

# C Series: Installation-Dedicated Amplifiers

When it comes to causing problems, power amplifiers are unique in audio systems. Whereas faults in other devices are usually confined within the device itself, failures – or extreme abnormalities – in a power amplifier can have devastating secondary effects. In some cases, costs for damage to connected loads can far exceed the cost of the amplifier.

In other, less dire circumstances, inadequate protection features can cause short-term service interruptions due to muted outputs or tripped mains breakers. Such temporary interruptions can prove costly in terms of lost clientele or audience dissatisfaction.

To minimize any likelihood of either equipment damage or service interruptions, C Series amplifiers from Lab.gruppen are equipped with the industry's most comprehensive suite of protection, monitoring, and fault warning features.

## Current Protection Limiting (CPL) and Safe Operating Area Detection (SOAD)

**Technology:** Current Peak Limiting (CPL) and Safe Operating Area Detection (SOAD) are two related features that work in concert to ensure that the amplifier output stages always operate within defined parameters, safeguarding the critical output transistors. The SOAD circuits constantly monitor the outputs and compare voltage against current to make sure the output transistors are working inside their safe operating area. This sensing circuit works in conjunction with the Current Peak Limiter (CPL), which applies dynamic gain reduction only when the output devices draw current outside their safe operating area. Activity of the CPL is indicated by a flashing LED on the front panel, and by a CPL warning on the GUI of NomadLink's DeviceControl software. The CPL is non-adjustable: fixed threshold values are determined by the model type, ranging from 24.5 Arms on the C 68:4 to 8.5 Arms on the C 16:4.

**Benefits:** CPL and SOAD work together to prevent excessive output current that could damage output transistors.

## Voltage Peak Limiting (VPL)

**Technology:** Voltage Peak Limiting (VPL) keeps the amplifier working within its safe operating limits. In addition, VPL makes it possible to scale the peak voltage in eight steps, adjusting the Voltage clip level - and thereby the output power - to various connected loads. This applies to both constant voltage systems (70 V and 100 V), as well as when output power needs to be adjusted to suit a lower rated load. For constant voltage systems, setting the VPL is simply a matter of selecting the voltage setting corresponding to the system type. (The 141 V peak, for example, equates to 100 Vrms.) For various low impedance loads, Lab.gruppen provides charts in the C Series manual and on the Lab.gruppen web site that can be used as guides for optimum setting of the VPL function. Also, a load setting calculator is built into the DeviceControl software used with

Lab.gruppen's NomadLink monitoring and control network.

**Benefits:** VPL keeps the amplifier operating safely within its hardware capabilities, as well as providing a smooth and well controlled output signal even when the amplifier is driven into clipping. VPL's output power management allows the same amplifier to be configured for use in several different applications. For example, in a smaller theater or house of worship application, a single amplifier could use one or two output channels (separately or bridged) for the subwoofers, one or two channels for the full-range FOH cluster, and the fourth channel to drive a constant voltage system

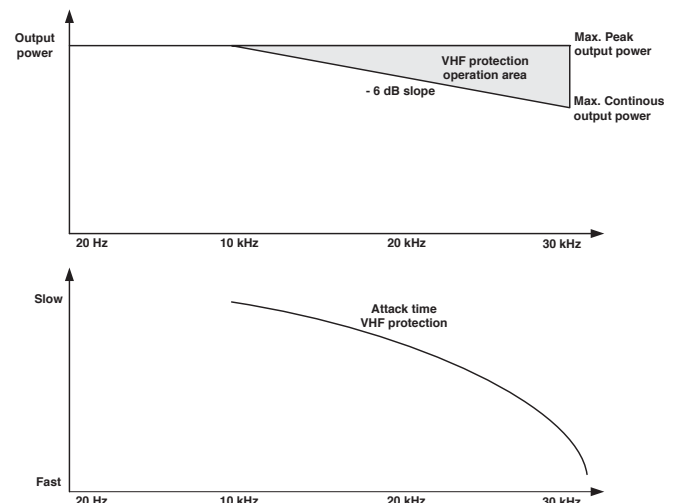
## Power Average Limiter

**Technology:** The Power Average Limiter (PAL) is a unique feature that controls the flow of line current into the power supply. Power consumption is limited to the amount that falls within the design parameters of the power supply, ensuring that the PSU will never be overloaded. Also, higher power models in the C Series can potentially draw more current (with output devices still within safe operating areas) than is allowed by the safety-mandated mains fuse. In this case, the PAL limits average current draw to protect the mains fuse.

**Benefits:** PAL keeps current draw within operating limits to prolong operational life of the PSU, and prevents blowing of the mains fuse on higher power models.

## Very High Frequency (VHF) Protection

**Technology:** C Series amplifiers are designed to reproduce high frequency audio signals nearly a full octave above those audible to typical adult listeners. This high-end bandwidth contributes to the renowned transparency and pristine transient response of



Lab.gruppen amplifiers. However, musical transients last only a fraction of a second. Continuous very high frequency content does not exist in normal program material, and is potentially damaging to connected high frequency drivers. All C Series amplifiers include a sophisticated VHF detection circuit that effectively discriminates between musical content and spurious signals. The circuit's operational area factors in output power, frequency and duration. Detection begins at about 10 kHz for maximum peak power, and continues at a -6 dB slope. The higher the frequency, the lower the power level for detection. The attack time for implementing protection decreases at higher frequencies, allowing some sustained activity at 10 kHz but acting very rapidly above 20 kHz. The VHF protection has no limiting function; all signals are passed at full power with no effect on transient material. However, should dangerous VHF content be detected, the output will mute for six seconds; if no further VHF content is detected, the output automatically un-mutes. Simultaneously, a fault condition is shown on a front panel LED and transmitted via NomadLink for indication on the DeviceControl software GUI.

**Benefits:** Protection of connected high frequency drivers with no effect on the amplifier's high-frequency transient response.

### Temperature Protection

**Technology:** C Series amplifiers offer cooling facilities that far exceed the industry norm, including robust cooling fans and a proprietary Intercooler® copper heat sink with thousands of tiny cooling fins. Nevertheless, overheating can result from environmental and operational factors: blocked airflow, high ambient temperature, or prolonged operation at or near current output limits. To guard against service interruptions or damage, the C Series has implemented comprehensive over-temperature warning and protection measures. Thermal measurement points are located on each output channel and in the power supply. When a pre-set temperature threshold is reached, a warning status is displayed on the front panel (flashing LED) and on the DeviceControl GUI via NomadLink. As the critical temperature threshold approaches, longer warning flashes are given. When temperature exceeds the critical limit, the output channel will mute. Temperature is re-measured every six seconds, and the channel un-mutes when temperature drops to safe levels. Power supply over-temperature protection operates in a similar way, but indirectly. There is no separate indicator or action for it, instead it effects the individual outputs ("hottest first").

**Benefits:** Output transistors and power supply components are protected from damage due to excessively high temperatures.

### High Impedance/Open Load Warning

**Technology:** C Series amplifiers are equipped to sense an open or extremely high impedance load condition whenever a signal above approximately -29 dB is present at the input. When this situation is detected, a warning LED lights on the front panel and indication is given on the DeviceControl software GUI via the NomadLink network.

**Benefit:** Operator is notified of possible fault in wiring or connected loudspeakers.

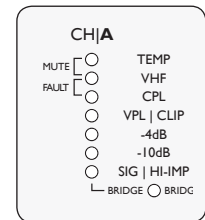
### Extreme Low Impedance / Short Circuit Protection

**Technology:** C Series amplifiers are designed to accommodate load impedances as low as 2 ohms. However, any sustained impedances below this level usually indicates a wiring fault or short circuit. The C Series amplifier detects this condition when current draw is high (activating the Current Peak Limiter) while simultaneously the output signal is low. Under these conditions, the output is muted. The protection circuit sequences at six second intervals; if the fault condition is no longer detected, the output channel will un-mute.

**Benefit:** Output transistors are protected from damage, and further damage to connected loudspeakers is possibly avoided as well.

### DC Protection

**Technology:** All C Series amplifiers incorporate circuits that will immediately sense the presence of DC at the outputs. Since DC is never present under normal operating conditions, any DC component indicates an internal fault condition requiring repair. The output is muted (electronically disconnected) and the corresponding fault condition is shown on the front panel LED display and on the Device Control software GUI via NomadLink. Note that only the channel showing DC fault will mute; other amplifier channels will continue to operate.



**Benefit:** Connected loudspeakers are protected from potential damage.

### Soft Start

**Technology:** When first tuned on, high-power amplifiers can draw a considerable amount of current from the AC mains. If two or more are turned on simultaneously, this can trip the mains breaker. C Series amplifiers implement a slow, controlled charging of capacitors to limit current inrush.

**Benefits:** Several power amplifiers may be turned on simultaneously with greatly diminished chance of tripping the mains breaker. (Note: The NomadLink network and NLB 60E bridge provide facilities for sequential turn-on in larger installations.)



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