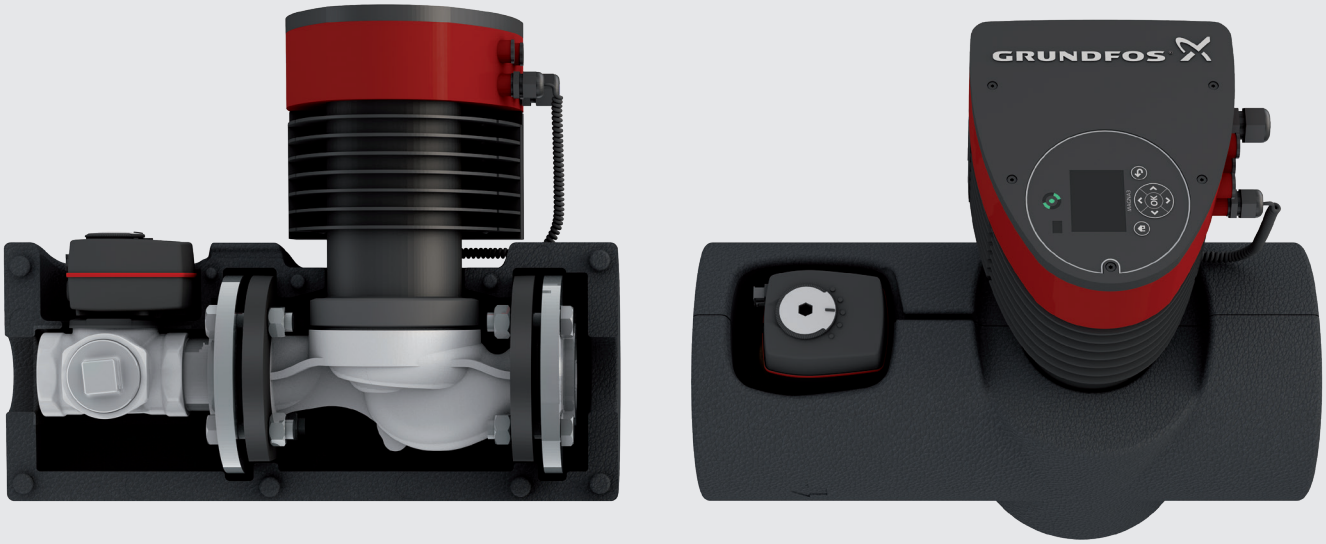


Figure shows FM type 350

HOW IT WORKS

The Flow Master is a motorized valve and variable speed pump unit controlled by the supplied Flow Master Control module. The heat storage enables the µCHP system to service short-term peak loads way beyond the normal output of the Power Unit. This minimizes the need for supplemental heat from backup heating units and maximizes the number of runtime hours and electrical production of the Power Unit. Therefore, the Flow Master should always be able to deliver at least twice the normal Power Unit heat output, and generally significantly more.

The normal heat outputs are based on a delta T of 35°F between the µCHP flow and main return, corresponding to a main return temperature of 140-150°F. The Flow Master heat output will increase proportionally with lower return temperatures.

The Flow Master provides steady regulation down to approximately 2% of maximum load (provided it has been installed correctly).

FM Type	Thermal output	ΔT (@ return of 140 to 150°F)	Maximum flow rate
FM 50	170,000 BTU/HR	35°F	9.5 GPM
FM 150	512,000 BTU/HR	35°F	28.5 GPM
FM 250	853,000 BTU/HR	35°F	47.5 GPM
FM 350	1,194,000 BTU/HR	35°F	66.5 GPM

STORAGE CONTROL

Included with µCHP Storage Tank
Part Number 100310060

HOW IT WORKS

The Storage Control is supplied with and manages the storage tank(s). The temperature sensors detect the stratification layer between hot supply water and cold return water. The clear separation of the two is crucial for proper operation of the µCHP system.

THE µCHP SYSTEM REQUIRES AT LEAST ONE STORAGE CONTROL WITH FOUR (4) TEMPERATURE SENSORS. OPERATION IS NOT POSSIBLE WITHOUT THIS CONTROL.

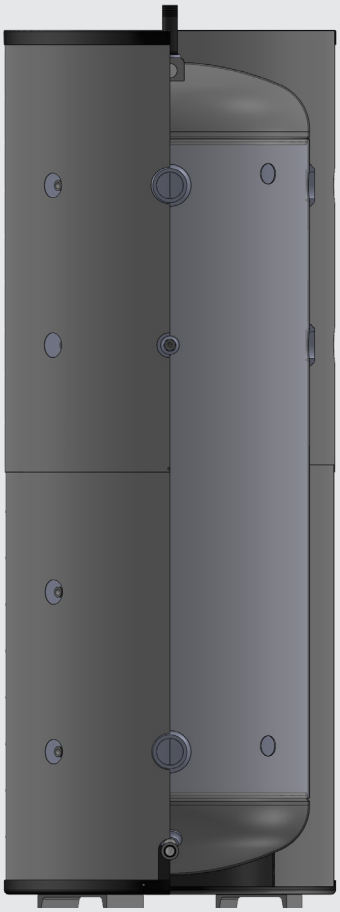
Fully automated Storage Tank management is achieved with the following characteristics:
1. Ensuring a minimum runtime for each start:
The Power Unit only starts when there is sufficient cold water in the Storage Tank.

2. Maximum servicing of heat demand by the µCHP system:
The Power Unit starts before all heat is removed from the Storage Tank. The heat reserve needed is continuously determined based on the actual supply profile.

The reserve capacities determined by the µCHP system vary according to season and heat demand profiles. For instance, in the colder months the system will try to maintain a very high heat reserve, whereas the “cold reserve” requirement will be minimal. The situation will be reversed in lower heat demand periods, with the system maintaining a much smaller heat reserve along with a larger “cold reserve” to ensure sufficient periods of operation.

STORAGE TANK

CST 150-001
150 Gallons
25” Diameter
76” Tall



Tanks include Storage Control

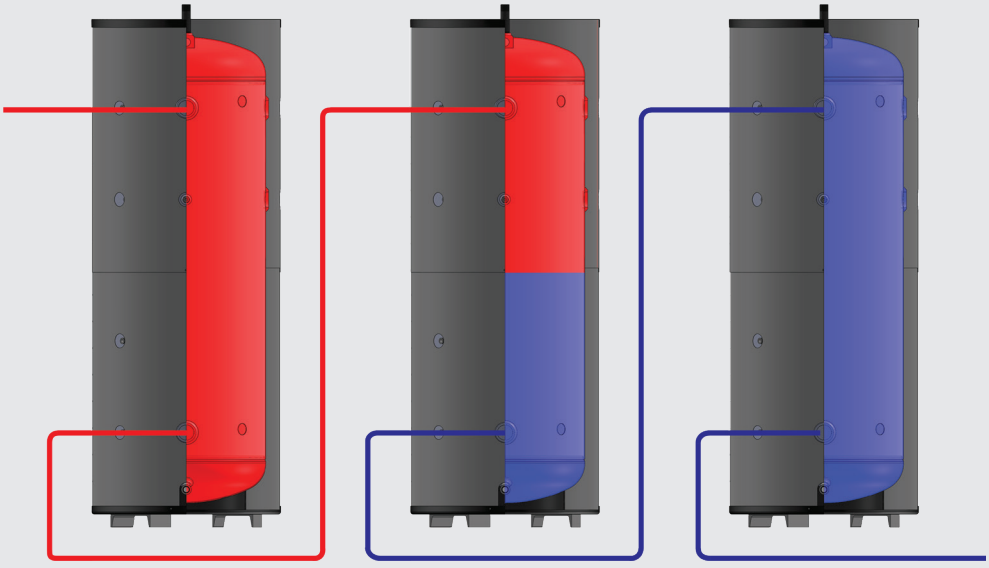
HOW IT WORKS

The Storage Tank forms an integral part of the µCHP system and is **REQUIRED** for proper operation of the system. It ensures that any temporary drops in heat load below the output of the Power Unit do not cause the Power Unit to stop, and enables the µCHP system to service temporary heat loads beyond the output of the Power Unit. When heat loads are below the output of the Power Unit for extended periods of time, the Storage Tank allows the µCHP system to operate longer and schedule operation according to load patterns on site.

If multiple Storage Tanks are used, they must be installed in series. Experience has shown that parallel or reverse return circuits do not operate satisfactorily and must not be utilized.

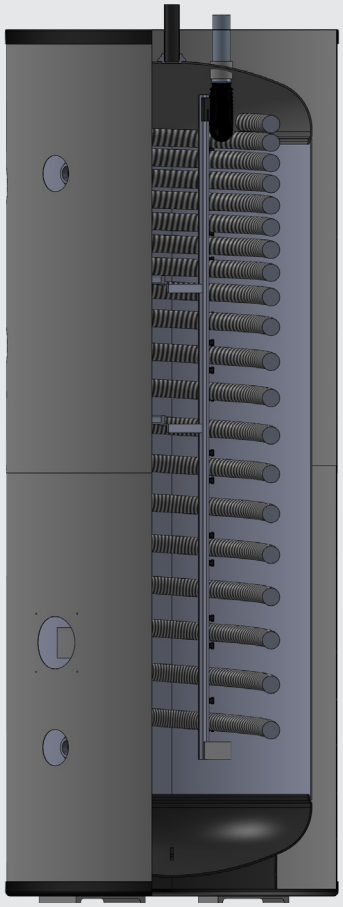
Use a minimum of one (1) Storage Control with four (4) temperature sensors for a storage capacity of 150 gallons.

The Lochinvar Storage Tank with factory supplied Storage Control ensures proper operation of the µCHP system.



DHW TANK

CST 150-002
150 Gallons
25” Diameter
76” Tall



Tanks include Storage Control

HOW IT WORKS

The Domestic Hot Water (DHW) Tank works in much the same way as the Storage Tank, with the addition of an indirect coil installed in the tanks interior. It functions alongside the µCHP’s control system to ensure proper operation and control over the heat stored in the tank.

· Potable water is passed through the coil allowing it to absorb heat stored in the tank by the µCHP.

· Cold water is fed into the bottom connection of the coil maintaining the stratification effect within the volume of the tank.

· Indirect heat transfer provides a second layer of separation between potable DHW and the Power Unit’s cooling glycol.

Application of the µCHP in DHW systems is quite flexible. In new installations, auxiliary heat can be supplied by a boiler tied directly to the DHW Tank as shown in the piping diagrams. Retrofit applications may be directly supplemented by injecting the heated DHW to existing storage.

BOILER CONTROL

Part Number 100310059

HOW IT WORKS

The Boiler Control ensures optimum operation of the µCHP and the back up heating unit (boiler or water heater). A contact in the Boiler Control activates the backup heating unit to produce heat when consumption exceeds the heat produced by the µCHP. The back up heating unit stops as soon as heat production by the µCHP exceeds consumption.

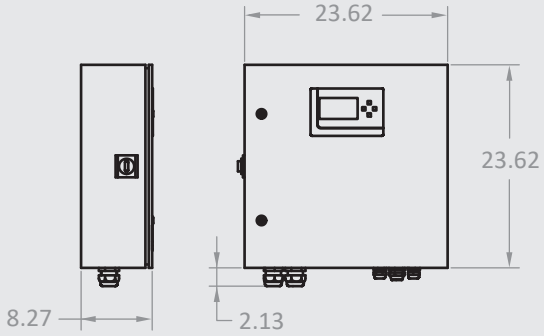
THE BOILER CONTROL OPERATION IS DETERMINED BY THE TWO TOP STORAGE CONTROL SENSORS S1 & S2 IN THE STORAGE TANK AND THE PREDETERMINED FLOW TEMPERATURE TF.

If the heat consumption is higher than the heat produced by the µCHP, the top storage tank sensor S1 will generate a signal to the IQ25 Control Panel. The Boiler Control enables the back up heating unit to produce heat until the second storage tank sensor S2 reads a sufficient temperature. When this occurs, the Boiler Control disables the back up heating unit.

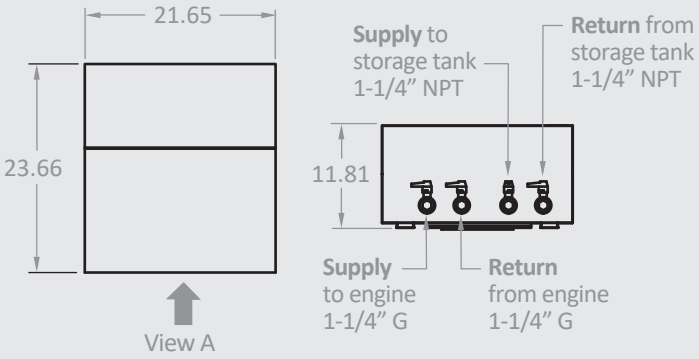
The optional installation of the Boiler Control ensures that the back up heating unit is only enabled when it is needed in order to maximize the operation time of the µCHP.

XRGI COGENERATION SYSTEM DIMENSIONS, SPECIFICATIONS, AND CALLOUTS

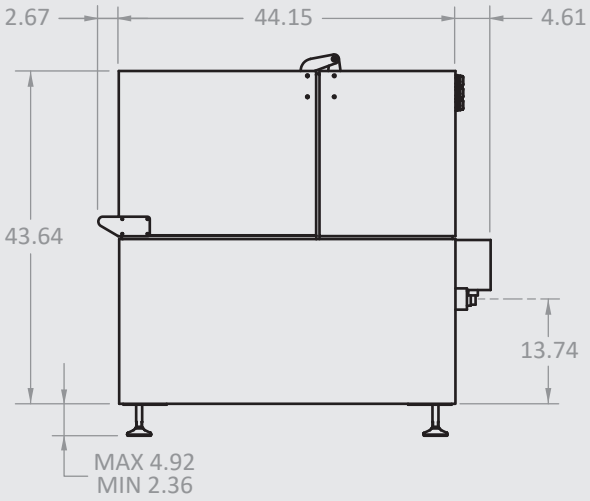
ALL DIMENSIONS IN INCHES



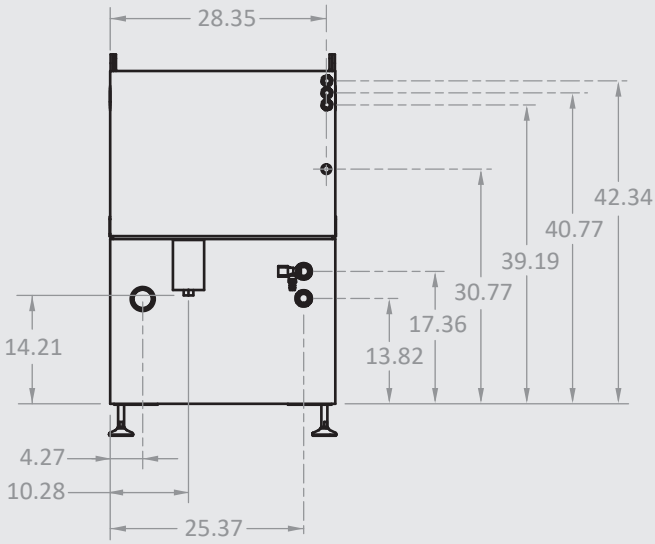
IQ25 CONTROL PANEL



Q70 HEAT DISTRIBUTOR



POWER UNIT



Model Number	Power Generation Capability	BTU/Hr Output	Approximate Shipping Weights (lbs) Power Unit	Heat Distributor	Control Panel
XRGI25	24 kW/60 Hz	163,000	1,500	97	88

1 **Terminal box for generator cable**

2 **Exhaust gas connection** - DN60
(Adapter provided for 3" AL29-4C vent)

3 **Outlet to Q-70 Heat Distributor**
(1-1/4" G) Flex Provided

4 **Inlet from Q-70 Heat Distributor**
(1-1/4" G) Flex Provided

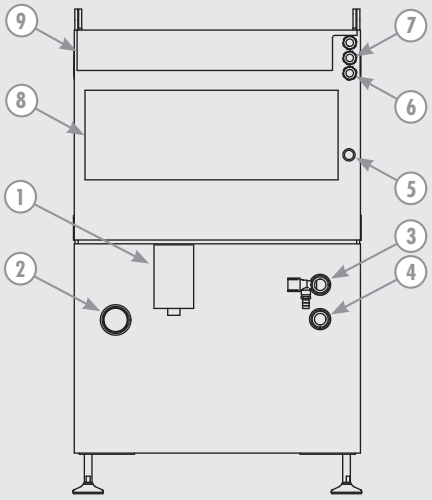
5 **Gas connection** *(3/4" NPT)*

6 **Network cable**
(CAT6 RJ45, Provided)

7 **Control cable to IQ25 Control Panel**

8 **Compartment** for air filter, gas pressure controller, stepper engine, and gas mixture control

9 **Compartment** for control board, safety circuit, and ignition system



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