TUWH4000®

WHET® Wideband High Efficiency Transmitters

HIGH EFFICIENCY · ULTRA-WIDEBAND

UHF TV Transmitters
Air cooling system

Maximum return on investment

Egatel

COMSA CORPORACIÓN

TUWH4000® Series

UHF TV Transmitters

Air cooling system

The TUWH4000 transmitters series features a market-leading energy efficiency. They offer an efficiency up to 42%, providing broadcasters with a high economic benefit. The customer oriented and extremely compact design provides full flexibility and multiple configurations per rack, saving a lot of space in the transmitter site.

The rapid and easy startup of the transmitter and the power of the Web Server ensures fast commissioning and easy operation. The different options for redundancy and optimal design of critical modules guarantee continuity of service throughout the life of the transmitter.

Table of models

TUWH4000 Series*	TUWH4601	TUWH4602	TUWH4603	TUWH4604	TUWH4605	TUWH4606
Power (before the filter) COFDM	600 Wrms	1.2 KWrms	1.8 KWrms	2.4 KWrms	3 KWrms	3.6 KWrms
Power (before the filter) ATSC	1 KWrms	2 KWrms	3 KWrms	4 KWrms	5 KWrms	6 KWrms
Number of amplifiers	1	2	3	4	5	6
Maximum of TX per rack	6	3	2	1	1	2
Maximum N+1 systems per rack	4+1	2+1	1+1	N/A	N/A	N/A
Output RF connector	7/16 or EIA 1 5/8”	EIA 1 5/8”	EIA 1 5/8”	EIA 1 5/8”	EIA 1 5/8” (COFDM) EIA 3 1/8” (ATSC)	

(*) The models are referenced according to standard: TUWH46xx - DVB-T/H/T2, TUWH46xxB - ISDB-T/TB, TUWH46xxA - ATSC
Example: TUWH4606B - 3.6 KWrms ISDB-T/TB. Other configurations of output power and number of amplifiers, on request.

Benefits and key features

1 Leading efficiency wideband transmitters

- Doherty Technology
- Wideband advantages
- Economic benefit

2. Multiple configurations, full flexibility

- Compact design
- TE9000 Series Exciter
  - Advanced integrated features
  - *Adaptive Digital Precorrection*
  - *Crest factor reduction*
  - *TSoIP inputs*
  - *QoS analyzer*
- CCU9000 Control Unit
  - Supervision Guaranteed
- AUWH601 Power amplifier

3. Quick start-up and easy operation

- Instantaneous configuration via SD card
- Powerful Web Server to manage and monitor the transmitters

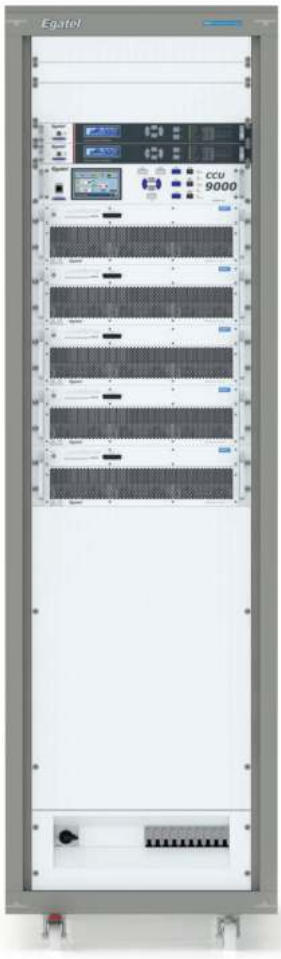
4. High reliability

- Redundant configurations
- Redundant power supplies removable from the front panel
- Optimum cooling system design

5. Service and Support

- Rigor and professionalism

Leading efficiency wideband UHF TV Transmitters



TUWH4000 Series
Model: TUWH4605

Doherty Technology

Transmitter's energy efficiency is a key factor for network operators by the time of selecting TV transmitters. The main reason is the energy cost, since after ten years of operation it can represent up to three times the initial investment.

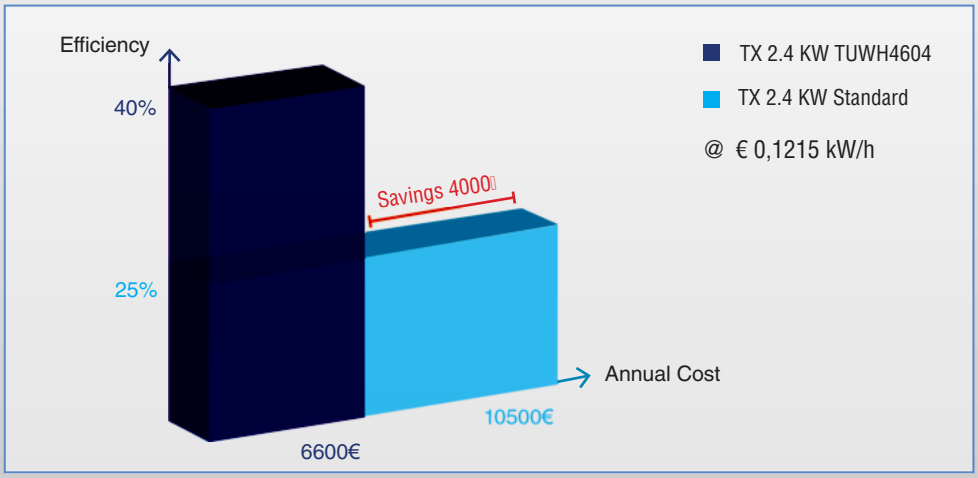
With the adoption of Doherty Technology in TV transmitters it was possible to boost energy efficiency values up to 42%, representing an improvement of almost 50% over traditional technology transmitters.

Furthermore, higher energy efficiency leads to an enhancement of other important aspects that also have an impact on the network cost. By dissipating less energy, the cooling system load is reduced and so the transmitter form factor. Thus, more amplifiers can be integrated in a single rack. In other words, more power in less space.

Despite all its advantages, classical Doherty topology has an inconvenient: It is an inherently narrowband technology. It involves that so far, the power amplifiers had to be precisely adjusted to work optimally in their RF channel. Therefore, when a channel change was requested, the network operator had to modify the power amplifiers or replace them with new ones. Obviously, this also greatly complicates the maintenance tasks, management and logistics of spare units.

Energy efficiency improving in wideband TV transmitters

The arising costs from electricity bill can be up to three times the equipment acquisition cost after ten years of operation.



Wideband advantages

The TUWH4000 series, equipped with wideband Doherty technology, overcomes the drawbacks of classical Doherty transmitters while keeping all the benefits. Thus definitively ends with trade-offs. You don't need to waste frequency agility to optimize energy efficiency.

TUWH4000 transmitters reach an energy efficiency of up to 38% for COFDM and 42% for ATSC waveforms. The efficiency is maintained throughout the UHF range, so no adjustment is required in the power amplifiers at the time of changing the RF channel of operation. Moreover, with the wideband technology there is only one reference for the power amplifiers, which drastically simplifies the management of spare parts.

An example that illustrates the benefits of wideband Doherty amplifiers is the N+1 configuration. With classic Doherty technology, each main transmitter must be perfectly adjusted to its transmission channel in order to get the maximum efficiency. On the other hand, the reserve transmitter must be able to replace any of the main transmitters.

Therefore, it can not work in Doherty mode and its energy efficiency is lower. As a consequence, the design of the power supply network of the entire system becomes more complex. Moreover, it is necessary to handle different types of power amplifiers, depending on they are for main or reserve transmitters.

Since all TUWH4000 transmitters comprising an N +1 system are identical, mains and reserve, the power consumption of the whole system is optimal and homogeneous. Furthermore, working with just a unique reference leads to reduction in the maintenance and logistics cost.

Economic benefit

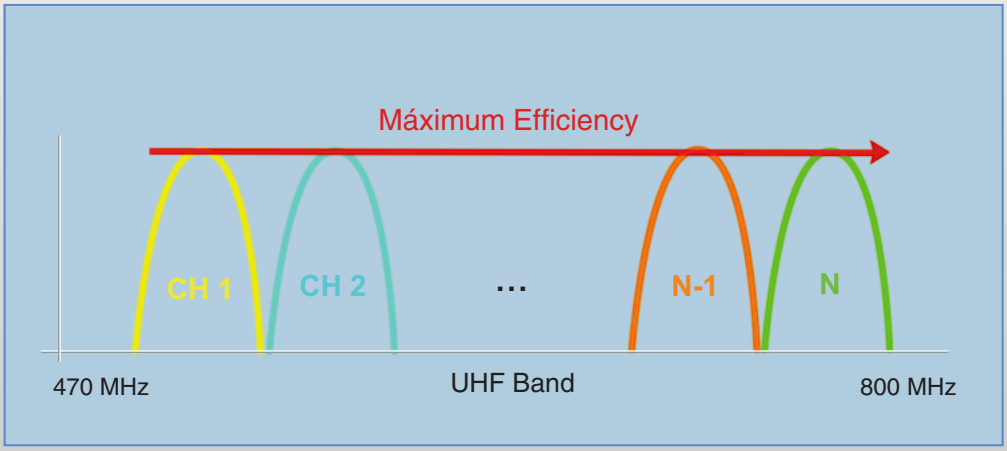
The high energy efficiency of the TUWH4000 transmitters provides an immediate economic benefit to operators. As an example, taking a transmitter of 2.4kW with a standard efficiency of 25% as the basis and considering the average price of industrial energy in Europe (0.1215€ / kWh), then the cost related to the annual consumption is approximately 10500 .

The same transmitter operating in high efficiency mode and featuring additional techniques for crest factor reduction may reach an efficiency of 40%. This means that in this new situation, the cost of the annual consumption of the transmitter is 6600 . Therefore, the savings are approximately 4.000€ per year. What is more, as increasing the number of transmitters in the network and the higher is their output power, the highest economical saving.

We can conclude that network operators save money as soon as the TUWH4000 transmitters enter in operation.

Efficiency optimization throughout the UHF band

TUWH4000 Series transmitters as part of N +1 system, main and reserve, are identical. The associated cost with equipment replacement is reduced and simplified.



Multiple configurations, full flexibility

Compact Design

The TUWH4000 series provides maximum versatility and flexibility. Customers can choose from a multitude of different configurations to get the one that best suits their needs.

The use of LDMOS-50 volts transistors technology and the optimum design of the amplifier stage yield in an excellent power density, allowing each amplifier to deliver an output power of 600W for COFDM standards an 1000W for ATSC in just three height units.

A single rack of 42U can accomodate up to six transmitters or a 4+1 redundant system. The 600W COFDM (1000W ATSC) transmitters can be ordered without a rack for being installed in any existing in the transmitter site. Moreover, all the additional elements such as the combiner, harmonic filter, dummy loads or lightning protection are integrated inside the rack.

The high capacity of integration considerably relaxes the space requirements for installation. This is a key factor in those locations suffering a lack of space. Considering the cost per square meter, saving space also means saving money.

To increase the flexibility of the equipment and to match the customer needs, the transmitters can operate without an exhaust air unit. If the exhaust air unit is used, then exciter or CCU9000 Control Unit monitors the operation of the cooling system.

TE9000 Series Exciter

Advanced integrated features

The exciter is ready to work with the major international TV standards: DVB-T/H, DVB-T2, ISDB-T/T_B, ATSC MH/SFN. They are equipped with advanced features to accelerate the start up, ease the operation and monitoring as well as to optimize the transmitted signal.

Adaptive Digital Precorrection

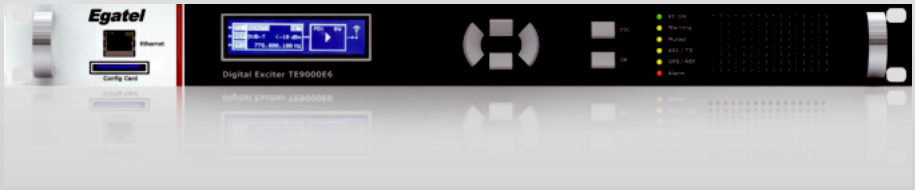
The adaptive digital precorrection system enables the equalization of the signal easily and quickly. It can be activated manually, by a programmed trigger or it can run continuously and adaptively. The processing power of the precorrector allows to achieve unbeatable Shoulders and MER values, ensuring the highest quality in the transmitted signal.

Crest factor reduction

The TE9000E6 exciter offers for all OFDM standards the advantage of crest factor reduction implemented by a proprietary technology, that allows without any negative impact on MER, to reduce the signal crest factor enhancing the transmitter efficiency.

TE9000 Series Exciter

It integrates a HW demodulator to provide with Shoulders, MER, BER and PER values



TSoIP inputs

The exciter has an integrated Transport Stream over IP receiver able to manage two ASI streams over a Gigabit Ethernet bus. The switching between the two inputs is fully automatic and Seamless. Thus, operators get both economic and space savings avoiding the installation of an external receiver.

QoS analyzer (DVB-T and DVB-T2)

The TE9000E6 exciter integrates a HW demodulator to provide with Shoulders, MER, BER and PER values. This feature allows to evaluate the quality of the signal in realt time and to access this information remotely through the Web server or an SNMP client. Therefore, it saves unnecessary trips to unattended sites and the use of an external analyzer to check the output signal of the transmitter.

CCU9000 Control Unit

Guaranted supervision

The transmitters can optionally incorporate a Control Unit. This module is responsible for the controlling and monitoring of each transmitter and the redundant systems, both dual drive and N +1, as well as the air extraction system if used. It can be remotely controlled via its powerful Web Graphic User Interface or through an SNMP client.

The Control Unit can be also managed locally through its high-resolution graphical display that gathers in a single window all the status information of single transmitters or N +1 systems.

CCU9000 Control Unit

AUWH601 Power amplifier

The design of power amplifiers of the TUWH4000 transmitters family is based on LDMOS 50-volt transistors technology. They provide a compact design, high efficiency and excellent linearity, getting high energy savings. To increase the efficiency offered by Broadband Doherty configuration, the supply voltage of the transistors can be adjusted through the exciter or the control unit increasing the efficiency for all digital standards. This mechanism is considerably boosts efficiency when working at reduced power.

AUWH601 Amplifier

The amplifiers are self-protected by having circuits that control the input level, output power and other critical parameters such as the temperature of the amplifier or the reflected power. The protection system automatically lowers the output power of the amplifier any time the default threshold is exceeded, preventing an amplifier damage. Those parameters, along with the values of consumption of the transistors as well as the generated alarms are sent through a data bus to both the exciter and the control unit (if any), where they can be checked at any time through the display, making the monitoring and maintenance tasks easier.

They have a redundant power supply system composed by three power supplies hot-swappable from the front, so that the fault of one does not suppose any output power reduction.

Each amplifier includes two fans that allow a correct transmitter operation without an exhaust air unit and an innovative cooling system that prevents air flow through the electronic components, providing full immunity to corrosion.

Quick start up and easy operation

Instantaneous configuration via SD card

Both the exciters as the control unit include an SD card to store the whole configuration of the transmitter, so the start up of a new transmitter or the configuration of a spare unit is done in seconds. It is also particularly useful to put in operation N+1 systems quickly.

Powerful Web Server to manage and monitor the transmitters

The flexibility and versatility present in the design of all modules is revealed once again allowing the transmitters to be fully managed through the exciter. Thus, with a single IP address is sufficient to control and monitor the status of the equipment.

For this purpose, besides the SNMP protocol, the exciter integrates the most powerful and friendly Web Server on the market. The Graphical User Interface (GUI) divides the screen into two parts. All the blocks that make up the transmitter chain are shown in the upper half. A simple color coding is used to check instantly the status of individual blocks. To read or modify any parameter, just click and drag the corresponding block to drop it in the bottom of the screen, where the parameters of up to to three different blocks can be displayed. The GUI has been designed to never lose sight of the transmitter status.

Exciter Web GUI

High reliability

Redundant configurations

The transmitters can optionally include the CCU9000 Control Unit to set up N+1 and / or dual drive redundant configurations. The extremely compact design concept allows to integrate N +1 systems in the same rack.

The Control Unit is equipped with a high resolution graphical display through which is easy to locally set or change any parameter and to perform an assesment of the transmission chain at a glance. Similarly, the control unit provides remote access to the transmitters through a powerful Web GUI or via the SNMP protocol.

Optimum cooling system design

The amplifiers feature an innovative cooling system that prevents air flow through the electronic components, providing full immunity to corrosion. This is a critical point in transmitter sites located in areas with high salinity in the air. This aspect contributes greatly to increase the lifetime of the amplifiers.

Each amplifier includes two fans that allow a correct transmitter operation without and external air conducting unit. Furthermore, the fans can be easily and quickly hot-swapped during maintenance tasks.

Redundant power supplies removable from the front panel

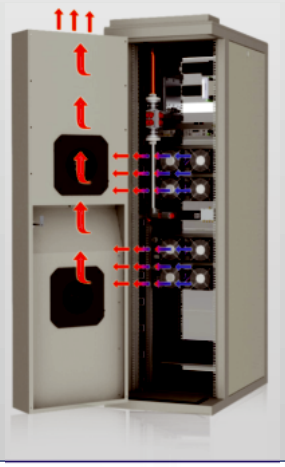
With the aim of maximizing ease of maintenance and ensuring service availability, the amplifiers include two power supplies plus a redundant unit. In case of a power supply fails, it can be easily replaced by opening the front cover of the amplifier and pulling the faulty unit out.

Furthermore, this process can be performed during the normal operation of the transmitter. Thus, by avoiding uncomfortable access to the rear part of the rack or to swtich off the amplifier, the maintenance tasks are significantly simplified without interrupting the TV service.

AUWH601 Amplifier

To replace any power supply just need to open the front cover of the amplifier and pulling the faulty unit out

Cooling system options



With extraction unit. Air extraction through ducting unit installed on rear dooor

No extraction unit. Air goes directly to the room where the transmitters is installed

Transmitters can be supplied with or without air ducting unit. In the first case, the speed of the ducting unit fans is controlled by a microcontroller according to real-time cooling needs, boosting the overall energy efficiency.

Service and support

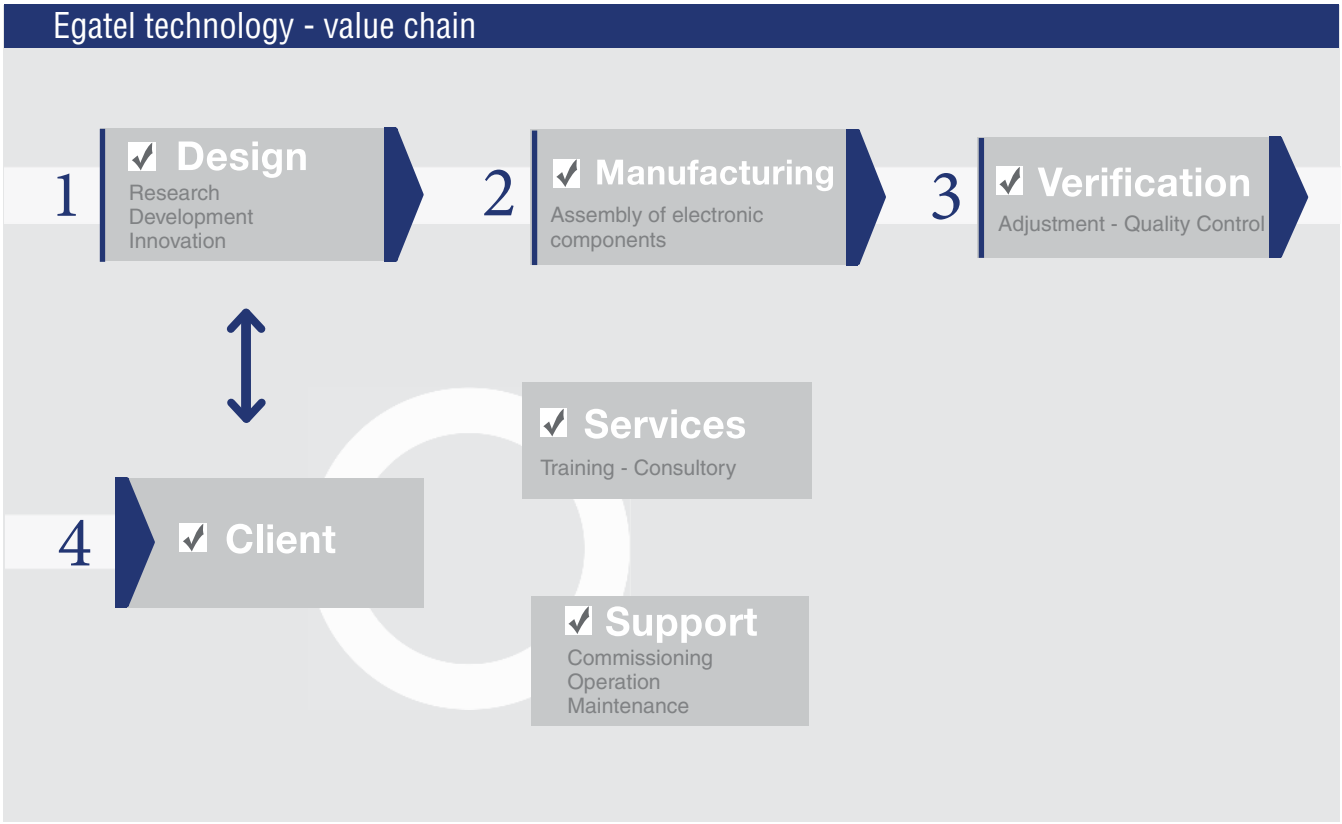
Rigor and professionalism

All processes that add value from the design stage to the manufacturing of the transmitters are carried out in-house. The company owns dedicated facilities for the mount of electronic components with several production lines equipped with the most advanced machines on the market. Therefore, the quality control throughout the production process is kept at Egatel, reaching the maximum reliability.

The international recognition achieved by the company is due not only to the supply of high technology products, but also to the wide range of services offered. They go a step beyond, with dedicated staff to provide full assistance during commissioning and normal operation or to offer qualified training, adding value and completing the process that begins when a customer trust in Egatel.

Each project is undertaken with the maximum level of commitment, acomplishing the delivery times and adapting to the demands of each customer, being aware of the importance of a professional attitude in their loyalty.

Egatel is integrated in Comsa-Emte, which is one of the biggest industrial gropus in Spain within the sectors of infrastructure and technology. The group has a strong activity all around the five continents and it is established in 18 countries. The customers benefit from this wide international presence and the stability provided by a multinational company, guaranteeing local support and the purchase of Egatel equipment as a safe investment.



Technical specifications

Exciter

DVB-T/-H/-T2	
Standard	EN300744, EN302304, EN302755, TS 102831, TS 102 773 (T2-MI)
Inputs	2xASI BNC (H), 75 ohm / TSoIP 10/100/1000 RJ45
FFT size	1K (DVB-T2), 2K, 4K, 8K, 16K (DVB-T2), 32K (DVB-T2)
Code rate	1/2, 2/3, 3/4, 5/6, 3/5 (DVB-T2), 4/5 (DVB-T2)
Guard interval	1/32, 1/16, 1/8, 1/4, 19/256 (DVB-T2), 19/128 (DVB-T2), 1/128 (DVB-T2)
Constelation	QPSK, 16QAM, 64QAM, 256QAM (DVB-T2). Rotated and no rotated (DVB-T2)
ATSC	
Standard	ATSC A/53, A/54, A/64, A/153, A/110B, A/110: 2011, SMPTE-310M
Inputs	2xSMPTE BNC (F), 75 ohm - 2xASI BNC (F), 75 ohm
Constelation	8VSB
Symbol rate	10.76 Msymbols/s
Data rate	19.39 Mbits/s
Trellis coding	2/3
Reed-Solomon encoder	207 / 187 / 10
ISDB -T/-Tb	
Standard	ARIB STB-B31, TR-B14
Inputs	2xASI BNC (F), 75 ohm
FFT size	2K, 4K, 8K
Code rate	1/2, 2/3, 3/4, 5/6, 7/8
Guard interval	1/4, 1/8, 1/16, 1/32
Carrier spacing	4 KHz, 2 KHz, 1 KHz
Hierarchical modulation	Up to 3 layers
Constelation	QPSK, 16QAM, 64QAM, DQPSK
Clock and synchronization	
Internal clock	10 MHz
External reference	10 MHz BNC (F). Impedance = 50 ohm / high (configurable). Level = -5 a +10 dBm
1pps reference	BNC (F). Impedance = 50 ohm / high (configurable)
SFN	Resolution SFN = ±100 ns. SFN configurable delay = ±500 ms
Local and remote control	
Display	Local operation through the display and keyboard located on the front panel
RJ-45	Ethernet network management interface for local and remote operation via SNMP agent and / or Web Browser
Parallel interface	Floating contacts for messages and commands

General

Frequency range	UHF: 470 - 800 MHz (resolution: 1Hz)
Channel bandwidth	6, 7, 8 MHz plus 1.7, 5 and 10 MHz for DVB-T2 | ISDB-T/Tb , ATSC: 6 MHz
Cooling	Air - cooled
Power supply	Three-phase: 400VAC +/- 15%, 47 a 63Hz
Max. installation altitude	Up to 2500 m (> 2500 m on request)

Remark: To comply with the out-of-band regulations and with the required shoulder attenuation, the RF output of the transmitters must be connected to an appropriate filter.

EGATEL.SL

Web: www.egatel.es
e-mail: egatel@egatel.es

HEADQUARTERS

Egatel Building
Av. Ourense, 1
Parque Tecnolóxico de Galicia
32901 Ourense
Phone: +34 988 368 118
Fax: +34 988 368 119

INTERNATIONAL SALES

C/ Julián Camarillo, 6A - 2ª
28037 Madrid
Phone: +34 91 788 5070
Fax: +34 988 368 119

EGATEL MEXICO

Av. Insurgentes Sur 664, 9th floor
Col. del Valle,
Mexico D.F. 03100
Phone: +52 (1) 55 4880 9238
e-mail: ssanz@egatel.es

EGATEL CHILE

Avda. Presidente Riesco, 5335
9th floor - 7561127 Las Condes
Santiago de Chile
Phone: +54 9 11 5937 4848
e-mail: crusso@egatel.es

EGATEL ARGENTINA

Av. Santa Fé 1845
4th floor Of. B
1123 Buenos Aires, C.F.
Phone: +54 9 11 5937 4848
e-mail: crusso@egatel.es