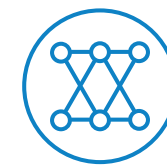




150 to 5000W FM Transmitters
Wave Series - Compact versions



Technology and talent
deliver their strongest signal and
the FM Transmitter becomes intuitive.
To achieve it we could use only the head,
but then we put the heart, too.



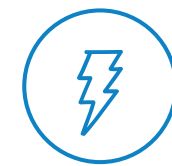
Technology



Heart



Intuition



Power



Head





WaveArt: it's coming the era of **digital humanism**

WaveArt is a company specialized in the design and manufacture of **innovative FM transmitters** that provide outstanding performance for cutting-edge radio stations.

We are fascinated by **smart technology** and by solutions that improve people's life. Our focus is on people, to their business and to their radio experience.



Excellence of our product:

Reliability, efficiency, design and fair price are just a few of our inspiring principles. Decades of experience in TV Broadcasting and continuous **interactions** with other fields make our products **unique**. Just as unique are the head and the heart of who conceived them. **WaveArt is an ABE Elettronica spin-off.**



Our mission:

Innovate Radio Broadcasting.

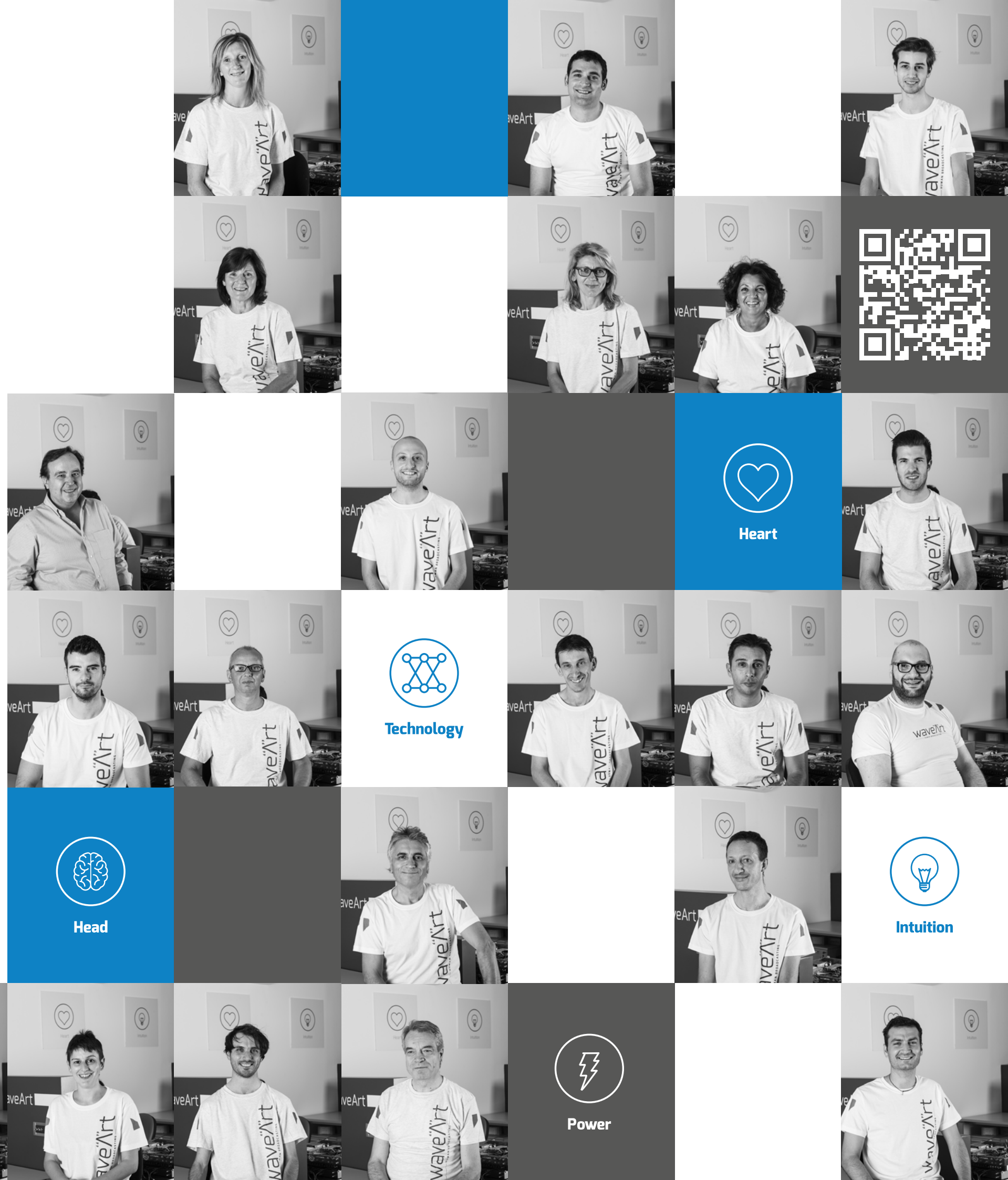


The team makes the difference. Always.

Our team has been able to express its **know-how** in a unique way, combining a proven experience in TV Broadcasting with the typical enthusiasm of the new generations. The mix of personalities, experiences and expertise that encloses WaveArt team led to design **exceptional FM transmitters**, combining **skills, technology and passion**.

Technological melting-pot: is there a greater power?

The human wealth always makes the difference: WaveArt expresses the value of a mature, inventive and lively team, looking for **new and flexible solutions**, ahead of their time. The **heterogeneous professional and cultural background** of our team has allowed us to merge into our products **solutions coming from different fields**. The result: unequaled service and performance **never seen before**.





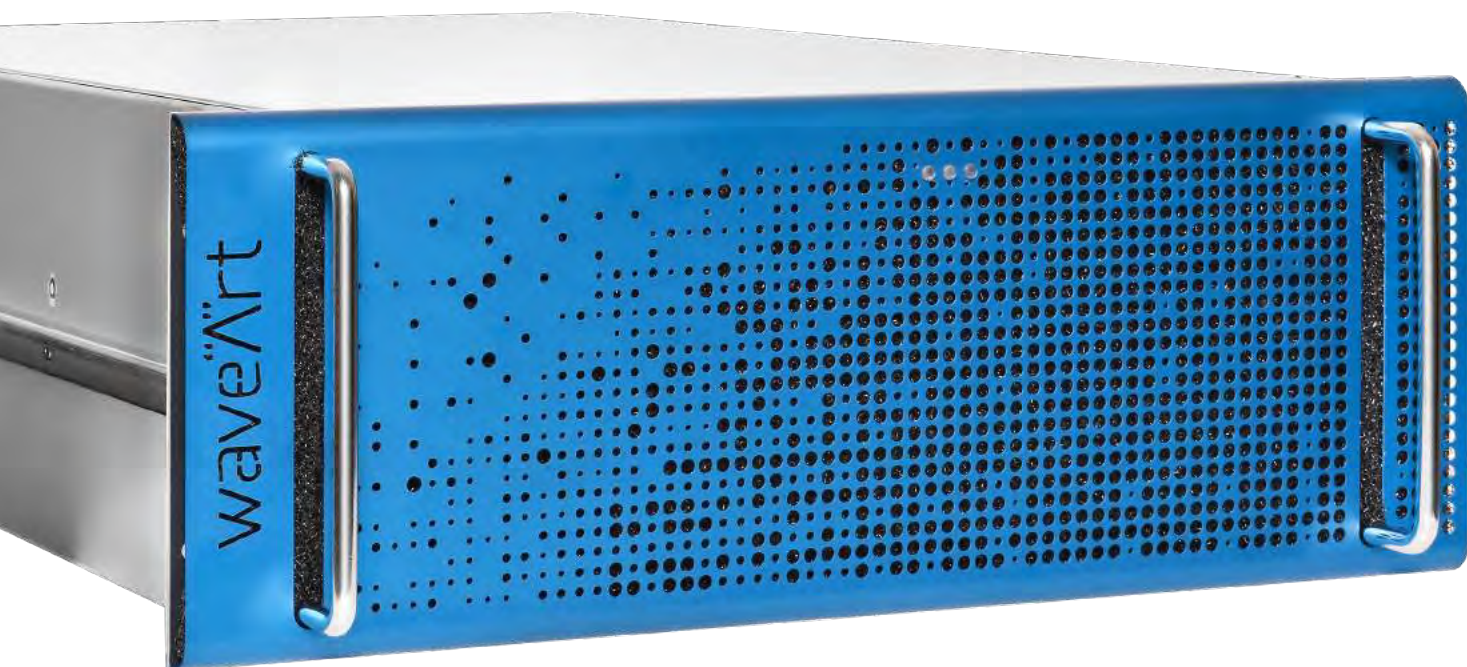
The reinvention of FM Transmitters

Listening to the needs and requests of broadcasters, we managed to incorporate in our transmitters features that make them unique in terms of **reliability, ease of management and reaction to critical scenarios.**

Our goal is to simplify network management and complexity, in order to **prevent you to waste money and time.**

Thanks to this approach, in a few years **the concept of FM transmitter will be revolutionized...**

Have you ever seen a double SAT receiver inside an FM transmitter?



ProDigy

Digital Processing with DDS Modulator

Digital Processing is a technique that involves **the conversion of the input signal from analog to digital**; the sampling result is then processed and modulated at the frequency required. This method introduces **less distortion**, requires no calibration and allows more flexibility on input and output signal handling. A further benefit is the hardware scalability, allowing a simple transition to Digital Broadcasting and **additional tailor made features.**



EffiSense

Prognostics

Analysis for predictive maintenance

WaveArt transmitters are able to **collect and process several parameters** to evaluate the operating conditions at the site. This feature is crucial for maintenance and for **predictive analysis** of potential future failures.

WorryFree

Free warranty up to 5 years

Based on the collected data, the unit recommends the proper operations to extend its life span, rewarding more careful customers with an **unmatched warranty.**



All-in

It receives, sharpen and deliver your audio

Our transmitters integrate a **comprehensive set of input interfaces**, as well as **MPX/RDS Encoder** and **Audio Processor.**

Say goodbye to headaches, you won't need to use external units anymore!



Designed to be intuitive

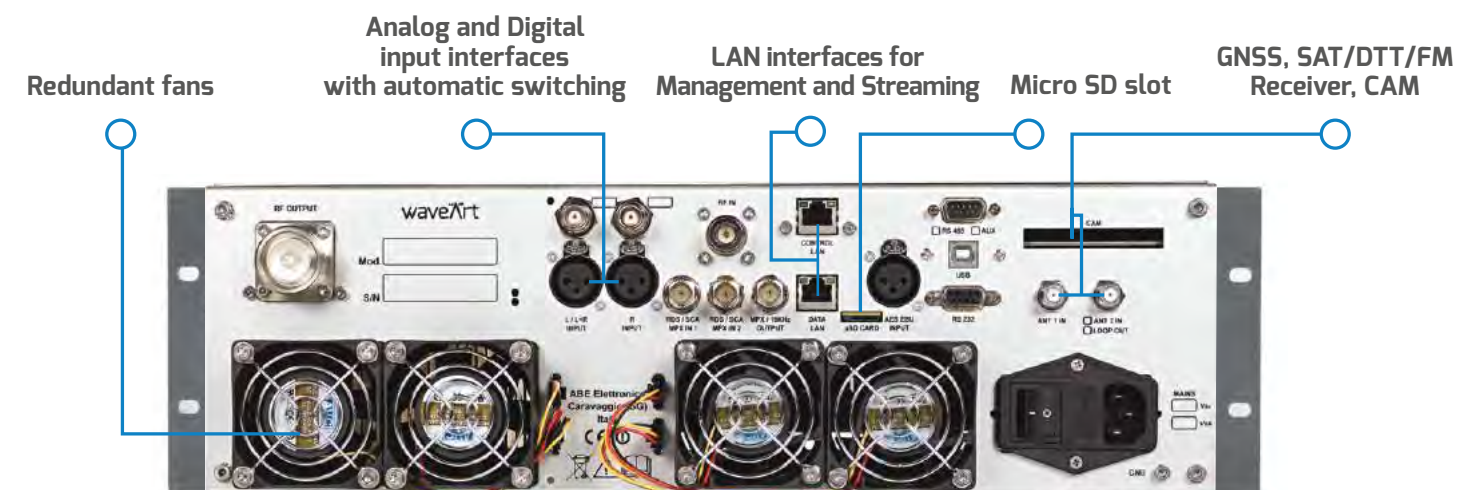
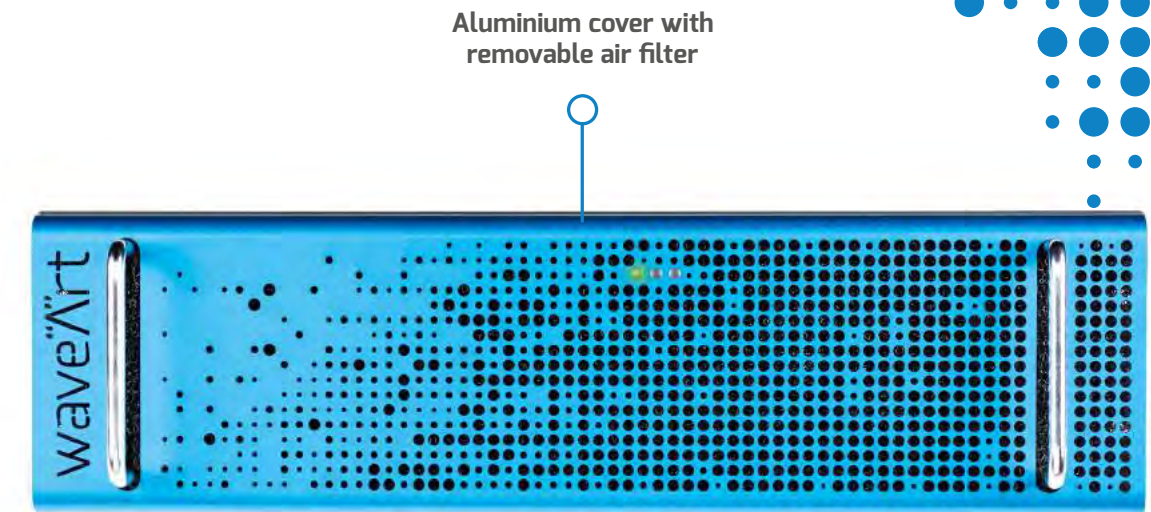
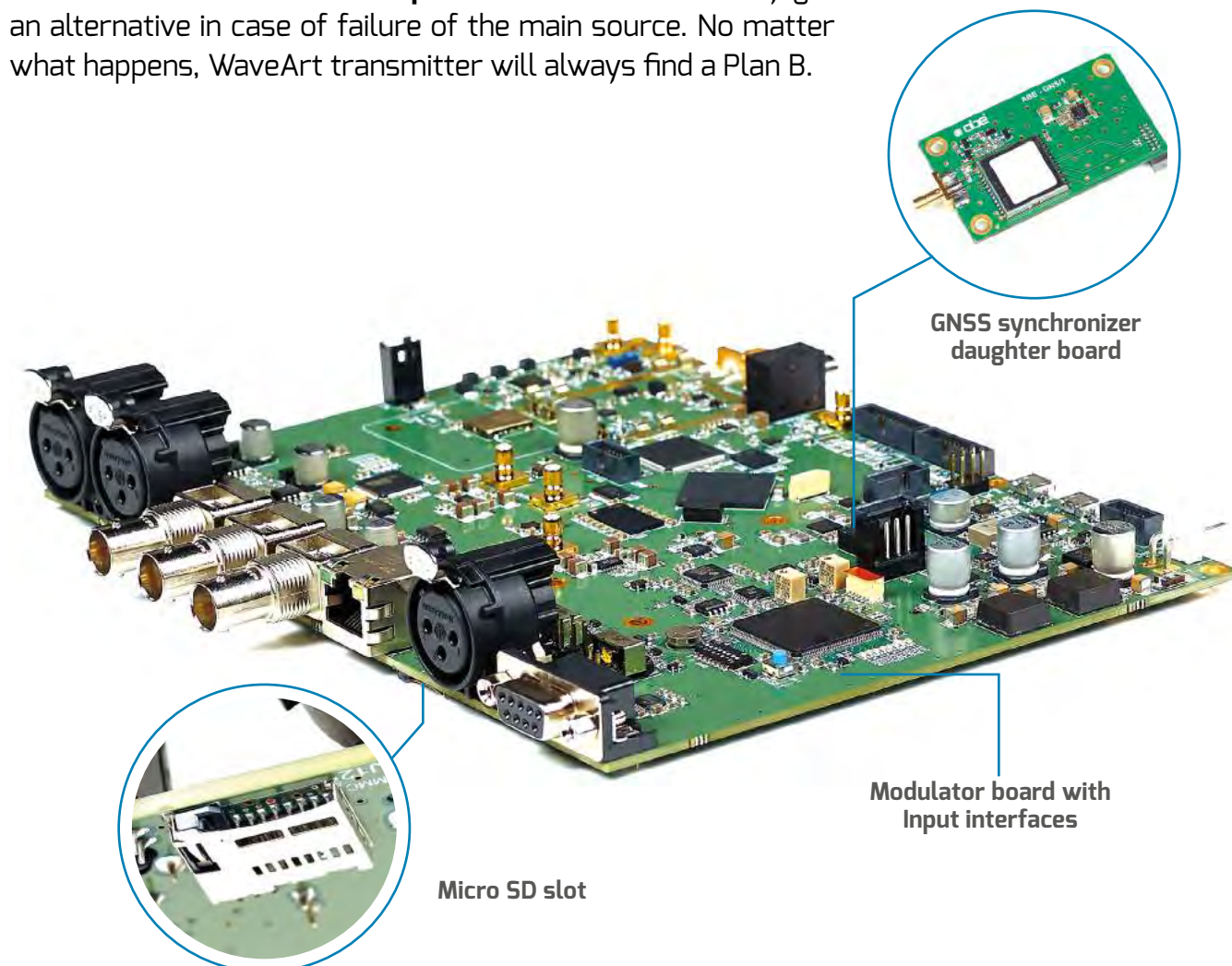
WaveArt transmitters are a synthesis of a **forefront hardware design**, combining state-of-the-art technology with great ease of management.

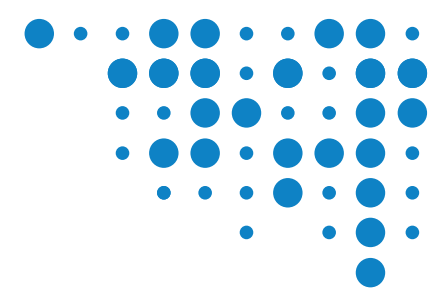
Be part of the innovation

We'll release **FREE software upgrades**, adding new features and **constantly increasing the equipment performance**. Simply get the latest software version from our website and upload it in your transmitter via LAN or USB interface.

Always on-air

Loosing input signal is one of the worst conditions you can face. Our **built-in automatic input switch** will immediately get an alternative in case of failure of the main source. No matter what happens, WaveArt transmitter will always find a Plan B.





It's easy to be smart

We know that power surges and dust constantly threaten your transmitters and so we implemented the **best technology** to **make maintenance easier**.

In case of a power supply failure, you don't need to waste your time disassembling the unit. You can pull out the damaged PSU from the front panel in **just few seconds**, with **no need to turn off the transmitter**.

Have you forgotten your tools? No problem, WaveArt transmitter holds the necessary set of tools behind the cover!

Easy plug power supplies and
Maintenance tools

Wave 5000



Wave 3000





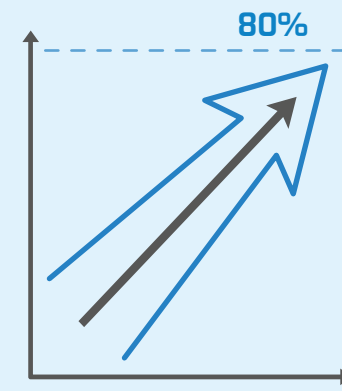
A penny saved is a penny earned

Developing strategies to increase sales to drive up profit and grow up the organization is the target of every CEO.

But you know that increasing sales is much more difficult and inconstant than reducing costs.

WaveArt transmitters, thanks to their typical **75% efficiency** and **exclusive features**, work right by your side to minimize your running costs, thus freeing up resources.

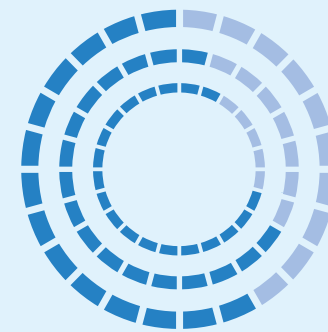
So, just switch on and start monetizing!



AEB

Adaptive Efficiency Boost

Using a proprietary algorithm that directly acts on the RF stages, WaveArt transmitters are able to **self optimize the key parameters** to **achieve the maximum efficiency** without any retuning.



Wave Plan

Power scheduler

Using WavePlan you are able to **fit your power consumption** according to your audience. You can create **daily and weekly plans**, setting up start and stop time and output power level. You can even save and recall plans on different transmitters.





Always connected providing concrete answers

Telemetry: which advantages?

Having **total control** and knowing how the equipment works is priceless: that's why in our transmitters **telemetry will never be an option**. The embedded **web server** and **SNMP agent** provide a quick connection to the equipment, allowing you to check and manage all the parameters **from any device**, wherever you are.

WaveArt transmitters are able to **send SMS** in case of specified events. The transmitter shows you its past behavior through the advanced event log and it **foresees the future** thanks to the **EffiSense prognostics** feature.

Our experience at your service

We offer **professional technical training courses** to enable operators to become familiar with theoretical and practical aspects of radio broadcasting.

Detailed content of each course will be customized to suit the particular needs of those attending.

Our team assists you in every step of your **network planning**, as well as in every kind of **troubleshooting**.

We care for **human relationships** first and we'll always do our best to **put you and your station on top**.





150 to 5000W FM Transmitters

Wave Series - Compact versions

RF OUTPUT	
Output frequency range	87.5 to 108MHz (Output frequency adjustable in 1Hz steps)
Class of emission and Frequency deviation	F3E – Standard: $\pm 75\text{kHz}$ peak deviation – Max: $\pm 200\text{kHz}$ peak deviation
Frequency stability	In the temperature range -5 to $+45^{\circ}\text{C}$: $\geq \pm 1\text{ppm}$ in one year (aging): $\geq \pm 1\text{ppm}$ Option: GNSS synchronizer (GPS + GLONASS) with oven oscillator for better than 0.1Hz precision and stability
Model/Nominal output power	Wave 150: 150W – Wave 300: 300W (housed in 1U or 2U rack drawer) Wave 600: 600W – Wave 1000: 1kW – Wave 2000: 2kW (housed in 3U rack drawer) Wave 3000: 3kW – Wave 5000: 5kW (housed in 4U rack drawer) tolerance: $\pm 0.5\text{dB}$
Output power range	Output power is adjustable from nominal value up to -10dB
Output power stability	$\pm 0.2\text{dB}$ (with ALC inserted – Automatic Level Control)
Output connector and impedance	N female 50Ω up to 300W DIN 7-16 female 50Ω up to 3kW flange EIA 7/8" up to 5kW
Load (Antenna) VSWR	Normal operation up to 1.5:1 (4% reflected power – 14dB return loss). Fold-back and Fast Protection functions operate (see description under "Embedded Features")
Spurious emissions (including harmonics)	Compliant with ETSI and FCC specification
RF Monitor output	SMA Female on the front panel (coupled to the RF output @ -50dB typ.)

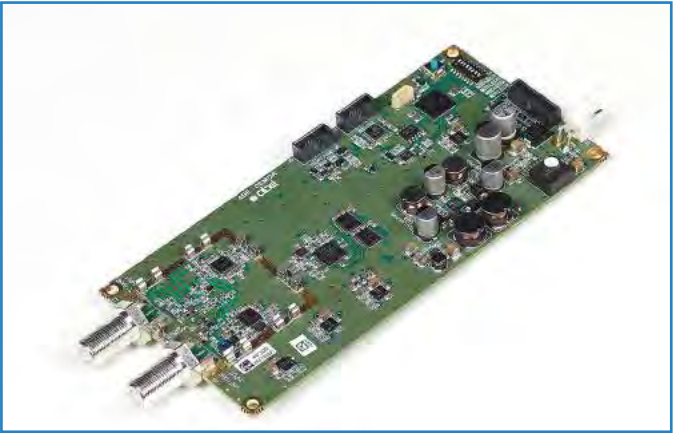
INPUT INTERFACES	
Analog Audio	L; R or L+R: N \times 2 XLR female (Balanced; impedance $600\Omega/10\text{K}\Omega$ jumper selectable) Nominal input level: $+15\text{dBu}$ to -15dBu (software adjustable). MPX / SCA / RDS: N \times 2 BNC female (Unbalanced; impedance $50\Omega/10\text{K}\Omega$ jumper selectable). Nominal input level: $+12.5\text{dBu}$ to -12.5dBu (software adjustable).
Digital Audio	AES/EBU: XLR female (Balanced; impedance 110Ω). Nominal input level: -24dBfs to 0dBfs (software adjustable); automatic sample rate selection up to 192kHz for AES192 (MPX over AES) Ethernet 10/100 base T (Iccast 2 streaming and MPX over IP): RJ45 ASI: BNC (female) 75Ω

Micro SD Card slot	Cards up to 32GB; Supported format: MP3; AAC-LC; AAC-HE; MPEG1 L2; WMA; FLAC; Ogg Vorbis Card reader for emergency content transmission (in case other input sources are not available)
Analog receiving interfaces	FM receiver (for regenerative transposer application or for audio monitoring) Input connector (for transposer application): N female 50Ω Note: for regenerative transposer application it is also required an input filter
Digital receiving interfaces	DVB-S/S2 receiver: input "L" band, "F" female connector 75Ω ; LNB power supply and control - single or redundant configuration DVB-T/T2 (Base and Lite) and ISDB-T/Tb receiver: input 42 to 1002MHz, "F" female connector 75Ω - single or redundant configuration Digital receivers have the possibility to select and decode the wanted audio service (PID). Supported formats: MP3; AAC-LC; AAC-HE; MPEG1 L2; WMA; FLAC; Ogg Vorbis. Additional option: CAM slot for encrypted services
Input Interface selection	Manual or Automatic with priority levels user selectable

AUDIO PERFORMANCES	
Pre-emphasis	0, 50 or 75 μs selectable
Mono / Stereo Audio bandwidth	20Hz to 15kHz
Audio amplitude/frequency response flatness	$\geq \pm 0.15\text{dB}$ (30Hz to 15 kHz - including pre-emphasis)
MPX bandwidth	Up to 100kHz (according to the filter selected)
FM S/N ratio	80dB (typ. below 100% deviation at 400Hz)
Distortion (THD)	$\leq 0.05\%$ (typ. 0.012%)
Stereo crosstalk attenuation (30Hz to 15 kHz)	$\geq 50\text{dB}$ (typ. 70dB)
Asynchronous AM S/N ratio	$\geq 55\text{dB}$ below equivalent 100% AM @ 400Hz measured with 75 μs de-emphasis (no FM modulation)
Synchronous AM S/N ratio	$\geq 50\text{dB}$ below equivalent 100% AM @ 400Hz measured with 75 μs de-emphasis (FM $\pm 75\text{kHz}$ peak deviation with 1kHz tone)



CAM slot for encrypted services



DVB-T/T2 (Base and Lite), ISDB-T/Tb and DVB-S/S2 receiver board

EMBEDDED FEATURES & FUNCTIONS

Encoders	Stereo MPX (ITU-R Recommendation 450) RDS/RBDS (static and dynamic) Dynamic data through RS232 port – other options for dynamic data on custom basis
Digital Audio processing	Soft Clipper with band limitation. This function allows modulation peaks limitation (within certain limits) without perceiving the annoying distortion effect, without affecting the mono or stereo transmission bandwidth, without overmodulating but maintaining a high emission volume. This function is made inside a FPGA (Field Programmable Gate Array) with a high oversampling real time processing. Full multi-band hi-performance embedded audio processor available from Q1 2019.
Isofrequency option (IsoWave)	Exceptionally accurate Isomodulation/Isofrequency generation with timestamp and network delay sinchronization. Adjustable additional latency in 0.1µs steps. Require GNSS (GPS + GLONASS) synchronizer and oven oscillator options.
Audio test mono/stereo generator	From 20Hz to 15kHz
MPX output/19 kHz for external RDS	BNC female 50Ω connector
Fold-back function	In case of high value of VSWR (exceeding the specified tolerance) or power amplifier high heatsink temperature, the Fold-back function operates to reduce the RF output power before tripping off
Fast Protection function	In case of instantaneous very high VSWR (e.g.: RF output disconnection or short circuit), the Fast Protection function operates to cut-off output power in few microseconds
Environmental sensors	Temperature, Humidity, Dust, Corrosion (for alarms, protections and predictive analysis)
Audio monitoring	Stereo jack 3.5 mm for headphones on the front panel to monitor input signals and the RF output signal (using the embedded FM receiver/demodulator).
“Wave Plan” Output Power Scheduler	Reduce the output power at specific times and days, thus further reducing operational costs (OPEX)

LOCAL & REMOTE CONTROLS

Controlled parameters	All main parameters of the transmitter are constantly controlled by the embedded MCU and available on the local display as well as through the remote control (Web Server, SNMP, etc.) Parameters include: transmitter and interfaces settings, output frequency and power (forward and reflected), voltages and currents, temperatures, input levels, optional devices (e.g.: GPS/GLONASS synchronizer, DVB-S/S2 receiver, etc.)
Web Server	Manage all the main equipment parameters. Access is protected by username/password
SNMP Agent	Version 2 Send alarms, read and set parameters. MIB file is downloadable from the web server
Clonation	Store the complete transmitter configuration on a USB key and load it in other units
Event Logger	Stores over 5.000 events (with time, date and description) The event Log can be downloaded through the web server
Remote control interface	RJ45 connector - Ethernet 10/100 Base-T (SNMP - web server) 2G/3G Modem/Router with SMS notifications (up to 7 phone numbers) and VPN support.

Firmware upgrade	Mini UPS for remote control, for router and telemetry interface + RF filter for router
Control Contacts	Remote and local upgrade supported One free contact available as general alarm; one contact (to be shorted) for transmission enabling Option: housekeeping interface (user configurable) with n.3 isolated clean contact outputs (max 100V 100mA), n.4 optoisolated inputs (5V 2mA pull-up) and n.4 analog outputs (0 to 5V - no isolation)

GENERAL SPECIFICATIONS

AC Input voltage and frequency	Wave 150 / 300 / 600 / 1000 / 2000: Full output power: 176 to 264Vac; 47 to 63Hz single phase Wave 3000 / 5000: 185 to 264Vac; 47 to 63Hz single phase or three phase (triangle configuration) 320 to 457Vac; 47 to 63Hz three phase (star configuration with power neutral)
AC/DC Power Supplies	Wave 150 / 300: single power supply Wave 600 / 1000: single power supply hot pluggable from the front panel Option for double, fully redundant, power supply Wave 2000: two power supplies hot pluggable from the front panel in semi-redundant configuration Wave 3000: three power supplies hot pluggable from the front panel in semi-redundant configuration Wave 5000: two power supplies hot pluggable from the front panel in semi-redundant configuration (single phase only) Option for three, fully redundant, power supplies
Power factor	≥ 0,96 (typ. 0,99 - @ nominal output power) Main power supplies have High Efficiency (typ. 95%) and are equipped with PFC (Power Factor Corrector)
AC to RF Efficiency	typ. 75% with AEB inserted - Adaptive Efficiency Boost Conditions: standard product @ nominal output power, 230 Vac supply voltage, 25°C ambient temperature
Operating temperature range and max. altitude	-5 to +45°C @ MSL Maximum operating temperature decreases by 6,5°C / 1.000m altitude (as per the international ICAO Standard Atmosphere) up to the maximum allowed operating altitude of 3.000m AMSL. Fold-back function operates (see description under “Embedded Features”)
Maximum operative humidity	95% non condensing
Fans	Fans are high quality, long life, ball bearings units, easily replaceable from the rear panel with automatic variable speed (according to the internal temperatures) to reduce dust and power consumption. Fold-back function operates (see description under “Embedded Features”)
Housing	Wave 150 / 300: 1U or 2U rack drawer (45cm) Wave 600 / 1000 / 2000: 3U rack drawer (depth 45cm) Wave 3000 / 5000: 4U rack drawer (depth 70cm) Note: measures taken from the front panel to the rear panel. Handles, covers, fans, connectors, etc. excluded
Net weight	Wave 150 / 300: approx 10kg (according to the installed options) Wave 600 / 1000 / 2000: approx 15kg (according to the installed options) Wave 3000 / 5000: approx 30kg (according to the installed options)



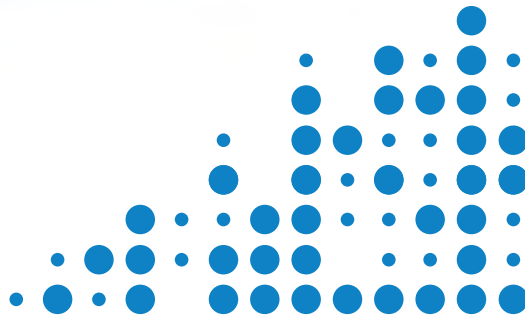
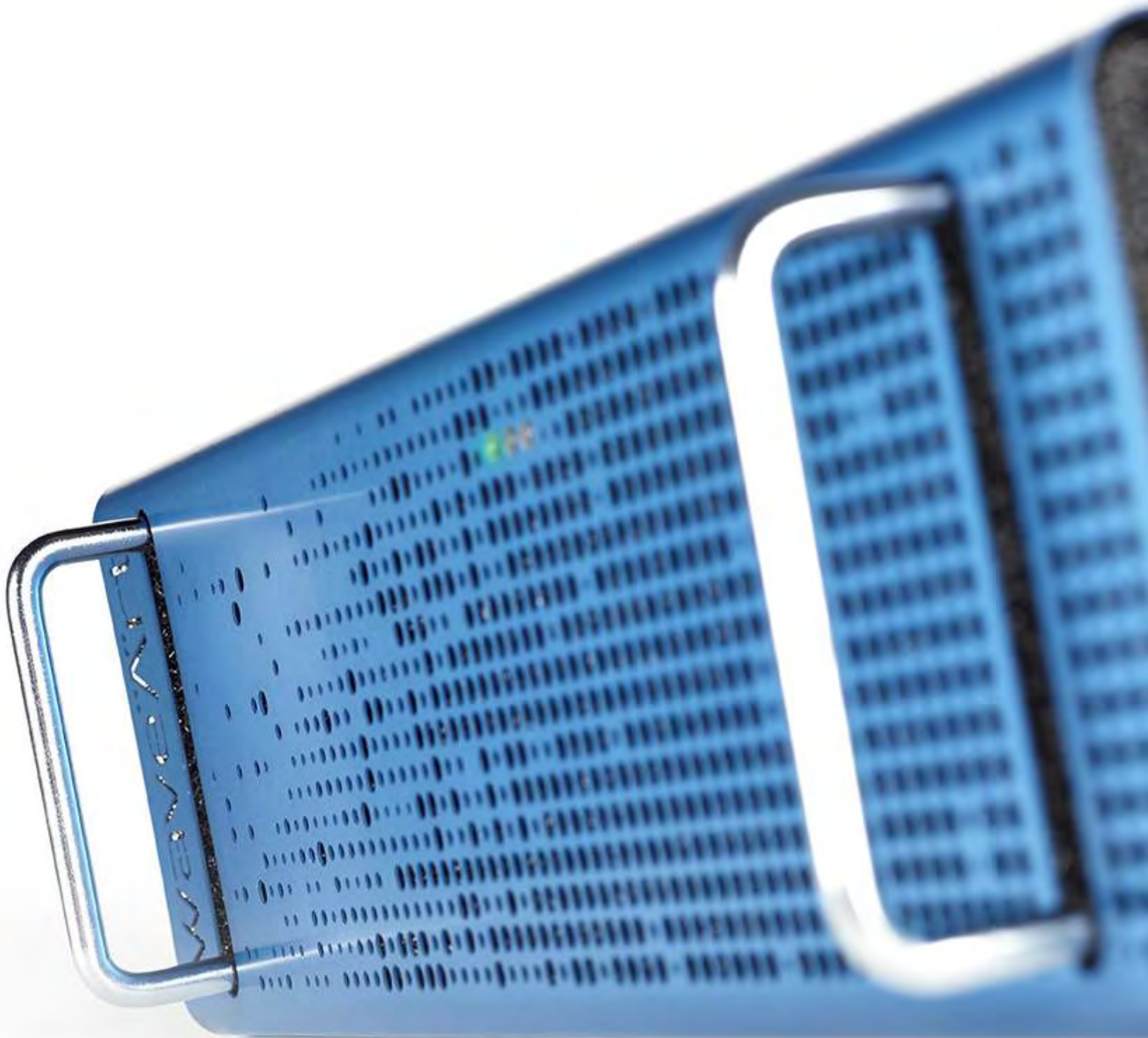
Ordering info

SOFTWARE OPTIONS

S-SD-UN	Slot for micro SD card	Included in S-FULL-UN
S-AES-UN	AES/EBU - AES192 (MPX over AES) input	
S-FMRX-UN	FM receiver input	
S-SWI-UN	Automatic input switching	
S-RDS-UN	Static RDS encoder	
S-EFFI	Environmental sensors with possibility of warranty extension up to 5 years	
S-RDS+-UN	Dynamic RDS	
S-SFN-UN	MPX over IP & SFN operation	
S-IP-UN	IP streaming input (Iccast2 streaming)	

HARDWARE OPTIONS

H-LAN	LAN management interface with: web server, event logger, SNMP, Wave Plan
H-ASI	ASI T.S. input (or output) interface
H-SATDTT	Embedded Satellite and Terrestrial receiver demodulator. DVB-S/S2 (L- Band input) and DVB-T/T2 or ISDB-T (VHF/ UHF band input)
H-SATDTT2	Second Redundant Embedded Satellite and Terrestrial receiver demodulator with seamless switching
H-CAM	CAM slot (Common Interface Module)
H-GPS	High stability reference oscillator GNSS (GPS + GLONASS) locked, oven clock 10MHz + 1pps
H-AGPS	GPS/GLONASS receiving antenna + 15 meters cable
H-REF	10MHz and 1pps inputs
H-FAN	Fully redundant fans (available for Wave 600 and Wave 1000)
H-PSU	Redundant power supply unit (available for Wave 600 and Wave 1000)
H-3G	2G/3G modem router for remote connection/telemetry and SMS (requires H-LAN)
H-I/O	Analog telemetry interface with n.3 isolated clean contact outputs, n.4 optoisolated inputs, n.4 analog outputs (0 to 5V), mini UPS for remote control, for router and for telemetry interface, RF filter for router



150 to 5000W FM Transmitters

Wave Series - Compact versions

Main Features & Specs

Model/Nominal output power	Wave 150 / 300 / 600 / 1000 / 2000 / 3000 / 5000
Employed technologies	Full digital processing with DDS modulator; High Efficiency RF Power Amplifier with AEB (Adaptive Efficiency Boost); High Efficiency Power Supply with PFC (Power Factor Corrector)
Input interfaces	Analog: L; R or L+R; N*2 MPX or SCA or RDS Digital: AES/EBU - AES192; Ethernet (Icecast 2 streaming and MPX over IP) Micro SD card reader (with decoders) Analog receiving interface (with demodulator): FM receiver (for regenerative transposer) Digital receiving interface (with CAM and decoders): DVB-S/S2; DVB-T/T2; ISDB-T Automatic switching between input interfaces
Embedded Decoders	MP3; AAC-LC; AAC-HE; MPEG1 L2; WMA; FLAC; Ogg Vorbis
Embedded Encoders	Stereo Encoder (MPX); RDS Encoder (static and dynamic)
Digital Audio Processing	Soft Limiter (oversampled - filtered); Hi-performance multi-band processor (Q1 2019)
Environmental sensors	Temperature, Humidity, Dust, Corrosion (for alarms, protections and predictive analysis)
Remote control	Ethernet 10/100 Base-T (SNMP - Web Server); 3G Router for IP connection and SMS; Housekeeping interface (4 inputs + 7 outputs). Other options on custom basis
Remote firmware upgrade	Supported
AC to RF efficiency	75% typ. (with AEB inserted - Adaptive Efficiency Boost)
Housing	19" Rack drawer (150/300: 1U or 2U - 600 to 2000: 3U - 3000/5000: 4U)
Other features & options	Isomodulation/Isofrequency generation with timestamp and network delay synchronization. GPS-GLONASS receiver/synchronizer (for Frequency precision/stability - Isofrequency) "Wave Plan" Output Power Scheduler to reduce operational costs (OPEX)

For more detailed features specification and for custom solutions (e.g.: remote controls, backhauling, isofrequency, customizations, etc.), the information is subject to an NDA (Non-Disclosure Agreement).

Some of the described features are included in the standard product; other features are available as hardware and/or software options. Please consult WaveArt technical/commercial office for more details and for availability.

All specifications contained in this document may be changed without prior notice.

