Notre Dame de Budapest
Pipe Organ Samples

Compact Edition

for Kontakt 4

User's Manual

Printed in Hungary.

Version 2020

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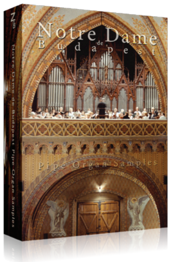
1. Welcome



Welcome to the Notre Dame de Budapest Pipe Organ Samples and congratulations on your purchase!

Notre Dame de Budapest Pipe Organ Samples (NDB) is the largest sampling library that contains pipe organ sound samples in Kontakt format. It features the sound of two symphonic organs from two famous Hungarian cathedrals with an unmatched level of authenticity. Both cathedrals have 'Our Lady' in their names – that's where the name 'Notre Dame' comes from.

While it is still impossible to reproduce electronically all the fine details and the various aspects of playing an organ, we managed to reach an extremely high level of authenticity – you can play these organs almost as if you were playing the original ones at the cathedral.

Together with many serious organists and pipe organ experts, we have carefully selected and captured all important stops and combinations for you and your studio. We recorded practically every important part of a pipe organ, even the noises of the inner cathedral and the organ engine itself. You can enjoy the rich pipe organ sounds with the natural reverb of the cathedrals, with all interferences at the organ case, all sound transients… like never before.

You can also play the stops located in the swellbox using the sweller pedal. With this collection of stops and combinations, you can play every organ piece from the organ literature, from pre-baroque to post-modern.

This version of the library is created especially for Kontakt. It features 48 kHz/24-bit organ samples and contains additional interesting samples like convolution reverbs and swellbox characteristics.

The Notre Dame de Budapest Pipe Organ Samples contributes financially to the upkeep of the original instruments.

1.1. What is contained inside the package

1.1.1. Contents of the box

If your version of the Notre Dame de Budapest Pipe Organ Samples was delivered to you in a physical form rather than a download, please make sure you have the following contents in the box to ensure you have received a complete product:

- Delivery Medium - DVD/USB flash drive(s) containing the installation data
- Your personal Activation Code / serial number on a printed registration card (in case of a retail box delivery)
- User's Manual (this document)

1.2. Hardware and software requirements

Notre Dame de Budapest Pipe Organ Samples is hosted within Kontakt sampler software, available for both PC and Mac computers from Native Instruments, found at http://www.native-instruments.com on the Internet. The NDB sample set is compatible with Kontakt 4 or later.

1.2.1. Notes on the hardware and software configuration

- CPU - Use a fast CPU because slower ones decrease the maximum polyphony you can play.
- RAM - Put as much RAM in your computer as you can as it limits the maximum capacity of the samples which you can load into the sampler software simultaneously).
- Hard disk - For good performance, we recommend using a high-speed hard disk or SSD dedicated for only the sample data. If you have a recent computer model, you should not worry much about this; if not, you might experience delays, clicks or misses in the sound and you may wish to upgrade your system.
- Additional devices - To use all the features of NDB Pipe Organ Samples in real time – in other words, to perform live –, you will need a MIDI keyboard with additional modulation wheel controller and foot pedal (expression controller pedal). You may also want to play the pedal notes with a real pipe-organ pedal.

2. Installation

2.1. Setting up NDB for Kontakt

If you received the Notre Dame de Budapest Pipe Organ Samples as a downloadable product, please make sure that you downloaded all the installation files before you begin installing. It is required to have all the files in the same folder.

- Make a folder (directory) on your hard disk.
- Copy the contents of the DVD disk(s)/USB drive(s) to the folder you have previously created.
- The instrument patches can be loaded into Kontakt by simply double clicking the .nki files or just dragging them from this folder into the multi rack.

2.2. License authorization

Installing the Notre Dame de Budapest Pipe Organ Samples doesn not require any additional activation through Kontakt or Native Access. The patches can be loaded into Kontakt by simply double clicking the .nki files or just drag-and-drop them into the multi rack.

If you have any problems, please contact us through our Website at:

http://www.inspiredacoustics.com.

3. The library

Together with many serious organists, pipe organ experts, and based on the response of our users, we tried to include almost every important part of a pipe organ in NDB Pipe Organ Samples. You can hear the natural reverb of the cathedrals, tremolo of some stops, crescendo, the swellbox; what's more, even the sound of the organ engine, valves and the registration.

3.1. Effects

In order to come as close to real organ playing as possible, the organ samples in NDB include a large number of effects. There are two methods to reproduce the natural reverb of the cathedrals; you can also control the swellbox. Below we give an overview of these effects.

3.1.1. Natural cathedral reverb

NDB Pipe Organ Samples feature the natural cathedral reverbs of the acoustic spaces where the organs are located. The reverb effect is realized in two different ways.

3.1.2. Convolution reverbs

The natural reverb of an acoustic space can be represented by its impulse response. In other words, by measuring the impulse response of the acoustic space, it is possible to calculate the reverb of any sound source – how that given sound would reverb in that space.

We measured carefully the im¬pulse responses of both cathe¬drals, using various micro¬phone setups and measuring methods. You can add these natural reverbs to any desired source of audio. The reverb is calculated by Kontakt each time a note is played back – it is hard to get it sound any more realistic. The amount of the reverb (the distance of the listener from the organ) can be freely adjusted – again, in real time – or can even be turned off, in case you want to add a different ambience than the real one.

3.1.3. Release sample reverbs (RT)

On some recordings it might be important to preserve the acoustic environment in which the samples were recorded. Another method for this is to simply record everything that is heard in the cathedral when the notes are hit and released. Though when they are transformed to release samples they will not sound as realistic as the convolution reverbs – especially on staccato notes – we did keep this type of reverb as well, just in case you need them. You may also add more reverb to the samples while you are not turning off the release samples – feel free to experiment.

3.1.4. Swellbox

The swellbox is a very important part of the organ – vital, if you are playing romantic or modern pieces. It contains the pipes of certain stops and by opening its shutters you can gradually increase the loudness and brightness of the sound of organ. This effect works perfectly in NDB Pipe Organ Samples and is achieved in two different ways.

3.1.5. Swellbox by convolution

It is possible to measure the acoustic characteristics of the swellbox, and model the box as a filter to the sound. We represented the filter characteristics by its impulse response and let Kontakt calculate the effect on the appropriate stops.

You can manually set up the IR effect programmed with a MIDI automation so that you can control the amount of mixing (the amount you open the swellbox) by adjusting the midi controller.

3.1.6. Swellbox by recorded samples (SW)

The other way to realize a working swellbox effect is to record the original sound, both when the box was opened and closed and then control Kontakt to mix the sound whenever you are adjusting the sweller pedal.

For certain samples, we provide you with samples for open and closed swellbox. Feel free to experiment with them.

3.1.7. Tremolo

The tremolo (tremulant) is a very well-known effect in a pipe organ. For certain combinations, where tremolos are very often used, such as Voix Céleste, the recorded sound samples contain the tremolo effect, so it is impossible to switch it off (these combinations are marked by Trem. in the Stops used in the combination column in the table below). You can also try the tremolo effect of Kontakt on appropriate stops, such as Cornet or Sesquialtera.

3.2. Dynamics and velocity settings

If you only use one stop of the library at the time, feel free to set its velocity where it best suits you and your piece. However, when creating a more complex piece with lots of combinations, we recommend using velocity settings close to our listed values if you want to have the dynamics of the real instrument.

3.3. Contents of the library

You will have the following files on your computer:

\<destination directory>
  .nki files (special effects sample data)
  NDB_Manual_Compact_Edition.pdf
  \IMPULSE
    .wav files (impulse responses)
  \Notre Dame de Buda
    .nki files (actual sample data)
    \RT
      .nki files (sample data with release samples)

Below we list all the stops and combinations included in NDB Pipe Organ Samples. A little explanation about the abbreviations used in the program names (NDB refers to the name of the library) showing where – on which manual – the stop or combination was originally located in the real instrument or the type of the sound:

POS	Positive
GPR	Grand-Orgue with Positive and Récit coupled
REC	Récit
PED	Pedal
SFX	Special effects

3.4. Detailed registration of the stops and combinations in the library

In the table below we list every stop and combination that is included in the library, their special effects, their recommended velocity settings for the proper representation of the organ's dynamics and some useful information where they can be used optimally.

Notre Dame de Buda

Combination name	Stops used in the combination	Volume	Possible music application
NDB_GPR - Fonds + Quint	Fonds 8', Quint 2 2/3'	77	baroque
NDB_GPR - Mixtures	Fonds 8' 4' 2', Mixtur 5x1 1/3'	80	baroque
NDB_PED - Fonds + Quint	Fonds 16' 8', P+I, P+II	70	baroque
NDB_PED - Fonds 16'	Fonds 16'	66	all
NDB_PED - Plenum Bassoon 16'	Fonds 16' 8' 4', Bassoon 16'	90	baroque
NDB_POS - Principal 8'	Principal 8'	62	all
NDB_POS - Scharff	Fonds 8' 4', Scharff 5x5 1/3'	67	baroque
NDB_POS - Sesquialtera	Fonds 8', Nasat 2 2/3', Terz 1 1/3'	67	baroque
NDB_REC - Trompete Harmonique 8'	Trompete Harmonique 8'	65	all
NDB_REC - Voix Humaine 8'	Voix Humaine 8'	44	romantic, modern

3.5. Special Effects

In order to reach the highest level of authenticity we recorded some noises that frequently occur while playing the organ and heard inside the cathedral and also some beautiful bell sounds of the cathedrals heard outside. Feel free to use them to make your recordings more realistic or make it sound like if it was recorded live.

Note: Please consult the legal issues in this document about creating recordings with NDB Pipe Organ Samples.

There are various .nki files containing these SFX 'instruments':

3.5.1. NDB_SFX – Organ Engines

This instrument contains the looped organ engine sound of both organs, which you can add to your recordings.

Tip: This organ engine sound was completely removed from each sampled note so that the engine noise does not add up with the stops and combinations you are playing. Adding it once to your recording in the background will make it sound more authentic.

Tip: For movie sound score application: add the engine noise only if the scene is inside the cathedral.

Some of these engine sounds come with Tremolo so that you can switch to the tremolo-ed organ engine sound, if you use tremolo combinations. The instrument includes the following sounds:

c3:	Turning on the organ of Notre Dame de Kispest (engine sound looped, tremolo possible)
d3:	Turning off the organ of Notre Dame de Kispest
e3:	Organ engine of Notre Dame de Kispest (looped, tremolo possible)
f3:	Turning on the organ of Notre Dame de Buda (engine sound looped)
g3:	Turning off the organ of Notre Dame de Buda
a3:	Organ engine of Notre Dame de Buda (looped, tremolo possible)
c4:	Mass registration sound of the organ at Notre Dame de Buda – pushing the Tutti piston
c#4:	Mass registration sound of the organ at Notre Dame de Buda – pushing the zero piston from Tutti
d4:	Mass registration sound of the organ at Notre Dame de Buda – pushing the zero piston from fewer stops
d#4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 1
e4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 2
f4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 3

f#4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 4
g4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 5
g#4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 6
a4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 7
a#4:	Mass registration sound of the organ at Notre Dame de Buda – Variant 8
c5:	Registration switch sound on the registration panel of the organ of Notre Dame de Buda
c#5:	Registration switch sound on the registration panel of the organ of Notre Dame de Buda
d5:	Registration switch sound on the registration panel of the organ of Notre Dame de Buda
f5:	Lots of valves go down when playing notes on the Positive at the organ of Notre Dame de Buda
g5:	Lots of valves come up when playing notes on the Positive at the organ of Notre Dame de Buda
a5:	Stops turning on when gradually turning the crescendo wheel at the organ of Notre Dame de Buda
a#5:	Swellbox shutters opening at the organ of Notre Dame de Buda
b5:	Swellbox shutters closing loudly at the organ of Notre Dame de Buda
c6:	Swellbox shutters opening at the organ of Notre Dame de Kispest
c#6:	Swellbox shutters closing loudly at the organ of Notre Dame de Kispest
d6:	The organist gets off the organ bench at Notre Dame de Buda – Variant 1
e6:	The organist gets off the organ bench at Notre Dame de Buda – Variant 2

3.5.2. NDB_SFX – Cathedral Bells

a3:	Notre Dame de Kispest Trinity Bells (unlooped)
b3:	Notre Dame de Kispest Small Bells (looped)
c4:	Notre Dame de Kispest All Bells (looped, release triggered)
d4:	Notre Dame de Buda Great Bells (looped)
e4:	Notre Dame de Buda Small Bells (looped)

3.5.3. NDB_SFX – Valves

This program was recorded on the Positive manual without turning on a single stop. Therefore, only the valve sound is heard when you hit a note and release it. This program contains only a few number of wave files in order to allow you to stack it to any other organ stop you may wish to sound closer.

3.5.4. NDB_SFX - Noises of the Inner Cathedral

To imitate a live recording, you may add the sounds of the inner cathedral in the background of your recording. Be sure to hold these notes as they are quite long.

c4:	Thunder heard from inside the cathedral (0:36)
d4:	Quiet thunder, footsteps in the background (0:16)
e4:	footsteps in the church (0:23)

f4:	footstep, money jingles (0:45)
f#4:	footsteps at the choir (0:07)
g4:	microphone setup – wood clicks (0:06)
a4:	microphone setup – stand (metal) clicks (0:02)
b4:	microphone setup – cable end knocks on the wooden floor (0:05)
c5:	microphone assembly (0:30)
d5:	car passes by, microphone assembly (0:17)
e5:	microphone setup, quiet thunder roaring, a bit of wheezing, quiet bell in the background (0:13)
f5:	various sounds of the inner cathedral, a sparrow tweets in the background up behind the choir (0:14)

4. 'Notre Dame de Buda', Matthias-Church, Budapest

At the very heart of Buda's Castle District is the Mátyás-templom. Officially named as the Church of Our Lady, it has been popularly named after King Matthias Corvinus (Good King Mátyás) who ordered the construction of its original southern tower. In many respects, the 700-year history of the church serves as a symbol (or perhaps a reminder for Hungarians) of the city's rich, yet often tragic history. Not only was the church the scene of several coronations, including that of Charles IV in 1916 (the last Habsburg king), it was also the site for King Mátyás' two weddings (the first to Catherine of Podiebrad and, after her death, to Beatrice of Aragon).
The darkest period in the church's history was the century and a half of Turkish occupation. Although following Turkish expulsion in 1686 an attempt was made to restore the church in the Baroque style, historical evidence shows that the work was largely unsatisfactory. It was not until the great architectural boom towards the end of the 19th century that the building regained much of its former splendor. The architect responsible for this work was Frigyes Schulek.
Not only was the church restored to its original 13th century plan but a number of early original Gothic elements were uncovered. By also adding new motifs of his own (such as the diamond pattern roof tiles and gargoyles laden spire) Schulek ensured that the work, when finished, would be highly controversial. Today however, Schulek's restoration provides visitors with one of the most prominent and characteristic features of Budapest's cityscape.

4.1. About the organ

While King Matthias had organ builders in his court and thus the church was likely to have an organ already that time, the first organ we have records of was built in 1688: Esztergom archbishop György Széchényi donated a positive organ worth 100 forints. A mere seven years later palatine Pál Esterházy had the choir of the church extended and probably a bigger organ built.

The organ was destroyed by a fire in 1723. A new one was soon made by an organ builder named Márton and an even larger one was started in 1768 but then later it was sold.

After the long restoration of the church a new organ was built again, the case of which was also designed by Frigyes Schulek. Unfortunately, it soon turned out that the instrument did not meet the requirements.

In 1909, using the donation of Franz Joseph the church received a new organ built by the Rieger manufacture in Jägerndorf. The instrument was built in a late romantic style, using the plans of Viktor Sugár and had four manuals and 77 stops. According to the fashion of the time, the pipes of manual 4 were put in the attic of the church and their sound was directed to the church aisle via a 14-meter-long wooden tube.

In 1931, again using the plans of Sugár, the Budapest manufacture of the Rieger company extended the instrument to 85 stops. The pipes were brought down from the attic and the inner construction of the organ was changed – unfortunately, to the worse.

During the 1944 Soviet siege the instrument was damaged badly. It was temporarily restored after the war but the condition of the organ turned worse and worse.

In 1979 a committee was created to design the new instrument with the cooperation of Ferenc Gergely, István Koloss, István Baróti and titulaire du grand-orgue of the church, Bertalan Hock. They designed a symphonic organ that uses the valuable pipes and the action of the old instrument that could be saved and combines romantic and baroque style marks.

It was again the Rieger-Kloss organ factory that performed the restoration. Their excellent work resulted in a new, five-manual, 85-stop organ with electropneumatic action (Rieger Op. 3541). The organ was consecrated by Cardinal László Lékai on January 25, 1984.

After finishing the grand organ, a two-manual, 18-stop Fernwerk was built. This instrument can also be sounded from the console of the grand organ but it can also be used independently during liturgy or as an accompaniment of the concerts in the church.

The organ was extended again in 1999 and the number of Setzer combinations was increased from 8 to 798 using a whole computer. Another stop, Chamade 8′ was built into the organ. Today it has 104 stops altogether.

Factsheet of the organ

Opus No.	3541
Built in	1983
Number of manuals	5 + pedal
Number of stops	104 (99 basic voices)
Action	electric key action
	electric stop action
Windchests	slider and cone
Console	electric, electric setter
Number of pipes	6 785
Tuning	Equal temperament

List of stops

I. Positiv A

(C-a3/a4, 70 tones)

Principal 8′
Boudon 8′
Salicional 8′
Octave 4′
Gedackt 4′
Nasat 2 2/3′
Waldflöte 2′
Terz 1 3/5′
Scharff 5x5 1/3′
Trompete 8′
Sp. Trompete 8′
Tremulant

II. Hauptwerk A

(C-a3, 58 tones)

Principal 16′
Praestant 8′
Gemshorn 8′
Nachthorn 8′
Octave 4′
Rohrflöte 4′
Quinte 2 2/3′
Superoctave 2′
Cornett 3-5x 8′
Mixtur 5x1 1/3′
Trompete 8′
Trompete 4′

III. Récit

(C-a3/a4, 70 tones)

Bourdon 16′
Principal 8′
Bourdon a cheminée 8′
Flûte traversière 8′
Gambe 8′
Voix céleste 8′
Octave 4′
Flûte octaviante 4′
Dulciane 4′
Quinte 2 2/3′
Octavin 2′
Flûte conique 1′

I. Positiv A

II. Hauptwerk A

III. Récit

Cornet 3-4x2 2/3′

Mixtur 5x 2′

Cymbale 3x1/5′

Basson 16′

Trompette harmonique 8′

Hauptbois 8′

Voix humanie 8′

Clairon 4′

Tremulant

IV. Positiv B – Brustwerk

(C-a3, 58 tones)

Gedackt 8′

Quintatön 8′

Spitzflöte 4′

Principal 2′

Larigot 1 1/3′

Octave 1′

Obertön 3x1 1/7′

Zimbel 3x 2/3′

Sordun 16′

Krummhorn 8′

Glocken

Tremulant

V. Hauptwerk B – Bombarde

(C-a3/a4, 70 t.)

Bourdon 16′

Flûte harmonique 8′

Quinte 5 1/3′

Praestant 4′

Tierce 3 1/5′

Septième 2 2/7′

Flûte 2′

Mixtur 6x2 2/3′

Bombarde 16′

Tuba 8′

Pedal

(C-f1, 30 t.)

Bourdon 32′

Principal 16′

Praestant 16′

Violon 16′

Subbass 16′

Bourdon 16′

Quinte 10 2/3′

Octave 8′

Flûte 4′

Bourdon 8′

Tierce 6 2/5′

Octave 4′

Flûte 4′

Nachthorn 2′

Locatio 5x5 1/3′

IV. Positiv B – Brustwerk	V. Hauptwerk B – Bombarde	Pedal
		Mixtur 4x2 2/3’
		Bombarde 32’
		Posaune 16’
		Basson 16’
		Trompete 8’
		Clairon 4’
		Glocken

Couples

I., Positiv A	I+III, I+IV, I+V, I Super, I+III Super
II., Hauptwerk A	II+I, II+III, II+IV, II+V, II+I Super, II+III Sub, II+III Super, II+V Super
III., Récit	III+IV, III+V, III Sub, III Super
IV., Positiv B - Brustwerk	Fernwerk I.
V., Hauptwerk B - Bombarde	Fernwerk II
Pedal	P+I, P+II, P+III, P+IV, P+V, P+V Super

Fernwerk (Choir organ) stop-list

Fernwerk I. man.	Fernwerk II. man.	Fernwerk Pedal
Principal 8’	Gedackt 8’	Subbass 16’
Flûte 8’	Blockflöte 4’	Principal 8’
Octave 4’	Dolce 4’	Gedackt 8’
Quinte 2 2/3'	Principal 2'	Octave 4’
Flûte 2'	Quinte 1 1/3'	Fagott 16’
Terz 1 3/5'	Krummhorn 8’	
Mixtur 3x1 1/3'		

5. 'Notre Dame de Kispest', Budapest

The first people settled in Kispest (currently the 19th district of Budapest) in the second half of the 19th century. Their first church was nothing more but a small chapel with a belfry and a wooden cross. The votive church was built later, in memory of crown prince Rudolf Habsburg who died in 1889. The foundation stone was laid on June 7, 1903 and following a fast construction, the church was consecrated on October 23, 1904.

The brick-covered, 50-meter long and 20-meter wide parish church of neogothic style was designed by Antal Hofhauser. The tower of the church is a very impressive sight and the church is still a very characteristic mark of the district. Inside you can find a neogothic, aisleless church, which is 32 meters long (without the altar) and 14 meters wide. The benches of various styles can seat 250-300 people.

The organ was originally made in 1927, by Otto Rieger. It was reconstructed between 1995 and 2002, according to the plans and direction of Bertalan Hock, by László Varga.

The church was renovated between 1998 and 2002 so now, a hundred years later it can again be seen in its full splendor.

Factsheet of the organ

Opus No.	2256*
Built in	1928 (reconstructed in 2002)
Number of manuals	2 + Pedal
Number of stops	38
Action	electric key action
	electric stop action
Windchests	slider and purse
Console	electric, electric Setter
Number of pipes	~2500
Tuning	Equal temperament

** Rieger Opus 2256. Fully reconstructed by Varga Organ Manufacture in 2002.*

List of stops

I. Grand Orgue

(C–a3)

Principal 16′

Praestant 8′

Flûte harmonique 8′

Bourdon 8′

Salicional 8′

Unda maris 8′

Octave 4′

Flûte 4′

Quinte 2 2/3'

Doublette 2'

Cornet 5x 8′

Mixtur 5-7x 8′

Trompette 8′

Clarinette 8′

II. Récit Expressif

(C–a3)

Bourdon 16′

Diapason 8′

Flûte 8′

Bourdon 8′

Gambe 8′

Voix céleste 8′

Dulcian 4′

Flûte octaviante 4′

Nasard 2 2/3'

Octavin 2'

Tierce 1 3/5'

Mixtur 3-5x 1 1/3'

Trompette harmonique 8′

Basson-hautbois 8′

Voix humaine 8′

Clairon 4′

Tremulant

Pédale

(C–f1)

Principal 16′

Violon 16′

Soubasse 16′

Octave 8′

Bourdon 8′

Octave 4′

Bombarde 16′

Trompette 8′

Couples

I. Grand Orgue	I+II, I+II sub, I+II super
II. Récit Expressif	Sub II, Super II
Pédale	P+I, P+II, P+II super

6. About the pipe organ

A pipe organ is a keyboard instrument that produces sound by letting wind travel through pipes or reeds. Pipe organs are most commonly encountered in churches and are not simply large, majestic musical instruments but also a beautiful piece of art. The pipe organ repertoire is particularly rich in solo music but the organ is also frequently used to accompany choral and congregational singing.

6.1. History of the pipe organ

As its name shows, the pipe organ consists of pipes, so technically, pipes made of animals and plants could be considered its earliest predecessor. Nevertheless, it is usually the bagpipe that is considered as its ancestor. Its history goes back to at least the ancient times. Findings of the period prove that the pipe organ and its various ancestors did exist (e.g. the water organ [hidraulis] uncovered in 1931, Aquincum). Many old instruments still work today.

We have already written records – pictures and descriptions in codices – about medieval pipe organs. A very characteristic organ type of the period was the portable organ, which had only a few ranks of pipes and was used only on occasion. Later, as the instrument grew, fixed solutions became popular (positive organ). The organ type that had only reed pipes (regal) also appeared first in the medieval ages. Its wind chest was made of bronze and was blown with pairs of bellows. Several people were needed to make the instrument sound (in the 13th century, 70 people had to work on blowing the 400-pipe organ of a cathedral). Until the medieval organs it was not possible to switch on the various pipe ranks separately (blockwerk). Sliders – which allowed this – appeared only in the 16th century. Organs of this time featured pipes of the same width (they were measured to the width of an egg). Later, as the size of the organ grew, several wind chests were built into the instruments. Each wind chest had its own manual, or playing keys. Later so-called 'werks' ('works', which featured certain stops to create specific sounds) were built on these chests.

By around the 16th century all the basic pipes were formed, those that can be found in almost all contemporary organs. Wind pressure measurement (a glass tube) was first used in the 17th century, which allowed designing pipe organs more consciously and more precisely. This was the time when stops imitating strings appeared and at the beginning of the 18th century, in Spain, the swellbox, which allowed controlling (via a pedal) the dynamics of the sound of the pipes locked in the wooden box. By this time the organs covered the classical range of voice and transmission stops were introduced, which used the pipes of other stops, without coupling. Organs built in Italy had no pedals, had only a few third-sounding mixture stops, had no reeds but features the so-called Italian principal stop (Diapason), which is an essential one ever since in modern instruments. Austrian and South German organ also had few reeds, while the Spanish instruments featured a lot of flutes, cornets, furthermore quint- and third-sounding mixture stops. Using combinations, (stopped 8′ + wide Principal 4′ + 2 2/3′ and 1 3/5′) they could create a trumpet-like sound. Spanish instruments have a lot of reeds up to day. The stop of horizontal trumpets built into the facade of the organ, the so-called 'Spanish trumpet', or Chamade is also a Spanish invention.

Organ building of the baroque and romantic era is very diverse. Instruments of many important organ builders have survived; some of them found their places in museums but most of them are still in the churches, being used (e.g. the Silbermann organs or the instruments of Cavaille-Coll). Some instruments were restored or rebuilt (e.g. St. Eustache, Paris), others are still in their original form (e.g. St. Ouen, Rouen).

The development of electronics and digital technologies made it possible to control and program the mechanic parts. Pneumatic actions were enhanced by electric aids: relays were used to open the valves (electropneumatic action). MIDI control is quite frequent in today's modern consoles.

6.2. Parts, mechanism, and sound production

Conventional pipe organs consist of four main parts: the console, consisting of keyboards and other controlling devices; the pipes that produce the sound; the mechanism, or action; and a device that generates wind. The pipes and the action are protected by a free-standing structure, the organ case. Traditionally, rows of dummy or real pipes and carved woodwork in attractive arrangements partially screen the openings in the case. As some of the organ pipes can be more than 20 feet long, organ cases can be very large and usually play an important artistic role.

To fully enjoy the beauty of organ sound, the instrument must be placed very carefully – most organ music requires a resonant space with three seconds or more of reverberation time. Pipes in an acoustically 'dead' environment sound pale, while fully exposed pipes without encasement usually produce a raw, unfocused sound, which you may usually hear in concert halls.

The pipes of the organ stand in a row on an airtight chest that is supplied with wind from bellows or a rotary blower. Under each pipe is a valve, or pallet, connected by a system of cranks and levers to its respective key. Normally a wind reservoir, loaded by weights or springs to maintain sufficient wind pressure, is interposed between the wind generator and the wind-chest. This reservoir has a safety valve that operates to relieve excessive pressure when the reservoir becomes full.

The pitch of the notes is determined by the length of their pipes. Among pipes of similar type, the one half the length of the other sounds exactly an octave higher. Since the loudness of a pipe sounding on a constant pressure of wind cannot be controlled, the expressive potential of an organ in improved by using several ranks (pipe sets, also called registers or stops). A harmonium has very few of them, a small organ may have 2-15, a middle-sized organ has 15-30 and large church and auditorium organs may have as many as a 100 or more ranks. (However, the majesty of the sound of the organ is not determined by its number of ranks, world's most beautiful sounding instruments usually don't have hundreds of ranks.) The pallet controlled from each key admits wind to all the pipes belonging to that key; but, in order to allow the organist to use any of the ranks of pipes, alone or in combination, an intermediate mechanism is provided by which he may stop off any rank or ranks. That is why the term stop is also used in the sense of 'rank of pipes'.

6.3. Stop and key mechanisms

The operative part of the stop mechanism lies between the pallet and the foot holes of the pipes. It normally consists of a strip of wood or plastic running the full length of each rank of pipes. In it is drilled a series of holes, one of which meets exactly the foot hole of each pipe. The perforated strip, or slider, is placed in a close-fitting guide in which it may be moved longitudinally. When it is moved a short distance, so that its holes no longer match the pipes, wind is cut off to that rank, even when the organist opens the pallets by means of the keys. Wind-chests in which the stops operate in this way are called slider chests and they were in almost universal use before the 20th century. The slider is connected to the console by a system of levers and cranks, and it terminates in a knob that the organist pulls outward to bring the stop into play or pushes in to silence it. Certain combinations of stops on each manual are more commonly needed than others so usually there are 'shortcut' knobs or pedals on the console (called pistons). When these combination (or composition) pedals are pushed, stops connected to it are drawn on, and any others that are already drawn are pushed off.

In order to play two or more interweaving, contrasted melodic lines, with two different voices (soft and loud, harsh and quiet together or in rapid succession) multiple manuals are needed. Each manual department is self-contained and each controls its separate wind-chest and stops. Thus, the organist may vary the sounds produced either by changing the stops on the manuals being played or by prearranging the stops and changing from one manual to another. Since the 18th century organists have had yet a third way, called swell boxes, of controlling the volume of sound. The pipes of one or more manuals may be enclosed in a box, one side of which has shutters that are connected to a pedal (sweller pedal) at the console. By opening and closing the shutters, the sound is made louder or softer. Further expressivity is realized by an accessory called a tremulant, which by repeatedly interrupting the flow of wind to the wind-chest creates a pulsation in the tone of the pipes.

Since the 14th century, one of the manuals – controlling longer pipes – is usually played by feet. Organs in the past in Italy and Spain had several different pedal keyboards with fewer keys than the modern organs, which have pedal keyboards of 30 or 32 notes. The organist may wish to combine the stops of two different manuals or to couple one or more of the manuals to the pedals. This is realized by a mechanism called a coupler.

In the simplest mechanical action, the connection from key to pallet is by a series of cranks, rollers, and levers that transmit motion horizontally and vertically from keyboard to wind-chest. The overall distance may be considerable, and the main distance is bridged by trackers, slender strips of wood, metal, or plastic, which are kept in constant tension. Adjustment screws are employed to take up slack occasioned by wear and changes of humidity.

Most of the organs built before the late 19th century have such tracker action and they are becoming popular again, especially in modern organs built according to historical principles. Many organists actually prefer tracker action to all other forms because of its superior sensitivity of touch – even though in very large organs with tracker action, considerable strength may be necessary to depress the keys.

Organs may also have other (pneumatic, direct electric, or electropneumatic) forms of action but these actions normally result in a loss of sensitivity and responsiveness. A compromise has been used successfully with tracker action for each department, with the coupler action operated electrically. This arrangement has considerable benefits, since the coupling together of three or four manuals with tracker action results in a very heavy touch. Electric stop action may also be combined with tracker key action, enabling the use of electric (including solid-state) combinations – an invaluable aid in quickly changing groups of stops, especially in larger instruments. Some organs may have more than one console to play on – usually with different action.

6.4. Flue pipes

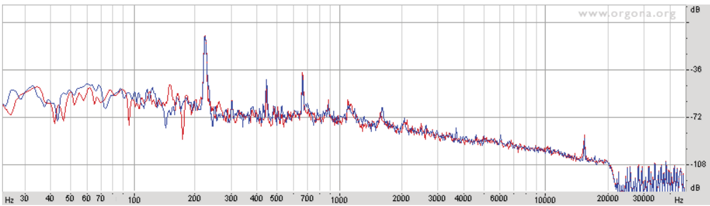
There are two main categories of organ pipes: flue pipes and reed pipes. Flue pipes (wood or metal) account for the majority of the stops of an average organ. The pipe consists of three main parts: the foot, the mouth, and the speaking length. The pipe stands vertically on the wind-chest, and wind enters at the foot hole. The foot is divided from the speaking length by the languid, a flat plate; the only airway connection between the foot and the speaking length is a narrow slit called the flue. The wind emerges through the flue and strikes the upper lip, producing an audible frequency, the pitch of which is determined by and amplified in resonance by the speaking length of the pipe.

The tone of a pipe is determined by many factors, including the pressure of the wind supply, the material of the pipe, the size of the foot hole, the width of the flue, the height and width of the mouth, and the scale, or the diameter of the pipe relative to its speaking length. The material of which the pipe is made also exerts an influence; it may be an alloy of lead and tin, wood, or, more rarely, pure tin or copper, and for the bass pipes zinc. The pipes may also vary in shape, a common variant being an upward taper in which the pipe is smaller in diameter at the top than at the mouth. Or, the top of the pipe may be completely closed by a stopper. Such a pipe is said to be stopped; a stopped pipe sounds an octave lower in pitch than an open pipe of the same speaking length.

Open pipes of large diameter are said to be of "large scale," and open pipes of small diameter are said to be of "small scale." Large-scale pipes produce a fluty or foundational quality of tone that is free from the higher harmonics. Small-scale pipes produce a bright quality of tone that is rich in harmonics, recalling bowed strings. Stopped pipes can be particularly foundational in tone, and they favor the odd-numbered at the expense of the even-numbered partials. Tapered pipes are somewhere between stopped and open pipes in tone quality.

Flue pipes are tuned by increasing or decreasing the speaking length. In the past, several methods of tuning were employed, but in modern times this is often done by fitting a cylindrical slide over the free end of the speaking length and sliding it up and down, lengthening or shortening the pipe as required. In stopped pipes the stopper is pushed farther down to sharpen the pitch or is pulled upward to lower it.

The attack of the note may also be greatly influenced by cutting a series of small nicks in the edge of the languid. Heavy nicking, commonly practiced in the early 20th century, produces a smooth and sluggish attack. Light nicking or no nicking, as used up to the 18th century and in some more advanced modern organs, produces a vigorous attack, or chiff, somewhat like tonguing in a woodwind instrument. If not excessive, this chiff enhances the vitality and clarity of an organ.



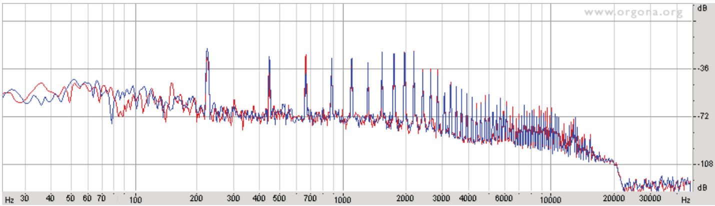
Spectral view of the sound of a flue pipe (Gedackt 8' – A3, +16 cent; 222.09 Hz)

6.5. Reed pipes

Organ reeds were probably originally copied from instrumental prototypes. A reed stop may have a beating reed like that of a clarinet or a free reed. The shallot of a beating reed pipe is roughly cylindrical in shape, with its lower end closed and the upper end open. A section of the wall of the cylinder is cut away and finished off to a flat surface. The slit, or shallot opening, thus formed is covered by a thin brass tongue that is fixed to the upper end of the shallot. The tongue is curved and normally only partially covers the shallot opening. But, when wind enters the boot, the pressure of the wind momentarily forces the tongue against the shallot, completely closing the opening. Immediately, the elasticity of the brass asserts itself, and the tongue reverts to its curved shape, thus uncovering the opening. This process is repeated rapidly.

The frequency of the pulsations of air that enter the shallot is determined by the effective length of the reed and, in turn, determines the pitch of the note. Thence, the pulsations pass out into the tube, or resonator, which further stabilizes the pitch and decides the quality of the note.

Most reed resonators have a flared shape. As in flue pipes, a wide scale favors a fundamental tone, and a narrow scale favors a bright tone. Cylindrical resonators produce an effect similar to that of stopped flue pipes, the note being an octave lower than the equivalent flared pipe and the tone favoring the odd partials. Some reed pipes, such as the Voix Humaine, have very short resonators of quarter or eighth length. Pipes the resonators of which have no mathematical relationship to the pitch are known as regals; regal stops were popular in the 17th century, particularly with the North German school, and their use has been revived in modern times.



Spectral view of the sound of a reed pipe (Trompete Harmonique 8' – C4, +19 cent; 445.11 Hz)

6.6. Organ stops

The pitch of any pipe is proportional to its length. Most modern organs have a manual compass of five octaves, from the second C below middle C to the third C above; an open pipe sounding the low C is about 8 feet (2,5 meters) in speaking length (64 vibrations per second). The shortest pipe in the same stop, is thus about 3 inches (8 centimeters) long (2 048 vibrations per second). While large- and small-scale ranks often imitate the tones of flutes and bowed strings respectively, and are named accordingly, the most characteristic tone of the organ is produced by its Principal stops. These are of medium scale and moderate harmonic development – neither too dull nor bright. Therefore, from the earliest times, stops were arranged in choruses, and the principal chorus is the very backbone of any organ. A chorus consists of stops of roughly similar quality and power but at a variety of pitches. A unison principal is known as Principal 8′ because of its longest (8-foot) pipe. The next stop at an octave pitch would have the largest pipe of 4 feet long. Next comes a 2-foot stop, while the suboctave pitch is represented by a 16-foot stop. The top pipe of a 2-foot stop has a speaking length of only three-quarters of an inch, and this is about the practical upper limit.

Because an organ with nothing higher in pitch than a 2-foot stop would be lacking in brilliance, organs have so-called mixture stops, which have several high-pitched pipes to each note. These mixture stops are so high that they cannot be carried right up to the top note so they break back an octave at some convenient point, sometimes even more than once. The result is a balance of power between bass and treble and a harmonious power that is completely peculiar to the organ and can be produced in no other way. Mixture stops also contain ranks sounding at pitches other than in octaves with the 8-foot principal. In chorus mixtures these normally sound at a fifth above the unison (e.g., G above C), although ranks sounding at a third above and even at a flat seventh can also be found. These quint- and third-sounding ranks reinforce the natural upper partials of the harmonic series (although they were included in organs long before this was understood). Off-unison ranks are also available as separate stops, mostly sounding at an interval of a 12th (an octave and a fifth; 2 2/3′), 17th (two octaves and a third; 1 3/5′), or 19th (two octaves and a fifth; 1 1/3′) above the unison. These are used melodically to color the unison and octave stops, and they may be wide or narrow in scale. Such stops are known as mutation stops, as opposed to the mixtures, or chorus stops. Their use is essential for the historically correct performance of organ music.

7. The recording and editing process

We have decided to record NDB Organ Samples in 2002 and started to work in February 2003. After a day of tests and measurements, the first recording process took three days at Matthias Church and two days at Notre Dame de Kispest. In 2004 we had a second chance to record more combinations and stops and spent two more nights at both churches.

For the recording we used a pair of Neumann U87 microphones and a high-precision sound card to capture the sound of the organ and the natural reverb of the cathedrals. The microphones were attached to a computer using a custom-built, low-noise microphone pre-amplifier. The sampling rate of the recording was 96 000 Hz, while the bit depth was 32 bits. The results were saved to .wav files (type 3, 32-bit 0.24 normalized float). Recording the noise of the organ engine was also important for the post processing. The noise reduction was a critical point of the editing, because we wanted to keep the high sound quality, while we had to remove the noise, as without removal, every new note in a chord would add another unit of noise to the sound. Therefore, every single note was de-noised with its own noise print at 96 kHz/32-bit in six-seven phases in average. This took well over a year to complete.

After reducing the noise, the samples were downsampled to 48 kHz/24-bit and the program files were created and programmed. For the measurements, we used the same equipment with the same recording conditions, but in some cases where they were appropriate, we recorded the impulse responses directly in 48 kHz. These measurements at both churches were a great help in having information about the natural coloration of the reverb of the organ sound and allowed us to create the presets for the convolution reverb engine.

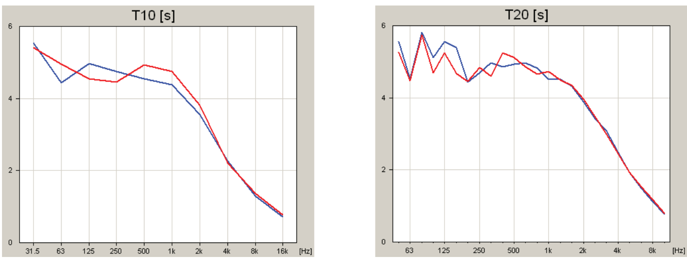
As we had a very limited time in the churches and our goal was to use this time optimally to record a large number of stops and combinations.

7.1. About transposition

We took a sample of every second or minor third on the manual stops and chromatically or seconds on the pedal stops. In our case it was rarely necessary to record every single note. These symphonic organs are evenly tempered and thus it is possible to use the computer to interpolate the sounds really well, with a difference hard to identify. Our measurements proved that there is no significant, audible difference in the harmonics, and we did carry out a number of listening tests to find the reasonable limit, where adding more samples only decreases performance but does not really make an audible difference.

The intonation of the pipes does not differ enough within a second or even a third in these organs that it would degrade the authenticity of the sound; and no problems result from transposing the pipe wind, either, because the pipe wind, especially at the high frequencies, is very similar to a band-limited white noise (i.e., it has the same volume at all frequencies), which means it is indifferent to transposition.

Measurements proved that the contraction of the reverb in the release samples caused by transposition is no more than 16% compared to actual reverb that is heard in the cathedral.



ISO 3382 T10 and T20 diagrams for two channels

The church reverb is actually shorter for high pitches than for low ones. This means that for a well and evenly tempered large organ, transposing sounds to this extent does not result in any audible problems.

Some interesting facts about NDB

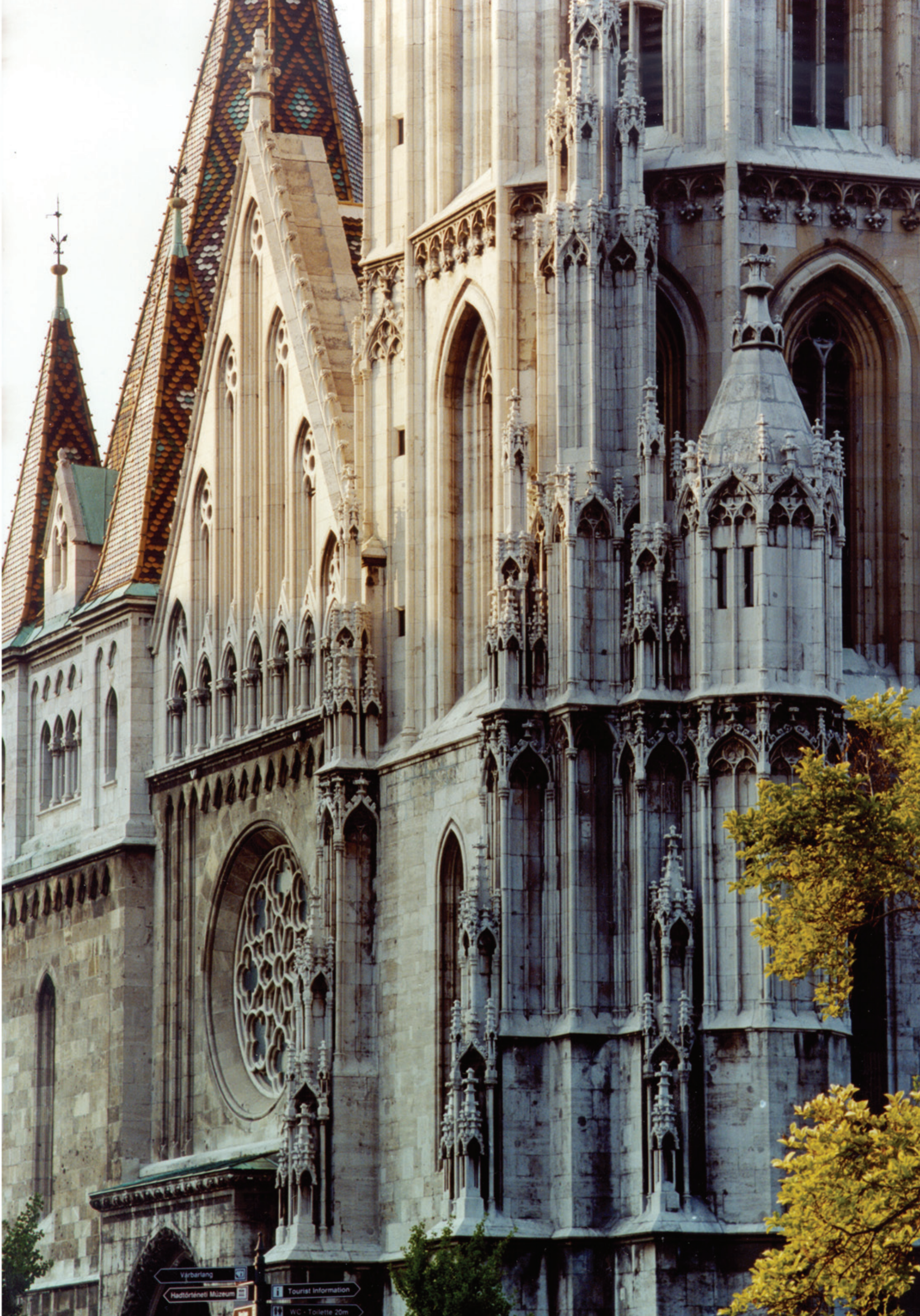
- Every recording was made actually at 96kHz/32-bit.
- 3401 wave files were created and the backups filled 64 DVD disks.
- There are over 2,000 manhours of work in this collection.
- Over half of the revenue is donated to the churches for the restoration of the two organs.
- We are still having a slightly bad remorse for playing loud white noise and sine sweep sounds when we were measuring the impulse responses in the cathedrals at midnight – for hours.
- A massive arsenal of pro-audio and IT equipment of over $100,000 value was used to create this library – and we dropped and broke a 19" monitor during the first recording night.
- For the impulse response measurements, we had to enter the organs, so we had the opportunity to make photographs and videos never seen before.
- We experienced a thunderstorm upon setting up the recording equipment inside the completely dark and empty cathedral which was flashing by lightning frequently – we were fast enough to record the sound: you'll find the results in the library.

8. Organ stops

Stop name	Description
Basson	Bassoon
Basson-hautbois	Bassoon-oboe
Bombarde	Bombarde – originally clear, colorful, later the strongest bass reed pipes.
Bourdon	Wide, deep, humming, in higher pitches singing, covered metal or wooden pipes.
Bourdon à cheminée	'Chimney' bourdon. 'á cheminée' (Rohr in German names) indicates the small extension piece at the end of a closed pipe.
Clairon	Clarion, a high-pitched trumpet sound
Clarinette	Clarinet – medium-pitched pipes that resemble the actual instrument.
Cornet, Cornett	Cornet
Cymbale, Cimbel	Highest-pitched, tight, multirow pipe set. Lots of repetitions, at various harmonics. The brightest-sounding crown of the organ sound.
Diapason	See Principal.
Doublette	2' principal stop on French organs.
Dulcian	Soft, cylinder-shaped or tapered flue pipes.
Flûte	Flute
Flûte conique	'Conic' flute.
Flûte harmonique	See Querflöte.
Flûte traversière	See Querflöte.
Gambe	Cylinder-shaped or tapered flue pipes with a colorful, string-like sound.
Gedackt	'Covered' – indicates that the pipes are covered.
Gemshorn	Medium-wide conic, medium-volume or quiet, horn-like flue pipes.

Stop name	Description
Glocken	Glockenspiel-like sound (realized by multiple pipe sets, e.g. 2' + ¾')
Hauptbois	Oboe
Krummhorn	'Bent horn', reed pipes with natural-length cornets
Locatio (Hintersatz)	A deep, large mixture of many unison and fifth pipe sets. Recently sometimes includes thirds and sevenths.
Mixtur	Mixed set of narrow pipes of high octaves and quints. At least two sets of pipes, on larger organs can be as many as 10 sets. This is the stop that gives the characteristic organ sound.
Nachthorn	'Night horn', the widest pipes of the organ, may be open or covered. In spite of being wide, these pipes sound quite soft.
Nasard, Nasat	A harmonic stop of quint or its octaves, giving a 'nasal' sound.
Obertön	Harmonics (several rows of them)
Octave	Principal pipes sounding at the octave of the unison. The cleanest stop of the whole organ, the base of tuning.
Octavin	Wide, soft blow-through pipes in French organs.
Posaune	Strong 16' or 32' reed pipes played by the pedal.
Praestant	Principal pipes standing in the front of the organ, usually 4'.
Principal	'Main play', the major element of the organ sound. Typical metallic, organ-like sound.
Querflöte	'Transversal flute', wide blow-through pipes of twice the size as the normal open pipes. A clear, somewhat veiled flute sound.
Quintatön	'Quinter', narrow, closed base pipes sounding the fifths strongly. Quite nasal, somewhat bitter sound.
Quinte	A harmonic register of fifths (e.g. when a C is pressed, a G sounds).
Rohrflöte	Pipe flute – medium-wide closed pipes with an extension that yields a brighter sound than the fully closed flute.
Salicional	Willow pipe – a tight, cylindric, somewhat string-like register.

Stop name	Description
Scharff	Acute, 'sharp' – a mixed rank that is tighter and of higher pitch than Mixtur.
Septième	Seventh – when a C is pressed, A# sounds.
Sordun	Reed pipes with short cornets that give a humming sound.
Soubasse	Same as Subbass.
Sp. Trompete	Spanish trumpet – strong trumpets built horizontally in the front of the organ.
Spitzflöte	'Peak flute' – a tight, bright flute with a nasal sound.
Subbass	Lower bass.
Superoctave	A 2' or 1' principal register.
Terz, Tierce	Third – when a C is pressed, E sounds.
Trompete, Trompette	Strong reed pipes that resemble trumpet sound, usually with a cornet-shaped resonator.
Trompette harmonique	Double-sized, blow-through trumpet.
Unda maris	'Wave of the sea' – a soft, flute-like pipe rank tuned a little different from normal. Together with other stops it makes the sound 'float'.
Violon	Tight, string-like pedal stop.
Voix céleste	'Heavenly sound' – two sets of tight string pipes tuned a little different from each other. Gives a floating sound.
Voix humanie	'Human voice' – quiet reed pipes with a short cornet that resemble human voice.
Waldflöte	'Forest flute' – medium-wide, somewhat conic pipes.
Zimbel	See Cimbel.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9. Credits

Special thanks to:

Szabolcs Varga

Bertalan Hock

Tamás Vadas

Bálint Karosi

György Gadányi

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- use the library to create sound recordings;
- give concerts with them;
- or even sell your recordings, use them in movies, etc.

However, you must not cheat and say you played on real organs or fake that you are playing on a real one. In particular, you are strictly forbidden to:

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- represent the name of Matthias Church (and its other names) and Notre Dame de Kispest (and its other names) on your recordings, product, film score, or whatsoever;
- use the samples in any electronic organs;
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