

Skeleton measurement sheet

Location:	Accademia Filarmonica di Verona				
Inv. N°:	13246				
Measured:	Adrian Brown, Thijs van Baarsel and Marcello Gatti				
Date:	11/07/2003				
Pitch @ a=440hz:	B				
Total length:	1369.6		Total length with cap:		
Speaking length:	1293				
Windway length:	76.6				
Material:	Maple				
mark:	!! !! below window and under bell				
	FINGERHOLES				
	length		diameter		direction
	<i>(from top)</i>	<i>(from bl)</i>	east/w	north/s	↑⇔↓⇐
	X	482.1	405.5	8.6	8.9
	1	504.6	428	10.0	10.5
	2	548.6	472	9.5	9.5
	3	590.1	513.5	10.0	9.7
	4	776.1	699.5	11.1	12.2
	5	825.6	749	9.5	9.8
	6	865.6	789	9.0	9.4
	7	1086.1	1009.5	19.0	
	Step:	c. 0.9		Window width:	25.7
		(block is high)		Cutup	8.8
	Edge thickness:	0.45			
	Windway exit chamfers: up	1.4		Ramp width north	26.0
		45°		south	26.7
	down	0.9			
	flatter and worm eaten				
				Ramp length: west	37.0
	W/W entrance: width	27		east	37.0
	height	2.7		middle	42.0

NOTES:

Mate to 13245

Holes 3 and 6 are very heavily angled down

Verona 13246 bass !!.xls: Cap, Fontanelle and External Diameters

Cap			External diameters	
Overall length	103.0		(east - west)	
internal Ø	63.7		distance	
depth	66.0	Upper joint	from top	Ø
sides	65	top	0	61.7
largest external Ø	80.2	tenon end	60.7	64.0/71.2
hole Ø	13.2	blockline	76.6	71.2
outside	8.5			
ring width	27.5		hole X	63.0
Ø (wood)	72		1	62.7
			2	61.8
			3	61.6
Fontanelle				
Overall length	191.0		4	59.5
			5	58.9
internal Ø south	79.2		6	58.2
internal Ø north	74.8			
		lower tenon	947.1	57.6/42.9
largest external Ø	90	bottom	1007.1	41.2
north ring width	28	Foot		
Ø	82.6	top	0	73.5
		hole 7	139	63.4/54.0
south ring width	27.8	lower fontanelle support	192.5	78.5
Ø	86.5	bead	199.5	71.2
			202.5	57.5
rose Ø	34.2			
holes	3.7			
rose line from top	118.5			
		bead	410	102.5
		bell	419	115
		end	422.5	
		Foot Socket	internal Ø	43.0
			(exterior)	
			Length	60.0

Cap hole is heavily tapered towards inside.
Crook is not original

Verona 13246 bass !!.xls, Bore from top

Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓
79.1	45.33	46.14		409.1	46.32	45.81		739.1	40.00	39.72		40	34.80	35.06
89.1	45.37	46.12		419.1	46.12	45.66		749.1	39.69	39.47		50	34.75	35.03
99.1	45.52	46.08		429.1	45.92	45.77		759.1	40.28	39.33		60	34.73	34.97
109.1	45.73	46.30		439.1	45.77	45.63		769.1	40.29	39.21		70	34.73	34.98
119.1	46.09	46.58		449.1	45.76	45.55		779.1	39.56	38.93		80	34.83	35.02
129.1	46.22	46.78		459.1	45.83	45.40		789.1	38.79	38.56		90	34.84	35.13
139.1	46.30	46.65		469.1	45.08	45.28		799.1	38.49	38.22		100	34.81	35.17
149.1	46.30	46.72		479.1	45.64	45.20		809.1	38.24	37.93		110	34.90	35.27
159.1	46.40	46.89		489.1	46.15	45.08		819.1	38.18	37.70		120	34.99	35.37
169.1	46.55	47.14		499.1	45.88	44.92		829.1	38.03	37.60		130	35.03	35.44
179.1	46.59	47.00		509.1	46.07	44.47		839.1	37.87	37.60		140	35.16	35.55
189.1	46.63	47.05		519.1	45.01	44.31		849.1	37.61	37.52		150	35.38	35.77
199.1	46.66	47.00		529.1	45.05	44.22		859.1	37.36	37.37		160	35.71	36.00
209.1	46.64	47.02		539.1	44.86	44.04		869.1	37.06	37.34		170	36.08	36.26
219.1	46.57	47.00		549.1	44.55	44.00		879.1	36.95	37.15		180	36.26	36.51
229.1	46.61	46.95		559.1	44.18	43.88		889.1	36.83	37.12		190	36.47	36.76
239.1	46.54	46.92		569.1	43.88	43.76		899.1	36.73	36.90		200	37.00	37.21
249.1	46.50	46.80		579.1	43.66	43.55		909.1	36.56	36.80		210	37.57	38.06
259.1	46.50	46.78		589.1	43.38	43.27		919.1	36.47	36.80		220	38.34	38.73
269.1	46.50	46.90		599.1	43.24	43.08		929.1	36.49	36.51		230	38.80	39.22
279.1	46.57	46.57		609.1	43.10	42.73		939.1	36.33	36.40		240	39.18	39.61
289.1	46.50	46.50		619.1	42.98	42.46		949.1	36.15	36.17		250	39.50	39.98
299.1	46.40	46.51		629.1	42.73	42.35		959.1	35.89	35.80		260	40.02	40.50
309.1	46.32	46.48		639.1	42.54	42.15		969.1	35.59	35.62		270	40.50	41.94
319.1	46.35	46.42		649.1	42.33	42.01		979.1	35.37	35.45		280	40.75	41.06
329.1	46.32	46.57		659.1	42.13	41.84		989.1	35.11	35.41		290	40.95	41.22
339.1	46.37	46.47		669.1	41.92	41.74		999.1	34.96	35.31		300	41.96	41.26
349.1	46.32	46.33		679.1	41.81	41.44		1007.1	35.15	34.96		310	41.14	41.50
359.1	46.27	46.36		689.1	41.54	41.15		Foot bore, from bottom of socket				320	41.34	41.80
369.1	46.27	46.33		699.1	41.14	40.80		0	35.04	35.25		330	41.46	41.90
379.1	46.26	46.27		709.1	40.89	40.57		10	35.11	35.13		340	41.53	42.08
389.1	46.27	46.06		719.1	40.62	40.27		20	35.10	35.01		350	41.54	42.39
399.1	46.28	45.87		729.1	40.31	40.00		30	34.93	35.11		358	42.00	43.22

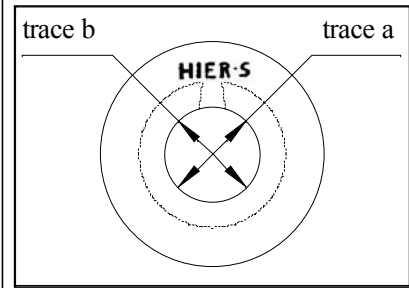
Tuning

	I = Tuner set to	B a=440hz			Temp. Humidity	23? 80%	
Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different	Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different
I				VIII			
II				IX			
III				X			
IV				XI			
V				XII			
VI				XIII			
VII				XIV			

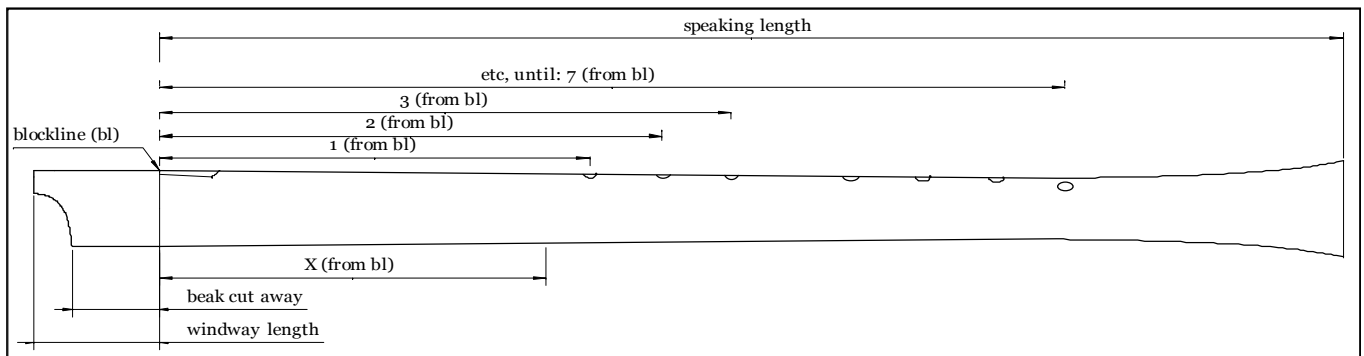
Edgy sound but tuning is pretty good.
 Octaves a little wide, II stable and articulates well, III harmonically good. I is a bit unstable at higher pressures and is 10-15cents low.
 Temperament seems pretty equal, not meantone.

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
Location:		Town, collection or both, where the instrument is currently located
Inv. N°:		Inventory number of the instrument
Measured:		Name of measurer
Date:		Date of measurements, where known
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
Material:		Material from which the instrument is made
mark:		Mark or stamp visible on the instrument, branded or embossed by maker or owner



<p>FINGERHOLES length (from bl) (from top)</p>		<p>Tone, or fingerholes of the instrument</p> <p>(See drawing above)</p> <p>Sum of length from blockline and windway length</p>
<p>diameter east/w north/s</p>		<p>Fingerhole minimum diameter in an east to west direction</p> <p>Fingerhole minimum diameter in a north to south direction</p>
<p>direction ↑ ⇌ ↓ ⇌</p>		<p>Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction</p>
<p>Step:</p>		<p>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</p>
<p>Edge thickness:</p>		<p>Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges</p>
<p>Windway exit chamfers: up</p>	<p>small, c. 0.6</p>	<p>Chamfer on upper surface of windway exit (on ceiling)</p>
	<p>flat</p>	<p>An estimate of its angle</p>
<p>down</p>	<p>2.0</p>	<p>Chamfer on lower surface of windway exit (on block)</p>
	<p>45°</p>	<p>An estimate of its angle</p>

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

W/W entrance: width
height

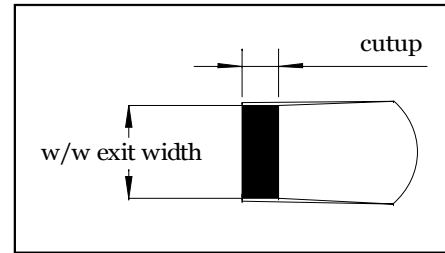
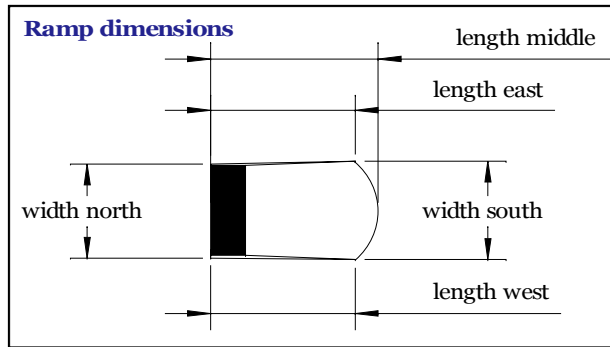
Width of windway entrance,
Height of windway entrance, distance between windway ceiling and block surface

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.



Cap		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
Fontanelle		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/H₂O.

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.

Note	Fingering
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.