CASTER TERMINOLOGY

Mounting Plate & Kingpin

Main Load Bearing

Horn Base

Horn

Lubrication Fitting

Leg

Axle Nut

Spanner Bushing

Secondary Load Bearing (precision)

Cupped Grease Retainer

Secondary Load Bearing (commercial)

Secondary Bearing Retainer

Kingpin Nut

Cotter Pin

Standard Bolt Axle

Lube Axle
**Capacity** - The maximum load per caster or wheel recommended for intermittent operation over smooth floors at speeds of 3 m.p.h. or less. (Gross weight should be divided by the number of casters or wheels on which it is distributed.)

**Caster Size** - A loose term for classifying casters, based on the nominal diameter of the wheel. For example: a “6 inch caster” is any caster having a 6 inch diameter wheel.

**Component Thrust** - Designates side forces exerted on a swivel caster and properly counteracted by the secondary load bearing.

**Direct Thrust** - Designates those downward forces exerted on a caster by the load, and counteracted by the main load bearing.

**Durometer** - A measure of the hardness of resilient tread wheels.

**Face** - The width of the wheel tread cross-section, measured at the base of the tread rather than at the point of floor contact.

**Horn** - The caster part which comprises legs, plus a base (horn base of swivel caster or mounting plate of rigid).

**Horn Base** - The flat part at the top of the horn from which the legs extend. Serves as lower raceway for main load bearing, and may provide a seat or upper raceway for secondary load bearing.

**King Pin** - A rivet, or threaded stud or bolt with nut, that holds the mounting plate and horn assembly of a swivel caster together. Forged as an integral part of mounting plate on higher quality casters for maximum rigidity and strength.

**King Pin Nut** - The nut on the bottom of a threaded king pin or bolt that permits the disassembly or adjustment of swiveling components; a maintenance feature of better casters not found with rivet type king pins.

**Legs** - The axle support brackets extending down from the horn base of a swivel caster, or from the mounting plate of a rigid caster.

**Main Load Bearing** - The row of steel balls or rollers that swivels the horn base in relation to the mounting plate of a swivel caster, and counteracts direct thrust.

**Mounting Plate** - The flat base, usually with four bolt holes, that forms the top of a caster and permits attachment by bolting or welding to a flat surface.

**Offset** - (swivel lead) The perpendicular distance between the vertical centerlines of the king pin and the axle of a swivel caster. Larger offsets afford easier swiveling, shorter offsets greater strength.

**Overall Height** - The vertical distances from the top of the caster mounting plate to the bottom of the wheel.

**Raceway** - A surface in which bearing balls or rollers rotate.

**Retaining Washer** - A steel washer pressed into the hub ends of some roller bearing wheels to hold the bearing in place.

**Rig** - A swivel or rigid caster assembly less wheel, that may or may not include axle, nut or spanner bushing.

**Rockwell C** - System for measuring hardness of metals.

**Rollability** - Ease of starting and rolling, measured by drawbar pull. This is determined by load, floor conditions, and type and size of wheels and bearings.

**Secondary Load Bearing (Commercial)** - The row of steel balls that rides in the raceway between the horn base and secondary bearing retainer of a swivel caster to counteract component thrust. It is this bearing that characterizes the popular “double ball race” caster.

**Secondary Load Bearing (Precision)** - A precision self contained bearing, usually a tapered roller bearing, operating between the horn base and the king pin of a swivel caster. Constitutes the most efficient means of assisting swivel action by counteracting component thrust.

**Spanner Bushing** - A non-rotating sleeve of seamless steel tubing that fits over the axle in many casters. Serves the dual purpose of providing a smooth inner raceway for the wheel bearings, and strengthening the caster by permitting the legs to be tightened against it.

**Swivel Radius** - The horizontal distance from the centerline of the caster king pin to the outer edge of the wheel (a measure of clearance required to swivel a caster 360°).

**Thrust Washer** - A steel washer between the hub ends of the wheel and the inside of the caster legs.

**Yoke** - Alternate term for horn.
How To Specify Casters For Direct Replacement

When existing casters of acceptable performance are in use, furnish a part number. Our Expert Customer Service Department can recommend an accurate, direct replacement.

**Note:** Send us a sample for free no obligation identification. Sample returned freight prepaid same day if necessary.

How To Specify Casters For New Applications

1. **How much load capacity is required?**
   Divide the load capacity needed by the number of casters being used to get the capacity per caster.
   Example: $1,000 \text{ lbs. total load} \div 4 \text{ casters used} = 250 \text{ lbs. per caster}.$
   Will the load be subject to shock or impact, or will the application involve towing?

2. **What diameter and tread width is required?**
   The best and easiest way to improve rollability is to choose the largest diameter wheel that is practical for the application.

3. **Type of mounting required?**
   **A.** If plate mount, what is the top plate and bolt hole pattern? If the casters are being welded, the above dimensions are not critical.
   **B.** If stem mount, type of stem (i.e. threaded, grip ring, expandable).
   1. Outside dimension of tubing?
   2. Inside dimension of tubing?
   3. Gauge or thickness of tubing?
   4. Actual stem dimensions?
   **Note:** See page 130 for tubing and pipe sizes, wire gauge chart, and decimal cross references.

4. **Is the overall height critical?**
   Refer to page 7.

5. **What is the operating environment?**
   Some applications may require special wheel materials, bearing types or swivel and rigid horn types (i.e. temperature extremes, moisture, caustic chemicals, variance in floor condition).

How To Specify Wheels For Direct Replacement

1. When existing wheels of acceptable performance are in use, furnish a part number. Our Expert Customer Service Department can recommend an accurate, direct replacement.

**Note:** Send us a sample for free no obligation identification. Sample returned freight prepaid same day if necessary.

How To Specify Wheels For New Applications

1. **How much load capacity is required?**
   Divide the load capacity needed by the number of wheels being used to get the capacity per wheel.
   Example: $1,000 \text{ lbs total load} \div 2 \text{ wheels used} = 500 \text{ lbs. per wheel}.$

2. **What diameter and tread width is required?**

3. **What hub length is required and is it offset or symmetrical?**

4. **What is the bore size?**

5. **What type of bearing is required?**

6. **What is the operating environment?**
   See Wheel Selection Guide on page 10.

7. **Do you need component parts to mount wheel?**
   See Component Parts on pages 101 to 103.
Precision Tapered Roller Bearings

Ideal for heavy duty caster applications because their tapered faces will handle any combination of downward and side forces. Used in various swivel assemblies as well as in wheels. Two bearings are installed per wheel, one in each side of the hub, consisting of a cup (hardened and ground outer raceway) and cone (roller assembly). Spanner bushings are not employed since adjustment requires tightening caster legs against the bearing assembly. Tapered bearings extend overall hub length of the wheel itself by approximately ¼”.

Roller Bearings

Most popular anti-friction bearing for industrial equipment. Consists of a cage-type roller assembly, and an outer race that may be separate or integral see on page 103. We most often use hardened and ground steel roller bearings for maximum loads and life. (Note: plastic retaining washers or other components may be used unless we are advised of a high-heat application.)

Ball Bearings

The standard ball bearings referred to in this catalog are the unground radial type, intended for light to medium duty service. On special order we can supply light or heavy duty precision ball bearings for both radial and thrust loads, in configurations including flanged, sealed, square bores, extended inner raceways, and wide inner raceways with self-locking collars.

Self Lubricating

A sleeve, usually of sintered iron or oil-impregnated bronze, is press-fit into the wheel bore. Lacks the ease of movement anti-friction bearings provide, but practical for light loads where re-lubrication is a problem. (A light application of oil or graphite improves rollability and extends bearing life.)

Precision Ball Bearings

This type of bearing consists of a hardened outer raceway and inner raceway, separated by a concentric ring of hardened steel balls. This bearing is used in pairs and is usually press fitted into a deep pocket of a wheel that has high load, and high speed capabilities. This type of bearing is primarily used to carry radial loads only.

Plain Bore

The term applied to running, machine bored wheels, directly on an axle; hence, the absence of a bearing. Suitable for light or seldom moved loads, where ease of starting and rolling is not too important or where price is a dominant factor. Except for roller bearing bores, we normally machine “plain bore” wheels ¼” oversize for good running fit. Closer tolerance machining available at extra cost.

Delrin®

(Registered DuPont trademark.) Sometimes referred to as plastic or celcon. For environments detrimental to metal bearings, acetyl resin bearings offer chemical and corrosion resistance. Delrin® is a standard offering in certain wheels, as either a sleeve or flange type bearing. Plastic bearings can be custom machined and installed in most other wheels on request. Note: flange type bearings extend actual hub length of wheel approximately 3⁄16”. 

WHEEL BEARINGS
**Wheel Material Selection Guide**

**Full-Pneumatic Wheel Assemblies**
**Page 71**
Smoothened ride over rough terrain. All are tube type.

**Semi-Pneumatic Wheels**
**Page 71**
Versatile wheel offering solutions to a multitude of applications.

**Soft Rubber-SR**
**Page 73**
Traditional composition hard core with soft tread. Very quiet ride for modest cost.

**Mold-On Rubber-MR**
**Page 74**
Traditional cushioned rubber tread vulcanized to a cast iron core. Quiet and floor protective.

**Santoprene® -SP**
**Page 72**
Patented by Monsanto, this thermoplastic rubber is mechanically and chemically bonded to a polyolefin core. Tread is grey non-marking.

**Polyurethane Iron Core-PI**
**Page 78**
3/8” to 1/2” thick polyurethane tread is chemically bonded to a cast iron core. Low rolling resistance and good floor protection.

**Polyurethane Severe Duty-PS**
**Page 79**
Combines class 1030 close grained grey iron casting with premium polyurethane tread for severe duty and shock applications. 1” thick thread on tapered bearing wheels.

**Solid Urethane-KT**
**Page 77**
This solid cast urethane wheel offers quiet operation combined with high load capacity and unequaled abrasion and wear resistance.

**Polyurethane on Polyolefin-PP**
**Page 80**
Injection molded polyurethane tread is mechanically and chemically bonded to a polyolefin core. Lighter than polyurethane treads on steel or aluminum cores.

**Polyurethane Aluminum Core-PA**
**Page 75**
Premium polyurethane mechanically and chemically bonded to a reinforced aluminum core. Offers high capacity, good floor protection and looks sharp.

**Advanced Elastomer-AE**
**Page 76**
High abrasion resistance. Withstands chemicals, greases and solvents. Very low rolling resistance for a resilient wheel.

**Polyolefin-PB/PW**
**Page 81**
Injection molded polyolefin is available in black or white color. Offers good load capacity and water resistance at a low cost.
<table>
<thead>
<tr>
<th>Material</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Rubber-HR</td>
<td>84</td>
<td>This one piece wheel is made of a molded hard rubber composition. Good load ratings and resists flat spotting.</td>
</tr>
<tr>
<td>Phenolic-PH</td>
<td>82</td>
<td>Single piece phenolic resin compound molded with macerated canvas under extreme pressure and heat.</td>
</tr>
<tr>
<td>Reinforced Thermoplastic-RT</td>
<td>83</td>
<td>Specially blended, reinforced thermoplastic. Excellent rollability and impact resistance will not absorb water. Above average chemical and solvent characteristics.</td>
</tr>
<tr>
<td>Cast Iron-SS</td>
<td>86</td>
<td>Sometimes called semi-steel because of scrap steel content. Couples high capacity with long service life.</td>
</tr>
<tr>
<td>V-Grooved-VG</td>
<td>89</td>
<td>Used on inverted angle iron for tracking applications. Available in many sizes and capacities.</td>
</tr>
<tr>
<td>Flanged Wheel-FW</td>
<td>90</td>
<td>Designed to run on parallel tracks. Face and flange machined for concentric, smooth mobility.</td>
</tr>
<tr>
<td>Grey Iron-GI</td>
<td>85</td>
<td>Close grained class 1030 casting makes this wheel ideal for shock and impact loads that will cause standard cast iron wheels to crack or shatter.</td>
</tr>
<tr>
<td>Heavy Duty Ductile Iron-HD</td>
<td>85</td>
<td>Heavily sectioned rims and solid web design ensures long service life in the most severe of applications.</td>
</tr>
<tr>
<td>Forged Steel-FS</td>
<td>88</td>
<td>Indestructible in normal applications. Longest service life. Used where floor protection is a secondary consideration.</td>
</tr>
</tbody>
</table>
## Wheel Characteristics Selection Guide

<table>
<thead>
<tr>
<th>Wheel Type</th>
<th>Load Capacity to lbs. (KGS)</th>
<th>Durometer</th>
<th>Temperature Range</th>
<th>Abrasion Resistance</th>
<th>Impact Resistance</th>
<th>Floor Protection</th>
<th>Noise Reduction</th>
<th>Moisture Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Pneumatic Wheel Assemblies PN</td>
<td>675 (307)</td>
<td>55A</td>
<td>-20° to +100°F</td>
<td>Medium</td>
<td>Low</td>
<td>Very Good</td>
<td>Very Good</td>
<td>Medium</td>
</tr>
<tr>
<td>Semi-Pneumatic Wheels SN</td>
<td>600 (273)</td>
<td>75A</td>
<td>0° to +100°F</td>
<td>Low</td>
<td>Low</td>
<td>Good</td>
<td>Good</td>
<td>Medium</td>
</tr>
<tr>
<td>Soft Rubber SR</td>
<td>300 (135)</td>
<td>70A</td>
<td>-40° to 158°F</td>
<td>Low</td>
<td>Low</td>
<td>Good</td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td>Mold-On Rubber MR</td>
<td>3020 (1359)</td>
<td>70A</td>
<td>-30° to 160°F</td>
<td>Low</td>
<td>Low</td>
<td>Good</td>
<td>Good</td>
<td>Low</td>
</tr>
<tr>
<td>Santoprene® SP</td>
<td>700 (315)</td>
<td>75A</td>
<td>-40° to 230°F</td>
<td>High</td>
<td>Medium</td>
<td>Very Good</td>
<td>Very Good</td>
<td>High</td>
</tr>
<tr>
<td>Polyurethane Iron Core PI</td>
<td>9000 (4050)</td>
<td>95A</td>
<td>-45° to 180°F</td>
<td>High</td>
<td>Medium</td>
<td>Good</td>
<td>Fair</td>
<td>Medium</td>
</tr>
<tr>
<td>Polyurethane Severe Duty PS</td>
<td>4800 (2160)</td>
<td>95A</td>
<td>-45° to 180°F</td>
<td>High</td>
<td>High</td>
<td>Very Good</td>
<td>Good</td>
<td>Medium</td>
</tr>
<tr>
<td>Solid Urethane KT</td>
<td>1500 (675)</td>
<td>55D</td>
<td>-50° to 180°F</td>
<td>High</td>
<td>High</td>
<td>Very Good</td>
<td>Fair</td>
<td>Very High</td>
</tr>
<tr>
<td>Polyurethane on Polyolefin PP</td>
<td>1000 (450)</td>
<td>90A</td>
<td>-45° to 180°F</td>
<td>High</td>
<td>Medium</td>
<td>Good</td>
<td>Good</td>
<td>Medium</td>
</tr>
<tr>
<td>Polyurethane Aluminum Core PA</td>
<td>1500 (675)</td>
<td>95A</td>
<td>-40° to 160°F</td>
<td>High</td>
<td>High</td>
<td>Good</td>
<td>Fair</td>
<td>Medium</td>
</tr>
<tr>
<td>Advanced Elastomer AE</td>
<td>1200 (545)</td>
<td>68D</td>
<td>-50° to +212°F</td>
<td>Very High</td>
<td>Very High</td>
<td>Very Good</td>
<td>Good</td>
<td>Very High</td>
</tr>
<tr>
<td>Polyolefin PB/PW</td>
<td>800 (360)</td>
<td>95A</td>
<td>-20° to 230°F</td>
<td>Medium</td>
<td>Medium</td>
<td>Fair</td>
<td>Poor</td>
<td>Very High</td>
</tr>
<tr>
<td>Hard Rubber HR</td>
<td>600 (270)</td>
<td>95A</td>
<td>-40° to 158°F</td>
<td>Medium</td>
<td>Medium</td>
<td>Fair</td>
<td>Poor</td>
<td>Low</td>
</tr>
<tr>
<td>Phenolic Resin PH</td>
<td>8000 (3600)</td>
<td>—</td>
<td>-45° to 250°F</td>
<td>Medium</td>
<td>Medium</td>
<td>Fair</td>
<td>Poor</td>
<td>Low</td>
</tr>
<tr>
<td>Reinforced Thermoplastic RT</td>
<td>1400 (630)</td>
<td>65D</td>
<td>-20° to 250°F</td>
<td>Medium</td>
<td>High</td>
<td>Fair</td>
<td>Poor</td>
<td>Very High</td>
</tr>
<tr>
<td>Cast Iron SS</td>
<td>3500 (1575)</td>
<td>—</td>
<td>-45° to 800°F</td>
<td>High</td>
<td>Medium</td>
<td>Poor</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Grey Iron GI</td>
<td>4000 (1800)</td>
<td>—</td>
<td>-45° to 800°F</td>
<td>Very High</td>
<td>Very High</td>
<td>Poor</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Heavy Duty Ductile Iron HD</td>
<td>10000 (4500)</td>
<td>—</td>
<td>-45° to 800°F</td>
<td>Very High</td>
<td>Very High</td>
<td>Poor</td>
<td>Poor</td>
<td>High</td>
</tr>
<tr>
<td>Forged Steel FS</td>
<td>15000 (6750)</td>
<td>—</td>
<td>-45° to 800°F</td>
<td>Very High</td>
<td>Very High</td>
<td>Poor</td>
<td>Poor</td>
<td>High</td>
</tr>
</tbody>
</table>

### Durometer Chart

**Durometer Chart**

_Score A_  
- Rubber Band
- Shoe Heel

_Score D_
- 45
- 55
- 65
- 75
- 85
**ROLLABILITY CHART**

**Sustained Rolling Force** is the number of pounds of force that needs to be applied to keep the unit rolling. **Breakaway Force** is the number of pounds of force that needs to be applied to start the unit rolling.

<table>
<thead>
<tr>
<th>Wheel Type</th>
<th>Wheel Size</th>
<th>Sustained Rolling Force</th>
<th>Breakaway Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Pneumatic Wheel Assemblies</td>
<td>PN 6 x 2</td>
<td>6.5</td>
<td>13</td>
</tr>
<tr>
<td>Semi-Pneumatic Wheels</td>
<td>SN 6 x 2</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Soft Rubber</td>
<td>SR 6 x 2</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Mold-On Rubber</td>
<td>MR 6 x 2</td>
<td>11.2</td>
<td>22.4</td>
</tr>
<tr>
<td>Santoprene</td>
<td>SP 6 x 2</td>
<td>9.5</td>
<td>19</td>
</tr>
<tr>
<td>Polyurethane Iron Core</td>
<td>PI 6 x 2</td>
<td>6.2</td>
<td>13.5</td>
</tr>
<tr>
<td>Polyurethane Severe Duty</td>
<td>PS 6 x 2</td>
<td>7.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Solid Urethane</td>
<td>KT 6 x 2</td>
<td>5.1</td>
<td>10.2</td>
</tr>
<tr>
<td>Polyurethane on Polyolefin</td>
<td>PP 6 x 2</td>
<td>7.2</td>
<td>14.4</td>
</tr>
<tr>
<td>Polyurethane Aluminum Core</td>
<td>PA 6 x 2</td>
<td>6.5</td>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wheel Type</th>
<th>Wheel Size</th>
<th>Sustained Rolling Force</th>
<th>Breakaway Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Elastomer AE</td>
<td>6 x 2</td>
<td>3.5</td>
<td>7.0</td>
</tr>
<tr>
<td>Polyolefin PB/PW</td>
<td>6 x 2</td>
<td>3.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Hard Rubber HR</td>
<td>6 x 2</td>
<td>1.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Phenolic Resin PH</td>
<td>6 x 2</td>
<td>1.0</td>
<td>2</td>
</tr>
<tr>
<td>Reinforced Thermoplastic RT</td>
<td>6 x 2</td>
<td>1.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Cast Iron SS</td>
<td>6 x 2</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>V-Grooved VG</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>FW Flanged FW</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Grey Iron GI</td>
<td>6 x 2</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Heavy Duty Ductile Iron HD</td>
<td>6 x 2</td>
<td>0.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Forged Steel FS</td>
<td>6 x 2</td>
<td>0.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Note: Based on 500 lbs. per wheel. Wheels have roller bearings.

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**SWIVEL BEARING DESIGNS**

**Single Ball Race**
Most basic of possible swivel constructions, this economical and low height caster depends on an accurately curved raceway to contact a single row of balls. Because of its minimal ability to withstand thrust against the king pin, this construction is not recommended where shock exists, but is nevertheless found in the world’s most popular “dolly” casters.

**Double Ball Race**
Two sets of hardened and polished steel balls rotate in machined or pressure-coined raceways. The upper raceway absorbs direct thrust, while the lower raceway surrounds the king pin to absorb side forces (component thrust). Raceways are hardened as required by the load rating, and king pins may be of the bolt or rivet type.

**King Pin-Free**
Unique design whereby a single row of ball bearings run between laterally facing, machined raceways. Eliminates the traditional king pin found in virtually all other swivel assemblies.

**Commercial Load and Precision Thrust Bearing**
A set of hardened and polished steel balls rotate in a machined raceway (flame hardening recommended for continuous service). Radial thrust is absorbed by a precision tapered roller bearing.