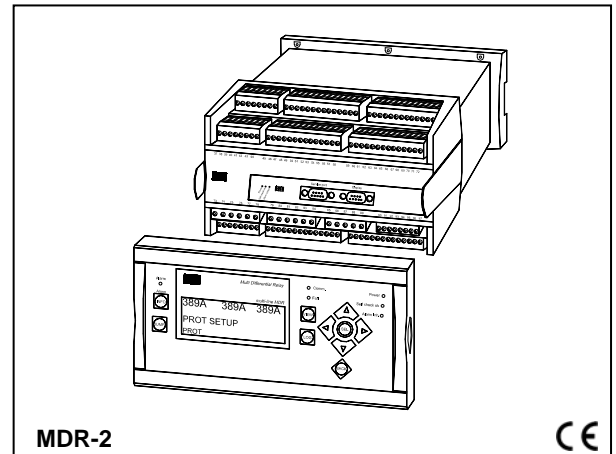


Type MDR-2

# Multi differential protection relay multi-line 2

4921240275E

- **Relay for generators/electric motors**
- **3-phase AC measurements**
- **Dynamic compensation for ext. failures**
- **Short response time (50 ms)**
- **Display indicating all measurements**



### Application

The MDR-2 differential protection relay is a micro-processor-based control unit containing all necessary functions for monitoring of the differential currents for a synchronous/asynchronous generator or motor (the object).

Via current transformers the MDR-2 measures each phase current on both sides of the object. The current transformers determine the limits of the protection area. Any failure within these limits (2- or 3-phase short circuits or earth leaks) will be detected as an error  $I_d$ : Differential currents, the currents flowing through the two current transformers of the phase in question differ, and, if a preset limit value is exceeded, a warning will be given or a tripping signal transmitted.

The MDR-2 dynamic compensation curves for warning and tripping are defined by the user.

Should an error occur outside the limits of the protection area, the MDR-2 will not transmit a tripping signal, as the above-mentioned phase currents are equal. In that way a selective protection is achieved.

Except for external measuring transformers the MDR-2 contains all necessary measuring circuits and presents all values on an LC display. Values and messages are presented in clear text (measuring values in engineering units).

The MDR-2 is a flexible and menu/PC programmed unit, enabling the user to easily adapt the unit to the object in question. The programming procedures are password protected.

### Standard functions

The unit is designed for differential current protection of a 3-phase generator/motor.

#### Inputs and outputs:

- Inputs:
- 6 currents via current transformers
  - 2 binary control inputs
- Outputs:
- 6 relay outputs
  - ("SYSTEM OK", 5 configurable relays)

#### Generator protective functions:

- Differential current (3-phase) protection, with programmable dynamic compensation (pick-up curves)
- Warning: Programmable value and delay
- Trip: Programmable value and delay

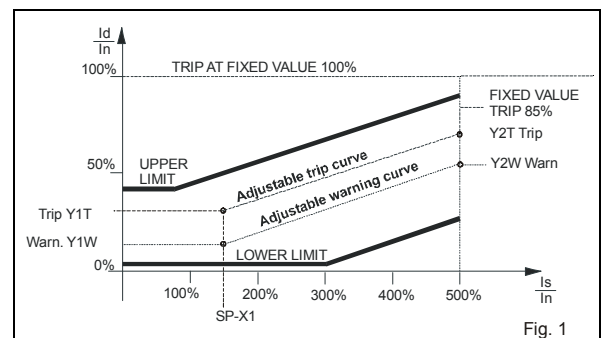


Fig. 1

A pick-up curve is shown in Fig. 1. The curves represent the warning and tripping values ( $I_d/I_n=Y$ ), defined as the differential current ( $I_d$ ) divided by the nominal generator/motor current ( $I_n$ ) referring to the stabilisation current ( $I_s$ ) divided by  $I_n$  ( $I_s/I_n=X$ ).

The starting horizontal limit lines are placed according to the keyed in values of the points  $P(X1, Y1T)$  and  $P(X1, Y2T)$ . These can be positioned anywhere within the marked area and must be decided according to the specifications of the plant in question.

For warning and tripping pick-up curves the following ranges are available:

- $I_d/I_n > 100\%$  Fixed tripping point  
Independent of the stabilisation current
- $I_s/I_n > 500\%$  Fixed tripping ( $I_d/I_n > 85\%$ )  
Fixed warning (Y2W)
- $I_s/I_n < 500\%$  Trip and warning programmable within "UPPER LIMIT" and "LOWER LIMIT" values and dependent on the  $I_s/I_n$  value

## Type MDR-2

### Display of values and texts:

- LEDs: Supervision, alarm
- Alarm and condition indication in clear text on LC display
- AC values (differential and actual currents for all 3 phases) on LC display

### Acknowledgement of alarms:

- Automatic acknowledgement YES/NO (programmable)
- Remote acknowledgement via push button input
- Local acknowledgement via display front push button

## Options

### Overcurrent/short circuit protection (option C3):

- 2 x definite time or inverse time (curve with 6 programmable points) overcurrent protection (400% overcurrent max.)
- 1 x definite time short circuit protection (500% short circuit current max.)

### Block differential current protection (option C4):

The block differential protection option protects a generator and a step-up transformer (a block) together.

The option handles the following:

- Step-up transformer ratio
- Different CT ratios on generator and on high voltage (HV) side of the step-up transformer
- Step-up transformer inrush current (2<sup>nd</sup> harmonic)
- Step-up transformer overexcitation current (5<sup>th</sup> harmonic)
- Step-up transformer phase angle shift from primary to secondary side. At present the following transformer couplings are supported:

- Dd 0, phase angle shift 0 deg.
- Dd 6, phase angle shift 180 deg.
- Dy 1, phase angle shift 30 deg.
- Dy 5, phase angle shift 150 deg.
- Dy 7, phase angle shift 210 deg.
- Dy 11, phase angle shift 330 deg.
- Yd 1, phase angle shift 30 deg.
- Yd11, phase angle shift 330 deg.

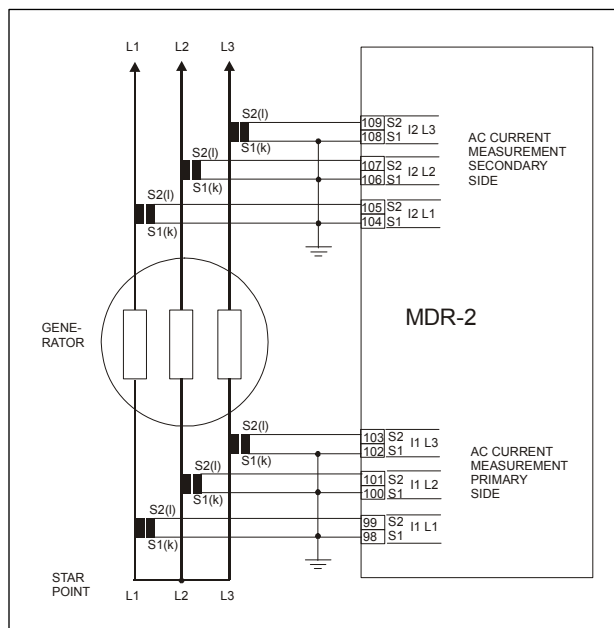
### Cables (option J):

- J1: Display cable, 3m
- J2: Display cable, 6m
- J3: Serial interface cable for PC utility software
- J6: Display cable, 1m

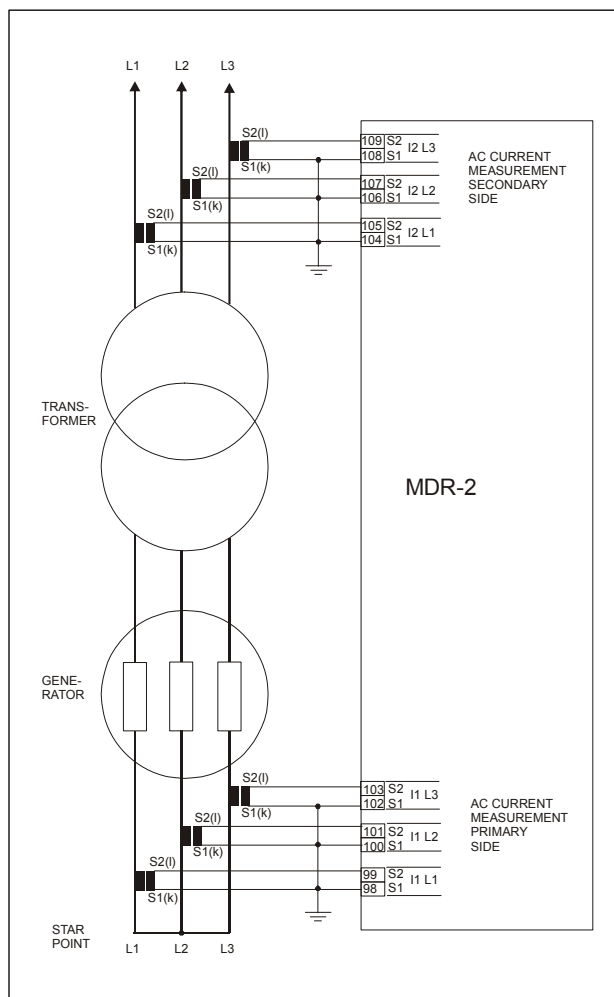
### Display gasket (option L):

Rubber gasket makes display protection IP54 (standard IP52)

## Principle diagram



## Principle diagram, option C4

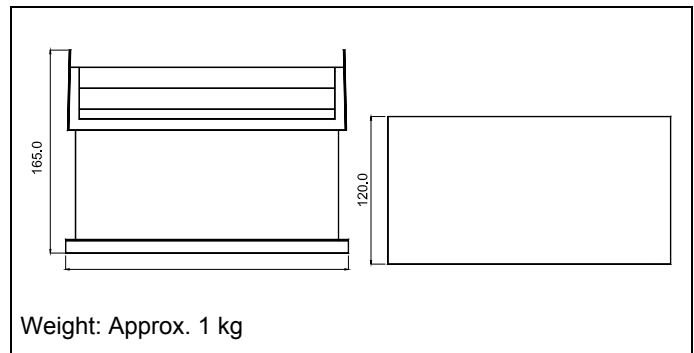


## Type MDR-2

### Technical specifications

Accuracy:	$0.1 \times I_N < I < I_N$ : 1% of $I_N$ $I_N < I$ : 1% of $I$ ( $I_N = 1A$ or $5A$ , $I =$ measured value)
Operating temp.:	-25...70°C
Climate:	Class HSE, to DIN 40040
Meas. frequency:	30...70Hz (nominal 50Hz or 60Hz)
Aux. supply:	12/24V DC -25/+30%, max. 8W
Binary inputs:	Input voltage: 6...32V DC (bi-directional) Input impedance: Max. 2.4 k $\Omega$
Meas. current:	-1A or -5A (option C4 -1A only), consumption: Max. 0.3VA per phase
Overcurrent:	4 x $I_N$ , continuously 20 x $I_N$ , 10 sec. (max. 75A) 80 x $I_N$ , 1 sec. (max. 300A)
Response times:	Differential current: 50 ms Block diff. current (option): 120 ms Overcurrent (option): 70 ms Short circuit (option): 50 ms  Response times are measured from end of period of measured current cycle
Fuse:	All voltage inputs should be protected by a 2A fuse
Relay outputs:	Contact rating: 8A/250V AC. ("Status": 1A)
Safety:	To EN 61010-1. Installation cat. III, 600V. Pollution degree 2
Galv. separation:	Between AC inputs and others: 3250V AC – 50Hz – 1 min.
EMC/CE:	To EN 61000-1/2/3/4 and IEC 255-3
Connections:	Current: Max. 4 mm <sup>2</sup> (multi-stranded) 6 mm <sup>2</sup> (single-stranded) Others: Max. 2.5 mm <sup>2</sup> (multi-stranded) Display: 9-pin SUB-D (female) Service port: 9-pin SUB-D (male)
Protection:	Terminals: IP20 Display front: IP52 (IP54 with gasket) According to IEC 529 and EN 60529
Material:	All plastic parts are self-extinguishing to UL 94 (V1)

### Dimensions



### Order specifications

**Type – Option – Option**  
Example: MDR-2 – J1

Due to our continuous development we reserve the right to supply equipment which may vary from the described.



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