Physics · Technology | Chemistry · Biology | Mathematics Computer Science

LEYBOLD-HERAEUS

LEYBOLD-HERAEUS GMBH

10/86 — kr — brs —

Instruction Sheet **514 55/56/57**

ESR Basic Unit
ESR Adapter

Measuring Principle:

A paramagnetic electron spin system sample consisting of DIPHENYL-PICRYL-HYDRAZYL (DPPH) – placed between the coils of an r-f oscillatory circuit and applying a constant field, will absorb r-f energy thus measurably changing the impedance of the oscillatory circuit. The impedance change of the constant magnetic field as produced by the modulation can be displayed on an oscilloscope.

Examples of experiments:

- Verification of electron spin resonance
- Magnetic field as a function of resonant frequency (linearity of Zeeman interaction)
- Measurement of the gyromagnetic ratio and factor of g
- ESR line width
- Signal amplitude as a function of resonant frequency

1 Safety

□ Output ⑲ of the ESR control unit (magnet supply) is not overload-protected! Max. current 3 A!

2 Parts, Description, Technical Data

2.1 514 55 ESR basic unit

The basic unit consists of the following parts:

Ⓐ ESR probe holder with frequency divider 1000 : 1 and signal amplifier

Ⓑ Measuring lead to use the apparatus as a resonance meter

Ⓒ Electric resonant circuit, passive (for investigating the relationship between resonant frequency and magnetic field)

Ⓓ DPPH probe

Ⓔ, Ⓕ, Ⓖ Plug-in coils for different frequency ranges

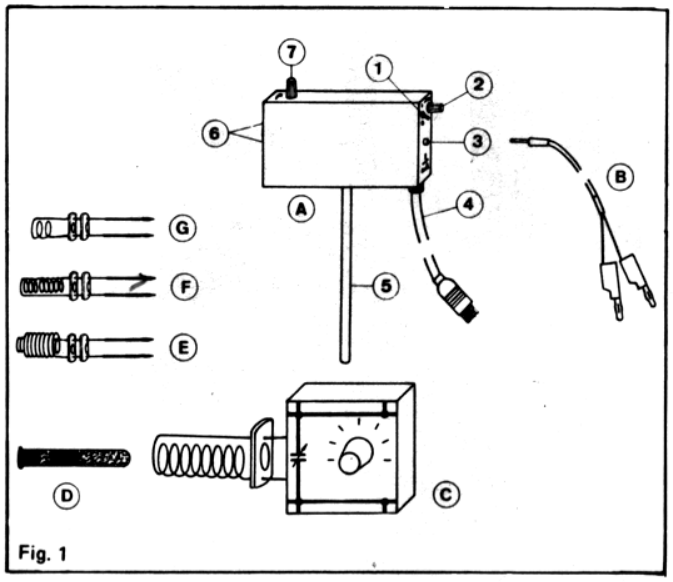


Fig. 1

Control elements:

① On/off switch
② Potentiometer for r-f amplitude adjustment
③ Socket for measuring cable Ⓑ
④ Multi-core lead for supply and signal voltages
⑤ Stand rod
⑥ Sockets for connecting the r-f plug-in coils
⑦ Variable capacitor for frequency adjustment

Technical Data:

Supply voltage and current:	±12 V/175 mA
Frequency ranges:	with plug-in coil Ⓔ: 13 to 30 MHz approx. with plug-in coil Ⓕ: 30 to 75 MHz approx. with plug-in coil Ⓖ: 75 to 130 MHz approx.
Voltage across the r-f coil: (with ref. to ground)	6 V_{pp} approx. at 13 MHz amplitude adjusted to maximum
ESR signal:	1 to 6 V approx. (depending on frequency)
Frequency divider:	1000 : 1
Frequency output for digital counter:	TTL
D. C. current (at output ③):	100 µA approx.
Test substance:	Diphenyl-Picryl-Hydrazyl (DPPH)

2.2 514 56 ESR adapter

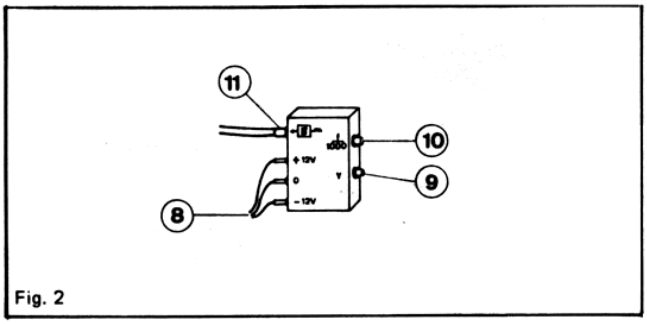


Fig. 2

Control elements:

⑧ Supply voltage connection
⑨ Signal output Y
⑩ Frequency output
⑪ Connection for the ESR basic unit (probe holder)

Technical Data:

Signal output Y:	BNC socket
Frequency output $\frac{f}{1000}$:	BNC socket
Supply voltage input	
+12 V, 0, −12 V:	4-mm sockets
Socket for ESR basic unit:	for 5-pin connector

3 Experiment Assemblies, Operation

3.1 Assembly for demonstrating the operating principle of the ESR basic unit (514 55)

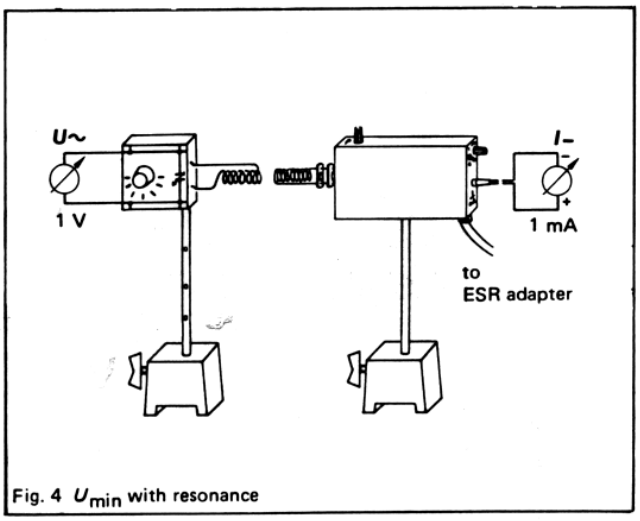
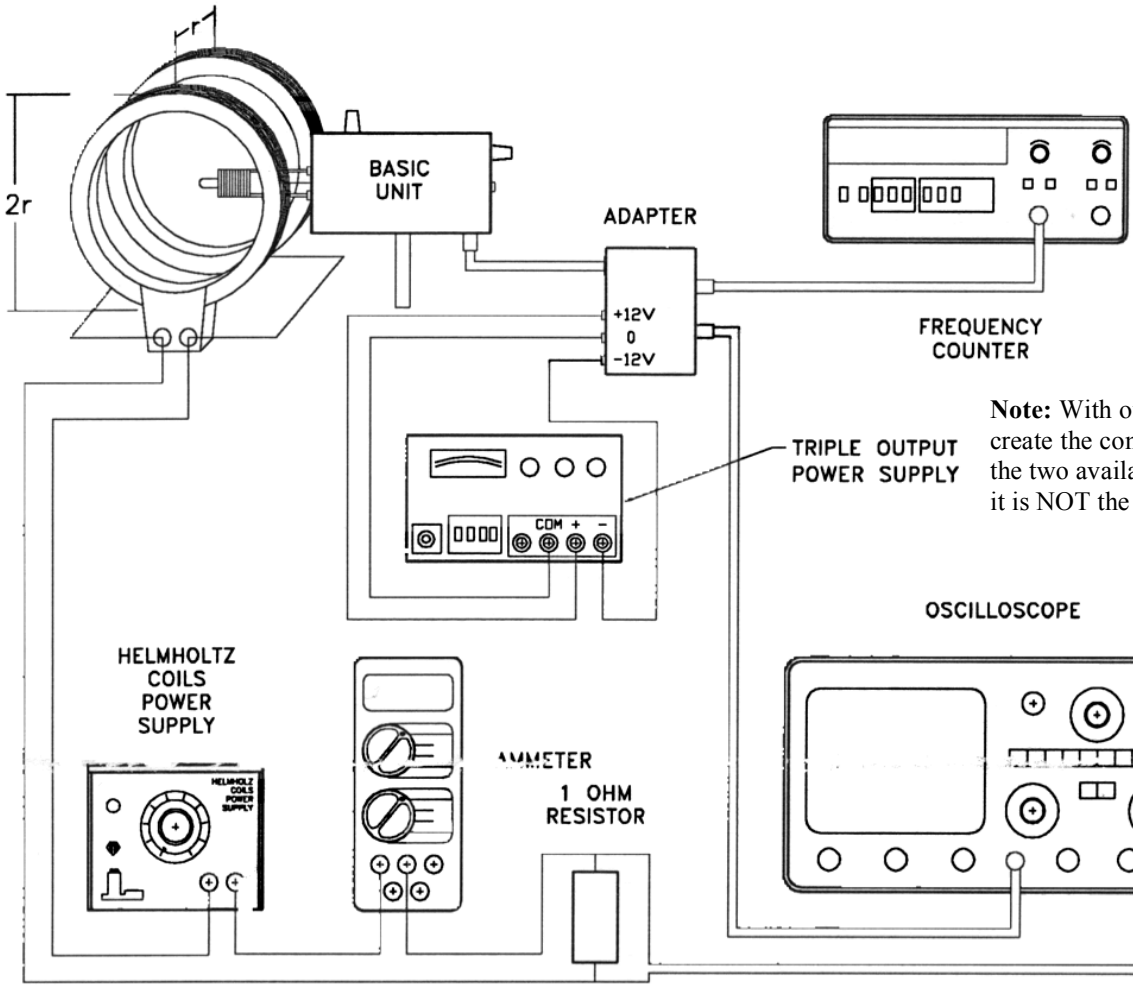


Fig. 4 U_{min} with resonance



Note: With our PS, you need to create the common yourself from the two available emfs (and it is NOT the GND connection).