Philip Acoustics Ltd.

Consultants in Noise and Vibration

REPORT TITLE: ACOUSTIC REPORT IN SUPPORT OF PLANNING APPLICATION FOR EXTERNAL AIR CONDITIONING EQUIPMENT AT 53 QUICKSWOOD, LONDON NW3 3SA

REPORT REF: 14277-002

ISSUED TO: Mr & Mrs Toye
53 Quickswood
London
NW3 3SA

ISSUED BY: Chris Swiejkowski MEng MIOA

CHECKED BY: David R Philip BEng (Hons) MIOA

DATE: December 2014

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SUMMARY

- Philip Acoustics has been commissioned to assess noise and vibration from proposed new air conditioning equipment to be installed externally at second floor flat roof level at 53 Quickswood, London NW3 3SA. The assessment considers London Borough of Camden's planning consent noise conditions for mechanical services equipment.

- As part of the assessment, a background noise survey has been carried out at the site over a five day period including weekdays and a weekend to establish lowest existing background noise levels representative of outside neighbouring residential windows during operational times of the proposed new equipment.

- Based on acoustic calculations using proposed equipment manufacturer's noise data, the noise level contribution due to the proposed equipment is calculated to be below existing background noise levels and comply with London Borough of Camden's planning consent noise requirements.

- Location for the new equipment is structurally linked, albeit indirectly and at distance, to adjacent residential properties and therefore it is possible that equipment vibration could transmit into these properties. Although this is considered very unlikely as location of the equipment is remote from these and because vibration from this type of modern equipment is generally low, as good practice, it is recommended that the equipment be installed on vibration isolators. Specification details for suitable vibration isolators are included in Section 5 of the report.

1. INTRODUCTION

Two new Panasonic air conditioning units are proposed to be installed externally at second floor flat roof level to serve a residential property at 53 Quickswood, London NW3 3SA.

As part of the planning process for the new equipment, the Local Planning Authority (London Borough of Camden) requested information in the form of an acoustic report regarding noise from the proposed new equipment in order to seek to protect the amenity of occupants of noise sensitive buildings in vicinity with regard to possible noise emissions from the equipment.

Philip Acoustics has therefore been commissioned to provide an acoustic assessment for the new equipment. This report presents results of the assessment and includes:-

- Confirmation of London Borough of Camden's planning consent noise requirements;
- Measurement of existing background noise levels;
- Calculation of equipment noise levels;
- Consideration of vibration from the equipment;
- Review of noise/vibration control treatments necessary to comply with London Borough of Camden's planning consent requirements.

2. LONDON BOROUGH OF CAMDEN NOISE REQUIREMENTS

Policy DP28 – Noise and Vibration of Section 3 of Camden Development Policies 2010-2025 covers in detail noise issues relating to a wide range of planning and noise pollution scenarios, including mechanical services equipment.

Policy DP28 includes the statement *"The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds"*. Camden's noise limit thresholds for plant and machinery are listed in Table E of Policy DP28. A copy of page 133 from Camden Development Policies 2010-2025 Policy DP28 showing Table E is included in Appendix A.

In summary, London Borough of Camden's noise conditions are:

i. That overall dBA noise from equipment shall be designed to at least 5dB below the existing L_{A90} dB background noise level;

ii. That, where it is anticipated any equipment will have a noise that has a distinguishable discrete note (whine, hiss, screech or hum) and/or there are distinct impulses (bangs, clicks, clatters and thumps) then the overall dBA noise from equipment shall be designed to at least 10dB below the existing L_{A90} dB background noise level. *Note it is the author's experience and observation based on octave band noise data and on-site noise measurements of similar modern air conditioning condensers, that the type of proposed Mitsubishi air conditioning condensers subject to this assessment generate a typically broadband type of noise (i.e. without any strong tonal or intermittent characteristics sufficient to attract attention), and therefore the more onerous noise limit as item (ii) of London Borough of Camden's planning consent noise conditions is not considered applicable in this instance.*

Although not specifically included within Table E of Policy DP28, Philip Acoustics Ltd is aware that London Borough of Camden also has noise conditions guidance that for each octave band (63Hz to 8KHz) then noise from equipment shall be designed to not add more than 1dB to the existing lowest L_{90} dB octave band background noise level.

All of the above are applicable over a period of 60 minutes and measured at 1m external to noise sensitive facades. For this development the nearest noise sensitive façade is taken as relating to windows of existing first floor offices within the building itself.

3. BACKGROUND NOISE SURVEY

In order to assess noise from the proposed new equipment it is necessary to establish representative background noise levels at the nearest noise sensitive (residential) facade. Details of the background noise survey carried out by Philip Acoustics are provided in Sections 3.1 to 3.3.

3.1 Instrumentation

Details of the noise survey instrumentation used are provided in Appendix B. The sound level meters were calibrated before and after the survey measurements using the UKAS certified calibrator.

3.2 Measurement Procedure

Although the proposed new equipment would likely only tend to operate during the daytime and evening periods, as it will serve a residential property it will potentially operate at any time over 24 hours. Therefore the survey was carried out over at least a full 24 hour period to obtain background noise levels during the entire possible time of operation for the equipment.

The background noise survey was carried out over a five day period from 4 December 2014 to 8 December 2014; the weather included dry and calm conditions during the day and also the night-time periods.

The background noise survey location was external at second floor flat roof of 53 Quickswood, London NW3 3SA using an extension pole and microphone extension lead arrangement, selected as being representative of, and as practically as close to the nearest (residential) windows at 51 Quickswood.

Proposed location of the new equipment at second floor flat roof and direction to the nearest noise sensitive (residential) windows are indicated on a drawing in Appendix C.

In accordance with London Borough of Camden's noise conditions, the sound level meter was set up to record background noise levels over 60 minute periods (split into 12 x 5 minute periods to enable more accurate analysis of results as required). Measurements of background noise were recorded as overall L_{A90} dB values.

In addition to the overall L_{A90} dB values, several manual samples of linear L_{90} dB octave band background noise were also recorded using the Bruel & Kjaer 2260 sound level meter to establish typical background noise octave band spectra.

3.3 Measurement Results

Existing background noise levels in the vicinity are dominated by traffic on the B509 Adelaide Road as well as by existing mechanical services equipment serving other residential properties in the vicinity.

The lowest recorded background noise level in terms of overall L_{A90} dB and associated equipment octave band values are shown in Table 1. A graph showing the overall raw data L_{A90} dB values over the entire background noise survey period is provided in Appendix D.

Description	Overall L_{A90} dB	Octave Band Centre Frequency (Hz) (linear L_{90} dB)							
		63	125	250	500	1k	2k	4k	8k
Lowest measured background noise level $L_{90\ (60\ minutes)}$	38	46	39	36	34	34	31	23	10
London Borough of Camden noise limit	33	42	35	32	30	30	27	19	6

Table 1: Lowest measured background noise levels and London Borough of Camden's noise conditions (*overall noise limit 5dBA below background level and octave band limit to not add more than 1dB to existing octave band noise levels*)

4. NOISE FROM MECHANICAL SERVICES EQUIPMENT

The two proposed new external air conditioning units are Panasonic model CU-4E23PBE.

Proposed location of the equipment is indicated on a drawing in Appendix C. Manufacturer's noise data for the equipment is provided in Appendix E.

The manufacturer noise data for the equipment is in terms of overall free-field dBA sound pressure level at 1m. Summary of noise from the equipment including indicative octave band values based on noise measurements by the author of this type of air conditioning equipment is shown in Table 2.

The client has advised the equipment will have the capability to operate in both heating and cooling modes. For the purpose of this noise assessment it is taken that the equipment is operating in heating mode, which has slightly higher noise output and therefore is "worse case".

Description	Overall dB(A)	Octave Band Centre Frequency (Hz) (Linear dB)							
		63	125	250	500	1k	2k	4k	8k
Panasonic CU-4E23PBE *(heating mode)*	49	50	48	47	46	43	42	36	29

Table 2: Equipment free field sound pressure levels at 1m

To calculate the overall noise contribution from the equipment to outside the nearest non-associated residential windows a spreadsheet based noise model calculation has been used. The model takes account of the distance between the air conditioning equipment location and windows, acoustic directivity (nil allowed), acoustic reflections and any natural line of sight acoustic screening. Acoustic calculation details are provided in Appendix F.

Summary overall calculated noise level from the equipment to outside the nearest windows of noise sensitive (residential) premises compared with London Borough of Camden's overall dBA noise limit is shown in Table 3 below.

The acoustic calculations are considered extremely cautious for the following reasons:

- The calculation assumes both new air conditioning units are operating simultaneously;
- The calculation assumes both units are operating constantly all of the time in any 60 minute period. In practice these types of air conditioning units operate "on demand" and even when providing significant cooling / heating during the middle of a hot / cold day tend to operate only 60 to 70% of the time. It is extremely unlikely that the air conditioning units would operate constantly for a full 60 minute period;
- The noise limits used for the assessment are cautiously based on the lowest measured background noise levels over the complete noise survey period which occurs during the middle of the night. Background noise levels for most of the time are much higher and correspondingly for these times any equipment noise would be significantly lower than noise limits applicable to these times based on the background noise during these times.

Description	**Equipment Overall Noise Level**	**London Borough of Camden Noise limit**
Assessment position to outside nearest residential windows at 51 Quickswood	31dBA	34dBA

Table 3: Equipment noise at nearest (residential) windows compared with noise limit

Table 3 shows that the overall equipment noise level is at least 5dBA below the lowest background noise. In addition, the equipment octave band noise levels are calculated to also comply with London Borough of Camden's octave band noise condition limits. Therefore the proposed new Panasonic CU-4E23PBE air conditioning units comply with London Borough of Camden's noise condition limits.

Noise from the equipment will not be audible or disturbing to occupiers of nearest noise sensitive properties and no additional noise reduction treatment is required in order to comply with London Borough of Camden's noise requirements.

5. VIBRATION FROM MECHANICAL SERVICES EQUIPMENT

Location for the new equipment is structurally linked, albeit indirectly and at distance, to adjacent residential properties and therefore it is possible that equipment vibration could transmit into these properties. Although this is considered very unlikely as location of the equipment is remote from these and because vibration from this type of modern equipment is generally low, as good practice, it is recommended that the equipment be installed on vibration isolators.

It is recommended the air conditioning equipment be mounted using proprietary rubber or neoprene turret type vibration isolators. The isolators should be selected to each have a static deflection not less than 5mm under load of the unit.

Details of example suitable proprietary rubber / neoprene turret type vibration isolator mountings from three acoustic hardware companies listed below are provided in Appendix G.

Suggested Supplier A	Suggested Supplier B	Suggested Supplier C
Supplier: Allaway Acoustics Ltd	Supplier: Christie & Grey	Supplier: EMTEC
Telephone: 01992 550825	Telephone: 01732 371100	Telephone: 020 8848 3031
Web: www.allawayacoustics.co.uk	Web: www.christiegrey.com	Web: www.emtecproducts.co.uk

APPENDIX A

London Borough Of Camden Noise Conditions For Mechanical Services Equipment

Table D: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and measurement location	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	0700-2300	L_{Aeq}, 5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	2300-0700	L_{Aeq}, 5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	L_{Aeq}, 5m (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB*

* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq},

Key evidence and references

- Camden's Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise

APPENDIX B

Noise Survey Instrumentation

Site: 53 Quickswood, London NW3 3SA

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Date: December 2014

NOISE SURVEY INSTRUMENTATION

Five Day Background Noise Survey:

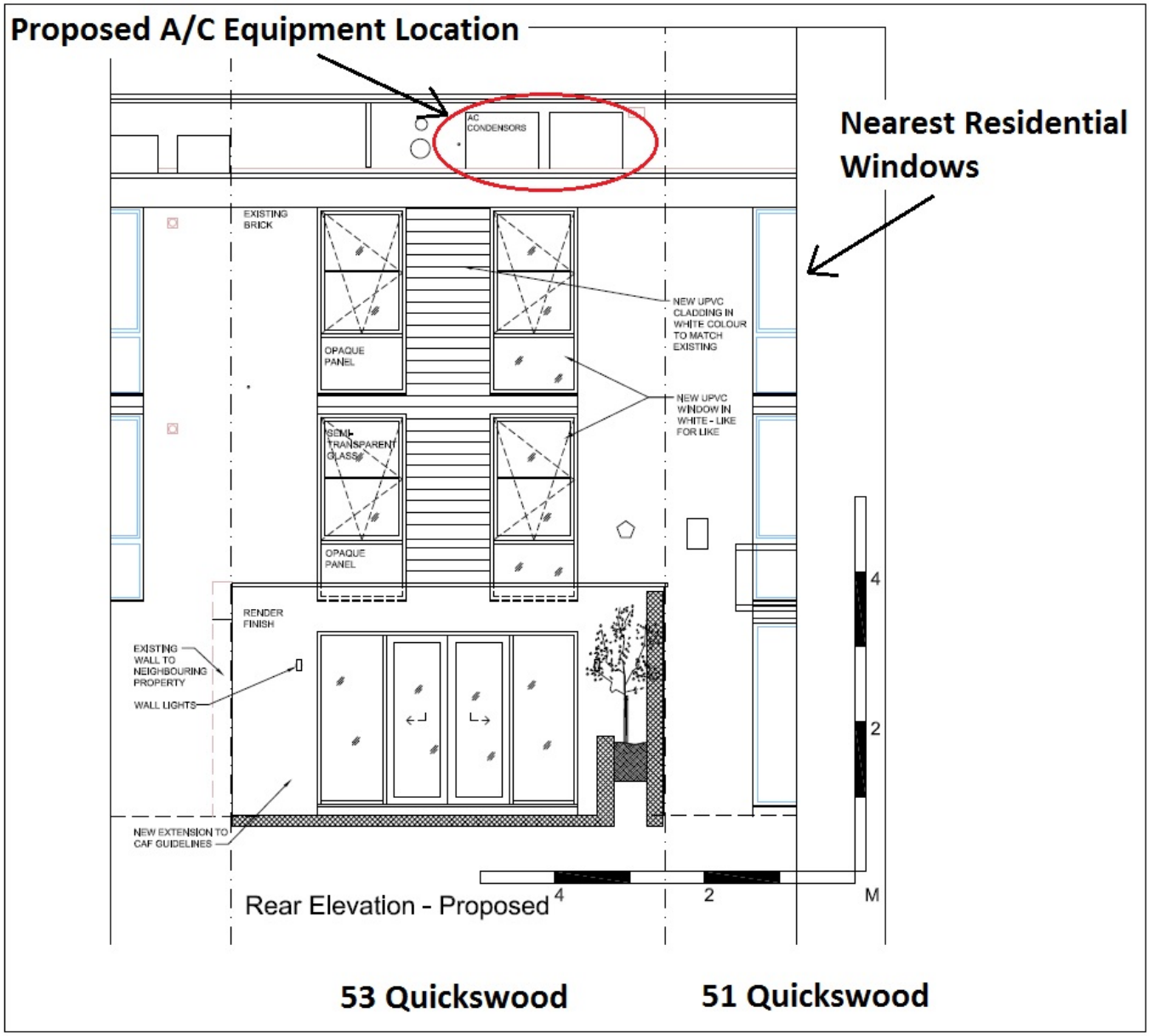
- Rion sound level meter type NL-31 Class 1 serial number 00773045 plus Rion microphone type UC-53A serial number 313002 complete with weatherproof and lockable outdoor environmental kit, microphone extension lead and extension boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2642929 (UKAS certified).

Sample Octave Band Values:

- Bruel & Kjaer sound level meter type 2260 serial number 2497368 plus Bruel & Kjaer microphone type 4189 serial number 2846933

APPENDIX C

Drawing Showing Proposed Equipment Locations


Proposed A/C Equipment Location
Nearest Residential Windows
AC CONDENSORS
EXISTING BRICK
NEW UPVC CLADDING IN WHITE COLOUR TO MATCH EXISTING
OPAQUE PANEL
NEW UPVC WINDOW IN WHITE - LIKE FOR LIKE
SEMI-TRANSPARENT GLASS
OPAQUE PANEL
RENDER FINISH
EXISTING WALL TO NEIGHBOURING PROPERTY
WALL LIGHTS
NEW EXTENSION TO CAF GUIDELINES
4
2
Rear Elevation - Proposed
4
2
M
53 Quickswood
51 Quickswood

APPENDIX D

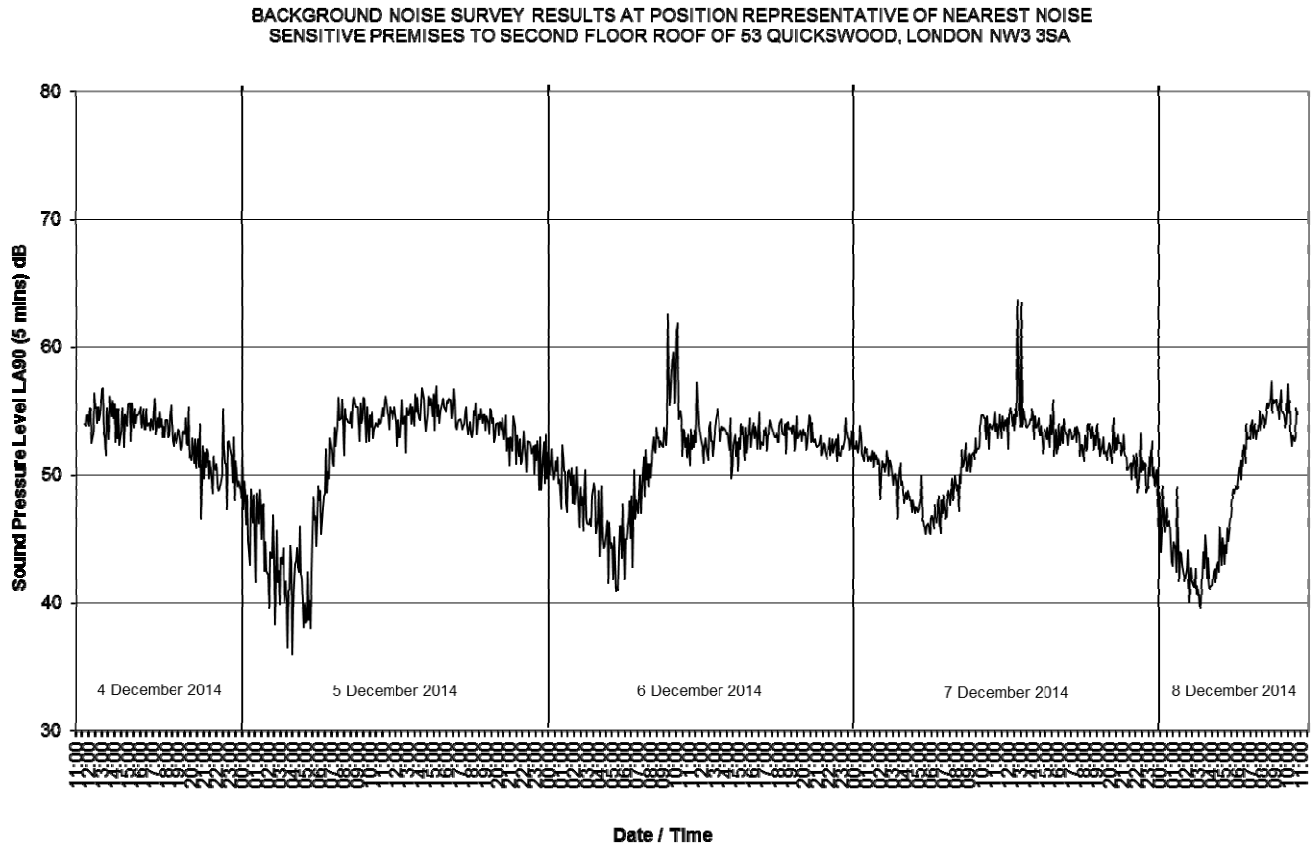
Background Noise Survey Results

Site: 53 Quickswood, London NW3 3SA

Report: 14277-002 Appendix D

Date: December 2014

BACKGROUND NOISE SURVEY RESULTS



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APPENDIX E

Manufacturer Noise Data For Proposed Equipment

Include on the indoor unit

INTERNET CONTROL READY and EASY CONTROL by BMS: Optional only for E9 and E12.

Low Static Pressure Hide Away			2.5 kW	3.2 kW	5.0 kW
Indoor			**CS-E9PD3EA**	**CS-E12QD3EAW**	**CS-ME18PD3EA**
Cooling capacity	Nominal	kW / kCal/h	2.50 / 2,150	3.4 / 2,920	5.00 / 4,300
Heating capacity	Nominal	kW / kCal/h	3.20 / 2,752	4.00 / 3,440	6.80 / 5,850
Connection		mm²	4 x 1.5 to 2.5	4 x 1.5 to 2.5	4 x 1.5
External static pressure[2]	S-Hi / Hi / Me / Lo	Pa	110 / 60 / 30 / 20	80 / 50 / 25 / 10	34 / 78 (3.47 / 7.95)
Air volume	Cooling / Heating	m³/h	414 / 486	558 / 624	624 / 528 / 444
Sound pressure level[1]	Cooling (Hi / Lo / S-Lo)	dB(A)	33 / 27 / 24	34 / 27 / 24	27 / 30 / 41
	Heating (Hi / Lo / S-Lo)	dB(A)	35 / 28 / 25	36 / 28 / 25	29 / 32 / 41
Sound power level	Cooling (Hi)	dB	49	49	57
	Heating (Hi)	dB	51	51	57
Dimensions	H x W x D	mm	235 x 750 x 370	235 x 750 x 370	285 x 750 (+65) x 370
Net weight		kg	17	17	18
Piping connections	Liquid / Gas pipe	Inch (mm)	1/4 (6.35	1/4 (6.35)	1/4 (6.35)
	Liquid / Gas pipe	Inch (mm)	3/8 (9.52)	3/8 (9.52)	1/2 (12.70)

Outdoor Units for Free Multi combinations

5 year compressor warranty


CU-2E15PBE


CU-2E18PBE


CU-3E18PBE


CU-4E23PBE


CU-4E27PBE


CU-5E34PBE

5 YEARS COMPRESSOR WARRANTY: Only for PRO partners.

Outdoor Unit //Inverter+			3.2 to 5.6 kW	3.2 to 6.4 kW	4.5 to 9.0 kW	4.5 to 11.0 kW	4.5 to 13.6 kW	4.5 to 17.5 kW
Unit			**CU-2E15PBE**	**CU-2E18PBE**	**CU-3E18PBE**	**CU-4E23PBE**	**CU-4E27PBE**	**CU-5E34PBE**
Cooling capacity	Nominal (Min - Max)	kW	4.50 (1.50 - 5.20)	5.20 (1.50 - 5.40)	5.20 (1.80-7.30)	6.80 (1.90 - 8.80)	8.00 (3.00 - 9.20)	10.00 (2.9 - 11.5)
	Nominal (Min - Max)	kCal/h	3,870 (1,290 - 4,470)	4,472 (1,290 - 4,644)	4,470 (1,548-6,278)	5,850 (1,630 - 7,570)	6,880 (2,580 - 7,912)	8,600 (2,494 - 9,890)
EER	Nominal	W/W	3.66 (6.00 - 3.42) **A**	3.42 (6.00 - 3.42) **A**	4.33 (5.00 - 3.35) **A**	4.05 (5.59 - 3.56) **A**	4.04 (5.66 - 3.21) **A**	3.5 (5.27 - 2.98) **A**
SEER	**Nominal**	**W/W**	**6.50** A++	**6.50** A++	**7.00** A++	**7.00** A++	**7.00** A++	**6.50** A++
Pdesign (cooling)			**4.50**	**5.20**	**5.20**	**6.80**	**8.00**	**10.00**
Power input cooling	Nominal (Min - Max)	kW	1.230 (0.250 - 1.520)	1.490 (0.250 - 1.540)	1.210 (0.360-2.180)	1.680 (0.340 - 2.470)	1.980 (0.530 - 2.870)	2.860 (0.550 - 3.860)
Annual electricity consumption (cooling)		kW	242	280	260	340	400	538
Heating capacity	Nominal (Min - Max)	kWh/a	5.40 (1.10 - 7.00)	5.60 (1.10 - 7.20)	6.80 (1.60-8.30)	8.50 (3.00 - 10.60)	9.40 (4.20 - 10.60)	12.00 (3.40 - 14.50)
	Nominal (Min - Max)	kCal/h	4,640 (950 - 6,020)	4,820 (950 - 6,190)	5,850 (1,200-7,140)	7,130 (2,580 - 9,120)	8,084 (3,612 - 9,116)	10,320 (2,924 - 12,470)
Heating capacity at -7°C	Nominal	kW	3.54	3.65	4.90	6.05	7.08	8.85
COP	Nominal	W/W	4.62 (5.24 - 4.19) **A**	4.63 (4.24 - 5.24) **A**	4.69 (3.93 - 5.00) **A**	4.47 (4.08 - 5.17) **A**	4.52 (6.00 - 3.46) **A**	4.20 (6.42 - 3.42) **A**
SCOP	**Nominal**	**W/W**	**4.00** A+	**4.00** A+	**4.00** A+	**4.00** A+	**4.00** A+	**4.00** A+
Pdesign at -10°C		kW	**4.00**	**3.80**	**4.80**	**5.50**	**8.00**	**10.00**
Power input heating	Nominal (Min - Max)	kW	1.170 (0.210 - 1.670)	1.300 (0.240 - 1.700)	1.450 (0.320 - 2.110)	1.850 (0.580 - 2.600)	2.080 (0.700 - 3.060)	2.860 (0.530 - 4.240)
Annual electricity consumption (heating)		kWh/a	1,400	1,330	1,680	1,925	2,800	3,500
Current	Cooling	A	5.75	7.10	5.30	7.50	9.40	13.20
	Heating	A	5.20	5.35	6.70	8.80	9.80	13.40
Power source		V	230	230	230	230	230	230
Recommended fuse		A	16	16	16	20	20	25
Recommended power cable section		mm²	1.5	1.5	2.5	2.5	2.5	3.5
Sound pressure level[1]	Cooling / Heating (Hi)	dB(A)	47 / 49	49 / 51	46 / 47	48 / 49	51 / 52	53 / 54
Sound power level	Cooling / Heating (Hi)	dB	62 / 64	64 / 66	60 / 61	62 / 63	67 / 68	69 / 70
Dimensions	H x W x D	mm	619 x 824 +70 x 299	619 x 824 x 229	795 x 875 (+95) x 320	795 x 875 (+95) x 320	999 x 940 x 340	999 x 940 x 340
Net weight		kg	39	39	71	72	80	81
Piping connections	Liquid pipe	inch (mm)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)	1/4 (6.35)
	Gas pipe	inch (mm)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)	3/8 (9.52)
Refrigerant loading	R410A	kg	1.40	1.40	2.64	2.64	3.4	3.4
Elevation diff. (in/out)	Max	m	10	10	15	15	15	15
Piping length total	Min / Max	m	3 / 30	3 / 30	3 / 50	60	80	80
Piping length to one unit	Min / Max	m	3 / 20	3 / 20	3 / 25	3 / 25	3 / 25	3 / 25
Precharge length		m (Max)	20	20	30	30	45	45
Additional charge		g/m	15	15	20	20	20	20
Operating range	Cooling Min/Max	°C	-10 / +46	-10 / +46	-10 / +46	-10 / +46	-10 / +46	-10 / +46
	Heating Min/Max	°C	-15 / +24	-15 / +24	-15 / +24	-15 / +24	-15 / +24	-15 / +24

For detailed information about ErP, please visit our page http://www.ptc.panasonic.eu

APPENDIX F

Acoustic Calculations

Site: 53 Quickswood, London NW3 3SA

Ref: 14277-002 Appendix F

Date: December 2014

ACOUSTIC CALCULATION SHEET

ASSESSMENT POSITION: To outside nearest noise sensitive residential windows at 51 Quickswood

NOISE CONDITION: 2 x Panasonic model CU-4E23PBE units operating simultaneously

Equipment	Sound Pressure Level at 1m Lp dBA *(1)*	Correction for noise directivity dB *(2)*	Distance to assesment position m *(3)*	Correction for distance to assessment position dB *(4)*	Correction for line of sight screening dB *(5)*	Correction for acoustic reflections dB *(6)*	Individual Contributions dBA
Roof Level							
1No Panasonic CU-4E23PBE	49	0	5	-14	-10	+3	28
1No Panasonic CU-4E23PBE	49	0	5	-14	-10	+3	28
Overall SPL from sources at assessment position:	**31.0 dB(A)**						

Notes:

Note 1: Free-field overall dBA sound pressure level at 1m based on manufacturer noise data.

Note 2: Cautiously no directivity benefit allowed for.

Note 3: Distance is from center of sound source (Air Conditioning equipment location) to outside center of nearest noise sensitive (residential) windows.

Note 4: Distance correction for point source sound radiation within hemispherical flat reflecting plane.

Note 5: Line of sight acoustic screening between Air Conditioning equipment location and nearest residential windows, cautiously limit acoustic screening benefit to a maximum of -10dB.

Note 6: Air Conditioning equipment is located in non free-field conditions, cautiously allow +3dB correction to account for noise reflections off surrounding vertical surface.

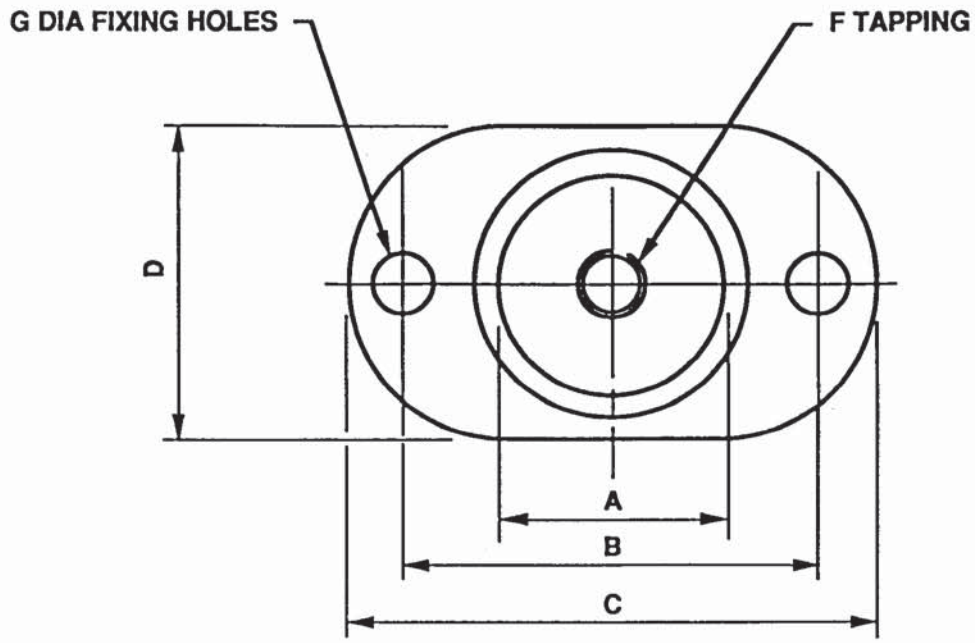
APPENDIX G

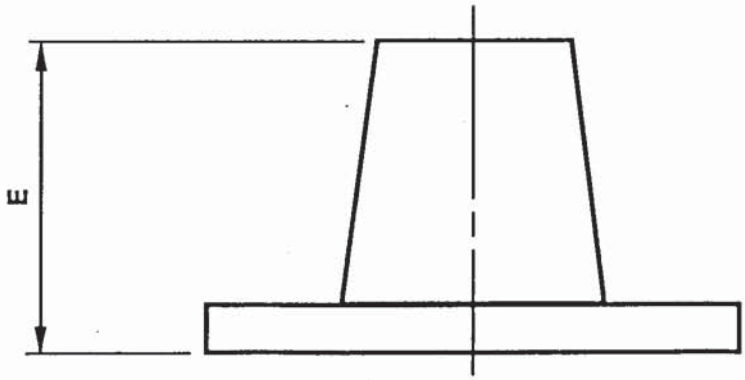
Suggested Details For Vibration Isolators

DRAWING No.
A4-3407A

NEOPRENE RUBBER AV MOUNTS
RANGE MRS0 - MRS4

ALLAWAY ACOUSTICS LTD





DIMENSIONAL DATA

MOUNT TYPE	A	B	C	D	E	F	G
MRS 0	22	50	61	38	18	6	4
MRS 1	29	59	74	41	32	8	7
MRS 2	43	75	98	61	39	12	11
MRS 3	30	60	74	41	37	8	6
MRS 4	41	76	98	60	59	12	11

Allaway Acoustics Ltd Old Police Station 1 Queens Road Hertford Herts. SG14 1EN. Tel: 01992 550825 Fax: 01992 554982

ALLAWAY ACOUSTICS
LIMITED

Mount Type	Colour	Weight Range - Kg From	To	Nominal Deflection
MRS0	Blue	2.5	5	3.0mm
MRS0	Yellow	4	8	3.0mm
MRS0	Green	7	14	3.0mm
MRS0	White	9	18	3.0mm
MRS1	Blue	9	18	4.0mm
MRS1	Yellow	14	28	4.0mm
MRS1	Green	20	40	4.0mm
MRS1	White	27	54	4.0mm
MRS1	Red	36	72	4.0mm
MRS2	Blue	18	60	5.0mm
MRS2	Green	54	108	5.0mm
MRS2	White	90	180	5.0mm
MRS2	Red	135	270	5.0mm
MRS2	Black	180	360	5.0mm
MRS3	Blue	9	18	9.0mm
MRS3	Yellow	14	28	9.0mm
MRS3	Green	20	40	9.0mm
MRS3	White	27	54	9.0mm
MRS3	Red	36	72	9.0mm
MRS4	Blue	18	60	10.0mm
MRS4	Green	54	108	10.0mm
MRS4	White	90	180	10.0mm
MRS4	Red	135	270	10.0mm
MRS4	Black	180	360	10.0mm

in business 30 YEARS

Head Office: Old Police Station, 1 Queens Road, Hertford, Hertfordshire, SG14 1EN. Tel: 01992 550825. Fax: 01992 554982.
Northern Office: Tradeforce Building, Cornwall Place, Bradford, West Yorkshire, BD8 7JT. Tel: 01274 306388. Fax: 01274 308305.
Registered in England 958950 Registered Office: 1 Queens Road, Hertford, Herts, SG14 1EN

Rubber Turret Mountings

Type RM

Type RM Rubber Turret mountings are designed to provide superior attenuation of medium to high frequency vibration and noise emanating from a wide range of motor driven machines particularly axial and centrifugal fans.

High resilience rubber with low dynamic to static stiffness ratio ensures maximum efficiency, good creep performance and long service life.

DESIGN FEATURES

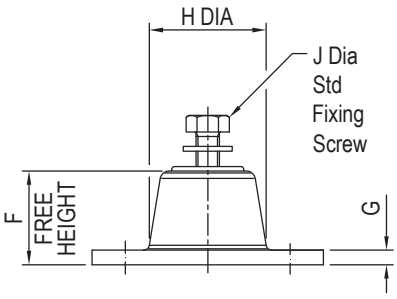
- Moulded in first grade natural rubber with integral steel base and upper fixing boss.
- Manufactured in three sizes, each available in three rubber compounds identified by a colour spot.
- Static deflections of up to 8 mm with loads from 5 kg to 400 kg.
- Upper fixing screw supplied as standard with optional height adjusters also available.

TYPICAL APPLICATIONS

- Axial and Centrifugal Fans.
- Air Handling Units.
- Refrigeration Plant.
- Pumps.
- Rotary and Multi Cylinder Compressors.
- Floating Floors.
- Isolation of Sensitive Equipment.
- Test Rigs and Special Purpose Machines.

CHRISTIE & GREY Vibration & Shock Control

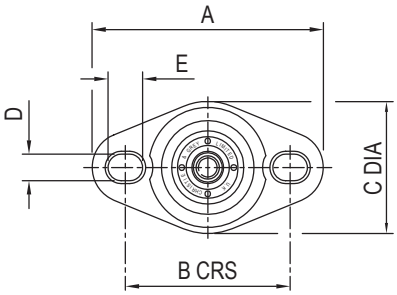
STANDARD PART (.F)



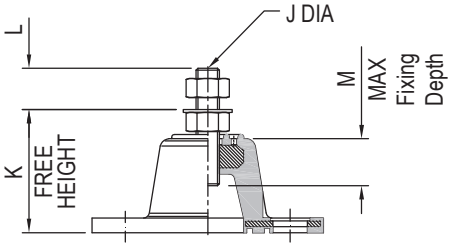
TYPE RM RUBBER TURRET MOUNTINGS

PART No.	COLOUR CODE	RATED LOAD (kg)	DEFLECTION AT RATED LOAD (mm)	DIMENSIONS (mm)												WT (kg) MAX
				A	B	C	D	E	F	G	H	J	K	L	M	
19.100.Y.F	YELLOW	28	6	80	57	45	9	12	32	5	41	M8 x 20	42	13	18	0.11
19.100.B.F	BLUE	50														
19.100.R.F	RED	80														
19.101.Y.F	YELLOW	110	8	95	71	60	9	14	45	5	56	M10 x 25	56	18	28	0.25
19.101.B.F	BLUE	180														
19.101.R.F	RED	280														
19.102.Y.F	YELLOW	150	8	150	115	86	11	22	70	6	82	M12 x 30	83	27	38	0.73
19.102.B.F	BLUE	260														
19.102.R.F	RED	400														

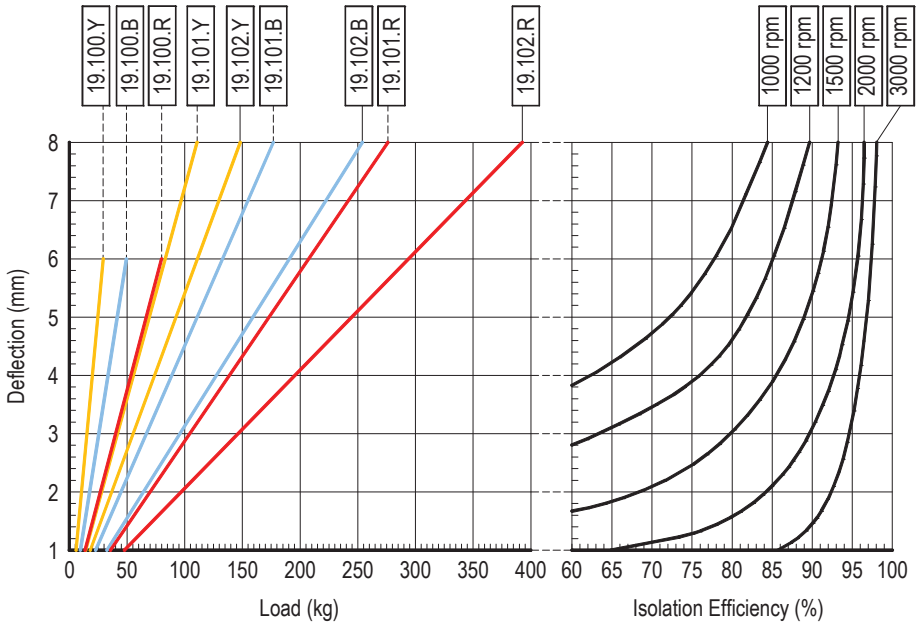
- Above part number includes standard upper fixing screw size J, for height adjustable variant replace **.F** with **.HA**.
- Maximum height adjustment available is 10 mm with **.HA** variant.



HEIGHT ADJUSTABLE VARIANT (.HA)



Load/Deflection and Isolation Efficiency Graphs.



Isolation efficiency is based on dynamic rather than static stiffness for accurate calculation of system performance.

Application Notes:

Rubber Turret mountings should not be used on machines exhibiting high out of balance forces or mobile applications without locking devices or independent restraints.

For full installation instructions please refer to our data sheet DS010.

For more detailed information and technical assistance please contact our Technical Department.

In the interests of continual development, the Company reserves the right to make modifications to these details without notice.

Christie & Grey Limited

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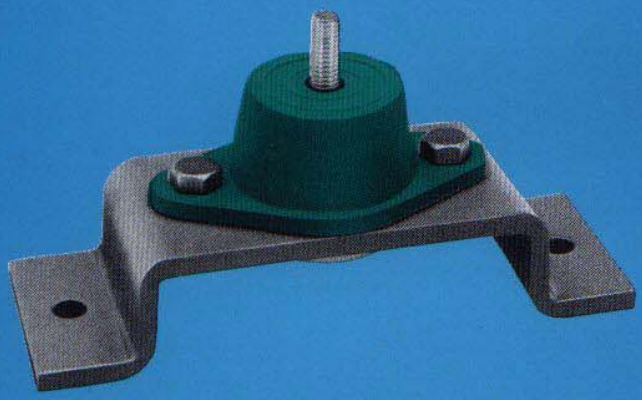
E-mail : sales@christiegrey.com • web site: www.christiegrey.com

Bulletin No. R12/93 (UK)

VMC
KORFUND

Neoprene Mountings
Series R/RD



- Available in 4 sizes – 5 durometers
- Load Range – 10 lbs. to 4,000 lbs.
- Deflections to ¼" with type R
  to ½" with type RD
- Corrosion Proof
- Molded in colored oil-resistant neoprene
- 5 colors for error free identification

Effective Isolation for Floor Mounted Equipment

Series R & RD Neoprene Mountings are molded in colored oil-resistant neoprene. This unique color coding provides instant identification of loading capacity — simplifies stocking — prevents installation errors.

The VMC molding process embeds all metal parts in neoprene, preventing corrosion. Mountings can also be molded in other elastomers to meet special requirements.

Typical Applications

Air Handling Units Business Machines

Compressors Fans Instrument Panels

Machine Tools Pumps

Motor Generators Transformers

To Specify:

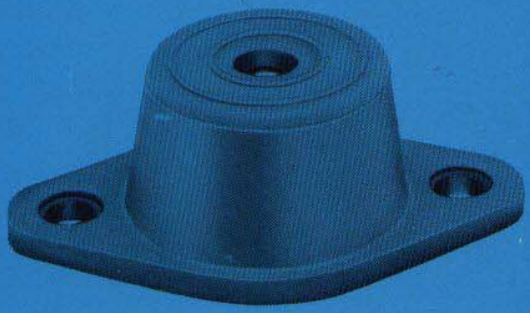
Neoprene mountings shall consist of a steel top plate and base plate completely embedded in coloured oil-resistant neoprene stock for easy identification of capacity. The mountings shall be Type R or RD, depending upon the required deflection of 1/4" to 1/2", as manufactured by VMC and as supplied by EMTEC Products Limited

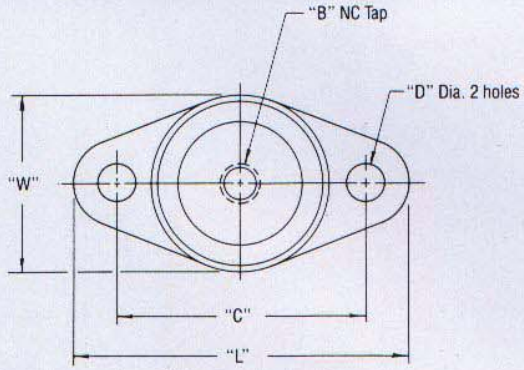
EMTEC

EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD

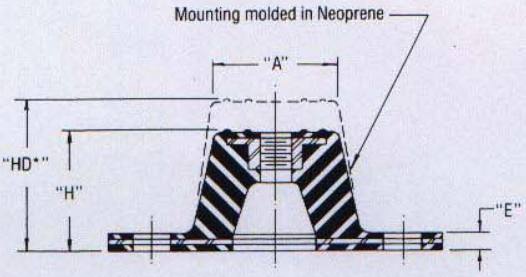
Telephone: 0181 848 3031 Facsimile: 0181 573 3605

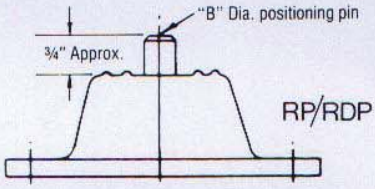
TYPE R/RD





TYPE RP/RDP





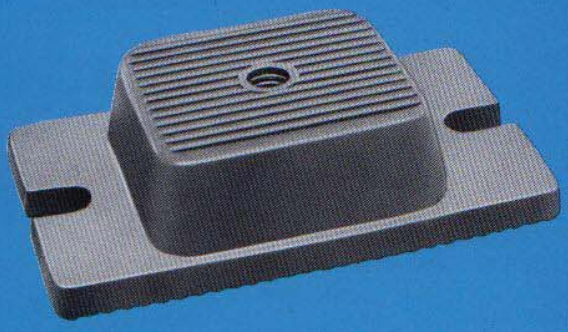
Dimensions: ins. (mm)

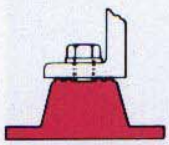
TYPE	L	W	H	*HD	A	B	C	D	E
R-1 or RD-1	3⅛" (79.4)	1¾" (44.4)	1" (25.4)	1¼" (31.7)	1¼" (31.7)	5/16" (8.0)	2⅜" (60.4)	11/32" (8.8)	3/16" (4.8)
R-2 or RD-2	3⅞" (98.6)	2⅜" (60.4)	1¼" (31.7)	1¾" (44.4)	1¾" (44.4)	⅜" (9.6)	3" (76.2)	11/32" (8.8)	7/32" (5.6)
R-3 or RD-3	5½" (139.7)	3⅜" (85.8)	1¾" (44.4)	2⅞" (73.2)	2½" (63.5)	½" (12.7)	4⅛" (104.8)	9/16" (14.4)	¼" (6.3)
R-4 or RD-4	6¼" (158.7)	4⅝" (117.6)	1⅝" (41.4)	2¾" (69.8)	3" (76.2)	½" (12.7)	5" (127.0)	9/16" (14.4)	⅜" (9.6)

* HD dimension applies to double deflection Type RD mountings only.

Type	Color Code	Max. Load lbs.	Max. Load (kg)	Deflection ins. (mm) R	Deflection ins. (mm) RD
R-1 or RD-1	BLUE	35	(15.8)	0.20 (5.0)	0.40 (10.1)
	BLACK	45	(20.4)		
	RED	70	(31.7)		
	GREEN	120	(54.4)		
R-2 or RD-2	BLUE	135	(61.3)	0.25 (6.3)	0.50 (12.7)
	BLACK	170	(77.0)		
	RED	240	(109.0)		
	GREEN	380	(172.5)		
	GRAY	550	(249.7)		
R-3 or RD-3	BLACK	250	(113.5)	0.25 (6.3)	0.50 (12.7)
	RED	525	(238.3)		
	GREEN	750	(340.5)		
	GRAY	1100	(499.4)		
R-4 or RD-4	BLACK	1500	(681.0)	0.25 (6.3)	0.50 (12.7)
	RED	2250	(1021.5)		
	GREEN	3000	(1362.0)		
	GRAY	4000	(1816.0)		

New design for Type R-4 and RD-4 neoprene mountings.

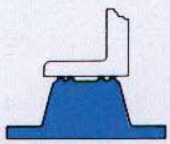




Type R or RD

IF BOLTING IS PREFERRED—

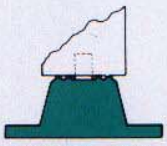
Type R or RD mountings are furnished with a tapped hole in the center. This enables the equipment to be bolted securely to the mounting.



Type R or RD

NO BOLTING REQUIRED—

Type R or RD mountings may be used without bolting under machines having no lateral or severe vertical motion.



Type RP or RDP

IF BOLT HOLE IS INACCESSIBLE

Type RP or RDP mountings with pin (equal in diameter to dimension B above) that simply fits freely into threaded or unthreaded bolt holes.

EMTEC Products Limited, Enterprise House, Blyth Road, Hayes, Middlesex UB3 1DD

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