General

KRAFTZWERG is the semi-modular version of our MFB-SYNTH 2 model. It replaces preset-memories and MIDI-control with a total of 37 patch-connections. By this, the predefined signal path can be split up and certain components may be externally controlled, e.g. through an analogue sequencer. It is also possible to use KRAFTZWERG as a stand-alone-unit without any patch cords. The classic routing VCO-VCF-VCA as well as the most popular modulations are internally prewired. Small labelings below the input jacks will indicate any existing prewiring with its destination. You can use the MIDI-input to play KRAFTZWERG just like any other synthesizer. The unit offers all components for powerful and variable synthesis: three VCOs with hard-sync-option, 24-dB-lowpass-filtering, noise generator, ring-modulation, two envelopes, two LFOs and a VCA.

Set-up and connections

Connect the external power-supply to the **Power**-jack. The main output is either **Out1 or Out2** in the VCA section. Use this jack to connect to an amplifier, a mixing desk or an audio-interface. **MIDI-In** allows you to connect a MIDI-keyboard or a sequencer. You may as well use CV1 (Triple VCO) and Gate1 (ADSR) with a CV/Gate-keyboard. Now, use the **On/Off** switch to turn KRAFTZWERG on.
Note: KRAFTZWERG is an analogue synthesizer. It is recommended letting the circuit warm up for approximately 5-10 minutes before recording or live-performance.

Function

The KRAFTZWERG contains all classic elements of analogue synthesis. Here is a small introduction.

DUAL LFO

To the left, you will find two LFOs. These low frequency oscillators are mainly used for sound modulation. The two sections are independent and offer three waveforms each and a CV-input with attenuator. The frequency ranges from approximately 100 Hz to 10 s and can be significantly expanded with a matching control-voltage. Positive or negative voltage can increase the maximum value (or decrease the minimum value) by a factor of 30.
Each LFO has its own reset-input (negative slope) to reset the waveform start. By adjusting the speed and using a separate reset-signal to this jack, a LFO can be synchronized to a sequencer.
LFO 1 offers three waveform shapes: descending saw tooth, triangle and square. LFO 2 offers: ascending saw tooth, triangle and Sample & Hold. The maximum output voltage is plus minus five volts.
The CV-inputs of both LFOs are internally connected. With unpatched inputs, LFO1 controls the speed of LFO2 and vice versa, the attenuation controls set the intensity/depth for the modulation like VCO, VCF, VCA and PWM (pulse width modulation for OSC1/2).

TRIPLE VCO

Three voltage-controlled oscillators are next. These are controlled by a CV-signal from the built-in MIDI/CV-converter from input CV1. This CV-signal conforms to the one volt/octave standard and is meant to be used for typical overall pitch-control by a keyboard or sequencer. At CV1, all three oscillators receive the same CV-voltage, meaning the same pitch. For individual oscillator-pitch-control, it is necessary to use the front CV inputs 1-3. This will decouple the other oscillators from CV1.

CV-inputs 1-3 and audio-outputs 1-3 are each interconnected. This means that a CV-signal applied to **CV1** will also control OSC2 and OSC3 as long as these are not individually patched. If, for example, input **CV3** is patched, OSC3 is decoupled from the voltage applied to **CV1**, while OSC2 is still under combined control with OSC1.
The output-logic is comparable: **Out3** carries all three oscillators' signals. With **Out1** or **Out2** patched, these signals are subtracted from **Out3**. To avoid internal clipping, the summing signal is slightly reduced in level compared to the invidual output of OSC3 at **Out3**.

All oscillators are globally tuned by the **Tune** control. Detuning of around plus minus one octave (in reference to OSC1) is available for OSC2 and OSC3 via **Interval2** and **Interval3**.
Each oscillator offers three waveforms, selectable by **Wave1...3** switches. The choices are triangle, square and saw tooth. The square symmetry (pulse width) of OSC1 and OSC2 is adjustable via **CV4** and **CV5** inputs. A shared attenuator **CV4+5** sets the modulation intensity.
Each oscillators' register is set with the **Octave1...3** switches. Select between 16', 8', 4' and 32', 16', 8' for OSC3).
Additional CV-inputs, e.g. for vibrato or creation of a pitch-envelope, are available through **CV4…6**. Depending on the setting of the corresponding switches, pitch (**OSC1...3**) or pulse-width (**PW1+2**) or all three oscillators are modulated. These inputs accept control voltage up to plus minus five volts.
This section also includes digital ring-modulation of OSC1 and OSC2. It is available on the separate output **RingOut**. The ring modulation sound is dependent on the selected waveforms and the pitch-difference between the oscillators.
The oscillators can also be synchronized internally or externally. With internal sync, OSC3 acts as master. Its lower pitch is best suited for this application. Depending on the position of the **Sync** switch, either OSC1 or both OSC1 and OSC2 act as slaves. Inputs **CV4** and **CV5** allow the synchronized oscillators to be modulated by envelope signals. Any external signal at the **Sync In** input will replace OSC3 as sync-master. It is usually necessary to apply a square signal here. Other waveforms will not deliver a sufficient master-signal in most cases.

The oscillators' outputs are routed into the following mixer that offers four controls: **Level1...3** (for OSC1...3) and **Noise** for the internal noise generator. The summed signal is available at **Out**.

24 dB VCF
The mixer output is routed into a voltage-controlled low pass-filter with 24 dB/octave slope. Its frequency is set by the **Cutoff** control. **CV CUT** controls the amount of influence **ADSR1** takes on the cutoff-frequency. **CV2/Key** selects whether the cutoff-frequency follows the MIDI/CV converter. **CV2** input can also be used to control **Cutoff**, depending on the setting of the **CV2/Key** control.
Emphasis controls the filter's bandwidth to pronounce the cutoff-frequency. At high values, the filter starts to self-oscillate. Voltage control is available via **CV EMP** with attenuation control. The filter-output is routed back to the input (In1 jack). The resulting feedback is controlled by **IN1**. The feedback will also affect emphasis.

VCA
The final signal processing stage is the voltage-controlled amplifier (VCA). **Gain** allows adjusting the amount of amplification and therefore the volume of the sound. With settings above five, the input signal will reach the output even with no control voltage being present. **ADSR2** also controls the amount of amplification through **CV1**. **CV2** offers an additional attenuation control for Gain. This is only active if a control voltage is present at **CV1**.

DUAL ADSR
To the right of the VCA, you will find two envelope generators. **ADSR1** and **ADSR2** offer controls for **Attack**, **Hold**, **Decay** and **Sustain**-level. When the key is released, **Release** sets the time for fade out. ADSR 1/2 are both triggered by **Gate1** input. ADSR2 can be separately triggered by **Gate2**. The default envelope shape character is exponential for both envelopes. The **Linear** switch allows setting either ADSR1 and/or ADSR2 for a linear character.

Setting the MIDI-channel
Use the dipswitches located on the rear to set the MIDI-channel (Ch.).

Ch.	1	2	3	4	Ch.	1	2	3	4
1	ON	ON	ON	ON	9	ON	ON	ON	OFF
2	OFF	ON	ON	ON	10	OFF	ON	ON	OFF
3	ON	OFF	ON	ON	11	ON	OFF	ON	OFF
4	OFF	OFF	ON	ON	12	OFF	OFF	ON	OFF
5	ON	ON	OFF	ON	13	ON	ON	OFF	OFF
6	OFF	ON	OFF	ON	14	OFF	ON	OFF	OFF
7	ON	OFF	OFF	ON	15	ON	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	16	OFF	OFF	OFF	OFF

Outputs for control voltage of pitchbend and modulation wheel as well as pitch and gate are available on unit's back. The upper row carries the CV and GATE signal as derived from the MIDI-interface, the lower row carries CV-outputs of pitchbend and modulation wheel.

Owner's manual

KRAFTZWERG