NASSAR® ELECTRONICS

SINCE 1973

User Manual

PUMP MONITOR
MODEL PM-31





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Description

The PM-31 is an electronic over/under load relay and pump monitor designed for 3-phase pumps. It provides protection against under /over current, phase failure, dry-well conditions, dead-head, jammed impeller, waterlogged tanks and rapid cycling.

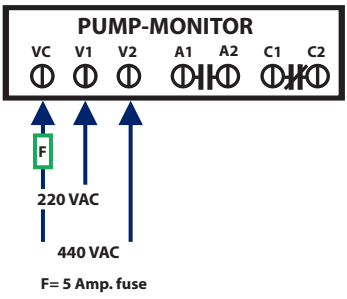
The PM-31 includes an LCD display that shows the 3-phase current readings, max current and faults in the system. The user can easily adjust the trip curves, restart delay, over/under current settings and protection class along with other settings. Overload protection can be set up with a fixed trip delay or with overload trip classes 5, 10 and 15.
This device operates with 220V/440V 3- phase pumps with current ratings from 2 to 80 amps and can be used with any motor starter.

When a critical condition is detected the PM-31 will protect the pump by turning it off after the trip delay specified by the user. The user can also select automatic or manual reset after a fault. When the automatic reset mode is selected the PM-31 will turn on the pump after the restart delay (this delay is also user-adjustable).

Wiring

220VAC supply voltage connection:
Connect the voltage supply to terminals VC and V1 with a 5 amp. fuse.

440VAC supply voltage connection:
Connect the voltage supply to terminals VC and V2 with a 5 amp. fuse.



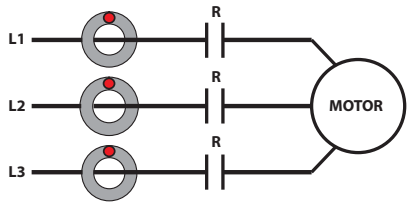
F= 5 Amp. fuse

Features

- **Provides protection against under/over current, phase failure, dry-well conditions, dead-head, jammed impeller, waterlogged tanks, and rapid cycling.**
- **Operates 220/440VAC motors up to 80 amps, current transformer included.**
- **Stores the last 10 faults on memory.**
- **LCD displays: 3 line currents, max. current, failures, time delays, and the setup menu.**
- **Manual or automatic reset.**

Connections diagram

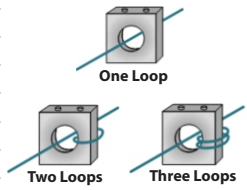
Pass the L1, L2 and L3 motor power leads through the current sensor coils.



It may be necessary to pass the leads more than once through the sensor coil depending on the motor's current.

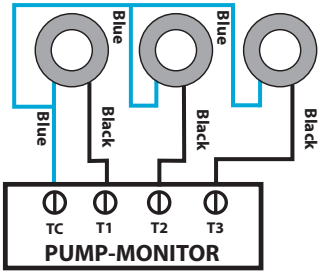
The following chart shows the number of loops needed depending on the amps used.

AMPS	LOOPS
2-3	5
3-4	4
4-5	3
5-6	2
OVER 6	1

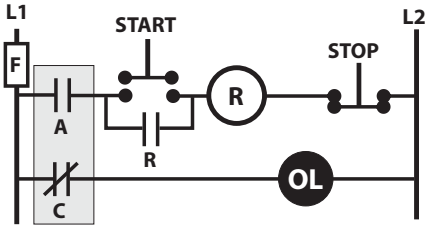


Current sensor coil wiring

Join the three blue wires and proceed to connect them to terminal TC. Then connect the remaining black wires from each sensor to terminals T1, T2, and T3 respectively as shown in the diagram below.



Connect contact "A" (terminals A1 and A2) to the starter as shown in the diagram below. When contact "A" opens the pump will shut down.
If an external failure indicator is needed by the user, use contact "C" (terminals C1 and C2) as shown in the diagram below. If the PM-31 shuts down the pump, the contact "C" will be closed.



R = Contactor
F = Fuse 8 Amps.
A = PM-3 normally open contact
C = PM-3 normally closed contact
OL = Failure indicator lamp



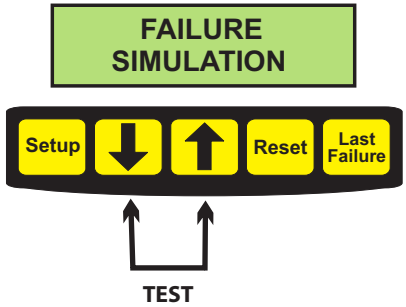
DANGER!

**Potentially hazardous voltages are present. Electrical shock can cause death or serious injury.
Installation should be done by qualified personnel following all National, State & Local Codes.**

**BE SURE TO REMOVE ALL POWER SUPPLYING THIS EQUIPMENT BEFORE CONNECTING OR DISCONNECTING THE WIRING.
READ THE INSTRUCTIONS BEFORE INSTALLING OR OPERATING THIS DEVICE.
KEEP THIS MANUAL FOR FUTURE REFERENCE.**

Failure simulation

To test the connections and confirm that the PM-31 was properly installed please follow the next procedure:
Start the motor and press the up an down arrow buttons simultaneously. Contact "A" (terminals A1 and A2) will open and the motor should stop. The LCD will display the following text:



Settings

To adjust the setup parameters press and hold the SETUP button:

LANGUAGE SELECTION
The screen will show the language selection setting.



Use the ARROW UP button to select English or the ARROW DOWN button to select Spanish.

OVER LOAD CURRENT
Press the SETUP button and the screen will show the overload current adjustment. Move arrows to set the required current. The recommended setting is between 105% and 110% of the full load amps (FLA) of your motor. The motor will stop after the trip delay if the motor current is greater than this value.

SETUP: OVERLOAD CURRENT= 12.5 Amp.

TRIP DELAY MODE: FIXED / CURVE
Press again the SETUP button to select the trip mode. Press the arrow down button to select CURVE mode or arrow up button to select the FIXED mode. If the CURVE trip delay mode is selected, the PM-31 will shutdown the motor after a delay determined by the CLASS CURVE (see page 6) in the event of an overload. If the FIXED trip delay mode is selected, the PM-31 will shutdown the motor after a fixed ammount of time .

SETUP: TRIP MODE CURVE

TRIP CLASS (ONLY IF CURVE MODE WAS SELECTED)
Once again press the SETUP button and the screen will show the trip class selection. The trip class defines the trip delay when an overload is detected (see page 6). Trip class is determined by the type of motor and application. Press the arrows to select between trip class 5,10 or 15. The higher the class selected the greater the trip delay would be. Your motor manufacturer should be consulted for the proper setting.

SETUP: TRIP CLASS 10

FIXED TRIP DELAY (ONLY IF FIXED MODE WAS SELECTED)
Press again the SETUP button and the screen will show the delay adjustment for the fixed trip mode. The protection will trigger after the selected trip delay whenever an overload is detected.Press the arrows to set the delay from 16 to 200s.

SETUP: TRIP DELAY 20 SEC.

MANUAL OR AUTOMATIC RESET
Press one more time the SETUP button and select between manual reset mode or automatic reset mode. If the PM-31 detects a failure and tripps with automatic mode selected, the motor will restart after a delay. If manual reset mode is selected, the user needs to manually restart the motor by pressing the RESET button. Use the arrow buttons to select between the two modes.

SETUP: RESET MANUAL MODE

RESTART DELAY (ONLY IF AUTOMATIC MODE WAS SELECTED)
Press again the SETUP button and the screen will show the restart delay adjustment, which is the delay that the PM-31 will take before attempting to reconnect the motor after a failure. This feature allows the motor to cool down after experiencing an overcurrent. It is also known as a motor cool down timer, a setting of 5-10 minutes will give most motors adequate time to cool down after an overload condition. Press the arrows buttons to set the delay from 5 to 120 minutes.

SETUP: RESTART DELAY 10 MIN.

UNDERLOAD CURRENT
Press the SETUP button, the screen will show the underload current setting. This feature is used to protect the pump on an underload/dry-well condition. Use the arrows to set the underload current, the recommended value for most applications is 80% of the full load amps (FLA) of your motor. To disable this protection, press the arrow down button until the screen says OFF.

SETUP: UNDERLOAD CURRENT= 40 AMP.

LOOP COUNT
Press again the SETUP button and the screen will show the Loop Count setting. This setting is used to indicate the PM-31 how many loops went through the current sensor coil. Use the arrows to set the loop count (See

example on Page 2). **It is very important to set up this setting correctly or the PM-31 will measure current incorrectly, please refer to the chart on Page 2**.



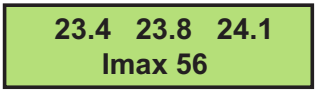
Operation

The PM-31 is set with the following default parameters:

Overload Current: 40 Amps
Underload Current: OFF
Trip Delay Mode: Curve
Overload Trip Class: 10
Reset: Manual
Loop Count: 1

To modify this settings, please refer to Page 4.

UNDER NORMAL CONDITIONS
Contact A (terminals A1 and A2) is closed.
The green "RELAY" LED is ON.
Display shows the 3 line currents and the maximum current recorded.



The maximum current is saved in permanent memory. To clear this value press the "RESET" button.

UNDER A FAILURE CONDITION
When the PM-31 detects a failure, it is shown in the display during trip delay.



After the trip delay, the green "RELAY" LED is turned OFF, Contact A (Terminals A1 and A2) opens, Contact C (Terminals C1 and C2) closes, and the motor is disconnected.

AUTOMATIC RESET
Display shows in minutes the time left to restart the motor after a failure.



When the timer ends, the green "RELAY" LED turns ON, Contact A (Terminals A1 and A2) closes, Contact C (Terminals C1 and C2) opens, and the motor starts running. The "RESET" button can be pressed to skip the timer and restart the motor immediately.

In the case of phase failure, the PM-31 **will not reset automatically and it will shift to manual reset mode** in order to avoid the motor from restarting with a faulty phase and then turning off again, repetitively until the motor is damaged.

To return the reset from manual to automatic, press the setup button and set again the reset mode to automatic.

MANUAL RESET
The PM-31 won't restart until the RESET button is pressed, in doing so the Contact A (Terminals A1 and A2) closes, Contact C (Terminals C1 and C2) opens, and the motor starts running.



FAILURE MEMORY
The 10 last failures are recorded permanently on the memory. After a failure the letter "F" will appear on the right bottom side of the display indicating a failure has occured.
This letter will disappear when the "LAST FAILURE" button is pressed. To erase the list of all recorded failures press the "RESET" button.



DISPLAYING THE FAILURES IN THE MEMORY
To view a list of the failures that have occured press the "LAST FAILURE" button. A maximum of 10 failures are stored. The most recent failure will be the in the last position.



RAPID CYCLING PROTECTION
Protects the motor from rapid cycling when the motor starts more than 4 times per minute.

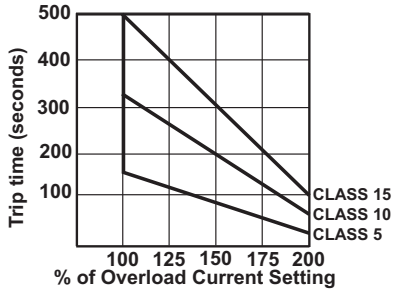
UNDER CURRENT PROTECTION
The PM-31 protects the pump if its running "dry" (without water passing through its mechanical parts). When this happens the motor uses less current, the PM-31 detects this failure and shuts down the motor after 5s. The underload current adjustment usually needs to be between 70% to 85% of the nominal current of your motor, the recommended setting is 80%. Also it is recommended to test the system with the pump running dry to make sure that the protection works with the configuration that was set up earlier. If possible, run the pump with no water for 5 seconds to determine the current consumption on a dry well condition. Set the underload current to this value plus 10%.

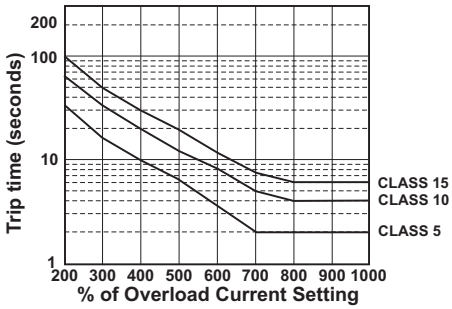
OVERLOAD PROTECTION
This device will protect the pump when the current consumption is greater than the overload current. The PM-31 has two different overload trip modes.

Fixed Trip Delay: The motor will stop after the time specified on the Fixed Trip Delay setting (16 to 200 seconds). This overload protection is more sensitive and adequate for submergible pumps or motors with very limited capacity.

Curve: The unit will trip after a delay determined by the TC (trip class). For standard motors, the TC is typically set at class 10. The motor manufacturer should be contacted for exact TC settings. The following curves show the range of TC settings and trip times:

OVERLOAD TRIP CURVES

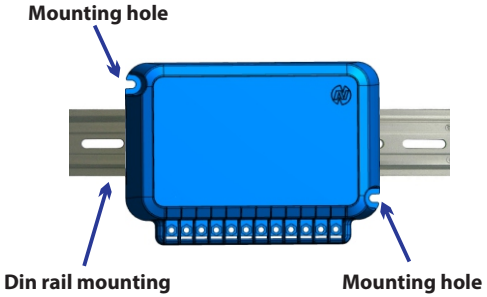




Mounting options & Dimensions

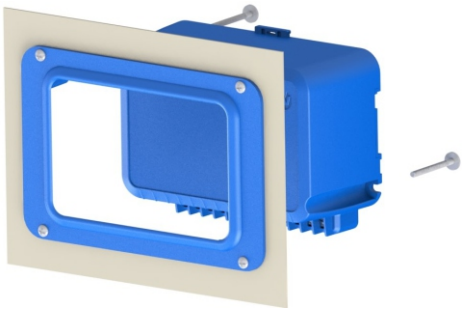
This unit can be mounted on a standard 35 mm DIN rail or screwed into a surface using the screws included in the package.

Enclousure Dimensions: 5.7 x 4.1 x 2.4 in



Panel mounting

Panel mounting for this equipment is available using the adapter plate model **PMF-237** (sold separately). Mounting on a panel door allows to visualize the LED indicators , it also makes setup adjustments easier. If this unit is panel mounted, the panel needs to be installed **indoors.**





Specifications

OVERLOAD CURRENT SETUP	Adjustable from 2 to 80 Amps.
ACCURACY	± 2.5 % at 80 Amps, THD<1%.
SUPPLY VOLTAGE	220/440 VAC ± 10%.
TRIP CLASS	Class 5, 10 and 15.
UNDERLOAD SETUP	Adjustable from 0 to 90% of the overload current.
RAPID CYCLYNG PROTECTION	4 starts per minute.
MAXIMUM CURRENT READINGS	0.5 s duration.
FAILURE MEMORY	Last 10 faults.
TRIP DELAY	Phase failure: 5 s
	Under current: 5 s.
	Overload Fixed Trip: 16 to 200 s. /Trip Class: See page 4
	Rapid cycling: 0.5 s.
RESTART DELAY	Adjustable from 5 to 120 minutes.
OUTPUT CONTACT RATING	1 NA and 1 NC 8 Amps @ 220 VAC resistive load.
CONTACTS ELECTRIC LIFETIME	100,000 operations at nominal capacity.
FREQUENCY	50 / 60 Hz.
OPERATION TEMPERATURE	14 to 122 °F (-10 to 50 °C).
STORAGE TEMPERATURE	-4 to 158 °F (-20 to 70 °C).
POWER CONSUMPTION	3 Watts maximum.
WEIGHT	25 oz

*Specifications subject to change without notice.

WARRANTY

These products are warranted to be free from defects in workmanship or material under normal service and use for a period of three (3) years from date of manufacture. Nassar Electronics shall, at its option, repair or replace F.O.B. point of manufacture the portion of the product found by Nassar Electronics to be defective. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, use of unauthorized replacement parts, storage or handling, or any other cause not the fault of Nassar Electronics are not covered by this limited warranty, and shall be at the buyer's expense. All costs of dismantling, reinstallation and freight, and the time and expenses shall be borne by the buyer.

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