

## Floor Characteristics

The type of the floor and the possible obstacles are factors that influence the amount of force required to move the cart as well as the transmission of vibrations and the wear on the wheel.

Based on the characteristics of the floor, the guidelines apply to selecting the right wheel:

- For irregular floors and in the case of obstacles, the wheels should have soft and thick tread and large diameter.
- For smooth floors and heavy loads, the wheels should have hard tread.

The table below provides a simple breakdown of the suitable tread for every floor type.

| Flooring                  | Suitable tread material                  |
|---------------------------|--|
| Tiles                     | Plastic material, polyurethane or rubber |
| Asphalt                   | Rubber                                   |
| Synthetic resin, concrete | Plastic material, polyurethane or rubber |
| Unpaved                   | Rubber                                   |
| Grating                   | Rubber                                   |
| With chips                | Rubber                                   |

Additional information can be found in the wheel type overview, on page XYZ. There, for each wheel series the suitable floor types are specified in detail.

## Chemical Resistance

The table summarizes a number of general resistances for each wheel series to make the selection process easier.

Given the numerous chemicals, solvents, etc., precise information cannot be offered since materials with low resistance to a general class of substances may have high resistance to particular substances and vice versa. The concentration, temperature and length of exposure also has a major influence. Users should perform their own resistance tests with relevant materials.

| Resistant to: | GN 22868 | GN 22870 | GN 22872 | GN 22873 | GN 22874 | GN 22875 | GN 22880 | GN 22882 | GN 22884 | GN 22885 | GN 22886 | GN 22887 | GN 22892 | GN 22894 |
|---------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Alcohol       | +        | o        | +        | o        | o        | +        | +        | +        | +        | +        | +        | +        | +        | +        |
| Hydrocarbons  | +        | o        | +        | o        | o        | o        | +        | +        | +        | +        | +        | +        | +        | +        |
| Solvents      | -        | -        | o        | -        | -        | -        | o        | -        | -        | -        | -        | -        | o        | +        |
| Weak acids    | +        | +        | +        | +        | o        | +        | +        | +        | +        | o        | o        | o        | o        | +        |
| Strong acids  | -        | -        | o        | -        | -        | -        | o        | -        | -        | -        | -        | -        | -        | -        |
| Weak alkali   | o        | o        | +        | o        | o        | o        | +        | o        | o        | o        | o        | o        | +        | +        |
| Strong alkali | -        | o        | o        | o        | o        | o        | o        | o        | o        | -        | -        | -        | o        | -        |
| Water         | o        | +        | +        | +        | +        | o        | +        | +        | +        | o        | o        | o        | +        | +        |

+ Resistant, o Limited resistance, - Not resistant

## Temperature Correction Factors

Depending on the ambient temperature, the load capacity must be adjusted based on the temperature correction factors given in the table.

| Ambient temperature |         | Temperature correction factor |          |          |          |          |          |          |          |          |          |          |          |
|---------------------|---------|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|                     |         | GN 22868                      | GN 22872 | GN 22873 | GN 22874 | GN 22875 | GN 22882 | GN 22884 | GN 22885 | GN 22886 | GN 22887 | GN 22892 | GN 22894 |
| from                | to      |                               |          |          |          |          |          |          |          |          |          |          |          |
| -40 °C              | -20 °C  | -                             | -        | -        | 0,4      | 0,4      | -        | -        | -        | -        | -        | 0,5      | 0,5      |
| -20 °C              | 0 °C    | 1                             | 0,8      | 0,8      | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| 0 °C                | +20 °C  | 1                             | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| +20 °C              | +40 °C  | 1                             | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| +40 °C              | +60 °C  | 0,9                           | 0,85     | 0,85     | 0,85     | 0,85     | 0,9      | 0,85     | 0,9      | 0,9      | 0,9      | 0,9      | 1        |
| +60 °C              | +80 °C  | 0,8                           | 0,5      | 0,5      | 0,6      | 0,6      | 0,7      | 0,6      | 0,8      | 0,8      | 0,8      | 0,7      | 1        |
| +80 °C              | +120 °C | -                             | -        | -        | -        | 0,4      | 0,4      | -        | -        | -        | -        | 0,6      | 1        |
| > +120 °C           |         | -                             | -        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1        |

1 = 100% of the load capacity specified in the standard sheet

## Speed Correction Factors

The load capacities given for industrial casters in the standard sheet refer to a speed no greater than 4 km/h. At higher speeds, the load capacity must be adjusted based on the speed correction factors given in the table.

| Speed   |         | Speed correction factor |          |          |          |          |          |          |          |          |          |          |          |
|---------|---------|-------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|         |         | GN 22868                | GN 22872 | GN 22873 | GN 22874 | GN 22875 | GN 22882 | GN 22884 | GN 22885 | GN 22886 | GN 22887 | GN 22892 | GN 22894 |
| from    | to      |                         |          |          |          |          |          |          |          |          |          |          |          |
| 0 km/h  | 4 km/h  | 1                       | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        | 1        |
| 4 km/h  | 6 km/h  | 0,7                     | -        | -        | -        | 0,8      | 0,6      | 0,6      | 0,8      | 1        | 0,8      | -        | -        |
| 6 km/h  | 10 km/h | 0,5                     | -        | -        | -        | -        | -        | -        | -        | 0,8      | 0,6      | -        | -        |
| 10 km/h | 12 km/h | 0,4                     | -        | -        | -        | -        | -        | -        | -        | 0,7      | 0,5      | -        | -        |
| 12 km/h | 16 km/h | 0,3                     | -        | -        | -        | -        | -        | -        | -        | 0,6      | 0,4      | -        | -        |

1 = 100% of the load capacity specified in the standard sheet

The speed correction factors should only be regarded as general guide values, as many application-specific factors can affect the load capacity. A corresponding check should be carried out by the user.

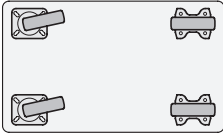
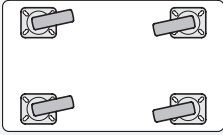
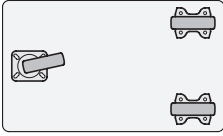
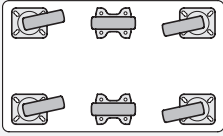
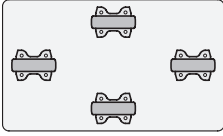
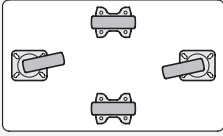


## Maneuverability

Maneuverability is the ability of a cart to be moved more or less easily during use. Production halls with limited space or winding paths require good maneuverability to make the operator's work easier.

In general, swivel brackets allow for easy direction changes, while rigid brackets ensure good directional stability. Rigid brackets must be mounted parallel to each another to avoid distortion.

The table shows the most frequently used arrangements and their features.

| Diagram   | Caster arrangement   | Special features   | Application examples  |
|---|--|--|---|
|    | 2 swivel casters,<br>2 rigid casters,<br>identical height                                  | + Most common arrangement<br>+ Good directional stability<br>+ Good cornering<br>- Poor maneuverability in tight spaces  | Workshops,<br>warehouses  |
|    | 4 swivel casters,<br>identical height  | + Good steering ability<br>+ Can be turned on the spot<br>+ Good maneuverability in tight spaces<br>- Poor straight travel   | Supermarkets,<br>industrial plants,<br>logistics centers  |
|   | 1 swivel caster,<br>2 rigid casters,<br>identical height                                   | + Inexpensive<br>+ Good steering ability<br>+ Can be turned on the spot<br>+ Good maneuverability in tight spaces<br>- Poor directional stability<br>- Tends to tip over | Small carts,<br>light loads   |
|  | 4 swivel casters,<br>2 rigid casters,<br>identical height                                  | + Good for heavy loads<br>+ Good load distribution for long equipment<br>+ Good steering ability<br>+ Can be turned on the spot<br>- High cost                           | Parcel<br>distribution,<br>postal service,<br>train stations,<br>heavy loads,<br>long equipment |
|  | 4 rigid casters,<br>the middle rigid casters<br>have a higher overall<br>height            | + Inexpensive<br>+ Good directional stability<br>+ Good steering ability<br>- Tends to tip over  | Assembly lines,<br>industrial carts   |
|  | 2 swivel casters,<br>2 rigid casters,<br>the rigid casters have a<br>higher overall height | + Good directional stability<br>+ Can be turned on the spot<br>- Tends to tip over   | Workshops,<br>warehouses,<br>long material<br>carts   |

## Static Load Capacity

The static load capacity is the maximum load that can be supported by a stationary wheel or caster without causing permanent deformation that impairs its functionality. A wheel mounted on a device that is rarely moved and therefore almost always remains in the same position is defined as statically loaded.

## Dynamic Load Capacity

The dynamic load capacity of a wheel or caster is the maximum load that it can withstand based on the test procedure as per ISO 22878 – 22884 (DIN EN 12527 – 12533).

The load capacities specified in the standard sheet refer to the dynamic load capacities. The most important test conditions are listed in the table.

| Test conditions     | Light duty casters  | Medium duty casters / Heavy duty casters   | Heavy duty casters                                       |
|---------------------|---|--|--|
| Standard            | ISO 22881:2004<br>DIN EN 12530                            | ISO 22883:2004<br>DIN EN 12532   | ISO 22884:2004<br>DIN EN 12533                           |
| Test load           | Rated load capacity                                       |  |  |
| Test speed          | 3 km/h  | 4 km/h   | 6 km/h, 10 km/h, 16 km/h                                 |
| Temperature range   | +15 °C to +28 °C  |  |  |
| Floor               | Hard and horizontal floor with obstacles                  |  |  |
| Obstacle height     | 3% of the wheel diameter                                  | -5% of the wheel diameter with soft tread (hardness < 90 Shore A)<br>-2.5% of the wheel diameter with hard tread (hardness ≥ 90 Shore A) |  |
| Number of obstacles | Number of obstacles corresponds to 10x the wheel diameter | 500 obstacles  | Number of obstacles corresponds to 5x the wheel diameter |
| Test cycle          | 3-minute operating time; followed by max. 3-minute break  |  | 3-minute operating time; followed by max. 1-minute break |
| Test duration       | Overcoming of all obstacles                               | 15,000 wheel rotations and overcoming of 500 obstacles   | Overcoming of all obstacles                              |

## Recommended Ergonomic Maximum Load

The recommended ergonomic maximum load is determined by exerting a pulling or pushing force of 200 N on a four-wheeled cart (200 N / 4 = 50 N per wheel) and measuring the maximum transportable load per wheel at a constant speed of 4 km/h.

The applied drive force of 200 N corresponds to the international workplace standard for moving carts indoors and is generally recognized as the limit of the load that a person can withstand over a longer period of time without signs of fatigue.

## Calculation of the Load Capacity per Wheel

To determine the required load capacity of a wheel or caster, the maximum applied load must be added to the empty weight of the cart, then this sum is divided by the number of wheels. For a cart with 4 wheels, however, the total load capacity should generally be divided by 3, as not all wheels will carry the load equally, e.g. due to uneven floors or uneven load distribution.

The formula for calculating the required load capacity is as follows:

$$W = \frac{G + Z}{n}$$

- W = Required load capacity per wheel or caster
- G = Empty weight of the cart
- Z = Maximum applied load
- n = Number of supporting wheels or casters

