

# HALL EFFECT EXPERIMENTAL SET-UP METAL /SEMICONDUCTORS & ALLOYS

MHECS-Series

## Introduction:

MHECS series of hall effects experimental set-ups are available in more than ten different model to examine and explore hall effect in existing and new semiconductors/metal and alloys. To meet new application. These tabletop set-up comprises Variable magnetic field electromagnet in various ranges from 5000 to 30,000 gauss, precision electrometer with constant current source. On account its versatile feature these preferable choice for research and teaching institution, generation, traction, telecom, airlines, 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 efficiency with additional integrated power/voltage and frequency control/protection. Company offers tailor made solution to custom requirement.

## Operating Principle:

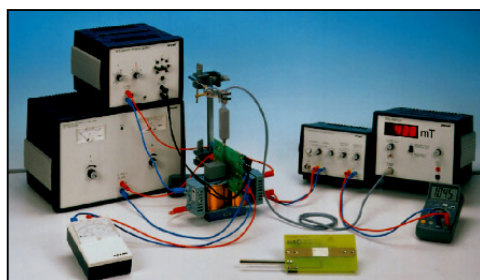
Vector Hall voltage generated on account of Lorentz force in any metal/semiconductors/alloys due to vector current flowing in plane of magnetic field is as under.....

$$V_h = J_x \cdot B_x \cdot d \cdot (p \cdot U_h^2 - n \cdot U_e^2) / e(p \cdot U_h + n \cdot U_e)^2$$

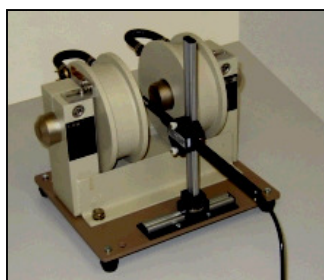
$J_x$  = Current density vector,  $B_x$  = magnetic field vector  
 $p$  &  $n$ ; hole and electron concentration;  $D$  = sample thickness  $U_h$  &  $U_e$  electron and hole mobility

This hall experimental set-up is to observe.....

1. Normal Hall Effect
2. Anomalous Hall Effect
3. charge carrier
4. Hall mobility
5. electron and defect electron



MHEMS-05305



MHECS-096100



MHECS-012050

Model	Electromagnet-field Gauss/pole dia/gap m.m.	Precision Power supply Volt/current range	Hall material	Voltage measurement range
MHEMS-05305	05000(25/25)	50 Volt/10 amps	Cu/Ag/Ga.As or Alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts
MHEMS-05305	10,000(40/25)	50 Volt/20 amps	Cu/Ag/Ga.As Or alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts
MHEMS-05305	10,000(40/40)	50 Volt/30 amps	Cu/Ag/Ga.As Or alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts
MHEMS-05305	15,000(40/40)	50 Volt/40 amps	Cu/Ag/Ga.As Or alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts
MHEMS-05305	20,000(50/50)	75 Volt/50 amps	Cu/Ag/Ga.As Or alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts
MHEMS-05305	30,000(65/50)	100 Volt/100 amps	Cu/Ag/Ga.As Or alloys	0.1/0.5 -99999.9mV & 10.0 mV-10.0Volts

## General electrical/mechanical specification of Hall 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

Reference tesla meter: :  $10^{-12}/10^{-6}/10^{+3}$ Tesla e AC/DC (optional)

Hall sample: si, cu,zn, Ga.As , Cu.Ni.

Contact paste: Silver/pt paste

Data logger: 100 to 1000 sample parsec at RS-232

Accessories: clamps/stands, chillar Zero magnetic field reference



MHPEM-050025

## MOTORON SEMICONDUCTORS CORPORATION

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# HALL EFFECT SET-UP IN METAL/SEMICONDUCTORS & ALLOYS

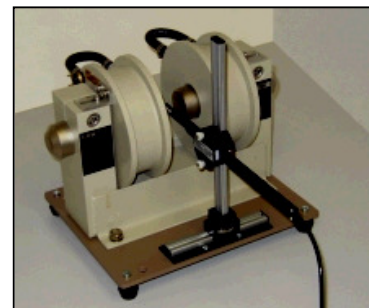
## SPECIFICATIONS OF RESISTIVE ELECTROMAGNETS/ (D.C. & Ramp)

Power range <100.0 K.Watt

Model	Pole dia m.m.	Pole gap m.m.	Frame size LxBxH	B <sub>max</sub> 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
MHPEM-150125	150	125	45X20X08	04.0	80,000.0	200.0	400.0	60.0	WATER
MHPEM-150150	200	150	48X20X08	04.0	100,000.0	200.0	500.0	20.0	WATER
MHPEM-250050	200	050	48X20X08	06.0	2000,000.0	400.0	500.0	20.0	WATER
MHPEM-300075	250	075	48X20X08	06.0	2000,000.0	500.0	500.0	20.0	WATER
MHPEM-500050	300	050	48X20X08	08.0	2000,000.0	1000.0	500.0	20.0	WATER

### General Specifications 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 milli-henry (MEASURE AT LOW FREQUENXY)  
 Oil time Constant: 10-100 milli-secs  
 Oil Voltage: 50-400 VOLT d.c  
 Oil Current: 50-500 amps d.c.  
 Duty cycle: 30 min on/30 min off  
 Frame size: 6x24 to 100x200"



MHPEM-025010

## Specifications OF HIGH XURRENT/LOW VOLTAGE POWER SUPPLIES DX/RAMP

Power range <100.0 K.Watts

Model	Watts	Volts	Current	Pulse 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 Specifications 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)/multiooutput mode  
 Voltage/Current Control accuracy 99.9% of set point  
 Output impedance: 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. 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 <sub>max</sub> °C	Model	GAUSS	Step-down ratio	k.hz	T <sub>max</sub> °C
MHEMM-00000901	0.099999	1:1000000	0-50	90	MHEMM-00000902	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 Hall 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<sup>-3</sup>/10<sup>-6</sup>/10<sup>-9</sup> 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 milli/ , 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<sup>-9</sup>-10<sup>-04</sup> /10<sup>-4</sup>-10<sup>+1</sup> /10<sup>+1</sup>-10<sup>+3</sup> Volt least count- nano tesla  
 upto 100 nano Volt  
 Input imedence: ultra high (<1000 counts) ,  
 Filtering: low pass( adjustable)  
 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 B  
 Size: 5X8X8 inches/rack mounted or portable  
 Interface: RS-232



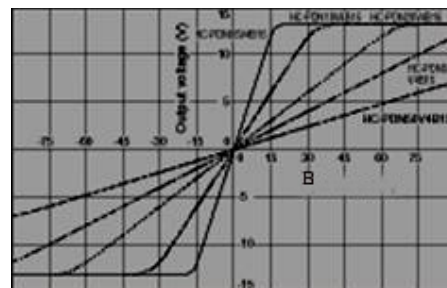
MLCHVEM-

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)

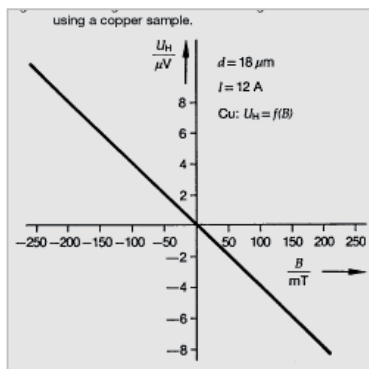
**Hall Effect Monitor diemension:**

MHEMM-00000901	08X06X06	MHEMM-00000902	08X06X06
MHEMM-00000991	08X06X06	MHEMM-00000992	08X06X06
MHEMM-00009991	08X06X06	MHEMM-00009992	08X06X06

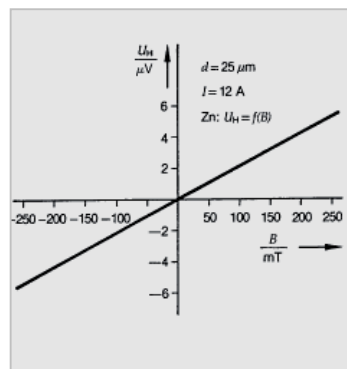


Input/output characteristic of sensor

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



HALL RESULT IN COPPER SAMPLE



HALL RESULT COPPER SAMPLE IN Zn SAMPLE

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