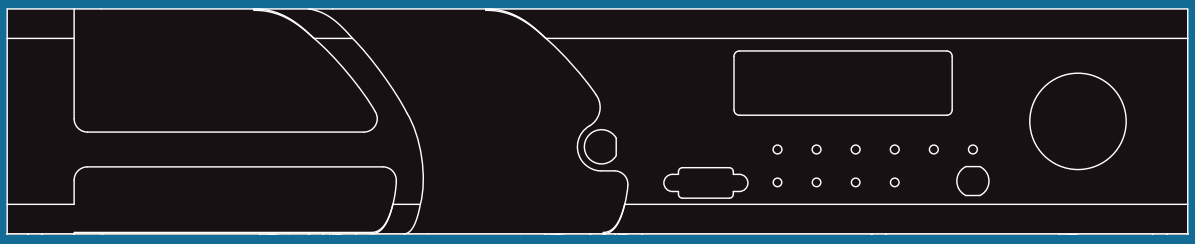


AND

FROM 20W TO 5kW

ETG DIGITAL TRANSMITTERS SERIES
LOW AND MEDIUM POWER

ELENOS®
World Broadcast Experience

*All images are proprietary from Elenos and are for indicative purposes only.
Technical data can be subject to change without notice.

our technologies

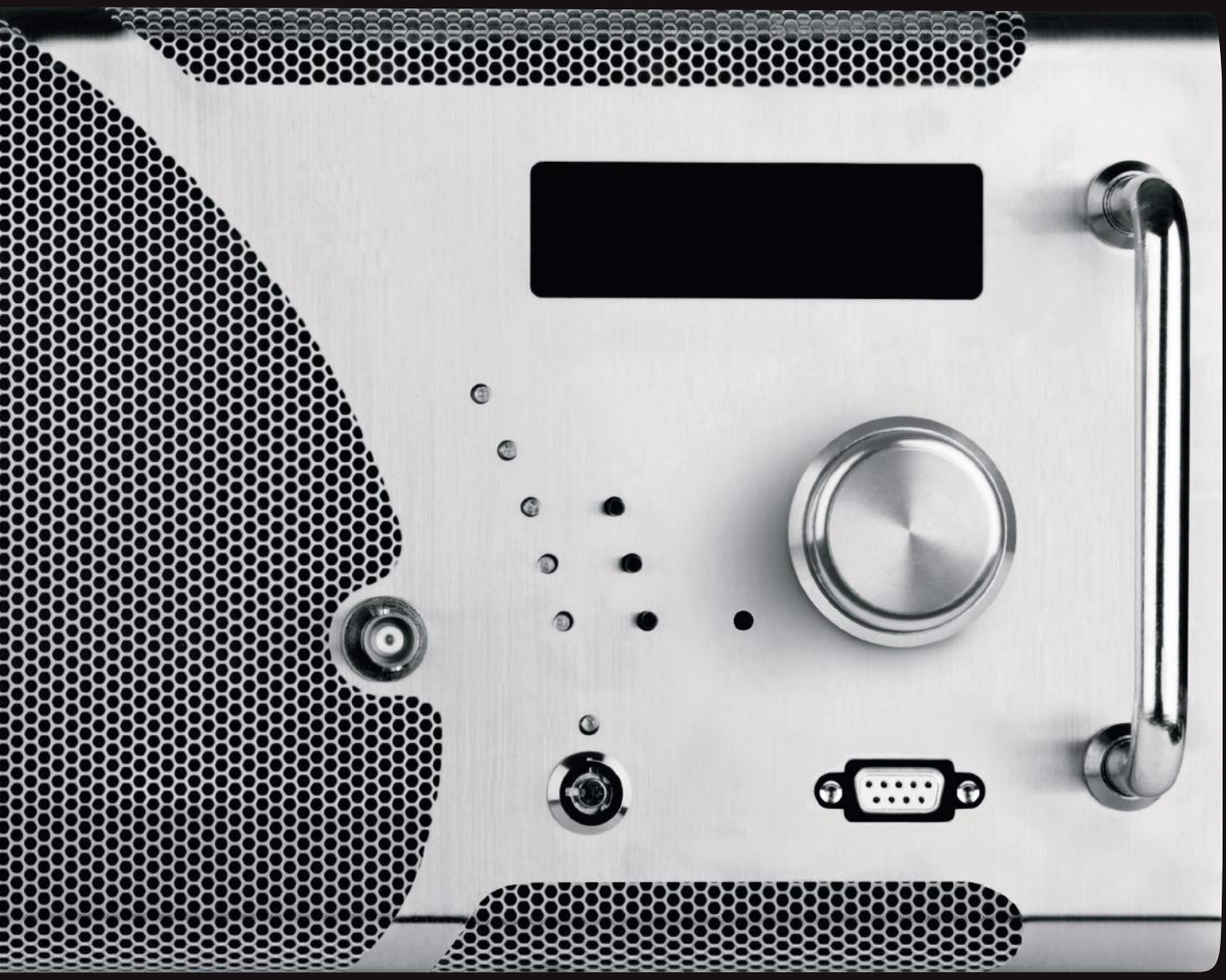
Indium

Icefet

Ecosaving

Life Extender

*All images are proprietary from Elenos and are for indicative purposes only.
Technical data can be subject to change without notice.



our technologies

Indium

Icefet

Ecosaving

Life Extender

ETG DIGITAL TRANSMITTERS SERIES

The ETG Digital transmitters series (low and medium power), ultra-compact FM transmitter with direct to channel digital exciter from Elenos, is a lightweight system housed in two or four rack units.
Combining efficiency, low-power consumption and reliability with high fidelity and extreme sound purity through the use of digital technology.
The line is the result of the company's know-how gained through many years of experience.

The Elenos digital series of FM transmitters, maximizes the concept of energy efficiency, compactness and reliability, factors that have guided Elenos in equipment design over the past decade.
The unit's extremely small size and low weight allow for easy installation and reduced transport costs. Extreme energy efficiency also permits users to benefit from remarkable operating cost savings. Additionally, thanks to integrated technologies such as intelligent protection, ICEFET technology, ecosavings and Lifextender algorithms, and our own power supply design, the reliable Elenos transmitter even performs under extreme conditions. High audio performance is ensured by advanced digital signal processing technology (e.g.: 2.4 GHz clock, 24-bit analog converter). Sound fidelity, purity and the total absence of microphonic noise are guaranteed over the entire band.
The extremely fast performance is particularly important in N+1 systems, allowing the transmitter to remain on air without interruption even in the case of a system failure. Through the use of trimmer electronics (presets), the characteristics and performance remain unchanged over time, even under different environmental conditions. The system is equipped with audio MPX input (balanced and unbalanced), L&R (or mono) with stereo generator, AES/EBU (electrical and optical), SCA, RDS, and an option for an Ethernet input for IP audio streaming. Each of these audio channels are independent and simultaneous with the infinite possibility of switching back and forth from one to another.
The ETG is also equipped with a USB port for storing audio program data in the event of a complete loss of the studio to transmitter live data link. The Single Frequency Network (SFN) function allows for reception continuity, which is particularly important for applications that require extended coverage. This also includes a built in GPS receiver and antenna with the transmitter.
Equipped with remote control and management, the user can receive data and send instructions to the transmitter via several communication channels — SMS, GPRS, TCP/IP and SNMP.

Features

High efficiency

Extremely low-power consumption and reduced operating costs.

Very compact size and condensed power

Two/Four rack units in height, with a weight of less than 14 kilograms (Max for 2U - up to 3kW) or 38Kg (Max for 4U - up to 5kW) and unmatched volume and power versus weight ratio.

Smart functions/synaptic functions

Extraordinary performance level through the use of powerful operational algorithms and inter-module communications within the transmitter.

Planar technology

Exceptional stability, repeatability, reliability and ease of maintenance through the use of planar technology within the entire RF section (RF modules, combiners, splitter and low-pass filter). This allows for the minimization of internal connections and soldering which increases the long term operation and performance.

Steady performance

Through the use of trimmer electronics (presets) and the most advanced components, the characteristics and performance of the system remain unchanged over time, even under adverse environmental conditions. The SFN function allows for reception continuity.

Connected everywhere

The remote control and management features allow users to receive data and send instructions to the transmitter via several state-of-the-art communication channels — SMS, GPRS, TCP/IP and SNMP.

Sound purity and fidelity

Clean audio with the absence of distortion on all requencies, including the lowest. No microphonic noise.

GENERAL DATA	
Output Nominal Power	20 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	1 Drive Board
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	9.4 Kg / 20.72 lbs
Number of cooling fans	2
CONNECTORS	
RF Output connector	N
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz

Pre-emphasis	0/25/50/75 microseconds selectable
Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	110, 230 Two-Singlephase Version 50-60 Hz VAC
Power consumption (typical)	< 70 W
Current drain (typical @230V)	0,3 A
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	240 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

GENERAL DATA	
Output Nominal Power	100 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	1
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	9.4 Kg / 20.72 lbs
Number of cooling fans	2
CONNECTORS	
RF Output connector	N
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	110, 230 Two-Singlephase Version 50-60 Hz VAC
Power consumption (typical)	< 220 W
Current drain (typical @230V)	1 A
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 15 A BT311315 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	240 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

GENERAL DATA	
Output Nominal Power	150 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	1
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	9.4 Kg / 20.72 lbs
Number of cooling fans	2
CONNECTORS	
RF Output connector	N
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	110, 230 Two-Singlephase Version 50-60 Hz VAC
Power consumption (typical)	230 W
Current drain (typical @230V)	1 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 15 A BT311315 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	240 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

GENERAL DATA	
Output Nominal Power	300 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	1
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	9.4 Kg / 20.72 lbs
Number of cooling fans	2
CONNECTORS	
RF Output connector	N
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	110, 230 Two-Singlephase Version 50-60 Hz VAC
Power consumption (typical)	430 W
Current drain (typical @230V)	1.9 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 15 A BT311315 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	240 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

FM TRANSMITTER | ETG500 DIGITAL

GENERAL DATA	
Output Nominal Power	500 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	1
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	9.4 Kg / 20.72 lbs
Number of cooling fans	2
CONNECTORS	
RF Output connector	7/16" DIN Female or N (on demand)
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	110, 230 Two-Singlephase Version 50-60 Hz VAC
Power consumption (typical)	690 W
Current drain (typical @230V)	3 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 15 A BT311315 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	240 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	1000 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	2
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	13.2 Kg / 29.1 lbs
Number of cooling fans	3
CONNECTORS	
RF Output connector	7/16" DIN Female
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230 Singlephase Version 50-60 Hz VAC
Power consumption (typical)	1430 W
Current drain (typical @230V)	6.2 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	420 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	1500 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	2
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	13.2 Kg / 29.1 lbs
Number of cooling fans	3
CONNECTORS	
RF Output connector	7/16" DIN Female
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230 Singlephase Version 50-60 Hz VAC
Power consumption (typical)	2000 W
Current drain (typical @230V)	8.7 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	420 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	2000 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	3
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	13.2 Kg / 29.1 lbs
Number of cooling fans	3
CONNECTORS	
RF Output connector	7/16" DIN Female
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230 Singlephase Version 50-60 Hz VAC
Power consumption (typical)	2700 W
Current drain (typical @230V)	11.7 A
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	420 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	3000 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	4
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	2U
Dimensions: W - H - D	48.5 - 8.5 - 58.5 cm / 19.11 - 3.35 - 23.05 inches
Weight	13.2 Kg / 29.1 lbs
Number of cooling fans	3
CONNECTORS	
RF Output connector	7/8
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230 Singlephase Version 50-60 Hz VAC
Power consumption (typical)	4200 W
Current consumption (typical @230V)	19 A
Overall efficiency (typical from -3dB to Pnom)	69%
Power factor	> 0.95
Fuses and circuit breakers	No fuses
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	420 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

GENERAL DATA	
Output Nominal Power	2500 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	4
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	4U
Dimensions: W - H - D	48.5 - 17.6 - 70 cm / 19.11 - 6.93 - 27.55 inches
Weight	38 Kg / 83.8 lbs
Number of cooling fans	6
CONNECTORS	
RF Output connector	7/8"
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230/400 Threephase - Singlephase Version 50-60 Hz VAC
Power consumption (typical)	3500 W
Current drain (typical @230V)	15 Amp
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	700 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	3500 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	5
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	4U
Dimensions: W - H - D	48.5 - 17.6 - 70 cm / 19.11 - 6.93 - 27.55 inches
Weight	38 Kg / 83.8 lbs
Number of cooling fans	6
CONNECTORS	
RF Output connector	7/8"
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230/400 Threephase - Singlephase Version 50-60 Hz VAC
Power consumption (typical)	4900 W
Current drain (typical @230V)	21.3 Amp
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	700 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

Datasheet

GENERAL DATA	
Output Nominal Power	5000 W adjustable
Operating band	87.5 ÷ 108 MHz
Direct to channel	Yes
RS232/RS485	Yes. Connector DB9 Female
Points of measure	RF Sample - MPX Monitor
Displayed Parameters	More than 50 parameters displayed on a wide graphic OLED
Adjustments	From the frontal panel through OLED/from PC
Number of L-DMOS in amplifier stage	7
RF power stage technology	ICEFET & ECOSAVING
Dimensions: Rack units	4U
Dimensions: W - H - D	48.5 - 17.6 - 70 cm / 19.11 - 6.93 - 27.55 inches
Weight	38 Kg / 83.8 lbs
Number of cooling fans	6
CONNECTORS	
RF Output connector	7/8"
MPX Connector	BNC Female balanced, unbalanced
LEFT & RIGHT Connectors (or Mono)	XLR Female
AES/EBU Connector	XLR Female/optical
AUX Connectors	BNC Female
RDS	BNC Female
SCA	BNC Female
ETHERNET	RJ45
19 kHz monitor	BNC Female
MPX monitor	BNC Female
10 MHz IN/OUT	SMA
PPS IN/OUT	SMA
GPS ANTENNA	SMA
RF PERFORMANCE	
Output impedance	50 Ω
Automatic power RF control	Stabilizes the output power value on the set value
Overall output power RF stability	+/- 0,1 dB
VSWR	2:1 at full power. Automatic power reduction beyond 1.7:1. Transmitter is protected from both open and short circuit conditions.
Harmonics	< -85 dBc
Out of band emission (spurious)	< -85 dBc
AUDIO PERFORMANCE	
MPX input level	+15/-10 dBu for 75 KHz standard deviation
MPX input impedance	Selectable 5 K unbalanced, 600Ω balanced
L/R input level	+15/-10 dBu for 75 KHz standard deviation
L/R input impedance	Selectable 10 K - 600 Ω, balanced
AES/EBU	Electric and optical input
AES/EBU input resolution	24 bits
AES/EBU input sample rate	32,44.1,48,96,192 KHz automatically selected
AES/EBU input level	-20 dBFS - 0 dBFS
AES/EBU input impedance	110 Ω balanced
SCA/RDS input level	0 dBu for 10% deviation
Pilot amplitude adjustment	Soft adjust 0.05% steps from front panel
Pilot phase adjustment	Soft adjust 0.01 degree steps from front panel
Pilot tone frequency	19 KHz
Pilot tone deviation	Soft adjust +/- 7.5 KHz
Pilot tone frequency stability	+/-1 Hz
THD+N (Mpx operation)	< 0.01% or better with 75 KHz frequency deviation < 0.01% or better with 100 KHz frequency deviation 30 Hz to 15 KHz
THD+N (Stereo/Mono operation)	< 0.03% or better with 75 KHz frequency deviation < 0.03% or better with 100 KHz frequency deviation 30 Hz to 15 kHz
Pre-emphasis	0/25/50/75 microseconds selectable

Pre-emphasis tolerance	+/- 0.1 dB
FM S/N (Mpx operation)	85 dB 20 Hz to 23 KHz @ 53 KHz - detector RMS
FM S/N CCIR (Stereo/Mono operation)	> 80 dB weighted > 80 dB unweighted @ 400 Hz, 75 KHz frequency deviation, quasi-peak detector, 50 us de-emphasis
Asynchronous AM S/N unweighted	> 60 dB @ 400 Hz, 75 us de-emphasis
Synchronous AM S/N	> 50 dB @ 400 Hz, 75 us de-emphasis
Amplitude-frequency characteristic (Mpx operation)	+/- 0.1 dB (without pre-emphasis) 20 Hz to 100 kHz @ 400 Hz
Amplitude frequency characteristic (Stereo/Mono operation)	+/- 0.1 dB (without pre-emphasis) +/- 0.2 dB (with pre-emphasis) 20 Hz to 15 kHz @ 400 Hz
Stereo separation	> 70 dB 20 Hz to 15 KHz
Linear crosstalk	> 70 dB 20 Hz to 15 kHz
Intermodulation distortion	<0.05% Measured with two of tones 1 kHz & 1.3 KHz, ratio 1:1 at 100% modulation
Class of emission	F3
Stereo emission	According to ITU-R reccomendation 450 (pilot tone)
EXCITER PERFORMANCE	
Frequency deviation	+/- 75 KHz 0.1 dB steps adjustable
Maximum frequency deviation	+/- 150 KHz
Frequency stability	+/- 0.1ppm with oven
RF frequency steps	1 Hz
Phase Response	+/- 0.1 degree from linear phase 20 Hz to 100 KHz
Internal sample rate	2.4 GHz
Oven 10 MHz	Yes internal, aging +/- 0.1ppm year
GPS	Yes internal
SFN	Yes, with delay from 0 to 1s, step 100ns
INSTALLATION REQUIREMENTS	
Power supply	230/400 Threephase - Singlephase Version 50-60 Hz VAC
Power consumption (typical)	7100 W
Current drain (typical @230V)	31 Amp
Overall efficiency (typical from -3dB to Pnom)	> = 70%
Power factor	> 0.95
Fuses and circuit breakers	n.2 fuses 25 A BT311325 OMEGA
COOLING/NOISE/DATA	
Cooling system	Forced air-cooling
Acoustic noise	< 65 phon @ transmitter room, 2 m distance of the front of transmitter
Air outlet	700 m^3/h
ENVIRONMENT	
Temperature range (operating)	-5 ÷ +45 °C, 23 ÷ 113 °F
Temperature range (non operating)	-20 ÷ +55 °C, -4 ÷ 131 °F
Humidity range (operating)	95% @ 40 °C, 104 °F
Humidity range (non operating)	90% @ 55 °C, 131 °F
Altitude range (operating)	<3000 meters / <9840 Feet
Altitude range (non operating)	<15000 meters / < 49200 Feet
TELECONTROL & TELEMETRY	
Remote control	Yes
Remote control, dry contacts	Yes
SNMP option	Yes (external)

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