

TÜV Rheinland Energy & Environment GmbH

Environmental Protection / Noise Control

Accredited test institute



**Test report on noise measurements performed
for the Air-to-Water Heat Pump Split Unit WH-
WXG12ME8 / WH-ADC0316M9E82 manufactured
by Panasonic Heating & Ventilation Air-
conditioning Europe**

TÜV Report No.: EuL/21265179/01A
Cologne, 2024-10-02

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1 Definition of Task

Determination of sound power level emitted by Air Water Heat Pump Split Unit Heat Pump Split Unit WH-WXG12ME8 / WH-ADC0316M9E82 manufactured by Panasonic Heating & Ventilation Air-conditioning Europe in accordance with EN 12102-1 [3]. The measurements were on September 22th, 2024 in the Test Centre for Energy Appliance of TUV Rheinland Energy & Environment GmbH in Cologne.

2 Test Object

Product name	WH-WXG12ME8 / WH-ADC0316M9E82
Type	Air Water Heat Pump Split Unit
Model	WH-WXG12ME8 / WH-ADC0316M9E82
Manufacturer	Panasonic Heating & Ventilation Air-conditioning Europe
Year of construction	2024
Serial no.	WH-WXG12ME8 / WH-ADC0316M9E82
Production number	WH-WXG12ME8 / WH-ADC0316M9E82
Production date	2024

Product photo: WH-WXG12ME8 / WH-ADC0316M9E82





shown in the following tables. The dimensions of the entire stepped surface consisting of the entire noise wall, front, right and left side:

$$L_{NW} = 1000 \text{ m}, H_{NW} = 1000 \text{ m}, H_{NW} = 1000 \text{ m}$$

Figure 2.1: Measuring points for determining the sound power level of the noise wall



2.4 Measurement results

The following tables show the measurement results in an overview. The applied measurement methods are the ISO 3745:2009-05 and the ISO 3746:2009-05 as well as the abbreviations in the following tables are described in Appendix 1, page 12 and Appendix 2, page 13.

2.2.1 Measurement results for the outdoor unit at operating point 1

Table 2.2.1 Measurement results Outdoor unit at operating point 1

Frequency	Sound power level $L_{w,i}$ according to EN ISO 9613-1							
	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency	PL	PL
125 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	5000 Hz	8000 Hz
125	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
250	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
500	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
1000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
2000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
4000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
5000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
8000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
10000	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
1 octave band	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2
1 octave band	85.2	85.2	85.2	85.2	85.2	85.2	85.2	85.2



Measurement uncertainty

The sound power level was determined in accordance with EN ISO 9613-1:2009. The standard deviation of the sound power level according to EN ISO 9613-1:2009 is ± 1 dB. At a confidence level of 95%, the real value of the outdoor sound power level lies in the interval of ± 1 dB around the measured value.



2.2.2 Measurement results for the outdoor unit at operating point 2

Table 2.2: Measurement results Outdoor unit at operating point 2

Frequency	Sound power level L_{WA} according to EN ISO 9613-1							
	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency
125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	16000 Hz	31500 Hz
125	125	125	125	125	125	125	125	125
250	125	125	125	125	125	125	125	125
500	125	125	125	125	125	125	125	125
1000	125	125	125	125	125	125	125	125
2000	125	125	125	125	125	125	125	125
4000	125	125	125	125	125	125	125	125
8000	125	125	125	125	125	125	125	125
16000	125	125	125	125	125	125	125	125
31500	125	125	125	125	125	125	125	125
1/3 octave band	125	125	125	125	125	125	125	125
1 octave band	125	125	125	125	125	125	125	125



Measurement uncertainty

The sound power level was determined in accordance with EN ISO 9613-1:2009. The standard deviation of the sound power level estimate is ± 1 dB. At a confidence level of 95%, the real value of the outdoor sound power level lies in the interval of ± 1 dB around the measured value.

2.2.2 Measurement results for the outdoor unit at operating point 2

Table 2.2: Measurement results Outdoor unit at operating point 2

Frequency	Sound power level $L_{w, \text{outdoor unit}}$ according to EN ISO 9613-1							
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	16000 Hz
$L_{w, \text{outdoor unit}}$	85	85	85	85	85	85	85	85
125 Hz	85	85	85	85	85	85	85	85
250 Hz	85	85	85	85	85	85	85	85
500 Hz	85	85	85	85	85	85	85	85
1000 Hz	85	85	85	85	85	85	85	85
2000 Hz	85	85	85	85	85	85	85	85
4000 Hz	85	85	85	85	85	85	85	85
8000 Hz	85	85	85	85	85	85	85	85
16000 Hz	85	85	85	85	85	85	85	85
$L_{w, \text{outdoor unit}}$	85	85	85	85	85	85	85	85
$L_{p, \text{outdoor unit}}$	85	85	85	85	85	85	85	85



Measurement uncertainty

The sound power level was determined in accordance with EN ISO 9613-1:2018. The standard deviation of the sound power level amounts to ± 1 dB. At a confidence level of 95%, the real value of the outdoor sound power level lies in the interval of ± 1 dB around the measured value.

2.4.2 Measurement results for the outdoor unit at operating point 2

Table 2.1: Measurement results Outdoor unit at operating point 2

Frequency	Sound power level L_{WA} according to EN ISO 9612-1							
	1/1 octave	1/3 octave	1/3 octave	1/3 octave	1/3 octave	1/3 octave	1/3 octave	1/1 octave
125 Hz	85	85	85	85	85	85	85	85
160 Hz	85	85	85	85	85	85	85	85
200 Hz	85	85	85	85	85	85	85	85
250 Hz	85	85	85	85	85	85	85	85
315 Hz	85	85	85	85	85	85	85	85
400 Hz	85	85	85	85	85	85	85	85
500 Hz	85	85	85	85	85	85	85	85
630 Hz	85	85	85	85	85	85	85	85
800 Hz	85	85	85	85	85	85	85	85
1000 Hz	85	85	85	85	85	85	85	85
1250 Hz	85	85	85	85	85	85	85	85
1600 Hz	85	85	85	85	85	85	85	85
2000 Hz	85	85	85	85	85	85	85	85
2500 Hz	85	85	85	85	85	85	85	85
3150 Hz	85	85	85	85	85	85	85	85
4000 Hz	85	85	85	85	85	85	85	85
5000 Hz	85	85	85	85	85	85	85	85
6300 Hz	85	85	85	85	85	85	85	85
8000 Hz	85	85	85	85	85	85	85	85
10000 Hz	85	85	85	85	85	85	85	85
1 octave total	85	85	85	85	85	85	85	85
1/3 octave total	85	85	85	85	85	85	85	85



Measurement uncertainty

The sound power level was determined in accordance with EN ISO 9612-1:2018. The standard deviation of the sound power level estimate is ± 1 dB. At a confidence level of 95%, the real value of the outdoor sound power level lies in the interval of ± 1 dB around the measured value.

Table 1.10 Measurement results for the outdoor unit at operating point 2

Table 1.10

Measurement results Outdoor unit at operating point 2

Frequency	Sound power level $L_{w,f}$ according to EN ISO 9613-1							
	1/3 octave	1 octave	1 octave	1 octave	1 octave	1 octave	1/3 octave	1 octave
125 Hz	dB	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB	dB
125	85.0	85.0	85.0	85.0	85.7	85.0	85.7	85.0
160	85.0	87.0	85.0	85.7	87.0	85.0	87.0	87.0
200	75.0	85.0	85.0	85.0	85.0	85.0	85.0	85.7
250	75.0	77.0	85.0	85.7	85.0	85.0	85.0	85.0
315	85.0	85.0	87.0	85.0	87.0	85.0	85.0	85.0
400	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
500	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
630	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
800	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
1000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
1250	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
1600	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
2000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
2500	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
3150	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
4000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
5000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
6300	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
8000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
10000	85.0	85.0	87.0	85.0	85.0	85.0	85.0	85.0
1 octave 1/3	85.0	85.0	85.7	85.0	85.0	85.0	85.0	85.0
1 octave 1/1	85.0	85.0	85.7	85.0	85.0	85.0	85.0	85.0

Sound power level $L_{w,f}$ in dB(A)



Measurement uncertainty

The sound power level was determined in accordance with EN ISO 9613-1:2009. The standard deviation of the sound power level estimate is ± 1 dB. At a confidence level of 95%, the real value of the outdoor sound power level lies in the interval of ± 1 dB around the measured value.

Alter in Jahren	Anzahl der Mitarbeiter
18-24	25
25-34	45
35-44	35
45-54	35
55-64	30
65-74	30
75-84	35
85-94	35
95-104	30
115+	85

Table 2.10: Measurement results for the noise level at operating point 2

Table 2.10: Measurement results for the noise level at operating point 2

Frequency	Sound power level L_{WA} according to DIN EN 12518						
	L_{WA} dB(A)	L_{WA} dB(A)	L_p dB	L_p dB	L_p dB(A)	L_p dB	L_{WA} dB(A)
50	75.2	75.2	7.2	8.2	8.2	71.2	75.2
63	74.8	75.1	7.2	8.1	8.2	71.2	75.1
80	75.2	75.2	7.2	7.8	8.2	71.2	75.2
100	71.2	81.1	7.2	8.7	8.8	71.2	71.2
125	75.2	80.5	7.2	7.7	7.8	71.2	75.2
160	75.1	75.8	7.2	7.7	8.7	71.2	75.1
200	74.8	76.1	7.2	7.8	71.2	71.2	74.8
250	74.8	74.8	7.2	7.7	71.2	71.2	74.8
315	71.2	71.2	7.2	7.2	8.2	71.2	71.2
Sum 1/3 octave	75.2	75.1	7.2	8.7	75.2	71.2	75.2
Sum 1 octave	75.2	75.2	7.2	8.7	75.2	71.2	75.1



Measurement uncertainty

The sound power level was determined in accordance with DIN EN 12518 (2). The standard deviation of the sound power level amounts to 1 dB. At a confidence level of 95%, the upper value of the 1/3 octave sound power level lies in the interval of 0.5 dB above the measured value.



Age Group	Number of Employees
18-24	120
25-34	150
35-44	130
45-54	130
55-64	110
65-74	110
75-84	120
85-94	130
95-104	130
105-114	110
115-124	150

Kategorie	Anzahl der Ereignisse (in %)
1	35
2	45
3	55
4	55
5	35
6	40
7	45
8	55
9	55
10	40
11	95



4 Summary of results

TUV Rheinland Energy GmbH was commissioned to determine the sound power level L_{WA} emitted by Air Water Heat Pump Split Unit WH-WXG12ME8 / WH-ADC0316M9E82 manufactured by Panasonic Heating & Ventilation Air-conditioning Europe in accordance with EN 12102-1 [3]. The measurements were performed on September 22th, 2024 in the Test Centre for Energy Appliance of TUV Rheinland Energy & Environment GmbH in Cologne.

The following table shows the results in an overview:

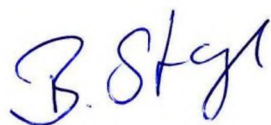
Table 4.1: *Measurement results*

Operating Conditions	1	2	3	4	5	6
	A7W55 (full load)	A7W55 (ErP - C)	A7W55 (silent mode 3)	A7W65 (full load)	A2W42 (part load)	A2W30 (part load)
Panasonic Testmode	23	20	no test mode	79	17	12
Compressor frequency n [U/min]	41	21	17	41	24	25
Fan frequency min [U/min]	420	300	180	190	610	610
Fan frequency max [U/min]	420	290	170	190	600	610
Internal hydraulic pump performance [%]	73	73	38	N/A	71	70
Flow temperature [°C]	54.9	54.9	54.9	65.0	41.9	30.1
Return temperature [°C]	47.1	46.8	51.0	55.0	33.9	25.0
Air inlet temperature [°C]	7.2	7.1	7.2	7.1	2.1	2.1
Volume flow [l/h]	1443	553	952	1144	751	1191
Relative humidity [%]	87	86	85	84	85	85
Heating capacity Q_c [kW]	13.069	5.119	4.180	13.197	6.926	6.937
Electrical power consumption P [kW]	3.721	1.818	1.517	5.055	1.800	1.430
Outdoor Unit: L_{WA}, Outdoor Unit in dB(A)	57	52	49	59	64	64
Indoor Unit: L_{WA}, Indoor Unit in dB(A)	31	30	30	31	31	31

The sound power level of the outdoor Unit was determined in accordance with EN ISO 3743-1 [5] or EN ISO 3744 [6]. The standard deviation of the sound power level amounts to 1.5 dB. At a confidence level of 95%, the real value of the A-rated sound power level lies in the interval of ± 3 dB around the measured values.

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Cologne, 2024-10-02
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Appendix 5 Bibliography

- (1) Directive 2002/49/EC of the European Parliament and of the Council of 26 June 2002 on the approximation of the laws of the Member States relating to the noise emitted in the environment by transport for use outdoors.
- (2) Directive 2002/49/EC of the European Parliament and of the Council of 26 June 2002 on the approximation of the laws of the Member States relating to the noise emitted in the environment by transport for use outdoors. A report produced for the European Commission, December 2001.
- (3) EN ISO 12813-1: Acoustics. Road traffic noise prediction. Part 1: Prediction of noise with statistically strong components for urban road traffic and railway. Measurement of reference noise. Determination of the sound power level. July 2003.
- (4) EN ISO 12813-2: Acoustics. Road traffic noise prediction. Part 2: Prediction of noise with statistically strong components. Determination of the sound power level. Part 2: Road using motor vehicles. German version EN 12813-2:2003.
- (5) EN ISO 12813-1: Acoustics. Determination of sound power levels and sound energy levels of noise sources using sound pressure. Engineering methods for small movable sources in measurement fields. Part 1: Comparison method for a semi-reflecting test room. October 2010.
- (6) EN ISO 12813: Acoustics. Determination of sound power levels and sound energy levels of noise sources using sound pressure. Engineering methods for an anechoic test field over a reflecting plane. February 2011.
- (7) EN 12813-1: Acoustics. Determination of sound power levels. Part 1: Specifications. July 2010.
- (8) EN 12813-2: Acoustics. Determination of sound power levels of noise sources using sound intensity. Part 2: Measurement by scanning.

Appendix 2: Measurement Methods in accordance with DIN 12102

2.1 Scope of standard DIN EN 12102-1:2017

Standard DIN 12102-1 forms the basis for measurement of stationary soundpower levels in the following, in accordance with a standardized procedure. The sound power level method can be used for the surrounding air by all conditions, free sound, free reflecting surfaces, all stationary sound conditions other than for space heating and/or cooling, including water under hot light systems, as described in DIN 12102-1 and subconditions as described in DIN 12102-1.

Standard DIN 12102-1 offers ways to determine the sound power level of noise. Some of them are specifically adapted to provide results with low uncertainty by using stationary state sound methods under highly controlled working conditions. These measurements are suitable for certification, testing and testing purposes.

In some cases, the range under the environment of the measurements do not allow such stationary state methods. The European Standard also offers ways to obtain sound power levels with acceptable accuracy even though sound methods under working conditions are not stationary type, e.g. in situ or quality control measurements.

Standard DIN 12102-1 gives two classes of measurements and results according to the test environment.

- a) **Class A measurements** correspond to controlled working conditions intended to apply under working conditions. It is defined by the report in the references of Table A.2.1, page 27 and should be used for the conformity to requirements of the Commission Regulation (EC) No 2000/12/EC and Directive 2002/90/EC implementing Directive 2000/14/EC of the European Parliament and of the Council with regard to working requirements for all conditions.
- b) **Class B measurements** correspond to the case where the range defined by the test areas of Table A.2.1, page 27, cannot be fulfilled.

In both classes, precision or engineering class sound methods should be applied. The choice of the sound measurement method is done in accordance with DIN EN 12102-1 and DIN EN 12102-2 depending on the type of surrounding sound field (free or free field, or closed or open space) and the available instrumentation.

8.2.2 Requirements for instruments used for Class A measurements

The instruments used for measuring and evaluation shall comply with the requirements of the standards appropriate to the test method used. They should not require periodic recalibration.

To support Class A measurements, the instruments necessary to collect the testing data shall meet the requirements of Table 2.

Table 2.2.1: Requirements for instruments used for Class A measurements

Measured quantity	ISO	Accuracy of measurement
Level		
Frequency response	1	±0.2%
Weighting filter	±0.5	±0.5%
Level		
Frequency response	1	±0.2%
Weighting filter	±0.5	±0.2%
Time constant	1	±0.2%
Stability	1	±0.2%
Resolution	1	±0.2%
Linearity	1	±0.2%
Repeatability	1	±0.2%
Drift	1	±0.2%
Temperature stability	1	±0.2%
Humidity stability	1	±0.2%
Power supply	1	±0.2%
Measurement uncertainty	1	±0.2%

8.2.3 Requirements for the operation of the tested unit

As a general rule, the sound power level is dependent on the operating conditions of the unit. Sound measurements shall be carried out at the standard operating rating conditions. The unit shall be installed and connected to the test as recommended by the manufacturer in its installation and operation manual according to EN 12345-1:2012. The accessories provided by option for complete testing elements shall not be included in the test. Steady state conditions of operation of the appliances are considered achieved and maintained when all the measured quantities remain constant with respect to the maximum value in Table 2. The noise measurement shall be carried out under free field conditions under steady state conditions of the appliance. These steady state conditions shall be maintained during the sound pressure or other data measurements that may require free field conditions and/or in conditions covered by the test method. This requires the continuous recording of the measuring data. The uncertainty of each measurement shall not exceed the values specified in the following Table 2.2.2.

If space around objects or components are not available, only engineering or survey methods can be applied, such as DIN EN 12544, DIN EN 12544-1 or DIN EN 12544-2.

The resulting certification is applicable if deviations from limits do not occur. Cases of noise increases are reported.

However, acoustic methods such as DIN EN 12544, DIN EN 12544-1 and DIN EN 12544-2 are recommended as they lead to the smallest air pollution. Measurements using engineering methods, DIN EN 12544, DIN EN 12544-1 and DIN EN 12544-2 are also allowed, even if their uncertainty is higher, as these prevent an over-estimating risk level of accuracy/measurement costs.

When only open space is available, the operating conditions can usually not be fulfilled due to measurements. The result cannot be considered as standardized level of acoustic pressure. Results could be used, in that case, the results are considered as specific for an operating condition. The test report must mention "non-standard condition" and give the details of actual working conditions.

6.2.2 Reverberation room methods

The conditions and the room design must comply with DIN EN 12544-1 or DIN EN 12544-2.

6.2.2.1 Reverberation cells

To determine the sound power level $L_{w,i}$ of a complete unit without ducts, the unit shall be in position inside the reverberation room with a minimum distance of at least 1.5 m from the walls and with one (Figure 6.2.2.1) or two (Figure 6.2.2.2) reflecting surfaces to position the unit into the room with its intake side parallel to the wall (a), with an angle of 30°-60° to avoid additional air flow in ducts.

Figure 8.2.2.1 Measurement of L_{pA} at sound-absorbing walls



Non-absorbed walls

To determine the sound power radiated by the ceiling, the wall shall be installed into the room, with ducts connected to the outside through the wall. Care shall be taken to avoid possible reflection of ducts. To determine the sound power level L_{pA} , the wall shall be installed outside the measuring room. The ducts shall be set into the sound-absorbing room. The arrangement, construction, and setting of the length of the ducts shall be as described above. The ducts shall come into the wall according to Figure 8.2.2.2.

Figure 8.2.2.2 Measurement of L_{pA} with duct penetrating wall



5.2.2 Installation of the free field over a reflecting plane method

The environment of measurement shall be in accordance with 5.1.2.1. The set-up of the free field is shown in Figure 5.2.2. It is recommended to use the hemisphere of measurement surface method, which leads to reduced level of uncertainty, see 5.1.2.1.2.

The mode of use can be considered:

- a) with diffuse sound: the reference surface is specified in 5.1.2.1.2.1.
- b) with self sound: the reference surface shall include the boundary of the duct and parts of floor.

For measuring $L_{p,A}$ the reference surface shall be a flat reference area designed as shown in Figure 5.2.2.

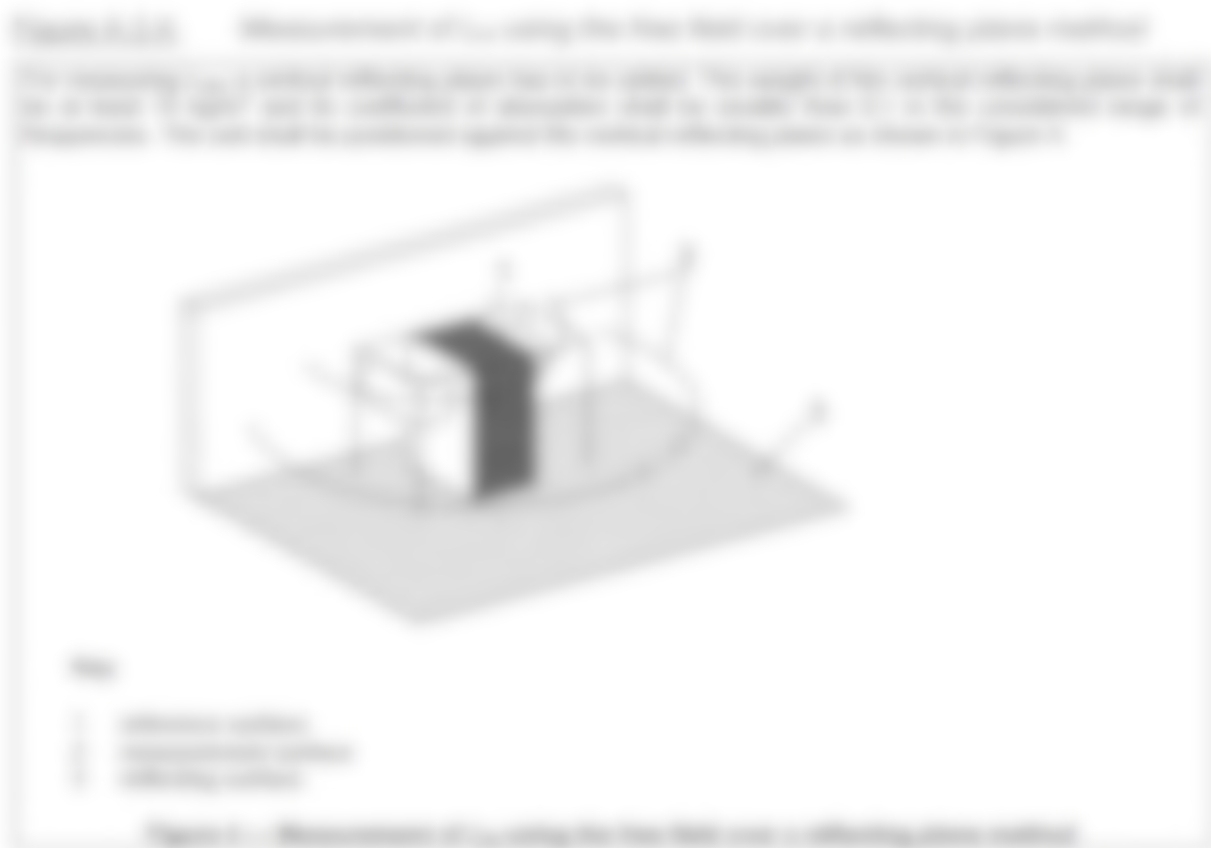
In all cases, the reflecting plane shall extend in all directions at least half a wavelength of the lowest frequency of interest away from the measuring surface. The following figure illustrates the requirements for installation conditions according to the type of unit.

Figure 5.2.2 Installation of a fan duct unit

For measuring $L_{p,A}$ the set-up conditions in a hemispherical reflecting plane as shown in Figure 5.2.2

around the reference surface, a hemispherical measurement surface shall be specified, ending at the side





Appendix 2 Measurement method according to DIN EN ISO 21632-1

Because of the non-spherical sound field, surface flow, walls and ceilings of the test room the sound power level of the machine will vary depending on how well the reference receiver (R1) (R1) is placed according to the methods of measurement specified in DIN EN ISO 21632-1. To compensate, the sound power level $L_{w,eq}$ of the noise source under test was calculated according to the following equation for every octave band:

$$L_{w,eq} = L_{p,ref} + C_1 + C_2 + K_{ref} + K_{eq}$$

where:

- $L_{w,eq}$ is the calculated sound power level of the reference sound source, expressed in dB(A);
- $L_{p,ref}$ is the average of three averaged sound pressure levels of the reference sound source in the surface surrounding the noise source in the test room;
- C_1 is the in the room frequency band α three averaged sound pressure level with the noise source under test in operation, in dB(A);
- K_{ref} is the background noise correction for the reference sound source;
- K_{eq} is the background noise correction for the noise source under test in operation, expressed in dB(A).

The background noise correction K_{ref} and K_{eq} were calculated using the following equation:

$$K = -10 \lg \left(1 - 10^{-\frac{L_{p,ref} - L_{p,eq}}{10}} \right)$$

where:

$$K = C_1 + C_2 + C_3 + C_4$$

where:

- C_1 is the room frequency band α three averaged sound pressure level of the background noise, expressed in dB(A).

If $L_{p,ref} - L_{p,eq} < 0$ dB for one or more octave bands, the accuracy of the results may be reduced and the value of K is to be applied in the case of these bands is -1.5 dB. The value for $L_{p,ref} - L_{p,eq} < 0$ dB in this case is to be clearly stated in the text of the report, as well as in graphs or tables of results. For the value in each band represent upper bounds in the sound power level of the noise source under test.

Appendix B Measurement method according to DIN EN 12544

B.1 Determination of the noise time-averaged sound pressure level

The measurement surface having microphone positions is normally associated with a fixed segment area. The noise time-averaged sound pressure level from the array of microphone positions over the measurement surface, for the chosen mode of operation of the noise source under test, shall be calculated using the following equation:

$$L_{p,T} = 10 \lg \left(\frac{1}{N} \sum_{i=1}^N L_{p,i}^2 \right) + K$$

where

- $L_{p,T}$ is the frequency-weighted or frequency time-averaged sound pressure level measured at the N microphone position or N microphone locations with the noise source under test in operation, in decibels;
- $L_{p,i}$ is the value, in square metres, associated with the N microphone position or N microphone locations;
- N is the total area, in square metres, of the measurement surface;
- $K = 10 \lg \left(\frac{4\pi}{N} \right)$;
- N is the number of microphone positions or individual microphone locations.

The noise time-averaged sound pressure level of the measurement noise shall be calculated using the following equation:

$$L_{p,T} = 10 \lg \left(\frac{1}{N} \sum_{i=1}^N L_{p,i}^2 \right) + K$$

where

- $L_{p,T}$ is the time-averaged sound pressure level of the measurement noise, measured at the N microphone position or N microphone locations, in decibels;
- $L_{p,i}$ is the value, in square metres, associated with the N microphone position or N microphone locations;
- N is the total area, in square metres, of the measurement surface;
- $K = 10 \lg \left(\frac{4\pi}{N} \right)$;
- N is the number of microphone positions or individual microphone locations.

