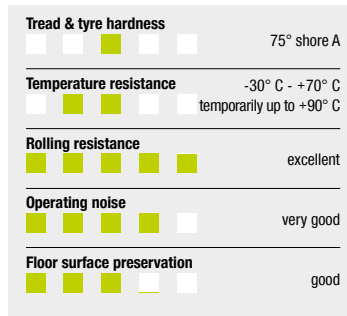


# Tread & tyre hardness. Temperature resistance. Starting and rolling resistance. Operating noise. Floor surface preservation.



Infobox Blickle wheel series

## Tread & tyre hardness

On the product pages the tread & tyre hardness is illustrated by an Infobox with a summary of the specification. The further to the right the mark is situated the harder the tread or tyre. Therefore, the illustration allows a fast estimation of the tread & tyre hardness. The specification of the tread & tyre hardness allows a comparison between the different wheel series.

The specification of the hardness is made for

- elastomers and polyurethanes rated in shore A,
- hard synthetics rated in shore D and
- metals rated in Brinell hardness (HB)

## Temperature resistance

The temperature resistance is illustrated by an Infobox with a summary of the specification. Marks on the left indicate that the wheels are suitable in particularly cold temperatures, marks on the right in particularly high temperatures. Besides the illustration the application ranges are indicated by concrete values. In the specified temperature application range the wheel characteristics such as tread & tyre hardness, load capacity, starting and rolling resistance can change.

## Starting and rolling resistance

The starting resistance is the force which has to be overcome to accelerate a wheel from a passive state to translatory motion. The force which is necessary to set a wheel in uniform motion is called rolling resistance. The starting and rolling resistance depend on the following factors:

- Wheel Ø
- Tread
- Tread hardness
- Resilience of the tread
- Wheel bearing
- Floor

The rolling resistance is caused by a permanent downward and upward deflection of the tread during the rolling motion (hysteresis).

The measurement of the rolling resistance is carried out on a test bench. The measured values are evaluated under ideal conditions:

- Even, free of dirt steel surface without obstacles
- Speed: 4 km/h
- Temperature: +20° C
- Load: 2/3 of the max. load capacity

Under these standardized constraints the rolling resistances of the different wheel series can be compared with each other.

Deviating conditions (floor condition, temperature, speed, etc.) must be considered when defining the equipment frame and can influence the rolling resistance values significantly.

The swivel resistance depends on the following factors:

- Tread
- Tread hardness
- Contact surface
- Offset
- Floor

## Operating noise

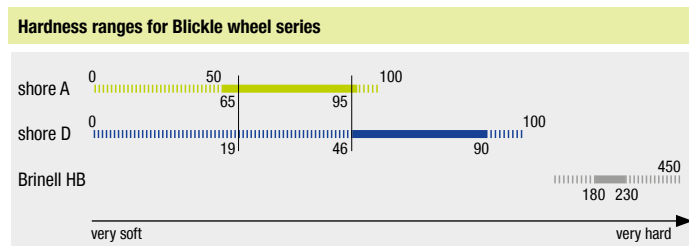
The more points shown on the scale, the less vibration and lower noise emission during the transport of the goods will be noticed. The basic principle is: The larger the wheel and softer as well as thicker the tread, the smoother a vehicle can be moved. This means that a soft tread associates with lower, and a harder tread associates with higher noise emission. With low loads and a soft surface (i.e. carpet), hard wheels with low noise emission and high operational comfort can be used.

## Floor surface preservation

The situation is similar with floor surface preservation. A hard tread affects the surface more than a soft tread. Therefore a tread with five points in the category floor surface preservation indicates an exceptionally floor-preserving behaviour.

Characterizing for floor surface preservation is the average floor pressure. For the different tread materials the following reference values can be used:

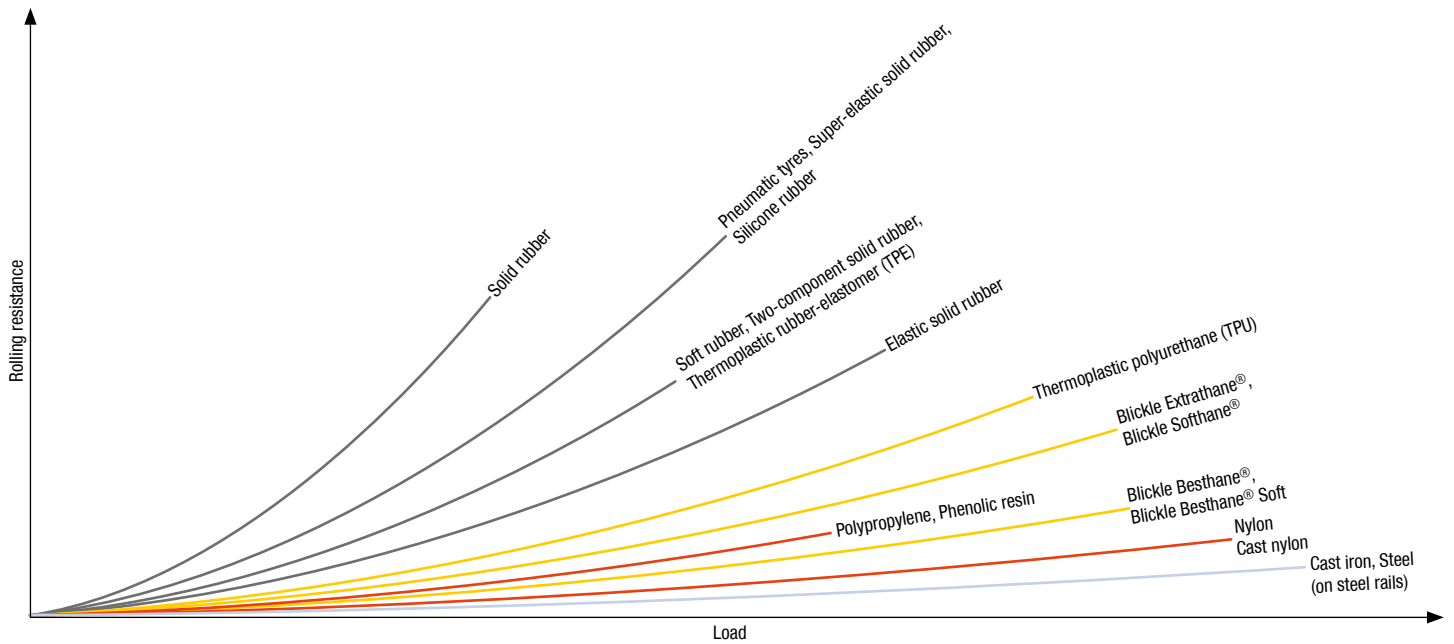
Pneumatic tyres	~ 0.8 N/mm <sup>2</sup>
Soft rubber	~ 0.8 N/mm <sup>2</sup>
Super-elastic solid rubber	~ 1.5 N/mm <sup>2</sup>
Elastic solid rubber	~ 1.8 N/mm <sup>2</sup>
Solid rubber/polyurethane (approx. 75° shore A)	~ 3.5 N/mm <sup>2</sup>
Polyurethane (approx. 92° shore A)	~ 8.0 N/mm <sup>2</sup>
Thermoplastic polyurethane	~ 11.0 N/mm <sup>2</sup>
Polypropylene/nylon	~ 40.0 N/mm <sup>2</sup>
Cast nylon	~ 60.0 N/mm <sup>2</sup>
Cast iron	~ 350 N/mm <sup>2</sup>
Steel	~ 500 N/mm <sup>2</sup>



Between the different hardness test methods there aren't any linear correlations. The presented values only serve as reference values and were determined empirically.

**Tread & tyre hardness. Temperature resistance. Starting and rolling resistance. Operating noise. Floor surface preservation.**

Rolling resistance of different Blickle tread materials



Tread material	Wheel series	Refer to page
<b>Rubber</b>		
Solid rubber	VPA	93
	VGA	93, 148
	VE	132
	V	136-137
	VPP / VPE	139-140
	VEHI VKHT	378 386
Thermoplastic rubber-elastomer (TPE)	TPA	88, 145
Soft rubber	VW WWPP	154 156
Two-component solid rubber	RD	158
Elastic solid rubber	POEV	164
	ALEV	171, 445
	SE	180
	GEV	187
	DS	189
	REV	448-456
	GEVN	460
	GEVA	467
	BEV	475-476
Pneumatic tyres	P	192-193
	PS	195
	PK	197
	PA	470
Super-elastic solid rubber	VLE	202
	VLEA	471
	BSEV	474
Silicone rubber	POSI / ALSI	381

Tread material	Wheel series	Refer to page
<b>Polyurethane</b>		
Thermoplastic polyurethane (TPU)	PATH	99, 208
	POTH	213
	FPTH	433
	FPU	434
Blickle Softthane® polyurethane-elastomer	ALST	222, 445
	GST	229
	GSTN	461
	GSTA	468
Blickle Besthane® Soft polyurethane-elastomer	ALBS	238
Blickle Extrathane® polyurethane-elastomer	ALTH	246, 445-446
	SETH	254
	VSTH / GTH	258-259, 446
	FTH	430
	FSTH	431
	HTH	438-440
	HTHW	442-443
	RTH	448-457
	GTHN	462-463
	BTH	477
Blickle Besthane® polyurethane-elastomer	VSB / GB	268-269, 447
	FPOB	432
	HB	441
	RB	448-457
	GBN	464-465
	GBA	469
	BB	478-479

Tread material	Wheel series	Refer to page
<b>Synthetics</b>		
Nylon	POA	104
	PO	276-277, 445
	POW	288
	SPO	300-301
	POHI	389
	FPO HPO	435 444
Cast nylon	GSP0	314
	SPKGSPO	338
	DSPKGSPO	340
Polypropylene	PPN	293
Phenolic resin	PHN	394
<b>Metal</b>		
Cast iron	G	320, 399
	SPK	336
Steel	SVS	330
	SPKVS	339
	DSPK	341
	SPKVSN	466