

Group Standard

TL 82566

Issue 2011-05

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Descriptors: electromagnetic compatibility, EMC, interference immunity, magnetic field, electronic component

Electromagnetic Compatibility of Automotive Electronic Components Interference Immunity with Respect to Magnetic Fields

Previous issues

TL 82566: 2006-11

Changes

The following changes have been made compared with TL 82566: 2006-11:

- Functional performance status classification (FPSC) as per ISO Standard introduced
- Industrial Assembly Kit (IBK) introduced
- Selection of testing field strengths limited to three options
- Testing in the DC field added
- Reference changed from MIL-STD-461E to ISO 11452-8
- Section "Generation of the magnetic field" omitted (because of reference to ISO 11452-8)

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This electronically generated Standard is authentic and valid without signature.

The English translation is believed to be accurate. In case of discrepancies, the German version is alone authoritative and controlling.

Numerical notation acc. to ISO convention.

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1 Scope

The Technical Supply Specifications TL 82566 determine requirements and testing methods to ensure interference immunity of electronic components, assemblies, or systems with respect to magnetic fields, which may couple into the component, assembly, or system as well as into their respective supply and signal lines.

2 Symbols and abbreviations

Component	General term used to designate an electronic component, assembly, or system (e.g., control unit, sensor, actuator)
DUT	Electronic component, assembly or system to be tested (Device Under Test)
FPSC	Function Performance Status Classification
IBK	Industrial Assembly Kit (German abbreviation)

3 General test conditions

Deviations from the following test conditions must always be noted in the test report.

Operating temperatures	As per drawing, Performance Specifications, or TL
Testing temperature	(23 ± 5) °C; operating temperature in special cases
Operating voltages	As per drawing, Performance Specifications, or TL

4 Functional performance status classification (FPSC)

These TL apply the functional performance status classification (FPSC) as defined in ISO 11452-1 AMD 1. The following status definitions as specified in ISO 11452-1 AMD 1 are used:

Status 1	The function behaves as specified prior to, during, and after the test.
Status 2	The function does not behave as specified during the test, but returns to normal operation automatically after completion of the test.

The following definitions from ISO 11452-1 AMD 1 are used to determine which status (I or II) must be complied with up to which field strength:

L1	Field strength up to which status 1 must be complied with.
L2	Field strength up to which at least status II must be complied with (status 1 is permissible as well).

The vehicle manufacturer alone defines the required function for status 1 or the still permitted functional deviation for status 2. If no permissible functional deviation is defined for status 2, proper function as per status 1 is required automatically.

These TL do not categorize the occurring effects in accordance with their importance for the customer.

5 Test documentation

The following information must be provided to the EMC department when samples for EMC tests are delivered:

1. System designation and description
2. Hardware version, component location drawings, layout plans as well as bills of materials, circuit diagram, and description of the EMC measures (e.g., filter and protection circuits for inputs/outputs as well as supply lines and screening measures)
3. Software version with description of the EMC measures (e.g., filtering of signals implemented in the software, temporary deactivation of individual circuit components, limp-home features)
4. Deviations from TL specifications as agreed upon between Volkswagen Group and supplier
5. EMC qualification report of the relevant sample status

6 Component testing

As agreed upon in the testing concept, the supplier carries out all component tests required in TL 82566. The requirements as per ISO 11452-8 apply, unless otherwise provided in the following.

The frequency range to be tested with these TL is 0 Hz (DC) to 30 kHz. Unless provided otherwise herein, the frequency increment can be found in Table 1. Irrespective of this, the following frequencies must be tested in any case: 15 Hz, 16 $\frac{2}{3}$ Hz, 50 Hz, 60 Hz. All test frequencies must be specified in the test report. The specimen is exposed to each frequency for at least 2 s. The test is to be performed without modulation, i.e. a pure sinusoidal signal must be used in all cases.

Table 1 – Frequency increment

Frequency range in Hz			Frequency increment in Hz
15	to	100	10
100	to	1 000	20
1 000	to	10 000	200
10 000	to	30 000	500

To this effect, the specimen must be connected to a supply voltage as well as to any peripheral components necessary for proper function. The wiring harness used in this test must be designed such that as few interferences as possible are coupled into the specimen by the applied magnetic field. This can, for instance, be achieved by twisting the cables. The operating state of the specimen must be chosen such that all of its relevant functions can be tested. If it is impossible to test all functions in one single operating state, the test must be performed in several test runs.

These TL apply the three maximum testing field strengths 2, 3, or 4 (see Table 2). Unless otherwise provided herein, test field strength 4 must be complied with. Testing field strength 4 must be applied to all components that belong to the Industrial Assembly Kit (IBK). The magnetic field strength is defined as per ISO 11452-1.

Table 2 – Testing field strengths used

Frequency range in Hz				
	-	Testing field strength 2 Level 2	Testing field strength 3 Level 2	Testing field strength 4 Level 2
	Testing field strength 2 Level 1	Testing field strength 3 Level 1	Testing field strength 4 Level 1	-
	H in A/m	H in A/m	H in A/m	H in A/m
DC	30	100	300	1 000
15 to 60	30	100	300	1 000
60 to 180	$30 / (f/60)$	$100 / (f/60)$	$300 / (f/60)$	$1\,000 / (f/60)$
180 to 600	10	$100 / (f/60)$	$300 / (f/60)$	$1\,000 / (f/60)$
600 to 1 800	10	10	$300 / (f/60)$	$1\,000 / (f/60)$
1 800 to 6 000	10	10	10	$1\,000 / (f/60)$
6 000 to 30 000	10	10	10	10

A Level 1 as per the FPSC is defined for each of the three possible testing field strengths until which status 1 must be complied with. In addition, a Level 2 is defined until which the status 2 must be complied with.

Figure 1 shows the required levels for testing field strength 4, Figure 2 for testing field strength 3, and Figure 3 for testing field strength 2 (see Table 2). It is to be taken into account that the required test with DC (0 Hz) is not shown in Figure 1, Figure 2, and Figure 3.

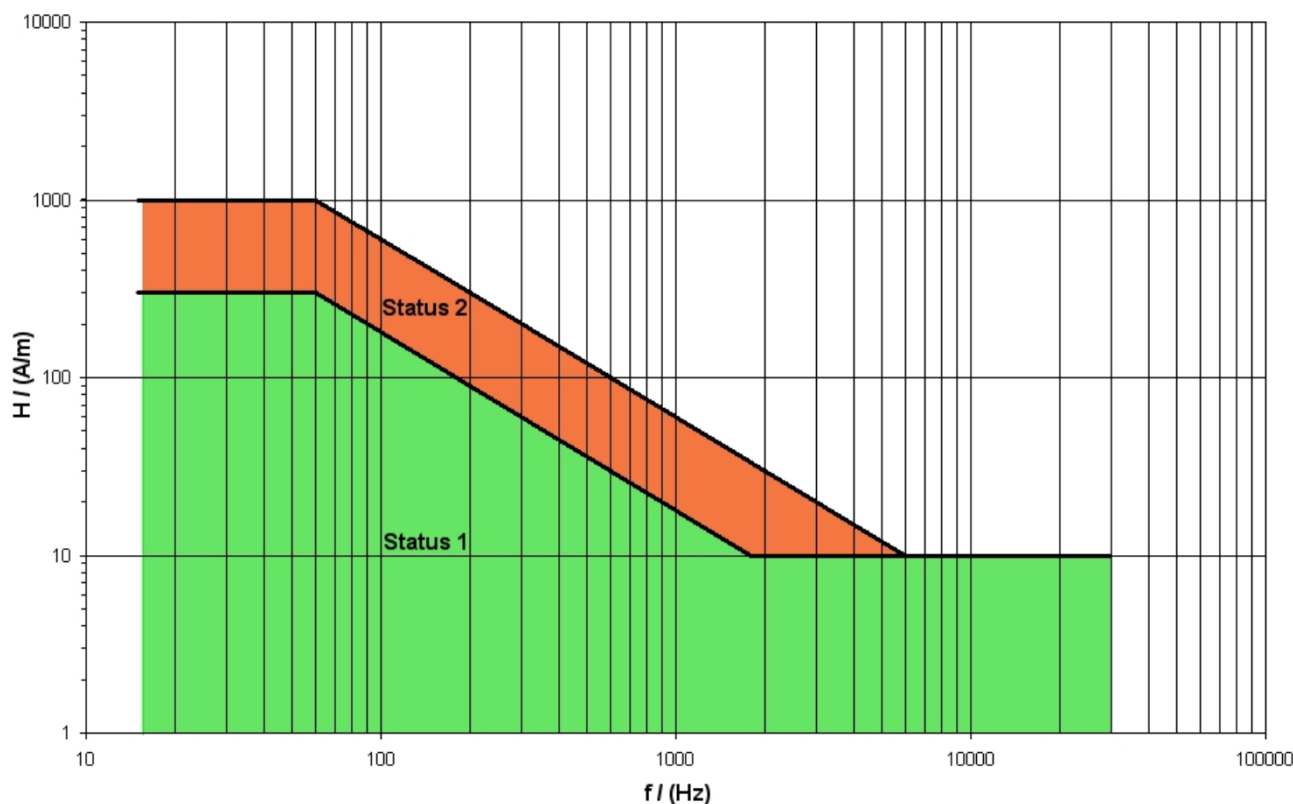


Figure 1 – Testing field strength 4

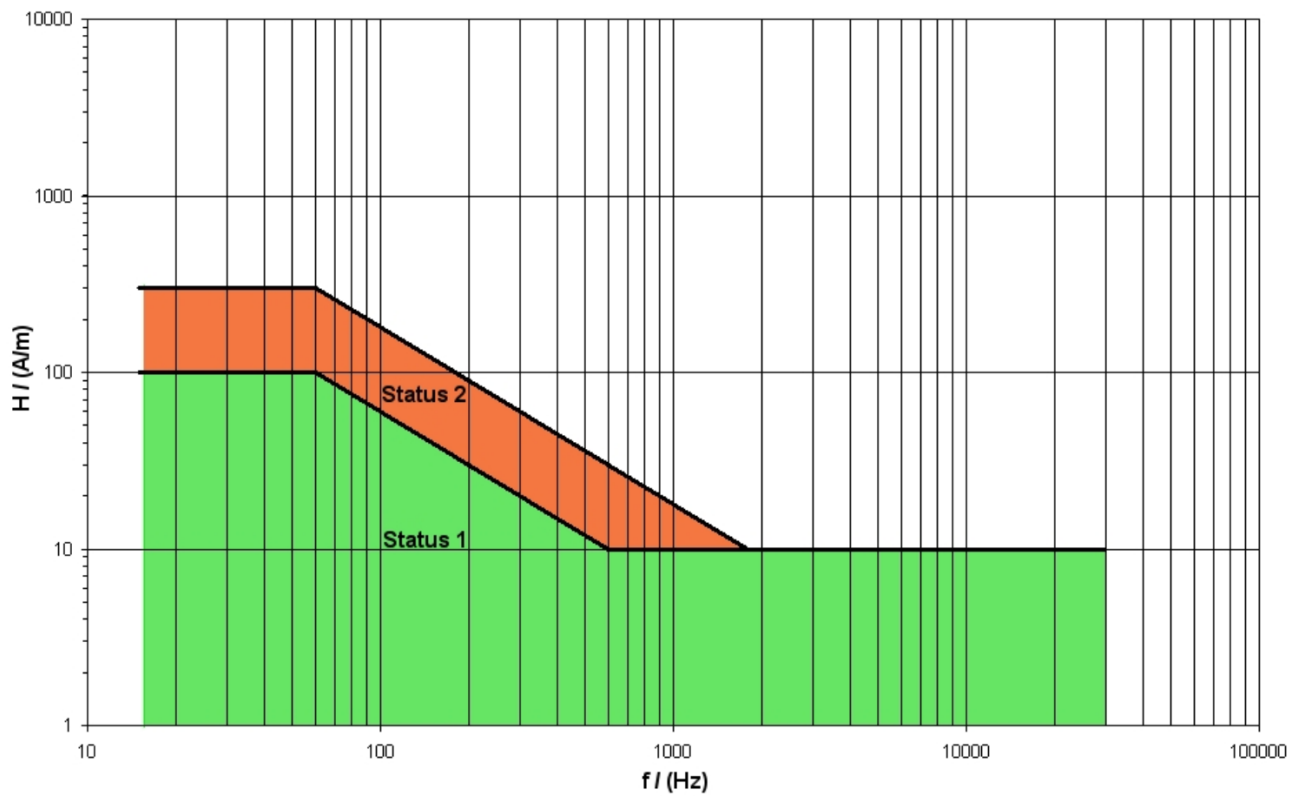


Figure 2 – Testing field strength 3

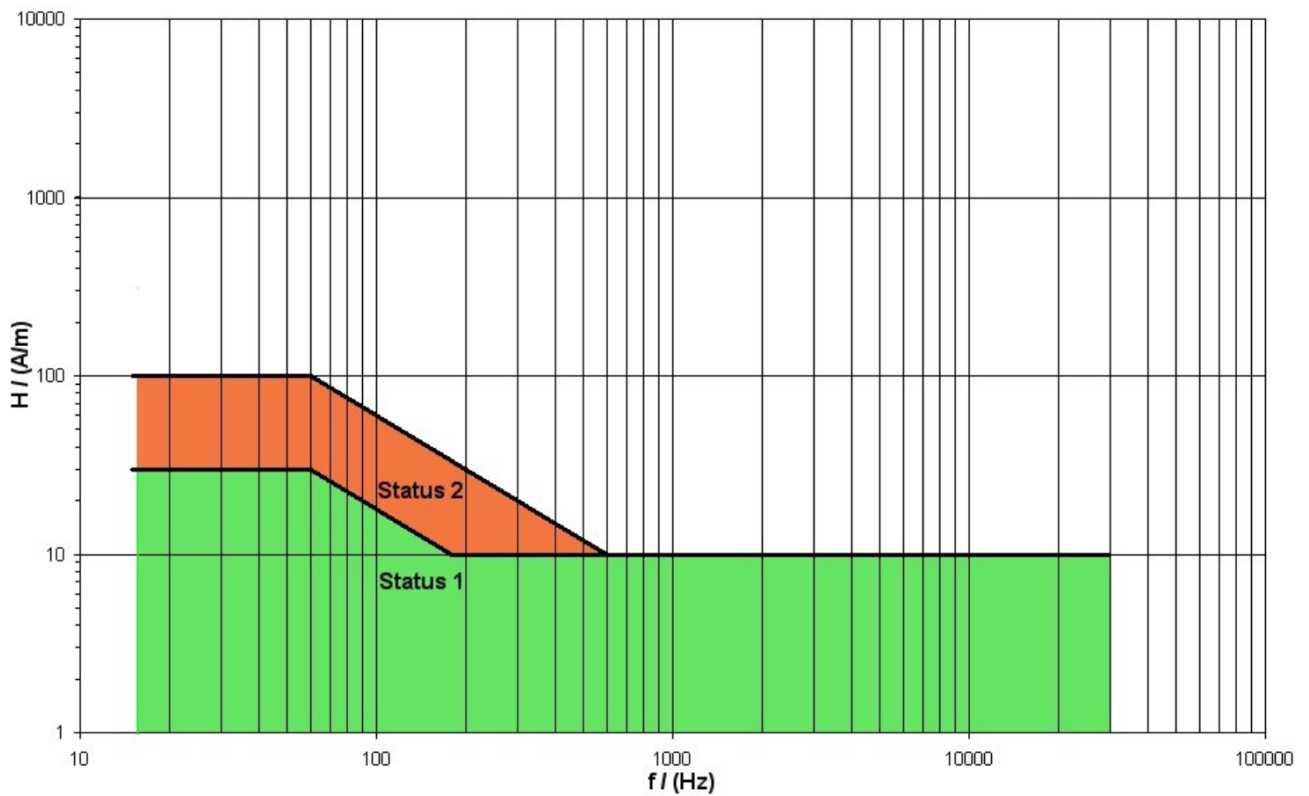


Figure 3 – Testing field strength 2

7 Other applicable documents

The following documents cited in this Standard are necessary to its application.

Some of the cited documents are translations from the German original. The translations of German terms in such documents may differ from those used in this Standard, resulting in terminological inconsistency.

Standards whose titles are given in German may be available only in German. Editions in other languages may be available from the institution issuing the standard.

ISO 11452-1	Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 1: General principles and terminology
ISO 11452-1 AMD 1	Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 1: General principles and terminology
ISO 11452-8	Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 8: Immunity to magnetic fields

Appendix A (informative)

Table A.1 – Correlation between the magnetic field strength H and the magnetic flux density B in air

H in dBμA/m	H in A/m	B in μT	B in dBpT
180,0	1 000,0	1 256,0	182,0
170,0	316,2	397,1	172,0
169,5	300,0	376,8	171,5
160,0	100,0	125,6	162,0
158,0	79,6	100,0	160,0
150,0	31,6	39,7	152,0
149,5	30,0	37,7	151,5
104,1	0,16	0,2	106,1