

Skeleton measurement sheet

Location:	Accademia Filarmonica di Verona				
Inv. N°:	13244				
Measured:	Adrian Brown, Thijs van Baarsel and Marcello Gatti				
Date:	11/07/2003				
Pitch @ a=440hz:	B+				
Total length:	1285		Total Length with cap:		1334
Speaking length:	1216				
Windway length:	69				
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	423.3	354.3	8.7	8.9	
1	469.5	400.5	11.5	11.6	
2	515.3	446.3	9.7	9.7	
3	557.5	488.5	7.4	7.3	
4	738.3	669.3	11.5	12.0	↓
5	784.2	715.2	10.0	10.5	
6	821.8	752.8	8.5	8.8	↓
7	1032	963	14.5	14.8	
Step:	?		Window width:		23.8
Edge thickness:	0.55		Cutup		8.9
Windway exit chamfers: up	0.8				
	45°		Ramp width north		22.5
down	irregular		south		26.2
W/W entrance: width	25.7		Ramp length: west		37.0
height	1.6		east		38.0
			middle		43.0
NOTES.					
Visible joint above the fontanelle, decision was made to measure instrument assembled, as it was felt attempts to separate might result in damage.					
North wall of window (blockline) is angled outwards and the general workmanship, like that of 13254, is poorer than the other !! instruments from "gruppo" 1 and 2.					
Body is bent and visibly elliptical					
So much damage to windway that it is impossible to estimate an original step. Block is also very high, obscuring the step.					
Tone hole X measurement seems in retrospect a mistake (yellow) cell. Needs to be checked.					

Verona 13244 bass !.xls: Cap, Fontanelle and External Diameters

Cap		External diameters		
Overall length	104.0		(east - west)	
internal Ø	62.5		distance	
depth	66.0		from top	Ø
largest external Ø	74.3		top	0
hole Ø	12.8		tenon end	53
			blockline	69
ring width	26.0			270
Ø	67.5		hole X	62.5
				1
				2
				3
Fontanelle				650
Overall length	165.0			59.5
				4
internal Ø south	77.5			58.8
internal Ø north	72			5
				58.5
				6
				58.1
largest external Ø	86		above fontanelle	888/892
				57.9/71.9
				7
				67.8/52.4
north ring width	23.2		lower fontanelle mount	1053
Ø	78.0		bead	78.0
				1060
				68
south ring width	24			1150
Ø	83			56.2
				1220
				63.7
rose Ø	34.5		bead	1277
holes	25.3		bell	102
			bottom	1283
				111
				1286
				110.6

Cap, fontanelle, key parts, crook and possibly the rings are all modern replacements.

Verona 13244 bass !!.xls, Bore from top

Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓		Length	Ø⇐⇒	Ø↑↓
71	45.66	45.40		396	46.61	47.66		726	39.89	40.72		1056	35.92	34.93
76	45.66	45.42		406	46.42	47.60		736	39.87	40.65		1066	36.13	35.33
86	45.54	45.48		416	46.17	47.38		746	39.79	40.68		1076	36.35	35.47
96	45.28	45.51		426	46.09	47.13		756	39.65	40.75		1086	36.38	35.60
106	45.30	45.46		436	46.08	47.12		766	39.35	40.35		1096	36.48	35.77
116	45.40	45.56		446	45.90	46.95		776	39.25	40.15		1106	36.41	35.69
126	45.29	45.67		456	45.76	46.75		786	38.88	39.85		1116	36.47	35.71
136	45.74	46.19		466	45.53	46.15		796	38.50	39.55		1126	36.49	35.91
146	45.93	46.37		476	45.31	45.76		806	38.23	38.87		1136	36.05	35.84
156	45.96	46.67		486	45.25	45.53		816	37.44	37.88		1146	36.10	35.66
166	46.20	46.77		496	45.35	45.20		826	37.20	37.42		1156	36.22	35.42
176	46.45	46.66		506	45.32	44.85		836	36.88	37.04		1166	36.34	35.49
186	46.66	47.09		516	44.77	44.80		846	36.43	36.45		1176	36.47	35.80
196	46.57	47.17		526	44.40	44.50		856	36.20	36.33		1186	36.61	36.18
206	46.43	47.10		536	44.00	44.30		866	35.97	36.11		1196	36.58	35.97
216	46.31	47.04		546	43.67	44.22		876	35.72	35.98		1206	36.81	35.93
226	46.32	47.15		556	43.46	44.21		886	35.50	35.67		1216	36.62	35.76
236	46.39	47.09		566	42.92	43.87		896	35.41	35.28		1226	36.32	35.62
246	46.50	47.16		576	42.61	43.59		906	35.27	34.97		1236	37.12	36.26
256	46.83	47.20		586	42.24	43.30		916	35.21	34.75		1246	37.51	37.00
266	47.07	47.37		596	41.79	42.91		926	35.25	34.73		1256	37.87	37.47
276	47.05	47.85		606	41.46	42.58		936	35.46	34.56		1266	38.02	37.59
286	47.09	48.05		616	41.03	42.15		946	37.28	35.72		1276	38.13	37.82
296	46.94	48.16		626	40.96	41.80		956	35.38	34.95		1283	38.43	38.60
306	46.89	48.26		636	40.75	41.75		966	34.09	33.61		0	0.00	0.00
316	46.74	48.14		646	40.59	41.68		976	33.79	33.54		0	0.00	0.00
326	46.78	48.20		656	40.85	41.64		986	34.13	33.92				
336	46.68	48.27		666	40.76	41.73		996	34.31	33.96				
346	46.70	48.25		676	40.81	41.64		1006	34.35	34.03				
356	46.63	48.21		686	40.72	41.50		1016	34.37	33.94				
366	46.68	48.12		696	40.63	41.31		1026	34.59	33.90				
376	46.74	47.96		706	40.23	41.09		1036	34.97	34.17				
386	46.73	47.88		716	40.02	40.88		1046	35.50	34.43				

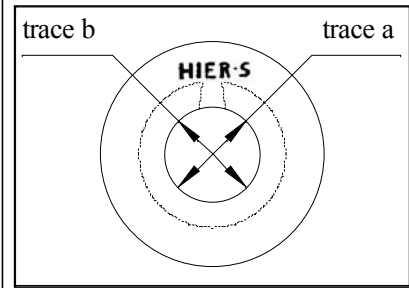
Tuning

	I = Tuner set to	B a=452hz	Equal tempered		Temp. Humidity	24 58%	
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 XV			

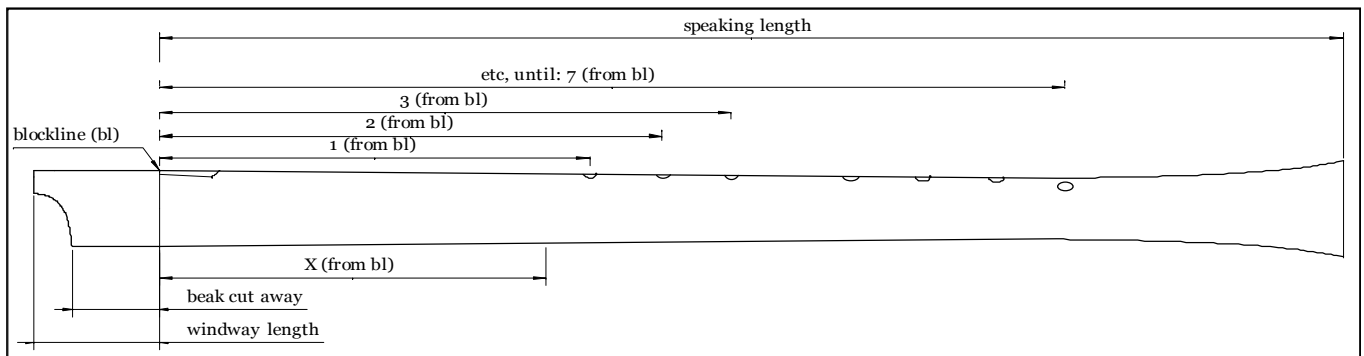
Tuning is centred around +20 cents sharp of a=452Hz. The octaves are not bad but the low notes are weak and it is not possible to blow them properly. Sound is windy but has a centre. Works as a fifth below 13254 but is a bit sharper. As with 13254, this instrument is a less good than expected.

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 (See drawing above) 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 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 flat Chamfer on upper surface of windway exit (on ceiling) An estimate of its angle</p>
<p>down</p>	<p>2.0 45° Chamfer on lower surface of windway exit (on block) 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

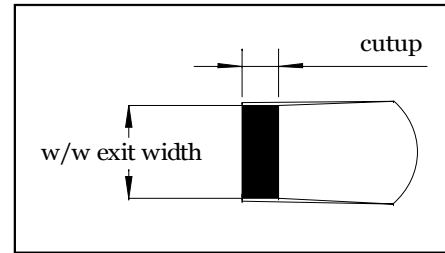
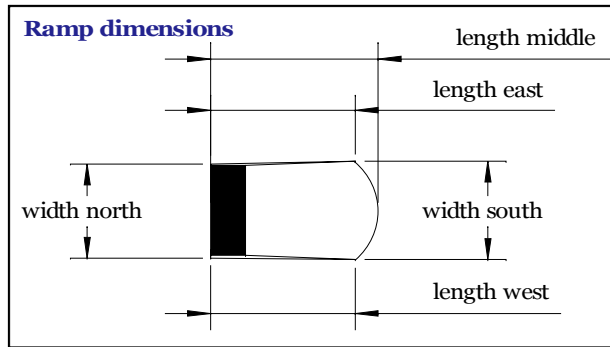
Width of windway entrance,
Height of windway entrance, distance between windway ceiling and block surface

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.