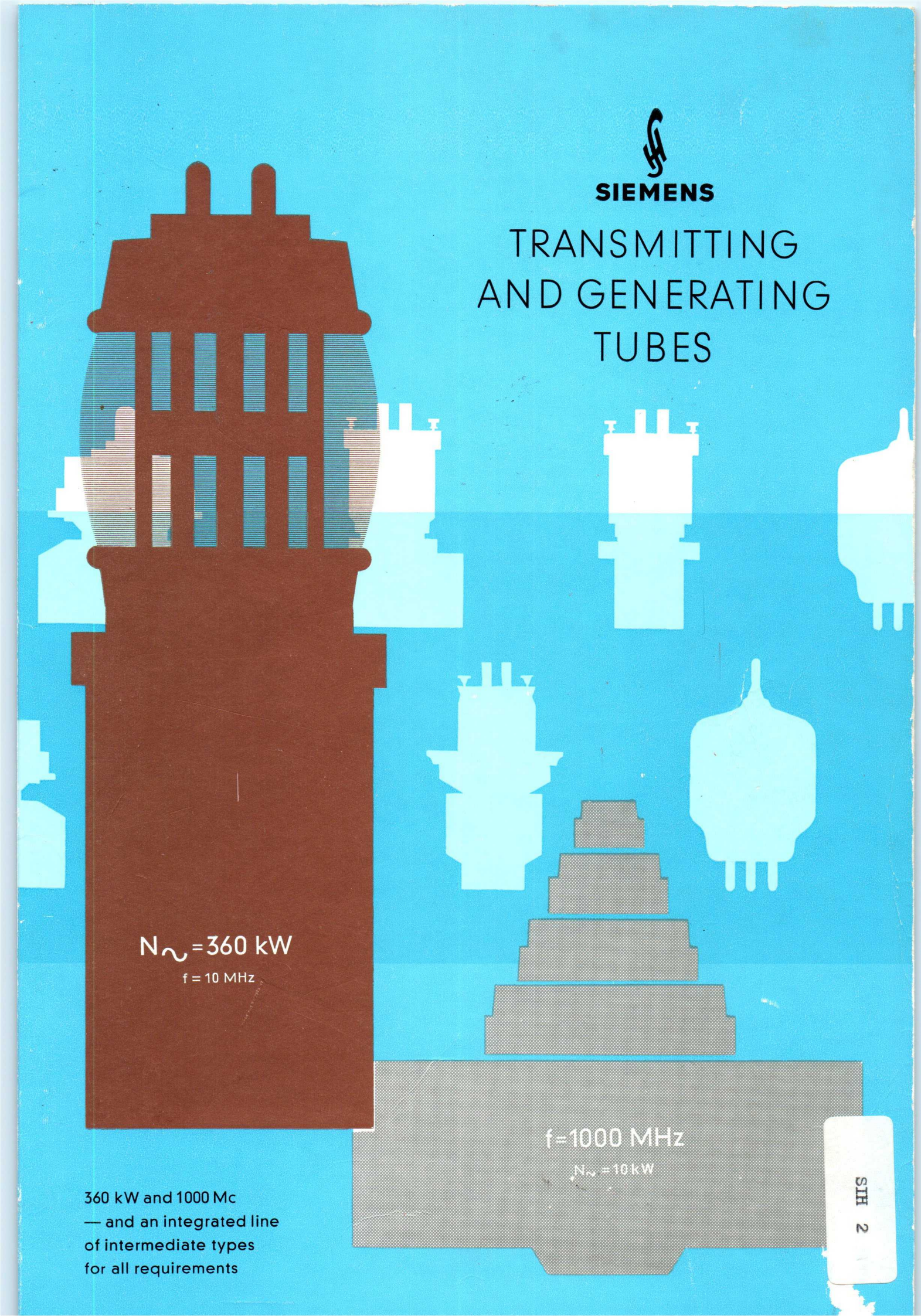

SIEMENS
TRANSMITTING
AND GENERATING
TUBES
N~ = 360 kW
f = 10 MHz
f = 1000 MHz
N~ = 10 kW
360 kW and 1000 Mc
— and an integrated line
of intermediate types
for all requirements
SIH 2

TRANSMITTING AND GENERATING TUBES

SIEMENS & HALSKE AKTIENGESELLSCHAFT
WERNERWERK FÜR BAUELEMENTE · MÜNCHEN

Contents

Introduction	4
Preface	6
General Data	6
Classes of operation, maximum ratings and typical operating data	8
Installation and connection	10
Cooling	10
Protection	12
Accessories	13
Explanation of Symbols	13
Technical Engineering Service	13
RS 1001	14
RS 1002 A	16
RS 1003	18
RS 1006 B	20
RS 1007	22
RS 1009	24
RS 1011	26
RS 1012	28
RS 1016	30
RS 1019	32
RS 1021	34
RS 1022 C	36
RS 1026	38
RS 1029	40
RS 1031	42
RS 1032 C	44
RS 1036	46
RS 1041	48
RS 1046	50
RS 1051	52
RS 1052 C	54
RS 1061	56
RS 1071 L	58
RS 1081	60
RS 1082 C	62
RS 1091	64
RS 2001	66
RS 2011	68
RS 2021	70
List of equivalent types of tubes	72
Production line of Siemens transmitting tubes and special tubes	73

Introduction

Ever since the invention of electron tubes for the generation and amplification of r-f oscillations, the Siemens & Halske AG have been active in the development and production of high-power transmitting tubes. Such tubes were developed very early for broadcast-band and longwave transmitters as well as for shortwave operation.

Since the range of application of power tubes of this category has grown steadily with the advance of technology, a wide variety of potential applications today exist:

Radio broadcast transmitters (LW, BC and SW)
Communications transmitters for civil and military applications
VHF transmitters
TV transmitters
Ultrasonic transmitters
Apparatuses for r-f therapy
Industrial r-f generators for inductive and capacitive heating
Pulse transmitters for radar and radio prospecting
Nuclear plants (particle accelerators)

For these highly diversified applications we have created a broad spectrum of modern transmitting tube types that satisfy practically all the requirements placed on grid-controlled tubes with respect to power and frequency.

The drive towards higher and higher frequencies here made it necessary to establish new design concepts, the designs used hitherto not being suitable for use high up in the spectrum on account of their long structure and resultant lead inductances and capacitances.

In addition, the almost exclusive use of the grounded-grid configuration at very high frequencies demanded the adoption of coaxial grid lead-through units.

Through the development of a completely novel tube structure it was found possible to create a tube type that can also be used at frequencies of about 1000 mc.

Meshed grid
Meshed cathode

As a result, all our external anode tubes were designed according to these new principles. In this novel structure the self-supporting design of both grid and cathode as a meshed grid and a meshed cathode is of particular interest. This solution largely avoids all lead capacitances and inductances in the tube, while at the same time securing optimum utilization of the applied heating power.

The cathode of all modern tubes of Siemens make are thoriated tungsten models; vacon is used for the glass-to-metal seals.

The use of meshed grids and cathodes further makes for compact structures of high mechanical stability. Other advantages are narrow electrode spacing and hence extremely high mutual conductances with no danger of electrode shorts. This in turn introduces the advantage that less prestages are required in transmitters equipped with such tubes.

The self-supporting grid and cathode structure chosen for our tubes also positively excludes the possibility of undesired focusing of the electron beam, with the accompanying danger of burnt spots appearing on the anode such as may occur with conventional electrode structures.

Another advantage is that the tubular form of the electrode favors the use of our tubes in coaxial circuits.

The cathode and screen grid connections of our tubes for tv bands III and UHF TV bands are for this purpose given a coaxial design, thus satisfying a major requirement of r-f technology.

Our tubes RS 1022 C, RS 1032 C and RS 1052 C for UHF TV bands are additionally provided with ceramic insulating bodies instead of ones of glass. Owing to the low dielectric losses in the ceramic it is possible to allow higher voltages and plate dissipations. Through closer production tolerances it is further possible to agree to closer electrical tolerances.

Radiation cooling

Whereas the tubes described are provided with radiation cooling for a plate dissipation of up to 1.2 kw, practically all our modern external anode tubes are available in three versions:

Air cooling
Water cooling
Evaporative cooling

Equipment makers are thus able to choose a tube with the most suitable type of cooling for any given application.

in industrial r-f plants

Particularly on account of the changing load, tubes in industrial r-f plants very frequently operate under far less favorable conditions than in transmitters.

The steadily increasing application of radio frequencies in industrial equipment has given rise to a demand for special r-f generator tubes with the following features:

Rugged mechanical design
Insensitivity to load fluctuations
Capability of operating with relatively low plate voltages
Long life
Switching stability under heavy usage
Low operating costs

Developed for this application, our transmitting tubes RS 1006 B, RS 1016, RS 1026, RS 1036, RS 1046, RS 1061, RS 1081 and RS 1091, used as oscillators, provide coverage of a power range from 0.4 to 33 kw. For high-power and extra-high-power generators (up to 250 kw) our transmitting tubes RS 1031, RS 2021, RS 2001 and RS 1041 are available.

In the r-f section of particle accelerator plants for nuclear research our transmitting triodes RS 1001, RS 1011, RS 1031 and RS 1041 have proved their value.

Owing to their considerable emission reserve and the suitability of their structure for very high frequencies, our high-power transmitting tubes can also readily be used for other applications of pulse technology such as radar and radio prospecting.

High-voltage rectifier tubes and **thyratrons** are available for the power supply of transmitters and r-f generators, and also for many industrial applications.

Preface

The classes of operation, maximum ratings and typical operating data, characteristics and data on tube cooling given for each tube represent a summary of the complete data sheets covering the type of tube concerned.

These sheets can be furnished on application. The typical operating data together with the characteristics apply to average tubes. Although factory tolerances may cause negligible deviations from the data given, this will not impair normal operation in any way.

General Data

Heating

General

In addition to the heating data, the type of heater and cathode material is stated for each tube in view of the fact that, as will be shown in the following, the type of cathode imposes different requirements with respect to the heater voltage fluctuations, that should be permitted under consideration of attaining optimum service life.

In general, the heater voltage is the determining factor for adjusting the heating, while the heater current may admissibly deviate from the stated value within the given tolerance. Thoriated tungsten cathodes have filament-type heating, while oxide cathodes have heater-type heating.

Thoriated tungsten filaments

The stated filament voltage is the maximum value that a new tube requires before it can deliver its rated power. The maximum admissible deviation from rated value due to power supply voltage fluctuations must not exceed ± 5 %, whereas for our line of industrial tubes (e.g. RS 1061) and radiation-cooled tubes + 5 / – 10 % are admissible. As power supply voltage fluctuations of + 10 / – 20 % are liable to be encountered, voltage regulation will usually be essential. The continuous deviation from rated value that may occur due, for instance, to inaccurate adjustment of the filament voltage, must not exceed + 1 / – 3 %.

The filament voltage should be adjusted with the aid of a moving-iron instrument of the 0.5 accuracy class that is connected directly to the filament terminals. In dimensioning filament transformers for tubes with a thoriated tungsten cathode, an allowance should be made for an increase in filament current of anything up to 20 % of its original value during operation.

No r-f voltage must be allowed to appear between the two filament leads of tubes. If necessary, a capacitive short-circuit must be established.

Oxide cathodes

With these cathodes overheating produces a rapid drop in emission, while underheating results in restricting the emission to a small number of preferred parts of the coating, thus damaging the cathode. There is also a danger of cathode contamination. The maximum admissible deviation from rated value due to power supply voltage fluctuations should not exceed ± 10 % for oxide cathodes, while the continuous deviation should not exceed + 1 / – 3 %.
Undesired heating due to r-f voltages between heater and cathode must be prevented by appropriate circuitry.

Placing in service

Application of heating

Application of heating may generally take place with full filament voltage. This is conditional upon the use of a filament transformer with the usual tolerance. The maximum initial current for modern transmitting tubes should not exceed 6 times the normal filament current. The maximum current to be expected can be calculated from the cold-state resistance of the filament and the interdependence of heater voltage and heater current. Information about the attained maximum current can be gained more easily by observing the initial current by means of an oscilloscope.

The grid bias may generally be applied simultaneously with the filament voltage, unless instructions to the contrary may be found in the data sheets.

Application of plate d-c voltage

The plate voltage may be applied to tubes with external plates and thoriated tungsten cathodes only after the cathode has reached its operating temperature. This factor may be checked by means of the heater current. The time required for the cathode to reach its operating temperature, different for each type of tube and also dependent on the internal resistance of the heater current source, amounts to about 2 to 3 seconds. The switching sequence described here must be observed even in the event of mains outages and operating faults. It is advisable to pre-heat tubes that are used for the first time or after a longer period of storage. Preheating for 15 minutes is normally sufficient.

When dealing with transmitting tubes having external plates, care must be taken to assure that the plate d-c voltage used to harden the tube and trim the tuned circuits be applied to the tube with at least one intermediate step. On the other hand, when a transmitter already tuned is switched on normally, the plate voltage may be applied without an intermediate step, if it is assured that the voltage peak when switching on will not exceed the permissible maximum plate voltage as specified in the data sheets. For this reason it is advisable to check the switching-on process by means of an oscilloscope.

In the case of industrial r-f generators a step-by-step application of the plate voltage is not required since the specified voltages are generally lower.

Positive electrode voltages may be applied to tubes equipped with oxyde cathodes only after a pre-heating period of 1 minute.

Required protective measures in the grid and plate circuits are enumerated in the Section entitled "Protective Measures".

Application of screengrid voltage for tetrodes

The screen-grid voltage may only be applied to the tube after the plate voltage. A voltage relay must be used in the plate circuit to make sure that the screen-grid voltage is turned off at the same instant as the plate voltage. It is advisable to use an over-voltage protector between the screen grid and the cathode to protect the control grid and the cathode against the effects of tube flashovers.

Service intermissions

Frequent on/off switching of the filament in the case of tubes with a thoriated tungsten cathode will shorten service life. It is therefore advisable to leave the filament switched on during service intermission of up to 2 hours.

Typical characteristics

The stated emission current I_e represents the current delivered by the cathode when all the other electrodes are interconnected and fed with voltage. The value of this voltage is stated together with the value of the emission current. To prevent the tube from being overloaded, the I_e value must be measured by special methods and only by the manufacturer. The stated value usually also represents the maximum value that can be drawn from the cathode during operation of the tube. Values for pulse operation will be furnished on request.

The amplification factor μ represents the ratio of a plate voltage variation (a screen grid voltage variation in the case of tetrodes) to the control grid voltage variation assuming constant plate current.

The transconductance Gm represents the ratio of a plate current variation to the control grid voltage variation with the voltage of all other electrodes regulated. As the curves of the tubes are not linear, which means that μ and Gm are not constants, the voltages chosen for the measurement of these two quantities and also the value of the plate current are stated.

The values stated for μ and Gm are average. Deviations may therefore be encountered from tube to tube due to fabrication tolerances. The admissible tolerance is so dimensioned as to insure interchangeability between tubes of the same type. The same also applies with respect to capacitance values. These are measured with the tube in its cold state and so dimensioned that the capacitances of electrodes not used in the measurement are not reflected in the measuring result.

Classes of operation, maximum ratings and typical operating data

General

The various classes of operation impose different requirements on the tubes with respect to, say, emission and dielectric strength. Separate limits are for this reason stated for each class of operation. In the interest of tube service life and operating reliability, these limits must in no circumstances, e.g. detuning of tuned circuits, load or voltage fluctuations, be exceeded. Each individual limit represents a maximum value that must still be observed even if all the other limits are not reached. If a tube is to be used for a class of operation not here listed, it is recommendable to consult the manufacturer in order to prevent endangerment of the tube by exceeding limit values, and hence the loss of the right to send in a claim on the basis of the tube guarantee.

Maximum ratings

The cutoff frequency is determined by the tube technology. Operation beyond cutoff may result in destruction of the electrodes and the glass or ceramic insulating body. In determining the cutoff frequency for a tube type, consideration is given to factors such as lead inductances, electrode capacitances, electron transit time, capacitive heating of glass or ceramic parts, and the development of r-f voltages. R-f voltage may be reduced by reducing the anode d-c voltages. The data sheets therefore state the d-c plate voltage limits appropriate for various maximum ratings of the operating frequency
(e.g. RS: 2001 $f_{max} = 10$ Mc at $U_a = 15$ kv; $f_{max} = 30$ Mc at $U_a = 12$ kv).

The maximum ratings of the plate and grid d-c voltages U_a and U_g may depend on operating frequency, electrode spacing in correspondence with the class of operation, and the dielectric strength of the insulating materials. They must not be exceeded even when the cathode is not heated. This condition must be especially observed if the screen grid is connected via a resistor.

The maximum rating of the plate voltage in the case of operation with a-c or unsmoothed voltage is the a-f peak value U_{asp}.
The maximum rating of the d-c current I_k ist the value that may be drawn from the cathode for the class of operation used. It is composed of the plate d-c current and all the grid d-c currents combined.

The same applies analogously for the stated cathode peak current $I_{k\,sp}$.

The maximum rating of the plate dissipation Q_a is determined by the admissible thermal load capacity of the plate. Excessive plate temperature may rapidly lead to destruction of the tube due to effects such as escape of gas, increase in cathode temperature, thermal grid emission, degradation of insulation, overheating of glass bulb of radiation-cooled tube, formation of vapor bubbles in the case of water-cooled tubes, or appearance of the Leidenfrost phenomenon in the case of tubes with evaporative cooling. In the case of tubes with supplementary cooling, the stated limit must still not be exceeded even if more coolant is used than that indicated in the cooling diagram. If the maximum quantity of coolant is not available, the reduced maximum rating indicated in the diagram must be adhered to in all circumstances.

For appropriate protective measures against thermal overloading of the plate, see under "Protection".

The maximum ratings of the grid and screen grid dissipation Q_{g1} and Q_{g2} are determined, as with the plate, by the thermal load capacity. To make allowance for the undesirable heating of the grid by r-f current, which will not always be readily noticeable to the user, the limit may often have different values according to class of operation and frequency. Due attention should be given to this fact by the user.

The electrode d-c voltage listed under maximum ratings and typical operation refer, unless otherwise indicated by an index, to the cathode. A-c voltages are always given as peak values (e.g. U_{gs}).

Typical operating data

The operating data listed for the various classes of operation represent settings recommended for the favorable utilization of the tube. The power output $N_{a\sim}$ is calculated for optimum adjustment and represents the power available at the tube output. No allowance

is made for circuit losses. For a self-excited circuit the driving power stated as N_{st} is already subtracted; $N_{a\sim}$ therefore here again denotes the available power without allowing for circuit losses. The actual power fed to the load is then lower by the losses in the output circuit and input circuit. If the tubes are operated in grounded-grid circuit, where a portion of the driving power to be used passes directly into the output circuit, the power available at the output of the tube will analogously be composed of the tube power plus this transferred power. The magnitude of the transferred power is stated together with the power output and driving power.

The plate input power N_a is the product of U_a and I_a only if smoothed plate voltage is used; for operation with nonsmoothed voltage an allowance is made in the operating data for the form factor (see Table 1).

The values I_a and I_g represent the arithmetic average value of the rectified currents as indicated by a moving coil instrument.

The driving power N_{st} represents half the product of the r-f grid voltage and grid fundamental current determined from the curve. The approximate driving power may be calculated with the aid of the formula $N_{st} = 0.9 \cdot V_{gs} \cdot I_g{}^{*}$.

The plate dissipation Q_a is calculated from the difference between the plate power input N_a and the tube power output. For radiation-cooled tubes the plate dissipation $N_{a\sim}$ can be measured with a pyrometer. The plate temperature for the desired case of operation is here compared with the tube under a d-c load. This measurement is particularly recommended in designing new equipment. The dissipation of tubes with supplementary cooling can be calculated from the temperature increase of the coolant.

The screen grid dissipation Q_{g2} is the product of the screen grid voltage and the screen grid current. If the screen grid voltage is not smoothed, the form factor must be taken into account.

The control grid dissipation Q_{g1}, representing the difference between the driving power and the power given up to the grid bias source, may be calculated to an approximation using the formula: $Q_{g1} = I_{g1}(0.9\ U_{gs1} - U_{g1})$.

The efficiency η represents the ratio of the tube power output to the anode power input expressed as a percentage. In the case of a grounded grid, the transferred power is not

for number of phase $m \geqq 2$:

$$U_{-} = \frac{m}{2\pi} \cdot U_{sp} \int_{\frac{\pi}{2} - \frac{\pi}{m}}^{\frac{\pi}{2} + \frac{\pi}{m}} \sin \varphi \, d\varphi$$

$$\boxed{\frac{U_{-}}{U_{sp}} = \frac{m}{\pi} \cdot \sin \frac{\pi}{m}}$$

$$N_m = \frac{m}{2\pi} \cdot N_{sp} \int_{\frac{\pi}{2} - \frac{\pi}{m}}^{\frac{\pi}{2} + \frac{\pi}{m}} \sin^2 \varphi \, d\varphi$$

$$\boxed{\frac{N_m}{N_{sp}} = \frac{1}{2} + \frac{m}{4\pi} \cdot \sin \frac{2\pi}{m}}$$

$$\sin 15^\circ = \frac{1}{4}\sqrt{2}\,(\sqrt{3} - 1)$$

$$\sin 22.5^\circ = \sqrt{\frac{1}{2} - \frac{1}{4}\sqrt{2}}$$

$$\sin 30^\circ = \frac{1}{2}$$

$$\sin 45^\circ = \frac{1}{2}\sqrt{2}$$

$$\sin 60^\circ = \frac{1}{2}\sqrt{3}$$

* This approximation formula applies with exactitude only for a certain angle of current flow which, providing the shape of the grid current pulse in a certain case of operation lies between that of a sinewave pulse and a squared sine pulse, will be in the range of $59^\circ \leqq -g^\circ \leqq 71.5^\circ$

Table 1

Anzahl der Phasen	$\frac{U_-}{U_{sp}}$	$\frac{U_{eff\ tr}}{U_{sp}}$	$\frac{U_{eff\ tr}}{U_-}$	$\frac{N_m}{U_{eff\ tr}\ I_-}$	$\frac{N_m}{U_-\ I_-}$	$\frac{N_m}{N_{sp}}$
1	$\frac{1}{\pi} = 0.318$	$\frac{1}{\sqrt{2}} = 0.707$	$\frac{\pi}{\sqrt{2}} = 2.22$	$\frac{\pi}{2\sqrt{2}} = 1.11$	$\frac{\pi^2}{4} = 2.442$	$\frac{1}{4}$
2	$\frac{2}{\pi} = 0.636$	"	$\frac{\pi}{2\sqrt{2}} = 1.11$	$\frac{\pi}{2\sqrt{2}} = 1.11$	$\frac{\pi^2}{8} = 1.2325$	$\frac{1}{2}$
3	$\frac{3\sqrt{3}}{2\pi} = 0.826$	"	$\frac{\pi\sqrt{2}}{3\sqrt{3}} = 0.855$	$\frac{3\sqrt{3}+4\pi}{6\sqrt{2}\sqrt{3}} = 1.209$	$\frac{3\pi\sqrt{3}+4\pi^2}{54} = 1.035$	$\frac{1}{2}+\frac{3\sqrt{3}}{8\pi} = 0.707$
4	$\frac{2\sqrt{2}}{\pi} = 0.9$	"	$\frac{\pi}{4} = 0.786$	$\frac{1}{2}+\frac{\pi}{4} = 1.285$	$\frac{2\pi+\pi^2}{16} = 1.01$	$\frac{1}{2}+\frac{1}{\pi} = 0.8183$
6	$\frac{3}{\pi} = 0.955$	"	$\frac{\pi}{3\sqrt{2}} = 0.741$	$\frac{3\sqrt{3}+2\pi}{6\sqrt{2}} = 1.353$	$\frac{3\pi\sqrt{3}+2\pi^2}{36} = 1.005$	$\frac{1}{2}+\frac{3\sqrt{3}}{4\pi} = 0.914$

taken into account in calculating efficiency. For self-excited operation the term η_{osc} denotes that the tube power output is already reduced by the driving power that it has to furnish.

The plate load resistance R_a is the required load resistance of the circuit calculated from the appropriate operating data, and thus represents the ratio of the r-f plate voltage to the plate fundamental current.

The depth of modulation m, which is a measure of the modulation power for sinewave modulation, represents the ratio of the amplitude of the modulating a-f voltage to the voltage amplitude of the unmodulated carrier, expressed as a percentage. It will preferably be measured with the aid of a cathode-ray oscilloscope. For operation with plate voltage modulation, the value N_{mod} represents the power to be delivered by the modulator at m = 100 %. The following applies:

$$N_{mod} = \frac{m^2}{2} N_a$$

The tubes can naturally also be used with other operating data than that stated in the data sheet. Such data should be determined by interpolation or, better, by calculation with the aid of the attached curves. These values are also available upon request.

Installation and connection

The data sheets contain suitable instructions for the mounting and connection of each tube. In general the following rules apply:

1. For small radiation-cooled transmitting tubes ($Q_a \approx 100$ watts) mounting is optional.
2. Large radiation-cooled and external-anode tubes are mounted with their axis vertical and their anode at the top or bottom.

Cooling

Maximum temperature of tube exterior

The tube is heated during operation by the filament due to the grid and plate dissipation. The maximum temperatures stated in the data sheet for exterior parts of the tube must not be exceeded. These temperatures may be measured with the aid of a calibrated thermoelement, thermocolors[1], or fusible crystals[2].

Manufactured by:
1 e.g. "Badische Anilin- & Sodafabriken", Ludwigshafen/Rhein
2 e.g. "E. Merck AG", Darmstadt

Prior to measurement, the thermocolors are applied at the points of interest. The color spot must not be larger than a pinhead. The temperature of the exterior parts of the tube is determined from the discoloration of the color spots. The spots must afterwards be removed with a suitable solvent. It is not advisable to scrape spots off the glass parts of the tube because any scratches that may here be made are liable to lead to the destruction of the tube.

Fusible crystals, if used, should likewise be attached to the parts of interest of the tube exterior. A few crystals are sufficient. After having been used for evaluating the measurements, the melted or unmelted crystals on the exterior parts of the tube must be removed. In many cases a rag will be sufficient; otherwise a suitable solvent must be used.

All other details will be found in the instructions for use issued by the respective manufacturer.

Radiation cooling

The removal of heat due to plate dissipation by means of radiation alone is possible only for tubes with a maximum dissipation of up to approx. 1-2 kw, and is conditional upon open design and free air circulation. For operation at relatively high frequencies, for high dissipation, and for enclosed design, it will frequently be necessary to provide supplementary cooling for the anode seal, the tube base, and possibly also the glass bulb.

Forced air cooling

Tubes with forced air cooling have a metallic external anode, the outer surface of which is enlarged by cooling fins. Cooling air is fed to the radiator by a blower. The cooling air should be filtered to prevent contamination of the radiator. Cooling data stated in this booklet apply for maximum admissible plate dissipation. For operation with lower plate dissipation required quantity of cooling air can be found in the respective air cooling characteristics of the complete tube data sheets.

No further cooling is normally required once the tube has been switched off, the quantity of air transported due to the inertia of the blower as it runs down being sufficient.

Air flow and temperature should be checked during operation. Safety measures should be provided to insure that plate voltage and heater voltage are automatically removed if the air flow becomes insufficient.

For tubes with a relatively high power output, and for operation at relatively high frequencies, it may be necessary to provide supplementary cooling in order to protect the grid and screen grid connecting rings and cathode pins from overheating.

Water cooling

Water-cooled tubes must be used together with their cooling jacket. The water must be fed insulated. Make sure that the direction of flow is correct so that the jacket will remain full when the water pump is switched off or breaks down. It is generally recommendable to use distilled water in order to minimize the formation of mineral deposits on the anode.

With industrial generator tubes, for which frequently no distilled water is used, deposits are liable to form on the plate. In such cases, customers are requested to consult us. In general it will be sufficient to soak the plate for about 30 min in a 5–10 % muriatic acid bath. After soaking, the plate should be rinsed with clear water. Cooling data stated in this booklet apply for maximum permissible plate dissipation. For operation with lower plate dissipation the required quantity of cooling water can be found in the respective water cooling characteristics of the complete tube data sheets. The maximum admissible static cooling water pressure is 5 kg/cm² (approx. 71 psi)

Further cooling after the tube has been switched off is not necessary. An automatic safety feature must prevent the tube from being used if the water supply is too low, and remove the plate voltage and heating if the flow of cooling water becomes inadequate during operation. For tubes with a relatively high power output, and for the use of relatively high frequencies, supplementary cooling may be necessary for the grid and plate terminals.

Evaporative cooling

Evaporative cooling utilizes the fact that 539 kcal is required for converting 1 liter of water of 100 deg. C into vapor of 100 deg. C. This thermal energy is drawn from the plate, which is thereby effectively cooled.

The complete tube data sheet contains particulars on total dissipation, the quantity of water evaporated per time unit, and the volume of vapor generated with the coolant flowing into the cooling jacket at different temperatures (water supply temperature). Distilled water should be used as a coolant. When the cooling system is placed in service for the first time, the entire water supply should be changed at frequent intervals until the system and piping are clear of inevitable contaminants.

To insure the proper working of the system, the use of accessories specially developed for evaporative cooling is strongly recommended.

Detailed information on accessories and operation is compiled in a separate folder containing a description of the evaporative cooling system, instruction for installation and maintenance, diagrams, and a list of accessories.

This folder will be supplied to customers on request.

As a supplement to the evaporative cooling system, tubes with a high power output and operating at relatively high frequencies may require an additional cooling system for their grid and cathode terminals.

Protective Measures

The operation of transmitting tubes calls for certain protective measures upon which the acceptance of claims under the tube guarantee will be conditional.
These consist of automatic safety and cut-out devices that protect the tube against the effects of faults.

Aside from the excess-current protection, a high-speed plate voltage cutoff facility is also required to protect the tube from the effects of possible flashovers. This high-speed cutoff facility provides for the immediate disconnection of voltage from the electrodes. There is a simple test-wire method for determining whether the high-speed cutoff used meets the requirements essential to adequate protection of the tube. This involves short-circuiting the applied plate voltage immediately at the inlets to the tube by means of a copper wire having a definite diameter (see Table 2). If the copper wire does not burn through during this test, the high-speed cutoff fulfills its requirements. Even if the short circuit remains in effect until the plate voltage is cut in again, the new cutoff must also take place in such a way that the copper wire does not burn through.

Diameters of test wires for testing the effectiveness of the protective measures:

Transmitting tube	Testwire mm	Transmitting tube	Testwire mm	Transmitting tube	Testwire mm
RS 1001	0.16	RS 1031	0.16	RS 1081	0.16
RS 1011	0.13	RS 1032 C	0.13	RS 2001	0.25
RS 1012	0.13	RS 1041	0.25	RS 2011	0.2
RS 1021	0.13	RS 1051	0.2	RS 2021	0.25
RS 1022 C	0.13	RS 1052 C	0.13		
		RS 1061	0.16		
		RS 1071	0.13		

Table 2

In order to fulfill the above requirements, equipment with nongrid-controlled rectifiers and with smoothed plate voltages requires the use of a device such as a thyratron, an ignitron, or a heavy-duty spark gap (see tube protector Rö Kt 2) connected in parallel to the tube and functioning as a short-circuiting device, so that a rapid voltage cutoff and, if necessary, a rapid discharge of the smoothing capacitor is assured over this parallel path.

Aside from this measure, power supplies with smoothed plate voltages must additionally be equipped with an appropriately sized protective resistor (between 5 and 25 ohms) in the plate circuit, which absorbs the greater part of the capacitor's charge in case of a tube flashover and thus permits the test-wire requirements to be met. If the plate voltage is modulated by means of a modulation transformer, a separate protective resistor for the plate is generally not required.

Plate voltage may not be reapplied until after a steadying period of at least 100 msecs.

Protective measures must also be provided in the grid circuit, in order to prevent continuance of an arc discharge after a flashover in a tube with individual grid voltage power supply. It is appropriate to do this by cutting in a high-ohmic resistor of about 50,000 ohms by means of an plate excess-current realy. Additional protection may be achieved if this same resistor can also be cut in via an excesscurrent relay in the grid circuit. The dropping resistor may only be disconnected after a steadying period of 100 msecs.

In order to avoid undue grid loads in industrial r-f generators with variable external resistance, use of non-linear circuit elements (e.g. glow lamps) is recommended in the grid circuit.

An air-cooled plate can be protected against excessive thermal stress by means of tube fuses that were developed to cut off plate current and heating in the tube, if needed, in conjunction with a pull-switch.

Particulars concerning the type of tube protection required are to be found in the data sheeets covering the various tubes.

Accessories

To insure the proper operation of transmitting tubes, the use of specially designed accessories is strongly recommended. A list of accessories of the various tube types is to be found in the data sheets.

Explanation of Symbols

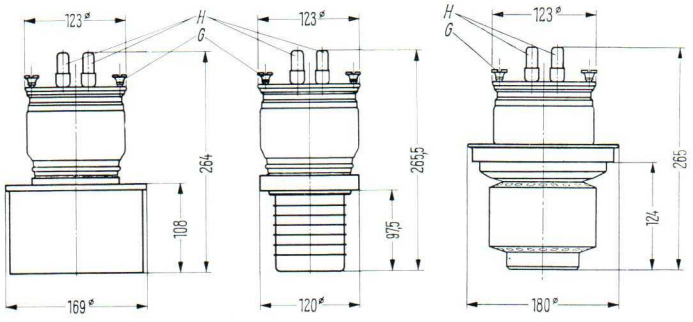
g	Angle of Grid Current Flow
$I_{\_}$	DC Current
I_a	DC Plate Current
I_e	Emission Current
I_{g1}, I_g	DC Grid Current
I_{g2}	DC Screen Current
I_k	DC Cathode Current
I_{ksp}	Peak Cathode Current
m	Modulation Factor
N_a	Plate Input
$N_{a\sim}$	Power Output
N_m	Average Power
N_{sp}	Peak Power
N_{st}	Driving Power
Q_a	Plate Dissipation
Q_{g1}, Q_g	Grid Dissipation
Q_{g2}	Screen Dissipation
G_m	Transconductance
$U_{\_}$	DC Voltage
U_a	DC Plate Voltage
U_{ag1}	DC Plate to Grid Voltage
U_{asp}	Peak Plate Voltage
$U_{eff\ tr}$	RMS Transformer Voltage
U_g, U_{g1}	DC Grid Voltage
U_{g1s}	Peak RF Grid Voltage
U_{g2}	DC Screen Voltage
$U_{g2\,g1}$	DC Screen to Grid Voltage
U_{kg1}	DC Cathode to Grid Voltage
U_{sp}	Peak Voltage
μ	Amplification Factor

Technical Engineering Service

Our Technical Engineering Service will be pleased to give advice on any specific problem connected with the use of the tubes described.

RS 1001

Triode with coaxial grid terminal, usable as RF Amplifier, Oscillator, and Modulator,
especially suitable for 10 kW-VHF-FM Transmitters



RS 1001 L
Weight appr. 11.5 kg

RS 1001 W
Weight appr. 5.2 kg

RS 1001 V
Weight appr. 7.2 kg

General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 150 amps	

Emission Current	22 amps at DC Plate Voltage = DC Grid Voltage = 400 volts
Amplification Factor	65 at DC Plate Voltage = DC Grid Voltage = 1000 to 6000 volts; DC Plate Current = 1 amp
Transconductance	40,000 µmhos at DC Plate Voltage = 3000 volts; DC Plate Current = 1 amp

INTERELECTRODE CAPACITANCES

Grid-Filament	75 µµF
Plate-Filament	0.6 µµF
Grid-Plate	36 µµF

Maximum Ratings

DC Plate Voltage ($f \leqq 100$ Mc)	8	max. kilovolts
DC Plate Voltage (with plate modulated operation $f \leqq 30$ Mc)	6	max. kilovolts
DC Cathode Current	7	max. amps
Peak Cathode Current	22	max. amps
Plate Dissipation	10	max. kilowatts
Grid Dissipation	400	max. watts

Typical Operation

RF Amplifier	Communications Transmitter	Class B VHF-Transmitter [1]	
Frequencies up to	30	100	Mc
Plate Power Output	20	11	kilowatts
DC Plate Voltage	6	6	kilovolts
DC Grid Voltage	–90	–90	volts
Peak RF Grid Voltage	380	260	volts
DC Plate Current	4.7	2.3	amps
DC Grid Current	1	0.4	amp
Plate Dissipation	8	3.5	kilowatts
Driving Power	340	595 [2]	watts

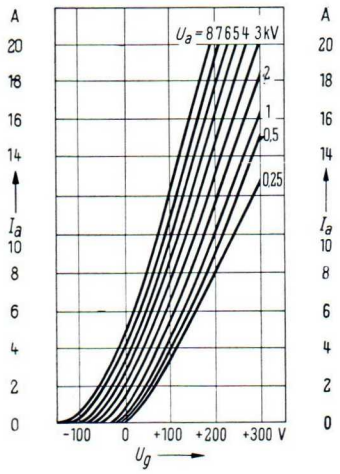
[1] Grounded-grid operation
[2] Including transferred power (grounded grid)

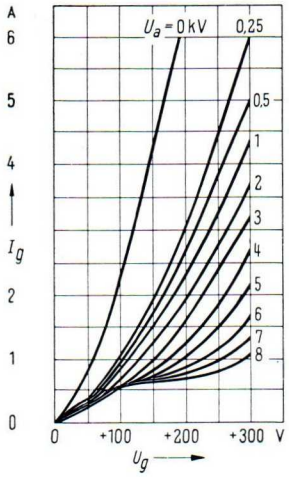
Other kinds of operation:

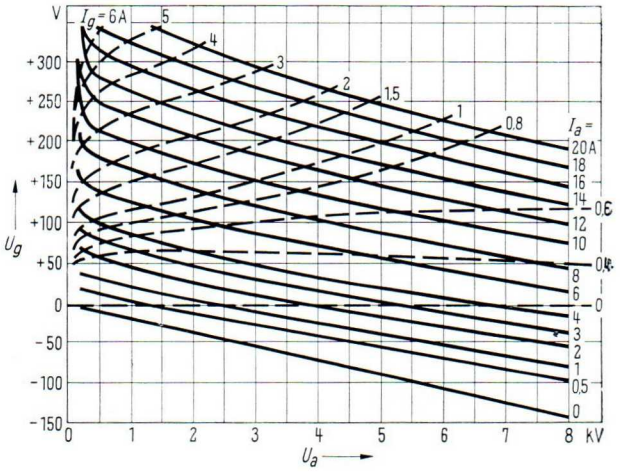
Plate Modulation
$f \leqq 30$ Mc
Carrier Power Output = 10 kilowatts at
DC Plate Voltage = 6 kilovolts

Prestage Modulation
Class B Telephony
$f \leqq 30$ Mc
Carrier Power Output = 5 kilowatts at
DC Plate Voltage = 6 kilovolts

Characteristics







Cooling

RS 1001 L
Required air flow on anode at max. plate dissipation . . . 8 m³/min
≈ 282.5 cubic feet per min
Static Pressure Drop . . . 100 mm of water ≈ 3.95 inches of water
Outlet Air Temperature . . . . . max. 90 deg. C = 194 deg. F

RS 1001 W
Required water flow on anode for inlet water temperature of
20 deg. C = 68 deg. F at max. plate dissipation . . .
15 liters per min ≈ 3.96 gallons (US liq.) per min

RS 1001 V
Particulars on request

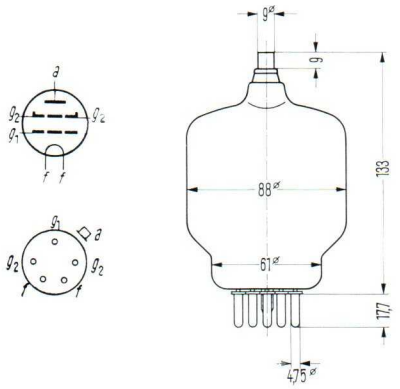
Accessories

Cathode Connectors (2 per tube)	Rö Kat 01
Coaxial Grid Connector	Rö Git 01
Air Socket (RS 1001 L)	Rö Anst 01
Water Jacket (RS 1001 W)	Rö Kü 01
Jacket for evaporative cooling RS 1001 V	Rö Kü V 01
Tube Fuse (RS 1001 L)	Rö Sich 1

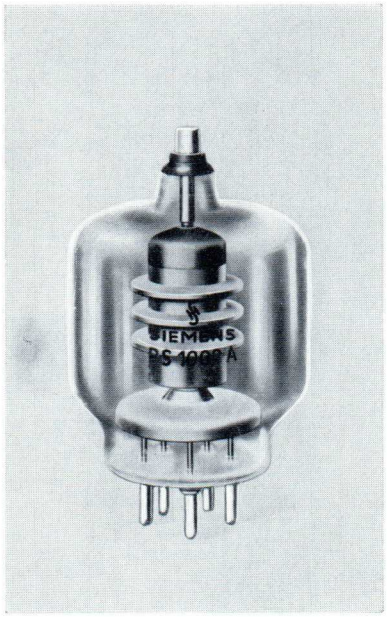
Supplementary accessories on enquiry

RS 1002 A

Radiation-cooled 1100 Watt Tetrode, especially for VHF Transmitters, as RF Amplifier, Oscillator and Modulator suitable in Pre- and PA-Stages.



Weight appr. 0.25 kilogramms



General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 14.1 amps	

Grid-Screen Amplification Factor	5.1	
	at DC Plate Voltage	= 2.5 kilovolts;
	DC Screen Voltage	= 500 volts;
	DC Plate Current	= 100 ma;
Transconductance	4000 μmhos	
	at DC Plate Voltage	= 2.5 kilovolts;
	DC Screen Voltage	= 500 volts;
	DC Plate Current	= 100 ma

INTERELECTRODE CAPACITANCES

Input	12.7 μμF
Output	4.9 μμF
Grid-Plate	0.12 μμF

Maximum Ratings

Frequencies up to	110	Mc
DC Plate Voltage	4000	max. volts
DC Screen Voltage	600	max. volts
DC Grid Voltage	–500	max. volts
DC Cathode Current	0.48	max. amp
Peak Cathode Current	2.6	max. amps
Plate Dissipation	400	max. watts
Screen Dissipation	35	max. watts
Grid Dissipation	10	max. watts

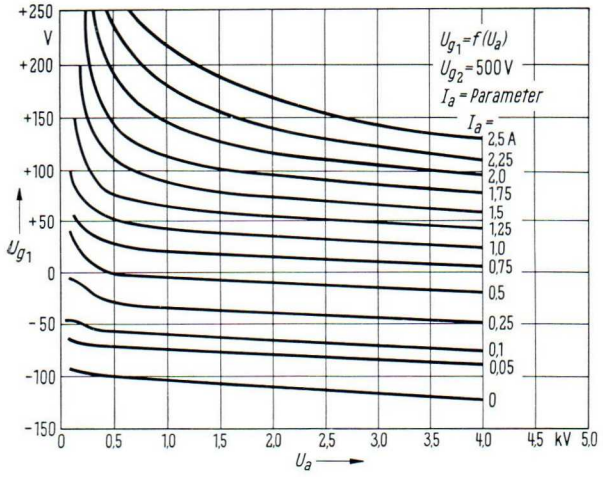
Typical Operation

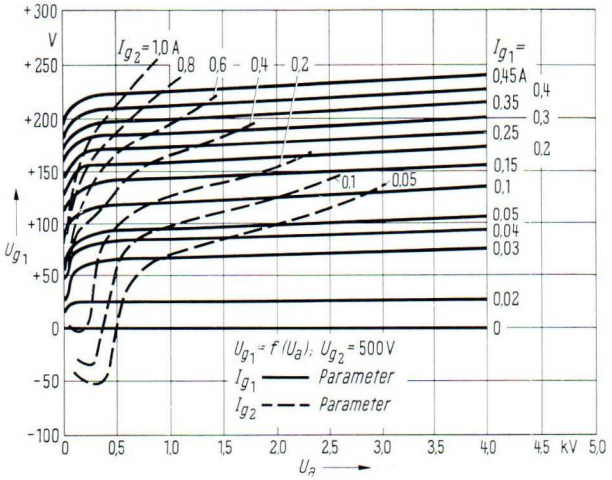
	RF Power Amplifier Class C		Plate and Screen Modulation	
Frequencies up to	75	110	75	Mc
Power Output	1100	800	–	watts
Carrier Power Output	–	–	630	watts
DC Plate Voltage	4000	4000	3000	volts
DC Screen Voltage	500	500	500	volts
DC Grid Voltage	–220	–170	–220	volts
Peak RF Grid Voltage	305	240	305	volts
DC Plate Current	350	270	275	ma
DC Screen Current	25	16	36	ma
DC Grid Current	6	9,5	6	ma
Plate Dissipation	300	280	195	watts
Screen Dissipation	12.5	8	18	watts
Driving Power	1.8	2	1.6	watts
Modulation Factor	–	–	100	%
Peak AF Screen Voltage	–	–	400	volts
Modulating Power	–	–	413	watts

Other kinds of operation:

Single-Sideband Operation (Single Tone)	Frequency $\leqq$ 110 Mc; Power Output = 650 watts at DC Plate Voltage = 4000 volts
AF Power Amplifier and Modulator (2 tubes in push-pull)	Power Output = 1750 watts at DC Plate Voltage = 4000 volts

Characteristics





Cooling

Temperature of Bulb	max. 350 deg. C = 662 deg. F
Temperature of Plate Seal	max. 220 deg. C = 428 deg. F
Temperature of Base Seals	max. 180 deg. C = 356 deg. F

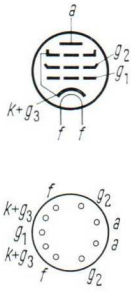
The plate terminal must be provided with a heat-dissipating connector. Provision must be made for cooling the plate seal and the base by a low velocity air stream.

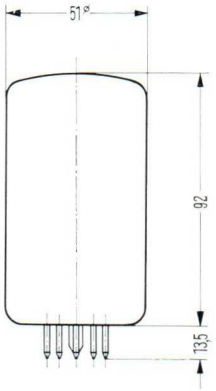
Accessories

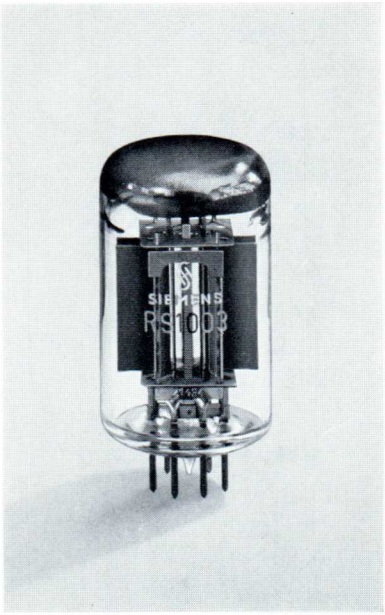
Ceramic Socket	Rö Fsg 2
Heat-Dissipating Plate Connector	Rö Kfl 02
Glass Air Flow Chimney	Rö Zub 02

RS 1003

Radiation-cooled 105 Watt Pentode
for Communication and Electromedical Applications,
usable as RF-Amplifier, Oscillator and Modulator in Pre- and PA-Stages







Weight 0.09 kg

General Data

HEATING

Heater Voltage	6.3 volts	Heating indirectly,
Heater Current	approx. 2.3 amps	oxide-coated cathode

Grid-Screen Amplification Factor	20 at DC Plate Current = 100 ma DC Plate Voltage = DC Screen Voltage = 400 volts;
Transconductance	18,000 µmhos at DC Plate Voltage = DC Screen Voltage = 400 volts; DC Plate Current = 100 ma

INTERELECTRODE CAPACITANCES

Input	21 µµF
Output	11 µµF
Grid-Plate	0.13 µµF
Grid-Screen	7 µµF

Maximum Ratings

DC Plate Voltage (f ≦ 30 Mc)	1000 max. volts
DC Plate Voltage (f ≦ 100 Mc)	800 max. volts
DC Screen Voltage	600 max. volts
DC Plate Voltage (f ≦ 30 Mc)	800 max. volts [1]
DC Screen Voltage	300 max. volts [1]
DC Cathode Current	260 max. ma
Peak Cathode Current	1.5 max. amps
Plate Dissipation	60 max. watts
Screen Dissipation	10 max. watts
Grid Dissipation	0.5 max. watt

[1] With plate- and screen modulation

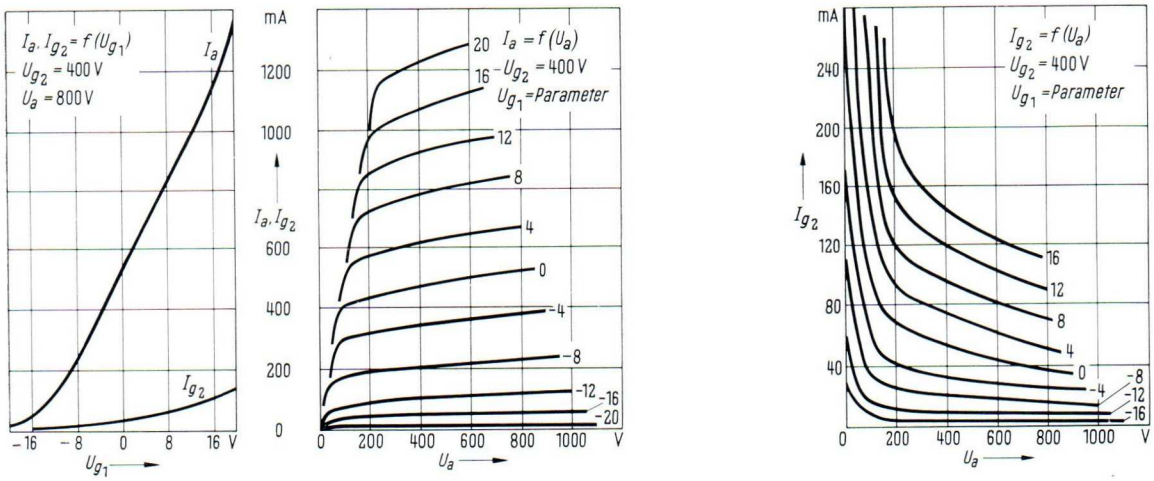
Typical Operation

	RF-Power Amplifier Class C		Plate and Screen Modulation	
Frequencies up tos	100	100	30	Mc
Power Output	105	26	–	watts
Carrier Power Output	–	–	70	watts
DC Plate Voltage	800	300	800	volts
DC Screen Voltage	380	300	300	volts
DC Grid Voltage	–35	–25	–90	volts
Peak RF Grid Voltage	50	40	110	volts
DC Plate Current	200	163	130	ma
DC Screen Current	25	30	25	ma
DC Grid Current	14	14	14	ma
Plate Dissipation	55	23	34	watts
Screen Dissipation	9.5	9.0	7.5	watts
Driving Power	0.7	0.55	1.5	watts
Modulation Factor	–	–	100	%
Peak AF Screen Voltage	–	–	230	volts
Modulating Power	–	–	55	watts

Other kinds of operation:

Prestage Modulation	Frequency	≦ 30 Mc;
Class B Telephony	Power Output	= 23 watts;
	at DC Plate Voltage	= 1000 volts

Characteristics

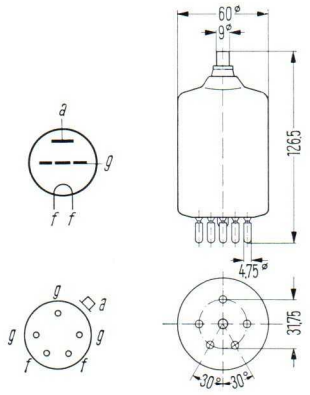


Accessories

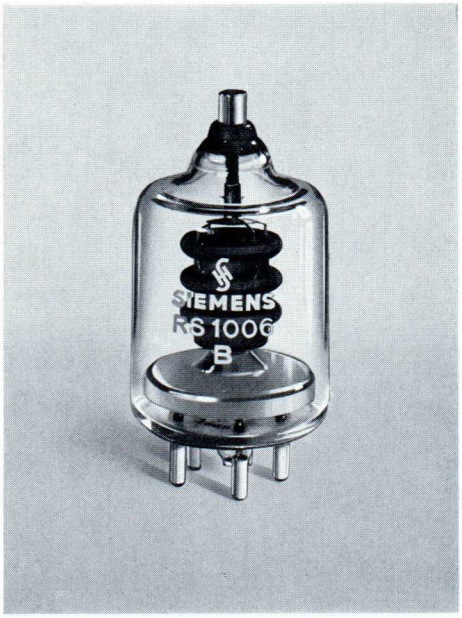
Ceramic Socket	Rel stv 9a

RS 1006 B

Radiation-cooled 390 Watt Triode for Communication and Electromedical Applications, usable as RF Amplifier, Oscillator and Modulator at frequencies up to 200 Mc.



Weight approx. 0.125 kg



General Data

FILAMENT

Filament Voltage	6.3 volts	Thoriated tungsten filament
Filament Current	approx. 5.8 amp	
Emission Current	1.8 amps	
	at DC Plate Voltage	= DC Screen Voltage = 250 volts
Amplification Factor	25	
	at DC Plate Voltage	= 2500 volts;
	DC Plate Current	= 60 ma
Transconductance	2800 µmhos	
	at DC Plate Voltage	= 2500 Volts;
	DC Plate Current	= 60 ma

INTERELECTRODE CAPACITANCES

Grid-Filament	4.9 µµF
Plate-Filament	0.1 µµF
Grid-Plate	5.0 µµF

Maximum Ratings

DC Plate Voltage ($f \leqq 150$ Mc)	3000	max. volts
DC Cathode Current	300	max. ma
Peak Cathode Current	1.8	max. amps
Plate Dissipation	150	max. watts
Grid Dissipation	35	max. watts

Typical Operation

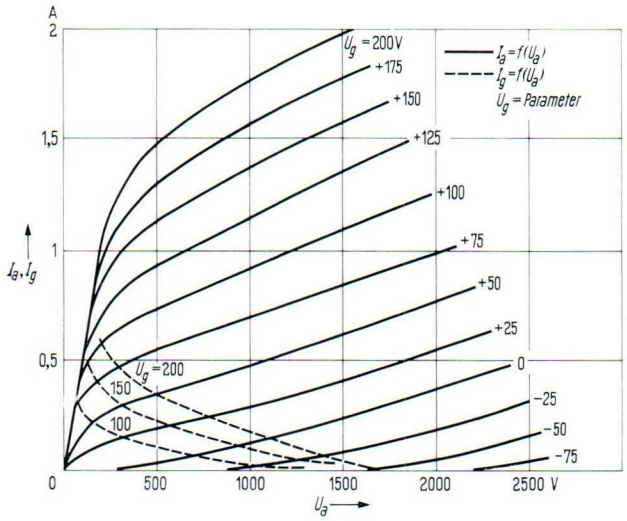
	RF-Power Amplifier Class C	
Frequencies up to	150	Mc
Power Output	390	watts
DC Plate Voltage	2500	volts
DC Grid Voltage	–200	volts
Peak RF Grid Voltage	390	volts
DC Plate Current	205	ma
DC Grid Current	40	ma
Plate Dissipation	122	watts
Driving Power	14	watts

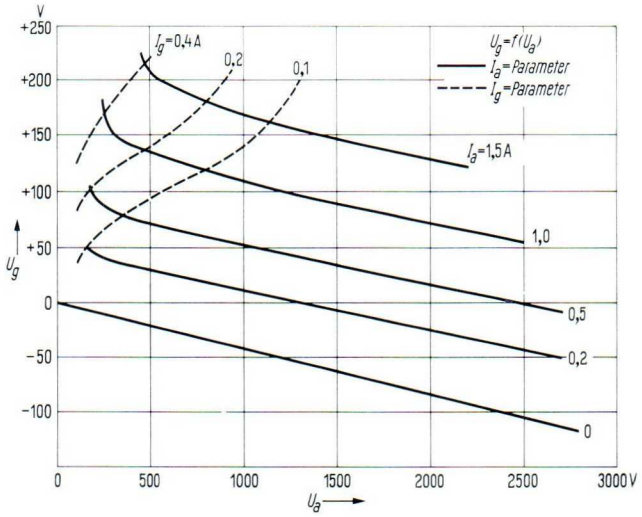
Oscillator for Industrial Applications		
Frequencies up to	50	Mc
Power Output	170	watts
DC Plate Voltage	2500	volts [1]
AC Grid Voltage	85	volts [1] [2]
DC Plate Current	90	ma
DC Grid Current	20	ma
Grid Resistor	1700	ohms
Plate Dissipation	85	watts

[1] RMS value

[2] Phase-shift between U_a and U_g 180 deg.

Characteristics





Cooling

Temperature of Plate seal	max. 220 deg. C = 428 deg. F
Temperature of Base	max. 180 deg. C = 356 deg. F

The plate terminal must be provided with a heat-dissipating connector. At operating frequencies above 50 Mc provision must be made for cooling the plate seal and the base by a low velocity air stream.

Accessories

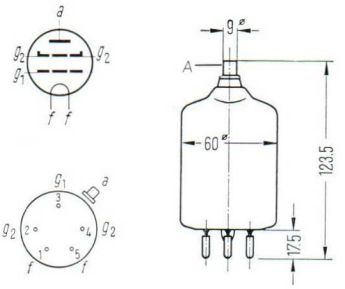
Ceramic Socket	Rö Fsg 2
Heat Dissipating Plate Connector	Rö Kfl 06
Tube Fastening Straps [1]	Rö Zub 06

[1] for mobile equipment

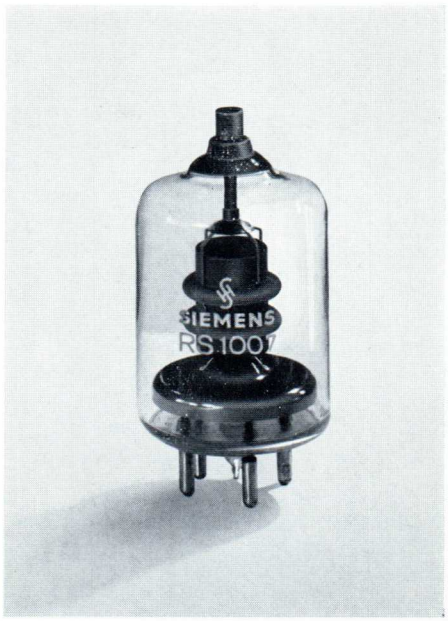
RS 1007

6155

Radiation-cooled 375-Watt Tetrode for Communications and Electromedical Applications, usable as RF and AF Amplifier at frequencies up to 200 Mc.



Weight approx. 0.125 kg



General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 6.5 amps	

Emission Current	1.6 amps at DC Plate Voltage = DC Screen Voltage = DC Grid Voltage = 250 volts
Grid-Screen Amplification Factor	6.2 at DC Plate Voltage = 3000 volts; DC Screen Voltage = 400 volts; DC Plate Current = 40 ma
Transconductance	2200 µmhos at DC Plate Voltage = 3000 volts; DC Screen Voltage = 400 volts; DC Plate Current = 40 ma

INTERELECTRODE CAPACITANCES

Input	10.8 µµF
Output	3.1 µµF
Grid-Plate	0.05 µµF

Maximum Ratings

DC Plate Voltage ($f \leqq 120$ Mc)	3000	max. volts
DC Plate Voltage ($f \leqq 200$ Mc)	2200	max. volts
DC Screen Voltage	400	max. volts
DC Cathode Current	290	max. ma
Peak Cathode Current	1.6	max. amps
Plate Dissipation	125	max. watts
Screen Dissipation	20	max. watts
Grid Dissipation	5	max. watts

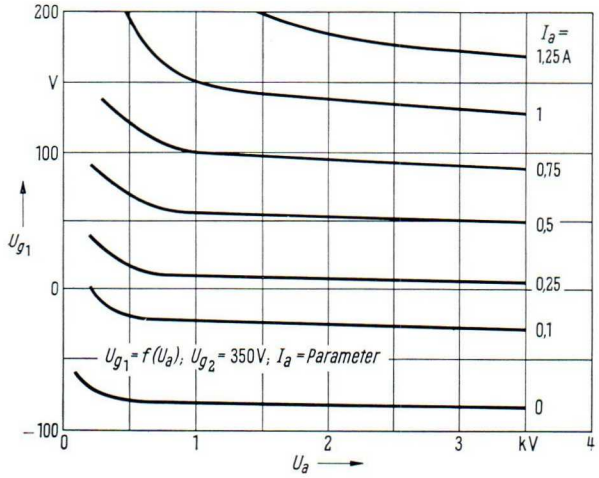
Typical Operation

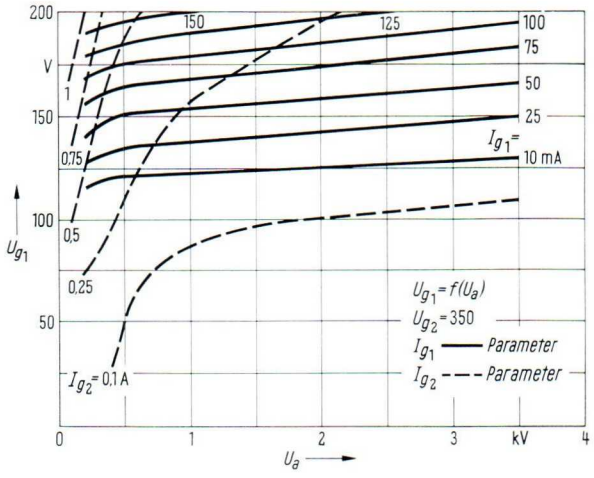
	RF Power Amplifier Class C		Plate and Screen Modulation	
Frequencies up to	120	120	120	Mc
Power Output	375	110	–	watts
Carrier Power Output	–	–	300	watts
DC Plate Voltage	3000	1500	2500	volts
DC Screen Voltage	350	350	350	volts
DC Grid Voltage	–150	–150	–210	volts
Peak RF Grid Voltage	300	225	380	volts
DC Plate Current	167	110	152	ma
DC Screen Current	30	16	30	ma
DC Grid Current	6.5	8	4.5	ma
Plate Dissipation	125	55	80	watts
Screen Dissipation	10.5	5.6	10.5	watts
Driving Power	2	1.7	1.7	watts
Modulation Factor	–	–	100	%
Peak AF Screen Voltage	–	–	300	volts
Modulating Power	–	–	190	watts

Other kinds of operation:

Prestage Modulation Class B Telephony	Frequency $\leqq$ 120 Mc Carrier Power Output = 58 watts at DC Plate Voltage = 3000 volts
AF Amplifier and Modulator (Class B, 2 tubes in push-pull)	Power Output = 550 watts at DC Plate Voltage = 2500 volts

Characteristics





Cooling

Temperature of Bulb	max. 350 deg. C = 662 deg. F
Temperature of Plate Seal	max. 220 deg. C = 428 deg. F
Temperature of Base	max. 180 deg. C = 356 deg. F

The plate terminal must be provided with a heat-dissipating connector.
At operating frequencies above 50 Mc provision must be made for cooling the plate seal and the base by a low velocity air stream.

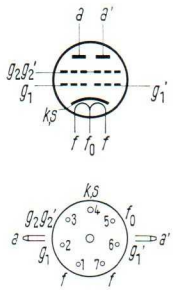
Accessories

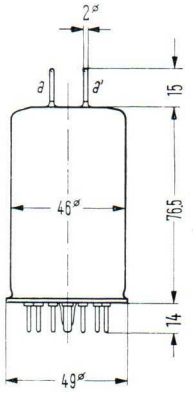
Ceramic Socket	Rö Fsg 2
Heat Dissipating Plate Connector	Rö Kfl 06
Tube Fasting Straps [1]	Rö Zub 06

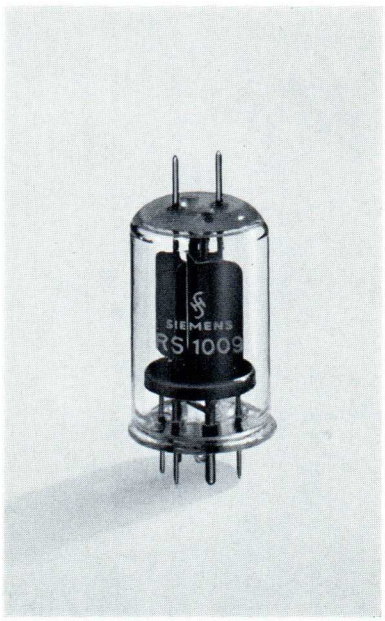
[1] for mobile equipment

RS 1009
5894

Radiation-cooled 90 Watt Double Tetrode for VHF, UHF and TV Transmitters usable as RF Amplifier, Oscillator, Pulse Modulator and Frequency Multiplier, at frequencies up to 500 Mc
Joint screen grid for both sections. Internally neutralised.







Weight approx. 0.06 kg

General Data

HEATING

Heater voltage	6.3 resp. 12.6 volts	Heating indirectly,
Heater Current approx.	1.8 resp. 0.9 amp	oxide-coated cathode

per section

Grid-Screen Amplification Factor	8.2
Transconductance	4500 µmhos at DC Plate Current = 30 ma

INTERELECTRODE CAPACITANCES

per section		in push-pull operation	
Input	10.5 µµF	Input	6.7 µµF
Output	3.2 µµF	Output	2.1 µµF
Grid-Plate	< 0.08 µµF		

Maximum Ratings

DC Plate Voltage	($f \leqq 500$ Mc)	750 max. volts
DC Plate Voltage	($f \leqq 250$ Mc)	600 max. volts
DC Screen Voltage		300 max. volts
DC Cathode Current		2 × 120 max. ma
Peak Cathode Current		2 × 700 max. ma
Plate Dissipation		2 × 20 max. watts
Screen Dissipation		7 max. watts
Grid Dissipation		2 × 1 max. watts

Typical Operation

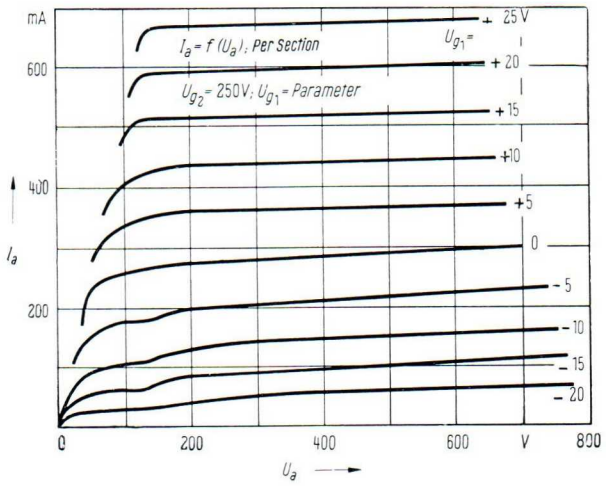
RF Power Amplifier, Class C
both sections in push-pull

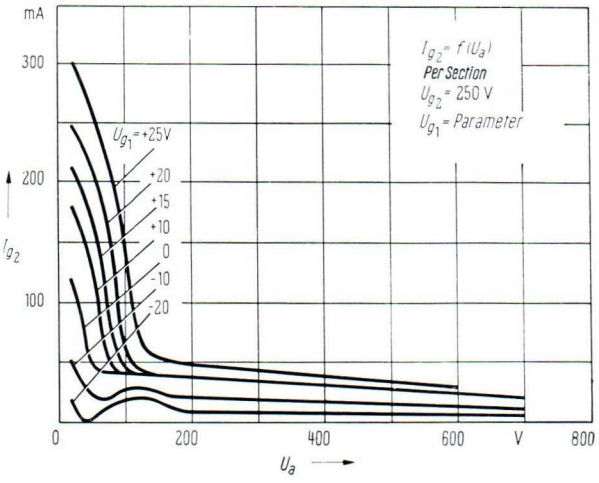
Frequencies up to	200	500	Mc
Power Output	90	60	watts
DC Plate Voltage	600	500	volts
DC Screen Voltage	250	250	volts
DC Grid Voltage	–80	–	volts
Peak RF Grid Voltage	2 × 100	–	volts
DC Plate Current	2 × 100	2 × 100	ma
DC Screen Current	16	2 × 20	ma
DC Grid Current	2 × 2.5	2 × 3	ma
Plate Dissipation	2 × 15	2 × 20	watts
Grid Resistor	–	20.000	ohms

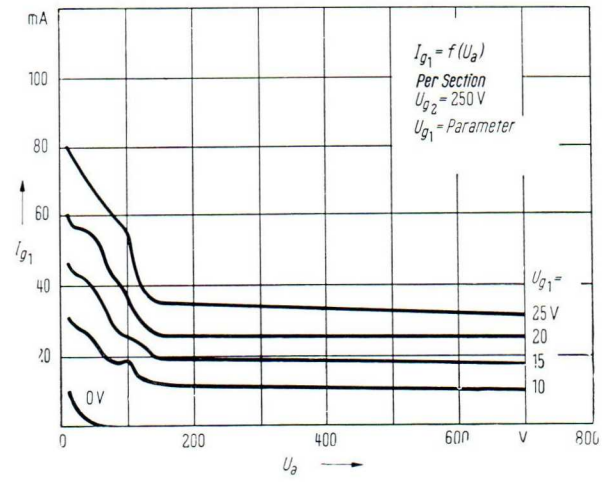
Other kinds of operation

Plate and Screen Modulation (Both sections in push-pull)	Frequency	≦ 60 Mc
	Carrier Power Output	= 71 watts
	at DC Plate Voltage	= 600 volts
Frequency Tripler (Both sections in push-pull)	Frequency	= 50/150 Mc
	Power Output	= 20 watts
	at DC Plate Voltage	= 500 volts
Pulse Modulator Pulse Frequency 1250 cycles	DC Plate Voltage	= 7000 volts
	Peak Plate Current	= 5 amps
AF Power Amplifier and Modulator (Both sections in push-pull)	Power Output	= 86 watts
	at DC Plate Voltage	= 600 volts

Characteristics







Cooling

Temperature of Plate Seals max. 200 deg. C = 392 deg. F
Temperature of Base max. 180 deg. C = 356 deg. F

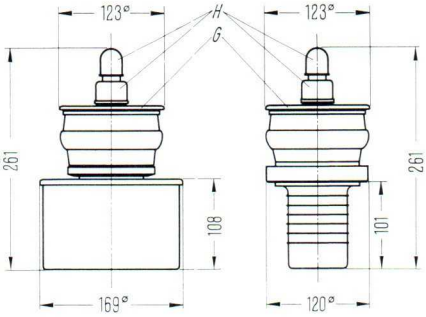
When tube is used above 150 Mc a low velocity air flow on the bulb and on the plate seals will be necessary.

Accessories

Ceramic Socket Rö Fsg 3 Anode Clips Rö Kfl 09

RS 1011

12 Kilowatt Triode with coaxial sealing of all electrodes for applications in VHF and TV Transmitters at frequencies up to 220 Mc.



RS 1011 L
Weight approx. 11 kg

RS 1011 W
Weight approx. 4.5 kg

General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 75 amps	
Emission Current	30 amps at DC Plate Voltage = DC Grid Voltage = 350 volts	
Amplification Factor	62 at DC Plate Voltage = 1000 to 4000 volts; DC Plate Current = 1 amp	
Transconductance	60,000 µmhos at DC Plate Voltage = 4000 volts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	80 µµF
Plate-Filament	0,7 µµF
Grid-Plate	30 µµF

Maximum Ratings

DC Plate Voltage	($f \leqq 100$ Mc)	5000	max. volts
DC Plate Voltage	($f \leqq 220$ Mc)	4000	max. volts
DC Cathode Current		8	max. amps
Peak Cathode Current		30	max. amps
Plate Dissipation		10	max. kilowatts
Grid Dissipation	($f \leqq 100$ Mc)	350	max. watts
Grid Dissipation	($f \leqq 220$ Mc)	250	max. watts

Typical Operation

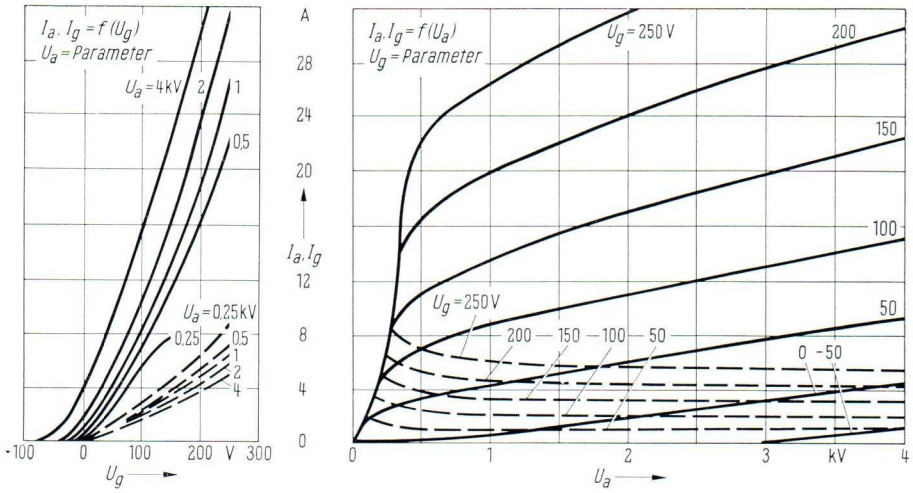
	TV Transmitter PA Stage Modulation [1] (Synchron level)	RF Power Amplifier Class B [1]	
Frequencies up to	220	100	Mc
Bandwidth $2\Delta f$ with circuit detuning of 45 deg.	6	–	Mc
Power Output	12	20	kilowatts [2]
DC Plate Voltage	4000	4500	volts
DC Grid Voltage	–70	–70	volts
Peak RF Grid Voltage	250	330	volts
DC Plate Current	4.8	6.5	amps
DC Grid Current	1.1	1.3	amps
Plate Dissipation	7	9.5	kilowatts
Driving Power	1070	2100	watts

[1] Grounded-grid operation
[2] Transferred power (grounded grid) included

Other kinds of operation:

Prestage Modulation Class B Telephony	Frequency Carrier Power Output at DC Plate Voltage	≦ 100 Mc; = 5000 watts = 4500 volts

Characteristics



Cooling

RS 1011 L

Required water flow on anode for inlet water temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . 15 liters/min ≈ 494 cubic feet per minute
Static Pressure Drop. . . . 130 mm of water ≈ 5.1 inches of water
Temperature of air at outlet . . . 70 deg. C = 158 deg. F

RS 1011 W

Required water flow anode for inlet water temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . 15 liters/min ≈ 3.96 gallons (U.S. liq.) per minute

RS 1011 V

Particulars on request

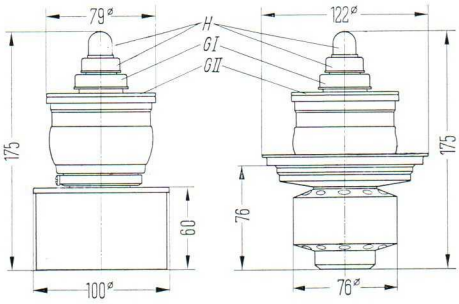
Accessories

Coaxial Cathode Connector	Rö Kat 11
Coaxial Grid Connector	Rö Git 01
Air Socket (RS 1011 L)	Rö Anst 01
Water Jacket (RS 1011 W)	Rö Kü 11
Tube Fuse (RS 1011 L)	Rö Sich 1

Supplementary accessories on enquiry

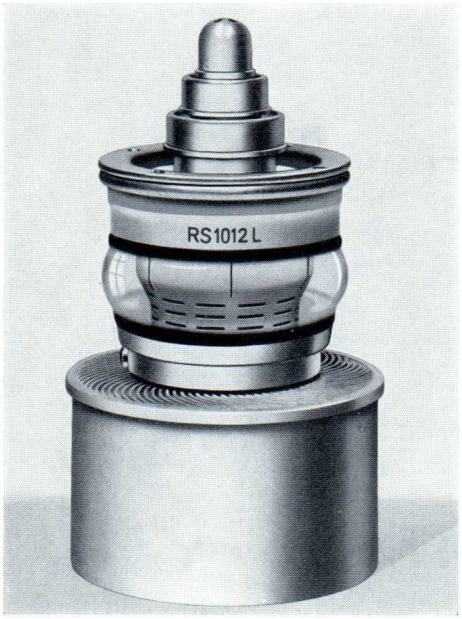
RS 1012

Tetrode for 5500 Watt VHF- and 2000 Watt TV-Transmitters at frequencies up to 220 Mc. With coaxial sealing of all electrodes including the filament terminals.



RS 1012 L
Weight approx. 2.5 kg

RS 1012 V
Weight approx. 1.7 kg



General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 62 amps	
Emission Current	10 amps at DC Plate Voltage = DC Screen Voltage = DC Grid Voltage = 400 volts	
Grid-Screen Amplification Factor	5.3 at DC Plate Voltage = 2000 to 6000 volts; DC Screen Voltage = 600 to 800 volts; DC Plate Current = 1 amp	
Transconductance	22,000 µmphos at DC Plate Voltage = 3000 volts; DC Screen Voltage = 600 volts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Filament-Grid	36 µµF	Filament-Plate	0.06 *
Filament-Screen	3 µµF	Grid-Plate	0.23 *
Grid-Screen	42 µµF	Screen-Plate	14

Maximum Ratings

DC Plate Voltage ($f \leqq 100$ Mc)	6000	max. volts
DC Plate Voltage ($f \leqq 220$ Mc)	4000	max. volts
DC Screen Voltage	800	max. volts
DC Cathode Current	2.5	max. amps
Peak Cathode Current	10	max. amps
Plate Dissipation (RS 1012 L)	3000	max. watts
Plate Dissipation (RS 1012 V)	4000	max. watts
Screen Dissipation	100	max. watts
Grid Dissipation	30	max. watts

*) measured with 30 × 30 mm grounded flat metal shield attached to the screen-grid terminal

Typical Operation

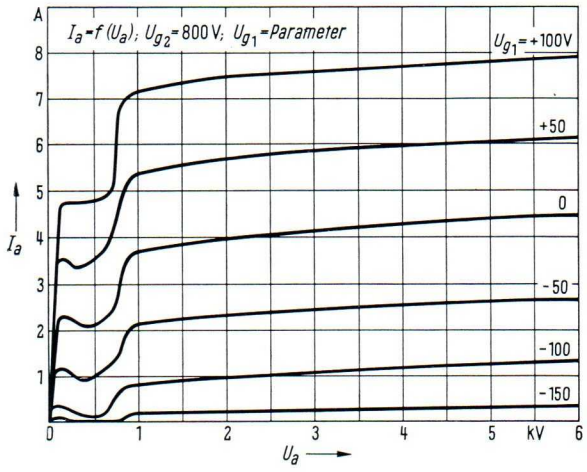
	Cathode modulated TV-Video-Transmitter (Synchron Level) Grounded Grid and Screen		RF Power Amplifier Class B Grounded-cathode		
Frequencies up to	220	Mc	Frequencies up to	100	220 Mc
Bandwidth $2\Delta f$	10	Mc [1]	Power Output	5500	3300 watts
Power Output	5.49+0.51	kilowatts [2]	DC Plate Voltage	6000	4000 volts
DC Plate to Grid Voltage	4000	volts	DC Screen Voltage	600	600 volts
DC Screen to Grid Voltage	750	volts	DC Grid Voltage	–150	–110 volts
DC Cathode to Grid Voltage	150	volts	Peak RF Grid Voltage	230	220 volts
Peak Cathode to Grid Voltage	260	volts	DC Plate Current	1.4	1.4 amps
DC Plate Current	2.28	amps	DC Screen Current	125	125 ma
DC Screen Current	160	ma	DC Grid Current	60	60 ma
DC Grid Current	75	ma	Plate Dissipation	2900	2300 watts
Plate Dissipation	3.300	watts	Driving Power	40	60 watts
Driving Power	17+550	watts [2]			

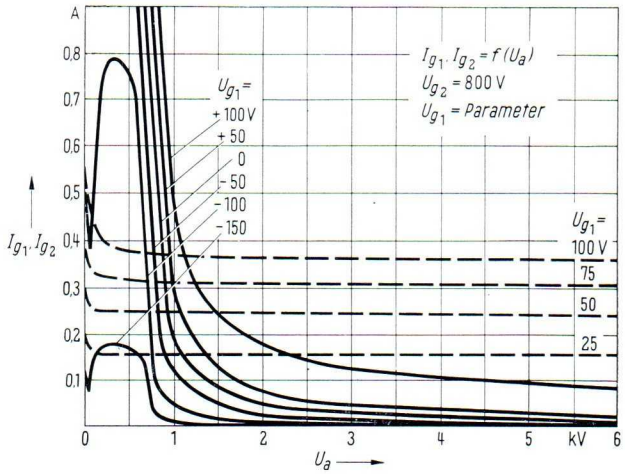
[1] Bandwidth with circuit detuning of 45 deg.
[2] Transferred Power (Grounded Grid)

Other kinds of operation:
Plate and Screen Modulation

Frequency	≦	220 Mc
Carrier Power Output	=	1500 watts
at DC Plate Voltage	=	2500 volts

Characteristics





Cooling

RS 1012 L

Required air flow on anode at max. plate dissipation . . . 4 m³/min
≈ 141 cubic feet per minute
Static Pressure Drop . . . 115 mm of water
≈ 4.53 inches of water
Temperature of air at outlet . . . max. 65 deg. C
≈ 149 deg. F

RS 1012 V

Particulars on request

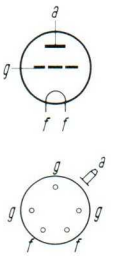
Accessories

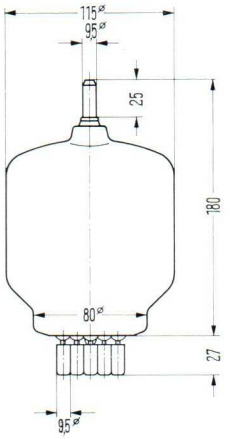
Coaxial Cathode Connectors	Rö Kat 12
Coaxial Grid Connector	Rö Git 12a
Coaxial Screen Grid Connector	Rö Git 12b
Air Socket (RS 1012 L)	Rö Anst 21
Jacket for evaporative cooling (RS 1012 V)	Rö Kü V 12
Tube Fuse (RS 1012 L)	Rö Sich 2

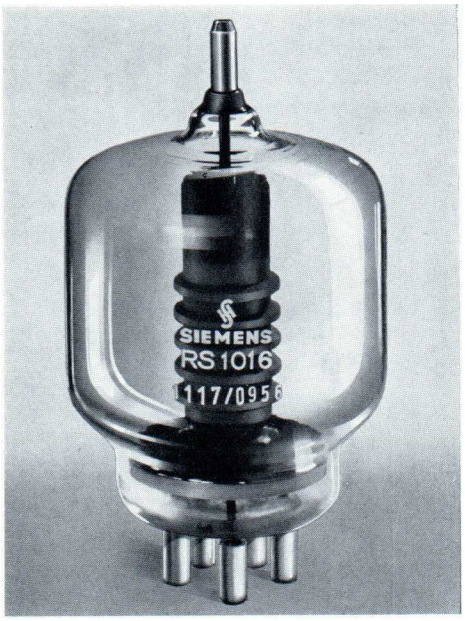
Supplementary accessories on enquiry

RS 1016
5868

Radiation-cooled 1690 Watt Triode for Communications and Industrial RF Applications, usable as RF Amplifier and Oscillator at Frequencies up to 100 Mc.







Weight approx. 0.4 kg

General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 9.9 amps	
Emission Current	5 amps at DC-Plate Voltage = DC Grid Voltage = 500 volts	
Amplication Factor	28 at DC Plate Voltage = 3500 volts DC Plate Current = 125 ma	
Transconductance	4500 µmhos at DC Plate Voltage = 3500 volts DC Plate Current = 125 ma	

INTERELECTRODE CAPACITANCES

Input	8 µµF
Output	0.17 µµF
Plate-Grid	7.0 µµF

Maximum Ratings

DC Plate Voltage ($f \leqq 100$ Mc)	4000	max. volts
DC Plate Voltage with self rectification	4500	max. volts [1]
DC Plate Voltage with plate modulation	3000	max. volts
DC Cathode Current	650	max. ma
Peak Cathode Current	5	max. amps
Plate Dissipation	500	max. watts
Grid Dissipation	50	max. watts

[1] RMS value

Typical Operation

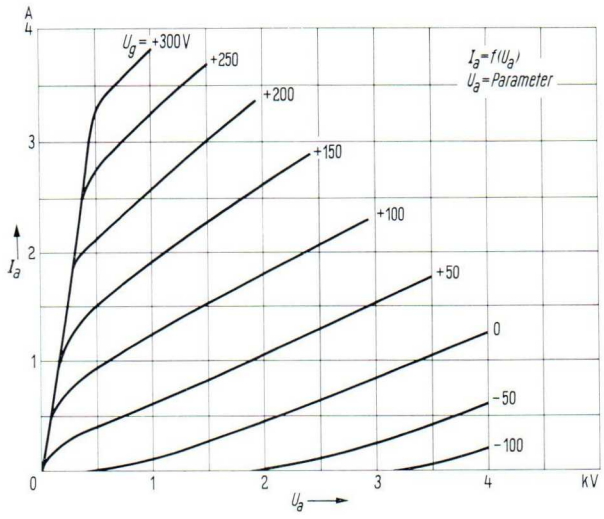
	RF Power Amplifier Class C		Oscillator for industrial applications with self-rectification	
Frequencies up to	100	Mc	30	Mc
Power Output	1690	watts	1000	watts
DC Plate Voltage	4000	volts	4500	volts [1]
DC Grid Voltage	–350	volts	280	ma
Peak RF Grid Voltage	580	volts	55	ma
DC Plate Current	535	ma	3400	ohms
DC Grid Current	115	ma	350	watts
Plate Dissipation	450	watts	71.5	%
Driving Power	60	watts		

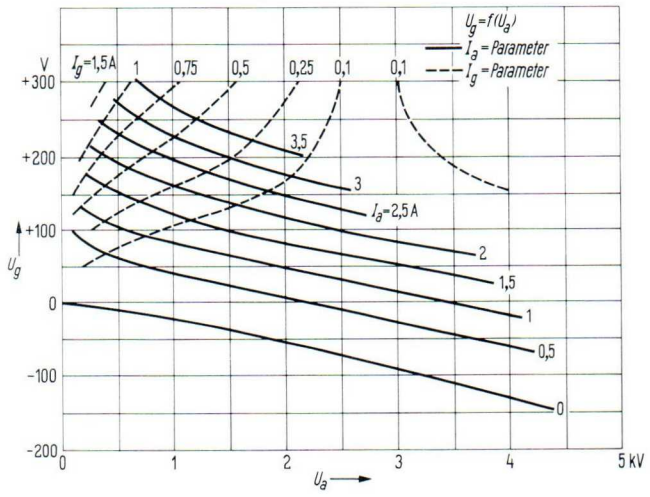
[1] RMS value

Other kinds of operation:

Plate Modulation	Frequency	≦ 100 Mc
	Carrier Power Output	= 1050 watts
	at DC Plate Voltage	= 3000 volts
AF Power Amplifier and Modulator (2 tubes in push-pull)	Power Output	= 2290 watts
	at DC Plate Voltage	= 4000 volts
Oscillator for industrial applications (With Plate Voltage from single-phase full wave rectifier)	Frequency	≦ 30 Mc
	Power Output	= 1500 watts
	at DC Plate Voltage	= 3600 volts
Oscillator for industrial applications (With Plate Voltage from three phase half-wave rectifier)	Frequency	≦ 30 Mc
	Power Output	= 1630 watts
	at DC Plate Voltage	= 4000 volts

Characteristics





Cooling

Temperature of Bulb	max. 250 deg. C = 482 deg. F
Temperature of Plate Seal	max. 220 deg. C = 428 deg. F
Temperature of Base	max. 180 deg. C = 356 deg. F

The plate terminal must be provided with a heat dissipating connector. At operating frequencies above 50 Mc provision must be made for cooling the plate seal und the base by a low velocity air stream.

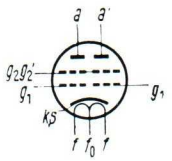
Accessories

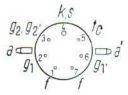
Ceramic Socket	Rö Fsg 4
Heat Dissipating Plate Connector	Rö Kfl 02

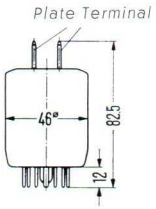
RS 1019
6252

Radiation-cooled 48 Watt Double Tetrode for VHF and TV Transmitters usable as RF Amplifier, Frequency Multiplier up to 600 Mc and as AF Amplifier. Internally neutralised.

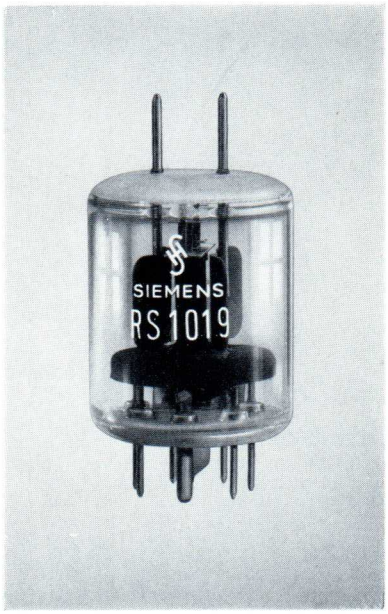
Joint screen grid for both sections.







Weight approx. 0.06 kg



General Data

HEATING

Heater voltage	6.3 resp. 12.6 volts	Heating indirectly,
Heater Current	1.3 resp. 0.65 amps	oxide-coated cathode

per Section

Grid Screen Amplification Factor	8
Transconductance	2500 µmhos at DC Plate Current = 20 ma

INTERELECTRODE CAPACITANCES

per Section		in push-pull operation with internal neutralisation	
Input	7 µµF	Input	4.4 µµF
Output	2.6 µµF	Output	1.6 µµF

Maximum Ratings

DC Plate Voltage	600	max. volts
DC Screen Voltage		max. volts
DC Cathode Current	2 × 55	max. ma
Peak Cathode Current	2 × 330	max. ma
Plate Dissipation	2 × 10	max. watts
Screen Dissipation	3	max. watts

Typical Operation

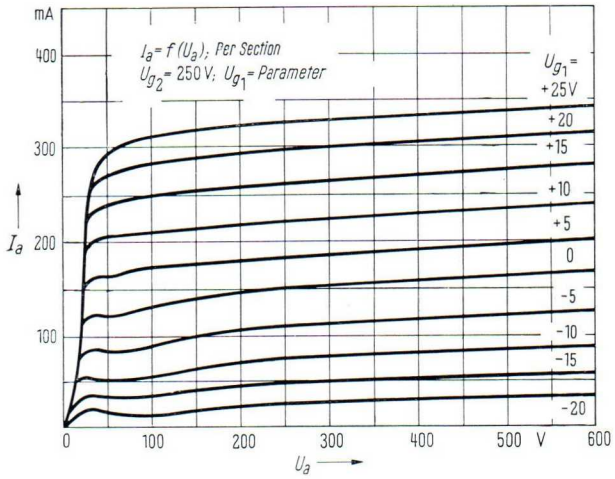
RF Power Amplifier, Class C,
Both sections in push-pull operation

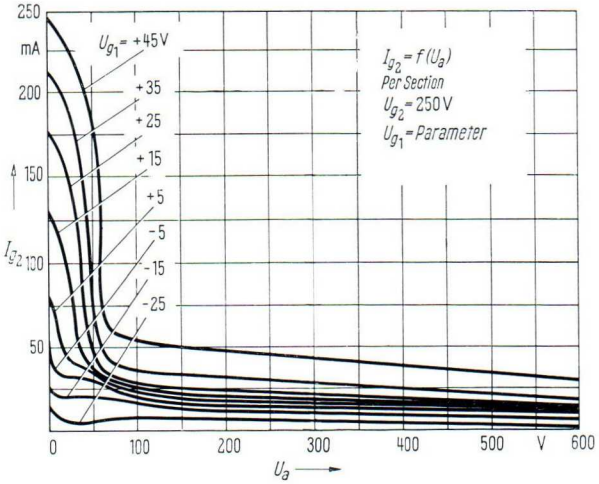
Frequencies up to	200	600 Mc
Power output	48	20 watts
DC Plate Voltage	600	400 volts
DC Screen Voltage	250	250 volts
DC Grid Voltage	−60	−50 volts
DC Plate Current	2 × 50	2 × 50 ma
DC Screen Current	8	5 ma
DC Grid Current	2 × 0.7	2 × 0.7 ma
Plate Dissipation	2 × 6	2 × 10 watts
Driving Power	1.5	watts

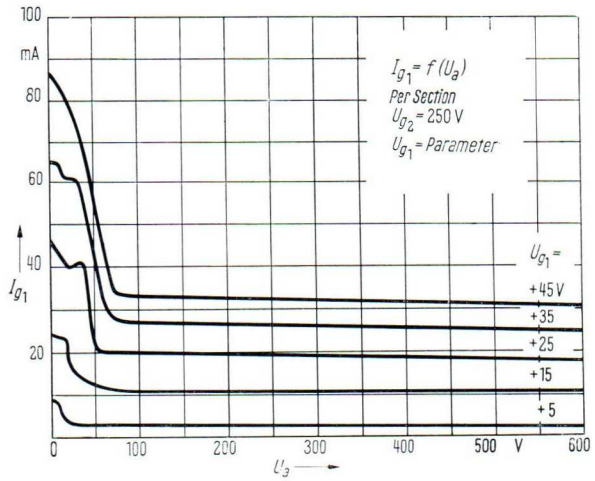
Other kinds of operation:

Plate and Screen Modulation (Both sections in push-pull operation)	Frequency	≦ 200 Mc;
	Carrier Power Output	= 31 watts
	at DC Plate Voltage	= 500 volts
Frequency Multiplier (Both sections in push-pull operation)	Frequency	= 67/200 Mc;
	Power Output	= 10 watts
	at DC Plate Voltage	= 300 volts
AF-Power Amplifier and Modulator (Both sections in push-pull operation)	Power Output	= 23.5 watts
	at DC Plate Voltage	= 500 volts

Characteristics







Cooling

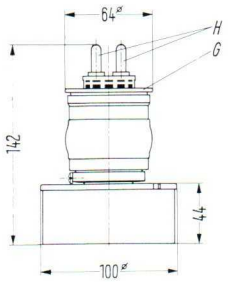
Temperature of seals max. 180 deg. C = 356 deg. F
Natural cooling of the tube will be sufficient at
DC Plate Voltages = 600 volts up to frequencies of 150 Mc
DC Plate Voltages = 500 volts up to frequencies of 200 Mc
DC Plate Voltages = 300 volts up to frequencies of 430 Mc
When the tube is used above these limits or at high ambient temperatures, an air flow directed on the bulb and the anode seals will be necessary. The air flow should approx. be 15 l/min ≈ 3.96 gallons (US liq.) per minute.

Accessories

Ceramic Socket	Rö Fsg 3
Anode Clips	Rö Kfl 09

RS 1021

Triode with coaxial grid mounting for VHF and TV-Transmitters up to 220 Mc, particulary suitable for PA Stages in TV Transmitters of 1000 watts and for Prestages in RS 1011 equipped TV Transmitters of 10 kilowatts power output.



RS 1021 L
Weight approx. 2 kg

General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 52 amps	
Emission Current	10 amps at DC Plate Voltage = DC Grid Voltage = 300 volts	
Amplification Factor	60 at DC Plate Voltage = 1000 to 3000 volts; DC Plate Current = 1 amp	
Transconductance	30,000 µmhos at DC Plate Voltage = 3000 volts DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	32 µµF
Plate-Filament	0.2 µµF
Grid-Plate	16 µµF

Maximum Ratings

DC Plate Voltage	($f \leqq$ 30 Mc)	5000	max. volts
DC Plate Voltage	($f =$ 100 Mc)	3500	max. volts
DC Plate Voltage	($f =$ 220 Mc)	2500	max. volts
DC Cathode Current		2.5	max. amps
Peak Cathode Current		8	max. amps
Plate Dissipation (RS 1021 L)		3000	max. watts
Grid Dissipation		60	max. watts

Typical Operation

TV Transmitter PA Stage Modulation [1]
(Synchron level)

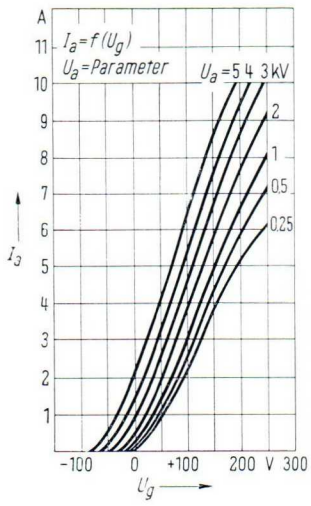
Frequencies up to	220	100	Mc
Bandwidth $2\Delta f$	6	–	Mc
Power Output	1650	3300	watts [2]
DC Plate Voltage	2200	3500	volts
DC Grid Voltage	–40	–60	volts
Peak RF Grid Voltage	180	230	volts
DC Plate Current	1.15	1.35	amps
DC Grid Current	300	320	ma
Plate Dissipation	1000	1600	watts
Driving Power	200	300	watts [2]

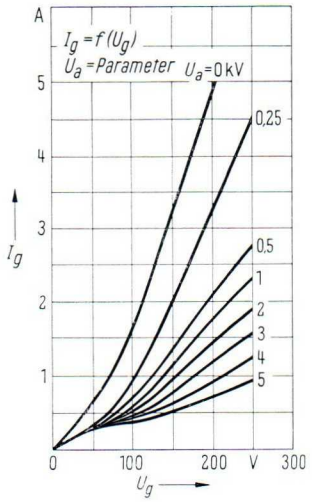
[1] Grounded-Grid Operation
[2] Transferred Power (grounded grid) included

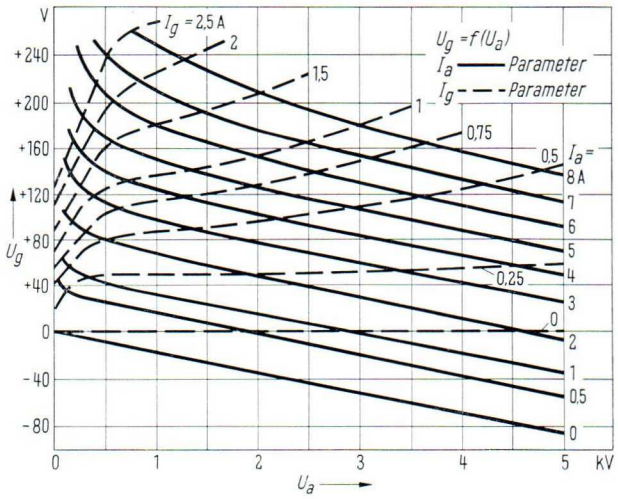
Other kinds of operation:

Pate Modulation	Frequency	≦ 30 Mc
	Carrier Power Output	= 1500 watts
	at DC Plate Voltage	= 3000 volts
Prestage modulation (Class B Telephony)	Frequency	≦ 30 Mc
	Carrier Power Output	= 1500 watts
	at DC Plate Voltage	= 5000 volts

Characteristics







Cooling

Required air flow on anode at max. plate dissipation · · · 3.5 m³/min
≈ 123.5 cubic feet per min

Static Pressure Drop . . . 55 mm of water ≈ 2.6 inches of water.

Temperature of air at outlet . . . max. 70 deg. C = 158 deg. F

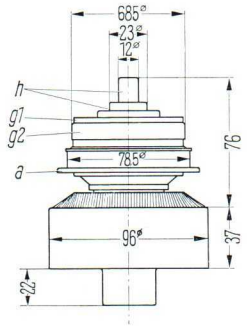
Accessories

Cathode Connectors (2 per tube)	Rö Kat 21
Coaxial Grid Connector	Rö Git 21
Air Socket (RS 1021 L)	Rö Anst 21
Tube Fuse (RS 1021 L)	Rö Sich 2

Supplementary accessories on enquiry

RS 1022 C

Tetrode for frequencies up to 900 Mc. Featuring a metal and ceramic envelope with coaxial sealing of all electrodes including filament terminals.



Weight approx. 1.4 kg

General Data

FILAMENT

Filament Voltage	6 volts	Filament Power = 220 watts
Filament Current	approx. 38 amps	at control of Filament Power
		Thoriated tungsten filament
Emission Current	7.5 amps at DC Plate Voltage = DC Screen Voltage = DC Grid Voltage = 100 volts	
Grid-Screen Amplification Factor	4 at DC Plate Voltage = 2000 volts; DC Screen Voltage = 300 to 500 volts; DC Plate Current = 1 amp	
Transconductance	17,000 µmhos at DC Plate Voltage = 2000 volts; DC Screen Voltage = 450 volts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Filament-Grid	26	µµF
Filament-Screen	3.2	µµF
Filament-Plate	0.05	µµF *
Grid-Screen	29	µµF
Grid-Plate	0.15	µµF *
Screen-Plate	19	µµF

*) measured with 30 × 30 mm grounded flat metal shield attached to the screen-grid terminal

Maximum Ratings

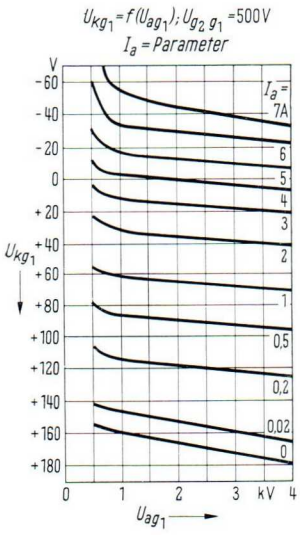
Frequencies up to	790	max. Mc
DC Plate to Grid Voltage	3800	max. volts
DC Screen to Grid Voltage	700	max. volts
DC Cathode to Grid Voltage	300	max. volts
DC Cathode Current	1.5	max. amps
Peak Cathode Current	7.5	max. amps
Plate Dissipation	3200	max. watts
Screen Dissipation	60	max. watts
Grid Dissipation	15	max. watts

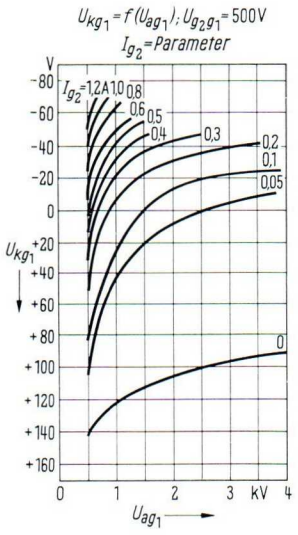
Typical Operation

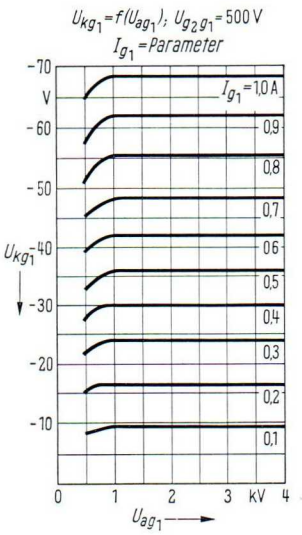
	Cathode modulated TV Video-Transmitter Grounded Grid and Screen	Frequency Modulation TV Audio-Transmitter Grounded Grid and Screen	
Frequencies up to	600	600	Mc
Bandwidth $2\Delta f$ with circuit detuning of 45 deg.	10 [1]	–	Mc
Power Output	–	2400 [2]	watts
Power Output sync. level	2500 [2] [4]	–	watts
pedestal level	1500 [2] [5]	–	watts
DC Cathode to Grid Voltage	3300	3500	volts
DC Screen to Grid Voltage	600	600	volts
DC Plated to Grid Voltage	160 [6]	160	volts
Peak Cathode to Grid Voltage	200 [6]	200	volts
DC Plate Current	1.3 [5]	1.5	amps
DC Screen Current	30 [5]	80	ma
DC Grid Current	30 [5]	80	ma
Plate Input	4100 [5]	5000	watts
Driving Power	350 [6]	300	watts [7]
Plate Dissipation	2700 [5]	2600	watts
Screen Dissipation	16 [5]	50	watts
Grid Dissipation	2 [5]	4	watts
Efficiency	–	48	%

[1] Bandwidth with secondary circuit
[2] Power Output at 90 % circuit efficiency
[3] Power Output at 85 % circuit efficiency
[4] With TV-Modulation only
[5] Pedestal level with mixed-in synchronizing level
[6] Sync. level
[7] Required power output of driver stage

Characteristics







Cooling

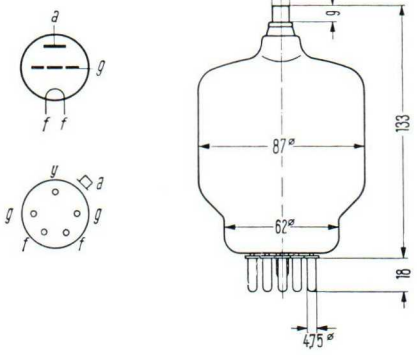
Required air flow on anode at max. plate dissipation . . .
3.6 m³/min ≈ 126 cubic feet per min
Static Pressure Drop . . . 70 mm of water ≈ 275 inches of water
Temperature of air at inlet . . . 25 deg. C = 77 deg. F
Temperature of air at outlet . . . 85 deg. C = 185 deg. F

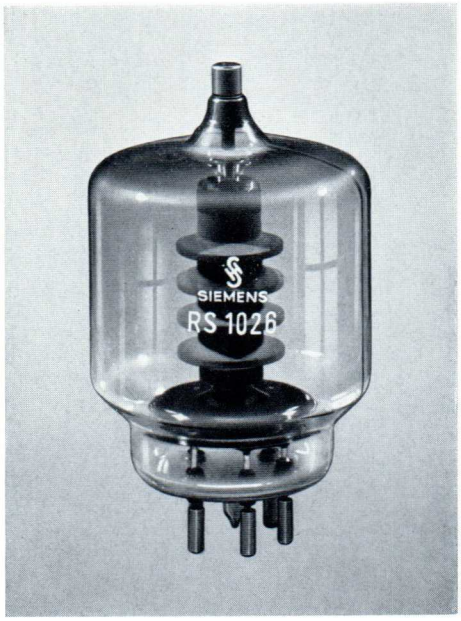
Accessories

Air Socket	Rö Anst 21

RS 1026
5867

Radiation-cooled 840-Watt Triode for Communications and Electromedical Applications, usable as RF Amplifier, Oscillator, Modulator at frequencies up to 150 Mc.





Weight approx. 0.17 kg

General Data

FILAMENT

Filament Voltage	5.0 volts	Thoriated tungsten filament
Filament Current	approx. 14 amps	DC Platte Voltage = 3000 volts
Amplification Factor	25	at DC Plate Current = 90 ma
Transconductance	5000 µmhos	DC Plate Voltage = 3000 volts

INTERELECTRODE CAPACITANCES

Grid-Filament	6.3 µµF
Plate-Filament	0.16 µµF
Grid-Plate	5.0 µµF

Maximum Ratings

DC Plate Voltage	3000	max. volts
DC Cathode Current	500	max. ma
Peak Cathode Current	3.0	max. amps
Plate Dissipation	350	max. watts
Grid Dissipation	40	max. watts
Grid Dissipation	100	max. kiloohms

Typical Operation

	RF Power Amplifier Class C		Oscillator for industrial applications [2]	
Frequencies up to	100	100	40.68	Mc
Power Output	840	585	665	watts [1]
AC Transformer Voltage	–	–	2800	volts
DC Plate Voltage	3000	2000	2500 [2]	volts
DC Grid Voltage	–250	–150	–	volts
Peak RF Grid Voltage	430	320	–	volts
Grid Resistor	–	–	3330	ohms
DC Plate Current	363	400	340	ma
DC Grid Current	69	80	60	ma
Plate Input	1090	800	935	watts
Driving Power	27	23	20	watts [1]
Plate Dissipation	250	215	250	watts
Efficiency	77	73	71	%

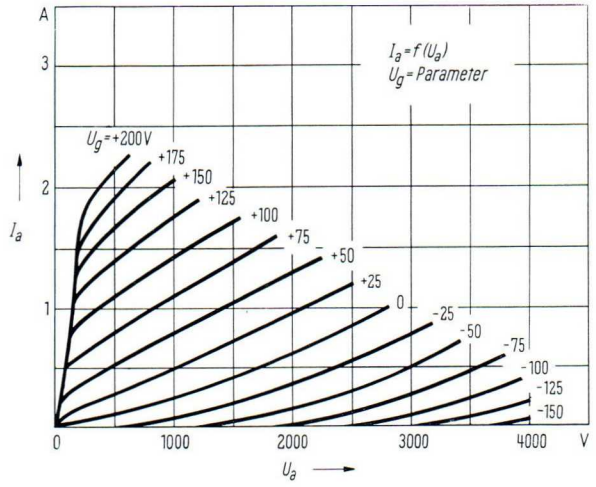
[1] Circuit losse are not included

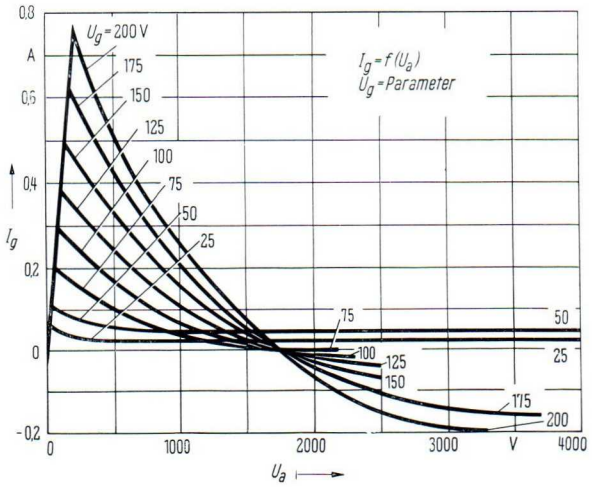
[2] With Plate Voltage from single-phase full-wave rectifier

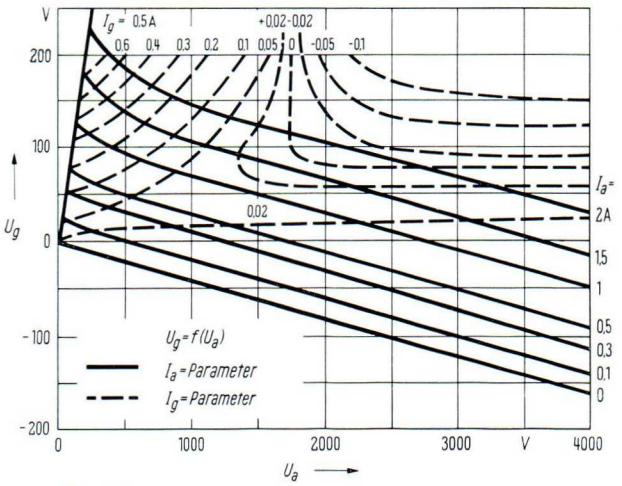
Other kind of operation

Oscillator for industrial application (self rectification)	Frequency = 40.68 Mc; Power Output = 415 watts at DC Plate Voltage = 3000 volts

Characteristics







Cooling

Temperature of Plate Seal	max. 220 deg. C = 428 deg. F
Temperature of Base	max. 180 deg. C = 356 deg. F

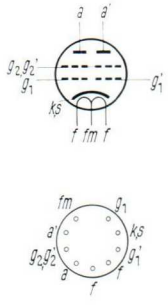
At operating frequencies above 30 Mc provision must be made for cooling the base and plate seal by a low velocity air stream.

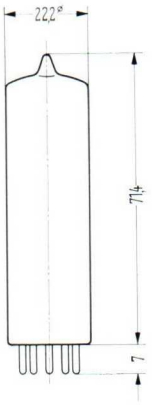
Accessories

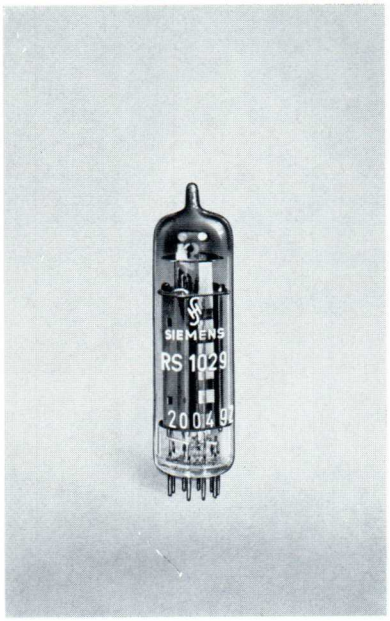
Socket	Rö Fsg 2
Heat Dissipating Plate Connector	Rö Kfl 02
Glass Air Flow Chimney	Rö Zub 02

RS 1029
6360

Radiation-cooled 14,5 Watt Double Tetrode for mobile VHF Transmitters at frequencies up to 200 Mc. Internally neutralised.







Weight approx. 0.016 kg

General Data

HEATING

Heater Voltage	6.3 resp. 12.6 volts	Heating, indirectly oxide-coated cathode
Heater Current	0.82 resp. 0.41 amp	

Grid Screen Amplification Factor	7.5 at DC Plate Current = 30 ma
Transconductance	3300 µmhos at DC Plate Current = 30 ma

INTERELECTRODE CAPACITANCES

per Section		in push-pull operation	
Input	6.2 µµF	Input	5.1 µµF
Output	2.6 µµF	Output	1.4 µµF
Grid-Plate	< 0.1 µµF		

Maximum Ratings

Heater to Cathode Voltage	100	max. volts
DC Plate Voltage (f ≦ 200 Mc)	300	max. volts
DC Screen Voltage	200	max. volts
DC Grid Voltage	–150	max. volts
DC Cathode Current	2×50	max. ma
Peak Cathode Current	2×225	max. ma
Plate Dissipation	2×5	max. watts
Screen Dissipation	2	max. watts
Grid Dissipation	2×0.2	max. watts

Typical Operation

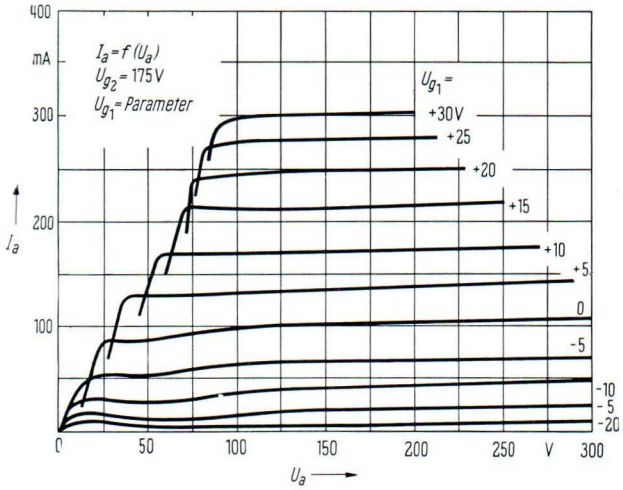
RF Power Amplifier, Class C both sections in push-pull operation

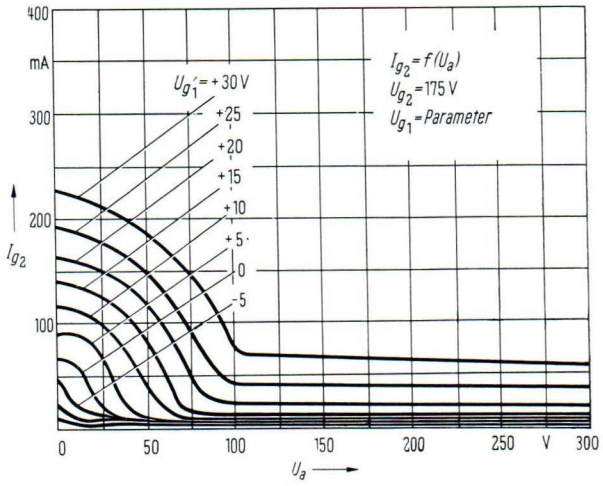
Frequencies up to	200	200	Mc
Power Output	14.5	11	watts
DC Plate Voltage	300	250	volts
DC Screen Voltage	175	–	volts
DC Grid Voltage	–40	–	volts
Peak RF Grid to Grid Voltage	110	110	volts
DC Plate Current	2×37.5	2×33.5	ma
DC Screen Current	2.3	1.8	ma
DC Grid Current	2×0.9	2.2	ma
Plate Dissipation	2×4	2×2.9	watts
Plate Input	2×11.25	2×8.4	watts
Grid Resistor	–	18,000 [1]	ohms
Efficiency	65	65	%

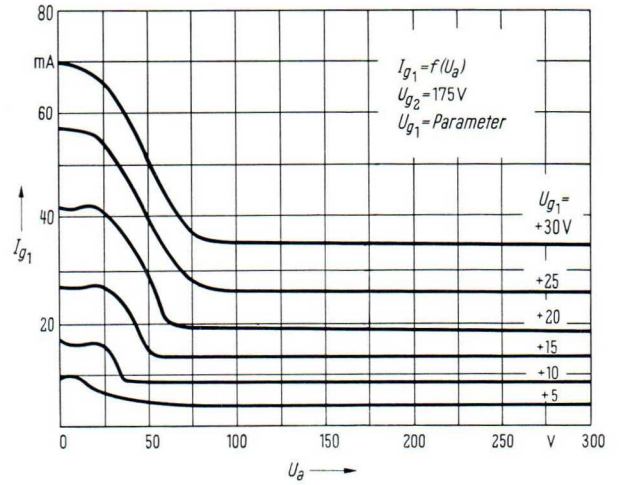
[1] Common resistor for both sections

Plate and Screen Modulation (both sections in push-pull)	Frequency	≦ 200 Mc;
	Carrier Power Output	= 8.1 watts
	at DC Plate Voltage	= 200 volts
Frequency Tripler (bot sections in push-pull)	Frequency	= 67/200 Mc;
	Power Output	= 7.8 watts
	at DC Plate Voltage	= 300 volts
AF Power Amplifier and Modulator (Class AB, both sections in push-pull)	Power Output	= 17.5 watts
	at DC Plate Voltage	= 300 volts

Characteristics







Cooling

Temperature of Bulb	max. 225 deg. C = 437 deg. F
Temperature of Base	max. 120 deg. C = 248 deg. F

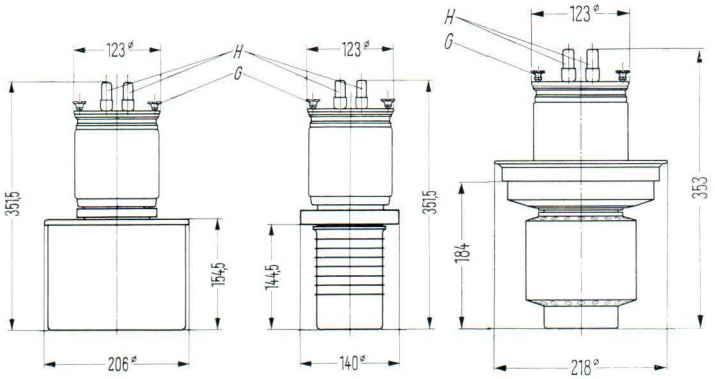
Radiation and Convection Cooling.
The use of a tight screening casing is not allowed.

Accessories

Socket	Rel stv 99c

RS 1031

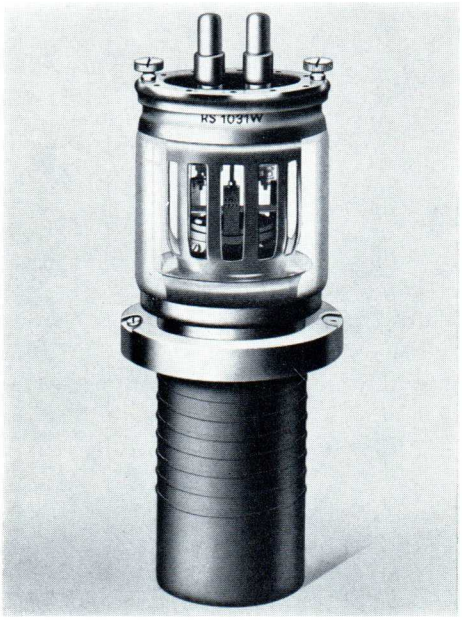
90 Kilowatt Triode with coaxial grid terminal usable as RF Amplifier, Oscillator and Modulator at frequencies up to 70 Mc.



RS 1031 L
Weight approx. 18.5 kg

RS 1031 W
Weight approx. 6 kg

RS 1031 V
Weight approx. 18.5 kg



General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 130 amps	
Emmission Current	50 amps at DC Plate Voltage = DC Grid Voltage = 600 volts	
Amplication Factor	58 at DC Plate Voltage 1000 up to 6000 volts; DC Plate Current = 1 amp	
Transconductance	56,000 µmhos at DC Plate Voltage = 3000 volts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	110 µµF
Plate-Filament	1,2 µµF
Grid-Plate	42 µµF

Maximum Ratings

	RF Power Amplifier Class C			Plate Modulation	
Frequencies up to	10	30	70	30	Mc
DC Plate Voltage	15	12	6	10	max. kilovolts
DC Grid Voltage	–1000	–1000	–800	–1000	max. volts
DC Cathode Current	12	12	12	8	max. amps
Peak Cathode Current	45	45	45	50	max. amps
Plate Dissipation (RS 1031 L)	25	25	25	25	max. kilowatts
Plate Dissipation (RS 1031 W)	25	25	25	25	max. kilowatts
Plate Dissipation (RS 1031 V)	50	50	50	50	max. kilowatts
Grid Dissipation	600	600	500	600	max. watts

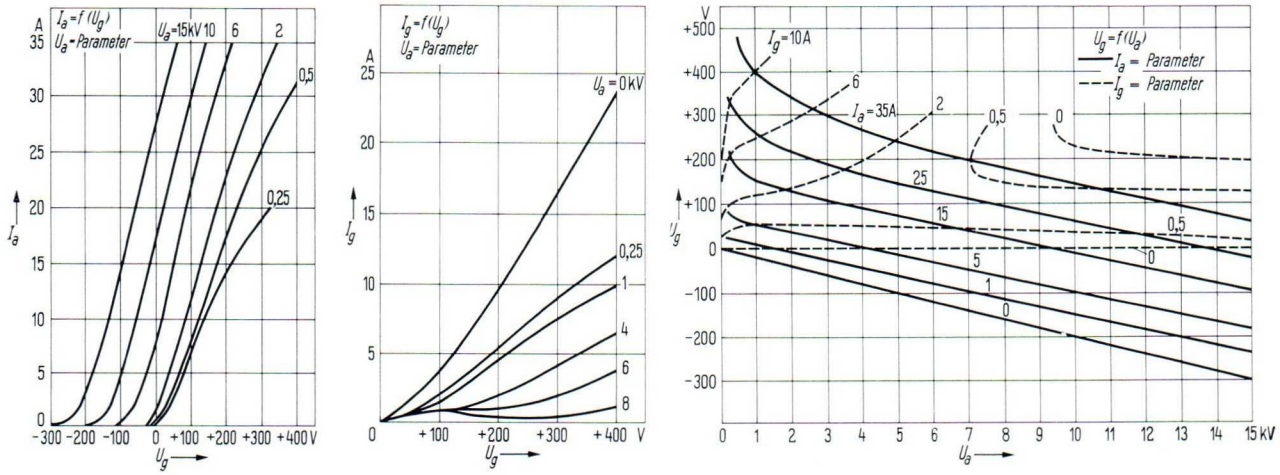
Typical Operation

	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	Mc
Power Output	90	70	–	kilowatts
Carrier Power Output	–	–	42	kilowatts
DC Plate Voltage	15	12	10	kilovolts
DC Grid Voltage,	–600	–550	–175 (fixed)	volts
Grid Resistor	–	–	150	ohms
Peak RF Grid Voltage	950	900	780	volts
DC Plate Current	7.35	7.2	5.6	amps
DC Grid Current	1.4	1.4	1.85	amps
Plate Dissipation	20	16.5	14	kilowatts
Grid Dissipation	420	410	510	watts
Driving Power	1250	1180	1350	watts

Other kinds of operation:

TV-Video-Transmitter at 70 Mc	Power Output sync.	= 30 kilowatts
Grounded Grid Operation	at DC Plate Voltage	= 5.5 kilovolts
AF Power Amplifier and Modulator	Power Output	= 116 kilowatts
(Class B, 2 tubes ins push-pull)	at DC Plate Voltage	= 12 kilovolts

Characteristics



Cooling

RS 1031 L

Required air flow on anode at max. plate dissipation . . . 25 m³/min
≈ 883 cubic feet per min
Static Pressure Drop . . . 240 mm of water ≈ 9.45 inches of water

RS 1031 W

Temperature of air at outlet for inlet air temperature
of 25 deg. C = 77 deg. F . . . max. 75 deg. C = 167 deg. F
Required water flow on anode for inlet water
temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . 35 l/min
≈ 9.25 gallons (US liq.) per min.

RS 1031 V

Particulars on request

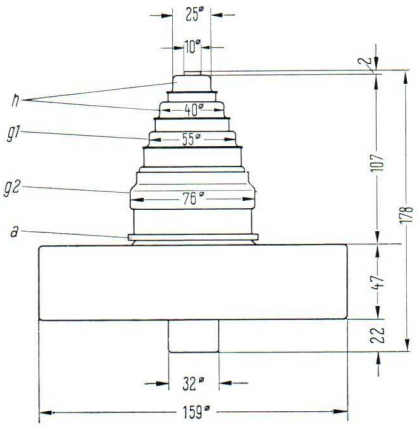
Accessories

Cathode Connectors (2 per tube)	Rö Kat 01
Air Socket (RS 1031 L)	Rö Anst 31
Water Jacket (RS 1031 W)	Rö Kü 31
Jacket for evaporative cooling (RS 1031 V)	Rö Kü V 221
Tube Fuse (RS 1031 L)	Rö Sich 3

Supplementary accessories on enquiry

RS 1032 C

Tetrode for frequencies up to 1000 Mc. With metal and ceramic envelope and coaxial sealing of all electrodes including filament terminals.



Weight approx. 4.7 kg

General Data

FILAMENT

Filament Voltage	4.1 volts	Filament Power = 530 watts
Filament Current	approx. 140 amps	at control of filament Power
		Thoriated tungsten filament

Emission Current	20 amps at DC Plate Voltage = DC Grid Voltage = DC Screen Voltage = 200 volts
Grid Screen Amplification factor	6 at DC Plate Voltage = 2000 volts; DC Screen Voltage = 300 to 500 volts; DC Plate Current = 1 amp
Transconductance	38,000 µmhos at DC Plate Voltage = 2000 volts; DC Screen Voltage = 450 volts; DC Plate Current = 1 amp

INTERELECTRODE CAPACITANCES

Measured

Filament-Grid	53 µµF
Filament-Screen	5,8 µµF
Filament-Plate	0,09 µµF *)
Grid-Screen	65 µµF
Grid-Plate	0,22 µµF *)
Screen-Plate	21 µµF

*) measured with 30 × 30 mm grounded flat metal shield attached to the screen-grid terminal

Maximum Ratings

Frequencies up to	790	max. Mc
DC Plate to Grid Voltage	5.2	max. kilovolts
DC Screen to Grid Voltage	800	max. volts
DC Cathode to Grid Voltage	300	max. volts
DC Cathode Current	3.6	max. amps [1]
Peak Cathode Current	20	max. amps
Plate Dissipation	10	max. kilowatts
Screen Dissipation	120	max. watts
Grid Dissipation	30	max. watts

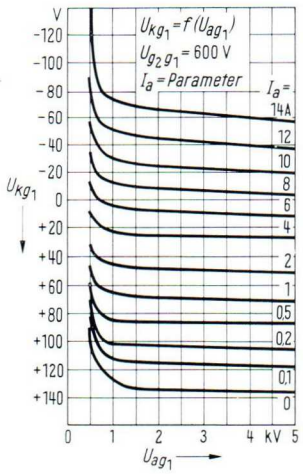
[1] Pedestal level with mixed-in synchronizing level

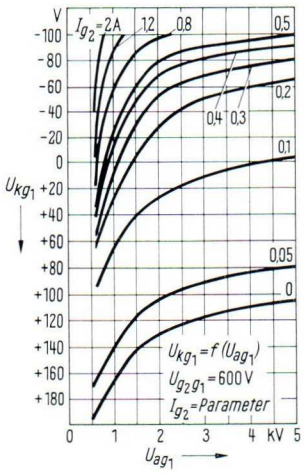
Typical Operation

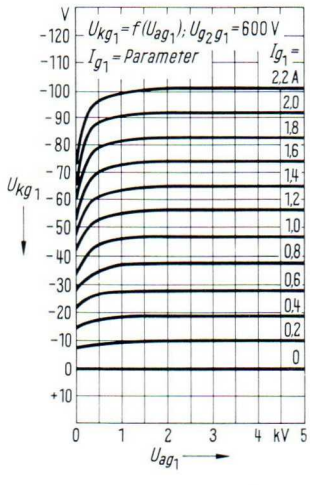
		Prestage modulated TV Video-Vransmitter Grounded Grid and Screen		Frequency Modulation TV Audio -Transmitter Grounded Grid and Screen	
Frequencies up to		790	600	790	Mc
Bandwidth 2 Δf with circuit detuning of 45 deg.		10 [1]	10 [1]	–	Mc
Power Output		–	–	5 [7] [8]	kilowatts
Power Output sync.		10 [3] [7]	11 [2] [3]	–	kilowatts
Power Output pedestal level		6 [4] [7]	6.6 [2] [4]	–	kilowatts
DC Plate to Grid Voltage		5	5	4.5	kilovolts
DC Screen to Grid Voltage		700	700	640	volts
DC Cathode to Grid Voltage		140	140	140	volts
Peak Cathode to Grid Voltage		230 [5]	210 [5]	180	volts
DC Plate Current		3 [4]	3 [4]	2.4	amps
DC Screen Current	approx.	130 [4]	100 [4]	60	ma
DC Grid Current	approx.	160 [4]	120 [4]	60	ma
Plate Input		14.5 [4]	14.5 [4]	10.5	kilowatts
Driving Power	approx.	800 [5] [6]	700 [5] [6]	400 [6])	watts
Plate Dissipation		8 [4]	7.6 [4]	5	kilowatts
Screen Dissipation	approx.	100 [4]	80 [4]	40	watts
Grid Dissipation	approx.	6 [4]	3 [4]	4	watts
Efficiency		–	–	47.5	%

[1] Bandwidth with secondary circuit
[2] Power Output at 90 % circuit efficiency
[3] With TV Modulation only
[4] Pedestal level with mixed-in synchronizing level
[5] Sync. level
[6] Required power output of driver stage
[7] Power Output at 85 % circuit efficiency
[8] For future 20/4 kw TV Transmitters

Characteristics





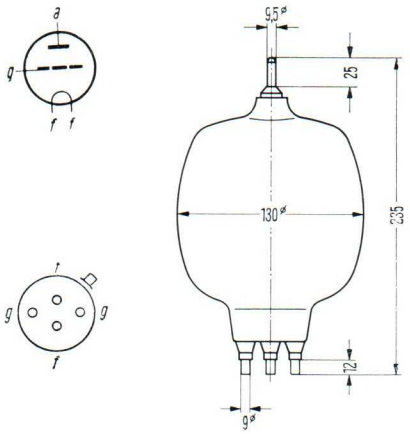


Cooling

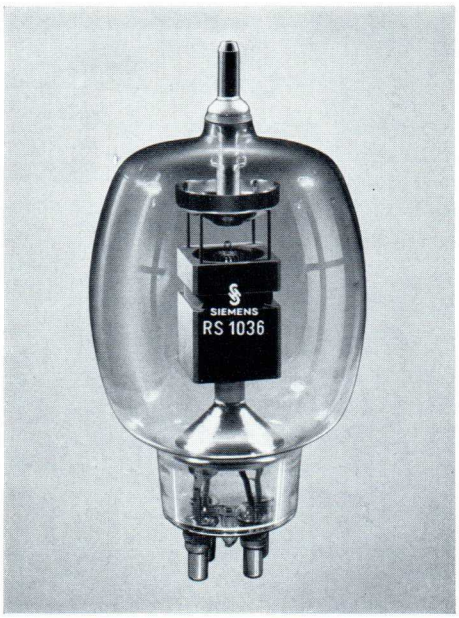
Required air flow on anode . . . 11 m³/min ≈ 390 cubic feet per min
Static Pressure Drop . . . 115 mm of water ≈ 4.52 inches of water
Temperature of air at outlet for inlet air
temperature of 25 deg. C = 77 deg. F . . . 80 deg. C = 176 deg. F

RS 1036

Radiation-cooled 1550 Watt Triode for industrial RF Applications at frequencies up to 50 Mc.



Weight approx. 0.450 kg



General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
Filament Current	approx. 32.5 amps	
Amplification Factor	21	at DC Plate Voltage = 4 kilovolts;
Transconductance	3300 µmhos	DC Plate Current = 120 ma

INTERELECTRODE CAPACITANCES

Input	7.5 µµF
Output	0.2 µµF
Grid-Plate	5.1 µµF

Maximum Ratings

	With plate voltage from three-phase half-wave rectifier without filter	With plate voltage from mains transformer (self rectification)	
Frequencies up to	50	50	max. Mc
DC Plate Voltage	7000	5000	max. volts
DC Grid Voltage	–1250	–	max. volts
Peak Grid Voltage	–	1350	max. volts
DC Plate Current	560	320	max. ma
DC Grid Current	210	110	max. ma
DC Grid Current (unloaded)	280	150	max. ma
Plate Dissipation (CCS)	500	500	max. watts
Plate Dissipation (1 sec on/4 sec off)	1000	1000	max. watts
Grid Resistor	15	15	kiloohms

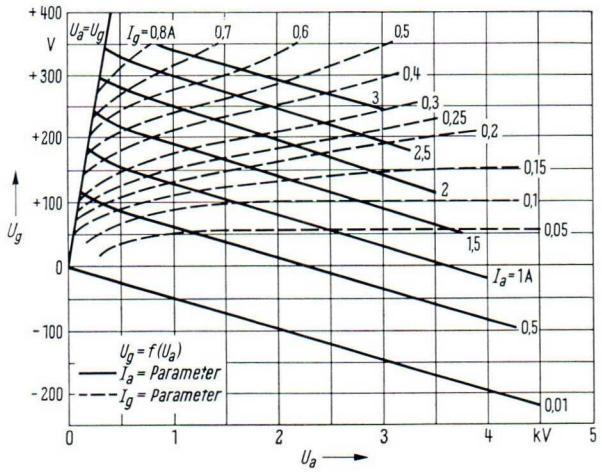
Typical Operation

Oscillator for industrial applications

	I	II	
Frequencies up to	50	50	Mc
Power Output	1640	1020	watts
AC Transformer Voltage	3400	4500	volts
DC Plate Voltage	6000	–	volts
Feedback Factor	15	18	%
Grid Resistor	4.2	2.7	kiloohms
DC Plate Current	350	280	ma
DC Plate Current (unloaded)	90	70	ma
DC Grid Current	120	80	ma
DC Grid Current (unloaded)	180	125	ma
Plate Input	2100	1400	watts
Plate Dissipation	460	380	watts
Efficiency	78	73	%

I With plate voltage from three-phase half-wave rectifier without filter
II With plate voltage from mains transformer (self rectification)

Characteristics



Cooling

Temperature of bulb	max. 350 deg. C = 662 deg. F
Temperature of seals	max. 220 deg. C = 428 deg. F

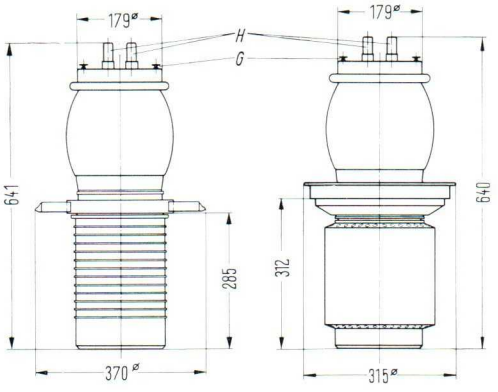
At high operating frequencies and/or nonmatched load a low velocity air stream along the bulb is necessary.

Accessories

Socket	Rö Fsg 1
Heat-Dissipating Plate Connector	Rö Kfl 02

RS 1041

360 Kilowatt Triode with coaxial grid terminal usable as RF Amplifier, Oscillator and Modulator at frequencies up to 30 Mc.



RS 1041 W
Weight approx. 32.5 kg

RS 1041 V
Weight approx. 50 kg

General Data

FILAMENT

Filament Voltage	18 volts	Thoriated tungsten filament
Filament Current	approx. 280 amps	

Emission Current	190 amps at DC Plate Voltage = DC Grid Voltage = 750 volts
Amplification Factor	55 at DC Plate Voltage = 4 up to 10 kilovolts; DC Plate Current = 5 amps
Transconductance	130,000 µmhos at DC Plate Voltage = 4 kilovolts; DC Plate Current = 5 amps;

INTERELECTRODE CAPACITANCES

Grid-Filament	240 µµF
Plate-Filament	7.5 µµF
Grid-Plate	120 µµF

Maximum Ratings

	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	Mc
DC Plate Voltage	15	12	11	max. kilovolts
DC Grid Voltage	–1200	–1200	–1000	max. volts
DC Cathode Current	40	40	30	max. amps
Peak Cathode Current	170	170	190	max. amps
Plate Dissipation (RS 1041 W)	120	120	120	max. kilowatts
Plate Dissipation (RS 1041 V)	180	180	180	max. kilowatts
Grid Dissipation	4	4	4	max. kilowatts

Typical Operation

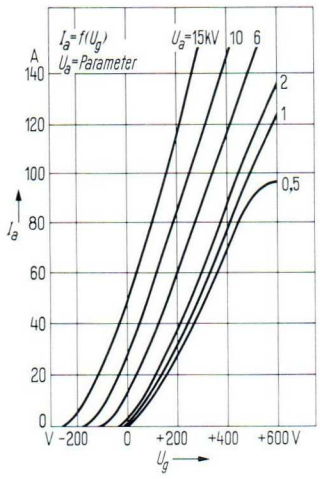
	RF Power Amplifier Class C		
Frequencies up to	10	30	Mc
Power Output	360	285	kilowatts
DC Plate Voltage	15	12	kilovolts
DC Grid Voltage	–520	–480	volts
Peak RF Grid Voltage	1090	1050	volts
DC Plate Current	29.3	29.3	amps
DC Grid Current	5.4	5.9	amps
Plate Dissipation	80	68	kilowatts
Grid Dissipation	2.7	2.9	kilowatts
Driving Power	5.5	5.7	kilowatts

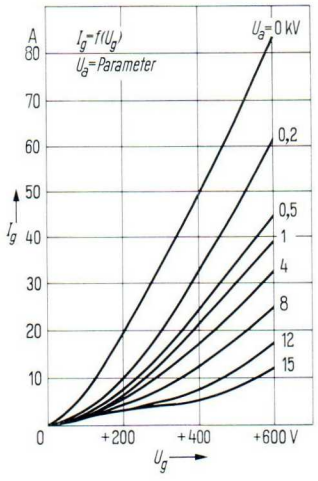
	Plate Modulation	
Frequencies up to	30	Mc
Carrier Power Output	165	kilowatts
DC Plate Voltage	11	kilovolts
DC Grid Voltage (fixed)	–170	volts
Grid Resistor	40	ohms
Peak RF Grid Voltage	1000	volts
DC Plate Current	19	amps
DC Grid Current	7.4	amps
Plate Dissipation	44	kilowatts
Grid Dissipation	3.6	kilowatts
Driving Power	7.1	kilowatts

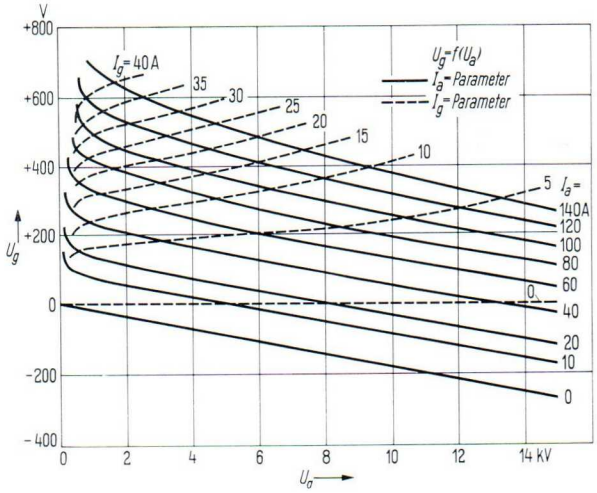
Other kinds of operation:

Prestage Modulation Class B Telephony	Frequency	≦ 30 Mc
	Carrier Power Output	= 75 kilowatts
	at DC Plate Voltage	= 12 kilovolts
AF Power Amplifier and Modulator (Class B; 2 tubes in push-pull)	Power Output	= 450 kilowatts
	at DC Plate Voltage	= 12 kilovolts

Characteristics







Cooling

RS 1041 W

Required water flow on anode for inlet water temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . . . 150 l/min ≈ 29.6 gallons (US Lip.) per min

RS 1041 V

Particulars on request

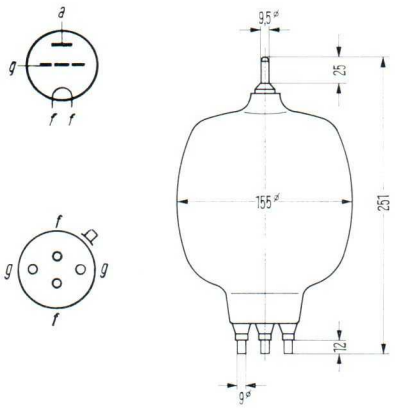
Accessories

Cathode Connectors (2 per tube)	Rö Kat 41
Water Jacket (RS 1041 W)	Rö Kü 41
Jacket for Evaporative Cooling (RS 1041 V)	Rö Kü V 41

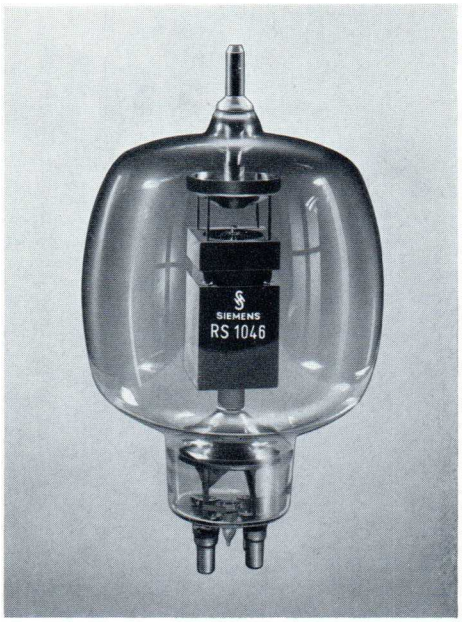
Supplementary accessories on enquiry

RS 1046
7092

Radiation-cooled 2840-Watt Triode for industrial RF Applications at frequencies up to 50 Mc.



Weight approx. 0.6 kg



General Data

FILAMENT

Filament Voltage	6.3 volts	Thoriated tungsten filament
Filament Current	approx. 32.5 amps	
Amplification Factor	22	at DC Plate Voltage = 4 kilovolts;
Transconductance	5100 μmhos	DC Plate Current = 190 ma

INTERELECTRODE CAPACITANCES

Input	9.1 μμF
Output	0.25 μμF
Grid-Plate	6.2 μμF

Maximum Ratings

	I	II	IIII	
Frequencies up to	50	50	50	max. Mc
DC Plate Voltage	7000	6300	–	max. volts
AC Transformer Voltage	–	–	5600	max. volts
DC Grid Voltage	–1250	–1250	–	max. volts
DC Plate Current	750	670	400	max. ma
DC Grid Current	300	270	160	max. ma
Plate Dissipation	800	800	800	max. watts
Grid Resistor	10	10	10	max. kiloohms

I. Oscillator for industrial application, with plate voltage from three-phase half-wave rectifier

II. Oscillator for industrial application, with plate voltage from single-phase full-wave rectifier

III. Oscillator for industrial application, with plate voltage from mains transformer (self rectification)

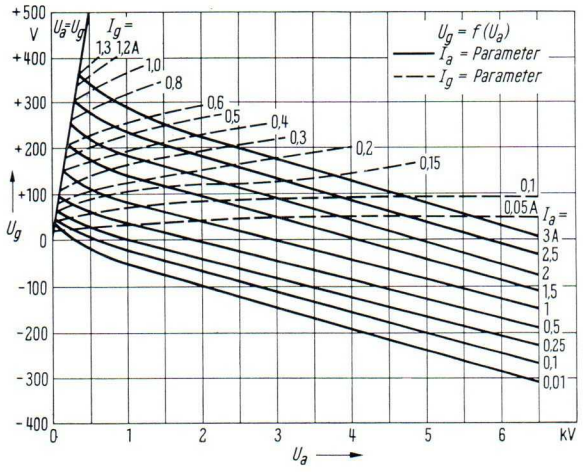
Typical Operation

Oscillator for industrial applications

	I	II	III	
Frequencies up to	50	50	50	Mc
Power Output	2840	2650	1560	watts
AC-Transformer Voltage	5100	6000	5200	volts
DC Plate Voltage	6000	5400	–	volts
Feedback Factor	13.1	13.3	17	%
Grid Resistor	3000	3000	1800	ohms
DC Plate Current	600	530	360	ma
DC Plate Current (unloaded)	120	100	90	ma
DC Grid Current	150	140	100	ma
DC Grid Current (unloaded)	260	240	140	ma
Plate Input	3600	3520	2080	watts
Plate Dissipation	760	770	520	watts
Efficiency	79	75	75	%

I. With Plate Voltage from three-phase half-wave rectifier without filter
II. With Plate Voltage from single-phase full-wave rectifier without filter
III. With Plate Voltage from mains transformer (self rectification)

Characteristics



Cooling

Temperature of Seals	max. 220 deg. C = 428 deg. F
Temperature of Bulb	max. 350 deg. C = 662 deg. F

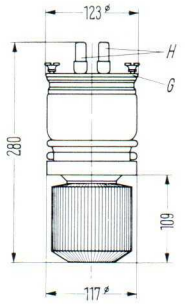
If the tube is installed in a narrow casing, sufficient cooling must be provided. Normally a small blower is sufficient.

Accessories

Socket	Rö Fsg 1
Heat Dissipating Plate Connector	Rö Kfl 02

RS 1051

15 Kilowatt-Triode with coaxial grid terminal usable as RF Amplifier and Modulator at frequencies up to 30 Mc.



Weight approx. 6 kg

General Data

FILAMENT

Filament Voltage	5.3 volts	Thoriated tungsten filament
Filament Current	approx. 135 amps	
Emission Current	30 amps at DC Plate Voltage = DC Grid Voltage = 600 volts	
Amplification Factor	45 at DC Plate Voltage = 1 to 6 kilovolts; DC Plate Current = 1 amp	
Transconductance	35,000 µmhos at DC Plate Voltage = 3 kilovolts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	65 µµF
Plate-Filament	0.6 µµF
Grid-Plate	33 µµF

Maximum Ratings

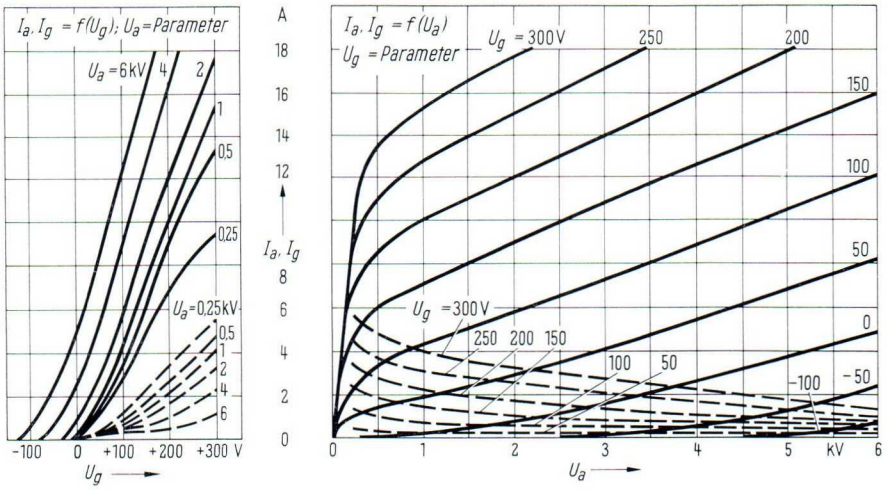
DC Plate Voltage ($f \leq 30$ Mc)	6	max. kilovolts
DC Plate Voltage at Plate Modulation	6	max. kilovolts
DC Cathode Current	6	max. amps
Peak Cathode Current	25	max. amps
Plate Dissipation	6	max. kilowatts
Grid Dissipation	250	max. watts

Typical Operation

	RF Power Amplifier Class B		
Frequencies up to	30	30	Mc
Power Output	10	15	kilowatts
DC Plate Voltage	6	6	kilovolts
DC Grid Voltage	–150	–150	volts
Peak RF Grid Voltage	340	370	volts
DC Plate Current	2.4	3.5	amps
DC Grid Current	0.5	0.8	amp
Plate Dissipation	4.5	6	kilowatts
Driving Power	170	300	watts

	Plate Voltage Modulation	
Frequencies up to	30	Mc
Carrier Power Output	10	kilowatts
DC Plate Voltage	6	kilovolts
DC Grid Voltage	–260	volts
Peak RF Grid Voltage	480	volts
DC Plate Current	2.3	amps
DC Grid Current	0.75	amp
Plate Dissipation	4	kilowatts
Driving Power	340	watts

Characteristics



Cooling

RS 1051 L

Required air flow on anode at max. plate dissipation . . . 3.3 m³/min ≈ 117 cubic feet per min
Static pressure drop 170 mm of water ≈ 6.7 inches of water
Temperature of air at outlet for inlet air temperature of
25 deg. C = 77 deg. F . . . 120 deg. C = 248 deg. F

Same type of tube for water cooling.

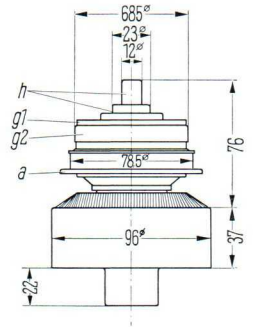
Required water flow on anode for inlet water temperature of
20 deg. C = deg. F at max. plate dissipation . . . 8 l/min
≈ 2.1 gallons (U.S. Liq.) per min

Accessories

Cathode Connectors (2 per tube)	Rö Kat 01
Coaxial Grid Connector	Rö Git 01

RS 1052 C

Tetrode for frequencies up to 1000 Mc. Featuring a metal and ceramic envelope with coaxial sealing of all electrodes including filament terminals.



Weight approx. 1.4 kg

General Data

FILAMENT

Filament Voltage	3.2 volts	Filament Power = 250 watts at control of Filament Power
Filament Current	approx. 80 amps	Thoriated tungsten filament
Emission Current	7.5 amps at DC Plate Voltage = DC Screen Voltage = DC Grid Voltage = 120 volts;	
Grid-Screen Amplification Factor	4 at DC Plate Voltage = 2 kilovolts; DC Screen Voltage = 300 to 500 volts; DC Plate Current = 1 amp	
Transconductance	17,000 µmhos at DC Plate Voltage = 2 kilovolts; DC Screen Voltage = 450 volts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Filament-Grid	28 µµF	Grid-Screen	30 µµF
Filament-Screen	3 µµF	Grid-Plate	0.17 µµF *)
Filament-Plate	0.05 µµF *)	Screen-Plate	19 µµF

*) measured with 30 × 30 mm grounded flat metal shield attached to the screen-grid terminal

Maximum Ratings

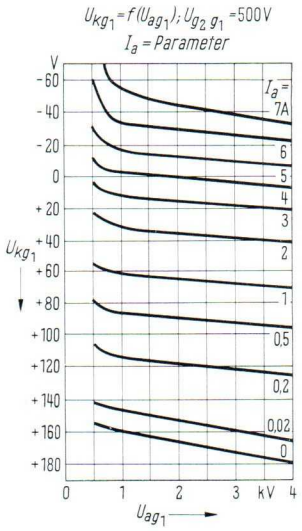
Frequency up to	790	max. Mc
DC Plate to Grid Voltage	3.8	max. kilovolts
DC Screen to Grid Voltage	700	max. volts
DC Cathode to Grid Voltage	300	max. volts
DC Cathode Current	1.5	max. amps
Peak Cathode Current	7.5	max. amps
Plate Dissipation	3.5	max. kilowatts
Screen Dissipation	70	max. watts
Grid Dissipation	15	max. watts

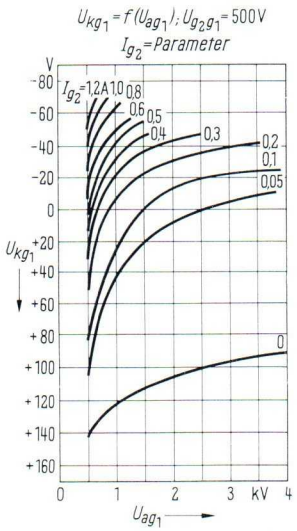
Typical Operation

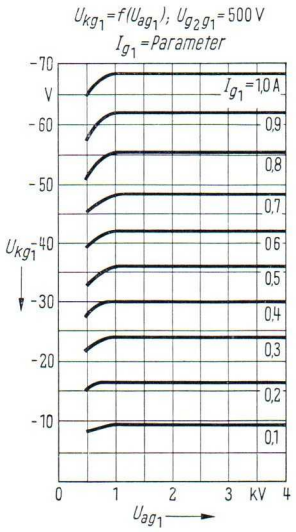
		Cathode modulated TV-Video-Transmitter Grounded Grid and Screen		Frequency Modulation TV-Audio-Transmitter Grounded Grid and Screen		
Frequencies up to		600	790	600	790	Mc
Bandwidth 2 Δf with circuit detuning of 45 deg.		10 [1]	10 [1]	–	–	Mc
Power Output				2.4 [2]	2.2 [3]	kilowatts
Power output, syn. level		2.5 [2] [4]	2.2 [3] [4]	–	–	kilowatts
Power Output, pedestal level		1.5 [2] [5]	1.32 [3] [5]	–	–	kilowatts
DC Plate to Grid Voltage		3.3	3.3	3.5	3.5	kilovolts
DC Screen to Grid Voltage		600	600	600	600	volts
DC Cathode to Grid Voltage		160 [5]	160 [5]	160	160	volts
Peak Cathode to Grid Voltage		200	220	200	220	volts
DC Plate Current		1.3 [5]	1.3 [5]	1.5	1.5	amps
DC Screen Current	approx.	30 [5]	30 [5]	80	100	ma
DC Grid Current	approx	30 [5]	50 [5]	60	80	ma
Plate Input		4.1 [5]	4.1 [5]	5	5	kilowatts
Driving Power	approx.	350 [6] [7]	400 [6] [7]	300 [7]	400 [7]	watts
Plate Dissipation		2.7 [5]	2.9 [5]	2.6	2.8	kilowatts
Screen Dissipation	approx.	16 [5]	20 [5]	50	60	watts
Grid Dissipation	approx.	2 [5]	4 [5]	4	6	watts
Efficiency		–	–	48	44	%

[1] Bandwidth with secondary circuit
[2] Power Output at 90 % circuit efficiency
[3] Power Output at 85 % circuit efficiency
[4] With TV-modulation only
[5] Pedestal level with mixed-in synchronizing level
[6] Synchron level
[7] Required power output of driver stage

Characteristics







Cooling

Required air flow on anode at max. plate dissipation . . .
3.5 m³/min ≈ 123.5 cubic feet per min

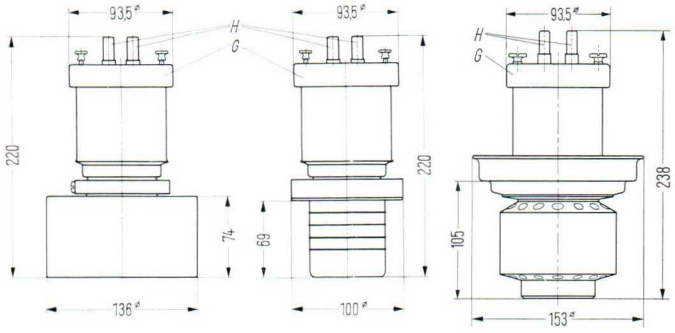
Static Pressure Drop. . . . 70 mm of water
≈ 2.75 inches of water

Temperature of air at inlet 25 deg. C = 77 deg. F

Temperature of air at outlet 75 deg. C = 167 deg. F

RS 1061

15 Kilowatt Triode with coaxial grid terminal for industrial RF Generators for frequencies up to 30 Mc.



RS 1061 L
Weight approx. 4.5 kg

RS 1061 W
Weight approx. 2 kg

RS 1061 V
Weight approx. 4.1 kg

General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 52 amps	
Emission Current	15 amps at DC Plate Voltage = DC Grid Voltage = 750 volts	
Amplification Factor	50 at DC Plate Voltage = 2 to 6 kilovolts, DC Plate Current = 1 amp	
Transconductance	14,000 μmhos at DC Plate Voltage = 3 kilovolts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	37 μμF
Plate-Filament	1 μμF
Plate-Grid	17 μμF

Maximum Ratings

DC Plate Voltage	($f \leqq 30$ Mc)	= 12	max. kilovolts
DC Plate Voltage	(mean value of three phase half-wave rectifier without filter)	= 10	max. kilovolts
DC Cathode Current		= 3.5	max. amps
Peak Cathode Current		= 15	max. amps
Plate Dissipation	(RS 1061 L and RS 1061 W)	= 8	max. kilowatts
Plate Dissipation	(RS 1061 V)	= 12	max. kilowatts
Grid Dissipation		= 300	max. watts

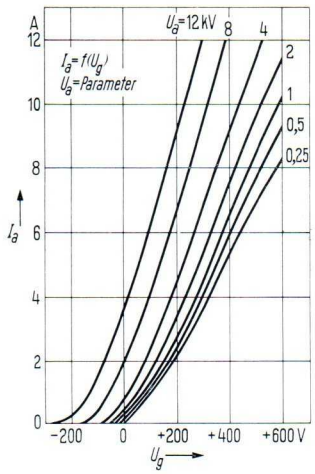
Typical Operation

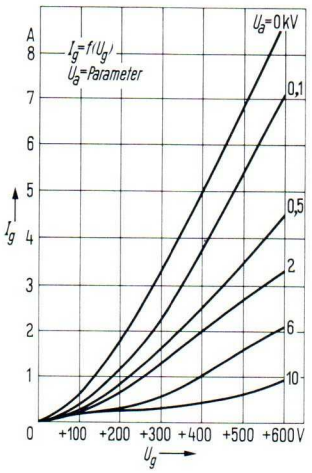
Oscillator for industrial application with plate voltage from three-phase half-wave rectifier without filter

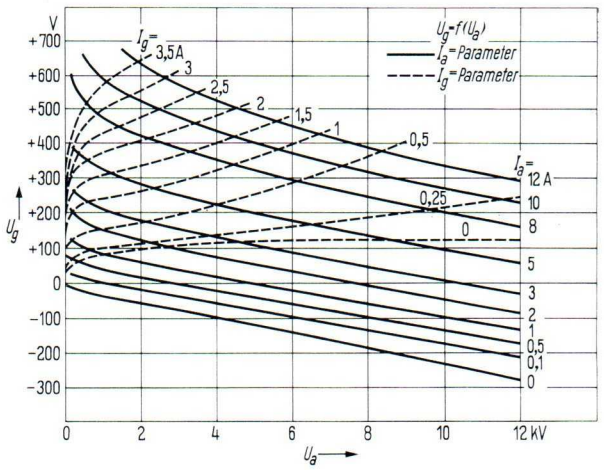
Frequencies up to	30	30	Mc
Power Output	15	7	kilowatts
DC Plate Voltage	9	6	kilovolts [1]
Peak RF Grid Voltage	1070	790	volts [2]
Feedback Factor	10.5	11.7	%
DC Plate Current	2.1	1.5	amps
DC Grid Current	0.6	0.5	amp
Grid Resistor	660	600	ohms
Plate Dissipation	4	2	kilowatts
Grid Dissipation	245	155	watts
Driving Power	490	285	watts

[1] average value
[2] During peak of AF Plate Voltage

Characteristics







Cooling

RS 1061 L

Required air flow on anode at max. plate dissipation . . . 8 m³/min
= 282.5 cubic feet per min

Static Pressure Drop . . . 85 mm of water
≈ 3.35 inches of water

Temperature of air at outlet . . . max. 80 deg. C
= 176 deg. F

RS 1061 W

Required water flow on anode for inlet water temperature of
20 deg. C = 68 deg. F at max. plate dissipation . . . 10 l/min
≈ 2.7 gallons (Us. liq.) per min

RS 1061 V

Particulars on request

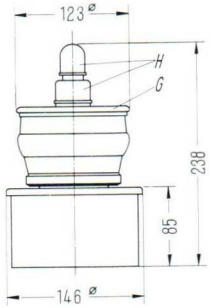
Accessories

Cathode Connectors (2 per tube)	Rö Kat 61
Air Socket (RS 1061 L)	Rö Anst 61
Water Jacket (RS 1061 W)	Rö Kü 61
Jacket for evaporative cooling (RS 1061 V)	Rö Kü V 61
Tube Fuse (RS 1061 L)	Rö Sich 1

Supplementary accessories on enquiry

RS 1071 L

Triode for 6.5 Kilowatt VHF and 3.5 Kilowatt-TV-Transmitters with coaxial sealing of all electrodes at frequencies up to 220 Mc.



Weight approx. 8 kg

General Data

FILAMENT

Filament Voltage	5 volts	Thoriated tungsten filament
FilamentCurrent	approx.80 amps	
Emission Current	12 amps at DC Plate Voltage = DC Grid Voltage = 300 volts	
Amplification Factor	60 at DC Plate Voltage = 1 to 4 kilovolts; DC Plate Current = 1 amp	
Transconductance	38,000 µmhos at DC Plate Voltage = 4 kilovolts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	67 µµF
Plate-Filament	0.4 µµF
Grid-Plate	24 µµF

Maximum Ratings

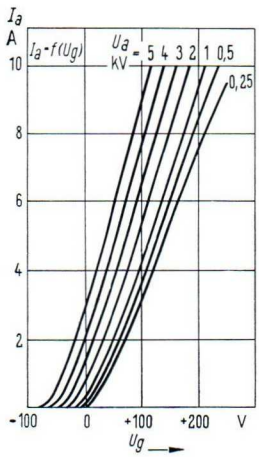
DC Plate Voltage	($f \leqq 100$ Mc)	5 max. kilovolts
DC Plate Voltage	($f \leqq 220$ Mc)	2.8 max. kilovolts
DC Cathode Current		4 max. amps
Peak Cathode Current		12 max. amps
Plate Dissipation		5 max. kilowatts
Grid Dissipation	($f \leqq 100$ Mc)	175 max. watts
Grid Dissipation	($f \leqq 220$ Mc)	125 max. watts

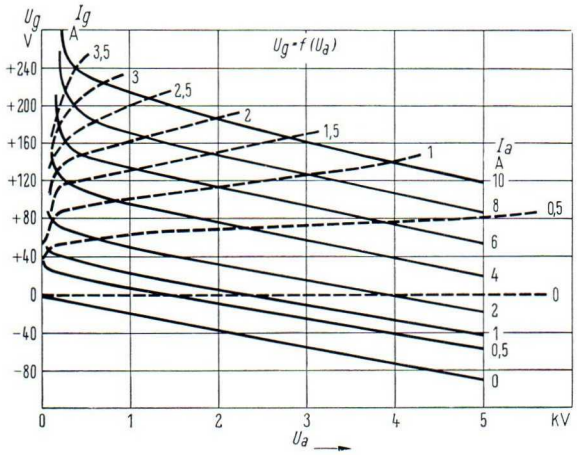
Typical Operation

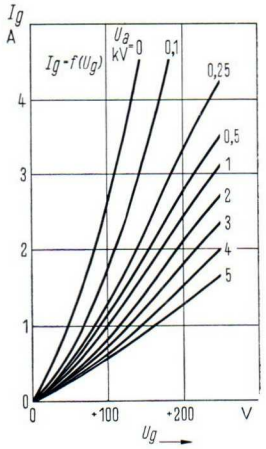
	TV Transmitter PA Stage Modulation [1] (Synchron level)	
Frequencies up to	220	Mc
Bandwidth 2 Δf with circuit detuning of 45 deg.	6	Mc
Power Output	3.5	kilowatts [2]
DC Place Voltage	2.8	kilovolts
DC Grid Voltage	–50	volts
Peak RF Grid Voltage	200	volts
DC Plate Current	1.95	amps
DC Grid Current	0.55	amp
Plate Dissipation	2	kilowatts
Driving Power	360	watts [2]

[1] Grounded Grid Operation
[2] Transferred Power (grounded grid) included

Characteristics







Cooling

RS 1071 L

Required air flow on anode at max. plate dissipation 5 m³/min
≈ 176.5 cubic feet per min

Static Pressure Drop . . . 65 mm of water
≈ 2.56 inches of water

Temperature of air at outlet . . . max. 78 deg. C = 172.4 deg. F

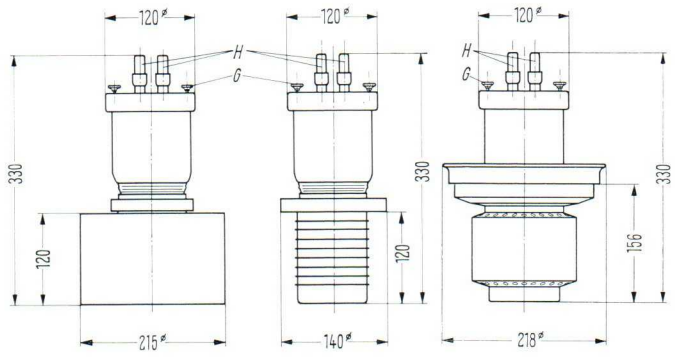
Accessories

Coaxial Cathode Connector	Rö Kat 11
Coaxial Grid Connector	Rö Git 01
Air Socket (RS 1071 L)	Rö Anst 71
Tube Fuse (RS 1071 L)	Rö Sich 1

Supplementary accessories on enquiry

RS 1081

45 Kilowatt Triode with coaxial grid terminal especially for application in industrial RF Generators at frequencies up to 30 Mc.



RS 1081 L
Weight approx. 15 kg

RS 1081 W
Weight approx. 5.3 kg

RS 1081 V
Weight approx. 13 kg

General Data

FILAMENT

Filament Voltage	8 volts	Thoriated tungsten filament
Filament Current	approx. 115 amps	
Emission Current	30 amps at DC Plate Voltage = DC Grid Voltage = 450 volts	
Amplification Factor	45 at DC Plate Voltage = 1 to 6 kilovolts; DC Plate Current = 1 amp	
Transconductance	35,000 µmhos at DC Plate Voltage = 3 kilovolts DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	80 µµF
Plate-Filament	1 µµF
Grid-Plate	33 µµF

Maximum Ratings

		RF Power Amplifier Class C		Plate Modulation	
Frequencies up to		10	30	30	Mc
DC Plate Voltage		15	12	10	max. kilovolts
DC Grid Voltage		–1000	–1000	–1000	max. volts
DC Cathode Current		8	8	8	max. amps
Peak Cathode Current		30	30	30	max. amps
Plate Dissipation	(RS 1081 L)	20	20	20	max. kilowatts
Plate Dissipation	(RS 1081 W)	20	20	20	max. kilowatts
Plate Dissipation	(RS 1081 V)	45	45	45	max. kilowatts
Grid Dissipation		500	500	500	max. watts

Typical Operation

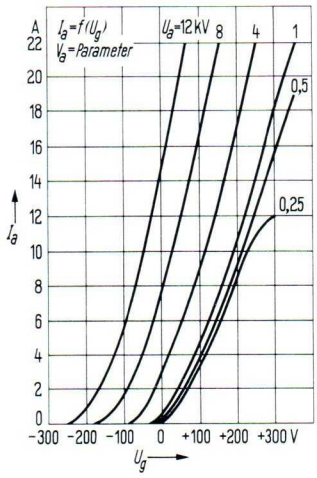
	RF Power Amplifier Class C			Plate Modulation	
Frequencies up to	30	30	30	30	Mc
Power Output	45	35	26	–	kilowatts
Carrier Power Output	–	–	–	22	kilowatts
DC Plate Voltage	12	10	8	10	kilovolts
DC Grid Voltage	–450	–415	–380	–195	volts
Grid Resistor	–	–	–	300	ohms
Peak RF-Grid Voltage	780	740	700	775	volts
DC Plate Current	4.6	4.4	4.2	2.75	amps
DC Grid Current	0.95	0.95	0.95	1	amps
Plate Input	55.2	44	33.6	27.5	kilowatts
Driving Power	685	650	610	725	watts
Plate Dissipation	10.2	9	7.6	5.5	kilowatts
Grid Dissipation	260	255	250	230	watts
Efficiency	81.5	79.5	77.5	80	%
Plate Load Resistance	1395	1210	1000	2230	ohms
Modulation Factor	–	–	–	100	%
Modulation Power	–	–	–	13.75	kilowatts

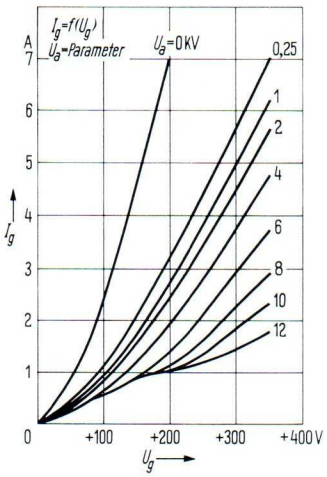
Other kinds of operation:

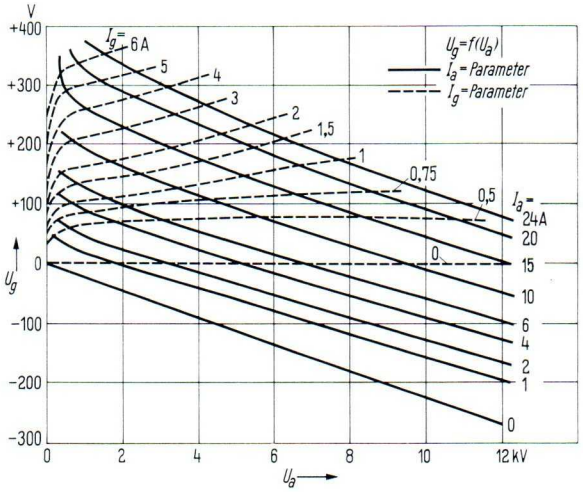
AF Power Amplifier and Modulator (Class B, 2 tubes in push-pull): Power Output = 60 kilowatts at DC Plate Voltage = 10 kilovolts

Oscillator for industrial applications, (With plate voltage from three-phase half-wave rectifier): Frequency ≦ 30 Mc; Power Output = 33 kilowatts at DC Plate Voltage = 10 kilovolts

Characteristics







Cooling

RS 1081 L

Required air flow on anode
at max. plate dissipation . . . 24 m³/min ≈ 847 cubic feet per min
Static Pressure Drop . . . 75 mm of water ≈ 2.95 inches of water
Temperature of air outlet . . . max. 70 deg. C = 158 deg. F

RS 1081 W

Required water flow on anode for inlet water temperature of 20 deg. C=68 deg. F
at max. plate dissipation . . . 30 l/min ≈ 8 gallons (US liq.) per min
Outlet temperature · · · 65 deg. C = 149 deg. F

RS 1081 V Particulars on request

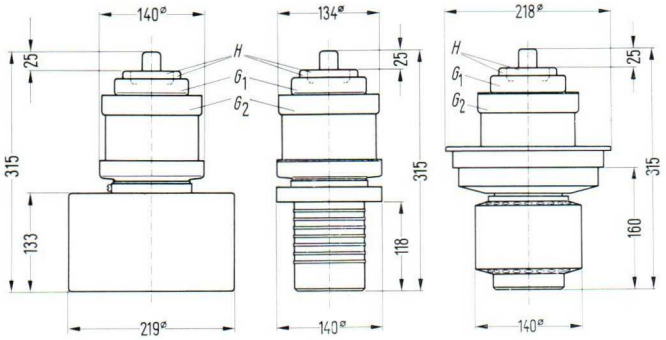
Accessories

Cathode Connectors (2 per tube)	Rö Kat 01
Air Socket (RS 1081 L)	Rö Anst 81
Water Jacket (RS 1081 W)	Rö Kü 81
Jacket for evaporative cooling (RS 1081 V)	Rö Kü V 221
Tube Fuse (RS 1081 L)	Rö Sich 1

Supplementary accessories on enquiry

RS 1082 C

Tetrode for frequencies up to 250 Mc.
Featuring a metal and ceramic envelope with coaxial sealing of all electrodes including filament terminals. Particularly designed for single sideband commercial communications transmitters.



RS 1082 CL Weight approx. 13.5 kg
RS 1082 CW Weight approx. 7 kg
RS 1082 CV Weight approx. 14.5 kg

General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 200 amps	

Emission Current	70 amps at DC Plate Voltage = DC Screen Voltage = DC Grid Voltage = 500 volts
Grid-Screen Amplification	Factor 6 at DC Plate Voltage 3000 volts, DC Screen Voltage = 800 up to 1200 volts, DC Plate Current = 2.5 amps
Transconductance	60,000 µmhos at DC Plate Voltage = 3000 volts, DC Screen Voltage = 1200 volts, DC Plate Current = 2 up to 3 amps

INTERELECTRODE CAPACITANCES

Grid-Filament	110 µµF	Grid-Plate	1.3 µµF *)
Grid-Screen	150 µµF	Plate-Filament	0.2 µµF *)
Screen-Filament	10 µµF	Screen-Plate	40 µµF

*) measured with 40 × 40 mm grounded flat metal shield attached to the screen-grid terminal

Maximum Ratings

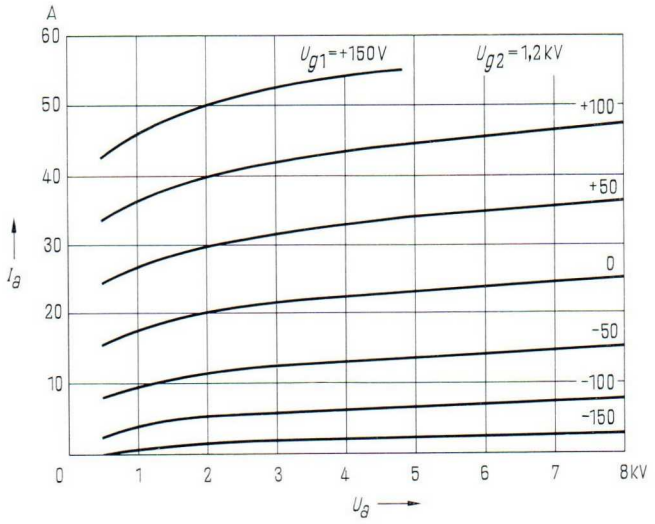
DC Plate Voltage	10	max. kilovolts
DC Screen Voltage	1400	max. volts
DC Grid Voltage	–250	max. volts
Peak Cathode Current	70	max. amps
Plate Dissipation (RS 1082 CL)	25	max. kilowatts
Plate Dissipation (RS 1082 CW)	30	max. kilowatts
Plate Dissipation (RS 1082 CV)	45	max. kilowatts
Grid Dissipation	300	max. watts
Screen Dissipation	600	max. watts

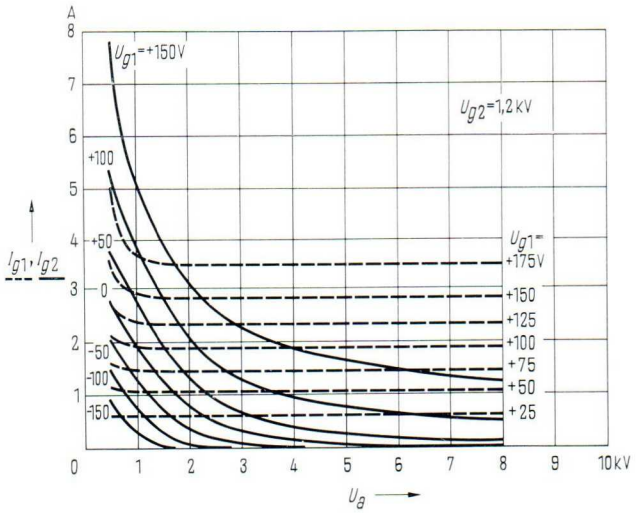
Typical Operation

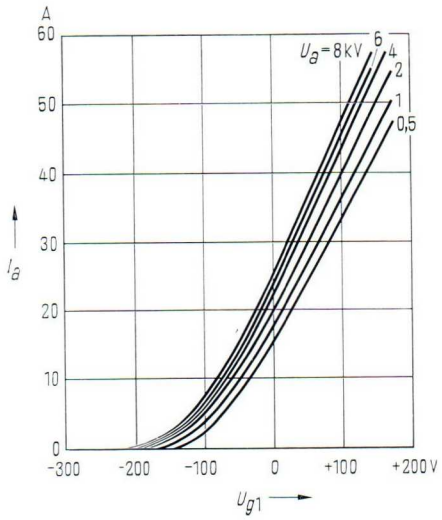
RF-Linear Power Amplifier, SSB Modulation,
Frequency = 30 Mc, Grid Current = 0

Modulation:	without	one tone	two tone	
Power Output	0	30	15	kilowatts
DC Plate Voltage	8	8	8	kilovolts
DC Screen Voltage	1200	1200	1200	volts
DC Grid Voltage	–190	–190	–190	volts
Peak RF Grid Voltage	0	190	190	volts
DC Plate Current	2	5.9	3.8	amps
Plate Input	16	47.2	29.6	kilowatts
Plate Dissipation	16	17.2	14.6	kilowatts
Efficiency	0	63.5	50.5	%
3rd Order Intermodulation products referred to signal level			41	dB
5th Order Intermodulation products reffered to signal level			54	dB

Characteristics







Cooling

RS 1082 CL

Required air flow on anode . . . 25 m³/min = 882 cubic feet per min.
Static Pressure Drop . . . 77 mm of water ≈ 3.03 inches of water
Temperature of air at outlet for inlet air temperature of
25 deg. C = 77 deg. F . . . 80 deg. C = 176 deg. F

RS 1082 CW

Required water flow on anode for inlet water temperature of
20 deg. C = 68 deg. F at max. plate dissipation . . . 45 l/min ≈12 gallons (US liq) per min
Water outlet temperature 30 deg. C = 86 deg. F

RS 1082 CV

Particulars on request

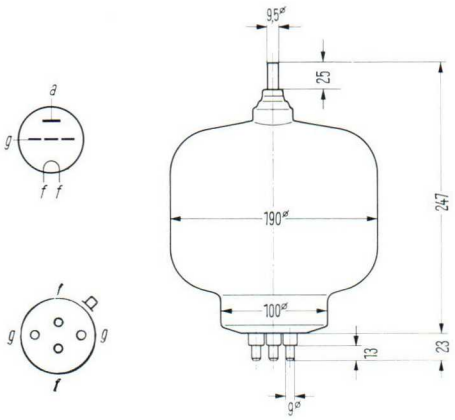
Accessories

Cathode Connectors	
Inner Part	Rö Kat 82 a
External Part	Rö Kat 82 b
Grid Connector	Rö Git 82 a
Screen Connector	Rö Git 82 b
Air Socket (RS 1082 CL)	Rö Anst 82
Water Jacket (RS 1082 CW)	Rö Kü 81
Jacket for evaporative cooling (RS 1082 CV)	Rö Kü V 221

Supplementary accessories on enquiry

RS 1091

Radiation-cooled 5.5 Kilowatt Triode for Industrial Applications, usable as RF Amplifier and Oscillator at frequencies up to 50 Mc.



Weight approx. 1.3 kg

General Data

FILAMENT

Filament Voltage	6.3 volts	Thoriated tungsten filament
Filament Current	approx. 50 amps	
Emission Current	10 amps at DC Plate Voltage = DC Grid Voltage = 450 volts	
Amplification Factor	24 at DC Plate Voltage = 1 to 3 kilovolts; DC Plate Current = 300 ma	
Transconductance	11,000 µmhos at DC Plate Voltage = 3 kilovolts; DC Plate Current = 300 ma	

Capacitances

Grid-Filament	29 µµF
Plate Filament	0.88 µµF
Grid-Plate	13.5 µµF

Maximum Ratings

	With plate voltage from three phase half-wave rectifier without filter	With plate voltage from mains transformer (self rectification)	
Frequencies up to	50	50	max. Mc
Peak AF Plate Voltage	7.25	7.8	max. kilovolts
Transformer Voltage	5.15	5.5	max. kilovolts
DC Plate Voltage	6 [1]	–	max. kilovolts
DC Grid Voltage	–650	–650	max. volts
DC Cathode Current	1.3	0.8	max. amps
Peak Cathode Current	10	10	max. amps
Plate Dissipation	1.2	1.2	max. kilowatts
Grid Dissipation	150	150	max. watts

[1] mean value

Typical Operation

Oscillator for Industrial Applications

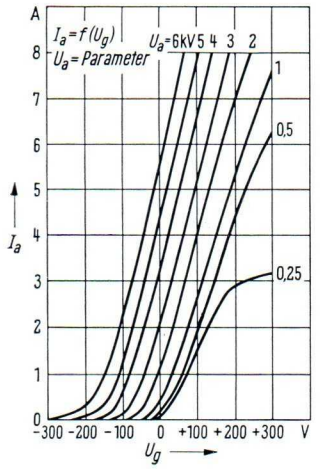
	With plate voltage from three phase half-wave rectifier	With plate voltage from mains transformer (self rectification)		
Frequencies up to	30	30	30	Mc
Power Output	4.3	2.5	1.85	kilowatts
DC Plate Voltage	6	–	–	kilovolts [2]
Peak AF Plate Voltage	–	7.02	5.65	kilovolts [1]
Transformer Voltage	5.3	5	4	kilovolts
Peak RF Grid Voltage	740	715	665	volts [3]
Feedback Factor	11	10.9	12.9	%
DC Plate Current	900	595	575	ma
DC Grid Current	120	115	120	ma
Grid Resistor	2	1.1	0.9	kiloohms
Peak Cathode Current	–	8.6	8.6	amps [3]
Plate Input	5.6	3.3	2.55	kilowatts
Driving Power	120	60	60	watts
Plate Dissipation	950	740	640	watts
Grid Dissipation	25	24	26	watts
Efficiency	78	75.5	72.5	%
Plate Load Resistance	1.6	2.15	1.75	kiloohms

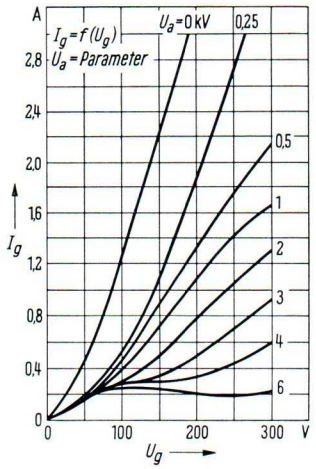
[1] AF-peak value
[2] Mean value
[3] during peak of AF plate voltage

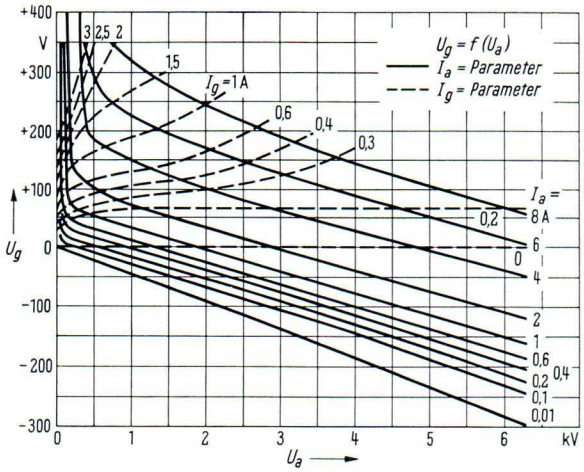
Other kinds of operation:

RF Power Amplifier	Frequency	≦ 30 Mc
Class C	Power Output	= 5.5 kilowatts
	at DC Plate Voltage	= 6 kilovolts

Characteristics







Cooling

Temperature of Plate Seal	max. 220 deg. C = 428 deg. F
Temperature of Base	max. 180 deg. C = 356 deg. F
Temperature of Bulb	max. 350 deg. C = 662 deg. F

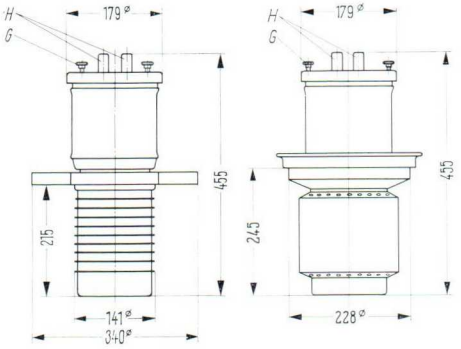
At higher frequencies and high dissipation an evenly distributed air stream is necessary.

Accessories

Socket	Rö Fsg 1
Heat Dissipating Plate Connector	Rö Kfl 91
Glass Air-Flow Chimney	Rö Zub 91

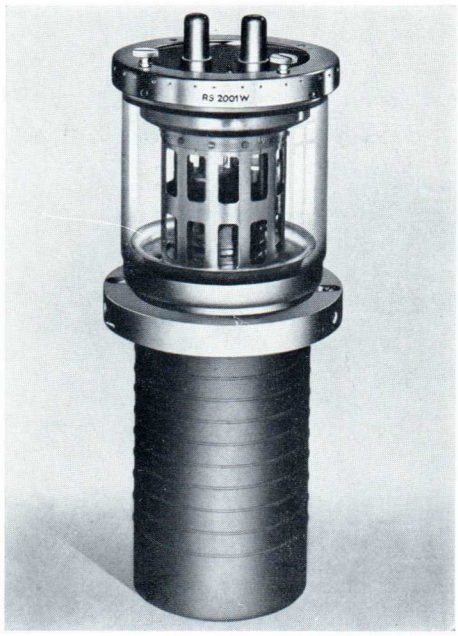
RS 2001

200 Kilowatt Triode with coaxial grid terminal usable as RF Amplifier, Oscillator and Modulator at frequencies up to 30 Mc.



RS 2001 W
Weight approx. 17 kg

RS 2001 K
Weight approx. 34 kg



General Data

FILAMENT

Filament Voltage	18 volts	Thoriated tungsten filament
Filament Current	approx. 164 amps	
Emission Current	125 amps at DC Plate Voltage = DC Grid Voltage = 750 volts	
Amplification Factor	50 at DC Plate Voltage = 4 to 10 kilovolts; DC Plate Current = 5 amps	
Transconductance	115,000 μmhos at DC Plate Voltage = 4 kilovolts; DC Plate Current = 5 amps	

INTERELECTRODE CAPACITANCES

Grid-Filament	170 μμF
Plate-Filament	4 μμF
Grid-Plate	68 μμF

Maximum Ratings

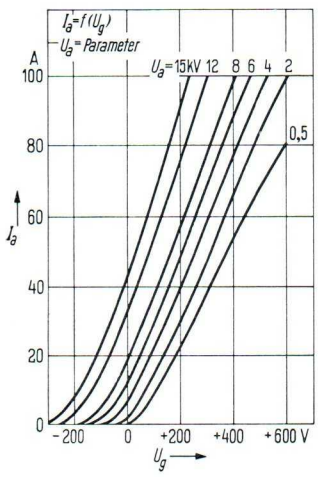
	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	max. Mc
DC Plate Voltage	15	12	11,5	max. kilovolts
DC Grid Voltage	–1000	–1000	–1000	max. volts
DC Cathode Current	30	30	20	max. amps
Peak Cathode Current	100	100	125	max. amps
Plate Dissipation (RS 2001 W)	60	60	60	max. kilowatts
Plate Dissipation (RS 2001 K)	110	110	110	max. kilowatts
Grid Dissipation	2	2	2	max. kilowatts

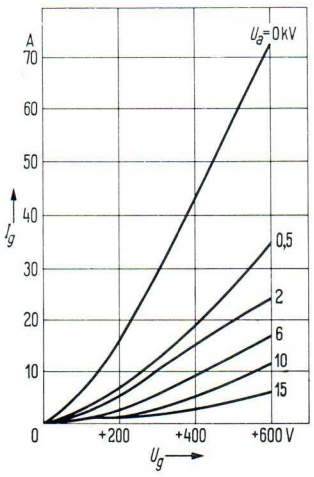
Typical Operation

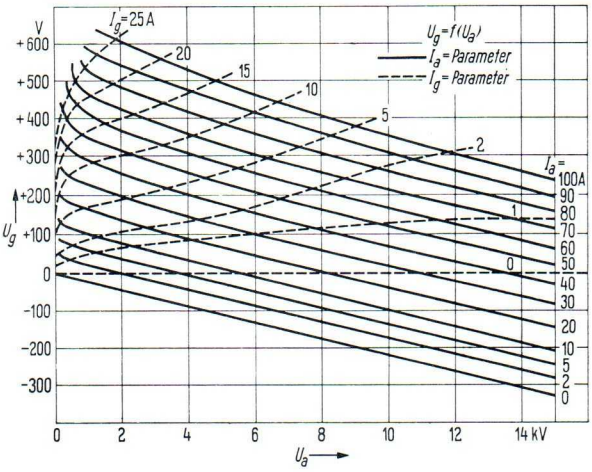
	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	Mc
Power Output	200	165	–	kilowatts
Carrier Power Output	–	–	100	kilowatts
DC Plate Voltage	14	12	11	kilovolts
DC Grid Voltage	–650	–600	–200 (fixed)	volts
Grid Resistor	–	–	70	ohms
Peak RF Grid Voltage	1150	1100	960	volts
DC Plate Current	17.6	17.1	11.4	amps
DC Grid Current	3.8	4	4.7	amps
Plate Input	247	205	125	kilowatts
Driving Power	4	4	4.3	kilowatts
Plate Dissipation	47	40	25	kilowatts
Grid Dissipation	1.55	1.6	1.8	kilowatts
Efficiency	81	80.5	80	%
Plate Load Resistance	442	387	600	ohms
Modulation Factor	–	–	100	%
Modulating Power	–	–	62.5	kilowatts

Other kinds of operation:
AF Power Amplifier and Modulator (Class B, 2 tubes in push-pull) — Power Output = 230 kilowatts at DC Plate Voltage = 11 kilovolts

Characteristics







Cooling

RS 2001 W

Required water flow on anode for inlet water temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . 60 l min ≈ 15.9 gallons (US Liq.) per min

RS 2001 K

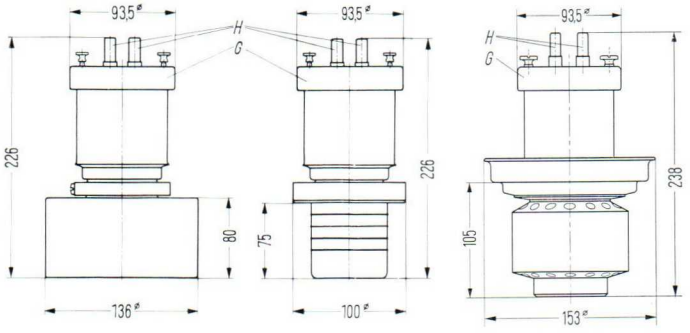
Particulars on request

Accessories

Cathode Connectors (2 per tube)	Rö Kat 201
Water Jacket (RS 2001 W)	Rö Kü 201
Jacket for evaporative cooling (RS 2001 K)	Rö Kü V 201

RS 2011

22 Kilowatt Triode with coaxial grid terminal usable as RF Amplifier and Modulator up to 70 Mc.



RS 2011 L
Weight approx. 5 kg

RS 2011 W
Weight approx. 2.5 kg

RS 2011 V
Weight approx. 4 kg

General Data

FILAMENT

Filament Voltage	10 volts	Thoriated tungsten filament
Filament Current	approx. 70 amps	
Emission Current	20 amps at DC Plate Voltage = DC Grid Voltage = 400 volts	
Amplification Factor	15 at DC Plate Voltage = 1 to 6 kilovolts; DC Plate Current = 1 amp	
Transconductance	20,000 µmhos at DC Plate Voltage = 3 kilovolts DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	48 µµF
Plate-Filament	1,5 µµF
Grid-Plate	21 µµF

Maximum Ratings

	RF-Power Amplifier Class C		Plate Modulation	
Frequencies up to	30	70	30	max. Mc
DC Plate Voltage	11	8	7	max. kilovolts
DC Grid Voltage	–1200	–1200	–1200	max. volts
DC Cathode Current	5	5	5	max. amps
Peak Cathode Current	20	20	20	max. amps
Plate Dissipation (RS 2011 L)	8	8	8	max. kilowatts
Plate Dissipation (RS 2011 W)	8	8	8	max. kilowatts
Plate Dissipation (RS 2011 V)	12	12	12	max. kilowatts
Grid Dissipation	100	100	100	max. watts

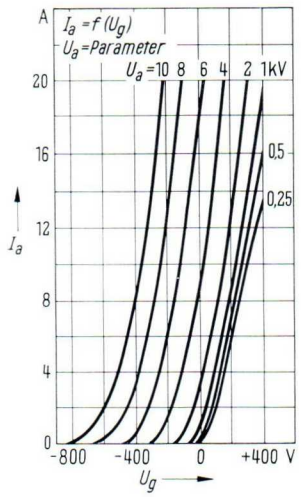
Typical Operation

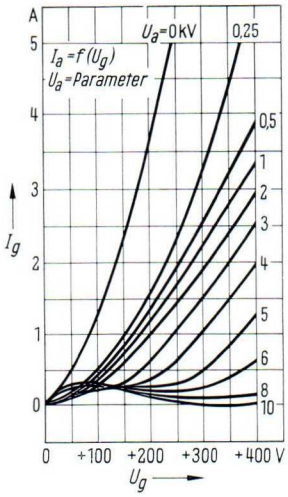
	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	30	70	30	Mc
Power Output	22	16.5	–	kilowatts
Carrier Power Output	–	–	6	kilowatts
DC Plate Voltage	10	8	6	kilovolts
DC Grid Voltage	–960	–800	–400 (fixed)	volts
Grid Resistor	–	–	3	kiloohms
Peak RF Grid Voltage	1260	1090	1260	volts
DC Plate Current	2.8	2.6	1.25	amps
DC Grid Current	275	280	210	ma
Plate Input	28	21	7.5	kilowatts
Driving Power	335	300	260	watts
Plate Dissipation	6.0	4.5	1.5	kilowatts
Grid Dissipation	70	75	40	watts
Efficiency	78.5	78.5	80	%
Plate Load Resistance	1840	1570	2700	ohms
Modulation Factor	–	–	100	%
Modulating Power	–	–	3.75	kilowatts

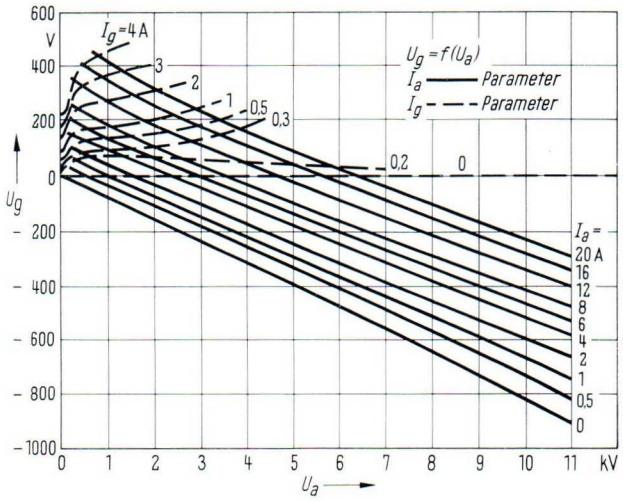
Other kinds of operation:

AF Power Amplifier and Modulator (Class B; 2 tubes in push-pull)	Power Output at DC Plate Voltage	= 39 kilowatts = 10 kilovolts
Driver Stage for AF Power Amplifier and Modulator (Cathode Follower) (2 tubes in push-pull)	DC Plate Voltage DC Cathode Current	= 4.9 kilovolts = 2 × 1.85 amps

Characteristics







Cooling

RS 2011 L

Required air flow an anode at max. plate dissipation . . . 8 m³/min
≈ 282.5 cubic feet per min

Static Pressure Drop . . . 87 mm of water ≈ 3.42 inches of water

Temperature of air at outlet . . . max. 80 deg. C = 176 deg. F

RS 2011 W

Required water flow on anode for inlet water temperature of 20 deg. C = 68 deg. F at max. plate dissipation . . . 10 l/min
≈ 2.66 gallons (Us liq.) per min

Temperature of water at outlet = 32 deg. C = 89.6 deg. F

RS 2011 V

Particulars on request

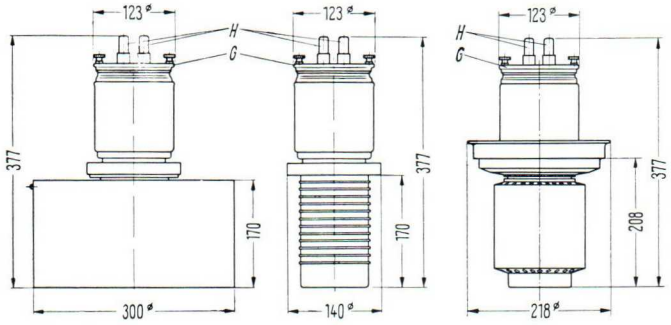
Accessories

Cathode Connectors (2 per tube)	Rö Kat 61
Air Socket (RS 2011 L)	Rö Anst 61
Water Jacket (RS 2011 W)	Rö Kü 61
Jacket for evaporative cooling (RS 2011 V)	Rö Kü V 61
Tube Fuse (RS 2011 L)	Rö Sich 1

Supplementary accessories on enquiry

RS 2021

120 Kilowatt Triode with coaxial grid terminal usable as RF Amplifier, Oscillator and Modulator at frequencies up to 70 Mc.



RS 2021 L
Weight approx. 39 kg

RS 2021 W
Weight approx. 6.2 kg

RS 2021 V
Weight approx. 17 kg

General Data

FILAMENT

Filament Voltage	12.6 volts	Thoriated tungsten filament
Filament Current	approx. 160 amps	
Emission Current	75 amps at DC Plate Voltage = DC Grid Voltage = 700 volts	
Amplification Factor	58 at DC Plate Voltage = 1 to 6 kilovolts; DC Plate Current = 1 amp	
Transconductance	60,000 µmhos at DC Plate Voltage = 3 kilovolts; DC Plate Current = 1 amp	

INTERELECTRODE CAPACITANCES

Grid-Filament	120 µµF
Plate-Filament	1.4 µµF
Grid-Plate	50 µµF

Maximum Ratings

	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	max. Mc
DC Plate Voltage	15	12	11	max. kilovolts
DC Grid Voltage	–1000	–1000	–1000	max. volts
DC Cathode Current	18	18	12	max. amps
Peak Cathode Current	65	65	75	max. amps
Plate Dissipation (RS 2021 L)	35	35	35	max. kilowatts
Plate Dissipation (RS 2021 W)	45	45	45	max. kilowatts
Plate Dissipation (RS 2021 V)	60	60	60	max. kilowatts
Grid Dissipation	1.3	1.3	1.3	max. kilowatts

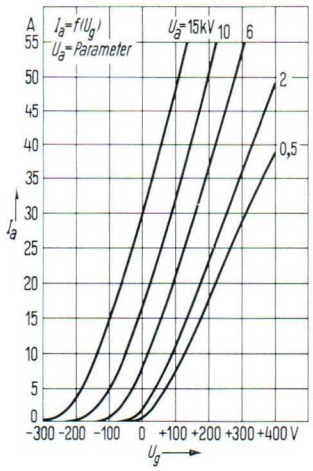
Typical Operation

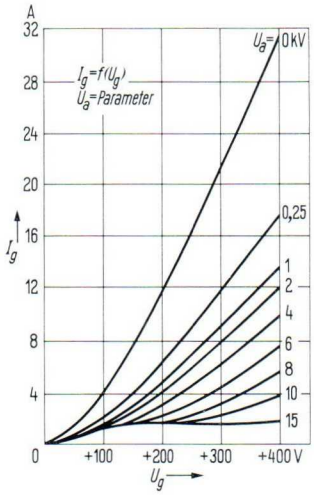
	RF Power Amplifier Class C		Plate Modulation	
Frequencies up to	10	30	30	Mc
Power Output	120	90	–	kilowatts
Carrier Power Output	–	–	66	kilowatts
DC Plate Voltage	15	12	11	kilovolts
DC Grid Voltage	–600	–550	–200 (fixed)	volts
Grid Resistor	–	–	100	ohms
Peak RF Grid Voltage	1000	940	900	volts
DC Plate Current	9.75	9.25	8	amps
DC Grid Current	2.2	2.2	3.1	amps
Plate Input	146	111	88	kilowatts
Driving Power	2.1	1.9	2.6	kilowatts
Plate Dissipation	26	21	22	kilowatts
Grid Dissipation	780	690	1020	watts
Efficiency	82	81	75	%
Plate Load Resistance	850	710	920	ohms
Modulation Factor	–	–	100	%
Modulating Power	–	–	44	kilowatts

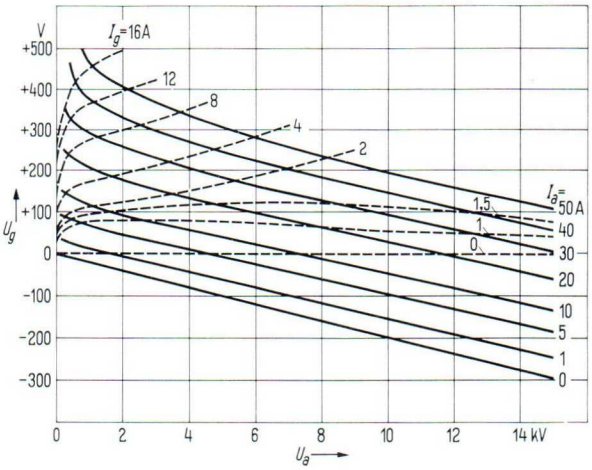
Other kinds of operation:

AF Power Amplifier and Modulator (Class B, 2 tubes in push-pull) — Power Output = 78 kilowatts at DC Plate Voltage = 10 kilovolts

Characteristics







Cooling

RS 2021 L

Required air flow on anode at max. plate dissipation . . . 40 m³/min
≈ 1415 cubic feet per min

Static Pressure Drop . . . 85 mm of water
≈ 3.3 inches of water

Temperature of air at outlet . . . max. 75 deg. C
= 167 deg. F

RS 2021 W

Required water flow on anode for inlet water temperature of 20 deg. C at max. plate dissipation . . . 52 l/min
≈ 14 gallons (US Liq.) per min

RS 2021 V

Particulars on request

Accessories

Cathode Connectors (2 per tube)	Rö Kat 221
Coaxial Grid Connector	Rö Git 01
Air Socket (RS 2021 L)	Rö Anst 221
Water Jacket (RS 2021 W)	Rö Kü 221
Jacket for evaporative cooling (RS 2021 V)	Rö Kü V 221
Tube Fuse (RS 2021 L)	Rö Sich 1

Supplementary accessories on enquiry

List of equivalent types of tubes

Type	Equivalent Siemenstype
AG 866 A	(Gle 10000/025/1)
AG 869 B	(Gle 20000/2,5/10)
AG 872 A	(Gle 15000/1,5/6)
AG 5006	Gle 15000/3/12
AG 8008	Gle 13000/1,5/6
ASG 5017	(Ste 2500/05/2)
ASG 5121	Ste 1300/01/05
ASG 6011	Ste 6011
AX 105	Ste 2500/6/40
AX 9900	(RS 1006 B)
AX 9901	RS 1026
AX 9902	RS 1016
AX 9903	RS 1009
AX 9910	RS 1019
B 142	(RS 1016)
BT 5	Ste 1000/2,5/15
C 144	RS 1009
C 180	RS 1019
C 1108	RS 1007
C 1112	(RS 1002 A)
C 1134	RS 1019
CE 309	Ste 2500/05/2
CT 1/2500	Ste 1000/2,5/15
CV 797	Ste 1300/01/05
CV 1350	RS 1046
CV 1351	RS 1016
CV 1625	Gle 10000/025/1
CV 1924	(RS 1006 B)
CV 2130	RS 1007
CV 2131	(RS 1002 A)
CV 2797	RS 1009
CV 2798	RS 1029
CV 2799	RS 1019
CV 2957	Ste 2500/05/2
CV 3879	RS 1002 A
DCG 4/1000 ED	Gle 10000/025/1
DCG 5/5000 GB	(Gle 15000/1,5/6)
DCG 5/5000 GS	Gle 13000/1,5/6
DCG 6/18	Gle 15000/3/12
DCG 6/6000	(Gle 15000/1,5/6)
DCG 7/100	Ste 15000/15/45
DCG 7/6000	(Gle 15000/1,5/6)
DCG 9/20	Gle 20000/2,5/10
DQ 2a	Gle 10000/025/1
DQ 4	(Gle 15000/1,5/6)
DQ 6	(Gle 20000/2,5/10)
E 125 A	RS 1007
E 250 A	(RS 1002 A)
FG 17	Ste 2500/05/2
FG 57	Ste 1000/2,5/15
FG 105	Ste 2500/6/40
G 7,5/0,6 d	(Gle 10000/025/1)
G 10/4 d	(Gle 15000/1,5/6)
GL 2D21	Ste 1300/01/05
GL 57	Ste 1000/2,5/15
GL 829	(RS 1009)
GL 5557	Ste 2500/05/2
GL 5559	Ste 1000/2,5/10
GI 6011	Ste 6011
K 2	Gle 10000/025/1
ML 4–125 A	RS 1007
MT 17	Ste 2500/05/2
MT 57	Ste 1000/2,5/15
MT 105	Ste 2500/6/40
NL 710	Ste 6011
NL 715	Ste 2500/05/2
NL 720	Ste 6011
NL 5557	Ste 2500/05/2
NL 5559	Ste 1000/2,5/15
NU 829	RS 1009
P 2–4013	(RS 1009)
PL 17	Ste 2500/0,5/2
PL 21	Ste 1300/01/05
PL 57	Ste 1000/2,5/15
PL 105	Ste 2500/6/40
PL 106	Ste 2000/6/80
PL 5557	Ste 2500/0/2
PL 5559	Ste 1000/2,5/15
PL 6011	Ste 6011
Q 160–1	(RS 1007)
Q 400–1	(RS 1002 A)
QB 3/300	RS 1007
QB 3,5/750	(RS 1002 A)
QB 4/1100	RS 1002 A
QQE 03/20	RS 1019
QQE 03/12	RS 1029
QQE 06/40	RS 1009
QQV 03–10	RS 1029
QQV 06–40 A	RS 1009
QQV 07–40	(RS 1009)
QY 3–125	RS 1007
QY 4–250	(RS 1002 A)
RG 4–3000	Gle 15000/3/12
RL 17	Ste 2500/05/2
RL 21	Ste 1300/01/05
RL 57	Ste 1000/2,5/15
RL 105	Ste 2500/6/40
RS 612	(RS 1006 B)
RS 613	(RS 1006 B)
RS 614	RS 1006 B
RS 630	RS 1026
RS 631	RS 1016
RS 635	(RS 1046)
RS 565	RS 2001 W
RS 567	RS 1041 W
RS 683	(RS 1007)
RS 685	RS 1007
RS 686	(RS 1002 A)
RS 865	RS 2001 V
RS 867	RS 1041 V
S 15/40 i	(Ste 15000/15/45)
SRS 360	RS 1026
SRS 551	RS 1003
SRS 4451	RS 1009
SRS 4452	RS 1019
T 130–1	(RS 1006 B)
T 300–1	(RS 1016)
T 350–1	(RS 1026)
TB 2,5/300	(RS 1006 B)
TB 2,5/400	RS 1006 B
TB 3/750	RS 1026
TB 4/1250	RS 1016
TB 4/1500	RS 1036
TB 5/2500	RS 1046
TBL 6/20	RS 1011 L
TBW 6/20	RS 1011 W
TBL 12/50	RS 1031 L
TBW 12/50	RS 1031 W
TG 57	Ste 1000/2,5/15
TH 171	RS 1011 W
TH 471	RS 1011 V
TH 478	RS 1041 V
TH 6011	Ste 6011
TH 6031	Ste 1000/2,5/15
TH 6120	Ste 2500/6/40
TQ 2	(Ste 2500/05/2)
TQ 7	(Ste 15000/15/45)
TT 16	RS 1007
TT 20	RS 1019
TXM 100	Ste 1300/01/05
TY 2–125	(RS 1006 B)
TY 2–150	RS 1006 B
TY 3–250	RS 1026
TY 4–500	RS 1016
TY 5–500	RS 1036
TY 6–800	RS 1046
VH 550	Gle 10000/025/1
VT 146	Gle 10000/025/1
WE 17	Ste 2500/05/2
WL 2D21	Ste 1300/01 /05
WL 17	Ste 2500/05/2
WL 57	Ste 1000/2,5/15
WL 105	Ste 2500/6/40
WL 631	Ste 1000/2,5/15
WL 5557	Ste 2500/05/2
WL 5559	Ste 1000/2,5/15
WT 210–0001	Ste 1300/01/05
WT 210–0015	Ste 2500/05/2
WT 210–0056	Ste 1000/2,5/15
WT 210–0074	Ste 2500/6/40
WT 272	Ste 2500/05/2
WT 606	Ste 1300/01/05
WTT 111	Ste 1000/2,5/15
WTT 117	Ste 2500/05/2
WTT 118	Ste 2500/6/70
XG 1–2500	Ste 1000/2,5/15
XG 5–500	Ste 2500/05/2
XG 15–12	Ste 15000/15/45
XGQ 2–6400	Ste 2500/6/40
1 × 9901	RS 1026
2 D 21	Ste 1300/01/05
3 V/390 A	Ste 1000/2,5/15
4 D 21	RS 1007
4 G/280 K	Ste 1300/01/05
4–125 A	RS 1007
4–250 A	(RS 1002 A)
4–400 A	RS 1002 A
5 D 22	(RS 1002 A)
11 E 13	RS 1029
17	Ste 2500/05/2
20 A 3	Ste 1300/01/05
57	Ste 1000/2,5/15
105	Ste 2500/6/40
272	Ste 2500/05/2
829 B	(RS 1009)
832 A	(RS 1019)
833 A	(RS 1016)
866 A	(Gle 10000/025/1)
872 A	(Gle 15000/1/4)
967	Ste 2500/05/2
1257	Ste 1000/2,5/15
4260	Ste 2500/05/2
4261	Ste 2500/05/2
4649	Gle 15000/1,5/6
5557	Ste 2500/05/2
5559	Ste 1000/2,5/15
5866	(RS 1006 B)
5867	RS 1026
5868	RS 1016
5894	RS 1009
6011	Ste 6011
6155	RS 1007
6156	(RS 1002 A)
6252	RS 1019
6360	RS 1029
6508	Gle 20000/2,5/10
6524	(RS 1019)
6693	Gle 15000/3/12
6850	(RS 1019)
7092	RS 1046
8008	Gle 13000/1,5/6
38217	Ste 2500/05/2

The types in brackets are practically equivalent and can in most cases be used without misgivings.
In some cases minor circuit modifications may be necessary.

Bestell-Nr. 1-6220-007-1 Printed in Germany

Production line of Siemens transmitting tubes and special tubes[1]

Transmitting and generating tubes

RS 1001 L	RS 1016	RS 1041 W	RS 1082 CV
RS 1001 V	RS 1019	RS 1046	RS 1082 CW
RS 1001 W	RS 1021 L	RS 1051 L	RS 1091
RS 1002 A	RS 1022 C	RS 1052 C	RS 2001 K
RS 1003	RS 1026	RS 1061 L	RS 2001 W
RS 1006 B	RS 1029	RS 1061 V	RS 2011 L
RS 1007	RS 1031 L	RS 1061 W	RS 2011 V
RS 1009	RS 1031 V	RS 1071 L	RS 2011 W
RS 1011 L	RS 1031 W	RS 1081 L	RS 2021 L
RS 1011 W	RS 1032 C	RS 1081 V	RS 2021 V
RS 1012 L	RS 1036	RS 1081 W	RS 2021 W
RS 1012 V	RS 1041 V	RS 1082 CL	C 3 e spez

Explanation of suffix letters:

L	Air cooling	CV	Evaporative cooling in Metal-Ceramic Technique
V resp. K	Evaporative cooling		
W	Water cooling	CW	Water cooling in Metal-Ceramic Technique
C	Air-cooled model in Metal-Ceramic Technique		

Tubes for telecommunication systems

Aa	CCa	C3d	Da	E2d
Ba	Cd	C3e	D3a	E2e
Bas	Ce	C3f	Ec	F2a
Be	Cf	C3g	Ed	Z2b
Bh	C3b	C3m	E2b	Z2c
Bi	C3c	C3o	E2c	Z2e

Special amplifier tubes

E 80 CC	E 83 CC	E 91 AA	E 280 F	5654 (6 AK 5 W)
E 80 CF	E 84 L	E 130 L	E 282 F	5751
E 80 L	E 86 C	E 180 F	E 283 CC	5814 A
E 81 CC	E 88 C	E 188 CC	E 288 CC	6463
E 81 L	E 88 CC	E 235 L	E 810 F	7586
E 82 CC	E 90 CC	E 236 L	E 1010[2]	7587
			F 2a 11	7895

Microwave tubes

Disc-Seal Triodes	2 C 39 A	2 C 39 BA	RH 6 C	RH 7 C
Reflex Klystrons	RK 6	RK 7[2]	RK 25	
Travelling Wave Tubes	RW 2[2]	RW 3	RW 4[2]	RW 6
	YH 1010	YH 1020		
Backward Wave Oscillator	RWO 40			

High-voltage rectifier tubes and thyratrons

Gle 10000 / 025 / 1	Ste 1300 / 01 / 05	Ste 2500 / 05 / 2
Gle 13000 / 1,5 / 6	Ste 1000 / 02 / 03	Ste 2500 / 6 / 40
Gle 15000 / 1,5 / 6	Ste 1000 / 2,5 / 15	Ste 15000 / 15 / 45
Gle 15000 / 3 / 12	Ste 2000 / 6 / 80	
Gle 20000 / 2,5 / 10	Ste 6011	

Voltage regulator tubes

85 A 2 | 108 C 1 | 150 C 2

Geiger-Müller counter tubes

HZa–15 / 40 | HZb–15 / 40 | HZ–20 / 100

1) Types printed in lightface letters are intended only as replacements
2) In the preparatory stage