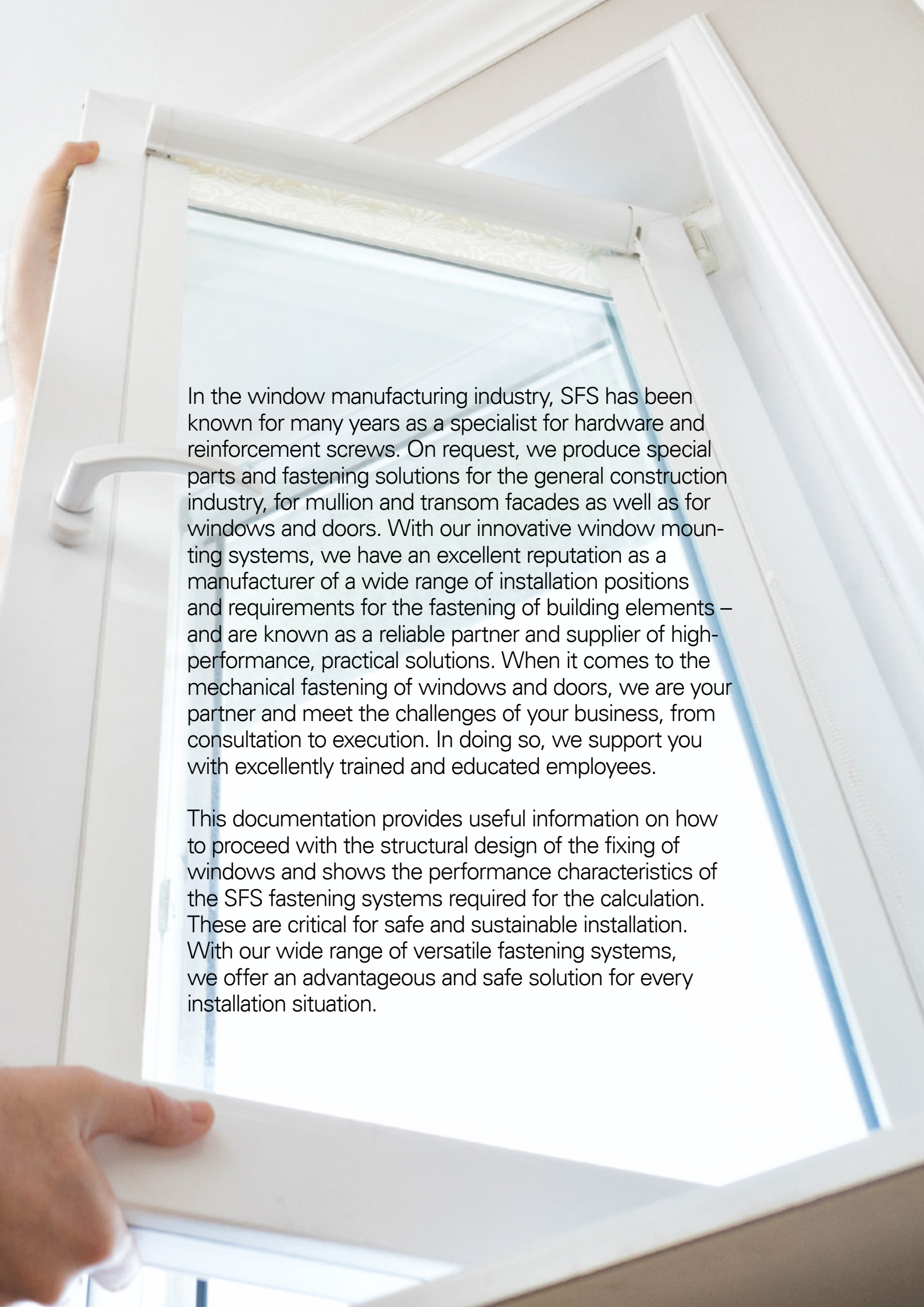
Dimensioning of Windows and Front Doors

Gfl 2020

Compendium Version 2.0

ift ZERTIFIZIERT CERTIFIED



In the window manufacturing industry, SFS has been known for many years as a specialist for hardware and reinforcement screws. On request, we produce special parts and fastening solutions for the general construction industry, for mullion and transom facades as well as for windows and doors. With our innovative window mounting systems, we have an excellent reputation as a manufacturer of a wide range of installation positions and requirements for the fastening of building elements – and are known as a reliable partner and supplier of high-performance, practical solutions. When it comes to the mechanical fastening of windows and doors, we are your partner and meet the challenges of your business, from consultation to execution. In doing so, we support you with excellently trained and educated employees.

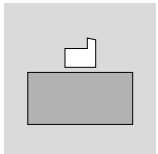
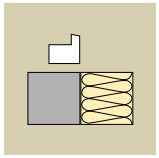
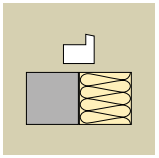
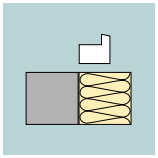
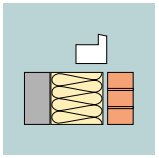
This documentation provides useful information on how to proceed with the structural design of the fixing of windows and shows the performance characteristics of the SFS fastening systems required for the calculation. These are critical for safe and sustainable installation. With our wide range of versatile fastening systems, we offer an advantageous and safe solution for every installation situation.

Content

Chapter	What	Application Case	Description	Page
1	Introduction	General Information	Overview of Installation Situations and Fastening Solutions	**4**
			ift-Cerfikate Structure Fitting Systems	**5**
			General Notes	**6**
			Determination of the Fixing Points	**7**
			Design Basics	**8**
		Standard Case 2	Acting and resulting Forces	**10**
			Distribution of Load Concentrations over several Fixing Points	**11**
			Building Materials, Notices and Definitions	**12**
		Special Case	Fastening building components with special characteristics	**13**
2	Installation in the wall	General Information	Product Overview	**16**
			Product Benefits Systems FB and FL	**17**
			Description and Installation Instructions for FB and FL Systems	**19**
			Product Benefits Systems JB-W, JB-W/XL and JB-A	**21**
			Description Systems JB-W, JB-W/XL and JB-A	**22**
		Standard Case 2	Design Values Systems FB, FL, JB-W, JB-W/XL, JB-A	**24**
			Test Reports and Installation Instructions System FB, FL, JB-W, JB-W/XL, JB-A	**32**
			Delivery Range Systems FB, FL, JB-W, JB-W/XL, JB-A	**34**

General Information

Overview of Installation Situations and Fastening Solutions

Single skin masonry	Insulated masonry			Double-skin masonry
In the wall	0–40 mm at/above the edge		In front of wall installation	In front of wall installation
				
 FB/FL fastener  JB-W bracket  JB-W/XL bracket  JB-A bracket	 JB-D/L-P plate +  JB-D/L-A bracket		 JB-W/XL bracket  JB-D-U console +	 JB-D-R console

Zertifikat / *Certificate*

Zertifikatsnr. / *Certificate No.*: 188-8002779-1-3

Baukörperanschlusssysteme

Structure fitting systems

Produktfamilien *product families*
Befestigungssystem FB, FL, JB-D/L, JB-D, JB-W/XL
Fixing systems FB, FL, JB-D/L, JB-D, JB-W/XL

Einsatzbereich *field of application*
Befestigungssysteme für Fenster und Außentüren
Fixing systems for windows and pedestrian doors

Hersteller *manufacturer*
SFS intec GmbH Construction
In den Schwarzwiesen 2, DE 61440 Oberursel

Produktionsstandort *production site*
SFS intec AG
Rosenbergsaustr. 10, CH 9435 Heerbrugg

Mit diesem Zertifikat wird bescheinigt, dass das benannte Bauprodukt den Anforderungen des zugrundeliegenden ift-Zertifizierungsprogramms in der aktuellen Fassung entspricht.

- Erstellung von Produktfamilien des aufgeführten Bauproduktes und Erstprüfung durch eine akkreditierte Prüfstelle nach der ift-Richtlinie MO-02/1:2015
- Einführung und Aufrechterhaltung einer werkseigenen Produktionskontrolle durch den Hersteller
- Erstinspektion des Werkes und der werkseigenen Produktionskontrolle durch ift-Q-Zert
- kontinuierliche Fremdüberwachung des Werkes und der werkseigenen Produktionskontrolle durch ift-Q-Zert

Dieses Zertifikat wurde erstmals am 26.10.2017 ausgestellt und gilt 3 Jahre, wenn sich zwischenzeitlich die Festlegungen in der oben angeführten technischen Spezifikation oder die Herstellbedingungen im Werk oder in der werkseigenen Produktionskontrolle selbst nicht wesentlich verändert haben.

Das Zertifikat darf nur unverändert vervielfältigt werden. Alle Änderungen der Voraussetzungen für die Zertifizierung sind dem ift-Q-Zert mit den erforderlichen Nachweisen unverzüglich schriftlich anzuzeigen.

Das Unternehmen ist berechtigt, das benannte Bauprodukt gemäß der ift-Zeichensatzung mit dem „ift-zertifiziert"-Zeichen zu kennzeichnen.

Dieses Zertifikat enthält 1 Anlage.

This certificate attests that the building product mentioned fulfils the requirements of the underlying ift-certification scheme in its current version.

- compilation of product families of the building product listed and initial type-testing by an accredited testing body as per ift-guideline MO-02/1:2015
- implementation and maintenance of a factory production control by the manufacturer
- initial inspection of the production site and the factory production control by ift-Q-Zert
- continuous third-party control of the production site and the factory production control by ift-Q-Zert

This certificate was first issued on 26.10.2017 and will remain valid for 3 years, as long as neither the conditions laid down in the technical specification listed above nor the manufacturing conditions in the production site nor the factory production control itself are modified significantly.

The reproduction of the certificate without any change from the original is permitted. Any changes to the prerequisites applicable to certification shall be immediately communicated in writing to ift-Q-Zert accompanied by the necessary evidence.

The company is authorized to affix the "ift-certified"-mark to the building product mentioned according to the ift-rules for use of the "ift-certified"-mark.

This certificate contains 1 annex.

ift Rosenheim
28.07.2020

Christian Kehrer
Leiter der ift-Zertifizierungs- und Überwachungsstelle
Head of ift Certification and Surveillance Body

Prof. Jörn P. Lass
Institutsleiter
Director of Institute

Gültig bis / *Valid until*: 25.10.2023

Vertrags-Nr. / *Contract No.*: 188 8002779

Ve-Zer-5162-de / 01.12.2019

Grundlage(n) / *Basics:*

ift-Zertifizierungsprogramm für Baukörperanschlusssysteme nach der ift-Richtlinie MO-02
ift-certification scheme for hardware for structure fitting systems according to the ift-guideline MO-02
(QM 360)
Ausgabe / *issue* 2018

Baukörperanschlusssysteme
structure fitting systems

MO-02/1

Befestigungssysteme
fixing systems

ZERTIFIZIERT
CERTIFIED

www.ift-rosenheim.de

ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
D-83026 Rosenheim

Kontakt
Tel.: +49 8031 261-0
Fax: +49 8031 261-290
www.ift-rosenheim.de

Prüfung und Kalibrierung – EN ISO/IEC 17025
Inspektion – EN ISO/IEC 17020
Zertifizierung Produkte – EN ISO/IEC 17065
Zertifizierung Managementsysteme – EN ISO/IEC 17021

Notified Body 0757
PGU Stelle: BAY 18

DAkkS Deutsche Akkreditierungsstelle D-ZE-11349-01-00

General Notes

Various loads act on windows when they are installed. In addition to their own weight, these loads result, among other things, from the effects of wind, mechanical stresses during use and from extraordinary loads (e.g. during break-in attempts). These loads must be permanently transferred by the fastening to the load-bearing structure and the building foundation.
The following criteria must therefore be ensured for the window in the design:

- Stability
- Safety in use
- Limitation of deformations (serviceability)

In the past, the design of the fastening was primarily based on recognised rules of technology (arrangement of support and spacer blocks, fastening distances, etc.). Due to changes in construction technology (heavier windows, more porous and thus less load-bearing building materials, as well as the shift of the window position to the outside), a more precise consideration is unavoidable.
The "Guidelines for Planning and Execution of the Installation of Windows and Front Doors for New Buildings and Renovations", hereinafter referred to as the "Guidelines for Installation" (GfI), distinguishes between three cases in chapter 5 "Fastening and Load Transfer":

Fastening of windows and exterior doors
Element-wise load transfer at least on two opposite sides

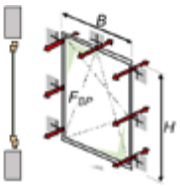
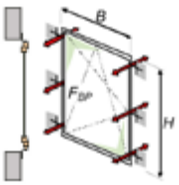
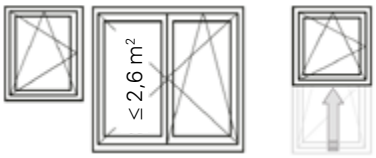
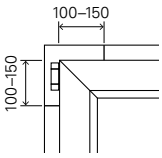
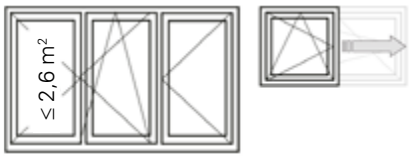
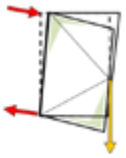
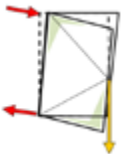
Standard Case 1	Standard Case 2	Special Case

• Load-bearing masonry with regard to fastening
• Installation in the wall with all-round fastening
• Window/exterior door:
  • max. 2 sashes
  • Sash area ≤ 2,6 m²
  • For turn or tilt&turn sashes:
  + Sash format b/h ≤ 1
  + Glass weight ≤ 35 kg/m²
• Required wind resistance class ≤ B3/B4 (double-leaf/single-leaf)
• In case of a sym. over-corner fastening in the corner and stay bearing area for tilt or tilt&turn sashes:
  • Glass weight ≤ 45 kg/m²
  • Consideration of vertical working loads (classes 1 and 2)
• In the case of special requirements, special case also applies in addition
	• Masonry with low load-bearing capacity with regard to fastening
	• Installation in front of the wall (prewall installation with brackets, angles or frames)
	• Oversizes (deviating from standard case 1)
	• Consideration of vertical working loads (classes 1 to 4 according to EN 13115)
	• Window installation in high-rise buildings
	• In the case of special requirements,
	• special case also applies in addition
		• Consideration of special requirements (e.g. installation of fall protection or burglar-resistant or bullet- and explosion-resistant elements, consideration of effects due to fire or earthquakes)
		• In addition, standard case 1 or 2 are to be considered

Adherence to the known generally valid rules	Dimensioning of the fastening required	Static proof Proof of testing Proof of usability
Workshop and installation planning by the person responsible for installation		Structural engineer Testing laboratory Approval body

Source: "Guidelines for Installation" (GfI), Edition 2020-03

The following explanations help to define more clearly the criteria mentioned in the overview table in the GfI:

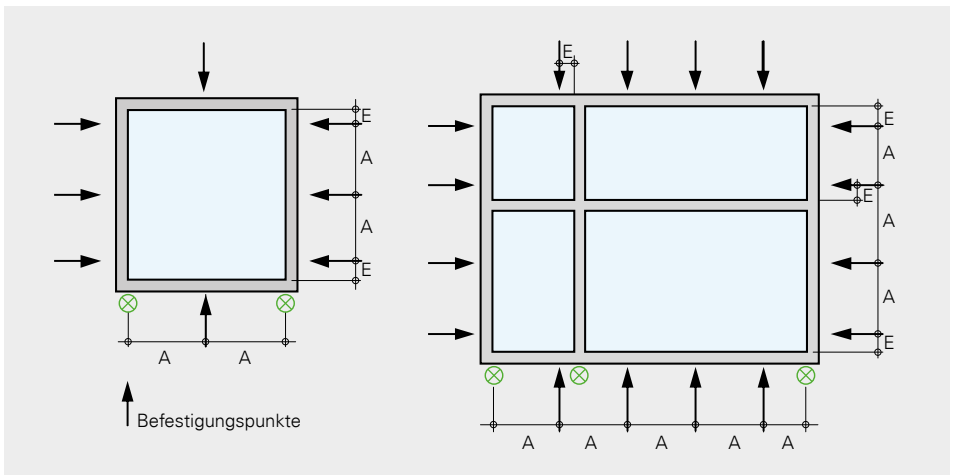
Standard Case 1		Standard Case 2
Special soffit stones	**Outer Wall**	High-heat insulating filigree/filled bricks
		
≥ C12/15 DFK ≥ 12 at DFK < 12 DFK ≥ 4		(DFK ≥ 12) without special soffit stones
 Installation in the wall and circumferential fastening	**Installation Situation**	 In front of the wall mounting or mounting not circumferential
  $n_{sash} \leq 2$ and $A_{sash} \leq 2{,}6\ m^2$ and b/h ≤ 1 (upright to square sash format) and glass weight ≤ 35 kg/m² or for over-corner fastening: Glass weight ≤ 45 kg/m²	**Window Structure**	 $n_{sash} > 2$ or $A_{sash} > 2{,}6\ m^2$ or b/h > 1 (horizontal sash format) or Glass weight > 35 kg/m² resp. > 45 kg/m²
Wind Load ≤ B4 ≤ B3 Vertical Load P  With over-corner fastening EN 13115 Class 1–2	**Performance Characteristics**	Wind Load > B4 > B3 Vertical Load P  EN 13115 Class 1–4

Special Case

Specific requirements, as:

Source: "Guidelines for Installation" (GfI), Edition 2020-03

Determination of the Fixing Points



A Spacing

- For Aluminium windows max. 800 mm
- For wooden windows max. 800 mm
- For PVCu windows max. 700 mm

E Distance from the inside corner

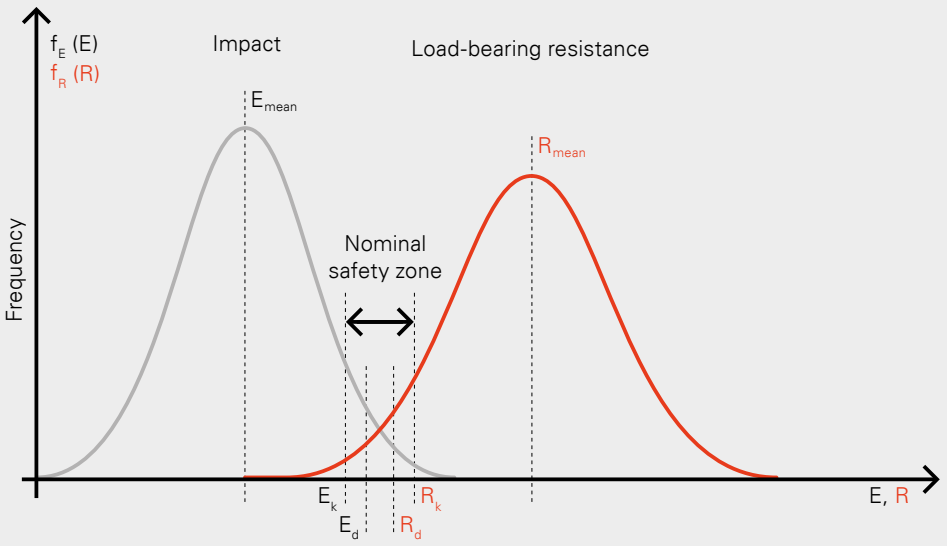
Distance from the **inside** corner of the frame and, for mullions a. transoms, from the inside of the profile 100 to 150 mm

⊗ Additional fastening point for load transfer in the window plane for projecting installation in front of the loadbearing wall construction. Replaces the support blocks. In the lateral area depending on the type of opening.

Design Basics

In the design, the acting forces (actions) are compared with the load-bearing resistance of the component or fastener.

Factorization by means of coefficients takes account of the variation in order to ensure the load-bearing capacity with sufficient safety.



E	Impact
E_{mean}	Impact mean value
E_k	Characterisitc value of the impact
E_d	Design value of the impact
R	Load-bearing resistance
R_{mean}	Mean value of the resistance
R_k	Characteristic value of the resistance
R_d	Design value of the resistance

Procedure structural engineer

Typically, the structural engineer performs his verification at design level, i.e. with design values on the side of the impact and load-bearing resistances **(Special Case)**.

Procedure according to GfI

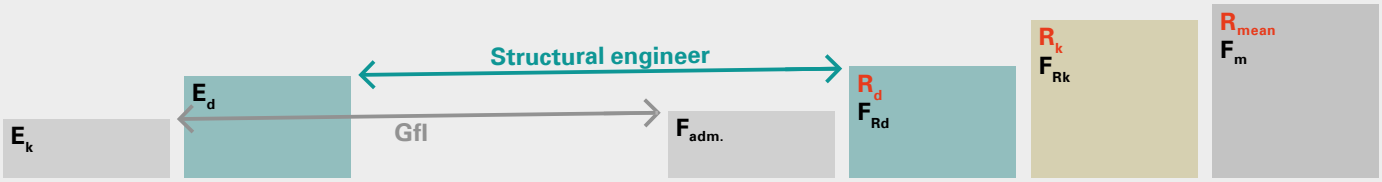
In contrast, the GfI chooses a simplified method for the verification by the executing company in **Standard Case 2**. The characteristic forces (actions) are compared with the admissible loads (service load) for the fastening systems:

Procedure structural engineer

Design value of the impact **E_d** < Design value of the resistance **R_d**

Procedure according to GfI

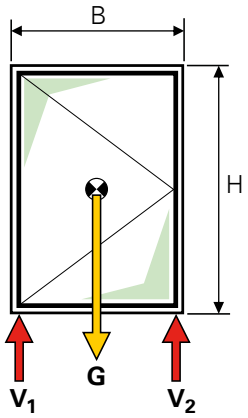
Characterisitc value of the impact **E_k** < Admissible loads (service load) **$F_{adm.}$**



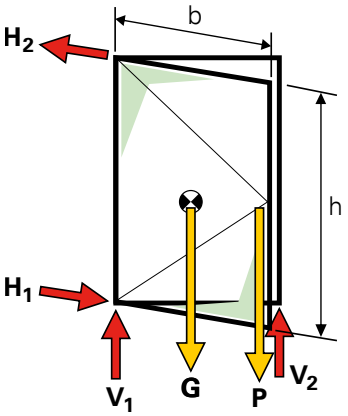
For this reason, our data sheets show both the design loads and recommended loads, leaving it up to the user to decide on the level of verification.

Acting and resulting Forces

Forces acting in window plane

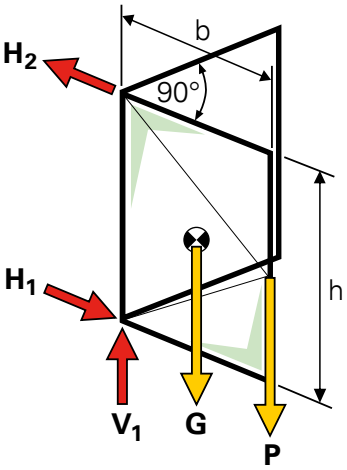


Dead weight: closed sash

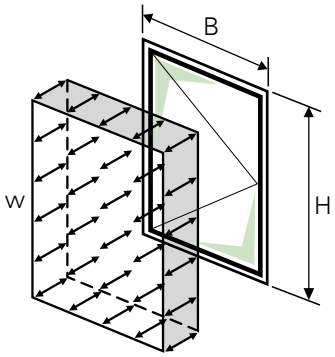


Dead weight and vertical live load:
minimum open sash

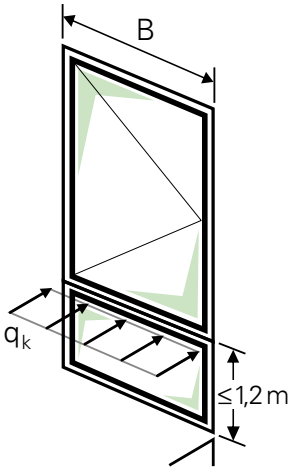
Forces acting perpendicular to the window plane



Dead weight and vertical live load:
sash 90° open



Wind loads (pressure + suction)

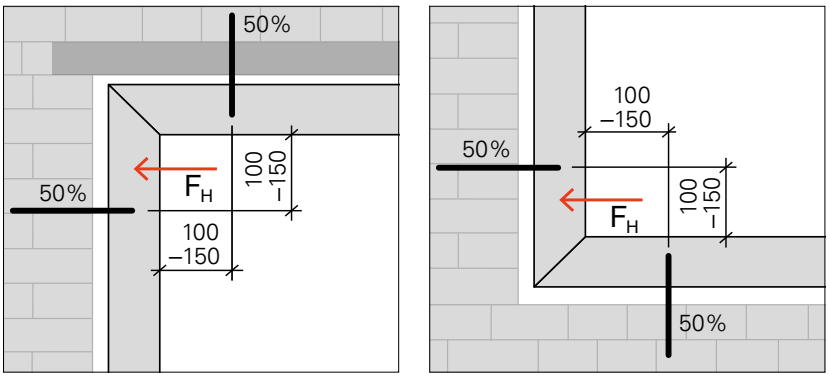


Horizontal live loads

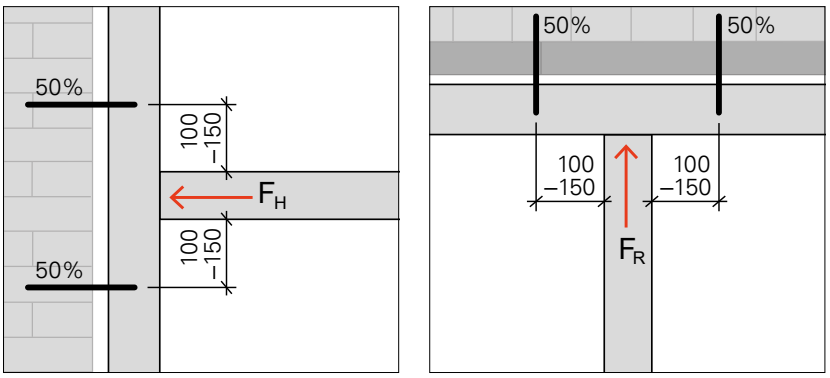
Distribution of Load Concentrations over several Fixing Points

If the applied forces exceed the load-bearing capacity of one fastening point, it is possible to divide them among several fastening points by means of a group fastening in the form of a cross-corner fastening or a double fastening.

1) Fastening across the corner
If two fixing points are fitted at a distance of 100 - 150 mm from the inner corner of the frame, the load can be distributed between them in a ratio of 50% to 50%.

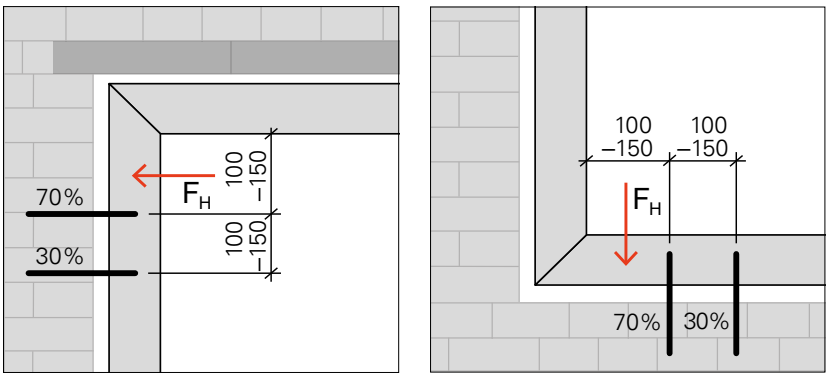


2) Double attachment symmetrical
In this case, too, the load can be distributed to both in a ratio of 50% to 50%.



3) Two grouped fixing points
With two grouped fixing points, the load can be applied to the side as well as at the bottom in a ratio of 70% (fixing point near the corner of the frame) to 30%. This leads to an increase in performance of 43% compared to the installation with only one fixing point. The following distances must be observed:

- Distance to inner corner of frame: max. 100–150 mm
- Spacing: 100–150 mm



All dimensions in mm

Building Materials, Notices and Definitions

Values from tests according to guideline MO-02/1
he correspondingly marked values were determined in tests according to guideline MO-02/1 of ift Rosenheim, June 2015 edition, on individual bricks and with the specified edge distances.

Concrete
Values for concrete were determined in tests in sand-lime bricks and confirmed by means of reference testing. The class C20/25, which is usually stated, corresponds to the quality commonly used in building construction.

Lime sandbrick
The values were determined with bricks of density strength class (DFK) 20, partly in small formats (type 3DF, 240 × 175 × 113 mm), partly in XL format (type 14 DF, 248 × 200 × 498 mm). In the case of lime-sand bricks, any finger holes must be taken into account.

Poroton vertically perforated clay blocks
All tests were carried out with Poroton vertically perforated clay blocks from Wienerberger. The values shown can be applied to blocks from other suppliers, provided they are equivalent (strength class, wall thicknesses and hole pattern). Due to common approvals, this is the case e.g. for bricks of the company Schlagmann with the corresponding designation.

Examples of tested block types


HLz-Plan-T acc. to Z-17.1-868


Plan-T8 acc. to Z-17.1-108


Poroton-T8-P acc. to Z-17.1-982


Poroton-T10 acc. to Z-17.1-889

Smooth coat rendering for Poroton vertically perforated bricks
Smooth coat rendering for Poroton vertically perforated bricks The values were determined according to the practice-relevant situation partly with, partly without smooth coat rendering, see notes on the individual table sheets.

Smooth coat type: Lightweight plaster type 1
Compressive strength class according to DIN EN 998-1: CS II (2,5–5 N/mm²). The smooth coat fills the profile of the block in the layup. In individual cases, an increased thickness of 10–12 mm was selected in the tooth base, which is noted on the corresponding table page. Values without smooth coating can also be used for applications with smooth coating, as the smooth coating leads to a higher load-bearing capacity.

Aerated concrete
Depending on the application, the values were determined with bricks of the typical building strength classes (PP).

Values from German general building approvals/general construction type approvals (abZ/aBG)
The general conditions of the corresponding abZ/aBG with regard to building materials, application limits (edge and intermediate distances, etc.) and processing must be taken into account.

Special Case

Fastening building components with special characteristics

Special requirements as well as the installation of windows in high-rise buildings are to be carried out in accordance with the requirements for the special case.

These exist, among others, for:
- Building components with burglary-restistant characteristics
- Building components with safety barrier characteristics
- Doors in escape routes and emergency exits
- Fire safety elements

Building components with burglary-restistant characteristics
Our fastening systems have been tested for their burglarresistant properties in various application variants. The test certificates are listed in the corresponding chapters.

Building components with safety barrier characteristics
The requirements for safety barrier component fastening are described in the Guidelines for Installation (GfI), chapter 5.3.2. The focus is on the protection of life and limb. Nowadays, french balconies are increasingly fastened directly to the window element and thus by the window installer. Even fixed glazed window elements must be secured against falling, depending on the height of the sill.

SFS provides you with complete systems for high-performance, safety barrier fastening. We have an extensive product range for the secure installation of windows and exterior doors, the suitability of which has been proven for the most varied wall substrates and window positions.

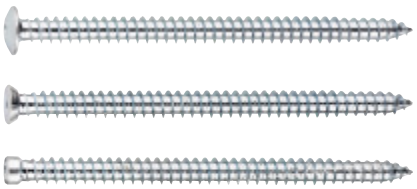
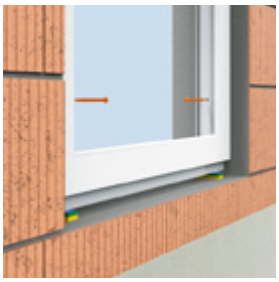
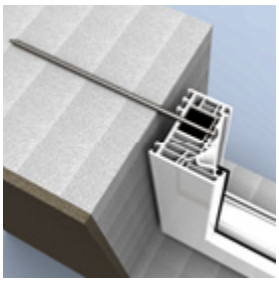
Installation in the Wall

Tested according to:

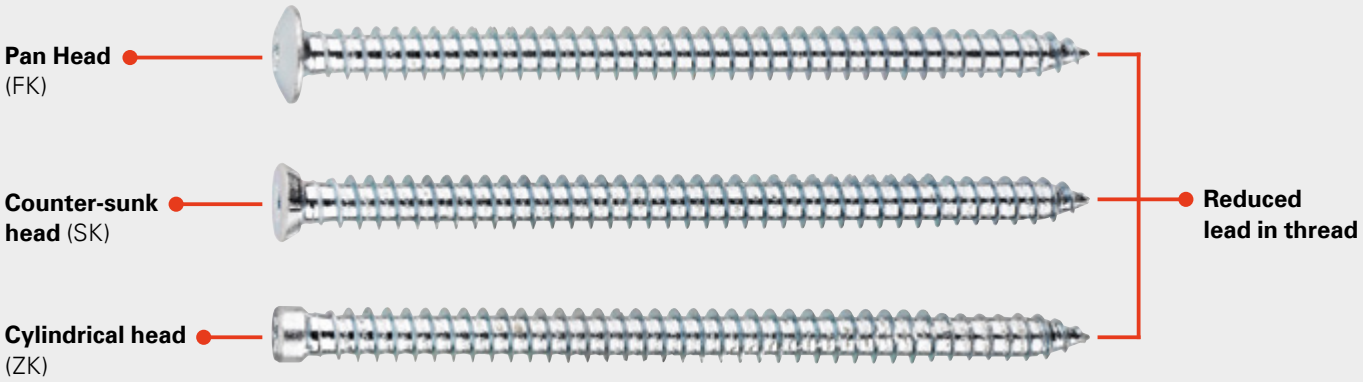
- RC2 acc.to DIN EN 1627
- RC3 acc.to DIN EN 1627
- Component test acc. to MO-02/1

General Information

Product Overview

System		Application	
FB			Universal frame anchor for various substrates in three head styles
FL			Special frame fastener for aerated concrete and vertically perforated bricks with low load-bearing capacity
JB-W			Mounting bracket for threshold fastening with low to medium height
JB-W/XL			Mounting bracket for threshold fastening up to medium heights and for increased performance requirements
JB-A			Heavy-duty mounting bracket for high floor constructions/threshold heights

Product Benefits System FB

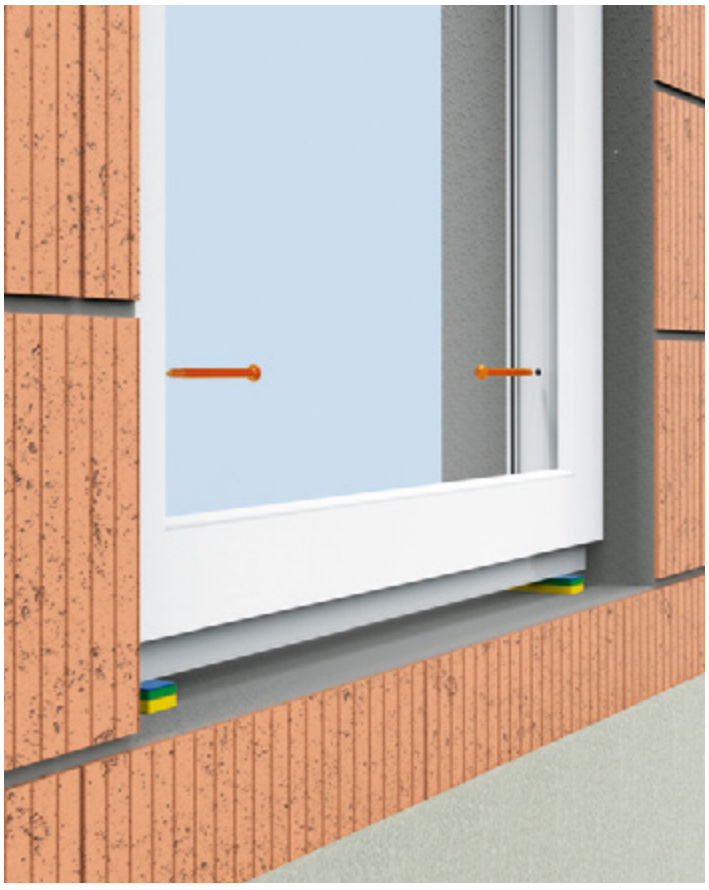


The solution – universal mounting screw FB
The most common form of mounting is through-hole mounting with mounting screws. The FB screw type covers a wide range of different substrates. With our product, you can fix to most substrates and have a secure fixing. Our range of screws includes extensive variants, starting with three head shapes and a wide range of lengths. Extensive test documentation and services round off the range for you. This type of screw is compatible and tested with all our other assembly systems.

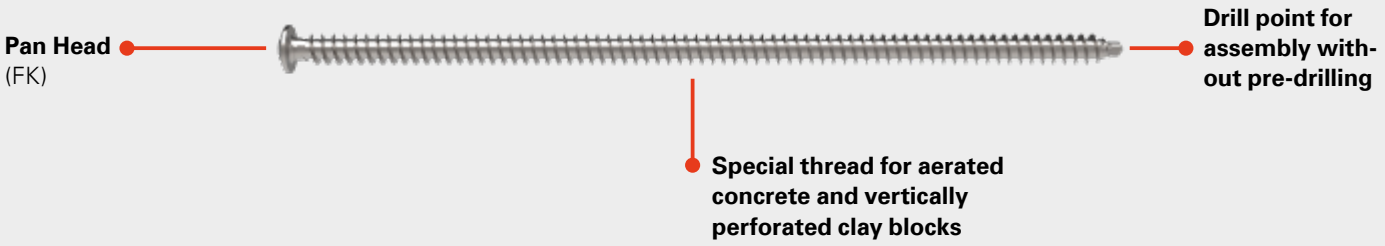
Product benefits at a glance
- Tested and approved up to RC3
- Design values available, MO-02 tested
- Various lengths
- Tapered inlet thread, supports an easy installation
- Highest quality level in straightness and forming
- Tested in combination with all systems of the SFS JB product family
- Clear characteristic & performance values for processing
- Attractive pan head for the “FK” variant

Tested according to:

- ☑ ift-zertified
- ☑ Resistance class RC2 + RC3
- ☑ Serviceability acc. to MO-02/1
- ☑ Fastening acc. to ONORM B 5320

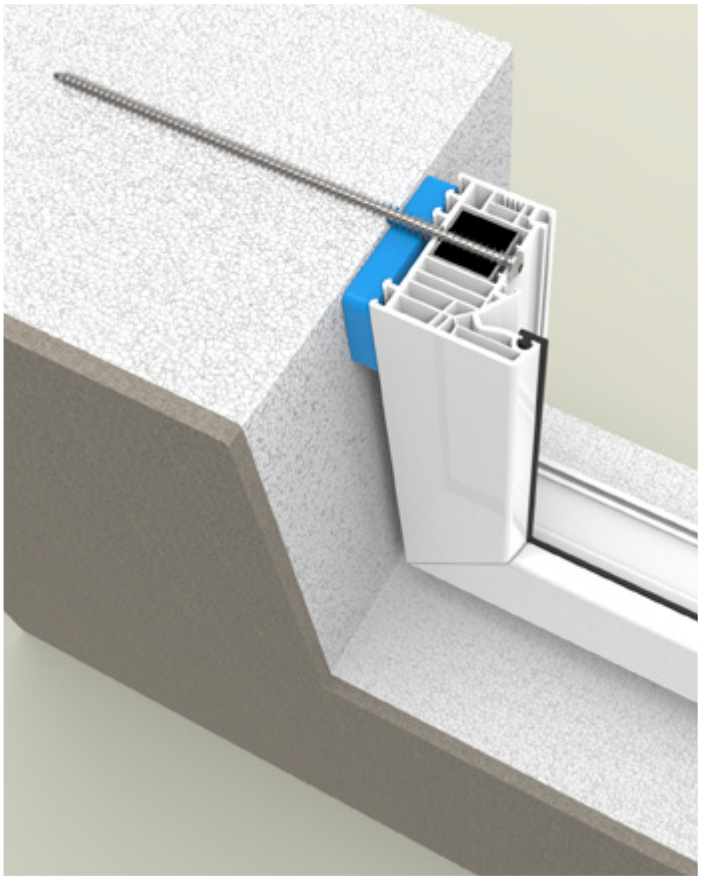


Product Benefits System FL



The solution – Frame Fastener FL
The fastening of windows always poses new challenges for the fabricators. Especially with weak wall substrates such as aerated concrete PP2 or vertically perforated bricks, the standard solutions usually reaching their limits. With the FL frame fastener, you achieve a high load-bearing capacity and work quickly and safely.

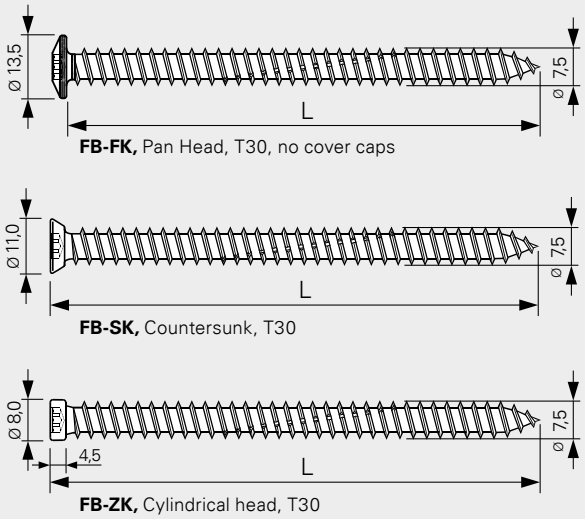
Product benefits at a glance
- Load-bearing fastening for critical wall substrates
- RC2-tested and passed
- Design values available, MO-02 tested
- Can be installed without pre-drilling (PP2)
- Highly corrosion-resistant surface
- Attractive pan head type “FK”
- Window frame pre-drilling with standard drill 6 mm



Tested according to:

- ☑ ift-zertified
- ☑ Resistance class RC2
- ☑ Serviceability acc. to MO-02/1
- ☑ Fastening acc. to ÖNORM B 5320

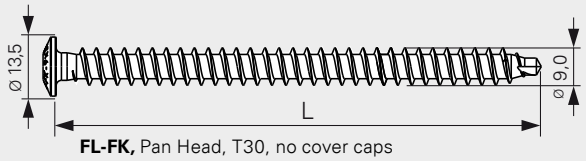
Description and Installation Instructions for FB and FL Systems



FB-FK, Pan Head, T30, no cover caps

FB-SK, Countersunk, T30

FB-ZK, Cylindrical head, T30



FL-FK, Pan Head, T30, no cover caps

FB Fastener

Material	Carbon steel, case hardened
Coating	White zinc plated
Cover caps	RAL-colors (only for FB-SK)
Packaging	Carton of 50/100 pieces (depending on length)
Processing	Electric or pneumatic screwdriver, Speed 700 rpm. Power over 500 W
Tip shape	Threaded tip
Application	Fastening in various substrates

FL Fastener

Material	Carbon steel, case hardened
Coating	HP special surface for increased corrosion protection
Cover caps	–
Packaging	Carton of 50 pieces
Processing	Electric or pneumatic screwdriver, Speed 700 rpm. Power over 500 W
Tip shape	Drill point
Application	Special fastener for aerated concrete and vertically perforated clay blocks

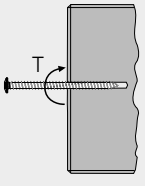
Setting torque and over-torque of fasteners

General conditions
Pre-drilling diameter and type:
Depending on the substrate, see "Processing instructions".

These values are not relevant for through-fixing, as the fixing is made at a distance. Accordingly, only the value for fixing brackets or consoles with FB to concrete is shown below.

To ensure sufficient assembly safety, the following condition must be fulfilled in accordance with MO-02:

$(T_u/T_{inst.})_{Rk} \geq 1{,}3$
This condition was met in the applications tested.



Substrate	Type/ Class	Insertion depth ET (mm)
Concrete	C20/25	40 to 60

Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition. The fasteners have been tested in conjunction with SFS bracket and fastening systems. A transfer of the values to other systems and own constructions must be checked on site.

Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition. The fasteners have been testedin conjunction with SFS bracket and fastening systems. A transfer of the values to other systems and own constructions must be checked on site.

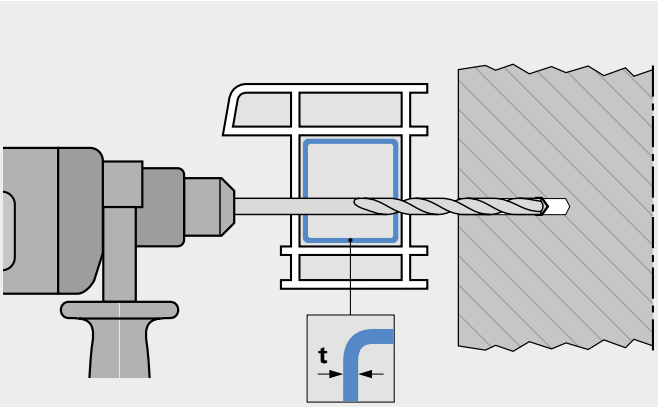
Pre-drilling Ø and insertion depth in various substrates

Substrate	Class	Fastener	Drill hole Ø (mm)	Rotary drilling	Impact drilling
Concrete	–	FB-7,5×L	6,0	–	x
Lime sandstone	≥ FKL 12		6,0	–	x
Poroton vertical perf. brick	< FKL 12		5,5	x	–
	≥ FKL 12		5,0	x	–
Aerated concrete	PP2	FL-9×L*	no pre-drilling	–	–
	≥ PP4		5 mm**	x	–
		FB-7,5×L	no pre-drilling	–	–
Wood	–		6,0	x	–
Steel	–		6,0	x	–

** Drilling depth: min. 50 mm

* **Pre-drilling-Ø für FL-9×L per reinforcement thickness**

t (mm)	**Ø** (mm)
1,5	6,0
2,0	6,5
3,0	7,5



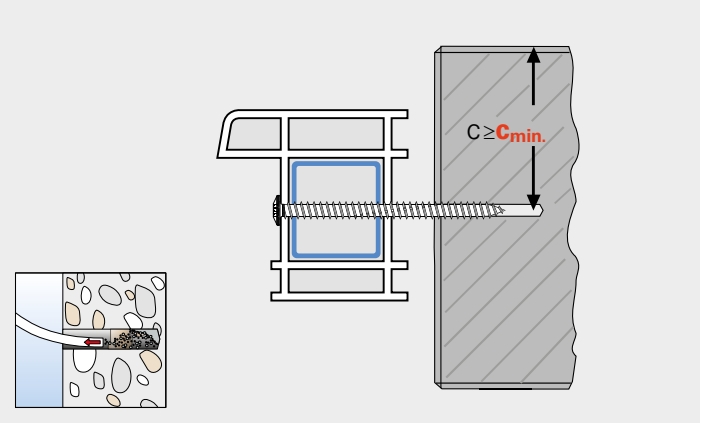
- Inserting and aligning of the window frame
- Drill holes through the pre-drilled window frames in the
- substrate
- Observe borehole diameter and depth!
- Drilling dust, dirt, etc. must be removed from the borehole with suitable tools

Edge distances

As a recognised rule of technology, the GfI basically specifies a **minimum edge distance (c_{min}) of 60 mm** for all substrates. Especially for substrates with low load-bearing capacity, such as vertically perforated bricks, an increase is necessary to achieve a permanently load-bearing connection. The specific edge distance for which the performance values were determined for each substrate is shown in the tables and must be observed.

Cleaning of the drill holes

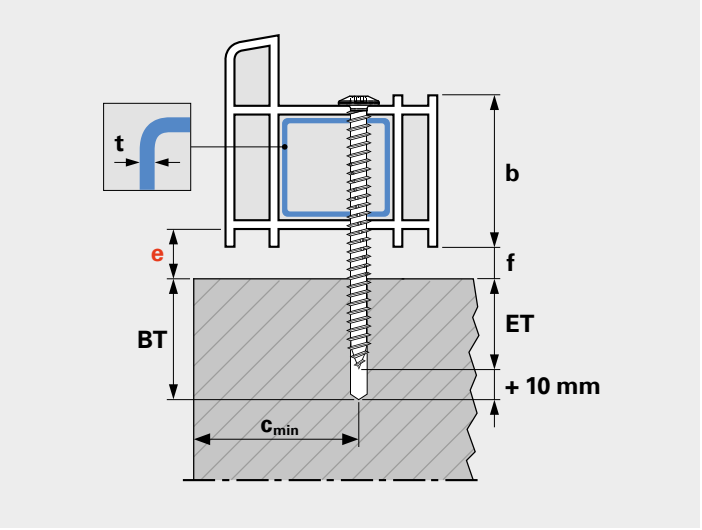
Drilling dust or other dirt must be removed from the drill holes.



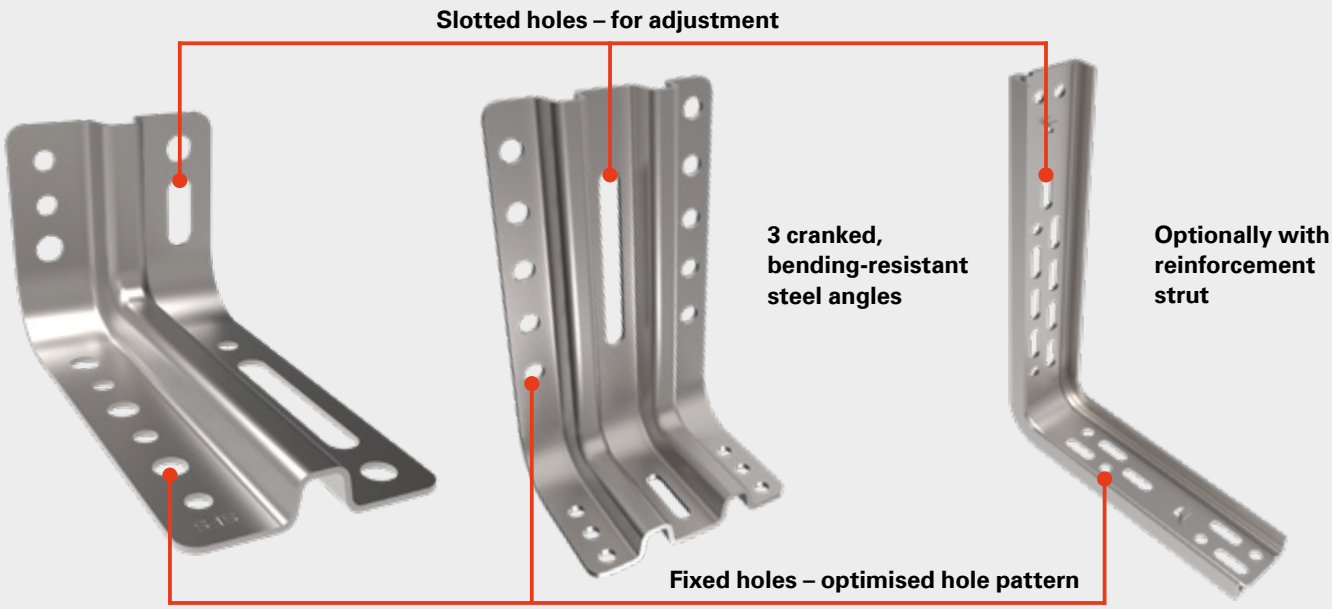
Free screw length, determination of correct fastener length and drilling depth

The free screw length "**e**" corresponds to the joint width plus any profiling of the frame or masonry. It is recommended to check the minimum drilling depth before setting the fasteners. The correct drilling depth without impurities must be observed. Minimum fastener length and minimum drilling depth are determined according to the following sketch:

b Frame width variable
f Joint width Frame to wall 10 10–20 mm (rec.)
BT Drilling depth Screw-in depth + 10 mm
ET Screw-in depth
c_{min} Minimum edge distance of 60 mm



Product Benefits JB-W, JB-W/XL and JB-A



The solution – mounting brackets JB-W, JB-W/XL and JB-A
Mounting brackets are used regularly in daily practice and are indispensable for craftsmen and fitters. We have developed a wide variety of mounting brackets for the most diverse needs and requirements. Whether for the force-locking installation of substructure profiles or the bottom connection on the window sill. As always, tested quality from SFS with clear application descriptions and load characteristics.

Description of Systems JB-W, JB-W/XL and JB-A

With the SFS bracket range, all threshold heights can be can be securely fastened.
Floor structures are getting higher and higher. With floor-toceiling window elements, this makes it necessary to install higher threshold profiles necessary. However, several coupled profiles act statically like a joint. To ensure the stability of the threshold and a safe transfer of the wind and service loads of windows, suitable fasteners must be used.

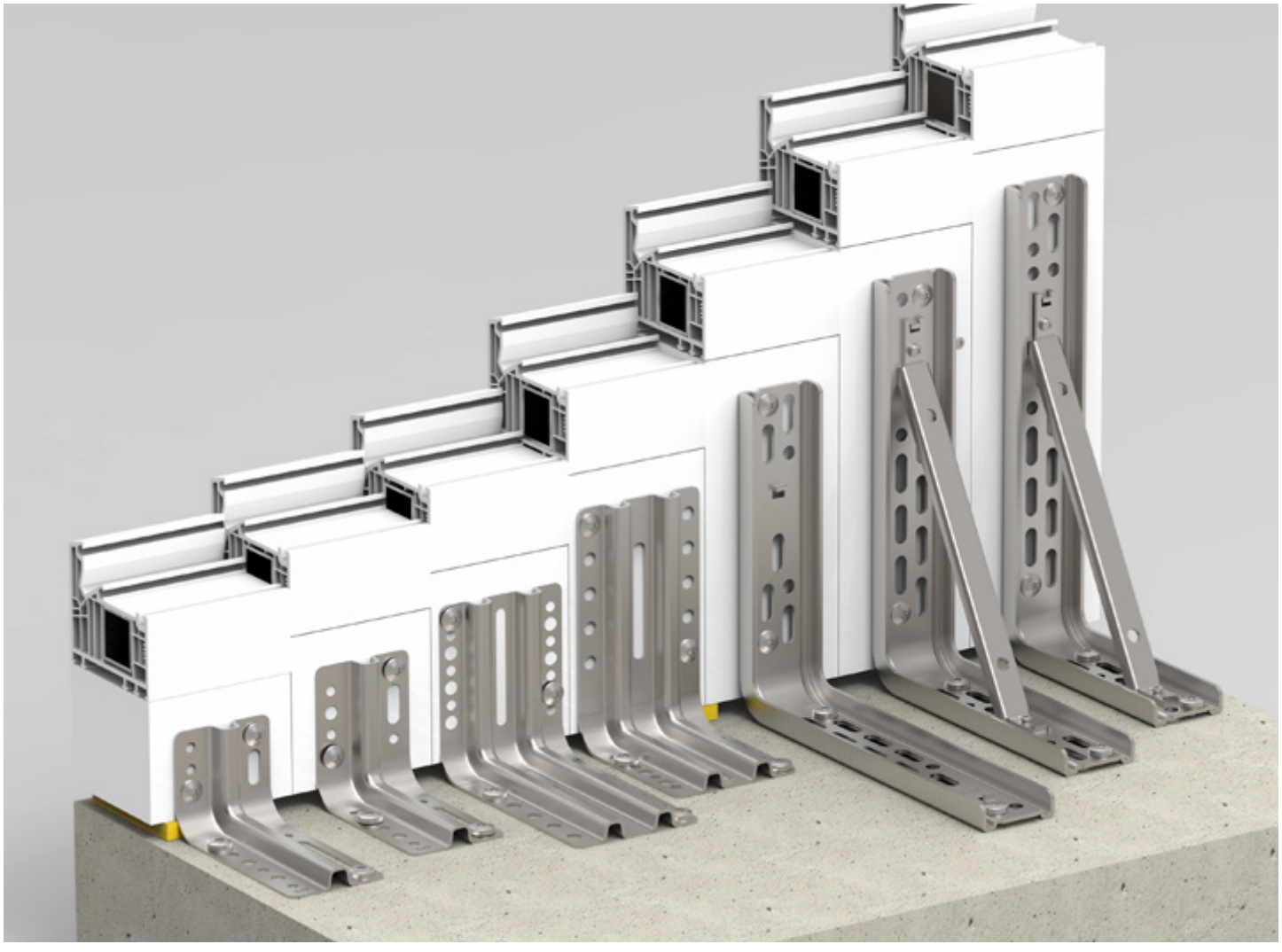
Product advantages at a glance
- Efficient, secure fastening of the profiles
- High flexibility due to offset fixing hole pattern
- Angles can be used on both sides
- Low stock keeping
- Tested and safe

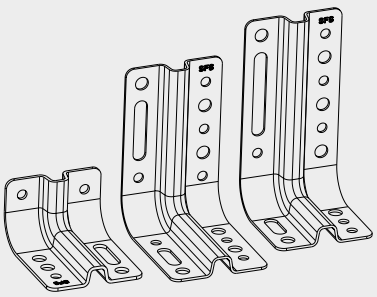
The complete bracket range from SFS

- Tested safety for floor-level elements in any installation situation
- Designed for all threshold heights and even suitable for XXL heights (> 300 mm)
- Developed for stable, durable connections
- Designed for the highest loads
- Increased load transfer thanks to optional reinforcement struts

Tested

- ☑ ift-Guideline MO-02/1
- ☑ ETB-Guideline
- ☑ RC2 acc. to DIN EN 1627

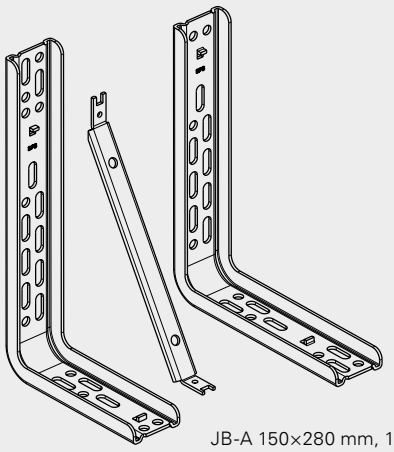




JB-W 70×40 mm, 120×60 mm, 100×80 mm

JB-W Mounting bracket

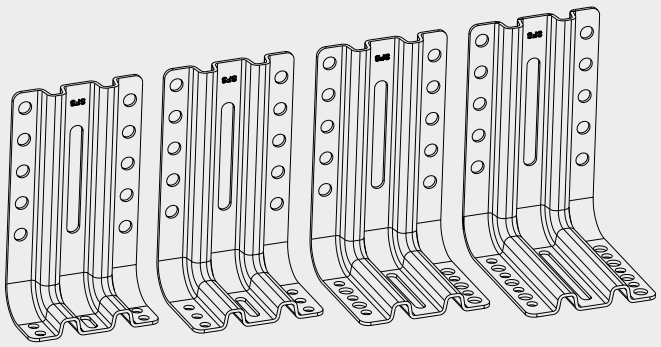
Material	Carbon steel S235
Coating	White zinc plated
Thickness	1,5 mm
Width	60 mm
Corrugation	10 mm
Hole Pattern	Ø 8/6 mm
Packaging	Carton of 50 pieces
Application	Carbon steel mounting bracket for secure fixing during window installation



JB-A 150×280 mm, 190×240 mm, JB-AS 205 mm

JB-A Mounting bracket

Material	Carbon steel S235
Coating	White zinc plated
Thickness	2,5 mm
Width	47 mm
Corrugation	15 mm
Hole pattern	Ø 8 mm
Packaging	Carton of 25 pieces
Application	Carbon steel mounting brackets for safe load transfer for floor-to-ceiling window elements



JB-W/XL 140×40 mm, 140×60 mm, 140×80 mm, 140×100 mm

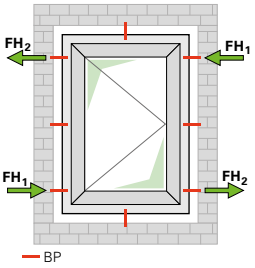
JB-W/XL Mounting bracket

Material	Carbon steel S235
Coating	White zinc plated Z275
Thickness	2 mm
Width	80 mm
Corrugation	12 mm
Hole Pattern	Ø 8/6 mm
Packaging	Carton of 50 pieces
Application	Carbon steel mounting brackets for a safe load transfer, for in front of the wall mounting and threshold fastening

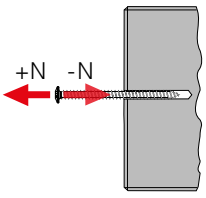
Design Values Systems FB and FL In Window Plane

Constraints

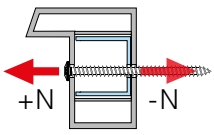
Free screw length (e)	Up to 20 mm (joint width + any profiling depth)
Pre-drilling diametrer and type	Depending on the substrate, see "Installation instructions"
Of blocking	In lime sandstone, concrete and aerated concrete ≥ PP 4, no blocking is required. For all other substrates, blocking is required
Profile extensions	Must be rigidly attached to frame profile, extension must be reinforced
Masonry strength classes	Values can be used for higher strength classes



Fastening to the sides and the top



Arrangement and force direction	In the substrate						Compression and traction	
	Building material	**Type/ Class**	**Fastening**	**Min. screw-in depth $ET_{min.}$** (mm)	**Min. edge distance $c_{min.}$** (mm)	**Tested acc. to**	**Permissible load $F_{empf.}$** (kN)	**Design load F_{Rd}** (kN)
	Concrete	C20/25	FB-7,5×L	40 1)	50	MO-02/1	0,85	1,19
	Lime sandstone	DFK 20		40	50		0,85	1,19
	Clay block Poroton-T8	DFK 6		235	100		2)	2)
	Clay block Poroton-T8-P	DFK 6		235	100		2)	2)
	Clay block Poroton-T10	DFK 8		120/235	100		2)	2)
	Clay block Poroton-T12	DFK 10		120/235	100		2)	2)
	Aerated concrete	PP 2	FL-9×L	160	60		2)	2)
				160	100		2)	2)
		PP 4		160	60		1,63	2,28
			FB-7,5×L	90	80		0,60	0,84
	Wood	C24		40	40		2,48	3,48



In the window frame				Compression and traction	
Building material	**Type/ Class**	**Fastening**	**Tested acc. to**	**Permissible load $F_{empf.}$** (kN)	**Design load F_{Rd}** (kN)
PVCu reinforced	1,5 mm	FB-7,5×L	MO-02/1	2,37	3,32
PVCu reinforced square	1,5 mm	FL-9×L		3,96	5,54
PVCu, unreinforced	3)			1,43	2,01
Softwood SPF 4)	400 kg/m³			2,49	3,48

1) For concrete, the screw-in depth (ET) is min. 40 mm to max. 60 mm.
If the ET for concrete is higher than 60 mm, pre-drilling with D = 6.5 mm is recommended. Please note that the load values change when increasing the drill diameter. Please send your enquiry for the application separately.
2) The load is transferred via suitable support blocks
3) Profile Type: Aluplast energeto® 8000
4) SPF= Spruce, Pine, Fir. Required screw-in depth in the wood: min. 41 mm

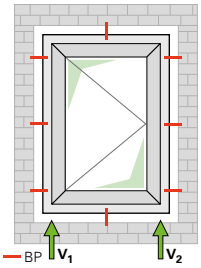
Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandbrick DFK 20.
Poroton: Values determined with smooth coat rendering (except soffit bricks). Clay block supplier: Wienerberger.

All information is non-binding and without guarantee.

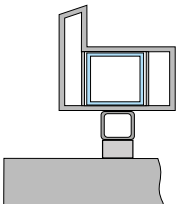
Design Values Systems FB and FL In Window Plane

Constraints

Free screw length (e)	Up to 20 mm (joint width + any profiling depth)
Pre-drilling diametrer and type	Depending on the substrate, see “Installation instructions”
Of blocking	In lime sandstone, concrete and aerated concrete ≥ PP 4, no blocking is required. For all other substrates, blocking is required
Profile extensions	Must be rigidly attached to frame profile, extension must be reinforced
Masonry strength classes	Values can be used for higher strength classes



Fastening to the bottom

Arrangement and force direction	In the substrate
	The load is transferred via suitable support blocks

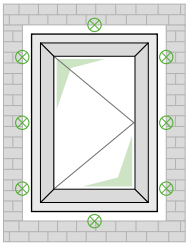
Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandbrick DFK 20.
Poroton: Values determined with smooth coat rendering (except soffit bricks). Clay block supplier: Wienerberger.

All information is non-binding and without guarantee.

Design Values Systems FB and FL
90° to the Window Plane

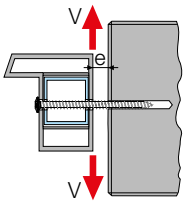
Constraints

Free screw length (e)	Up to 20 mm (joint width + any profiling depth)
Pre-drilling diametrer and type	Depending on the substrate, see “Installation instructions”
Of blocking	In lime sandstone, concrete and aerated concrete ≥ PP 4, no blocking is required. For all other substrates, blocking is required
Profile extensions	Must be rigidly attached to frame profile, extension must be reinforced
Masonry strength classes	Values can be used for higher strength classes

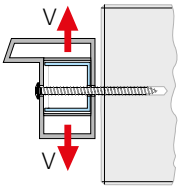


Fastening umlaufend

Arrangement and force direction



In the substrate						Transverse load	
Building material	**Type/ Class**	**Fastening**	**Min. screw-in depth $ET_{min.}$ (mm)**	**Min. edge distance $c_{min.}$ (mm)**	**Tested acc. to**	**Permissible load $F_{empf.}$ (kN)**	**Design load F_{Rd} (kN)**
Concrete	C20/25	FB-7,5×L	40 1)	50	MO-02/1	1,69	1,90
			40	60		1,91	1,91
Lime sandstone	DFK 20		40	50		0,88	1,23
			40	60		1,90	1,90
Clay block Poroton-T8	DFK 6		235	100		0,59	0,63
Clay block Poroton-T8-P	DFK 6		235	100		0,38	0,38
Clay block Poroton-T10	DFK 8		120	100		0,37	0,52
			235	100		0,72	1,01
Clay block Poroton-T12	DFK 10		120	100		0,38	0,53
			235	100		0,66	0,93
Aerated concrete	PP 2	FL-9×L	160	60		0,37	0,52
			160	100		0,48	0,60
	PP 4		160	60		0,75	0,77
		FB-7,5×L	90	80		0,56	0,78
Wood	C24		40	40		0,95	0,95



In the window frame				Transverse load	
Building material	**Type/ Class**	**Fastening**	**Tested acc. to**	**Permissible-load $F_{empf.}$ (kN)**	**Design load F_{Rd} (kN)**
PVCu reinforced	1,5 mm	FB-7,5×L	MO-02/1	2,39	2,39
PVCu reinforced square	1,5 mm	FL-9×L		2,60	2,60
PVCu, unreinforced	2)			1,39	1,39
Softwood SPF 3)	400 kg/m³			2,31	2,31

1) For concrete, the screw-in depth (ET) is min. 40 mm to max. 60 mm.
If the ET for concrete is higher than 60 mm, pre-drilling with D = 6.5 mm is recommended. Please note that the load values change when increasing the drill diameter. Please send your enquiry for the application separately.
2) Profile Type: Aluplast energeto® 8000
3) SPF = Spruce, Pine, Fir. Required dcrew-in depth in the wood: min. 41 mm

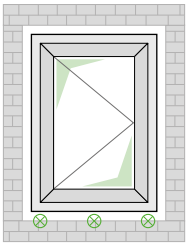
Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandbrick DFK 20.
Poroton: Values determined with smooth coat rendering (except soffit bricks). Clay block supplier: Wienerberger.

All information is non-binding and without guarantee.

Design Values Systems JB-W
90° to the Window Plane

Boundary conditions

Distance top edge angle to frame	Up to 20 mm
Tested profile extensions	Veka Softline 82 mm, reinforced square 1,5 mm Stadur Stadurlon 82 mm
Connection profile extensions	Must be designed to be bend-resistant. Selected: • PVCu: 4 × SPC4-5,5×L, screwing from the extension into the frame, distance 40/200 mm • Stadurlon: 4 × BS-4,8×L, screwing from the extension into the frame, distance 40/200 mm The profile extensions must have sufficient load-bearing capacity. PVCu profiles must be reinforced
Bracket attachment	PVCu reinforced: 2 × FB-FK-7,5×42 Stadurlon: 2 × FB-FK-7,5×62 Concrete: 6 mm, impact drilling
Pre-drill diameter and type	PVCu: 4,3 mm for SPC4 into the extension, rotary drilling Stadurlon: 5 mm, into the extension, rotary drilling The values shown are valid within these framework conditions



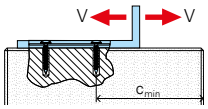

JB-W 70×40


JB-W 120×60


JB-W 100×80

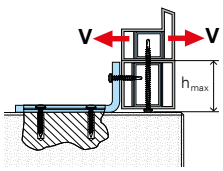
Fastening to the bottom

In the substrate

Arrangement and force direction	Building material	Type/ Class	Fastening	Min. edge distance $c_{min.}$ (mm)	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load $F_{empf.}$ (kN) Compr. 4)	Design load F_{Rd} (kN) Tension 3)	Design load F_{Rd} (kN) Compr. 4)
	Concrete	C20/25	2 × MMS-plus-P-7,5×50	50	MO-02/1	1)	1)	1)	1)
	Lime sandstone	DFK 20							

1) Failure in the JB-W or in the window frame

In the window frame

	Building material	Construction hight 2) $h_{max.}$ (mm)	Type/ Class	Fastening	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load $F_{empf.}$ (kN) Compr. 4)	Design load F_{Rd} (kN) Tension 3)	Design load F_{Rd} (kN) Compr. 4)
	PVCu reinf. square	80	1,5 mm	2 × FB-FK-7,5×42	MO-02/1	1.69	1.09	1.69	1.09
	+ PVC reinforced	120				1.09	0.62	1.09	0.62
	PVCu reinf. square	80	1,5 mm	2 × FB-FK-7,5×62		1.45	1.14	1.45	1.14
	+ Stadurlon	120				0.86	0.71	0.86	0.71

2) Extension incl. possible underblocking
3) Outwards
4) Inwards

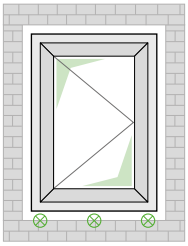
Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandstone DFK 20.

All information is non-binding and without guarantee.

Design Values Systems JB-W/XL
90° to the Window Plane

Boundary conditions

Distance top edge angle to frame	Up to 20 mm
Tested profile extensions	Veka Softline 82 mm, armiert Vierkant 1,5 mm Stadur Stadurlon 82 mm
Connection profile extensions	Must be designed to be bend-resistant. Selected: • PVCu reinforced, construction height 120 mm: 4 × SPC4-5,5×125, screwing from the extension into the frame, distance each 60 and 200 mm from axis bracke • PVCu reinforced, construction height 160 mm: 3 × FB-FK-7,5×182, screwing from the frame into the extension, distance 200 mm • Stadurlon: 4 × BS-4,8×170, respectively BS-4,8×130 (construction heigth of 120 mm), screwing from the extension into the frage, distance 40 mm each and 200 mm from bracket axis The profile extensions must have sufficient load-bearing capacity. PVCu profiles must be reinforced
Bracket attachment	PVCu reinforced: 2 × FB-FK-7,5×42 Stadurlon: 3 × FB-FK-7,5×62
Pre-drill diameter and type	Concrete: 6 mm, impact drilling PVCu: Verbreiterungen und Rahmen: 6 mm für FB, 5,5 mm für SPC4, Drehbohren Stadurlon: 6 mm, into the extension, rotary drilling The values shown are valid within these framework conditions



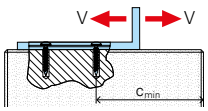
⊗BP

JB-W/XL 140×80

JB-W/XL 140×100

Fastening to the bottom

Arrangement and force direction

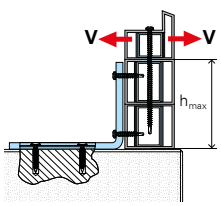


In the substrate

Building material	Type/ Class	Fastening	Min. edge distance $c_{min.}$ (mm)	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load $F_{empf.}$ (kN) Compr. 4)	Design load F_{Rd} (kN) Tension 3)	Design load F_{Rd} (kN) Compr. 4)
Concrete	C20/25	2 × MMS-plus-P-7,5×50	50	MO-02/1	1)	1)	1)	1)
Lime sandstone	DFK 20							

1) Failure in the JB-W/XL or in the window frame

In the window frame



Building material	Construction hight 2) $h_{max.}$ (mm)	Type/ Class	Fastening	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load $F_{empf.}$ (kN) Compr. 4)	Design load F_{Rd} (kN) Tension 3)	Design load F_{Rd} (kN) Compr. 4)
PVCu reinf. square.	120	1,5 mm	3 × FB-FK-7,5×62	MO-02/1	1.53	1.63	1.53	1.63
+ Stadurlon	160				0.67	0.87	0.67	0.87
PVCu reinf. square	120		2 × FB-FK-7,5×42		1.43	1.21	1.43	1.21
+ PVCu reinforced	160				0.72	0.59	0.72	0.59

2) Extension incl. possible underblocking

3) Outwards

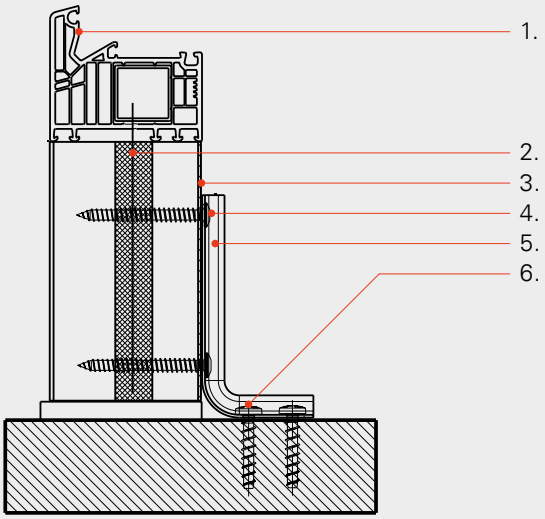
4) Inwards

Remarks

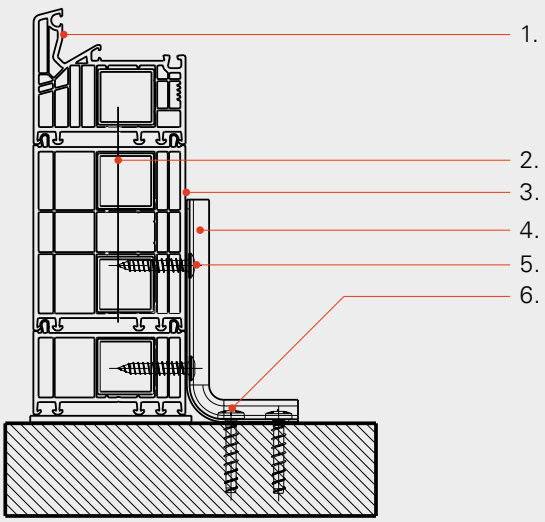
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandstone DFK 20.

All information is non-binding and without guarantee.

Installation Situations JB-W and JB-W/X



Description
1. Window frame
2. Screw BS-4,8×L/BS-6,1×L/FB-FK 7,5×L
3. Additional profile extension Stadur Frame Tec
4. Screw FB-FK 7,5×L
5. Bracket JB-W/JB-W/XL
6. Screw Multi Monti-plus 7,5×L

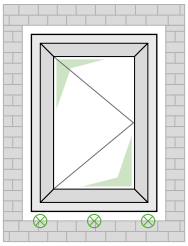


Description
1. Window frame
2. Screw SPC-5,5×L/FB-FK 7,5×L
3. Additional profile
4. Winkel JB-W/JB-W/XL
5. Screw FB-FK 7,5×L
6. Screw Multi Monti-plus 7,5×L

Design Values Systems JB-A
90° to the Window Plane

Boundary conditions

Pre-drill diameter and type	Concrete: 6 mm, impact drilling PVCu: extension and frame, 6 mm rotary drilling Stadurlon: extension 5 mm, frame: 6 mm, rotary drilling
Bracket attachment	PVCu reinforced: 3 × FB-FK-7,5×42, Stadurlon: 4 × FB-FK-7,5×62
Connection profile extensions	Must be designed to be bend-resistant. Selected: 2 × FB-FK-7,5×132 each The profile extensions must have sufficient load-bearing capacity. PVCu profiles must be reinforc.
Distance	Top edge angle to frame: up to 20 mm
Tested extensions	Veka Softline 3 × 82 × 100 mm, reinforced 1,5 mm, screwing from the extension into the frame Stadur Stadurlon 82 × 300 mm, screwing from the frame into the extension
Strut application	On all build-ups, except for arm length of 150 mm to the window frame
Screw-in depth in wood frames	Min. 30 mm The values shown are valid within these framework conditions



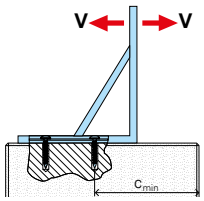

JB-A 150/280 + JB-AS-205


JB-A 190/240 + JB-AS-205


JB-A 150/280

Fastening to the bottom

Arrangement and force direction

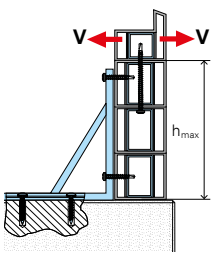


In the substrate

Building material	Type/ Class	Fastening	Min. edge distance $c_{min.}$ (mm)	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load Compr. 4)	Design load F_{Rd} (kN) Tension 3)	Design load Compr. 4)
Concrete	C20/25	2 × FC-7,2×45	60	MO-02/1	1)	1)	1)	1)
		2 × MMS-plus-P-7,5×50	50					

1) Failure in the JB-A or in the window frame

In the window frame



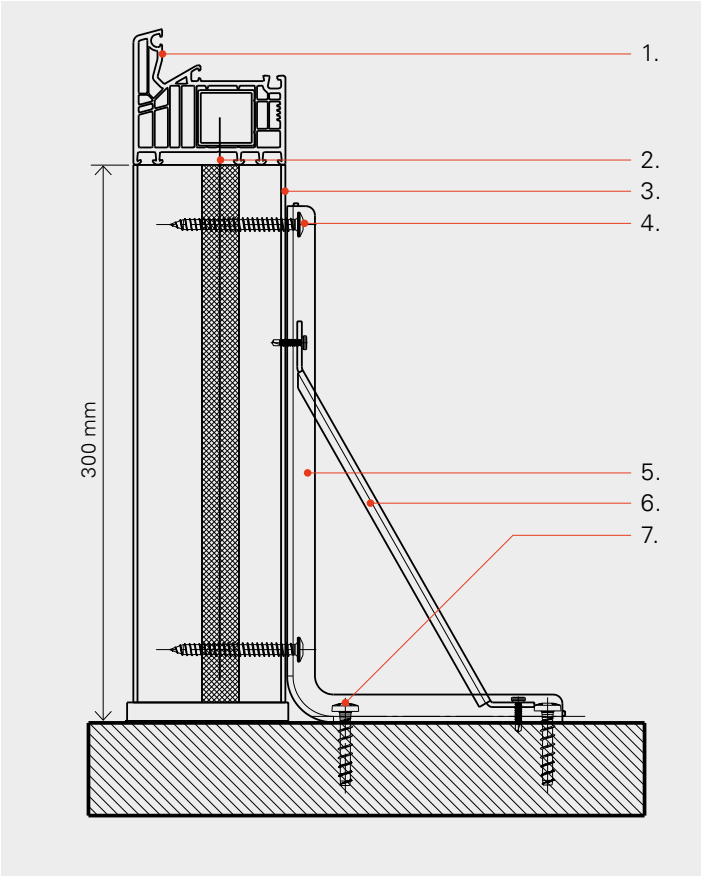
Building material	Type/ Class	Construct. hight 2) $h_{max.}$ (mm)	Fastening	Tested acc. to	Transverse load: Permissible load $F_{empf.}$ (kN) Tension 3)	Permissible load Compr. 4)	Design load F_{Rd} (kN Tension 3)	Design load Compr. 4)
PVCu reinforced + PVCu reinforced	1,5 mm	260	3 × FB-FK-7,5×42	ETB	0.92	0.61	0.92	0.61
PVCu reinforced + Stadurlon		300	4 × FB-FK-7,5×62		0.61	0.47	0.61	0.47

2) Extension incl. possible underblocking
3) Outwards
4) Inwards

Remarks
Testing and evaluation were carried out in accordance with MO-02/1, June 2015 edition.
In the case of a penetrating downward fastening, the frame profile must be adequately sealed.
Concrete: Values determined in tests in lime sandstone DFK 20.

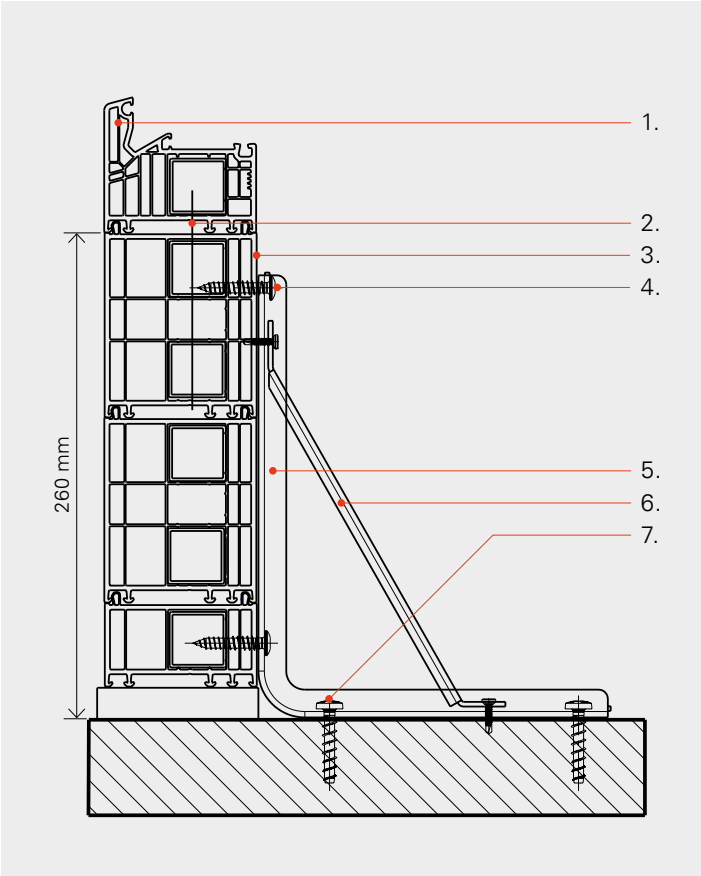
All information is non-binding and without guarantee.

Installation Situations JB-A



PVCu reinforced + Stadurlon

1. Window frame
2. Screw FB-FK 7,5×L
3. Additional profile extension Stadur
4. Screw FB-FK 7,5×L
5. Bracket JB-A
6. Strut JB-AS 205
7. Screw Multi Monti-plus 7,5×L



PVCu reinforced

1. Window frame
2. Screw SPC4-5,5×L/FB-FK-7,5xL
3. Additional profile
4. Screw FB-FK 7,5×L
5. Bracket JB-A
6. Strut JB-AS 205
7. Screw Multi Monti-plus 7,5×L

Test Reports and Installations Instructions Systems FB and FL

Application	System	What	Substrate/Remark	Institut	No.	Year	Link	QR-Code
Installation in the wall, Standard	FB	Component testing acc. to MO-02/1	Vertical perforated clay block Plan-T10-30.0-10DF	ift	14-004099-PR02	2015	www.sfs.com/bc_141	
Installation in the wall, Break-in resistance	FB	RC2 acc. to DIN EN 1627:2011	Brick work ≥ DFK12, with back lining	ift	18-002193-PR02	2018	www.sfs.com/bc_143	
Installation in the wall, Standard	FL	Installation instruction	Aerated concrete PP2	–	–	2020	www.sfs.com/bc_154	
Installation in the wall, Break-in resistance	FL	RC2 acc. to DIN EN 1627:2011		ift	18-002501-PR01	2018	www.sfs.com/bc_155	

Further test reports and installation manuals available in German Language

Test Reports and Installations Instructions Systems JB-W, JB-W/XL and JB-A

Application	System	What	Substrate/Remark	Institut	No.	Year	Link	QR-Code
Safety Barrier	JB-W, JB-W/XL, JB-A	Proof	ETB	ift Rosen-heim	19-004079-PR01 20-001405-PR01	2020	www.sfs.com/bc_107	
Threshold fastening	JB-A	Installation manual	Concrete/ Limesandstone	–	–	2020	www.sfs.com/bc_108	
Threshold fastening	JB-W	Installation manual	Concrete/ Limesandstone	–	–	2020	www.sfs.com/bc_109	
Threshold fastening	JB-W/XL	Installation manual	Concrete/ Limesandstone	–	–	2021	www.sfs.com/bc_113	
Threshold fastening	JB-A	Proof	MO-02	ift Rosen-heim	19-002573-PR04	2020	www.sfs.com/bc_110	

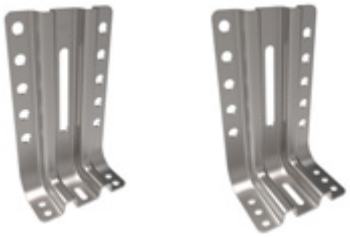
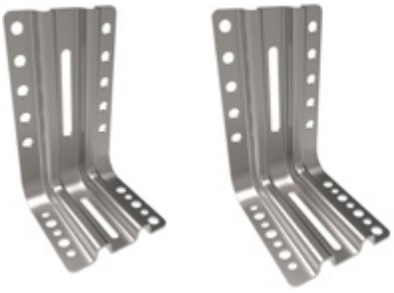
Further test reports and installation manuals available in German Language

Delivery Range FB and FL

Product	Designation	Code	Recess	Ø (mm)	Length (mm)	PU (pcs.)	Item no.
	FB Universal frame anchor Type **FK**	FB-FK-7,5×L	T30	7,5	42	100	1117989
					62		1117987
					72		1115791
					82		1115795
					92		1117985
					102		1117984
					112		1117982
					122		1115797
					132		1089936
					152		1115545
					182		1115546
					212		1117981
					252	50	1322555
					300		1175443
					350		1563818
					400		1563819
	FB Universal frame anchor Type **ZK**	FB-ZK-7,5×L	T30	7,5	42	100	533628
					62		533630
					72		533631
					82		533633
					92		533634
					102		533635
					112		533636
					122		533637
					132		533641
					152		533647
					182		533648
					212		533649
					252	50	1504218
					300		1504217
	FB Universal frame anchor Type **SK**	FB-SK-7,5×L	T30	7,5	42	100	1622825
					62		1622827
					72		1622828
					82		1622841
					92		1622843
					102		1622844
					112		1622846
					122		1622848
					132		1622849
					152		1622855
					182		1622857
					212		1622858
					252	50	1504216
					300		1107630
	FL Special frame fastener Type **FK**	FL-FK-9×L	T30	9,0	245	50	1580711
					300		1580718

Product	Designation	Code	Ø (mm)	Colour	PU (pcs.)	Item no.
	Cover caps, only for Type **SK**	CC-FB-RAL9010	10,5	White	100	283394
		CC-FB-RAL1015		Beige		633956
		CC-FB-RAL7035		Grey		935450
		CC-FB-RAL8014		Chestnut		633957
		CC-FB-RAL9005		Black		839147

Delivery Range Systems JB-W, JB-W/XL and JB-A

Product	Designation	Code	Length/s (mm)	Width (mm)	PU (pcs.)	Item no.
	JB-W Mounting bracket	JB-W-70×40	70/40	55	50	1653822
		JB-W-120×60	120/60			1653823
		JB-W-100×80	100/80			1653824
140×40 140×60 	JB-W/XL Mounting bracket	JB-W/XL-140×40	140/40	80	50	1573530
		JB-W/XL-140×60	140/60			1573575
140×80 140×100 		JB-W/XL-140×80	140/80			1691959
		JB-W/XL-140×100	140/100			1691946
	JB-A Mounting bracket	JB-A-150×280	150/280	47	25	1548812
		JB-A-190×240	190/240			1548789
	JB-A Strut	JB-AS-205	205	20		1548811

Accessories for Systems FB, FL, JB-W, JB-W/XL, JB-A

Product	Designation	Code	Recess	Ø (mm)	Length (mm)	PU (pcs.)	Item no.
	Drill screw BS	BS-4,8×L	T25	4,8	70	250	1261140
					100		1261144
					120		1261146
					170		1261151
					220		1261154
					300		1261157
		BS-6,1×L		6,1	70		1352562
					100		1352565
					120		1351286
					170		1352567
					220		1352579
					300		1352583
	Coupling screw SPC	SPC4-5,5×L	T25	5,5	45	100	1133336
					55		1133777
					65		1133778
					75		1133779
					85		1133780
					95		1133782
					105		1133783
					125		1384747
					150		1384501
	VAP mounting screw for wood and PVCu, not reinforced	VAP-6,0×40	T30	6,0	40	100	1147091
	MULTI-MONTI-plus-P for concrete and limesandstone	MMS-plus-P-7,5×50	T30	7,5	50	100	1480041
		P-7,5×60			60		1480042

Product	Designation	Code	Recess	Ø (mm)	Length (mm)	PU (pcs.)	Item no.
	Bit T25	T25-25-Hex¼"	T25	¼"	25	10	24008
	Bit T30	T30-50-Hex¼"	T30	¼"	50	1	57539
	Bit T30	T30-90-Hex¼"	T30	¼"	90	1	654613
	Special drill for vertical perforated clay block	ZSD-5,0×400/300		5,0	400	1	1514297
		ZSD-5,5X400/300		5,5			1488880

SFS intec AG | Division Construction | Rosenbergsaustrasse 20 | 9435 Heerbrugg | construction@sfs.com | www.sfs.com