



Test Report: Electromagnetic Compatibility – ESA

Legislation

UNECE Regulation 10.05

Test Details

Location of Test: INTEK SpA - 25086 Rezzato (BS) - Italy
Date of Test: 27 January 2015
VCA Representative(s): Francesco Barbierato
Manufacturer's Representative(s): Maksym Dmukhovskyy; Lorenzo Thione
Reason for Test Report: New approval

Manufacturer Details

Name and Address: iO-ENERGIES AG
Grenzstrasse 1a 6214 Schenkon (LU) - Switzerland
Type: family EQOPET
Commercial Description: Electromagnetic device for fuel saving, reduction of emission and increasing engine power
Category: ESA for L and M vehicle categories

Conclusion

The above mentioned component was tested in accordance with the above mentioned legislation and was found to comply in all respects.

Signature: *not signed because DRAFT version*

Name: Francesco Barbierato
Position: Type Approval Engineer
Date: 27 January 2015

List of Annexes

Annex	No of Pages	Subject
I	5	Broad-band EMI radiated test – Horizontal polarization
II	5	Broad-band EMI radiated test – Vertical polarization
III	6	ISO 7637-2 test results
IV	2	Photos of the component
V	3	Photos of test set-up



Worst Case Rationale

Regarding the component object of this Homologation we consider not influent any dimensional characteristics of the variants and we assume that the tested model **L 2-3 S** is considered as representative of the family under the EMC point of view.
The variants are different for dimensions, all other constructive particulars (material used and the proportional factor for the internal parts) are the same.

Tests Required

	Yes, NA, See Report ... / Approval ... / Annex ...
Narrowband Emissions:	NA
Broadband Emissions:	Yes, with Annex 8
Radiated Immunity:	NA, accordingly <i>to par 6.10.3.:</i> <i>“ESAs with no immunity related functions need not be tested for immunity to radiated disturbances and shall be deemed to comply with paragraph 6.7. and with Annex 9 to this Regulation”</i>
Transient Immunity:	Yes, accordingly with Annex 10
Conducted Transient Emissions:	Yes, accordingly with Annex 10

Component Specification

See enclosed “Component list” description for each part of the component and its associated material.
All documents presented for the Information Folder are considered issued on 27/01/2015 if not present a different date.

Manufacturer’s Documentation

Manufacturer’s documentation is complete and reflects the agreed specification for the component tested and covers all variants and versions agreed in the worst case rationale.

Yes

Facility and Equipment Checks

Calibration certificates checked and valid, recorded in the following table:

Yes

Equipment	Serial / Certificate No.	Calibration due*
<i>see Facility appraisal</i>		

*Specify calibrated date + (interval) or calibration due date.



Test Requirements		Complies Yes / NA
Approval		
R10, 4.2.2.	Manufacturer's documentation is complete.	Yes
R10, 4.2.2.1.	ESA corresponds to that agreed in worst-case meeting.	Yes
Radiated Emissions		
R10, Ann 1	Measuring equipment complies with CISPR 16-1-4 (2010).	Yes
	Types and calibration date:	
	Full Anechoic chamber SIDT, ref. ID 0309P 2011/01 (with due date 2015/01)	
Test Location		
	Test performed in:	ALSE
R10, Ann 7, 3.1.	- A.L.S.E (Absorber-lined Shielded Enclosure)*	
R10, Ann 7, 3.3.	- O.A.T.S (Open Area Test Site*)	
	<i>*Strike-through, as appropriate.</i>	
R10, Ann 7, 3.3.	O.A.T.S level is a clear area, free from electromagnetic reflecting surfaces, within a circle of 15 m minimum radius.	NA
R10, Ann 7, 3.3.	Measuring equipment is outside 15 m minimum radius circle.	NA
R10, Ann 7, 3.4.	Ambient noise at least 6 dB below reference limits in either case.	Yes
Test Arrangements		
CISPR25, 4.4.2.	EUT and antenna are greater than 2 m from the walls and ceiling, and 1 m from the nearest absorber material.	Yes
CISPR25, 6.1.1.	Ground plane is 900 ± 50 mm high and made from 0.5 mm thick copper, brass or galvanised steel .	Yes
CISPR25, 6.1.1.	Ground plane is at least 2000 mm length x 1000 mm width.	Yes
CISPR25, 6.4.2.3.	ESA and harness are supported at 50 ± 5 mm above the ground plane on low relative permittivity material.	Yes
CISPR25, 6.4.2.3.	Face of the ESA is within 200 mm ± 10 mm from the edge of the ground plane.	Yes
CISPR25, 6.4.2.4.	Length of test harness, parallel to the front of the ground plane, is 1500 ± 75 mm and does not exceed 2000 mm.	Yes
CISPR25, 6.4.2.4.	Long segment of test harness is located parallel to the edge of the ground plane, facing the antenna at a distance of 100 ± 10 mm from	Yes



	the edge.	<input type="checkbox"/>
CISPR25, 6.1.2.	Artificial Network (AN) is rated at 50Ω/5μH.	<input type="checkbox"/> Yes
	EUT is:	<input type="checkbox"/> Yes
CISPR25, 6.1.2.	- Remotely grounded (vehicle power return line longer than 200 mm): two artificial networks are required, one for the positive supply line and one for the power return line*; - Locally grounded (vehicle power return line 200 mm or shorter): one artificial network is required for the positive supply*. <i>Strike-through, as appropriate.</i>	
	Case of the ESA is:	<input type="checkbox"/> Yes
CISPR25, 6.1.2.	- Grounded, simulating actual vehicle configuration*; - Not grounded, simulating actual vehicle configuration*. <i>Strike-through, as appropriate.</i>	
CISPR25, 6.1.2.	AN is electrically bonded to the ground plane.	<input type="checkbox"/> Yes
Antenna		
Types and calibration date:		
<input type="checkbox"/> Bi-Log periodic antenna		
CISPR25, 6.4.2.6.	Height of the phase centre is 100 ± 10 mm above the ground plane.	<input type="checkbox"/> Yes
CISPR25, 6.4.2.6.	No part of any antenna radiating element is closer than 250 mm to the floor.	<input type="checkbox"/> Yes
CISPR25, 6.4.2.6.	Radiating elements of the measuring antenna are not closer than 1000 mm to any absorber material, except that used on the floor, and are not closer than 2000 mm to the walls or ceiling of the shielded enclosure.	<input type="checkbox"/> Yes
CISPR25, 6.4.2.6.	Phase centre (for biconical) or tip (for log-periodic) is 1000 ± 50 mm from the harness.	<input type="checkbox"/> Bi-Log, Phase center
CISPR25, 6.4.2.6.	Antenna calibrated for this distance to correct measuring point (phase centre or tip).	<input type="checkbox"/> Yes
CISPR25, 6.4.2.6.	Phase centre of the antenna is in line with the centre of the longitudinal part of the wiring harness.	<input type="checkbox"/> Yes
R10, Ann 7, Ann 8, 4.3.	Pre-test sweep supplied to show compliance throughout frequency range 30 to 1000 MHz.	<input type="checkbox"/> Yes
R10, Ann 7, Ann 8, 4.3.	Test frequencies chosen from pre-test data.	<input type="checkbox"/> Yes

Narrowband Test Results



R10, Ann 8, 2. Operational mode of ESA:
As in Normal use, powered at 13,75V. Gasoline flux 2,5 l/min

R10, Ann 8, 2. Detector used and bandwidth:
Average, 120 kHz

R10, 6.6.2. ESA meets narrowband emissions limits, with both vertical and horizontal polarisations. Yes

Broadband Test Results

R10, Ann 7, 2. Operational mode of ESA:
As in Normal use, powered at 13,75V. Gasoline flux 2,5 l/min

R10, Ann 7, 2. Detector used and bandwidth:
MaxPeak and Quasi-Peak, 120 kHz

R10, 6.5.2. ESA meets broadband emissions limits, with both vertical and horizontal polarisations. Yes

Radiated Immunity

Test Method (s) used and Frequency Range(s)

ISO11452-4	BCI frequency range: (Allowable: 20-400 MHz)	NA	MHz	NA
ISO11452-2	Free field frequency range: (Allowable: 80-2000 MHz)	NA	MHz	NA
ISO11452-3	TEM cell frequency range: (Allowable: 20-200 MHz)	NA	MHz	NA
ISO11452-5	150 mm stripline frequency range: (Allowable: 20-400 MHz)	NA	MHz	NA
	800 mm stripline frequency range: (Allowable: 20-2000 MHz)	NA	MHz	NA

Maximum frequency step sizes do not exceed:

Frequency band (MHz)	Linear steps (MHz)	Log steps %	Actual steps used	
20-200	5	5	---	NA
200-400	10	5	---	NA
400-1000	20	2	---	NA
1000-2000	40	2	---	NA

Test Arrangements (General)

R10, Ann 9, 2.2. Operational mode of ESA:

R10, Ann 9, 2.3. Extraneous equipment in place during calibration. NA



R10, Ann 9, 2.4.	Test equipment used is the same as for calibration.	NA
R10, Ann 9, 2.5.	Loads and actuators are as realistic as possible.	NA
R10, Ann 9, 2.5.	Case of ESA is: - Grounded, simulating actual vehicle configuration* - Not grounded, simulating actual vehicle configuration* <i>*Strike-through, as appropriate.</i>	NA
R10, Ann 9, 3.1.	Test frequency range is 20-2000 MHz.	NA
R10, Ann 9, 3.1.	Test signal is R.F. sine wave amplitude, modulated by a 1 kHz sine wave at a modulation depth of 0.8 ± 0.04 in the 20-800 MHz band and pulse modulation (time on 577 μ s, period 4600 μ s) in the 800-2000 MHz band.	NA
R10, 6.8.2.1.	Pre-test sweep supplied to show compliance throughout frequency range 20-2000 MHz.	NA
R10, Ann 9, 3.2.	Test frequencies chosen from pre-test data.	NA
R10, 6.8.2.2.	No degradation of immunity related functions during the tests.	NA

BCI Immunity

Calibration date:

ISO11452-4, 5. Shielded area used:

Comments:

ISO11452-4, 8.3.2.1.	Forward power used to achieve specified current.	NA
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Installation of ESA under Test

R10, Ann 9, 4.3.2.	Current probe located 150 ± 10 mm from ESA connectors.	NA
R10, Ann 9, 4.3.2.	ESA installed: - In a vehicle, as per ISO 11451-4* - On a ground plane, as per ISO 11452-4* <i>*Strike-through, as appropriate.</i>	NA
ISO11452-4, 7.1.	Ground plane is made from at least 0.5 mm thick copper, brass or galvanised steel.	NA
ISO11452-4, 7.1.	Minimum width of the ground plane is 1000 mm and the minimum length is 1500 mm, or length of the entire underneath of equipment	NA



	plus 200 mm, whichever is greater.	
ISO11452-4, 7.1.	Height of the ground plane is 900 ± 100 mm.	NA
ISO11452-4, 7.1.	Ground plane is bonded to the shielded enclosure, with the straps at a distance no greater than 300 mm apart.	NA
ISO11452-4, 7.2.	<p>- ESA remotely grounded (vehicle power return line longer than 200 mm): two artificial networks are required, one for the positive supply line and one for the power return line)*</p> <p>- ESA locally grounded (vehicle power return line 200 mm or shorter): one artificial network is required, for the positive supply*</p> <p>*Strike-through, as appropriate.</p>	
ISO11452-4, 7.2.	Power supply is Artificial Network (AN) rated at $50 \Omega/5 \mu\text{H}$.	NA
ISO11452-4, 7.3.	ESA and harness supported 50 ± 5 mm above ground plane, on low relative permittivity material.	NA
ISO11452-4, 7.3.	Face of the ESA within 100 mm from the edge of the ground plane.	NA
ISO11452-4, 7.3.	There is a distance of at least 500 mm between ESA and any metal parts, such as the walls of the shielded enclosure (exception is ground plane).	NA
ISO11452-4, 7.4.	Length of test harness is 1000 ± 100 mm, unless specified.	NA
	Actual wiring harness length: <input type="text" value="---"/> m	NA

BCI Test Results

R10, 6.8.2.1.	No malfunction at 60 mA or below. Comments: <input type="text" value="---"/>	NA
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Free Field Immunity

	Calibration date: <input type="text" value="---"/>	
ISO11452-2, 5.	Semi-anechoic chamber used: <input type="text" value="---"/>	
ISO11452-2, 8.3.1.	<p>- Forward power used to define test field*</p> <p>- Another parameter, directly related*</p> <p>*Strike-through, as appropriate.</p>	
ISO11452-2, 8.3.2.	The antenna is at a distance of 1000 ± 10 mm from the reference point.	NA
ISO11452-2, 8.3.2.	The reference point is 150 ± 10 mm above the ground plane.	NA



ISO11452-2, 8.3.2.	The reference point is 100 ± 10 mm from the edge of the ground plane.	NA
ISO11452-2, 8.3.2.	For frequencies from 80-1000 MHz, the reference point is in the centre of the harness.	NA
ISO11452-2, 8.3.2.	For frequencies from 1000-2000 MHz, the reference point is in line with the ESA.	NA
Test Arrangements		
ISO11452-2, 7.1.	Ground plane is made from at least 0.5 mm thick copper, brass or galvanised steel.	NA
ISO11452-2, 7.1.	Minimum width of the ground plane is 1000 mm and the minimum length is 2000 mm.	NA
ISO11452-2, 7.1.	Height of the ground plane is 900 ± 100 mm.	NA
ISO11452-2, 7.1.	Bonding straps at a distance no greater than 300 mm apart.	NA
ISO11452-2, 7.2.	Power supply is Artificial Network (AN) rated at $50 \Omega/5 \mu\text{H}$.	NA
ISO11452-2, 7.2.	- ESA remotely grounded (vehicle power return line longer than 200 mm): two artificial networks are required, one for the positive supply line and one for the power return line)* - ESA locally grounded (vehicle power return line 200 mm or shorter): one artificial network is required, for the positive supply* *Strike-through, as appropriate.	
ISO11452-2, 7.3.	AN mounted directly on the ground plane and cases bonded to the ground plane.	NA
ISO11452-2, 7.3.	ESA and harness supported 50 ± 5 mm above table, on low relative permittivity material.	NA
ISO11452-2, 7.3.	Face of the ESA located 200 ± 10 mm from the edge of the ground plane.	NA
ISO11452-2, 7.4.	Test harness parallel to the front edge of the ground plane.	NA
ISO11452-2, 7.4.	Total length of harness does not exceed 2000 mm.	NA
ISO11452-2, 7.4.	Actual wiring harness length: <input type="text" value="---"/> m	NA
ISO11452-2, 7.4.	OR Length is 1500 ± 75 mm between ECU and AN.	NA
ISO11452-2, 7.4.	Harness is at a distance of 100 ± 10 mm from the edge of the ground plane.	NA
ISO11452-2, Fig 1	Front face of ESA is at least 1.0 m from all other conductive	NA



structures.

[NA]

ISO11452-2, Fig 1 ESA harness is at least 2.0 m forward from the chamber wall.

[NA]

Antenna Type(s) and Frequency Range(s)

R10, Ann 9, 4.1.2. Antenna is vertically polarised.

[NA]

ISO11452-2, 7.6. Antenna is in the same position as the calibration.

[NA]

ISO11452-2, 7.6. Phase centre is 100 ± 10 mm above the ground plane.

[NA]

ISO11452-2, 7.6. Antenna elements are no closer than 250 mm to the floor of the facility, no closer than 0.5 m to any radio absorbent material, and no closer than 1.5 m to the wall of the facility.

[NA]

ISO11452-2, 7.6. Distance between wiring harness and antenna is 1000 mm ± 10 mm, measured from the phase-centre of the biconical antenna, or the nearest part of the log-periodic and horn antennas.

[NA]

R10, Ann 9, 3.1. Test signal modulation is:
 AM, 1 kHz modulation, 80% depth in 20-800 MHz frequency range;
 PM, Ton 577 µs, period 4,600 µs in 800-2,000 MHz frequency range.

[NA]
 [NA]

Free Field Immunity Test Results

R10, 6.8.2. No malfunction at 25 V/m or below.
 Comments:

[NA]

150 mm Stripline Immunity

Calibration date:

ISO11452-5, 5.3.1. Stripline housed in a shielded room.

[NA]

ISO11452-5, 6.2.2. - Forward power used to define test field*
 - Another parameter, directly related*
 *Strike-through, as appropriate.

ISO11452-5, 6.2.3. Field probe in the centre of stripline.

[NA]

Installation of ESA under Test

ISO11452-5, 5.3.1. ESA is 200 + 20 – 0 mm from the edge of the active conductor.

[NA]

ISO11452-5, 5.3.1. Peripherals minimum 200 mm from the edge of the active conductor.

[NA]

ISO11452-5. Harness supported 50 mm above the ground plane and is placed in

[NA]



5.3.1.	the centre of the stripline.	
ISO11452-5, 5.3.1.	Actual wiring harness length: <input type="text" value="---"/> m OR Minimum length under stripline is 1000 mm.	NA
ISO11452-5, 5.3.1.	All wires in the harness are terminated or open, according to the vehicle application.	NA
ISO11452-5, 5.3.1.	Device and peripherals connected to the ground plane, as specified by the vehicle installation.	NA
ISO11452-5, 5.3.1.	Power supply is Artificial Network (AN) rated at 50Ω/5μH.	NA

ISO11452-5,
5.3.1.

- ESA remotely grounded (vehicle power return line longer than 200 mm): two artificial networks are required, one for the positive supply line and one for the power return line)*.
 - ESA locally grounded (vehicle power return line 200 mm or shorter): one artificial network is required, for the positive supply*.
 *Strike-through, as appropriate.

150 mm Stripline Test Results

R10, 6.8.2.	No malfunction at 50 V/m or below. Comments: <input type="text" value="---"/>	NA
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800 mm Stripline Immunity

Calibration date:

R10, Ann 9, 4.5.2.1.	Stripline housed in a screened room.	NA
R10, Ann 9, 4.5.2.1.	Stripline positioned a minimum of 2000 mm from the walls or metallic enclosure.	NA
R10, Ann 9, 4.5.2.1.	Stripline placed on non-conducting supports at least 400 mm above the floor.	NA
R10, Ann 9, 4.5.2.2.	Field probe positioned within the central one-third of the longitudinal, vertical and transverse dimensions of the space between the parallel plates, with the system under test absent.	NA
R10, Ann 9, 4.5.2.2.	- Forward power used to define test field*. - Another parameter, directly related*. *Strike-through, as appropriate.	

Installation of ESA under Test

R10, Ann 9,	ESA is within the central one-third of the stripline.	NA
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4.5.2.3.		
R10, Ann 9, 4.5.2.3.	ESA is supported on non-conducting material.	NA
R10, Ann 9, 4.5.2.4.	Wiring loom is arranged as per Appendix 1, Figure 3.	NA
R10, Ann 9, 4.5.2.4.	Associated equipment is a minimum of 1000 mm from stripline.	NA

800 mm Stripline Test Results

Frequency suggested (MHz)	Frequency (MHz)	Forward power		Output level		Field strength (V/m)
		Cal. (w)	Test (w)	Cal. (dBm)	Test (dBm)	
---	---	---	---	---	---	---
---	---	---	---	---	---	---

R10, 6.8.2.	No malfunction at 12.5 V/m or below. Comments: ---	NA
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Transient Testing

Case of ESA is grounded simulating actual vehicle configuration*.
 Case of ESA is not grounded simulating actual vehicle configuration*.
 *Strike-through, as appropriate.

Transient Immunity

R10, 6.9.1.	Test setup according to ISO 7637-2 (second edition 2004).	Yes
R10, Ann 10, 2.	Supply lines and other lines, which may be connected to supply lines, are tested.	Yes
	Test voltage and time parameters within allowed envelopes.	Yes
	Test pulses and duration according to the following:	Yes

Test pulse	Immunity test level	Functional status for systems		Test duration	
		Related to immunity-related functions	Not related to immunity-related functions		
1	III	C	D	5000 pulses	Yes
2a	III	B	D	5000 pulses	Yes
2b	III	C	D	10 pulses	Yes
3a	III	A	D	1 hour	Yes
3b	III	A	D	1 hour	Yes
4	III	B (for ESA which must be operational during engine start), or C (for other ESA)	D	1 pulse	Yes



ESA operational after the tests, according to the above classification. Yes

Emission of Conducted Disturbances

R10, 6.9.1. Test setup according to ISO 7637-2. Yes

R10, Ann 10, 3. Supply lines and other lines, which may be connected to supply lines, are tested.
Comments:

12V Supply lines only

Slow pulses and fast pulses tested on both powering up and powering down. Yes

Polarity of pulse amplitude	Maximum allowed pulse amplitude for:		
	Vehicles with 12 V systems	Vehicles with 24 V system	
Positive	+ 75 V	+ 150 V	Yes
Negative	- 100 V	- 450 V	Yes

Remarks

The test results presented in this Test Report have not any correlation with performance of the device during a normal use. This Test Report analyse only the electromagnetic compatibility characteristic of the ESA.

Note: VCA apply measurement uncertainty to calibrated items but not test results.



Job Number ref.	MSQxxxxx
Manufacturer's Name	iO-ENERGIES AG
Manufacturer's Address	Grenzstrasse 1a 6214 Schenkon (LU) - Switzerland
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

Broad-Band EMI radiated test Horizontal polarization

Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power
Tested Model L 2-3 S
Powered during the radiated test at +13.5 V DC

Operating condition during the test:

Device operates as normal use condition:

- continuous fuel catalyst function; gasoline flux 2,5 l/min

Horizontal polarization,
file name 15_0039_fh_a

Noise

file name 15_0039_fh_b

Component

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EUT Information

Description:

EUT name: EQOPET
 Manufacturer: IO-ENERGIES
 Serial / Sample number: Sample n.1

Test specification: ECE R10-05
 Test site: Fully anechoic chamber
 Transducer: BiLog antenna - Horizontal at 1 m

Port under test: Enclosure
 Power supply: 13,7 Vdc
 Operating conditions: Noise floor

Remarks: --

EMI Auto Test Template: ECE R10 rev5 BB QP

Hardware Setup: Electric Field Strength 30-1000 MHz
 Measurement Type: Open-Area-Test-Site
 Frequency Range: 30 MHz - 1 GHz
 Graphics Level Range: 0 dB μ V/m - 100 dB μ V/m

Preview Measurements:

Scan Test Template: Automotive Components pre BB

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak; Average	120 kHz	0,01 s	ESU 26 [ESU 26]

Data Reduction:

Limit Line #1: ECE R10-05 ESA BB QP
 Limit Line #2: ECE R10-05 ESA BB QP
 Peak Search: 6 dB , Maximum Results: 10
 Subrange Maxima: 10 Subranges , Maxima per Subrange: 10
 Acceptance Offset: -10 dB
 Maximum Number of Results: 100

Maximization Measurements:

Template for Single Meas.: Automotive Components pre BB

Final Measurements:

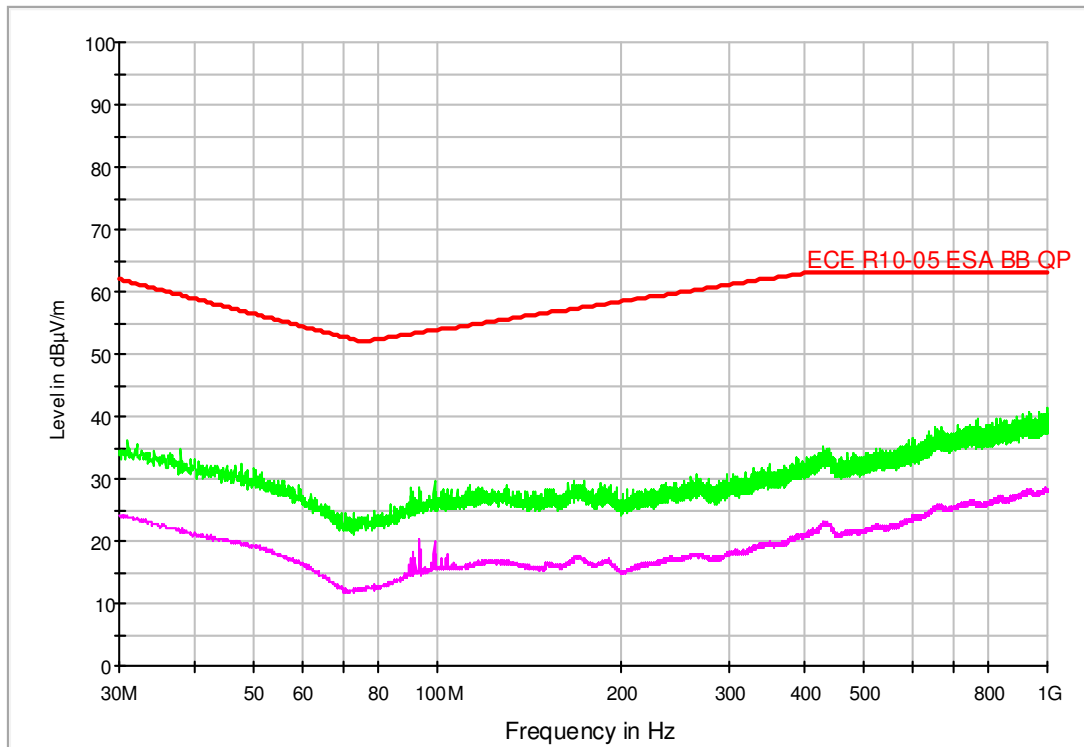
Template for Single Meas.: Automotive Components fin BB QP

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESU 26 [ESU 26]

Report Settings:

Report Template: EMC Test Report

ECE R10 rev5 BB QP



— ECE R10-05 ESA BB QP.LimitLine

— Preview Result 1

— Preview Result 2

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EUT Information

Description:

EUT name: EQOPET
 Manufacturer: IO-ENERGIES
 Serial / Sample number: Sample n.1

Test specification: ECE R10-05
 Test site: Fully anechoic chamber
 Transducer: BiLog antenna - Horizontal at 1 m

Port under test: Enclosure
 Power supply: 13,7 Vdc
 Operating conditions: Operate

Remarks: --

EMI Auto Test Template: ECE R10 rev5 BB QP

Hardware Setup: Electric Field Strength 30-1000 MHz
 Measurement Type: Open-Area-Test-Site
 Frequency Range: 30 MHz - 1 GHz
 Graphics Level Range: 0 dB μ V/m - 100 dB μ V/m

Preview Measurements:

Scan Test Template: Automotive Components pre BB

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak; Average	120 kHz	0,01 s	ESU 26 [ESU 26]

Data Reduction:

Limit Line #1: ECE R10-05 ESA BB QP
 Limit Line #2: ECE R10-05 ESA BB QP
 Peak Search: 6 dB , Maximum Results: 10
 Subrange Maxima: 10 Subranges , Maxima per Subrange: 10
 Acceptance Offset: -10 dB
 Maximum Number of Results: 100

Maximization Measurements:

Template for Single Meas.: Automotive Components pre BB

Final Measurements:

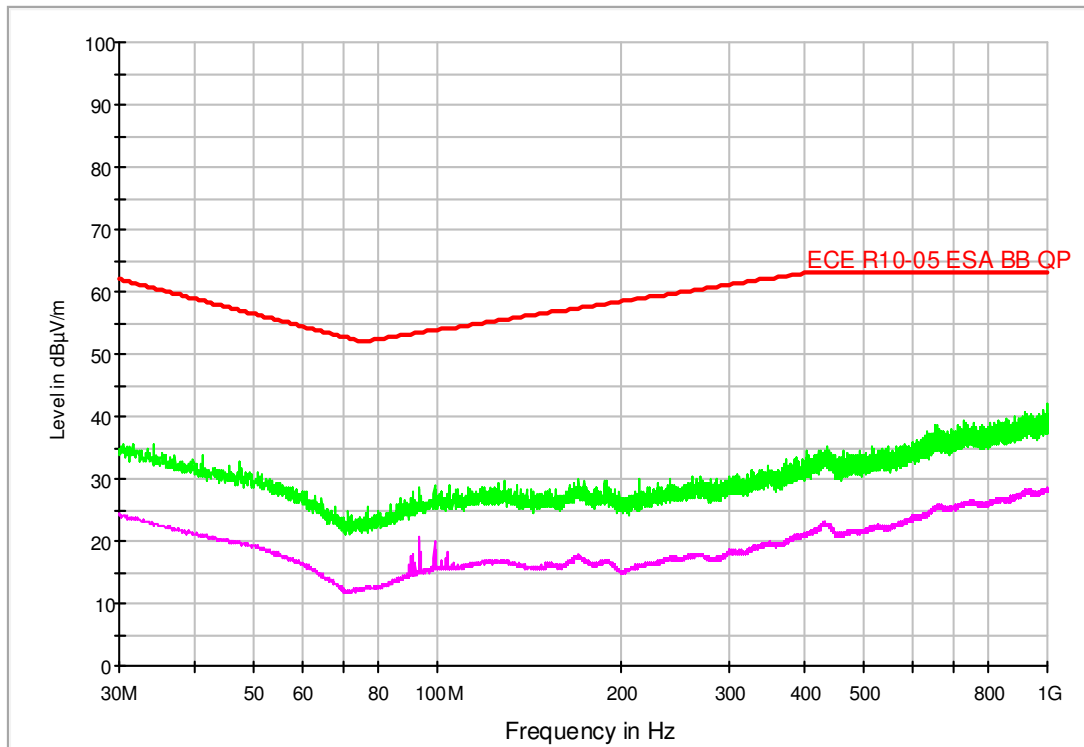
Template for Single Meas.: Automotive Components fin BB QP

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESU 26 [ESU 26]

Report Settings:

Report Template: EMC Test Report

ECE R10 rev5 BB QP



— ECE R10-05 ESA BB QP.LimitLine

— Preview Result 1

— Preview Result 2

Job Number ref.	MSQxxxxx
Manufacturer's Name	iO-ENERGIES AG
Manufacturer's Address	Grenzstrasse 1a 6214 Schenkon (LU) - Switzerland
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

Broad-Band EMI radiated test Vertical polarization

Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power
Tested Model L 2-3 S
Powered during the radiated test at +13.5 V DC

Operating condition during the test:

Device operates as normal use condition:

- continuous fuel catalyst function; gasoline flux 2,5 l/min

Vertical polarization,

file name 15_0039_fv_a Noise

file name 15_0039_fv_b Component

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EUT Information

Description:

EUT name: EQOPET
 Manufacturer: IO-ENERGIES
 Serial / Sample number: Sample n.1

Test specification: ECE R10-05
 Test site: Fully anechoic chamber
 Transducer: BiLog antenna - Vertical at 1 m

Port under test: Enclosure
 Power supply: 13,7 Vdc
 Operating conditions: Noise floor

Remarks: --

EMI Auto Test Template: ECE R10 rev5 BB QP

Hardware Setup: Electric Field Strength 30-1000 MHz
 Measurement Type: Open-Area-Test-Site
 Frequency Range: 30 MHz - 1 GHz
 Graphics Level Range: 0 dB μ V/m - 100 dB μ V/m

Preview Measurements:

Scan Test Template: Automotive Components pre BB

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak; Average	120 kHz	0,01 s	ESU 26 [ESU 26]

Data Reduction:

Limit Line #1: ECE R10-05 ESA BB QP
 Limit Line #2: ECE R10-05 ESA BB QP
 Peak Search: 6 dB , Maximum Results: 10
 Subrange Maxima: 10 Subranges , Maxima per Subrange: 10
 Acceptance Offset: -10 dB
 Maximum Number of Results: 100

Maximization Measurements:

Template for Single Meas.: Automotive Components pre BB

Final Measurements:

Template for Single Meas.: Automotive Components fin BB QP

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESU 26 [ESU 26]

Report Settings:

Report Template: EMC Test Report

ECE R10 rev5 BB QP



— ECE R10-05 ESA BB QP.LimitLine

— Preview Result 1

— Preview Result 2

INTEK S.p.A. - EMC Test Laboratory

EUT Information

Description:

EUT name: EQOPET
 Manufacturer: IO-ENERGIES
 Serial / Sample number: Sample n.1

Test specification: ECE R10-05
 Test site: Fully anechoic chamber
 Transducer: BiLog antenna - Vertical at 1 m

Port under test: Enclosure
 Power supply: 13,7 Vdc
 Operating conditions: Operate

Remarks: --

EMI Auto Test Template: ECE R10 rev5 BB QP

Hardware Setup: Electric Field Strength 30-1000 MHz
 Measurement Type: Open-Area-Test-Site
 Frequency Range: 30 MHz - 1 GHz
 Graphics Level Range: 0 dB μ V/m - 100 dB μ V/m

Preview Measurements:

Scan Test Template: Automotive Components pre BB

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	MaxPeak; Average	120 kHz	0,01 s	ESU 26 [ESU 26]

Data Reduction:

Limit Line #1: ECE R10-05 ESA BB QP
 Limit Line #2: ECE R10-05 ESA BB QP
 Peak Search: 6 dB , Maximum Results: 10
 Subrange Maxima: 10 Subranges , Maxima per Subrange: 10
 Acceptance Offset: -10 dB
 Maximum Number of Results: 100

Maximization Measurements:

Template for Single Meas.: Automotive Components pre BB

Final Measurements:

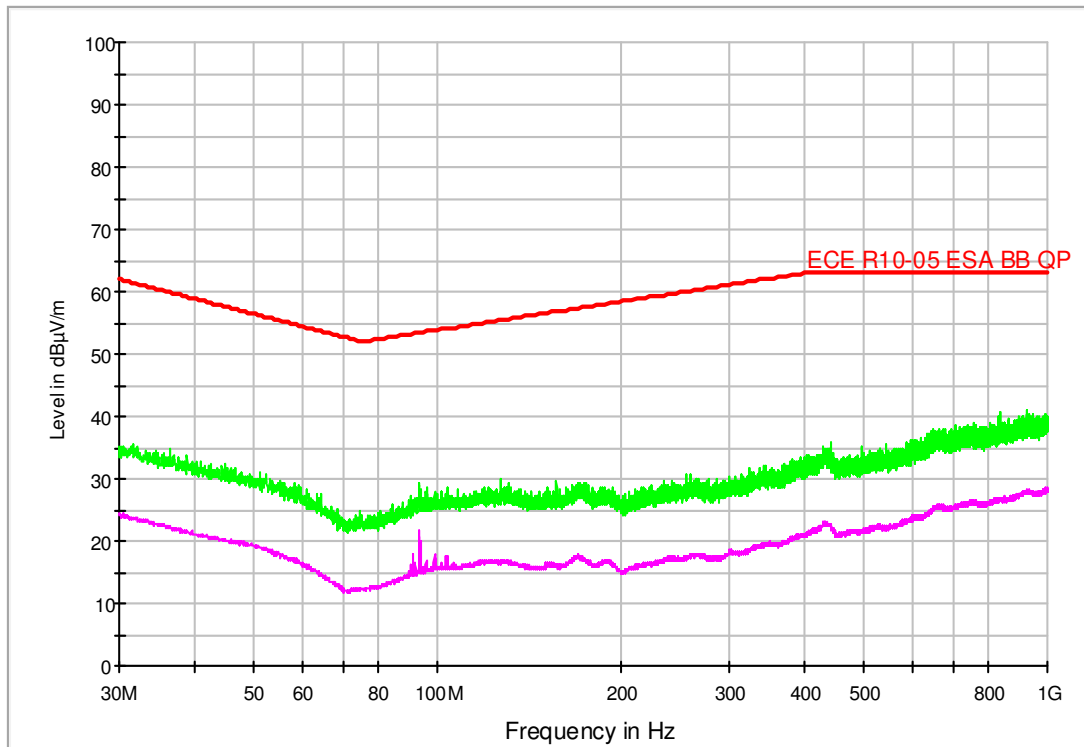
Template for Single Meas.: Automotive Components fin BB QP

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	1 s	ESU 26 [ESU 26]

Report Settings:

Report Template: EMC Test Report

ECE R10 rev5 BB QP



— ECE R10-05 ESA BB QP Limit Line — Preview Result 1 — Preview Result 2

Job Number ref.	MSQxxxxx
Manufacturer's Name	iO-ENERGIES AG
Manufacturer's Address	Grenzstrasse 1a 6214 Schenkon (LU) - Switzerland
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

- Date of test : 27-01-2015
- Ambient conditions during test : Tamb = 23.7 ± 2°C (allowed 23± 5°C)
Hr = 20.8 ± 10% (not def. by ECE)
- Tested by the method(s)
according to : ISO 7637-2 (2004)
- Operating conditions during test : (#1) ESA operates as normal condition
in a simulated installation; checked the
maintaining of the ionizing parameters
through monitoring status via a
multimeter.

§6.9. of the ECE-R10/05

Specifications concerning the immunity of ESAs to transient disturbances
conducted along supply lines.

Measuring records at 12V

Power supply	Operat. Cond.	Tested Pulse	Test Level	Voltage Level	No. pulses/ test time	Requirements / Limit	Test results
+13,5VDC	(#1)	1	III	-75V	5000	[D]	[B] passed
+13,5VDC	(#1)	2a	III	+37V	5000	[D]	[B] passed
+13,5VDC	(#1)	2b	III	+10V	10	[D]	[B] passed
+13,5VDC	(#1)	3a	III	-112V	1 h	[D]	[B] passed
+13,5VDC	(#1)	3b	III	+75V	1 h	[D]	[B] passed
Var.VDC	(#1)	4	III	-6V	1	[D]	[B] passed

- [A] All functions perform as designed during and after exposure to disturbance.
- [B] All functions perform as designed during exposure to disturbance.
All functions return automatically to within normal limits after exposure is removed.
- [C] All functions return automatically to within normal limits after exposure is removed.
- [D] All functions do not return automatically to within normal limits after exposure is removed
and the ESA is reset by simple "operator/use" action

Ionizing voltage characteristic through monitoring status via a multimeter:
FLUKE type 177 ref. INTEK ID 0737 P, cal. 2014-05-07 (due 1 year)

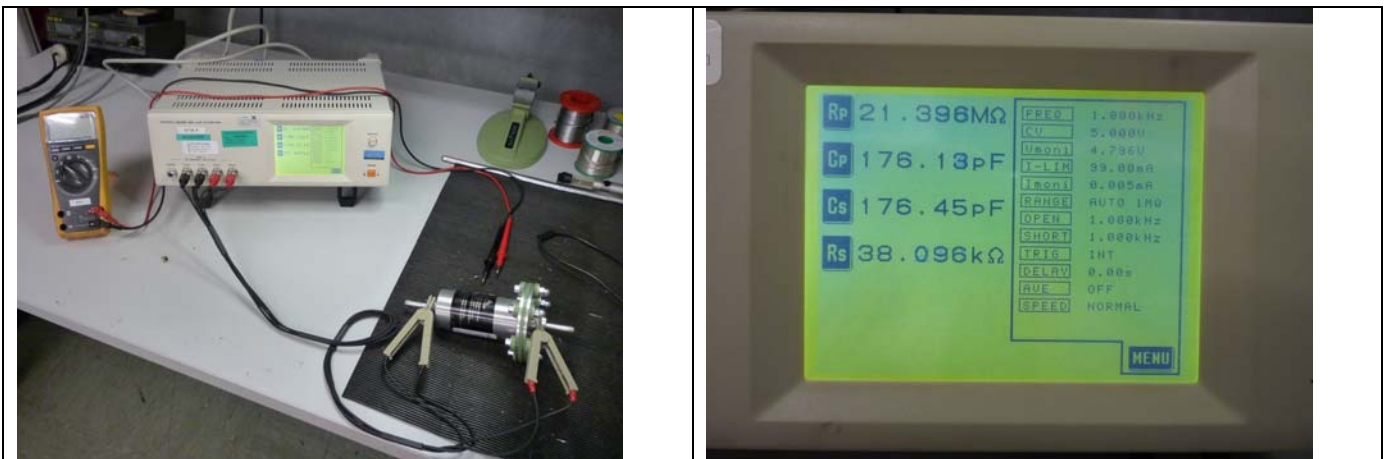
During these measures is present a gasoline flux at 2,5 l/min.
The component was not powered.

Ref. value before starting ISO pulse tests, measured between the supply terminals	166 mV
after Pulse 1	850 mV
after Pulse 2a	900 mV
after Pulse 2b	900 mV
after Pulse 3a	910 mV
after Pulse 3b	930 mV
after Pulse 4	940 mV

On the Component without gasoline we have also measured the Impedance parameters before and after the ISO pulse test so the following image shown the value saved.

The same Impedance parameters are maintained equal at the end of ISO tests.

For this measurement we have used a LCR HiTester by HIOKI mod. 3532-50.
INTEK ID 0778 P, Cal. 2013-10-04 Due 2015-10



§6.9. of the ECE-R10/05

Specifications concerning the emission of transient conducted disturbances generated by ESAs on supply lines.

Measuring records at 12V

The measured maximum pulse amplitude has been below the maximum permissible limit indicated in table 2, point 6.9. of the Regulation.

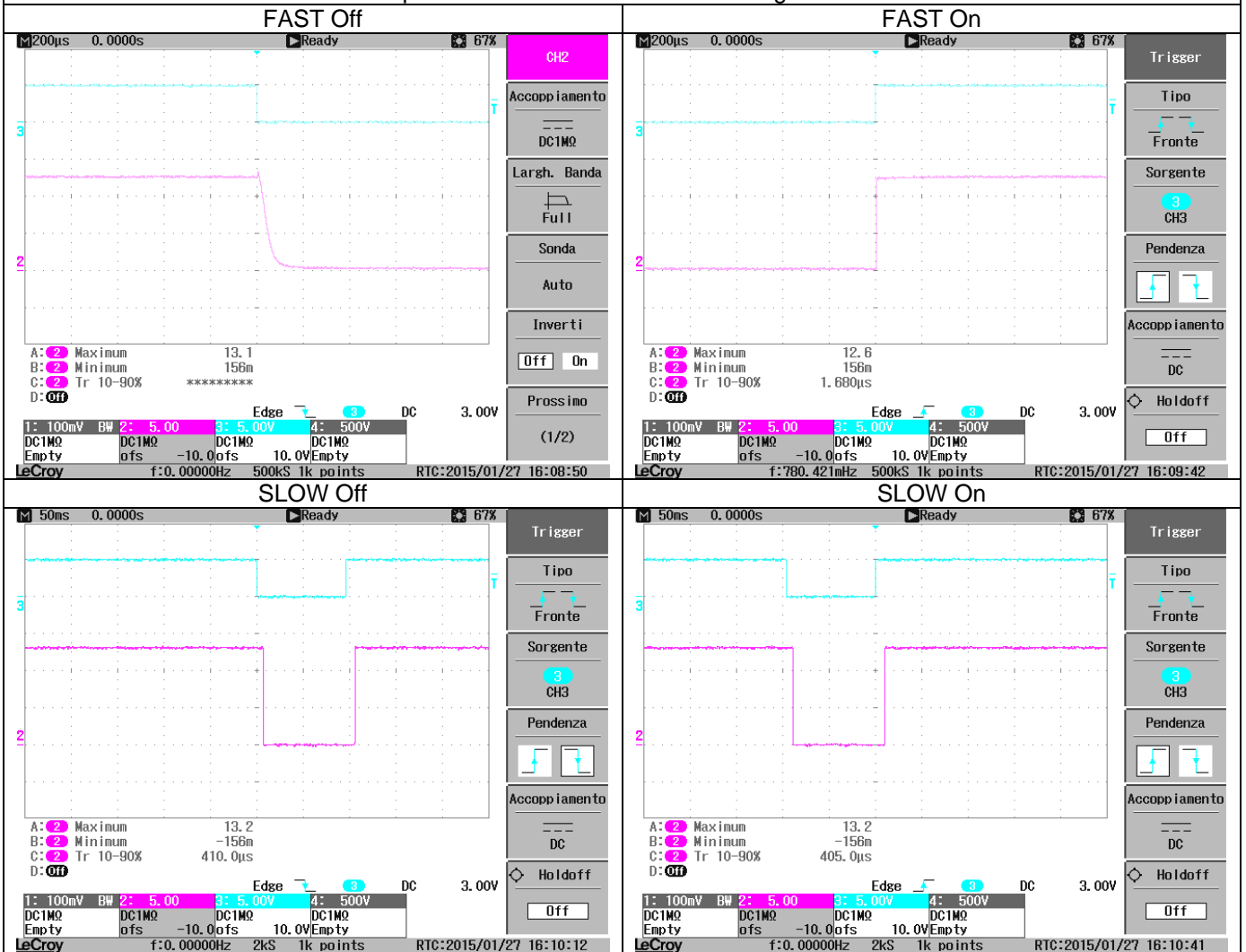
<i>Pulse amplitude (Us)</i>	<i>Limit for Us for severity level</i>	<i>Transient emissions for ESA powered at 12V</i>		<i>Result / Comments</i>
		<i>Slow</i>	<i>Fast</i>	
Positive	+75 V	0 V	0 V	Passed
Negative	-100 V	0 V	0 V	Passed

§6.9. of the ECE-R10/05

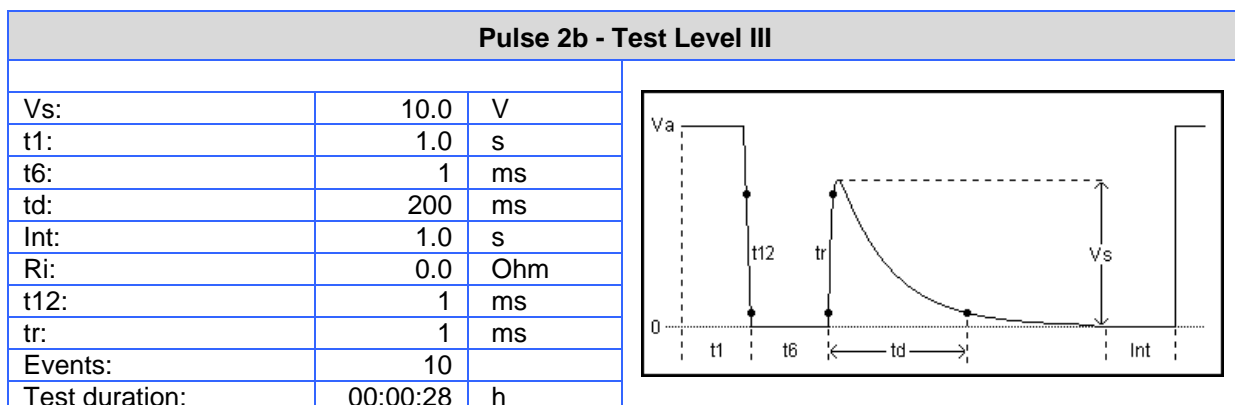
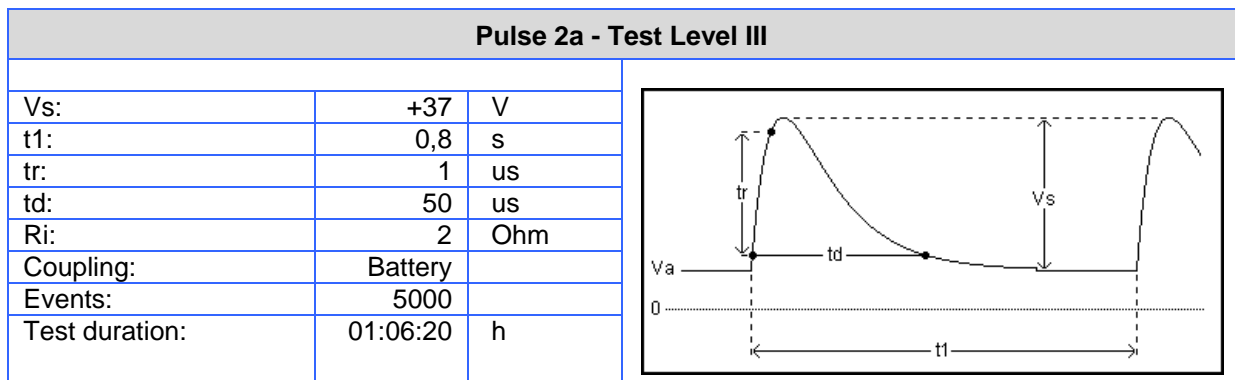
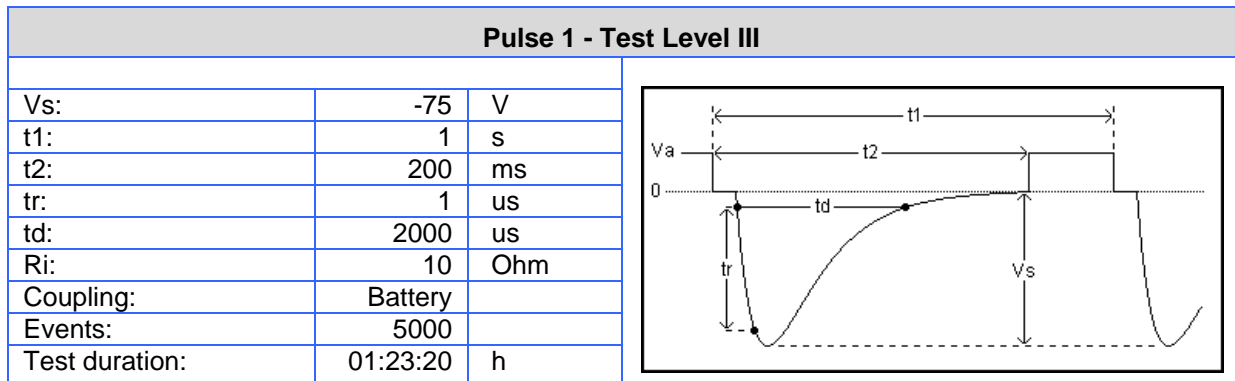
Specifications concerning the emission of transient conducted disturbances generated by ESA/Component on supply lines.

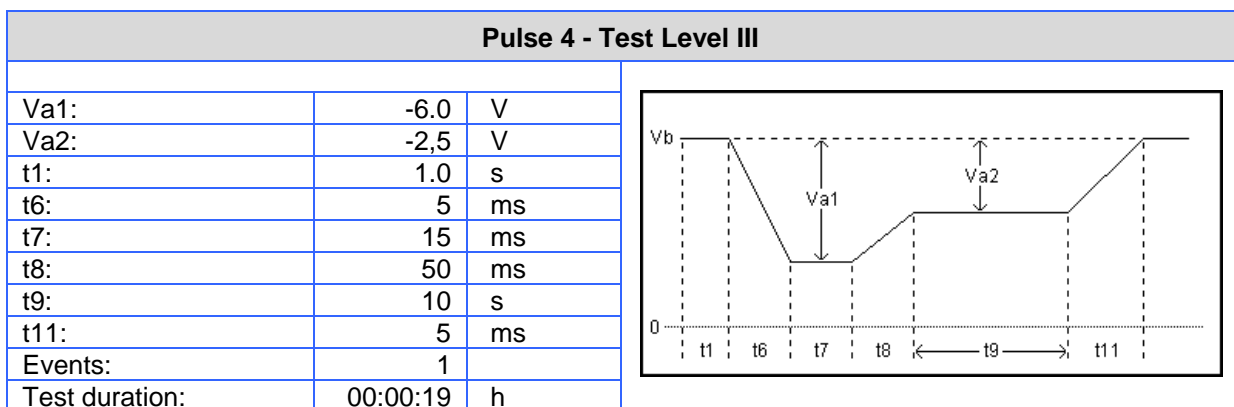
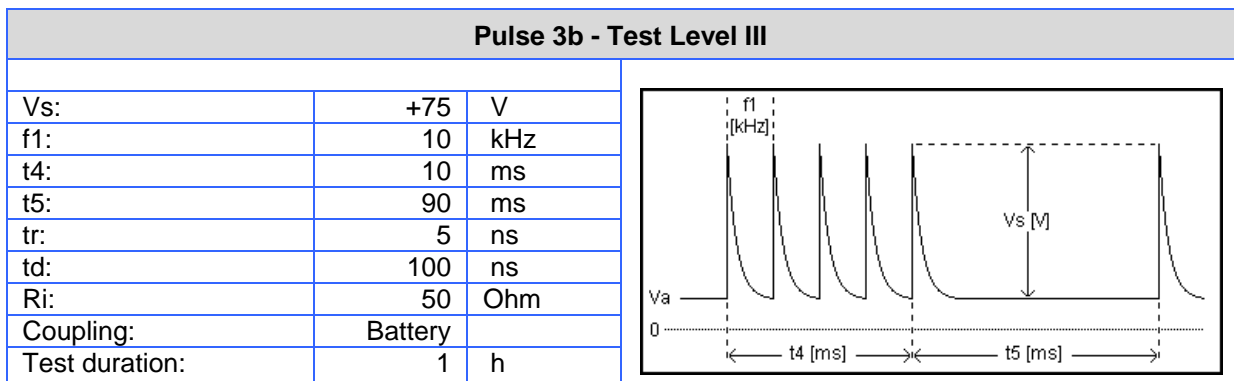
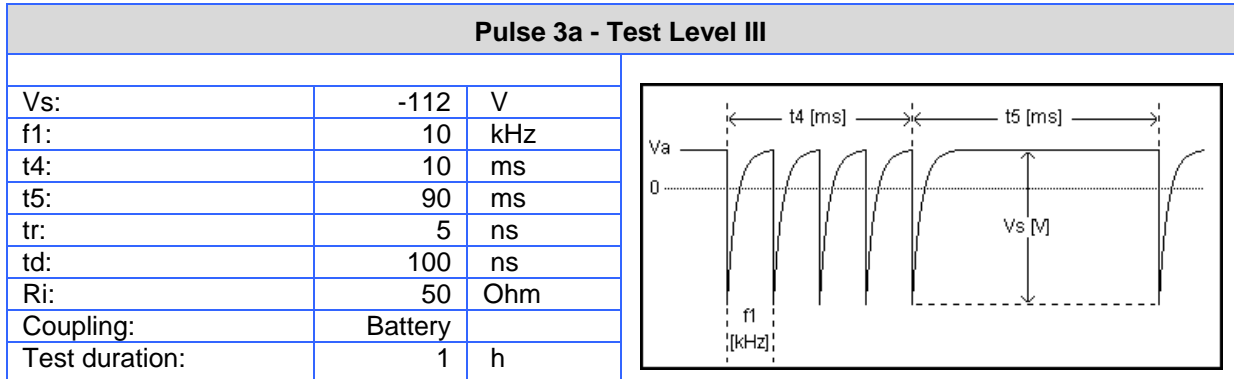
Measuring records at 12V

Representative waveform saved during the test



+12 V DC system
Resume of all parameters for each pulse applied on the ESA

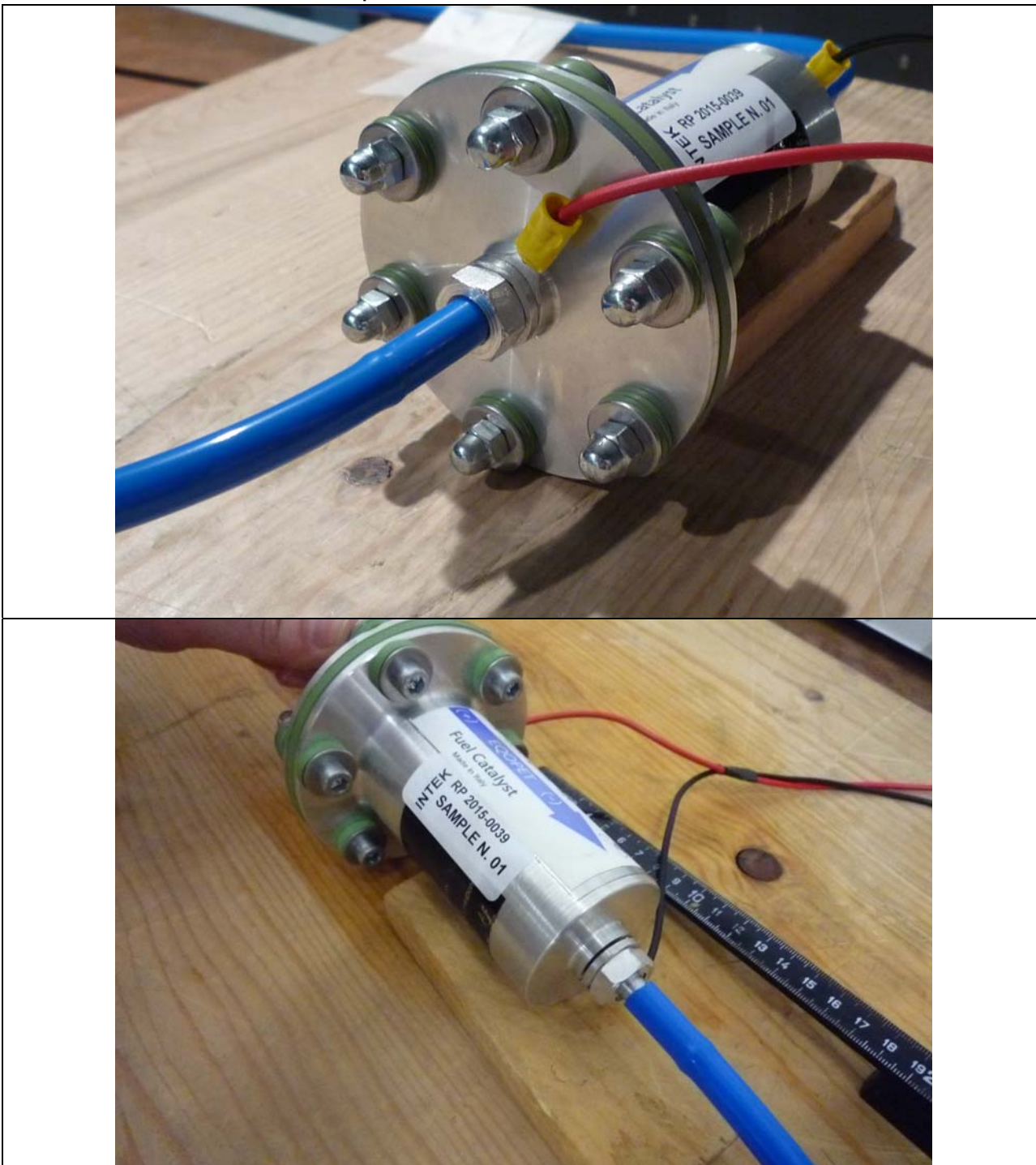




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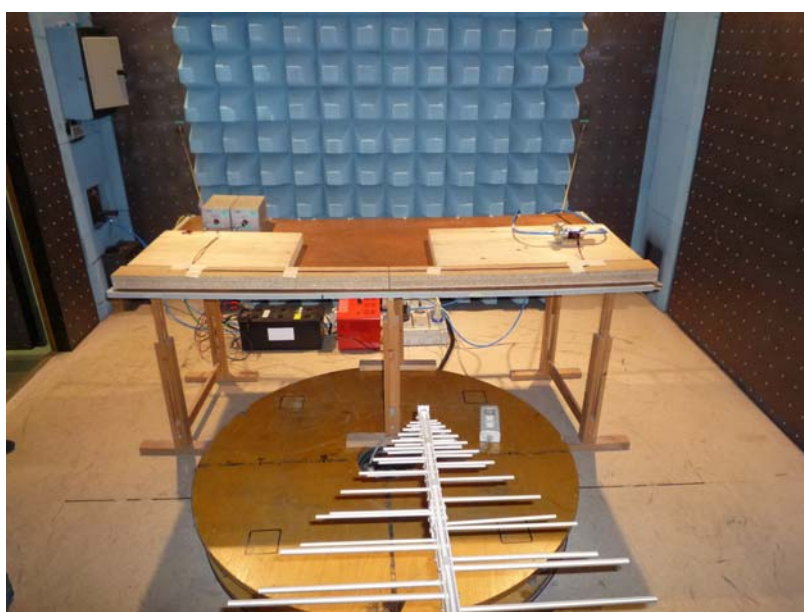
Job Number ref.	MSQxxxxx
Manufacturer's Name	iO-ENERGIES AG
Manufacturer's Address	Grenzstrasse 1a 6214 Schenkon (LU) - Switzerland
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

Component IDENTIFICATION



Job Number ref.	MSQxxxxx
Manufacturer's Name	iO-ENERGIES AG
Manufacturer's Address	Via Don Fracassi, 25/27 - 20010 Bareggio (MI) - ITALY
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

Photos of TEST SET-UP



View of the radiated emission test set-up with BiLog antenna



View of the Components under Homologation

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Photos of TEST SET-UP



External ancillary equipments used to simulate a normal function



ISO 7637-2 test set-up

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Manufacturer's Address	Via Don Fracassi, 25/27 - 20010 Bareggio (MI) - ITALY
Model Type & description	Type family EQOPET, Electro-magnetic device for saving fuel, reduction of emissions and increasing engine power in vehicles at 12V DC
Category	Component for L & M-category vehicles

Photos of TEST SET-UP



Conducted emission test set-up