

September 1995  
Supersedes Descriptive Bulletin 41-172S,  
pages 1-2, dated September 1990  
Mailed to: E, D, C/41-100B

Device Number: 46

## 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  $I_2^2 t = K$ . 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  $I_2^2 t$  accumulator when  $I_2$  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  $I_2^2 t$  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  $I_2^2 t$  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,  $I_2^2 t$  at 30 seconds, and Definite Maximum Time at 250 seconds.

If a pre-trip alarm function is required, a separate relay, the Type 46D, 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

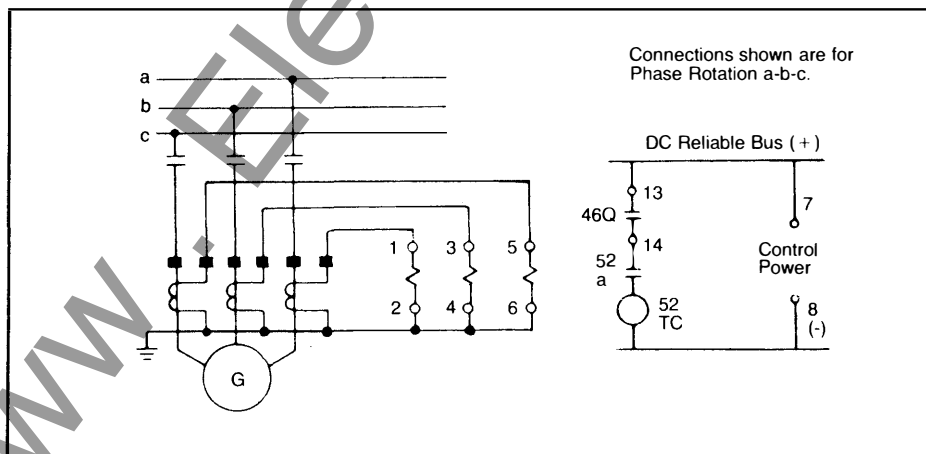


Figure 1: Typical Connections with Type 46Q

**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:**  $I_2^2 t = K$ , 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

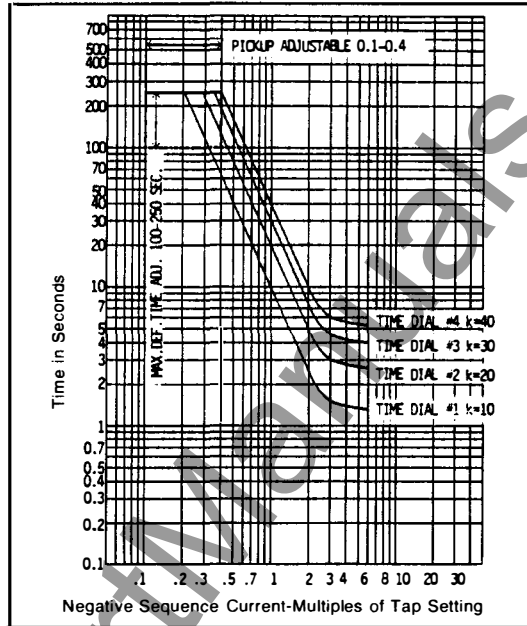


Figure 2: Type 46Q 10 second rating

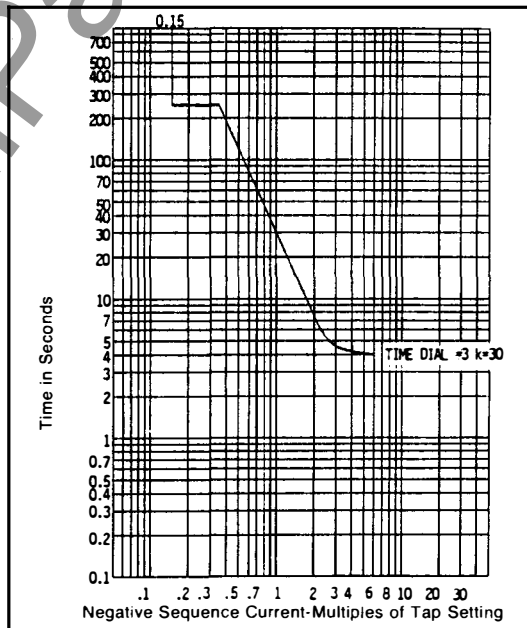


Figure 3: Type 46Q Time-Current Characteristic Settings



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Three Phase  
Tap Range 2.5-4.5A  
Pick-up 10%-40% of Tap

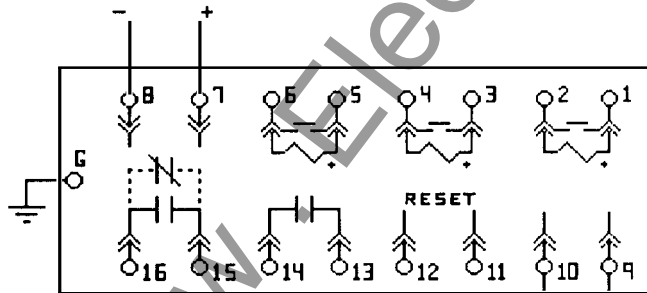
CIRCUIT SHIELD<sup>®</sup>  
**Type 46Q Negative  
Sequence Time  
Overcurrent Relay**

Type	Continuous Rating	Time-Current Curve (k)	Freq.	Control Voltage	Catalog Number Drawout Test Case
46Q	8 A	10 - 40	60 Hz	48/125 Vdc	427F1571
				24/32 Vdc	427F1591
			50 Hz	48/125 Vdc	427G1571
				24/32 Vdc	427G1591
			48/110 Vdc	427G1501	
				5 - 20	60 Hz
		24/32 Vdc	427F2591		
		50 Hz	48/125 Vdc		427G2571
			24/32 Vdc		427G2591
		48/110 Vdc	427G2501		
			2.5 - 5		60 Hz
		24/32 Vdc		427F3591	
50 Hz	48/125 Vdc	427G3571			
	24/32 Vdc	427G3591			
48/110 Vdc	427G3501				

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.