LAB.GRUPPEN

FULL LINE CATALOGUE

Passion, innovation and Swedish craftsmanship

In 1979, Kenneth Andersson and Dan Bavholm established Lab.gruppen while working out of a cramped electronics repair shop in Kungsbacka, Sweden. With a knack for creative circuit design and a passion for better sound, they set about developing new audio products – beginning with guitar amplifiers – that soon evolved into highly regarded professional power amplifiers. Within a remarkably short time, Lab.gruppen had built a loyal customer base among leading Swedish sound rental companies.

Not content with merely refining existing designs, the founders continually pushed the envelope of audio amplifier design. New technologies boosted output power while at the same time reducing weight and improving reliability under stress. Noteworthy among these developments were the patented Class TD® output stage, Regulated Switch Mode Power Supply (R.SMPS™), the Intercooler® heat dispersion system, and innovative limiter circuits that tailor amplifier output parameters for optimum performance with the connected load.

Unrelenting quality standards

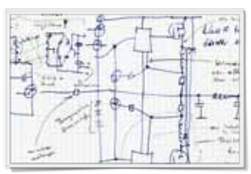
Within a decade, Lab.gruppen had expanded to become a major supplier of power amplifiers throughout Europe, and started making significant inroads into the world market. Demand often threatened to outstrip supply, but quality control standards never were compromised in order to increase production levels. With every new product, and at every stage of expansion, Lab.gruppen took pride in maintaining the highest levels of traditional Swedish craftsmanship. Only after a larger and highly efficient manufacturing facility – still in Kungsbacka – came online was product distribution fully expanded worldwide.

Lab.gruppen continued to build on its foundation in touring sound applications with the pristine sound and bulletproof reliability of the fP Series. With introduction of the FP+ Series Lab.gruppen dramatically boosted power density and added compatibility with NomadLink network control.

Responding to increasing demand from the systems integration market, Lab.gruppen introduced the C Series, a range of multi-channel units designed and fitted for installation applications – also featuring NomadLink® control.

Lab.gruppen + Lake®: The ultimate in power and control

In 2006, Dolby® Laboratories and Lab.gruppen announced an agreement to incorporate Lake Processing into the forthcoming PLM™ Series of Powered Loudspeaker Management™ systems. The first Lab.gruppen product to incorporate Lake processing, the PLM 10000Q, was introduced in 2007. When Dolby decided to exit the live sound market, Lab.gruppen acquired both the Lake trademarks and exclusive rights for use of Dolby Lake Processor technology for the touring and permanent sound reinforcement markets. Both divisions are now headquartered in Kungsbacka.



First drawing of Class TD circuit by Kenneth Andersson

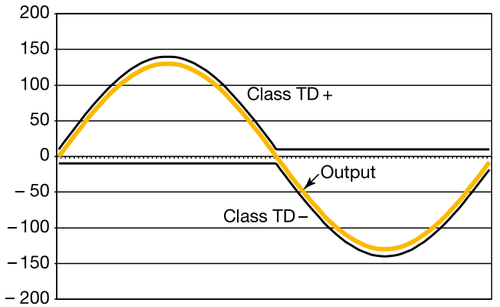
Lab.gruppen co-founder Kenneth Andersson

Lab.gruppen co-founder Dan Bavholm

Cutting edge amplifier development

Lab.gruppen power amplifiers and PLM Series Powered Loudspeaker Management systems have earned worldwide recognition for outstanding sound quality and remarkable durability in both touring and installed applications. At the core of this enviable reputation is Lab.gruppen's commitment to innovation, firmly established by the company founders and continuing with today's extensive R&D department. Notable technology advances include:

Class TD output stage
A patented breakthrough that occupied co-founder Kenneth Andersson for two years, Class TD combines the efficiency of digital Class D topologies with the sonic purity of Class B designs. The audio path remains in the analog domain: it never enters the switching portion of the circuit, and is therefore free from filtering ripple effects. Class TD is bridgeable and maintains a flat response with complex loads as low as 2 ohms nominal.



Regulated Switch Mode Power Supply (R.SMPS)
The latest generation of R.SMPS technology boosts power output while reducing size and weight. Precise regulation maintains constant voltage on the internal rails, ensuring full output power and undistorted sound even with significant drops in mains voltage.

Configurable for any signal, any load
All Lab.gruppen power platforms offer adjustable gain to optimize performance with any input signal. In addition, each channel incorporates a proprietary limiter circuit to optimize output characteristics for any type of load. The specific implementation is tailored to each power platform: Rail Sensing Limiter (RSL™) in the E Series, Voltage Peak Limiter (VPL™) in C Series and FP+ Series, and digitally implemented as ISVPL™ in the PLM Series.

Intercooler for efficient, uniform cooling
The ultra-efficient Intercooler uses thousands of tiny copper cooling fins to increase heat sink exposure to the cooling air flow. Output devices are mounted transverse to the airflow for uniform cooling, preventing heat buildup in "end of tunnel" transistors.

Comprehensive circuit protection
Features for protection and fault indication include DC at output, short circuit, excessive output current, sustained very high frequency (VHF), and open load. Additionally, a Power Average Limiter (PAL) monitors the current-drawing relationship between the power supply and the mains inlet, limiting current draw as necessary to prevent service interruption.

Planet protection standard
Lab.gruppen is a leader in building extraordinarily energy-efficient products, and also in manufacturing them with minimal environmental impact. The new E-Series has earned Energy Star certification, thanks to breakthrough circuit designs for higher operating efficiency along with flexible mode power control (including auto-power-down). With C Series and FP+ Series, phantom powering of the amplifiers' network modules via the NomadLink® network means zero amplifier current draw on standby. And in manufacturing, Lab.gruppen's modern plant in Sweden is a model for energy efficiency and near 100% waste recycling.

PLM Series: Three platforms, countless possibilities

PLM Series Powered Loudspeaker Management systems encompass a seamless fusion of cutting-edge technologies from two global innovators in live audio: Lake and Lab.gruppen. Each PLM product combines Lake Processing – the world standard for flexibility and sound quality – with an amplifier platform based on the power density, sonic purity and proven reliability of Lab.gruppen's FP+ Series. Intelligently merged, these complementary technologies comprise a complete loudspeaker drive system. All crossover, delay, equalization, limiting, audio networking, and power amplification functions are integrated into one chassis and controlled via a single Tablet PC software interface.

In addition, the PLM Series' revolutionary load verification and performance monitoring features assure extended reliability for all system components – loudspeakers included! PLM Series technology is accessible via three hardware platforms with either two- or four-channel output sections.

The flagship PLM 20000Q incorporates four channels with each producing a prodigious 4800 W at 2 ohms, while the PLM 10000Q offers 4 x 2350 W at 2 ohms. Optimized for high-power requirements, the two-channel PLM 14000 delivers a massive 7000 W per channel into 2 ohms and 4350 W per channel into 4 ohms, making it ideal for demanding subwoofer and low-end applications. A recent firmware update allows adjacent output bridging for additional power, and enables flexible configuration of PLM 20000Q and PLM 10000Q with two-, three- or four-channel output stages. All PLM Series platforms also incorporate Dante™ networked audio distribution, and everything is fitted into a roadworthy 2 U chassis. PLM Series – it's your one box solution for a multitude of challenging audio applications.

PLM SERIES AT A GLANCE

MAXIMUM OUTPUT POWER/CHANNEL

Model	Chan.	2 ohms	2.7 ohms	4 ohms	8 ohms
PLM 20000Q	4	4800 W	5000 W	4400 W	2300 W
PLM 10000Q	4	2350 W	2750 W	2300 W	1300 W
PLM 14000	2	7000 W	6100 W	4300 W	2300 W

Lab.gruppen power. Lake Processing.

LoadSmart™ takes a load off your mind
Yes, Powered Loudspeaker Management inserts a full-featured Lake processor inside a Lab.gruppen amplifier chassis. But that's only the beginning. The PLM Series also introduces a revolutionary set of tools for fast, accurate load verification and real-time performance monitoring. The key to this breakthrough is LoadLibrary™, a comprehensive database that provides a unique "Fingerprint" (load characteristic) for each loudspeaker model in the system. Using this data and on-board DSP, LoadSmart compares predicted response by applying a brief test signal. Any potential problems are identified instantly. During performance, SpeakerSafe™ monitors driver performance to prevent sonic degradation and provide critical, real-time information about system-wide driver performance.

Dante advanced audio networking
With the PLM Series, there's no need to install separate modules or configure custom software for integrated digital audio networking. Every PLM comes equipped with Dante, a self-configuring digital audio networking solution from Audinate® of Australia. Based on the newest developments in networking technology, Dante provides extremely reliable, sample accurate, low latency audio distribution over Ethernet. And with Zen™, Audinate's automatic device discovery and system configuration protocol, PLM Series products (as well as discrete Dolby Lake Processors and other Dante-enabled devices) find each other on the network and configure themselves automatically. – whether PLM units, Lake LM Series processors, Dolby Lake Processors, or other Dante-enabled devices.

Lake Processing: full-featured and backward compatible
All PLM Series models contain two full-featured 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.

Dante networking and much more.

Regardless of the make or type of loudspeaker system, the venue size or acoustics, or the program material, the integral Lake Processing in the PLM Series will help you create a more consistent sound with less time and hassle in system setup. Lake Controller software provides a unified interface for control and monitoring of PLM functions. In addition to controlling all parameters of Lake Processing, the software also provides control and monitoring of exclusive Lab.gruppen features: digital input gain and attenuation, and comprehensive load verification and monitoring via LoadSmart and SpeakerSafe.

The Lake Controller software is optimized for a Tablet PC, and operates on any newer Windows® PC equipped with an Ethernet interface. The same Lake Controller software interface also can be used for simultaneous operation of external Dolby Lake Processors, Lake Contour Pro 26 and Lake Mesa Quad EQ™ processors.

The Lake Analyser Bridge also allows seamless integration with third-party, real-time sound system measurement tools, enabling you to perform comprehensive measurement routines and adjust your system EQ at the same time, using the same user interface. This measurement plug-in feature is currently implemented for Smaart as well as Live-Capture Light and Pro.

The PLM Series provides a full range of connectivity for Dante network, AES digital, and analog signals

FP+ Series: Kings of the road

More power, more choices
More power from smaller and lighter racks, with more configuration flexibility, and yet with no compromise in the legendary Lab.gruppen sound – that's the promise fulfilled by FP+ Series amplifiers.

The FP+ Series includes six models, with both two- and four-channel versions spread across a range of power output levels. The flagship FP 14000 produces staggering output power of 14000 W (from a 2 U chassis weighing only 12 kg), making it ideal for powering larger subwoofers. Other FP+ Series models offer power levels and channel configurations scaled to match every conceivable touring application, from band-limited line array drivers to full-range monitor and fill loudspeakers.

To achieve the extraordinary power-to-size ratio in the FP+ Series, Lab.gruppen engineers refined and upgraded two proprietary technologies: the Regulated Switch Mode Power Supply (R.SMPS) and the patented Class TD output stage. Working together, these new-generation proprietary circuits produce more power from a smaller package while maintaining Lab.gruppen's peerless reputation for sonic excellence. The highs stay crisp and transparent. The mids are warm and natural. And the tight low end delivers visceral impact.

Information, control, reassurance
All FP+ Series amplifiers offer real-time monitoring and control via the NomadLink network, with network modules built in as standard equipment. Finally, standing behind Lab.gruppen's reputation for rock-solid reliability is a six-year, no-quibble warranty.

FP+ SERIES AT A GLANCE

MAXIMUM OUTPUT POWER/CHANNEL

Model	Chan.	2 ohms	4 ohms	8 ohms	16 ohms
FP 14000	2	7000 W	4400 W	2350 W	1200 W
FP 9000	2	4500 W	3000 W	1600 W	800 W
FP 7000	2	3500 W	2800 W	1450 W	730 W
FP 4000	2	2000 W	1600 W	800 W	400 W
FP 10000Q	4	2500 W	2100 W	1300 W	660 W
FP 6000Q	4	1500 W	1250 W	625 W	320 W

Built to the highest standards of meticulous Swedish craftsmanship.

C Series: Touring-grade installation amplifiers

The C Series builds on Lab.gruppen's unsurpassed experience in designing and manufacturing the world's finest amplifiers for touring applications. The underlying core technologies are the same in these dedicated installation amplifiers, assuring impeccable performance and rock-solid reliability – even when pushed hard in grueling "24/7" applications.

Go configure...easily

The C Series also sets new industry benchmarks for power density and configuration flexibility. All nine models are multi-channel, with four or eight channels available as discrete outputs or as bridged pairs. In addition, all channels offer individual adjustments for gain and maximum voltage, and all outputs are separately configurable for either low-Z or high-Z (70 V/100 V) systems.

To ensure long-term durability, each C Series amplifier incorporates a suite of seven protection and warning circuits. Exclusive Intercooler heat dissipation technology helps safeguard output devices. Also, advanced NomadLink networking, with remote monitoring and control facilities, comes as standard. And every amplifier is backed by Lab.gruppen's worldwide technical support and a no-hassle six-year warranty.

The four C…X models comprise a sub-group of amplifiers ideally suited to a wide range of lower-powered commercial sound applications. Additional standard features include a universal power supply, built-in GPIO facilities, and individually selectable high-pass filters on each channel.

Investing in your reputation needn't cost the earth

C Series amplifiers come from Sweden, a country with exceptionally stringent standards for environmentally friendly manufacturing. Also, watt-in for watt-out, Lab.gruppen amplifiers are among the world's most efficient. So your C Series amplifier goes greener into the box, and works greener in the rack.

C SERIES AT A GLANCE

MAXIMUM OUTPUT POWER/CHANNEL

Model	Chan.	4 ohms	8 ohms	16 ohms	70.7 Vrms	100 Vrms
C 88:4	4	2100 W	1250 W	650 W	2200 W	1700 W
C 68:4	4	1700 W	1200 W	650 W	1600 W	1200 W
C 48:4	4	1200 W	1000 W	625 W	1100 W	900 W
C 28:4	4	700 W	700 W	600 W	700 W	700 W
C 16:4	4	300 W	400 W	400 W	400 W	400 W
C 20:8X	8	250 W	250 W	250 W	250 W	N.A.
C 10:8X	8	125 W	125 W	125 W	125 W	N.A.
C 10:4X	4	250 W	250 W	250 W	250 W	N.A.
C 5:4X	4	125 W	125 W	125 W	125 W	N.A.

NomadLink: Know all, control all

Lab.gruppen's NomadLink Network offers a bulletproof system for comprehensive monitoring and control of many as 960 FP+ Series or C Series amplifiers with a total of 3840 output channels.

To create a NomadLink network, you simply daisy-chain the In and Out network ports of your amplifiers by snapping in standard Cat-5 cables. Then connect the first and last amplifiers to an NLB 60E NomadLink Bridge & Network Controller, forming a loop. That's it. You're done.

Failure: not an option

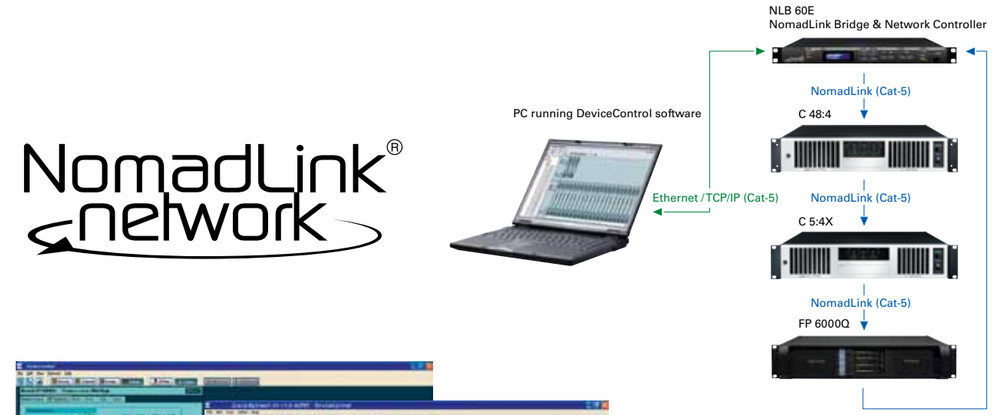
In this closed loop topology, NomadLink forms a robust and fully redundant network that is essentially fail-safe. Phantom powering through the loop makes it possible to maintain uninterrupted network communication even when an amplifier in the system is powered off or has AC current disconnected.

The NLB 60E functions as a stand-alone unit when needed to provide basic monitoring and control. Large front-panel keys and displays let you power-up and power-down all networked amplifiers, and also provide "in-the-rack" notification of warnings or faults.

However, most users will also use the NLB 60E as an Ethernet-to-NomadLink bridge to remotely access the enhanced feature set of DeviceControl software DeviceControl is a powerful tool for real-time monitoring and control as well as offline system configuration. The flexible GUI allows multi-level monitoring of amplifier status, from at-a-glance fault monitoring of an entire complex to detailed status reports on a single channel. Amplifier channels may be freely configured in groups for simultaneous on/off, mute or solo commands.

Welcome to the third-parties

The latest upgrades to DeviceControl software, working with new firmware for the NLB 60E, have further enhanced the network's capabilities. Not only is channel-level control and monitoring available via the DeviceControl interface, but detailed fault, warning and subnet status may now be reported to popular third-party control and monitoring applications.



E-Series: Simple economics, brilliant IDEEA™

A brilliant IDEEA

In designing the new E Series, Lab.gruppen engineers drew upon the cutting-edge amplifier design philosophies developed for the flagship PLM 20000Q, evolving these to create new circuit topologies and control features to meet the demands of 21st century AV installations. The result is a new amplifier platform called IDEEA: IntelliDrive Energy Efficient Amplifier.

The principal design challenge was maintaining Lab.gruppen's impeccable sonic performance and robust power output while meeting – or exceeding – the rigorous efficiency requirements of Energy Star™ 2.1 certification. The challenge was met on two fronts: reducing current draw during operating cycles with vigorous program material and high output levels, and reducing power consumption during non-operational cycles.

New power supply and output stage

For peak operating efficiency, the E Series incorporates a new high-headroom universal power supply accepting any mains voltage from 70 to 265 V at 50 or 60 Hz. A higher storage capacity in the power supply prevents excessive draw on the mains inlet during repeated peak bursts, maintaining extra headroom on the supply rails for sustained maximum output with minimal distortion. The Class D output stage is highly efficient (above 90%), while the inherently bridged topology allows up to twice the rated power output on one channel when the other channel is unused or driving a low power application.

RSL™: Mix, match and balance loads

The new Rail Sensing Limiter (RSL) is the latest refinement of Lab.gruppen's proprietary approach to optimizing amplifier output characteristics to match the connected load. Each channel has a two-position switch that sets the output for driving either low impedance or high impedance (70 V) loudspeaker systems, with a +4 dBu sensitivity regardless of load type. RSL works in conjunction with the high headroom power supply and inherently bridged output stage to allow asymmetric loading. Power resources in the amplifier can be utilized to maximum advantage, with one channel producing far beyond its rated output when the other channel has lesser power requirements.

Flexible mode power control

To conform with Energy Star requirements, E Series amplifiers offer auto-power-down, which activates when no signal is detected for 20 minutes. Auto-power-on is triggered when signal is again present at the input. The GPI-type contact closure can also be used to control the power state as well as external power sequencers if desired.

Target: Installation

E Series amplifiers are designed for ease of installation and reliable service, with notable features including a 35 Hz high-pass filter (switchable per channel), inputs and outputs on detachable Phoenix-type screw terminals, and a temperature controlled fan that turns off for low-level signals. Comprehensive circuit protection and fault indication also included.

The recessed grill allows the center section of the front panel to be used as a handle

E SERIES AT A GLANCE

MAXIMUM RATED OUTPUT POWER/CHANNEL

Model	Chan.	2 ohms	4 ohms	8 ohms	70 Vrms
E 4:2	2	200 W	200 W	200 W	200 W
E 8:2	2	400 W	400 W	400 W	400 W
E 12:2	2	600 W	600 W	600 W	600 W

The evolution of technology

Green Power: Maximizing dB SPL, minimizing kWh
In 21st century AV installations, systems integrators and end users must consider a power amplifier's total cost – financially and environmentally – as calculated over an extended lifetime.

The initial cost of a product can prove misleading. After ten years of use, an amplifier that costs less to install "out of the box" often will end up costing more after paying the "electricity penalty" for inefficiency. Consequently, the overriding goal of Lab.gruppen engineers has always been to produce the maximum possible power output – regardless of load type connected – with minimum current draw from AC mains. The latest generation Lab.gruppen amplifiers achieve this goal by applying new technologies that work in concert to deliver unprecedented overall efficiency – both minute-by-minute and over a decade or more.

RSL: Matching outputs to load conditions
A power amplifier performs more efficiently when key amplifier parameters are optimized for the loads connected to the outputs. With its exclusive Rail Sensing Limiter (RSL), Lab.gruppen's E Series adapts to load conditions of varying impedances. High-impedance (70 V) systems can be driven directly from the amplifier outputs, eliminating losses from output transformers. In addition, the dual range switch can be used to optimize power output for connected loads in the 2 – 16 ohm range.

Asymmetric loading: Power sharing for ultimate efficiency
The combination of a high-headroom power supply and the dual range RSL enables asymmetric loading on E Series amplifiers. That means amplifier one channel can produce undistorted power substantially beyond its rated output when loads on the other channel are less demanding. For example, an E 12:2 amplifier, nominally rated at 600 W per channel @ 4 ohms, can produce 1100 W @ 4 ohms into one channel while simultaneously delivering 100 W into a 70 V system on the other channel.

A measure of efficiency: Power to current draw ratio
One meaningful way to evaluate a power amplifier is to look at the ratio of peak output power to AC mains current draw. Essentially, this reveals the power consumption when the amplifier is working at its hardest, and new Lab.gruppen amplifiers are remarkable in this respect. The ratio for both E Series and the PLM 20000Q is 400: 1, or about 400 W output every 1 A of power draw from 115/120 V mains.

For tours this often means that the use of diesel generators complementing the local supply can be eliminated. For installs with 115/120 V mains, the functionality of E Series allows, for example, connection of four E 12:2 amplifiers – all on one circuit – to each deliver repeated beats of 4.8 kW while consuming less than 1 kW and never exceeding 12 Arms from the mains! And no, there is no power plant inside; the amplifiers simply use the dynamic behavior of the input signal and "recharge" between the peaks.

Lowering the "electricity penalty"
With already high energy costs moving higher in nearly every part of the world, the total amount of electricity required to power an amplifier must be factored in to the total cost of ownership and operation. When electricity costs are factored into the equation, Lab.gruppen E Series amplifiers quickly recoup any marginally higher initial costs within the first few years of operation, when compared to several popular installation amplifiers using conventional technologies. Depending on the specific application and on/off cycle periods, conventional amplifiers may impose an "electricity penalty" up to three times that of the E Series. Many of them will cost more in electricity over 6 years of use than they initially cost to purchase!

Power to integrate

Lab.gruppen's amplifier platforms, often in combination with Lake technology, can be found the world over and across a multitude of applications – ranging from arena or night club installations to touring concert sound. Integration is at the heart of the product range. Realizing the performance advantages of Lab.gruppen products is hassle-free, whatever the system configuration and irrespective of the other components. In touring sound, the seamless integration of Lake Processing and Lab.gruppen amplification powered the excitement of U2's globe-spanning 360 tour, with more than 150 PLM Series Powered Loudspeaker Management systems driving Clair loudspeaker arrays. In the installation market, the PLM Series brought the same advantages to BC Place in Vancouver, Canada, where the former Olympic venue employs 160 PLM Series units.

The advantages of Lake Processing and Lab.gruppen amplification are often realized when coupled to loudspeakers from sister company Tannoy. A recent example is at England's famed Ascot Racecourse, where PLM Series units drive a loudspeaker system comprising of Tannoy V Series, VQ Series and QFlex. Here, the combination of Lab.gruppen and Tannoy delivered measurable performance, reliability and cost advantages that simply couldn't be achieved by alternative configurations. This approach is echoed in smaller installations, such as retail outlets, bars, clubs and restaurants. At California's Cannery Row Brewing Company, the combination of Lab.gruppen C Series amplifiers along with Tannoy surface-mount and ceiling speakers contribute to a festive atmosphere that builds repeat business. Regardless of the product configuration – Powered Loudspeaker Management systems, discrete amplifiers with separate Lake processors , or Lab.gruppen amplifiers integrated into Tannoy VXP powered loudspeakers – Lab.gruppen's "power to integrate" brings performance and cost-saving advantages to any audio system.

LAB.GRUPPEN

LAB.GRUPPEN AB ▸ SWEDEN
INTERNATIONAL CONTACT ▸ INFO@LABGRUPPEN.COM
US & CANADA CONTACT ▸ INFO@TCG-AMERICAS.COM
WWW.LABGRUPPEN.COM

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TECHNICAL SPECIFICATIONS

PLM SERIES

POWERED LOUDSPEAKER MANAGEMENT

FP+SERIES

TOURING

C SERIES

INSTALLATION

E SERIES

INSTALLATION

LAB.GRUPPEN

Specifications C Series

Model	C 88:4	C 68:4	C 48:4	C 28:4	C 16:4	C 20:8X	C 10:8X	C 10:4X	C 5:4X
Number of channels	4	4	4	4	4	8	8	4	4
Peak total output all channels driven	8800 W	6800 W	4800 W	2800 W	1600 W	2000 W	1000 W	1000 W	500 W
Peak output voltage per channel	141 V	141 V	141 V	141 V	141 V	100 V	100 V	100 V	100 V
Max. output current per channel	35.5 Arms	24.5 Arms	17.5 Arms	12 Arms	8.5 Arms	8 Arms	5.6 Arms	8 Arms	5.6 Arms
Max Output Power									
16 ohms per ch. (all ch.'s driven)	650 W	650 W	625 W	600 W	400 W	250 W	125 W	250 W	125 W
8 ohms per ch. (all ch.'s driven)	1250 W	1200 W	1000 W	700 W	400 W	250 W	125 W	250 W	125 W
4 ohms per ch. (all ch.'s driven)	2100 W	1700 W	1200 W	700 W	300 W	250 W	125 W	250 W	125 W
2 ohms per ch. (all ch.'s driven)	2200 W	1200 W	600 W	300 W	140 W	125 W	60 W	125 W	60 W
Hi-Z per ch. (all ch.'s driven): 70 Vrms / 100 V peak	2200 W	1600 W	1100 W	700 W	400 W	250 W	125 W	250 W	125 W
Hi-Z per ch. (all ch.'s driven): 100 Vrms / 141 V peak	1700 W	1200 W	900 W	700 W	400 W	n.a.	n.a.	n.a.	n.a.
16 ohms Bridged per ch.[1)]	2500 W	2400 W	2000 W	1400 W	800 W	500 W	250 W	500 W	250 W
8 ohms Bridged per ch.[1)]	4200 W	3400 W	2400 W	1200 W	600 W	500 W	250 W	500 W	250 W
4 ohms Bridged per ch.[1)]	4400 W	2400 W	1200 W	600 W	n.r [4)]	250 W	125 W	250 W	125 W
2 ohms Bridged per ch.[1)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]	n.r [4)]
Hi-Z Bridged per ch.[1)]: 140 Vrms / 200 V peak	4400 W	3200 W	1800 W	1400 W	800 W	500 W	250 W	500 W	250 W

Performance with Gain:	35 dB and VPL: 100 V / C 88:4: 35 dB and VPL: 141 V	32 dB and VPL: 100 V
THD 20 Hz - 20 kHz for 1 W	<0.1%	<0.1%
THD at 1 kHz and 1 dB below clipping	<0.05%	<0.05%
Signal To Noise Ratio	>112 dBA	>112 dBA
Channel separation (Crosstalk) at 1 kHz	>70 dB	>70 dB
Frequency response (1 W into 8 ohms) +0/-3 dB	6.8 Hz - 34 kHz	6.8 Hz - 34 kHz
Input impedance	20 kOhm	20 kOhm
Common Mode Rejection (CMR)	>50 dB, 20 Hz - 20 kHz	>50 dB, 20 Hz - 20 kHz
Output impedance @ 100 Hz	30 mOhm	48 mOhm
Voltage Peak Limiter (VPL), max. peak output		
VPL, selectable per ch. [3)]	141, 118, 100, 85, 71, 59, 50, 42 V	100, 63, 45, 32 V
VPL, when bridged [1) 3)]	282, 236, 200, 170, 142, 118, 100, 84 V	200, 126, 90, 64 V
Voltage Peak Limiter mode (per ch.)	Hard / Soft	Hard / Soft
Gain and Level		
Amplifier gain selectable (all channels) [1)] – rear-panel switches	23, 26, 29, 32, 35, 38, 41, 44 dB	29, 32, 35, 38 dB
Default gain	35 dB	32 dB
Level adjustment (per ch.)	Front-panel potentiometer, 21 position detented from -inf to 0 dB, hidden behind security panel/dust filter grille	Front-panel potentiometer, 21 position detented from -inf to 0 dB, hidden behind security panel/dust filter grille
Connectors and switches		
Input connectors (per ch.)	3-pin Phoenix, electronically balanced	3-pin Phoenix, electronically balanced
Output connectors (per ch.)	Barrier strip 2-pole screw terminals	Barrier strip 2-pole screw terminals
Output bridge mode	A+B and/or C+D, inputs A and C are input source	A+B, C+D, E+F, G+H, inputs A, C, E, G are signal source
High pass filter	N/A	Fixed at 35 Hz, switchable per channel
NomadLink network	On board, 2 x RJ45 connectors IN and OUT	On board, 2 x RJ45 connectors, IN and OUT
Intelligent fans (on/off)	Yes, depending on presence of output signal	Yes, depending on presence of output signal
Power on/off and Remote enable on/off	Individual switches on front panel	Individual switches on front panel
Cooling	Two fans, front-to-rear airflow, temperature controlled speed	Two fans, front-to-rear airflow, temperature controlled speed
General Purpose Outputs (GPO)	N/A	Contact Closure types, 2-pole Phoenix
General Purpose Inputs (GPI)	N/A	Contact Closure types, 2-pole Phoenix
Front-panel indicators		
Common	NomadLink Network; Power Average Limiter (PAL)[2)]; Power on	NomadLink Network; Power Average Limiter (PAL)[2)]; Power on
Per channel	Signal present / High-impedance; -10 dB and -4 dB output signal;Voltage Peak Limiter (VPL); Current Peak Limiter (CPL): Very High Frequency (VHF); High temperature; Fault; Mute	Signal present / High-impedance; Voltage Peak Limiter (VPL); Current Peak Limiter (CPL): Very High Frequency (VHF); High temperature; Fault; Mute
Power		
Operating voltage, 230 V / 115 V nominal	130-265 V / 65 -135 V [6)]	Universal power supply 65-265 V
Minimum power-up voltage, 230 V / 115 V	171 V / 85 V	80 V
Power Average Limiter (PAL) [2)]	Yes	Yes
Power Factor Correction (PFC)	No	Yes
Soft-start / Inrush Current Draw	Yes / max. 5 A	Yes / max. 5 A
Mains connector [5)]	230 V CE: 16 A, CEE7; 115 V ETL: 20 A / NEMA 5-20P; C16:4: 15A/NEMA 5-15P	IEC Inlet
Dimensions	W: 483 mm (19"), H: 88 mm (2 U), D: 343 mm (13.5")	W: 483 mm (19"), H: 88 mm (2 U), D: 343 mm (13.5")
Weight	12 kg (26.4 lbs.)	8.5 kg (18.75 lbs.)
Finish	Black painted steel chassis with gray painted steel front	Black painted steel chassis with gray painted steel front
Approvals	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC

Note 1): Automatic -6 dB gain compensation when bridging channels. Ch.'s A+B and/or C+D, E+F, G+H, can be bridged individually.
Note 2): PAL can reduce the maximum output power to keep the power supply operating safely, and/or to prevent excessive current draw tripping the mains breaker. Refer to Operation Manual.
Note 3): For sine waves, peak voltage output values translate to Vrms with the formula V/1.41 = Vrms. E.g. 100 V peak equals app. 70 V peak. Hence, outputs can be set for high-impedance loads without requiring a transformer.
Note 4): Regarding n.r. (not recommended) notes: The amplifier will be fully operational in bridge-mode into 2 ohm and high impedance (Hi-Z) loads, but due to physical constraints in the construction, the max. output power will not be significanty higher than running individual channels and therefore this mode of operation is not recommended.
Note 5): C 88:4 mains connector: 30 A Twist lock.
Note 6): Separate 230 V or 115 V versions available. Not selectable on the amplifier.

All specifications are subject to change without notice.

Specifications FP+ Series

Model	FP 14000	FP 9000	FP 7000	FP 4000	FP 10000Q	FP 6000Q
Number of channels	2	2	2	2	4	4
Peak total output all channels driven	14000 W	9000 W	7000 W	4000 W	10000 W	6000 W
Peak output voltage per channel	195 V	170 V	155 V	121 V	150 V	101 V
Max. output current per channel	90 A peak	70 A peak	59 A peak	50 A peak	50 A peak	38 A peak
Max. Output Power						
16 ohms per ch. (all ch.'s driven)	1200 W	800 W	730 W	400 W	660 W	320 W
8 ohms per ch. (all ch.'s driven)	2350 W	1600 W	1450 W	800 W	1300 W	625 W
4 ohms per ch. (all ch.'s driven)	4400 W	3000 W	2800 W	1600 W	2100 W	1250 W
2 ohms per ch. (all ch.'s driven)	7000 W	4500 W	3500 W	2000 W	2500 W	1500 W
16 ohms Bridged per ch.	4700 W	3200 W	2900 W	1600 W	2600 W	1250 W
8 ohms Bridged per ch.	8800 W	6000 W	5600 W	3200 W	4200 W	2500 W
4 ohms Bridged per ch.	14000 W	9000 W	7000 W	4000 W	5000 W	3000 W
2 ohms Bridged per ch.	3)	3)	3)	3)	3)	3)
Performance with Gain:	35 dB and VPL: 195 V	35 dB and VPL: 170 V	35 dB and VPL: 155 V	35 dB and VPL: 121 V	35 dB and VPL: 150 V	35 dB and VPL: 101 V
THD 20 Hz - 20 kHz for 1 W	<0.1%					
THD at 1 kHz and 1 dB below clipping	<0.05%					
Signal To Noise Ratio	>112 dB					
Channel separation (Crosstalk) at 1 kHz	>70 dB					
Frequency response (1 W into 8 ohms) +0/-3 dB	2 Hz - 34.2 kHz	2 Hz - 34.2 kHz	6.8 Hz - 34 kHz	2 Hz - 34.2 kHz	6.8 Hz - 34 kHz	6.8 Hz - 34 kHz
Input Impedance	20 kOhm					
Common Mode Rejection (CMR)	>54 dB, 20 Hz to 20 kHz					
Output impedance @ 100 Hz	19 mOhm	19 mOhm	19 mOhm	32 mOhm	32 mOhm	32 mOhm
Voltage Peak Limiter (VPL), max. peak output						
VPL, selectable per ch. (V)	195, 170, 140, 116, 100, 80, 66, 54 V	170, 140, 116, 100, 80, 66, 54 V	155, 121, 101, 83, 70, 56, 47, 38 V	121, 101, 83, 70, 56, 47, 38 V	150, 121, 101, 83, 70, 56, 47, 38 V	101, 83, 70, 56, 47, 38 V
VPL, selectable when bridged (V) [1]	390, 340, 280, 232, 200, 160, 132, 108 V	340, 280, 232, 200, 160, 132, 108 V	310, 242, 202, 166, 140, 112, 94, 76 V	242, 202, 166, 140, 112, 94, 76 V	300, 242, 202, 166, 140, 112, 94, 76 V	202, 166, 140, 112, 94, 76 V
Voltage Peak Limiter mode (per ch.)	Hard / Soft					
Gain and Level						
Amplifier gain selectable (all channels) [1] – rear-panel switches	23, 26, 29, 32, 35, 38, 41, 44 dB					
Default gain	38 dB	38 dB	35 dB	35 dB	35 dB	35 dB
Level adjustment (per ch.)	Front-panel potentiometer, 31 position detented from -inf to 0 dB					
Connectors and switches						
Input connectors (per ch.)	3-pin XLR, electronically balanced					
Output connectors (per ch.)	Neutrik speakON or Binding Posts (must be specified upon order). BP only on FP 14000, FP 9000.					
Output bridge mode per two ch.'s	A+B - Ch. A is signal input source. A+B, C+D - Ch.'s A and C are input source					
NomadLink network	2 x RJ45 etherCON connectors, IN and OUT					
Intelligent fans (on/off)	Yes, depending on presence of output signal					
Power on/off and Remote enable on/off	Individual switches on front-panel					
Cooling	Two fans, front-to-rear airflow, temperature controlled speed					
Front-panel indicators						
Common	NomadLink network; Power Average Limiter (PAL) [2]; Power on					
Per channel	Signal present / High-impedance; -20 dB, -15 dB, -10 dB and -4 dB output					
	signal; Voltage Peak Limiter (VPL); Current Peak Limiter (CPL):					
	Very High Frequency (VHF); High temperature; Fault; Mute					
Power						
Operating voltage, 230 V / 115 V nominal [4]	130-265 V / 65-135 V					
Minimum power-up voltage, 230 V / 115 V	171 V / 85 V					
Power Average Limiter (PAL) [2]	Yes					
Soft start / Inrush Current Draw	Yes / max. 5 A					
Mains connector	230 V CE: 16 A, CEE7; 115 V ETL: 30 A Twist lock | FP 4000: 230 V CE: 16 A, CEE7; 115 V ETL: 20 A / NEMA 5-20P					
Dimensions	W: 483 mm (19"), H: 88 mm (2 U), Overall D: 396 mm (15.6"), Mounting D: 358 mm (14.1")					
Weight	12 kg (26.4 lbs.)					
Finish	Black painted steel chassis with black painted steel / aluminum front					
Approvals	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC					

Note 1): Automatic -6 dB gain compensation when bridging channels.
Note 2): PAL can reduce the maximum output power to keep the power supply operating safely, and/or to prevent excessive current draw tripping the mains breaker. Refer to the FP+ Operation Manual section 7.5.8 Power Average Limiter (PAL) for more information.
Note 3): The amplifier will be fully operational at bridge-mode 2 ohm loads, but due to physical constraints in the construction, the max. output power will not be significantly higher than running individual channels and therefore not stated here.
Note 4): Separate 230 V or 115 V versions available. Not selectable on the amplifier.

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Specifications PLM Series

Model	PLM 20000Q	PLM 14000	PLM 10000Q
Number of input channels	2	2	2
Number of output channels	4	2	4
Peak total output all channels driven	20000 W	14000 W	10800 W
Max. Peak output voltage per channel	194 V	193 V	153 V
Max. output current per channel	67 A peak	90 A peak	49 A peak
Max. Output Power			
16 ohms per ch. (all ch.'s driven)	1150 W	1150 W	660 W
8 ohms per ch. (all ch.'s driven)	2300 W	2300 W	1300 W
4 ohms per ch. (all ch.'s driven) [1]	4400 W	4300 W	2300 W
2 ohms per ch. (all ch.'s driven) [1]	4800 W	7000 W	2350 W
All channels driven into optimal impedance interval	>5000 W into 2.2 - 3.3 ohms	>7000 W into 1.8 - 2.1 ohms	>2700 W into 2.4 - 3.2 ohms
8 ohms bridged per ch.	8800 W	8600 W	4600 W
4 ohms bridged per ch.	9600 W	14000 W	4700 W
Bridged into optimal impedance interval	>10000 W into 4.4 – 6.6 ohms	>14000 W into 3.6 – 4.2 ohm	>5400 W into 4.8 – 6.2 ohms
Audio Performance			
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)	>114 dB	>114 dB	>116 dB
Dynamic range with analog inputs	>110 dB	>110 dB	>112 dB
Frequency response (1 W into 8 ohms, 20 Hz - 20 kHz)	+ /-0.05 dB		
Common Mode Rejection (CMR)	>74 dB, 20 Hz to 20 kHz		
Internal sample rate	96 kHz		
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		
Sample Rate Converters			
THD + Noise	0.00003 %, 20 Hz - 20 kHz, unweighted		
Analog to Digital inputs			
Inputs	2 inputs x 2 link		
Input sensitivity settings	+12 or +26 dBu		
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		
AES / EBU inputs			
Inputs	2 inputs x 2 link		
Supported resolutions	≤ 24 bit		
Supported sample rates	44.1, 48, 88.2, 96, 176.4, 192 kHz		
Dante Audio Network			
Inputs and outputs	2 inputs, 2 outputs		
Supported sample rates	48, 96 kHz		
Supports redundant paths	Yes		
Flexible topology	Yes		
Network latency	0.8, 1.3 and 4 ms		
Device presets			
Local memory locations for the settings of the product	100		
Limiters			
Adjustable Inter-Sample Voltage Peak Limiter (ISVPL)	17.8 - 194 V, step size 0.1 V	17.8 - 193 V, step size 0.1 V	17.8 - 153 V, step size 0.1 V
Current Peak Limiter < 300 ms	67 A peak	90 A peak	49 A peak
Current Average Limiter (CAL) > 300 ms	33 Arms	44 Arms	25 Arms
LimiterMax (rms and peak limiters)			
– MaxRMS (rms voltage limiter)	Yes		
– MaxPeak (peak voltage limiter)	Yes		
Gain			
Amplifier gain	22 - 44 dB, step size 0.1 dB		
Output attenuator	-Inf to 0 dB, step size 0.25 dB		
Rear-panel interface			
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)	Neutrik speakON (2 x NLT4) or 4 Binding Posts (pairs)	Neutrik speakON (1 x NLT8, 2 x NLT4) or 4 Binding Posts (pairs)
Auto 10/100, Auto Uplink	2 x RJ45 etherCON		
Control and monitoring interface	Via Ethernet for Lake Controller software, or DLM (the 3rd Party Protocol)		
Detachable mains cord	Neutrik powerCON 32 A		
Cooling	Three fans front-to-rear airflow, temperature controlled speed	Two fans front-to-rear airflow, temperature controlled speed	Two fans front-to-rear airflow, temperature controlled speed
Front-panel user interface			
Display	2.5 inch, daylight readable LCD		
Fault/Warning/Limit/Clip indicators	RGB LEDs and detailed fault description on display		
Mute and soft function buttons	8 provided		
Standby Power button	On/Standby		
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		
Power			
Operating voltage (45 - 66 Hz)	Universal power supply 70 - 265 V	140-265 V / 70-135 V [2]	140-265 V / 70-135 V [2]
Soft start / Inrush Current Draw	Yes / max. 8 A	Yes / max. 5 A	Yes / max. 5 A
Power Average Limiter (PAL)	Yes	Yes	Yes
Power Factor Correction (PFC)	Yes	No	No
Breaker Emulation Limiter (BEL), software controlled 5 - 32 A	Yes, selectable breaker profile	No	No
Under-Voltage Limiter (UVL)	Yes	No	No
Dimensions			
Rack rail to rear panel	W: 483 mm (19"), H:88 mm (2 U), D: 424 mm (16.7")	W: 483 mm (19"), H: 88 mm (2 U), D: 386 mm (15.2")	W: 483 mm (19"), H:88 mm (2 U), D: 386 mm (15.2")
Overall depth including handles and rear support	498 mm (19.6")	460 mm (18.1")	460 mm (18.1")
Weight	17 kg (37 lbs.)	13.5 kg (30 lbs.)	13.5 kg (30 lbs.)
Finish	Black painted steel chassis with black painted steel / aluminum front		
Approvals	CE, ANSI/UL 60065 (ETL), CSA C22.2 NO. 60065, FCC		

Note 1): Asymmetrical loading of the outputs will yield even higher ratings. If one (or two) channel(s) has reduced power requirements, then the voltage drop from the power supply will be reduced, resulting in higher power availability for the other channel(s).
Note 2): Separate 230 V or 115 V versions available. Not selectable on the product.

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Specifications E Series

Model	**E 12:2**	**E 8:2**	**E 4:2**
Number of channels	2	2	2
Peak total output all channels driven	1200 W	800 W	400 W
Peak output voltage per channel	100 V / 70 Vrms	100 V / 70 Vrms	100 V / 70 Vrms
Max. output current per channel	18 Arms	16 Arms	11 Arms
Max. Output Power Per ch. (all ch.'s driven)			
2 ohms (Lo-Z mode)	600	400	200
4 ohms (Lo-Z mode)	600	400	200
8 ohms (Hi-Z mode)	600	400	200
16 ohms (Hi-Z mode)	310	290	200
70 V (Hi-Z mode)	600	400	200
8 ohms (Lo-Z mode)	300	200	100
16 ohms (Lo-Z mode)	150	100	50
Performance			
THD 20 Hz - 20 kHz for 1 W	<0.1%	<0.1%	<0.1%
THD at 1 kHz and 1 dB below clipping	<0.05%	<0.05%	<0.05%
Signal To Noise Ratio	>112 dBA	>112 dBA	>112 dBA
Channel separation (Crosstalk) at 1 kHz	>70 dB	>70 dB	>70 dB
Frequency response	2 Hz - 40 kHz	2 Hz - 40 kHz	2 Hz - 40 kHz
Input impedance	20 kOhm	20 kOhm	20 kOhm
Common Mode Rejection (CMR)	50 dB	50 dB	50 dB
Output impedance	25 mOhm	25 mOhm	25 mOhm
Gain, Sensitivity and Limiters			
Limit and gain switch (per channel)	2 pos: Lo-Z and Hi-Z	2 pos: Lo-Z and Hi-Z	2 pos: Lo-Z and Hi-Z
VPL for Hi-Z mode	100 V	100 V	100 V
VPL for Lo-Z mode	69.3 V	56.6 V	40.0 V
Sensitivity for 70 V out in Hi-Z mode	4 dBu	4 dBu	4 dBu
Sensitivity for full power into 4/8/16 ohms in Lo-Z mode	4 dBu	4 dBu	4 dBu
Gain in Hi-Z mode	35.2 dBu	35.2 dBu	35.2 dBu
Gain in Lo-Z mode	32.0 dB	30.3 dB	27.2 dB
Level adjustment (per channel)	Rear panel potentiometer, detented from -inf to 0 dB		
Connectors and switches			
Input connectors (per ch.)	3-pin detachable screw terminals, electronically balanced		
Output connectors (per ch.)	2-pin detachable screw terminals		
High pass filter	Fixed at 35 Hz, switchable per channel		
Power control	Can be used to go between standby and ON		
GPI (power control input)	Contact closure type, 2-pin detachable screw terminal, controls the power state		
GPO (power state output)	Contact closure type, 2-pin detachable screw terminal, for external monitoring of the power state		
Cooling	Single fan, front to rear airflow, no filter required, temperature controlled speed		
Power			
Nominal voltage	100 - 240 VAC	100 - 240 VAC	100 - 240 VAC
Operating voltage	70 - 265 VAC	70 - 265 VAC	70 - 265 VAC
Standby consumption	<1 W	<1 W	<1 W
Mains connector	IEC inlet		
Dimensions	W: 483 mm (19"), H: 44 mm (1 U), D: 276 mm (10.9")		
Weight	4.2 kg (9.3 lbs.)	4.1 kg (9 lbs.)	4 kg (8.8 lbs.)
Finish	Dark grey aluminium front and black steel chassis		
Approvals	CE		
Warranty	3 years, components and factory workmanship. See full warranty statement.		

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LAB.GRUPPEN

LAB.GRUPPEN AB ▸ SWEDEN
INTERNATIONAL CONTACT ▸ INFO@LABGRUPPEN.COM
US & CANADA CONTACT ▸ INFO@TCG-AMERICAS.COM
WWW.LABGRUPPEN.COM