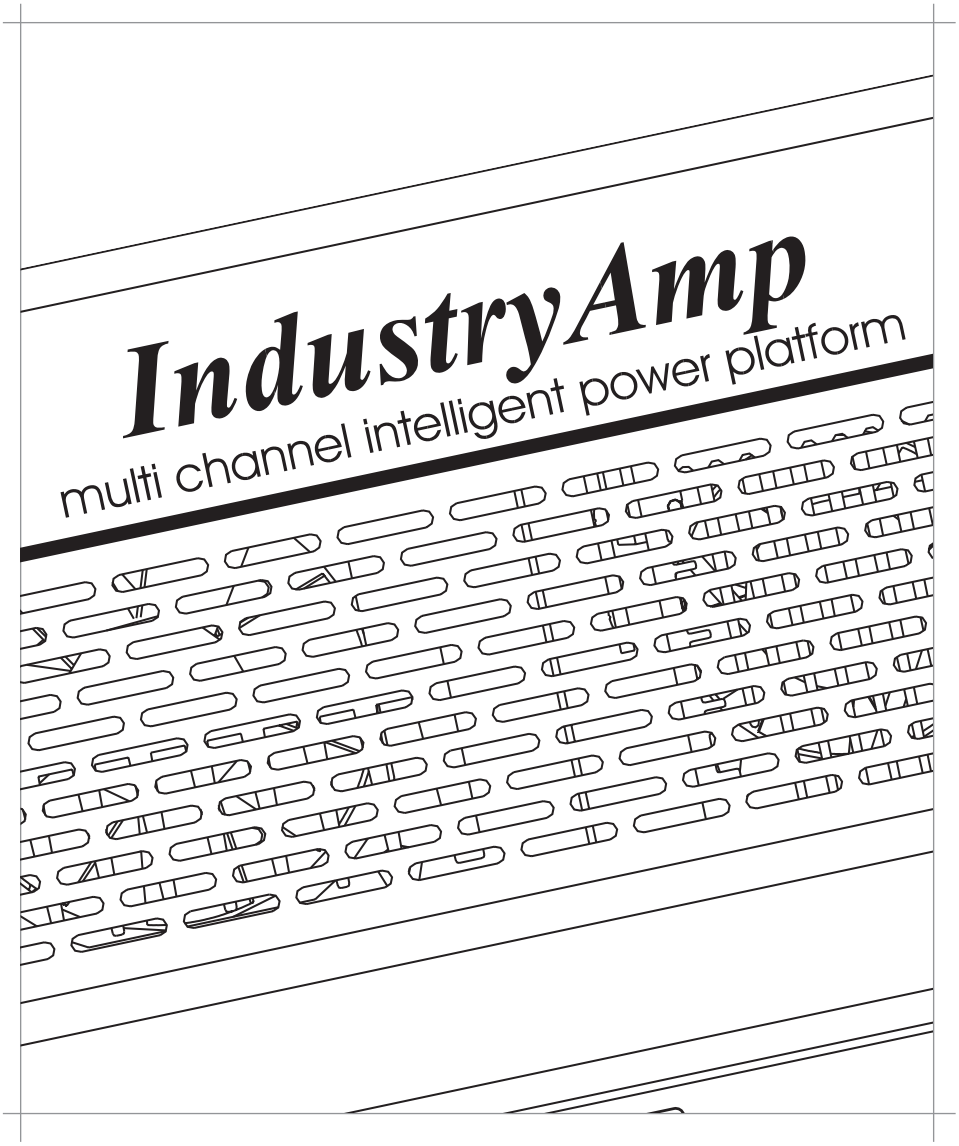
# PB-400-DN

## Datasheet

Applies to Part Numbers:

TUN-590404

## IndustryAmp PB-400-DN (Dante™)




Delivering Clear and Intelligible Messages

AXYS® TUNNEL by HARMAN

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# 1. Architectural and Engineering Specifications

The unit shall be constructed in a 3U 19" rack enclosure. It shall be a multi channel power amplifier with on-board DSP and RISC processor that is intended for use in distributed 70V/100V professional audio installations.

All signal processing functions, necessary to properly control and monitor each amplifier channel shall be implemented on-board in order to reduce the overhead costs related to external processors. The electronics shall consist of a 2 channel analogue audio input module, 16 digital audio inputs and 17 digital audio outputs via Dante™, a Digital Signal Processor with 16 inputs and 4 local outputs, 4 class AB power amplifiers with protection circuitry and a high power switched-mode power supply with a very high peak power capability.

The analogue audio inputs shall be transformer balanced. All necessary signal processing shall be implemented in the digital domain by means of a 32 bits floating point DSP.

The DSP shall realize appropriate output channel gain, equalisation filters and delays. Besides the aforementioned, the DSP shall be able to realize EQ, volume and autogain, and compression as required. The DSP software and coefficients shall reside in non-volatile memory in order to facilitate adaptations and software updates. Audio AD and DA conversion shall be performed with high quality 24 bits converters.

The output section shall be equipped with high-grade toroidal transformers to provide both 70V and 100V outputs. All loudspeaker terminals shall be protected against voltage spikes by means of gas discharge devices. The 4 outputs shall be driven by full complementary class AB amplifiers equipped with rugged industrial power mosfet devices capable of handling large currents without risk of failure. There shall be a large phase margin within the feedback loop to keep the amplifiers stable under any load condition. Each amplifier shall be capable of delivering 250 $W_{rms}$ into a 40 Ω load.

The device shall be controllable over Ethernet by using Layer 3 protocols. The DSP shall be controllable by means of the AxysBridge protocol. The Dante™ node shall be controllable via the Dante™ software tools. The interface shall be capable of redundant operation, both for the audio as well as for all control data.

The control unit shall serve four main functions:

- Remote monitoring of parameters like status of the DSP, amplifiers and their loads, monitoring and control of the internal fan, analogue and digital input pilot tone detection, status of the optional ambient noise sensing microphone, thermal overload protection, ambient noise level, control for the input section etc.
- Remote control of DSP parameters: volume, pre-delay, EQ, output sections, autogain configuration and surveillance related parameters.
- Updating DSP software and factory unit programming.
- Configuration of the Dante™ node.

The device shall provide failure relay contacts for monitoring purposes. The failure relay connections shall be configurable for either 'volt-free' or 'impedance-sensing' operation (to allow for a direct connection to impedance-sensing monitoring equipment).

The analogue audio signal shall be connected to a Phoenix type MC 1,5/ 3-ST-3,81 connector. The device shall be equipped with two RJ-45 sockets to enable either connection to primary and secondary 1 Gb/s Dante™ networks, or to provide daisy-chaining in non-redundant operation mode. Each of the amplifier outputs shall be connected to Phoenix type GIC 2,5/ 3-ST-7,62 connectors. The unit shall be equipped with a Neutrik® PowerCon® mains inlet connector.

The enclosure shall be constructed of steel finished with a nickel plating. All connectors, as well as the mains switch and fuse holder, shall be located on the rear of the enclosure. The front of the enclosure shall accommodate a bi-colour LED to indicate the status.

Dimensions are: 132 mm H x 483 mm W x 342 mm D. Weight 20.8 kg. The amplifier unit shall be the AXYS® model IndustryAmp PB-400-DN.

# 2. Specifications

**Electrical:**

| | | |
|---|---|---|
| Analogue Audio Inputs[1] | - Number of inputs | : 2 |
| | - Nominal level | : 0 dBV (RMS, line input) |
| | - Maximum level | : +19 dBV (peak, line input) |
| | - Type | : dual line input, transformer balanced |
| | - Impedance (balanced) | : 6k8 Ω |
| | - Frequency range | : 30 to > 20k Hz (-3 dB, analogue in to amp out, 100 Ω load) |
| | - CMRR | : > 55 dB (1k Hz), > 60 dB (50 Hz) |
| Digital audio interface[2] | - Number of inputs | : 16 |
| | - Number of outputs[3] | : 17 |
| | - Format | : 48 kHz / 32, 24 or 16 bit PCM<br>AES 67 supported |
| | - Type | : dual 1 Gb/s or 100 Mb/s Dante™ Ethernet connection |
| | - Implementation | : Brooklyn II Reference Design with internal Ethernet switch |
| | - Connection | : redundant or daisy-chain |
| | - Network latency | : 250 us, 500 us, 1 ms, 2 ms or 5 ms |
| General | - Dynamic range[4] | : > 90 dB |
| | - THD + N | : < 0.06 % @ 1k Hz (50 Vrms in 50 Ω)<br>< 0.4 % @ 50 to 10k Hz (50 Vrms in 50 Ω) |
| DSP module | - Type | : floating point 32 bits |
| | - Memory | : 512 Mb SDRAM + 10 Mb non volatile |
| | - AD - DA conversion | : 24 bits sigma-delta 128 x oversampling |
| | - Auxilliary processor | : single cycle RISC |
| | - Sample rate | : 48.0 kHz (default) |
| | - Latency | : 3.45 ms (analogue in to amp output)<br>3.64 ms (digital in to amp output)[5] |
| | - Signal processing | : - input configuration (16 inputs to DSP)<br>- individual input EQ, gain and polarity<br>- volume<br>- ambient noise level dependent gain adaptation ('fail-safe')<br>- individual output EQ, delay, gain and polarity<br>- output channel delay (87.2 seconds per output)<br>- individual RMS and peak limiters on each output |
| | - Dante™ transmission routing | : - Ch 1 Break-out Analog In 1[6]<br>- Ch 2 Break-out Analog In 2[6]<br>- Ch 3 Break-out In 1 (processed)<br>- Ch 4 Break-out In 2 (processed)<br>- Ch 5 Break-out In 3 (processed)<br>- Ch 6 Break-out In 4 (processed)<br>- Ch 7 Break-out In 5 (processed)<br>- Ch 8 Break-out In 6 (processed)<br>- Ch 9 Break-out In 7 (processed)<br>- Ch 10 Break-out In 8 (processed)<br>- Ch 11 Break-out In 9 (processed)<br>- Ch 12 Break-out In 10 (processed)<br>- Ch 13 Amplifier 1<br>- Ch 14 Amplifier 2<br>- Ch 15 Amplifier 3<br>- Ch 16 Amplifier 4<br>- Ch 17 Ambient Noise Mic |

| | | |
|---|---|---|
| Control & monitoring | - Interface[7] | : AxysBridge protocol |
| | - Remote surveillance | : - general status (DSP running, signal present etc.)<br>- amplifier monitoring and load monitoring schemes<br>- pilot tone detection on analogue inputs (20k5 - 28k Hz, level > -22 dBV)<br>- pilot tone detection on Dante™ inputs (19k2 to 23k5 Hz, software configurable parameters)<br>- monitoring of optional external ambient noise sensing microphone<br>- fan monitoring and control for internal fan<br>- thermal overload protection |
| | - Failure | : - internal hardware bypass circuit for analogue audio inputs<br>- failure relay (external connector, maskable conditions) SPDT 100 mA / 24 V<br>- configurable for volt-free or impedance-sensing (10k / 20k Ω) operation (internal jumper)<br>- failure status indicated at front by bi-colour LED |
| | - Load monitoring freq | : 22k Hz |
| | - Load monitoring level | : 8 Vrms (unloaded) |
| | - Load monitoring maximum impedance | :1600 Ω @ 22k Hz |
| Power amps | - Type | : full complementary FET class AB |
| | - Power | : 4 x 250 Wrms (40 Ω) |
| | - Protection | : - DC failure<br>- Short circuit |
| | - Output transformers | : toroidal |
| | - Taps | : 70 V, 100 V |
| | - Minimum load | : 40 Ω (@ 100 V), 20 Ω (@ 70 V) |
| | - Loudspeaker terminal surge protection clamping | : 350 V @ 20 kA |
| Connectors[8] | - Analogue audio inputs | : Phoenix type MC 1,5/ 3-ST-3,81 (2 x)[9]<br>p1 = Line 1 +, p2 = GND, p3 = Line 1 - |
| | - Dante™ interface | : RJ-45 (2 x)[2] |
| | - Ambient noise sensor | : Phoenix MC 1,5/ 3-ST-3,81<br>p1 = In +, p2 = GND, p3 = In - |
| | - Failure relay | : Phoenix type MC 1,5/ 3-ST-3,81<br>p1 = Common (CO), p2 = Normally closed (NC), p3 = Normally open (NO)[10] |
| | - Loudspeakers | : Phoenix type GIC 2,5/ 3-ST-7,62 (4 x)[11]<br>p1 = 0, p2 = 70 V, p3 = 100 V |
| | - Mains | : Neutrik® PowerCon® NAC3FCA |

| | | |
|---|---|---|
| PSU | - Type | : switched-mode, power factor correction, standby supply |
| | - Rated mains voltage | : 100 V to 240 V, 50 or 60 Hz |
| | - Mains fuse(s) | : 1 x 8 A quick-blow/anti-surge 20 x 5 mm glass fuse (type F8A HBC) |
| | - Power consumption[12] | : - 54 W (idle)<br>- 11 W standby (main power supply shut down)<br>- 122 W load monitoring active (all outputs 50 Ω)<br>- 1000 W (rated full load) |
| | - Power factor | : 0.50 (idle) / > 0.90 (full load) |
| | - Max mains inrush current | : 20 A short-time peak (@ 230 V) |
| | - Protection | : - thermal protection<br>- output current limiting<br>- under-voltage and over-voltage lock out |
| Fans | - Type | : large low-speed temperature-controlled fans |
| | - Number of fans | : 2 |
| | - Airflow | : rear to front |

**General:**

| | | |
|---|---|---|
| Temperature range (ambient) | | : 0 to 40 °C (32 - 104 °F) |
| Dimensions (H x W x D) | | : 132 x 483 x 342 mm (3U 19" rack enclosure) |
| Weight | | : 20.8 kg (46 lbs) |
| Finish | | : Nickel Plated |
| MTBF[13] | | : 70000 hours |
| Standards | - EMC | : EN 55032:2012/AC:2013<br>EN 55035:2017<br>EN 50130-4:2011 |
| | - Safety | : IEC 60065:2014 (edition 8)<br>EN 60065:2014 |
| | - Mains harmonics | : EN 61000-3-2:2014 |
| Certificates | | : CE, CB, CSA/UL |

**Notes:**

1. The device supports 2 analogue audio inputs and 16 digital Dante™ inputs. Either analogue input 1/2 or Dante™ input 1/2 can be routed to the DSP (software configurable).
2. The device is equipped with 2 RJ-45 sockets for either redundant or daisy-chain connection to 1 Gb/s or 100 Mb/s Dante™ network(s). A 1 Gb/s connection is strongly recommended.
3. Various signals are available on the 17 Dante™ transmit channels, see section 'DSP block diagram' for details.
4. A-weighed, 10 to 22k Hz analyzer bandwidth, open input, 50 Ω load.
5. Valid for typical Dante™ latency setting of 1 ms. Available Dante™ latency settings are 250 us, 500 us, 1 ms, 2 ms and 5 ms (software configurable). Ensure that lower latency settings are supported by the network infrastructure.
6. Analogue input 1/2 are always available as Dante™ break-out, even when not routed to the DSP.
7. The DSP can be accessed over the Dante™ Ethernet interface(s) by using the UDP/IP based AxysBridge protocol. Service discovery (DNS-SD), redundant operation mode and redundant status monitoring are supported.
8. All Phoenix type numbers refer to the required cable parts, a complete set of Phoenix connectors is supplied with the product.
9. For solid and stranded wires with conductor cross sections from 0.14 to 1.5 $mm^2$.
10. For volt-free operation CO is connected to NC if the device is powered and the status is OK (no masked failure).
11. For solid and stranded wires with conductor cross sections from 0.2 to 2.5 $mm^2$.
12. Typical values, valid for nominal operating temperature of the amplifier.
13. At ambient temperature of 20 °C.

# 3. PB-400-DN measurement plots

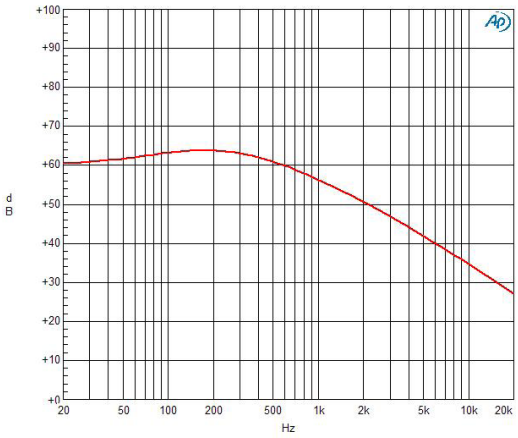



*Fig 1* CMRR versus frequency.

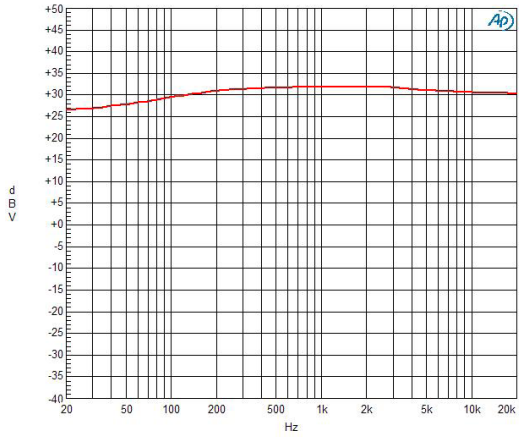



*Fig 2* Magnitude vs frequency, 50 Ω loaded, 40 Vrms out @ 1k Hz.

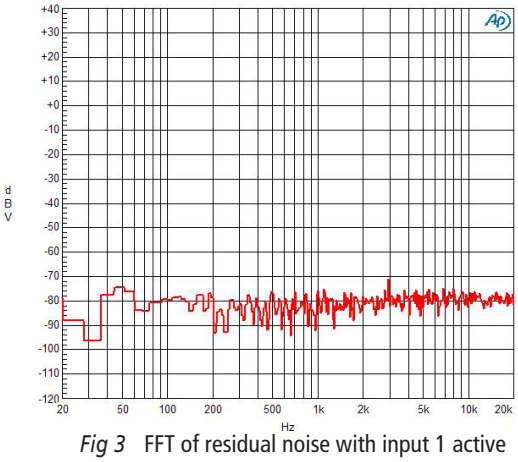



*Fig 3* FFT of residual noise with input 1 active (shorted), 50 Ω load.

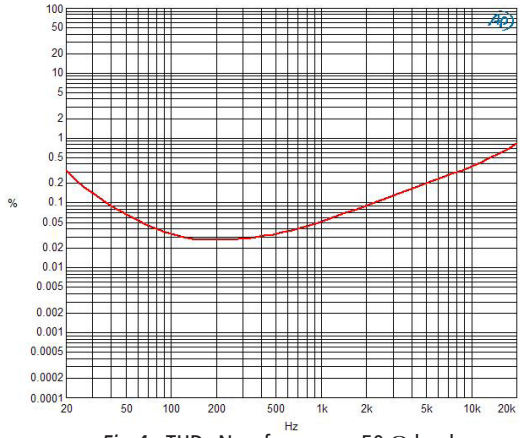



*Fig 4* THD+N vs frequency, 50 Ω load, 50 Vrms output level (@ 1k Hz).

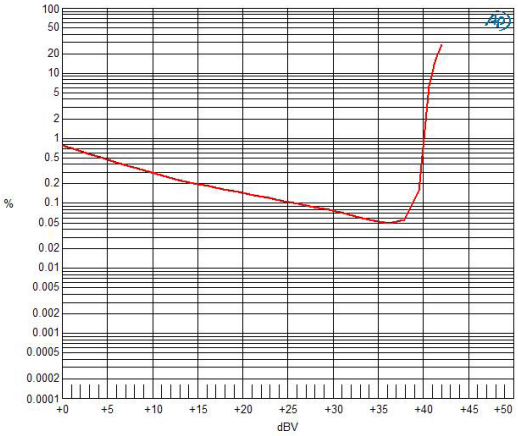



*Fig 5* THD+N vs output level, 1k Hz, 50 Ω load, output limiters not active.

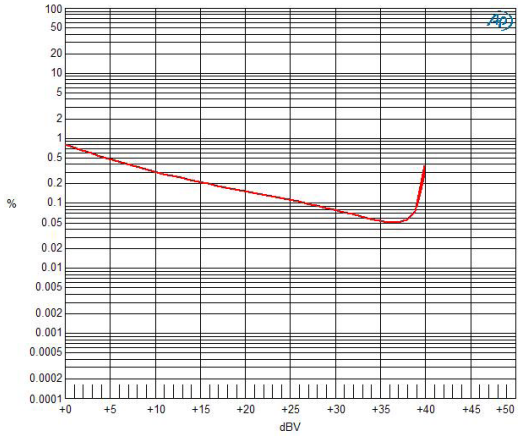
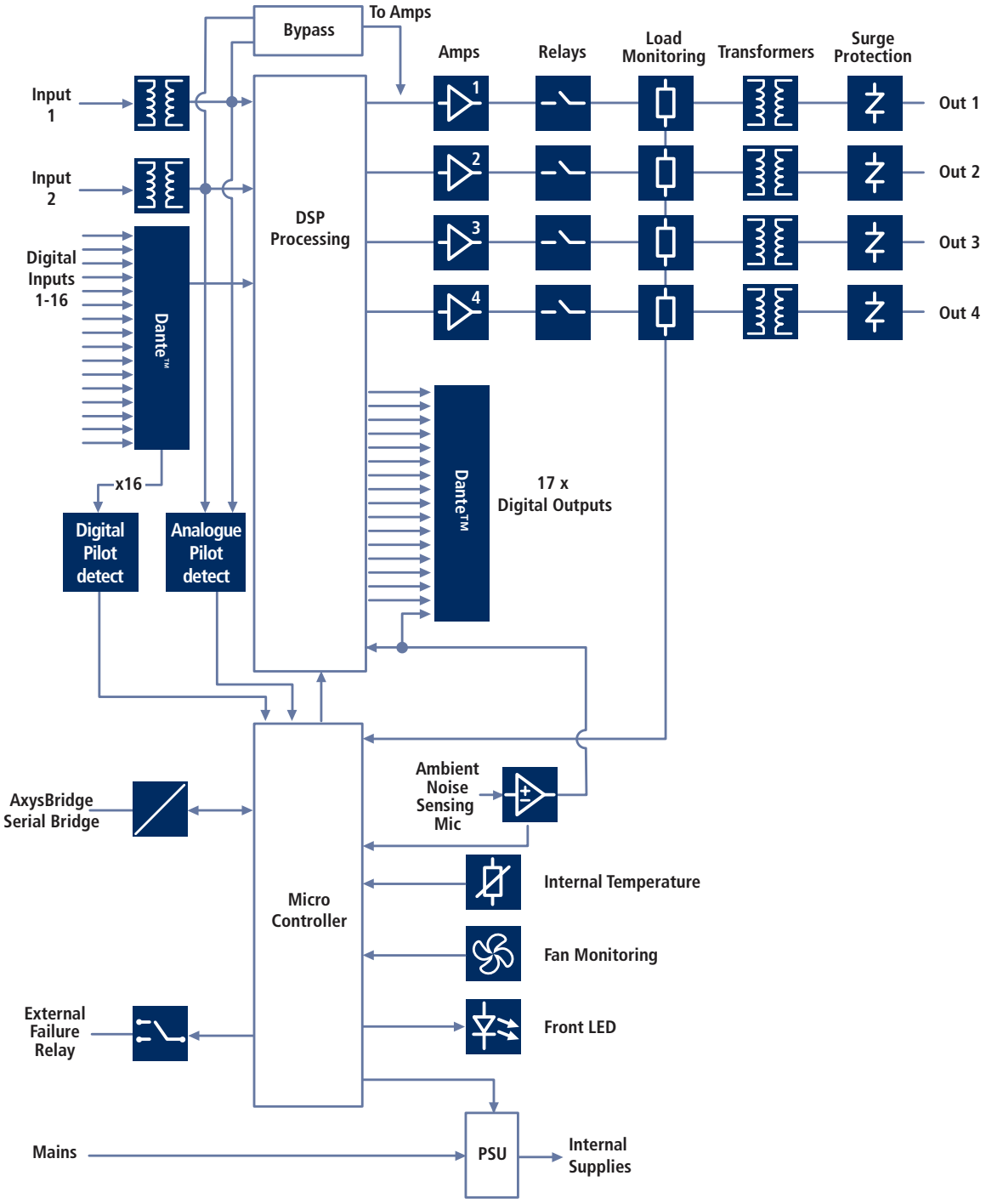


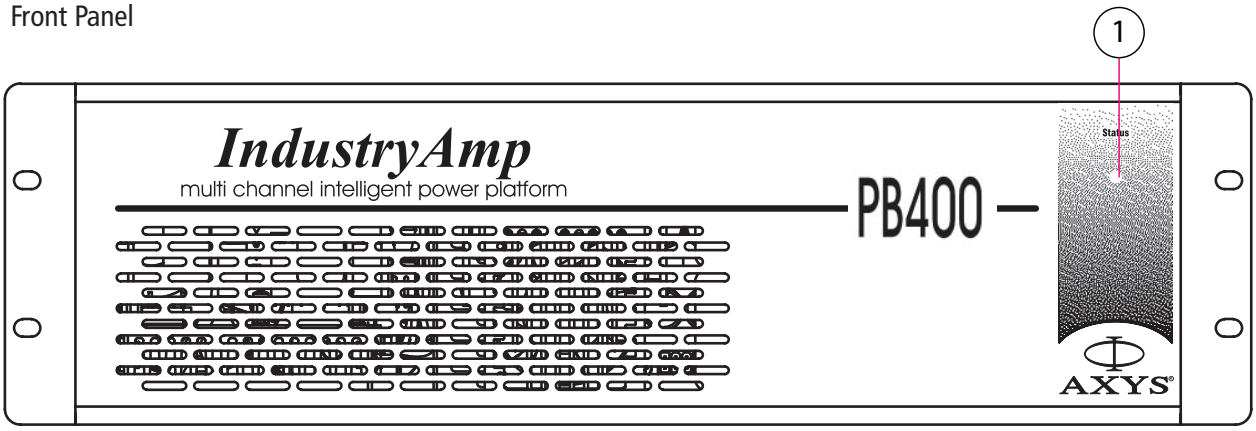

*Fig 6* THD+N vs output level, 1k Hz, 50 Ω load, output limiters with default params.

# 4. Functional Diagram (part number TUN-590404)



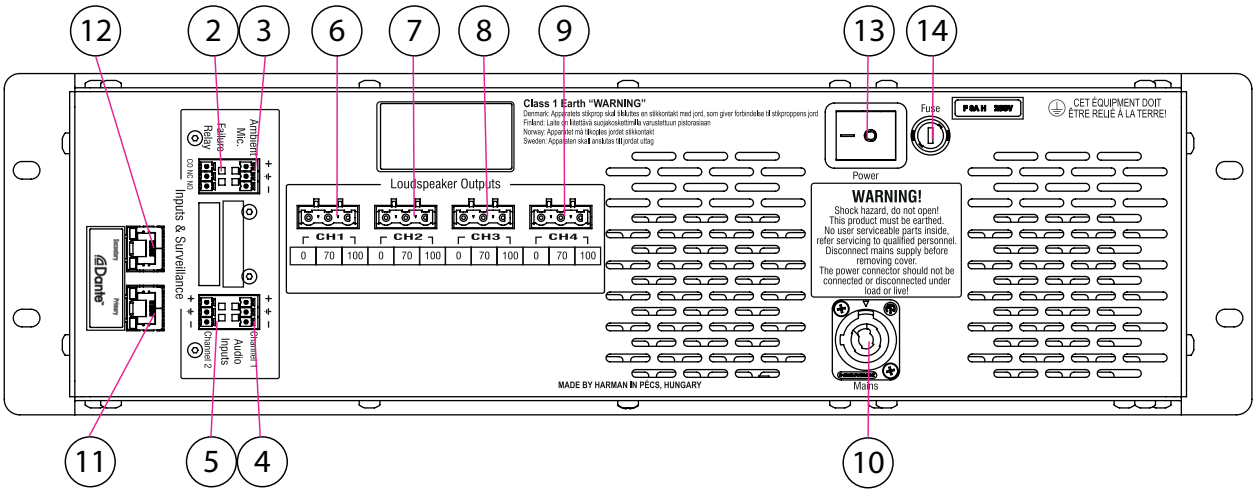
# 5. Mechanical Details (part number TUN-590404)

Front Panel



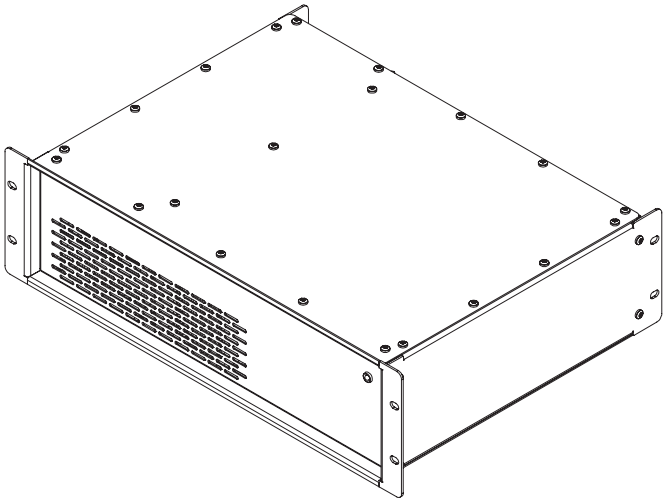

1. Status LED – bi-colour LED: normal (green), failure (red)

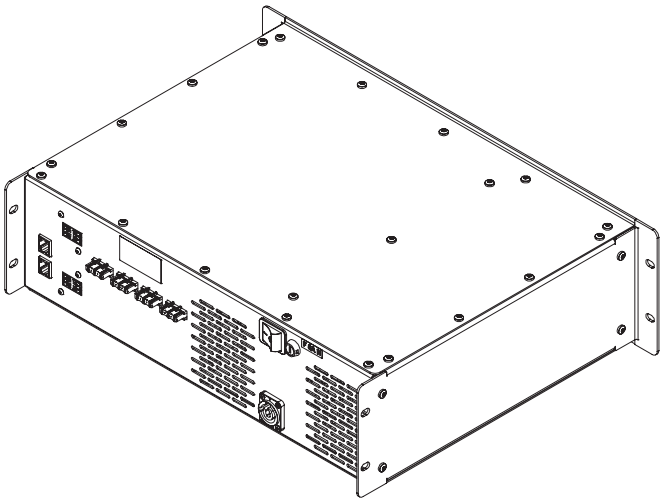
Rear Panel

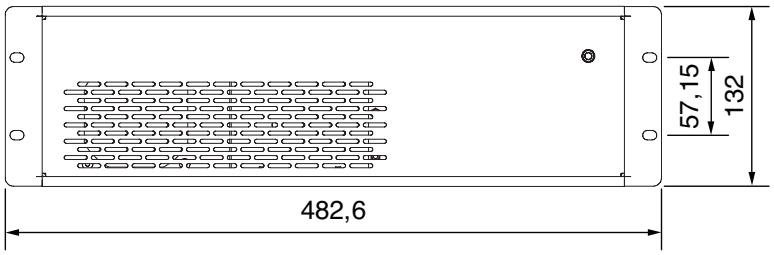


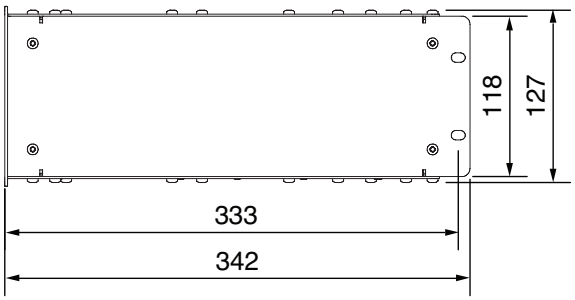

2. Failure relay connector
3. ANS microphone input
4. Analogue input 1
5. Analogue input 2
6. Output 1
7. Output 2
8. Output 3
9. Output 4
10. Mains power connector
11. Dante™ Primary Port
12. Dante™ Secondary Port
13. Mains switch
14. Mains fuse

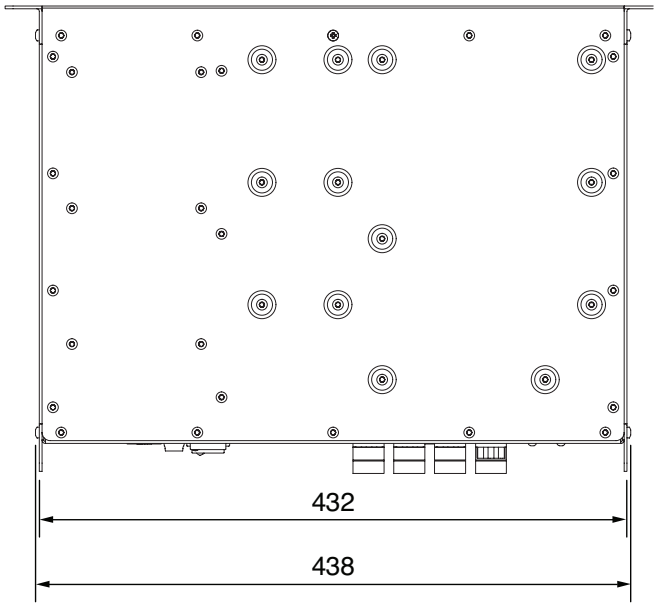
# 5. Mechanical Details (part number TUN-590404)





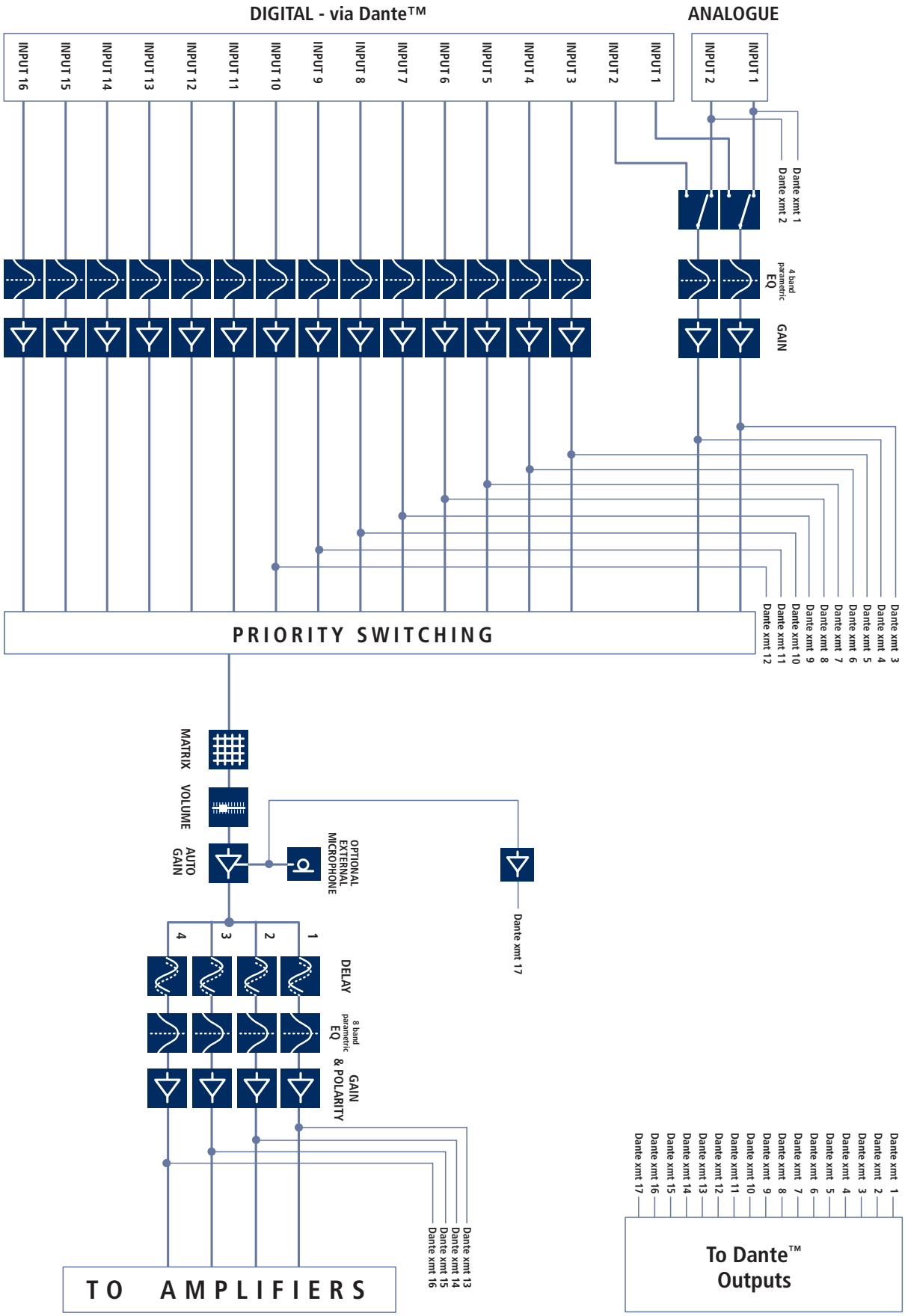



All dimensions in mm

# 6. DSP Block Diagram






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