SCHWARZBECK MESS-ELEKTRONIK
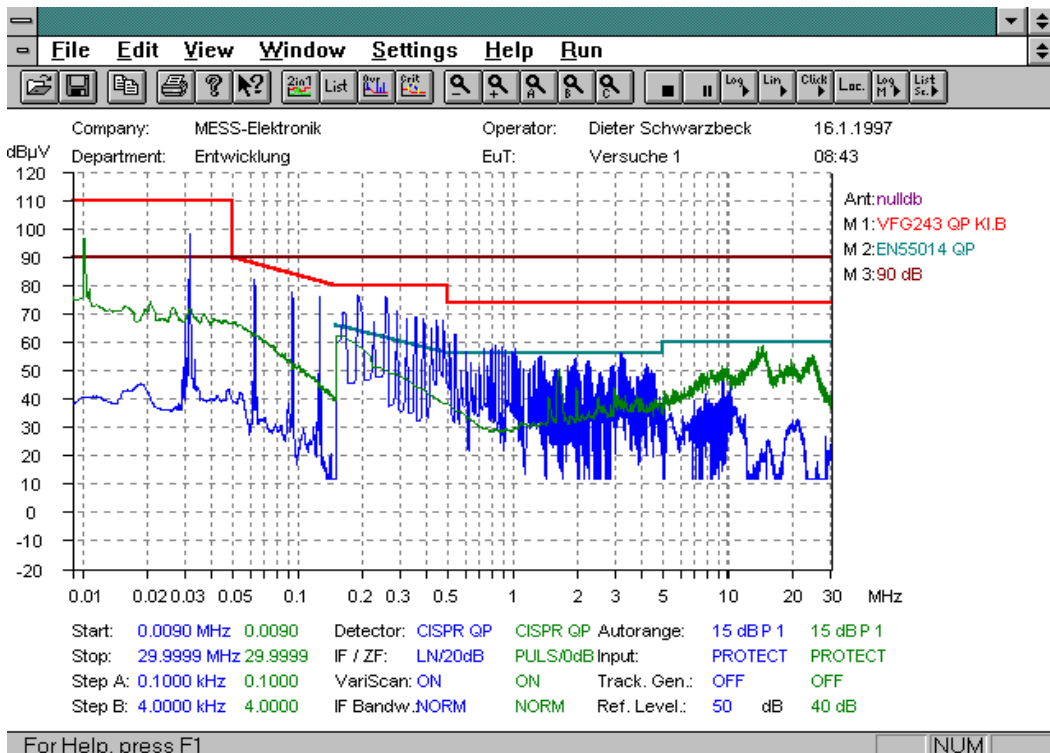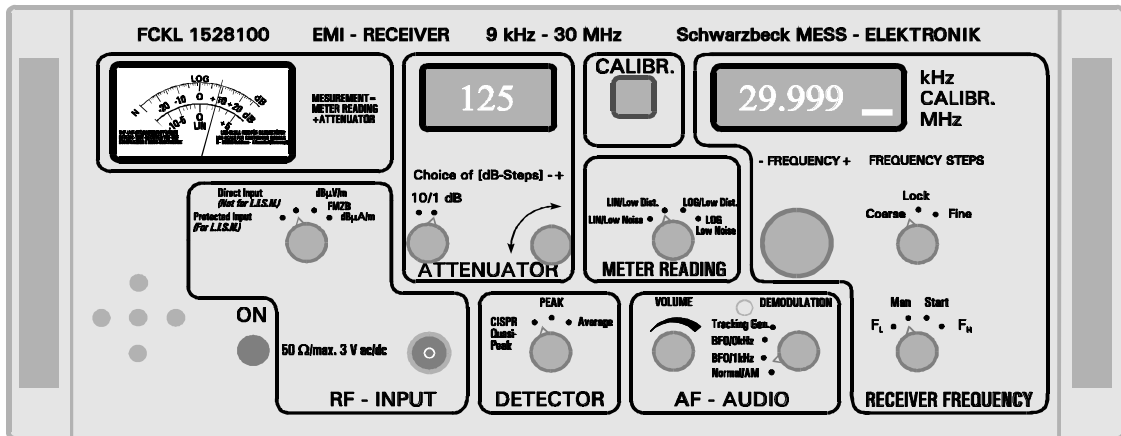
D-69250 Schönau-Altneudorf, Klinge 29, Tel. (0)6228-1001 FAX 49 6228 1003

DESCRIPTION, DATA SHEET
9 kHz - 30 MHz
Interference Measuring Receiver
FCKL 1528

- ♦ Frequency range 9 kHz - 30 MHz
- ♦ 10 Hz - Frequency steps
- ♦ Conducted interference measurement with L.I.S.N.
- ♦ Field strength measurement with adapter.
- ♦ Integrated power attenuator for receiver protection.
- ♦ Optional high level tracking generator is ideal to measure *Lamp attenuation acc. to EN 55015.*
  Also for filter attenuation, free area attenuation and to drive power amplifiers.
- ♦ Manual Operation, semi-automatic operation with xy-recorder and PC-control via IEEE-bus using the Schwarzbeck software.
- ♦ Fast 100% CISPR Quasipeak-measurement with VARISCAN.

For many decades, most of the interference measuring receivers were used in laboratories. They were operated manually using their front panel. This type of operation including front panel control will still be there in the future, but PC-control gives value added measurement because of increased speed and better documentation. The unique r. f. and analogue circuits of the FCKL 1528 give precise measurement with or without PC-control. The receiver comes complete for EMI-measurement, but can be equipped with useful options.

Characteristics of the FCKL 1528

Unique R.F. - circuitry

- ◆ Attenuator with r.f.-relays uses resistive Π-attenuators with 1 dB steps. Total resistive attenuation is 95 dB.

- ◆ Switchable 10 dB high-power-attenuator with 10 W for safe measurement with L.I.S.N.s up to 4 x 400 A.

- ◆ 5 Input filters. Shape factors optimised for EMI - measurement.

- ◆ CISPR standard filters with 200 Hz and 9 kHz / - 6 dB. Filters are classic double tuned band filters.

- ◆ Integrated 25 Hz / 100 Hz Pulse-standard for CISPR Band A and B similar to IGLK 2914 for calibration. Error is compensated by a EPROM list.

- ◆ Integrated (optional) tracking generator with 120 dBμV (1 V) / 50 Ω for measurement of *Lamp attenuation,* filter attenuation, field attenuation with an-tennas and amplifier drive.

High precision measurement

- ◆ Meter with 2 large scales.
  Linear voltage scale with 1 dB-scaling for the amplitude range
  -10 dB / 0 dB centre of meter +6 dB
  according to EN 55014 C.2.1.
  plus Logarithmic overview
  -25 dB / 0 dB centre of meter +25 dB

- ◆ 12 Bit A/D-converter

Easy to use

- ◆ Functional areas of controls and displays.

- ◆ Small size, moderate weight

- ◆ Rugged Aluminium cabinet

- ◆ Low heat dissipation

- ◆ Due to effective shielding no problems even when used in the shielding room.

Data Interface

IEC-Bus-Interface: Connector 24 sockets

Sub D-Connector 25 sockets

Supply Voltages d.c. +12 V / -12 V for auxiliary equipment

XY-recorder control Frequency Amplitude, Penlift

Output voltage of active Demodulator (Envelope) for auxiliary or monitoring with Oscilloscope

Sub-D-connector 9 sockets for L.I.S.N-control

BNC-Outputs

I. F.-Output

Tracking generator output 120 dBμV 50 Ω (optional)

Manual operation

As no other this mode of operation gives direct access to the receiver without any collision with PC or software. Especially in the measuring field outside of a shielding room, broadcast signals can be identified using the demodulator/loudspeaker. CW-signals can be monitored with 0 kHz and 1 kHz beat frequency.

Reading can be seen clearly on the meter which gives perfect reading from narrow band signals down to single click.
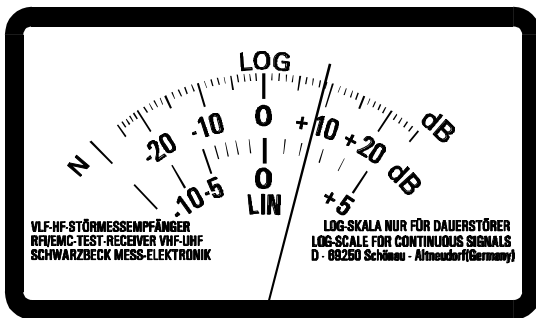
  The meter uses the classic 0 dB centre of meter scaling for safe measurement without interpretation.

  The linear scale gives true linear voltage reading avoiding problems with slow pulses.

  For any interference signal from continuous distortion to single click 0 dB centre of instrument is free of overload problems. For overview a 50 dB scaling can be used.

Semi-automatic operation

Spectrums can be recorded when the receiver is used in the scan mode together with an xy-recorder.

The time consumption is reduced substantially, because VARISCAN adjusts scan speed to the signals ahead.

So spectrum can be scanned directly in CISPR-Quasipeak to avoid switching CISPR/Peak.The xy-recorder can be used in manual tuning mode as well. The xy-recorder then follows the manual frequency tuning on the encoder. Doing so, it is very easy to stop on critical frequencies to find the maximum signal strength, which will be kept by the xy-recorder.

PC-controlled mode

Using a standard PC, a IEEE-card and the Schwarzbeck software Messbase together with the FCKL 1528 gives PC-controlled measurement. Modern PCs offer high speed and high capacity hard disks which improve considerably storage and documentation of measurement.

Primary goal of development was safe measurement of the complete range of interference signals keeping the high standard of manual measurement. This means that there must be no trade off considering even slow pulses.

The completely new approach using the fourth demodulator included in VARISCAN gives fast Quasipeak-measurement without using the Peak detector. VARISCAN analyses the signal ahead before it is really measured.

Practical spectrum often shows amplitude jitter which could be subject to misinterpretations using the Peak detector to decide which signal has to be re-measured in CISPR or not.

The second step towards safe measurement is controlling the receiver by the limits given in the standards.

Basically autorange can catch any signal, but there are restrictions when slow pulses occur.

The way out of the problem is to guide the receiver along the limits in such a way, that it is centred in the middle between noise and overload. Even antenna factors are included in this strategy.

SCHWARZBECK MESS - ELEKTRONIK

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Messbase-Software for Emission-tests under MS-WINDOWS 95/98/NT/2000/XP

- Easy to learn and to use
- Fast & Reliable with Variscan and Autorange
- High security against overload using mask-guidance
- User editable limits and antenna factors guarantee high flexibility
- Interactive final measurements with automatic test report generation
- Automatic creation and scan of frequency lists
- Free scalable prints
- User definable creation of test reports
- Convenient graphic features and data transfer to other Windows applications
- Marker with integrated final measurement capability
- Subranges reduce measuring time and provide data reduction
- Remote control for LISN or coaxial switching unit included
- Additional IEEE 488-devices can be integrated on request
- Attenuation measurements > 100 dB for site performance checks or insertion loss of filters
- Comparison of two measured diagrams and up to 3 masks simultaneously
- Accelerator keys for frequently used functions speed up operation
- Click measurement with 10 samples per second
- Context sensitive Online Help
- Macros performing up to 32 time-consuming measurements
- Find the Maximum Envelope out of a set of measurements

Hardware - Requirements:

IBM-compatible PC with 80386 and math. Coprocessor 80387 or better, 4 MByte RAM, VGA-Graphics, min. 10 MByte free space on hard disk, 3.5" floppy disk drive, INES IEEE 488 16- bit interface card. PCMCIA-card also available for portable Computers.
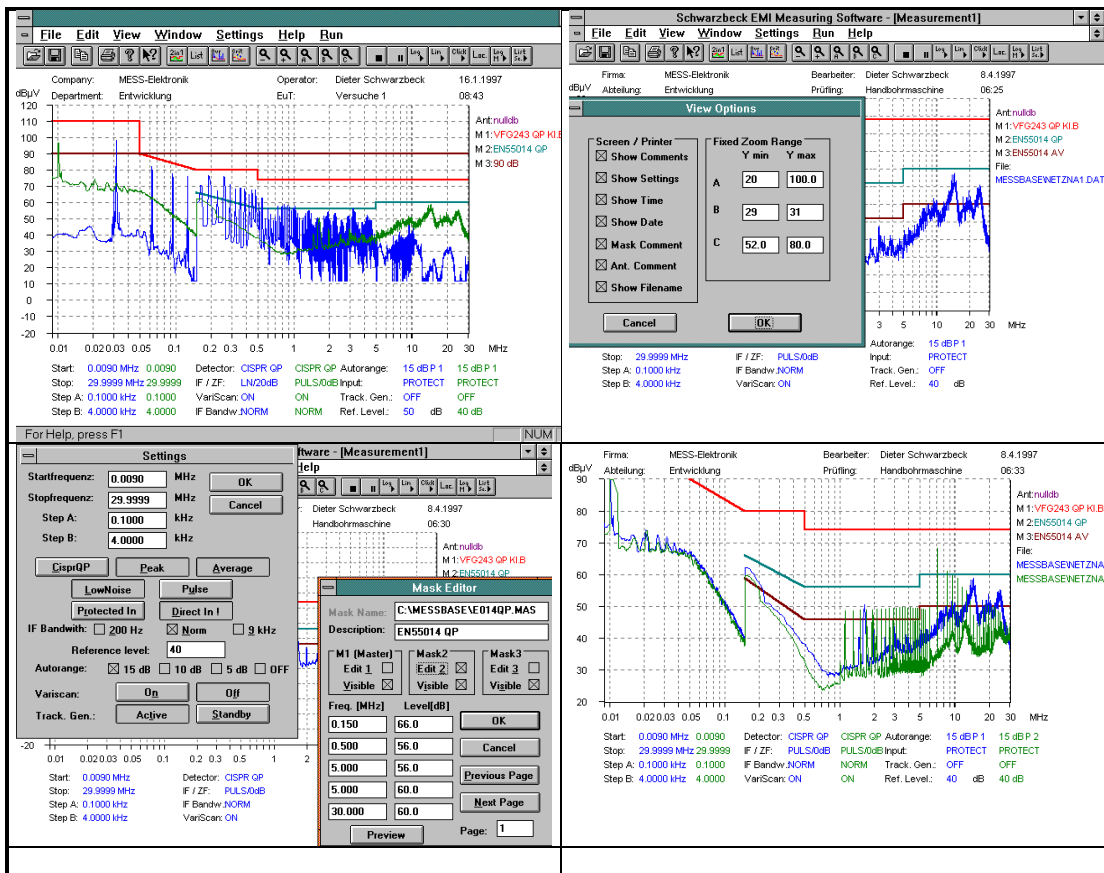
FCKL 1528 Technical data

Frequency range	9 kHz-30 MHz
Frequency tuning with encoder wheel	10 Hz-10 kHz,
Display	6 digits LED
Software	Start- and Stop frequency random, random steps > 10 Hz, automatic scanning with graphic.
Frequency error	$1*10^{-5}$ +-55 Hz
R.F.-Input	BNC-connector, 50 Ω
SWR	<1,2 for attenuator >10 dB <2 for attenuator 0 dB
Oscillator voltage on R.F. Input	<30 dBpW for attenuator 0 dB, <20 dBpW for 10 dB power attenuator.

R.F.-Prefiltering
5 Bandpass filters switched by

relays	1	9 kHz - 150 kHz
	2	150 kHz - 3 MHz
	3	3 MHz - 10 MHz
	4	10 MHz - 20 MHz
	5	20 MHz - 30 MHz

Calibration
Pulse standard for CISPR 3
    Standard 25 Hz, nom. 30 dBμV (25 Hz)
Pulse standard for CISPR 1
    Standard 100 Hz, nom. 30 dBμV (100 Hz)

Maximum Input Level
R.F-attenuation 0 dB (no D. C.-isolation)

D.C.	7 V
Sine wave R.F. voltage	130 dBμV (3,16 V)
R.F.-attenuation	10 dB (D. C-isolation)
Spectrum pulse density	96 dBμV/MHz
R.F.-attenuation 10 dB power attenuator	
D.C.-voltage	15 V
Sine wave R.F. voltage continuous	141 dBμV (3 W)
Intermittent 20% on, Burst <0,5 sec.	143 dBμV (5 W)

Spurious, Large Signal Handling Capability

Image frequency atten.	>65 dB / typ. 90 dB
I.F.-isolation	>70 dB / typ. 90 dB
Spurious:	None

Third order Intercept d3 standard setup >25 dBm, (>15 dBm w.o. power attenuator.)

R.F.-feed through
(1 dB error, w.o. receiver frequ.)	10 V/m

I.F. frequencies
range	9 kHz - 150 kHz
1. I.F.	455 kHz
2. I.F.	45 kHz
range	150 kHz - 30 MHz
1. I.F.	40 MHz
2. I.F.	455 kHz
3. I.F.	45 kHz

I.F.-Standard filter bandwidths acc. to CISPR3/1

200 Hz / 9 kHz (-6 dB)

Noise indication	(bandwidth 200 Hz)
Average	< -30 dBμV
Peak	typ. -18 dBμV
CISPR Quasipeak	< -30 dBμV

Noise indication	(bandwidth 9 kHz)
Average	< -14 dBμV
Peak	typ. -8 dBμV
CISPR Quasipeak	< -14 dBμV

Range for voltage measurement
(bandwidth 200 Hz)
Lower limit for <1 dB noise error
Average	< -25 dBμV
Peak	typ. -5 dBμV
CISPR Quasipeak Standard pulse 25 Hz	< - 25 dBμV

Range for voltage measurement
(bandwidth 9 kHz)
Average	-7 dBμV
Peak	+8 dBμV
CISPR Quasipeak Standard pulse 100 Hz	< -7 dBμV

Level Indication
Digital	3 digit LED display for reference level
Analogue	Meter with 0 dB centre of instrument. Voltage linear scale with dB scaling w.o. logarithmic converter. Logarithmic scale with -25 dB / 0 dB / +25 dB (low noise).

Recording with XY-recorder	Y-axis within dynamic range of demodulator linear or logarithmic acc. to meter scale.	**Control and supply**	
		L.I.S.N.	4 Bit code
	X-axis via EPROM list and D/A-converter derived from receiver frequency. Prefabricated measure- ment diagrams ready to use.	Connector 9-sockets	Path select, +12 V supply
		Conn. 24-sockets	IEEE-Bus-Controller

Detectors — Average, Peak, Quasipeak (CISPR)

Options

Tracking generator (optional, build in)

Error analogue, digital

< 1 dB (0 dB centre of meter, limit)

Frequency range	9 kHz-30 MHz
Frequency steps	same as receiver
Output voltage	120 dBμV (1 V) / 50 Ω
Control	Rotary switch on front panel, Software

Demodulation — AM, A0 (CW, BFO)
Beat frequencies 0 kHz
and 1 kHz.
Both zero beat frequency
measurement and 1 kHz
CW identification is
possible even with
200 Hz - I.F.-Filter.

Option 19" build in capability

General

Inputs, outputs

Analogue

Nominal temperature range	0°C to 50°C
Storage temperature range	-20°C to +70°C

Recorder outputs — Y-axis, amplitude
0 dB centre of meter
corresponds to 0,5V

linear,

Cooling	Temperature controlled, low noise cooling fan.
EMI	acc. VDE 0876, 1a
Shock, Vibration	acc. to DIN IEC 68-2-27/29

logarithmic, Ri < 10 kΩ
        X-axis, frequency,
9 kHz at 0 V,
30 MHz at 1,000 V
Pen Down Ri < 2 kΩ

Measuring outputs

Active demodulator
(Envelope of I.F.)
0 dB centre of meter
corresponds to
150 mV, Ri > 10 kΩ
Pulse weighted output
see Y-axis xy-recorder

Power supply 110,130,220,240 V +-10%
50 , 60 Hz   80 W
12 V DC optional

I.F.-output optional

Cabinet

47 mm x 180 mm x 460 mm
approx. 17 kg

Supply voltages
for auxiliaries +12 V / 100 mA
-12 V / 50 mA

Standard accessories

Mains cable,
Operation manual

Recommended accessories

A) Measuring conducted voltage with manual or software control.

L.I.S.N.	2 x 10 A	NSLK 8127
L.I.S.N.	4 x 16 / 25 A	NSLK 8126
L.I.S.N.	4 x 32 / 50 A	NSLK 8128
L.I.S.N.	4 x 100 A	NNLK 8121
L.I.S.N.	4 x 200 A	NNLK 8129
L.I.S.N. 150 Ω / (V)	4 x 25 A	NNBM 8112
L.I.S.N. 150 Ω / (V)	2 x 10 A	NNBM 8114
L.I.S.N. 150 Ω / Delta (symm./asymm.)	2 x 10 A	NNBM 8116
Automotive L.I.S.N. 5 μH // 50 Ω, 70 A, 1 Path		NNBM 8125
Automotive 5 μH // 50 Ω, 100 A, 1 Path		NNBM 8126 A
300 MHz, 10 (20) A		NNBM 8126 B
VHF - L.I.S.N. 4 x 25 A, DC/AC 50/60/400 Hz		UNN 8122

T - L.I.S.N. (Telecommunication)

T-L.I.S.N HF, 10 kHz-30 MHz	NTFM 8132
T-L.I.S.N. VHF, 300 MHz	NTFM 8133
T-L.I.S.N. Extremely symmetric	NTFM 8135
T-L.I.S.N. Four wire, 9 kHz-30 MHz 150 Ω	NTFM 8138

B) Probes for conducted voltage

R.F.-Probe,	150 Ω	TK 9415
R.F.-Probe,	1,5 kΩ	TK 9416
R.F.-Probe	2,5 kΩ	TK 9417
High voltage probe		TK 9420

C) Adapters for field strength

Adapter for magnetic field strength 9 kHz-30 MHz with constant conversion factor	FMZB 1516
Adapter with small loop, up to 20 V/m fictive E-Field-strength	FMZB 1517
same as FMZB 1517, but up to 150 V/m fictive E-Field-strength	FMZB 1527

D) Others

Transformers, converters

Symmetric/Unsymmetric transformer 105 Ω	SYM 9223
Current converter 10 kHz-200 MHz	SW 9602

Modulator HM 7001 9 kHz-30 MHz for modulated R.F. acc. to IEC 801

Near field probes FS-SET 7100, magnetic, elektric, separator, power supply, Box.

FCVU 1534 is the corresponding EMI receiver for the frequency range 20 MHz 1050 MHz. It is especially designed for EMI-requirements in this frequency range. A build in power attenuator protects the receiver under all circumstances.

The optional external preamplifier uses a standard coaxial cable for remote power supply and remote control. Connecting the preamplifier directly at the antenna eliminates cable loss.

The optional tracking generator delivers 1 V / 50 Ω . It can be used for filter measurement with extremely high dynamic range or for testing attenuation between 2 antennas in free area or anechoic chamber.

The receivers are similar in manual and PC controlled operation.

A multitude of antennas, clamps and other accessories makes this receiver a versatile tool for EMI - measurement.

This is only a part of our EMI-program. Please ask for more information.

Equipment may be subject to modification without any notice. Specifications without tolerance should be considered as order of magnitude.