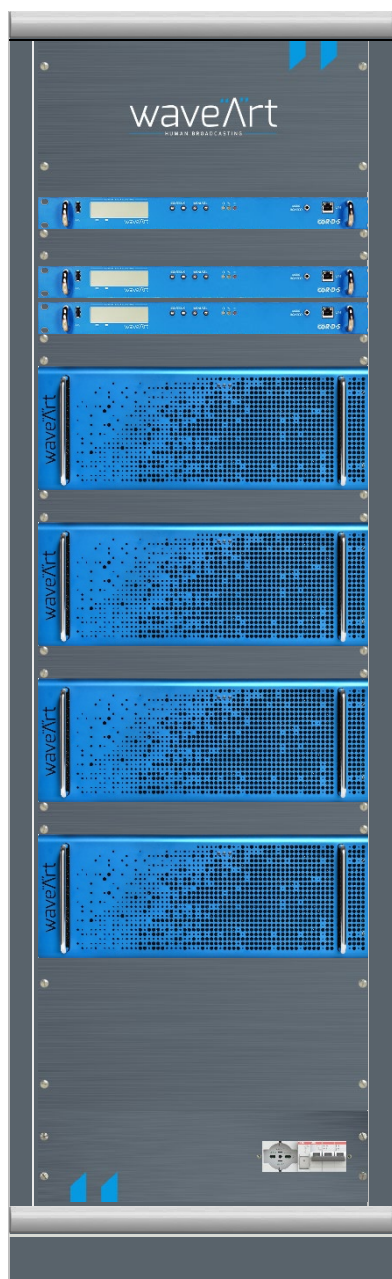


# WAVE20000 - 20kW FM TRANSMITTER

## SINGLE/DUAL DRIVER, MULTI AMPLIFIERS



### Advanced Efficiency Boost

Efficiency up to 75% with adaptive optimization

### Prognostics

Analysis for predictive maintenance

### Easy Care

Hot pluggable PSU - Easy to replace fans

Full redundant Power Supply modules in each amplifier

### Digital Processing

Unique performances thanks to DDS digital modulator

### Controls

LCD display, Web server and SNMP

### Stereo & Soft clipper

Always included

### Integrated unique features

Micro SD card slot

FM, Satellite and Terrestrial receiver

Audio processor

Full telemetry with 3G/4G connection

## GENERAL SPECIFICATION

<b>Output frequency range</b>	87.5 to 108MHz in 1Hz steps
<b>Output Power</b>	20kW (tol. +0/-0.5dB)
<b>Output connector</b>	EIA 3+1/8" flange, other on request
<b>Spurious and harmonic suppression</b>	Compliant with ETSI and FCC specification
<b>Analog input</b>	2x XLR female (Balanced; impedance 600Ω/10KΩ selectable)
<b>MPX/SCA/RDS input</b>	2x BNC female (Unbalanced; impedance 50Ω/10KΩ selectable)
<b>Soft Clipper with band limitation</b>	Included
<b>Power consumption</b>	Typ. 27,8kVA - Max. <30.4kVA
<b>AEB - Advanced Efficiency Boost</b>	Included
<b>AC Input voltage and frequency</b>	400Vac three phase star conn. (with power neutral) and 230Vac three phase delta conn. (without power neutral)
<b>AC/DC Power Supplies</b>	N.3 power supplies hot pluggable from the front panel (each amplifier)
<b>Operative temperature &amp; fans</b>	-5°C to +45°C @MSL. N.2 fans on the rear panel (each amplifier)
<b>Maximum operative altitude</b>	3000m ASL. For higher altitudes please contact our sales dept.
<b>Maximum operative humidity</b>	95% non-condensing
<b>Housing</b>	Rack Cabinet 19" 38U - dimensions: 570 x 1900 x 1000 mm (W x H x D)
<b>Weight</b>	<350Kg



## SOFTWARE OPTIONS

<b>S-AM-UN</b>	Audio monitor for input or on-air signal + test tone generator	Included in <b>S-FULL-UN</b>
<b>S-SD-UN</b>	Micro SD card slot	
<b>S-AES-UN</b>	Digital AES/EBU & AES192 (MPX over AES) inputs	
<b>S-FMRX-UN</b>	FM receiver input (for regenerative FM repeater/ translator)	
<b>S-SWI-UN</b>	Automatic input switching (n.3 MPX profiles – audio/ RDS)	
<b>S-RDS-UN</b>	Static RDS coder	
<b>S-IP-UN</b>	IP input (Icecast2 streaming & AES67)	
<b>S-DMPX-UN</b>	Digital MPX over TS & Digital MPX over IP in/out	Only with <b>H-AP</b>
<b>S-RDS+-UN</b>	Dynamic RDS	
<b>S-ISO-UN</b>	SFN/ Isfrequency operation	
<b>S-AP-DEL</b>	Delossifier	
<b>S-AP-ARDS</b>	Advanced RDS	

## HARDWARE OPTIONS

<b>H-SAT</b>	Embedded Satellite receiver demodulator. DVB-S/S2 (L-band input) Low Symbol Rate with loop
<b>H-SATDTT</b>	Embedded Satellite and Terrestrial receiver demodulator. DVB-S/S2 (L-band input) and DVB-T/T2 and ISDB-T (VHF/UHF band input)
<b>H-3G; H-4G</b>	2G/3G or 3G/4G modem router for remote connection/telemetry and SMS
<b>H-I/O</b>	GPIO interface with n.3 isolated clean contact out, n.4 optoisolated in, n.4 analog out (0 to 5V), mini UPS for remote control, RF filter for router
<b>H-AP-PRO</b>	Integrated audio processor card with professional software license
<b>H-SATDTT2</b>	Second Redundant Embedded Satellite and/or Terrestrial receiver demodulator with seamless switching
<b>H-CAM</b>	CAM Slot (Common Interface Module)
<b>H-ASI</b>	ASI T.S. input (or output) interface
<b>H-REF</b>	10MHz and 1pps inputs
<b>H-GNS</b>	High stability reference oscillator GNSS (GPS + GLONASS) locked, oven clock 10MHz + 1pps outputs
<b>H-AGNS</b>	GPS/GLONASS receiving antenna (gain 26dB typ.) + 15 meters cable

The software-based audio processor can be integrated in any Wave Transmitter, from low and medium compact versions to high power line. **H-AP-PRO Audio Processor** offers outstanding audio quality and comes with many unique features.



### FM Composite Clipper

Up to 140% audio level at 100% modulation gives 2-3 dB extra headroom for highs. Improve your audio, being the loudest and cleanest station on the dial!

### Stereo & RDS Coder

Built-in stereo and RDS encoder  
RT+

### Advanced Dynamics & EQ

Increases the dynamics for music that lacks dynamics. Adjusts the spectrum without compression, making it possible to generate a very consistent sound without sounding compressed

### Dehummer

Improves the sound of MPEG2/MP3 style lossy compressed files, removing unwanted constant sounds, such as a 50/60 Hz hum from bad cables

### Better FM reception

Improves stereo reception area up to 30Km

### Declipper & Natural Dynamics

Repairs clipped audio, removes distortion  
Restores Natural Dynamics

### Delossifier

Improves the sound quality of MPEG2/MP3 style lossy compressed files

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## RF OUTPUT

<b>Output frequency range</b>	87.5 to 108MHz (Output frequency adjustable in 1Hz steps)
<b>Class of emission</b>	F3E – Standard: $\pm 75$ kHz peak deviation – Max: $\pm 200$ kHz peak deviation
<b>Frequency stability</b>	In the temperature range -5 to +45°C: $\geq \pm 1$ ppm; in one year (aging): $\geq \pm 1$ ppm Option: GNSS synchronizer (GPS + GLONASS) with oven oscillator for better than 0.1Hz precision and stability
<b>Output power range</b>	Output power is adjustable from nominal value up to -10dB
<b>Output power stability</b>	$\pm 0.2$ dB (with ALC inserted – Automatic Level Control)
<b>Load (Antenna) VSWR</b>	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”)
<b>Spurious emissions (including harmonics)</b>	Compliant with ETSI and FCC specification
<b>RF Monitor output</b>	SMA Female on the front panel (coupled to the RF output @ -50dB typ.)

## INPUT INTERFACES

<b>Analog Audio</b>	L; R or L+R: N°2 XLR female (Balanced; impedance 600Ω/10KΩ jumper selectable). Nominal input level: +15dBu to -15dBu (software adjustable). MPX / SCA / RDS: N°2 BNC female (Unbalanced; impedance 50Ω/10KΩ jumper selectable). Nominal input level: +12.5dBu to -12.5dBu (software adjustable)
<b>Digital Audio</b>	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 (Icast 2 streaming and MPX over IP): RJ45. ASI: BNC (female) 75Ω
<b>Micro SD Card slot</b>	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)
<b>Analog receiving interfaces</b>	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
<b>Digital receiving interfaces</b>	DVB-S/S2 receiver: input “L” band, “F” female connector 75 Ω; LNB power supply and control; low symbol rate from 128kS/s - single or redundant configuration. DVB-T/T2 (Base and Lite) and ISDB-T/Tb receiver: input 42 to 1002MHz, “F” female connector 75 Ω - 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

Manual or Automatic with priority levels user selectable

#### Input Interface selection

## AUDIO PERFORMANCES

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

## EMBEDDED FEATURES & FUNCTIONS

<b>Encoders</b>	Stereo MPX (ITU-R Recommendation 450). RDS/RBDS (static and dynamic). Dynamic data through RS232 port and other options for dynamic data on custom basis, on request
<b>Digital Audio processing</b>	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 as option
<b>Isofrequency option (IsoWave)</b>	Exceptionally accurate Isomodulation/Isofrequency generation with timestamp and network delay synchronization. Adjustable additional latency

	in 0.1 s steps. Require GNSS (GPS + GLONASS) synchronizer and oven oscillator options
<b>Audio test mono/stereo generator</b>	From 20Hz to 15kHz
<b>MPX output/19 kHz for external RDS</b>	BNC female 50Ω connector
<b>Fold-back function</b>	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
<b>Fast Protection function</b>	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
<b>Environmental sensors</b>	Temperature, Humidity, Dust, Corrosion (for alarms, protections and predictive analysis)
<b>Audio monitoring</b>	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)
<b>“Wave Plan” Output Power Scheduler</b>	Reduce the output power at specific times and days, thus further reducing operational costs (OPEX)

## LOCAL & REMOTE CONTROLS

<b>Controlled parameters</b>	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.)
<b>Web Server</b>	Manage all the main equipment parameters. Access is protected by username/password
<b>SNMP Agent</b>	Version 2. Send alarms, read and set parameters. MIB file is downloadable from the web server
<b>Clonation</b>	Store the complete transmitter configuration on a USB key and load it in other units
<b>Event Logger</b>	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. Mini UPS for remote control, for router and telemetry interface + RF filter for router

**Firmware upgrade**

Remote and local upgrade supported

**Control Contacts**

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**

**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)

**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")

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