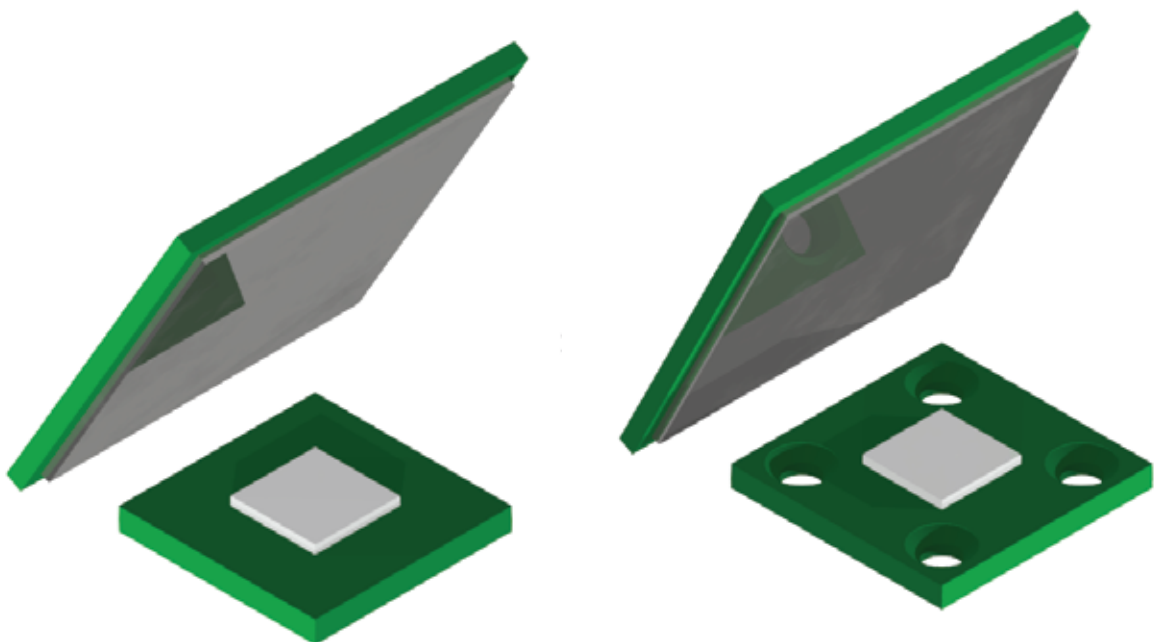




## SLIDE BEARINGS



# SLIDE BEARINGS

## GENERAL INFORMATION

Slide bearings are used in a wide range of applications, petrochemical plant, heavy machinery, pipelines, buildings and bridge girders; they accommodate expansion, contraction and other reciprocating motions of any structure that moves as a result of thermal, seismic or differential forces. The use of low friction materials means that supporting structures can be designed more economically, and where used with pipework, pipe stresses and equipment loadings resulting from high frictional loadings are reduced.

Carpenter and Paterson (Asia) Limited produce standard slide plates using PTFE with stainless steel and also graphite with stainless steel. The standard designs are suitable for loadings up to 1000kN and are compatible with CPAs range of pipe bases and clamp bases. Slide plates for attachment by welding and also using countersunk head bolts are provided. In addition to the standard designs, we offer a design service for slide plates to cover any situation where sliding needs to occur.

## MATERIALS

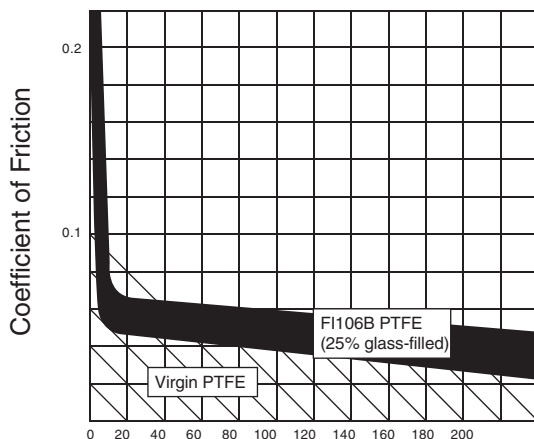
- Virgin PTFE sliding on stainless steel. This configuration gives the lowest possible coefficient of friction for unlubricated materials. PTFE is suitable for use at temperatures up to 200°C.
- 25% glass-filled PTFE on stainless steel. The use of glass-filled PTFE allows higher bearing pressure, so that more compact designs can be used. The coefficient of friction is slightly higher than with virgin PTFE.
- Graphite sliding on stainless steel. Graphite is normally used where the sliding surface is at high temperature. It can be used at up to 500°C.

## FRICTION

For PTFE on stainless steel, coefficient of friction reduces with increasing bearing pressure. The graph in Figure 1 gives an indication of how the applied loading affects the coefficient of friction.

For graphite on stainless steel, coefficient of friction will be approximately 0.15.

Figure 1 COEFFICIENT OF FRICTION:  
EFFECT OF LOADING



Bearing Pressure (kg/cm²)  
Do not exceed maximum loading

## ADVANTAGES OF CPA SLIDE BEARINGS

- The simplicity of the bearing design and its ease of fabrication and installation make the unit cost efficient.
- The costs of a construction can be reduced by designing for expansion rather than strain.
- Coefficient of friction over the bearing surface remains constant, even under worst case conditions.
- The bearings are maintenance free – both PTFE and graphite are inherently self-lubricating, while PTFE will absorb small dirt or grit particles. Only simple protection is required against the significant ingress of dirt.

## DESIGN / SELECTION

Carpenter & Paterson (Asia) Limited offers a specialist service, based on many years' experience of the design and application of slide bearings. Low friction slide plates with a coefficient of friction less than 0.1 are available. They are designed specifically for the loads and movements required. The standard slide plate assemblies SLB01 to SLB10 (pages 4-6) are designed to operate efficiently at the loadings shown.

## STANDARD BEARING ASSEMBLIES

- SLB01 to SLB04 (page 4) use 3mm thick PTFE bonded to an 8mm thick backing plate. Bonded PTFE bearings are the least expensive type of slide bearing. They can be used up to a maximum temperature at the sliding face of 130°C.
- SLB05 to SLB08 (page 5) use 5mm thick PTFE bonded to a recessed backing plate. The recessed design allows use up to 200°C at the sliding face and increased bearing pressure. The thicker PTFE allows greater absorption of dirt/grit into the PTFE.
- SLB09 and SLB10 (page 6) use 5mm thick graphite contained in a recessed backing plate. These items can be used at temperatures up to 400°C at the sliding face and up to 500°C if an alloy steel or stainless steel backing plate is specified.
- For all slide bearing assemblies, it is essential that the correct movement range is selected to ensure that the PTFE or graphite is in full contact with the stainless steel sliding plate. It is possible to choose a smaller movement range if the direction of movement is known and the upper plate is offset relative to the lower plate when installed.

## NON-STANDARD OPTIONS

- Alternative PTFE grades.
- Alternative backing plate material e.g. stainless steel.
- Other shapes.
- Higher loading.
- Greater movements.
- Different backing plate thickness.
- Different bolting configurations.

## SLIDING FACE TEMPERATURE AND THERMAL INSULATION

It is important to note that the maximum service temperature relates to the sliding face. As a rule of thumb, under normal conditions the temperature falls by 200°C for every 100mm from the heat source (in ambient air) - for example, a typical horizontal vessel operating at 500°C will have a bottom-of-saddle temperature of about 150°C.

Where PTFE is used and the temperature of the bearing face is likely to exceed 200°C by conduction through the bearing components, a thermal barrier can be interposed between the heat source and the sliding unit. Carpenter & Paterson (Asia) Limited recommend the use of Monolux 500. Thermal barriers are not usually needed on conventional high-pressure pipe-work supports.

## BONDING OF PTFE

Chemical bonding is the recommended method for locating the bearing material on its support. All bonded PTFE elements are not adversely affected by exposure to ultraviolet light, providing the minimum thickness requirement of 1.5mm is met. Site bonding of PTFE is not recommended - strictly controlled conditions of cleanliness, pressure and temperature are required to obtain a satisfactory bond between the PTFE and the substrate.

## INSTALLATION

The bearing components can be located to the installation by bolting, tack-welding, full welding or mortar embedment, and the appropriate type of bearing should be chosen according to the installation method. The PTFE should be adequately protected against weld spatter, paint spray, metal swarf etc., during installation.

## VIBRATION/ACOUSTIC DAMPING PADS

Slide bearing units can be built with a variety of elastomer composite interlayers or backings to suit customers design parameters when acoustic or vibration damping is necessary. Elastomers may be used when simple angular or rotational movements are required.

## DESIGN STEPS

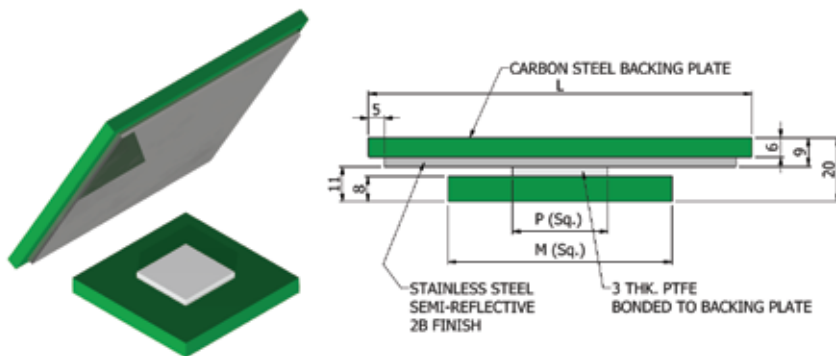
The following steps will provide an indication of the slide bearing requirements for a particular application:

1. Determine the load of the structure - this will indicate the total bearing area required at a suitable bearing pressure.
2. Decide the number and positions of the bearings according to the rigidity and function of the structure.
3. Take account of operating temperature limits, and specify any necessary thermal insulation.
4. Consider any unusual conditions affecting the bearings, such as the need for additional thermal insulation, damping pads, etc.
5. Decide the most appropriate method of mounting the bearings.
6. Select the types of bearings required and specify their dimensions.

## TECHNICAL ADVANTAGES OF PTFE SLIDE BEARINGS

- PTFE has the lowest coefficient of friction of any known solid engineering material, including lubricated metal.
- There is no stick-slip action.
- They have indefinite life, since chemicals and weather have no effect on PTFE - moisture absorption is less than 0.01% even under icing conditions or immersion, and the material is chemically inert.
- No maintenance is required, PTFE will never cold weld to itself and therefore requires no lubrication.
- The bearings are easily installed, either pre-assembled or on site.
- PTFE bearings are far less bulky than alternative assemblies.
- There is no possibility of fatigue failure.
- Electrical and thermal insulation minimise galvanic corrosion and heat loss.
- Vibrations are damped.
- Small particles which may become embedded do not cause binding of the surfaces.
- The slide bearing can accommodate some misalignment in construction without setting up stress corrosion along a leading edge, as can occur in conventional bearings.

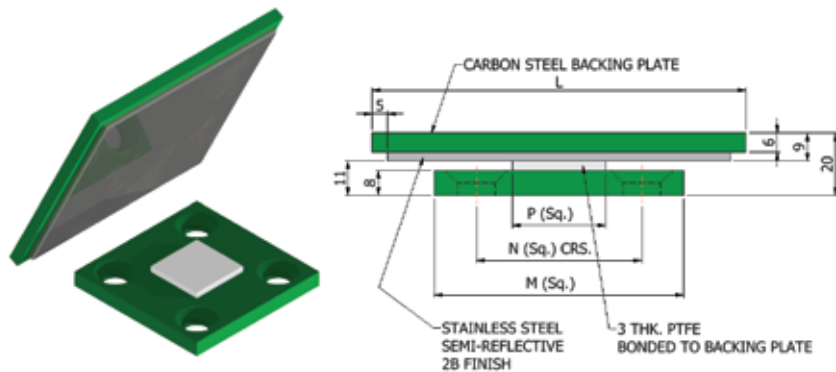
## SLB 01 & 02 - BONDED VIRGIN/GLASS-FILLED PTFE SLIDE BEARING - FOR WELDING



Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB02-4(AxC)

| SLB #             | SIZE    | Recommended Loading kg |                |         |          | M (Sq.) mm | P (Sq.) mm | L (mm) MOVEMENT RANGE |           |           |
|-------------------|---------|------------------------|----------------|---------|----------|------------|------------|-----------------------|-----------|-----------|
|                   |         | Minimum Load           | -20°C to +25°C | at 80°C | at 130°C |            |            | A (±13mm)             | B (±25mm) | C (±40mm) |
| VIRGIN PTFE       | SLB01-1 | 30                     | 250            | 170     | 120      | 70         | 20         | 60                    | 90        | 120       |
|                   | SLB01-2 | 120                    | 990            | 670     | 500      | 90         | 40         | 80                    | 110       | 140       |
|                   | SLB01-3 | 300                    | 2250           | 1500    | 1100     | 110        | 60         | 100                   | 130       | 160       |
|                   | SLB01-4 | 500                    | 3950           | 2700    | 2000     | 130        | 80         | 120                   | 150       | 180       |
|                   | SLB01-5 | 800                    | 6200           | 4200    | 3100     | 150        | 100        | 140                   | 170       | 200       |
|                   | SLB01-6 | 1300                   | 10500          | 7050    | 5250     | 180        | 130        | 170                   | 200       | 230       |
|                   | SLB01-7 | 2500                   | 20100          | 13550   | 10100    | 230        | 180        | 220                   | 250       | 280       |
|                   | SLB01-8 | 4000                   | 32800          | 22100   | 16450    | 280        | 230        | 270                   | 300       | 330       |
| GLASS FILLED PTFE | SLB02-1 | 50                     | 520            | 370     | 260      | 70         | 20         | 60                    | 90        | 120       |
|                   | SLB02-2 | 200                    | 2100           | 1500    | 1050     | 90         | 40         | 80                    | 110       | 140       |
|                   | SLB02-3 | 400                    | 4700           | 3350    | 2350     | 110        | 60         | 100                   | 130       | 160       |
|                   | SLB02-4 | 750                    | 8300           | 5950    | 4200     | 130        | 80         | 120                   | 150       | 180       |
|                   | SLB02-5 | 1250                   | 13000          | 9300    | 6550     | 150        | 100        | 140                   | 170       | 200       |
|                   | SLB02-6 | 2000                   | 21950          | 15700   | 11100    | 180        | 130        | 170                   | 200       | 230       |
|                   | SLB02-7 | 3500                   | 42100          | 30150   | 21250    | 230        | 180        | 220                   | 250       | 280       |
|                   | SLB02-8 | 6000                   | 68750          | 49200   | 34700    | 280        | 230        | 270                   | 300       | 330       |

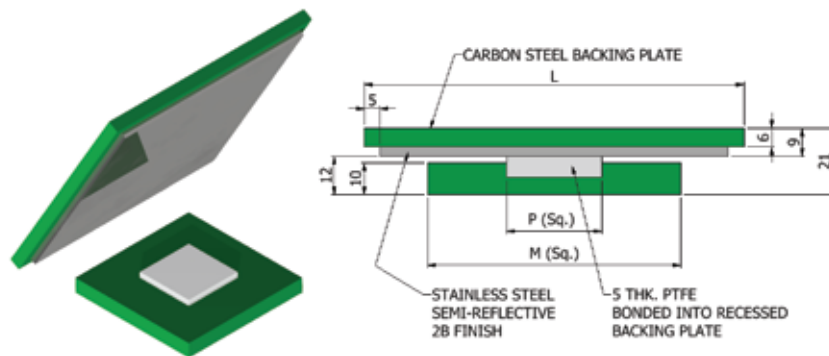
## SLB 03 & 04 - BONDED VIRGIN/GLASS-FILLED PTFE SLIDE BEARING - FOR BOLTING



Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB04-4(AxC)

| SLB #             | SIZE    | Recommended Loading kg |                |         |          | M (Sq.) mm | P (Sq.) mm | N (Sq.) mm | CSK Bolt Size | L (mm) MOVEMENT RANGE |           |           |
|-------------------|---------|------------------------|----------------|---------|----------|------------|------------|------------|---------------|-----------------------|-----------|-----------|
|                   |         | Minimum Load           | -20°C to +25°C | at 80°C | at 130°C |            |            |            |               | A (±13mm)             | B (±25mm) | C (±40mm) |
| VIRGIN PTFE       | SLB03-1 | 30                     | 250            | 170     | 120      | 80         | 20         | 46         | M10           | 60                    | 90        | 120       |
|                   | SLB03-2 | 120                    | 990            | 670     | 500      | 100        | 40         | 66         | M10           | 80                    | 110       | 140       |
|                   | SLB03-3 | 300                    | 2250           | 1500    | 1100     | 120        | 60         | 86         | M10           | 100                   | 130       | 160       |
|                   | SLB03-4 | 500                    | 3950           | 2700    | 2000     | 140        | 80         | 106        | M10           | 120                   | 150       | 180       |
|                   | SLB03-5 | 800                    | 6200           | 4200    | 3100     | 160        | 100        | 126        | M10           | 140                   | 170       | 200       |
|                   | SLB03-6 | 1300                   | 10500          | 7050    | 5250     | 190        | 130        | 156        | M10           | 170                   | 200       | 230       |
|                   | SLB03-7 | 2500                   | 20100          | 13550   | 10100    | 250        | 180        | 210        | M12           | 220                   | 250       | 280       |
|                   | SLB03-8 | 4000                   | 32800          | 22100   | 16450    | 300        | 230        | 260        | M12           | 270                   | 300       | 330       |
| GLASS FILLED PTFE | SLB04-1 | 50                     | 520            | 370     | 260      | 80         | 20         | 46         | M10           | 60                    | 90        | 120       |
|                   | SLB04-2 | 200                    | 2100           | 1500    | 1050     | 100        | 40         | 66         | M10           | 80                    | 110       | 140       |
|                   | SLB04-3 | 400                    | 4700           | 3350    | 2350     | 120        | 60         | 86         | M10           | 100                   | 130       | 160       |
|                   | SLB04-4 | 750                    | 8300           | 5950    | 4200     | 140        | 80         | 106        | M10           | 120                   | 150       | 180       |
|                   | SLB04-5 | 1250                   | 13000          | 9300    | 6550     | 160        | 100        | 126        | M10           | 140                   | 170       | 200       |
|                   | SLB04-6 | 2000                   | 21950          | 15700   | 11100    | 190        | 130        | 156        | M10           | 170                   | 200       | 230       |
|                   | SLB04-7 | 3500                   | 42100          | 30150   | 21250    | 250        | 180        | 210        | M12           | 220                   | 250       | 280       |
|                   | SLB04-8 | 6000                   | 68750          | 49200   | 34700    | 300        | 230        | 260        | M12           | 270                   | 300       | 330       |

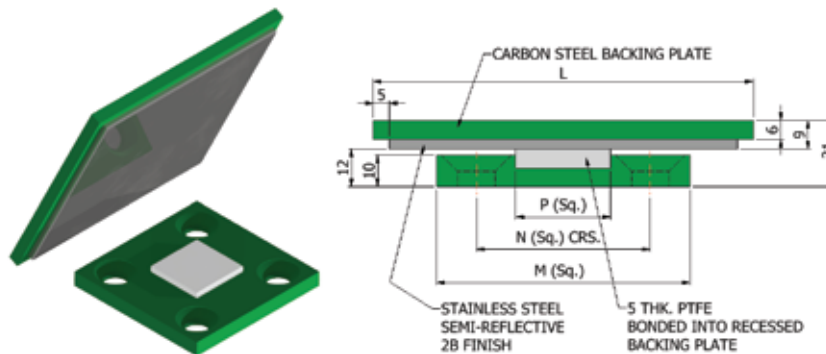
## SLB 05 & 06 - RECESSED VIRGIN/GLASS-FILLED PTFE SLIDE BEARING - FOR WELDING



Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB06-4(AxC)

| SLB #             | SIZE    | Recommended Loading kg |                |         |          |          |          | M (Sq.) mm | P (Sq.) mm | L (mm) MOVEMENT RANGE |           |           |
|-------------------|---------|------------------------|----------------|---------|----------|----------|----------|------------|------------|-----------------------|-----------|-----------|
|                   |         | Minimum Load           | -20°C to +25°C | at 80°C | at 130°C | at 170°C | at 200°C |            |            | A (±13mm)             | B (±25mm) | C (±40mm) |
| VIRGIN PTFE       | SLB05-1 | 30                     | 450            | 300     | 220      | 180      | 160      | 70         | 20         | 60                    | 90        | 120       |
|                   | SLB05-2 | 120                    | 1800           | 1200    | 900      | 710      | 630      | 90         | 40         | 80                    | 110       | 140       |
|                   | SLB05-3 | 300                    | 4000           | 2700    | 2000     | 1600     | 1450     | 110        | 60         | 100                   | 130       | 160       |
|                   | SLB05-4 | 500                    | 7150           | 4800    | 3600     | 2850     | 2550     | 130        | 80         | 120                   | 150       | 180       |
|                   | SLB05-5 | 800                    | 11150          | 7500    | 5600     | 4450     | 3950     | 150        | 100        | 140                   | 170       | 200       |
|                   | SLB05-6 | 1300                   | 18850          | 12700   | 9450     | 7500     | 6700     | 180        | 130        | 170                   | 200       | 230       |
|                   | SLB05-7 | 2500                   | 36150          | 24350   | 18150    | 14400    | 12850    | 230        | 180        | 220                   | 250       | 280       |
|                   | SLB05-8 | 4000                   | 59050          | 39800   | 29600    | 23550    | 20950    | 280        | 230        | 270                   | 300       | 330       |
| GLASS FILLED PTFE | SLB06-1 | 50                     | 780            | 560     | 390      | 300      | 230      | 70         | 20         | 60                    | 90        | 120       |
|                   | SLB06-2 | 200                    | 3100           | 2250    | 1550     | 1200     | 940      | 90         | 40         | 80                    | 110       | 140       |
|                   | SLB06-3 | 400                    | 7000           | 5000    | 3550     | 2700     | 2100     | 110        | 60         | 100                   | 130       | 160       |
|                   | SLB06-4 | 750                    | 12500          | 8950    | 6300     | 4750     | 3750     | 130        | 80         | 120                   | 150       | 180       |
|                   | SLB06-5 | 1250                   | 19500          | 13950   | 9850     | 7450     | 5850     | 150        | 100        | 140                   | 170       | 200       |
|                   | SLB06-6 | 2000                   | 32950          | 23600   | 16650    | 12550    | 9900     | 180        | 130        | 170                   | 200       | 230       |
|                   | SLB06-7 | 3500                   | 63200          | 45200   | 31900    | 24100    | 18950    | 230        | 180        | 220                   | 250       | 280       |
|                   | SLB06-8 | 6000                   | 103150         | 73800   | 52050    | 39350    | 30950    | 280        | 230        | 270                   | 300       | 330       |

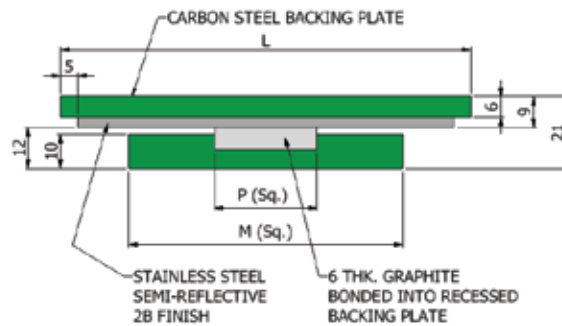
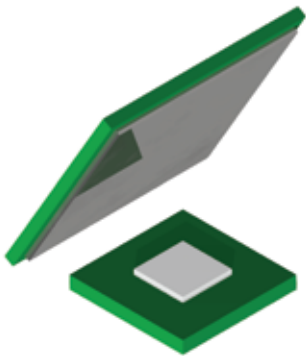
## SLB 07 & 08 - RECESSED VIRGIN/GLASS-FILLED PTFE SLIDE BEARING - FOR BOLTING



Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB08-4(AxC)

| SLB #             | SIZE    | Recommended Loading kg |                |         |          |          |          | M (Sq.) mm | P (Sq.) mm | N (Sq.) mm | CSK Bolt Size | L (mm) MOVEMENT RANGE |           |           |
|-------------------|---------|------------------------|----------------|---------|----------|----------|----------|------------|------------|------------|---------------|-----------------------|-----------|-----------|
|                   |         | Minimum Load           | -20°C to +25°C | at 80°C | at 130°C | at 170°C | at 200°C |            |            |            |               | A (±13mm)             | B (±25mm) | C (±40mm) |
| VIRGIN PTFE       | SLB07-1 | 30                     | 450            | 300     | 220      | 180      | 160      | 80         | 20         | 46         | M10           | 60                    | 90        | 120       |
|                   | SLB07-2 | 120                    | 1800           | 1200    | 900      | 710      | 630      | 100        | 40         | 66         | M10           | 80                    | 110       | 140       |
|                   | SLB07-3 | 300                    | 4000           | 2700    | 2000     | 1600     | 1450     | 120        | 60         | 86         | M10           | 100                   | 130       | 160       |
|                   | SLB07-4 | 500                    | 7150           | 4800    | 3600     | 2850     | 2550     | 140        | 80         | 106        | M10           | 120                   | 150       | 180       |
|                   | SLB07-5 | 800                    | 11150          | 7500    | 5600     | 4450     | 3950     | 160        | 100        | 126        | M10           | 140                   | 170       | 200       |
|                   | SLB07-6 | 1300                   | 18850          | 12700   | 9450     | 7500     | 6700     | 190        | 130        | 156        | M10           | 170                   | 200       | 230       |
|                   | SLB07-7 | 2500                   | 36150          | 24350   | 18150    | 14400    | 12850    | 250        | 180        | 210        | M12           | 220                   | 250       | 280       |
|                   | SLB07-8 | 4000                   | 59050          | 39800   | 29600    | 23550    | 20950    | 300        | 230        | 260        | M12           | 270                   | 300       | 330       |
| GLASS FILLED PTFE | SLB08-1 | 50                     | 780            | 560     | 390      | 300      | 230      | 80         | 20         | 46         | M10           | 60                    | 90        | 120       |
|                   | SLB08-2 | 200                    | 3100           | 2250    | 1550     | 1200     | 940      | 100        | 40         | 66         | M10           | 80                    | 110       | 140       |
|                   | SLB08-3 | 400                    | 7000           | 5000    | 3550     | 2700     | 2100     | 120        | 60         | 86         | M10           | 100                   | 130       | 160       |
|                   | SLB08-4 | 750                    | 12500          | 8950    | 6300     | 4750     | 3750     | 140        | 80         | 106        | M10           | 120                   | 150       | 180       |
|                   | SLB08-5 | 1250                   | 19500          | 13950   | 9850     | 7450     | 5850     | 160        | 100        | 126        | M10           | 140                   | 170       | 200       |
|                   | SLB08-6 | 2000                   | 32950          | 23600   | 16650    | 12550    | 9900     | 190        | 130        | 156        | M10           | 170                   | 200       | 230       |
|                   | SLB08-7 | 3500                   | 63200          | 45200   | 31900    | 24100    | 18950    | 250        | 180        | 210        | M12           | 220                   | 250       | 280       |
|                   | SLB08-8 | 6000                   | 103150         | 73800   | 52050    | 39350    | 30950    | 300        | 230        | 260        | M12           | 270                   | 300       | 330       |

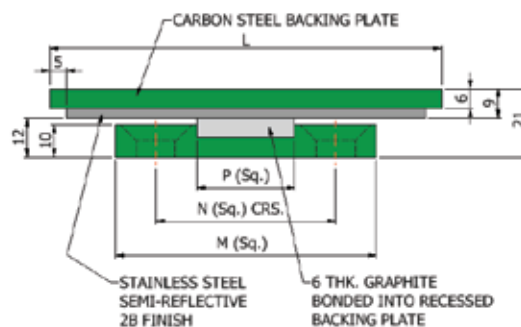
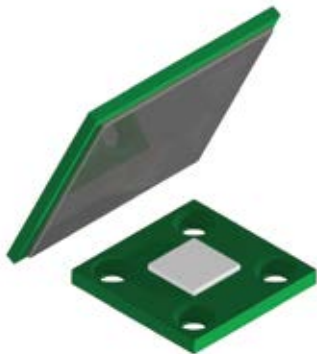
## SLB 09 - RECESSED GRAPHITE SLIDE BEARING - FOR WELDING



| SIZE    | Recommended Max. Loading kg at 400°C* | M (Sq.) mm | P (Sq.) mm | L (mm) MOVEMENT RANGE |           |           |
|---------|---------------------------------------|------------|------------|-----------------------|-----------|-----------|
|         |                                       |            |            | A (±13mm)             | B (±25mm) | C (±40mm) |
| SLB09-1 | 500                                   | 70         | 20         | 60                    | 90        | 120       |
| SLB09-2 | 2200                                  | 90         | 40         | 80                    | 110       | 140       |
| SLB09-3 | 5000                                  | 110        | 60         | 100                   | 130       | 160       |
| SLB09-4 | 9000                                  | 130        | 80         | 120                   | 150       | 180       |
| SLB09-5 | 14000                                 | 150        | 100        | 140                   | 170       | 200       |
| SLB09-6 | 23500                                 | 180        | 130        | 170                   | 200       | 230       |
| SLB09-7 | 45500                                 | 230        | 180        | 220                   | 250       | 280       |
| SLB09-8 | 74000                                 | 280        | 230        | 270                   | 300       | 330       |

Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB09-4(AxC)  
\*500°C when using alloy or stainless steel backing plate.

## SLB 10 - RECESSED GRAPHITE SLIDE BEARING - FOR BOLTING



| SIZE    | Recommended Max. Loading kg at 400°C* | M (Sq.) mm | P (Sq.) mm | N (Sq.) mm | CSK Bolt Size | L (mm) MOVEMENT RANGE |           |           |
|---------|---------------------------------------|------------|------------|------------|---------------|-----------------------|-----------|-----------|
|         |                                       |            |            |            |               | A (±13mm)             | B (±25mm) | C (±40mm) |
| SLB10-1 | 500                                   | 80         | 20         | 46         | M10           | 60                    | 90        | 120       |
| SLB10-2 | 2200                                  | 100        | 40         | 66         | M10           | 80                    | 110       | 140       |
| SLB10-3 | 5000                                  | 120        | 60         | 86         | M10           | 100                   | 130       | 160       |
| SLB10-4 | 9000                                  | 140        | 80         | 106        | M10           | 120                   | 150       | 180       |
| SLB10-5 | 14000                                 | 160        | 100        | 126        | M10           | 140                   | 170       | 200       |
| SLB10-6 | 23500                                 | 190        | 130        | 156        | M10           | 170                   | 200       | 230       |
| SLB10-7 | 45500                                 | 250        | 180        | 210        | M12           | 220                   | 250       | 280       |
| SLB10-8 | 74000                                 | 300        | 230        | 260        | M12           | 270                   | 300       | 330       |

Top plate (Dimension L) can be square or rectangular depending on movements in co-ordinate directions.  
Ordering Example: SLB10-4(AxC)  
\*500°C when using alloy or stainless steel backing plate.





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