

Skeleton measurement sheet

Location:	Accademia Filarmonica di Verona				
Inv. N°:	13243				
Measured:	Adrian Brown, Thijs van Baarsel and Marcello Gatti				
Date:	12/07/2003				
Pitch @ a=440hz:	F+				
Total length:	1869.5				
Speaking length:	1805.5				
Windway length:	64				
Material:	maple				
mark:	!! !! below window and beneath bell				
	FINGERHOLES				
	length		diameter		direction
	<i>(from top)</i>	<i>(from bl)</i>	east/w	north/s	↑⇔↓⇐
X	662	598	10.0	10.2	
1	704.3	640.3	11.2	11.4	
2	749	685	9.8	9.8	
3	787.5	723.5	9.1	8.5	↓
4	1069.8	1005.8	11.6	11.9	
5	1113	1049	10.3	10.3	
6	1153	1089	8.9	8.8	↓
7	1481	1417	23.9		
Step:	1.0 at sides		Window width:		30.0
	0.7 in middle		Cutup		8.9
Edge thickness:	0.3				
	(brass)				
Windway exit chamfers: up	1.2		Ramp width north		30.7
	steep		south		32.6
down	1.3				
	steep				
			Ramp length: west		42.4
W/W entrance: width	34.5		east		42.9
height	2		middle		46.7
NOTES:					
From the same set as 13249					
holes 3 and 6 are very heavily angled down and beautifully moulded into bore.					
Brass edge made in the same fashion as 13249. Beautifully effectuated, it is held in place presumably by the sides, there being no nail or other obvious fixing. The wood underneath has a normal shape with the brass protruding by about 2mm over the wood.					

Verona 13243 gt bass !!.xls: Cap, Fontanelle and External Diameters

Cap				External diameters	
Overall length	110.5			(east - west)	
internal Ø	74.0			distance	
depth	65.0	side	Upper joint	from top	Ø
	75	mid	top	0	73.0
largest external Ø	93.5		tenon end	44.5	74.5/82.8
hole Ø	12.7/12		blockline	64	82.8
ring width	24.7			430	76.9
Ø	83.5			hole X	73.4
				1	72.5
Fontanelle				2	72.1
Overall length	266.0			3	71.7
				930	70.4
internal Ø south	88			4	68.6
internal Ø north	83			5	68.1
				6	68.1
largest external Ø	134	c	lower tenon	1246.5	67.5/50.5
			bottom	1302.5	48.7
north ring width	28.5				
Ø	88.4		Foot		
			top	0	83.1
south ring width	29.5		hole 7	234.5	73.2/60.8
Ø	95.8		lower fontanelle support	268	89
			bead	275	73.7
rose Ø	45.3		below bead	278	63.4
holes	5.4			372	63
				525	71.5
				582	92
			bead	611	127
			bell	619	139
			end	623	
			Foot Socket	internal Ø	50.1
				Length	57.5

Very large fontanelle holes.
 Cap may not be original, slight dome on the inside.
 Original crook which was rolled up and soldered, Joint is positioned along centre line, for minimal stress. . Outside Ø: 12.8, Inner Ø: 11.0.
 Ø:11.5/10.0 at cap end where a taper is made.
 Crook length along centre line: 823mm, upper bend Ø: 80.0 along centre line. Crook length outside top bend to outside lower bend: 640.
 No mounts in the fashion of the HIE S instruments in Vienna.

Verona 13243 gt bass !!.xls, Bore from top

Length	Ø↔	Ø↑↓	Length	Ø↔	Ø↑↓	Length	Ø↔	Ø↑↓	Length	Ø↔	Ø↑↓	Length	Ø↔	Ø↑↓
87.5	50.32	50.49	452.5	51.85	50.60	812.5	49.36	49.75	1172.5	43.33	43.49	210	40.5	40.89
102.5	50.36	50.56	462.5	51.72	50.80	822.5	49.34	49.67	1182.5	43.28	43.49	220	40.56	40.88
112.5	50.29	50.56	472.5	51.76	50.77	832.5	49.22	49.48	1192.5	43.12	43.40	230	40.74	41.1
122.5	50.37	50.65	482.5	51.56	50.87	842.5	49.04	49.18	1202.5	43.02	43.25	240	40.8	41.07
132.5	50.48	50.74	492.5	51.45	50.95	852.5	48.87	48.89	1212.5	42.99	43.16	250	40.88	41.18
142.5	50.49	50.85	502.5	51.30	50.98	862.5	48.76	48.52	1222.5	42.92	43.05	260	41.01	41.2
152.5	50.55	51.00	512.5	51.30	50.98	872.5	48.41	48.10	1232.5	42.81	42.99	270	41.14	41.26
162.5	50.70	51.00	522.5	51.24	50.97	882.5	48.18	47.91	1242.5	42.77	43.06	280	41.27	41.34
172.5	50.92	51.16	532.5	51.03	51.11	892.5	47.97	47.63	1252.5	42.69	43.04	290	41.43	41.5
182.5	51.04	51.10	542.5	50.98	51.08	902.5	47.78	47.31	1262.5	42.51	43.07	300	41.78	41.69
192.5	51.10	50.95	552.5	50.92	51.17	912.5	47.61	47.11	1272.5	42.69	43.13	310	42.11	42
202.5	51.25	50.96	562.5	50.84	51.20	922.5	47.42	47.00	1282.5	42.67	43.21	320	42.64	42.5
212.5	51.39	50.99	572.5	50.78	51.17	932.5	47.14	46.62	1292.5	42.46	43.13	330	43.06	42.92
222.5	51.38	50.95	582.5	50.74	51.16	942.5	46.92	46.40	1302.5	42.21	43.00	340	43.43	43.26
232.5	51.38	50.93	592.5	50.76	51.15	952.5	46.74	46.23	Foot bore from bottom of socket			350	43.84	43.71
242.5	51.39	51.00	602.5	50.69	51.00	962.5	46.63	45.99	0	42	42.56	360	44.36	44.25
252.5	51.30	51.00	612.5	50.63	51.19	972.5	46.55	45.90	10	41.72	42.35	370	44.63	44.67
262.5	51.37	50.94	622.5	50.60	51.20	982.5	46.57	45.95	20	41.52	42.25	380	45.09	45.13
272.5	51.44	50.95	632.5	50.72	51.09	992.5	46.43	45.86	30	41.48	42.1	390	45.45	45.47
282.5	51.36	51.02	642.5	50.63	51.12	1002.5	46.29	45.80	40	41.33	41.86	400	45.78	45.87
292.5	51.21	51.09	652.5	50.73	51.11	1012.5	46.10	45.73	50	41.08	41.62	410	46.14	46.39
302.5	51.22	51.27	662.5	50.67	51.03	1022.5	45.85	45.59	60	40.89	41.5	420	46.5	46.79
312.5	51.14	51.48	672.5	50.75	51.01	1032.5	45.50	45.40	70	40.87	41.3	430	46.87	47.27
322.5	51.09	51.56	682.5	50.83	51.00	1042.5	45.22	45.11	80	40.85	41.25	440	47.25	47.52
332.5	51.15	51.62	692.5	50.83	51.05	1052.5	44.97	44.82	90	40.89	41.31	450	47.83	48.02
342.5	51.24	51.44	702.5	50.81	51.00	1062.5	44.74	44.45	100	40.96	41.31	460	48.4	48.6
352.5	51.18	51.26	712.5	50.82	51.00	1072.5	44.51	44.22	110	40.61	40.98	470	48.9	49.82
362.5	51.32	51.19	722.5	50.88	50.95	1082.5	44.24	44.12	120	40.38	40.72	480	49.61	49.36
372.5	51.30	51.28	732.5	50.95	51.03	1092.5	44.05	43.98	130	40.17	40.6	490	50.37	49.91
382.5	51.38	51.15	742.5	50.93	50.98	1102.5	43.87	43.81	140	40.07	40.43	500	51.56	50.88
392.5	51.62	51.01	752.5	50.89	50.98	1112.5	43.77	43.76	150	40	40.3	510	52.76	51.96
402.5	51.80	50.76	762.5	50.64	50.93	1122.5	43.76	43.72	160	39.85	40.33	520	53.88	52.83
412.5	51.89	50.52	772.5	50.39	50.76	1132.5	43.58	43.62	170	39.75	41.59	530	54.84	53.66
422.5	52.01	50.46	782.5	50.10	50.56	1142.5	43.50	43.54	180	40	41.42	540	55.76	54.42
432.5	52.08	50.46	792.5	49.75	50.23	1152.5	43.45	43.53	190	40.14	40.6	550	56.79	55.28
442.5	52.03	50.50	802.5	49.41	49.89	1162.5	43.36	43.44	200	40.36	40.83	558	58.08	56.53

Tuning

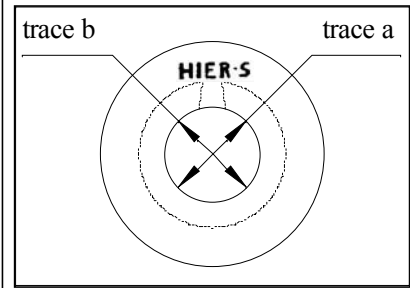
	I =	F			Temp.	22	
	Tuner set to	452			Humidity	80%	
Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different	Note	Cents deflection from 0	Pressure mm H ₂ O	Fingering, where different
I				VIII			
II				IX			
III				X			
IV				XI			
V				XII			
VI				XIII			
VII				XIV			

Octaves are really good, II is stable and easy to articulate, III is strong and I with only the slightest problems, probably due to badly sealing key. Large holes in the fontanelle rose probably help venting of hole 7

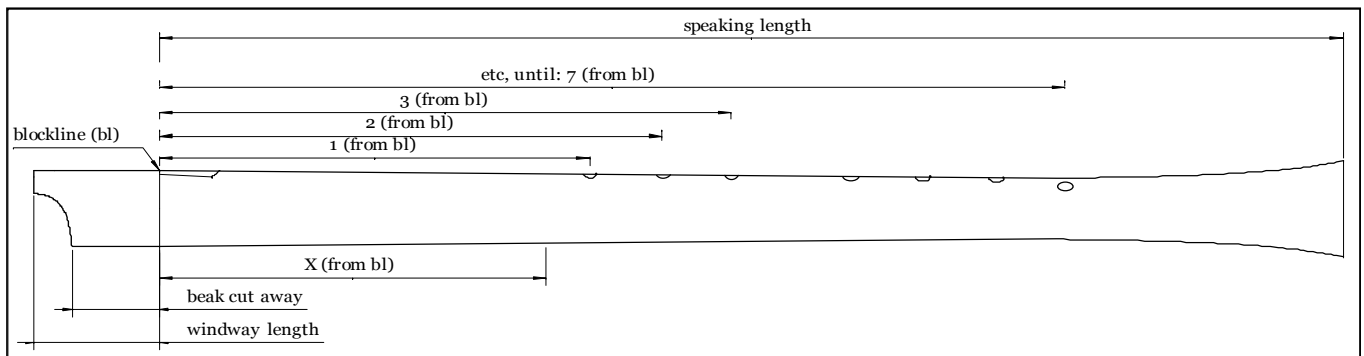
Lovely sound, as with 13249, quite the most beautiful of the whole collection. Perhaps a bit stuffy in the high register. Crook diameter seems very small.

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

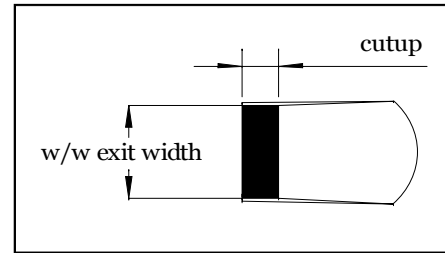
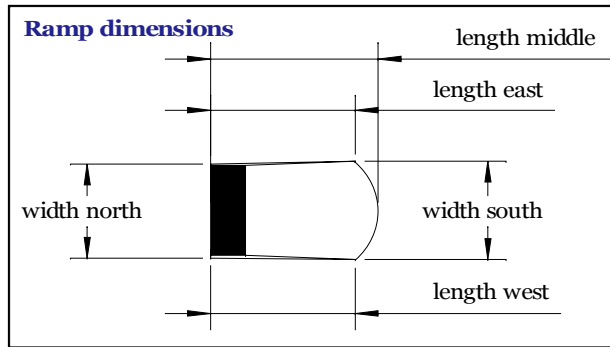
Width of windway entrance,
Height of windway entrance, distance between windway ceiling and block surface

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.