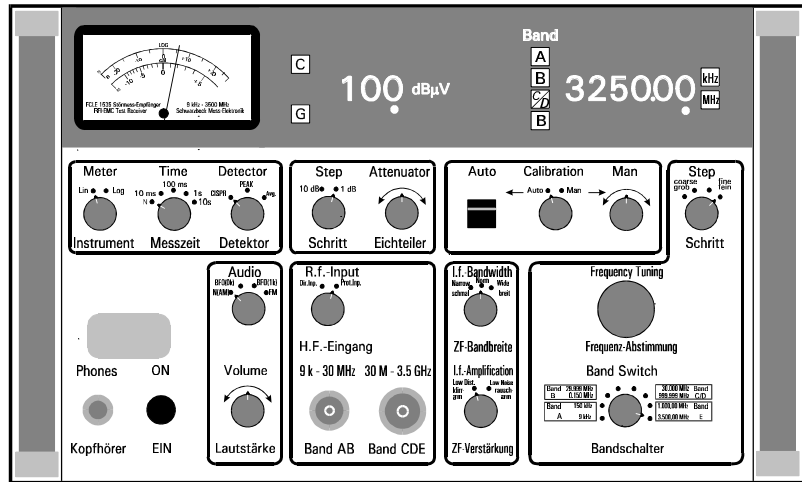


SCHWARZBECK MESS - ELEKTRONIK

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Interference Measuring Receiver FCLE 1535 (9 kHz - 3250 MHz)

The FCLE 1535 is the youngest member in the family of Schwarzbeck-EMI Test Receivers. It combines the precision and reliability of the well known existing receivers with the advantage of the extended frequency range. Special operational modes help to solve even non every day measuring problems.



Brief description

The interference measuring receiver FCLE 1535 is used for manual and automatic pc-controlled EMI measurement in accordance with the standards. It combines high overload capability in the frequency range 9 kHz - 30 MHz with good sensitivity and selectivity from 30 MHz - 3250 MHz.

■ Front panel operation (Manual operation)

- Fast, easy to use, transparent mode with direct, simultaneous access to all receiver controls
- Rotary switch gives easy and convenient access to the border frequencies of the bands
- Moving coil meter with big window for easy and convenient reading
- Meter reading directly (straight through) or via peak/hold using measuring times up to 10 seconds.
- PC-control with Software Messbase for Windows

- Fast & reliable using Variscan and Autorange. The Variscan-detector of the receiver controls the scan-speed during CISPR-Scans.
- High security against overload using mask-guidance
- User editable limits and antenna factors guarantee high flexibility
- Marker with integrated final measurement capability
- Interactive final measurements with automatic test report generation
- User definable creation of test reports
- Remote control for LISN or coaxial switching unit included
- Comparison of two measured diagrams and up to 3 masks simultaneously
- Find the Maximum Envelope out of a set of measurements
- Macros performing up to 32 time-consuming measurements
- Free scaleable prints
- Convenient graphic features and data transfer to other Windows applications
- Context sensitive Online Help
- Accelerator keys for frequently used functions speed up operation

Special features

■ 2 separate rf-inputs

Measuring conducted interference voltage using a LISN in the frequency range below 30 MHz requires high overload capability.

Measuring interference field strength using antennas in the frequency range above 30 MHz requires high sensitivity.

Suitable electronic components for the lower frequency range fail in the upper frequency range because they are too big while the tiny microwave components, which are best choice for the upper frequency range, may be killed by a high energy, low frequency pulse.

The FCLE 1535 solves the problem without compromising using two different rf-input circuits with the corresponding rf-connectors.

Two different coupling devices (one per range) may be connected simultaneously.

Connector	Band	Frequency range
BNC	A B	9 kHz - 30 MHz
N	C D E	30 MHz- 3250 MHz

■ Power attenuator for the frequency range 9 kHz - 30 MHz

The growing market of power semiconductors leads to measurement with LISNs with operation currents exceeding 100 A.

As a result, powerful interference spectrum endangers the receiver's input.

Pulse limiters provide protection for the price of non-linearity.

The FCLE 1535 uses a built-in power attenuator made of big resistors, serving as a broad-band linear termination of the LISN.

■ 0 dB centre of meter

Good interference measuring receivers provide a large dynamic range, but pulse spectrum consumes a big part of it and the small rest makes receiver adjustment somewhat critical.

Using the input attenuator of the FCLE 1535 with 1-dB-steps, the input signal is attenuated until the meter shows 0 dB centre of instrument. The digitally displayed reference now represents the measured level. The automatic or manual calibration relates this point to the internal CISPR-Quasi-peak pulse standards. This unique substitution method avoids saturation problems for any given signal from narrow band cw to single click, making an overload indicator obsolete.

This method is also used in the pc-controlled operation. Using mask-guidance, the receiver is controlled in such a way, that the limit is always near to 0 dB centre of instrument.

■ Variscan-guidance

The additional Variscan-detector of the FCLE 1535 recognises relevant narrow band signals in advance and slows down scan speed for correct Quasi-Peak-measurement. The measurement is made "at once" completely in the Quasi-Peak-mode.

■ Moving coil meter with big window

Many things have changed, but still many experts ask for big, easy to read meters. The receiver responds with a 95 mm x 45 mm window.

■ Internal calibration automatically and manually

Measuring is based on substitution with the internal pulse standards as reference.

During the internal calibration process, the amplification of the receiver is continuously increased until 0 dB centre of instrument is reached.

Internal calibration occurs after switching on, after changing bands, or is initiated by pushing the calibration key.

Proceeding of the calibration process can be monitored on the meter and is also available in the manual mode by adjusting the amplification factor of the receiver on the front panel.

This feature is very convenient in the every day laboratory work, because the amplification adjustment can be used to compensate for minor attenuation or amplification in a test set-up during informal measurement.

■ Optimised band switching in front panel operation

The standards give frequency bands with lower and upper frequency border and bandwidth, which also leads to a practical tuning step. The FCLE 1535 shows the receiving frequency clearly arranged on a 6-digit LED display and provides a choice of useful tuning steps.

So in each band the user has the impression to work with a classic band receiver. Each band (C together with D is considered as one band) uses "soft" borders.

The user can cross these "soft" frequency borders for information purposes without changing parameters until the "hard" borders are touched. Touching the "hard" borders will instantaneously preset the "soft" borders of the band.

A rotary switch gives easy and convenient access to the border frequencies of all 5 bands.

Measurement can begin right after the automatic calibration.

Specifications

Frequency range

Frequency setting, manually Band A
manually Band B
manually Band CD
manually Band E
Frequency readout
Frequency error

9 kHz - 3250 MHz
10 Hz, 100 Hz, 1kHz
1 kHz, 10 kHz, 100 kHz
1 kHz, 10 kHz, 100 kHz, 1 MHz
10 kHz, 100 kHz, 1 MHz, 10 MHz
6 digits LED display
$3 \cdot 10^{-6}$

RF inputs

Input 9 kHz - 30 MHz

RF attenuator
Power attenuator
VSWR

Max. input level, power attenuator ON
DC-voltage
Sine wave RF voltage, continuous
Intermittent 20% on,
Burst <math><0,5 \text{ sec.}</math>
Preselection

2
 $R_e=50 \Omega$, BNC-connector
0-95 dB, 1-dB-steps
10 dB, 5 watts
<math><1,2</math> for >10 dB rf-attenuation

15 V
141 dB μ V (3 W)

143 dB μ V (5 W)
5 fixed filters

Input 30 MHz - 3250 MHz

RF attenuator
VSWR
Max. input level (rf-attenuation >10 dB)
DC-voltage
Sine wave rf voltage, continuous
Max. pulse voltage
Preselection

$R_e=50 \Omega$, N-connector
0-91 dB, 1-dB-steps
<math><1,2</math> for >10 dB RF attenuation

15 V
137 dB μ V (1 W)
200 V
7 tuned preamplifiers (4 tuned circuits each)
in the frequency range 30 MHz-1000 MHz,
1 tuned high-pass-amplifier 1000-3250 MHz

IF bandwidths

200 Hz/9 kHz/20 kHz/120 kHz/1 MHz

Noise reading

Band	Frequency range	Bandwidth	AV (Average)	QP (CISPR Quasi-Peak)	PK (Peak)
A	9 kHz-150 kHz	200 Hz	<-30 dB μ V	<-30 dB μ V	<-18 dB μ V
B	150 kHz-30 MHz	9 kHz	<-19 dB μ V	<-14 dB μ V	<-9 dB μ V
CD	30 MHz-1000 MHz*	120 kHz	typ. -8 dB μ V	typ. -3 dB μ V	typ. +2 dB μ V
E	1000 MHz-3250 MHz*	120 kHz	typ. 0 dB μ V	typ. +5 dB μ V	typ. +10 dB μ V

* Above 30 MHz, the FCLE 1535 uses internal selective preamplifiers, which are always in the signal path.

This results in both high sensitivity and correct weighting at the same time.

For special purposes we recommend the external preamplifier BBV 9721. It can be mounted directly on the antenna connector. Because of the fact that low noise amplification takes place in front of cable attenuation, long cables will no longer degrade system sensitivity.

The amplifier uses the standard coaxial antenna cable for supply and control.

It can be switched off via a coaxial relay bypass in case of overload or intermodulation problems.

Level indication, front panel operation

Digital	3 digit LED display for reference level
Analog	Moving coil meter 0 dB centre of instrument Voltage linear scale in dB (scaling without logarithmic converter) Logarithmic scale with -25 dB / 0 dB / +25 dB
Detectors	QP (CISPR Quasi-Peak), PK (Peak), AV (Average)
Measuring times	10 ms, 100 ms, 1 s, 10 s

(Level indication, pc-control

see software description)

Accuracy

analog, digital	<1 dB (0dB centre of instrument, mask)
Quasi-Peak	CISPR 16

Demodulation modes

AM / FM / A0 zero beat / A0 1 kHz beat frequency

Inputs, outputs

D-connector 25-pins	
Level	0 dB centre of instrument corresponds to 0,5 V, linear and logarithmic for xy-recorder
Active demodulator	(envelope demodulated IF) 0 dB corresponds to 100 mV
Power supply for ext. aux. equipment	+12 V/100 mA / -12 V/50 mA
D-connector 9-pins	Control for Schwarzbeck LISN (rcfm)
IF-output 1	IF 45 kHz Band AB
IF-output 2	IF 10,7 MHz Band CDE
PC-control (optional)	IEEE-488 connector (GPIB)

Power supply110,130,230,240 V AC +/-10 %
50, 60 Hz 80 VA**Dimensions**(W x H x D)
447 mm x 275 mm x 460 mm