BUCHER hydraulics

Amplifier Card for Proportional Valves

2-channel for valves with two solenoids
Series SAN-527-11-08 / SAN-527-11-16

- **For 12 VDC and 24 VDC solenoids**
- **SAN-527-11-08: 800 mA** (24 VDC)
  SAN-527-11-16: 1600 mA (12 VDC)
- **Reverse polarity-proof**
- **Permanent short circuit-proof**
- **External ramps disable function**
- **Ramps with quadrant recognition**
- **Wide range of ramp adjustment**
- **External enable/stop function**
- **Test sockets for DC/signal and output**
- **Power supply (-), demand signal nul, auxiliary output nul are all bonded. Therfore several SAN-527's can be fed by one common power supply.**
- **PWM - output stages** (high dynamic)
- **4 different inputs for the most popular input-voltages and -currents, allows very flexible input switching**
- **LED indication for: Power on, Ramp off, Fail-safe**
- **Potentiometer for: Ramp time, Zero overlapping and amplification**

1 Description

The SAN-527 servo amplifier has been designed to control 4/3-way proportional valves with two solenoids.

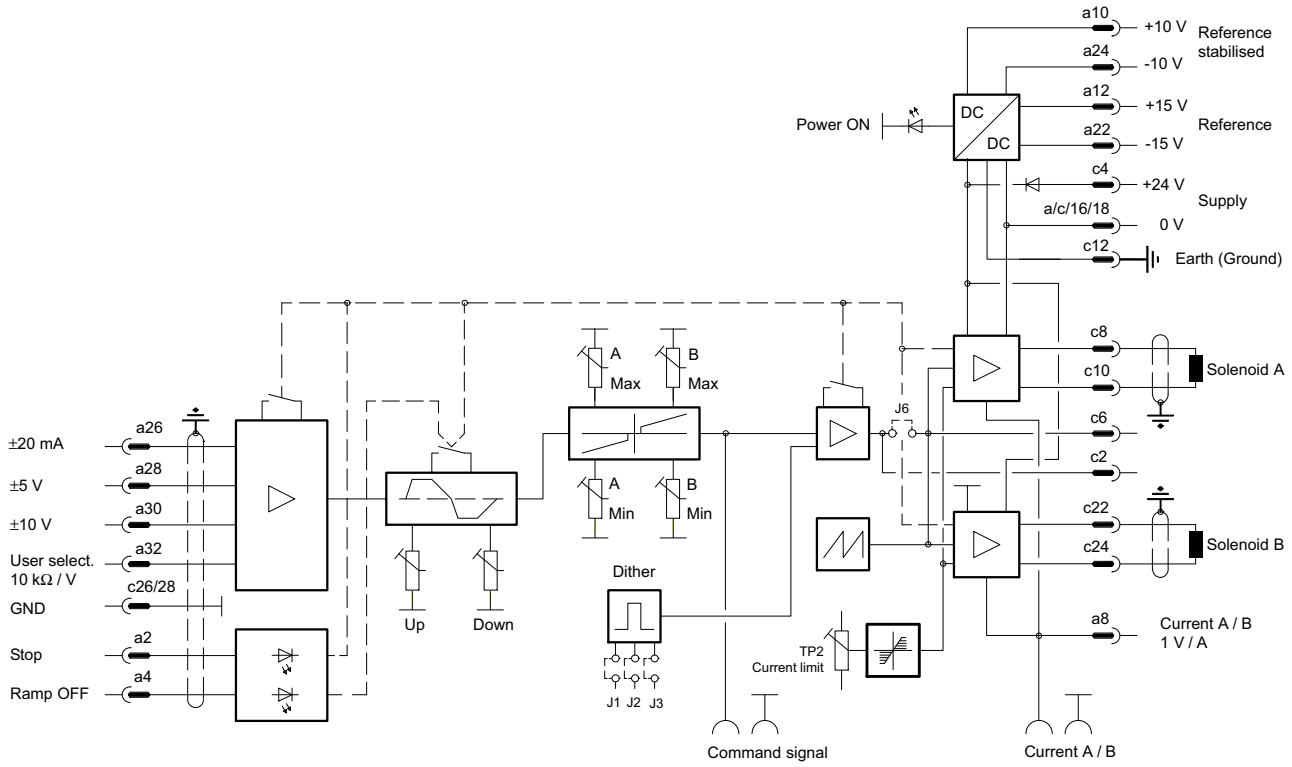
The pin assignments and functions of the SAN-527… are compatible with the SAN-227.

2 Technical data

General characteristics	Description, value, unit
Supply voltage	24 V DC (20 - 32 V DC)
Reference voltages	± 10 V, 10 mA, stabilised ± 15 V, 25 mA, unstabilised
Output current I_{max}	2600 mA 3 plug-selectable ranges: (0…800, 0…1600, 0…2600 mA)
Signal inputs	1x ± 20 mA, 100 Ω 1x ± 5 V, 50 kΩ 1x ± 10 V, 100 kΩ 1x user selectable 10 kΩ / V
Dither	3 plug-selectable ranges (100 Hz, 140 Hz, 280 Hz) Adjustable amplitude, approx. 0…10% of rated current
PWM frequency	~ 5.5 kHz
Ramp times	Ramp Up / Down independently adjustable 0.2…10 sec ± 20 %
Ramp off	Input voltage 24 V, 10 kΩ, Indication by LED "Ramp OFF"
Stop	Normally closed circuit, Input voltage 24 V, 10 kΩ Indication by LED "Fail safe"
Short-circuit protection	for output stage and reference voltages

General characteristics	Description, value, unit
Measurement sockets (∅ 2 mm)	VALVE CURRENT: 1 V = 1 A, ± 8 %, COMMAND SIG: desired signal ± 10 V depends on the input voltage
Connection	32-pole male multipoint connector, DIN 41612 D32
Dimensions (Overall dimensions)	Eurocard format (160 x 100) mm (40.5 x 128.7 x 189.7) mm (WxHxD), Front plate 3HUx8SU
Weight	~ 250 g

3 Block circuit diagram



4 Power supply

The SAN-527 servo-amplifier requires 24 V DC. A polarity diode is installed in order to exclude the possibility of incorrect card polarity. Since the module is equipped with pulse-width modulated end stages, it should be regarded as a DC/DC converter, with the result that the feed current taken up is generally lower than the valve current. Supply voltage may vary between 20 and 32 V. It is also possible to apply an unfiltered DC voltage of between 16 and 24 V.
The supply voltage should be connected to the following pins:

c4	= +24 V
a/c 16/18	= 0 V (GND)
c12	= Ground/Earth (EMC)

5 Reference voltages

The reference voltages are generated on the card in a DC/DC converter. These reference voltages (±10 V and ±15 V) are available for supply of external modules (e.g. PID controller or target-value [setpoint] card), target-value (setpoint) potentiometers and actual-value generators. The DC/DC converter on the module trips if a short-circuit occurs between connector pins a12/a22 or a10/a24 and/or GND. In this case, the servo-amplifier must be deenergized. The converter restarts after a waiting period of approx. 10…20 s and subsequent switching on of the servo-amplifier. This is possible only, provided any short-circuit has previously been eliminated.
The reference voltages are routed out via the following connector pins:

Pin a12: +15 V, 25 mA, ± 5 % unstabilized
Pin a22: -15 V, 25 mA, ± 5 % unstabilized
Pin a10: +10 V, 10 mA, ± 0,5 % stabilized
Pin a24: -10 V, 10 mA, ± 0,5 % stabilized

6 End stage

The end stages take the form of high-dynamic dual end stages equipped with field-effect transistors. High-speed deenergization of the solenoids is assured through high PWM frequency.
Solenoid A must be connected to Connector Pins c8 and c10 and Solenoid B to c22 and c24.

7 PWM frequency and Dither

The end stages operate at a PWM frequency of approx. 5kHz for high-dynamics mode.
The Dither frequency is generated by means of a separate square-wave generator and is superimposed on the PWM frequency. Dither amplitude can be set using the “Dither“ potentiometer on the main board. Maximum Dither deflection is approx. ±10 % of the selected rated current. Dither frequency can be selected in three ranges:

J1 approx. 100 Hz
J2 approx. 140 Hz
J3 approx. 280 Hz

8 Rated current and current limitation

Maximum end stage output current is 2600 mA. The amplifiers are equipped with a current limitation function which is set approx. 100 mA above rated current. The end stages feature a short-circuit protection function which reacts in case of short-circuit between Pins c8 and c10 or c22 and c24. Rated current is set on the board by means of switch-rider assignment. In exceptional cases, it is possible to modify the ex-works setting. It is also necessary to reset the current limitation function simultaneously to the new value if a different rated current is selected.
Switch-rider arrangement for rated current:

A1; A2 = 800 mA
B1; B2 = 1600 mA
E1; E2 = 2600 mA

9 Inputs

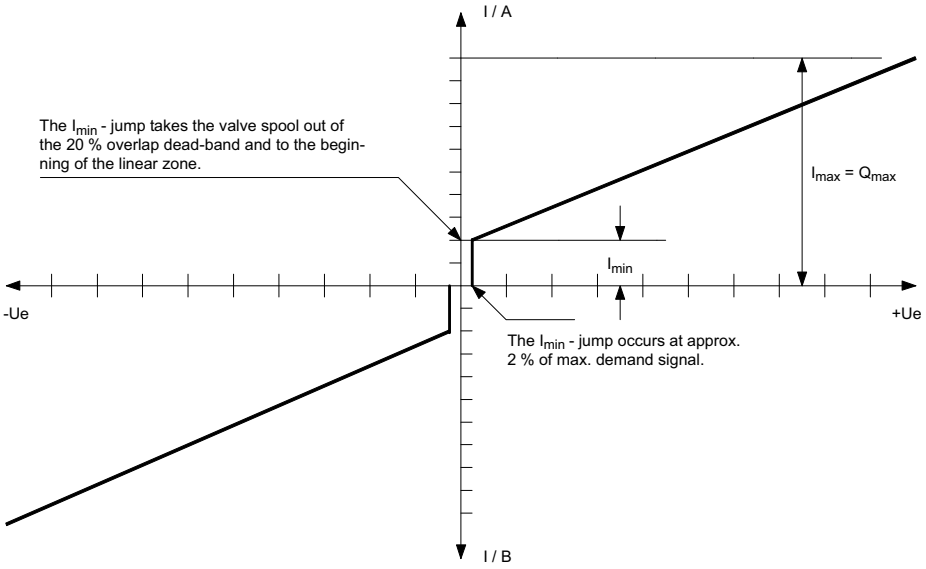
The servo-amplifier is equipped with 3 customary ±20 mA, ±5 V, ±10 V inputs and a fourth, user definable, demand signal. The definable demand signal must see an input resistance of 10 kΩ / V and it may be necessary for the user to replace resistance **R120** (see page 6/6) with a more appropriate value.

10 Ramp

The ramp features a quadrant recognition function, signifying that it is possible to operate a drive system with differing acceleration and deceleration. If a target-value (setpoint) is switched from Plus to Minus without waiting for the zero position of the drive (reversing mode), the ramp will decelerate from positive to 0 and then accelerate from 0 to negative if acceleration and deceleration are set differently. The ramp gradients for acceleration and deceleration can be set at a ratio of 1:100.

11 I_{min} jump

Proportional valves generally require a minimum current in order to reach the start of their pressure/volumetric-flow characteristics curve. This current is generally approx. 10…20 % of maximum current. A target-value (setpoint) deflection of approx. 1.5 % is firstly necessary in case of an I_{min} jump. The target value then jumps to the value set.



12 Card control

The servo-amplifier features an external Stop input. This input takes the form of a break current, i.e., Pin a2 must be supplied with +24 V if the Stop input is not used. The card is reset to Zero if the voltage on Pin a2 is interrupted. The **FAIL SAFE** LED illuminates. The **FAIL SAFE** LED is also actuated if a short-circuit occurs on the end stages. The following occurs in case of the Short-circuit or Stop functions:

- the pre-amplifier is switched off
- the ramps are disabled
- the output stages are switched off

The module must be switched off if a short-circuit occurs on the end stage; it can be activated again after approx. 10… 20 s. In case of an external Stop, the drive system is re-accelerated via the ramp when the external disable is cancelled, even if the external target-value (setpoint) is still on. This is a safety precaution which is intended to prevent the drive system being accelerated with a jump function in case of an external Emergency OFF.

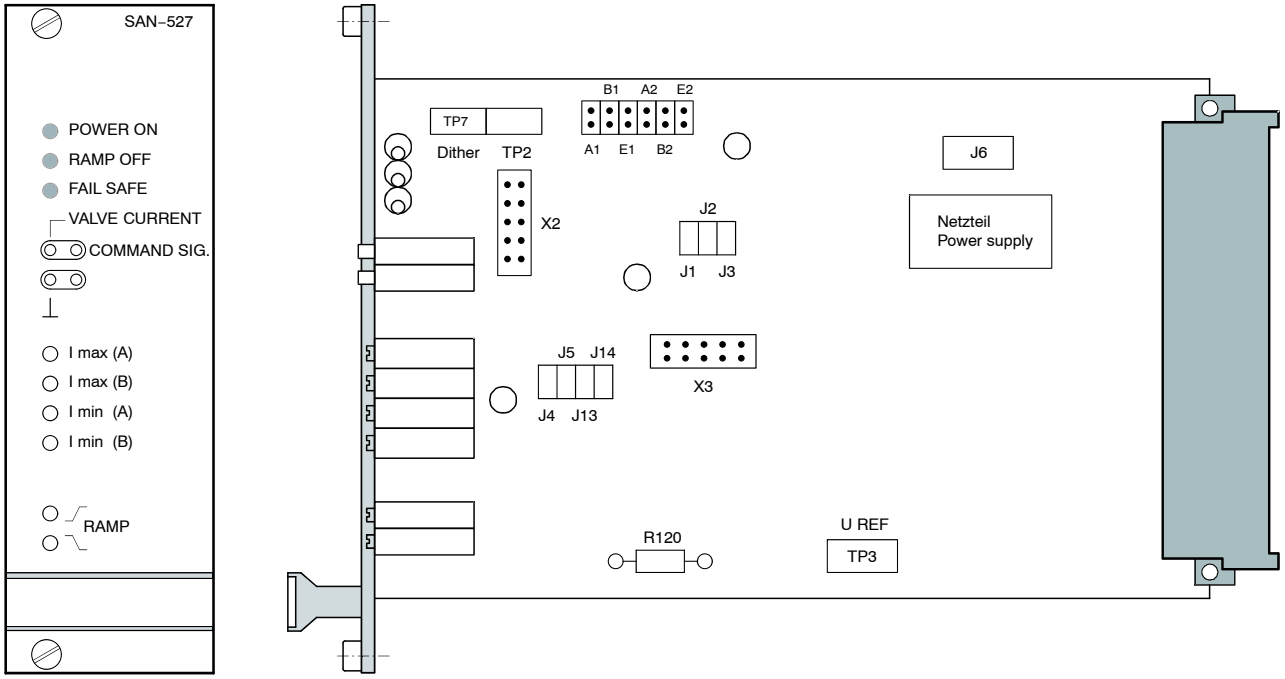
The I_{min} and I_{max} current is summated within the servo-amplifier. If I_{min} is decreased or enlarged for technical reasons, I_{max} will change by the same amount. For this reason, the two I_{max} potentiometers should firstly be set to Zero. The two I_{min} potentiometers must then be set to the necessary values. The I_{max} potentiometers should then be set to full valve deflection.

13 Instructions for commissioning

1. Connect the servo-amplifier in accordance with the technical data and the block circuit-diagram. Special attention must be devoted to the correct supply voltage. Ensure that the external Stop input is correctly connected.
2. The target-value (setpoint) voltage and valve current can be picked off from the measuring sockets. Both measured values are routed out in voltage form. The measuring-range values can be found in the technical data.
3. Die **POWER ON** LED must illuminate. The **RAMP OFF** and **FAIL SAFE** displays must go out. If this is not the case, switch the card off and switch it on again after approx. 10 to 20s. Check the entire installation again if the above-mentioned status is not achieved.
4. Set the spindle resistances to 0 by turning **I_{max}A, I_{max}B, I_{min}A** and **I_{min}B** counterclockwise up to the stop. Set the **RAMP UP** and **RAMP DOWN** spindle resistances to the longest time by turning clockwise.
5. Now apply a target-value (setpoint) of +1 V to the input and slowly turn I_{min}A up until the drive starts to move. Then turn it back slightly until the drive stops again. Repeat this procedure for the -1 V target-value (setpoint) for Solenoid B.
   The proportional valve is now set in such a way that the valve plunger will eliminate the null bias in case of a change of approx. 0…2 % in the input signal and will jump to the start of the Q characteristics curve.
6. Volumetric-flow amplification of Solenoids A and B is accomplished by applying an input signal of ±10 V to the inputs.
   An input signal of +10 V creates the volumetric-flow amplification on Solenoid A. The required speed can be set by changing spindle resistance I_{max}A.
   An input signal of -10V acts on amplification of Solenoid B. Turn the potentiometers clockwise for an increasing flow. Turn the potentiometers counterclockwise for a decreasing flow.
7. The ramp gradients for UP and DOWN can be set using the spindle resistances
   - RAMP UP (rising characteristics curve)
   - RAMP DOWN (falling characteristics curve)

   Turn the potentiometers clockwise for a lesser gradient. Turn the potentiometers counterclockwise for a greater gradient.
   Due to the quadrant recognition function, acceleration is identical for both directions of movement. The same applies analogously to deceleration.

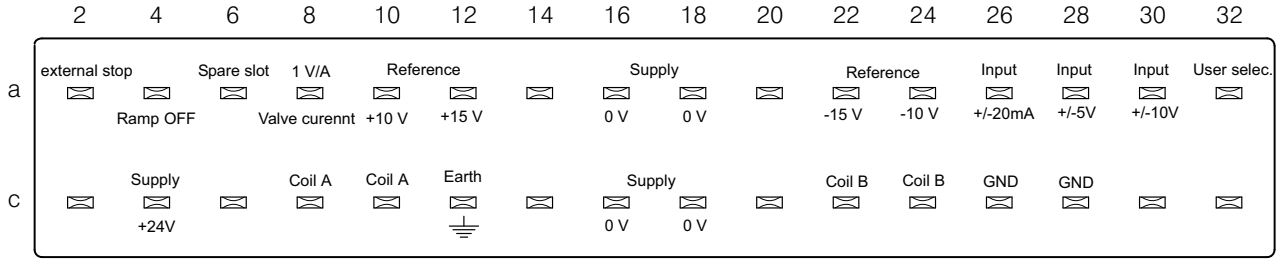
14 Jumper positions



J1) Dither frequency approx. 100 Hz
J2) Dither frequency approx. 140 Hz
J3) Dither frequency approx. 280 Hz
J4) Spare slot
J5) Spare slot
J6) Spare slot
A1) Current range, Solenoid A 800 mA
B1) Current range, Solenoid A 1600 mA
E1) Current range, Solenoid A 2600 mA
A2) Current range, Solenoid B 800 mA
B2) Current range, Solenoid B 1600 mA
E2) Current range, Solenoid B 2600 mA
J13) Spare slot
J14) Spare slot

15 Pin assignment

Female connector acc. to DIN 41 612, Type D32



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