C Series:

Installation-Dedicated Amplifiers

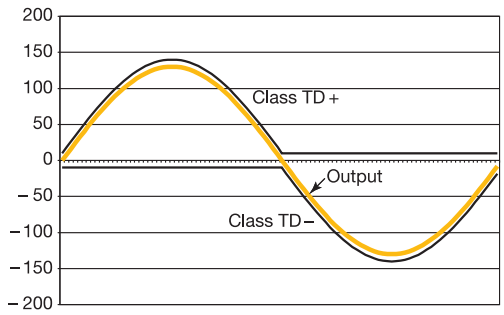
The LAB GRUPPEN C Series sets a new benchmark for power density in commercial audio amplifiers. The flagship C 68:4 produces up to 6800 W of total output (4 x 1700 W @ 4 ohms) in a 2U cabinet weighing about 12 kg (26.4 lbs). Despite the prodigious power produced inside an astonishingly compact package, C Series amplifiers will not overheat under normal use conditions. By keeping cool, they provide many years of reliable service – with state-of the-art sonic performance – in all types of installed sound applications.

To achieve this extraordinary combination of power density, performance and reliability, LAB GRUPPEN engineers applied the world's most advanced amplifier technologies – many patented or proprietary – in development of the C Series.

Class TD Design

Technology: For decades, the class AB output stage set the standard for high audio quality in power amplification. Although Class AB amplifiers are known for excellent sound, they do not use power efficiently. A great deal of heat is dissipated by the output stages, requiring large heat sinks and bulky fans to keep the output transistors inside safe temperatures. Larger power supplies are needed to produce power eventually dissipated as heat.

Two other familiar approaches to power amplification offer improved efficiency, though each comes with drawbacks. Class D switching amplifiers employ pulse width modulation (PWM) techniques to achieve very high efficiency, but most implementations of "pure" class D involve compromises in sound quality. Class H designs boost efficiency by modulating the power supply voltage with the input signal, "tracking" the input in order to provide the instantaneous voltage needed for optimum operation of the output devices. However, maximum efficiency with class H is achieved only within a relatively limited dynamic range.



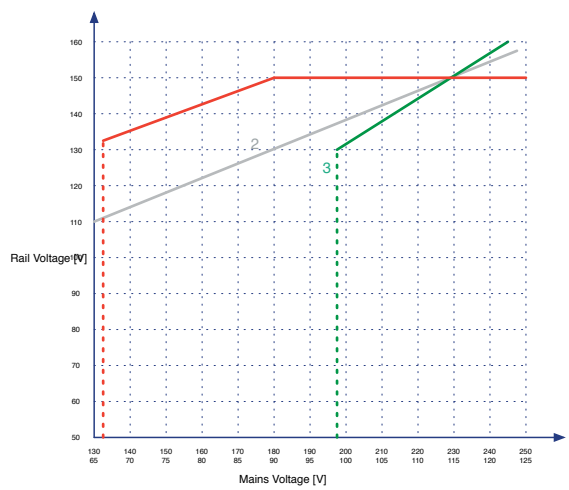
Both superb sound quality and high efficiency are made possible thanks to Class TD technology

The fundamental concepts behind both class D and class H amplifiers have been in the literature for decades, and are not covered by patents. However, specific circuits implementing these concepts can be patented, as is the case with LAB GRUPPEN's breakthrough Class TD amplifier topology. The TD stands for "tracking class D," which means that the power supply tracks the audio signal at all frequencies, supplying the required rail voltage while at the same time reserving additional headroom. The high-speed switching principles of class D are employed as well, though the final output stage remains a proven class AB component. The entire audio path remains analog, with the signal never converted to digital pulses and then filtered as in some class D designs. Very high efficiency is achieved without the ripple effect typical of a PWM output stage.

Benefits: LAB GRUPPEN's Class TD works perfectly under all load conditions. The output maintains its flat frequency response even into complex loads with nominal impedances as low as 2 ohms. Outputs may be bridged, reliability is very high, and there is no interference with nearby RF equipment. Superior efficiency allows greater power density while minimizing cooling requirements, yet sound quality matches that of the best class AB design.

Regulated Switch Mode Power Supply(R.SMPS™)

Technology: The power supply unit (PSU) in each C Series amplifier is an advanced, regulated design that is remarkably compact and exceptionally efficient. The transformer uses an enhanced ferrite core to create magnetic field capacity equivalent to iron core transformers of far greater bulk. The ingeniously simple layout is extremely efficient, generating less heat and reducing overall amplifier current draw from the mains.



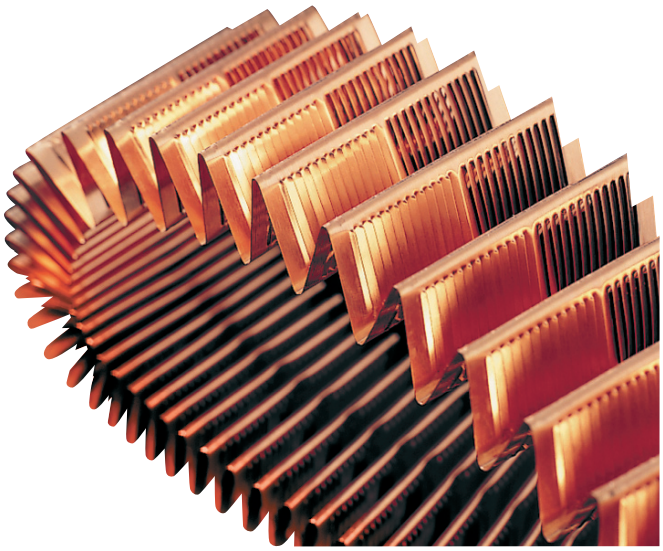
Characteristics of different power supply designs: 1) The Lab.gruppen R.SMPStm used in the C Series provides stable voltage rails even when mains voltage drops as low as 90V (@115V nom.) or 180V (@230V nom.).

2) The rail voltage of a conventional power supply (typically a toroidal transformer) drops proportionally (or worse) with mains voltage sag.

3) The rail voltage of other typical unregulated SMPS designs drops severely due to semiconductor losses. Current limiting or low-voltage conditions shut down the supply instead of continuing to lower the rail.

The R.SMPS design is regulated to keep supply voltage rails at optimum levels even when mains voltages sag due to external conditions. Mains voltages can drop as much as 20% below nominal before there is any effect on peak rail voltages.

Benefits: R.SMPS delivers full rail voltage to the output stage even when mains current sags or fluctuates significantly, allowing the amplifier to exhibit consistent transient response and tight, undistorted bass. Small size and high efficiency contribute to the extraordinary power density of the C Series.



Intercooler® Cooling System

Technology: The overall C Series amplifier topology is exceptionally efficient, from the power supply though the output stages. Nevertheless, one must keep in mind how much power is passing through the very compact chassis. The heat generated **per watt** of output is far less than with conventional designs.

LAB GRUPPEN's Intercooler® cooling system is unique in two respects.First, rather than mounting output devices on large aluminum fins, Intercooler utilizes a copper heat sink with thousands of very small, louvered fins. Copper dissipates heat much more effectively than aluminum, and the thousands of small fins vastly increase the total area exposed to the cooling airflow.

Many other amplifiers mount the output devices on a heat sink in a "cooling tunnel," with the coolest air hitting only the first output device. The last devices, at the end of the tunnel, are exposed to much warmer air. This uneven cooling makes the last device in the tunnel more susceptible to premature failure. With the C Series, however, all output devices are mounted in a row perpendicular to the airflow. Dual, variable speed fans force cool air into a pressure chamber, from where it passes through the cooling fins for each device. None receives "pre-heated" air for cooling.

Benefits: More efficient cooling ensures greater long-term reliability. Parallel mounting of output devices in the cooling airflow prevents premature failure of the "least-cooled" devices.