



RESEARCH

SCIENCE



# ZERO GAUSS CHAMBERS

EDUCATION

**MAGNETIC SHIELD** CORP.



ORDERS & TECHNICAL SUPPORT

P: 630-766-7800

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# MuMETAL® ZERO GAUSS CHAMBERS

Science • Research • Education



THREE-LAYER ZG-209 SHOWN DISASSEMBLED

## INTRODUCTION

One of our most popular research products, the Zero Gauss Chamber is used to create a low-field environment. Fabricated from MuMETAL® alloy, and field proven to be effective, the Magnetic Shield Corporation Zero Gauss Chamber is scientifically engineered to provide a laboratory work space of extremely low magnetic field. Ambient magnetic fields and the Earth's geomagnetic field (0.25 to 0.65 Gauss) are attenuated to the milliGauss level inside a multi-layer Zero Gauss Chamber.

Magnetic Shield Corporation has worked with a wide range of applications for scientific, industrial, and commercial users. Our MuMETAL® Zero Gauss Chambers have been used worldwide by hundreds of universities, private research companies, national laboratories and companies required to provide evidence for military or consumer regulatory compliance. Our chambers are preferred because they are manufactured from high permeability ( $\mu$ ) stress annealed MuMETAL®. A consistent, low-field environment is achieved by providing interference control of H-fields, DC or AC to 100 kiloHertz.

Zero Gauss Chambers are effective because of layering. When two or more concentrically spaced magnetic shields are used in series (one inside the other) and magnetically isolated, the attenuation of the external field is multiplied. This multiplying effect of successive shields provides substantially greater attenuation of magnetic fields than a single shield of equivalent total wall thickness. Although custom chambers are available in different diameters, lengths, thicknesses and configurations, most applications are solved with one of our standard models.

## STANDARD MODELS

Our standard Zero Gauss Chambers have three layers of MuMETAL® and are designed to attenuate external fields 1,000 to 1,500 times. In our standard configuration, each of the three magnetic shield layers consists of a cylinder with one closed end and one open end (access opening). A close-fitting, removable cover is provided on the access opening end. Of all geometric shapes, a cylindrical configuration is one of the most effective for absorbing external magnetic flux lines, thus creating an efficient magnetically shielded finite space.

To order MuMETAL® Zero Gauss Chambers online, visit [www.magnetic-shield.com](http://www.magnetic-shield.com).

## STANDARD SIZE CHAMBERS:

stock #	MuMETAL® thickness		Work Area (inner chamber)			A = Attenuation <sup>(1)</sup>		
	inches	[mm]	diameter	length	volume	1 Layer	2 Layers	3 Layers
ZG-206	.025	[0,64]	6"	15"	424 in <sup>3</sup>	25	200	1575
ZG-209	.030	[0,76]	9"	27"	1717 in <sup>3</sup>	24	190	1490
ZG-212	.040	[1,02]	12"	36"	4071 in <sup>3</sup>	23	185	1475
ZG-218	.062	[1,57]	18"	54"	13740 in <sup>3</sup>	23	180	1475

<sup>(1)</sup>Attenuation is estimated using a theoretical formula as the ratio of measured field before shielding to that measured after shielding. Typically, attenuation decreases in shields of larger volume, thus thicker layers of MuMETAL® are required. Attenuation ratios above are estimated at room temperature in an Earth field of 0.5 Gauss – actual results will vary in different operating environments.



STOCK ZG-206 SHOWN

## CUSTOM CHAMBERS

Following are the critical design factors for manufacturing and use of a MuMETAL® Zero Gauss Chamber. You are invited to contact our Engineering Department to discuss your design requirements and to send a sketch or description for a prompt quotation.

### EXTERNAL FIELD STRENGTH (H<sub>0</sub>)

Most Zero Gauss Chambers are operated in Earth's field, which is usually about 0.5 Gauss. In most environments, however, there are additional sources of magnetic fields, usually 60 Hertz and its harmonics. Since all magnetic fields around the chamber are part of the ambient magnetic field, their magnitude must be considered as part of the shielding requirement. For strong external fields, the outer layer may be manufactured from our high saturation NETIC® Alloy

### ATTENUATION (A) & LAYERS

The number of concentric shields (layers) required is a function of the degree of Attenuation (A) desired. Typically three layers are required, however, additional layers may be added. The external field strength (H<sub>0</sub>) and the maximum allowable magnetic field inside the chamber (H<sub>i</sub>), or the required attenuation, are determined by the customer. To achieve internal magnetic fields of 10 milliGauss or less, additional layers and a Degaussing Coil are usually required.

### INTERIOR SIZE

For best results, the inside chamber diameter should be as small as possible because attenuation is inversely proportional to diameter. The inside depth should be 2-3 times longer than the inside diameter to provide a workable area.

### OPERATING ENVIRONMENT

Normal room conditions usually do not present any problems. High or low operating temperatures may affect the insulation of an optional Degaussing Coil. The operating range of MuMETAL® alloys is -452°F (-269°C) to 850°F (454°C). Operation in a vacuum will preclude use of plastics and many finishes because of outgassing.

### WALL THICKNESS

Typically .025" [0,64mm] is the minimal wall thickness for Zero Gauss Chamber construction. Thicker materials are used on large diameter chambers to provide more attenuation. After fabrication and Perfection Anneal, MuMETAL® alloy is relatively soft. Consequently, the chambers must be fabricated with sufficient wall thickness to maintain the physical integrity of the assembly. The chamber must be able to support itself and provide sufficient strength to support the item being shielded.

### ACCESS HOLES & COVERS

Holes are specified by the customer, for connecting power and signal cables to the interior. Access holes should be as few and as small as possible to minimize interfering field fringe into the chamber. Hole axes should be perpendicular (transverse) to the ambient field. The minimum distance between any two holes in a shield should be equal to the diameter of the larger hole. Interfering field fringe can be substantially reduced with cylindrical extensions welded onto the outer surface of the chamber assembly, and by using our SPIRA-SHIELD or Co-NETIC® Braided Sleeving to shield cables.

Typically, the close-fitting removable covers have a lip of 1.0" [25,4mm] to avoid magnetic field leakage and still allow access to the chamber interior. For easy cover removal, each cover is typically provided with a .88" [22mm] hole in the center to allow removal with a finger.

See back to specify your custom design.

CONTACT US TODAY



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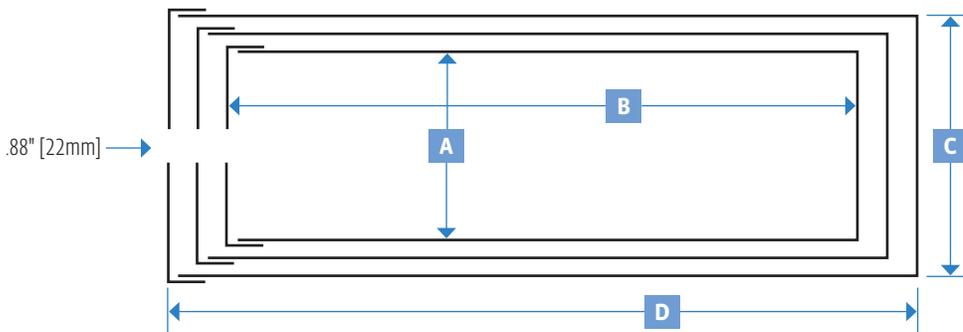
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### Zero Gauss Chambers - MuMetal®

ZG-206 used to attenuate Earth's magnetic field  
In stock at Magnetic Shield Corp.  
[www.magnetic-shield.com/zerogauss](http://www.magnetic-shield.com/zerogauss)

# SPECIFY YOUR CUSTOM ZERO GAUSS CHAMBER



Your part number	A Min Inside Diameter	B Min Inside Depth	C Max Outside Diameter	D Max Overall Length	Number of Layers	Thickness per Layer
ZG-206	6" [152mm]	15" [381mm]	8.25" [210mm]	17.25" [438mm]	3	.025" [0,64mm]
ZG-209	9" [229mm]	27" [686mm]	11.25" [286mm]	29.25" [743mm]	3	.030" [0,76mm]
ZG-212	12" [305mm]	36" [914mm]	14.25" [362mm]	38.25" [972mm]	3	.040" [1,02mm]
ZG-218	18" [457mm]	54" [1372mm]	20.50" [521mm]	56.50" [1435mm]	3	.062" [1,57mm]

Please provide size and location of additional holes as required.

You are invited to contact our Engineering Department to discuss your fabrication and finishing requirements. For a prompt and accurate quotation, send a drawing, sketch, or written description to [shields@magnetic-shield.com](mailto:shields@magnetic-shield.com).

## PROPER USE AND CARE

### SHOCK AND DAMAGE

Normal handling of the Zero Gauss Chamber will not cause any significant reduction in magnetic shielding effectiveness. If your chamber receives severe shock or deformation, return it to Magnetic Shield Corporation for inspection, testing and repair. We will re-anneal the individual cans and covers after all necessary rework is complete.

### MOUNTING

We offer various size Cradles to hold the Zero Gauss Chambers in a stable horizontal position. This option may be quoted upon request



ZG-206 CRADLE SHOWN

### ORIENTATION

For best results, the chamber should be oriented so that the axis of the Zero Gauss Chamber and the axes of the holes are perpendicular to the ambient field. This position is easily determined by rotating the chamber until the level of the field within the chamber is reduced to a minimum.

### DEGAUSSING

To achieve the lowest magnetic levels within the chamber and for providing optimum long term stability and uniformity of the internal magnetic field levels, the periodic use of a Degaussing Coil is recommended. The coil is driven with sufficient 60 Hertz current to saturate the chamber. Then the current is slowly reduced so that the residual magnetism is minimized. We offer both standard and high temperature insulated Degaussing Coils.



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