

*Bozhidar "Boz" Ivanov*  
Sr. Product Specialist, Domestic Pump

## Switch to Domestic Pump

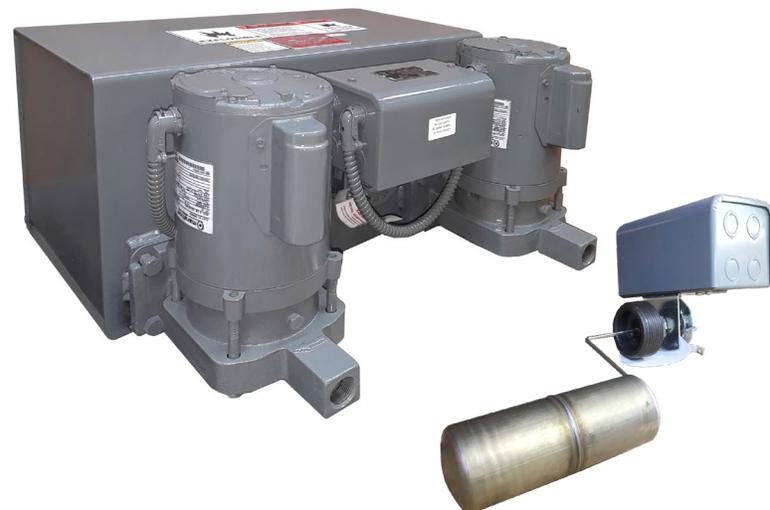
Float switches are very important part of Domestic Pump units. They perform variety of functions for both condensate return and boiler feed units. The switches are operated by the movement of the water level in the tank. They include electrical and mechanical parts. The electrical part is in a an electrical conduit box that is seen on the outside of the tank. The mechanical part includes a rod and a float - both of them are inserted into the tank and move up and down with the water level. When the float reaches the required set point it will either close or open the electrical contacts., depending upon the position of the float switch and the type of control.

Condensate return units include pumps that are controlled by the water level in the tank. When the float of the float switch reaches the preset high point, it will close the electrical contacts on the switch and power the pump. The pump will then start pumping the water out of the tank until the float drops to its low point and opens the contacts on the switch thus stopping the pump. The float controls ensure there is some water left in the tank to keep the pump primed and the float switch starts the pump before the tank overflows. Each pump may have its own dedicated float switch (photo 1), or the unit may be equipped with a duplex switch called "mechanical alternator" (photo 2). The mechanical alternator will control two pumps with a single float in the tank. This alternating device will sequence the lead-lag role of each pump thus operating the two pumps more evenly, and its single float provides space for installing more control switches in the tank.

There is a variation of the mechanical alternator that very much looks like it but its alternating function is disabled. Why? Because some customers prefer to have an electrical alternator instead, or to not have alternation at all, but include an additional float switch, say for a high level alarm. This, combined with fewer openings on a smaller tank is the reason to use the non-alternating duplex switch. Here is an



**Photo 1: A float switch and a simplex unit with the float switch on.**



**Photo 2: A mechanical alternator and a duplex unit with the mechanical alternator on.**

example - you need to control two pumps without mechanical alternation, and you also need to have high level alarm switch, too, but the receiver tank can only accommodate two float switches. The solution to that example is to use the duplex non-alternating switch and a second switch for the high level alarm. The working principle of the high level alarm float switch is the same but its function is to send a signal to the control panel and trigger an alarm.

Speaking of alarms - what about the low water level alarm? Here, opposite to the high level switch, we would need the contacts to close when water level drops too much. We can achieve this by using a float switch with reverse action. Such a switch is also used to control a make-up water solenoid that is normally closed. The two examples for reverse-action float switch are primarily used on boiler feed units. Those units are not controlled by the water level in their own tank, but by the water level in the boiler they are feeding. That is why we use safety switches like for low

level alarms, for controlling make up water connections, and for stopping the pumps in case the water gets so low that even the make-up water capacity cannot catch up with the boiler demand.

Float switches are robust, long-lasting and a simple solution for opening and closing electrical circuits. Once the user has selected the required unit features and enclosures, they do not need to worry about switch design, dimensions, materials or adjustment. Just get yourself familiar with the operating manual and remove the shipping bracket off the switches before operating the unit - all else has been covered and tested in the factory.

Any questions? Let me know.

[bozhidar.ivanov@xyleminc.com](mailto:bozhidar.ivanov@xyleminc.com)

Check out our products on [www.domesticpump.com](http://www.domesticpump.com)

*Jarek Berezowski*

Assistant Product Line Manager-Steam Products,  
McDonnell & Miller

## Why residential hot water boilers need LWCO's?

There are both legal, and practical considerations that create the need to install mechanical or electronic low water cut-off (LWCO) control on a residential hot water boiler. From the legal side, jurisdictions have adopted codes which state when an LWCO must be installed, while the practical side is based upon system conditions.

### ASME (American Society of Mechanical Engineers)

ASME Boiler and Pressure Vessel Code (BPVC) have been universally adopted as the minimum requirement for the manufacture, installation and maintenance of boilers. Section I, for Power Boilers, requires low water protection. Steam heating boilers of any size, regardless of where they are installed, must have a low water cut-off per ASME BPVC.IV. The same code only requires that hot water boilers with input greater than 400,000 btu must have a low water cut-off. In lieu of an LWCO, coil type boilers above 400,000 btu input, which require a flow of water to prevent overheating, shall have a safety device (typically a flow switch) to prevent burner operation when the flow of water is inadequate.



**RB-24 Low Water Cut-Offs**

### ASME CSD-1 (Control and Safety Devices)

CSD-1-2018 is an additional ASME standard for Controls and Safety Devices for Automatically Fired Boilers. As per Section 4, CSD-1 Part CW-120a requires at least one LWCO on all steam boilers, however the requirement for hot water boilers (Part CW-130a) have exception for residential boilers.

### IMC (The Internal Mechanical Code)

This is a newer standard that is being adopted by jurisdictions. It is a consolidation of codes written in the past by BOCA, SBCC, and other independent code councils. Section 1007.1 of the IMC states "All steam and hot water boilers shall be protected by a low water cut-off control." If it's a hot water boiler, it must have a low water cut-off.

## 2014 New York City Construction Code

### SECTION MC 1007 BOILER LOW WATER CUT-OFF 1007.1 General.

All steam and hot water boilers shall be protected with dual low water cut-off control.

Exception:

Hot water boilers located within a dwelling unit supplying only that unit and having a total heat input of less than 350,000 Btu/h (1025 kW) may be protected by only one low water cut-off control.

## The Reducing Valve

There has always been a controversy about whether to keep the fill valve open or closed after initially filling a hot water heating system. Bell & Gossett recommends closing the fill valve. If the valve is closed and there is a leak in the system, no water is added to the system which may cause damage to the boiler and flooding. Also a fill valve has a strainer, debris (sand, silt, minerals, rust, etc.) that is present in the water can clog the strainer. If the strainer is clogged, an open valve is no guarantee that water will flow, but if it does, a flood could result. The best practice in a hot water system is to fill the system, close the valve and install a low water cutoff to protect the system.

## Piping Elevation

Some systems have piping for radiators, snow melt, and tankless water heaters below the minimum safe water level of the boiler. Boiler manufacturers and organizations such as the National Fuel Gas have recognized this. Each has added a section in their literature or standards that indicates that if a hot water boiler is installed above level of radiation, then a low water cut-off should be installed

For many years, industry leaders have identified the need for low water cut-offs on hot water boilers. They agreed that the only way to detect a low water condition is with a low water cut-off device. No other safety device can determine if water is present. In 1997, McDonnell & Miller introduced the Series RB line of probe type low water cut-offs. Designed for use in residential hot water boiler applications, they feature a green "power on" LED, a "low water condition" red LED, and high sensitivity for use in a water, and water-glycol mixture. The series RB are equipped with a self-cleaning probe for years and years of worry free protection. The Series RB can be installed in either the boiler tapping or supply riser and are easy to wire. They are an excellent choice as the device to sense a low water condition in a hot water boiler. Remember, even with the many other safety devices (temperature limits, pressure relief valves, flow sensors, etc.) installed

on a hot water boiler, the low water cut-off is a low cost component which will protect the boiler and system from damage if a low water condition occurs.

Give your customer and yourself peace of mind, and install low water cut-off. It is a low cost way to protect property, health, and even life.

Since 1924 McDonnell & Miller company is protecting boilers in the USA and oversees from dry fire and offers many excellent mechanical and electronic low water cut-offs for hot water boilers.

Our featured electronic controls provide two different versions, based upon the power supply.

McDonnell & Miller [RB-122E](#) low water cut-off for residential hot water boilers is an excellent choice for oil or gas hot water boilers with 120V burner circuit.



**RB-122-E Low Water Cut-Offs**

- For residential and commercial applications
- Electronic operation
- Easy to install and wire
- Red LED indicating low water condition
- Green LED indicating power is on
- Test button
- Automatic reset
- No blow down required
- 20,000 ohms probe sensitivity
- Maximum ambient temperature 120°F (49°C)
- Maximum water temperature 250°F (121°C)
- Maximum water pressure 160 psi (11.2 kg/cm<sup>2</sup>)

For more information regarding Series [RB-122E](#) [MM-238REVO.pdf](#)

## Good Dog.



**Patented Self-Cleaning Probe**

Minimizes scale build-up and extends recommended cleaning interval to 5 years.

**Brass Threads**

Metal-to-metal seal ensures a leak-free installation.

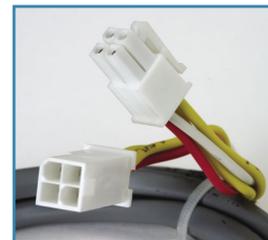
**Wrench Flats**

Easily and quickly installs in any hydronic system.



**Push-to-Test Button**

Enables low water cut-off protection to be verified without draining any part of the system.



**Plug & Play Installation**

Universal wiring harness fits any gas boiler. "Plug & Play" harnesses available for most residential boilers.

For more information regarding [Series RB-24E](#) please visit our website or download the pdf files [MM-288C.pdf](#) and [MPF-009B RB 24E.pdf](#).

If you have additional questions regarding McDonnell & Miller products please see our website or contact our factory representative for your area [mcdonnellmiller.com](http://mcdonnellmiller.com).



Xylem Inc.  
8200 N. Austin Avenue  
Morton Grove, Illinois 60053  
Phone: (847) 966-3700  
Fax: (847) 965-8379  
[www.xylem.com/bellgossett](http://www.xylem.com/bellgossett)

Bell & Gossett and McDonnell & Miller are trademarks of Xylem Inc. or one of its subsidiaries. © 2019 Xylem