Castors and wheels

ELESA S.p.A.
Via Pompei 29
20052 Monza (Milano) ITALY
Phone: +39 039 28 11.1
Fax: +39 039 83 63 51
www.elesa.com
info@elesa.com

OTTO GANTER GmbH & Co.KG
Triberger Straße 3
78120 Furtwangen GERMANY
Phone: +49 7723 65 07 130
Fax: +49 7723 65 07 165
www.ganter-griff.com
info@ganter-griff.de

www.elesa-ganter.com

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RE.FF

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Castors and wheels

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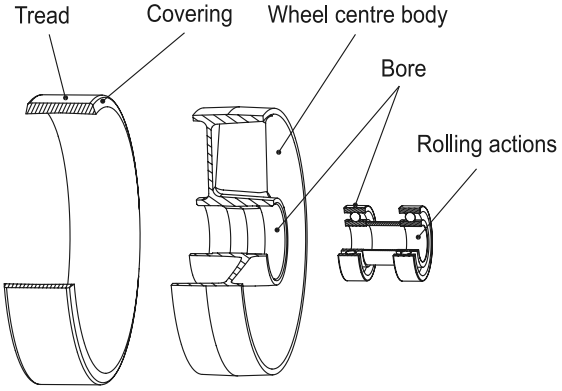
1. GENERAL INFORMATION

The wheel is a mechanical assembly in which sliding motion is replaced by rolling motion through rotation around an axis.

The wheel consists of the following components:
the tread, the covering, the wheel centre body, the bore and the rolling action.



- **Tread**
  The tread is the wheel's outer surface, i.e. the part that comes in contact with the ground. It can be smooth or engraved with raised patterns to increase its grip on the ground.
- **Covering**
  The covering, or rolling strip, is the outer ring. It is made of different materials and characterises the wheel. The covering is fixed when joined with the wheel centre body as a single solid piece (using an adhesive or through a mechanical connection) or fitted when mechanically assembled on the wheel centre body.
- **Wheel centre body**
  The wheel centre body is the wheel part that connects the covering to the bore. It comes in various shapes and is made of different materials; it can be a single piece or two or more parts joined together.
- **Bore and rolling actions**
  The bore is the middle part of the wheel that houses the axle or the rolling actions that make rotation easier (ball bearings, roller bearings, plain bearings, etc.).

Depending on the construction methods and materials forming the covering, wheels can be divided into three families: rubber wheels, polyurethane wheels and monolithic (or hard tread) wheels.

1.1 Rubber wheels

A rubber wheel covering consists of an elastomer made from natural and/or synthesised rubber. The rubber used to build industrial wheels can be vulcanised or injection moulded.
Vulcanised rubber: special mineral loads and vulcanising agents are added to the rubber that undergoes a process called "vulcanising".
During this process, the rubber's molecular structure changes significantly: the "pasty" material at the beginning of the process becomes a non-fusible product that acquires and, over time, maintains the form of the mould in which the reaction occurs. The ring obtained is mechanically assembled to the wheel centre body. Vulcanised rubber has enhanced elastic deformability properties within relatively broad ranges of applied traction and compression loads.
The physical-mechanical characteristics of vulcanised rubber vary according to the quality of the natural and/or synthesised rubber used, the type and quantity of mineral loads added and the conditions under which the vulcanisation process takes place.
Injected rubber: the rubber goes through a chemical synthesis process. The material obtained is injected into a mould in which the wheel centre body has already been inserted. The injected rubber maintains its fusibility even after moulding.

Normally, the elastic properties of injected rubber are worse than those of the best quality vulcanised rubber, even though they are comparable to those of medium and low-quality vulcanised rubber. The following are some of the main physical-mechanical parameters relative to the quality of rubber (for the definition of each parameter see the standards indicated next to that parameter):
- hardness UNI EN ISO 868:1999; ASTM D 2240-2004
- specific density UNI 7092:1972; ISO 2781:1988
- impact strength UNI 7716:2000; ISO 4662:1986
- abrasion loss UNI 9185:1988; DIN 53516:1987
- ultimate tensile strength UNI 6065:2001; ISO 37:1994; ASTM D 412c-1998
- ultimate elongation UNI 6065:2001; ISO 37:1994; ASTM D 412c-1998
- tearing resistance UNI 4914:1987; ASTM D 624b-2000
- compression set UNI ISO 815:2001

These parameters are not independent; in other words, changing one of them usually leads to a change in other parameters (to varying degrees). Hardness is the easiest parameter to determine: in general, increased hardness reduces the elastic properties (impact strength, ultimate elongation, compression set) and lowers overall wheel performances. Instead, parameters such as tearing resistance and abrasion loss depend mainly on the composition of the vulcanised rubber and, to a lesser extent, on hardness.

1.2 Polyurethane wheels

A polyurethane wheel covering consists of an elastomer obtained exclusively from the synthesis of raw materials.
Polyurethanes are chemical compounds obtained from a polymerisation reaction triggered by mixing two components, belonging to two different families of compounds (Di-Isocyanates and Polyalcohols), that were previously heated to temperatures that keep them in the liquid state with relatively low viscosity. In general, elastomer polyurethanes do not contain any additional mineral loads. The reactive mix is cast or injected into heated moulds containing the metal or plastic centres. Thanks to the temperature of the mould and of the wheel centre body, the polymerisation reaction can be completed inside the polyurethane, while the polyurethane is chemically linked to any adhesive that may be present on the surface of the wheel centre body.

Mould-on polyurethane is no longer fusible, has good elasticity characteristics in addition to medium-high hardness and compression and traction strength.

Injected polyurethane is fusible even after moulding; in general, it has inferior elasticity characteristics but superior hardness with respect to mould-on polyurethane.
The following are some of the main physical-mechanical characteristics of polyurethane (for the definition of each characteristic see the standards indicated next to that parameter):
- hardness UNI EN ISO 868:1999; ASTM D 2240-2004
- specific density UNI 7092:1972; ISO 2781:1988
- impact strength UNI 7716:2000; ISO 4662:1986
- abrasion loss UNI 9185:1988; DIN 53516:1987
- ultimate tensile strength UNI 6065:2001; ISO 37:1994; ASTM D 412c-1998
- ultimate elongation UNI 6065:2001; ISO 37:1994; ASTM D 412c-1998
- tearing resistance UNI 4914:1987; ASTM D 624b-2000
- compression set UNI ISO 815:2001

1.3 Monolithic (hard tread) wheels

In monolithic (hard tread) wheels, the wheel centre body and the covering are made with the same material. The physical-mechanical characteristics of the wheel will change depending on the material used.

2. BRACKETS

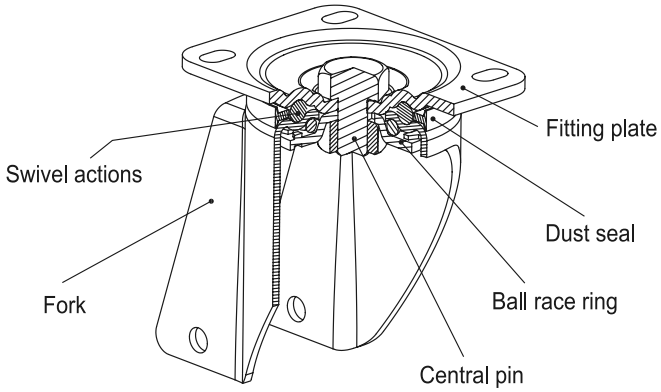
The bracket is the part that connects the wheel to the equipment. Normally, all wheels need a bracket to be applied to the equipment; an exception is made for wheels whose axle is built into the equipment. Brackets can be the swivel or the fixed type.

2.1 Swivel bracket

The swivel bracket rotates around its own vertical axis as the running direction changes. The wheel axis is misaligned with respect to the bracket axis so that it is easier to manoeuvre the equipment.

"Manoeuvrability" is defined as the ability of the equipment to change direction, while "directionality" refers to the equipment's ability to maintain a trajectory along a specific direction. Excessive offset reduces equipment directionality due to "sliding" of the wheel (the "Swimmy" effect).

Swivel brackets can also be equipped with brakes. The swivel bracket consists of a connecting plate, a fork, a ball race ring, swivel actions, a central pin and, if necessary, a dust seal.

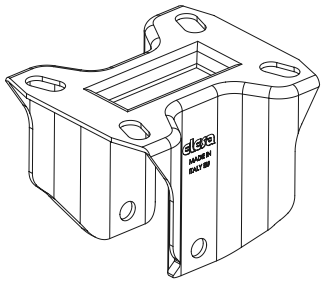


- **Fitting plate**
  The fitting plate is used to connect the bracket to the equipment (four connection holes).
- **Wheel support fork**
  The fork is the piece with the characteristic upside-down "U" shape that supports the wheel. Holes are drilled at the bottom to house the wheel's axle set, while the swivel actions are inserted in the top.
- **Ball race ring**
  The ball race ring contains the castor's swivel actions. In special cases, it can also be used only as a dust seal or a guard.
- **Swivel actions**
  Swivel actions allow the plate to rotate on the fork. They consist of a ring of balls in contact between the plate and the fork (called "ball gyro") lubricated with grease to protect against dust, liquids and other aggressive agents. The bracket load capacity varies significantly according to the type of swivel action being used.
- **Central pin**
  The central pin is the part that joins the plate and the ball race ring. Thanks to the central pin, the plate and the ball race ring form a single piece, while the fork is free to rotate around its own axis.The pin can:
  - be incorporated in the plate, through forming and riveting after assembling the parts;
  - be incorporated in the plate, through hot forming on the plate and tightening with a self-locking nut;
  - consist of a screw and a nut.
- **Dust seal**

The dust seal protects the swivel actions of the bracket against dust and solid and medium-grain aggressive agents.

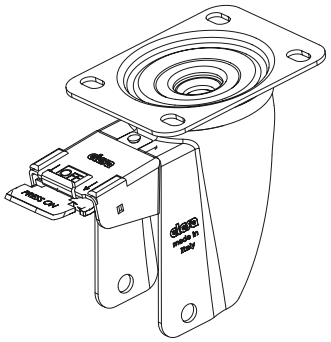
2.2 Fixed bracket

The fixed bracket is designed to keep the wheel moving in a specific direction; therefore, it guarantees equipment directionality. Instead, equipment manoeuvrability depends on the use of swivel brackets. In general, the fixed bracket consists of a single pressed steel plate shaped into an upside-down "U". Holes to house the wheel axle set are drilled at the bottom, while the equipment attachment holes are at the top.



2.3 Swivel bracket with brake

The brake is the device that allows the blocking of the rotation of the bracket around its axis, of the rotation of the wheel and of the rotation of the castor (wheel+bracket assembly).



3. AXLE SET

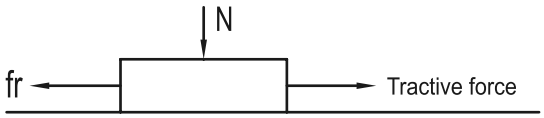
The axle set is the piece used to connect the wheel to the castor. Normally, it consists of a threaded pin with nut, washers, tube and, where necessary, spacers. For standard applications, the axle set can be riveted directly on the castor fork.

4. LOADS, FRICTION AND FORCES

Dissipative forces or friction occur along the contact surfaces between bodies and tend to oppose the movement.

4.1 Sliding friction

Sliding friction force opposes the movement between two contact surfaces that slide against each other.
This force depends on the type of contact surfaces (materials and finishing level) and on the load applied in the direction perpendicular to the motion direction (Normal force).



In mathematical terms, the sliding friction force is defined as follows:

$$F_r = b_r \times N$$

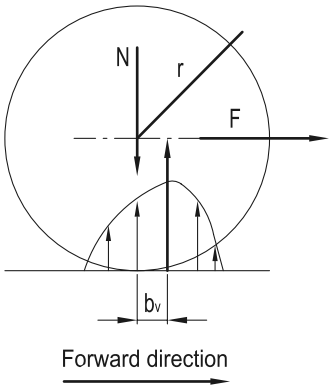
where: b_r = sliding friction coefficient **N** = normal force (or load)
If two bodies are initially stationary, the resistance force is called the static friction force and represents the minimum force that must be applied to start moving the two bodies.
When the two bodies are in relative motion, a force lower than the static friction force is sufficient to keep the speed constant: this is called the dynamic friction force.
The friction coefficient is obtained experimentally for both static friction and dynamic friction.

4.2 Rolling friction

Rolling friction force is generated when two bodies roll on each other without sliding.

Let's imagine a wheel with **radius r** subjected to a **load N**. As the wheel approaches the contact point, the material is compressed and afterwards, once the contact point has been surpassed, undergoes an elastic release.
If the material used to manufacture the wheel is not perfectly elastic, some of the energy required for compression is lost in the subsequent return phase – dissipated in the form of heat to counteract internal frictional resistance of the material.
If we think in terms of forces, instead of energies, we could say that the distribution of pressure in the contact is not symmetrical compared to the direction of force N.

$$M_r = b_v \times N$$



To keep the wheel turning evenly it is necessary to apply a motive moment identical to and opposite **Mr** or a **traction force F** parallel to the forward direction and such that:

$$F \times r = M_r$$

From the previous formulas we obtained:

$$F = \frac{M_r}{r} = \frac{b_v \times N}{r} = f_v \times N$$

Where

$$f_v = \frac{b_v}{r}$$

With **fv** known as the **rolling friction coefficient** which can be found with experimental tests.

4.3 Tractive force

Tractive force is the force needed to overcome the resistance caused by friction when two bodies slide or roll on each other. Compared to the resistance generated by friction, tractive force has the same intensity and the same sense, but the opposite direction. The lower the force needed to keep a equipment moving, the greater the smoothness of the wheel applied to the moving equipment.
In the specific case of a wheel rolling on a flat surface, the tractive force must overcome the resistance caused by rolling friction - that arises when the wheel comes in contact with the surface - and by sliding friction - generated by the mechanical bore and axle set coupling.

5. CHOOSING THE RIGHT WHEEL

Any product that isn't used under the conditions for which it was designed may not satisfy the user's needs. It may also damage materials and cause injuries.
Here are some examples in which wheels and castors are used incorrectly:
- using a wheel not suitable for the floor will deteriorate the wheel covering and damage the floor;
- choosing a fixed castor under operating conditions for which a equipment must be very manoeuvrable will make it extremely difficult to move that equipment;
- applying a load that exceeds the wheel's rated load capacity will lead to wheel malfunctions and premature deterioration.

Therefore, a technical analysis of the operating conditions must be performed. The most economical solution should be chosen only after the product has been technically evaluated.
The purpose of performing a technical analysis on a equipment moving solution is to define the operating conditions and any external factors that may affect equipment use.

The following factors must be analysed in order to choose the right wheel:
- nature and condition of the ground (5.1)
- environment (5.2)
- magnitude and nature of the load (5.3)
- speed and means of traction (5.4)
- manoeuvrability (5.5)
- diagrams (5.6)

The process of choosing the right wheel to match the operating conditions can be divided into three steps:
Step one: identifying the correct type of wheel based on the floor and the characteristics of the operating environment;
Step two: calculating the dynamic capacity, static load and rolling resistance required by the specific application and, therefore, determining the wheel diameter;
Step three: identifying the correct bracket and checking the dynamic capacity of the castor (wheel+bracket assembly).

If the evaluation of these various aspects generates different data with reference to the same wheel and/or castor characteristic, the final choice must be made based on the most conservative condition.

• Static load [N]
Static load is the maximum load that a motionless (stationary) wheel can support without generating any permanent deformations that may reduce its operating efficiency. A wheel mounted on a equipment that is seldom moved, and therefore almost always remains in the same position, is defined as being subjected to a static load.

• Dynamic carrying capacity
Dynamic carrying capacity of a wheel is defined as the value (expressed in N) of the maximum load that can be supported by that wheel in conformity with ISO 22883:2004 and UNI EN 12532:2001 that,
for industrial wheels, require dynamic testing under the following conditions:
- constant speed of 1.1 m/s (4 km/h)
- overcoming 500 obstacles and 15,000 revolutions of the diameter;
- obstacles with width 100 mm and height 5% of the wheel diameter with an elastic rolling strip (hardness up to 90 Shore A) and 2.5% of the diameter for wheels with a rigid rolling strip (hardness greater than 90 Shore A);
- temperature 20 °C (tolerance ± 10 °C);
- non-continuous operation (3 minutes of operation and 1 minute stopped);
- smooth, hard and horizontal floor.

• Rolling resistance
Rolling resistance is the value (expressed in N) of the maximum load that can be supported by each single wheel at a constant speed of 4 km/h with application of a tractive force or thrust equal to 50N (excluding the initial pickup). This value is obtained by applying a tractive force of 200N to a 4-wheeled equipment and measuring the magnitude of the maximum transportable load per wheel during normal moving conditions.
The applied tractive force of 200N complies with the international workplace standard for indoor moving and is universally recognised as the human fatigue limit that can be supported for extended periods of time.

5.1 Nature and condition of the ground

The nature and condition of the ground and the presence of any obstacles will have an influence on choosing the right wheel. They are also important factors affecting the performance of the moving equipment as well as the efficiency and the duration of the wheels and castors.
Special attention is required for cases involving uneven floors or where obstacles are present. In this case, the impact of the wheel against an obstacle generates advancement resistance whose magnitude depends on the elasticity of the rolling strip material. In fact, the energy absorbed during an impact is greater in a wheel with an elastic rolling strip than in a rigid wheel, thus partially cancelling the braking effects caused by the obstacle.
For floors that are uneven or on which obstacles are present, with load capacity being equal, a wheel with a greater diameter should be chosen in order to overcome the obstacle.

The wheel must be chosen very carefully in all cases in which there are obstacles, chemical and/or organic substances and machining residues. The main types of flooring are:
- tiles;
- asphalt;
- cement-resin;
- not paved floor;
- expanded metal floor;
- floor with chips, obstacles etc.

The main floor-wheel covering combinations are listed in the following table.

Floor type		Suitable covering
Tiles		Polyurethane or rubber
Asphalt		Rubber
Cement-resin		Polyurethane or rubber
Not paved		Rubber
Expanded metal		Rubber
With chips/obstacles		Rubber

5.2 Environment

To choose the right wheel, it's also important to determine if the wheel materials are compatible with the chemical-environmental conditions, the temperature, the humidity and the inductive electrostatic phenomena that may affect wheel operation.
The standard operating conditions are indicated in the manufacturer's catalogue for each type of wheel.

Chemical-environmental conditions

Because there are so many different types of aggressive chemical agents in work environments, it's difficult to provide a complete and exhaustive description.
The main chemical substances that a wheel may come in contact with include:
- weak acids (e.g. boric acid, sulphurous acid);
- strong acids (e.g. hydrochloric acid, nitric acid);
- weak bases (e.g. alkaline solutions);
- strong bases (soda, caustic soda);
- chlorinated and aromatic solvents (e.g. acetone, turpentine);

- hydrocarbons (e.g. petrol, oil, diesel oil, mineral oils);
- alcohol (e.g. ethyl alcohol);
- fresh water;
- salt water;
- saturated steam.

Therefore, when choosing a wheel, it's very important to check if the material forming the covering, the wheel centre body, the rolling actions and the bracket is compatible with the specific features of the operating environment. Caution is required in those sectors in which water, acids, bases, steam and other aggressive agents are often present. For example, a polyurethane wheel should be used instead of a tyred wheel in environments with a large quantity of oils, fats and hydrocarbons, while it is recommended to use stainless steel castors in humid environments and in the presence of high saline concentrations.

Temperature

If operating temperatures in an application differ from the standard range of values indicated by the manufacturer, check the resistance of the wheel materials. This not only applies to the rolling strip and the wheel centre body, but also to the type of lubricant used (it may be necessary to contact the manufacturer). The indicative percentages of carrying capacity variation as a function of temperature are shown in the following table.

Temperature range [°C]		**Carrying capacity variation coefficient (1 = 100% of the carrying capacity)**					
from	to	**RE.E2**	**RE.E3**	**RE.F8**	**RE.FF**	**RE.F5**	**RE.G1**
-40	-20	0,40	0,40	0,50	▲	▲	▲
-20	0	1,00	1,00	1,00	1,00	1,00	0,80
0	+20	1,00	1,00	1,00	1,00	1,00	1,00
+20	+40	1,00	1,00	1,00	1,00	1,00	1,00
+40	+60	0,85	0,85	0,90	0,90	0,90	0,85
+60	+80	0,60	0,60	0,70	0,70	0,80	0,50
+80	+120	0,40	0,40	0,60	0,40	0,40	▲
> 120 °C		▲	▲	▲	▲	▲	▲

▲ not recommended

The above-mentioned variation values refer to the prolonged and continued use (over 30 minutes) of the wheels at the specified ambient temperatures.

5.3 Magnitude and nature of the load

The magnitude of the load is the value [N] obtained by adding the weight to be transported to the equipment weight (tare). The nature of the load, either a liquid or a solid, has a significant effect on the wheel load capacity calculation. The formula to determine the load capacity for each wheel is:

$$Q = \frac{P_U + P_C}{n}$$

where: **Q** = load capacity for each wheel **P_U** = weight to transport **P_C** = equipment tare (equipment weight) **n** = number of wheels in contact with the ground

SOLID LOAD:

For a solid load, **n=3** for a four-wheeled equipment (where three out of four wheels are considered to be in contact with the ground at all times).

LIQUID LOAD:

For a liquid load **n=2** for a four-wheeled equipment (where two out of four wheels are considered to be alternatively in contact with the ground).

A thorough analysis is indispensable when the equipment is part of an automated or continuous cycle production unit. In this case, all the forces that act on the wheel must be taken into consideration; therefore, it is recommended to include allowances and safety factors.

5.4 Speed and means of traction

Equipment speed is an important factor when choosing a wheel. In fact, if the speed is 0, and thus the use is mainly static, it is enough to compare the load capacity for each wheel with the static load indicated in the manufacturers' catalogues.
If the speed is other than 0, then the means of traction must be taken into consideration.
The means of traction is the tool used to exert the force that moves the body. In industry, traction devices can be manual or mechanical. Manual moving refers to the situation in which the force is exerted by one or more persons, while mechanical refers to the situation in which such force is exerted by a mechanical device (on-board drives or by using towing devices).

• *Manual moving*

For manual moving, the speed is generally less than or equal to 4 km/h**.**
Choosing a wheel that allows only one operator to move a load should be based on a wheel rolling resistance value determined by the following formula:

$$S = \frac{P_U + P_C}{n}$$

where: **S** = rolling resistance **P_U** = weight to transport **P_C** = equipment tare (equipment weight) **n** = number of equipment wheels (maximum 4) The value obtained should be compared to the wheel rolling resistance value indicated in the manufacturer's catalogue.

• *Mechanical moving with towing devices*

or towed mechanical moving, the wheel should be chosen based on the equipment's operating speed. The wheel rated dynamic load capacity normally refers to a speed of no more than 4 km/h (1.1 m/s).
If the speed is higher than 4 km/h, a correction factor must be applied to the load capacity value since the materials forming the wheel undergo chemical-physical changes during which their performances decrease with an increase in operating speed.
The indicative percentages of load capacity variation with an increase in speed for different types of wheels are shown in the following table.

Speed range [Km/h]		**Carrying capacity variation coefficient (1,00 = 100% of the carrying capacity)**					
min	MAX	**RE.E2**	**RE.E3**	**RE.F8**	**RE.FF**	**RE.F5**	**RE.G1**
0,00	4,00	1,00	1,00	1,00	1,00	1,00	1,00
4,00	6,00	0,50	0,50	0,40	0,60	0,80	0,50
6,00	10,00	▲	▲	▲	▲	0,60	▲
10,00	16,00	▲	▲	▲	▲	0,40	▲
> 16 Km/h		▲	▲	▲	▲	▲	▲

▲ not recommended

• *On-board mechanical movement*

For equipments with an on-board drive (equipments with drive wheels – self-propelled equipments), the wheels are subjected to particular stress and strain.
In fact, the drive wheels not only support the load, but also must transmit the tangent stress that allows the wheel and therefore the equipment to advance. In addition, the drive wheel covering is subjected to even greater stress.
In particular, when choosing wheels and castors for self-propelled equipments, the following factors must also be taken into consideration:

• type of plain or ball bearing applied in the bore;

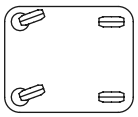
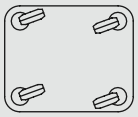
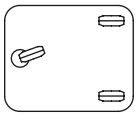
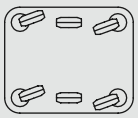
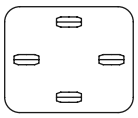
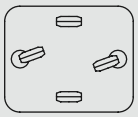
- shaft/bore coupling tolerances;
- bore material in relation to shaft material;
- start and stopping frequency of the motion transmission part;
- direction reversals;
- presence of even temporary overloads.

Since many factors have to be evaluated, it is recommended to contact us to choose the wheels and castors to apply to self-propelled equipments.

5.5 Manoeuvrability

Equipment manoeuvrability refers to the ability of a equipment to be moved more or less easily during use.

The limited space available inside some production departments or particularly winding routes that sometimes connect on work unit to another may require special equipment manoeuvrability characteristics to make operator tasks easier. Swivel castors allow the equipment to rotate and the greater the castor offset (i.e. the distance between the bracket rotation axis and the wheel rotation axis), the easier the rotation. However, though it does guarantee excellent manoeuvrability, excessive offset may cause the castor to oscillate along straight routes (Swimmy effect). Fixed castors do not allow the equipment to change direction but do guarantee directionality. In any case, the fixed castors must be mounted so that they are perfectly parallel to each other. The most common wheel layouts along with the relative castors are shown in the following table.

DIAGRAM	CASTOR LAYOUT	OPERATING CONDITIONS	APPLICATION EXAMPLES
	**Stable equipment:** two swivel castors and two fixed castors.	Long and straight routes. Few direction changes.	Mechanical workshops, semi-automated warehouses, metallurgical workshops.
	**Stable equipment:** four swivel castors.	Short routes. Frequent direction changes. Approach to machines or shelves.	Supermarkets, wood machining companies, small distribution centres.
	**Stable equipment:** one swivel castor and two fixed castors.	Long and straight routes. Few direction changes.	Small equipments Tool/object carriers Light loads.
	**Tipping equipment** two fixed castors and four swivel castors.	Long routes with mechanical towing. Few direction changes.	Moving in railway, postal, airport areas. Heavy loads.
	**Tipping equipment** four fixed castors.	Long and straight routes without direction changes.	Assembly or machining lines with round trip and head transfer device.
	**Tipping equipment** two fixed castors and two swivel castors.	Long routes with manual or mechanical towing. Few direction changes.	Mechanical and metallurgical workshops, semi-automated warehouses.

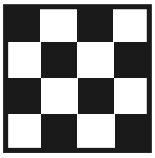
5.6 Choosing the wheel

Each of the parameters and operating characteristics outlined in the previous paragraphs is used in one of the three steps involved in choosing the wheel.

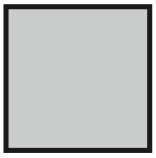
Step 1

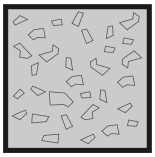
The type of wheel suitable for the floor and operating environment is identified in step 1.
The following graph summarizes the factors that influence the choosing of the type of wheel; "type of wheel" means:
materials that form the covering and the wheel centre body; type of anchorage between covering and wheel centre body; rolling actions

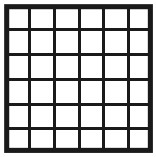
FLOOR TYPE


Tiles


Asphalt

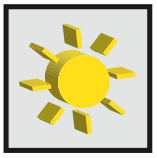

Cement Resin


Not paved


Expanded metal


With chips, obstacles, etc.

ENVIRONMENTAL CONDITIONS


Temperature


Humidity


Aggressive Chemicals

TYPE OF WHEEL

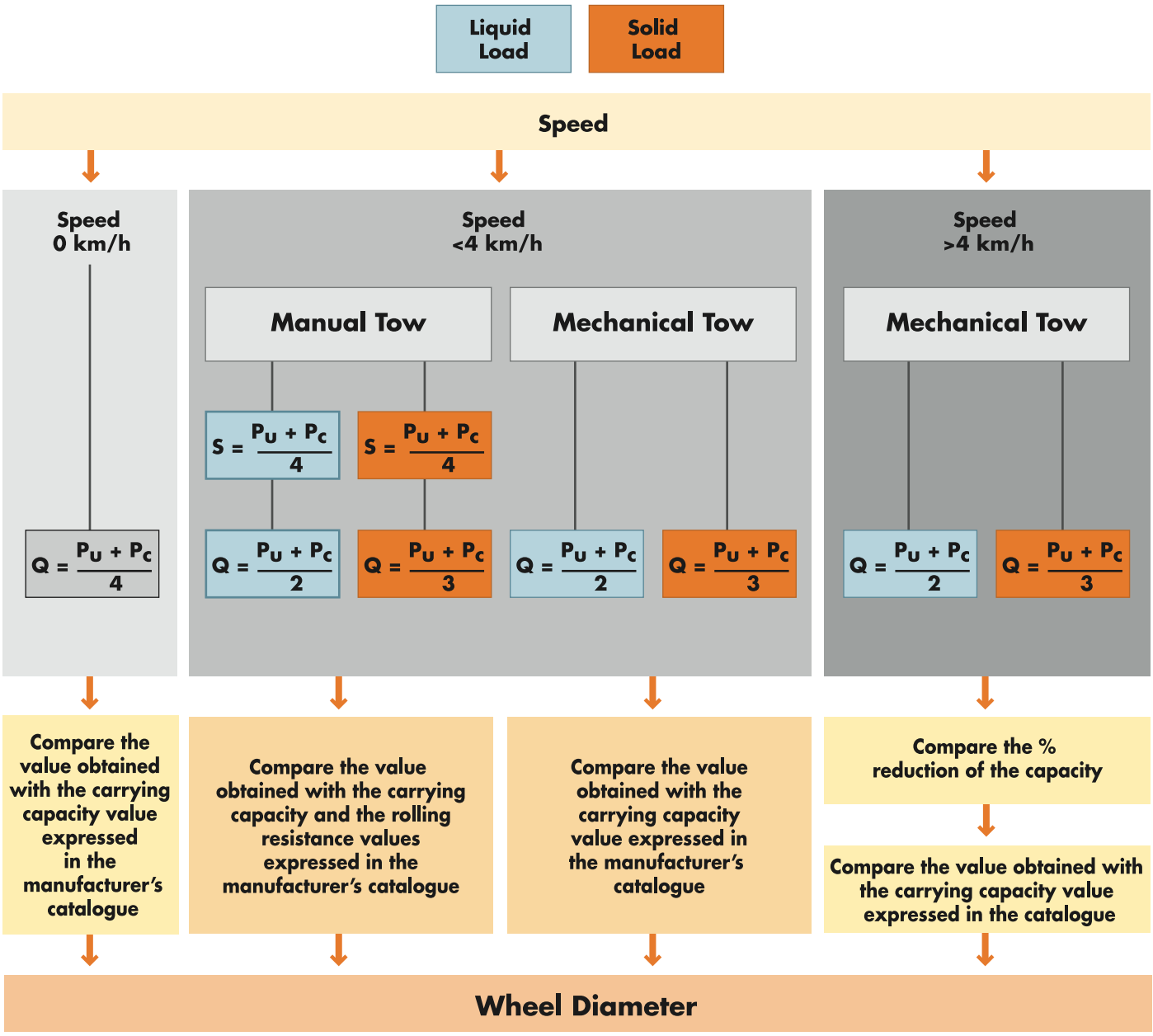
Step two

The load capacity, static load and smoothness values required by the specific application and needed to determine the wheel diameter are calculated in step two.

One of the most important parts of this step is an analysis of the load that the wheel must support.

The following diagram indicates what calculations to perform and what values to consider depending on the various operating conditions. These aspects must always be indicated (magnitude and nature of the load and speed), while ensuring that all the values determined are not higher than the rated values indicated in the manufacturer's catalogue.

If the evaluation of various aspects generates different data with reference to the same wheel characteristic, the final choice must be made based on the most conservative condition.



S = rolling resistance **Pu** = weight to transport
Q = load capacity **Pc** = equipment weight

Step three

The correct castor is chosen in the third step. The step can be divided into two separate parts:
1. choosing fixed or swivel brackets, depending on manoeuvrability and directionality needs;
2. checking the compatibility between dynamic load capacity and rated dynamic load capacity of the wheel and bracket.

The following table summarizes some general indications for choosing the right wheels according to the application's features.

Selection parameters		Value range	RE.E2	RE.E3	RE.F8	RE.FF	RE.F5	RE.G1
Load capacity		Light load, up to 250 kg	●	●	●	●	●	●
		Medium load, up to 750 kg	▲	▲	●	●	●	▲
		Heavy load, more than 750 kg	▲	▲	❒	❒	●	▲
Rolling resistance		< 125 kg	●	●	●	●	●	●
		> 125 kg	▲	▲	●	❒	●	▲
Flooring		Tiles	●	●	●	●	●	●
		Asphalt	●	●	❒	●	●	●
		Cement - resin	●	●	❒	●	●	●
		Not paved	●	●	▲	▲	▲	▲
		Expanded metal	●	●	▲	❒	❒	●
		With chips, obstacles, etc.	▲	▲	▲	▲	❒	▲
Environmental chemical conditions		No aggressive chemicals	●	●	●	●	●	●
		With aggressive chemicals	▲	▲	●	❒	❒	●
Temperature		-40° / -20°	❒	❒	●	▲	▲	❒
		-20° / +80°	●	●	●	●	●	●
		+80° / +120°	▲	▲	❒	❒	❒	▲
		> 120°	▲	▲	▲	▲	▲	▲
Means of traction		Manual	●	●	●	●	●	●
		Mechanical	❒	❒	❒	❒	●	▲

● recommended ❒ tolerated ▲ not recommended

6. GLOSSARY

Axle set
Connection through which the wheel is assembled to the castor. Normally, it consists of a threaded pin with nut, washers, tube and, where necessary, spacers.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Ball race ring
The part that encloses the castor rolling actions.

Bolt hole
Hole made in the top of the bracket and used to attach the castor to the equipment.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Bore
Central part of the wheel designed to house the axle set or the rolling actions that facilitate rotation (ball bearings, roller bearings, plain bearings...).
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Bracket
Connection part between wheel and equipment. Normally, all wheels must use a bracket to be applied to the equipment; an exception is made for wheels whose axle is built into the equipment.
Swivel bracket: rotates around its vertical axis as the operating direction changes; it can be a swivel plate bracket, swivel bracket with through hole or swivel bracket with stem. The swivel bracket can be equipped with a brake.
Fixed bracket: no rotation; it is designed to keep the wheel moving along a straight line.
Reference standards: UNI EN 12526:2001- ISO 22877:2004

Brake
A device that blocks the rotation of the bracket around its own axis, the wheel rotation or the rotation of the castor (wheel and bracket assembly). Front, rear brakes can be mounted on swivel castors.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Central pin
Swivel bracket part that joins the plate, fork and ball race ring; thanks to the central pin, the plate and fork form a single piece, while the ball race ring remains free to rotate around its own axis.

Wheel centre body
The wheel centre body is the wheel part that connects the covering to the bore. It comes in various shapes and is made of different materials; it can be a single piece or two or more parts joined together.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Covering
Outer ring of the wheel; it can be made of various materials and characterises the wheel. The covering is fixed when joined with the wheel centre body and is fitted when mechanically assembled on the wheel centre body.

Dynamic carrying capacity
Carrying capacity of a wheel is defined as the value (expressed in N) of the maximum load that can be supported by that wheel in conformity with European UNI EN 12532:2001 and International ISO 22883:2004 standards.
Dynamic testing under constant speed (4 km/h, 1.1 m/s) requires overcoming 500 100mm-wide obstacles, with height equal to 5% of diameter for wheels with an elastic rolling strip (hardness up to 90 Shore A) and to 2.5% of the diameter for wheels with a rigid rolling strip (hardness greater than 90 Shore A), without permanent deformation of the wheel affecting its operating efficiency.

Directionality
Possibility of an object to continue moving along a predetermined direction.

Dust seal
The part of the swivel bracket that protects the rolling actions.

Fork
Fixed or swivel bracket part that supports the wheel; normally, it has an upside-down "U" shape. The holes to house the wheel axle set are made at the bottom ends of the fork; the swivel actions are installed in the top.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Hardness
Propensity of a material to be penetrated by another material. It is measured with empirical tests that are used to evaluate the magnitude of the penetration of a specific force in the material under specific conditions. The penetration hardness is inversely proportional to the penetration.
Different tests can be performed to measure the hardness of a material. Shore A and Shore D durometers are used in some of the most widely used tests: durometer type A is used for the softer materials (elastomers), while type D is used for harder materials (thermoplastic material, polypropylene).
Reference standards: UNI EN ISO 868:1999 - ASTM D 2240-2004

Manoeuvrability
Possibility of an object to easily change its operating direction.

Plate
Top part of the bracket, with holes or slots used for the equipment connection. It can be made in different shapes: rectangular with four fitting holes, square with four fitting holes, triangular with three fitting holes, circular with a bolt hole, circular with a stem.
Reference standard: UNI EN 12526:2001 - ISO 22877:2004

Rolling resistance
Value (expressed in N) of maximum load, applicable for each single wheel that an operator can move, over level paths, even for long periods without fatigue.

Static load
Value (expressed in N) of the maximum load that a stationary wheel can withstand without generating any permanent changes to that wheel.
Reference standards: UNI EN 12527:2001 - ISO 22878:2004

Stem
Vertical end of the castor used to attach the castor into a hole in the equipment.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

Tearing resistance
Capacity of a material to resist the propagation of a cut. It is measured through a test under the conditions defined in standards ASTM D 624b-2000 - UNI 4914:1987. During that test, a cut perpendicular to the tractive force is made on a test piece placed under traction.

Tread
Wheel external surface; the part of the wheel in contact with the ground. It can be smooth or sculpted with raised patterns to increase its grip on the ground.

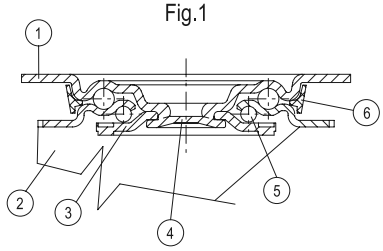
Vulcanisation
Treatment with sulphur or sulphurous compounds applied to some substances, including rubber, to eliminate their plastic characteristics and to make them perfectly elastic.

Wheel
A circular mechanical assembly in which sliding motion is replaced by rolling motion through rotation around its own axis. The wheel consists of the following components: the tread, the covering, the wheel centre body, the bore and the rolling action. Depending on the different construction versions and materials used, wheels can be classified into four families: rubber, polyurethane, monolithic (hard tread) and pneumatic.
Reference standards: UNI EN 12526:2001 - ISO 22877:2004

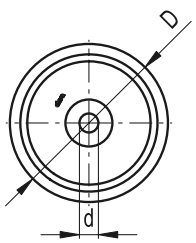
Injected polyurethane wheels

- **Covering**
  Injected polyurethane, hardness 55 Shore D.
- **Centre**
  Polyamide-based technopolymer (PA). Resistant to solvents, oils and other chemicals.
- **Bore**
  Directly made into the centre.
- **Axle set**
  Calibrated precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions**
  - **RBL**: wheel only.
  - **PBL**: brakeless wheel with zinc-plated steel fixed plate and bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
  - **PBL-SST**: brakeless wheel with fixed plate with bracket in stainless steel.
  - **SBL-SST**: brakeless wheel with turning plate with bracket in stainless steel.
  - **SBF-SST**: stainless steel turning plate wheel with bracket, with stainless steel brake.
  - **FBL-SST**: brakeless wheel with stainless steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF-SST**: stainles steel wheel with brake and turning plate with bracket, assembly pass through hole.
- **Fixed plate bracket**
  Zinc-plated steel or stainless steel (SST version) plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
- **Turning plate bracket**
  Zinc-plated steel or stainless steel (SST version) plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1).
  Does not require maintenance. It consists of:
  1) Bracket: electrolytically zinc-plated steel plate.
  2) Fork: electrolytically zinc-plated steel plate.
  3) Ball race ring: electrolytically zinc-plated steel plate.
  4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
- **Front-actuated brake**
  Total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel or stainless steel (SST version) spring.

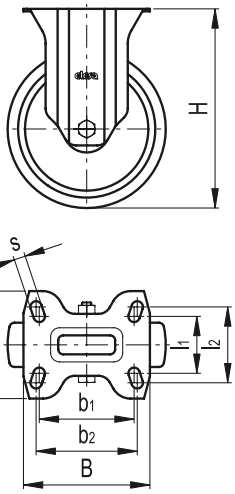
Fig.1



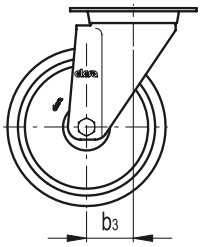
RE.FF-RBL



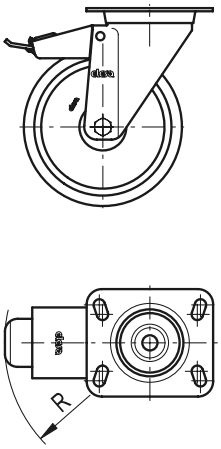
RE.FF-PBL
RE.FF-PBL-SST



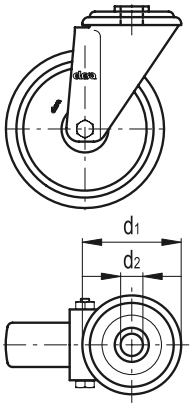
RE.FF-SBL
RE.FF-SBL-SST



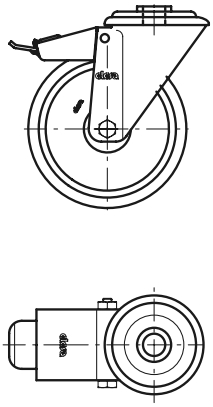
RE.FF-SBF
RE.FF-SBF-SST



RE.FF-FBL
RE.FF-FBL-SST



RE.FF-FBF
RE.FF-FBF-SST



Standard Elements		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖⚖
Code	Description	D	d	l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
451001	RE.FF-080-RBL	80	12	30	39	-	-	-	-	-	-	-	-	-	-	-	-	2200	1200	1200	110
451006	RE.FF-100-RBL	100	12	30	44	-	-	-	-	-	-	-	-	-	-	-	-	3000	1700	1700	150
451011	RE.FF-125-RBL	125	15	35	44	-	-	-	-	-	-	-	-	-	-	-	-	3500	2300	2300	250
451016	RE.FF-150-RBL	150	20	45	59	-	-	-	-	-	-	-	-	-	-	-	-	5000	2800	3500	470
451151	RE.FF-080-PBL	80	12	30	-	107	100	85	9	75	45	80	60	-	-	-	-	-	1200	1200	380
451156	RE.FF-100-PBL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	1700	1700	430
451161	RE.FF-125-PBL	125	15	35	-	156	100	85	9	75	45	80	60	-	-	-	-	-	2300	2200	660
451166	RE.FF-150-PBL	150	20	45	-	194	140	114	11	105	73	105	85	-	-	-	-	-	2800	3000	1460
451051	RE.FF-080-SBL	80	12	30	-	107	100	85	9	75	45	80	60	39	-	-	-	-	1200	1200	620
451056	RE.FF-100-SBL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	1700	1700	740
451061	RE.FF-125-SBL	125	15	35	-	156	100	85	9	75	45	80	60	37	-	-	-	-	2300	2200	910
451066	RE.FF-150-SBL	150	20	45	-	194	140	110	11	105	73	105	87	56	-	-	-	-	2800	3000	1830
451101	RE.FF-080-SBF	80	12	30	-	107	100	85	9	75	45	80	60	39	120	-	-	-	1200	1200	810
451106	RE.FF-100-SBF	100	12	30	-	128	100	85	9	75	45	80	60	35	120	-	-	-	1700	1700	890
451111	RE.FF-125-SBF	125	15	35	-	156	100	85	9	75	45	80	60	37	120	-	-	-	2300	2200	1050
451116	RE.FF-150-SBF	150	20	45	-	194	140	110	11	105	73	105	87	56	156	-	-	-	2800	3000	2110
451171	RE.FF-80-FBL	80	12	30	-	107	-	-	-	-	-	-	-	39	-	73	12	-	1200	1200	550
451173	RE.FF-100-FBL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	1700	1700	670
451176	RE.FF-125-FBL	125	15	35	-	156	-	-	-	-	-	-	-	37	-	73	12	-	2300	2200	850
451179	RE.FF-150-FBL	150	20	45	-	188	-	-	-	-	-	-	-	56	-	102	20	-	2800	3000	1690
451181	RE.FF-80-FBF	80	12	30	-	107	-	-	-	-	-	-	-	39	120	73	12	-	1200	1200	730
451183	RE.FF-100-FBF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	1700	1700	880
451186	RE.FF-125-FBF	125	15	35	-	156	-	-	-	-	-	-	-	37	120	73	12	-	2300	2200	1000
451189	RE.FF-150-FBF	150	20	45	-	188	-	-	-	-	-	-	-	56	156	102	20	-	2800	3000	1980

* The static load value is characteristic of the wheel only without motion.

Standard Elements		Main dimensions															Rolling resistance	Dynamic carrying capacity	⚖⚖
Code	Description	D	d	l3	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	g
451301	RE.FF-080-PBL-SST	80	12	30	107	100	85	9	75	45	80	60	-	-	-	-	1200	1200	350
451306	RE.FF-100-PBL-SST	100	12	30	128	100	85	9	75	45	80	60	-	-	-	-	1700	1700	400
451311	RE.FF-125-PBL-SST	125	15	35	156	100	85	9	75	45	80	60	-	-	-	-	2300	2200	640
451201	RE.FF-080-SBL-SST	80	12	30	107	100	85	9	75	45	80	60	39	-	-	-	1200	1200	610
451206	RE.FF-100-SBL-SST	100	12	30	128	100	85	9	75	45	80	60	35	-	-	-	1700	1700	650
451211	RE.FF-125-SBL-SST	125	15	35	156	100	85	9	75	45	80	60	37	-	-	-	2300	2200	810
451251	RE.FF-080-SBF-SST	80	12	30	107	100	85	9	75	45	80	60	39	120	-	-	1200	1200	780
451256	RE.FF-100-SBF-SST	100	12	30	128	100	85	9	75	45	80	60	35	120	-	-	1700	1700	830
451261	RE.FF-125-SBF-SST	125	15	35	156	100	85	9	75	45	80	60	37	120	-	-	2300	2200	950
451351	RE.FF-080-FBL-SST	80	12	30	107	-	-	-	-	-	-	-	39	-	73	12	1200	1200	550
451353	RE.FF-100-FBL-SST	100	12	30	128	-	-	-	-	-	-	-	35	-	73	12	1700	1700	670
451356	RE.FF-125-FBL-SST	125	15	35	156	-	-	-	-	-	-	-	37	-	73	12	2300	2200	850
451361	RE.FF-080-FBF-SST	80	12	30	107	-	-	-	-	-	-	-	39	120	73	12	1200	1200	550
451363	RE.FF-100-FBF-SST	100	12	30	128	-	-	-	-	-	-	-	35	120	73	12	1700	1700	770
451366	RE.FF-125-FBF-SST	125	15	35	156	-	-	-	-	-	-	-	37	120	73	12	2300	2200	860

Selection parameters

Selection parameters		Value range	
Load capacity	fino a 250	Light load, up to 250 kg	●
	fino a 750	Medium load, up to 750 kg	●
	oltre 750	Heavy load, more than 750 kg	❒
Rolling resistance	< 125	< 125 kg	●
	> 125	> 125 kg	❒
Flooring		Tiles	●
		Asphalt	●
		Cement - resin	●
		Not paved	▲
		Expanded metal	❒
		With chips, obstacles, etc.	▲
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	❒
Temperature	-40 -20	-40° / -20°	▲
	-20 +80	-20° / +80°	●
	+80 +120	+80° / +120°	❒
	>120	> 120°	▲
Means of traction		Manual	●
		Mechanical	❒

● Recommended
❒ Tolerated
▲ Not recommended

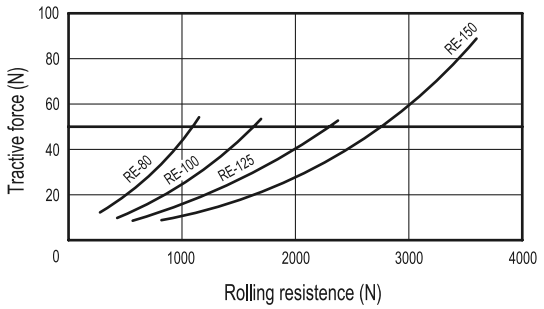
Applications
Excellent smoothness and elasticity features, good wear and tearing resistance.

Environmental conditions
Suitable for use in environments with the presence of atmospheric agents, alcohols and glycols; weak organic and mineral acids, water and saturated vapour.

Rolling resistance - force / load applied
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices
For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature
If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.



RE.F5

Mould-on polyurethane wheels

- **Covering**
  Mould-on polyurethane, hardness 95 Shore A.
- **Centre**
  Die-cast aluminium.
- **Bore and axle**
  The axle is mounted using a calibrated tube processed to obtain an even surface where roller bearings and spacers are inserted. Screw and nut are tightened to lock the spacer and the roller bearings. Ideal solution for large loads and continuous moving.
- **Standard executions**
  - **RSL**: wheel only.
  - **PSL**: brakeless wheel with zinc-plated steel fixed bracket.
  - **SSL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SSF**: wheel with brake and zinc-plated steel turning plate and bracket.
  - **FSL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FSF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
  - **PSL-H**: brakeless wheel with zinc-plated steel fixed bracket for heavy loads.
  - **SSL-H**: brakeless wheel with zinc-plated steel turning plate and bracket for heavy loads.
  - **SSF-H**: wheel with brake and zinc-plated steel turning plate and bracket for heavy loads.
- **Fixed plate bracket**
  - Standard bracket: zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  - Bracket type **H**: tropical galvanisation steel plate (test in saline fog chamber above 72h). The bracket is designed to withstand loads up to 7500N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature. Ensures capacities that make it suitable for heavy industrial applications.
- **Turning plate bracket**
  - Standard bracket: zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1). Does not require maintenance.
  It consists of:
  1) Bracket: electrolytically zinc-plated steel plate.
  2) Fork: electrolytically zinc-plated steel plate.
  3) Ball race ring: electrolytically zinc-plated steel plate. 4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
  - Bracket type **H**: the bracket is designed to withstand loads up to 7500N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature. Ensures capacities that make it suitable for heavy industrial applications (see fig. 2).
  It consists of:
  1) Plate: tropical zinc-plated steel plate.
  2) Fork: tropical zinc-plated steel plate.
  3) Ball race ring: tropical zinc-plated steel plate.
  4) Central pin: class 8.8 steel screw and steel nut.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer

Fig.1

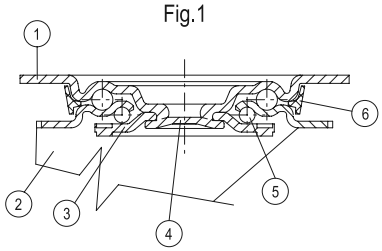
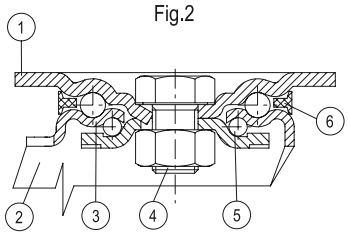
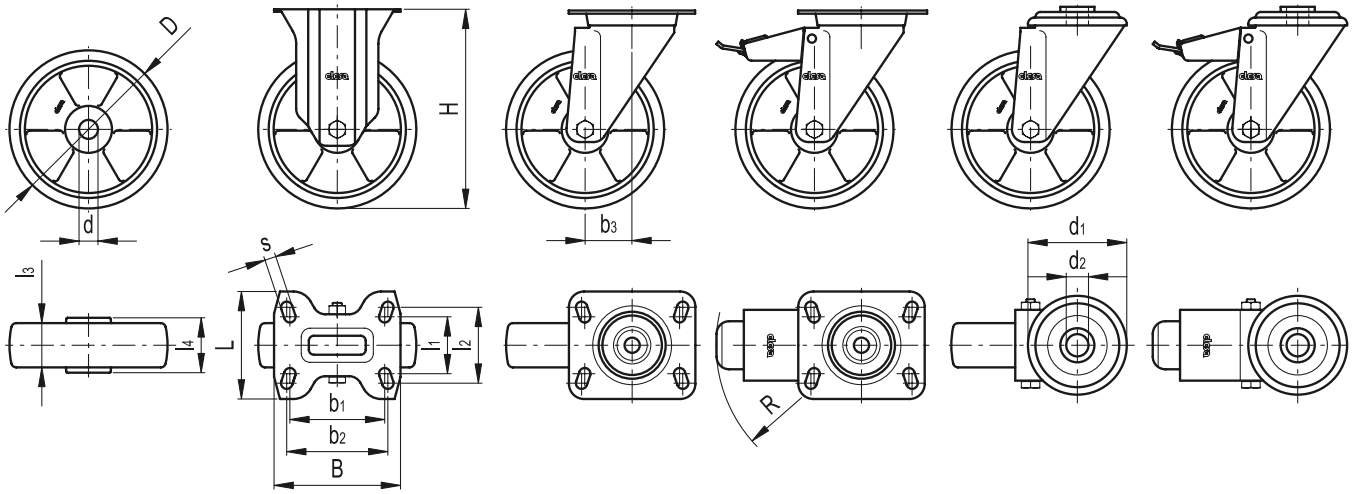


Fig.2



RE.F5-RSL | RE.F5-PSL, RE.F5-PSL-H | RE.F5-SSL, RE.F5-SSL-H | RE.F5-SSF, RE.F5-SSF-H | RE.F5-FSL | RE.F5-FSF



Standard Elements		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D		l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
451501	RE.F5-080-RSL	800	12	25	30	-	-	-	-	-	-	-	-	-	-	-	-	2800	1500	2200	200
451506	RE.F5-100-RSL	100	12	30	40	-	-	-	-	-	-	-	-	-	-	-	-	3500	2250	2500	340
451511	RE.F5-125-RSL	125	12	35	40	-	-	-	-	-	-	-	-	-	-	-	-	5000	2800	4000	500
451516	RE.F5-150-RSL	150	20	40	50	-	-	-	-	-	-	-	-	-	-	-	-	8500	3300	6000	910
451521	RE.F5-200-RSL	200	25	50	55	-	-	-	-	-	-	-	-	-	-	-	-	10000	3600	8500	1450
451651	RE.F5-080-PSL	80	12	25	-	107	100	85	9	75	45	80	60	-	-	-	-	-	1500	2000	520
451656	RE.F5-100-PSL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	2250	2000	690
451661	RE.F5-125-PSL	125	12	35	-	156	100	85	9	75	45	80	60	-	-	-	-	-	2800	2200	890
451551	RE.F5-080-SSL	80	12	25	-	107	100	85	9	75	45	80	60	39	-	-	-	-	1500	2000	720
451556	RE.F5-100-SSL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	2250	2000	940
451561	RE.F5-125-SSL	125	12	35	-	156	100	85	9	75	45	80	60	37	-	-	-	-	2800	2200	1140
451601	RE.F5-080-SSF	80	12	25	-	107	100	85	9	75	45	80	60	39	120	-	-	-	1500	2000	910
451606	RE.F5-100-SSF	100	12	30	-	125	100	85	9	75	45	80	60	35	120	-	-	-	2250	2000	1080
451611	RE.F5-125-SSF	125	12	35	-	156	100	85	9	75	45	80	60	37	120	-	-	-	2800	2200	1280
451851	RE.F5-080-FSL	80	12	25	-	107	-	-	-	-	-	-	-	39	-	73	12	-	1500	2000	650
451856	RE.F5-100-FSL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	2250	2000	880
451861	RE.F5-125-FSL	125	12	35	-	156	-	-	-	-	-	-	-	37	-	73	12	-	2800	2200	1080
451901	RE.F5-080-FSF	80	12	25	-	107	-	-	-	-	-	-	-	39	120	73	12	-	1500	2000	780
451906	RE.F5-100-FSF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	2250	2000	1020
451911	RE.F5-125-FSF	125	12	35	-	156	-	-	-	-	-	-	-	37	120	73	12	-	2800	2200	1230

* The static load value is characteristic of the wheel only without motion.

Standard Elements		Main dimensions													Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D	d	l3	H	B	L	s	b1	l1	b2	l2	b3	R	[N]	[N]	g
451801	RE.F5-125-PSL-H	125	12	35	161	100	85	9	75	45	80	60	-	-	2800	3500	970
451806	RE.F5-150-PSL-H	150	20	40	200	140	114	11	105	73	105	85	-	-	3300	6000	2190
451811	RE.F5-200-PSL-H	200	25	50	250	140	114	11	105	73	105	85	-	-	3600	7500	2480
451701	RE.F5-125-SSL-H	125	12	35	161	100	85	9	75	45	80	60	48	-	2800	3500	1390
451706	RE.F5-150-SSL-H	150	20	40	200	140	110	11	105	73	105	87	70	-	3300	6000	3180
451711	RE.F5-200-SSL-H	200	25	50	250	140	110	11	105	73	105	87	70	-	3600	7500	3940
451751	RE.F5-125-SSF-H	125	12	35	161	100	85	9	75	45	80	60	48	120	2800	3500	1540
451756	RE.F5-150-SSF-H	150	20	40	200	140	110	11	105	73	105	87	70	146	3300	6000	3750
451761	RE.F5-200-SSF-H	200	25	50	250	140	110	11	105	73	105	87	70	146	3600	7500	4510

- **Brake**
  - Standard bracket: total brake that locks the wheel and bracket rotation. The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel spring.
  - Type **H**. bracket, dual-effect brake with simultaneous locking of wheel and bracket. Pushing the trolley, the rear brake is not within the operator's reach as it stays under the trolley.
  The trolley must be turned to use the device. The brake is simple and effective to use: it is actuated and released by a simple action from the top downward at the tip of two separate pedals, thus ensuring the utmost manoeuvring comfort.
  The braking efficacy may be adjusted with a socket head screw M8.

Applications

Excellent smoothness and elasticity features, high wear and tearing resistance.

Environmental conditions

The wheel RE.F5 is suitable for use in environments with the presence of atmospheric agents, alcohols and glycols; use in environments with the presence of organic and mineral acids, basic solutions and saturated vapour is not recommended.

Rolling resistance - force / load applied

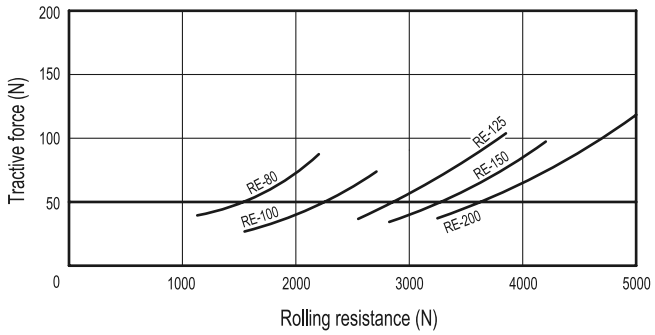
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices

For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature

If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.



Selection parameters

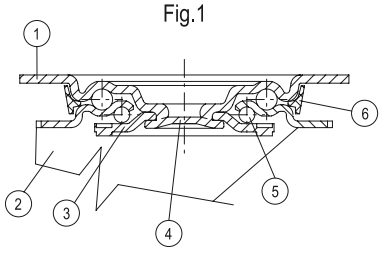
Selection parameters		Value range	
Load capacity	fino a 250	Light load, up to 250 kg	●
	fino a 750	Medium load, up to 750 kg	●
	oltre 750	Heavy load, more than 750 kg	●
Rolling resistance	< 125	< 125 kg	●
	> 125	> 125 kg	●
Flooring		Tiles	●
		Asphalt	●
		Cement - resin	●
		Not paved	▲
		Expanded metal	❒
		With chips, obstacles, etc.	❒
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	❒
Temperature	-40 -20	-40° / -20°	▲
	-20 +80	-20° / +80°	●
	+80 +120	+80° / +120°	❒
	>120	> 120°	▲
Means of traction		Manual	●
		Mechanical	●

● Recommended
❒ Tolerated
▲ Not recommended

Monolithic (hard tread) wheels

- **Centre**
  Polyamide-based technopolymer (PA). Resistant to solvents, oils and other chemicals.
- **Bore**
  Directly made into the centre.
- **Axle set**
  Calibrated precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions**
  - **RBL**: wheel only.
  - **PBL**: brakeless wheel with zinc-plated steel fixed bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
  - **PBL-SST**: brakeless wheel with fixed bracket in stainless steel.
  - **SBL-SST**: brakeless wheel with turning plate with bracket in stainless steel.
  - **SBF-SST**: stainless steel turning plate wheel with bracket, with stainless steel brake.
  - **FBL-SST**: brakeless wheel with stainless steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF-SST**: stainles steel wheel with brake and turning plate with bracket, assembly pass through hole.
- **Fixed plate bracket**
  Zinc-plated steel or stainless steel (SST version) plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
- **Turning plate bracket**
  Zinc-plated steel or stainless steel (SST version) plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1).
  Does not require maintenance. It consists of:
  1) Bracket: electrolytically zinc-plated steel plate.
  2) Fork: electrolytically zinc-plated steel plate.
  3) Ball race ring: electrolytically zinc-plated steel plate.
  4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
- **Front-actuated brake**
  Total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel or stainless steel (SST version) spring.

Fig.1



RE.F8-RBL

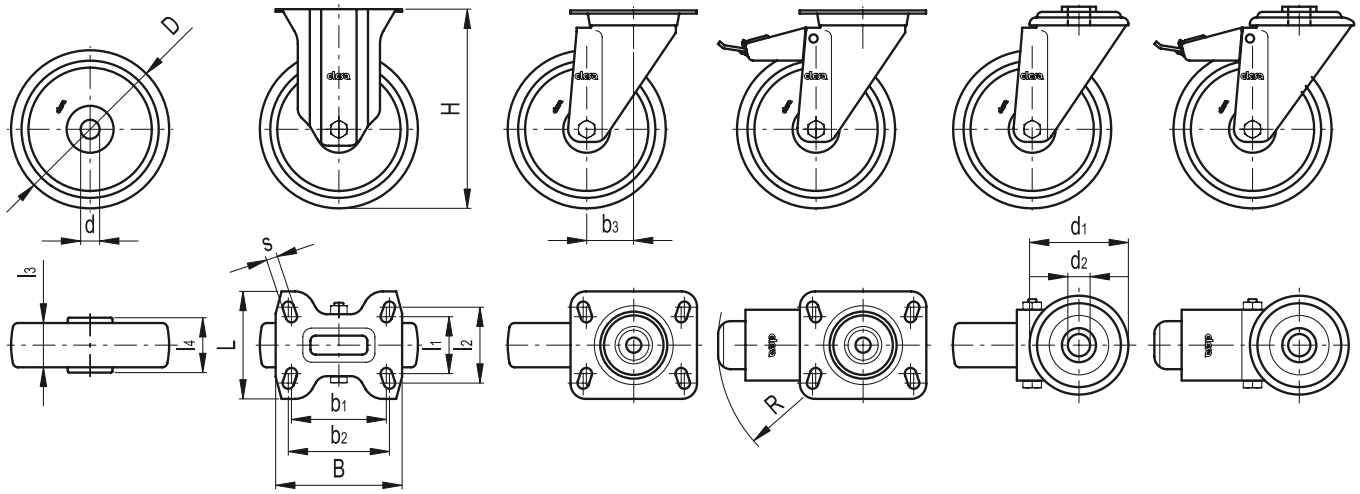
RE.F8-PBL
RE.F8-PBL-SST

RE.F8-SBL
RE.F8-SBL-SST

RE.F8-SBF
RE.F8-SBF-SST

RE.F8-FBL
RE.F8-FBL-SST

RE.F8-FBF
RE.F8-FBF-SST



Standard Elements		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D	d	l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
450501	RE.F8-065-RBL	65	12	30	34	-	-	-	-	-	-	-	-	-	-	-	-	1250	900	1200	60
450506	RE.F8-080-RBL	80	12	30	39	-	-	-	-	-	-	-	-	-	-	-	-	2000	1500	1800	80
450511	RE.F8-100-RBL	100	12	30	44	-	-	-	-	-	-	-	-	-	-	-	-	3500	1750	3000	130
450516	RE.F8-125-RBL	125	15	38	44	-	-	-	-	-	-	-	-	-	-	-	-	4500	2000	4000	230
450521	RE.F8-150-RBL	150	20	45	59	-	-	-	-	-	-	-	-	-	-	-	-	6000	2500	5000	340
450651	RE.F8-065-PBL	65	12	30	-	100	100	85	9	75	45	80	60	-	-	-	-	-	900	1200	370
450656	RE.F8-080-PBL	80	12	30	-	107	100	85	9	75	45	80	60	-	-	-	-	-	1500	1800	390
450661	RE.F8-100-PBL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	1750	2000	460
450666	RE.F8-125-PBL	125	15	38	-	156	100	85	9	75	45	80	60	-	-	-	-	-	2000	2200	640
450671	RE.F8-150-PBL	150	20	45	-	194	140	114	11	105	73	105	85	-	-	-	-	-	2500	3000	1450
450551	RE.F8-065-SBL	65	12	30	-	100	100	85	9	75	45	80	60	39	-	-	-	-	900	1200	570
450556	RE.F8-080-SBL	80	12	30	-	107	100	85	9	75	45	80	60	39	-	-	-	-	1500	1800	580
450561	RE.F8-100-SBL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	1750	2000	650
450566	RE.F8-125-SBL	125	15	38	-	156	100	85	9	75	45	80	60	37	-	-	-	-	2000	2200	890
450571	RE.F8-150-SBL	150	20	45	-	194	140	110	11	105	73	105	87	56	-	-	-	-	2500	3000	1770
450601	RE.F8-080-SBF	80	12	30	-	107	100	85	9	75	45	80	60	39	120	-	-	-	1500	1800	780
450606	RE.F8-100-SBF	100	12	30	-	128	100	85	9	75	45	80	60	35	120	-	-	-	1750	2000	850
450611	RE.F8-125-SBF	125	15	40	-	156	100	85	9	75	45	80	60	37	120	-	-	-	2000	2200	1040
450616	RE.F8-150-SBF	150	20	45	-	194	140	110	11	105	73	105	87	56	156	-	-	-	2500	3000	1990
450681	RE.F8-065-FBL	65	12	30	-	100	-	-	-	-	-	-	-	39	-	73	12	-	900	1200	520
450683	RE.F8-080-FBL	80	12	30	-	107	-	-	-	-	-	-	-	39	-	73	12	-	1500	1800	535
450685	RE.F8-100-FBL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	1750	2000	555
450687	RE.F8-125-FBL	125	15	38	-	156	-	-	-	-	-	-	-	37	-	73	12	-	2000	2200	850
450689	RE.F8-150-FBL	150	20	45	-	188	-	-	-	-	-	-	-	56	-	102	20	-	2500	3000	1570
450693	RE.F8-080-FBF	80	12	30	-	107	-	-	-	-	-	-	-	39	120	73	12	-	1500	1800	700
450695	RE.F8-100-FBF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	1750	2000	800
450697	RE.F8-125-FBF	125	15	38	-	156	-	-	-	-	-	-	-	37	120	73	12	-	2000	2200	990
450699	RE.F8-150-FBF	150	20	45	-	188	-	-	-	-	-	-	-	56	156	102	20	-	2500	3000	1860

* The static load value is characteristic of the wheel only without motion.

Code	Description	D	d	l3	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	g
450801	RE.F8-080-PBL-SST	80	12	30	107	100	85	9	75	45	80	60	-	-	-	-	1500	1800	290
450806	RE.F8-100-PBL-SST	100	12	30	128	100	85	9	75	45	80	60	-	-	-	-	1750	200	360
450811	RE.F8-125-PBL-SST	125	15	40	156	100	85	9	75	45	80	60	-	-	-	-	2000	2200	630
450701	RE.F8-080-SBL-SST	80	12	30	107	100	85	9	75	45	80	60	39	-	-	-	1500	1800	550
450706	RE.F8-100-SBL-SST	100	12	30	128	100	85	9	75	45	80	60	35	-	-	-	1750	200	610
450711	RE.F8-125-SBL-SST	125	15	40	156	100	85	9	75	45	80	60	37	-	-	-	2000	2200	780
450751	RE.F8-080-SBF-SST	80	12	30	107	100	85	9	75	45	80	60	39	120	-	-	1500	1800	730
450756	RE.F8-100-SBF-SST	100	12	30	128	100	85	9	75	45	80	60	35	120	-	-	1750	200	760
450761	RE.F8-125-SBF-SST	125	15	40	156	100	85	9	75	45	80	60	37	120	-	-	2000	2200	950
450851	RE.F8-080-FBL-SST	80	12	30	107	-	-	-	-	-	-	-	39	-	73	12	1500	1800	500
450856	RE.F8-100-FBL-SST	100	12	30	128	-	-	-	-	-	-	-	35	-	73	12	1750	200	610
450861	RE.F8-125-FBL-SST	125	15	38	156	-	-	-	-	-	-	-	37	-	73	12	2000	2200	790
450901	RE.F8-080-FBF-SST	80	12	30	107	-	-	-	-	-	-	-	39	120	73	12	1500	1800	520
450906	RE.F8-100-FBF-SST	100	12	30	128	-	-	-	-	-	-	-	35	120	73	12	1750	200	760
450911	RE.F8-125-FBF-SST	125	15	38	156	-	-	-	-	-	-	-	37	120	73	12	2000	2200	930

Selection parameters

Selection parameters		Value range	
Load capacity		Light load, up to 250 kg	●
		Medium load, up to 750 kg	●
		Heavy load, more than 750 kg	❒
Rolling resistance		< 125 kg	●
		> 125 kg	●
Flooring		Tiles	●
		Asphalt	❒
		Cement - resin	❒
		Not paved	▲
		Expanded metal	▲
		With chips, obstacles, etc.	▲
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	●
Temperature		-40° / -20°	●
		-20° / +80°	●
		+80° / +120°	❒
		> 120°	▲
Means of traction		Manual	●
		Mechanical	❒

● Recommended
❒ Tolerated
▲ Not recommended

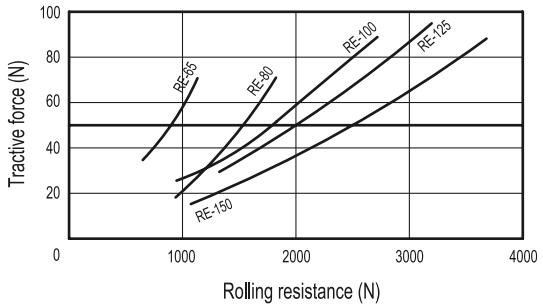
Applications
Excellent wear and tearing resistance.

Environmental conditions
Suitable for use in humid environments, with the presence of highly aggressive chemicals. Use in environments with the presence of strong organic acids and concentrated minerals is not recommended.

Rolling resistance - force / load applied
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices
For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature
If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.

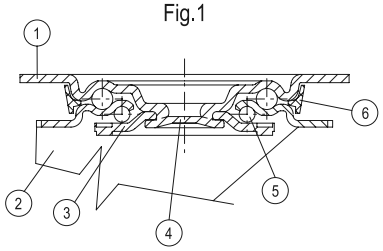


RE.G1

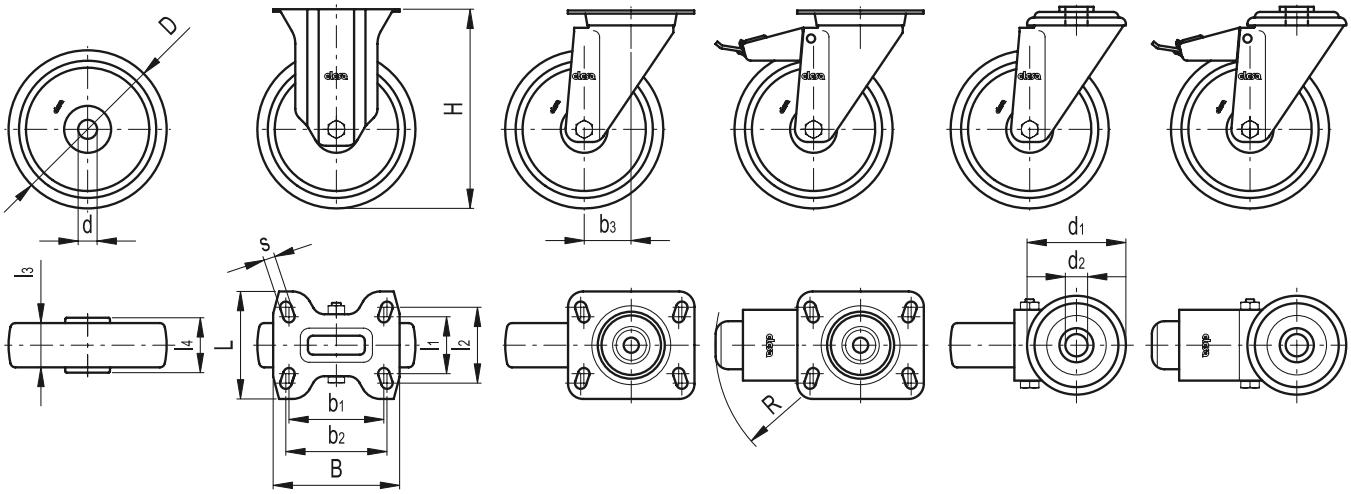
Thermoplastic rubber wheels

- **Covering**
  Grey anti-trace thermoplastic wheel, hardness 85 Shore A.
- **Centre**
  Polypropylene-based technopolymer (PP). Resistant to solvents, oils and other chemicals.
- **Bore**
  Directly made into the centre.
- **Axle set**
  Calibrated zinc-plated steel precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions**
  - **RBL**: wheel only.
  - **PBL**: brakeless wheel with zinc-plated steel fixed plate and bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
- **Fixed plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
- **Turning plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1).
  Does not require maintenance. It consists of:
  1) Bracket: electrolytically zinc-plated steel plate.
  2) Fork: electrolytically zinc-plated steel plate.
  3) Ball race ring: electrolytically zinc-plated steel plate.
  4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
- **Front-actuated brake**
  Total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel spring.

Fig.1



RE.G1-RBL RE.G1-PBL RE.G1-SBL RE.G1-SBF RE.G1-FBL RE.G1-FBF



Standard Elements		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D	d	l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
452501	RE.G1-080-RBL	80	12	30	39	-	-	-	-	-	-	-	-	-	-	-	-	1000	700	700	90
452506	RE.G1-100-RBL	100	12	30	44	-	-	-	-	-	-	-	-	-	-	-	-	1500	1000	1000	120
452511	RE.G1-125-RBL	125	15	35	44	-	-	-	-	-	-	-	-	-	-	-	-	1800	1200	1200	200
452516	RE.G1-150-RBL	150	20	45	59	-	-	-	-	-	-	-	-	-	-	-	-	2700	1800	1800	360
452651	RE.G1-080-PBL	80	12	30	-	107	100	85	9	75	45	80	60	-	-	-	-	-	700	700	360
452656	RE.G1-100-PBL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	1000	1000	390
452661	RE.G1-125-PBL	125	15	35	-	156	100	85	9	75	45	80	60	-	-	-	-	-	1200	1200	610
452666	RE.G1-150-PBL	150	20	45	-	194	140	114	11	105	73	105	85	-	-	-	-	-	1800	1800	1350
452551	RE.G1-080-SBL	80	12	30	-	107	100	85	9	75	45	80	60	39	-	-	-	-	700	700	600
452556	RE.G1-100-SBL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	1000	1000	700
452561	RE.G1-125-SBL	125	15	35	-	156	100	85	9	75	45	80	60	37	-	-	-	-	1200	1200	860
452566	RE.G1-150-SBL	150	20	45	-	194	140	110	11	105	73	105	87	56	-	-	-	-	1800	1800	1720
452601	RE.G1-080-SBF	80	12	30	-	107	100	85	9	75	45	80	60	39	120	-	-	-	700	700	790
452606	RE.G1-100-SBF	100	12	30	-	128	100	85	9	75	45	80	60	35	120	-	-	-	1000	1000	850
452611	RE.G1-125-SBF	125	15	35	-	156	100	85	9	75	45	80	60	37	120	-	-	-	1200	1200	1000
452616	RE.G1-150-SBF	150	20	45	-	194	140	110	11	105	73	105	87	56	156	-	-	-	1800	1800	2000
452701	RE.G1-080-FBL	80	12	30	-	107	-	-	-	-	-	-	-	39	-	73	12	-	700	700	530
452706	RE.G1-100-FBL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	1000	1000	630
452711	RE.G1-125-FBL	125	15	35	-	156	-	-	-	-	-	-	-	37	-	73	12	-	1200	1200	800
452716	RE.G1-150-FBL	150	20	45	-	188	-	-	-	-	-	-	-	56	-	102	20	-	1800	1800	1580
452751	RE.G1-080-FBF	80	12	30	-	107	-	-	-	-	-	-	-	39	120	73	12	-	700	700	710
452756	RE.G1-100-FBF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	1000	1000	840
452761	RE.G1-125-FBF	125	15	35	-	156	-	-	-	-	-	-	-	37	120	73	12	-	1200	1200	950
452766	RE.G1-150-FBF	150	20	45	-	188	-	-	-	-	-	-	-	56	156	102	20	-	1800	1800	1870

* The static load value is characteristic of the wheel only without motion.

RE.G1

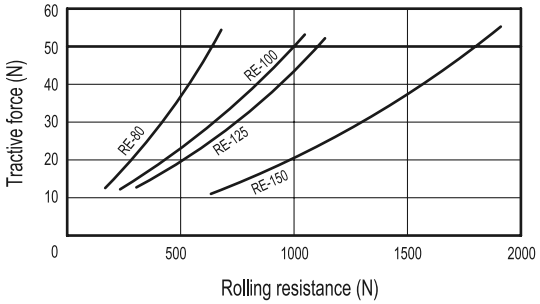
Applications
The wheel RE.G1 has excellent smoothness and elasticity features.

Environmental conditions
The wheel RE.G1 is suitable for use in humid environments and in the presence of medium-aggressive chemicals; use in environments with the presence of organic, chlorinated solvents, hydrocarbons and mineral oils is not recommended.

Rolling resistance - force / load applied
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices
For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature
If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.



Selection parameters

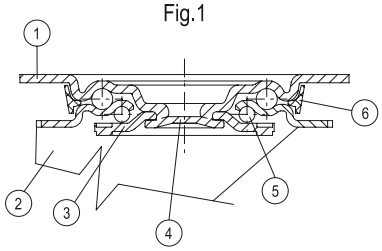
Selection parameters		Value range	
Load capacity	fino a 250	Light load, up to 250 kg	●
	fino a 750	Medium load, up to 750 kg	▲
	oltre 750	Heavy load, more than 750 kg	▲
Rolling resistance	< 125	< 125 kg	●
	> 125	> 125 kg	▲
Flooring		Tiles	●
		Asphalt	●
		Cement - resin	●
		Not paved	▲
		Expanded metal	●
		With chips, obstacles, etc.	▲
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	●
Temperature	-40 -20	-40° / -20°	❒
	-20 +80	-20° / +80°	●
	+80 +120	+80° / +120°	▲
	>120	> 120°	▲
Means of traction		Manual	●
		Mechanical	▲

● Recommended
❒ Tolerated
▲ Not recommended

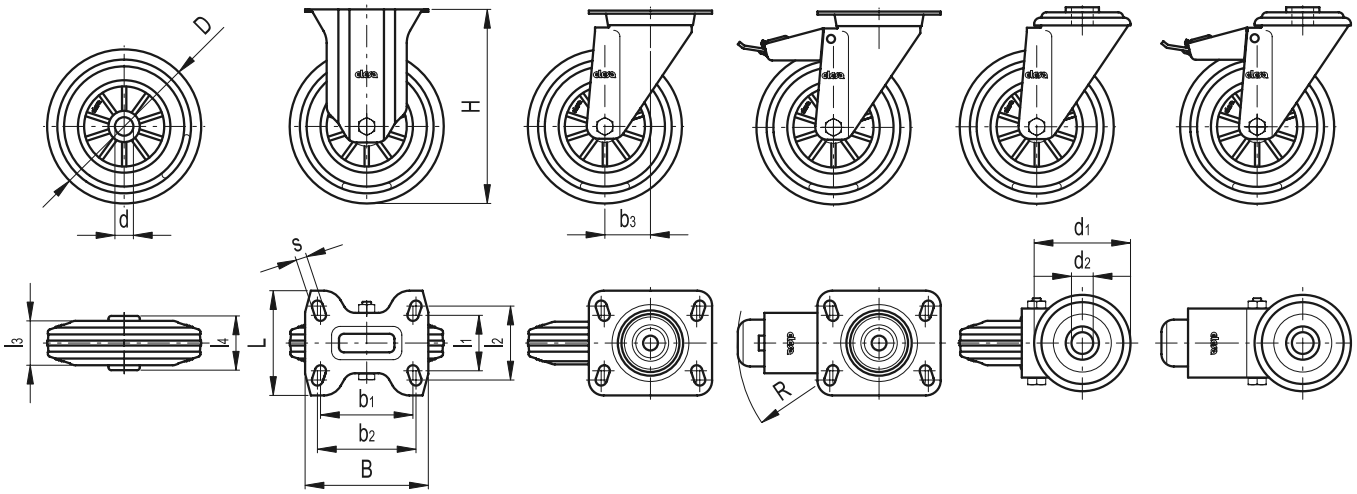
Vulcanised rubber wheels

- **Covering with tread**
  Vulcanised rubber NBR; hardness 83 Shore A.
- **Centre**
  Polypropylene-based (PP) technopolymer. Resistant to solvents, oils, greases and other chemical agents.
- **Bore**
  Directly made into the centre.
- **Axle set**
  Calibrated zinc-plated steel precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions**
  - **RBL**: wheel only.
  - **PBL**: brakeless wheel with zinc-plated steel bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
- **Fixed plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
- **Turning plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1).
  Does not require maintenance. It consists of:
  1) Bracket: electrolytically galvanised steel plate.
  2) Fork: electrolytically galvanised steel plate.
  3) Ball race ring: electrolytically galvanised steel plate.
  4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
- **Front-actuated brake**
  - 80-150mm diameter wheels: total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel spring.
  - 200mm diameter wheel: total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease. Hardened carbon steel spring.

Fig.1



RE.E2-RBL RE.E2-PBL RE.E2-SBL RE.E2-SBF RE.E2-FBL RE.E2-FBF



Elesa Standards		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D	d	l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
449501	RE.E2-080-RBL	80	12	25	39	-	-	-	-	-	-	-	-	-	-	-	-	1500	500	650	110
449506	RE.E2-100-RBL	100	12	30	44	-	-	-	-	-	-	-	-	-	-	-	-	2000	750	800	210
449512	RE.E2-125-RBL	125	15	37.5	44	-	-	-	-	-	-	-	-	-	-	-	-	2250	850	1100	410
449516	RE.E2-150-RBL	150	15	40	44	-	-	-	-	-	-	-	-	-	-	-	-	2750	1000	1300	610
449518	RE.E2-180-RBL	180	20	45	59	-	-	-	-	-	-	-	-	-	-	-	-	3500	1300	1800	1020
449522	RE.E2-200-RBL	200	20	50	59	-	-	-	-	-	-	-	-	-	-	-	-	4000	1400	2250	1310
449651	RE.E2-080-PBL	80	12	25	-	107	100	85	9	75	45	80	60	-	-	-	-	-	500	650	360
449656	RE.E2-100-PBL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	750	800	480
449661	RE.E2-125-PBL	125	15	37.5	-	156	100	85	9	75	45	80	60	-	-	-	-	-	850	1100	710
449666	RE.E2-150-PBL	150	15	40	-	182	100	85	9	75	45	80	60	-	-	-	-	-	1000	1300	930
449668	RE.E2-180-PBL	180	20	45	-	219	140	114	11	105	73	105	85	-	-	-	-	-	1300	1800	2110
449671	RE.E2-200-PBL	200	20	50	-	240	140	114	11	105	73	105	85	-	-	-	-	-	1400	2250	2500
449551	RE.E2-080-SBL	80	12	25	-	107	100	85	9	75	45	80	60	39	-	-	-	-	500	650	640
449556	RE.E2-100-SBL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	750	800	730
449561	RE.E2-125-SBL	125	15	37.5	-	156	100	85	9	75	45	80	60	37	-	-	-	-	850	1100	1060
449566	RE.E2-150-SBL	150	15	40	-	182	100	85	9	75	45	80	60	34	-	-	-	-	1000	1300	1310
449568	RE.E2-180-SBL	180	20	45	-	219	140	114	11	105	73	105	85	56	-	-	-	-	1300	1800	2400
449571	RE.E2-200-SBL	200	20	50	-	240	140	110	11	105	73	105	87	56	-	-	-	-	1400	2250	2720
449601	RE.E2-080-SBF	80	12	25	-	107	100	85	9	75	45	80	60	39	120	-	-	-	500	650	820
449606	RE.E2-100-SBF	100	12	30	-	128	100	85	9	75	45	80	60	35	120	-	-	-	750	800	880
449611	RE.E2-125-SBF	125	15	37.5	-	156	100	85	9	75	45	80	60	37	120	-	-	-	850	1100	1200
449616	RE.E2-150-SBF	150	15	40	-	182	100	85	9	75	45	80	60	34	120	-	-	-	1000	1300	1450
449618	RE.E2-180-SBF	180	20	45	-	219	140	114	11	105	73	105	85	56	156	-	-	-	1300	1800	2690
449621	RE.E2-200-SBF	200	20	50	-	240	140	110	11	105	73	105	87	56	156	-	-	-	1400	2250	3000
449701	RE.E2-080-FBL	80	12	25	-	107	-	-	-	-	-	-	-	39	-	73	12	-	500	650	550
449706	RE.E2-100-FBL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	750	800	680
449711	RE.E2-125-FBL	125	15	37.5	-	156	-	-	-	-	-	-	-	37	-	73	12	-	850	1100	960
449716	RE.E2-150-FBL	150	15	40	-	182	-	-	-	-	-	-	-	37	-	73	12	-	1000	1300	1250
449718	RE.E2-180-FBL	180	20	45	-	214	-	-	-	-	-	-	-	56	-	102	20	-	1300	1800	2280
449721	RE.E2-200-FBL	200	20	50	-	236	-	-	-	-	-	-	-	56	-	102	20	-	1400	2250	2620
449751	RE.E2-080-FBF	80	12	25	-	107	-	-	-	-	-	-	-	39	120	73	12	-	500	650	680
449756	RE.E2-100-FBF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	750	800	750
449761	RE.E2-125-FBF	125	15	37.5	-	156	-	-	-	-	-	-	-	37	120	73	12	-	850	1100	1100
449766	RE.E2-150-FBF	150	15	40	-	182	-	-	-	-	-	-	-	37	120	73	12	-	1000	1300	1390
449768	RE.E2-180-FBF	180	20	45	-	214	-	-	-	-	-	-	-	56	156	102	20	-	1300	1800	2570
449771	RE.E2-200-FBF	200	20	50	-	236	-	-	-	-	-	-	-	56	156	102	20	-	1400	2250	2910

* The static load value is characteristic of the wheel only without motion

Selection parameters

Selection parameters		Value range	
Load capacity	fino a 250	Light load, up to 250 kg	●
	fino a 750	Medium load, up to 750 kg	▲
	oltre 750	Heavy load, more than 750 kg	▲
Rolling resistance	< 125	< 125 kg	●
	> 125	> 125 kg	▲
Flooring		Tiles	●
		Asphalt	●
		Cement - resin	●
		Not paved	●
		Expanded metal	●
		With chips, obstacles, etc.	▲
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	▲
Temperature	-40 -20	-40° / -20°	❒
	-20 +80	-20° / +80°	●
	+80 +120	+80° / +120°	▲
	>120	> 120°	▲
Means of traction		Manual	●
		Mechanical	❒

● Recommended
❒ Tolerated
▲ Not recommended

Applications

The wheel RE.E2 may be mounted on different kind of trolleys, with medium-light loads; it is also suitable for outdoor use.
Typical applications: trolleys for industrial moving, for outdoor use also, waste dumpsters.

Environmental conditions

Suitable for use in humid environments and in the presence of atmospheric agents; use in environments with the presence of organic, chlorinated solvents, hydrocarbons and mineral oils is not recommended.

Rolling resistance - force / load applied

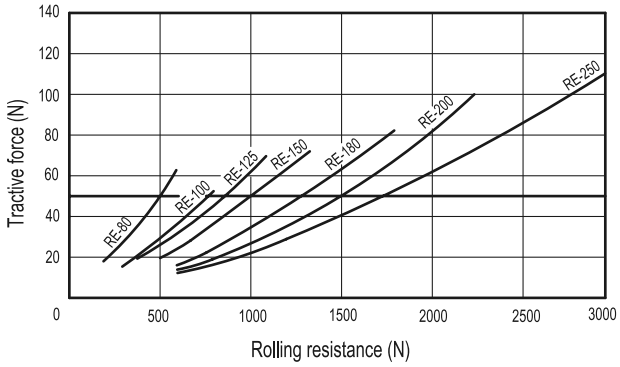
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices

For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature

If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.

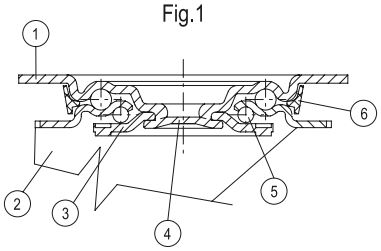


RE.E3

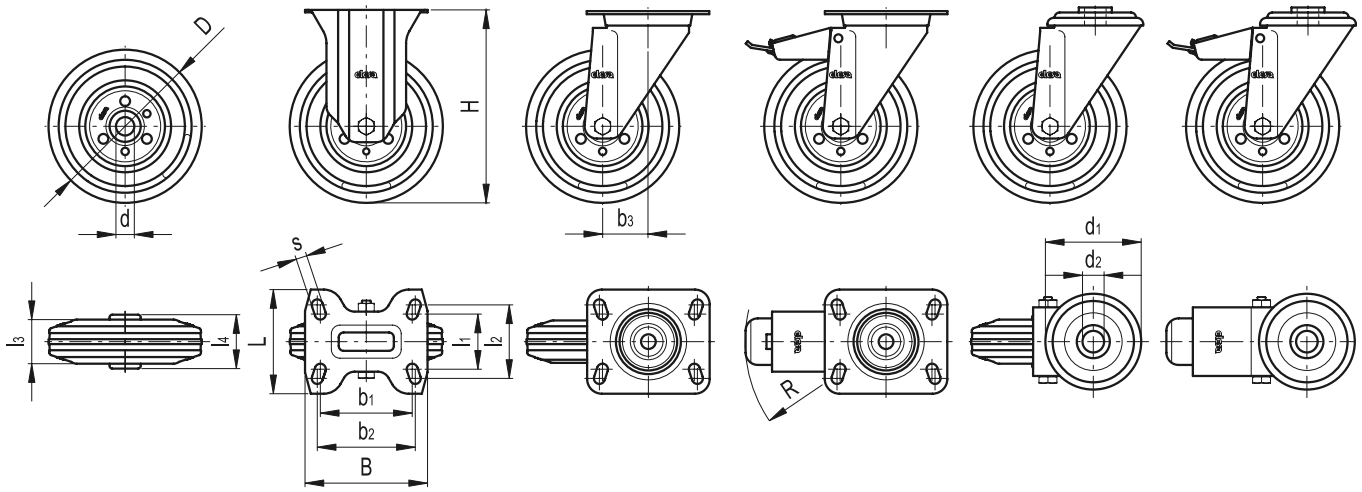
Vulcanised rubber wheels

- **Covering with tread**
  Vulcanised rubber NBR; hardness 83 Shore A.
- **Centre**
  Consisting of two zinc-plated and riveted plate disks.
- **Bore**
  Polyamide-based technopolymer (PA) plain bearings, resistant to solvents, oils and other chemicals, integral to the centre.
- **Axle set**
  Calibrated zinc-plated steel precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions** (bore with plain bearing)
  - **RBL**: wheel only.
  - **PBL**: brakeless wheel with zinc-plated steel fixed bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
- **Fixed plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
- **Turning plate bracket**
  Zinc-plated steel plate, the bracket is designed to withstand loads up to 4000N. The bracket load capacity is greater than the dynamic carrying capacity of the wheel assembly plus the bracket (see table), this is a further safety feature.
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance (see fig. 1).
  Does not require maintenance. It consists of:
  1) Bracket: electrolytically galvanised steel plate.
  2) Fork: electrolytically galvanised steel plate.
  3) Ball race ring: electrolytically galvanised steel plate.
  4) Central pin: incorporated in the plate, cold reflanged.
  5) Fitting plate: dual grease-lubricated ring of ball.
  6) Dust seal: RAL 7015 dark grey technopolymer.
- **Front-actuated brake**
  - 80-150mm diameter wheels: total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.
  In order to optimise the wheel lock in both directions of rotation, the spring is fitted with a dual braking tooth. Hardened carbon steel spring.
  - 200mm diameter wheel: total brake that locks the wheel and bracket rotation.
  The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease. Hardened carbon steel spring.

Fig.1



RE.E3-RBL RE.E3-PBL RE.E3-SBL RE.E3-SBF RE.E3-FBL RE.E3-FBF



Standard Elements		Main dimensions																Static load *	Rolling resistance	Dynamic carrying capacity	⚖
Code	Description	D	d	l3	l4	H	B	L	s	b1	l1	b2	l2	b3	R	d1	d2	[N]	[N]	[N]	g
450001	RE.E3-080-RBL	80	12	25	39	-	-	-	-	-	-	-	-	-	-	-	-	2600	600	650	170
450006	RE.E3-100-RBL	100	12	30	44	-	-	-	-	-	-	-	-	-	-	-	-	3000	750	800	280
450012	RE.E3-125-RBL	125	15	37.5	44	-	-	-	-	-	-	-	-	-	-	-	-	3300	850	1300	510
450016	RE.E3-150-RBL	150	15	40	44	-	-	-	-	-	-	-	-	-	-	-	-	3500	1000	1700	730
450022	RE.E3-200-RBL	200	20	50	58	-	-	-	-	-	-	-	-	-	-	-	-	4100	1400	2300	1750
450151	RE.E3-080-PBL	80	12	25	-	107	100	85	9	75	45	80	60	-	-	-	-	-	600	650	490
450156	RE.E3-100-PBL	100	12	30	-	128	100	85	9	75	45	80	60	-	-	-	-	-	750	800	620
450161	RE.E3-125-PBL	125	15	37.5	-	156	100	85	9	75	45	80	60	-	-	-	-	-	850	1300	920
450166	RE.E3-150-PBL	150	15	40	-	182	100	85	9	75	45	80	60	-	-	-	-	-	1000	1700	1220
450171	RE.E3-200-PBL	200	20	50	-	240	140	114	11	105	73	105	85	-	-	-	-	-	1400	2300	2890
450051	RE.E3-080-SBL	80	12	25	-	107	100	85	9	75	45	80	60	39	-	-	-	-	600	650	690
450056	RE.E3-100-SBL	100	12	30	-	128	100	85	9	75	45	80	60	35	-	-	-	-	750	800	820
450061	RE.E3-125-SBL	125	15	37.5	-	156	100	85	9	75	45	80	60	37	-	-	-	-	850	1300	1180
450066	RE.E3-150-SBL	150	15	40	-	182	100	85	9	75	45	80	60	34	-	-	-	-	1000	1700	1400
450071	RE.E3-200-SBL	200	20	50	-	240	140	110	11	105	73	105	87	56	-	-	-	-	1400	2300	3250
450101	RE.E3-080-SBF	80	12	25	-	107	100	85	9	75	45	80	60	39	120	-	-	-	600	650	870
450106	RE.E3-100-SBF	100	12	30	-	128	100	85	9	75	45	80	60	35	120	-	-	-	750	800	1000
450111	RE.E3-125-SBF	125	15	37.5	-	156	100	85	9	75	45	80	60	37	120	-	-	-	850	1300	1300
450116	RE.E3-150-SBF	150	15	40	-	182	100	85	9	75	45	80	60	34	120	-	-	-	1000	1700	1570
450121	RE.E3-200-SBF	200	20	50	-	240	140	110	11	105	73	105	87	56	156	-	-	-	1400	2300	3390
450201	RE.E3-080-FBL	80	12	25	-	107	-	-	-	-	-	-	-	39	-	73	12	-	600	650	610
450206	RE.E3-100-FBL	100	12	30	-	128	-	-	-	-	-	-	-	35	-	73	12	-	750	800	740
450211	RE.E3-125-FBL	125	15	37.5	-	156	-	-	-	-	-	-	-	37	-	73	12	-	850	1300	1090
450216	RE.E3-150-FBL	150	15	40	-	182	-	-	-	-	-	-	-	37	-	73	12	-	1000	1700	1350
450221	RE.E3-200-FBL	200	20	50	-	236	-	-	-	-	-	-	-	56	-	102	20	-	1400	2300	3160
450251	RE.E3-080-FBF	80	12	25	-	107	-	-	-	-	-	-	-	39	120	73	12	-	600	650	780
450256	RE.E3-100-FBF	100	12	30	-	128	-	-	-	-	-	-	-	35	120	73	12	-	750	800	940
450261	RE.E3-125-FBF	125	15	37.5	-	156	-	-	-	-	-	-	-	37	120	73	12	-	850	1300	1240
250266	RE.E3-150-FBF	150	15	40	-	182	-	-	-	-	-	-	-	37	120	73	12	-	1000	1700	1490
450271	RE.E3-200-FBF	200	20	50	-	236	-	-	-	-	-	-	-	56	156	102	20	-	1400	2300	3290

* The static load value is characteristic of the wheel only without motion.

RE.E3

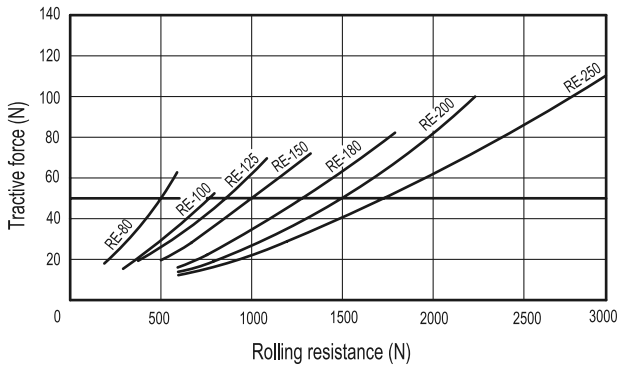
Applications
The wheel RE.E3 may be mounted on different kind of trolleys, with medium-light loads; it is also suitable for outdoor use.
Typical applications: trolleys for industrial moving, for outdoor use also, waste dumpsters.

Environmental conditions
Suitable for use in humid environments and in the presence of atmospheric agents; use in environments with the presence of organic, chlorinated solvents, hydrocarbons and mineral oils is not recommended.

Rolling resistance - force / load applied
The diagram shows the force to be applied to a wheel to keep it moving at the constant speed of 4 km/h, according to the applied load.
The intersection point with a 50N value is the maximum transportable load with a manually actuated 4-wheel trolley; in fact, 200N = 50N x 4 wheels is the maximum force that may be supported by the operator according to the regulations in force regarding work safety.

Mechanical moving with towing devices
For mechanical towing, please see the technical specifications to determine the capacity variation.

Temperature
If operating temperatures in an application differ from the standard range of values, please see the technical specifications to determine the capacity variation.



Selection parameters

Selection parameters		Value range	
Load capacity	fino a 250	Light load, up to 250 kg	●
	fino a 750	Medium load, up to 750 kg	▲
	oltre 750	Heavy load, more than 750 kg	▲
Rolling resistance	< 125	< 125 kg	●
	> 125	> 125 kg	▲
Flooring		Tiles	●
		Asphalt	●
		Cement - resin	●
		Not paved	●
		Expanded metal	●
		With chips, obstacles, etc.	▲
Environmental chemical conditions		No aggressive chemicals	●
		With aggressive chemicals	▲
Temperature	-40 -20	-40° / -20°	❒
	-20 +80	-20° / +80°	●
	+80 +120	+80° / +120°	▲
	>120	> 120°	▲
Means of traction		Manual	●
		Mechanical	❒

● Recommended
❒ Tolerated
▲ Not recommended

RE.C7

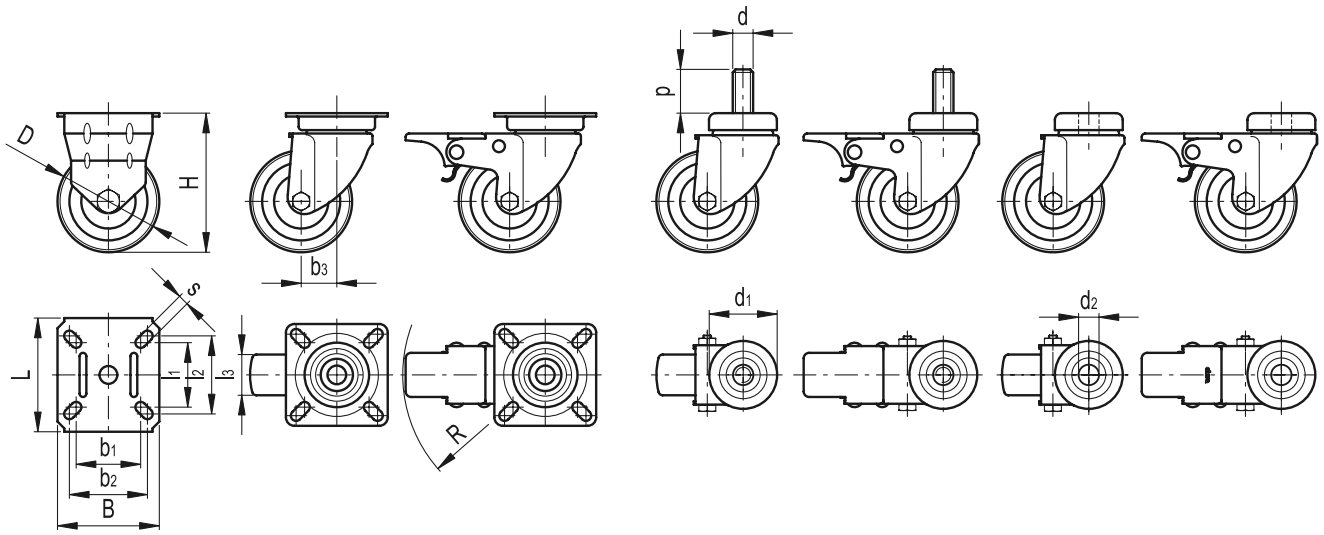
Vulcanised rubber wheels for the general public

- **Covering**
  Grey anti-trace vulcanised rubber.
- **Centre**
  Polyamide-based technopolymer (PA). Resistant to solvents, oils and other chemicals.
- **Bore**
  Directly made into the centre.
- **Axle set**
  Calibrated zinc-plated steel precision tube. The tube serves as a spacer, is tightened to the bracket with screw and nut to a un predetermined torque value.
  The wheel bore rotates onto the tube freely.
- **Standard executions**
  - **PBL**: brakeless wheel with zinc-plated steel fixed bracket.
  - **SBL**: brakeless wheel with zinc-plated steel turning plate and bracket.
  - **SBF**: wheel with brake and zinc-plated steel turning plate with bracket.
  - **CBL**: brakeless wheel with zinc-plated steel turning plate and bracket with assembly stem.
  - **CBF**: wheel with brake with zinc-plated steel turning plate and bracket with assembly stem.
  - **FBL**: brakeless wheel with zinc-plated steel turning plate with bracket and assembly pass thorugh hole.
  - **FBF**: wheel with brake and zinc-plated steel turning plate and bracket, assembly pass through hole.
- **Fixed plate bracket**
  Electrolytically zinc-plated steel plate bracket.
- **Turning plate bracket**
  The presence of two ball turns and the direct contact between the plate and the ball race ring with built-in pin ensure excellent manoeuvrability and very limited clearance.
- **Front-actuated brake**
  Brake that locks the wheel rotation. The optimised dimensions and the retractible pedal ensure minimal space occupied and maximum actuation ease.

Applications
Wheels for the general public, excellent smoothness and elasticity features.
Environmental conditions
The wheel RE.C7 is suitable for use in humid environments and in the presence of medium-aggressive chemical environments; use in environments with the presence of organic, chlorinated solvents, hydrocarbons and mineral oils is not recommended.

RE.C7

RE.C7-PBL RE.C7-SBL RE.C7-SBF RE.C7-CBL RE.C7-CBF RE.C7-FBL RE.C7-FBF



Elesa Standards		Main dimensions																Dynamic carrying capacity	⚖
Code	Description	D	l3	H	B	L	s	b1	l1	b2	l2	b3	R	d	p	d1	d2	[N]	g
452101	RE.C7-050-PBL	50	20	67	55	55	6	38.5	38.5	44	44	-	-	-	-	-	-	350	200
452106	RE.C7-060-PBL	60	24	83	60	60	6	38	38	48	48	-	-	-	-	-	-	500	260
452111	RE.C7-080-PBL	80	24	104	60	60	6	38	38	48	48	-	-	-	-	-	-	550	340
452001	RE.C7-050-SBL	50	20	67	55	55	6	38.5	38.5	44	44	24	-	-	-	-	-	350	200
452006	RE.C7-060-SBL	60	24	83	60	60	6	38	38	48	48	21	-	-	-	-	-	500	280
452011	RE.C7-080-SBL	80	24	104	60	60	6	38	38	48	48	30	-	-	-	-	-	550	430
452051	RE.C7-050-SBF	50	20	67	55	55	6	38.5	38.5	44	44	24	76	-	-	-	-	350	240
452056	RE.C7-060-SBF	60	24	83	60	60	6	38	38	48	48	21	84	-	-	-	-	500	400
452061	RE.C7-080-SBF	80	24	104	60	60	6	38	38	48	48	30	91	-	-	-	-	550	500
452151	RE.C7-050-CBL	50	20	66	-	-	-	-	-	-	-	24	-	M8	15	35	-	350	180
452156	RE.C7-060-CBL	60	24	83	-	-	-	-	-	-	-	21	-	M12	25	41	-	500	290
452161	RE.C7-080-CBL	80	24	104	-	-	-	-	-	-	-	25	-	M12	25	41	-	550	390
452201	RE.C7-050-CBF	50	20	66	-	-	-	-	-	-	-	24	76	M8	15	35	-	350	210
452206	RE.C7-060-CBF	60	24	83	-	-	-	-	-	-	-	21	84	M12	25	41	-	500	360
452211	RE.C7-080-CBF	80	24	104	-	-	-	-	-	-	-	25	91	M12	25	41	-	550	460
452251	RE.C7-050-FBL	50	20	66	-	-	-	-	-	-	-	24	-	-	-	35	10	350	160
452256	RE.C7-060-FBL	60	24	83	-	-	-	-	-	-	-	21	-	-	-	41	12	500	250
452261	RE.C7-080-FBL	80	24	104	-	-	-	-	-	-	-	25	-	-	-	41	12	550	340
452301	RE.C7-050-FBF	50	20	66	-	-	-	-	-	-	-	24	76	-	-	35	10	350	190
452306	RE.C7-060-FBF	60	24	83	-	-	-	-	-	-	-	21	84	-	-	41	12	500	320
452311	RE.C7-080-FBF	80	24	104	-	-	-	-	-	-	-	25	91	-	-	41	12	550	430