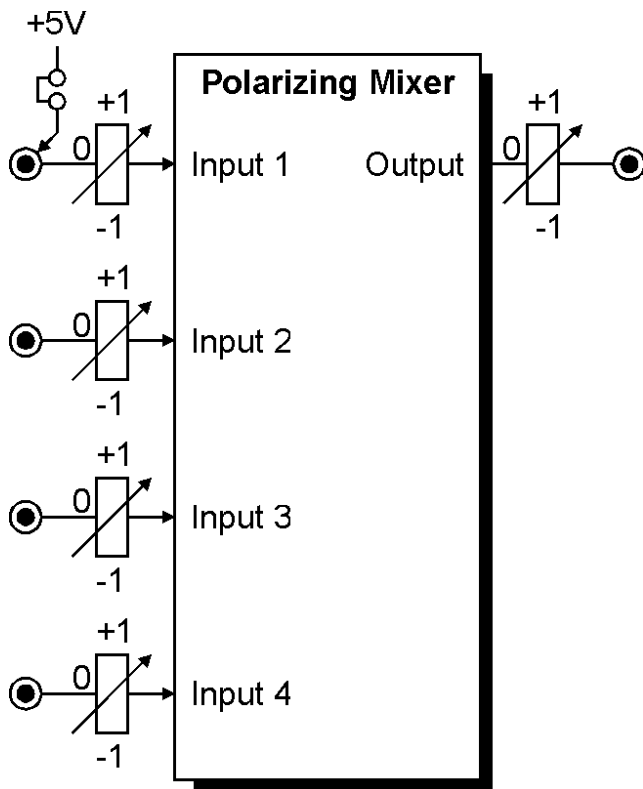# 1. Introduction

Module A-138c is a **four channel mixer**, that allows to **add or subtract** four incoming voltages to the output signal.

In the **middle position** of the corresponding control knob the amplification is zero, i.e. the signal will be suppressed. Turning the knob **counterclockwise** the signal is **subtracted** from the output sum with increasing amount. Turning the knob **clockwise** the signal is **added** to the output sum with increasing amount.

The **output control** works in the **same way**, i.e. the resulting output signal can be additionally attenuated and/or inverted.

The module is used in the first place to **mix control voltages** (e.g. ADSR, LFO). It can be used to **mix audio signals** too but there is no difference between adding and subtracting audio signals unless they have a **fixed phase relationship** (e.g. the outputs of a VCO, or the input and output signal of a VCF). For audio signals without phase correlation there is no difference between addition and subtraction for the human ear.

Control In1 works as a **DC offset generator** (about -5V...+5V) provided that no patch cord is plugged into socket Input 1. If this feature is not required it can be deactivated by removing a jumper on the pc board.

The **voltage controlled** version of a **polarizer** is the module **A-133**.

2. Overview
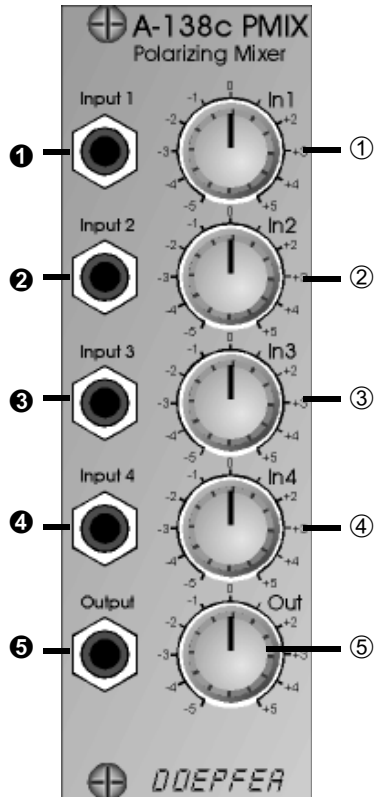
Controls:

①...④ **In1 ... In4**   polarizing control input 1 ...4
⑤ **Out**   polarizing control output

Inputs / Outputs:

❶...❹ **Input 1 ...4** input 1 ...4
❺ **Output**   output

3. Controls / Inputs / Outputs

①...④ **In1 ... In4** (controls)
❶...❹ **Input 1 ... Input 4** (sockets)

These are the four inputs ❶...❹ of the module with the corresponding polarizing controls ①...④. In contrast to a normal attenuator (e.g. the mixer controls A-138 a/b) the zero position of a polarizing control is in the center of the rotating angle. This corresponds to position 5 of a normal attenuator.

Left from the **middle position** (i.e. turning the knob counterclockwise) the corresponding input signal is **subtracted** from the output sum with increasing amount.

Right from the **middle position** (i.e. turning the knob clockwise) the corresponding input signal is **added** to the output sum with increasing amount.

Fig.1 shows the function of a polarizing control by means of an ADSR envelope as input signal. -1 corresponds to the fully counterclockwise position of the control, 0 to middle position and +1 to the fully clockwise position.
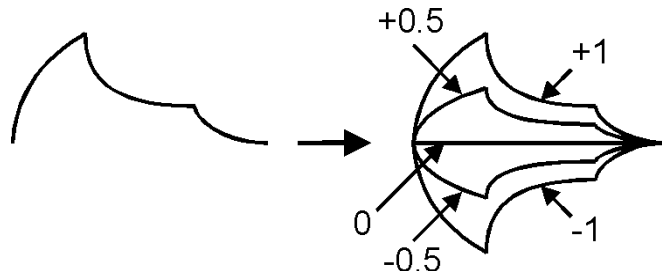

Fig. 1: Function of the polarizing controls

⑤ **Out** (control) / ❺ **Output** (socket)

Socket ❺ is the output of the module with the corresponding polarizing output control ⑤. The output control works in the same way as the input controls, i.e. the output sum appearing at socket ❺ can be additionally attenuated and/or inverted and adjusted to the desired level.

The way of negative/positive control with **zero position** in the **center** of the rotating angle will be a bit unusual in the beginning as one is used to turn a control fully counterclockwise to make a signal disappear. For the polarizing control one has to adjust the knob very carefully to the center position to extinguish a signal. If you want to have an **inverted signal** that can be set to **zero in the usual way** (i.e. fully counterclockwise control position) the **voltage inverter A-175** in combination with a normal attenuator has to be used.

If a **voltage controlled** version of a **polarizer** is required module **A-133** is the solution.
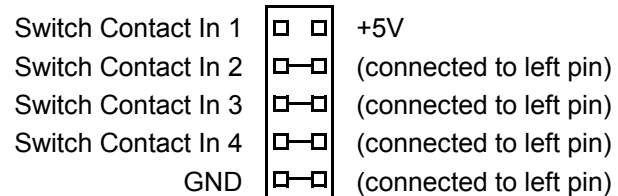
The factory setting for the maximum **amplification** for both the input and output polarizers is **-1 ... +1**. The module can be **modified** to obtain another amplification range (e.g. -0.5 ... +0.5 or -2.5 ... +2.5). Electronically experienced users can do this modification themselves. Simply a resistor has to be replaced to change the maximum amplification (for details please refer to the chapter "module modifications" on DIY page of our web site www.doepfer.com).

Control In1 works as a **DC offset generator** (about -5V...+5V) provided that no patch cord is plugged into socket Input 1. If this feature is not required it can be deactivated by removing a jumper on the pc board.

For this a two row pin header with 10 pins (2x5) is located behind input control 2. The upper pair of pins is marked with an arrow and labelled "offset opt.". In the factory a jumper is put on this pair of pins to activate the offset option for input 1. To cancel the offset option the jumper simply has to be removed.

The complete pin header is labelled "ext. Inputs". It can be used to establish default connections from other modules to the switching contacts of the A-138c input sockets, e.g. from the four outputs of a quad modulation modules **A-143**-x, the VCO **A-110** or the multimode filter **A-121**. For this the two modules (A-138c and A-143-x) have to placed side by side and the corresponding connections (outputs of A-143-x to the default inputs of the pin header of A-138c) have to established internally. Such modifications should be carried out only by qualified personnel or electronically experienced users. A female connector with flat cable (similar to the bus cables) should be used for this connection (no direct soldering to the pins).

This is the pin-out of the pin header:

Switch Contact In 1	☐ ☐	+5V
Switch Contact In 2	☐—☐	(connected to left pin)
Switch Contact In 3	☐—☐	(connected to left pin)
Switch Contact In 4	☐—☐	(connected to left pin)
GND	☐—☐	(connected to left pin)

4. User Examples

not yet ready

- **general CV input expander (for each CV input) with polarizer function**
- **new VCO waveforms by mixing the outputs of a VCOs**
- **new filter types by mixing of filter in and outputs**
- **positive/negative resonance feedback with inserted modules**