



HOW TO CHOOSE

**pneumatic, solid and puncture-proof
wheels for professional applications**

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Choosing the right wheel has a direct impact on **comfort, reliability, durability** and **operational continuity**. In professional and OEM applications, there is no universal solution: pneumatic wheels, solid wheels and puncture-proof systems must be selected based on the actual operating conditions.

Tecnoruote develops solutions for agriculture, gardening, material handling and industrial applications, with particular expertise in pneumatic wheels and puncture-proof configurations.

MAIN DIFFERENCES

Pneumatic wheels

Pneumatic wheels are equipped with an **inner tube** or a **tubeless structure** and work thanks to the pressure of the air inside.



ADVANTAGES

- Excellent shock absorption.
- Greater comfort on uneven surfaces.
- Reduced vibration.
- Better traction on rough terrain.

LIMITATIONS

- Risk of puncture.
- Higher maintenance.
- Sensitive to extreme environmental conditions.

Solid wheels

Solid wheels **eliminate the risk of puncture** and ensure **high operational continuity**.

Depending on the compound used, they can offer different characteristics in terms of elasticity, resistance and dynamic behavior.

Some solutions based on recycled materials make it possible to achieve a good balance between **robustness**, **absorption** and **durability**.



ADVANTAGES

- No risk of puncture.
- High wear resistance, depending on the chosen compound.
- Ideal for intensive and continuous use.
- Reduced or no maintenance.

LIMITATIONS

- Lower shock absorption capacity.
- Greater transmission of vibrations.
- Less comfort on uneven surfaces.

INTERMEDIATE AND PUNCTURE-PROOF SOLUTIONS

Puncture-proof solutions and hybrid configurations

In many professional applications, it is necessary to find a balance between comfort, shock absorption and operational continuity.

For this reason, in addition to traditional pneumatic and solid wheels, there are intermediate solutions designed to **reduce the risk of machine downtime** caused by punctures.

These include:

- Filling pneumatic tires with polyurethane.
- Puncture-proof gel treatments.
- Specific configurations depending on the use.

These solutions preserve part of the comfort typical of pneumatic wheels while **improving reliability** and **resistance to punctures**.

How to choose the right solution

The choice between a solid wheel and a pneumatic wheel should be based on clear technical parameters.

1. SURFACE TYPE

Uneven or rough surfaces	→ PNEUMATIC WHEELS
Smooth or industrial surfaces	→ SOLID WHEELS

2. LOAD AND USE

High loads and continuous use, depending on the chosen compound	→ SOLID WHEELS
Variable loads and the need for absorption	→ PNEUMATIC WHEELS

3. ENVIRONMENTAL CONDITIONS

Presence of debris or sharp objects	→ SOLID WHEELS
Controlled environments	→ BOTH SOLUTIONS

4. FREQUENCY OF USE

Intensive and continuous use, depending on the chosen compound	→ SOLID WHEELS
Intermittent use or use on variable terrain	→ PNEUMATIC WHEELS

TYPICAL APPLICATIONS

Pneumatic wheels

- Equipment for uneven terrain.
- Machinery for outdoor use.
- Applications where comfort and shock absorption are required.

Solid wheels

- Industrial handling.
- Machines for intensive use.
- Applications where reliability and operational continuity are priorities.

PROFESSIONAL APPROACH TO SELECTION

In industrial and OEM contexts, wheel selection is **never standard**.

It is essential to consider:

- static and dynamic load.
- Operating speed.
- Real operating conditions.
- Required service life over time.

A correct technical assessment helps avoid:

- Premature wear.
- Operational inefficiencies.
- Unplanned maintenance costs.

Custom solutions

For professional applications, the best solution is often not a standard product but a custom-designed configuration.

The combination of:

- materials,
- wheel structure,
- components,

must be defined according to the final application.

HOW TO CHOOSE

a wheel based on load:

technical guide for professional applications

Choosing industrial wheels based on load is a key step to **ensure safety, durability and long-term performance**.

An incorrect selection can cause:

- Premature wear.
- Deformation.
- Operational inefficiencies.
- Machine downtime.

For this reason, it is **essential to evaluate the load in a technical and accurate way**.

TYPES OF LOAD TO CONSIDER

STATIC LOAD

This is the weight the wheel must support when stationary.

It should be considered especially for:

- Stationary machines.
- Systems with constant loads.

DYNAMIC LOAD

This is the load while moving, including:

- Acceleration.
- Braking.
- Direction changes.

It is the most important parameter in most industrial applications.

IMPACT LOADS

These occur in the presence of:

- Obstacles.
- Uneven surfaces.
- Intermittent use.

They can generate load peaks higher than the nominal value.

HOW TO CALCULATE LOAD PER WHEEL

A common mistake is to simply divide the total weight by the number of wheels.
In reality, it is necessary to consider that the load is never distributed perfectly evenly.

Basic technical rule

In many cases, it is assumed that: **only 3 out of 4 wheels actually support the load**
This implies an inherent safety factor.

Practical example

Machine total weight: 400 kg
Number of wheels: 4
Correct calculation:
 $400 \text{ kg} \div 3 = 133 \text{ kg per wheel}$
NOT 100 kg as one might think

Factors influencing the choice

1. TYPE OF USE

Continuous use
Intermittent use

- CHOOSE WHEELS WITH A HIGH MARGIN.
- POSSIBLE OPTIMIZATION.

2. OPERATING SPEED

Higher speed = greater stress

- REQUIRING SUITABLE MATERIALS AND STRUCTURE.

3. OPERATING ENVIRONMENT

Presence of chemical agents.
High or low temperatures.
Humidity.

- THESE DIRECTLY AFFECT DURABILITY.

4. SURFACE TYPE

Smooth
Uneven

- LOWER STRESS
- HIGHER DYNAMIC LOADS

Wheel material selection

The material must be selected according to the load and the environment.

- Pneumatic rubber → **SHOCK ABSORPTION.**
- Solid rubber → **RESISTANCE AND OPERATIONAL CONTINUITY.**
- Technical materials → **SPECIFIC APPLICATIONS.**

There is no universal material: each application requires a dedicated choice.

Safety margin

In professional settings, it is essential to provide an adequate safety margin.

In general, it is recommended never to work at the limit of the wheel's nominal capacity.

This makes it possible to:

- Increase service life.
- Reduce failures.
- Ensure operational continuity.

Common mistakes to avoid:

- Underestimating dynamic load.
- Not considering impacts and level differences.
- Choosing wheels based only on price.
- Using standard solutions for complex applications.

OEM approach: custom engineering

For industrial applications and professional machines, wheel selection should be part of the overall design process.

It is necessary to consider:

- Weight distribution.
- Load points.
- Real operating conditions.

In many cases, the optimal solution is a **custom-designed configuration**.

Technical support

Correct wheel selection based on load requires specific expertise.

Our team supports manufacturers and companies in defining the most suitable solution, with a technical approach focused on real operating conditions.

Tecnoruote s.r.l

Via Galilei n. 26 fr. Feletto Umberto
33010 TAVAGNACCO (UD) ITALY

tel. +39 0432 571089
fax. +39 0432 570459
mail: info@tecnoruote.com
www.tecnoruote.com

