

Electromagnetic Compatibility (EMC) SECTOR

EUT:	Cylindrical linear Motor with sensor
Model:	ML4070X4 (motor) – SE9ABZ1 (sensor)

Test specification:	EN 61000-6-2:2005 /EC:2005 /IS1:2005 EN 61000-6-4:2007 /A1:2011
Application:	Full application
Remarks:	None

Manufacturer:	Gimatic S.p.A. Via Enzo Ferrari, 2/4 - 25030 Roncadelle (BS) - Italy Tel. +39.030.2584655 Fax +39.030.2583886 url: http://www.gimatic.com		
Applicant:	Same as Manufacturer		
Customer:	Same as Manufacturer		
Purchase Order:	ODA-U01396	dated:	2016-03-29
Order Confirmation:	CO 2016-0103-00	dated:	2016-03-29

Samples receiving date:	2016-04-27		
Tests date:	from:	2016-04-27	to: 2016-05-03

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00	2016-05-03	Formal issue
Rev.	Date	Description

Results of tests and controls reported in this document refer only to samples as tested and described.

It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

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1. PURPOSE

Purpose of this document is to contain results of the tests performed to verify correspondence of test sample, as identified and described in paragraph 3, to requirements of standards listed in paragraph 2.

2. APPLICABLE DOCUMENTS

In the following of this test report, the “applicable documents” will be indicated without date and/or edition number and/or amendments.

2.1 REFERENCE STANDARDS

On customer request, the tests have been performed in compliance with the standards listed below:

Standard	Title
EN 61000-6-2:2005 /EC:2005 /IS1:2005	Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4:2007 /A1:2011	Electromagnetic compatibility (EMC) Part 6-3: Generic standards - Emission standard for industrial environments

and test methods listed on chapter 2.2.

2.2 TEST METHODS

The reference standards listed in the par. 2.1 require the use of the following basic standards that specify *how* the tests shall be performed. The dates of publication of the following basic standards are in conformity with the reference standards requirements.

Standard	Title
EN 55016-2-3:2010	Specification for radio disturbance and immunity measuring apparatus and methods Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test - Basic EMC publication
EN 61000-4-3:2006 /A1:2008 /IS1:2009 /A2:2010	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) -Part 4: Testing and measurement techniques Section 4: Fast transients / burst immunity test
EN 61000-4-6:2009	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8:2010	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 8: Power frequency magnetic field immunity test

2.3 OTHERS DOCUMENTS

Document	Title
INTEK 05 04 PP 001 PRE rev.03	Procedure for electrostatic discharge immunity test
INTEK 05 04 PP 003 PRE rev.02	Procedure for radiated disturbances measurement
INTEK 05 04 PP 005 PRE rev.04	Procedure for radiated, radio-frequency, electromagnetic field immunity test
INTEK 05 04 PP 010 PRE rev.03	Procedure for fast transients / burst immunity test
INTEK 05 04 PP 012 PRE rev.04	Procedure for immunity to conducted disturbances, induced by radio-frequency field
INTEK 05 04 PP 013 PRE rev.02	Procedure for power frequency magnetic field immunity test

3. TEST SAMPLE IDENTIFICATION

Unless otherwise specified, the technical data stated in this paragraph are declared by the manufacturer or obtained from the product technical documentation.

3.1 DESCRIPTION

Identification data of test samples are reported in the first page of this document.



Sample identification



Marking plate / markings

EUT composed of:	Single unit
Sample/Unit No. 1	
Serial / batch number:	Not available
Hardware version:	Not available
Firmware/software release:	Not available
Dimensions:	Diameter 40 mm x 205 mm

3.1.1 TECHNICAL DATA

Identification	Power source	Rated voltage	Rated power	Highest internal frequency
Sample No. 1	Driver	DC 75 V	500 W	200 kHz

3.1.2 CLASSIFICATION

On the basis of the definition given by the applicable standard the test sample is classified as:	
Emission requirements:	Equipment intended for use in residential locations
Immunity requirements:	Equipment intended for use in industrial locations
As far as tests are concerned, test sample is considered as:	
Setup for equipment:	<input type="checkbox"/> Floor standing <input checked="" type="checkbox"/> Table top
Other information:	None

3.1.3 ADDITIONAL INFORMATION

None

3.2 SAMPLES ORIGIN

The test samples are supplied by:			
<input checked="" type="checkbox"/> Manufacturer	<input type="checkbox"/> Customer	<input type="checkbox"/> Applicant	<input type="checkbox"/> _____
The beginning sampling is carried out by:			
<input checked="" type="checkbox"/> Manufacturer	<input type="checkbox"/> Customer	<input type="checkbox"/> Applicant	<input type="checkbox"/> _____
Received samples:	1	Tested samples:	1
Selection method:	<input type="checkbox"/> Random taking <input checked="" type="checkbox"/> None		

3.3 PORTS DESCRIPTION

ID	Name	Type	Length	Shield	Cable	Connector	Remarks
0	Enclosure	Metal	N/A	N/A	N/A	N/A	None
1	Motor	DC	30 m	Yes	/	/	Shield of cable not connected
2	Sensor	I/O	30 m	Yes	/	/	Shield of cable not connected

Remarks: the ports listed above are only the ports connected to the EUT during the tests, this not means necessarily that all these ports are submitted to the tests. The ports involved in the tests are identified in paragraphs of the tests.

Key to columns:

ID:	Number assigned to the cable. Ports with the same ID means that are contained in the same cable.
Name:	Name given by manufacturer
Type:	AC = AC Power Port AC mains = AC Mains Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port CMD = Command Port TP = Telecommunication Ports PE = Protective Earth FE = Functional Earth
L:	Maximum length declared by applicant in meters. The abbreviation "N/Av" indicates no length limitation.
S:	Shielded cable
Cable:	For instance type of cable used during tests; 2Pdc : Two lines (positive and negative) 2Pac : Two lines (line and neutral) 3Pdc : Three lines (positive, negative and ground connection) 3Pac : Three lines (line, neutral and ground connection) SW : Single wire(s) TW : Twisted pair
Remarks:	If necessary indicated the line details, shield connection side, connected from-to, classification, etc.

4. TEST INFORMATION

Unless otherwise specified, during the tests the sample/s was/were been configured following the methods and procedure specified in the reference standard.

4.1 CONDITIONS DURING THE TESTS

4.1.1 PERSONNEL PRESENT TO THE TESTS

Test performed by:	<i>Luigi Sala (Intek S.p.A.)</i>
Other people present:	<i>None</i>

4.1.2 MODIFICATIONS TO SAMPLES

Test samples are not modified during the tests.

4.1.3 ENVIRONMENTAL CONDITIONS

Laboratory environmental conditions are recorded during tests and they are shown on relevant chapters.
The measurement uncertainties are given with expanded uncertainty with a level of confidence of 95% (k=2)

4.1.4 CONVENTIONS

If applicable, on the right of each chapter or paragraph is written the number of the chapter or paragraph of reference Standard in the form: § number

4.1.5 ABBREVIATIONS

The following abbreviation and acronyms are applicable to this test report (not all could be used):

N/A	Not Applicable	LISN	Line Impedance Stabilization Network
N/Av	Not Available	ISN	Impedance Stabilization Network
N/R	Not Required by the customer	VP	Voltage Probe
N/D	Not Declared	HVP	High Voltage Probe
N/T	Not Tested	CP	Current Probe
NCR	No Calibration Required	CD	Coupling Device
TR	Test Report	CDN	Coupling / Decoupling Network
Req.	Required	CCC	Capacitive Coupling Clamp
Obt.	Obtained	Z _{coup}	Coupling Impedance
EUT	Equipment Under Test	AM	Amplitude Modulation
AE	Auxiliary Equipment	PM	Pulse Modulation
U _{LAB}	Laboratory Measurement Uncertainty	PK	Peak detector
U _{CISPR}	Instrumentation Measurement Uncertainty	AV	Average detector
EMI	ElectroMagnetic Interference	QP	Quasi-Peak detector
EMS	ElectroMagnetic Susceptibility	LF	Low Frequency
GRP	Ground Reference Plane	HF	High Frequency
AMN	Artificial Mains Network		

4.2 CONFIGURATION MODES

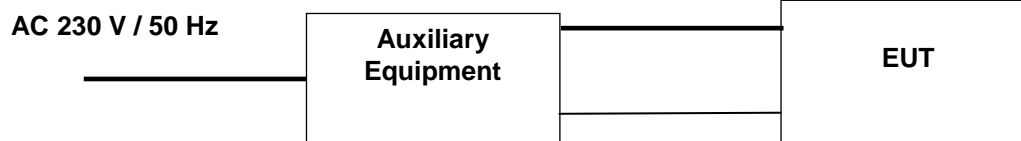
In agreement with the	<input checked="" type="checkbox"/> Manufacturer	during tests the sample was connected to a power supply able to generate voltage and current required for sample operation.
	<input type="checkbox"/> Customer	
	<input type="checkbox"/> Applicant	

Emission: the EUT was configured to measure its highest possible radiation level. The test modes selected are according to EUT instruction manual and/or manufacturer information.


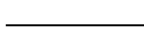

Immunity: the EUT was configured to have its highest possible susceptibility against tested phenomena. The configuration modes are according to EUT instruction manual and/or manufacturer information.

Configuration mode	Description
CM1	Normal conditions - Voltage supply by driver

Connections of sample are shown on following figure:



Caption:

 Power Supply lines
  Signal lines
  Data lines

4.2.1 AUXILIARY EQUIPMENT DESCRIPTION

Driver

Provided by manufacturer
Model: N/A
S/N: N/A



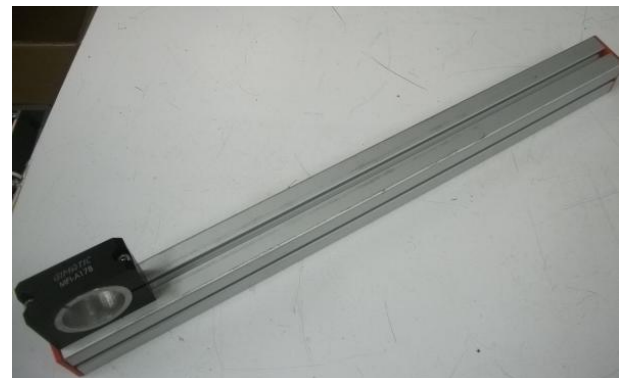
Metal driving

Provided by manufacturer
Model: code ML20X27L542
S/N: N/A



Support

Provided by manufacturer
Model: code MFI-A178
S/N: N/A



4.3 OPERATION MODES

The operation mode adopted during the tests are listed in the following table:

Operation mode	Description
Run	Cylindrical piston moves left and right, Driver parameters set to: - Change of position = 80 mm; - Max speed = 500 rpm = 0,295 m/s; - Acceleration / deceleration time = 1 s.

4.4 PERFORMANCE CRITERIA

Emission tests:

"Quasi peak" emissions, and "average" emissions if any, shall be lower than relevant limits.

Measured values are identified on plots as here below described:

- Red line: "quasi peak" emission limit
- Blue line: "average" emission limit
- x [symbol] red: "quasi peak" measured value
- + [symbol] blue: "average" measured value

"Current harmonics" and "voltage fluctuations and flicker" tests:

Results are shown in tabular form.

Measured values shall be lower than limit values listed in relevant column.

For a quick view of tests results two column with "pass" or "fail" verdicts are provided.

Immunity tests:

According to requirements of standard EN 61000-6-2, here below reported:

"The general principles (performance criteria) for the evaluation of the immunity test results are the following:

Performance criterion A:

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B:

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C:

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

4.5 PERFORMANCE EVALUATION METHOD

EUT performance check:

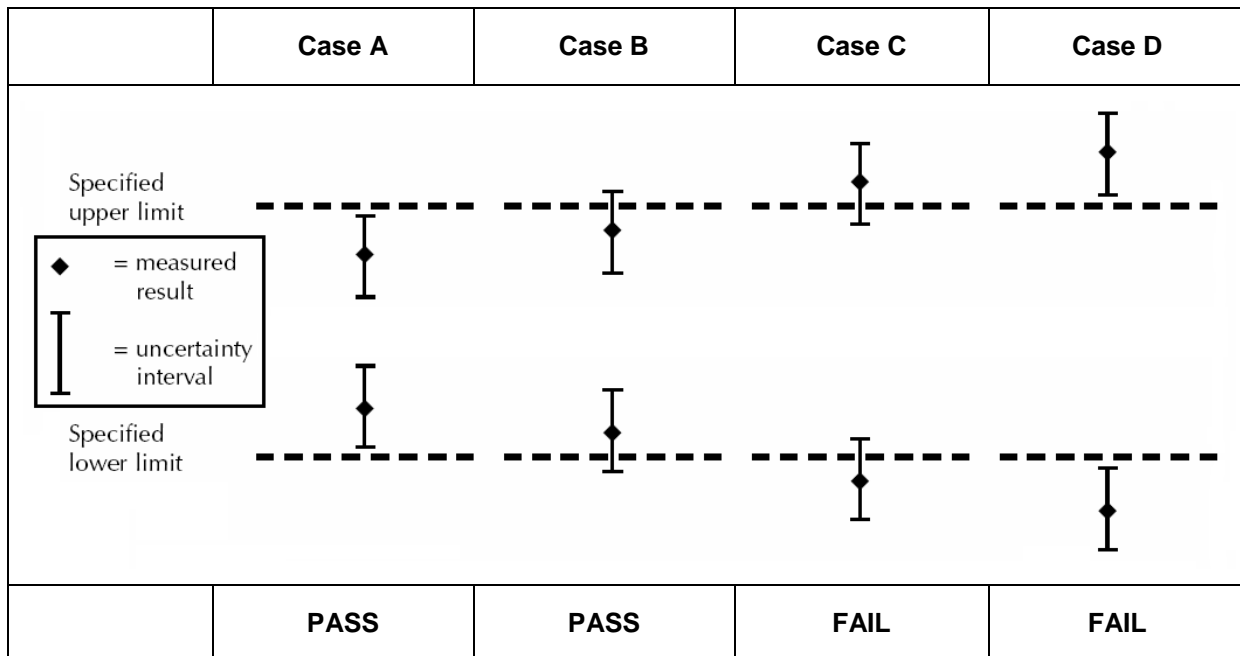
The here above listed performance criteria are applied to the sample by means of visual verification of the correct operational cycle.

4.6 CRITERIA ADOPTED FOR COMPLIANCE EVALUATION

If applicable for compliance evaluation of test results, the Laboratory adopts the following criteria:

- Reference standard specifies uncertainty for measurements:
 - measurements uncertainty permitted;
 - instruments accuracy;
 - application of measurements uncertainty to the measured values;
 in this case the measurement complies with the requirement if the measured value is within the limits, or with the correction due to the Laboratory uncertainty.
- Reference standard doesn't specify uncertainty for measurements:

Calculate uncertainty for measurement and compare the measured result with uncertainty band to defined acceptable limit. The measurement complies with the requirement if the probability it being within the limit is at least 50 % (see following figure):



5. TEST RESULTS

Par. TR	Test / Requirement	Specification	Result
	EMISSION TEST		
6.1	Radiated emission 30-1000 MHz	EN 61000-6-4 (*)	PASS
N/A	Radiated emission 1-6 GHz	EN 61000-6-4 (*)	N/A (#1)
N/A	Conducted emission	EN 61000-6-4 (*)	N/A (#2)
	IMMUNITY TEST		
6.2	Power-frequency magnetic field	EN 61000-6-2	PASS
6.3	Radio-frequency electromagnetic field	EN 61000-6-2	PASS
6.4	Electrostatic discharge	EN 61000-6-2	PASS
6.5	Radio-frequency common mode	EN 61000-6-2	PASS
6.6	Fast transients	EN 61000-6-2	PASS
N/A	Surge	EN 61000-6-2	N/A (#3)

Notes:

(*) This test is not under ACCREDIA accreditation.

#1 According to EN 61000-6-4/A1 Table 1 note "c", the test was not performed because the highest internal frequency of the EUT is less than 108 MHz.

#2 Port not present.

#3 Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may be exceed 30 m.

5.1 SAMPLES CORRELATION / TEST SEQUENCE

The sample(s) was(were) sequentially subjected to the tests described in the following table:

Test	Sample(s)	Remarks
Radiated emission 30-1000 MHz	1	None
Radio-frequency electromagnetic field	1	None
Radio-frequency common mode	1	None
Fast transients	1	None
Power-frequency magnetic field	1	None
Electrostatic discharge	1	None

5.2 TEST METHOD DEVIATIONS

Test methods described in the reference document were adopted without any deviation.

6. TEST PERFORMED

6.1 RADIATED EMISSION 30-1000 MHz

Test was performed according to requirements of standards listed on chapter 2.

The test method is compliant to requirements of the: EN 55016-2-3

The test is performed following the procedure: INTEK 05 04 PP 003 PRE

6.1.1 TEST SET-UP

Test site:	FAR - Room N. 26
Antenna height:	155 cm
Distance:	3 m
Antenna polarity:	Horizontal and vertical

6.1.2 TEST PARAMETERS

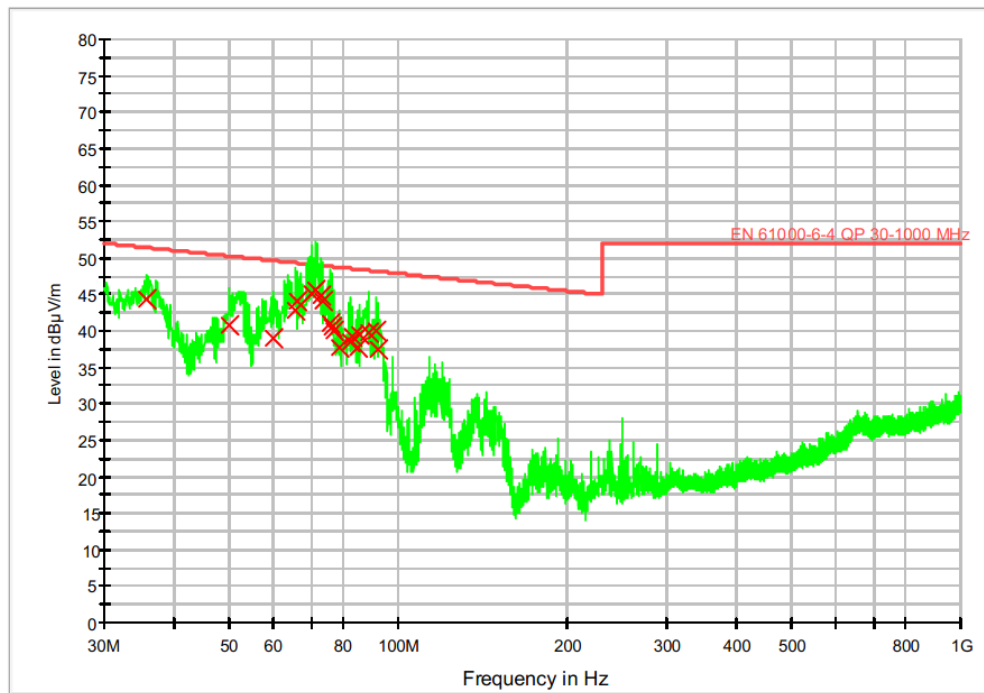
Preliminary scan:	0° to 180° (45° step) with peak detector
Final measurement:	0° to 315° (45° step) with quasi peak detector
Frequency range:	30 - 1000 MHz
Limits:	See graph

6.1.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

Temperature:	23 °C ± 5 °C
Relative humidity:	50 % ± 25 %
Atmospheric press.:	960 mBar ± 100 mBar

6.1.4 SUMMARY OF RESULTS

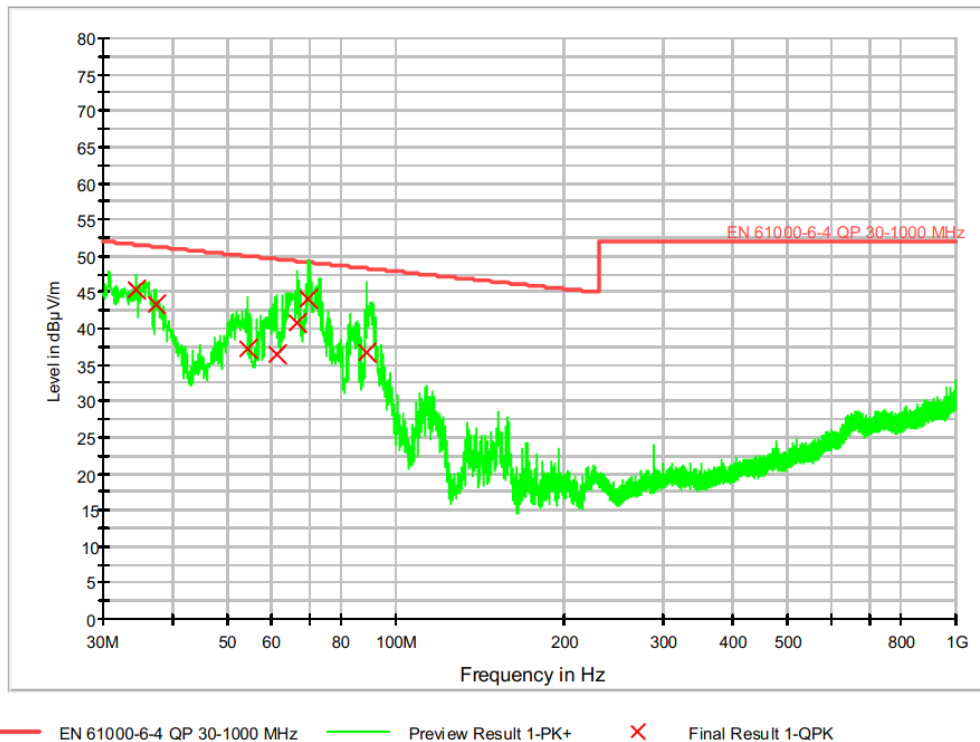
Sample No.:	1			
Configuration mode:	CM1			
Graph No.	Port under test	Polarity	Operative mode (ref. par. 4.3)	Result
1	Enclosure	Horizontal	Run	PASS
2	Enclosure	Vertical	Run	PASS



— EN 61000-6-4 QP 30-1000 MHz — Preview Result 1-PK+ X Final Result 1-QPK

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
35.760000	44.3	1000.0	120.000	H	202.0	17.6	7.1	51.4
49.920000	40.6	1000.0	120.000	H	19.0	15.0	9.6	50.2
59.820000	38.9	1000.0	120.000	H	-14.0	11.2	10.7	49.6
65.700000	42.9	1000.0	120.000	H	133.0	8.8	6.4	49.3
66.120000	44.1	1000.0	120.000	H	158.0	8.7	5.2	49.3
70.020000	45.1	1000.0	120.000	H	-16.0	7.9	3.9	49.1
71.400000	45.6	1000.0	120.000	H	-4.0	7.8	3.5	49.0
72.960000	44.9	1000.0	120.000	H	133.0	8.0	4.1	48.9
73.440000	44.2	1000.0	120.000	H	133.0	8.1	4.8	48.9
75.960000	41.1	1000.0	120.000	H	136.0	8.5	7.8	48.8
76.380000	40.5	1000.0	120.000	H	169.0	8.6	8.3	48.8
76.860000	40.0	1000.0	120.000	H	167.0	8.7	8.8	48.8
78.660000	37.8	1000.0	120.000	H	167.0	9.1	10.9	48.7
82.080000	38.5	1000.0	120.000	H	146.0	9.6	10.0	48.5
82.560000	39.3	1000.0	120.000	H	122.0	9.6	9.2	48.5
85.020000	37.8	1000.0	120.000	H	168.0	9.9	10.6	48.4
85.560000	39.4	1000.0	120.000	H	158.0	10.0	9.0	48.4
88.440000	39.7	1000.0	120.000	H	167.0	10.4	8.5	48.3
91.200000	39.9	1000.0	120.000	H	146.0	10.7	8.2	48.2
91.860000	37.4	1000.0	120.000	H	167.0	10.8	10.7	48.2

Graph No. 1 – Horizontal polarity



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.320000	45.3	1000.0	120.000	V	279.0	17.8	6.2	51.5
37.260000	43.4	1000.0	120.000	V	257.0	17.5	7.9	51.3
54.420000	37.2	1000.0	120.000	V	202.0	13.5	12.7	50.0
61.200000	36.5	1000.0	120.000	V	123.0	10.5	13.1	49.5
66.480000	40.8	1000.0	120.000	V	248.0	8.6	8.5	49.3
69.900000	44.1	1000.0	120.000	V	235.0	7.9	5.0	49.1
88.680000	36.6	1000.0	120.000	V	112.0	10.5	11.6	48.3

Graph No. 2 – Vertical polarity



Photo of the test set-up

6.1.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
EMI Receiver	Rohde & Schwarz	ESU26	0692 P	2016-03	2017-03
Biconical log-periodic antenna	Antenna Research Associates	LPB-2513	0308 P	2013-07	2016-07
Coaxial cable (external)	INSULATED WIRE	NPS-2301-2167	0820 P	2016-03	2017-03
Coaxial cable (internal)	INSULATED WIRE	NPS-2301-2167	0817 P	2016-03	2017-03
Decoupling clamp	LUTHI	FTC 101	1034 P	2015-01	2017-01
Measurement Software	Rohde & Schwarz	EMC32 PLUS	0686 SW	NCR	NCR
Full Anechoic Chamber	SIDT Europe	/	0309 P	NCR	NCR
Turntable	HD	DS 415	0302 P	NCR	NCR

6.1.6 MEASUREMENTS UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

- $U_{LAB} = 2,68$ dB except for the frequency range from 410 MHz to 450 MHz where $U_{LAB} = 4,33$ dB,
and $U_{LAB} < U_{CISPR} = 5,3$ dB (measurement instrumentation uncertainty) in according to standards CISPR 16-4-1 and CISPR 16-4-2.

6.2 POWER-FREQUENCY MAGNETIC FIELD TEST

Test was performed according to requirements of standards listed on chapter 2.	
The test method is compliant to requirements of the:	EN 61000-4-8
The test is performed following the procedure:	INTEK 05 04 PP 013 PRE

6.2.1 TEST SET-UP

Test site:	Laboratory - Room N. 27
Coupling method:	<input checked="" type="checkbox"/> Immersion <input type="checkbox"/> Proximity

6.2.2 TEST PARAMETERS

Waveform:	Sinusoidal
Duration:	1 minute

6.2.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

Temperature:	23 °C ± 5 °C
Relative humidity:	50 % ± 25 %
Atmospheric press.:	960 mBar ± 100 mBar

6.2.4 SUMMARY OF RESULTS

Port under test:		Enclosure port				
Configuration mode:		CM1				
Level	Axle	Frequency	Criteria (ref. par. 4.4)		Operation mode (ref. par. 4.3)	Result
			Req.	Obt.		
30 A/m	X	50 Hz	A	A	Run	PASS
30 A/m	Y	50 Hz	A	A	Run	PASS
30 A/m	Z	50 Hz	A	A	Run	PASS



Photo of the test set-up

6.2.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Signal generator	Spitzenberger + Spies	Sycore 1K4	0439 P	2015-02	2017-02
Power amplifier	Spitzenberger + Spies	PAS 5000	0071 P	2015-02	2017-02
Induction coil with "power" connector	Schaffner	INA 702	0437 P	2016-01	2017-01
Trasformer 230/24 Vac	INTEK	/	0810 P	2016-01	2017-01
Test software	Spitzenberger + Spies	Signal Manager	0851 SW	NCR	NCR

6.2.6 MEASUREMENTS UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

- $U_{LAB} = 3,50$ dB.

6.3 RADIATED RF IMMUNITY TEST

Test was performed according to requirements of standards listed on chapter 2.	
The test method is compliant to requirements of the:	EN 61000-4-3
The test is performed following the procedure:	INTEK 05 04 PP 005 PRE

6.3.1 TEST SET-UP

Test site:	FAR - Room N. 26
Antenna height:	155 cm
Distance:	2,5 m (up to 1 GHz) 4,7 m (above 1 GHz)
Antenna polarity:	Horizontal and vertical

6.3.2 TEST PARAMETERS

Frequency range:	80 - 1000 MHz and 1,4 - 2,7 GHz
Frequency step:	1 % of previous frequency
Modulation	AM: 1 kHz depth 80 %
Dwell time:	3 seconds at each frequency
Antenna polarity:	Horizontal and vertical
Exposure side:	0° / 90° / 180° / 270° (clockwise respect to antenna)

6.3.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

Temperature:	23 °C ± 5 °C
Relative humidity:	50 % ± 25 %
Atmospheric press.:	960 mBar ± 100 mBar

6.3.4 SUMMARY OF RESULTS

Port under test:	Enclosure port					
Configuration mode:	CM1					
Level (#1)	Frequency range	Polarity	Criteria (ref. par. 4.4)		Operation mode (ref. par. 4.3)	Result
			Req.	Obt.		
10 V/m	80 - 1000 MHz	Horizontal	A	A	Run	PASS
		Vertical	A	A	Run	PASS
3 V/m	1,4 - 2,0 GHz	Horizontal	A	A	Run	PASS
		Vertical	A	A	Run	PASS
1 V/m	2,0 - 2,7 GHz	Horizontal	A	A	Run	PASS
		Vertical	A	A	Run	PASS

Notes:

#1 V/m (rms) unmodulated.



Photo test set-up for frequency up to 1 GHz



Photo test set-up for frequency above 1 GHz

6.3.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Anechoic chamber	SIDT	/	0309 P	2016-01	2017-01
Signal generator	Rhode & Schwarz	SML 03	0431 P	2015-07	2016-07
Power meter	Amplifier Research	PM 2002	0433 P	2015-07	2016-07
Probe for power meter	Amplifier Research	PH 2004	0434 P	2015-07	2016-07
Probe for power meter	Amplifier Research	PH 2004	0809 P	2015-07	2016-07
Coaxial cable (external)	INTEK	RG58	0510 P	2015-07	2016-07
Amplifier 80-1000 MHz	Amplifier Research	100W1000M1	0307 N	2016-01	2017-01
Coaxial cable (external)	INSULATED WIRE	NPS-2301	0935 P	2016-03	2017-03
Coaxial cable (external)	INSULATED WIRE	NPS-2301	0934 P	2016-03	2017-03
Directional coupler 600 W, 80-1000 MHz	Amplifier Research	DC 6180	0303 P	2016-03	2017-03
Coaxial cable (internal)	INSULATED WIRE	NPS-2301	0816 P	2016-03	2017-03
Log-periodic Antenna	Amplifier Research	AT 1080	0304 N	2016-01	2017-01
Amplifier 800-4200 MHz	Amplifier Research	50S1G4A	0430 N	2016-01	2017-01
Coaxial cable (external)	INSULATED WIRE	NPS-2301	0933 P	2016-03	2017-03
Coaxial cable (external)	INSULATED WIRE	NPS-2301	0936 P	2016-03	2017-03
Directional coupler 400 W, 800-4200 MHz	Amplifier Research	DC 7144	0438 P	2016-03	2017-03
Coaxial cable (internal)	INSULATED WIRE	NPS-2301	0818 P	2016-03	2017-03
Horn Antenna	Amplifier Research	AT 4200 A	0432 N	2016-01	2017-01
Test software	Dare	Radimation	0641 SW	NCR	NCR

6.3.6 TEST MEASUREMENTS UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

- $U_{LAB} = 3,50$ dB for frequencies range 80-1000 MHz;
- $U_{LAB} = 3,50$ dB for frequencies range 1,0-3,0 GHz.

6.4 ELECTROSTATIC DISCHARGES TEST

Test was performed according to requirements of standards listed on chapter 2.	
The test method is compliant to requirements of the:	EN 61000-4-2
The test is performed following the procedure:	INTEK 05 04 PP 001 PRE

6.4.1 TEST SET-UP

Test site:	Laboratory - Room N. 27
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6.4.2 TEST PARAMETERS

Repetition rate:	1 discharge every 1 second for contact method
Number of discharges for contact discharge type:	10 discharges
Number of discharges for air discharge type:	10 discharges

6.4.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

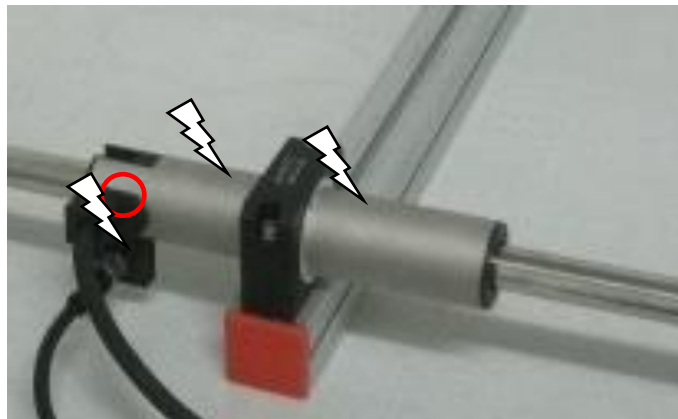
Temperature:	23 °C ± 5 °C
Relative humidity:	40 % ± 20 %
Atmospheric press.:	960 mBar ± 100 mBar

6.4.4 SUMMARY OF RESULTS

Port under test:	Enclosure					
Configuration mode:	CM1					
Level	Coupling	Discharge point	Criteria (ref. par. 4.4)		Operation mode (ref. par. 4.3)	Result
			Req.	Obt.		
±2; ±4; ±8 kV	Air	Non conductive parts	B	A	Run	PASS
±4 kV	Direct	Conductive parts	B	A	Run	PASS
±4 kV	Indirect	VCP	B	A	Run	PASS
±4 kV	Indirect	HCP	B	A	Run	PASS



Photo of the test set-up

**Legend**

Air discharge



Contact discharge

Point of application of the discharges

6.4.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
ESD Generator	EMC-Partner	ESD-3000	0764 P	2016-02	2018-02
RC filter 150 pF – 330 Ω	EMC-Partner	ESD3000DN1	0765 P	2016-02	2018-02
High-voltage relay module	EMC-Partner	ESD3000RM32	1118 P	2016-02	2018-02
Grounding cable	EMC-Partner	/	0807 A	2016-02	2018-02
HCP + 2x470 k Ω bleeder	INTEK	/	0808 A	2016-02	2018-02
VCP + 2x470 k Ω bleeder	INTEK	/	0808 A	2016-02	2018-02

6.4.6 TEST MEASUREMENTS UNCERTAINTYValues of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):- $U_{LAB} = \pm 5,00$ % for voltage.

6.5 RADIO-FREQUENCY COMMON MODE

Test was performed according to requirements of standards listed on chapter 2.

The test method is compliant to requirements of the: EN 61000-4-6

The test is performed following the procedure: INTEK 05 04 PP 012 PRE

6.5.1 TEST SET-UP

Test site: Laboratory - Room N. 27

6.5.2 TEST PARAMETERS

Frequency range:	150 kHz - 80 MHz
Frequency step:	1 % of previous frequency
Modulation:	AM: 1 kHz depth 80 %
Dwell time:	3 seconds at each frequency

6.5.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

Temperature:	23 °C ± 5 °C
Relative humidity:	50 % ± 25 %
Atmospheric press.:	960 mBar ± 100 mBar

6.5.4 SUMMARY OF RESULTS

Sample No.:		1				
Configuration mode:		CM1				
Level (#1)	Port under test	CD	Criteria (ref. par. 4.4.)		Operation mode (ref. par. 4.3)	Result
			Req.	Obt.		
10 V	Motor	EM CLAMP	A	A	Run	PASS
10 V	Sensor	EM CLAMP	A	A	Run	PASS

Notes:

#1 V (rms) unmodulated.



Photo of the test set-up

6.5.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Signal generator	Rohde & Schwarz	SMY 01	0221 P	2015-07	2016-07
RF Cable (SG-PA)	INTEK	RG58	0292 P	2016-03	2017-03
Amplifier 10 kHz-250 MHz	Amplifier Research	75A250	0249 N	2016-01	2017-01
Power meter 3 channels	Teseo	SOPM03S	0635 P	2015-07	2016-07
Directional coupler	Amplifier Research	DC 3001A	0636 P	2016-03	2017-03
RF Cable (PA-ATT)	INTEK	RG 58	0293 P	2016-03	2017-03
Attenuator 6dB (OUT PA)	A-INFOMW	ACB06-100SN	0896 P	2016-03	2017-03
RF Cable (ATT-CD)	INTEK	RG 58	0955 P	2016-03	2017-03
Test software	Dare	Radimation	0642 SW	NCR	NCR
Decoupling clamp	LUTHI	FTC 101	1034 P	2015-01	2017-01
EM Clamp	FCC	F-203I	0240 P	2016-03	2017-03

6.5.6 MEASUREMENTS UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

- $U_{LAB} = \pm 2,50$ dB with CDN injection method
- $U_{LAB} = \pm 3,50$ dB with EM CLAMP injection method

6.6 FAST TRANSIENTS

Test was performed according to requirements of standards listed on chapter 2.	
The test method is compliant to requirements of the:	EN 61000-4-4
The test is performed following the procedure:	INTEK 05 04 PP 010 PRE

6.6.1 TEST SET-UP

Test site:	Laboratory - Room N. 27
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6.6.2 TEST PARAMETERS

Frequency:	5 kHz
Burst duration:	15 ms
Burst repetition:	300 ms
Coupling:	Asynchronous
Test duration:	1 minute for polarity
Pause:	10 seconds

6.6.3 ENVIRONMENTAL CONDITIONS IN THE TEST SITE

Temperature:	23 °C ± 5 °C
Relative humidity:	50 % ± 25 %
Atmospheric press.:	960 mBar ± 100 mBar

6.6.4 SUMMARY OF RESULTS

Sample No.:		1					
Configuration mode:		CM1					
Frequency:		5 kHz					
Level	Port under test	Line under test	CD	Criteria (ref. par. 4.4)		Operation mode (ref. par.4.3)	Result
				Req.	Obt.		
±1,0 kV	Sensor	All lines/cable	CCC	B	A	Run	PASS
±2,0 kV	Motor	All lines/cable	CCC	B	A	Run	PASS



Photo of the test set-up

6.6.5 TEST INSTRUMENTATION

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Fast transient generator	EM TEST	EFT 500	0481 P	2015-02	2017-02
Coupling Clamp	EM TEST	EFK	0037 P	2015-02	2017-02
Cable generator / clamp	EM TEST	/	0803 P	2015-02	2017-02
Test software	EM TEST	ISMIEC	0685 SW	NCR	NCR

6.6.6 MEASUREMENTS UNCERTAINTY

Values of expanded uncertainty are given with a level of confidence of 95 % ($k = 2$):

- $U_{LAB} = \pm 20\%$ for amplitude.

7. TEST INSTRUMENTATION

Instruments not listed in the relative paragraph of the tests:

Description	Manufacturer	Model	Intek ID	Last Calibration	Calibration due
Room N. 25: Shielded room					
Thermometer / hygrometer	Salmoiraghi	1750-2/QM	0301 P	2015-02	2016-02
Barometer	DeltaOhm	HD35EDG14bNTVI	1044 P	2015-03	2016-03
Room N. 26: Fully anechoic room					
Thermometer / hygrometer	Salmoiraghi	1750-2/QM	0222 P	2015-02	2016-02
Barometer	DeltaOhm	HD35EDG14bNTVI	1044 P	2015-03	2016-03
Room N. 27: Bench test					
Thermometer / hygrometer / barometer	DeltaOhm	HD35EDG14bNTVI	1044 P	2015-03	2016-03

7.1 INSTRUMENTATION ACCURACY

If reference standard doesn't specify otherwise, accuracy of used instrumentation for the tests is in accordance to the limits indicated in the IEC document - CTL Decision Sheet DSH251B 2009 Developed by WG4-WG1 "Measurements accuracy".

8. EUT DOCUMENTATION

List of documentation supplied to the laboratory:

- Not available.

9. ANNEXES LIST

None.

End of test report.