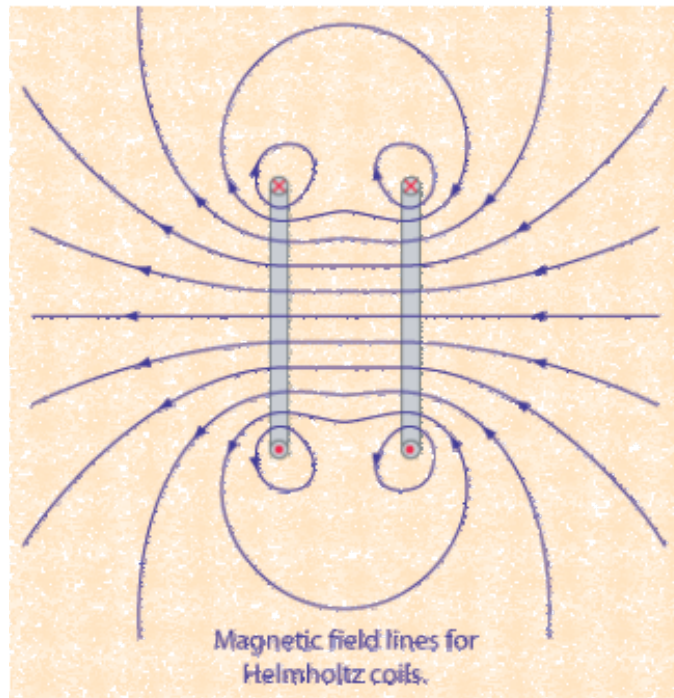


# Helmholtz Coils

A useful laboratory technique for getting a fairly uniform magnetic field, is to use a pair of circular coils on a common axis with equal currents flowing in the same sense. For a given coil radius, you can calculate the separation needed to give the most uniform central field. This separation is equal to the radius of the coils. The magnetic field lines for this geometry are illustrated below.

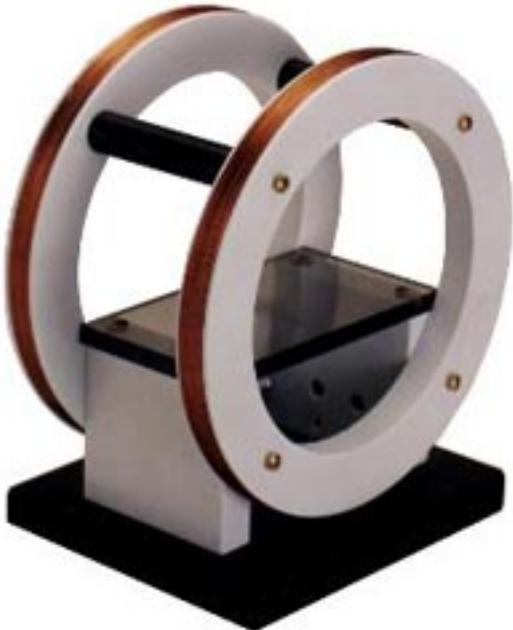
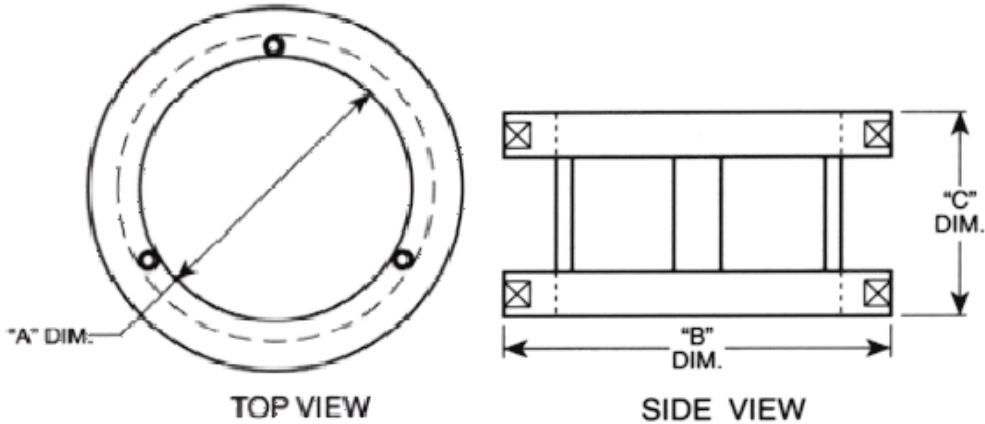


This was the original purpose of the Helmholtz coil to create a very homogeneous magnetic field inside two separate coils. The coils would have a certain radius, and as long as they 2 coils were then separated by this exact same radius, then the magnetic field inside the  $\frac{2}{3}$  of the coils radius there was a perfect homogeneous magnetic field.

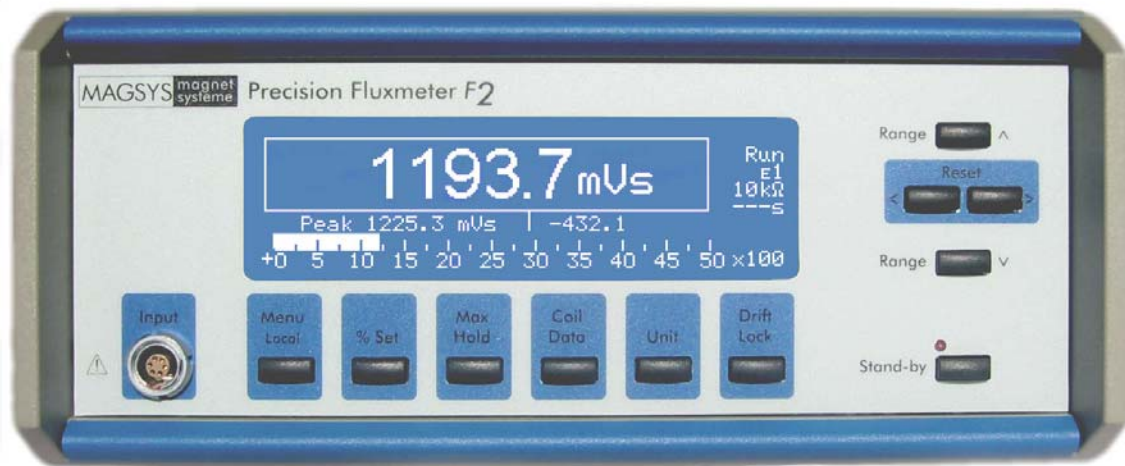
Now for measuring a magnet, we do the exact opposite. We place the magnet on a flat plane inside this homogeneous area, and then we remove the magnet and it induces a voltage into a fluxmeter. A good fluxmeter is then just a “integrating voltmeter”. The advantage of this compared to a gaussmeter is that it doesn’t depend on the operator placement of the probe to the exact position. It also doesn’t matter the speed at which the magnet is removed. Therefore, this process of measuring the magnets offers the highest precision and repeatability.

The Helmholtz Coil and Fluxmeter are used for the measurement of a wide range of magnet sizes, materials, and geometries without specimen destruction, complicated set-up times, or bulky and expensive equipment. Complex geometries common with Neodymium, Samarium and Hard Ferrite permanent magnets, including motor arc segments, can be easily measured. Consult one of our experienced engineers for design and application assistance. The Helmholtz coil can come in any size you want. We have 50,80,100,150,200mm as normal sizes available.

**Physical Specifications** (Custom design available.)



## Measuring Magnetic Fields Using the Precision Fluxmeter F2



The Precision Fluxmeter F2 enables you to measure the magnetic values flux  $\Phi$ , flux density B, field strength H and polarization J. A coil made for your specific purpose is connected to the fluxmeter as a probe.

This device is suitable for sophisticated measurements in the R&D department, automatic process control, quality control, and quality conformance inspection. Due to the built-in calibrator, long term accuracy is obtained.

Some examples of applications are

- measurement of flux density inside the air gap of magnet systems
- checking the polarization of magnets
- stray field measurements
- measurements of magnetic fields next to super conductors.

Several steps have been taken in order to minimize drift effects. The connecting plug of each probe is equipped with a memory chip, in which the relevant data of the probe are stored. By this, faulty measurements caused by improper parameter entries are impossible. Moreover, flux densities or field strengths can be directly displayed and conversion is not required.

Even the standard model of this fluxmeter has a digital interface which makes it possible to control the unit remotely. A tolerance test function and a digital peak value indicator are also built in. All required accessories such as probes, reference magnets etc. can be ordered with your fluxmeter.

The advantages of a fluxmeter compared to field meters using hall probes are:

- that in principle there is a linearity between intensity of magnetic field and output signal
- a wide range of operating temperature permitted for measuring coil
- the possibility of measuring flux inside iron parts and magnetic potentials

## Special Features

- low drift
- low thermo voltage probe connector plug
- built-in calibrator
- automatic probe recognition
- unit of measurement can be selected (flux, flux density, field strength, etc.)
- simple way of operation
- lit graphical display, easy to watch
- robust cabinet, can be mounted into 19" rack
- virtually all interfaces available
- built-in go/no-go test; user can set valves
- auto test when switched on
- pos. and neg. digital peak value indicator
- fast analog peak value indicator (most Gaußmeters cannot measure the sine pulse generated by a magnetizer)
- software update can be done via interface by using a standard PC
- 2nd input socket at the back panel of the cabinet
- frequency range 0..30 kHz
- All inputs and outputs decoupled galvanically

## Technical Data

construction	low drift integrator followed by a 19 bit analog digital converter	
measuring ranges	+/- 1mVs	+/- 10mVs
	+/- 100mVs	+/- 1Vs
range selection	automatically or manually	
accuracy	0.5% after self calibration	
noise suppression	50 / 60 Hz line power	
sample rate	16 conversions per second	
calibrator section	internal reference of voltage and time	
drift	< ± 1µVs/min	
input resistance	1.2kΩ ± 0.1%	10.2kΩ ± 0.1%
input terminals	low thermovoltage miniconnectors at the front and back side of cabinet; banana plugs at the back side	
display	graphical LCD 125mm x 35 mm <sup>2</sup> , 4 digits of reading displayed, green lit, contrast can be set via menu, bargraph	

## Analog Output I

function	continuous output of readings
output voltage	+/-10V
inner resistance	100Ω
decoupled galvanically	

## Analog Output II

function	output of peak value, reference voltage, reference frequency
output voltage	0V - 10V
inner resistance	100Ω
update rate	62.5 ms
decoupled galvanically	

### Serial Interface

type	RS 232C	function	SCPI (Standard Commands for Programmable Instruments) or printermode
connector	9-pole DB-9 plug	memory	512 readings
baud rate	300 - 9600 Baud		
handshake	None, DTR/DSR, XON/XOFF		

### Digital Outputs

number	4
functions	low / high /go / run
log. level	to be set in menu
supply voltage	DC 24V (externally fed)
output current	max. 100mA short circuit proof
technique	M / P switching
standard	IEC1131 (24VDC)

### Digital Inputs

number	4
functions	reset / hold or drift lock (can be set in menu) / 2 x spare
log. level	to be set in menu
supply voltage	5-34V external / internal
input resistance	type. 2.2 K $\Omega$
standard	IEC1131 (24VDC)

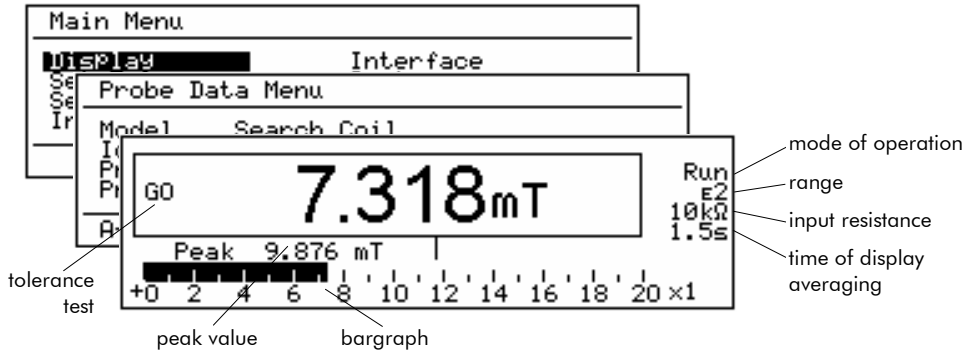
### Peak Value Measurement

analog	analog peak hold circuits store even short peaks. The positive and negative value is displayed. Maximum delay until output of value to analog output is 62.5 ms (as option)	digital	max. displayed reading is stored, time slot pattern 62.5 ms (standard)
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### Software functions

- Compensation of drift
- Enable the external control of all fluxmeter functions
- Digital smoothing of reading
- Conversion of units
- Self calibration
- Bargraph
- Tolerance test
- Percent reading
- Storage of probe parameter
- Manual range control, auto ranging

## Display Example



## Scope of Delivery

- Fluxmeter
- Operation manual
- Test report
- Floppy disk containing demo program ( WIN version )

## Options

- Opt. 001 USB interface
- Opt. 002 IEEE-488 (GPIB) interface
- Opt. 003 insulated parallel BCD output
- Opt. 004 external tolerance display
- Opt. 010 additional operation manual
- Opt. 999 warranty 2 years

## Deliverable Accessories

- Search coils
- Helmholtz coils
- Potential coils
- Reference magnets
- Probe plug equipped with a 2 pole shielded cable, 2m long, for connection of self made coils to the fluxmeter. Built-in memory chip.
- Switch box for the connection of up to 5 probes to the fluxmeter. Power supply and control via single cable to fluxmeter.
- Coaxial cable 2m, BNC plugs at both ends
- Connecting cable for RS-232 interface, 2.5m long, 9 pole plugs at both ends
- Adaptor 9 pole plug to 25 pole socket
- Mounting kit for assembly of fluxmeter into 19" rack

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Dimensions	125mm x 260mm x 260mm (H x W x D) 4.9" x 10.24" x 10.25" (H x W x D)
Weight	3.2 Kg (7 lb.) not including packing and accessories
Power Supply	100-130V / 210-250V internal voltage selection
Power Line Frequency	50-60 Hz
Power Consumption	max. 25VA
Warranty	12 months standard (24 months with Option 999)

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Further information? Please contact us:

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