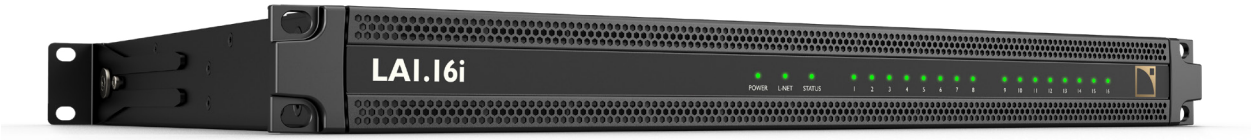
PRELIMINARY

LA1.16i AMPLIFIED CONTROLLER for install

- 16 x 16 architecture
- Seamless audio network redundancy
- Ultra-compact (1U)
- L-SMART power management technology
- High channel density
- Versatile bridge mode capabilities



LA1.16i is an ultra-compact 16 x 16 architecture amplified controller designed for permanent installations, providing a unique solution for applications that can benefit from high discretization amplification and processing. Primarily developed to power L-Acoustics small format loudspeakers in large quantities, LA1.16i is ideal for near-field applications that require lower sound pressure levels (SPL). With its channel density and flexible output bridging, LA1.16i offers unrivaled versatility. In single-ended (SE mode), each of the 16 output channels delivers 80 W at 8 ohms or 160 W at 4 ohms. Additionally, odd/even pairs of outputs can be bridged (BTL mode), increasing the available power to 300 W at 8 ohms. This functionality enables the 16 outputs to be operated in any combination of SE or BTL modes, providing unmatched value and adaptability for installers and integrators.

The feature set offered by LA1.16i benefits many types of integration projects. The high channel density is an asset for applications such as fills and delays in theaters and performing arts centers and distributed background music systems in restaurants, cruise ships, or museums. Setups requiring individual channel processing such as L-ISA spatial audio or Ambiance active acoustics designs, can fully utilize the 16 discrete inputs and outputs. Residential and marine spaces can take advantage of the flexible bridging capabilities and compact form factor, enabling a single LA1.16i to power a combination of full-range and subwoofer enclosures used in home theaters or poolside entertainment systems simply and efficiently.

First introduced with the groundbreaking LA7.16i amplified controller, L-SMART is a suite of advanced power management technologies, developed by L-Acoustics, that uses predictive modeling algorithms to manage the PSU and the individual amplification channels. Hardware sensors feedback data that is analyzed by the DSP to match the real-time needs of the loudspeaker system being driven. LA1.16i incorporates this patented technology to manage its dual internal PSUs, with a combined output of 1200 W, and this energy is delivered dynamically and intelligently to the advanced Class-D output stages, assuring optimum system performance, smart mains current limiting is also included.

Packaged in an ultra-compact 1U chassis for efficient use of rack space and lower cost of integration, LA1.16i reduces the associated carbon footprint of any L-Acoustics sound system, supporting our constant effort for greater sustainability. It incorporates features tailored for installation applications, such as loudspeaker monitoring, protection, and management, GPIO's, terminal block connectors, and a backup 24V DC input enabling the DSP card to continue functioning if mains power is lost. The Milan-certified LA1.16i supports Milan-AVB and AES67 seamless network redundancy and is remotely controlled and monitored using LA Network Manager. An embedded web interface (Web UI) is also included to enable the configuration and monitoring of AES67 input streams.

I/O

LA1.16i provides 16 inputs selected from up to 128 channels (16 Milan-AVB (48 kHz or 96 kHz) or AES67 (48 kHz only) streams of up to 8 channels each) on EtherCON™ connectors. Seamless network redundancy is standard; if there is a connection loss on the primary network, audio will pass automatically and seamlessly to the secondary network, with no audible artifacts. If non-redundant network mode is selected the two network ports can be used to daisy-chain additional units, reducing the need for network switches.

In addition, an AES/EBU and analog input are available on terminal block connectors. Assignable automatic fallback functions from the audio network to two channels of AES/EBU or a single channel of analog are available for additional audio path redundancy. These inputs can also be utilized as main inputs or for integration into a PAVA system, together with the GPIO and third-party monitoring and control options.

The 16 loudspeaker outputs are presented in pairs on eight terminal block connectors, making the LA1.16i fast to deploy and integrate. Terminal block connectors are also used to connect the configurable GPIO's and the backup 24V DC input.

Mains power is connected via a V-lock compatible IEC connector and the dual internal switch-mode power supplies (SMPS) can be used worldwide without the need to change the voltage range.

GREEN POWER

Efficiency is a core design principle of LA1.16i. L-Acoustics System Modeling Adaptive Resource Technology, or L-SMART, intelligently matches the real-time needs of the loudspeaker enclosures being driven and the available power, maximizing the output channel capacity for a given loudspeaker configuration and its power demands. In addition to the intelligent dimensioning of the power supplies, LA1.16i has been designed for efficient heat dissipation, prolonging the long-term power delivery of the amplifier modules, by dramatically increasing their thermal performance.

Like all L-Acoustics amplified controllers, LA1.16i utilizes the latest SMPS technology and features power factor correction (PFC), which adds several benefits. Taking advantage of virtually 100% of the mains power cycle maximizes amplifier efficiency, increases tolerance to unstable mains, and enables significantly more economical use of the available electrical power. From a single 230 V / 10 A line, the LA1.16i delivers up to 16 channels of amplification with 160 W at 4 ohms (SE mode).

LA1.16i was also developed with sustainability in mind and brings direct economic benefits to integration costs and the long-term operational overheads of any system. The exceptional channel density minimizes network and rack infrastructure needs, with up to four times less requirements than an equivalent design using four-channel amplified controllers. Additionally, there are significant reductions in weight and idle mains power consumption, which positively impacts the running costs of the system.

The design choices mentioned above lower the stress on the components, offering the benefit of added long-term durability.

SYSTEM MONITORING

L-Acoustics amplified controllers integrate system supervision functions that monitor amplifier and loudspeaker status, behavior, and continuity. The amplified controllers can monitor input and output signal integrity, levels, temperature, and voltage values as well as a power amplifier fault status. Any malfunction is reported in real-time within LA Network Manager control software or third-party control systems.

The Load Checker feature verifies the output cabling, validates that the preset loaded matches the expected load and number of enclosures in parallel.

LA1.16i monitors the output circuits using a combination of real-time load presence and periodic silent tests. It provides comprehensive integration with voice alarm systems via the control network and GPIO interfaces, including pilot tone, amplifier channel, and PSU status reporting. In addition to seamless redundancy for the audio network, options for automatic fallback and backup of input signals are available. These can be configured and enabled on a per-channel basis or globally as an input override if required.

DSP

LA1.16i exploits our 5th generation DSP engine, with a summation matrix for the inputs, expanded audio network capabilities and capacity for new technologies. All L-Acoustics amplified controllers integrate powerful DSP resources gathering loudspeaker management, protection for transducers and electronics, and a comprehensive set of tools for system adjustments to create a natural, transparent, and realistic sound experience. The LA1.16i DSP processing is divided into four blocks.

System alignment:

The first block provides tools to create a coherent system by setting optimal summation of each element:

- Gain, polarity and up to 1 second of delay for each output channel
- The Autoalign tool, available as part of the M1 measurement suite, enables quick and easy alignment of an entire system

System tonal balance:

The second block provides advanced tools to maintain a consistent sonic signature between arrays in the system and from one venue to another:

- The Autofilter tool is used to linearize the full frequency response of the entire array across the audience space on a per amplifier channel basis.
- The adjustable IIR & linear phase FIR filters are used to fine-tune the system to a specific venue or configuration
- The Array Morphing tool is a simple and yet efficient tool to adjust the sonic signature of line sources to meet the program material needs.
- The Autoclimate and Air Compensation tool are used to adjust the system response in relation to atmospheric conditions while preserving driver resources.

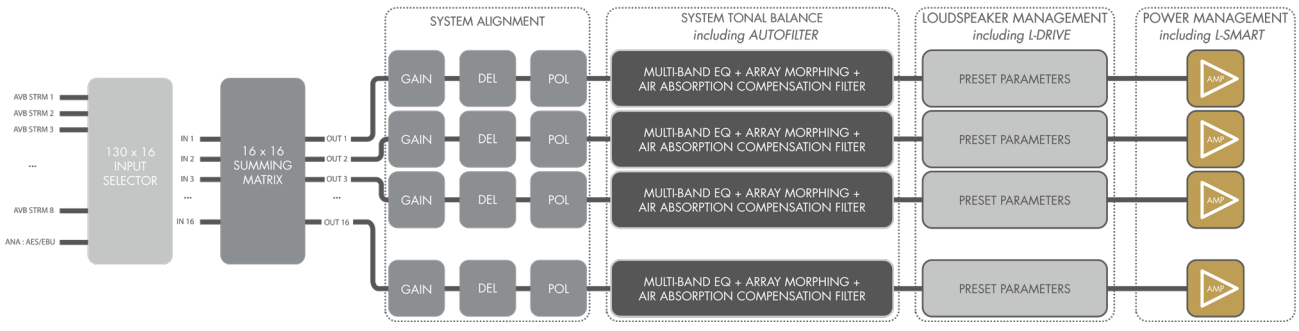
Loudspeaker management:

The third block is the system parameters that unify loudspeaker response and system protection through specific loudspeaker presets developed in-house. It integrates the proprietary L-DRIVE system, providing over-excursion, over-voltage and thermal protection, to maximize output power and minimize nonlinearities. L-DRIVE optimum protection ensures durable performance and preserves sonic transparency in the linear and nonlinear domains.

Power management:

In addition to the standard system tools, LA1.16i utilizes a suite of power management technologies. L-SMART intelligently manages PSU and amplifier efficiency by analyzing present needs and anticipating future demand thanks to a combination of DSP-controlled sensors, feedback loops, and predictive modeling techniques, which adapt to real-time conditions, automatically applying momentary gain reduction to the outputs if excessive long-term power demands are experienced. LA1.16i incorporates two internal 600 W PSU's, each supplying eight amplifier channels respectively, giving a total capacity of 1200 W. L-SMART monitors the performance of each PSU independently, only applying momentary gain reduction to a block of eight outputs when necessary, protecting the electronics and reducing the risk of long-term damage to the system.

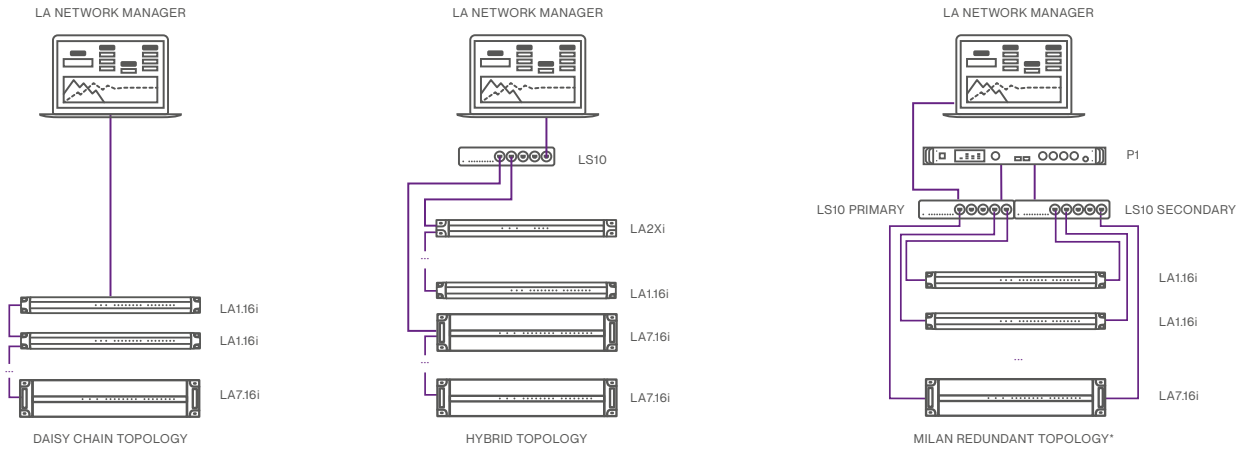
Within L-SMART, the Power Budget enables flexible deployment of loudspeaker systems based on users' requirements. Leveraging the multichannel architecture and capabilities of LA1.16i, the concepts of 'Nominal' and 'Maximized Use' empower users to optimize loudspeaker system efficiency by exploiting real-time temporal and level differences across the outputs. There is no need for the user to fix or allocate channel resources, it is managed intelligently and automatically by L-SMART.



SOFTWARE AND NETWORK

LA Network Manager is designed to efficiently take users through the workflow process of Setup, Tuning, and Live. The tools required for each task are available on the dedicated page for each step of the control and supervision process. An advanced network engine allows automatic discovery of connected units, multiple-group assignment, real-time monitoring with event logging, and includes numerous productivity tools.

Our proprietary TCP/IP protocol is used to configure and monitor the L-NET network of all L-Acoustics amplified controllers. Thanks to its high-speed data transfer capability of 1 Gbit/s, up to 253 units can be controlled and monitored in real-time by LA Network Manager, a proprietary software available for both Windows and Mac operating systems. All amplified controllers are fitted with two Ethernet ports allowing daisy-chain topologies, star topologies or a hybrid of the two, using standard CAT5e U/FTP cables.



*Milan redundant topology is not available for LA4X.

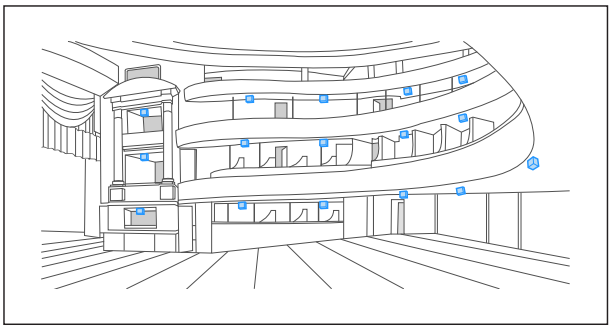
AVB is the only protocol that guarantees deterministic and synchronous network behavior, ensuring on-time delivery of time-sensitive data. Milan is the applications layer on top of AVB, independent from any private entity, that ensures seamless interoperability between any Milan-certified device. The Milan initiative developed agreed-upon standards for media stream format, media clocking, seamless redundancy, and more so that no IT expertise is required to set up a reliable and deterministic AVB network with Milan-certified devices.

Milan-AVB is an evolving, long-term, viable and durable network developed by the industry for the industry.

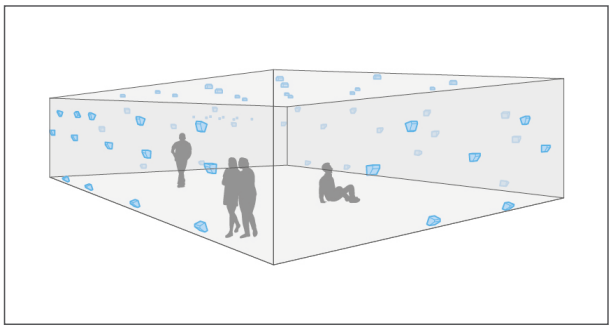
Several audio-over-IP (AoIP) systems have been developed to support high-performance media networking, but until AES67 there were no recommendations for connecting these systems in an interoperable manner. The AES67 standard provides comprehensive recommendations in the areas of synchronization, media clock identification, network transport, session description, connection management, encoding, and streaming. L-Acoustics supports this open standard in addition to Milan-AVB on several installation-focused products for increased compatibility and simplified connectivity in AoIP networks.

APPLICATIONS

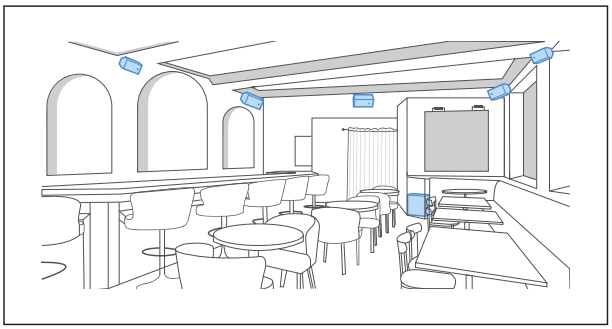
LA1.16i supports a wide variety of near-field or background music installation applications that do not require maximum sound pressure levels (SPL) from the loudspeakers. The available power makes it ideal for driving fill and delay systems in theaters and performing arts centers. Deployments that require large numbers of discrete signals such as L-ISA Immersive Hyperreal, Ambiance™ active acoustics and HYRISS experiences or distributed loudspeaker deployments in hospitality, museums, and exhibitions all benefit from the channel density and network connectivity. The versatile bridging functionality and compact form factor complement residential and marine deployments.



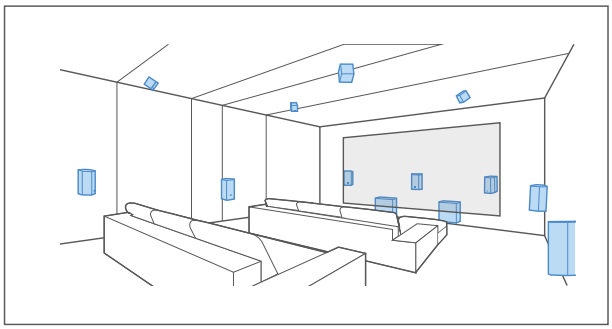
Fills and delays: theaters and performing arts centers



L-ISA and Ambiance: Rehearsal spaces, art and musuem installations



Distributed systems: hospitality venues, theme parks, cruise ships, corportate



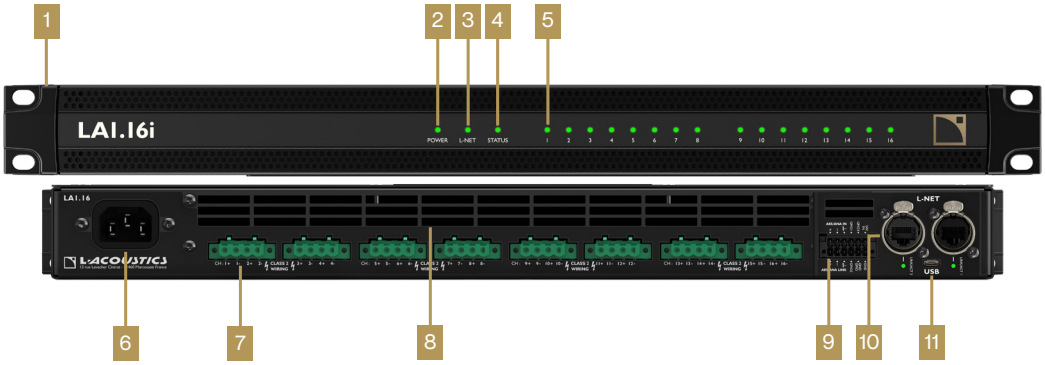
Home & Yacht: HYRISS experiences, cinemas, indoor and outdoor spaces

ENCLOSURE DRIVE CAPACITY

Categories - Series*	Reference	Nominal Use - Single Ended (SE mode)				Nominal Use - Bridged Tied Load (BTL mode)			
		Power Budget per enclosure**	nb of enclosures per output	nb of enclosures per LA1.16i***	Achievable Max SPL (dB)	Power Budget per enclosure**	nb of enclosures per output	nb of enclosures per LA1.16i***	Achievable Max SPL (dB)
Short throw X Series	X4i	3.0%^	3	48	107^	16.6%^	2	12	115^
	5XT	3.8%	3	48	112	14.3%	2	14	120
	X6i	8.3%^	2	24	115^	25.0%^	1	4	122^
	X8i	6.1%^	2	32	117^	23.0%^	1	8	124^
	X8	6.1%	2	32	117	23.0%	1	8	124
	X12	-	-	-	-	42.5%	1	4	131
Medium throw S Series	Soka	6.5%^	2	30	119^	33.5%	1	6	127^
Medium throw A Series	A10(i) Wide/ Focus	-	-	-	-	41.5%	1	4	132
Long throw K Series	KIVA II	-	-	-	-	19.8%	2	10	132
Subwoofers	SB6i	12.5%^	1	16	106^	-	-	-	-
	SB10i	8.0%^	2	24	112^	39.0%	1	4	120^
	Syva Sub	-	-	-	-	20.5%	1	4	125^

* Only the loudspeakers listed are supported by LA1.16i
** Approximate values per enclosure at full power; for accurate values refer to the latest version of LA Network Manager or Soundvision
*** The maximum number of enclosures per LA1.16i is given for Nominal Use, assuming that all channels are driven at full power (SE or BTL modes)
^ Max SPL and Power Budget can vary slightly by preset, please refer to the Preset Guide or Amplification Reference TB for full details

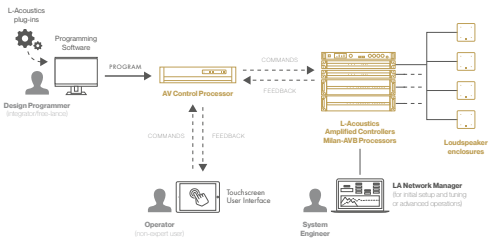
USER INTERFACE



1 1U chassis
2 Power LED
3 L-NET control network LED
4 Status LED
5 Signal, limit, clip LEDs
6 IEC V-Lock compatible power supply inlet
7 Loudspeaker outputs on 4-point terminal blocks (x8)
8 Fan grill
9 24 V DC External DSP backup voltage input
General Purpose I/O (GPIO)
AES/EBU / analog input connector
AES/EBU / analog link connector
10 etherCON™ 1 Gb/s Ethernet connectors
11 USB port for IP address configuration

THIRD-PARTY INTEROPERABILITY

L-Acoustics has developed several modules and plug-ins which facilitate integration with many popular media control systems, allowing interoperability between the L-Acoustics ecosystem and third-party platforms. Permitting centralized monitoring and management, via a customized interface, of L-Acoustics electronics products alongside other types of devices. This includes continuous monitoring where voice alarm integration is a requirement.



Supported AV control solutions: HTTP

AMPLIFIED CONTROLLERS – THE RANGE

The latest generation of amplified controllers share similar architecture with extremely powerful DSP. The main differentiators between amplified controllers are gathered in the following table:

Specifications	LA1.16i	LA2Xi	LA4X	LA7.16(i)	LA12X
Touring / Install	Install	Install	Touring / Install	Touring / (i) Install	Touring / Install
In x Out	16 x 16*	4 x 4 / 4 x 3 / 4 x 2 / 4 x 1	4 x 4	16 x 16	4 x 4
Output power 12 dB Crest Factor, sine burst, 1 kHz, 2 ms	16 x 80 W (at 8 ohms) 16 x 160 W (at 4 ohms) 8* x 300 W (at 8 ohms)	4 x 190 W (at 16 ohms) 4 x 370 W (at 8 ohms) 4 x 710 W (at 4 ohms)	4 x 560 W (at 16 ohms) 4 x 1100 W (at 8 ohms) 4 x 1400 W (at 4 ohms)	16 x 700 W (at 16 ohms) 16 x 1300 W (at 8 ohms) 16 x 1100 W (at 4 ohms)	4 x 1400 W (at 8 ohms) 4 x 2600W (at 4 ohms) 4 x 3300W (at 2.7 ohms)
All channels loaded CEA-2006/490A, Sine burst , 1 kHz, 20 ms, THD < 1%, all channels loaded	16 x 80 W (at 8 ohms) 16 x 120 W (at 4 ohms) 8* x 230 W (at 8 ohms)	4 x 190 W (at 16 ohms) 4 x 360 W (at 8 ohms) 4 x 640 W (at 4 ohms)	4 x 1000 W (at 8 ohms) 4 x 1000 W (at 4 ohms)	16 x 580 W (at 16 ohms) 16 x 920 W (at 8 ohms) 16 x 1000 W (at 4 ohms)	4 x 1400 W (at 8 ohms) 4 x 2600 W (at 4 ohms) 4 x 3300 W (at 2.7 ohms)
Nominal current requirements for 200 - 240 V / 100 - 120 V	10 A / 20 A	10 A / 20 A	10 A / 20 A	16 A / 30 A	16 A / 30 A
Input channels	16 x AVB or AES67 1 x Analog / 2 x AES/EBU	4 x AVB or AES67 4 x Analog / 4 x AES/EBU	4 x AVB 4 x Analog / 4 x AES/EBU	16 x AVB (i: or AES67) 1 x Analog / 2 x AES/EBU	4 x AVB 4 x Analog / 4 x AES/EBU
Noise level (20 Hz - 20 kHz, 8 Ω, A-weighted, digital input)	< - 85 dBV	< - 77 dBV	< - 70 dBV	< - 79 dBV	< - 75 dBV
Front panel	LED's only	LED's only	LCD display with rotary encoder, power and mute keys	TFT Colour Touch Screen (i: LED's only)	LCD display with rotary encoder, power and mute keys
Height	1U	1U	2U	2U	2U
Weight	5.6 kg / 12.3 lb	4.4 kg / 9.70 lb	11.3 kg / 24.9 lb	15.8 kg / 34.8 lb (i: 14.5 kg / 32 lb)	14.5 kg / 32 lb

* Any odd/even pair of outputs can be bridged (BTL)

PRELIMINARY

LA1.16i AMPLIFIED CONTROLLER

AES67

MILAN

LA1.16i is an ultra-compact 16-channel amplified controller dedicated to permanent installations. It is efficiently dimensioned for multichannel and distributed systems utilizing small format enclosures or for near-field applications.

Offering high channel density and versatile bridging functionality, LA1.16i integrates our patented L-SMART power management technology to dynamically match the real-time needs of the loudspeaker system being driven. Its streamlined and elegant 1U chassis hides a powerful DSP engine with features for loudspeaker management, system protection, and monitoring as well as a comprehensive set of tools for system adjustment and calibration. The Milan-certified LA1.16i supports AVB or AES67 network inputs with seamless redundancy, in addition to AES/EBU and analog connections. Three GPIO and a 24 V DC backup power for the DSP card offer external control and increased reliability.

SPECIFICATIONS

Amplification and power supply			
Output power, all channels loaded	16 channels at 4 Ω	16 channels at 8 Ω	8 channels* at 8 Ω
Peak output power 12 dB Crest Factor, sine burst, 1 kHz, 2 ms	160 W	80 W	300 W
Output power, CEA-2006 / 490A, sine burst, 1 kHz, 20 ms, ≤ 1 % THD	120 W	80 W	230 W
Amplification class	High efficiency Class D		
Power supply model	Universal Switched Mode Power Supply (SMPS) with Power Factor Correction (PFC)		
External DSP backup voltage input	24 V DC (+/- 15%) 0.8 A		
Mains rating	100 V - 240 V ~ ±10%, 50-60 Hz		
Audio specifications			
Frequency response (20 Hz - 20 kHz, 8 Ω load, Pmax/8 output power)	± 0.25 dB		
Distortion THD+N (20 Hz - 20 kHz, 8 Ω load, Pmax/8 output power)	< 0.003%		
Output dynamic range (20 Hz - 20 kHz, 8 Ω, A-weigthed, Digital input)	> 114 dB		
Noise level (20 Hz - 20 kHz, 8 Ω, A-weigthed, Digital input)	< - 85 dBV		
DSP			
Digital Signal Processor (DSP)	Gen.5 Dual SHARC 32-bit, floating point, 96 kHz sampling rate		
I/O routing	16 x 16 routing and summation matrix		
Per output channel	Built-in EQ station with 8 IIR, 4 FIR EQ filters Array morphing (LF contour, zoom factor), Air absorption compensation filters		
	Internal IIR and FIR EQ algorithms for speaker phase linearization and improved impulse responses		
	Output delay from 0 to 1000 ms		
Technologies			
Loudspeaker Management	L-DRIVE advanced system protection (excursion, temperature and over-voltage)		
Power Management	L-SMART adaptive power management		
Circuits protection			
Mains and power supply	Over and under voltage / over temperature / overcurrent / inrush current protection		
Power outputs	Over current limiting / DC / short circuit / over temperature		
Inputs / Outputs			
AVB input with support of Milan seamless dual networking	16 channels 48 kHz / 96 kHz from 16 streams of up to 8 channels		
Alternative network protocol (with support of seamless dual networking)	AES67: 16 channels 48 kHz from 16 streams of up to 8 channels		
AES/EBU input (shared connectors with Analog)	2 channels (1 x AES/EBU, 44.1 - 192 kHz sampling rate) With active link and bypass relay		
Analog input (shared connectors with AES/EBU)	1 channel, link output		
Loudspeaker output	8 female 4-point terminal blocks		
Control and monitoring			
Network connection	Dual-port Ethernet Gigabit interface etherCON™ I/O		
General Purpose Inputs / Outputs (GPIO)	3 GPIO, isolated optocoupler inputs, isolated relays contacts		
Third-party control solutions	Q-SYS® / Crestron®/ HTTP API		
Operating conditions			
Temperature	Room temperature from -5° C / 23° F to +50° C / 122° F		
Physical data			
Dimensions W x H x D	483 x 44 (1U) x 411 mm / 19 x 1.75 (1U) x 16.2 in		
Weight	5.6 kg / 12.3 lb		

* Any odd/even pairs of channels can be bridged (BTL mode)