

## Central Air and Sound Testing

### ENVIRONMENTAL NOISE ASSESSMENT

Odfellows wine Bar

Market place

Shifnal

Shropshire

TF11 9AU

**CLIENT:**

**Mr M Wozniak**

**DATE:**

12<sup>th</sup> January 2024

**Acoustic Survey undertaken by:**

Acoustic Consultant N Bagley

Checked by OB

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## 1. INTRODUCTION

Central Air and Sound Testing have been appointed by the client Mr Wozniak, at the request of the Local Planning Department to undertake an Acoustic Noise Assessment, to assess the noise impact of the Installation of new Air conditioning units at the rear of a new dental practice in the town of Shifnal.

Ref - Planning Application 23/05443/FUL

The assessment is required to provide evidence that noise emissions from the HVAC system, will not be detrimental to the amenity of the nearby noise sensitive receptors (NSR).

This assessment is taken in accordance with the National Policy Planning Framework (NPPF) The Noise Policy Statement for England (NPSE) THE National Policy planning guidance (NPPG) including British Standard BS 4142. 2014.

Shifnal is a small market town, in the county of Shropshire ( Fig 1 ) and is a busy mix of commercial offices , industrial premises , Shops , fast food takeaway businesses, , restaurants, and residential properties all located within the immediate vicinity . The new dental practice is located adjacent to Shifnal Railway Station which gives rail access to the nearby cities of Wolverhampton and Birmingham.

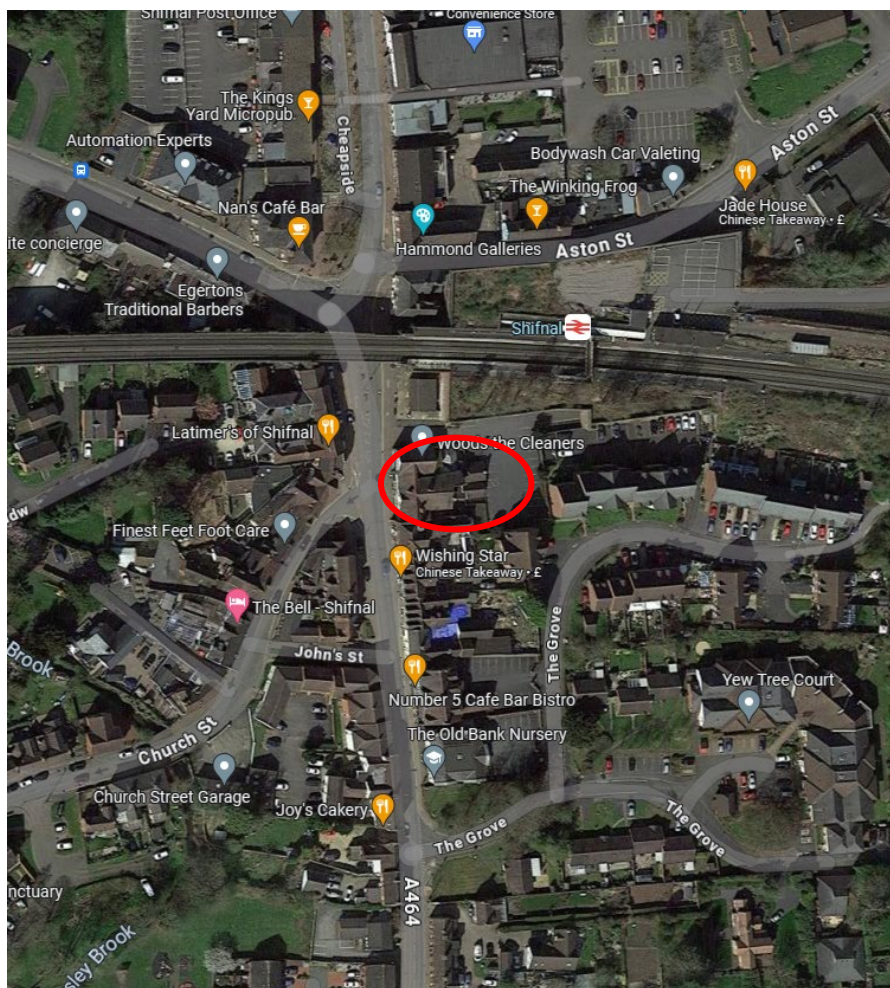


Fig 1

## 2. LEGISLATION & GUIDENCE

In order to provide a suitable assessment a number of national planning polices and guidance have been considered, including:

- The National Policy Planning Framework (NPPF),
- The Noise Policy statement for England (NPSE).
- The National Policy Planning Guidance (NPPG).
- British Standards BS 8233: 2014 Guidance on sound insulation for buildings.
- BS4142: Methods for rating and assessing industrial and commercial sound.
- The world health authority (W.H.O) Guidelines for community noise.

**The National Policy Planning Framework states the following with respects to noise.**

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of development.
- Mitigate and reduce to a minimum other adverse impact on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

## Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

: The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

**1) NOEL**– No Observed Effect Level.

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

**2) SOAEL**– Significant Observed Adverse Effect Level.

This is the level above which significant adverse effects on health and quality of life occur.

**3) LOAEL**– Lowest Observed Adverse Effect Level.

This is the level above which adverse effects on health and quality of life can be detected.

## Noise Policy statement for England and National Planning Guidance

The NPSE has stated that the impact of noise be classified according to an “effect level” Shown in the previous table (Table A).

The National Policy Planning Guidance (NPPG) has clarified what this effect level above means in terms of its perception by people at receptors and what action should be taken.

( *Table A* ).

(Table A) **The National Policy Guidance Noise Exposure Hierarchy**

Perception	Examples of Outcome	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and / or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum.
		Significant Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and / or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and / or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation / awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

**World Health Authority (W.H.O) Guidelines for Community Noise.**

These guidelines entitled “Guidance for Community Noise”; were approved by the World Health Organisation and consider guideline values for annoyance in the community. These have been set at 50 or 55 dBA, representing daytime levels below which most of the adult population will be protected from becoming moderately or seriously annoyed, respectively.

See below an extract of Table 4.1 from Section 4.4 Guideline values for community noise in specific environments.



Specific Environment	Critical Health effect (s)	LAeq (dB)	Time base (hours)	LA max fast (dB)
Outdoor Living Area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors Inside bedrooms	Speech intelligibility and moderate annoyance daytime and evening.	35	16	
	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Table 4.4

The guidelines also suggest that; “At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB LAeq and 60 dB LAm<sub>ax</sub>, so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.” LAeq for daytime is for 16 h and for night-time 8h. It is also noted that the WHO suggest “where a development is deemed necessary or desirable despite external noise levels above recommended guidelines, the internal LAeq target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.

## British Standards BS 4142:2014

The BS 4142 is a standard which describes a method for assessing whether a specific noise from an industrial or commercial source i.e., Extract fans, Air conditioning units is likely to give rise to complaint from residents of the adjacent dwellings the specific noise levels are determined outside dwellings.

The specific noise level is determined for a reference time of 1hour daytime (7am-11pm) and 15mins night-time (11pm-7am).

Tonal or impulsive characteristics of a noise are likely to increase the scope for complaints and this is considered by adding a value to a specific noise source level to obtain a rating level. The value may be between 0 and 15dB depending on objective and subjective measures detailed in the standard.

BS 4142 Requires that the rating level of a noise source is compared with the existing difference between the rating level and the background noise.

- A difference of 0dB is indicative of a “minor impact”.
- A difference of +5dB is indicative of an “adverse impact”.
- A difference of +10dB is indicative of a significant “adverse impact”.

BS4142:2014 states, -

**“Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood.”**

The lower the rating level is to the measured background sound level ,the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background level ,this is an indication of a specific sound source having a low impact , depending on context.

The British Standard 4142 describes methods for rating and assessing sound of an industrial or commercial nature.

### 3. SITE DETAILS

The mechanical air conditioning equipment is installed externally , on the rear façade of the new dental practice , which is located off the A464 Market place , Shifnal , near the centre of the town. ( Figure 2)

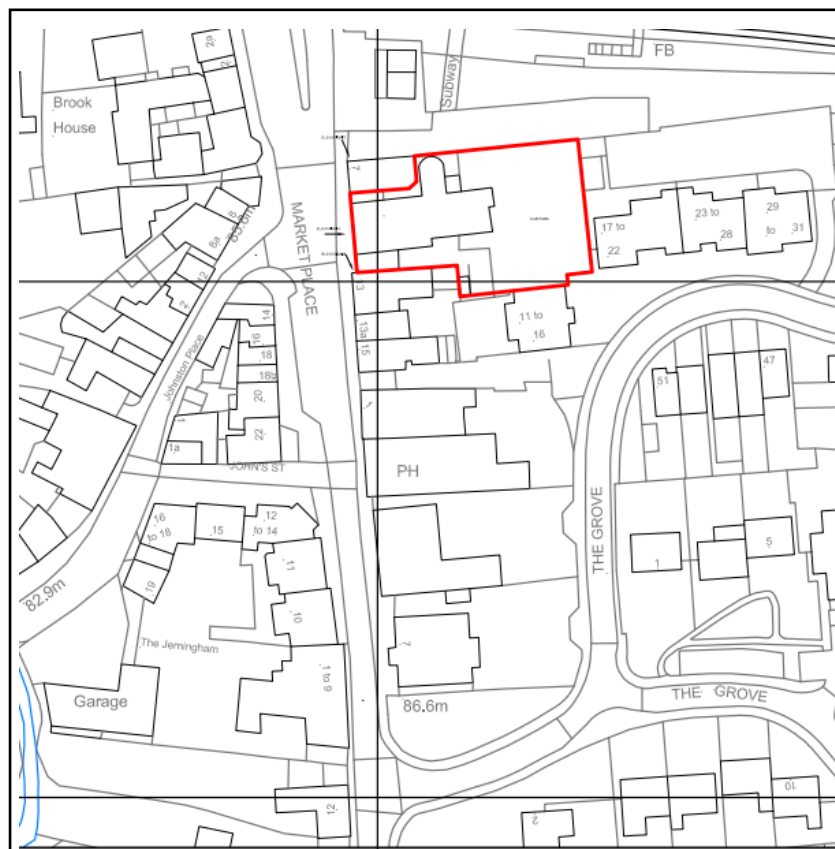


Fig 2

#### Existing Noise Environment

Due to the Dental practices proximity near the centre of town, the busy road traffic on Market Place dominates the existing noise environment .

The site is also located adjacent to the towns railway station and is positioned in front of the station car park, during site visits it was noted that a number of trains stopped on each occasion , contributing to the existing noise climate.

## 4.Environmental Noise Impact Survey

### British Standard BS 4142: 2014 + A1:2019

#### **Noise Survey.**

The site was visited at 1pm on Friday 12<sup>th</sup> January 2024 to assess sound levels from the installed mechanical Plant equipment, it is necessary to measure the existing noise climate to establish the background sound levels (LA90) at the location.

In accordance with BS 4142:2014 the prevailing background level is not necessarily to be taken at the lowest recorded value, but rather the level that best represents the typical background sound level in the area over a defined period .

To undertake a full assessment, acoustic data was measured over a 24-hour period, although the client has informed me the Dental Practise will only be open during daytime only, with a few evenings until 8pm , after which all the air conditioning units will be switched off .

The night -time data has been included within this report as reference.

This assessment has taken into consideration the nearest noise sensitive receptors (NSR) being the residential window of the neighbouring property at No 13 Market Place located 6.3m and 3.2m from the installed plant. (FIG 3)

A Class 1 sound level meter was used to measure noise data at Position 1 and positioned 1.2 from the floor on a fixed tripod at the rear of the premises.

Measurement period to include Day time 07.00-23.00 and Night-Time 23.00-07.00.

## Noise Measurement

Noise data was measured at Position 1 near to the recently installed plant at the rear of the practice.

Measurements at Position 1 were recorded over a 24-hour period to assess the average continuous noise levels, noise levels were recorded in 15-minute samples to determine equivalent continuous A weighted sound level in dB of the Leq and LA90 and Lmax.

(Statistical Data has been supplied with this report.)

A class 1 sound meter was installed near the rear of the building in a weatherproof acoustic outdoor case, and the microphone fitted with an appropriate weather shield.

The Sound meter has been fully laboratory calibrated within the past 12 months and field calibrated before and after the survey. No significant drift was noted for this report (Not more than  $\pm 0.1\text{dB}$ ).

## Metrological Conditions

Weather during the survey was cool and dry, with relatively low wind speed, and is not considered to have adversely impacted the outcome of the survey. Temp 3-8 degrees Celsius

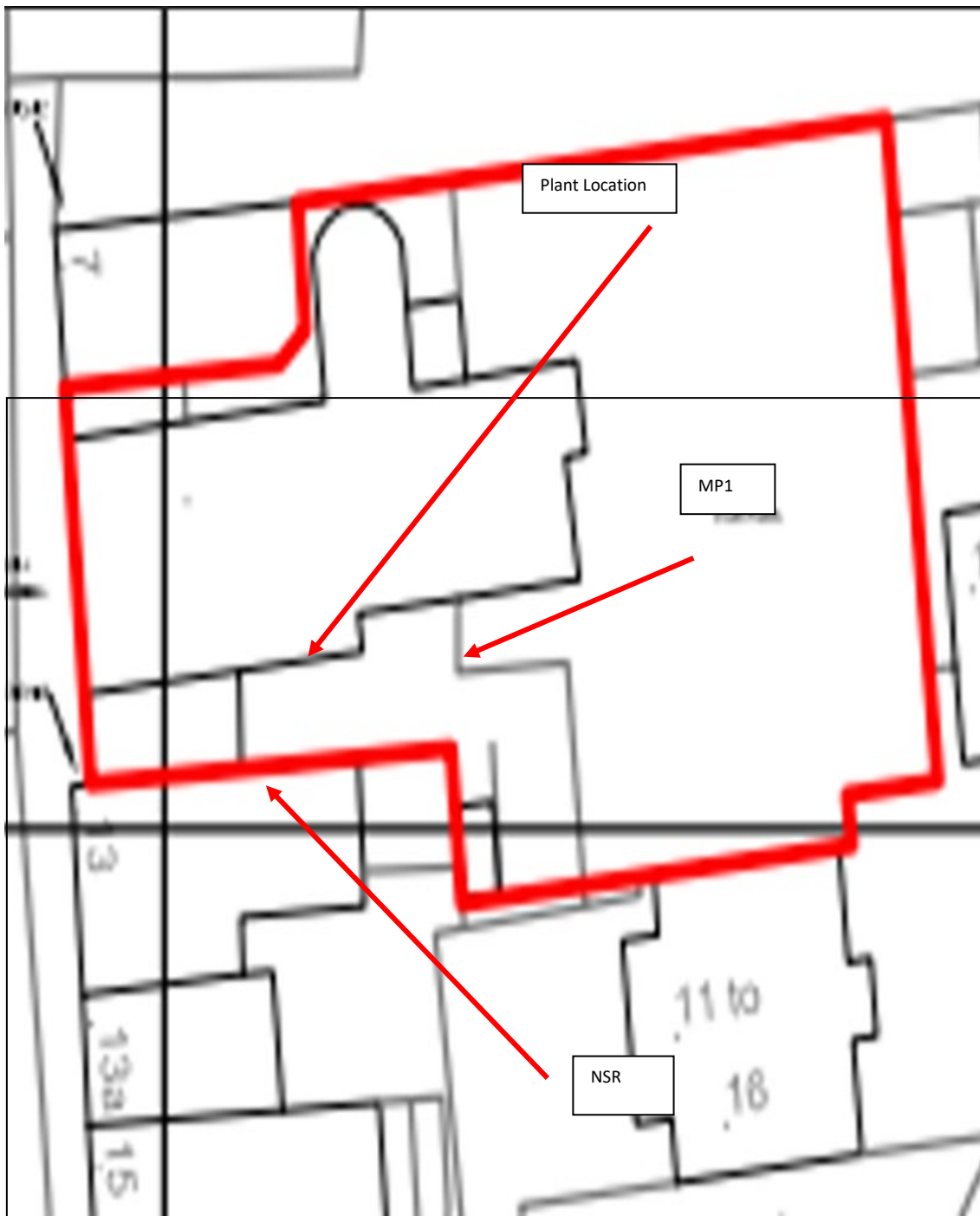


Figure 3 Sound meter position (MP1)

### Equipment .

NTI XL2 Sound Meter Class 1 complete with weatherproof outdoor environmental kit

NTI Class 1 Microphone

Larson Davis Sound Calibrator Class 1 with UKAS Calibration 14/12/2023

## Environmental Noise Survey Results Summary

Position	Daytime (07.00-23.00 hrs)		Night-Time (23.00-07.00hrs)		
	LA eq 16hr	LA90	LAeq 8hr	LA90	LAmx
1	56	49	50	45	83

In accordance with guidance from BS 4142:2014, The period LAeq T is obtained from the logarithmic average of measured sound levels., The background noise levels (LA90) are recorded to best represent the typical noise environment, of the time averaged sound levels over the defined measurement period.

( Measured Statistical data is presented within this report)

### Installed Fixed Plant & Equipment

The installed Air conditioning units consist of 1 x Mitsubishi FDC 100 VNA- W 1x Mitsubishi SRK 50 ZSK -W & 6 Mitsubishi SRK 20ZS invertor units installed at the rear of the building.

Sound emissions from the proposed mechanical plant equipment has been determined using manufactures published data which is presented at the end of this report.

#### Air conditioning units

Plant Manufacturer / Model	Sound Power Level (dB)
Mitsubishi FDC100 VNA-W	69.0dB
Mitsubishi SRC 25 ZSP-W	58.0dB
Mitsubishi SRC 20 ZS	56.0dB

#### Mitsubishi FDC100 VNA-W

UNIT	Sound Pressure Level at each Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
Mitsubishi FDC100 VNA-W	75.0	71.0	64.0	59.0	58.0	52.0	49.0	44.0	69.0



**Mitsubishi SRC 25 ZSP-W**

	Sound Pressure Level at each Octave Band Centre Frequency (Hz)								
UNIT	63	125	250	500	1000	2000	4000	8000	dBA
Mitsubishi SRC 25 ZSP-W	58.0	46.0	43.0	42.0	41.0	33.0	28.0	24.0	58.0

**Mitsubishi SRC 20 ZS**

	Sound Pressure Level at each Octave Band Centre Frequency (Hz)								
<u>UNIT</u>	63	125	250	500	1000	2000	4000	8000	dBA
<u>Mitsubishi SRC 20ZS x 6</u>	57.0	46.0	43.0	42.0	41.0	32.0	28.0	24.0	56.0

## Rating Method for Fixed Plant

Methods for rating and assessing industrial and commercial sound' is the current British Standard providing guidance for assessment of noise impact from industrial and commercial sites. In general, the likelihood of adverse impact for a particular noise source is dependent upon factors including the margin by which it exceeds the background noise level, the character of the noise and its occurrence. The Standard recommends the determination of the Rating Level of the specific source and advises a correction factor of between +3dB and +9dB if the sound has a tonal quality, is intermittent or impulsive or has any other distinct characteristics which would make it more noticeable.

The determination of these noise characteristic penalties is to be considered at the noise sensitive receptor location in the presence of typical prevailing ambient and background noise sources and not at the sound source location.

Modern air conditioning units such as the installed plant tend not to emit noticeable tonal or intermittent noise features, specifically on new and regularly serviced models, but for allowance of worst case a +3db correction was added to the calculations as a matter of precaution.

The degree of impact is assessed by comparing the measured background level with the Rating Level. Where the Rating Level exceeds the background, the level of impact increases as shown in the following table.

<u>Comparison with background</u>	<u>Assessment</u>
+0 dB or below measured background	<u>Low impact</u>
+ 5 dB	<u>Adverse impact</u>
+ 10 dB or more above measured background	<u>Significant adverse impact</u>

Acoustic Calculations and Corrections are made in accordance with British Standard BS4142 and ISO 9613 2. Attenuation of sound propagation outdoors.

## Calculations & Results

Sound Pressure Level at each Octave Band Frequency ( Hz) Mitsubishi FDC100 VNA-W									
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dBA
Sound Pressure level	75.0	71.0	64.0	59.0	58.0	52.0	49.0	44.0	
A- weight Value	-26	-16	-9	-3	0	1	1	-1	
Conformal area Distance Correction	-16	-16	-16	-16	-16	-16	-16	-16	
Barrier Correction	0	0	0	0	0	0	0	0	
Directivity/ propagation	-8	-8	-8	-8	-8	-8	-8	-8	
'A' Weight	49.0	55.0	55.0	56.0	58.0	53.0	50.0	43.0	
Feature Correction BS:4142	+3	+3	+3	+3	+3	+3	+3	+3	
Calculated Noise Level at Receptor (NSR)	28	34	34	35	37	32	29	22	<b>42.0</b>

Sound Pressure Level at each Octave Band Frequency ( Hz) Mitsubishi SRC 25 ZSP-W									
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dBA
Sound Pressure level	58.0	46.0	43.0	42.0	41.0	33.0	28.0	24.0	
A- weight Value	-26	-16	-9	-3	0	1	1	-1	
Conformal Area Distance Correction	-10	-10	-10	-10	-10	-10	-10	--10	
Barrier Correction	0	0	0	0	0	0	0	0	
'A' Weight	32.0	30.0	34.0	39.0	41.0	34.0	29.0	23.0	
Feature Correction BS:4142	+3	+3	+3	+3	+3	+3	+3	+3	
Calculated Noise Level at Receptor (NSR)	25.0	23.0	27.0	32.0	34.0	27.0	22.0	16.0	<b>37.6</b>

Sound Pressure Level at each Octave Band Frequency ( Hz) Mitsubishi SRC 20ZS									
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Pressure level	57.0	46.0	43.0	42.0	41.0	32.0	28.0	24.0	
A- weight Value	-26	-16	-9	-3	0	1	1	-1	
Conformal Area Distance Correction	-10	-10	-10	-10	-10	-10	-10	-10	
Correction for number of units	6	6	6	6	6	6	6	6	
Barrier Correction	0	0	0	0	0	0	0	0	
'A' Weight	31.0	30.0	34.0	39.0	41.0	33.0	28.0	23.0	
Feature Correction BS:4142	+3	+3	+3	+3	+3	+3	+3	+3	
Directivity /propagation	-8	-8	-8	-8	-8	-8	-8	-8	
Calculated Noise Level at Receptor (NSR)	22.0	21.0	25.0	30.0	32.0	24.0	19.0	14.0	<b>35.5</b>

<b>Cumulative Noise Level Total @NSR (dB)</b>	<b>44.0</b>
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### **Survey Results:**

Calculated Rating Level at Nearest Receptor	44.0 dB
Background Sound level	49.0 dB
Excess of Rating over Background Sound level BS4142	-5 dB

**BS: 4142 - 2014 LOW IMPACT**

BS 4142 Requires that the rating level of a noise source is compared with difference between the rating level and the background noise.

- A difference of 0dB is indicative of a “minor impact”.
- A difference of +5dB is indicative of an “adverse impact”.
- A difference of +10dB is indicative of a significant “adverse impact”.

In accordance with BS 4142;2014 Guidance ,

The rating level is an indication of a specific sound source having a Low Impact in relation to noise, the lower the rating level is relative to the measured LA90 Background noise, the less likely the specific sound source will have an adverse impact

## 6 Summary

- Results from this Noise impact Assessment undertaken with guidance from BS 4142:2014 . indicate that noise levels , emitting from the installed Air conditioning Units to be **44dB** at the nearest noise sensitive receptor , being the nearest residential window in the building adjacent to the new Dental Practice, this has been calculated to be **-5.0 dB below** the measured background noise level of 49dB which was used for this assessment ..
- Due to the sites town centre location and its close proximity to the local Railway station, the existing noise climate is generally high due to road traffic noise and other commercial elements which operate nearby , noise created by newly installed plant would not increase the existing noise levels within the immediate area .
- Prior to planning consent being granted for the change of use to a new dental practice the building operated for many years as an established wine bar, with parking for patrons at the rear , The wine bar operated until quite late some of the evenings, with amplified music being played most evenings when open , in contrast to noise emitting from the operation of the new dental practice, we believe noise levels would now be considerably lower , and the benefit of a new dental practice within the town could also be considered , against any contribution to noise within the area.
- In accordance with BS 4142:2014 Guidance ,  
**'The rating level is an indication of the specific sound source having a low**  
**Impact** indicating no detectable effect on health and quality of life due to noise.
- Uncertainty. The measurements and calculations undertaken for this assessment, were taken under repeatable conditions. Manufacturers data and specification is likely to be robust and the uncertainty in these results will be considered low.

## 7. CONCLUSION

Central Air and Sound Testing have been commissioned to assess the acoustic impact of a newly installed Heating and Ventilation system at the rear new Dental Practice in Shifnal Town

A detailed environmental noise assessment has been conducted to establish the representative sound levels at the nearest residential noise sensitive receptors.

Based on the measured noise levels obtained, and calculations using manufactures sound data for the proposed new plant equipment, sound levels at the nearest receptor will be at least 5dB below the existing background noise level, and defined as **Low impact** in accordance with BS 4142: 2014

**Therefore, it is our conclusion this noise assessment has established that noise from the installation of the HVAC Plant equipment, should not be disturbing or detrimental to the amenity of nearby residents and no further mitigation measures would be necessary.**

### Disclaimer

This report has been prepared with all reasonable skill and care in accordance with accepted acoustic consultancy principles for the client only, and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Statements and conclusion made within this report are based on reasonable assumptions and good industry practice, Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence.

The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.



## 8. EQUIPMENT

NTI XL2 Class 1 SOUND METER	456778	UKAS Calibration Dec 2023
NTI Class 1 MICROPHONE		
NTI Class 1 calibrator	69678	UKAS Calibration Dec 2023

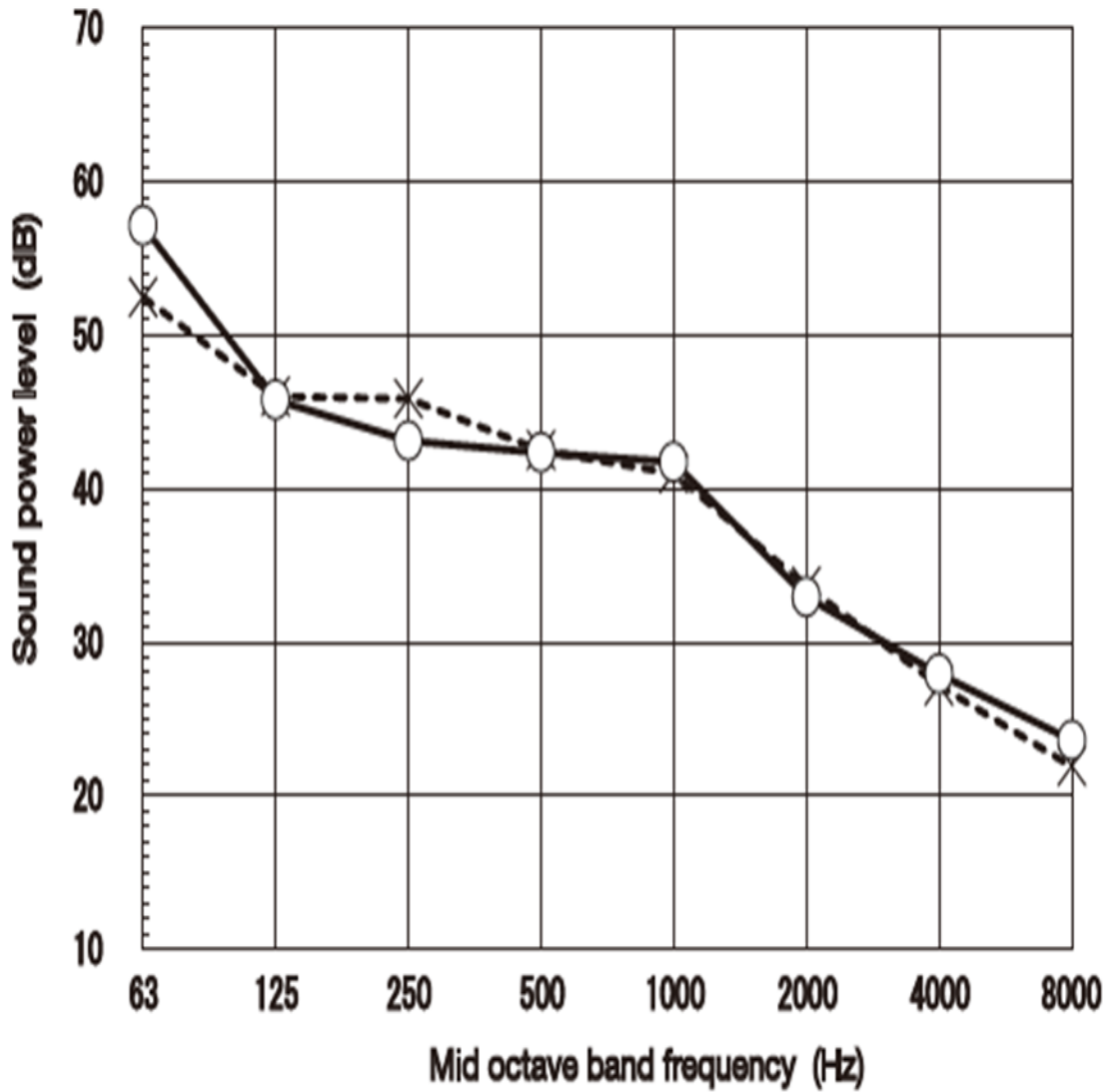
## 9. Glossary of Terms

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds $s_1$ and $s_2$ is given by $20 \log_{10} (s_1/s_2)$ . The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$ .
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,F}$	A noise level index defined as the maximum noise level during the period T. $L_{max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall $L_{eq}$ noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. $L_{90}$ can be considered to be the 'average minimum' noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ( $L_{Aeq,T}$ ).
Residual Noise Level	The ambient noise remaining at a given position in a given situation when specified sources are suppressed to a degree such that they do not contribute to the ambient noise level ( $L_{Aeq,T}$ )
Specific Noise Level	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given time interval ( $L_{Aeq,T}$ )
Rating Noise Level	The specific noise level plus any adjustment for the characteristic features of the noise ( $L_{Ar,Tr}$ ).

(Outdoor unit)

Model	SRC25ZS-W, -W1, -W2	
Noise Level	Cooling	56 dB(A)
	Heating	58 dB(A)

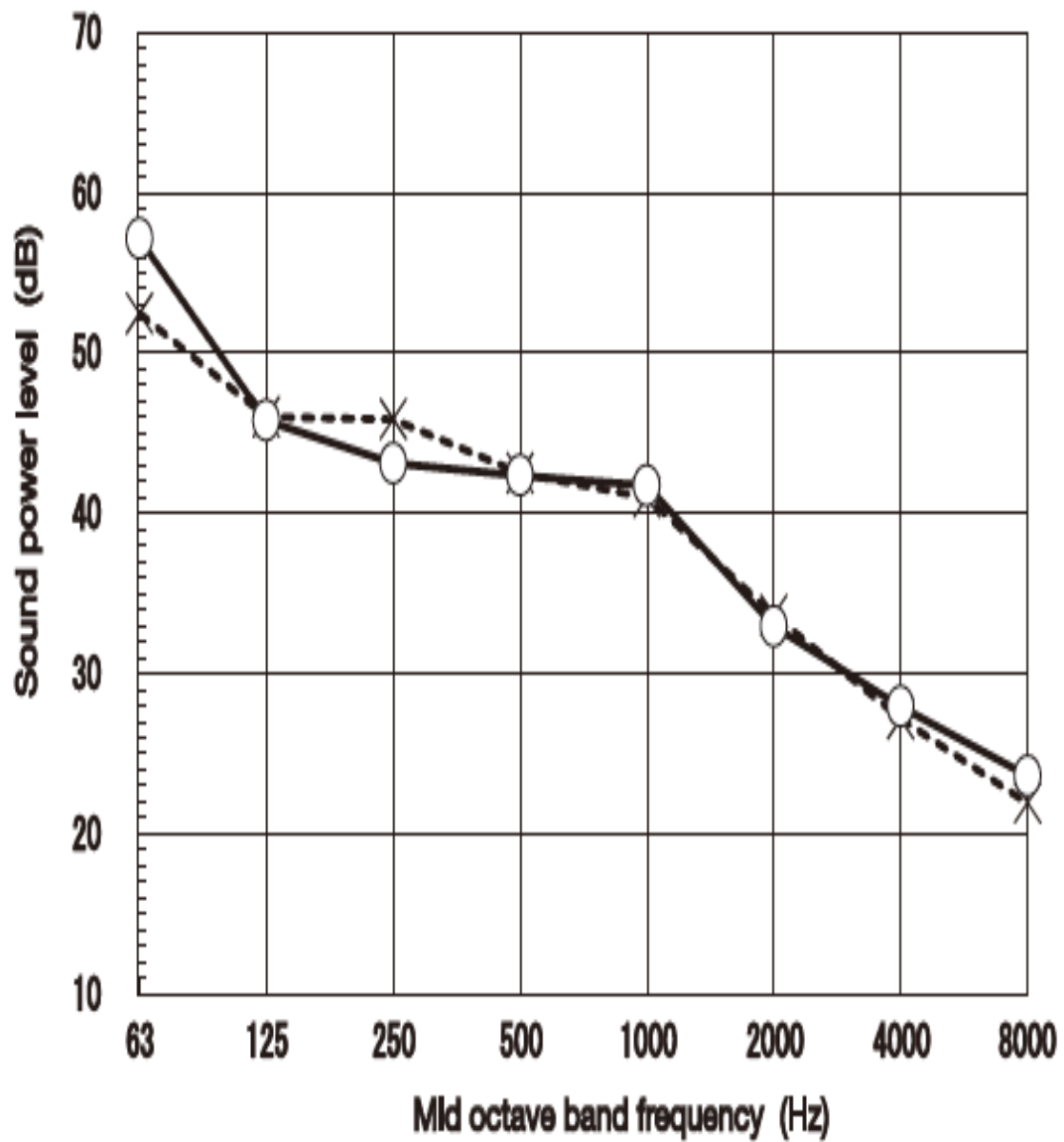
x..... Cooling O—— Heating



(Outdoor unit)

Model	SRC20ZS-W	
Noise Level	Cooling	56 dB(A)
	Heating	56 dB(A)

x..... Cooling O—— Heating

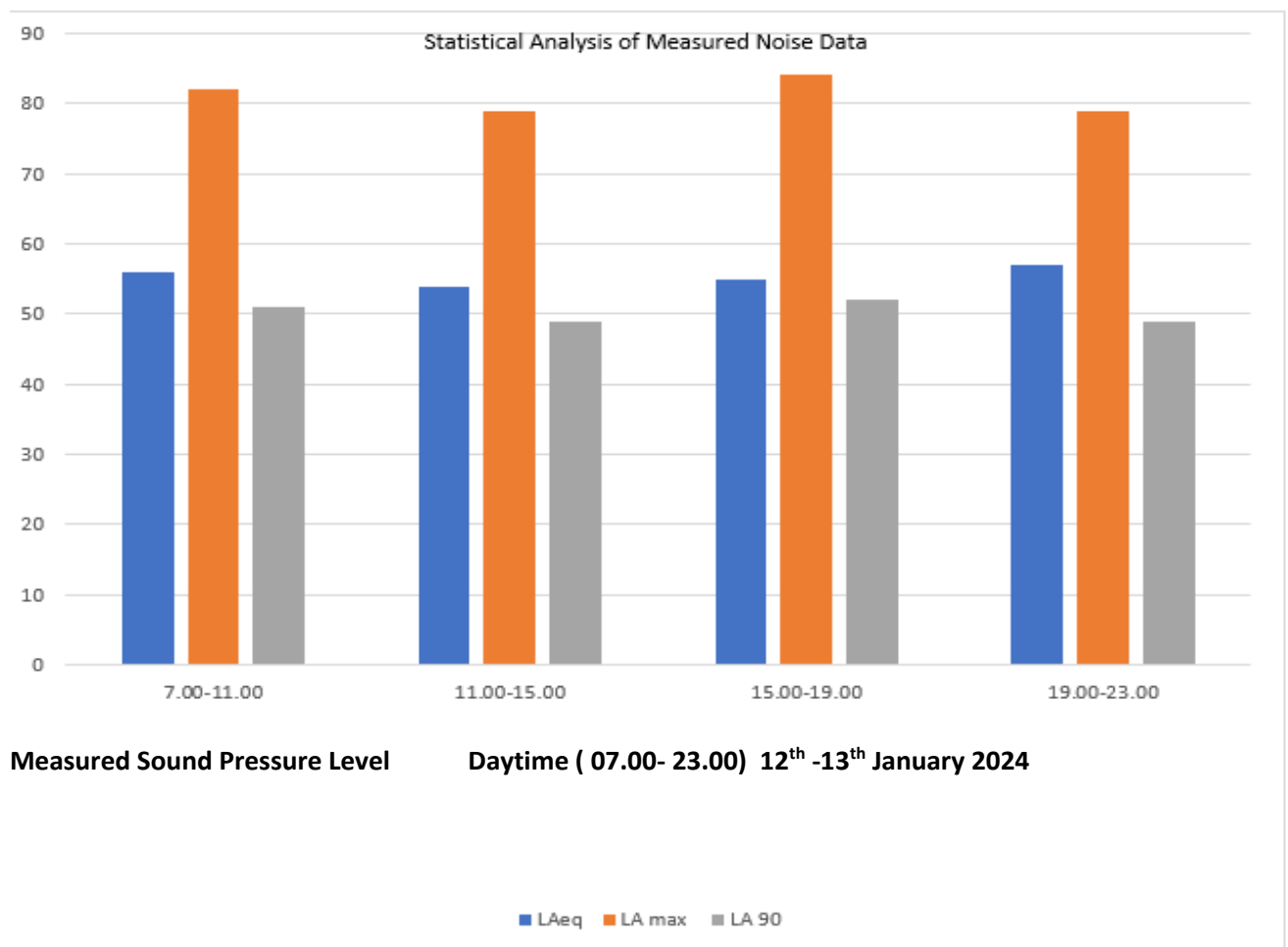


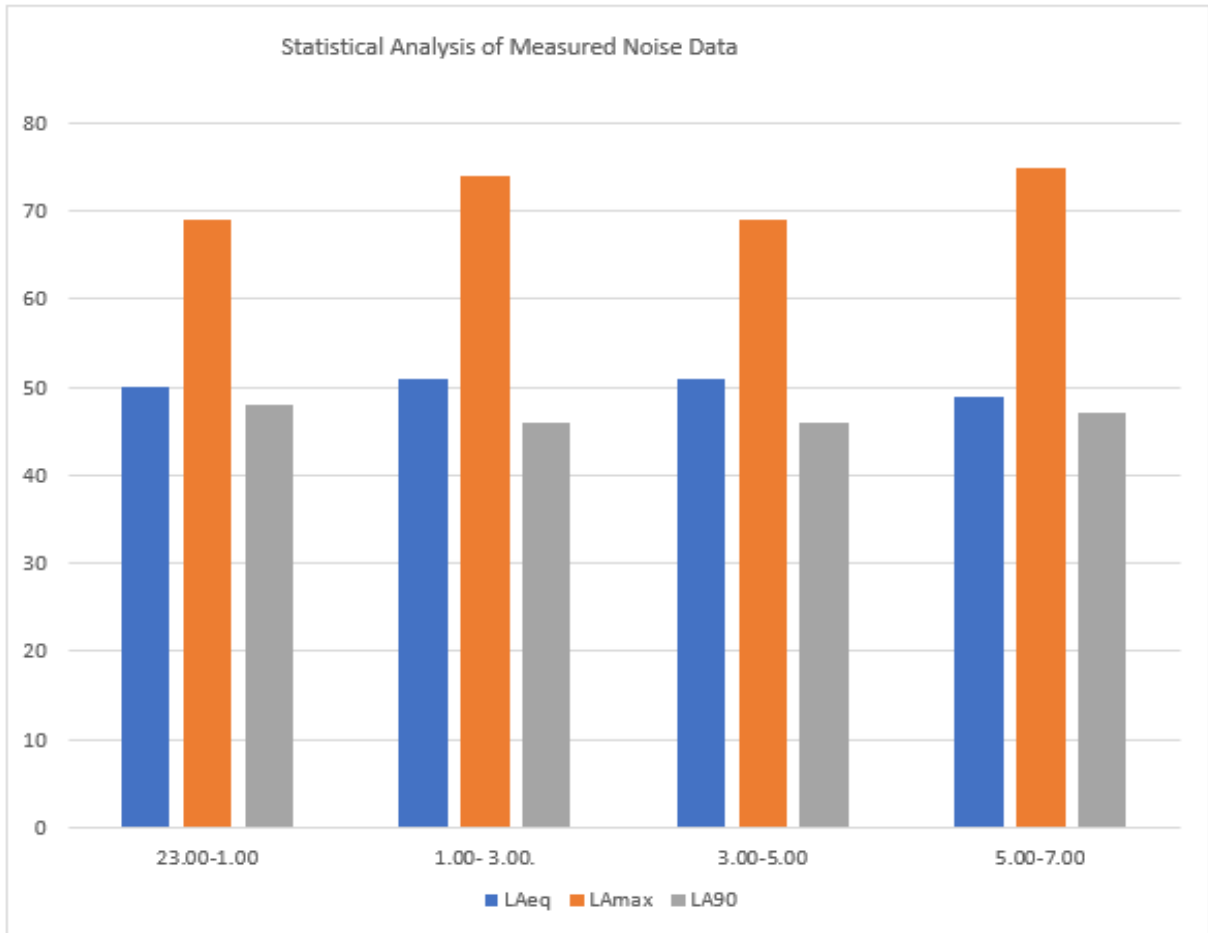
## Statistical Analysis of Measured Noise Data (Time Averaged )

The period LAeq T is obtained from the logarithmic average of measured sound levels.

The period LA90 T is obtained from the time average of sound levels measured during the period.

The Maximum sound levels LAmax represent the highest sound levels measured.





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**Measured Sound Pressure Level Night-Time (23.00-07.00) 12<sup>th</sup> -13<sup>th</sup> January 2024**

## Continuous Measured Noise Data

Continuous Measured Noise Data (Friday 12<sup>th</sup>- 13<sup>th</sup> January)

Start time	End time	L <sub>Amax</sub> (dB)	L <sub>Amin</sub> (dB)	L <sub>A,eq</sub> (dB)	L <sub>A90</sub> (dB)
13:45	14:00	68.4	45.0	55.2	50.8
14:00	14:15	76.7	45.8	54.9	49.2
14:15	14:30	68.1	46.2	57.2	52.2
14:30	14:45	70.6	46.4	53.8	48.7
14:45	15:00	68.2	45.7	56.6	51.9
15:00	15:15	67.1	46.8	54.5	48.7
15:15	15:30	69.2	44.4	54.7	49.2
15:30	15:45	68.8	45.3	54.5	47.9
15:45	16:00	69.9	44.9	53.8	49.4
16:00	16:15	68.0	44.7	52.3	48.3
16:15	16:30	81.6	45.4	60.6	53.9
16:30	16:45	71.6	44.7	53.3	49.7
16:45	17:00	81.7	43.8	58.8	51.8
17:00	17:15	71.7	45.8	53.9	49.8
17:15	17:30	69.4	44.4	58.8	51.5

17:30	17:45	71.2	44.4	53.8	49.1
17:45	18:00	66.7	44.8	54.1	49.8
18:00	18:15	78.8	44.5	57.2	48.5
18:15	18:30	72.7	44.1	52.8	49.4
18:30	18:45	83.6	44.8	58.0	50.8
18:45	19:00	67.1	44.8	52.7	49.7

19:00	19:15	80.0	43.5	54.1	49.6
19:15	19:30	64.9	41.3	51.0	49.4
19:30	19:45	88.0	43.0	60.5	52.9
19:45	20:00	84.4	42.1	54.6	49.8
20:00	20:15	67.0	42.2	52.8	49.4
20:15	20:30	63.3	42.5	53.7	49.4
20:30	20:45	66.0	43.1	51.5	48.9
20:45	21:00	73.5	42.3	53.5	48.0

21:00	21:15	69.5	38.8	56.1	50.5
21:15	21:30	68.5	38.6	53.0	48.7
21:30	21:45	65.1	38.8	53.0	48.0
21:45	22:00	84.1	38.6	56.5	49.9
22:00	22:15	63.5	38.2	51.0	47.8
22:15	22:30	65.0	37.6	52.5	49.4
22:30	22:45	75.2	37.8	53.3	49.4
22:45	23:00	66.2	37.3	51.1	49.0
23:00	23:15	65.1	37.9	51.0	48.5
23:15	23:30	59.8	37.9	51.5	47.3
23:30	23:45	67.2	37.5	50.8	47.9
23:45	00:00	63.7	36.6	50.7	46.8
00:00	00:15	59.9	36.7	49.8	48.0
00:15	00:30	61.5	36.6	49.0	46.0
00:30	00:45	61.6	37.7	49.2	45.9
00:45	01:00	69.7	37.3	51.8	47.5
01:00	01:15	71.3	36.4	52.0	47.5
01:15	01:30	61.2	36.6	47.1	46.4

01:30	01:45	66.2	36.9	47.2	45.4
01:45	02:00	61.2	36.6	46.2	44.2
02:00	02:15	60.8	37.3	46.9	45.1
02:15	02:30	63.7	37.7	47.7	44.8
02:30	02:45	61.4	38.3	49.4	46.5
02:45	03:00	67.9	36.9	50.1	46.4
03:00	03:15	74.5	36.4	49.8	45.8
03:15	03:30	61.1	37.0	49.3	45.0
03:30	03:45	57.9	37.2	49.2	45.2
03:45	04:00	61.8	38.4	51.5	46.1
04:00	04:15	63.6	37.9	50.2	44.6
04:15	04:30	59.8	37.9	49.6	46.5
04:30	04:45	65.5	39.0	49.4	45.4
04:45	05:00	60.2	37.4	47.6	45.5
05:00	05:15	64.6	37.6	49.4	47.2
05:15	05:30	65.5	37.8	49.2	46.5
05:30	05:45	68.8	38.3	49.5	45.7
05:45	06:00	63.2	39.0	49.6	46.1
06:00	06:15	66.2	40.0	50.4	47.3
06:15	06:30	68.9	40.1	52.5	48.1
06:30	06:45	68.1	38.4	53.4	47.8
06:45	07:00	76.0	40.0	54.5	47.2
07:00	07:15	65.7	40.0	53.9	49.7
07:15	07:30	67.1	41.7	54.0	48.7
07:30	07:45	74.9	41.4	53.4	48.6
07:45	08:00	67.4	41.8	53.9	48.7
08:00	08:15	71.5	43.1	55.8	49.6
08:15	08:30	82.3	43.2	58.5	51.3



08:30	08:45	69.8	43.7	54.0	49.7
08:45	09:00	65.5	43.8	53.1	47.7
09:00	09:15	83.5	44.1	54.9	49.8
09:15	09:30	66.5	44.8	52.9	47.4
09:30	09:45	68.9	44.1	54.5	50.6
09:45	10:00	71.4	43.6	52.8	48.1
10:00	10:15	67.5	42.9	52.5	48.9
10:15	10:30	71.8	43.1	52.0	47.5
10:30	10:45	66.1	44.0	53.5	50.8
10:45	11:00	69.3	44.3	54.1	48.1
11:00	11:15	68.1	45.0	53.4	48.4
11:15	11:30	73.0	43.9	53.9	47.6
11:30	11:45	72.5	47.1	54.2	49.0
11:45	12:00	66.6	47.2	53.7	49.0
12:00	12:15	72.0	47.3	54.5	49.9
12:15	12:30	68.8	46.2	53.5	49.3
12:30	12:45	66.3	45.2	53.0	48.0
12:45	13:00	79.0	44.4	58.7	51.9
13:00	13:15	82.4	44.5	59.8	51.7
13:15	13:30	70.1	45.6	54.3	50.8
13:30	13:45	77.2	45.5	61.9	53.3





## SRK25ZSP-W / SRC25ZSP-W

2.5(0.9~3.1)

Indoor Unit : SRK25ZSP-W

Outdoor Unit : SRC25ZSP-W

### Specifications

R32

Indoor unit			SRK25ZSP-W	
Outdoor unit			SRC25ZSP-W	
Power source			1Phase, 220 - 240, 50Hz	
Nominal cooling capacity (Min~Max)		kW	2.5(0.9~3.1)	
Nominal heating capacity (Min~Max)		kW	2.8(1.0~4.1)	
Power consumption		Cooling/Heating	kW	0.710 / 0.690
EER/COP		Cooling/Heating		3.52/4.05
Max. running current			A	9
Sound power level	Indoor	Cooling/Heating		57 / 57
	Outdoor	Cooling/Heating		57 / 56
Sound pressure level	Indoor	Cooling (Hi/Me/L0/Ulo)	dB(A)	45 / 34 / 23
		Heating (Hi/Me/L0/Ulo)		43 / 34 / 26
	Outdoor	Cooling/Heating		47 / 45
		Air flow	Cooling (Hi/Me/L0/Ulo)	m3/min
Indoor	Heating (Hi/Me/L0/Ulo)	9.5 / 7.3 / 5.2		
Exterior Dimensions	Indoor	Height x Width x Depth	mm	267 x 783 x 210
	Outdoor			540 x 645(+57) x 275
Net weight		Indoor / Outdoor	kg	7.0 / 26.5
Refrigerant		Type/GWP		R32 / 675
Refrigerant		Charge	kg/TCO2Eq	0.550 / 0.371
Refrigerant piping size		Liquid/Gas	ø mm	6.35(1/4") / 9.52(3/8")
Refrigerant line (one way) length			m	Max. 15
Vertical height differences		Outdoor is higher/lower	m	Max. 10 / Max. 10
Outdoor operating temperature range		Cooling	°C	-15~46
		Heating		-15~24
Clean filter				-
Energy Class (Cooling/Heating)				A++/A+
SEER				6.80
SCOP (Average climate)				4.10
Pdesign (cooling/heating(@-10°C))			kW	2.50/2.80
Annual Electricity Consumption (cooling/heating)			kWh/a	129/957
Designated Heating Season				Average

\* The data is measured under the following conditions(ISO-T1, H1). Cooling: Indoor temp. of 27°CDB, 19°CWB, and outdoor temp. of 35°CDB. Heating: Indoor temp. of 20°CDB, and outdoor temp. of 7°CDB, 6°CWB.

\* Sound level indicates the value in an anechoic chamber. During operation these values are somewhat higher due to ambient conditions.

\* 'tonne(s) of CO2 equivalent' means a quantity of greenhouse gases- expressed as the product of the weight of the greenhouse gases in metric tonnes and of their global warming potential.

\*SEER/SCOP are based on EN14825:2016 and Commission regulation (EU) No.2016/2281



## SRK20ZS-WF / SRC20ZS-W

2.0(0.9~2.9)

Indoor Unit : SRK20ZS-WF

Outdoor Unit : SRC20ZS-W

### Specifications

R32

Indoor unit		SRK20ZS-WF	
Outdoor unit		SRC20ZS-W	
Power source		1Phase, 220 - 240, 50Hz	
Nominal cooling capacity (Min~Max)		kW	2.0(0.9~2.9)
Nominal heating capacity (Min~Max)		kW	2.7(0.9~4.3)
Power consumption		Cooling/Heating	kW
			0.44 / 0.59
EER/COP		Cooling/Heating	4.55 / 4.58
Max. running current		A	9
Sound power level	Indoor	Cooling/Heating	48 / 50
	Outdoor	Cooling/Heating	56 / 56
Sound pressure level	Indoor	Cooling (Hi/Me/Lo/Ulo)	dB(A)
		Heating (Hi/Me/Lo/Ulo)	
	Outdoor	Cooling/Heating	34 / 25 / 22 / 19
			36 / 29 / 23 / 19
Air flow	Indoor	Cooling (Hi/Me/Lo/Ulo)	m3/min
		Heating (Hi/Me/Lo/Ulo)	
	Outdoor	Cooling/Heating	9.3 / 7.0 / 5.9 / 5.0
Exterior Dimensions	Indoor	Height x Width x Depth	mm
	Outdoor		290 x 870 x 230
Net weight		Indoor / Outdoor	kg
			9.5 / 31.0
Refrigerant		Type/GWP	R32 / 675
Refrigerant		Charge	kg/TCO2Eq
			0.62 / 0.419
Refrigerant piping size		Liquid/Gas	ø mm
			6.35(1/4") / 9.52(3/8")
Refrigerant line (one way) length		m	Max. 20
Vertical height differences		Outdoor is higher/lower	m
			Max. 10 / Max. 10
Outdoor operating temperature range		Cooling	°C
		Heating	-15~-46
			-15~-24
Clean filter		Allergen Clear Filter x 1, Photocatalytic Washable Deodorizing Filter x 1	
Energy Class (Cooling/Heating)		A+++/A++	
SEER		10.00	
SCOP (Average climate)		8.5	
Pdesign (cooling/heating(@-10°C))		kW	2.00/2.60
Annual Electricity Consumption (cooling/heating)		kWh/a	83/793
Designated Heating Season		Average	

- The data is measured under the following conditions(ISO-T1, H1). Cooling: Indoor temp. of 27°CDB, 19°CWB, and outdoor temp. of 35°CDB. Heating: Indoor temp. of 20°CDB, and outdoor temp. of 7°CDB, 6°CWB.
- Sound level indicates the value in an anechoic chamber. During operation these values are somewhat higher due to ambient conditions.
- 'tonne(s) of CO2 equivalent' means a quantity of greenhouse gases- expressed as the product of the weight of the greenhouse gases in metric tonnes and of their global warming potential.
- SEER/SCOP are based on EN14825:2016 and Commission regulation (EU) No.2016/2281



## FDT100VNAWPVH

10.0 ( 4.0 ~ 11.2 )

Indoor Unit : FDT50VH x 2

Outdoor Unit : FDC100VNA-W

### Specifications

R32

Indoor unit		FDT50VH x 2		
Outdoor unit		FDC100VNA-W		
Power source		1 Phase 220-240V, 50Hz / 220V, 60Hz		
Nominal cooling capacity (Min-Max)		kW	10.0 ( 4.0 ~ 11.2 )	
Nominal heating capacity (Min-Max)		kW	11.2 ( 4.0 ~ 12.5 )	
Power Consumption	Cooling/Heating	kW	2.82 / 2.73	
EER/COP	Cooling/Heating	kW	3.55 / 3.88	
Inrush current		A	5	
Max. current		A	24	
Sound power level <sup>1</sup>	Indoor <sup>3</sup>	Cooling/Heating	dB(A)	55 / 56
	Outdoor	Sound power level	dB(A)	69 / 70
Sound pressure level <sup>2</sup>	Indoor <sup>3</sup>	Cooling (P-Hi/Hi/Me/Lo)	dB(A)	41 / 33 / 30 / 26
	Indoor	Heating (P-Hi/Hi/Me/Lo)	dB(A)	42 / 33 / 28 / 20
	Outdoor	Cooling/Heating	dB(A)	54 / 55
Air flow	Indoor <sup>3</sup>	Cooling (P-Hi/Hi/Me/Lo)	m <sup>3</sup> /min	22 / 16 / 13 / 10
	Indoor	Heating (P-Hi/Hi/Me/Lo)	m <sup>3</sup> /min	22 / 16 / 13 / 10
	Outdoor	Cooling/Heating	m <sup>3</sup> /min	75 / 73
Exterior dimensions	Indoor	HeightxWidthxDepth	mm	Unit: 236 x 840 x 840 Panel: 35 x 950 x 950
	Outdoor		mm	845 x 970 x 370
Net weight	Indoor/Outdoor	kg	24(Unit:19 Standard Panel:5) / 77	
Refrigerant charge		kg/TCO <sub>2</sub> E <sub>q</sub>	3.3/2.228	
Refrigerant Type GWP			R32/675	
Ref.piping size	Liquid/Gas	ømm	9.52(3/8") / 15.88(5/8")	
Refrigerant line (one way) length		m	Max. 50	
Vertical height differences	Outdoor is higher/lower	m	Max.50 / Max.15	
Outdoor operating temperature range	Cooling <sup>2</sup>	°C	-15~-50	
	Heating	°C	-20~-20	
Panel			T-PSA-5AW-E, T-PSAE-5AW-E	
Air filter, Q'ty			Pocket plastic net x 1(Washable)	
Remote control (option)			wired:RC-EX3A, RC-E5, RCH-E3 wireless:RCN-T-5AW-E2	
Energy Class (Cooling/Heating)			A++/A+	
SEER			7.41	
SCOP (Average climate)			4.47	
Pdesign (cooling/heating(@-10°C))			10.0/8.5	
Annual Electricity Consumption			473/2665	
Designated Heating Season			Average	