

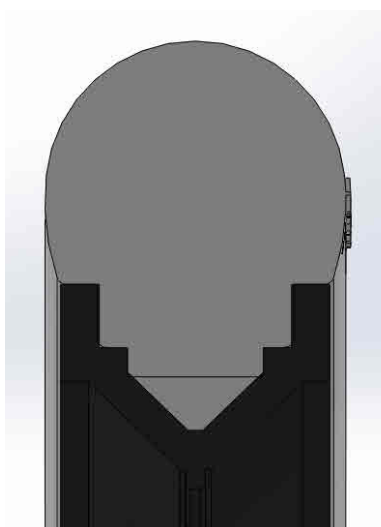
Wheelchair castors performance information.

The front castors on a wheelchair determine its ability to turn for manoeuvring and to climb over obstacles. Larger diameter front castor wheels take up space, but they swivel and climb more easily than smaller diameter compact castor wheels. Choice of castor wheel size depends upon occupant size, weight distribution, application dynamics, and intended environment of use. Optimised static weight distribution on a manual wheelchair is in the range 30% to 40% on the front castors and 70% to 60% on the rear wheels.

Greencare modular builds have a range of castor wheel diameter options. Wheels, of 190mm diameter and above, are recommended for attendant propelled wheelchairs, irrespective of occupant size. This is because the effect of a carer, pushing and controlling, usually means constant floor surface contact and loading on front wheels. Occupant propellers are usually more dynamic in use of the wheelchair, frequently adjusting body position to manoeuvre. So an occupant propelled active user chair or low seat height foot propelling chair for a lightweight person, or child size wheelchair, may benefit from a 150mm diameter compact castor wheel, with a wide tyre section.

The importance of optimised weight distribution becomes more significant with heavy people. A castor carrying a heavy load can increase the damaging effect of frontal impact on the wheelchair frame. A castor carrying excessively high load will increase turning effort, and also make indoor manoeuvrability on carpets difficult. A castor with a lighter weight occupant may be carrying insufficient load, causing it to rotate too easily, and induce flutter vibration.

Setting up to suit user and intended environment is possible. For general use to avoid flutter and loss of directional control outdoors, excessive clearance should be taken up, and swivel tension in the castor head carefully adjusted through the underside M10 nyloc nut, with a 17mm A/F spanner, so that the castor just about rotates under its own weight. For indoor use on a flat surface a more freely swivelling castor head may be preferred. Pneumatic castor tyres can be fitted to reduce the jarring effect of frontal impact if necessary.



Smooth tread castor tyres perform better in most aspects of wheelchair use than grooved tread castor tyres which increase turning effort. All Greentyre and Greencare castor tyres are manufactured in puncture free microcellular polyurethane. The narrow profile 190mm dia tyres are a good general purpose specification.

200mm larger dia tyres are most suitable for heavy occupant use, particularly outdoors and over uneven surfaces. The Greencare 200mm dia x 32mm wide castor tyre section introduced in January 2013 is shown opposite, has a technically developed profile, with a deep location into the wheel hub, shown opposite.

Wheelchair castors performance information, (continued)

Using Greencare component modularity, an optimised weight distribution can be achieved, even when occupant size and body shape limit positional adjustment within the wheelchair seating area. Use of the tension adjustable back upholstery, or a special back support, can allow additional movement of occupant position, relative to wheelbase. Modular Greencare wheelchair front frame connectors and the choice of wheel position within the castor fork can set wheelbase from the front, and control the weight distribution.



The castor position on the front wheelchair frame determines where an occupant foot can be safely located to avoid wheel contact when the wheelchair turns.

The illustration opposite left shows a set up with the 190mm castor wheel set central in the modular fork. The type A front castor connector and 190mm castor wheel set effective seat to ground height at 495mm.

When an occupant has additional issues with forward stability, such as habitually reaching forwards, castor wheels may be mounted forwards in the modular fork, maintaining 495mm effective seat to ground height.

The illustration opposite on the right shows the 190mm front castor wheel set forwards in the modular fork. The type A castor connector mounts the castor swivel point forwards and outwards increasing the forward wheelbase contact point.



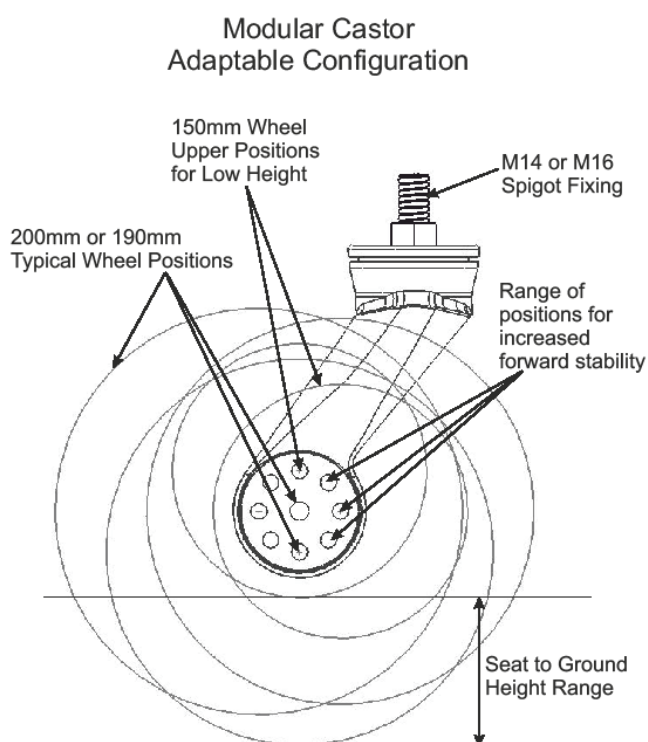
When an occupant uses feet on the ground to push the chair along, the type B low outrigger castor connector, reduces effective seat to ground height by 35mm to 460mm. This mounting option allows more space for the occupant foot to reach the floor and propel.

The type B low mount connector is used with either the standard 190mm or smaller 150mm wheel. For a compact low seat to ground height of 420mm the 150mm castor wheel is mounted in the top position in the modular fork, shown in the illustration opposite left.

Wheelchair castors performance information (continued)

A low seat build allows the occupant foot to have ground contact. Seat depth may also need to be short, allowing sufficient space for the foot propelling leg movement in front of the seat. The force dynamics of foot propelling create changes in rearward stability. Anti tippers should be fitted for additional safety. Foot propelling can provide an additional degree of independence indoors for some users, however, variables in the surface levels compromise safety of foot propelling outdoors.

Castor components and castor mountings used on Greencare DB1 are assembled in the UK to meet prescribed occupant requirements. The range of castor build options is shown in the diagram below. Castor performance can also be changed and adjusted retrospectively on site to meet change of use, or a review following an initial trial period, by removing the hub caps, and changing the wheel axle position in the castor fork. Technical staff should note that hub caps have a hexagonal location which needs to be horizontally aligned with the axle head when replacing hub caps. When correctly assembled the hub cap prevents loosening of the axle fixings under vibration.



150mm smaller diameter castor wheels and the low height, type B front castor front connectors are recommended for compact occupant propelling builds, when turning space is limited or for a low seat to ground height of 420mm.

Smaller diameter wheels however demand more effort to push when they are heavily loaded. As a consequence small castor wheels are not normally recommended for very heavy occupant builds.

200mm diameter castor wheels and standard height, type A front castor connectors are generally recommended for outdoor use, and large occupants, when restrictions of space are not a factor.

In addition to the integrated modularity of the castor fork, and range of wheel sizes, effective front seat to ground height can be increased to 560mm using an extended castor spigot, with higher weight rated M16 spigot thread. Refer to seat to ground height chart gcqa 035 for more information.

Wheelchair castors performance information (continued)

A special 125mm castor wheel with an adapted small size castor fork, can be fitted as a final option when lowest possible seat height is the overriding assessment factor, and when all else does not work, The objective of a low seat to ground height for foot propelling may not be ideal for standing transfer of adult occupants. A very low 400mm seat to ground height can significantly increase in effort of getting back up and out of the wheelchair.

Seat to ground angle for foot propelling is in range 4degrees to 5degrees.

Seat to ground angle for heavy occupant is in range 5degrees to 6degrees.

Outside these angles the castor head rotation is not normal with the floor, and manoeuvrability dynamics are adversely affected.

125mm castor wheels and special fork, rated to 125Kg with optimised occupant weight distribution, provide lowest seat to ground height of 395mm.

150mm castor wheels are rated up to 150Kg occupant.

The 150mm castor is not recommended for attendant propelled builds for heavy users, it is most suitable for active occupant propelling builds.

190mm castor wheels are rated up to 150Kg occupant.

200mm castor wheels are rated up to 200Kg occupant.

Castor ratings and specifications are indicated below.

Castor wheel Diameter and Width	Spigot fitting thread spec.	Castor fork type	Tyre availability	Max. Occ. Weight
125mm dia (5inch) 31mm wide (1.25inch)	M14 screw fitting	Basic single position used as a special build for lowest seat height only, require optimised loading	Puncture free microcellular polyurethane	125Kg
190mm dia (7.5inch) 28mm wide (1.1 inch)	M14 screw fitting	Basic single position used on basic specification wheelchairs only.	Puncture free microcellular polyurethane	125Kg
150mm dia (6inch) 32mm wide (1.25 inch)	M14 screw fitting	Greencare Modular multi wheel position	Puncture free microcellular polyurethane	125 Kg
150mm dia (6inch) 32mm wide (1.25 inch)	M16 screw fitting	Greencare Modular multi wheel position	Puncture free microcellular polyurethane	150 Kg
190mm dia (7.5inch) 28mm wide (1.1 inch)	M14 screw fitting	Greencare Modular multi wheel position	Puncture free microcellular polyurethane	125Kg
190mm dia (7.5inch) 28mm wide (1.1 inch)	M16 screw fitting	Greencare Modular multi wheel position	Puncture free microcellular polyurethane	150Kg
200mm dia (8 inch) 32mm wide (1.25 inch)	M16 screw fitting	Greencare Modular multi wheel position	Puncture free microcellular polyurethane	200Kg

Wheelchair castors performance information (continued)

DB1 builds rated up to 125kg have an M14 castor spigot thread.
DB1L XL and XXL builds rated up to 200Kg have an M16 castor thread.
For ease of identification when assembled into a wheelchair frame,
M14 spigots are silver colour, M16 spigots are black colour.

Should the occupant need change, it is possible to upgrade any DB1 wheelchair frame from M14 to M16 by replacing the front castor connector units, both of which are available with M14 or M16 threaded inserts. We make this recommendation when recycling wheelchairs, if there is a history of damage or misuse. To complete a full wheelchair specification upgrade however, it is not just castor mountings that need to be reviewed, armrest and back support upgrades may also be required.

A typical castor service change could be after four years use, or sooner if there is a high service demand. Castors should be torqued up to 40NM. Removal will often require a torque of 60NM.

For normal use, Loctite 243 or equivalent should be applied to the screw threads during assembly of the castor spigot into the front castor connector. The thread locking adhesive will run along the threads naturally as the screw is turned to finally be torqued up into position. This type of threadlocking adhesive is formulated to allow the castor to be removed and replaced for a service change,

If the anticipated level of use is extreme, such as when the build specification has extended spigot leverage, or if there is a history of damage. A stronger more permanent Loctite 270 or equivalent should be applied to the screw threads. This type of locking adhesive is more permanent, it sticks in the threads, resisting a loosening impact. It is difficult to remove. In such cases removal of the castor for service replacement will require disassembly and replacement of the complete castor connector unit, by removal of the fixing screws from both sides of the wheelchair frame.

Technical staff need accurate data from prescribers to set a wheelchair up or to carry out a retrospective change. Accuracy of the wheelchair build specification is increasingly significant when a resolution of occupant postural requirements and function in the intended environment is needed for a successful outcome. A build instruction form that includes additional notes about particular occupant requirements is often helpful.

Greencare staff will work as part of the support team when needed, and we are continually innovating and developing our modular wheelchair construction system and range of materials used, to meet the needs of heavy and demanding users, both occupants and carers, and the dynamics of an ever changing application environment.