GUOY SUSCEPTIBILITY EXPERIMENTAL SET-UP

MGSA-Series

Introduction:

MGSA series of Guoy susceptibility experimental set-ups are available in four different models to examine and is settled tool to diagnose the magnetic susceptibility for liquid/solid and to some extent gases as well. Guoy method involves measuring the force on the sample by a magnetic field and is dependent on the tendency of a sample to concentrate a magnetic field within itself. Tabletop Guoy experimental set-up comprises Variable magnetic field electromagnet in various ranges from 5000 to 20,000 gauss, precision hall probe, electrometer and precision current scale with sensitivity to as much as 100 nano gram. Force. On account it's versatile feature this preferable choice for research and teaching institution, generation, traction, telecom, railways, electrical utilities, M.E.M.S, organic/inorganic chemical, heavy electrical/mechanical industries, sensors, and many uncountable defense/nuclear applications. Updated design topology ensures better controllability and right measurement. Company offers tailor made solution to custom requirement.

Operating Principle:

Magnetic susceptibility of any medium is defined as …$B/H = 1 + 4\pi\kappa$

B/H is magnetic permeability of the material's is the magnetic susceptibility per unit volume,

Magnetic susceptibility depends on the measurement of B/H. Experimentally the Guoy method involves measuring the force on the sample by a magnetic field and is dependent on the tendency of a sample to concentrate a magnetic field within itself. At any given point, dX, of the sample, the force is given by…..

$fd=\mu°H\ \kappa dV\ (dH)/dx$ ..where $\mu°$ is the permeability of a vacuum ,H is mmf at point, dx,, dV is the volume of the sample at point dx, κ is the magnetic susceptibility per unit volume.

The sample is uniformly packed into a glass tube in a constant magnetic field such that the bottom of the sample is in the centre of the field whilst the top of the sample is out of the field, ie H=0. By integrating the above equation, the total force on the sample can be given as:

$F= 1/2\ \mu°\ A\ \kappa\ (H^2-H°^2)$ or $F= 1/2\ \mu°A\ \kappa\ H^2$ as H° is zero. A is the sectional area of the sample.

The force on sample under test is defined as $F=g\delta w =1/2\ \mu°A\ \kappa\ H^2$

where δw is the apparent change in mass,g is the acceleration due to gravity.

Keeping in view the magnewtic property of tube force under magnetic field may be difined as .

$g\ \delta w'=1/2\ A\ \mu°\ (\kappa-\kappa')\ H^2$ where $\delta w'=\delta w + \delta$ …..δ is a constant allowing for the magnetic properties of the empty tube

κ' is the volume susceptibility of the displaced air.

accordingly volumetric magnetic susceptibility is defined as

$\kappa= (2g\delta w')/(\mu°AH^2) + \kappa'$ or gram susceptibility (χ_g) is defined as

$\chi_g = \kappa/\rho = \kappa.V/W$ where ρ is the density of the sample

$\chi_g = (\alpha + \beta\ \delta w')\ /\ W$…….where α is a constant allowing for the air displaced by the sample,β is a constant that is dependent on the field strength, $=2gV/(\mu°AH^2)$, W is the weight of the sample used.

in mplified manner χ_g cal = $\beta\ \delta w'\ /\ W$cal (+ α/(Wcal) the last expression is usually negligible.

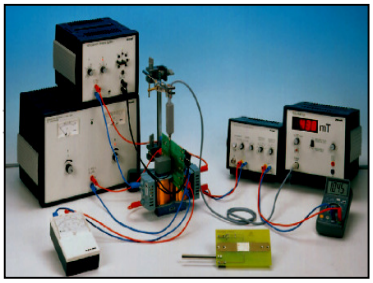
β is then obtained and from this ,χ_g sam = $\beta\ \delta w'\ /\ W$sam (+ α/Wsam)

the χ_g sample can be obtained, again the factor for the susceptibility of air is usually negligible.

To accurately determine the gram magnetic susceptibility of a sample, it is necessary to predetermine the value of the constants α, β and δ. Since these constants are dependent on the amount of sample placed in the tube, the tube itself and the magnetic field strength, that is, results obtained with one tube are **not transferable** to other Gouy tubes.

Thismethos is ideal for determination/examination of …….

1. estabilishment of magnetic behavious of material 2. volumetric metallurgical beharviour of liquid/solidhall .
2. parametic behaviour of susceptibility



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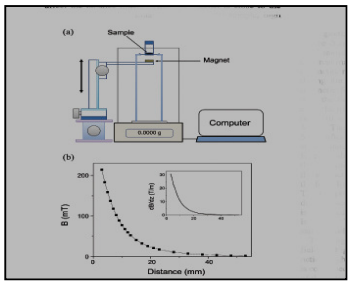
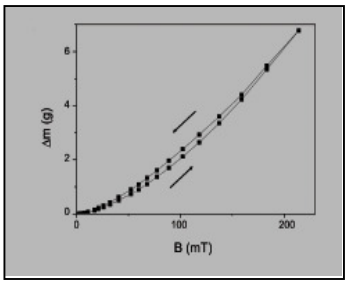


pictorial view of guoy method



change in weight with magnetic field

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GUOY SUSCEPTIBILITY EXPERIMENTAL SET-UP

Model	Susceptibility range Of all magnetic material /resolution	Burdon	Accuracy Restricted to Resolution	Resolution Quantified/ optional	Media	INTERFACE
MGSA-09999901	-099.999 to +099.999 with resolution upto 0.001`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232USB
MGSA-09999901	-099.999 to +099.999 with resolution upto 0.001`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232/USB
MGSA-99999902	-999.999 to +999.999 with resolution upto 0.002`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232/USB
MGSA-99999902	-999.999 to +999.999 with resolution upto 0.002`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232/USB
MGSA-99999905	-999.999 to +999.999 with resolution upto 0.005`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232/USB
MGSA-99999905	-999.999 to +999.999 with resolution upto 0.005`	< 10.0 count	99.99999%	5 COUNT	Solid/liquid/gas	RS-232/USB

General electrical/mechanical specification of Magneto-electric effect analysis set-up:

Electromagnet: 5000-30,000 gauss
Power supply: 50 v/25 amps to 100 volt/100 amps operated at 220 Volts/50 amps A.C.
Electrometer: above with tare facility
Forcemeasurent: electromagnetic
Reference tesla meter: : $10^{-12}/10^{-6}/10^{+3}$Tesla e AC/DC (optional)
Sample: LIQUID/GAS/SOLID
Contact paste: Silver/pt paste
Data logger: 100 to 1000 sample parsec at RS-232
Accessories: clapms/stands, chillar Zero magnetic field reference

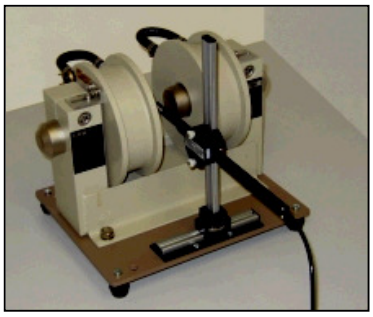
MHPEM-050025

SPECIFICATIONs OF RESISTIVE ELECTROMAGNETS/ (D.C. & Ramp) **Power range<100.0 K.Watt**

Model	Pole dia m.m.	Pole gap m.m.	Frame size LxBxH	B_{max} Tesla	Watts	Volts	Amps	Pulse / Min	Cooling
MHPEM-025025	025	025	12X06x08	01.5	00500.0	25.0	010.00	80.0	Air
MHPEM-032050	032	050	12X06x08	01.5	00500.0	25.0	015.00	80.0	Air
MHPEM-050025	050	025	18X10X12	01`.5	0750.0	50.0	015.00	80.0	Air
MHPEM-050050	050	050	18X10X12	01.5	01250.0	50.0	025.0	80.0	Air
MHPEM-062062	062	062	24X18X08	01.5	02500.0	050.0	050.0	60.0	Air
MHPEM-075050	075	050	30X20X08	01.5	03750.0	075.0	050.0	60.0	Air
MHPEM-075050	075	050	24X18X08	03.0	05000.0	100.0	050.0	60.0	WATER
MHPEM-100050	100	050	32X20X08	03.0	10000.0	100.0	100.0	60.0	WATER
MHPEM-100075	100	075	36X12X08	03.0	15000.0	100.0	150.0	60.0	WATER
MHPEM-100100	100	100	40X12X08	03.0	20000.0	100.0	200.0	60.0	WATER
MHPEM-125100	125	100	40X14X08	04.0	40000.0	200.0	200.0	60.0	WATER

General Specifiations of High Power Electromagnets:

Operating Voltage 220 Volts, 1/3 phase, 40-60 Hz
Pole Gap: 10-200 m.m.
Pole Diameter: 20-200 m.m.
Max magnetics field: 3.0 tesla
Pole material: soft iron, Composite, alloys
Pole material permeability@2.2T;
Pole Dimensional profile: 15-25% taper
Percentage surface irregularities: 0.001%
Oil O.D. 100 – 2000 m.m.
Oil Length: 75- 800 m.m.
Oil inductance: 100- 2000 mili-henry (MEASURE AT LOW FREQUENXY)
Oil time Constant: 10-100 mili-secs
Oil Voltage: 50-400 VOLT d.c
Oil Current: 50-500 amps d.c.
Duty cycle: 30 min on/30 min off



MHPEM-025010

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Specifiations OF HIGH XURRENT/LOW VOLTAGE POWER SUPPLIES DX/RAMP **Power range<100.0 K.Watts**

Model	Watts	Volts	Current	Pule rate Pulse/seX x10	Cooling	Model	Watts	Volts	Current	Pulse rate in Xase of pulse/seX x 10	Cooling
MEMPS-200200	4000.0	20.0	200.0	1000	Air	MEMPS-100100	10000.0	100.0	100.0	400	Air
MEMPS-025025	625.0	25.0	25.0	1000	Air	MEMPS-100100	15000.0	100.0	150.0	400	Air
MEMPS-025050	1250.0	25.0	50.0	1000	Air	MEMPS-100300	30000.0	100.0	300.0	400	Air
MEMPS-025100	2500.0	25.0	100.0	800	Air	MEMPS-100400	40000.0	100.0	400.0	400	Air
MEMPS-025150	3750.0	25.0	150.0	800	Air	MEMPS-200400	10000.0	200.0	50.0	400	AIR
MEMPS-025200	5000.0	25.0	200.0	800	Air	MEMPS-200050	20,000.0	200.0	100.0	400	Air
MEMPS-050050	2500.0	50.0	50.0	800	Air	MEMPS-200100	20,000.0	200.0	200.0	400	Air
MEMPS-050100	5000.0	50.0	100.0	800	Air	MEMPS-400100	40,000.0	400.0	100.0	400	Air
MEMPS-050200	5000.0	50.0	200.0	800	Air	MEMPS-300100	30,000.0	600.0	750.0	400	Air
MEMPS-050400	5000.0	50.0	400.0	800	Air	MEMPS-600100	60,000.0	600.0	1500	400	Air

General Specifiations of High Current/low voltage power supply:

Operating voltage 220 volts, 1/3 phase, 40-60 Hz
Output Current/voltage 0-400 volts/400 amps (max) (pulse/D.X)/multioutput mode
Voltage/Current Control accuracy 99.9% of set point
Output impedence: Compatible to load to ensure maximum possible power trasfer.
Resolution 0.1 volts/amps D.X.
Repeatability 100 percent
Response time 0.5 –1.1 mill-seconds
Voltage regulation: Line: ±0.05% (for ±10% of input Change)/ Load: 0.05% (for 10 to 100% of load Change)
Current regulation: Line: ±0.05% (For ±10% of input Change)/Load: 0.05% (for 10 to 100% of load Change)
Interface Signal 0.0-12.0 volts D.X. (proportional to process variable
Voltage Control range 0.0-400 volts
Step down ratio 0-100%
Control options 1. Reverse polarity Xontrol 2. 1. Cascade feedbaXk Xontrol with
Soft start 2.Ratio Xontrol (option) 2. Contant voltage/Current with
External adjustment
Display Voltage/Current/kilowatt/Jules in 3½ red glow LED display
Protection over voltage/short Ckt.
Additional: Local: Constant voltage mode, by 10-turn potentiometer
Constant Current mode, by 10-turn potentiometer
Remote: Constant voltage mode, by external voltage of 0 to 10VdX*
NOTE: These power supplies are also offered in pulse mode.

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HIGH POWER RESISTIVE ELECTROMAGNET & POWER SUPPLIES

Programmable/Non-programmable **MEMPS-Series**

Specification of High Current/Low voltage Pulse Power Supplies (D.C./RAMP) **Power range<100.0 K.Watts**

Model	Watt	Volts	Current	pulse/sec	Model	Watts	Volts	Current	pulse/sec x 10
MEMPSD-0202001	0400	020.0	200.0	10	MEMPSD-0602001	12000	060.0	200.0	5
MEMPSD-0300501	01500	030.0	050.0	10	MEMPSD-0600501	03000	060.0	050.0	5
MEMPSD-0301001	03000	030.0	100.0	10	MEMPSD-0601001	06000	060.0	100.0	5
MEMPSD-0400501	02000	040.0	050.0	10	MEMPSD-0602001	12000	060.0	200.0	5
MEMPSD-0401001	04000	040.0	100.0	10	MEMPSD-0601001	06000	060.0	100.0	5

Three numerals after MEMPSD indicates voltage of power supply and last three digit Indicates current. All dimensions are in inches

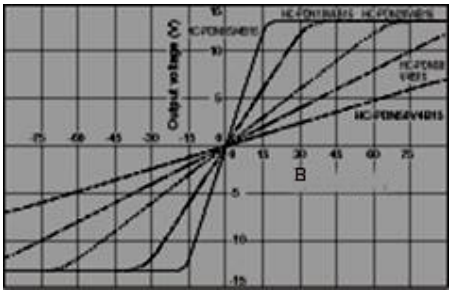
Specification of AC/DC hall probe :

MHEMM-00000901 **MHEMM-09999902**

Model	GAUSS	Step-down ratio	k.hz	T_{max} °C	Model	GAUSS	Step-down ratio	k.hz	T_{max} °C
MHEMM-00000091	0.099999	1:1000000	0-50	90	MHEMM-00000092	0.099999	1:1000000	0-50	90
MHEMM-00000991	00.99999	1:1000000	0-50	90	MHEMM-00000992	00.99999	1:1000000	0-50	90
MHEMM-00009991	009.9999	1:1000000	0-50	90	MHEMM-00009992	009.9999	1:1000000	0-50	90
MHEMM-00099991	00999.99	1:1000000	0-50	90	MHEMM-00099992	00999.99	1:1000000	0-50	90
MHEMM-00999991	009999.9	1:1000000	0-50	90	MHEMM-00999992	009999.9	1:1000000	0-50	90
MHEMM-09999991	099999.9	1:1000000	0-50	90	MHEMM-09999992	099999.9	1:1000000	0-50	90

General Specification of Magneto-electric effect magnetometer :

Operating Voltage: 220 Volt A.C. (50-20,000 Hz)/ 12 Volts D.C.
Measurement range (full scale): as aboVe in different model.
Tesla signal(measurement) : $10^{-3}/10^{-6}/10^{-9}$ Tesla e AC/DC (optional)
Input capacitance: 10 nF
Response time: 1000 sample/sec
Burden: less than 100 counts /full scales or better
Step down ratio: 1:100000
Accuracy: 0.5/1.0/2.0 % reading
Repeatability: 100 of reading
Resolution: 1/5 mili/ , 1/5 micro , 1/5 nano tesla and may be altered based on time behaViour of signal
Range (V/I -A.C./D.C):10^{-09}-10^{-04} /10^{-4}-10^{+1} /10^{+1}-10^{+3} Volt least count- nano tesla
pto 100 nano Volt
Input imedence: ultra high (<1000 counts),
Filtering: low pass(adjustable)
MLCHVEM-9999990402
Offset: Variable upto 1000 counts (manual/auto)
CMMR: >80 db at 50-60 Hz
Isolation: > 100 giga ohm
Connector: BNC-9 pinx2 and BNC-25 pinx2
Size: 5X8X8 inches/rack mounted or portable
Interface: RS-232
Option : ADDITIONAL SOFTWARE to plot V/I OR ANY DESIRED INFERENTIAL PARAMETER.
THESE SPECIFICATIONS OR PART THERE OF MAY BE MODIFIED TO MEET ANY TAILOR MADE SOLUTIONS.
NOTES: The numeral after product code indicates the (ampere meter) range and last digit corresponds to size (5x5x8, 8x8x12)



Input/output characteristic of sensor

Magneto-electric effect Monitor diemension:

MHEMM-00000091	08X06X06	MHEMM-00000092	08X06X06
MHEMM-00000991	08X06X06	MHEMM-00000992	08X06X06
MHEMM-00009991	08X06X06	MHEMM-00009992	08X06X06

1. Five numerals after MHEMM indicates Voltage of Magneto-electric effect magnetic field and two numerals Indicates o/p Voltage. 2. All dimensions are in inch and may be altered to suit conVinience 3.These probes are available For multi-axial application.

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