DATASHEET 2.5

ELECTRONIC DECOUPLING DEVICE

ELECTRONIC DECOUPLING DEVICE - EDD

An Electronic Decoupling Device (EDD) has been designed as a polarisation cell replacement (PCR). The EDD is a solid state device used in the cathodic protection industry which prevents the flow of Direct Current (DC) volts across the terminals between +2/- 2V (symmetrical) or +1/-3V (asymmetrical) DC, while simultaneously providing a grounding (coupling) path for steady state alternating current (AC), should AC be present. The device can be configured for symmetrical or asymmetrical by moving a linking bar (factory set to asymmetrical). The product has the added features of being rated to carry lightning and AC fault currents.

It has been designed to be an ideal replacement for electrochemical polarisation cells as the solid state design eliminates the need for maintenance with potentially hazardous chemicals.

Common Applications

- DC Isolation of Cathodically Protected structures from power utility grounding systems.
- Blocking Stray DC Voltages.
- Over Voltage protection of equipment form AC faults, lightning and switching transients.
- Over voltage protection of insulating joints.
- Mitigation of AC induced voltages on structures.
- AC Fault Current Rating
- There are four different current sizes available at 50Hz and 60Hz with the following replacements.

BAC® CORROSION CONTROL

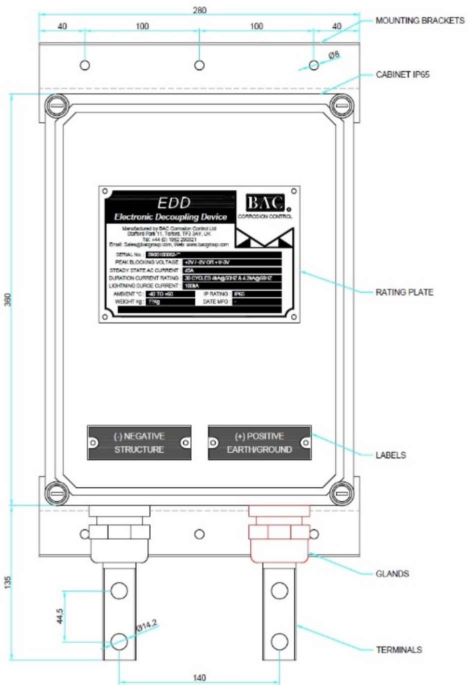
BAC Corrosion Control Ltd
Stafford Park 11 • Telford • TF3 3AY
United Kingdom

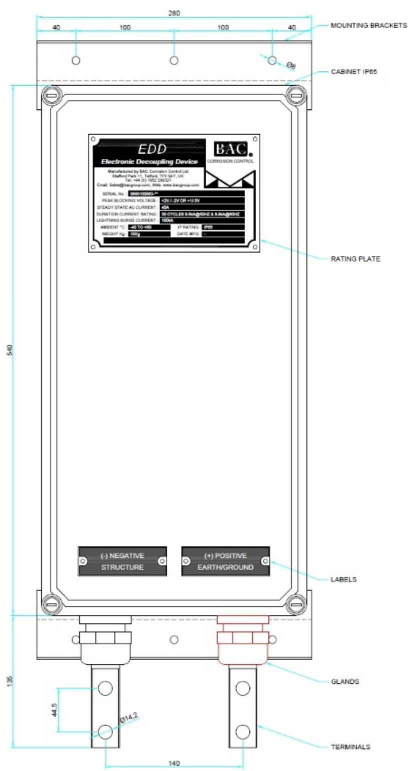
T: +44 (0) 1952 290 321
E: sales@bacgroup.com
W: www.bacgroup.com

ELECTRONIC DECOUPLING DEVICE - EDD

DATASHEET 2.5

ELECTRONIC DECOUPLING DEVICE





AC Fault Current Rating

The Maximum Surge Rating for 50Hz are as follows:

	AC Fault Current kA						
	Cycles at 50Hz						
	1	3	5	10	30	50	100
Type 1	4.4	3.2	2.8	2.32	1.6	1.52	1.2
Type 2	8.64	7.2	5.6	4.64	3.4	2.96	2.4
Type 3	15.6	13.6	10.4	8.4	5.6	5.2	4.4
Type 4	22.6	18.4	15.2	12.8	10.5	7.6	6.4
Type 5	42.4	36	28	22.4	16	13.6	12
Type 6	57.6	48	38.4	32	26	20	8.8

Standard rating at 30 cycles.

The Maximum Surge Rating for 60Hz are as follows:

	AC Fault Current kA						
	Cycles at 60Hz						
	1	3	5	10	30	50	100
Type 1	3.84	3.44	3.04	2.48	1.7	1.6	1.28
Type 2	9.6	7.92	6.16	5.12	3.7	3.28	2.64
Type 3	16.8	14.6	11.2	9.04	6	5.6	4.72
Type 4	24	19.5	16.1	13.6	11	8.08	6.88
Type 5	49.2	41.8	32.8	26	19	15.8	13.9
Type 6	64	53.4	42.6	35.5	29	22.2	9.76

Standard rating at 30 cycles.

Steady State AC Ratings

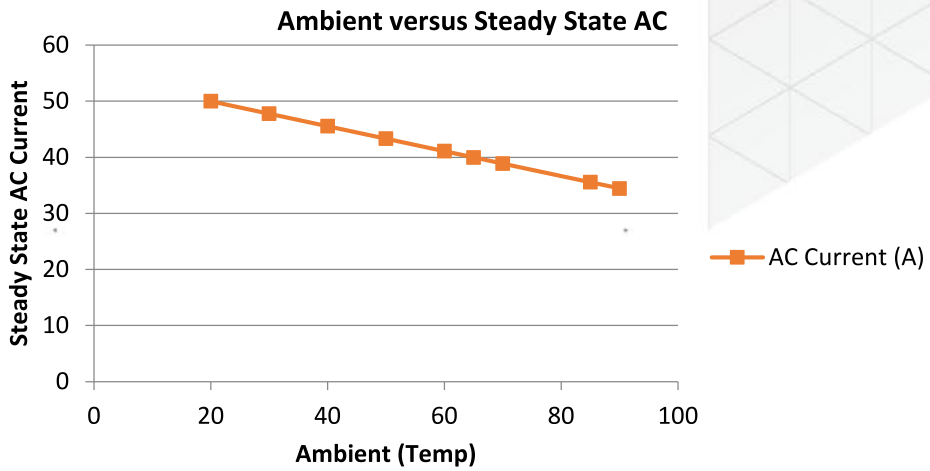
EDD's are used in a number of applications which require the device to block DC while carrying steady state AC. For example, when a pipeline runs in the same corridor as power lines, steady state AC voltage is often induced onto the pipeline. The unit provides a low impedance path to ground, while simultaneously preventing the flow of DC.The EDD is rated for steady state AC as follows:

Ambient Temperature	Rating
20°C	50A
50°C	45A
65°C	40A

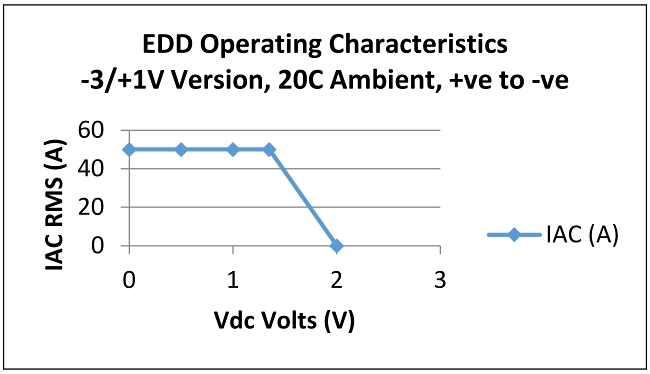
BAC® CORROSION CONTROL

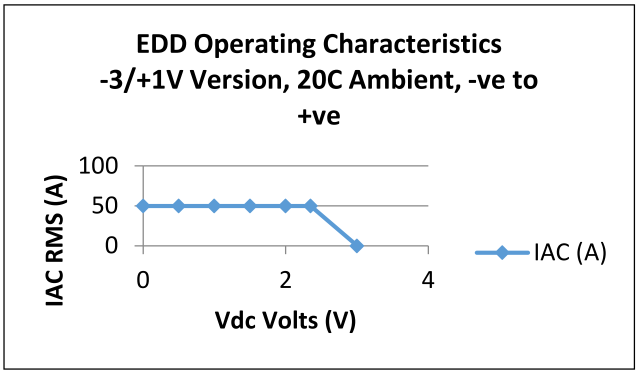
MEMBER OF MIDROC EUROPE

ELECTRONIC DECOUPLING DEVICE - EDD



As the DC voltages rise towards +1 / -3V the allowable steady state current rating reduces due to DC leakage see table below:





DC Blocking Voltage
The EDD DC blocking voltage can be configured to:

+2/- 2V (symmetrical) DC
+1/-3V (asymmetrical) DC,

The device can be configured for symmetrical or asymmetrical by moving a linking bar (factory set to asymmetrical).

The reason there are two types can be most easily explained by looking at the example of an insulating joint. The EDD is fitted across the joint to provide over voltage protection to the insulation joint. If both sides of the pipeline are protected by their own cathodic protection system, then the voltage across the joint should be near to zero, therefore it is desirable to select a symmetrical +/-2V EDD. In the event of either system being switched off the EDD will block voltages of 2V in either direction. If only one side of the insulating joint is cathodically protected, and the other side is grounded, then an asymmetrical version which blocks -3V to +1V should be specified since the DC flow need only be blocked in one polarity.

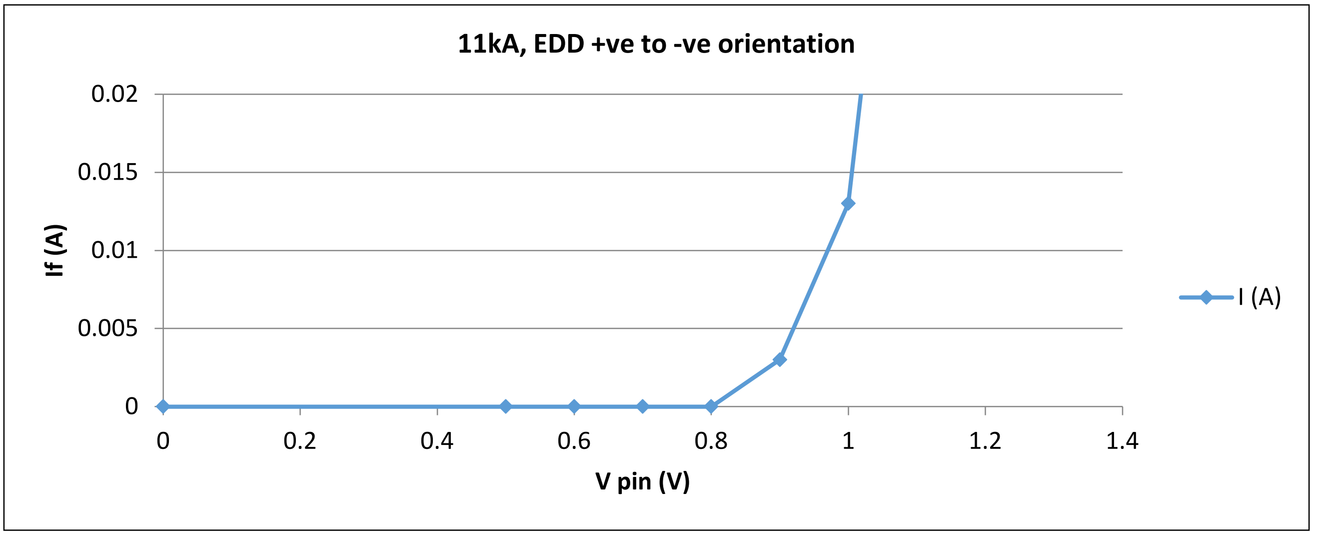
BAC®
CORROSION CONTROL
MEMBER OF MIDROC EUROPE

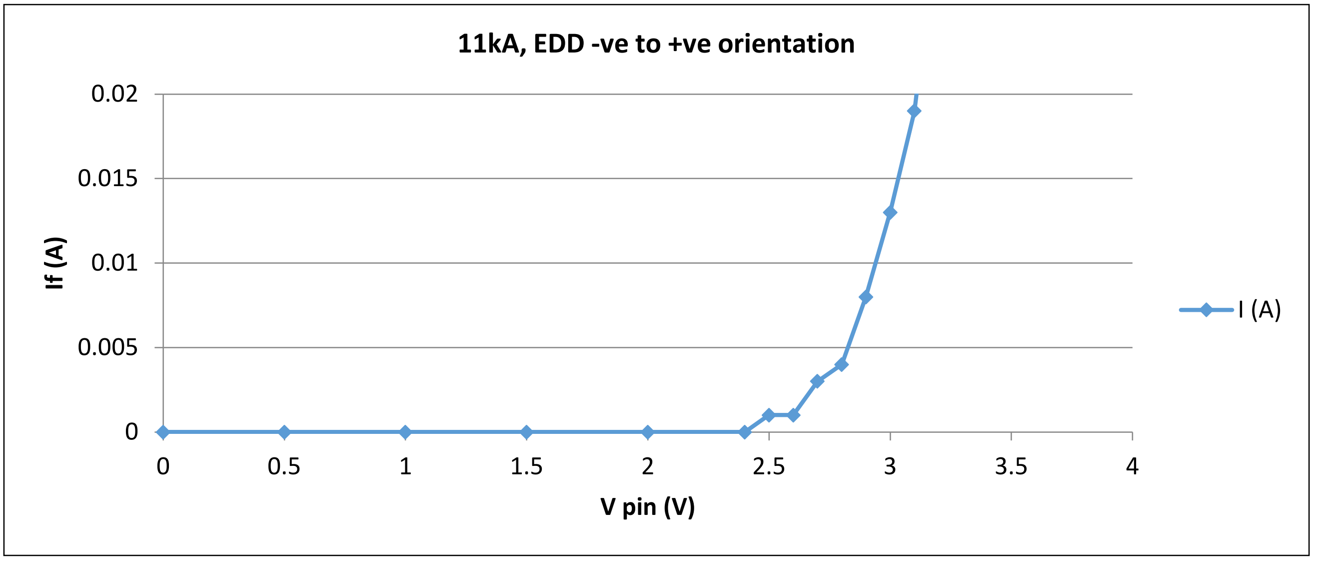
ELECTRONIC DECOUPLING DEVICE - EDD

The below charts show blocking voltage versus leakage current:

As can be seen the current flow remains low (<13mA) up to 1V (+ve to –ve) and 3V (-ve to +ve).

At higher DC voltages, the current flow starts to rapidly increase.



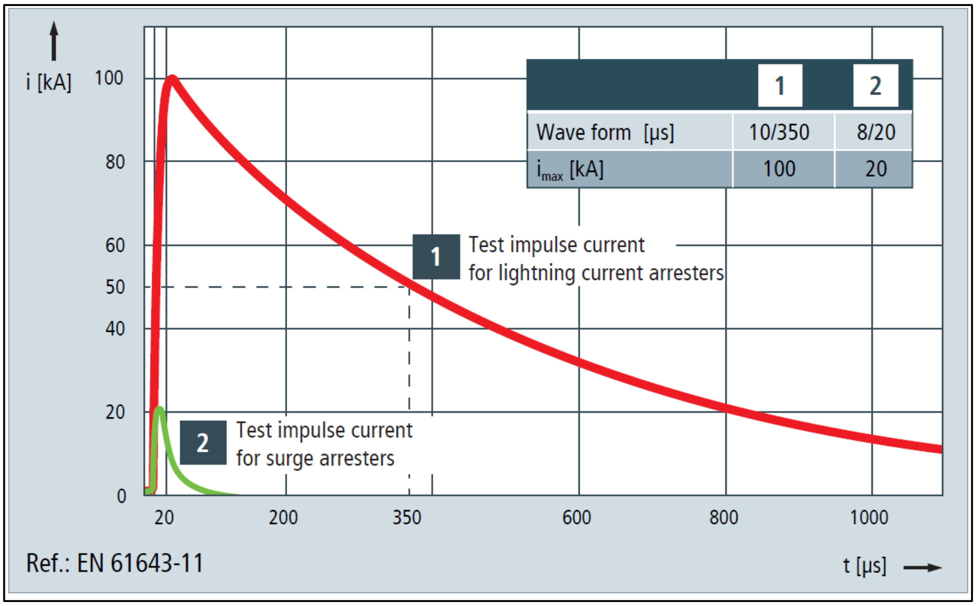


ELECTRONIC DECOUPLING DEVICE - EDD

Lightning Surge Rating

Lightning strikes are modelled by either a 'direct strike' 100kA 10/350us model or an 'induced surge' model of 20kA 8/20us, see table below, We have based our calculations on the peak current of 20kA and 100kA as the key parameters.
The unit is rated to withstand the following lightning pulse and maintain a low clamping voltage:

- 20kA at 8/20us
- 100kA at 10/350us



The diode and busbar assembly is designed to handle the above lightning strikes. In areas with high lightning activity we recommend fitting an **optional spark gap** co-ordinated to clamp and divert lightning strikes to ground without passing through the diodes and resistive busbar assembly thus reducing wear and increasing the life of the EDD.

Ideally the EDD terminals should be connected directly to the structure/s and ground were this is not possible the connecting cables used are required to be as short as possible to reduce the effect of inductive voltage drop on the clamping voltage of the EDD during lightning strikes (or any other quick di/dt events).
When cables are used we recommend the maximum length of 150mm.

Without knowing the exact cable characteristics it's not possible to say the exact effect the cable length will have, but using an 'industry standard' rule of thumb the following table has been created (Voltage drop is 'per cable' – two are required to connect to the EDD),

Cable Length mm	Inductive Voltage Drop (V) 100kA 10/350us Model	Inductive Voltage Drop (V) 20kA 8/20us Model
300	1970	492
500	3280	820
1000	6560	1640

ELECTRONIC DECOUPLING DEVICE - EDD

The values are derived by using the rule of thumb of an inductance of 0.2uH/ft for connecting leads. This inductance is then used in the following formula to calculate voltage drop,

Vcabledrop = Lbusbar * di/dt

For example, for the 300mm cable length, 300mm = 0.98ft, therefore inductance = 0.197uH. For a 10/350us lightning strike,

Vcabledrop = 0.197u * 100000/10e-6
=1970V

For installations with high lightning activity we recommend addition of optional lightning surge diverter which will ensure lightning strikes are grounded without passing through the diodes and will increases life of the EDD.

Polarity
The EDD has 2 tin plated brass terminals (14.2mmØ holes) fitted through M40 cable glands.
- (-) Negative Structure *(Black Gland)*
  Connect to the structure with CP or more negative structure.
- (+) Positive Earth/Ground *(Red Gland)*
  Connect to the ground or more positive structure.

Connections should be kept as short as feasibly possible.

Solid State Design
The unit uses a proven solid state design, which will instantaneously clamp voltages above the specified blocking levels. There are no user serviceable parts inside the unit, and any attempt to open the unit will invalidate any warranty.

Fail Safe Design
If the unit is subjected to AC fault currents or lightning surge currents in excess of the rating of the unit, failure will cause the unit to fail short circuit. Once shorted the unit can carry greater than the rated fault current and still provide an effective ground path.

Enclosure
The enclosure is manufactured fibreglass reinforced polyester with stainless steel mounting brackets and tin plated terminals.
IP rating IP65
IK rating IK09

Operating Temperature
-40°C to +60°C