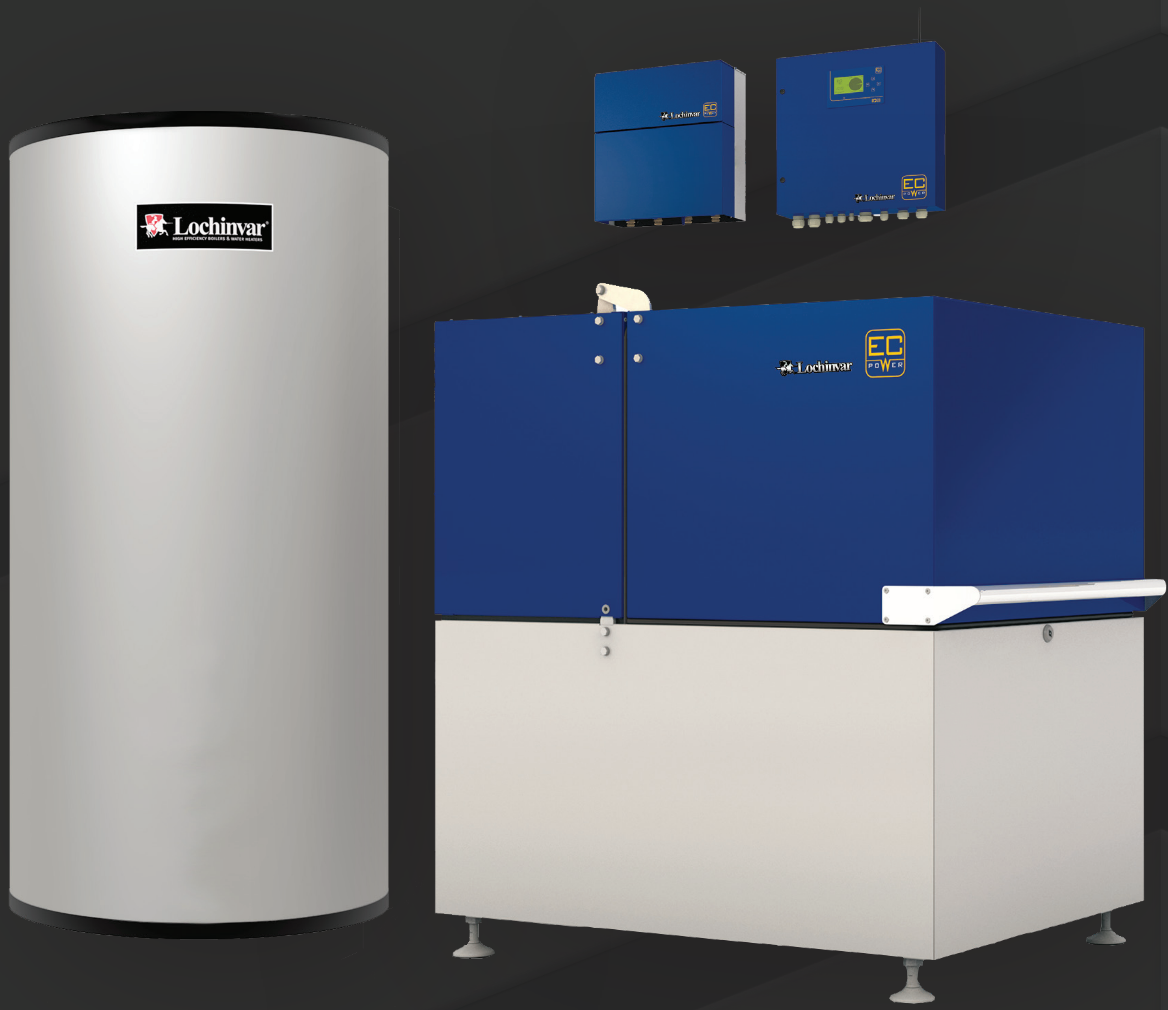
Lochinvar® EC POWER

Greater savings in areas where electricity costs are high.



GROWING DEMAND FOR COGENERATION SOLUTIONS

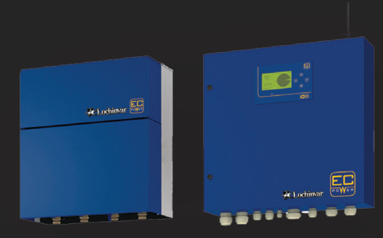
XRGI®25

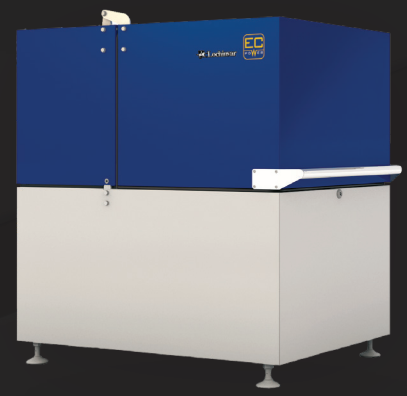
MICRO COMBINED HEAT AND POWER APPLICATION GUIDE

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 90 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 hydronic and electrical connections.
- Proper hydronic integration (and prevention of short cycling) is necessary to comply with warranty conditions.

TECHNICAL DATA FOR THE XRGI®25

Lochinvar®

Cogeneration

Product Summary XRGI25 - 01

POWER UNIT	
Manufacturer	EC POWER
Generator	
Output	kW (Btu)
	24 (81,891)
Type	Asynchronous / Induction
Engine	
Cylinders	Qty
	4
Ignition	Distributorless, Direct Fire
Combustion	Stoichiometric
Rotation Speed	RPM
	1850

EFFICIENCY	
Electrical (LHV/HHV) 100% Load	31%/28.14%
Heat (LHV/HHV) 100% Load	62%/50.52%
Overall (LHV/HHV) 100% Load	93%/78.66%

ELECTRICAL		
iQ25 Contral Panel		
Input	480 V/ 3 PH / 60 Hz	
480 Leg	(3 hot, 1 neutral, 1 ground)	
Input, Max Fuse	Amps	
	63	
Output (3 phase)	Amps	kW
	36	24
Short Circuit Rating (SCCR)	kA	
	10	
Grid Connection	Direct	
Protection Grade	IP	
	54	
Q70 Heat Distributor		
Input	240 Volts	
	(1 hot, 1 neutral, 1 ground)	
Input, Max Fuse	Amps	
	10	

EXHAUST	
Size	(inch)
	(3) Adapters Included
Material	UL 1738 Approved
Length	ft (m)
	150 (45.7)
Temperature Max	°F (°C)
	250 (121)

FUEL	
Input	Btu (kW)
	262,000 (76.8)
Type	Natural Gas
Input Max (Static)	WC (in.)
	20
Input Min (Static)	WC (in.)
	4.5
Connection	NPT 3/4 in. Adapter Included

HYDRONIC	
Piping, Unit Connection Size	BSP 1- 1/4 in. Hoses Included
Piping, System Connection Size	NPT 1- 1/4 in. Adapters Included
Rated Hot Water Outlet	°F (°C)
	185 (85)
Max. Hot Water	°F (°C)
	185 (85)
Max Rated Hot Water Return	°F (°C)
	167 (75)
Output	Btu (kW)
	163,000 (47.7)

iQ25 CONTROL PANEL DIMENSIONS	
Width	in. (mm)
	23-5/8 (600)
Height	in. (mm)
	23-5/8 (600)
Depth	in. (mm)
	8-3/4 (210)
Weight	lb (kg)
	66.1 (30)

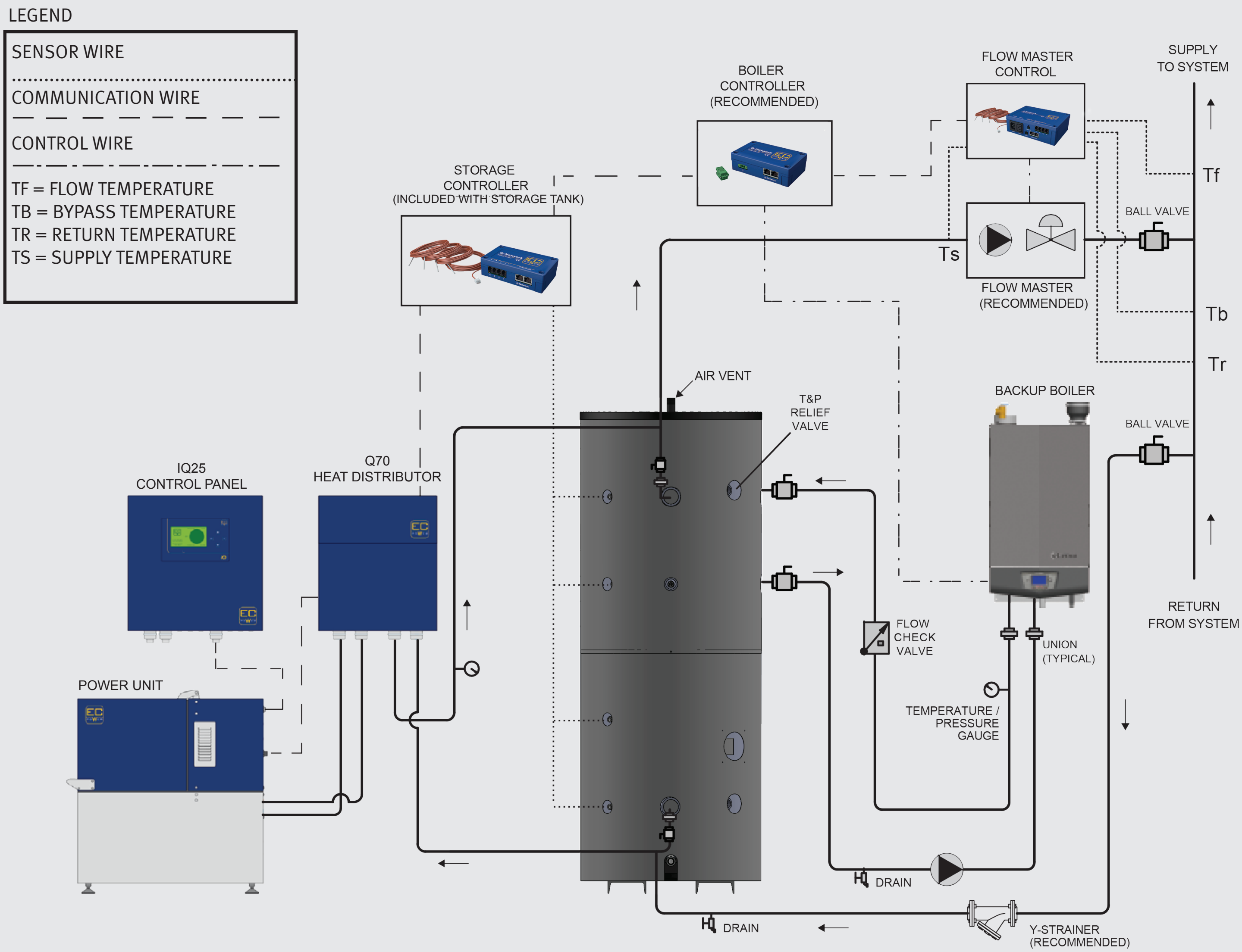
MAINTENANCE	
Interval (run hours)	Hours
	4000

ENVIRONMENT	
Maximum Ambient Temperature	°F (°C)
	95 (35)

POWER (ENGINE) UNIT DIMENSIONS	
Width	in. (mm)
	29-1/2 (750)
Length	in. (mm)
	44-1/8 (1120)
Height	in. (mm)
	46-1/8 (1170)
Weight (ready to operate)	lb (kg)
	1501 (681)

Q70 HEAT DISTRIBUTOR DIMENSIONS	
Width	in. (mm)
	21-3/4 (550)
Height	in. (mm)
	23-5/8 (600)
Depth	in. (mm)
	11-5/8 (295)
Weight	lb (kg)
	97 (44)

PIPING DIAGRAM:
HYDRONIC INSTALLATION



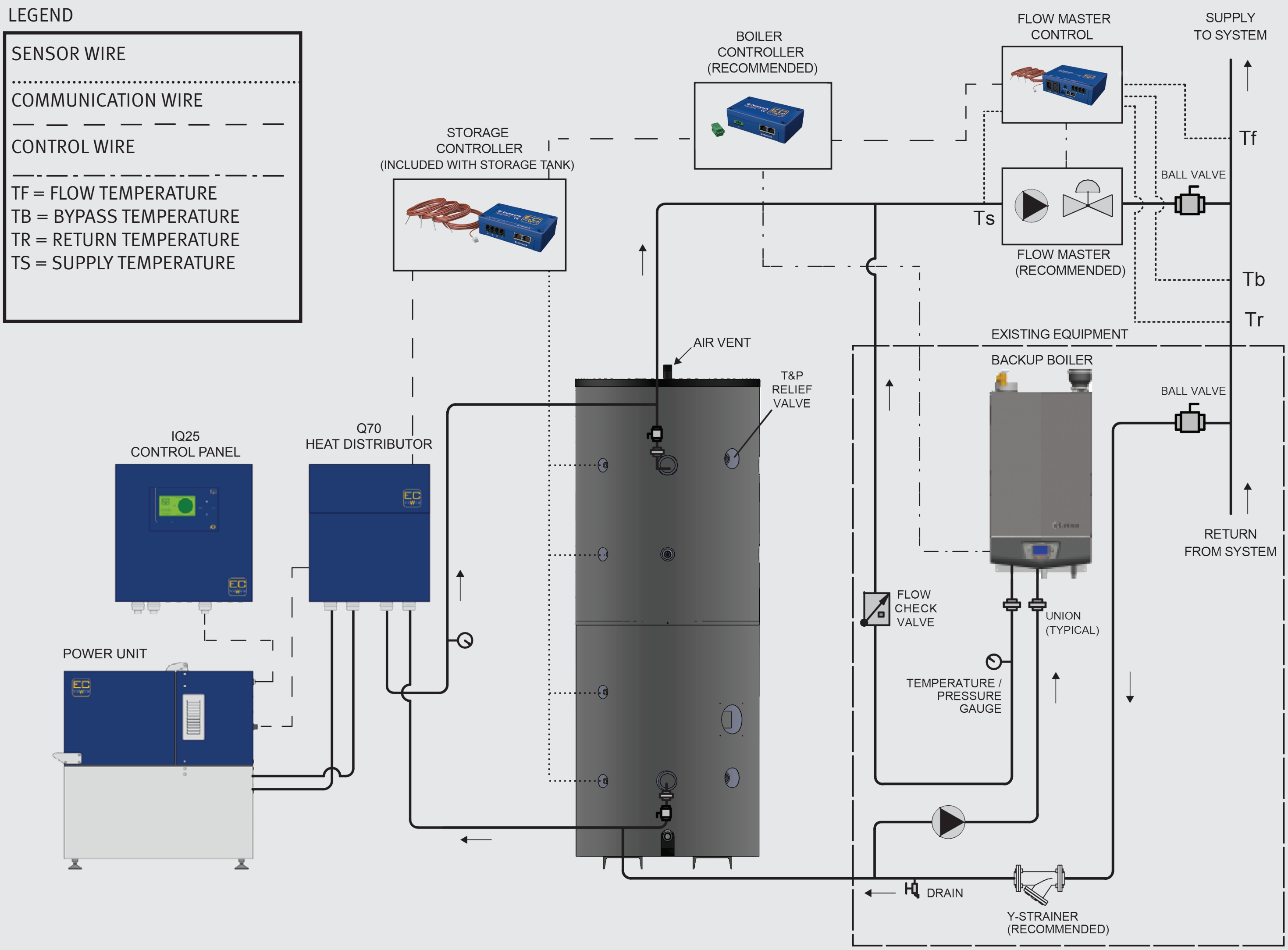
NOTES

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.

Use a minimum of two (2) storage controls with eight (8) temperature sensors in system utilizing more than one MicroCHP.

PIPING DIAGRAM:
HYDRONIC RETROFIT



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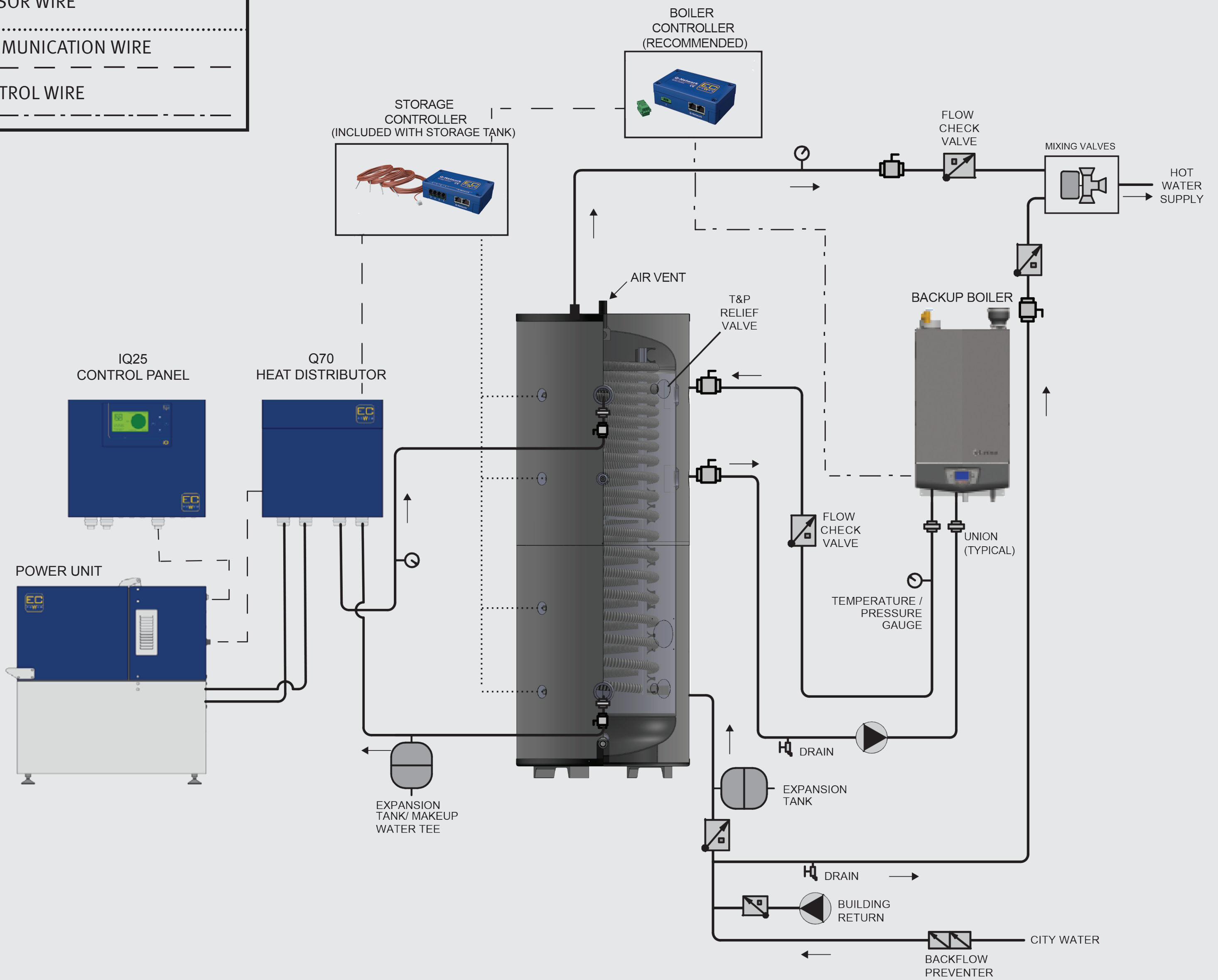
Select the flow master size based on the discharge capacity required.

Use a minimum of two (2) storage controls with eight (8) temperature sensors in system utilizing more than one MicroCHP.

PIPING DIAGRAM:
DHW NEW INSTALLATION

LEGEND

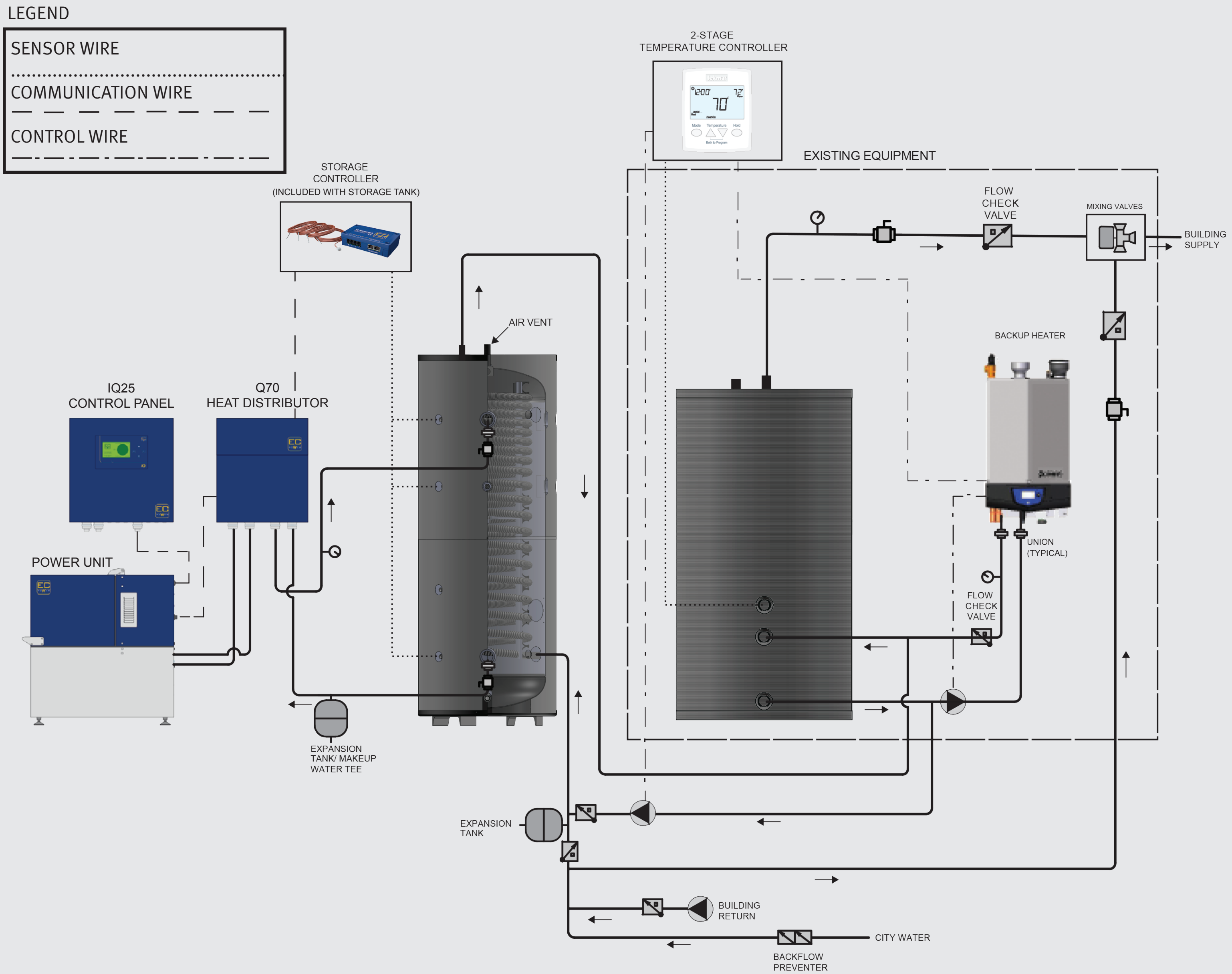
SENSOR WIRE (dotted line)
COMMUNICATION WIRE (dashed line)
CONTROL WIRE (dash-dot line)



NOTES

Use a minimum of two (2) storage controls with eight (8) temperature sensors in system utilizing more than one MicroCHP.

PIPING DIAGRAM:
DHW RETROFIT

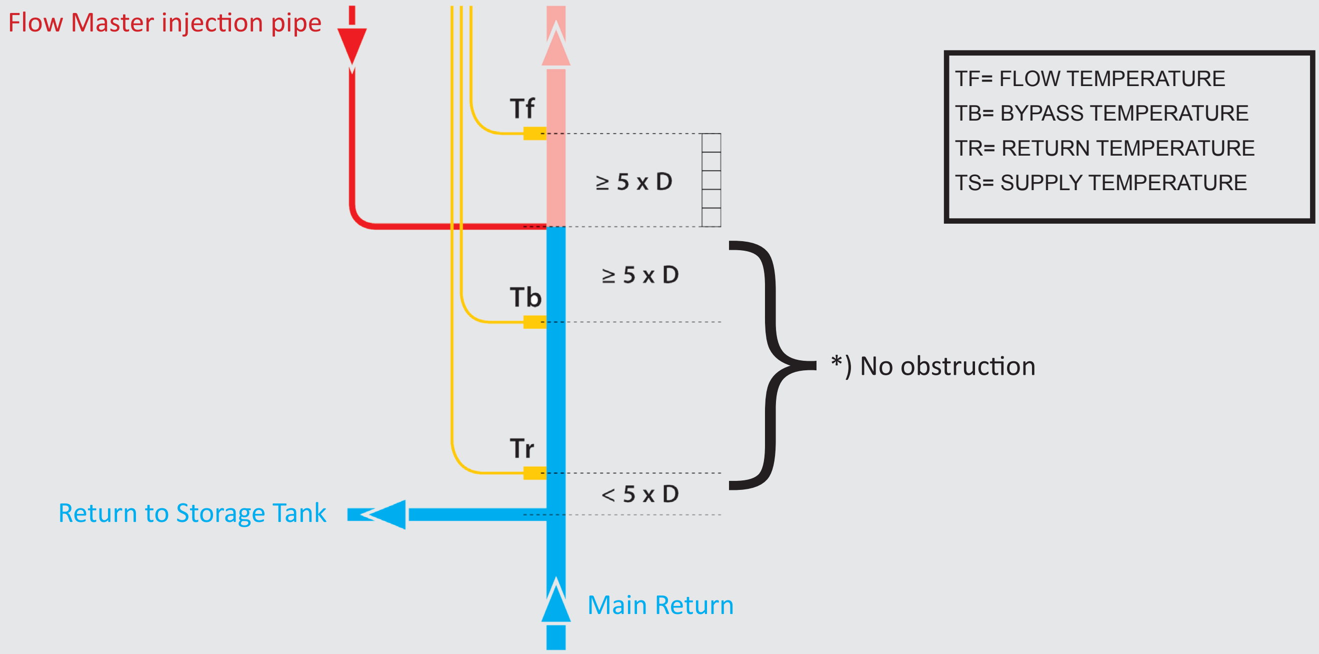


NOTES

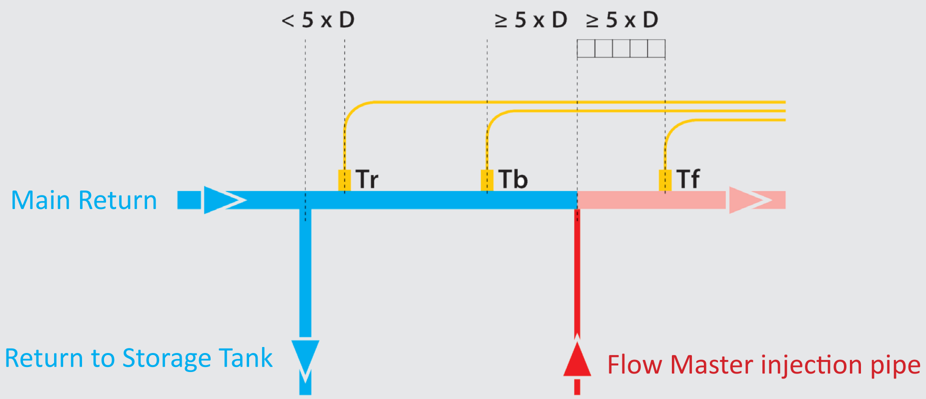
Use a minimum of two (2) storage controls with eight (8) temperature sensors in system utilizing more than one MicroCHP.

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 (e.g. check valve) on the main pipe between the Flow Master and Storage Tank. The Flow Master will automatically maintain the correct direction of flow between these connections.

Note the following when installing the temperature sensors.

· Install temperature sensors in immersion sleeves 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 immersion sleeves) 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

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).

The heat storage will fill up if the heat load is lower than the heat produced by the µCHP. The µCHP will stop production once the heat storage is full. During periods of peak demand, it will wait until there is sufficient cooling capacity in the heat storage before it restarts, otherwise it 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

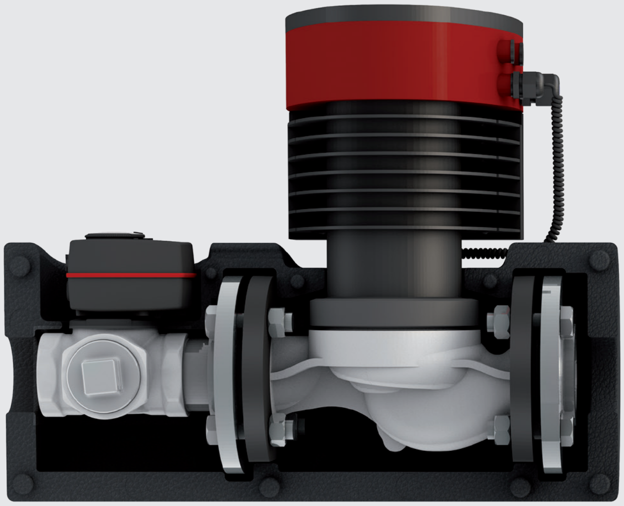


Figure shows FM type 350

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. The Flow Master should therefore 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 (at a 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

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.

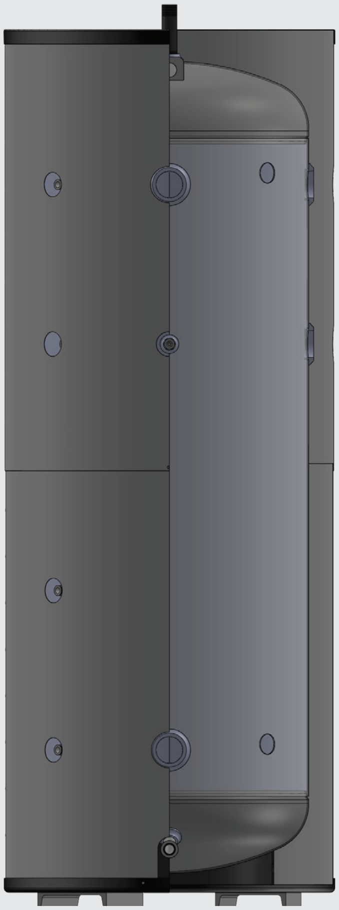
THE µCHP SYSTEM REQUIRES AT LEAST ONE STORAGE CONTROL WITH FOUR (4) TEMPERATURE SENSORS. OPERATION IS NOT POSSIBLE WITHOUT THIS CONTROL.

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 the Storage Tank is empty. 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



Tanks include Storage Control

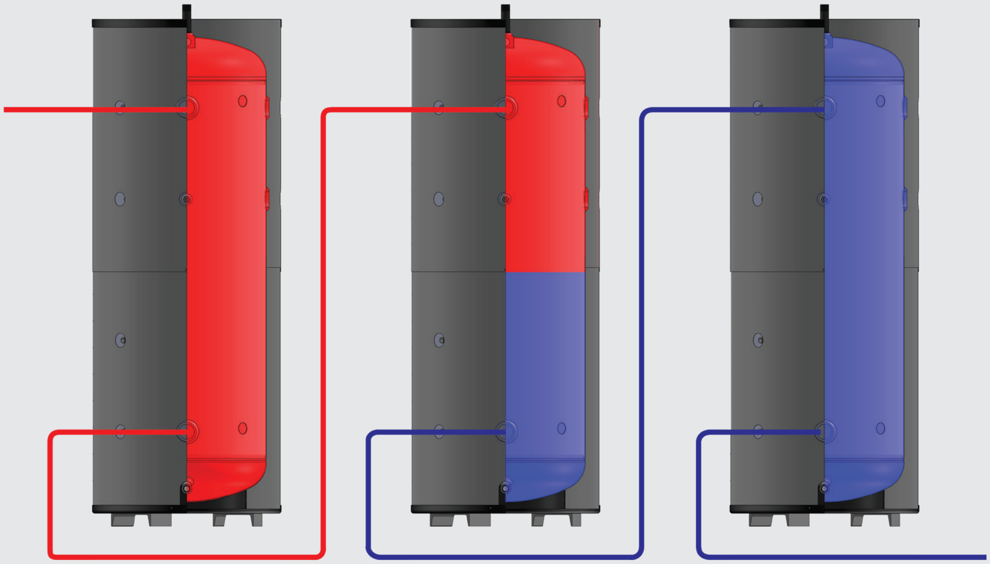
HOW IT WORKS

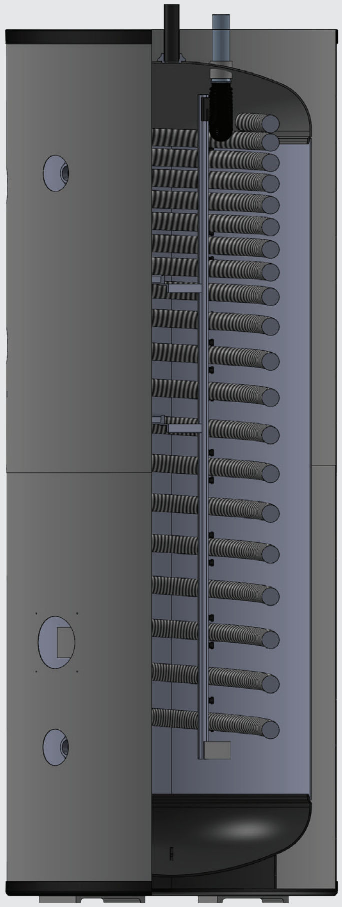
The Storage Tank forms an integral part of the µCHP system and is **REQUIRED** for proper operation of the system. It ensures that any temporary drops in heat load below the output of the Power Unit do not cause the Power Unit to stop, and enables the µCHP system to service temporary heat loads beyond 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 power 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 250 gallons.

The Lochinvar Storage Tank with built-in Storage Control ensures proper operation of the µCHP system.





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

HOW IT WORKS

The Boiler Control ensures optimum operation of the µCHP and the peak load heating unit (boiler or water heater). A contact in the Boiler Control activates the heating unit to produce heat when consumption exceeds the heat produced by the µCHP and the storage tank is almost empty. The heating unit stops as soon as heat production by the µCHP exceeds consumption.

THE BOILER CONTROL IS CONTROLLED 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 over the long term, the top storage tank sensor S1 reads cold. The Boiler Control enables the peak load heating unit to produce heat until the second storage tank sensor from the top S2 reads a sufficient temperature. When this occurs, the Boiler Control disables the peak load heating unit.

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

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