Skeleton measurement sheet

Location:	Poznan, Muzeum Instrumentów Muzycznych					
Inv. N°:	**213**	**former inv. numbers on instrument: A.1392 – S/5306**				
Measured:	Adrian Brown					
Date:	29-Oct-26					
Pitch @ a=440hz:	f ?					
Total length:	839					
Speaking length:	784					
Windway length:	55					
Material:	body: boxwood, foot: maple? See notes					
mark:	W + crown	under window				

		FINGERHOLES				
		length		**diameter**		**direction**
		(from top)	(from bl)	east/w	north/s	⇧⇨⇩⇦
	X	*313.8*	258.8	7.0	6.8	
	1	*342.5*	287.5	9.0	9.0	
	2	*384.3*	329.3	8.3	8.0	
	3	*426.7*	371.7	8.0	7.8	⇩
	4	*500*	445	9.0	9.1	
	5	*544.5*	489.5	7.4	7.1	
	6	*586*	531	6.7	6.8	⇩
	7 (under key)	*689*	634	9.7	10.3	

	Step:		Window width:		18.1
Edge thickness:				Cutup	7.1
					damaged
Windway exit chamfers:					
up	largish	c. 1.0	Ramp width north		18.7
down	largish	c. 1.0		south	19.2
	W/W entrance:				
width		20.1	Ramp length: west		27.6
height		1.6		east	28.3
	large chamfers			middle	29.7

NOTES:
Strangely, this recorder is made of boxwood, unlike its two siblings. However, the foot joint, which is separate, seems to be made of another wood, like the siblings either maple, or a hornbeam/service wood. The cap and fontanelle are also made of boxwood.

The edge cannot be seen as the block is high, but the step also seems very big, although with the damage to the labium, it's is difficult to say.

Cap And Fontanelle

Cap					**External diameters**	
Overall length	73.8				(east - west)	
internal Ø	45				**distance**	
depth	49.7/50.3	slightly domed			**from top**	**Ø**
largest external Ø	57.2				0	45.5
				tenon	44.8	45.7/49.4
blow hole	7.1x3.0			blockline	55	48.9
ring width	19.3				hole X	436.0
Ø	50.8				1	43.4
					2	42.6
Fontanelle					3	41.8
Overall length	86.5				4	40.3
					5	39.9
internal Ø south	52				6	39.3
internal Ø north	50.2		above fontanelle		625.5/626	39.2/50.5
					7	46.5/37.9
largest external Ø	59.1	lower fontanelle mount			715	52.0
				bead	720	47.9
north ring width	17.5		below bead		722.5	38.7
Ø	54.4				757	39.4
					802	42.8
south ring width	18		tenon end for bell		821	49.7
Ø	57.8					
				bell	839	69.0
rose Ø	26				replacement bell ring	
holes	1.9					
line from top	49.4	no actual line				

NOTE:
The joint above the fontanelle does not work well and I suspect it is not original. There's just not enough wood to make it work and the socket is broken through to the key cutaway. The keywork is original and very similar to its siblings. The small size of hole 7 makes me suspect the whole foot is a replacement piece, that used the original metalwork.
Length of the socket in the foot is c.32.5 but the tenon is 34.6. There is a chamfer on the tenon and it does go further into the bore than the socket dimension allows, but there is still a 1mm discrepancy/ gap between them. The measurements on this page have taken this into account.

Tuning

	I =	g			Temp.		
Tuner set to		440	Equal tempered		Humidity		
Note	**Cents deflection from 0**	**Pressure mm H_2O**	**Fingering, where different**	**Note**	**Cents deflection from 0**	**Pressure mm H_2O**	**Fingering, where different**
I				**VIII**	+45	38	
II				**IX**	+20	38	
III	+20	22		**X**	+40	38	
IV	+30	24		**XI**			
V	+20	30		**XII**	+50	45	
VI	+10	32		**XIII**			
VII	+5	34		**XIV**			
				XV			

Quite a woolly sound, not surprising considering the damage top the labium and the high block
Both octaves measured are quite wide

Poznan 213 basset w-crown.xls, Bore from top

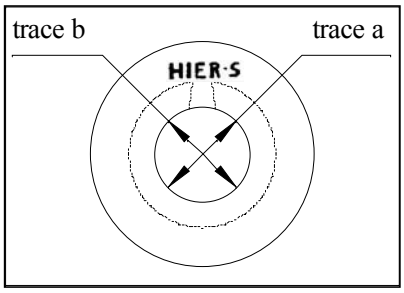
Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩		Length	Ø⇦⇨	Ø⇧⇩
57.5	29.99	29.73		222.5	29.99	30.03		387.5	28.11	28.01		552.5	26.43	26.41		717.5	24.98	24.96
62.5	30.03	29.92		227.5	29.97	30.01		392.5	27.94	27.93		557.5	26.35	26.37		722.5	25.00	24.88
67.5	29.97	29.99		232.5	29.93	30.00		397.5	27.73	27.78		562.5	26.43	26.45		727.5	25.00	24.90
72.5	30.01	29.88		237.5	29.97	30.03		402.5	27.62	27.60		567.5	26.44	26.44		732.5	24.95	24.92
77.5	29.90	29.80		242.5	30.01	30.03		407.5	27.40	27.44		572.5	26.50	26.48		737.5	24.96	25.10
82.5	29.78	29.68		247.5	30.03	29.99		412.5	27.24	27.25		577.5	26.35	26.36		742.5	25.00	25.09
87.5	29.78	29.68		252.5	29.99	29.93		417.5	27.02	27.00		582.5	26.36	26.34		747.5	25.03	25.04
92.5	29.79	29.53		257.5	30.04	29.99		422.5	26.91	26.94		587.5	26.42	26.34		752.5	24.93	25.00
97.5	29.75	29.68		262.5	29.99	29.96		427.5	26.98	26.88		592.5	26.40	25.79		757.5	24.99	25.01
102.5	29.72	29.72		267.5	29.98	30.00		432.5	26.94	26.97		597.5	24.87	24.81		762.5	24.97	25.07
107.5	29.74	29.79		272.5	30.04	29.98		437.5	26.90	26.93		602.5	24.98	24.84		767.5	25.04	25.11
112.5	29.86	29.79		277.5	30.05	29.93		442.5	26.82	26.80		607.5	24.92	24.98		772.5	25.05	25.15
117.5	29.83	29.80		282.5	30.03	29.98		447.5	26.76	26.76		612.5	24.90	24.89		777.5	25.02	25.20
122.5	29.75	29.80		287.5	29.97	30.00		452.5	26.70	26.75		617.5	24.86	24.83		782.5	25.09	25.15
127.5	29.71	29.82		292.5	30.03	29.97		457.5	26.59	26.55		622.5	24.87	24.81		787.5	25.08	25.08
132.5	29.65	29.80		297.5	30.06	29.95		462.5	26.49	26.57		627.5	24.67	24.67		792.5	25.09	25.07
137.5	29.72	29.84		302.5	30.09	29.96		467.5	26.40	26.41		632.5	24.49	24.64		797.5	25.05	25.07
142.5	29.74	29.82		307.5	30.12	29.94		472.5	26.31	26.25		637.5	24.65	24.70		802.5	25.02	25.10
147.5	29.74	29.81		312.5	30.14	29.95		477.5	26.37	26.25		642.5	24.78	24.86		807.5	25.10	25.22
152.5	29.73	29.78		317.5	30.05	29.90		482.5	26.30	26.28		647.5	24.80	25.02		812.5	25.14	25.31
157.5	29.76	29.82		322.5	30.07	29.89		487.5	26.26	26.23		652.5	24.91	25.14		817.5	25.33	25.40
162.5	29.78	29.79		327.5	30.02	29.89		492.5	26.29	26.26		657.5	25.04	25.29		822.5	25.39	25.51
167.5	29.79	29.83		332.5	29.91	29.78		497.5	26.26	26.30		662.5	26.12	25.95		827.5	25.54	25.62
172.5	30.06	30.06		337.5	29.69	29.50		502.5	26.45	26.28		667.5	25.98	25.91		832.5	25.65	25.76
177.5	30.14	30.24		342.5	29.62	29.39		507.5	26.39	26.28		672.5	25.68	25.66		837.5	25.65	25.78
182.5	30.15	30.27		347.5	29.42	29.28		512.5	26.36	26.24		677.5	25.56	25.50				
187.5	30.15	30.21		352.5	29.37	29.20		517.5	26.38	26.23		682.5	25.42	25.41				
192.5	30.16	30.20		357.5	29.19	29.06		522.5	26.38	26.25		687.5	25.34	25.18				
197.5	30.10	30.20		362.5	29.06	28.82		527.5	26.37	26.25		692.5	25.06	24.94				
202.5	30.08	30.15		367.5	28.89	28.69		532.5	26.42	26.28		697.5	25.01	25.12				
207.5	30.03	30.11		372.5	28.64	28.49		537.5	26.37	26.29		702.5	25.02	24.99				
212.5	30.02	30.12		377.5	28.49	28.42		542.5	26.34	26.21		707.5	25.04	25.01				
217.5	30.01	30.06		382.5	28.26	28.35		547.5	26.38	26.32		712.5	24.98	24.97				

Key parts

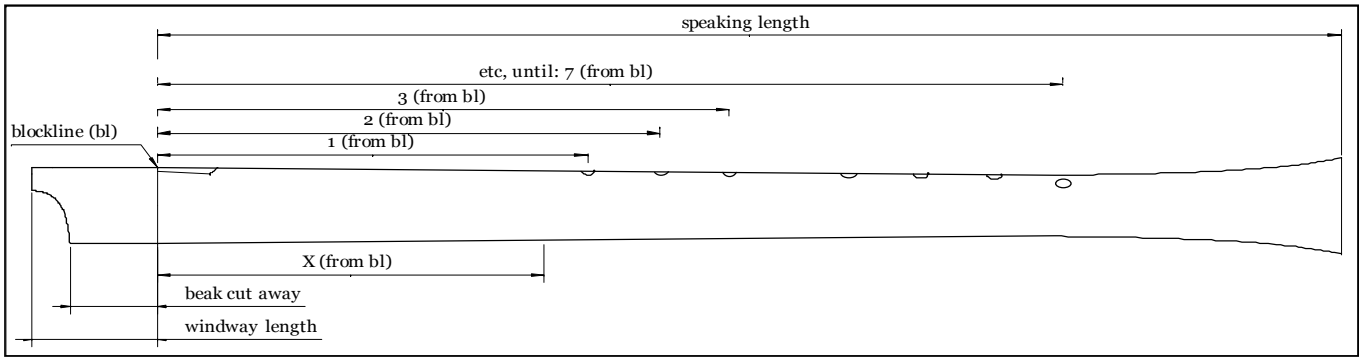
	213	**214**	**215**
Main touch length	78.0	79.5	80.2
main touch width at widest point = bent	34.2	33.3	34.0
lower bout	22.5	22.6	20.6
shaft length from axle	39.0	40.3	42.5
shaft width	5.5/4.1	5.4/4.3	5.3/3.7
distance between axles	20.5	21.0	20.7
pad flap diameter	24.3	24.4	24.5
length	35.0	37.0	34.2
distance between axles	26.6	24.8	26.3
axle from lower end	28.5	28.0	27.5
spring width	6.8/3.0	5.7/3.6	6.6/1.9
spring thickness	0.4	0.3	0.3

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.



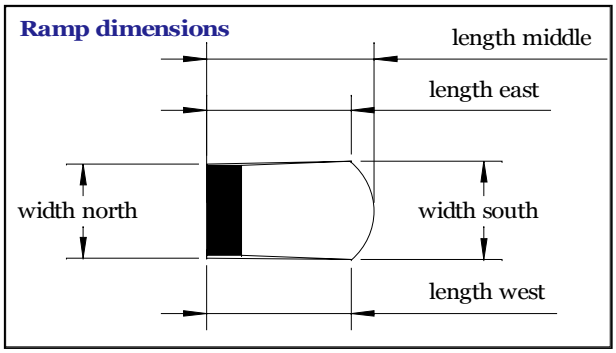
FIELD	TYPICAL VALUE	EXPLANATION
Location:		Town, collection or both, where the instrument is currently located
Inv. N°:		Inventory number of the instrument
Measured:		Name of measurer
Date:		Date of measurements, where known
Pitch @ a=440hz:		Pitch in terms of lowest note, all holes covered, relative 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

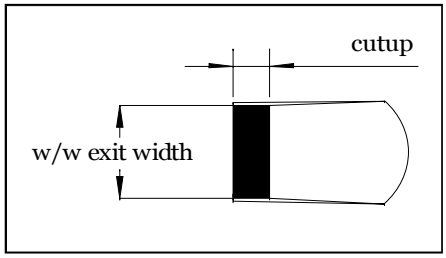


FINGERHOLES		Tone, or fingerholes of the instrument
length (from bl)		(See drawing above)
(from top)		Sum of length from blockline and windway length
diameter		
east/w		Fingerhole minimum diameter in an east to west direction
north/s		Fingerhole minimum diameter in a north to south direction
direction ⇧⇨⇩⇦		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 measurment 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 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 aproximate 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=440hz, 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.

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