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 a European Economic Community Directive that is being developed. All EEC countries are expected to ratify the interference directives during 1977/78. The directives are based upon 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 und 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 interfence 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 distinct 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 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 2. 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).

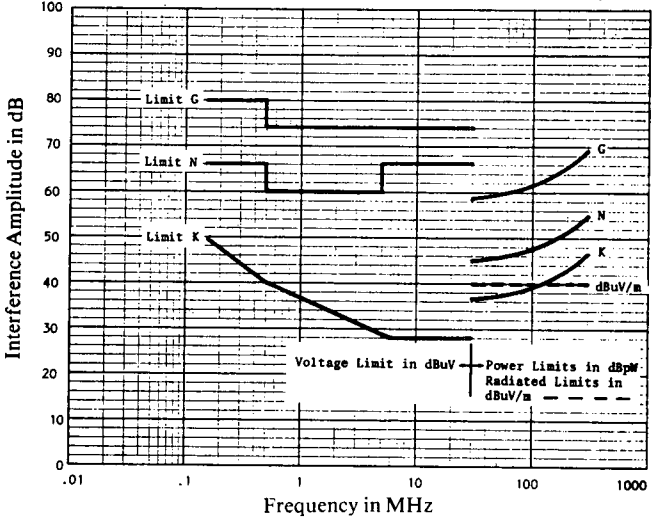
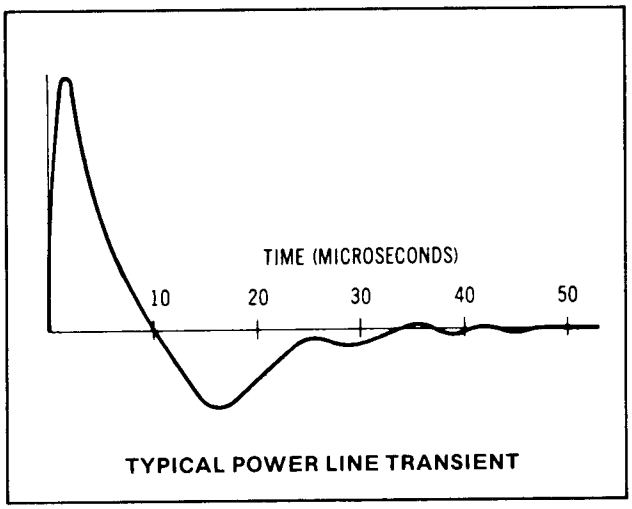
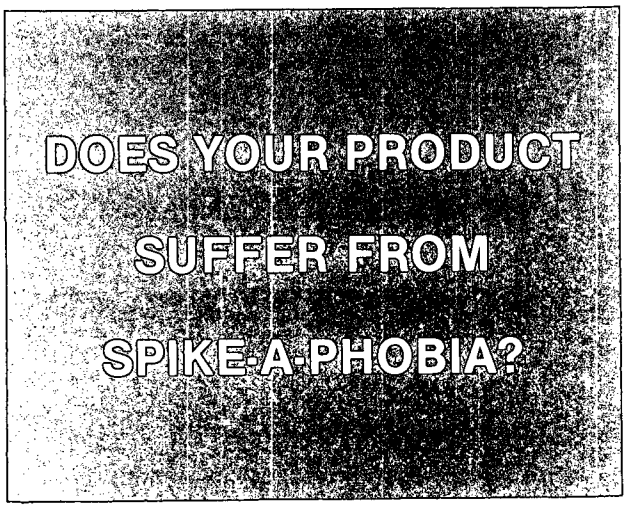


Figure 1. VDE 0875/6.77 Interference Limits.



TYPICAL POWER LINE TRANSIENT



Does your product suffer from spike-a-phobia? Does it stutter at line transients? Does it run scared or stumble when the secretary's finger discharges her high voltage to its surface? Does it miss a beat when the heavy equipment next door takes a bite out of the power line?

Say what you will, low voltage logic circuits are vulnerable and need all the protection you can give them. The problem is to isolate the particular circuit that is susceptible to outside influences such as fast line transients and static discharges.

That's where we come in. We specialize in supplying equipment which creates controllable spikes and sparks. With the test equipment we provide you can simulate the problem and adjust the level of the interfering signal to determine the threshold of your susceptibility. So what? So you can accurately measure the effectiveness of the things you do to make your system immune to the nasty devils.

This approach takes the problem out of the realm of "black magic" and creates a quasi-scientific atmosphere which can be documented and studied. You can even write a lengthy report on it to confound other engineers or prepare a paper for your favorite journal. But best of all, you can build a computer or a peripheral device which stands up in the face of the enemy and earn yourself a reputation as a creator of the invincible.

THINGS YOU NEED FOR TESTING TO MIL-STD-461A/462*

6220-1A	Audio Isolation Transformer (CE01[1], CS01, CS06, RS02)
6254-5S	Transient Generator (CS06)
6338-5-PJ-50N	Line Imp. Stab. Network (CE02[2], CE04[2], CS02[2])
6338-57-PJ-50N	Line Imp. Stab. Network (CE02[2], CE04[2], CS02[2])
6512-106R	10 mfd Feedthru Capacitor (CE02, CE03, CS06, RE02, RE04)
6550-1	100 W. Power Sweep Generator (CS01, RS02)
6552-1A	100 W. Power Amplifier (CS01, RS02, RS03, RS04)
6623-( )	Low Pass Filter, 50 ohms (CE05, CE06, CS02, CS03 CS04, CS05, CS08, RS04)
6741-1	EMI Current Probe (CE01, CE02, CE03, CE04, CE05)
6815-1	Precision Resistor, .01 ohm (RS02)
6824-( )	High Pass Filter, 600 ohms (CE01, CE02)
6920-0.5	Resistive Network (CE01[1])
7021-1	Phase Shift Network (CS01)
7032-1	Isolation Transformer, 800 W. (All Test Methods)
7033-1	Impedance Matching Transformer (CS02, RS03)
7144-1.0	Precision Resistor, 1.0 ohm, 50 W. (RS01)
7144-10.0	Precision Resistor, 10.0 ohms, 50 W. (RS02[2])
7205-( )	High Pass Filter, 50 ohms (CE01, CE02)
7334-1	Loop Sensor (RE01, RE04)
7429-1	Loop Antenna (RS01)
7415-1	R.F. Coupler - High Pass Filter (CS02)
7835-891	Coupling Network (CE07[2])
7835-892	Coupling Network (CE07[2])

*See our catalog for devices to be used with other EMI specifications.

NOTE: X[1]. See Notice 3, MIL-STD-462 for CE01 in lieu of current probe.
X[2]. Required by Notice 3, MIL-STD-462, U.S. Army Contracts.

Circle Number 140 on Inquiry Card

INSTRUMENTS, COMPONENTS and ACCESSORIES for the RFI / EMC ENGINEER

SOLAR ELECTRONICS CO.
a division of A. T. Parker, Inc.
901 NORTH HIGHLAND AVENUE / HOLLYWOOD, CALIFORNIA 90038 / (213) 462-0806

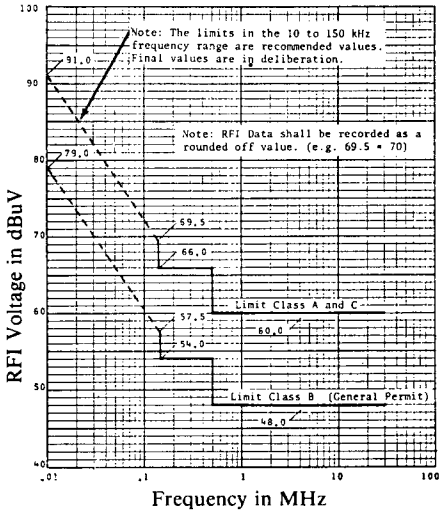


Figure 2. RFI Voltage Limits of VDE 0871.

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	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 0879	Interference Suppression of Vehicles and Equipment with Internal Combustion Engines.
VDE 0879 Part 1/9.66	Regulation for the Far-Field Suppression of Ignition Systems.
VDE 0879 Part 1/6.79	Revision to Part 2/9.66.
VDE 0879 Part 2/1.58	Guidelines for near-Field Suppression of Ignition Systems.
VDE 0565	VDE Regulation for Radio Interference Suppression Networks (New Drafts)
VDE 0565 Part 1/...75	Suppression Capacitors
VDE 0565 Part 2/9.78	Suppression Chokes (Released)
VDE 0565 Part 3/...75	Suppression Filters to 16 Amp.
VDE 0565 Part 4/...76	Ceramic Capacitors

DEVELOPMENTS IN 1979:

A draft of VDE 0877 Part 1/... 79 "Measurement of RFI Voltages" was issued for review and comments in July 1979. 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 meausrement 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 as shown in Figure 3. The same limits are also under consideration by FTZ Referat C-24 for inclusion in the law that enforces VDE 0871.

Table 1 RFI Field Strength Limits of VDE 0871

Frequency Range MHz	RFI Field Strength Measured at a Measurement Site and Distance of: Limit Class A 30 m uV/m	Limit Class A 100 m uV/m	Limit Class B 10 m uV/m	Limit Class B 30 m uV/m	RFI Field Strength Measured at an Operational Site and Distance of: Limit Class C 30 m[5] uV/m	Limit Class C 100 m[5] uV/m	Limit Class C 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 and 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").

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