

Supplement baroque traversos

July 2017

This supplement contains plans with drawings, tables with measurements, drawings, photos and descriptions of a number of historical baroque traversos. This supplement is compiled as an addition to my series of articles about making woodwind instruments in the FoMRHI Quarterly (the first one in this series was published in 2015, the articles about traversos in 2017) and will only be available and as digital files, distributed exclusively to members of the FoMRHI.



traverso by R. Wijne in its bag, and a copy of another traverso of Wijne; collection of the author

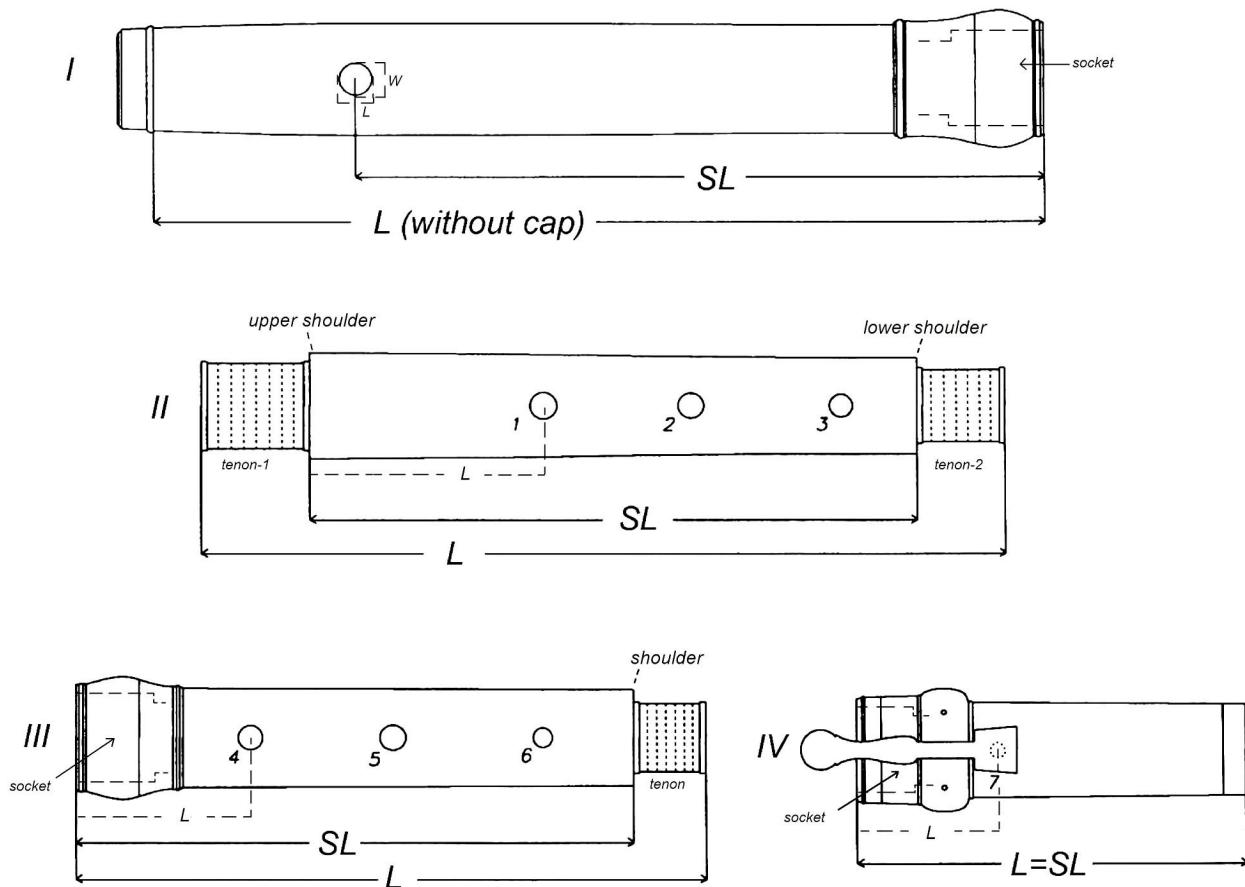
The data for the plans were collected over a long period, from 1980 onwards. Several methods were used to perform the measurements and to present them in the plans. That means that some drawings are more comprehensive than others. Also: there is always a chance that there might be some incorrect or incomplete data in the plans; it was - with only a few exceptions - not possible to return to the instruments to check all measurements.

A strong advice for who is planning to make a copy of a particular traverso: make always your own drawing after the data of the original plan. See Comm. 2031 in FoMRHI Quarterly 131 (July 2015) for my article about measuring woodwind instruments and how to present the results.

Two instruments (by Naust and Willem Wijne) of which plans are presented in this supplement, haven been stolen since I have examined them. I am very interested to know if you by chance have seen these traversos recently. That is also the case for new finds of historical instrument by Dutch woodwind makers. See the list on my website for a list of the known makers and their instruments (www.mcjouterse.nl/dutch-wwinstruments/list-NL-instruments.pdf).

Alphen aan den Rijn, Netherlands

July 2017



This drawing shows the names of parts of a traverso, as used in the descriptions and tables with measurements. All measurements in the plans are in millimeters, on older drawings with the decimal komma, on recent drawings with the decimal point.

List of plans:

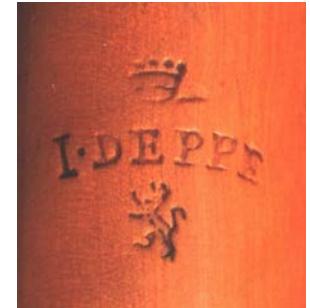
- (copy after a) traverso by I. Deppe; Boers collection, Rijksmuseum Amsterdam, Netherlands
- traverso by August Grenser; Gemeentemuseum Den Haag, Netherlands
- copy after a traverso by August Grenser in the Germanisches Nationalmuseum, Nürnberg (D)
- traverso by Richard Haka, Ehrenfeld collection, Netherlands
- traverso by F.G.A. Kirst; private collection, Netherlands
- traverso by D. Lot; private collection, Netherlands
- traverso by Naust; private collection, Netherlands (instrument is lost)
- traverso by J.W. Oberlander Senior; Openluchtmuseum Arnhem, Netherlands
- traverso by Robbert Wijne; private collection, Netherlands
- traverso by Willem Wijne; Sammlung Jehle, Sigmaringen, Germany (instrument is lost)

Traverso by I. Deppe

Boers Collection, Rijksmuseum Amsterdam, Inv. No. BK-NM-9687

Traverso in light brown coloured boxwood, with ivory rings and a silver key. The instrument is in excellent condition and has very good playing qualities. The pitch is around a-430 Hz.

This traverso was from 1952 to 2010 on loan to the Gemeentemuseum Den Haag where it had the inventory number Ea 48-x-1952. Who was I. Deppe? Only this one instrument with his stamp is known and mainly because some characteristics of that stamp (his name combined with a crown and a lion rampant) it is included in the catalogue (by Rob van Acht, Jan Bouterse and Vincent van den Ende) Dutch traversos and clarinets of the 18th century (Frankfurt 2004). But since then I have found some more information: another (or perhaps the same?) traverso was reported in 1831, in the sale of the effects of J.D. Schermerts, former burgomaster of the Dutch town of Elburg. And I found a record that a man with the name Joseph Deppe (born c. 1730 in Leiden) has worked as an ivory turner in Amsterdam, where he died in 1801. He is a possible candidate as maker of this instrument.



A striking feature of the Deppe traverso is the combined length of III and IV, which is with 240 mm very long for an instrument in this pitch and is very much in the same design as of a lot of Dutch traversos from the first half of the 18th century. The fingerholes are all undercut in the dome and chimney shape, and that is just a later feature. This traverso combines also old and new traditions. Barthold Kuyken, who once played it, told me that this one of the best instruments in the collection. For me it is also a much better (or easier to play?) instrument than the traversos by Beuker and Christiani and other makers from the later years of the 18th century.

I have used the Deppe traverso as starting-point for a traverso in a-440 Hz. But for the best result I had to shorten joints II, III and IV, and made some changes in the bore as well. But there were no problems at all to add a longer part II for playing the flute in a-415 Hz.

Traverso by I. Deppe, Boers Collection, Rijksmuseum Amsterdam, Inv. No. BK-NM-9687

Measurements: Jan Bouterse, 1994. See also the (different set of) measurements of this instrument in the catalogue *Niederländische Traversos und Klarinetten des 18. Jahrhunderts - Dutch traversos and clarinets of the 18th century* by Rob van Acht, Jan Bouterse and Vincent van den Ende (Frankfurt 2004).

- I L with cap: 233.8; L without cap: 223.5; SL 146; socket: Lmax 27.3, Ømax 24.3
mouth hole (\varnothing WxL): 8.6 x 9.5, undercut to L 14;
bore: Ø 18.7 (cylindrical over the whole length);
- II SL: 157; upper tenon: L 26.8; lower tenon: L 21.2; Ø wood at shoulders: 27.5 and 25.1
fingerholes (L from upper shoulder to centre hole; ØWxL; Ømax of wood at hole):
hole 1- 73.5, 5.9x6.0, 26.0; hole 2- 110, 5.8x6.0, 25.5; hole 3- 143, 5.3x5.4, 25.3
bore (Ø, Lmax, from upper end): 18.2/18.5-0; 18.2-10; 18.0-32; 17.8-47; 17.6-59; 17.4- 73;
17.2-84; 17.0-90; 16.8-105; 16.6-111; 16.4-120; 16.2-131; 16.0-140; 15.8-152; 15.6-159;
15.4-167; 15.2-178; 15.0-185; 14.8-190; 14.6-195; 14.4-199; 14.2-203/through
- III SL 139; L tenon to foot: 16.5; socket: L 22.2, Ømax 20.8
fingerholes (L from upper end to centre hole; ØWxL; Ømax of wood at hole):
hole 4- 45, 5.6x5.8, 24.5; hole 5- 81, 5.6x5.9, 24.0; hole 6- 117, 4.4x4.5, 24.1
bore (Ø, Lmax, from upper end): 14.6-23; 14.4-30; 14.2-49; 14.0-55; 13.8-78; 13.6-81; 13.4-96;
13.2-111; 13.0-122; 12.8-136; 12.4-150; 12.0-end
- IV L 101.2; socket: L 17.4, Ømax 19.1; hole 7 at L 38.8, Ø ca 6.3, Ø wood at hole 7: 23.8
bore (Ø, Lmax, from lower end): 13.6-0; 13.2-18; 13.0-41; 12.8-59; 12.6-63; 12.2-78; 12.1- through

Copy by the author, after the Deppe traverso, in a-440 Hz with an extra joint in a-415 Hz

- I dimensions the same as original traverso by Deppe; cork position at 170.5 from lower end
- II-440 SL 145.5; fingerholes (L from upper shoulder to centre hole; ØWxL; Ømax of wood):
hole 1: 65, 61x6.3, 25.0; hole 2: 6.0x6.2, 24.5; hole 3: 132, 5.2x5.5, 24.3
bore (Ø, Lmax, from upper end): 18.4-0; 18.0-4; 17.6-24; 17.2-45; 17.1-57; 17.0-95; 16.8-
104; 16.4-126; 16.2-130; 15.6-140; 15.2-151; 14.8-164; 14.4-177; 14.2-185; 13.1-end
- II-415 SL 173; fingerholes (L from upper shoulder to centre hole; ØWxL; Ømax of wood):
hole 1: 85.5, 6.5x6.8, 25.2; hole 2: 121, 6.3x6.4, 24.5; hole 3: 157.5, 5.3x5.6
bore (Ø, Lmax, from upper end): 18.7-2; 18.5-4; 18.0-27; 17.7-30; 17.5-88; 17.2-94; 17.0-
112; 16.6-127; 16.2-152; 15.8-168; 15.4-180; 15.0-191; 14.6-209; 14.3-end (220)
- III SL 135; fingerholes (L from upper shoulder to centre hole; ØWxL; Ømax of wood):
hole 4: 45, 5.9x6.2, 24.2; hole 5: 79.2, 6.2x6.5, 23.8; hole 6: 113, 4.5x4.5, 23.3
bore (Ø, Lmax, from upper end): 15.4-26; 15.0-25; 14.6-51; 14.2-66; 13.8-89; 13.4-115; 13.0-
130; 12.6-137; 12.2-145; 12.0- end (151.5)
- IV L 92.7; hole 7 at L 35.3, Ø 7.5x7.8, Ø wood at hole: 23.8
bore (Ø, Lmax, from lower end): 14.8-0; 14.4-14; 14.0-18; 13.6-36; 13.2-48; 12.8-59; 12.4-
70; 12.3- through



Baroque traverso in d, a-440 Hz by Jan Bouterse (Netherlands)

October
1995

this flute is based on a traverso by I. Deppe (Haags Gemeentemuseum, Den Haag / The Hague, Netherlands). Which instrument has a pitch of a - 430 to 435 Hz.

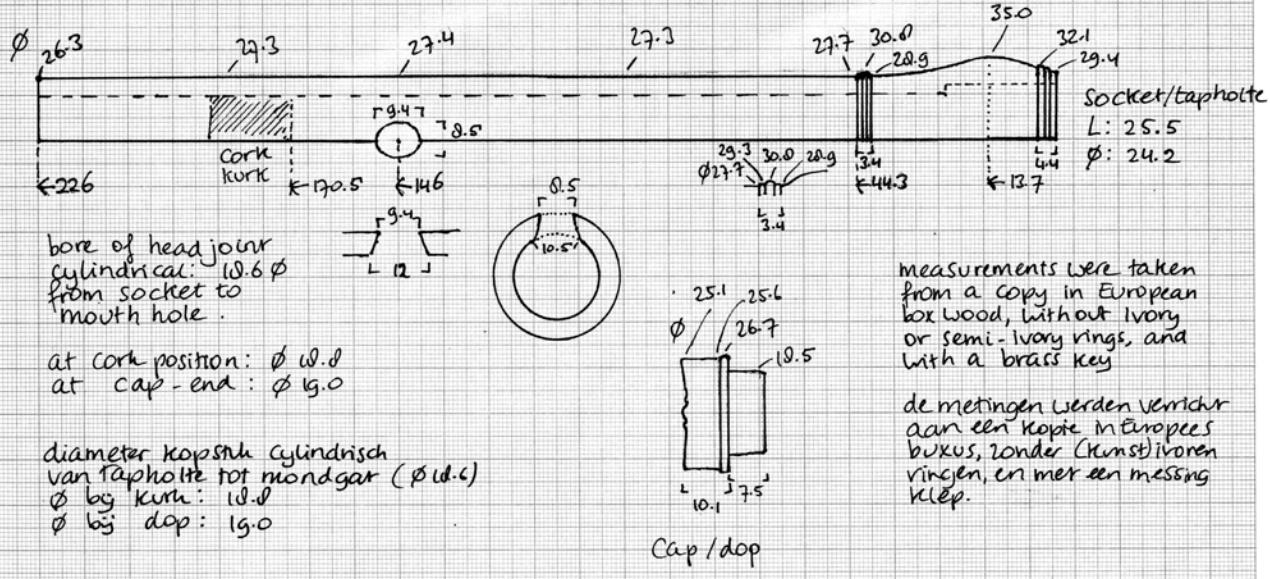
d deze fluit is afgeleid van een traverse
van J. Deppe (Haags Gemeentemuseum)
Welke staat in a- f''' 435 Hz.

alle maten
in millimeters

All measurements in millimeters

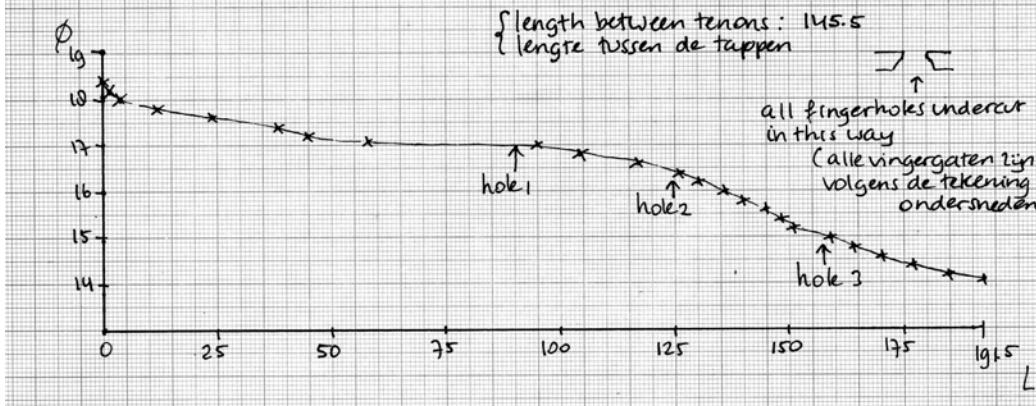
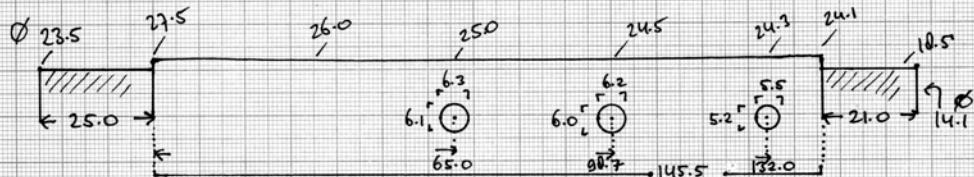
Head joint / Kopfstück

total length without cap: 226 mm
length under cap: 226 mm.



Left hand joint - Linkerhand deel

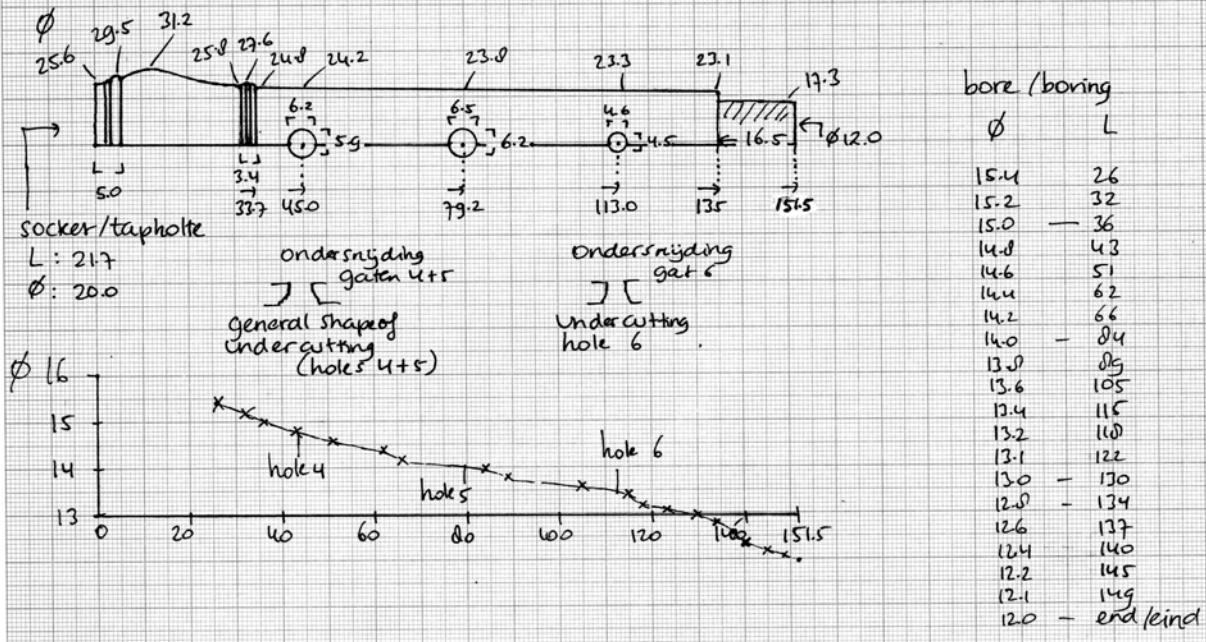
total length: $25.0 + 145.5 + 21.0 = 191.5$ (totale lengte)



bore	/boring	L
Ø		L
10.4	-	0
18.2	-	1
18.0	-	4
17.9	-	12
17.6	-	24
17.4	-	35
17.2	-	45
17.1	-	57
17.0	-	99
16.8	-	105
16.6	-	117
16.4	-	126
16.2	-	130
16.0	-	120
15.8	-	140
15.6	-	145
15.4	-	146
15.2	-	151
15.0	-	152
14.8	-	157
14.6	-	161
14.4	-	162
14.2	-	163
14.1	-	164

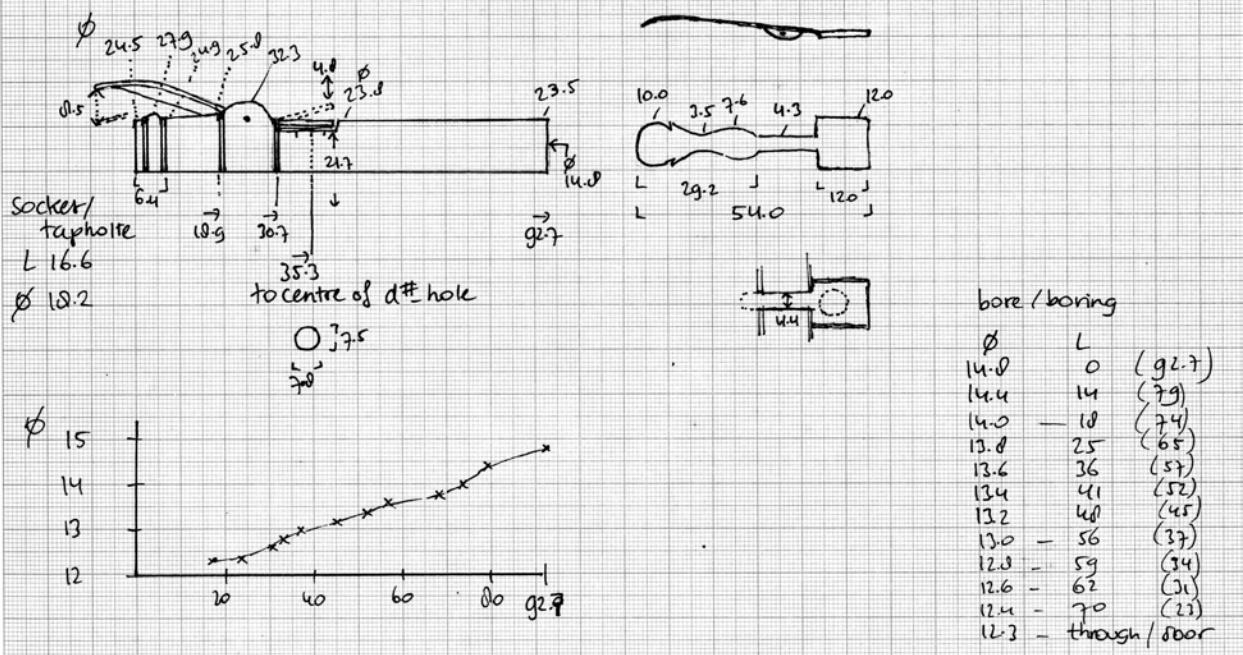
right hand joint - rechterhand deel

total length: $135.0 + 16.5 = 151.5$ (totale lengte)



foot joint - voetje

total length: 92.7 (totale lengte)



August Grenser

Two instruments are presentend here:

- a copy of a traverso based on an instrument in the Germanisches Nationalmuseum in

Neuremberg

- an original traverso by A. Grenser in the collection of the Gemeentemuseum De Haag

The copy of the traverso of August Grenser is based on an instrument in the Germanisches Nationalmuseum in Neuremberg (Germany), which has seven different corps de recharge, in the range of a-415 to a-440 Hz. For my copy (in a-415 Hz) I also used some data from a Grenser copy by Guido Klemisch. Some years later I added an extra joint in a-440 Hz, the result of some calculations (scaling) and study of a drawing from Neuremberg. That drawing gives mainly the bore profiles and some lengths of all parts, but not the dimensions (diameters) of the exterior of the flute. You might derive these from the drawing (which is in scale 1:1), but that is not easy and not accurate as well.

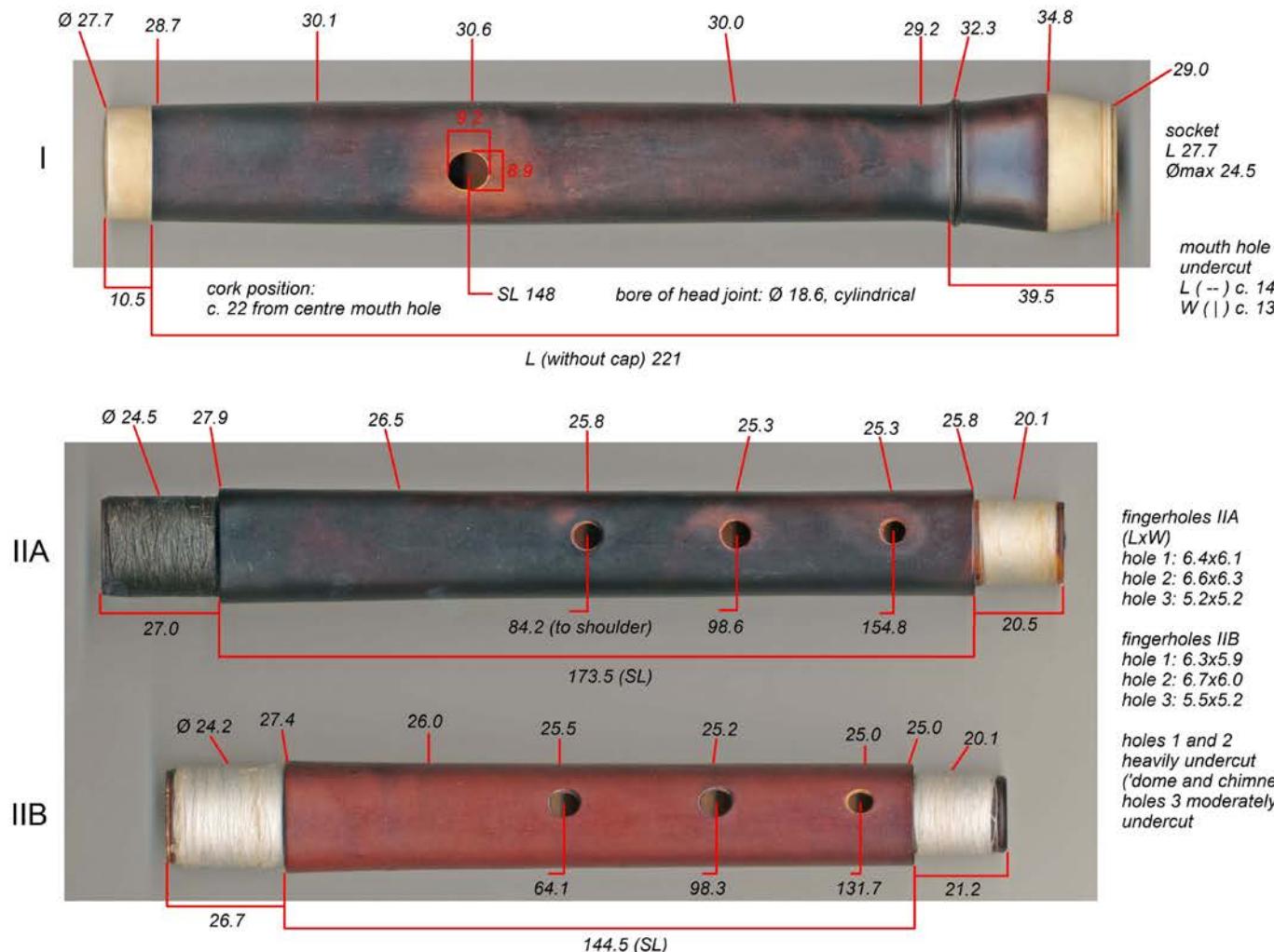
Copy (by Jan Bouterse) of a traverso by August Grenser

copy (415 Hz): SL 148 + 173.5 + 137 + circa 98 = 556.5

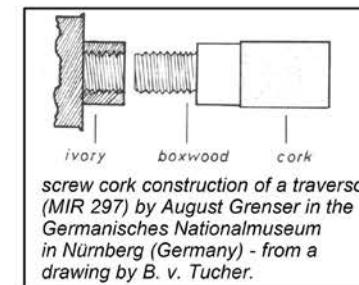
copy (440 Hz): SL 148 + 144.5 + 137 + circa 92 = 521.5

- I SL = 148, Ø bore: 18.6, cylindrical; mouth hole: 8.9x9.2 (WxL), undercut to 14 (L); socket: L 27.5, Ømax 24.2; Ø wood at mouth hole: 30.7; cork at 23 mm from centre mouth hole
IIa (415) SL 173.5; fingerholes (L from centre to upper end, Ø-L xW hole, Ø wood at hole):
hole 1: 84.2, 6.4x6.1, 25.6; hole 2: 98.6, 6.6x6.3, 25.3; hole 3: 154.8, 5.2x5.2, 25.3
bore (Ø, Lmax, from upper end): 18.5-0; 18.2-2; 18.0-12; 17.8-18; 17.6-48; 17.4-62; 17.2-67;
17.0-80; 16.7-95; 16.6-101; 16.4-hole 1; 16.2-140, 16.2-hole 2; 15.8-161; 15.6-hole 3; 15.4-
189; 15.2-193; 15.0-199; 14.9-203; 14.8-through; 15.0- end
IIb (440) SL 144.5; fingerholes (L from centre to upper end, Ø-L xW hole, Ø wood at hole):
hole 1: 6.3x5.9, 25.5; hole 2: 6.7x6.0, 25.2; hole 3: 5.5x5.2, 25.0
bore (Ø, Lmax, from upper end): 18.5-0; 18.2-10; 18.0-18; 17.8-25; 17.6-42; 17.4-59; 17.2-
66; 17.0-102; 16.8-115; 16.6-hole 2; 16.4-124; 16.2-130; 16.0-141; 15.8-144; 15.6-154; 15.4-
160; 15.2-166; 15.0-170; 14.8-183; 14.6- through
III L (SL + tenon): 137.0 + 17.5 =154.5; socket: L 21.5, Ømax 20.6
fingerholes (L from centre to upper end, Ø-L xW hole, Ø wood at hole):
hole 4: 42, 5.9x5.8, 25.0; hole 5: 77.5, 6.0x5.9, 24.9; hole 6: 114.5, 4.9x5.0, 24.7
bore (Ø, Lmax, from upper end): 15.3-22; 15.0-28; 14.8-33; 14.6-hole 4; 14.4 + 14.2- hole 4;
14.0-62; 13.8-hole 5; 13.6-83; 13.4-90; 13.2-95; 13.0-102; 12.8-107; 12.6-122; 12.4-126;
12.2-128; 12.0-145 and end of bore
IV L: ca. 98 (depending on register); without register: L 90; hole 7 at L 35, Ø 7.2x6.3
bore of register: 17.5, cylindrical; body (L, Ømax from lower end): 13.5-0; 13.2-16; 13.0-21;
12.8-32; 12.6-48; 12.4-hole 7; 12.1- touching through

Traverso, copy after August Grenser by Jan Bouterse



Baroque traverso, based on instruments by August Grenser with two corps de recharge in a1= 415 (IIA) and 440 Hz (IIB)



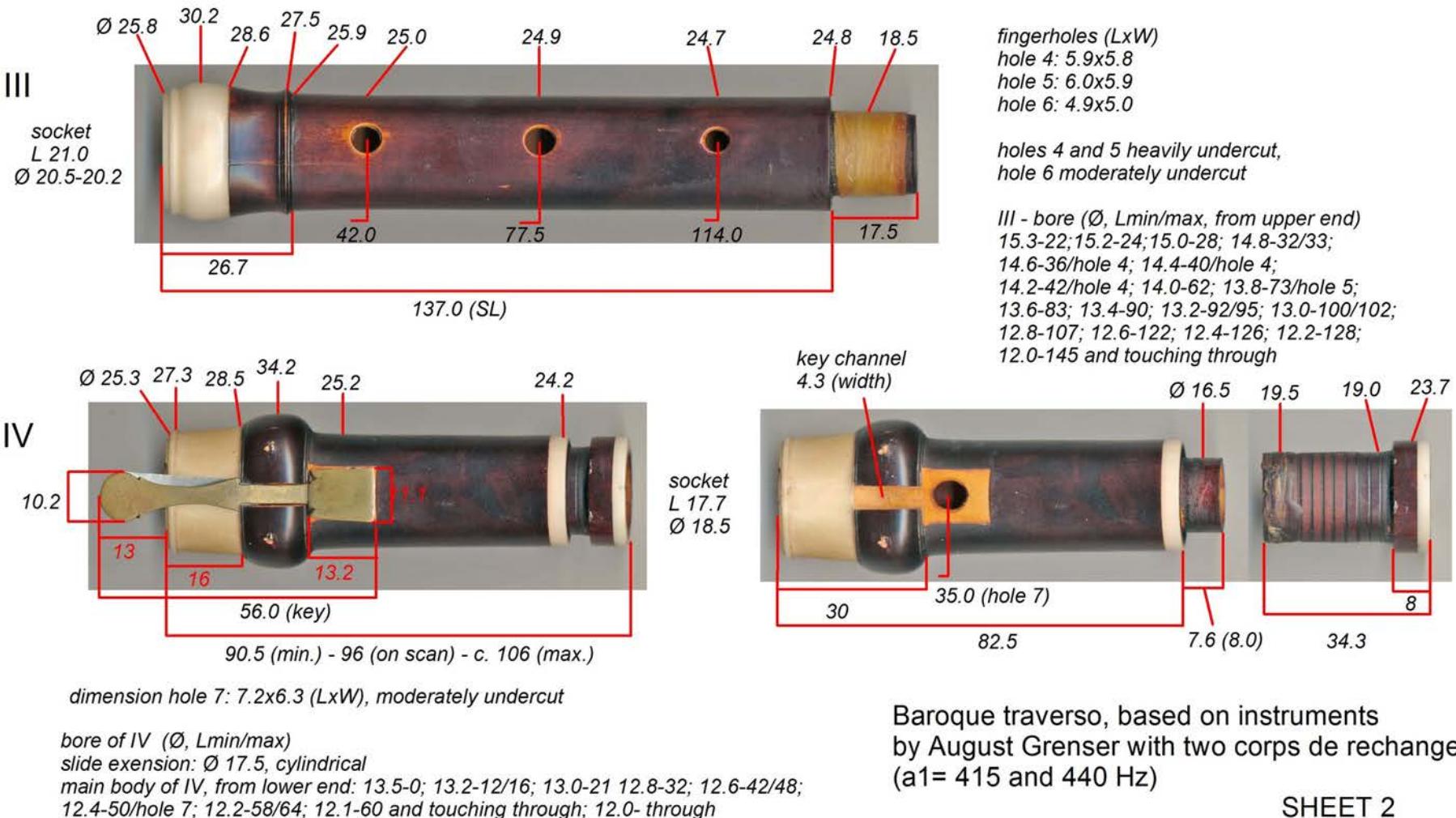
Bore IIA (Ø - Lmin/max, from upper end)
 18.2/18.5-0; 18.2-0/2; 18.0-6-12;
 17.8-16/18; 17.6-30/48; 17.4-60/62;
 17.2-65/67; 17.0-70/80; 16.8-95;
 16.6-101; 16.4-107/hole 1;
 16.2-118/140; 16.0-145/hole 2;
 15.8-161; 15.6-169/hole 3; 15.4-189;
 15.2-193; 15.0-199; 14.9-203; 14.8-trough;
 from lower end: 15.0-0; 14.9-6/10

Bore IIB

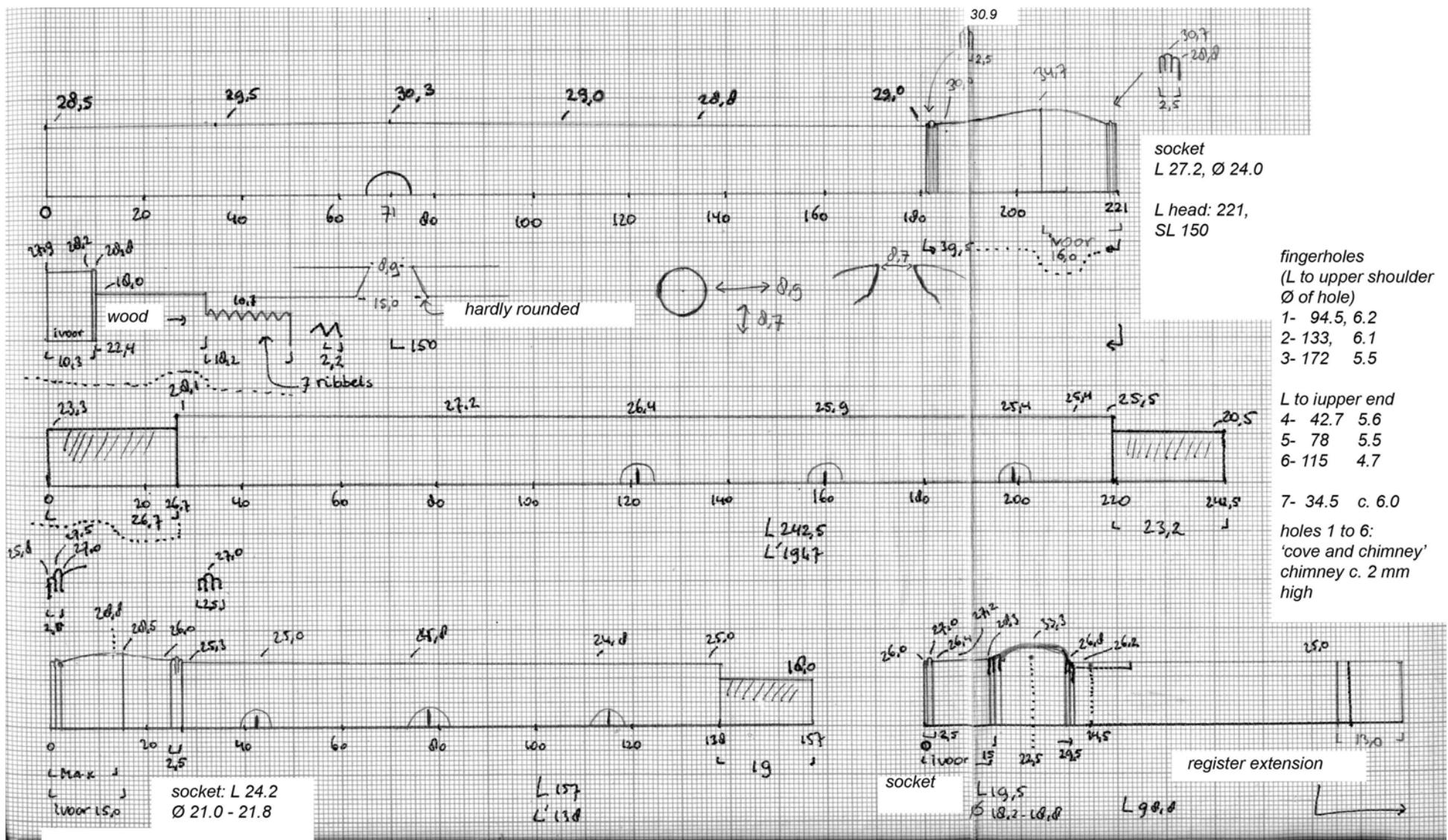
18.5-0; 18.2-10; 18.0-18; 17.8-25;
 17.6-42; 17.4-59; 17.2-66; 17.0-102;
 16.8-112/115; 16.6-119/hole 2; 16.4-124;
 16.2-130; 16.0-141; 15.8-144; 15.6-154;
 15.4-160; 15.2-166; 15.0-170;
 14.8-172/183; 14.6-182 and through;
 14.5/14-6- end of bore

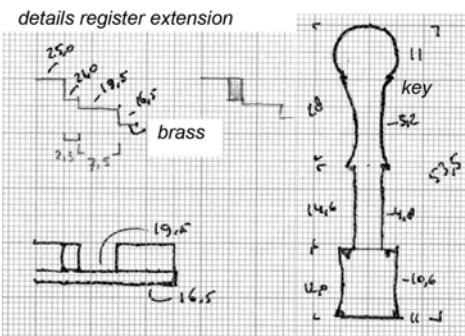
SHEET 1

all measurements in millimeters, after a copy in boxwood, cap and rings in artificial ivory, brass key Jan Bouterse, Alphen aan den Rijn, Netherlands, June 2017



Traverso by August Grenser, Gemeentemuseum Den Haag Inv. No. Ea 14-1935
boxwood, ivory mounts, silver key, screw cork, register foot; only upper middle joint with the number 1 did survive
pitch: about 30 cents under a-415 Hz



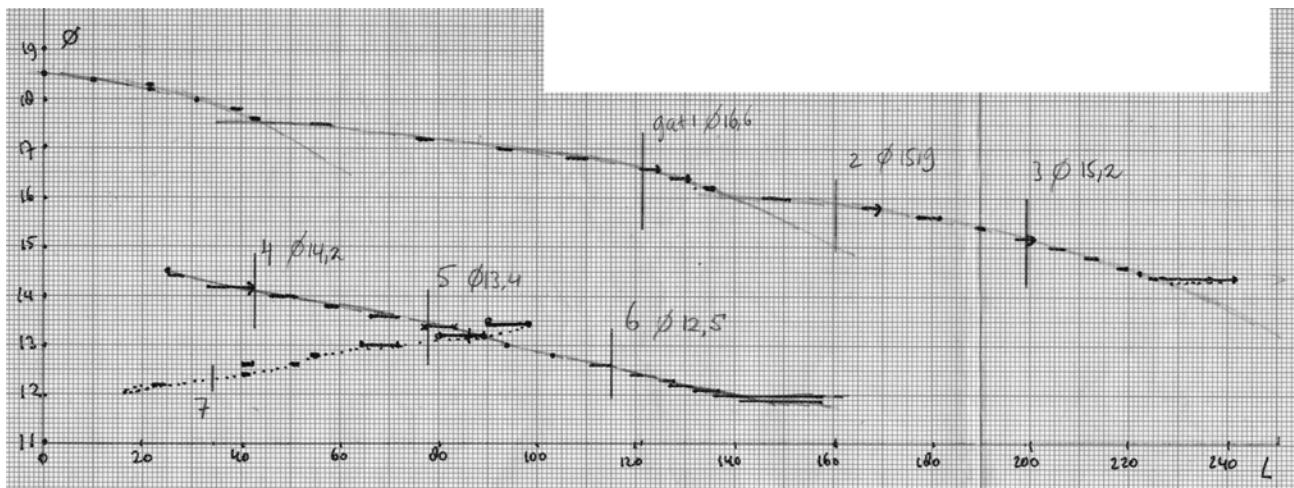


**Traverso by August Grenser, Gemeentemuseum Den Haag
Inv. No. Ea 14-1935**

measurements by Jan Bouterse, March 1984

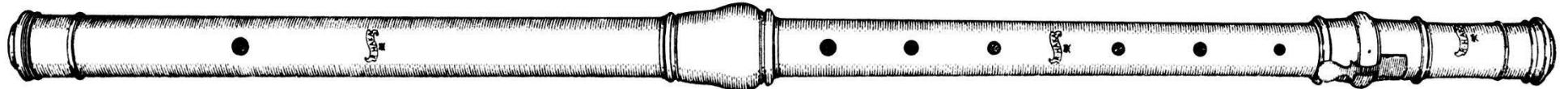
$$\text{SL: } 150 + 191.7 + 138 + 98.8 = 578.5$$

- I L (without cap): 221; SL: 151; socket: L 27.2, Ømax 24.0; bore: cylindrical, Ø 18.2
mouth hole: L 8.9, W 8.7, undercut to 15 (L),
- II L (tenon 1 + SL + tenon 2): $26.7 + 191.7 + 23.2 = 242.5$
bore (Ø, Lmin/max): 18.5-0; 18.4-10; 18.2-22; 18.0-31; 17.8-38/40; 17.6-42/44; 17.4-58/66;
17.2-76/79; 17.0-92/95; 16.8-106/110; 16.6-121/hole 1; 16.4-127-hole 1; 16.2-134/136; 16.0-
146/151; 15.8-166/hole 2; 15.4-189/191; 15.2-197/hole 3; 15.0-204/207; 14.8-211/214; 14.6-
219/220; 14.4-224/through; 14.2/14.4-end
- III L (SL + tenon): $138 + 19 = 157$; socket L 24.2, Ømax 21.0
bore (Ø, Lmin/max, from upper end): 14.5-26; 14.4-25/28; 14.2-hole 4/33; 14.0-46/51; 13.8-
57/60; 13.6-66/72; 13.4-77/83; 13.2-86/87; 13.0-94; 12.8-103; 12.6-111/hole 6; 12.4-119/121;
12.2-127/131; 12.1-132/137; 12.0-136/through 11.9/12.0-end
- IV L 98.8 (with extension extended, but when I assessed it not movable); socket: L 19.5, Ømax
18.8;
bore (Ø, Lmin/max, from lower end): 13.0/14.0-0; 13.4-0/10; 13.2-11/18; 13.0-26/35; 12.8-
43/44; 12.6-48/52; 12.4-56/58; 12.2-71/73; 12.1-through



bore profiles of parts II, III and IV, with suggestion of division in (reamer) sections for part II.

Traverso by Richard Haka, collection foundation Ehrenfeld, Netherlands
boxwood, brass key, in three parts



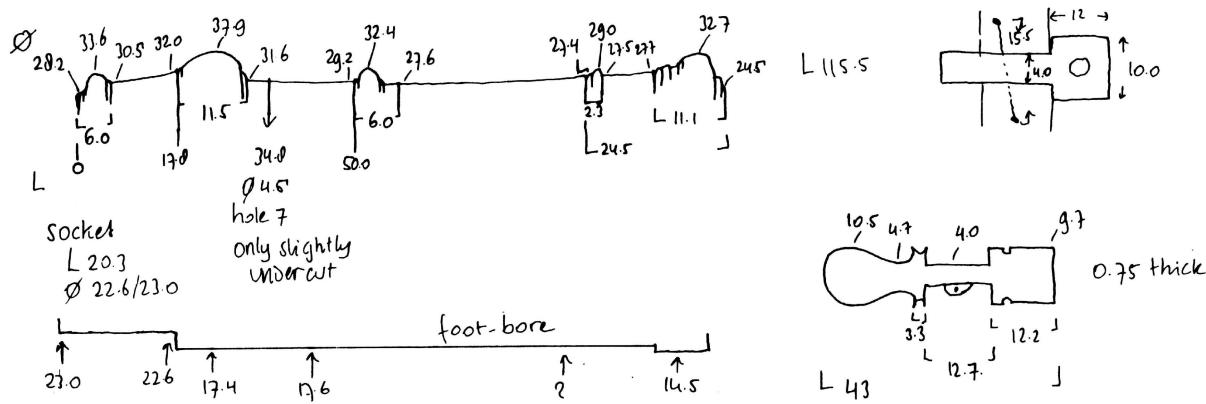
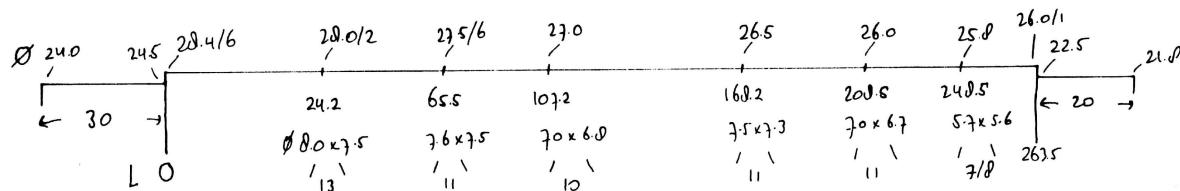
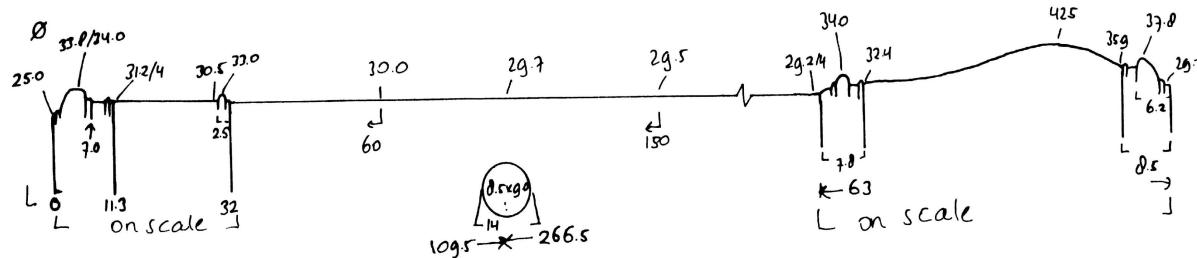
drawing with permission from prospect of Von Huene traversos



Traverso in boxwood (without ivory rings), stained brown, with a brass key. The instrument is preserved very well and shows several early characteristics, such as the division in three (not four) joints, there is no cap at the end of the head (the upper section with some turned ornaments is only suggesting a cap), the bore is only slightly narrowing in the middle joint, the key has the shape of a d#-key of a baroque oboe.

I suppose that this instrument is probably a flûte d'amour, a minor third lower than a flute in d, but at a relative high pitch (close to $a=440$ Hz, which is also known of some other 'early' instruments by this maker).

The key is very much like the small key of a baroque oboe. At the end of the foot is a ring inserted which narrows the bore - but this ring makes the lowest note too flat and is probably not original.



reconstruction of the foot bore

measurements

head (I): L 376; SL 266.5; socket: L 33.7, Ømax 25.5; mouth-hole (LxW): 9.0 x 8.5, Øwood-max 29.7; bore (L, Øhor/ver, from upper end): 19.2- 0; 19.0- towards cork; from lower end: 18.5- 70 18.4- ->

middle joint (II): L 314; SL 263.5; upper tenon: L 30, Øext-max 24.5; lower tenon: L 20, Øext-max 22.5; Øext-max of shoulders: 28.6 and 26.1;

finger-holes (L from upper shoulder to centre of hole; ØWxL; Øwood):

hole 1- 24.2; 8.0 x 7.5; 28.2
hole 4- 168.2; 7.5 x 7.3; 26.5

hole 2- 65.5; 7.6 x 7.5; 27.6
hole 5- 208.5; 7.0 x 6.7; 26.0

hole 3- 107.2; 7.0 x 6.8; 27.0
hole 6- 248.5; 5.7 x 5.6; 25.8

bore (Ø, Lmin/max, from upper end): 18.6/19.0-0; 19.0-22; 18.8- 28/78; 18.6- 80/86; 18.4-108/156;
18.2-171/175; 18.0-179/199; 17.8-208/209; 17.6- 216/217; 17.4- 223/231; 17.0- 253; 16.8- 259; 16.7- 261;
16.6- through->; 16.5/16.7- end

foot (III): L 115.5; socket: L 20.3, Ømax 23.0; hole 7 at L 34.8, Ø 4.5, Øwood ca 30;

bore (Ø, Lmin/max, from upper end):

17.1/17.2- 21; 17.3- 28/40; 17.5- 41; 17.7- 50/54; 18.0- 60 and just till ring which is placed (by Haka?) at the lower end of the bore; 14.5- 105 to 115 (=Ø of that ring)

tone	fingering	actual tone	pitch tone: deviations in cents compared with a-440 Hz
d1 -	1 2 3 4 5 6	b	-30
d2 -	. 2 3 4 5 6	b	0
d3 -	. 2 3 4 . 6	b	-20
d3	. 2 3 . . . 7	b	-10
d#1 -	1 2 3 4 5 6 7	c	-40/-45
d#2 -	. 2 3 4 5 6 7	c	-30
d#3 -	. 2 3 . 5 6 7	c	-35
e1 -	1 2 3 4 5	c#	0
e2 -	1 2 3 4 5	c#	0
e3 -	1 2 . 4 5 6 7	c#	-15
f1 -	1 2 3 4 . 6	d	+35
f2 -	1 2 3 4 . 6	d	+15
f#1 -	1 2 3 4 . . 7	d#	-25
f#2 -	1 2 3 4 . . 7	d#	-25
g1 -	1 2 3	e	+10
g2 -	1 2 3	e	0
g3 -	1 . 3	e	-10
a1 -	1 2	f#	+5
a2 -	1 2	f#	-10
b1 -	1	g#	0
b2 -	1 . . (4 5 6)	g#	-30
c2 -	. 2 3	a	+20
c3 -	. 2 . 4 5 6 7	a	-25
c#2 -	all holes open	b-flat	0

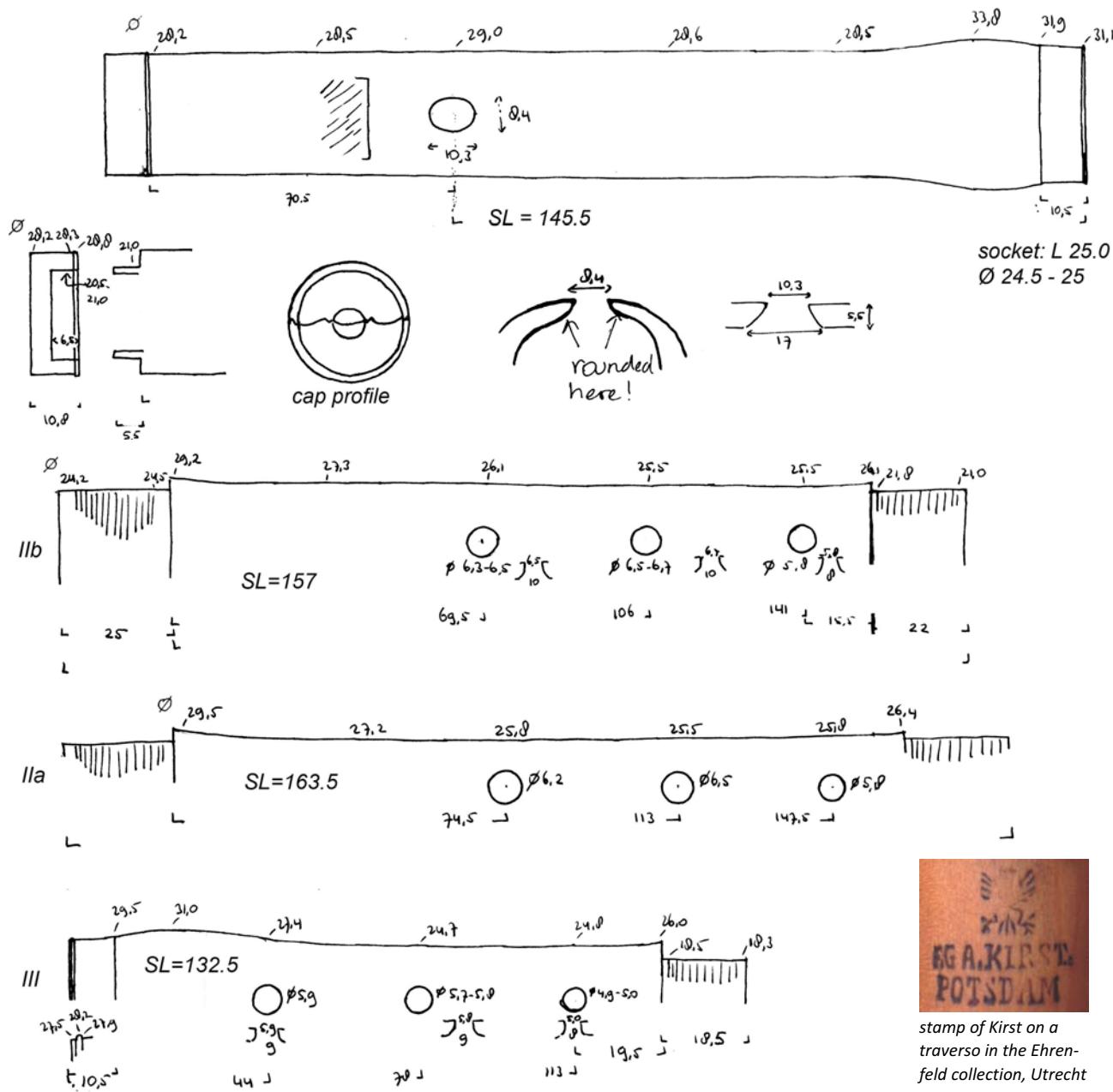


cap end



head socket baluster





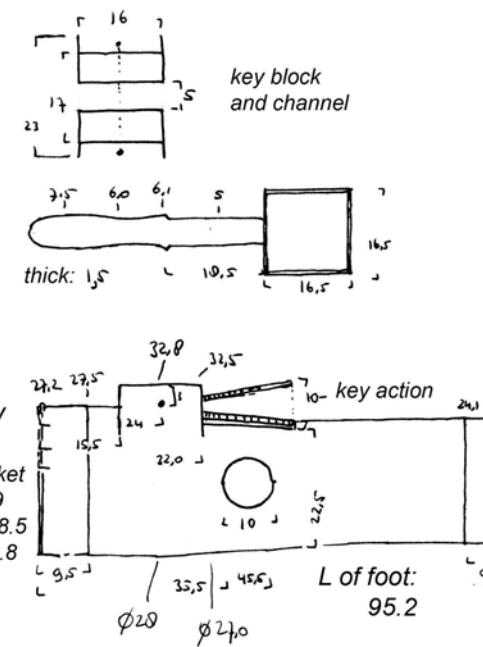
stamp of Kirst on a
traverso in the Ehren-
feld collection, Utrecht

Traverso by F.G.A.Kirst, private collection - (Netherlands ?)

This is the first historic traverso I ever had in my hands; it was in the possession of the family of a member of the student orchestra of the university of Wageningen. Since then, it changed hands at least two times, I have no information about the present location.

The instrument was in excellent condition, made of unstained boxwood, ivory rings and a brass key and has three corps de recharge (they are not numbered on the wood). The pitch with the two longest corps is a-435 and 440 Hz.

Friedrich Gabriel August Kirst (c. 1750-1806) lived in Potsdam and made many woodwind instruments for the Prussian army. His traversos are with one, but also with more keys.



F.G.A. Kirst, traverso, private collection (ex-Wageningen)

measurements from January 1982, by the author

$$SL: 145.5 + 163.5/157/150.5 + 132.5 + 95.2 = 536.7/530.2/523.7$$

- I L 216 (without cap and tenon to cap); SL 145.5; socket: L 25.0, Ømax 25.0; bore: from cap end to cork 18.5; from socket end (\varnothing -L): 18.2- 100/140; 18.1-140/18.0-155; mouth hole (WxL): 8.4x10.3, undercut to a very wide L 17; Ø wood at mouth hole: 29.0
- IIa pitch ca. a-435 Hz; L 212, SL 163.5
fingerholes (L from centre to upper shoulder, Ø of hole, Ø wood at hole):
hole 1: 74.5, 6.2, 25.8; hole 2: 113, 6.5, 25.5; hole 3: 147.5, 5.8, 25.8
bore (\varnothing , Lmax, from upper end): 18.0-0; 17.6-12; 17.0-73; 16.5-108; 16.0-141; 15.5-175; 15.0-193; 14.5- end
- IIb pitch a-440 Hz, L 203.5, SL 157, fingerholes (L from centre to upper shoulder, Ø-W/L of hole, Ø wood at hole):
hole 1: 69.5, 6.3/6.5, 26.1; hole 2: 106, 6.5/6.7, 25.5; hole 3: 141, 5.8/5.8, 25.5
bore (\varnothing , Lmin/max, from upper end): 18.4-0; 18.2-4; 18.0-11; 17.8-19/22; 17.6-28/32; 17.4-44/47; 17.2-58/67;
17.0-69/81; 126.8-89/100; 16.6-95/117; 16.4-115/124; 16.2-130/135; 16.0-138/142; 15.8-151/152; 15.6-
167/170; 15.4-177/178; 15.2-183; 15.0-192/194; 14.8-198 and through
- IIc no pitch measurement; SL 150.5; fingerholes at 65, 101 and 136 from upper shoulder; bore: Ø at upper end 18.0, at lower end 14.8
- III L (SL + tenon): 132.5 + 18.5 = 151; socket L 23.5, Ømax 21.5
fingerholes (L from centre to upper end, Ø-W/L of hole, Ø wood at hole):
hole 4: 44, 5.9/5.9, 27.4; hole 5: 78, 5.7/5.8, 24.7; hole 6: 113, 4.9/5.0, 24.8;
bore: (\varnothing /Lmax, from upper end): 14.8-24; 14.6-30/31; 14.4-40/hole 4; 14.2-51/61; 14.0-65/hole 5; 13.8-86/93;
13.6-100/103; 13.4-109/hole 6; 13.2-117; 13.0-126/130; 12.8-133/134; 12.6-135/137; 12.5-137/through
- IV L 95.2; socket: L 19, Ømax 18.8; hole 7 at 40.5 from upper end, Ø ca. 10
bore (\varnothing , Lmax, from lower end): 14.0-0; 13.8-9; 13.6-23/25; 13.4-35; 13.2-41; 13.0-47/hole 7; 12.8-57/hole 7;
12.6-64/65; 12.4-71 and through

see the drawings for additional measurements



This is the only photo of the instrument: my mother in 1980, with the Kirst traverso from Wageningen.

In 1983, I have made a drawing with measurements of another traverso with one key by Kirst, in private collection in Zutphen (Netherlands; no information about present location). It was also made in boxwood, but only one of the corps de rechange (numbered '4', likely the shortest) did survive. There should have been more, because the cork was made with a screw construction. The cap was, however, missing and the flute was because of some cracks not in playable condition. There is a large step in the bore between II and III (from 14.3 in II to 15.7 in III).

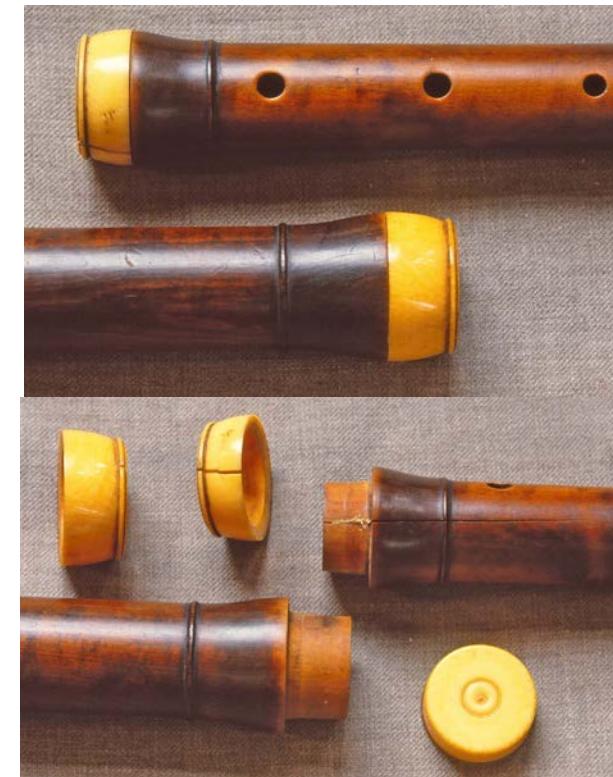
There is an excellent plan, made by J.F. Beaudin, of a traverso by Kirst in the collection of the Muskinstrumenten Museum in Berlin (Inv. No. 4895). That traverso is made of ebony and has four numbered corps de rechange and a screw cork.

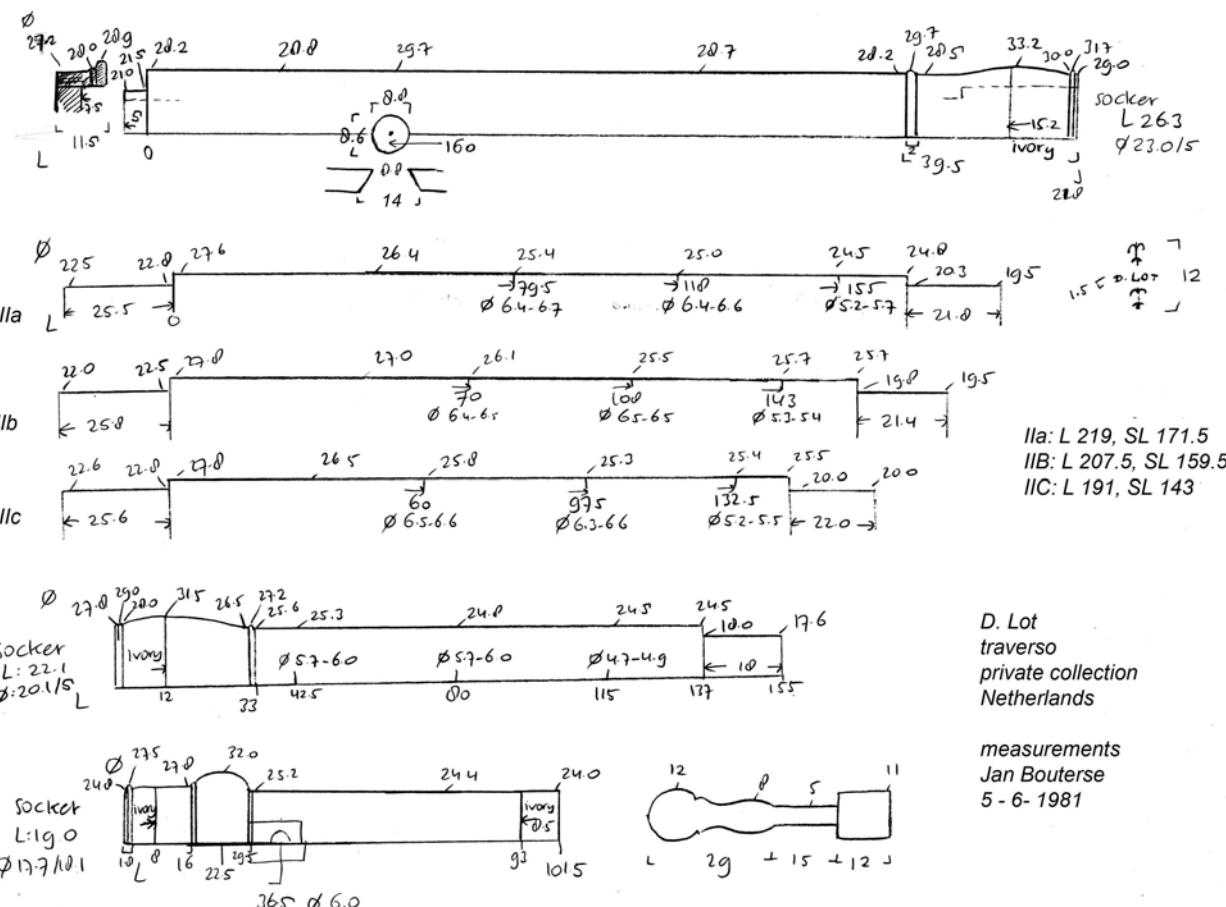
The bore profile of this instrument is very regular and it is interesting to see how Kirst has designed the bore profiles and positions of the fingerholes of the corps de rechange. Beaudin found the pitches: a-425, 430, 435 and 440 Hz. But in the information in the museum files are these pitches about 5 Hz lower, and is also stated that the instrument is made from African blackwood.

Traverso by D.Lot, private collection - (Netherlands)

Traverso with one key, in dark stained boxwood with ivory rings and a brass key. There are three corps de recharge, for the pitches of (about) a-406, 415 and 427 Hz. At a second visit - in 1989 - I measured higher pitches: a-415, 425/430 and 440 Hz (but these pitches are quite high in relation to the lengths of the combinations). Cracks are visible in III and IV from the socket to the next tone hole, some ivory rings are loose. But mouth hole, the corps de recharge with toneholes and bore profiles are in good condition, not altered. The spring (attached to the key wing) is missing. The instrument is well designed and proportioned, I have not made a copy of it, but it might be interesting as starting point for a traverso in a-415 Hz.

About D.Lot: there was (and still is) rather much confusion. Makers with the Lot family worked in the 18th century in Paris (three with the name Thomas Lot, one Martin Lot, one Gilles Lot and one Pierre Lot). But no makers with the initial D. However, there might have been a woodwind maker with the name D.Lott in Saxony. See The New Langwill Index by William Waterhouse, p. 241-243, (London, 1993), and an oboe of this maker is in the Boers Collection (Rijksmuseum Amsterdam). However, no biographical data about this maker are known to me and the stamp on the flute has clearly only one T in the name (I have checked that thoroughly on the flute). Above and below the name is a fleur de lis, but that device seems not to be used by members of the French Lot-family, but on the other hand, we find one or two fleurs de lis on the instruments with the D Lott stamp. The question was this traverso made in Germany, or in France?





Traverso D. Lot, private collection, Netherlands

measurements from January 1982, by the author

$$SL: 160 + 171.5/159.5/143 + 137 + 101.5 = 570/558/541.5$$

- I L 228 (without cap and tenon to cap); SL 160; socket: L 26.3, Ømax 23.5; bore: Ø 18.5/18.6 over most of the length, but narrower from the cork to the cap end (from Ø 18.4 to 18.0); socket: L 26.3, Ø 23.5 to 23.0; mouth hole (WxL): 8.6x8.8, undercut to L 14 and W 13; Ø wood at mouth hole: 29.3x29.7
- IIa pitch a-406 (415) Hz; L 219, SL 171.5
fingerholes (L from centre to upper shoulder, Ømin/max of hole, Ø wood at hole):
hole 1: 79.5, 6.4/6.7, 25.4; hole 2: 118, 6.4/6.6, 25.0; hole 3: 155, 5.2/5.7, 24.5
bore (Ø, Lmin/max, from upper end): 18.5-0; 18.2-10; 18.0-15/19; 17.8-20/33; 17.6-41/48; 17.4-38/60; 17.2-69/75; 17.0-86; 16.8-97/hole 1; 16.6-110-hole 1; 16.4-118/120; 16.2-134/137; 16.0-140/hole 2; 15.8-161/162; 15.6-168/171; 15.4-179/hole 3; 15.2-183/hole 3; 15.0-192; 14.8-198/200; 14.6-208; 14.4-213/through, 14.2/14.4-end
- IIb pitch a-415 (425/430) Hz, L 207.5, SL 159.5, fingerholes (L from centre to upper shoulder, Ø-min/max of hole, Ø wood at hole):
hole 1: 70, 6.4/6.5, 26.1; hole 2: 108, 6.5/6.5, 25.5; hole 3: 143, 5.2/5.7, 25.7
bore (Ø, Lmin/max, from upper end): 18.2-3; 18.0-5/8; 17.8-13/14; 17.6-16/36; 17.4-50/55; 17.2-66/71; 17.0-79/84; 16.8-90-hole 1; 16.6-100/hole 1; 16.4-108/113; 16.2-118/hole 2; 16.0-135/hole 2; 15.8-149/153; 15.6-162/163; 15.4-169-hole 3; 15.2-174-hole 3; 15.0-182; 14.8-184/191; 14.6-193/198; 14.4-198/through; 14.2/14.4-end
- IIc pitch a-427 (c. 440) Hz; L 191, SL 143; fingerholes (L from centre to upper shoulder, Ø-min/max of hole, Ø wood at hole):
hole 1: 60, 6.5/6.5, 25.8; hole 2: 97.5, 6.3/6.6, 25.3; hole 4: 132.5, 5.2/5.5, 25.4
bore (Ø, Lmin/max, from upper end): 18.2-0; 18.0-1; 17.8-4/10; 17.6-11/35; 17.4-40/48; 17.2-48/50; 17.0-68; 16.8-80/hole 1; 16.6-88/hole 1; 16.4-95/98; 16.2-115/hole 2; 16.0-127/hole 2; 15.8-132/142; 15.6-148/150; 15.4-157/hole 3; 15.2-163/hole 3; 15.0-170/172; 14.8-174/178; 14.6-through
- III L (SL + tenon): 137 + 18 = 155; socket L 17.7-18.1, Ømax 20.5-20.1
fingerholes (L from centre to upper end, Ø-min/max of hole, Ø wood at hole):
hole 4: 42, 5.7/6.0, 25.3; hole 5: 80, 5.7/6.0, 24.8; hole 6: 115, 4.7/4.9, 4.5
bore: (Ø/Lmin/ from upper end): 14.6-25/36; 14.4-33/46; 14.2-47/53; 14.0-56/61; 13.8-65/70; 13.6-71/78; 13.4-85/90; 13.2-92/93; 13.0-105/108; 12.8-120; 12.6-125/128; 12.4-136/139; 12.2-147/through; 12.0/12.2-end
- IV L 101.5; socket: L 19, Ø 18.1 to 17.7; hole 7 at 36.5 from upper end, Ø 6.0
bore (Ø, Lmax, from lower end): 13.5-0; 13.4-0/18; 13.2-20/26; 13.0-32/35; 12.8-38; 12.6-44/51; 12.4-63/gat 7; 12.2-65/through; 12.1-80/through, 12.0-through.

Undercutting of fingerholes (L)

- IIa: 1: 9; 2:10; 3: 9
IIb: 1: 10, 2: 10, 3: 10
IIc: 1: 10, 2: 11, 3: 10
III: 4: 9, 5: 10. 6: 8

Thickness of key: 1.1 mm

Traverso by Naust (private collection, but lost)

This instrument was from a private Dutch owner, whose grandfather still played on it. There was some damage: the key was hammered in a curve, the key ring left and right of the channel broken off, there were some cracks in the head (which made the flute not playable), a piece of ivory was broken off the cap. But the mouth hole was in original condition and the middle joints had not been shortened. The bore profile is regular, there is not too much ovality and there are hardly gaps or steps in the bore at the connections of the joints.

The German woodwind maker Martin Wenner has restored this traverso and it appeared to have excellent qualities, such as a very good intonation. But this story has a tragic end: the owner wanted to sell the instrument, but her carrier bag with the instrument in it was stolen just when she was travelling to the buyer.



key and cap after and before restauration by Martin Wenner (Singen, Germany)

variations in colour on photos due to different light conditions



I have made a copy this traverso by Naust, which has excellent qualities. It must not be very difficult to make a corps de rechange to play the instrument in the low French baroque pitch (a = about 392 Hz).

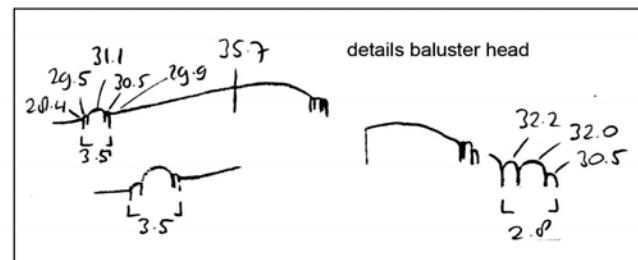
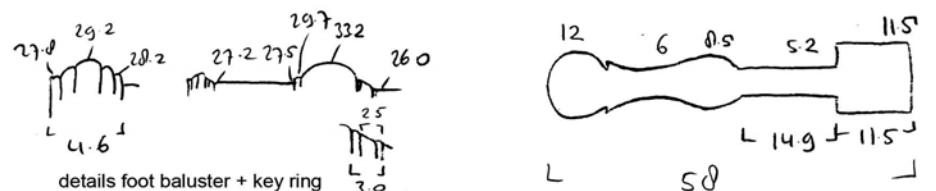
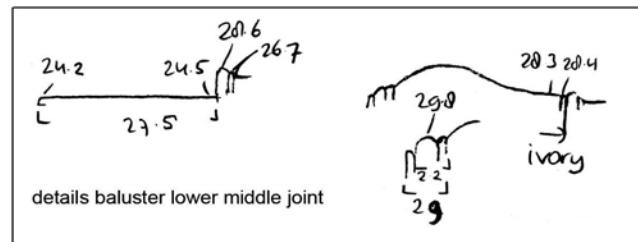
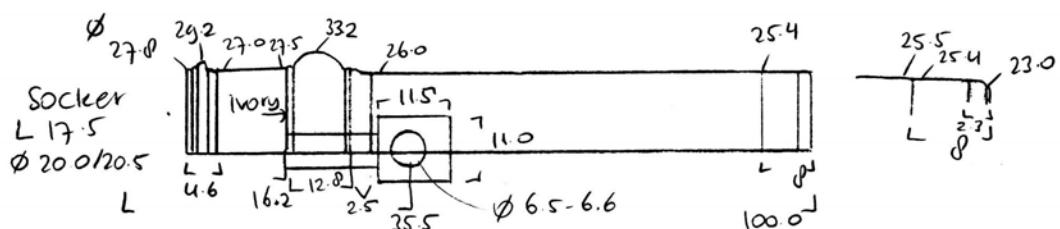
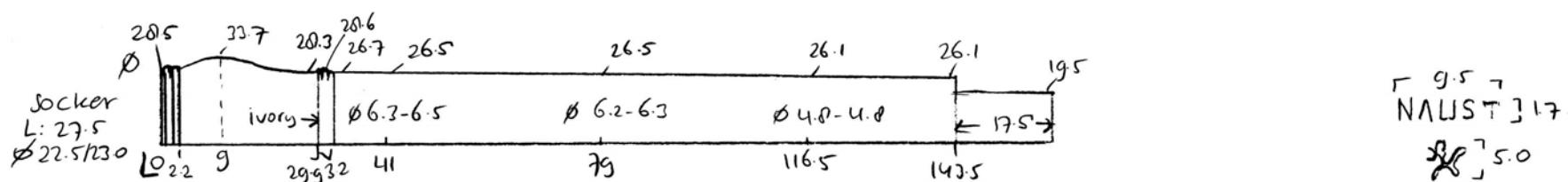
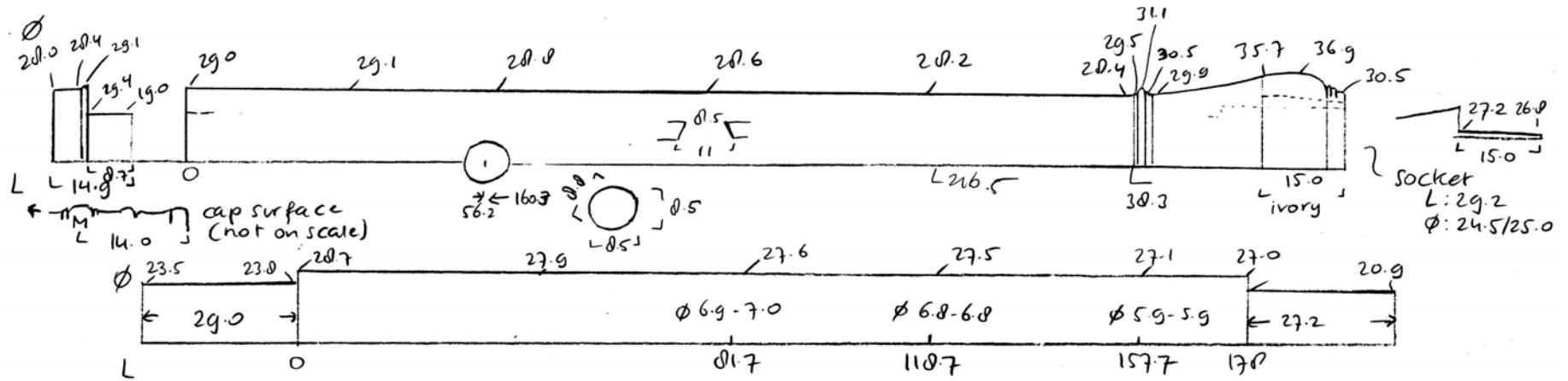
Measurement data of the traverso by Naust (from a Dutch private collection, but lost)

SL: $160.3 + 178 + 143.5 + 100.0 = 581.8$; pitch: about a1=400 Hz.

- I L (without cap): 216.5; SL: 160.3; socket: L 29.2, Ømax 25.0; bore: cylindrical, Ø 19.5 to 19.6 (slightly oval); mouth hole: L 8.5, W 8.5, diagonal 8.8, undercut to 11 (L), on copy 12 (which works well), Ø wood at mouth hole: 28.8; supposed cork position: at 28 mm from centre mouth hole
- II L (tenon 1 + SL + tenon 2): $29 + 178 + 27.2 = 234$
fingerholes (L from centre to upper shoulder, Ømin/Ømax of hole, Ø wood at hole):
hole 1: 81.7, 6.9/7.0, 27.6; hole 2: 118.7, 6.8/6.8, 27.5; hole 3: 5.9/5.9, 27.1; hole 1 and 2 moderately strong and hole 3 moderately undercut.
Ø wood at tenon 1: 23.5/23.8; upper shoulder: 28.7; lower shoulder: 27.0; tenon 2: 20.9 bore (Ø, Lmin/max): 19.2-0; 19.0-2/40; 18.9-46/50; 18.8-48/51; 18.6-59/60; 18.4-63/64; 18.2-66/84; 18.0-84/87; 17.8-99/hole 1; 17.6-112/115; 17.4-123/126; 17.2-136/139; 17.0-141/hole 2; 16.8-162/175; 16.6-180/hole 3; 16.4-186/191; 16.2-195/199; 16.0-206/208; 15.8-211/216; 15.6-221; 15.4-229; 15.3-230; 15.2-234/through; there is some tenon contraction between L0 and L40, the bore was there likely a bit wider (for instance from Ø 19.4 at L 0 to 19.0 at L 40).
- III L (SL + tenon): $143.5 + 17.5 = 161$; socket L 27.5, Ømax 23.0
fingerholes (L from centre to upper end, Ø-min/max of hole, Ø wood at hole):
hole 4: 41, 6.3/65, 26.5; hole 5: 79, 6.2/6.3, 26.5; hole 6: 116.5, 4.8/4.8, 26.1; hole 4 and 5 moderately strong to strongly undercut, hole 6 slightly undercut.
bore (Ø, Lmin/max, from upper end): 15.2-28/34; 15.0-56/60; 14.8-65/70; 14.6-84/86; 14.4-100; 14.2-108; 14.0-119/121; 13.8-134/137; 13.6-144/160; 13.5-160/end
Ø wood (or ivory) at socket rim: 27.8, baluster 33.7, lower shoulder 26.1, tenon end 19.5
- IV L 100.0; socket: L 17.5, Ømax 20.5; hole 7 at 35.5 from upper end, Ømin/max 6.5/6.6, Ø wood 26.0, hole 7 is moderately strong undercut; Ø wood at socket rim: 27.8, key ring 33.2, lower end 25.4; bore (Ø, Lmin/max, from lower end): 14.1-0; 14.0-5/12; 13.8-32/40; 13.7-70-end



cast of mouth hole undercutting



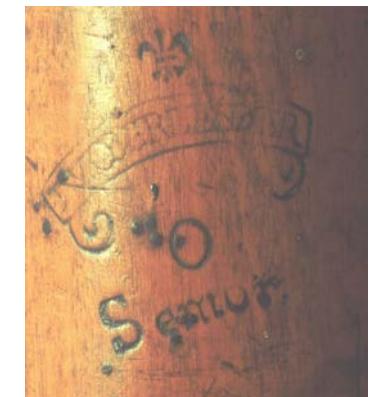
NAUST traverso in d (private collection, but lost),

Traverso by J.W. Oberlender Senior
Nederlands Openluchtmuseum Arnhem, Netherlands, Inv. No. 1264

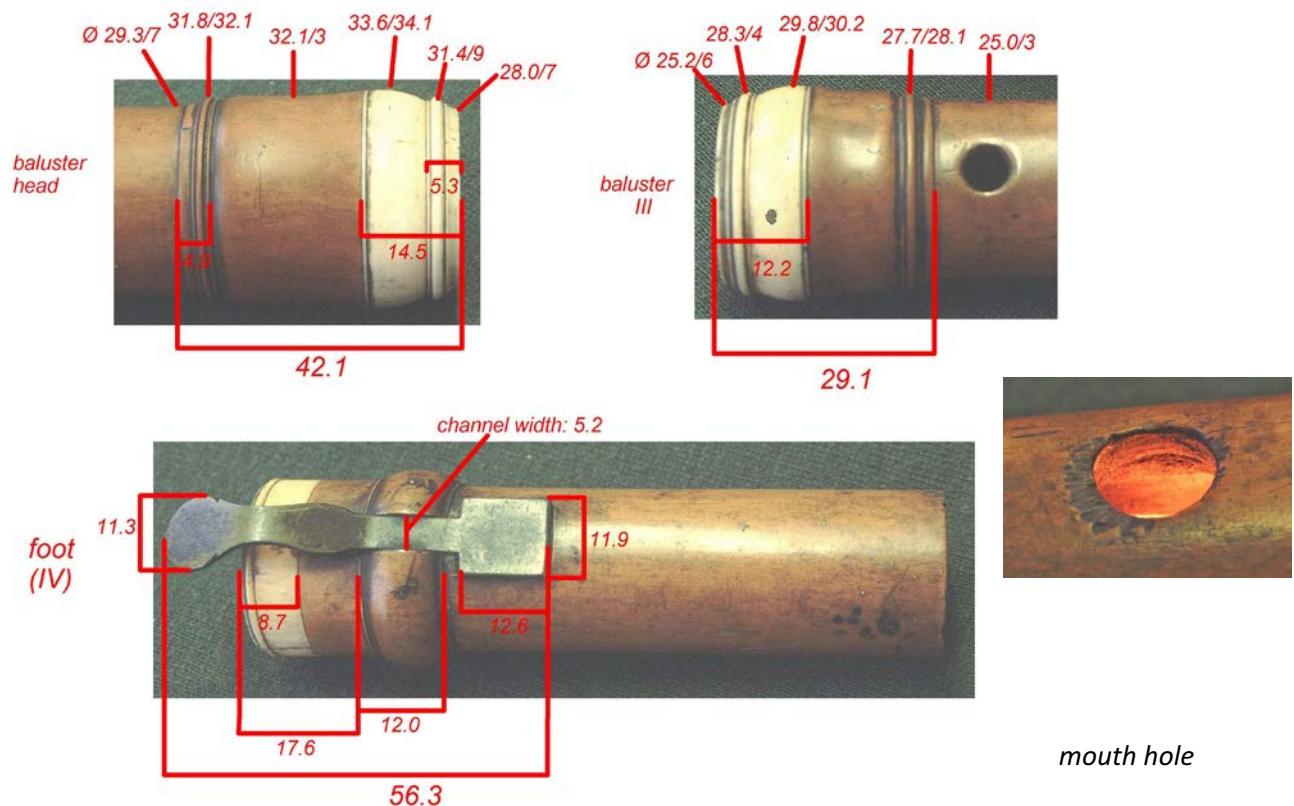
Traverso with one key, in light brown boxwood with ivory rings and a brass key. This is as far as I know the only instrument by Oberlender with the addition 'SENIOR' to the stamp. That means that the traverso is likely made after 1735 by father Johann Wilhelm Oberlender, when his son with the same name also began making woodwind instruments. The traverso was donated in 1924 to the museum by 'Wed. (widow) Lugten from Zevenbergen. The cap of the traverso is missing, and part II is likely shortened at both ends, but the original dimensions can be reconstructed. There is some more damage, such as a crack in the head (which is rather warped as well), to the mouth hole and to some ivory rings. All parts show some ovality in cross section. Characteristic for this traverso: the small round mouth hole high on the head (close to the cap end).



lower tenon from III and upper tenon from II



**Traverso by J.W. Oberlender Senior, Nederlands Openluchtmuseum, Arnhem - Netherlands,
Inv. No. 1264**
Measurements: Jan Bouterse, January 1999



$$SL: 178 + 137.1 \text{ (originally 154.4)} + 131.8 + 100.4 = 547.3 \text{ (originally 564.6)}$$

- I L 227 (back) / 230 (front); socket: L 27.5, Ømax 24.2; mouth hole (Ø WxL): 8.6x8.5, undercut to L 11, Ø wood at mouth hole: 29.4/29.6; bore of head: Ø 18.8/19.0 near socket end, 19.0/19.2 at mouth hole, 20.0/20.2 at cap end; cork position: 189.5 from lower end
- II L: $27.2 + 137.0/137.1 + 24.2 = 188.4$. There are obvious traces of shortening of this joint. At the upper tenon is a section visible with a deviating diameter with a length of circa 12.5 mm and at the lower tenon of 4.8 mm. That means that the original SL was 17.3 mm longer, thus 154.4 mm
fingerholes (L from centre to upper shoulder, Ømin/max of hole, Ø wood at hole):
hole 1: 47.0, 6.6x7.4 (undercut to L 9), 25.8/26.1; hole 2: 82.3, 6.8x7.1 (undercut to L 9), 25.0/25.3; hole 3: 119.3, 6.4x6.7 (undercut to L 8), 24.3/24.5
bore (Ø, Lmin/max, from upper end): 18.3-0; 18.0-8/11; 17.5-36/44; 17.3-54/57; 17.0-hole 1/102; 16.5-118/125; 16.0-hole 3/147; 15.5-165/167; 15.0-178/183; 15.0/15.3-end
- III L (SL + tenon): $131.8 + 15.5 = 147.3$; socket: L 25.9, Ømax 21.4
fingerholes (L from centre to upper end, Ø-min/max of hole, Ø wood at hole):
hole 4: 35.8, 6.3x6.4, 25.0/25.3; hole 5: 73.4, 6.0x6.0, 24.5/24.6; hole 6: 112.8, 5.3x5.3, 24.3/24.5
bore: (Ø/Lmin/ from upper end): 15.6-26; 15.5-30; 15.0-33/64; 14.5-85/103; 14.0-112/123; 13.5-136; 13.2-through; 13.2/13.4-end; all holes moderately undercut
- IV L 100.4; socket: L 16.0, Ø 19.4 to 19.2; hole 7 at 37.4 from upper end, Ø ca. 5.5, Ø wood at hole: 24.1
bore (Ø, Lmax, from lower end): 14.2/14.5-0; 14.0-16/22; 13.5-45/48; 13.0-60/65; 12.8/60 and through

Some tones were playable on this traverso, at a pitch of about 40 cents above a-415 Hz. I expect a pitch between a-410 and 415 Hz with the original length of the upper middle joint.

Traverso by Robbert Wijne, private collection, Netherlands
unstained boxwood, ivory mounts, silver key, screw cork, three corps de recharge (a-400, 415 and c. 430 Hz)

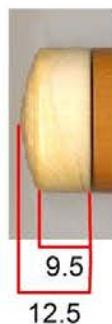
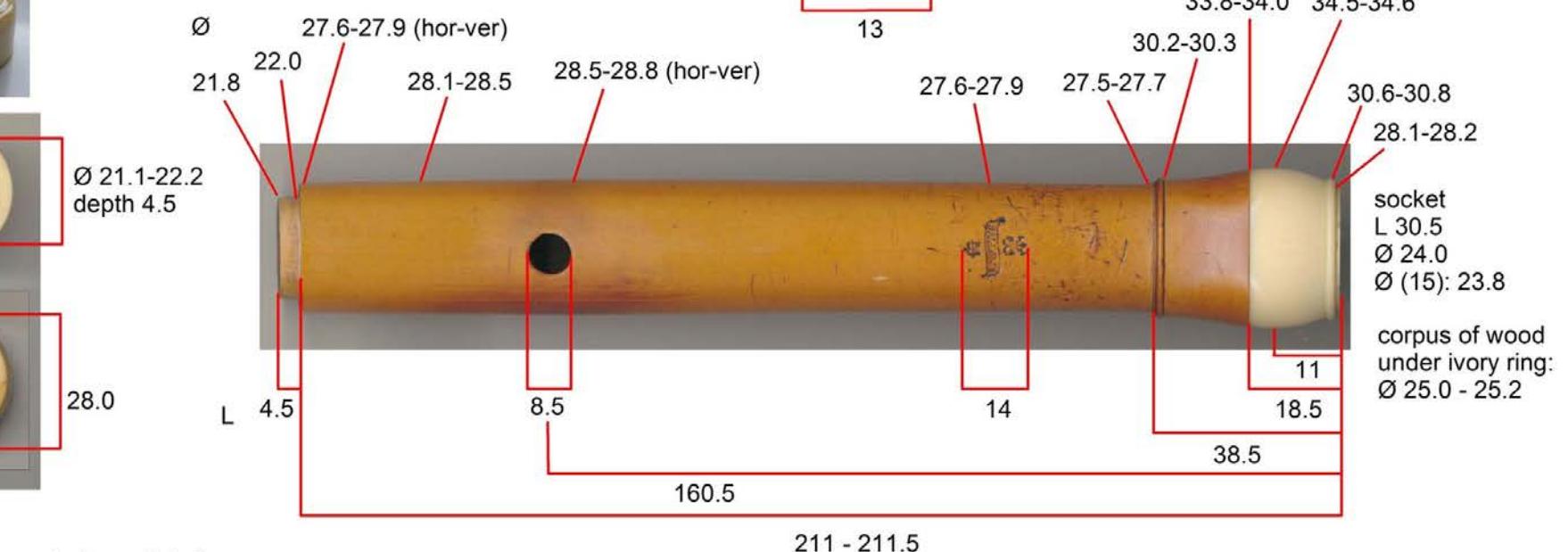
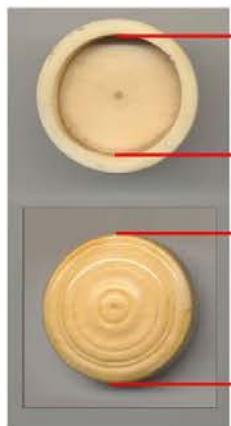


This is a very fine traverso, in excellent condition and with superb playing qualities, especially with the longest of the three unnumbered corps de recharge. These corps differ rather much in length; with the second corps you can play at the useful pitch of a-415 Hz (only d1 and d2 are a bit too flat); the third and shortest corps is rather uneven in pitch.



Robbert (or Robert) Wijne (or Wyne) lived from 1698 to 1774 in the Dutch city of Nijmegen, close to the border with Germany. He has made all sorts of woodwind instruments: recorders, traversos, oboes and maybe also bassoons and racketts. Wijne made one keyed traversos in boxwood (with and without ivory rings), ebony and ivory. There is also a 'pypers fluit' by Robbert Wijne, a flute with a cylindrical bore and with no key(s).

Flauto traverso van Robbert Wijne (Nijmegen, 1698-1774)
 privaten collection, Netherlands
 measurements: Jan Bouterse (1981 en 2013)

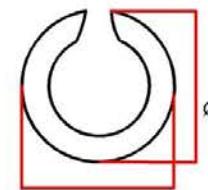


cast of mouth hole

8.5
ca. 12 length
9.5
12.5



edge of mouth hole,
slightly rounded, small damage

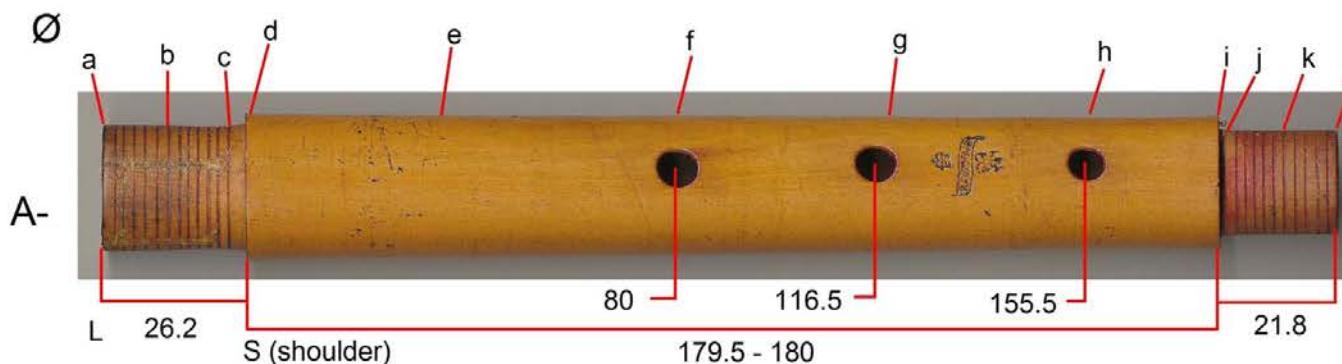


Ø-ver (v)

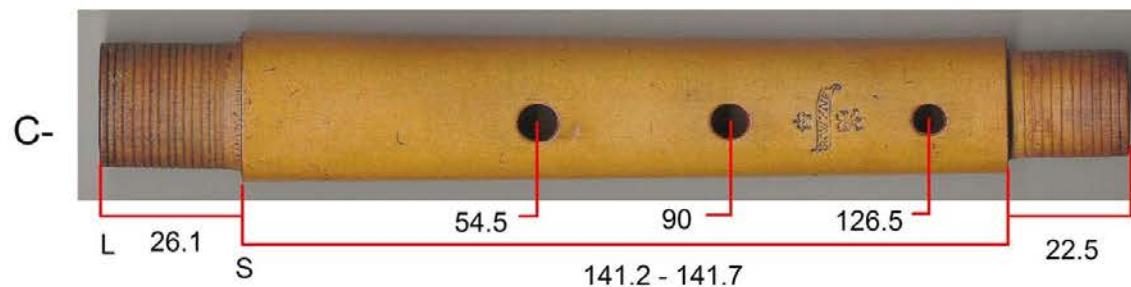
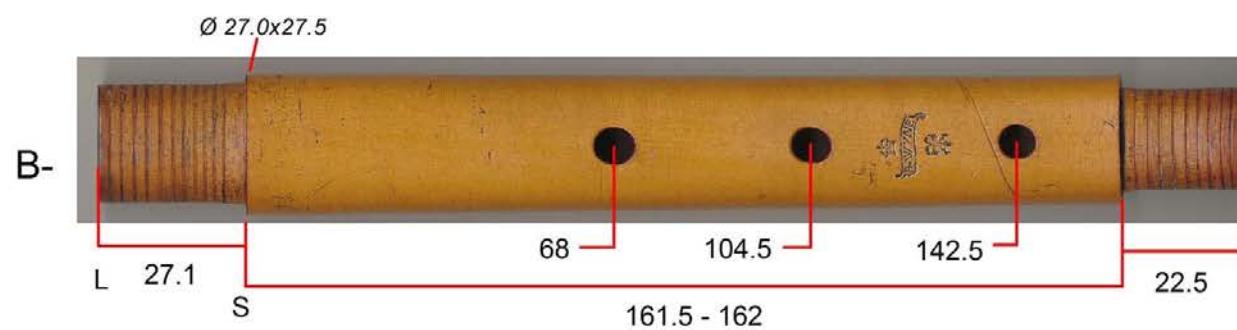
Ø-hor (h)



traverso in unstained boxwood, three corps de rechange, ivory rings and cap and a silver key



general shape of undercutting of fingerholes
length cross



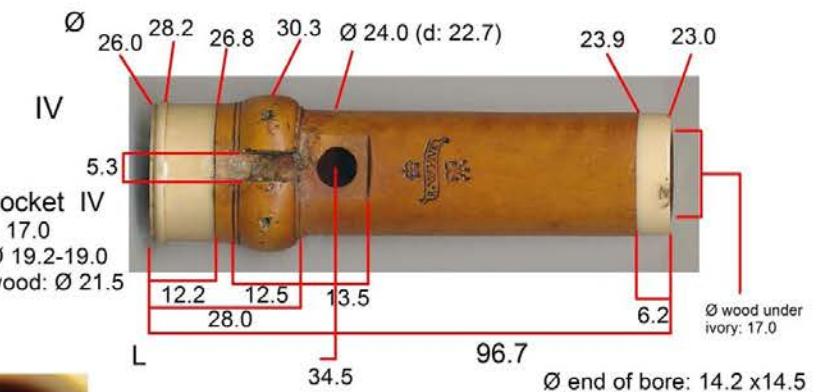
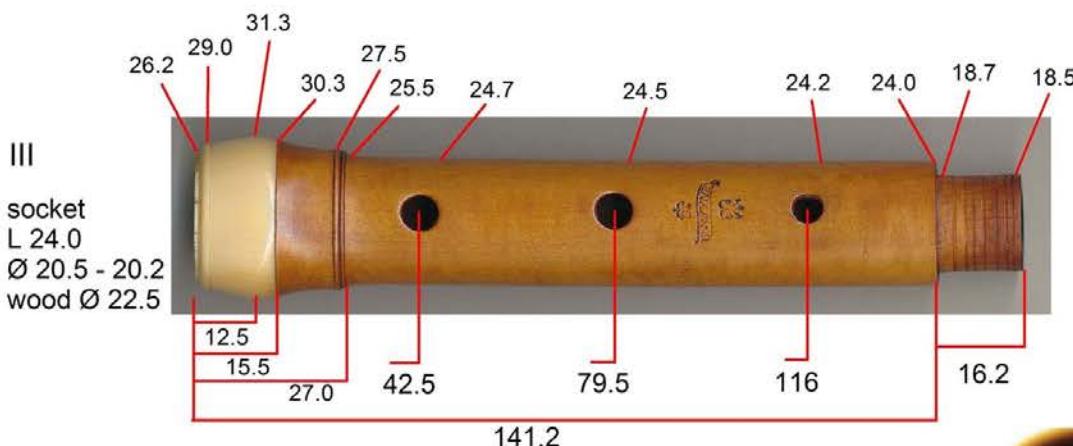
positions of fingerholes measured from centre hole to shoulder

diameter of wood of the corps

	A	B	C
\emptyset min-max			
a:	23.5-24.0	22.7-23.2	22.9-23.2
b:	23.0-23.5	23.0-23.5	22.9-23.1
c:	23.3-23.6	23.5-23.7	23.3-23.5
d:	27.6-27.7	27.0-27.5	27.4-27.5
e:	26.7	26.7	26.8
f:	26.0-26.3	26.0	26.2
g:	25.5	25.5	25.4
h:	24.5	25.0	25.0
i:	24.8	24.9	25.1
j:	19.6-19.8	20.0-20.2	19.6-19.9
k:	19.5	19.3-19.7	19.5-19.6
l:	19.5	19.4-20.0	19.3-19.5



flute parts in old leather (pigskin?) cover



fingerholes: Ø L (length) - W (cross) and U: undercutting in length direction rounded off to: 0.1 - 0.1 - 0.5 mm

corps de rechange (IIA, IIB en IIC)

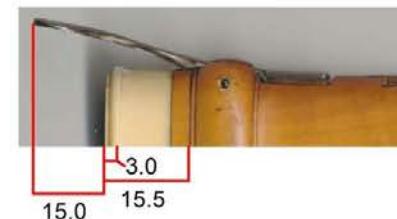
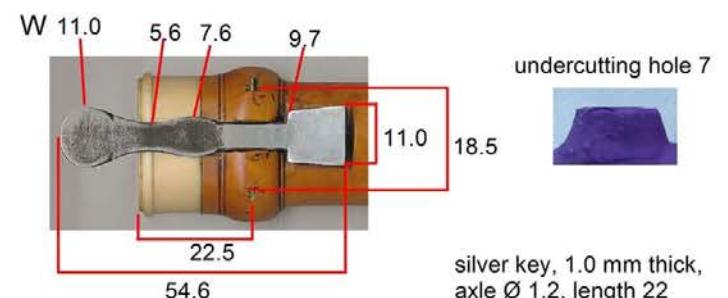
A 1:	7.4 - 6.6 UL10	B 1:	7.5 - 6.7 UL11	C 1:	7.1 - 6.6 UL 9.5
A 2:	7.0 - 6.6 UL 9	B 2:	7.0 - 6.3 UL 9.5	C 2:	6.8 - 6.2 UL 9.5
A 3:	6.4 - 6.1 UL 9	B 3:	6.6 - 6.1 UL 9	C 3:	5.9 - 5.5 UL 9

III (lower middle joint)

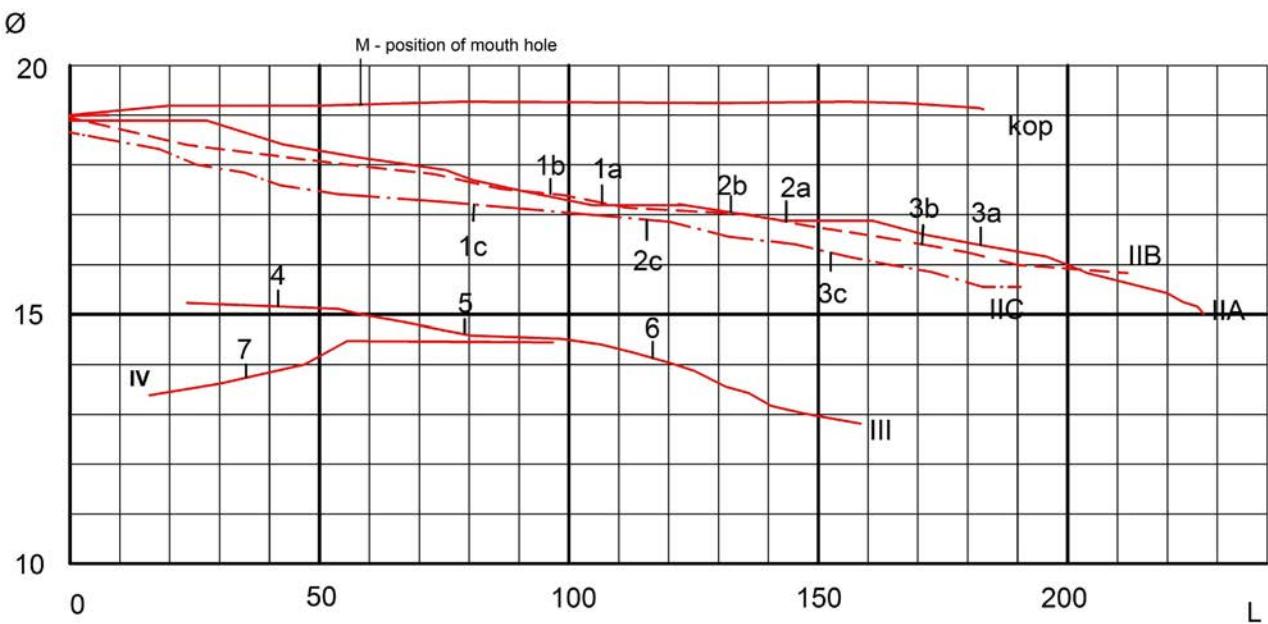
4:	7.0 - 6.4 UL 9
5:	6.8 - 6.8 UL 9
6:	5.1 - 5.3 UL 6.5

IV (foot)

7:	7.3 - 7.3 UL 9
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abbreviations:
Ø = diameter
L = length
w = width



Graphs (schematic) of the bore profiles of the traverso by Robbert Wijne

Traverso by Robbert Wijne, private collection, Netherlands - bore measurements

- I The bore of the head was originally cylindrical, with a (maximum) diameter of 19.3 to 19.4; but there has been some shrinking (contraction) at both ends: to Ø 19.0 at the cap end and 19.2 close to the socket.
- IIA Ø, Lmax-Lmin, from upper end:
19.0x18.2: opening; 19.0: 0-8; 18.8: 0-28; 18.6: 0-28; 18.4: 0-43; 18.2: 50-58; 18.0: 67-68; 17.8: 71-75; 17.6: 81; 17.4: 88-92; 17.2: 105-135; 17.0: 120; 16.8: 142-161; 16.6: 162-172; 16.4: 168-hole 3; 16.2: 180-195; 16.0: 186-200; 15.8: 200-203; 15.6: 210-215; 15.4: 214-220; 15.2: 222; 15.0: 223; 15.0x15.2: end
- IIB 19.0x18.4: opening; 19.0: 0-3; 18.8: 0-5; 18.6: 0-15; 18.4: 0-23; 18.2: 20-40; 18.0: 52-54; 17.8: 66-72; 17.6: 81-84; 17.4: 92-99 (hole 1); 17.2: 111; 17.0: 128-135 (hole 2); 16.8: 147; 16.6: 159-163; 16.4: 167-172; 16.2: 174-180; 16.0: 178-190; 15.8: 185-212 (through); 15.6: 190-through; 15.4: 200-through; 16.0x15.4: end
- IIC 18.6x18.4: opening; 18.6: 0-7; 18.4: 0-28; 18.2: 13-18; 18.0: 25; 17.8: 33-34; 17.6: 41; 17.4: 53; 17.2: 64-74; 17.0: 104; 16.8: 122-hole 2; 16.6: 132; 16.4: 142-145; 16.2: 153-hole 3; 16.0: 161-163; 15.8: 172; 15.6: 182-through; 15.4x15.6: end
- III 15.2: 24; 15.1: 47-53; 15.0: 53-57; 14.8: 60-67; 14.7: hole 5; 14.6: 92-98; 14.4: 100-104; 14.2: 110-112; 14.0: 114-120; 13.8: 120-124; 13.6: 128-131; 13.4: 135-137; 13.2: 140; 13.0: 144-146; 12.8: 148-end (157.5); 12.7x12.9: end.
- IV: Ø lower end: 14.2x14.5: Ø, L (from upper end!) 14.4: 60-97; 14.2: 50; 14.0: 42; 13.8: 32-38; 13.6: 30; 13.4: 23-26; 13.2: 18

Some pitch measurements (cork at 27 mm from centre of mouth hole)

- with IIA, tuner set at a1=400 Hz, deviations in cents

d1: -5	d2: -5	d3: 0 (both fingerings)	e1: 0	e2: +10	e3: 0
f1: +15	f2: +20	f3: + 5 (1 2 4 5h . 7)	f#1: -10	f#: -10	f#: 0
g1: 0	g2: 0	g3: +5	a1: +10	a2: + 20	
b1: +10	b2: +15	b-flat2: +20, a#: +15 (1 . 3)			
c2: 0	c3: 0 (. 2 . 3 4 5 6 7)		c#2: 0	c#3: +10	
- with IIB, tuner set at a1=415 Hz.

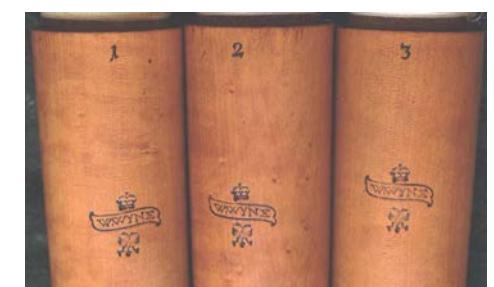
d1: -10	d2: -10	d3: -5 (met . 2 3 7: 0)	e1: -5	e2: -5	e3: 0
f#1: -10	f#2: -10	f#3: difficult			
g1: -5	g2: 0	g3: 0 (difficult)	a1: +10	a2: +10	
b1: -5	b2: -5	c#: -10			
- with IIC, tuner set at a1- = 440 Hz

d1: -40	e1: -15	g1: 0	a1: -5	b1: -10	c#2: -20
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Traverso by W. Wijne, Sammlung Jehle, Schloss Lautingen (Germany), inventory number 63 (instrument is lost)
boxwood, ivory mounts, silver key, screw cork, three corps de recharge (a-410, 418 and 425 Hz)



III



cap



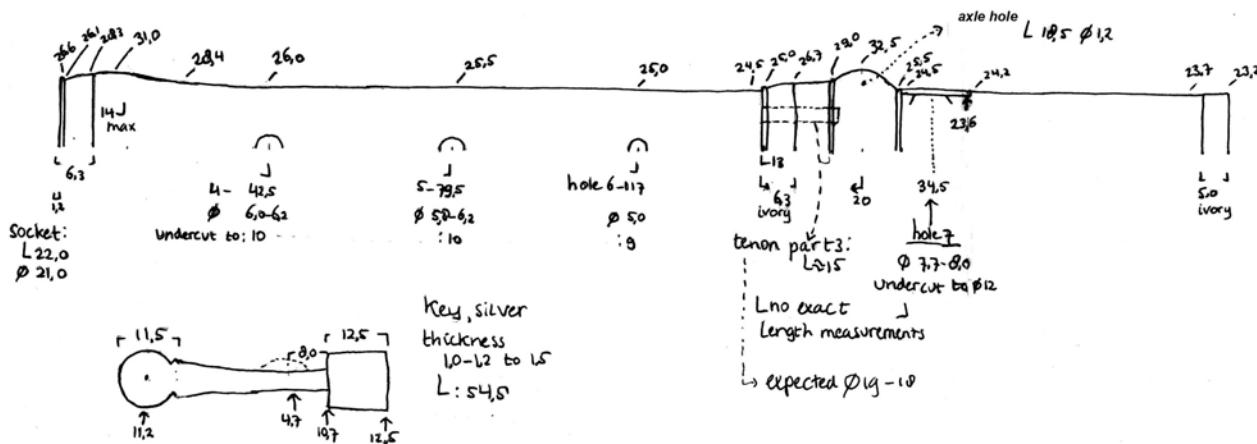
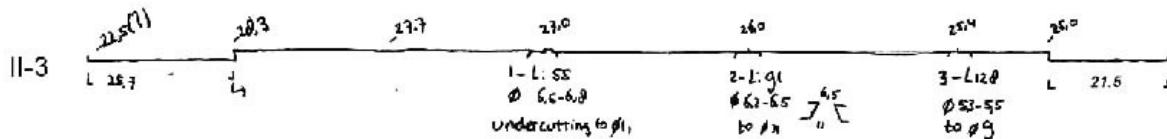
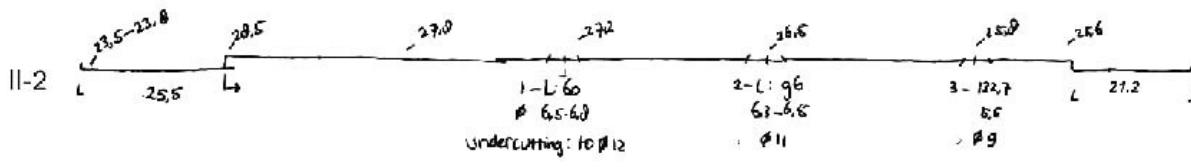
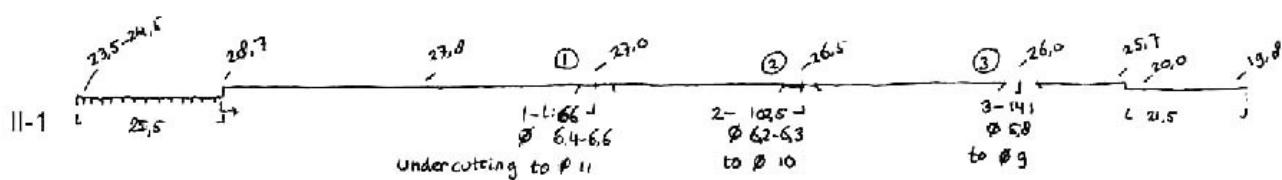
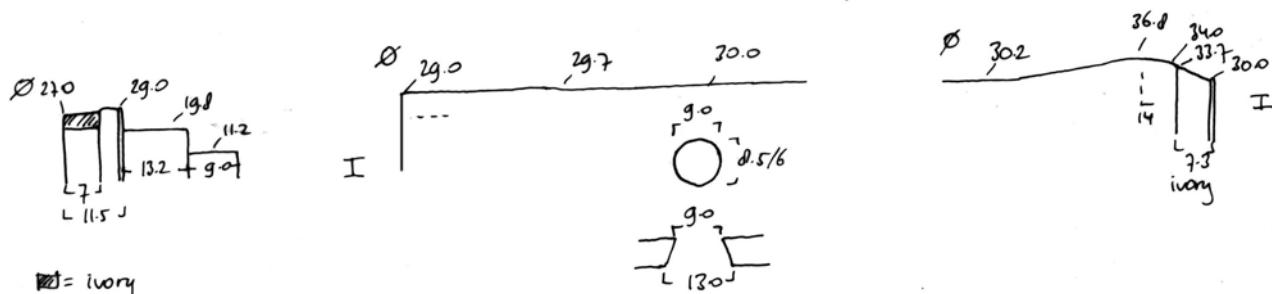
This is - or was - a very fine instrument, beautifully finished and in excellent condition. There is only clear warping of the wood at the upper tenons of the three corps de recharge. There was a problem at my investigation, parts III and IV could not be separated at that time.

It is likely that Willem Wijne (1730-1816) was the son of Robbert Wijne, who was a very skilled woodwind maker. Despite he lived for a long time, it is surprising that only a very few instruments of Willem did survive (apart from this traverso a bassoon, a racket and perhaps a double recorder).

The traverso is likely to be made after 1750, and shows a combination of old and new elements.

New: the 'smooth' balusters and the screw cork, old are the wide bore profile and only slightly oval mouth hole.

I am told that the flute was stolen (in 2001) from the museum, apparently by a young Frenchman whose mother has thrown away the instrument in a river (Rhône) after she had discovered what her son has done. So this beautiful traverso is likely lost for ever.



**Traverso by W. Wijne, Sammlung Jehle, Schloss Lautingen (Germany), inventory number 63
(instrument is lost after burglary in museum)**

SL: 166.5 + 160/149.5/142 + 142 + 94 = 562.5/552/544.5

- I L (without cap): 224; SL: 166.5; socket: L 26.5, Ømax 24.2/24.5; bore: cylindrical, Ø 19.5/19.6 at cap end to L 110, Ø 19.4 goes through; cork at L 193 from lower end mouth hole: L 9.0, W 8.5/8.6 undercut to 13 (L), Ø wood at mouth hole: 30.0
- II-1 L (tenon 1 + SL + tenon 2): 25.5 + 160 + 21.5 = 207
fingerholes (L from upper shoulder, Ømin/max of hole, L of undercutting, Ø wood at hole)
hole 1: 66, 6.4/6.6, 11, 27.0; hole 2: 102.5, 6.2/6.3, 10, 26.5; hole 3: 141, 5.8/5.8, 9, 26.0
bore (Ø, Lmin/max, from upper end): 19.5-0/2; 19.2-0/7; 19.0-0/13; 18.6-0/55; 18.4-2/63;
18.0-80/85; 17.8-88/hole 1; 17.6-96/105; 17.4-107/115; 17.2-119/hole 2; 17.0-139/141; 16.8-
155; 16.6-161/164; 16.4-170/hole 3; 16.2-177; 16.0-181; 15.8-185/186; 15.6-192; 15.4-
19.2/through; end: Ø 15.0/15.4
- II-2 fingerholes (L from upper shoulder, Ømin/max of hole, L of undercutting, Ø wood at hole)
hole 1: 60, 6.5/6.8, 12, 27.2; hole 2: 96, 6.3/6.5, 11, 26.5; hole 3: 132.7, 5.5/5.5, 9, 25.8
bore (Ø, Lmin/max, from upper end): 18.8-0/2; 18.6-0/9; 18.4-0/42; 18.2-50; 18.0-59/63;
17.8-68/72; 17.6-85/hole 1; 17.4-91/95; 17.2-104; 17.0-115/125; 16.8-139/141; 16.6-148/150;
16.4-160/161; 16.2-165/168; 16.0-170/173; 15.8-174/176; 15.6-177-end; 154-182/end; end: Ø
15.0/15.5
- II-3 fingerholes (L from upper shoulder, Ømin/max of hole, L of undercutting, Ø wood at hole)
hole 1: 55, 6.6/6.8, 11, 27.0; hole 2: 91, 6.2/6.5, 11, 26.0; hole 3: 128, 5.3/5.5, 9, 25.4
bore (Ø, Lmin/max, from upper end): 18.2-0/2; 18.0-44/45; 17.8-50; 17.6-65/85; 17.4-
8491/95; 17.2-89/hole 1; 17.0-96/98; 16.8-116/hole 2; 16.6: 128/132; 16.4-140/145; 16.2-
155/158; 16.0-162; 15.8-166/170; 15.6-174; 15.4-end; end: Ø 15.1/15.5
- III SL: 142, socket: L 22.0, Ø 21.0; no information about tenon to foot (L about 15 mm)
fingerholes (L from upper end, Ømin/max of hole, L of undercutting, Ø wood at hole)
hole 4: 42.5, 6.0/6.2, 10, 26.0; hole 5: 79.5, 5.8/6.2, 10, 25.5; hole 6: 117, 5.0/5.0, 9, 25.0
bore (Ø, Lmin/max, from upper end): 15.8-22; 15.6-23/32; 15.4-40/hole 4; 15.2-41/51; 15.0-
70/hole 5; 14.8-81/85; 14.6-92/94; 14.4-101; 14.2-120/124; 14.0-129/132; 13.8-136/138;
13.6-141; 13.4-141/144; 13.2- 146/through; 13.1-149/through
- IV L: 94, no information about socket (L about 15 mm)
hole 7 at L 34,5 from upper end, Ø 7.7/8.0, undercut to L 12; Ø wood at hole: 24.2
bore (Ø, Lmin/max, from lower end): 14.6-0; 14.4-4; 14.2-42; 14.0-59/64; 13.8-65/71; 13.6-
74/79; 13.4-79