

<b>13-key tenoroon, Giacinto RIVA, Ferrara, ca 1860–70</b>			
<b>BASIC - OUTSIDE</b>	mm	mm	Comments
<b>Joint lengths</b>			<b>Only partial measurements</b>
Standing length to bell	940		With ferrule
Standing length to wing joint	641		With ferrule
Wing joint length	372		
Wing joint - tenon length	35.5		
Butt joint length	304		With ferrule
Long joint length	457		
Long joint - south tenon length	35.7		
Long joint - north tenon length	33.1		
Bell length	249		
Vent hole distance from north	x		
Vent hole approx diameter	x		
<b>Tone hole distance, axis</b>			
Wing - tone hole 1 distance from north	180		
Wing - tone hole 2 distance from north	213		
Wing - tone hole 3 distance from north	243		
Butt - tone hole 4 distance from north	78		
Butt - tone hole 5 distance from north	110		
Butt - tone hole 6 distance from north	140		
Butt - tone hole F distance from north	x		
Butt - tone hole E distance from north	x		
Butt - tone hole Ab distance from north	x		
Butt - tone hole F# distance from north	x		
Long joint - tone hole D distance from north	x		

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Long joint - tone hole Eb distance from north	x	
Long joint - tone hole C distance from north	x	Covered
Long joint - tone hole Bb distance from north	x	
Wing - major axis at tone hole 1	x	
Wing - major axis at tone hole 2	x	
Wing - major axis at tone hole 3	x	
Butt - major axis (side to side) at tone hole 4	x	
Butt - minor axis (front to back) at tone hole 4	x	
Butt - major axis (side to side) at tone hole 5	x	
Butt - minor axis (front to back) at tone hole 5	x	
Butt - major axis (side to side) at tone hole 6	x	
Butt - minor axis (front to back) at tone hole 6	x	
Butt - major axis (side to side) at tone hole F	x	
Butt - minor axis (front to back) at tone hole F	x	
Butt - major axis (side to side) at tone hole E	x	
Butt - minor axis (front to back) at tone hole E	x	
Butt - major axis (side to side) of the bottom butt ellipse	x	
Butt - minor axis (front to back) of the bottom butt ellipse	x	
Butt - major axis (side to side) of the top butt ellipse	x	
Butt - minor axis (front to back) of the top butt ellipse	x	
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 D	x	
Long joint - major axis (side to side) at tone hole D	x	
Long joint - minor axis (front to back) at tone hole Eb	x	

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Long joint - major axis (side to side) at tone hole Eb	x		
Long joint - minor axis (front to back) at tone hole C	x		
Long joint - major axis (side to side) at tone hole C	x		
Long joint - minor axis (front to back) at tone hole Bb	x		
Long joint - major axis (side to side) at tone hole Bb	x		
<b>Tone hole angle, Ø, length</b>			
Wing - tone hole 1 angle	x		
Wing - tone hole 2 angle	x		
Wing - tone hole 3 angle	x		
Wing - tone hole 1 approx. Ø	x		
Wing - tone hole 2 approx. Ø	x		
Wing - tone hole 3 approx. Ø	x		
Wing - tone hole 1 approx. length	x		
Wing - tone hole 2 approx. length	x		
Wing - tone hole 3 approx. length	x		
Butt - tone hole 4 angle	x		
Butt - tone hole 5 angle	x		
Butt - tone hole 6 angle	x		
Butt - tone hole E angle	x		
Butt - tone hole 4 approx. Ø	x		
Butt - tone hole 5 approx. Ø	x		
Butt - tone hole 6 approx. Ø	x		
Butt - tone hole E approx. Ø	x		
Butt - tone hole 4 approx. length	x		
Butt - tone hole 5 approx. length	x		

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Butt - tone hole 6 approx. length	x	
Butt - tone hole E approx. length	x	
Long joint - tone hole C angle	x	
Long joint - tone hole C Ø	x	
Long joint - tone hole C approx. length	x	
<b>BASIC - INSIDE</b>		
<b>Inner bore length</b>		
Bore length	1587	
Wing joint - bore length	372	
Butt - small bore length	290	
Butt - big bore length	290	
Butt - small bore socket length	35	
Butt - big bore socket length	36	
Butt - small bore beginning of septum	272.5	
Butt - big bore beginning of septum	272	
Long joint - bore length	454	
Bell - bore length	250	
<b>Inner bore beginning Ø (not socket!)</b>	<b>Min.</b>	<b>Max.</b>
Wing bore Ø north	x	
Wing bore Ø south	x	
Bocal well length	27	
Butt - small bore Ø north	x	
Butt - big bore Ø north	x	
Long joint Ø north	x	
Long joint Ø south	x	

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Bell bore Ø north	x		
Bell bore Ø south	x		
Bell socket length	33		
Bocal Ø at the beginning	4.4	4.7	
Bocal thickness at the beginning	0.2	0.4	
Bocal Ø at the tenon	8.3	8.5	
Bocal thickness at the tenon	0.5	0.6	
Bocal length (along top)	281.6		
<b>COMPLETE - OUTSIDE</b>	<b>Min.</b>	<b>Max.</b>	
Bocal well thickness with ferrule	3.7	4	
Bocal well ferrule thickness	0.3	0.5	
Wing - tenon thickness	3.7	4	
Wing - tenon northern extern. Ø	19.7	20.1	
Wing - tenon southern extern. Ø	18.7	19	
Wing - tone hole A distance from north	x		
Wing - tone hole A angle	x		
Wing - tone hole A extern. Ø	x		
Wing - tone hole A approx. length	x		
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	x		
Butt - small socket thickness with ferrule	x		
Butt - top ferrule thickness	x		

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Minimum wall thickness between butt sockets	x		
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	x		
Long joint - south tenon thickness	x		
Long joint - south tenon northern extern. Ø	x		
Long joint - south tenon southern extern. Ø	x		
Long joint - north tenon thickness	x		
Long joint - north tenon northern extern. Ø	x		
Long joint - north tenon southern extern. Ø	x		
Bell socket thickness with brass	x		
Brass thickness of the bell ferrule	x		
Bell ferrule height	x		
<b>Tone hole angle, Ø, length</b>			
Butt - tone hole Ab angle	x		
Butt - tone hole F angle	x		
Butt - tone hole F# angle	x		
Butt - tone hole Ab approx. Ø	x		

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Butt - tone hole F approx. Ø	x		
Butt - tone hole F# approx. Ø	x		
Butt - tone hole Ab approx. length	x		
Butt - tone hole F approx. length	x		
Butt - tone hole F# approx. length	x		
Long joint - tone hole D angle	x		
Long joint - tone hole E $\flat$ angle	x		
Long joint - tone hole B $\flat$ angle	x		
Long joint - tone hole D approx. Ø	x		
Long joint - tone hole E $\flat$ approx. Ø	x		
Long joint - tone hole B $\flat$ approx.Ø	x		
Long joint - tone hole D approx. length	x		
Long joint - tone hole E $\flat$ approx. length	x		
Long joint - tone hole B $\flat$ approx. length	x		
<b>COMPLETE - INSIDE</b>			
Wing - tone hole 1 distance from south	x		
Wing - tone hole 2 distance from south	x		
Wing - tone hole 3 distance from south	x		
Wing - tone hole A distance from south	x		
Wing - tone hole C distance from south	x		
Butt - tone hole 4 distance from north	x		
Butt - tone hole 5 distance from north	x		
Butt - tone hole 6 distance from north	x		
Butt - tone hole Ab distance from north	x		
Butt - tone hole F distance from north	x		

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Butt - tone hole F# distance from north	x		
Butt - tone hole E distance from north	x		
Long joint - tone hole D distance from north	x		
Long joint- tone hole E $\flat$ distance from north	x		
Long joint - tone hole C distance from north	x		
Long joint - hole B $\flat$ distance from north	x		
Bell - vent hole distance from north	x		