INSTRUCTION SHEET

CAMBER, REAR WHEEL PARALLELISM, TOE-IN, TOE-OUT, AND HOW TO VERIFY ALIGNMENT

This document explains:

- what are rear wheels camber angles
- what are rear wheels parallelism, toe-in and toe-out and wheel alignment
- what camber angles are available on Motion Composites folding and rigid wheelchairs
- when wheels alignment must be checked and performed.
- **How to verify the rear wheel alignment**

Please, also refer to the other documents of the series available at motioncomposites.com (Support and Education/ How-to documents):

- **Camber, rear wheel parallelism, toe-in, toe-out, and how to verify alignment** (MC-MTKG-WI-0001) (this document)
- Perform rear wheel alignment on Motion Composites folding wheelchairs (MC-MTKG-WI-0002)
- Perform rear wheel alignment on Motion Composites rigid wheelchairs (MC-MTKG-WI-0003)
- Rear wheel camber parts and hardware for folding and rigid wheelchairs (MC-MTKG-INF-0001)
- Changing camber angle on folding wheelchairs (MC-MTKG-WI-0004)
- Changing camber angle on rigid wheelchairs (MC-MTKG-WI-0005)

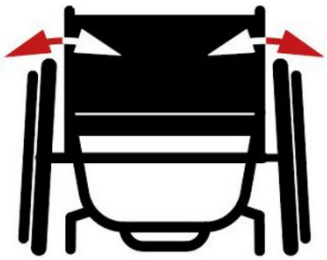
Wheelchair models:	Tool(s) required:
• All models	• Measuring tape • Non-permanent marker or masking tape

REAR WHEEL CAMBER ANGLE

- Camber angle (or just "camber") is the angle the wheels make from the vertical axis when you look at the wheelchair from the front.
- On a wheelchair, we may have a 0° angle (or "zero camber") or a camber angle, for example of 3°, 4° or 6° angle outward (or "negative camber").
- Wheelchairs can only have zero or negative camber but no positive camber (bottom of wheel pointing toward the inside of the wheelchair).
- If you notice with the naked eye that the wheelchair as a positive camber the wheelchair may have one or several issues.
  - You may need to inspect the wheel, the axle, the wheel mounting plate or mounting tube, frame and potentially adjust parts or replace any damaged parts.
- On a wheelchair, different camber angles are used for different reasons depending on the user medical requirements, needs, and personal preferences.

Wheelchair view from the front

No camber angle
or
0° camber
or
Zero camber



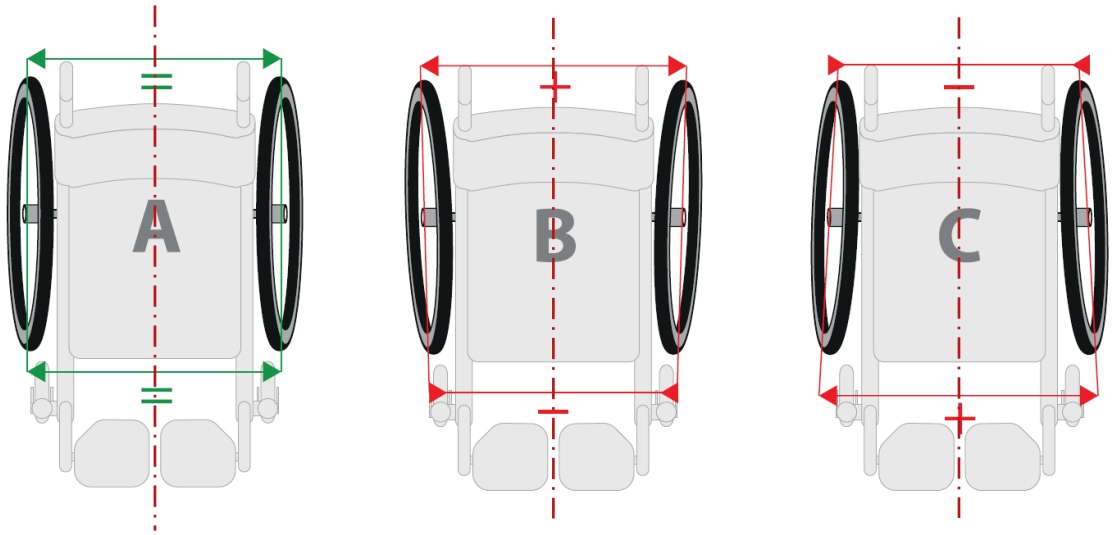
With camber angle
or
Negative camber
or
3°, 4° or 6° camber

CAMBER, REAR WHEEL PARALLELISM, TOE-IN, TOE-OUT, AND HOW TO VERIFY ALIGNMENT

REAR WHEEL PARALLELISM, TOE-IN, TOE-OUT, AND ALIGNMENT

Wheel alignment (also refer as wheel tracking) is the parallelism of the wheels between them and the central axis of the chair as viewed from the top.

- If both wheels and the central axis are parallel, we have a no toe situation and wheels are aligned (illustration A). That is the situation we want to ensure proper operation and optimal performance of the wheelchair.
- If both wheels are parallel but are not parallel to the central axis, the wheels must be aligned (not illustrated).
- If the wheels are pointing toward the front of the chair, we have a toe-in situation and the wheels must be aligned (illustration B).
- If the wheels are pointing toward the rear of the chair, we have a toe-out situation and the wheels must be aligned (illustration C).



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CAMBER ANGLES ON MOTION COMPOSITES WHEELCHAIRS

Folding wheelchairs

0°, 3° and 6°

- HELIO A7/C2/XC2/Kids/K
- VELOCE
- PLATINE 1/2

*These models use **multi-position rear wheel mounting plates***

0° and 3°

- HELIO A6

*These models use the **12 positions reversible rear wheel mounting plates***

0° only

- MOVE
- CHRONOS
- COBALT

*These models use the **6 positions non-reversible mounting plates***

Rigid wheelchairs

0°, 2°, 4°, 6°, and 8°

- APEX Aluminum:
- APEX Carbon

WHEN DO WHEELS ALIGNMENT MUST BE CHECKED AND PERFORMED?

This only applies **if the wheelchair has a camber angle**. **0° camber angle rear wheels cannot be aligned**.

When the **user** finds that:

- the wheelchair is pulling to one side
- the wheelchair is hard to push or is getting harder to push in time.

When you **change** one or more of these **parts** or **settings**:

- the axle bushing (except 0° axle bushing)
- the rear wheels mounting plates
- the seat-to-floor height.

When **visually**, the wheels are:

- pointing inward toward the front (toe-in situation)
- pointing outward toward the front (toe-out situation)
- not parallel to one another

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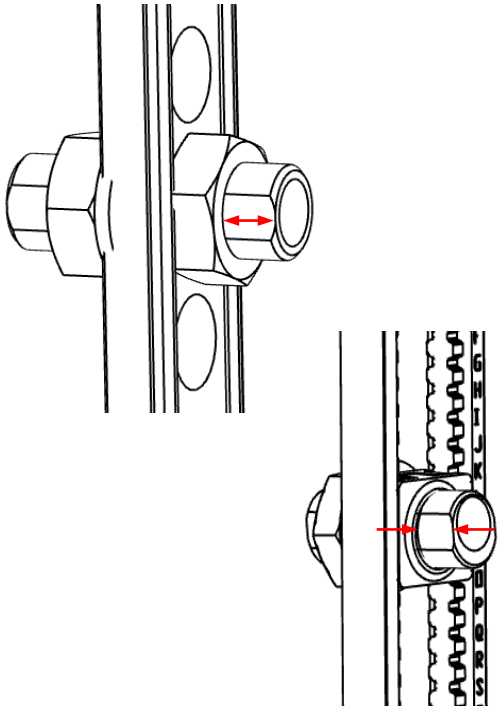
VERIFY THE WHEEL ALIGNMENT

- For **pneumatic tires**, make sure that the **air pressure** is at the **recommended value**.
- Place the wheelchair on a **flat and even surface**, on a worktable when possible.
- **Block** the wheels **on both sides**, using blocks, tools (photo) or any suitable object.
- **Do not use the wheel lock system because it can affect the wheel alignment.**

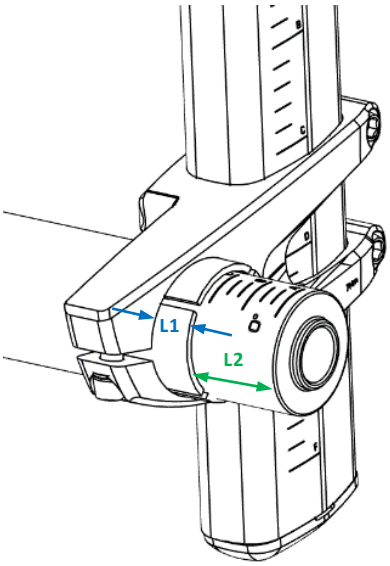
Folding Wheelchair

- Ensure the axle bushings are the same length on both sides (left and right).



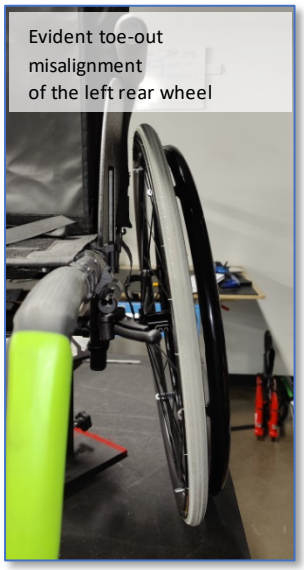
Rigid Wheelchair

- Ensure the **camber tube** is **symmetric** (**L1**) on **both sides**.
- Ensure the **axle bushings** are the **same length** (**L2**) on **both sides**.



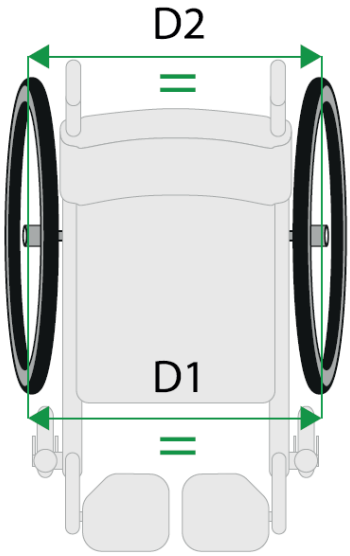
CAMBER, REAR WHEEL PARALLELISM, TOE-IN, TOE-OUT, AND HOW TO VERIFY ALIGNMENT

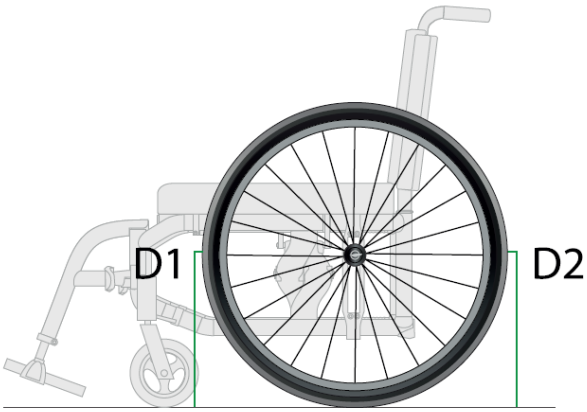
- Check if the wheels are parallel between them and the central axis.
  - Sometimes, misalignment is evident to the eye (photo), but most of the time, you will need to take measures.



- **Mark** the **centre of each wheel** in the front and in the back (4 marks total).
  - Use a **non-permanent marker** (like chalk) or **masking tape**.
  - For **example**, if the wheel diameter is 23 inches, the centre is at 11 ½ inches measured from the floor.

- Measure the front (D1) and rear (D2) distances between wheels at their centre marks.





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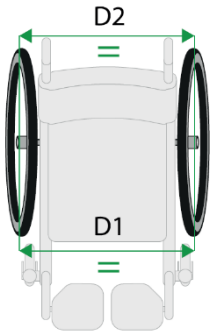
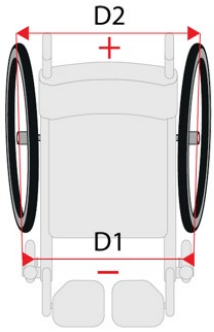
- Front and back measured distances must be the same **within ¼.'' (6 mm)**



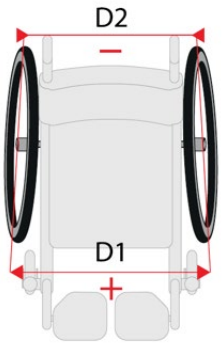
D2 = D1 ± ¼'' (6 mm): No-toe
GOOD

- If the front measure (D1) is smaller than the back measure (D2), it is a **toe-in** situation, and the **wheels must be aligned**. According to the type of wheelchair, refer to document "Perform rear wheel alignment on Motion Composites folding wheelchairs (MC-MTKG-WI-0002) or document Perform rear wheel alignment on Motion Composites rigid wheelchairs (MC-MTKG-WI-0003).



D1 < D2: Toe-in
Alignment needed

- If the front measure (D1) is greater than the back measure (D2), it is a **toe-out** situation, and the **wheels must be aligned**. According to the type of wheelchair, refer to document "Perform rear wheel alignment on Motion Composites folding wheelchairs (MC-MTKG-WI-0002) or document Perform rear wheel alignment on Motion Composites rigid wheelchairs (MC-MTKG-WI-0003).



D1 > D21: Toe-out
Alignment needed

- If the measured distances are the same within tolerance this mean that **both wheels are parallel** with each other. Now **check if they are parallel to the wheelchair centre line** or **vertical axis**.
  - Measure the distance between the **outside frame side** and the **inner side of the tire**.
  - Take the same measure at the same location on the other wheel.
- The measured distances must be the same **within 1/8'' (3 mm)**. If the difference is greater than that it means that the **wheels are not parallel** with the **centre line and alignment must be performed**. See document "Perform rear wheel alignment on Motion Composites folding wheelchairs (MC-MTKG-WI-0002).