No. 1 Design Criteria for Track System Drives

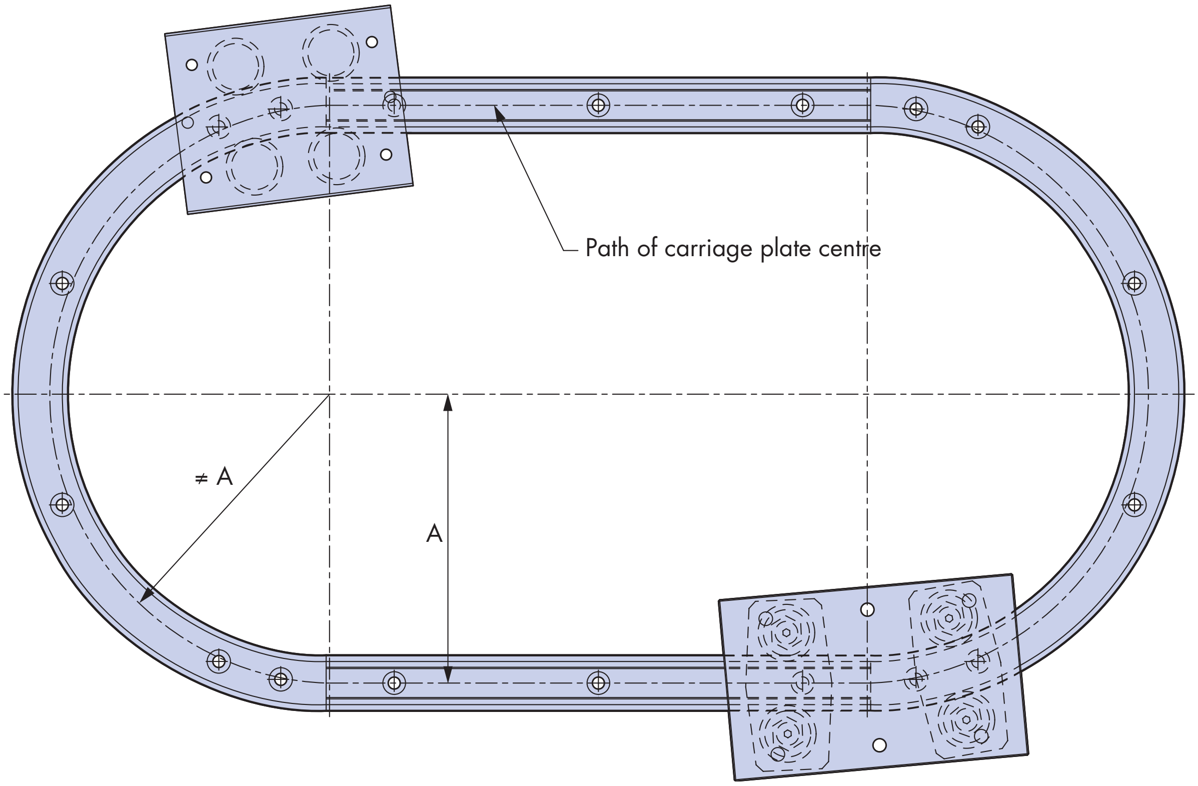

Figure 2 Path of centre of carriage traversing an oval track

Carriage Type	FCC 12 93	FCC 12 127	FCC 20 143	FCC 20 210	FCC 25 159	FCC 25 255	FCC 25 351	FCC 44 468	FCC 44 612	FCC 76 799	FCC 76 1033	FCC 76 1267	FCC 76 1501
Movement into centre	1.44	0.96	1.46	1.12	3.11	1.61	1.32	2.69	2.28	2.99	3.32	3.69	4.08

Carriage Type	BCP25 On R25159	BCP25 On R25255	BCP25 On R25351	BCP44 On R44468	BCP44 On R44612	BCP76 On R76799	BCP76 On R761033	BCP76 On R761267	BCP76 On R761501
Movement into centre	9.4	5.7	4.1	5.4	4.1	5.4	4.1	3.3	2.8

Table 2 Movement of carriage towards centre of ring segment as the carriage turns the corner

In most applications for closed circuit track systems, the important area for the process is the straight section, where the 'action' of the application occurs. The curved section usually only functions as a return path. In such instances, precise motion control is only needed on the straight sections and hence the slight clearance which develops as the fixed centre carriages traverse the joint from straight to curve (or vice versa) is unlikely to cause a problem. In those circumstances where this clearance is unacceptable then Hepco bogie carriages, which do not develop play in this way, may be specified.

When driving a track system using a chain or toothed belt, bends will usually be negotiated by wrapping the chain or belt around sprockets or pulleys. Because of the movement of the carriage plate towards the centre of the curve as the carriage traverses the joint, some flexibility must be engineered into the system to accommodate this. Driving via a spigot engaging in a slot as shown in figure 3 is a practical means of achieving this.

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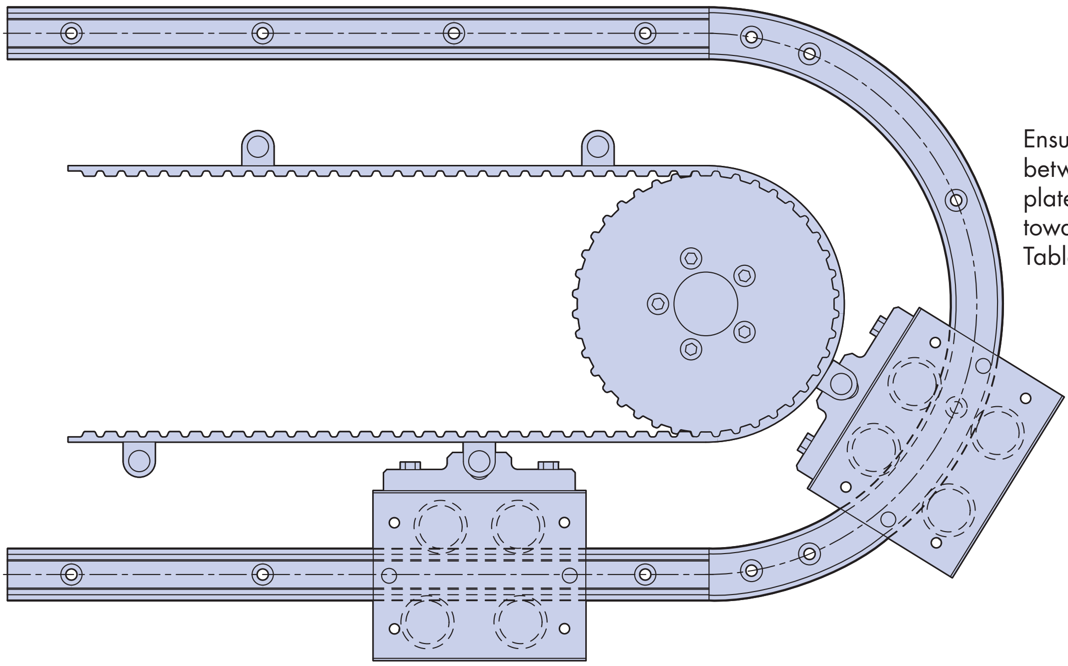
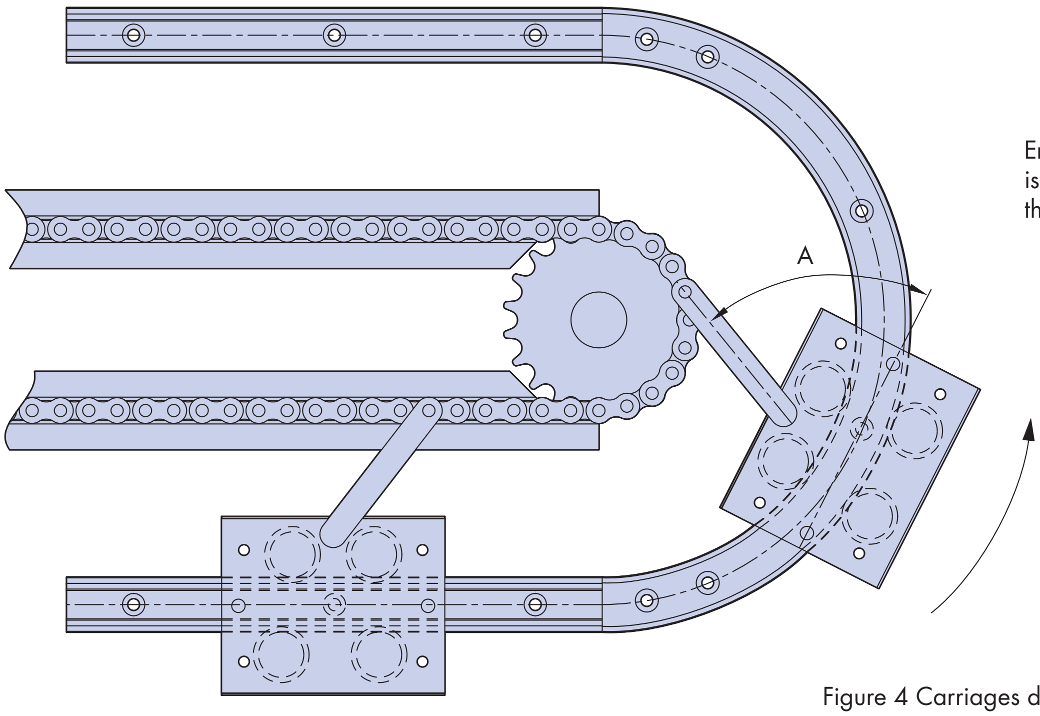


Ensure that the connection between the belt and carriage plate allows for movement towards the centre identified in Table 2.

Figure 3 Carriages driven via a spigot on a toothed belt or chain

When using this type of arrangement, it is usual to have the driving force on the carriage off centre, and consequently there will be some contribution to the moment loading of the system. Such loading must be accounted for when calculating the load and life of the system (see datasheet No. 3 Load life information). Alternatively the carriage may be connected to the chain or belt via a drag link as illustrated in figure 4 below.



Ensure that the effect of angle ‘A’ is accounted for when calculating the load on the system.

Figure 4 Carriages driven by a drag link on a chain

When using a drag link it should be remembered that there will be a component of force pulling the carriage towards the centre of the track system, and this force should be accounted for when calculating the load and life of the system. The force on the carriage plate should be calculated when the carriage is on the curve, since this is where the worst case occurs.

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When using linked carriages as described above, several methods may be used to provide the driving force. These methods include the use of a HepcoMotion Powerslide indexing the system by one pitch per stroke, or using a screw drive. Both of these drive possibilities are illustrated in figure 6 below.

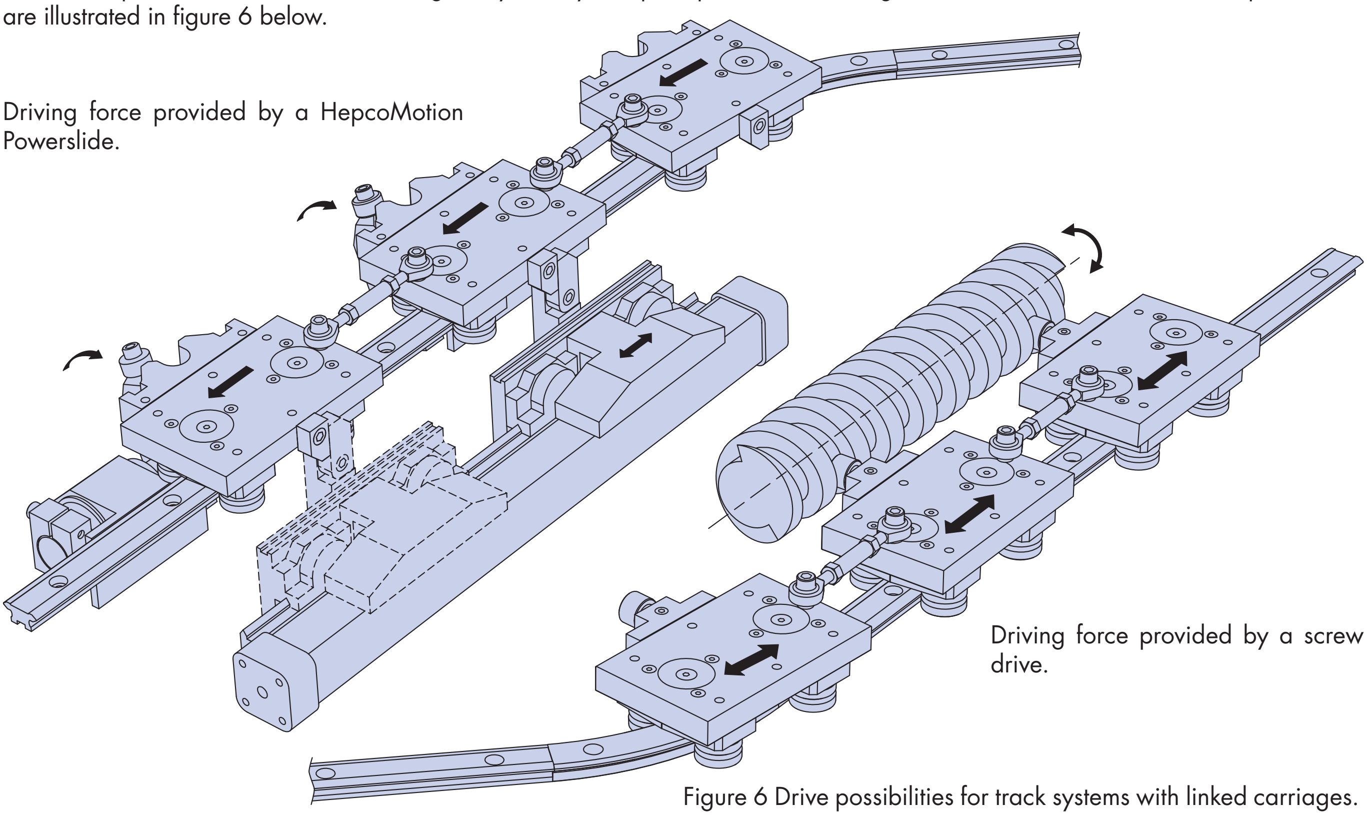

Figure 6 Drive possibilities for track systems with linked carriages.

Linked carriage drives can encounter difficulties if the tie bar length or carriage plate link mounting centres are larger than about 40% of the ring diameter. This criterion prevents the use of this driving method with 159 diameter rings.
A scale drawing should be made to visualise the track system in those applications where long links are required on small diameter rings. Since this will identify any adverse driving conditions where the links are at a large angle to the ring tangent and hence will have a tendency to generate significant edge loading or even cause uneven running or jam-ups.
If a screw drive is being specified, care should be taken when designing a linked carriage system to ensure that the distance between adjacent carriages is a whole number of screw pitches. In most closed circuit applications, the distance between carriages would be determined by the overall length of the track along with the number of carriages, so this must be accounted for when selecting the screw.
When designing a drive for a belt or chain driven system, care should be taken to take into account the increase in speed of the carriage as it travels from straight to curve. When the carriage is travelling along the straight track it has the same velocity as the belt. (See figure 7).

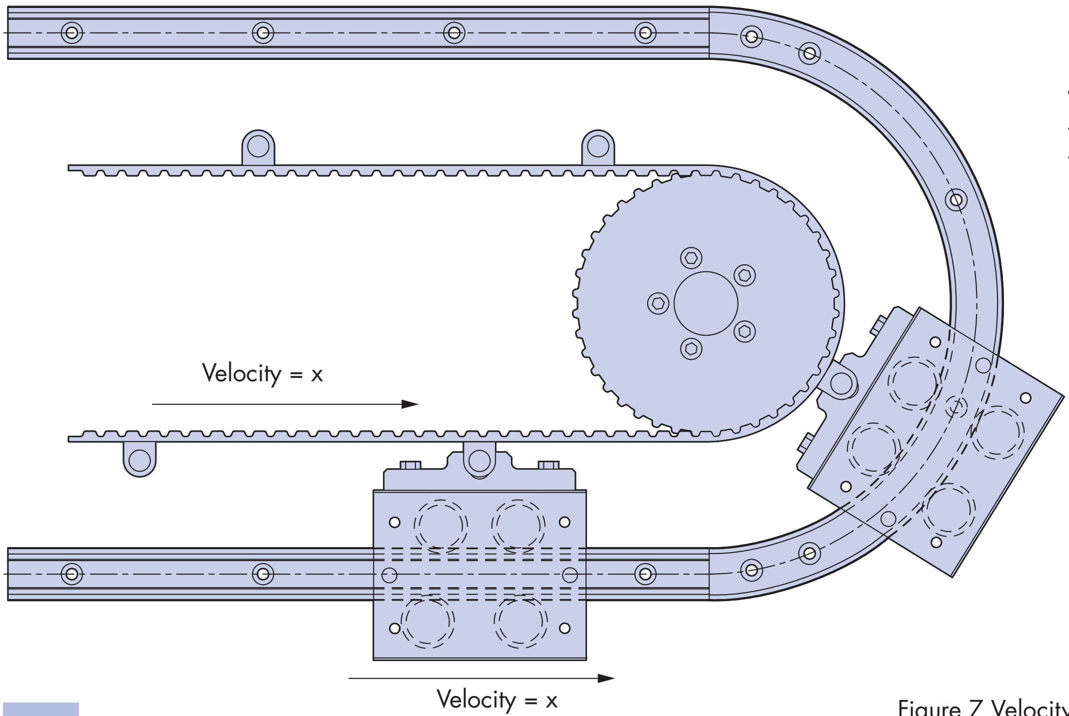

Figure 7 Velocity change in the track system.

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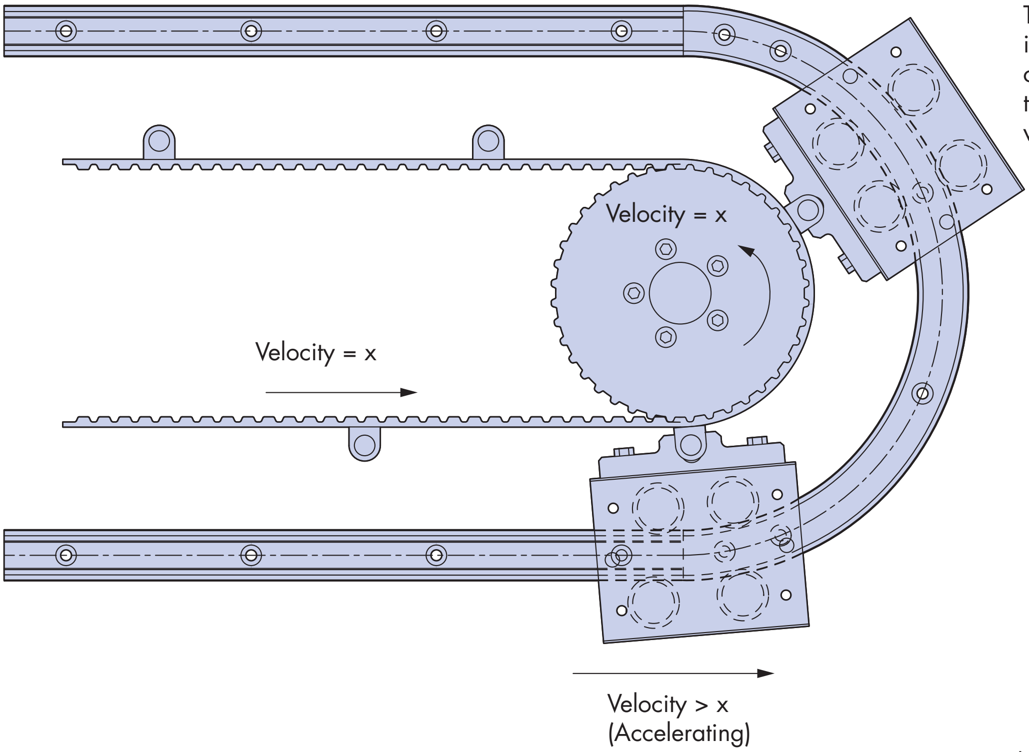
As the carriage travels from the straight to the curve, there is a rapid change in velocity due to the increased distance the carriage needs to travel compared with the belt. This increase in velocity takes place over a very small distance, and therefore extremely high accelerations can take place at the slide/segment joint. Care should be taken in the design of the drive system and the belt lugs to take into account the large forces generated due to the high accelerations (see figure 8). Hepco have developed a successful belt connection method used in the DTS system, please refer to datasheet No. 8 DTS Components for more details.



The belt maintains its velocity as it travels around the pulley, as the carriage travels from the straight to the curve it accelerates over a very small distance.

Figure 8 Velocity change in the track system.

Once the carriage is fully on the segment, it will be travelling at a constant velocity, however this velocity will be much higher than the velocity of the belt. The relationship between the velocities of the carriage and belt is directly proportional to the difference in the diameters of the pulley and ring segment. (See figure 9).

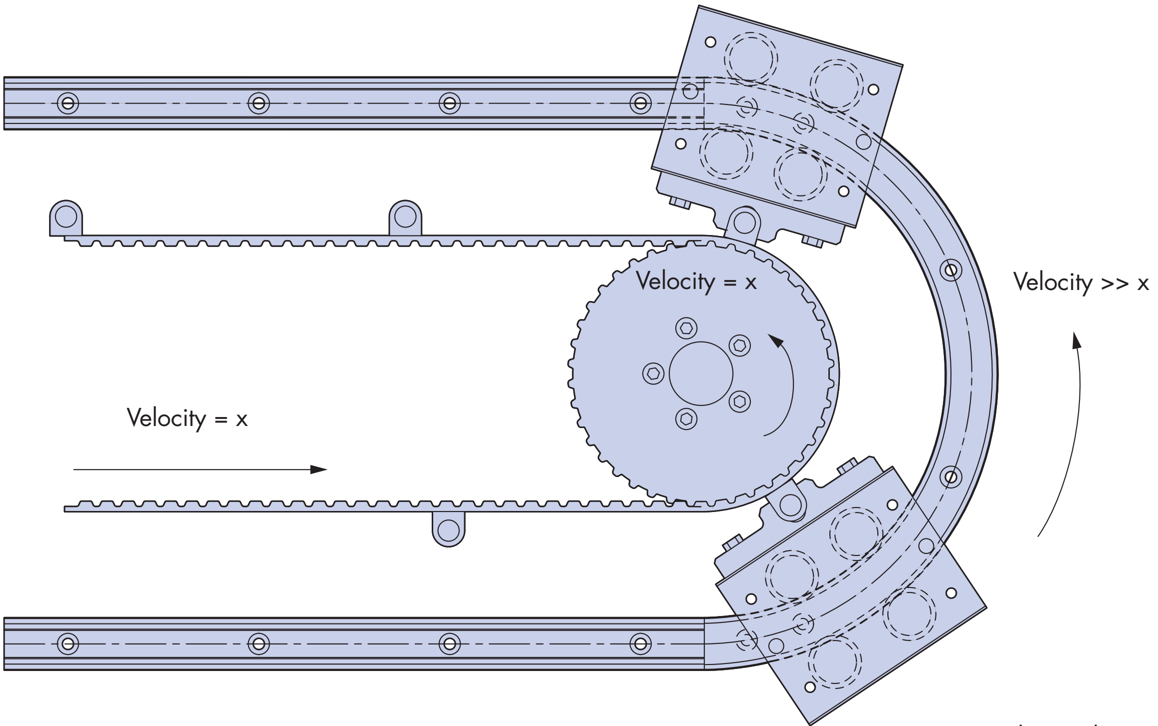


Figure 9 Velocity change in the track system.

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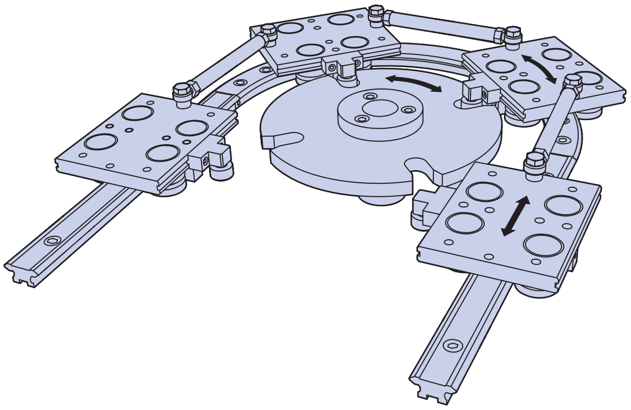
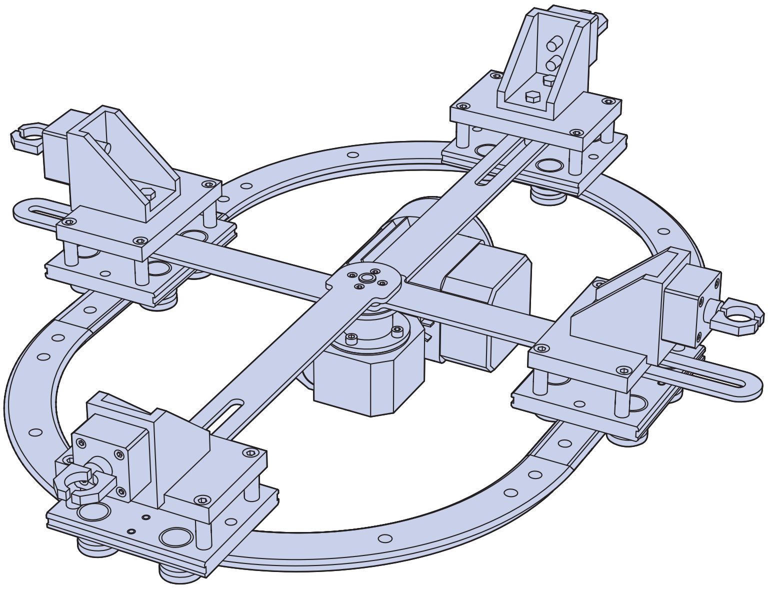
The illustrations below give details of alternative methods of driving track systems with linked carriages. For more information or for help with a particular application, please contact Hepco's technical department.



Pocket Wheel Drive
Carriages are linked together by connecting rods. A cam follower located on each carriage engages with cutouts in a pocket drive wheel which moves the carriages around the track system. This method of driving requires some compliance in the connecting rods and sufficient clearance in the wheel for cam follower engagement.



Spider Drive
For use with short track systems, carriages can be driven from a central motor and spider. The arms of the spider incorporate slots to accommodate the changing distance of the carriages from the motor drive shaft.

DTS2 Dynamic Track System
Derived from PRT2, the DTS2 was developed for tracks requiring high speed, rapid indexing and high driving forces. Standard or corrosion resistant versions are available. For more information please see **www.HepcoMotion.com/dts2datauk**.