| | S | Skeletor | n measu | rement | sheet | | | | |
|----------------------|--|-------------|---------|-------------|--------------|--------------|---------------|---------|--|
| Location: | Delft, Archeo | o plan | | | | | | | |
| Inv. N°: | | | | | | | | | |
| Measured: | Adrian Brow | n, Boaz Be | erney | | | | | | |
| Date: | 29/09/2003 | | | | | | | | |
| | | | | | | | | | |
| Pitch @ a=440hz: | c"+ | | | | | | | | |
| Total length: | 345 | | | | | | | | |
| Speaking length: | 300 | | | | | | | | |
| Windway length: | 45 | | | | | | | | |
| Material: | walnut?, ivo | ory mount : | at bell | | | | External di | ameters | |
| mark: | R HAKA in | | | eath and 16 | to left side | | (east - west) | | |
| | | | | | 00 1010 5100 | | distance | ., 650) | |
| | | FIN | GERHOL | ES | 3 | | from top | Ø | |
| | leng | | | neter | direction | | 19.2 | 31 | |
| | | (from bl) | 3 | north/s | Û⇔Ç⇔ | | 45 | 28.4 | |
| X | 142.5 | 97.5 | 5.5 | 5.0 | | | hole X | 21.0 | |
| 1 | 157 | 112 | 5.9 | 5.4 | | | 1 | 20.8 | |
| 2 | 177.8 | 132.8 | 6.3 | 6.0 | | | 2 | 20.2 | |
| 3 | 198.8 | 153.8 | 6.5 | 6.2 | | | 3 | 19.6 | |
| 4 | 221.5 | 176.5 | 6.5 | 6.2 | | | 4 | 19.3 | |
| 5 | 244.3 | 199.3 | 6.4 | 6.4 | | | 5 | 19.4 | |
| 6 | 266.2 | 221.2 | 6.9 | 6.5 | | | 6 | 20.2 | |
| west (r hand player) | 286.3 | 241.3 | 5.4 | 5.3 | | | 7 | 22.0 | |
| 7 east | 286.8 | 241.8 | 5.4 | 5.3 | | | | | |
| | | | | | | | bottom | c.51 | |
| | C) | 0 | | 777; | 1 1/1 | 11.0 | | | |
| ГЛ | Step: | | | Winc | low width: | 11.2 | | | |
| Euş | ge thickness: | ! | | | Cutup | 3.60 | | | |
| | | | | | | original tra | ce visible | | |
| Windway exit | chamfers: up | | | | | | | | |
| | ······································ | flat, 30 ° | | Ramp v | vidth north | 13 | | | |
| | down | 0.4 | | | south | 12.8 | | | |
| | | circa. 45° | | | | | | | |
| W/W ent | rance: width | 12.7 | | Ramn le | ngth: west | 19 | | | |
| ,,, ,, Olic | height | | | ramp ic | east | 19.5 | | | |
| n- | ak cut away: | 25.8 | | | middle | 25.5 | | | |

NOTES:

Recorder found 2003 in Amsterdam under building foundations. Measurements made after PEG treatment but before freeze-drying. Instrument was rinsed and air dried for circa 1 hour before bore traces were made

Ornamental turning at bell with large ivory mount

Labium is completely damaged, trace of original cutup, appears to have been repaired by lowering the ramp and covering, perhaps with metal. There seems to be some metallic debris there possibly even residue of three nails? Instrument has seen some use, thumb hole is well worn

Tone-holes drilled on slab side of wood

Holes 7, both undercut downwards

Instrument is in a good state of preservation, bore is quite round, difference of 0.3 - 0.4 at most points along the length. Wood is difficult to judge, could also be Palisander? Open grain but the colour of Walnut

Amsterdam, Soprano, Haka.xls, Bore from top

| Length | Ø⇔⇒ | Ø介⇩ | Length | Ø⇔⇒ | ØûŢ | Length | Ø⇔⇒ | Øûţ | Length | Ø⇔⇒ | Øft |
|--------|-------|-------|--------|-------|-------|--------|--------------|---------------|----------------|-----|-----|
| 47 | 15.65 | 15.2 | 197 | 14.33 | 14.12 | | | | | | |
| 52 | 15.2 | 15.15 | 202 | 14.32 | 14.38 | | | | | | |
| 57 | 15.01 | 15.12 | 207 | 14.18 | 14.36 | | | | | | |
| 62 | 14.88 | 15.16 | 212 | 14.16 | 14.37 | | | | | | |
| 67 | 14.83 | 15.22 | 217 | 14.13 | 14.33 | | | | | | |
| 72 | 14.78 | 15.17 | 222 | 14.13 | 14.21 | Bl | ock was rei | noved easily | , probably due | ; | |
| 77 | 14.62 | 15.18 | 227 | 13.98 | 13.99 | | wetness | J | , 1 | | |
| 82 | 14.6 | 15.17 | 232 | 13.91 | 13.92 | Irr | egularity in | bore over fi | rst 100mm | | |
| 87 | 14.63 | 15.16 | 237 | 13.77 | 13.81 | | | | ayward drill, | | |
| 92 | 14.58 | 15.21 | 242 | 13.7 | 13.4 | | | with block re | • | | |
| 97 | 14.5 | 15 | 247 | 13.63 | 13.56 | 1 | | | | | |
| 102 | 14.53 | 14.96 | 252 | 13.47 | 13.48 | | | | | | |
| 107 | 14.53 | 14.74 | 257 | 13.31 | 13.39 | | | | | | |
| 112 | 14.61 | 14.67 | 262 | 13.32 | 13.3 | | | | | | |
| 117 | 14.59 | 14.67 | 267 | 13.28 | 13.28 | | | | | | |
| 122 | 14.58 | 14.64 | 272 | 13.22 | 13.1 | | | | | | |
| 127 | 14.58 | 14.66 | 277 | 13.13 | 12.97 | | | | | | |
| 132 | 14.64 | 14.69 | 282 | 13.08 | 13.1 | | | | | | |
| 137 | 14.71 | 14.67 | 287 | 13.38 | 13.57 | | | | | | |
| 142 | 14.68 | 14.68 | 292 | 12.79 | 12.7 | | | | | | |
| 147 | 14.65 | 14.64 | 297 | 12.46 | 12.48 | | | | | | |
| 152 | 14.55 | 14.52 | 302 | 12.37 | 12.38 | | | | | | |
| 157 | 14.63 | 14.58 | 307 | 12.36 | 12.53 | | | | | | |
| 162 | 14.52 | 14.62 | 312 | 12.54 | 12.61 | | | | | | |
| 167 | 14.58 | 14.6 | 317 | 12.66 | 12.78 | | | | | | |
| 172 | 14.6 | 14.56 | 322 | 12.75 | 12.82 | | | | | | |
| 177 | 14.51 | 14.47 | 327 | 12.82 | 12.86 | | | | | | |
| 182 | 14.47 | 14.4 | 332 | 12.86 | 12.96 | | | | | | |
| 187 | 14.38 | 14.37 | 337 | 12.74 | 13.08 | | | | | | |
| 192 | 14.32 | 14.4 | 342 | 13.76 | 13.46 | | | | | | |

Adrian Brown 29/09/2003

Amsterdam, Soprano, Haka.xls[Tab]

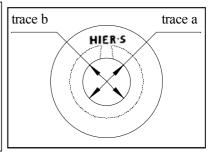
| | I = | c" | | | Temp. | | |
|------|-------------------------|---------------------------------|----------------------------|------|-------------------------|---------------------------------|----------------------------|
|] | Tuner set to | a'=440 | Equal tempered | | Humidity | ! | |
| Note | Cents 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 | | | |
| | | | Cointagt vyhigman af | | | | |

Hardly a note possible, only the faintest whisper of a sound, but the lowest note gave c" at a=438hz All the higher notes are very sharp due to the huge cutup. The octave relationship III/X and V/XII seem to be good. XIII needs 0/12--567. Difficult to really judge however

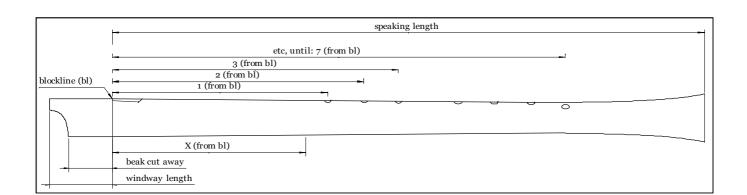
Adrian Brown 29/09/2003

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. No: Inventory number of the instrument Measured: Name of measurer Date of measurements, where known Date: 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

| | Tone, or fingerholes of the instrument |
|-------------------------------------|--|
| | (See drawing above) Sum of length from blockline and windway length |
| | Fingerhole minimum diameter in an east to west direction Fingerhole minimum diameter in a north to south direction |
| | Indicates if a fingerhole is bored obliquely, or undercut with an unusual bias, and in which direction |
| | 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 |
| | Thickness of edge (labium). Measured by impression made in fine gum and compared using feeler gauges |
| small, c. 0.6 flat 2.0 45° | Chamfer on upper surface of windway exit (on ceiling) An estimate of its angle Chamfer on lower surface of windway exit (on block) An estimate of its angle |
| | flat 2.0 |

(These measurements have either been obtained by the same method as the edge thickness, or are a visual estimate) $\frac{1}{2}$

W/W entrance: width Width of windway entrance,

height Height of windway entrance, distance between windway ceiling and

block surface

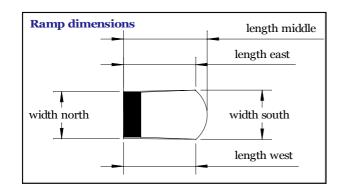
External diameters Diameter of the instrument's exterior

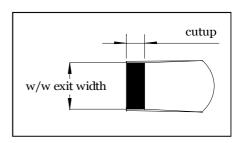
(east - west) Measured at 90 degrees to the longitudinal plane of the fingerholes

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 Overall length internal Ø depth largest external Ø hole Ø blow hole ring width | 99 57.6 73 74.7 11.8 | Measurements relative to cap Total length of the cap Approximate internal diameter of cap recess Maximum depth of cap recess Maximum diameter of caps external turning Diameter of crook hole, where appropriate Width and height of blowing hole, where appropriate Width of brass strengthening ring |
|--|----------------------------------|--|
| Ø | 64 | Diameter of brass strengthening ring |
| Fontanelle Overall length | 151 | Measurements relative to fontanelle Total length of fontanelle |
| internal Ø south internal Ø north | 69.5 | Approximate internal diameter of lower end |
| internal Ø north | 64.3 | Approximate internal diameter of upper end |
| largest external \emptyset | 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 |
| norm ring width | 71.7 | Diameter of upper brass strengthening ring |
| Ø | /1./ | 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 |
| ~ | 70.0 | 2 minotes of 10 not prime offengateming range |
| $\operatorname{rose} \varnothing$ | 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.