

Skeleton measurement sheet

Location: Linz

Inv. N°: **MU1**

Measured: Adrian Brown, Peter Van Heyghen

Date: 15/12/2016

Pitch @ a=440hz: c#
 Total length: 623
 Speaking length: 563.5
 Windway length: 59.5

Material: Cherry?
 mark: C.C.S.

External diameters
 (east - west)

distance

from top	Ø
33.5	39.9
59.5	39.5
hole X	37.5
1	37.3
2	36.7
3	35.9
4	34.9
5	33.4
6	32.1
7	31.2
583	32.6
bell	48.3

FINGERHOLES

	length		diameter		direction
	<i>(from top)</i>	<i>(from bl)</i>	east/w	north/s	
X	243.5	184	7.7	7.6	
1	259.5	200	8.1	8.2	
2	297.7	238.2	8.4	8.2	
3	332	272.5	8.2	8.2	
4	379.3	319.8	8.5	8.3	
5	419.3	359.8	9.3	9.2	
6	455.5	396	8.6	8.4	
7 west (r hand player)	484.3	424.8	5.9	5.6	
7 east	<i>none</i>				

Step: irregular
 Edge thickness: broken in places

Window width: 14.6
 Cutup 5.70

Windway exit chamfers: up largish
 45deg
 down rough and small

Ramp width north 14.7
 south 15.9

W/W entrance: width 14.5
 height 2.5

Ramp length: west 21.8
 east 22.3
 middle 26.2









Beak cut away: 26

NOTES:

Holes and windway cut on slab side of wood, as MU2 and the cornettos MU15 & 16 Surface of the wood is wavy and the windway is parallel cut! (As MU2)

Single hole 7, long beak cut away and late external flare at the bell point to a later date, perhaps 17th century?

Linz Tenor .xls, Bore from top

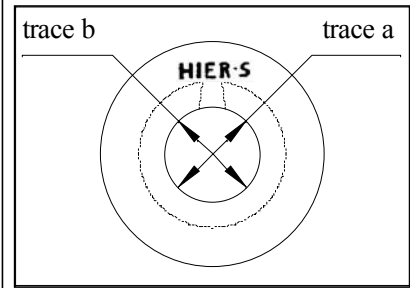
Length	Ø 	Ø 	Length	Ø 	Ø 	Length	Ø 	Ø 	Length	Ø 	Ø 
61.5	22.46	22.39	211.5	21.85	21.85	361.5	20.61	20.68	511.5	18.93	18.82
66.5	22.43	22.43	216.5	21.74	21.77	366.5	20.46	20.61	516.5	18.78	18.71
71.5	22.50	22.39	221.5	21.66	21.66	371.5	20.53	20.61	521.5	18.64	18.56
76.5	22.54	22.36	226.5	21.63	21.55	376.5	20.68	21.30	526.5	18.78	18.53
81.5	22.54	22.28	231.5	21.52	21.55	381.5	20.53	20.93	531.5	18.89	18.75
86.5	22.57	22.32	236.5	21.52	21.55	386.5	20.42	20.39	536.5	19.08	18.89
91.5	22.46	22.36	241.5	21.37	21.44	391.5	20.39	20.42	541.5	19.22	19.04
96.5	22.43	22.32	246.5	21.26	21.37	396.5	20.31	20.42	546.5	19.26	19.08
101.5	22.39	22.28	251.5	21.30	21.52	401.5	20.31	20.39	551.5	19.33	19.15
106.5	22.36	22.21	256.5	21.26	22.32	406.5	20.35	20.31	556.5	19.37	19.18
111.5	22.28	22.17	261.5	21.23	21.59	411.5	20.42	20.50	561.5	19.48	19.29
116.5	22.28	22.14	266.5	21.15	21.19	416.5	20.46	21.08	566.5	19.55	19.37
121.5	22.28	22.14	271.5	21.08	21.15	421.5	20.42	20.61	571.5	19.66	19.55
126.5	22.21	22.06	276.5	21.08	21.19	426.5	20.39	20.28	576.5	19.88	19.66
131.5	22.21	22.06	281.5	21.04	21.30	431.5	20.39	20.13	581.5	19.99	19.88
136.5	22.10	22.06	286.5	21.23	21.41	436.5	20.31	20.10	586.5	20.21	20.06
141.5	22.06	22.03	291.5	21.52	22.10	441.5	20.28	20.06	591.5	20.68	20.64
146.5	22.03	22.03	296.5	21.15	22.32	446.5	20.28	20.10	596.5	21.15	21.15
151.5	22.03	21.95	301.5	21.01	21.88	451.5	20.21	20.28	601.5	21.52	21.44
156.5	21.99	21.99	306.5	21.04	21.12	456.5	20.13	20.21	606.5	21.81	21.66
161.5	22.10	21.92	311.5	20.90	21.04	461.5	19.91	19.73	611.5	22.25	22.03
166.5	22.06	21.99	316.5	20.79	20.97	466.5	19.73	19.62	616.5	22.61	22.36
171.5	22.10	22.06	321.5	20.61	20.93	471.5	19.55	19.44	619.5	22.94	22.68
176.5	22.10	22.10	326.5	20.79	21.37	476.5	19.51	19.26			
181.5	22.14	22.06	331.5	20.86	21.92	481.5	19.37	19.84			
186.5	22.10	22.06	336.5	20.75	21.08	486.5	19.26	19.69			
191.5	22.03	21.99	341.5	20.68	20.68	491.5	19.18	19.04			
196.5	21.92	21.92	346.5	20.68	20.68	496.5	19.11	19.00			
201.5	21.88	21.92	351.5	20.75	20.72	501.5	19.00	18.97			
206.5	21.88	21.92	356.5	20.68	20.68	506.5	19.04	18.89			

Linz Tenor .xlsTuning

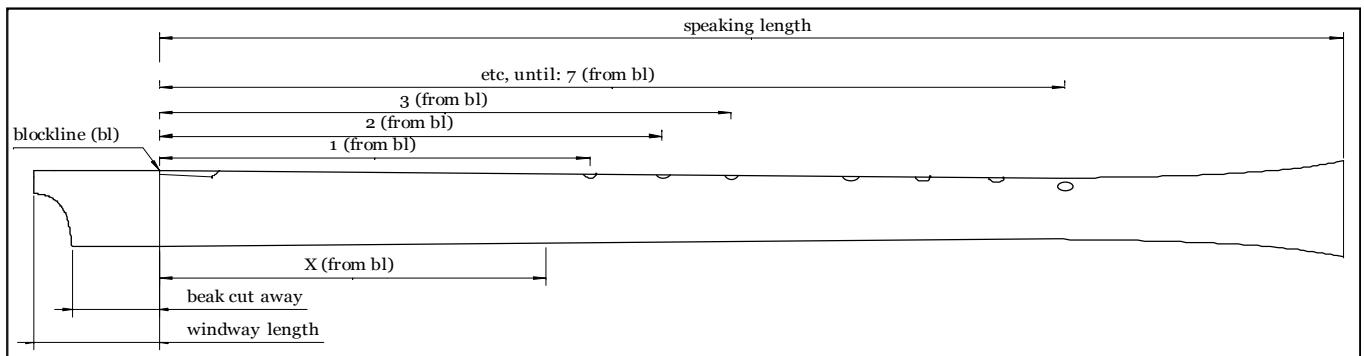
	I =	C#			Temp.		
Tuner set to		440	Equal tempered		Humidity	!	
Note	Cents deflection from 0	Pressure mm H₂O	Fingering, where different	Note	Cents deflection from 0	Pressure mm H₂O	Fingering, where different
I	-28	18		VIII	-5	23	
II	-5	19		IX	0	24	
III	-18	19		X	-35	27	
IV	+2	19		XI			
V	21	-20		XII	-15	32	
VI	22	-25		XIII	0	40	+567
VII	23	-40		XIV			
				XV			
<p>Range is only and octave and a sixth but the instrument seems well in tune. Sound is soft and muffled in the low register.</p>							

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

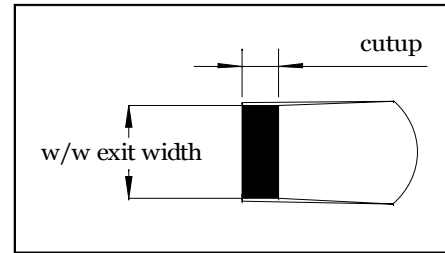
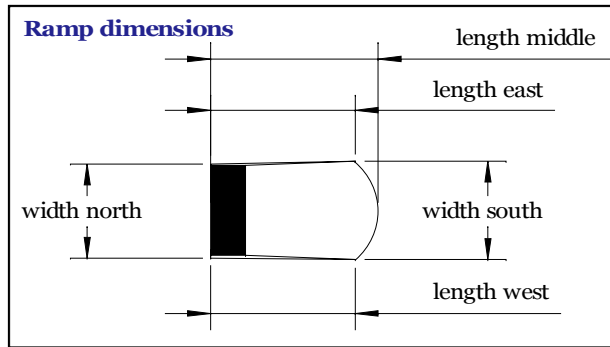
Width of windway entrance,
Height of windway entrance, distance between windway ceiling and block surface

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.