

Technical Bulletin

PDI-772HE and PDI-772HE-IND 10-Tap Central Power Supplies

Recommendation for Branch Circuit Breaker

PDi

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The high inrush current of the 1kVA toroid transformer in the PDI-772HE can sometimes trip the branch breaker. This will happen when the PDI-772HE is first plugged into the wall outlet or any time power is lost and then returned such as a power outage or backup generator test. If this is a nuisance for the customer, a “high magnetic” version of most common breakers exists. These breakers have a higher short circuit trip point and should be used with PDI-772HE power supplies whenever possible.

Brand / Series	Rating	Normal Breaker	High Magnetic Trip Point
Square-D QO	15A	QO115	QO115HM
Square-D QO	20A	QO120	QO120HM
Siemens QP	15A	Q115	Q115HID
Siemens QP	20A	Q120	Q120HID
GE Q-Line	15A	THQL1115	THQL1115HM
GE Q-Line	20A	THQL1120	THQL1120HM

Background:

On the SquareD website (as of this writing) you can search for residential circuit breakers. Then select the QO line. Then select the category HM (High Magnetic) which is essentially a "slow blow". If you select one of the breakers shown, like the QO120HM, there will be PDF's to download. The one labeled "*Square D QO and QOB Miniature Circuit Breakers Catalog (Version 1.0)*" has an explanation of the "high magnetic" style and you can compare the trip point graphs.

The standard 20A QO trips within one line cycle (16.6ms) with as little as 6X (120A) to 11X (220A) rated current. Compare that to the QO-HM which is guaranteed to require at least 11X rated current to trip within one line cycle. The higher trip point helps avoid tripping due to the brief inrush current of the toroid.

Where does inrush come from? [This](#) is from Wikipedia.

When a [transformer](#) is first energized, a transient current up to 10 to 15 times larger than the rated transformer current can flow for several cycles. **Toroidal transformers, using less copper for the same power handling, can have up to 60 times inrush to running current.** Worst-case inrush happens when the primary winding is connected at an instant around the zero crossing of the primary voltage (which for a pure inductance would be the current maximum in the AC cycle) and if the polarity of the voltage half-cycle has the same polarity as the remanence in the iron core has (the [magnetic remanence](#) was left high from a preceding half cycle).