TEST REPORT

SAE J1171
External Ignition Protection of Marine Electrical Devices

Report Number. .....:	21PP120-01_0
Date of issue.....:	2021-02-22
Total number of pages.....	26

Tested by .....:	Stjepan Peretin
(printed name and signature) .....:	Stjepan Peretin - Digitally signed | see http://ca.kiwa-deutschland.de for more details -
Approved by.....:	Nadiya Trushnikova
(printed name and signature) .....:	Nadiya Trushnikova - Digitally signed | see http://ca.kiwa-deutschland.de for more details -

Testing Laboratory .....:	Kiwa Primara GmbH
Address.....:	Gewerbestrasse 28, 87600 Kaufbeuren; Germany

Applicant's name.....:	Victron Energy B.V.
Address.....:	De Paal 35 1351 JG Almere Netherlands

Test specification:	
Standard .....:	SAE J1171:2016-09

Test procedure .....:	Continuous Device Operation to Determine External Surface Temperatures Method of Test—Sealed Devices
Non-standard test method .....:	N/A

Test item description.....:	Blue Smart IP67 Charger
Trade Mark .....:	victron energy BLUE POWER
Manufacturer .....:	Victron Energy B.V.
Model/Type reference.....:	Blue Smart IP67 Charger 12/7(1) 120V NEMA 5-15, Blue Smart IP67 Charger 24/5(1) 120V NEMA 5-15, Blue Smart IP67 Charger 24/8(1) 120V NEMA 5-15, Blue Smart IP67 Charger 12/13(1) 120V NEMA 5-15, Blue Smart IP67 Charger 12/17(1) 120V NEMA 5-15, Blue Smart IP67 Charger 12/25(1) 120V NEMA 5-15, Blue Smart IP67 Charger 24/12(1) 120V NEMA 5-15.
Ratings.....:	See General Product Information

General Product Information:

Sample A	Blue Smart IP67 Charger 24/5(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 2A / 130W; 85 x 211 x 60 mm; 1,8 kg.
Sample B	Blue Smart IP67 Charger 24/12(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 6A / 380W; 99 x 219 x 65 mm; 2,4 kg.
Sample C	Blue Smart IP67 Charger 12/7(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 2A / 105W; 85 x 211 x 60 mm; 1,8 kg.
Sample D	Blue Smart IP67 Charger 24/8(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 3A / 260W; 99 x 219 x 65 mm, 2,4 kg.
Sample E	Blue Smart IP67 Charger 12/25(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 6A / 400W; 99 x 219 x 65 mm; 2,4 kg.
Sample F	Blue Smart IP67 Charger 12/13(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 3A / 200W; 85 x 211 x 60 mm; 1,8 kg.
Sample G	Blue Smart IP67 Charger 12/17(1) 120V NEMA 5-15; 110-120V / 50-60Hz / 4A / 260W; 99 x 219 x 65 mm; 2,4 kg.

Summary of testing:

Test was performed on fully functional Blue Smart IP67 Chargers on all samples (A to G).

During Continuous Device Operation to Determine External Surface Temperatures test, the samples were tested at temperature of 40°C and 60°C for at least 7 hours in mode that draws maximal current from the sample. Test voltage was adjusted to 120% of nominal voltage and 50Hz and 60Hz frequency was also considered.

Method of Test—Sealed Devices was performed in a way that samples were submerged into a water at depth of 355 mm below the surface of water and left for 15 minutes for each possible leakage source.

Final Result:

☒ **The product fulfils the requirements of SAE J1171:2016-09 for Continuous Device Operation to Determine External Surface Temperatures and Method of Test—Sealed Devices.**

History Sheet:			
Date	Project Engineer	What was changed What was required to implant the change (like retest)	Report Number with Revision
2021-02-22	Stjepan Peretin	Initial Report written	0

Possible test case verdicts:

- test case does not apply to the test object.....: N/A
- test object does meet the requirement.....: P (Pass)
- test object does not meet the requirement.....: F (Fail)

Testing .....:

Date of receipt of test item .....: 2021-01-20

Date(s) of performance of tests .....: 2021-01-26 – 2021-02-18

General remarks:

The test results presented in this report relate only to the object tested and for the sample as received.

The basis for conformity statements is ILAC G8:09/2019 section 4.2.1.

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"(see Enclosure #)" refers to additional information appended to the report.
"(See test data sheet)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

This test report consists of the following documents:

Test Report
Appendix 1 – Photo Documentation
Appendix 2 – Test results
Appendix 2 – Test Equipment List

SAE J1171			
Clause	Requirement + Test	Result – Remark	Verdict
General			
3	Due to its design, the sample is declared as type of Sealed Devices and following tests were applied: Continuous Device Operation to Determine External Surface Temperatures and Method of Test—Sealed Devices. In first part of the test the samples were tested at temperature of 40°C and 60°C for at least 7 hours in mode that draws maximal current from the sample. Second test was performed in order to determine that no combustible mixture can enter into the device and thus preventing from making an explosion. No test for Non-Sealed Devices have been performed.		P
Continuous Device Operation to Determine External Surface Temperatures			
4.1	The Blue Power IP67 chargers will charge and maintain lead-acid and Li-ion batteries, and supply users connected to the battery. In addition, the models with suffix (1+Si) feature a second current limited output which is always powered as long as 110 – 120 VAC is present on the input. This output can for example be used to prevent starting of a vehicle before unplugging the battery charger (start interrupt function).		P
4.2	Due to the stated operating temperature range of -20 to +60°C (full rated output up to 40°C), derate 3% per °C above 40°C the test was conducted at 40°C and 60°C.		P
4.3	The test was running continuously for a minimum of 7 h in the mode in which it draws its maximum current.		P
4.4	Due to the stated input voltage range and frequency: 110-120 VAC 50-60Hz, the test voltage was adjusted to 120% of nominal voltage and 50Hz and 60Hz frequency was also considered.		P
4.5	Maximal measured surface temperature has never exceeded 200°C. See Appendix 2.		P
Method of Test—Sealed Devices			
5.1	Test was performed according to Figure 1 of SAE J1171:2016-09 where top of device was submerged 355 mm under water surface.		P
5.2	Test procedure		
5.2.1	Each device was submerged for 15 minutes for each possible leakage source. In total there was detected three possible sources of leakage.		P
5.2.2	Few bubbles have been detected during the test from samples with fuse. According to the received documentation “Technical Data 2009 for ATC blade fuses” stored on KIWA Primara server, those fuses have been tested and accepted for SAE J1171 standard. As for the sample without fuse (Sample E), no forming of bubbles has been observed.		P
5.2.3	Samples (Chargers) are considered as Sealed Device and Fuses are have been tested and accepted for SAE J1171 standard.		P
5.2.4	Samples were dried prior to disassembling.		P
5.2.5	Due to its design, devices were cut in half in order to be possible of performing internal inspection.		P
5.2.6	During inspection, no water was found inside the enclosure of a charger.		P

Method of Test—Non-Sealed Devices			
6.1	Equipment Description	Equipment is declared as Sealed Device.	N/A
6.2	Device Preparation	Equipment is declared as Sealed Device.	N/A
6.3	Test Procedure	Equipment is declared as Sealed Device.	N/A
6.4	Special Notes for Non-Sealed Devices	Equipment is declared as Sealed Device.	N/A
Marking			
7.1	No marking was made according to SAE J1171.		N/A
7.2	No marking was made according to SAE J1171.		N/A
7.3	No marking was made according to SAE J1171.		N/A
7.4	No marking was made according to SAE J1171.		N/A

Appendix No. 1

Photo Documentation (Photos of the test sample before, during and after the test)

Figure 1: Blue Smart IP67 Charger – top view - Sample A

Figure 2: Blue Smart IP67 Charger – bottom view - Sample A

Figure 3: Blue Smart IP67 Charger – side 1 view – Sample A

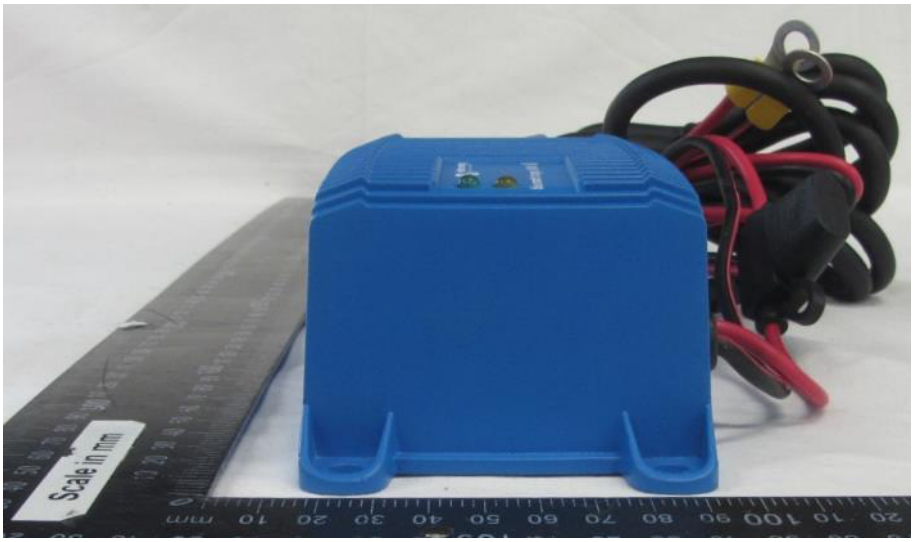

Figure 4: Blue Smart IP67 Charger – side 2 view – Sample A

Figure 5: Blue Smart IP67 Charger – side 3 view – Sample A

Figure 6: Blue Smart IP67 Charger – side 4 view – Sample A

Figure 7: Blue Smart IP67 Charger – nameplates details – Sample A

Figure 8: Blue Smart IP67 Charger – bottom view - Sample B

Figure 9: Blue Smart IP67 Charger –side view - Sample C

Figure 10: Blue Smart IP67 Charger – side view – Sample D

Figure 11: Blue Smart IP67 Charger – bottom view – Sample E

Figure 12: Blue Smart IP67 Charger – bottom view – Sample F

Figure 13: Blue Smart IP67 Charger – side view – Sample G

Figure 14: Sample G during pre-test

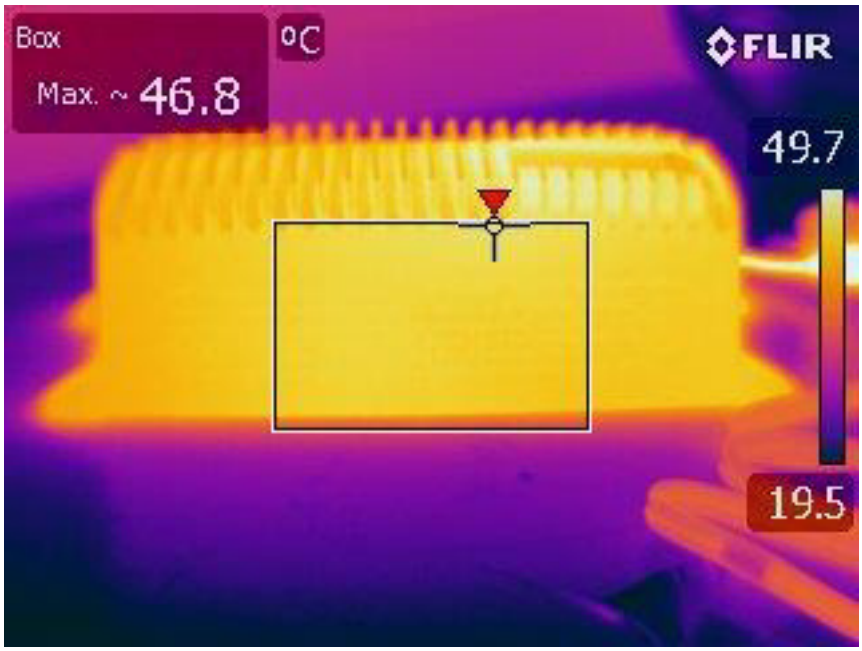

Figure 15: Sample G during pre-test – detecting hotspots on thermal camera

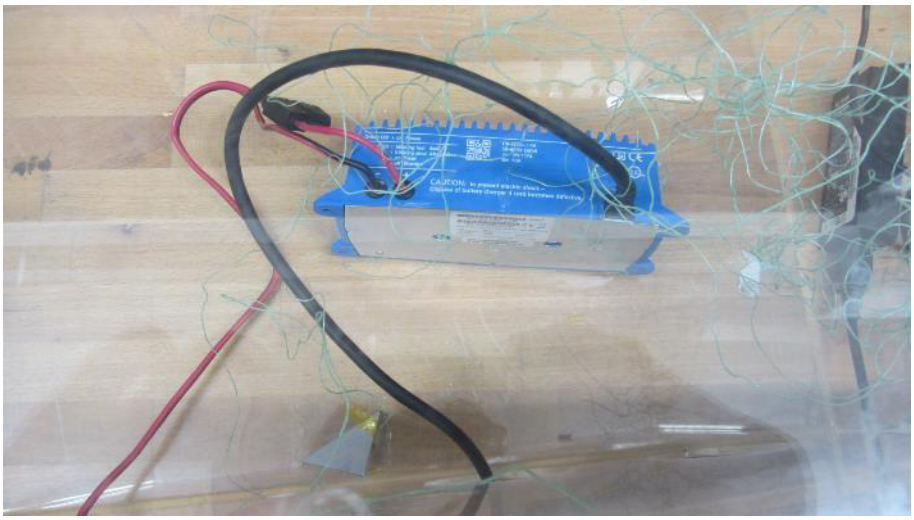

Figure 16: Sample G during pre-test – determination of the worst orientation position

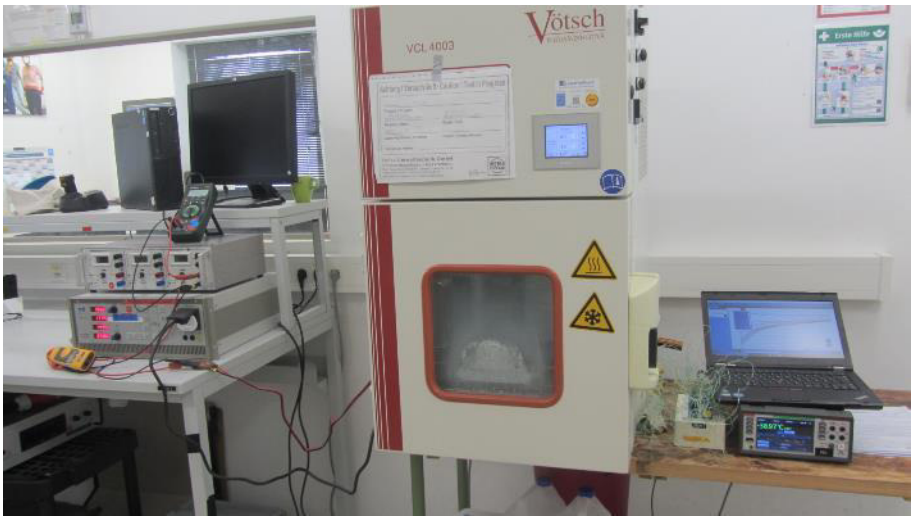

Figure 17: Sample A during Continuous Device Operation to Determine External Surface Temperatures

Figure 18: Sample D during Continuous Device Operation to Determine External Surface Temperatures – inside climate chamber

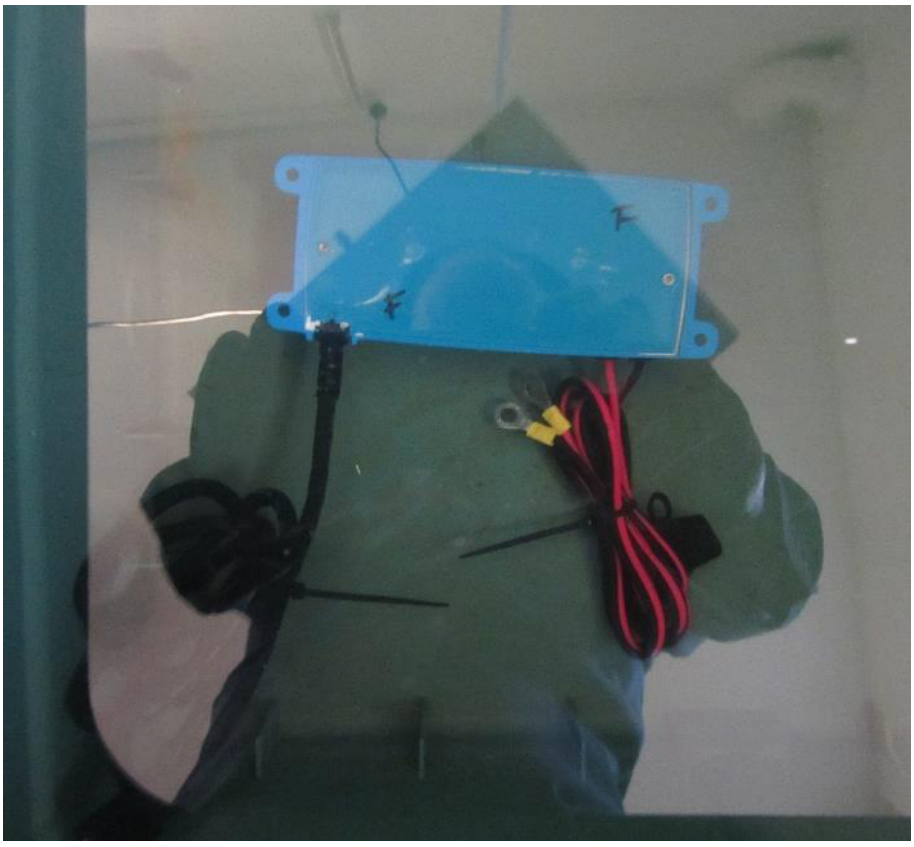

Figure 19: Sample F during Method of Test—Sealed Devices

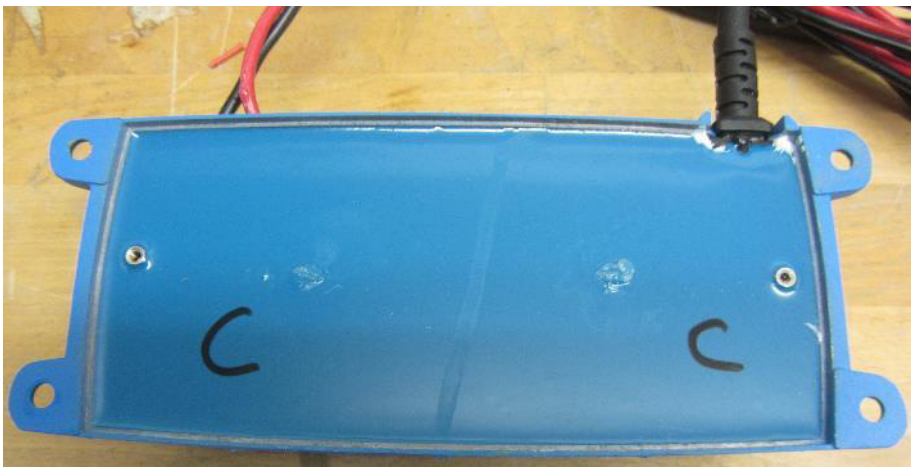

Figure 20: Sample C dried after Method of Test—Sealed Devices

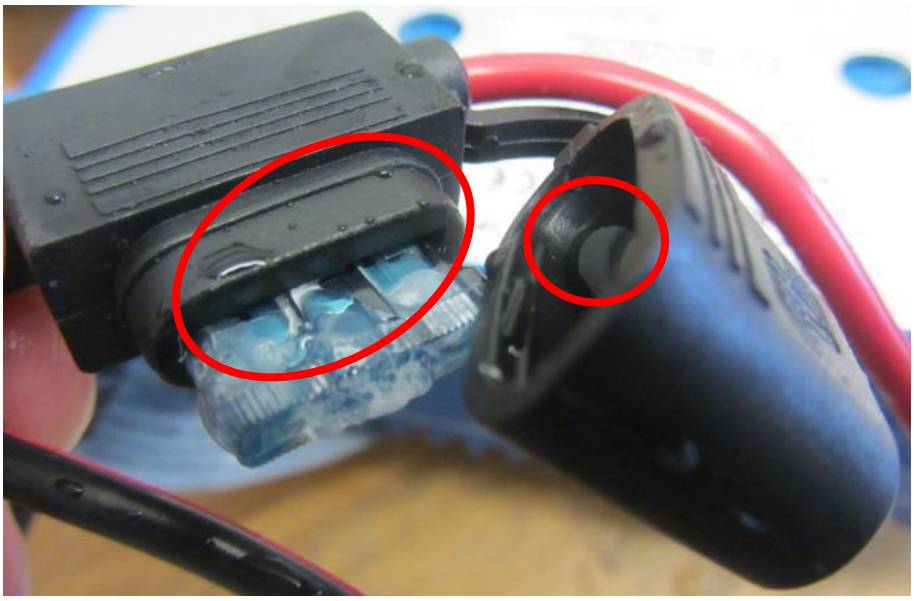

Figure 21: Detailed view of water drop in the fuse box of Sample B after Method of Test—Sealed Devices

Figure 22: Detailed view of water drop in the fuse box of Sample B after Method of Test—Sealed Devices

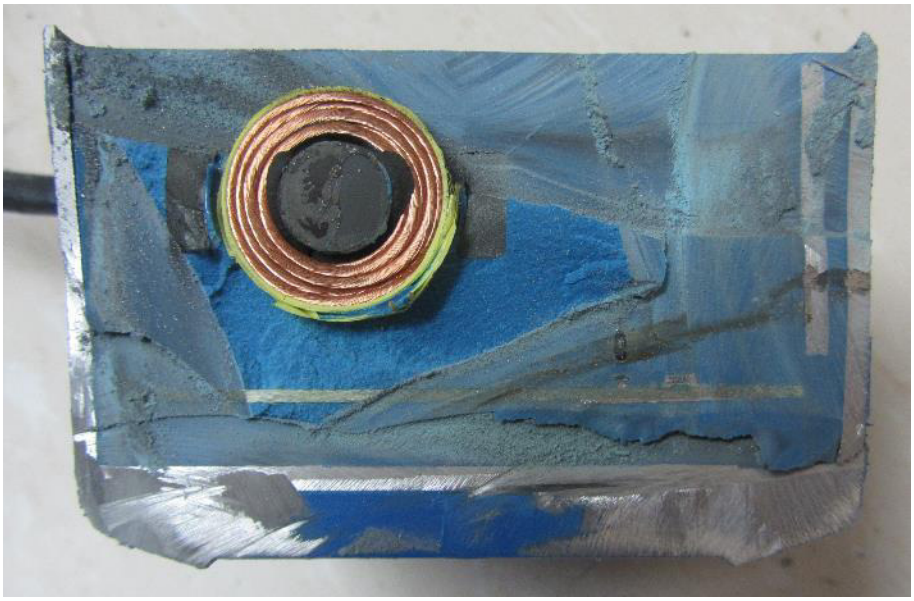

Figure 23: Part of Sample B opened after Method of Test—Sealed Devices

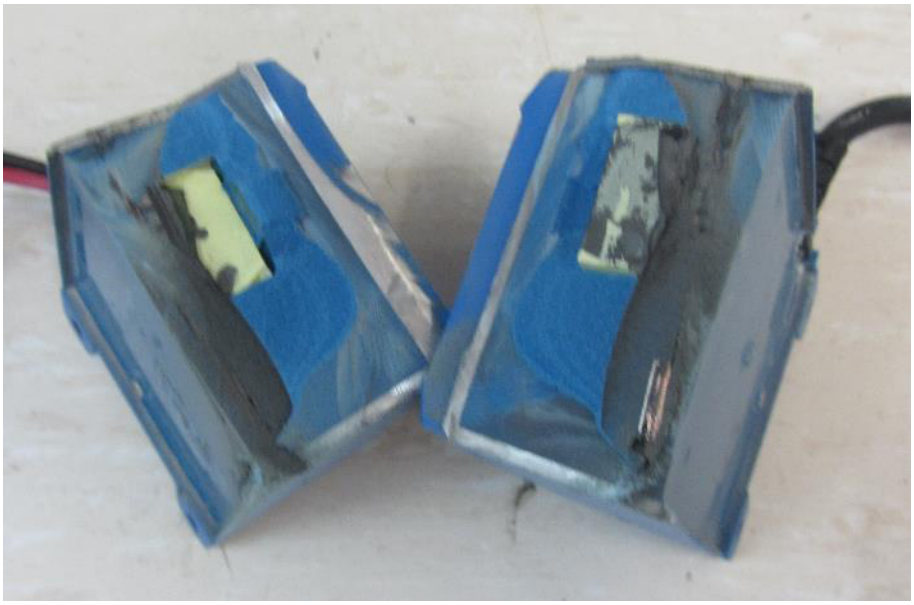

Figure 24: Parts of Sample C opened after Method of Test—Sealed Devices

Figure 25: Part of Sample E opened after Method of Test—Sealed Devices

Appendix No. 2
Test results

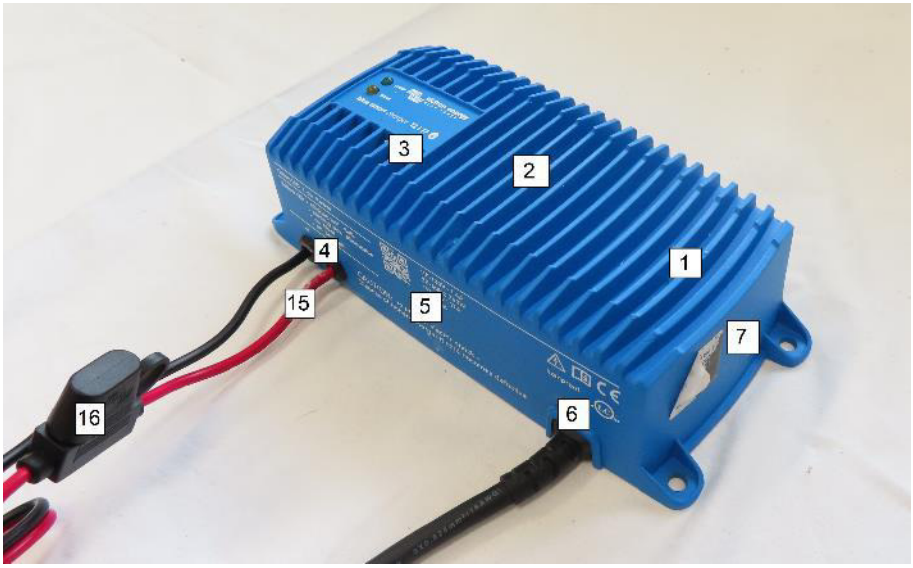

Figure 26: Location of the temperature measurement positions were placed as on Sample G – view 1

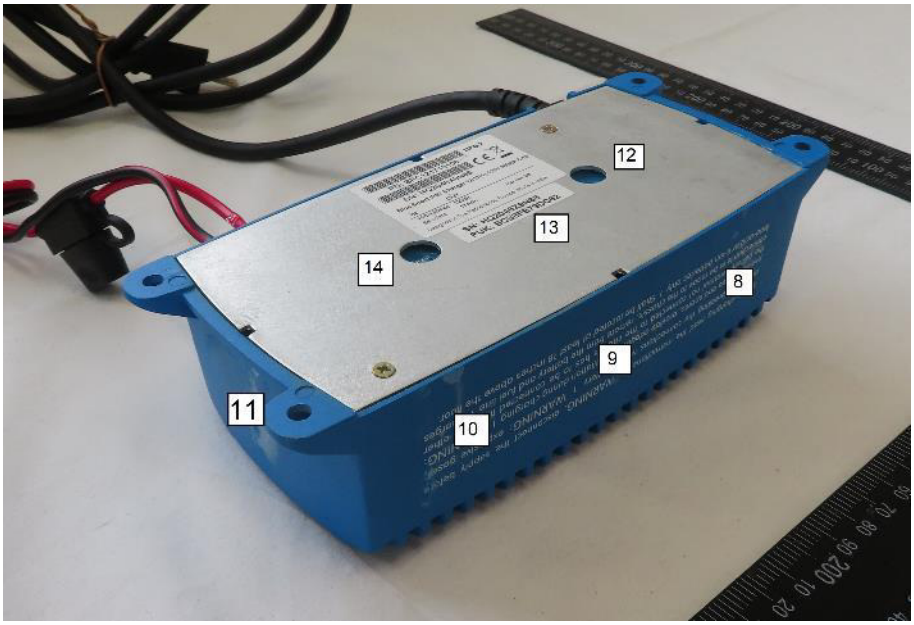

Figure 27: Location of the temperature measurement positions were placed as on Sample G – view 2

During pre-test phase following options were considered: maximal voltage of 110V and 120V increased for 20%, frequency of 50Hz and 60Hz and ambient temperature of 40°C, 50°C and 60°C. Overall the highest temperatures of all samples during work were measured at ambient temperature of 60°C and 120V increased for 20%, while frequency change had no significant impact on the temperature rise.

Table 1: Maximal temperatures [°C] of each sample recorded during minimum of 7h of work at 60°C on selected positions at 120% of nominal voltage with maximal current and 50Hz frequency

Measuring position		Sample						
		A	B	C	D	E	F	G
1	Front side – Right	74,6	75,1	73,7	72,8	73,8	69,1	68,1
2	Front side – Middle	74,7	76,7	74,0	73,3	75,6	68,9	69,4
3	Front side – Left	74,4	76,2	73,9	73,9	76,0	70,0	69,8
4	Left side – Output wire	73,4	75,1	73,7	70,6	73,7	66,5	69,1
5	Left side – Middle	74,9	75,4	73,5	73,3	75,3	68,5	70,0
6	Left side – Input wire	73,5	75,4	73,1	72,1	73,2	68,8	67,7
7	Back side	73,6	73,7	72,5	70,9	71,2	68,2	67,3
8	Right side – Right	72,7	75,1	73,1	72,2	73,7	68,9	68,9
9	Right side – Middle	73,8	74,9	72,1	71,8	73,4	67,8	69,3
10	Right side – Left	72,8	75,8	73,1	70,3	74,2	69,0	67,5
11	Top side	73,1	74,9	73,0	70,4	73,0	68,7	67,3
12	Bottom side – Right	76,6	76,3	79,2	73,3	71,5	73,4	68,3
13	Bottom side – Middle	74,1	74,6	73,1	70,3	76,8	68,0	68,4
14	Bottom side – Left	75,3	77,3	80,0	72,3	73,8	73,8	72,9
15	Red wire	68,9	72,0	69,7	68,5	73,8	67,3	70,9
16	Fuse	64,4	77,9	69,1	73,5		73,8	88,2

Table 2: Overall maximal temperatures [°C] of each sample recorded during minimum of 7h of work at 60°C and 120% of nominal voltage with maximal current and 50Hz frequency

Measuring position	Sample						
	A	B	C	D	E	F	G
Maximal temperature	76,9	77,9	80,0	73,9	76,8	73,8	88,2

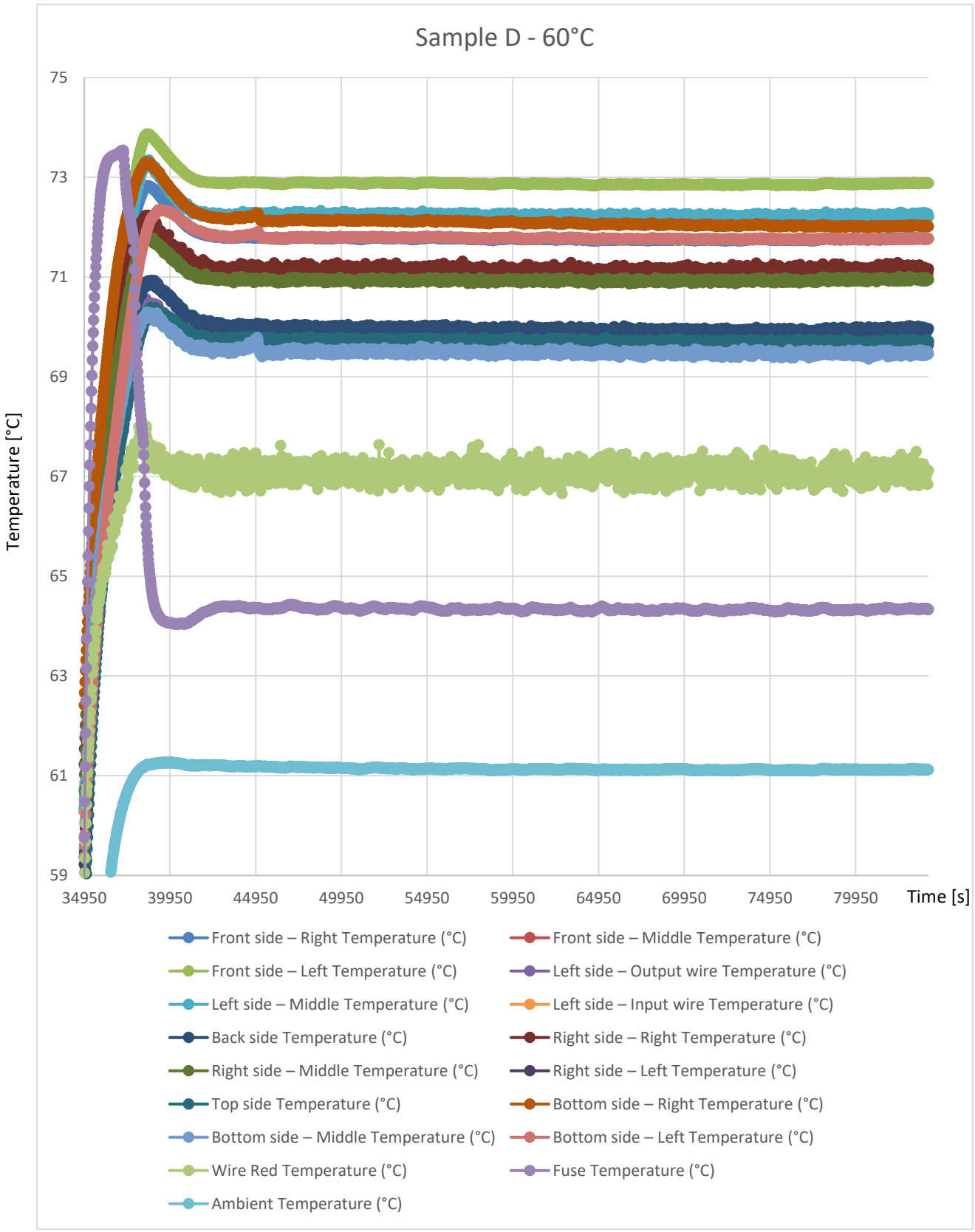

Chart 1: Temperature measurement curve for Sample D at ambient temperature of 60°C

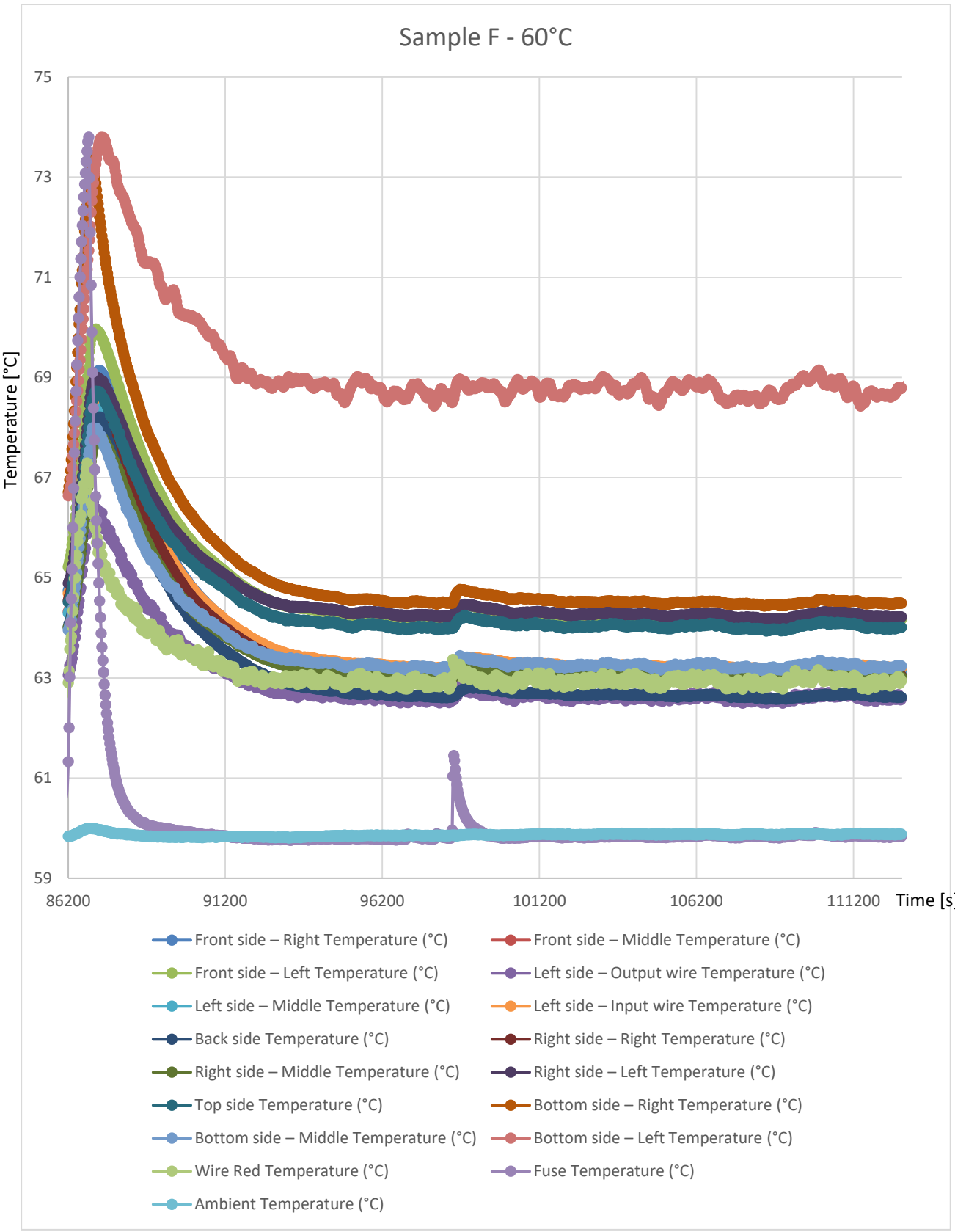

Chart 2: Temperature measurement curve for Sample F at ambient temperature of 60°C

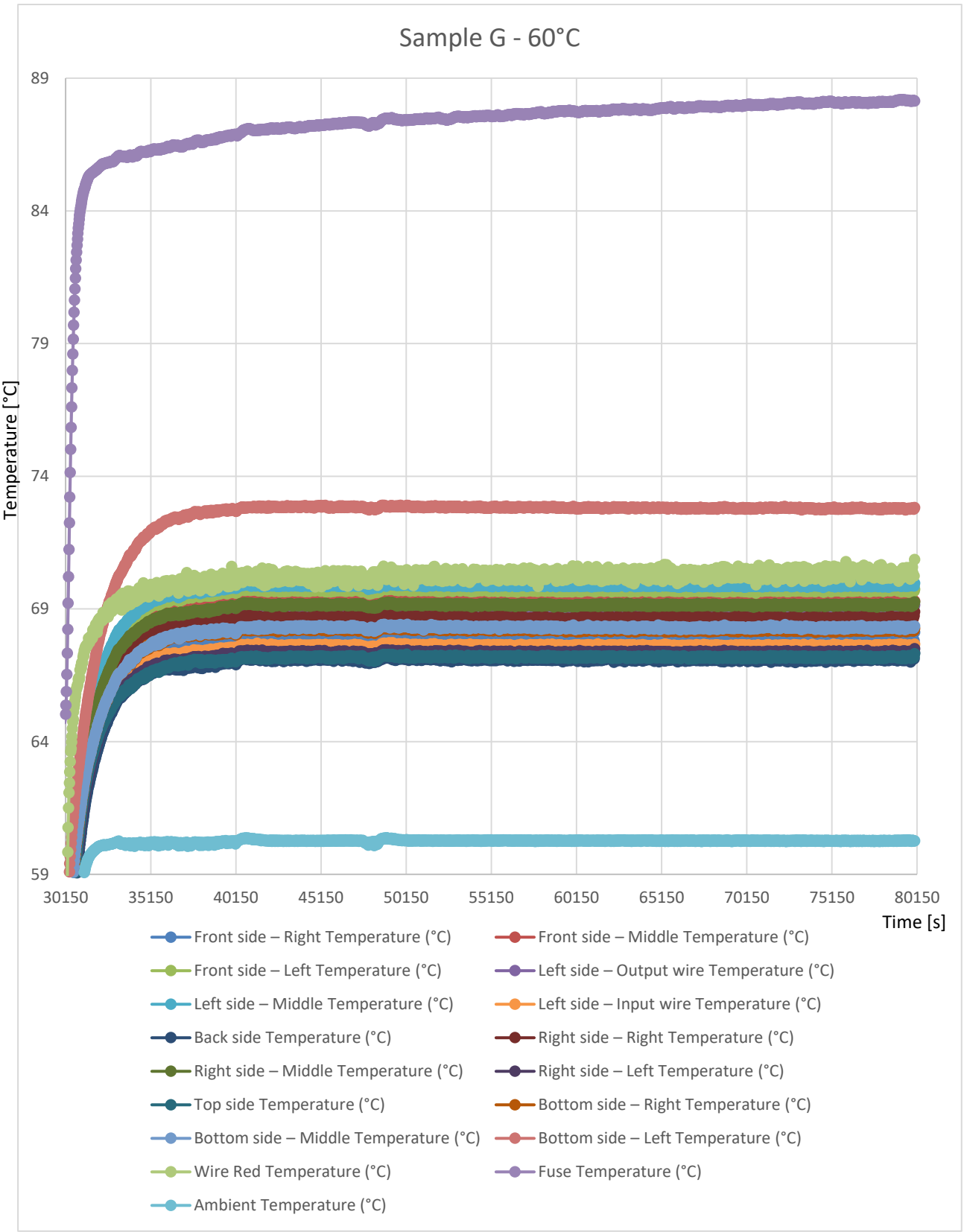

Chart 3: Temperature measurement curve for Sample G at ambient temperature of 60°C

Appendix No. 3
Test Equipment List

Equ. Nr.	Equipment	Manufacturer	Type	Serial No.	Last Calibration	Next Calibration
090	timer / stop watch	Orion	JS-506	160844	31.08.2018	28.02.2021
193	Thermal Camera	FLIR	T420bx	62102693	N/A	N/A
218	Tape measure	BRÜDER MANNESMANN WERKZEUGE GmbH	Green Line	80507	23.06.2020	ICO
273	AC Power supply	ET System electronic GmbH	EAC500	10.40.3875	N/A	N/A
321	Digital Multimeter	GMC-I Messtechnik GmbH	MetraHit 18S	M43375297	10.06.2020	10.06.2021
581	Climatic chamber	Vötsch Industrietechnik GmbH	VCL4003	5654600270 0010	03.02.2021	03.08.2022
642	Current Clamp	Fluke	365	39100076WS	23.11.2020	23.11.2021
883	Digital Multimeter / Datalogger (Temp.)	Keithley	DAQ6510	4439415	05.10.2020	05.10.2021
884	Multiplexer for Thermocouples Type K	Keithley	7700	4389369	24.11.2020	24.11.2021
901	Ambient Logger	Testo Se & Co. KGaA	Saveris 2 (H1)	54664309	04.01.2021	04.01.2022
919	AC/DC Loads	Statron Gerätetechnik GmbH	3227.3	2006001	N/A	N/A
The Equipment fulfills the requirements of OD-5014. The uncertainties of the measurement method and of the test equipment have been identified and can be provided on request.						

END OF THE REPORT