



# PLM 20000Q



## PLM 20000Q Powered Loudspeaker Management System

The PLM 20000Q Powered Loudspeaker Management system seamlessly integrates an extraordinarily powerful four-channel amplifier platform with Lake® Processing, Dante networked signal distribution, accurate load verification and real-time performance monitoring.

Engineered as a unified system, the PLM 20000Q affords significant advantages – in sonic performance, user functionality, inventory utilization, and long-term cost savings – when compared to conventional approaches using separate components.

## Lab.gruppen Technology

- ▶ >5000 W per channel @ 2.2 – 3.3 ohms
- ▶ 4400 W per channel @ 4 ohms
- ▶ 2U chassis weighing only 17 kg (37 lbs)
- ▶ Class TD® output stage
- ▶ Universal (100 – 240 V) Regulated Switch Mode Power Supply (R.SMPS™) works anywhere in the world
- ▶ Power factor correction (PFC) helps maintain full output during extended power bursts
- ▶ Copper-finned Intercooler® with transverse-mounted output devices
- ▶ Comprehensive loudspeaker preset database
- ▶ LoadSmart™ load verification and SpeakerSafe™ continuous loudspeaker performance monitoring
- ▶ Dante™ low-latency digital network included as standard
- ▶ Compatible with Lake LM 26, Dolby® Lake Processor and other legacy Dolby Lake devices
- ▶ Primary and secondary network connections
- ▶ Digitally controlled “amplifier gain” adjustable in 0.1 dB steps
- ▶ Digital output attenuation in 0.25 dB steps from -inf to 0 dB
- ▶ Binding post or Neutrik® speakON® output connectors
- ▶ Digitally implemented, zero-overshoot Inter-Sample Voltage Peak Limiting (ISVPL™) adjustable in 0.1 V steps from 17.8 to 194 V
- ▶ Power Average Limiter (PAL) with software-controlled Breaker Emulation Limiter (BEL™) prevents mains fuse tripping
- ▶ Under-Voltage Limiting (UVL™) enables continued operation with mains voltage sags as low as 65 V
- ▶ High-brightness front-panel LCD display
- ▶ Moisture resistant silicone touchpad for front-panel display mode selection and menu navigation

## Lake Processing Technology



- ▶ Raised Cosine Equalization™
- ▶ Linear phase and classical crossovers
- ▶ LimiterMax™ – peak and RMS limiters
- ▶ Iso-Float™ ground isolation
- ▶ Super Module capability
- ▶ Integration of third party frequency measurement and analysis system via the Lake Analyzer Bridge
- ▶ Analog and AES digital inputs with loop-thru outputs
- ▶ Auto-select input router for all inputs with user definable priorities

# Powered Loudspeaker Management: Technology Overview

## Power Amplifier

The power amplifier platform of the PLM 20000Q integrates several new developments to maintain reliable, sustained output at unprecedented power levels. The Regulated Switch Mode Power Supply (R.SMPS) is a new universal design that connects to any mains supply in the world. (Operating range is 100 V - 265 V, but new Under Voltage Limiting extends operation down to 65 V with reduced output power.) The design also incorporates power factor correction (PFC) to reduce peak current draw from the mains. In addition, new rail regulation maintains stable rail voltages during extended bursts; extreme low-frequency beats will not affect mid- and high-frequency headroom. The patented Class TD output stage, renowned for its sonic purity, has been refined and augmented to allow high current capacity with up to 194 V maximum peak voltage output. Advanced peak limiting circuits hold output devices inside tolerances and below the thermal protection threshold. Despite high efficiency, the extreme total power output of the PLM 20000Q places extraordinary demands on the mains supply; therefore, to ensure uninterrupted operation, a Power Average Limiter works with software-controlled Breaker Emulation Limiter (BEL™) to avoid tripping mains breakers even with prolonged peak demands. Reliability is further enhanced by patented Intercooler heat dissipation and a full suite of circuit protection features.

## Load Verification and Continuous Performance Monitoring

The PLM 20000Q includes a revolutionary set of tools for accurate load verification and real-time performance monitoring. The key to both features is LoadLibrary, a comprehensive database that provides unique "Fingerprints" (load characteristics) for each loudspeaker model in the system. Using this data and on-board DSP, LoadSmart compares predicted response (using a brief test signal) to the actual response, instantly identifying potential problems. When activated, SpeakerSafe real-time performance monitoring helps the operator avoid power compression and provides detailed information about system-wide driver integrity.

## Lake Processing

The PLM 20000Q contains two Lake Processing modules, each offering precise settings for gain, delay, crossover slope, equalization, and limiting. Exclusive Lake Processing algorithms are included for Raised Cosine Equalization, linear phase crossovers, LimiterMax loudspeaker protection, and Iso-Float ground isolation. Raised Cosine Equalization is the foundation for the Lake Mesa EQ and the Ideal Graphic EQ. Mesa EQ offers asymmetric filtering to match the asymmetric responses of many loudspeaker systems; the Ideal Graphic EQ offers true sum-to-flat response, so the adjustments provide uniform boost and cut along with greater selectivity. Lake Processing also offers classical crossovers (selectable up to 48 dB per octave) as well as linear-phase crossovers capable of slopes exceeding 180 dB per octave for greater control to limit lobing and off-axis cancellation. Lake Processing also offers both classical crossovers (selectable up

to 48 dB per octave) and linear phase crossovers. Capable of slopes exceeding 180 dB per octave, linear phase crossovers offer greater control to limit lobing and off-axis cancellation.

## Lake Controller Software

Lake Controller software provides a unified interface for control and monitoring of all functions of the PLM 20000Q. In addition to controlling all parameters of standard Lake Processing, new versions also provide control and monitoring of exclusive PLM features: digital input gain and attenuation, and load verification and performance monitoring via LoadSmart and SpeakerSafe.

The flexible Lake Controller software environment can control extensive networks of powered loudspeaker management systems from a single computer. The user interface is based on discrete processing modules, with each module assigned to power outputs normally defined for sets of band-limited drivers (e.g. low, mid, high, subs). Adjustments can be made in real time to any parameter of any module on the network. Modules may be assigned to groups representing subsystems in larger systems, such as main arrays, delays, and fills in an arena system. Because each module can be assigned to more than one group, Lake Controller can simultaneously address multiple groups for global adjustments as needed while maintaining independent control of separate subsystems and individual components.

The Super Module functionality allows a single on-screen module interface to control output channels in different PLM units. For example, a three-way Super Module could be configured using a high-power LF channel in one PLM unit along with lower-powered MF and HF channels in a different unit.

The Lake Controller software is optimized for a wireless Tablet PC. The same Lake Controller interface can be used to operate Dolby Lake Processors, Lake Contour, and Lake Mesa Quad EQ processors as part of a unified system. Another feature is seamless integration with third party real-time sound system measurement and optimization software packages via the Lake Analyzer Bridge. Users can measure spectrum and transfer function while simultaneously adjusting system EQ on the same user interface.

## Dante Digital Audio Network

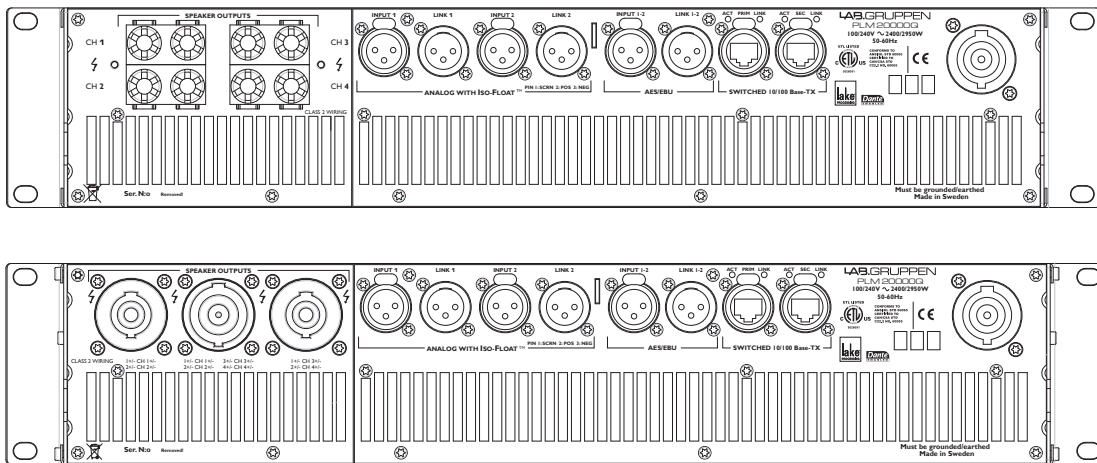
PLM Series Powered Loudspeaker Management systems are equipped with Dante, a self-configuring digital audio networking solution from Audinate® of Australia. Based on the newest developments in networking technology, Dante provides reliable, sample-accurate audio distribution over Ethernet with extremely low latency. Dante incorporates Zen™, an automatic device discovery and system configuration protocol which enables PLM Series products and other Dante-enabled products to find each other on the network and configure themselves.



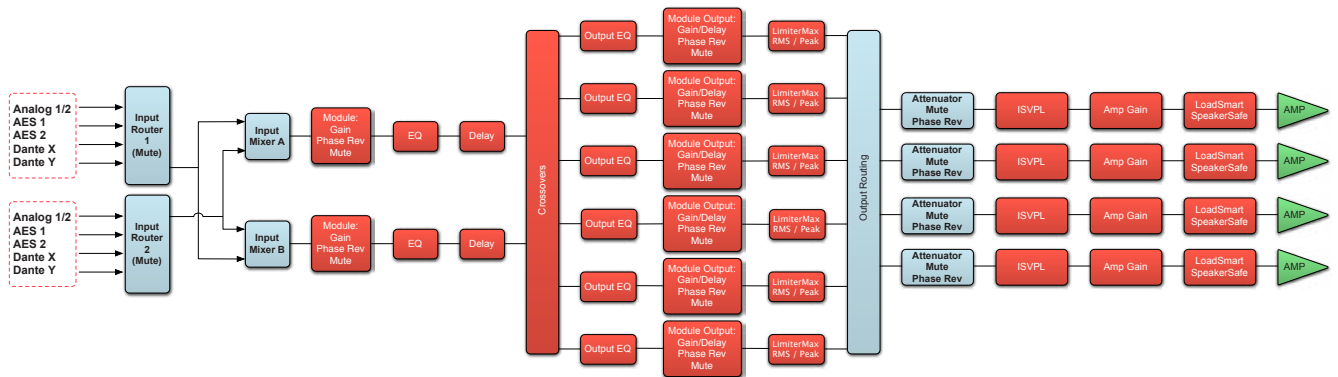
PLM 20000Q Neutrik speakON connector version shown.



The front panel is the “local control center” for the PLM 20000Q. An intuitive, menu driven interface allows quick access to key functions using the moisture resistant silicone touchpad. Information is clearly displayed on the daylight-readable, 2.5-inch LCD panel. The soft-button keypad and precision rotary encoder provide control of processing and amplification functions, with key lock available.



The PLM 20000Q is available with either binding posts or an “embedded patch panel” with Neutrik speakON connectors (2 x NLT4 and 1 x NLT8). Common connectors include; 2 x analog input XLR with switchable Iso-Float, 2 channels of AES/EBU with link-through capability for daisy chaining, 2 x etherCON® for linking or redundancy. A 32 amp powerCON® connector is used for mains supply.



This signal flow block diagram illustrates the flexible mixing and routing, as well as the powerful signal processing capabilities, offered by the PLM Series. The input routers allow for redundant and prioritized inputs, with automatic switch over in case of signal failure. The input mixers provide mixing capabilities between the outputs of the two input routers. The two Lake Processing modules (covering all red blocks) provide user EQ, crossover and output filters along with gain adjustments, mute, phase reverse, delay, and limiters. Module outputs can be routed to either power output channel. Each power output channel provides individual channel attenuation, mute and phase reversal. Each power output channel also implements configurable amplifier gain and an advanced peak limiter in the ISVPL.

The flexible architecture of the PLM Series allows the settings for each unit to be stored in different hierarchies. The Lake Processing modules can be instantly configured with module files that are cross compatible with Dolby Lake products. Settings can also be stored and recalled on a system and subsystem level (system/subsystem files) as well as on a device level (frame presets).

# Specifications PLM 20000Q

<b>General</b>					
Number of input channels	2				
Number of output channels	4				
Peak total output all channels driven	20000 W				
Max. Peak output voltage per channel	194 V				
Max. output current per channel	67 A peak				
<b>Max. Output Power</b>					
All channels driven	<b>2 ohms</b>	<b>4 ohms</b>	<b>8 ohms</b>	<b>16 ohms</b>	
Channels 1 and 2, while channels 3 and 4 are driven at -3 dB <sup>1)</sup>	4800 W	4400 W	2300 W	1150 W	
All channels driven into optimal impedance interval	5000 W	4500 W	2300 W	1150 W	
	> 5000 W into 2.2 – 3.3 ohms				
<b>Audio Performance</b>					
THD + N 20 Hz - 20 kHz for 1 W	< 0.05%				
THD + N at 1 kHz and 1 dB below clipping	< 0.04%				
Dynamic range with digital inputs (for all supported sample rates)	> 116 dB				
Dynamic range with analog inputs	> 114 dB				
Frequency response (1 W into 8 ohms, 20 Hz - 20 kHz)	+/-0.05 dB				
Input Common Mode Rejection (CMR) 20 Hz to 1 kHz	> 78 dB				
Internal sample rate	96 k				
Internal data path	32 bit floating point				
Product propagation delay, best case (96 kHz AES)	1.61 ms				
Product propagation delay, analog input	1.68 ms				
<b>Sample Rate Converters</b>					
THD + Noise	0.00003 %, 20 Hz - 20 kHz, unweighted				
<b>Analog to Digital inputs</b>					
THD + Noise	0.00022 %, typical at 1 kHz unweighted at +26 dBu headroom setting				
	0.00033 %, typical at 20 Hz and 20 kHz unweighted at +26 dBu headroom setting				
<b>AES / EBU inputs</b>					
Supported resolutions	≤ 24 bit				
Supported sample rates	44.1, 48, 88.2, 96, 176.4, 192 kHz				
<b>Dante Audio Network</b>					
Supports redundant paths	Yes				
Flexible topology	Yes				
Network latency	0.8, 1.3 and 4 ms				
<b>Device presets</b>					
Local memory locations for the settings of the product	100				
<b>Limiters</b>					
Adjustable Inter-Sample Voltage Peak Limiter (ISVPL)	17.8 - 194 V, step size 0.1 V				
Current Peak Limiter < 300 ms	67 A peak				
Current Average Limiter (CAL) > 300 ms	33 Arms				
LimitersMax (rms and peak limiters)					
– MaxRMS (rms voltage limiter)	Yes				
– MaxPeak (peak voltage limiter)	Yes				
<b>Gain</b>					
Amplifier gain	22 - 44 dB, step size 0.1 dB				
Analog attenuator	-Inf to 0 dB, step size 0.25 dB				
<b>Back panel interface</b>					
AES / EBU / I/O (input + link)	2 x 3-pin XLR				
Analog, 2-channel I/O (input + link)	4 x 3-pin XLR, electronically balanced				
Output connectors	Neutrik speakON (1 x NLT8, 2 x NLT4) or 4 Binding Posts (pairs) (must be specified upon order)				
Auto 10/100, Auto Uplink	2 x RJ45 etherCON				
Control and monitoring interface	Via Ethernet for Lake Controller software, as well as third party programs				
Detachable mains cord	Neutrik powerCON 32 A				
Cooling	Three fans, front-to-rear airflow, temperature controlled speed				
<b>Front-panel user interface:</b>					
Display, daylight readable LCD	2.5 inch				
Fault/Warning/Limit/Clip indicators	RGB LEDs				
Mute and soft function buttons	8 provided				
Standby Power button	On/Off				
Mute Enable button	Enables muting of outputs and inputs via soft-button keypad				
Meter button	Toggles through meter views				
Menu button	Provides a menu driven interface for full function front panel control				
Rotary Encoder	Yes				
Exit button	Provides a "back" function				
<b>Power</b>					
Operating voltage	Universal power supply 70 - 265 V (45 - 66 Hz)				
Soft start / Inrush Current Draw	Yes / max. 8 A				
Mains Power Average Limiter (PAL)	Yes! SW controlled				
<b>Dimensions (W/H/D)</b>					
	W: 483 mm (19"), H: 88 mm (2 U), Overall D: 460 mm (18.1") from rack rails to the rear of the rack support <sup>2)</sup>				
<b>Weight</b>					
	17 kg (37 lbs)				
<b>Finish</b>					
	Black painted steel chassis with black painted steel / aluminum front				
<b>Approvals</b>					
	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC				

**Note 1):** Asymmetrically loading the output channels (as shown, for example): If one channel has reduced output power requirements, the voltage drop from the power supply will be reduced, resulting in a higher voltage and power output for the other channel.

**Note 2):** The handles will extend 40 mm in front of the rail.

**All specifications are subject to change without notice.**

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Item no. TDS-PLM20000Q