Broadcasting DTV

LINEAR DENKI

E-Compact

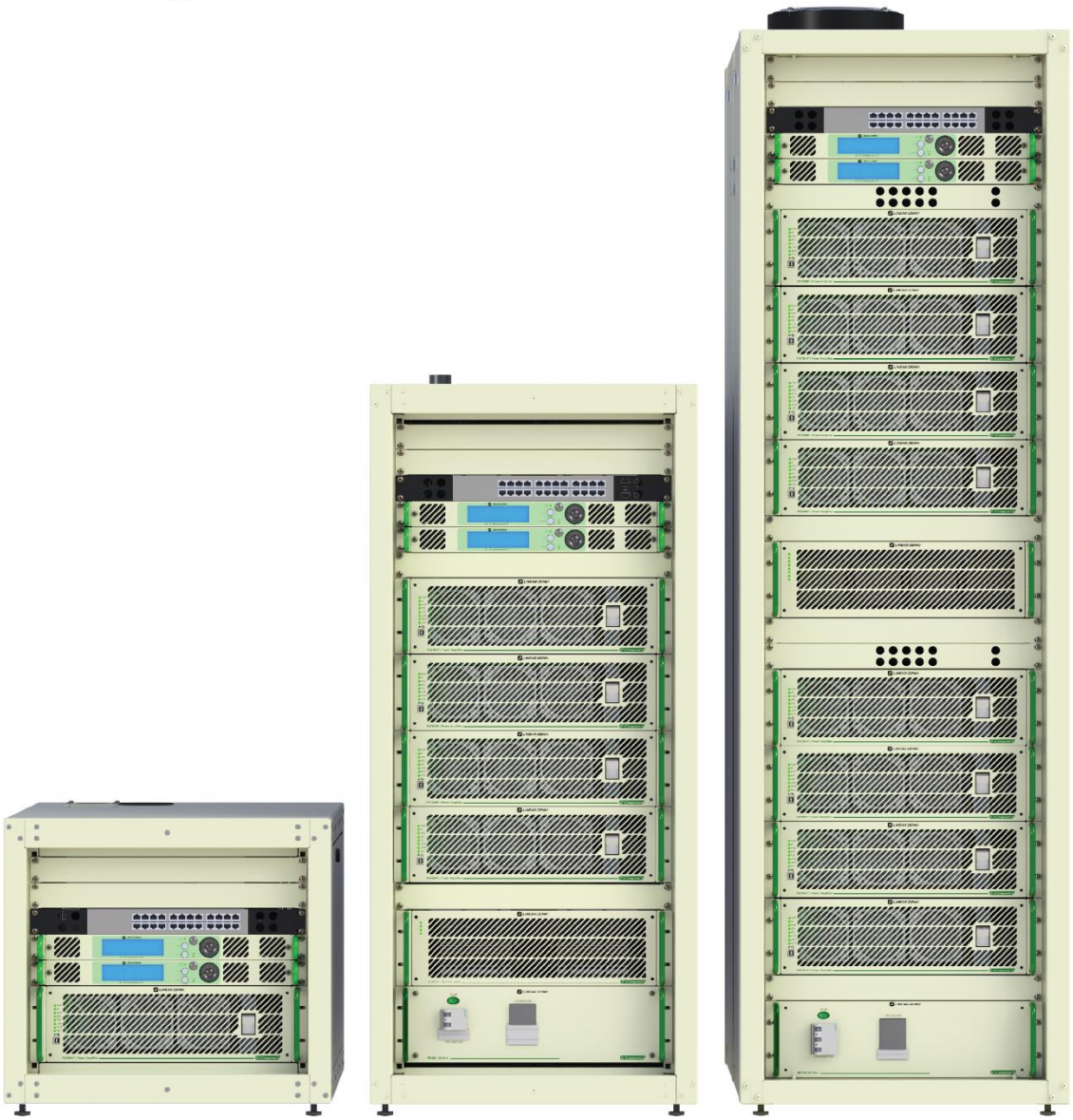
Less energy. More power.

HP Series - EX9001

High Efficiency UHF Transmitters

ISDB-T TV Digital: 580 to 7.200 Watts RMS

English



ISDB-T Digital TV Standard | High Efficiency | Redundant Power Supply | Smart Fan Control | SoC Technology | Adaptive Linearization | Embedded WEB Sever | Remote Access | SFN | BTS Decomp | Remux | [*****] Conditional Access | Surge Protector

KOKUSAI DENKI Electric Linear S/A

HP Series

Family E-Compact of high-power UHF digital TV transmitters. Fully solid-state, air-cooled, and with a standard 19" rack modular structure.

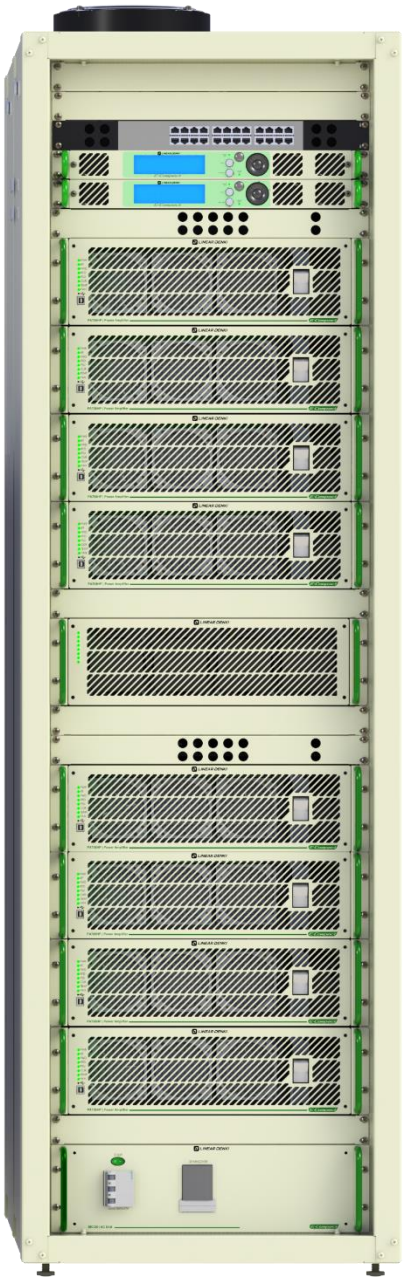
Compact, high density, and efficiency, embedded with adaptive non-linear technology; allowing for imperceptible recovery of MER values in case of changes in the equipment's output power.

It features the option of Dual Exciter, providing automatic redundancy to the equipment without the need for separate control module management.

Doherty topology Power Drawer, high-performance, with efficiency up to 36%. Warranty and high reliability against failures.

Developed and manufactured in Brazil, it offers complete support through local engineering and after-sales, contributing to low maintenance costs and reduced repair time.

Highlights



- **ISDB-T Exciter EX9001 with System on Chip (SoC) technology.**
- **Measurement tools through the WEB interface. In a graphical environment, it provides visualization of measurements such as Intermodulation and MER, eliminating the need for expensive measurement equipment.**
- **Equipment control, including Power Drawers, executed by the Exciter, eliminating the need for external control units.**
- **Power Drawers with high-efficiency Doherty topology, operating with up to 860 W RMS @ ISDB-Tb.**
- **Real-time adaptive non-linear and linear pre-correction function.**
- **Parametrizable embedded BTS decompressor, allowing compatibility with other brands.**
- **Embedded remux allows signal adaptation according to transmission needs.**
- **Embedded satellite receiver, with optional licenses for Free to Air, IRDETO[2], CONAX[2], VERIMATRIX[2], NAGRAVISION[2], BISS-1, and BISS-E.**
- **Automatic fan speed control, resulting in low noise levels, energy savings, and extended device lifespan.**
- **"Easy Maintenance" concept, including Plug-In connection for Power Supplies and Power Drawers.**
- **Isolated RF Combiners[3] allowing Hot Swap[4].**
- **MCCB (Molded Case Circuit Breaker)[3], AC distribution module with Surge Protection Device (SPD) – optional surge protection devices.**

Available Features

System on Chip (SoC) Technology The SoC hardware integrates various system elements into a single chip, allowing the embedding of high-processing-power software. This makes it a compact system with significant processing power and high reliability.	**AVAILABLE**
Measurement Tool MER, Intermodulation, Power, Temperature, and other measurements via WEB in a graphical environment. Enables the visualization of constellation and spectral density diagrams, among others, providing a cost-effective alternative for measuring these parameters.	**AVAILABLE**
Remote Software Update It is possible to update the equipment's software remotely through the WEB interface.	**AVAILABLE**
MCCB (Molded Case Circuit Breaker)[3] AC distribution module from 8kW to 30kW composed of circuit breakers, In-Rush current limiting system, phase loss protection, overvoltage protection, undervoltage protection (<180VAC), auxiliary power supplies of +50VDC, +15VDC, and +8VDC, and a safety interlock input for cutting off equipment power supply.	**INCLUSO**
"Easy Maintenance" Concept Power supplies with plug-in connection, eliminating the need for cables and wiring and allowing for quick and secure replacement. Power supplies can be removed via the front panel of the Power Drawer.	**AVAILABLE**
Embedded WEB Server Remote access to transmitter settings and management is possible via PC or Smartphone through the Ethernet[1] port. It utilizes the PC or Smartphone's own browser, eliminating the need for driver or application installations.	**AVAILABLE**
Adaptive Linear and Nonlinear Pre-Correction Adaptive pre-correction applied due to changes in the transmitter's output power to imperceptibly recover MER and intermodulation values.	**AVAILABLE**
BTS Decompression Parametrizable BTS decompressor, embedded in the transmitter, eliminates the need for auxiliary equipment in the system and enables interoperability with other brands.	**AVAILABLE**
Remux and Embedded Table Generator Table generator embedded in the transmitter, with the ability to filter PIDs, insert static PSI/SI tables, parameterize TMCC, among other functionalities.	**AVAILABLE**
Exciter Inputs/Outputs Inputs: BTS/TS over IP, 2x ASI/310M, 1PPS, 10MHz, and GPS ANTENNA. Outputs: 2x ASI/310M, 1PPS, 10MHz, and Ethernet[1] RJ45. The BTS/TS over IP input can be converted to ASI and made available in the ASI/310M outputs without interfering with the modulated signal.	**AVAILABLE**
Passive Elements Mask filter, directional coupler with integrated FWD and REF signal samples, combined with a low-pass filter.	**AVAILABLE**
Isolated RF Combiners[3] allowing Hot Swap[4].	**AVAILABLE**
3500 W Power Supply Plug-in power supply easily removable through the rear panel of the Power Drawer.	**AVAILABLE**
Digital Manuals in English.	**AVAILABLE**
Dual Driver Backup exciter, providing automatic redundancy without the need for management by a separate control module. Comes with a standard 19" rack Ethernet[1] switch.	**OPTIONAL**
DPS (Surge Protection Devices) [3] Extra protection against overvoltage surges from the electrical network.	**OPCIONAL**
ASI to IP Converter Bidirectional Ethernet[1] port for TSoIP streaming (input/output). The BTS/TS signal inserted into ASI or TUNER (SAT or UHF) inputs can be made available on the Streaming port (TSoIP) without interfering with the currently modulated signal. This functionality is optional and enabled through a software license.	**OPTIONAL**
TS Analyzer Allows checking TS information such as PIDs, Continuity Package Error, Program Name, Bit Rate, among others.	**OPTIONAL**
GPS Time Base High-precision time base synchronization via GPS. High performance in SFN (Single Frequency Network) operation. Comes with an external GPS antenna and surge protector.	**OPTIONAL**
VHF-BIII / UHF Tuner (Terrestrial Reception) ISDB-T VHF-BIII / UHF receiver and demodulator for terrestrial signal retransmission. Comes with a 5 or 7-pole mechanical tuning filter, depending on the conditions of adjacent channels.	**OPTIONAL**
SAT Tuner (Satellite Reception) Banda L DVB-S/S2 compatible tuner for C and Ku-band LNB. Comes with a coaxial surge protector.	**OPTIONAL**
CAS Tuner (Conditional Access Satellite Reception) Banda L DVB-S/S2 compatible tuner for C and Ku-band LNB. Decrypts up to 04 simultaneous services and allows viewing of up to 08 services on the display. Comes with a coaxial surge protector.	**OPTIONAL**
Decryption Licenses for CAS Tuner: IRDETO[2], CONAX[2], NAGRAVISION[2], VERIMATRIX[2], BISS-1, and BISS-E Decryption licenses can be acquired individually or collectively, for new transmitters or for transmitters already in operation in the field. In some cases, it is possible to enable licenses remotely.	**OPTIONAL**
Telemetry Remote via 4G Network Remote monitoring of the transmitter using the 4G telephony network.	**OPTIONAL**
Manuals in printed English.	**OPCIONAL**

General Features

- Exciter model EX9001 with System on Chip (SoC) technology.
- Mounting in a standard 19" Rack cabinet;
- Fully solid-state;
- 860 Watts RMS Doherty Power Drawers with LDMOS transistors;
- Air-cooled;
- Automatic reconnection in case of power failure;
- Operates in SFN (Single Frequency Network) and MFN (Multiple Frequency Network);
- Control firmware managing the entire equipment;
- Access to settings and parameter management via display interface on the Exciter's front panel or remotely via Ethernet[1] (WEB server or SNMP);
- Alarm indicator LEDs on the front panel of the Exciter and the Power Drawer;
- Access to the current or past alarm list via the display interface on the Exciter's front panel or remotely via the WEB interface;
- VSWR and Overpower protection via hardware and software, with automatic power reduction;
- Software-based protection against module temperature increase, with alarm signaling and power reduction;
- Automatic fan speed control;
- Automatic compensation of power transistor quiescent bias current based on temperature;
- AGING compensation adjustment for transistors via the display on the Exciter's front panel;
- Automatic and programmable input switching in hold-on and hold-off modes;
- Power supply with Power Factor Correction (PFC) and soft start with In-Rush current limitation.
- RF interconnections between equipment components using rigid lines.

Models and their specific features (EX9001 - ISDB-Tb)

	EC701HP*	EC702HP*	EC703HP ONLY AVAILABLE WITH EX8001	EC704HP ONLY AVAILABLE WITH EX8001	EC706HP ONLY AVAILABLE WITH EX8001	EC708HP ONLY AVAILABLE WITH EX8001	EC712HP ONLY AVAILABLE WITH EX8001
Output power after the filter (W) [5]	580	1.200	1.800	2.400	3.600	4.800	7.200
Output power before the filter (W) [5]	734	1.446	2.169	2.892	4.337	5.647	8.182
AC power consumption (W) [5]	2.107	4.044	6.078	8.083	12.095	15.729	23.292
Thermal Dissipation (BTU/h) [5]	5.210	9.704	14.597	19.391	28.986	37.291	54.908
Efficiency after the filter (%) [5]	27,5	29,7	29,6	29,7	29,8	30,5	30,9
Efficiency before the filter (%) [5]	34,8	35,8	35,7	35,8	35,9	35,9	35,1
Power Drawers	1	2	3	4	6	8	12
Number of Racks	1						2
Units in 19" Rack (RU)	8	25			40		
Width (mm)	570						1.140
Length (mm)	900	1.100					
Weight (kg)	70	170	210	250	350	420	700

*Equipment also available with EX8001 exciter (consult specific catalogue).

Transmission Spectrum Mask (Intermodulation) [6]

	Critical Mask	Subcritical Mask	Non-critical Mask
±3,15 MHz @ BW = 6 MHz	≥50 dB	≥43 dB	≥36 dB
±4,50 MHz @ BW = 6 MHz	≥67 dB	≥60 dB	≥53 dB
±9,00 MHz @ BW = 6 MHz	≥97 dB	≥90 dB	≥83 dB
±15,00 MHz @ BW = 6 MHz	≥97 dB	≥90 dB	≥83 dB

Transmission spectrum mask according to ABNT NBR 15601:2007

Technical Specifications

RF	
Standard	ISDB-Tb
Operation frequency	470 MHz to 806 MHz (Chanel 14 to Chanel 69)
Bandwidth	6 MHz / 8 MHz
Minimum operating power	1 % of rated power
Pré-correction	Adaptive Nonlinear Linear
Typical MER	Minimum ≥35 dB. Typical 38 dB (depends on channel, power, and transmitter efficiency)
Out-of-channel spurs and harmonic distortions	Better than -60 dBc
Transmission Mask (Intermodulation) [6]	Critical Subcritical Non-critical
Power stability	±2 %
RF output impedance	50 Ω
Output Connections [7]	EIA 1-5/8" @EC701HP, EC702HP, EC703HP e EC704HP EIA 3-1/8" @EC706HP, E708HP e EC712HP

ASI Inputs / Outputs	
Quantity	02 inputs, 02 Outputs
Standard	DVB-ASI 188 /204 BYTES
Connectors	BNC Female
Impedance	75 Ω

Input TSoIP	
Standard	IEEE802,3u 10 Base-T /100Base TX
Connector	RJ45
Encapsulation	UDP/RTP
IP assignment	Static
Multicast	IGMP v2

GPS antenna input (optional)	
Connectors	SMA Female
Impedance	50 Ω
Accessories	External antenna, cable and surge protector

UHF / VHF-BIII Tuner Input (optional)	
Reception band	UHF / VHF-BIII
Standard	ISDB-T
Connectors	SMA Female (Exciter) N Female (input UHF filter)
Impedance	50 Ω

Satellite tuner input (optional)	
Reception band	L band
Polarization	Vertical / Horizontal
LNB voltage	+13 V, +18 V
Standard	DVB-S / DVB-S2
Connectors	SMA Female (Exciter) F Female (connection w/ LNB)
Impedance	75 Ω
Accessories	surge protector

CAS tuner input (optional)	
Reception band	L band
Polarization	Vertical / Horizontal
LNB voltage	+13 V, +18 V
Standard	DVB-S / DVB-S2
Connectors	SMA Female (Exciter) F Female (connection w/ LNB)
Impedance	75 Ω
Optional decryption licenses[3]	IRDETO [2] CONAX [2] NAGRAVISION [2] VERIMATRIX [2] BISS-1 BISS-E
Accessories	surge protector

10MHz external references - Input / output	
Quantity	01 input, 01 output
Connector	BNC Female
Impedance	50 Ω
Input level	0 a +10dBm
Output Level	+10 dBm

1PPS external references - Input / output	
Quantity	1 input, 1 output
Connectors	Female BNC
Impedance	1 kΩ
Input Level	3.3V LVTTL
Output Level	3.3V LVTTL

Linearization inputs After F. / Before F.	
After Filter Input	Linear pre-correction
Before Filter Input	Nonlinear pre-correction
Connector	SMA Female
Impedance	50 Ω
Input level	-5 to +5 dBm

Local oscillator

Oscillator	Synthesized by PLL
Frequency stability	±1 Hz (with Internal GPS) ±35 Hz (without Internal GPS)
Phase noise	≤-95 dBc/Hz @ 1 kHz

ISDB-T Modulation

Mode OFDM	Mode 1: 2K (2048/3,96 KHz) Mode 2: 4K (4096/1,98 KHz) Mode 3: 8K (8192/0,99 KHz)
Guard interval	1/4, 1/8, 1/16, 1/32
Partial reception	Single segment for mobile devices (1-Sec)
Hierarchical Transmission	Support for 3 layers (A, B and C)
Segments	1 to 13
Modulation	QPSK, DQPSK, 16QAM, 64QAM
FEC	1/2, 2/3, 3/4, 5/6, 7/8
Time Interleaving	0, 1, 2, 4

Electrical characteristics

Compatible power grid (Factory Configured)	Single-phase 220 VAC (M220) Two-phase 220 VAC (B220) Three-phase 220 VAC (T220) Three-phase 380 VAC (T380)
EC701HP	M220 / B220
EC702HP / EC703HP / EC704HP / EC706HP / EC708HP / EC712HP	M220 [8] / B220 [8] / T220 / T380
AC Input Voltage	180~254 VAC
AC Frequency	43~63 Hz
Power Factor Correction (PFC)	0,95 (typical), 0,9 (minimum)

Interfaces

Local Equipment Control Interface	Graphic display 256x64 pixels
Signaling LEDs	Navigation cursor keys
Remote Access	Alarm LEDs on the Exciter
(Management)	RJ45 connector

Operating Environment Characteristics

Operating altitude	Up to 2.500 meters [5] (8.200 ft) [5] above sea level
Environment temperature range	0°C (32°F) to + 45°C (113°F) +25°C (77°F) recommended
Environment humidity range	0 to 95 % non-condensing
Power amplifier cooling	Forced ambient air, front-to-rear flow through high-volume integral fans

Notes:

[1] Ethernet is a trademark of Xerox Corporation.

[2] Module with PCMCIA CAM slot (Irdeto, Conax, Nagravision, and Verimatrix systems), SMARTCARD, and CAM not included.

[3] Except for the EC701HP model with a Power Drawer. It does not have an RF combination and plug-in devices.

[4] Power Drawers can be removed or inserted with the Transmitter in operation, but the Power Drawer to be removed or inserted must have the AC key on its front panel in the OFF position. The EC701HP model does not have a plug-in drawer.

[5] Considering optimized channel and environmental conditions. May vary according to the channel frequency and operating conditions.

[6] The transmission mask depends on the type of filter used.

[7] Consult the factory for other types of output connections.

[8] AC Power Supply Upon Request for EC708HP and EC712HP models.

[9] Rated power up to 2.500m. Above 2.500m, consult the factory.

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