

## Skeleton measurement sheet

Location:	Accademia Filarmonica di Verona				
Inv. N°:	<b>13248</b>				
Measured:	Adrian Brown, Thijs van Baarsel and Marcello Gatti				
Date:	11/07/2003	12/07/2003			
Pitch @ a=440hz:	c#				
Total length:	1171.7				
Speaking length:	1125				
Windway length:	46.7				
Material:	maple				
mark:	two trefoil	below window and under bell			
	<b>FINGERHOLES</b>				
	<b>length</b>		<b>diameter</b>		<b>direction</b>
	<i>(from top)</i>	<i>(from bl)</i>	east/w	north/s	↑⇔↓⇐
	<b>X</b>	426.2	379.5	7.5	7.6
	<b>1</b>	460.7	414	8.3	8.4
	<b>2</b>	502.2	455.5	8.0	8.0
	<b>3</b>	540.5	493.8	6.7	6.7
	<b>4</b>	686.5	639.8	9.0	9.2
	<b>5</b>	728.9	682.2	7.8	7.8
	<b>6</b>	769.5	722.8	6.9	6.9
	<b>7</b>	958.2	911.5	16.0	16.4
	Step:	0.9		Window width:	22.8
	(more at sides with ears)			Cutup	8.6
	Edge thickness:	0.6			
	Windway exit chamfers: up	1.6		Ramp width north	23.3
		45°		south	24.7
	down	1.2			
		flatter			
				Ramp length: west	33.0
	W/W entrance: width	24.3		east	33.5
	height	1.8		middle	37.0
<p><b>NOTES.</b> This instrument, like its sister has very small fingerholes and huge undercutting. The crooks are very strange and heavy, but have a seam, so could quite possibly be the originals, although they seem to fit badly in the new caps. Edge is slightly warped upwards</p>					

## Verona 13248 bass schrattenbach.xls: Cap, Fontanelle and External Diameters

<b>Cap</b>			<b>External diameters</b>		
Overall length	81.0			(east - west)	
internal Ø	53.2			<b>distance</b>	
depth	55.0			<b>from top</b>	<b>Ø</b>
largest external Ø	68.8		top	0	51.6
hole Ø	12.8		tenon end	38.4	54/63.5
			blockline	46.7	63.2
ring width	22.9				
Ø	62.6			hole X	54.0
				1	53.5
<b>Fontanelle</b>				2	53.0
Overall length	157.0			3	52.1
internal Ø south	69.5			4	50.7
internal Ø north	64			5	50.5
				6	50.0
largest external Ø	79		above fontanelle	838	49.6/63.9
				7	60.5/50.4
north ring width	23	lower fontanelle mount		996	70.4
Ø	72.5		bead	1001	61.5
				1005	49.7
south ring width	23				
Ø	78.5				
rose Ø	33.5		bead	1163	90.5
holes	3		bell	1170	99.4
rose scribed line	102.5		bottom	1171.7	
Cap, fontanelle, crook and key parts all look modern replacements					

Verona 13248 bass schrattenbach.xls, Bore from top

Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓
48.7	38.59	39.27		348.7	39.27	40.27		648.7	35.14	35.42		948.7	32.60	32.53
58.7	39.95	39.70		358.7	39.30	40.45		658.7	35.00	35.53		958.7	32.43	32.26
68.7	40.49	40.47		368.7	39.36	40.67		668.7	34.92	35.74		968.7	32.30	31.80
78.7	40.75	40.59		378.7	39.23	40.75		678.7	34.78	35.64		978.7	32.26	31.94
88.7	41.03	40.34		388.7	39.21	40.67		688.7	34.93	35.90		988.7	32.41	32.18
98.7	41.22	40.15		398.7	39.05	40.75		698.7	35.04	35.73		998.7	32.53	32.37
108.7	40.77	39.50		408.7	38.89	40.52		708.7	35.21	36.15		1008.7	32.68	32.53
118.7	39.75	39.36		418.7	39.33	40.45		718.7	35.11	36.62		1018.7	32.71	32.60
128.7	39.34	39.24		428.7	39.58	40.53		728.7	34.94	37.33		1028.7	32.78	32.60
138.7	39.43	39.14		438.7	39.66	40.80		738.7	35.38	36.51		1038.7	32.81	32.68
148.7	39.54	39.07		448.7	39.56	40.61		748.7	35.44	36.45		1048.7	32.81	32.65
158.7	39.59	39.17		458.7	39.20	40.19		758.7	35.50	35.92		1058.7	32.81	32.67
168.7	39.33	39.15		468.7	39.28	39.73		768.7	35.83	35.75		1068.7	32.90	32.75
178.7	39.26	39.29		478.7	39.12	39.21		778.7	36.45	35.74		1078.7	32.96	32.95
188.7	39.64	39.40		488.7	38.98	38.24		788.7	36.01	35.66		1088.7	33.11	33.15
198.7	39.53	39.26		498.7	38.54	37.59		798.7	36.67	34.95		1098.7	33.19	33.30
208.7	39.51	39.64		508.7	38.20	37.08		808.7	35.24	34.58		1108.7	33.53	33.72
218.7	39.38	39.65		518.7	38.11	36.91		818.7	34.64	34.25		1118.7	33.90	34.07
228.7	39.24	39.70		528.7	37.79	36.77		828.7	34.69	34.11		1128.7	33.96	34.23
238.7	39.01	39.31		538.7	37.64	36.67		838.7	34.48	33.97		1138.7	34.03	34.30
248.7	39.03	39.36		548.7	37.37	36.59		848.7	34.21	34.00		1148.7	34.05	34.41
258.7	39.17	39.40		558.7	37.11	36.37		858.7	34.15	34.12		1158.7	34.13	34.33
268.7	39.43	39.70		568.7	36.83	36.28		868.7	33.97	34.47		1168.7	34.26	34.77
278.7	39.39	39.46		578.7	36.54	36.09		878.7	33.97	34.44		1169.7	34.34	34.88
288.7	39.33	39.75		588.7	36.34	35.90		888.7	33.66	34.33				
298.7	39.22	39.56		598.7	36.14	35.75		898.7	33.55	34.41				
308.7	39.04	39.82		608.7	35.88	35.63		908.7	33.40	34.14				
318.7	39.07	39.99		618.7	35.70	35.58		918.7	33.53	33.46				
328.7	38.98	39.60		628.7	35.59	35.47		928.7	33.36	33.27				
338.7	39.06	39.81		638.7	35.38	35.41		938.7	32.60	32.69				

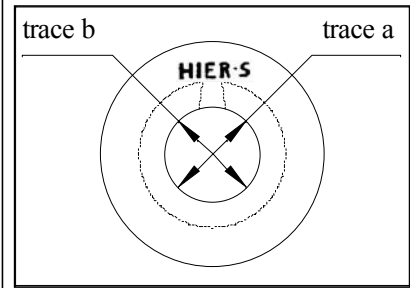
## Tuning

<b>I =</b>		c#			<b>Temp.</b>	24	
<b>Tuner set to</b>		a=440hz	Equal tempered		<b>Humidity</b>	58%	
Note	Cents deflection from 0	Pressure mm H <sub>2</sub> O	Fingering, where different	Note	Cents deflection from 0	Pressure mm H <sub>2</sub> O	Fingering, where different
I				VIII			
II				IX			
III				X			
IV				XI			
V				XII			
VI				XIII			
VII				XIV			

Tuning centre seems around -10cents at this temperature. Octave III/X is narrow and II is sharp by 10-15 cents but otherwise tuning is pretty good.  
 Sound is windy and has much resistance, but has more 'centre' than its sibling.

## KEY AND NOTES TO MEASUREMENT SHEETS

All attempts at measuring are necessarily subjective and the current survey was undertaken with some finite objectives: To undertake an inclusive study of ALL the recorders, using a skeleton format of the most important measurements and minimal intervention. The bores were measured from the bottom, using a strain gauge based digital internal caliper. This has the advantage that bores can be measured with the blocks in situ, thus preventing damage to this sensitive part. Normally, two traces were made, at approximately 90° from each other, avoiding the fingerholes where possible. Calculations were then made to give internal diameters from the top of the instruments, and allow bore traces to be plotted.



FIELD	TYPICAL VALUE	EXPLANATION
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Location:		Town, collection or both, where the instrument is currently located
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Inv. N°:		Inventory number of the instrument
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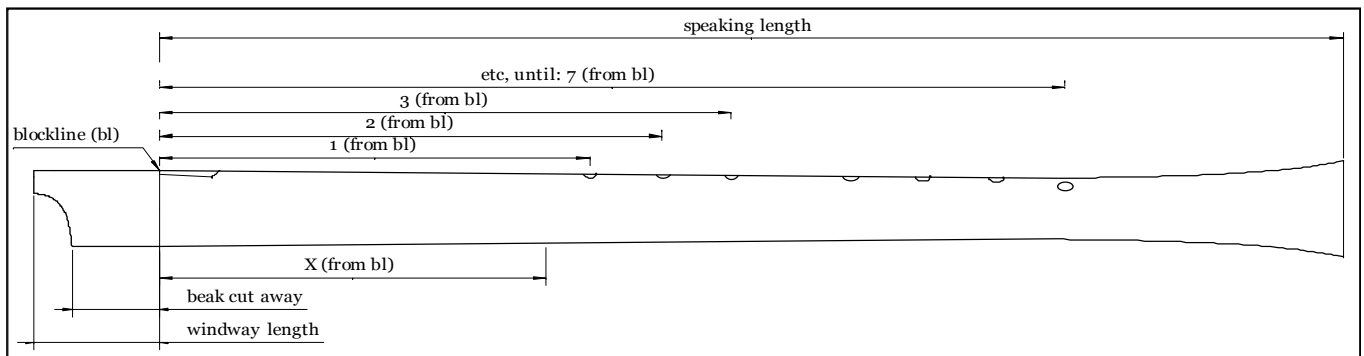
Measured:		Name of measurer
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Date:		Date of measurements, where known
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Pitch @ a=440hz:		Pitch in terms of lowest note, all holes covered, relative to modern pitch (a=440hz). + or - indicates a quarter tone step, relative to modern pitch
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Material:		Material from which the instrument is made
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mark:		Mark or stamp visible on the instrument, branded or embossed by maker or owner
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FINGERHOLES	Tone, or fingerholes of the instrument
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length	(See drawing above)
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(from bl)	Sum of length from blockline and windway length
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(from top)	
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diameter	Fingerhole minimum diameter in an east to west direction
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east/w	Fingerhole minimum diameter in a north to south direction
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north/s	
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direction	Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction
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↑ ⇒ ↓ ⇐	
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Step:	Difference between lower surface of edge (labium) and upper surface of windway ceiling. Typically, this measurement is a visual estimate, given that the blocks would not normally be removed
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Edge thickness:	Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges
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Windway exit chamfers: up	small, c. 0.6	Chamfer on upper surface of windway exit (on ceiling)
	flat	An estimate of its angle
down	2.0	Chamfer on lower surface of windway exit (on block)
	45°	An estimate of its angle

(These measurements have either been obtained by the same method as the edge thickness, or are a visual estimate)

W/W entrance: width  
height

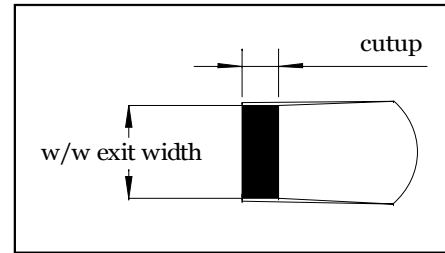
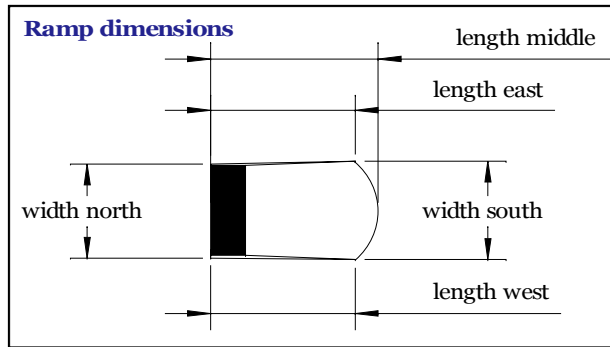
Width of windway entrance,  
Height of windway entrance, distance between windway ceiling and block surface

External diameters  
(east - west)

Diameter of the instrument's exterior  
Measured at 90 degrees to the longitudinal plane of the fingerholes

distance from top

Distance from the north end of the instrument, at which measurement was taken. Note: On basses with fontanelles, the approximate measurements of beads and fontanelle supports were also included.



<b>Cap</b>		Measurements relative to cap
Overall length	99	Total length of the cap
internal Ø	57.6	Approximate internal diameter of cap recess
depth	73	Maximum depth of cap recess
largest external Ø	74.7	Maximum diameter of caps external turning
hole Ø	11.8	Diameter of crook hole, where appropriate
blow hole		Width and height of blowing hole, where appropriate
ring width	21.6	Width of brass strengthening ring
Ø	64	Diameter of brass strengthening ring
<b>Fontanelle</b>		Measurements relative to fontanelle
Overall length	151	Total length of fontanelle
internal Ø south	69.5	Approximate internal diameter of lower end
internal Ø north	64.3	Approximate internal diameter of upper end
largest external Ø	81.2	Maximum exterior diameter, typically scored with a line though the middle of the roses
north ring width	22.5	Width of upper brass strengthening ring
Ø	71.7	Diameter of upper brass strengthening ring
south ring width	22.9	Width of lower brass strengthening ring
Ø	78.5	Diameter of lower brass strengthening ring
rose Ø	28	Diameter of the largest ring of hole arrangement. Typically holes are arranged in three rings, with an extra hole in the centre.
holes	3	Diameter of the rose holes

For the exterior of the instruments, measurements were taken at strategic points, relative to the functionality of the instruments. Some decorative details, particularly with regard to the bass instruments, were also recorded to allow a faithful reproduction to be made.

Concerning the voicing of the instruments, only the most basic details such as those concerning the window and ramp, windway width could be recorded with any surety. Many of the blocks are badly damaged, missing or replacements and it was felt that little would be gained by miniscule examination of these areas. From instruments with an undamaged labium or chamfers, estimates were made to give instrument makers an idea of the sort of degree of voicing these recorders might have originally had.

The recorders were mouth blown and measurements taken with a Korg tuner calibrated in equal temperament at  $a=440\text{hz}$ , Readings were taken as cents deflection from this two pitch standard. The pressure measurements were read in millimetres of water column, using an Appleby and Ireland pressure gauge with the range 0 to 100 mm/H<sub>2</sub>O.

Each instrument was blown to find the centre of the sound and the pressure and pitch recorded. Where fingerings other than the st The following fingerings were tested.

<b>Note</b>	<b>Fingering</b>
I	1234567
II	0123456-
III	012345--
IV	01234-5-
V	0123----
VI	012-----
VII	01-----
VIII	0-2-----
IX	-----
X	0/12345--
XI	Not recorded
XII	0/123----
XIII	0/12-----
XIV	Various
XV	Various

It was not deemed necessary to take readings for note XI due to different half holing of hole 6. All recorders were tried for Jambe de Fer and Ganassi fingerings and where this was successful, the fingerings were recorded.