Report VA1928.170817.NIA

Unit 52, Brunswick Shopping Centre

Noise Impact Assessment

18 August 2017

Wilton Property Group

Venta Acoustics

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1. Introduction

A new gym facility is proposed for tenancy at Unit 52, Brunswick Shopping Centre.

Venta Acoustics has been commissioned by Wilton Property Group to undertake an assessment of the potential noise impact of these proposals in support of an application for planning permission.

As part of the assessment, airborne sound insulation tests and weight drop investigations have been undertaken. An environmental noise survey has also been undertaken to determine the background noise levels at the most affected noise sensitive receptors. These levels are used to undertake an assessment of the likely impact with reference to the planning requirements of Camden Council.

2. Camden Council Requirements

2.1 Plant Noise

Camden Council's planning policy requirements that noise emissions from plant is at least 5dB below the local background noise level as assessed at the most affected noise sensitive receivers. Noise levels should also not exceed the background noise level by more than 1dB in any octave band between 63Hz and 8kHz. The requirements are summarised below.

> *Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (L_{A90}), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the L_{A90}, expressed in dB(A).*

However, recent discussions with Edward Davis, Environmental Health Officer at Camden Council have highlighted that a new set of criteria is at consultation stage currently, with the standard noise condition 1m from noise sensitive façades being a minimum of 10dB below than background (L_{A90}), or 15dB below the background should the plant have any tonal, intermittent or distinguishable characteristics. To ensure a robust assessment, the 10dB below background criterion has been adopted for this assessment.

2.2 Other Noise Sources

Although no conditions have been set, during a previous application for the refurbishment of the Brunswick Centre in 2002, the following conditions were applied, which are a good guide to which noise should be defined.

> *No music shall be played on the premises in such a way as to be audible within any adjoining premises or in the adjoining highway.*

Potential noise due to weight drops will be assessed using drops onto the bare concrete screed of the floor and a range of different gym floor build-ups to ascertain a solution that controls noise from weight drops to minimise impact in the residential dwelling above.

2.3 BS8233:2014

BS8233 *Guidance on sound insulation and noise reduction for buildings* provides guidance as to suitable internal noise levels for different areas within residential buildings.

The relevant section of the standard is shown below in Table 2.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq, 16 hour}$	-
Dining	Dining Room	40 dB $L_{Aeq, 16 hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 hour}$	30 dB $L_{Aeq, 8 hour}$

Table 2.1 - Excerpt from BS8233: 2014 **[dB ref. 20µPa]**

3. Site Description

As illustrated on attached site plan VA1928/SP1, Unit 52 is located in the Brunswick Centre at ground floor level. Directly above the unit is an office, with the nearest apartment offset to the north, adjacent to the first floor office. On ground level to the north of Unit 52 is a Waitrose store, and to the south is a stair core. Below the premises is storage space associated with Unit 52 and a basement level car park and service road.

It is understood that all building services plant is located in the basement service road.

The most affected noise sensitive receiver is expected to be the apartment at 1st floor level, offset to the north.

4. Environmental Noise Survey

4.1 Survey Procedure & Equipment

In order to establish the existing background noise levels at the site, a noise survey was carried out between Tuesday 15th and Thursday 18th August 2017 at first floor level at the location shown in site plan VA1928/SP1. This location was chosen to be representative of the background noise level at the most affected noise sensitive receivers.

Continuous 5-minute samples of the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were undertaken at the measurement location.

The weather during the survey period was generally dry with light winds. The background noise data is not considered to have been compromised by these conditions.

Measurements were made generally in accordance with ISO 1996 2:2007 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*.

The following equipment was used in the course of the survey:

Manufacturer	Model Type	Serial No	Calibration	
			Certificate No.	Date
NTi Class 1 Integrating SLM	XL2	A2A-11586-E0	42530-A2A-11586-E0	9/6/16
Larson Davis calibrator	CAL200	13049	42647-13049-CAL200	4/10/16

Table 4.1 – Equipment used for the tests

The calibration of the sound level meter was verified before and after use with no significant calibration drift observed.

4.2 Results

The measured sound levels are shown as time-history plots on the attached charts VA1928/TH1-2.

The background noise level is determined by road traffic noise in the surrounding streets.

The typical background noise levels measured were:

Monitoring Period	Typical $L_{A90,5min}$
07:00 – 23:00 hours	43 dB
23:00 – 07:00 hours	38 dB

Table 4.2 – Typical background noise levels **[dB ref. 20 µPa]**

4.3 Plant Noise Emission Limits

On the basis of the measured noise levels and the planning requirements of the Local Authority, and considering that it is not expected that tonal noise will be generated by the proposed plant units, the following plant specific sound levels should not be exceed at the most affected noise sensitive receivers:

Monitoring Period	Design Criterion (L_{Aeq})
07:00 – 23:00 hours	38 dB
23:00 – 07:00 hours	33 dB

Table 4.3 – Specific sound pressure levels not to be exceeded at most affected noise sensitive receivers

5. Predicted Plant Noise Impact

5.1 Proposed plant

The following plant is proposed for installation at sub-basement level at the location indicated on site plan VA1928/SP1.

This location benefits from a high degree of screening from all noise sensitive receptors as it is located in the basement.

Plant Item	Quantity	Proposed Model
Condensers	3	Daikin RXS71F8

Table 5.1 – Indicative plant selections assumed for this assessment.

Consulting the manufacturer's datasheets, the following noise emissions levels are attributed to the proposed plant items:

Plant Item	Octave Band Centre Frequency (Hz) Sound Pressure, L_p@1m (dB)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Daikin RXS71F8	53	56	53	51	47	40	33	25	52

Table 5.2 – Advised plant noise data used for the assessment.

5.2 Recommended Mitigation Measures

It is not envisaged that any additional mitigation measures beyond the site's inherent geometry will be required for external noise emissions.

5.3 Predicted noise levels

The cumulative noise level at the most affected noise sensitive receiver, some 15 meters away, has been calculated on the basis of the above information. This is a very pessimistic assumption and it is likely that noise levels will be considerably lower at any residential receivers.

A summary of the calculations are shown in Appendix B.

	dB(A)
Plant noise criterion	33
L_p 1m from receiver	15

Table 5.3 – Predicted noise and level and design criteria at noise sensitive location

5.4 Comparison to BS8233:2014 Criteria

BS8233 assumes a loss of approximately 15dB for a partially open window. The external noise level shown in Table 5.3 would comfortably result in internal noise levels that achieve the guidelines shown in Table 2.1.

6. Sound Insulation Investigations

6.1 Airborne Sound Insulation

Airborne sound insulation testing was undertaken between Unit 52 and the office directly above at first floor level. The most affected residential received is offset from the unit and so would be expected to benefit from a greater degree of sound insulation.

Tests were undertaken in general accordance with the procedures defined in BS EN ISO 16283-1:2014 *Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation* using a pair of uncorrelated pink noise sources.

The tests result has been shown in Appendix C and are weighted as per the methodology described in BS EN ISO 717-1: 1997 *Acoustics – Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation*.

Source	Receive	Sound Insulation, D_w
Unit 52	1st Floor Office	62 dB

Table 6.1 – Airborne sound insulation test result

The sound insulation performance between the two spaces is relatively good, with no leaks or obvious transmission paths apparent during the tests.

6.1.2 Airborne Sound Insulation Recommendations

With the current situation, music could be played in Unit 52 at levels of around 80dB and would not be expected to be audible in the apartment above. However, it is recommended that as part of the fit out, an independent ceiling comprising 2 layers of 15mm dense plasterboard (minimum mass 11kg/m^2) is installed on either a separate joist system, or a metal frame ceiling hung from isolated hangers, such as Gypframe GAH1 hangers. To maximise the performance of the ceiling, the void between the soffit and the isolated ceiling should be maximised, and should not be any less than 300mm, with 100mm mineral wool (minimum density 20kg/m^3) installed in the void.

It is recommended that music noise is limited to 80dB(A) in any area, in conjunction with the new ceiling to control airborne noise breakout to acceptable levels. Should there be a desire to have higher noise levels in certain areas, further mitigation measures will likely be required.

To avoid re-radiated structureborne noise, speakers should be fitted on isolated mounts and not fixed rigidly to structural columns or walls.

6.2 Natural Frequency of the Floor

Response testing of the floor slab in multiple locations showed a natural frequency of around 8Hz. Within this range, the use of treadmills would not be expected to significantly excite the floor slab.

6.3 Transmitted Noise and Vibration (Weights)

Tests of noise from a weight dropped within Unit 52 were undertaken with the resultant noise levels being measured at first floor level directly above. In all cases, the weight drops and test flooring was set up in vertical alignment with the measurement locations.

Tests involved the dropping of a 13.5kg dumbbell onto a set of test floor samples, with the corresponding maximum noise level measured in the space above. The dumbbell was released from around 900mm height for all tests.

Testing commenced with a measurement of the ambient noise in the space followed by the weight being dropped on the existing floor. A number of alternative flooring build up types were then evaluated as described in Table 6.2.

Floor Build Up Type	Description of Build Up (top to bottom)
1	On screed
2	TVS Sportec Tile / Regupol 6010BA
3	TVS Sportec Tile / Regupol 6010BA / Regupol 6010BA
4	TVS Sportec Tile / 25mm SR42 / Regupol 6010BA
5*	TVS Sportec Tile / 25mm SR42
6*	TVS Sportec Tile / 25mm SR28

Table 6.2 – Assessed floor build ups

The findings of the measurements are shown in Figure 6.1.

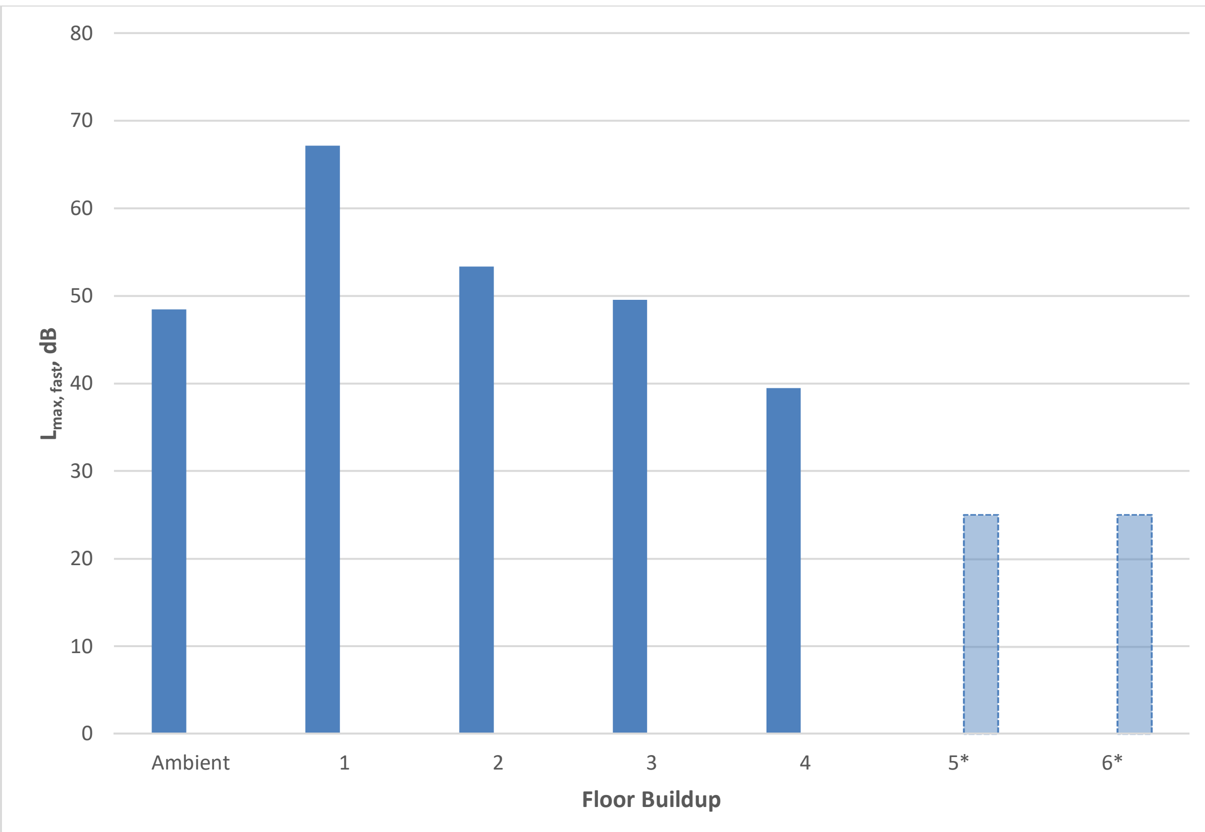


Figure 6.1 – Measured noise levels due to weight drops

Floor build ups 5 and 6 have been shown in a pale shade, as weight drops were not audible in the receive room.

6.3.2 Vibration Recommendations

It is likely that in most areas of the gym, the installation of a soft gym floor covering would control noise from normal use to suitable levels in the space above. The floor slab appears to be massive and highly damped and as such harmonic response to vibration energy sources is expected to be unlikely.

The equipment used in the gym is expected to be primarily cardiovascular exercise equipment.

Treadmills should be mounted on resilient mounts as a matter of good practice. Weights machines should be similarly mounted on resilient mounts, which, along with the inbuilt spring systems on the machine, would likely control noise to acceptable levels. Placing the entire machine on suitable rubber mounts / mats would be recommended. Most manufacturers can provide information of suitable systems for their equipment, should it not be already installed.

Free-weights areas will require mitigation such as a floor build-up with the same characteristics as build-ups 5 and 6 which were:

- TVS Sportec Tile / 25mm SR42

or

- TVS Sportec Tile / 25mm SR28

Datasheets for all these products are attached in Appendix C for reference and comparison to preferred suppliers' products.

The floor build up should be installed with effective and continuous perimeter isolation to all columns and walls.

It is recommended that to maximise the separation between these areas and the residential receivers, the free weights area is located at the front of Unit 52, which has nothing above, and is at a maximum distance from the apartments.

It should be noted that although the above floor build-up would control impact noise from reasonable weight drops, this will not adequately control all weight drops , such as very heavy weight drops, or drops from great heights. Irresponsible use of equipment could generate higher levels of noise and vibration, and it is recommended that gym staff monitor and control equipment use in order to avoid extreme events.

7. Conclusion

A baseline noise survey has been undertaken by Venta Acoustics to establish the background noise climate in the locality of Unit 52, Brunswick Shopping Centre in support of a planning application for the proposed introduction of new building services plant.

This has enabled noise emission limits to be set at the most affected noise sensitive receiver such that the proposed installation meets the requirements of Camden Council .

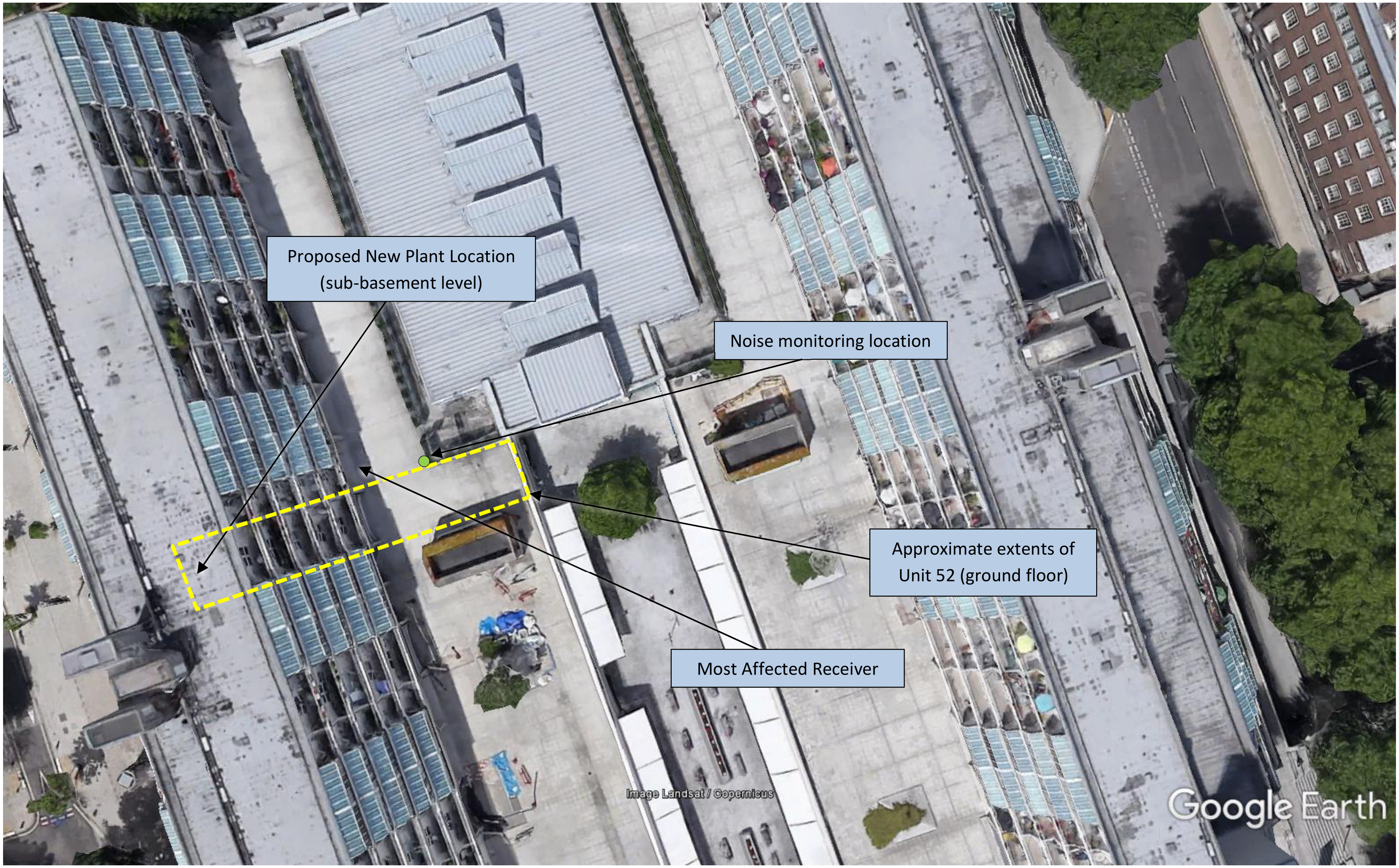
The cumulative noise emission levels from the proposed plant have been assessed to be compliant with the plant noise emission limits.

The proposed scheme is not expected to have a significant adverse noise impact and the relevant Planning Conditions have been shown to be met.

Airborne sound insulation and weight drop investigations have been undertaken to the area above Unit 52.

Recommendations regarding potential mitigation solutions for airborne noise and control of noise at source have been highlighted. Potential floor build ups for the free-weights areas have been investigated to control impact noise to below ambient levels in the spaces above, as well as a discussion of the importance of good gym management to prevent misuse of the equipment.

Jamie Duncan MIOA

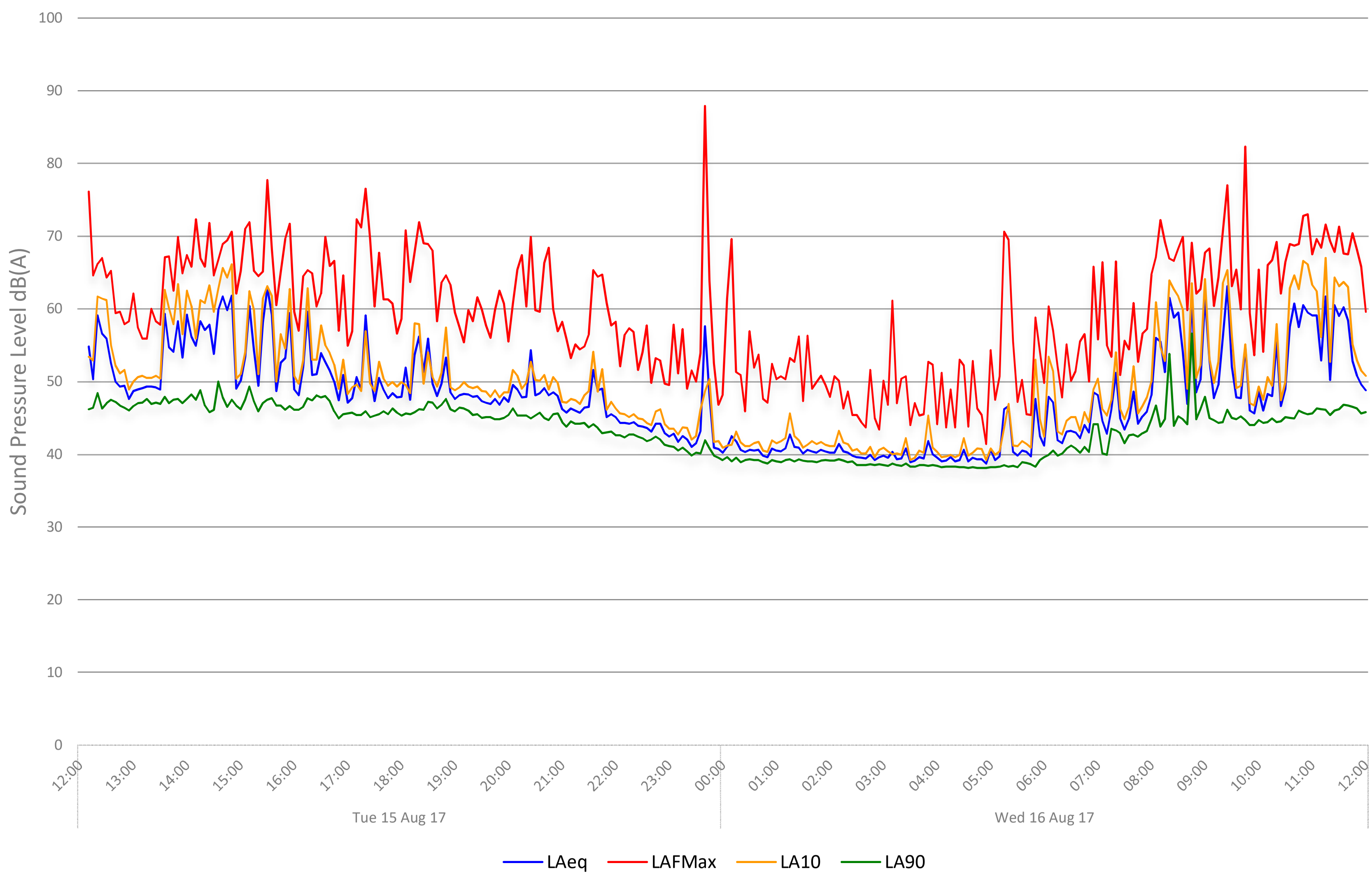

Proposed New Plant Location
(sub-basement level)
Noise monitoring location
Approximate extents of
Unit 52 (ground floor)
Most Affected Receiver
Image Landsat / Copernicus
Google Earth

Unit 52, Brunswick Shopping Centre

Environmental Noise Time History: 1

Venta Acoustics

Figure VA1928/TH1

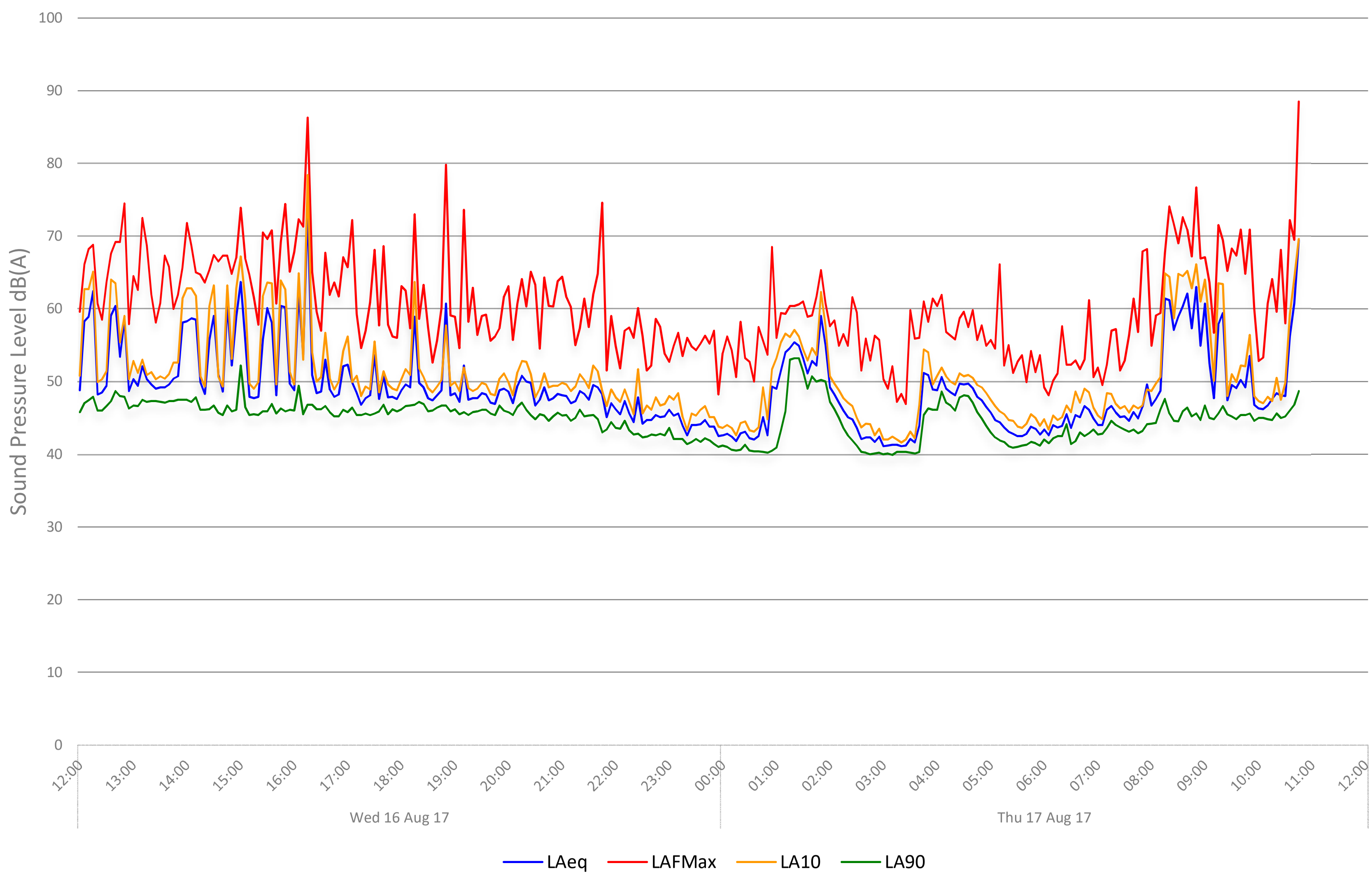


Unit 52, Brunswick Shopping Centre

Environmental Noise Time History: 2

Venta Acoustics

Figure VA1928/TH2



1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

1.4 Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

APPENDIX B

VA1928 - Unit 52, Brunswick Shopping Centre

Noise Impact Assessment

		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dB(A)
Daikin RXS71F8	Lp @ 1m	53	56	53	51	47	40	33	25	**52**
Number of Plant	3	5	5	5	5	5	5	5	5	
Distance Loss	To 15m	-24	-24	-24	-24	-24	-24	-24	-24	
Screening loss (finite Barrier)*		-18	-18	-18	-18	-18	-18	-18	-18	
Level at receiver		**16**	**19**	**16**	**14**	**10**	**3**	**-4**	**-12**	**15**

* Screening loss limited to 18dB

Appendix C

Manufacturer Datasheets

1. Application – Impact Protection Tiles for Weightlifting Areas

TVS SPORTEC® Style tiles protect subfloors from damage by falling heavy objects such as barbells and dumbbells and are frequently used in weightlifting areas of gyms or strength and conditioning facilities. Even if not themselves damaged by falling weights, conventional floor surfaces transmit impact shock that often results in serious damage to the concrete or screed subfloor. **SPORTEC® Style** avoids this deep-impact damage. The tiles are loose laid and interlocked together with plastic pins, creating a stable, none-slip performance platform for weight lifting activity. Edges and corner profile are also available, providing a smooth transition between gym areas.

2. Material

Polyurethane-bonded recycled rubber granules with a surface layer made of a **SPORTEC®** floor finish such as Color-15, Purcolor and UNI Outdoor.

3. Product Design

Surface Finish:	**SPORTEC® Color-15** (with 15% EPDM). **SPORTEC® Purcolor**. **SPORTEC® UNI Outdoor**.
Surface Colours:	**Color-15:** Black with 15% Grey, Red, Green, Yellow, Blue, Blue / Grey. **Purcolor:** Black with 85% Grey, Red, Dark Grey, Blue **UNI Outdoor:** 100% Grey, Dark Grey, Red, Blue, Green, Beige.



4. Dimensions / Tolerances

Thickness:	40mm (± 3mm)
Length / Width:	1000 x 500mm (± 0.8%)
Weight:	Approx. 36 kg/m²

TVS Sports Surfaces
Low Bay, Commerce Street, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5JT United Kingdom
Tel: +44(0) 1706 260 220 Fax: +44(0) 1706 260 240

E-mail: **sales@floors4gyms.com** Website: **www.floors4gyms.com**

5. Product Testing

Fire resistance:	E_{fl} (B2)	(EN 13501-1)
Tensile strength:	Approx. 0.7N/mm²	(EN ISO 1798)
Elongation at break:	Approx. 70%	(EN ISO 1798)
Hardness:	60 ± 5 Shore A	(DIN 53505)
Temperature range:	-30°C to 80°C	(internal tested)
Ball rebound:	Approx. 95%	(internal tested)
Abrasion:	Depending on tile surface	
	Max. 200mm³*	(DIN 53516)
	Max. 450mm³**	(DIN 53516)
	2.9 g***	(ISO 5470-1)
Coefficient of friction:	Depending on tile surface	
	> 0.3 µ (DS)*	(EN 13893)
	> 0.3 µ (DS)**	(EN 13893)
	0.75 µ (DS)***	(EN 13893)
Light fastness:	Depending on tile surface	
	2-3*	(DIN EN 105-B02:1999-09)
	4**	(DIN EN 105-B02:1999-09)
	4***	(DIN EN 105-B02:1999-09)

(*Tile surface with SPORTEC Color 15)
(**Tile surface with SPORTEC Purcolor)
(***Tile surface with SPORTEC UNI Outdoor)

TVS Sports Surfaces supply flooring materials to the sport, leisure and play industries. For more information about our products and services visit www.floors4gyms.com or contact our UK office on:

T: +44 (0) 1706 260 220
E: sales@floors4gyms.com

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E-mail: **sales@floors4gyms.com** Website: **www.floors4gyms.com**

Sylomer® SR 42
Product datasheet

Material mixed cellular polyurethane
Colour pink

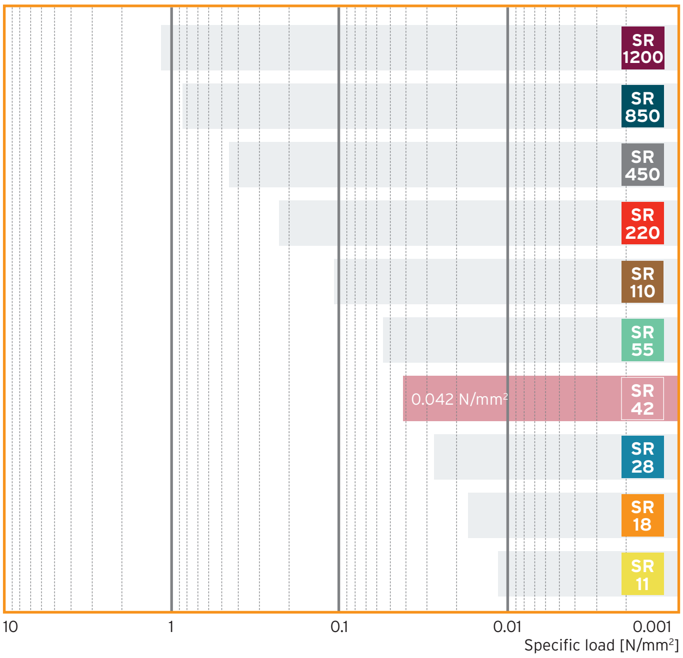
Standard dimensions on stock

Thickness: 12.5 mm with Sylomer® SR 42 - 12
25 mm with Sylomer® SR 42 - 25
Rolls: 1.5 m wide, 5.0 m long
Stripes: max. 1.5 m wide, up to 5.0 m long

Other dimensions (also thickness), as well as stamped and molded parts on request.

Area of application	Compression load	Deflection
	depending on form factor, values apply to form factor 3	
Static range of use (static loads)	up to 0.042 N/mm²	approx. 7 %
Operating load range (static plus dynamic loads)	up to 0.065 N/mm²	approx. 25 %
Load peaks (short term, infrequent loads)	up to 2 N/mm²	approx. 80 %

Standard Sylomer® range
Static range of use



Material properties		Test methods	Comment
Mechanical loss factor	η = 0.16	DIN 53513*	depending on frequency, load and amplitude
Rebound elasticity	55 %	DIN 53573	tolerance +/- 10 %
Compression set	< 5 %	EN ISO 1856	50 %, 23 °C, 70 h, 30 min after unloading
Static shear modulus	0.08 N/mm²	DIN ISO 1827*	at specific load of 0.042 N/mm²
Dynamic shear modulus	0.17 N/mm²	DIN ISO 1827*	at specific load of 0.042 N/mm², 10 Hz
Coefficient of friction (steel)	μ_S = 0.5	Getzner Werkstoffe	dry
Coefficient of friction (concrete)	μ_B = 0.7	Getzner Werkstoffe	dry
Abrasion	1200 mm³	DIN 53516	load 7.5 N, bottom surface
Operating temperature	-30 bis 70 °C		short term higher temperatures possible
Specific volume resistance	> 10^{11} Ω·cm	DIN IEC 93	dry
Thermal conductivity	0.07 W/(mK)	DIN 52612/1	
Flammability	B2 B, C and D	DIN 4102 EN ISO 11925-2	normal flammable passed

* Tests according to respective standards

All information and data is based on our current knowledge. The data can be applied for calculations and as guidelines, are subject to typical manufacturing tolerances and are not guaranteed. We reserve the right to amend the data.

Further information can be found in VDI Guideline 2062 (Association of German Engineers). Further characteristic values on request.

www.getzner.com

Sylomer® SR 42

Load deflection curve

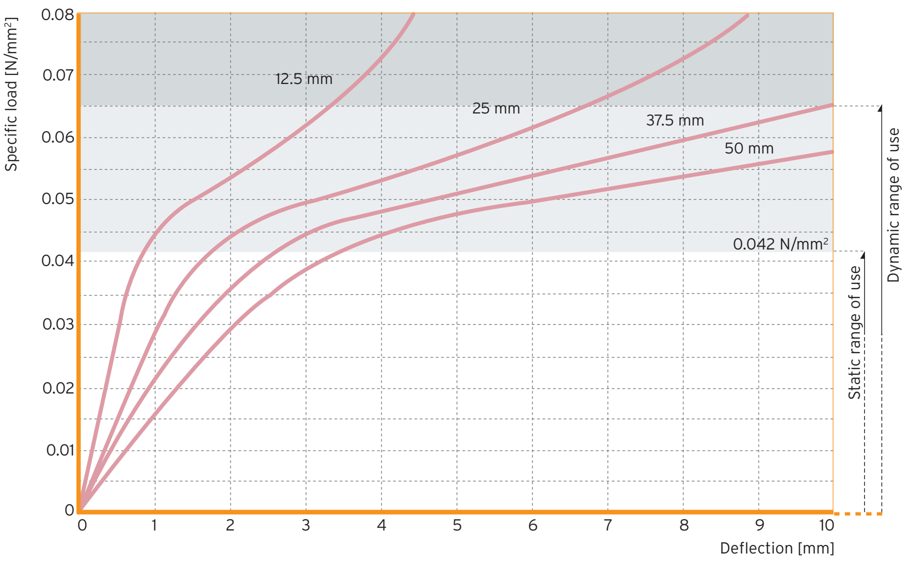


Figure 1: Quasistatic load deflection curve measured with a loading rate of 0.0042 N/mm²/s

Testing between flat steel-plates; recording of the 3rd loading; testing at room temperature

Form factor 3

Modulus of elasticity

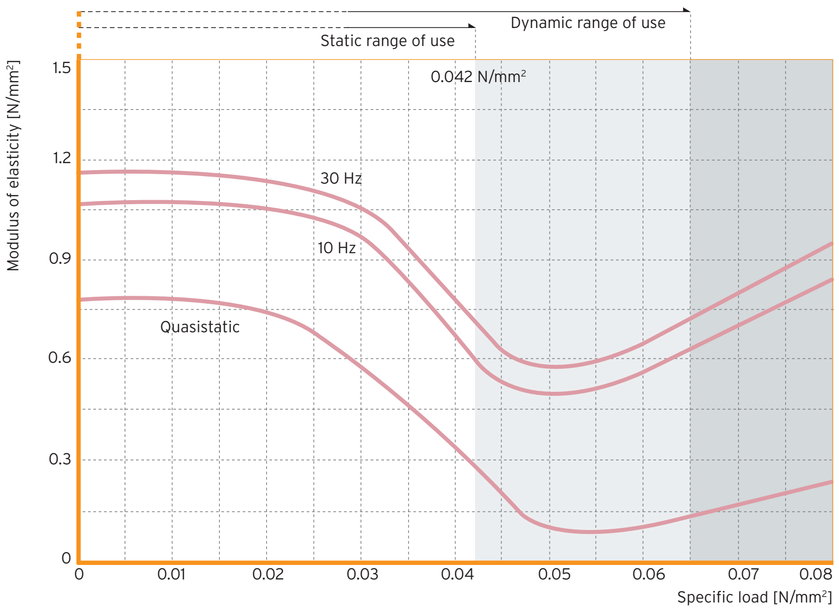


Figure 2: Load dependency of the static and dynamic modulus of elasticity

Quasistatic modulus of elasticity as a tangent modulus taken from the load deflection curve; dynamic modulus of elasticity due to sinusoidal excitation with a velocity level of 100 dBv re. $5 \cdot 10^{-8}$ m/s (equal to an oscillating range of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz, see also in the glossary)

Test according to DIN 53513

Form factor 3

Natural frequency

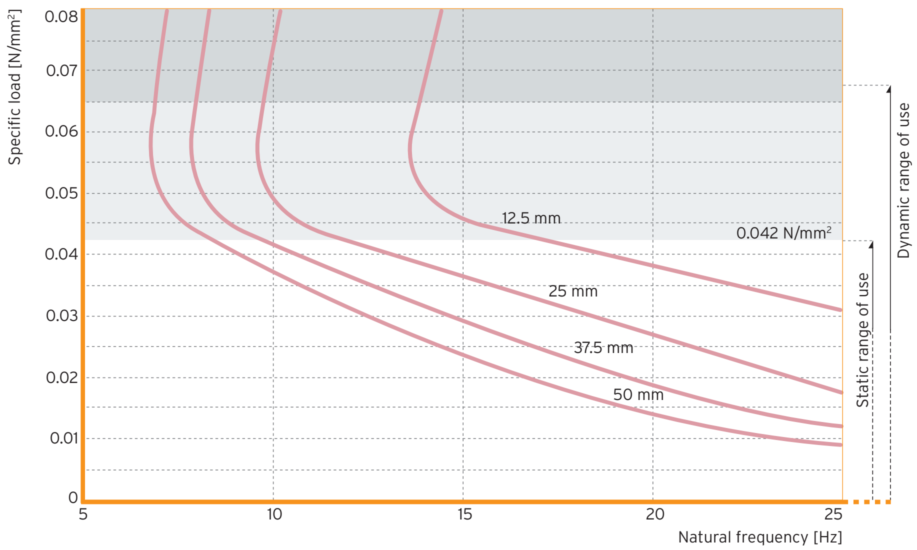


Figure 3: Natural frequency of a single-degree-of-freedom system (SDOF system) consisting of a fixed mass and an elastic bearing consisting of Sylomer® SR 42 based on a stiff subgrade

Parameter: Thickness of elastomeric bearing

Form factor 3

Vibration isolation efficiency

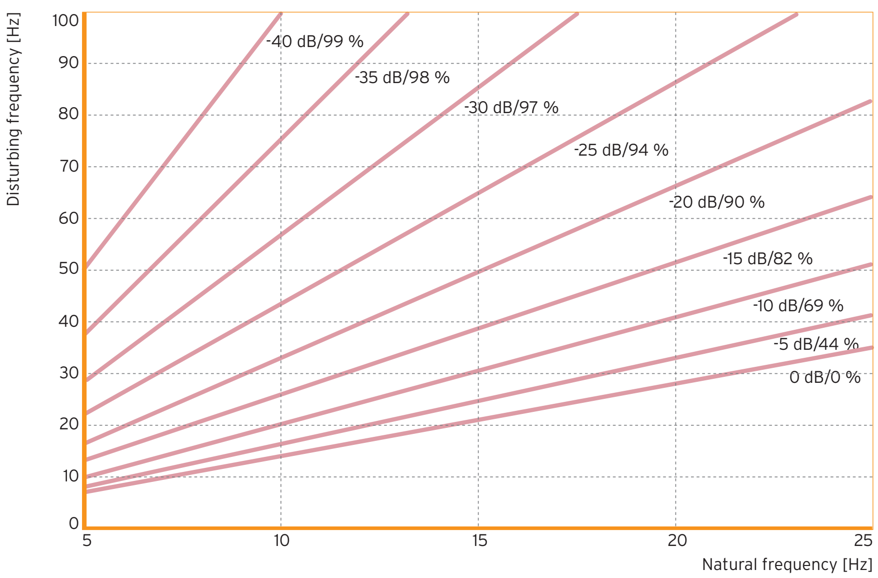


Figure 4: Reduction of the transmitted mechanical vibrations by implementation of an elastic bearing consisting of Sylomer® SR 42

Parameter: Factor of transmission in dB, isolation rate in %

Influence of the form factor

In the figures below one can find correction varying form factors.

Figure 5: Static load range

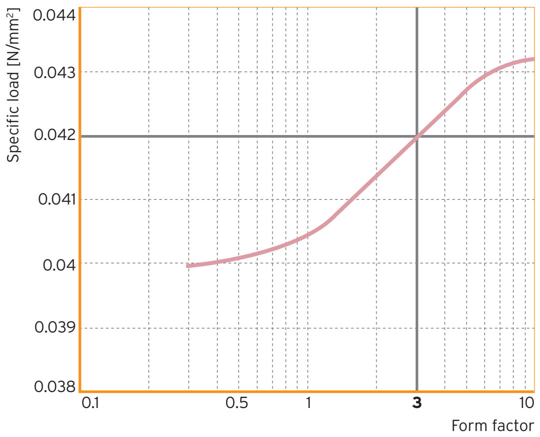


Figure 6: Deflection*

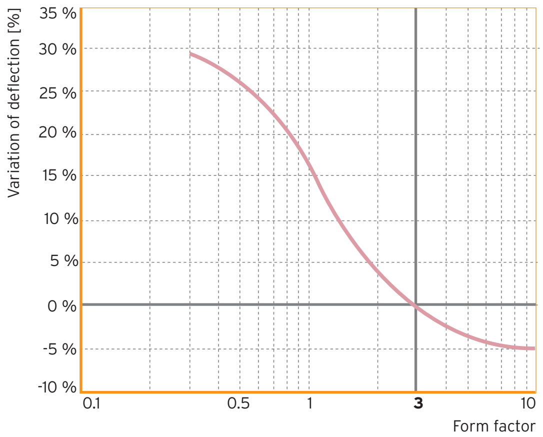


Figure 7: Dynamic modulus of elasticity at 10 Hz*

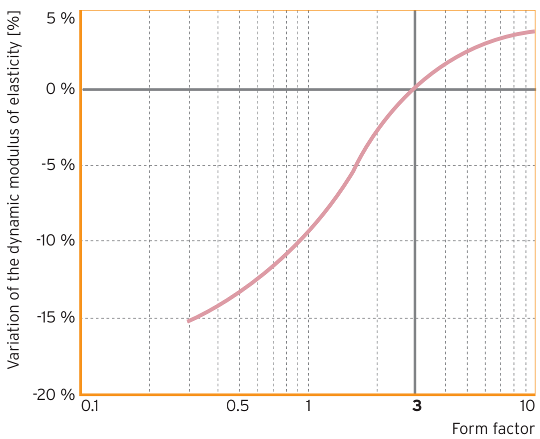
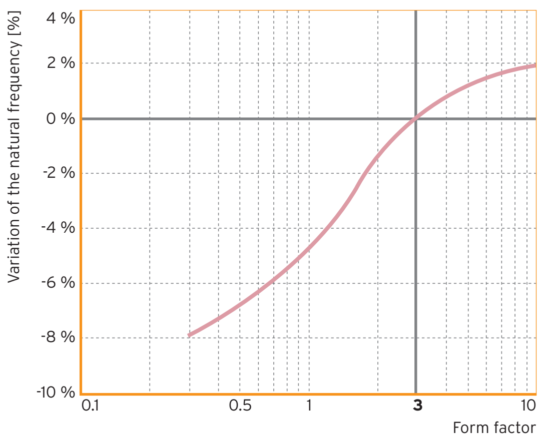


Figure 8: Natural frequency*



* Reference value: specific load 0.042 N/mm², form factor 3

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Sylomer® SR 28
Product datasheet

TVS TOTAL VIBRATION SOLUTIONS

sylomer® by getzner

Material mixed cellular polyurethane
Colour blue

Standard dimensions on stock

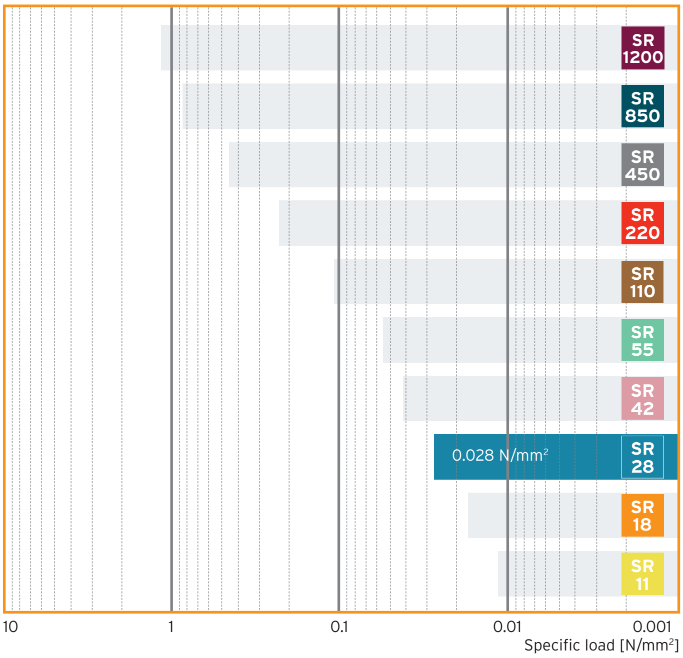
Thickness: 12.5 mm with Sylomer® SR 28 - 12
25 mm with Sylomer® SR 28 - 25
Rolls: 1.5 m wide, 5.0 m long
Stripes: max. 1.5 m wide, up to 5.0 m long

Other dimensions (also thickness), as well as stamped and molded parts on request.

Area of application	Compression load	Deflection
	depending on form factor, values apply to form factor 3	
Static range of use (static loads)	up to 0.028 N/mm^2	approx. 7 %
Operating load range (static plus dynamic loads)	up to 0.042 N/mm^2	approx. 25 %
Load peaks (short term, infrequent loads)	up to 1 N/mm^2	approx. 80 %

Standard Sylomer® range

Static range of use



Material properties		Test methods	Comment
Mechanical loss factor	$\eta = 0.21$	DIN 53513*	depending on frequency, load and amplitude
Rebound elasticity	45 %	DIN 53573	tolerance +/- 10 %
Compression set	< 5 %	EN ISO 1856	50 %, 23 °C, 70 h, 30 min after unloading
Static shear modulus	0.07 N/mm^2	DIN ISO 1827*	at specific load of 0.028 N/mm^2
Dynamic shear modulus	0.15 N/mm^2	DIN ISO 1827*	at specific load of 0.028 N/mm^2, 10 Hz
Coefficient of friction (steel)	$\mu_S = 0.5$	Getzner Werkstoffe	dry
Coefficient of friction (concrete)	$\mu_B = 0.7$	Getzner Werkstoffe	dry
Abrasion	1300 mm^3	DIN 53516	load 5 N, bottom surface
Operating temperature	-30 bis 70 °C		short term higher temperatures possible
Specific volume resistance	> 10^{11} Ω·cm	DIN IEC 93	dry
Thermal conductivity	0.06 W/(mK)	DIN 52612/1	
Flammability	B2 B, C and D	DIN 4102 EN ISO 11925-2	normal flammable passed

* Tests according to respective standards

All information and data is based on our current knowledge. The data can be applied for calculations and as guidelines, are subject to typical manufacturing tolerances and are not guaranteed. We reserve the right to amend the data.

Further information can be found in VDI Guideline 2062 (Association of German Engineers). Further characteristic values on request.

Sylomer® SR 28

Load deflection curve

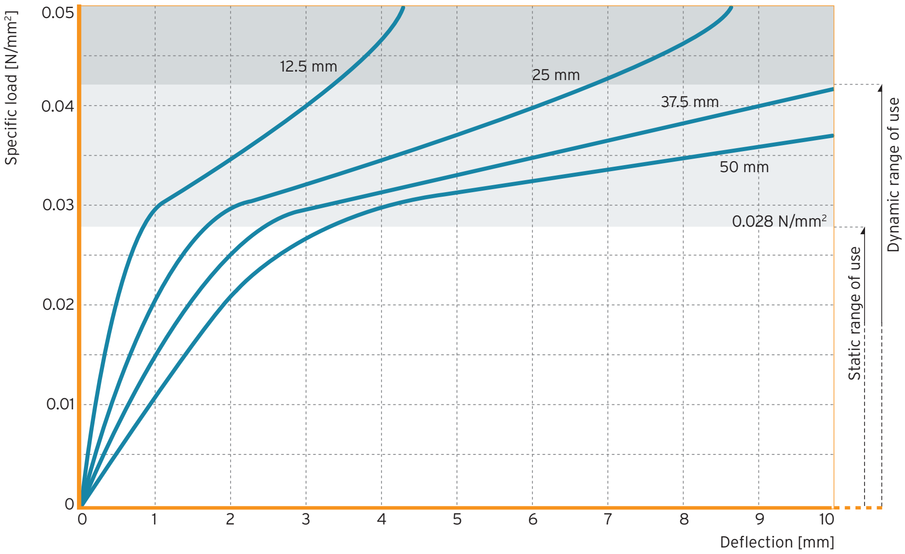


Figure 1: Quasistatic load deflection curve measured with a loading rate of 0.0028 N/mm²/s

Testing between flat steel-plates; recording of the 3rd loading; testing at room temperature

Form factor 3

Modulus of elasticity

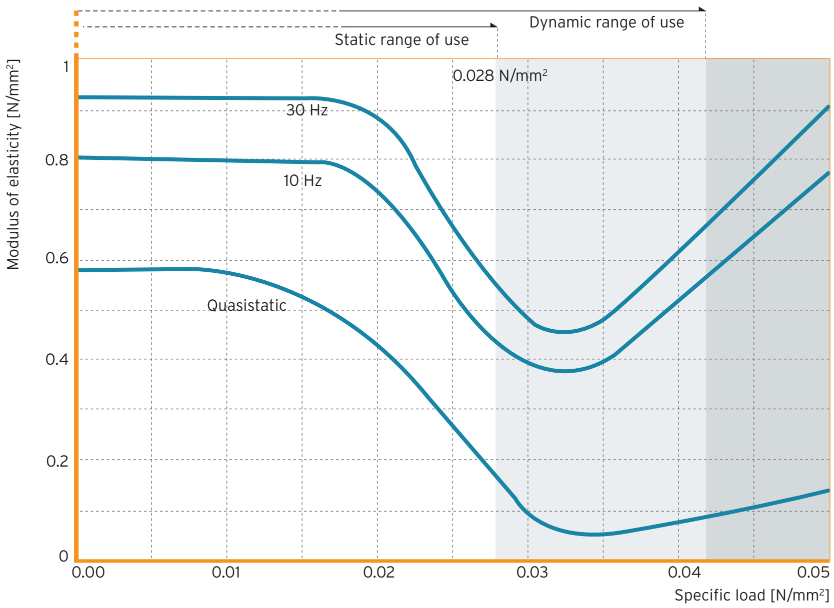


Figure 2: Load dependency of the static and dynamic modulus of elasticity

Quasistatic modulus of elasticity as a tangent modulus taken from the load deflection curve; dynamic modulus of elasticity due to sinusoidal excitation with a velocity level of 100 dBv re. $5 \cdot 10^{-8}$ m/s (equal to an oscillating range of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz, see also in the glossary)

Test according to DIN 53513

Form factor 3

Natural frequency

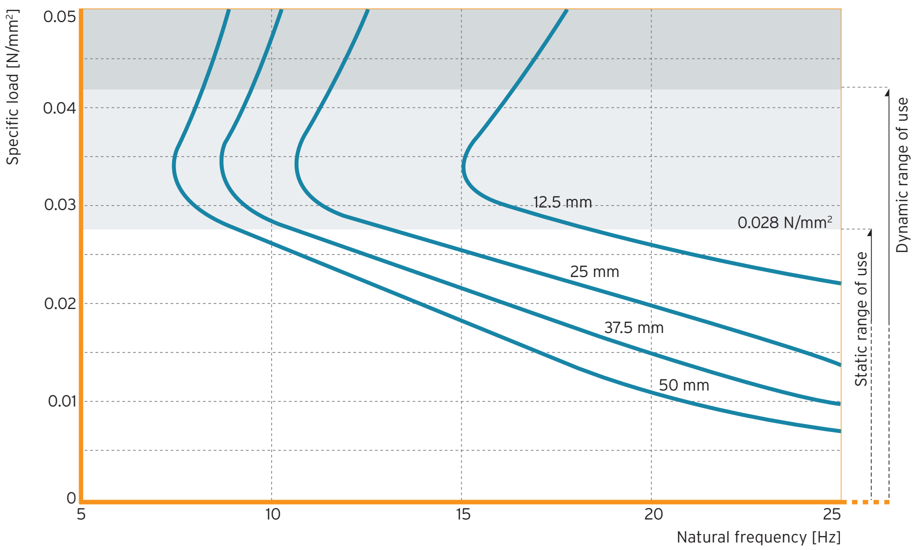


Figure 3: Natural frequency of a single-degree-of-freedom system (SDOF system) consisting of a fixed mass and an elastic bearing consisting of Sylomer® SR 28 based on a stiff subgrade

Parameter: Thickness of elastomeric bearing

Form factor 3

Vibration isolation efficiency

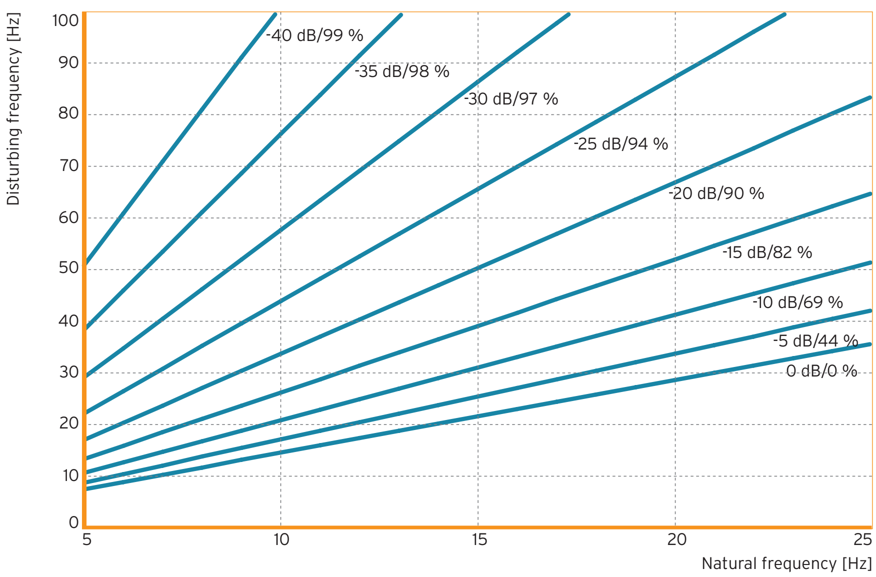


Figure 4: Reduction of the transmitted mechanical vibrations by implementation of an elastic bearing consisting of Sylomer® SR 28

Parameter: Factor of transmission in dB, isolation rate in %

Influence of the form factor

In the figures below one can find correction varying form factors.

Figure 5: Static load range

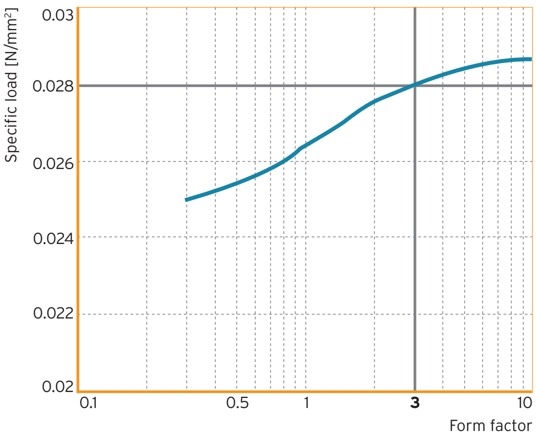


Figure 6: Deflection*

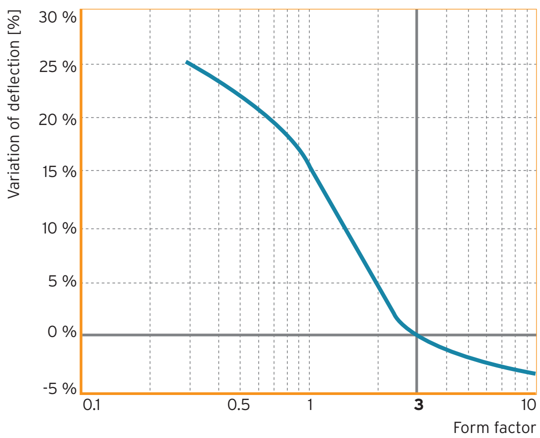


Figure 7: Dynamic modulus of elasticity at 10 Hz*

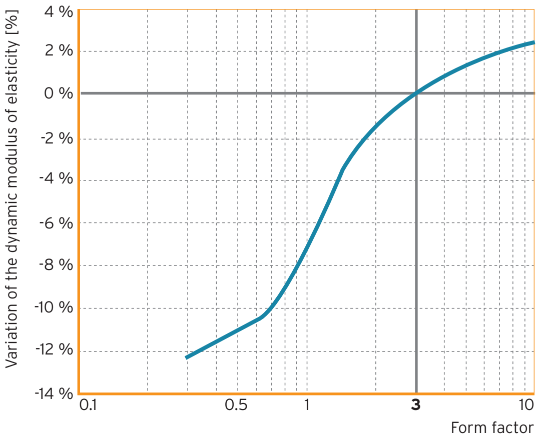
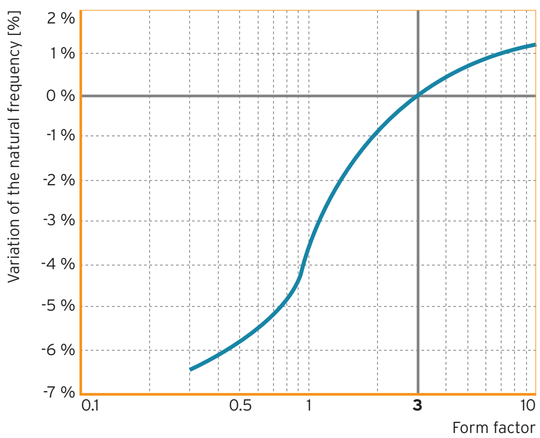


Figure 8: Natural frequency*



* Reference value: specific load 0.028 N/mm², form factor 3

TVS TOTAL VIBRATION SOLUTIONS
NOISE & VIBRATION CONTROL SPECIALISTS
SURVEYS • CONSULTANCY • MATERIALS • INSTALLATION

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