BOSCH

PRA-AD604 Amplifier, 600W 4-channel
PRAESENSA

▶ Flexible power partitioning across all channels

▶ Low power consumption and heat loss

▶ Full supervision with integrated fail-safe redundancy

▶ Digital signal processing per channel

▶ IP-networked on OMNEO for audio and control

This is a flexible and compact multi-channel power amplifier for 100 V or 70 V loudspeaker systems in Public Address and Voice Alarm applications. It fits in centralized system topologies, but also supports decentralized system topologies because of its OMNEO IP-network connection, combined with DC-power from a multifunction power supply.
The output power of each amplifier channel adapts to the connected loudspeaker load, only limited by the total power budget of the whole amplifier. This flexibility, and the integration of a spare amplifier channel, makes it possible to utilize the available power effectively and use less amplifiers for the same loudspeaker load, compared to using traditional amplifiers.
Digital sound processing and control, adjusted to the acoustics and requirements of each zone, allow for better sound quality and speech intelligibility.

Functions

Efficient 4-channel power amplifier

- Transformerless, galvanically isolated, 70/100 V outputs, with a total loudspeaker output power of 600 W.
- Flexible partitioning of the available output power across all amplifier channels to use it effectively, significantly reducing the amount of required amplifier power in a system.
- Cost and space saving, integrated, independent spare channel for fail-safe redundancy.
- Class D amplifier channels with two-level power lines for high-efficiency in all operating conditions; dissipation and heat loss is minimized to save on energy and battery capacity for backup power.

Flexibility in loudspeaker topologies

- A/B outputs on every amplifier channel to support redundant loudspeaker wiring topologies. Both outputs are individually supervised and disabled in case of a fault.
- Class A loop wiring possible between the A and B loudspeaker outputs. Dedicated connection facility for an end-of-line device to supervise the complete loop, including the B-output connection.
- Load independent frequency response; the amplifier channels can be used with any loudspeaker load up to the maximum, without any change in audio quality.

Sound quality

- Audio-over-IP, using OMNEO, the Bosch high-quality digital audio interface, compatible with Dante and AES67; audio sample rate is 48 kHz with 24-bit sample size.
- Large signal to noise ratio, wide audio bandwidth and very low distortion and crosstalk.
- Digital signal processing on all amplifier channels, including equalization, limiting and delay, to optimize and tailor the sound in each loudspeaker zone.
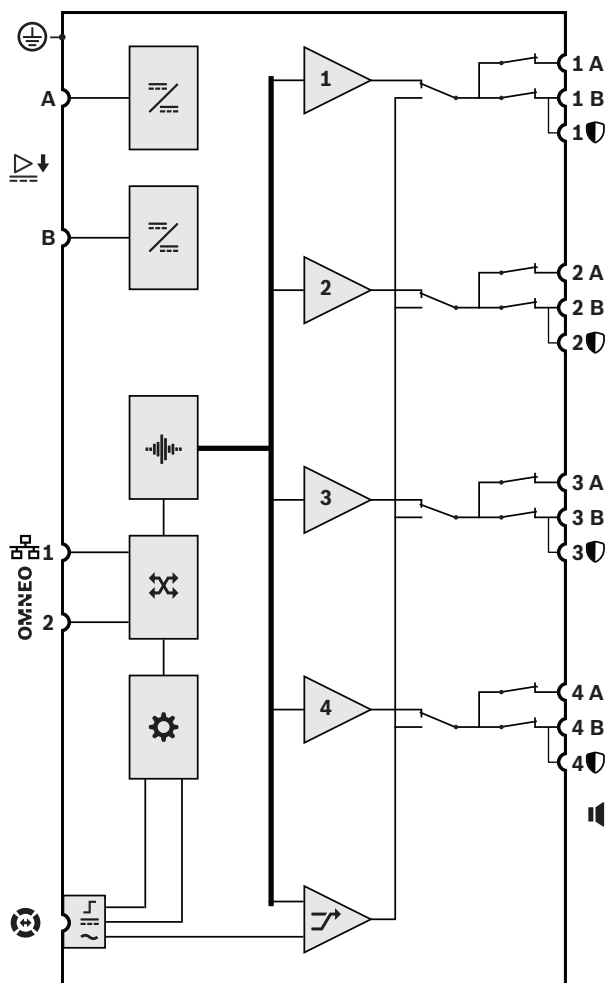
Supervision

- Supervision of amplifier operation and all of its connections; faults are reported to the system controller and logged.
- Loudspeaker line integrity supervision without interruption of audio, using end-of-line devices (separately available) for best reliability.
- Network link supervision.

Fault tolerance

- Dual OMNEO network connections, supporting Rapid Spanning Tree Protocol (RSTP), for loop-through connections to adjacent devices.
- Dual 48 VDC inputs with polarity reversal protection, each with a full power DC/DC converter, operating in tandem for redundancy.
- Fully independent amplifier channels; the integrated spare channel automatically replaces a failing channel, with due regard of the actual sound processing settings.
- All amplifier channels support two independent loudspeaker groups, A and B, enabling redundant loudspeaker wiring topologies.
- Backup analog audio lifeline input driving the spare amplifier channel to serve all connected loudspeaker zones in case both network connections, or the amplifier network interface, would fail.

⎍	Lifeline control interface	---	Lifeline supply input
∼	Lifeline audio input	1-4	Amplifier channel
↗	Spare channel		

Connection and functional diagram

⫽	DC to DC converter	⑇	Audio processing (DSP)
⤬	OMNEO network switch	✿	Controller

Front view

	Spare channel substitute 1-4	White
	Signal present 1-4 Fault present 1-4	Green Yellow
	Ground fault present	Yellow
	Device fault present	Yellow
	Audio lifeline substitute	White
	Network link to system controller present Network link lost Amplifier in standby mode	Green Yellow Blue
	Power on	Green

Rear view

Rear panel indicators

	100 Mbps network 1 Gbps network	Yellow Green
	Power on Device in identification mode	Green Green blinking
	Device fault present	Yellow

Rear panel controls

	Device reset (to factory default)	Button

Rear panel connections

	48 VDC input A-B	
	Lifeline interface	
	Loudspeaker output A-B (1-4) End-of-line device	
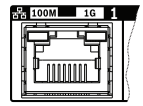
	Network port 1-2	
	Safety ground	

Architects' and engineers' specifications

The IP-networked 4-channel amplifier shall be designed exclusively for use with Bosch PRAESENSA systems. The amplifier shall adapt the maximum output power of each amplifier channel to its connected loudspeaker load, with free assignable output power per channel for a total maximum of 600 watt per amplifier, supporting 70 V or 100 V operation with direct drive capability and outputs that are galvanically insulated from ground. The amplifier shall have a built-in independent spare amplifier channel for automatic failover. The amplifier shall provide an interface for control data and multi-channel digital audio over OMNEO using dual Ethernet ports for redundant network connection, supporting RSTP and loop-through cabling, with automatic failover to an analog lifeline input. The amplifier shall have dual power supply inputs and power supplies. All amplifier channels shall have independent A/B zone outputs with support for class-A loudspeaker loops. All amplifier channels shall supervise the integrity of connected loudspeaker lines without interruption of audio distribution. The amplifier shall provide front-panel LED status indications for the network link, ground fault, power supplies and audio channels, and provide additional software monitoring and fault reporting features. The amplifier shall be rack mountable (1U) and feature software-configurable signal processing including level control, parametric equalization, limiting and delay for each channel. The amplifier shall be certified for EN 54-16 / ISO 7240-16, marked for CE and be compliant with the RoHS directive. Warranty shall be three years minimum. The amplifier shall be a Bosch PRA-AD604.

Certifications and approvals

Emergency standard certifications

Europe	EN 54-16
International	ISO 7240-16
Maritime applications	DNV GL Type Approval

Emergency standard compliance

Europe	EN 50849
UK	BS 5839-8

Regulatory areas

Safety	EN/IEC/CSA/UL 62368-1
Immunity	EN 55024 EN 55103-2 (E1, E2, E3) EN 50130-4
Emissions	EN 55032 EN 61000-6-3 ICES-003 ANSI C63.4 FCC-47 part 15B class A
Environment	EN 50581
Railway applications	EN 50121-4

Conformity declarations

Europe	CE/CPR
Australia	RCM
Morocco	CMIM
Russian Federation	EAC
United Arabic Emirates	CoC Civil Defense

Parts included

Quantity	Component
1	Amplifier, 600W 4-channel
1	Set of 19"-rack mounting brackets (pre-mounted)
1	Set of screw connectors and cables
1	Quick Installation Guide
1	Safety information

Technical specifications

Quick overview

Operating voltage (VDC)	44 - 60 VDC
Power consumption (W)	230 W maximum
Number of outputs	4
Maximum output power (W)	600 W burst
Number of analog inputs	1
Number of Ethernet ports	2

Ethernet type	100BASE-TX; 1000BASE-T
Protocols and interfaces	OMNEO; AES 70
Sample rate (kHz)	48 kHz
Signal processing	Equalization; Limiter; Delay; Level
Rated output voltage (V)	70 V; 100 V
Frequency response (Hz)	20 - 20000 Hz
Minimum signal-to-noise ratio (dBA)	107 dBA
Pilot tone frequency (kHz)	25,50 kHz
Pilot tone level (V)	3 V
Protection	Overheat; Overload; RMS output power limiter; Ground fault; Watchdog; DC output; RSTP; Spare channel; Lifeline
Degree of protection (IEC 60529)	IP30
Operating temperature (℃)	-5 - 50℃
Dimension (H x W x D) (mm)	44 x 483 x 400 mm
Weight (kg)	8,10 kg

Electrical

Loudspeaker load

Maximum loudspeaker load
    100 V mode, all channels*
    70 V mode, all channels*
	600 W
	600 W

Minimum loudspeaker load impedance
    100 V mode, all channels*
    70 V mode, all channels*
	16.7 ohm
	8.3 ohm

Maximum cable capacitance
    100 V mode, all channels*
    70 V mode, all channels*
	2 uF
	2 uF

*All channels combined.

Amplifier outputs

Rated output voltage
    100 V mode, 1 kHz, THD <1 %, no load
    70 V mode, 1 kHz, THD <1 %, no load
	100 VRMS
	70 VRMS

Amplifier outputs

Burst / rated power**	
All channels combined	
100 V mode, load 16.7 ohm	600 W / 150 W
70 V mode, load 8.3 ohm	600 W / 150 W
Channel 1	
100 V mode, load 16.7 ohm // 20 nF	600 W / 150 W
70 V mode, load 11.7 ohm // 20 nF	420 W / 105 W
Other channels	
100 V mode, load 33.3 ohm // 20 nF	300 W / 75 W
70 V mode, load 16.7 ohm // 20 nF	300 W / 75 W

Full to no load regulation	
20 Hz to 20 kHz	< 0.2 dB

Frequency response	
Rated power, +0.5 / -3 dB	20 Hz to 20 kHz

Total Harmonic Distortion + Noise (THD+N)	
Rated power, 20 Hz to 20 kHz	< 0.5 %
6 dB below rated power, 20 Hz to 20 kHz	< 0.1 %

Intermodulation Distortion (ID)	
6 dB below rated power, 19+20 kHz, 1:1	< 0.1 %

Signal to Noise Ratio (SNR)	
100 V mode, 20 Hz to 20 kHz	> 110 dBA typical
70 V mode, 20 Hz to 20 kHz	> 107 dBA typical

Crosstalk between channels	
100 Hz to 20 kHz	< -84 dBA

DC offset voltage	< 50 mV

Signal processing per channel	
Audio equalization	7-section parametric
Level control	0 to -60 dB, mute
Level control resolution	1 dB
Audio delay	0 to 60 s
Audio delay resolution	1 ms
RMS power limiter	Rated power

Lifeline	
Sensitivity (100 V out)	0 dBV
Mute attenuation	> 80 dB
Signal to Noise Ratio (SNR)	> 90 dBA

**Full voltage swing into maximum loudspeaker load for speech and music program material (crest factor > 9 dB)

Power transfer

Power supply input A/B	
Input voltage	48 VDC
Input voltage tolerance	44 to 60 VDC

Power consumption (48 V)	
Sleep mode, no supervision	6.0 W
Snooze mode, supervision active	7.5 W

Power transfer

Active mode, idle	38 W
Active mode, low power	52 W
Active mode, rated power	222 W
Per active port	0.4 W

Heat loss (including power supply)	
Active mode, idle	166 kJ/h (157 BTU/h)
Active mode, low power	227 kJ/h (215 BTU/h)
Active mode, full power	339 kJ/h (321 BTU/h)

Supervision

End-of-Line detection mode	Pilot tone 25.5 kHz, 3 VRMS
Power supply input A/B	Undervoltage
Ground short detection (loudspeaker lines)	< 50 kohm
Amplifier channel redundancy switching	Internal spare channel
Amplifier channel load	Short circuit
Loudspeaker line redundancy switching	A/B group, Class-A loop
Controller continuity	Watchdog
Temperature	Overheat
Fan	Rotation speed
Network interface	Link presence

Network interface

Ethernet	100BASE-TX, 1000BASE-T
Protocol	TCP/IP
Redundancy	RSTP

Audio/control protocol	OMNEO
Network audio latency	10 ms
Audio data encryption	AES128
Control data security	TLS

Ports	2

Reliability

MTBF (extrapolated from calculated MTBF of PRA-AD608)	300.000 h

Environmental

Climatic conditions

Temperature	
Operating	-5 to +50 ℃ (23 to 122 ℉)
Storage and transport	-30 to +70 ℃ (-22 to 158 ℉)
Humidity (non condensing)	5 to 95 %
Air pressure (operating)	560 to 1070 hPa
Altitude (operating)	-500 to +5000 m (-1640 to 16404 ft)
Vibration (operating)	
Amplitude	< 0.7 mm
Acceleration	< 2 G
Bump (transport)	< 10 G

Airflow

Fan airflow	Front to sides/rear
Fan noise	
Idle condition, 1 m distance	< 30 dBSPLA
Rated power, 1 m distance	< 53 dBSPLA

Mechanical

Enclosure

Dimensions (HxWxD)	
With mounting brackets	44 x 483 x 400 mm (1.75 x 19 x 15.7 in)
Rack unit	19 in, 1U
Ingress protection	IP30
Case	
Material	Steel
Color	RAL9017
Frame	
Material	Zamak
Color	RAL9022HR
Weight	8.1 kg (17.9 lb)