

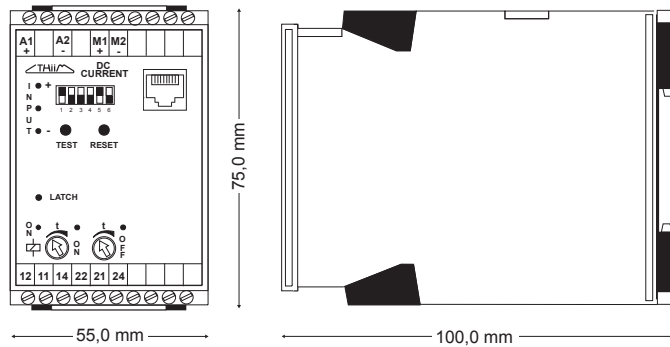


DIFFERENTIAL DC CURRENT RELAY

DC Earth Leakage Relay

Type: DDCB

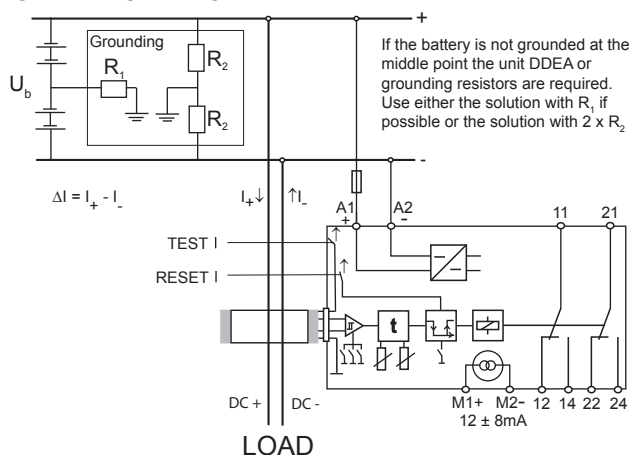
with external coil DDCC



FEATURES

- Early warning for Insulation deterioration and/or Earth leakage
- Minimum current detection
- 6 Ranges from 5 to 200mA (7.5 to 300) selected by DIP switches
- 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
- External current transformer $\varnothing 50\text{mm}$ or $\varnothing 90\text{mm}$
- Extremely compact and μ metal screened sensor 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

CONNECTION DIAGRAM



Description:

The differential DC current relay is designed to monitor IT systems for insulation deterioration. The DDCB 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, the DDCB can monitor a circuit for connectivity and under current. If the DC current drops below the set value, the relay will trip. This is another key feature as the DDCB 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 15A 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 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.

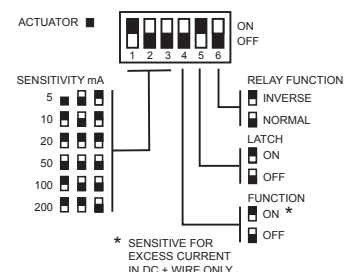
Test and Reset function:

The Test switch activates a real functional test as it conducts a DC current through a separate winding on the sensing core. The Reset switch will, when activated, release the latch function.

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, petrochemical, mining industry as well as in seagoing vessels. The DDCB is also ideal in AC installations including loads with rectifiers e.g. in variable speed drives, causing the AC monitors to malfunction.

PROGRAMMABLE FEATURES



SPECIFICATIONS

INPUT

Set points selectable by dipswitch	AC/DC Current. No specified limitation 5, 10, 20, 50, 100, 200mA Optional: 7.5, 15, 30, 75, 150, 300 mA Range max. 2.0A
Differential	Typical 2%
Transformer Diameter	ID 50, OD 85 mm ID 90mm OD 130 mm

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 15 Amp
Precision	Set point $\pm 2\%$ Analog output class 2
Temp. dependence	Typ. $\pm 0.02\%$ / $^{\circ}\text{C}$

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 \pm 8mA @ input = \pm set point current

SUPPLY

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

GENERAL

Precaution	The DDCA is screened with μ metal for high 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 $^{\circ}\text{C}$ to + 55 $^{\circ}\text{C}$ ambient
Humidity	Up to 90 % RH non-condensing
Dielectric test voltage	Coil to relay contacts 4000 VAC Pole to pole 2500 VAC
Weight	Size 3: 0.17 kg. Size 5: 0.23 kg

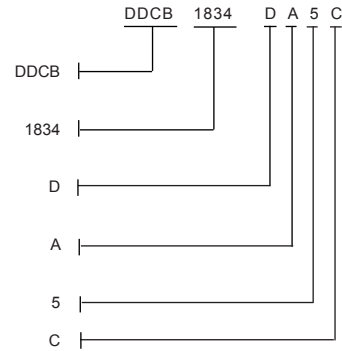


EMC directive 89/336:	International Standards EN50081 - Emission EN50082 - Immunity
Low voltage directive 73/23:	EN60255 - Electrical Relays

ORDERING INFORMATION

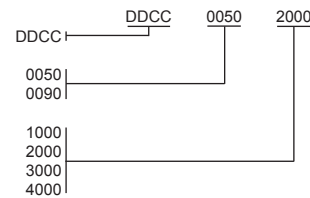
Main Unit DDCB

TYPE	Differential DC current control relay
SUPPLY VOLTAGE	18 V - 340 VDC
ADJUSTMENT	Dipswitch adj.
HOUSING	Rail mounting
SIZE	55 mm
CODE END	

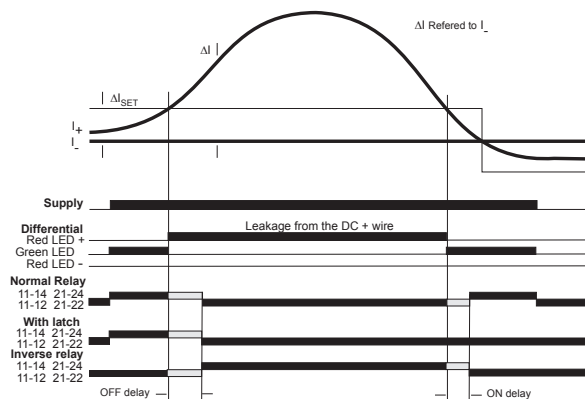


EXTERNAL Coil DDCC

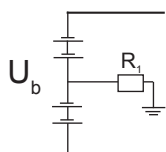
TYPE	External Coil DDCC
Coil Size, ID mm	
Length, connecting cable, mm	



FUNCTION DIAGRAM



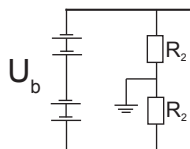
Calculations of grounding resistors for not grounded batteries



Examples for $U_b = 48\text{V}$, $\Delta I_{\text{set}} = 5\text{mA}$

$$R_1^* = \text{Max} \frac{U_b}{4 \Delta I_{\text{set}}} \Omega \quad R_1 = \text{Max} \frac{48}{4 \times 0.005} = \text{Max. } 2400 \Omega$$

$$W^{**} = \text{Min. } 0.4 \frac{U_b^2}{R_1} \text{ Watt} \quad W = \text{Min. } 0.4 \frac{48^2}{2400} = \text{Min. } 0.384 \text{ Watt}$$



$$R_2^* = \text{Max} \frac{U_b}{2 \Delta I_{\text{set}}} \Omega \quad R_2 = \text{Max} \frac{48}{2 \times 0.005} = \text{Max. } 4800 \Omega$$

$$W^{**} = \text{Min. } 1.6 \frac{U_b^2}{R_2} \text{ Watt} \quad W = \text{Min. } 1.6 \frac{48^2}{4800} = \text{Min. } 0.768 \text{ Watt}$$

* 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%.

