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**TEST REPORT CONCERNING THE COMPLIANCE OF
OF A SERIES OF MICROPROCESSOR CONTROLLED
BATTERY SEPARATORS, BRAND ARFT,
TYPE/MODELS BS100, BS140, BSW160 AND BS250,
WITH THE (EMC) REQUIREMENTS FROM THE
STANDARDS:**

**EN61000-6-2:2005, EN61000-6-3:2007 AND THE
AUTOMOTIVE DIRECTIVE 2004/104/EC**

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Description of test item

Test item : Microprocessor Controlled Battery Separators
Manufacturer : A-RFT
Brand : ARFT
Model/Version : BS100, BS140, BSW160 and BS250
Serial : ---
Receipt date : November 10, 2008

Applicant information

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Test(s) performed

Location : Niekerk
Test(s) started : November 10, 2008
Test(s) completed : December 30, 2008
Purpose of tests : Compliance with standards
Test specification(s) : EN 61000-6-2:2005, EN 61000-6-3:2007 and
Automotive Directive 2004/104/EC

Project leader : T.E.T. Koning

Test engineer : T.E.T. Koning

Report written by : T.E.T. Koning

Report approved by : O.H. Hoekstra

Report date : January 5, 2009

This report is in conformity with NEN-EN-ISO/IEC 17025: 2005 for the CE required test items.
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The test results relate only to the item(s) tested.

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1 General.

1.1 Applied standards.

The Microprocessor Controlled Battery Separators, brand ARFT, models BS100, BS140, BSW160 and BS250 have been tested in conformity with the EMC parts of the standards:

EN61000-6-2:2005, Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments.

EN61000-6-3:2007, Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments.

COMMISSION DIRECTIVE 2004/104/EC of 14 October 2004 adapting to technical progress Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers.

1.2 Description of EUT.

The Microprocessor Controlled Battery Separators, brand ARFT, models BS100, BS140, BSW160 and BS250 are to be documented as follows:

1.2.1 Description of test configuration.

Test item 1 (EUT1) : Microprocessor Controlled Battery Separator
Manufacturer : A-RFT
Brand : ARFT
Model/partnumber : BS100
Serial number : ---
Voltage input rating : 12-24 V DC
Remarks : Tested at 30 V DC



Test item 2 (EUT2) : Microprocessor Controlled Battery Separator
Manufacturer : A-RFT
Brand : ARFT
Model/partnumber : BG60
Serial number : ---
Voltage input rating : 12-24 V DC
Remarks : Tested at 30 V DC



Test item 3 (EUT3) : Microprocessor Controlled Battery Separator
Manufacturer : A-RFT
Brand : ARFT
Model/partnumber : BSW160
Serial number : ---
Voltage input rating : 12-24 V DC
Remarks : Tested at 30 V DC



Test item 4 (EUT4) : Microprocessor Controlled Battery Separator
Manufacturer : A-RFT
Brand : ARFT
Model/partnumber : BS250
Serial number : ---
Voltage input rating : 12-24 V DC
Remarks : Tested at 30 V DC *)



*) The BS250 has not been tested for EFT and Surges. The device is developed for interconnection between two batteries and cannot receive surges (EN 61000-4-5) and EFT (EN 61000-4-4) because of the nature of Automotive electric systems.

2 Test conditions.

2.1 General.

Environmental condition	Parameter	Range
Temperature	°C	20 – 22
Relative humidity	%	30 – 50
Air pressure	hPa	990 - 1030
Supply voltage	Volts DC	12-30

The system was configured for testing in a typical fashion (as a customer would normally use it). During all tests EUT has been set up to function in accordance with the manufacturer's instructions. Tested with 30 V DC or 14.4 V DC as specified in this report.

2.1.1 Description of tested input and output ports.

Number	Terminal	From	To	Length
1	12-24 VDC	Battery plus Charger	EUT's	< 3 m
2	12-24 VDC	EUT's	To load	> 3 m

Table 1

I/O ports as connected to the EUT.

2.1.2 Operation mode(s).

The EUT's are loaded with a bulb load during emission and immunity tests. When starting at 13.1 or 26.2 V DC the lamp shall not light. In case of 14,4 or 29 V DC the lamp shall light up, showing charging the second battery is charging.

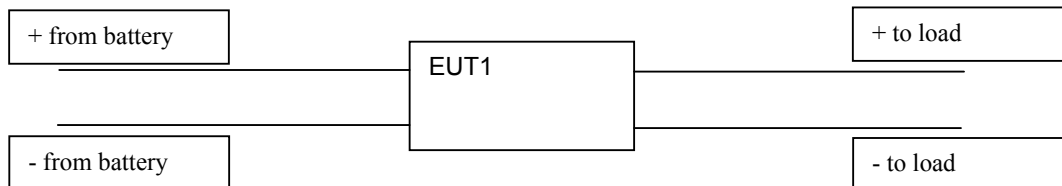


Figure 1. General set-up during tests

3 Emission.


The EUT has been tested in conformity with the EMC emission requirements of the standard EN 61000-6-3:2007 and Automotive Directive 2004/104/EC.

3.1 DC power input ports.

3.1.1 In accordance with EN 61000-6-3:2007.

The disturbance voltage levels at the DC power input port of the EUT to be measured in conformity with- and according to the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61000-6-3:2007
Test set-up	:	EN 55022: 2006
Frequency range 1	:	150 kHz – 0.5 MHz
Limit	:	66.0 – 56.0 dB(μV) quasi peak and 56.0 – 46.0 dB(μV) Average,
Frequency range 2	:	0.5 – 5.0 MHz
Limit	:	56.0 dB(μV) quasi peak and 46.0 dB(μV) Average,
Frequency range 3	:	5.0 - 30 MHz
Limit	:	60.0 dB(μV) quasi peak and 50.0 dB(μV) Average,

Result of the measurements concerning the emission of disturbance voltage levels at the DC mains input ports of EUT1, EUT2 and EUT3.	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 and EUT 4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARK: NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12507	Artificial mains network 3-phase	Rohde & Schwarz	ESH2-Z5
13313	Impulse limiter	Rohde & Schwarz	ESH3Z2.357
15667	EMI test receiver	Rohde & Schwarz	ESCS 30
12493	Spectrum monitor	Rohde & Schwarz	EZM
99113	Probe	Rohde & Schwarz	TK9416
12567	Plotter	HP	Color Pro

Frequency	Measured values (QP)		Limits
	Line	Neutral	
(MHz)	(dB μ V)	(dB μ V)	(dB μ V)
0.15 – 0.5	< 25.0	< 25.0	66.0 – 56.0
0.5 – 5.0	< 25.0	< 25.0	56.0
5.0 – 30.0	< 25.0	< 25.0	60.0
Except for:			
27.01	28.1 (BS100)	28.7 (BS100)	60.0
27.01	28.1 (BS140)	28.8 (BS140)	60.0
27.01	26.6 (BSW160)	27.5 (BSW160)	60.0
27.01	27.0 (BS250)	27.4 (BS250)	60.0

Table 2

The results of the measurements, carried out in conformity with the standard EN 55022:2006, concerning conducted disturbance levels, emitted by the EUT in the configuration and operation mode(s) as stated in this test report, are depicted in table 2. Results are quasi-peak values. Maximum values recorded of EUT1, EUT2, EUT3 and EUT4

Frequency	Measured values (AV)		Limits
	Line	Neutral	
(MHz)	(dB μ V)	(dB μ V)	(dB μ V)
0.15 – 0.5	< 25.0	< 25.0	56.0 – 46.0
0.5 – 5.0	< 25.0	< 25.0	46.0
5.0 – 30.0	< 25.0	< 25.0	50.0
Except for:			
27.01	28.1 (BS100)	28.8 (BS100)	50.0
27.01	28.1 (BS140)	28.8 (BS140)	50.0
27.01	26.3 (BSW160)	27.4 (BSW160)	50.0
27.01	27.0 (BS250)	27.4 (BS250)	50.0

Table 3

The results of the measurements, carried out in conformity with the standard EN 55022:2006, concerning conducted disturbance levels, emitted by the EUT in the configuration and operation mode(s) as stated in this test report, are depicted in table 3. Results are average values. Maximum values recorded of EUT1, EUT2, EUT3 and EUT4

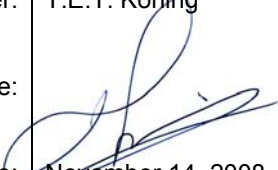


Photo 1. BS100/BS140 conducted emission (example for all types)

3.1.2 In accordance with Automotive Directive 2004/104/CE.

The disturbance voltage levels at the DC power input port of the EUT to be measured in conformity with- and according to the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard : Automotive Directive 2004/104/CE
 Test set-up : ISO 7637-2:2004
 Frequency range : low frequency
 Limit : +150 VDCmax, -450 VDCmax

Result of the measurements concerning the emission of disturbance voltage levels at the DC mains input ports of EUT1, EUT2 and EUT3.	PASS / FAIL/ NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARK: NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12513	LISN	EMCO	3625/2 LISN
80002/80004/80003	Automotive Generator modified with 99611	Schaffner	NSG500B, 506C
99611	TNO modification to 80002/80004/80003	TNO EPS	---
15232	Scope	Tektronix	TDS220

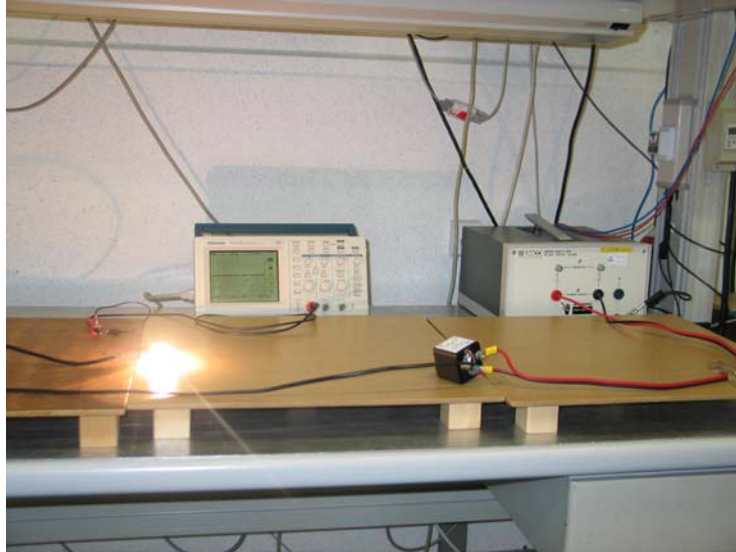


Photo 2. Basic set-up Conducted noise of BS100/140 in accordance with ISO 7637-2:2004, example for all types.

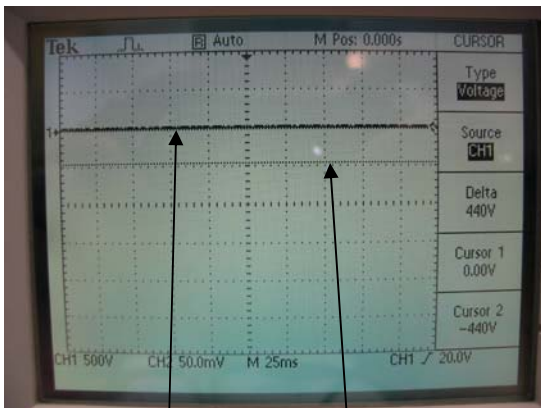


Photo 3. Measured levels (limit - 450 V)

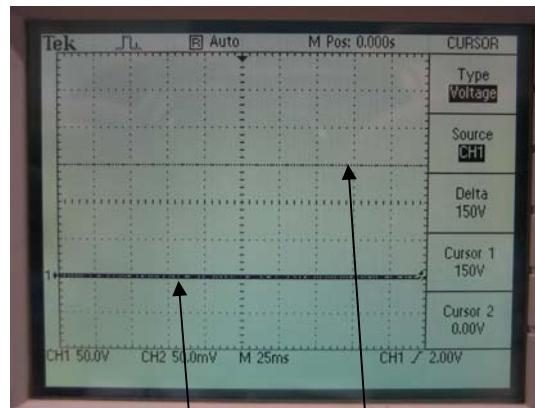


Photo 4. Measured levels (limit +150 V)

Results identical for all types: << limits

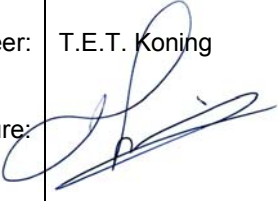
3.2 Enclosure.

3.2.1 In accordance with EN 61000-6-3:2007.

The radiated field strength levels (electric component) of the EUT's have been measured in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	EN 61000-6-3:2007
Test set-up	:	EN 55022:2006
Measuring distance	:	10 meters
Frequency range 1	:	30 MHz - 230 MHz
Limits	:	30 dB(μ V/m)
Frequency range 2	:	230 MHz - 1000 MHz
Limits	:	37 dB(μ V/m)

Detailed results of the measurements concerning radiated field strength levels (electric component), emitted by the EUT, are depicted in table 4 on the next pages of this test report.

Result of the measurements concerning radiated electromagnetic fields (electric component) emitted by the EUT1, EUT2 and EUT3 (enclosure)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS:	
NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12636	Plastic measurement room	Polyforce	-
13886	Open Area Test Site	Comtest	-
99609	Antennamast 4m	Shoshin	AP-4702C
99107	Controller OATS	Comtest	4630-100
15633	Biconilog antenna 30MHz – 1000MHz	Chase	CBL6111B
15667	EMI test receiver	Rohde & Schwarz	ESCS 30
99108	Turntable OATS	Heinrich Deisel	HD050
12526	Field site source	Emco	4610
99608	Controller antenna	EMCS	DOC-202
99071	Coax cable RG213	Intercond	RG213
99070	Coax cable RG213 for 3meters	Intercond	RG213
99069	Coax cable RG213 for 10 meters	Intercond	RG213

Frequency (MHz)	Measurement results dB(μV)/m @ 10 meters Quasi-peak		Limits dB(μV)/m @ 10 meters Quasi-peak (Class B)	Result
	Vertical	Horizontal		
30.0 – 230.0	< 20.0	< 20.0	30.0	PASS
230.0 – 1000.0	< 25.0	< 25.0	37.0	PASS

Table 4 for all EUT's

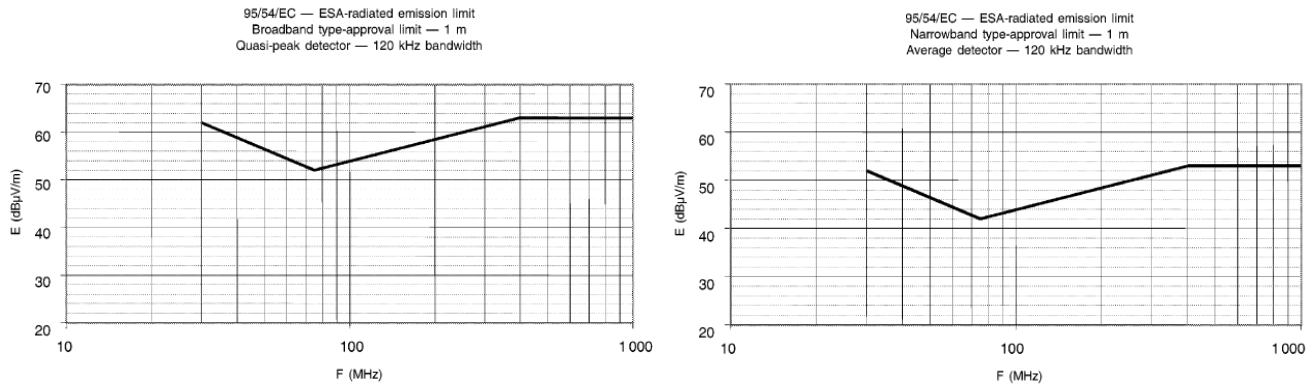
The results of the measurements, carried out in conformity with the standard EN 55011: 1999, Class B, Group 1 and EN 61000-6-3: 2007, including all relevant amendments, concerning radiated field strength levels (electric component), emitted by the EUT in the configuration and operation mode(s) as stated in this test report, are depicted in table 4. Maximum results of EUT1, EUT2, EUT3 and EUT4 have been recorded

<< = tested results far below results other polarization


3.2.2 In accordance with Directive 2004/104/CE.

The radiated field strength levels (electric component) of the EUT's have been measured in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard : Automotive Directive 2004/104/CE



Detailed results of the measurements concerning radiated field strength levels (electric component), emitted by the EUT, are depicted in table 5 and 6 on the next pages of this test report.

Result of the measurements concerning radiated electromagnetic fields (electric component) emitted by the EUT1, EUT2 and EUT3 (enclosure)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer: T.E.T. Koning Signature: Date: November 14, 2008	
REMARKS: NONE	

Utilized test equipment:

Inventory number	Description	Brand	Type
12636	Plastic measurement room	Polyforce	-
13886	Open Area Test Site	Comtest	-
14277	Antenna mast 4.7m	Shoshin	AP-4702C
14278	Controller OATS	Comtest	4630-100
15633	Biconilog antenna 30MHz – 1000MHz	Chase	CBL6111B
15667	EMI test receiver	Rohde & Schwarz	ESCS 30
99108	Turntable OATS	Heinrich Deisel	HD050
99608	Controller antenna mast	EMCS	DOC-202

Frequency (MHz)	Measurement results dB(μV)/m @ 1 meter Quasi-peak		Limits dB(μV)/m @ 1 meter Quasi-peak	Result
	Vertical	Horizontal		
30.0 – 34.0	< 20.0	< 20.0	62.0 - 52.0	PASS
34.0 - 45.0	< 20.0	< 20.0	62.0 – 52.0	PASS
45.0 – 60.0	< 20.0	< 20.0	62.0 – 52.0	PASS
60.0 – 80.0	< 20.0	< 20.0	62.0 – 53.0	PASS
80.0 – 100.0	< 20.0	< 20.0	53.0 – 54.0	PASS
100.0 – 130.0	< 20.0	< 20.0	54.0 – 54.5	PASS
130.0 – 170.0	< 20.0	< 20.0	54.5 – 55.5	PASS
170.0 – 225.0	< 20.0	< 20.0	55.5 – 58.5	PASS
225.0 – 300.0	< 25.0	< 25.0	58.5 – 61.0	PASS
300.0 – 400.0	< 25.0	< 25.0	61.0 – 63.0	PASS
400.0 – 525.0	< 25.0	< 25.0	63.0	PASS
525.0 – 700.0	< 25.0	< 25.0	63.0	PASS
700.0 – 850.0	< 25.0	< 25.0	63.0	PASS
850.0 – 1000.0	< 25.0	< 25.0	63.0	PASS

Table 5

The results of the measurements, carried out in conformity with the Automotive Directive 2004/104/CE, concerning radiated field strength levels (electric component), emitted by the EUT's (each tested separately, only highest values recorded) in the configuration and operation mode(s) as stated in this test report, are depicted in table 5.

Frequency (MHz)	Measurement results dB(μV)/m @ 1 meter Average		Limits dB(μV)/m @ 1 meter Average	Result
	Vertical	Horizontal		
30.0 – 34.0	< 20.0	< 20.0	52.0 - 42.0	PASS
34.0 - 45.0	< 20.0	< 20.0	52.0 – 42.0	PASS
45.0 – 60.0	< 20.0	< 20.0	52.0 – 42.0	PASS
60.0 – 80.0	< 20.0	< 20.0	52.0 – 43.0	PASS
80.0 – 100.0	< 20.0	< 20.0	43.0 – 44.0	PASS
100.0 – 130.0	< 20.0	< 20.0	44.0 – 44.5	PASS
130.0 – 170.0	< 20.0	< 20.0	44.5 – 45.5	PASS
170.0 – 225.0	< 20.0	< 20.0	45.5 – 48.5	PASS
225.0 – 300.0	< 25.0	< 25.0	48.5 – 51.0	PASS
300.0 – 400.0	< 25.0	< 25.0	51.0 – 53.0	PASS
400.0 – 525.0	< 25.0	< 25.0	53.0	PASS
525.0 – 700.0	< 25.0	< 25.0	53.0	PASS
700.0 – 850.0	< 25.0	< 25.0	53.0	PASS
850.0 – 1000.0	< 25.0	< 25.0	53.0	PASS

Table 6

The results of the measurements, carried out in conformity with the Automotive Directive 2004/104/CE, concerning radiated field strength levels (electric component), emitted by the EUT's (each tested separately, only highest values recorded) in the configuration and operation mode(s) as stated in this test report, are depicted in table 6.



Photo 5. Basic set-up during radiated emission (and immunity tests) for automotive requirements: BS250 (example set-up for all models)

4 Immunity.

The EUT been tested in conformity with EMC Immunity parts of the standard EN 61000-6-2: 2006 and Automotive Directive 2004/104/EC with all relevant amendments concerning the susceptibility to continuous and transient, conducted and radiated disturbances including electrostatic discharges.

4.1 Performance criteria.

The general principles (performance criteria) for the evaluation of the immunity test results are given below.

4.1.1 Performance criterion A.

During testing, normal performance, no change of settings after start-up shall occur during testing.

4.1.2 Performance criterion B.

During testing, temporary degradation, or loss of function or change of settings after start-up may occur during testing which is self recovering after finishing testing.

4.1.3 Performance criterion C.

During testing, temporary degradation, or loss of function or change of settings after start-up may occur during testing which requires operator intervention or system reset after testing.

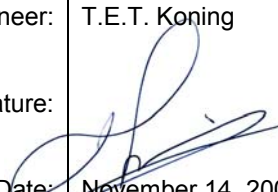
4.2 Enclosure port.

4.2.1 EN 61000-6-2:2005 requirements.

4.2.1.1 Radio-frequency electromagnetic field. Amplitude modulated.

The susceptibility of the EUT to radio-frequency electromagnetic fields has been tested in conformity with-and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	EN 61000-6-2: 2005
Test set-up	:	IEC 61000-4-3: 2006
Frequency range	:	80 MHz - 2700 MHz
Field strength level	:	10 V _{rms} /m (selected without modulation, applied with modulation)
Modulation	:	1 kHz, modulation depth 80%
Performance criterion	:	A

Result of the tests concerning the susceptibility of the EUT1, EUT2 and EUT3 to radio-frequency electromagnetic fields (amplitude modulated, enclosure port)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance	

Utilized test equipment:

Inventory number	Description	Brand	Type
12441	Tripod	EMCO	TR3
12520	Function generator	Tabor Electronics	8241
14051	Compact anechoic room	Euroshield/ Comtest	RFSD-F-100
14298	Amplifier 0.01 MHz-220 MHz	SPS/Comtech	SPS7010
14307	Amplifier 200 MHz-1000 MHz	SPS/Comtech	SPS8030
14351	Biconilog antenna 20 MHz-1100 MHz	EMCO	3143
15392	Signalgenerator 0.1 MHz-2048 MHz	Rohde & Schwarz	SMY02
99107	Turntable anechoic room + controller	Heinrich Deisel	HD050
13826	Amplifier 1-2 GHz/30W	MilMega	--
12484	Gainhorn	EMCO	3115

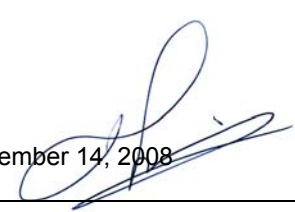


Photo 6. Basic set-up during radiated immunity tests) for EN 61000-6-2 requirements: EUT 1 (example set-up for all models)

4.2.1.2 Electrostatic discharge.

The susceptibility of the EUT to electrostatic discharges has been tested in conformity with- and according to the criteria as stated below. Tested in mode 1.

Basic standard : EN 61000-6-2: 2005
 Test set-up : IEC 61000-4-2: 2001
 Test levels : ±8 kV air discharge
 : ±6 kV contact discharge
 Performance criterion : B

Result of the tests concerning the susceptibility of EUT1, EUT2 and EUT3 to electrostatic discharges (enclosure port)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance	

Utilized test equipment:

Inventory number	Description	Brand	Type
99002	ESD simulator system	Schaffner	NSG 435-01
99660+99661	Resistor 470K	Philips	-
99604	ESD validation unit	TUV	-


4.3 DC input and DC output power ports.

4.3.1 EN 61000-6-2:2005 requirements.

4.3.1.1 Radio-frequency (common mode). Amplitude modulated.

The susceptibility of the EUT to radio-frequency (common mode), amplitude modulated, has been tested in conformity with- and according to the criteria as stated below. Tested in mode 1 and at port 1.

Basic standard	:	EN 61000-6-2: 2005
Test set-up	:	IEC 61000-4-6: 2003
Frequency range	:	0.15 MHz - 80 MHz
Test level	:	10 V _{rms} (selected without modulation, applied with modulation)
Modulation	:	1 kHz, modulation depth 80%
Source impedance	:	150 Ohms
Performance criterion	:	A

Result of the tests concerning the susceptibility of EUT1, EUT2 and EUT3 (common mode, amplitude modulated, DC input and DC output power ports)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance.	

Utilized test equipment:

Inventory number	Description	Brand	Type
15690	Signal generator 0.1 MHz - 1000 MHz	Rohde & Schwarz	SMG
15627	Amplifier 10 kHz - 250 MHz, 75 Watts	Amplifier Research	75A250
99039	Attenuator 6 dB	Trilithic	HFP-560/6-NM/NF
99138	RF injection clamp	Lüthi	EM101
99393	Power meter	Rohde & Schwarz	NRVD
99395	Power sensor, 2 mV - 100 V	Rohde & Schwarz	URV5-Z4
59601/x	CDN coupling devices	Air Parts	Mx
-	Test software conducted immunity	Rohde & Schwarz	ES-K1
-	Personal computer + monitor	Hewlett-Packard	HP Vectra VE 5/75




Photo 7. Basic set-up Conducted Immunity on DC input line of EUT1, EUT2 and EUT 3 (EUT2 as example).

4.3.1.2 Surges.

The susceptibility of the EUT to surges has been tested in conformity with- and according to the criteria as stated below.

Basic standard	:	EN 61000-6-2: 2005
Test set-up	:	IEC 61000-4-5: 2005
Test level 1	:	±2 kV (Power to earth)
Test level 2	:	±1 kV (between powerlines)
Tr/Th	:	1.2/50 (8/20) µs
Number of pulses	:	1 minute: 5 pulses per minute
Performance criterion	:	B

Result of the tests concerning the susceptibility of EUT1, EUT2 and EUT3 to surges (DC input and DC output power ports)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2 AND EUT3
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance.	


Utilized test equipment:

Inventory number	Description	Brand	Type
15108	Surge simulator syst. mainframe 25A	Schaffner	NSG 2050
15111	Pulse network 1.2/50 µs 6.6 kV 3.3 kA	Schaffner	PNW 2050
99004	3-phase coupling network 25A	Schaffner	CDN 133
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99008	Blind cover	Schaffner	-
99010	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99029	Software control package	Schaffner	WIN 2050

4.3.2 Fast transients (common mode).

The susceptibility of the EUT to fast transients (common mode) to be tested in conformity with- and according to the criteria as stated below. Tested in mode 1 and at Port 1.

Basic standard : EN 6060101-2: 2007, EN 61000-6-2: 2005 and EN 55014-2: 1997
 Test set-up : IEC 61000-4-4: 2004
 Test level : ± 2 kV
 Tr/Th : 5/50 ns
 Repetition frequency : 5 kHz
 Number of pulses/time : 1 minute for each of positive and negative pulses
 Performance criterion : B

Result of the tests concerning the susceptibility of EUT1, EUT2 and EUT3 to fast transients (common mode, DC input and DC output power ports)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2 AND EUT3
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance.	

Utilized test equipment:

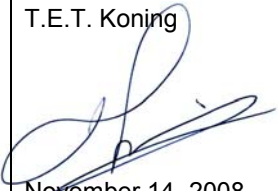
Inventory number	Description	Brand	Type
15110	Three phase burst simulator system	Schaffner	NSG 2025-4
99001	IEC 1000-4-4 capacitive coupling clamp	Schaffner	CDN 126
99005	3-phase IEC 309 coupling adapter 32A	Schaffner	INA 250
99006	1-phase Schuko coupling adapter 16A	Schaffner	INA 252
99007	Blind cover	Schaffner	-
99014	Attenuator 30 dB for burst verification	Schaffner	INA 265
99015	Software control package	Schaffner	WIN 2025

4.3.3 ISO 7637-2:2004 requirements.

4.3.3.1 Radiated Immunity requirements.

The susceptibility of the EUT to radio-frequency electromagnetic fields has been tested in conformity with-and according to the criteria as stated below. Tested in mode 1.

Basic standard	:	Automotive Directive 2004/104/EC
Test set-up	:	Automotive Directive 2004/104/EC
Frequency range	:	20 MHz - 2000 MHz
Field strength level	:	25 V _{rms} /m (applied incl. modulation)
Modulation	:	1 kHz, modulation depth 80%
Performance criterion	:	A

Result of the tests concerning the susceptibility of the EUT1, EUT2 and EUT3 to radio-frequency electromagnetic fields (amplitude modulated, enclosure port)	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer: T.E.T. Koning Signature:  Date: November 14, 2008	
REMARKS: During and after testing no loss of performance	

Utilized test equipment:

Inventory number	Description	Brand	Type
12441	Tripod	EMCO	TR3
12520	Function generator	Tabor Electronics	8241
14051	Compact anechoic room	Euroshield/ Comtest	RFSD-F-100
14298	Amplifier 0.01 MHz-220 MHz	SPS/Comtech	SPS7010
14307	Amplifier 200 MHz-1000 MHz	SPS/Comtech	SPS8030
14351	Biconilog antenna 20 MHz-1100 MHz	EMCO	3143
15392	Signalgenerator 0.1 MHz-2048 MHz	Rohde & Schwarz	SMY02
99107	Turntable anechoic room + controller	Heinrich Deisel	HD050
13826	Amplifier 1-2 GHz/30W	MilMega	--
12484	Gainhorn	EMCO	3115

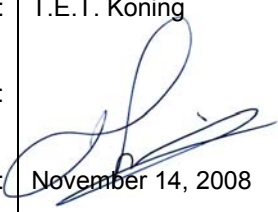


Photo 8. Basic set-up radiated Immunity of EUT1, EUT2, EUT 3 and EUT 4 (EUT2 as example).

4.3.3.2 Pulse shaped disturbances.

The susceptibility of the EUT to radio-frequency electromagnetic fields to be tested in conformity with-and according to the criteria as stated below. Tested in mode 1 and on port 1

Basic Directive : Directive 2004/104/EC
Test set-up : ISO 7637-2:2004, paragraph 4.4 of the ISO document
Performance criterion : See § 3.1. of this report

Result of the tests concerning the susceptibility of the EUT1, EUT2 and EUT3 to pulse shaped immunity on DC ports	PASS / FAIL / NOT APPLICABLE FOR EUT1, EUT2, EUT3 AND EUT4
Name of test engineer:	T.E.T. Koning
Signature:	
Date:	November 14, 2008
REMARKS: During and after testing no loss of performance.	

Utilized test equipment:

Inventory number	Description	Brand	Type
12513	LISN	EMCO	3625/2 LISN
80002/80004/80003	Automotive Generator modified with 99611	Schaffner	NSG500B, 506C
99611	TNO modification to 80002/80004/80003	TNO EPS	---
15232	Scope	Tektronix	TDS220

4.3.3.2.1 ISO 7637-2:2004, pulse 1, level III.

Pulse polarity: negative
Pulse level -450 V , $R_i=50\Omega$
Pulse illumination time: 5000 pulses with 0,5 s steps between pulses

4.3.3.2.2 ISO 7637-2:2004, pulse 2a, level III.

Pulse polarity: positive
Pulse level $+37\text{ V}$, $R_i=2\Omega$
Pulse illumination time: 5000 pulses with 0,5 s steps between pulses

4.3.3.2.3 ISO 7637-2:2004, pulse 2b, level III.

Pulse polarity: positive
Pulse level $U_s + 20\text{ V}$, $R_i=0\dots0,05\Omega$, $t_d = 2\text{ s}$
Pulse illumination time: 10 pulses

4.3.3.2.4 ISO 7637-2:2004, pulse 3a, level III.

Pulse polarity: negative
Pulse level -200 V , $R_i=50\Omega$
Pulse illumination time: 1 hour

4.3.3.2.5 ISO 7637-2:2004, pulse 3b, level III.

Pulse polarity: negative
Pulse level $+200\text{ V}$, $R_i=50\Omega$
Pulse illumination time: 1 hour

5 Conclusion.

The Microprocessor Controlled Battery Separators, brand ARFT, models BS100, BS140, BSW160 and BS250 comply with the EMC requirements of standard EN61000-6-2:2005, Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments, EN61000-6-3:2007, Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments in the configuration and operation mode(s) as stated and tested in this test report.

COMMISSION DIRECTIVE 2004/104/EC of 14 October 2004 adapting to technical progress Council Directive 72/245/EEC relating to the radio interference (electromagnetic compatibility) of vehicles and amending Directive 70/156/EEC on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers in the configuration and operation mode(s) as stated and tested in this test report.