

VDE INTERFERENCE REGULATIONS OF WEST GERMANY

Manufacturers of electronic or electrical products that export to other countries should be aware of the legal and technical regulations of the importing country. In some countries rigid laws are established to ensure control of radio frequency interference. For most European countries the interference control regulations will eventually be unified and will be based upon European Economic Community Directives that are derived from the International Electrotechnical Commission, Special Committee on Radio Interference (IEC/CISPR) Recommendations and Publications [1]. Since West Germany's interference regulations are harmonized with IEC/CISPR recommendations it is expected that most countries in Europe will follow West Germany's approach to interference control.

German Interference Control Laws

In West Germany, the interference control laws have been written and the technical and administrative organizations have been established to enforce the limits. The International Telecommunication Union Treaty of 1947 is the foundation of the "Law for the Operation of High Frequency Apparatus, dated 9 August 1949" [2]. The law assigns the responsibility of interference control to the Minister fuer das Post and Fernmeldewesen (DP-FTZ) (FTZ, Referat C-24, Am Kavalleriesand, D-6100 Darmstadt, West Germany) enforces the administrative regulation [3] which stipulates that if equipment meets a specified interference limit (i.e. VDE 0875) a "General Permit" is issued. The proof of compliance with the limits is the "Radio Protection Emblem" issued by the VDE Testing Station that must be affixed to the equipment.

VDE Organizations

The VDE consists of three organizations that work together to advance electro-technology. Verband Deutscher Elektrotechniker (VDE) is the Association of German Electrical Engineers which consists of dues paying members. As part of this voluntary effort the VDE Regulations are prepared by VDE Standards Committees (VDE Normen Ausschuss). Individual regulations are written for personnel safety, consumer protection, reliability, and to harmonize German and international standards. Each new regulation has a well publicized review that is coordinated with the German Standards Institute (Deutsches Institute fuer Normen, DIN), and the German Electrotechnical Commission (Deutsche Elektrotechnische Kommission, DEK). New VDE regulations also receive a DIN number that is based on the last three digits of the VDE number, i.e. VDE 0874/10.73 becomes DIN 57 874.

The second organization is the VDE Publishing House (VDE Verlag) with offices in Berlin (1 Berlin 12, Bismarkstrasse 33) and Offenbach (D-6050 Offenbach, Merianstrasse 29). The VDE regulations and draft regulations may be ordered from either office.

The third organization is the VDE Testing Station (VDE Pruefstelle) at D-6050 Offenbach, Merianstrasse 28. The VDE Testing Station has been in existence since 1920 [4] originally in Berlin. It was founded to determine the compliance of electrical equipment with VDE safety

regulations. The first products tested were fuses and switches up to 60 amperes, trouble lights, and plugs. After the Second World War it was moved to Frankfurt-Main, and in 1968 to its present location in Offenbach.

VDE Testing Station

The VDE Testing Station is a quasi-independent institution of the Association of German Electrical Engineers (VDE). Management of the VDE Testing Station is controlled by the Board of the Testing Station of the VDE which is a standing committee that determines the work areas and fee structure and that draws its members from firms who have an interest in the work of the testing station. The Director of the VDE Testing Station is responsible for the management of the testing station and for the proper performance of the tests. The Director makes the decision to grant, reject or withdraw the permission to use a VDE Emblem. All of the decisions of the testing station may be contested by filing a complaint with the VDE Board. The work areas and fees of the testing station are determined by the VDE Board. The work of the testing station is chartered to be for the common good and extends over the following areas:

1. Safety tests for the VDE Emblem
2. Radio Frequency Interference Suppression Tests
3. Qualification Tests for Electronic Components
4. General Investigations
5. Administration of the VDE Testing Station

The electrical safety is the classical work area of the VDE testing station which caused the foundation of the testing station. These tests extend over products which are used by the general public. The specific items to be tested are tabulated in VDE 0024/11.64, "The VDE Testing Station and VDE Testing Seal" [5]. Principally, it covers electrical installation materials, household appliances, light fixtures, power tools, toys, cables, and wires.

The measurement of radio frequency interference originating from electrical appliances and the effectiveness of interference suppression measures was the second work area that was undertaken by the testing station in 1951. Contractual agreements between the German Postal Service and the VDE are the basis for the RFI measurements by the VDE. The VDE issues certificates of compliance for (1) equipment that generates RF energy intentionally (VDE 0871) and (2) radio and television receivers (VDE 0872.) The German Postal Service then issues a test number that must be affixed to the equipment. For equipment that generates interference as a by-product (VDE 0875) the VDE issues a permit to use the "Radio Protection Mark" that must be affixed to the equipment.

VDE Interference Limits

For equipment that does not intentionally generate RF signals, such as equipment for household use, VDE 0875/6.77 is applicable. Figure 1 shows the limits of VDE 0875/6.77. Most equipment should meet the "N" limit. The "G" limit is intended for equipment in industrial areas. The "K" limit is for equipment used in

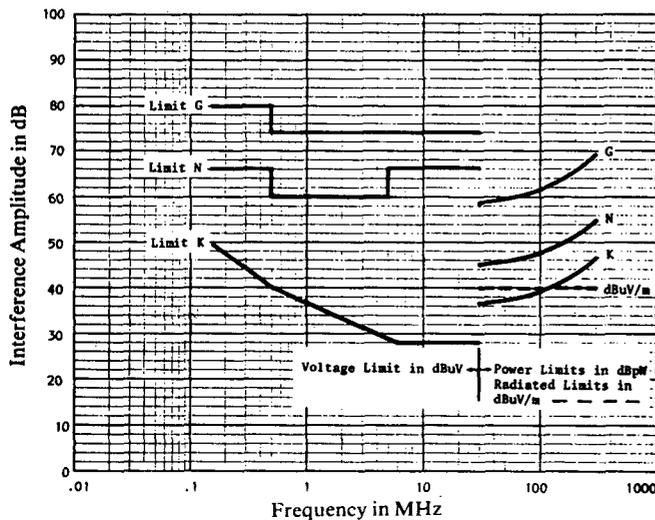


Figure 1. VDE 0875/6.77 Interference Limits.

remote areas or in radio receiver installations. It should be noted that it is optional to measure either the interference power on the powerline or the radiated interference at a distance of 10 meters.

For equipment that generates or processes RF signals, VDE 0871/6.78 was issued in 1978. Figure 2 shows the limit for conducted RFI voltages on powerlines. These limits are based upon a 50 micro-henry/50 ohm power mains network. VDE 0876 Part 1/9.78 details the power mains networks to be used. The radiated RFI limits are shown in Table 1. The limits for Class B are applicable for equipment to be type-tested under the "general permit" procedure. The definition of the limit categories is as follows:

Limit Category A—For equipment that complies with this limit a type approval and a permit must be obtained. (Voltage limit is 12 dB above "B" limit).

Limit Category B—For equipment that complies with this limit the "general permit" provision of the German Law is applicable.

Limit Category C—For equipment that complies with this limit when measured after installation in an industrial area a special permit must be obtained. (Voltage limit is 12 dB above "B" limit).

The listing of the VDE RFI regulations is as follows:

VDE 0871/6.78	Specification for Equipment that generates or processes RF.
VDE 0872/7.72 and Rev. A/10.79	Regulation for Radio and TV Receivers
VDE 0874/10.73	VDE Guidelines for Interference Suppression
VDE 0875/6.77	Regulation for Household Equipment (Unintentional RF)

VDE 0876 Part 1/9.78	Specification for RFI Measurement Equipment
VDE 0877 Part 1/12.59	Procedure for Measurement of Interference Voltages
VDE 0877 Part 1/...79	Measurement of RFI Voltages (Draft)
VDE 0877 Part 2/12.55	Procedure for Measurement of Interference Field Strength
VDE 0877 Part 3/4.80	The Measurement of RFI Power on Power Cords
VDE 0879	Interference Suppression of Vehicles and Equipment with Internal Combustion Engines
VDE 0879 Part 1/6.79	Regulation for the Far-Field Suppression of Ignition Systems
VDE 0879 Part 2/1.58	Guidelines for near-Field Suppression of Ignition Systems
VDE 0565	VDE Regulation for Radio Interference Suppression Networks
VDE 0565 Part 1/12.79	Suppression Capacitors
VDE 0565 Part 2/9.78	Suppression Chokes
VDE 0565 Part 3/...80	Suppression Filters to 16 Amp. (Draft 3)
VDE 0565 Part 4/...76	Ceramic Capacitors (Draft 1)
New drafts of VDE specifications are as follows:	
VDE 0847 Part 1/...79	Measurement Procedures for Assessment of EMC Part 1: The Measurement of RFI Emissions
VDE 0848 Part 1/...79	Electromagnetic Hazards Part 1: Determination of Field Amplitudes by Measurement and Calculation
VDE 0848 Part 2/...79	Part 2: Electromagnetic Hazards of Personnel
VDE 0873 Part 1/...78 and Rev. a/...80	RFI Suppression Measures for Power Utilities and Electric Traction Vehicles Part 1: RFI from 10 kV Systems
VDE 0875 Rev. a/...79	RFI Suppression of Electrical Equipment
VDE 0876 Part 1 Rev. a/...78	Rev. a to Part 1/6.78
VDE 0876 Part 100/...77	Part 100: Automatic Click Analyzer
VDE 0876 Part 101/...78	Part 101: Absorbing Clamps for RFI Measurement
VDE 0877 Part 100/...78	Part 100: CISPR Measuring Set, 0.15—30 MHz
VDE 0877 Part 101/...78	Part 101: Procedures for the Measurement of the Decoupling Factor
VDE 0879 Part 3/...79	Part 3: Near Field Suppression of Equipment On-Board of Vehicles

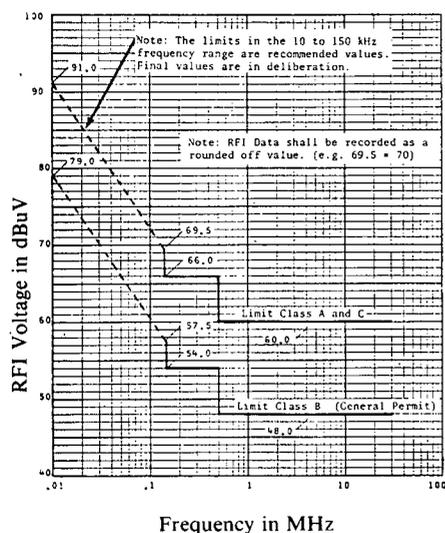


Figure 2. RFI Voltage Limits of VDE 0871.

Recent Developments

A draft of VDE 0877 Part 1/...79 "Measurement of RFI Voltages" was issued for review and comments in July 1979 and will be released in 1981 for general use. This draft specifies how to measure and identify broadband RFI in terms of microvolts per kHz and microvolts per MHz. The recommended CW and BB identification approach is similar to the MIL-STD-461 approach: Change the tuned center frequency by a frequency span equal to the impulse bandwidth. If the output changes by more than 3 dB the RFI is CW. This measurement method supports some of the new FTZ limits for specific equipments. (eg. Vfg 526/1979, RFI Measuring Sets, Vfg. 257/1979 Infrared Communication Equipment). The limits are given in terms of broadband and CW and (note!) the CW limit is 12 dB lower than the broadband limit. However, the broadband RFI limit is not yet normalized to a unit bandwidth; unless the bandwidths of 220 Hz, 9 kHz, and 120 kHz are considered "unit" bandwidths in their respective frequency ranges. For a student of VDE limits it is interesting to note that this approach restores the original intent of the N-12 limit which was instituted when DPE expanded and was measured per VDE 0875 which had only broadband limits.

Another interesting development pertains to radiated measurements below 30 MHz. Since it is usually difficult to measure RFI at a distance of 30 meters, Vfg. 526/1979 and Vfg. 257/1979 gives RFI limits for a measurement distance of 3 meters. The same limits are also under consideration by FTZ Referat C-24 for inclusion in the law that enforces VDE 0871.

VDE booklet No. 25 [7] gives several decisions of the VDE Testing Station applicable to RFI measurements:

Decision No. 73: Video recorders and players shall be measured in accordance with VDE 0872/7.72. Any RF output on the antenna terminals shall not exceed 10 microvolts across 75 ohms.

Decision No. 86: RFI measurement sets shall meet the requirements of Postal Regulation 605/1977. The "B" limit of VDE 0871 applies to RFI powerline voltage. The limit for radiated RFI is 4 nW (36 dBpW) when measured via the generator substitution method.

Decision No. 89: Handheld electrical tools may be measured with the 50 ohm/50 microhenry power mains network. The N-limit of VDE 0875 is applicable.

Table 1 RFI Field Strength Limits of VDE 0871

Frequency Range MHz	RFI Field Strength Measured at a Measurement Site and Distance of				RFI Field Strength Measured at an Operational Site and Distance of		
	Limit Class A		Limit Class B		Limit Class C		
	30 m uV/m	100 m uV/m	10 m uV/m	30 m uV/m	30 m ⁵⁾ uV/m	100 m ⁵⁾ uV/m	300 m ⁶⁾ uV/m
0.01 to 0.15 ²⁾	-	50	-	50	-	250	200
0.15 to 0.285	-	50	-	50	-	50	200
0.285 to 0.49	-	50	-	50	-	250	200
0.49 to 1.605	-	50	-	50	-	50	200
1.605 to 3.95	-	50	-	50	-	250	200
3.95 to 30	-	50	-	50	-	50	200
30 to 41	500	-	50	-	500	-	200
41 to 68	30	-	50	-	30	-	200
68 to 87	500	-	50	-	500	-	200
87 to 107,828	500	-	50	-	30 ¹⁾	-	200
107,828 to 174	500	-	50	-	500	-	200
174 to 230	30	-	50	-	30	-	200
230 to 470	500	-	50	-	500	-	200
470 to 760	180 ³⁾	-	200	-	100	-	200
760 to 790	3) 4)	-	200	-	100	-	200
790 to 1000	3) 4)	-	200	-	500	-	200

NOTES: When field strengths are measured at other than specified distances, the influence of the measurement area must be considered in the calculations for other distances.

- 1) Recommended value: Limit = 500 uV/m.
- 2) In the 10 to 150 kHz frequency range, the values shown are at present only recommended.
- 3) RFI field strengths measured at a measurement site and at a distance of 10 m.
- 4) RFI field strength of 900 uV/m at 760 MHz and decreasing linearly to 700 uV/m at 1000 MHz.
- 5) Distance of 30 m and 100 m is measured from the boundary of the contiguous work areas or from the industrially zoned area.
- 6) Distance of 300 m is measured from the operating location of the equipment.

REFERENCES

- [1] Mertel, H. K., National and International Radio Frequency Interference Regulations, Don White Consultants, Inc. Publishing Division, Germantown, Maryland, 20767.
- [2] Warner, Alfred, Explanations for the Interference Suppression Regulations for High Frequency Apparatus and Installations, (in German) VDE Booklet 20, 101 p., VDE Publishing House, Berlin, 1970.
- [3] Amtsblatt des Bundesministers fuer das Post und Fernmeldewesen, Ausgabe A., No. 63, Bonn, 10 May 1973, p. 831, Statute No. 319 Interference Suppression of Electrical Apparatus, Machines, and Installations (in German).
- [4] Walther, H., The VDE Testing Station (in German), VDE Booklet 22, 53 p., VDE Publishing House, Berlin, 1970.
- [5] VDE 0024/11.64, The VDE Testing Station and VDE Testing Seal, (in German), VDE Publishing House, Berlin, 1970.
- [6] Amtsblatt des Bundesministers fuer das Post und Fernmeldewesen, No. 97, Bonn, 24 July 1970, p. 1062. Statute No. 529/1970, General Permit based upon the Law for the Operation of High Frequency Equipment. (The "Minus 12 dB Law").
- [7] VDE Booklet No. 25, Decisions of the VDE Testing Station Applicable to VDE Specifications, 6th Issue, 1979.

The above material was written for ITEM by Herbert K. Mertel of EMACO EMC Consultants, Technical Export/Import Consulting Division, San Diego, California