

**Roto FS** Kempton  
Stainless-steel friction stays  
for outward opening windows




Installation, maintenance and operation instructions  
for aluminium, PVC and timber profiles



## Contact

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# 1 General information

## 1.1 Version history

Version	Date	Changes
v0	04/11/2020	Publication

## 1.2 Instructions

This manual contains important information, instructions, application diagrams (max. sash sizes and weights) and assembly instructions for the installation, maintenance and operation of hardware.

The information and instructions contained in this document refer to products belonging to the Roto hardware system named on the front page.

All steps must be completed in sequence.

The following documents apply in addition to these instructions:

- Outward opening catalogue: CTL\_90
- Handles catalogue: CTL\_1

The following guidelines also apply:

### **Gütegemeinschaft Schlösser und Beschläge e.V.**

- Directive TBDK: Attachment of supporting fitting components for turn-only and tilt&turn fittings
- Directive VHBE: Hardware for windows and balcony doors – Guidelines/ advice for end-users
- Directive VHBH: Hardware for windows and balcony doors – Guidelines/ advice on the product and on liability

### **VFF (German Window and Facade Association)**

- TLE.01: Correct handling of ready-to-install windows and external doors during transport, storage and installation
- WP.01: Maintenance of windows, facades and external doors – Maintenance, care and inspection – Information for sales
- WP.02: Maintenance of windows, facades and external doors – Maintenance, care and inspection – Measures and documents
- WP.03: Maintenance of windows, facades and external doors – Maintenance, care and inspection – Maintenance agreement

### **Additional guidelines**







- Instructions and information issued by profile manufacturers, e.g. manufacturers of windows and balcony doors
- Instructions and information issued by screw manufacturers
- The applicable regulations, directives and national laws

### **Storing the instructions**

These instructions are an important part of the product. The instructions must be stored so that they are always to hand.

### **Explanation of the markings**

The manual uses the following markings for emphasis (e.g. in figures or instructions):

Marking	Meaning
	Sash
	Frame
	Drill holes, routing or screw positions
	Unaffected components Indirectly affected components
	Components that have just been described Arrows or movements
	Item number
[1]	Legend
[A]	Steps



### INFO

Any dimensions without a unit in the instructions are given in millimetres (mm). Other units of measurement are clearly indicated by the presence of the differing unit.












### INFO


Figures are provided in the right-hand version (DIN 107).

## 1.3 Symbols












Symbol	Meaning
■	First-level list
□	Second-level list
→	(Cross-)reference
▷	Result
►	Unnumbered step
1.	Numbered step
a.	Numbered second-level step
⇒	Requirement

## 1.4 Pictographs

Symbol	Meaning
	Sash rebate width
	Sash rebate height
	Sash weight
 	Aluminium
 	Timber
 	PVC

Symbol	Meaning
	Timber, PVC and aluminium

## 1.5 Product features

Symbol	Meaning
	Description
	DIN left / right
	Sash rebate width
	Sash rebate height
	Sash weight
	Size
	Information
	Material number
	Maximum opening angle (degrees)
	Opening angle (mm)
	Scissor stay length
	Track width
	Stack height
	Packaging unit

## 1.6 Abbreviations

Abbreviation	Meaning
approx.	approximately
CTL	Catalogue
DIN L / R	DIN left / right
d <sub>k</sub>	Screw head diameter
T&T	Tilt&Turn
SEW	Sash external width
SEH	Sash external height
RC	Rebate clearance

Abbreviation	Meaning
SRW	Sash rebate width
SRH	Sash rebate height
S.kg	Sash weight
HV	Height adjustment
IMO	Installation instructions
Y	Yes
kg	Kilograms
max.	Maximum
mm	Millimetres
N	No
Nm	Torque in newton metres
FIW	Frame internal width
FIH	Frame internal height
FgD	Frame groove insertion depth
SH	Side-Hung
TH	Top-Hung
e.g.	For example

## 1.7 Target groups

The information in this document is directed at the following target groups:

### Hardware dealers

The “hardware dealers” target group includes all companies and individuals that purchase hardware from hardware manufacturers for resale, without modifying or further processing the hardware.

### Window and balcony door manufacturers

The “window and balcony door manufacturers” target group includes all companies and individuals that purchase hardware from hardware manufacturers or hardware dealers and further process the hardware by integrating it in windows and balcony doors.

### Building element dealers or installation companies

The “building element dealers or installation companies” target group includes all companies and individuals that purchase windows and balcony doors from window and balcony door manufacturers for resale and for installation in construction projects, without modifying the windows or balcony doors.

### Builders

The “builders” target group includes all companies and individuals who place orders for the manufacture of windows and balcony doors for installation in their construction projects.

### End users

The “end users” target group includes all individuals who use the installed windows and balcony doors.

## 1.8 Target groups' obligation to give instructions



### INFO

Each target group must fulfil their obligation to give instructions in full.

Unless specified otherwise in the text below, documents and information can be passed on as a printed document, on a data storage device or via the Internet.

### Responsibility of hardware dealers

Hardware dealers must pass the following documents on to the window and balcony door manufacturer:

- Catalogue
- Installation, maintenance and operation instructions
- Directive on attachment of supporting fitting components for turn-only and tilt&turn fittings (TBDK)
- Guidelines/advice on the product and on liability (VHBH)
- Guidelines/advice for end-users (VHBE)

### Responsibility of the window and balcony door manufacturer

The window and balcony door manufacturer must pass the following documents on to building element dealers or the builder, even if a subcontractor (installation company) is involved:

- Installation, maintenance and operation instructions
- Directive on attachment of supporting fitting components for turn-only and tilt&turn fittings (TBDK)
- Guidelines/advice on the product and on liability (VHBH)
- Guidelines/advice for end-users (VHBE)

They must ensure that the end users are provided with the documents and information intended for them in printed format.

### Responsibility of building element dealers and the installation company

Building element dealers must pass the following documents on to the builder, even if a subcontractor (installation company) is involved:

- Installation, maintenance and operation instructions (with a focus on hardware)
- Guidelines/advice on the product and on liability (VHBH)
- Guidelines/advice for end-users (VHBE)

### Responsibility of the builder

The builder must pass the following documents on to the end user:

- Installation, maintenance and operation instructions (with a focus on hardware)
- Guidelines/advice for end-users (VHBE)

## 1.9 Copyright protection

The contents of this document are copyright-protected. This content can be used when working with the hardware. Any other use is not permitted without written permission of the manufacturer.

## 1.10 Limitation of liability

All information and instructions contained in this document have been compiled in consideration of the applicable standards and regulations, the latest developments in technology and many years of knowledge and experience.

The hardware manufacturer assumes no liability for damage caused by:

- Failure to comply with this document and all product-specific documents and other applicable directives (see the chapters entitled "Security" and "Stipulated use").
- Improper use / misuse (see the chapters entitled "Security" and "Stipulated use").
- Insufficient invitation to tender, non-compliance with installation specifications and non-compliance with the application diagrams (where available).
- Increased contamination.

Claims made by third parties against the hardware manufacturer on account of damage resulting from misuse or failure to comply with the obligation to give instructions on the part of hardware dealers, window, door and balcony door manufacturers and building element dealers or the builder are passed on accordingly.

The obligations agreed in the delivery contract, the general terms and conditions, the hardware manufacturer's terms and conditions of delivery and the legal provisions applicable when the contract was concluded shall apply.

The warranty only covers original Roto components.

We reserve the right to make technical changes as part of improvement to performance characteristics and further development.

## 1.11 Preserving the surface finish



### ATTENTION

#### **Surface treatments may cause property damage.**

Surface treatments (e.g. painting and varnishing) on elements can damage components or prevent them from working properly.

- ▶ For masking, only use adhesive tape that does not damage the paint coats. Consult the manufacturer if in doubt.
- ▶ Protect components against direct contact with the surface treatment.
- ▶ Protect components against contamination.





#### ATTENTION

##### **Using incorrect cleaning agents and sealing compounds may cause property damage.**

Cleaning agents and sealing compounds may damage the surfaces of components and gaskets.

- ▶ Do not use aggressive or flammable liquids, acidic cleaners or abrasive cleaners.
- ▶ Only use mild, pH-neutral cleaning agents that have been diluted.
- ▶ Apply a thin protective film to the components, for example using a cloth soaked in oil.
- ▶ Avoid aggressive vapours (e.g. produced by formic acid, acetic acid, ammonia, amine compounds, ammonia compounds, aldehyde, carboic acid, chlorine, tannic acid) around the element.
- ▶ Do not use any acetic acid-crosslinking or acid-crosslinking sealing compounds or those with the aforementioned constituents as both direct contact with the sealing compound and its fumes can corrode the surface of the components.



#### ATTENTION

##### **Contamination may cause property damage.**

Contamination prevents components working properly.

- ▶ Remove deposits and contamination caused by construction materials (e.g. plaster, gypsum).
- ▶ Keep components free of deposits and contaminants.



#### ATTENTION

##### **(Permanently) damp room air may cause property damage.**

Damp room air can lead to mould growth and corrosion caused by condensation.

- ▶ Provide adequate ventilation for components, particularly during the construction phase.
- ▶ Intensively air out the room several times per day by opening all elements for approximately 15 minutes. If intensive airing is not an option, place the elements in the tilt position and provide airtight masking inside the room, e.g. if there is fresh screed that cannot be walked on or must not be exposed to draughts. Discharge any humidity present in the room air to the outside using condensation dryers.
- ▶ Establish a ventilation plan for more complex construction projects if necessary.
- ▶ Provide adequate ventilation during holiday periods as well.

## 2 Security

This manual contains instructions relating to safety. The principal safety information in this chapter includes information and instructions relevant to the safe use or maintaining the safe condition of the product. Warning instructions that relate to handling warn of residual risks and are located before steps that are relevant to safety.

- Follow all of the instructions in order to prevent personal injury and property and environmental damage.

### 2.1 Presentation and structure of warning instructions

The warning instructions relate to individual actions and are structured as follows with a warning symbol:



#### **DANGER**

##### **Nature and source of the danger.**

Explanation and description of the danger and the implications.

- Measures to take to avert the danger.

### 2.2 Security levels of warning instructions

The warning instructions that relate to handling are identified differently according to the severity of the associated danger. The signal words and the associated warning symbols used are clarified below.



#### **DANGER**

##### **Immediate risk of death or serious injuries.**

- Observe these warning instructions to avoid personal injuries.



#### **WARNING**

##### **Potential risk of death or serious injuries.**

- Observe these warning instructions to avoid personal injuries.



#### **CAUTION**

##### **Risk of injuries**

- Observe these warning instructions to avoid personal injuries.



#### **ATTENTION**

##### **Reference to property or environmental damage.**

- Observe these warning instructions to avoid property or environmental damage.

### 2.3 Stipulated use

Outward opening hardware is hardware for outward opening windows in building construction. This hardware is used to open window sashes and balcony door sashes by actuating a hand lever.

Outward opening hardware may be used on vertically installed windows made of timber, PVC, aluminium or steel, or corresponding combinations of the aforementioned materials.

When closing a sash and locking the hardware, the gasket counter force must generally be overcome.



Stipulated use also includes compliance with all safety information and specifications contained in these instructions, the other applicable documents and the applicable regulations, directives and national laws.

Any use and processing of the products that goes beyond or differs from the stipulated use is considered misuse and can lead to hazardous situations. The product can be used without restrictions under the warranty if the stipulated use is adhered to.

Note the following usage restriction: open window sashes and balcony door sashes, and window sashes and balcony door sashes that are unlocked or placed in ventilation positions, only have a shielding effect.



#### **WARNING**

##### **Opening and closing sashes in an uncontrolled manner may pose a risk of death!**

Opening and closing the sash in an uncontrolled manner may lead to serious injuries.

- ▶ When operating the sash, do not lean too far outward.
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.



#### **ATTENTION**

##### **Opening and closing sashes in an uncontrolled manner may result in property damage.**

Opening and closing the sash in an uncontrolled manner may cause the element to malfunction.

- ▶ When opening the sash, watch out for obstacles on the building (e.g. window sills, protruding roller shutter boxes, etc.).
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.

No claims can be made on account of damage resulting from failure to comply with the stipulated use.

### **2.3.1 Misuse**

Any use and processing of the products that goes beyond or differs from the stipulated use is considered misuse and can lead to hazardous situations.



#### **WARNING**

##### **Misuse may pose a risk of death!**

Misuse and incorrect installation of hardware can lead to serious injuries.

- ▶ Only use hardware combinations that have been approved by the hardware manufacturer.
- ▶ Only use original accessories or those that have been approved by the hardware manufacturer.
- ▶ Note the product-related documentation → *from page 7*.

### **2.3.2 Usage restriction**

Open window sashes, and windows that are unlocked or placed in ventilation positions, only have a shielding effect. They do not meet the following requirements:

- Joint sealing

- Driving rain impermeability
- Sound insulation
- Thermal insulation
- Burglary inhibition

## 2.4 Stipulated use for end users

Outward opening hardware is hardware for outward opening windows in building construction. This hardware is used to open window sashes and balcony door leaves by actuating a hand lever.

When closing a sash and locking the hardware, the gasket counter force must generally be overcome.



### **WARNING**

#### **Opening and closing sashes in an uncontrolled manner may pose a risk of death!**

Opening and closing the sash in an uncontrolled manner may lead to serious injuries.

- ▶ Ensure that the sash does not collide with the frame, opening restrictor (buffer) or other sashes when it is moved into the fully open or closed position.
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.



### **ATTENTION**

#### **Opening and closing sashes in an uncontrolled manner may result in property damage.**

Opening and closing the sash in an uncontrolled manner may cause the element to malfunction.

- ▶ Ensure that the sash does not collide with the frame, opening restrictor (buffer) or other sashes when it is moved into the fully open or closed position.
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.

Any use and processing of the products that goes beyond or differs from the stipulated use is considered misuse and can lead to hazardous situations.

No claims of any kind can be made on account of damage resulting from failure to comply with the stipulated use.

### 2.4.1 Misuse

Any use and processing of the products that goes beyond or differs from the stipulated use is considered misuse and can lead to hazardous situations.



### **WARNING**

#### **Misuse may pose a risk of death!**

Misuse and incorrect installation of hardware can lead to serious injuries.

- ▶ Only use hardware combinations that have been approved by the hardware manufacturer.
- ▶ Only use original accessories or those that have been approved by the hardware manufacturer.
- ▶ Note the product-related documentation → *from page 7*.



## 2.5 Basic safety information

The following hazards may arise when handling the product:

### 2.5.1 Installation

#### **Incorrect installation poses an immediate risk of death or serious injuries.**

Incorrect installation or assembly of hardware can lead to hazardous situations or property damage. Depending on the height of the fall, this can result in serious to life-threatening injuries and glass breakage.

- ▶ Only use hardware combinations that have been approved by the hardware manufacturer.
- ▶ Only use original accessories or those that have been approved by the hardware manufacturer.
- ▶ Always have installation performed by a specialist company.

#### **Heavy loads pose a risk of injury.**

Lifting and carrying heavy loads may lead to injuries in the event of a fall or physical overexertion.

- ▶ Note the applicable accident prevention regulations.
- ▶ Transport heavy loads with two people and use suitable transportation means (such as an industrial truck).

#### **Physical strain may cause damage to health.**

Moving heavy loads for extended periods leads to physical injury in the long term.

- ▶ When carrying and lifting by hand, comply with a maximum weight of 25 kg for men and 10 kg for women.
- ▶ Carry and lift even small loads with an ergonomically correct posture.

### 2.5.2 Use

#### **Falls from open windows and balcony doors present an immediate risk of death and pose the risk of serious injuries.**

Opened sashes of windows and balcony doors create a danger zone. Depending on the height of the fall, this can result in serious to life-threatening injuries and glass breakage.

- ▶ Take care when in the vicinity of open windows and balcony doors.
- ▶ Keep children and anyone unable to understand the risks away from the hazardous area.

#### **Trapping body parts in the opening between sash and frame may lead to serious injuries.**

Gripping between the sash and frame when closing windows and balcony doors poses the risk of crushing injuries.

- ▶ When closing windows and balcony doors, never grip between the sash and frame and always exercise caution.

- ▶ Keep children and anyone unable to understand the risks away from the hazardous area.

**Opening and closing sashes improperly poses the risk of injury and property damage.**

Incorrect opening and closing of sashes can result in serious injuries and substantial property damage.

- ▶ When moving the sash, ensure that it will not slam against the frame or other sashes once fully opened or closed.
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.
- ▶ When closing a sash and locking the hardware, the gasket counter force must be overcome.
- ▶ If no opening restrictor is used, the sash may close in an uncontrolled manner. Ensure that the sash does not strike any obstacles.

**Misuse poses a risk of injury and property damage.**

Misuse can lead to hazardous situations and may destroy the hardware, frame materials or other individual components within the windows or balcony doors.

- ▶ Do not introduce any obstacles in the opening area between the frame and window or balcony door sashes.
- ▶ Do not place additional loads on windows and balcony door sashes.
- ▶ Refrain from intentionally or uncontrollably slamming or pushing the window or balcony door sash against the window reveal.

**Improper maintenance poses the potential risk of injury and property damage.**

Windows and balcony doors, including the hardware, require expert maintenance (care, cleaning, maintenance and inspection) in order to guarantee their proper condition and safe use.

- ▶ Keep the hardware free of deposits and contaminants.
- ▶ Carry out care and cleaning tasks as specified in these instructions.
- ▶ Always have regular maintenance, adjustment and repair work carried out by a specialist company.

## **2.5.3 Ambient conditions**

**Physical and chemical influences may result in property damage.**

Hardware components can be permanently damaged to the point that they can no longer function in a saline, aggressive or corrosive environment.

- ▶ Do not use the hardware components in a saline, aggressive or corrosive environment.
- ▶ Carry out care and cleaning tasks as specified in these instructions.
- ▶ Corrosion protection must be inspected by an authorised specialist company as part of regular maintenance work.

**Moisture may cause property damage.**

Depending on the outside temperature, relative humidity of the room air and installation conditions for the windows and balcony doors, a temporary build-up of condensation may occur. This can lead to corrosion on the hardware and mould growth on the frame or wall. Ambient conditions that are too



damp, particularly during the construction phase, can lead to window elements warping.

- ▶ Avoid preventing the circulation of air (e.g. due to deep reveals, curtains and unfavourable positioning of heaters or the like).
- ▶ Intensively air out the room several times per day.






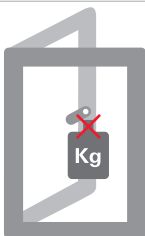


Open all windows and balcony doors for approximately 15 minutes so that the air in the room can be completely replaced.



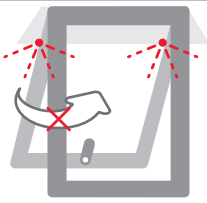
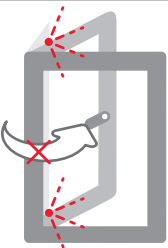
- ▶ Provide adequate ventilation during holiday periods as well.
- ▶ Create a ventilation plan for construction projects if necessary.

## 2.6 Operation

The safety symbols and markings and the associated warning instructions explained below apply to the safe operation of windows and balcony doors.

### Safety symbols and markings

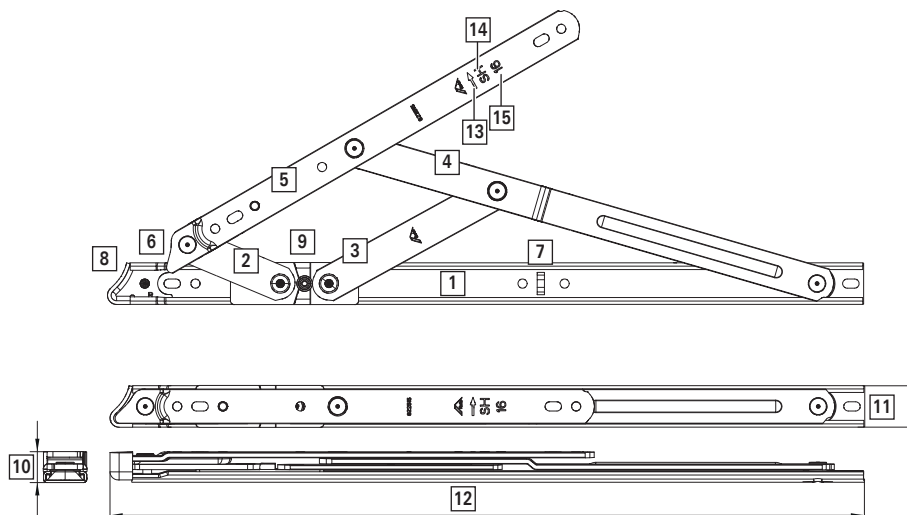
Symbol		Meaning
Top-Hung	Side-Hung	
		<p><b>Falls from open windows and balcony doors present an immediate risk of death and pose the risk of serious injuries.</b></p> <p>Take care when in the vicinity of open windows and balcony doors.</p> <p>Keep children and anyone unable to understand the risks away from the hazardous area.</p>
		<p><b>Trapping body parts in the opening between sash and frame may lead to serious injuries.</b></p> <p>When closing windows and balcony doors, never grip between the sash and frame and always exercise caution.</p> <p>Keep children and anyone unable to understand the risks away from the hazardous area.</p>
		<p><b>Placing additional loads on the sash may lead to minor injuries and property damage.</b></p> <p>Avoid placing additional loads on the sash.</p>
		<p><b>The impact of wind may lead to minor injuries and property damage.</b></p> <p>Avoid exposing the open sash to wind.</p> <p>Close and lock the window and balcony door sash in windy or draughty conditions.</p>

Symbol		Meaning
Top-Hung	Side-Hung	
		<p><b>Introducing obstacles into the opening between sash and frame may result in minor injuries and property damage.</b></p> <p>Avoid introducing obstacles into the opening between sash and frame.</p>
		<p><b>Pressing the sash against the edge of an opening (reveal) may pose a risk of minor injuries and cause property damage</b></p> <p>Refrain from pressing the sash against the edge of an opening (reveal).</p>



## 3 Information on the product









### 3.1 General hardware characteristics











- |                 |                          |                                       |                        |
|-----------------|--------------------------|---------------------------------------|------------------------|
| [1] Guide track | [5] Scissor stay arm     | [9] Brake                             | [13] Opening direction |
| [2] First link  | [6] Scissor stay arm lug | [10] Scissor stay installation height | [14] Opening type      |
| [3] Second link | [7] End stop             | [11] Scissor stay width               | [15] Scissor stay size |
| [4] Third link  | [8] Retraction mechanism | [12] Scissor stay length              |                        |

### Specifications

#### Side-Hung

							
8	HX SH / TH 08	212	23	16	300 – 400	35 kg	±2.5° 50°
10	HX SH 10	261	23	16	350 – 450	40 kg	87°
12	HX SH 12	312	23	16	380 – 570	40 kg	87°
14	HX SH 14	357	23	16	500 – 600	40 kg	87°
16	HX SH 16	413	23	16	550 – 750	45 kg	87°

#### Top-Hung

							
8	HX SH / TH 08	212	23	16	300 – 450	35 kg	±2.5° 50°
10	HX TH 10	261	23	16	300 – 650	35 kg	40°
12	HX TH 12	305	23	16	450 – 800	45 kg	40°
14	HX TH 14	353	23	16	600 – 950	50 kg	40°
16	HX TH 16	414	23	16	750 – 1250	65 kg	50°
22	HX TH 22	565	23	16	1100 – 1500	100 kg	20°
24	HX TH 24	613	23	16	1200 – 1800	120 kg	20°
26	HX TH 26	666	23	16	1450 – 2500	180 kg	20°

### Technical features

- Side-Hung and Top-Hung version of friction stays
- Adjustable friction stays.
- Can be used for a variety of sash formats.
- Sash weights up to max. 180 kg with scissor stay size of 26".
- Surface: class 5 = 480 h corrosion resistance (EN 1670:2007).
- Resistance to repeated opening and closing: class H3 = 20,000 cycles DIN EN 13126-6:2018 or 35,000 cycles JG/T 127:2017.
- Safety in use class 1.

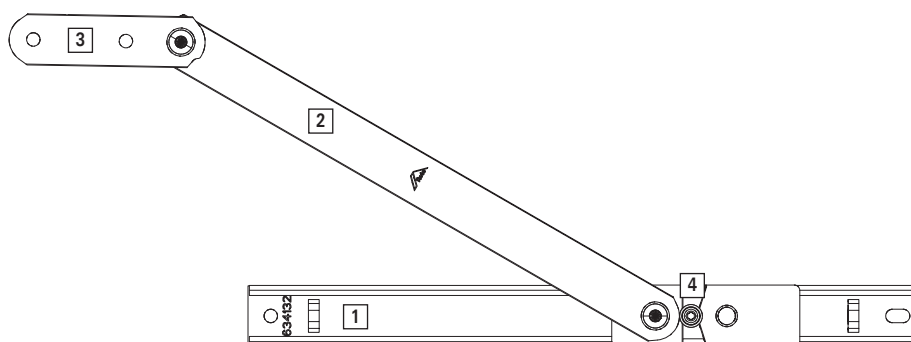
### Advantages

- Specified mounting points enable correct installation simply and quickly.
- Tight sealing in outward opening windows.
- High-performance components are used in the entire scissor stay area. This achieves high operational reliability.

### Benefits

- Simple, reliable operation.
- Ten-year performance warranty.
- Entire room can be used because the window opens outward.

## 3.2 Opening restrictor



- [1] Guide track
- [2] Arm
- [3] Sash bearing
- [4] Brake

### Purpose of use

- To help prevent the window moving by itself or to limit the opening width.

### Operation

In daily use, the sash with the RH version of the Roto FS Kempton opening restrictor is opened until the slider hits the end point.

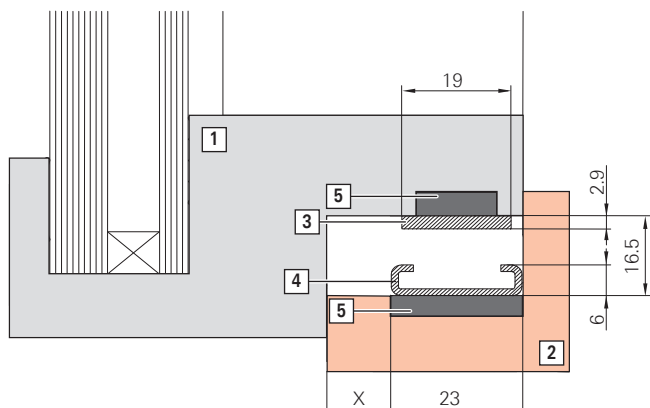


### INFO

Choose a sash opening width that will not cause self-jamming of the sash.



### 3.3 Requirements for the frame and sash



[1] Sash

Tolerance: SEW / SEH  $\pm 1$  mm

[2] Frame

Tolerance: FIW / FIH  $\pm 1$  mm

[3] Scissor stay arm

[4] Guide track

[5] Pressure-resistant packer, if required

[x] As small as possible



#### INFO

Choose the smallest dimension [x] possible so that a maximum opening angle can be achieved.



#### INFO

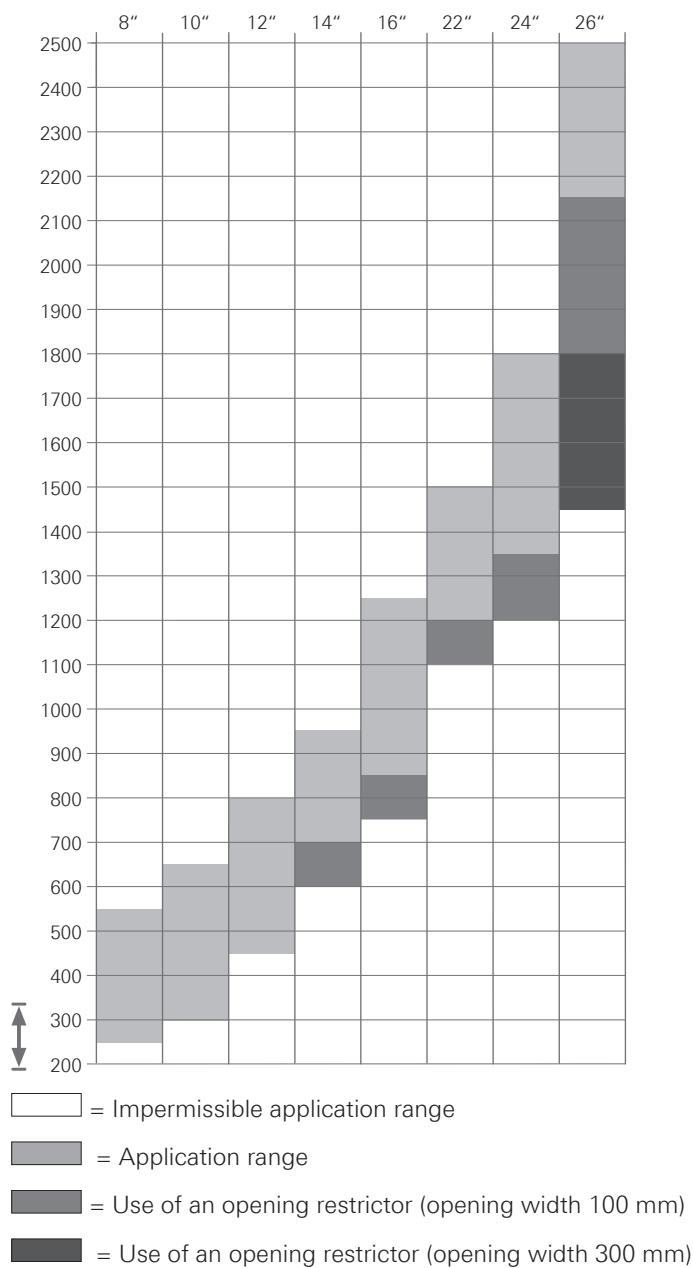
Individual profile assessment by Roto customer service is recommended.

### 3.4 Profile assessment

Roto generally recommends carrying out profile assessments in the form of theoretical and practical tests. Roto customer service can assist with this upon request.

## 3.5 Application ranges

### 3.5.1 Top-Hung selection



#### INFO

Select the scissor stay size so that the SRH is in the middle of the application range.



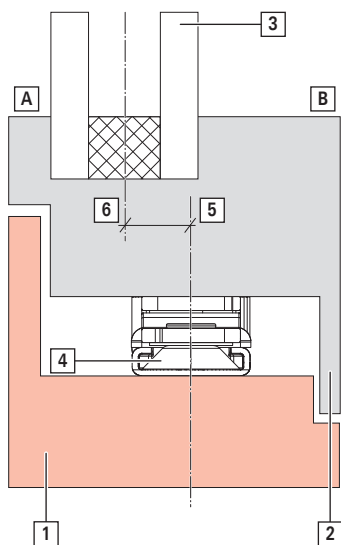
### Opening and closing behaviour – factors

Various factors (such as sash format, sash centre of mass, hardware axis, etc.) influence the behaviour of the sash and therefore operating convenience. The impact of a changing sash centre of mass, for example, is demonstrated below. Other factors such as profile design, installation situation and wind conditions are not taken into consideration at this point.

The opening behaviour is influenced by two factors: sash format (see diagram above) and profile geometry.

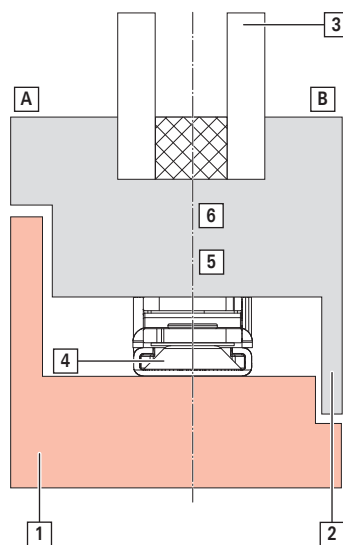
### Example profile geometry

**Sash centre of mass moved inwards in relation to the hardware axis**



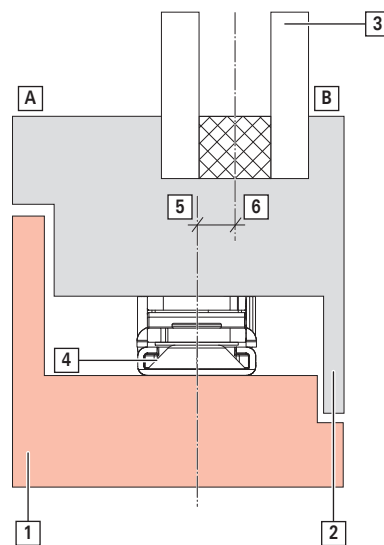
[A] Inside  
 [B] Outside

**Sash centre of mass in alignment with hardware axis – optimal profile structure**



[1] Frame  
 [2] Sash  
 [3] Sash panelling

**Sash centre of mass moved outwards in relation to the hardware axis**



[4] Friction stay  
 [5] Hardware axis  
 [6] Sash axis centre of mass



#### INFO

Sash tends to open in an uncontrolled manner. This becomes worse as the opening angle and width increase.

Recommended: use of an opening restrictor

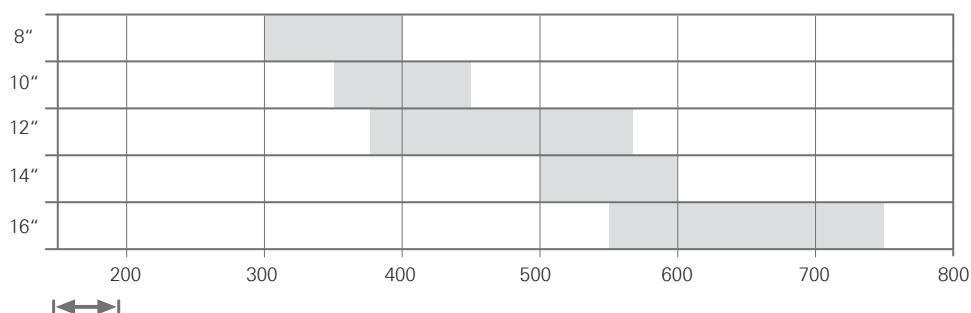


#### INFO

Sash tends to fall back in an uncontrolled manner when opening. This becomes worse as the opening angle and width increase.

Recommended: use of an opening restrictor

### 3.5.2 Side-Hung selection



= Impermissible application range

= Application range

## 3.6 Application diagrams

### 3.6.1 Top-Hung



#### INFO

The middle of the application range is where the operating forces when opening and closing are the most balanced.



#### INFO

If manually operated sashes go beyond the specified application range, contact the technical customer service team.

#### 3.6.1.1 HX SH / TH 08

##### Application range

Basic security		
	Sash rebate height	300 – 450 mm
	Sash weight	35 kg
	Opening angle	max. 50° [1]

#### 3.6.1.2 HX TH 10

##### Application range

Basic security		
	Sash rebate height	300 – 650 mm
	Sash weight	35 kg





[1] Depending on the profile system, only a limited installation sequence may be possible and the brake might not be adjustable.



Basic security		
	Opening angle	max. 40°




### 3.6.1.3 HX TH 12

#### Application range

Basic security		
	Sash rebate height	450 – 800 mm
	Sash weight	45 kg
	Opening angle	max. 40° [2]
	Opening width	max. 500 mm [3]




### 3.6.1.4 HX TH 14

#### Application range

Basic security		
	Sash rebate height	600 – 950 mm
	Sash weight	50 kg
	Opening angle	max. 40°

### 3.6.1.5 HX TH 16

#### Application range

Basic security		
	Sash rebate height	750 – 1250 mm
	Sash weight	65 kg
	Opening angle	max. 50° [4]





[2] Depending on the format and weight, it may be necessary to use an opening restrictor as an additional brake.

[3] The opening width may need to be limited to reduce the operating forces.

[4] Depending on the format and weight, it may be necessary to use an opening restrictor as an additional brake.





### 3.6.1.6 HX TH 22

#### Application range

Basic security		
	Sash rebate height	1100 – 1500 mm
	Sash weight	100 kg
	Opening angle	max. 20° [5]
	Opening width	max. 500 mm [6]





### 3.6.1.7 HX TH 24

#### Application range

Basic security		
	Sash rebate height	1200 – 1800 mm
	Sash weight	120 kg
	Opening angle	max. 20° [7]
	Opening width	max. 500 mm [8]

### 3.6.1.8 HX TH 26

#### Application range

Basic security		
	Sash rebate height	1450 – 2500 mm
	Sash weight	180 kg
	Opening angle	max. 20° [9]
	Opening width	max. 500 mm [10]

[5] Depending on the profile system, only a limited installation sequence may be possible and the brake might not be adjustable.

[6] The opening width may need to be limited to reduce the operating forces.

[7] Depending on the profile system, only a limited installation sequence may be possible and the brake might not be adjustable.

[8] The opening width may need to be limited to reduce the operating forces.

[9] Depending on the profile system, only a limited installation sequence may be possible and the brake might not be adjustable.

[10] The opening width may need to be limited to reduce the operating forces.





3.6.2 Side-Hung

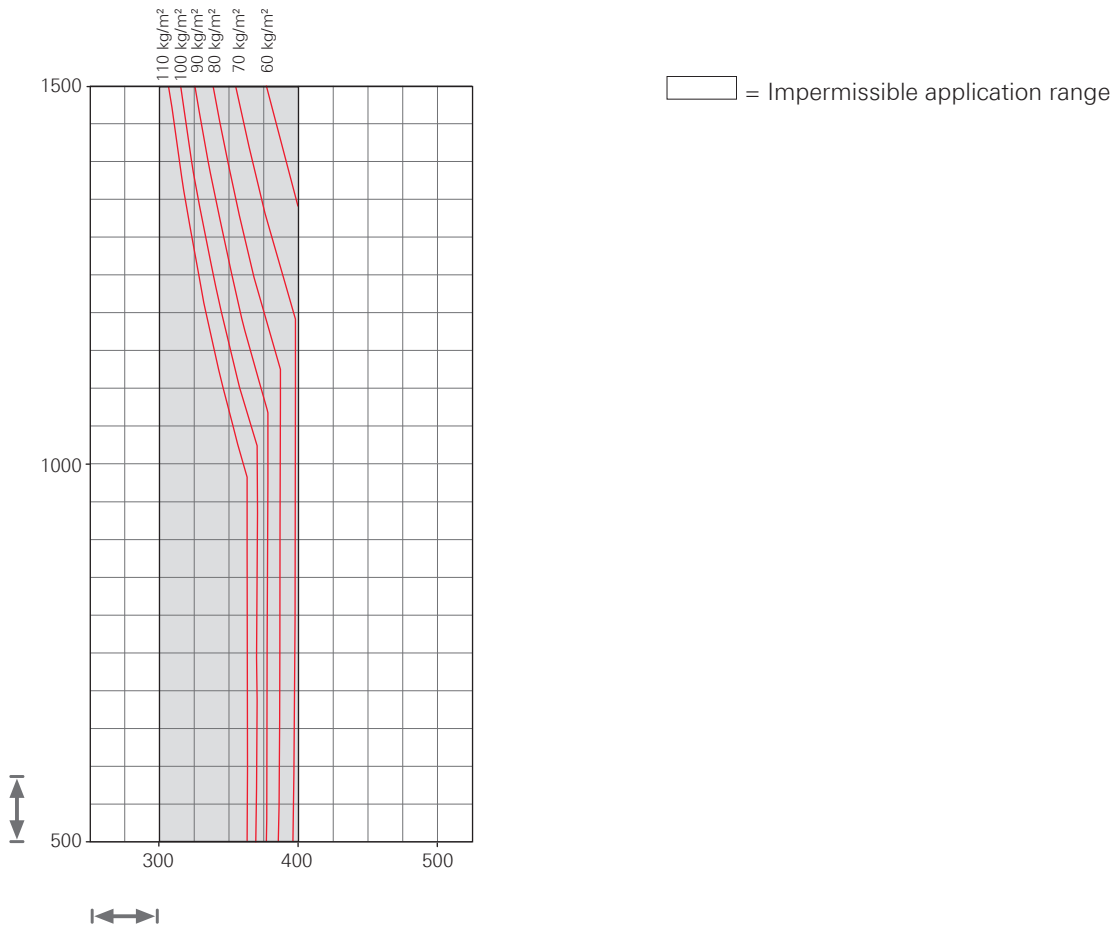


**INFO**  
If manually operated sashes go beyond the specified application range, contact the technical customer service team.



**INFO**  
Lower glass clearance dimensions or higher profile weights require a separate assessment.

3.6.2.1 HX SH / TH 08



The specifications in the application diagram refer to the glass weight in kg/m².

1 mm/m² glass thickness  $\approx$  2.5 kg

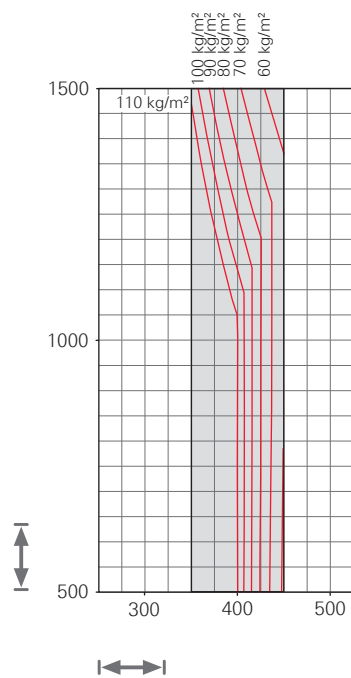
Assumption: sash profile weight is 2 kg/m.


Application range

Basic security		
	Sash rebate width	300 – 400 mm
	Sash rebate height	max. 1500 mm

Basic security		
	Sash weight	35 kg
	Opening angle	max. 50°

### 3.6.2.2 HX SH 10







 = Impermissible application range

The specifications in the application diagram refer to the glass weight in kg/m².

1 mm/m² glass thickness  $\approx$  2.5 kg

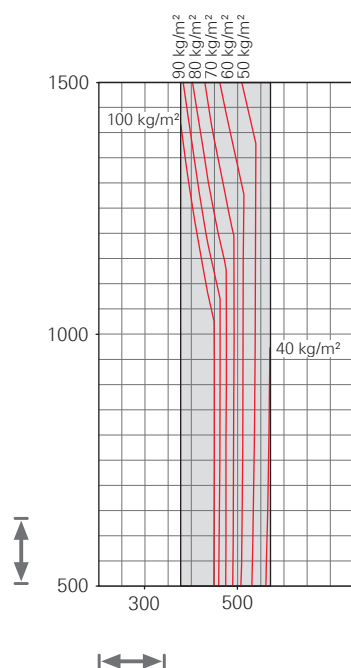
Assumption: sash profile weight is 2 kg/m.

### Application range

Basic security		
	Sash rebate width	350 – 450 mm
	Sash rebate height	max. 1500 mm
	Sash weight	40 kg
	Opening angle	max. 87°



### 3.6.2.3 HX SH 12







 = Impermissible application range

The specifications in the application diagram refer to the glass weight in kg/m<sup>2</sup>.

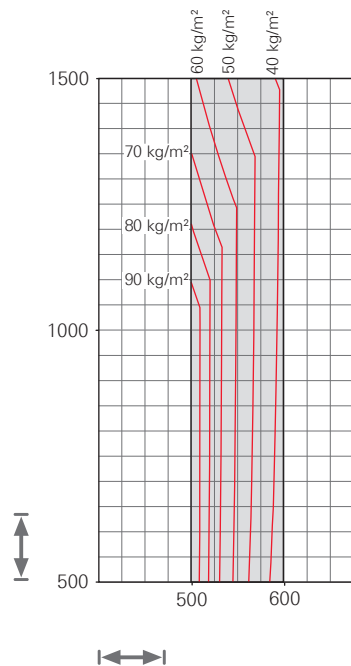
1 mm/m<sup>2</sup> glass thickness  $\approx$  2.5 kg


Assumption: sash profile weight is 2 kg/m.

#### Application range

Basic security		
	Sash rebate width	380 – 570 mm
	Sash rebate height	max. 1500 mm
	Sash weight	40 kg
	Opening angle	max. 87°

### 3.6.2.4 HX SH 14







 = Impermissible application range

The specifications in the application diagram refer to the glass weight in kg/m<sup>2</sup>.

1 mm/m<sup>2</sup> glass thickness  $\approx$  2.5 kg

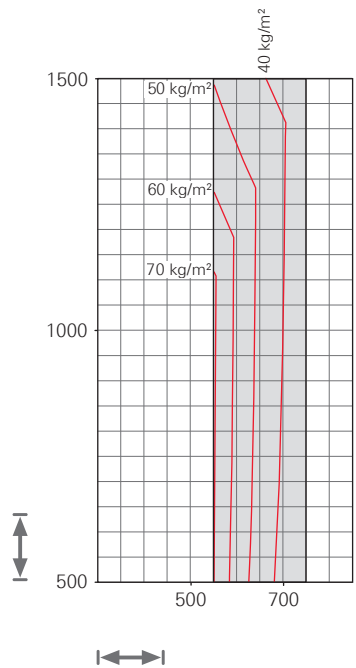
Assumption: sash profile weight is 2 kg/m.

#### Application range

Basic security		
	Sash rebate width	500 – 600 mm
	Sash rebate height	max. 1500 mm
	Sash weight	40 kg
	Opening angle	max. 87°



3.6.2.5 HX SH 16



= Impermissible application range

The specifications in the application diagram refer to the glass weight in kg/m<sup>2</sup>.

1 mm/m<sup>2</sup> glass thickness  $\approx$  2.5 kg

Assumption: sash profile weight is 2 kg/m.

Application range

Basic security		
	Sash rebate width	550 – 750 mm
	Sash rebate height	max. 1500 mm
	Sash weight	45 kg
	Opening angle	max. 87°

## 4 Hardware overviews

The hardware overviews on the following pages are a recommendation on the part of Roto Frank Fenster- und Türtechnologie GmbH.

The basic page layout in the hardware overviews chapter firstly shows examples of the combination of individual hardware components, and the associated parts list can be seen on the following pages.

Additional combinations of hardware components can be found in the catalogue.

The item numbers in the squares link the hardware overview to the parts list.

The actual composition of the hardware depends on:

- the height of the element
- the width of the element
- the weight of the element
- the profile system

Profile-related frame components and general sets are listed in additional chapters.

Recommended handles can be found in the handles catalogue.

Determine the quantity of required hardware components with Roto Con Orders.



### INFO

#### Roto Con Orders

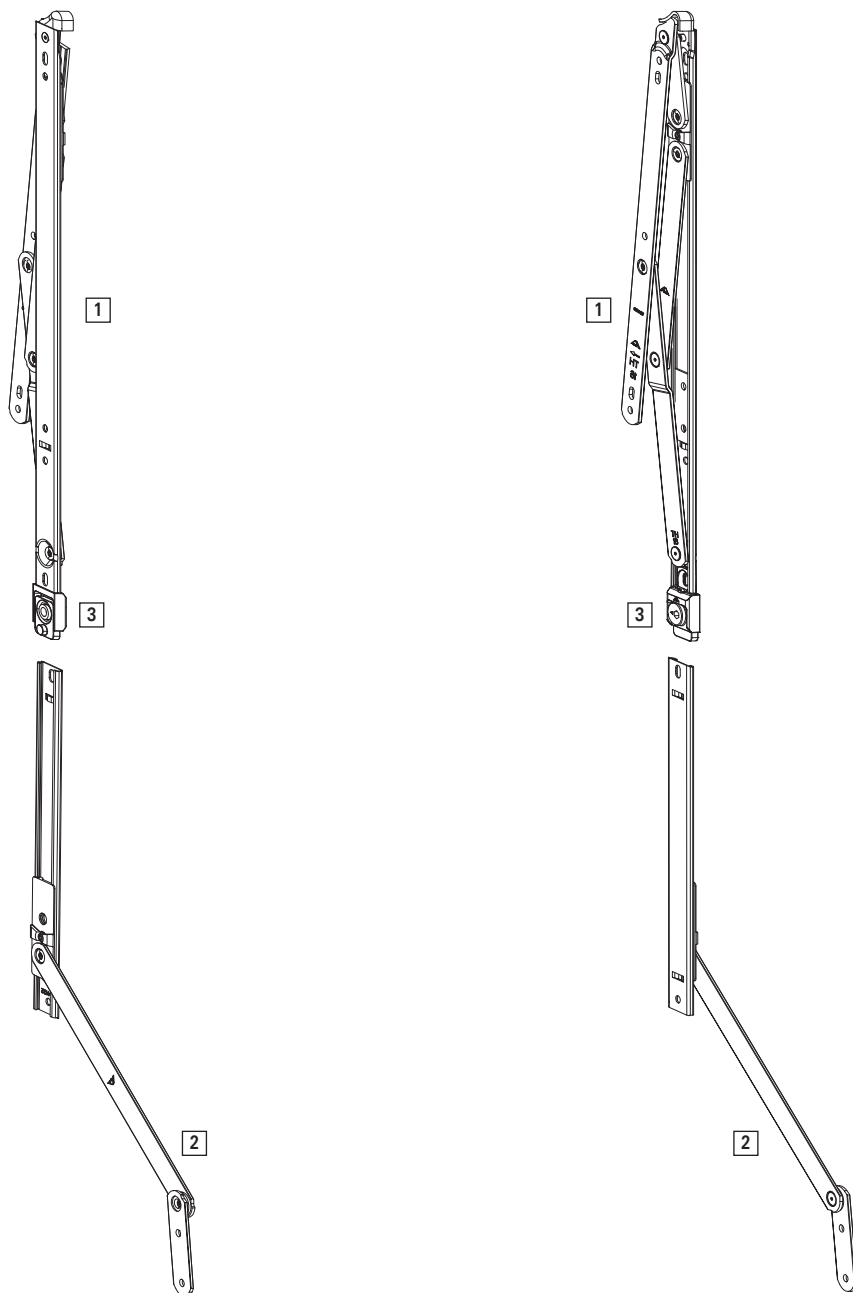
Efficient online hardware configurator for the custom configuration of individual window and door hardware components. All conventional shapes and opening types can be automatically configured quickly and easily. Individual parts lists, including application ranges and an exemplary hardware overview, can be ordered from your responsible sales representative.

**[www.roto-frank.com](http://www.roto-frank.com)**










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## 4.1 Top-Hung



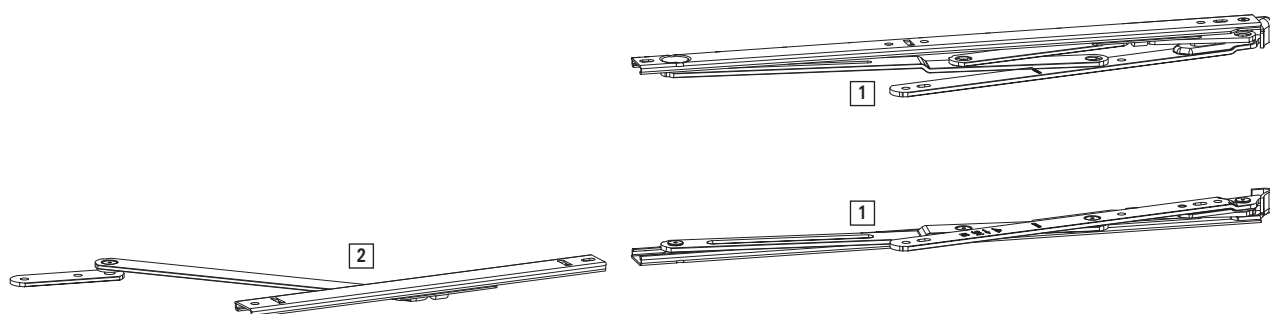
[1] Friction stay









									Nº
HX TH / SH 8	212	23	16	300 – 450	35 kg	50	–	25 Piece(s)	785740
HX TH 10	261	23	16	300 – 650	35 kg	40	–	25 Piece(s)	823192
HX TH 12	305	23	16	450 – 800	45 kg	40	–	25 Piece(s)	823193
HX TH 14	353	23	16	600 – 950	50 kg	40	–	20 Piece(s)	823194
HX TH 16	414	23	16	750 – 1250	65 kg	50	–	20 Piece(s)	823195
HX TH 22	565	23	16	1100 – 1500	100 kg	20	500	20 Piece(s)	823196
HX TH 24	613	23	16	1200 – 1800	120 kg	20	500	10 Piece(s)	823197
HX TH 26	666	23	16	1450 – 2500	180 kg	20	500	10 Piece(s)	823198

[2] RH opening restrictor					
					Nº
249	23	16	50 Piece(s)		785746

[3] Height adjustment					
					Nº
Height adjustment			50 Piece(s)		857142

## 4.2 Side-Hung



[1] Friction stay								
								Nº
HX TH / SH 8	212	23	16	300 – 400	35 kg	50	25 Piece(s)	785740
HX SH 10	261	23	16	350 – 450	40 kg	87	25 Piece(s)	823188
HX SH 12	312	23	16	380 – 570	40 kg	87	25 Piece(s)	823189
HX SH 14	357	23	16	500 – 600	40 kg	87	20 Piece(s)	823190
HX SH 16	413	23	16	550 – 750	45 kg	87	20 Piece(s)	823191

[2] RH opening restrictor					
					Nº
249	23	16	50 Piece(s)		785746





## 5 Installation

### 5.1 Processing instructions

#### Friction stay

##### Positioning and rebate clearance

- The Roto FS Kempton friction stays are designed to be installed between two parallel, fixed surfaces with a correct rebate clearance distance.
- The retraction mechanism of the friction stays must be placed in the inner corner of the frame rebate unless adaptation is required.
- If the profile does not have any parallel surfaces for mounting the scissor stays, use packer strips or adapters to fill the gap and adapt the scissor stay space in accordance with requirements → 5.3 "Reference surfaces" from page 40.
- The installation space for the friction stays must meet the requirements defined in this document.

##### Sash formats

- Refer to the specifications of the friction stays for the maximum permitted sash heights and widths.
- Do not exceed the maximum permitted sash weight → 3.6 "Application diagrams" from page 26.  
The component with the lowest permitted load bearing capacity determines the maximum permitted sash weight.
- Before using electronic data records and implementing them in window fabrication programs in particular, check that they match the specifications, application diagrams and component assignments.

##### Limiting the opening width

- Additional hardware components (such as opening restrictors) may be required to hold sashes in a specific position.  
This applies particularly to large formats, very small opening angles (10° or less) or in areas exposed to wind.
- Windows with Top-Hung friction stays of sizes 22", 24" and 26" are equipped with an internal opening width restrictor. An additional opening restrictor can be installed if necessary → 3.6 "Application diagrams" from page 26.
- Installation or maintenance work may require opening angles that exceed the nominally permitted opening angles of the friction stays. These opening angles must not be used in regular operation. For this reason, take suitable measures (such as integrated opening restrictor or additional opening restrictor) to limit the sashes to the maximum permitted opening angle.

##### Specifications from profile manufacturers

- The window and balcony door manufacturer must comply with all specified system dimensions (e.g. gasket gap dimensions or locking distances).
- They must continue to ensure and check this on a regular basis, especially when new hardware components are used for the first time, during production and on a continuous basis, up to and including window installation.



#### INFO

The hardware components are always designed in such a way that any system dimensions affected by the hardware can be adjusted. The hardware manufacturer shall not be liable for any additional expenses incurred if a deviation from these dimensions is not discovered until after the windows have been installed.

##### Combining hardware

- Windows and balcony doors for wet rooms and those for use in environments with aggressive, corrosive constituents in the air require hardware that meets special requirements.
- The resistance of windows and balcony doors to wind loads when they are closed and locked depends on the individual design of the windows and balcony doors. The hardware system is capable of handling wind loads specified by legislation and standards (for example in accordance with EN 12210 – especially test pressure P3).

- Coordinate suitable hardware combinations and installation procedures in windows and balcony doors with the hardware manufacturer and profile manufacturer for the areas listed above, and conclude a separate agreement for them.



### INFO

The hardware manufacturer's specifications on the combination of hardware (e.g. the use of additional scissor stays, the design of hardware for burglar-inhibiting window sashes and balcony door sashes) are binding.

## Opening restrictor

### Positioning and rebate clearance

- All Roto FS Kempton opening restrictors are designed to be installed between two parallel, fixed surfaces whose dimensions correspond to the specifications in this document.
- The scissor stay space between the sash and outer frame or upstand must meet the requirements for opening restrictors defined in this document (see drawings) .
- The closer the opening restrictor and the friction stay are to one another, the larger the sash opening angle; accordingly, installing the opening restrictor further away from the friction stay reduces the opening angle.

### Using the opening restrictor

Depending on the rigidity of the window sash, one opening restrictor at the bottom or two opening restrictors (at the top and bottom) may be used for Side-Hung sashes. For Top-Hung sashes, two opening restrictors must always be used as required.



### INFO

The opening width depends on:

- the positioning of the opening restrictor,
- the friction stay used,
- the sash size,
- the window profile.

- The window profile must match the requirements of the opening restrictor.
- The opening restrictors must be fitted on both sides (Top-Hung) or at the top and bottom (Side-Hung).



### INFO

If there is insufficient space available for installing opening restrictors and friction stays, Roto provides assistance with the generally recommended profile assessments.

## 5.2 General information on drill holes

### Drilling diameter



### INFO

If the corner connector has any raised sections in the area of the drill hole, drill holes with suitable aids (such as drilling jig, two-flute cutter).

### Aluminium profile

Drilling diameter:

Ø 4.2 mm in the area of the corner connector

Ø 3.9 mm in the aluminium profile

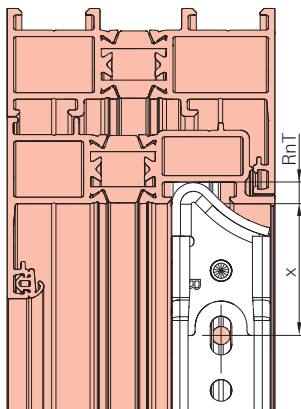
### Timber and PVC profile

Drilling diameter: Ø 3.0 mm



## Frame

Profile with frame groove  
(figure shows an aluminium profile)



$$x = 35.4 \text{ mm} - \text{FgD} + \text{HA}$$

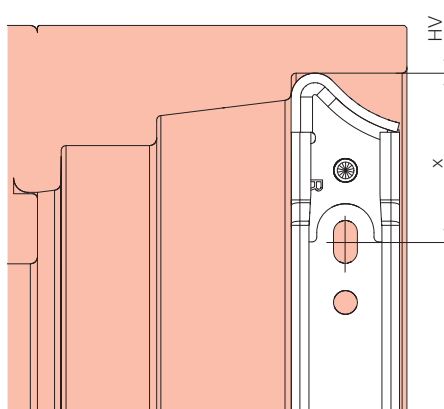
FgD = frame groove insertion depth

Standard values

HA = 0, no height adjustment

HA = 2.0 with height adjustment.

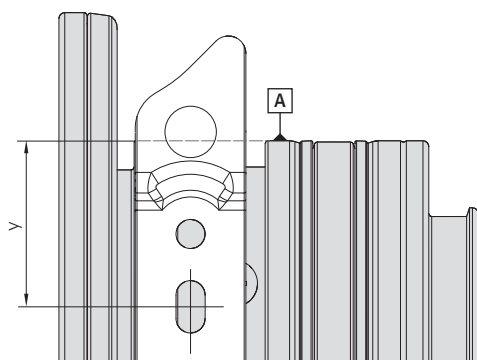
Profile without frame groove  
(figure shows a timber profile)



$$x = 35.4 \text{ mm} + \text{HA}$$

## Sash

Profile with sash groove  
(figure shows an aluminium profile)



$$y = 49.5 \text{ mm} - \text{RC} - \text{FgD} + \text{HA}$$

RC = rebate clearance

FgD = frame groove insertion depth

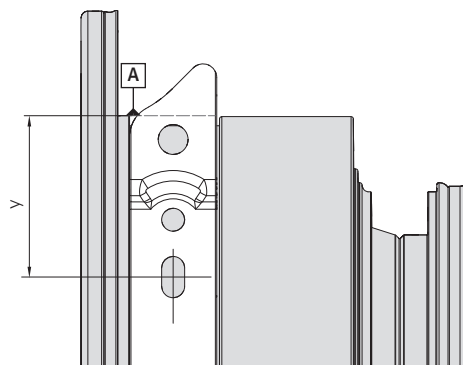
A = reference surface

Standard values

HA = 0, no height adjustment

HA = 2.0 with height adjustment.

Profile without sash groove  
(figure shows a timber profile)



$$y = 49.5 \text{ mm} - \text{RC} - \text{FgD} + \text{HA}$$

(in this figure, FgD = 0)

## 5.3 Reference surfaces

Reference surfaces are the surfaces on which the friction stays are installed.

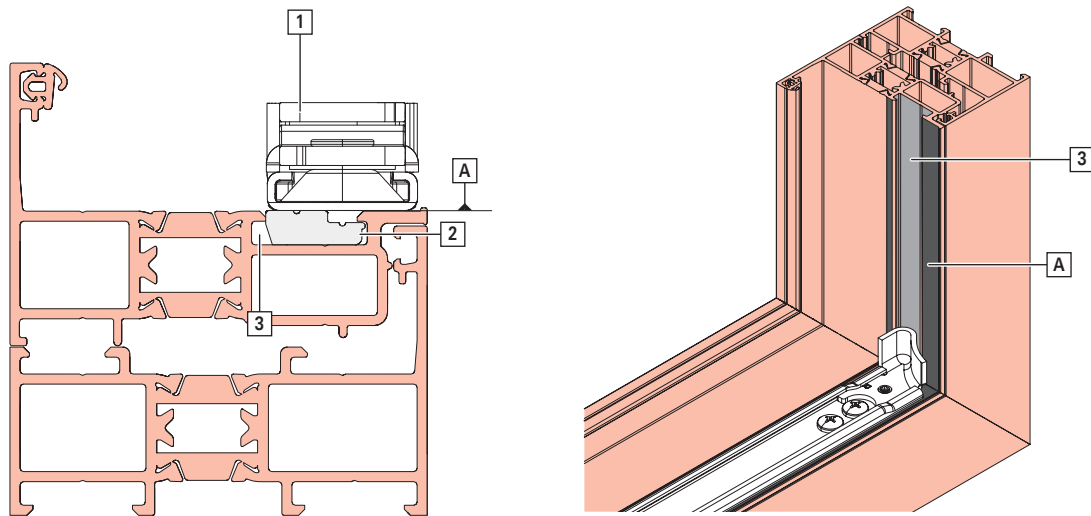


### INFO

Profiles with frame / sash groove: packer strips must be installed.

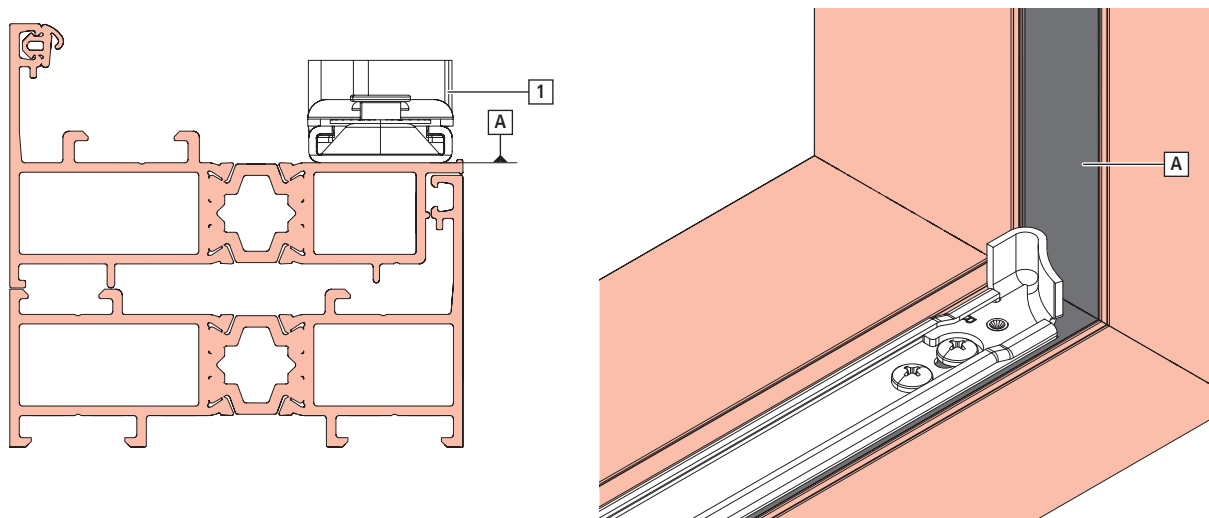
Profiles without frame / sash groove: friction stays can be installed directly.

### Frame profile with groove



- [1] Friction stay
- [2] Packer strip
- [3] Frame groove
- [A] Reference surface

### Frame profile without groove

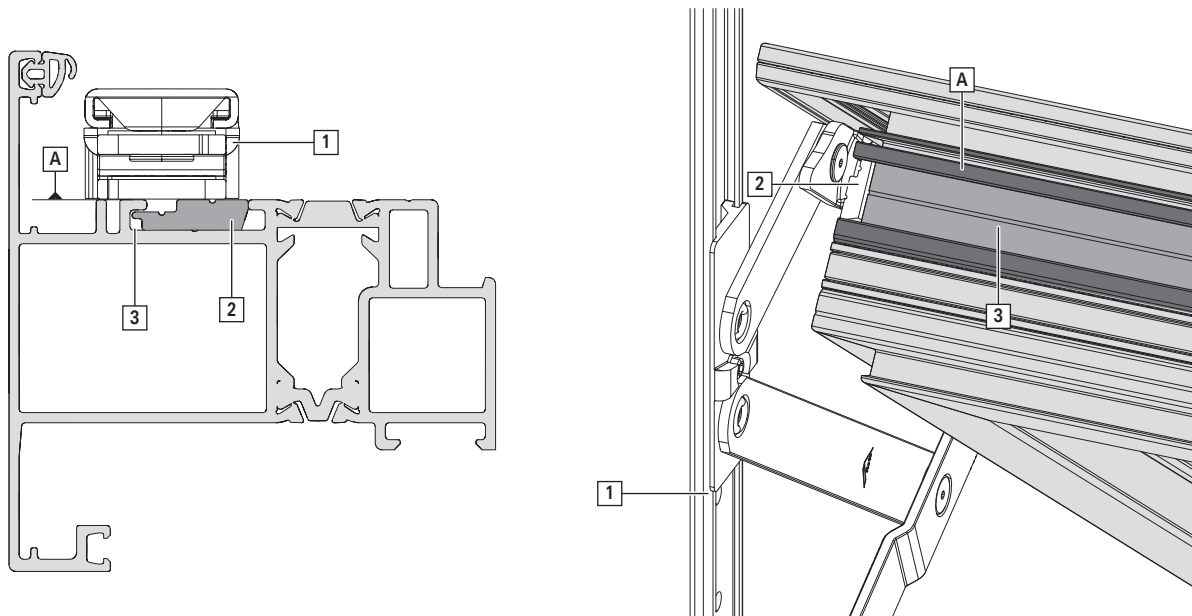


- [1] Friction stay



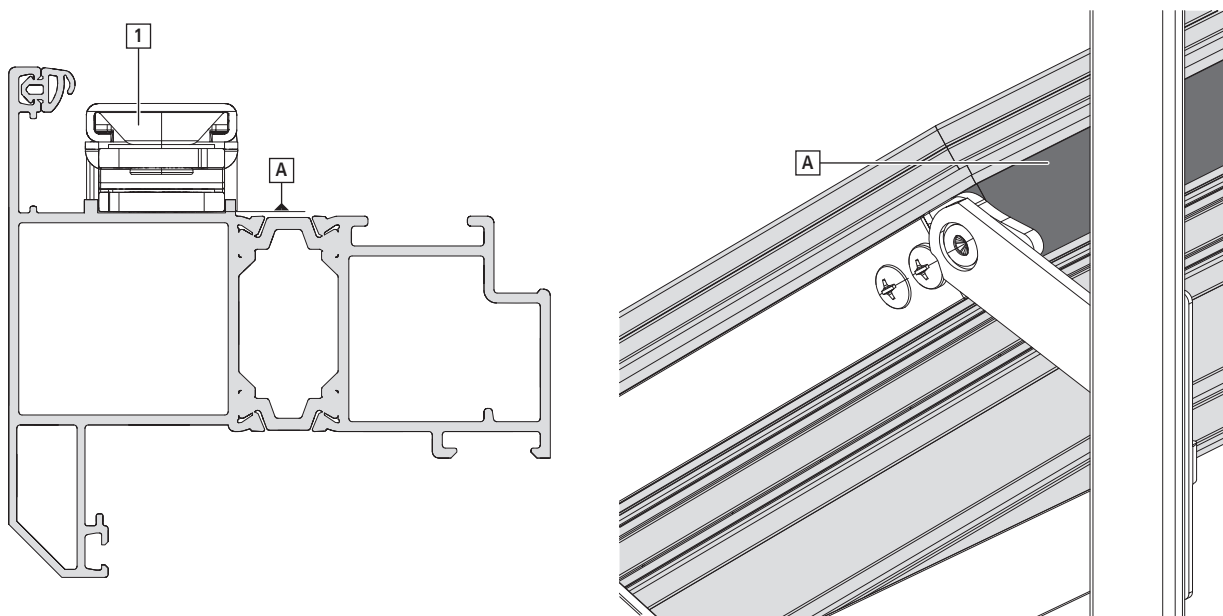
[A] Reference surface

### Sash profile with groove



- [1] Friction stay
- [2] Packer strip
- [3] Sash groove
- [A] Reference surface

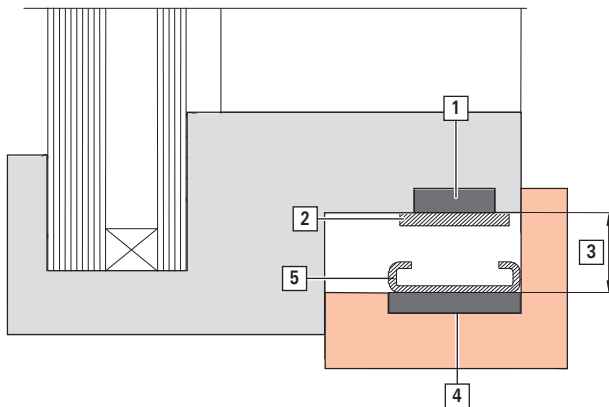
### Sash profile without groove



- [1] Friction stay
- [A] Reference surface

## 5.4 Profile related packer

If the profile does not have two parallel surfaces, packer strips must be used.



- [1] Packer strip on the sash side
- [2] Scissor stay arm
- [3] Stack height
- [4] Packer strip on the frame side
- [5] Guide track

## 5.5 Screw connections



### **DANGER**

**Incorrectly installed or screwed-in hardware components present a risk of death.**

Incorrectly installed and screwed-in hardware components may lead to hazardous situations and cause serious or fatal accidents.

- ▶ During installation and screwdriving work, observe the specifications provided by the profile manufacturer; contact the profile manufacturer if necessary.
- ▶ Use the recommended screws.
- ▶ Select the length of the screws according to the profiles used.
- ▶ Ensure that the hardware components are adequately secured; contact the screw manufacturer if necessary.



### **ATTENTION**

**Using incorrect screw material may cause property damage.**

Using the wrong screws may damage the components.

- ▶ Only use galvanised zinc-plated and passivated steel screws.
- ▶ Use screws with additional sealing in more challenging climatic conditions.
- ▶ Use stainless-steel screws on stainless-steel components only.
- ▶ For aluminium components, use screws made of steel (coated with zinc-nickel or zinc flakes) or stainless steel.



### **ATTENTION**

**Improper screw fixings may cause property damage.**

Improper screw fixings may damage the components and the element as a whole, and stop them from working properly.

- ▶ Unless stated otherwise, turn screws in straight.
- ▶ Tighten screw heads until they are flush with the surface.
- ▶ Do not over-tighten screws. Note the torque. Choose a torque that will not deform the hardware and profile. Define profile-specific torques on the basis of the demo assembly.
- ▶ Use the recommended screws.
- ▶ Select the length of the screws according to the profiles used.



## Aluminium profile



### INFO

The length of the fixing screws (e.g. ST 4.8 x 16 or ST 4.8 x 25) must be selected according to the profiles used.



### INFO

Drilling diameter:

Ø 3.9 mm in the area of the corner connector

Ø 4.2 mm in the aluminium profile

## Timber and PVC profile



### INFO

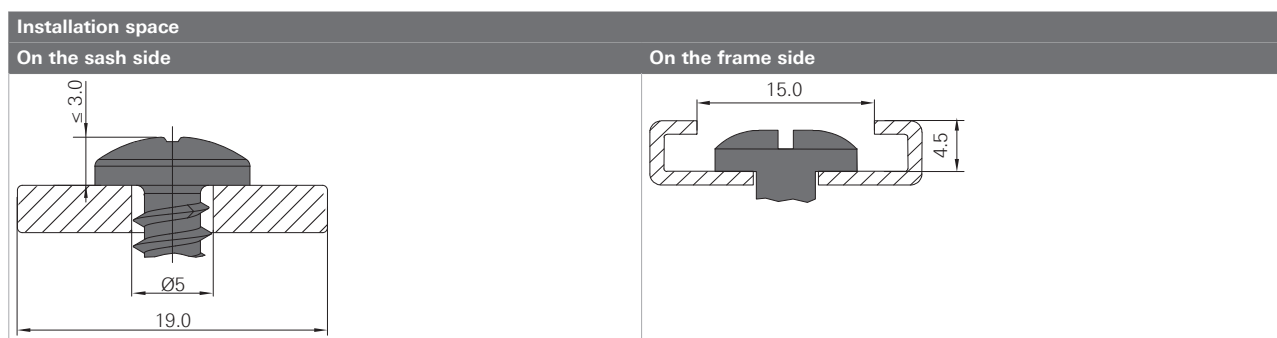
The length of the fixing screws (e.g. ST 4 x 40, etc.) must be selected according to the profiles used.



### INFO

Drilling diameter: Ø 3.0 mm

## Installation space



Screws made from austenitic steel have greater corrosion resistance and are therefore suitable for use in the industrial sector or in coastal regions.

## 5.6 Top-Hung

### 5.6.1 Drilling and routing dimensions

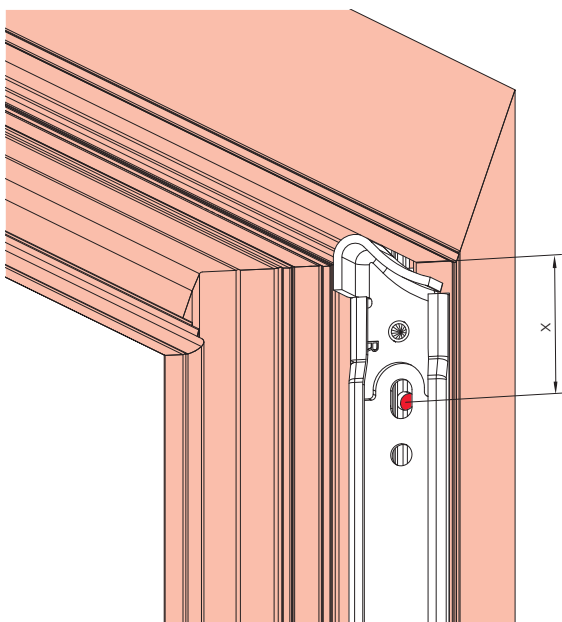
#### 5.6.1.1 Calculation of first drilling position

##### Profile with frame groove



##### INFO

Packer strips supplied with the system come with compatible drilling patterns.



[x] Dimension for making the first drill hole

If the packer strip supplied with the system is not being used, the position has to be calculated.

##### Profile with frame groove

$$x = 35.4 \text{ mm} - \text{FgD} + \text{HA}$$

##### Profile without frame groove

$$x = 35.4 \text{ mm} + \text{HA}$$

→ 5.2 "General information on drill holes" from page 38

Standard values

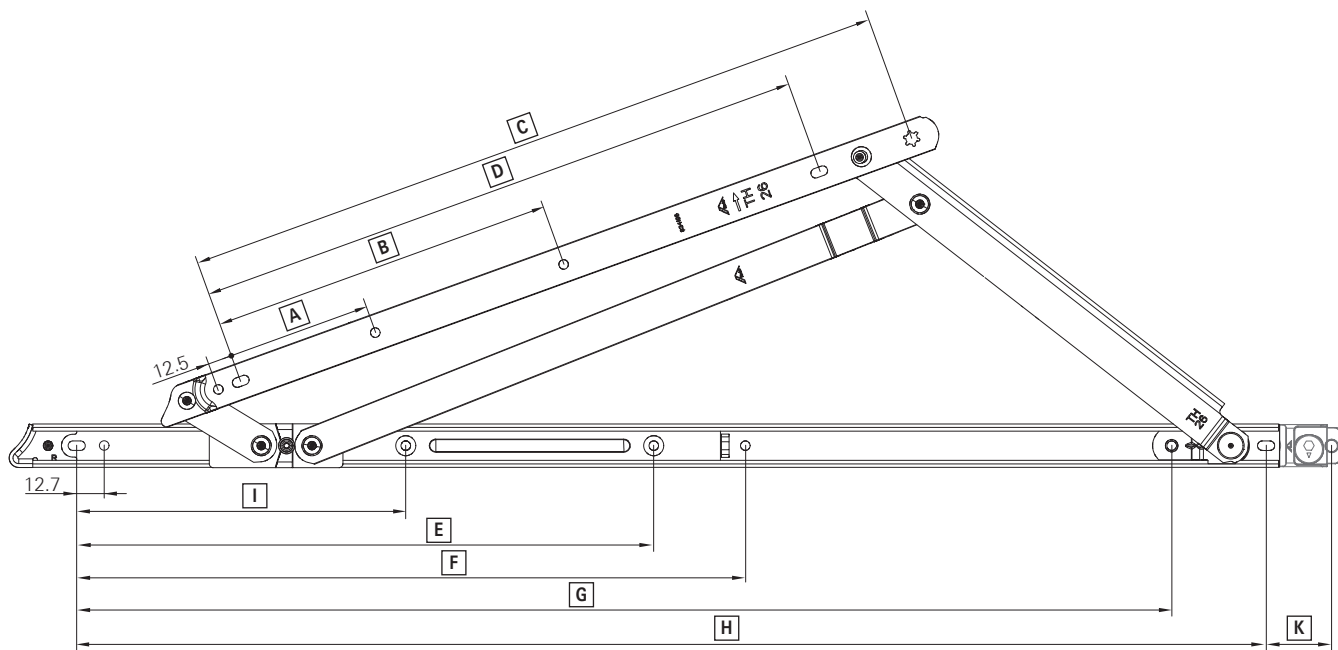
HA = 0, no height adjustment

HA = 2.0 with height adjustment.





### 5.6.1.2 Drilling dimensions



Size	A	B	C	D	E	F	G	H	I	K
8	–	–	–	123.5	102.5	125.5	–	170	–	–
10	45	–	157.5	145	153	176	–	218.5	–	–
12	65	–	182.5	170	191	214	–	262.5	–	–
14	90	–	207.5	195	244.5	267.5	–	310	–	–
16	118	–	247.5	235	263.5	286.5	–	371	–	–
22	90	–	248.5	197	280	323	473.5	523	160	36
24	120	–	292	240.5	274.5	322.5	521.5	571	144.5	36
26	75	180	374	322.5	302.5	350.5	574	623.5	172.5	36



#### INFO

All mounting holes and grooves must be used for optimum implementation and sealing.

## 5.6.2 Frame

### 5.6.2.1 Friction stay



#### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

1. Ensure that the frame and sash are securely joined.



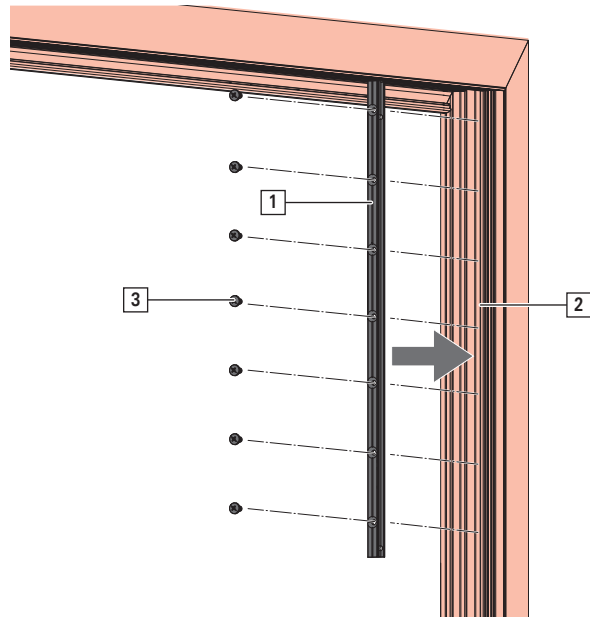
#### INFO

Ensure that the installation surface is level.

The figure and installation steps below apply to profiles with a frame groove.

Packer strips are not required for profiles without a frame groove.

Position the packer strip [1] in the frame groove [2] on the stop.



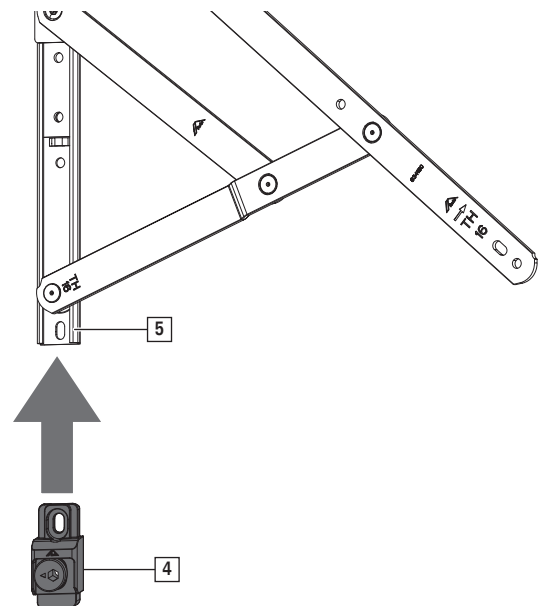
2. Fasten with screws [3]. The number of screws depends on the size of the packer strip.
3. **Optional:** fit the height adjustment [4] to the friction track [5].



#### INFO

Height adjustment is recommended for  $S.kg \geq 100$  kg. Profile assessment required.

The two slots must be positioned above one another.

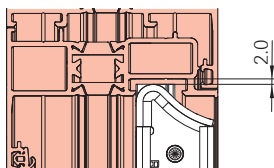


4. Position the friction stay in the open position on the reference surface → 5.3 "Reference surfaces" from page 40.

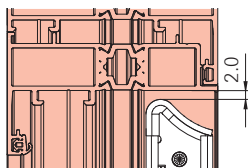


### When using height adjustment

Profile with frame groove



Profile without frame groove



5. Mark the position of the first slot [6] and predrill it.  
When using packer strips, the first position may be prespecified.

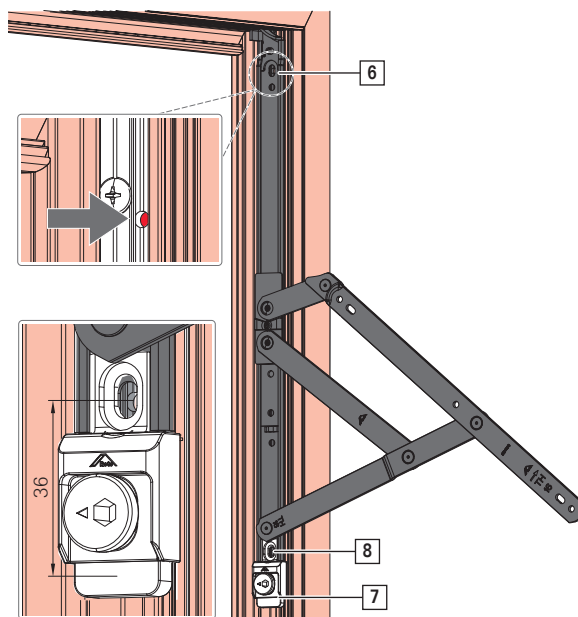
#### Profile with frame groove

$x = 35.4 \text{ mm} - \text{FgD} + \text{HA}$

#### Profile without frame groove

$x = 35.4 \text{ mm} + \text{HA}$

→ 5.2 "General information on drill holes" from page 38



6. Refer to the table → from page 45 for the position of the second slot [8] and predrill it → 5.2 "General information on drill holes" from page 38.

### 7. When using height adjustment

Predrill the hole for height adjustment [7].

Drilling diameter:  $\varnothing 7.0 \text{ mm}$

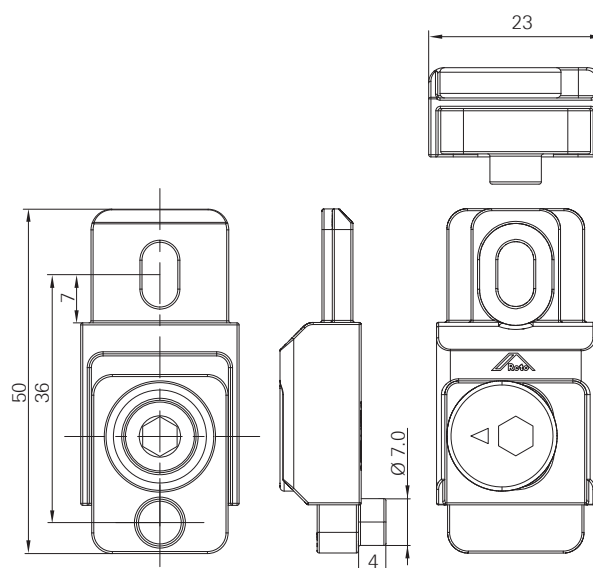
Drilling depth:  $\geq 4 \text{ mm}$

Adjustment distance:  $\pm 2.0 \text{ mm}$



#### INFO

Height adjustment is in the neutral position when delivered, see image.



8. Drill all other holes after aligning the sash.

## 5.6.3 Sash

### 5.6.3.1 Friction stay



#### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

1. Ensure that the frame and sash are securely joined.



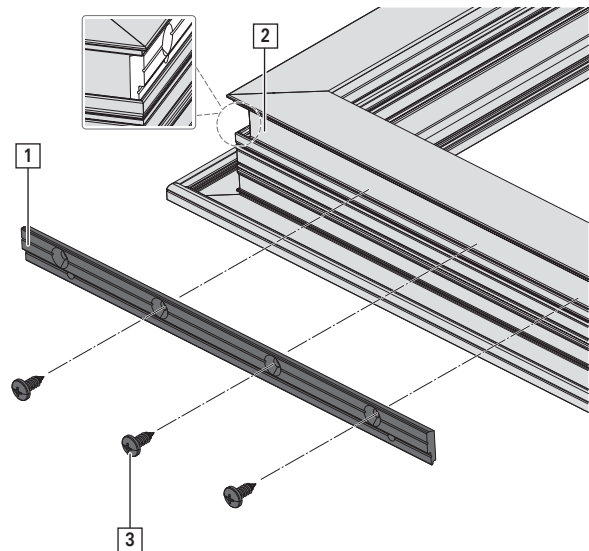
#### INFO

Ensure that the installation surface is level.

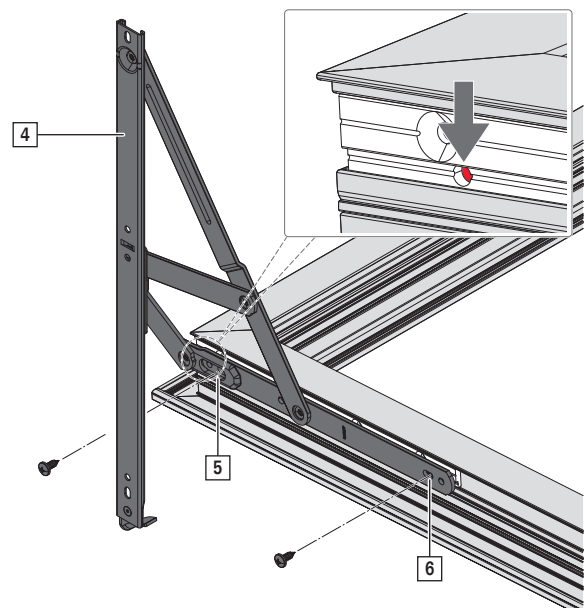
The figure and installation steps below apply to profiles with a sash groove.

Packer strips are not required for profiles without a sash groove.

Position the packer strip [1] in the sash groove [2] on the stop.



2. Fasten with screws [3]. The number of screws depends on the size of the packer strip.
3. Position the friction stay [4] in the open position on the reference surface → *5.3 "Reference surfaces" from page 40.*



4. Mark the position of the first slot [5] and predrill it. When using packer strips, the first position may be prespecified.



**Profile with sash groove**

$$y = 49.5 \text{ mm} - RC - FgD + HA$$

**Profile without sash groove**

$$y = 49.5 \text{ mm} - RC - FgD + HA$$

→ 5.2 "General information on drill holes" from page 38

Standard values

HA = 0, no height adjustment

HA = 2.0 with height adjustment.

5. Refer to the table → 5.7.1.2 "Drilling dimensions" from page 56 for the position of the second slot [6] and predrill it → 5.2 "General information on drill holes" from page 38.
6. Drill all other holes after aligning the sash.

## 5.6.4 Joining the sash and frame



### WARNING

**Heavy loads pose the risk of injury and property damage.**

Lifting and carrying heavy loads in an uncontrolled manner may lead to physical injury and property damage.

- ▶ Transport and installation must be carried out by at least two people.
- ▶ Use transportation means. → 9 "Transport" from page 85

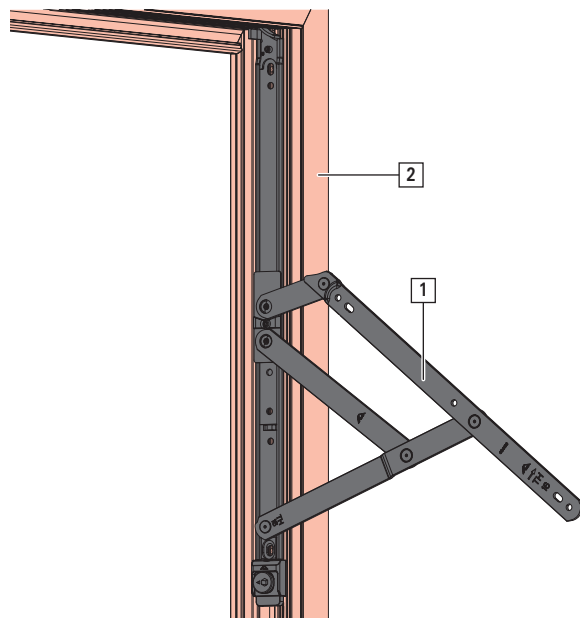
### 5.6.4.1 Friction stay



### INFO

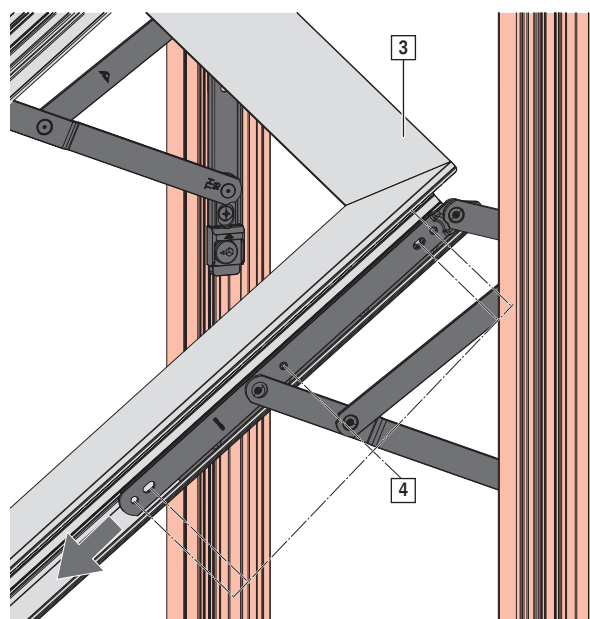
The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

1. Open the friction stays [1] on the frame [2] as far as possible.



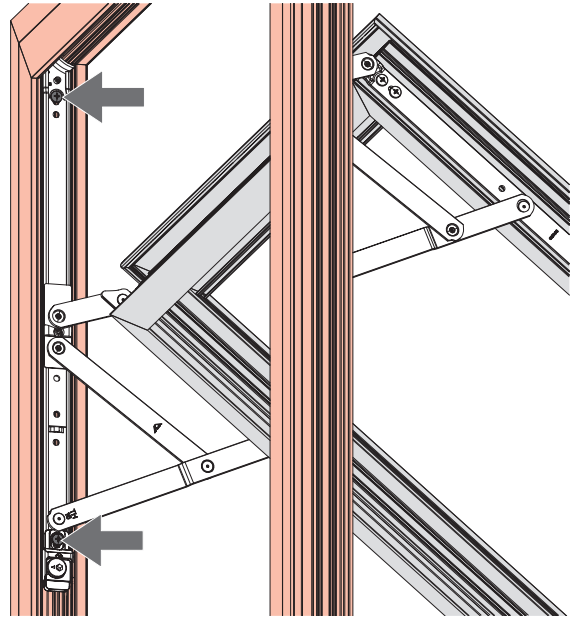
2. Position the friction stays parallel on the sash [3] and fasten with screws [4].

Number of screws → from page 45

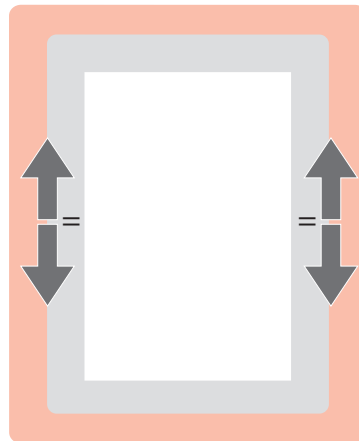




3. Undo the screws in the slots on the frame.



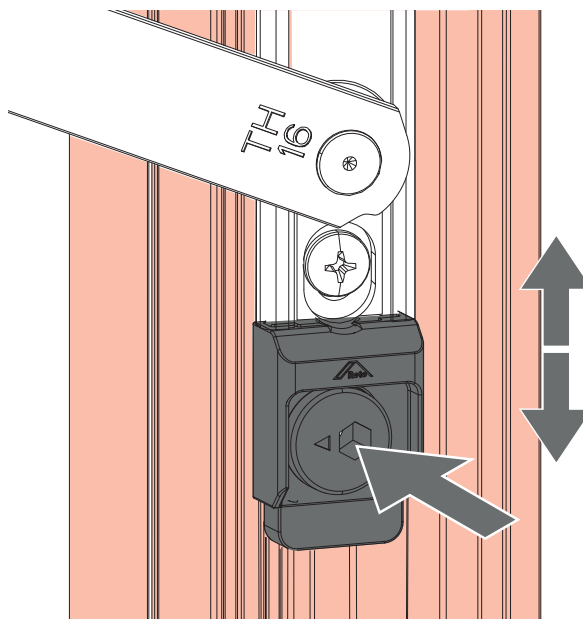
4. Align the sash and frame so they are parallel.



5. When using height adjustment

Adjustment  $\pm 2$  mm

Tool: hex key size 5



6. Fasten the screws in the slots on the frame.

7. Drill the rest of the holes on the frame → *from page 45.*

Tighten the screws → 5.2 "General information on drill holes" from page 38.



#### INFO

##### Aluminium profile

If the screw fixing is created in the sash profile itself, rivet nuts must be inserted and the scissor stay must be fastened with metric screws.





#### 5.6.4.2 Setting the brake force



##### **WARNING**

##### **Uncontrolled movement of the sash poses a risk of injury.**

Windows may start moving by themselves and open or close in an uncontrolled manner.

- ▶ Set the brake force of the friction stays.
- ▶ Also install an opening restrictor with friction brake.



##### **INFO**

Unfavourable profile geometries may make subsequent adjustment of the brake impossible. Set the brake before installation.



##### **INFO**

In the delivery state, the threaded pin is only attached. The brake has no braking effect whatsoever.

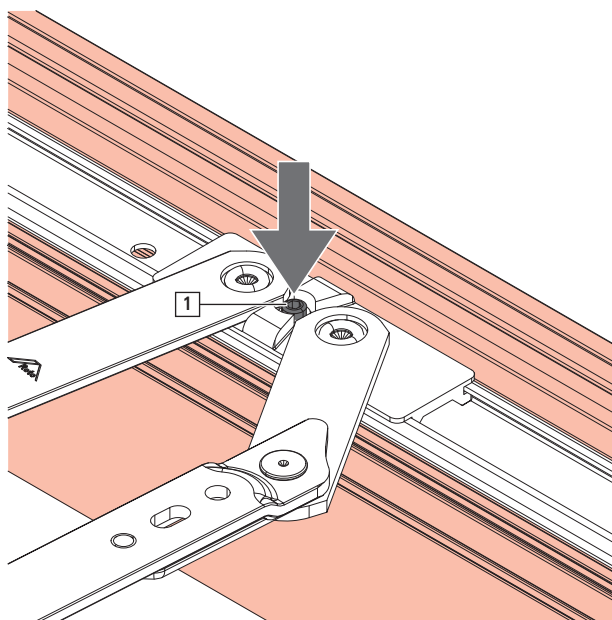
1. Turn in the screw [1] clockwise until the required brake force is achieved.

Tool: hex key size 2.5



##### **INFO**

Always set the same brake force on both friction stays. The sash must run in and out evenly.



##### **ATTENTION**

##### **A blocking friction stay may cause property damage**

If excessive force is used to apply the brake, the individual links may bend.

- ▶ Tighten the threaded pin so that the friction stay moves evenly.

When unscrewing anticlockwise, ensure that the threaded pin does not fall out.



##### **INFO**

If the opening width is reduced, it may not be possible to adjust the friction brake, depending on the profile. Set the friction brake before installing the internal opening restrictor.

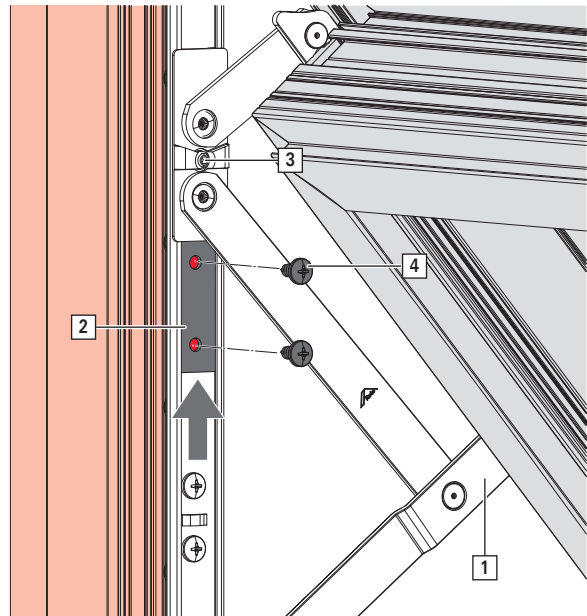
#### 5.6.4.3 Adjusting the variable end stop

1. Set the required opening width on the friction stay [1].
2. Push the variable end stop [2] towards the brake [3].



#### INFO

Always ensure the settings of the variable end stop on both friction stays are the same.



3. Drill holes.
4. Secure with two screws [4].  
Insert screws into all screw holes if possible.



## 5.7 Side-Hung

### 5.7.1 Drilling and routing dimensions

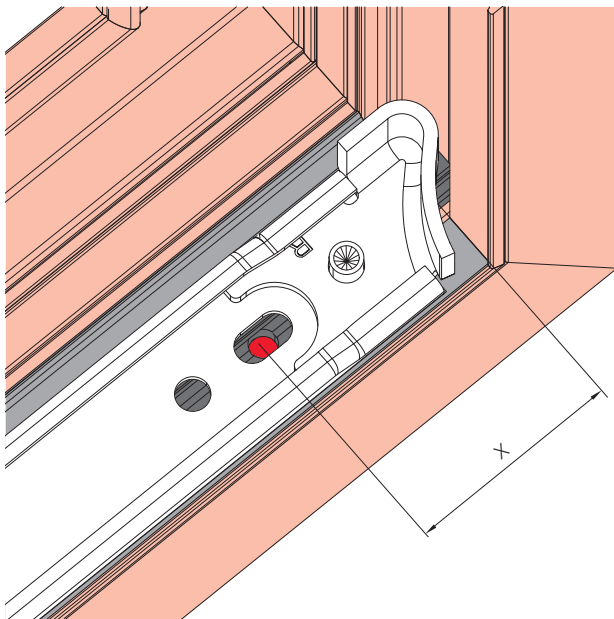
#### 5.7.1.1 Calculation of first drilling position

##### Profile with groove



##### INFO

Packer strips supplied with the system come with compatible drilling patterns.



[X] Dimension for making the first drill hole

If the packer strip supplied with the system is not being used, the position has to be calculated.

##### Profile with frame groove

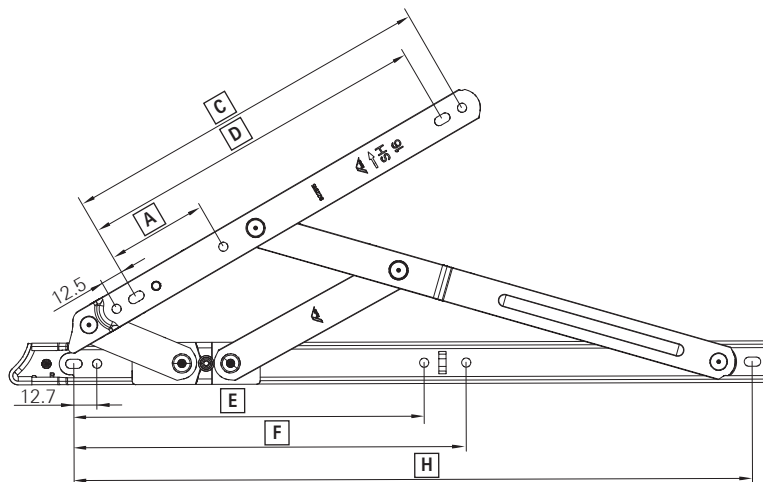
$x = 35.4 \text{ mm} - \text{FgD}$

##### Profile without frame groove

$x = 35.4 \text{ mm}$

→ 5.2 "General information on drill holes" from page 38

### 5.7.1.2 Drilling dimensions



Size	A	C	D	E	F	H
8	–	–	123.5	102.5	125.5	170
10	–	163.5	151	153.5	176.5	218.5
12	37.5	189	176.5	191	214	269.5
14	55	218.5	206	217	240	314
16	55	206	193.5	191.5	214.5	371



#### INFO

All mounting holes and grooves must be used for optimum implementation and sealing.



## 5.7.2 Frame

### 5.7.2.1 Friction stay



#### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

1. Ensure that the frame and sash are securely joined.



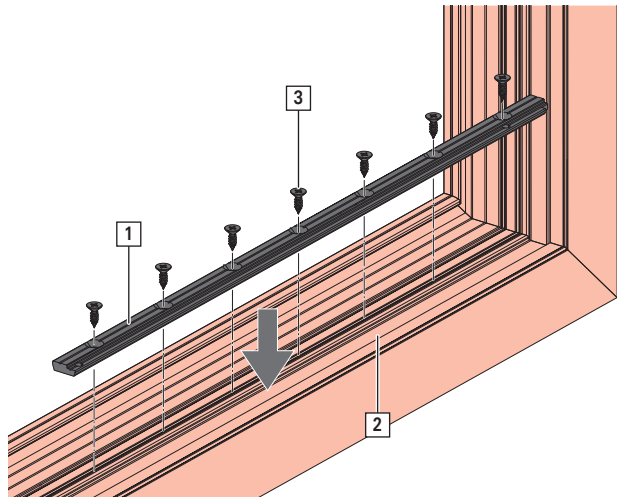
#### INFO

Ensure that the installation surface is level.

The figure and installation steps below apply to profiles with a frame groove.

Packer strips are not required for profiles without a frame groove.

Position the packer strip [1] in the frame groove [2] on the stop.



2. Fasten with screws [3]. The number of screws depends on the size of the packer strip.
3. Position the friction stay [4] in the open position on the reference surface → 5.3 "Reference surfaces" from page 40.

4. Mark the position of the first slot [5] and predrill it. When using packer strips, the first position may be prespecified.

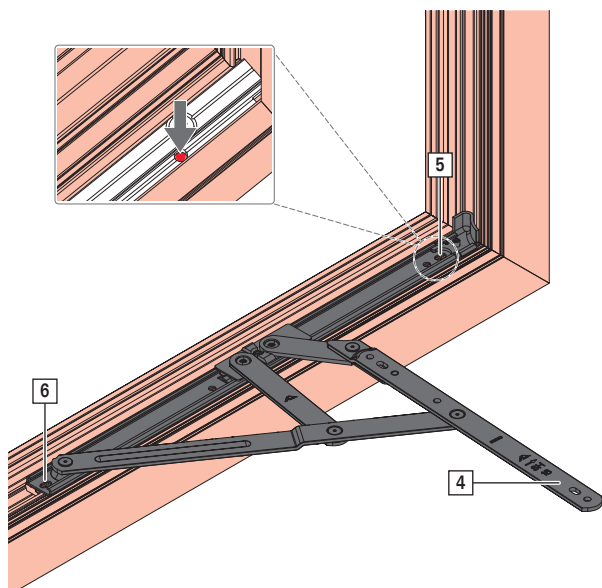
#### Profile with frame groove

$x = 35.4 \text{ mm} - \text{FgD}$

#### Profile without frame groove

$x = 35.4 \text{ mm}$

→ 5.2 "General information on drill holes" from page 38



5. Refer to the table → 5.7.1.2 "Drilling dimensions" from page 56 for the position of the second slot [6]

and predrill it → 5.2 *“General information on drill holes” from page 38.*

6. Drill all other holes after aligning the sash.



## 5.7.3 Sash

### 5.7.3.1 Friction stay



#### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

1. Ensure that the frame and sash are securely joined.



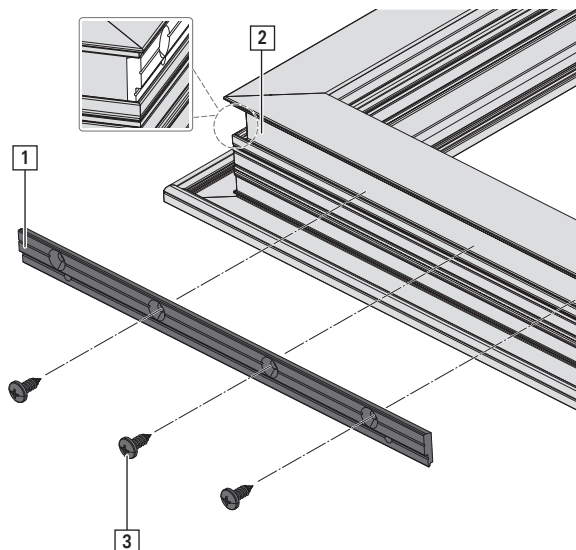
#### INFO

Ensure that the installation surface is level.

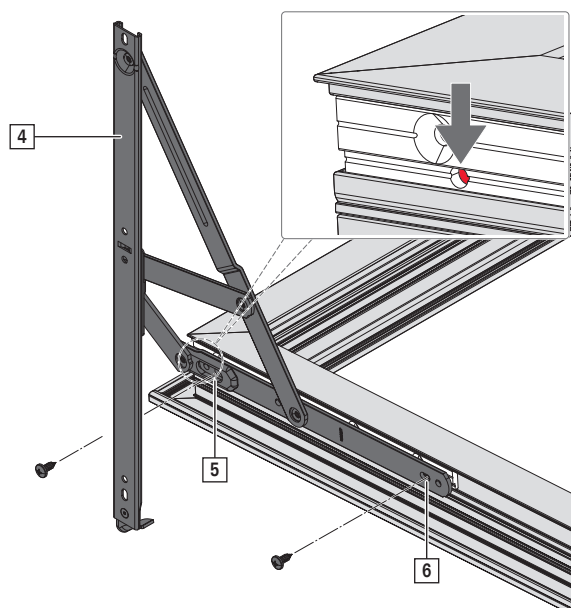
The figure and installation steps below apply to profiles with a sash groove.

Packer strips are not required for profiles without a sash groove.

Position the packer strip [1] in the sash groove [2] on the stop.



2. Fasten with screws [3]. The number of screws depends on the size of the packer strip.
3. Position the friction stay [4] in the open position on the reference surface → 5.3 "Reference surfaces" from page 40.



4. Mark the position of the first slot [5] and predrill it. When using packer strips, the first position may be prespecified.

**Profile with sash groove**

y = 49.5 mm - RC - FgD

**Profile without sash groove**

y = 49.5 mm - RC - FgD

→ 5.2 "General information on drill holes" from  
page 38

5. Refer to the table → 5.7.1.2 "Drilling dimensions"  
from page 56 for the position of the second slot [6]  
and predrill it → 5.2 "General information on drill  
holes" from page 38.
6. Drill all other holes after aligning the sash.





## 5.7.4 Joining the sash and frame



### WARNING

**Heavy loads pose the risk of injury and property damage.**

Lifting and carrying heavy loads in an uncontrolled manner may lead to physical injury and property damage.

- ▶ Transport and installation must be carried out by at least two people.
- ▶ Use transportation means. → 9 "Transport" from page 85

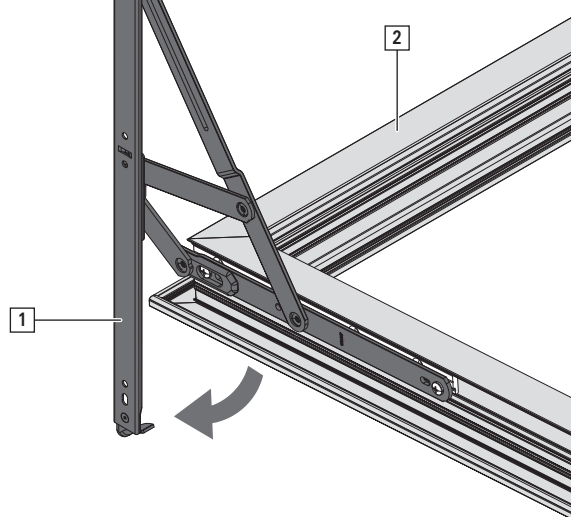
### 5.7.4.1 Friction stay



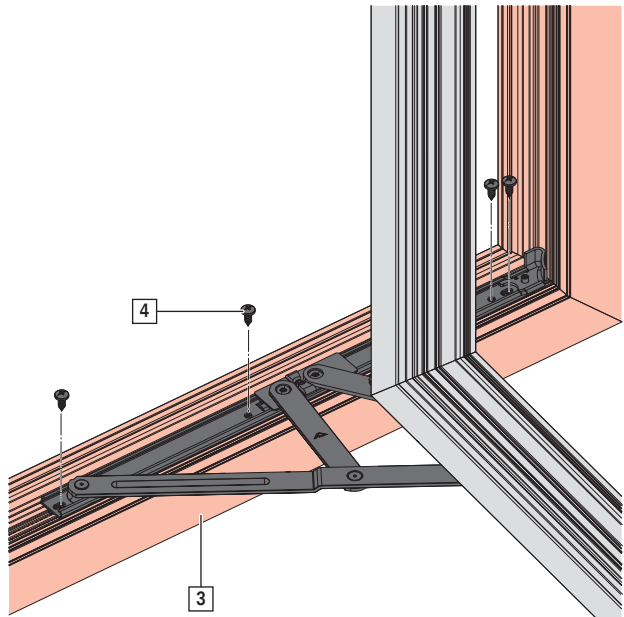
### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.

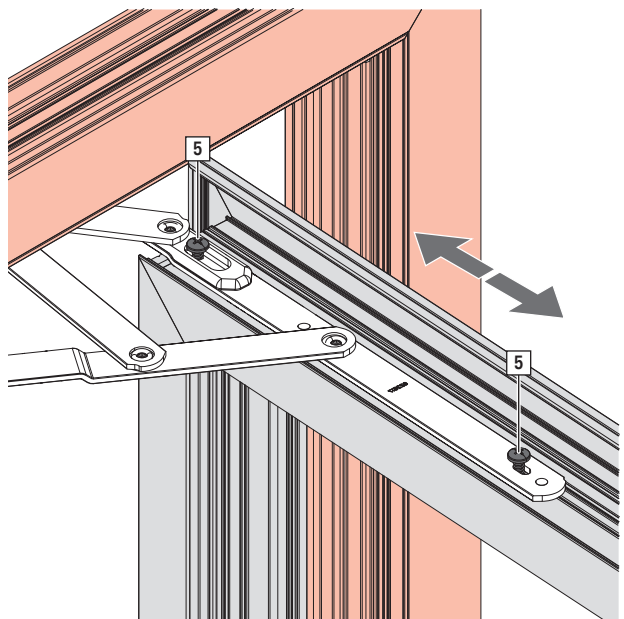
1. Open the friction stay [1] at the bottom of the sash [2].



2. Position the lower friction stay on the frame [3] and fasten with screws [4].

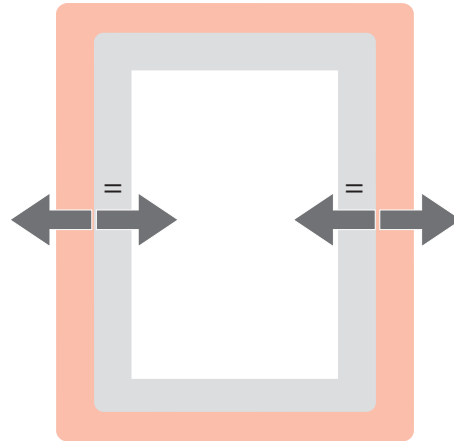


3. Open the friction stay at the top of the sash.
4. Position the friction stay on the frame and fasten with screws.
5. Undo the screws in the slot [5] on the sash.





6. Align the sash so that it is parallel with the frame.



7. Fasten the screws in the slot on the sash.
8. Drill the rest of the holes on the sash → *from page 56*.  
Tighten the screws → 5.2 “General information on drill holes” from page 38.



**INFO**  
**Aluminium profile**

If the screw fixing is created in the sash profile itself, rivet nuts must be inserted and the scissor stay must be fastened with metric screws.

#### 5.7.4.2 Setting the brake force



##### WARNING

##### Uncontrolled movement of the sash poses a risk of injury.

Windows may start moving by themselves and open or close in an uncontrolled manner.

- ▶ Set the brake force of the friction stays.
- ▶ Also install an opening restrictor with friction brake.



##### INFO

Unfavourable profile geometries may make subsequent adjustment of the brake impossible. Set the brake before installation.



##### INFO

In the delivery state, the threaded pin is only attached. The brake has no braking effect whatsoever.

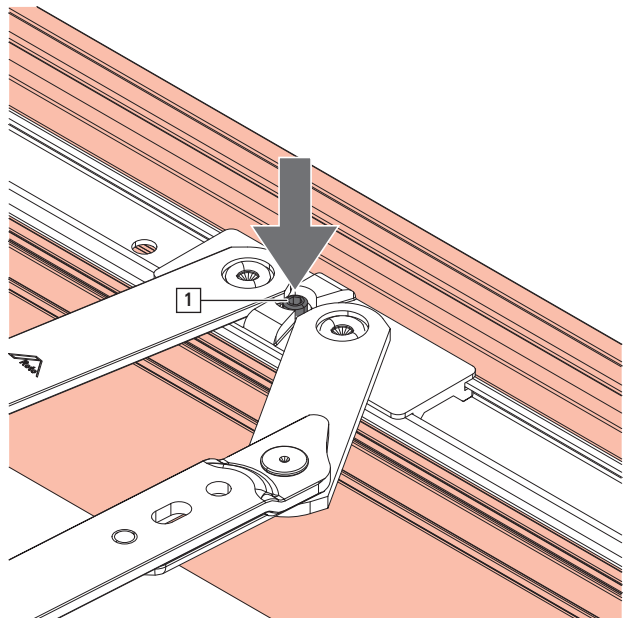
1. Turn in the screw [1] clockwise until the required brake force is achieved.

Tool: hex key size 2.5



##### INFO

Always set the same brake force on both friction stays. The sash must run in and out evenly.



##### ATTENTION

##### A blocking friction stay may cause property damage

If excessive force is used to apply the brake, the individual links may bend.

- ▶ Tighten the threaded pin so that the friction stay moves evenly.

When unscrewing anticlockwise, ensure that the threaded pin does not fall out.



##### INFO

If the opening width is reduced, it may not be possible to adjust the friction brake, depending on the profile. Set the friction brake before installing the internal opening restrictor.

## 5.8 Accessories



##### INFO

The figure shows installation on an aluminium profile. The installation process is the same for timber and PVC profiles.



## 5.8.1 RH opening restrictor

### 5.8.1.1 Sash

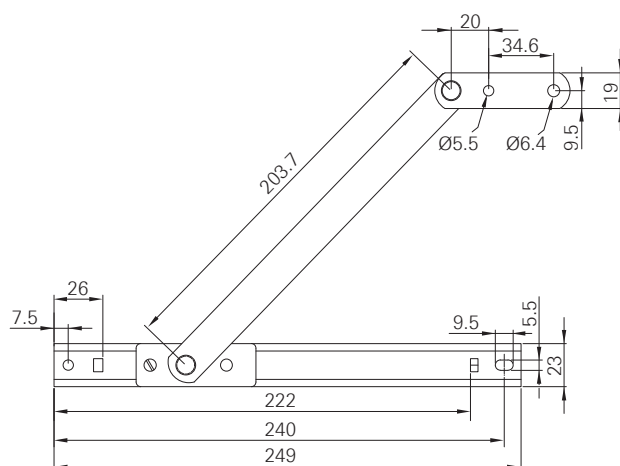


#### INFO

Side-Hung: install the opening restrictor at the bottom. Install a second opening restrictor at the top if necessary.

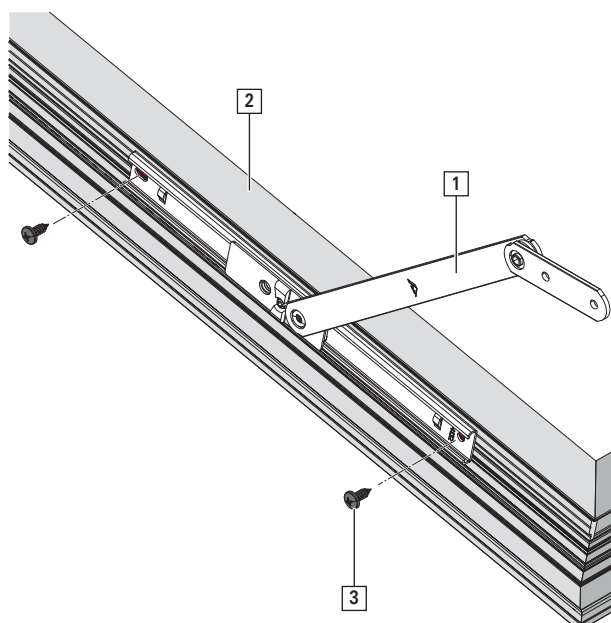
Top-Hung: install opening restrictors on the right- and left-hand side.

#### Dimensions



#### Installation

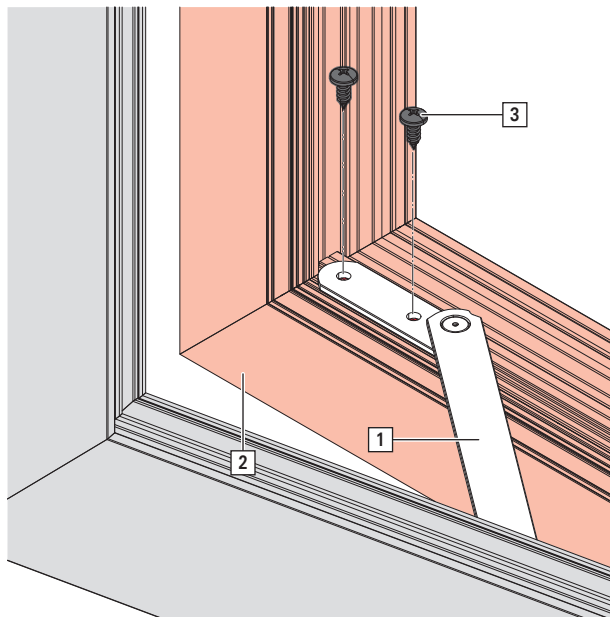
1. Position the opening restrictor [1] on the sash [2].



2. Fasten with two screws [3].

### 5.8.1.2 Frame

1. Position the opening restrictor [1] in the frame [2].



2. Fasten with two screws [3].

### Setting the brake force

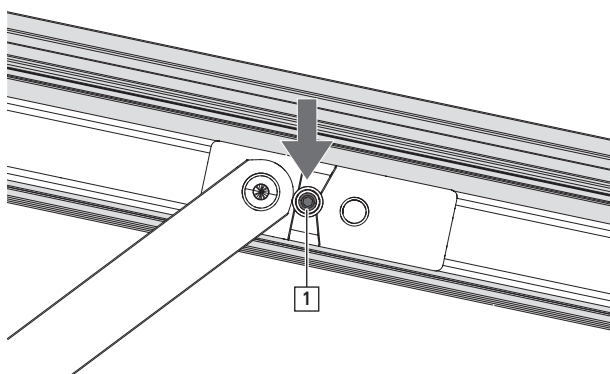
1. Turn in the screw [1] clockwise until the required brake force is achieved.

Tool: hex key size 2.5



#### INFO

When using two opening restrictors, always set both to the same brake force. The sash must run in and out evenly.



#### ATTENTION

##### **A blocked opening restrictor may cause property damage**

If excessive force is used to apply the brake, the individual links may bend.

- Tighten the threaded pin so that the opening restrictor moves evenly.

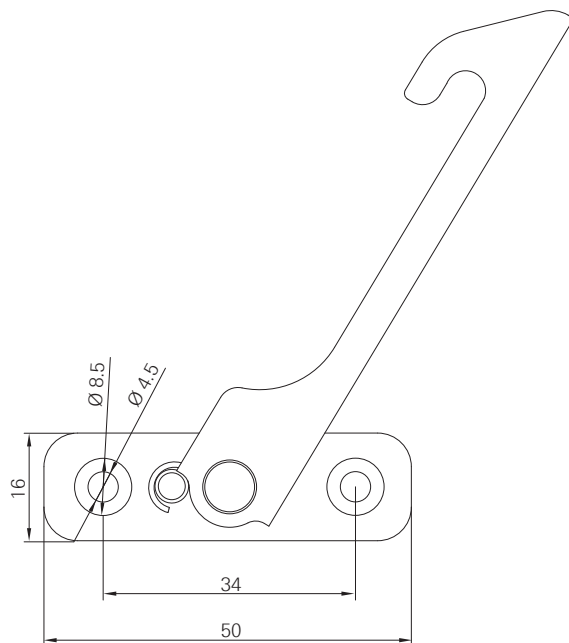
When unscrewing anticlockwise, ensure that the threaded pin does not fall out.



## 5.8.2 RC opening restrictor

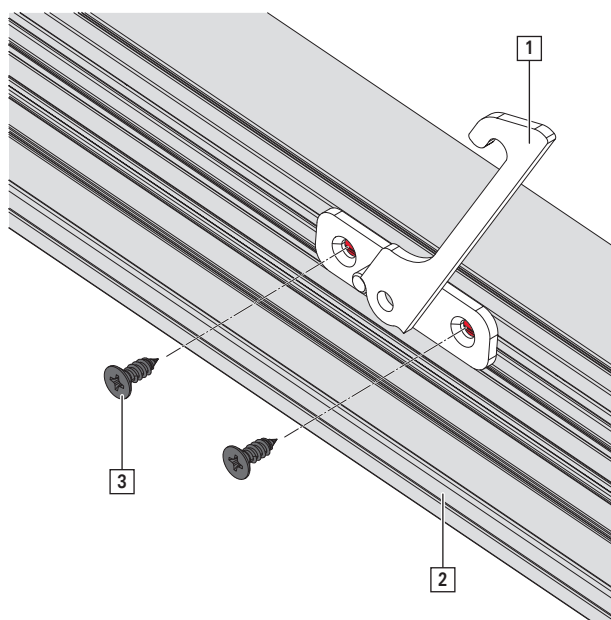
### 5.8.2.1 Sash component

#### Dimensions



#### Installation

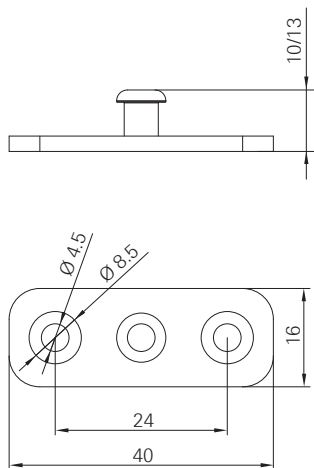
1. Position the sash component [1] on the sash [2].



2. Fasten with two screws [3].

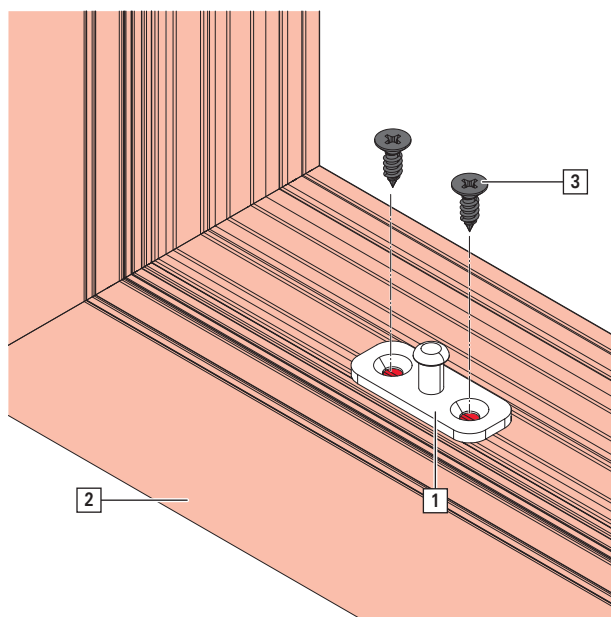
### 5.8.2.2 Frame component

#### Dimensions



#### Installation

1. Position the frame component [1] in the frame [2].



2. Fasten with two screws [3].

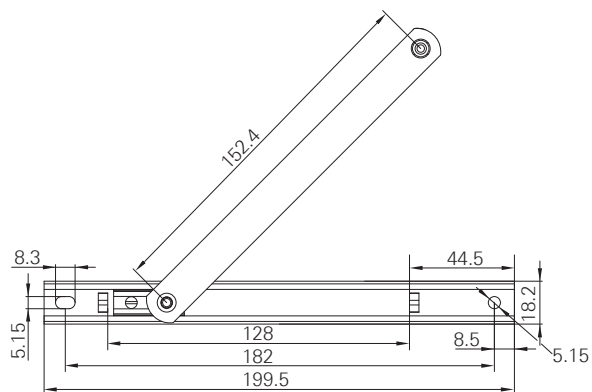




## 5.8.3 RD opening restrictor

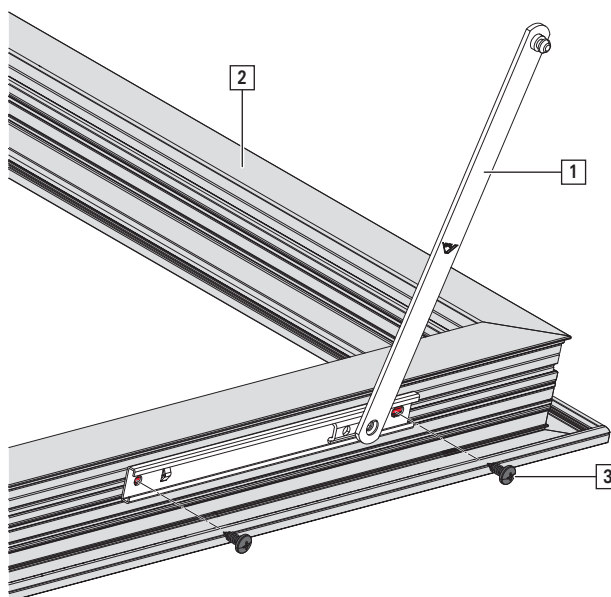
### 5.8.3.1 Sash component

#### Dimensions



#### Installation

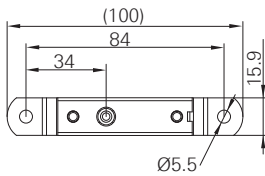
1. Position the opening restrictor [1] on the sash [2].



2. Fasten with two screws [3].

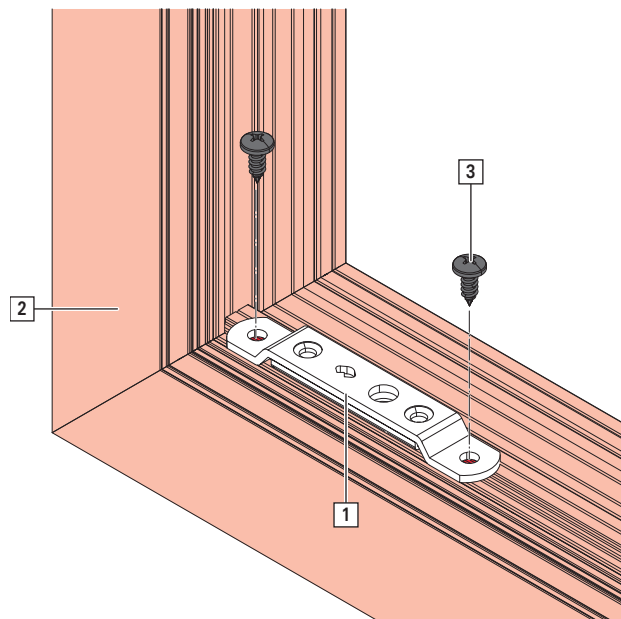
### 5.8.3.2 Frame component

#### Dimensions



#### Installation

1. Position the frame component [1] in the frame [2].

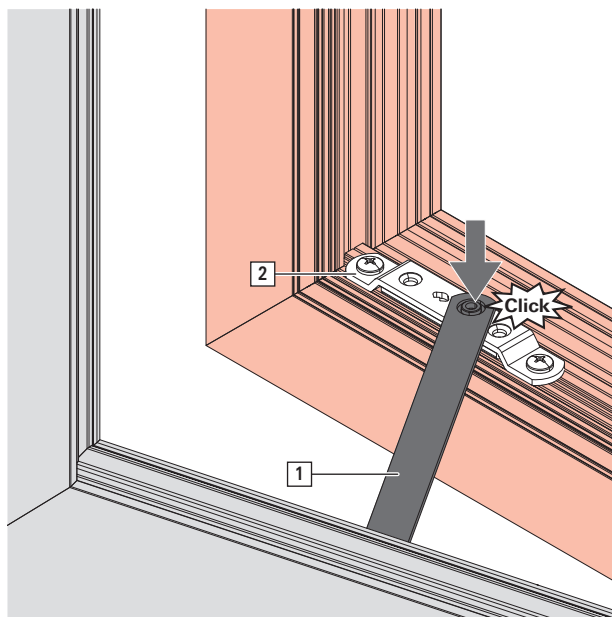


2. Fasten with two screws [3].



### 5.8.3.3 Joining the sash and frame components

1. Place the arm [1] above the frame component [2].



2. Push downwards until the arm engages and a click can be heard.

### Setting the brake force

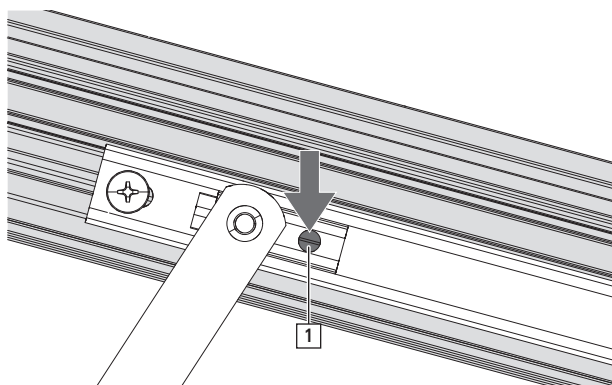
1. Turn in the screw [1] clockwise until the required brake force is achieved.

Tool: slotted screwdriver



#### INFO

When using two opening restrictors, always set both to the same brake force. The sash must run in and out evenly.



#### ATTENTION

##### **A blocked opening restrictor may cause property damage**

If excessive force is used to apply the brake, the individual links may bend.

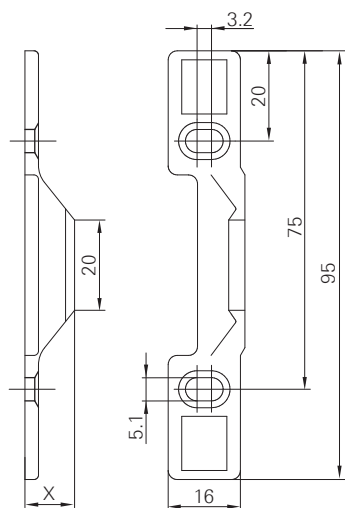
- Tighten the threaded pin so that the opening restrictor moves evenly.

When unscrewing anticlockwise, ensure that the threaded pin does not fall out.

## 5.8.4 Anti-jemmy device

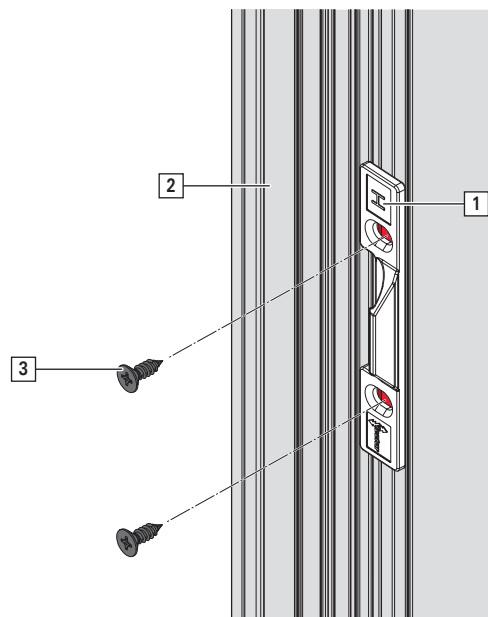
### 5.8.4.1 Sash component

#### Dimensions



#### Installation

1. Position the sash component [1] on the sash [2].

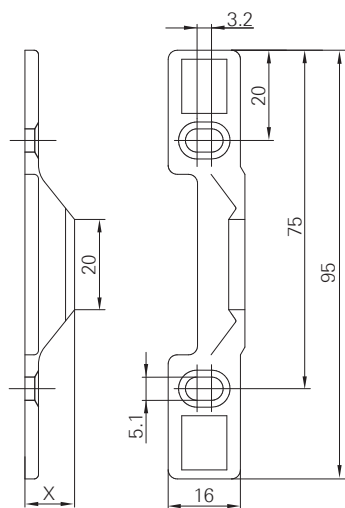


2. Fasten with two screws [3].



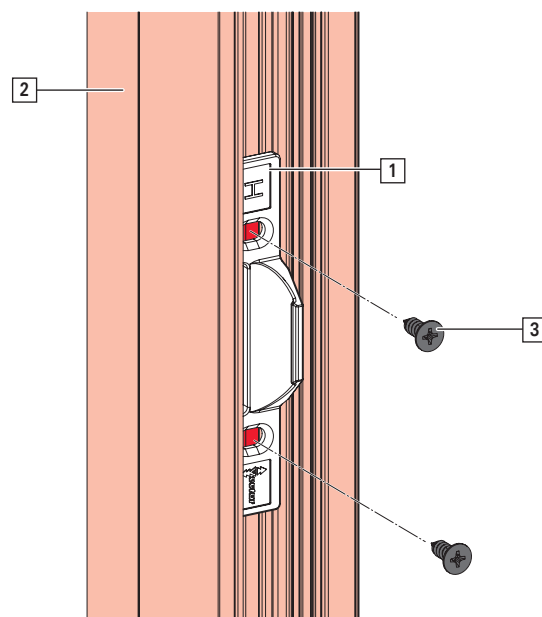
### 5.8.4.2 Frame component

#### Dimensions



#### Installation

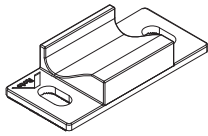
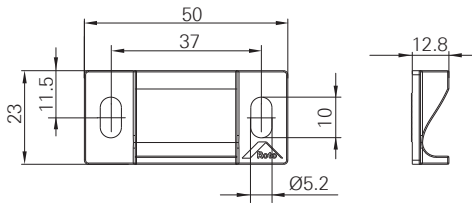
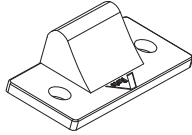
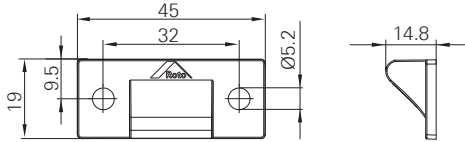
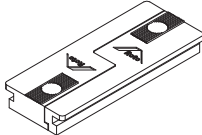
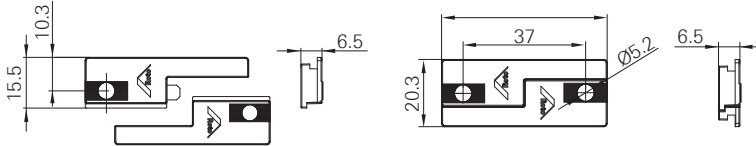
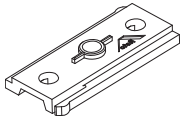
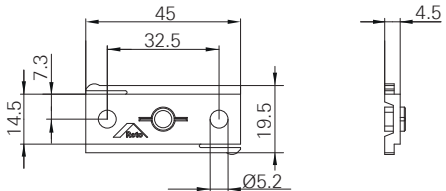
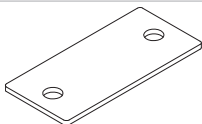
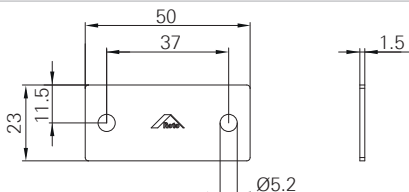
1. Position the frame component [1] in the frame [2].



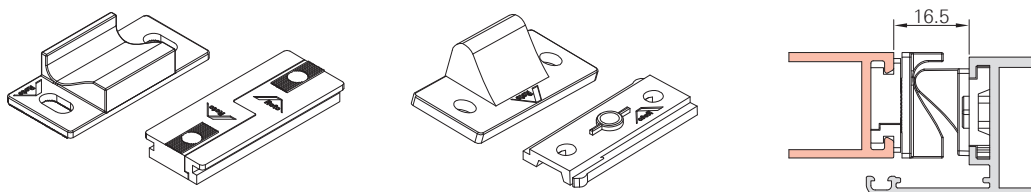
2. Fasten with two screws [3].

## 5.8.5 Concealed lock

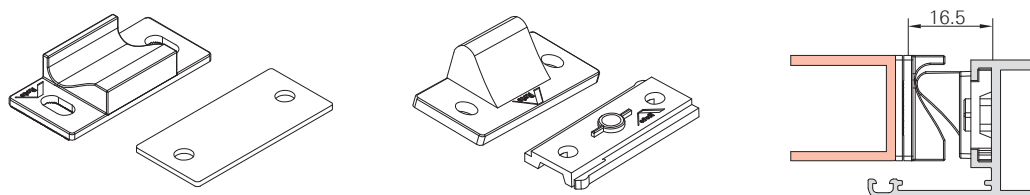
### 5.8.5.1 Combinations

Concealed lock			
Frame component			
Sash component			
Packers			
For profiles with groove (e.g. C-groove)			
For sash component			
For frame component			

#### Combination 1



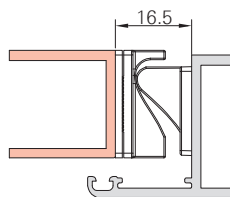
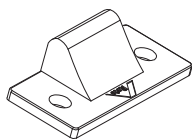
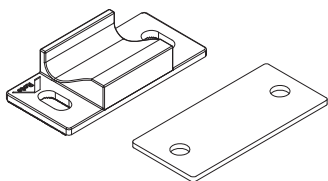
#### Combination 2



With a larger rebate clearance, fit additional packers.



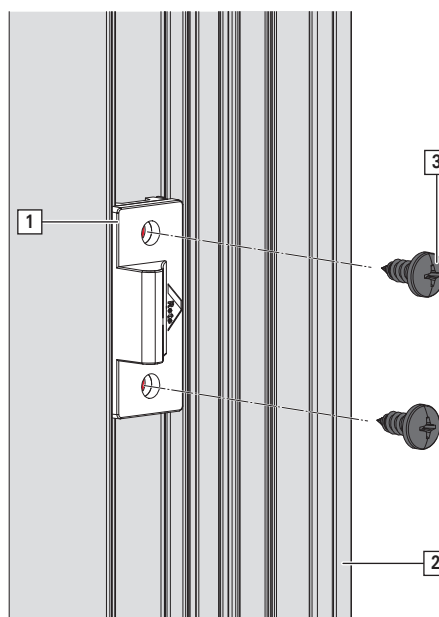
### Combination 3



With a larger rebate clearance, fit additional packers.

### 5.8.5.2 Sash component

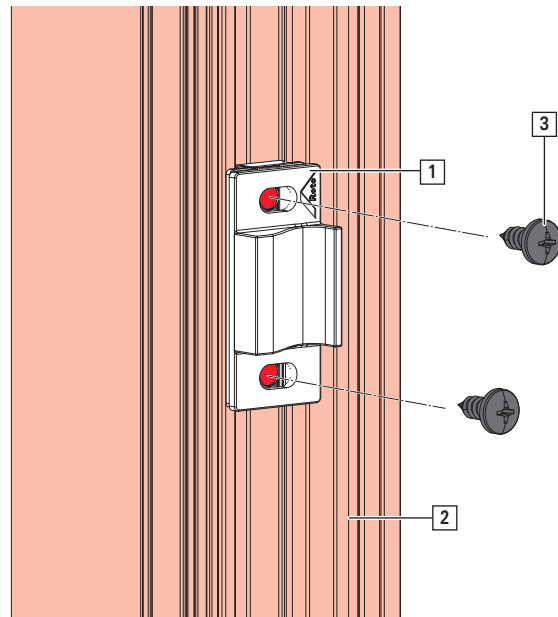
1. Position the sash component [1] on the sash [2].



2. Fasten with two screws [3].

### 5.8.5.3 Frame component

1. Position the frame component [1] on the frame [2].



2. Fasten with two screws [3].





## 6 Operation

### 6.1 Operation information



#### WARNING

##### Opening and closing sashes in an uncontrolled manner may pose a risk of death!

Opening and closing the sash in an uncontrolled manner may lead to serious injuries.

- ▶ Use opening restrictors to prevent the sash moving by itself.
- ▶ When operating the sash, do not lean too far outward.
- ▶ Ensure that the sash is slowly guided by hand throughout its entire movement range, until it has been brought into a fully closed or opening position.
- ▶ When pressing the restrictor, hold on to the sash with your other hand to prevent it from falling back. One hand on the sash, one on the handle.



#### ATTENTION

##### The impact of wind on open sashes may cause property damage.

In extremely windy conditions, too much force may impact on the scissor stays.

- ▶ Keep the sash closed in extremely windy conditions.
- ▶ Do not leave open sashes unattended.

The windows are operated using a handle.

The following symbols illustrate the different handle positions and the resultant sash positions of the windows.

#### 6.1.1 Side-Hung

Handle position	Sash position	Meaning
		Sash in closed position.
		Sash in opening position.

#### 6.1.2 Top-Hung

Handle position	Sash position	Meaning
		Sash in closed position.
		Sash in opening position.

## 6.2 Fault assistance

Fault	Cause	Corrective action	To be carried out by
Window is difficult to open / close.	Friction stay is incorrectly adjusted.	Adjust the friction stay.	■
	Incorrect sash alignment.	Check glazing and correct if necessary.	■
	Incorrect rebate area dimensions.	Remeasure and readjust the rebate area.	■
	Obstacle in the opening between frame and sash.	Remove the obstacle.	□
	Obstacle between the scissor stay arms.	Remove the obstacle.	□
	Deposits or dirt on the hardware components.	Clean and lubricate the hardware components.	□
	Friction stay is faulty.	Replace the friction stay.	■
	Opening restrictor is faulty.	Replace the opening restrictor.	■
Window opens / closes automatically.	Insufficient friction on the friction stay.	Check the friction stay and readjust.	■
		Install an opening restrictor.	■
No grip between open and closed position.	Friction stay is faulty.	Replace the friction stay.	■
	No opening restrictor installed.	Install an opening restrictor.	■
Window is not closed tightly.	Window gasket is faulty.	Replace the window gasket.	■
	Gasket compression setting is incorrect.	Adjust the gasket compression.	■
	Espagnolette is damaged.	Replace the espagnolette.	■
	Friction stay is not secured tightly enough.	Tighten or replace fixing screws.	■
Window cannot be opened.	Friction stay / opening restrictor is faulty.	Do not use force to open the window.	□
		Secure the sash to prevent it falling out.	
		Contact a specialist company.	
	Espagnolette is faulty.	Replace the espagnolette.	■
Handle is difficult to turn.	Frame components have not been greased.	Grease the frame components.	□
	Handle is faulty.	Replace the handle.	■
	Handle screwed into place too tightly.	Undo the screw fixing slightly.	■
	Sash components with slanting screws.	Screw the sash components in straight.	■
	Sash components are faulty.	Replace the sash components.	■
	Incorrect striker positions.	Adapt the striker positions.	■
Handle cannot be turned 90°.	Sash components hinged or installed incorrectly.	Check the setting in the turn position (potentially rehang – start from the T&T espagnolette).	■

□ = May be carried out by a specialist company or the end user

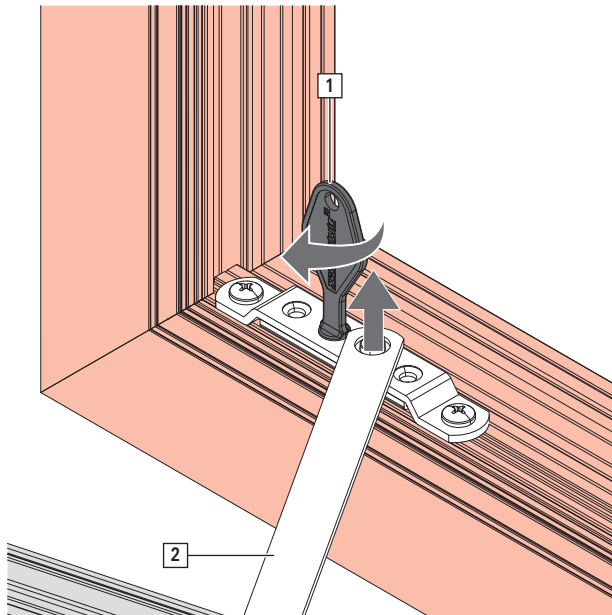
■ = **Must** be carried out by a specialist company



## 6.3 RD comfort opening restrictor

### Unlocking

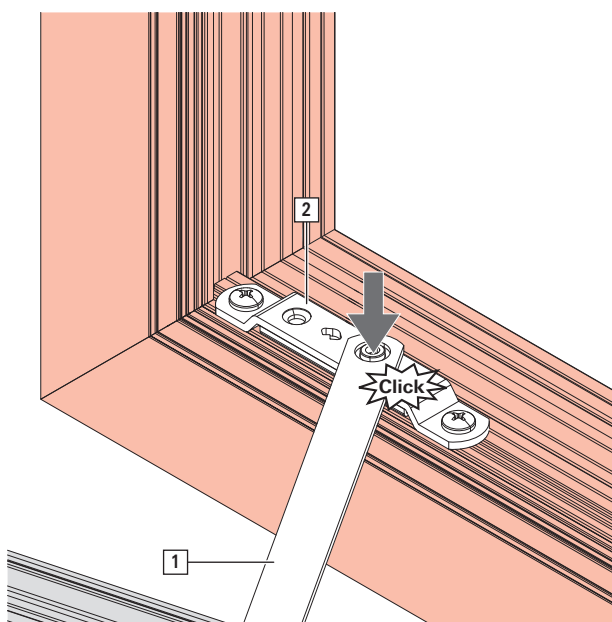
1. Insert the release key [1] and turn it clockwise by 90°.  
While doing so, pay attention to the outline of the release key.



2. Pull the arm [2] upwards to remove it.
3. Turn the release key anticlockwise by 90° and remove it.

### Locking

1. Push the arm [1] downwards onto the frame component [2] until a click can be heard.



## 7 Maintenance



### CAUTION

#### Performing maintenance work incorrectly can lead to injuries.

Performing maintenance incorrectly can lead to injuries.

- ▶ Ensure that there is sufficient space for installation before starting work.
- ▶ Ensure that the installation site is clean and tidy.
- ▶ Always have hardware adjustment and replacement work performed by a specialist company.
- ▶ Secure the sash against unintentionally opening or closing.
- ▶ Do not unhinge the sash for maintenance.



### ATTENTION

#### Incorrect or improper testing may cause property damage.

Incorrect or improper testing of the hardware may cause the element to malfunction.

- ▶ Have the hardware checked by a specialist company when installed.
- ▶ If defects need to be remedied, have the element unhinged and remounted by a specialist company.



### INFO

Maintenance work may require opening angles that exceed the nominally permitted opening angles of the scissor stays. These opening angles must not be used in regular operation. For this reason, take suitable measures (such as integrated opening restrictor or additional opening restrictor) to limit the sashes to the maximum permitted opening angle.



### INFO

The manufacturer must draw the attention of builders and end consumers to these maintenance instructions.

Roto Frank Fenster- und Türtechnologie GmbH recommends the manufacturer conclude a maintenance agreement with their end users.

No legal claims can be derived from the following recommendations; their application is to be based on the specific individual case.

	Responsibility	
<b>Maintenance interval</b>	<input type="checkbox"/>	→ from page 81
<b>Cleaning</b>		→ from page 81
Clean hardware	<input type="checkbox"/>	
<b>Care</b>		→ from page 81
Lubricate movable parts	<input type="checkbox"/>	
Lubricate locking points	<input type="checkbox"/>	
<b>Performance test</b>		→ from page 82
Check that hardware components are fitted securely	<input type="checkbox"/>	
Inspect hardware components for wear	<input type="checkbox"/>	
Check that movable parts work properly	<input type="checkbox"/>	
Check that locking points work properly	<input type="checkbox"/>	
Check ease of movement	■	
<b>Repair</b>		→ from page 83
Retighten screws	■	
Replace damaged components	■	

☐ = May be carried out by a specialist company or the end user

■ = **Must** be carried out by a specialist company



## 7.1 Maintenance intervals



### ATTENTION

#### **Failure to adhere to maintenance intervals may cause property damage.**

The maintenance interval for all tasks relating to the hardware components is **annually** at the least. In hospitals, schools and hotels, the maintenance interval is **six-monthly**.

Regular maintenance is necessary in order to maintain the proper and smooth-running operation of the hardware and to prevent premature wear or even defects.

- ▶ Determine and adhere to the appropriate maintenance interval in accordance with the ambient conditions.

## 7.2 Cleaning



### ATTENTION

#### **Using incorrect cleaning agents and sealing compounds may cause property damage.**

Cleaning agents and sealing compounds may damage the surfaces of components and gaskets.

- ▶ Do not use aggressive or flammable liquids, acidic cleaners or abrasive cleaners.
- ▶ Only use mild, pH-neutral cleaning agents that have been diluted.
- ▶ Apply a thin protective film to the components, for example using a cloth soaked in oil.
- ▶ Avoid aggressive vapours (e.g. produced by formic acid, acetic acid, ammonia, amine compounds, ammonia compounds, aldehyde, carbolic acid, chlorine, tannic acid) around the element.
- ▶ Do not use any acetic acid-crosslinking or acid-crosslinking sealing compounds or those with the aforementioned constituents as both direct contact with the sealing compound and its fumes can corrode the surface of the components.

### Cleaning the hardware

- ▶ Clean deposits and contaminants off the hardware using a soft cloth.
- ▶ Lubricate movable parts and locking points after cleaning. → 7.3 "Care" from page 81
- ▶ Apply a thin protective film to the hardware, for example using a cloth soaked in oil.

## 7.3 Care



### ATTENTION

#### **Using incorrect lubricants may cause property damage.**

Substandard lubricants can prevent the hardware from working properly.

- ▶ Use high-quality lubricants.
- ▶ Only use resin-free and acid-free lubricants.



### ATTENTION

#### **Cleaning agents and lubricants may pollute the environment.**

Leaking or excess cleaning agents and lubricants may pollute the environment.

- ▶ Remove any leaking or excess cleaning agents and lubricants.
- ▶ Dispose of cleaning agents and lubricants separately and properly.
- ▶ Observe the applicable directives and national laws.

Ease of movement can be improved by lubricating or adjusting the hardware. All functional hardware components must be lubricated on a regular basis.

### Recommended lubricants

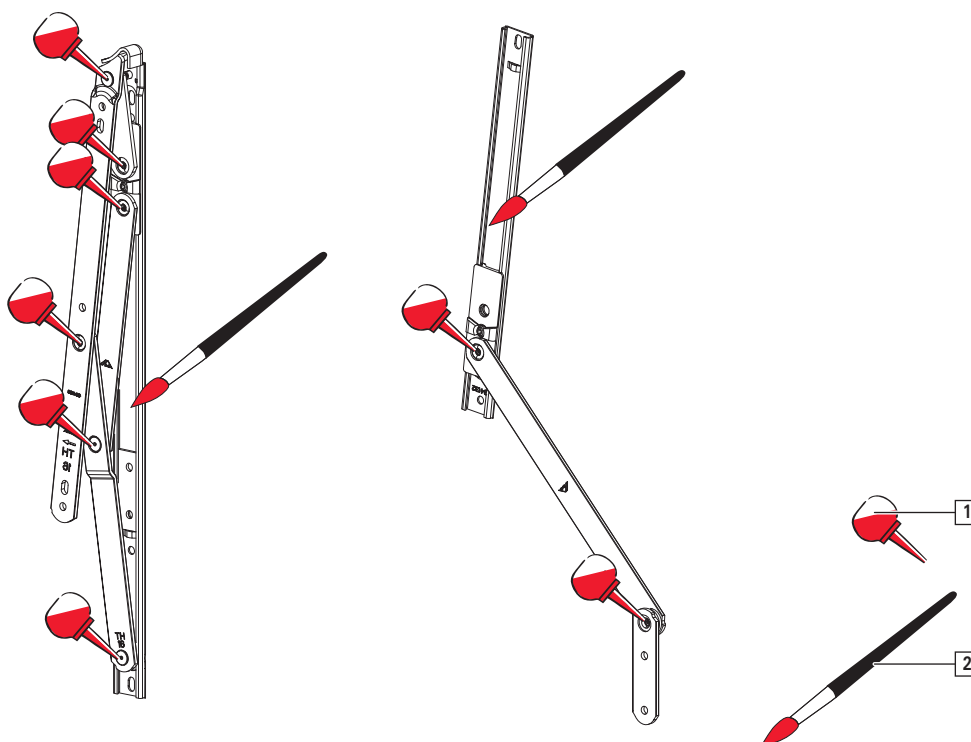
- Roto NX / NT grease



### INFO

The figure displays the positioning of potential lubrication points. The figure does not necessarily match the installed hardware. The quantity of lubrication points varies depending on the size and design of the element.

## 7.3.1 Lubrication points



[1] Oil spray / oil

[2] Grease

## 7.4 Performance test



### WARNING

**Improper repair work may pose a risk of death!**

Improper maintenance may prevent the element from working properly and make it less safe to use.

- ▶ Always have repairs performed by a specialist company.

Check for proper operation:

- ▶ Inspect hardware components for damage, deformation and a firm fit.
- ▶ Check that windows run smoothly by opening and closing them.
- ▶ Check the window gaskets for elasticity and fit.
- ▶ Check closed windows to ensure that they are leakproof.
- ▶ Locking and unlocking torque max. 10 Nm. The test can be performed on the handle.

Have malfunctions remedied by a specialist company.



## 7.5 Repair



### WARNING

#### **Improper repair work may pose a risk of death!**

Improper maintenance may prevent the element from working properly and make it less safe to use.

- ▶ Always have repairs performed by a specialist company.



### ATTENTION

#### **Improper screw fixings may cause property damage.**

Loose or faulty screws can prevent the hardware from working properly.

- ▶ Check that the individual screws are secure and seated correctly.
- ▶ Tighten or replace loose or faulty screws.
- ▶ Use only the suggested screws.

Repair work includes replacing and repairing components and is only necessary if components have become damaged after wear or as a result of external circumstances. The hardware must be secured reliably in order to ensure that the element works properly and is safe to use.

The following tasks must only be performed by a specialist company:

- All adjustment work on the hardware,
- Replacing hardware or hardware components,
- Installing and removing windows, doors or balcony doors

The specialist company must observe the following:

- Perform the necessary repair work properly, according to generally recognised engineering practice and in accordance with the applicable regulations.
- Do not perform makeshift repairs on worn or damaged components.
- Only use original or approved spare parts for repairs.

## 8 Dismantling

---



### WARNING

#### **Improper dismantling may pose a risk of death!**

The sash may fall during dismantling.

- ▶ Secure the sash to prevent it from falling, e.g. by using two people.
  - ▶ Always have dismantling work performed by a specialist company.
- 



### CAUTION

#### **Physical strain may cause injury and damage to health.**

Carrying and lifting heavy loads for extended periods leads to physical injury in the long term.

- ▶ When carrying or lifting loads, maintain an ergonomically correct posture. The maximum permissible load is 25 kg for men and 10 kg for women.
- 



### INFO

Unless otherwise stated, dismantling is performed in reverse order to installation.

---

## 8.1 Hardware components

### Removing hardware components

1. Undo all screw connections.
2. Remove the hardware components.
3. Dispose of the hardware components properly.





## 9 Transport

### 9.1 Transporting elements and hardware



#### **DANGER**

##### **Improper transport poses a risk of death!**

Improper procedures for transporting, loading or unloading elements may cause serious injuries and glass breakage as a result of the elements swinging open, falling or becoming overloaded.

- ▶ Note the applicable accident prevention regulations.
- ▶ Note force application points and reaction forces.
- ▶ Prevent the sash from opening uncontrollably.
- ▶ Avoid jerky movements.
- ▶ Use suitable transportation means and protective devices.
- ▶ Watch out for protruding components.
- ▶ Transport heavy loads with two people and use suitable transportation means (such as an industrial truck).



#### **CAUTION**

##### **Trapped limbs may result in injuries.**

The transported goods can skid, open, close or fall during transportation tasks. This can result in limbs being trapped and seriously injured.

- ▶ Never reach near the scissor stays.
- ▶ Close the sash after installation and secure it in place for transport.
- ▶ Wear safety gloves and protective footwear.



#### **CAUTION**

##### **Physical strain may cause injury and damage to health.**

Carrying and lifting heavy loads for extended periods leads to physical injury in the long term.

- ▶ When carrying or lifting loads, maintain an ergonomically correct posture. The maximum permissible load is 25 kg for men and 10 kg for women.

Hardware is supplied to the specialist company as complete sets. The components are packaged accordingly for each scope of delivery. The instructions for safely transporting the hardware are described below.

Observe the following basic instructions when transporting hardware:

- ▶ Transport larger scopes of delivery using appropriate transportation means (such as industrial trucks).
- ▶ Note the transport weight in order to select appropriate transportation means.
- ▶ Immediately check the delivery for completeness and transport damage on receipt.
- ▶ Only transport fully assembled windows with rebate clearance panelling.



#### **INFO**

Submit a complaint about any defects as soon as they are identified. Claims for damages may only be made within the reclamation period.

Use the following transportation means for support when transporting, loading and unloading larger scopes of delivery:

- Industrial trucks, e.g. forklifts, telescopic handlers, pallet trucks
- Lifting equipment, e.g. transport nets, carry straps, round slings
- Protective devices, e.g. edge protection, spacer blocks



#### **INFO**

Industrial trucks and lifting devices may only be operated by qualified persons.

---



#### **INFO**

Lifting equipment and protective devices may only be used if they are in full working order.

---

## **9.2 Storing the hardware**

Store all hardware components as follows until they are installed:

- Dry and protected
- On a level surface
- Protected against sunlight



## 10 Disposal



### ATTENTION

#### **Incorrect disposal may pollute the environment.**

Pieces of hardware are raw materials.

- ▶ Dispose of hardware for environmentally friendly material reutilisation as mixed scrap.

### 10.1 Disposing of packaging

The hardware is supplied as complete sets together with the packaging. Once unpacked, the installation company or builder is responsible for disposing of the packaging properly. The packaging materials are produced in accordance with current environmental protection standards. The materials can be recycled separately.

Follow the basic instructions below for the proper disposal of packaging:

- ▶ Do not dispose of packaging in household waste.
- ▶ Hand over packaging at local waste collection points or recycling centres.
- ▶ Observe the national regulations on the disposal of recyclable materials.
- ▶ Contact the local authorities if necessary.

### 10.2 Disposing of hardware

Once the hardware is finished with, the end user or builder is responsible for properly disposing of the windows, doors or balcony doors and the hardware, including any accessories. Hardware is produced in accordance with current environmental protection standards. The materials can be recycled separately.

Follow the basic instructions below for the proper disposal of hardware:

- ▶ Observe the information and specifications for disposal contained in the other applicable documents.
- ▶ Separate hardware components from windows, doors or balcony doors.
- ▶ Do not dispose of hardware in household waste.
- ▶ Hand over hardware at local waste collection points or recycling centres.
- ▶ Observe the national regulations on the disposal of recyclable materials.
- ▶ Contact the local authorities if necessary.



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