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PRT2 Catalogue



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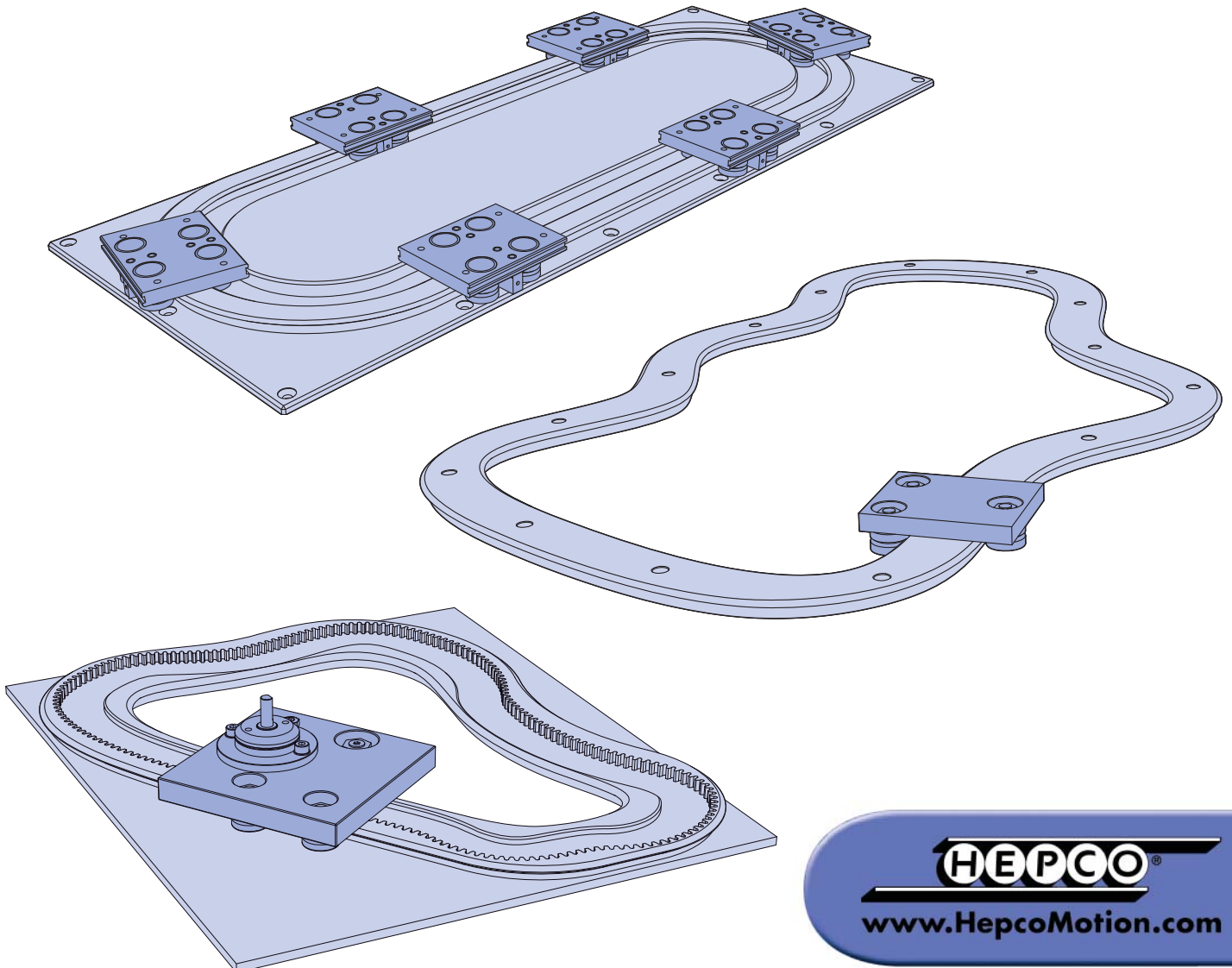
HepcoMotion®

No.14 PRT2 1-Trak

PRT2 1-Trak is a new innovation in guided motion systems which further enhances the acclaimed HepcoMotion PRT2 range of Ring and Track System Products. 1-Trak enables track circuits and applications hitherto thought impossible, to be achieved. The technology is patent pending, and has the following features and benefits:

- Tracks which are made in one piece, without joints.
- Tracks with integral base to form the structural part of a machine.
- Tracks which can follow almost any conceivable 2 dimensional path.
- Tracks with a Vee profiled section of any size to suit bearings from $\text{Ø}13$ to 150mm .
- Tracks with a rectangular profile and roller carriages, for use in tandem with Vee profiled systems to compensate for parallelism tolerances.
- Track systems with no play between carriage wheels and the track, anywhere around the circuit.
- The option of corrosion resistant tracks, carriages and bearings.

Example systems are shown below, with further details on the following pages.



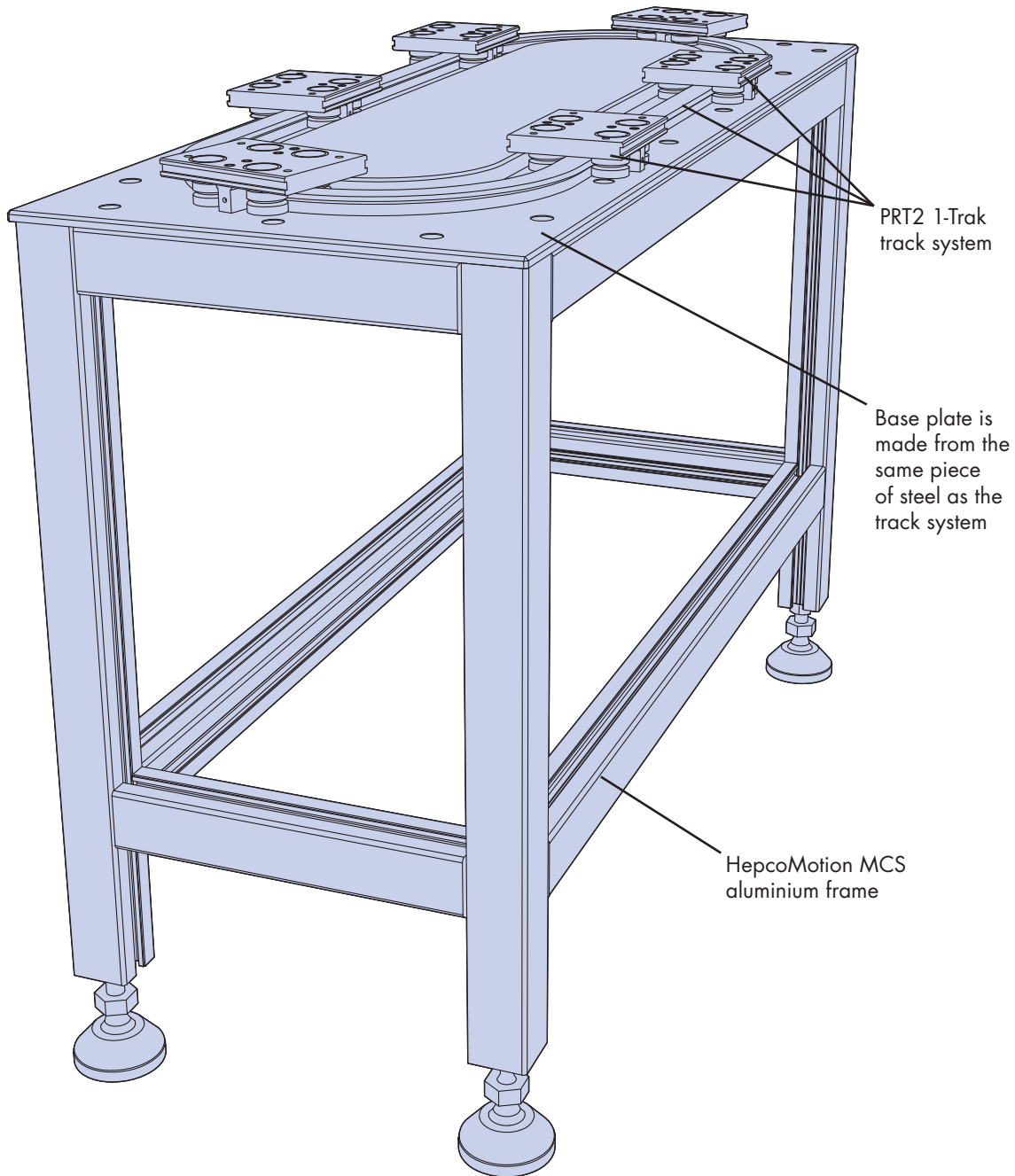
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One-Piece Tracks with Integral Base Plate

HepcoMotion PRT2 1-Trak systems are precision machined in one piece from very high grade steel and are surface hardened for wear resistance. A unique manufacturing approach ensures high accuracy and close tolerances on straightness, flatness and shape.

This construction eliminates assembly, due to the absence of joints, with no possibility of misalignment during installation or in service.

1-Trak is made from a single piece of steel so that the track is one with the base plate. This gives a very strong and accurate foundation which can be the key structural element of a machine. It can be made to a customer's design with holes, slots and other features, and can be supplied mounted to a HepcoMotion MCS frame, as shown below.



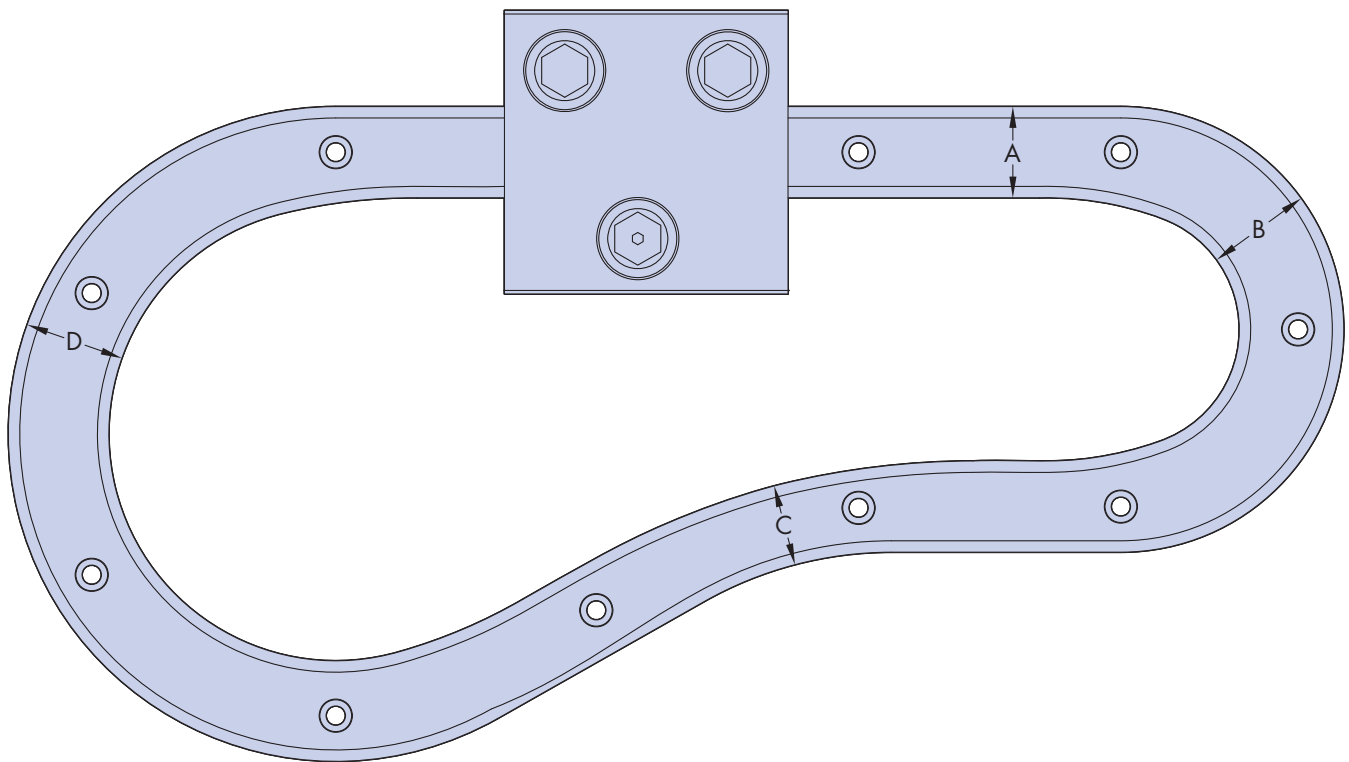
The 1-Trak construction provides the flexibility to choose curves of any radius, and tracks of any width. Overall system size is limited to within a 5.5m x 1m rectangle or a 1.9m square. Larger track systems can be made up from individual elements.

Three Bearing Carriage Geometry

A key innovation of the PRT2 1-Trak design is the three bearing carriage. This offers great flexibility, but at the expense of reduced load capacity compared to a four bearing carriage. The reduction depends on the load configuration, but 25% is typical.

In a conventional PRT2 track system, the width of straight and curved sections in one track is always the same. When fixed centre (FCC type) carriages are used, a small amount of play is experienced at the straight-to-curve transitions, but not elsewhere.

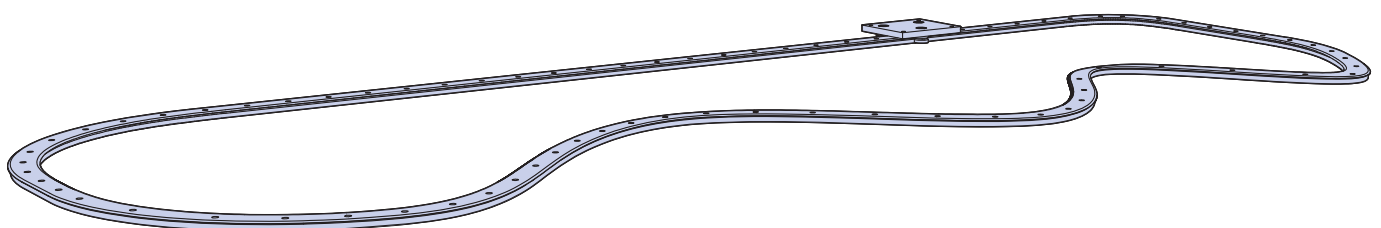
In a 1-Trak three bearing system, the track width constantly changes depending on the bend radius, to eliminate play. In the track system below, the widths of the track at positions A, B, C and D are all different, and the carriage travels with all three wheels in uniform contact all of the way round the circuit.



The concept is very simple, but its design and manufacture require innovative and sophisticated methods which are newly developed by HepcoMotion and patent pending.

The use of three bearing carriage geometry provides many advantages:

- Carriages have zero play at all positions on the track.
- A track system can follow almost any two dimensional path, including straight sections, curves of differing radii, reverse bends and free-form curves.
- Track systems can have much tighter bends than is possible with other designs, saving space and cost.
- For tracks with both left and right hand bends, in lower load situations, three bearing carriages are a simple low cost alternative to bogie carriages.
- Tracks can be made in a wide section to give higher moment load capability.



Track Systems with Complete Size Flexibility

Standard PRT2 track system components are produced in volume and are the popular choice for most rectangular and oval circuits, where the straight and curved slides can use standard radii and section widths. The 1-Trak approach, however, provides complete flexibility to choose dimensions to meet exactly the requirements of the application.

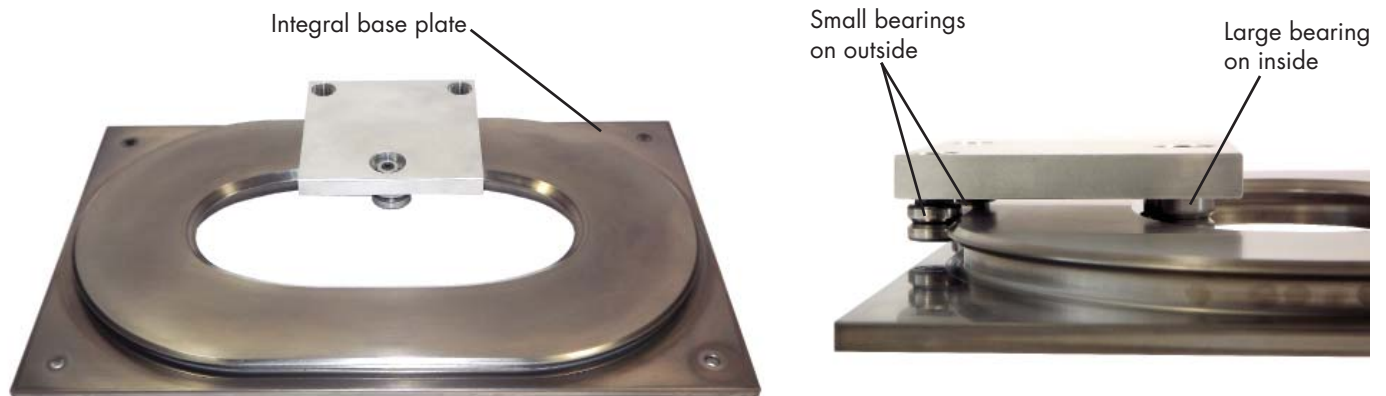
Generally, 1-Trak systems are more expensive than similar standard PRT2 tracks, but smaller systems made in volume may cost less.

With the 1-Trak system, it is possible to have very wide slide sections with bearings which are widely spaced both across and along the carriage. This will provide a very rigid platform and increase moment load capacity. Such carriage design can negotiate curves with a much smaller bend radius than is possible using conventional designs. Reduced bend radii allow machines to be made smaller, which saves space, cost and can improve speed of operation.

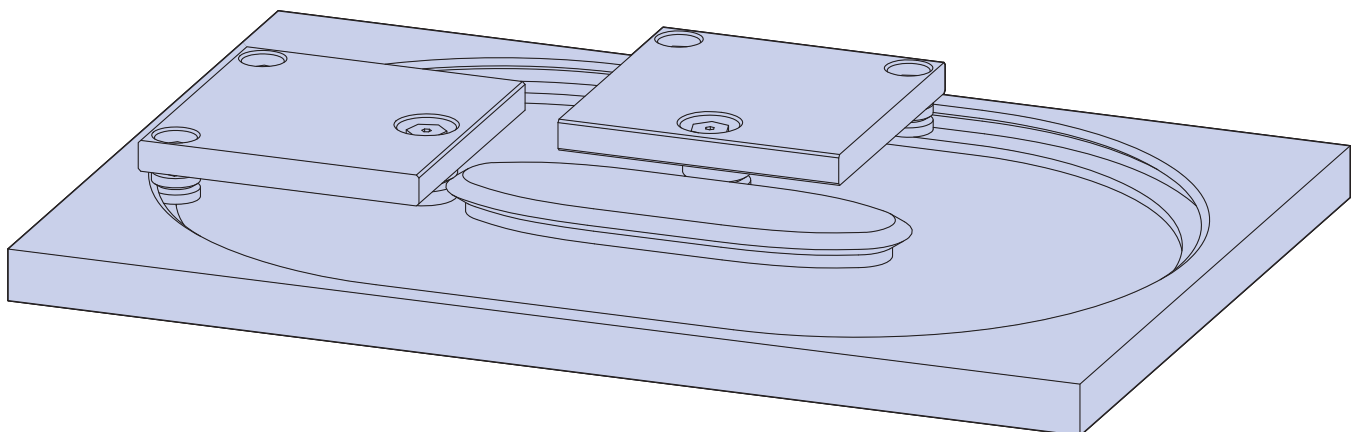
Carriages with all three bearings of the same size, have an asymmetric load capacity. In such cases, the single bearing of the three bearing format which is usually on the inside of the circuit, will be the life-determining factor.

By specifying a larger size single bearing, it is possible to achieve a more equal load capacity across the carriage and more load capacity overall.

The example system shown below has widely spaced bearings, a tight bend radius, uses a larger bearing on the inside of the track and also has an integral base plate. It therefore uses many of the positive features of the PRT2 1-Trak approach.



A further useful version of PRT2 1-Trak is shown below. In this design, the carriage fits inside a channel-section track which has inward-facing Vees that engage with the bearings. The advantage of this configuration is that the contact points between bearings and slide vees are spaced very far apart, giving higher moment load capacity and stiffness.



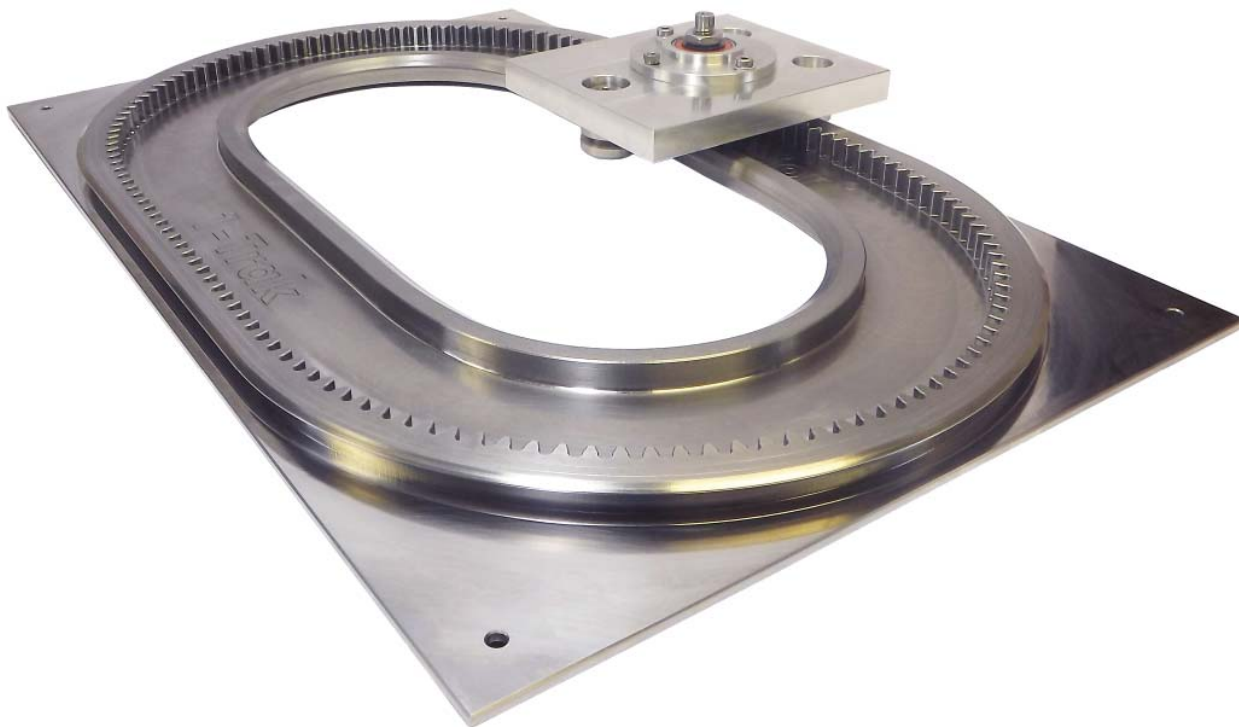
PRT2 1-Trak systems can be made in a huge range of sizes, using bearings from $\text{Ø}13$, through 18, 25, 34, 54, 64, 95, 120, 128 to 150mm. These bearings are taken from the HepcoMotion PRT2 & HDS2 ranges. Individual bearing capacities are given on page 8. Customers should discuss system load capacity with Hepco's Technical Department.

Visit www.HepcoMotion.com/PRT2datauk or www.HepcoMotion.com/HDS2datauk to view these catalogues.

Track Systems with Rack and Pinion Drive

PRT2 1-Trak is also available with a rack and pinion driven carriage.

Uniquely, the 1-Trak design allows correct and constant mesh between pinion and rack all around the circuit. Unlike other systems, the pitch line of the rack follows a complex path in unison with that of the pinion. Therefore, there is no requirement to have the pinion sprung against the rack to compensate for varying engagement. This hugely simplifies the carriage design, and increases load capacity.



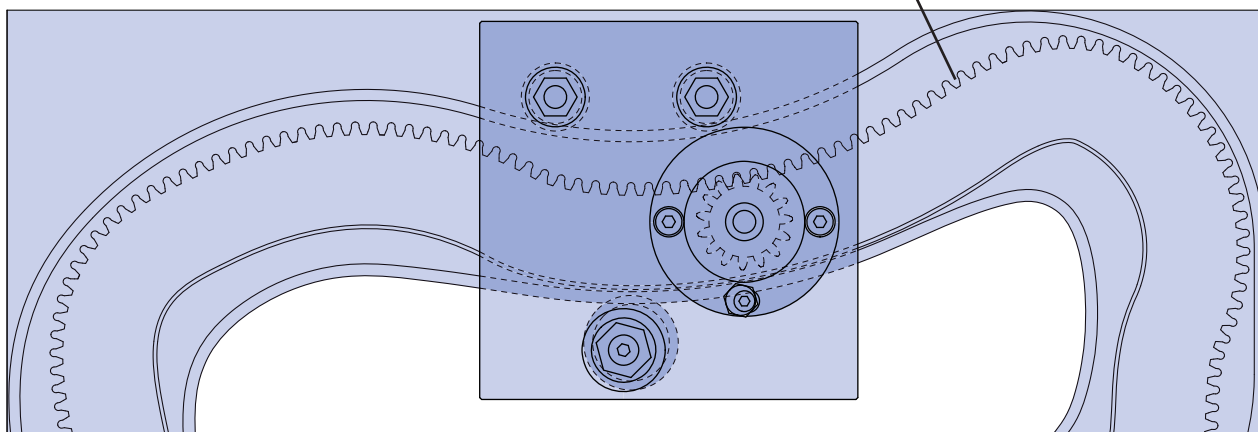
The gear teeth on the track are precision machined and surface hardened to produce outstanding strength and durability. When used with a hardened pinion and properly lubricated, high driving forces, minimal backlash and long life will be achieved.

MOD1.5 gear teeth up to 6mm wide are possible for smaller systems. For larger gears, MOD2 teeth up to 8mm, MOD3 teeth up to 12mm, MOD5 teeth up to 20mm, MOD8 teeth up to 33mm, and MOD10 teeth up to 40mm wide are recommended.

Hepco can supply the pinions alone, carriages complete with pinion and drive flange, or with the pinions mounted onto a gearbox or geared motor.

Guidance on gear and pinion specification, and information on load capacity and life expectancy are available from Hepco's Technical Sales Department.

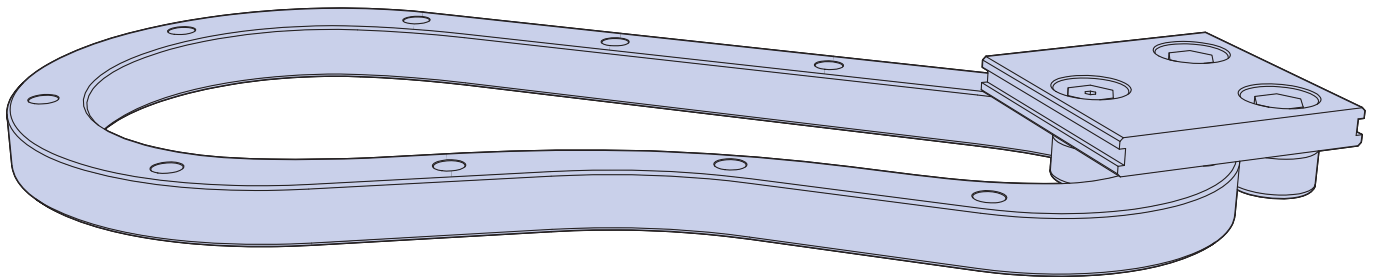
Gear pitch line follows a complex curve to eliminate play.



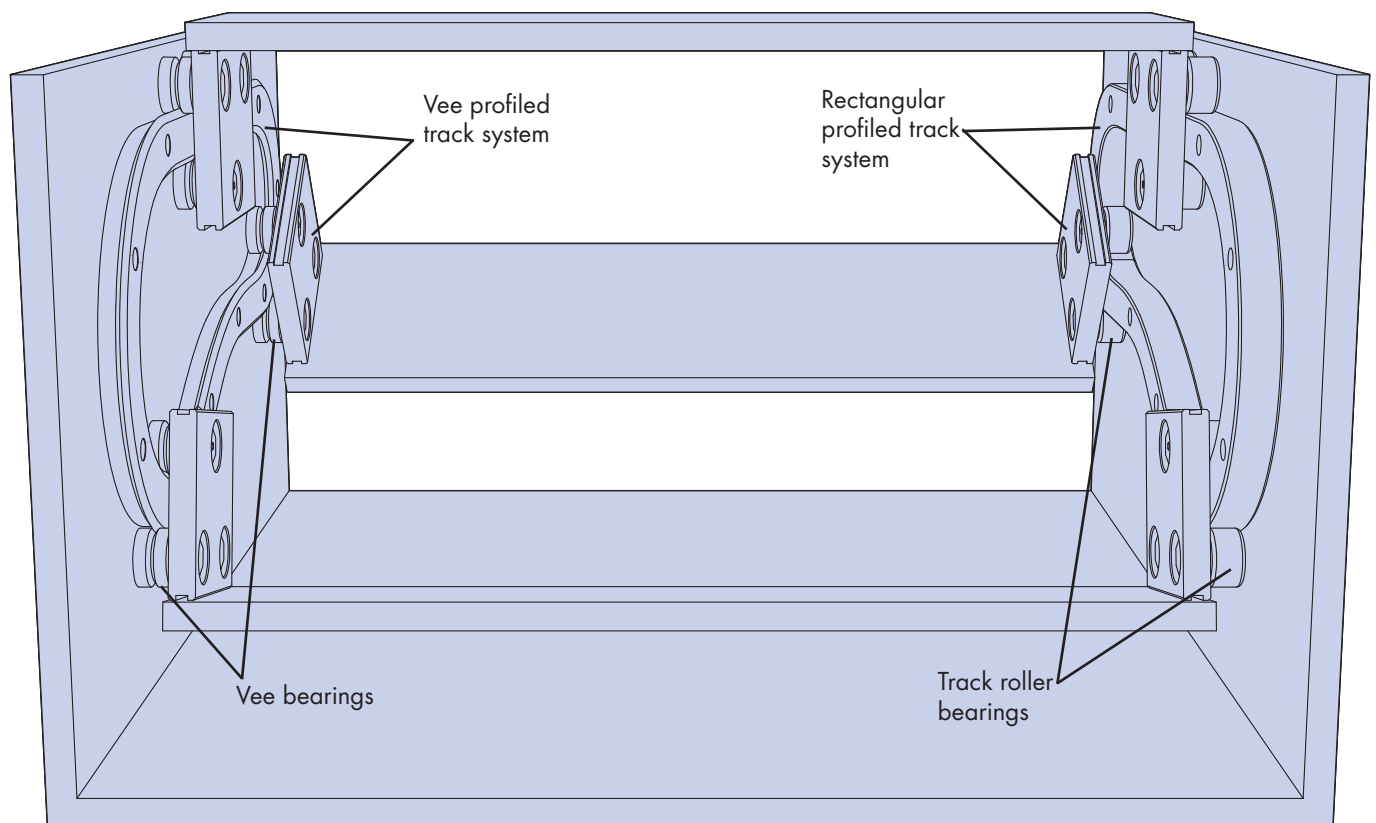
Track Systems Used in Parallel

When Vee profiled track systems are mounted in parallel onto a rigid support, any installation parallelism errors can result in the preloading of the system. This may cause binding, excessive loading of bearings and increased friction.

To address this issue, PRT2 1-Trak systems can be made with a rectangular profile using carriages with HepcoMotion GV3 track rollers (visit www.HepcoMotion.com/GV3datauk select GV3 catalogue, and see pages 41-43). This design provides precise, play-free guidance for movement around the track, but allows freedom for the carriages to move in the direction of the roller axes. An example is shown below:



This type of track system is shown in parallel with a Vee profiled track, in the arrangement below. The rectangular section track system ensures that no preloading stresses are created. This will improve the running quality, friction, life and ease-of-installation of such systems.



The methods of manufacture, materials, and size capability are the same for rectangular track systems as they are for Vee profiled ones. They should be specified as a set, with the rectangular and Vee profiled tracks being made to match. In these sets, the diameters of the rollers and Vee bearings will usually be the same.

In this type of system, it can be beneficial to have a gear drive on both track systems, with the driving pinions connected together, either using a common drive shaft, or with separate servo drives and linked controls. This approach can eliminate the distortion which can occur if drive comes from one side only.

How to Specify a PRT2 1-Trak System

The following is intended as a guide and customers are requested to involve Hepco's technical sales engineers in the final specification before ordering. Communication is best assisted by submission of a sketch.

1-Trak systems are made to order and HepcoMotion will produce a drawing for approval prior to manufacture.

Specify the carriage: For bearing sizes, part numbers and capacities see table page 8. For other information see PRT2 catalogue at www.HepcoMotion.com/PRT2datauk.

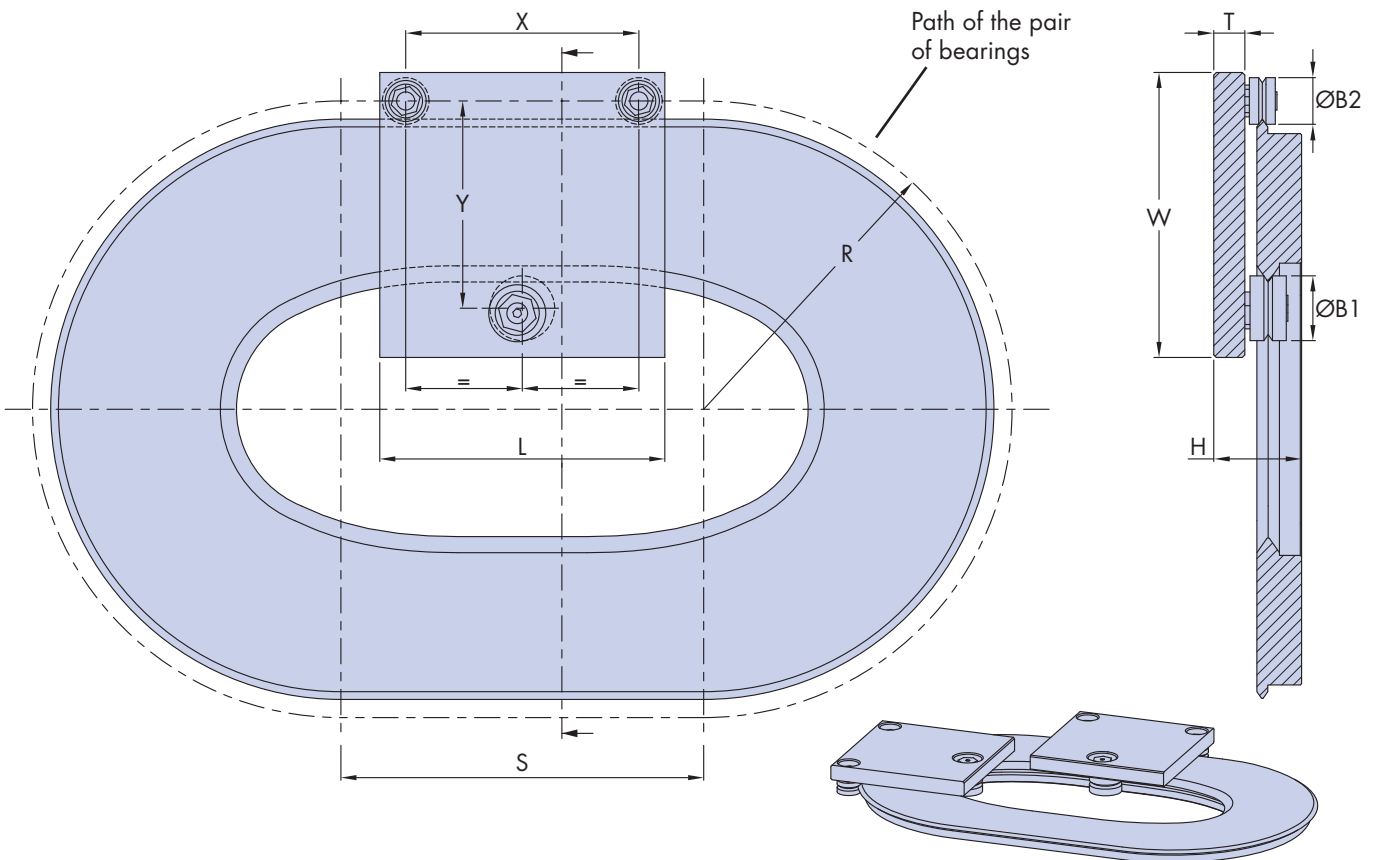
Pair of concentric (non adjustable) bearings: Specify the part number and whether the bearings face inside or outside the circuit.

Single eccentric (adjustable) bearing: Consider whether this should be the same size as the pair of concentric bearings, for asymmetrical load bearing or a larger size to achieve symmetrical load bearing capability. Specify the part number.

Bearing positions: Specify dimensions X & Y (see drawing).

Carriage dimensions: Specify dimensions L, W, T & H (see drawing).

Specify the number of carriages on the circuit.



Specify the track: The carriage information specified above, will automatically define the track section.

Specify the track shape: The shape is defined by the path of the centre of the pair of bearings, as shown in the drawing above. This is best communicated using a sketch showing the relevant dimensions (e.g. straight length S and radius R).

The pair of bearings can follow (subject to limits imposed by the bearing diameter) any 2-D path including ellipses, spirals, parabolas and B-splines. For track designs which include such shapes, a CAD file of the required path should be provided.

It is also possible to produce a track system where another point on the carriage follows the defined path. In these cases, the position of that point should be advised along with details of the path required.

Specify integral base & customization requirements: Please provide a sketch showing details and dimensions of all holes, slots, cut outs and special carriage shape requirements. Also, details of the integral base if required, including overall dimensions within the size limitations stated on page 2.

To minimize cost, customers are encouraged to specify systems where the overall thickness is at or below one of the following sizes: 9, 12.5, 18, 25 & 36mm. Other sizes are possible up to 100mm thick.

How to Specify a PRT2 1-Trak System

Lubrication Options: An oil film on the running surfaces of the Vees is essential for the 1-Trak system in order to reduce wear and prolong life. This can be achieved by the following methods and should be discussed first, with Hepco's technical sales engineers.

Lubricators: In many cases, PRT2 Lubricators can be fitted to the carriage (see PRT2 catalogue page 37). However, this is only possible in systems without tight bends, due to limited stroke of the wipers.

Bleed Lubrication: This system channels lubricant directly to the Vees of the track and can be incorporated on most 1-Trak systems (Please visit www.HepcoMotion.com/PRT2datauk and select datasheet No. 6 Bleed Lubrication).

Gear Driven Option: The gears on a 1-Trak system have enhanced load capacity due to surface hardness. This increases life and gives superior performance. Hepco will provide calculations of load capacity and life for specific applications.

To define the gear, it is only necessary to specify the pinion size required, its position on the carriage, the face width of the gear (see information on page 5) and whether the gear is facing inwards or outwards. Note that the pinion may be positioned away from the centre of the carriage.

A range of hardened pinions can be found in the HepcoMotion HDS2 catalogue page 35.

Hepco have a range of geared motors, gearboxes and drive flanges available to cater for most drive requirements. Please see HepcoMotion GV3 and HDS2 catalogues.

MATERIALS AND FINISHES

Standard PRT2 1-Trak systems are made from a high grade of steel and have a precision machined finish. A corrosion resistant finish is available for the tracks.

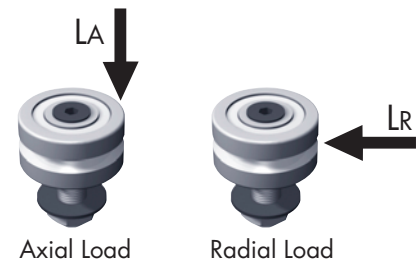
The Vee bearings and track rollers are all available in standard and stainless steel variants.

Carriage plates can be manufactured in any convenient engineering material, but the default choice is high strength aluminium, with a clear anodised finish. An enhanced corrosion resistant treatment is available if required.

LOADS AND LIFE

The loading on individual bearings in a 3 bearing carriage can be determined using a standard statics calculation method, with the loads resolved into axial (L_A) and radial (L_R) components (see right).

The maximum load capacities of the bearings are shown in the table below:



Bearing Part Number	Load Capacities for Double Row Bearings (N)			Load Capacities for Twin Standard Bearings (N)		
	Lubricated			Lubricated		
	LA (max) N	LR (max) N	Basic Life km	LA (max) N	LR (max) N	Basic Life km
...J13...	-	-	-	60	120	50
...J18...	190	600	100	125	200	100
...J25...	400	1500	70	320	600	50
...J34...	900	3000	250	800	1400	100
...J54...	2500	5000	500	1800	3200	250
...J64...	2500	8000	500	-	-	-
...J95...	7000	20 000	400	-	-	-
...J120...	10 000	30 000	700	-	-	-
...J128...	10 000	30 000	700	-	-	-
...J150...	17 000	50 000	2000	-	-	-

The working load capacity system life is calculated following the approach detailed on pages 2 & 3 of the PRT2 Load Life Information datasheet (please visit www.HepcoMotion.com/PRT2datauk and select datasheet No. 3).

The load capacity and life of 1-Trak systems with rectangular profiled tracks are determined by the track rollers which run on them. The performance of these rollers is detailed on page 60 of the HepcoMotion GV3 catalogue (visit www.HepcoMotion.com/GV3datauk).

For further information and assistance, please contact HepcoMotion.

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