CIRCUIT SHIELD®

Type 46Q Negative Sequence Time Overcurrent Relay

Application

The Type 46Q is designed especially for the protection of generators against damage caused by prolonged unbalanced loads, open conductors, or persistent faults on the power system. The relay operates on the negative sequence component of the line currents, and ignores the balanced component caused by three phase loads. The time-current characteristic is designed to match the generator’s negative sequence rating; that is \( I_T = K \). In order to protect the generator from damage due to recurrent unbalances, the relay is provided with a “memory” function. This feature provides a linear reset of the \( I_T \) accumulator when \( I_T \) decreases below the pickup setting.

The relay is provided with taps which are used to set one per unit relay current equal to the generator rated full load current. A separate adjustment is used to set the relay pickup current from 10 to 40% of tap value. A light-emitting diode indicates that pickup has been achieved and that the relay is timing out to trip. The \( I_T \) rating of the machine is specified by the manufacturer. The relay characteristic is matched to this requirement by adjusting the Time-Dial to a value equal to or less than this value, according to the user's conservative practice and other requirements which may be dictated by the system. The Type 46Q is offered in time models of \( I_T \) rating, listed under Specifications. The Time-Current Characteristic for the 10-40 second model is shown in Figure 2.

In order to decrease the tripping times for modest unbalances, a Definite Maximum Time is provided. This is continuously adjustable from 100 to 250 seconds, as shown in Figure 2. The Definite Maximum Times are the same for all models. Coordination with the primary and backup line relaying is assured by the basic design of the time-current characteristic which has a definite minimum time, also shown in Figure 2. An example of settings of the Type 46Q for a particular application is shown in Figure 3. Pickup is set at 15% rating, \( I_T \) at 30 seconds, and Definite Maximum Time at 250 seconds.

If a pre-trip alarm function is required, a separate relay, the Type 46O, a negative sequence overcurrent relay with a definite time characteristic can be used. See IB 7.6.1.7-2 for the details of this relay.

Features

- Accurate settings
- Transient immunity
- Built-in test
- 2 year warranty
- Seismic capability to 6g ZPA
- UL recognized

Connections shown are for Phase Rotation a-b-c.

Figure 1: Typical Connections with Type 46Q
Specifications

Continuous Current: 8 Amperes
Tap Settings: 6 Taps, from 2.5 to 4.5 Amperes
Pickup: Continuously adjustable from 10 to 40% of tap setting.
Time-Current Curve: $I = K$, with Definite Minimum Time 
K is continuously adjustable, from 
10 to 40, 5 to 20, or 2.5 to 10, as 
specified. See Figure 2.

Definite Maximum 
Time: Continuously adjustable, 100 to 250 seconds. See Figure 2.

Burden: 0.04 ohms, resistive
Control Power: Dual-rated 48/125 Vdc, 0.06A max., 
24/32 Vdc, 0.08A max.
Output Contacts: 2 N.O. or 1 N.O. & 1 N.C.
Output Rating: At 125 Vdc, each contact 
30A, Tripping Duty 
5A, Continuous 
1A, Opening Resistive 
0.3A, Opening Inductive

Harmonic Filter: Minimum of 10 to 1 rejection of third 
harmonic.

Temperature: Minus 20° to Plus 70°C.

Seismic Capability: More than 6g ZPA either axis 
biaxial broadband multifrequency 
vibration without damage or 
malfunction (ANSI/IEEE C37.98)

Transient Immunity: More than 2500 V, 1MHz bursts at 400 Hz 
repetition rate, continuous 
(ANSI C37.90 A SWC); 
Fast transient test: EMI test.

Dielectric: 2000 Vac RMS 60 sec. all circuits to ground.

Weight: Unboxed − 4.2 lbs. (1.9 kg) 
Boxed − 4.9 lbs. (2.2 kg) 
Volume − 0.26 cubic feet

How To Order

For a complete listing of available negative 
sequence overcurrent relays, including the 
Asea Brown Boveri Type 46Q series, see 
TD 41-025. To place an order, or for further 
information, contact the nearest ABB 
Representative.

Further Information

List Prices: PL 41-020 
Technical Data: TD 41-025 
Instruction Book: 7.6.1.7-3 
Generator Protection Paper: TP 18.6-3 
Other Protective Relays: 
Application Selector Guide, TD 41-016
### Type 46Q Negative Sequence Time Overcurrent Relay

<table>
<thead>
<tr>
<th>Type</th>
<th>Continuous Rating</th>
<th>Time-Current Curve (k)</th>
<th>Freq.</th>
<th>Control Voltage</th>
<th>Catalog Number</th>
<th>Drawout Test Case</th>
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<td>8 A</td>
<td>10 – 40</td>
<td>60 Hz</td>
<td>48/125 Vdc</td>
<td>24/32 Vdc</td>
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<td>5 – 20</td>
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<td>24/32 Vdc</td>
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**Internal Connections: 16D427B**

**Internal Connection Diagram**

16D427B Type 46Q Negative Seq. Overcurrent Relay Drawout Test Case

**RESET INPUT 11-12 FOR TEST ONLY. CONTACT 15-16 CONVERTIBLE. EXTERNAL RESISTOR SUPPLIED WITH RELAY.**