

Skeleton measurement sheet

Location: Paris, Musee de la Musique

Inv. N°: **E.2376**

Measured: Adrian Brown

Date: 22-Jun-26

Pitch @ a=440hz: g#

Total length: 834.8

Speaking length: 783

Windway length: 51.8

Material: figured maple

mark: double !! (see notes)

FINGERHOLES					
	length		diameter		direction
	(from top)	(from bl)	east/w	north/s	↑⇌↓⇌
X	317.8	266	9.8	10.6	
1	344.8	293	9.8	10.6	sl up
2	384.8	333	9.7	9.9	
3	429.8	378	9.9	10.2	sl down
4	503.8	452	10.4	10.3	sl up
5	546	494.2	9.3	9.4	
6	584.3	532.5	7.9	7.9	sl down
7 (under key)	684.3	632.5	15.3	16.1	

Step:	0.9	Window width:	19.3
Edge thickness:	damaged	Cutup	6.6

Windway exit chamfers: up	+/-1.0	Ramp width north	20.3
down + rounding		south	22.5

W/W entrance: width	22.5	Ramp length: west	24.4
height	2.3	east	24.3
		middle	28.2

NOTES:

Large tone holes and large bell flare in bore – Are these original? The holes are nicely undercut and with no obvious transition, so possibly the case, but the bell flare looks crude and chiseled rather than reamed. The marks have a certain resemblance to the Bassano marks, but are of a style I have not seen before. There is a double mark under the window and also originally on the bell, but this is now partly removed (see photos).

Cap And Fontanelle

Cap		External diameters	
Overall length	68.3	(east - west)	
internal Ø	43	distance	
depth	50.0	flat bottom	from top
largest external Ø	55.0		Ø
blow hole	13.1x4.7		0 42.6
		blockline	42 43.6/49.6
ring width	16.7		52.7 49.3
Ø	49.5/50		215 45.5
		hole X	43.7
		1	43.2
Fontanelle		2	42.4
Overall length	86.2	3	41.8
		4	41.0
internal Ø south	55	5	40.5
internal Ø north	51.7	6	40.2
		above fontanelle	621/623 39.6/51.8
largest external Ø	62.2	7	49.5/41
		lower fontanelle mount	710 55.2
north ring width	17.9	bead	714 48.1
Ø	58.2/59.7	below bead	717 38.8
			754 40.6
south ring width	18.3		800 46.7
Ø	61.2/62.4		
		1.4 bead	830 72.3
rose Ø	23.8	5.1 bell	834 77.6
holes	2.1		
line from top	49.5/50		

NOTE:

The font rings are original, the cap ring probably a replacement. The blow hole alligns with the edge of the bore. Very small fontanelle holes. The bell has been much patched and has had woodworm, and even a nail (see photos)

Tuning

I = Tuner set to				Temp. Humidity			
g# 440				Equal tempered			
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	-12	12		VIII	+5	30	
II	-12	14		IX	+5	31	
III	-20	22		X	-18	32	
IV				XI			
V	-18	26		XII	-10	39	
VI	0	28		XIII	-8	39	Ø12
VII	-30	30		XIV			
				XV			

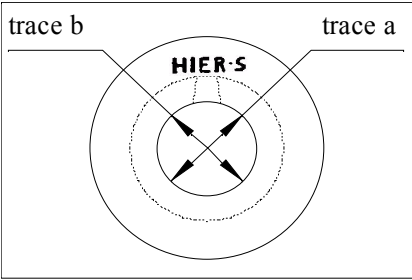
Tested with an organ blower. The pitch is very sharp of g, and considering the octaves are quite good, it was probably always intended to be around modern this pitch. Note XIII also works with an open fingering, so with a better voicing, perhaps a larger range would have been possible. The low notes seem quite strong considering the current state of the voicing and general condition

Paris E 2376 basset !!.xls, Bore from top

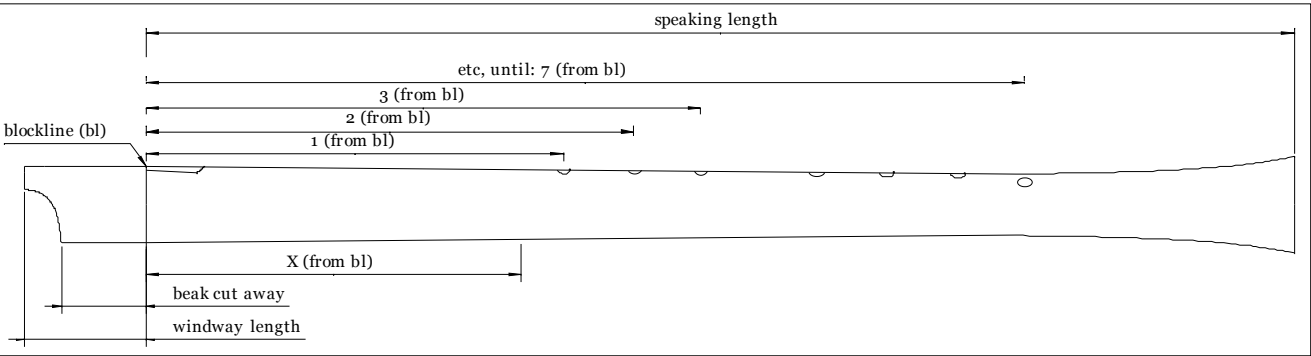
Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓		Length	Ø↔	Ø↑↓
54.3	30.34	33.89		229.3	30.11	29.95		404.3	28.12	28.14		579.3	26.01	25.97
59.3	30.26	33.45		234.3	30.04	29.91		409.3	28.01	28.11		584.3	26.01	27.74
64.3	30.30	30.02		239.3	30.00	29.80		414.3	28.12	28.07		589.3	25.97	29.21
69.3	30.26	30.06		244.3	29.93	29.80		419.3	28.04	27.96		594.3	25.90	26.85
74.3	30.26	30.02		249.3	29.97	29.73		424.3	28.04	28.00		599.3	25.97	25.93
79.3	30.15	30.10		254.3	29.97	29.77		429.3	27.97	32.42		604.3	25.93	25.90
84.3	30.11	30.13		259.3	30.00	29.69		434.3	27.97	31.94		609.3	26.01	25.86
89.3	30.22	30.21		264.3	30.00	29.77		439.3	27.93	30.61		614.3	26.01	25.82
94.3	30.19	30.17		269.3	30.00	29.80		444.3	27.78	28.77		619.3	25.97	25.90
99.3	30.15	30.02		274.3	29.93	29.73		449.3	27.67	27.66		624.3	25.90	25.90
104.3	30.08	30.13		279.3	29.85	29.54		454.3	27.56	27.59		629.3	25.93	25.78
109.3	30.15	30.13		284.3	29.71	29.77		459.3	27.56	27.59		634.3	25.93	25.75
114.3	30.15	30.13		289.3	29.67	29.69		464.3	27.38	27.66		639.3	25.97	25.75
119.3	30.11	30.17		294.3	29.45	29.47		469.3	27.38	27.48		644.3	25.97	25.90
124.3	30.22	30.06		299.3	29.34	29.32		474.3	27.23	27.41		649.3	25.97	25.93
129.3	30.26	30.17		304.3	29.26	29.54		479.3	27.08	27.33		654.3	25.93	26.08
134.3	30.15	30.24		309.3	29.00	31.98		484.3	27.01	27.22		659.3	25.38	26.15
139.3	30.11	30.10		314.3	28.89	35.18		489.3	26.90	27.19		664.3	25.90	26.19
144.3	30.11	30.13		319.3	28.82	36.62		494.3	26.78	29.32		669.3	25.97	26.23
149.3	30.15	30.06		324.3	28.78	35.48		499.3	26.75	30.80		674.3	26.04	26.19
154.3	30.19	29.99		329.3	28.89	31.68		504.3	27.12	30.50		679.3	26.04	27.70
159.3	30.15	30.02		334.3	28.89	31.79		509.3	26.82	26.74		684.3	26.04	29.54
164.3	30.08	29.91		339.3	28.78	33.08		514.3	26.75	26.82		689.3	26.01	29.32
169.3	30.19	29.91		344.3	28.78	32.71		519.3	26.75	26.67		694.3	25.93	25.64
174.3	30.22	29.91		349.3	28.89	32.09		524.3	26.71	26.78		699.3	25.97	25.75
179.3	30.22	29.91		354.3	28.86	28.88		529.3	26.64	26.78		704.3	26.01	25.67
184.3	30.15	29.80		359.3	28.75	28.62		534.3	26.60	26.71		709.3	25.97	25.67
189.3	30.19	29.84		364.3	28.60	28.55		539.3	26.60	28.73		714.3	26.04	25.71
194.3	30.00	29.91		369.3	28.38	28.40		544.3	26.53	30.47		719.3	25.97	25.78
199.3	30.04	29.84		374.3	28.34	28.36		549.3	26.34	30.13		724.3	26.04	25.86
204.3	29.93	29.91		379.3	28.34	29.99		554.3	26.23	27.30		729.3	26.04	25.78
209.3	30.00	29.84		384.3	28.30	32.20		559.3	26.34	26.45		734.3	26.38	25.93
214.3	30.00	30.06		389.3	28.26	32.46		564.3	26.19	26.26		739.3	26.64	26.23
219.3	30.00	29.99		394.3	28.15	31.72		569.3	26.12	26.12		744.3	26.93	26.41
224.3	29.93	30.02		399.3	28.15	29.07		574.3	26.04	26.01		749.3	27.19	26.82

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 surviving recorders, using a skeleton format of the most important measurements and minimal intervention. The bores are 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, at least two traces are made, at approximately 90° from each other, avoiding the tone holes where possible. Calculations are then made to give internal diameters from the top of the instruments, and to 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

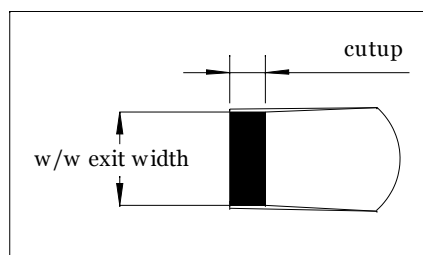
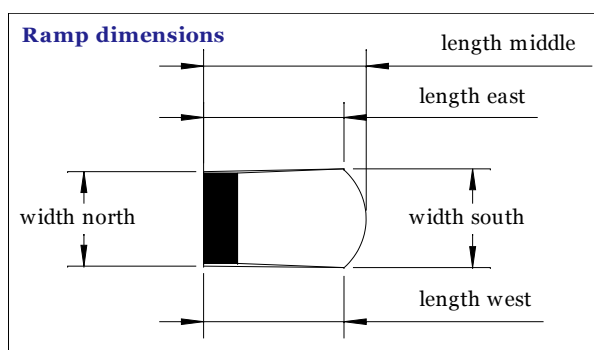


FINGERHOLES	Tone, or fingerholes of the instrument
length	
(from bl)	(See drawing above)
(from top)	Sum of length from blockline and windway length
diameter	
east/w	Tone hole minimum diameter in an east to west direction
north/s	Tone hole minimum diameter in a north to south direction
direction	
↕ ⇄ ↘ ⇐	Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction
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
Edge thickness:	Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges

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

External diameters (east - west)	Diameter of the instrument's exterior
distance from top	Measured at 90 degrees to the longitudinal plane of the tone holes
	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 are taken at strategic points, relative to the functionality of the instruments. Some decorative details, particularly with regard to 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 can be recorded with any surety. Many of the blocks are badly damaged, missing or replacements and it is felt that little can be gained by miniscule examination of these areas. With instruments with an undamaged labium or chamfers, estimates are made to give instrument makers an idea of the sort of degree of voicing these recorders might have originally had.

The recorders are mouth blown and measurements taken with a Korg tuner calibrated in equal temperament at $a=440\text{hz}$, Readings are taken as cents deflection from this pitch standard. In some cases, pressure measurements are taken in millimetres of water column, using an Appleby and Ireland pressure gauge with the range 0 to 100 mm/H₂O.

Each instrument is blown to find the centre of the sound and the pressure and pitch recorded. Where fingerings other than the standard fingerings given below are used, these too are recorded, as are any variants. Whilst finding the 'centre of the sound' is always a subjective process, using a mechanical method to test pitch and sound does have the advantage of consistency and is generally more objective than having several players try the instruments. It is also considerably less destructive to the recorders and gives a good idea of the relationship between different instruments.

The following standard fingerings are 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