FLAME
FM KOSMOS

QUAD POLYPHONIC FM VOICE
EURO RACK MODULE

for firmware version 1.00 and above

last change: October 11, 2024

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SHORT DESCRIPTION

Thank you for purchasing the FLAME FM KOSMOS eurorack module!

The module is a fully functional up to 4-way polyphonic FM synthesizer with an integrated multi-effects processor. The FM synthesizer has 6 operators per voice, which are connected in 32 selectable algorithms. The respective algorithm can be shown on the graphic display. Each operator has an ADSR envelope, which can also be looped. A highlight is the ability to morph between two sound variants A and B. The parameters of the effects can also be morphed in two variants.

The multi-effects processor offers 3 effects connected one after the other: stereo chorus, stereo delay and reverb. The stereo delay can be synchronized via MIDI clock or analog clock.

Parameters for global sound changes are available on the MASTER page. The envelope of all operators can be compressed/stretched at the same time. There is also a low and high pass filter for the audio sum.

During development, particular attention was paid to direct and simple operation with regard to live operation. The parameters in the pages can be changed directly using the 8 potentiometers. The menus can usually be reached directly without detours or submenus. This is primarily used to simplify editing sounds. There are already 128 preset sounds in 8 groups to choose from. Sounds can be loaded or saved in a further 128 memory locations.

The sounds can be triggered analogously using the input trio Gate, 1V/Octave and Velocity CV. Another CV input for the Morph function and two additional programmable CV inputs can be used for further controls. Regardless of the analog connection, the module offers full MIDI functionality. The MIDI input and a MIDI output allow integration into an external MIDI setup. The MIDI-TRS-B type is used.

The firmware can be updated via MIDI Sysex. The created sound data can also be saved or exchanged.

MODUL OVERVIEW

1   1x MIDI-In, 1x MIDI-out (Typ: TRS-B)

2   Button: LOAD/SAVE

3   Buttons: A/B, SETUP, MULTIEFFECT (FX)

4   Buttons: OPERATOR 1-6, MAIN, MASTER

5   DISPLAY / PUSH ENCODER

6   8x KNOBS (POTENTIOMETERS)

7   3x Inputs: Gate, 1V/Octave CV, Velocity CV

8   3x CV inputs: Morph, User CV1 and CV2

9   Stereo AUDIO output
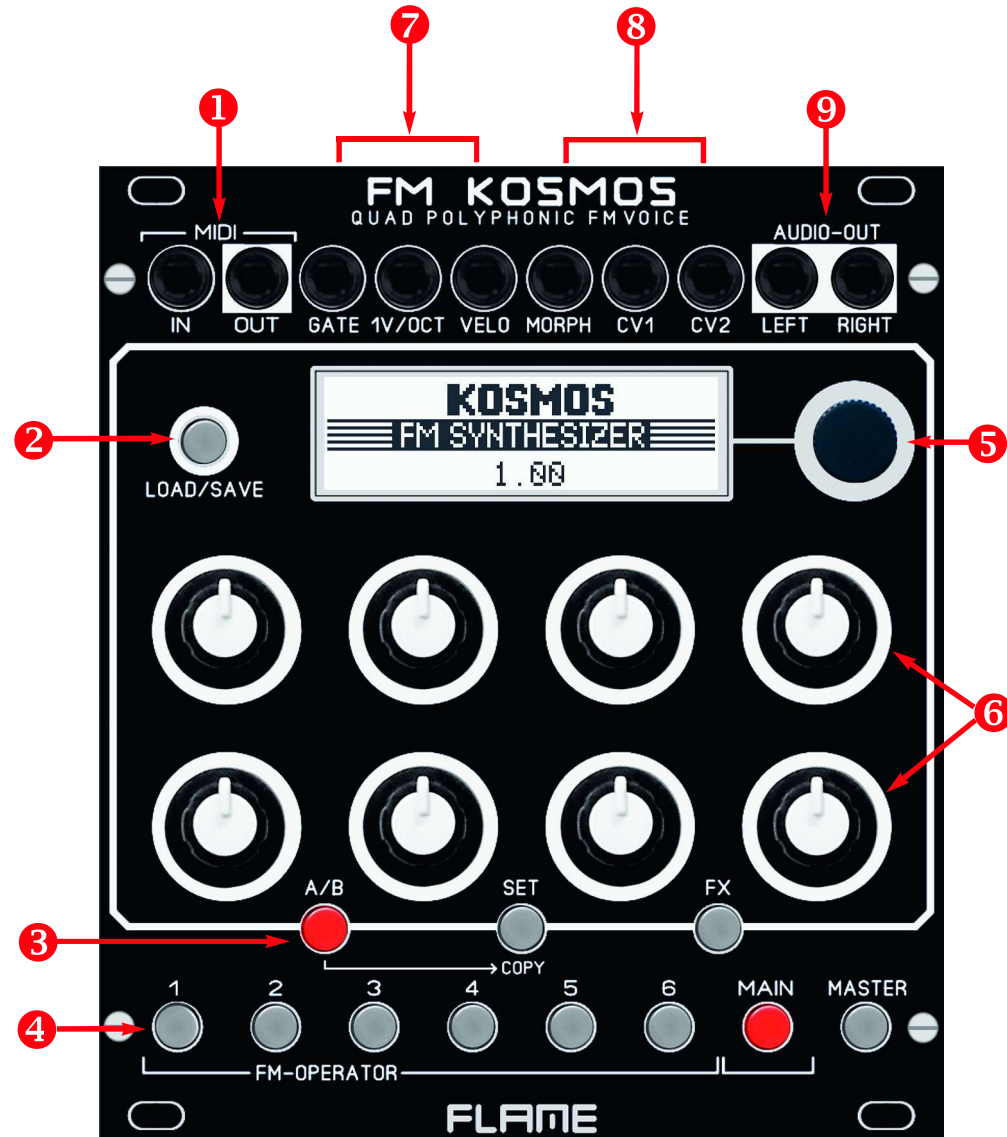
CONNECTION TO THE MODULAR SYSTEM

DOEPFER POWER CONNECTOR

The module is delivered with a ribbon cable connected to the Doepfer bus. The color-coded wire (usually red) represents minus 12 volts.

It is important to ensure that the polarity is correct when connecting. If the module is accidentally connected incorrectly, protective diodes prevent the module from being destroyed immediately (but it cannot be ruled out that damage may still occur).

Therefore, be careful: Check the connection several times before switching on for the first time!

The module's maximum current consumption at 12V is approx. +120mA / - 60mA (peak +140mA-70mA). The 5V supply is not used.

NOTE!

Do not accidentally connect high CV voltages to the MIDI-IN! This may damage the hardware!

CV INPUTS

The CV inputs are normalized as follows when the cable is not plugged in:

CV Velocity: +5v (input level range 0..+5v)
CV Morph: -5v (input level range -5v..+5v)
CV 1+2:   -5v (input level range -5v..+5v)

1V/Octave input for notes 8 Octaves 0..+8V

Velocity CV input (unipolar 0..+5v)

GATE input 0/+5V

MORPH CV input (bipolar +-5v)

MIDI IN/OUT Type TRS-B

CV1+2 inputs (bipolar +-5v)

Stereo AUDIO OUT (Modular level 10Vpp)
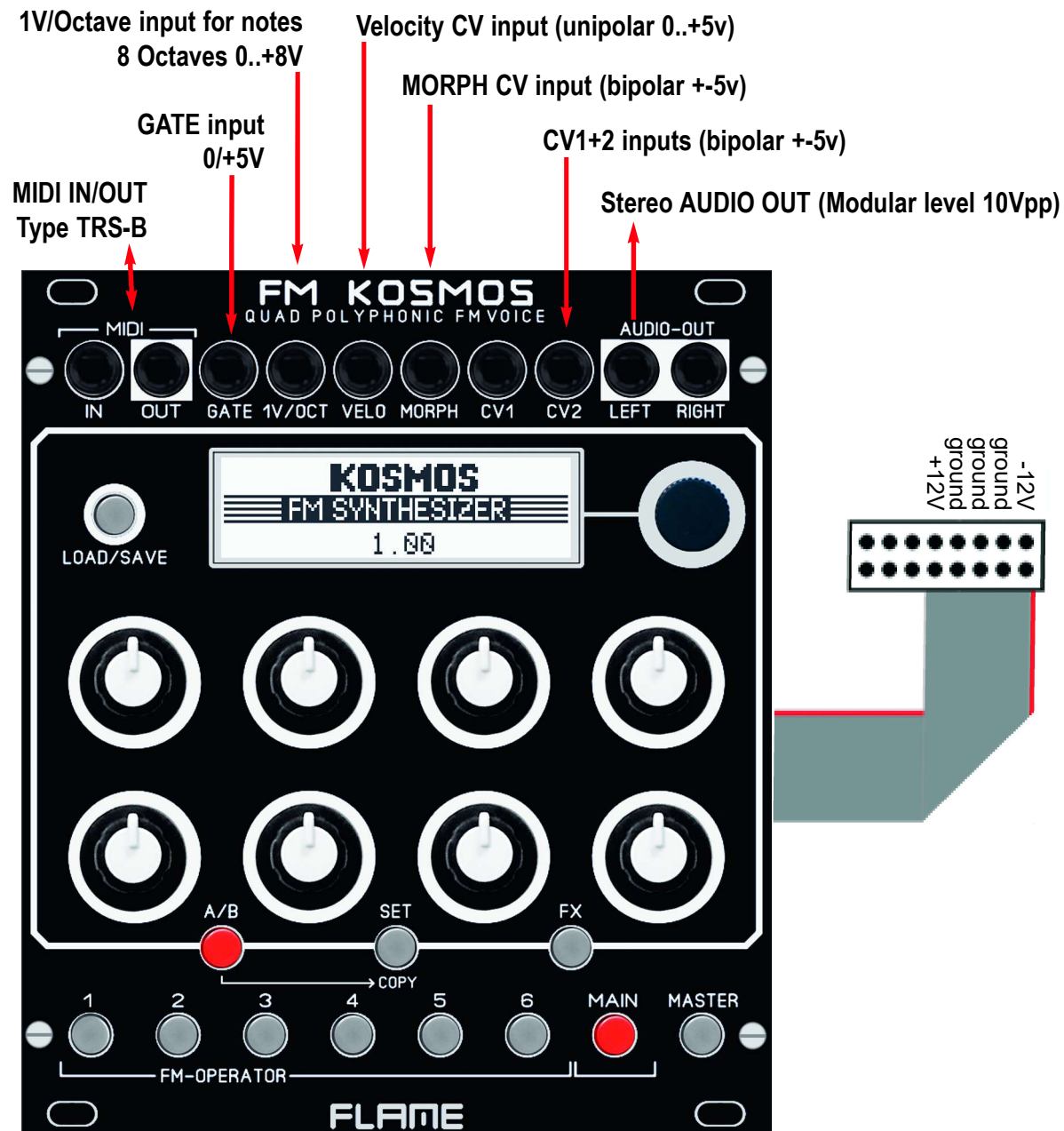
FIRST STEPS

OPERATION

All important menus can be called up directly using buttons. There are 6 buttons for the operators, one button for the MAIN menu (global sound settings) and one button for the MASTER menu. The effects can be called up directly using the FX button. Step through the three FX pages by pressing the FX button several times. More on this in the chapter: FX PAGES - MULTI-EFFECTS

The SETUP menu is also called up using the SET button and steps through the various settings by pressing it several times. When you call up the FX or SET function again, you are immediately taken back to the last page used. The parameters in the pages are described in the relevant chapters.

The functions for loading and saving a sound use the same button, whereby a short press calls up the Load menu and a long press on the button calls up the Save menu. More on this in the chapter: LOADING/SAVING SOUNDS

The A/B button does not call up a page, but is used in the Operator and FX menus to select the sound variant A or B. All parameters in these menus always refer to one of the two sound variants and you only ever hear this sound variant (no morphed sound between A and B). However, the Morph setting takes effect in the MAIN and MASTER menus. This can be done using the Morph parameter in the MASTER menu, the voltage at the Morph CV input or the MIDI Controller 1 (Mod wheel).

The 8 knobs are used to edit up to 8 parameters that are shown in the display. When changing the page, the controls are set to override the value so that there are no jumps in the value. The approximate current value of the parameter is either shown with a small slider graphic below the name and/or directly in the parameter name (e.g. parameter 7 chord in the MAIN menu). If a parameter is not used in the page, it is marked with a dashed line (here parameter 8 in the MAIN menu).

Parameters 1 - 4
Parameters 5 - 8

Knobs for parameters 1 - 4

Knobs for parameters 5 - 8

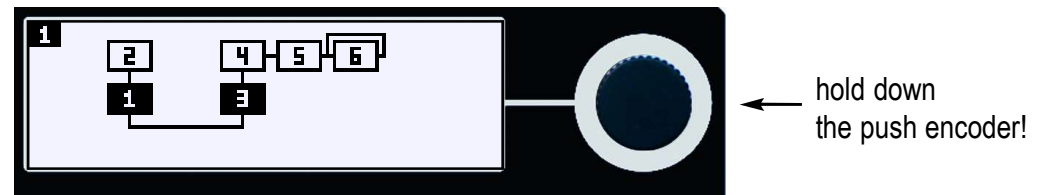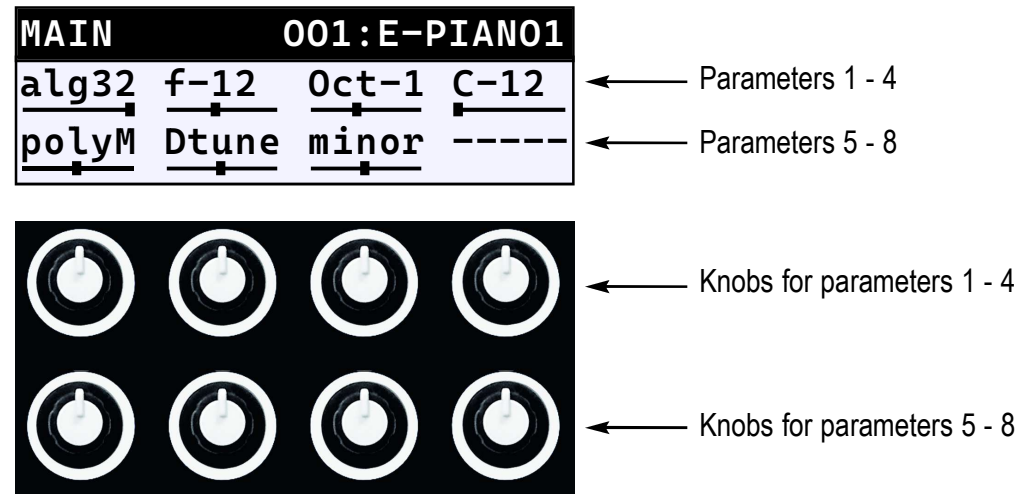
hold down
the push encoder!

DISPLAY ALGORITHM GRAPHIC

In the Operator 1-6, Main and Master menus, holding down the data wheel displays the graphic of the active FM algorithm.

TUNING TO FUNDAMENTAL NOTE C

The module can be globally tuned in the MASTER menu. First, set the three parameters 2-4 to the middle position with a loaded sound in the MAIN page: **f0 Oct0 c0**
Send a MIDI note C and then tune the module in the SETUP menu with the Mastertune parameter (default setting: 30).

LOAD / SAVE SOUNDS

LOAD SOUNDS

LOAD USER SOUND:
There are 128 USER memory locations for sounds. Only these can be used to save your own sound programs. These sound programs can also be loaded using MIDI program change commands.

Briefly pressing the LOAD/SAVE button calls up the LOAD menu. Use the DATA control to select the USER sound (001-128). Pressing the DATA control then loads the USER sound. Cancel without loading using the LOAD button or another menu.

```
LOAD SOUND

USER
OO1:SOLIDBASS
```
← User Bank
← No. and sound name

LOAD PRESET SOUND:
There are 128 PRESET sounds, organized in 8 groups with 16 sounds each. These sounds cannot be overwritten, but serve as templates for your own sound programs. The 8 banks are assigned to the 8 rotary controls. Each rotary control can be used to select one of 16 PRESET sounds as follows:
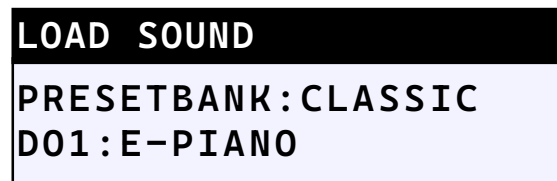
Briefly press the LOAD/SAVE button to call up the LOAD menu. Then use one of the 8 potentiometers (bank A-H) to select a sound (01-16) from the respective bank. Press the DATA control to load the PRESET sound. You can cancel (without loading) by pressing the LOAD button or another menu button.

```
LOAD SOUND

PRESETBANK:CLASSIC
DO1:E-PIANO
```
← Preset Bank
← No. and sound name

BANKS OF PRESET SOUNDS:
A   BASS   (different basses)
B   LEAD   (Solo voices)
C   PAD   (Padsounds, Drones, Complex sounds)
D   CLASSIC   (classic sounds like EPiano, Organ, Bell, Strings etc)
E   PERCUSSION (tonal and noisy drum sounds)
F   SEQUENCE   (Arpeggio sounds)
G   RHYTHMIC   (Sounds with looping envelopes)
H   FX+NOISE   (Effect sounds, lofi sounds, noisy sounds)
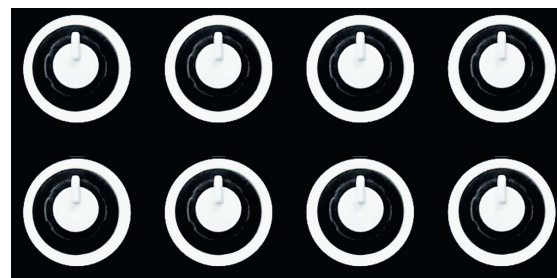
← Knobs for Bank A .. D
← Knobs for Bank E .. H

LOAD / SAVE SOUNDS

SAVE SOUND

SAVE USER SOUND:
There are 128 USER memory locations for sounds. You can only save your own sound programs to these. The preset sound banks cannot be changed.

Long press on the LOAD/SAVE button calls up the SAVE menu. Use the DATA control to select the USER memory location (001-128) where you want to save the currently loaded sound. The bottom line of the display shows the memory location number and the name of the sound program there. Save by pressing the DATA control (cancel with the LOAD button or the Menu buttons).
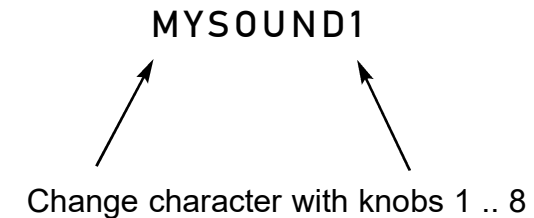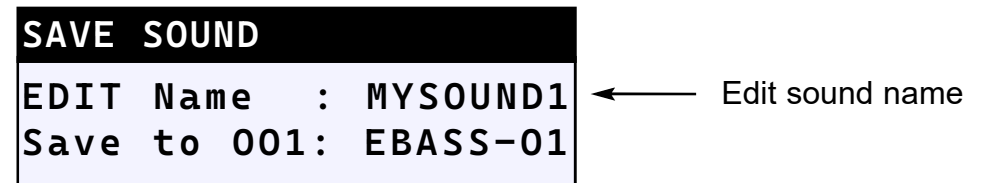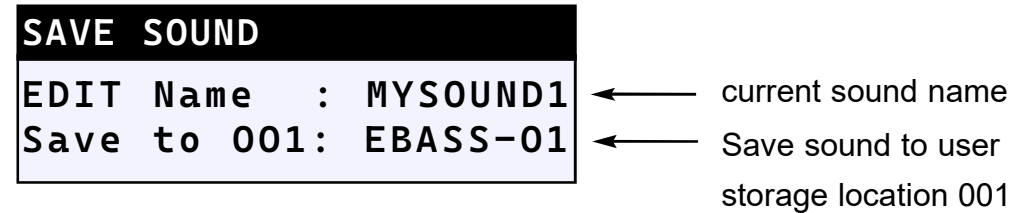
```
SAVE  SOUND
EDIT  Name   : MYSOUND1    ←———  current sound name
Save  to 001: EBASS-01     ←———  Save sound to user
                                 storage location 001
```

EDIT SOUND NAME

In the SAVE SOUND menu, you can specify a name of up to eight characters for the sound you want to save. This sound name is in line 2 of the display. Line 3 contains the memory number and the name of the sound already there.
Change the characters of the name in line 2 using the controls, with potentiometers 1-8 corresponding to character positions 1-8 of the name.

Turn the knobs to set the name. Starting from the left stop, you can use the potentiometer to set a space, the capital letters A-Z, the numbers 0-9 and, when turned to the right, a hyphen.

In the example on the right, the current sound "MYSOUND1" is saved to location 001 and the sound "EBASS-01" that is there is overwritten (i.e. replaced).

```
SAVE  SOUND
EDIT  Name   : MYSOUND1    ←———  Edit sound name
Save  to 001: EBASS-01
```

```
        MYSOUND1
```
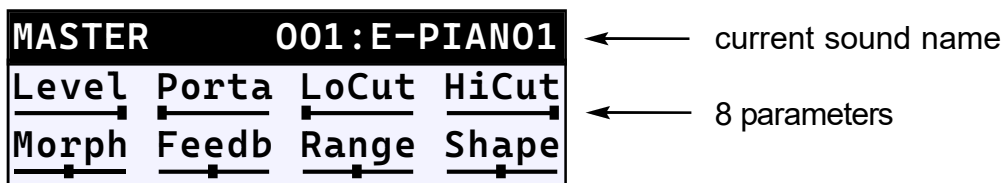
Change character with knobs 1 .. 8

MASTER MENU

After switching on, the MASTER menu is active (MASTER button lights up). The Autoload sound (see SETUP menu) is automatically loaded. The memory number and name of this sound are displayed at the top left. This is set in the SETUP menu on page 4 "AUTOLOAD". The value is automatically saved permanently when you leave the SETUP menu.

The parameters in the Master menu can be used to create interesting sound variations in live operation without having to go into sound programming. Change the values using the corresponding potentiometers.

```
MASTER        OO1:E-PIANO1    ←——  current sound name
Level Porta LoCut HiCut
 ▪——        ▪——         ←——  8 parameters
Morph Feedb Range Shape
 ▪——    ▪——    ▪——    ▪——
```

The MASTER menu contains the following parameters:

Level	overall volume audio output
Porta	portamento time (Glide) of notes
LoCut	HighPass filter
HiCut	LowPass filter
Morph	Mix between the sound/FX variants A / B
Feedb	level of feedback operator
Range	envelope time of all operators
Shape	envelope shape of all operators

Level
Use Knob 1 to adjust the overall sound volume for the stereo audio output.

Porta (Glide)
Use Knob 2 to set the portamento time (glide) of the notes. When turned all the way to the left, glide is turned off. When turned all the way to the right, the portamento time is at its longest (slow glide).

LoCut / HiCut
Use Knobs 3 and 4 to limit the low and/or high frequencies with these two filters. The filters are only used to reduce unwanted low and/or high frequency components. The filters do not resonate.

Morph
Use Knob 5 to mix between the two sound/FX variants A and B. Turn the knob all the way to the left if you are controlling the Morph CV input.

Feedb (Operator feedback)
Every algorithm has at least one operator with feedback. Use Knob 6 to change the proportion globally. This can be used to create noise effects.
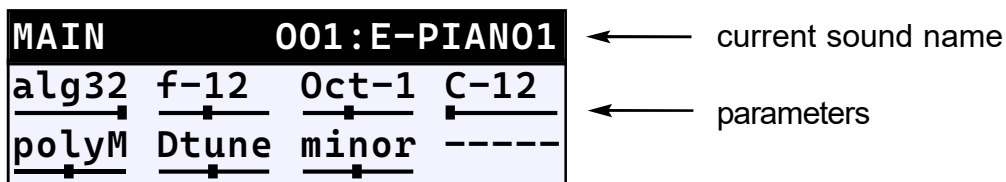
Range (Envelopes)
Compress or stretch all the envelopes of the operators together with Knob 7. The ratios of the individual envelopes of the operators are retained. This allows you to create sounds that range from percussive to long-lasting.

Shape (Envelopes)
Use Knob 8 to change the curve shapes of all the envelopes of the operators. The length of time always remains the same. This can change the character of the sound considerably.

MAIN MENU

The parameters in the main menu are used to set global parameters of the FM sound. They do not affect Morph. This is where the algorithm, i.e. the wiring of the operators, is selected, as well as the tuning of the sound (compared to global master tune). All parameters are saved in the sound and belong only to this sound. The main parameters are therefore set separately for each sound. Change the values using the corresponding knobs.

```
MAIN        OO1:E-PIANO1    ← current sound name
alg32 f-12  Oct-1 C-12
   ■     ■      ■    ■     ← parameters
polyM Dtune minor -----
   ■     ■      ■
```

Im MAIN-Menu befinden sich folgende Parameter:

Algo	Operator algorithm of the current sound
f	Tuning: Fine tune of the current sound
Oct	Tuning: Octave of the current sound
C	Tuning: Semitone of the current sound
Mode	Playmode (monophon / polyphon, MIDI / analog)
Dtune	Detuning of the four voices
Chord	Chords for monophone sounds

Algo (No. of algorithm)
Use Knob 1 to select the FM algorithm that applies to this sound. When you turn the knob, the connection is shown graphically on the display. Hold down the data wheel if you want to see the graphic of the currently set algorithm. In the chapter "List of operator algorithms" you will find an overview of all 32 variants.

f - Finetune (f-100 to f100)
Use Knob 2 to detune the sound from the center position up or down in fine increments (cents) compared to the master tuning (in the Setup Menu).

Oct - Octave shift (Oct-2 to Oct2)
Use Knob 3 to detune the sound from the center position up or down in octaves compared to the master tuning (in the Setup Menu).

C - Semitone shift (C-12 to C12)
Use Knob 4 to detune the sound from the center position up or down in semitones compared to the fundamental note C of the master tuning (in the setup menu).

Mode - Playmode of current sound
Use Knob 5 to choose how the sound should be played. Either via MIDI or analog via the 1V/Oct input (monophonic or polyphonic):

monoA	monophone analog per 1V/Oct input
polyA	polyphone analog per 1V/Oct input
monoM	monophone per MIDI
polyM	polyphone per MIDI

Detune (Detuning of the four voices)
Use Knob 6 to detune the individual voices against each other. This creates chorus effects with monophonic sounds and unison chords.

Chord (Chords for monophone sounds)
Select a chord with Knob 7 in monophonic play mode.

LIST OF CHORDS

Chord name	Display	Intervals	
1. unisono	unisn	0,0,0,0	
2. octave 1	oct1	0,12,0,12	
3. octave 2	oct2	0,12,24,0	
4. octave 3	oct3	0,12,24,36	
5. fifth 1	5th 1	0,7,0,7	
6. fifth 2	5th 2	0,7,14,21	
7. fourth 1	4th 1	0,5,0,5	
8. fourth 2	4th 2	0,5,10,15	
9. third major	maj 3	0,4,0,4	
10. third minor	min 3	0,3,0,3	
11. augmented	augm	0,4,8,12	
12. diminished	dim	0,3,6,12	
13. diminished flat seven	dimb7	0,3,6,10	(= m7 b5)
14. diminished doubleflat	dim 7	0,3,6,9	
15. minor add9	m+9	0,3,7,14	
16. minor 7 add 9	m7+9	0,3,10,14	
17. minor 7 add 11	m7+11	0,3,10,17	
18. minor 7 b5	m7 b5	0,3,6,10	(= dim b7)
19. minor maj7	m M7	0,3,7,11	(=dominant 7th)
20. minor 6	m6	0,3,7,9	
21. minor 6 add9	m6+9	0,3,9,14	
22. minor	minor	0,3,7,12	

Chord name	Display	Intervals	
23. major	Major	0,4,7,12	
24. major add9	Madd9	0,4,7,14	
25. major 7	M7	0,4,7,10	
26. major maj7	M M7	0,4,7,11	(= dominant 7th)
27. major 6	M6	0,3,7,9	
28. major sus4	Msus4	0,5,7,12	
29. major sus2	Msus2	0,2,7,12	
30. major 6 add9	M6+9	0,4,9,14	
31. major #5	M #5	0,4,8,12	
32. major b5	M b5	0,4,6,12	
33. major 7 sus4	M7su4	0,5,7,10	
34. major 7 #5	M7 #5	0,4,8,10	
35. major 7 b5	M7 b5	0,4,6,10	
36. major 7 add 9	M7/9	0,4,11,14	
37. major 7 add b9	M7 #9	0,4,11,13	
38. major 7 add #9	M7 b9	0,4,11,15	
39. major 7/9/11	M7911	0,11,14,17	
40. major 7/13	M7/13	0,11,16,21	
41. major 7/9/13	M7913	0,11,14,21	
42. major 11	M11	0,4,10,17	
43. major 7/11	maj11	0,4,11,17	
44. minor 11	m11	0,3,10,17	

FM OPERATOR ALGORITHM

DESCRIPTION

The simplest form of FM synthesis (FM = frequency modulation) is formed by two sine oscillators (so-called operators), where one (the modulator) modulates the other (carrier). The intensity (level) and frequency of the modulator generate a wide variety of overtones, whereby the sine waveform of the carrier can be distorted beyond recognition.

The FM KOSMOS module has 6 operators per voice, which are hard-wired in 32 fixed algorithms. The graphics illustrate the signal flow, with the black boxes symbolizing the carrier (output operators) and the white boxes symbolizing the modulator operators.
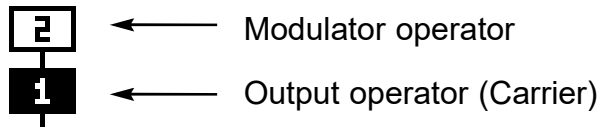
These different algorithms provide flexibility and variety in sound generation. Multiple modulation stages produce harmonically rich sounds. On the other hand, multiple output operators allow the combination of different sounds. For example, an electric piano sound could have one tone for the hammer strike, a second tone for the body of the sound, and a third tone for the sounding tine, all of which change over time.

FEEDBACK OPERATOR

For individual operators in the algorithms, the signal is fed back (feedback loop). Parameter 6 (Feedb) in the MASTER page affects these operators and increases the level. This allows more overtones to be dynamically generated, including distortion and white noise.
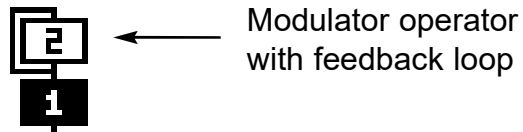

EXAMPLE 1

For example, looking at Algorithm 8, the structure of an algorithm becomes clear. Each box represents an operator (oscillator). Operators 1 and 3 (black) are combined to form the output.
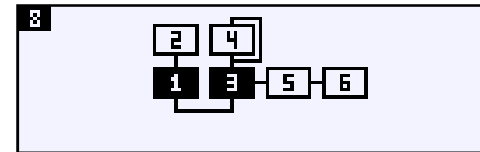
The remaining operators provide the modulation, as indicated by the lines. Operator 2 modulates Operator 1. Operators 4 and 5 are combined to modulate Operator 3, creating a complex modulation. Operator 6 in turn modulates Operator 5. Finally, the line running around Operator 4 indicates that Operator 4 is modulating itself (feedback loop). Since each modulation level can vary over time through the envelope levels, the resulting sound can be very complex.

EXAMPLE 2

In the second example, let's look at algorithm 32. Here, all operators are connected to the output in parallel. None is modulated by another operator.
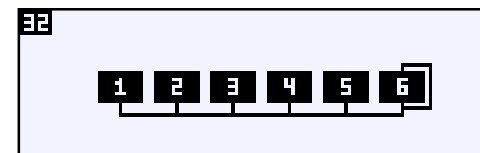
This algorithm does not produce an FM sound, but rather the frequencies of the individual operators add together to create a sound. This synthesis is called "additive synthesis". This form of synthesis can be used to produce a wide variety of organ sounds. Take operator 1 as the loudest basic voice. Tune the other operators with other frequencies and mix them in at different volumes. These then form the overtones of the sound.

LIST OF OPERATOR ALGORITHM
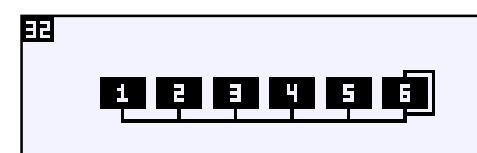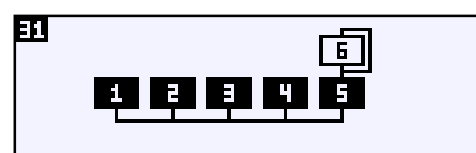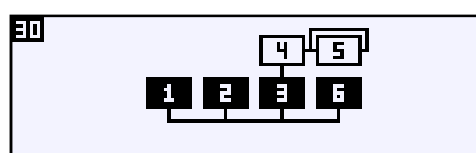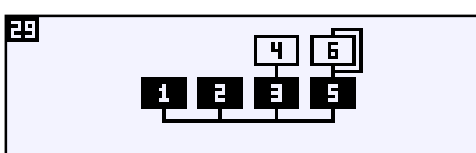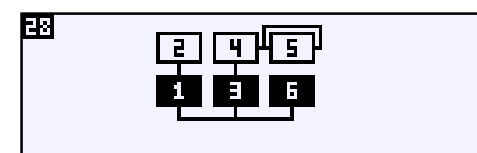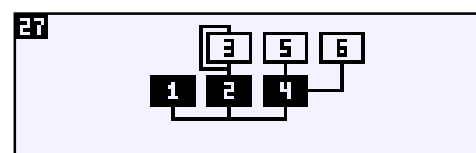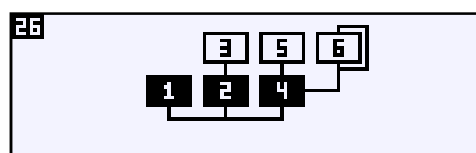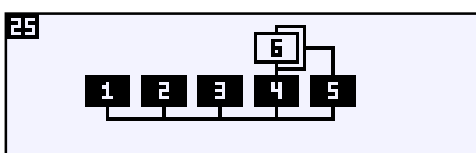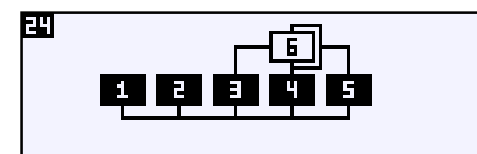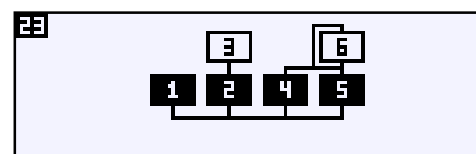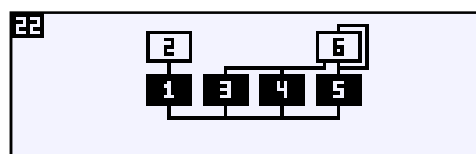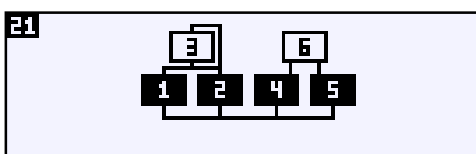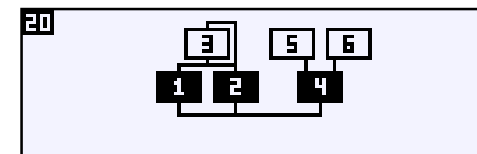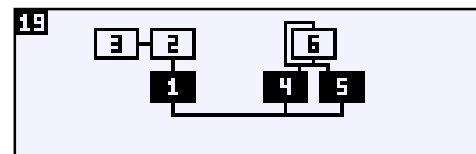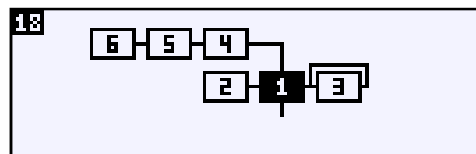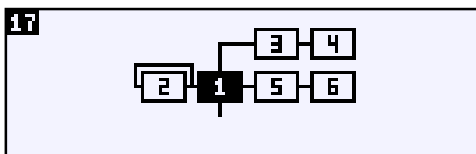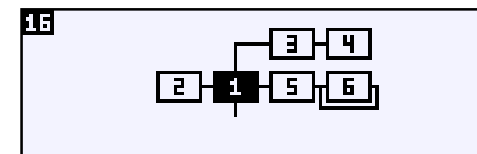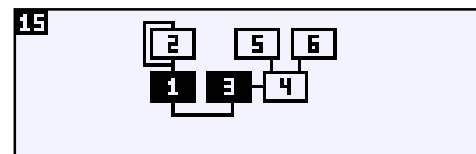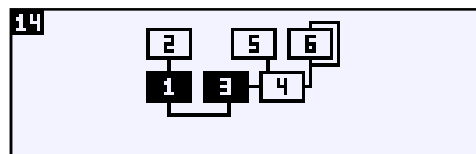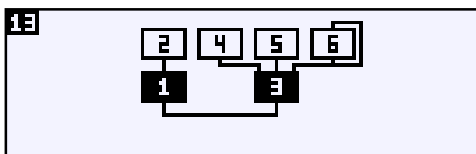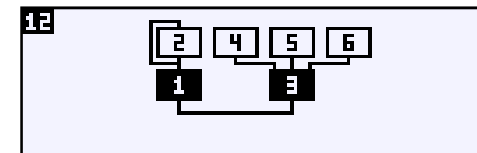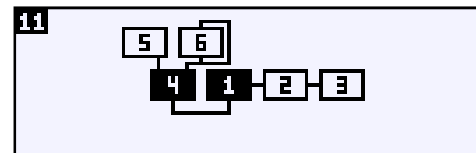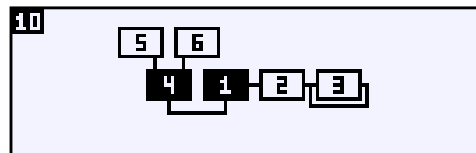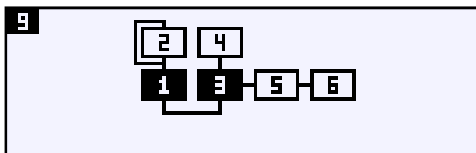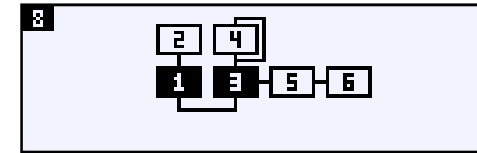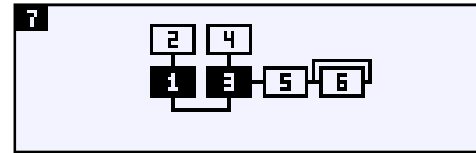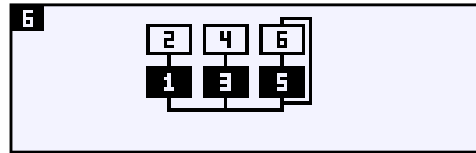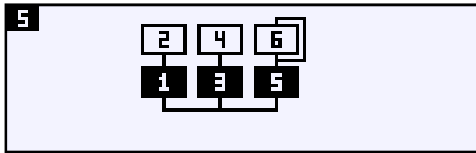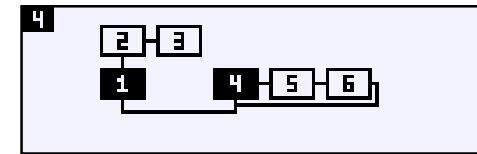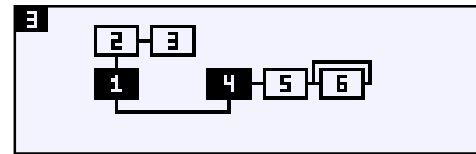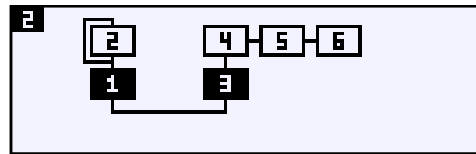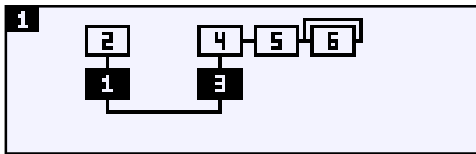
OPERATOR 1-6 PAGES

The module has 6 sine oscillators, called operators. Each of the six operators has its own page, which can be called up directly using a button. Each operator page contains exactly 8 parameters, and all six operator pages are identical.

The connection (wiring) of the six operators, i.e. the signal flow, is specified by one of the 32 algorithms. Change the algorithm in the MAIN menu using parameter 1 (and Knob 1). The graphic of the algorithm can be shown on the display in the operator pages. To do this, hold down the encoder (data wheel).

Note that two sound variants A and B can be created for Morph! Switch between the two variants using the A/B button (lit button = B). See more in the chapter: A/B MORPH FUNCTION .

```
OPERATOR:1
r0.50 Level fLFO  1shot
Attac Decay Susta Relea
```

1 - Ratio
Use Knob 1 to set the frequency ratio of the operator in staggered steps. The parameter is only effective if parameter 3 is off. If parameter 3 (LFO) is switched on (i.e. fLFO is displayed), then Ratio is ineffective.

2 - Level
Use Knob 2 to adjust the volume or intensity of the operator. If the operator is a modulator (white box in the algorithm graphic), then the parameter determines the modulation depth. If it is an output operator (black box in the algorithm graphic), then the parameter determines the volume. If the operator is feedback (shown in the graphic where the box leads the output back to the input), the Feedback parameter in the MAIN menu affects this parameter.

3 - LFO (fix LFO frequency instead of ratio)
Instead of Ratio, a fixed (not tonally playable) LFO frequency can be set. Set the parameter to "**fLFO**" (frequency LFO). Ratio has no effect in this case. Set the LFO to "**off**" if Ratio is to be effective. The value can be set with Knob 3.

4 - Loop on/off
The ADSR envelope can either be played just once (**1Shot**) or repeated (**Loop**) as long as the note is switched on (Gate On). All 4 elements of the envelope (including the release time) are looped through. The value can be adjusted using Knob 4.

5-8 Attac, Decay, Susta, Relea (ADSR envelope parameters)
Use Knob 5-8 to adjust the 4 parameters of the ADSR volume envelope:

Attac = Attack: temporal rise of the envelope

Decay = Decay: temporal descent to sustain level

Susta = Sustain: Hold Level at Gate=On

Relea = Release: temporal decay to zero at Gate=Off
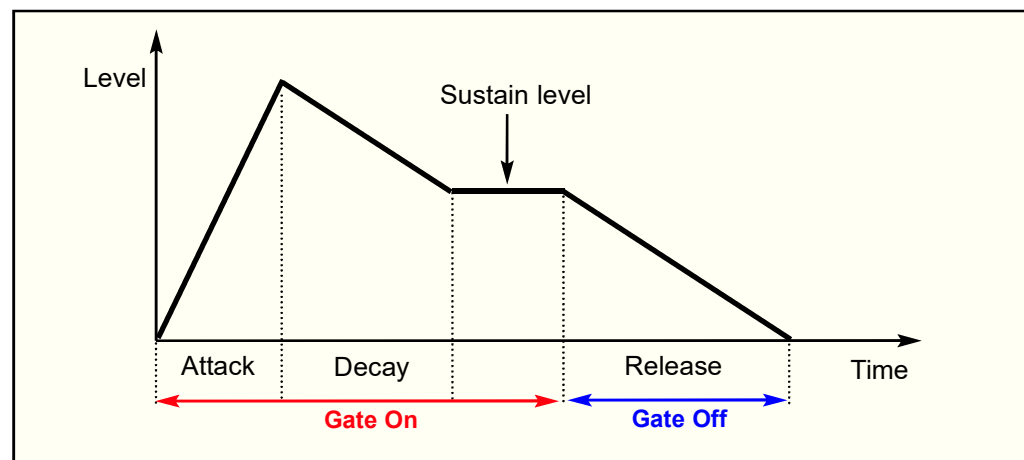
FX PAGES - MULTIEFFECTS

In the FX multi-effects menu, three effects are available for the master output. Use the FX button to step through the three pages. In the FX menu, the parameters for sound A and B are set separately. So you always hear either variant A or B, but not the mixture through morph. See also chapter: A/B MORPH FUNCTION

FX1 CHORUS (Stereo Chorus)

mixCh: Dry-Wet control between original signal and effect
min: min Delay time
Feedb: Feedback
Depth: Intensity of the effect
lFreq: LFO frequency = Rate of modulation

```
FX1 CHORUS
mixCh min    Feedb Depth
lFreq ----- ----- -----
```
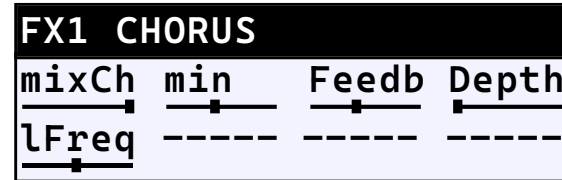
FX2 DELAY (Stereo Delay)

mixDl: Dry-Wet control between original signal and effect
timeL: Delay time left channel
Feedb: Feedback
timeR: Delay time right channel
Sync: Sync off: Delay time fix (in msec),
Sync on: sync per MIDI-Clock or per analog clock via CV1 or CV2 input
(CV parameter: "**del Clock**" analoge Clock with 24ppqn = 96 impulses per bar)

```
FX2 DELAY
mixDl timeL Feedb timeR
Sync  ----- ----- -----
```
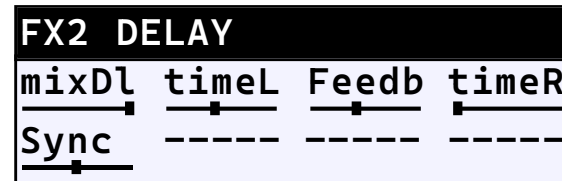
FX3 REVERB

mixRv: Dry-Wet control between original signal and effect
loCut: Highpass on reverb signal (suppress low frequencies)
Decay: reverberation time
Mod: modulation
Bandw: bandwidth of the input signal
Damp: Frequency attenuation of the reverb signal (reverberation becomes duller)

```
FX3 REVERB
mixRv loCut Decay Mod
Bandw Damp  ----- -----
```
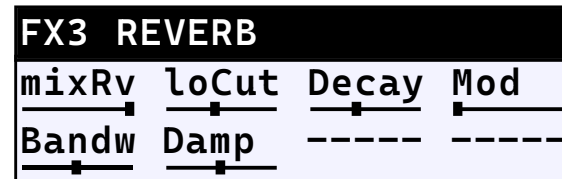
A / B MORPH FUNCTIONS

DESCRIPTION
The MORPH function (e.g. with knob 5 in the MASTER menu) is based on the fact that all parameters of a sound are moved smoothly between two variants A and B. It is therefore possible to change a sound (A) smoothly into another sound (B).

In the FM KOSMOS module, all parameters of the 6 operator pages and all FX parameters can be edited separately for one sound variant A and one for B. Morphing then takes place between these two variants.

An example would be to set the envelope in sound A to be short and percussive and in variant B to have a long release. When you turn up the morph control, the sound would then become increasingly long-lasting. Or you change the modulation level in a variant, then the sound changes when morphing.

If the A/B button is not lit, sound variant A is active (or sound variant B if the A/B button is lit). If you are in the Operator Pages or the FX Pages, you will only hear the currently active variant (no mixture between the two).

Simply switch between the two variants using the A/B button. This way you can create both variants specifically. To play the morph (via CV, MIDI controller or knob) go to the MAIN or MASTER menus.
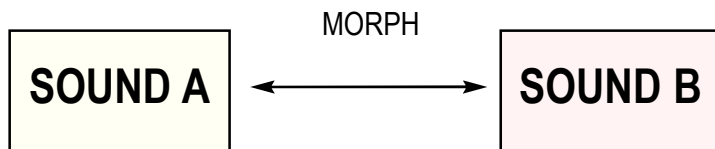
COPY A<>B
It is possible, for example, to copy variant A or B to the corresponding other variant. Both variants are identical after copying and you can then change individual parameters of a variant (or none at all if you want morph to be ineffective).

COPY FUNCTION SEPARATELY FOR FX & OPERATORS
The parameters of the operators and effects are copied separately. Go to the corresponding menu and copy like this:

Hold down the A/B button and then briefly press the SET button:
If A is active (A/B button is not lit) and you copy, then A has been copied to B.
If B is active (A/B button is lit) and you copy, then B has been copied to A.
After copying, the other variant is active (just like when switching between A and B).

NOTE that the parameters of the 6 OPERATOR pages and the 3 FX pages are copied separately. If you copy within an Operator page, all parameters of these 6 operators are copied, but not the effect parameters. If you copy within an active FX page, only the FX parameters are copied, without changing the variants of the operators.

Copying is only possible if you are in either an Operator Page or an FX Page.

MORPH CV control / MIDI control:
The values at the Morph CV input and the controller value in the MASTER menu are added together. To cover the entire range between A and B with the CV, the MORPH controller in the MASTER must be turned to the left. If it is turned up (offset), the CV controls between this and the maximum end value.

The MORPH parameter can also be controlled via MIDI using the modulation wheel (set to Control Change 1, Mod wheel).

MORPH

SOUND A <-----> **SOUND B**

SETUP MENU

DESCRIPTION

In the SET (Setup) menu you will find the global settings for the module. These are automatically saved when you leave the menu. An exception are the parameter assignments for the two CV1+2 inputs. This data is set separately for each sound and saved in the sound.

Call up the SETUP menu with the SET button. The last menu you visited is shown on the display. The first time you open it, the page for the parameter assignment of the two CV1+2 inputs (cv destination) appears.

SETUP PAGE 1: CV DESTINATION

Assign parameters to the two CV1+2 inputs here (with Knob 1 and 5). This data is saved in the sound (SAVE menu), but not automatically when you leave the menu (as with all other SETUP parameters). This also means that every loaded sound can be modulated with other parameters via the CV inputs.

The two CV1+2 inputs are bipolar with a +/-5v range (in order to be able to use bipolar LFOs). The parameters from the FX menus, as well as most of the MAIN and MASTER menus, can be controlled via MIDI. All other parameters (such as those from the operator pages) can be controlled via MIDI.

LIST OF SETUP PAGES

Page1:	cv1 destination	Parameter assignment for input CV1
	cv2 destination	Parameter assignment for input CV2
Page2:	MIDI chan	MIDI receive channel for notes
	Clk Thru	forward received MIDI clock via MIDI out
Page3:	progCh Rx	MIDI receive channel for program change
	progCh Tx	MIDI transmit channel for program change
Page4:	Autoload	sound that loads automatically when power on
	Mst tune	global master tune (on fundamental note C)
Page5:	Lcd Contr	contrast of the LCD display
Page6:	DUMP	Sysex Dump menu
Page7:	CALIBRATE	Calibration menu for the 1V/Oct input

```
SETUP1
cv 1 Dest:main chord
cv 2 Dest:no dest
```

CV1+2 LIST OF PARAMETERS

NAME	PARAMETER	NAME	PARAMETER
no dest	no function!	rvb decay	FX Reverb decay
chor depth	FX Chorus depth	rvb mod	FX Reverb mode
chor min	FX Chorus min delay	rvb bw	FX Reverb bandwidth
chor fb	FX Chorus feedback	rvb damp	FX Reverb damp
chor mix	FX Chorus dry/wet mix	main detune	MAIN Detune
chor lfreq	FX Chorus lfo rate	main chord	MAIN Chord
del mix	FX Delay dry/wet mix	mst level	MASTER Level
del time1	FX Delay time left	mst locut	MASTER LoCut
del fb	FX Delay feedback	mst hicut	MASTER HiCut
del time2	FX Delay time right	mst fb	MASTER Feedback
del clock	FX Delay clock 24ppq	mst range	MASTER Range
rvb mix	FX Reverb dry/wet mix	mst shape	MASTER Shape
rvb locut	FX Reverb low cut filter		

SETUP MENU

SETUP PAGE 2

With Knob 1: MIDI receive channel for notes: 1-16
With Knob 5: forward received MIDI clock data via MIDI out: on/off

```
SETUP2
Midi Chan:1
Clk  Thru:off
```

SETUP PAGE 3

With Knob 1: MIDI receive channel for program change commands: off,1-16
With Knob 5: MIDI send channel for program change commands: off,1-16

```
SETUP3
progCh Rx:1
progCh Tx:off
```

SETUP PAGE 4

With Knob 1: Autoload (number of the user sound that is automatically loaded): 1-128
With Knob 5: Global master tune to fundamental note C (in cents): -100 .. 100
       (default: 30)

```
SETUP4
Autoload:1
Mst tune:30
```

SETUP PAGE 5

With Knob 1: Contrast of LCD display: 32-63

```
SETUP5
Lcd Contr:47
```

SETUP PAGE 6

SYSEX MIDI DUMP (sending or loading sound programs)
See the chapter: MIDI DUMP SOUNDS

```
SETUP6 MIDI DUMP
USER
Sysex Rx: all
```

SETUP PAGE 7

CV CALIBRATE - here the 1V/Oct input is calibrated (the input is already calibrated at the factory).
If necessary, see the chapter: 1V/OCT CALIBRATION

```
CV CALIBRATE
push encoder to start
```

MIDI

OVERVIEW

The module can be controlled extensively using MIDI commands. In addition to MIDI note commands, pitch bend, portamento, master volume and modulation wheel can also be received. In addition, all parameters of the operator pages can be controlled using defined MIDI control change commands. A list of these controllers can be found on the next page of this manual.

NOTE: Note that the MIDI sockets are of the MIDI-TRS-B type.

Adapter diagrams
MIDI DIN socket to
3.5mm mini jack
in MIDI-TRS-B standard
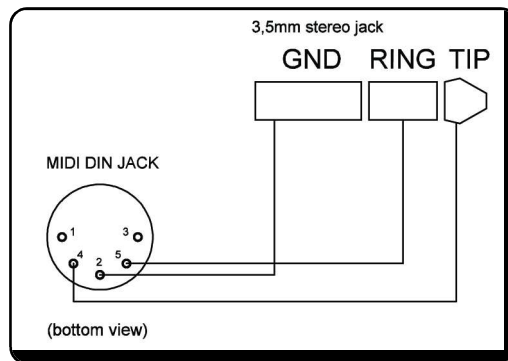
MIDI RECEIVE CHANNEL FOR NOTE ON/OFF

The module only receives notes on the MIDI channel set in the SETUP2 menu. In addition, the play mode of the sound in the MAIN menu must be set to **monoM** or **polyM** (MIDI).

MIDI RECEIVE CHANNEL FOR PROGRAM CHANGE

The MIDI channel for receiving program change commands is set in the SETUP3 menu. This can be independent of the MIDI channel for notes or sending program change commands.

MIDI TRANSMIT CHANNEL FOR PROGRAM CHANGE

The MIDI channel for sending program change commands is set in the SETUP3 menu. This can be independent of the MIDI channel for notes or receiving program change commands.

MIDI CLOCK for FX3 SYNC DELAY

The module can process MIDI clock commands for the FX3 stereo delay to sync the delay time. The clock commands can be forwarded via MIDI OUT.

CONTROL CHANGE NUMBERS

The module can be controlled with MIDI count change commands. The list of controller numbers is on the next page. The MIDI channel depends on the receiving channel for MIDI notes.

PITCHBEND

The module can receive pitch bend commands. The MIDI channel depends on the receiving channel for MIDI notes.

MIDI SYSEX

In the SETUP menu, MIDI DUMP functions are available for saving sounds or loading them into memory via SYSEX. It is possible to load individual sounds into specific memory locations. Sounds can also be saved or loaded individually or all together (ALL).

LIST OF MIDI CONTROLLERS

MIDI CONTROL CHANGE NUMBERS (CC-Nr)

MASTER

CC	Parameter
1	Master Morph
5	Portamento Amount
65	Portamento On/Off
7	Master Volume
104	Master LoCut
105	Master hiCut
106	Master feedB
107	Master range
108	Master Shape

MAIN

CC	Parameter
97	Main Algorithm
98	Main fFine
99	Main fOct
100	Main fCoar
101	Main mode
102	Main detune
103	Main chord

OPERATOR 1-3

CC	Parameter
16	OP1 ratio
17	OP1 Level
18	OP1 Loop
19	OP1 Attack
20	OP1 Decay
21	OP1 Sustain
22	OP1 Release
23	OP2 ratio
24	OP2 Level
25	OP2 Loop
26	OP2 Attack
27	OP2 Decay
28	OP2 Sustain
29	OP2 Release
30	OP3 ratio
31	OP3 Level
32	OP3 Loop
33	OP3 Attack
34	OP3 Decay
35	OP3 Sustain
36	OP3 Release

OPERATOR 4-6

CC	Parameter
37	OP4 ratio
38	OP4 Level
39	OP4 Loop 58
40	OP4 Attack
41	OP4 Decay
42	OP4 Sustain
43	OP4 Release
44	OP5 ratio
45	OP5 Level
46	OP5 Loop
47	OP5 Attack
48	OP5 Decay
49	OP5 Sustain
50	OP5 Release
51	OP6 ratio
52	OP6 Level
53	OP6 Loop
54	OP6 Attack
55	OP6 Decay
56	OP6 Sustain
57	OP6 Release

FX CHORUS

CC	Parameter
80	Chorus Mix
81	Chorus min
82	Chorus fb
83	Chorus depth
85	Chorus lfo Rate

FX DELAY

CC	Parameter
86	Delay Mix
87	Delay timeL
88	Delay fb
89	Delay TimeR
90	Delay sync

FX REVERB

CC	Parameter
91	Rvb Mix
92	Rvb loCut
93	Rvb decay
94	Rvb mod
95	Rvb bw
96	Rvb damp

MIDI

MIDI CONNECTIONS

The module has MIDI IN/OUT sockets (3.5mm mini jack in TRS-B standard) for controlling parameters, loading/editing sequences or firmware updates via Sysex. Connect the MIDI input of the module to the MIDI output of your keyboard/controller or computer. A suitable commercially available adapter (MIDI-DIN to mini TRS-B) or a 3.5mm stereo jack cable is used for the MIDI connection.

An overview of the MIDI commands can be found in the MIDI chapter.

Examples of possible connections:

COMPUTER
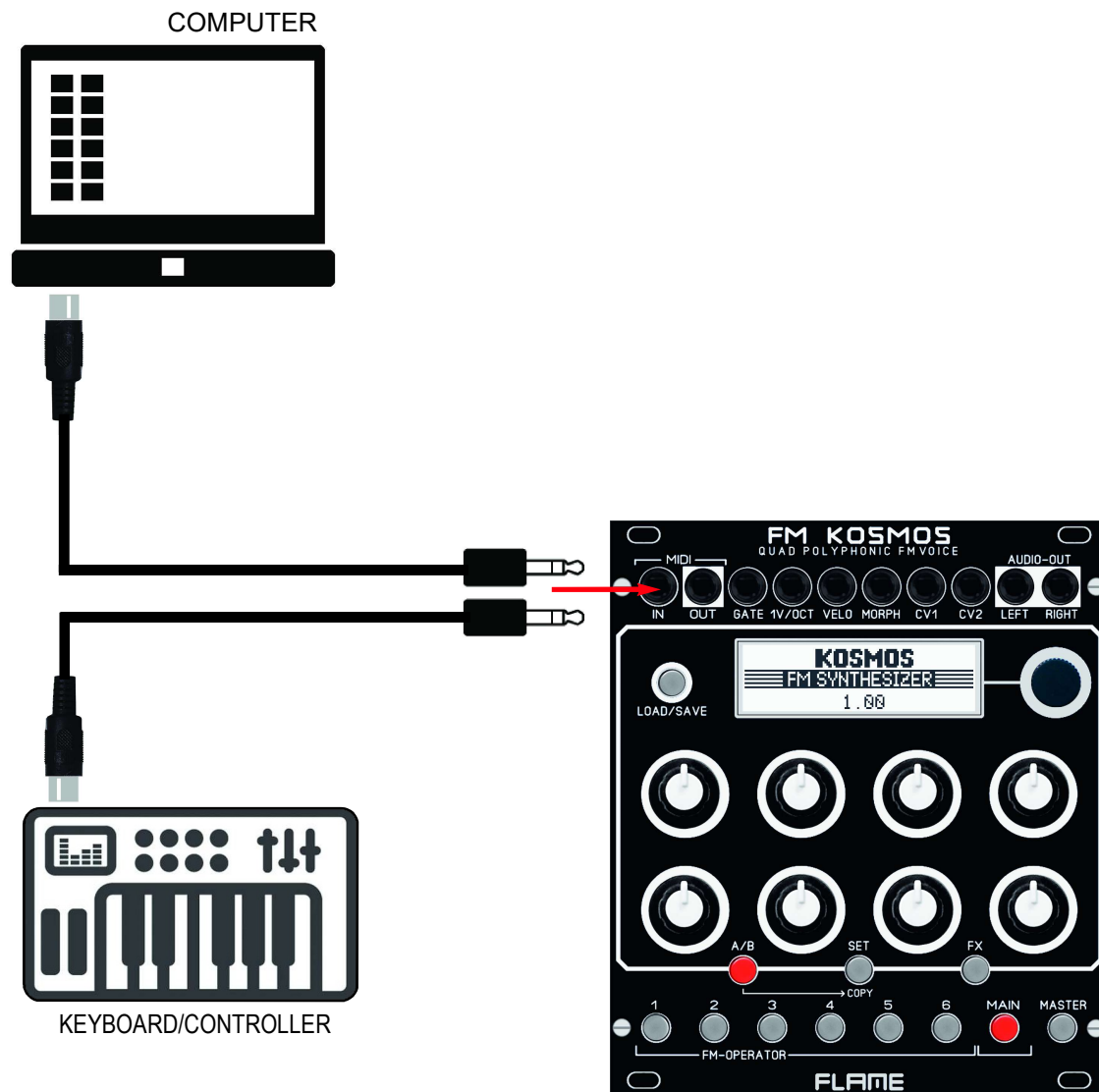
3.5mm mini jack stereo cable for direct MIDI connection between two TRS-B sockets

Adapter diagrams
MIDI DIN socket to 3.5mm mini jack in MIDI-TRS-B standard

3,5mm stereo jack
GND   RING TIP

MIDI DIN JACK

(bottom view)

KEYBOARD/CONTROLLER

FM KOSMOS
QUAD POLYPHONIC FM VOICE
MIDI   AUDIO-OUT
IN OUT GATE 1V/OCT VELO MORPH CV1 CV2 LEFT RIGHT

KOSMOS
FM SYNTHESIZER
1.00

LOAD/SAVE

A/B   SET   FX
→ COPY
1   2   3   4   5   6   MAIN MASTER
FM-OPERATOR

FLAME
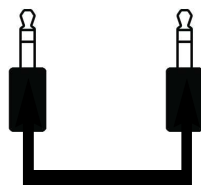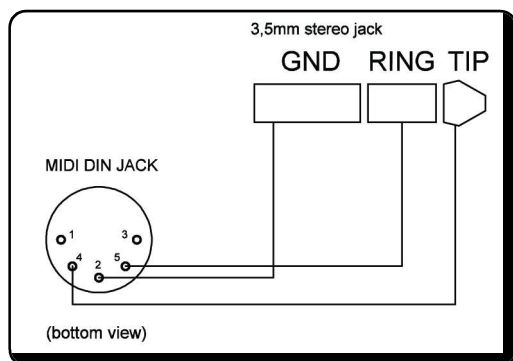
MIDI DUMP SOUND DATA

As SYSEX programs we recommend the freeware program MIDI-OX for PC and the program "SYSEX LIBRARIAN" for Apple's MAC.

DUMP SOUNDS

Go to the SETUP menu. Press the SET button several times to switch to the "SETUP 6 MIDI DUMP" menu.

❶ TRANSMIT SOUNDS

Use Knob 1 to set to "**USER**".
Use Knob 5 to set the sound number to be sent (or "**all**" for all 128 sounds together).

Values

all	all 128 sounds are transmitted together in one file
001-128	only the sound from this memory location is sent

Connect the MIDI output of the FM KOSMOS (type: MIDI-TRS-B) to the MIDI input of the computer. Set the Sysex program on the computer to receive Sysex to receive data. Press the LOAD button on the module to send the data. The display will indicate "transmit KitId001" for example. After the transmission has finished, the display will indicate "transmit finished". Save the received data in the computer's Sysex program.

NOTE for users of the Apple software "SYSEX LIBRARIAN":
Start the SYSEX reception with the "Record Many" button at the top right.
After sending, stop the Sysex recording on the computer.

❷ RECEIVE SOUNDS

Set to "**Load**" with knob 5.
Set the memory location with knob 6.

Values

all	a file with all 128 sounds is expected
001-128	the received sound is saved to this memory location

Connect the MIDI input of the FM KOSMOS (Type: MIDI-TRS-B) to the MIDI output of the computer. Send the SYSEX file from the computer using a Sysex program (**first set the parameter "Delay..." in the Sysex program to at least 100ms**). After the transmission has finished, the display will signal, for example, "received KitId001". The SOUND is saved to the corresponding memory location in the module (old data is overwritten).

NOTE:
To hear a sound program saved via SYSEX, it must be loaded into the internal memory using LOAD (Menu Load)!

FIRMWARE UPDATE

A firmware update requires a computer with a MIDI interface and a SYSEX program. For PCs we recommend the freeware software MIDI-OX, for MACs the software "SYSEX LIBRARIAN". Set the parameter "Delay..." in the SYSEX program to 20ms.


Adaptor typ: MIDI-TRS-B

Proceed as follows:

❶ Load the firmware file (e.g. FlameKosmosV1_00.syx) onto the computer.

❷ Connect the MIDI input of the module directly to the MIDI output of your computer or MIDI interface using a MIDI-TRS-B adapter (avoid detours, e.g. via USB hubs).
Attention: A **MIDI-TRS-B** adapter is required for the MIDI connection!

❸ Switch the module on while holding down buttons 1 (Operator 1) and 8 (MASTER). The module now starts in the bootloader menu and waits for the SYX file at the MIDI input.

❹ Send the firmware file from the SYSEX program to the module. The module's display should now show that the data has been received (a counter counts up). If nothing is shown on the display when the file is sent, the MIDI connection is not correct (please check the cables, MIDI interface settings and the SYSEX program settings).

❺ If the upload was successful, the module first saves the new program and then automatically starts with the new firmware.

Attention: Do not switch off the module before it has rebooted!
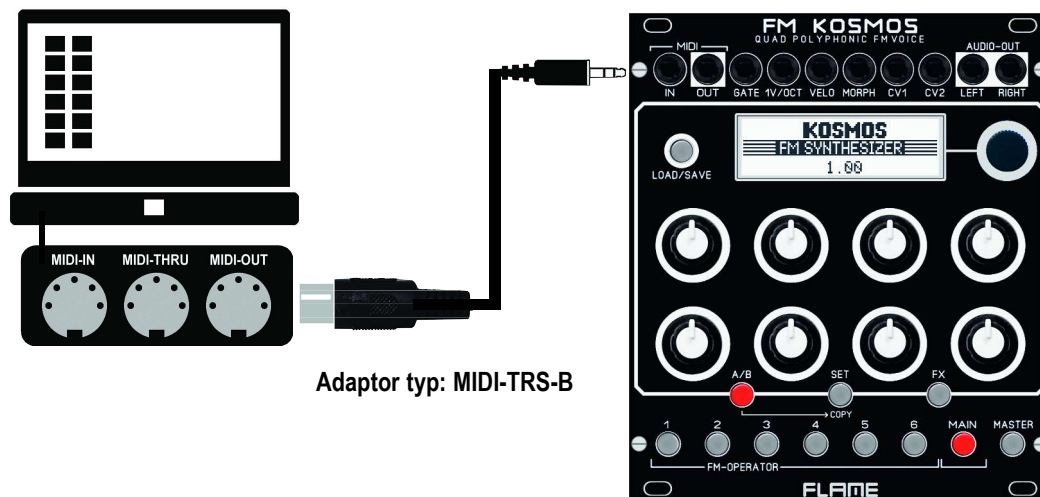
```
fm bootloader V1.0

update: wait for data
        on midi input
```

```
fm bootloader V1.0


update: 0593/3750
```

```
fm bootloader V1.0

write firmware
Do not turn off!
```

When booting, the new version number is displayed on the start screen ⟶

1V/OCT CALIBRATION

The CV input 1V/OCT must be calibrated so that the 1V per octave semitone scaling is accurate. This is already done at the factory when the module is delivered.

If you want to calibrate again later, the SETUP Page 7 "CV CALIBRATE" is available. You need an exact external CV voltage of 0.000V and 2.000V (or a calibrated MIDI-to-CV interface that can generate the two voltages).

To call up the "CV CALIBRATE" menu, press the SET button (several times) until the menu is displayed. Then press the data wheel to start the calibration and follow the text on the display:

```
CV CALIBRATE
push encoder to start
```

❶ Plug a cable into the 1V/OCT input and apply a voltage as close to 0.000V as possible. Then press the data wheel.

```
CV CALIBRATE
set cv to 0V and
push encoder
```

❷ Now apply a voltage as close to 2.000V as possible to the input.
Then press the data wheel again.

```
CV CALIBRATE
set cv to 2V and
push encoder
```

❸ To save the calibration values, press the data wheel again. To cancel the process without saving, press another menu button.

```
CV CALIBRATE
to save
push encoder
```

After calibration, the input should be playable over 8 octaves in exact semitones. Note that the 1V/OCT input resistance is 100kohm.

FAQ / TROUBLESHOOTING

Which parameters can I control via CV?
Most parameters from the two menus MAIN and MASTER and all FX parameters can be controlled with the two CV inputs. In the SETUP menu, an individual assignment can be defined for each saved sound. There is a separate CV input for MORPH.

Which parameters can I control via MIDI?
You can use the modulation wheel (Control Change 1) to control Morph, as well as pitch bend, portamento and the master volume (Control Change 7). In addition to these most common controllers, all parameters of the operator pages can be controlled with defined MIDI control change commands (see list in the MIDI chapter).

The FIRMWARE update or MIDI dump does not work:
Check the MIDI cables (use a TRS-B adapter) and make sure that you are using a direct MIDI connection to the computer, not a USB hub or similar. Other errors are often caused by the Sysx program - make sure that the correct MIDI connection is selected.
If you are a Mac user and use the "SYSEX LIBRARIAN" program, always receive the SYSEX data using the "Record Many" button (top right).
If it still doesn't work, try a different (older) sound card - many new and especially cheaper sound cards have a different power supply on the MIDI socket and therefore often work with limitations.

I use the 1V/Oct input, but I can't trigger the sound!
You also have to use the GATE input. The LED on the SETUP button indicates whether a note signal is present. Also go to the MAIN menu and check whether the sound is set to "Analog" (monoA or polyA). Also check the Master Level in the Master Menu.

I use the MIDI input, but I can't trigger the sound!
First check the MIDI receive channel in the SETUP menu. Send the notes on this channel. Go to the MAIN menu and check if the sound is set to "MIDI" (monoM or polyM). The LED of the SETUP button signals when a note command is received (LED lights up e.g. when a keyboard key is pressed). Also check the Master Level in the Master Menu.

I control a parameter using CV, but I can't get over the whole range!
Turn the parameter in the sound that you are controlling with CV all the way to the left. Now the CV voltage covers the whole range. The controller value and the input CV are added (offset). Another reason could be that the input voltage is too low. The CV inputs work bipolarly between minus and plus 5 volts.

What is the function of the MIDI output?
You send the sound SYSEX data when dumping via the MIDI output. The module can also send a program change command when loading sounds and forward incoming MIDI clock commands (see SETUP functions).

Can I sync the stereo delay to a clock?
Yes, you can set the delay to sync in the FX page. The timing is then either based on the MIDI clock, or you can use the CV1 or CV2 input to specify whether an analog clock should be used to sync the delay (see parameter list for CV1 and CV2).

APPENDIX & TECHNICAL DETAILS

Technical details

Connections:
Ribbon cable adapter for Doepfer bus +/-12Volt
Inputs: 1x MIDI-TRS-B, 5x CV, 1x Gate, 3,5mm Mono/stereo jacks
Outputs: 1xMIDI-TRS-B, 2x Audio 3,5mm Mono/stereo jacks

Controls:
12 illuminated buttons
8 Potentiometer, 1 Encoder
1 LCD graphic display

Resolution: DA-Wandler: 16Bit, Audio output: +/-5V
Current consumption: +/-12v: +120mA / -60mA
Size: Euro Format 3U / 22HP   110x128,5x33mm, Installation depth: 30mm

Warrenty

Beginning from the date of purchase a 2-year warranty is guaranteed for this device in case of any manufacturing errors or other functional deficiencies during runtime.

The warranty does not apply in case of:
- damage caused by misuse
- mechanical damage arising from careless treatment
  (dropping, vigorous shaking, mishandling, etc)
- damage caused by liquids penetrating the device
- heat damage caused by overexposure to sunlight or heating
- electric damage caused by improper connecting
  (wrong power supply/ jacks/ MIDI connections/ voltage problems).

If you have any complaints please contact your dealer or send an e-mail to:
service@flame-instruments.de

Terms of production
conformity: CE, RoHS, UL

Disposal
The device is produced with RoHS-conformity (subject to the regulations of the European Union) and is free of hazardous substances (like mercury, plumb, cadmium and hexavalent chrome). But electronical scrap is hazardous waste. Please don't add this to consumer waste. For an environment friendly disposal of waste please contact your distributor or specialist dealer.

Support
Updated and additional informations, updates, downloads and more see:

http://www.flame-instruments.de

Instagram: @flame_instruments

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