HepcoMotion®
GV3
Linear Guidance and Transmission System
Introducing the HepcoMotion® GV3 linear guidance and transmission system

The GV3 linear guidance and transmission system has been designed to provide the customer with an unrivalled choice of sizes and options to cater for virtually every linear motion requirement.

In devising GV3, HepcoMotion has retained the best features of their highly successful Generation 2 and CM Slide systems in a greatly expanded range. Many new components have been added including single edge slides, flat tracks and drive options.

Customers may now choose slides from three grades of precision and combine them with either twin bearings, double row bearings or low cost slimline bearings. This enables the ideal system to be specified for optimum performance within the budget available.

The reliability of the all steel slideway and V bearing concept has been proved conclusively over nearly fifty years. Improvements are continually being made to this fundamentally sound design resulting in a truly evolutionary system for the 21st century.

By choosing GV3, customers can be assured of a quality and performance which surpasses all expectations.

GV3 Benefits

SMOOTH: ● High accuracy and fine finish of components allows constant driving force without vibration.
         ● Friction free motion allows smaller, lower cost motors to be selected.

FAST: ● Optimized bearing and slide interface design enables very high speeds with low wear.
       ● Low stick friction and low inertia of bearing rotation allows fast acceleration for shortest stroke.

ACCURATE: ● High degree of slide parallelism and minimum bearing clearance results in virtually zero play.
          ● Important dimensions accurately controlled for reliable system height and positional accuracy.

QUIET: ● Specially designed bearing and slide geometry results in one of the quietest slide systems available.

DURABLE: ● All steel slideway three times stiffer than composite aluminum slide systems.
         ● Rugged construction suits high duty applications and harsh environments.
         ● Lubrication devices available maximizes life with no relubrication necessary in most instances.
         ● Unique wiping action expels debris in environments where other systems fail.
         ● Compliant bearing design for tolerance of misalignment.
         ● Reliable performance confirmed by testing specify GV3 with confidence.

SIMPLE: ● Easily understood proven technology little to go wrong and simple to maintain.

VERSATILE: ● Huge range of sizes, types and ancillary components provides solution to most design problems.
           ● Long lengths available up to 4 m in most sizes saves on assembly time.
           ● Available as assembled unit or in component form provides maximum flexibility of design.
           ● Works in any plane and orientation unrestricted use in machine construction.
           ● Operates without lubrication ideal for food machinery and clean applications.
           ● Driven systems available complete solutions from a single source saves design and administration time.

ECONOMIC: ● Choice of slide precision and bearing design to match cost/performance requirements.
          ● Designed for minimum installation time significantly reduces cost.
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System Composition

Linear Motion System with Standard Bearing Program

Pages 2-7 provide an overview of the comprehensive GV3 linear motion system. Below is shown the basic range of slides and components available with standard twin and double row bearings. A similar range is available with slimline bearings, details of which are shown on the following page. Components are available factory assembled where possible or as individual parts.

ALL SLIDES (COMMON FEATURES) 20-25
- One piece construction for assured parallelism and rigidity.
- Manufactured from high quality bearing steel.
- Deep hardened V faces for maximum wear resistance.
- Soft center section allows customizing.
- Wide range of sizes to choose from.
- 3 grades of precision to suit cost/performance requirements.
- Any length supplied up to 4 meters, unground grade to 6 meters.
- Unlimited length achieved by butting.
- Attractive, corrosion inhibiting black finish on unground faces.
- Common 70° V allows many bearing/slide combinations.

LUBRICATORS 34
- Lubricates contact surfaces increasing load capacity and life.
- Can be attached from either side of a carriage.
- Lightly sprung felt wiper ensures low friction.
- Long lubrication interval.

CAP SEAL 32
- Lubricates contact surfaces increasing load capacity and life.
- "Lubricated for life" in most applications.
- Seals against ingress of debris.
- Improves operational safety.
- Enhances appearance of system.
- Incorporates both through hole and tapped hole fixing facility.

SINGLE EDGE FLAT SLIDE/DOUBLE EDGE FLAT SLIDE 24-25
- Lower weight for less inertia where slide is the moving component.
- Lower cost in cases where spacer is part of customer's construction.
- Plain hole, or counterbored fixing option for flush top surface.
- A number of widths for each basic section gives 11 sections to choose from.
- Can be spaced apart for high moment load capacity.

PINIONS 41
- Bored type and integral shaft type available.
- Hardened teeth for long life.
- Keyway provided in bored type pinion.
- Shaft type pinion compatible with rack driven carriage.
- Shaft type pinion compatible with motor gearboxes.

SINGLE EDGE SPACER SLIDE 22-23
- Mounts directly to a flat surface. No spacer required.
- Can be spaced apart for high moment load capacity.
- Keyway and datum edges provide means of location and alignment.
- Counterbored hole fixing, tapped hole fixing or undrilled options available.
- Plastic hole plugs provided to avoid debris traps.
- Rack cut option provides means of driving.
- Back face provides mounting register, or running surface for track roller.
- 5 sections to choose from.

DOUBLE EDGE SPACER SLIDE 20-21
- Mounts directly to a flat surface. No spacer required.
- Keyway and datum edges provide means of location and alignment.
- Counterbored hole fixing, tapped hole fixing or undrilled options available.
- Plastic hole plugs provided to avoid debris traps.
- A number of widths for each basic section gives 11 sections to choose from.
if preferred. Many sizes and types of components can be interchanged to achieve an unrivalled combination of space and performance possibilities.

The GV3 philosophy is to provide a solution to every linear motion problem

ALL BEARINGS (COMMON FEATURES & OPTIONS) 28-31
- Special raceway conformity and low radial clearance, for slide applications.
- Twin bearing for tolerance of misalignment and smooth running.
- Double row bearing for tolerance of debris and higher load capacity.
- Range of 5 useful sizes to choose from.
- Metal shields for exclusion of particulates and low friction running.
- Nitrile sealed version prevents ingress of liquids.

CONCENTRIC BEARING 28-29
- Provides datum reference for the system.
- Short fixing stud for thin carriage plate.
- Long fixing stud for thick carriage plate.
- Controlled height option improves system height accuracy.

ECCENTRIC BEARING 28-29
- Provides simple means of adjustment via center hexagon or socket each end.
- Short fixing stud for thin carriage plate.
- Long fixing stud for thick carriage plate.
- Controlled height option improves system height accuracy.

CARRIAGE/CARRIAGE PLATE 14-15
- Factory adjusted to chosen slide, or supplied as a kit of parts.
- Available with bearings only, or with the addition of cap seals or lubricators.
- Useful size platform with flush surface for mounting purposes.
- Tapped holes in convenient positions for attachment purposes.
- Groove along sides to provide register for switch brackets etc.
- Carriages available for all 11 slide sections in all grades.
- 3 lengths available in each size and most types.
- Tamper proof option.
- Removable option for direct disengagement from slide.
- Controlled height option for special accuracy requirements.

DOWEL PINS 21&23
- Easy method of location and alignment.

DOWEL PINS 21&23
- Easy method of location and alignment.

DOUBLE ECCENTRIC BEARING 28-29
- Eccentric throw sufficient for direct removal of carriage from slide.
- All attributes of the standard eccentric version apply.

BLIND HOLE CONCENTRIC BEARING
- For mounting into thick plates or where access to opposite side restricted.
- Adjustable from operating side for ease of access.

TWIN BEARING/DUOUBLE ROW BEARING 28-29
- Twin bearing for tolerance of misalignment and smooth running.
- Double row bearing for tolerance of debris and higher load capacity.
- Special raceway conformity and low radial clearance, for slide applications.
- General quality to ISO Class 4. Aspects to Class 2.
- Factory has the following accreditation: - ISO 9001 Aerospace Sector Certification TS 157
System Composition

Linear Motion System with Slimline Bearing Program

Pages 2-7 provide an overview of the comprehensive GV3 linear motion system. Below is shown the basic range of slides and components available with slimline bearings. An identical range of slides is available with standard bearings, details of which are shown on the previous page. Components are available factory assembled where possible or as individual parts if preferred.

ALL SLIDES (COMMON FEATURES)  ▼20-25
- All slides suitable for both slimline and standard bearings. Please see previous page for specific features.
- One piece construction for assured parallelism and rigidity.
- Manufactured from high quality bearing steel.
- Deep hardened V faces for maximum wear resistance.
- Soft center section allows customizing.
- Wide range of sizes to choose from.
- 3 grades of precision to suit cost/performance requirements.
- Any length supplied up to 4 meters, unground grade to 6 meters.
- Unlimited length achieved by butting.
- Attractive, corrosion inhibiting black finish on unground faces.
- Common 70° “V” allows many bearing/slide combinations.

DOUBLE EDGE FLAT SLIDE  ▼24
- Please see previous page for features.

DOUBLE EDGE SPACER SLIDE  ▼20-21
- Please see previous page for features.

SINGLE EDGE SPACER SLIDE  ▼22-23
- Please see previous page for features.

SINGLE EDGE FLAT SLIDE  ▼25
- Please see previous page for features.

BEARING ATTRIBUTES  ▼26-27
- Special raceway conformity and low radial clearance, for slide applications.
- General quality to ISO Class 4. Aspects to Class 2.
- Made in the factory which has the following accreditation: - ISO 9001
  Aerospace Sector Certification TS 157.

PINIONS  ▼41
- Bored type and integral shaft type available.
- Hardened teeth for long life.
- Keyway provided in bored type pinion.
- Shaft type pinion compatible with rack driven carriage.
- Shaft type pinion compatible with motor gearboxes.

LUBRICATOR  ▼34
- Lubricates contact surfaces increasing load capacity and life.
- Lightly sprung felt wiper ensures low friction.
- Can be attached from either side of the carriage/mounting surface.
- Long lubrication interval.

CAP WIPER  ▼33
- Lubricates contact surfaces increasing load capacity and life.
- “Lubricated for life” in most applications.
- Seals against ingress of debris.
- Improves operational safety.
- Enhances appearance of system.
- Incorporates both through hole and tapped hole fixing facility.

BLIND HOLE ECCENTRIC BEARING  ▼30-31
- For mounting into thick plates or where access to opposite side is restricted.
- Adjustable from operating side for ease of access.
Many sizes and types of components can be interchanged to achieve an unrivalled combination of space and performance possibilities.

*The GV3 philosophy is to provide a solution to every linear motion problem.*

**SLIMLINE BEARINGS (COMMON FEATURES & OPTIONS) 30-31**
- Special raceway conformity and low radial clearance, for slide applications.
- Narrow profile for compact system height.
- Low cost system, especially if combined with P3 grade (unground) slides.
- Load capacity adequate for many applications.
- Single piece bearing for tolerance of debris.
- Range of 4 useful sizes to choose from.
- Metal shields for exclusion of particulates and low friction running.
- Nitrile sealed version prevents ingress of liquids.

**DOWEL PINS 21&23**
- Easy method of location and alignment.

**ECCENTRIC BEARING 30-31**
- Provides simple means of adjustment via center hexagon.
- Short fixing stud for thin carriage plate.
- Long fixing stud for thick carriage plate.

**BLIND HOLE CONCENTRIC BEARING 30-31**
- For mounting into thick plates or where access to opposite side is restricted.

**CONCENTRIC BEARING 30-31**
- Provides datum reference for the system.
- Short fixing stud for thin carriage plate.
- Long fixing stud for thick carriage plate.

**FLANGE CLAMP 35**
- Enables slide to become a self supporting beam.
- Two mounting possibilities, face fixing or base fixing.
- Easy removal of slide and positive relocation.
- Available in long or short type, to support a slide at one or both ends.

**CARRIAGE/CARRIAGE PLATE 18-19**
- Factory adjusted to chosen slide, or supplied as a kit of parts.
- Available with bearings only, or with the addition of cap wipers or lubricators.
- Useful size platform with flush surface for mounting components.
- Tapped holes in convenient positions for attachment purposes.
- Groove along sides to provide register for switch brackets, etc.
- Carriages available for most slide sections in all grades.
- 3 lengths available in each size and most types.
- Tamper proof option.
System Composition

Linear Motion System Incorporating Flat Tracks & Rollers

Pages 2-7 provide an overview of the comprehensive GV3 linear motion program. Below is shown the extensive range of flat tracks and track rollers compatible with linear motion systems.

The GV3 philosophy is to provide a solution to every linear motion problem.

**FLAT TRACK** 36
- Choose from ground all over, ground on 2 opposing faces, or unground.
- Attractive, corrosion inhibiting black finish on unground faces.
- Deep hardened faces for maximum wear resistance.
- Manufactured from high quality carbon steel.
- Offset fixing holes for versatility of mounting.
- 4 useful sizes compatible with V slides.
- Any length supplied up to 4 meters in most sizes.
- Unlimited length achieved by butting.

**SLIMLINE ROLLER (CONCENTRIC)**
- Provides datum reference for the system.

**WIDE ROLLER (CONCENTRIC)**

**SLIMLINE ROLLER (ECCENTRIC)**
- Provides simple means of adjustment.

**WIDE ROLLER (ECCENTRIC)**

**TRACK ROLLERS (COMMON FEATURES)** 37-39
- Size and load capacity equivalent to V bearing.
- Special raceway conformity with low radial clearance.
- Range of 4 useful sizes to choose from.
- Crowned running face for tolerance of misalignment.
- Metal shields for exclusion of particulates and low friction running.
- Nitrile sealed version prevents ingress of liquids.
- Designed to run on track or back face of single edge spacer slides.
- General quality to ISO Class 4. Aspects to Class 2.
- Made in the factory which has the following accreditation: ISO 9001 - Aerospace Sector Certification TS 157.

**BLIND HOLE, WIDE, CONCENTRIC ROLLER**
- For mounting into thick plates or where access to opposite side restricted.
- Adjustable from operating side for ease of access.
- Provides datum reference for the system.

**BLIND HOLE, WIDE, ECCENTRIC ROLLER**

**FLAT TRACK**
- Choose from ground all over, ground on 2 opposing faces, or unground.
- Attractive, corrosion inhibiting black finish on unground faces.
- Deep hardened faces for maximum wear resistance.
- Manufactured from high quality carbon steel.
- Offset fixing holes for versatility of mounting.
- 4 useful sizes compatible with V slides.
- Any length supplied up to 4 meters in most sizes.
- Unlimited length achieved by butting.
Linear Motion System with Drive Facility / Support Structure

Pages 2-7 provide an overview of the comprehensive GV3 linear motion program. Below is shown the range of GV3 products available with enhanced features to provide a complete engineering package.

The GV3 philosophy is to provide a solution to every linear motion problem.

BELT DRIVEN CARRIAGE 42-43
- Use with flat slides, spacer slides or slide beams in all grades of precision.
- Choice of 5 sizes each available in two useful lengths.
- Integral belt tensioners for ease of adjustment.
- Removable mounting platform for ease of customizing.
- Tapped holes for convenience of attaching components.
- Available with most standard bearing variants and lubrication devices.

TIMING PULLEYS 42-43
- Low backlash profile for high positional accuracy.
- Width to suit belt driven carriages.
- Diameter enables belt return through slide beam.

SLIDE BEAMS 26-27
- Can be used as machine construction member.
- Strong section, spans wide gaps.
- Available up to 8 meters in one piece.
- Choice of 2 beam sections and 5 slide widths.
- Slides available in 3 grades of precision.
- Lightweight version available.
- Counterbored slide version for belt support.
- Hollow center for belt, cable or chain return.
- T slots for attaching components.
- Plastic T slot covers, T nuts and fixing clamps available.

TIMING BELT 42-43
- High strength, steel reinforced AT profile open length belt.
- Cut to length, up to 50 m.
- Widths to suit belt driven carriages & pulleys.

RACK DRIVEN CARRIAGE UNIT 44-45
- Carriage includes drive pinion & AC geared motor or gearbox.
- Carriages available to suit 7 rack-slide sizes.
- Size, shape, and drive position tailored to your requirements.
- Carriages available with all standard bearing types and lubrication devices.
- Fine adjustment facility for pinion assures low backlash.
- Gearbox, flange, pinions & motor are available separately for use in your own design, or with rack cut single edge slides or separate racks.

RACK-SLIDE ASSEMBLY 22-23
- Dowelled rack-slide assembly is ready to fix to your mounting surface.
- Available in 10 useful sizes and 3 grades of precision for slide.
- Slides with compound racks available up to 4 meters, unground slide grade to 6 meters.
- Unlimited rack-slide length achieved by butting.
- Attractive, corrosion inhibiting black finish on unground slide faces and on rack.

SEPARATE RACK 36
- As used in rack-slide assembly.
- 4 sizes available.
- Lengths up to 1.83 m, longer lengths achievable by butting.

PINIONS 40
- Please see previous page for features.
Application Examples

Fixing Slides to Tubular Framework
Single edge flat slides have been designed to attach to the edges of many sizes of square or rectangular tube with sufficient protrusion of the slide V running face to provide clearance for bearings and lubrication devices. The fixing hole positions have been regulated to clear the external corner radius of the tube and to allow attachment by means of standard sizes of hexagon bar. Alternatively, slides can be attached by "flowdrilling" or by welding.

Low Height System
A very compact slide system can be achieved by using flat slides in conjunction with slimline bearings and by choosing thin section material for the carriage and slide support.

Removable Carriage
This example shows how a carriage incorporating double eccentric type bearings can be taken off a slide in any position without running the carriage off the end. This facility saves having to dismantle part of the machine in cases where the ends of the slide are "blocked".

Tamper Proof Carriage
Carriages can be supplied "tamper-proof" by pinning the bearing studs once they have been factory adjusted to the slide. After pinning, the counterbores are filled with resin.
Ease of Alignment Using all Eccentric Bearings
Example shows the possibility to adjust the HepcoMotion GV3 slide system in one plane, thus avoiding the necessity for precision drilling and fitting.

Light Applications
Where very light loads are anticipated, three bearings may be used instead of the usual configuration of four. This saves on component cost and assembly time.

Heavy Load Requirements
For increased load capacity, additional eccentric bearings may be installed in between the outermost ones. Multiple bearing installations benefit from the use of controlled height bearings which ensure better load distribution. Cap seals will also maximize load capacity (see load/life section). Please consult Bishop-Wisecarver Corporation's Heavy Duty Slide System catalog where very high loads are anticipated.

Wide Platform
Rigidity is achieved at the extremities of a wide platform by mounting slides in parallel; this provides maximum support for a wide but short platform. Single edge slides (see pages 22-23) should be considered for a wide but long platform. Alternatively, flat track with track rollers (see pages 36-39) in conjunction with an opposing double edge slide, will obviate the need to set slides parallel.
Application Examples

Simple Two Axis Connection
Short series flange clamps (1) are an ideal method of connecting opposing carriages and creating a second axis which can be easily installed or removed. Care should be taken to ensure parallelism between slides. Using flat track and track rollers in place of one of the slides will overcome necessity to set parallel (see page 13).

Remote Controlled Camera
Slides are used extensively in theater and filming for positioning cameras or lighting. This example shows a slide beam (1) with flush slide surface for engagement with a friction drive roller. The slide beam which is attached to the ceiling members, provides a rigid foundation and absorbs vibration.

Cantilevered Linear Guide
Short stroke sliding movements may be supported from one end only, using long series flange clamps (1). Flange clamps may be bolted to either side of the supporting framework and are available with either through holes or tapped holes.

Telescopic Pick and Place Gantry
The beam retracts out of the paths of adjacent production lines, enabling components to be moved from one line to another without interrupting flow.

Primary X axis: Double edge spacer slides (1) are mounted back to back, sandwiching the support plate for the racks (2) providing a compact design and a rigid beam.

Secondary X axis: The gripper mechanism is driven end-to-end along the beam by motor and pinion engaged in the secondary rack.

Z axis: A 120 mm wide spacer slide with rack (3) is chosen for the vertical axis to withstand the high moment forces involved.
High Speed Marking Machine

**X axis:** The double edge spacer slide with rack (1), assures parallelism between teeth and "V" faces of the slide, providing smooth motion with low backlash. Slides are attached to proprietary frame building systems using a T section location strip (2).

**Y axis:** Single edge spacer slides are mounted wide apart for increased stiffness. The lower rack cut slide (3) enables direct drive via pinion.

Double row bearings for high radial loads and cap seals (4) to provide lubrication for long life, are used in this high speed application.

Compact Rack Driven X-Z Movement

**X axis:** Outward facing single edge spacer slides (1) are mounted sufficiently far apart to provide the required rigidity and to accommodate the drive pinion. A compact design is achieved by mounting the bearings on a common plate which also supports the slides for the Z axis.

**Z axis:** Inward facing single edge spacer slides allow the motor and drive pinion to be accommodated adjacent to the gripper housing. Blind hole fixing bearings (2) are used as through hole fixing is not possible.

Lubricators (3) are used throughout, for friction free application of oil to minimize risk of stalling the stepper motors.

Telescopic Loader

Flat slides (1) combined with slimline bearings (2) produce a low profile slide system enabling a compact telescopic system to be designed. Racks (3) are easily incorporated to provide an efficient means of driving via pinions of suitable ratio.
Multi Station Product Picking and Collating System

**X axis:** Single edge flat slides (1) bolt direct to machine frame to achieve a simple low cost design. Bearings are fixed to the carriage structure which spans the collation conveyor and provides room for the drive. Lubrication is not permitted, therefore three bearings are fitted each side to compensate for reduced load associated with dry running.

**Y axis:** Guidance for the product picking device is provided by a double edge spacer slide with fitted rack (2) to enable drive via pinion. The slide runs in a "railway" of controlled height, twin type bearings (3) which ensure alignment and compliance as the slide engages. All eccentric bearings are used except the two innermost on one side, which are concentric to provide the datum.

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Cereal Bar Collator

**X Axis:** Spacer slides attach to most makes of frame building system by means of T section location strip (1). Belt driven carriages (2) incorporate an easy means of tensioning as well as providing support for the Y axis.

**Y axis:** Comprises a HepcoMotion® DLS unit (3) which is a complete linear motion element with pulleys, switch components and motor-gearbox, if required. Please send for the DLS catalog.

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Multi Axis Robotic Arm

A number of axes can be built up in a compact manner by using single edge spacer slides (1) spaced apart to accommodate platforms sufficiently large to support the adjacent axis. The rotary turn-table is also easy to construct by using components selected from the Ring Slide and Track System catalog.

The vertical axis supporting the robotic arm is fixed to the rotary table by a long series flange clamp (2).
Flat Track and Track Roller Applications
The examples below, demonstrate the many and versatile ways flat track and track rollers can be used in a linear system. They are especially useful as the opposing element in a system where two guides are mounted apart. This overcomes the necessity to set parallel in both planes, as would be required for two opposing V slides.
# Standard Carriages

Standard carriages are available to suit all sizes and types of double edge slide in all grades of precision. Each carriage comes complete with 4 standard bearings and is available in 3 useful lengths to cater for customers' component size and offset load requirements. The carriage plates are fully machined from aluminum alloy and are supplied anodized. Tapped holes are provided in convenient positions to enable components to be attached.

Carriages may be specified as **Assembled Units (AU type)** which are factory assembled and set to the slide. Alternatively, the carriage may be specified as a **Kit of components (K type)** for customers wishing to carry out their own assembly.

The following types or options of bearing and lubrication device may be specified (refer also to availability table below right).

The twin bearing type which is the default choice, comprises two individual bearings on a common stud. This offers some compliance, with smoother running, easy adjustment and greater tolerance of misalignment.

**The Double Row bearing type (DR)** incorporates a one piece bearing with two ball tracks. This offers higher load capacity, especially in the radial direction and is less susceptible to entrapment of debris.

## See Application Examples on page 10

**Example: Short Carriage with Lubricators on a Flat Slide**

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<th>For Use With Slides</th>
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<th>B</th>
<th>C</th>
<th>D*6</th>
<th>E</th>
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<td>50</td>
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<td>80</td>
<td>100</td>
<td>160</td>
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<td>70</td>
<td>100</td>
</tr>
<tr>
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<td>M, 44 &amp; NM 44 34</td>
<td>44</td>
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<td>14.5</td>
<td>88</td>
<td>103</td>
<td>153</td>
<td>96</td>
<td>50</td>
<td>80</td>
<td>103</td>
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<tr>
<td>AU 60 34...</td>
<td>M, 60 &amp; NM 60 34</td>
<td>60</td>
<td>135</td>
<td>17</td>
<td>110</td>
<td>125</td>
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<tr>
<td>AU 76 34...</td>
<td>M, 76 &amp; NM 76 34</td>
<td>76</td>
<td>150</td>
<td>18</td>
<td>130</td>
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<td>265</td>
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<td>160</td>
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<tr>
<td>AU 76 54...</td>
<td>L, 76 &amp; NL 76 54</td>
<td>76</td>
<td>185</td>
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<td>140</td>
<td>198</td>
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<tr>
<td>AU 120 54...</td>
<td>L, 120 &amp; NL 120 54</td>
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<td>378</td>
<td>210</td>
<td>120</td>
<td>165</td>
<td>225</td>
</tr>
</tbody>
</table>

*Notes:
1. Maximum loads quoted assume lubrication at the interface of bearings and slide. This can best be achieved by using cap seals or lubricators. It is strongly recommended that load and life are determined using the methods shown in the calculations section. The bearing static and dynamic load capacities (C & Co) often quoted by manufacturers are not the best basis for practical life calculations. C & Co figures are included on the bearing pages for comparison.
2. Some dimensions will vary by the amount of the grinding allowance according to which grade of slide is selected. All carriages are compatible with all grades of slide with the exception of the smallest (size 2-3). Two sizes of 2-3 carriages are therefore required, AU 2P1/P2 3 which is suitable for slide grades P & P2, and AU 12P3 13 which is suitable for slide grade P3.
3. The carriage size AU 28 18 incorporates a recess in the underside for fixing screw clearance when used with size V28 flat slide. The V dimension in the table includes for this recess.
4. The datum mark identifies the reference edge used in manufacture. The concentric bearings are always mounted on this side.
5. CH (Controlled Height) bearings are selected to be within ±0.005 mm in respect of ‘B’ dimension on pages 28-29 compared to standard bearings which are within ±0.025 mm. Customers requiring CH bearings with the same tolerance band in respect of a number of carriages should state this on their order.
6. Bearings are available in 3 standard lengths, therefore bearing centers ‘D’ and the number and position of component mounting holes ‘G’ will vary accordingly. Bishop-Wisecarver Corporation can provide carriages to your special length requirement on request.
7. The carriage plate bearing centers are optimized for use with any precision grade of slide. Customers making their own carriage should calculate their bearing & lubricator/cap seal mounting centers for the particular slide grade selected. Please see assembled systems or individual component pages for details of calculations.
The Nitrile Sealed bearing option (NS) provides a higher degree of sealing against ingress of water or debris than does the default metal shielded type. A small increase in friction may result.

The Controlled Height bearing option (CH) minimizes variation between bearings in respect of the important ‘Q’ dimension. This may be desirable in some high precision applications.

The Tamper proof option (T) which prevents any adjustment or removal of the bearing assemblies, may be desirable if equipment is to be maintained by untrained personnel.

The Cap Seal option (CS) ensures best possible lubrication of the V contact surfaces and protects against ingress of debris. Operational safety and system appearance are also improved. Lubrication vastly increases load capacity and life. Depending on stroke, duty and environmental factors, no further lubrication is required. Access to cap seal fixing screws is from the top of the carriage for ease of adjustment.

The Lubricator option (LB) applies oil to the V contact surfaces by means of lightly sprung felt pads which are charged with oil to give long intervals between re-lubrication. The lubricator option is useful where the advantages of increased load and life are required but with lower friction compared to the cap seal.

Example: Medium Length Carriage with Cap Seals on a Spacer Slide

<table>
<thead>
<tr>
<th>K</th>
<th>L (mm)</th>
<th>M</th>
<th>N²</th>
<th>P</th>
<th>Q</th>
<th>R²</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>W</th>
<th>~Weight (kg)</th>
<th>Max Load Capacity (N)</th>
<th>~Double Row (mm)</th>
<th>~Nitrile Sealed (mm)</th>
<th>~Controlled Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>100</td>
<td>75</td>
<td>4 x 1.8</td>
<td>8.5</td>
<td>9.9</td>
<td>10.1</td>
<td>10.1</td>
<td>5.46</td>
<td>5.46</td>
<td>1.49</td>
<td>1.49</td>
<td>1.6</td>
<td>1.6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>65</td>
<td>140</td>
<td>100</td>
<td>5 x 2</td>
<td>12</td>
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</tr>
<tr>
<td>75</td>
<td>175</td>
<td>125</td>
<td>6 x 2.5</td>
<td>20</td>
<td>20.4</td>
<td>20.4</td>
<td>6.75</td>
<td>6.75</td>
<td>2.1</td>
<td>2.1</td>
<td>2.2</td>
<td>2.2</td>
<td>42</td>
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<td>2.5</td>
<td>2.5</td>
<td>55</td>
</tr>
<tr>
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<td>200</td>
<td>150</td>
<td>8 x 3</td>
<td>25</td>
<td>25.4</td>
<td>25.4</td>
<td>16.6</td>
<td>16.6</td>
<td>9</td>
<td>9</td>
<td>2.36</td>
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<td>2.5</td>
<td>2.5</td>
<td>55</td>
</tr>
<tr>
<td>110</td>
<td>220</td>
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<td>16.6</td>
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<td>9</td>
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<td>2.5</td>
<td>2.5</td>
<td>55</td>
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<tr>
<td>125</td>
<td>225</td>
<td>180</td>
<td>8 x 3</td>
<td>26</td>
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<td>26.4</td>
<td>21.3</td>
<td>21.3</td>
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<tr>
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<td>200</td>
<td>10 x 3.5</td>
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<td>42.4</td>
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<td>21.3</td>
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<td>11.5</td>
<td>3.05</td>
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<td>3.2</td>
<td>3.2</td>
<td>70</td>
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<tr>
<td>175</td>
<td>340</td>
<td>240</td>
<td>12 x 4</td>
<td>58</td>
<td>58.4</td>
<td>58.4</td>
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<td>3.05</td>
<td>3.05</td>
<td>3.2</td>
<td>3.2</td>
<td>70</td>
</tr>
<tr>
<td>200</td>
<td>400</td>
<td>300</td>
<td>15 x 5</td>
<td>50</td>
<td>50.4</td>
<td>50.4</td>
<td>34.7</td>
<td>34.7</td>
<td>19</td>
<td>19</td>
<td>4.56</td>
<td>4.56</td>
<td>4.7</td>
<td>4.7</td>
<td>98</td>
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<tr>
<td>225</td>
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<td>360</td>
<td>45 x 9.5</td>
<td>94</td>
<td>94.4</td>
<td>94.4</td>
<td>34.7</td>
<td>34.7</td>
<td>19</td>
<td>19</td>
<td>4.56</td>
<td>4.56</td>
<td>4.7</td>
<td>4.7</td>
<td>98</td>
</tr>
</tbody>
</table>

Ordering Details

- **Part Number:** AU4434 L180 (CS) (DR) (NS) (CH) (T) + Sliding Part Number
- **Part Number Legend:**
  - AU... = Assembled carriage
  - K... = Kit of parts
  - CP... = Carriage Plate only
  - Carriage Length ‘L’ = 180mm
  - Lubrication options:
    - **CS** for Cap Seals* or **LB** for Lubricators
    - Leave blank if not required

Assembled carriages will be adjusted to the slide to make a system. Simply state the number of systems with the number of carriages per slide:

**Example:** 2 x (3 x AU6034 L200 CS DR + NM60 L3056 P1) (2 systems each with 3 carriages per slide)

| Availability of Carriage Options |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AU... = Assembled carriage |
| K... = Kit of parts |
| CP... = Carriage Plate only |
| Carriage Length ‘L’ = 180mm |
| Lubrication options: |
| CS for Cap Seals* or LB for Lubricators |
| Leave blank if not required |

Additional notes:
- **T** = Tamper proof option
- Leave blank if not required
- **CH** = Controlled Height bearings* (LB)
- Leave blank if not required
- **NS** = Nitrile Sealed bearings
- Leave blank if not required
- **DR** = Double Row bearings
- Leave blank if not required

| Max Load Capacity (N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ~Double Row (mm) |
| ~Nitrile Sealed (mm) |
| ~Controlled Height (mm) |

**Not available on short carriages.**
Removable Carriages

Removable carriages are available to suit all sizes and types of double edge slide in all grades of precision. Each carriage comes complete with 4 standard bearings and is available in 3 useful lengths to cater for customers’ component size and offset load requirements. The carriage plates are fully machined from aluminum alloy and are supplied anodized. Tapped holes are provided in convenient positions to enable components to be attached.

The key feature of removable carriages is the incorporation of double eccentric bearings. By slackening the bearing stud fixing nuts and rotating the eccentric using the adjusting spanner, the carriage can be disengaged from the slide (see diagram on page 8). This can be a considerable advantage over standard and slimline carriages, which must either be run off the end of the slide, or be disassembled to allow removal.

Carriages may be specified as Assembled Units (AU type) which are factory assembled and set to the slide. Alternatively, the carriage may be specified as a Kit of components (K type) for customers wishing to carry out their own assembly.

See Application Examples on page 10

Example: Short Carriage with Lubricators on a Flat Slide

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Slides</th>
<th>Bearing</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>C</th>
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<td>O</td>
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<td>18R... V 20 &amp; NV 20</td>
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<td>18</td>
<td>20</td>
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<td>43</td>
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<td>95</td>
</tr>
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<td>18R... V 28 &amp; NV 28</td>
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<td>28</td>
<td>72</td>
<td>11</td>
<td>52</td>
<td>80</td>
<td>130</td>
</tr>
<tr>
<td>AU 25</td>
<td>25R... S 25 &amp; NS 25</td>
<td>9</td>
<td>25</td>
<td>25</td>
<td>80</td>
<td>11.5</td>
<td>51</td>
<td>74</td>
<td>120</td>
</tr>
<tr>
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<td>25R... S 35 &amp; NS 35</td>
<td>9</td>
<td>25</td>
<td>35</td>
<td>95</td>
<td>12.5</td>
<td>70</td>
<td>90</td>
<td>140</td>
</tr>
<tr>
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<td>25R... S 50 &amp; NS 50</td>
<td>9</td>
<td>50</td>
<td>50</td>
<td>112</td>
<td>14</td>
<td>80</td>
<td>100</td>
<td>160</td>
</tr>
<tr>
<td>AU 44</td>
<td>34R... M 44 &amp; NM 44</td>
<td>9</td>
<td>44</td>
<td>44</td>
<td>116</td>
<td>14.5</td>
<td>88</td>
<td>103</td>
<td>153</td>
</tr>
<tr>
<td>AU 60</td>
<td>34R... M 60 &amp; NM 60</td>
<td>9</td>
<td>60</td>
<td>60</td>
<td>135</td>
<td>17</td>
<td>110</td>
<td>125</td>
<td>205</td>
</tr>
<tr>
<td>AU 76</td>
<td>34R... M 76 &amp; NM 76</td>
<td>9</td>
<td>76</td>
<td>76</td>
<td>150</td>
<td>18</td>
<td>130</td>
<td>165</td>
<td>265</td>
</tr>
<tr>
<td>AU 54...</td>
<td>L 76 &amp; NL 76</td>
<td>9</td>
<td>76</td>
<td>76</td>
<td>185</td>
<td>20</td>
<td>140</td>
<td>198</td>
<td>298</td>
</tr>
<tr>
<td>AU 120</td>
<td>54R... L 120 &amp; NL 120</td>
<td>9</td>
<td>120</td>
<td>120</td>
<td>240</td>
<td>24</td>
<td>180</td>
<td>258</td>
<td>378</td>
</tr>
</tbody>
</table>

*Notes:
1. Maximum loads quoted assume lubrication at the interface of bearings and slide. This can best be achieved by using lubricators. It is strongly recommended that load and life are determined using the methods shown in the calculations section. The bearing static and dynamic load capacities (C & Co) often quoted by manufacturers are not the best basis for practical life calculations. C & Co figures are included on the bearing pages for comparison.
2. Some dimensions will vary by the amount of the grinding allowance according to which grade of slide is selected. All carriages are compatible with all grades of slide.
3. Carriage size AU 28 18 R incorporates a recess in the underside for fixing screw clearance when used with size V28 flat slide. The V dimension in the table includes for this recess.
4. The datum mark identifies the reference edge used in manufacture. The concentric bearings are always mounted on this side.
5. Carriages are available in 3 standard lengths, therefore bearing centers ‘D’ and the position of component mounting holes ‘G’ will vary accordingly. Bishop-Wisecarver Corporation can provide carriages to your special length requirement on request.
The following types or options of bearing and lubrication device may be specified (refer also to availability table below right).

The twin bearing type which is the default choice, comprises two individual bearings on a common stud. This offers some compliance, with smoother running, easy adjustment and greater tolerance of misalignment.

**The Double Row bearing type (DR)** incorporates a one-piece bearing with two ball tracks. This offers higher load capacity, especially in the radial direction and is less susceptible to entrapment of debris.

**The Nitrile Sealed bearing option (NS)** provides a higher degree of sealing against ingress of water or debris than does the default metal shielded type. A small increase in friction may result.

**The Lubricator option (LB)** applies oil to the V contact surfaces by means of lightly sprung felt pads which are charged with oil to give long intervals between re-lubrication. The lubricator option is useful where the advantages of increased load and life are required in conjunction with low friction.

Lubricators are fixed with screws through the carriage, so that they can be detached easily in the event of carriage removal from the slide.

**Example: Medium Length Carriage on a Spacer Slide**

**Ordering Details**

**Part Number**

AU... = Assembled carriage

K... = Kit of parts

CP... = Carriage Plate only

Carriage Length 'L' = 180mm

R = Removable type carriage

**NS** = Nitrile Sealed bearings

Leave blank if not required

**DR** = Double Row bearings

Leave blank if not required

Lubrication Option: **LB** for Lubricators

Leave blank if not required

**Availability of Carriage Options**

- **DR**
- **NS**
- **LB**

**Example:** 2 x (3 x AU4434 L180 R LB NS + NM44 L3146 P2) (2 systems each with 3 carriages per slide)

**Part Number**

AU 12 13R... = ASSEMBLED (DR) (NS)

AU 20 18R... = ASSEMBLED (NS) (LB)

AU 28 18R... = ASSEMBLED (NS) (LB)

Larger sizes
Slimline Carriages

Slimline carriages are available to suit all sizes and types of double edge slide in all grades of precision. Each carriage comes complete with 4 slimline bearings which ensure that the overall system height is minimized. Slimline carriages have a lower load capacity than corresponding sizes of standard carriage, but benefit from being lower in cost. All sizes are available in 3 useful lengths to cater for customers’ component size and offset load requirements. The carriage plates are fully machined from aluminum alloy and are supplied anodized. Tapped holes are provided in convenient positions to enable components to be attached.

Carriages may be specified as **Assembled Units (AU type)** which are factory assembled and set to the slide. Alternatively, the carriage may be specified as a **Kit of components (K type)** for customers wishing to carry out their own assembly. The following types or options of bearing and lubrication device may be specified (refer also to availability table below right).

See Application Examples on page 10

**Example: Short Carriage with Lubricators on a Flat Slide**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Slides</th>
<th>Bearing Ø</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G x thread</th>
<th>H</th>
<th>J^2</th>
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</thead>
<tbody>
<tr>
<td>AU 20 195...</td>
<td>V 20 &amp; NV 20</td>
<td>19.5</td>
<td>20</td>
<td>64</td>
<td>10</td>
<td>43</td>
<td>55</td>
<td>90</td>
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</tr>
<tr>
<td>AU 28 195...</td>
<td>V 28 &amp; NV 28</td>
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<td>28</td>
<td>72</td>
<td>11</td>
<td>52</td>
<td>75</td>
<td>125</td>
<td>58</td>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>AU 25 265...</td>
<td>S 25 &amp; NS 25</td>
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<td>25</td>
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<td>11.5</td>
<td>55</td>
<td>74</td>
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<td>60</td>
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<td>S 35 &amp; NS 35</td>
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<td>50</td>
<td>70</td>
</tr>
<tr>
<td>AU 44 360...</td>
<td>M 44 &amp; NM 44</td>
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<td>44</td>
<td>116</td>
<td>14.5</td>
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<td>80</td>
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<tr>
<td>AU 60 360...</td>
<td>M 60 &amp; NM 60</td>
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<td>200</td>
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<td>130</td>
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</table>

*Notes:*
1. Maximum loads quoted assume lubrication at the interface of bearings and slide. This can best be achieved by using cap wipers or lubricators. It is strongly recommended that load and life are determined using the methods shown in the calculations section. The bearing static and dynamic load capacities (C & Co) are often quoted by manufacturers are not the best basis for practical life calculations. C & Co figures are included on the bearing pages for comparison.
2. Some dimensions will vary by the amount of the grinding allowance according to which grade of slide is selected. All carriages are compatible with all grades of slide.
3. All carriages except sizes AU 76 580 & AU 120 580 incorporate a recess in the underside for fixing screw clearance when used with flat slides. The V dimension in the table includes for this recess.
4. The datum mark identifies the reference edge used in manufacture. The concentric bearings are always mounted on this side.
5. Carriages are available in 3 standard lengths, therefore bearing centers ‘D’ and the number and position of component mounting holes ‘G’ will vary accordingly. Bishop-Wisecarver Corporation can provide carriages to your special length requirement on request.
6. The carriage plate bearing centers are optimized for use with any precision grade of slide. Customers making their own carriage should calculate their bearing and lubricator/cap wiper mounting centers for the particular slide grade selected. Please see assembled systems or individual component pages for details of calculations.
Beam-Mounted System Varieties

The Nitrile Sealed bearing option (NS) provides a higher degree of sealing against ingress of water or debris than does the default metal shielded type. A small increase in friction may result.

The Tamper proof option (T) which prevents any adjustment or removal of the bearing assemblies, may be desirable if equipment is to be maintained by untrained personnel.

The Cap Wiper option (CW) ensures best possible lubrication of the V contact surfaces and protects against ingress of debris. Operational safety and system appearance are also improved. Lubrication vastly increases load capacity and life. Depending on stroke, duty and environmental factors, no further lubrication is required. Access to cap wiper fixing screws is from the underside of the carriage.

The Lubricator option (LB) applies oil to the V contact surfaces by means of lightly sprung felt pads which are charged with oil to give long intervals between re-lubrication. The lubricator option is useful where the advantages of increased load and life are required but with lower friction compared to the cap wiper.

Example: Medium Length Carriage with Cap Wipers on a Spacer Slide

<table>
<thead>
<tr>
<th>K</th>
<th>L = 100</th>
<th>S</th>
<th>N</th>
<th>P</th>
<th>Q</th>
<th>R^2</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>Weight (kg)</th>
<th>Max Load Capacity (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>65</td>
<td>100</td>
<td>140</td>
<td>5 x 2</td>
<td>12</td>
<td>12.4</td>
<td>9.2</td>
<td>5.7</td>
<td>2.1</td>
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<tr>
<td>11.2</td>
<td>75</td>
<td>125</td>
<td>175</td>
<td>6 x 2.5</td>
<td>20</td>
<td>20.4</td>
<td>9.2</td>
<td>5.7</td>
<td>2.1</td>
<td>16 x 8</td>
<td>0.25</td>
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<td>0.47</td>
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<td>135</td>
<td>180</td>
<td>6 x 2.5</td>
<td>15</td>
<td>15.4</td>
<td>11.3</td>
<td>6.8</td>
<td>2.36</td>
<td>2.5</td>
<td>54</td>
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<td>3</td>
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<td>6.8</td>
<td>2.36</td>
<td>2.5</td>
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<td>4</td>
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<tr>
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<td>150</td>
<td>200</td>
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<td>10 x 3.5</td>
<td>42</td>
<td>42.4</td>
<td>14</td>
<td>8.3</td>
<td>3.05</td>
<td>3.2</td>
<td>72</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>15.5</td>
<td>170</td>
<td>240</td>
<td>340</td>
<td>12 x 4</td>
<td>58</td>
<td>58.4</td>
<td>14</td>
<td>8.3</td>
<td>3.05</td>
<td>3.2</td>
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<td>4</td>
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<td>360</td>
<td>480</td>
<td>45 x 9.5</td>
<td>94</td>
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<td>22.8</td>
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<td>4.56</td>
<td>4.7</td>
<td>106</td>
<td>27</td>
<td>6</td>
</tr>
</tbody>
</table>

Ordering Details

Part Number: AU44360 L180 (CW) (NS) (T) + Slide Part Number

- AU... = Assembled carriage
- K... = Kit of parts
- CP... = Carriage Plate only
- Carriage Length ‘L’ = 180mm

Availability of Carriage Options

<table>
<thead>
<tr>
<th>Part Number</th>
<th>NS</th>
<th>CW</th>
<th>LB</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU 20 195...</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>AU 28 195...</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Not available on short carriages.

Example: 2 x (2 x AU35265 L200 CW + S35 L3146 P3) (2 systems each with 2 carriages per slide)
Double Edge Spacer Slides

Double edge spacer slides are available in 11 sizes and three precision grades to meet exactly the requirements of almost any linear motion application. They are zone hardened on the “V” edges to provide an extremely hard wearing surface. Grades P1 & P2 are precision ground on the V running faces to a high degree of accuracy and parallelism, with P1 being ground on the mounting surface as well. The unground version P3 is also sufficiently accurate for many applications. Please see system selector for comparative data.

In addition to the fixing hole options shown below, slides are also available without holes if preferred. Slide fixing holes are accurately positioned, allowing customers to pre-drill their mounting holes. All slides are left ‘soft’ in the center portion to allow for subsequent machining if required.

The one piece construction of the spacer slide bolts directly to the mounting surface of the machine, providing the required running clearance for bearings and lubrication devices. A central keyway is provided for simple location by means of dowel pins or customer’s own key. In cases where cap seals or lubricators are not being used, the precision datum edges on the spacer portion of the slide may be used for location against a machined register.

---

### Notes:

1. Any length of slide within L max dimension can be supplied, but for optimum price and delivery time, slide lengths should be specified which maintain the C and D dimensions in the table above. In cases where the preferred choice of bearings to use with each slide are quoted. However, other combinations are possible (please see mix and match tables at www.bwc.com/products/gv3.html).
2. The C & D dimensions for rack mounted slides are less than that for plain versions to provide support for the rack close to its end. Slides in their free unmounted state are not necessarily absolutely straight. If straightness is important, the slide may be set by bolting down against a register or by utilizing the central keyway. If dowel pins are used, these should be positioned one each end centrally between the slide end and first hole and one located centrally between each pair of fixing holes, or as deemed necessary for the application.
3. Where slides longer than the maximum length are required, lengths can be matched suitable for butting.
4. In the table, the preferred choices of bearings to use with each slide are quoted. However, other combinations are possible (please see mix and match tables at www.bwc.com/products/gv3.html).
5. Slides in their free unmounted state are not necessarily absolutely straight. If straightness is important, the slide may be set by bolting down against a register or by utilizing the central keyway. If dowel pins are used, these should be positioned one each end centrally between the slide end and first hole and one located centrally between each pair of fixing holes, or as deemed necessary for the application.
6. The NL120 section recess has a wider tolerance than keyways in other sections. One side only should be used as a register face if precise straightness is important.
7. Low head cap screws DIN 6912 are not universally stocked, so Bishop-Wisecarver Corporation offers them as a convenience to customers in a single length for each thread size (see table). The NL120 rack slide assembly (and all plain double edged spacer slides) is secured with cap screws to DIN 912 which are widely stocked.
The rigidity of the spacer slide enables it to be used as a self-supporting element or construction member of the machine, when used in conjunction with flange clamps. Slide deflection is covered in the calculations section.

All double edge spacer slides with the exception of the smallest are available with a rack attached by dowels to the top surface. This becomes a fully serviceable element when bolted down to the mounting surface, providing a convenient means to power the linear movement. Rack teeth are machined to a high degree of precision and conform to ISO 1328 grade 8. Racks may comprise a number of lengths, precision mounted to a single slide. Pinions which mate with these racks are included in the GV3 range as are rack driven carriages which mount directly to the slide and may be specified with optional AC motor, to provide a complete drive solution.

Note that double edge spacer slides with the fitted rack option are not compatible with carriages using the slimline bearings, as there is no clearance for the rack.

See Application Examples on pages 9 - 12

Available Grades of Slide

| M | M1 | N | N1 | P | P1<sup>1</sup> | Q | R | S | T | U | V | W Mod | Dowel Pin | X | Y | Z | Z1 | Weight | Slide Only | Slide + Rack |
| 3.5 | 6.2 x 3.1 | - | - | M3 | - | - | - | - | - | - | - | - | SDP4 | 4 | 4 | 6.75 | - | 0.5 | - |
| 4.5 | 8 x 4.1 | 4.5 | 7.6 x 2.9 | M4 | M4 x 20 | FS420 | 4 | 6.35 | 6.35 | 6.2 | 4 | 5.65 | 0.7 | SDP6 | 4 | 5 | 6 | 1.75 | 1 | 0.1 | 1.4 |
| 5.5 | 10 x 5.1 | 4.5 | 7.6 x 2.9 | M5 | M5 x 20 | FS420 | 4 | 6.35 | 6.35 | 6.2 | 4 | 5.65 | 0.7 | SDP6 | 4 | 6 | 6 | 2.25 | 1 | 1.6 | 2.0 |
| 5.5 | 10 x 5.1 | 5.5 | 9.6 x 4 | M5 | M5 x 25 | FS525 | 5 | 7.8 | 7.85 | 8.5 | 6 | 6.85 | 1 | SDP6 | 4 | 6 | 6 | 2.25 | 1.5 | 2.3 |
| 7 | 11 x 6.1 | 5.5 | 9.6 x 4 | M6 | M6 x 25 | FS525 | 5 | 7.8 | 7.85 | 8.5 | 6 | 6.85 | 1 | SDP8 | 6 | 8 | 8 | 2.75 | 2.3 | 3.0 |
| 7 | 11 x 6.1 | 5.5 | 9.6 x 4 | M6 | M6 x 25 | FS525 | 5 | 7.8 | 7.85 | 8.5 | 6 | 6.85 | 1 | SDP10 | 8 | 10 | 12 | 3.25 | 3.2 | 4.0 |
| 7 | 11 x 6.1 | 6.5 | 11 x 4.5 | M6 | M6 x 30 | FS630 | 6 | 8.3 | 11.7 | 10.8 | 7.5 | 10.2 | 1.5 | SDP6 | 6 | 8 | 8 | 2.75 | 3.5 | 4.7 |
| 9 | 15 x 8.1 | 6.5 | 11 x 4.5 | M8 | M8 x 30 | FS630 | 6 | 8.3 | 11.7 | 10.8 | 7.5 | 10.2 | 1.5 | SDP10 | 8 | 10 | 12 | 3.25 | 5.5 | 5.7 |
| 9 | 15 x 8.1 | 6.5 | 11 x 4.5 | M8 | M8 x 30 | FS630 | 6 | 8.3 | 11.7 | 10.8 | 7.5 | 10.2 | 1.5 | SDP12 | 10 | 12 | 15 | 3.75 | 7 | 8.2 |
| 14 | 20 x 12 | 14 | 20 x 8 | M12 | M12 x 50 | FS1250 | 8 | 13.2 | 18.6 | 18 | 13.3 | 16.6 | 2 | SDP15 | 10 | 15 | 15 | 4.75 | 10 | 13 |
| 11 | 18 x 10 | 11 | 18 x 10 | M10 | - | - | 8 | 13.2 | 18.6 | 18 | 13.3 | 16.6 | 2 | - | - | - | - | 15 | 18 |

Part Number: NS35 L1290 P1 (R) (T) (C15) (D15)

Tailored values of ‘C’ & ‘D’ dimensions

Leave blank if standard<sup>1,2</sup>

Fixing hole style: T - Tapped fixing holes;

R - Rack mounted on slide (not available on NMS12)

Leave blank if not required

Precision grade: options are P1, P2 & P3

N - No holes, leave blank for counterbored holes

(Options T & N are only available with rack option to special order)

Example:
1 x NM60 L480 P2 R Double edge spacer slide x 480 mm long in precision grade 2, fitted with rack
7 x SDP10 Low head socket cap screws M6 thread x 30 mm long (optional)
6 x FS630 10 mm Ø dowel pins (optional)
Single Edge Spacer Slides

Single edge spacer slides are available in 5 sizes and three precision grades. They are zone hardened on the ‘V’ edge to provide an extremely hard wearing surface. Grades P1 & P2 are precision ground on the V faces and datum edges to a high degree of accuracy and parallelism, with P1 being ground on the top and bottom faces as well. The unground version P3 is also sufficiently accurate for many applications (please see system selector for comparative data).

In addition to the fixing hole options shown below, slides are available without holes if preferred. Slide fixing holes are accurately positioned, allowing customers to pre-drill their mounting holes. All slides are left ‘soft’ in the center portion to allow subsequent machining if required.

The one piece construction of the spacer slide bolts directly to the mounting surface of the machine, providing the required running clearance for bearings and lubrication devices. A central keyway is provided for simple location by means of dowel pins or customer’s own key. In cases where cap seals or lubricators are not being used, the precision datum edge on the spacer portion of the slide

Notes:
1. Any length of slide within L max dimension can be supplied, but for optimum price and delivery time, slide lengths should be specified which maintain the C and D dimensions in the table above. In all cases unless otherwise specified by the customer, C and D dimensions will be supplied equal. The position of the teeth on the rack cut versions relative to the mounting holes or slide ends, will vary. Rack cut slides with a regulated tooth position can be supplied on request.
2. Where slides longer than the maximum length are required, lengths can be matched suitable for butting. Some sizes of rack cut slides are not always stocked in maximum lengths. In such cases the customer will be offered matched lengths for butting.
3. In the table, the preferred choices of bearings to use with each slide are quoted. However, other combinations are possible (please see mix and match tables at www.bwc.com/products/gv3.html).
4. Slides in their free unmounted state are not necessarily absolutely straight. If straightness is important, the slide may be set by bolting down against a register. If dowel pins are used, these should be positioned one each end centrally between the slide end and first hole and one located centrally between each pair of fixing holes, or as deemed necessary for the application.
5. For slide size NVE, the counterbore diameter ‘N’ for the rack cut grade has been regulated to suit socket head cap screws DIN 912 with a plain head which has a slightly smaller diameter than those with a knurled finish. This is to maximize the strength between the counterbore and the root of the rack teeth. Suitable screws are available from Bishop-Wisecarver if required: Part No. PFS415 (M4 x 15 long). Customers are advised not to pre-drill fixing holes for these unless they have the means to control their hole positions very accurately.
6. The max rack force quoted is that continual drive force which can be sustained by a well lubricated rack used in conjunction with the appropriate pinion.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Bearings</th>
<th>A -Slide Width</th>
<th>B</th>
<th>B1</th>
<th>C¹</th>
<th>D¹</th>
<th>E</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMS E.....</td>
<td>...J13.....</td>
<td>11</td>
<td>11.19</td>
<td>11.71</td>
<td>5</td>
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<td>...J18..... ...J195.....</td>
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<td>16.19</td>
<td>16.72</td>
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<td>43</td>
<td>43</td>
<td>90</td>
</tr>
<tr>
<td>NS E.....</td>
<td>...J25..... ...J265.....</td>
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<td>21.37</td>
<td>21.59</td>
<td>8.5</td>
<td>8.7</td>
<td>43</td>
<td>43</td>
<td>90</td>
</tr>
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<td>29.99</td>
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<td>16.2</td>
<td>88</td>
<td>88</td>
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</tr>
</tbody>
</table>
may be used for location against a machined register.

The single edge format allows two slide V's to be mounted wide apart, thus providing a considerable increase in moment load capacity, stiffness and stability. The space between the two slides can be made sufficient to allow central positioning of the drive, whether by means of ball screw, air cylinder or other type of actuator.

Single edge spacer slides are available with a rack cut into the back face, providing a convenient means of driving. Rack teeth are machined to a high degree of precision and conform to ISO 328 grade 8. The large face width of the racks makes these the best choice for applications which require high driving forces (see drive calculations). Pinions which suit the racks are also available. Shaft type pinions can be coupled directly to the geared motor or gearbox, which can be mounted using the drive flange to the customer’s own carriage plate. Although not hardened, the rear face of the slide is sufficiently durable to act as track for track rollers.

See Application Examples on pages 11 - 13

### Available Grades of Slide

- Indicates surfaces which are precision ground

### Ordering Details

- Part Number: NME L930 P1 (R) T (C15) (D15)
- Tailored values of C & D dimensions
- Leave blank if standard
- Fixing hole style: T - Tapped fixing holes
- N - No holes, leave blank for counterbored holes

### Example:

1 x N S E L2066 P3 N — Single edge spacer slide in precision grade 3, 2066 mm long with no holes
24 x SDP6 — 6 mm Ø head dowel pins (optional)
Double Edge Flat Slides

Double edge flat slides are available in a range of 11 sizes corresponding to those of the double edge spacer slides. Single edge flat slides are also available in 5 complementary sections. All flat slides come in 3 grades of precision and are zone hardened on the ‘Vʼ edges to provide an extremely hard wearing surface. Grades P1 and P2 are precision ground on V and opposing faces to a high degree of accuracy and parallelism with P1 being ground on the mounting surfaces as well*. The unground version P3 is also sufficiently accurate for many applications (please see system selector for comparative data).

Flat slides are supplied with plain fixing holes as standard and with counterbored holes to suit low head cap screws as an option. Unground grade P3 slides are available without holes if preferred. The counterbored option is necessary if the double edge flat slides are used in conjunction with belt driven carriages in order to provide an uninterrupted path for the belt. Also, where there is insufficient room between slide and carriage plate for a conventional screw head (possible in "mix and match" situations or where customer’s own flat carriage plates are used in conjunction with slimline bearings).

The slide fixing holes are accurately positioned, allowing customers to pre-drill their mounting holes. All flat slides are left ‘softʼ outside

![Slide with Standard Holes](image1)

![Slide with Counterbored Holes](image2)

Available Grades of Slide

- **Indicates surfaces which are precision ground**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Bearings *</th>
<th>A -Slide Width</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E ±0.2</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Edge</td>
<td>Single Edge</td>
<td>Standard</td>
<td>Slimline</td>
<td>P1 &amp; P2</td>
<td>P3</td>
<td>P1</td>
<td>P2 &amp; P3</td>
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<td>...J54... ...J580...</td>
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<td>121.58</td>
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<tr>
<td>L E...</td>
<td>...J54... ...J580...</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>43</td>
<td>43</td>
</tr>
</tbody>
</table>

*Notes:
1. Any length of slide within L max dimension can be supplied, but for optimum price and delivery time, slide lengths should be specified which maintain the C and D dimensions in the table above. In all cases unless otherwise specified by the customer, C and D dimensions will be supplied equal.
2. Where slides longer than the maximum length are required, lengths can be matched suitable for butting.
3. In the table, the preferred choices of bearings to use with each slide are quoted. However, other combinations are possible (please see mix and match tables at www.bwc.com/products/gv3.html).
4. Slides in their free unmounted state are not necessarily absolutely straight. If important, the slide should be set straight by bolting down to a register.
5. Counterbored holes for flat slides are designed to suit socket cap head screws DIN 6912. These screws are not universally stocked, so Bishop-Wisecarver offers them as a convenience to customers in a single length for each thread size (see table).
6. The L120 section has 2 rows of holes.
Single Edge Flat Slides

the area of the V’s to allow subsequent machining if required.
Flat slides are useful where weight saving or minimum inertia is required in cases where the slide is the moving component. Also, where it is practical to design a support profile as an integral part of the machine to provide running clearance for the bearings and lubrication devices.
The single edged format allows two slide V’s to be mounted wide apart, thus providing a considerable increase in moment load capacity, stiffness and stability. The space between the two slides can be made sufficient to allow central positioning of the drive whether by means of ball screw, air cylinder or other types of actuator.

Single edge flat slides can be attached to commonly available square and rectangular hollow section material by means of tapped hexagonal bar to achieve a low cost, high strength structure complete with linear guide (see page 8).

See Application Examples on pages 8-9, 11 and 12

---

### Available Grades of Slide

- P1 & P2
- P3

### Ordering Details

**Part Number**

**Slide Length ‘L’ = 930 mm**

Precision grade: options are **P1, P2 & P3**

---

**Example:**

1 x LE 2156 P3 C

Single edge flat slide x 2156 mm long in unground grade 3 with counterbored holes

24 x FS820

Low head socket cap screws M8 thread x 20 mm long (optional)
Slide Beams

The slide beam consists of a flat slide mounted onto a precision, anodized aluminum extrusion to provide a rigid self-supporting beam which can form an integral part of a machine structure (refer to slide deflection calculations). There are two basic sizes of beam, each available with a number of different slide widths to cater for customer's space and moment load requirements. The smaller size beam is available as a lightweight version, which reduces inertia where the slide beam is to be used dynamically. All slide beams can be supplied in lengths of up to 8 meters in one piece, and are compatible with all bearings, carriages and lubrication devices. Slides can be specified in any of the three grades of precision available depending upon the requirements for cost, accuracy and performance (see system selector).

Customers contemplating driving by means of a belt, steel band, cable or chain, will benefit from the large hollow center which can be used for routing the return. If drive by timing belt is required, please consider the belt driven carriage which has been

---

**Part Number**

<table>
<thead>
<tr>
<th>For Use With Cartridges*4</th>
<th>A</th>
<th>B</th>
<th>C2</th>
<th>D2</th>
<th>E</th>
<th>F</th>
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<tr>
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<td>P3</td>
<td>P1</td>
<td>P2 &amp; P3</td>
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<td>Belt Drive</td>
<td>&lt;Slide Width</td>
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<td></td>
<td></td>
</tr>
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<td>SB S 35...</td>
<td>AU 35 25... AU 35 265... AU BD 35 25...</td>
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<td>AU 44 34... AU 44 360... AU BD 44 34...</td>
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<td>77.58</td>
<td>43</td>
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</tbody>
</table>

*Notes:

1. Beams longer than 4020 mm (6000 mm for P3 grade) will be supplied with two or more lengths of matched slide each mounted and doweled to form a precision joint. Additional fixing screws will normally be provided adjacent to each join. Slide beams with shorter slides fixed in any position can be supplied upon request.
2. For optimum price and delivery time, slide beam lengths should be specified which maintain the C and D dimensions in the above table. In all cases unless otherwise specified by the customer, C and D dimensions will be supplied equal.
3. For requirements in excess of 8 m, slide beams can be supplied matched ready for joining. Please contact Bishop-Wisecarver for details.
4. In the table, the available choices of carriage to use with each slide beam are quoted. However, it is possible to use a customer made carriage incorporating other sizes of bearings (please see details of “mix and match” possibilities at www.bwc.com/products/gv3.html).
5. The heavy duty T nut is recommended for the lightweight beam and where greater security of fixing is required. T nut section is also available in undrilled lengths up to 3000 mm. Please specify part number TN8S followed by the required length in mm.
6. The T slot cover is made from black UPVC and is available in lengths up to 8000 mm. Please specify part number TC8 followed by the required length in mm.
specifically designed for such application. This will require the counterbored screw fixing option to be specified for the slide in order to provide a flush running surface for the belt. The counterbored screw fixing option will also be required where there is insufficient room between slide and carriage plate for screw heads (possible in “mix and match” situations or where customer’s own flat carriage plates are used in conjunction with slimline bearings).

For customers requiring a belt driven system complete with end pulley units, Bishop-Wisecarver recommends their standard range of Driven Linear Systems, details of which may be found in the comprehensive HepcoMotion DLS catalog. Also included in the DLS catalog are compatible motors, gearboxes and switching equipment, all of which may be suitable for customers carrying out their own designs using the slide beam.

See Application Examples on page 10

**Ordering Details**

<table>
<thead>
<tr>
<th>G</th>
<th>H</th>
<th>J Standard</th>
<th>J C/Bored</th>
<th>K</th>
<th>L Max *1, 2, 3</th>
<th>Fixing Clamps Short</th>
<th>Fixing Clamps Long</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Weight kg/m</th>
<th>Part Number</th>
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<td>DFC3L</td>
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<td>DFC3L</td>
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<td>DFC4L</td>
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<td>DFC4L</td>
<td>100</td>
<td>65</td>
<td>M8</td>
<td>11.5</td>
<td>-</td>
</tr>
</tbody>
</table>

**Ancillary Items:**

See drawing for the part numbers relating to T nuts, T slot cover and fixing clamps.
Standard Bearings

All standard bearings are compatible with all grades of slide and although designed to be used with particular sizes of slide, may be “mixed and matched” in many instances. The following bearing formats and fixing methods may be chosen to cater for most design requirements.

The twin bearing type which is the default choice, comprises two individual deep groove ball bearings on a single stud. This construction offers some compliance allowing smoother running, easy adjustment and greater tolerance of misalignment.

The Double Row bearing type (DR) incorporates a one-piece bearing with two ball tracks. This offers higher load capacity, especially in the radial direction and is less susceptible to entrapment of debris.

Both types of bearing have been designed specially for slide system applications and their performance confirmed by rigorous testing. External dimensions are identical.

The Nitrile Sealed option (NS) available for both bearing formats, provides a higher degree of sealing against ingress of water or debris than does the default metal shielded type. A small increase in friction may result.

The through hole fixing type is available in two stud lengths covering most thicknesses of carriage or mounting plate, the short stud version being compatible with the carriage plates. Both versions are available in Concentric type (C) which are fixed,

Through Fixing Type (SJ/LJ)

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<thead>
<tr>
<th>Part Number</th>
<th>For Use With Slide Section*</th>
<th>A</th>
<th>B</th>
<th>±0.025</th>
<th>B1</th>
<th>C</th>
<th>C1</th>
<th>C2</th>
<th>±0.025</th>
<th>D</th>
<th>D1</th>
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<td>9.51</td>
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<td>V &amp; NV</td>
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<td>12.4</td>
<td>6.75</td>
<td>7.4</td>
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<tr>
<td>...25...</td>
<td>S &amp; NS</td>
<td>25</td>
<td>16.6</td>
<td>9</td>
<td>9.8</td>
<td>19</td>
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<td>20.27</td>
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<tr>
<td>...34...</td>
<td>M &amp; NM</td>
<td>34</td>
<td>21.3</td>
<td>11.5</td>
<td>13.8</td>
<td>22</td>
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<td>5.2</td>
<td>5.9</td>
<td>27.13</td>
</tr>
<tr>
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<td>34.7</td>
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<td>17.8</td>
<td>30</td>
<td>8.2</td>
<td>20.4</td>
<td>5.7</td>
<td>7.9</td>
<td>41.76</td>
</tr>
</tbody>
</table>

*Notes:
1. It is recommended that holes to suit bearing mounting studs should be reamed to tolerance F6 for a sliding fit.
2. All eccentric through fixing type bearing studs are supplied with sockets for adjustment as shown, with the exception of size 13.
3. Nuts for the through fixing type bearings are chemically blackened on the concentric version and bright zinc plated on the eccentrics for identification purposes.
4. ‘R’ dimension is both the eccentric offset of the adjusting nut and the total adjustment available at the bearing centers.
5. Double eccentric bearings require different mounting hole centers.
6. The blind hole eccentric bearings cannot be fitted with cap seals, however lubricators may be specified instead.
7. Controlled height bearings are selected within ±0.005 mm in respect of B1 dimension compared to the normal tolerance of ±0.025 mm. They are supplied in sets of up to eight bearings within the same tolerance band. Larger quantities of bearings within the same tolerance band are available on request.
8. The quoted static and dynamic load capacities are based on industry standard calculations. These do not accurately reflect system performance, and are only provided for comparison with other systems.
9. The preferred slide choices for each bearing are listed. Other slides may be used as shown in the “mix & match” tables available at www.bwc.com/products/gv3.html.
**Eccentric type (E),** adjustable and **Double Eccentric type (DE)** which have sufficient adjustment to enable a carriage to be disengaged from the slide (see application drawing on page 8).

All through hole fixing types are available in a **Controlled Height version (CH)** which minimizes variation between bearings in respect of the important ‘B’ dimension. This may be desirable in some high precision applications.

The **Blind Hole fixing type (BHJ)** allows mounting into a solid machine base where through mounting holes are not possible, or where the thickness of the mounting plate is too great. The blind hole fixing type is also useful where adjustment from the front is preferred or where access to the opposite side of the mounting hole is restricted. They are available in **Concentric type (C)** which are fixed, or **Eccentric type (E)** which are adjustable.

All bearings are greased for life internally. Customers are strongly recommended to provide lubrication to the interface between bearings and slide by specifying cap seals which fit over the bearings, or by using lubricators. Lubrication greatly increases load capacity and life.

See Application Examples on pages 8-13

### Blind Hole Fixing Type (BHJ)

To calculate drilling centers with all types of slide, refer to theoretical 'V' apex dimension B or H on the relevant slide page.

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L²</th>
<th>M</th>
<th>M1</th>
<th>N</th>
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<tr>
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<td>17</td>
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<td>1</td>
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<tr>
<td>25</td>
<td>M14 x 1.5</td>
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<td>1.6</td>
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<td>6</td>
<td>22</td>
<td>28</td>
<td>1.5</td>
<td>5.5</td>
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</tbody>
</table>

Max Working Load Capabilities (N) Bearing Static (Co) and Dynamic (C) Load Capacities (N)^8

### Ordering Details

Fixing type. Choose from:

- **SJ** = Short stud, **LJ** = Long stud
- **BHJ** = Blind Hole fixing

Part Number (~ bearing diameter in mm)

- **C** = Concentric (fixed), **E** = Eccentric (adjustable)
- **DE** = Double Eccentric (for disengagement purposes)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Options Available</th>
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<tr>
<td>-</td>
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<td><em><strong>J54</strong></em></td>
<td>✔</td>
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</tbody>
</table>

*Controlled Height*^7^ Leave blank if not required

**Nitrile Sealed** bearing Leave blank if metal shields are required

**Double Row** bearing Leave blank if twin bearing is required

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Slimline Bearings

Slimline bearings are very compact due to the single ball track design. Good rigidity is maintained by a combination of ball to raceway conformity and low radial clearance resulting in a low cost bearing ideally suited to many slide system applications. Performance of these bearings has been confirmed by rigorous testing.

Slimline bearings are compatible with all grades of slide and although designed to be used with particular sizes of slide, may be "mixed and matched" in many instances.

The following options and fixing methods may be chosen to cater for most design requirements.

The Nitrile Sealed option (NS) provides a higher degree of sealing against ingress of water or debris than does the default metal shielded type although a small increase in friction may result.

The through hole fixing type is available in two stud lengths covering most thicknesses of carriage or mounting plate, the short stud version being compatible with the slimline carriage plates. Both versions are available in Concentric type (C) which are fixed and

Through Fixing Type (GSJ/GLJ)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Use with Slide Section*</th>
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<th>B</th>
<th>± 0.005 B1</th>
<th>C</th>
<th>C1</th>
<th>C2</th>
<th>D</th>
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*R3

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</table>

* Notes:
1. It is recommended that holes to suit bearing mounting studs should be reamed to tolerance F6 for a sliding fit.
2. Nuts for the through fixing type bearings are chemically blackened on the concentric version and bright zinc plated on the eccentrics for identification purposes.
3. ‘R’ dimension is both the eccentric offset of the adjusting nut and the total adjustment available at the bearing center line for 360° rotation of the adjusting nut.
4. The blind hole eccentric bearings cannot be fitted with cap wipers, however lubricators may be specified instead.
5. The quoted static and dynamic load capacities are based on industry standard calculations. These do not accurately reflect system performance, and are only provided for comparison with other systems.
6. The preferred slide choices for each bearing are listed. Other slides may be used as shown in the "mix & match" tables available at www.bwc.com/products/gv3.html.

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Eccentric type (E) which are adjustable.

The Blind Hole fixing type (GBHJ) allows mounting into a solid machine base where through mounting holes are not possible, or where the thickness of the mounting plate is too great. The blind hole fixing type is also useful where adjustment from the front is preferred or where access to the opposite side of the mounting hole is restricted. They are available in Concentric type (C) which are fixed, or Eccentric type (E) which are adjustable.*

All bearings are greased for life internally. Customers are strongly recommended to provide lubrication to the interface between bearings and slide by specifying cap wipers which fit over the bearings, or by using slimline lubricators. Lubrication greatly increases load capacity and life.

See Application Examples on pages 8-11 and 12

Blind Hole Fixing Type (GBHJ)

To calculate drilling centers with all types of slide, refer to theoretical ‘V’ apex dimension B or H on the relevant slide page.

<table>
<thead>
<tr>
<th>E</th>
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<th>G</th>
<th>H</th>
<th>I</th>
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<th>K</th>
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Weight-g

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Max Static (Co) and Dynamic (C) Load Capacities (N)\(^*\)

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<th>Axial</th>
<th>Co</th>
<th>C</th>
<th>Co</th>
<th>C</th>
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Part Number Options Available

- Metal Sheets Nitrile Sheets

- J 95... ✓ ✓
- J 265... ✓ ✓
- J 360... ✓ ✓
- J 580... ✓ ✓

Ordering Details

Fixing type. Choose from:

- GSJ = Short stud, GLJ = Long stud
- & GBHJ = Blind Hole fixing

Part Number (~10x bearing diameter in mm)
Cap Seals

Flexible plastic cap seals fit over individual standard bearings, providing effective sealing and protection, plus wiping of debris from the slide profile. Lubrication of the ‘V’ surface is provided by means of oil-impregnated felt wipers.

The internal cavity is filled with grease via the lubrication points, further improving lubrication and recharging the felt wipers as the grease partially liquefies under operation. Most systems require no further lubrication during the lifetime of the machine\(^3\). Fitment of these seals increases load, life and linear speed capability as well as improving operator safety.

Cap seals are not available for use with size 12 bearings.

See Application Examples on pages 9-12

Through Hole Fixing

Tapped Hole Fixing

2 x self tapping screws for plastic are supplied with each cap seal. These have a cross-recessed pan head and use the PT thread form.

2. 2 machine screws with cross-recessed pan heads (DIN84A) and 2 flat washers (DIN25A) are supplied.

3. Lubrication interval depends on length of stroke, duty and environmental factors. Replenish lubricant as necessary using a No. 2 consistency lithium soap based grease. A male grease connector Part No. CSCHF4034 or a complete gun is available from Bishop-Wisecarver if required.

4. The fixing screw positions for the CS8 do not lie on the centerline of the nominal bearing position, unlike all other sizes. Please ensure that this is taken into account if designing your own carriage plate.

Ordering Example

State quantity and part number ——— 4 x CS 34

| Part Number | Use With Bearings A | B | C | D | E | F | G | H | J | K | M^2 | N | P | Q | R | S | T | U | V | Mass | g |
|-------------|---------------------|---|---|---|---|---|---|---|---|---|-----|---|---|---|---|---|---|---|---|-----|
| CS 18       |                     | 42| 13.8| 21.2| 32.5| 6.75| 12.3| 10.4| 32.3| 18 | 6   | M2.5| 12 | 5.5| 4.5| 3  | 8.5 | 12 | 2 | 2 | 8.9  | 6  |
| CS 25       |                     | 55| 18  | 30  | 44  | 9   | 14.8| 14.8| 43  | 22 | 8.6 | M3  | 12 | 2.9| 5.5| 3.5| 11 | 16 | 2 | 2.5| 10.2 | 13 |
| CS 34       |                     | 70| 22.5| 40  | 56  | 11.5| 19.6| 19.6| 54  | 28 | 13  | M4  | 20 | 6.2| 7  | 4.5| 14 | 20 | 2.7| 3.3| 13.6 | 28 |
| CS 54       |                     | 98| 36.5| 60  | 80  | 19  | 29.7| 29.7| 78  | 40 | 20  | M5  | 25 | 4  | 9  | 6  | 24 | 35 | 3.5| 4  | 21  | 78 |

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Suitable for Slide Sections MS V S M L</th>
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<tr>
<td>CS 18</td>
<td>x    x    x    x    x    x    x</td>
</tr>
<tr>
<td>CS 25</td>
<td>x    x    x    x    x    x    x</td>
</tr>
<tr>
<td>CS 34</td>
<td>x    x    x    x    x    x    x</td>
</tr>
<tr>
<td>CS 54</td>
<td>x    x    x    x    x    x    x</td>
</tr>
</tbody>
</table>

*Notes:
1. 2 self tapping screws for plastic are supplied with each cap seal. These have a cross-recessed pan head and use the PT thread form.
2. 2 machine screws with cross-recessed pan heads (DIN84A) and 2 flat washers (DIN125A) are supplied.
3. Lubrication interval depends on length of stroke, duty and environmental factors. Replenish lubricant as necessary using a No. 2 consistency lithium soap based grease. A male grease connector Part No. CSCHF4034 or a complete gun is available from Bishop-Wisecarver if required.
4. The fixing screw positions for the CS18 do not lie on the centerline of the nominal bearing position, unlike all other sizes. Please ensure that this is taken into account if designing your own carriage plate.
Cap Wipers

Rigid plastic cap wipers fit over individual slimline bearings, providing effective protection, plus wiping of debris from the slide profile. Lubrication of the ‘V’ surface is provided by means of oil-impregnated felt wipers.

The internal cavity is filled with grease via the lubrication points, further improving lubrication and recharging the felt wipers as the grease partially liquefies under operation. Most systems require no further lubrication during the lifetime of the machine*. Fitment of cap wipers increases load, life and linear speed capability as well as improving operator safety.

Cap wipers may be attached using either of the methods shown below. If using the through hole method, please ensure that the mounting hole is slotted to provide for adjustment.

See Application Examples on pages 8 and 10

Through Hole Fixing

Tapped Hole Fixing

Notes:
1. 2 cross-recessed pan head screws to DIN 7985A and washers (DIN 433) are supplied with each cap wiper.
2. Cap wipers may be secured using the blind holes ‘K’ in the underside. These may be tapped thread form ‘M’ to take a machine screw, or will accept a self tapping screw.
3. Lubrication interval depends on length of stroke, duty and environmental factors. Replenish lubricant as necessary using a No. 2 consistency lithium soap based grease. A male grease connector Part No. CSCHF4034 or complete gun is available from Bishop-Wisecarver if required.

Ordering Example

State quantity and part number ——— 4 x CW 360
Lubricators

Plastic lubricators normally fit one each side of the slide between pairs of bearings. However, any number may be fitted in any position according to requirements. Lubricators provide positive lubrication to the working surface of the slide by means of spring loaded oil impregnated felt wipers which act as a reservoir.

System load capacity and life are greatly increased at the same time as retaining the low friction characteristics of dry running. Lubricators may be specified as part of any HepcoMotion GV3 carriage assembly or used within the customers’ own design.

One size of lubricator will operate with a single size of bearing, but can sometimes accommodate more than one size of slide (see table). Lubricators are available to suit both standard and slimline bearings (with slightly differing designs). Both types are supplied with suitable fasteners and can be attached with either a blind or through hole fixing.

See Application Examples on pages 8 and 11

Lubricators for Standard Bearings

Drilling Center Calculation

Lubricators for Slimline Bearings

Drilling Center Calculation

**Notes:**

1. 2 machine screws with cross-recessed pan heads size R (DIN7985A ~ISO7045) are supplied with each flanged type and slimline lubricator.
2. 2 self tapping screws for plastic (size Q) are supplied with each compact type lubricator. These have a cross-recessed pan head and use the PT thread form.
3. 2 machine screws with cross-recessed pan heads size R (DIN7985A ~ISO7045) are supplied with each flanged type and slimline lubricator.
4. To calculate the drilling centers with all types of slide, refer to theoretical “V” apex dimension B or H on the relevant slide page.

**Ordering Details**

Part Number
Lubricator Type:
F = Flanged, C = Compact

**Part Number** | **Use With** | **Suitable for Slide Sections** | **Types Available** | **Flanged (F)** | **Compact (C)**
--- | --- | --- | --- | --- | ---
LB 12  | ... J13... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 20  | ... J18... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 25  | ... J25... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 44  | ... J44... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 76  | ... J54... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 195 | ... J195... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 265 | ... J265... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 360 | ... J360... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
LB 580 | ... J580... | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |

**Notes:**

1. 2 machine screws with cross-recessed pan heads size R (DIN7985A ~ISO7045) are supplied with each flanged type and slimline lubricator.
2. 2 self tapping screws for plastic (size Q) are supplied with each compact type lubricator. These have a cross-recessed pan head and use the PT thread form.
4. To calculate the drilling centers with all types of slide, refer to theoretical ‘V’ apex dimension B or H on the relevant slide page.

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Flange Clamps

Flange clamps enable the slide system to act as a self-supporting constructional element of the machine. Manufactured from aluminum alloy, the clamps are anodized to achieve an attractive and corrosion resistant finish. They are available for use with all double edged spacer slides in the S series sizes and larger. Short Flange Clamps (SFC) enable the slide to be supported between two opposing faces. The Long Flange Clamp (LFC) enables short lengths of slide to be supported from one end only. The machined base mounting facility may be utilized by customers wishing to space the slide system away from the mounting surface. Deflection of slides can be determined using data given in the calculations section.

Assembly

During assembly, care should be taken to ensure that the flange clamps are positioned proud of the ends of the slide*. Flange fixing screws should be located and slightly tightened, before clamping screws ‘M’ are fully tightened. Progressive tightening of each screw ‘M’ is recommended. Flange fixing screws may then be fully tightened.

See Application Examples on pages 10 and 12

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Slide</th>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
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<th>S</th>
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</table>

Ordering Details

Clamp Length
‘S’ = Short type (use one at each end of slide)
‘L’ = Long type (use for cantilever slide mounting)

SFC60 (Q)

Q indicates tapped hole option is required
Leave blank for through hole fixing.
Part Number (60 = nominal slide width in mm\(^3\))

*Notes:
1. For mounting slides between opposing faces, slides should be ordered 2 mm shorter than the required span.
2. The drawings show dimensions from the centerline of slide ‘V’ when in the clamped condition. The figures quoted are valid for precision grades P2 & P3.
   For P1 slides, dimensions D & E will be reduced by 0.2 mm and dimensions B & H will be reduced by 0.4 mm. The keyway register ensures the slide is located centrally.
3. Flange clamps are available to suit both the NM76 and NL76 slides. For the NM76 compatible flange clamp, please state S/L FC M76 as per table.
4. Standard drilled flange clamps will be reworked for customers requiring tapped hole option ‘Q’.

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Flat Tracks

HepcoMotion GV3 flat tracks are made from high quality carbon steel and are hardened on all four faces to provide an extremely durable running surface. They have been designed to be used with a range of track rollers. Flat tracks are often used in conjunction with V slides in large systems where the design can eliminate the requirement to set slides accurately parallel. Flat tracks are available in 4 sizes and in a number of quality grades. The P3 grade has a commercial finish on all faces and is sufficiently accurate for many applications while the other grades are precision surface ground to high accuracy on various faces according to the requirements of the application.

The standard means of securing flat tracks to the mounting surface is via counterbored fixing holes in the positions shown. Other fixing hole possibilities are available on request. Tracks in their free unmounted state are not necessarily absolutely straight, however, they may be set to the required degree of straightness during installation. It is recommended that holes in the mounting surface are positioned by ‘spotting through’ from the flat track.

See Application Examples on page 13

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Use With Track Roller</th>
<th>A</th>
<th>B</th>
<th>C₁</th>
<th>D₁</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>Φ</th>
<th>Screw Size</th>
<th>H</th>
<th>O</th>
<th>J</th>
<th>K (min)</th>
<th>L₁, L₂ (max)</th>
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</tbody>
</table>

Ordering Details

Part Number: FT4020 L1830 P2A C15 D15

Tailored values of C and D dimensions
Leave blank if standard (see table)

Precision grade: options are P1, P2A, P2B & P3

*Notes:
1. Any length of flat track within maximum length stated can be supplied, but for optimum price and delivery time, track lengths should be specified which maintain the C and D dimensions in the table above. In all cases unless otherwise specified by the customer, C and D dimensions will be supplied equal.
2. Where tracks longer than maximum length are required, two or more lengths in grades P1, P2A & P2B can be matched suitable for butting, on request. In these cases the mating ends will be ground square.
Narrow Track Rollers

The range of narrow track rollers complements the other ranges of bearings in the GV3 program. They are available mounted on both concentric and eccentric through hole fixing studs, but there is no blind hole version.

Narrow track rollers can be used in conjunction with flat tracks, single edge spacer slides and almost any type of running surface. Each uses a high capacity single row deep groove ball bearing with a substantial and stiff outer ring and a crowned outer profile. Their design makes them particularly suited to use as a retaining roller on the rear face of single edged spacer slides, and their low cost makes them suitable for any application where the high load capacity of the wide track rollers is not needed.

All track rollers are available with the Nitrile Seal (NS) option which provides a higher degree of sealing against ingress of water and debris than does the default metal shielded type. A small increase in friction may result.

See Application Examples on page 13

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Use With Flat Track</th>
<th>A</th>
<th>B</th>
<th>B1</th>
<th>C</th>
<th>C1</th>
<th>C2</th>
<th>D</th>
<th>E</th>
<th>F Metric Fine</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRN 18...</td>
<td>FT 24 12</td>
<td>18</td>
<td>11.5</td>
<td>8</td>
<td>14</td>
<td>10</td>
<td>2.5</td>
<td>500</td>
<td>7</td>
<td>M6 x 0.75</td>
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<td>1</td>
<td>0.8</td>
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</tr>
<tr>
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<td>FT 32 16</td>
<td>25</td>
<td>14.5</td>
<td>10</td>
<td>19</td>
<td>13</td>
<td>5</td>
<td>500</td>
<td>10</td>
<td>M8 x 1</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>5</td>
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<tr>
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<td>34</td>
<td>18.2</td>
<td>12.5</td>
<td>22</td>
<td>14.8</td>
<td>6</td>
<td>500</td>
<td>12</td>
<td>M10 x 1.25</td>
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<td>1.2</td>
<td>1.25</td>
<td>6</td>
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<tr>
<td>LRN 54...</td>
<td>FT 66 33</td>
<td>54</td>
<td>29.5</td>
<td>21</td>
<td>30</td>
<td>20.4</td>
<td>8</td>
<td>500</td>
<td>23.5</td>
<td>M14 x 1.5</td>
<td>14</td>
<td>1.4</td>
<td>1.6</td>
<td>8</td>
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<table>
<thead>
<tr>
<th>L*3 M M1 N</th>
<th>-0.03 -0.03</th>
<th>P</th>
<th>Weight</th>
<th>Max Working Load Capacity</th>
<th>Roller Static and Dynamic Radial Load Capacities (N)*4</th>
<th>Part Number</th>
<th>Options Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 10 13 0.7 6 11 16</td>
<td>6 11 16 400</td>
<td>593</td>
<td>1438</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>3 13 17 0.75 8 13 40</td>
<td>13 40 1000</td>
<td>1333</td>
<td>3227</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 17 21 1 10 15 85</td>
<td>2000</td>
<td>2600</td>
<td>5921</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 22 28 1.5 14 27 310</td>
<td>5000</td>
<td>6657</td>
<td>13595</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ordering Details

Part Number _____

LRN Indicates a Narrow track roller
25 denotes roller diameter in mm

LRN25 C (NS) Leave blank if metal shields are required
Nitrile Sealed bearings

C = Concentric (fixed) or E = Eccentric (adjustable)

*Notes:
1. It is recommended that holes to suit track roller mounting studs should be reamed to tolerance F6 for a sliding fit.
2. Nuts are chemically blackened on the concentric version and bright zinc plated on the eccentrics for identification purposes.
3. All eccentric narrow track roller fixing studs are supplied with sockets for adjustment as shown.
4. The quoted static and dynamic load capacities are based on industry standard calculations. These do not accurately reflect system performance, and are only provided for comparison with other systems.
5. Each size of narrow track roller has been designed for use with a specific size of flat track, as shown in the table. However, any track roller may be used in conjunction with any size of flat track, single edged slide or other running surface according to practicality of design.
Wide Track Rollers

The range of wide track rollers includes a broad range of mounting options to cater for most design requirements, and can be used in conjunction with flat tracks, single edge spacer slides and almost any type of running surface. Each uses a high capacity twin row deep groove ball bearing with a substantial and stiff outer ring and a crowned outer profile.

The through hole fixing type is available in two stud lengths covering most thicknesses of mounting plate and are available with concentric (fixed) and eccentric (adjustable) fixing studs.

The Blind Hole fixing type (BHR) allows mounting into a solid machine base where through mounting holes are not possible, or where the thickness of the mounting plate is too great. The blind hole fixing type is also useful where adjustment from the front is preferred, or where access to the opposite side of the mounting hole is restricted. They are available in Concentric type (C) which are fixed, or Eccentric type (E) which are adjustable.

The wide track rollers are available in the same basic sizes as standard ‘V’ bearings. This ensures that systems using both ‘V’ bearings and track rollers will be matched well in terms of functionality and performance.

Through Fixing Type (SR/LR)

The through fixing type is available in two stud lengths covering most thicknesses of mounting plate and are available with concentric (fixed) and eccentric (adjustable) fixing studs.

The Blind Hole fixing type (BHR) allows mounting into a solid machine base where through mounting holes are not possible, or where the thickness of the mounting plate is too great. The blind hole fixing type is also useful where adjustment from the front is preferred, or where access to the opposite side of the mounting hole is restricted. They are available in Concentric type (C) which are fixed, or Eccentric type (E) which are adjustable.

The wide track rollers are available in the same basic sizes as standard ‘V’ bearings. This ensures that systems using both ‘V’ bearings and track rollers will be matched well in terms of functionality and performance.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Use With Flat Track</th>
<th>A</th>
<th>B</th>
<th>B1</th>
<th>C</th>
<th>C1</th>
<th>C2</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>...R 18...</td>
<td>FT 24 12...</td>
<td>18</td>
<td>12.4</td>
<td>6.75</td>
<td>7.4</td>
<td>14</td>
<td>3.4</td>
<td>10</td>
<td>2.4</td>
</tr>
<tr>
<td>...R 25...</td>
<td>FT 32 16...</td>
<td>25</td>
<td>16.6</td>
<td>9</td>
<td>9.8</td>
<td>19</td>
<td>3.8</td>
<td>13</td>
<td>3.4</td>
</tr>
<tr>
<td>...R 34...</td>
<td>FT 40 20...</td>
<td>34</td>
<td>21.3</td>
<td>11.5</td>
<td>13.8</td>
<td>22</td>
<td>6.6</td>
<td>14.8</td>
<td>5.2</td>
</tr>
<tr>
<td>...R 54...</td>
<td>FT 66 33...</td>
<td>54</td>
<td>34.7</td>
<td>19</td>
<td>17.8</td>
<td>30</td>
<td>8.2</td>
<td>20.4</td>
<td>5.7</td>
</tr>
</tbody>
</table>

*SNotes:*
1. It is recommended that holes to suit track roller mounting studs should be reamed to tolerance F6 for a sliding fit.
2. Nuts are chemically blackened on the concentric version and bright zinc plated on the eccentrics for identification purposes.
3. All eccentric wide track roller fixing studs are supplied with sockets for adjustment as shown.
4. ‘R’ dimension is both the eccentric offset of the adjusting nut and the total adjustment available at the roller centerline for 360° rotation of the adjusting nut.
5. The quoted static and dynamic load capacities are based on industry standard calculations. These do not accurately reflect system performance, and are only provided for comparison with other systems.
6. Each size of wide track roller has been designed for use with a specific size of flat track, as shown in the table. However, any track roller may be used in conjunction with any size of flat track, single edged spacer slide or other running surface according to practicality of design.
Common mounting faces for track rollers and ‘V’ bearings in conjunction with flat tracks and single edge spacer slides have been achieved in most instances, to simplify customer’s machine design.

All track rollers are available with the Nitrile Seal (NS) option which provides a higher degree of sealing against ingress of water and debris than does the default metal shielded type. A small increase in friction may result.

Since track rollers have a pure rolling contact with the track, wear is much less of an issue than it is with ‘V’ bearings. Special lubricating devices are not normally required, but it is recommended that rollers and tracks are lightly oiled to ensure maximum durability.

See Application Examples on page 13

### Blind Hole Fixing Type (BHR)

<table>
<thead>
<tr>
<th>Part Number (~ Roller diameter in mm)</th>
<th>Weight ~g</th>
<th>Max Working Load Capacity</th>
<th>Static and Dynamic Radial Load Capacities (N)²</th>
<th>Part Number</th>
<th>Options Available</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>C²</td>
<td></td>
<td>Metal Shields (-)</td>
</tr>
<tr>
<td>M6 x 0.75</td>
<td>10</td>
<td>6.4</td>
<td>600</td>
<td></td>
<td>...R 18...</td>
</tr>
<tr>
<td>M8 x 1</td>
<td>14</td>
<td>8.6</td>
<td>1600</td>
<td></td>
<td>...R 25...</td>
</tr>
<tr>
<td>M10 x 1.25</td>
<td>18</td>
<td>10.8</td>
<td>3200</td>
<td></td>
<td>...R 34...</td>
</tr>
<tr>
<td>M14 x 1.5</td>
<td>28</td>
<td>13.5</td>
<td>8000</td>
<td></td>
<td>...R 54...</td>
</tr>
</tbody>
</table>

**Ordering Details**

Fixing type. Choose from:
- **SR** = Short stud, **LR** = Long stud
- **BHR** = Blind Hole fixing

Part Number (~ Roller diameter in mm) **LR 25 C (NS)**

Leave blank if metal shields are required

Nitrile Sealed rollers

C = Concentric (fixed) or E = Eccentric (adjustable)
Racks

HepcoMotion GV3 racks provide a durable and powerful linear drive when used in conjunction with good quality hardened tooth pinions.

Racks are made from high quality carbon steel, ground on all faces prior to tooth cutting. They are available in 4 standard sizes, with tooth forms from 0.7 to 2.0 metric module with 20° pressure angle and are supplied in an attractive corrosion resistant black finish.

The teeth are machined to a high degree of precision and conform to ISO 1328 grade 8. The back face of the rack is controlled parallel to the tooth pitch line enabling it to be used as a register for setting.

The racks are available with counterbored fixing holes, through tapped holes or without holes for customers to drill as required. All holes are accurately positioned to enable customers to pre-drill their mounting holes.

Care should be taken at installation to set the rack straight, and to align parallel with the relevant slide.*4 Adjustment for the pinion should be provided in order to achieve the desired mesh quality. For best performance, the teeth should be lubricated with No. 2 consistency lithium soap-based grease.

See Application Examples on pages 10 - 11

Rack with Counterbored Holes

Rack with Tapped Holes

Section X-X

Section Y-Y

Part Number | Use With Pinions | A | B | C | D | E | F | G | H | J | K | L*1,2 (max) | M | M1*3 | N mod | Max Rack Force (N)*5 | Weight kg/m
R 07... | P 07 W 5... | 12.7 | 4.0 | 20.5 | 20.5 | 45 | 6.35 | 5.65 | 4.5 | 7.6 | 2.9 | 1828 | M4 | M4 x 10 | FS410 | 0.7 | 110 | 0.37 |
R 10... | P 10 W 7... | 15.65 | 6.75 | 43 | 43 | 90 | 7.8 | 6.85 | 5.5 | 9.6 | 4.0 | 1828 | M5 | M5 x 10 | FS510 | 1.0 | 250 | 0.77 |
R 15... | P 15 W 8... | 20.0 | 8.25 | 43 | 43 | 90 | 8.3 | 10.2 | 11 | 4.5 | 1828 | M6 | M6 x 12 | FS612 | 1.5 | 400 | 1.2 |
R 20... | P 20 W 13... | 31.75 | 14.0 | 43 | 43 | 90 | 13.2 | 16.55 | 11 | 18 | 10.5 | 1828 | M10 | M10 | - | 2.0 | 950 | 3.3 |

Ordering Details

Part Number ____________
(Numbers relate to the tooth module)
Rack Length ‘L’ = 845 mm

R15 L845 (T) (C15) (D20)

Tailored values of C & D dimensions

Fixing hole style: T - Tapped fixing holes
N - No holes, leave blank for counterbored holes

*Notes:
1. Any length of rack within L max dimension can be supplied, but for optimum price and delivery time, lengths should be specified which maintain the C and D dimensions in the table above. In all cases unless otherwise specified by the customer, C and D dimensions will be supplied equal.
2. Where longer racks are required, standard lengths matched suitable for mounting end-to-end will be supplied. In these cases additional holes may be inserted to give support near the join positions. When mounting such compound racks, care must be taken to match accurately the pitch line and tooth spacing across the join. A rack matching tool, which is a short length of rack to engage in the two pieces to be mounted, will be supplied with such orders.
3. The standard counterbored holes on the three smallest sizes suit low head hex socket cap screws (to DIN 6912). These screws are not universally stocked so Bishop-Wisecarver offers them as a convenience to customers in a single length for each thread size (see table). The largest size R20 racks are thick enough to accommodate cap head screws to DIN92 which are widely available.
4. Racks in their free unmounted state are not necessarily absolutely straight. If straightness is important, the rack should be set by bolting down with the rear face located against a register.
5. The max rack force quoted is that continuous drive force which can be sustained by a well lubricated rack used in conjunction with the appropriate pinion.
Pinions

Bishop-Wisecarver supplies a range of pinions which are compatible with rack cut single edge spacer slides, double edge spacer slides with fitted racks and separate racks. Pinions have teeth with a 20° pressure angle and metric module tooth sizes. They are made to standard ISO 1328 grade 10 and are nitride hardened for durability.

Pinions are available in 2 formats: **Boss type (B, BK)** and **Shaft type (S)**. The boss type is supplied with a precision bore, optional keyway* and grub screw and is specified for general use. The shaft type includes an extended shaft with keyed diameter, which is compatible with the hollow shaft of the worm gearbox/AC geared motor and flange. This assembly provides a powerful and accurate linear drive system. (See rack driven carriage page for a complete system using these parts.)

Shaft type pinions are supplied with the key, retaining washer and screw necessary to connect to the worm gearbox. Form best performance, the teeth of the rack and pinion should be lubricated with No. 2 lithium soap-based grease.

See Application Examples on pages 10 - 12

### Shaft Type Pinion

![Diagram of Shaft Type Pinion]

Shaft type pinions are supplied with a steel key.

| Part Number | A | B | C | D | E | F | G | H | J Thread x Length | K | L² | M | N | P | Q | R¹ | S¹ | T | mod | V | W | Weight/g Boss Type |
|-------------|---|---|---|---|---|---|---|---|-------------------|---|----|---|---|---|---|----|---|----|---|---|-------------------|
| P05 W7 T28... |  14 | 15 | 14 | 10 | - | - | - | - | - | - | 5 | - | - | - | - | - | 28 | 0.5 | 7 | 11 |
| P07 W9 T28... |  19.6 | 21 | 17 | 16 | - | - | - | - | - | - | 5 | - | - | - | - | - | 28 | 0.7 | 9 | 31 |
| P07 W5 T28... |  19.6 | 21 | 13 | 16 | - | - | - | - | - | - | 5 | - | - | - | - | - | 28 | 0.7 | 5 | 22 |
| P10 W11 T42... |  42 | 44 | 23 | 15 | 30 | 23 | 76 | 40 | M6 x 16 | 5 | to order | 3 | 15 | 24 | 4 | 5 | 2.3 | 42 | 1 | 11 | 160 |
| P10 W7 T42... |  42 | 44 | 18.5 | 30 | - | - | - | - | - | - | 5 | - | - | - | - | - | 28 | 0.7 | 5 | 12 |
| P125 W14 T34... |  42.5 | 45 | 25.5 | 20 | 30 | 81 | 50 | M8 x 20 | 6 | to order | 3.5 | 15 | 32 | 5 | 5 | 2.3 | 34 | 1.5 | 34 | 14 | 200 |
| P15 W8 T28... |  42 | 45 | 19.8 | 15 | 30 | 23 | 76 | 40 | M6 x 16 | 5 | 57.4 | 3 | 15 | 24 | 4 | 5 | 2.3 | 28 | 1.5 | 8 | 125 |
| P20 W20 T27... |  54 | 58 | 35 | 20 | 40 | 81 | 50 | M8 x 20 | 6 | to order | 3.5 | 20 | 32 | 5 | 6 | 2.8 | 27 | 2 | 20 | 430 |
| P20 W13 T27... |  54 | 58 | 25 | 20 | 40 | 81 | 50 | M8 x 20 | 6 | 64.4 | 3.5 | 20 | 32 | 5 | 6 | 2.8 | 27 | 2 | 13 | 300 |

**Notes:**
1. Small boss type pinions (with bores below 8 mm) are not supplied with keyways as standard. It is usual to secure these small pinions by an alternative method such as a set screw onto a flat on the mating shaft or using a taper pin.
2. The length of the pinion shaft will depend on the exact design. Shaft pinions are made to length from part machined stock, to ensure rapid delivery and economy. The lengths shown for the P15W8T28 & P20W13T27 are those used in the rack driven carriage. Other lengths are available as required.
Belt Driven Carriages

Belt driven carriages are available to suit 10 sizes of double edge slide in all grades of precision. They have all of the benefits of the standard carriages along with many additional features:

Carriages may be specified with the **Removable option (R)** which is the key feature of the removable carriage. This allows the carriage to be disengaged from the slide at any position along its length, without the need for complete disassembly.

Each belt driven carriage incorporates a base plate and a removable top plate which can simply be unscrewed and reworked as required. Tapped holes are provided in convenient positions to enable components to be attached.

Belt driven carriages are normally supplied as **Assembled Units (AU)** which are factory assembled and set to the slide. Information regarding the options for bearings, lubrication devices and load capacities is given on the page for standard carriages.

The belt driven carriage incorporates an integral belt gripper & tensioner at each end. The gripper securely holds the toothed belt and the fixing screws allow controlled pretensioning and adjustment.

**Example: Short Carriage with Cap Seals on a Spacer Slide**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>For Use With Slides</th>
<th>Bearing G</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D4</th>
<th>E</th>
<th>F4</th>
<th>No of Holes x Thread</th>
<th>H</th>
<th>J2</th>
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</thead>
<tbody>
<tr>
<td>AU BD 35 25...</td>
<td>S 35 &amp; NS 35</td>
<td>25</td>
<td>35</td>
<td>90</td>
<td>13</td>
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<td>150</td>
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<td>50</td>
<td>100</td>
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</tr>
<tr>
<td>AU BD 50 25...</td>
<td>S 50 &amp; NS 50</td>
<td>25</td>
<td>50</td>
<td>112</td>
<td>14</td>
<td>82</td>
<td>162</td>
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<td>4 x M6</td>
</tr>
<tr>
<td>AU BD 44 34...</td>
<td>M 44 &amp; NM 44</td>
<td>34</td>
<td>44</td>
<td>116</td>
<td>15</td>
<td>95</td>
<td>168</td>
<td>65</td>
<td>60</td>
<td>90</td>
<td>6 x M8</td>
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<td>M 60 &amp; NM 60</td>
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<td>60</td>
<td>135</td>
<td>17</td>
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<td>75</td>
<td>115</td>
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<tr>
<td>AU BD 76 34...</td>
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<td>76</td>
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<td>18</td>
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<td>239</td>
<td>100</td>
<td>80</td>
<td>130</td>
<td>6 x M8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carriage Part Number</th>
<th>Pulleys</th>
<th>Belt Part No.</th>
<th>Belt Tension*5</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU BD 35 25...</td>
<td>TP20... IP20...</td>
<td>DB 20 AT5...</td>
<td>560 5390</td>
</tr>
<tr>
<td>AU BD 50 25...</td>
<td>TP20... IP20...</td>
<td>DB 20 AT5...</td>
<td>5590</td>
</tr>
<tr>
<td>AU BD 44 34...</td>
<td>TP25... IP25...</td>
<td>DB 25 AT10...</td>
<td>1225 12450</td>
</tr>
<tr>
<td>AU BD 60 34...</td>
<td>TP25... IP25...</td>
<td>DB 25 AT10...</td>
<td>1225 12450</td>
</tr>
<tr>
<td>AU BD 76 34...</td>
<td>TP25... IP25...</td>
<td>DB 25 AT10...</td>
<td>1225 12450</td>
</tr>
</tbody>
</table>

*Notes:*

1. For load capacities see standard carriages page. It is strongly recommended that load and life are determined using the methods shown in the calculations section.
2. Some dimensions will vary by the amount of the grinding allowance according to the grade of slide selected. All carriages are compatible with all grades of slide.
3. CH (Controlled Height) bearings are selected to be within ±0.005 mm in respect of ‘B’ dimension on pages 28-29 compared to standard bearings which are within ±0.025 mm. Customers requiring CH bearings with the same tolerance band in respect of a number of carriages should state this on their order.
4. Carriages are available in 2 standard lengths, therefore bearing centers ‘D’ and the number and position of component mounting holes ‘G’ will vary accordingly. Bishop-Wisecarver can provide carriages to your special length requirements on request.
5. The max belt tension stated relates to the breaking load, and is provided for comparison purposes only. The working belt tension should not be exceeded when used with pulleys and grippers.
6. The removable option is not available in conjunction with cap seals or controlled height bearings.
7. The IP 25 P15 idler pulley is fitted with 2 off 6302 2RS deep groove ball bearings (C = 11400N, Co = 5400N per bearing). The IP 20 P12 idler pulley is fitted with 2 off 6001 2RS deep groove ball bearings (C = 5070N, Co = 2360N).
In addition to the carriage, Bishop-Wisecarver will supply the necessary belt and pulleys to complete the system. Belts are steel reinforced polyurethane, and have the high strength AT tooth profile. Bored drive pulleys with zero backlash AT profile teeth are available in one size to provide a useful driving ratio for most applications. Idler pulleys are plain without teeth and are supplied complete with fitted deep groove ball bearings, ready to fit onto a shaft.

Customers wishing to run the carriage on a flat slide must specify the counterbored slide fixing hole option as the belt would otherwise foul the heads of the screws.

Customers requiring a beam mounted belt driven carriage with pulleys should consider the HepcoMotion DLS Linear Transmission which is a complete ready to mount positioning system including drive motor if required. Please send for the DLS catalog.

See Application Examples on pages 10 and 12

Example: Short Carriage with Lubricators on a Flat Slide

<table>
<thead>
<tr>
<th>K</th>
<th>L²</th>
<th>LP²</th>
<th>M</th>
<th>N²</th>
<th>P</th>
<th>Q</th>
<th>R²</th>
<th>S</th>
<th>T²</th>
<th>U</th>
<th>V²</th>
<th>Carriage Weight (kg)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>150</td>
<td>230</td>
<td>138</td>
<td>218</td>
<td>8 x 3</td>
<td>25</td>
<td>25.4</td>
<td>16.6</td>
<td>9</td>
<td>2.4</td>
<td>2.5</td>
<td>55</td>
</tr>
<tr>
<td>18</td>
<td>160</td>
<td>240</td>
<td>148</td>
<td>228</td>
<td>10 x 3.5</td>
<td>40</td>
<td>40.4</td>
<td>16.6</td>
<td>9</td>
<td>2.4</td>
<td>2.5</td>
<td>55</td>
</tr>
<tr>
<td>22.5</td>
<td>200</td>
<td>280</td>
<td>184</td>
<td>264</td>
<td>8 x 3</td>
<td>26</td>
<td>26.4</td>
<td>21.3</td>
<td>11.5</td>
<td>3.1</td>
<td>3.2</td>
<td>70</td>
</tr>
<tr>
<td>22.5</td>
<td>224</td>
<td>304</td>
<td>208</td>
<td>288</td>
<td>10 x 3.5</td>
<td>42</td>
<td>42.4</td>
<td>21.3</td>
<td>11.5</td>
<td>3.1</td>
<td>3.2</td>
<td>70</td>
</tr>
<tr>
<td>22.5</td>
<td>244</td>
<td>344</td>
<td>228</td>
<td>328</td>
<td>12 x 4</td>
<td>58</td>
<td>58.4</td>
<td>21.3</td>
<td>11.5</td>
<td>3.1</td>
<td>3.2</td>
<td>70</td>
</tr>
</tbody>
</table>

Ordering Details

Part Number: AUBD4434 L200 (R) (CS) (DR) (NS) (CH) (T) + Slide Part Number

- **AU** = Assembled carriage
- **L** = Carriage Length 'L' = 200 mm
- **R** = Removable carriage option
- **CS** = Cap Seals or **LB** for Lubricators
- **CH** = Controlled Height bearings
- **NS** = Nitrile Sealed bearings
- **DR** = Double Row bearings
- **T** = Tamper proof option
- Leave blank if not required

Ordering Details for Pulleys & Belts

- **TP** 20 AT5 T27 P12.0
- **TP** 25 AT10 T20 P15.0
- **IP** 20 P12
- **IP** 25 P15
- **DB** 20 AT5 L2345
- **DB** 25 AT10 L3456

- **Toothed Drive Pulley** for 20 mm wide AT5 belt with 27 teeth & 12 mm plain bore.
- **Toothed Drive Pulley** for 25 mm wide AT10 belt with 20 teeth & 15 mm plain bore.
- **Idler Pulley** for 20 mm wide belt with fitted bearings to run on 12 mm Ø shaft.
- **Idler Pulley** for 25 mm wide belt with fitted bearings to run on 15 mm Ø shaft.
- **Drive Belt** 20 mm wide with AT5 tooth profile. **L2345** is the required length in mm.
- **Drive Belt** 25 mm wide with AT10 tooth profile. **L3456** is the required length in mm.
Rack Driven Carriages

Driven carriages are available to suit 5 sizes of double edge spacer slide (with fitted racks) in all grades of precision. They have all of the benefits of the standard type carriage along with many additional features including micro-adjustment facility for achieving the correct engagement of the pinion with the rack.

Rack driven carriages include the worm gearbox, drive flange and shaft pinion of suitable ratio. The gearbox may be supplied coupled with an integral AC motor which is the most economical means of producing point-to-point linear motion, and which may be controlled for speed and acceleration via the AC speed controller, which is available from Bishop-Wisecarver. The gearbox can also be supplied with an adaptor flange and input shaft coupling tailored to suit other makes or types of motors including steppers and servos which benefit from the low backlash of the gearbox.

Tailored carriages are available on short delivery for customers wishing to use their own motor, gearbox and pinion.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Use with Slides</th>
<th>A</th>
<th>B</th>
<th>F</th>
<th>F1</th>
<th>G</th>
<th>G1</th>
<th>G2</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>N</th>
<th>P</th>
<th>P1</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU RD 44 34...</td>
<td>NM 44...R</td>
<td>44</td>
<td>133</td>
<td>38.2</td>
<td>72.3</td>
<td>74.8</td>
<td>28.8</td>
<td>22</td>
<td>97.8</td>
<td>56</td>
<td>74.1</td>
<td>43</td>
<td>18</td>
<td>22.5</td>
</tr>
<tr>
<td>AU RD 60 34...</td>
<td>NM 60...R</td>
<td>60</td>
<td>144</td>
<td>29.7</td>
<td>88.3</td>
<td>90.8</td>
<td>20.3</td>
<td>22</td>
<td>105.3</td>
<td>56</td>
<td>74.1</td>
<td>43</td>
<td>18</td>
<td>22.5</td>
</tr>
<tr>
<td>AU RD 76 34...</td>
<td>NM 76...R</td>
<td>76</td>
<td>154</td>
<td>21.7</td>
<td>104.3</td>
<td>106.8</td>
<td>12.3</td>
<td>22</td>
<td>113.3</td>
<td>56</td>
<td>74.1</td>
<td>43</td>
<td>18</td>
<td>22.5</td>
</tr>
<tr>
<td>AU RD 76 54...</td>
<td>NL 76...R</td>
<td>76</td>
<td>193</td>
<td>41.2</td>
<td>119.1</td>
<td>123</td>
<td>27.2</td>
<td>33</td>
<td>141.2</td>
<td>80</td>
<td>100.6</td>
<td>57</td>
<td>20</td>
<td>36.5</td>
</tr>
<tr>
<td>AU RD 120 54...</td>
<td>NL 120...R</td>
<td>120</td>
<td>240</td>
<td>38.5</td>
<td>163.1</td>
<td>167</td>
<td>24.5</td>
<td>33</td>
<td>182.5</td>
<td>80</td>
<td>119.8</td>
<td>111.3</td>
<td>20</td>
<td>36.5</td>
</tr>
</tbody>
</table>

Please see other table for dimensions C, D, E & L

*Notes:*
1. The maximum load capacities quoted on the standard and removable carriage pages, assume lubrication at the interface of bearings and slide. This can best be achieved by using cap seals or lubricators. It is strongly recommended that load and life are determined using methods shown in the calculations section.
2. Some dimensions will vary by the amount of the grinding allowance according to the grade of slide selected. All carriages are compatible with all grades of slide.
3. CH (Controlled Height) bearings are selected to be within ±0.005 mm in respect of ‘B’ dimension on pages 28-29 compared to standard bearings which are within ±0.025 mm. Customers requiring CH bearings with the same tolerance band in respect of a number of carriages should state this on their order.
4. The carriage bearing and cap seal fixing centers F are optimized for use with any precision grade of slide. Customers making their own carriage plate should calculate their drilling centers for the particular grade of slide selected. Please see assembled systems or individual component page for details of calculations.
5. Any number and size of tapped mounting holes ‘M’ can be provided in any available position. These may be specified in the ordering details after the designation M by stating the co-ordinates X & Y relative to the datum point, followed by the tapped hole size. Example: M - X10Y25M6 - x=X=10 mm, y=25 mm, hole size = M6. Care should be taken to avoid any hole position that bridges the contact area between cap seal and carriage plate as this will allow grease to escape.
6. The removable option is not available in conjunction with cap seals or controlled height bearings.
7. The quoted rack drive force is determined by the rack and pinion size, gearbox bearings and gears, and the duty.
Carriages may be specified as the removable type which incorporates double eccentric bearings and allows the disengagement of the carriage from the slide at any position along its length without the need for complete disassembly.

Rack driven carriages are normally supplied as **Assembled Units (AU)** which are factory assembled and set to the slide. More specific information regarding the options for bearings, lubrication devices and load capacities is given on the pages for both standard and removable carriages*. For details of linear drive performance, please see the calculations section.

For best performance, the teeth should be lubricated with No. 2 consistency lithium soap-based grease.

---

### Specifying the Format and Size of the Carriage

3 styles of carriage are available with motor mounting positions as shown in the diagram below. The style and size are specified by selecting the required values for dimensions C, D, E, & L in the table below the diagram. Any values for these dimensions may be chosen subject to the recommended limitations in the table. If lubricators are specified with style 2 carriage, these will be offset to one another as indicated in the diagram.

The motor and gearbox can be mounted in any one of 8 orientations.

---

### Ordering Details

**Part Number**

- **AU RD...34...**
  - Style 1
  - Style 2
  - Style 3

**Minimum Recommended Values**

- **With Cap Seals**
  - **C**
  - **D**
  - **E**
  - **L**
- **With Lubricators**
  - **C**
  - **D**
  - **D1**
  - **E**
  - **L**

**Ordering Details**

- **T** = Tamper proof option
  - Leave blank if not required
- **DR** = Double Row bearings - Leave blank if not required
- **CS** for Cap Seals or **LB** for Lubricators
  - Leave blank if not required
- **CH** = Controlled Height bearings
  - Leave blank if not required
- **NS** = Nitrile Sealed bearings
  - Leave blank if not required

---

*Figures marked * are the minimums which can be achieved without the flange covering the bearing stud counterbore or the cap seal or lubricator fixings. Smaller values of these dimensions can be achieved if overlap is acceptable to the customer. When specifying such reduced dimensions, the customer should ensure that the pinion does not interfere with either bearings, cap seals or lubricators.*
Load/Life Calculations

V Slide & Bearing Systems

The load capacity and life of V slide systems will be determined by several factors. The key issues are the size and type of bearing and slide, the presence or absence of lubrication and the magnitude and direction of loads.

Other factors including operational speed, length of stroke and environmental conditions may also have an effect*2.

When calculating the system load and life, one of two approaches should be taken; if the system uses a conventional 4 bearing carriage (such as any of the GV3 carriages), then this may be treated as a single item, and the load and life be determined as in the 4 Bearing Carriage Calculations below; alternatively, each V bearing can be treated separately according to the method shown in the Individual Bearing Calculations section.

4 Bearing Carriage Calculations

When calculating the loading and life of a V slide system using a 4 bearing carriage, the loading on the system should be resolved into the direct load components, \( L_A \) and \( L_R \), and the moment loading components \( M_P \), \( M_R \), and \( M_Y \) (see diagram on right).

The maximum direct and moment load capacities for standard carriages are given in the tables below. Capacities are included for both 'dry' and 'lubricated'*4 conditions - this refers to the 'V' contact, since all bearings are greased internally for life. Values are based on shock-free duty.

<table>
<thead>
<tr>
<th>Carriage Part Numbers</th>
<th>Dry System, Twin and DR Type Bearing</th>
<th>Lubricated System, Twin Type Bearing</th>
<th>Lubricated System, DR Type Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( L_{A\text{max}} )</td>
<td>( L_{R\text{max}} )</td>
<td>( M_{R\text{max}} )</td>
</tr>
<tr>
<td>AU...12 13...</td>
<td>90</td>
<td>90</td>
<td>0.5</td>
</tr>
<tr>
<td>AU...20 18...</td>
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<td>1.6</td>
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<td>AU...28 18...</td>
<td>180</td>
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<td>16</td>
</tr>
<tr>
<td>AU...60 34...</td>
<td>800</td>
<td>800</td>
<td>22</td>
</tr>
<tr>
<td>AU...76 34...</td>
<td>800</td>
<td>800</td>
<td>29</td>
</tr>
<tr>
<td>AU...76 54...</td>
<td>1800</td>
<td>1800</td>
<td>64</td>
</tr>
<tr>
<td>AU...120 54...</td>
<td>1800</td>
<td>1800</td>
<td>100</td>
</tr>
</tbody>
</table>

Calculating the System Load Factor

To calculate the system life, the load factor \( L_F \) should first be calculated using the equation below. Where \( M_R \) & \( M_P \) loads are concerned, the \( M_{Y\text{max}} \) and \( M_{P\text{max}} \) for the relevant carriage will need to be determined. This is established by multiplying the figure shown in the table by the spacing of the bearings, \( D \), in meters.

\[
L_F = \frac{L_A}{L_{A\text{max}}} + \frac{L_R}{L_{R\text{max}}} + \frac{M_R}{M_{R\text{max}}} + \frac{M_P}{M_{P\text{max}}} + \frac{M_Y}{M_{Y\text{max}}}
\]

\( L_F \) should not exceed 1 for any combination of loads.

Once \( L_F \) has been determined for the application, the life is calculated as shown at the bottom of page 47.
Individual ‘V’ Bearing Calculations

Many systems do not use a standard 4 bearing carriage. In such cases it is necessary to use conventional statics calculations to determine the loading on each bearing in the system, by resolving loads into axial (L_A) and radial (L_R) components.

The maximum L_A and L_R load capacities for all types of ‘V’ bearing are given in the tables below. Capacities are included for both ‘dry’ and ‘lubricated’ conditions - this refers to the ‘V’ contact, since all bearings are greased internally for life. Values are based on shock-free duty.

### Load Capacities for Twin Standard Bearings

<table>
<thead>
<tr>
<th>Bearing Part Numbers</th>
<th>Dry L_A(N)</th>
<th>Dry L_R(N)</th>
<th>Lubricated L_A(N)</th>
<th>Lubricated L_R(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J 13...</td>
<td>22.5</td>
<td>45</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>J 18...</td>
<td>45</td>
<td>90</td>
<td>125</td>
<td>200</td>
</tr>
<tr>
<td>J 25...</td>
<td>100</td>
<td>200</td>
<td>320</td>
<td>600</td>
</tr>
<tr>
<td>J 34...</td>
<td>200</td>
<td>400</td>
<td>800</td>
<td>1400</td>
</tr>
<tr>
<td>J 54...</td>
<td>450</td>
<td>900</td>
<td>1800</td>
<td>3200</td>
</tr>
</tbody>
</table>

### Load Capacities for Double Row Standard Bearings

<table>
<thead>
<tr>
<th>Bearing Part Numbers</th>
<th>Dry L_A(N)</th>
<th>Dry L_R(N)</th>
<th>Lubricated L_A(N)</th>
<th>Lubricated L_R(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J 18 DR...</td>
<td>45</td>
<td>90</td>
<td>190</td>
<td>600</td>
</tr>
<tr>
<td>J 25 DR...</td>
<td>100</td>
<td>200</td>
<td>400</td>
<td>1500</td>
</tr>
<tr>
<td>J 34 DR...</td>
<td>200</td>
<td>400</td>
<td>900</td>
<td>3000</td>
</tr>
<tr>
<td>J 54 DR...</td>
<td>450</td>
<td>900</td>
<td>2400</td>
<td>5000</td>
</tr>
</tbody>
</table>

### Load Capacities for Slimline Bearings

<table>
<thead>
<tr>
<th>Bearing Part Numbers</th>
<th>Dry L_A(N)</th>
<th>Dry L_R(N)</th>
<th>Lubricated L_A(N)</th>
<th>Lubricated L_R(N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J 195...</td>
<td>45</td>
<td>90</td>
<td>100</td>
<td>235</td>
</tr>
<tr>
<td>J 265...</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>J 360...</td>
<td>200</td>
<td>400</td>
<td>500</td>
<td>1200</td>
</tr>
<tr>
<td>J 580...</td>
<td>450</td>
<td>900</td>
<td>1060</td>
<td>2600</td>
</tr>
</tbody>
</table>

The above figures assume that bearings are used with slides equal to or larger than the preferred slide selection for that bearing size. For details of the preferred sizes, see tables on pages 28-31. For loading of bearings with smaller slides, please contact Bishop-Wisecarver Corporation.

### Calculating the System Load Factor

To calculate the system life, the load factor L_F should first be calculated using the equation below.

\[
L_F = \frac{L_A}{L_{A(max)}} + \frac{L_R}{L_{R(max)}}
\]

L_F should not exceed 1 for any combination of loads.

Once L_F has been determined for each bearing, the life can be calculated as follows:

#### Calculating System Life

With L_F determined for either a 4 bearing carriage or for an individual bearing, the life in km can be calculated using one of the two equations below. These equations, the Basic Life is taken from the table (right) in respect of the bearing and the lubrication condition applicable.

**Dry System**

\[
\text{Life (km)} = \frac{\text{Basic Life}}{(0.03 + 0.97L_F)^3}
\]

**Lubricated System**

\[
\text{Life (km)} = \frac{\text{Basic Life}}{(0.03 + 0.97L_F)^3}
\]

*Notes:

1. The maximum values of M_N, M_v, M_a, L_A and L_R, and the magnitudes of the system Basic Life for each bearing type relate to the performance of complete systems. Tests have shown these figures to be more reliable than working from the theoretical static and dynamic load capacities (C and Co) of the bearings. Values of C and Co have been included in tabulated data on the relevant bearing pages as a means of comparison with other systems.
2. The calculations within this section assume that the linear stroke involves a number of complete bearing revolutions. If the stroke of any application is less than five times the bearing outside diameter, then please calculate the distance travelled as if it moves five bearing diameters per stroke. Systems operating at speeds in excess of 8 m/s may require additional calculation. Please contact Bishop-Wisecarver Corporation for assistance.
3. For the purposes of the load/life calculations on this page, the axial load L_A is that load in the axial direction which the bearing can accept from a ‘V’ slide engaged in its outer ring. Since the line of force is some distance removed from the axis of the bearing, this value is much less than the theoretical axial load capacity which is quoted on the relevant bearing page.
4. In the above calculations, the term lubricated refers to the contact between the slide and bearing ‘V’s. This lubrication may best be achieved using lubricators, cap seals or cap wipers, however other methods which ensure the presence of a suitable grease or oil in the critical area are acceptable.
5. When a system consists of more than 4 bearings per carriage (e.g. see application examples on pages 9 & 12) it cannot always be guaranteed that the load will share equally between all bearings. In such cases it is recommended that controlled height bearings are specified (where available) and that the system is derated to allow for the life of the most heavily laden bearing.
6. For some sizes of DR bearing, the actual life for applications with mainly L_R/radial loads may be higher than the calculations indicate. This is because the calculations are simplified for easy use. Please contact Bishop-Wisecarver Corporation for details in instances where a higher system life is required.
System Assembly and Adjustment*

Through Fixing Type Bearings & Track Rollers

Having loosely assembled the components (minus load), the concentric bearings should be fully tightened and the eccentric bearings tightened just sufficiently to permit adjustment.

The adjusting wrench should then be engaged with hexagon flanges of the eccentric bearings and gradually turned until the slide or track is captivated between each pair of bearings such that there is no apparent play, but with minimal pre-load. Each pair of bearings should then be checked for correct pre-load by rotating one of them between forefinger and thumb with the slide or track stationary so that the bearing skids against it. A degree of resistance should be felt, but the bearing should turn without difficulty.

When all eccentric bearings have been adjusted and tested in this manner, the fixing nuts should be fully tightened to the recommended torque settings as in the table on page 49, then checked again for pre-load as before.

Please note that too much pre-load will shorten the life of the system. Customers not familiar with this setting procedure may wish to purchase a preload adjusting tool (available for standard bearings only) for use as a training aid and as a means of checking by the quality control department.

Alternative means of adjustment

The eccentric bearings may also be adjusted using a standard allen key and socket tool. This method permits re-adjustment without first having to remove cap seals or cap wipers; however, extreme care should be taken not to induce excessive pre-load which can only be judged in this case from the resulting friction of the system. Due to the reduced control associated with this method, it is only recommended when the adjusting wrench method is not possible.

Blind Hole Fixing Type Bearings & Track Rollers

The concentric blind hole fixing bearings or track rollers are simply screwed into tapped holes in the mounting surface and tightened down using the adjusting wrench.

Each eccentric bearing or roller should be located by means of the two screws provided and tightened just sufficiently to still enable adjustment via the eccentric hexagon bush. The same basic procedures as outlined for the through fixing type should be used to ensure that the correct level of pre-load is applied before finally tightening down the fixing screws.
Cap Seals
Fitting of the cap seals should be carried out after bearing adjustment has been completed.

To fit the cap seals over the bearings, the carriage should be removed from the slide, then the cap seals loosely assembled to the carriage plate utilizing either the through hole fixing facility which is the default method for GV3 carriages, or the tapped hole fixing facility which requires tapped holes to be provided in the carriage plate. Two sets of plastic inserts are included with each cap seal to cater for both methods.

The slide should be re-engaged with the carriage and each cap seal adjusted in, until the felt wipers just make contact with the slide 'V' surface until smearing of the lubricant is observed when the system is operated. When adjusting the cap seal using the through hole fixing method, care should be taken to hold the plastic inserts to prevent them from moving while the screws are tightened.

Greater sealing effect, at the expense of increased friction, may be achieved by adjusting each cap seal body in further until it's 'V' profile makes contact with the 'V' profile of the slide.

The fixing screws should be fully tightened and each cap seal charged with a No. 2 lithium soap-based grease until grease is seen to overflow.

Male grease connector, part No. CSCHF 4034 or complete gun is available from Bishop-Wisecarver Corporation if required.

Cap Wipers
Fitting of the cap wipers should be carried out after bearing adjustment has been completed.

To fit the cap wipers over the bearings, the carriage should be removed from the slide, then the cap wipers loosely assembled to the carriage plate utilizing either the tapped hole fixing facility which is the default method for slimline carriages, or the through hole fixing facility which requires slotted clearance holes to be provided in the carriage plate for adjustment.

The slide should then be re-engaged with the carriage and each cap wiper adjusted in, until the felt wipers just make contact with the slide 'V' surface until smearing of the lubricant is observed when the system is operated.

The fixing screws should be fully tightened and each cap wiper charged with a No. 2 lithium soap-based grease until grease is seen to overflow.

Male grease connector, part No. CSCHF 4034 or complete gun is available from Bishop-Wisecarver Corporation if required.

Bearing/Track Roller Adjusting Tools and Tightening Torques
When ordering individual components for the first time, an adjusting wrench or socket tool should also be ordered - these are only available from Bishop-Wisecarver Corporation.

<table>
<thead>
<tr>
<th>Bearing/Roller Type</th>
<th>13...</th>
<th>195...</th>
<th>18...</th>
<th>265...</th>
<th>25...</th>
<th>360...</th>
<th>34...</th>
<th>580...</th>
<th>54...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusting Wrench</td>
<td>AT13</td>
<td>AT18</td>
<td>AT18</td>
<td>AT25</td>
<td>AT25</td>
<td>AT34</td>
<td>AT34</td>
<td>AT54</td>
<td>AT54</td>
</tr>
<tr>
<td>Socket Tool</td>
<td>-</td>
<td>RT6</td>
<td>RT6</td>
<td>RT8</td>
<td>RT8</td>
<td>RT10</td>
<td>RT10</td>
<td>RT14</td>
<td>RT14</td>
</tr>
<tr>
<td>Preload Adjusting Tool</td>
<td>ST13</td>
<td>-</td>
<td>ST18</td>
<td>-</td>
<td>ST25</td>
<td>-</td>
<td>ST34</td>
<td>-</td>
<td>ST54</td>
</tr>
<tr>
<td>Fixing Nut Torque</td>
<td>2 Nm</td>
<td>7 Nm</td>
<td>7 Nm</td>
<td>18 Nm</td>
<td>18 Nm</td>
<td>33 Nm</td>
<td>33 Nm</td>
<td>90 Nm</td>
<td>90 Nm</td>
</tr>
</tbody>
</table>

*A guide to installation and adjustment of other components may be found on the individual component pages as relevant.
System Selector

The customer has a wide choice of HepcoMotion GV3 components in order to satisfy most linear motion requirements. To facilitate the selection process, the most commonly used components for a basic slide system have been tabulated to show comparative benefits when used within a complete system.

The benefits in the table are the important ones which can be shown in comparative form and are by no means exhaustive. Please see the system composition section (pages 2-7) and pages relating to the individual components for other features, benefits and variants.

<table>
<thead>
<tr>
<th>Bearing Type</th>
<th>Load</th>
<th>Speed</th>
<th>Smoothness</th>
<th>Tolerance of Misalignment</th>
<th>Rigidity</th>
<th>System Height</th>
<th>Tolerance of Debris</th>
<th>Price</th>
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<tbody>
<tr>
<td>Standard Pattern</td>
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<td>Twin Type</td>
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<td>Double Row Type</td>
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<thead>
<tr>
<th>Slide Precision Grade</th>
<th>General Accuracy</th>
<th>Smoothness /Quietness</th>
<th>Friction</th>
<th>Price</th>
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<td>P3</td>
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<thead>
<tr>
<th>Lubrication Method</th>
<th>Load</th>
<th>Lubrication Interval</th>
<th>Debris Exclusion</th>
<th>Friction</th>
<th>Safety &amp; Appearance</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
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<tr>
<td>Lubricators</td>
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<tr>
<td>Cap Seals or Cap Wipers</td>
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</table>

*The Vee bearing principle has a natural wiping action which tends to expel debris.

The above information is a general guide intended for preliminary selection purposes only.
APPLICATION DATA SHEET

Company: ____________________________________________________________
Contact: ____________________________________________________________
Address: ____________________________________________________________

City: ___________________ State: ___________________ Zip Code: ___________________
Phone: ___________________ Fax: ___________________ e-mail: ___________________

System Orientation: ___________________
Load: ___________________ horizontal lbs________________________ vertical N
Stroke Length: ___________________ in________________________ in________________________
Velocity: ___________________ in/s________________________ m/s________________________
Accel/Decel: ___________________ in/s^2________________________ m/s^2________________________
Linear Accuracy: ___________________ in________________________ mm________________________
Repeatability: ___________________ in________________________ mm________________________
Duty Cycle: ___________________ in/day________________________ m/day________________________
Environment: ___________________ factory________________________ food grade________________________
Temperature: ___________________ °F________________________ °C________________________
Additional Forces: ___________________ lbs________________________ N________________________

Product/Machine Description: ____________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Additional Requirements: ______________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Expected Volume: ___________________ Date Needed: ___________________

System Sketch
TECHNICAL SPECIFICATIONS

‘V’ Slides
Material and Finish: High carbon bearing steel AISI 52100, hardened on ‘V’ faces to 58-62 Rockwell ‘C’ scale. Those areas which are ground have N5 surface finish. Other areas have a chemical black finish.

Flat Tracks
Material and Finish: Carbon steel, hardened on all faces to 58-62 Rockwell ‘C’ scale. Those areas which are ground have N5 surface finish. Other areas have a chemical black finish.

Bearings & Track Rollers
Bearing Raceways and Balls: Carbon-chromium bearing steel AISI 52100, hardened and tempered
Shields: Steel with bright zinc plated finish
Seals: Nitrile rubber
Cage: Plastic
Studs: High tensile steel with tensile strength = 695 N/mm², chemical black finish
BH...‘E’ Base Plate: Cast steel with chemical black finish
Temperature Range: -20°C to +120°C

Carriage Plates & Flange Clamps
Material: High strength aluminum alloy
Finish: Clear anodized to 15µm thickness

Carriage Plate & Slide Counterbore Plugs
Material: Plastic

Cap Seals
Material: Body: Thermoplastic elastomer
Inserts: Impact resistant plastic
Wipers: Felt
Temperature Range: -20°C to +60°C

Cap Wipers & Lubricators
Material: Impact resistant plastic with felt wiper
Temperature Range: -20°C to +60°C

Frictional Resistance for ‘V’ Slide Systems
Coefficient of friction (without cap seals, cap wipers or lubricators) = 0.02
Cap seals and lubricators add friction as follows:
4 cap seals or wipers per carriage
   CS18 or CW195 = 4 N
   CS34 or CW360 = 15 N
2 lubricators per carriage
   LB12 = 1 N
   LB25 & LB265 = 2.5 N
   LB54 & LB580 = 4 N
   CS25 or CW265 = 7 N
   CS54 or CW580 = 28 N
   LB20 & LB195 = 1.5 N
   LB44 & LB360 = 3 N

External Lubrication
Cap seals and cap wipers should be lubricated with grease NLGI consistency No. 2.
Lubricators should be oiled using 68 cSt viscosity or similar oil. Food compatible lubricants can also be used.

Maximum Linear Speeds for ‘V’ Slides & Bearings and Flat Tracks & Rollers
Unlubricated ‘V’ slides = 12 m/s
Lubricated ‘V’ slides & all flat track applications = 8 m/s

Material specifications may change for reasons of technical advantage or availability.
Bishop-Wisecarver Corporation: Manufacturer of the original DualVee® guide wheel and industry leader in guided motion technology, and exclusive North and Central American partner and distributor for HepcoMotion products since 1984.

Bishop-Wisecarver
DualVee® Guide Wheels
LoPro® Linear Motion System
MadeWell™ Crown Rollers
MinVee® Linear Slide System
QuickTrak® Linear Motion System
SRX-150 Linear Motion System
UtiliTrak® Linear Motion Guide

HepcoMotion®
DAPDU2 Double Acting Profile Driven Unit
DLS Driven Linear System
DTS Driven Track System
GV3 Linear Guidance and Transmission System
HDCB Heavy Duty Compact Beam
HDSC Heavy Duty Compact Screw
HDLS Heavy Duty Driven Linear System
HDS Heavy Duty Slide System
MHD Heavy Duty Track Roller Guidance System
PDU2 Profile Driven Unit
PRT Precision Ring Track System
PSD120 Profile Screw Driven Unit
SBD Sealed Belt Drive
Simple-Select®
SL2 Stainless Steel Based Slide System

PRODUCT ORDERS
Please call Bishop-Wisecarver with your specific application requirements. Our technical staff is available to assist with your custom solution.

Bishop-Wisecarver provides a written one year limited warranty assuring the customer that its products conform to published specifications and are free from defects in material or workmanship.

Complete terms and conditions and warranty information is available at www.bwc.com/about_conditions.vp.html

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