SIEMENS power supply 322P for Traveling wave tubes

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Technical specifications

Introduction

Power supply to operate SIEMENS Travelling Wave Tubes type RW 248, RW 289, RW 290, RW 1127, RW 1538 and RW 2135. Special design with rotated (180 °) high-voltage socket.

The power supply is designed for a nominal input voltage range from 24 to 60V without switching and contains the required security, monitoring and control options. Internal switching enables the power supply to provide drive voltages for each individual tube type.

The mounting side is designed to be attached to a heatsink, and heat is dissipated over the surface.

A plug-in control unit is available for the power supply, providing the power switch, standby switch and a restart button, along with an alarm and pre-alarm display with outputs for remote pre-alarm. The PSU Includes remote reset, cathode and helixcurrent measurement.

Power supply RWN 322P:	**Order no. 087-2317**
Weight:	Approx 2.8 kg net, 4.3 kg gross
Dimensions of the power supply	340 mm x 50 mm x 190 mm
Shipping package dimensions	550mm x 160mm x 310mm
Low-voltage connector	D-subminiature connector, 15-pin
High voltage socket:	MRAC 663J, Litton / Winchester

For the operation of highly linear traveling wave tubes it is required that the grid-2-voltage automatically readjusts dependent upon the tube temperature to reduce thermal effects and equalize the tube output to keep performance almost constant. The readjustment takes place via an NTC resistor in the tube and in the grid-2-circle is switched in the power supply.

The control unit contains the following functional groups:

- Block system

This prevents output voltages being generated when the tube is not connected.

- preheating time

After the preheating time of approx. 60 seconds, it is possible to switch on the G2 voltage via relay S103 via the command input STDBY / TRANS.

In the event of supply voltage failures lasting longer than 5 seconds the preheating time will take effect and the amplifier will switch on automatically after approx. 60 seconds, provided the command TRANS is pending. If the failure is < 5 seconds, the

V preheating time is suppressed. With the application of input supply, Ui, the amplifier switches on again automatically, provided the TRANS signal remains applied.

- G2 delay after high voltage start

This prevents the G2 from starting up at the same time as the Helix voltage, otherwise unfavourable Helix loads up can kick.

- Overload counter

In the case of automatic shutdowns due to helix current overload (defocusing, arcing, etc,) or collector 1- Overload (RF control too high) every switch-on for the high voltage converter is counted, if there are 8 such automatic switch-on processes in a short time, the power supply will switch off completely. The last power-on process activates the IND indicator so that its status shows the next error if a total shutdown occurs. In the event of a complete shutdown, the indicator remains active.

- Automatic reset command

Every 2 hours, the built-in electronics generates an automatic zero-set command to the error counter, (see above) and earlier error cases that were counted are deleted.

Electrical characteristics, input

Nominal voltage range	U, 24 ... 60 V-
Operating voltage range	U, 20 ... 75 V_
Power consumption	150 W max
Internal input fuse (Picofuse)	1 5 A

The input is designed for positive of negative supply, and the Power supply enclosure must be grounded.
Attention! Switching on without earthing destroys the device.

Electrical characteristics, output

(Operating voltages for the tube)

Heater voltage	U, 6.3 + 0.2 Y
Heater current	I, 0.5 ... 0.6 A
Grid-2-voltage Uaa	2300 ... 4700 V (1)
Grid 2-5 current Isa	-0.2 ... +0.5 mA
Helix voltage Ur	3600 ... 5100 V (2)
Helix current Ih	max. 3 mA
Collector voltage Yo	1600/1800/2000/ 2400 V (2)
Collector 1 current Io	max.30 mA (3)
Collector-2 voltage Uor	270/300/330/400 V (2)
Collector-2-current 17	max. 140 mA (3)

A faulty tube should not lead to failure of the power supply.

(1) Continuously adjustable on the front panel (within limits that can be set in the device depending on the tube type.

2) Can be set in stages in the device.

3) Do not exceed a current of 140 mA for the sum of collector 1 plus collector 2 current.

Environmental conditions

Operating temperature on the front panel (1)

(at the panel temperature measurement point)

Continuous operation	0 ... 65 C
For a maximum of 8 hours, and for a maximum of 96 hours per year	70 ° C
Switch-on temperature	min. -20 C
Storage temperature	-40 ... + 75 C
Rel. Humidity in operation, no condensation	max. 95 %
Application height max.	4500 m

(1) To determine the room temperature, refer to FTZ A 01 AN 1 specified climate requirements for telecommunications technical facilities of the Deutsche Bundespost.

Suitable measures for heat dissipation must ensure that that at the upper corner points of the applied Climatogram - e.g. according to climate model R12 {(FTZ A O1 AN 1) do not exceed the maximum measuring point temperature of 70 ° C.

Dissipation of waste heat

The heat is dissipated through the surface of the mounting side. It is essential to ensure that the maximum permissible Temperature at the mounting surface of the power supply is 65 ° C even at the maximum ambient temperature.

For best life and reliability, however, keep the power supply temperature as high as possible but below the limit value.

A thermally conductive connection between the tube and the power supply should be avoided for reasons of reliability.

Response of the protective devices

The power turns off automatically when

- the maximum permissible helix load of the tube exceeded

or

- the collector 1 current increases above 31 + 2 mA (e.g., due to RF overdrive of the tube.
After these protective devices respond, the current supply is switched on again for a total of 8 times but only when the overload is finally switched off. A new test cycle can be initiated by pressing the "RESET" button.
An automatic reset command is issued every two hours to set the error counter back to zero.
In the event of a power failure or shutdown as a result of the above-mentioned fault states, and a downtime of <5s, after automatic restart, the tube is immediately operational. If the failure or shutdown lasts longer than 5 s, the delay of grid-2-voltage is effective.

15-way D Connections on the low voltage side

Ground or COM Pin 8:	This connection is electrically connected to the housing. It serves solely as a reference potential for the helix and cathode current measurement and not for grounding the device.
U : + Pin 7, 14 - pin 6, 13	Supply voltage feed (potential-free)
Stby / Trm: + Pin 4 - Pin 12	After application of a DC voltage of 6 ... 30 V the grid 2 of the tube switched. voltage (after the preheating time has elapsed) The input is potential-free and has an impedance of approx. 3.3k
Pin 3 Pin 1	Reset: Brief application of a DC voltage of + 6 ... 30 V at this input sets the error to zero and switches the power supply on again after automatic shutdown. The input is potential-free and has an impedance of approx. 3.3k.
Pin 5 Aux.	Positive output voltage against -U_ of approx. 15 to 25 V (Ri approx. 47 ohm) for operation of the functions Stby/Trm, Reset, Indic.
+ Pin 2 Indic- pins 10:	Open collector NPN transistor (U max 35 V / Io max 100 mA). a) the power supply will automatically check, b} has completely switched off the power supply, c) the helix current exceeds 2.5 + 0.3 mA, d} the collector 1 current exceeds 31 + 2 mA.
Pin 9	Terminal for measuring the overall cathode current. 1V corresponds to 10 ma Cathode current at an external load resistance of 100k (error max. + 3 mA at I, = 100 mA). The Impedance of the measurement output is about 2.2k
Pin 1	Connection for measuring the Helix current. l V corresponds to 1 mA helix current with an external resistance of 100k, due to the temperature compensation the value of the Helix current displayed may be up to 0.3mA too high. The impedance of the measuring output is 1k.

Connections on the high voltage side

+ Heater / cathode	+ F /K	21
-H	-F	22
Grid 2	G2	38
Helix,	H, (GROUND)	64/65
Collector 1	cl	51
Collector 2	c2	34
Block loop		54-60
Temperature compensation		6 l

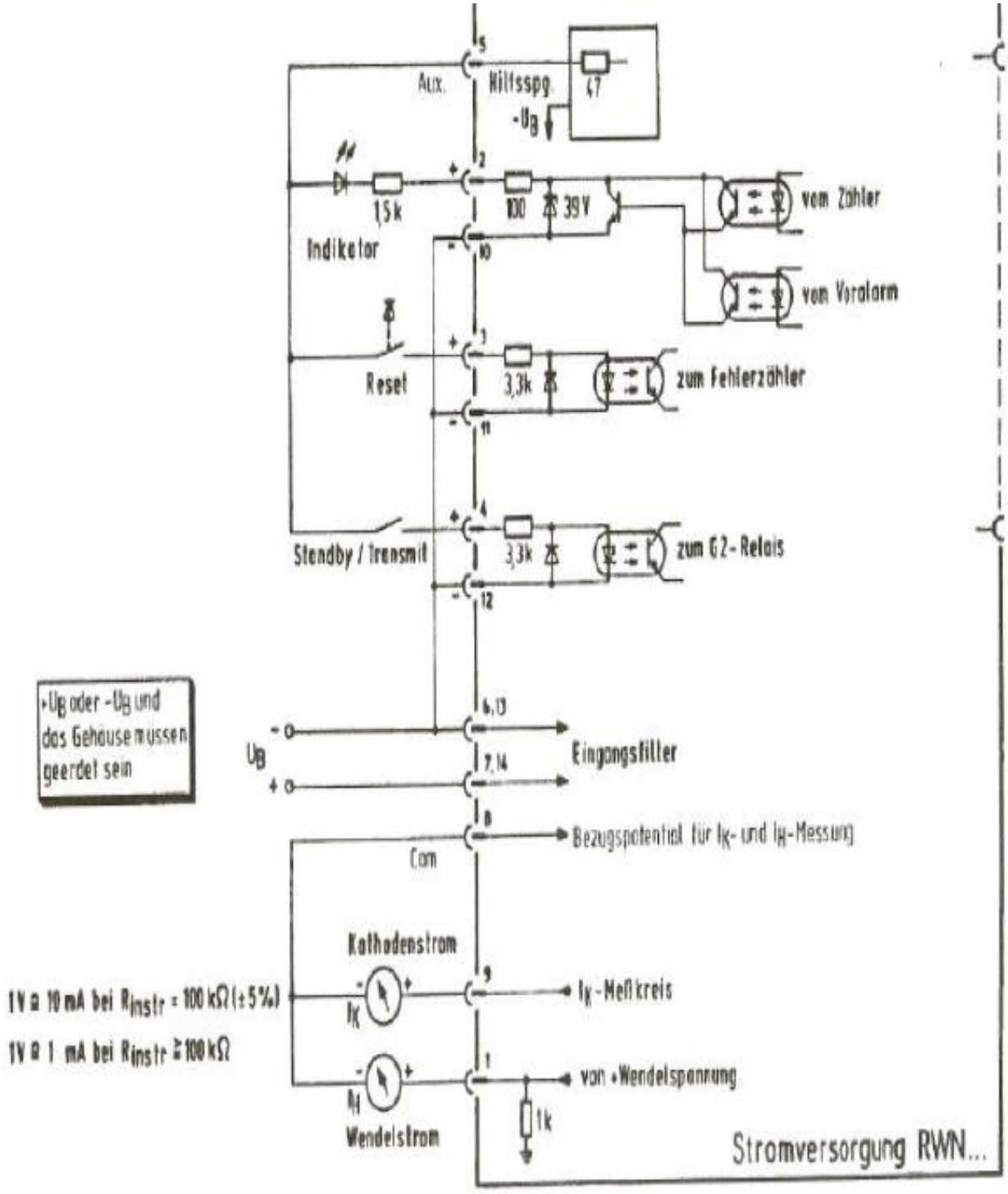
Storage

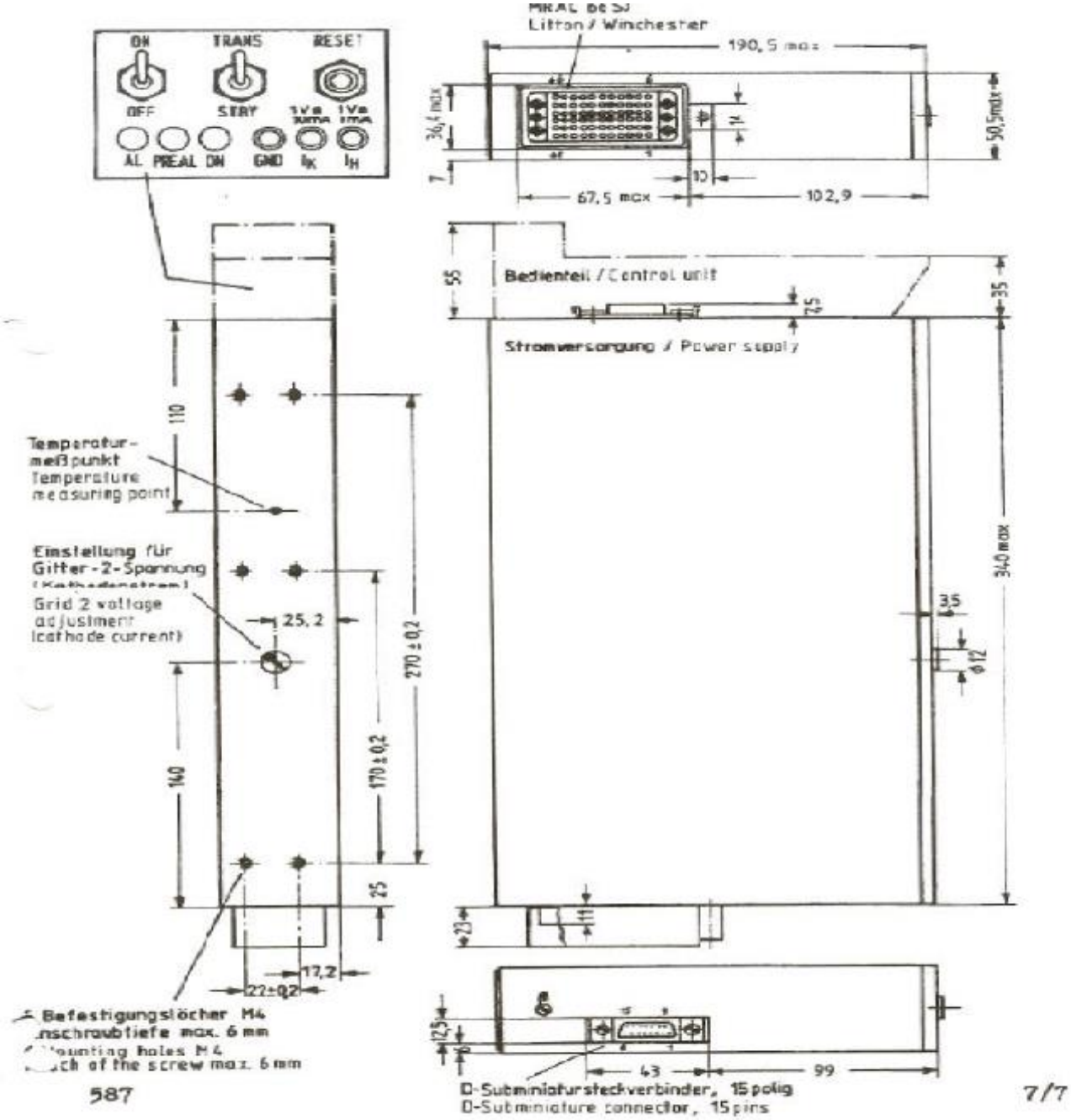
The shelf life of the power supply depends on the Environmental conditions during storage. On storage under the specified conditions, a safe switch-on is always guaranteed up to a storage time of one year. After long periods of storage it is recommended that the power supply is operated at least once a year for several hours. (To form the capacitors).

Commissioning must with a suitable equivalent load or a tube.

Please note that at higher temperatures and humidity the service life and reliability of the devices decrease. It should therefore not be stored for longer periods at temperatures above 40 ° C and at a relative humidity of more than 70%

Connection to the high-voltage socket




ON
TRANS
RESET
OFF
STBY
AL PREAL ON GND
Litton / Winchester
190,5 max
67,5 max
102,9
50,5max
Bedienteil / Control unit
Stromversorgung / Power supply
340 max
Temperatur-
meßpunkt
Temperature
measuring point
Einstellung für
Gitter-2-Spannung
Grid 2 voltage
adjustment
(cathode current)
110
140
170±0,2
270±0,2
25,2
25
17,2
22±0,2
Befestigungslöcher M4
Einschraubtiefe max. 6 mm
Mounting holes M4
depth of the screw max. 6 mm
43
99
D-Subminiaturstecker, 15polig
D-Subminiature connector, 15pins

Functional description

(See block diagram)

After an input filter, the battery voltage reaches a step-up converter, which together with the driver stages, modulator and controller works as a pre-controller. The voltage +V generated at the output of the step-up converter is constant but can be changed in 4 steps. This so-called intermediate circuit voltage is a half-bridge converter [chopper), which acts as a self-oscillating converter with a saturation transformer TR501 fitted in the driving circuit of the power transistors.
The primary side of the Collector transformer TR 101 is switched in the bridge arm of this converter. The half bridge converter works at a frequency of approx. 30 kHz, whereby on the primary winding has a rectangular voltage of approx. 0.5 x the amplitude of the intermediate circuit voltage.
The alternating voltage obtained in this way is used via the transformer TR 102 at the same time as generating in other assembly's necessary auxiliary voltages and the relief of the originally from +Vbat fed auxiliary voltage for commissioning the Total Unit. The half-bridge converter is via the control output "HV out" the control unit can be switched on and off.

On the secondary side of the transformer TR 101:

- a square wave AC voltage on winding C2, which is equal to directed and filtered as UT, "" - voltage of the tube between Cathode S-1 and collector 2 (it is supplied.

- at the winding Cl a square wave alternating voltage, the equal-
directed, filtered as Un and direct voltage behind connected to each other with U of the tube between Cathode f-1 and collector 1 (+ is supplied. carefully against overload).

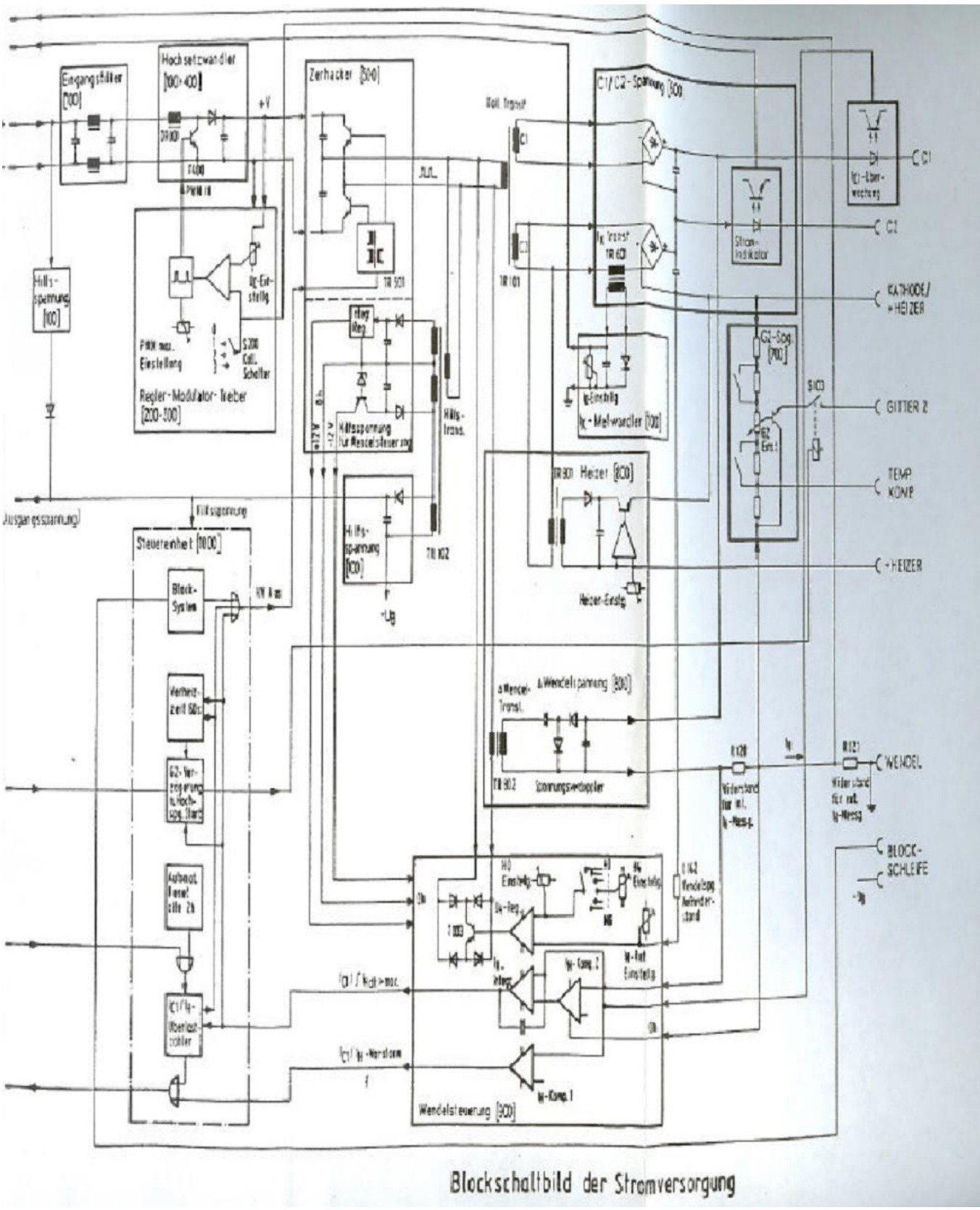
If the collector 1 current exceeds a value of 31 + 2 mA - e.g. caused by RF overload - a signal is sent to two comparators and one integrator. The comparators 1 and 2 change their initial state, Comparator 1 transfers the pre-alarm function to the IND pin of the low-voltage plug, at the same time the comparator switches gate 2 activates the integrator and if the overload persists the integrator switches the power supply for longer than 0.5 s via the control unit/
The entire cathode current of the tube flows through alternating voltage the C2 winding of the transformer TR 101,
A current-voltage converter transformer TR 601 produces gives an alternating voltage on its secondary, the mean value of which is proportional to the Cathode current and is made available on the input plug for measuring purposes.

In order to avoid collector overvoltage in the unloaded state of MAIN = ON, STDBY/TRANS switch = STDBY, the intermediate circuit voltage is lowered via an indicator to the lowest Setting.

The square-wave generated on the C2 winding of the TR 101 voltage feeds the stimulus voltage via the heating transformer TR 801. This consists of a rectifier circuit and a series regulator with heating current limitation.

The entire helix voltage (voltage between the cathode and the helix) is generated from a DC voltage-like circuit of Uc2 Uc1 and a delta-helix voltage.

The voltage doubling circuit of the delta -helix voltage their energy from the TR 802 transformer, the primary with a connection directly, with the second connection via the actuator of the helix controller with the primary side of the torroidal transformer TR 101. Since Uc1 and Uc2 are unregulated, the helix voltage must be tremendously stable, and depends on the load conditions the delta -helix voltage readjusted.
The actual value is obtained via the helical voltage measuring resistor R 142 of the cathode potential fed to the control amplifier. The target value specification of this control amplifier can allow adjustment to the various tube data or operating states in stages to be changed.
The control variable deviation is increased by the control amplifier Actuator transistor T 003 fed to the flow of energy controlled by TR 802, R 120 is used in connection with the electronics of the monitoring in the tube of the helix current.
The voltage drop on R 120, caused by the helix current Ih is assigned two converters and one integrator.
Comparator 1 changes its initial state when the helix current value is exceeded and causes the function pre-alarm at the IND output of the input connector.
Comparator 2 changes its output state when it reaches the Max. permissible helix current and thus switches the downstream integrator on. This measures the product of current amplitude and time and switches off the power supply via the control unit after reaching the maximum amount of charge ' which can hit the helix without destroying it.
The G2 voltage is generated via a high-voltage resistor current divider with subsequent current amplifier, The G2 voltage can be continuously adjusted in the required areas.
For the operation of the highly linear traveling wave tubes it is required that the grid-2-voltage automatically readjusts according to the tube temperature to reduce thermal effects. The readjustment takes place via an NTC resistor in the tube and in the grid-2-circuit in the power supply.



Blockschaltbild der Stromversorgung