Fomrhi Comm. 2087 **Philippe Allain-Dupré**

Measurements of Jörg Wier Crumhorns

Two incomplete Jörg Wier crumhorns have been discovered in 2009 in a private collection in the Madrid area (MAD1 and MAD2). They were presented to me as two *orlos*, a discant in g and a tenor-alt in c, both missing their wind caps. Also another tenor was discovered in 2006 in Ronse, Belgium.

In 2015 I published an article in *Early Music* titled:

Three newly discovered Ieorg Wier crumhorns
Early Music 2015 43 (3): 471-491

I offer to FoMRHI readers the opportunity to get all measurements I collected as I promised in Early Music p. 480. To understand all the tables it is necessary to firstly read my EM article.

In order to compare these two crumhorns to their cousins, 29 crumhorns previously described, I have tried to collect as much information as possible:

I have measured three Jörg Wier crumhorns in *Brussels MIM*, three in *Augsburg MaximilianMuseum* and one in *Ronse MUST (MUSeum for Textile)*. Renato Meucci invited me to spend two days with the seven in *Rome Museo degli Strumenti musicali*. I have kindly been provided with measurements of the three JW crumhorns from *Vienna Sammlung alter Musikinstrumente des Kunsthistorischen Museums* by Beatrix Darmstaedter and one from *Leipzig Museum* by Eszter Fontana. Information on the four Meran crumhorns is taken from Roos's article in GSJ XXXII and from 1983 measurements kindly provided by Ture Bergström.
I have been able to obtain accurate measurements, unpublished, of all the five *Salamanca* crumhorns by John Hanchet who measured them together with the shawms in 1985. Two of them show measurements identical to those of the newly discovered crumhorns MAD 1 and MAD 2.
AUG 3010 was on loan to *the Badisches Landesmuseum, Karlsruhe*, for an exhibition when I visited the *Augsburg MaximilianMuseum*, so I only have Rainer Weber's measurements for this instrument. It is in any case very similar to AUG 3011, AUG 3009, SLM 3 and MAD 2
I got information for the great bass in *Prague* from Emanuele Gadaleta and Frantisek Ibl, together with the two measurements published by Boydell. It is a giant and the only known great bass in BBflat at written pitch.
The smallest Salamanca crumhorn, the only known exilent or soprano crumhorn made by Jörg Wier, is unfortunately broken at the ends, tenon and curve. This instrument will be only listed, but not compared to the others, since many of its measurements are missing.

Table 1 shows how all the measurements were collected on MAD1 and MAD2. The measurements which interest us in this study are in bold type.
The measurements and main characteristics of the 31 Jörg Wier crumhorns have been listed in table 2.

NOTES ABOUT MEASUREMENTS

The shape of the crumhorn makes measurements difficult. The large ring of the cotton reel prevents the use of a hard ruler, and because of the curve, measurements of tone hole location and total length vary significantly depending on whether measurements are taken from the front or the back. Thus the computer tomography (CT) method offers the best solution, when a scanner is available. In museums where this method is not available I have therefore developed an easier approach: I introduce a soft and flexible electric wire (flex) of 4 or 5 mm in diameter until its end is visible in the middle of the hole I want to measure. I then draw a mark on this wire at the top of the tenon, then when the wire is withdrawn I can measure precisely the acoustical length[1] of the hole with a hard ruler. Of course, if the hole is drilled at an angle, which occurs frequently on bass instruments, this measurement will differ a lot from the exterior measurement which does not take this angle into account, and which is often imprecise due to the curve of the instrument. This occurs on finger and key holes, but the vent and slider holes are usually drilled perpendicularly to the bore. Therefore I have used this method of measurement only on vent holes and slider holes, and also for measuring the total length of the tube.
When three measurements are given in tables (inside curve, bore measurement and outside curve), these take into account the three possibilities. For instance, this gives three results for Brussels B 2313: 690, 700 and 710mm for the first slider hole.
Most scholars have taken measurements based on the inside curve, facing the holes. Barra Boydell, on the other hand, explains that he took the measurements at the back, opposite the vent hole or the first sliding key on an extended bass (second figure marked b in his table, p.138). This may explain why most of his measurements are larger than those of other scholars. [2]

My measurement method, almost as accurate as the CT method, always gives a number between those two methods: the inside curve facing the holes and the outside curve, opposite the holes.
For example, compare two sets of measurements of AUG 3011:

Museum N°	Measurer	Size	HOLE 2	HOLE 5	5-2 difference	HOLE 6	1st vhole	Total Length
AUG 3011	Weber	Tenor	*169*	*277*	*108*	*313*	*416*	*778*
AUG 3011	PAD	Tenor	168,5	277	108,5	312	422	744

It seems clear that the tone hole locations measured by external rule are almost the same. Rainer Weber's measurement of the acoustical length to the first vent hole by the inner curve is 6mm shorter than mine, measured inside the bore with flex. His measurement of the total length, done in a similar way to Barra Boydell on the back of the instrument, (what I call the outside curve), gives a much longer total length than mine which is done inside the bore.

The Computer Tomography method (abreviated as CT in the tables) has been applied to all six crumhorns of *the Sammlung alter Musikinstrumente des Kunsthistorischen Museums,*

[1] "Acoustical length of the hole" is the distance from the top of the cotton reel to the centre of the hole. The actual sounding length of each note is determined by the (missing) reed and staple. I use the term "sounding length" to describe the distance from the top of the tenon to first vent hole, which determines the fundamental note of the instrument.
[2] Boydell pp.139-147.

Vienna in the FWF-research-project "Cornetts and crumhorns of the SAM". Unfortunately, these measurements have not yet been published, and only the measurements of sixth hole location and total length have appeared in the presentation of this method given at the Jussieu proceedings of the Conference on Interdisciplinary Musicology (CIM).[3]

I have recorded in table 2 the Basic Unit (B.U.) which is the distance between holes 2 and 5, i.e. the centre hole of each group of three finger holes. These two holes are very important to enable comparison between the cousins:

- Situated at the centre of each hand, they do not follow any stretch requirement, so their distance gives an accurate indication of the pitch of the crumhorn.
- If the original cotton reel is missing (as on Merano 6848), or the lower part of the instrument broken (as with SLM1), it still provides evidence of the maker's intentions.

You may read in my EM article that the study of this B.U. reveals exceptional proportions and correlations with length standards.

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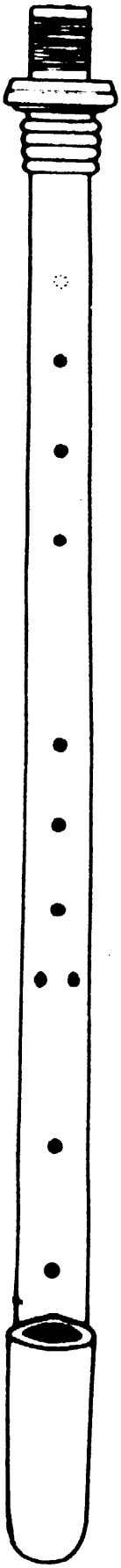
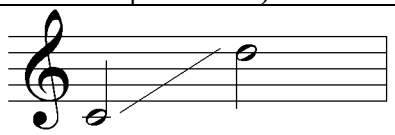
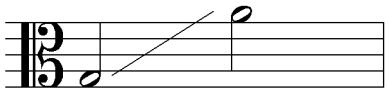
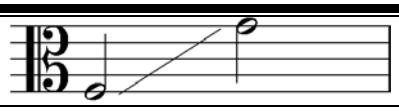
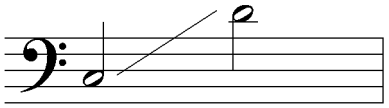
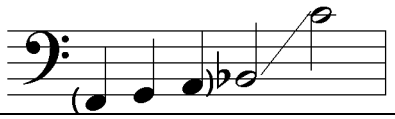
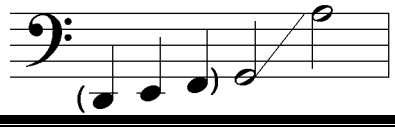
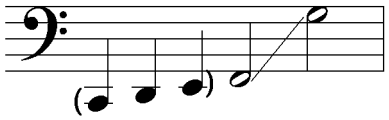
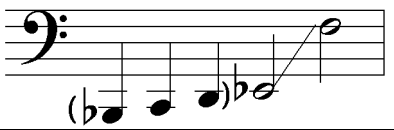
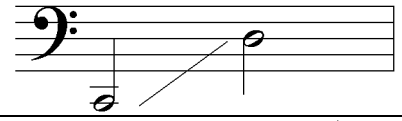
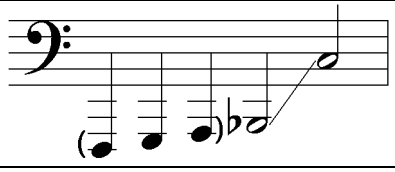
[3] Beatrix Darmstädter, Dietmar Salaberger**,** 'Integral Curve versus Separate Bell. New Aspects on the Construction Modes of Crumhorns', *Jussieu proceedings (*Paris, 2009).

Table 1 Measurements of the 2 newly-discovered Jorg Wier crumhorns signed ?



All measurements in mm.	MAD 1	MAD 2
Measured by:	PAD	PAD
Socket for staple depth Diameter	29,5 8-7,5	36 9,5-9
Ext Diameter tenon	19,5-20,5	23- 24,5
Tenon length	25	32
Max. diameter of rings	33,6	39,5
Min. diameter	22,2	26,5
Cotton reel length (rings) Total length with tenon	31,5 56	34,5 66,5
Ext. diameter of body	19,5	23,5
Acoustical length of back hole	81	120
Hole diameter	3,4	4
A.L. hole 1	93,5	139
Diameter	3,1	3,9
A.L. hole 2	**115**	**169**
Diameter	3,5	4,3
A.L. hole 3	135	197
Diameter	3,5	4,3 10°S
Ext diameter between the two sets of finger holes **5-2 difference (Basic unit)**	20.8 **70**	25,2 **109**
A.L. hole 4	160	239
Diameter	3,6	4,3
A.L. hole 5	**185**	**278**
Diameter	4	4,5 15°S
A.L. hole 6	**210** **212 by bore**	**315** **318 by bore**
Diameter	4 10°S	4,6 20°S
A.L. hole 7	239	352
Diameter hole7	3,8 40°S	4,3 40°S
Sounding length to 1st venthole		
Inside curve	278	423
Bore measurement (using flex)	**283**	**426**
Outside curve	285	429
Diameter of venthole	3.8	4.3
Ext. diameter at 2nd vent hole	21,2	26,5
A. L. 2nd vent hole	325	502
Diameter 2nd vent hole	3,8	4,3
External Diameter of bell	23,7x24	32x30,8
Internal Diameter of bell	16,5	21
Inside length of bell	55	75
Height (excluding cap, reed, or staple) Width	385 180	558 255
Total length of bore, from tenon to bell (using flex)	**490 by bore**	**735 by bore**
Bore diameter	5	7

Table 2: List of 31 Jörg Wier crumhorns classified by sizes, pitches and ranges, with the new nomenclature

Location	Museum N°	Size and brand	Unit	1st venthole or 1st slider	Pitch in Hz	Range (extensions are shown by quarter notes)
Salamanca	SLM 1	Exilent in c'	***60,5***	*?*		
Rome	689	Discant alla 4ta	**53,5**	208	458	
Rome	690	Discant alla 4ta	**54**	208		
Merano	6846	Discant in g	***66***	*256 259*	?	
Salamanca	SLM 2	Discant in g	***69,5***	*278*	458	
Madrid	MAD 1	Discant in g	**70**	283		
Rome	688	Tenor alla 4ta	**82**	314	458	
Merano	6847	Tenor	***100***	*383 385*	?	
Vienna	SAM 206	Tenor	***107***	*403*	?	
Brussels	2311	Tenor	**107,5**	412	470	
Ronse, B.	MUST	Tenor	**107,5**	412		
Augsburg	3009	Tenor	**106**	422	458	
Augsburg	3010	Tenor	***108***	*416?*		
Augsburg	3011	Tenor	**108,5**	422		
Salamanca	SLM 3	Tenor	***108,5***	*427*		
Madrid	MAD 2	Tenor	**109**	426		
Rome	687	Bass alla 4ta	**123**	502	458	
Rome	686	E.bass alla 4ta	**123**	545		
Merano	6848	Bass in G	***130***	*580*	?	
Vienna	SAM 679	E.bass in G	***132***	*630*		
Merano	6849	E.bass	***142***	*639 642*	?	
Brussels	2312	Bass	**157,5**	645	470	
Brussels	2313	E.bass	**158**	700		
Augsburg	3008	E.bass	**160**	715	458	
Leipzig	1429	E.bass	***163***	*685*		
Salamanca	SLM 4	Bass	***164***	*640*		
Salamanca	SLM 5	E.bass	***165***	*721*		
Rome	685	G.bass alla 4ta	**180**	697	458	
Rome	684	E.G. bass alla 4ta and	**180**	780		
Vienna	SAM 678	G.bass in C	***200***	*770*	?	
Prague	489E	E.G.bass in BB	***248***	*1056 1090*	?	

E.bass= extended bass, G.bass = great bass, E.G.bass = extended great bass. Bass pairs are indicated by a crotchet

Measurements of the 7 descants and small tenors Jorg Wier crumhorns signed ©Philippe Allain-Dupré

All measurements in mm.		Rome 690	Rome 689	Meran 6846	MAD 1	SLM2	ROME 688	Meran 6847
Measured by:	Exilent SLM1 is Broken	PAD 17/11/2010	PAD 17/11/2010	*Bergström 1983*	PAD	*Hanchet 1985*	PAD 11/2010	*Bergström 1983*
Socket for staple depth Diameter		25 6.5-7	25 6.5-7.3	*26* *7,4*	29,5 8-7,5		34 8.8x8.6	*33* *9.9*
Ext Diameter tenon		18- 19	18- 19	*19** *20*	19,5- 20,5	*21,2*	21.2	*22.4* *23.3*
Tenon length		21.2	21.3	*23*	25	*25?brok*	25.8	*28.5*
Max. diameter of rings		30.5	31	*33*	33,6	*37.7*	35.5	*39.5*
Min. diameter		19.3	? (wire)	*21.5*	22,2	*23,1*	25	*24.7*
Cotton reel length (rings) Total length with tenon		24.5 45.6	24 46	*28.5* *51.5*	31,5 56	*30,5* *49,5+6?*	34.5 60.3	*34* *62.5*
Ext. diameter of body		19	19	*19.3/19.6*	19,5	*19,4*	21.6	*22.7*
Acoustical length of back hole		55.5	55	*73*	81	*83*	84.5	*105* *10°N*
Hole diameter		3.5	3.5	*3 ,3* *10°N*	3,4	*3*	3.7	*3,8-4*
A.L. hole 1		66.5	66	*85*	93,5	*93*	100	*122*
Diameter		3.2	3.2	*3 ,1*	3,1	*3,1*	4	*4* *5°S*
A.L. hole 2		81.5	81	*105*	115	*115*	**122.5**	***147***
Diameter		3.3	3.4	*3 ,3*	3,5	*3,3*	4	*4* *5°S*
A.L. hole 3		97.5	97.5	*122*	135	*135,5*	147	*175*
Diameter		4.2	4.05	*3 ,5*	3,5	*3,4*	4.1	*4* *5°S*
Ext diameter between the two sets of holes		20	19.5	*21*	20.8	*20.5-20,7*	23.3	*25*
DIFFERENCE 5-2=BU		**53.5**	**54**	***66***	**70**	***69.5***	**82**	***99***
A.L. hole 4		116	116	*147*	160	*161*	177	*211*
Diameter		4.1	4.05	*3 ,5*	3,6	*3,6*	4.15	*4* *5°S*
A.L. hole 5		135	135	*171*	185	*184,5*	**204.5**	***246***
Diameter		3.9	4	*3 ,6*	4	*3,8*	4.3	*4.2-4.5* *10°S*
A.L. hole 6 **Bore measurement (flex)**		155.5 **156**	156.5 **157**	***196***	210 **212**	***209,5***	236 **237**	*278*
Diameter		4	4.2	*3 ,7*	4 10°S	*3,7*	4.6	*4.5* *15°S*
A.L. hole 7		178	178	*220-*	239	*238*	267	*316*
Diameter hole7		4 25°S	4.3 20°S	*3 ,8* *30°S*	3,8 40°S	*3,7-3,8*	3.8x4.7	*4-4.4* *30°S*
Sounding length to 1st venthole								
Inside curve		204	204	***259***	278	***278***		
Bore measurement (using flex)		**208**	**208**		**282**		**314**	
Outside curve		208	208		285		318	
Diam of venthole		3.8	3.8	*3 ,8*	3,8	*4*	4.3	*4.5*
Ext. diameter at 2nd vent hole		21	20.5	*21.2*	21,2	*21,3*	25.1	
A. L. 2nd vent hole		231	232	*297*	325	*317*	350	*447*
Diameter 2nd vent hole		3.9	4	*3 ,8*	3,8	*3,8*	4.4	*4.5*
External Diameter of bell		24.5*24	23.3*24.3	*24*25.5*	23,7x24	*24,1x26*	28.9x28.3	*32,5x30.3*
Internal Diameter of bell		16.5	15.5*16	*16,6*17.9*	16,5	*17*	18.7	*21x22.7*
Inside length of bell		70	60	*58*	55	*50*	60	*82*
Height (excluding cap, reed, or staple) Width		315 180	295 175		385 180		520 215	*480*
Total length of bore, from tenon to bell (using flex)		**412**	**415**	***440***	**490**	***486***	**575**	***650***
Bore diameter		4.5	4.5	5.25	5,5	*5,5*		*6,25*

Measurements of the 8 tenors Jorg Wier crumhorns signed 4

excepted Aug 3010 and 3011 signed 44 ©Philippe Allain-Dupré

All measurements in mm.	MAD 2	AUG 3009	AUG 3010	AUG 3011	*SLM3*	Ronse	Brux 2311	Wien 206
Measured by:	PAD	PAD 26/04/2011	Aug 3010 was not measured. It is anyhow very similar to both 3009 and 3011. Wax in double hole 7 for left-handed.	PAD 2010	*Hanchet 1985*	PAD 22/02/2010	PAD 20/10/2009	*StAlbans or* **CT**
Socket for staple depth Diameter	36 9,5-9	39 9,5-9		33,3 10x9,5	 *9,7*	29 10	29 10	*32* *9,5x8,5*
Ext Diameter tenon	23 24,5	23,5		23,7 24,5	*23* *24,6*	23,7	23,7	*21,5*
Tenon length	32	34		33,5	*31*	25,05	25,05	*28*
Max. diameter of rings	39,5	37		38,2	*40,6*	36	36	*31,5*
Min. diameter	26,5	25,8		26	*27,5*	24,5	24,5	*CR*
Cotton reel length (rings) Total length with tenon	34,5 66,5	37,1		35,3	*35,5* *66,5*	31,15 56	31,15 56	*15*
Ext. diameter of body	23,5	24,5		24,5	*24,2*	23,4	23,4	*24,25*
Acoustical length of back hole	120	120		119	*119,5*	111	111	*113*
Hole diameter	4	4,5		3,9	*3,5*	4	4	*4,5*
A.L. hole 1	139	142		139	*139*	133,5	133,5	*134*
Diameter	3,9	4		3,9	*3,6*	4,5	4,5	*4,5*
A.L. hole 2	**169**	**170**		**168,5**	***168,5***	**163,5**	**163,5**	***164***
Diameter	4,3	4,2		4,3	*4*	4,4	4,4	*4,5*
A.L. hole 3	197	198		197	*196,5*	192	192	*192,5*
Diameter	4,3 10°S	4,2		4,2 10°S	*4,2*	4,6	4,6	*4,6x4,3*
Ext diameter between the two sets of finger holes	25,2	26,8		27,5	*24,8*	25,3	25,3	*26*
DIFFERENCE 5-2=BU	**109**	**106**		**108,5**	***108 ,5***	**107,5**	**107,5**	***107***
A.L. hole 4	239	241		239	*238,5*	233,5	233,5	*234*
Diameter	4,3	4,4		4,6	*4,3*	4,4	4,4	*4,6*
A.L. hole 5	**278**	**276**		**277**	***277***	**271**	**271**	***271***
Diameter	4,5 15°S	4,5 10°S		4,7 10°S	*4,3*	4,5 5°S	4,5 5°S	*4,5*
A.L. hole 6 **Bore measurement (flex)**	315 **318**	312		312	*313*	306	306	*306* **304,3CT**
Diameter	4,6 20°S	4,5 20°S		4,6 10°S	*4,3*	4,6 15°S	4,6 15°S	*4,5*
A.L. hole 7	352	351		350	*351,5*	340	340	*342*
Diameter hole7	4,3 40°S	4,25 40°S		4,6 30°S	*4,2*	4,4 40°S	4,4 40°S	*4,3x4,2*
Sounding length to 1st venthole								
Inside curve	423	420		417	*427*	409	409	*403*
Bore measurement (using flex)	**426**	**422**		**422**		**412**	**412**	
Outside curve	429	421		419 (sic)		414	414	
Diam of venthole	4,3	4,6		4,8	*4*	4,8	4,8	*4,75*
Ext. diameter at 2nd vent hole	26,5	28,3		28,6	*26*	26,4	26,4	*27*
A. L. 2nd vent hole	502	496		490	*492,5*	475	475	*No 2nd venthole*
Diameter 2nd vent hole	4,3	4,6		4,9	*4*	4,6	4,6	
External Diameter of bell	32x30,8	31x33,5		33x30,5	*31,4x33*	32,6x29,8	32,6x29,8	*36x28*
Internal Diameter of bell	21	20,8		21,8	*22*	21,5x22,5	21,5x22,5	*28x21*
Inside length of bell	75	70		90		90	90	
Height (excluding cap, reed, or staple) Width	558 255	586 250		560 260		548 235	548 235	
Total length of bore, from tenon to bell(using flex)	**735**	**747**		**744**	***722***	**718**	**718**	**642** **642,5CT**
Bore diameter	7	7		7	*6,6*	7	7	>6,5

Measurements of the 5 small bass and extended bass Jorg Wier crumhorns all signed 77

All measurements in mm.	Rome 687	Rome 686	Meran 6848	Meran 6849	WIEN SAM 679
Measured by:	PAD	PAD	*ROOS, Boydell (SL, TL)*	*ROOS*	*Bergström*
Socket for staple depth Diameter	32.5 9.8x9.3	35 9.5x10	*25* *8,5*	*40* *11,2*	
Ext Diameter tenon	24.5-25.5	25-26	*22*	*27,5*	*24,7*
Tenon length	31.5	28.5	*14*	*35*	*30,5*
Max. diameter of rings	41.5	42	*Cotton reel lost Add 40-50 mm*		*40,5*
Min. diameter	wire	26.5			*?*
Cotton reel length (rings) Total length with tenon	42 73.5	42 70		*40*	*36,5*
Ext. diameter of body	25	26	*26,2*	*26,5*	*25*
Acoustical length of back hole	138	125	*125*	*158*	*145*
Hole diameter	4.3 10°N	3.8	*4* *N*	*4,5* *N*	*4,1* *15°N*
A.L. hole 1	162	148	*150*	*178*	*168*
Diameter	4.5 10°N	3.8	*4* *N*	*4,5* *N*	*4,3* *20°N*
A.L. hole 2	196	182	*190*	*214*	*206*
Diameter	4.4	4.2 15°S	*4* *N*	*4,5* *S*	*4,3* *5°S*
A.L. hole 3	228	214	*226*	*252*	*240*
Diameter	4.5 20°S	4.3 20°S	*4* *N ?*	*4,5* *S*	*4,6* *20°S*
Ext diameter between the two sets of finger holes	26.75		*28,2*	*28*	*28,2*
DIFFERENCE 5-2=BU	**123**	**123**	***130***	***142***	***132***
A.L. hole 4	283	269	*280*	*319*	*303*
Diameter	4.6 10°N	4.4 20°N	*4*	*4,5* *N*	*4,6* *10°N*
A.L. hole 5	319	305	*320*	*356*	*338*
Diameter	4.3 20°S	4.6 20°S	*4* *S*	*4,5* *S*	*4,8* *15°S*
A.L. hole 6 **Bore measurement (flex)**	357 361	343	*355*	*397*	*376* 387,7 CT
Diameter	4.7 20°S	4.6 30°S	*4* *S*	*4,5* *S*	*5* *20°S*
A.L. hole 7, first key	?Fontanelles not removed		*434*	*470*	487
Diam hole7 , first key			*4*	*4.5*	5.7 N
A.L. 2nd key hole		*?*		*558*	543
Diam 2nd key hole		*?*		*4,5*	*4,8* *S*
Sounding length to 1st venthole	Vhole	Slider	*vhole*	*Slider*	*Slider*
Inside curve	493	530	*506-545*	*639*	*630*
Bore measurement (using flex)	502	545			
Outside curve	508	555	*5*		*4,7x5,5*
Diam of venthole	5	4.6		*4,5*	
Ext. diam at 2nd vent hole	29	30.5			*30*
S L 2nd vent hole or slider	550/580	592/630		*716*	*715*
Diam 2nd vent hole or slider	4.45	4.6		*4,5*	*5,3x7,4*
Diam ext bell	31.5/33.5	36.3/34.5	*33,5*	*37,2*	*33,3x35,5*
Diam int bell	21	23.2/23.8		*25x23*	*25 ,5x26,5*
Inside length of bell	90	93		*50*	*105*
height (excluding cap, o width	600 270	600 290			
Total length of bore, from tenon to bell(using flex)	793 **755**	835 **793**	*750-800*	*930*	*920* 915,1CT
Bore diameter	7	7	*6,5*	*7*	*7,25* 7,5CT

Measurements of the 6 bass and extended bass Jorg Wier crumhorns all are signed

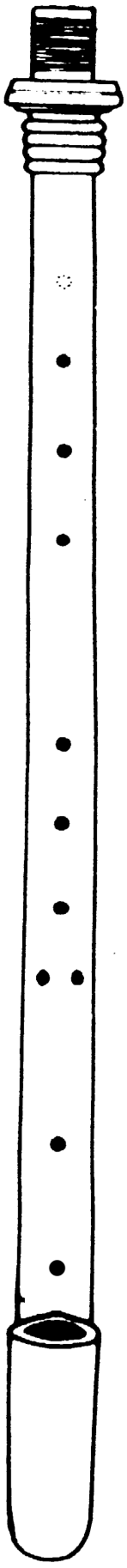
All measurements in mm.	Brux 2312	Brux 2313	Aug 3008	Leipzig 1429	SLM4	SLM5
Measured by:	.PAD 20/10/2009	PAD 20/10/2009	PAD 27/04/2010	*Fontana V. Seumel*	*Hanchet 1985*	*Hanchet 1985*
Socket for staple depth Diameter	25 11,5	25 11,5	40 12x11,5	*26* *11,5*	*35* *11,5-10*	*50* *12-9*
Ext Diameter tenon	28,6	29,2	27,3	*28,3*	*27* *28,8*	*27* *28,5*
Tenon length	30	34	39	*25,7*	*36*	*37*
Max. diameter of rings	43	43,6	46,2	*40*	*47,2*	*47,8*
Min. diameter	27,8	28	30	*27,3*		*30*
Cotton reel length (rings) Total length with tenon	35,4	39,6	42	*43*	*45* *81*	*43* *80*
Ext. diameter of body	26,8	26,3	28,5	*28,4*	*27*	*27,4*
Acoustical length of back hole	178	155	169	*160*	*166,5*	*166*
Hole diameter	4,44 40°N	4,6 45°N	4,7 30°N	*3,7*	*4,1*	*4*
A.L. hole 1	210	185	197	*184*	*193,5*	*193,5*
Diameter	4,6 30°N	4,5 30°N	4,7 25°N	*4,8*	*4,1*	*4,2*
A.L. hole 2	250	224	238	*223*	*234*	*233*
Diameter	4,5 0°	4,5 0°	4,8 15°S	*4,8*	*4,2*	*4,6*
A.L. hole 3	290	263	277	*263*	*273,5*	*272*
Diameter	4,6 25°S	4,7 30°S	4,7 40°S	*5*	*4,4*	*4,7*
Ext diameter between the two sets of finger holes	29,8	29,8	31,2	*31*	*31*	*30*
DIFFERENCE 5-2=BU	**157.5**	**158**	**160**	***163***	***164***	***165***
A.L. hole 4	365	338	355	*343*	*355*	*352,5*
Diameter	4,8 10°N	4,6 15°N	4,7 20°N	*5*	*4,3*	*4,5*
A.L. hole 5	407,5	382	398	*386*	*398*	*398*
Diameter	4,8 30°S	4,4 10°S	4,8 30°S	*4,8*	*4,5*	*4,8*
A.L. hole 6 **Bore measurement (flex)**	450	425	441	*428*	*439*	*437*
Diameter	4,9 30°S	5 30°S	4,9 40°S	*5*	*4,6*	*4,4*
A.L. hole 7, first key	547	546	562	*546*	*555*	*566*
Diam hole7 , first key	4,7, 0°	5,1 50°N	5,1 40°N	*5,5*	*4,5*	*4,2*
A.L. 2nd key hole		600	617	*613*		*627*
Diam 2nd key hole		4,7 50°S	4,5 50°S	*4,8*		*4,4*
Sounding length to 1st venthole	Vhole	Slider	Slider	*Slider*	*Vhole*	*Slider*
Inside curve	633	690		*685*	*640*	*711*
Bore measurement (using flex)	645	700	715			
Outside curve	658	710				
Diam of venthole	4,9	4,8	4,9		*4,6*	*4,3*
Ext. diam at 2nd vent hole	31,2	?	33,7	*33*	*31*	*32*
S L 2nd vent hole or slider		790/820	824	*785*	*733*	*814*
Diam 2nd vent hole or slider		4,9	4,9	*4,8*	*4,4*	*4,5*
Diam ext bell	33,5x39,6	36x38	38,3x41,3	*36x38,5*	*37x36*	*38,7x38,5*
Diam int bell	24	26	25,5	*27*	*26*	
Inside length of bell	115	130	100		*100*	*100*
height (excluding cap, o width			795 335	*937 cap* *334*		
Total length of bore, from tenon to bell(using flex)	998	1085	1055	*1090* *1078*	*958*	*1072*
Bore diameter	8	8	8		*7,8*	*7,9*

Measurements of the 4 great bass Jorg Wier all are signed [4]

All measurements in mm.	Wien SAM 678	Rome 685	Rome 684 Cap Ebass in Eb	Prague E 489
Measured by:	*St Albans,* **CT**	PAD 11/2010	PAD 11/2010	*Gadaletta, Ibl, 05/2011*
Socket for staple depth Diameter	*37* *12x10,5*	40 11x11,5	36,5 11,5	 *14.3-14.9*
Ext Diameter tenon	*30*	28,5x29,5	28,5x29,9	
Tenon length	*39*	37,5	35,9	
Max. diameter of rings	*47*	47,5	47	
Min. diameter	*?*	30,6	30,5 rings 35,5	
Cotton reel length (rings) Total length with tenon	*47* *86*	47,5 84,5	48,5 84,5	 *82*
Ext. diameter of body	*28*	28	29	
Acoustical length of back hole	*182,5*	163	165	
Hole diameter	*5* *N*	4,2 30°N	4,5 25°N	
A.L. hole 1	*223*	199	197	*265*
Diameter	*5* *N*	4,6 30°N	4,5 35°N	
A.L. hole 2	***275***	**245**	**240**	***315***
Diameter	*5*	4,7 0°	4,8 0°	
A.L. hole 3	*315*	284	278	*357*
Diameter	*5* *S*	4,8 30°S	4,5 30°S	
Ext diameter between the two sets of finger holes	*31*	30,7	31,7	
DIFFERENCE 5-2=BU	***200***	**180**	**180**	***248***
A.L. hole 4	*422*	379	374	*513*
Diameter	*4,75* *N*	4,7 30°N	5 25°N	
A.L. hole 5	***475***	**425**	**420**	***563***
Diameter	*4,75* *N*	4,9 30°S	4,7 35°S	
A.L. hole 6	***520*** **527,3 CT**	**469** **482 by flex**	**465** **476 by flex**	***609***
Diameter	*5* *S*	4,9 35°S	5 45°S	
A.L. hole 7	*634*	≈588	?	*791*
Diameter hole7	*?*	?	?	
S.L. 2nd key hole			?	*913*
Diam 2nd key hole			?	
Sounding length to 1st venthole	*venthole*	venthole	FIRST slider	
Inside curve	*770*	681	764	*1056*
Bore measurement (using flex)		597	780	
Diam of venthole	*?*	4,7	4,5	
Outside curve		704	785	*1090(Boydell, back)*
Ext. diam at 2nd vent hole	*33*	33,7	34,5	*30-32*
S L 2nd vent hole or slider		768/807	864/906	
Diam 2nd vent hole or slider		4,2	4,9	
Diam ext bell	*40,3x38,3*	37,6	41,2x43,2	
Diam int bell	**30x28**	24,5	28x29	
Inside length of bell	**100**	100	112	
height (excluding cap, reed, or staple) width		760 340	860 350	*1105*
Total length of bore, from tenon to bell (using flex)	*984* **996,4CT**	**998**	1205 back **1143 by flex**	*1570* *1635(Boydell back)*
Bore diameter	*8,8* **9CT**	8	?	

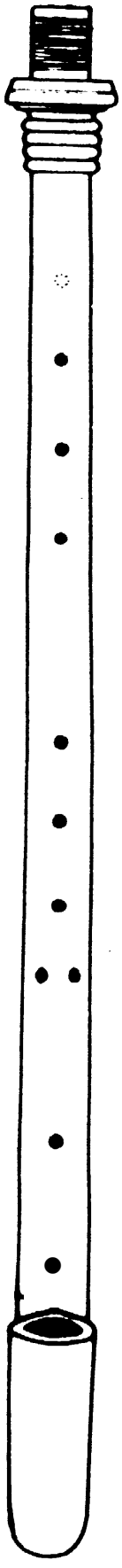
[4] Excepted Rome 684 which has a triple mark on the bell.

Measurements of the 9 bass et extended bass Jorg Wier crumhorns all are signed 77



All measurements in mm.	Rome 687	Rome 686	Meran 6849	Leipzig 1429	Brux 2312	Brux 2313	SLM4	SLM5	Aug 3008
Measured by:	PAD	PAD	*ROOS*	Fontana	.PAD	PAD	Hanchet	Hanchet	PAD
Socket for staple depth Diameter	32.5 9.8x9.3	35 9.5x10	*40* *11,2*	26 11,5	25 11,5	25 11,5	35 11,5-10	50 12-9	40 12x11,5
Ext Diameter tenon	24.5- 25.5	25-26	*27,5*	28,3	28,6	29,2	27 28,8	27 28,5	27,3
Tenon length	31.5	28.5	*35*	25,7	30	34	36	37	39
Max. diameter of rings	41.5	42		40	43	43,6	47,2	47,8	46,2
Min. diameter	wire	26.5		27,3	27,8	28		30	30
Cotton reel length (rings) Total length with tenon	42 73.5	42 70	*40*	43	35,4	39,6	45 81	43 80	42
Ext. diameter of body	25	26	*26,5*	28,4	26,8	26,3	27	27,4	28,5
Acoustical length of back hole	138	125	*158*	160	178	155	166,5	166	169
Hole diameter	4.3 10°N	3.8	*4,5* *N*	3,7	4,44 40°N	4,6 45°N	4,1	4	4,7 30°N
A.L. hole 1	162	148	*178*	184	210	185	193,5	193,5	197
Diameter	4.5 10°N	3.8	*4,5* *N*	4,8	4,6 30°N	4,5 30°N	4,1	4,2	4,7 25°N
A.L. hole 2	196	182	*214*	223	250	224	234	233	238
Diameter	4.4	4.2 15°S	*4,5* *S*	4,8	4,5 0°	4,5 0°	4,2	4,6	4,8 15°S
A.L. hole 3	228	214	*252*	263	290	263	273,5	272	277
Diameter	4.5 20°S	4.3 20°S	*4,5* *S*	5	4,6 25°S	4,7 30°S	4,4	4,7	4,7 40°S
Ext diameter between the two sets of finger holes **5-2 difference (Basic unit)**	26.75 123	 123	*28* *142*	31	29,8 157.5	29,8	31	30	31,2
A.L. hole 4	283	269	*319*	343	365	338	355	352,5	355
Diameter	4.6 10°N	4.4 20°N	*4,5* *N*	5	4,8 10°N	4,6 15°N	4,3	4,5	4,7 20°N
A.L. hole 5	319	305	*356*	386	407,5	382	398	398	398
Diameter	4.3 20°S	4.6 20°S	*4,5* *S*	4,8	4,8 30°S	4,4 10°S	4,5	4,8	4,8 30°S
A.L. hole 6 **Bore measurement (flex)**	357 361	343	*397*	428	450	425	439	437	441
Diameter	4.7 20°S	4.6 30°S	*4,5* *S*	5	4,9 30°S	5 30°S	4,6	4,4	4,9 40°S
A.L. hole 7, first key	Fontan	Ells	*505*	546	547	546	555	566	562
Diam hole7 , first key	not	remove d	*4,5*	5,5	4,7, 0°	5,1 50°N	4,5	4,2	5,1 40°N
A.L. 2nd key hole			*558*	613		600		627	617
Diam 2nd key hole			*4,5*	4,8		4,7 50°S		4,4	4,5 50°S
Sounding length to 1st venthole	Vhole	slider	*Slider*	Slider	Vhole	Slider	*Vhole*	*Slider*	Slider
Inside curve	493	530	*639*	685	633	690	*640*	*711*	
Bore measurement (using flex)	502	545			645	700			715
Outside curve	508	555			658	710	*4,6*	*4,3*	
Diam of venthole	5	4.6	*4,5*		4,9	4,8			4,9
Ext. diam at 2nd vent hole	29	30.5		33	31,2	?	*31*	*32*	33,7
S L 2nd vent hole or slider	550/580	592/630	*716*	785	NO	790/820	*733*	*814*	824
Diam 2nd vent hole or slider	4.45	4.6	*4,5*	4,8		4,9	*4,4*	*4,5*	4,9
Diam ext bell	31.5/33. 5	36.3/34. 5	*37,2*	36x38,5	33,5x39 ,6	36x38	*37x36*	*38,7x38* *,5*	38,3x41 ,3
Diam int bell	21	23.2/23.8	*25x23*	27	24	26	*26*		25,5
Inside length of bell	90	93	*50*		115	130	*100*	*100*	100
height (excluding cap, o width	600 270	600 290		937 cap 334					795 335
Total length of bore, from tenon to bell(using flex)	793 **755**	835 **793**	*930*	1090 1078	998	1085	*958*	*1072*	1055
Bore diameter	7	7	*7*		8	8	*7,8*	*7,9*	8

Measurements of the 5 discants Jorg Wier crumhorns signed ©Philippe Allain-Dupré



All measurements in mm.	Exilent SLM1	Rome 690 Inv 2809	Rome 689 +cap	Meran 6847	MAD 1	Discant in g SLM2
Measured by:		PAD 17/11/2010	PAD 17/11/2010	*Bergström 1983*	PAD	*Hanchet 1985*
Socket for staple depth Diameter		25 6.5-7	25 6.5-7.3	*26* *7,4*	29,5 8-7,5	
Ext Diameter tenon	broken	18- 19	18- 19	*19** *20*	19,5- 20,5	*21,2*
Tenon length		21.2	21.3	*23*	25	*25?brok*
Max. diameter of rings		30.5	31	*33*	33,6	*37.7*
Min. diameter		19.3	? (wire)	*21.5*	22,2	*23,1*
Cotton reel length (rings) Total length with tenon		24.5 45.6	24 46	*28.5* *51.5*	31,5 56	*30,5* *49,5+6?*
Ext. diameter of body		19	19	*19.3/19.6*	19,5	*19,4*
Acoustical length of back hole		55.5	55	*73*	81	*83*
Hole diameter		3.5	3.5	*3 ,3* *10°N*	3,4	*3*
A.L. hole 1		66.5	66	*85*	93,5	*93*
Diameter		3.2	3.2	*3 ,1*	3,1	*3,1*
A.L. hole 2		81.5	81	*105*	115	*115*
Diameter		3.3	3.4	*3 ,3*	3,5	*3,3*
A.L. hole 3		97.5	97.5	*122*	135	*135,5*
Diameter		4.2	4.05	*3 ,5*	3,5	*3,4*
Ext diameter between the two sets of finger holes		20	19.5	*21*	20.8	*20.5-20,7*
5-2 difference (Basic unit)		**53.5**	**54**	***66***	**70**	***69.5***
A.L. hole 4		116	116	*147*	160	*161*
Diameter		4.1	4.05	*3 ,5*	3,6	*3,6*
A.L. hole 5		135	135	*171*	185	*184,5*
Diameter		3.9	4	*3 ,6*	4	*3,8*
A.L. hole 6 **Bore measurement (flex)**		155.5 **156**	156.5 **157**	***196***	210 **212**	***209,5***
Diameter		4	4.2	*3 ,7*	4 10°S	*3,7*
A.L. hole 7		178	178	*220-*	239	*238*
Diameter hole7		4 25°S	4.3 20°S	*3 ,8* *30°S*	3,8 40°S	*3,7-3,8*
Sounding length to 1st venthole						
Inside curve		204	204	***259***	278	***278***
Bore measurement (using flex)		**208**	**208**		**282**	
Outside curve		208	208		285	
Diam of venthole		3.8	3.8	*3 ,8*	3,8	*4*
Ext. diameter at 2nd vent hole		21	20.5	*21.2*	21,2	*21,3*
A. L. 2nd vent hole	broken	231	232	*297*	325	*317*
Diameter 2nd vent hole		3.9	4	*3 ,8*	3,8	*3,8*
External Diameter of bell		24.5*24	23.3*24.3	*24*25.5*	23,7x24	*24,1x26*
Internal Diameter of bell		16.5	15.5*16	*16,6*17.9*	16,5	*17*
Inside length of bell		70	60	*58*	55	*50*
Height (excluding cap, reed, or staple) Width		315 180	295 175		385 180	
Total length of bore, from tenon to bell (using flex)		**412**	**415**	***440***	**490**	***486***
Bore diameter		4.5	4.5	5.25	5,5	*5,5*