DESIGN VERIFICATION TEST REPORT

Test Item	Interscale M
Identification	Interscale M 14825-297 Fan ebm-papst 8412 N
Test Order	Determine the total air flow and the acoustic noise of the case
Reported by	Daniel Dörflinger
Date	28.10.2013
Signature	

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1. Assessment

In this report you will find the measurement results of the **total air volume** of the case. The case was tested with the **test stand for air flow volume measurements** (description see page 6) at **normal operation**.

Furthermore you will find the measurement results of the **acoustic noise measurement**. The case was tested at **normal operation**. The description of the test equipment see page 7.

2. Description of the test

On the one hand the case was fixed to the **test stand for air volume measurements**. Operating voltage of the fans was 12V DC and the operating conditions for the fans were **maximum speed**.

On the other hand the case was placed on the floor and tested with the **sound intensity measuring method**. Operating voltage of the fans was 12V DC and the operating conditions for the fans were also **maximum speed and the measurement distance was 0,2m.**

2.1 Sample(s)

The Interscale case was equipped with following components:

- 2x axial fans, ebm-papst 8412 N

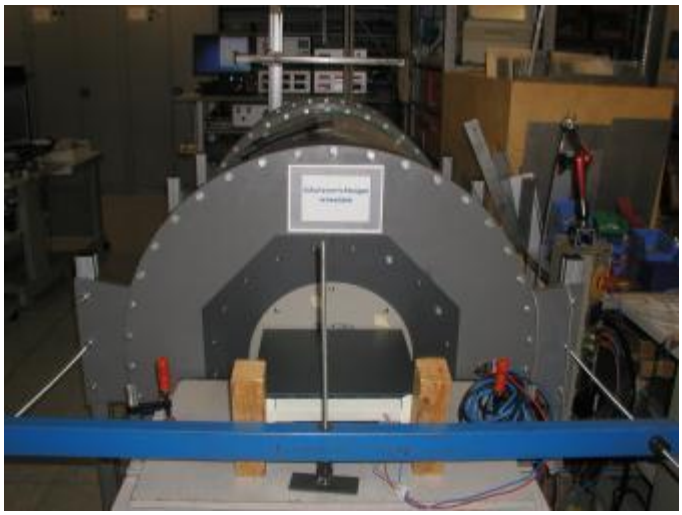

Figure 1 Interscale case fixed to Test stand for air flow volume measurement - 1

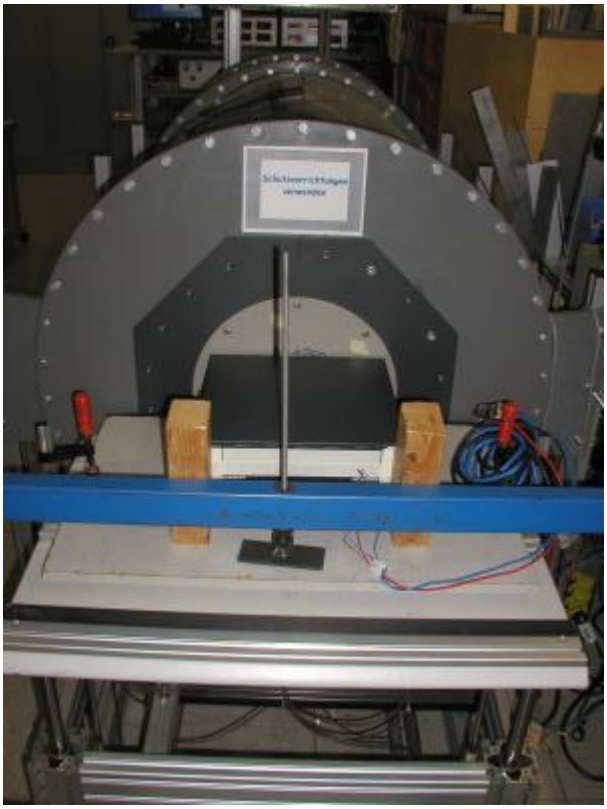

Figure 2 Interscale case fixed to Test stand for air flow volume measurement - 2

2.2 Test resources/equipment
Total air flow (Test stand for air flow volume measurements)

- Chamber test stand works on the vacuum side
  in accordance to DIN 24163

Figure 3 Test stand for air volume measurements

- Specially developed from the university of Cologne (Germany)

- Measurements:
  - Air flow volume of fans in cases, cabinets and systems
  - Determination, air drag characteristic curves of filter mats, perforations and openings
  - Fan comparison, air flow volume, speed, power input, power, AC, DC clamping

Figure 4 Power supply

- Output characteristic curves of fans with characteristic drag curves or characteristic systems curves
- Measurement equipment for the wind tunnel, Linseis Datalogger
- Power supply EA-PS 9080

Figure 5 Measurement equipment

Test equipment acoustic noise

Figure 6 Test equipment acoustic noise measurements

- Measurement of the sound intensity in accordance to DIN EN ISO 9614-2
- Determination of the sound power with the results from the sound intensity measurement
- Measurement in all rooms with constant background sound possible
- Determination of frequency spectrums of all measurement areas
- Measurement of sound pressure level
- Measurement of mechanical vibration (oscillating acceleration) with acceleration sensor
- Sound Intensity Investigator B & K – 2260
- Microphone B & K – 4181
- Sound Level Calibrator B & K - 4231
- Power supply EA-PS 9080


Figure 7 Power supply

2.3 Fan

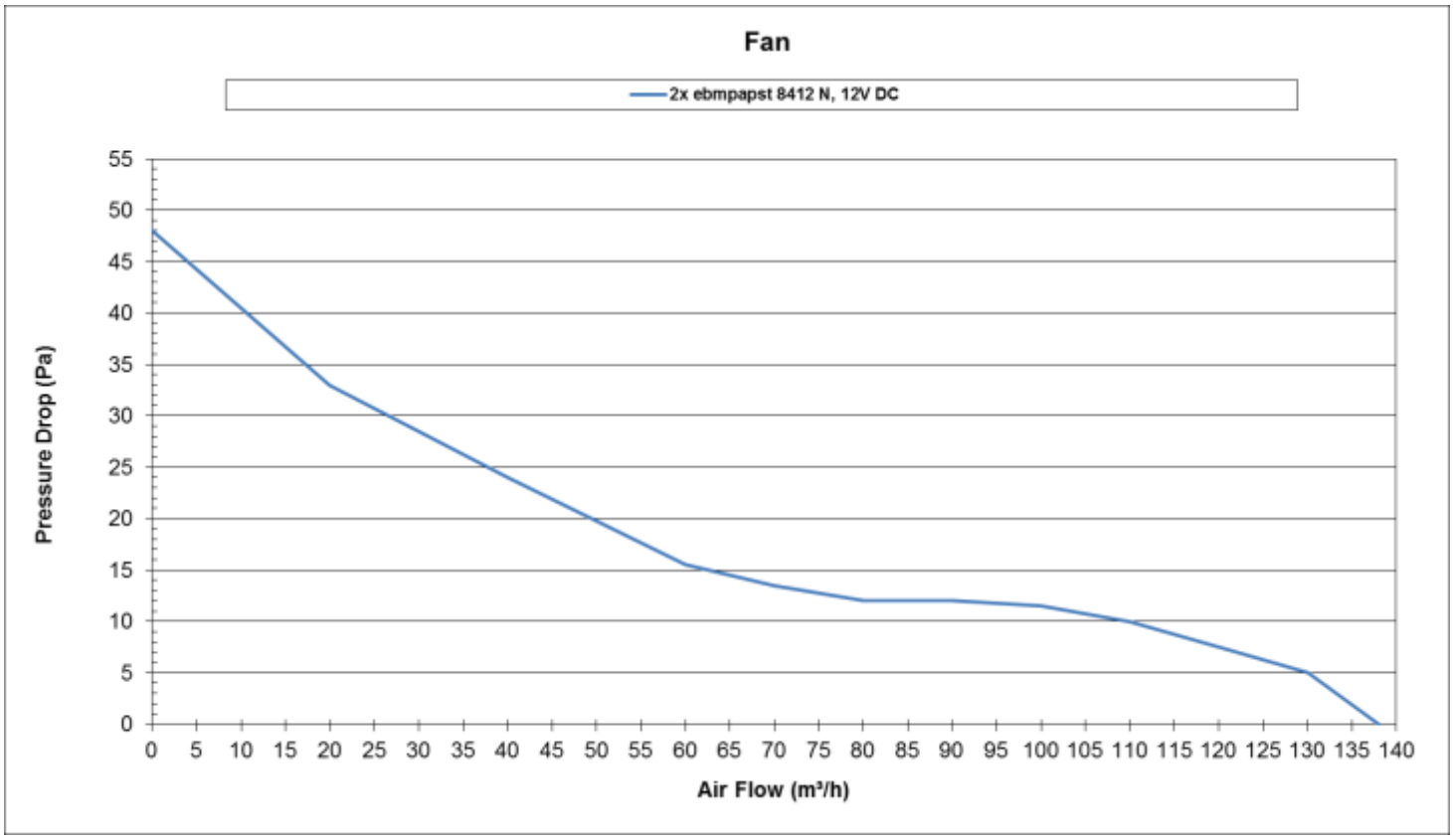

Figure 8 ebm-papst 8412N

3. Results

3.1 Pull cooling with ebm-papst 8412 N and without impedance

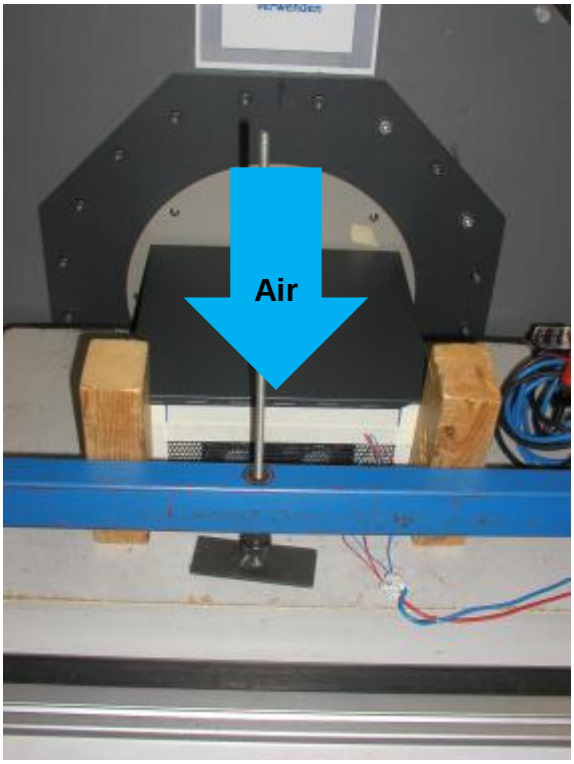

Figure 10 Pull cooling without Impedance-1

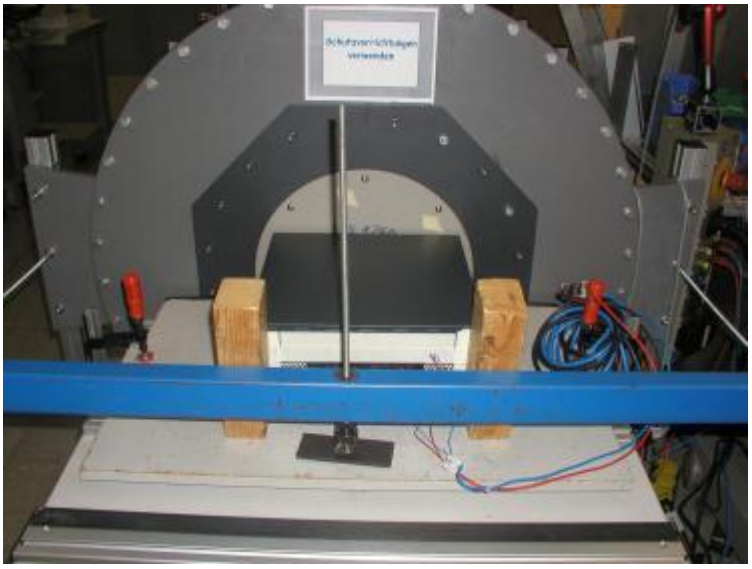

Figure 9 Pull cooling without Impedance-2

	without Impedance	
	[m³/h]	[cfm]
Bulk air flow	87	51

Table 1 Pull cooling without impedance

3.2 Pull cooling with ebm-papst 8412 N and with impedance

Figure 11 Impedance

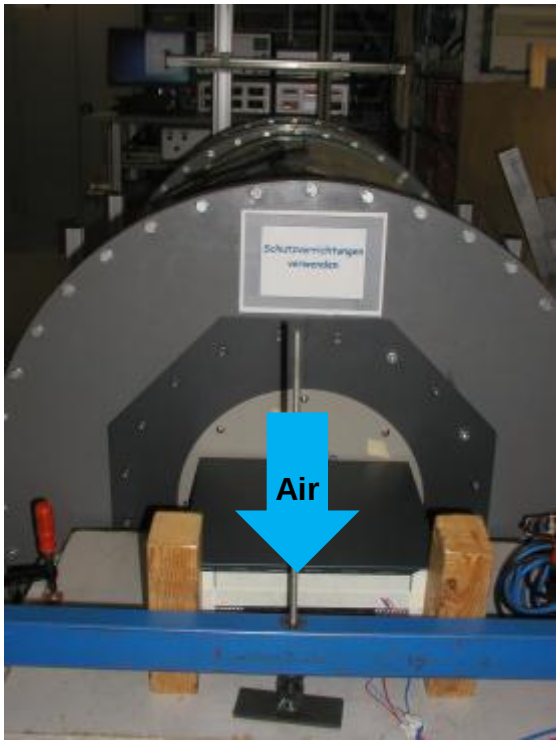

Figure 12 Case with Impedance

	with Impedance	
	[m³/h]	[cfm]
Bulk air flow	84	49

Table 2 Pull cooling with impedance

3.3 Advice-1

To get the best working point for the fans, the distance between air inlet and impedance has to be approx. 20,0mm.

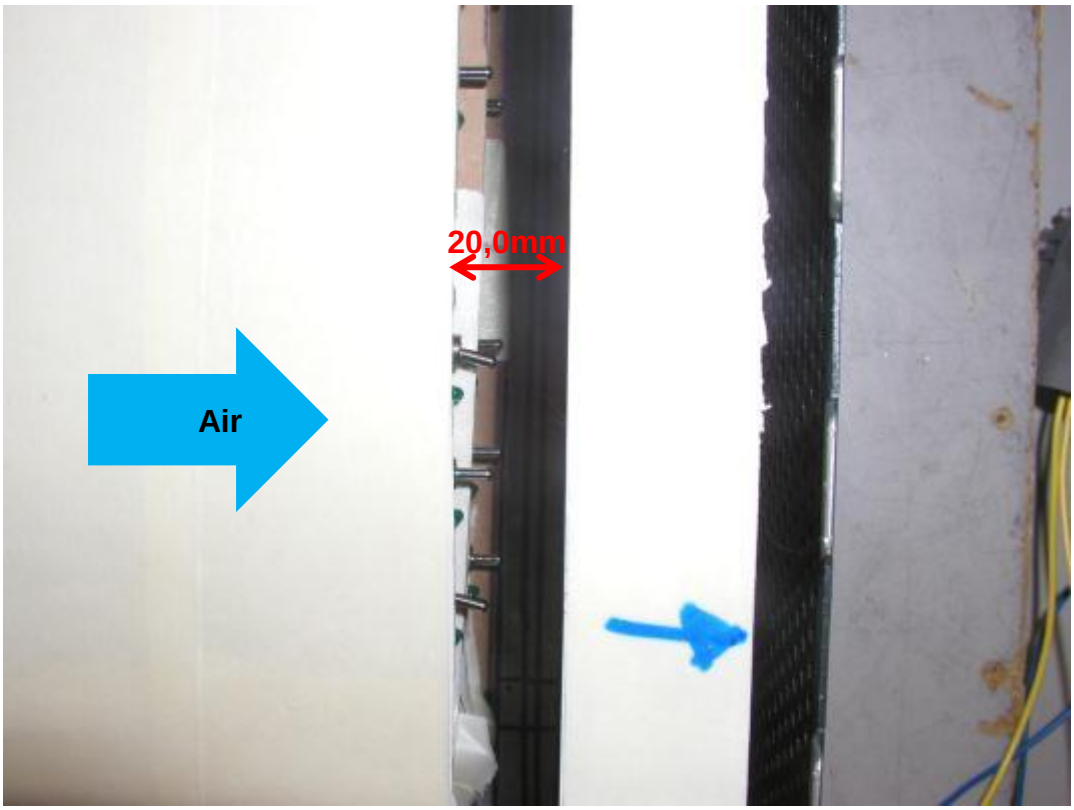

Figure 13 Advice-1

3.5 Push cooling with ebm-papst 8412 N and without impedance

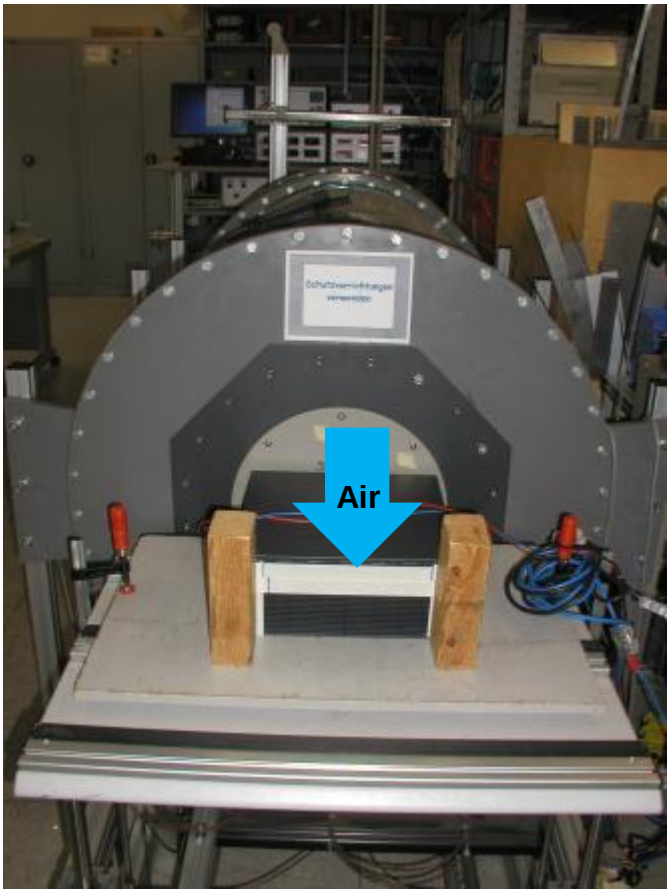

Figure 14 Push cooling without Impedance-1

	without Impedance	
	[m³/h]	[cfm]
Bulk air flow	92	54

Table 3 Push cooling without impedance

3.6 Push cooling with ebm-papst 8412 N and with impedance

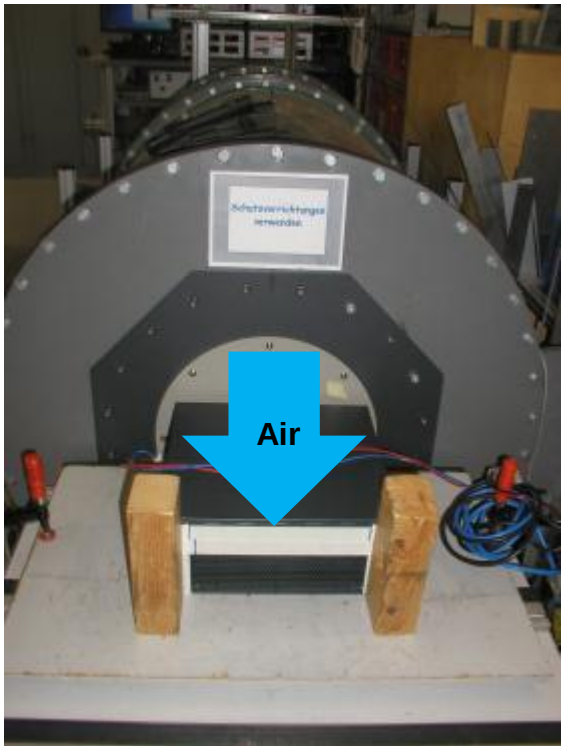

Figure 16 Push cooling with Impedance-1

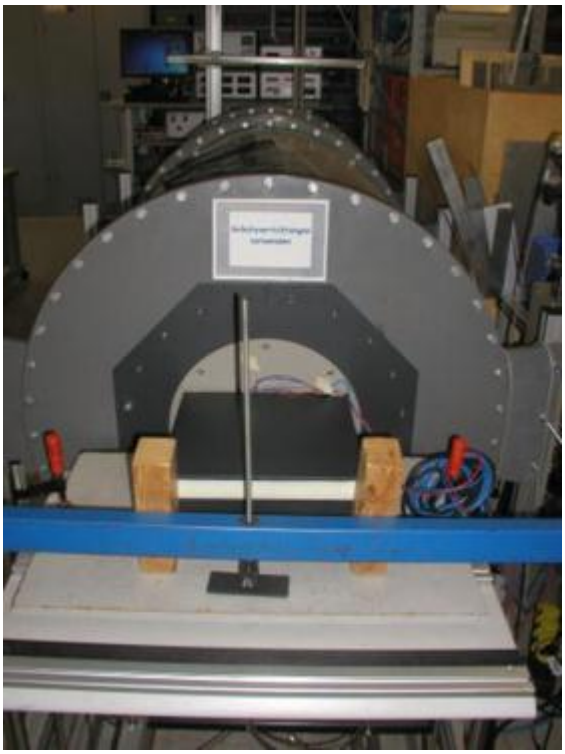

Figure 15 Push cooling with Impedance-2

	with Impedance	
	[m³/h]	[cfm]
Bulk air flow	88	52

Table 4 Push cooling with Impedance-1

3.7 Advice-2

To get the best working point for the fans, the distance between air outlet and impedance has to be approx. 20,0mm.

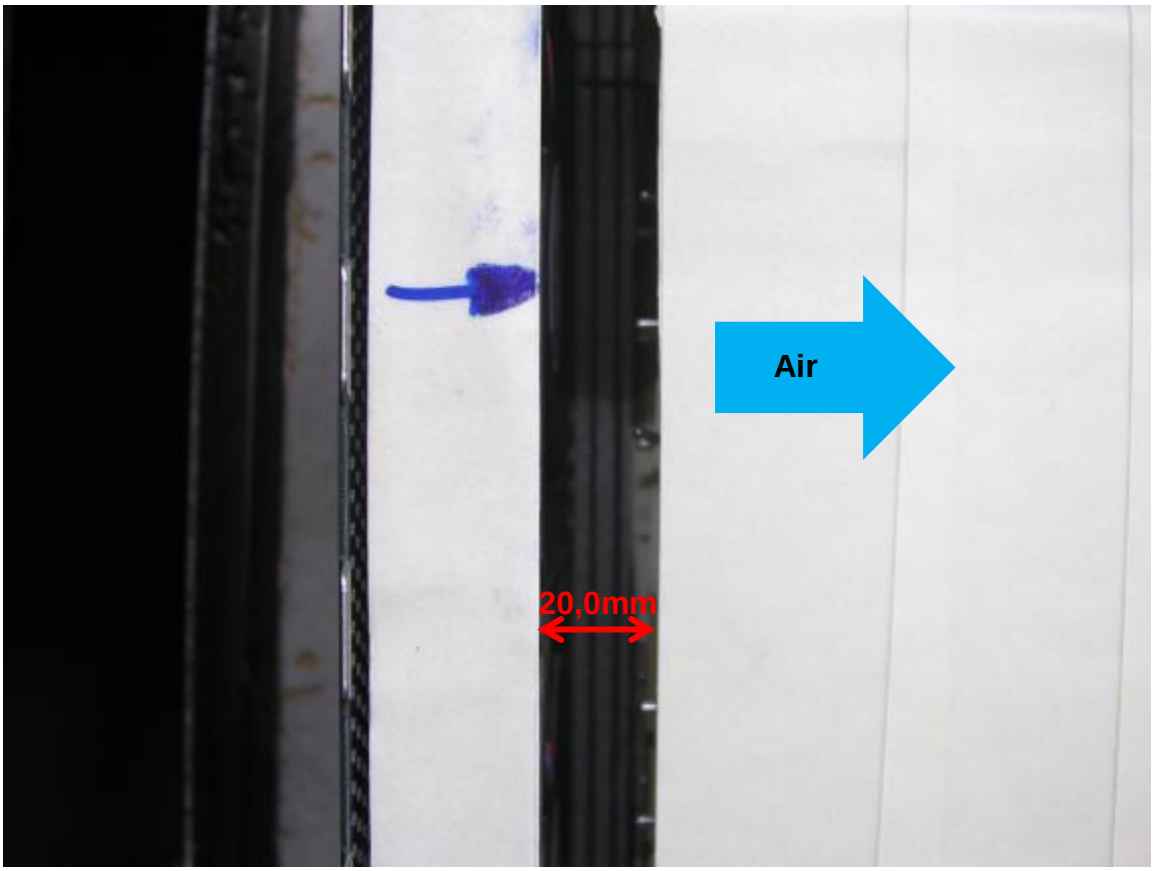

Figure 17 Adice-2

3.8 Comparison Push vs. Pull (with Impedance) ebm-papst 8412 N

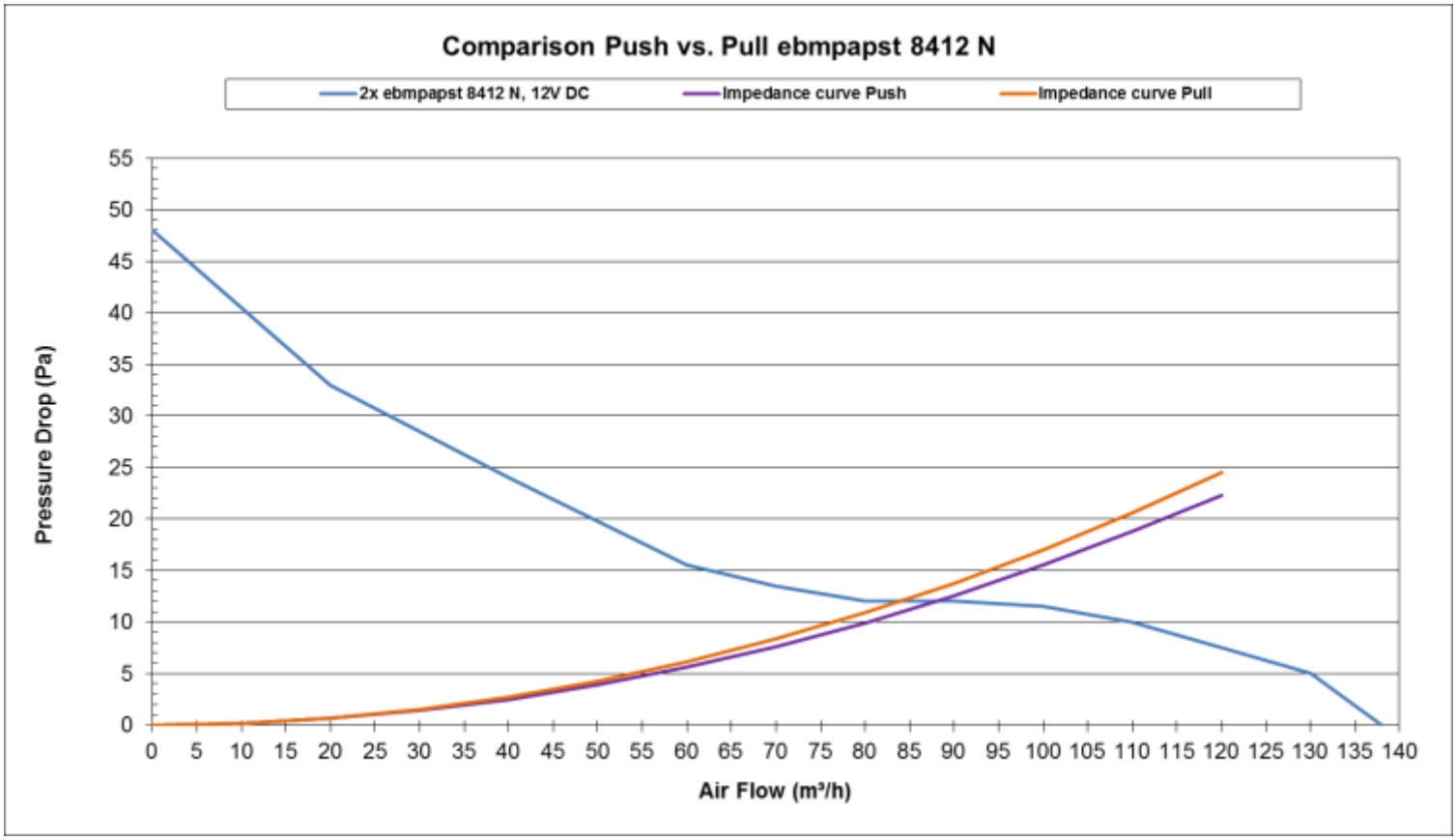

Figure 18 Comparison Push vs. Pull ebm-papst 8412 N

3.9 Résumé

	ebm-papst 412			
	Pull cooling		Push cooling	
	[m³/h]	[cfm]	[m³/h]	[cfm]
Without Impedance	87	51	92	54
With Impedance	84	49	88	52

Table 5 Résumé

4. Acoustic Noise

Fan	**Sound Power L_{WA} [dB(A)]**	Sound Pressure L_{PA} [dB(A)] 0,2m distance
ebm-papst 8412 N	54,2	54,7

Table 6 Acoustic Noise

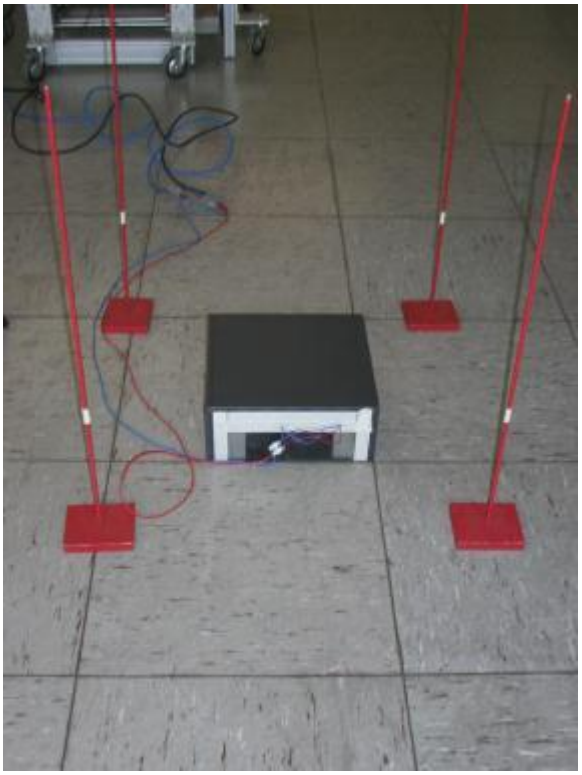

Figure 20 Measurement setup Acoustic Noise-1

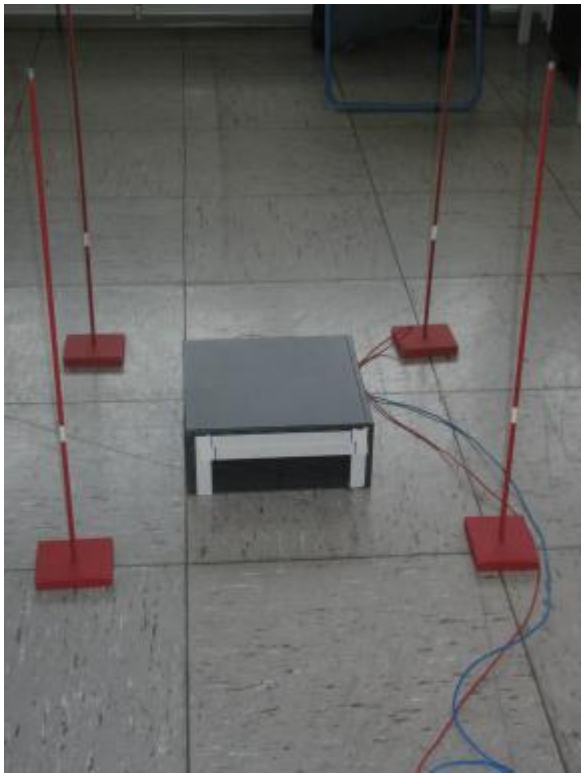

Figure 19 Measurement setup Acoustic Noise-2