



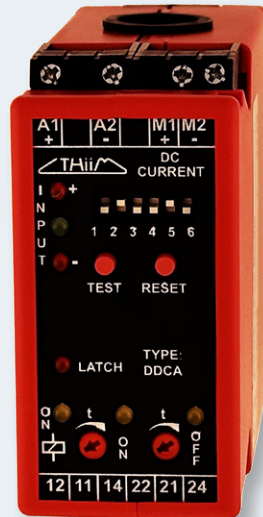
DC EARTH LEAKAGE RELAY

for Residual Current Monitoring (RCM)

DDCA

DC

UPS



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
- Built-in measuring coil
- 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 $12 \pm 8\text{mA}$ output and LED indication for supervision and easy trouble shooting

Benefits

- Detects faults in both main supply line, and branches
- Easy installation without using external measuring transformers
- Improves safety in industrial DC Power supply systems
- Increases 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



DC EARTH LEAKAGE RELAY

for Residual Current Monitoring (RCM)
DDCA

DESCRIPTION

The DDCA Earth Leakage Relay is designed to monitor residual current in unearthed DC supply systems (IT net). The DDCA is measuring differential current in individual supply lines/feeders, suitable for selectively indicating 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, it can monitor a circuit for connectivity and function. If the DC current drops below the set value, the relay will trip. An additional key feature is that the DDCA allows AC and DC currents to flow under normal conditions without having the usual voltage drop and heat from a shunt resistor.

APPLICATION

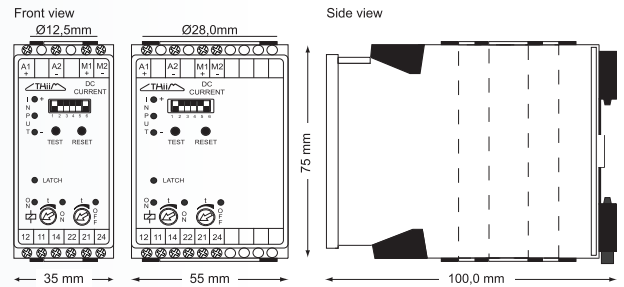
Selective DC earth leakage detection in single and branched systems. The DDCA is the solution for pure DC installations used in UPS and control systems for chemical, solar panel inverters, petrochemical, mining industry as well as seagoing vessels. The DDCA is also ideal for measuring the DC component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

For DC unearthed branched systems (IT systems) & setpoint below 30 mA, the DDCA 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 DDCA's detect 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.

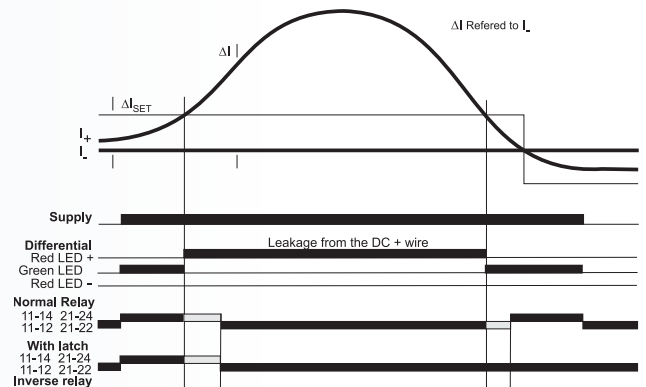
TEST AND RESET FUNCTION

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





DC EARTH LEAKAGE RELAY

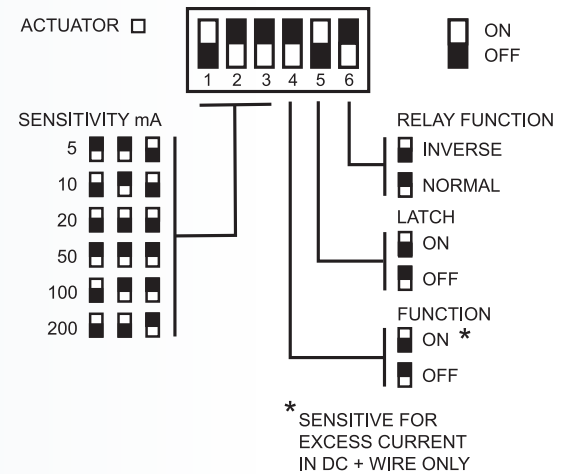
for Residual Current Monitoring (RCM)
DDCA

INSTALLATION AND SETUP

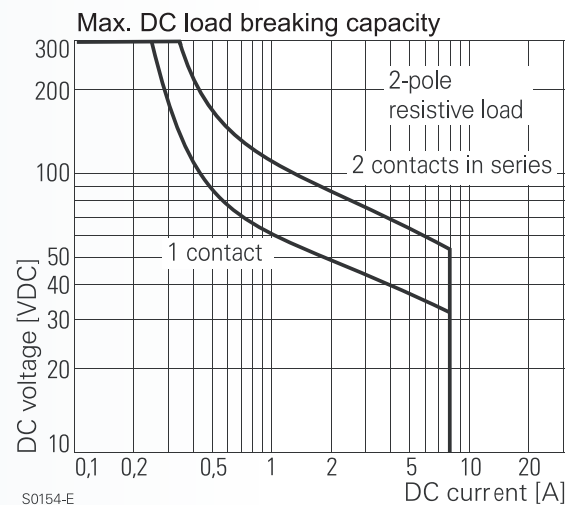
Set the DIP switches (123) to the requested sensitivity, latching relay (5) to On or Off and the relay (6) to Normal (fail safe) or Inverse function.

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 10A both red Differential LEDs will be switched on indicating that the DDCA is saturated and cannot detect which cable is leaking). When high current is detected, the OFF delay starts to elapse, indicated by a yellow 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 yellow LED. The relay will pull in (normal function) when the set time has expired.

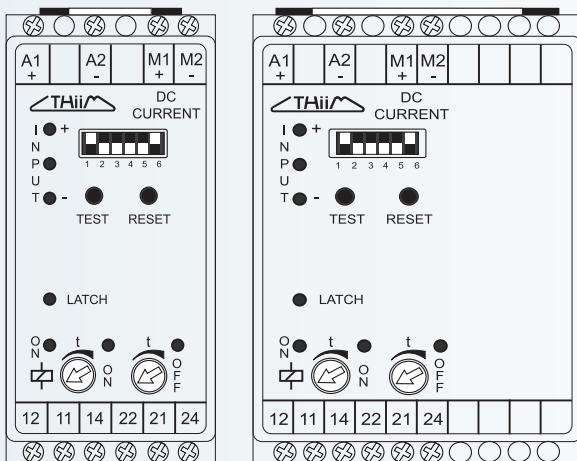
CONFIGURATION



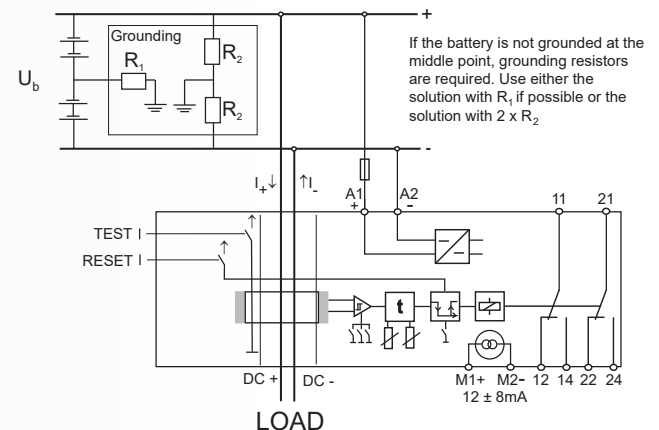
RELAY CONTACT RATING



FRONT

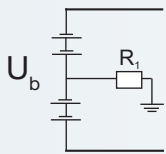


CONNECTIONS



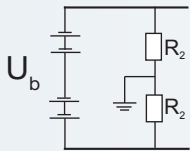
CALCULATIONS OF GROUNDING RESISTORS FOR UN-GROUNDED IT SYSTEM

CALCULATIONS OF GROUNDING RESISTORS FOR NOT GROUNDED BATTERIES



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

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



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

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

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

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

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

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

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

* 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 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 5, 10, 20, 50, 100, 200 mA
 by dipswitch
 Transformer Diameter Ø 12.5 mm (Housing size 3)
 Ø 28.0 mm (Housing size 5)

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 10 A
 Precision Set point ±2 %
 Analog output class 2
 Temp. dependence Typ. ±0.02 %/°C

OUTPUT

RELAY
 2 C/O, AgNi/Au
 Contact rating 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 ± 8 mA @ input = ± set point current

SUPPLY

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

GENERAL

Precaution The DDCA 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 DDCA 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 mm² or 12 AWG

Weight Size 3: 0.17 kg Size 5: 0.21 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

TYPE
 DC Earth Leakage Relay

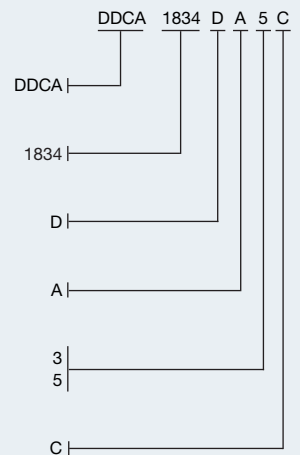
SUPPLY VOLTAGE
 18 V-340 VDC

ADJUSTMENT
 Dipswitch adj

HOUSING
 Rail mounting

SIZE
 35 mm, 12.5 mm throughput
 55 mm, 28.0 mm throughput

CODE END
 Code end



Company info

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