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Edition	Ch.	--	Code	PEL
3				

Change	Date	
-	04/07/96	Edition 1 – New; drawn up in accordance with the Technical Memory Procedure.
-	16/09/96	2nd Edition – Updated. (SS)
-	04/27/04	3rd Edition – Supervisor changes (was Durando). Deleted paragraph “Test time requirements”. (SS)

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CRITERIA GOVERNING THE USE OF THE STANDARD

This Standard aims at chcecking the operation of the system under test when subjewct to high intensity and low frequency magnetic fields (15 Hz ÷ 30 kHz), such as those generated by power lines or transformer rooms nearby.

REFERENCE STANDARDS

Specifications 9.90110: Specifications for motor vehicle electronic devices

EQUIPMENT REQUIRED FOR THE TEST

1- TEST ENVIRONMENT

The test room must be sized so to house all needed test instrumentation, allowing to place the magnetic field generator (Helmholtz Coil) at a suitable distance (at least 2 m) from the instrumentation and must be free from disturbances which might alter test results.

The following environmental requirements must be met:

Temperature:	23 ± 5 °C
Relative humidity:	45 ÷ 70 %
Atmospheric pressure:	860 ÷ 1060 mbar

2- HELMHOLTZ COIL

It must generate magnetic fields of at least 170 dBµA/m (310 A/m) at 30 Hz up to 50 dBµA/m (0.31 mA/m) at 30 kHz, with logarithmic change in the said points within a test volume sized at least 30x30x30 cm.
In addition, it must be equipped with loop sensor, to measure the magnetic field generated within the 15 Hz to 30 kHz frequency band.

3- LOW FREQUENCY GENERATOR

It must meet the following minimum requirements:

- Minimum frequency band:	15 Hz ÷ 30 kHz;
- Waveforms:	Sinusoidal and Triangular;
- Output signal amplitude:	at least 5 Vpp;
- Output impedance:	50 Ω;
- Frequency accuracy:	better than 1%;
- Amplitude range:	steps lower than 0.5 dB.

4- POWER AMPLIFIER

It must meet the following minimum requirements:

- Minimum frequency band:	15 Hz ÷ 30 kHz;
- Current delivered:	6.33 Arms on 3.6 Ω at 30 Hz up to 6.33 µArms on 3.6 kΩ at 30 kHz with linear flow between the said points;
- Harmonic level:	lower by at least 15 dB than fundamental frequency, for the whole band.

5- CURRENT TESTER BOX

It must contain the suitable shunts for 4-point measurement of the current present in the helmholtz coil; which can be selected by means of a capacity switch, as well as a device to switch the signal source between Amplifier and Generator.
NOTE: Switching between Amplifier and Generator is needed in high frequency conditions to inject to the helmholtz coil currents lower than the minimum current rate delivered by the amplifier.
On switching, the amplifier is cut out and the coil is directly controlled by the generator.

EQUIPMENT REQUIRED FOR THE TEST (CONT'D)

6- MEASUREMENT INSTRUMENTATION

It must ensure rms value measurements of the voltage by shunts and loop sensor within the 15 Hz to 30 kHz frequency band.
Either an oscilloscope or rms voltmeter may be used.

7- POWER SUPPLY UNIT

It must supply the required voltage as well as the maximum current needed to properly operate the device under test.
It is suggested the use of a power supply unit with adjustable voltage, 0 to 24 V, 40 A, equipped with 45 Ah, 225 A buffer battery.

8- IMPEDANCE STABILIZATION NETWORK (L.I.S.N.)

It must have an electrical circuit and impedance features in response to frequency variations as per **H1** and meet the following requirements:

- the resistance between terminals P and A must be lower than 5 mΩ;
- the impedance measured between terminals P and B, with terminals A and B closed in short-circuit, must not deviate by more than 10% of the theoretical curve shown in the diagram, within a frequency band range equal to 100 kHz÷20 MHz;
- capacity C2 must withstand continuous voltage of at least 1500 V;
- inductance L must withstand the power supplied to the tested device.

9- TESTED DEVICE STIMULATION AND MONITORING SYSTEM:

- It must allow for proper operation of the device under test in normal conditions of use, as per related drawing or specifications;
- It must be able to suitably interface with the tested system sensors and actuators, without altering their electrical features (impedance).
- Unreal (simulated) sensors/actuators, if any, must not be affected by the magnetic field levels generated by the helmholtz coil.

Therefore, it is suggested the use of stimulation and monitoring systems meeting the following requirements, where possible:

STIMULATION SYSTEM:

- external instruments needed to generate sensor stimulating signals;
- external transmitter for stimulation signals, equipped with electro-optic conversion;
- shielded and self-powered receiver, equipped with opto-electrical conversion (to be placed within the room);
- devices to inject stimulation signals to the sensors (transducers connected to the system sensors);
- fiber optics connections between transmitter and receiver.

MONITORING SYSTEM:

- shielded and self-powered transmitter to monitor the tested device operating status, equipped with electro-optic conversion (to be placed by the system under test);
- external receiver to monitor the tested device operating status, equipped with opto-electrical conversion;
- fiber optics connections between transmitter and receiver;
- external instruments needed to monitor the signals.

DESCRIPTION OF THE ITEM UNDER TEST

SYSTEM :
DRAWING No. :
CODE :
CONTROL UNIT ID No. :
SUPPLIER :
DESTINATION :

Date: .....

Engineer Name: ..... Signature: .....

SIGNIFICANCE OF THE COMPONENTS UNDER TEST

COMPONENT TYPE	SIGNIFICANCE VALUE % A	WEIGHT % B	COMPONENT AFFECTING TEST SIGNIFICANCE	SIGNIFICANT FEATURES	MINIMUM MANUF. LEVEL
Active		50	Control unit	printed circuit box, if metallic software release	B
Active		20	Wiring	cable length cable section	C
Active		30	Sensors and actuators	impedance	C

Significance of the system under test: SUM (A x B) % =

Where components are not shown in the drawing, enter "0" into both significance and component weight boxes.

Date: .....

Engineer Name: ..... Signature: .....

CHECK BY CALCULATION

As of today, there are no instruments in the field of Electromagnetic Compatibility able to run calculation checks.

TEST PRE-REQUIREMENTS

1- EQUIPMENT SET-UP

1.1- Collect all technical documentation necessary to carry out the test, including:
- operating conditions of the system under test.
- stimulation system (where needed).
- monitored parameters and relevant tolerances (as listed in **H5** to **H21**).
- definition of failure (as listed in **H5** to **H21**).
- system connection lay-out during testing. Engineer: [ ]

1.2 Prepare all instruments needed to carry out the test (as listed in the relevant form: "EQUIPMENT REQUIRED FOR THE TEST"), following the set-up given in **H2**. Engineer: [ ]

1.3- Place the system to be tested into the test volume of the helmholtz coil. Engineer: [ ]

1.4- Set-up the wiring of the device under test and all instruments needed for its proper operation, as per **H3**.

1.5- Connect the sensors and actuators provided for the device under test. These should be the same as shown in the drawings for installation on the vehicle; moreover, they must be triggered by the stimulation and monitoring system.
If actuators are electric motors, mechanical load must be provided or, where needed, stimulated by a brake. Engineer: [ ]

1.6- Connect the tested system power supply lines to the battery and power supply unit through the impedance stabilization network (L.I.N.S.). Engineer: [ ]

Date: ..... VIOLATION: YES [ ] NO [ ]

Engineer Name: ..... Signature: .....

TESTING

1- STARTING THE DEVICE UNDER TEST

1.1 Connect and power the device under test as per drawing or relevant specifications. Engineer: [ ]

1.2 Apply the signals needed to operate the system to all inputs or physical sensors. Engineer: [ ]

1.3 Set the system up under the specific static (no change in stimulation signals) or dynamic (sequence of specific changes in stimulation signals, able to alter the system status or behavior) operating conditions, as per related drawing or specifications, so to test its operation. Engineer: [ ]

1.4 Acquire the parameters related to the signals provided by the actuators, to be used as reference on testing. Engineer: [ ]

TESTING (CONT'D)

2- TEST ARRANGEMENT

The susceptibility curve of the system under test must be measured, for each possible arrangement of its three axes toward the magnetic field (X, Y and Z axes, arranged along the helmholtz coil axis) and for each operating condition of the system, within the frequency range and conditions listed in Specifications 9.90110.
Frequency steps must be as follows:
50 points/decade (4.7 % increase) 15 Hz to 30 kHz. Engineer: [ ]

NOTE: Frequency steps may be doubled (25 points/decade) if using specific devices requiring lengthy test times.

3- MEASURING THE SUSCEPTIBILITY CURVE OF THE DEVICE UNDER TEST

Repeat the following procedure for each frequency point of the susceptibility curve to be measured:

3.1 Select the suitable current tester box setting, according to the frequency and level of magnetic field you want to generate (switch the helmholtz coil control between generator and amplifier and select the suitable current capacity) Engineer: [ ]

3.2 Set the signal generator to the waveform (Sinusoidal, Triangular, etc.) and frequency needed to generate the magnetic field; Engineer: [ ]

3.3 Adjust the signal generator output so to obtain the current required to create the magnetic field by the amplifier or generator output (adjustment procedures through the magnetic field level tester are given in **H4**); Engineer: [ ]

NOTE: If the required magnetic field intensity is not achieved, try to obtain the maximum allowed field, by using the maximum amplifier output current.

3.4 Check for the tested device operation in the current operating conditions by comparing the peculiar parameters of the signals provided by the sensors with reference parameters; Engineer: [ ]

3.5 In the event of device failure, search for the minimum field level (repeat steps 3.3 and 3.4) at which the systems fails, starting from a "safe" field level (i.e. ensuring the system is not damaged); Engineer: [ ]

3.6 Draw a chart of the field level achieved at the current test frequency and try to distinguish, for the device under test, failure stages from proper operation ones. Engineer: [ ]

Date: ..... VIOLATION: YES [ ] NO [ ]

Engineer Name: ..... Signature: .....

DATA PROCESSING

1- ACCEPTANCE LIMITS

In each testing condition, the device under test should show immunity from the field levels listed in Specifications 9.90110.

2- SPACE FOR RELEVANT DIAGRAMS, TABLES, CHARTS, ETC.

Enclose diagrams or tables related to the system susceptibility curves, as well as charts, etc., if any.

TESTED ITEM / BENCH RESTORING OPERATIONS

1	Disconnect sensors, actuators, probes and any other external device from the system under test.	Engineer: [ ]
2	Restore any connections modified for testing.	Engineer: [ ]
3	Ready the test bench for a new test.	Engineer: [ ]

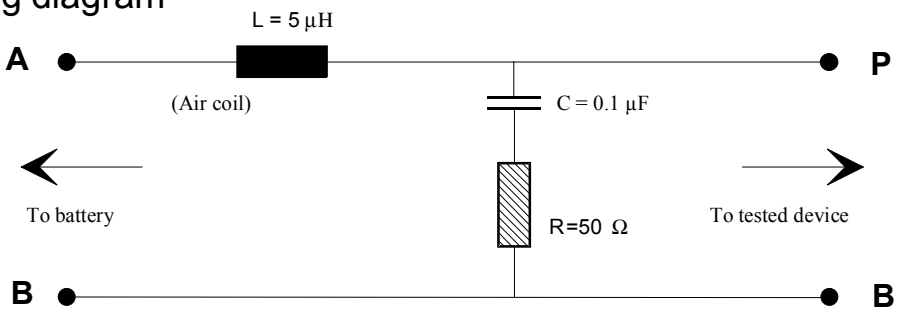
Date: ..... VIOLATION: YES [ ] NO [ ]

Engineer Name: ..... Signature: .....

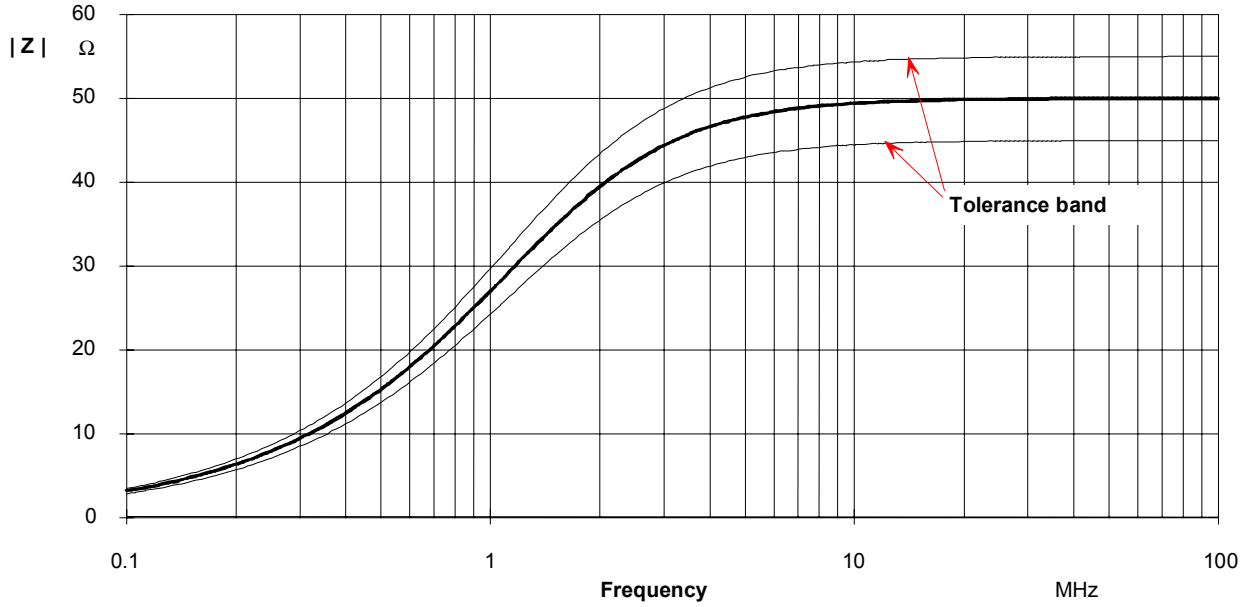
HELP 1

IMPEDANCE STABILIZATION LINE (L.I.S.N.)

Wiring diagram



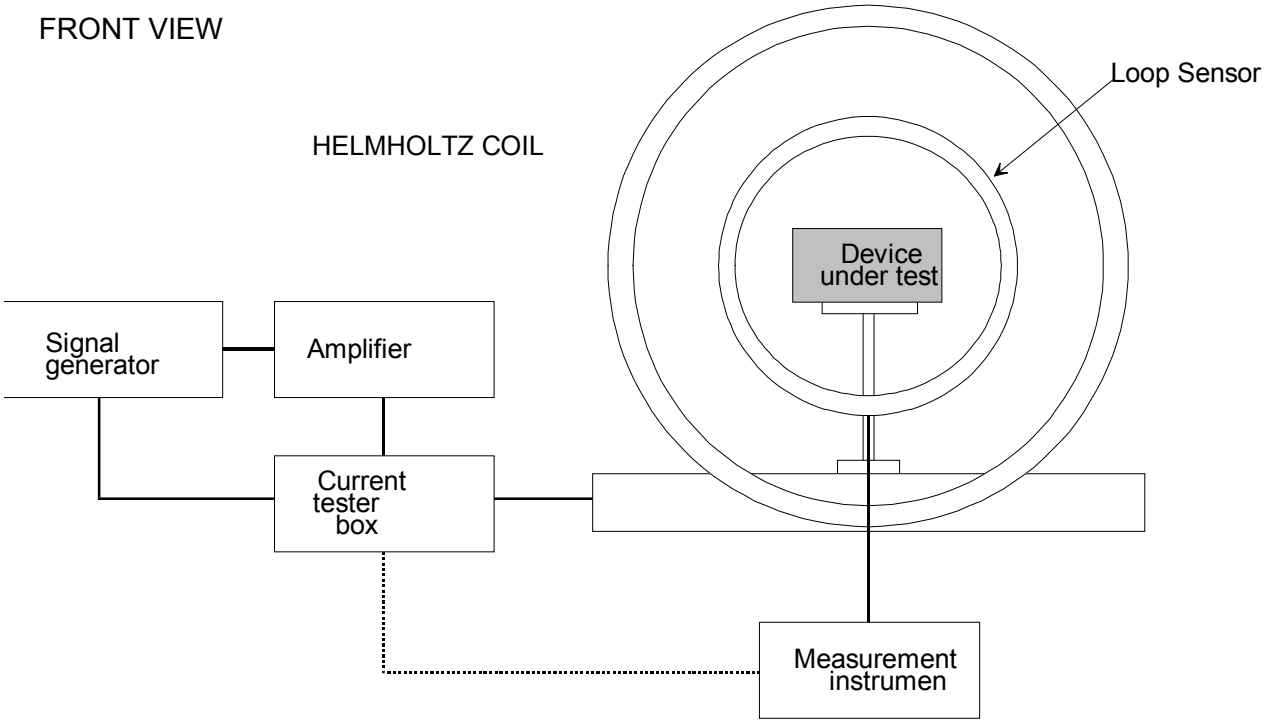
Impedance module



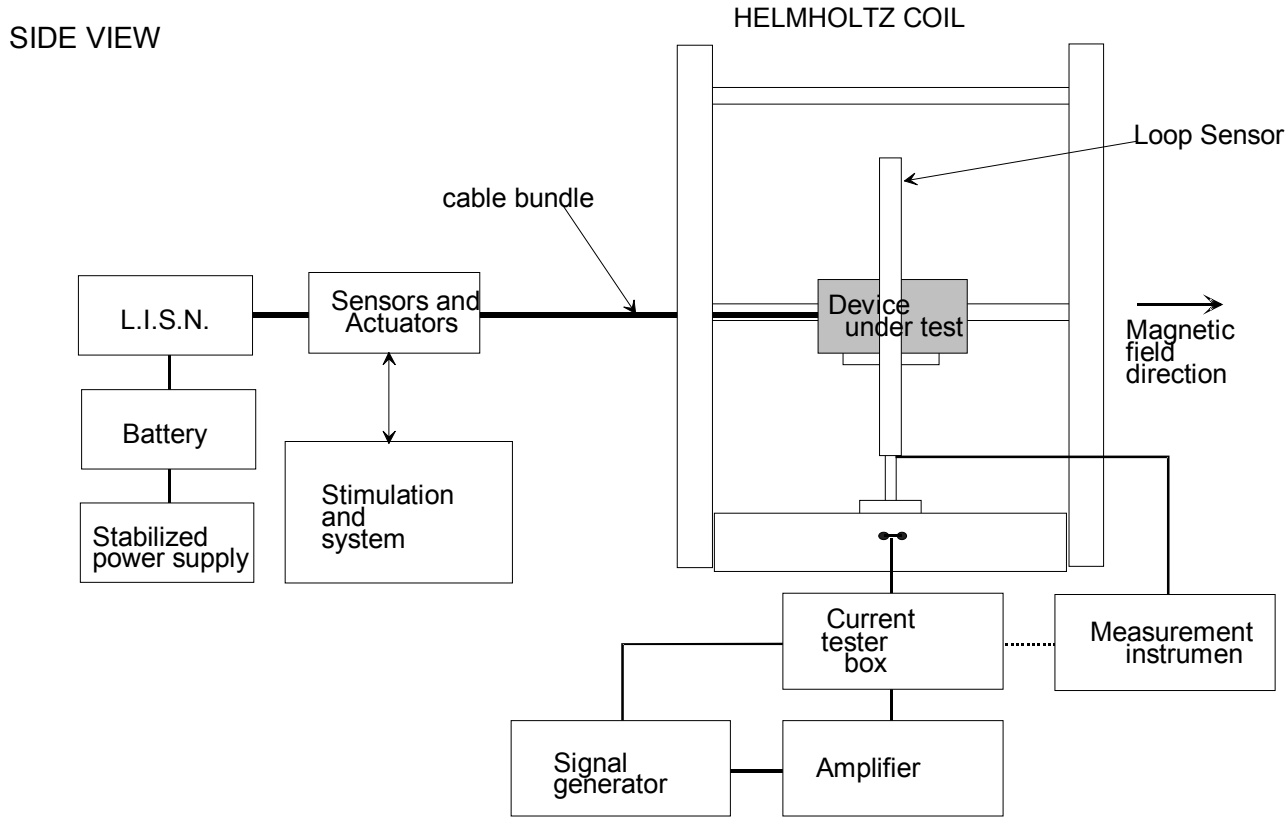
HELP 2

EQUIPMENT SET-UP

FRONT VIEW



SIDE VIEW



HELP 3

TESTED DEVICE SET-UP

1- Place into the helmholtz coil test volume the device to be tested, oriented toward the magnetic field (coil axis) along one of its 3 axes (X, Y and Z), and arrange the related wiring and instruments needed to properly operate it (real sensor and actuators and/or simulation and monitoring system to be connected to the device) on a magnetic-proof table (e.g. a wood table) away from the coil.
The required set-up is given in **H2**.

2- In case ground connection must be provided to the system case or to one of the sensors/actuators, use a suitably sized ground braid or cable, connecting it to the nearest ground (e.g. L.I.S.N. negative pole).

3- Lay the cables so to keep them as parallel as possible to the magnetic field lines, trying to arrange sensors and actuators away from the coil.
In case the vehicle wiring is used, if power lines (positive and negative wires) do not allow for connection to the impedance stabilization line (L.I.S.N.), while keeping it outside the helmholtz coil, provide an extension using two cables arranged parallel and side-by-side.
Otherwise, the cable bundle (as for section, shielding, twist, ground runs, etc.) must comply with the one provided on the vehicle.

HELP 4

MAGNETIC FIELD LEVEL ADJUSTMENT

Magnetic field adjustment (H) must be carried on closed-loop through magnetic field probe readings (helmholtz coil loop sensor), as described in the following item 1.
In case such adjustment is not allowed, due to technical reasons, follow one of the 2 procedures given as an alternative and described in items 2 and 3.

1- CLOSED-LOOP:
Magnetic field adjustment is carried out on measuring, by means of the field reading given by a probe ('loop sensor') installed into the helmholtz coil.
To adjust, proceed as follows:
1.1 Acquire the rms value of the voltage level read by the instrument (V) by both loop sensor ends.
1.2 Calculate the measured field level (Hm) using the loop sensor antenna factor (AF=20*Log(H[A/m]/V[V])) according to the following formula:
Hm[dBµA/m]=V[dBµV]+AF(f) or Hm[dBµA/m]=20*Log(V[V])+120+AF(f)
where f is the measurement frequency.
1.3 increase the level on the generator by one factor H[A/m]/Hm[A/m] (equal to an increment in dB of H[dBµA/m]-Hm[dBµA/m]) and repeat steps 1.1 and 1.2 until the required field level is achieved (Hm=H±toll.) or up to the maximum current supply.

2- PRE-CALIBRATION:
Magnetic field adjustment is carried out on measuring, by means of the helmholtz coil firing current reading (measured through a few shunts), keeping as a reference the current intensity needed to generate the required field without the device under test.
This adjustments requires a pre-calibration, without the device under test, during which we measure the rms value of the coil firing current I(f) needed to obtain a pre-set reference field Hr(f), as measured by a magnetic field probe in closed-loop.
During testing, the field is adjusted a follows:
2.1 Acquire the rms value of the voltage level read by the instrument (V) by both shunt ends.
2.2 Calculate the measured field level (Hm) according to one of the following formulas:
Hm[dBµA/m]=V[dBµV]+20*Log(S[1/Ω])-I(f)[dBµA]+Hr(f)[dBµA/m]
Hm[dBµA/m]=20*Log(V[V])+120+20*Log(S[1/Ω])-I(f)[dBµA]+Hr(f)[dBµA/m]
Hm[dBµA/m]=20*Log(V[V]*S[1/Ω]/I(f)[A])+Hr(f)[dBµA/m]
where f is the measurement frequency and S is the current/voltage ratio for the shunt used.
2.3 increase the level on the generator by one factor H[A/m]/Hm[A/m] (equal to an increment in dB of H[dBµA/m]-Hm[dBµA/m]) and repeat steps 2.1 and 2.2 until the required field level is achieved (Hm=H±toll.) or up to the maximum current supply.

3- THEORETICAL:
Magnetic field adjustment is carried out on measuring, by means of the helmholtz coil firing current reading (measured through a few shunts), by theoretical calculation of the current intensity needed to generate the required field.
To adjust, proceed as follows:
3.1 Acquire the rms value of the voltage level read by the instrument (V) by both shunt ends.
3.2 Calculate the measured field level (Hm) using the helmholtz coil antenna factor(AF=20*Log(H[A/m]/I[A])) according to the following formula:
Hm[dBµA/m]=V[dBµV]+20*Log(S[1/Ω])+AF(f)
or Hm[dBµA/m]=20*Log(V[V])+120+20*Log(S[1/Ω])+AF(f)
where f is the measurement frequency and S is the current/voltage ratio for the shunt used.
3.3 increase the level on the generator by one factor H[A/m]/Hm[A/m] (equal to an increment in dB of H[dBµA/m]-Hm[dBµA/m]) and repeat steps 3.1 and 3.2 until the required field level is achieved (Hm=H±toll.) or up to the maximum current supply.

NOTE: If loop sensor closing on low impedance(50Ω, etc.) loads is provided by the manufacturer, arrange the said load parallel to the measurement instrument.

HELP 5

WINDOW CONTROL UNIT (ACCCY929)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional classes F1 and F2
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	*Condition 1:* Windows stopped at half stroke *Condition 2:* Window control on
Monitored parameters	- Window motion - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA:
Invalid upward/downward controls (functional class F1).
Undesired shift from the set position (functional class F2).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 6

ELECTRONIC ANTITHEFT SYSTEM (AB7ZY922)	
Stay time on each test frequency	The time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional classes F1.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Simulated switched off motor, repeating for each frequency point the following cycle: - effraction by means of volumetric devices - antitheft system disabling - antitheft system enabling, then switch to the following frequency. NOTE: every 3 frequency steps, the effraction must be made using either a door or hood contact.
Monitored parameters	- Blinkers - Antitheft system alarm - Antitheft system status LEDs - Other parameters, if needed to carry out an accurate diagnosis of the device under test

NOTES:

FAILURE CRITERIA (functional class F1):
Invalid alarm signaling (false alarms).
Failed alarm signaling in effraction conditions.
Failed antitheft system enabling and/or disabling.
Any other discrepancy compared to the set cycle shall be considered as a failure.

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 7

PASSENGER COMPARTMENT AIR-CONDITIONER (ACGAT751)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional classes F1 (condition 2) and F2 (condition 1).
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	*Condition 1:* Intermediate air speed; air distribution set to "BI-LEVEL"; air temperature set to HI. *Condition 2:* alternately operate the air mixing/distribution motor so to reach both limit switches.
Monitored parameters	- Blower control - Starters - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA:
In condition 1, on field generation no change must occur in the settings and the blower must not be started at the field level belonging to class F2.
In condition 2, the required operations must not be affected by field RF and the blower must not be started (functional class F1).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 8

MULTIPURPOSE DEVICE (ACDAY50)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional classes F1 and F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Simulated input signals so to set all indicators to their intermediate positions and switch all pilot lamps off.
Monitored parameters	- Instruments, through telecamera (TVCC). - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

The following components belong to functional class F2 :
- Odometer, computer set, check system and tachometric signals used by other devices belonging to class F2.

The remaining instrumentation belongs to class F1.

FAILURE CRITERIA:
For needle or numeric indicators, any change in +/- 10% range of the set value (functional classes F1 and F2).
For pilot lamps and check system, any false lighting up of lamps/LEDs (functional class F1).
For the odometer, any change in the read values or reading set to zero (functional class F2).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 9

LIGHT CONTROL UNIT (ACDAY752)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Stop light switch on, left/right turn indicator lights on.
Monitored parameters	- Stop and indicator lights. - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA:
Change in the set operating conditions (change in intermittence frequency, switching off, etc.)

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 10

4WD CONTROL UNIT (AB7ZY751)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Simulated input signals so to have: *Condition 1:* idle motor, vehicle speed equal to 40 km/h, joint engaged by means of related button *Condition 2:* idle motor, vehicle speed equal to 40 km/h, joint released *Condition 3:* idle motor, vehicle speed equal to zero, joint engaged by means of related button Cyclically engage/release the joint by operating on the headlight/stop light switch
Monitored parameters	- Electromagnetic joint control. - System failure pilot lamp. - Engaged joint pilot lamp. - Other parameters, if needed to carry out an accurate diagnosis of the device under test
NOTES: FAILURE CRITERIA (Functional class F2): False or failed engagement/release of the electromagnetic joint. System failure pilot lamp switched on. Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.	

HELP 11

AUTOMATIC TRANSMISSION CONTROL UNIT (AA0AZ914)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions (with air-conditioner off)	Simulated input signals so to have: *Condition 1:* idle motor, speed gear set to "PARKING". *Condition 2:* vehicle speed equal to 20 Km/h, speed gear set to "DRIVE".
Monitored parameters	- Solenoid valve enabling/disabling control. - Failure pilot lamp (if provided) - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Undesired change in the set gear;
Undesired change in the digital reading of the set gear (if provided);
Failure pilot lamp on (if provided).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 12

PASSENGER COMPARTMENT AIR-CONDITIONER / WINDSHIELD DEFROSTER (ACGAT751)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	-intermediate air speed; -air temperature set to HI; -blower button set to OFF; -blow-by set to ON.
Monitored parameters	- blower control; - fan control signal (PWM); - mixer feed back; - fan control signal by the regulator output. - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Any change in the set conditions.

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 13

SERVOTRONIC steering control unit (AB7ZY916)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Simulated input signals so to obtain: *Condition 1:* idle motor *Condition 2:* 40 Km/h vehicle speed
Monitored parameters	- Control solenoid valve signal - Failure pilot lamp - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Control solenoid valve false start.
System failure pilot lamp on.

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 14

MOTOR CONTROL UNIT (ACDAZ913)	
Stay time on each test frequency	5 s.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions (wit air conditioner off)	Simulated input signals: *Condition 1:* idle motor *Condition 2:* motor running at 3000 rpm
Monitored parameters	- Coil start signal - Injection time signal - Failure pilot lamp - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Change in injection time higher than +/- 20% if compared to the rated time;
False or no spark start;
Failure pilot lamp steady on.

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 15

CRUISE CONTROL (AB7ZY913)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Simulated signals so to have: *Condition 1:* Vehicle speed equal to 60 Km/h (with cruise control on) *Condition 2:* Cruise **disabling** (stored speed 60 Km/h) by means of stop button (or clutch); cruise **enabling** by means of speed setting control, found on the steering wheel. *Condition 3:* Vehicle speed set to 80 Km/h on the cruise control, whereas simulated vehicle speed must be kept to 60 Km/h.
Monitored parameters	- Start signal; - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Undesired cruise control disabling.
Invalid cruise disabling/enabling control.
Change in the required speed (change in start signals).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 16

ELECTRONIC CLUTCH (AB7ZY895)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions (with air- conditioner off)	Simulated input signals so to have: *Condition 1:* vehicle speed equal to zero, speed gear set to "DRIVE". *Condition 2:* vehicle speed equal to 20Km/h, speed gear set to "DRIVE".
Monitored parameters	- Clutch control signal. - Clutch enabling/disabling signal. - Gear on digital display (if provided). - Other parameters, if needed to carry out an accurate diagnosis of the device under test.
NOTES: FAILURE CRITERIA (Functional class F2): Undesired change in the set gear; Undesired change in the clutch control signal; Change in the gear digital display (if provided). Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.	

HELP 17

IMMOBILIZER (AB7ZY921)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions (with properly stored key)	Proceed as follows: - Turn the key to ON for at least 1 sec. - Turn the key back to OFF.
Monitored parameters	- serial line signal; - LED status signal. - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F2):
Failed transponder key reading (LED steady on, "missing key" code transmitted);
Improper key code transmission (LED steady on, transmitted code not acknowledged by the motor control);
No answer to the motor control code request (LED steady on, no code transmitted).
No code request by the motor control (LED steady on, no transmission on the serial line)

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 18

SELF-LEVELING SUSPENSIONS (AB7Z7917)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions (with air-conditioner off)	Simulated input signals so to have: idle motor, speed gear set to parking (for vehicles equipped with automatic transmission), zero vehicle speed, parking brake released, control unit active and set to "STAND-BY", with remotely controlled start of the parking brake switch.
Monitored parameters	- Charge and discharge failure lamps on. - Sensor output signals. - Other parameters, if needed to carry out an accurate diagnosis of the device under test.
NOTES: FAILURE CRITERIA: Failure pilot lamp on Sensor output signals beyond tolerance Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.	

HELP 19

CONTROLLED DAMPING SUSPENSIONS (AB7ZY924)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F2.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Tested device operating conditions	Vehicle simulated speed signals able to set the system to "Automatic control": *Condition 1:* button set to "AUTO" and suspensions in "SOFT" mode *Condition 2:* button set to "SPORT" Simulated sudden brake (manual contact of the brake circuit in short-circuit) so to set the suspensions to "HARD" mode.
Monitored parameters	- Control solenoid valves status - System failure lamp on - Other parameters, if needed to carry out an accurate diagnosis of the device under test.
NOTES: FAILURE CRITERIA (Functional class F2): Change in the suspension working status if compared to the set test (AUTO / HARD / SOFT) False control solenoid valve start System failure lamp on Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.	

HELP 20

A.B.S. (AB7ZY918)	
Stay time on each test frequency	The time required to complete the ABS operating cycle.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional classes F2 and F3.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Vehicle operating conditions	Simulated input signals: *Condition 1:* simulated braking **with** ABS *Condition 2:* simulated braking **without** ABS
Monitored parameters	- Solenoid valve control signals (where possible) - Failure pilot lamp - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:
Exciters are applied to the system, by the phonic wheel electromagnetic pick-ups; the latter are stimulated by means of a simulated braking cycle, which results in activating the ABS. The features of this cycle are agreed upon with the supplier.

FAILURE CRITERIA:
Undesired change in the solenoid valve control signal under conditions 1 and 2 (Functional class F2);
Failure lamp on (Functional class F2);
Solenoid valve opening, under normal braking conditions (**Functional class F3**).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

HELP 21

AIRBAG (AB7ZY759)	
Stay time on each test frequency	5 s., or the time required to check for the tested device proper operation.
Magnetic test field intensity	As per Specifications 9.90110 concerning functional class F3.
Type of injected signal	Sinusoidal and triangular.
Magnetic field polarization	X, Y and Z axes of the device under test.
Monitored parameters	- Failure lamp. - Other parameters, if needed to carry out an accurate diagnosis of the device under test.

NOTES:

FAILURE CRITERIA (Functional class F3):
Failure lamp on (check for stored errors with Fiat/Lancia tester).

Any other testing condition concerning specific cases not provided for in this Standard, implying a different approach to failure criteria, shall be considered and evaluated from time to time together with the supplier and the system RSC.

Fiat Auto S.p.A. DIREZIONE TECNICA F.V. - S.I.E.E. SPERIMENTAZIONE APPLICAZIONI VEICOLO	**TEST DATA TRANSMISSION**	**DATE:**
	PROT.No. : **INTERNAL No.:**	
	REFERENCE: **JOB ORDER:** **Date of test :**	**VIOLATION**

DT-FV-RSV DT - SIEE - S.
DT-FV-SIEE-RPA DT - SIEE - P.
DT-FV-SIEE-TL
DT-FV-SIEE-TLS
DT-FV-SIEE-RSC

STANDARD No.: 7-Z0450 **STANDARD TITLE:** Electronic systems: bench tests for immunity from magnetic fields.

ABS:	**PBS:**	**SERIES**
CHASSIS No.:		**SK. No.:**
VEHICLE TYPE:		**CC:**
MOTOR TYPE:		**MANUFACTURING LEV.:**
COMPONENT:		**DWG. No.:**
SUPPLIER:		**D.L.C.:**

Test result : **for :**

ENGINEER SIGNATURE: **T.L./ MANAGER:**

ENCL. forms : **No. of pages :**