

OPERATING MANUAL

# SAM-3B.v2 EX

MULTI - BALANCING / DIFFERENTIAL / SUMMING - AND DISTRIBUTION  
AMPLIFIER SYSTEM



FUNK TONSTUDIOTECHNIK

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## FOR YOUR SPECIAL ATTENTION

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These operating instructions are generally valid for all versions of the SAM-3B.V2-EX as long as no differences are pointed out.

### ATTENTION :

Mains connection only permitted to AC voltage of 90..265 volts/45...400 Hz !

To avoid fire and electric shock, do not expose the unit to rain or moisture! If any liquid enters the interior of the unit, switch it off immediately and have it checked by the manufacturer or a specialist workshop before continuing to use it!

### NOTES ON INSTALLATION :

Never place the unit near heat sources such as radiators or hot air outlets, or in locations subject to a lot of dust, mechanical vibrations or shocks..

### FOR CONDENSATION ACCUMULATION :

If the unit is moved immediately from a cold to a warm place, condensation may form inside and there is a risk that the unit will not work properly. In this case, leave the unit switched off for half an hour after transport.

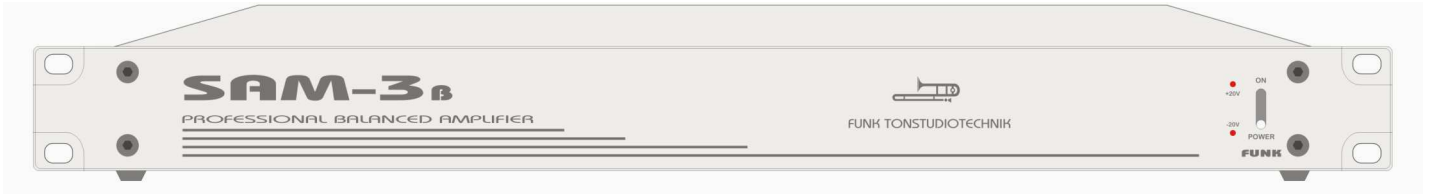
### FOR CLEANING :

Clean the housing, front panel and controls with a soft cloth lightly moistened with a mild soap solution. Abrasive sponges, scouring powders and solvents such as alcohol or petrol must not be used as they may attack the surface of the housing.

### WARRANTY :

The warranty period is 3 years. Defects that are due to manufacture or faulty material will be repaired free of charge during this period. The warranty claim expires after external intervention!

## **SAM-3B.v2EX** 4...16-CHANNEL MATCHING AMPLIFIER



### **INTENDED USE :**

The SAM-3B.V2 EX is a professional MULTIANNAL UNIVERSAL SYMMETRIER/DIFFERENCE AMPLIFIER with excellent sonic characteristics for balancing/asymmetrising/distributing and summing, as well as for its high bandwidth for level and impedance matching for analogue audio or timecode signals. The SAM-3B.V2 EX differs from its predecessor SAM-3B by a stronger power supply with additional reserve for special configurations and further optimised technical. Data. The second difference is that it is easier to adjust the respective gain of the channels. This was made possible by extending the spindle trimmers through the rear wall.

The unit can also be used, for example, for matching mixing consoles, sound cards and hi-fi equipment with -10 dBv inputs/outputs and studio equipment inputs/outputs with +4 dBu or +6 dBu standard levels.

The SAM-3B.V2EX can enable the following functions simultaneously:

1. A high-impedance signal becomes low-impedance (impedance conversion).
2. an input signal can be amplified/attenuated
3. a balanced signal becomes asymmetrical (differential amplifier)
4. an asymmetrical signal becomes symmetrical (balancing amplifier)
5. Balanced signals can be summed (mixed).
6. balanced signals can be distributed
7. configurations as balancing and distribution amplifier possible at the same time
8. hum loops between asymmetrical units can be eliminated.

To ensure that the interference voltages induced or influenced on a line cause as little interference as possible in an input of an audio control system connected to this line, this input must be "symmetrical to earth", i.e. the two resistances measured between each of the input terminals and earth must be equal in magnitude and phase.

The induced interference voltages, which are equal in magnitude and phase on both conductors, then cancel each other out in their effect with a symmetrical input and have no influence. If the symmetry is not exact, however, the induced voltage is not completely cancelled out and a residual interference voltage remains in the subsequent transmission path.

The input amplifiers of the SAM-3B.V2EX have an exceptionally high common-mode rejection to optimally suppress interspersed interference voltages.

# INTRODUCTION...SAM-3B.V2-EX

The use of integrated, laser-trimmed networks ensures a particularly high common-mode rejection (CMMR) and consistency of the electrical characteristics. The balanced input stages of the SAM-3B.V2 EX achieve a suppression of balanced interference in the ratio  $300\,000/1 = -110\text{ dB}$  (at 1 kHz) ! This means that the interferences scattered on the transmission line are practically completely eliminated.

During the development of the unit, special emphasis was placed on lowest noise (dynamic range at amplification 1:  $> 130\text{ dB}$  !) and minimal distortion, while at the same time ensuring a very broadband design of all amplifier stages. The balanced input stages are designed as particularly low-noise instrumentation amplifiers with high input impedance. This makes the SAM-3B.V2-EX one of the lowest noise units of its kind. At the same time, the signal source is hardly burdened by this circuitry measure. The phase response is less than  $1^\circ$  in the range 20 Hz...20 kHz!!

The balanced inputs of the SAM-3B.V2 EX can also be operated asymmetrically at the input (for example as an asymmetrical catch-up amplifier/impedance converter or phase-rotation stage).

All balanced outputs are servo-balanced (cross-coupled). Therefore, once the output level has been set, it remains constant with balanced and unbalanced connections and there are no negative consequences for the transmission quality.

In contrast to the usual amplifier circuits, the headroom of the balanced outputs of the unit is the same for balanced and asymmetrical circuits. circuitry. With normal electronically balanced amplifier circuits, the headroom and thus the dynamic range decreases by typ. 4..6 dB with an asymmetrical load!

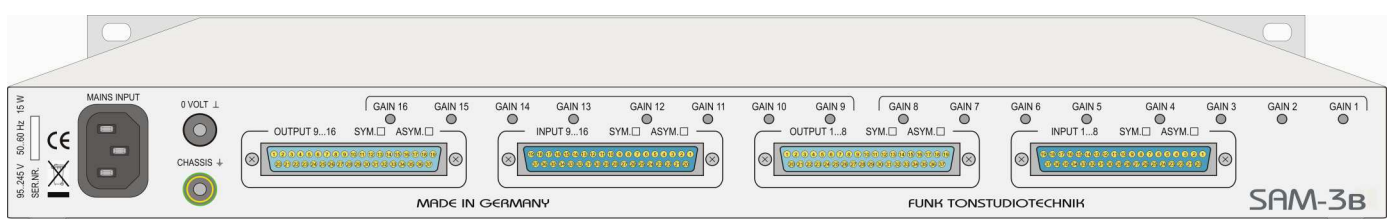
Faultless operation at all outputs is guaranteed down to  $300\ \Omega$  output load.

By designing the essential circuitry in SMD technology, very compact dimensions of the circuit boards were achieved with excellent crosstalk attenuation at the same time (1 kHz over 120 dB, 15 kHz over 110 dB). The SAM-3B.V2 EX is therefore also ideally suited for level correction on independent main signal paths.

All inputs/outputs have separate spindle trimmers GAIN on the rear panel of the unit, with which the gain can be adjusted externally very precisely and separately for each channel. The gain of the balancing amplifiers can be changed from 0..23 dB. The asymmetric amplifiers have a selectable adjustment range of 0...- 20 dB or +6...- 14 dB with internally set jumpers.

The unit has 37-pin D-sub male connectors for connecting all inputs and outputs.

For special purposes and with expected input levels of max. + 18 dBu, the balanced input amplifiers can operate with an additional gain of +6 dB in the first amplifier stage by closing a jumper. This measure can further increase the overall dynamic range of the unit with smaller input signals.



Rear view

# INTRODUCTION SAM-3B.V2-EX

## Configurations :

The SAM-3B.V2 EX is modularly constructed with the 4-channel amplifier cards SIA-4.EX (balanced inputs to asym. outputs) and SOA-4EX (asym. inputs to asym. outputs) and can therefore be offered in different versions. Due to the service-friendly design, the amplifier modules incl. all sockets can be exchanged, extended or retrofitted in a few minutes without soldering.

The balanced output modules (SOA-4EX) of the unit can also be configured internally as distribution amplifiers (1 unbalanced input to 2 or more balanced outputs).

The unit is also available partially equipped with at least two 4-channel amplifier cards. These versions can be subsequently expanded to a maximum of the 16-channel version.

The input and output amplifiers of the SAM 3B.V2 EX are internally equipped with pin connectors to ensure a solder-free, quick replacement of the amplifier cards in case of malfunction.

In the standard versions, the unit has the following equipment:

- SAM-3B.V2 EX/4-4 :** 4 unbalanced inputs to 4 balanced outputs and 4 balanced inputs to 4 unbalanced outputs
- SAM-3B.V2 EX/8-0 :** 8 unbalanced inputs to 8 balanced outputs
- SAM-3B.V2 EX/0-8 :** 8 balanced inputs to 8 unbalanced outputs
- SAM-3B.V2 EX/8-8 :** 8 unbalanced inputs to 8 balanced outputs and 8 balanced inputs to 8 unbalanced outputs
- SAM-3B.V2 EX/16-0 :** 16 unbalanced inputs to 16 balanced outputs
- SAM-3B.V2 EX/0-16 :** 16 balanced inputs to 16 unbalanced outputs

## Type designation :

The unit is available in many versions with channel-wise independent or interconnected amplifier trains.

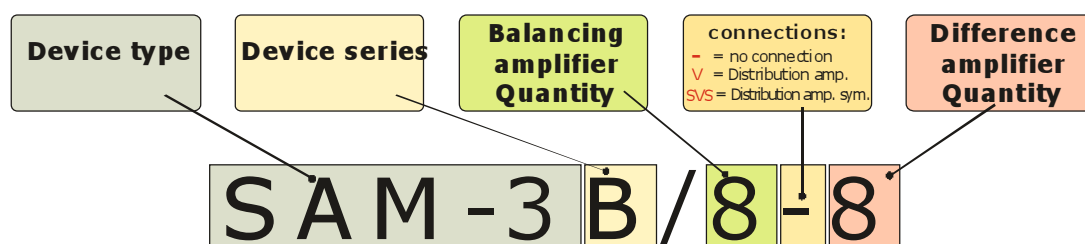
The type designation means :

1st digit after slash = number of balancing channels 2nd digit = number of differential channels (de-symmetrizer).

Example: SAM-3B.V2/0-8 means: 0 balancing and 8 differential amplifier channels. The hyphen (-) between the digits means: no connection between the amplifier channels. If this hyphen is replaced by a letter or a combination of letters, all or some of the audio channels are internally connected to each other, as described below.

Example: SAM-3B.V2/8v0 means: 8 balancing amplifier channels and 0 differential amplifier; the **v** between the digits means: the balancing channels are internally configured as distribution amplifiers. 1 unbalanced input is distributed to 8 balanced outputs.

Configurations with balancing amplifiers only (inputs asym. and outputs asym. in each case) or with asymmetrical amplifiers/differential amplifiers only (inputs asym. and outputs asym. in each case) are also available. Special versions with max. 8 balanced inputs on 8 balanced outputs as fully balanced matching amplifier (SAM-3B.V2 EX/ 8SVS8) are also configurable (see also under CONFIGURATION EXAMPLES). Also with the distribution amplifier configurations, each output in the SAM-3B.V2EX is separately adjustable in level.



Audio connections between the boards

# SAM-3B.V2-EX OPERATING INSTRUCTIONS

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Zum Einstellen der Verstärkung der Ein/Ausgangsverstärker durch die Rückwandbohrungen nur Schlitzschraubendreher mit 2...2,5 mm Klingenbreite und mindestens 30 mm Klingenlänge bzw. Kreuzschlitzschraubendreher Größe 0 verwenden! Rechtsdrehung der Spindeltrimmer vergrößert die Verstärkung.

To adjust the gain of the input/output amplifiers through the rear panel holes, use only slotted screwdrivers with a blade width of 2...2.5 mm and a blade length of at least 30 mm or Phillips screwdriver size 0! Clockwise rotation of the spindle trimmers increases the amplification

The max. 16 input signals are connected to 1 or 2 37-pin D-sub male connectors. Required mating connector: 37-pin Sub-D female connector strip female.

The max. 16 output signals are connected to 1 or 2 37-pin D-sub male connectors. Required mating connector: 37-pin Sub-D female connector strip female.

The required Sub-D connectors are optionally available in different versions.

## 6.4 WIDE-RANGE POWER SUPPLY :

Considerable effort has been put into the newly developed power supply in order to prevent even the slightest interference from being fed into the audio mass. Mains frequency interference components or their harmonics are typically below -140 dB! in the audio signal and are therefore no longer perceptible. The SMPS-24T.V2 soft-start precision switching power supply produces extremely stable and pure supply voltages. Due to the particularly gentle switch-on process, no interference pulses occur in the mains during switch-on and switch-off. The modern switching power supply technology ensures low current consumption from the mains and thus the power consumption of a fully equipped SAM-3B.V2 EX is only typ. 13 W. This applies to all mains supply voltages between 100...245 V with frequencies of 45...400 Hz. The unit can therefore be used on all common power supply networks worldwide. This technology generates less heat in the unit. In addition to the positive effects on the environment, this effort also benefits the service life of the unit.

A particularly extensive mains filter reliably eliminates interference that could otherwise enter the SAM-3B.V2EX via the mains supply.

The power supply unit generates 2 balanced stabilised supply voltages of +/- 20.0 V for feeding the balancing amplifier modules. 2 LEDs on the front panel serve to monitor these voltages. To avoid damage to the amplifiers and loudspeakers in case of overload or short-circuit of a supply voltage, the power supply unit has a monitoring of the symmetry of the output voltages. If a defined limit value for the symmetry is exceeded even minimally, e.g. by overloading an output, the second output automatically follows the overloaded one in the amount of the output voltage. In the event of a short circuit at one output, both main voltages in the SMPS-24T.V2 are regulated back and the amplifier stage involved is switched off. The symmetry monitoring of the two supply voltages does not allow a greater difference than typically +/- 100 mV.

The noise on the power supply lines is below 10  $\mu$ V rms at full load in the range of 20 Hz...22 kHz.!

II stabilised supply voltages of the integrated power supply unit are short-circuit-proof due to internal current limits and therefore do not require fuses. The unit works perfectly even with strongly fluctuating or unclean mains voltages between 100...265 volts AC at frequencies of 45...400 Hz.

### 6.4.1 Overtemperature protection

When mounting the unit in a rack, make sure that there is sufficient ventilation, as the SAM-3B.V2 mainly cools via the surface of the housing. This applies especially to fully equipped units. The power supply unit is temperature-monitored and switches off automatically if it heats up too much, e.g. if the unit is installed very unfavourably in the rack. When the unit has reached a preset, safe temperature again, the internal power supply unit restarts automatically. This process is signalled by the two voltage monitoring LEDs on the front.

# SAM-3B.V2-EX INPUT AMPLIFIER (SIA-4EX)

The SIA-4EX serves as a 4-fold differential amplifier (instrumentation amplifier) in the unit. Adjustment of the output levels is possible via the 19mm spindle trimmers P1a, P1b, P1c, P1d.

The input symmetry at 1 kHz is adjusted via the trimmers P2a, P2b, P2c, P2d, the symmetry for high frequencies (10 kHz) is adjusted via P3a, P3b, P3c, P3d. However, these trimmers should not be changed under any circumstances without precise technical knowledge and appropriate measurement technology!

## Assignment of the trimmers:

Signal	Gain	Symmetry	Input CN1	Output CN2
CHANNEL 1	P1a	P2a/P3a	Pin 3 + 4	Pin 3
CHANNEL 2	P1b	P2b/P3b	Pin 7 + 8	Pin 7
CHANNEL 3	P1c	P2c/P3c	Pin 11 + 12	Pin 11
CHANNEL 4	P1d	P2d/P3d	Pin 15 + 16	Pin 15

All other contacts of the 20-pin post connector CN2 are connected to ground (circuit zero). All other contacts of the post connector CN1 are also grounded except for pin 19/20.

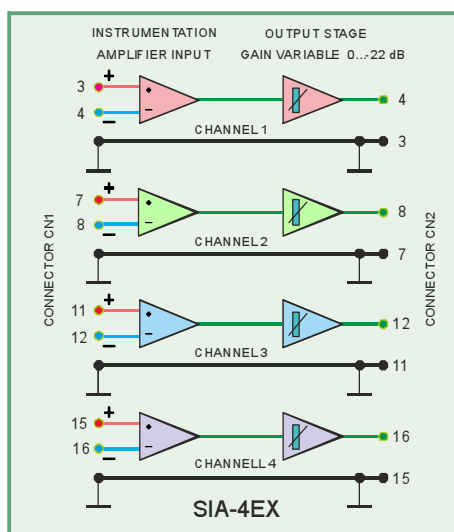
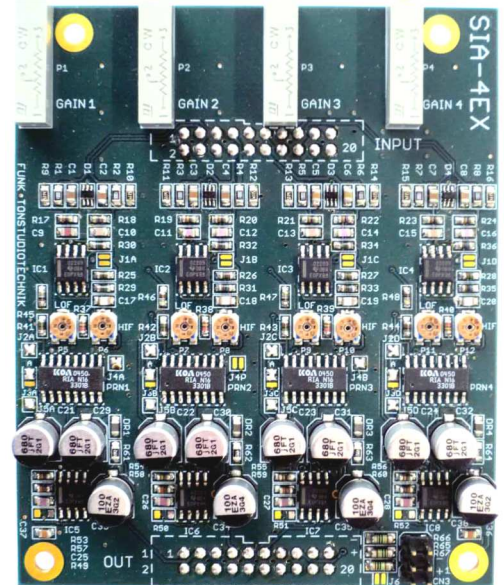
The supply voltages reach the amplifier board via CN 3.

Contact assignment CN3 :	Pin 1 and 4	+ 20,0 Volt
	Pin 2 and 5	Ground
	Pin 3 and 6	- 20,0 Volt

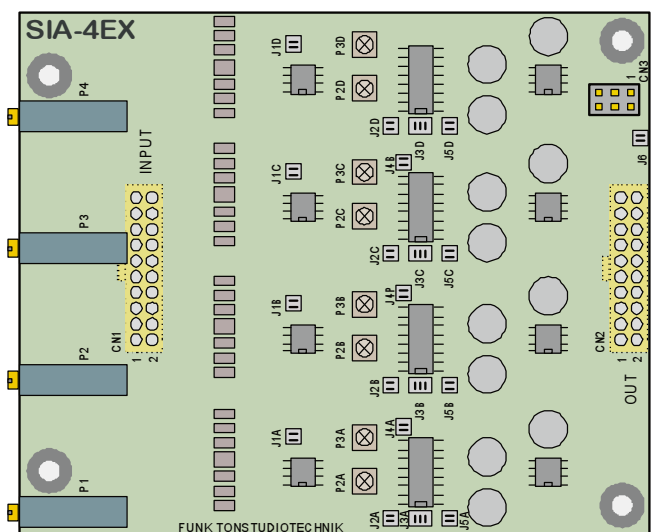
With the jumpers J1a, J1b, J1c, J1d the gain of the input stage of each channel can be increased individually by +6 dB (adjustment of the gain then +6 dB...-14 dB).

Jumper J5 connects circuit zero of the board with 0V of the power supply. This jumper is closed in the SAM-3B.V2. For special purposes, a "soft" coupling between circuit zero and 0V of the power supply can be achieved by opening this jumper (0V and circuit zero are then bridged with 1 Ω).

Jumpers J2\*...J4\* determine the configuration of the individual channels. This is where the signal flow on the board is set for summation and distribution. For more information, see the next page and the chapter "Block diagram".



Simplified block diagram



SIA-4EX Position of the jumpers and connectors



## SAM-3B.V2-EX INPUT AMPLIFIER (SIA-4EX)

The functions of the SIA-4EX amplifiers are set by various solder jumpers on the circuit board. The following diagram illustrates how these jumpers work.

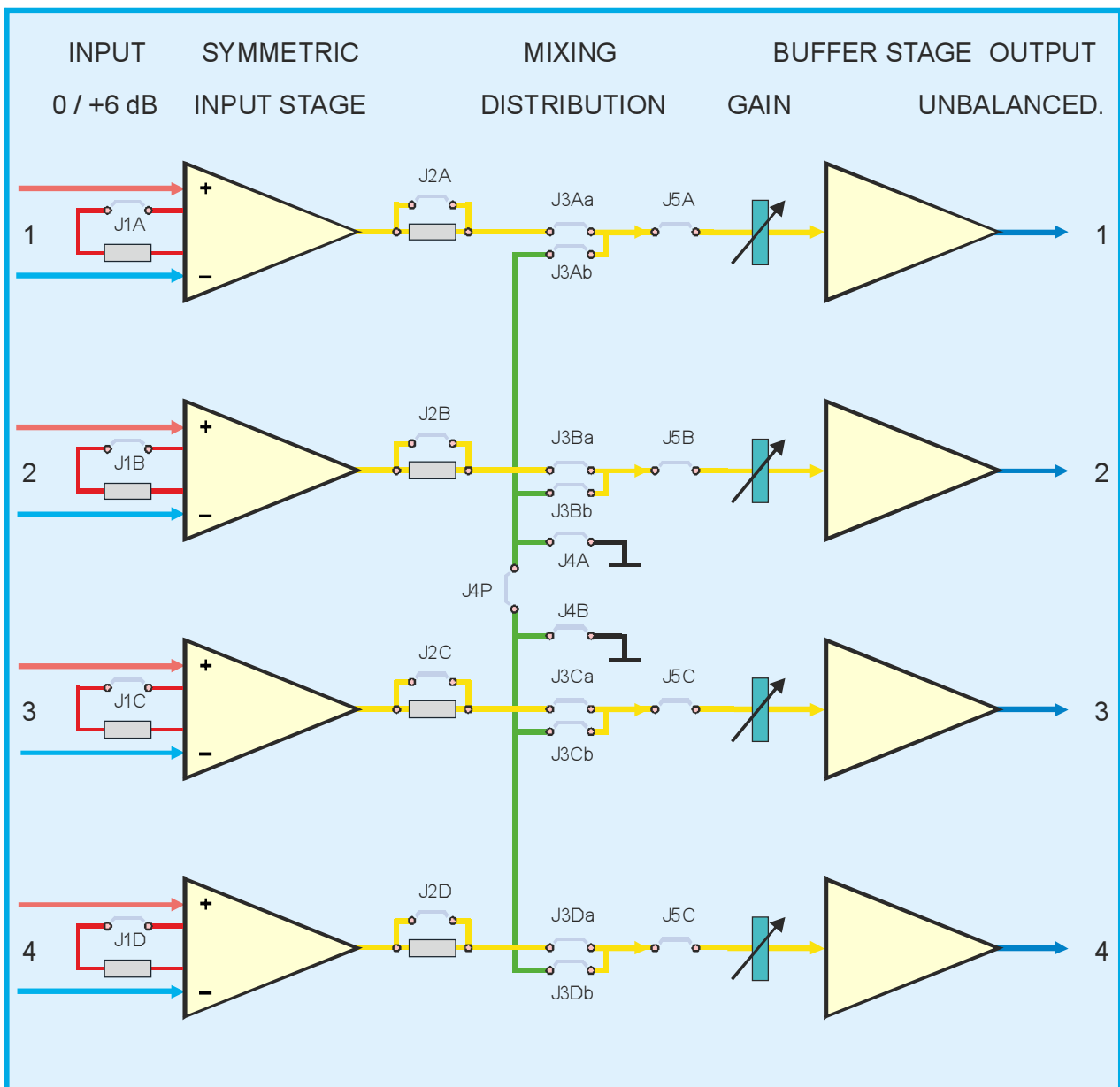
Jumpers J1A..J1D are normally open. The gain of the input stage is then exactly 1 (0.0 dB). Closing these jumpers increases the gain of the corresponding input stage by 6.0 dB.

Jumpers J2A..J2D are normally closed. For input signals that are to be mixed with others on the board via the summing bus (green), these jumpers must be opened.

Jumpers J3Aa..J3Da are normally closed. This jumper must be opened if the output stage is not to forward the signal of the corresponding input stage to the output, but the signal of the summing bus. If, on the other hand, the input signal is to be mixed with other inputs, the jumper J3a..J3d remains closed.

The jumpers J3Ab..J3Db are used to select the signals that are to be mixed via the summing bus. To do this, the jumpers J4A..J4P must be partially or fully opened.

### SIA-4EX



# SAM-3B.V2-EX OUTPUT AMPLIFIER (SOA-4EX)

The SOA-4EX serves as a 4-fold balancing amplifier in the SAM-3B.V2 EX. Adjustment of the output levels is possible via the 19 mm spindle trimmers P1..P4.

The output voltage and impedance symmetry is adjusted via SMD trimmers. These trimmers should **not be changed** under any circumstances without precise technical knowledge and appropriate measurement technology!

## Assignment of the trimmers :

Signal	Gain	Input CN1	Output CN2
CHANNEL 1	P1	Pin 4	Pin 3 + 4
CHANNEL 2	P2	Pin 8	Pin 7 + 8
CHANNEL 3	P3	Pin 12	Pin 11 + 12
CHANNEL 4	P4	Pin 16	Pin 15 + 16

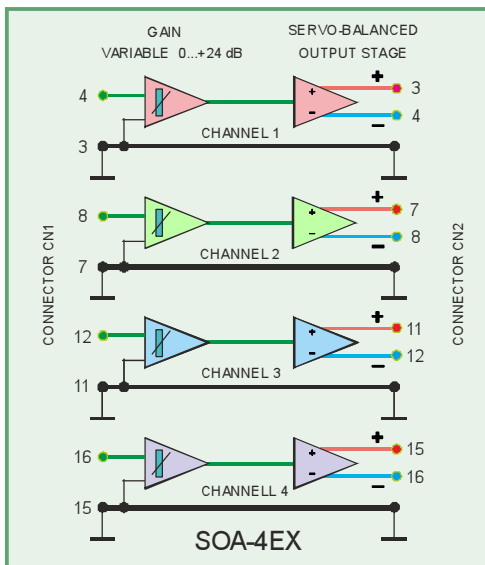
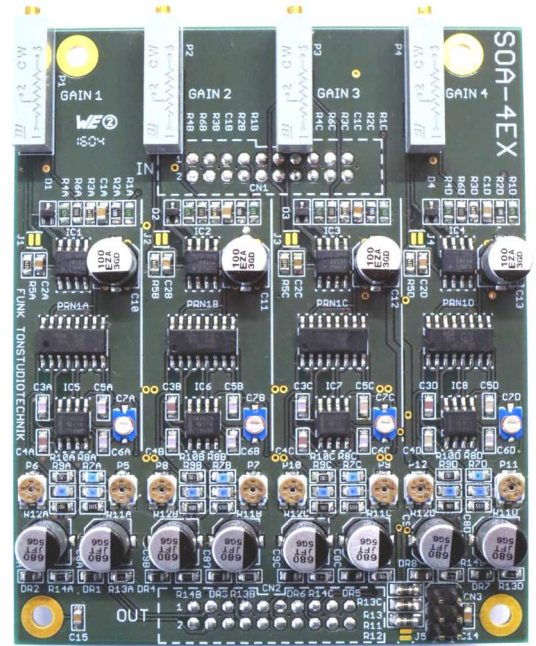
All other contacts of the 20-pin post connector CN1 are connected to ground (circuit zero). All other contacts of the post connector CN2 are also grounded except for pin 19/20.

The supply voltages reach the amplifier board via CN 3.

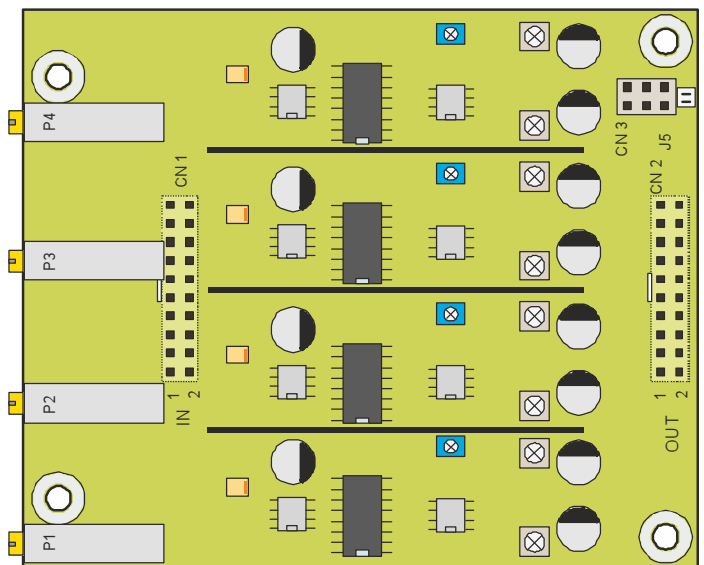
Contact assignment CN3 :	Pin 1 and 4	+ 20,0 Volt
	Pin 2 and 5	Ground
	Pin 3 and 6	- 20,0 Volt

With jumpers J1..J4, the gain of each channel can be fixed individually at 0 dB.

Jumper J5 connects circuit zero of the board with 0V of the power supply. For special purposes, a "soft" coupling between circuit zero and 0V of the power supply can be achieved by opening this jumper (0V and circuit zero bridged with 1 Ohm).



Simplified block diagram



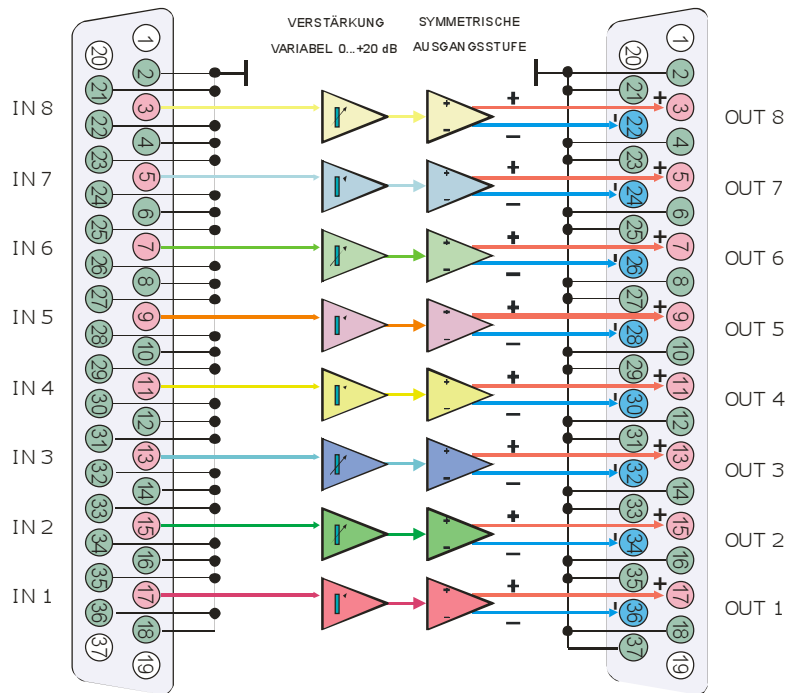
SOA-4EX Position of jumpers and connectors

# STANDARD - CONFIGURATION EXAMPLES

## STANDARD CONFIGURATIONS :

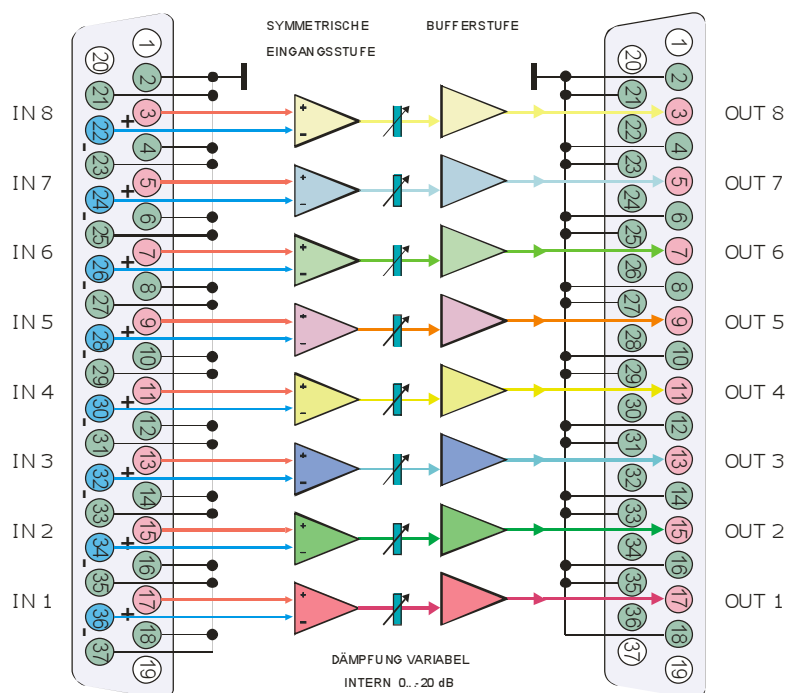
The following diagram shows the schematic structure of an 8-channel **balancing amplifier**

### Balancing amplifier SAM-3B.V2-EX/8-0



The following diagram shows the schematic structure of an 8-channel **differential amplifier**

### Differential amplifier SAM-3B.V2-EX/0-8

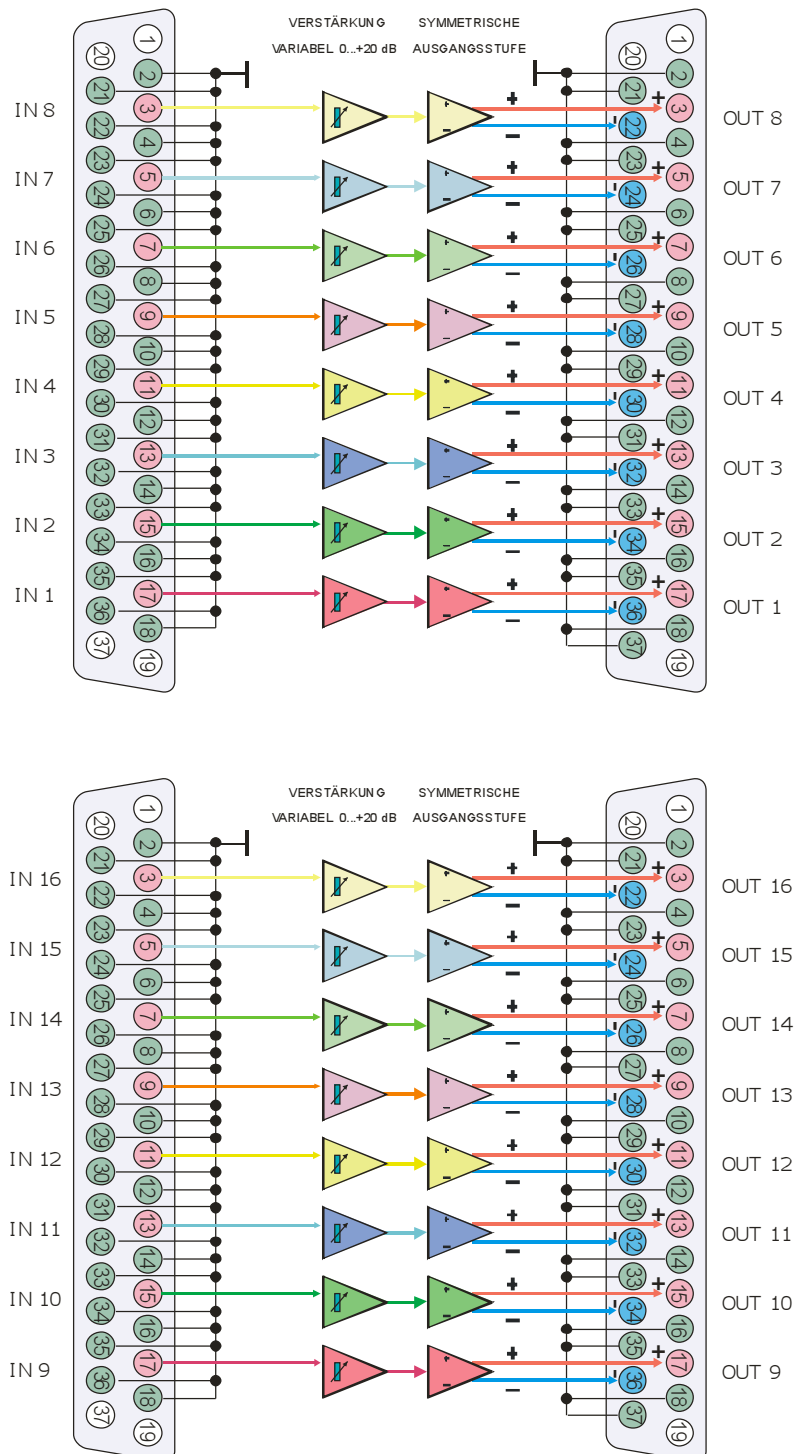


# STANDARD - CONFIGURATION EXAMPLES

## STANDARD CONFIGURATIONS :

The following diagram shows the schematic structure of a 16-channel **balancing amplifier** and the corresponding pin assignment of the 37-pin Sub-D connectors on the SAM-3B.V2-EX :

Balancing amplifier SAM-3B.V2-EX/16-0

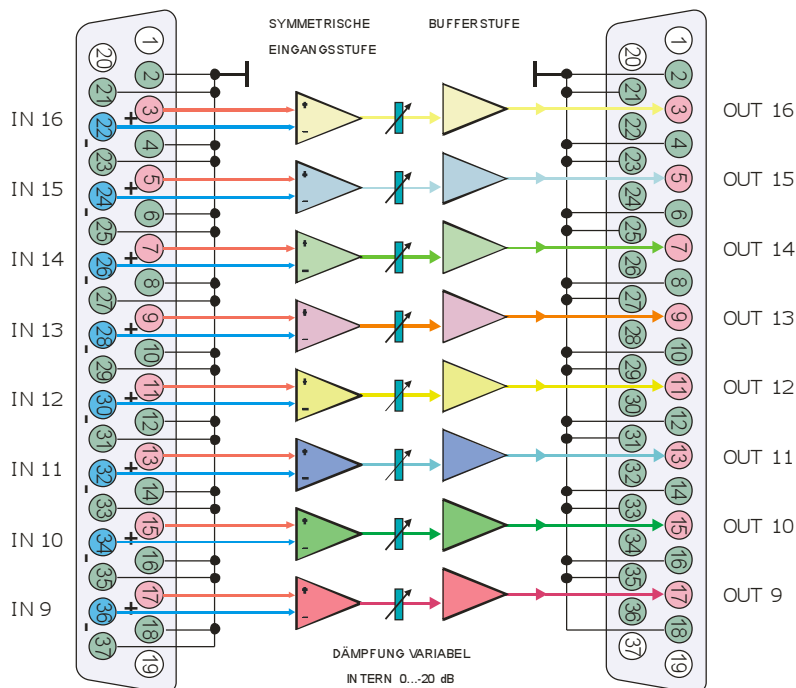
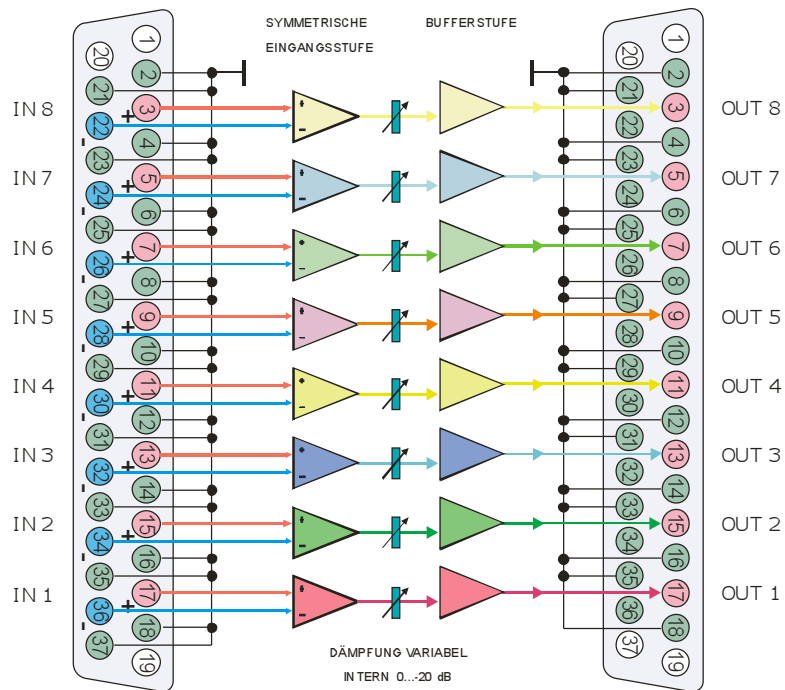


# STANDARD - CONFIGURATION EXAMPLES

## STANDARD CONFIGURATIONS :

The following diagram shows the schematic structure of a 16-channel **differential amplifier** and the corresponding pin assignment of the 37-pin sub-D connectors on the SAM-3B.V2-EX :

Differential amplifier SAM-3B.V2-EX/0-16

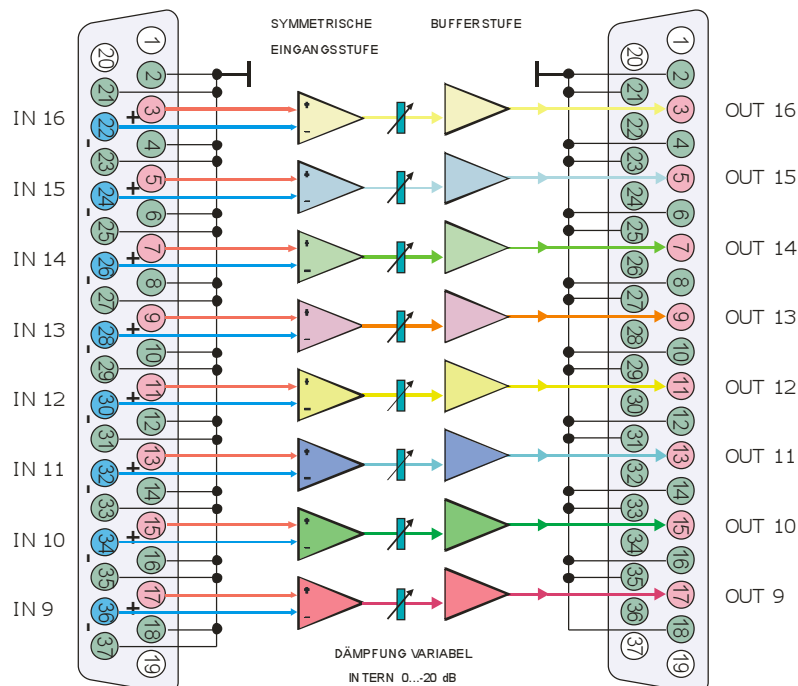
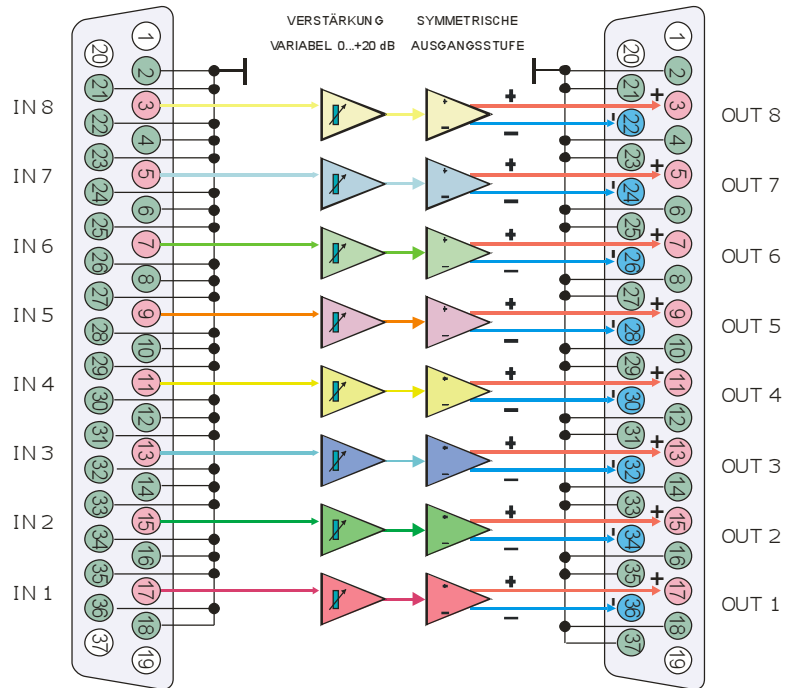


# STANDARD - CONFIGURATION EXAMPLES

## STANDARD CONFIGURATIONS :

The following diagram shows the schematic structure of an 8-channel **balancing amplifier** and an 8-channel **differential amplifier** and the corresponding pin assignment of the 37-pin sub-D connectors on the SAM-3B.V2-EX :

### Balancing and differential amplifier SAM-3B.V2-EX/8-8



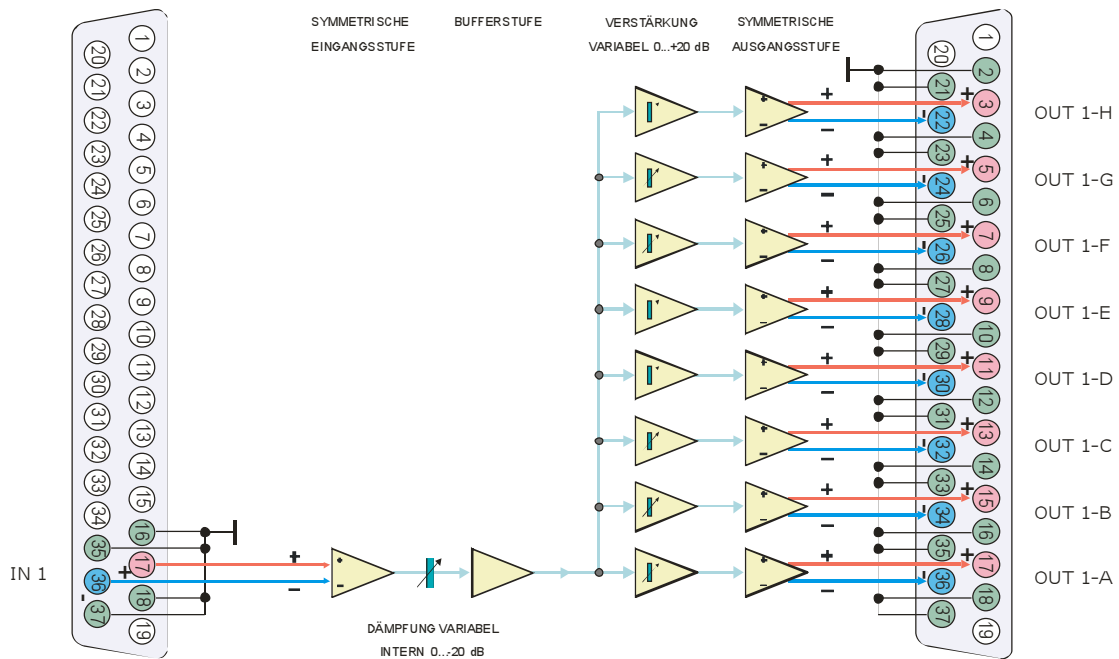
# SPECIAL VERSIONS (fully balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The current versions of the SAM-3B.V2 EX can also be equipped with more than 16 amplifier channels. This can be useful for distribution amplifiers that are to be fully balanced. The following are some examples of such configurations.

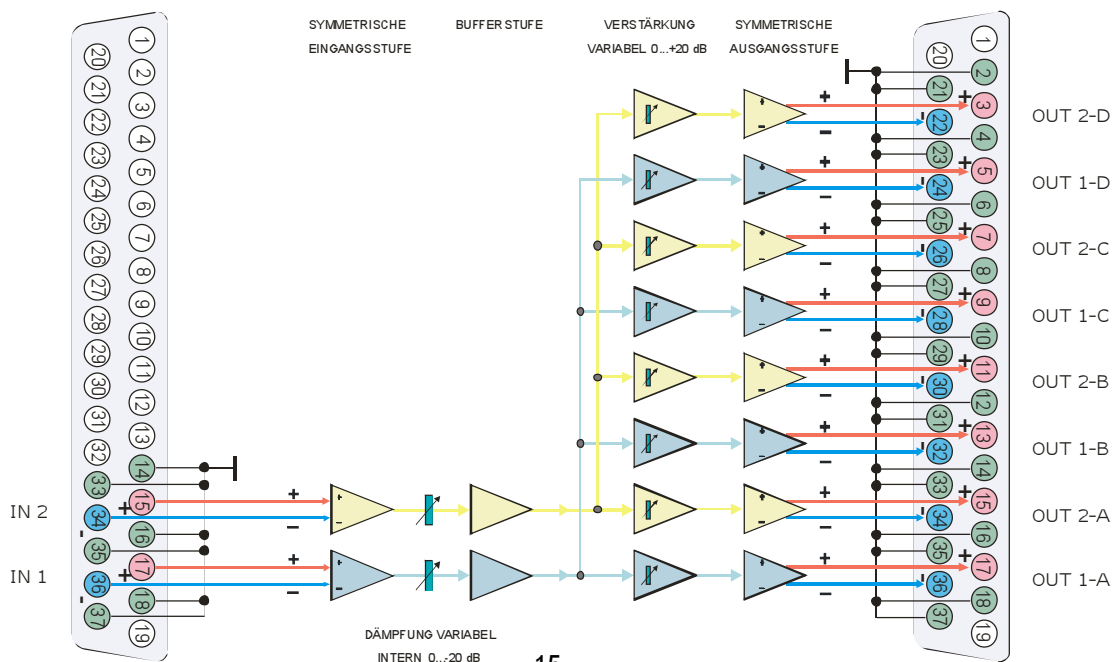
The diagram below shows the schematic structure of a distribution amplifier 1x **1 on 8** with 8 balanced output stages and 1 balanced input amplifier.

fully balanced distribution amplifier SAM-3B.V2-EX/8v1



The following diagram shows the schematic structure of a distribution amplifier 2x **1 on 4** with 8 balanced output stages and 2 balanced input amplifiers n.

fully balanced distribution amplifier SAM-3B.V2-EX/8v2

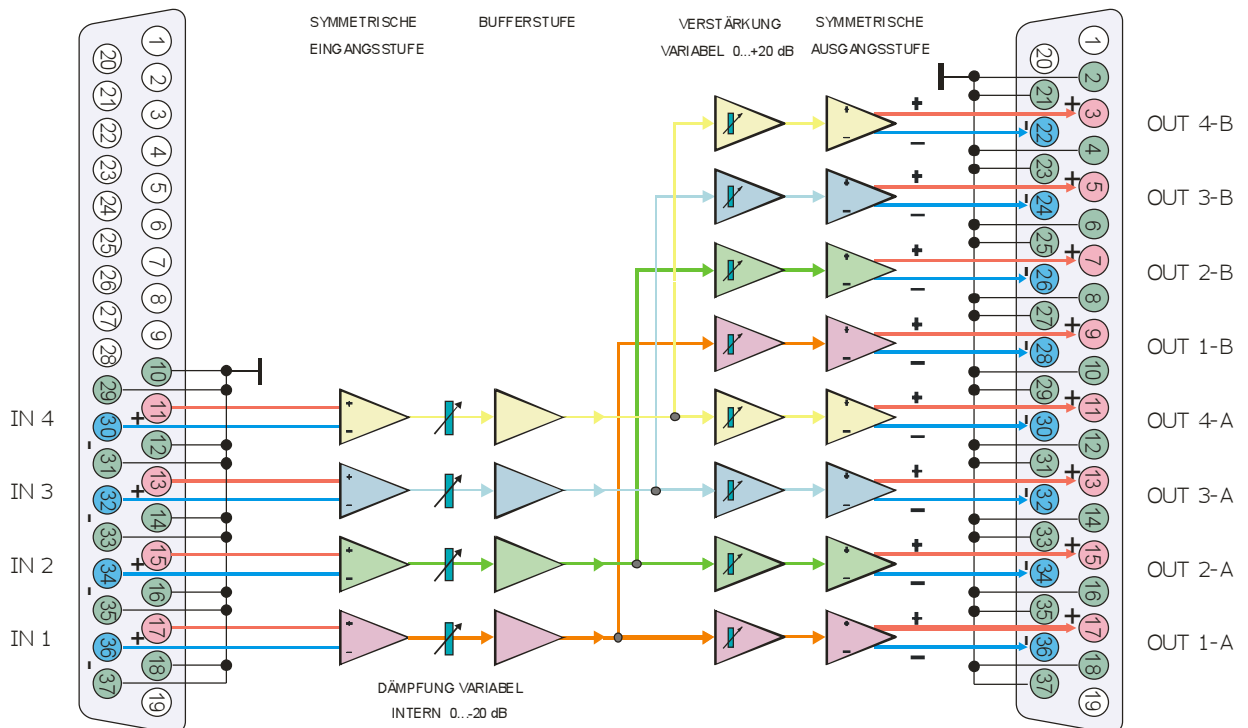


# SPECIAL VERSIONS (full- balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The following example shows the construction of a distribution amplifier 4x **1 on 2** with 8 balanced output stages and 4 balanced input amplifiers with the corresponding wiring of the Sub-D connectors.

fully balanced distribution amplifier SAM-3B.V2-EX/8v4



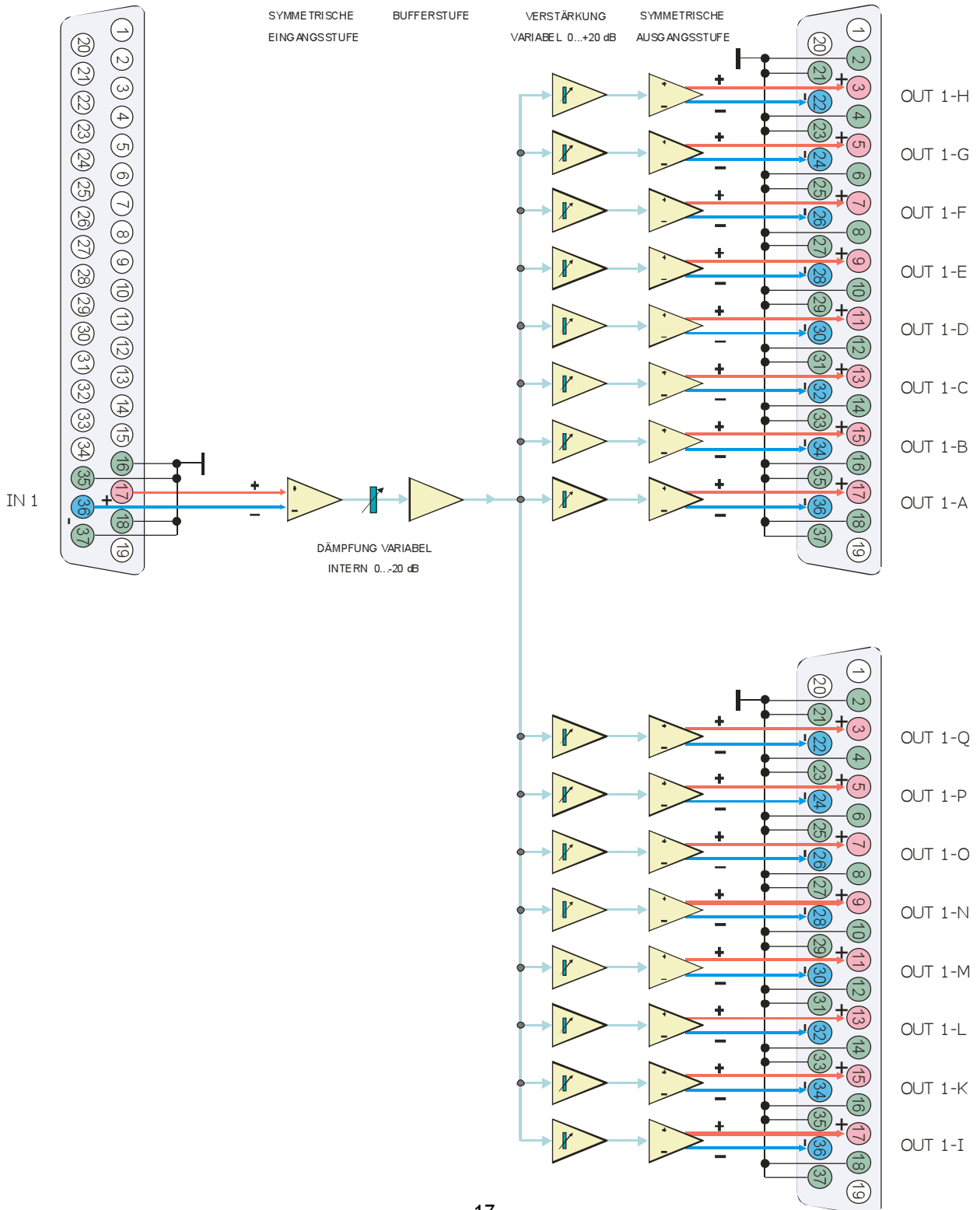


# SPECIAL VERSIONS (fully balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The following example shows the design of a distribution amplifier 1x **1 to 16** with 16 symmetrical output stages and 1 symmetrical input amplifier with the corresponding wiring of the Sub-D connectors.

fully balanced distribution amplifier SAM-3B.V2-EX/16v1

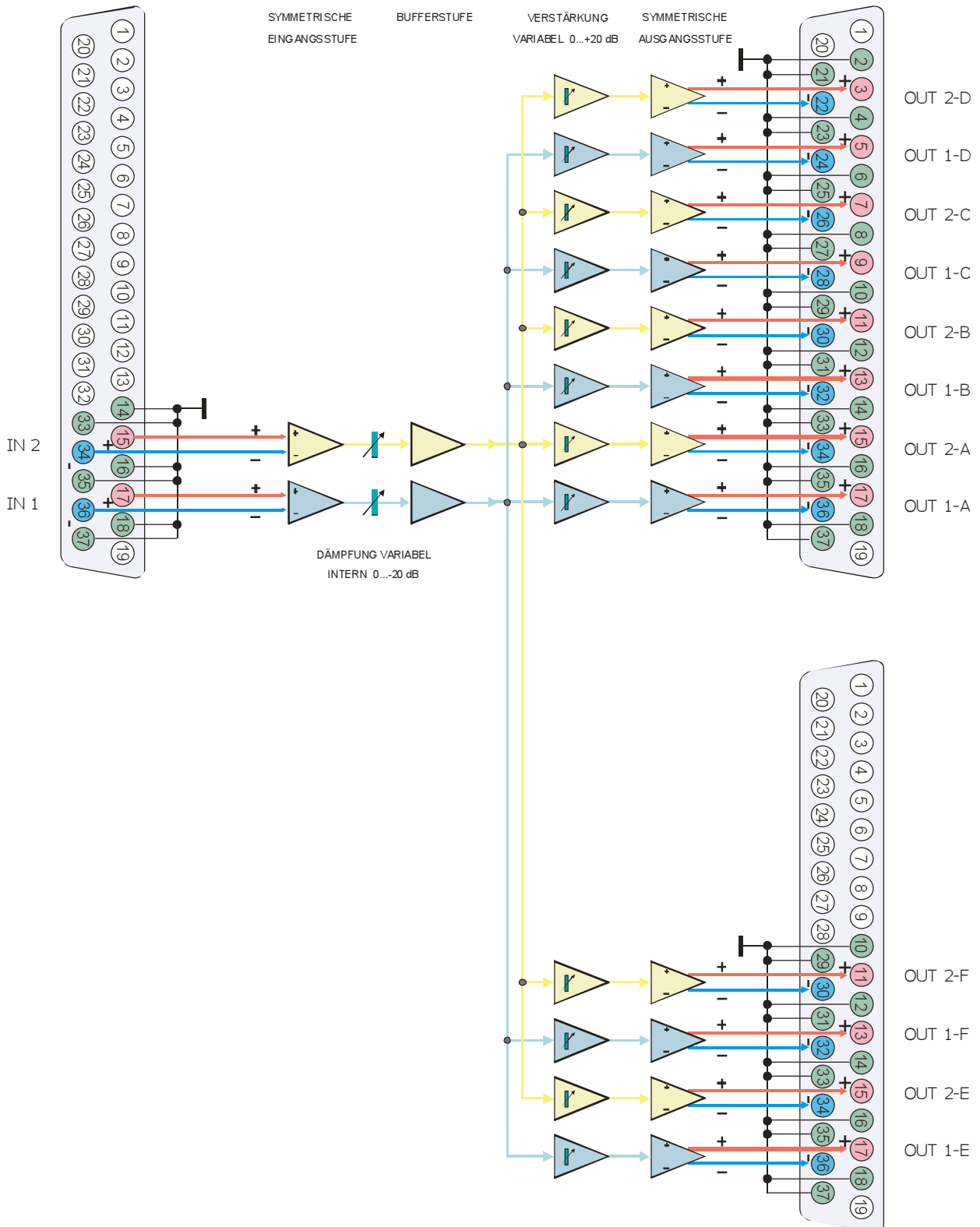


# SPECIAL VERSIONS (fully balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The following example shows the construction of a distribution amplifier 2x **1 to 6** with 12 symmetrical output stages and 2 symmetrical input amplifiers with the corresponding wiring of the Sub-D connectors.

fully balanced distribution amplifier SAM-3B.V2-EX/12v2

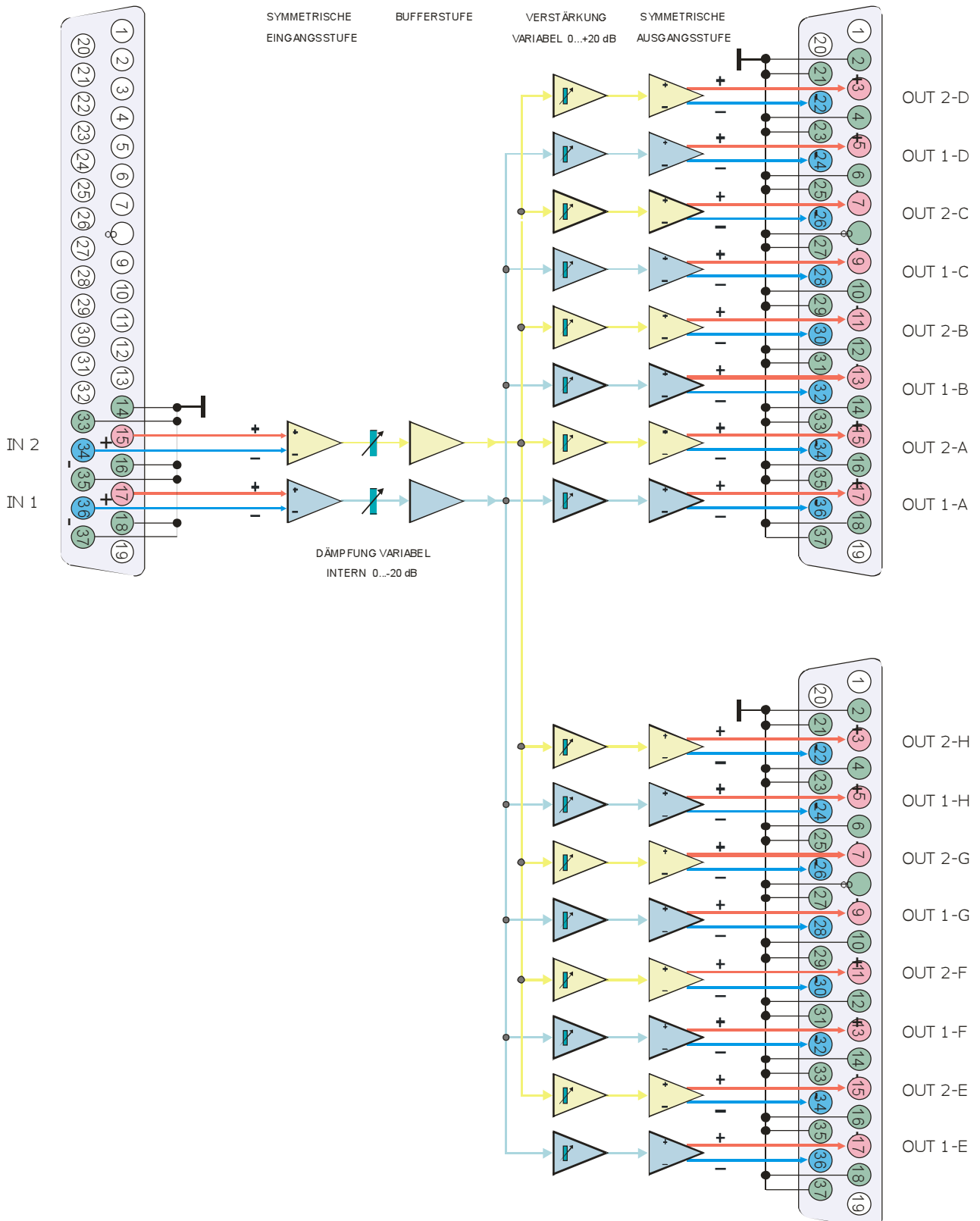


# SPECIAL VERSIONS (fully balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The following example shows the construction of a distribution amplifier 2x **1 on 8** with 16 balanced output stages and 2 balanced input amplifiers with the corresponding wiring of the Sub-D connectors.

fully balanced distribution amplifier SAM-3B.V2-EX/16v2

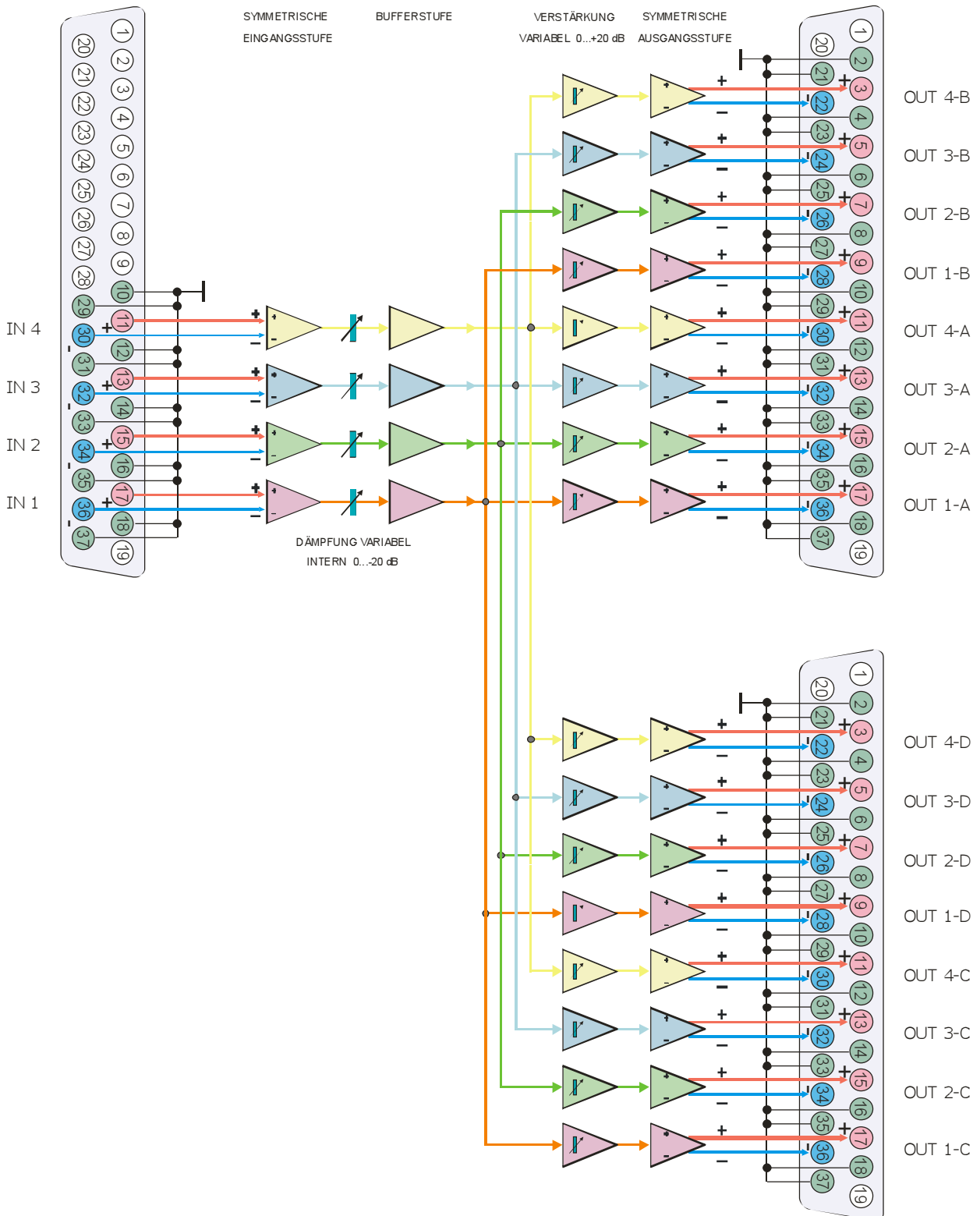


# SPECIAL VERSIONS (fully balanced distribution amp.) SAM-3B.V2-EX

## SPECIAL CONFIGURATIONS :

The following example shows the construction of a distribution amplifier 4x **1 on 4** with 16 balanced output stages and 4 balanced input amplifiers with the corresponding wiring of the Sub-D connectors.

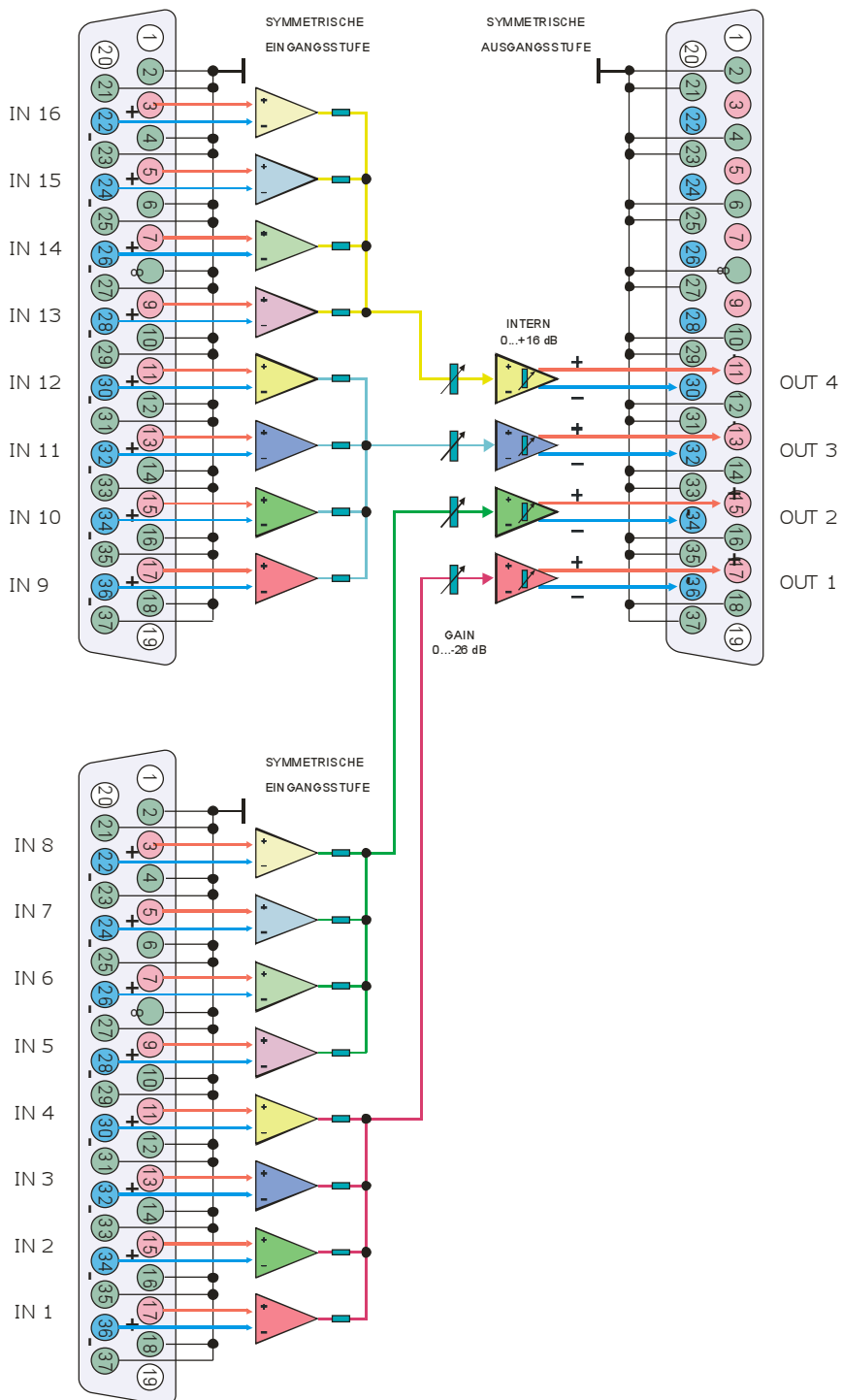
fully balanced distribution amplifier SAM-3B.V2-EX/16v4



## SPECIAL CONFIGURATIONS :

The following example shows the construction of a summing amplifier 4x **4 on 1** with 16 symmetrical input stages and 4 symmetrical output amplifiers with the corresponding wiring of the Sub-D connectors. The gain is set to -6 dB for a single channel. For the sum of 4 input signals to one output, this results in a gain of typ. 0 dB for non-correlating audio signals.

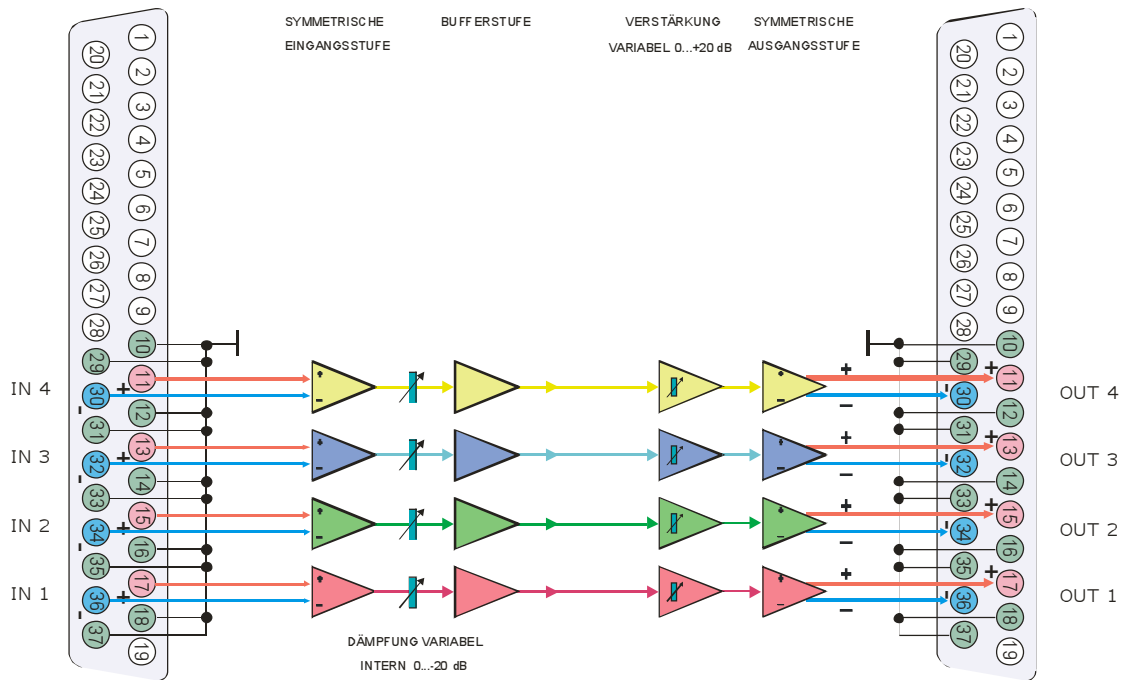
fully symmetrical mixing amplifier SAM-3B.V2-EX/4x 1S4



## SPECIAL CONFIGURATIONS :

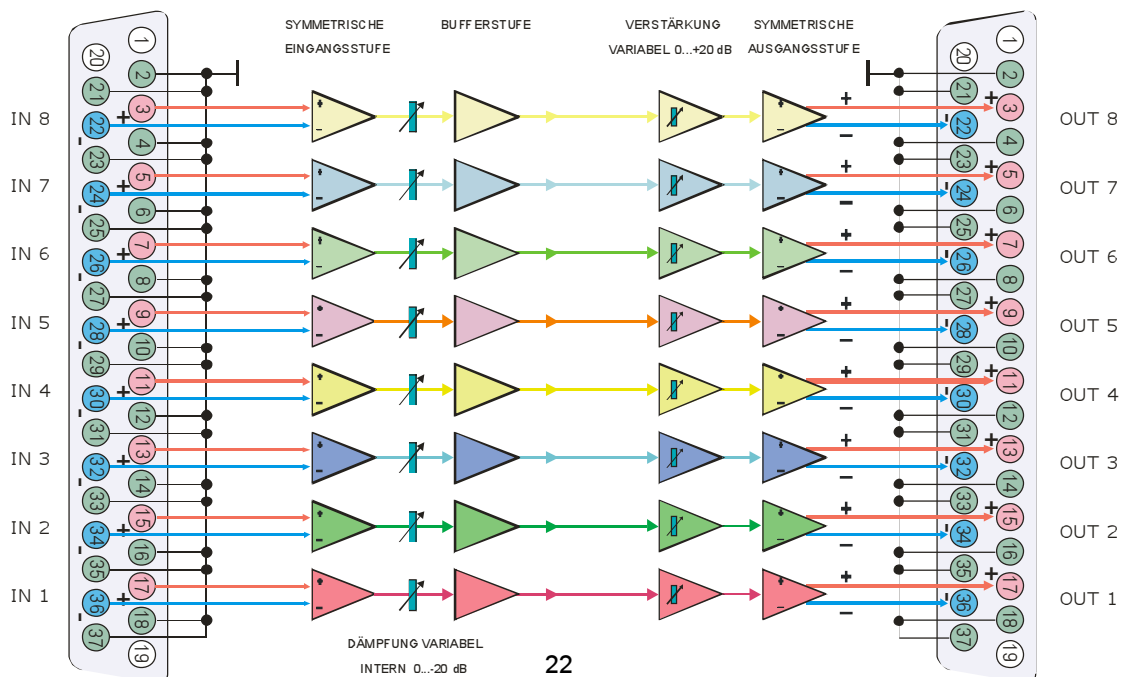
The following example shows a fully balanced 4-channel level and impedance matching amplifier 4x **1 on 1** with 4 balanced inputs and 4 balanced outputs with the corresponding wiring of the Sub-D connectors.

fully balanced matching amplifier SAM-3B.V2-EX/4SVS4



The following example shows a fully balanced 8-channel level and impedance matching amplifier 8x **1 on 1** with 8 balanced inputs and 8 balanced outputs :

fully balanced matching amplifier SAM-3B.V2-EX/8SVS8



## HUM LOOPS :

Often, hum interference is not caused by electrical or magnetic interference fields alone. Ground potential differences between the connected units, e.g. due to double earthing, result in "hum loops", which can sometimes cause considerable interference currents due to the low-impedance shields of the cables of the wired units. Depending on the circuit design, these currents also generate hum voltages within the connected audio devices and add to the already disturbed audio signals. This can be easily remedied by using balanced circuit technology.

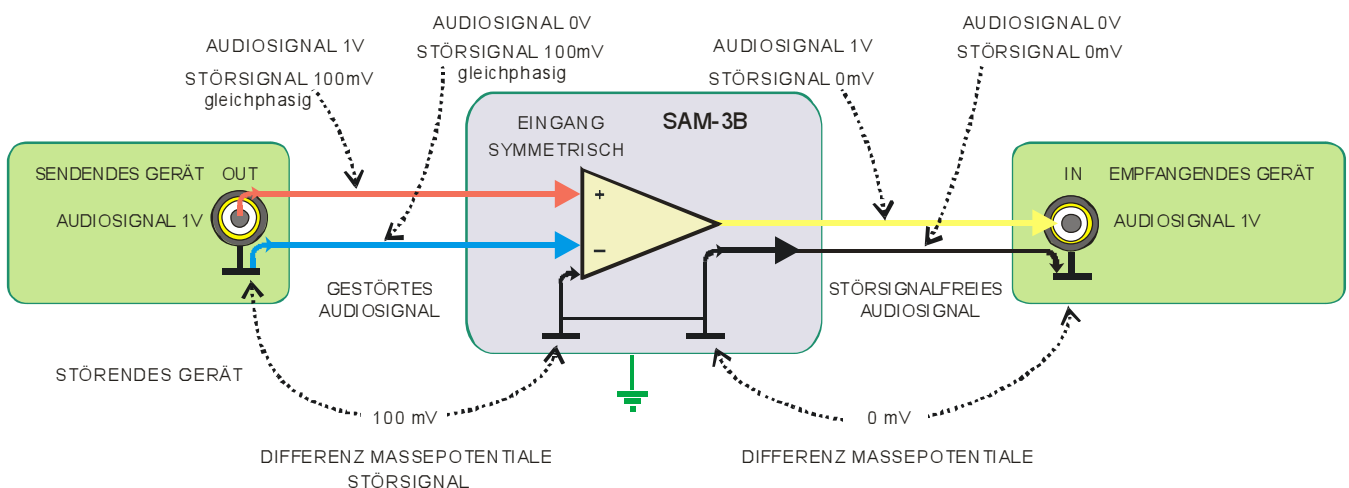
### Ground loops with asymmetrical circuit technology :

A real remedy can only be achieved by disconnecting this ground connection and using an audio frequency transformer or differential amplifier.

The following diagram shows the effect of a ground loop separation within an asymmetrical cabling by interposing a balanced amplifier input (differential amplifier SAM-3B.VEX).

High impedance "instrumentation amplifiers" such as those used in the SAM-3B.V2-EX ideally only take into account the voltage difference between their two inputs. If the two inputs are connected to each other and then modulated together, no signal is produced at the output. If the - input is connected to the earth or shield connection of the transmitting unit and the + input is connected to the hot pin of the signal output, in our example, both inputs of the balanced receiver are modulated in phase with a 100 mV interference signal. The output signal, however, remains at 0 volts, since there is no difference between the + and - inputs.

If the output of the sending unit is modulated with an audio signal of 1V, this difference of 1V is also present at the balanced input of the SAM-3B.V2 EX. Consequently, this audio signal will also be present at the output of the SAM-3B.V2 EX, but freed from the hum voltage. This principle also works if the two wires (blue and red) were interchanged. Only the phase position for the useful signal would turn by 180°. This can also be used to compensate for "phase shifts".



No amplifier works ideally. Common circuits achieve a suppression of the interference signal to 1/100..1/10.000 (40..80 dB). Therefore, a small residual interference voltage will often be detectable in the output signal of the differential amplifier. Due to careful development, laser-trimmed precision circuits and instrumentation amplifier technology, suppressions of typically more than 1/300,000 (110 dB) can be expected with the SAM-3B.V2EX. In our example, this means that the interference signal is still approx. 0.3  $\mu$ V ( $\sim$  -130 dB compared to the useful signal) and thus far below the background noise of connected devices.

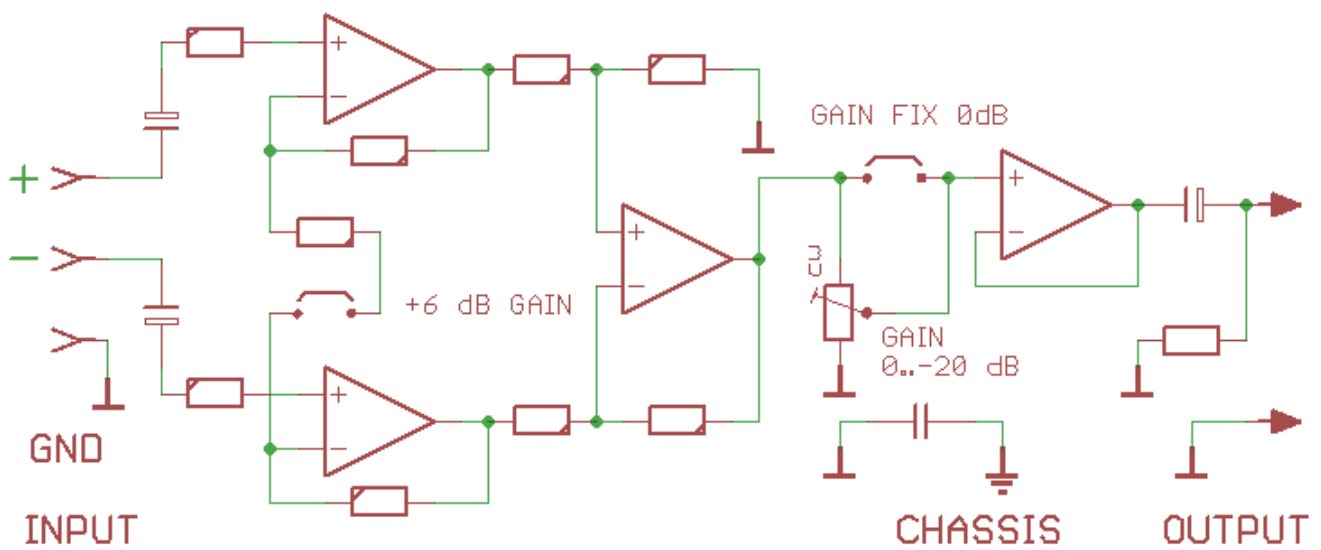
In the unit, the housing (earth or protective earth potential) and circuit zero (ground) are separated from each other in order to avoid the additional risk of hum loops. Protective earth potential and circuit zero are accessible on the rear panel via screw terminals.

# SAM-3B.V2-EX BLOCK DIAGRAM

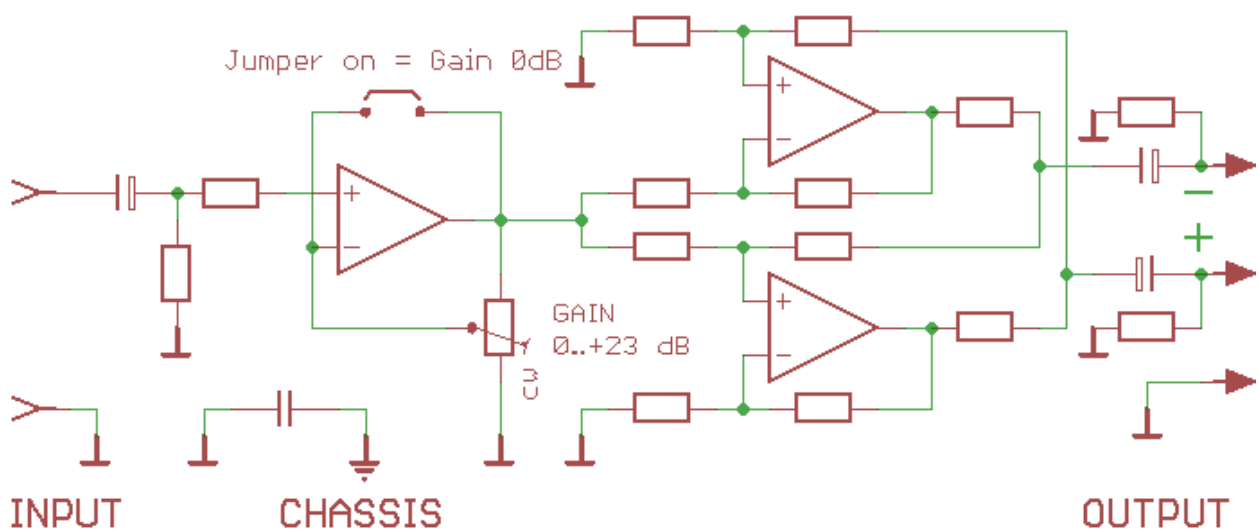
## SIMPLIFIED BLOCK DIAGRAM

The following block diagrams of the audio amplifiers used in the SAM-3B.V2-EX show only 1 channel of the corresponding 4-channel amplifier. The highly simplified diagrams only serve for a basic understanding of the mode of operation of the SIA-4EX and SOA-4EX modules.

### BLOCK CIRCUIT DIAGRAM SIA-4EX 1 CHANNEL



### BLOCK CIRCUIT DIAGRAM SOA-4EX



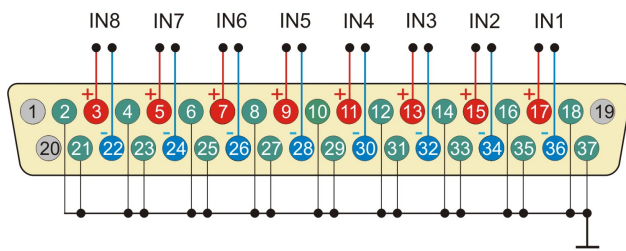


# SAM – 3B.V2-EX INPUT AND OUTPUT ASSIGNMENT

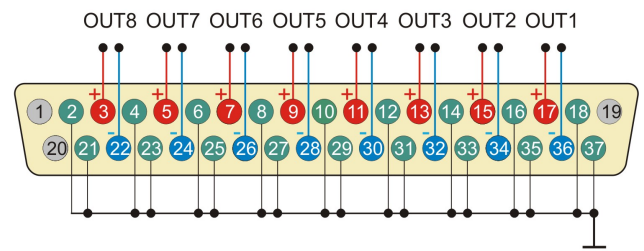
## Pin assignment audio signals

### EIN- UND AUSGANGSBESCHALTUNG SYMMETRISCH SUB-D 37-POL. MALE

AUF GERÄTE-BUCHSE MALE GESEHEN

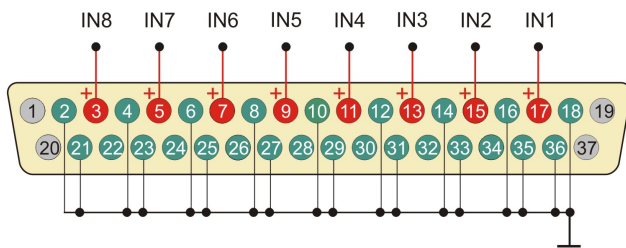


- + EINGANG
- - EINGANG
- OV SCHALTUNGSNULL
- NC (nicht angeschlossen)

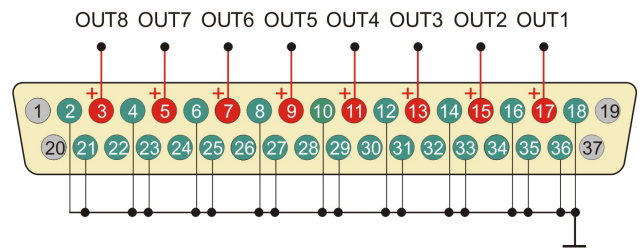


- + AUSGANG
- - AUSGANG
- OV SCHALTUNGSNULL
- NC (nicht angeschlossen)

### EIN- UND AUSGANGSBESCHALTUNG ASYMMETRISCH SUB-D 37-POL. MALE



- EINGANG
- OV SCHALTUNGSNULL
- NC (nicht angeschlossen)



- AUSGANG
- OV SCHALTUNGSNULL
- NC (nicht angeschlossen)

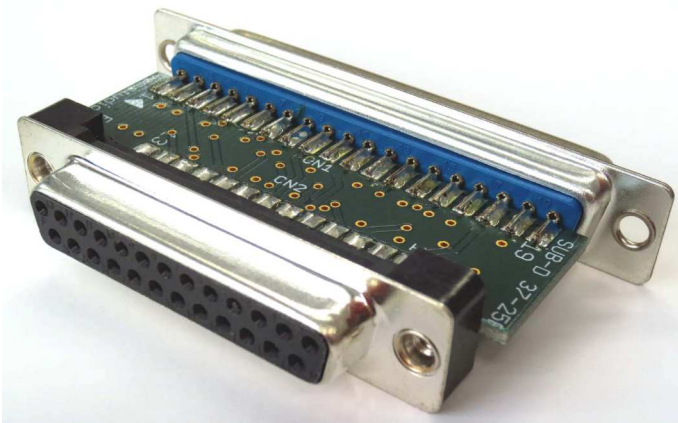
The inputs and outputs for channels 9..16 are connected identically. For the wiring, 37-pin sub-D connectors female are required for the inputs and outputs.

## ADAPTER 37-Pol-SUB-D to 25-Pol-SUB-D (Option) :

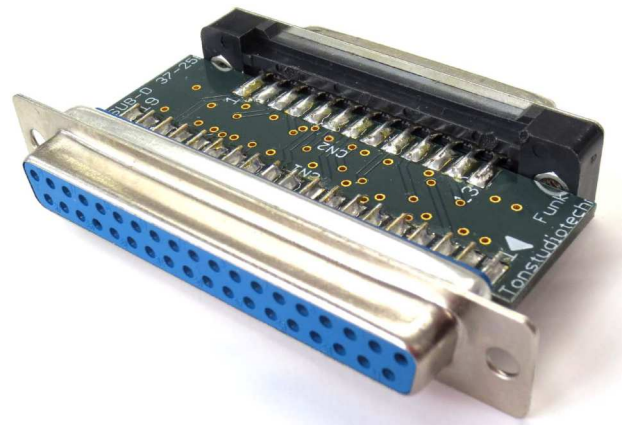
Adapters from the common 25-pin configuration to the 37-pin connection used in the unit are optionally available. This allows the use of inexpensive 25-pole SUB-D cables on the SAM-3B.V2-EX. At the same time, the adapter for the inputs on the 25-pin side converts the signal to a female connector. This also corresponds to the configurations predominantly found today for multi-channel cabling. The assignment of these adapters on the 25-pin side corresponds to the usual "Tascam" assignment.

The 37-pin connectors used on the SAM-3B.V2 EX are generally easier to solder than the 25-pin versions. In addition, the achievable crosstalk attenuation for high frequencies is minimally better with the 37-pin connectors.

For the **inputs** of the SAM-3B.V2EX, there is the adapter **SUB-D-25/37 female**.



View 25-pin input



View rotated 180° (SAM-3B side)

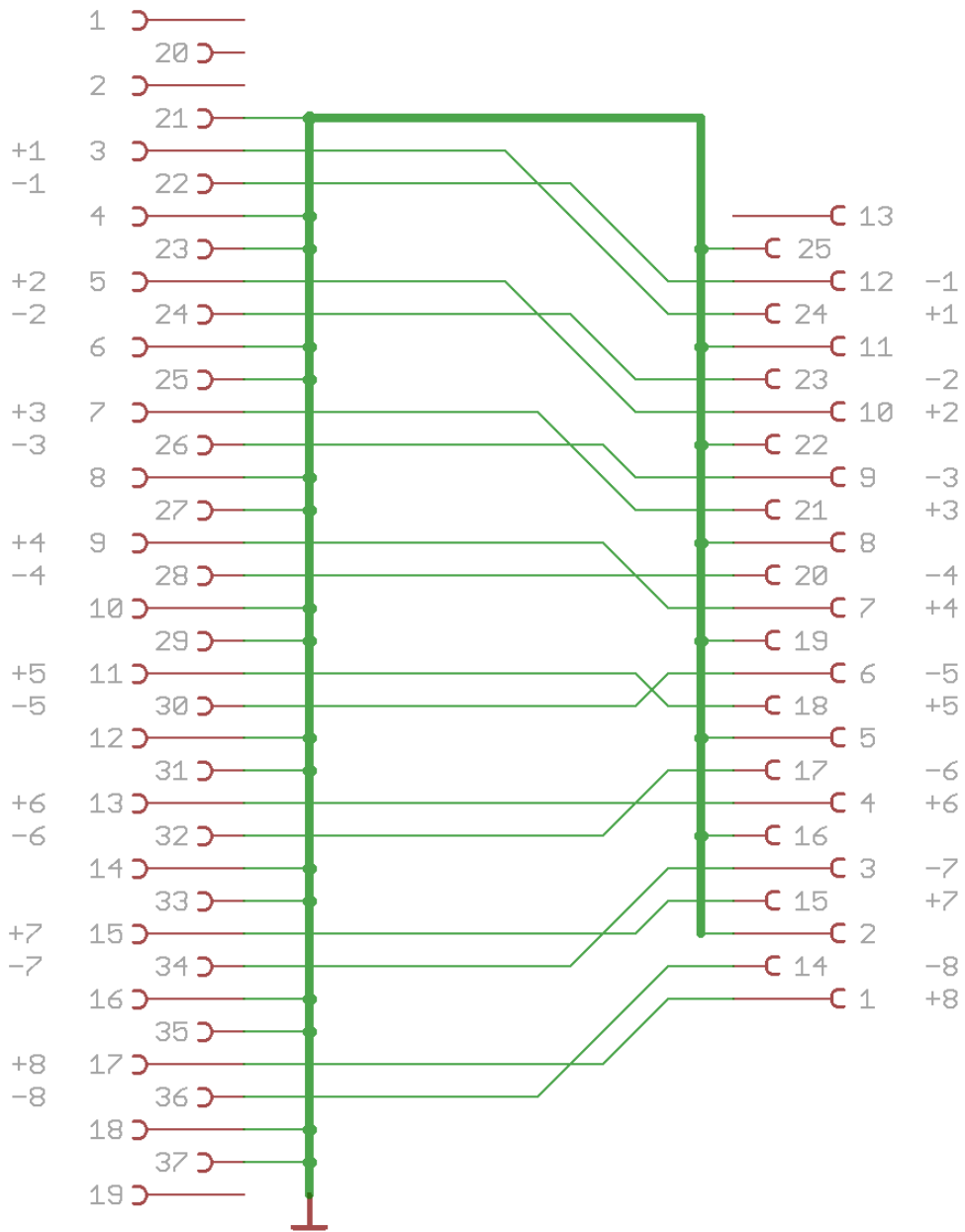
For the **outputs** of the SAM-3B.V2EX there is the adapter **SUB-D-37/25 male**



View 25-pin output

## Sub-D-Konverter 25/37-Pol

INPUT/OUTPUT SAM-3B.v2-EX 37-pol.Sub-D female



OUTPUT/INPUT 25-pol. Connection cable to periphery



## FOR YOUR SPECIAL ATTENTION

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### **INTERFERENCE RADIATION AND INTERFERENCE IMMUNITY**

The unit complies with the protection requirements in the field of electromagnetic compatibility, which are listed in Directives 89/336/EEC and FCC, Part 15, among others :

The electromagnetic emissions generated by the unit are limited to such an extent that proper operation of other devices and systems is possible.

The unit has adequate immunity to electromagnetic interference so that it can be operated as intended.

The unit has been tested and meets the following conditions :

Security : Protection class 1 according to EN60950; 1992 + A1/A2; 1993 (UL1950)

EMV : Audio, video and audiovisual equipment and for  
Studio lighting control equipment for professional use.

Interference emission : EN55103-1

Interference immunity : EN55103-2

Observance of these standards ensures with a reasonable probability both protection of the environment and appropriate immunity of the unit. However, there is no absolute guarantee that no unauthorised electromagnetic interference will occur during operation of the unit.

In order to largely exclude the likelihood of such impairments, the following measures must be observed :

When installing the unit, take into account the instructions in this operating manual.

Use shielded cables for all audio paths. Make sure that the shielding is connected to the corresponding connector housing in a flawless, large-surface, corrosion-resistant manner. A cable shield connected at one end only can act as a receive/transmit antenna.

In the system and in the environment in which the unit is used, only use components (installations, devices) that themselves meet the requirements of the standards mentioned above.

Provide an earthing concept for the system that takes into account both safety requirements and EMC concerns. When deciding between star or surface or combined earthing, weigh the advantages and disadvantages against each other.

Avoid the formation of current loops or reduce their undesirable effect by keeping their area as small as possible (no unnecessarily long cables) and reducing the current flowing in them, e.g. by inserting a common-mode choke.

# MAINTENANCE AND REPAIR

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## **SAFETY**

Interventions in the unit may only be carried out by qualified personnel in compliance with the applicable regulations.

Before removing housing parts, the unit must be switched off and disconnected from the mains.

When carrying out maintenance work on the open, mains-operated unit, bare circuit parts and metal semiconductor housings must not be touched either directly or with an uninsulated tool.

For maintenance and repair of the safety-relevant parts of the unit, only replacement material in accordance with the manufacturer's specifications may be used.

## **ELECTROSTATIC DISCHARGE (ESD)**

Integrated circuits and other semiconductors are sensitive to electrostatic discharge (ESD). Improper handling of assemblies with such components during maintenance and repair can impair their technical properties or service life or lead to total failure.

The following rules must therefore be observed when handling ESD-sensitive components :

ESD-sensitive components may only be stored and transported in packaging designed and marked for this purpose.

Unpackaged ESD-sensitive components may only be handled in the protective zones set up for this purpose (EPA, e.g. area for field service, repair or service station) and only touched by persons connected to the earth potential of the repair or service station. The serviced or repaired unit as well as tools, aids, EPA-suitable (electrically semi-conductive) work, storage and floor mats must also be in contact with metallic surfaces (risk of shock discharge).

To avoid undefined transient stress on the components and their possible damage due to unauthorised voltage or equalising currents, electrical connections may only be made or disconnected when the unit is switched off and after any capacitor charges have dissipated.

# CE CONFORMITY

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## CE- DECLARATION OF CONFORMITY

FUNK TONSTUDIOTECHNIK  
10318 Berlin GERMANY

declares on its own responsibility that the product

### **MULTI - BALANCING / DIFFERENTIAL AMPLIFIER SAM-3B.V2**

complies with the following standards in accordance with the provisions of the EU directives and their supplements :

Safety :

Protection class 1, EN60950; 1992 + A1/A2; 1993

EMV :

EN55103-1 EN55103-2

Evaluation criterion B electromagnetic environment E4

Berlin, 5.09.2022



Th. Funk, Owner