

## BORGinsole Measurement devices

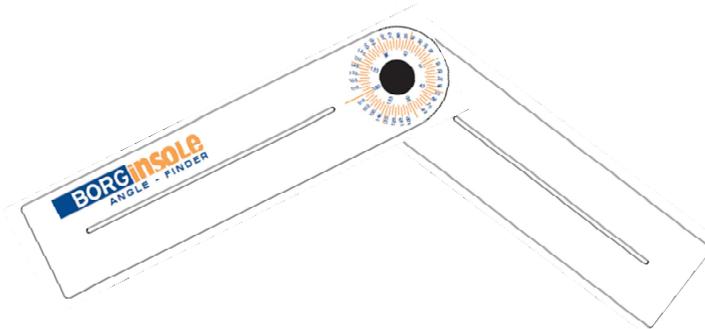


**BORGinsole®**  
INTELLIGENT FOOT

BorgInsole biomechanical angle measuring devices

- BORGinsole®** FOOT-RISK-FINDER
- BORGinsole®** FOREFOOT-ANGLE-FINDER
- BORGinsole®** MALLEOLAR-TORSION-FINDER
- BORGinsole®** FIRST-RAY-FINDER
- BORGinsole®** TIBIA-ANGLE-FINDER
- BORGinsole®** ANGLE-FINDER

1st MTP	Dorsal Flexion		65°
Mal Torsion			18°
<b>PRONE POSITION</b>		<b>Left</b>	<b>Normal</b>
STJ	Supination		20°
	Pronation		10°
MTJ	Forefoot - Rearfoot		0°
1st Ray	Dorsal Flexion		5 mm
	Plantar Flexion		6 mm
	Struct Plant Flexion	<input type="checkbox"/>	<input type="checkbox"/>
Ankle Dorsal Flexion	Knee Extension		10°
	Knee Flexion		20°
<b>STANCE POSITION</b>		<b>Left</b>	<b>Normal</b>
OCS			0°
NCS			0°
Tibia OCS			7°
Knee Frontal Plane			0°



### **Dorsal Flexion of the first Metatarsophalangeal joint**

- P. is sitting up on the examination table, with legs straight.
- T. is sitting at the end of the patients feet.
- T. places one part of the [BORGinsole Angle-Finder](#) equal with the first metatarsal and the other part equal with the hallux. The pivot point has to be at the first metatarsophalangeal joint.
- T. places the first metatarsophalangeal joint in maximal dorsal flexion. Now you can read the range of motion of that joint.
- Normative value = minimum 65° dorsal flexion.

### **Subtalar Joint (STJ): supination (inversion) and pronation (eversion)**

- P. is in prone position, feet must be of the examination table.
- T. is sitting at the end of the patients feet.
- T. places the calcaneus in the frontal plane of the patient.
- T. draws a bisection in the middle of the calcaneus and a line in the middle of the distal 1/3th of the lower leg.
- ! Make sure you check this.
- T. Takes the calcaneus with one hand in between his thumb and forefinger. Now you can bring the calcaneus to maximal inversion and eversion. You can find the amount of degrees on the BORGinsole angle finder.
- ! Attention: Make sure the skin doesn't shift.
- With the other hand, the T places one part of the [BORGinsole Angle-Finder](#) just above the line on the calcaneus. The other part above the line on the lower leg. The pivot point has to be at the height of the subtalar joint. Read the range of motion.
- Normative value: minimum 20° supination en 10° pronation (Always ratio 2/1)

### Talocrural Joint (TCJ): dorsal flexion with knee in extension

- P. in prone position, feet must be of the table.
- T. is sitting at the end of the patients feet
- T. places one part of the [BORGinsole Angle-Finder](#) in the middle of the distal 1/3th of the lower leg. The other part equal with the lateral side of the foot (5<sup>th</sup> metatarsal). This 90° angle between foot and lower leg should be the starting position.
- T. moves the talocrural joint to a maximal dorsal flexion and reads the amount of range of motion.
- ! Attention ! Don't put the forefoot in a valgus position relative to the ankle. Rather choose a small amount of varus.
- Purpose = measuring the amount of dorsal flexion of the talocrural joint and measuring the length of the M. Gastrocnemius.
- Normative value = minimum 10° dorsal flexion

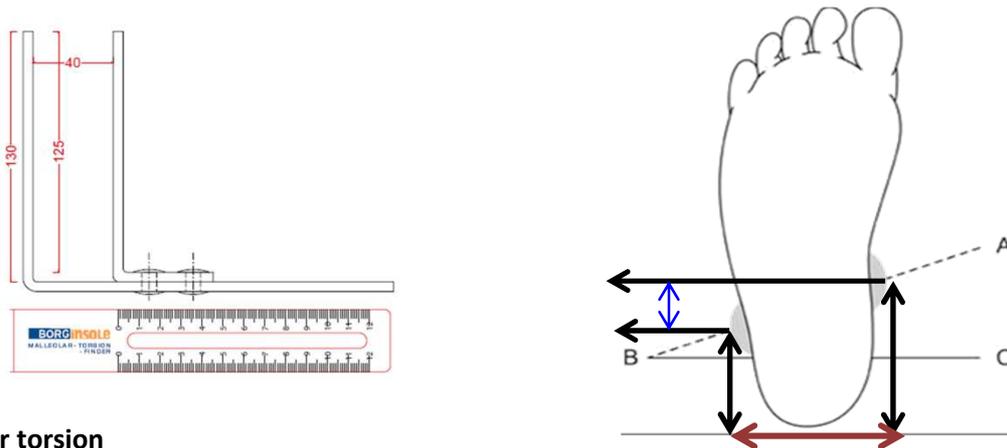
### Talocrural joint (TCJ): dorsal flexion with knee in flexion

- P. in prone position, knee in 90° flexion
- T. is sitting at the end of the patients feet.
- T. places one part of the [BORGinsole Angle-Finder](#) in the middle of the distal 1/3th of the lower leg. The other part equal with the lateral side of the foot (5th metatarsal). This 90° angle between foot and lower leg should be the starting position.
- T. moves the talocrural joint to a maximal dorsal flexion and reads the amount of range of motion.
- ! Attention ! Don't put the forefoot in a valgus position relative to the ankle. Rather choose a small amount of varus.
- Purpose = measuring the amount of dorsal flexion of the talocrural joint and measuring the length of the M. Soleus.( a limitation of movement in-between tibia and fibula will also decrease the range of motion)
- Normative value = 20° dorsal flexion

### Knee in the Frontal plane in relaxed calcaneaire position

- P. is standing on the [BORGinsole-measuring device](#) in relaxed position: normal gait angle (7° foot abduction) and gait distance (advice = 8 cm in-between both bisections on the calcaneus)
- T. places one part of the [BORGinsole Angle-Finder](#) on the femur and one part on the lower leg. The pivot point has to be at the knee joint.
- Normative value = 0°  
Positive (+) = O-stand = genu varum  
Negative (-) = X-stand = genu valgum

Fig a green line



**Malleolar torsion**

- P. is in supine position on the examination table, with the hip in the neutral position.
- T. is sitting at the end of the patients feet
- T. draws a line in the middle of the medial malleolus and the lateral malleolus.
- T. places the patella parallel with the examination table.
- T. places the measuring devise under the ankle in line with the lateral and medial malleolus.
- T. calculates the difference in height (the medial malleolus is always higher) (**Height**)
- T. measures the width of the ankle. (**Width**)
- With these two variables "Width" en "Height" you can read the malleolar torsion angle on the chart.
- Normative values = 18° (range 15 to 21) exorotation

<b>BORGinsole</b>											
<b>Malleolar-Torsion-Finder</b>											
mm											
Width	30	35	40	45	50	55	60	65	70	75	80
Height ↓	degrees of malleolar torsion										
5	12	10	9	8	7	6	5	4	3	3	3
10	20	15	14	13	12	11	10	8	8	7	6
15	25	22	20	18	16	15	14	13	12	11	10
20	32	27	25	22	20	18	17	16	15	14	13
25	37	33	30	27	25	23	22	19	18	17	16
30	42	37	35	32	30	27	25	23	22	21	20
35	47	42	40	37	36	33	30	27	25	24	23
40	50	45	43	40	37	34	32	30	28	27	25
45		50	45	42	40	36	35	32	30	28	27
50			48	45	42	40	37	35	33	32	30

B  
O

**Midtarsal joint (MTJ)**

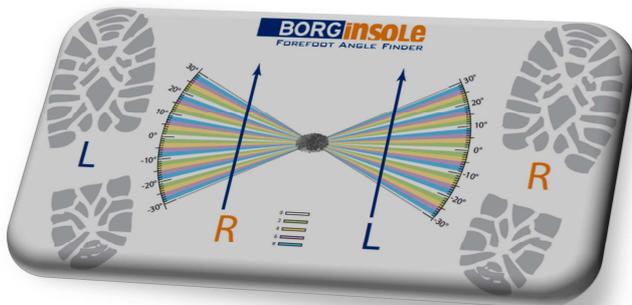
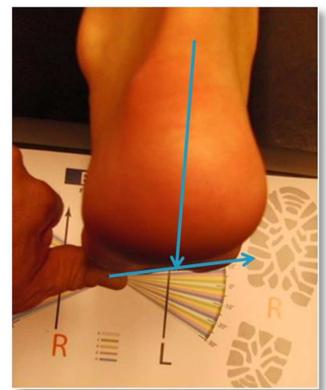
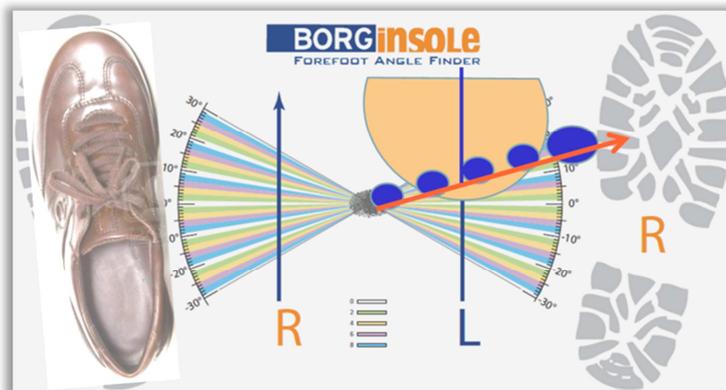
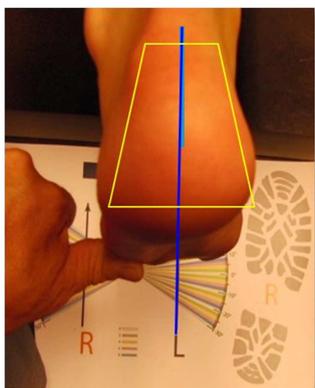
- P. in prone position, foot must be of the table.
- T. is sitting at the end of the patients foot
- T. places the calcaneus in the frontal plane of the patient. STJ in his neutral position.
- T. places the bisection of the calcaneum equal with the line of the **BORGinsole Forefoot - Finder** and reads at the height of the forefoot the amount of degrees. Now you can see the forefoot- rear foot relationship.

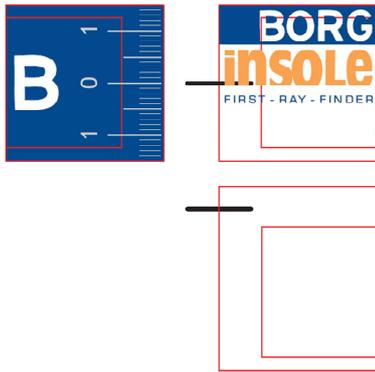
Positive (+) = forefoot varus = when the forefoot is inverted compared to the rear foot

Negative (-) = forefoot valgus = when the forefoot is everted compared to the rear foot.

Normative value = 0°

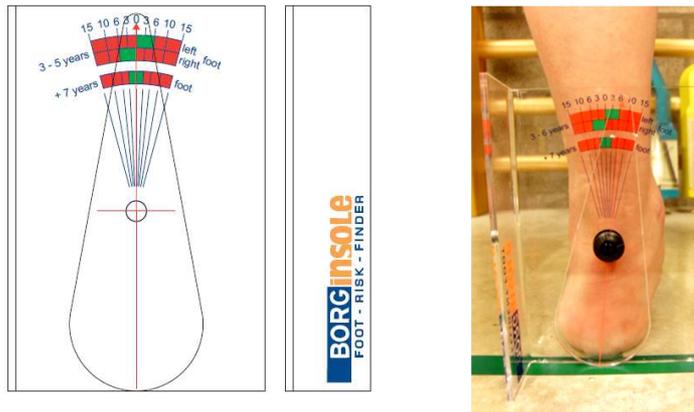
- Pitfalls: Palpate the supinators of the foot. Check if they are not active while doing the test. The supinators can make a greater amount of varus.





**First ray (= first metatarsal and the first cuneiform): Dorsal and plantar flexion range of motion**

- P. in prone position, feet must be of the table.
- T. is sitting at the end of the patients feet
- T. places the subtalar joint in the neutral position.
- T. fixates with one hand the second and the fifth metatarsal between forefinger and thumb.
- T. fixates with the other hand the first metatarsal between the forefinger and thumb. The first metatarsal must be in line with the other metatarsals as starting position.
- T. places the **BORGinsole First-Ray -Finder** on the forefoot.  
! Attention ! Don't put the 'two devices' too close. Otherwise the skin is too tense and will not allow a lot of movement.
- T. moves the first metatarsal to a maximal dorsal and a maximal plantar flexion and reads the amount of range of motion.  
! Structural plantar= When a dorsal flexion movement is not possible when all the metatarsals are in line.
- Normative value = 5mm dorsal flexion en 6mm plantar flexion range of motion



**OCS (= relaxed calcaneal stands position)**

- P. is standing on the **BORGinsole-measuring platform** in a relaxed position normal gait angle (7° foot abduction) and gait distance (advice = 8 cm in-between both bisections on the calcaneus)
- T. measures the angle between the line on the calcaneus and the horizontal plane with the lower side of the **BORGinsole Foot-Risk-Finder**. Now you can read the amount of degrees.  
 Normative value = -3°/+3 (in adults)° Blue line in fig a  
 Positive (+) = rear foot varus = The calcaneus is inverted compared to the lower leg  
 Negative (-) = rear foot valgus = The calcaneus is everted compared to the lower leg  
 For kids under 7 we can use the formula: 2X age - 14 = normal (in eversion). Inversion never is normal  
 Example for a 4 year old boy: 2 x 4 = 8 – 14 = -6 (6° valgus is normal)

*Handwritten signature*

**NCS (= neutral calcaneal stands position)**

- P. is standing on the **BORGinsole-measuring platform** in relaxed position: (7° foot abduction) and gait distance (advice = 8 cm in-between both bisections on the calcaneus)
- T. palpates the subtalar joint and asks the patient to move his foot to the STG neutral position.  
 For example: move from eversion to supination until you become the neutral position for the subtalar joint.  
 T. measure the angle between the bisection on the calcaneus and the horizontal plane with the **BORGinsole Foot-Risk-Finder** and read the amount of degrees.
- Normative value = -3°/+3°  
 Positive (+) = rear foot varus = The calcaneus is inverted compared to the lower leg  
 Negative (-) = rear foot valgus = The calcaneus is everted compared to the lower leg

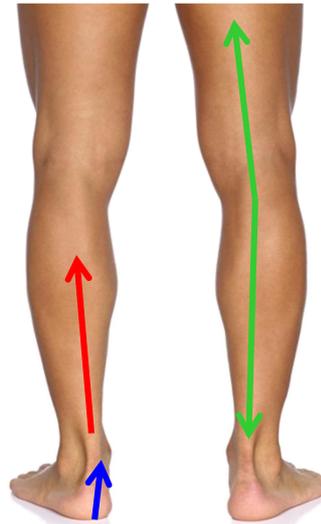


Fig a

### Position Tibia in OCS or NCS

- P. is standing on the **BORGinsole-measure platform** in his relaxed position: (7° foot abduction) and gait distance (advice = 8 cm in-between both bisections on the calcaneus)
- T. measures the angle between the line on the lower leg and the horizontal plane with the **BORGinsole Tibia-Angle-Finder** and reads the amount of degrees. (red line in fig a)
- Normative value = +7° Tibia Varum
- ! Attention ! This measurement is in relaxed calcaneal stand position. You also can measure in the neutral position (NCSP)