

Fire Pump Controller

For Electric Motor Driven Fire Pumps



Solid State
Reduced Voltage Types

Series M700
Soft Start, Soft Stop

Description

Metron series M700 Solid State, reduced voltage, automatic fire pump controllers provide "Soft" starting and "Soft" stopping of electric motors. This solid state starting method reduces the inrush current and mechanical shocks associated with other conventional reduced voltage starting types. At start-up, a breakaway current is provided, followed by a timed ramp-up to 500% of the motor's full load amps. Initial current steps as well as current ramp time are completely adjustable to provide optimum starting in any electrical motor driven fire pump application. The solid state unit is supplied with the following protection features:

- Instantaneous Overcurrent Detection
- Shorted SCR Detection
- Phase Loss Monitor
- Heatsink Over Temperature Switch

In addition, the M700 series can be supplied with all of the other proven standard features found in the complete line of Metron electric fire pump controllers.



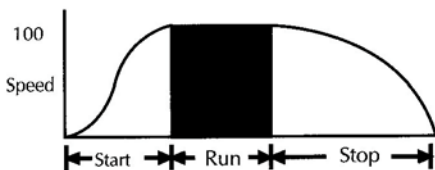
M700 Fire Pump Controller



Standard and Optional Features

Function - The M700 series Soft Start electric fire pump controllers utilizes a state of the art solid state motor controller. The motor voltage is raised to an initial torque value. This is an adjustable value of locked rotor torque. The motor voltage is gradually increased during the acceleration ramp time. The acceleration ramp time is set to 10 seconds as required by NFPA 20, but it is adjustable from approximately 3 to 30 seconds.

After a minimum run period and all starting causes have returned to normal, the solid state controller will initiate a stop sequence. This function will reduce surges in the pumping system during stopping of a centrifugal pump by smoothly decelerating the motor at a selectable rate. This will reduce the possibility of surges occurring in the system.



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.
- **A by-pass Jumper** is installed on a convenient terminal strip which energizes the running period timer for automatic stop operation. When manual stop is required, just remove the jumper. A stop push-button is provided for emergency stop along with a soft stop push-button which will activate the soft stop sequence if desired.
- **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, Phase Reversal, and Drive Fault.
- **Digital Volt/Amp Display** on face of enclosure.
- **Emergency Start Lever** for closing the bypass contactor independent of automatic or manual control circuits.
- **Remote Start Circuit** for remote starting.
- **NEMA Type 2**, drip-proof enclosure.
- **UL Service Entrance Rated.**

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

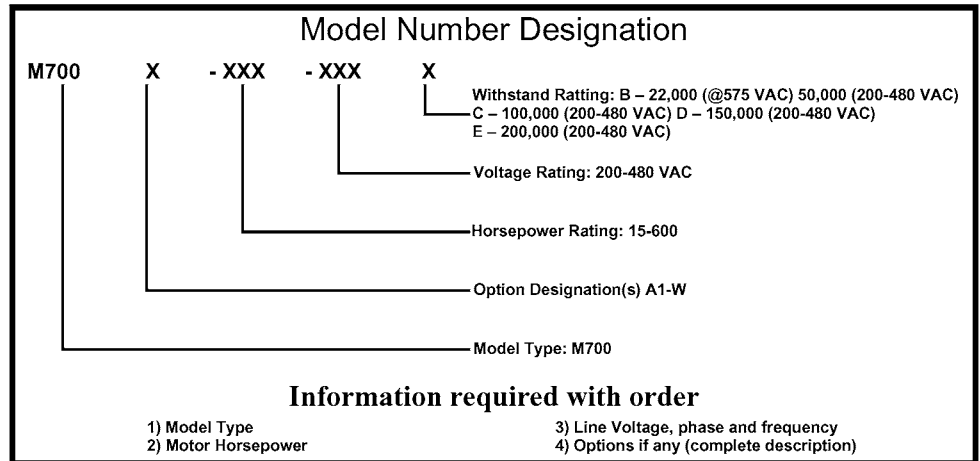
An externally mounted pilot light is supplied which illuminates when the motor contactor is open, and the electric motor is not energized.

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 M700

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

Optional Withstand Ratings

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

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For Electric Motor Driven Fire Pumps



Model M700 Soft Start/Soft Stop 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 Soft Start starting and shall incorporate a special Pump Control feature which eliminates excessive acceleration torque problems (water hammer) and related effects. The controller shall stop the motor by reducing the speed in a manner that prevents any sudden changes in torque and minimizes surges in the system resulting in a smooth deceleration to the pump. 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 often 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, CONTROLLER POWER AVAILABLE, and MOTOR OVERLOAD 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.