

**PBG51523 - February 24, 2020**

Item # PBG51523 was discontinued on February 24, 2020. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

**ALUMINUM BREADBOARDS: HIGH STIFFNESS, 25 MM (0.98") THICK**

- ▶ Aluminum Plates and Core Minimize Thermal Instabilities
- ▶ High Strength-to-Weight Ratio
- ▶ Non-Magnetic Material
- ▶ Breadboards with Rail-Compatible Sides Available



**PBG51523**  
 300 mm x 450 mm UltraLight™ Optical Breadboard



**PBG1212F**  
 12" x 12" UltraLight™ Optical Breadboard

T-Slot for 25 mm Rail Compatibility



See BB Selection Guide Tab

**OVERVIEW**

**Features**

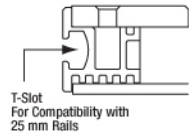
- Thickness: 25 mm (0.98")
- Sides with Smooth Finish or T-Slot for 25 mm Rail Compatibility
- Lighter than Equivalent Surface Area Solid Aluminum Surface Plates
- All-Aluminum Plates and Core for Matching CTE to Reduce Thermal Effects
- Large Range of Sizes (W x L):
  - Imperial: 1' x 1' to 3' x 4'
  - Metric: 300 mm x 300 mm to 900 mm x 1500 mm
- More Rigid than 0.5" Thick Solid Aluminum Breadboards (See *Construction* Tab for Details)
- Matte Black Painted Surface Reduces Reflectivity and Backscatter
- High-Density Honeycomb Core Provides Static and Dynamic Rigidity
- Custom Sizes Available; Contact Tech Support for Details

General Specifications <sup>a</sup>	
<b>Breadboard Thickness</b>	25 mm (0.98")
<b>Top Skin Flatness</b>	±0.15 mm (±0.006") Over Any 0.3 m <sup>2</sup>
<b>Construction</b>	Double-Plate, Single-Honeycomb Core, Athermalized Aluminum Design
<b>Top Plate</b>	6 mm Thick Aluminum
<b>Bottom Plate</b>	3 mm Thick Aluminum
<b>Core</b>	High-Density Plated Aluminum Honeycomb
<b>Finish</b>	Matte Black Paint
<b>Maximum Screw Depth</b>	6 mm (0.24") from Top Surface
<b>Breadboard Mounting</b>	1/4"-20 (M6) Taps on Bottom Plate

- For additional specifications that include specific breadboard dimensions and weights, see the tables below.

Thorlabs' UltraLight™ Honeycomb Breadboards offer a high strength-to-weight ratio and all-aluminum plates and core. Due to this construction, each breadboard has similar coefficients of

thermal expansion throughout, which minimizes thermal instabilities. These breadboards are ideal for optical setups where portability and dynamic rigidity are important. They are typically used as replacements for aluminum, steel, or granite surface plates, as well as for applications demanding a totally nonmagnetic surface. Additionally, breadboards ending in "F" or "A" feature a t-slot that is compatible with our 25 mm rails and accessories. This allows for construction of rail systems or optical enclosures without the loss of taps. These breadboards also have plastic covers on the corners; two have labels with either the item number or serial number.



T-Slot For Compatibility with 25 mm Rails

Click

for Details  
The T-Slot located on the sides is compatible with our 25 mm rails and accessories.



Click to Enlarge  
[APPLIST]  
[APPLIST]

An optical enclosure can be constructed and attached to the side of a 25 mm rail compatible breadboard for easy placement of the enclosure. Please note this application requires the use of drop-in T-Nuts and standard 8-32 cap screws for attaching the hinges to the breadboard.

### Choosing an Optical Breadboard

When choosing an aluminum optical breadboard, stiffness is a major consideration. For aluminum optical breadboards, Thorlabs offers two levels of stiffness: high and enhanced. Although most people associate deflection under load with thickness, it is actually the stiffness of a board that determines the deflection.



The higher the stiffness, the better the breadboard's ability to resist bending when a load or force is applied to it. Therefore, when a heavy load is placed in the center of a breadboard with high stiffness, the board will deflect more than it would if the same load were placed on an enhanced stiffness breadboard. This deflection can create misalignment between two components on opposite ends of the breadboard. This is especially important, for example, when conducting experiments that require sliding optical setups across the breadboard while maintaining a straight optical axis.

We also offer a broad selection of Nexus<sup>®</sup> Steel Honeycomb Breadboards, which provide greater stiffness and vibration damping. For a quick comparison of our different breadboard options, please see the *BB Selection Guide* tab.

### Frame and Isolation Options

We offer a number of support options for breadboards. Our standard breadboard frames are available with rigid supports, or with passive or self-leveling active vibration isolation. We also offer passive and electronic isolator feet for mounting a breadboard on top of a table.

## CONSTRUCTION

### Ultralight™ Honeycomb Aluminum Breadboard Construction

Thorlabs UltraLight™ optical breadboards offer high strength-to-weight ratio and excellent thermal stability. These breadboards are ideal for optical setups where portability and dynamic rigidity are important. Breadboards with item numbers that do not have a letter at the end feature standard aluminum side panels, while those with item numbers ending in F or A feature t-slots with compatibility with our 25 mm rails and their accessories.



Click to Enlarge  
Construction  
Features

As shown in the diagram to the right, these breadboards incorporate a double-plate, single-honeycomb design, providing excellent stiffness and dynamic rigidity (see test performed below). The top layer consists of a 6 mm aluminum top plate. The second layer adds the main aluminum honeycomb structure and the 3 mm aluminum bottom plate. The main honeycomb core is fabricated from strips of precision-formed plated aluminum, which is bonded together with a high tensile strength epoxy adhesive. This all-aluminum construction minimizes thermal bowing effects caused by temperature variations.

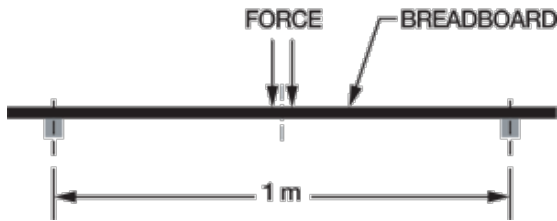
### Excellent Surface Flatness

Breadboard flatness is critically important during many experimental setups. Lack of local flatness requires readjustment of components for height variations across the breadboard and can cause component "wobble". Thorlabs breadboards offer an unsurpassed flatness of  $\pm 0.15$  mm ( $\pm 0.006$ " ) over any 0.3 m<sup>2</sup> area due to the high-precision aluminum plates which are specially handled to maintain superior flatness throughout the manufacturing process. A unique thermal bonding process ensures that stress is not induced during manufacture, thereby retaining the flatness of the top plate.

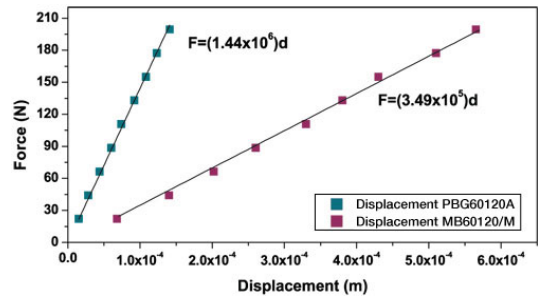
### Stiffness Comparison Testing: Honeycomb Aluminum Breadboards vs. Solid Aluminum Breadboards

**Purpose:** Show that an UltraLight PBG60120A breadboard measuring 600 mm x 1200 mm x 25 mm with an unpackaged mass of 20.3 kg has a greater stiffness than the equivalent size MB60120/M solid aluminum breadboard that is 0.5" thick and has an unpackaged mass of 23.49 kg.

**Procedure:** As shown in Figure 1 below, each table was supported by fulcrum points that were spaced 1 m apart. Then, various loads were applied uniformly across the center of the breadboard and the amount of deflection was measured. From the data collected, a plot of Force vs. Displacement was created as shown to the right.



**Figure 1:** Both breadboards were reinforced at two defined fulcrum points. A uniform force was then applied to the center of each board and deflection measured.









**Figure 2:** Plot Showing the Overall Displacement of the PBG60120A and MB60120/M After a Uniform Force was Applied to the Center of the Breadboard (See Diagram to the Left)

**Results:** The result shown in figure 2 shows that the PBG60120A honeycomb aluminum breadboard, which is 14% lighter than the MB60120/M solid aluminum breadboard, is 4.1 times stiffer. This can be found by dividing the two stiffness values,  $1.44 \times 10^6$  and  $3.49 \times 10^5$ .

**Conclusions:** As can be seen in Figure 2, it is clear that the PBG60120A UltraLight honeycomb aluminum breadboards, though lighter by 3.19 kg, have a greater stiffness than the MB60120/M 0.5" thick solid aluminum breadboards. Therefore, our UltraLight series of breadboards is an excellent choice if you are looking for a light-weight breadboard with extremely good rigidity.

## BB SELECTION GUIDE

Breadboards	 Nexus, Optimized Damping	 Intrinsically Damped	 Aluminum Honeycomb	 Stainless Steel	 Solid Aluminum	 Optically Clear Acrylic
<b>Construction</b>						
Breadboard Thickness	60 mm (2.4") 110 mm (4.3")	58 mm (2.28")	25 mm (0.98") 55 mm (2.2")	12.7 mm (0.5")	7.0 mm (0.28") 9.5 mm (0.375") 12.7 mm (0.5") 19.05 mm (0.75")	12.7 mm (0.5")
Working Surface	430 Grade Stainless Steel or 304L Grade Nonmagnetic Steel Top Plate	430 Grade Stainless Steel Top Plate	Aluminum	416 Grade Stainless Steel	Solid Aluminum Anodized or Unanodized	Acrylic
Top Skin	5 mm (0.20")	5 mm (0.20")	6 mm (0.24")	N/A	N/A	N/A
Bottom Skin	5 mm (0.20")	3 mm (0.12")	3 mm (0.12")	N/A	N/A	N/A
Core Design	High-Density Plated Steel Honeycomb, 0.26 mm Thick		High-Density Plated Aluminum Honeycomb	N/A	N/A	N/A
Side Panels	Rigid Steel Box Section	Unplasticized Polyvinyl Chloride (uPVC)	Black Laminated Aluminum Sides	N/A	N/A	N/A
Ferromagnetism	Magnetic or Non-Magnetic Options	Magnetic	Non-Magnetic	Magnetic	Non-Magnetic	
Sealed Holes	Sealed (25 mm Depth) or Non-Sealed Options	Non-Sealed		N/A	N/A	N/A
					1/4"-20 (M6), 4-40	

Thread Options	1/4"-20 (M6) Tapped Holes	1/4"-20 (M6) Tapped Holes		1/4"-20 (M6) Tapped Holes	(M3), or 8-32 (M3) and 1/4"-20 (M6) Tapped Holes	1/4"-20 Tapped Holes
Spacing	1" (25 mm) Centers	1" (25 mm) Centers		1" (25 mm) Centers	1" (25 mm) Centers or 0.5" (12.7 mm) Centers	0.5" (12.7 mm) Centers
Distance from Edge to First Holes	0.5" (12.5 mm) on all Sides		0.5" (12.5 mm) or 1.0" (25 mm) on all Sides	0.5" (12.5 mm) on all Sides	0.5" (12.5 mm) on all Sides	1.0" (25.4 mm) on all Sides
<b>Performance<sup>a</sup></b>						
Damping				N/A	N/A	N/A
Stiffness	 60 mm (2.4") Thick	 58 mm (2.28") Thick	 25 mm (0.98") Thick	 12.7 mm (0.5") Thick	 7.0 mm (0.28") Thick	 12.7 mm (0.5") Thick
	 110 mm (4.3") Thick		 55 mm (2.2") Thick		 19.05 mm (0.75") Thick	

- a. The damping and stiffness performance shown here is qualitative and does not relate to exact specifications of each breadboard.

### Optical Breadboard Selection Guides

The selection guides below list every size offered for our honeycomb, solid aluminum, and acrylic breadboards. Simply locate the specific width and length needed and then select the type of breadboard. Expand each table by clicking the *More [+]* button within the header.

Thorlabs also offers several unique breadboard solutions. For applications requiring temperature control, we offer anodized aluminum water cooled breadboards in several sizes, in addition to a temperature-controlled mini-series breadboard for small-scale operations. Our anodized aluminum large-area translation stages and rotating breadboards offer hand-operated positioning control, while our manual and motorized translating mounting platforms are ideal for use in microscopy applications.

Imperial Optical Breadboard Size Options											
Width	Length	Honeycomb					Stainless Steel	Solid Aluminum <sup>a</sup>			Acrylic, Transparent
		Nexus (60 mm Thick) <sup>b</sup>	Nexus (110 mm Thick) <sup>b</sup>	Intrinsically Damped (58 mm Thick)	Aluminum (25 mm Thick)	Aluminum (55 mm Thick)		Standard	Double Density	High Density	

- a. Solid aluminum breadboards are offered with four different thicknesses: 0.5" (item # prefix MB), 0.75" (item # prefix MBH), 3/8" (item # prefix MS), or 0.28" (item # prefix MS). Select sizes are also available in hard-coat anodized aluminum (item #s CMMP1818 and CMMP2424) or without an anodized coating (item #s ending with U).
- b. Item Number Suffix:
  - F, A, B, or G: Non-Sealed Mounting Holes
  - T, L, U, or N: Sealed Mounting Holes
  - FN or AN: Nonmagnetic Mounting Holes
  - Y or Z: No Mounting Holes
  - S: Stainless Steel
- c. Tapped Hole Pattern Aligned at 45°
- d. Build-to-Order
- e. Includes a T-Slot in Side Panels for Compatibility with 25 mm Rail Accessories
- f. This product has an access aperture.

Metric Optical Breadboard Size Options										
Width	Length	Honeycomb					Stainless Steel	Solid Aluminum <sup>a</sup>		
		Nexus (60 mm Thick) <sup>b</sup>	Nexus (110 mm Thick) <sup>b</sup>	Intrinsically Damped (58 mm Thick)	Aluminum (25 mm Thick)	Aluminum (55 mm Thick)		Standard	Double Density	High Density

- a. Solid aluminum breadboards are offered with four different thicknesses: 12.7 mm (item # prefix MB), 19.05 mm (item # prefix MBH), 9.5 mm (item # prefix MS), or 7.0 mm (item # prefix MS). Select sizes are also available without an anodized coating (item #s ending with U).
- b. Item Number Suffix:
  - F, A, B, or G: Non-Sealed Mounting Holes

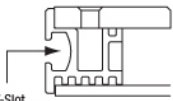
- T, L, U, or N: Sealed Mounting Holes
- FN or AN: Nonmagnetic Mounting Holes
- Y or Z: No Mounting Holes
- S: Stainless Steel
- c. Tapped Hole Pattern Aligned at 45°
- d. Build-to-Order
- e. Includes a T-Slot in Side Panels for Compatibility with 25 mm Rail Accessories
- f. This product has an access aperture.

## Imperial Breadboards, 25 mm Rail Compatible Sides, Stocked in USA

These breadboards feature sides with a t-slot that is compatible with our 25 mm rails and accessories. See the diagram to the bottom left for more information.

Item #	Size	Number of Taps	Unpackaged Mass	Unpackaged Weight	Packaged Shipping Mass <sup>a</sup>	Packaged Shipping Weight <sup>a</sup>	Distance From Edge to First Holes
PBG1212F	12" x 12"	144	2.9 kg	6.4 lbs	7.0 kg	15.4 lbs	0.5"
PBG1218F	12" x 18"	216	4.1 kg	9.0 lbs	9.0 kg	19.8 lbs	
PBG1224F	12" x 24"	288	5.5 kg	12.1 lbs	11.0 kg	24.3 lbs	
PBG1236F	12" x 36"	432	8.1 kg	17.9 lbs	17.0 kg	37.5 lbs	
PBG1818F	18" x 18"	324	6.0 kg	13.2 lbs	12.0 kg	26.5 lbs	
PBG1824F	18" x 24"	432	8.1 kg	17.9 lbs	15.0 kg	33.1 lbs	
PBG2424F	24" x 24"	576	10.7 kg	23.6 lbs	18.0 kg	39.7 lbs	
PBG2436F	24" x 36"	864	15.8 kg	34.8 lbs	28.0 kg	61.7 lbs	
PBG2448F	24" x 48"	1152	20.9 kg	46.1 lbs	36.0 kg	79.4 lbs	
PBG3036F	30" x 36"	1080	19.6 kg	43.2 lbs	34.0 kg	75.0 lbs	
PBG3048F	30" x 48"	1440	26.0 kg	57.3 lbs	45.0 kg	99.2 lbs	
PBG3648F	36" x 48"	1728	31.0 kg	68.3 lbs	52.0 kg	114.6 lbs	

- a. These masses and weights are approximate and are subject to change. The information is only to be used as a guideline.



T-Slot  
For Compatibility with  
25 mm Rails

Click

for Details  
The T-Slot located on the sides is compatible with our 25 mm rails and accessories.

Part Number	Description	Price	Availability
PBG1212F	UltraLight Breadboard, 12" x 12" x 0.98", 1/4"-20 Taps	\$458.81	Lead Time
PBG1218F	UltraLight Breadboard, 12" x 18" x 0.98", 1/4"-20 Taps	\$517.26	Today
PBG1224F	UltraLight Breadboard, 12" x 24" x 0.98", 1/4"-20 Taps	\$574.61	Today
PBG1236F	UltraLight Breadboard, 12" x 36" x 0.98", 1/4"-20 Taps	\$691.47	Today
PBG1818F	UltraLight Breadboard, 18" x 18" x 0.98", 1/4"-20 Taps	\$810.51	Lead Time
PBG1824F	UltraLight Breadboard, 18" x 24" x 0.98", 1/4"-20 Taps	\$692.55	Today
PBG2424F	UltraLight Breadboard, 24" x 24" x 0.98", 1/4"-20 Taps	\$810.51	Today
PBG2436F	UltraLight Breadboard, 24" x 36" x 0.98", 1/4"-20 Taps	\$1,043.16	Today
PBG2448F	UltraLight Breadboard, 24" x 48" x 0.98", 1/4"-20 Taps	\$1,284.47	Today
PBG3036F	UltraLight Breadboard, 30" x 36" x 0.98", 1/4"-20 Taps	\$1,217.39	Today
PBG3048F	UltraLight Breadboard, 30" x 48" x 0.98", 1/4"-20 Taps	\$1,516.05	Today
PBG3648F	UltraLight Breadboard, 36" x 48" x 0.98", 1/4"-20 Taps	\$1,748.70	Today

## Imperial Breadboards, Smooth Sides, Stocked in USA

Item #	Size	Number of Taps	Unpackaged Mass	Unpackaged Weight	Packaged Shipping Mass <sup>a</sup>	Packaged Shipping Weight <sup>a</sup>	Distance From Edge to First Holes
PBG11112	36" x 36"	1225	21.9 kg	48.3 lbs	38.9 kg	85.8 lbs	1.0"

- a. These masses and weights are approximate and are subject to change. The information is only to be used as a guideline.

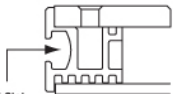
Part Number	Description	Price	Availability
PBG11112	UltraLight Breadboard, 36" x 36" x 0.98", 1/4"-20 Taps	\$1,129.82	Today

## Metric Breadboards, 25 mm Rail Compatible Sides, Stocked in UK

These breadboards feature sides with a t-slot that is compatible with our 25 mm rails and accessories. See the diagram to the bottom left for more information.

Item #	Size	Number of Taps	Unpackaged Mass	Unpackaged Weight	Packaged Shipping Mass <sup>a</sup>	Packaged Shipping Weight <sup>a</sup>	Distance From Edge to First Holes
PBG3030A	300 mm x 300 mm	144	2.8 kg	6.2 lbs	6.0 kg	13.2 lbs	12.5 mm
PBG3045A	300 mm x 450 mm	216	4.1 kg	9.0 lbs	9.0 kg	19.8 lbs	
PBG3060A	300 mm x 600 mm	288	5.4 kg	11.9 lbs	11.0 kg	24.3 lbs	
PBG3090A	300 mm x 900 mm	432	8.0 kg	17.6 lbs	16.0 kg	35.3 lbs	
PBG4545A	450 mm x 450 mm	324	6.0 kg	13.2 lbs	11.0 kg	24.3 lbs	
PBG4560A	450 mm x 600 mm	432	7.9 kg	17.4 lbs	14.0 kg	30.9 lbs	
PBG6060A	600 mm x 600 mm	576	10.2 kg	22.5 lbs	18.0 kg	39.7 lbs	
PBG6090A	600 mm x 900 mm	864	15.3 kg	33.7 lbs	27.0 kg	59.5 lbs	
PBG60120A	600 mm x 1200 mm	1152	20.3 kg	44.8 lbs	35.0 kg	77.2 lbs	
PBG7590A	750 mm x 900 mm	1080	19.0 kg	41.9 lbs	33.0 kg	72.8 lbs	
PBG75120A	750 mm x 1200 mm	1440	25.2 kg	55.6 lbs	44.0 kg	97.0 lbs	
PBG90120A	900 mm x 1200 mm	1728	30.1 kg	66.4 lbs	50.0 kg	110.2 lbs	

- a. These masses and weights are approximate and are subject to change. The information is only to be used as a guideline.



T-Slot  
For Compatibility with  
25 mm Rails

Click

for Details

The T-Slot located on the sides is compatible with our 25 mm rails and accessories.

Part Number	Description	Price	Availability
PBG3030A	UltraLight Breadboard, 300 mm x 300 mm x 25 mm, M6 Taps	\$458.81	Lead Time
PBG3045A	UltraLight Breadboard, 300 mm x 450 mm x 25 mm, M6 Taps	\$517.26	Lead Time
PBG3060A	UltraLight Breadboard, 300 mm x 600 mm x 25 mm, M6 Taps	\$574.61	Lead Time
PBG3090A	UltraLight Breadboard, 300 mm x 900 mm x 25 mm, M6 Taps	\$691.47	Lead Time
PBG4545A	UltraLight Breadboard, 450 mm x 450 mm x 25 mm, M6 Taps	\$604.91	Today
PBG4560A	UltraLight Breadboard, 450 mm x 600 mm x 25 mm, M6 Taps	\$692.55	Lead Time

PBG6060A	UltraLight Breadboard, 600 mm x 600 mm x 25 mm, M6 Taps	\$810.51	Lead Time
PBG6090A	UltraLight Breadboard, 600 mm x 900 mm x 25 mm, M6 Taps	\$1,043.16	Lead Time
PBG60120A	UltraLight Breadboard, 600 mm x 1200 mm x 25 mm, M6 Taps	\$1,284.47	Today
PBG7590A	UltraLight Breadboard, 750 mm x 900 mm x 25 mm, M6 Taps	\$1,217.39	Lead Time
PBG75120A	UltraLight Breadboard, 750 mm x 1200 mm x 25 mm, M6 Taps	\$1,516.05	Today
PBG90120A	UltraLight Breadboard, 900 mm x 1200 mm x 25 mm, M6 Taps	\$1,748.70	Lead Time

### Metric Breadboards, Smooth Sides, Stocked in UK

Item #	Size	Number of Taps	Unpackaged Mass	Unpackaged Weight	Packaged Shipping Mass <sup>a</sup>	Packaged Shipping Weight <sup>a</sup>	Distance From Edge to First Holes
PBG51501	300 mm x 300 mm	121	2.5 kg	5.5 lbs	7.0 kg	15.4 lbs	25 mm
PBG51523	300 mm x 450 mm	187	3.7 kg	8.2 lbs	9.0 kg	19.9 lbs	
PBG51524	450 mm x 450 mm	289	5.5 kg	12.1 lbs	12.0 kg	26.5 lbs	
PBG51514	900 mm x 1500 mm	2065	35.2 kg	77.6 lbs	56.9 kg	125.4 lbs	

- a. These masses and weights are approximate and are subject to change. The information is only to be used as a guideline.

Part Number	Description	Price	Availability
PBG51501	UltraLight Breadboard, 300 x 300 x 25 mm, M6 Taps	\$371.65	Lead Time
PBG51523	UltraLight Breadboard, 300 x 450 x 25 mm, M6 Taps	\$451.97	Lead Time
PBG51524	UltraLight Breadboard, 450 x 450 x 25 mm, M6 Taps	\$528.56	Lead Time
PBG51514	UltraLight Breadboard, 900 x 1500 x 25 mm, M6 Taps	\$1,882.56	Lead Time