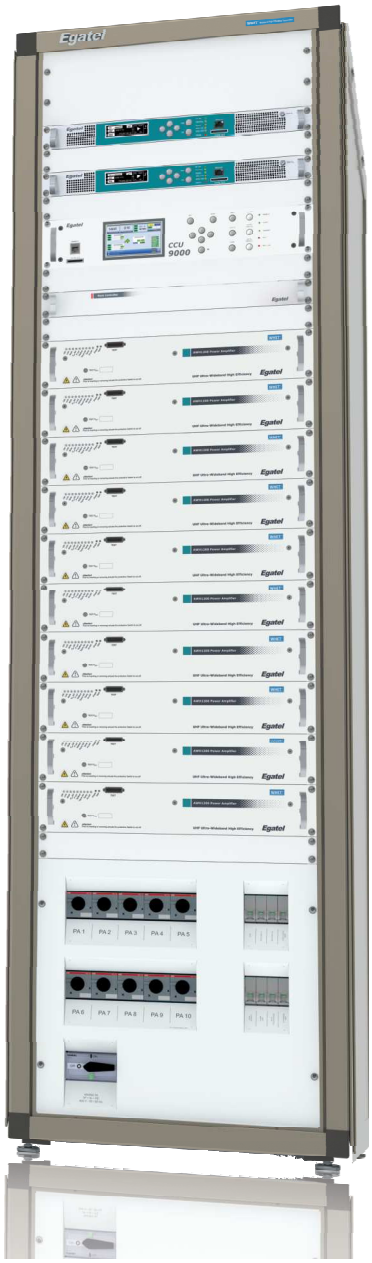
TLWH7900E®

WHET® Wideband High Efficiency Transmitters

HIGH EFFICIENCY · ULTRA-WIDEBAND

UHF TV Transmitters
Liquid cooled



Maximum return on investment

Egatel

TLWH7900E® Series

New generation transmitters

The TLWH7900E series marks a milestone in high power UHF liquid-cooled transmitter technology. TLWH7900E transmitters achieve an impressive energy efficiency of up to 42%, providing broadcast operators with huge operating costs savings and making them the optimal solution for deploying or expanding DTV networks worldwide.

Equipped with the state-of-the-art signal processing technology and high- efficiency wideband asymmetric Doherty power amplifiers, TLWH7900E transmitters offer a wide power range, from 1.5 KWrms to 14.4 KWrms for all modulation standards (DVB-T / T2 / H, ISDB-T / Tb and ATSC).

They have a power-to-size and performance-to-reliability ratio that allow to broadcast the signal with the highest quality. Its compact and modular design, as well as its high energy efficiency, facilitate the installation and maintenance, thus significantly reducing the total expenditures for network operators throughout the transmitter lifecycle.

Table of models

TLWH7900E *	TLWH7901E	TLWH7902E	TLWH7903E	TLWH7904E	TLWH7908E	TLWH7910E
Power (before the filter) COFDM, ATSC	1.5 KWrms	3 KWrms	4.4 KWrms	5.8 KWrms	11.5 KWrms	14.4 KWrms
Number of amplifiers	1	2	3	4	8	10
Number of racks	1	1	1	1	1	1
Output RF connector	EIA 1 5/8”	EIA 1 5/8”	EIA 1 5/8”	EIA 3 1/8”	EIA 3 1/8”	EIA 3 1/8” EIA 4 1/2”

(*) The models are referenced according to standard: TLWH79xxE - DVB-T/H/T2, TLWH79xxEB - ISDB-T/TB, TLWH78xxA - ATSC
Example: TLWH7808EB - 11.5 KWrms ISDB-T/TB. Other configurations of output power and number of amplifiers, on request.

Benefits and key features

1 Leading efficiency wideband transmitters

- Asymmetrical Doherty Technology
- Economic benefit

2. Flexible configurations, compact design

- TE9000 Series Exciter

  Advanced integrated features

  - QoS analyzer
  - Adaptive Digital Precorrection
  - Spectrum Analyzer

  TSoIP Inputs
- CCU9000 Control Unit
- AWH1500E Power Amplifier

3. Quick start-up and easy operation

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

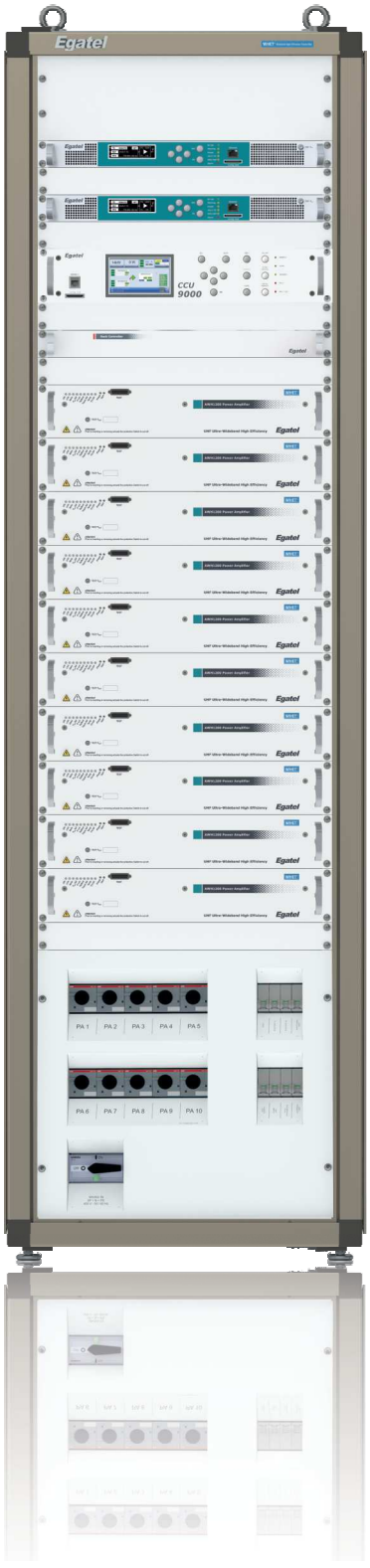
4. Optimum cooling system

- Efficient and reliable

5. Service and support

- Rigor and professionalism

Leading efficiency wideband transmitters



TLWH7900E series
Model: TLWH7910E
Configuration: Dual Drive

Asymmetric Doherty Technology

Reducing operating costs is paramount for network operators, as the lifetime operational expense of a transmitter is estimated to be more than three times the initial investment. Egatel TLWH7900E transmitters incorporate Wideband Asymmetric Doherty Technology that boost energy efficiency through broadband designs thereby lowering total cost of ownership (TCO) and helping broadcasters to reduce carbon footprints.

The new TLWH7900E transmitters achieve up to 42% energy efficiency for OFDM waveforms, cooling system included, in UHF band; the design is fully broadband, which means that no change or optimization of any kind is needed on a channel change making this a very simple task.

To allow network operators to achieve maximum energy savings, the TLWH7900E transmitter family offers an intelligent algorithm that optimizes the working point of power amplifiers to meet specific quality requirements, always ensuring maximum efficiency: this efficiency optimization, plus a high-end digital adaptive precorrection, is of particular importance when working with reduced power: system efficiency always remains optimal.

In addition, thanks to the broadband design, N+1 systems can now operate at maximum efficiency, as the reserve transmitter is exactly the same and with the same high efficiency as the main ones, also facilitating the management and logistics of the spare parts.

Higher energy efficiency leads also to improvements in other aspects that also have an impact on network costs: By dissipating less power, the cooling system and thus the form factor of the transmitter is reduced: more amplifiers can be integrated in the same space, resulting in higher power density.

Economic benefit

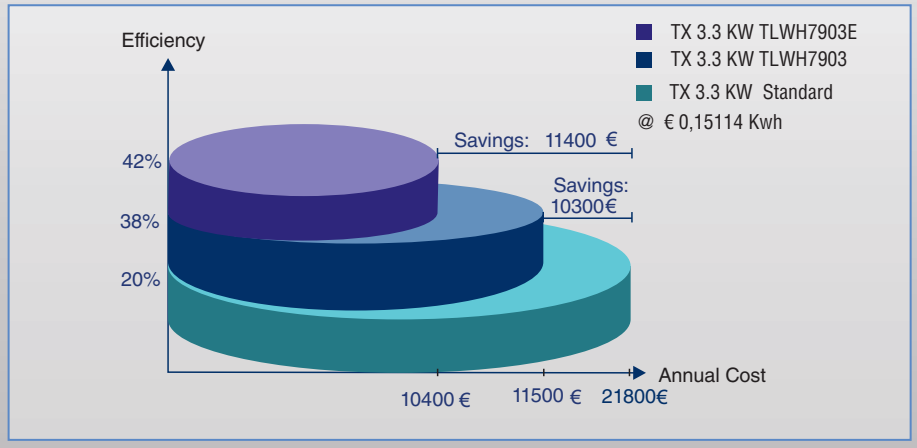
The lifetime operational expense of a transmitter is estimated at greater more than six times the original product cost. As a direct conclusión, the increase of the energy efficiency of a transmitter provides an immediate economic benefit to the users.

As an example, considering the average price of industrial energy in Europe (0,15114€/Kwh), an old 3,3 KW transmitter with a standard efficiency of 20% has a consumption yearly cost about 21.800€. The same transmitter with Doherty Wide Band technology, with an efficiency up to 38%, saves 10.300€ yearly, while with Asymmetric Doherty Wide Band technology, with an efficiency up to 42%, increase this savings to 11.400€

Asymmetric Doherty Wide Band technology lowers monthly bills through sharp power efficiency increases, and reduces rack space requirements with an increase in power density.

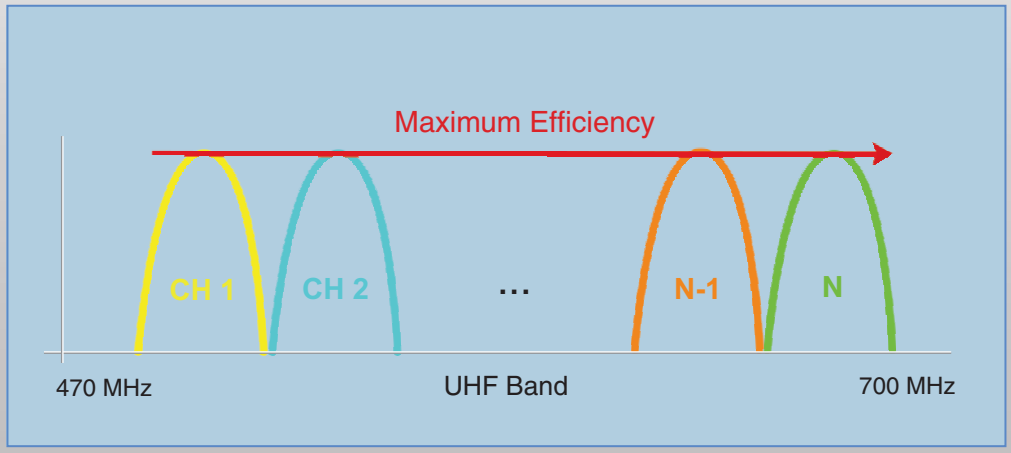
Energy efficiency improving in wideband TV transmitter

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



Efficiency optimization throughout the UHF band

TLWH7900E Series transmitters as part of N +1 system, main and reserve, are identical. The associated cost with equipment replacement is reduced and simplified.



Flexible configurations and compact design

The TLWH7900E series provides maximum versatility and flexibility. Customers can choose from a multitude of different configurations to get the one that fits their needs the best.

The LDMOS-50 volts transistors technology, the optimum design of the amplifier and adaptative networks achieve an excellent power density, allowing each amplifier to deliver an output power of 1500W in all TV standards. A single rack of 42U can accomodate up to a 14,KWrms transmitter.

In order to adapt to the customer demands and needs, transmitters up to 5.8kWrms can be supplied with an integrated cooling system in the transmitter rack or in an external cabinet.

TE9000E8 Series Exciter

Advanced integrated features

The exciter is ready to work with most of the international TV standards: DVB-T/H, DVB-T2, ISDB-T/TB, ATSC. They are equipped with the most advanced technology in signal processing and with an automatic efficiency optimization system, providing the best cost effective operation possible in all working scenarios.

The TE9000E8 series has two modulation engines inside what permits the exciter to store two standards simultaneously. This feature allows network operators an easy way to keep an exisiting standard, i.e. DVB-T or migrate to DVB-T2, just pressing a button.

Adaptive Digital Precorrection

The TLWH7900E transmitters offer best-in-class adaptive digital precorrection, specially adapted to Egatel Doherty amplifiers. It can be activated manually, by a programmed trigger or continuously and adaptively. The processing power of the precorrector allows to achieve unbeatable Shoulders and MER values, ensuring maximum quality in the transmitted signal.

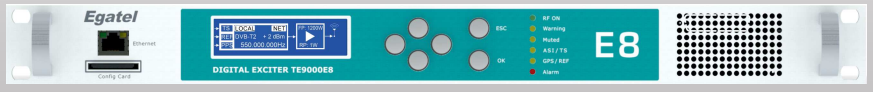
QoS and Spectrum Analyzer

Focusing on the reduction of operating costs faced by network operators, the TLWH7900E series comes with a function that allows to measure locally or remotely the quality of the transmitted signal in real time, thus avoiding the use of external analysers and saving unnecessary trips to unattended sites.

The operator can measure the main QoS parameters of the signal: MER, BER, PER (DVB-T/T2 and ISDB-Tb) Shoulders and efficiency, enabling real-time control of the transmitter.

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.

CCU9000 Control Unit

All of the components of the transmitter have been designed following a policy of design focused on ensuring an always-on-the-air TV service. Transmitters optionally can incorporate a Control Unit. It manages and monitors the operation of the entire transmitter and redundant systems, both Dual Drive and N+1 system, as well as the liquid cooling system.

CCU9000 Control Unit

The CCU9000 Control Unit can control and monitor Egatel transmitters as well as transmitters from other manufacturers. With a footprint of only two units, it manages and monitors the operation of the entire transmission chain, switching between exciters / amplifiers / transmitters manually or automatically, as needed.

It includes a high resolution TFT graphical display to check at a glance the transmitter status. In addition it can be modified any configuration parameter of transmitter, either locally or remotely.

The CCU9000 monitors and controls the liquid cooling system. The main window of either Control Unit or the Web Server shows a graphical representation of the refrigeration unit and all information related to its operation.

One or more authorized users may monitor and manage the transmitters remotely using a powerful Web Graphical user Interface or an SNMP agent.

AWH1500E Power Amplifier

The liquid-cooled amplifiers of TLWH7900E transmitters are based on Wideband Asymmetrical Doherty technology delivering in a compact design, only 2RU, 1500W of output power for all TV standards. They have been designed to provide the best possible performance and efficiency across the entire UHF band without hardware changes or optimizations of any kind

Ongoing maintenance is now simplified thanks to a broadband modular, pallet-based design, and compact power supplies. Three redundant, high efficiency power supplies, which can be easy replaced, deliver power for the pallets and allow the amplifiers to operate at full power even if one of them fails.

To allow network operators lowering the total cost of ownership over the lifetime of the transmitters, all parameters of the power amplifiers can be checked and controlled locally, by means of the display of the control unit or via web server as well as remotely.

The clever efficiency optimization algorithm, deployed manual or automatically at the press of a button, features power and channel agile efficiency, making these amplifiers ideal for N+1 configurations, as all transmitters can use the same amplifiers minimizing spares requirements, as well as for operation at reduced power.

AWH1500E Amplifier

It has circuits that control critical parameters such as the temperature of the amplifier or the reflected power

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 remotely.

In this way, a single IP address is enough to control and monitor the transmitter status.

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 Webserver

Optimum cooling system

The cooling system of the TLWH7900E transmitters uses efficient, field-proven components for the different power configurations. For single transmitters with up to five amplifiers, the cooling system with two redundant pumps integrated into the rack is the ideal choice. The control and continuous adjust of the working point of pumps and heat exchanger fans involves an optimization of the system efficiency

Efficient and reliable

The cooling system consists of a pumping unit including two series-connected pumps and a heat exchanger usually located outside of the transmitter room.

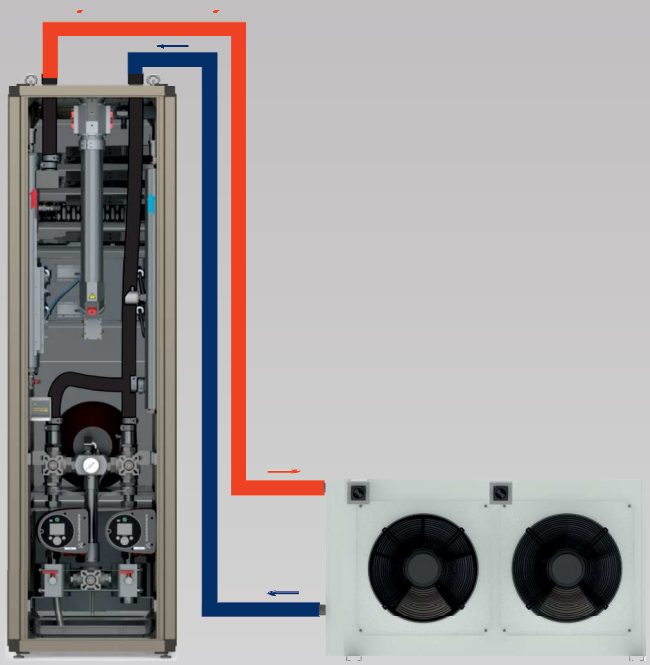
To increase the performance and reliability, two fans of Electronically Conmutated type (EC) are incorporated in the heat exchanger. In normal operating con ditions, they work simultaneously and at a low rpm.

The necessary coolant flow is calculated based on the system configuration and the number of amplifiers. The rotational speed of the pumps and the fans in the heat exchanger is adapted to the coolant flow to save energy and extend transmitter life, and according to the temperature measured at the input and output of the transmitter rack.

Only aluminum and stainless steel are used in the interconnections of the liquid cooling system, where a biodegradable glycol is used as coolant.

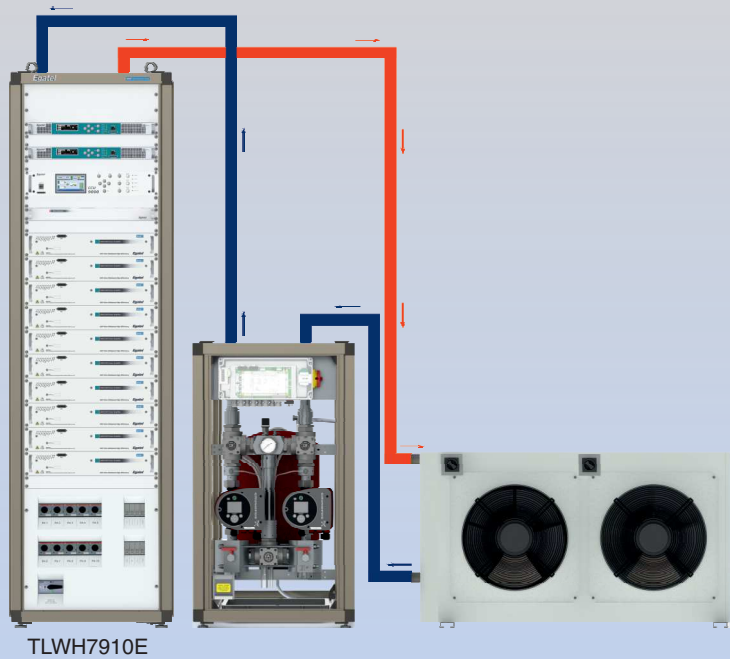
Cooling system options

Pump unit included into the rack



TLWH7902E

External Pump Unit



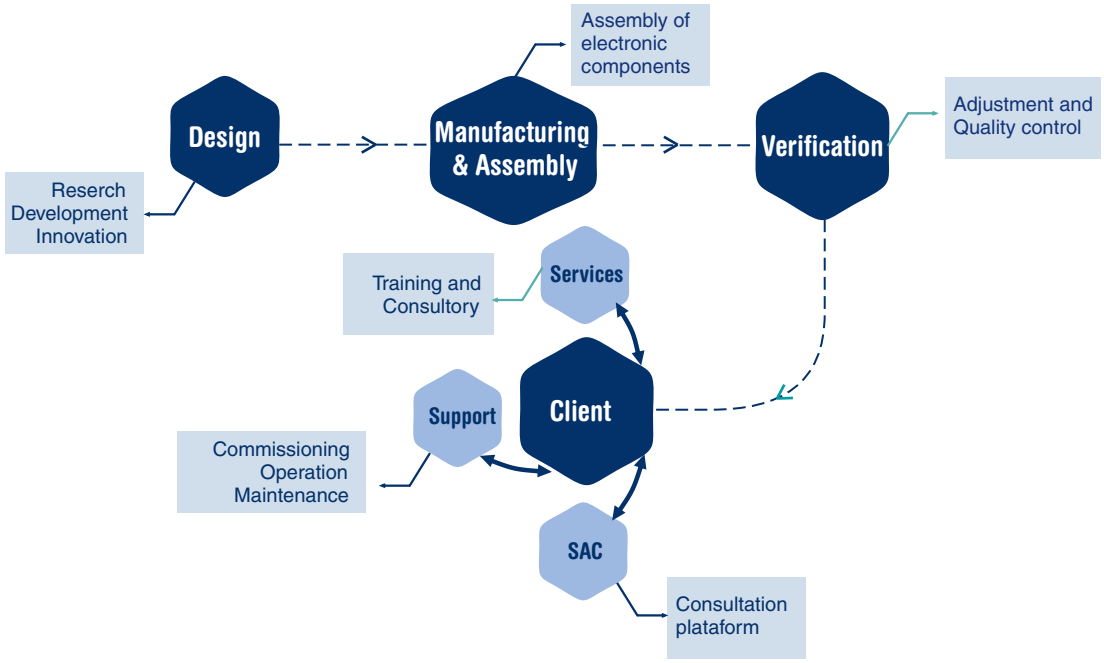
TLWH7910E

Service and support

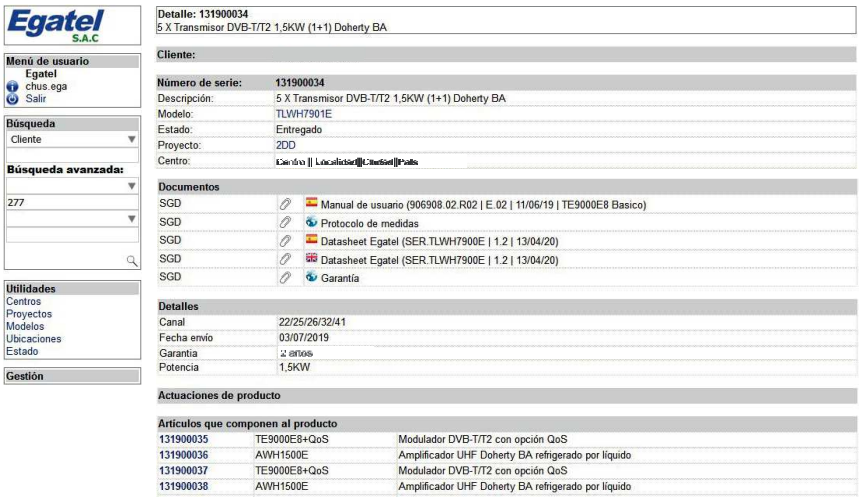
Rigor and professionalism

The international recognition achieved by the company is due not only to the supply of high technology products, but also that it is offering our full assistance during the equipment start up and the daily operation of the devices and 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 has designed an innovative application called **Customer Service (S.A.C.)**. Through this platform, the user can access a web page to consult all technical documentation associated with their equipment, including technical manuals, interconnection diagrams, datasheets, conformity certificates and warranty time, and all the serial numbers at the module level.



Technical specification

Exciter

DVB-T/-H/-T2	
Standard	EN300744, EN302304, EN302755, TS 102831, TS 102 773 (T2-MI)
Inputs	2xASI BNC (F), 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 Msmbols/s
Data rate	19.39 Mbits/s
Trellis coding	2/3
Reed-Solomon coding	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
Carriers 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 to +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	
Keyboard and display	Local operation through the display and keyboard located on the front panel
RJ-45	Interface Ethernet network management 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 - 700 MHz (resolution: 1Hz)
Channel bandwidth	6, 7, 8 MHz plus the 1.7, 5 and 10 MHz for DVB-T2 | ISDB-T/T , ATSC: 6 MHz
Cooling	Air cooling system
Power supply	Three-phase: 400VAC +/- 15%, 47 to 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

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HEADQUARTERS

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