

HepcoMotion®

MHD
heavy duty
track roller
guidance
system



HEPCO®

www.HepcoMotion.com

System Composition

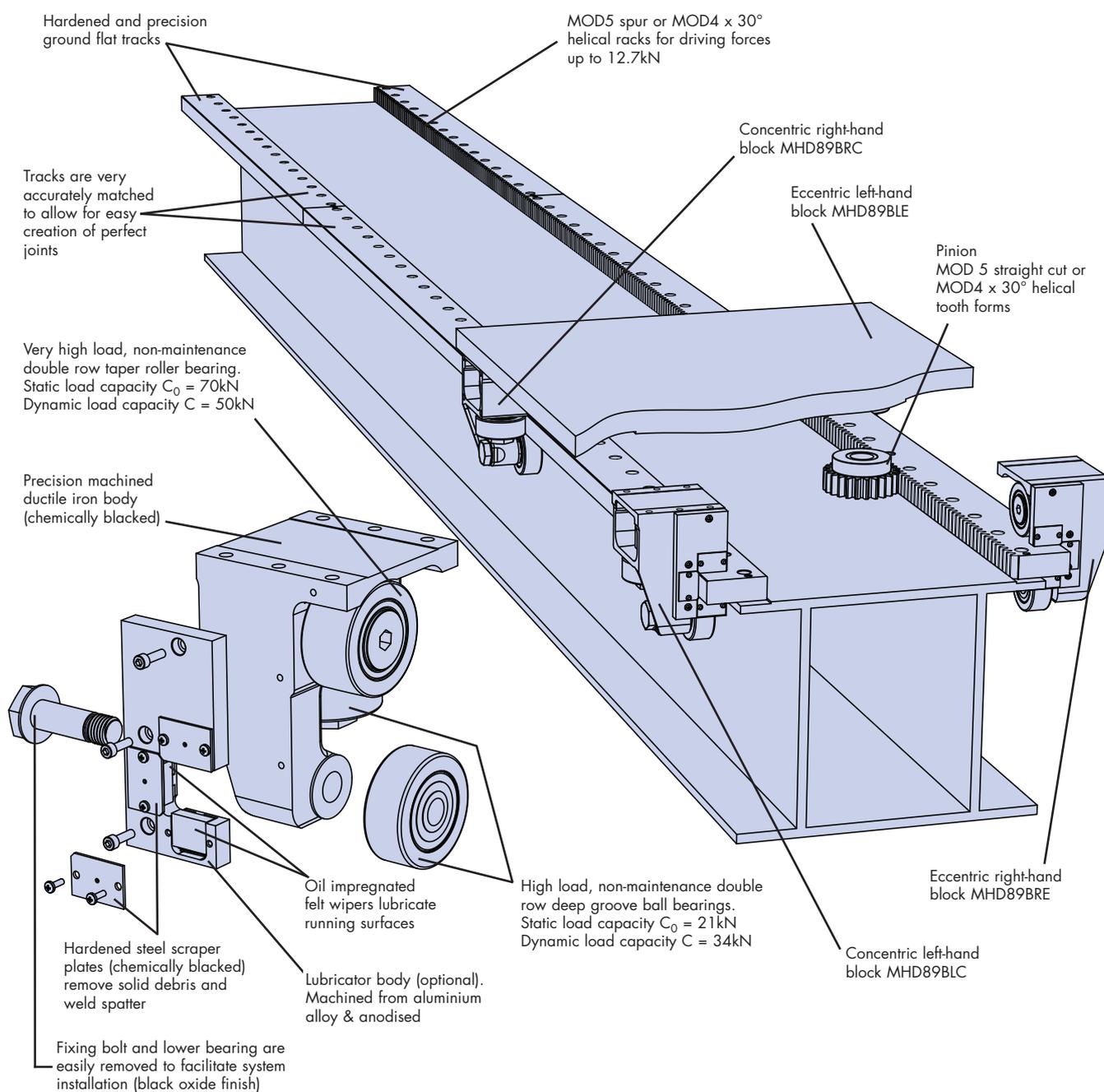
The HepcoMotion MHD system provides an **accurate, durable** and **low friction** linear guide which is particularly suitable for moving heavy items of automation equipment. Bearing blocks use wheels with sealed, **maintenance free** taper roller and deep groove ball bearings. The flat tracks are hardened and precision ground, and may be specified with spur or helical racks and pinions to provide a strong, precise drive.

The system has **high load capacity** and speed capability of **over 6m/s**. The large wheels with axial capacity make the system **tolerant of debris, misalignment, disturbance to joints** and **accidental damage**. It is **easy to install** in machines of any length and can be relied upon to give a long and trouble free service life.

Bearing blocks may be specified with lubricators. These apply oil to the tracks to maximise life, and the scraper plates remove debris, including weld spatter, from the track surfaces.

Bearing blocks have substantial capacity in all directions, but have enhanced strength in the downward direction to cater for heavy payloads. This arrangement is ideally suited to robot applications, even where there is an overhanging load and high acceleration.

The lower bearing wheel of each block can be removed easily, which facilitates assembly onto the tracks by lowering the carriage from above. This unique feature dramatically simplifies installation and maintenance.

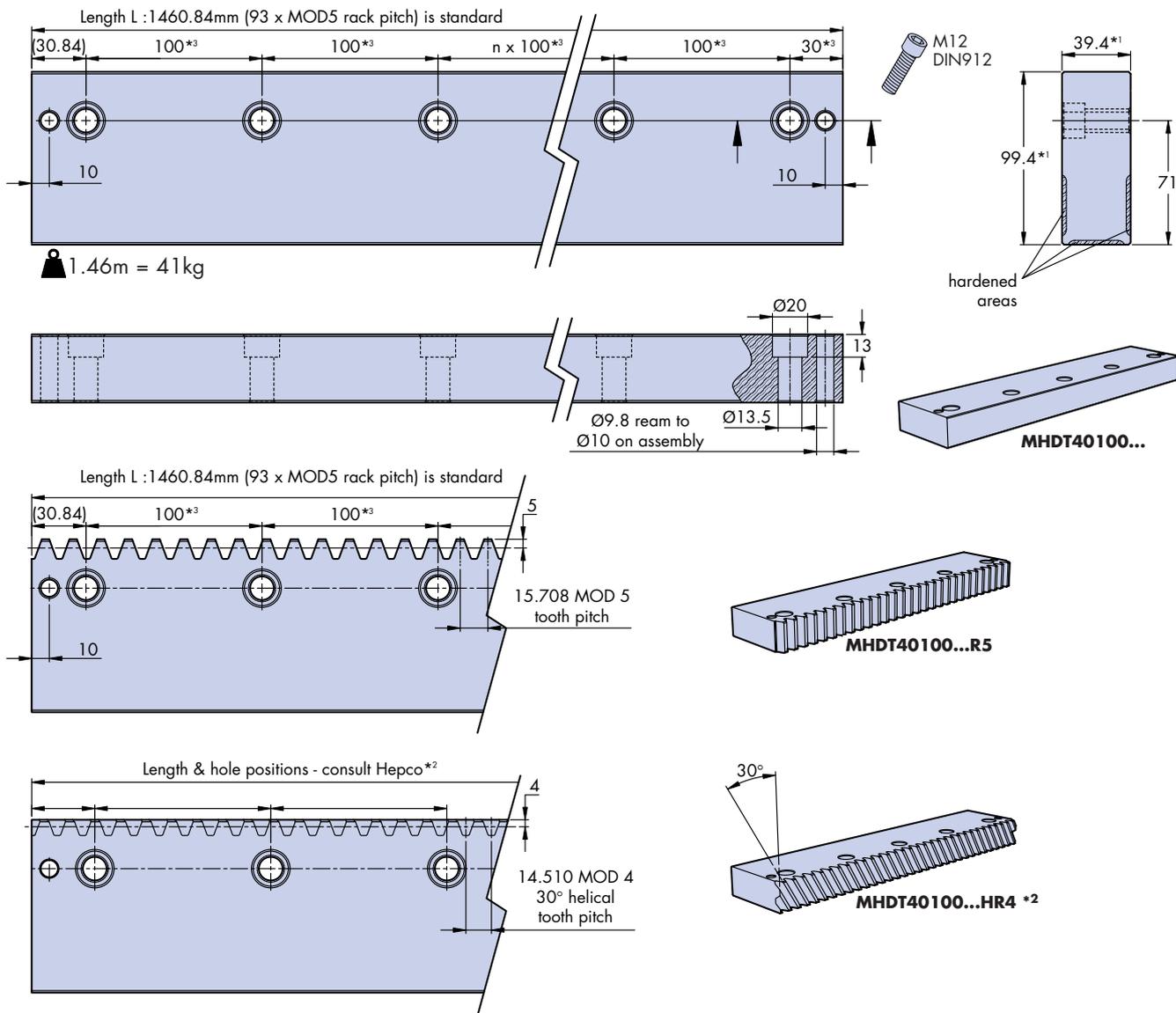


Flat Tracks

Hepco MHD flat tracks are made from high quality carbon steel, surface hardened for maximum durability and precision ground on all flat faces. Tracks may be specified plain or with a MOD5 straight-cut rack or a MOD4 30° helical rack to ISO 1328 grade 10. Plain and straight rack cut flat tracks are made in fixed lengths of ~1.46m which are joined to produce unlimited runs*1. Other lengths can be supplied. All tracks are drilled and counterbored to suit fixing with M12 socket head cap screws*3.

Installation is achieved by butting tracks end-to-end*1 against a machined register. This gives a perfect joint for bearings and pinions. Tracks should be doweled in place either side of the joint.

Full installation instructions are available on the web: visit www.HepcoMotion.com/mhddata and select MHD_installation.pdf



Ordering Details

MHDT40100 L1461 R5

Part Number. **MHDT40100** indicates an MHD flat track.

Length code. **1461** indicates the nominal track length in mm*2.

Rack option. **R5** - MOD5 straight cut rack; **HR4** - MOD4 x 30° helical rack; leave blank for no rack.

Notes:

1. The width and thickness dimensions of tracks in one set are matched to 0.025mm, and the position of the ends of slides is accurately controlled to coincide with the centre of the rack tooth root to give perfect running joints for tracks and racks.
2. Enter the full length of each complete track run. For plain tracks and those with the R5 rack, the standard length of each piece is L1461. Longer systems are made up from multiples of this length. Flat tracks with HR4 helical rack option in lengths over 1500mm will usually be supplied in more than one piece. Due to the rack helix, joints are angled and the pieces are handed. In such cases Hepco will provide a drawing showing track lengths and hole positions.
3. Fixing holes are accurately positioned, and for systems up to 3m, holes in the mounting surface may be pre-drilled to nominal positions. For systems longer than this, it is recommended that fixing holes are drilled to suit by "spotting through" or a report on exact hole positions is requested with the order.

Bearing Blocks

Hepco MHD bearing blocks have a high strength ductile iron body, precision machined and chemically blacked. The upper wheel uses a very high load double row taper roller bearing, and the lower two wheels have double row ball bearings. This arrangement gives high load capacity, excellent durability, and a predominant load capacity in the L_{1A} direction (16).

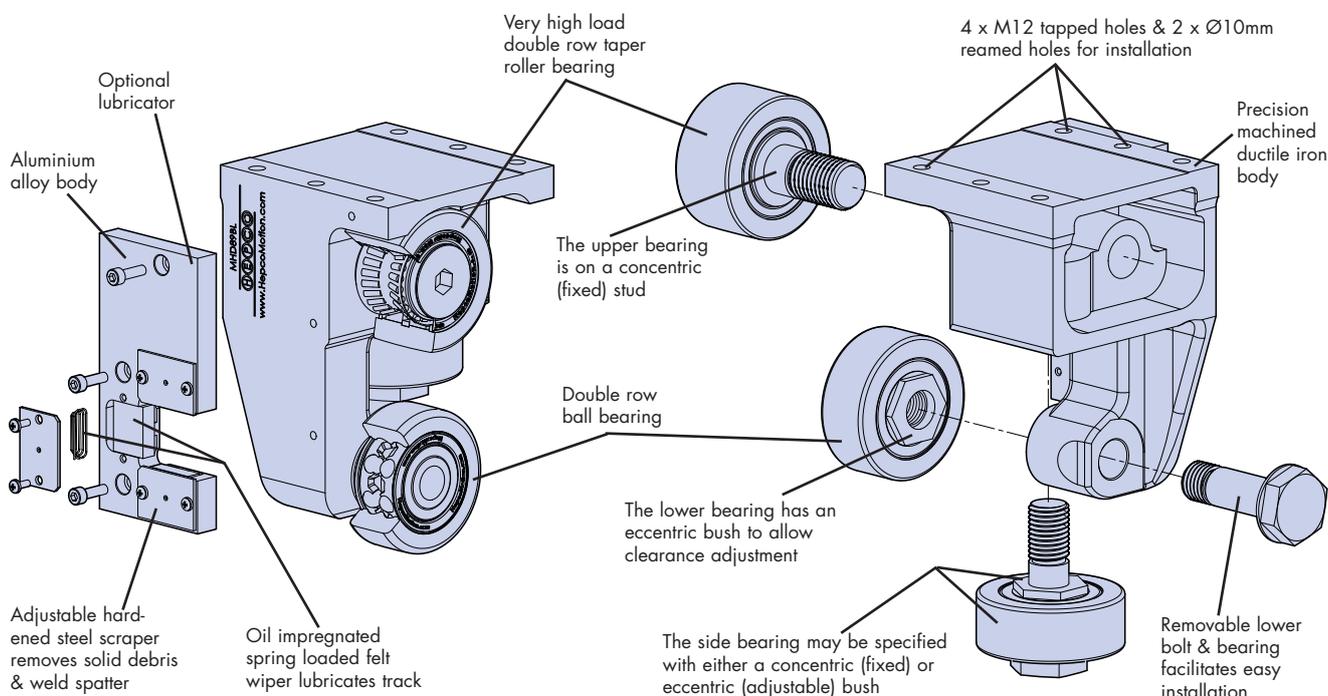
The upper wheel rotates on a fixed (concentric) stud. The lower wheel rotates on an eccentric fixing to allow the adjustment of running clearance. This wheel is easily removable to facilitate installation. The third roller is mounted concentrically or eccentrically depending on what is specified. In most systems it is usual to specify fixed (concentric) studs on the datum side of the system, with eccentric ones on the other side for ease of installation (11).

The lubricator has spring-loaded oil impregnated felts which wipe lubricant onto the track running surfaces. Adjustable hardened scrapers remove debris from the track surfaces, which ensures running quality is maintained even in dirty environments. Lubricators may be deleted where the application does not require them.

The default design has tapped holes, accurate machined registers and dowel holes for mounting off the top surface. An alternative block pattern is available which allows the block to be mounted using the rear face.

Full installation instructions are available on the web: visit www.HepcoMotion.com/mhddata and select MHD_installation.pdf

Features of MHD Bearing Blocks



The above drawings show a left-handed block

Ordering Details

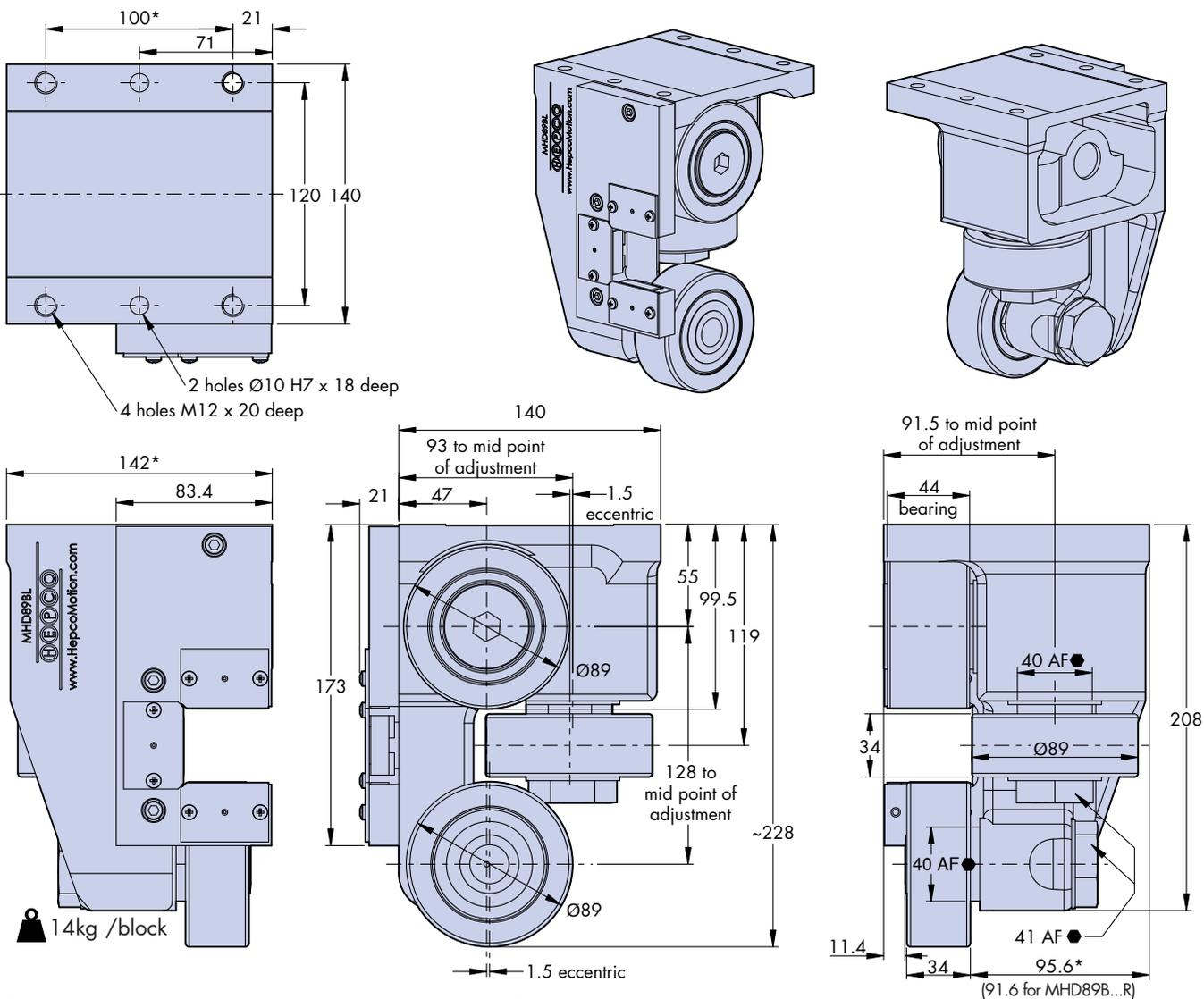
Part Number. **MHD89B** indicates an MHD block. **L** indicates a **L**eft handed block; **R** indicates a **R**ight handed block (see above). **E** indicates an **E**ccentric (adjustable) fitting for the side bearing; **C** indicates a **C**oncentric (fixed) fitting. **NL** indicates a block without lubricator / slide scraper. Leave blank for blocks with lubricator / slide scraper. **R** indicates the rear fixing option. Leave blank for blocks with standard fixing.

Notes:

1. To set up an MHD block on a track it is necessary to adjust the eccentrics. To do this a standard 41mm A/F spanner and a special 40mm A/F thin spanner (available from Hepco: part number AT95) are required.

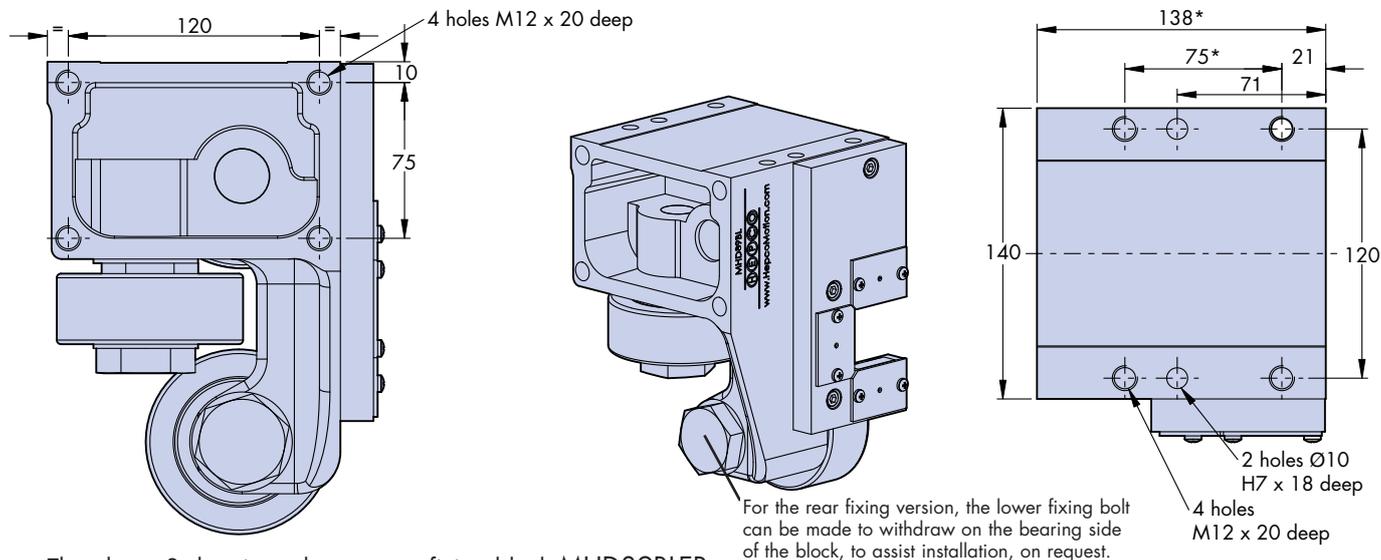
Bearing Blocks

Dimensions



The above 6 drawings show a standard block MHD89BLE

Right-handed blocks are a mirror image of the left-handed versions shown.



The above 3 drawings show a rear fixing block MHD89BLER

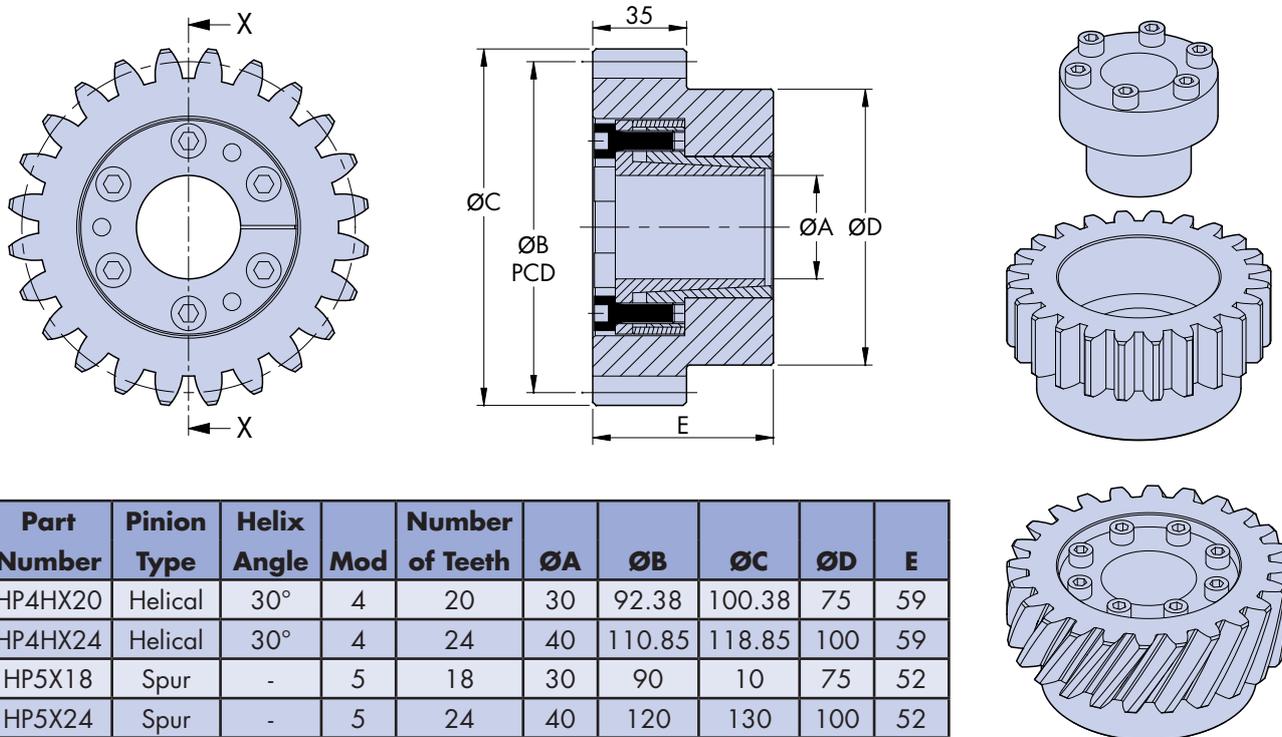
dimensions marked * differ between the standard and rear fixing variants.

Pinions

Hepco pinions are available in two sizes to suit MHD flat tracks with both straight cut and helical racks. Pinions have a metric module tooth form with a 20° pressure angle and are made from high quality case hardened steel. The teeth are precision ground to ISO 1328 grade 6.

The pinions are supplied with keyless locking bushes which allow them to be securely fitted to a standard h8 toleranced shaft.

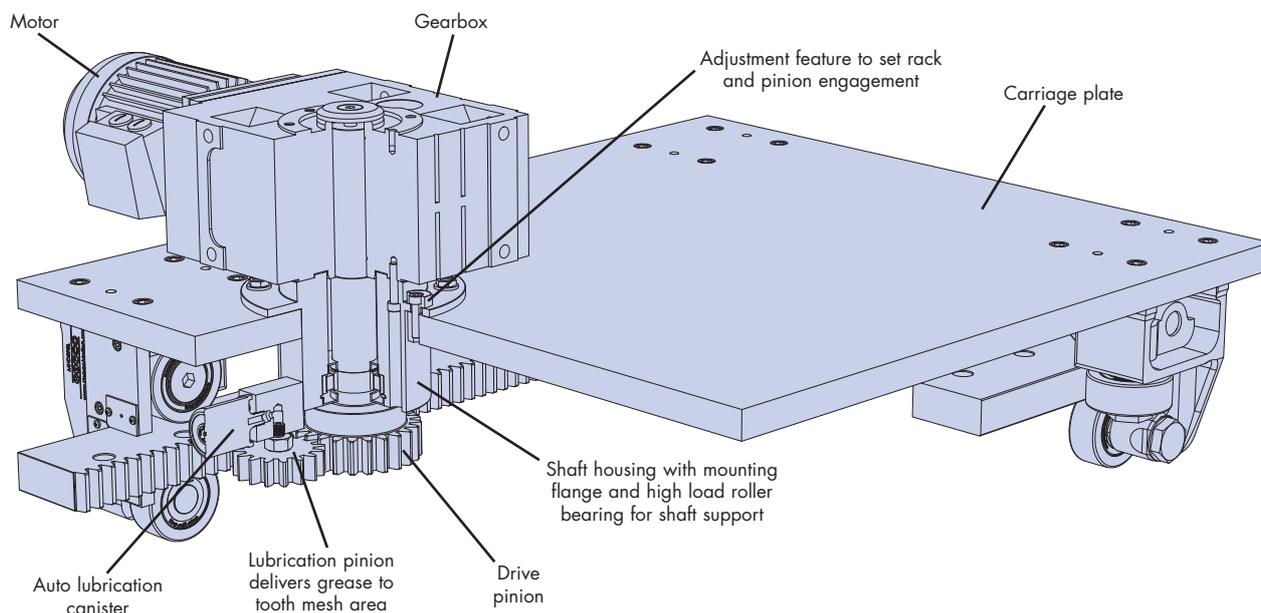
For best performance, the pinion and rack should be lubricated (see bottom of page).



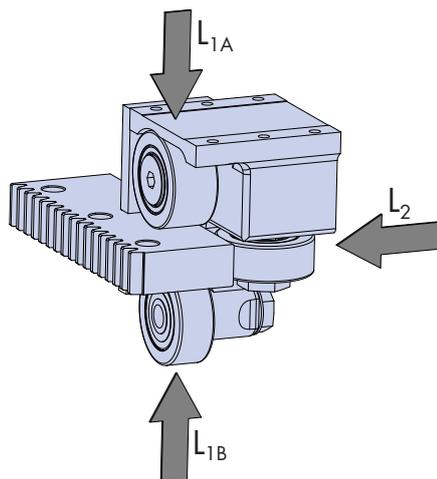
| Part Number | Pinion Type | Helix Angle | Mod | Number of Teeth | ØA | ØB | ØC | ØD | E |
|-------------|-------------|-------------|-----|-----------------|----|--------|--------|-----|----|
| HP4HX20 | Helical | 30° | 4 | 20 | 30 | 92.38 | 100.38 | 75 | 59 |
| HP4HX24 | Helical | 30° | 4 | 24 | 40 | 110.85 | 118.85 | 100 | 59 |
| HP5X18 | Spur | - | 5 | 18 | 30 | 90 | 10 | 75 | 52 |
| HP5X24 | Spur | - | 5 | 24 | 40 | 120 | 130 | 100 | 52 |

Carriage Solutions

Hepco can make carriages for MHD systems to suit any application. Hepco has a number of standard elements including gearboxes, geared motors, bearing cartridges and lubricating pinions as well as MHD blocks and pinions. These can be integrated into a rugged and cost-effective rack driven carriage, such as the one below. Please contact Hepco for details.



Technical



Bearing Calculations

The MHD system uses a track roller bearings which run on a flat track. Due to the hardness of the track and the contact with the bearings, the track will not determine system life. The system life will be equivalent to the shortest bearing life.

Hepco quotes the basic life for each bearing, which corresponds to a linear travel of 1000km. The table also includes the expected bearing load for 10,000km of linear travel and the industry standard static (C_0) and a dynamic (C) load capacity figures*¹.

| MHD block loading mode | Basic load capacity for 1000 km life | Load for 10000km life | Bearing load capacities * ¹ | |
|----------------------------------|---|-----------------------|--|-------------------------|
| | | | C - dynamic | C ₀ - static |
| L _{1A} | L _{1A(max)} = 34000 N | 17000 N | 50000 N | 70000 N |
| L ₂ & L _{1B} | L _{2(max)} =L _{1B(max)} = 21000 N | 9830 N | 34000 N | 21000 N |

*¹ The C and C₀ figures quoted are for cam roller operation. The normal C and C₀ figures can be up to 40% higher but are not relevant to this application. Some companies quote these higher figures.

To determine system life, the user should first resolve the load into L_{1A}, L_{1B} and L₂ components for each MHD block using normal statics calculations. The life for the upper (twin row taper roller) bearing is determined using the equation below:

$$\text{Upper bearing life (km)} = 1000 \times \left(\frac{L_{1A(max)}}{L_{1A}} \right)^{3.3}$$

The life for the lower (twin row deep groove) bearing is determined using the equation below:

$$\text{Lower bearing life (km)} = 1000 \times \left(\frac{L_{1B(max)}}{L_{1B}} \right)^3$$

The life for the side (twin row deep groove) bearing is similar to the above and is determined using the equation below:

$$\text{Side bearing life (km)} = 1000 \times \left(\frac{L_{2(max)}}{L_2} \right)^3$$

It will usually be apparent after the resolution of the load into components which bearing will determine the system life. The above calculation will normally only need to be done for that one bearing. Normal safety factors should be applied.

Fully worked example bearing life calculations are available on the web. Go to www.HepcoMotion.com/mhddata and select MHD_load_life.pdf

Rack and Pinion Force Calculations

The driving force which can be transmitted through a rack and pinion will depend on the choice of rack (i.e. MOD5 spur or MOD4 x 30° helical), the size of pinion selected, the length of stroke and the desired life (total travel in km). The table below details the driving force in N for all combinations of parts and for a useful range of stroke lengths and design lives. All figures assume ideal lubrication and pinion contact conditions, and that all movement is for the full stroke indicated. It is recommended that a safety factor be applied when selecting rack and pinion components. This table is suitable for initial selection of parts, but please contact Hepco if you require a specific calculation tailored for your application.

Rack and Pinion Driving Forces

| Rack and pinion combination | Stroke length = 1m | | | Stroke length = 4m | | | Stroke length = 16m | | |
|---|--------------------------------|--------|---------|--------------------------------|--------|---------|--------------------------------|--------|---------|
| | Expected life of rack & pinion | | | Expected life of rack & pinion | | | Expected life of rack & pinion | | |
| | 1000km | 5000km | 25000km | 1000km | 5000km | 25000km | 1000km | 5000km | 25000km |
| MOD5 & 18 tooth pinion MHDT40100...R5 & HP5X18 | 5700 N | 4500 N | 3300 N | 8300 N | 7200 N | 4700 N | 8600 N | 7500 N | 4900 N |
| MOD5 & 24 tooth pinion MHDT40100...R5 & HP5X24 | 7000 N | 5500 N | 4000 N | 12500 N | 8700 N | 6300 N | 12700 N | 9600 N | 6300 N |
| MOD4 helical & 20 tooth pinion MHDT40100...HR4 & HP4HX20 | 7300 N | 5700 N | 4200 N | 8600 N | 7900 N | 5700 N | 8700 N | 8000 N | 5800 N |
| MOD4 helical & 24 tooth pinion MHDT40100...HR4 & HP4HX24 | 8200 N | 6400 N | 4700 N | 10000 N | 8100 N | 5900 N | 10200 N | 8300 N | 6000 N |



GV3
Linear Guidance and
Transmission System



HDS
Heavy Duty Slide System



PRT
Ring Slides and
Track System



SL2
Stainless Steel Based
Slide System



LBG
Linear Ball Guides



MCS
Aluminium Frame and
Machine Construction System



HPS
Powerslide-2 Guided
Rodless Cylinder



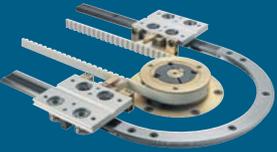
HDLS
Heavy Duty Driven
Linear System



DLS
Linear Transmission and
Positioning System



HTS
Telescopic Ball
Bearing Slides



DTS
Driven Track System



BSP
Ballscrew Premier



Simple Select®
Vee Slide Linear
Guidance Systems



PDU2
Profile Driven Unit



PSD120
Profile Screw Driven Unit

BishopWisecarver Product Range

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Single Edge Slide System



LoPro
Aluminium Based
Slide System



Utilitrak
Lightweight U Channel
Guideway



QuickTrak
Linear Motion System

For further information on HepcoMotion® products -
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