High Precision Motorized Goniometric Cradles

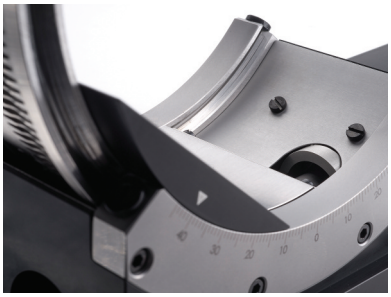
BG SERIES

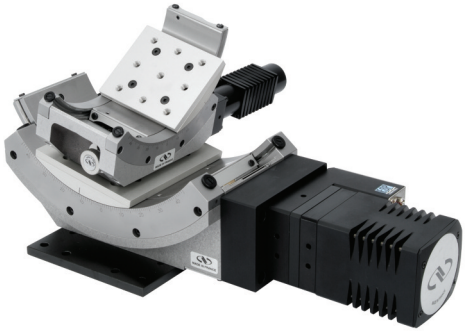
For tip and tilt applications, the BG series of goniometers allows open access to the load. When two BG stage are stacked together, the sample rotates about a common pivot point.

- ±45° transverse axis rotation with maximum free access to the rotating platform
- Stacked cradles provide orthogonal rotation about the same pivot point
- Precision machined ball bearing races assure smooth motion and high stability
- Precision ground worm gear provides 0.002° MIM
- Vacuum compatible versions up to 10^{-6} hPa

Open Rotation Platform

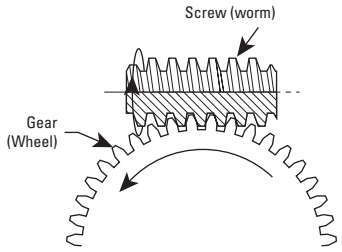
The BGS series stages provide up to ±45° of transverse axis rotation enforced with mechanical limit switches. The stage is designed for maximum free access to the rotating platform, allowing for simplified stacking and mounting.





Precision Worm Gear Drive

Precise rotation is ensured by a precision ground, hardened worm gear drive. In addition to being non-backdrivable, the worm gear drive's advantages include higher MIM, repeatability, and overall accuracy.



Direct Mounting Interface

BG cradles are designed so that two adjacent-sized models mounted orthogonally, such as BGS80 with BGM120, pivot about the same point in space. For a third rotation axis, yaw for example, a rotation stage can be mounted under the assembly. The direct mounting capability saves set-up time, design time, and adapter plate costs.

Ball Bearings with Tool-Steel Races

Single-row ball bearings and precision-ground, hardened tool-steel races ensure smooth rotation with minimal wobble and eccentricity. This allows for higher load capacities, stiffness, and stability.

Newport®

Performance DC Motor and Encoder Versions

The BG cradles are available in DC motor versions, which results in higher torque and repeatability. All encoders come with index pulses for precision homing. The BGS50CC uses a miniature DC servo motor, kept in a compact, lightweight package. All other models feature a high resolution, worm mounted rotary encoder which bypasses most drive train errors, resulting in improved bi-directional repeatability. The BGM models use high torque DC motors with a built-in tachometer to provide superior speed stability.

Stepper Motor Versions

The PP mini-step drive version are for applications that require higher speeds. For higher torque and vacuum applications, the PE full-step drive version is recommended.

DESIGN DETAILS

Base Material	Stainless steel with aluminum body
Bearings	Ball bearings
Drive Mechanism	Ground worm gear
Worm Gear Ratio	BGS50, BGS80 and BGM120: 1:180 BGM160 and BGM200: 1:60
Reduction Gear	BGS50CC: 14:1, BGS50PP: 43:1, BGS80CC: 44:20 BGS80PP and BGM120 (1): None BGM160 (1) and BGM200 (1): 3:1
Feedback	BGS50CC: Motor mounted rotary encoder, 2,048 cts/rev BGS50PP and BGS80PP: none BGS80CC: Worm mounted rotary encoder with index pulse, 4,000 cts/rev BGM120 to BGM200: Worm mounted rotary encoder with index pulse, 2000 cts/rev
Limit Switches	Mechanical, at ±45° (for BGS50 Mechanical, at ±30°)
Origin	Optical, at 0°
Cable	3 m long cable included
Vacuum Compatibility	Available up to 10^{-6} hPa using full step motor (BGM120PE to BGM200PE only)

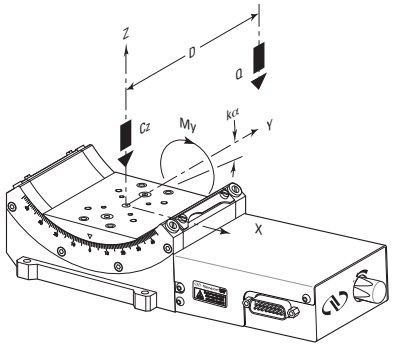
1) Additional motor mounted 10:1 reduction gear with PE versions.

SPECIFICATIONS

	BGS50CC	BGS50PP	BGS80CC	BGS80PP	BGM120, BGM160, BGM200
Travel Range (°)	±30	±30	±45	±45	±45
Minimum Incremental Motion (°)	0.0005	0.0002	0.0005	0.0002	0.002
Uni-directional Repeatability Typical (1) (°)	0.001	0.001	0.001	0.001	0.004
Bi-directional Repeatability, Typical (1) (°)	0.013 or ±0.0065	0.016 or ±0.008	0.003 or ±0.0015	0.005 or ±0.0025	0.024 or ±0.012
Absolute Accuracy, Typical (1) (°)	0.05 or ±0.025	0.07 or ±0.035	0.05 or ±0.025	0.06 or ±0.03	0.05 or ±0.025
Maximum Speed (°/s)	10	4	20	20	CC and BPP: 20, PE: 2
Wobble, Typical (1) (µrad)	200 or ±100	200 or ±100	200 or ±100	200 or ±100	200 or ±100
MTBF (h)			20,000		

1) For the definition of Typical and Guaranteed specifications see "Motion Basics Terminology & Standards" Tutorial at www.newport.com
The actual performance of BG stages are not verified on all production units, hence typical specifications are provided.

LOAD CHARACTERISTICS AND STIFFNESS



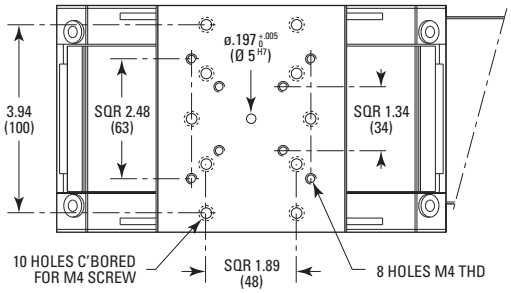
		BGS50	BGS80	BGM120	BGM160	BGM200
Cz, Normal centered load capacity (N)		20	60	200	300	500
a, Construction parameter (mm)		30	40	70	90	120
kα, Radial compliance (µrad/Nm)		100	20	10	5	2
My, Maximum torque (Nm)	PE:	–	–	10	20	29
	BPP:	0.5	1	6	16	17
	CC:	0.5	1	9	10	10
Q, Off-center load:		$Q \leq Cz \div (1 + D/a)$				
Where D = Cantilever distance in mm						

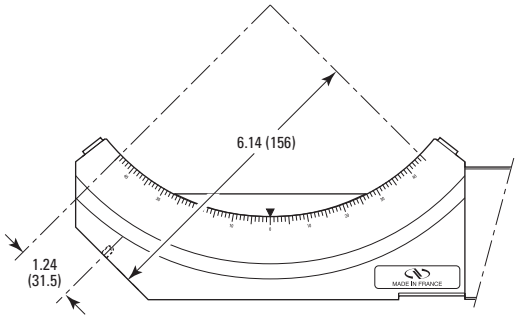
ASSEMBLY PATTERN

BGM120

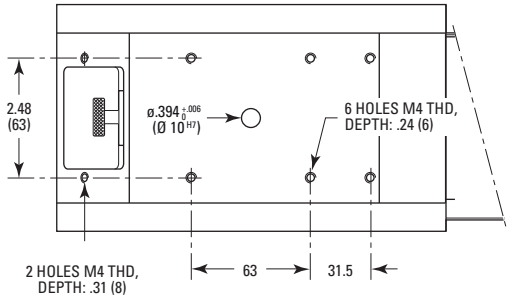
BGM120 CARRIAGE INTERFACE AFTER REMOVING THE TOP PLATE

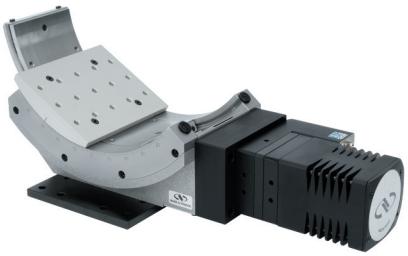
DIMENSIONS IN INCHES (AND MILLIMETERS)





BGM120 STAGE INTERFACES AFTER REMOVING THE BASE PLATE





Note: To access the interface holes of the carriage, simply move the bottom stage to its extreme position. Two c'bored holes will be accessible from one end of travel and the other two holes will be accessible from the other end of travel. For example, between the BGM160 and BGM200, use the M6 holes in a 6.14 x 3.62 (156 x 92 mm) pattern. BGS80 on BGM120, use M4 holes in a SQR 1.89 (48 mm) pattern.

Adjacent sizes of BG cradles can easily be stacked to provide orthogonal 2 axis rotation around a fixed point.

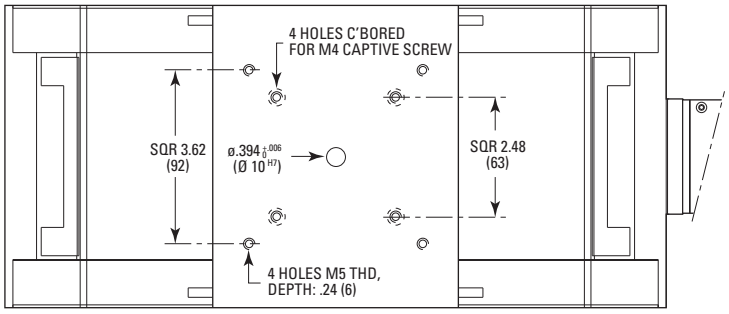
Stacking BG Series stages with other Newport stages is easy. Here are shown the assembly patterns used.

For BGM goniometric cradles, these interfaces are accessed by removing the upper and/or lower plates of the stages (see dimension drawings).

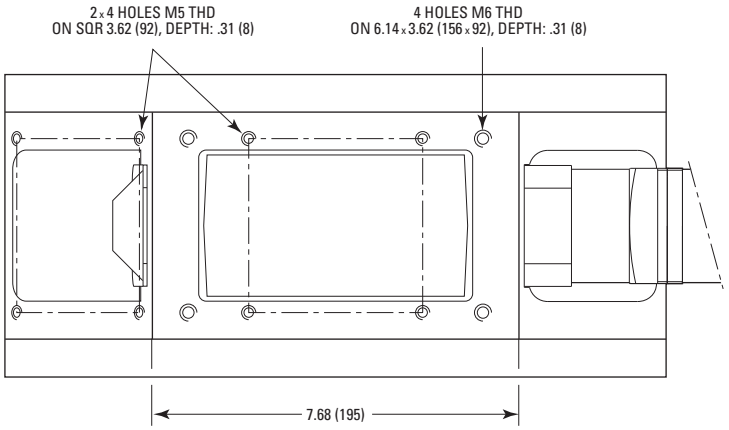
BGM160

BGM160 CARRIAGE INTERFACE AFTER REMOVING THE TOP PLATE

DIMENSIONS IN INCHES (AND MILLIMETERS)



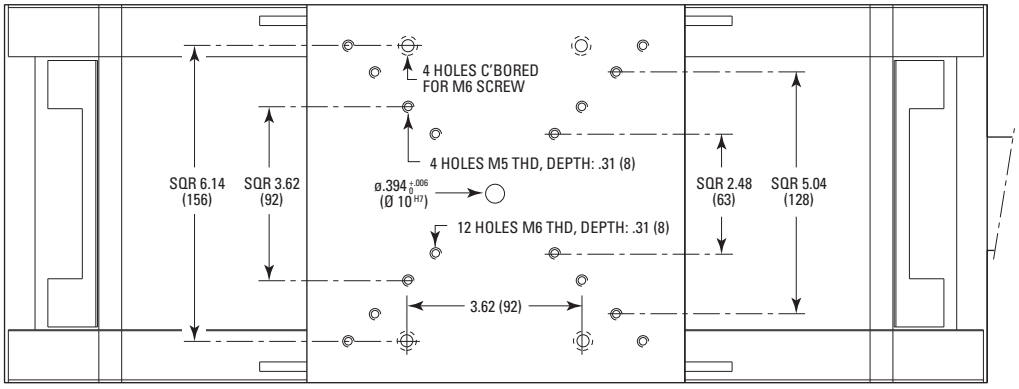
BGM160 STAGE INTERFACES AFTER REMOVING THE BASE PLATE



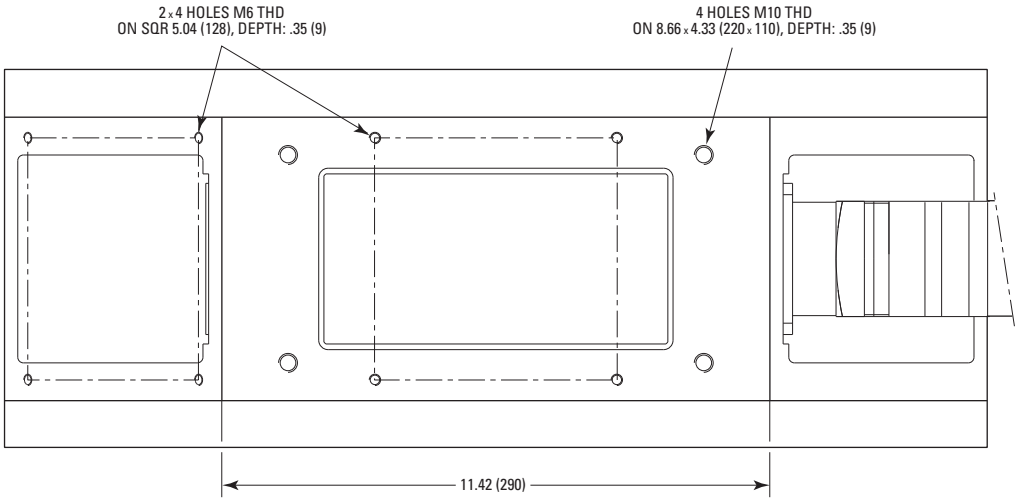
BGM200

BGM200 CARRIAGE INTERFACE AFTER REMOVING THE TOP PLATE

DIMENSIONS IN INCHES (AND MILLIMETERS)



BGM200 STAGE INTERFACES AFTER REMOVING THE BASE PLATE



RECOMMENDED CONTROLLERS/DRIVERS

Model	Description
XPS-D	1- to 8-axis universal high-performance motion controller/driver
XPS-DRV11	Universal digital driver card for stepper, DC and direct motors
XPS-RL	1- to 4-axis universal high-performance motion controller/driver
XPS-DRV01	PWM drive module for DC brush and stepper motors, 3 A/43 V max.
ESP301	1- to 3-axis motion controller/driver
SMC100CC	Single-axis DC motor controller/driver
SMC100PP	Single-axis stepper motor controller/driver

ORDERING INFORMATION

Model	Series	Travel (mm)	Drive	Vacuum Prep.[2]
M-	BGS	50[3]	CC	
		80		
	BGM	120	BPP	
		160	PE[1]	V6
		200		

Example:
*The **BGM80PE** is an BGM goniometric cradle with a full-step motor drive, English version.*

1) Only available as BGM Series stage.
2) Vacuum compatible to 10^{-6} hPa. In this case max. speed and load capacity are divided by two.
3) BGS50BCC is also available with integrated CONEX controller (CONEX-BGS50CC).

M-: For metric version
CC: DC motor
BPP: Micro-step motor
PE: Full-step motor

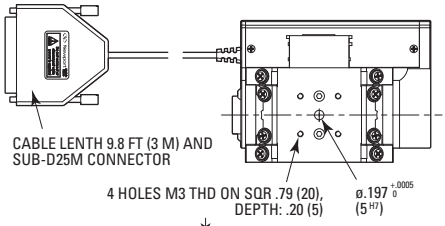
BGS50CC Stage with CONEX Controller

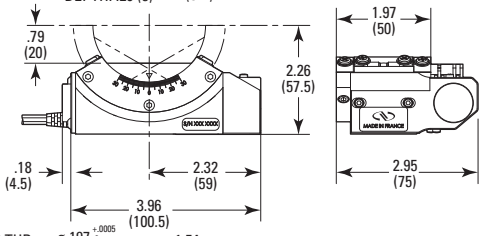
The CONEX-BGS50CC goniometric cradle has its rotation axis above the mounting platform for easy access and allow construction of very compact multi-axis rotation assemblies. It uses a miniature DC servo motor with a motor mounted rotary encoder, a reduction gear and a belt drive in order to fold the motor. The CONEX controller comes with a USB cable and a CONEX-PS-CB for daisy-chaining modules. Power supply to be ordered separately. For OEM applications, an optional retainer to secure the USB and power cables is available.

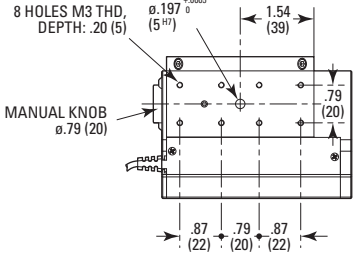
BGS80

DIMENSIONS

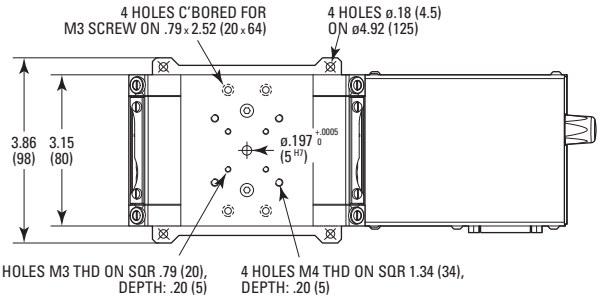
BGS50

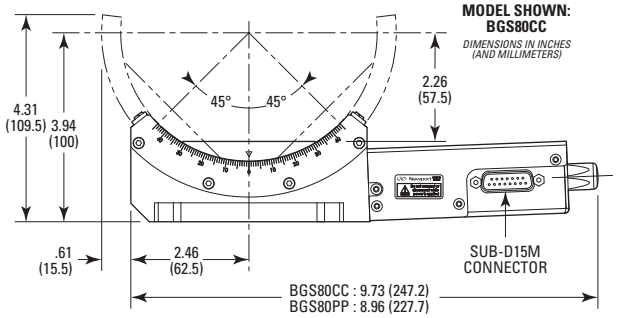




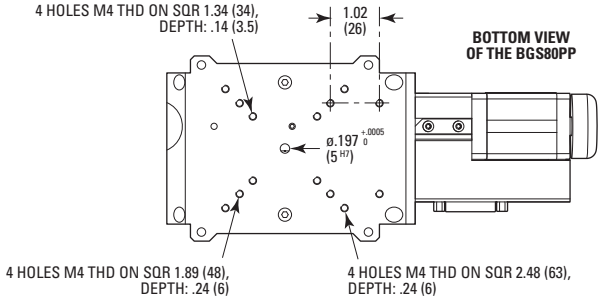


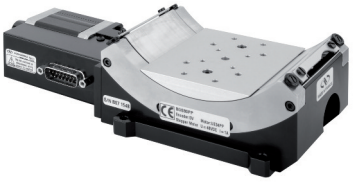
MODEL SHOWN: BGS50
DIMENSIONS IN INCHES (AND MILLIMETERS)



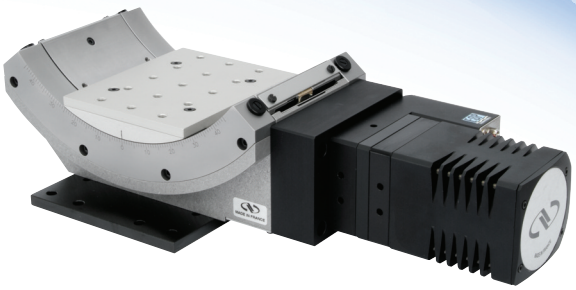


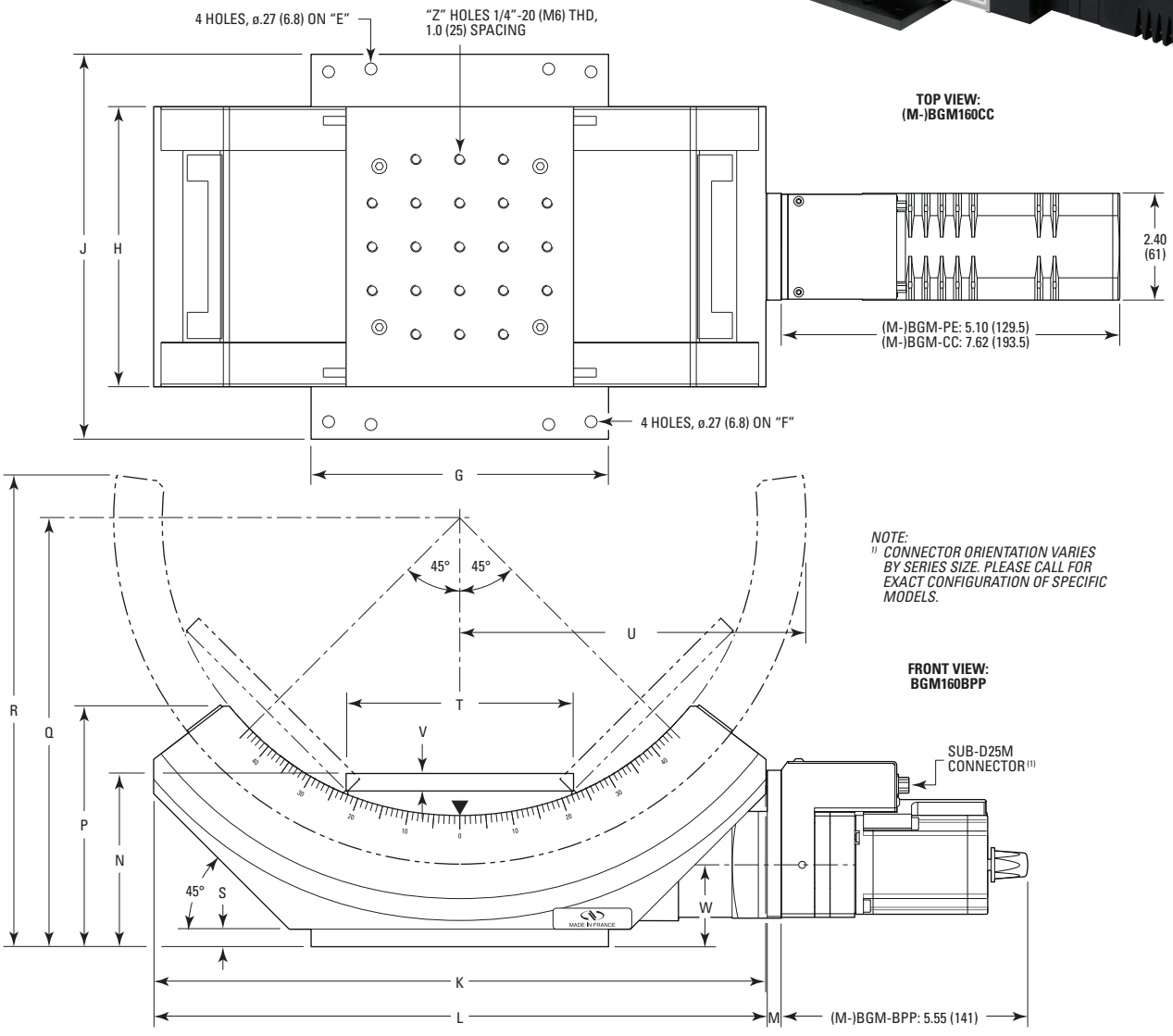
MODEL SHOWN: BGS80CC
DIMENSIONS IN INCHES (AND MILLIMETERS)





BGM120 to BGM200





NOTE:
1) CONNECTOR ORIENTATION VARIES BY SERIES SIZE. PLEASE CALL FOR EXACT CONFIGURATION OF SPECIFIC MODELS.

MODEL SHOWN: BGM160
DIMENSIONS IN INCHES (AND MILLIMETERS)

MODEL (METRIC)	E	F	G	H	J	K	L	M
(M-)BGM120	6.0 x 2.0 (152.4 x 50.8)	5.91 x 3.94 (150 x 100)	4.72 (120)	4.72 (120)	6.69 (170)	8.11 (206)	8.11 (206)	1.22 (31)
(M-)BGM160	8.0 x 4.0 (203.2 x 101.6)	7.87 x 5.91 (200 x 150)	6.69 (170)	6.30 (160)	8.66 (220)	13.78 (350)	13.81 (350.7)	.31 (8)
(M-)BGM200	10.0 x 8.0 (254 x 203.2)	9.84 x 9.84 (250 x 250)	10.63 (270)	7.87 (200)	10.63 (270)	20.47 (520)	18.11 (460)	.31 (8)

MODEL (METRIC)	N	P	Q	R	S	T	U	V	W	Z
(M-)BGM120	2.76 (70)	3.70 (94)	6.46 (164)	7.09 (180)	.31 (8)	3.90 (99)	5.04 (128)	.24 (6)	1.70 (43.2)	15
(M-)BGM160	3.90 (99)	5.44 (138.2)	9.65 (245)	10.63 (270)	.39 (10)	5.12 (130)	7.78 (197.5)	.39 (10)	1.84 (46.8)	21
(M-)BGM200	5.31 (135)	7.72 (196)	14.17 (360)	15.67 (398)	.39 (10)	7.87 (200)	11.81 (300)	.39 (10)	2.46 (62.5)	49

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