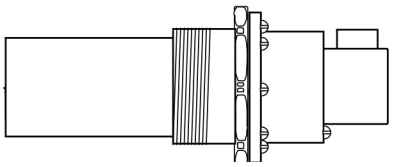
McDonnell & Miller
a xylem brand

INSTRUCTION MANUAL
MM-226F

246753

Series 69
Low Water Cut-Offs
For Steam Boilers



Series 69

Applications:

For residential and commercial boilers of any steaming capacity.

⚠ WARNING











- Before using this product read and understand instructions.
- Save these instructions for future reference.
- All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of plumbing, steam, and electrical and/or systems in accordance with all applicable codes and ordinances.
- To prevent serious burns, the boiler must be cooled to 80°F (27°C) and the pressure must be 0 psi (0 bar) before servicing.
- To prevent electrical shock, turn off the electrical power before making electrical connections.
- This low water cut-off must be installed in series with all other limit and operating controls installed on the boiler. After installation, check for proper operation of all of the limit and operating controls, before leaving the site.
- We recommend that secondary (redundant) Low Water cut-off controls be installed on all steam boilers with heat input greater than 400,000 BTU/hour or operating above 15 psi of steam pressure. At least two controls should be connected in series with the burner control circuit to provide safety redundancy protection should the boiler experience a low water condition. Moreover, at each annual outage, the low water cut-offs should be dismantled, inspected, cleaned, and checked for proper calibration and performance.
- To prevent serious personal injury from steam blow down, connect a drain pipe to the control opening to avoid exposure to steam discharge.
- To prevent a fire, do not use this low water cut-off to switch currents over 7.2A, 1/3 hp at 120 VAC or 3.6A, 1/3 hp at 240 VAC, unless a starter or relay is used in conjunction with it.
- This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.
- Previous controls should never be installed on a new system. Always install new controls on a new boiler or system.

Failure to follow this warning could cause property damage, personal injury or death.

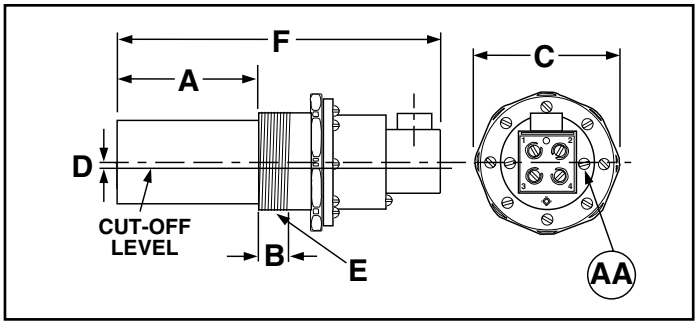
CAUTION:

- A more frequent replacement interval may be necessary based on the condition of the unit at time of inspection. McDonnell & Miller's warranty is one (1) year from date of installation or two (2) years from the date of manufacture.

OPERATION

Maximum Steam Pressure: 20 psi (1.4 kg/cm^2)

The 69 Series Built-in Low Water Cut-Off is furnished with a threaded barrel casting which fits right into a 2 1/2" tapping provided by some boiler manufacturers in the side of the boiler. Selection of the particular model depends upon the insertion length into the boiler (see chart). Order the built-in which provides maximum insertion within the boiler.



Electrical Ratings

Voltage	Motor Switch Rating (Amperes)		Pilot Duty
	Full Load	Locked Rotor	
120 VAC	7.4	44.4	125 VA at 120 or 240 VAC
240 VAC	3.7	22.2	

NOTE: MV models are rated at 24 VA @ 24 VAC to 120 VAC

Dimensions, in. (mm)

A		B	C	D	E	F
Model	Insertion Length				NPT	
69	4⅛ (105)	1 (25)	4⅛ (105)	⅛ (3)	2½	9½ (241)
169	3⅛ (79)					
269	2¼ (57)					
369	1¾ (45)					
469, 569	1 3/16 (30)					

Based on desired usage, connect wires from low water cut-off to appropriate control/alarm.

Diagram 1

SCHEMATIC OF TWIN SWITCH INTERNAL OPERATION

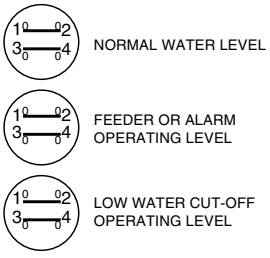


Diagram 2

USED AS MAIN LINE SWITCH

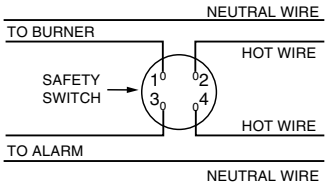


Diagram 3

USED AS PILOT SWITCH IN SERIES WITH HOLDING COIL OF AUTOMATIC STARTER

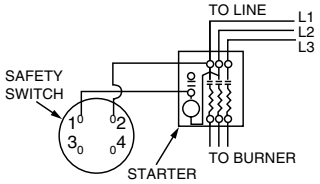
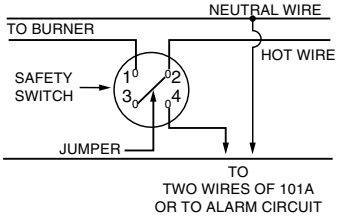


Diagram 4

USED WITH MODEL 101 ELECTRIC WATER VALVE OR IN ALARM CIRCUIT



IMPORTANT: Low water cut-off circuit of the 69 series must be electrically wired in series with all other boiler limit operating controls.

INSTALLATION –

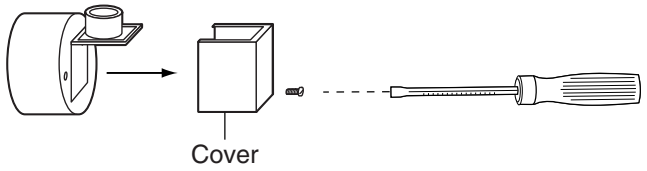
TOOLS NEEDED:
One (1) flathead screwdriver, one (1) level indicator and one (1) pipe wrench.

IMPORTANT: Follow the boiler manufacturer's instructions along with all applicable codes and ordinances for piping, blow down valve and water gauge glass requirements.

The center line on the casting of the Series 69 must be installed above the lowest permissible water level determined by the boiler manufacturer.

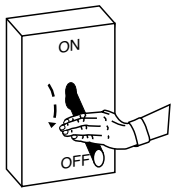
Whether the gauge glass is mounted directly into the boiler or on an independent water column, the cut-off line on the 69 control should be mounted 1/2” (15mm) above the lowest visible point of the gauge glass.

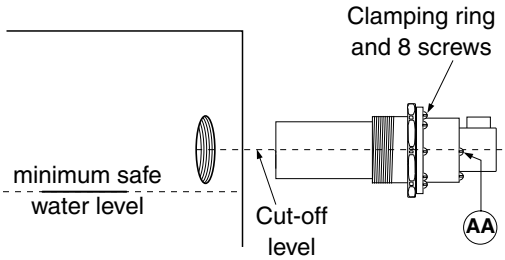
Using a flathead screwdriver, remove the one (1) screw that secures the switch cover.



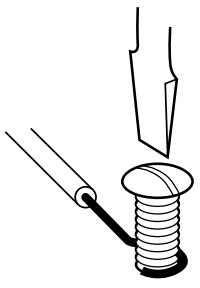
Installation of the Low Water Cut-Off

- Turn the boiler off.
- Drain the water in the boiler to a level which is below the tapping on the boiler. Allow the boiler to cool to 80˚F (27˚C) and allow the pressure to release to 0 psi (0 bar).
- Determine where to install the control. The low water cut-off must be positioned at or above the boiler manufacturer’s minimum safe water level.
- Separate the mounting barrel from the control slightly by loosening the eight (8) slotted screws on the clamping ring. This allows the barrel to be turned into the tapping in the boiler without rotating the whole control. (The barrel may also be completely removed to install easily).
- Apply a small amount of pipe dope or thread sealant to the 2 1/2 NPT and hand screw the barrel into the boiler without rotating the rest of the control. Tighten the barrel securely using a pipe wrench to about 150 ft-lbs. (200 N•m) torque.
- Rotate the control in the barrel to the finished position using a level to set the two (2) conduit housing screws (AA) in a horizontal position. Complete the installation by securing the control onto the barrel by tightening the eight (8) clamping ring screws to 5 ft-lbs (7 N•m) torque. "TOP" on the switch terminal panel MUST be in the up position.





NOTE: To connect wires to the terminals on the water feeder, burner, or low water cut-off, place the bare end of the wire under the terminal screw and tighten the screw with a flathead screwdriver.



Wiring Instructions

⚠ WARNING

- **To prevent electrical shock, turn off the electrical power before making electrical connections.**
- **This low water cut-off must be installed in series with all other limit and operating controls installed on the boiler. After installation, check for proper operation of all of the limit and operating controls before leaving the site.**

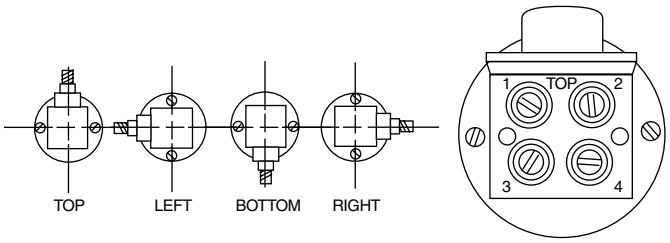
Failure to follow this warning could cause electrical shock, an explosion and/or a fire, which could result in property damage, personal injury or death.

Electrical connector is movable into any one of four positions illustrated, by simply removing two black headed screws and rotating housing.

NOTE: This control should be wired with materials suitable for use at 75˚C.

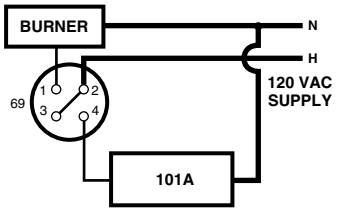
Switch Operation

The No. 11 switch can be identified by a black terminal panel. The switch contains two (2) single pole single throw switches to control the water feeder and the low water cut-off. The low water cut-off switch is between terminals marked “1” and “2”. A second switch is located between terminals marked “3” and “4”. This can be used to operate a low water alarm or a McDonnell & Miller electric water feeder.



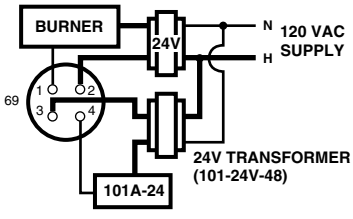
Wiring Diagrams:
Series 69 Low Water Cutoff with M&M Model 101-A Electronic Water Feeders
120V Burner and 120V Feeder

Using a wire nut, connect a wire from the neutral side of the power supply to one of the wires inside the feeder's junction box. (Does not make a difference which one). Connect a wire from the "hot" side of the power supply to terminal 2 of the Series 69 junction box. Connect the neutral side of the power supply to the burner.
Connect the wire from the burner to terminal 1 of the low water cut-off.
Connect a "jumper" from terminal 2 to terminal 3 of the low water cut-off.
Connect a wire from terminal 4 of the low water cut-off to the remaining wire in the 101-A water feeder.



24V Burner and 24V Feeder

Connect the "hot" wire from the boiler transformer to terminal 2 of the low water cut-off. Connect the "hot" side of the water feeder transformer to terminal 3 of the low water cut-off. Connect the neutral side of the boiler transformer to the burner. Using a wire nut, connect the neutral side of the water feeder transformer to the water feeder.
Connect the wire from the burner to terminal 1 of the low water cut-off.
Connect a wire from terminal 4 of the low water cut-off to the remaining wire in the water feeder.

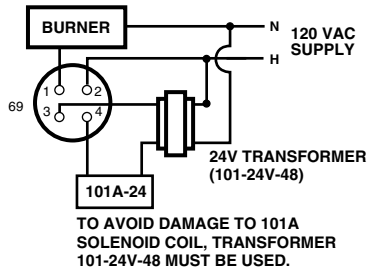


⚠ IMPORTANT

To prevent damage to the water feeder, a McDonnell & Miller transformer Model 101-24V-48 must be used.

Wiring Alternatives - Controls of Different Voltages

For 120V Burner/24V Feeder setups

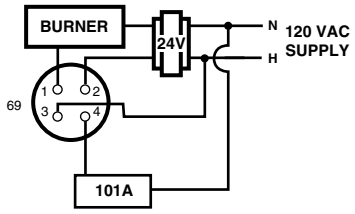


TO AVOID DAMAGE TO 101A SOLENOID COIL, TRANSFORMER 101-24V-48 MUST BE USED.

⚠ IMPORTANT

To prevent damage to the water feeder, a McDonnell & Miller transformer Model 101-24V-48 must be used.

For 24V Burner/120V Feeder setups



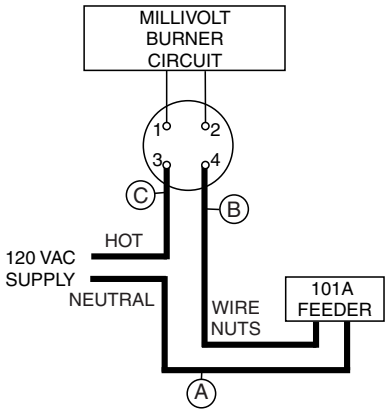
Models 69-MV-P and 369-MV Millivolt Burner Circuit Controls with Water Feeder Millivolt Burner Control and Model 101-A 120V Water Feeder

Wire only terminals 1 and 2 into the millivolt circuit. Do not attach any other wiring to terminals 1 and 2.

Install wire (A) from water feeder to 120 volt Neutral wire.

Install wire (B) from water feeder to terminal 4 of the low water cut-off.

Install wire (C) from terminal 3 of the low water cut-off to 120 volt Hot wire.



Millivolt Burner Control and Model 101-A 24V Water Feeder

Wire only terminals 1 and 2 into the millivolt circuit. Do not attach any other wiring to terminals 1 and 2.

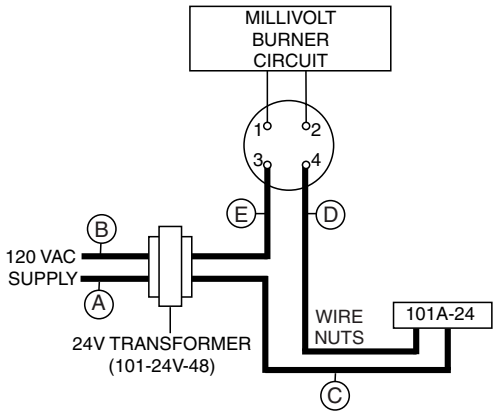
Install wire (A) from 120 volt circuit Neutral wire to the transformer input Neutral terminal.

Install wire (B) from burner circuit Hot wire to the transformer input Hot terminal.

Install wire (C) from transformer output Neutral terminal to the water feeder.

Install wire (D) from the water feeder to terminal 4 on the low water cut-off.

Install wire (E) from terminal 3 on the low water cut-off to the transformer output Hot terminal.



⚠ IMPORTANT

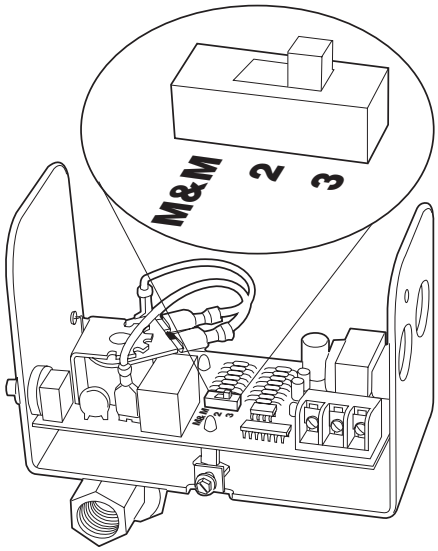
To prevent damage to the water feeder, a McDonnell & Miller transformer Model 101-24V-48 must be used.

Wiring Diagrams (continued):
Series 69 Low Water Cut-off with M&M Model WF-2-U Electronic Water Feeders

The Uni-Match® water feeders have a three-position slide switch which initiates a dwell period specific to the position of the switch. If the system condensate raises the boiler water level above the cut-off level during the dwell period, no additional water will be added to the boiler. Once the dwell period has passed, the feeder will be activated and water will be added to the boiler. The feeder will be deactivated when the LWCO reactivates the burner circuit.

The position of the slide switch also sets the length of the dwell period, the length of time valve is open and the number of dwell/feed cycles. The control is set with the slide switch in **position 3** and can be changed in the field after installation. The chart on the right indicates the cycles and length of dwell/feed cycles for each position.

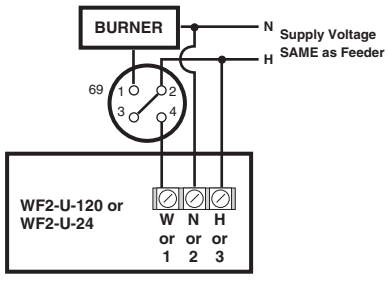
Switch Position	Initial Dwell	Initial Feed	Dwell/Feed Cycles
M&M	60 seconds	60 seconds	Repeats until LWCO reactivates the burner circuit
2	90 seconds	90 seconds	One
3	100 seconds	100 seconds	One



Connect a wire from the "Hot" side of the power supply to the water feeder terminal 3, and low water cut-off terminal 2. Connect a wire from the neutral side of the power supply to the water feeder terminal 2, and to the neutral side of the burner.

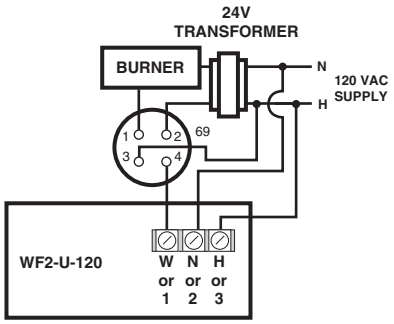
Connect the wire from the burner to terminal 1 of the low water cut-off. Connect a jumper from terminal 2 to terminal 3 of the low water cut-off. Connect a wire from terminal 4 of the low water cut-off to terminal 1 of the water feeder.

120V Burner/120V Feeder
or
24V Burner/24V Feeder

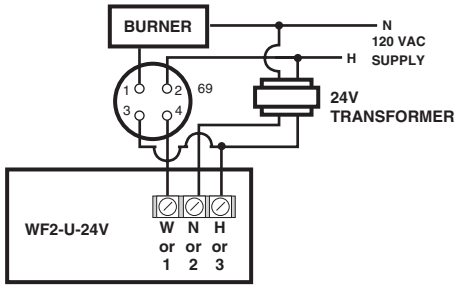


WIRING ALTERNATIVES WHEN USING MIXED VOLTAGES

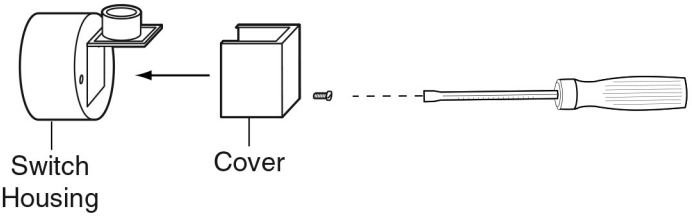
24V Burner/120V Feeder



120V Burner/24V Feeder



Replace the cover on the switch housing and, using a flathead screwdriver, tighten the one (1) screw to approximately 2 ft•lb (2.6 N•m).



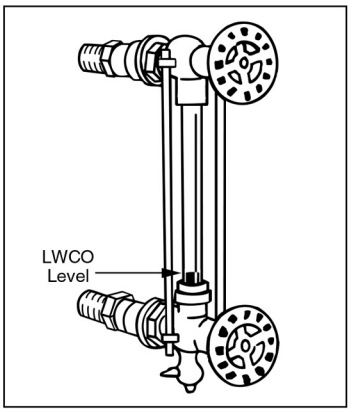
INSTALLATION COMPLETE

TESTING

- Manually fill boiler until water level in the sight glass is above the control.
- Turn on the power to the boiler and water feeder. Activate the burner by raising the thermostat set point.
- Using the sight glass as a reference, slowly drain water from boiler by opening the blow down valve or the boiler drain until the low water cut-off activates the water feeder.

  IMPORTANT: If the water feeder does not activate before the water level reaches the bottom of the sight glass, immediately close any open drain or blow down valve and check controls and piping for proper installation. Correct any problems.
- Continue to drain the boiler slowly. If the burner does not turn off before the water level reaches the bottom of the sight glass, immediately close any open drain or blow down valve. Check control for proper installation. Correct any problems.
- Once the burner turns off on low water, close all boiler drains or blow down valves.
- Using the sight glass as a reference, see that the water feeder activates and fills to approximately 1/2" to 1" (13 - 25mm) above the burner cut-off level of the low water cut-off.

  IMPORTANT: If the water feeder does not turn off once the water level has surpassed the halfway point of the sight glass, immediately turn off the power to the boiler and water feeder and check control for proper installation. Correct any problems.
- Repeat test 2 or 3 times. Restore boiler and controls to normal settings.



TROUBLESHOOTING

Problem:

1. Burner does not shut off on low water.

a. **Cause:** Float shield is loaded with mud or sediment. Shield may be out of position or damaged; bellows folds obstructed.

Test: With water level below the control check if terminals 1 and 2 are open. If not, remove switch and manually test if terminals 1 and 2 can be opened.

Solution: Remove the control and clean. At this time, check for a build-up of scale or sediment between corrugations of the bellows.

b. **Cause:** Contacts are fused together.

Test: Remove switch and operate manually to verify proper switch operation.

Solution: Replace switch. Check electrical load and make sure it is within the ratings of the switch.

2. Electric water feeder does not shut off.

a. **Cause:** Float obstructed or damaged. Build-up of scale or sediment between corrugations of the bellows. Shield may be out of position.

Test: With water level above the control, check if terminals 3 and 4 are open. If not, remove switch and manually test to verify terminals 3 and 4 can be opened.

Solution: Check the clearance of the shield; replace or clean the bellows.

b. **Cause:** Contacts are fused together.

Test: Remove switch and operate manually to verify proper switch operation.

Solution: Replace switch. Check electrical load and make sure it is within the ratings of the switch.

MAINTENANCE

SCHEDULE:

- **Blow down weekly (at least once) when the boiler is in operation.**
- **Disassemble and inspect annually. Replace the low water cut-off if it is worn, corroded, or if components no longer operate properly.**
- **Inspect the shield, float and bellows annually. Remove all sediment and debris.**
- **We recommend replacement when the switch no longer operates properly.**
  If you choose to replace the switch, order the McDonnell & Miller replacement switch and follow the Repair Procedure provided.
- **Replace the low water cut-off every 10 years.**
  More frequent replacement may be required when severe conditions exist such as rapid switch cycling, surging water levels, and use of water treatment chemicals.

PROCEDURE:

⚠ CAUTION



To prevent serious personal injury from steam pipe blow down, connect a drain pipe to avoid exposure to steam discharge.

Failure to follow this caution could cause personal injury.

Test the low water cut-off when the water level is at its normal level and the burner is on. **Slowly** open the boiler drain valve and observe the water level fall in the gauge glass. Close the valve after verifying that the alarm/feeder contacts have closed and the burner shuts off. If this does not happen, immediately shut off the boiler and correct the problem.

COMMERCIAL WARRANTY

Warranty. For goods sold to commercial buyers, Seller warrants the goods sold to Buyer hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be (i) be built in accordance with the specifications referred to in the quotation or sales form, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of installation or two (2) years from the date of manufacture, whichever shall occur first, unless a longer period is specified in the product documentation (the "Warranty").

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall terminate Seller's obligations under this Warranty and render the Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller's written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO THE GOODS PROVIDED HEREUNDER, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

LIMITED CONSUMER WARRANTY

Warranty. For goods sold for personal, family or household purposes, Seller warrants the goods purchased hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be free from defects in material and workmanship for a period of one (1) year from the date of installation or two (2) years from the product date code, whichever shall occur first, unless a longer period is provided by law or is specified in the product documentation (the "Warranty").

Except as otherwise required by law, Seller shall, at its option and at no cost to Buyer, either repair or replace any product which fails to conform with the Warranty provided Buyer gives written notice to Seller of any defects in material or workmanship within ten (10) days of the date when any defects or non-conformance are first manifest. Under either repair or replacement option, Seller shall not be obligated to remove or pay for the removal of the defective product or install or pay for the installation of the replaced or repaired product and Buyer shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have sole discretion as to the method or means of repair or replacement. Buyer's failure to comply with Seller's repair or replacement directions shall terminate Seller's obligations under this Warranty and render this Warranty void. Any parts repaired or replaced under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. The Warranty is conditioned on Buyer giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest.

Seller shall have no warranty obligations to Buyer with respect to any product or parts of a product that have been: (a) repaired by third parties other than Seller or without Seller's written approval; (b) subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) damaged from ordinary wear and tear, corrosion, or chemical attack; (e) damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) damaged due to a defective power supply or improper electrical protection; or (g) damaged resulting from the use of accessory equipment not sold or approved by Seller. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Buyer any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS PROVIDED IN PLACE OF ALL OTHER EXPRESS WARRANTIES. ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO ONE (1) YEAR FROM THE DATE OF INSTALLATION OR TWO (2) YEARS FROM THE PRODUCT DATE CODE, WHICHEVER SHALL OCCUR FIRST. EXCEPT AS OTHERWISE REQUIRED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER FOR THE DEFECTIVE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

To make a warranty claim, check first with the dealer from whom you purchased the product or call +1-847-966-3700 for the name and location of the nearest dealer providing warranty service.

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