

QUICK-START GUIDE
AND SAFETY INSTRUCTIONS

TWT Amplifiers:

Teseq TWT Series

Version: 1.0 31.3.2021
Replaces:
Filename: Quick Start and Safety TWT Amplifier Series_1.1.docx
Print date: 4.29.202121



AMETEK CTS GmbH
Sternenhofstrasse 15
4153 Reinach BL1
Switzerland

Phone: +41 61 204 41 11
Fax: +41 61 204 41 00

URL : www.ametek-cts.com

Copyright © 2021 AMETEK CTS GmbH

All right reserved.
Specifications subject to change.

Table of Contents

Table of Contents	3
1. Safety	4
1.1 Safety Aspects	4
1.2 Safety symbols and terms	4
1.3 Safety Precaution.....	4
2. Installation	7
2.1 General	7
2.2 Connecting the line cord.	7
2.3 Connecting the chassis to a suitable ground connection.	7
2.4 Connecting the RF cables	7
2.5 Connecting the Safety interlock.....	8
2.6 Connecting an RF Load and Signal Generator	8
2.7 Line supply input connector	8
3. Quick Start	9
3.1 Rear Panel Connections	9
3.2 Front Panel Connection & Control	9
3.3 RF on / RF Standby Operation	9
3.4 Amplifier Power On	9
3.5 Applying an RF Signal	9
3.6 Switching RF On / Standby.....	9
4 MAINTENANCE	10
4.1 General cleaning	10
4.2 RF connectors.....	10
4.3 Air-filter cleaning.	10
4.4 Repairs.....	10
4.5 Disposal	10

1. Safety

1.1 Safety Aspects

The amplifier described in this manual is designed to be used only by qualified personnel. Installation and use of the amplifier in a manner not specified in this manual may impair the protection provided by the amplifier. Before use, inspect the amplifier for damage which may impair safety.

There are no user-serviceable parts inside the amplifier, and any warranty is rendered void if the seals on any covers are broken.

The following safety information is intended to protect all installers and operators, and to prevent damage to the amplifier. It should be read and understood before installing and operating the amplifier.

1.2. Safety symbols and terms



This symbol warns of a potential risk of shock hazard. The symbol on an instrument shows that that it can source 1000 volt or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.



This symbol indicates where a caution is required. Refer to the operating instructions located in the manual to protect against personal injury or damage the equipment.



When used on the amplifier, warns the user of a non-ionising radiation hazard. When used in this operation manual, alerts the user to the part of the manual that deals with a non-ionising radiation hazard.



GROUND protective ground terminal



Warns personnel to observe correct lifting practices.

CAUTION:

CAUTION: indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could possibly cause damage to equipment. Such damage may invalidate the warranty. If a **“CAUTION”** is indicated, do not proceed until its conditions are fully understood and met.

WARNING:

WARNING: indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could possibly cause bodily injured or death. If a **“WARNING”** is indicated, do not proceed until its conditions are fully understood and met.

1.3 Safety Precautions

Observe all the following precautions to ensure personal safety and prevent damage to the amplifier or equipment connected to it.

**WARNING: Do not touch the inner conductor of the RF-output connector.**

High voltages can occur on the inner conductor of the RF output connector, or on cables or antennas connected to it. These can cause RF burns if touched.

**WARNING: The Amplifier is required to be connected to a suitable ground point.**

The amplifier conforms with IEC Safety class 1, meaning that it is provided with a protective grounding terminal. This is through the line supply cord to the centre pin of the power inlet connector. To maintain this protection, the line supply cord must always be connected to the source of line supply via a socket with a grounded contact. Do this before making connections to the RF-input or RF-output connectors of the amplifier.

Without the protective ground connection, all parts of the amplifier constitute a potential shock hazard.

**WARNING: Use the correct power cord.**

Use only the line supply cord and connector specified for the amplifier. Use only a line supply cord that is in good condition.

**WARNING: Do not remove covers or panels.**

To avoid personal injury, do not operate the amplifier without the panels or covers in place. Removal of panels will expose the operator to high voltages that can remain in the amplifier after being switched off for some time.

**WARNING: Do not operate in explosive atmospheres.**

The amplifier provides no explosive protection from static discharges or arcing components. Do not operate the amplifier in an atmosphere of explosive gasses.

**CAUTION: Avoid static discharges.**

The RF input and output connections are static-sensitive and should not be subjected to static discharge.

**CAUTION: Do not obstruct the circuit breaker.**

Ensure that there are no obstructions that impair the operation of the rear panel line-supply circuit breaker(s).

**CAUTION: Do not obstruct the airflow through the amplifier.**

The cooling airflow is drawn in through the front and exhausted at the rear. If this airflow is obstructed, overheating of the amplifier may occur.

**CAUTION: Do not operate the amplifier outside its specification.**

This may cause the amplifier to malfunction or be damaged.

**WARNING: Do not touch the exterior of the amplifier (rack mount version) when in use.**

The top and side panels of the amplifier can get hot during use, especially on high power models.

**CAUTION: Periodically replace the air-intake filters.**

Operating the amplifier with the air filters dirty may cause the amplifier to overheat.

**CAUTION: Exercise caution when lifting.**

The appropriate lifting practices should be observed during transportation, installation, or removal of the amplifier from its mounting position.



WARNING: Use the safety interlock facility within danger areas.

Any area where personnel may come into direct contact with high power RF, or be exposed to non-ionising radiation, should be designated as a danger area. A barrier should be established around any such area, with a switch in place when the barrier is broken. This switch can be linked to the safety interlock BNC connector on the rear of the amplifier, thus disabling the amplifier when the barrier is breached.

It is the responsibility of the operator to ensure that the working environment is safe. The 'safety interlock' feature is provided to assist the purchaser in establishing such a 'safe' area.

2. Installation

2.1 General



CAUTION! Exercise care when lifting.

Amplifier models that are very heavy have a caution label on the top cover. Appropriate lifting practices should be observed during transportation, installation, or removal of the amplifier from its mounting position. When mounted in a rack, the amplifier **must not** be supported by the front panel fixing holes alone. For easier installation and removal, we recommend that the amplifier is positioned with its top **no more than** 1.4 metres above ground level.



CAUTION: Do not support the whole weight of the amplifier with the front panel handles.

These should only be used for sliding the amplifier in and out on the rack.

◆ **Note:** The amplifier may be lifted using the rear protection handles.

The amplifier is designed to be mounted in a 19" fixed rack installation. When mounted in a rack, use a support tray-slider-assembly or rack sliders, especially for heavy amplifier models.



CAUTION: Do not obstruct the airflow through the amplifier.

At least 200mm clearance should be allowed behind the amplifier, so that air flow and connecting cables are not obstructed. An unobstructed area of at least 200mm should be allowed in front of the amplifier front panel air-intakes.



CAUTION: Even though the ambient air temperature may be within the amplifier's specification, the internal temperature may rise above operational limits if it is operated in direct sunlight.

The cooling airflow is drawn in through the front and exhausted at the rear. If this airflow is obstructed, overheating of the amplifier may occur. For correct amplifier operation, airflow through the unit must be maintained.

2.2 Connecting the line cord.



CAUTION: It is essential that the amplifier operates from a line source that does not apply voltages and frequencies between the line conductors (or between either line conductor and ground) that are outside the range detailed in the specification sheet.



CAUTION: Ensure that the line cord does not interfere with the operation of the rear panel line-input circuit breaker(s).

2.3 Connecting the chassis to a suitable ground connection.



To improve EMC immunity, bond the amplifier to a good ground with a conductor of 4 sq.mm or the equivalent earth braid, a ground post being provided for this purpose on the rear panel. Although it provides an extra measure of safety, this is NOT a protective earth connection. The protective earth is the ground pin on the line supply connector(s).

2.4 Connecting the RF cables



CAUTION: Ensure that the RF source is in, "RF OFF" mode when making connections.



CAUTION: Ensure any cables and connectors mating with the RF input and RF output connectors are of 50-ohm impedance and are designed to handle the power at the frequencies generated by the amplifier. Although very similar, 75-ohm connectors must not be used.

Use cable with the lowest loss that is practical. The connectors or wave guide should not be over-tightened, and any tightening instructions for the connector or wave guide should be observed. Ensure that any bends in cables conform to the recommended minimum-bend-radius of those cables, especially where the cables enter the RF connectors.

2.5 Connecting the Safety interlock



WARNING: Use the safety interlock facility within danger areas.

If the amplifier is to be connected to an antenna, personnel may be exposed to non-ionising radiation. In such systems, the safety interlock function should be used.

Connection (via the rear panel) is with a BNC-type connector. We recommend that shielded cable is used for all interlock connections to ensure EMC immunity.

The current in the safety-interlock circuit is less than 1mA, so cable with a low current capacity is suitable.

If you do not need this function, fit the supplied BNC shorting-link in place. Failure to do this will result in the amplifier latching in an “Interlock Open” status which switches the amplifier into standby mode.

2.6 Connecting an RF Load and Signal Generator






CAUTION: Ensure the RF output of the amplifier is connected to a suitable load that is rated for the frequency and peak RF output of the amplifier.

Do not switch the amplifier on without the RF output connected to a suitable 50ohm load. Switching the amplifier to an “RF on” state without a suitable load connected has the potential to damage the amplifier. The load must be rated for the frequency and maximum power the amplifier can generate. Any under rating in the load can lead to it being damaged with excessive power from the amplifier.

The selection of the load is the responsibility of the customer. The load can vary in type though it is important to note if the load is a poor match this will affect the amplifiers ability to deliver full power.

2.7 Line supply input connector

Dependent on RF output power requirements the amplifier power supply is equipped with an IEC or a high current 3 phase / 5 wire Star configuration (184-264 VAC line to neutral) or 4 wire Delta configuration (184-264 VAC line to line) connector for high power models. The amplifier systems are supplied with mating power cords. No wiring of power supply leads is required from the customer. Always ensure the supplied power supply lead is fully inserted and locked into place before the amplifier is powered On.

<u>120/240 single Phase</u> <u>IEC C20 Mains Inlet</u>	<u>Three Phase</u> <u>L2120-C Mains Inlet</u>	<u>Three Phase</u> <u>IEC 60309 Mains Inlet</u>
		

3. Quick Start

3.1 Rear Panel Connections

- A. Remote interface panel
- B. Mians power connector
- C. Earth/Ground Terminal
- D. Interlock



3.2 Front Panel Connection & Control

- A. LCD Display
- B. AC Mains on indicator
- C. Standby (push button)
- D. Operate (push button)
- E. Air inlet cover and filter
- F. FWD RF sample port
- RFL RF sample port
- G. RF output (coaxial or waveguide)
- H. Modulator Input (BNC)
- I. Main's switch
- J. RF Input



3.3 RF on / RF Standby Operation



CAUTION: Ensure mains voltage is present at the mains power connector.

3.4 Amplifier Power On

When the equipment is first switched on, especially if it has been in storage for a period time the initial operation will need to be performed at low power. In addition, for pulsed units it's recommended to start the unit with a short (1 μ s) pulse and slowly widen back to the desired operating pulse width, this will help to remove any gas that may have built up in the TWT. To avoid TWT Arcs and damage caused by excessive gas build-up, it is advisable to run the Amplifier for at least 24 hours every 6 months.

- Connect power cord to a suitable power source. (B)
- Engage the front panel circuit breaker. (I)
- Display screen becomes illuminated. (A)
- Amplifier is on in a "Standby" State. (C)

3.5 Applying an RF Signal

- Set to "RF OFF" connect a suitable signal generator to the RF input (J)
- To start we recommend the power level is set to -25dBm.
- For pulse TWT a 1 μ S pulse width.
- Switch RF signal generator to "RF on"

3.6 Switching RF On / Standby

- Pressing the "operate" button (D) on the front panel will switch the amplifier to an "RF On" state.
- The power from the signal generator can now be turned up until the required output power from the amplifier is achieved.
- Pressing the "standby" button will return the amplifier to the standby state.

4 MAINTENANCE

4.1 General cleaning

For cleaning the front panel, use an anti-static foam cleaner and a soft lint-free cloth or tissue. Using abrasive materials or strong solvents may damage the surface finish or the front panel overlay.

4.2 RF connectors

If the RF connectors or wave guide are used frequently, or left disconnected for long periods, there is a tendency for dirt and oxide deposits to build up. This increases the contact resistance and creates localized heating of the “RF out” connector pin, which may cause damage on high power models. Periodically inspect the inner pins of the RF connectors for damage or deposits, and carefully clean if required.



CAUTION: Do not use cleaning materials that leave a residue or that are abrasive for cleaning the RF connectors, as this seriously degrades their performance.

When storing the amplifier for long periods, the RF connectors should be protected with the plastic covers provided.

4.3 Air-filter cleaning.



CAUTION: Operating the amplifier with the air-filter clogged, may cause the amplifier to overheat.

The air-intake-filter on the amplifier front panel should periodically be checked for cleanliness. If it is seen to be obstructed with any dust or debris this should be cleaned away before the amplifier is operated.

4.4 Repairs

Repair work is to be carried out exclusively by an authorized AMETEK CTS repair department.



WARNING: Voltages of more than 230 VAC and are generated within the instrument. Do not open the cover.

Only original replacement parts and accessories are to be used.

Do not continue to use the instrument in the event of mechanical damage occurring. The metal chassis also performs insulating and protective functions.

4.5 Disposal



For the disposal of electronic devices, the country-specific regulations are to be considered. The equipment should be delivered to a specialized waste collection center.

Milmega and Teseq' devices can be returned to AMETEK CTS in England or to their agency for adequate disposal. Alternatively, the equipment can be handed over to a specialized enterprise for disposal of electronic devices.

Details to used material and components.

The traveling wave tubes in these products contain Beryllium Oxide, and other components contain PTFE. The appropriate precautions and regulations must be observed concerning the disposal of this amplifier and certain internal components. **Do not crush or incinerate.**