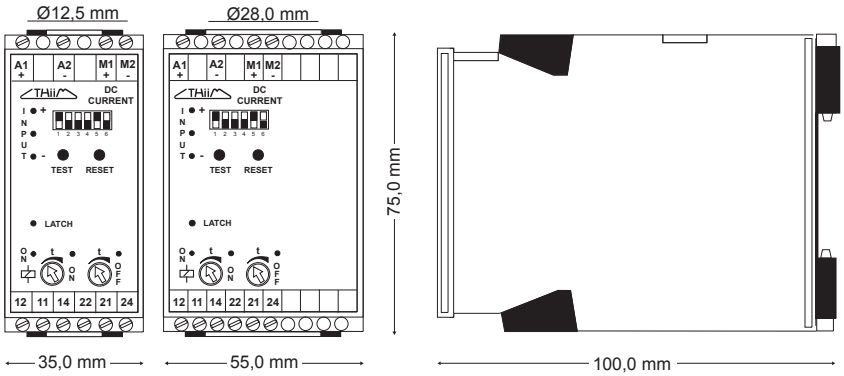


DIFFERENTIAL DC CURRENT RELAY

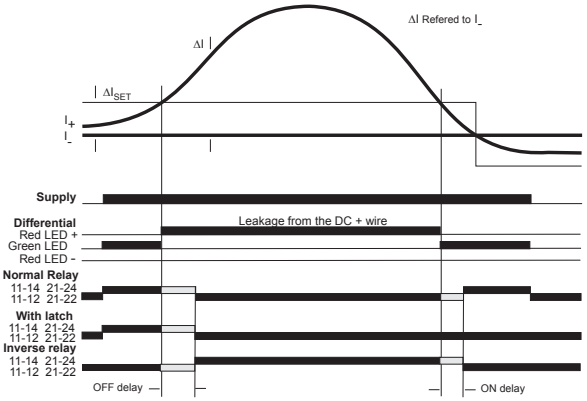
DC Earth Leakage Relay

Type: DDCA

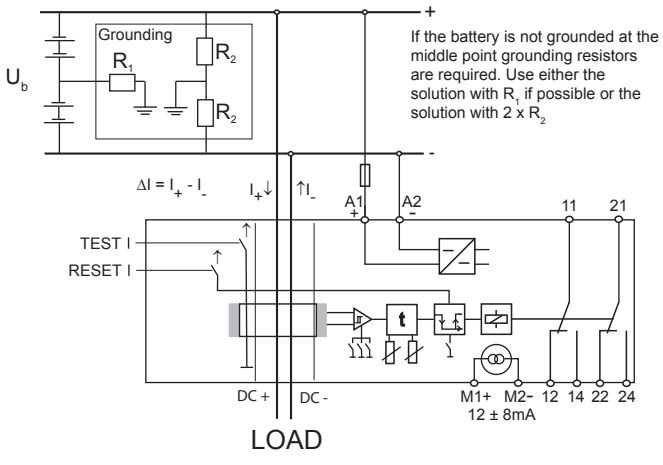
FEATURES

- **Early warning for Insulation deterioration and Earth leakage**
- **Minimum current detection**
- **6 Ranges from 5 to 200mA selected by DIP switches**
- **Wide DC supply range from 18 to 340 V**
- **Directional 12 ± 8mA output and LED indication for supervision and easy trouble shooting**
- **Extremely compact and with µ metal screened transformer for high accuracy and noise immunity**
- **Time delay - on and off - individually adjustable**
- **Relay function can be inverted**
- **Latch function can be selected**
- **LEDs indicate the status of the relay, latch and timing function**
- **Test and Reset switch**

FUNCTION DIAGRAM



CONNECTION DIAGRAM



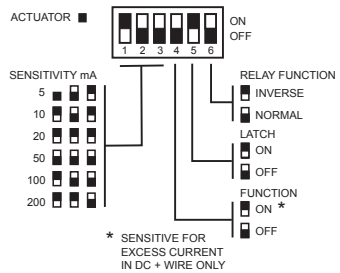
Description:
The differential DC current relay is designed to monitor IT systems for insulation deterioration. The DDCA is able to selectively indicate faults in branched systems. In addition to this it shows if the fault is related to the positive or the negative wire for easy maintenance. Used with only one wire through the sensing core, it can monitor a circuit for connectivity and function. If the DC current drops below the set value, the relay will trip. This is another key feature as the DDCA allows, up to the cable capacity, AC and DC Amps to flow under normal conditions without having the usual voltage drop and heat from a shunt resistor.

Operation:
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.

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 disconnectiong the power or by pressing the Reset switch.

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, 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, causing the AC monitors to malfunction.
For DC unearthed branched systems (IT systems) & setpoint below 30mA, the DDCA can be used in combination with a DDEA or DDEB. The DDEA or DDEB make the Grounding and monitor the total system, and the DDCA monitor a branch, use a DDCA for each branch.

PROGRAMMABLE FEATURES



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SPECIFICATIONS

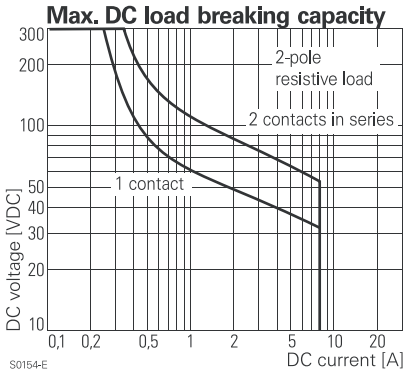
INPUT	DC Current. No specified limitation
Set points selectable by dipswitch	5, 10, 20, 50, 100, 200mA
Differential	Typical 2%
Transformer Diameter	Ø 12,5 mm (Housing size 3) Ø 28,0 mm (Housing size 5)
PERFORMANCE PARAMETERS	
TIMING	
Response time	Typical <200msec.
Time range during run	Separate On and Off delay 0 - 10 sec. adjustable
ELECTRICAL	
Current direction indication	Up to 10 Amp
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	12mA @ Input (fault)= 0mA 12 ± 8mA @ input = ± set point current
SUPPLY	DC voltage
Supply range	18 - 340V
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
Dieletric test voltage	Coil to relay contacts 4000 VAC Pole to pole 2500 VAC
Weight	Size 3: 0.17 kg. Size 5: 0.23 kg.
CE	International Standards
Directive 2002/95/EC of	RoHS
EMC directive 89/336:	EN50081 - Emission EN50082 - Immunity
Low voltage directive 73/23:	EN60255 - Electrical Relays

ORDERING INFORMATION

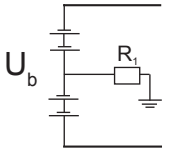
EXAMPLE: DDCA 1834 D A 5 C

TYPE Differential DC current control relay	DDCA
SUPPLY VOLTAGE 18 V - 340 VDC	1834
ADJUSTMENT Dipswitch adj.	D
HOUSING Rail mounting	A
SIZE 35 mm, 12,5 mm throughput 55 mm, 28,0 mm throughput	3 5
CODE END	C

RELAY CONTACTS

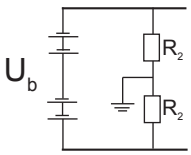


Calculations of grounding resistors for not grounded batteries



R_1* = Max $\frac{U_b}{4\,\Delta I_{set}}\,\Omega$

Size of resistor W** = Min. 0,4 $\frac{U_b^2}{R_1}$ Watt



R_2* = Max $\frac{U_b}{2\,\Delta I_{set}}\,\Omega$

Size of resistor W** = Min. 1,6 $\frac{U_b^2}{R_2}$ Watt

Examples for U_b = 48V, ΔI_{set} = 5mA

R_1 = Max $\frac{48}{4 \times 0{,}005}$ = Max. 2400Ω

W = Min. 0,4 $\frac{48^2}{2400}$ = Min. 0,384 Watt

R_2 = Max $\frac{48}{2 \times 0{,}005}$ = Max. 4800Ω

W = Min. 1,6 $\frac{48^2}{4800}$ = Min. 0,768 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%.

We reserve the right to make changes for product improvement.