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POST VERIFICATION REPORT – KITCHEN EXTRACTION SYSTEM

147 PARROCK STREET, GRAVESEND DA12 1EY

FOR

GOYA WORKS LTD



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Contents Page

1	Executive Summary	
2	Introduction	
3	Site Description	
4	Environmental Noise Survey Methodology	
5	External Noise Survey Results and Observations	
	5.1	Results
	5.2	Observations
6	External Noise Emission Limits	
	6.1	Local Authority Requirements
	6.2	BS 4142:2014+A1:2019
7	Kitchen Extraction System and Associated Noise Levels	
8	Description of Determination Process	
9	Recommended Noise Mitigation	
10	Conclusion	
	Appendix A	Acoustic Terminology & References
	Appendix B	Data Sheets and Figures
	Appendix C	Calculations

The preparation of this report by Sound Licensing Ltd. has been undertaken within the terms of the proposal using all reasonable skill and care. Sound Licensing Ltd accepts no responsibility for the data provided by other bodies and no legal liability arising from the use by other persons of data or opinions contained in this report.

1. EXECUTIVE SUMMARY

The client has been granted planning approval (20221254) for the installation of a new kitchen extraction system to service the premises at 147 Parrock Street, Gravesend DA12 1EY. Acoustic related conditions have been attached to the planning permission.

Sound Licensing has undertaken a post verification noise assessment at the site in order to verify the resultant noise levels after the installation of the kitchen extraction system detailed in our previous report dated 17/11/2022.

The results of the noise survey are considered reasonable given the location of the measurement position.

The existing kitchen extraction system has been measured and the specific noise level would not meet the requirements of planning condition 4, therefore additional mitigation will be required.

In accordance with BS 4142:2014+A1:2019 guidance, the measured noise impact due to the operation of the mechanical plant, with recommended mitigation installed, ***“is an indication of the specific sound source having a low impact”***. The predicted noise level of the mechanical plant at the nearest noise sensitive properties, with recommended mitigation installed, is considered to comply with the Gravesham Borough Council’s planning condition and therefore, planning condition 4 may be discharged.

2. INTRODUCTION

The client has installed a new kitchen extraction system at the rear of 147 Parrock Street, Gravesend DA12 1EY, the noise from which could have the potential to affect existing noise sensitive properties nearby. Following a previous BS4142:2014+A1:2019 assessment, the system has now been installed.

The purposes of this report are:

- To identify the noise level contributions of the newly installed mechanical plant
- Based on the above, to check compliance with the requirements of BS4142:2014+A1:2019 and the Gravesham Borough Council's planning condition 4.

3. SITE DESCRIPTION

Planning permission has been granted (20221254) with acoustic related conditions for the installation of a new kitchen extraction system at 147 Parrock Street, Gravesend DA12 1EY (hereafter referred to as 'the site'). The property is a traditionally built two-storey building in the Borough of Gravesham. It is located in a mixed-use area with a large car park opposite and residential properties directly above

The nearest sensitive residential receptors were noted to be the first-floor windows on the rear façade of 147 Parrock Street at an approximate distance of 0.7m from the extraction fan motor casing, 2m from the extraction system terminus and 1.5m from the air intake terminus.

The nearest sensitive receptors are identified in figure 3.1. If the noise impact assessment details that there is an indication of the specific sound source having a low impact at these premises then it can be safely assumed it will be met at other properties of equal distance and/or those further away.

Figure 3.1 shows the site highlighted in **blue** with the nearest noise sensitive premises highlighted in **red**.

Figure 3.1 Site Location and Surrounding Land Use



Source: Google Maps

4. ENVIRONMENTAL NOISE SURVEY METHODOLOGY

A manned environmental noise survey was undertaken at a single measurement location. The sound level meter microphone was positioned at first-floor level at the rear of the site, 1m from the nearest sensitive window. The survey was undertaken between 13:24 and 14:28 hours on the 19th of July 2024. A survey at this time covers the most sensitive period of time in which the mechanical plant system may be operational.

Ambient and background noise levels (L_{Aeq} and L_{A90} respectively) were measured throughout the noise survey in continuous 15-minute periods. The approximate measurement position is indicated in **orange** on Figure 4.1 below.

Figure 4.1 Site Plan Showing Approximate Location of Measurement Position



Source: Google Maps

The sound level meter microphone was positioned on a tripod at first-floor level at the rear of the site, one metre from the nearest sensitive receptor. The position is not considered to be in free-field and therefore a 3dB façade correction will be applied. The monitoring position is considered representative of background noise levels at the nearest identified noise sensitive properties.

The equipment used for the noise survey is summarised in Table 4.1.

Table 4.1 **Description of Equipment used for Noise Survey**

Equipment	Description	Quantity	Serial Number
Larson Davis Sound Expert LxT	Type 1 automated logging sound level meter	1	0003739
Larson Davis 377B02	½" microphone	1	308849
Larson Davis	Pre-amplifier	1	028021
Larson Davis CAL200	Class 1 Calibrator	1	12245

The noise survey and measurements were conducted in accordance with BS7445-1:2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*'.

Weather conditions throughout the entire noise survey period were noted to be hot (approx. 30-31° Celsius), clear skies (0 to 10% cloud cover approximately) with a light wind (<5m/s). These weather conditions were checked against and confirmed by the use of the Met Office mobile application available on smart phone technology. These conditions were maintained throughout the majority of the survey period and are considered reasonable for undertaking environmental noise measurements.

The noise monitoring equipment was field calibrated before and after the noise survey period. No significant drift was recorded (± 0.3 dB). Equipment calibration certificates can be provided upon request.

5. NOISE SURVEY RESULTS AND OBSERVATIONS

5.1 Results

A summary of the measured ambient noise levels with the kitchen extraction system operating at its typical maximum level (8/10) and without the system operating during the proposed operational hours are shown in Table 5.1.1 below.

Table 5.1.1 Measured ambient sound pressure levels

Date	Time	On/Off	L _{Aeq,15min} *	L _{A90,15min} *
19/07/2024	13:24	Off	44.7	40.4
	13:41	On	55.9	58.1
	13:57	On	55.9	58.2
	14:13	Off	46.6	41.3

*Façade correction -3dB

Spectral Data

In order to assess whether the noise emanating from the mechanical plant has any tonality 1/3 octave measurements were also recorded and are shown in Table 5.1.2 below.

Table 5.1.2 Spectral Data

Time	On/Off	63Hz*	125Hz*	250Hz*	500Hz*	1kHz*	2kHz*	4kHz*	8kHz*
13:24	On	49.9	39.1	40.1	36.7	34.6	32.5	26.7	16.7
13:41	Off	56.7	52.2	59.3	42.2	42.6	39.6	34.1	26.4
13:57	Off	56.7	52.3	59.2	43.8	42.8	39.9	34.5	26.8
14:13	On	47.7	39.7	39.5	36.9	36.6	35.1	31.5	23.7

*Façade correction -3dB

Tonality

BS 4142:2014 (Annex C) states: -

For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

Using the objective assessment method as specified in BS4142:2014 a penalty would be applied to the rated noise level if both adjacent 1/3 octave values;

- Exceeds by 15dB from 25Hz-125Hz
- Exceeds by 8dB from 160-400Hz
- Exceeds by 5dB from 500-10kHz

At no time during the measurement period did the 1/3 octave band measurements with the mechanical plant in operation exceed both adjacent 1/3 octave bands by the BS 4142 objective criteria.

A subjective assessment of the tonality of the extraction system was also completed. There was no audible tonal element to the noise from the extraction system terminus.

5.2 Observations

During the survey, the dominant noise sources were noise from adjacent commercial activities. It is considered that the measured noise levels are reasonable given the location of the measurement position.

A subjective assessment of the noise source was undertaken at the time of the noise survey. It was noted that there were no perceptible acoustic characteristics produced by the noise source. The extraction system was audible at the nearest sensitive residential receptor.

6. EXTERNAL NOISE EMISSION LIMITS

6.1 Local Authority Requirements

The site lies within the jurisdiction of the Gravesham Borough Council. The following acoustic related condition has been attached to the approved planning application (20221254):

4) 'The rating level of the noise emitted from plant/machinery/equipment installed at the premises, shall not exceed the existing background noise level by more than -10dB at the nearest noise sensitive premises when measured and assessed in accordance with BS4142:2014.'

For the purposes of this report, an assessment has been undertaken in line with BS4142:2014+A1:2019 in order to verify the resultant noise levels after the installation of the kitchen extraction system. The rating noise level criteria as detailed in our previous report, dated 17/11/2022, is shown in Table 6.1 below.

Table 6.1 Maximum noise emission design target at residential premises

Date / Period (hours)	Typical Background Sound Pressure Level, dB $L_{A90,15min}$	Rating noise level at nearest residential facade, dB $L_{Aeq,T}$
29/06/2021 (11:00 to 00:00)	48	38
28/06/2021 & 30/06/2021 (11:00 to 00:00)	48	

6.2 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound” presents a method for assessing the significance and possible adverse impact due to an industrial noise source, based on a comparison of the source noise levels and the background noise levels, both of which are measured or predicted at a noise sensitive receiver e.g. a residential property.

The specific noise level due to the source is determined, with a series of corrections for tonality, impulsivity, intermittency or other unusual characteristic. The rating level is then compared to the background noise level and the significance of the new noise source likelihood of any adverse impact is determined in accordance with the following advice:

“The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occur. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context. The lower the rating level is relative 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 sound level, this is an indication of the specific sound source having a low impact, depending on the context.”

7. KITCHEN EXTRACTION SYSTEM AND ASSOCIATED NOISE LEVELS

The following items of plant have been installed at the rear of the premises.

Table 7.1 Kitchen Extraction Fan Motor

External Plant Item	Make	Model	Reference Noise Level* $L_{W(A)}$
Kitchen Extraction Fan Motor	Helios	GBW 450/4	Outlet 75dB Breakout 60dB
Kitchen Intake Fan Motor	Ruck Fans	EL 250 E2 01	Intake 72dB

*Reference sound power levels. Manufacturer's specifications are provided in Appendix B.

In reference to section 6 of this report, a penalty addition has not been applied for intermittency as the system will switch on at the start of service and off at the end. Penalty additions have not been applied for tonality as both the BS 4142 objective method and the consultant's subjective assessment show that no prominent tones are present. No other significant characteristics, including impulsiveness were witnessed during the assessment.

8. DESCRIPTION OF THE DETERMINATION PROCESS

In accordance with the methodologies of BS 4142:2014+A1:2019, measurements have been undertaken to determine noise levels of the new kitchen extraction system installed at 147 Parrock Street, Gravesend DA12 1EY.

Noise level measurements were completed over a one-hour period with the system on and off. The average $L_{Aeq,15min}$ measurements at the 1/1 octave band frequencies between 63Hz and 8000Hz with the system off have been logarithmically subtracted from the measurements with the system on. Full calculations can be found in Appendix C.

The rating noise level at the nearest sensitive receptor, with the mechanical plant operating, has been measured at **56dB $L_{Aeq,1hour}$** which is **8dB(A) above** the typical background noise level (48dB $L_{A90,15min}$).

In accordance with BS 4142:2014+A1:2019 guidance, the rating noise ***“is an indication of the specific sound source having a significant adverse impact”***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact.*

9. RECOMMENDED NOISE MITIGATION

Due to the close proximity of the noise sources to each other, it was not possible to isolate the noise sources sufficiently. Therefore, prediction calculations have been undertaken to determine the specific noise level at the nearest sensitive receptor from each noise source. The cumulative predicted calculated level is within 0.5dB of the measured level and is considered reasonable for the purposes of specifying appropriate noise mitigation. Full calculations can be found in Appendix C.

In order to meet the required design target, it is recommended to install the following mitigation:

Silencer

An additional Acoustica CP01-M45-120 silencer should be installed on the atmosphere side of the fan of the extraction system. The silencer provides the attenuation shown in Table 9.0.1. All silencers should be Melinex lined.

Table 9.0.1 Silencer Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
4	8	13	20	29	25	16	11

Extraction Fan Jacket

The extraction fan motor should be fitted with a Helios acoustic jacket. The jacket provides the attenuation shown in Table 9.0.2.

Table 9.0.2 Jacket Attenuation

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
12	18	24	32	34	39	42	44

The rating noise level at the nearest residential façade, with the mechanical plant operating, with recommended mitigation installed, is predicted to be **37dB L_{Aeq,T}** which is **11dB(A) below** the typical background noise level (48dB L_{A90, 15min}).

In accordance with BS 4142:2014+A1:2019 guidance, the rating noise, with the recommended mitigation measures installed, ***“is an indication of the specific sound source having a low impact”***. *The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact.*

10. CONCLUSION

Sound Licensing has undertaken a post verification plant noise assessment at the site in order to determine the resultant noise levels following the installation of a new kitchen extraction system. The operation of the mechanical plant, with recommended mitigation installed, in accordance with BS 4142:2014+A1:2019 guidance, indicates to creating a low impact.

The existing kitchen extraction system has been measured and the specific noise level would not meet the requirements of planning condition 4, therefore additional mitigation will be required.

The measured maximum operating noise level of the mechanical plant, with recommended mitigation installed, is demonstrated to comply with the Gravesham Borough Council's planning condition and therefore, with recommended mitigation installed, planning condition 4 may be discharged.

APPENDIX A – Acoustic Terminology

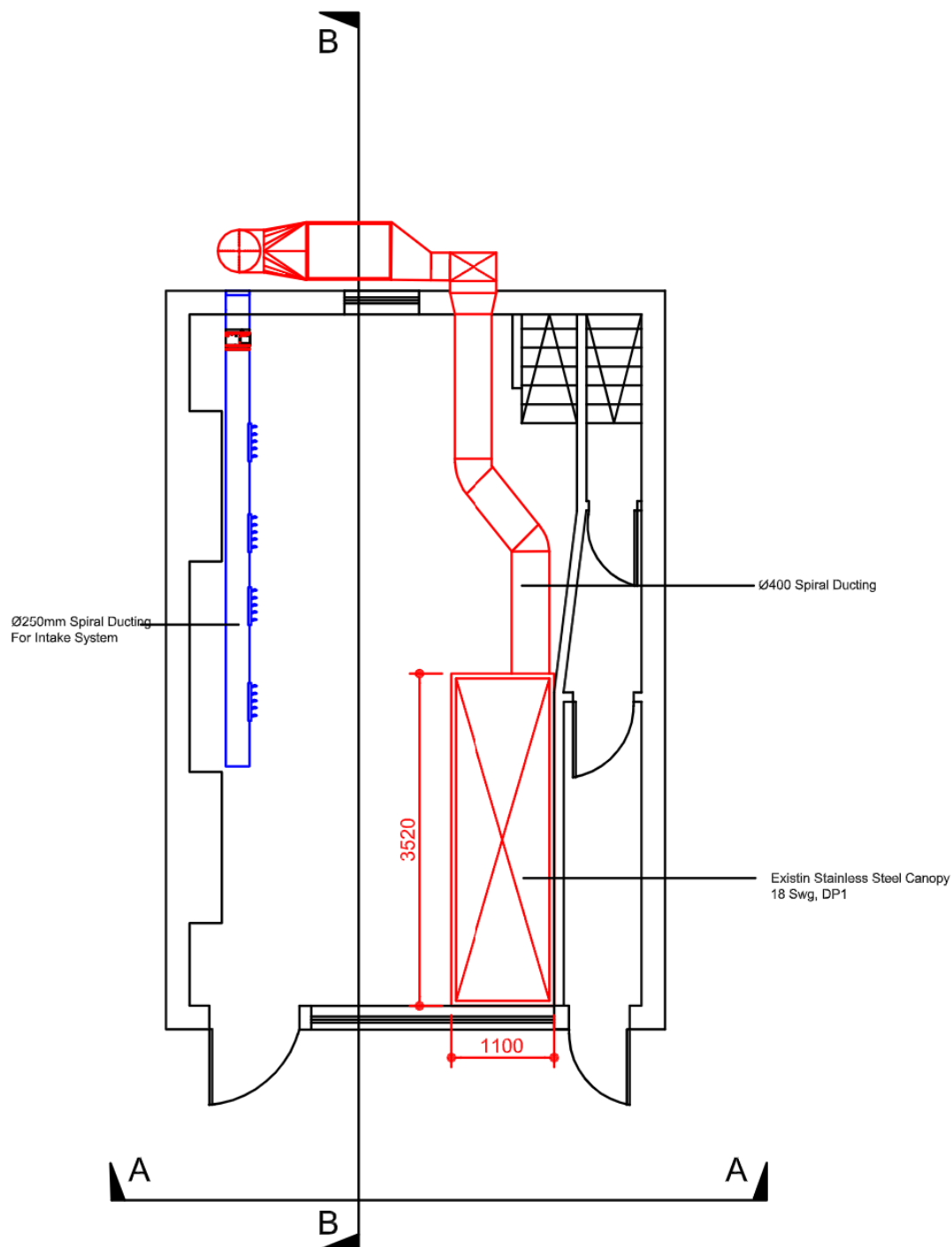
Parameter	Description
Acoustic environment	Sound from all sound sources as modified by the environment
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far
Ambient sound level, $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T
Background sound level, $LA_{90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels
Decibel (dB)	A logarithmic scale representing the sound pressure or power level relative to the threshold of hearing (20×10^{-6} Pascals).
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time
Measurement time interval, T_m	Total time over which measurements are taken
Rating level, $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound
Reference time interval, T_r	Specified interval over which the specific sound level is determined
Residual sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound
Residual sound level, $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T
Specific sound level, $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r
Specific sound source	Sound source being assessed

References:

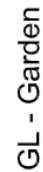
BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'

APPENDIX B – Data Sheets and Figures

Proposed Ground Floor Plan



EXISTING GROUND FLOOR PLAN



Section B-B

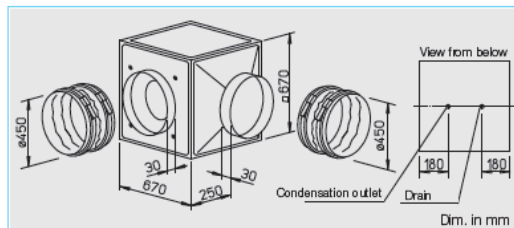
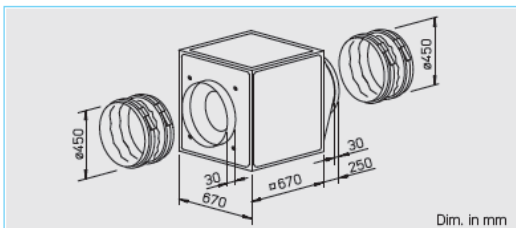
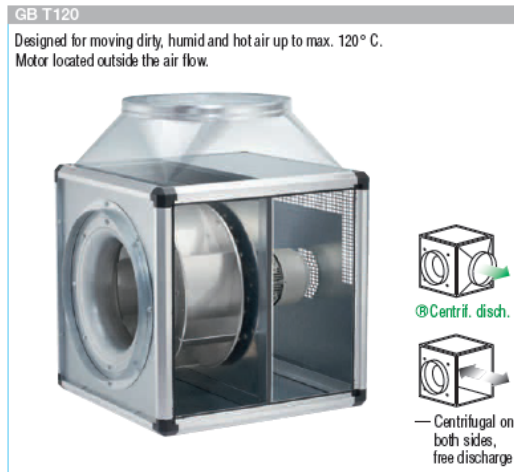
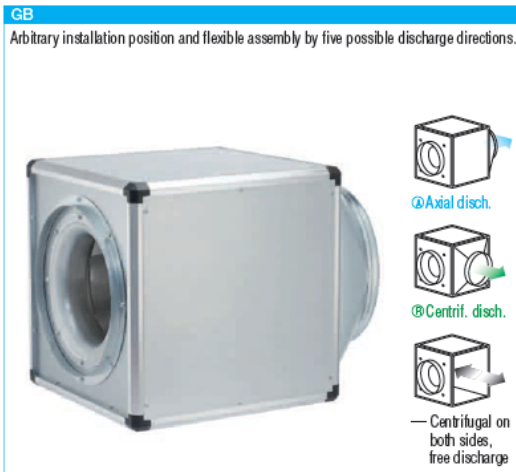
PROPOSED BB SECTION ELEVATION

PROPOSED REAR ELEVATION

Extraction Fan Motor – Helios Gigabox 450/4

450 mm ø GigaBox centrifugal fan

Helios



■ Special features of types GB T120

- Designed for moving dirty, humid and hot air volumes up to max. 120° C.
- Motor located outside of air flow.
- Temperature insulated partition panel between motor and impeller, lined with 20 mm thick, flame-retardant mineral wool.
- Easily accessible motor and impeller unit, removable without disassembling the system components.
- Inspection cover with handle, simply remove for cleaning and maintenance.
- Condensate collector with condensate spigot included in delivery. Drill hole for rain drainage (accessories) for outdoor installation is prepared.

□ Assembly GB T120

Installation must be carried out with condensation discharge showing downward. Flexible assembly by three possible centrifugal discharge directions via the discharge adapter. Outdoor installation is possible using outdoor cover hood and external weather louvers (accessories).

■ Feature

□ Assembly of types GB

Arbitrary installation position and flexible assembly by five possible discharge directions via the discharge adapter. For wall mounting the wall bracket (accessories) have to be used. Outdoor installation is possible using outdoor cover

hood and external weather louvers (accessories).

■ Specification of both types

□ Casing

Self-supporting frame construction from aluminium hollow profiles. Double-walled side panels from galvanised sheet steel, lined with 20 mm thick temperature insulating and flame-retardant mineral wool. Intake cone for ideal inflow as well as spigot and flexible sleeve (for the respective max. permissible air flow temperature) for duct connection. With discharge adapter (from square to circular) on the pressure side for low-loss discharge and flexible sleeve to reduce vibration transmission. Simple positioning by standard crane hooks.

□ Impeller

Smooth running backward curved centrifugal impeller highly efficient with polymer blades on galvanised steel disc (with GB T120 aluminium impeller), direct driven. Energy efficient with a low noise development. Dynamically balanced together with the motor to DIN ISO 1940 Pt.1 – class 6.3.

□ Motor

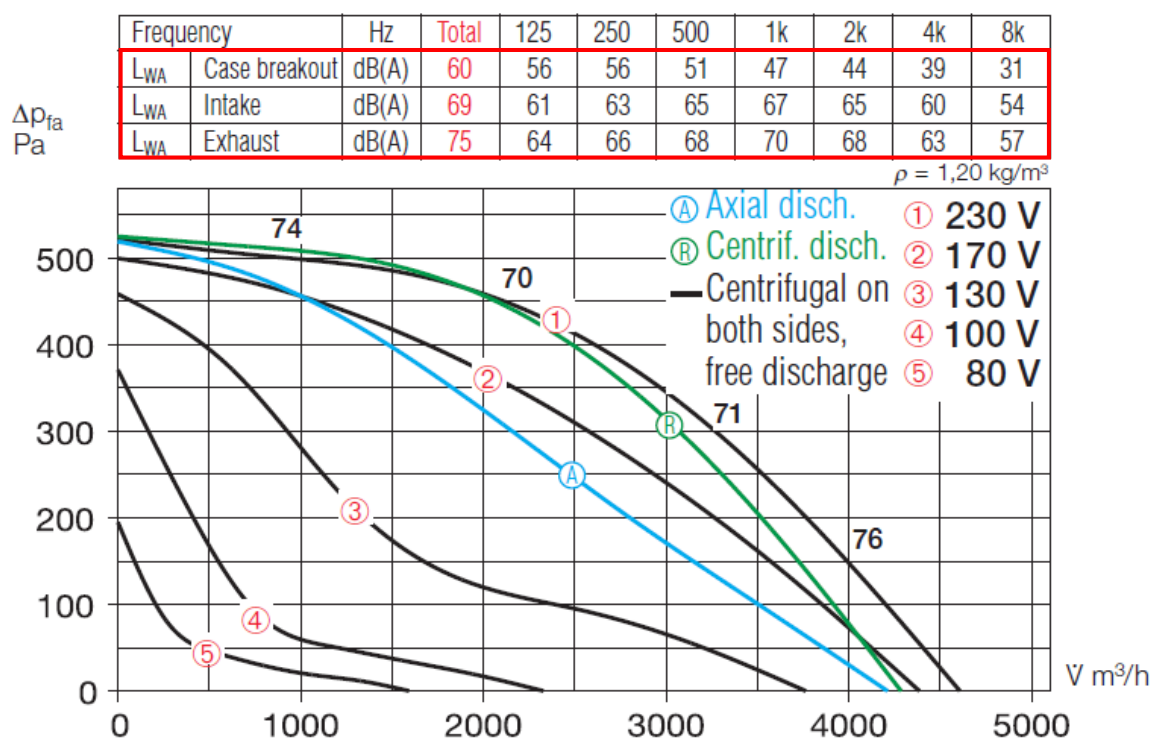
Maintenance-free external rotor motor or IEC-standard motor protected to IP 54. With ball bearings and interference-free as standard.

Type	Ref. no.	Air flow volume (FID)	R.P.M.	Sound press. case breakout	Motor power (nominal)	Current (full load)	Current speed controlled	Wiring diagram	Maximum air flow temperature Full load controlled	Weight (net)	5 step transformer controller with mot. protect. unit	Full motor protection unit using the thermal contacts
		V m³/h	min⁻¹	dB(A) in 4 m	kW	A	A	No.	°C	kg	Type Ref. no.	Type Ref. no.
1 Phase motor, 230 V / 1 ph. / 50 Hz, capacitor motor, protection to IP 54												
GBW 450/4	5515	4800	1380	40	0.66	2.90	4.0	854	45	49.0	MWS 5 1949	TSW 5,0 1487 MW 1) 1579
2 speed motor, 3 Phase motor, 400 V / 3 ph. / 50 Hz, Y/Δ wiring, protection to IP 54												
GBD 450/4/4	5516	4350/5450	880/1240	40	0.36/0.67	0.67/1.33	1.30	867	55	55	RDS 2 1315	TSO 1,5 1501 MD 5849
1 Phase motor, 230 V / 1 ph. / 50 Hz, capacitor motor, protection to IP 54												
GBW 450/4 T120	5774	7110	1370	45	1.00	4.60	5.50	935	120	100	MWS 7,5 1950	TSW 7,5 1596 MW 1) 1579
2 speed motor, 3 Phase motor, 400 V / 3 ph. / 50 Hz, Y/Δ wiring, protection to IP 54												
GBD 450/4/4 T120 5775	6210/7180	1100/1350	45	0.65/0.90	1.10/1.60	1.80	947	120	110	74.0	RDS 2 1315	TSO 3,0 1502 MD 5849

1) incl. operation switch

Helios Gigabox 450/4 Acoustic Data

GBW 450/4



Acoustica CP01-M45-120 Silencer – Recommended Silencer

CP01 M Series



CP01 - M45 Silencer

Available in four standard lengths, M-Series Silencers have excellent attenuation properties, achieved with sound absorbing infill retained in the attenuator casing by a perforated galvanised steel liner.

- Fits directly into 100mm diameter ducting
- Standard lengths 300, 600, 900 & 1200mm
- Use up to 70°C (standard construction)
- Systems up to 1000 Pascals
- Special lengths on request



Typical Noise Reduction (dB) - Centre Band Frequency

Product Code	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
CP01 - M45 - 030	1	1	4	10	14	15	12	7
CP01 - M45 - 060	2	4	6	14	16	16	13	11
CP01 - M45 - 090	3	6	8	17	24	21	15	11
CP01 - M45 - 120	4	8	13	20	29	25	16	11

Typical noise reduction data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

Helios Gigabox Acoustic Jacket – Recommended Fan Jacket



GB ACOUSTIC JACKETS

As a company HELIOS is working towards a better environment for all and therefore as acoustic issues become more prominent with the requirement of breakout noise reaching levels externally that were only previously used internally we have produced a range of items to help in the fans performance.

Acoustic Jacket.

This is a cladding that simply bolts to the existing casing giving a lower breakout noise for the fan casing. It uses existing fixing holes and comes as 4 x 50mm panels that fit together around the GB Fan box.

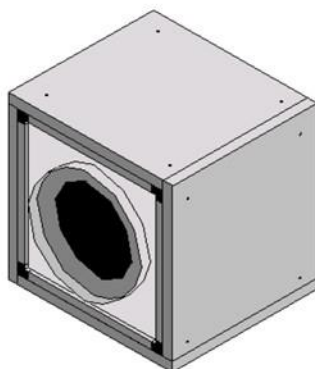


Illustration of GB630 with Cladding fitted

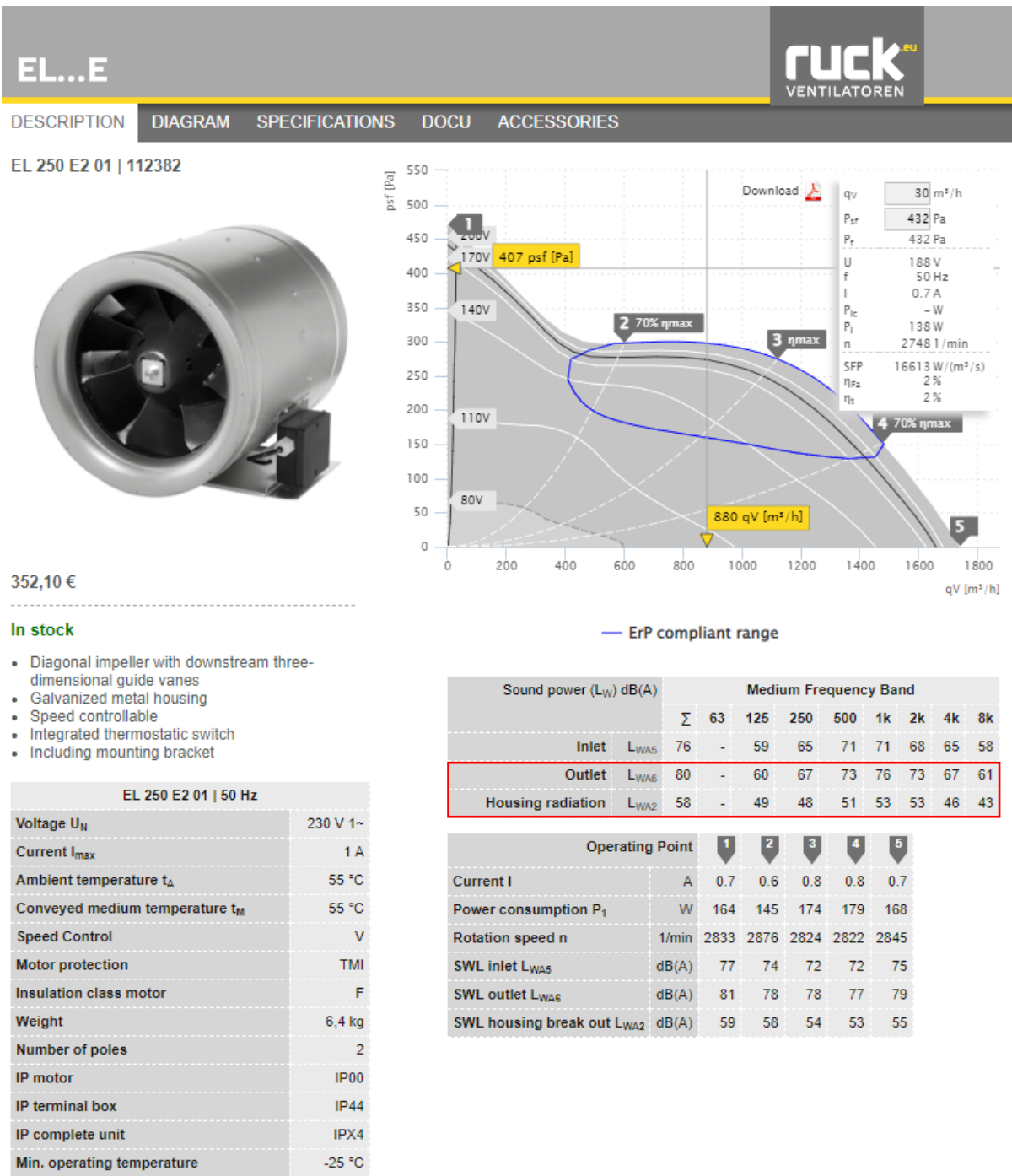
The Acoustic panel construction

The panel is made of a sandwich of internal perforated galvanised sheet steel 0.9mm thk with 50mm rockwool material of 60kg/m³ density with an outer skin of 1.0mm sheet steel.

Reduction for panel

Mid band freq Hz	63	125	250	500	1K	2K	4K	8K
Sound reduction dB	12	18	24	32	34	39	42	44

Ruck Fans EL 250 E2 01 Data Sheet – Air Intake Fan Motor



Acoustica CP01-M25-60 and CP01-M25-120 Silencers

CP01 M Series



CP01 - M25 Silencer

Available in four standard lengths, M-Series Silencers have excellent attenuation properties, achieved with sound absorbing infill retained in the attenuator casing by a perforated galvanised steel liner.

- Fits directly into 100mm diameter ducting
- Standard lengths 300, 600, 900 & 1200mm
- Use up to 70°C (standard construction)
- Systems up to 1000 Pascals
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Typical Noise Reduction (dB) - Centre Band Frequency

Product Code	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
CP01 - M25 - 030	2	3	6	12	16	19	17	8
CP01 - M25 - 060	3	6	10	19	25	29	18	10
CP01 - M25 - 090	5	8	12	24	30	30	22	14
CP01 - M25 - 120	7	10	15	31	37	38	26	15

Typical noise reduction data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

APPENDIX C – Calculations

Measured Noise Levels

Where:

L_1 = Measured $L_{Aeq,1hour}$ With the Extraction System Operating

L_2 = Measured $L_{Aeq,1hour}$ Without the Extraction System Operating

L_P = Sound Pressure Level of Extraction System 1m from nearest receptor

$$L_P = 10 \log \left(10^{\left(\frac{L_1}{10}\right)} - 10^{\left(\frac{L_2}{10}\right)} \right)$$

The specific measured level of each 1/1 octave frequency band was determined using the above formula, A-weighted and logarithmically added to determine the specific $L_{Aeq,1hour}$ at 1m from the nearest sensitive receptor. The calculation is shown below:

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required = 6dB for LpA recommended)	6		dB				Metres	Ref Dist'	
	Enter Distance =						1	1	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
	61.3	63.0	61.5	48.8	46.3	43.2	38.8	30.7	66.90
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LPA	35.08	46.91	52.86	45.58	46.26	44.38	39.78	29.64	55.59
LPA at New Dist'	35.08	46.91	52.86	45.58	46.26	44.38	39.78	29.64	55.59
LPA After Insert	35.08	46.91	52.86	45.58	46.26	44.38	39.78	29.64	55.59

Measured Specific Sound Pressure Level @ 1m from the Nearest Sensitive Receptor = 56dB $L_{Aeq,1hour}$

Predicted Noise Levels – Existing System

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required =				6	dB			Metres	
5dB for LpA recommended)				Enter Distance =				0.7	
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
		72.1	64.6	54.2	47	42.8	38	32.1	72.89
Total LW	4.8	72.1	64.6	54.2	47.0	42.8	38.0	32.1	72.89
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	-21.4	56.0	56.0	51.0	47.0	44.0	39.0	31.0	60.03
LPA at New Dist'	-26.34	51.09	51.09	46.09	42.09	39.09	34.09	26.09	55.12
LPA After Insert	-26.34	51.09	51.09	46.09	42.09	39.09	34.09	26.09	55.12

Extraction Fan Motor @ 0.7m = 55dB $L_{Aeq,T}$

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required = 5dB for LpA recommended)			6	dB			Metres	
			Enter Distance =				2	
	Frequency Hz							
	125	250	500	1000	2000	4000	8000	Total
	80.1	74.6	71.2	70	66.8	62	58.1	82.08
Total LW	80.1	74.6	71.2	70.0	66.8	62.0	58.1	82.08
'A' Weight	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	64.0	66.0	68.0	70.0	68.0	63.0	57.0	75.00
LPA at New Dist'	50.00	52.00	54.00	56.00	54.00	49.00	43.00	61.00
SILENCER	8	13	20	29	25	16	11	
DUCT LENGTH, 4m	3	1	1	1	1	1	1	
DIRECTIVITY 120°	2	5	10	13	20	22	22	
LPA After Insert	40.20	35.80	26.20	16.20	11.20	13.20	12.20	41.70

Extraction System Terminus @ 2m = 42dB L_{Aeq,T}

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required = 5dB for LpA recommended)			6	dB			Metres	
			Enter Distance =				1.5	
	Frequency Hz							
	125	250	500	1000	2000	4000	8000	Total
	75.1	73.6	74.2	71	66.8	64	59.1	80.10
Total LW	75.1	73.6	74.2	71.0	66.8	64.0	59.1	80.10
'A' Weight	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	59.0	65.0	71.0	71.0	68.0	65.0	58.0	75.94
LPA at New Dist'	47.49	53.49	59.49	59.49	56.49	53.49	46.49	64.43
SILENCER	10	15	31	37	38	26	15	
SILENCER	6	10	19	25	29	18	10	
DIRECTIVITY 90°	0	0	4	7	12	14	17	
LPA After Insert	31.49	28.49	5.49	-9.51	-22.51	-4.51	4.49	33.27

Intake System Terminus @ 1.5m = 33dB L_{Aeq,T}

Adding dB								
Levels to be added (Max. of eight)								
Enter values	55	42	33	0	0	0	0	0
Total =				55.2 dB				

Predicted Existing Sound Pressure Level @ 1st Floor Window = 55dB dB L_{Ar,T}

Predicted Noise Levels – Recommended Mitigation Installed

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required = 6dB for LpA recommended)				6	dB			Metres	
					Enter Distance =				0.7
	Frequency Hz								
	63	125	250	500	1000	2000	4000	8000	Total
		72.1	64.6	54.2	47	42.8	38	32.1	72.89
Total LW	4.8	72.1	64.6	54.2	47.0	42.8	38.0	32.1	72.89
'A' Weight	26.2	16.1	8.6	3.2	0	-1.2	-1	1.1	
LWA (Power)	-21.4	56.0	56.0	51.0	47.0	44.0	39.0	31.0	60.03
LPA at New Dist'	-26.34	51.09	51.09	46.09	42.09	39.09	34.09	26.09	55.12
JACKET	12	18	24	32	34	39	42	44	
LPA After Insert	-38.34	33.09	27.09	14.09	8.09	0.09	-7.91	-17.91	34.12

Extraction Fan Motor @ 0.7m = 34dB L_{Aeq,T}

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required =				6	dB			Metres	
6dB for LpA recommended)				Enter Distance =				2	
	Frequency Hz								
	125	250	500	1000	2000	4000	8000	Total	
	80.1	74.6	71.2	70	66.8	62	58.1	82.08	
Total LW	80.1	74.6	71.2	70.0	66.8	62.0	58.1	82.08	
'A' Weight	16.1	8.6	3.2	0	-1.2	-1	1.1		
LWA (Power)	64.0	66.0	68.0	70.0	68.0	63.0	57.0	75.00	
LPA at New Dist'	50.00	52.00	54.00	56.00	54.00	49.00	43.00	61.00	
SILENCER	8	13	20	29	25	16	11		
SILENCER	8	13	20	29	25	16	11		
DUCT LENGTH, 4m	3	1	1	1	1	1	1		
DIRECTIVITY 120°	2	5	10	13	20	22	22		
LPA After Insert	29.20	19.80	3.20	-15.80	-16.80	-5.80	-1.80	29.69	

Extraction System Terminus @ 2m = 30dB L_{Aeq,T}

Attenuation per double distance required =
(6dB for LpA recommended)

ion per double distance required = 6dB for LpA recommended)	6		dB				Metres		
			Enter Distance =				1.5		
	Frequency Hz								
	125	250	500	1000	2000	4000	8000	Total	
	75.1	73.6	74.2	71	66.8	64	59.1	80.10	
Total LW	75.1	73.6	74.2	71.0	66.8	64.0	59.1	80.10	
'A' Weight	16.1	8.6	3.2	0	-1.2	-1	1.1		
LWA (Power)	59.0	65.0	71.0	71.0	68.0	65.0	58.0	75.94	
LPA at New Dist'	47.49	53.49	59.49	59.49	56.49	53.49	46.49	64.43	
SILENCER	10	15	31	37	38	26	15		
SILENCER	6	10	19	25	29	18	10		
DIRECTIVITY 90°	0	0	4	7	12	14	17		
LPA After Insert	31.49	28.49	5.49	-9.51	-22.51	-4.51	4.49	33.27	

Intake System Terminus @ 1.5m = 33dB L_{Aeq,T}

<u>Adding dB</u>								
<u>Levels to be added</u> (Max. of eight)								
<i>Enter values</i>	30	34	33	0	0	0	0	0
Total = 37.4 dB								

Predicted Existing Sound Pressure Level @ 1st Floor Window = 37dB dB $L_{Ar,T}$