



Fall safe glazing and tested glass structures

This document contains information about fall safe glazing and a summary of glass structures that can be used for fall safeguarding for people, taking certain framework conditions into account.

General:

Since the publication and introduction of DIN 18008, the requirements for fall safe glazing have been redefined. This regulates vertical glazing and horizontal glazing inclined towards the impact side (by glazing and the traffic area on the impact side spanned angle less than 80°), which protect people in traffic areas from lateral falling.

Definition of “fall safeguarding”

A fall is the unintentional falling of a surface or falling through one surface onto another. In general, the term is used for people and movable objects.

Fall safe glazing is a safety-relevant building element that secures people against falling from a height defined by law.

In addition, people who are on the traffic routes below the fall safe glazing must not be endangered by failure of the building elements.

The fall safe function is only achieved by means of the interaction of glass, frame and the proper structural connection.

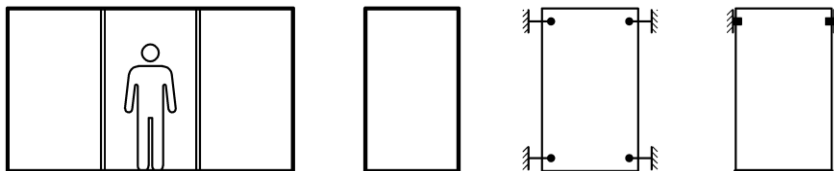


Areas of application:

Fall safe glazing is divided into the following categories in accordance with DIN 18008:

Examples for Category A

Floor-to-ceiling, linearly mounted glazing without load-bearing parapet ledges or a front bar.



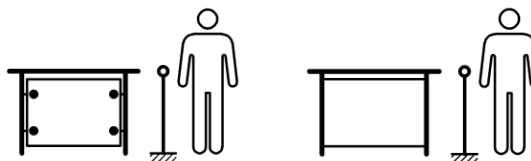
Examples for Category B

Glass parapets without posts, which are clamped below and which have a handrail.



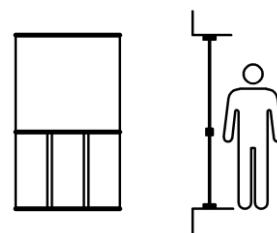
Examples for Category C 1

Railing bracings



Examples for Category C 2

Glazing below a load-bearing crossbar at the required height.



Examples for Category C 3

Glazing with a load-bearing bar set in front at the required height.





Building products

Insofar as Parts 1, 2 and 3 of DIN 18008 provide for the use of heat-treated single-pane safety glass, heat-treated single-pane safety glass must also be provided for fall safe glazing, even if the term toughened safety glass is used uniformly in the following.

The thicknesses of the glass panes used for the production of laminated safety glass may differ from one another by a maximum factor of 1.7.

Usable glass types:

Category A:

- Single glazing must be made of laminated safety glass.
- For the impact-facing side of multi-pane insulating glass, only laminated safety glass, toughened safety glass or laminated glass made of toughened safety glass may be used.
- In general, at least one pane of multi-pane insulating glass must consist of laminated safety glass.
- Multi-pane insulating glazing with toughened safety glass on the impact side may contain coarse-breaking types of glass (e.g. float glass) immediately behind this pane if there is no breakage of glass on the impact-side toughened safety glass pane during a pendulum impact test.

Category B:

- Only laminated safety glass may be used.

Category C:

- All category C single glazing must be made of laminated safety glass. Notwithstanding this, single glazing of categories C1 and C2 with linear mounted on all sides may also be made of toughened safety glass.
- For multi-pane insulating glazing of categories C1 and C2, only laminated safety glass, toughened safety glass or laminated glazing made of toughened safety glass may be used on the impact-facing side. For the other panes, all glass products permitted in accordance with Part 2 and 3 of this standard can be used.
- For glazing of Category C3, the requirements of Category A apply with regard to the glass products that can be used.
- Multi-pane insulating glazing with toughened safety glass on the impact side may contain coarse-breaking types of glass (e.g. float glass) immediately behind this pane if there is no breakage on the impact-side toughened safety glass pane during a pendulum impact test.



Glass structures

Glass structures for fall safe glazing meet the requirements of DIN 18008 Part 4, Table B 1 when using single-pane safety glass and laminated safety glass.

The ISOLAR Group also has a general building authority test certificate for fall safe multi-pane insulating glazing.

The possible variants from Table B1 of DIN 18008-4 as well as the variants from the test certificate of the ISOLAR Group are listed in the following table.

The glass thicknesses specified in the table below are minimum glass thicknesses, which are only designed for dynamic load cases, collisions with people, as proof of impact resistance! The project-related required glass thicknesses and the selection of the type of glass result from the relevant standards, regulations and statutory provisions. The glass structures specified here can be used as a basis for a structural calculation, but must be adapted if necessary

Explanations for the tables below:

MIG = Multi-pane insulating glass

SZR = Cavity between the panes

FG = Float glass

ESG = Thermally toughened safety glass

PVB = Polyvinyl butyral foil

TVG = Semi-tempered glass

any = any

*) = Structures from Table B1 / DIN 18008-4, SZR for insulating glazing min. 12 mm, max. 20 mm.

***) = Structures from AbP 2021-3094, SZR min 8 mm max. 40 mm. SDR with triple structure min. 12 mm / max. 16mm.



Cat.	Type	Line support	Width		Height		Glass structure from impact to fall side	Line	
			min.	max.	min.	max.			
Line 1 - 30 superstructures of Tab. B1 from DIN 18008-4:2013-07 ¹⁾									
A	MIG	All sides	500	1300	1000	2500	8 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	1	
			1000	2000	500	1300	8 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	2	
			900	2000	1000	3000	8 ESG / SZR / 5 FG / 0.76 PVB / 5 FG	3	
			1000	2500	900	2000	8 ESG / SZR / 5 FG / 0.76 PVB / 5 FG	4	
			1100	1500	2100	2500	5 FG / 0.76 PVB / 5 FG / SZR / 8 ESG	5	
			2100	2500	1100	1500	5 FG / 0.76 PVB / 5 FG / SZR / 8 ESG	6	
			900	2500	1000	4000	8 ESG / SZR / 6 FG / 0.76 PVB / 6 FG	7	
			1000	4000	900	2500	8 ESG / SZR / 6 FG / 0.76 PVB / 6 FG	8	
			300	500	1000	4000	4 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	9	
			300	500	1000	4000	4 FG / 0.76 PVB / 4 FG / SZR / 4 ESG	10	
	Simple	All sides	500	1200	1000	2000	6 FG / 0.76 PVB / 6 FG	11	
			500	2000	1000	1200	6 FG / 0.76 PVB / 6 FG	12	
			500	1500	1000	2500	8 FG / 0.76 PVB / 8 FG	13	
			500	2500	1000	1500	8 FG / 0.76 PVB / 8 FG	14	
A	Simple	All sides	1000	2100	1000	3000	10 FG / 0.76 PVB / 10 FG	15	
			1000	3000	1000	2100	10 FG / 0.76 PVB / 10 FG	16	
			300	500	500	3000	6 FG / 0.76 PVB / 6 FG	17	
C1 + C2	MIG	All sides	500	2000	500	1100	6 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	18	
			500	1500	500	1100	4 FG / 0.76 PVB / 4 FG / SZR / 6 ESG	19	
	Simple	2 sided top + bottom	1000	any	500	1100	6 ESG / SZR / 5 FG / 0.76 PVB / 5 FG	20	
			All sides	500	2000	500	1100	5 FG / 0.76 PVB / 5 FG	21
		2 sided top + bottom		1000	any	500	800	6 FG / 0.76 PVB / 6 FG	22
			800	any	500	1100	5 ESG / 0.76 PVB / 5 ESG	23	
			800	any	500	1100	8 FG / 1.52 PVB / 8 FG	24	
			2 sided left + right	500	800	1000	1100	6 FG / 0.76 PVB / 6 FG	25
				500	1100	800	1100	6 ESG / 0.76 PVB / 6 ESG	26
				500	1100	800	1100	8 FG / 1.52 PVB / 8 FG	27
C3	MIG	All sides	500	1500	1000	3000	6 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	28	
			500	1300	1000	3000	4 FG / 0.76 PVB / 4 FG / SZR / 12 ESG	29	
	Simple	All sides	500	1500	1000	3000	5 FG / 0.76 PVB / 5 FG	30	



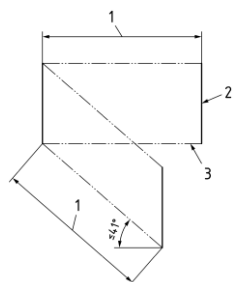
Cat.	Type	Line support	Width		Height		Glass structure from impact to fall side	Line
			min.	max.	min.	max.		
Line 31 – 62 structures from AbP 2021-3094 **)								
A + C3	MIG	All sides	300	1800	1500	3500	4 FG / 0.76 PVB/ 4 FG / SZR / 6 ESG	31
			500	3500	900	1800	4 FG / 0.76 PVB/ 4 FG / SZR / 6 ESG	32
			500	3000	900	4000	5 FG / 0.76 PVB/ 5 FG / SZR / 8 ESG	33
			1000	4000	500	3000	5 FG / 0.76 PVB/ 5 FG / SZR / 8 ESG	34
			300	5000	1500	4500	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	35
			300	4500	1500	5000	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	36
			300	1600	1500	3500	6 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	37
			500	3500	900	1600	6 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	38
			300	2400	1500	3500	8 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	39
			500	3500	900	2400	8 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	40
			300	4000	1500	2500	4 FG / 0.76 PVB/ 4 FG / SZR / 3 FG / 0.38 PVB / FG 3	41
			500	4000	900	2500	4 FG / 0.76 PVB/ 4 FG / SZR / 3 FG / 0.38 PVB / FG 3	42
			300	2500	1500	4000	4 FG / 0.76 PVB/ 4 FG / SZR / 3 FG / 0.38 PVB / FG 3	43
			500	2500	900	4000	4 FG / 0.76 PVB/ 4 FG / SZR / 3 FG / 0.38 PVB / FG 3	44
			300	5300	1500	3500	4 FG / 0.76 PVB/ 4 FG / SZR / 4 FG / 0.38 PVB / FG 4	45
500	5300	900	3500	4 FG / 0.76 PVB/ 4 FG / SZR / 4 FG / 0.38 PVB / FG 4	46			
A + C3	MIG	All sides	300	3500	1500	5300	4 FG / 0.76 PVB/ 4 FG / SZR / 4 FG / 0.38 PVB / FG 4	47
			500	3500	900	5300	4 FG / 0.76 PVB/ 4 FG / SZR / 4 FG / 0.38 PVB / FG 4	48
A + C3	MIG	3-sided	300	2500	1500	4000	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	49
			500	2500	900	4000	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	50
			300	4000	1500	2500	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	51
			500	4000	900	2500	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	52
C2	MIG	All sides	500	5000	500	1100	4 FG / 0.76 PVB/ 4 FG / SZR / 6 ESG	53
			500	5000	500	1100	5 FG / 0.76 PVB/ 5 FG / SZR / 8 ESG	54
			500	5000	500	1100	6 FG / 0.76 PVB/ 6 FG / SZR / 8 ESG	55
			500	2400	500	1100	6 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	56
			500	2400	500	1100	8 ESG / SZR / 4 FG / 0.76 PVB / 4 FG	57
			500	5300	500	1100	4 FG / 0.76 PVB/ 4 FG / SZR / 3 FG / 0.38 PVB / FG 3	58
			500	5300	500	1100	4 FG / 0.76 PVB/ 4 FG / SZR / 4 FG / 0.38 PVB / FG 4	59
			500	4000	500	1100	3 FG / 0.76 PVB/ 3 FG / SZR / 3 FG / 0.38 PVB / FG 3	60
A + C3	MIG (3-fold)	All sides	500	2100	800	3500	FG 4 / 0.76 PVB / FG 4 / SZR / FG 4 / SZR / FG 6	61
C2			500	2100	800	1100	FG 4 / 0.76 PVB / FG 4 / SZR / FG 4 / SZR / FG 6	62



Additional requirements for linearly mounted glazing of Categories A and C.

The linearly mounted rectangular glazing listed is considered impact-proof within the meaning of DIN 18008-4 under the conditions listed below.

- The glazing must be level. Permissible deviations from the rectangular shape are shown in Figure B.1.



Key

- 1 Width of the glazing
- 2 Mounted edge
- 3 Free edge

Figure B.1 - Permissible deviations from the rectangular shape using the example of glazing mounted on two sides

- The glass inset must not be less than 12 mm when the glazing is bedded on all sides. In the case of line-type bedding on both sides, the glass inset is at least 18 mm.
- If the glazing is supported by clamping strips in the direction of impact, these must be sufficiently rigid and made of metal. The clamping strips are to be attached to the supporting structure with metal screws at a distance of no more than 300 mm. For these and other frame systems, proof of impact resistance must be provided in accordance with D.1.
- The glazing must not be weakened by holes or recesses.
- The glass and film thicknesses listed in the table may be exceeded. Instead of laminated safety glass made of float glass, laminated safety glass made of partially toughened glass (TVG) of at least the same thickness may be used.
- Glass panes must not have any surface treatment that reduces their strength (e.g. enamelling).
- The cavities between the panes of insulating glazing in lines 1-30 must be at least 12 mm and may not be more than 20 mm. The cavities between the panes in lines 31-60 must be at least 8 mm and may not be more than 40 mm. The cavity between the panes of the triple glazing in lines 61 + 62 must be at least 12 mm and may not be more than 16 mm.
- The multi-pane insulating glass listed in lines 1-4, 7-9, 18, 20 and 28 of the table can be regarded as sufficiently impact-resistant without further testing if they are supplemented by one or more toughened safety glass or heat-treated toughened safety glass panes in the cavity between the panes.
- The glass structures specified in lines 37-40, 56 and 57 may be supplemented by one or more layers of toughened safety glass or laminated safety glass in the cavity between the panes.
- The glass structures listed in lines 31-36, 41-55 and 58-60 may be supplemented by all glass products in accordance with DIN 18008 in the cavity between the panes. This glass can also be printed with ceramic. The resulting cavities between the panes must each be at least 10 mm. Fixed or movable blind elements (lamella thickness <math><0.1\text{ mm}</math>) may be inserted in the cavities between the panes.
- In lines 31-62, all intermediate layers may be used as laminated safety glass for which a corresponding general type approval according to DIN 18008 is available.
- In the case of the glass structures in lines 31-36 and 53-55, a laminated glass unit according to EN 14449 of the same thickness may also be provided on the fall side instead of the monolithic toughened safety glass pane.
- When using monolithic toughened safety glass, the current building regulations must be observed.



State building regulations to determine the fall height

The following table shows the stipulations on fall heights and heights of barriers contained in the individual State building regulations and Regulations on places of assembly of the Federal States. The full wording of the respective State building regulations and / or the Regulations on places of assembly must always be used.

	Fall height, from which a railing is necessary	Height of the railing	Height of the window parapet	Fall height from which a railing is necessary	Height of the railing
Model building regulations § 38 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	0-12 m min. 0.80 m over 12 m: min. 0.9m m	Model Regulation on places of assembly Section 11 "Barriers and Protective Devices"	min. 1.10 m
State	acc. LBO			acc. Regulation on places of assembly of the State	
Baden-Württemberg § 3 "Railings of the general Implementation Ordinance (LBOAVO) (on § 16 para. 1 LBO)	1 m	Min. 0.90 m 0.80 m are permissible with a depth of the railing of at least 0.20 m	Min. 0.90 m 0.80 m are permissible with a depth of the railing of at least 0.20 m	§ 11 "Barriers and protective devices", 0.20 m	min. 1.10 m
Bavaria Art. 36	50 cm	Sufficiently high and firm		§ 11 "Barriers and protective devices"	min. 1.10 m
Berlin § 38 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80 m, over 12 m fall height: 0.90 m	Currently only regulated by MVStättV	min. 1.10 m
Brandenburg § 33 "Railings and covers"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	1-12 m: min. 0.90 m; over 12 m: min. 1.10 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Bremen § 38 "Railings"	1 m	Min. 1 m over 12 m fall height 1.10 m	0-12 m: min. 0.80 m over 12 m: min 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Hamburg § 38 "Railings and parapets"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m insofar as parapet depth ≥ 15 cm	§ 11 "Barriers and protective devices"	min. 1.10 m
Hessen § 35 "Railings"	1 m	1 to 12 m fall height: a) for residential buildings and other structures that are not workplaces: 0.90 m b) for workplaces: 1.00 m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m



	Fall height from which a railing is necessary	Height of the railing	Height of the window parapet	Fall height from which a railing is necessary	Height of the railing
Mecklenburg-Vorpommern §38 "Railings and covers"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Niedersachsen § 4 "Railings" of the general Implementation Ordinance on NbauO to § 23 NbauO	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices", 0.20 m	min. 1.10 m
Nordrhein-Westfalen § 41 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices", of the special building regulation	min. 1.10 m
Rheinland-Pfalz § 38 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Railings", 0.20 m	min. 0.90 m
Saarland § 38 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1 m*
Saxony § 38 "Railings and covers"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Saxony-Anhalt § 37 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Schleswig-Holstein § 39 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	§ 11 "Barriers and protective devices"	min. 1.10 m
Thüringen § 36 "Railings"	1 m	From 1 to 12 m fall height: 0.90m, over 12 m fall height: 1.10 m	From 1 to 12 m fall height: 0.80m, over 12 m fall height: 0.90 m	Currently only regulated by MVStättV	min. 1.10 m

* Observe special regulations for parapets in front of rows of seats and with a certain depth of the parapet!

Some Federal States have additional requirements for fall safeguarding in their State building regulations or corresponding ordinances/Provisions for State building regulations, if the presence of children or small children is to be expected. The wording and requirements vary from State to State.

On the subject of fall safe glazing, see also:

ISOLAR Customer information: "Compass glass types".