

# Astrid® Modular Forefoot System

Surgical Technique





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## Astrid – a System for Surgery of the Forefoot



Double-threaded compression screw



Tino® Screw, self-tapping and self-drilling

### Astrid – a System for Surgery of the Forefoot

The Astrid System was created to meet the demand for a modular system featuring flexibility of use.

Its modular nature means that it adapts to individual surgical practices.

The Astrid System consists of original implants such as snap-off screws, self-tapping double-threaded compression screws, straight or slanting staples, anatomical minipin plates and one-quarter tubular plates. The appropriate instrument set for each implant makes it easier to position them in place.



**Staple**



**Small quarter tubular plate**



**Anatomical minipin plate**



**Convex and concave reamer**

The Astrid System enables surgery of the metatarsals and great toe (Scarf and Chevron techniques for the M1, shortening, varization and derotation of P1) and of the other toes (Weil technique), as well as arthrodesis of the metatarsals and great toe prepared by spherical reaming.

## Scarf Osteotomies

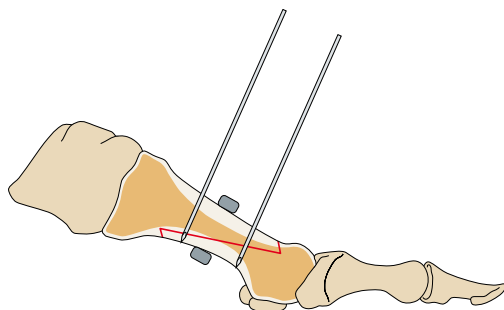
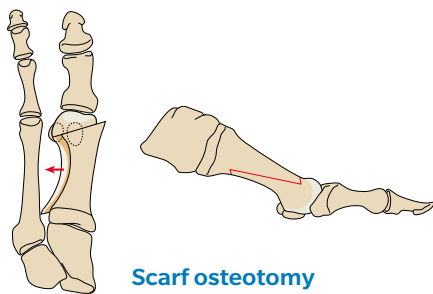


Figure 1

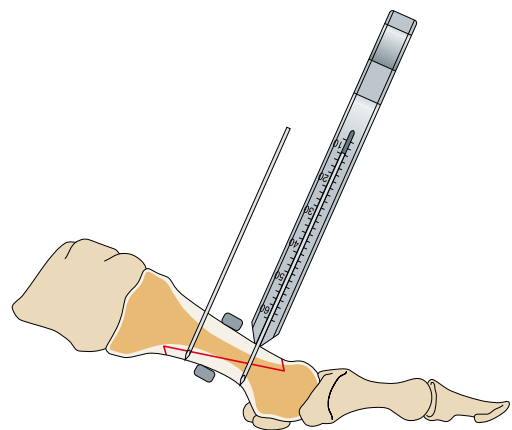


Figure 2

### Stabilization by Means of Two Parallel Double-Threaded Screws Introduced over Guide Wires

Stabilize the osteotomy by means of the reduction forceps (REF 02.00023.020) and insert the Ø 1.0 mm guide wires (REF 02.00023.050) as far as the cortical bone on the opposite side (Figure 1).

Use the reverse measuring device (REF 02.00023.081) to measure the length of the part of each guide wire that is inside the bone (Figure 2).

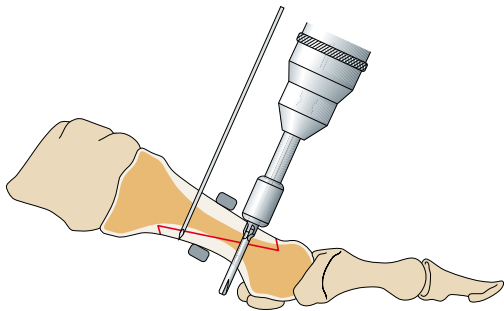


Figure 3

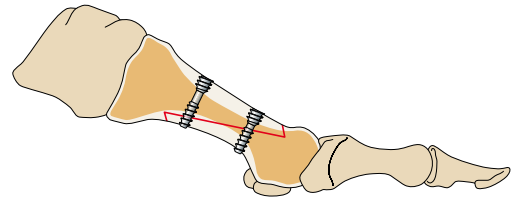


Figure 4

Proceed with reaming, using the step reamer with stop (REF 02.00023.060) (Figure 3).

ⓘ **Note:** The step reamer (REF 02.00023.062) has a working length of 22 mm. The step reamer (REF 02.00023.063) has a working length of 16 mm.

Insert the double-threaded screws over the Ø 1.0 mm guide wire, using the screwdriver (REF 02.00023.085) (Figure 4).

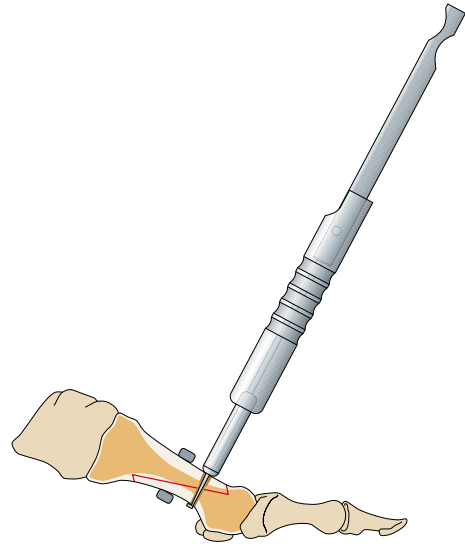
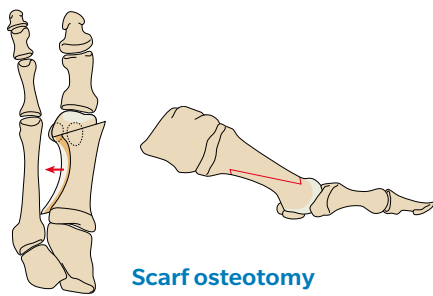


Figure 6

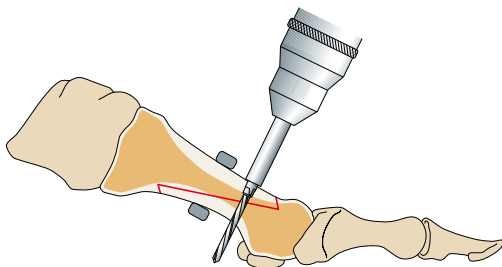


Figure 5

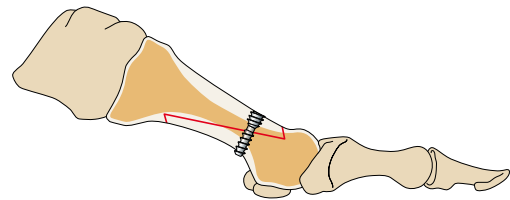


Figure 7

## Stabilization by Means of Two Parallel Double-Threaded Screws

Proceed with reaming using the Ø 2.0/2.9 mm step reamer with stop (REF 02.00023.064) to insert the first double-threaded screw (non-cannulated reamer) (Figure 5).

Use the measuring device (REF 02.00023.080) to measure the length of the first screw (Figure 6).

Insert the first screw, using the screwdriver (REF 02.00023.085) (Figure 7).



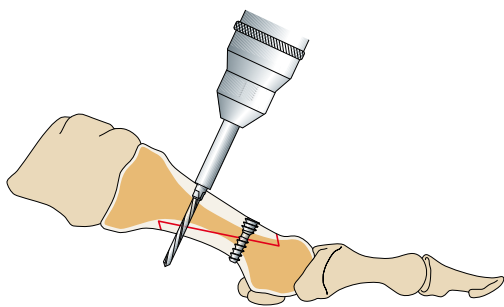


Figure 8

Ream using the Ø 2.0/2.9 mm step reamer with stop (REF 02.00023.064) to insert the first double-threaded screw (non-cannulated reamer (Figure 8)).

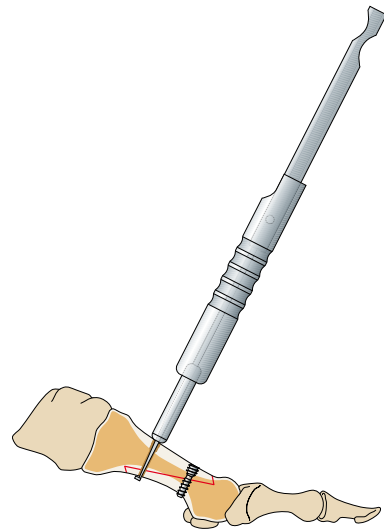


Figure 9

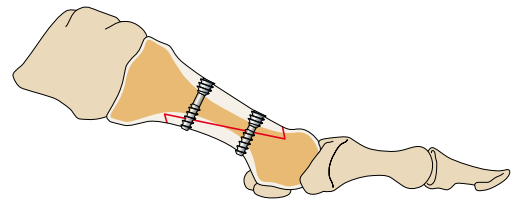


Figure 10

Use the measuring device (REF 02.00023.080) to measure the length of the second screw (Figure 9).

Introduce the second screw, using the screwdriver (REF 02.00023.085) (Figure 10).

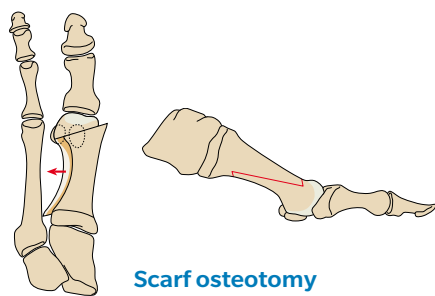


Figure 11

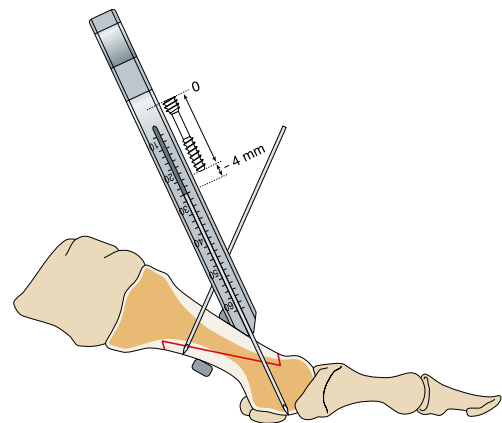
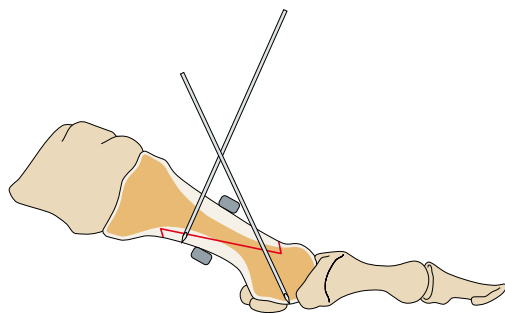


Figure 12

## Stabilization by Means of Two Divergent Double-Threaded Screws Introduced over Guide Wires

Stabilize the osteotomy by means of the reduction forceps (REF 02.00023.020) and insert the Ø 1.0 mm guide wires (REF 02.00023.050) (Figure 11).

Use the reverse measuring device (REF 02.00023.081) to measure the length of the part of the guide wire that is inside the bone (Figure 12).

**Note:** For oblique screwing choose a screw that is 4 mm shorter (so as to embed the whole proximal thread in the cortical bone). This enables the distal hold to be limited to the cancellous bone and avoids any interference with the sesamoids.

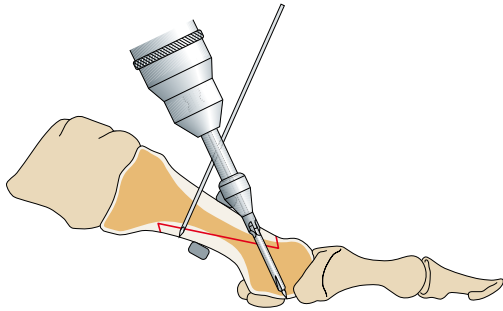


Figure 13

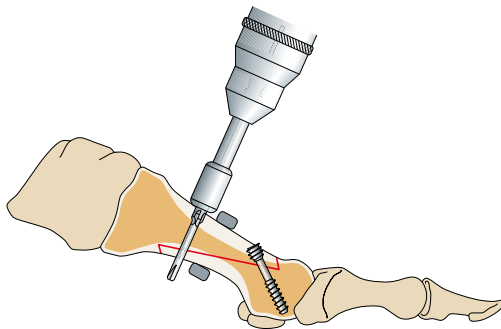


Figure 14

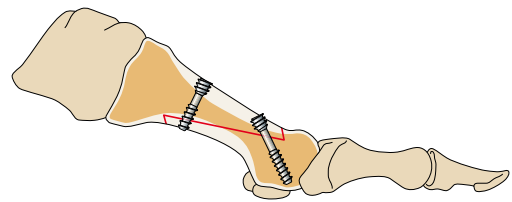


Figure 15

Proceed with reaming, using the step reamer with stop for oblique holes (REF 02.00023.062) (Figure 13).

Proceed with reaming using the step reamer with stop (REF 02.00023.060) (Figure 14).

**Note:** The step reamer (REF 02.00023.62) has a working length of 22mm. The step reamer (REF 02.00023.063) has a working length of 16mm.

Insert the double-threaded screws over the Ø 1.0 mm guide wire, using the screwdriver (REF 02.00023.085) (Figure 15).

## Chevron Osteotomy

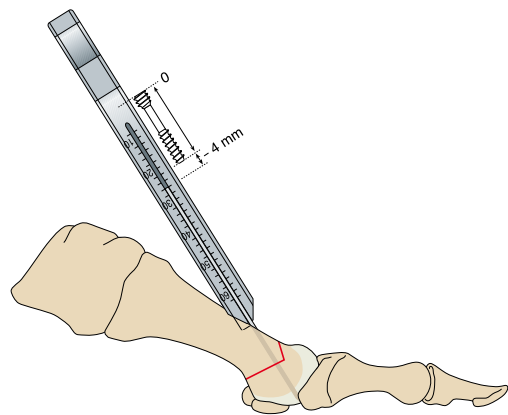
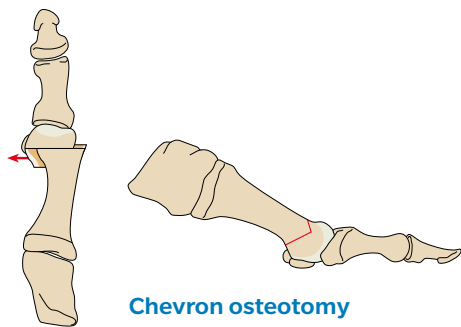


Figure 17

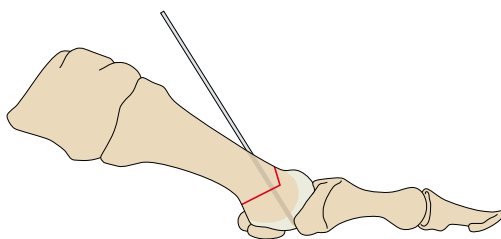


Figure 16

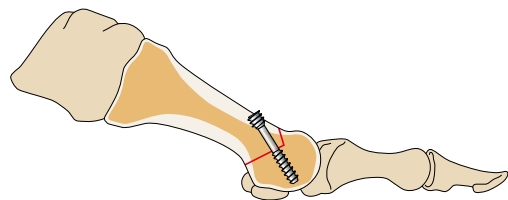


Figure 18

Insert the Ø 1.0 mm guide wire (REF 02.00023.050), stopping outside the joint (Figure 16).

Use the reverse measuring device (REF 02.00023.081) to measure the length of the part of the guide wire that is inside the bone (Figure 17). Choose a screw that is 4 mm shorter (so as to embed the whole proximal thread in the cortical bone). This enables the distal hold to be limited to the cancellous bone and avoids any interference with the sesamoids.

Insert the double-threaded screw over the Ø 1.0 mm guide wire, using the screwdriver

## Osteotomy of the first phalanx of the great toe

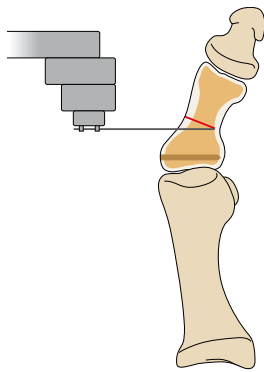


Figure 19

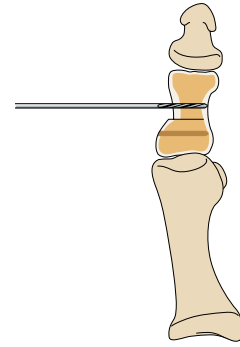


Figure 20

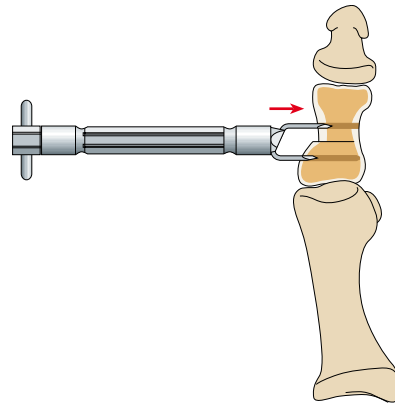


Figure 21

### Varization Osteotomy: Fixation by Means of a Staple

Use the drill (REF 02.00023.116) to make a hole parallel to the joint surface (Figure 19).

- Carry out the first cut of the osteotomy parallel to the direction of drilling. The lateral cortical bone must remain intact in order to achieve a hinge effect.
- Remove the osteotomy wedge through the second cut (cut parallel to the proximal edge of the nail).

Drill a second hole parallel to the first, at a distance corresponding to the size of the staple (Figure 20).

Insert the staple, using the staple-holding instrument (REF 02.00023.110) (Figure 21).

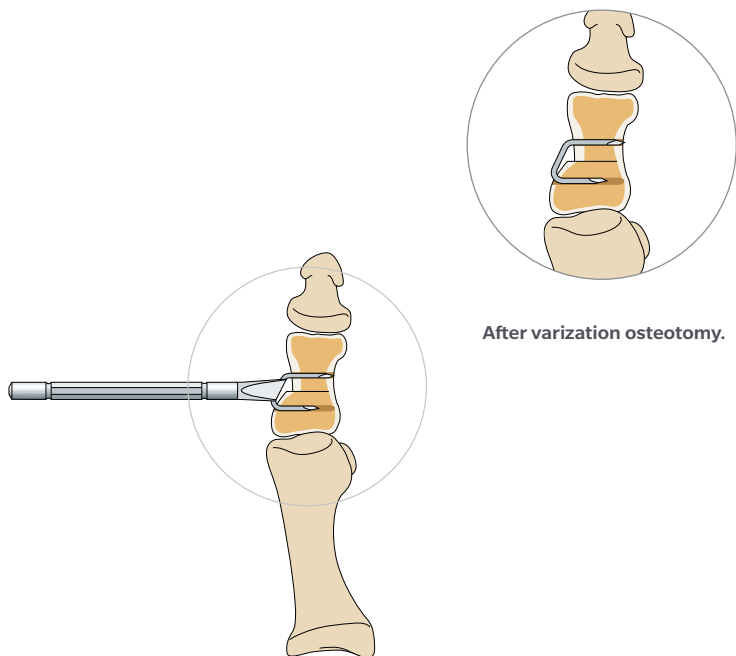


Figure 22

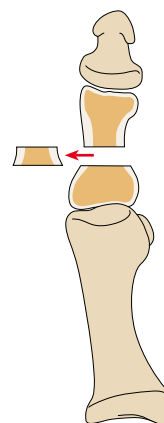


Figure 23

Possibility of multiple corrections of the first phalanx (shortening, vari-zation, derotation)

Use the impactor (REF 02.00023.111) to drive the staple in (Figure 22).

## Shortening Osteotomy: Fixation by Means of a Double-Threaded Screw

Carry out the first cut of the osteotomy parallel to the joint surface. Remove the osteotomy fragment through the second cut (Figure 23).

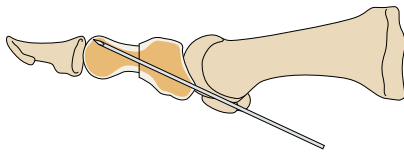


Figure 24

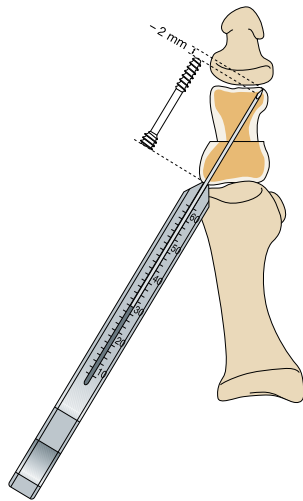


Figure 25

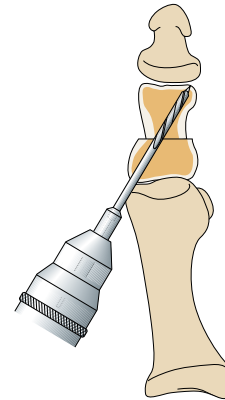


Figure 26

Stabilize the osteotomy by means of the Ø 1.0 mm guide wire (REF 02.00023.050) (Figure 24). Do not penetrate any further than the joint surface. The path of the wire and the position of the screw are shown in the diagram.

Use the reverse measuring device (REF 02.00023.081) to measure the length of the part of the guide wire that is inside the bone. The screw selected must be about 2 mm shorter (Figure 25).

Drill the hole using the Ø 2.0 mm cannulated drill bit (REF 02.00023.066). The drill bit has a scale on it to enable the drilling depth to be seen (Figure 26).

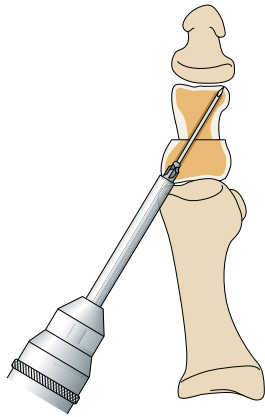


Figure 27

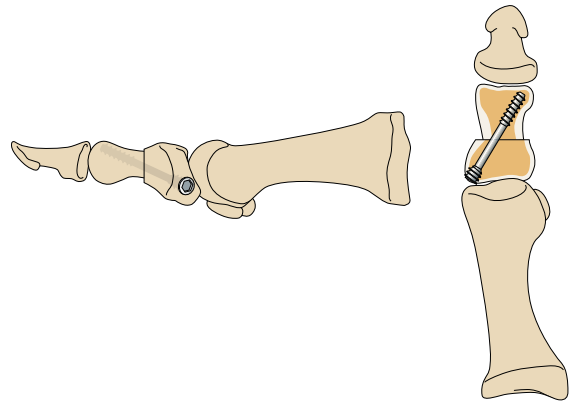


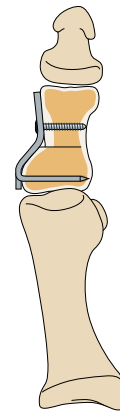
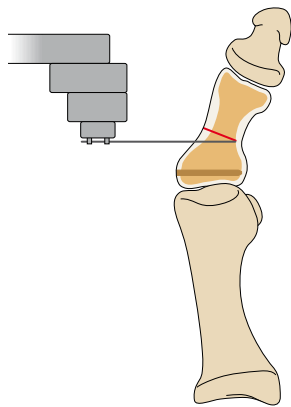
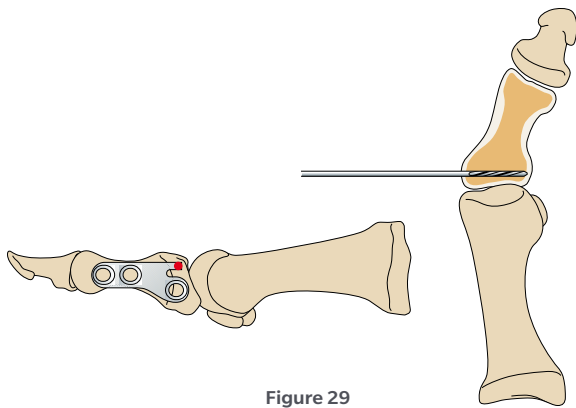
Figure 28

### Shortening Osteotomy: Fixation by Means of a Double- Threaded Screw (cont.)

Ream the hole using the Ø 2.9 mm countersink cannulated reamer with stop (REF 02.00023.070) (Figure 27).

Insert the double-threaded compression screw over the Ø 1.0 mm guide wire, using the screwdriver (REF 02.00023.085) (Figure 28).





### Varization Osteotomy: Fixation by Means of an Anatomical Minipin Plate

Use the Ø 1.5 mm drill bit (REF 103.15.085) to drill a hole parallel to the joint surface, creating the path of the pin of the anatomical minipin plate (Figure 29).

Carry out the first cut of the osteotomy parallel to the drilled hole (Figure 30). The lateral cortical bone must remain intact in order to achieve a hinge effect.

Remove the osteotomy wedge through the second cut (part parallel to the proximal edge of the nail).

Insert the anatomical minipin plate (right or left), using the plate-holder (REF 02.00023.130). The pin must slide in without requiring any effort. Fix the plate with Ø 2.0 mm self-tapping cortical screws (REF 02.03185.31X) (Figure 31). For varization alone, leaving the external cortical bone intact, only one screw is required.

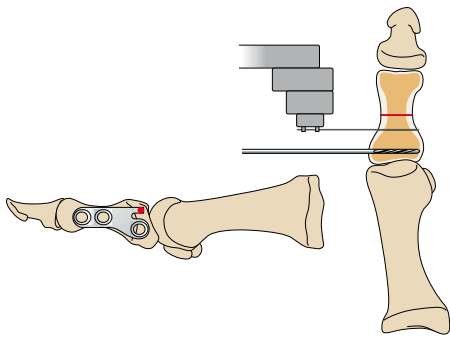


Figure 32

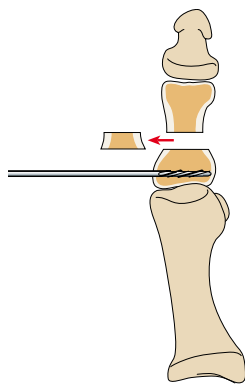


Figure 33

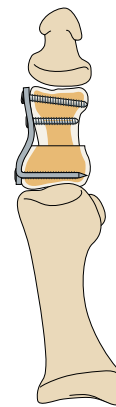


Figure 34

### Shortening Osteotomy: Fixation by Means of an Anatomical Minipin Plate

Use the Ø 1.5 mm drill bit (REF 103.15.085) to drill a hole parallel to the joint surface to create the path for the pin of the minipin plate (Figure 32).

Make the first cut of the osteotomy parallel to the drilled hole and, remove the osteotomy fragment through the second cut (Figure 33).

Insert the anatomical minipin plate using the plate-holder (REF 02.00023.130). The pin must slide in without requiring any effort (Figure 34).

The anatomical minipin plate must be fixed by means of three Ø 2.0 mm self-tapping cortical screws (REF 02.03185.31X), so that the assembly is stiff and stable.

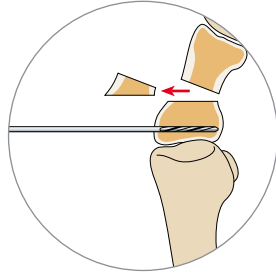


Figure 35a

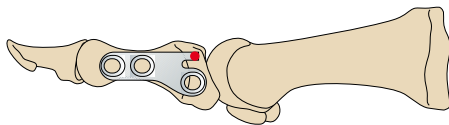


Figure 35

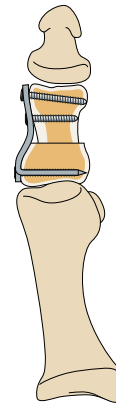


Figure 36

### Multiple Corrections: Fixation by Means of an Anatomical Minipin Plate

Use the Ø 1.5 mm drill bit (REF 103.15.085) to drill a hole parallel to the joint surface, creating the path for the pin of the minimin plate (Figure 35).

Carry out the first cut of the osteotomy parallel to the drilled hole and, remove the osteotomy wedge through the second cut.

Insert the anatomical minimin plate using the plate-holder (REF 02.00023.130). The pin must slide in without requiring any effort. The anatomical minimin plate must be fixed by means of three Ø 2.0 mm self-tapping cortical screws (REF 02.03185.31X) so that the assembly is stiff and stable (Figure 36).

## Weil Osteotomy (Tino screw)

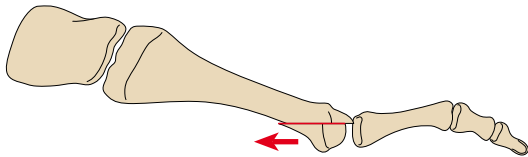


Figure 37

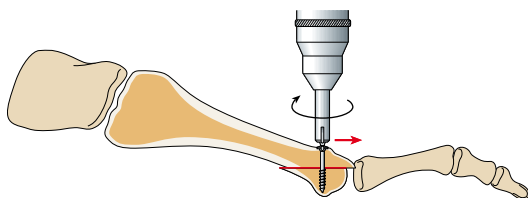


Figure 38

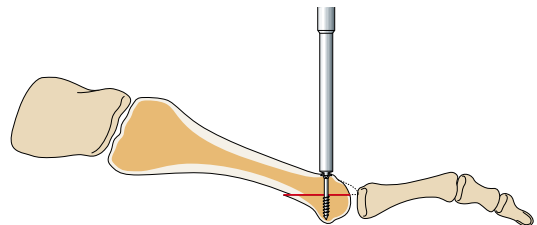


Figure 39

Draw the metatarsal heads back (Figure 37).

- ⓘ Note: The saw cut must be as horizontal as possible. Thinning may be considered.

Insert the Tino Snap-Off Screw (REF 02.03185.011014) directly using the chuck (Figure 38).

- ⓘ Note: Compression is ensured when the head of the screw is in contact with the cortical bone. At this point remove the insertion peg from the screw.

The blade of the screwdriver (REF 02.00023.010) can be used to tighten the Tino Screw completely or, if necessary, to remove it (Figure 39).

## Arthrodesis of the metatarso-phalangeal joint of the great toe

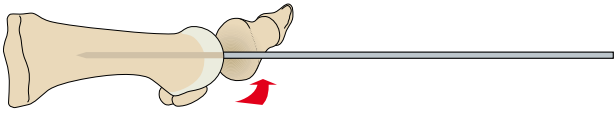


Figure 40

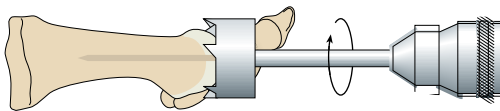


Figure 41

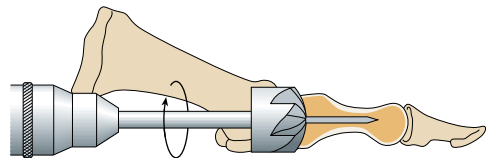


Figure 42

### Preparation Using Spherical Reamers, Stabilization by Means of a One-Quarter Tubular Plate and a Ø 4 mm Cancellous Screw

Insert a Ø 1.8 mm guide wire (REF 290.18.150) mechanically along the axis of M1 (Figure 40).

Choose the appropriate concave reamer (REF 02.00023.1XX) for the size of the head of M1 (18 mm/22 mm).

Ream the joint surface mechanically over the guide wire, as far as the cancellous area (Figure 41).

Insert a second Ø 1.8 mm guide wire (REF 290.18.150) mechanically, along the axis of P1.

Use the appropriate convex reamer (14 mm/18 mm) (REF 02.00023.1XX) to ream the joint surface mechanically, over the guide wire, until the required surface quality is achieved (Figure 42).

Drill some holes according to Pridie.<sup>1</sup>

1. Pridie KH: A method of resurfacing osteoarthritic knee joints. J Bone Joint Surg Br 41 (1959) 618–619.

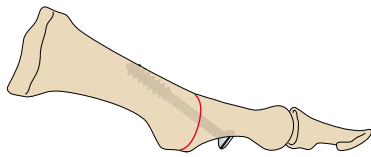


Figure 43

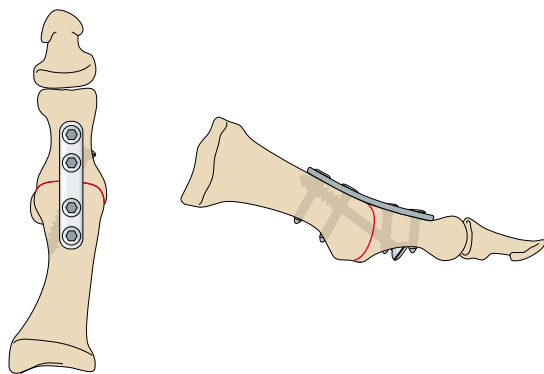


Figure 44

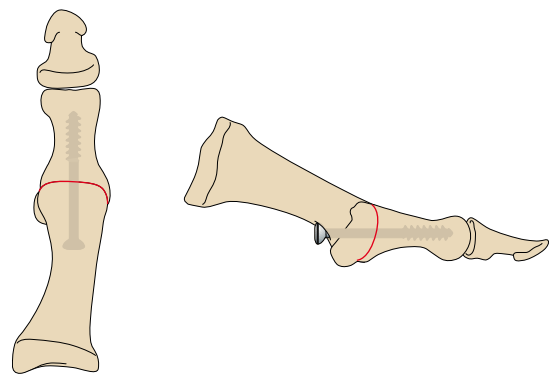


Figure 45

### Arthrodesis of the metatarso-phalangeal joint of the great toe (QT plate w/ 2.7 mm Cortical screws, 4 mm Cancellous screw) (cont.)

After adjusting the position of the arthrodesis, stabilize the assembly by first introducing a small Ø 4 mm cancellous screw for compression, inserting it as far as the plantar surface of P1 and reaching the lateral cortical bone of M1 (Figure 43).

Next, put a one-quarter tubular neutralization plate (REF 02.03185.30X) into place dorsally, fixing it by means of Ø 2.7 mm cortical screws (REF 02.03185.41X) (Figure 44).

Another option for stabilizing the assembly is to introduce a small Ø 4 mm cancellous screw (REF 02.03135.0XX) (Figure 45).


## Implants and Instruments – Hallux-Valgus Graphic Case


Astrid® Lid for Hallux-Valgus graphic case (02.00023.200)

Astrid Graphic Case, base (empty) (02.00023.000)





### Module for Compression Screw ZS 02.00023.253 (complete) | 02.00023.203 (empty)

Product	Description	Label	L mm	Ø mm	Quantity*	Part Number
	Guide wire, with trocar tip	A	70	1.0	10	02.00023.050

Product	Description	Label	L mm	I mm	Quantity*	Part Number
	Astrid Double Threaded Compression Screw, cannulated, self-tapping	B	10	5	2	02.03185.110
			12	7	4	02.03185.112
			14	7	4	02.03185.114
			16	7	4	02.03185.116
			18	7	4	02.03185.118
			20	7	4	02.03185.120
			22	10	4	02.03185.122
			24	10	2	02.03185.124
			26	10	2	02.03185.126
			28	10	2	02.03185.128

### Module for Tino Screws ZS 02.00023.254 (complete) | 02.00023.204 (empty)

Product	Description	Label	L mm	I mm	Quantity*	Part Number
	Astrid Tino Screw, self-tapping and self-drilling, Protasul®-100	C	11	2	4	02.03185.011
			12	2	4	02.03185.012
			13	2	4	02.03185.013
			14	2	4	02.03185.014
	Holding instrument for pin plate	D	165	-	1	02.00023.130

\* Indicates the quantity in the module

## Implants and Instruments – Hallux-Valgus Graphic Case (cont.)



Module for Minipin Plate ZS 02.00023.255 (complete) | 02.00023.205 (empty)

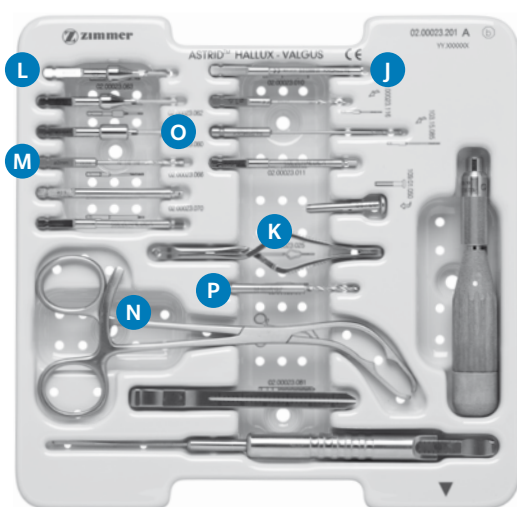
Product	Description	Label	L mm	Quantity*	Part Number
	Astrid Minipin Plate, anatomical Protasul-Ti (Left)	D	–	2	02.03185.300
	Astrid Minipin Plate, anatomical Protasul-Ti (Right)	E	–	2	02.03185.301
	Astrid Cortical Screw, self-tapping Protasul -100, Ø 2.0 mm	F	12	4	02.03185.312
			14	4	02.03185.314
			16	4	02.03185.316
			18	4	02.03185.318
			20	4	02.03185.320

Module for Ti staples 1.8 mm ZS 02.00023.256 (complete) | 02.00023.206 (empty)






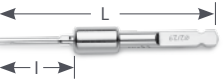

Product	Description	Label	A mm	B mm	C mm	Quantity*	Part Number
	Astrid Staple, 90°, symmetric Protasul -Ti, Ø 1.8 mm	G	8	12	–	2	02.03185.515
			10	13	–	2	02.03185.508
	Astrid Staple with 26° varization Protasul -Ti, Ø 1.8 mm	H	10	13	–	2	02.03185.501
			8	13	–	2	02.03185.502
	Astrid Staple, 90°, staggered Protasul -Ti, Ø 1.8 mm	I	10	14	16	2	02.03185.510
			12	14	16	2	02.03185.512

\* Indicates the quantity in the module



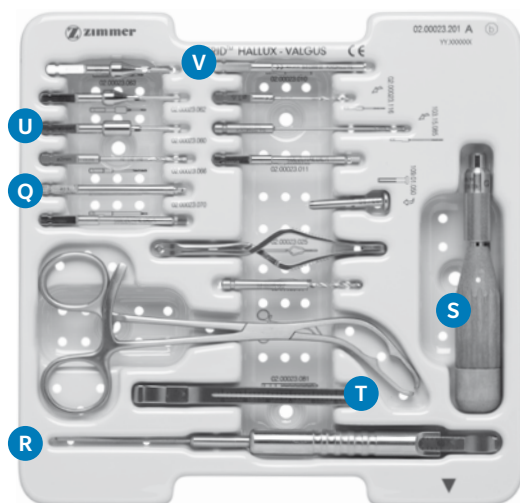


### Astrid Instrument Insert for Hallux-Valgus ZS 02.00023.251 (complete) | 02.00023.201 (empty)

Product	Description	Label	Ø mm	I mm	L mm	Quantity*	Part Number
	Screwdriver shaft for Tino Screw, for quick coupling	J	–	–	68	1	02.00023.010
	Screw forceps self-holding	K	–	–	100	1	02.00023.025
	Step reamer Ø 2.0/2.9 mm, cannulated, with stop for oblique bore, for quick coupling	L	–	22	62	1	02.00023.062
				16	56	1	02.00023.063
	Drill bit Ø 2.0 mm, cannulated, for quick coupling	M	–	38	65	1	02.00023.066
	Foot reduction forceps, with ratchet lock	N	–	–	156	1	02.00023.020
	Step reamer Ø 2.0/2.9 mm, cannulated, with stop, for quick coupling	O	–	22	62	1	02.00023.060
	Step reamer Ø 2.0/2.9 mm, with stop, for quick coupling	P	–	22	65	1	02.00023.064






\* Indicates the quantity in the module

## Implants and Instruments – Hallux-Valgus Graphic Case (cont.)



### Astrid Instrument Insert for Hallux-Valgus (cont.)

ZS 02.00023.251 (complete) | 02.00023.201 (empty)



Product	Description	Label	Ø mm	I mm	L mm	Quantity*	Part Number
	Countersink, cannulated, with stop, for quick coupling	Q	2.9	–	65	1	02.00023.070
	Depth gauge for screws	R	2–4 1.5–2	–	195 197	1 1	02.00023.080 100.90.010
	Handle, with quick coupling	S	–	–	110	1	100.90.200
	Measuring device, for double-threaded compression screw	T	–	–	100	1	02.00023.081
	Two-fluted drill bit, for quick coupling	U	15	59	85	1	103.15.085
	Screwdriver shaft, cannulated, hexagonal, for double-threaded compression screw, for quick coupling	V	2	–	65	1	02.00023.085

\* Indicates the quantity in the module



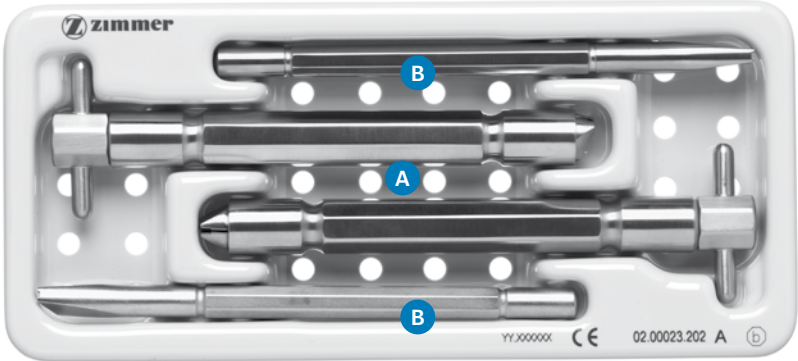
### Astrid Instrument Insert for Hallux-Valgus (cont.)

ZS 02.00023.251 (complete) | 02.00023.201 (empty)



Product	Description	Label	Ø mm	I mm	L mm	Quantity*	Part Number
	Holding sleeve, for hexagonal miniscrewdriver	X	–	–	30	1	109.01.050
	Hexagonal screwdriver shaft, mini	Y	1.5	–	65	1	02.00023.011
	Two-fluted drill bit, for staples 1.8 mm	Z	1.6	33	60	1	02.00023.116

\* Indicates the quantity in the module

Implants and Instruments – Hallux-Valgus Graphic Case (cont.)



Astrid Instrument Insert for staples 1.8 mm  
ZS 02.00023.252 (complete) | 02.00023.202 (empty)

Product	Description	Label	Ø mm	Staple	L mm	Quantity*	Part Number
	Holding instrument for staple Ø 1.8 mm	A	1.8	26°	155	1	02.00023.110
			1.8	90°	155	1	02.00023.113
	Impactor for staple, Ø 1.8 mm	B	–	26°	150	1	02.00023.111
			–	90°	150	1	02.00023.114

\* Indicates the quantity in the module


## Implants and Instruments – Arthrodesis Graphic Case


Astrid Lid for Arthrodesis graphic case (02.00023.300)

Astrid Arthrodesis Graphic Case, base (empty) (02.00023.000)




Module for Quarter, Tubular Plate ZS 02.00023.253 (complete) | 02.00023.303 (empty)

Product	Description	Label	L mm	Holes	Quantity*	Part Number
	Astrid quarter tubular low profile for cortical screw, Protasul-Ti Ø 27mm	A	31	4	2	02.03185.304
			39	5	2	02.03185.305
			47	6	2	02.03185.306

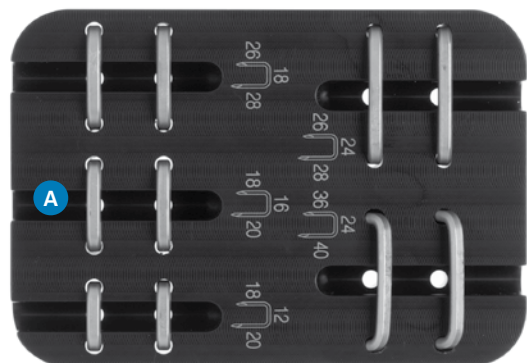
Product	Description	Label	L mm	Ø mm	Quantity*	Part Number
	Astrid Cortical Screw, self-tapping Protasul-100	B	12	2.7	3	02.03185.412
			14	2.7	3	02.03185.414
			16	2.7	3	02.03185.416
			18	2.7	3	02.03185.418
			20	2.7	3	02.03185.420
			22	2.7	–	02.03185.422
			24	2.7	–	02.03185.424

Module for 4.0mm Cancellous Screws ZS 02.00023.355 (complete) | 02.00023.305 (empty)

Product	Description	Label	L mm	Ø mm	Quantity*	Part Number
	Cancellous Screw, Protasul-100	C	26	4	2	02.03135.026
			28	4	2	02.03135.028
			30	4	2	02.03135.030
			32	4	2	02.03135.032
			34	4	2	02.03135.034
			36	4	2	02.03135.036
			38	4	2	02.03135.038
			40	4	2	02.03135.040
			42	4	2	02.03135.042

\* Indicates the quantity in the module

## Implants and Instruments – Arthrodesis Graphic Case (cont.)



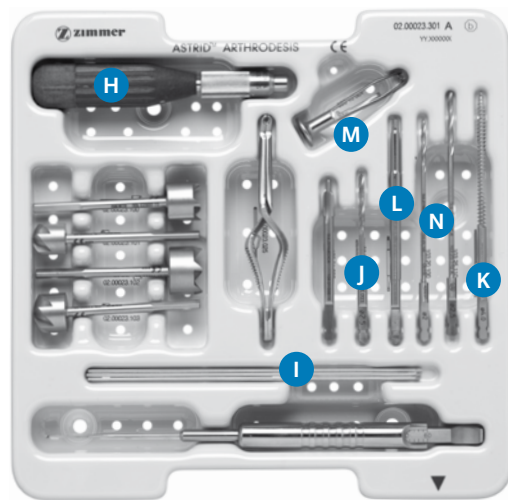
Module for Staples 2.5 mm ZS 02.00023.354(complete) | 02.00023.304 (empty)

Product	Description	Label	A mm	B mm	C mm	Quantity*	Part Number
	Astrid Staple, 90°, staggered Protasul®-Ti, Ø 2.5mm	A	12	18	20	2	02.03185.522
			16	18	20	2	02.03185.526
			18	26	28	2	02.03185.528
			24	26	28	2	02.03185.534
			24	36	40	2	02.03185.536


Astrid Instrument Insert for Arthrodesis ZS 02.00023.251 (complete) | 02.00023.301 (empty)

Product	Description	Label	Ø mm	I mm	L mm	Quantity*	Part Number
	Screw forceps self-holding	B	–	–	100	1	02.00023.025
	Depth gauge for screws	C	–	–	195	1	02.00023.080
	Reamer Concave	D	18 Sm	–	–	1	02.00023.100
			22 Med	–	–	1	02.00023.102
	Reamer Convex	E	14 Sm	–	–	1	02.00023.101
			18 Med	–	–	1	02.00023.103
	Impactor with pincer for 90° Staple	F	–	–	215	1	02.00023.112
	Two-fluted drill bit, for staples 2.5mm	G	2.5	48	75	1	02.00023.125

\* Indicates the quantity in the module\* Indicates the quantity in the module



### Astrid Instrument Insert for Arthrodesis ZS 02.00023.251 (complete) | 02.00023.301 (empty)

Product	Description	Label	Ø mm	I mm	L mm	Quantity*	Part Number
	Handle, with quick coupling	H	–	–	110	1	100.90.200
	Kirschner wire with trocar tip	I	1.8	–	180	4	290.18.150
	Hexagonal screwdriver J shaft small for quick coupling	J	2.5	–	–	1	109.01.025
	Tap Ø 4.0mm	K	–	60	110	1	106.40.110
	Countersink	L	–	–	–	1	108.01.035
	Holding sleeve for hexagonal screwdriver	M	–	–	–	1	109.01.060
	Two-fluted drill bit, for quick coupling	N	2.0	74	100	1	103.20.100
			2.5	84	110	1	103.25.110

\* Indicates the quantity in the module

**INTENDED USE & INDICATIONS**

The implants of the Astrid foot system are intended for internal fixation and stabilization after osteotomy and for arthrodesis purpose in the forefoot, including the following indications:

- Scarf Osteotomies (DTC screw)
- Chevron Osteotomy (DTC screw)
- Osteotomy of the first phalanx of the great toe (Staples, DTC screw, Mini pin plate)
- Weil Osteotomy (Tino screw)
- Arthrodesis of the metatarso-phalangeal joint of the great toe (QT plate w/ 2.7 mm Cortical screws, 4 mm Cancellous screw)

**CONTRAINDICATIONS**

- All concomitant diseases that may impair the fixation of the implant and/or the success of the intervention.
- Lack of bone substance or poor bone quality impairing stable fixation of the implant.
- Severe muscular, neural or vascular diseases that endanger the success of the intervention.
- Allergy to the implanted material.
- Acute or chronic, local or systemic infections.





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Please refer to the package inserts for important product information, including, but not limited to, contraindications, warnings, precautions, and adverse effects.

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