

# Fire Pump Controller

For Electric Motor Driven Fire Pumps



Autotransformer  
Closed-Transition  
Reduced Voltage Type

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## Series M450 - Combined Manual and Automatic

Metron Fire Pump Controllers conform to the latest requirements of Chapter 7, National Fire Protection Association Pamphlet 20, Standard for Centrifugal Fire Pumps as adopted by Underwriters Laboratories and Factory Mutual. They are withstand rated and listed by Underwriters' Laboratories and approved by Factory Mutual Research Corporation.

Sizes range from 15 to 600 horsepower, 200 to 600 volts, 60 Hz. These controllers are for use on Reduced Voltage type installations.

Only the highest quality components, all UL listed or UL recognized, are used throughout to assure the best possible reliability. The cabinet is fabricated of heavy gauge reinforced steel with drip-proof hood. All field wiring and service connections may be made from the front, allowing the controller to be mounted flush against a wall.

The controller is completely wired, assembled, and tested at the factory before shipment, and ready for immediate installation.



M450 Fire Pump Controller



# Standard and Optional Features

## Standard Features

- **Minimum Running Period Timer** to prevent cycling of the system. This timer is factory set for 10 minutes. A drop in system pressure will initiate the start sequence and the running period timer. The pump will run until the timer times-out or the system pressure is restored.
- **By-pass Jumper** installed on a convenient terminal strip which by-passes the running period timer for manual stop operation. When automatic stop is required, just remove the jumper. A stop push-button is provided for emergency stop.
- **Single Handle Mechanism** for operating both isolating switch and circuit breaker in the proper sequence.
- **Built-in Pressure Switch** (standard is 25-300 psi freshwater type), mounted internally.
- **Pressure Recorder** 0-300 psi freshwater type, mounted externally.
- **Power Monitor** which constantly monitors and alarms Phase Reversal and Loss of Power conditions.
- **Dry Contacts** for remote indication of Pump Running, Power Available, and Phase Reversal.
- **Dry contacts** for remote indication of Motor Overload set at 125% of motor full load current.
- **Pilot Lights** to indicate Power Available, and Phase Reversal.
- **Digital Volt/Amp Display** on face of enclosure.
- **Emergency Start Lever** for closing the starting contactor independent of automatic or manual control circuits.
- **Remote Start Circuit** for remote starting.
- **NEMA Type 2**, drip-proof enclosure.
- **UL Service Entrance Rated.**

### Series M450

Autotransformer Fire Pump Controllers incorporate a heavy-duty autotransformer with

taps available at 50%, 65%, and 80% to reduce the starting voltage to the motor. The autotransformer is factory wired to the 65% taps unless specified otherwise.

The starting inrush current drawn from the power source is reduced to approximately 25% of normal when using the 50% tap, 42% of normal on 65% tap, and 64% of normal on 80% tap.

Taps other than listed above are also available. Consult factory for information.

An adjustable timing relay is provided to control time between reduced voltage start and full voltage operation. An emergency start handle to close starting contactor independent of automatic control circuits is also supplied as standard. When used, this handle will bypass the reduced voltage start feature and start the motor with full inrush current drawn from the power source.

## Options

### Option A1: Built-in Alarm Panel

This option supplies an audible alarm with silence pushbutton for PUMP RUNNING and POWER FAILURE. It also provides a visual only indication of SUPERVISORY POWER on. This option requires that a separate reliable source of 120 V.A.C. be connected to the controller. Additional lights and alarm conditions may be added if required. Consult factory for availability.

### Option A2: This Alarm Provides a Visual Indication only of the following:

Low Pressure, Local Start, Remote Start, Deluge Valve Open, Phase Failure, Interlock on, Run Timer On, Pump Running. Can be supplied separately or all eight.

### Option C: Pump Failed to Start

A pilot light and dry contact, N.O./N.C. are furnished to indicate that the pressure switch has signaled a start but the motor contactor has not closed to supply power to the electric motor. An adjustable 0 to 10 second timer is supplied to control the time between the closing of the pressure switch and the activation of the alarm condition.

### Option D: Deluge Valve Start

This option is a remote start function. An external normally closed contact is connected to the controller which, when opened, signals the controller to start as if the pressure switch had sensed a low pressure condition. If option

“S” Sequential Start is supplied, the timer must time out before the controller will start after the deluge valve contact opens.

### Option E: Engine Lockout

A set of normally open dry contact is provided to interconnect to the lockout circuit in a diesel engine fire pump controller. When the electric motor controller starts, the diesel engine controller is prevented from starting on a pressure drop or is stopped if it is already running.

### Option G1: Pressure Switch Auxiliary Contacts

One set of N.O./N.C. dry contacts for indication of pressure switch position.

### Option G2: Contacts for High Zone/Low Zone Operation

A relay with N.O. contacts wired to the field wiring terminal block closes upon the operation of the pressure switch on a low pressure condition. It remains closed as long as the electric motor is running. This option along with option “S” Sequential Start is normally furnished on a High Zone controller to provide a signal to the Low Zone controller causing it to start and provide pressure to the suction side of the High Zone pump. The Low Zone controller must be supplied with option “D” (deluge valve start) for proper operation of the two controllers.

### Option G3: Low/Low Pressure Indication

A set of N.O./N.C. dry contacts are furnished via a second pressure switch which will activate an alarm if the pressure drops below the preset starting pressure of the controller.

### Option H: Space Heater

If the ambient atmosphere is especially damp, a space heater rated at 100 watts may be supplied to reduce moisture in the cabinet. A thermostat is supplied as standard with this option. A humidistat may be substituted if specified



**Option J: Loss of Control Power Dry Contacts**

A relay is wired across the secondary side of the control power transformer. Dry contacts, N.O./N.C. are wired to the field terminal strip to provide a remote signal if the control power transformer fails. This relay will also be activated if there is a complete loss of power to the fire pump controller; i.e., the circuit breaker/isolation switch is turned off.

**Option K: Pump Room Temperature Alarm**

Provides visual indication, an audible alarm, thermostat, and dry N.O./N.C. contacts which operate from the externally mounted thermostat to indicate a LOW PUMP ROOM TEMPERATURE condition.

**Option L: Local Pump Running Light**

An externally mounted pilot light is supplied which illuminates when the motor contactor is closed and supplies power to the electric motor.

**Option M: Motor Lockout**

This option is used with multiple pump installations when only one pump should be running. Upon receipt of an external signal (may be from another fire pump controller if it is compatible), this option will prevent the motor from starting or will stop it if running. It is also used with Low Suction Cutoff Panels when authorized. When used for this purpose, power to the Low Suction Cutoff Panel is provided by the controller.

**Option P: Supervisory Power Failure Start**

This option provides a start of the electric motor if there is a loss of an external source of 120 V.A.C. A relay is provided that is energized when the external 120 V.A.C. is present. Upon loss of the 120 V.A.C. the relay drops out and a contact closes and starts the electric motor.

**Option Q: Loss of Supervisory Power Light**

A pilot light is provided which illuminates if there is a loss of the 120 V.A.C. external source.

**Option R: Audible Alarm**

An externally mounted bell is supplied which sounds when an alarm condition occurs in the fire pump controller. An example would be if the controller activates into a PUMP RUNNING condition. Other conditions can be supplied if specified, i.e. SUPERVISORY POWER FAILURE (Option "P"), PUMP

FAILED TO START (Option "C") etc. The condition(s) must be specified.

**Option S: Sequential Start**

This option is normally used on multiple pump installations to prevent the pumps from starting simultaneously. This is accomplished by use of adjustable timer supplied in all the controllers except the lead controller. The standard timer is adjustable from 0 to 100 seconds. These timers should be adjusted at a 5 to 10 second interval in order to allow a preceding pump to start. Failure of preceding pump to start will not prevent a subsequent pump from starting.

**Option T1 and T2: Weekly Test Start**

In some cases it may be desirable to have the electric motor run at a preset time each week for approximately 30 minutes. A program clock is provided to control the time of day, day of week, and the running time for the test period. The start can be accomplished by the activation of a relay or through an externally mounted solenoid valve. The solenoid valve is opened to begin the start by dropping pressure

to the controller pressure switch. This option can be provided with a test pushbutton (T1) or without (T2).

**Option U: Local Motor Stopped Light**

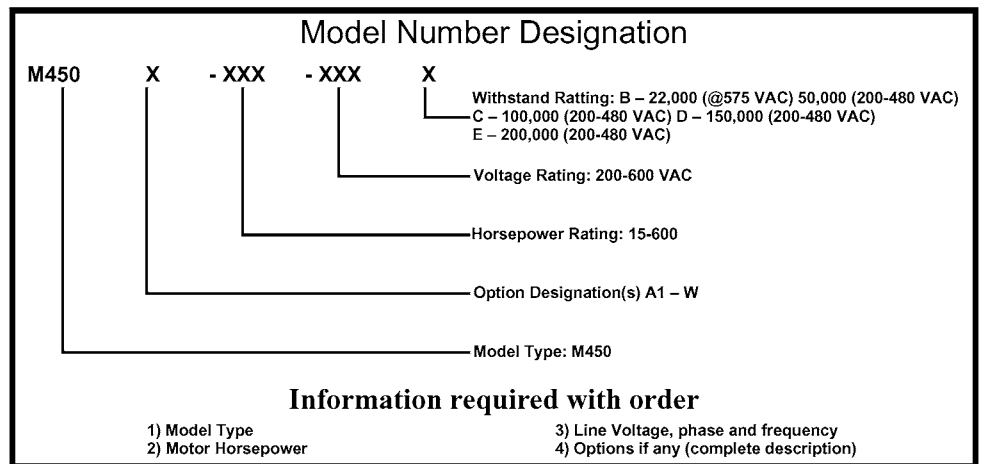
An externally mounted pilot light is supplied which illuminates when the motor contactor is open, and the electric motor is not energized.

**Option W: Omit Legs**

For systems where the controller is mounted on a common skid with the pump and motor, the legs of the controller may be omitted, and 3" mounting channels or wall mounting brackets can be supplied. If specified, lifting eyes may also be supplied.

**Enclosure**

The following NEMA type enclosures are also available: 3R, 4, 4X (Painted Cold Rolled Steel), 4X (Unpainted 304 or 316 Stainless Steel), and 12



**Standard Withstand Ratings: Model M450**

200-208 Volts	15-150 HP — 100kA RMS Symmetrical	15-200 HP — 100kA RMS Symmetrical
220-240 Volts	15-200 HP — 100kA RMS Symmetrical	15-300 HP — 100kA RMS Symmetrical
380-415 Volts	15-300 HP — 100kA RMS Symmetrical	15-400 HP — 100kA RMS Symmetrical
460-480 Volts	15-400 HP — 100kA RMS Symmetrical	200-250 HP — 50kA RMS Symmetrical
200-208 Volts	200-250 HP — 50kA RMS Symmetrical	250-300 HP — 50kA RMS Symmetrical
220-240 Volts	220-240 Volts	350-350 HP — 50kA RMS Symmetrical
380-415 Volts	380-415 Volts	500-600 HP — 50kA RMS Symmetrical
460-480 Volts	460-480 Volts	15-400 HP — 22kA RMS Symmetrical
550-600 Volts		

**Optional Withstand Ratings**

200-208 Volts	15-150 HP — 150kA / 200kA RMS Symmetrical	15-200 HP — 150kA / 200kA RMS Symmetrical
220-240 Volts	15-200 HP — 150kA / 200kA RMS Symmetrical	15-300 HP — 150kA / 200kA RMS Symmetrical
380-415 Volts	380-415 Volts	15-400 HP — 150kA / 200kA RMS Symmetrical
460-480 Volts	460-480 Volts	

# Fire Pump Controller

## For Electric Motor Driven Fire Pumps



### Model M450 Autotransformer Start Electric Motor Fire Pump Controller

## Specifications

#### 1.00 References

- A. Factory Mutual System (FM) - Approval Guide.
- B. UL- Fire Protection Equipment Directory.
- C. UL 508 - Industrial Control Equipment.
- D. UL 218- Fire Pump Controllers.
- E. NFPA 20 - Installation of Centrifugal Fire Pumps.
- F. NFPA 70 - National Electrical Code.

#### 2.00 Quality Assurance

- A. Perform work in accordance with NFPA 20.
- B. Equipment: Bear UL and FM label and marking.
- C. Components: Shall be UL listed or UL recognized.
- D. The controller shall be completely tested at the factory prior to shipment. This test shall verify proper operation of all normal automatic and manual functions along with the continuity of all dry contacts for remote alarms. The test shall also include a high potential voltage test of all primary power circuits equal to twice the rated voltage plus 1000 volts for one minute according to UL 508.

#### 3.00 Electric Fire Pump Controller

- A. The controller shall be housed in a UL Environmental type 2 Drip-proof enclosure, fabricated from heavy gauge cold rolled steel per the requirements of UL 508. The controller shall be designed for Autotransformer starting and shall start the motor using a heavy-duty motor starting autotransformer, reducing inrush current to 42% of normal using the 65% tap. Taps of 25% and 80% shall be supplied. The controller shall include the following:

- 1. Isolation switch: Externally operable, quick break type sized at least 115% of motor full load current.
- 2. Circuit breaker: Externally operable sized at least 115% of the motor full load current.
- 3. The locked rotor overcurrent protection shall be provided by a separate overcurrent monitor of the microprocessor type, set at 300 percent of motor full load current and shall have a trip time between 8 and 20 seconds at 600 percent of

motor full load current. The overcurrent monitor shall also have as standard a set of dry contacts and LED visual indication that activates when the motor current exceeds 125% of normal.

- 4. The isolation switch and circuit breaker shall be operable via a single operating handle. When moving the handle from the OFF to ON position, the handle shall sequence the isolating switch on first and then the circuit breaker. When the handle is moved from the ON to the OFF position, the handle shall sequence the circuit breaker off first and then the isolating switch. This sequencing operation shall prevent the isolating switch from interrupting motor current. The operating handle shall be capable of being padlocked in either the ON or OFF position for installation and maintenance safety. The operating handle shall permit normal tripping operation of the circuit breaker.
- 5. Controllers utilizing a 100-600 amp circuit breaker shall be suitable for use on a circuit capable of delivering 100,000 Amps Symmetrical short circuit current. Controllers utilizing a 800-1200 amp circuit breaker shall be suitable for use on a circuit capable of delivering 50,000 Amps Symmetrical short circuit current.
- 6. Provisions shall be made to display the amps/volts of each phase on the face of the enclosure. Display shall automatically store the highest ampere reading. Display of amps/volts and retrieval of highest current reading shall be accessed via a push-button on digital display. In addition to the digital display, provisions shall be made between the circuit breaker and the isolation switch for using a clamp-on type ammeter to measure motor current draw.
- 7. Motor contactor: IEC rated, UL listed, capable of being operated by an external emergency operating handle. The contactor shall be horsepower rated as determined in UL 218 for the applicable horsepower and voltage.
- 8. Pressure switch: With adjustable independent high and low set points. The switch shall be mounted inside the controller cabinet and plumbed to an external coupling for field connection.
- 9. Pressure Recorder: A DC Powered Seven (7) Day Pressure Recorder mounted on exterior of enclosure shall be provided.
- 10. Externally mounted pilot lights: To indicate controller primary power is available and phase reversal of normal power. Primary power on light to be wired in true power on configuration.

Loss of any phase or control power will cause light to turn off.

- 11. Solid state running period timer: Set for a minimum of ten (10) minutes, per NFPA 20, shall be provided to keep the motor running when started automatically. The timer shall have a pilot light to indicate when the timer is in the timing mode. The controller shall be factory set for manual stop with terminals provided to allow field conversion to automatic stop.
  - 12. Control circuit transformer: Heavy duty type with a minimum rating of 150 VA without integral overcurrent protection per the requirements of NFPA 20.
  - 13. Dry alarm contacts for remote alarm of PUMP RUNNING, PHASE REVERSAL, MOTOR OVERLOAD and CONTROLLER POWER AVAILABLE shall be supplied. One normally open and one normally closed contact for each alarm shall be supplied. Controller power shall be monitored by a three phase power monitor. The monitor shall trip on either LOW VOLTAGE, SINGLE PHASE, LOSS OF POWER, or PHASE REVERSAL. Normal power shall be indicated by a Green LED on the power monitor and a tripped condition shall be indicated by a Red LED.
  - 14. A circuit for manual remote starting of the controller shall be supplied requiring only a contact closure to initiate. This circuit shall not be capable of stopping the controller remotely per NFPA 20.
  - 15. All components shall be front mounted and wired for ease of maintenance and allowing the unit to be mounted flush against a wall.
- B. The controller shall be capable of the addition of optional control features.
  - C. The controller shall be manufactured by Metron, Inc.