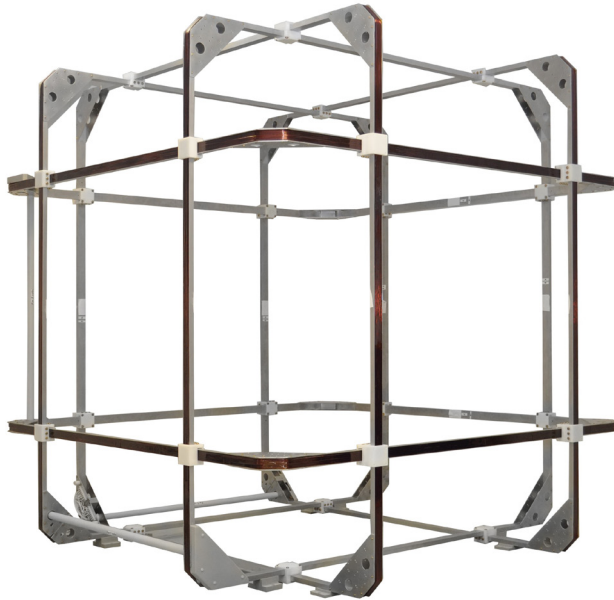


Ferronato® Helmholtz Coil Systems



BHC2000

These Ferronato® Helmholtz coils are used in the calibration of magnetic field sensors, or for conducting tests or experiments that require a known magnetic environment.

The coils are available in a range of diameters from 300mm to 2m.

Bartington's Helmholtz Control System (PA1, CU1 and CU2) can be used with the Ferronato® coils described here. A compatibility table at the end of this brochure details the performance which can be achieved when using the PA1.

Full system specifications for PA1, CU1, CU2 and recommended National Instruments acquisition card, are available in the Helmholtz coil systems brochure DS2613.

Features

- Option of 1, 2 or 3 axes
- DUT (Device Under Test) mounting setup available
- BH1300HF4 coil is suitable for high frequency field generation
- Full system available including active cancellation

Typical Applications

- Calibration of three-axis magnetic field sensors, including satellite and sub assemblies
- Creation of a known magnetic environment

Product Identification

Product name	Variant	Axes	Description
BH300	1A-A	X	1 axis with scaling of 500 μ T/A field/current ratio
	1B-A	Z	1 axis with scaling of 500 μ T/A field/current ratio
	2A-A	X, Y	2-axis with scaling of 500 μ T/A field/current ratio
	2B-A	X, Z	2-axis with scaling of 500 μ T/A field/current ratio
	3-A	X, Y, Z	3-axis with scaling of 500 μ T/A field/current ratio
BH300HF	3-B	X, Y, Z	3-axis with scaling of 54 μ T/A field/current ratio, high frequency
BH600	1A-B	X	1 axis with scaling of 300 μ T/A field/current ratio
	1B-B	Z	1 axis with scaling of 300 μ T/A field/current ratio
	2A-B	X, Y	2-axis with scaling of 300 μ T/A field/current ratio
	2B-B	X, Z	2-axis with scaling of 300 μ T/A field/current ratio
	3-B	X, Y, Z	3-axis with scaling of 300 μ T/A field/current ratio
BH1300	1A-A/C	X	1 axis with scaling of 200 μ T/A (A) or 50.5 μ T/A (C) field/current ratio
	1B-A/C	Z	1 axis with scaling of 200 μ T/A (A) or 50.5 μ T/A (C) field/current ratio
	2A-A/C	X, Y	2-axis with scaling of 200 μ T/A (A) or 50.5 μ T/A (C) field/current ratio
	2B-A/C	X, Z	2-axis with scaling of 200 μ T/A (A) or 50.5 μ T/A (C) field/current ratio
	3-A/C	X, Y, Z	3-axis with scaling of 200 μ T/A (A) or 50.5 μ T/A (C) field/current ratio
BH1300HF4	1A-A	X	1 axis with scaling of ~5.8 μ T/A field/current ratio, high frequency
	1B-A	Z	1 axis with scaling of ~5.8 μ T/A field/current ratio, high frequency
	2A-A	X, Y	2-axis with scaling of ~5.8 μ T/A field/current ratio, high frequency
	2B-A	X, Z	2-axis with scaling of ~5.8 μ T/A field/current ratio, high frequency
	3-A	X, Y, Z	3-axis with scaling of ~5.8 μ T/A field/current ratio, high frequency
BHC2000	1A-A/B	Y	1 axis with scaling of 25 μ T/A (A) or 14.7 μ T/A (B) field/current ratio
	2A-A/B	X, Y	2-axis with scaling of 25 μ T/A (A) or 14.7 μ T/A (B) field/current ratio
	2B-A/B	Y, Z	2-axis with scaling of 25 μ T/A (A) or 14.7 μ T/A (B) field/current ratio
	3-A/B	X, Y, Z	3-axis with scaling of 25 μ T/A (A) or 14.7 μ T/A (B) field/current ratio

BHC2000-A Helmholtz Coils

Each pair of coils generates a homogeneous magnetic field X, Y or Z axis.

BHC2000-A customers may specify the number of axes required. One-axis, two-axis, or three-axis versions are available in any combination (1A, 2A, 2B, or 3) and are provided in flat-pack assembly to facilitate easier freight carriage and installation.

Specifications

Performance:	X axis	Y axis	Z axis
Field/current ratio	25.0 μ T/A (0.5G/A). For bifilar winding in parallel, as delivered from factory, or 25.0+25.0 μ T/A for independent split windings.		
Maximum field	1.0 mT (10 Gauss) for each axis		
Maximum current	40A, each axis, with bifilar windings in parallel. For maximum heating to around 70°C measured on coil surface. 20A, each axis, for each independent bifilar circuit (20 + 20A).		
Coil homogeneous volume (\pm 1% error)	Cubic 48cm side		
Coil homogeneous volume (\pm 5% error)	Cubic 92.5cm side		
Nominal diameter in \pm 1mm	2046mm	2000mm	1954mm
Secondary field generated by the coil formers when used as coils (Xs, Ys, Zs) \pm 3%	0.82 μ T/A (max. 16.4 μ T) (20A max)		

Environmental	
Maximum operating temperature	80°C for the whole set, 100°C for the coils.

Mechanical	
Winding	Bifilar copper wire
Coil formers	Aluminium alloy
Dimensions (W x H x D)	2086 x 2086 x 2040mm
Weight	Single coil about 35kg. Total about 220kg.

Electrical	X axis	Y axis	Z axis
Field/current ratio \pm 1%, circuits in parallel	24.8 μ T/A	25.3 μ T/A	25.1 μ T/A
Field/current ratio \pm 1%, circuits in series	49.5 μ T/A	50.6 μ T/A	50.1 μ T/A
DC resistance at 20°C \pm 5% measured at the general terminal block with factory wiring configuration	0.62 Ω	0.61 Ω	0.57 Ω
Resistance for each separated circuit at 20°C \pm 5%	1.24 Ω	1.21 Ω	1.15 Ω
Self-inductance at 120Hz \pm 5%	14.7mH	14.3mH	13.1mH

BHC2000-B Helmholtz Coils

Each pair of coils generates a homogeneous magnetic field X, Y or Z axis.

BHC2000-B customers may specify the number of axes required. One-axis, two-axis, or three-axis versions are available in any combination (1A, 2A, 2B, or 3) and are provided in flat-pack assembly to facilitate easier freight carriage and installation.

Specifications

Performance:	X axis	Y axis	Z axis
Field/current ratio	14.7 μ T/A (0.15G/A). For bifilar winding in parallel, as delivered from factory, or 14.7+14.7 μ T/A for independent split windings.		
Maximum field	240 μ T (2.4 Gauss) for each axis		
Maximum current	16A, each axis, with bifilar windings in parallel. For maximum heating to around 70°C measured on coil surface. 8A, each axis, for each independent bifilar circuit (5 + 5A).		
Coil homogeneous volume (\pm 1% error)	Cubic 48cm side		
Coil homogeneous volume (\pm 5% error)	Cubic 92.5cm side		
Nominal diameter in \pm 1mm	2046mm	2000mm	1954mm
Secondary field generated by the coil formers when used as coils (Xs, Ys, Zs) \pm 3%	0.82 μ T/A (max. 16.4 μ T) (20A max)		

Environmental	
Maximum operating temperature	80°C for the whole set, 100°C for the coils

Mechanical	
Winding	Bifilar copper wire
Coil formers	Aluminium alloy
Dimensions (W x H x D)	2086 x 2086 x 2040mm
Weight	Single coil about 9.5kg; total about 90kg

Electrical	X axis	Y axis	Z axis
Field/current ratio \pm 2%, circuits in parallel	14.4 μ T/A	14.7 μ T/A	15.1 μ T/A
Field/current ratio \pm 2%, circuits in series	28.7 μ T/A	29.4 μ T/A	30.1 μ T/A
DC resistance at 20°C \pm 5% measured at the general terminal block with factory wiring configuration	1.8 Ω	1.7 Ω	1.6 Ω
Resistance for each separated circuit at 20°C \pm 5%	3.6 Ω	3.4 Ω	3.2 Ω
Self-inductance at 120Hz \pm 5%	4.9mH	4.8mH	4.7mH

Ferronato Coils Compatibility Table

When using Bartington's Helmholtz Control System (PA1 and CU1), the following field performances can be achieved.

The values given are worst case scenario (i.e. the smallest calculated field which can be generated) and are calculated using the axis with the highest DC resistance and inductance.

All calculations assume the standard factory wiring without the use of the coil formers.

The PA1 DC offset adjustment will apply a DC bias and therefore when used, reduces the current available.

Coil Version:	DC Max Field (Current)	AC 100Hz Max Field (Current)	AC 500Hz Max Field (Current)
BH300-A	~2mT each axis - Max current per axis 4A (coil limited) - Max current delivered by PA1 - ~5A spread across 3 axes	~2mT each axis - Max current per axis 4A (coil limited) - Max current delivered by PA1 - ~6A spread across 3 axes	~800µT each axis - Max current delivered by PA1 - ~1.6A spread across 3 axes
BH300HF-B	~430µT each axis - Max current per axis 8A (coil limited) - Max current delivered by PA1 - ~15A spread across 3 axes	~430µT each axis - Max current per axis 8A (coil limited) - Max current delivered by PA1 - ~28A spread across 3 axes	~430µT each axis - Max current per axis 8A (coil limited) - Max current delivered by PA1 - ~28A spread across 3 axes
BH600-B	~810µT each axis - Max current delivered by PA1 - ~2.7A spread across 3 axes	~600µT each axis - Max current delivered by PA1 - ~2A spread across 3 axes	~120µT each axis - Max current delivered by PA1 - ~0.4A spread across 3 axes
BH1300-A	~400µT each axis - Max current delivered by PA1 - ~2A spread across 3 axes	~100µT each axis - Max current delivered by PA1 - ~0.5A spread across 3 axes	~20µT each axis - Max current delivered by PA1 - ~0.1A spread across 3 axes
BH1300-C	~620µT each axis - Max current delivered by PA1 - ~12.5A spread across 3 axes	~350µT each axis - Max current delivered by PA1 - ~7A spread across 3 axes	~80µT each axis - Max current delivered by PA1 - ~1.7A spread across 3 axes
BH1300HF-A	~100µT each axis - Max current delivered by PA1 - ~18A spread across 3 axes	~110µT each axis - Max current per axis 20A (coil limited) - Max current delivered by PA1 - ~28A spread across 3 axes	~110µT each axis - Max current per axis 20A (coil limited) - Max current delivered by PA1 - ~28A spread across 3 axes
BHC2000-A	~350µT each axis - Max current delivered by PA1 - ~14A spread across 3 axes	~125µT each axis - Max current delivered by PA1 - ~5A spread across 3 axes	~25µT each axis - Max current delivered by PA1 - ~1A spread across 3 axes
BHC2000-B	~130µT each axis - Max current delivered by PA1 - ~9A spread across 3 axes	~161µT each axis - Max current per axis 10A (coil limited) - Max current delivered by PA1 - ~11A spread across 3 axes	~44µT each axis - Max current delivered by PA1 - ~3A spread across 3 axes