SÄLZER
building security
Part of Schüco

Norms, Standards, Individual Requirements

Tested + Certified = Safe!

Tested security – customised planning and production

Our customers have been relying on SÄLZER protection concepts against forced entry, break out*, bullets, explosions, fire and smoke as well as for perimeter security for more than 40 years. Each security solution is the result of intensive research and development work, numerous product tests according to national and international standards as well as individual security requirements.

Over 250 of our own patents as well as more than 950 test certificates for SÄLZER security products speak for our extensive expertise that enables us to offer combined security in products, that have already been developed with the most diverse, sometimes contradictory requirements in mind.

This ultimately results in well-conceived, customised and elegant design concepts for building protection; with full service from consulting, design and manufacture continuing right the way through to programmed routine maintenance.

In 2018 SÄLZER became "part of Schüco". The Schüco group develops and distributes system solutions for windows, doors and facades worldwide. Our clients both at home and worldwide will benefit from this strong partnership, as service and support for our high security products will become even faster and more extensive.

Inhalt

SÄLZER building security
Part of Schüco

Over 950 test certificates from renowned national and international testing institutes

A selection of SÄLZER standards, certifications and awards:

- **Certified according to DIN EN ISO 9001:2015**
- **Certified according the integrated management systems EcoStep**, meets the core requirements of the ISO 50001:2018, ISO 14001:2015, ISO 45001:2018.
- **Registered with "association for prequalification of construction companies"** registration number 011.080020
- **Approved for simplified customs procedures:** "Authorised Economic Operator|C"
- **Listed with the Bavarian State Office for Criminal Investigation ("Bayerisches Landeskriminalamt")** for forced entry resistant windows, facades, doors and security grilles
- **Certified quality monitoring by the test institute PfB Rosenheim** for forced entry resistant windows, facades, doors and security grilles
- **Production facility for VdS-approved security grilles**
- **Security Innovation Award** in gold for the steel frame door series SECUFIRE® from the exhibition Security in Essen
- **German Design Award 2018** for the steel door series S4

Combined protection, integrated building security, variety at a glance:

- Multi-certification: combined protection against forced entry, break out*, bullets, explosions, fire and smoke in one product
- Compatibility of all product groups within the SYSTEM SÄLZER® (facades, windows, partition walls, doors)
- SÄLZER offers the complete product range for building protection, starting with the perimeter security e.g. by barriers, guard houses, doors, windows, facades, grilles, partition walls, safe and panic rooms
- Complete product testing and certification in accordance with national and international standards and customer-specific requirements
- Many tested and certified design variations
- Outstanding design, awarded with renowned design prizes
- Variety of materials

*There are no specific testing regulations for break out resistant products. SÄLZER therefore tests both sides of their products according to the regulations for forced entry resistance as stated in DIN EN 1627-1630.

Forced entry resistance

Graduated protection against forced entry and vandalism

Security that goes beyond the norms and standards

In view of the high number of forced entries but low detection rate, effective protection against such attempts plays a particularly important role in building security. SÄLZER offers a multitude of tested and certified doors, windows, facades, grilles and many other security products.

Tests according international test standards

- DIN EN 1627-1630, European standard for forced entry resistance
- DIN EN 1143-1, security standard for strongroom doors
- SD-STD-01.01 Rev.G. | Rev.H, standard of the US-Dept. of State

The tests are documented by the appropriate type-related test certificates issued by accredited testing institutes.

Extract from DIN EN 1627-1630 in accordance with DIN EN 356 (glass)

Level	Glass (EN356)	Description testing tools	Resistance-time[1]	Tool test time[2]
RC1 N	no requirement	protection: the attacker using his own body as the attack vector	–	-
RC1	P2A	protection: the attacker using his own body as the attack vector		
RC2 N	no requirement	additional: simple tool for example screwdriver, pipe wrench and wedges	3 Min.	15 Min.
RC2	**P4A** 3 x steel ball drop test from 9.0 m height	additional: simple tool for example screwdriver, pipe wrench and wedges	3 Min.	15 Min.
RC3	**P5A** 9 x steel ball drop test from 9.0 m height	additional: hand drill, second screwdriver and crowbar 	5 Min.	20 Min.
RC4	**P6B** 31-50 axe blows	additional: saws, power tools i.e. axe, crowbar, hammer, battery drill, chisel, hack saw 	10 Min.	30 Min.
RC5	**P7B** 51-70 axe blows ⚠	additional: electric power tools such as drill, jig saw, sabre saw, angle grinder 	15 Min.	40 Min.
RC6	**P8B** over 70 axe blows ⚠	additional: more efficient electric power tools than class RC5 	20 Min.	50 Min.

[1] The resistance time is the working time of the tester performing the manual forced entry attempt.
[2] The maximum total test time is the sum of resistance time, rest time, tool change time and observation time.

⚠ Information about forced entry resistance

Extract from EN 1630:2021 paragraph 6.3 Attack areas: "For construction products in resistance classes 5 and 6 according to EN 1627:2021, the glass itself as well as the glazing and the filling attachment system shall be attacked".
This means that the glass in classes RC 5 and RC 6 must be tested with the same solid tools as the profile system, e.g. with a drill, jig saw, sabre saw or angle grinder. However, P7B and P8B glazing is only tested with axe blows in accordance with EN 356. These glazings cannot withstand attacks with the electrical tools mentioned. A 'passable opening' can be created without any problems. **Therefore, more resistant and higher-quality glazing than P7B or P8B must be used in classes RC 5 and RC 6.**

Testing at several defined weak points
According to the DIN EN 1627-1630 series of standards, the tester may test the test specimen at several alleged weak points that he/she has defined.
Example: In the test of a glazed 2-panel door in resistance class RC 5, the following test points or weak points can be defined and tested, e.g. lock (locking system), hinges, panel, glazing, door rebate, inactive leaf locking (6 test points).
In class RC 5, 15 min. testing time per defined, supposed weak point are permissible or 40 min. total testing time (testing time incl. set-up, rest, observation time). In our example, the pure testing time at the door is 90 min. (6 test points x 15 min.) and the total testing time is up to 240 min. (6 x 40 min.).

SÄLZER has tested all windows, doors and facades as complete elements including glazing and wall connection and offers complete security even in the highest classes RC 5 and RC 6.

Failure criteria in the test:
Either the product can be opened or an 'accessible opening' is created in the test specimen in the following sizes: Rectangle 400 mm x 250 mm or Ellipse 400 mm x 300 mm or Circle Ø 350 mm or Rectangle 150 mm x 660 mm.

Voluntary quality monitoring and special certifications

SÄLZER's high standards of security technology extend to production and its monitoring by external institutions. As a result, the accredited independent testing institute PfB Cert Rosenheim regularly checks whether SÄLZER products are manufactured exactly according to the respective test certificate.

This voluntary quality control is the prerequisite for the "Police Commission for Crime Prevention (KPK)" recommending the forced entry resistant windows, facades, doors and grilles from SÄLZER and certifying them with the "K-EINBRUCH" (no burglary) quality seal.

PfB CERT

KEINBRUCH – SICHERN SIE IHR ZUHAUSE! – WWW.K-EINBRUCH.DE
Benannt im polizeilichen Herstellerverzeichnis für geprüfte und zertifizierte einbruchhemmende Produkte.

Doors in escape and rescue routes Forced entry resistance despite panic function

Entrance doors must protect against forced entry; often these entrances also fulfil the function of escape doors to the outside. Such doors in escape and rescue routes must be equipped with anti-panic locks in accordance with DIN EN 179 and DIN EN 1125, so that in an emergency the door can be unlocked and opened quickly by simply pressing the handle or panic bar.

When this panic function is triggered, all locking systems are immediately retracted, which, however, considerably increases the risk of forced entry, especially in the case of generously glazed doors.

Sophisticated special solutions

To prevent unauthorised opening of these doors, SÄLZER uses several additional security features:

Glazing: Even security glazing can be easily pierced with a screwdriver. The resulting opening makes it possible to operate the handle and open the door from the outside (see photo). To prevent this, SÄLZER uses specially developed security glazing with polycarbonate layers (from RC 2), which cannot be pierced with a hammer or sharp objects.

Threshold: The floor connection is designed in such a way that no attack on the door handle can be made by means of a wire loop or comparable tools.

Door rebate: The rebate geometry of SÄLZER security doors does not allow manipulation with loops or tools.

Protective fittings and locks: Specially developed rosettes and protective fittings, which are light and filigree in design despite their high protective function, prevent direct attack on the lock and the lock cylinder.

This special equipment guarantees reliable forced entry protection - despite anti-panic fittings - up to class RC 5.

The same problem also exists with forced entry resistant doors equipped with louvers and anti-panic fittings.

Normative requirements for wall construction according to DIN EN 1627 Table NA.2, NA.3, NA.4

The composition of the wall materials for the installation of forced entry resistance building components is also regulated by standards.

It is imperative to comply with these requirements, because only then can the elements effectively fulfil their intended protective function to the full extent in an emergency.

Example: In resistance class RC 4, the surrounding walls must fulfil the following criteria:

Masonry: wall thickness (without plaster) of ≥ 240 mm, compressive strength class of the bricks (SFK) of ≥ 12

Reinforced concrete: nominal thickness min. ≥ 140 mm, compressive strength class of min. C12/15 required.

Professional installation

The installation of forced entry resistant building elements should only be carried out by experienced specialist companies in accordance with the manufacturer's installation instructions. The installation instructions are part of the test report of the testing institute and are therefore binding. The specifications, e.g. on fixing materials and distances, must be observed without fail; otherwise the guaranteed protective function of the elements cannot be warranted. Proper installation must be documented by an installation certificate in accordance with DIN EN 1627 NA.5.

Protection against forced entry despite tilted window position up to RC 3

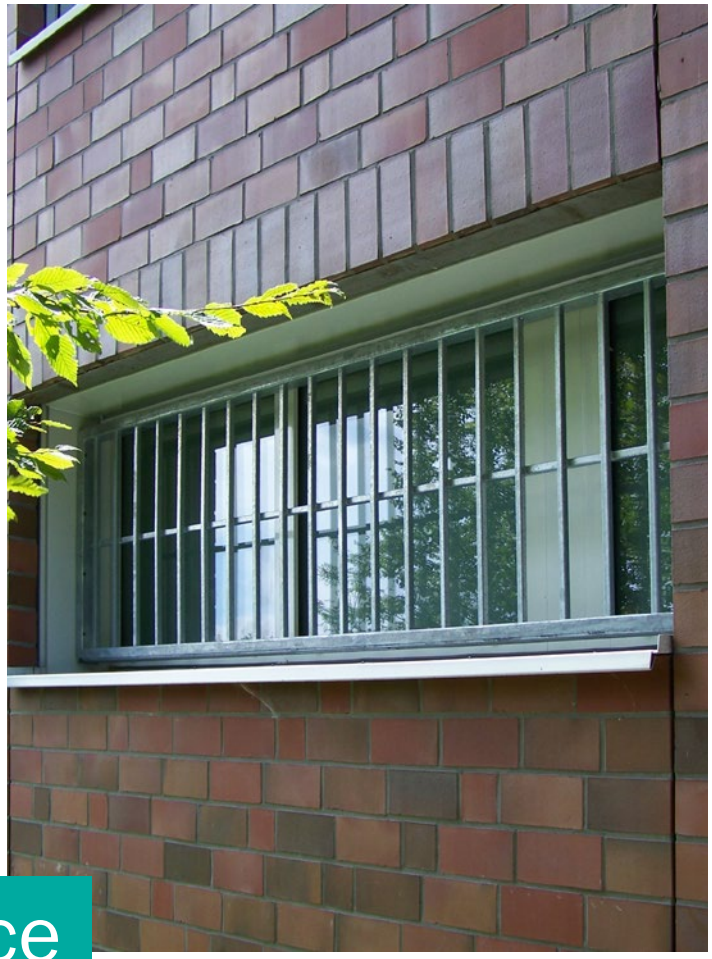
The supply of fresh air through tilted windows is normally not conducive to protection against forced entry. A usual forced entry resistant window in the tilted position can be forced open in less than 10 seconds using simple tools such as screwdrivers, as the window sash has very little protection. Unlike the special SÄLZER window series SECURON® : reinforced scissors and additional locking devices successfully prevent levering, sawing through or drilling open.

The window has been tested and certified in the tilted window position according to the European standard in level RC 3. When closed, it achieves the security level up to class RC 4.

Extract from the extensive test history of the SÄLZER products

- **Aluminium facade series S1es-60 up to RC 5**
- **Aluminium facade series S1es-50 up to RC 4 and series S1es-50 Semi SG up to RC 4**
- **Aluminium window series S2es (fixed window) up to RC 6**
- **Aluminium door series S2es up to RC 5 (optionally with anti-panic function)**
- **Sheet steel door series S4es up to RC 6 (up to RC 5 optionally with anti-panic function)**
- **Aluminium windows and doors series S6es up to RC 4**
- **windows, doors (glazed) of the steel frame series SECUFIRE® up to RC 4**

Tested in various design variants and of course with combined protection against bullets and explosions, series S4 and series SECUFIRE ® additionally available with protection against fire/smoke.



Break out resistance

Break out resistance plus protection against vandalism, suicide and fire

There is no independent test standard for the break out resistance characteristics of security products. SÄLZER tests its break out resistant doors, windows, facades and grilles according to the standard for forced entry resistance DIN EN 1627-1630 from both sides to guarantee reliable security. This means that they offer protection against breaking out attempts from the inside and attempts to break free (forced entry) from outside.

The SÄLZER Series S4Z cells or detention room doors have been tested up to class RC 4. In addition, they have passed extensive tests according to the guidelines for detention room doors of the state of Saxony-Anhalt and the guidelines of the VfS Hamburg.

Like the door of the S4Z series, the METAS® series aluminium window (tested in various variants), which was specially developed for this purpose, offers no possibility of suicide attempts and injuries. This window is also suitable for forensic hospitals. Since no window bars of medical security up to class RC 4 are warranted, the window offers protection without bars.

For installation situations in which additional protection against fire and smoke is required, the tubular steel frame doors of the SECUFIRE® series and the steel doors of the SÄLZER S4 series are additionally equipped with tested fire protection properties in the resistance classes T30/EI30 or T90/EI90.

The high forced entry and breakout protection provided by the robust construction also ensures extremely effective protection against vandalism.

Bullet resistance

Complete elements that thwart even the highest forces

SÄLZER security doors, windows and facades, tested and certified for bullet resistance, protect human lives against ballistic attacks from a wide variety of weapons and ammunition. Special security glass structures, specially developed frame profiles, security fittings, fasteners and professional assembly on the building structure provide reliable protection as a complete composite element.

The projectiles hits windows, facades or doors with an enormous force. Reliable protection against this threat requires structural stability and mass. The connections and material transitions particularly have to be taken into account: the transitions between the glazing and frame, leaf and frame as well as the masonry and frame are potential weak points.

Numerous test certificates from accredited test institutes in accordance with the following international security standards and customised specifications provide evidence of the effective bullet resistance:

- DIN EN 1522 +1523 (see chart at page 10)
- VPAM APR 2020
- UL 752 | NIJ
- SD-STD-01.01 Rev.G | REV.H
- GOST R 51112-97
- AS/NZS 1170 2.2011
- STANAG 4569
- Individual test, e.g. with calibre .338 Lapua Mag.

Extract of DIN EN 1522 + 1523 in accordance with DIN EN 1063 (glazing)

Level	Glass	Weapon | callibre	Mass of the bullets (g)	Test range (m)	Velocity of bullets (m/s)	Bullet energy (J)
FB1	BR1	rifle 22 LR 	2,6 +/- 0,1	10 +/- 0,5	360 +/- 10	168
FB2	BR2	handgun 9 mm Luger 	8 +/- 0,1	5 +/- 0,5	400 +/- 10	689
FB3	BR3	handgun .357 Magnum 	10,2 +/- 0,1	5 +/- 0,5	430 +/- 10	943
FB4	BR4	handguns .357 Magnum + .44 Rem. Magnum 	10,2 +/- 0,1 15,6 +/- 0,1	5 +/- 0,5 5 +/- 0,5	430 +/- 10 440 +/- 10	1,510
FB5	BR5	rifle 5,56x45 	4 +/- 0,1	10 +/- 0,5	950 +/- 10	1,805
FB6	BR6	rifles 5,56x45 + 7,62x51 (soft core) 	4 +/- 0,1 9,5 +/- 0,1	10 +/- 0,5 10 +/- 0,5	950 +/- 10 830 +/- 10	3,289
FB7	BR7	rifle 7,62x51 (hard core) 	9,8 +/- 0,1	10 +/- 0,5	820 +/- 10	3,261*
FSG	SG2	Shotgun cal. 12/70 	31 +/- 0,5	10 +/- 0,5	420 +/- 20	2,734

The test results must have the addition: S = splinters, NS = no splinters
*The penetration power of hard core ammunition is twice that of soft core ammunition

Extract from the extensive test history of the SÄLZER products

- **Aluminium façade, series S1es, up to FB7-NS**
- **Aluminium window and door, series S2es, up to FB7-NS**
- **Steel door, series S4, up to FB7-NS**
- **Aluminium windows and doors, series S6es, up to FB4-NS**
- **Windows and glazed doors of the tubular steel frame, series SECUFIRE® , up to FB4-NS**

Tested in various design variants and of course with combined protection against forced entry and explosions, series S4 and series SECUFIRE® additionally available with protection against fire/smoke.

Other countries, other weapons: customised tests by SÄLZER

A wide variety of different weapons and ammunition are used worldwide. To provide customised protection adapted to the threats, SÄLZER not only tests according to international standards but also according to national and customer specifications; for example with sniper rifles calibre .300 Win. Mag., 7.62x54R, .30-06 Springfield, .338 Lapua Mag. up to .50 BMG.

Integrated security: complete element and wall connection tested

Only complete tested elements can offer protection in case of emergency. The connections and material transitions in particular pose the greatest risks of bullet penetration. SÄLZER therefore recommends also the protection of the connection between element and masonry, although this is not required by the European standard for bullet resistance. SÄLZER had tested the wall connection of the products at independent testing institutes to offer reliable and complete security.

The advantage of SÄLZER: testing facilities in the company's own ballistic testing centre

Customers have the possibility to reliably test the performance of their customised protection solution in SÄLZER's own ballistic test centre before official testing and certification by an accredited national or international testing institute. Materials, their thicknesses and compositions are optimised within the framework of clearly defined test series in such a way that the subsequent official testing and certification can be successfully completed by the shortest and most economical route.

Customised (preliminary) tests can be carried out at SÄLZER up to the highest ballistic classes and the response times of the team at the ballistic test centre are short and customer friendly.

SÄLZER ballistic test centre's services:

- Optional tests according to customised requirements or international test standards
- Ballistic testing of different materials: glass, steel, aluminium, wood, fibre composites and much more
- Use of all rifles and handguns relevant to the test
- Use of all standard ammunition according to DIN EN 1522 +1523 including hard core ammunition
- Option to customise ammunition configuration for individual adaptation to country and threat-specific requirements

Explosion and blast resistance

Effective protection against criminal and terrorist threats and against the effects of industrial accidents, particularly in the chemical and petrochemical industries

An explosion suddenly releases large amounts of energy, usually in the form of pressure and kinetic energy. Decisive factors for the destructive power of an explosion are mainly:

› The mass of the explosive charge

› The distance to the source of the explosion and

› The duration of the pressure

Three different threat scenarios can be derived from the interaction of these factors, whose specific destructive forces have to be taken into account to ensure the elements' corresponding protective function

› **High explosive charge, long distance to target object**
VBIED 'Vehicle Borne Improved Explosive Device', e.g. vehicle bomb with an explosive charge of 500 kg is detonated at a distance of 30 m, see also ISO 16933.

› **Small explosive charge, short distance to target object**
PBIED 'Personal Borne Improved Explosive Device' e.g. backpack bomb with a 20 kg explosive charge is detonated in immediate proximity, 4 m distance, this corresponds to the threat scenario according to European Standard 13123-2 as well as ISO 16933.

› **Low pressure, long duration of pressure**
E.g. explosion or low-speed detonation of a gas-air mixture in the event of accidents in petrochemical plants or in the chemical industry.

In order to provide effective protection against these 3 different threat scenarios, SÄLZER has conducted extensive real tests.

1. Tests and classifications according to international standards

SÄLZER security windows, facades and doors are tested and classified for explosion and blast resistance according to the following standards:

- Open range test: **DIN EN 13123-2 + 13124-2**
- Shock tube test: **DIN EN 13123-1 + 13124-1**
- Blast resistant glazing according to **ISO 16933, ISO 16934, DIN EN 13541**
- **UFC 4-010-02**
- **NATO STANAG 2280**
- Classification according to **GSA-TS01-2003 und ISO 16933**

Test of the complete element according to DIN EN 13123-2 and 13123-1

Open range: extract from DIN EN 13123-2 | 13124-2

façade, window, door, shutter	mass	distance
EXR1	3 kg	5.0 m
EXR2	3 kg	3.0 m
EXR3	12 kg	5.5 m
EXR4	12 kg	4.0 m
EXR5	20 kg	4.0 m

Test results according both test methods have the addition:
S = splinters NS = no splinters

Shock tube: extract from DIN EN 13123-1 | 13124-1

façade, window, door, shutter	peak pressure[1]	Pos. specific impulse (i+) (bar-ms)
EPR1	0.50 bar	3.7
EPR2	1.00 bar	9.0
EPR3	1.50 bar	15.0
EPR4	2.00 bar	22.0

[1] The duration of the positive phase (t+) is not allowed to be less than 20 ms.

SÄLZER tests complete windows, doors and facades including frames, leafs and glazing according to these European standards. The different assembly of the elements is also taken into account when testing in open range tests according to DIN EN 13123-2. By simulating the subsequent installation situation of the products, a realistic test environment is created that reflects the real requirements in the property. Only complete secured elements are able to really fulfil their intended protective function in case of an emergency.

Extract from the extensive test history of the SÄLZER products:

- **Steel door, series S4, up to the highest resistant level EXR5**
- **Glazed steel door, series S4, up to EXR4**
- **Aluminium window, series S6es, various tests with reflected peak pressure of 50 kPa up to 200 kPa**
- **Aluminium door, series S6es and S2es, certificates up to EXR2**

Of course with combined protection against forced entry and bullets, series S4 and series SECUFIRE® additionally available with protection against fire/smoke.

Blast resistant glazing: tests according to ISO 16933, ISO 16934 and DIN EN 13541

The test criteria is defined exclusively for the testing of blast resistant security glazing in these special standards. The frame, glazing bead, integration of the glass into the frame construction, assembly of the complete element into the masonry, etc. are not part of the test. In the test, the glass element is firmly clamped in a steel frame, the glazing bite 50 mm (± 2 mm). This large glazing bite is unrealistic; for example, in the case of explosion-resistant facades glazing with a glazing bite of 18-25 mm is installed in practice. No statements can be made about the explosive properties of the complete element on the basis of these laboratory test conditions.

The results of the glazing test are classified in hazard and protection levels (see page 16 table GSA-TS01-2003 | ISO 16933 – Classification). The tests are based on two different threat scenarios:

Assumption: backpack bomb, PBIED

portable high explosive blasting charges are placed a few meters in front of the target .

Classification code	**Pressure** (kPa)	**Impulse** (kPa-ms)	**Mass charge** TNT (kg)	**Distance** (m)	**analogous EN 13123-2** open range
SB1(X)	70	150	3	9	–
SB2(X)	110	200	3	7	–
SB3(X)	250	300	3	5	EXR1
SB4(X)	800	500	3	3	EXR2
SB5(X)	700	700	12	5.5	EXR3
SB6(X)	1,600	1,000	12	4	EXR4
SB7(X)	2,800	1,500	20	4	EXR5

Assumption: car bomb, VBIED

blasting charge 100 kg is placed in a car in a certain distance in front of the target

Classification code	**Pressure** (kPa)	**Impulse** (kPa-ms)	**Distance** (m)
EXV45(X)	30	180	45
EXV33(X)	50	250	33
EXV25(X)	80	380	25
EXV19(X)	140	600	19
EXV15(X)	250	850	15
EXV12(X)	450	1,200	12
EXV10(X)	800	1,600	10

Fine tuning of all components and complete testing

An explosion releases extreme forces, e.g. in the case of a blast of 100 kPa, pressure act on the element corresponding to a load of 10 tonnes per square metre. To withstand this immense pressure, all the complete element's components must be fine-tuned with each other in terms of their blast resistant effect.

At SÄLZER every single component element, e.g. the wall connection, fastening, locking system, frame, leaf, and glazing, is designed in such a way that the complete element reliably resists the explosion pressure when installed.

2. Tests according to individual customer requirements

SÄLZER has carried out extensive real tests using different test conditions according to various customer requirements.
In this way, it is possible to choose a solution from the SÄLZER range that is optimally adapted to the individual explosive-induced threat scenario.

Extract from the extensive test history of the SÄLZER products according to individual requirements:

- **Aluminium mullion-transom construction in various design variants tested with explosive charges up to 500 kg, Series S1es-60, GSA 2/ISO B**
- **Glazed double steel door, series S4es, in the test equipped with different locks, explosive charge 200 kg, GSA 2/ISO B**
- **Aluminium window in tilt position tested with 500 kg, SECURON series, GSA 2/ISO B**
- **Double sash aluminium window, series S6es, explosive charge 100 kg and 500 kg, GSA 2/ISO B**
- **Double glazed aluminium door, series S6es, explosive charge 100 kg and 500 kg, GSA 2/ISO B**
- **Steel window, series SECUFIRE® , explosive charge 100 kg, GSA 2/ISO B**
- **Glazed tubular steel frame door, series SECUFIRE ® , explosive charge 500 kg, GSA 2/ISO B**
- **Aluminium mullion construction with 2-leaf escape door tested with 500 kg, Series S1es-60 Semi SG a. Series S2es, GSA 2/ISO B**

Of course with combined protection against forced entry and bullets, series S4 and series SECUFIRE® additionally available with protection against fire/smoke.

The advantage of SÄLZER: unprecedented extensive testing experience

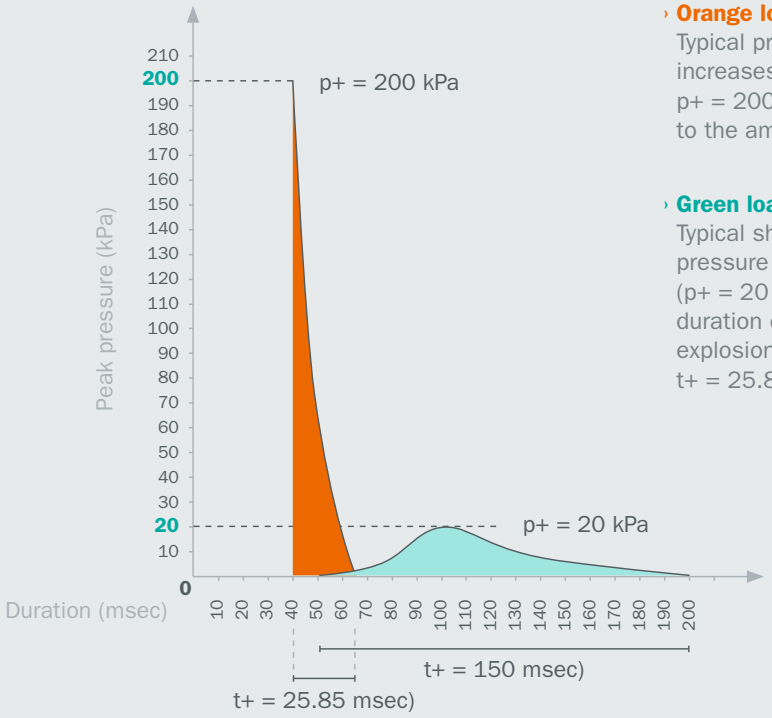
Irrespective of the standard or customer requirement that they are based on, all tests for SÄLZER products and systems are documented by certificates from accredited test institutes. In individual cases, it is possible to have the test results on elements, e.g. other dimensions, calculated and derived by independent engineering firms who specialise in this. However, only with reference to and submission of numerous test results on successfully completed tests.

SÄLZER offers the advantage of extremely extensive testing experience compared to competitors. The accumulated knowledge about how pressure waves impact on the individual elements is not limited to standard solutions, but to a large number of design variations, element dimensions, shapes and materials.

This broad expertise particularly comes into play with large-area elements that are particularly sensitive to explosion pressure: SÄLZER can refer to many successful tests with very large glazed facades in this application area.

3. Tests according to the petrochemical industry's requirements

Explosions can have very different load profiles. While, for example, an explosion caused by TNT is characterised by a short duration of pressure at immensely high pressure, an exploding gas-air mixture in a petrochemical plant produces a long-lasting duration of pressure at lower pressure.



› **Orange load curve:**
Typical pressure wave during an explosion with TNT, pressure increases immediately and rapidly up to the peak pressure of p+ = 200 kPa, which then drops off again almost linearly back to the ambient pressure.

› **Green load curve:**
Typical shock wave of a petrochemical explosion, here the pressure increases continuously up to the maximum pressure (p+ = 20 kPa here). The pressure drops in the same way. The duration of pressure, t+ = 150 ms, is much longer than for an explosion with an explosive charge of e.g. 500 kg TNT, t+ = 25.85 ms.

Extract from the extensive test history of the SÄLZER products according to the requirements of the petrochemical industry:

- **Glazed double steel door, series S4es, reflected pressure 93 kPa, reflected impulse 210,000 kPa-ms, pressure duration 4,500 ms, GSA 2/ISO B**
- **Steel window, series S4, openable for cleaning, reflected pressure 256 kPa, reflected impulse 106,900 kPa-ms, pressure duration 900 ms, GSA 2/ISO B**
- **Steel door with glazed sidelight, series S4, reflected pressure 89 kPa, reflected impulse 150,000 kPa-ms, pressure duration 3,500 ms, GSA 2/ISO B**
- **Openable aluminium window, Series S6es, reflected pressure 249 kPa, reflected impulse 114,200 bar-ms, duration of the pressure 880ms, GSA 2/ISO B**

Of course with combined protection against forced entry and bullets, series S4 and series SECUFIRE® additionally available with protection against fire/smoke.

Classification of test results in accordance with GSA-TS01-2003 | ISO 16933

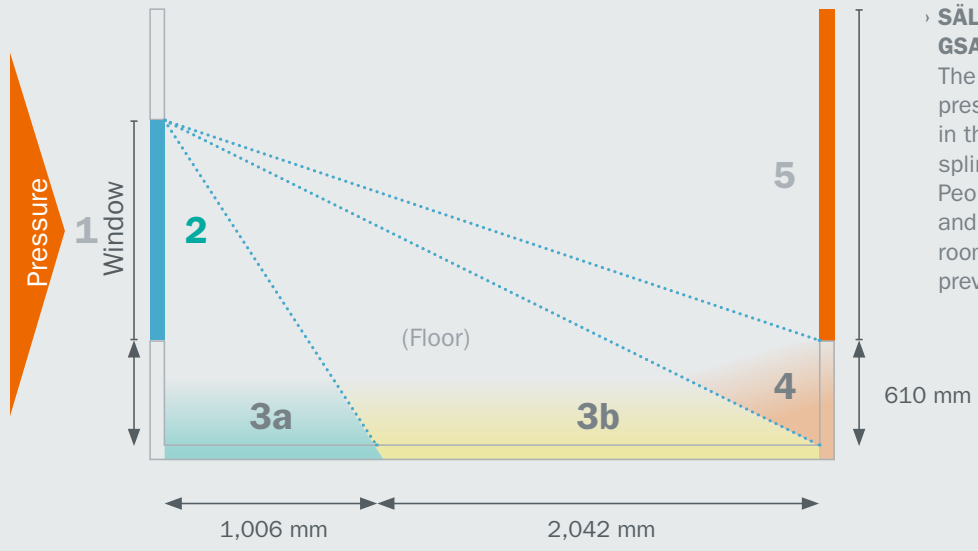
These guidelines are not test standards and therefore do not define any load values. The explosion pressure, impulse, load duration are individually specified by the customer. The guideline divides the respective explosion test results into hazard and protection level (see classification below).

GSA-TS01-2003 | ISO 16933 – classification

GSA	ISO*	Description	Exposure classes	Protection classes
GSA 1	A	Glazing does not break. No visible damage to glazing or frame.	none	safe
GSA 2	B	Glazing cracks but is retained by the frame. Dusting or very small fragments near sill or on floor acceptable.	none	very high
GSA 3a	C	Glazing cracks. Fragments enter space and land on floor not further than 1.006 mm from the window.	very low	high
GSA 3b	D	Glazing cracks. Fragments enter space and land on floor not further than 3.048 mm from the window.	low	high
GSA 4	E	Glazing cracks. Fragments enter space and land on floor and impact a vertical witness panel at a distance of no more than 3.048 mm from the window at a height no greater than 610 mm above the floor.	medium	medium
GSA 5	F	Glazing cracks and the window system fails catastrophically. Fragments enter space impacting a vertical witness panel at a distance of no more than 3.048 mm from the window at a height greater than 610 mm above the floor.	high	low

*Does not correspond fully but relatively good comparability

Exposure matrix:



› **SÄLZER recommends:**
GSA 2 or ISO B*
The glazing is damaged by the pressure wave but remains in the frame, no dangerous splinters fly into the room. People can escape unharmed and employees, e.g. in control rooms, can react quickly and prevent major damage.

Protection against fire and smoke

Highest security requirements combined with fire and smoke protection

The SÄLZER series S4 and SECUFIRE® offer various possibilities to combine the highest protection levels against forced entry, bullets and explosion with protection against fire and smoke. Fire resistance is tested and classified according to the European standards DIN EN 1363-1, 1363-2, 1634-1 in conjunction with DIN EN 14600 and 13501-2.

Physical barrier and protection against heat radiation

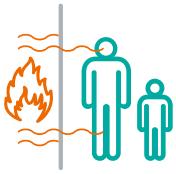
DIN EN 13501-2 replaces the previous classification according to DIN 4102-5. Classification according to DIN EN 13501-2 is based on a comparable performance principle, differentiated according to the duration of the fire load in minutes and type of load (E = space-enclosing effect, I = thermal insulation).

Fire: Classification according to EN 13501-2

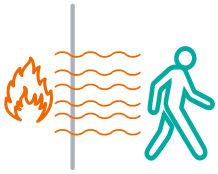
Performance criteria	**Duration in minutes**								
E	15	20	30	45	60	90	120	180	240
EI_1*	15	20	30	45	60	90	120	180	240
EI_2**	15	20	30	45	60	90	120	180	240
EW	–	20	30	–	60	–	–	–	–

* $EI_1 \leq 140°$ max punctual $< 180°$ ** $EI_2 \leq 140°$ max punctual $< 360°$

EI:
Protection against fire, heated gas and smoke. Thermal insulation.



EW:
Protection against fire, heated gas and smoke. Reduced passage of heat radiation.



E:
Protection against fire, heated gas and smoke. Passage of heat radiation.

Separate smoke protection testing and classification

This test is carried out according to DIN EN 1643-1, the result is classified according to EN 13501-2:

- **S_a: Test at ambient temperature**
- **S_m bzw. S_{200}: Test at 200°C**

Long-term durability test required

After successful durability testing, the doors are classified according to DIN EN 14600 in the classes C1 to C5. Classification C5 is the highest category with 200,000 test cycles (= opening and closing) to be carried out.

Other fire protection tests

Other tests were carried out at accredited testing institutes in accordance with the following international standard:

- **BS 476 Part 22**

Extract from the extensive test history of the SÄLZER product series and expert options:

- **Glazed and unglazed steel doors, series S4, fire protection up to T90-1/EI90, smoke protection S_{200}, in combination with protection against forced entry up to RC 5, bullets up to FB7-NS and against explosion up to EXR5 (unglazed), durability level C5**
- **Glazed and unglazed double steel doors, series S4, fire protection up to T90-2/EI90, smoke protection S_{200}, in combination with protection against forced entry up to RC 4, bullets up to FB7-NS and against explosion up to a reflected pressure of 880kPa, durability level C5**
- **Tubular steel frame door (fully glazed) and window, series SECUFIRE® , fire protection up to E30, smoke protection S_{200}, in combination with protection against forced entry up to RC 4, against bullets up to FB4-NS and against explosion up to a reflected pressure of 272 kPa, durability level C5**
- **Tubular steel frame door, series SECUFIRE® , fire protection up to T90-1/EI90, smoke protection S_{200}, protection against forced entry up to RC 4 and against bullets up to FB4-NS.**
- **Special fire protection tests combined with blast tests for the petrochemical industry: Double steel door, series S4, fire protection according to BS 476 Part 22, 120 min as well as protection against blast up to a reflected pressure of 93 kPa, reflected impulse 210,000 kPa-ms, pressure duration 4,500 ms, GSA 2/ISO B**

Perimeter security

Distance from the danger: protection against unauthorised access

Recent attack scenarios have shown the importance of effectively securing the perimeter to buildings and public spaces. SÄLZER also offers a wide range of products that deter the unauthorised and violent entry or exit of all kinds of vehicles.

A large number of different standards are available for testing the vehicular barriers. However, the test basis is identical for all standards; the vehicular barriers resistance is tested in a crash test.

In principle, the vehicle mass and vehicle speed are decisive in determining the vehicular barriers resistance (energy absorption). The mass (m) flows linearly and the speed squared (V2) into the kinetic energy:

$$\textbf{Kinetic energy (kJ)} = \frac{\text{Mass (m) x Velocity}^2\,(v^2)}{2}$$

The most important standards

The most frequently used standards are shown as examples using the classes - vehicle weights 15,000 lbs up to 16,530 lbs, vehicle speeds of 30 mps and 50 mps - in the following list. The SÄLZER vehicular barriers meet the high requirements of the listed standards:

Standard	Requirements[1]	
SD-STD-02.01 (DoS-Standard) (incorporated in the standard ASTM F2656-07)	vehicle mass 15,000 lbs vehicle speed 30 mph **impact load 656 kJ** K4 or M30 level	vehicle mass 15,000 lbs vehicle speed 50 mph **impact load 1,680 kJ** K12 or M50 level
ASTM F2656-07	vehicle mass 15,000 lbs vehicle speed 30 mph **impact load 656 kJ** M30 level	vehicle mass 15,000 lbs vehicle speed 50 mph **impact load 1,680 kJ** M50 level
IWA 14-1 2013	vehicle mass 15,870 lbs vehicle speed 30 mph **impact load 694 kJ**	vehicle mass 15,870 lbs vehicle speed 50 mph **impact load 1,778 kJ**
PAS68:2013	vehicle mass 16,530 lbs vehicle speed 30 mph **impact load 723 kJ**	vehicle mass 16,530 lbs vehicle speed 50 mph **impact load 1,852 kJ**

[1]Standards differ in test conditions, e.g. the impact angle of the vehicle, or in classification guidelines.

Customised variety and combined protection:

› **Security drop arm barriers**
The barrier from SÄLZER blocks a standard driveway width of up to 6 m when in a horizontal position. You can of course have larger widths. The opening and closing speed can be individually adjusted. Another advantage is the extremely economical and cost-effective use of SÄLZER barriers.

› **Security barriers**
SÄLZER barriers are developed for maximum impact protection up to the very highest security levels. Special features are low installation depth of just 400 mm as well as the "Emergency-up" option, which activates the barrier in just one second and secures the adjacent land or buildings against attacks by heavy trucks, cars or motorbikes.

› **Mobile security barriers**
SÄLZER offers the M850 mobile barrier for temporary protection e.g. for major events, Christmas markets or conferences. Options: Rent or purchase.

› **Security bollards**
Anti-terrorist bollards from SÄLZER were specially designed for fixed and automatically retractable protection against all kinds of vehicular impact. They allow for a flexibly designed barrier width thanks to the possibility of arranging the bollards any way you like. All the bollards developed by SÄLZER are distinguished by maximum stability and resistance.

The design can be adapted in a variety of ways to compliment building design requirements.

Special protection concepts

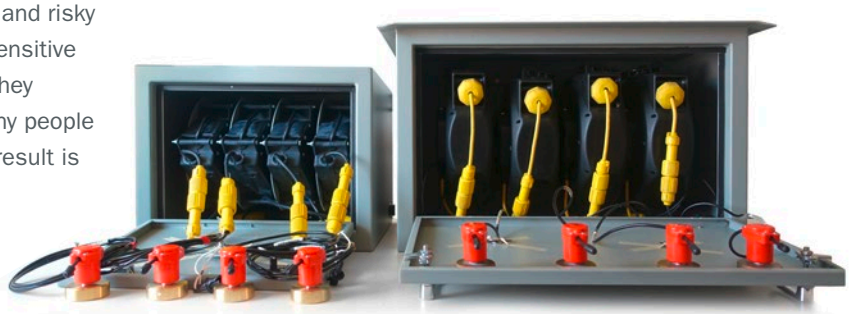
Protection against cyclones

In parts of the world with strong winds, windows, doors and facades have to withstand extraordinary requirements due to extreme wind loads and flying objects. SÄLZER products have been tested and certified e.g. for their resistance against cyclones according to Australian standard AS/NZS 1170:2:2011 for use in these regions.

Heartbeat detector, reliable vehicle checks

Extensive market analysis and testing therefore convinced SÄLZER to add the AVIAN heartbeat detector to its security product range. The heartbeat detector reliably identifies people in all types of vehicles. There are no time-consuming and risky searches of the vehicles at the exit. Special, highly sensitive sensors are attached to the chassis of the vehicle. They measure the vibrations caused by the heartbeat of any people in the vehicle. Following the short data analysis, the result is displayed on the screen after a few seconds.

Application area: Indoor and outdoor use
Examples: Forensics, police, federal police, correctional facilities.



Maximum burst and explosion protection: tests according to NATO STANAG 2280

SÄLZER steel constructions including glazed window elements withstood the test of the enormous explosion force of mortars and artillery shells, which were detonated at a short distance from the test elements.

Tested according to NATO STANAG 2280

Class	Type/tested	Calibre	Distance	Weight
up to C5	Artillery shell	155 mm	1,5 m	approx. 43 kg

The high security elements tested under the most extreme conditions are suitable for a wide range of operating conditions:

1. Application: protection for military forces in crisis areas as well as protection for high-risk buildings

By combining several elements as walls and roof structures, it is possible to create a complete protective building including windows and doors, which provides a complete protective element against the threat of artillery shells, level C5, according to NATO standard 2280. The tested steel constructions can also be installed as modular protective walls in front of high-risk buildings.

2. Application: testing enclosures for industrial product tests

With industrial product tests and load tests, there is the risk that e.g. motors, turbines or pumps could burst with great force and high speed. The elements tested in accordance with NATO STANAG can be used in an industrial environment or a testing institute for the construction of test benches to reliably protect employees and industrial resources from bursting and exploding materials.

Other protective functions against explosions and bullets

The tested steel constructions also offer protection against blast. They protect up to a reflected impulse of 4,000 kPa. This corresponds to a 7 kg explosive charge detonating at a distance of 1.5 m.

The high security elements also protect against bullets from all portable, fully automatic rapid firearms up to and including machine guns such as AK-47, AK-74, Nato G3, M16, MG3.

General advantages at a glance:

- Quick to assemble and use
- Flexible modular system with partition walls, doors, windows and roof constructions
- Customised construction: height, width, design, equipment
- Flexible use: protection for all high-risk buildings, e.g. embassies, industrial plants, military facilities, or for security zones/test facilities inside a building
- Easy transport due to modular construction
- Temporary use also possible: quick disassembly and assembly in front of or in another building
- Low space requirement

Rev. 03-2022

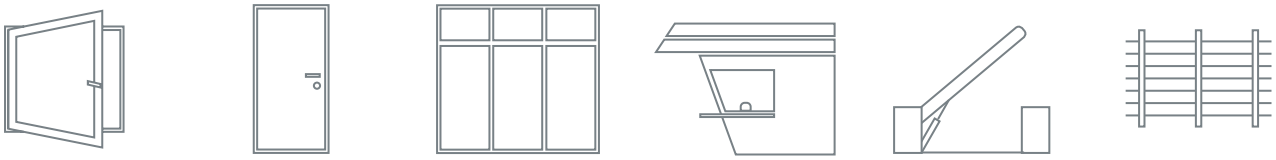
SYSTEM SÄLZER® – Systemized security

SÄLZER building security
Part of Schüco

For more than 50 years, SÄLZER GmbH, based in Marburg, has specialized in innovative high-security solutions, which have been sold and distributed worldwide to more than 90 countries. Our team of over 130 specialists design and produce high-security windows, doors, facades, and guard houses to meet the unique functional and aesthetic needs of our customers. Multi-certified and comprehensively tested, the SÄLZER System assures combined protection against forced entry, break out, bullets, explosion, fire, and smoke. Each security solution is individually developed to the highest security and resistance classes to meet the respective protection requirements. Public, industrial, and residential building owners worldwide benefit from a wide range of networkable and combinable products of all security levels.

In 2018, SÄLZER became “Part of Schüco”. Based in Bielefeld, the Schüco Group develops and sells system solutions for windows, doors and facades.

For more information, visit: www.saelzer-security.com and www.schueco.com



SÄLZER GmbH
Dietrich-Bonhoeffer-Str. 1-3
35037 Marburg, Germany

Switchboard: +49 (0) 6421 938 100
Sales: +49 (0) 6421 938 127
Fax: +49 (0) 6421 938 190
E-Mail: info@saelzer-security.com