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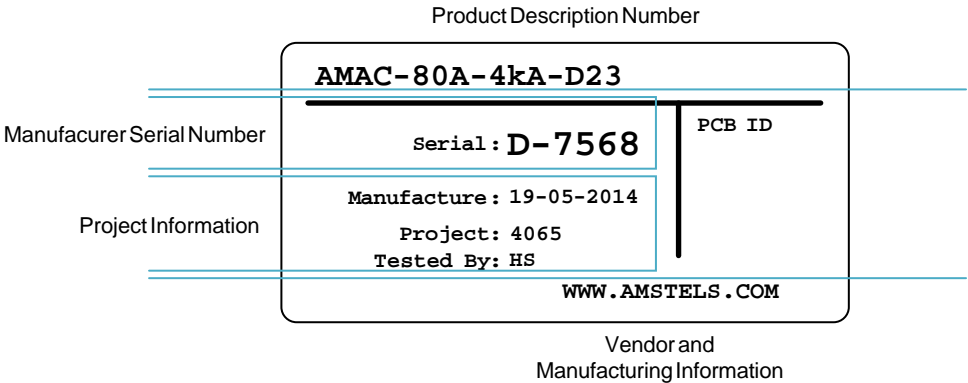
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# 1 Installation

## 1.1 Rating Plate

### 1.1.1 Rating Plate explanation

Example of a rating plate:



The following information is found on the rating plate:

- Product Description Number

AMAC-xxA-4kA-CDxx

  - Diode configuration
  - Surge Current
  - AC Current
  - Device
- Manufacturer Serial Number

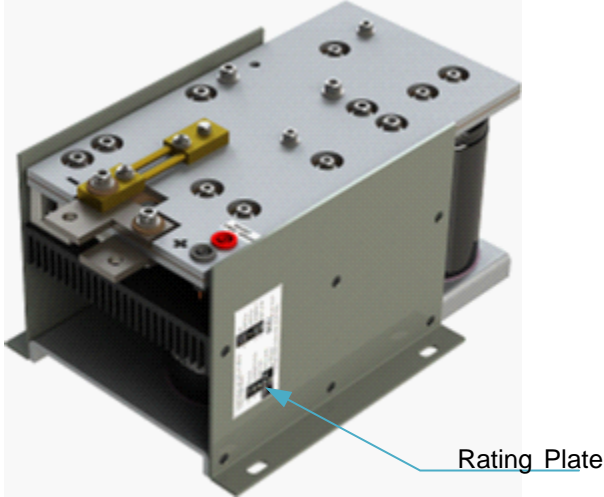
The manufacturer serial number is needed for support on Amstel hardware and Firmware
- Project information

The Project Number and Test Date are shown here
- Vendor and Manufacturing information

Contact information is shown here

**1.1.2 Location of Rating Plate**

The rating plate of the Amstel rectifier is located at the right side panel of the Amstel rectifier.



**1.2 Electrical Specifications**

Parameter	Limits		Unit	Remarks
	MIN	MAX		
Nominal current		40	A	
Surge current		4	kA	100mS
Voltage		50	Vac	50Hz - 60Hz
Shunt	0	60	mV	100A / 60mV

**1.3 Environment Specifications**

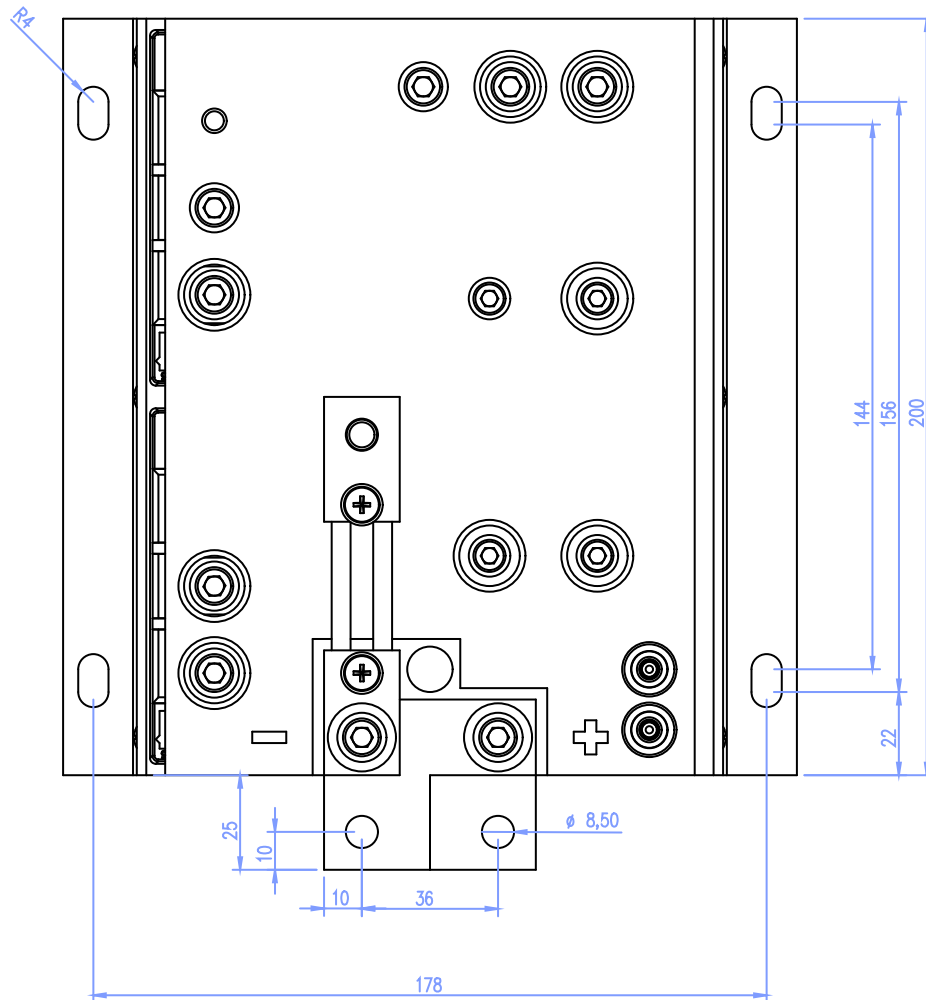
Parameter	Limits		Unit	Remarks
	MIN	MAX		
Humidity	5	85	%	
Temperature	-10	35	°C	
Height	-	999	m	

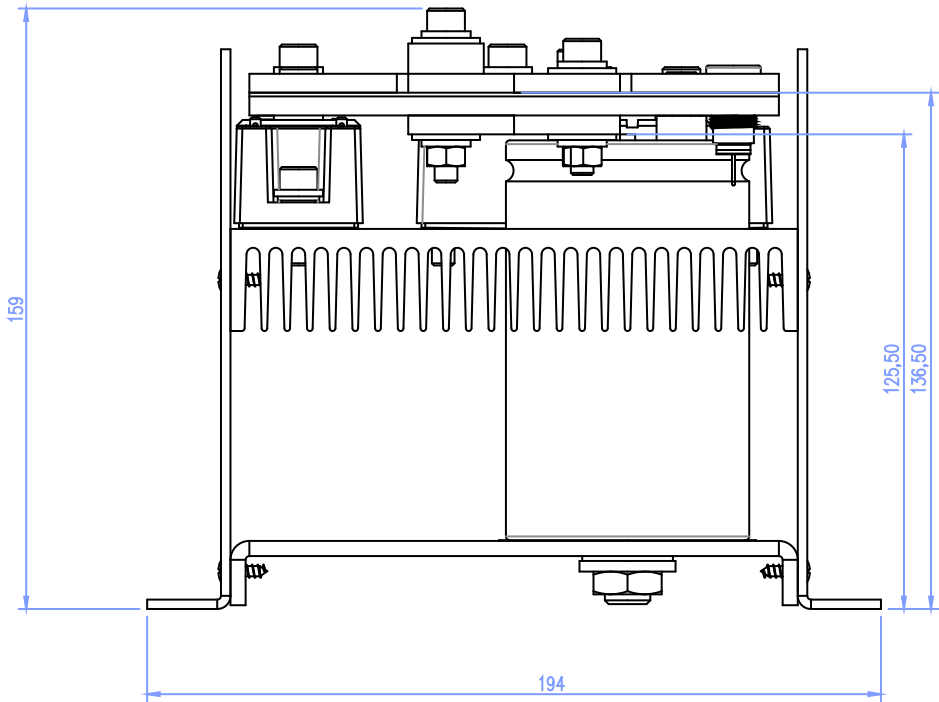
**1.4 Mechanical Specifications**

Parameter	Limits		Unit	Remarks
	MIN	MAX		
Height		225	mm	Connectors included, Excluding Cable parts
Width		195	mm	Mounting flange included
Depth		160	mm	
weight		T.B.D.	kg	
Mounting hole		14x8	mm	M6 bolts

For more detailed dimensions, see [mechanical drawing](#).

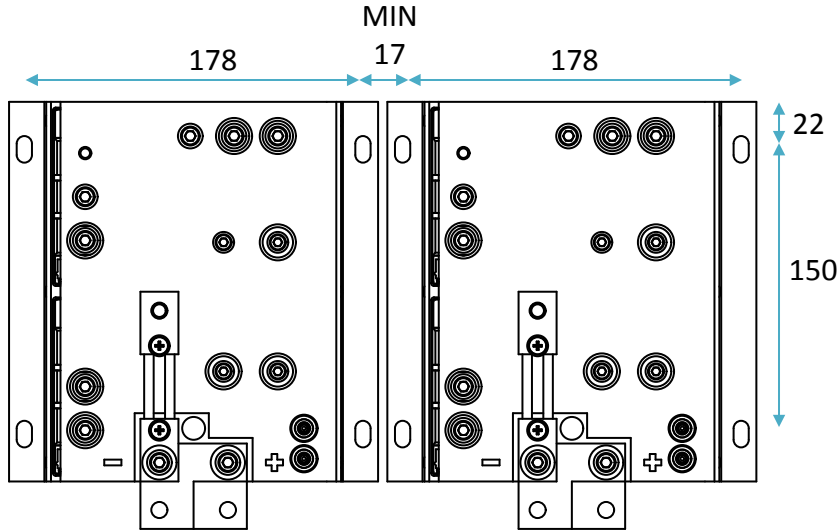
### 1.4.1 Mechanical Drawing





**1.5 Mounting**

Use 4x M6 screws to mount the AMAC in vertical position on a firm and vibration free base. Mounting hole pattern:



All dimensions are in mm. For more detailed dimensions, see [mechanical drawing](#).

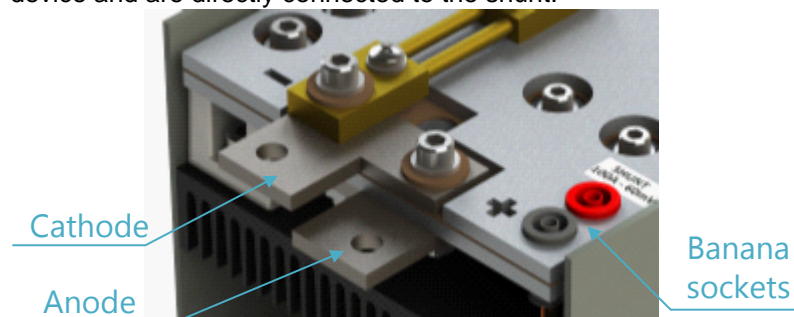
### 1.5.1 Cooling

In order to ensure that the AMAC is sufficiently cooled neither air intake nor discharge must be impeded. Also make sure exhaust air doesn't build up in the area surrounding the AMAC as an insufficient air supply may lead to failures or even destruction of the AMAC. See [Environment Specifications](#) for humidity and air temperature.

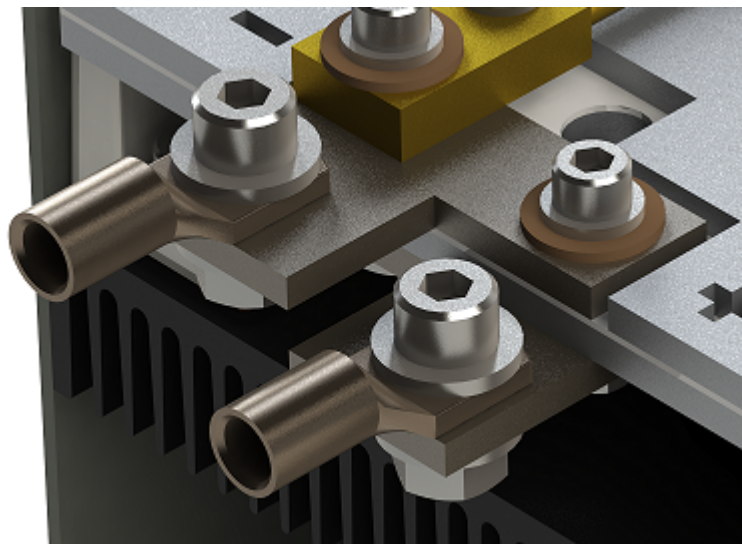
## 1.6 Connecting

### 1.6.1 Connectors

The connectors of the AMAC are located at the bottom of the front side of the device. The 4mm banana sockets can be used to measure instantaneous current flowing through the device and are directly connected to the shunt.



### 1.6.2 Power Connection



Connect the AMAC Anode and Cathode with M8 Cable Lugs with 16..35mm<sup>2</sup> cables. Make sure contacts are corrosion free before connecting.



## 1.7 Comissioning and Periodical Checks

### 1.7.1 Comissioning

- Check if the device is clean.
- Check the screwed and bolted connections and tighten them, if necessary.
- Compare the wires with the wire diagram.
- Check voltages.
- Check the polarity.
- Make sure not to leave tools or something behind in the cabinet.

### 1.7.2 Periodical Checks

- Check the Anode and Cathode connections. Bad connections can cause damage or fire.
- Check for dust in the air inlet, clean if necessary.
- Check for corrosion.
- Measure if no dc is present on the banana sockets.

### 1.7.3 AMAC Test

The AMAC can be tested with the AMAC Tester, shown in the pictures below.



Error Blinks (Red LED)	Error:	Explanations:
2x	initialization fail.	May occur if AMAC is broken.
3x	Capacitance out of range.	AMAC needs to be replaced.
4x	Open Leads.	Recheck your connections.
5x	Low Battery.	Replace battery of AMAC Tester.

Diode Blinks (Green LED)	Module type:
2x	Either -CD23 or -CD24 module
3x	-CD23 Module
4x	-CD24 Module

1. Before the AMAC Tester is connected, disconnect the AMAC anode and cathode cables.
2. Make sure the AMAC Tester switch is in 'OFF' position.

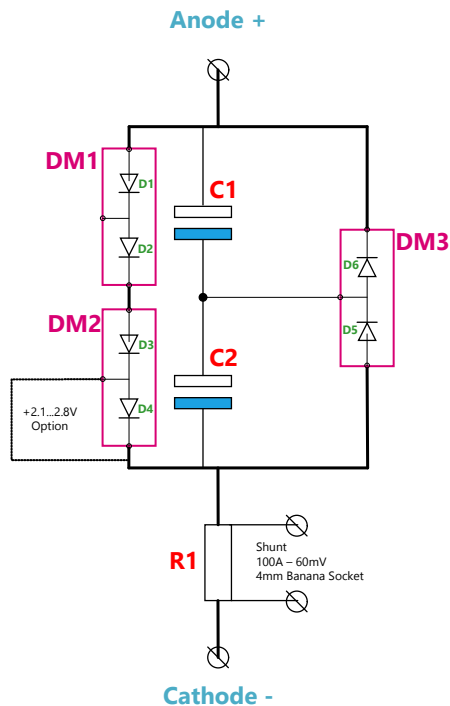
3. Connect the AMAC Tester on the anode and cathode connections of the AMAC.
4. Flip the switch in the 40A position, the Red LED will start blinking; The Tester is initializing the AMAC for testing.
5. The Green LED will start blinking, the capacitors are tested.
6. The Green and Red LED toggle, the diodes are tested.
7. Wait until the Green LED blinks the number of detected diodes.
8. Flip the switch in the OFF position again, and wait a couple of seconds before disconnecting the AMAC Tester.
9. Reconnect the AMAC Tester, switch poles, to check the antiparallel diodes.

If the number of Green blinks at the end of the test cycle corresponds the number of diodes placed in series in the AMAC, the AMAC is good. Reconnect anode and cathode connection.

If Fail, rerun the test, to double check. If fail, replace the AMAC unit with a spare one.

## 2 Application

### 2.1 Application Diagram



### 2.2 Application Note

The AMAC shorts AC current flowing through the structure, without creating a DC offset.

The compact design allows the AMAC to be swapped quick and easily. On site repairs can be done, but we recommend to swap the damaged AMAC and have it repaired by an expert.

Cooling is done so, that when the capacitors fail the diodes are able to take the full AC current. The temperature of the housing will rise in that case, which indicates the capacitors need to be replaced.

### 3 Operation

#### 3.1 Readings



Banana sockets

$(100A / 60mV) * \text{Measured Voltage [mVac]} = \text{Instantaneous Current.}$

Measured Voltage [mVac]	Current [A]
0	0
5	8,3
10	16,6
15	25,0
20	33,3
25	41,6
30	50,0
35	58,3
40	66,6
45	75,0
50	83,3
55	91,6
60	100,0

The Measured voltage in mVdc should measure 0mV.

## 4 Failure Mode and Effect Analyses (FMEA)

- **DM1:** A module with two diodes (D1 and D2) connected in series. When one of the diodes fails, or both diodes fail they can become a short circuit, or an open circuit.  
 In case of an open circuit in DM1, the potential of the structure the AMAC is connected to is not secured anymore.  
 In case of a short circuit in DM1, the potential of the structure the AMAC is connected to is lowered by 1 or 2 (depending on the amount of shorted diodes) forward voltage drops.
- **DM2:** A module with two diodes (D3 and D4) connected in series. If the -CD23 option is chosen, only one diode (D3) is used. If this diode fails it can become a short circuit, or an open circuit.  
 In case of an open circuit in DM2, the potential of the structure the AMAC is connected to is not secured anymore.  
 In case of a short circuit in DM2, the potential of the structure the AMAC is connected to is lowered by 1 forward voltage drop.  
 If the -CD24 option is chosen, two diodes (D3 and D4) are used in series. When one of the diodes fails, or both diodes fail they can become a short circuit, or an open circuit.  
 In case of an open circuit in DM2, the potential of the structure the AMAC is connected to is not secured anymore.  
 In case of a short circuit in DM2, the potential of the structure the AMAC is connected to is lowered by 1 or 2 (depending on the amount of shorted diodes) forward voltage drops.
- **DM3:** A module with two diodes (D5 and D6) connected in series. When one of the diodes fails, or both diodes fail they can become a short circuit, or an open circuit.  
 If one or both of the diodes fail and become an open circuit, the Capacitors C1 and C2 are not protected against negative voltage across the capacitor, which will damage the capacitors permanently.
- **The Capacitors** C1 and C2 connected in series, protected by diodes (D1,D2,D3,D5,D6 and optional D4). If one of the capacitors fail, the diodes connected will take over the current.  
 Temperature of the cabinet will rise.

If one of the above described failures occur, it is recommended to swap the AMAC with a fully functional device, and have the original one repaired by an expert.

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