Electronic Instruments

INSTRUCTION

POWER SUPPLY SN 19

INTRODUCTION

The Electronic Instruments Power Supply SN19 is a universally applicable power supply unit for application in workshops, schools, laboratories, industrial undertakings, etc.
The SN19 is a 0..30 V / 0..10 A power supply, with a variable voltageregulation and 5 preprogrammed voltage step : 5 V, 10.8 V, 12.6 V, 13.2 V og 15.6 V.
SN19 is konstructet with sense connection, so the outputimpedance is $< 0.1 m\Omega$ at DC. Also the random noise is extremely low $< 100\ \mu V$.
The power supply unit is safeguarded against short-circuiting and overloading, and it may be connectet in series or in parallel without introduction of equalizing resistors.
The built in DC-fan ensures the correct cooling of heatsink and nettransformer.

TECNICAL DATA

Ranges	
Variable	0..30 V , 0..10 A
preprogrammed voltage	5 V, 10.8 V, 12.6 V, 13.2 V, 15.6 V (tol. < +/- 100 mV)
Regulation at +/- 10 % variation of mains voltage	
Constant voltage	< +/- 0.01 %
Constant current	< +/- 4 mA
Regulation at loads 0..100 %	
Constant voltage	< +/- 0.01 %
Constant current	< +/- 10 mA
Temp. Coefficient, Constant Voltage	< 0.001 % / °C
Outputimpedance	
With 0 V over +sense and -sense	< 0.1 mΩ at DC
	Typical 0.03 Ω at 100 kHz
With < 2.0 V over +sense and < 2.0 V over -sense	< 0.3 mΩ at DC
Ripple and noise 20 Hz..200 kHz	
Variable voltage	< 100 μV eff.
Preprogrammed Voltage	< 40 μV eff.
Transient Response load 30 % - 100 % - 30 %, rated voltage +/- 10 mV	< 50 μsec
Indicating instruments	
Ranges	0..30 V, 0..2 A, 0..10 A
Accuracy	+/- 2 % of full deflection
Mains connection	220/230/240 V AC 50/60 Hz
Consumption	10..550 W
Temp. range	5-40 °C From 30 °C decreases Iomax with 100mA/°C
Dimensions, W x D x H	323 x 230 x 80 mm
Weight	6.6 Kg (14.6 lbs)
Surface	Silvergrey and blue matt varnish
Accessories	1 manuel

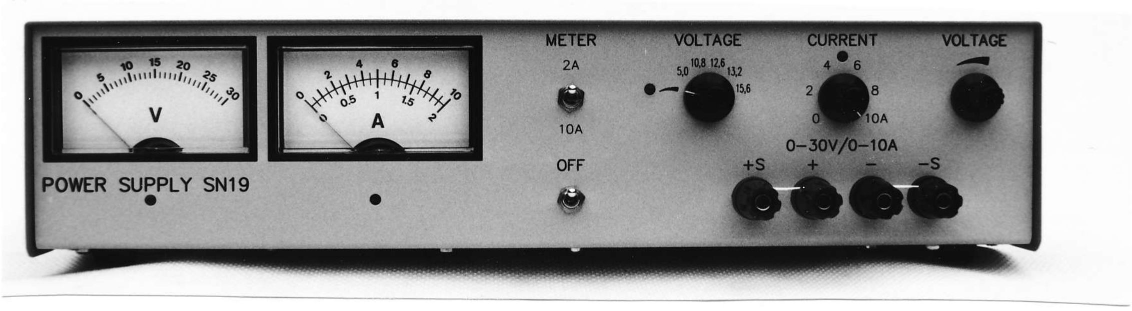
Subject to alteration

OPERATION

Operation of the instrument appears from fig. 1 and 2.

1. Voltmeter with scale for 0..30 V.
2. Ammeter with scales for 0..2 A og 0..10 A.
3. Meter switch. Switching between 0..2 A and 0..10 A.
4. LED indicating Uvar. > Upreprog.
5. Voltage switch. Switching between Uvar. and the 5 preprogrammed voltage.

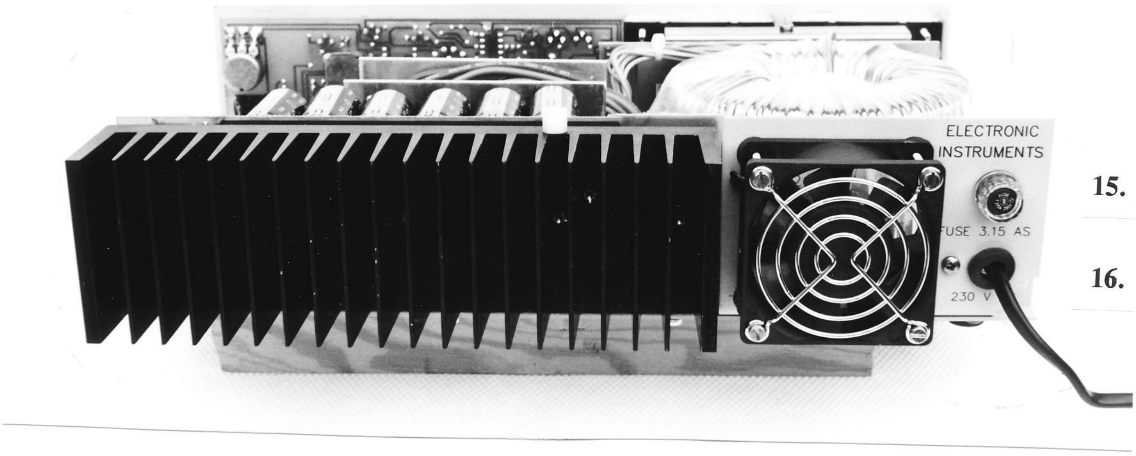
1. 2. 3. 4. 5. 6. 7. 8.



14. 13. 12. 11. 9. 9. 10.

Fig. 1 Front view of Power Supply SN19

6. Regulation of currrent limiting.
7. LED indicating current limiting.
8. Regulation of Uvar.
9. + and - output.
10. -Sense terminal. Used for compensation of voltage drop over - wire.
11. +Sense terminal. Used for compensation of voltage drop over + wire.
12. On/off mains switch.
13. Adjustment of the mechanical zeropoint for ammeter.
14. Adjustment of the mechanical zeropoint for voltmeter.



15.
16.
17.

Fig. 2 Rear view of Power Supply SN19.

15. Mains fuse. 3.15 A slow-blow.
16. Mains connection (Euro-plug).
17. Temperature controlled DC fan. Controlled by the temperature on heatsink and transformator.

The SN19 Power Supply is factory-wired for 230 V mains voltage, but can easily be modified for 220/240 V AC (fig. 3)

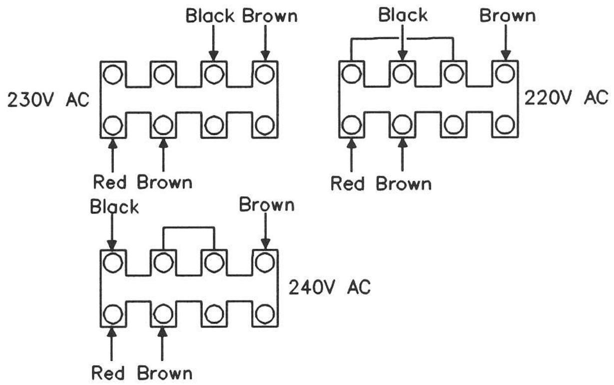


Fig. 3 Changing of mains voltage.

Figur 4 shows the voltage as function of the load current for a power supply unit according to the constant-current mode.
Without load (Rl = ∞) is I = O and E = Eo (point A in fig.4). When a load resistor is connected, the current will rise while the voltage is maintained constant (point B). If the the load resistance is lowered, the current will rise further, but the voltage remains constant until the current flow equals Io (point C). In this state the regulation switches automatically from constant voltage to constant current.
If the load resistance is furhter lowered, the voltage will drop while the current remains constant (point D). If the load resistance is lowered still furhter, the voltage will drop correspondingly until the state in point K is reached, i.e. short-circuiting.
By gradually changing the load resistance from short-circuiting to noload (Rl = ∞) the sequence is repeated, only in the reverse order.

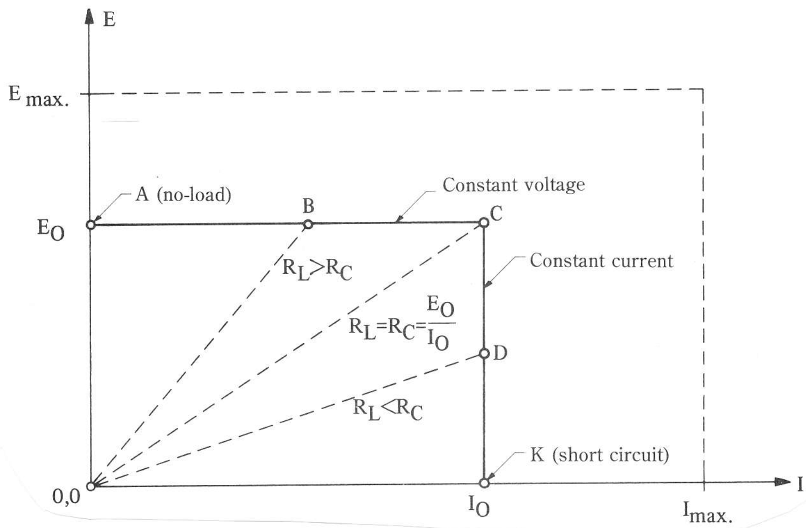


Fig. 4 Load characteristics according to the constant-current mode

The slope of the line between each operational point in the characteristics rectangle and the point 0,0 is proportional to the magnitude of load resistance. The "critical" value of the latter Rl = Rc = Eo/Io, can be chosen arbitrarily between O og ∞ by combination of the output voltage ("Voltage") and current limit ("Current"). If the resistance is higher than Rc, the voltage will remain constant while the current on the other hand, will remain constant when the resistance is less than Rc.

Constant voltage

Example 1 :
A test arrangement requires a supply voltage of 12.6 V, and at this voltage it has a current consumption of approx. 3 A. Because of the special components in the arrangement the current consumption must not, in case of defects, exceed 4 A.
The voltage switch (5) is set at position 12.6 V. The current potentiometer (6) is turned against 0 A. The meter switch (3) is set at position 10 A. The output (9) is short-circuited and the current potentiometer (6) is adjusted to 4 A on the permanent-magnet moving-coil instrument. The short-circuit is removed, and then the test arrangement may be connected.

Constant current

Example 2 :
The disengaging time for a small parcel of 1.25 A fine fuses with slowacting characteristic is desired measured at a current of 5 A. For the measurement of the disengagement time an electronic counter is connected. "Start/stop"-input maximum voltage, e.g. 5 V, must not be exceeded.
The voltage switch "VOLTAGE" is set in position 5 V. The meter switch is set in position 10 A, and the current potentiometer "CURRENT" turned against 0 A. The output is short-circuited, and the "CURRENT" potentiometer is adjusted to 5 A. The short-circuit is removed, and then the fuses may be connected directly over the output.

SENSE

The output impedance, measured under the terminal screws, is extremly low (< 0.1 mΩ).
This is achieved by moving the feed-back, for the Power Supply SN19, out to the terminal screws named +S and -S. On this way any possible voltage drops over the connection wires can be outcompensated.
This gives a great advantages especially at large current consumption. When using e.g. a Cu wire with a cross-section of 0.75 mm^2, the line resistance is approx. 25 mΩ. With a wire length of 1 m and Io = 10A, the voltage drop is 0.5 V over the wire connections.
When removing the short-circuiting guard between +S and +, and between -S and -, the measurementpoint for the feed-back can be mounted directly on the load resistance. That gives a maximum voltage drop of < 6 mV, over the connection wires.

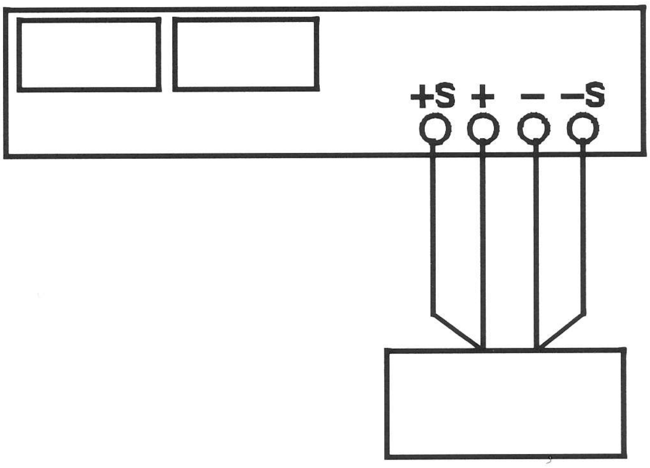


Fig. 5 Shows the correct connection of sense wired to the load resistance.

If desired not to use sense connection, the short-circuiting guards between +S and +, and between -S and -, must be mounted.
Use of the power suppy SN19 without any short-circuiting guards, gives normally a weaker ripple and noise reduction. Max. compensation of each connection wire are set to 2 V, a total of 4 V.
Any how it is always best to use as short and thick connection wires as possible, to improve the Ac compensation for the SN19.

Connection in Parallel of two SN19 units

As already mentioned, the shift from constant voltage to constant current (or the ohter way around) takes place automatically. This may be advantageously exploited by connection of two units in parallel. At increasing loads the unit with the highest output voltage will supply the current consumption until the current limitation steps into action. Then the unit with the lowest output voltage will supply the additional current consumption until the current limitation for this unit steps into action.

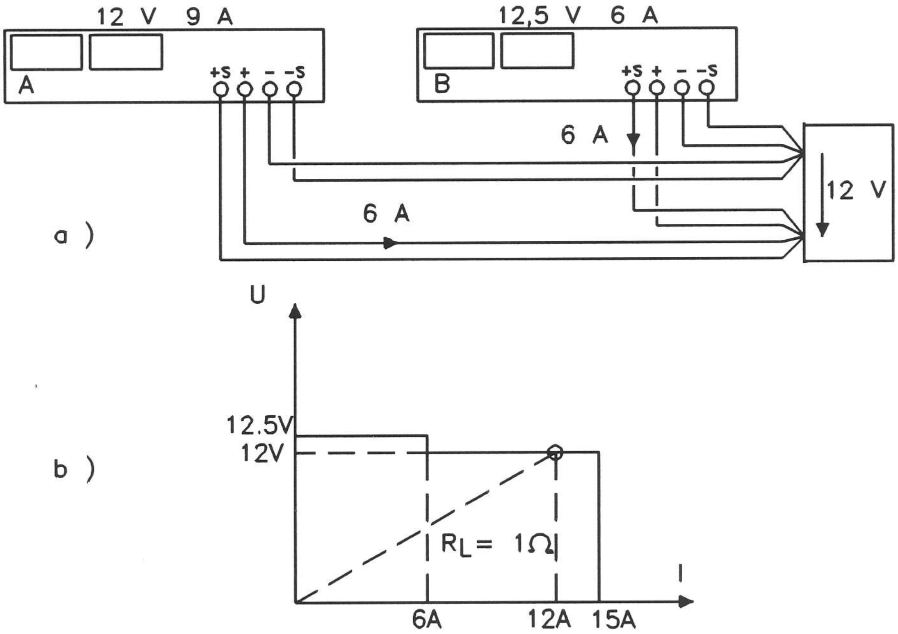


Fig. 6 Connection in parallel of two SN19 units, with sense.

Example 3 :
An imaginary circuit requires a supply voltage of 12 V, and it has a current consumption of 12 A, corresponding to a load resistance of 1 Ω. In fault situations the load current must not exceed 15 A.
Adjust the A Unit (fig. 6a) to 12 V and to a current limit of 9 A. Adjust unit B to a Voltage somewhat above that of unit A, e.g. 12.5 V, and to a current limit of 15 A - 9A = 6 A. Connect the output- and the senseterminals in parallel, as shown in fig. 6a, to the load.
The Unit B will now regulate for constant current (6 A) and the voltage will drop to 12 V (fig. 6b). The unit B will regulate for constant voltage (12 V) and supply the remaining current consumption (6 A). In case of a fault situation such as a short-circuit, both power supplies will regulate for constant current (6 + 9 = 15 A).

Connection in series of two SN19

Two or more SN19 units may be connected in series. Total voltage compared to chassis must not exceed 300 V, however. The current limitation is set at the same value on all units.

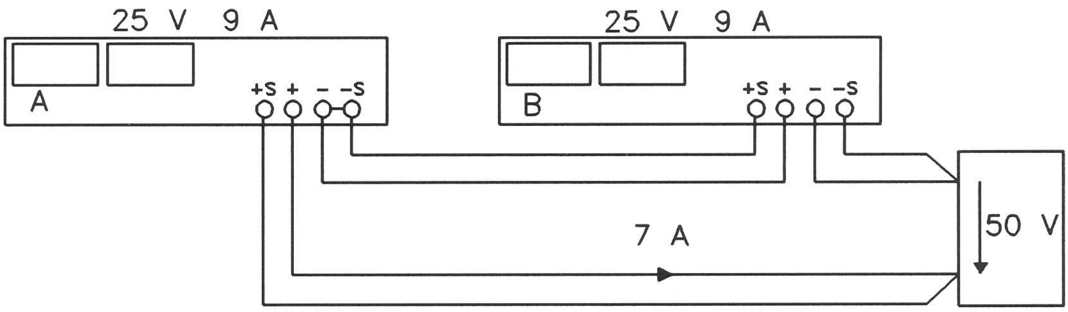


Fig. 7 Connection in series of two SN19 units, with sense.

Example 4:
An imaginary circuit requires a supply voltage of 50 V, and it has a current consumption of approx. 7 A. The current consumption mus not exceed 9 A. Unit A, and unit B, are set to 25 V. The current limitation is set at 9 A on both units. The units are connected as indicated in fig. 7.

Bipolar voltage supply

If two SN19 units are connected in series, as indcated in fig. 8, a so called bipolar voltage supply is achtieved. The posetive and negative output voltages must be adjusted separately. This also applies to the current limitation.

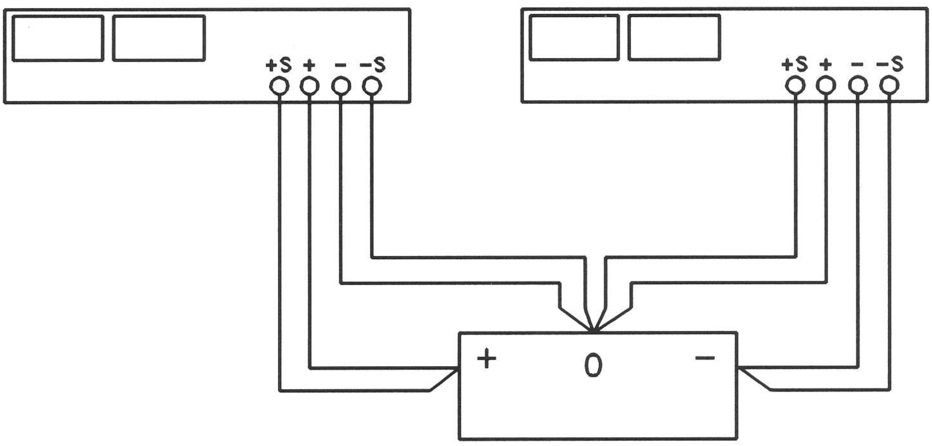


Fig. 8 Bipolar voltagesupply, with sense.

Figur 6,7 and 8 are all shown with sense connection. In cases where consideration to voltage drop over connection wires not are necessary, should sense connections not be wired.

Blokdiagram