DEIF

-power in control

CE

DATA SHEET

Multi differential protection relay, MDR-2

- Relay for generators/electric motors
- 3-phase AC measurements
- Dynamic compensation for ext. failures
- Short response time (70 ms)
- Display indicating all measurements

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Application

The MDR-2 differential protection relay is a microprocessor-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 (pickup curves)
- Warning: Programmable value and delay
- Trip: Programmable value and delay

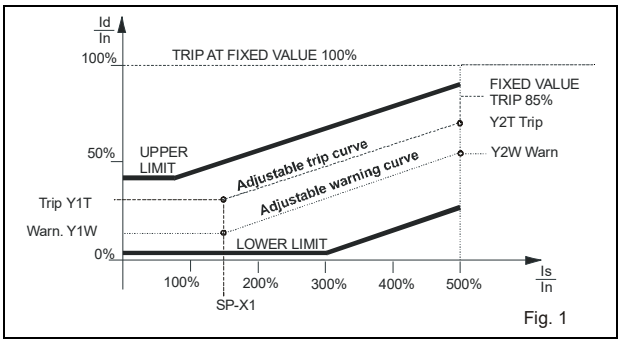


Fig. 1

A pickup curve is shown in Fig. 1. The curves represent the warning and tripping values (Id/In=Y), defined as the differential current (Id) divided by the nominal generator/motor current (In) referring to the stabilisation current (Is) divided by In (Is/In=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 pickup curves the following ranges are available:

Id/In > 100 % Fixed tripping point
Independent of the stabilisation current

Is/In > 500 % Fixed tripping (Id/In > 85 %)
Fixed warning (Y2W)

Is/In < 500 % Trip and warning programmable within "UPPER LIMIT" and "LOWER LIMIT" values and dependent on the Is/In value

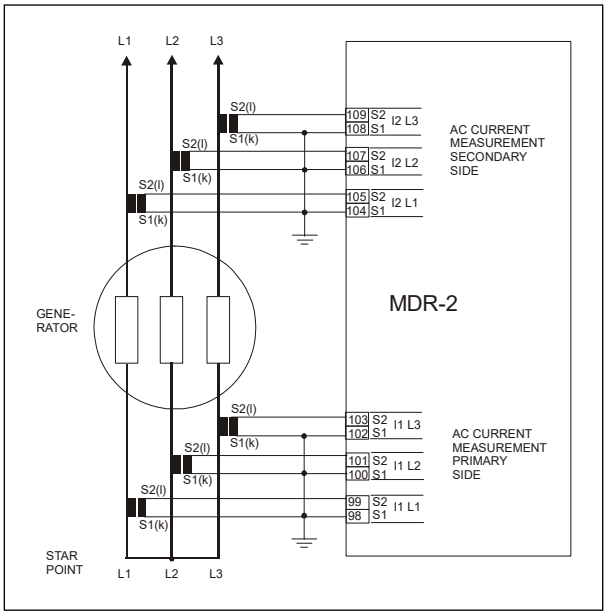
Display of values and texts:

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

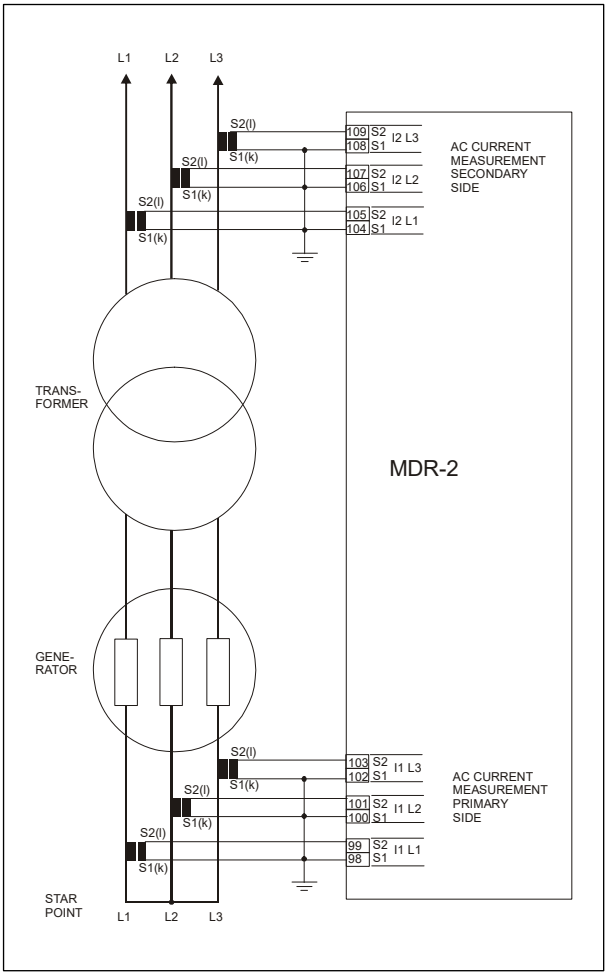
Acknowledgement of alarms:

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

Principle diagram



Principle diagram, option C4



Available variants

Type	Variant no.	Description	Item no.	Note
MDR-2	01	MDR-2 with display and display cable	2912500020-01	
MDR-2	02	MDR-2 with display, display cable and option C3	2912500020-02	
MDR-2	03	MDR-2 with display, display cable and option C4	2912500020-03	
MDR-2	04	MDR-2 without display	2912500020-04	

Available options

Option	Description	Slot no.	Option type	Note
C	**Generator add-on protection package**			
C3	Over-current/short circuit protection (option C3): - 2 × definite time or inverse time (curve with six programmable points) over-current protection (400 % over-current max.) - 1 x definite time short circuit protection (500 % short circuit current max.)		Software	
C4	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 (2nd harmonic) - Step-up transformer overexcitation current (5th harmonic) - Step-up transformer phase angle shift from primary to secondary side. The following winding connections 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 150 deg. ● Dy 11, phase angle shift 30 deg. ● Yd 1, phase angle shift -30 deg. ● Yd 5, phase angle shift -150 deg. ● Yd 7, phase angle shift 150 deg. ● Yd 11, phase angle shift 30 deg.		Software	

Available accessories

Accessory	Description	Item no.	Note
Operator panels			
Standard Display Unit, DU-2	For connection directly to base unit with display cable	2912210050	
Display gasket for IP54 (L)	Standard is IP40	1134510010	
Cables			
Display cable, 3 m (J1)		1022040076	
Display cable, 6 m (J2)		1022040057	
RS-232 serial interface cable (J3)	For PC utility software	1022040044	
Display cable, 1 m (J6)		1022040064	
Documentation			
Designer´s Reference Handbook (K1)		4189340583	
CD-ROM with complete documentation (K2)		2304230002	

Technical specifications

Accuracy: For I1 > 0.05 × IN at rated frequency:

For I_N = 1 A
$I \leq I_N$: 1 % of I_N
$I_N < I$: 1 % of I

For I_N = 5 A
$I \leq I_N$: 1 % of I_N
$I_N < I \leq 3 \times I_N$: 1 % of I

(I = measured value)

Measurement range
I1 & I2: 0.03 to 6 × I_N

Operating temp.: -25 to 70 °C (-13 to 158 °F)

(UL/cUL Listed: Max. surrounding air temp.: 55 °C/131 °F)

Climate: Class HSE, to DIN 40040

Meas. frequency: 30 to 70 Hz
Rated frequency: 50 Hz or 60 Hz

Aux. supply: 12/24 V DC nominal (8 to 36 V DC operational), max. 11 W consumption

0 V DC for 10 ms when coming from at least 24 V DC

The aux. supply inputs are to be protected by a 2 A slow blow fuse

(UL/cUL Listed: AWG 24)

Binary inputs: Input voltage: 6 to 32 V DC (bi-directional)

Input impedance: Max. 2.4 kΩ

Meas. current: -/1 A or -/5 A (option C4 -/1 A only)

(UL/cUL Listed: From CTs 1-5 A)

Consumption: Max. 0.3 VA per phase

Over-current: 4 × I_N, continuously
20 × I_N, 10 sec. (max. 75 A)
80 × I_N, 1 sec. (max. 300 A)

Response times:
(Delay set to minimum)
Differential current: 70 ms
Block diff. current (option): 120 ms
Over-current (option): 90 ms
Short circuit (option): 70 ms

Relay outputs: Contact rating: 5 A/250 V AC
("Status": 1 A)

(UL/cUL Listed: 250 V AC/24 V DC, 2 A resistive load)

Safety: To EN 61010-1. Installation cat. III, 600 V. Pollution degree 2

To UL 508 and CSA 22.2 no. 14-05, over-voltage category III, 300 V, pollution degree 2

Galv. separation: Between AC inputs and others: 3250 V AC – 50 Hz – 1 min.

EMC/CE: To EN 61000-1/2/3/4 and IEC 255-3

Connections: Current: Max. 4 mm^2 (multi-stranded)
6 mm^2 (single-stranded)

(UL/cUL Listed: AWG28-10)

Tightening torque:
0.5 to 0.6 Nm (4.4 to 5.3 lb-in)

Others: Max. 2.5 mm^2 (multi-stranded)

(UL/cUL Listed: AWG28-12)

Tightening torque:
0.5 to 0.6 Nm (4.4 to 5.3 lb-in)

Display: 9-pin SUB-D (female)

Service port: 9-pin SUB-D (male)

Protection: Terminals: IP20
Display front: IP40 (IP54 with gasket)

(UL/cUL Listed: Type Complete Device, Open Type)

According to IEC 529 and EN 60529

Material: All plastic parts are self-extinguishing to UL 94 (V1)

Approval: The MDR-2 is approved by the major classification societies. Contact DEIF for details

UL and cUL

UL markings: Wiring:
Use 60/75 °C copper conductors only

Mounting:
For use on a flat surface of type 1 enclosure

Installation:
To be installed in accordance with the NEC (US) or the CEC (Canada)

Mounting and dimensions

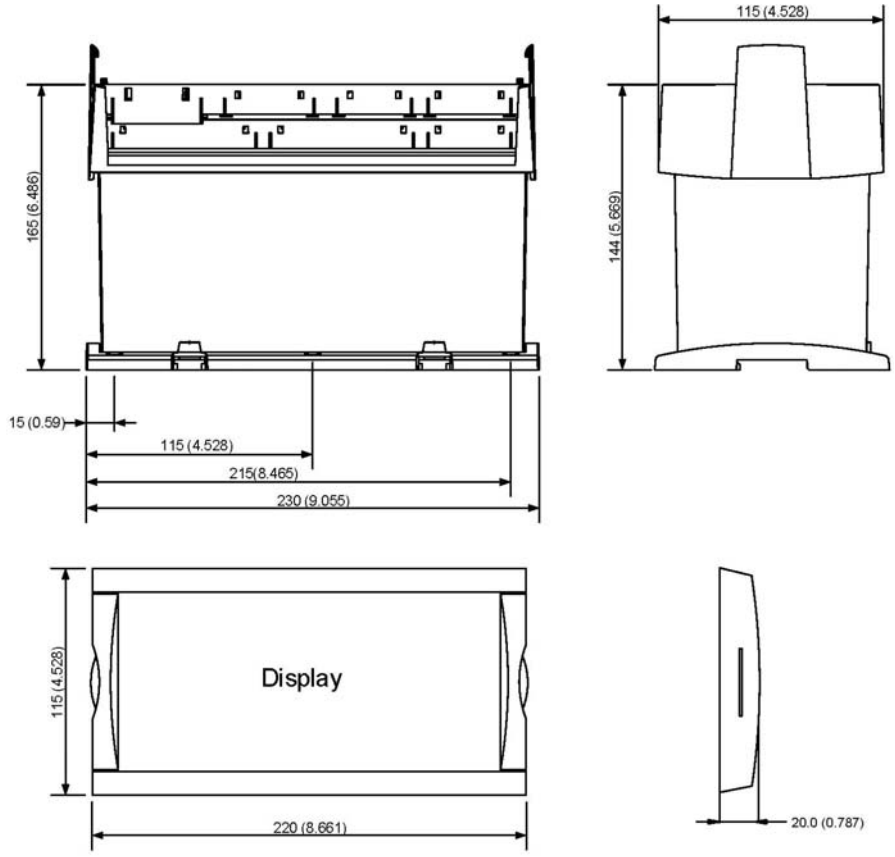
Mounting of the unit
The unit is designed for mounting inside the panel. The display can be installed on the panel door and connected to the main unit with a display cable.

The unit is primarily used in marine applications and must be mounted with screws to the rear side of the cabinet. Six screw holes are available for this mounting method.

DEIF recommends using the screw hole fastening.

Do not use chemicals or oils (cutting oil, lubricating oil/grease) on or near the surfaces of the controller housing or display panel. These may cause serious damage to the plastic parts and render the warranty void.

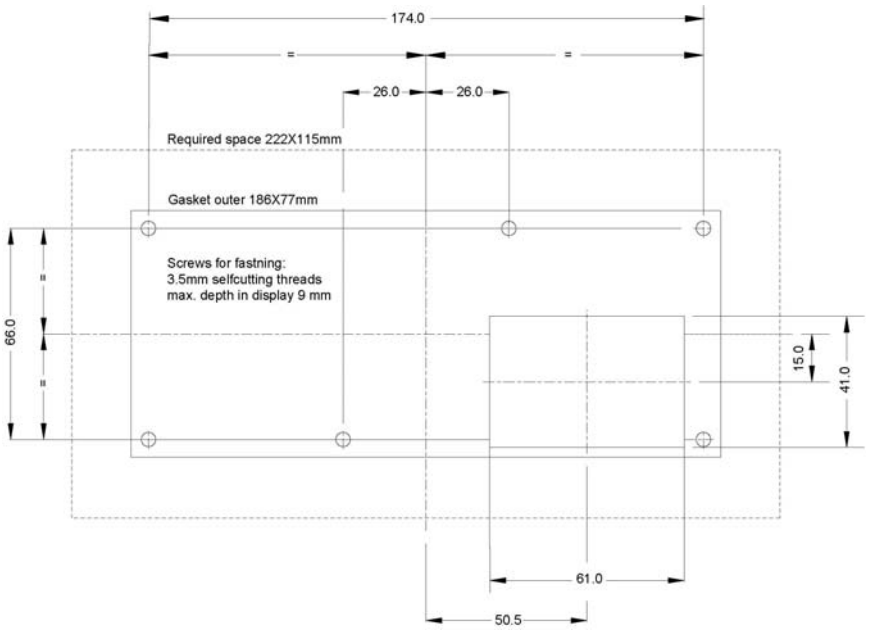
Unit dimensions



Dimensions are given in mm (inches).

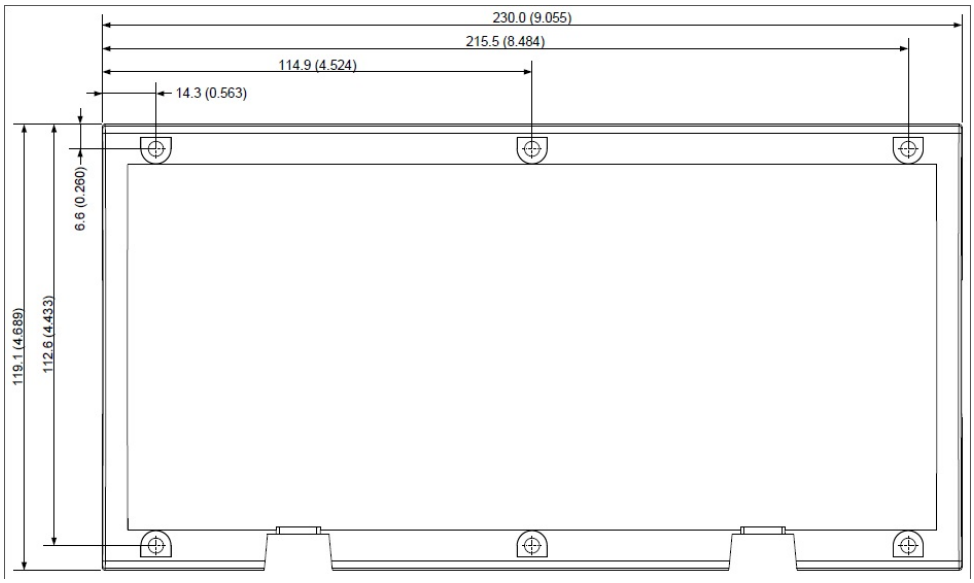
Panel cutout

In order to ensure optimum mounting, the panel door must be cut out according to the panel cutout illustration.



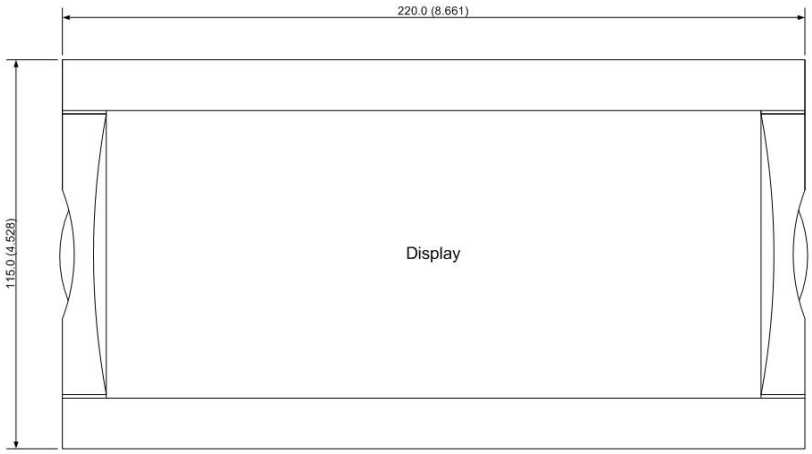
Dimensions are given in mm.

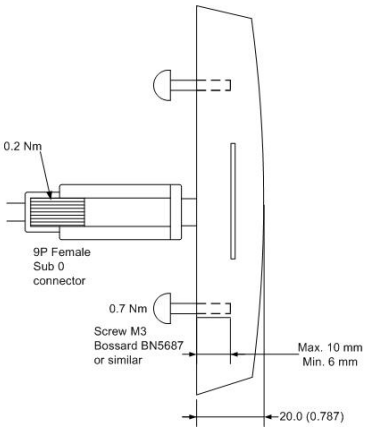
Drilling template in mm (inches)



Tightening torques

Controller unit:	1.5 Nm for the six M4 screws (countersunk screws are not to be used)
Unit panel door mounting:	0.3 Nm, 2.7 lb-in (see diagram in "Unit dimensions")
Plug connections (terminals):	0.5 Nm, 4.4 lb-in
Display (see diagram below)	
Panel door mounting:	0.7 Nm, 6.2 lb-in
Sub-D screw:	0.2 Nm, 1.8 lb-in





Order specifications

Variants

Mandatory information			**Additional options to the standard variant**					
Item no.	**Type**	**Variant no.**	**Option**	**Option**	**Option**	**Option**	**Option**	**Option**

Example:

Mandatory information			**Additional options to the standard variant**					
Item no.	**Type**	**Variant no.**	**Option**	**Option**	**Option**	**Option**	**Option**	**Option**
2912500020-01	MDR-2	01	C4					

Accessories

Mandatory information		
Item no.	**Type**	**Accessory**

Example:

Mandatory information		
Item no.	**Type**	**Accessory**
1022040076	Accessories for MDR-2	Display cable, 3 m (J1)

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

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