CIRCUIT SHIELD
Type 87M
Percentage Differential Relay

Application

The Type 87M provides fast, sensitive differential protection for AC motors and generators.

The relay has a non-linear percentage differential characteristic which allows operation for faults as low as 0.1 ampere, but provides security against misoperation on external faults. In addition, this characteristic reduces the requirements on current transformer accuracy and transient response since it requires more operating current as the restraint current magnitude becomes large.

The Type 87M is available as a single-phase relay in the totally drawout Test Case style or as a three-phase unit in the Standard Case style. The three-phase unit is especially attractive when panel space is limited.

Three-phase relays require an external, surface mounted reactor package. The reactor is built into the relay on single-phase units. The reactor is connected in series with the operating coil. It acts as a stabilizing impedance to prevent nuisance operations of the relay that might occur due to poor performance of the current transformers, for example on high-inrush load conditions.

Since frequency response characteristic is fairly flat the Type 87M may be used on 50 Hz systems as well as 50 or 60 Hz.

For a self-balancing machine differential scheme, see the GRD relay (DB 41-351S) used with Type GS sensors, or the Type 50D (DB 41-112S) used with a conventional zero-sequence window current transformer.

Features

- Fast, sensitive protection
- Adjustable pickup
- Low burden
- Seismic capability to 6g ZPA
- Built in test
- Transient immunity
- 2-year warranty
- UL recognized

![Typical Frequency Response Graph]
Specifications

Sensitivity: 0.1 to 0.5 amperes (25 to 60 Hz)

Restraint Circuit Ratings:
- Continuous: 12 amperes
- One Second: 300 amperes
- Burden: 0.25 VA at 5A

Operating Circuit Ratings:
- Continuous: 5 amperes
- One Second: 200 amperes
- Burden: 1.0 VA at 5A

Control Power:
- 48/125 Vdc at 0.035 A Drain
- 48/110 Vdc at 0.035 A Drain
- 24/32 Vdc at 0.050 A Drain
- 250 Vdc at 0.035 A Drain

Output Circuit:
- 1 normally open contact; 1 selectable normally open or normally closed

Output Circuit Rating:
- Each contact at 125 Vdc
- 30 amps. Tripping Duty
- 5 amps. Continuous
- 1 amp. Opening Resistive
- 0.3 amp. Opening Inductive

Operating Temperature: Minus 20°C to plus 70°C

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

Seismic Capability:
- More than 6g ZPA either Axis biaxial broadbanc multifrequency vibration without damage or malfunction ANSI/IEEE C37.98

Settings Required:
- Sensitivity adjustment is factory set at 0.25A; may be adjusted from 0.1 to 5.5A

Dielectric:
- 2000 Vac rms 1 min. all circuits to ground

Weight:
- Unboxed: 4.5 lbs. (2.0 Kg)
- Boxed: 5.2 lbs. (2.3 Kg)
- 0.26 Cubic Feet

How to Specify

Relay shall be Asea Brown Bovery Type 87M or equal. Relay shall have adjustable sensitivity 0.1 to 0.5 amperes. Relay shall be capable of withstandin up to 6g ZPA seismic stress without malfunction. A magnetic operation indicator which retains position on loss of control power shall be provided. Built-in means shall be provided to allow operational tests without additional equipment.

How to Order

For a complete listing of available differential 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 7.6.1.7-1
Motor Protection Guide: 41-205M
Other Protective Relays:
- Application Selector Guide, TD 41-016

NOTE: FOR TYPE 87M SINGLE PHASE RELAY CONNECTIONS, REFER TO INSTRUCTION BOOK IB 7.6.1.7-1.

June 1995
### Type 87M

#### Percentage Differential Relay

**Type**: Standard Case

**Control Voltage**: 50/60 Hz, Non-linear Slope

**Sensitivity**: 0.1-0.5A

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<th>Control Voltage</th>
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**Note**: The three-phase Type 87M requires a separately mounted 3D reactor assembly. The single-phase model has the reactor mounted internally to the relay.

#### Internal Connection Diagrams

16D219B Type 87M

Machine Differential Relay

Three Phase: Standard Case

16D419B Type 87M

Machine Differential Relay

Single Phase: Drawout Test Case

6S219M

Reactor Assembly, 3D

Surface Mounted

R = RESTRAINT WDG.

OP = OPERATE COIL

Z = REACTOR WDG.

CONTACT 14-15 CONVERTIBLE