



DC EARTH LEAKAGE RELAY

for Residual Current Monitoring (RCM)
DDCB with external coil DDCC

DC

UPS



DDCB



DDCC

Features

- Detects earth current leakage in DC supply systems (IT net) by differential current measurement
- Shows if the fault is related to the positive or negative wire
- Measuring coils available for cables up to Ø90 mm
- Configurable trip levels and alarm outputs to suit specific application requirements
- High immunity to false trips caused by noise and electromagnetic interference
- Wide DC supply range from 18 to 340 V
- Directional 12 ± 8 mA output and LED indication for supervision and easy trouble shooting

Benefits

- Detects faults in both main supply line, and branches
- Usable for thick high amperage cables or bus bar sections
- Improves safety in industrial DC Power supply systems
- Increased protection of electrical equipment against damage caused by earth leakage
- Facilitating maintenance providing early warnings and overview of fault location

Applications

- DC power distribution nets
- UPS systems
- Battery banks and Charger systems
- DC/AC inverters
- Cable and connectivity monitoring in mobile power installations



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DESCRIPTION

The DDCB Earth Leakage Relay is designed to monitor residual current in unearthed DC supply systems (IT net). The DDCB is measuring differential current in individual supply lines/feeders, suitable for selectively indicate faults in branched systems. In addition to this it shows if the fault is related to the positive or the negative wire for easy maintenance. Used with only one wire through the sensing core, the DDCB can monitor a circuit for connectivity and under current. If the DC current drops below the set value, the relay will trip. An additional key feature is that the DDCB allows AC and DC currents to flow under normal conditions, without having the usual voltage drop and heat from a shunt resistor.

APPLICATION

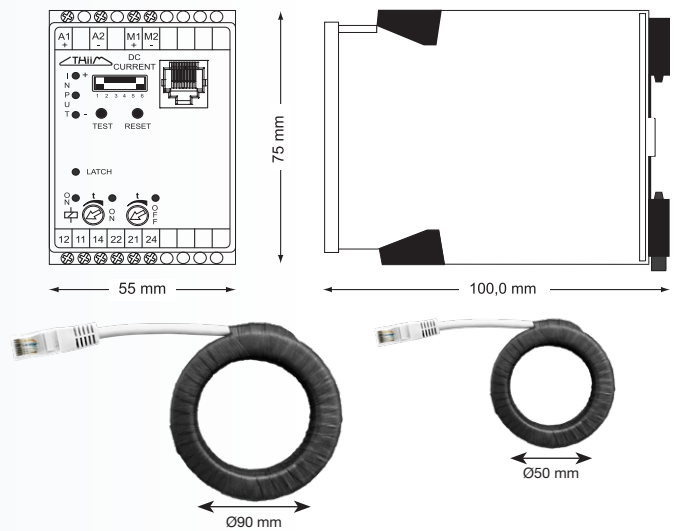
Selective DC earth leakage detection in single and branched systems. The DDCB is the solution for pure DC installations used in UPS and control systems for chemical, solar panel inverters, petrochemical, mining industry as well as in seagoing vessels. The DDCB is also ideal for measuring the DC component in AC installations including loads with rectifiers e.g. in variable speed drives.

For DC unearthed branched systems (IT nets), and setpoint below 30 mA, the DDCB can be used in combination with a DDEA or DDEB. The DDEA or DDEB providing the grounding for the DDCA and earth fault detection at system level, while DDCB detects faults locally in the branches/feeders where they are installed. Without a DDEA or DDEB unit, it is necessary to establish a resistor grounding circuit, as indicated in the "CONNECTIONS" diagram.

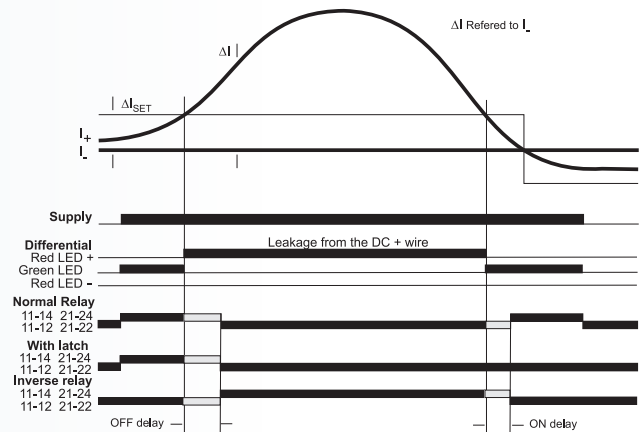
TEST AND RESET FUNCTION

The Test switch activates a real functional test as it conducts a DC current through a separate winding on the sensing core. The latch function can be released by disconnecting the power or by pressing the Reset switch.

DIMENSIONS



FUNCTIONS





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INSTALLATION AND SETUP

Set the DIP switches (123) to the requested sensitivity, latching relay (5) to On or Off and the relay (6) to Normal (fail safe) or Inverse function.

When the power is connected to A1 and A2, and with no differential current through the sensing coil, the green LEDs for Differential and Relay ON (normal function) will be on.

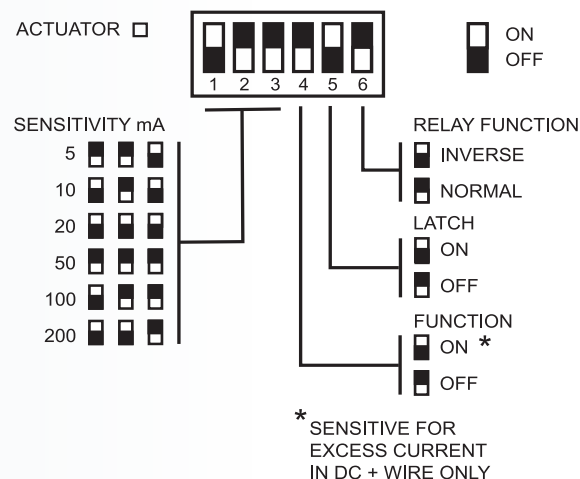
When a differential current above the set limit is detected, one of the red Differential LED's will be switched on, showing the polarity of the cable leaking to ground. (For leak currents above 15 A both red Differential LEDs will be switched on indicating that the DDCB is saturated and cannot detect which cable is leaking).

When high current is detected, the OFF delay starts to elapse, indicated by a green LED, and the relay will drop out when the set time has expired. If the latch function is selected the relay will stay de-energized (normal function) and the red Latch LED will be on until the Reset button is activated.

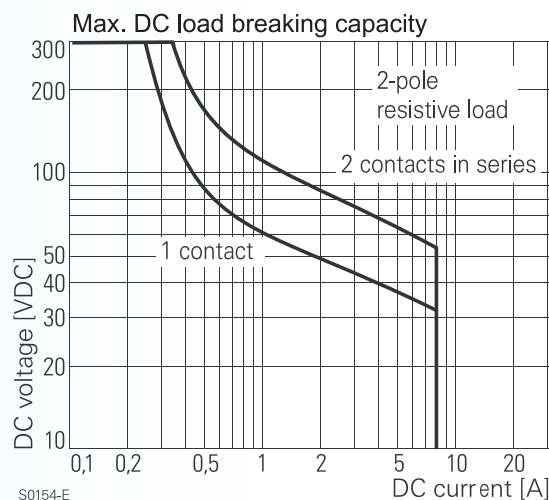
If the latch function is not active and the differential current drops below the set level, the green Differential LED will be switched on and the ON delay starts to elapse, indicated by a green LED.

The relay will pull in (normal function) when the set time has expired.

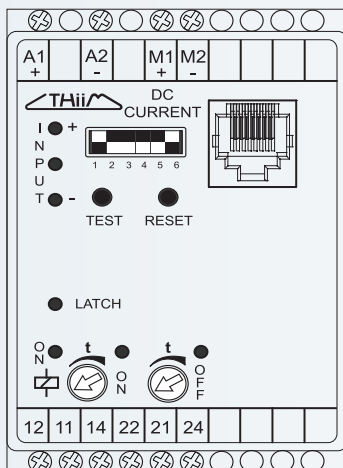
CONFIGURATION



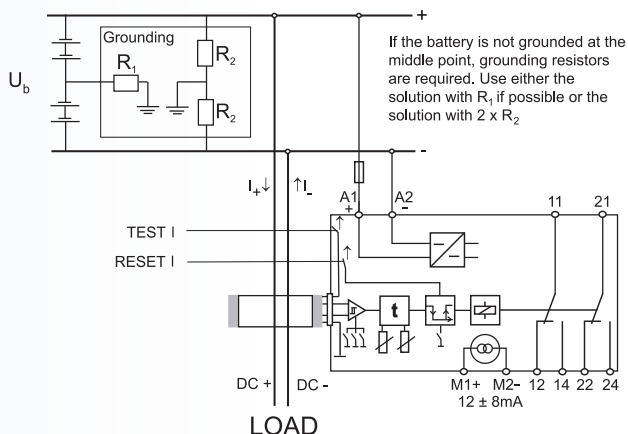
RELAY CONTACT RATING



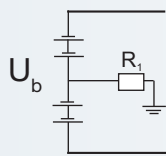
FRONT



CONNECTIONS



CALCULATIONS OF GROUNDING RESISTORS FOR NOT GROUNDED BATTERIES



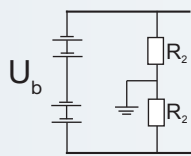
$$R_1^* = \text{Max.} \frac{U_b}{4 \Delta I_{\text{set}}} \Omega$$

$$\text{Size of resistor } W^{**} = \text{Min.} 0.4 \frac{U_b^2}{R_1} \text{ Watt}$$

EXAMPLES FOR $U_b = 48 \text{ V}$, $\Delta I_{\text{SET}} = 5 \text{ MA}$

$$R_1 = \text{Max.} \frac{48}{4 \times 0.005} = \text{Max.} 2400 \Omega$$

$$W = \text{Min.} 0.4 \frac{48^2}{2400} = \text{Min.} 0.384 \text{ Watt}$$



$$R_2^* = \text{Max.} \frac{U_b}{2 \Delta I_{\text{set}}} \Omega$$

$$\text{Size of resistor } W^{**} = \text{Min.} 1.6 \frac{U_b^2}{R_2} \text{ Watt}$$

$$R_2 = \text{Max.} \frac{48}{2 \times 0.005} = \text{Max.} 4800 \Omega$$

$$W = \text{Min.} 1.6 \frac{48^2}{4800} = \text{Min.} 0.768 \text{ Watt}$$

* The calculation of the resistor is based on a safety factor of 2 corresponding to a detection of a short from one pole to ground down to half battery voltage. A resistor selected according to the maximum resistor value as calculated above will limit the leak current to 2 times ΔI_{set} in case of direct short to ground. If it is a branched circuit with distributed "acceptable" leaks, it is recommended to use a lower value of the resistor.

** The calculation of the resistor size is based on a safety factor of 1.6 corresponding to an acceptable increase in battery voltage of up to 26 %



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SPECIFICATIONS

INPUT

| | |
|-------------------------------------|---|
| DC Current. No specified limitation | |
| Set points selectable by dipswitch | 5, 10, 20, 50, 100, 200 mA |
| Differential | Optional: 7.5, 15, 30, 75, 150, 300 mA Typical 2 % |
| Transformer Diameter | ID 50 mm, OD 85 mm ID 90 mm, OD 130 mm |

PERFORMANCE PARAMETERS

| | |
|-----------------------|--|
| TIMING | |
| Response time | Typical <200 ms |
| Time range during run | Separate On and Off delay 0-10 s adjustable |

ELECTRICAL

| | |
|------------------------------|--|
| Current direction indication | Up to 15 A |
| Precision | Set point ± 2 % Analog output class 2 |
| Temp. dependence | Typ. ± 0.02 %/°C |

OUTPUT

| | |
|-----------------|--|
| RELAY | |
| Contact rating | 2 C/O, AgNi/Au 6 A, 250 VAC, 1500 W See figure for DC rating |
| Mechanical life | 30 million operations |

ANALOG INDICATION

| | |
|---------|--|
| Current | 12 mA @ Input (fault)= 0 mA 12 \pm 8 mA @ input = \pm set point current |
|---------|--|

SUPPLY

| | |
|-------------------|----------|
| DC voltage | |
| Supply range | 18-340 V |
| Power consumption | Max. 3 W |

GENERAL

| | |
|------------|--|
| Precaution | The DDCB is screened with μ metal for high noise immunity. If the analog output in the highly sensitive ranges is used, precautions should be taken against permanent magnetic fields close to the DDCB as they can influence on the accuracy. In the sensitive ranges the wires should be kept close and in the center of the core. |
|------------|--|

| | |
|-------------------------|--|
| Temperature range | -25 °C to +55 °C ambient |
| Humidity | Up to 90 % RH non-condensing |
| Dielectric test voltage | Coil to relay contacts 4000 VAC Pole to pole 2500 VAC |

TERMINALS

| | |
|-------------------|---|
| Tightening torque | 0.32 Nm to 0.39 Nm |
| Screw type | PH1 |
| Cable size | Accepts up to 3.3 mm ² or 12 AWG |

| | |
|--------|---------|
| Weight | 0.23 kg |
|--------|---------|



International standards

EMC directives 89/336:

| | |
|----------|----------|
| EN 50081 | Emission |
| EN 50082 | Immunity |

EU directive: Low voltage directive 73/23:

| | |
|----------|-------------------|
| EN 60255 | Electrical Relays |
|----------|-------------------|

ORDERING INFORMATION

EXAMPLE – DDCB MAIN UNIT

TYPE

DC Earth Leakage Relay

SETPOINTS

5, 10, 20, 50, 100, 200 mA
7.5, 15, 30, 75, 150, 300 mA

SUPPLY VOLTAGE

18-340 V

ADJUSTMENT

Dipswitch adj

HOUSING

Rail mounting

SIZE

55 mm

CODE END

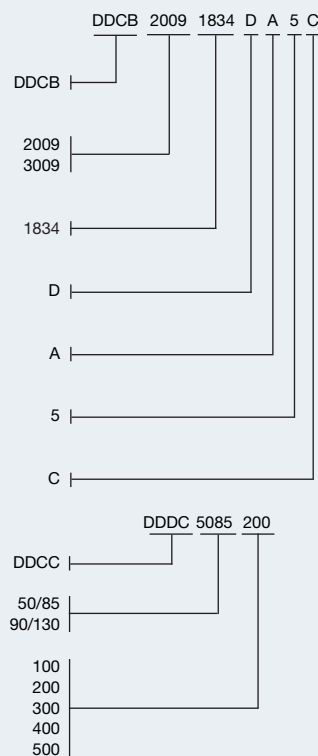
Code end

EXTERNAL Coil DDCC

External Coil DDCC

Coil Size, ID mm (Inner/outer diam.)

Length, connecting cable, cm



Company info

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