

MAC Quantum™ Wash Acoustic Test Report



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Title

MAC Quantum Wash Acoustic Test Report

Test conditions

Test carried out according to ISO 3744:2010(E)

Device tested

Make: HARMAN Professional Denmark ApS

Test Date: August 20, 2014

Model: MAC Quantum Wash

Software version: 1.0.0

Results

An image of the test setup can be found on page 4. Test results are listed in Table 1 and Table 2 on pages 5 and 6.

HARMAN Professional Denmark ApS, R&D QA are responsible for the test results given in this report.

Environment

Temperature: 24.5°C Ta

Humidity: 53.4 %RH

AC mains power: 230 V, 50 Hz

Warm-up time: Minimum 20 minutes at full intensity.

Fixture placement: Fixture was placed at least one meter from walls and ceiling, as described in the Standard ISO 3744:2010(E)

Remarks

Test results apply only to the tested specimen.

Rev: (last five)	Made by:	Description:	Approved by:	Date approved:
A	Dennis Svane	MAC Quantum Wash Sound Measurement	Markus Klüsener	2017-09-21

Setup

The product was placed indoors in a hemi-anechoic chamber at the test facility of DELTA in Aarhus, Denmark (see Figure 1). The ceiling and walls were all acoustically absorbent and the floor was reflective. The main dimensions of the room were 12 m x 8 m x 4.5 m (length x width x height).



Figure 1: Test setup

The product was allowed a minimum of 20 minutes of warm-up time before measurements were performed.

Measurement method

Measurements were carried out using a setup with 3 microphones. The microphones were in turn moved to the measurement positions described below.

Measurement setup:

- Box measurement model
- 9 microphone positions in total
- Measurement surface area: 72.68 m²
- Measurement distance: 1 m to a reference box enclosing the test object

Instrumentation

Please refer to Page 7 for a full instrumentation list.

Results

The MAC Quantum Profile was measured in 2 different scenarios:

1. Idle, output intensity = 0%
2. Output intensity = 100%, Mode = Extended color, Fan Mode = Regulated fan

Sound Pressure Levels are listed in Table 1 below. Results of Sound Power Level measurements are listed in Table 2 on Page 6.

Sound Pressure Levels		
Distance from fixture	Scenario 1 [dB(A)]	Scenario 2 [dB(A)]
LpA at 0 m	41.8	51.1
LpA at 1 m	33.8	43.1
LpA at 4 m	21.8	31.1
LpA at 7 m	16.9	26.2

Sound Pressure Levels have been converted from Sound Power Levels using the formula:
 $LpA = (LwA - \text{reduction}_{\text{distance}})$

Reductions used: 8 dB(A)@1 m, 20 dB(A)@4 m, 24.9 dB(A)@7 m

Table 1: Sound Pressure Levels

The measurement results corrected for background noise are listed in the table below for 1/1-octave band and A-weighted values. Results marked with an (*) do not meet the 6 dB criterion in clause 4.2.1.1 of ISO 3744:2010(E) for the difference between measured sound power level and background noise.

1/1 Octave bands and A-weighted sound power levels

Measured Sound Power Levels		
1/1 Octave band, Hz	Scenario 1 [Lw, dB re.1pW]	Scenario 2 [Lw, dB re.1pW]
63 Hz	23.7*	21.9*
125 Hz	27.0*	30.2*
250 Hz	25.5*	35.8
500 Hz	35.3	44.8
1000 Hz	39.3	48.0
2000 Hz	30.7*	43.8
4000 Hz	28.1*	37.0
8000 Hz	25.6*	29.8*
A-weighted (LwA, dB re.1pW)	41.8	51.1

These results are corrected for background noise with a maximum of 2 dB only.

Results marked with a () do not meet the 6 dB criterion in clause 4.2.1.1 in ISO 3744:2010(E) for the difference between measured sound pressure level and background noise.*

Table 2: Measured Sound Power Levels

Instrumentation

No.	Equipment	Make	Type
02L021	Calibrator	Brüel & Kjær	4231
14L002	Data acquisition card	National Instruments	NI9233
06L061	½" Microphone	G.R.A.S	40AE
06L064	½" Microphone	G.R.A.S	40AE
06L067	½" Microphone	G.R.A.S	40AE
09L037	Preamplifier	G.R.A.S	26CF
09L038	Preamplifier	G.R.A.S	26CF
09L044	Preamplifier	G.R.A.S	26CF

Table 3: Instruments Used

The programs *noiseLAB Capture Professional version 3.0.17* and *Batch processor version 3.1.0* were used for recording and analysis. All instruments and programs are calibrated regularly in accordance with DANAK guidelines.

