Green is life tmg

ABN 43 064 478 842

231 osborne avenue clayton south, vic 3169
PO box 1548, clayton south, vic 3169
t 03 9265 7400 f 03 9558 0875
freecall 1800 680 680
www.tmgtestequipment.com.au

Test & Measurement

- sales
- rentals
- calibration
- repair
- disposal

Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

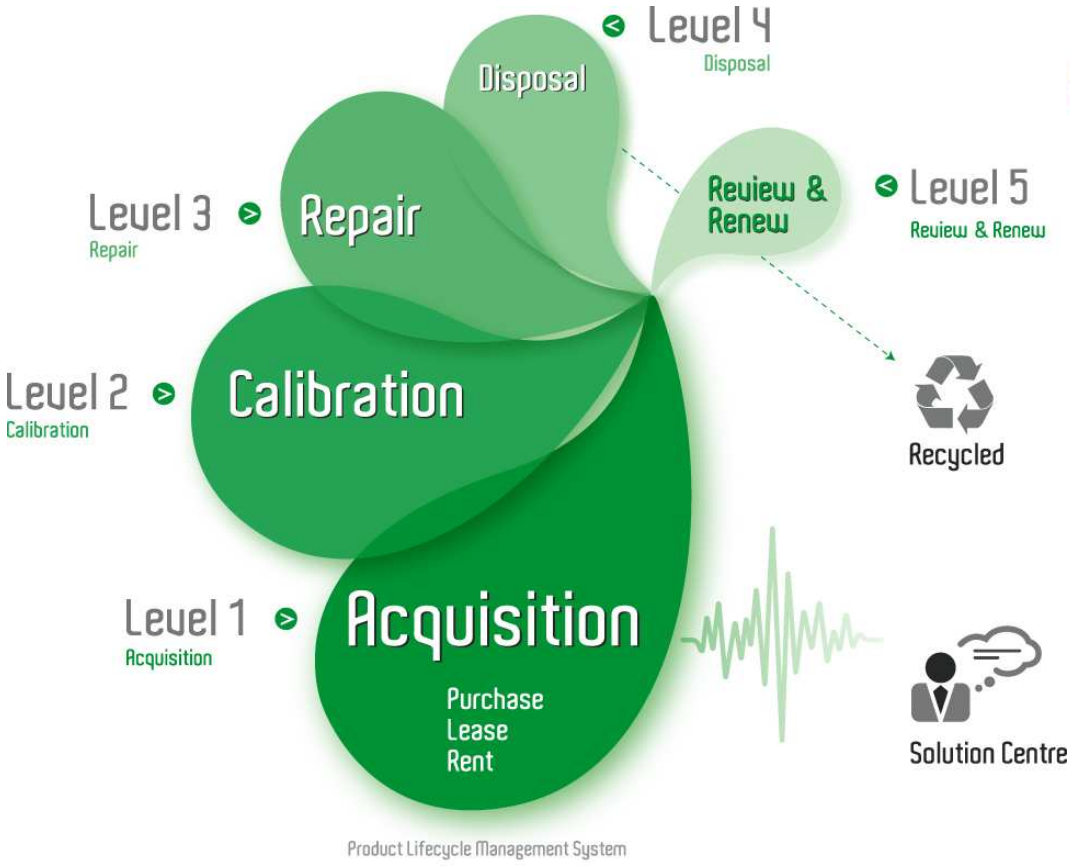
TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

If you click on the "Click-to-Call" logo below, you can all us for FREE!

TMG Corporate Website **TMG Products Website**

Click-to-Call
TMG Now



Version 06.00

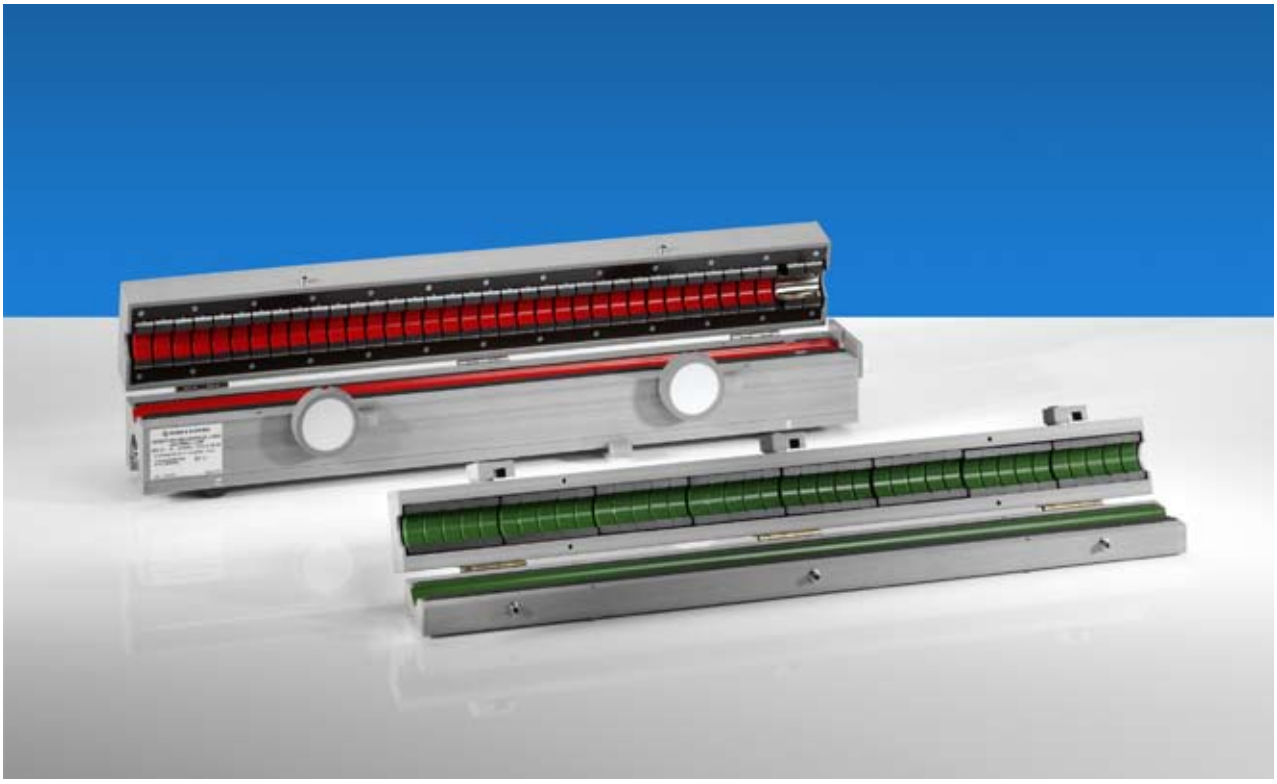
July 2007

R&S®MDS-21 Absorbing Clamp, R&S®EZ-24 Ferrite Clamp

Measurement of disturbance power and screening effectiveness on cables
Reproducible measurements of disturbance field strength and disturbance power

- R&S®MDS-21 for 30 MHz to 1000 MHz
- R&S®EZ-24 for 1 MHz to 1000 MHz for improved reproducibility of disturbance field strength measurements
- Calibrated in accordance with CISPR Publ. 16-1-3
- R&S®MDS-21 with ball bearing rollers for continuous use in automatic measurements
- Maximum diameter of cable
  - 20 mm for R&S®MDS-21
  - 22 mm for R&S®EZ-24
- Clamps can be opened to put in cable to be tested

ROHDE&SCHWARZ



R&S®MDS-21 absorbing clamp, R&S®EZ-24 ferrite clamp

The disturbance emitted by electrical appliances, machines, and systems must comply with the limits specified by national and international standards. Absorbing clamps (MDS clamps) in conjunction with EMI measuring receivers are used to measure the disturbance power on cables in accordance with CISPR 13 or EN 55013, in accordance with CISPR 14-1 or EN 55014-1, as well as in accordance with EN 50083-2. They can also be used in conjunction with two-port measuring devices to measure the screening effectiveness of cables in accordance with DIN 47250 Part 6, IEC 96-1, and EN 50083-2. The MDS clamps are also used to test the efficiency of disturbance suppression devices for high voltage ignition systems in accordance with CISPR 12 or EN 55012. Drafts on the measurement of radiated emission call for ferrite absorbers to load cables in order to improve the reproducibility of disturbance field strength measurements. Ferrite absorbers are also useful to improve the measurements of disturbance power and screening effectiveness.

Measuring disturbance in the VHF/UHF range

In the frequency range below 30 MHz, the interference stipulated in many standards is defined by measuring the disturbance voltage produced by the EUT at the terminals of a line-impedance stabilization network. This is important because disturbance in this frequency range is mainly propagated via cables.

In the VHF/UHF range, where radiated disturbance is predominant, the interference is defined by the disturbance field strength at a certain distance. Small EUTs mainly emit disturbance via closed cables, e.g. power cables. For this reason and also to reduce extensive field strength measurements to a minimum, many standards stipulate the MDS clamp to measure the disturbance power.

Measurement methods and test setups

Disturbance power measurement
A ferrite absorber provided in the MDS clamp surrounds the power cable and acts as resistance for the high-frequency RFI power. The incoming current is measured at the absorber input by using a current transformer and an EMI measuring receiver. Since there is no matching between the disturbance source, the cable, and the absorber in this setup, the MDS clamp is slid along the cable to obtain maximum current.

By selecting suitable absorber material and correctly dimensioning the current transformer, the dBµV readout of an EMI measuring receiver is almost identical to a dBpW readout. A corresponding calibration certificate is part of the equipment supplied.

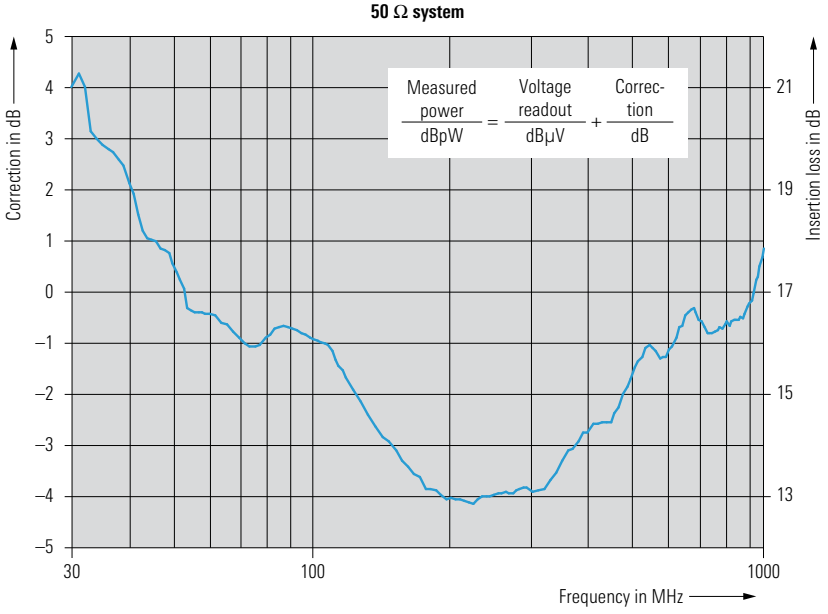
Screening effectiveness measurement
The screening effectiveness of a cable is defined as the ratio of the disturbance power of the surface acoustic wave of an unshielded cable measured with the MDS clamp to the disturbance power of the surface acoustic wave on the cable screen. The shielded cable is terminated into its nominal impedance. Disturbing effects caused by standing waves are reduced by the ferrite absorber of the MDS clamp and by an additional ferrite absorber. Relevant standards on screening effectiveness measurements such as DIN 47250 Part 6, IEC 96-1 Amendment 2, and EN 50083-2 slightly differ from each other.

Design
The MDS clamp consists of a number of ferrite ring cores arranged in a row that surround the cable of the EUT. Some of these ring cores are part of the current transformer. The output voltage of this current transformer is taken to the measuring receiver via an internal RF cable also loaded by ferrite rings. With power cables, the measurement result is not affected by the magnitude of the current, since the currents of the forward and return leads cancel each other out.

MDS clamps consist of a two-part plastic case that can be opened. Each part includes a set of ferrite ring core halves. The halves are arranged in spring-loaded holding devices to form a channel to surround the cable of the EUT to be inserted. By closing the upper part of the plastic case, the magnetic loop around the cable is completed. Practical eccentric catches provide the necessary contact pressure.

To determine disturbance maxima, the clamp has ball bearing rollers rated for continuous use that is typical of automatic measurements.

R&S®EZ-24 ferrite clamp
The absorber material characteristics of the R&S®EZ-24 ferrite clamp correspond to those of the R&S®MDS-21 absorbing clamp. In a 50 Ω circuit, the clamp produces decoupling attenuation of more than 15 dB in the range from 30 MHz to 1000 MHz. The ferrite clamp can be opened to insert the cable to be loaded.



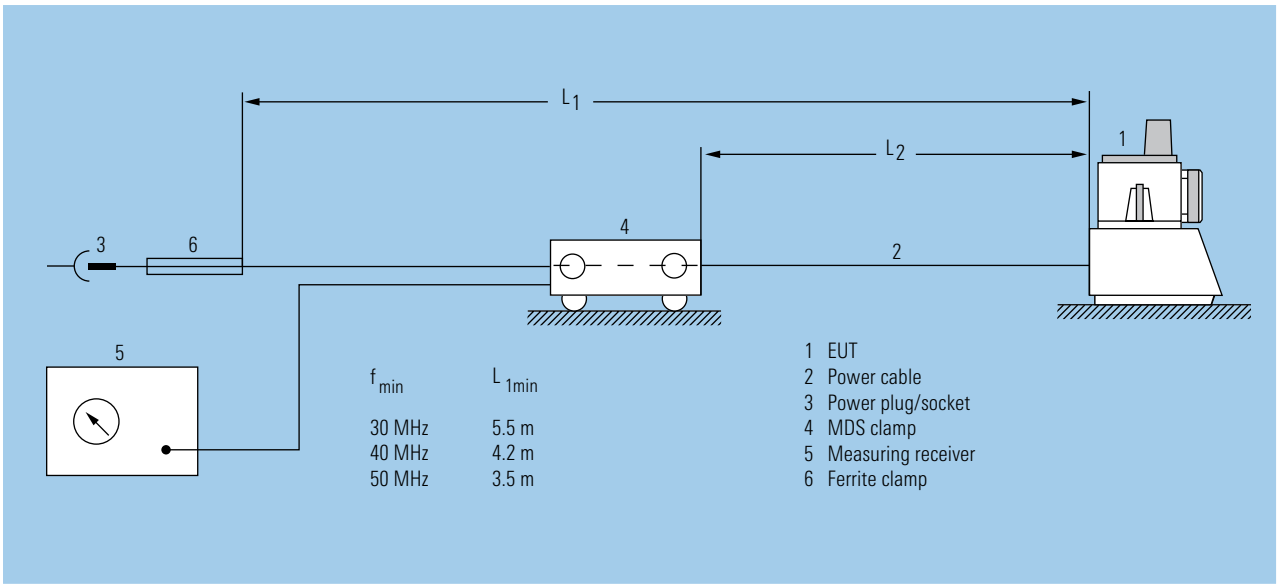
Characteristic calibration curve of an R&S®MDS-21 absorbing clamp

Test procedure

To measure the disturbance power of an EUT, the EUT is put on a non-conductive surface (test table) so that it is at least 40 cm away from a conductive floor or wall. The cable is to be extended to $\lambda/2$ + 60 cm depending on the lowest disturbance frequency (30 MHz) to be measured. The cable is inserted horizontally so that the absorbing clamp surrounding the cable can be easily slid along the cable. The current transformer faces the EUT.

Test setup for disturbance power measurements
The following example describes the test procedure (see figure on page 4). The EUT is first switched on and the measuring receiver is set to a frequency of the disturbance spectrum. The MDS clamp is then slid away from the disturbance source until the maximum is displayed on the measuring receiver. The operator should hold the MDS clamp at the end away from the EUT or slide the clamp along the cable by means of a traction line.

Usually, the maximum near the disturbance source is measured. In the case of frequencies above 150 MHz, the maximum may occur in the handle of the EUT. If this is the case, the clamp must be slid along the cable to obtain the second maximum (distance L_2) provided that this yields a higher value than that with the MDS clamp slid close to the EUT. The disturbance level is now displayed at the measuring receiver.



Test setup for measuring the disturbance power

The following applies to readout in dBµV:

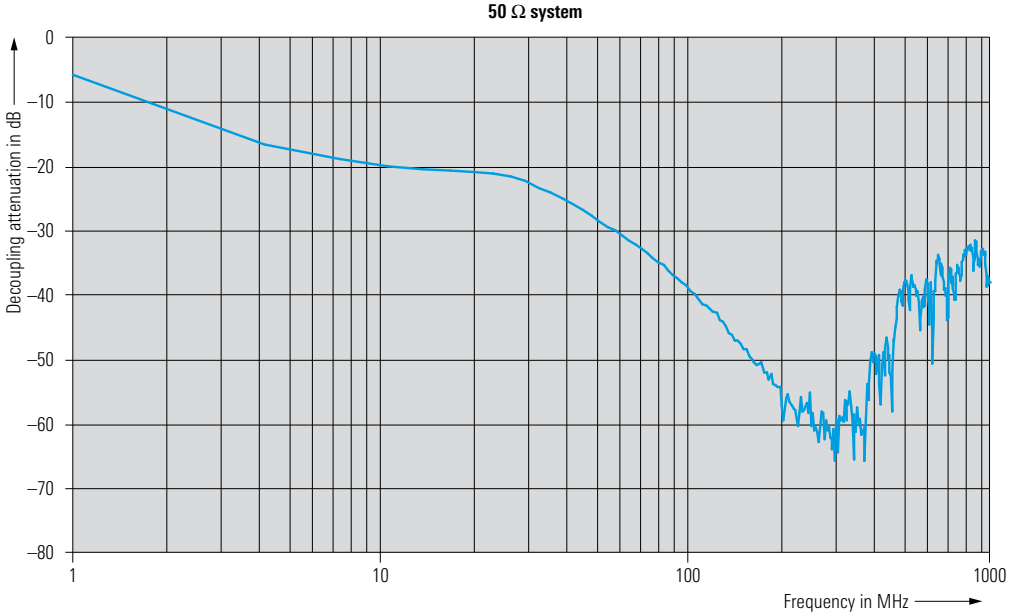
disturbance power/dBpW = reading/dBµV + correction value/dB

Advanced measuring receivers allow a transducer factor to be entered. MDS absorbing clamp slideways are to be used to perform automatic measurements.

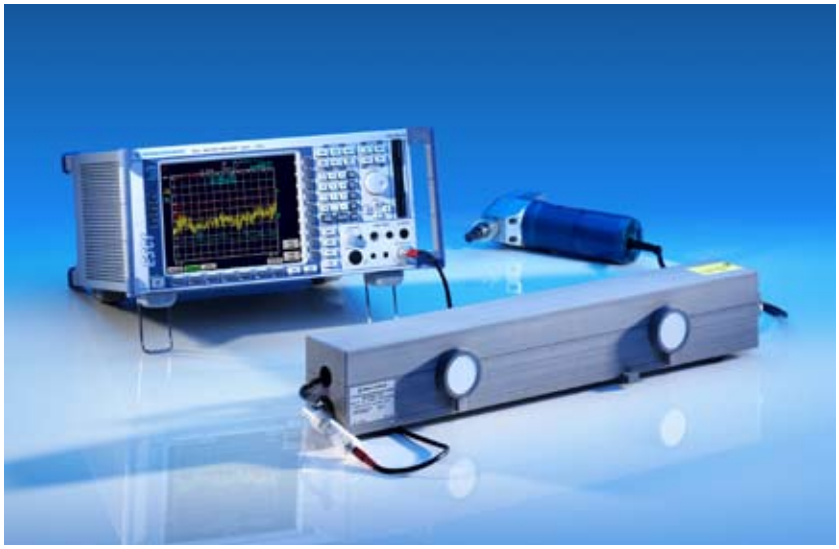
Further applications

In addition to measuring the disturbance emitted from small appliances and measuring the screening effectiveness of cable screens, the R&S®MDS-21 absorbing clamp can also be used for measuring the efficiency of disturbance suppression devices for high-voltage ignition systems in accordance with CISPR 12 or EN 55012. High-energy pulses are then coupled out and taken to the measuring receiver. This means that measuring receiver inputs must be thoroughly protected .

The MDS clamps are also suitable for use as coupling clamps in order to test the immunity of electronic devices.



Characteristic decoupling attenuation of the R&S®EZ-24 ferrite clamp



Compact, cost-efficient test set consisting of the R&S®ESCI EMI test receiver and the R&S®MDS-21 absorbing clamp for semiautomatic measurement of the disturbance power

Specifications

	R&S®MDS-21
Frequency range	30 MHz to 1000 MHz
Typical insertion loss in accordance with CISPR 16-1-3 (individual calibration certificate supplied with clamp)	17 dB ± 4 dB
Receiver input impedance	50 Ω
Connector	N female, 50 Ω
Permissible DC current or peak value of AC current	30 A
Maximum permissible RF input power for susceptibility measurement	5 W
Maximum cable diameter	20 mm
Supplied spacer (diameter)	10 mm
Rollers	ball bearing, dust-protected
Overall dimensions (W × H × D)	610 mm × 115 mm × 80 mm (24.9 in × 4.5 in × 3.1 in)
Weight	6.3 kg (13.9 lb)

	R&S®EZ-24
Frequency range	1 MHz to 1000 MHz
Decoupling attenuation in the range from 30 MHz to 1000 MHz in 50 Ω circuit	>15 dB (see typ. curve)
Maximum permissible skin current RF power	50 W
Overall dimensions (W × H × D)	626 mm × 57 mm × 80 mm (24.6 in × 2.2 in × 3.1 in)
Weight	3.5 kg (7.7 lb)

Ordering information

Designation	**Type**	**Order No.**
Absorbing Clamp	R&S®MDS-21	0194.0100.50
Accessories supplied	1 coaxial connecting cable (for connecting the R&S®MDS-21 to the EMI measuring receiver), 5 m long with 2 × N male; 6 dB attenuator with 2 × N female, elbow adapter	
Ferrite Clamp	R&S®EZ-24	1107.2535.02

More information at
www.rohde-schwarz.com
(search term: MDS-21, EZ-24)

www.rohde-schwarz.com
Europe: +49 1805 12 4242, customersupport@rohde-schwarz.com
USA and Canada: +1-888-837-8772, customer.support@rsa.rohde-schwarz.com
Asia: +65 65 130 488, customersupport.asia@rohde-schwarz.com