Broadcasting DTV

LINEAR DENKI

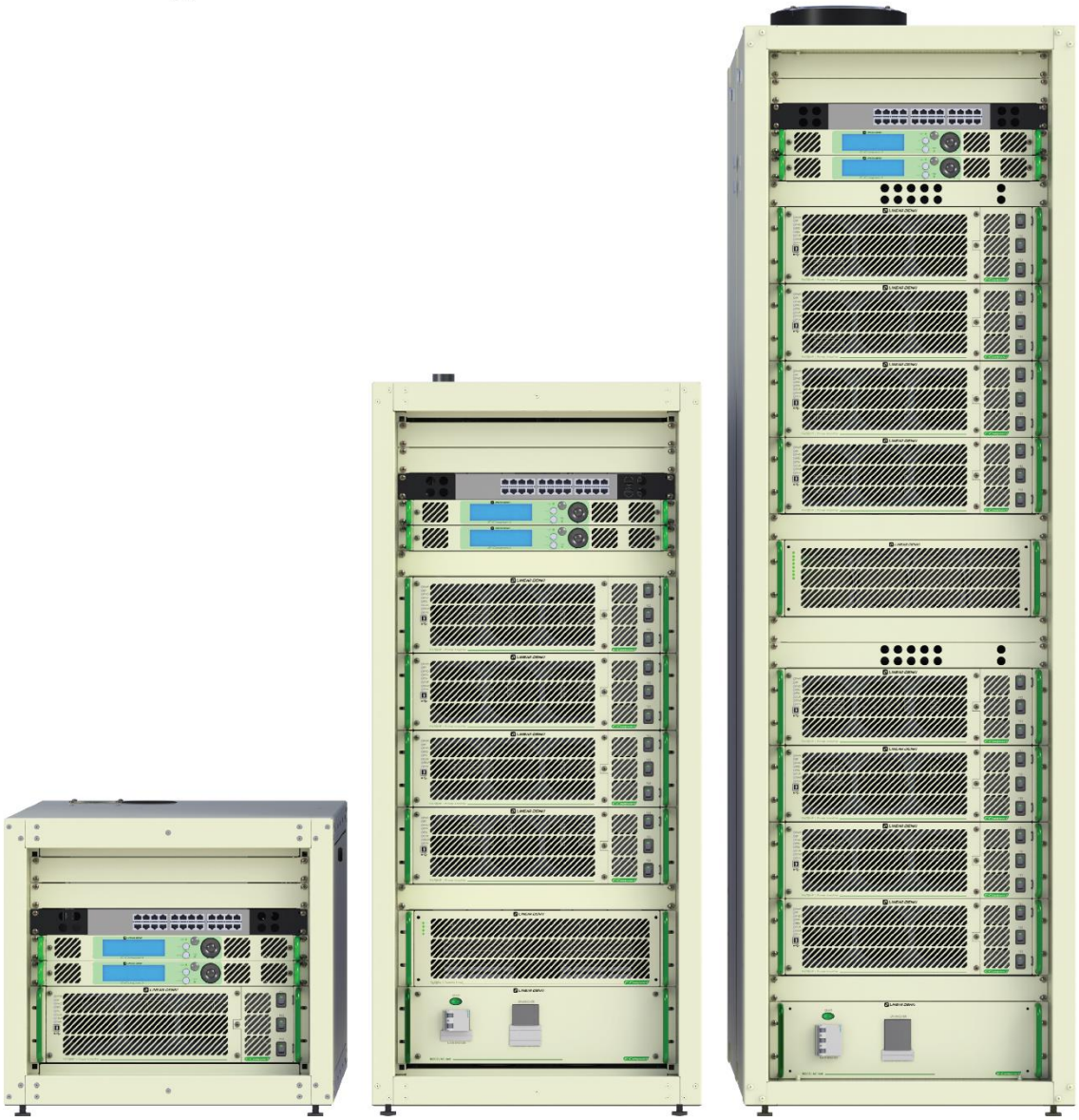
E-Compact

Less energy. More power.

HP-BB Series - EX9001

High Efficiency UHF Broadband Transmitters

ISDB-T TV Digital: 680 to 8.400 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

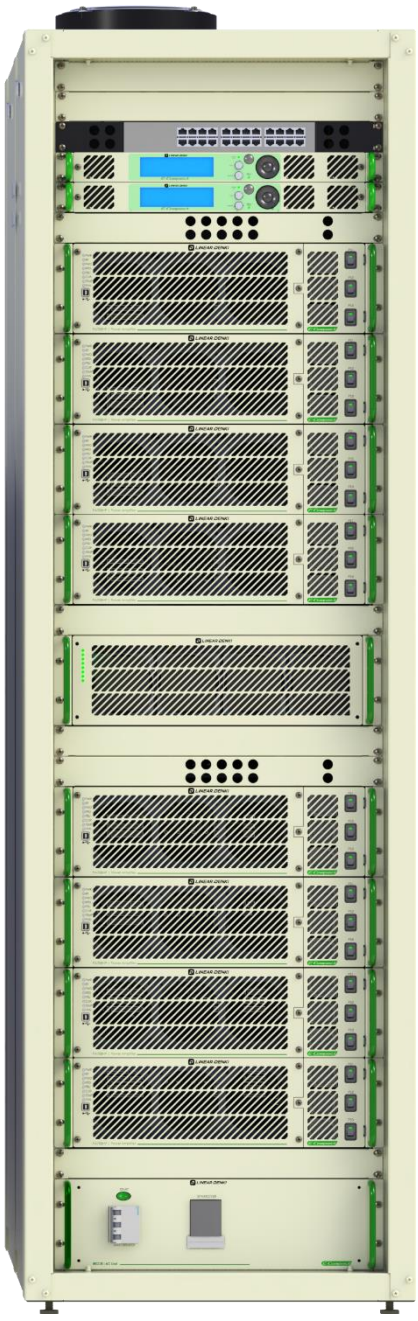
KOKUSAI DENKI Electric Linear S/A

HP-BB Series

Family E-Compact of high-power UHF broadband digital TV transmitters. Fully solid-state, air-cooled, and featuring a standard 19" rack modular structure. Compact, high-density, and efficient, embedded with adaptive non-linear technology; allowing for imperceptible recovery of MER values in case of changes in equipment output power.

It offers the option of Dual Exciter, providing automatic redundancy to the equipment without the need for separate control module management. Broadband Power Drawer with Doherty topology, high performance, with up to 41% efficiency, featuring three built-in power supplies for warranty and high reliability against failures.

Highlights



- **ISDB-T EX9001 Exciter 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.**
- **Broadband Power Drawers with high-efficiency Doherty topology.**
- **Real-Time adaptive non-linear and linear pre-correction function.**
- **Parametrizable embedded BTS decompressor, allowing compatibility with other brands.**
- **Embedded remux, enabling signal adaptation according to transmission needs.**
- **Embedded satellite receiver, with optional licenses for Free to Air, IRDETO², CONAX², VERIMATRIX², NAGRAVISION², BISS-1, and BISS-E.**
- **Automatic control of fan speed, resulting in low noise levels, energy savings, and extended device lifespan.**
- **High reliability against failures. For the HP-BB line, 3 (three) power supplies for each Power Drawer. Balanced distribution of electrical network in a three-phase system.**
- **"Easy Maintenance" concept offering, among other features, Plug-In connection for Power Supplies and Power Drawers.**
- **Isolated RF³ combiners allowing Hot Swap⁴.**
- **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**
1.200W Power Supply Three 1200-watt power supplies per Power Drawer. Energy redundancy operation. Plug-in type Power Supplies ("Easy Maintenance" concept), eliminating the need for cables and wiring, and allowing quick and secure replacement. Balanced distribution of electrical network in a three-phase system.	**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) 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.
- 900 Watts RMS Doherty Power Drawers with LDMOS transistors.
- Air-cooled.
- Automatic restart in case of power outage.
- 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 Exciter and Power Drawer front panels.
- Access to the list of current or past alarms via display interface on the Exciter's front panel or remotely via WEB interface.
- VSWR and Overpower protection via hardware and software, with automatic power reduction.
- Software protection against module temperature increase, with alarm signaling and power reduction.
- Automatic fan speed control.
- Automatic compensation of power transistor bias quiescent current based on temperature.
- AGING compensation adjustment for transistors via 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 limitation.
- RF interconnections between equipment parts using rigid lines.

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

	EC701HP-BB*	EC702HP-BB*	EC703HP-BB*	EC704HP-BB*	EC706HP-BB*	EC708HP-BB*	EC712HP-BB*
Output power after the filter (W) [5]	680	1.400	2.100	2.800	4.200	6.000	8.400
Output power before the filter (W) [5]	850	1.720	2.560	3.420	5.120	6.700	10.000
AC power consumption (W) [5]	2.340	4.620	6.900	9.180	13.740	19.600	27.420
Thermal Dissipation (BTU/h) [5]	5.664	10.987	16.378	21.769	32.552	46.430	64.899
Efficiency after the filter (%) [5]	29,1	30,3	30,4	30,5	30,6	30,6	30,6
Efficiency before the filter (%) [5]	36,3	37,2	37,1	37,2	37,3	37,3	36,5
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

Características Técnicas

RF	
Standard	ISDB-Tb
Operation frequency	470 MHz to 608 MHz (Canal 14 to Canal 36) 608 MHz to 698 MHz (Canal 37 to Canal 51)
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-BB, EC702HP-BB, EC703HP-BB and EC704HP-BB EIA 3-1/8" @EC706HP-BB, E708HP-BB and EC712HP-BB

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

Electrical network compatible (Factory set)	Single-phase 220 VAC (M220) Two-phase 220 VAC (B220) Three-phase 220 VAC (T220) Three-phase 380 VAC (T380)
EC701HP-BB	M220 / B220
EC702HP-BB / EC703HP-BB / EC704HP-BB / EC706HP-BB / EC708HP-BB / EC712HP-BB	M220 [8] / B220 [8] / T220 / T380
AC input voltage	AC input voltage: 180~254 VAC
AC frequency	AC frequency: 43~63 Hz
Number of power supplies per Power Drawer	Number of power supplies per Power Drawer: 03 PSUs of 1.200 W
Power Factor Correction (PFC)	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-BB model.

[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.

[5] Considering optimized channel and environmental conditions. May vary depending on 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-BB and EC712HP-BB models.

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

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