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INSTITUTE FOR BUILDING PHYSICS

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– BUILDING MATERIALS & APPLICATION –
OFFICIALLY RECOGNIZED
TESTING AUTHORITY

TEST CERTIFICATE

45479 MÜLHEIM/RUHR, GROSSENBAUMER STRASSE 240

DATED 21.03.1997 **NO.** 10529/C/Bg/97

CLIENT	HILTI Deutschland GmbH: Befestigungssysteme Werk 6.8 Hiltistraße 2 86916 Kaufering
APPLICATION	Examination of the structure-borne noise decoupling of an insulating element for fastening pipe clamps based on DIN 52 218.
TEST OBJECT	HILTI vibration damper in combination with rigid pipe clamp, type 3/4", 25 to 30 mm
SCOPE OF THE TEST	6 pages and 2 appendices (8 pages)

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1. About the Object

The vibration damper to be investigated with regard to its structure-borne noise decoupling consists of a metal part which, insulated with EPDM, prevents a hard metallic connection to the fastening base during the mounting, e.g. of plant components that excite structure-borne noise. In the case of the system to be tested, excitation was initiated by a water pipe mounted to the vibration damper via rigid clamps.

The mounting system and fastening of the individual parts can be seen in the sketch in Appendix 2 to this test certificate.

The water pipe clamp is fastened to the insulating section by means of M 8 threaded nipples which are moulded into the insulating section in a system-compatible manner.

In the design to be tested here, after inserting a commercially available water pipe with an outer diameter of 33.7 mm (inner diameter 1"), the pipe clamp was closed at the bends with two M 5 bolts, leaving a gap width of 2 mm.

The installation can be described as standard because it ensured that the pipe was held securely in place and it was not possible to manually turn the pipe, which was fastened with four clamps.

2. General information

On supply lines of the sanitary installation, cavitation effects, which occur when using tap fittings, cause more or less intensive structure-borne sound vibrations. This structure-borne noise is transmitted backwards via the supply water and the pipe walls, which can lead to bothersome sound stimulation of the building structure where there are rigid contacts with the pipe system.

The generation of structure-borne noise can be sustainably reduced through suitable shaping of the tapping devices in combination with limiting the tap quantity. Thus, according to DIN 52 218, it is measured that high-quality tap fittings, reduce the sound transmitted through a thin wall (required mass per unit area m' > 220 kg/m^2) as follows:

Fitting group I:	L_{ap}	$\leq$	20 dB(A)
Improvement measurement:	ΔL_{AG}	$\geq$	25 dB(A)
Fitting group II:	L_{ap}	$\leq$	30 dB(A)
Improvement measurement:	ΔL_{AG}	$\geq$	15 dB(A)

The assessment is based on:

I Application of an extremely loud installation noise standard – IGN according to DIN 52 218 – as a reference source.

II Measurement of the volume at 1 to 6 bar, but assessment of the ratios at 3 bar.

III Generation of the noise in a 1" steel pipe (outer diameter d = 33.7 mm) directly terminated with the installation noise standard (IGN).

IV Fixing of the pipe to a thin masonry partition wall - 11.5 cm brick, plastered on both sides - with four floor clamps, whereby the area-related mass of the wall is

$$\gamma_F = 100 \text{ to } 250 \text{ kg/m}^2.$$

Instead of the square nail connection, an M8 screw connection with metal anchors, which is common in the industry today, can also be used with the same result.

V Conversion of the noise occurring in the test room behind the measuring wall to the reference area

$$A_0 = 10 \text{ m}^2.$$

VI Shifting of all decibel-weighted reception values by the test station correction (K_p), the size of which is determined in such a way that, at a tap pressure of 3 bar, a corrected volume from the unfavorable fitting – in this case the installation noise standard (IGN).

$$L_{IGN} = 45 \text{ dB(A)}$$

is emitted by the most unfavorable fitting.

In accordance with the above explanation, DIN 52 218 ensures that sonically favorable fittings are developed and designated accordingly. However, this did not eradicate the dreaded nuisance of pipe noise, as originally assumed.

Reasons for further nuisances include:

I With larger specific tapping quantities, for example with pressure flushing, the desired noise reduction of

$$\Delta L_{AG} \geq 15 \text{ dB(A)}$$

cannot be achieved, so no test certificate can be obtained.

II If the connection between the pipe and the building is unfavorable and goes beyond the square contact, e.g. due to plastering, the noise emission will be higher than standardized in DIN 4109.

III If the walls are opened for pipe laying and thin covering shells are used with contact to the pipe system, the noise emission will also be higher than standardized in DIN 4109.

IV Especially during noise-sensitive nighttime hours, the water withdrawal on the total network, which is much lower on average, leads to tapping pressures that are higher than 3 bar, therefore all line noise emissions increase accordingly.

Because of the criteria mentioned above, the pipelines of the sanitary installation are nowadays separated from the building by structure-borne sound insulation. For this purpose, pipe clamps with appropriate decoupling measures or corresponding insulating elements are used at the fastening points. Within the scope of the present test certificate, this type of element was to be tested.

Experience has shown that such clamps can reduce the noise of a water pipe system installed and tested in accordance with DIN 52 218 by up to

$$\Delta L_{AG} \approx 18 \text{ dB(A)}$$

In addition to using suitable clamps, plastered pipes should be encased in soft springy insulating material before bonding. The system of pipelines and tapping equipment is therefore to be installed as 'floating'.

3. Measuring arrangement and assessment principle

A commercially available water pipe with a suitable inside diameter, in this case 1" (outside diameter 33.7 mm), was inserted into the clamps mounted here via the vibration damper to be tested (compare the manufacturer's specifications in accordance with Appendices 1 and 2 of this test certificate) and fastened by closing the clamp with a 2 mm gap between the bends by means of an M 5 screw fastening.

Four insulating elements with rigid pipe clamps, each of the design described above, were firmly attached to the wall of an installation test station using M 8 threaded nipples moulded into the EPDM in corresponding metal anchors in accordance with DIN 52 218.

For comparison, four rigidly fixed clamp connections are mounted. For the two arrangements, each terminated by an installation noise standard (IGN B DIN 52 218), the improvement dimension ΔL_{AG} could be determined as the difference.

As shown later, if – at 3 bar – this has the size

$$\Delta L_{AG} = 11.3 \text{ dB(A)},$$

then the reduced volume transmitted through a half-brick masonry wall is calculated as:

$$L_{AG} = 45.0 - 11.3 \text{ dB(A)}$$
$$= 33.7 \text{ dB(A)}$$

4. Measuring procedure

To determine the characteristic improvement of the test object, the noise-causing tap water is fed from a pressure boosting system via a 1" thick hose to the freestanding test stand.

The flow pressure was determined directly at the tap source in accordance with the standard. An installation noise standard according to DIN 52 218 was used as the tapping source. The determination of the volume in the test station at the various flow pressures was carried out using a weighting filter according to DIN IEC 651. For the standard-compliant correction of the values, the test station correction (Kp) at 3 bar was determined according to the regulations of DIN 52 218, sheet 1, and the measured values were corrected. Through this conversion, the water pipe transmission corresponds to the average volume transmission, which must be expected under analog conditions on average in the building.

The test results specified in Appendix 2 represent an average of three successive measurements.

5. Measurement result

The measurement result can be found in Appendix 1 of the test certificate. Accordingly, the following was found:

Test object	Volume reduction at 3 bar in dB(A)	Remaining volume at 3 bar in dB(A)	Average reduction at flow pressures between 1 and 6 bar in dB(A)
Vibration damper of the applicant with decoupling made of EPDM (Shore hardness A ≈ 60°± 3°) with direct connection of a 1" water pipe via rigid clamp	(11,3) 11	(33,7) 34	(12,2) 12

The investigation shows that the tested insulating element at the flow pressure of 3 bar to be used for weighting at a valve measuring wall with the standard volume transmission

$$L_{AG} = 45 \text{ dB(A)}$$

fall below the permissible measurement according to DIN 4109 of

$$L_{AG\ target} \leq 35 \text{ dB(A)}$$

.

(Institute Management)

INSTITUTE FOR BUILDING PHYSICS IFB Officially recognized sound test authority * MÜLHEIM/RUHR *

Dipl.-Ing. Horst Grün Publicly appointed and sworn expert of the Chamber of Industry and Commerce for the city districts of Essen, Mülheim (Ruhr) and Oberhausen in Essen Mülheim (Ruhr)

Publicly appointed and sworn expert for sound, thermal, and moisture protection, and related building materials and bonding agents

Measurement of water installation noises in the laboratory

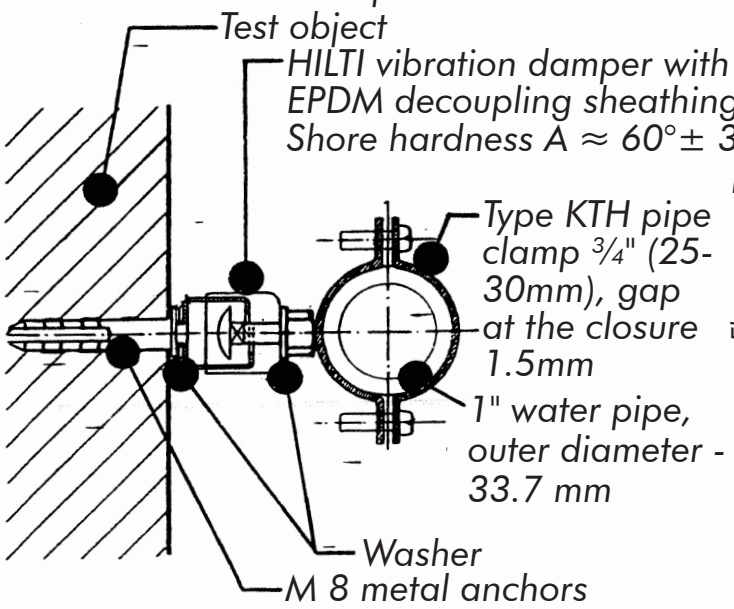
based on DIN 52 218

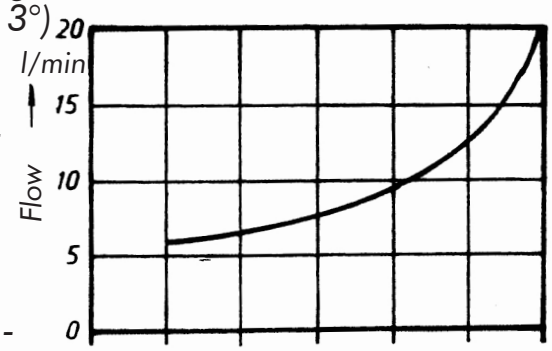
Applicant: HILTI Deutschland GmbH, Befestigungssysteme Werk 6.8, Hiltistraße 2, 86 916 Kaufering

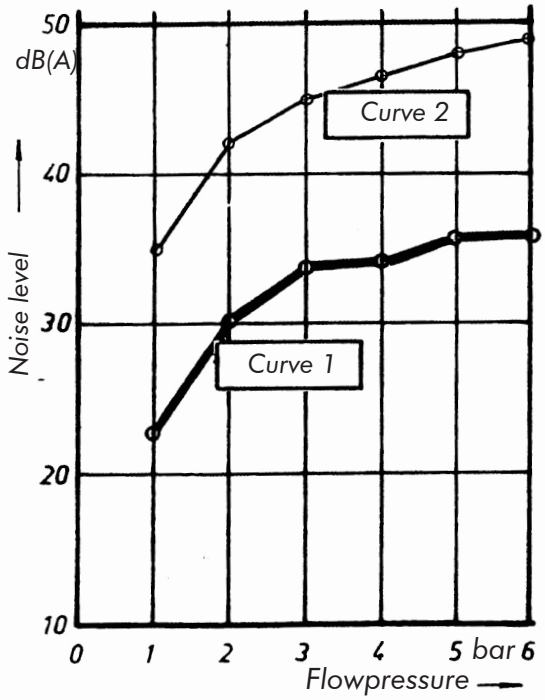
Test object: 1" water pipe connected via vibrration damper of the applicant (curve 1) and fastened rigily to the test wall (curve 2)

Operation: Installation noise standard (JGN DE DIN 52 218) with water flow of 1 to 6 bar. Assessment in the receiving room in dB(A) and with this the conversion to the noise transmission to be expected in the center of the building.

Structure of the test object: - Appendix 2 -







Surface weight of the measuring wall 232 kg/m²
Teststand correction K_p 4.3 dB(A)

Flow pressure in bar	Noise level L_{AG} in dB(A)
3	33.7
5	35.8
Flow pressure in bar	**Noise reduction ΔL_{AG} in dB(A)**
3	11.3
1-6*	12.2

*energy -equivalent mean value

No. of the test report:
10 529 / 97
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21.03.1997

INSTITUTE FOR BUILDING PHYSICS * MÜLHEIM/RUHR * IFB Officially recognized sound test authority

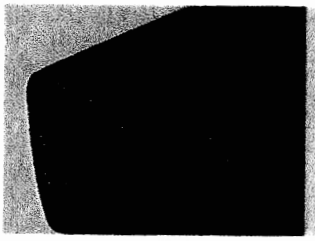
(Administrator)

(Institute Management)

Sound insulation systems for pipe mounting

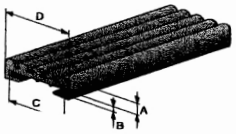
Hilti Dämmgripp

Sound insulation for DIN 4109



Advantages:
- Overlapping edge protection: prevents direct conttact between pipe ring and pipe (no acoustic bridging).

Design A mm	B mm	C mm	D mm	Packed	Order Designation	Part no.
6	2,5	21	27,5	10 m roll	RL-DG 100	56115/9



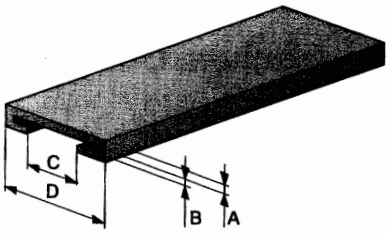
SOUND INSULATION for DIN 4109 TESTED

43,7

Lining strips for sound insulation

Application with strip fastening from roll

Design A mm	B mm	C mm	D mm	Packed	Order designation	Part no.
2	1,5	16	25	10 m roll	RL-DG 100	56133/2

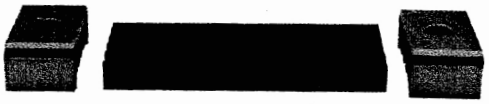


31,6

Sound insulation set

For two-hole baseplate MGS-2; M 10-M 16, ½"-¾" coupling.

Packed in pieces	Order Designation	Part no.
10	RT-IG 2	56235/5



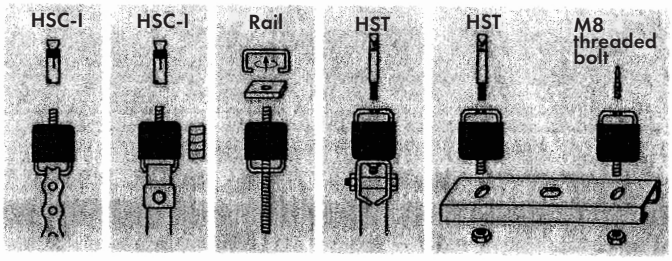
874,0

Sound insulation systems for all applications

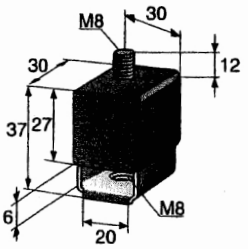
Hitti insulating element

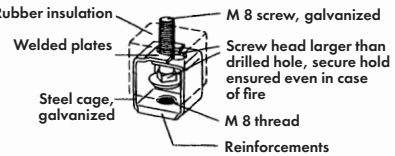
For pipe hangers, ventilation ducts, rail installations sound insulation for DIN 4109

Structural values		
Resistant to		aging, ozone, sunlight, weathering and environmental influences
Quality		EPDM (APTK)
Hardness	Shore A	approx. 60°
Resistance to aging		good
Tear resistance	N/nurf	approx. 20
Elongation at break	%	approx. 450
Rebound resilience		good
Temperature resistance		
Short term	°C	-50 to +170
Long-term	°C	-30 to +140
Resistance to permanent deformation		good
Technical data:		
Load recommended for suspended mounting:		
Maximum $F_{2\,rec}$ = 1200 N		



Advantages:
- For M8 threaded rods.
- Short ceiling distance.
- Insulation value, depending on frequency, 25-35 dB.
- Tear-out-proof design (in case of fire)





Packed separately	Order designation	Part no.
20	DE M 8/20	77838/1

SOUND INSULATION for DIN 4109 TESTED

851,0

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In advance by fax no. 0 81 91 /90-63 60

Hilti Entwicklungsgesellschaft mbH
Installation Systems Division
Dipl.-Ing. Mr. Loose
Dipl.-Ing. Mr. Zenk
Hiltistrasse 6

86916 Kaufering

Investigation of the structure-borne sound decoupling of the Hilti vibration damper type 25 to 30 mm

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Mülheim an der Ruhr, 11/11/2002

Dear Mr. Loose,
Dear Mr. Zenk,

Regarding the above-mentioned matter, you refer to our test certificate No. 10529/C/Bg/97 dated 3/21/1997 with the request to provide information on the noise reduction VM L_{In}(dB) in the individual octave center frequencies at a flow pressure of p = 0.3 MPa (3 bar).

These results are available to us, they were also measured previously, but not individually listed in the Appendix sheet of the above mentioned test certificate.

The noise reduction amounts to:

Table

$f_{oct.}$ in Hz	125	250	500	1000	2000	4000
VM L_{In} in [dB]	33,4	34,3	32,7	27,5	24,9	14,3

The result of the A assessment is:

$$L_{In} = \textbf{(11.3) 11 dB(A).}$$

We hope to have been of assistance with this information.

Yours sincerely

Institute for Building Physics
Horst Grün GmbH

Jan Penkala

Institute for Building Physics
Horst Grün GmbH

Building physics
Facade technology
Quality inspection
Building material testing

Certified
Sound insulation testing center
VMPA-SPG 181-97 NRW

Testing center according to
Article 26 Federal Immission
Control Act (BImSchG)

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