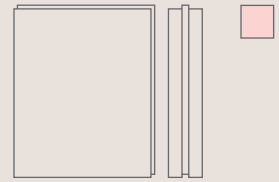


MultiGips

Technical data sheet

Solid gypsum block D100-R48

EN 12859 — lead-free radiation protection



RADIATION PROTECTION

MAIN FEATURES

Building material Pre-fabricated building element of calcium sulphate and water with smooth visible surfaces for creating lead-free, non-load bearing, indoor radiation protection partitions, free-standing radiation protection facing panels and supply shafts for diagnostic X-ray rooms and low-power radiation therapy X-ray rooms.

MultiGips D100-R48 blocks contain baryte (barium sulphate, BaSO_4) as the key constituent for their suitability as a radiation protection block. MultiGips D100-R48 blocks are gypsum blocks according to EN 12859 with the additional property of "radiation protection". Gypsum blocks according to EN 12859 even without the additional property of "radiation protection" are sufficient for the vast majority of dental X-ray and mammography devices.

MultiGips D100-R48 blocks can be used in conjunction with radiation protection filling plaster MultiGips FG 70-B Strahlenschutz-Füllgips as well as with gypsum-based adhesives for gypsum blocks just like all other types of gypsum blocks. They therefore offer largely identical sound insulation and fire protection properties.

Properties Mineral (calcium sulphate hemihydrate with 20% barium sulphate content)
High dimensional stability
Tongue and groove profile for positively locking partitions
Basically dry processing with gypsum-based adhesive according to EN 12860
Smooth, flat visible surfaces for rapid final treatment; no radiation protection plaster required

Performance as building element Non-load bearing partitions in drywall construction
Without the need for a stud framework
Identical material properties in cross-section and surface
Low weight per unit area for optimum ceiling dimensions

Fire resistance class EI 120, E 120

High resistance to mechanical stresses, and hence less maintenance required

**Special features as partition for
radiation protection**

Solid radiation protection material without additional lead film lamination

Extremely simple processing for maximum installation reliability (no framework, no planking)

Contemporary sound insulation via decoupling from supporting building elements

Environmentally-friendly dismantling due to lack of lead content

Particularly economical in comparison with lead-based structures

TECHNICAL FEATURES

Performance feature	Building material
European standard	EN 12859
Building element thickness	100
Length x height (mm)	400 x 500
Block requirement (blocks/m²)	5
Colour	Reddish
Density class	D (dense) high density
Density [kg/m³]	approx. 1,400
Unit weight (kg)	approx. 28
Weight per unit area (kg/m²) of building element, incl. its component	approx. 142
Strength class	Type R
Bending strength (kN) Minimum average breaking load	9.4
Moisture content (% by weight) at time of delivery	≤ 8
pH level	7 – 9 (normal)
Water absorption class	H3
Water absorption	No requirement
Reaction to fire EN 13501-1, Euroclass	A1, no contribution to fire
Areal thermal resistance R	0.19
Thermal conductivity λ_{23-50} (W/mK)	0.51
Water vapour diffusion resistance (μ)	5 – 10
Storage	Dry on Euro pallets

BUILDING PHYSICS DATA

Performance feature	Component
Fire resistance class EN 13501-2	F180-AB ¹⁾
Weighted sound reduction index R_w (dB) EN ISO 717-1	48 ²⁾

1) With MultiGips AkustikPro 120-3/120-3 sk or MultiGips AkustikBit 1000

2) With MultiGips AkustikBit 1000; without longitudinal transmission via adjacent building elements

ORDER INFORMATION

Performance feature	Building material	
Material number	781	
Format (mm)	400 x 500 x 100	
Weight (kg/unit) (kg/pallet), approx.	28 kg/unit	672 kg/pallet
Packaging unit/pallet (unit) (package)	24 units	2 packages
Area (m²/pallet)	4.80	

DOCUMENTATION

EN multigips.com

EU ce.multigips.de

EPD ibu-epd.com

ENVIRONMENTAL DATA

Performance feature	Building material, building element
Composition	Hardened gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)
Barium sulphate content	approx. 20%
Emission of hazardous substances [Regulation (EC) No. 1272/2008 (materials)] (preparations 1999/45/EC)	Not liable to marking
Persistence, bio-accumulation potential, toxicity	No PBT characteristics
Toxicity	Non-toxic, non-irritant, non-sensitising
Carcinogenicity, mutagenicity and toxicity to reproduction	No CMR properties
Bio-accumulation potential	No potential (inorganic, mineral)
Ecology	Safe in air, water and soil
Duration of use ¹⁾ (y)	> 50
For other environmental information, see also	Safety data sheet according to Regulation (EC) 1907/2006 (REACH), 05.2008 Environmental product declaration for gypsum products of the Bundesverband der Gipsindustrie e.V., 06.2009 REACH Annex IV Dossier Calcium Sulphate, 11.2007 (English)

1) Table Duration of Use of Building Components for Life Cycle Analyses according to the Nachhaltiges Bauen (Sustainable Building) (BNB) evaluation system, source: Bundesinstitut für Bau-, Stadt- und Raumforschung (Federal Institute for Research on Building, Urban Affairs and Spatial Development)(BBSR)

LEAD EQUIVALENTS FOR DIAGNOSTIC X-RAY ROOMS

X-ray tube voltages at 2.5 mm aluminium filter (kV)	Lead equivalents ¹⁾ in mm Pb ²⁾ depending on the baryte content and the wall thickness		
	Without baryte, 100 mm	With baryte, 100 mm	With baryte, 200 mm (2 x 100 mm)
60	0.6	1.4	2.8
70	0.8	2.0	4.0
80	0.7	2.0	4.0
90	0.8	2.2	4.4
100	0.9	2.4	4.8
120	0.8	2.0	4.0
150	0.8	1.7	3.4

1) Intermediate values can be interpolated

For the area of mammography (35 kV), gypsum blocks without barium sulphate content are sufficient for radiation protection.

2) Lead equivalent unit: A material with a lead equivalent of, for example, 1 mm Pb (Pb, chemical symbol for lead) has the same radiation protection effect as a 1 mm thick lead plate.

LEAD EQUIVALENTS FOR RADIATION THERAPY X-RAY ROOMS ¹⁾

X-ray tube voltages with aluminium filtering (kV)	Lead equivalents in mm Pb ²⁾ depending on the baryte content and the wall thickness		
	Without baryte, 100 mm	With baryte, 100 mm	With baryte, 200 mm (2 x 100 mm)
200	0.6	1.5	3.0
250	0.7	1.5	3.0
300	0.8	1.6	3.2

1) The comparison value for X-ray tube voltages above 200 kV is relatively low in comparison with the wall thickness and weight per unit area of the radiation protection structure. Therefore, the only effective application is as supplementation of existing shielding.

2) Lead equivalent unit: A material with a lead equivalent of, for example, 1 mm Pb (Pb, chemical symbol for lead) has the same radiation protection effect as a 1 mm thick lead plate.

DIMENSIONS ACCORDING TO DIN 4103-2 AND EN 15318

Max. permissible dimensions ¹⁾ of a building element of gypsum block D100-R48 according to DIN 4103-2 (2017-09)

Connection location/ characteristic	Horizontal load ¹⁾	Wall height (m) Single-leaf	Wall length (m)
Double-sided support:	1	≤ 7.00	Any
Closed at least at the top and bottom, large openings possible	2	≤ 5.50	Any
Four-sided support:	1	≤ 7.50	Any
No large openings possible	2	≤ 6.00	≤ 16.50
3-sided connection:	1	≤ 7.00	≤ 8.00
attached at bottom and sides, no large openings possible	2	≤ 5.00	≤ 5.00

1) Horizontal load (0.5 kN/m): Areas with low numbers of people, e.g. in homes, hotels, office buildings, hospitals, including corridors

Installation area 2: Areas with large numbers of people, e.g. large auditoriums, assembly halls, school rooms, exhibition halls and sales rooms

Max. permissible dimensions ¹⁾ single-leaf walls or wall sections with normal load levels for gypsum blocks with medium to high density without cavities according to EN 15318 (2008-01)

Gypsum blocks (Density class)		Partition wall without wall openings			Partition wall with wall openings			Partition wall without attachment to ceiling		
D ²⁾	M ³⁾	Area ⁴⁾ (m ²)	Height (m)	Length (m)	Area (m ²)	Height (m)	Length (m)	Area (m ²)	Height (m)	Length (m)
	60	32	4.00	8.00					1.50	1.50
60	70	55	5.00	11.00		2.75			2.50	2.50
70	80	77	5.50	14.00		3.50			3.50	3.50
80	100		5.50	16.50		5.00			4.00	4.00

1) Dimensions apply for gypsum blocks and hydrophobic gypsum blocks

2) High gross density (D) according to EN 12859: $1,100 \text{ kg/m}^3 \leq \rho \leq 1,500 \text{ kg/m}^3$

3) Medium gross density (M) according to EN 12859: $800 \text{ kg/m}^3 \leq \rho < 1,100 \text{ kg/m}^3$

4) The main selection criterion is the maximum wall area

APPLICATION PRINCIPLES

Application The radiation protection blocks R48 must be installed in accordance with DIN 4103-2 (Internal non-load bearing partitions of gypsum blocks).

Gypsum blocks must be assembled with gypsum-based adhesive for gypsum blocks EN 12860 in a staggered pattern. Wherever possible, the joints of subsequent blocks should not meet. For staggering of the joints, a minimum of 1/4 to 1/2 of the block length is recommended, similar to a masonry construction. In the joint area, or over the full surface, the partitions are smoothed with MultiGips adhesive for gypsum blocks or with the special MultiGips SG 90 Uni surface smoothing plaster. Joints and wall surfaces to which cladding is to be attached need not be smoothed.

NOTE: Blocks and block joints with MultiGips Gipskleber according to EN 12860 were measured for inspection of the joint area. No difference was identified here between the measurement points of the block bodies and block joints. In X-ray imaging and evaluation of the film density, however, the block joint is discernible. Based on the increase in density in the joint area of 0.5 optical density, a reduction of the dampening effect in the joint area of 0.2 to 0.3 mm lead cannot be entirely ruled out at an X-ray tube voltage of 300 kV. However, due to the overall low proportion of joint area and the low joint width (< 1 mm), block joints can be neglected in the evaluation of the overall radiation protection function.

Cut the gypsum blocks by handsaw or with a chainsaw. Sawdust must be removed from the cut edges. Slots and cut-outs, e.g. for electrical installations, or small wall openings may not be chiselled out; they must be made with a power tool. Large openings, e.g. for doors, are created via placement of the blocks or are sawed out after the partition has been built. Door frames are filled with the specified radiation protection filling plaster MultiGips FG 70-B Strahlenschutz-Füllgips.

NOTE: Slots and cut-outs may be created in building elements of gypsum blocks in accordance with the relevant rules (see table "Maximum permissible horizontal slots"). Based on experience, slots with a depth of approx. 20 mm are created in building elements for the installation of electrical lines; cut-outs with a depth of 40 – 50 mm are created for flush-mounted sockets. The lead equivalent value is therefore locally reduced at the slots and cut-outs. Whether additional radiation protection measures are required due to this reduction depends on the required lead equivalent value for the respective radiation protection structure.

During construction, the site air temperature and the temperature of the building elements may not fall below +5 °C. Work must be suspended if night frost is expected. If possible, the top floor ceiling should be sealed in order to greatly reduce the effects of moisture during the construction phase. If screed is to be subsequently installed, the covering of the insulation layer must be properly continued up the walls. In particular with poured asphalt screed, adequate cross-ventilation must be ensured.

Maximum permissible horizontal slots

Wall thickness (mm)	Slot depth (mm) ¹⁾		Spacing of parallel slots (mm)
	Slot length ≤ 1,000 mm	Slot length unrestricted	
100	≤ 50	≤ 33	≥ 500

1) Without minimum overlapping of mounted parts (≥ 10 mm)

Joints Gypsum blocks are connected to adjacent building components by the use of elastic interlayer. In particular for the construction of ceiling connections, care must be taken that the elastic interlayer form a sealed joint without cavities. The edges of the top-blocks can be either horizontal or bevelled. Bevelled edges increase the bonding area for the filling plaster. Dust must be removed from the cut edges, and the edges must be moistened before filling the ceiling joint. The ceiling joint must be completely filled in accord with the intended sound insulation, fire protection and structural engineering requirements.

Sound insulation In case of sound insulation requirements the connections of the partitions have to be designed with elastic interlayer. If there are no sound insulation requirements and negligible bearing forces, the connections may be rigid (without elastic interlayer).

NOTE: For partitions with certified sound insulation characteristics, the joints must be made with elastic interlayer as stated in the table "Building Physics Data".

Fire protection If the walls are to meet fire protection requirements, the joints must be made according to the national regulations. For example, elastic joints may be made if insulating material according to EN 13162 is incorporated in the form of rock wool strips.

NOTE: An assessment report by Exova Warringtonfire is available which presents a considered opinion regarding the expected fire resistance performance of a non-load bearing partition wall assembly as previously tested to German DIN 4102-2 at iBMB MPA Braunschweig. It can be concluded that the proposed partition wall assembly should be capable of providing 120 or 240 minutes integrity and insulation performance (dependent upon thickness).

Radiation protection Especially for radiation protection structures of StWD.100-R48, the radiation protection filling plaster MultiGips FG 70-B Strahlenschutz-Füllgips specially developed for this application must be used for the ceiling connection, filling slots, etc.

SAFETY AND DISPOSAL

Possible risks The material is categorised as non-hazardous according to Regulation (EC) No. 1272/2008

Disposal Recommendation Disposal according to official regulations.

European List of Waste 17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01. Disposal as landfill, landfill category 1 and 2 according the German ordinance on the list of waste.

Packaging Bags or other packaging material must be optimally emptied and can be recycled after appropriate cleaning.

Transport Non-hazardous within the sense of international transport regulations.

Safety data sheet The information in the current safety data sheet at ce.multigips.de applies.

CALCULATION AND DELIVERY INFORMATION¹⁾

Requirements for standard application based on experience. Deviations due to changes to general conditions such as wall dimensions, room layout, type of construction, transport routes, etc. must be taken into account.

System components	Unit	Material requirement	Delivery units Form of packaging	Packaging unit
Gypsum blocks MultiGips D100-R48 radiation protection blocks	m ² /m ²	1	2.4 m ² /package (= 12 pcs.) 4.8 m ² /pallet (= 24 pcs.)	1 pallet (2 packages/pallet)
Elastic interlayer AkustikPro 120-3/120-3 sk AkustikBit 1000 ²⁾	m/m ²	1.3	25 m roll 1 m strips	4x 25 m rolls 50 m/package
Gypsum-based adhesive for gypsum blocks Adhesive ClassicWeiss 90 Adhesive SuperWeiss 120/SuperWeiss 200 Adhesive Hydro 90	kg/m ²	approx. 1.0 – 1.5	25 kg bag	40 pcs./pallet
Fill ceiling joint, close electrical slots FG 70-B Strahlenschutz-Füllgips	kg/m ²	approx. 2 – 3	25 kg bag	40 pcs./pallet
Gypsum filler (backfilling doorframes) FG 70-B Strahlenschutz-Füllgips	kg/doorframe	approx. 17	25 kg bag	40 pcs./pallet
Surface smoothing plaster SG 90 Uni	kg/mm/m ²	approx. 0.8	25 kg bag	42 pcs./pallet

1) Based on experience. Deviations due to changes to general conditions such as wall dimensions, room layout, type of construction, transport routes, etc. must be taken into account.

2) As a wall structure with a verified sound insulation value of R_w 48 dB, the connections must be created with MultiGips AkustikBit 1000.

LITERATURE

EN 12859 (2011-05) Gypsum blocks – Definitions, requirements and test methods

EN 12860 (2002-07) Gypsum based adhesives for gypsum blocks – Definitions, requirements and test methods

DIN 4103-2 (2017-09) Internal non-load bearing partitions – Part 2: Partitions made of gypsum blocks

EN 15318 (2008-01) Design and application of gypsum blocks

NOTE: In Germany gypsum blocks according to EN 12859 are used for non-load bearing partitions on the basis of German standard DIN 4103-2. The European standard EN 15318 for design and application of gypsum blocks is not applicable in Germany as it contradicts national building authority requirements.

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