

# Power Xpert C445™ series global motor management relay protects pumps from dead-head and underloaded conditions



The C445 motor management relay offers the most configurable protection options in the industry, with features specifically designed to protect critical pumps from costly damages due to dead-head and other underloaded or starved pump conditions.

## What is a dead-headed pump?

A dead-head is when a centrifugal pump operates with no flow through the pump due to a closed discharge valve or line blockage. The pump re-circulates the same water, causing water temperature to continually rise. If a pump is run in a dead-headed condition for too long, excessive heating can damage expensive seals and reduce the life of the pump.

## Why is a dead-head hard to detect?

A pump float switch will not detect a dead-head because the water level does not decrease. The key to accurate pump protection against dead-head damage is that the motor load decreases. Two methods are available to determine motor load: motor current and input power. However, monitoring current for underloaded conditions is not effective because current is nearly constant up to 50% of the motor load. Current is high even at light loading and the power factor is high, as current is flowing to the motor but it is not doing useful work (power).

In contrast, input power varies linearly across the motor load range, making low power detection an extremely reliable method for catching even small decreases in motor load. At light loads, power is up to 10X more sensitive than amperes. Therefore, a protective device looking at current may not be able to distinguish between "normal" and "dead-head" conditions while a device providing low power detection can.

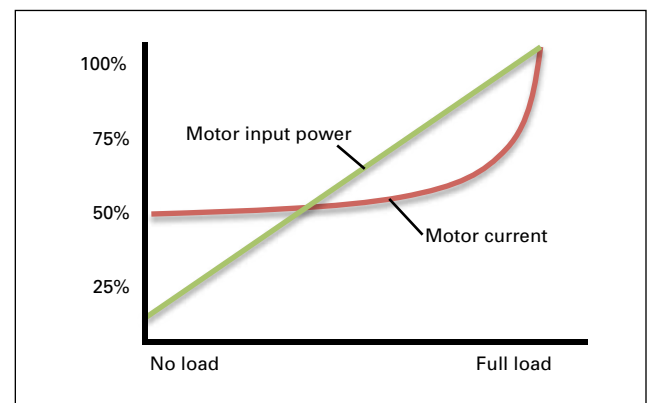


Figure 1. Current and input power vs. motor load

## C445 dead-head protection

C445 provides current, voltage, and power-based monitoring and protection including low power protection. Customers can easily apply C445 to quickly and accurately detect a dip in power when a pump dead-heads and take the motor offline before costly damage occurs. C445 does this without the addition of separate relays for deadhead detection. Many "pump-off" or dedicated dead-head protection relays exist on the market today, but all they are doing is providing the same low power detection embedded directly in C445. C445's low power detection is user settable to the desired percentage of rated power and is fully customizable to provide separate warning and trip levels and delays. Using C445 therefore provides customers with critical pump protection while providing additional critical motor protections such as thermal overload and other current and voltage-based protections.

For more information, consult the user manual MN042003EN at [www.eaton.com/c445](http://www.eaton.com/c445).

Eaton  
1000 Eaton Boulevard  
Cleveland, OH 44122  
United States  
Eaton.com

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