ABB Power T&D Company, Inc.
Relay Division
Coral Springs, FL
Allentown, PA

September 1995
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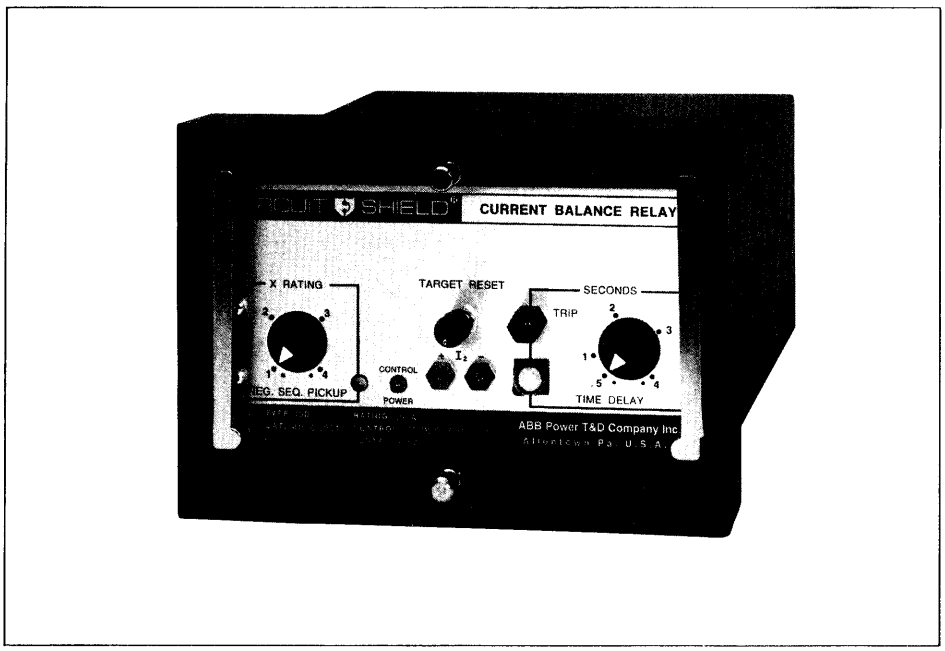
Mailed to: E, D, C/41-100B

Negative Sequence
Overcurrent Relays
Three Phase, 50/60 Hz
Device Number: 46

CIRCUIT SHIELD®

Type 46D, 46H Current Balance Relays



Features

- One relay protects against
  - Open phase
  - Phase unbalance
  - Reverse phase
  - Ground fault
- Accurate settings
- Built-in test
- Self contained filter
- Seismic capability to 6g ZPA
- Transient immunity
- 2 year warranty
- UL recognized

Application

The Current Balance Relay operates on the negative phase-sequence component of the three phase currents. This allows it to provide three different and important functions, for the protection of motors against open phase, phase unbalance, and ground fault.

An open phase condition, caused by a blown fuse or an open winding, produces a negative-sequence component, I_2, equal to the running current before the open occurred. While overload relays may not be able to detect this condition, the Type 46 is sensitive enough to provide fast tripping before the motor is damaged.

Single phase loads can cause the voltages to be unbalanced. Since the negative-sequence impedance of a motor is so low, by a factor equal to the starting to running current ratio, a 5% voltage unbalance causes typically 30% negative-sequence current. This condition should be detected quickly since the negative-sequence component causes disproportionate overheating. The Type 46 can operate on negative-sequence current as low as 3% of full load.

Since the negative and zero sequence networks are in series for a ground fault, negative-sequence current detection functions in the same manner as zero-sequence (or residual current schemes; however, due to its low burden on the primary current transformers, the Type 46 provides more sensitive protection. The relay has a built-in third harmonic filter which renders it insensitive to poor wave shapes.

Models are offered to suit various application requirements for sensitivity, time delay and separate alarm functions. The Type 46D has a built-in timer while the Type 46H is a high speed version. Both are offered with form C output contacts, allowing either to be applied with circuit breakers or motor starters.

Specifications

Pickup: Continuously Adjustable.
Models available for:
0.5 to 2 amperes neg. seq.
0.3 to 1.2 amperes neg. seq.
0.1 to 0.4 amperes neg. seq.

Input Circuit Rating: 8A, 50/60 Hz continuous
200A, one second

Burden: Measured at 5A, three phase, 1.0 pF
(.5-2A) 0.25 VA, phases, A, C
0.50 VA, phase B
(.3-1.2A) 0.25 VA, phases, A, C
0.50 VA, phase B
(.1-.4A) 1.0 VA, phases, A, C
2.0 VA, phase B

Control Power: Models available for:
120V 50/60 Hz, at 0.03 amperes, 24/32 Vdc, at 0.05 amperes, 48/125, 48/110 Vdc, at 0.05 amperes, 250 Vdc, at 0.05 amperes

Output Circuit Rating:

	@120 Vac	@125 Vdc	@250 Vdc
Tripping Duty	30A	30A	30A
Continuous	5A	5A	5A
Opening, Resistive	3A	1A	0.1A
Opening, Inductive	1A	0.3A	

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

Temperature: Minus 20°C to Plus 70°C

Seismic Capability: More than 6g ZPA biaxial broadband multi-frequency vibration without damage or malfunction (ANSI/IEEE C37.98).

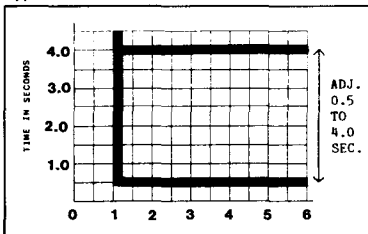
Transient Immunity: More than 2500V, 1 MHz bursts at 400 Hz repetition rate continuous. (ANSI C37.90.1 SWC); Fast Transient Test; EMI Test.

Operating Time: Type 46H High Speed
Type 46D Definite time, continuously adjustable 0.5 to 4 seconds.

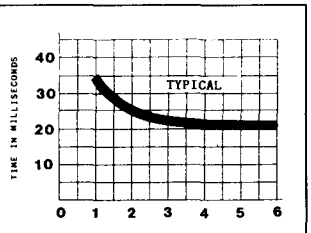
Weight: Unboxed — 4.0 lbs. (1.8 kg)
boxed — 4.7 lbs. (2.1 kg)
0.26 cubic feet

Definite Time Characteristics

Type 46D



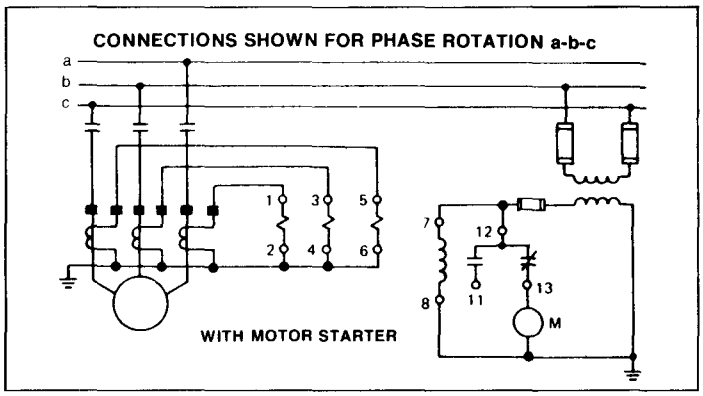
Type 46H

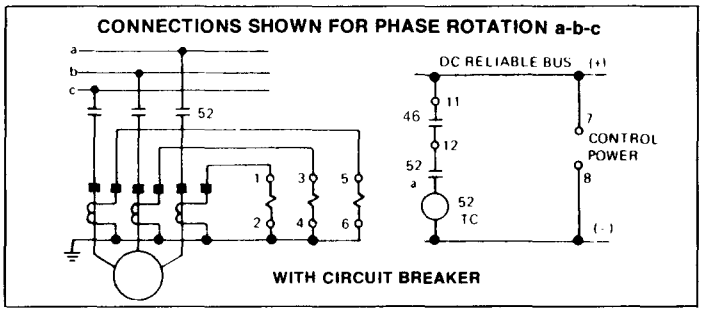


How to Specify

Current balance relay shall be Asea Brown Boveri Type 46 or approved equal. Relay shall be capable of withstanding up to 6g ZPA seismic stress without malfunction at minimum current and time settings. A magnetic operation indicator shall be provided which retains position on loss of control power. Built-in means shall be provided to allow operational tests without additional equipment.

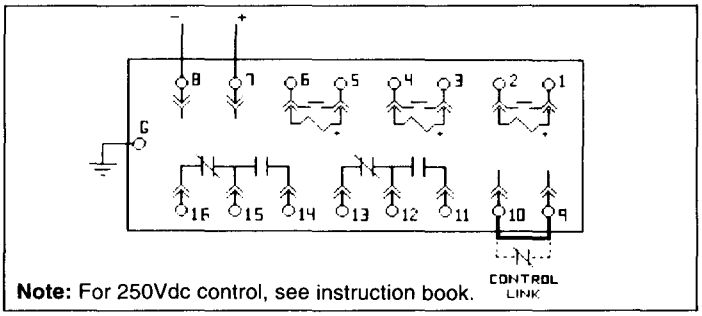
Wiring Diagrams





Note: Phase rotation and C.T. polarities must be observed for proper relay operation.

Connections



Note: For 250Vdc control, see instruction book.

How to Order

For a complete listing of available versions of the Type 46D and Type 46H current balance relays 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: IB 7.6.1.7-2
Motor Protection paper: TP 18.0-3
Other Protective Relays:
Application Selector Guide, TD 41-016

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CIRCUIT SHIELD ®

Type 46D, 46H Current Balance Relays

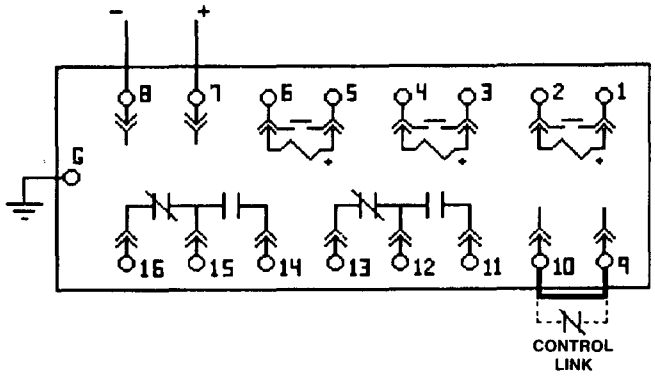
Type	Continuous Rating	Pickup Range I_2	Operating Time	① Catalog Numbers Drawout Test Case
46D	8A	0.5 - 2.0A	0.5 - 4 sec. Definite Time	427Q42x1
		0.3 - 1.2A		427Q44x1
		0.1 - 0.4A		427Q41x1
		0.5 - 2.0A	0.12 - 1 sec. Definite Time	427Q62x1
		0.3 - 1.2A		427Q64x1
		0.1 - 0.4A		427Q61x1
46H		0.5 - 2.0A	High Speed	427Q02x1
		0.3 - 1.2A		427Q04x1
		0.1 - 0.4A		427Q01x1

① Each of the listed catalog numbers for the Type 46D and Type 46H contains an "x" for the control voltage designation. To complete the catalog number, replace the "x" with the proper control voltage code digit:

		Internal Connections
24/32 Vdc	9	16D427A
48/110 Vdc	0	16D427A
48/125 Vdc	7	16D427A
250 Vdc	5	16D427B
120 Vac	6	16D427A

Internal Connection Diagrams

16D427A Types 46D, 46H Current Balance Relays Drawout Test Case



16D427B Types 46D, 46H Current Balance Relays Drawout Test Case