

Thermal test - winter conditions

SixCase SC1330P (polar)

Aivia 210

Rotaid Solid plus heat

SmartCase SC1230

Prepared by:

G.P. Wit

Report Number: GTM-SC-RP-23-08-2018

Table of contents

1	Summary.....	3
2	Test setup	5
2.1	Thermal Test Instrumentation.....	7
3	Cabinet design for winter conditions.....	8
4	Test results	9
4.1	Temperature Graphs	9
4.2	Video and Summer testing	13
5	Conclusions Winter simulation Test.....	14

1 Summary

Manufacturers of AED's specify a thermal range from 0°C to +50°C for the device and pads for storage. This report publishes the results of a test performed on 4 types of outdoor cabinets under winter conditions:

- SixCase SC1330P (polar version)
- Aivia 210
- Rotaid Solid plus heat
- SmartCase 1230

The test has been performed under identical conditions for all 4 cabinets:

- Same Date and timeframe: 22-08-2018, 23 hours
- Same Calibrated temperature controlled room: Topa institute, Voorhout
- Same AED inside the cabinet: Zoll AED plus (without bag)
- Same temperature profile
- Same mounting structure

The applied temperature (simulated outside temperature) profile is: -15°C (10 hours), -20°C (7 hours), -25°C (6 hours)

The temperature results are presented in graphic form.

Test results and conclusions:

SixCase SC1330P (polar version):

Product manufacturing specification:

AED temperature remains >0°C until -25°C outside temperature

Test result summary:

- At -15°C: minimum AED temperature is 9.8°C
- At -20°C (product specification): minimum AED temperature is 9.8°C
- At -25°C: minimum AED temperature is 5.9°C

Conclusions:

- SixCase fulfils its product specification
- SixCase performs very good under winter conditions (++)

Aivia 210:

Product manufacturing specification:

AED temperature remains >0°C until -20°C outside temperature

Test result summary:

- At -15°C: minimum AED temperature is -2.2°C
- At -20°C (product specification): minimum AED temperature is -7.2°C
- At -25°C: minimum AED temperature is -12.0°C

Conclusions:

- Aivia does not fulfil its product specification
- Aivia performs poor under winter conditions (-)

Rotaid Solid plus heat:

Product manufacturing specification:

AED temperature remains >5°C until -20°C outside temperature

Test result summary:

- At -15°C: minimum AED temperature is -8.0°C
- At -20°C (product specification): minimum AED temperature is -12.3°C
- At -25°C: minimum AED temperature is -16.2°C

Conclusions:

- Rotaid does not fulfil its product specification by far. It is even doubtful if the AED is protected against frost at -10°C outside temperature
- Rotaid performs very poor under winter conditions (--)

SmartCase SC1230:

Product manufacturing specification:

AED temperature remains >0°C until -20°C outside temperature

Test result summary:

- At -15°C: minimum AED temperature is 3.4°C
- At -20°C (product specification): minimum AED temperature is 2.0°C
- At -25°C: minimum AED temperature is 1.3°C

Conclusions:

- SmartCase fulfills product specification
- SmartCase performs very good under winter conditions (++)

A full video of the test, test set-up and results can be viewed on youtube:

<https://youtu.be/ub86MdVxt1k>

2 Test setup

For the test A ZOLL AED plus (without bag) is placed inside the cabinets, See Figure 2-1 for the ZOLL AED.



Figure 2-1: Zoll AED plus (without bag)

Temperature probes are placed on the following locations:

1. In the front compartment of the pads, in front of the pads (see Figure 2-2)
2. At the top of the AED (see Figure 2-3)
3. At the back of the AED (see Figure 2-4)
4. At the bottom of the AED (see figure 2-4)

The cabinets are all mounted to a 12mm wooden board. Mounting has been done according to the manufacturers mounting instructions (see figure 2-5).



Figure 2-2: Temperature probe 1: in front of the AED pads



Figure 2-3: Temperature probe 2: top of the AED



Figure 2-4: Temperature probe 3 and 4: At the back and bottom of the AED



Figure 2-5: Mounting of Cabinets

2.1 Thermal Test Instrumentation

During the test, the temperature is monitored using a Pace Scientific XR5-SE data logger and PT907 temperature probes. The data logged by the XR5-SE is transferred to a computer using LogXR software provided by Pace Scientific.

The XR5-SE data logger is presented in Figure 2- whereas a PT907 temperature probe is presented in Figure 2-.



Figure 2-6: Pace scientific XR5-SE data logger



Figure 2-7: Pace scientific PT907 temperature probe

3 Cabinet design for winter conditions

Aivia 210:

All outdoor cabinets of the Aivia brand are equipped with a thermal heating pad that is bonded to the back and lower part of the cabinet.

SixCase SC1330P (polar version):

All polar versions of the outdoor cabinets of the SixCase serie are equipped with 2 electrical heating elements: one is bonded to the bottom plate and the second one to the back plate of the AED container. In addition, the polar versions are fully insulated to keep the warmth inside the cabinet.

Rotaid Solid plus heat:

The Rotaid cabinet is equipped with an electrical heating element that is located at the back side of the cabinet.

SmartCase SC1230:

All outdoor cabinets of the SmartCase serie are equipped with an electrical heating element which is bonded to the metal AED container. In addition, the SmartCases are fully insulated to keep the warmth inside the cabinet.

4 Test results

4.1 Temperature Graphs

Figure 4-1 shows the temperature test results for the Aivia 210 between 9:00 (21-08-2018) and 7:00 the next morning. The grey line shows the ambient temperature of the climate chamber. The (2) small peaks in the ambient temperature are due to automatic de-icing of the airconditioning unit.

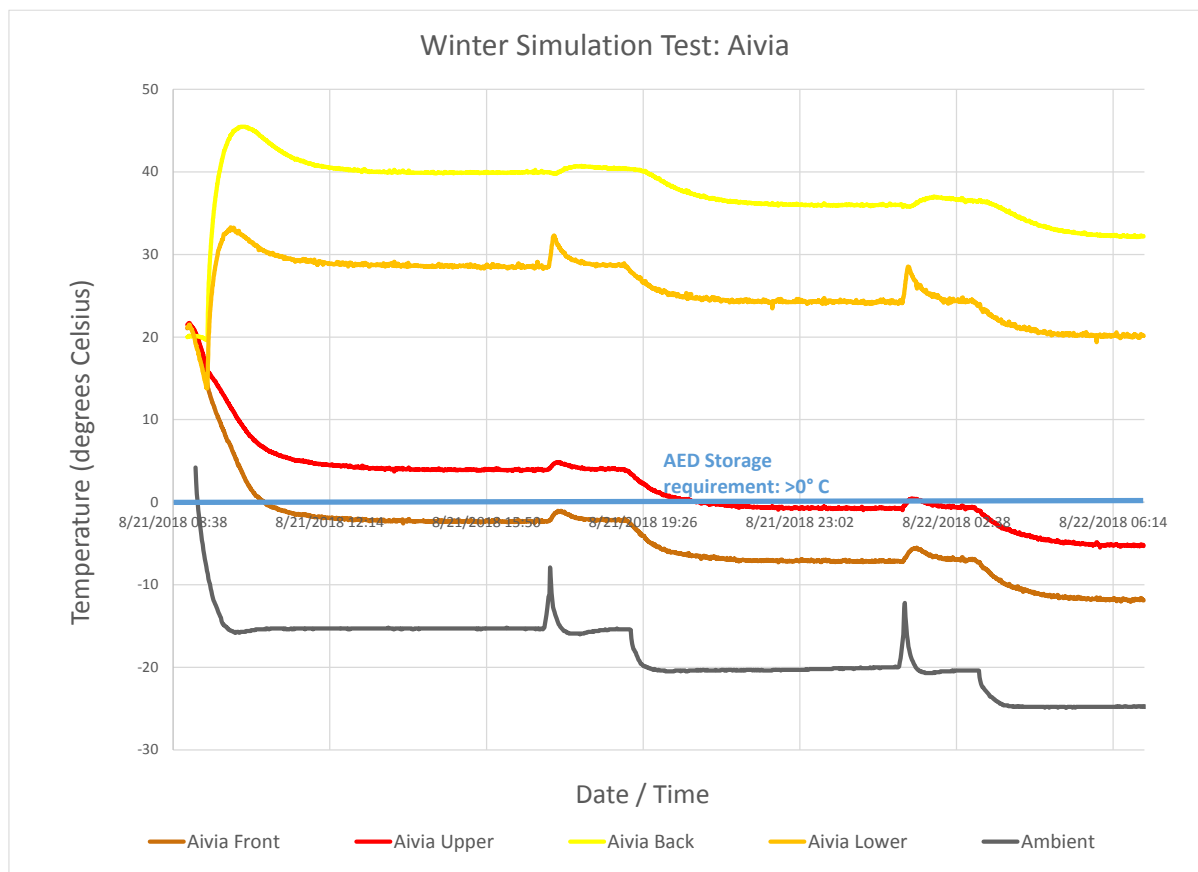


Figure 4-1: Temperature test results AIVIA.

Minimum temperature summary:

Probe nr	location	Minimum temperature (°C)		
		Ambient temperature (°C)		
		-15	-20	-25
1	In front of pads	-2.2	-7.2	-12.0
2	Upper side of AED	3.6	-0.8	-5.3
3	Back of AED	40.3	36.0	32.2
4	Bottom of AED	28.1	24.2	20.2

Figure 4-1 shows the temperature test results for the SixCase SC1330P (polar) between 9:00 (21-08-2018) and 7:00 the next morning. The grey line shows the ambient temperature of the climate chamber. The (2) small peaks in the ambient temperature are due to automatic de-icing of the airconditioning unit.

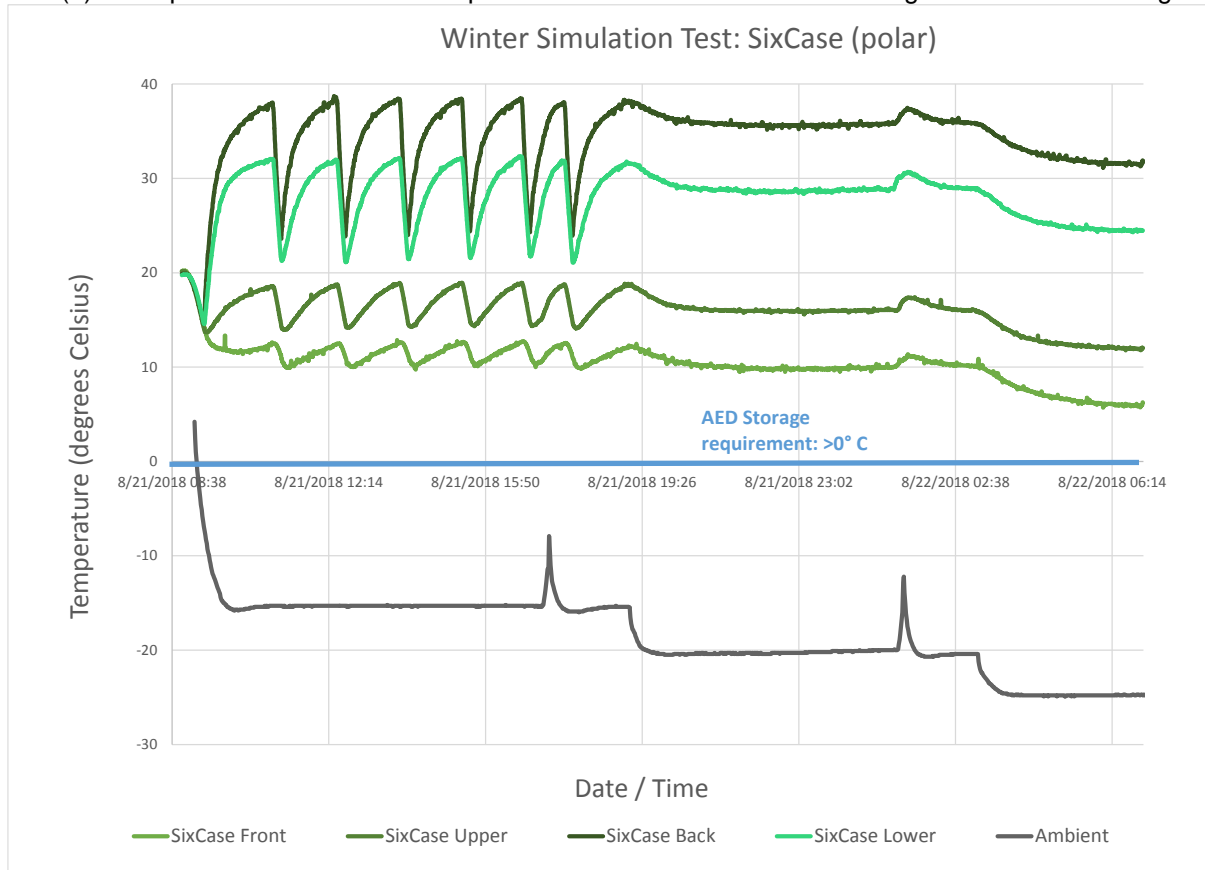


Figure 4-2: Temperature test results SixCase.

Maximum temperature summary:

Probe nr	location	Minimum temperature (°C)		
		Ambient temperature (°C)		
		-15	-20	-25
1	In front of pads	9.8	9.8	5.9
2	Upper side of AED	14.1	15.9	11.9
3	Back of AED	23.9	35.6	31.5
4	Bottom of AED	21.1	28.7	24.5

Figure 4-13 shows the temperature test results for the Rotaid Solid plus heat between 9:00 (21-08-2018) and 7:00 the next morning. The grey line shows the ambient temperature of the climate chamber. The (2) small peaks in the ambient temperature are due to automatic de-icing of the airconditioning unit.

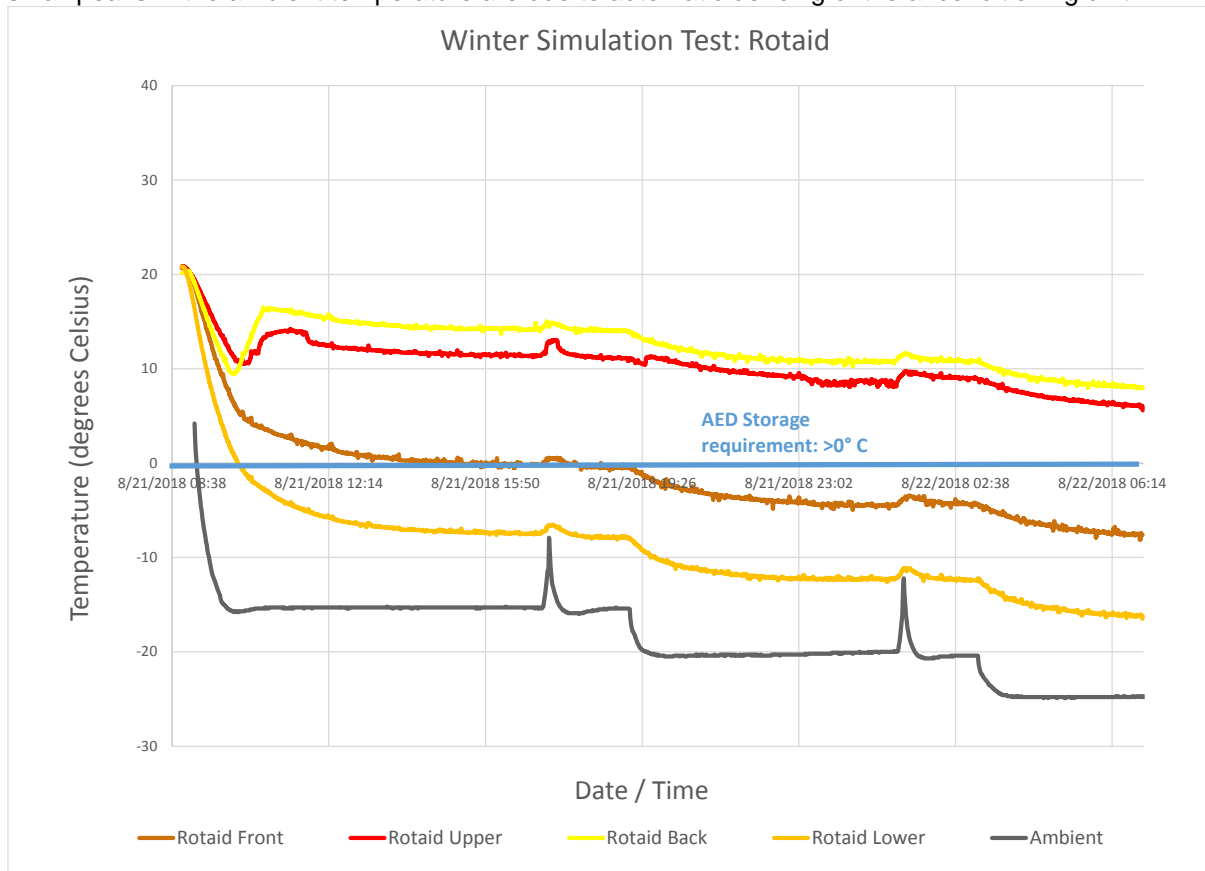


Figure 4-3: Temperature test results Rotaid.

Maximum temperature summary:

Probe nr	location	Minimum temperature (°C)		
		Ambient temperature (°C)		
		-15	-20	-25
1	In front of pads	-0.5	-4.4	-7.6
2	Upper side of AED	11.0	8.1	5.6
3	Back of AED	13.9	10.8	8.0
4	Bottom of AED	-8.0	-12.3	-16.2

Figure 4-1 shows the temperature test results for the SmartCase SC1230 between 9:00 (21-08-2018) and 7:00 the next morning. The grey line shows the ambient temperature of the climate chamber. The (2) small peaks in the ambient temperature are due to automatic de-icing of the airconditioning unit.

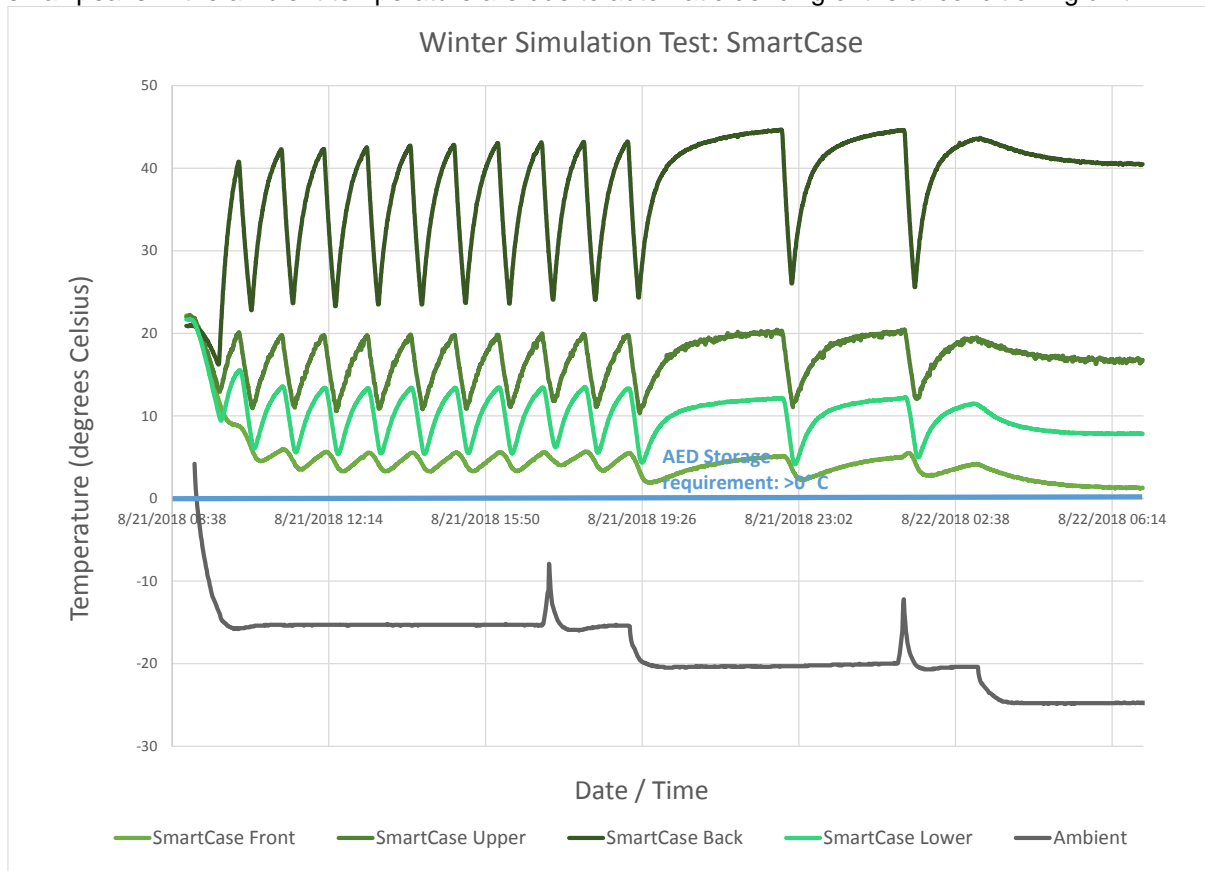


Figure 4-4: Temperature test results SmartCase.

Maximum temperature summary:

Probe nr	location	Minimum temperature (°C)		
		Ambient temperature (°C)		
		-15	-20	-25
1	In front of pads	3.4	2.0	1.3
2	Upper side of AED	11.1	10.2	16.74
3	Back of AED	24.1	24.3	40.5
4	Bottom of AED	5.5	4.3	7.8

4.2 Video and Summer testing

There is a video of this test that can be viewed by using the following link: <https://youtu.be/ub86MdVxt1k>

We have also tested cabinets under hot summer conditions. The test report can be made available on request.

Other relevant video' with respect to AED cabinet testing can be found using the following links:

Opening Test Rotaid performed by Twente Hartsafe: <https://www.youtube.com/watch?v=zJWA-PaDyTM>

Opening Test Rotaid performed by BHVtotaal: <https://www.youtube.com/watch?v=2oplROu5dvU>

Complete summer testing: <https://youtu.be/oUg5zbe2Bqs>

5 Conclusions Winter simulation Test

Aivia 210:

- The temperature at 2 locations on the AED get below the minimum allowed storage temperature of 0°C (up to -12°C). This also occurs at the specified outside temperature (-20°C) for which the manufacturer claims that the AED is protected against frost.

Conclusion: The Aivia cabinet does not comply with the technical specification of the manufacturer. Overall performance under simulated winter conditions is poor (-)

SixCase SC1330P (polar):

- All measured temperatures stay well above the minimum allowed storage temperature of 0°C. Even at outside temperatures as low as -25°C, the AED is protected against frost.

Conclusion: The SixCase cabinet complies with its technical specification. Overall performance under simulated winter conditions is very good (++)

Rotaid Solid plus heat:

- The temperature at 2 locations on the AED get well below the minimum allowed storage temperature of 0°C (up to -16.2°C). This also occurs at the specified outside temperature (-20°C) for which the manufacturer claims that the AED is protected against frost.









Conclusion: The Rotaid cabinet does not comply with the technical specification of the manufacturer. Overall performance under simulated winter conditions is very poor (--)

SmartCase 1230:

- All measured temperatures stay above the minimum allowed storage temperature of 0°C. Even at outside temperatures as low as -25°C, the AED is protected against frost.

Conclusion: The SmartCase cabinet more than complies with its technical specification. From this test, it can even be concluded that the AED is protected until -25°C outside temperature (specification claims protection until -20°C). Overall performance under simulated winter conditions is very good (++)

A summary of the overall performance of the different cabinets is provided in the next table.

Tested AED Cabinet	Used AED (without bag)	Claim in Technical Specification	Measured Temperature on AED at ambient temperature			Cabinet performance under Winter conditions
			-15 °C	-20 °C	-25 °C	
AIVIA 210 	ZOLL Plus 	> 0 °C at -20 °C	-2.2 °C	-7.2 °C	-12.0 °C	-
Rotaid SOLID PLUS HEAT 	ZOLL Plus 	> 5 °C at -20 °C	-7.5 °C	-12.6 °C	-16.2 °C	--
SixCase 1330P (polar) 	ZOLL Plus 	> 0 °C at -25 °C	+9.8 °C	+9.8 °C	+5.9 °C	++
SmartCase 1230 	ZOLL Plus 	> 0 °C at -20 °C	+3.3 °C	+2.0 °C	+1.3 °C	++