

<b>13-key tenoroon, HIRSBRUNNER (GEBRÜDER) 1, Sumiswald, ca 1815–47</b>			<b>Comments</b>
<b>BASIC - OUTSIDE</b>	<b>mm</b>	<b>mm</b>	
<b>Joint lengths</b>			
Standing length to bell	1064		
Standing length to wing joint	725		
Wing joint length	408		
Wing joint - tenon length	49.7		
Butt joint length	379		
Long joint length	477		
Long joint - south tenon length	48.3		
Long joint - north tenon length	33.7		
Bell length	417		
Vent hole distance from north	x		
Vent hole approx diameter	x		
<b>Tone hole distance, axis</b>			
Wing - tone hole 1 distance from north	186.5		
Wing - tone hole 2 distance from north	220		
Wing - tone hole 3 distance from north	250		
Butt - tone hole 4 distance from north	95		
Butt - tone hole 5 distance from north	133		
Butt - tone hole 6 distance from north	167.5		
Butt - tone hole F distance from north	290.6		
Butt - tone hole E distance from north	107		
Butt - tone hole Ab distance from north	315.5		
Butt - tone hole F# distance from north	248.5		RT
Long joint - tone hole D distance from north	416		
Long joint - tone hole Eb distance from north	376.5		
Long joint - tone hole C distance from north	250		
Long joint - tone hole Bb distance from north	71		
Wing - major axis at tone hole 1	46,8		
Wing - major axis at tone hole 2	46.5		

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Wing - major axis at tone hole 3	46.1		
Butt - major axis (side to side) at tone hole 4	62.1		
Butt - minor axis (front to back) at tone hole 4	43.7		
Butt - major axis (side to side) at tone hole 5	61.2		
Butt - minor axis (front to back) at tone hole 5	42.7		
Butt - major axis (side to side) at tone hole 6	59.6		
Butt - minor axis (front to back) at tone hole 6	41.6		
Butt - major axis (side to side) at tone hole F	49.9		
Butt - minor axis (front to back) at tone hole F	36.1		
Butt - major axis (side to side) at tone hole E	62		
Butt - minor axis (front to back) at tone hole E	43.3		
Butt - major axis (side to side) of the bottom butt ellipse	44.8		
Butt - minor axis (front to back) of the bottom butt ellipse	34		
Butt - major axis (side to side) of the top butt ellipse	61.3		
Butt - minor axis (front to back) of the top butt ellipse	46.6		
Butt - cork major axis (side to side)	x		
Butt - cork minor axis (front to back)	x		
Long joint - minor axis (front to back) at tone hole Eb	36.9		
Long joint - major axis (side to side) at tone hole Eb	34.7		
Long joint - minor axis (front to back) at tone hole C	41.3		With protruding bone inset
Long joint - major axis (side to side) at tone hole C	37.1		
Long joint - minor axis (front to back) at tone hole Bb	42		
Long joint - major axis (side to side) at tone hole Bb	40.5		
<b>Tone hole angle, Ø, length</b>			
Wing - tone hole 1 angle	43.5° North		
Wing - tone hole 2 angle	37° South		
Wing - tone hole 3 angle	36.5° South		
Wing - tone hole 1 approx. Ø	4		

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Wing - tone hole 2 approx. Ø	4.2		
Wing - tone hole 3 approx. Ø	4		
Wing - tone hole 1 approx. length	29.6		
Wing - tone hole 2 approx. length	28.7		
Wing - tone hole 3 approx. length	28.2		
Butt - tone hole 4 angle	21° North		
Butt - tone hole 5 angle	21° South		
Butt - tone hole 6 angle	28° South		
Butt - tone hole E angle	7.5° South		
Butt - tone hole 4 approx. Ø	6.8		
Butt - tone hole 5 approx. Ø	5.8		
Butt - tone hole 6 approx. Ø	4		
Butt - tone hole E approx. Ø	8		
Butt - tone hole 4 approx. length	20.1		
Butt - tone hole 5 approx. length	20.9		
Butt - tone hole 6 approx. length	23.3		
Butt - tone hole E approx. length	18		
Butt - cork major axis (side to side)	x		
Butt - cork minor axis (front to back)	x		
Long joint - tone hole C angle	0		
Long joint - tone hole C Ø	8		
Long joint - tone hole C approx. length	10.2		
<b>BASIC - INSIDE</b>			
<b>Inner bore length</b>			
Bore length	1828.8		
Wing bore length	413.5		
Butt - small bore length	362		
Butt - big bore length	362		
Butt - small bore socket length	49.8		
Butt - big bore socket length	50.2		

<b>13-key tenoroon, HIRSBRUNNER (GEBRÜDER) 1, Sumiswald, ca 1815–47</b>			<b>Comments</b>
Butt - small bore beginning of septum	355.5		
Butt - big bore beginning of septum	355		
Long joint bore length	479		
Bell bore length	311		
<b>Inner bore beginning Ø (not socket!)</b>	<b>Min.</b>	<b>Max.</b>	
Wing bore Ø north	x	x	Bocal well Ø north 10.7/10.8 mm
Wing bore Ø south	13.4	13.6	
Bocal well length	27.7		
Butt - small bore Ø north	13.4		
Butt - big bore Ø north	22.2		
Long joint Ø north	27.2	28.5	
Long joint Ø south	21.1	21.5	
Bell bore Ø north	20.4	20.7	
Bell bore Ø south	27.5		
Bell socket length	33.7	34	
Bocal Ø at the beginning	4.8		
Bocal thickness at the beginning	0.3		
Bocal Ø at the tenon	9.3		
Bocal thickness at the tenon	0.7		
Bocal length (along top)	319		
<b>COMPLETE - OUTSIDE</b>	<b>Min.</b>	<b>Max.</b>	
Bocal well thickness with ferrule	7.8	9	Bore is not in center
Bocal well ferrule thickness	0.7		
Wing - tenon thickness	37.2		
Wing - tenon northern extern. Ø	27.8		
Wing - tenon southern extern. Ø	22.8		
Wing - tone hole A distance from north	71		
Wing - tone hole A angle	x		

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Wing - tone hole A extern. Ø	2.7		Metal inset protruding into bore
Wing - tone hole A approx. length	12.3		
Wing - tone hole C distance from north	x		
Wing - tone hole C angle	x		
Wing - tone hole C extern. Ø	x		
Wing - tone hole C approx. length	x		
Butt - big socket thickness with ferrule	3.2		Without ferrule, 2.6
Butt - small socket thickness with ferrule	3.3		Without ferrule, 2.6
Butt - top ferrule thickness	34.6		
Minimum wall thickness between butt sockets	x		Only one cork
Butt - wood space between corks - bottom	x		
Butt - big bore cork Ø - bottom	x		
Butt - small bore cork Ø - bottom	x		
Butt - wood wall between cork/front - small bore	x		
Butt - wood wall between cork/front - big bore	x		
Butt - wood wall between cork/back - small bore	x		
Butt - wood wall between cork/back - big bore	x		
Wood wall between cork/side - small bore	x		
Wood wall between cork/side - big bore	x		
Butt - bottom ferrule thickness	0.5		
Long joint - south tenon thickness	3.8	4.3	
Long joint - south tenon northern extern. Ø	29.5	30.1	
Long joint - south tenon southern extern. Ø	28.9	29.5	
Long joint - north tenon thickness	3.2		
Long joint - north tenon northern extern. Ø	34.8		
Long joint - north tenon southern extern. Ø	35.5		
Bell socket thickness with brass	3		Without ferrule, 2.2
Brass thickness of the bell ferrule	0.7		
Bell ferrule height	41.2		

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<b>Tone hole angle, Ø, length</b>			
Butt - tone hole Ab angle	0		In big bore
Butt - tone hole F angle	3.5° South		In big bore
Butt - tone hole F# angle	3.5° South		RT, in big bore
Butt - tone hole Ab approx. Ø	7		
Butt - tone hole F approx. Ø	8		
Butt - tone hole F# approx. Ø	4.2		RT, in big bore
Butt - tone hole Ab approx. length	10.3		In big bore
Butt - tone hole F approx. length	10.7		In big bore
Butt - tone hole F# approx. length	13.4		RT, in big bore
Long joint - tone hole D angle	1.5° North		
Long joint - tone hole E $\flat$ angle	0°		
Long joint - tone hole B $\flat$ angle	0°		
Long joint - tone hole D approx. Ø	8.3		
Long joint - tone hole E $\flat$ approx. Ø	4.3		
Long joint - tone hole B $\flat$ approx.Ø	9.6		
Long joint - tone hole D approx. length	8.5		
Long joint - tone hole E $\flat$ approx. length	10		
Long joint - tone hole B $\flat$ approx. length	8.7		
<b>COMPLETE - INSIDE</b>			
Wing - tone hole 1 distance from south	243		
Wing - tone hole 2 distance from south	174		
Wing - tone hole 3 distance from south	141		
Wing - tone hole A distance from south	337		
Wing - tone hole C distance from south	x		
Butt - tone hole 4 distance from north	87		
Butt - tone hole 5 distance from north	140		
Butt - tone hole 6 distance from north	184		
Butt - tone hole Ab distance from north	313		
Butt - tone hole F distance from north	296		

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Butt - tone hole F# distance from north	250		
Butt - tone hole E distance from north	19		
Long joint - tone hole D distance from north	417		
Long joint- tone hole E $\flat$ distance from north	376		
Long joint - tone hole C distance from north	250		
Long joint - hole B $\flat$ distance from north	75		
Bell - vent hole distance from north	x		
<b>EXTRAS</b>			
Wing joint - axis Eb key -major	46		
Wing joint - Eb key distance from north	282		
Wing joint - angle Eb key	17° South		
Wing joint - Eb key $\emptyset$	3.2		
Wing joint - Eb key length	15.4		
Butt joint - major axis top without brass -	60.2		
Butt joint - minor axis top without brass	43.7		
Butt joint - major axis bottom without brass	x		
Butt joint - front C# distance from north	52.5		
Butt joint - front B $\flat$ distance from north	215		
Butt joint - front F# distance from north	268.5		
Butt joint - F# angle	0°		R4, in big bore
Butt joint - F# $\emptyset$	3.8		R4, in big bore
Butt joint - F# length	10		R4 in big bore
Butt joint - B $\flat$ angle	5° North		R3, in small bore
Butt joint - B $\flat$ $\emptyset$	4.3		R3, in small bore
Butt joint - B $\flat$ length	25		RT, in small bore
Butt joint - C# angle	5° South		R1 in small bore
Butt joint - C# $\emptyset$	5		R1, in small bore
Butt joint - C# length	25.1		R1, in small bore
Long joint - front C# distance from north	15.4		L4

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Long joint - C# angle	0°		L4
Long joint - C# Ø	6		L4
Long joint - C# length	5.9		L4