



## Instruction Manual

### OM2500 HF



# SHORTWAVE POWER AMPLIFIER WITH GU84B

## General description of the short wave power amplifier

The linear power amplifier is designed for all short wave bands 1.8 to 29 MHz ( including WARC - bands ) and all modes.

A Russian GU84b tetrode is used to generate power output up to 2700W.

**That's PEP of more than 4 kW !**

### Characteristics:

<b>Frequency:</b>	<b>1.8 – 29.7 MHz (incl. WARC)</b>
<b>Power output:</b>	<b>2 500 W in CW and SSB 2 000 W in RTTY, AM and FM</b>
<b>Power input:</b>	<b>40 to 60W for full Output</b>
<b>Input resistance:</b>	<b>50 Ohms VSWR &lt; 1.5:1</b>
<b>Power amplification:</b>	<b>typically 16 dB ( = factor 40 )</b>
<b>Output resistance:</b>	<b>50 Ohms asymmetrically</b>
<b>Maximum output – SWR:</b>	<b>2:1</b>
<b>SWR-protection:</b>	<b>Automatic switching to STBY, when reflected power is 350W or higher.</b>
<b>Intermodulation distance:</b>	<b>36 dB below nominal power</b>
<b>Suppression of harmonics:</b>	<b>&lt; -55 dBc</b>
<b>Tube:</b>	<b>Ceramic GU84b tetrode</b>
<b>Cooler:</b>	<b>Centrifugal blower</b>
<b>Power supply:</b>	<b>230 V - 50Hz, one or two phases</b>
<b>Transformers:</b>	<b>2 pieces of toroidal transformer, 2 kVA each!</b>
<b>Protection circuits :</b>	<ul style="list-style-type: none"><li>- SWR too high</li><li>- Anode current too high</li><li>- current at screen too high</li><li>- mistuning of power amplifier</li><li>- Soft start for protecting your fuses</li><li>- “switch-in blocking” at opened amplifier</li></ul>
<b>Bar graph indications :</b>	<ul style="list-style-type: none"><li>- Power output ( Bar graph 50 LED)</li><li>- Reflected power ( Bar graph 20 LED)</li><li>- Current at screen ( Ig2 - Bar graph 10 LED)</li><li>- Anode voltage, anode current, tuning (Bar graph 30 LED)</li></ul>
<b>LED indications:</b>	<b>Current at control grid (Ig1 - 2 LED)</b> <b>WAIT – preheating of tube (150 sec)</b> <b>STBY - standby</b> <b>OPR - operating condition</b> <b>FAULT - failure, switching off for abt. 4sec</b>
<b>Dimensions:</b>	<b>485 x 200 x 455 mm (B x H x D)</b>
<b>Weight:</b>	<b>38 kg = 84 pounds</b>

## General Description of OM2500 HF POWER AMPLIFIER



Top view of the opened amplifier

### **HF PART**

In this amplifier a tetrode GU 84b is used in a grounded-cathode circuit ( input into control grid ). This amplifier achieves excellent linearity by the voltage stabilization of the control grid bias and the screen voltage. The power input is given to the control grid, using a broadband power transformer with an input impedance of 50 Ohms. This input circuitry ensures a good input SWR of lower than 1.5:1 on all short-wave bands.

The output of the amplifier is a Pi-L circuit. The ceramic capacitor for TUNE and LOAD was specially made for this amplifier ! This enables the amplifier to be tuned exactly and makes it possible to easily return to the previously set positions after band change.

### **POWER SUPPLY**

Power supply of the amplifier is effected by two 2kVA toroidal transformers. A soft start is realized with the help of relays and resistors.

The high anode voltage consists of 8 times 300V and 2A. Each of them has its own rectifier and filter. In the high voltage circuit safety resistors are employed so protect the amplifier against overload. The screen voltage is stabilized by a MOSFET circuit with IRF830 and delivers a voltage of 360V at 100mA.

The -120V for the control grid is stabilized by means of zener diodes.

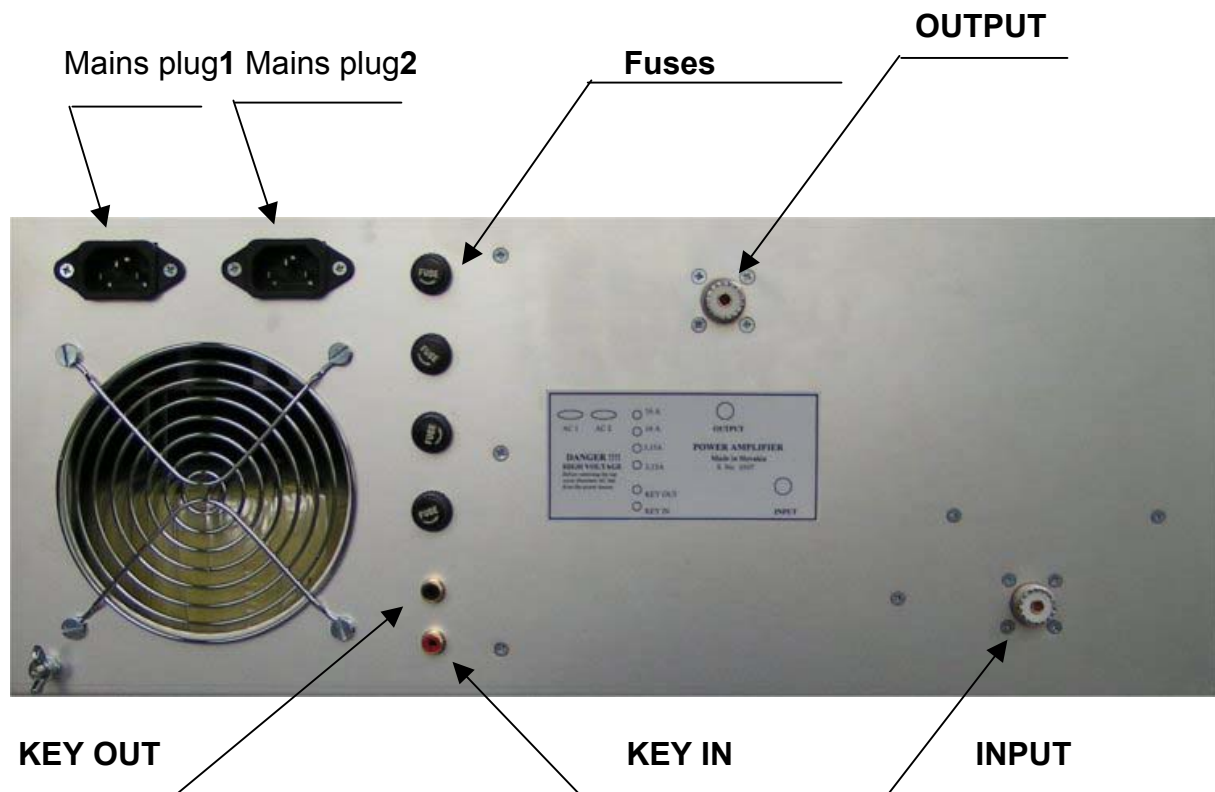
## SAFETY DEVICES

Safety devices and the corresponding indicators ensure proper operations and prevent the malfunctioning of the power amplifier. They are placed on a separate printed board behind the front panel.

## Putting the power amplifier into operation

### Coaxial cable

The output of the transceiver is to be connected with the input of the amplifier via RG58 or a similar cable. For the connection between the power amplifier and the antenna RG213 or a similar coaxial cable suited for this high power is to be used. For INPUT and OUTPUT PL-259-sockets with Teflon isolation are used.



Rear view of the amplifier

### Control cable

With the control cable (included if you buy an OM2500) you switch from reception to transmission. The cable is shielded. On the side of the power amplifier an CINCH-socket is used. On the side of your transceiver you have to use the socket, which belongs to your transceiver. During transmitting the middle pin is connected to the ground. The relays of the power amplifier have to be switched earlier than HF is applied (cold switching). Modern transceivers have a time delay between PTT switching and power output.

If you use older transceivers or transmitters without time delay we recommend to connect the PA in such a way that the transmit / receive switch is connected with the KEY IN socket of the amplifier. The KEY OUT socket is to be connected with the PTT socket at the transceiver. The amplifier is equipped with two safety devices, which ensure that the Output relay is not switched over under power mistakenly (hot switching).

### **MAIN SUPPLY:**

The amplifier is connected to the mains with 2 cables. Each cable is to be switched to another phase of your main supply system !

Both of them have to be able to deliver a power of 2.5 kVA !

If you use only one phase, you have to connect both cables to this one phase ! Your main supply has to be able to deliver 4.5 kVA on this one phase ! In this case the power amplifier can't deliver the full output!

### **ATTENTION:**

**In each case the power amplifier has to be connected to your main supply system with the 2 cables ! Normally the amplifier is used at 2 phases. If there is only one phase give the 2 cables to this one !**

### **Grounding**

The amplifier has to be grounded properly ! Connect the screw at the rear panel of the amplifier to your local grounding system with a copper-cable, use a cross-section of 4 mm<sup>2</sup> at least.

Connect your transceiver to the same grounding system of your shack carefully !

If you use a power amplifier with higher output you have to be aware that your grounding system works properly. **All parts have to be grounded to the same system.** Use short cables and make sure that there are good contacts ! Otherwise you run the risk of damaging your equipment, having problems with TVI/BCI or your signal may be distorted.

### **Cooling**

The centrifugal blower provides the necessary cooling of the amplifier, even during long contests !

If you want to use modes like AM, FM, RTTY or digital mode with transmitting longer than 5 minutes you have to add an additional blower. This blower has to be mounted at the ventilating aperture at the rear .

## Operating elements (see photo)

- BAND -** band selector switch
- TUNE -** Anode capacitor for tuning, tuning of higher frequencies to "0", lower frequencies to „100“.
- LOAD -** Output capacitor tunes antenna load resistance to amplifier. Capacity is low at „0“ and high at "100" on the scale.
- OFF -** You switch off the amplifier by pressing this button.
- ON -** You switch on the amplifier by pressing this button. Heating of tube is on and after 3min of delay the amplifier will be ready for operation.
- OPR/STBY -** „OPERATE“ you will be ready for operation. At STBY, if WAIT-LED is on or the amplifier is off your transceiver is in bypass-mode directly connected to antenna. Maximum 200Watts ! 400Watts version is possible (FT9000). Please tell us at order !
- RF OUTPUT -** Bar graph – shows output power .
- REFLECTED POWER-** Bar graph – shows reflected power of the antenna. 350W maximum or amplifier switches to STANDBY-mode

## TUNING

The amplifier is operated in class AB. Thus its possible to obtain a maximum output power and an excellent linearity. For this purpose the amplifier has to be tuned carefully.

The operation of a mistuned PA will cause malfunctions, the increase of grid current (the GRID-MAX-LED will light up ) and problems with TVI/BCI.

The grid-current is shown with 2 LED. Its normal if the green LED is flashing or may be shining a little bit. If you increase the output power the grid current is increasing very small and the red GRID-MAX-LED is shining. You have maximum output power if this LED lights up from time to time. If the red GRID-MAX-LED lights up with full intensity, you have overloaded the amplifier and must decrease the output.

In SSB you will have a good output power if the green LED lights up a bit and the red LED is only flashing at the highest peaks of your voice. The current of screen grid is measured and shown in a Bar graph indicator. The amplifier has to be tuned in such a way that the current is between - 30 mA to +50 mA. At currents beyond this values the operating point will be shifted and IM-products will be generated. If a value of + 70mA is exceeded, the safety devices will switch the amplifier to STBY mode.

## Tuning instruction :

### **Please note :**

**Before starting tuning you have to check if the right antenna or a 50 Ohms load resistance is connected at the antenna output !**

### **Switching on the amplifier:**

- put the switch at the multimeter to HV position
- put the OPR/STBY switch to STBY position
- press the „ON“ button

Within the amplifier operation is prepared with the following steps:

- the toroidal transformers are switched step by step.
- the blower of tube is switched on.
- the multimeter bar graph measures the high voltage; the normal value is 2.4-2.8 kV
- the WAIT LED lights up

After switching on you have to check the functioning of the blower. Air must be blown out of the ventilating apertures above the tube.

( If there is any failure you have to press the „OFF“-button immediately !)

Heating the tube takes about 150 seconds. After this time the WAIT LED goes out and the amplifier is ready for operation.

### **Tuning the amplifier to an output of 2500W**

1. A tuning table is delivered with the amplifier. Select a band with band switch and choose the setting of “TUNE” und “LOAD“ according to your table.

(You will find my tuning table at: [www.dl3jj.de/etunetable.html](http://www.dl3jj.de/etunetable.html) ! )

Band	Tuning	Load
1.8	70	40
3.5	75	30
7	30	85
10	25	45
14	70	70
18	32	50
21	25	60
24	60	66
28	40	70

**The tuning table available to you is made by using a dummy load!  
Each amplifier will have other values depending on used frequency and antenna! Make your own list for your own antennas!  
Use tuning position (see later)!**

2. Reduce the power output of your transceiver to the **minimum!**
3. Switch **OPR/STBY** to „**OPR**“ position (OPR LED lights up)
4. Choose **TUNE** position of multimeter.
5. Use **CW** and give about **10W** (OUTPUT PA abt. 500W)

## **Please note!**

**If the input power is higher than 15 W and the power amplifier is not correctly tuned, the safety devices will switch to STBY for about 4 seconds!**

**After switching off the PTT, the amplifier will automatically switch back to OPR mode after approximately 4 seconds.**

6. Set TUNE in such a way, that the TUNE-LED lights up maximum left.
7. Set load in such a way, that the TUNE LED on the TUNE scale lights up under the "V" sign. If it is possible to obtain the LOAD in 2 positions, set the position that the father to the right.
8. Repeat tuning several times according to 6 and 7.
9. Increase the input power until an output power of approximately 2500 W is reached. (You will need abt. 50W input)
10. Repeat this operation two times according to 6 und 7.

Then the amplifier will be tuned correctly and ready to deliver 2500 Watts of HF power in CW und SSB to your antenna.

If you use modes like AM, FM, RTTY or digital modes, please use „only“ 2000 Watts!

If you use more than 2 kW, the red LEDs of OUTPUT - POWER will light up.

**Please note: Shoned the amplifier exhibit any malfunctions during tuning or should it not behave in accordance witch the description, interrupt the tuning procedure immediately and check the amplifier! Be sure to have not done any mistakes in choosing bands or TUNE/LOAD values!**

**Be sure that SWR is not higher than 1:2 and input power is LOW! After cancelling human mistakes you will be able to work for long time with this amplifier!**

**We are interested in any kind of response!**

**Please look at [www.om-power.com](http://www.om-power.com) for contact and send any kind of stimulation!**

**Thanks!**