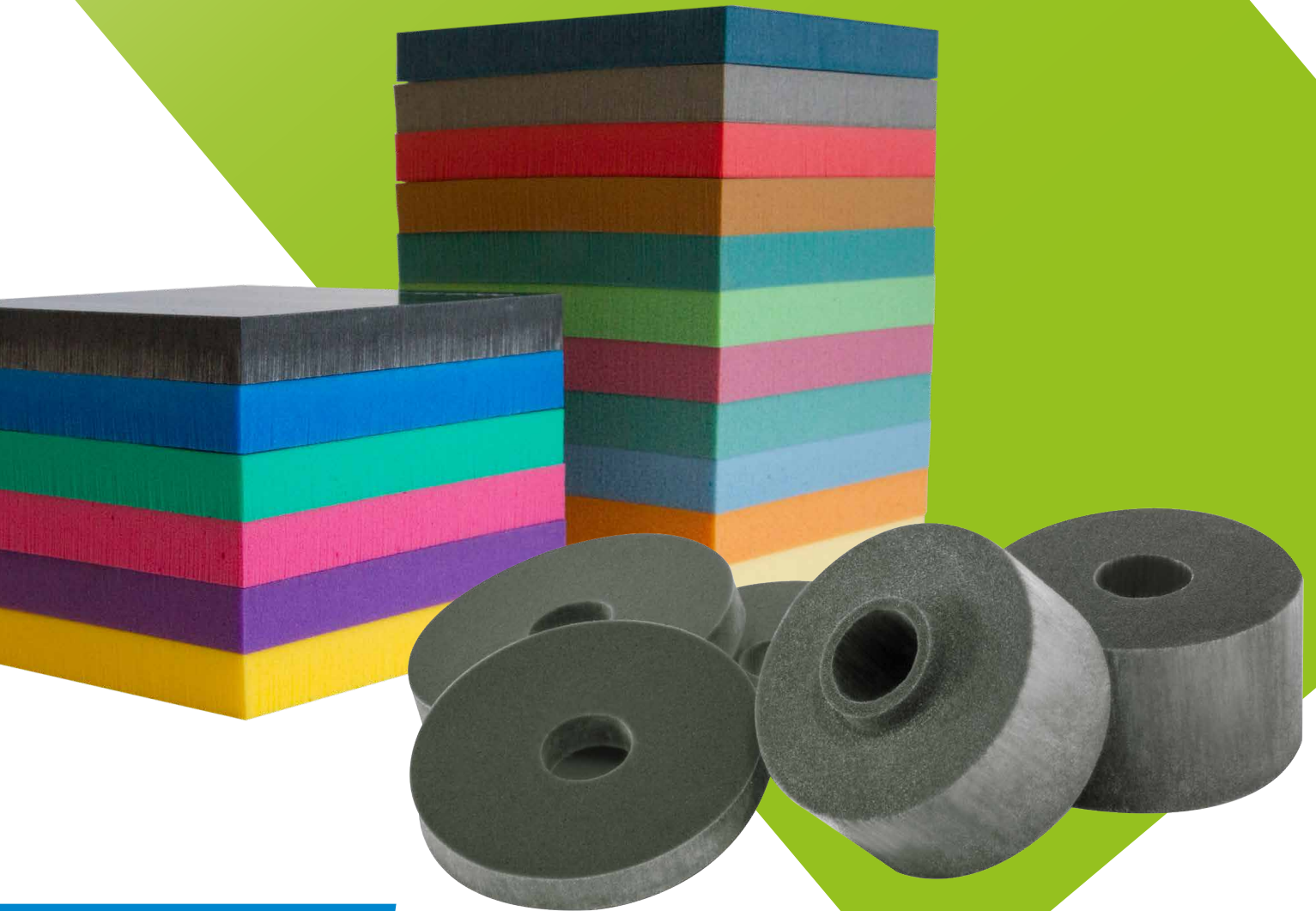


Sound protection

The innovative concept with high-performance angles, efficient insulation tapes and elastic washers



Post bases

Connectors

Balcony/fence posts

Tools

Fasteners

Sound protection



Prof. Hans-Joachim Grottel & Co. KG
DIN EN 1090-2



Innovative wood connection systems
for highest requirements.

Sound protection

In today's very fast-paced society, people are increasingly longing for peace and relaxation. To be able to switch off properly, they want a quiet place of retreat. Thus, higher demands are made on sound insulation at home, but also at work.

In order to meet the increasing demands, *Pitzl Metallbau* is constantly working on new and innovative solutions. In the course of this and in close cooperation with *Getzner Werkstoffe* and the *University of Innsbruck's* wood construction department, a comprehensive sound insulation concept – a high-performance, perfectly sound-decoupled angle for the CLT construction method and wood-concrete composite – was developed.

Basics

Air-borne sound

Music or speech cause the air to vibrate, which spreads in wave form and excites building components such as walls and ceilings. These components in turn emit sound that is perceived in adjacent rooms.

In order to determine the airborne sound insulation of a building component, such as a wall or ceiling, this excitation is specifically generated via loudspeakers.

Structure-borne sound

If vibrations are introduced directly into the building structure – e.g. by water pipes in a wall, by hammering, drilling or by household appliances – we speak of structure-borne sound.

Impact sound

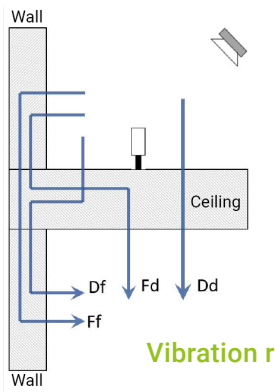
A special form of structure-borne sound is impact sound. This is introduced directly into a ceiling or staircase by walking on or moving or dropping objects. Secondary airborne sound is radiated into adjacent rooms.

In order to determine the impact sound insulation of a building component, a standard hammering machine specifically excites the building component.

Sound transmission over edges (flank transmission)

Building components must always be considered together with the building system. Part of the sound transmission takes place via so-called „flanking“ components. Doors, shafts or pipe penetrations can also serve as transmission paths for sound. The perceived noise level always depends on the interaction of all transmission paths.

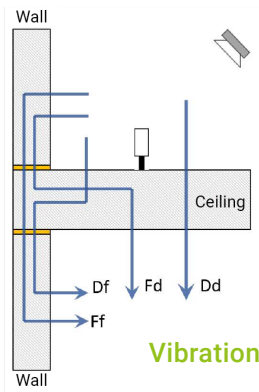
Rigid bearing situation



Vibration reduction index K_{ij}

Rigid	Path Ff	24 dB
	Path Fd	12 dB
	Path Df	12 dB

Completely decoupled (incl. elast. fasteners)



Vibration reduction index K_{ij}

Decoupled	Path Ff	35 dB
	Path Fd	22 dB
	Path Df	22 dB



Sound protection angle bracket with power

The **GePi angle** developed in the course of the cooperation with *Getzner Werkstoffe* has a load-bearing capacity many times higher than comparable concepts on the market. Based on test results from the *TVFA-Innsbruck*, characteristic shear and tensile forces of up to 62 kN are confirmed for the GePi 240 angle. An additional advantage of this system is the energy dissipation without any breakage in the event of an earthquake. Cyclic stresses impressively confirm the performance under dynamic loads of the revolutionary GePi angle.



81000.0080



81000.0100



81000.0240



81000.3100

GePi-Connect

Item no.	Designation	Dimensions				Screwing 8 mm		Characteristic load-bearing capacity [kN]		
		A	B	H	s	Horizontal (TK 8 x 80 TG)	Vertical (SK 8 x 160 VG)	F _{1,k}	F _{2/3,k}	F _{4/5,k}
81000.0080	GePi 80	80 mm	80 mm	80 mm	3	3	2	8	5	5
81000.0100	GePi 100	100 mm	100 mm	100 mm	3	5	4	16	12	20
81000.0240	GePi 240	100 mm	240 mm	100 mm	3	16	11	54	62	55
81000.3100	GePi 100 Concrete	100 mm	100 mm	100 mm	3	5	4	10	5,5	10

Item no.	Designation	Material		
		Angle bracket	Sylodyn®	Supporting plate
81000.0080	GePi 80	Steel S250GD + Z275	Closed cellular pore structure	Steel S250GD + Z275
81000.0100	GePi 100	Steel S250GD + Z275	Closed cellular pore structure	Steel S235
81000.0240	GePi 240	Steel S250GD + Z275	Closed cellular pore structure	Aluminium EN AW 6082
81000.3100	GePi 100 Concrete	Steel S250GD + Z275	Closed cellular pore structure	Steel S235

In contrast to other common building materials, elastomers have a non-linear material behaviour. This means that material parameters such as static and dynamic stiffness depend on the respective pressure. In order to use the material Sylodyn® ideally, it is therefore recommended to use an installation template with a defined pretension.

Application areas

Angle brackets for shear loads with decoupled flanks

- Connection timber-timber
- High wind forces
- Earthquake loads
- Lifting forces
- Increased requirements on sound insulation





Advantages and benefits

- High shear and tensile strength
- Sound transmission decoupled connection
- Proofed sound insulation
- Resistant to earthquakes (GePi 240)
- Reliability for engineers and users
- Approved product quality



ETA-21/0750

Each of our GePi brackets has a
European Technical Assessment
(ETA-21/0750)



Characteristic load-bearing
capacity up to **62 kN**
acc. to EN 1995:2014

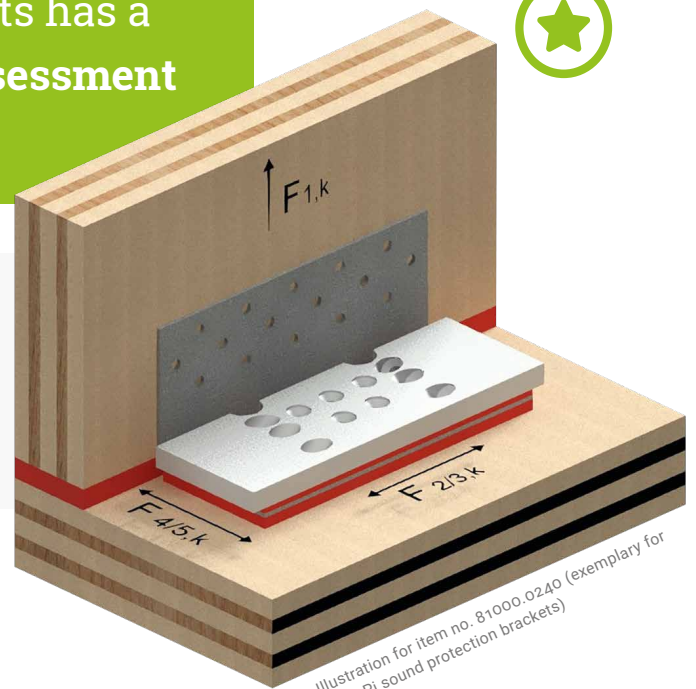


Illustration for item no. 81000.0240 (exemplary for all GePi sound protection brackets)

Accessories

Fitting tool

Item no.	Description
81010.0000	Fitting tool, 2-parts for GePi angle bracket



81010.0000



99200.0880



99211.0816

Screws

Item no.	Description	d	l	lg	dk	Drive train
99200.0880	Washer-head screw	8	80	60	18,0	T-40
99211.0816	Countersunk screw	8	160	150	14,8	T-40

Sylodyn® and Sylomer® insulation tapes

Counteract sound transmission in a targeted manner.

Sylodyn tapes in various thicknesses, widths and designs are the guarantee for a smooth and efficient project process.

Getzner's decades of experience with vibration insulation in the railway, construction and industrial sectors enable architects, planners and building physicists as well as carpenters and timber construction companies to meet the high structural requirements in buildings where people live and work.

The strips are 6.25, 12.5 or 25 mm thick, depending on requirements, and are manufactured in the required dimensions according to customer specifications. They are offered in various stiffnesses and installed between the wall and ceiling. Stiffer Sylodyn® types can also be offered for particularly heavily stressed components with high pressures.

Sylodyn®

Material parameter	Test method	NB	NC	ND	NE	NF	HRB HS 3000	HRB HS 6000	HRB HS 12000
Colour		red	yellow	green	blue	violet	dark-green	dark-blue	dark-brown
Item no.		81100	81200	81300	81400	81500	81601	81602	81600
12.5 mm tape, width 100 mm						_____1100			
12.5 mm tape, width 120 mm						_____1120			
Static application ¹ in MPa		0,075	0,150	0,350	0,750	1,500	3,000	6,000	12,000
Load peaks ¹ in MPa		2,00	3,00	4,00	6,00	8,00	12,00	18,00	24,00
Mechanical loss factor	DIN 53513 ²	0,07	0,07	0,08	0,09	0,10	0,07	0,07	0,08
Rebound elasticity in %	EN ISO 8307	70	70	70	70	70	70	70	70
Compression set ³ in %	EN ISO 1856	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Static modulus of elasticity ¹ in MPa		0,75	1,10	2,55	6,55	11,80	33,20	74,00	181,00
Dynamic modulus of elasticity ¹ in MPa	DIN 53513 ²	0,90	1,45	3,35	7,70	15,20	49,10	113,80	323,00
Static shear modulus ¹ in MPa	DIN ISO 1827 ²	0,13	0,21	0,35	0,61	0,80	2,40	3,50	4,00
Dynamic shear modulus ¹ in MPa	DIN ISO 1827 ²	0,18	0,29	0,53	0,86	1,18	2,80	4,20	5,30
Min. breaking stress in tension in MPa	DIN EN ISO 527-3/5/100 ²	0,75	1,50	2,50	4,00	7,00	12,00	15,00	16,00
Min. breaking elongation in tension in %	DIN EN ISO 527-3/5/100 ²	450	500	500	500	500	400	400	400
Abrasion ³ in mm ³	DIN EN ISO 4649	1.400	550	100	80	90	100	80	70
Friction coefficient (steel)	Getzner Werkstoffe	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,4
Friction coefficient (concrete)	Getzner Werkstoffe	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,7	≥ 0,6
Specific contact resistance in Ω · cm	DIN IEC 60093	> 1010	> 1010	> 1010	> 1010	> 1010	> 1010	> 1010	> 1010
Thermal conductivity in W/mK	DIN EN 12667	0,060	0,075	0,090	0,100	0,110	0,160	0,170	0,190
Working temperature in °C							-30 to 70		
Temperature peak in °C	short term / instantaneous ⁴						120		
Fire behavior	EN ISO 11925-2						Class E/EN 13501-1		

¹ Values are valid for form factor q = 3
² Measurement / evaluation based on the respective standard
³ Measurement data depend on density and varying test parameters
⁴ Custom-designed



Sylomer®

Material parameter	Test method	SR 11	SR 18	SR 28	SR 42	SR 55	SR 110	SR 220	SR 450	SR 850	SR 1200
Colour		yellow	orange	blue	pink	green	brown	red	gray	turquoise	burgundy
Item no.		84200	84700	84400	84000	84300	84110	84100	84800	84900	84500
12.5 mm tape, width 100 mm	1100									
12.5 mm tape, width 120 mm	1120									
Static application ¹ in MPa		0,011	0,018	0,028	0,042	0,055	0,110	0,220	0,450	0,850	1,200
Load peaks ¹ in MPa		0,50	0,75	1,00	2,00	2,00	3,00	4,00	5,00	6,00	6,00
Mechanical loss factor	DIN 53513 ²	0,25	0,23	0,21	0,18	0,17	0,14	0,13	0,12	0,11	0,11
Rebound elasticity in %	EN ISO 8307	40	40	45	55	55	55	55	60	60	60
Compression set ³ in %	EN ISO 1856 ²	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Static modulus of elasticity ¹ in MPa		0,06	0,08	0,19	0,22	0,34	0,83	1,47	3,36	7,23	9,37
Dynamic modulus of elasticity ¹ in MPa	DIN 53513 ²	0,20	0,29	0,42	0,60	0,73	1,52	2,58	5,42	11,08	15,62
Static shear modulus ¹ in MPa	DIN ISO 1827 ²	0,04	0,06	0,07	0,09	0,11	0,22	0,38	0,58	0,84	0,94
Dynamic shear modulus ¹ in MPa	DIN ISO 1827 ²	0,10	0,12	0,14	0,17	0,20	0,34	0,57	0,82	1,15	1,28
Min. breaking stress in tension in MPa	DIN EN ISO 527-3/5/100 ²	0,30	0,35	0,40	0,50	0,60	0,80	1,20	1,80	2,50	2,70
Min. breaking elongation in tension in %	DIN EN ISO 527-3/5/100 ²	300	300	250	250	250	220	200	170	170	160
Abrasion ³ in mm ³	DIN EN ISO 4649	1.400	400	1.300	1.200	1.100	1.100	1.000	400	300	350
Friction coefficient (steel)	Getzner Werkstoffe	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Friction coefficient (concrete)	Getzner Werkstoffe	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
Specific contact resistance in $\Omega \cdot \text{cm}$	DIN EN 62631-3-1 ²	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰	> 10 ¹⁰
Thermal conductivity in W/mK	DIN EN 12667	0,045	0,050	0,050	0,055	0,060	0,075	0,090	0,110	0,130	0,140
Working temperature in °C		-30 to 70									
Temperature peak in °C	short term / instantaneous ⁴	120									
Fire behavior	EN ISO 11925-2	Class E/EN 13501-1									

¹ Values are valid for form factor $q = 3$

² Measurement / evaluation based on the respective standard

³ Measurement data depend on density and varying test parameters

⁴ Custom-designed

Elastic washers

Elastic washers (EW) are used to decouple structure-borne sound bridges that occur via screw connections. The polyurethane material Sylodyn® effectively isolates vibrations and retains its material properties over the entire service life. In addition to vibration decoupling, the washers are electrically non-conductive and resistant to common oils and greases.



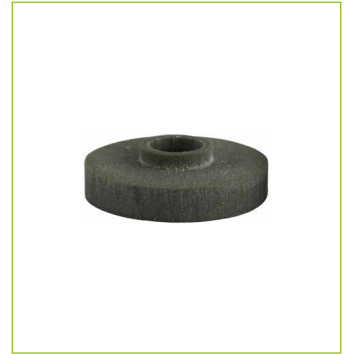
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81900.1612



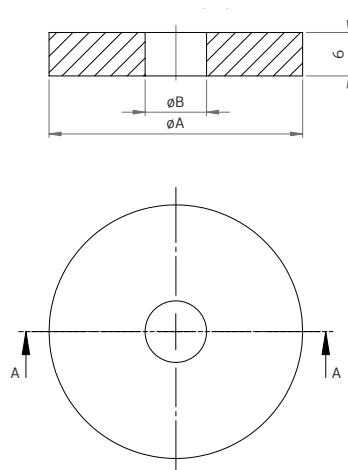
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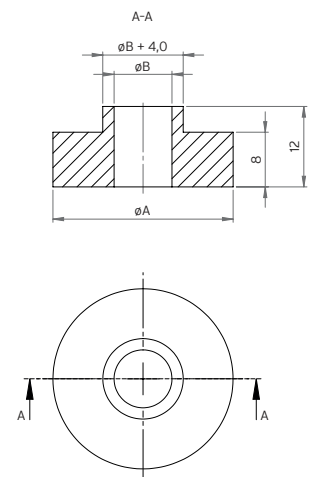
81901.1208

Item no.	Description	Thickness	Screw dimension	Ø A	Ø B
81900.0806	EW M8-6	6 mm	M8	35 mm	9 mm
81900.1006	EW M10-6	6 mm	M10	40 mm	11 mm
81900.1206	EW M12-6	6 mm	M12	50 mm	13 mm
81900.1606	EW M16-6	6 mm	M16	55 mm	17 mm
81901.0808	EW M8-8	8 mm	M8	28 mm	9 mm
81901.1008	EW M10-8	8 mm	M10	34 mm	11 mm
81901.1208	EW M12-8	8 mm	M12	44 mm	13 mm
81901.1608	EW M16-8	8 mm	M16	56 mm	17 mm
81900.0812	EW M8-12	12 mm	M8	35 mm	9 mm
81900.1012	EW M10-12	12 mm	M10	40 mm	11 mm
81900.1212	EW M12-12	12 mm	M12	50 mm	13 mm
81900.1612	EW M16-12	12 mm	M16	55 mm	17 mm
81901.0821	EW M8-21	21 mm	M8	28 mm	9 mm
81901.1021	EW M10-21	21 mm	M10	34 mm	11 mm
81901.1221	EW M12-21	21 mm	M12	44 mm	13 mm
81901.1621	EW M16-21	21 mm	M16	56 mm	17 mm

Standard solution



With centring aid





Available versions

In addition to the standard version, washers with a centring aid (fold) are also available to facilitate installation and ensure the exact positioning of the screw to the hole. The dimensions are adapted for screw sizes M8, M10, M12 and M16 and are available in various bearing thicknesses for different insulation efficiencies. Maximum screwing torques on request.



Advantages

- Effective vibration insulation and decoupling
- Constant material properties over the long term
- No embrittlement (free of plasticisers)
- Assortment for different screw sizes
- Variants with centring aid
- Fire behaviour conforms to DIN EN 13501-1
- Surface protection
- Electrically non-conductive
- Resistant to oils and greases
- Thermally insulating

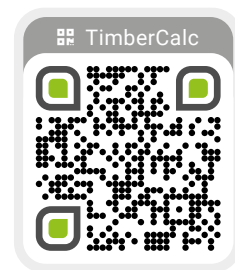
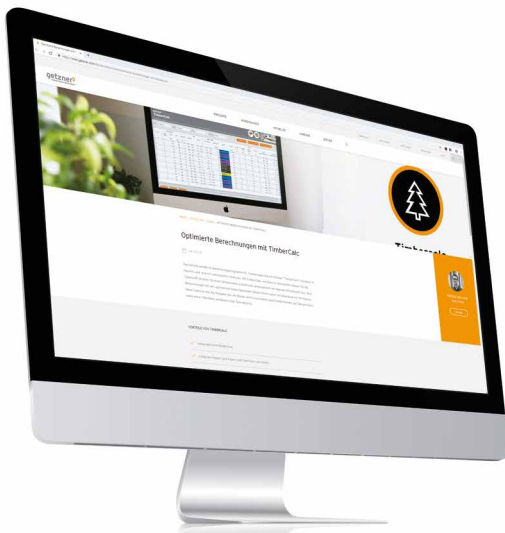
Selection of sound decoupling

The following procedure is recommended for a smooth and efficient process:

1. Based on the structural conditions and the possibly already defined ceiling and wall structures, the required bearing positions are determined.
2. The Sylodyn® bearings are dimensioned with the TimberCalc calculation program and adjusted to the load. TimberCalc can be used free of charge at apps.getzner.com.
3. All the data required to determine the optimum Sylodyn® bearing is entered in the input mask:
 - Position number
 - Length and width of the bearing
 - Characteristic loads
 - Point or line bearing

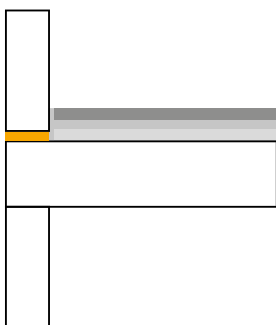


4. The programme determines the optimum Sylodyn® type and displays all relevant material data at a glance:
 - Existing bearing pressure
 - Optimum material
 - Load limit of the material
 - Subsidence (after 1 day and 10 years)
 - Natural frequency
 - Material load
 - Design resistance
5. The data can be transferred to other programmes such as Excel or as a PDF for further processing.
6. With this data, a parts list can be created at your workplace, as well as an installation plan with the existing plans.
7. The installation of Sylodyn® bearings is carried out in accordance with the parts list and the installation plan, which is drawn up at the customer's request (charged according to expenditure). This ensures a flawless installation.



Design rules

At the joints below, Sylodyn® strips should be used as shown:

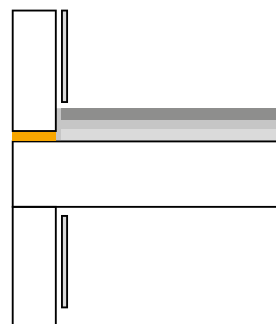


Sylodyn® above the slab

without facings on the wall and no suspended ceilings

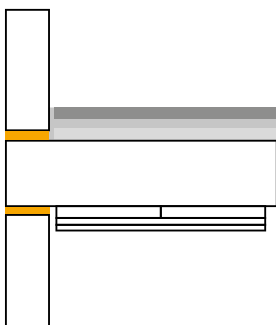
Sylodyn® above the slab

with facings on the wall and no suspended ceilings



Sylodyn® above and below the slab

without facings on the wall and with suspended ceiling



Design concept

When verifying sound decoupling, two points must be considered separately:

Proof of serviceability (sound insulation)

In order to achieve optimum dynamic effectiveness, *Getzner* has defined a so-called static application range $\sigma_{R,perm}$. The acting quasi-permanent loads, which are permanently present and place long-term stress on the material, should lie within the static application range. This ensures that the dynamic properties are maintained for decades and that the optimum vibration insulation occurs in the usual case of use. Temporary overloads or load reductions have no significant influence on the product properties of Sylodyn®.

Proof of load-bearing capacity (statics)

Appropriately tested and approved elastomers must be used for the verification of load-bearing capacity in construction. For the material Sylodyn®, this requirement is fulfilled in each case by means of a general building authority approval (abZ) according to Building Rules List B, Part 1 - Issue 2013/1, 1.7.2 Elastomeric bearings. Due to its non-linear properties, Sylodyn® has spring characteristic curves which have a positive effect on the maximum permissible load capacity in the verification of the load-bearing capacity. The bearing resistances $\sigma_{R,d}$ have been verified both internally and externally, are continuously checked and can be taken from the following tables or the approval document for verification purposes.

Approval

A general building approval is a reliable proof of the usability of a building product with regard to the building requirements under which the product is used. In addition, the approval states that the consistent quality of the bearings is regularly verified externally.



Vertical load transfer

The verification of the bearings in the ultimate limit state is to be carried out with the bearing resistances listed below for the respective material type. For the verification of the vertical load capacity, the following must apply:

Verification of the bearing arrangement in the ultimate limit state

$$F_{E,z,d} \leq F_{R,z,d}$$

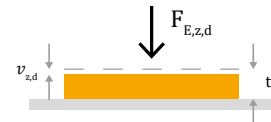
Vertical bearing resistance at design level

$$F_{R,z,d} = \sigma_{R,d} \cdot A$$

Area calculation for rectangular bearings

$$A = a \cdot b$$

- A Loaded area of the bearing
- a, b Side lengths of a rectangular bearing
- E_z E-modulus of the material for design level dimensioning
- $F_{E,z,d}$ Vertical impact at design level
- $F_{R,z,d}$ Vertical bearing resistance at design level
- $\sigma_{R,d}$ Bearing resistance at design level (values in table)
- $v_{z,d}$ Vertical deformation at design level



Horizontal load transfer

The maximum horizontal bearing resistance $F_{R,xy,d}$ that can be transferred over a bearing for a short period of time is the restoring force of the bearing that results from a shear distortion of $\varepsilon_{xy} = 20\%$ of the unloaded bearing thickness t_0 . This bearing resistance can be used as a safe value for the load transfer of short-term shear forces.

Verification of horizontal load transfer

$$F_{E,xy,d} \leq F_{R,xy,d}$$

Horizontal bearing resistance at design level (max. 20 % shear distortion)

$$F_{R,xy,d} = G \cdot A \cdot \varepsilon_{xy,d} < G \cdot A \cdot 0,2$$

- A Loaded area of the bearing
- $F_{E,xy,d}$ Horizontal impact at design level
- $F_{R,xy,d}$ Horizontal bearing resistance at design level
- G Shear modulus (values in table)
- $\varepsilon_{xy,d}$ Design value of the shear distortion
- $v_{xy,d}$ Deformation from horizontal load



Item no.	Type	$\sigma_{R,d}$ [N/mm ²]	E_z [N/mm ²]	G [N/mm ²]
81100	NB	0,163	0,597	0,155
81200	NC	0,345	1,23	0,234
81300	ND	0,838	2,92	0,469
81400	NE	2,01	8,34	0,832
81500	NF	4,02	17,8	1,250
81601	HRB HS 3000	8,02	36,7	3,560
81602	HRB HS 6000	16,6	76,3	5,130

Design resistance, E-modulus and shear modulus of Sylodyn® for the form factor $q = 3$. Further calculation models and characteristic values can be found in Getzner's design concept.

Fast, easy and precise for the **best result**

All information, technical data, downloads and videos:
Always up to date for you on www.pitzl-connectors.com.

Feel free to seek our competent advice at any time by
calling **+49 (0) 8703 9346-0** or simply send us an e-mail
to info@pitzl-connectors.com.

Post bases

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Balcony/fence posts

Tools

Fasteners

Sound protection



Pitzl Metallbau GmbH & Co. KG
Siemensstr. 26
DE-84051 Altheim, Germany

Phone: +49 (0) 8703 9346-0
Fax: +49 (0) 8703 9346-55
info@pitzl-connectors.com

