



**EN**

## **Instructions for Fitting and Maintenance**

Single-leaf and double-leaf steel doors (OD doors, H3G, H16G, HS75, H16S1)

**ENGLISH** ..... **3**




..... **8**

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Dear Customer,  
 We are delighted that you have decided to choose a product from our company.


**1 About These Instructions**

Please read and follow these instructions carefully. They provide you with important information on the fitting, maintenance and care of your steel door and are an important document for the construction file.

Should you have any questions after working through these instructions, please contact our After-Sales Service.

**1.1 Warnings used**

 The general warning symbol indicates a danger that can lead to **injury** or **death**. In the text section, the general warning symbol will be used in connection with the caution levels described below. In the illustrated section, an additional instruction refers back to the explanation in the text.

 **DANGER**

Indicates a danger that leads directly to death or serious injuries.

**1.2 Symbols used**



Fire protection



Smoke protection



Security door



Acoustic rating



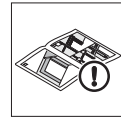
Function door



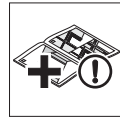
Important note



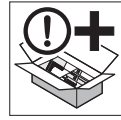
See text section



See illustrated section



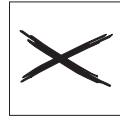
See installation instructions in accessory pack



To be ordered as an accessory



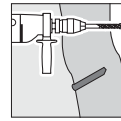
Correct procedure



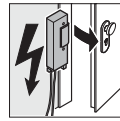
Non-permissible procedure



Welding



Drilling



Electric door strike



Possible burglar attack from opening side



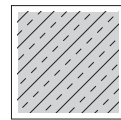
Possible burglar attack from closing side



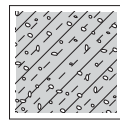
Escape route



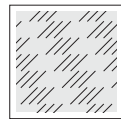
Timber



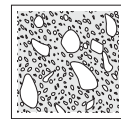
Concrete / brickwork



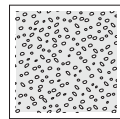
Gas concrete



Plaster



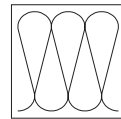
Concrete



Mortar



Frame seal CR  
 T60 / El<sub>2</sub> 60 / HBS60  
 T90 / El<sub>2</sub> 90 / HBS90  
 T120 / El<sub>2</sub> 120 / HBS120  
 T30 / El<sub>2</sub> 30 backfilled with mineral wool



Insulation material A  
 (EN 13501-1)

## 2 Safety Instructions

### DANGER

#### Danger to life while fitting the steel door

During fitting, the door or door frame can fall and kill persons.

- ▶ Prior to and during fitting, secure the door and frame against falling over.

- Only qualified and instructed personnel may perform fitting and maintenance.
- Electrical work may only be carried out by qualified electricians.
- Do not make any alterations through attachments or conversions which could impair safety.
- Exclude hazards caused by gas, dust, vapour, smoke, fire and explosion during welding, burning and grinding work.
- When welding, ensure that intumescent materials do not react as a result of heat input, as this would render the materials ineffective!

## 3 Information on the Door Features

Please observe that the door may have single features, a combination of fire protection, smoke protection, acoustic rating and burglar protection features, or may be a function door.

### 3.1 Fire doors and smoke-tight doors

- The respective approval can be found in the Internet at [www.hoermann.de/dokumentation/zulassungsbescheide-fuer-feuerschutzabschluesse/](http://www.hoermann.de/dokumentation/zulassungsbescheide-fuer-feuerschutzabschluesse/). The approval must be present at the place of use.
- The information given represents the minimum requirements for installation in Germany. For installation in other countries, the corresponding national allowances are valid. However, these must be based on material parameters equal to or exceeding DIN standard.
- Observe the standards DIN 18093 (Installation of Fire Doors) and DIN 18100 (Wall Openings for Doors) or the country-specific regulations.
- In individual cases, in accordance with §22 and §23 of the German building code, the manufacturer can issue a declaration of conformity.

- **The operator / owner is responsible for the flawless condition of the door.**
- In Germany, spring hinges must **not** be used on doors and hatches having the following characteristics:
  - Leaf weight > 80 kg
  - Glazing
  - Fitting in prefabricated walls (exception: dimensions < 1000 × 1000 mm)
  - Combination as smoke-tight doors acc. to DIN 18095
  - Double leaf

Different regulations may apply outside Germany, however, we recommend compliance with the German regulations.

- Use only those fittings, locks, closing devices and electric attached parts that are part of the door approval or are approved by the manufacturer.
- Doors rebated on 3 sides, without a bottom seal for the shaft, should be installed at the lowest floor level.
- Gypsum plasterboard walls and wall thicknesses: see Tab. 1:
- Permissible walls and wall thicknesses: see Tab. 3:
- Backfill the frame with cement-based mineral mortar (e.g. LM21 from Sakret) provided it is not described differently in the corresponding installation situation. Profile frames and corner frames (with and without counter frames) must be splayed prior to backfilling to ensure that they do not buckle under the pressure of the mortar.
- **Smoke protection:**
  - Use bottom seals and sealing wedges (see illustrated section, section 10.6 and section 11).
  - If the frame is not backfilled with mortar, seal the frame connection to the adjacent structural components to provide an unbroken flexible seal on both sides.
  - Use locking cylinders.
- Do not expose glazings on fire-rated doors to direct sunlight.

### 3.2 Acoustic-rated doors

- The overall acoustic rating is dependent on the surrounding structural components. The resulting acoustic rating of wall and door must be verified separately, as it cannot be derived from the evaluated acoustic value  $R_w$  or  $R$  of the door alone.
- Ensure that any seal(s) make full contact.

Tab. 1: Permissible F90A prefabricated walls with minimum wall thicknesses for fire-rated and smoke-tight doors, height ≤ 5000 mm

Test certificate no.	Wall	H3 OD H_30 OD	H3-1G H_30 D1	<sup>1)</sup> H3-2 VM H_30 D2	H16 S1 H_90 E1
P-3310/563/07-MPA BS	Knauf W 112	≥ 100 mm	≥ 100 mm	≥ 100 mm	≥ 125 mm
P-3391/170/08-MPA BS	Knauf W 131	≥ 116 mm	—	—	≥ 177 mm
P-3310/563/07-MPA BS	Knauf W 132	≥ 100 mm	—	—	—
P-3202/2028-MPA BS	RiGips W 352 / W 353	≥ 100 mm	≥ 100 mm	≥ 100 mm	≥ 150 mm
P-3956/1013-MPA BS	RiGips 3.40.01ff. / 3.41.01ff.	≥ 100 mm	≥ 100 mm	≥ 100 mm	—
P-3014/1393-MPA BS	RiGips 3.60.20	≥ 100 mm	≥ 100 mm	≥ 100 mm	≥ 125 mm
P-3020/0109-MPA BS	RiGips 6.70.10	≥ 165 mm	—	—	≥ 165 mm
P-SAC-02/III-681	LaFarge L11 – L14	≥ 100 mm	≥ 100 mm	≥ 100 mm	—
P-MPA-E-98-005	LaFarge L15	≥ 100 mm	—	—	≥ 125 mm
P-3515/0519-MPA BS	LaFarge L16	≥ 150 mm	—	—	≥ 150 mm
P-3391/0890-MPA BS	LaFarge L18	—	—	—	≥ 161 mm
P-MPA-E-99-047	Promat 450.81	≥ 140 mm	—	—	≥ 140 mm
P-11-003478-PR01	B + M W 50 / 100 – W 100 / 150	≥ 100 mm	—	—	—
P-3854/1372-MPA BS	Fermacell 1 S 31/3.1	≥ 95 mm	≥ 95 mm	≥ 95 mm	—

1) Max 2750 × 2750 mm

Tab. 2: Permissible walls and minimum wall thicknesses for fire-rated and smoke-tight doors (mm) see 4.2

Wall	H3-1 OD H_30-1 OD		H3-2 OD H_30-2 OD		H3-1 G H_30 D1	H3-2 VM H_30 D2	H16-1 G H_90 D1	H16-2 G H_90 F-2	H16-S1 H_90 E-1	H16-1 OD H_90-1 OD		H16-2 OD H_90-2 OD	
	<sup>1)</sup> k ≤ 2500 100	<sup>2)</sup> k > 2500 140	<sup>1)</sup> k ≤ 2500 100	<sup>2)</sup> k > 2500 140						—	—	—	—
<b>Steel door</b> Concrete DIN 1045-1, strength ≥ C12/15	<sup>1)</sup> k ≤ 2500 100	<sup>2)</sup> k > 2500 140	<sup>1)</sup> k ≤ 2500 100	<sup>2)</sup> k > 2500 140	140	140	140	140	120	—	—	—	—
<b>Brickwork</b> DIN 1053-1, strength ≥ 12, mortar group ≥ 2	<sup>1)</sup> k ≤ 2500 115	k > 2500	<sup>1)</sup> k ≤ 2500 115	<sup>2)</sup> k > 2500 175	175	175	240	240	175	e ≤ 625 k ≤ 750	e > 625 k > 750	140	140
<b>Gas concrete stone slabs or concrete precision blocks</b> DIN 4165-3, strength class ≥ 4, Gas concrete slabs acc. to general official approval strength class ≥ 4.4	k ≤ 2500 150		k ≤ 2500 150		175	175	200	200	175	—	—	—	—
<b>Prefabricated wall F90-A</b> acc. to ABP Observe Figure 9D, max. height 5000 mm	<sup>3)</sup> —		<sup>3)</sup> —		<sup>3)</sup> —	<sup>3)</sup> —	—	—	<sup>3)</sup> —	—	—	—	—
<b>Prefabricated wall F90-A</b> DIN 4102-4/Tab. 48, Observe Figure 9D, max. height 5000 mm	e ≤ 1320 100		e ≤ 2500 100		—	e ≤ 2750 and k ≤ 2750	—	—	—	—	—	—	—
<b>Prefabricated wall F90-B</b> DIN 4102-4/Tab. 49, Observe Figure 9D, max. height 5000 mm	e ≤ 1250 and k ≤ 2500 <sup>4)</sup> 100 / <sup>5)</sup> 130		e ≤ 2500 and k ≤ 2500 <sup>4)</sup> 100 / <sup>5)</sup> 130		—	—	—	—	—	—	—	—	—
<b>Prefabricated wall F30-B</b>	e ≤ 1125 and k ≤ 2125 185		—		—	—	—	—	—	—	—	—	—
<b>Plaster wallboards</b> VG Orth, P-SAC 02 / III-468 Observe Figure 9/A17	— 100		— 100		—	—	—	—	—	—	—	—	—

1) Without top part

2) With top part

3) see, Tab. 1:

3) Double-shell frame

5) Dryfix

Minimum wall thicknesses

- The floor must be smooth to ensure the sealing function of the bottom seal.
- Split the screed in the threshold area.
- Use sealing wedges and a bottom seal (see illustrated section, section 10.6 and section 11).
- Use locking cylinders.
- Backfill the frame completely with mortar.
- Glue the mitre-cut corners of the frame seal with, for example, Kóratan UC<sup>2</sup>41.

**3.3 Burglar protection doors**

- The door does not fulfil its security function unless the latch is completely closed and the key is removed.
- Secure the door leaves on RC4/B doors and on all double-leaf RC doors at the hinges with two screws each (see illustrated section, section 8.3b).
- Only use corner frames, corner frames with counter frame and profile frames.
- For RC2/N doors, the frame must be back-packed at the locking points, hinges, and security bolts in order to withstand pressure.
- For RC3/A and RC4/B doors, the frame must be back-packed around the full perimeter to withstand pressure.
- In doors with glazing, fit the glazing frame with securing lugs towards the attack side.
- If the top glazing is replaced, fit the back-blocking in the same manner as prior to fitting.
- For double-leaf doors, measure the bottom gap dimensions from the floor trough.
- For panic doors, intrusion with a wire must be made more difficult, e.g. by a small bottom air gap or use of a semi-round threshold.
- Completely fill in the frames for RC2 doors with mortar if they are to be fitted in 90A prefabricated walls.

**3.3.1 Minimum requirements for security doors**

Resistance class acc. to DIN EN V 1627 / DIN EN 1627 / VDS	RC2 / N	RC3 / A	RC4 / B
Brickwork DIN 1053 part 1 (mm)	115	115	240
Reinforced concrete, at least C12 / 15 (mm)	100	120	140
Gas concrete blocks class 4 (mm)	175, 115 <sup>1)</sup>	300	-
Gas concrete slabs class 4 (mm)	150	-	-
Prefabricated wall F90	✓	-	-
Profile cylinder acc. to DIN 18252 <sup>3)</sup>	P2BS	P2BS	P3BS
Profile cylinder <sup>2) 3) 4)</sup>	Class A	Class A	Class B
Protective fittings acc. to DIN 18257 <sup>3)</sup>	ES1 (ZA)	ES2 (ZA)	ES3 (ZA)
Protective fittings <sup>2) 3)</sup>	Class A	Class A	Class B
EN 356 glazing (fire protection)	P4A	P6B / P7B	-

1) Only single-leaf doors, we recommend wall thicknesses of 150 mm or more  
 2) For VdS-approved doors  
 3) Protective fitting or profile cylinder must be equipped with pull-off protection (ZA).  
 4) Not necessarily included in scope of delivery

**3.4 Function doors**

The frames need not be backfilled.

**3.5 Fire protection and outside application**

Fire protection and outside application require their own approval. Please note the separate fitting instructions art- no. 479166.

**4 Fitting**

**4.1 Before fitting**

Before fitting, please clarify the following questions:

- What characteristics does the door have?
- Is the wall structure suitable for installing the door?
- Is the floor height known (metre line)?
- In which direction should the door open?
- Do any building regulations need to be considered?
- Does the wall need to be chiseled out in the area of the wall protective boxes?

**4.2 Dimensions**

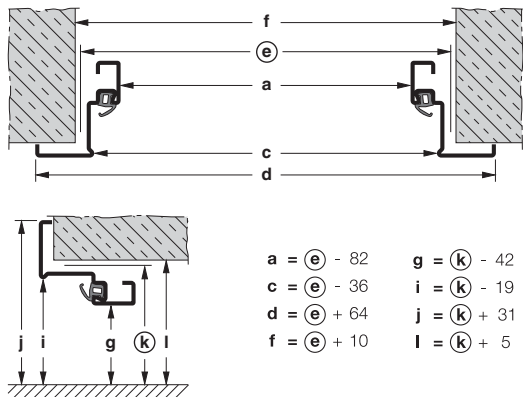


Fig. 1: Dimensions

- a/g Clear opening width / height
- c/i Clear rebate width / height
- d/j Overall frame dimension width / height
- e/k Ordering width / height
- f/l Clear unfinished structure dimension width / height acc. to EN 12519

**4.3 When fitting**

- Observe the fitting instructions in the accessory packs.
- Use fitting material if it is supplied, e.g. dowel brackets, plugs or screws.
- Use the plugs indicated in section 8.
- In combination with corner frame and vertically perforated brick or plaster, use the dowel FUR 10 x 80/100 mm and follow item 8 in the fitting instructions.
- Drill the vertically perforated brick and hollow bricks without impact.
- Note a minimum edge distance of 50 mm for horizontal/vertical holes as well as the expansion direction of the dowel.
- Please note that, for frames for finished floors, the bottom fitting bracket must be removed before fitting.

**4.4 Information on illustrated section**

See section	Description
8	Fitting situations and frame shapes
8.1a	Flush
8.1b	Thin rebate
8.1c	Thick rebate
8.2a / 8.2b	Number of fixing points
8.2c	Mounting instructions

See section	Description
8.3a	Removing the standard door
8.3b	Removing the security door
8.4	Assembling the corner frame
8.5	Floor trough and fitting bracket
8.6	Fastenings
8.7	Minimum edge spacing and expansion direction of the dowel
8.8	Fitting the edge recess profiles
8.9	Tubes in the frame
8.10	Suitable electric strikes
8.11	Wall protective cap in gypsum board walls
8.12	Design of GKF walls
9.0	Fitting situations
10.1a	Fitting with standard hinges
10.1b	Fitting with 3-way adjustable hinges
10.2	Fitting the security door
10.3	Adjusting the air gaps
10.4	Removing the transportation brackets in the case of frames for finished floors
10.5	Fitting the counter frame
10.6	Fastening the sealing wedges with silicone
10.7	Fitting the frame seal
10.8	Raising the door
10.9	Tensioning the spring hinge
10.10	Latch engagement verification
10.11	Alteration of ventilation grille
10.12	Alteration of glazing frame
10.13	Intumescent coating on fire doors and smoke-tight doors
10.14	Intumescent coatings at security bolts
10.15	Marking of large glass surfaces
10.16	Anti-panic doors and RC3/A
10.17	Block lock fitting for multiple-point locking
11	Bottom seals
12	Door closer
13.1	Removing the key in anti-panic doors
13.2	Avoiding incorrect operation of the lock

## 5 Care and Maintenance

### 5.1 Annual maintenance work

- ▶ Check the door leaf, frame and fastening for mechanical and corrosion damage.
- ▶ Check the function of the lock and grease the latch if needed.
- ▶ Lubricate the lock bolts with Teflon spray.
- ▶ Check the fastening of the attached parts, such as lever handle, lock, door closer, hinges etc.
- ▶ Grease hinge pins and bearing rings.
- ▶ Check the gap dimensions.
- ▶ Check that the identification is visible.



**DANGER**

#### **Danger to life due to detached intumescent coatings**

The fire door loses its function if the intumescent coatings are detached.

- ▶ Replace intumescent coatings that have detached, see illustrated section 10.13.

- ▶ Replace defective parts.
- ▶ Only use original spare parts from the manufacturer.

If you discover defects that you yourself cannot remedy, call in a specialist company.

### 5.2 Required surface treatment for elements with standard priming

The surface of door leaf and frame consists of a primer powder coating on epoxy resin polyester basis.

1. Remove the seal(s).
2. With the exception of the intumescent coatings, sand all of the surfaces to be painted.
3. Clean the surfaces thoroughly.
4. To finish door leaf, frame and the intumescent coating, use the following coating system:
  - Primer-coating 2-component epoxy etch primer and final coating with suitable commercially available construction paint or
  - Primer and final coating with 2-component PUR paint.
 Do not use dark paints in direct sunlight. Please note BFS information sheet no. 24, follow the directions of the paint manufacturer and test a sample surface. Finish the products within three months of fitting to avoid corrosion damage.
5. After the paint has dried, reattach the seal(s).

### 5.3 Cleaning

- ▶ Clean the surfaces with clear water or conventional paint cleaner.

### 5.4 Cleaning stainless steel components

- ▶ Regularly clean stainless steel components by applying "Edel Glanz" stainless steel cleaner (available from Hörmann) with a soft cloth.

## 6 Labelling and marking

The label for **door types D65-1, D65-2, D65-1 OD, D65-2 OD** bears the CE conformity mark based on the (EU) Directive no. 305/2011. The European product standard used and applied is EN 14351-1:2006 + A1:2010 "Windows and doors – Productstandard, performance characteristics – Part 1: Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics." The number of the corresponding CE mark or declaration of performance is indicated in the rebate area of the door on the above-mentioned label between the manufacturer logo and the CE conformity mark.

The above-mentioned harmonised European product standard does not apply for doors that do not bear a CE conformity mark on their labels; thus those doors must not have a CE mark and a declaration of performance.

## 7 General

Putting the door into operation is prohibited until it has been established that the door has been installed in accordance with our specifications and its function has been properly tested. A product's declaration of performance becomes invalid if an alteration to the product is carried out.

## 8 Declaration of performance

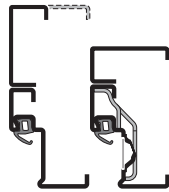
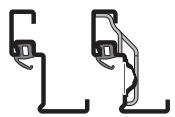
Declaration of performance see section 8.3:  
[www.hoermann.com/dop](http://www.hoermann.com/dop)



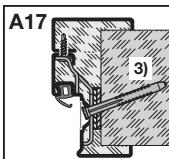
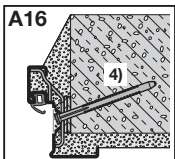
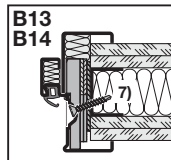
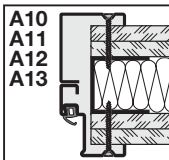
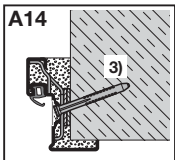
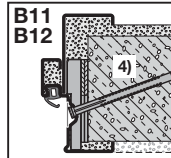
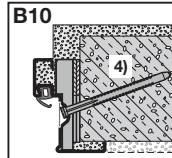
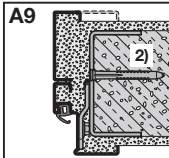
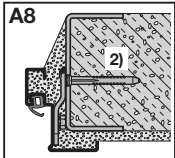
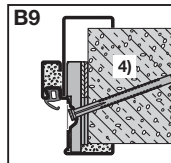
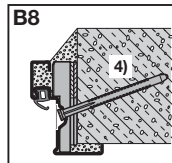
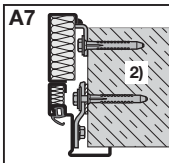
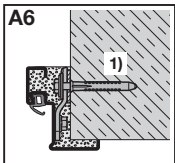
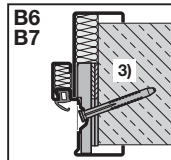
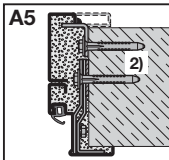
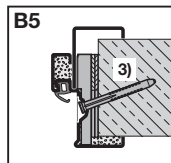
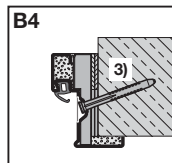
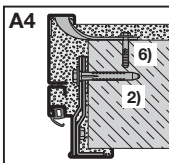
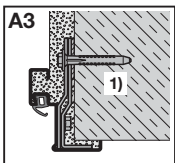
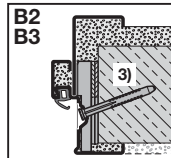
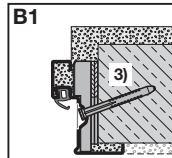
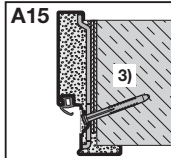
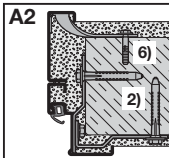
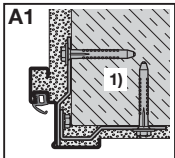
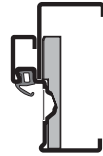
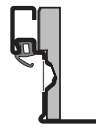
4.3/4.4



A



B



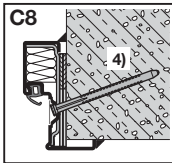
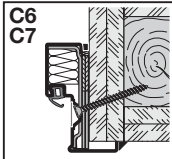
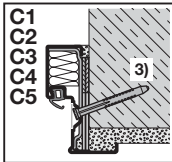


8

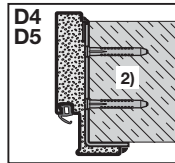
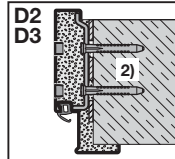
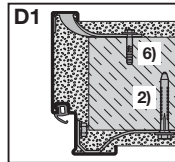
4.3/4.4

9

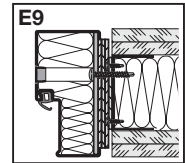
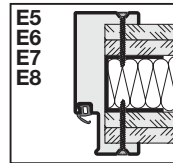
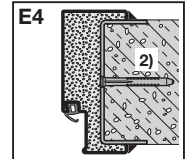
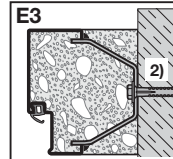
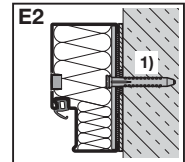
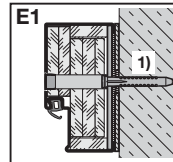
C



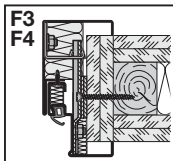
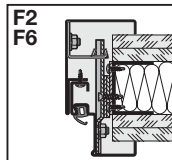
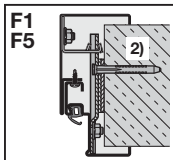
D



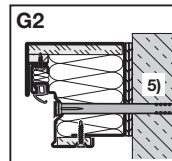
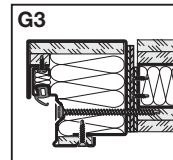
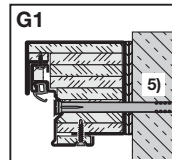
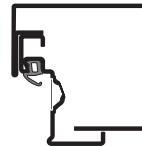
E



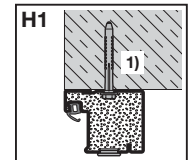
F



G



H



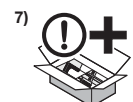
1) Fischer: FUR 10 x 80/100

Fischer: SXS 10 x 80/100 →  
 Hilti: HRD 10 x 80/100 →  
 MEA: MFR 10 x 80/100 →  
 Würth: W-UR 10 x 80/100 →

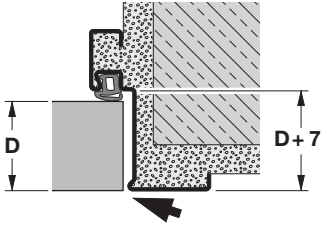


2) Fischer: FUR 10 x 80/100/115  
 Fischer: SXS 10 x 80/100/120  
 Hilti: HRD 10 x 80/100  
 MEA: MFR 10 x 80/100/115  
 Würth: W-UR 10 x 80/100/115

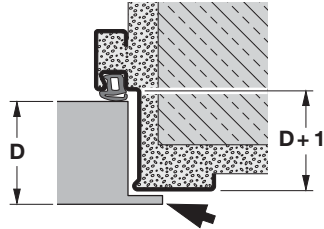
3) Fischer: FUR 10 x 100  
 4) Fischer: FUR 10 x 160  
 5) Fischer: FUR 10 x 200  
 6) 8 x 40



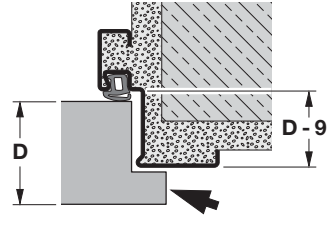
8.1a



8.1b

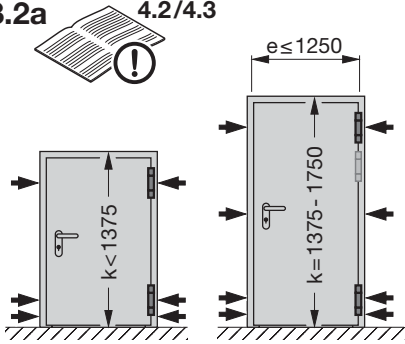


8.1c



8.2a

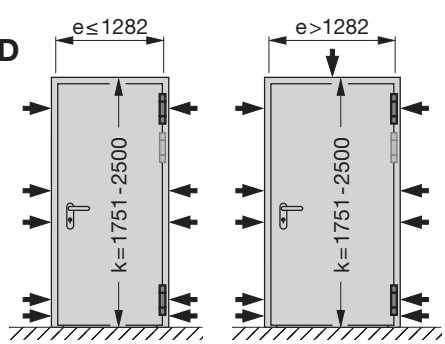
4.2/4.3



H16-S1

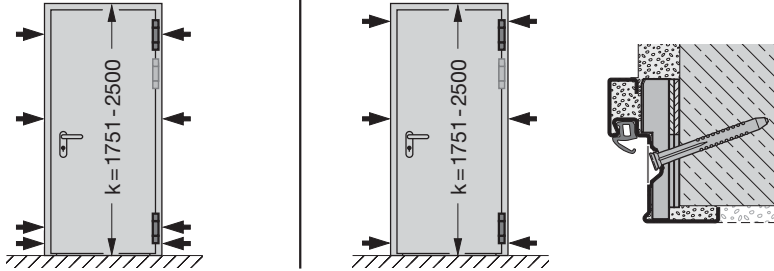
H16-1 OD

HS75



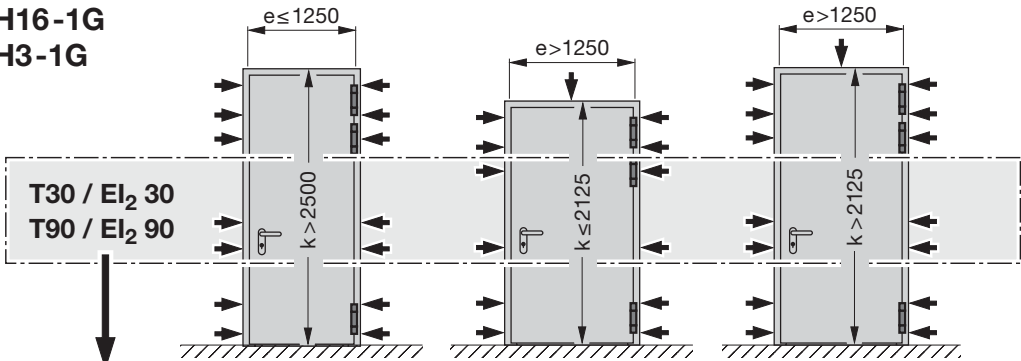
D65-1 OD

H3-1 OD

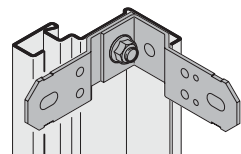


H16-1G

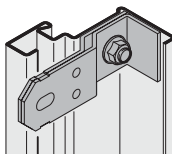
H3-1G



T30 / EI<sub>2</sub> 30

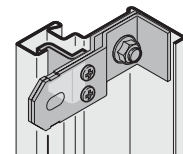
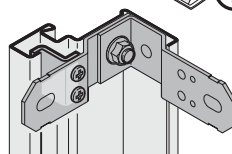


T90 / EI<sub>2</sub> 90



8.6a

8.6b



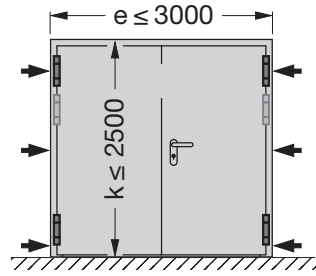
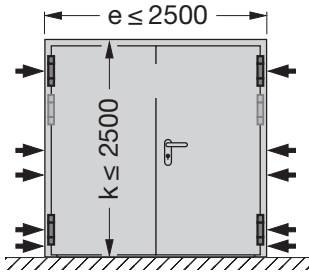
8.2b



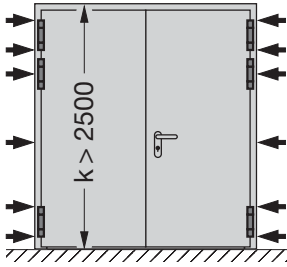
4.2/4.3

H16-2 OD  
H3-2 OD

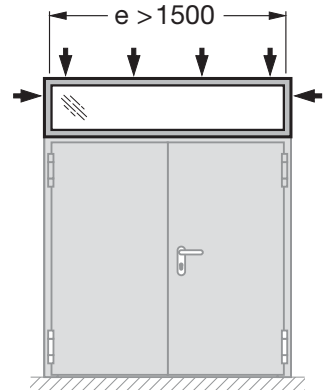
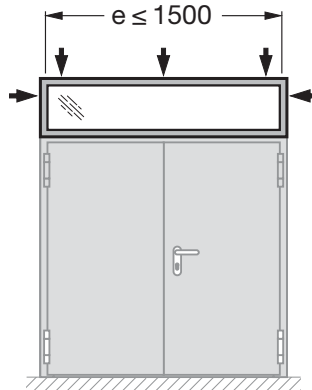
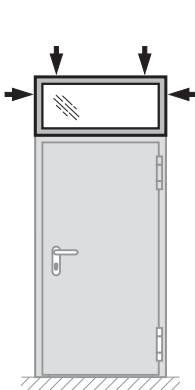
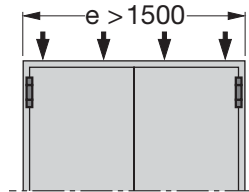
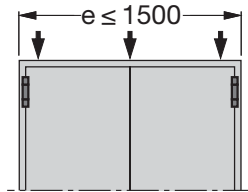
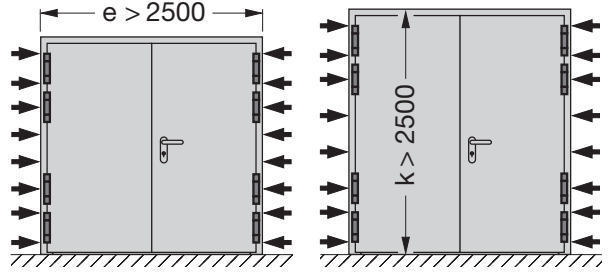
D65-2 OD



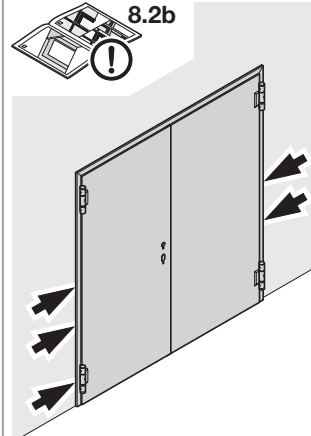
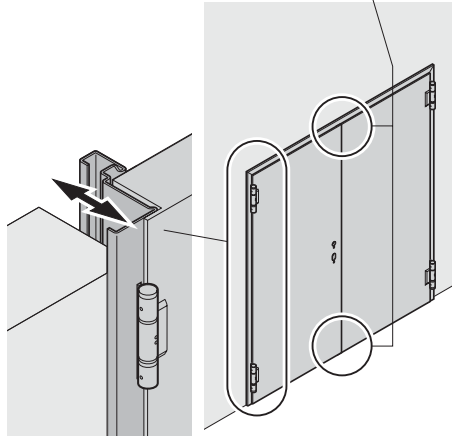
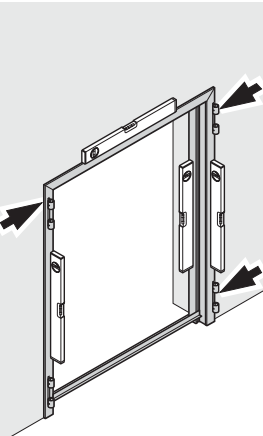
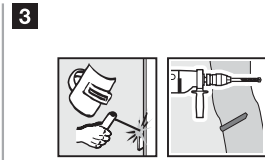
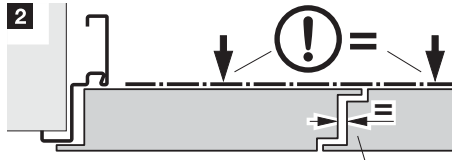
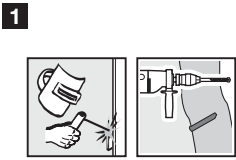
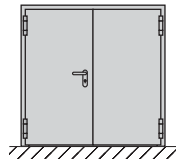
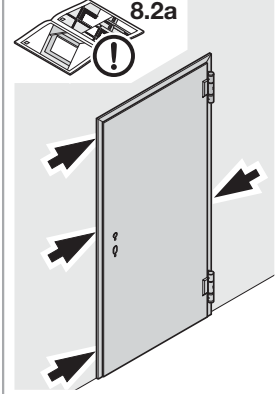
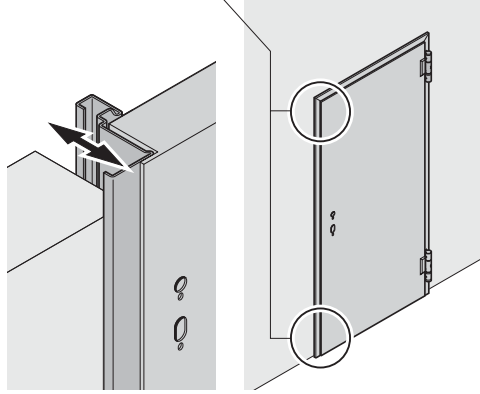
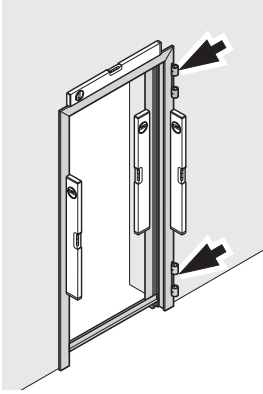
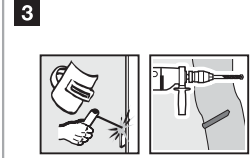
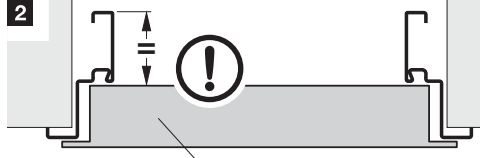
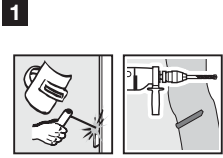
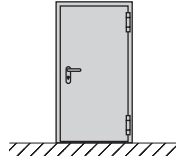
H3-2 VM



H16-2 G  
H\_90 F2



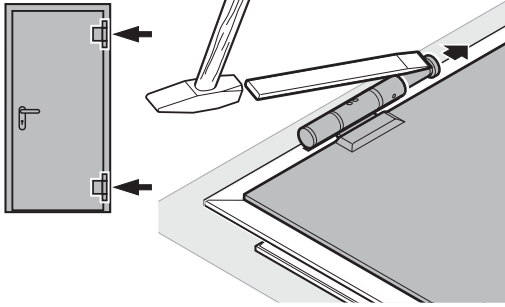
8.2c



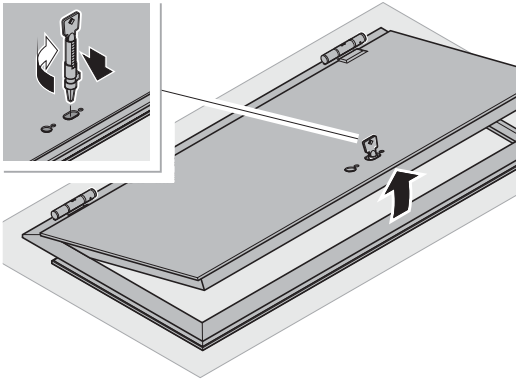
8.3a 4.3



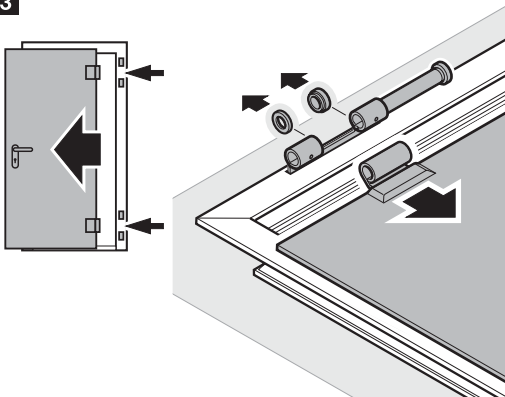
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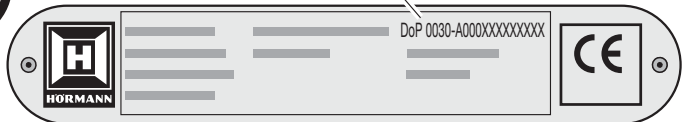
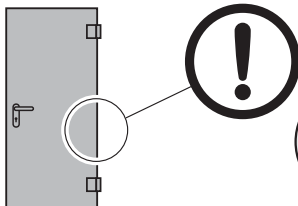
2



3



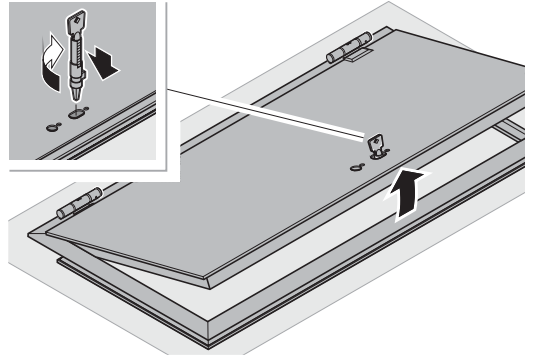
4



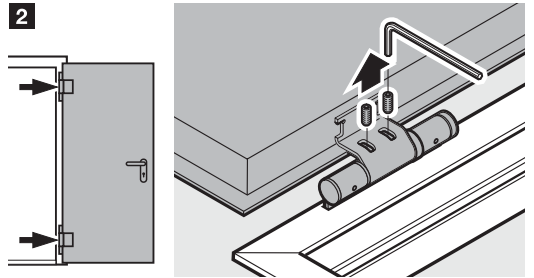
8.3b 3.3/4.3



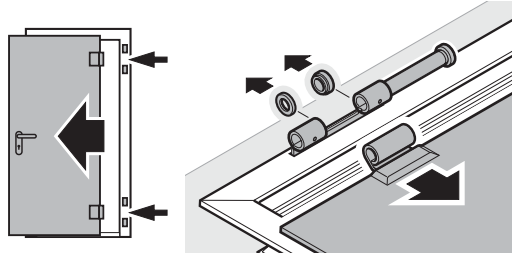
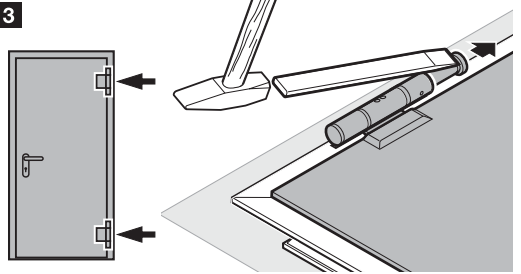
1



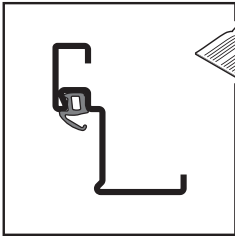
2



3



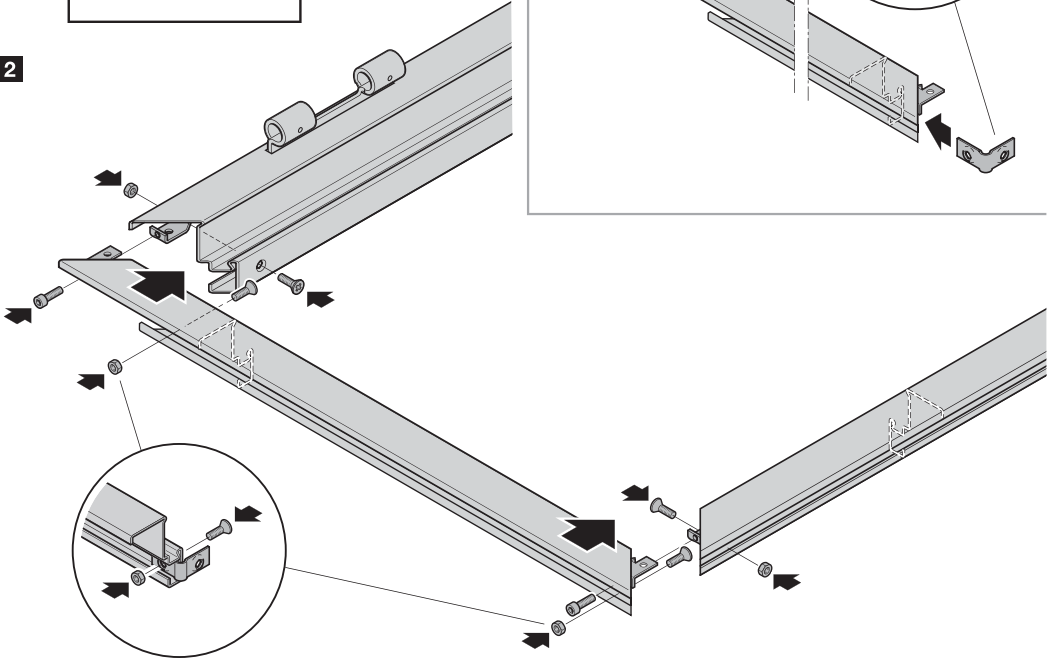
8.4



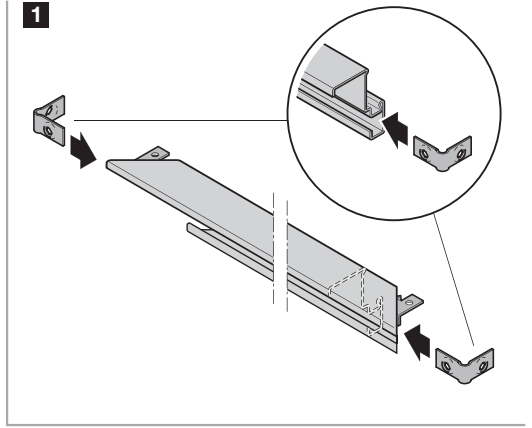
4.3



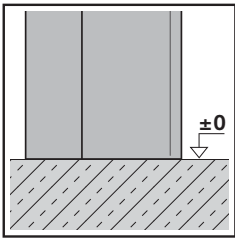
2



1

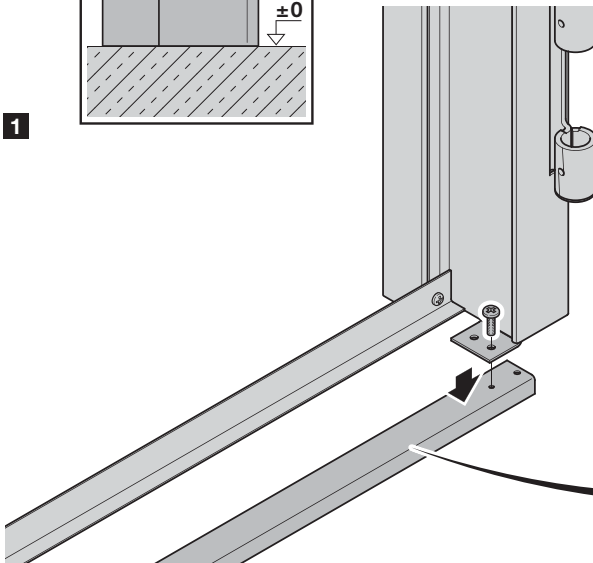


8.5a

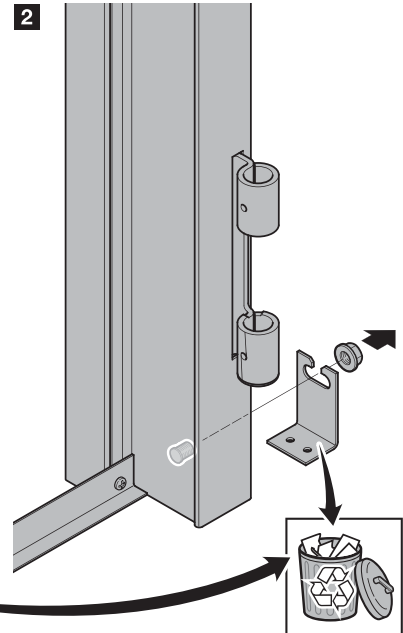


4.3

1

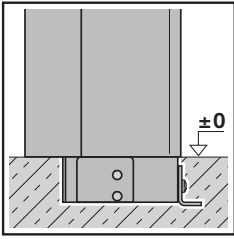


2

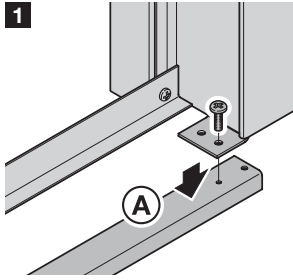


8.5b

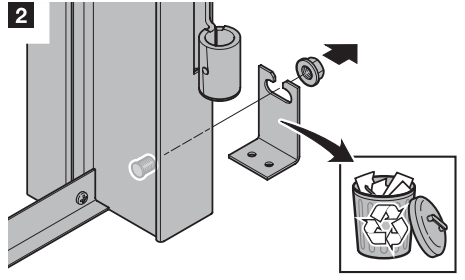
4.3



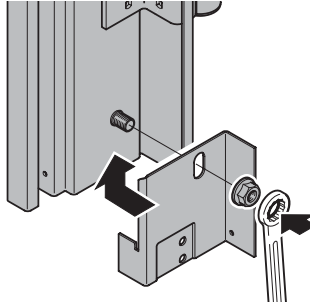
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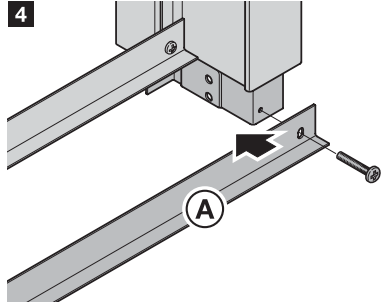
2



3

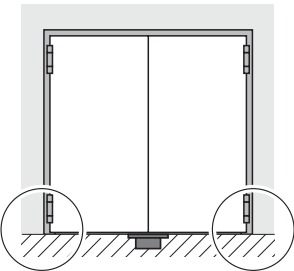
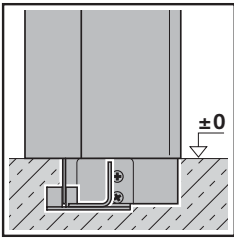


4

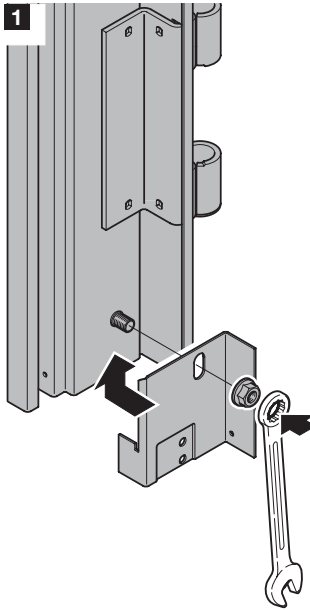


8.5c

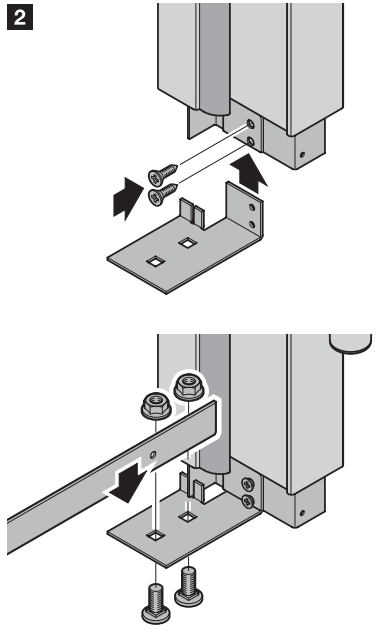
4.3



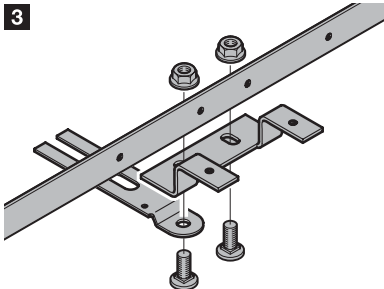
1



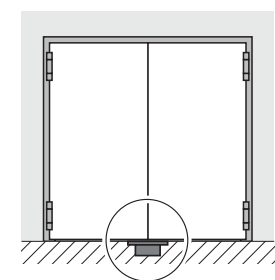
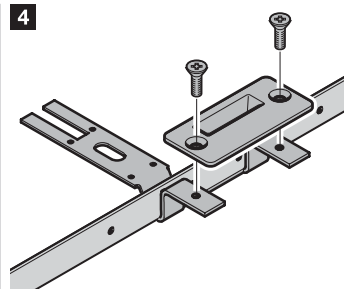
2



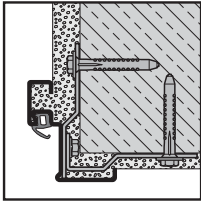
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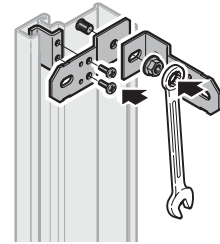
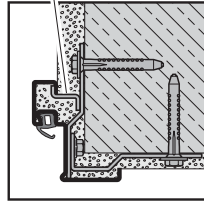
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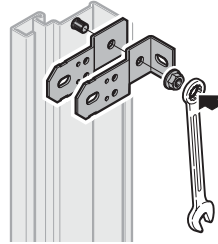
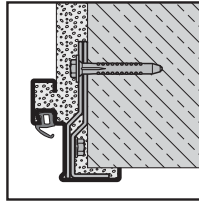
8.6a 4.3



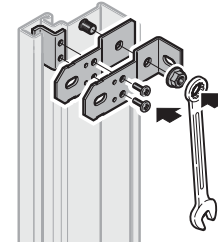
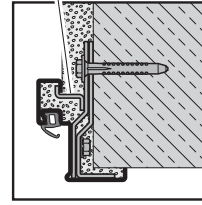
8.2a



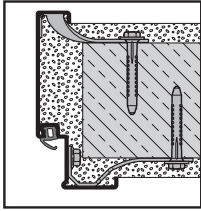
8.6b 4.3



8.2a



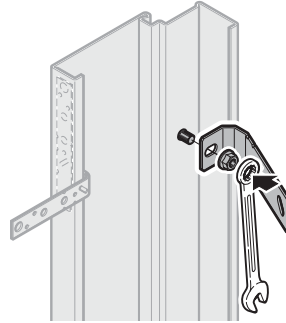
8.6c 4.3



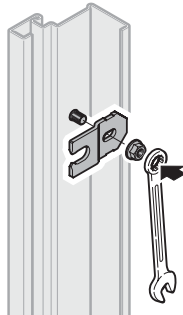
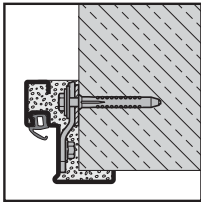
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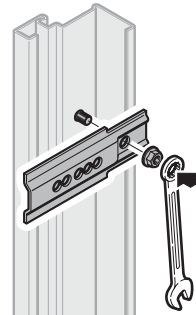
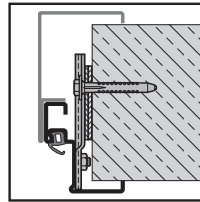
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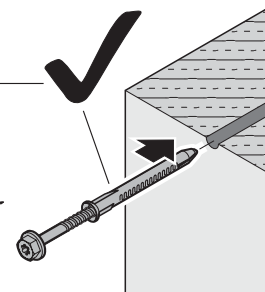
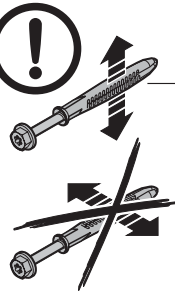
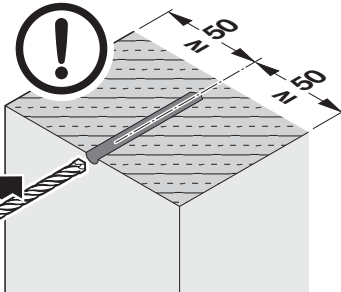
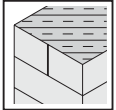
8.6d 4.3



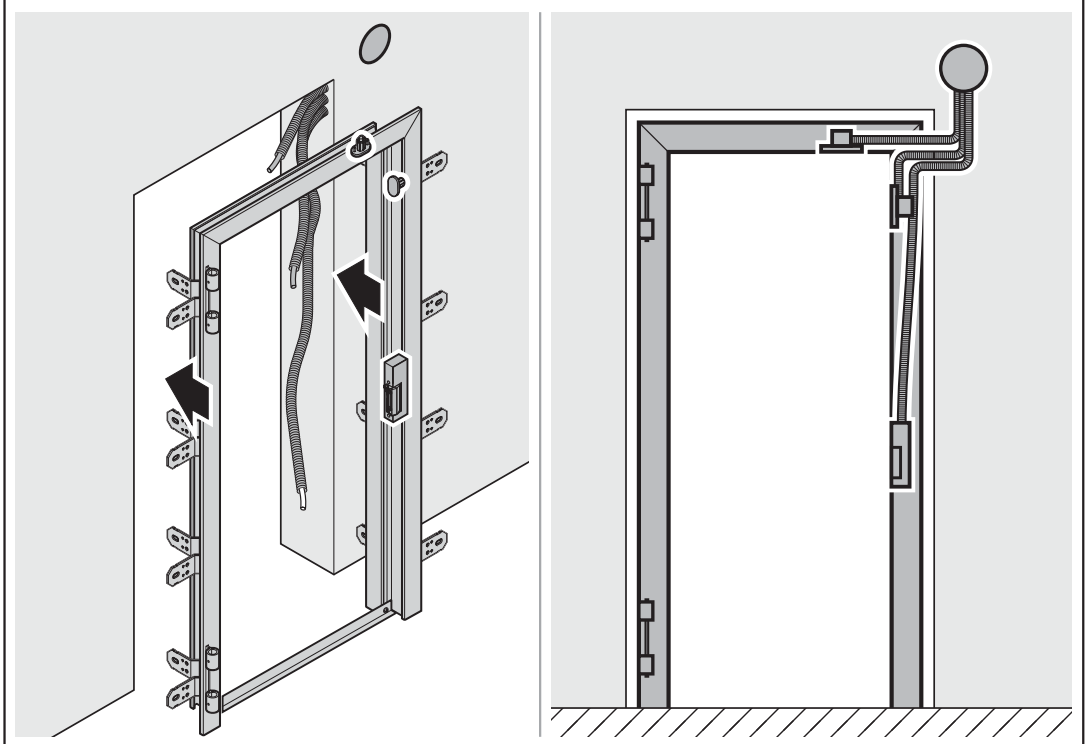
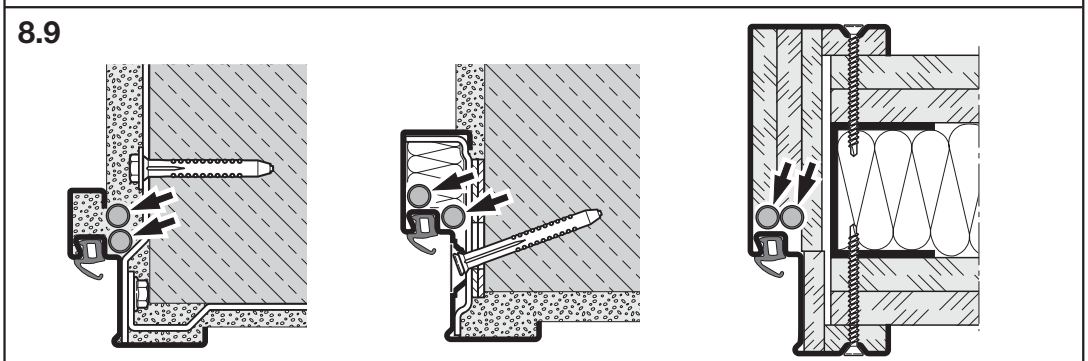
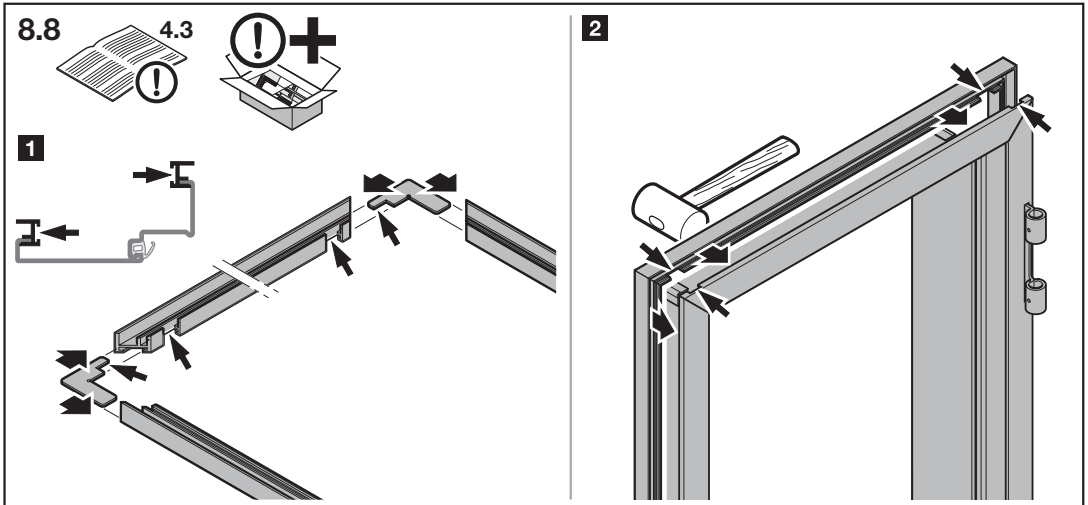
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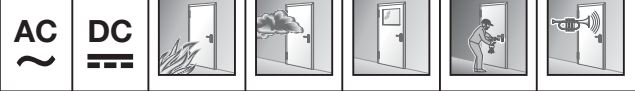
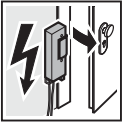
8.7







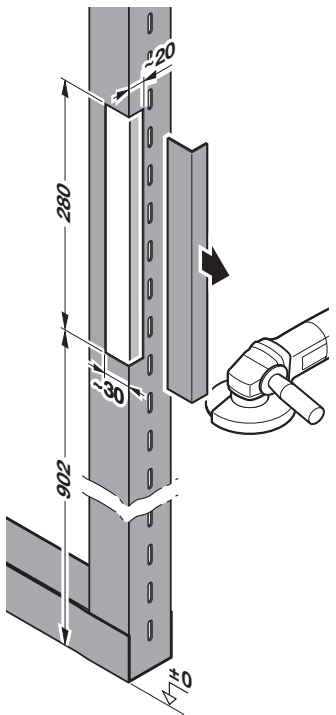
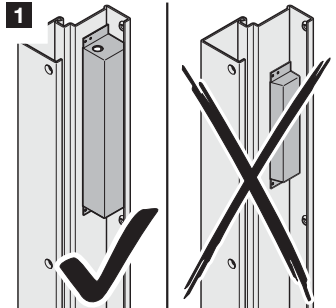
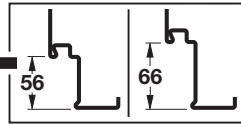
8.10



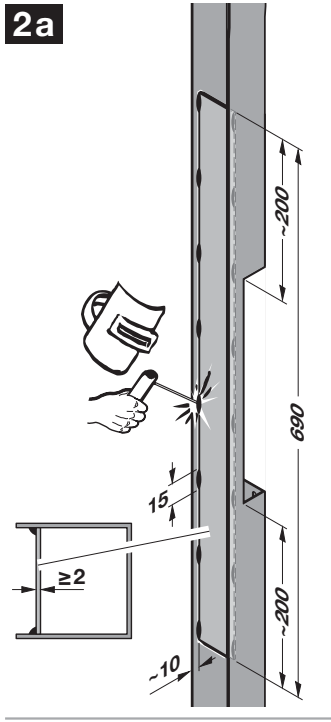
		AC ~	DC ≡					
<b>I.S.T. Systems</b>	<b>FT200/FT201</b>	x				x	x	x
	<b>142 UF</b>	x		x	x	x	x	x
<b>effeff</b>	<b>143</b>	x	x	x (T90/2)	x	x	x	x
	<b>14/34</b>	x				x	x	x
	<b>447/Basic</b>	x				x	x	x
<b>Dorma</b>	<b>Lucky Basic</b>		x			x	x	x

8.11

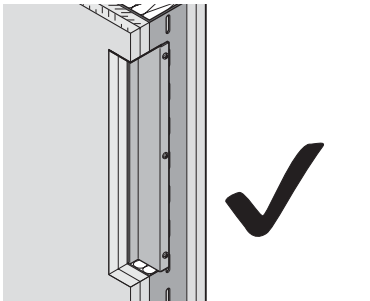
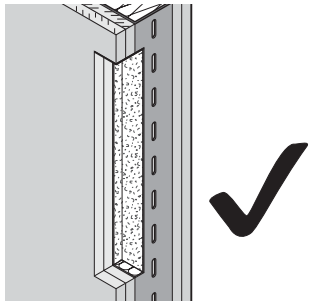
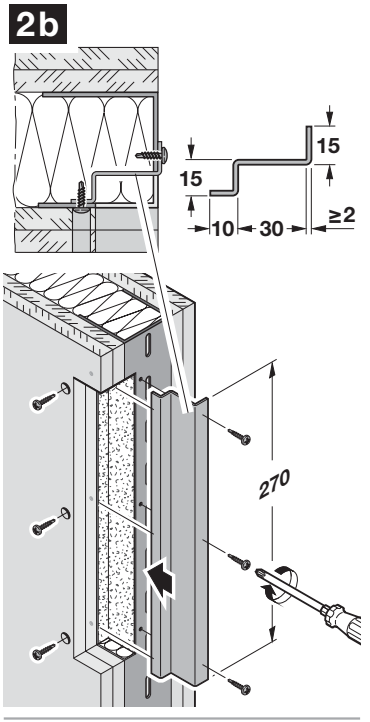
8.12



2a



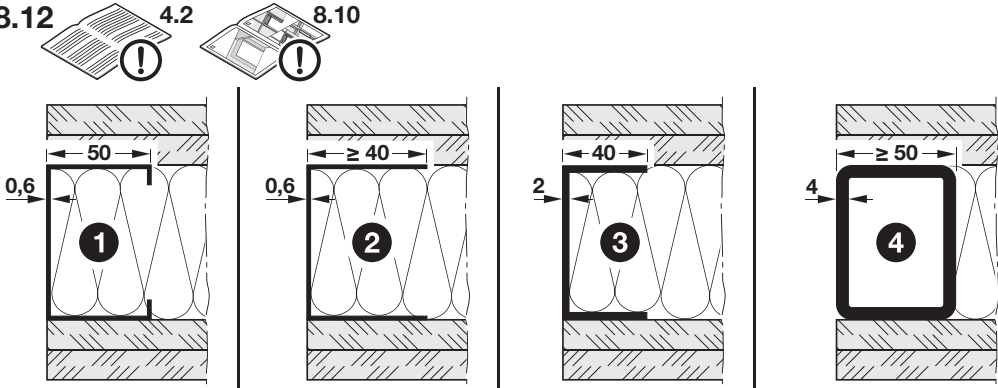
2b



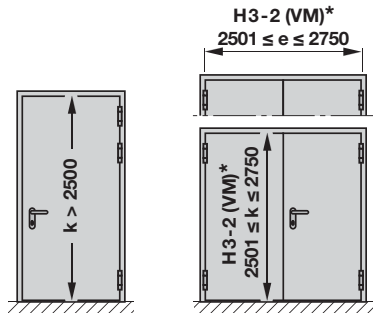
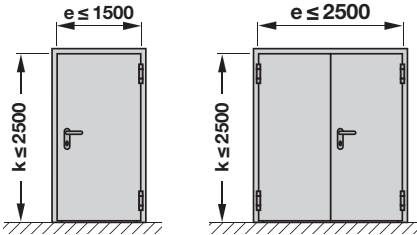
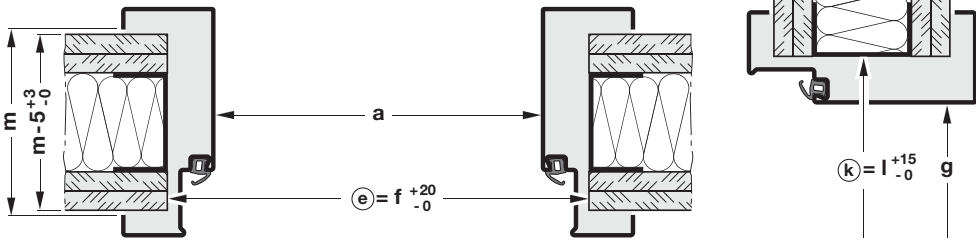
8.12

4.2

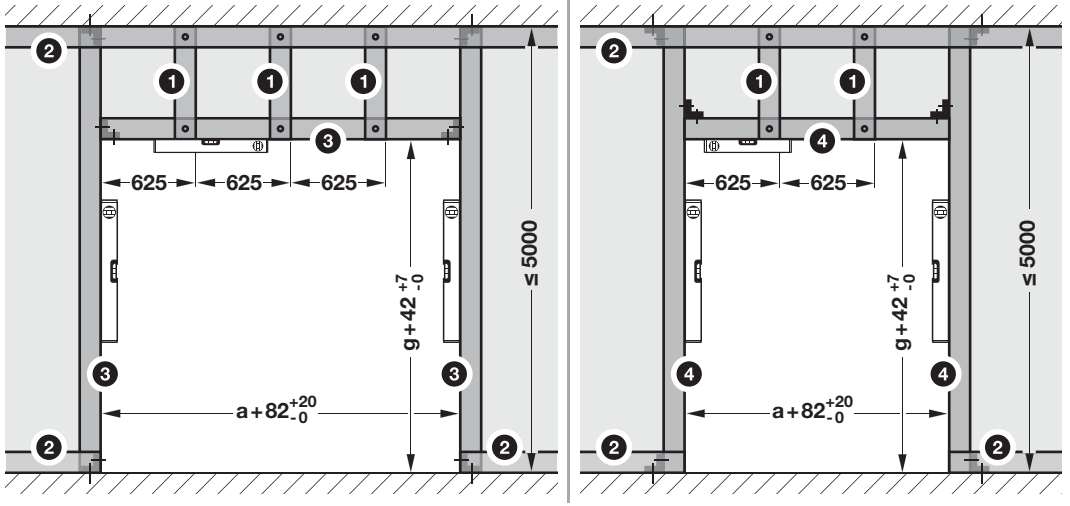
8.10



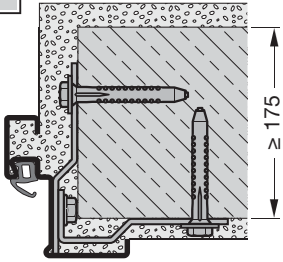
**i** [www.felko-systeme.de/teleskopstuetzen.php](http://www.felko-systeme.de/teleskopstuetzen.php)



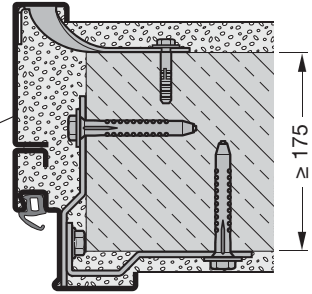
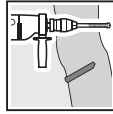
\*[www.felko-systeme.de/teleskopstuetzen.php](http://www.felko-systeme.de/teleskopstuetzen.php)



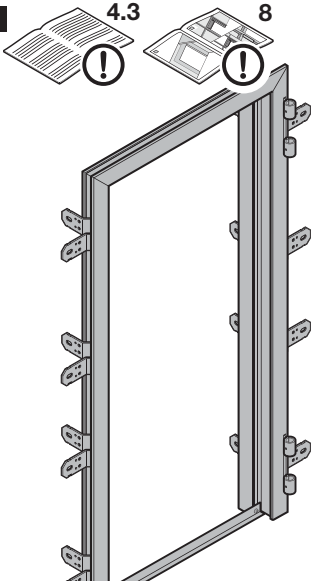
9/A1



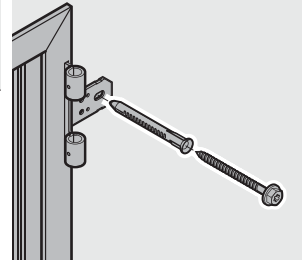
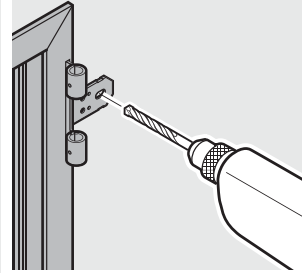
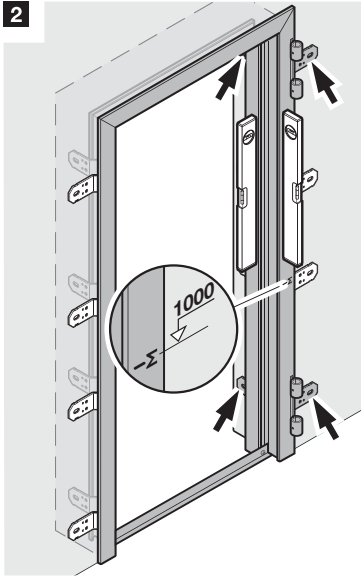
9/A2



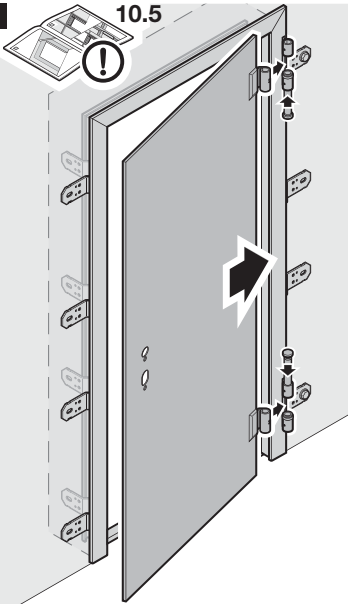
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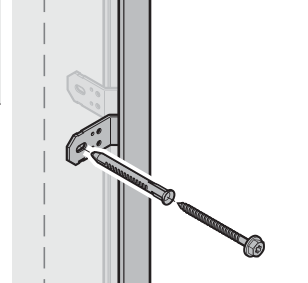
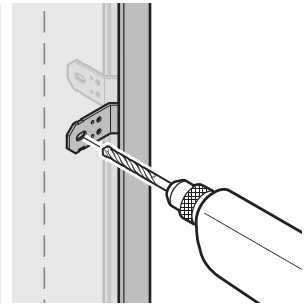
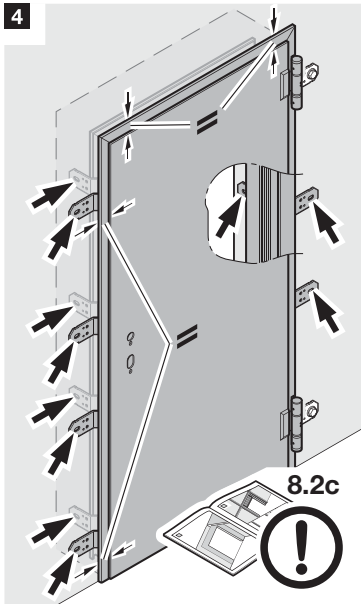
2

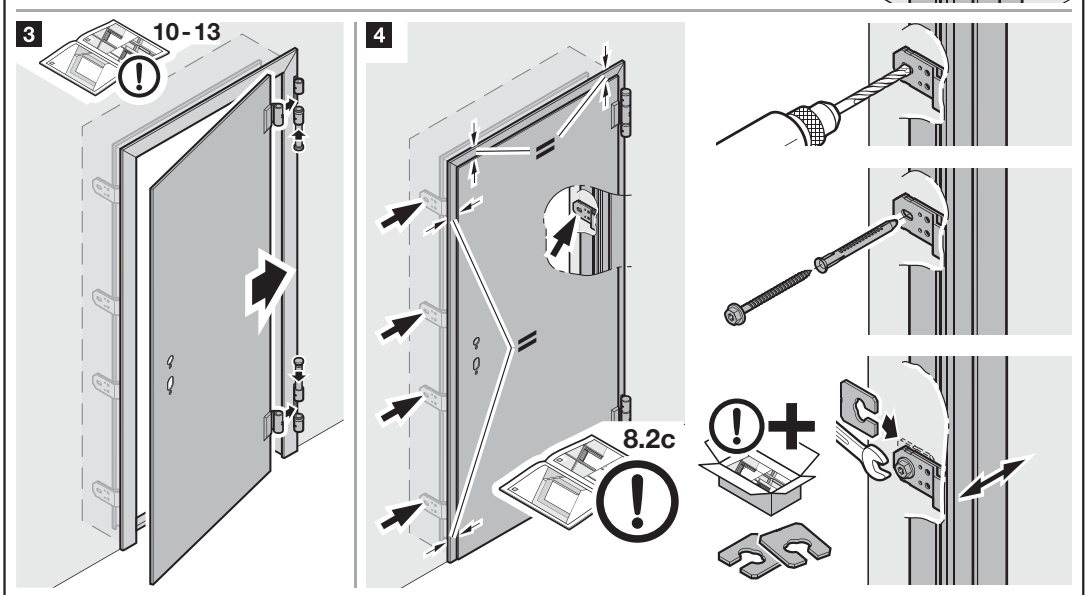
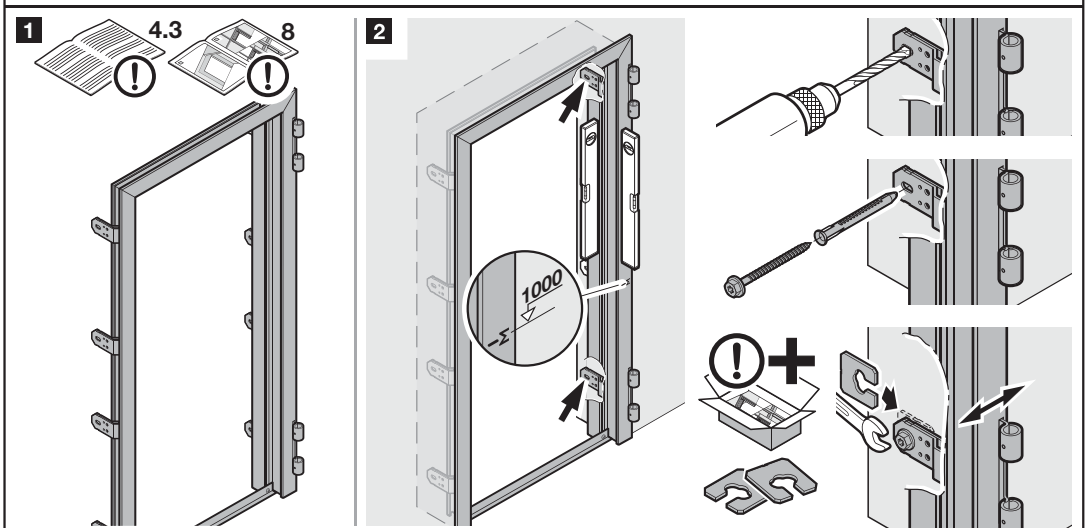
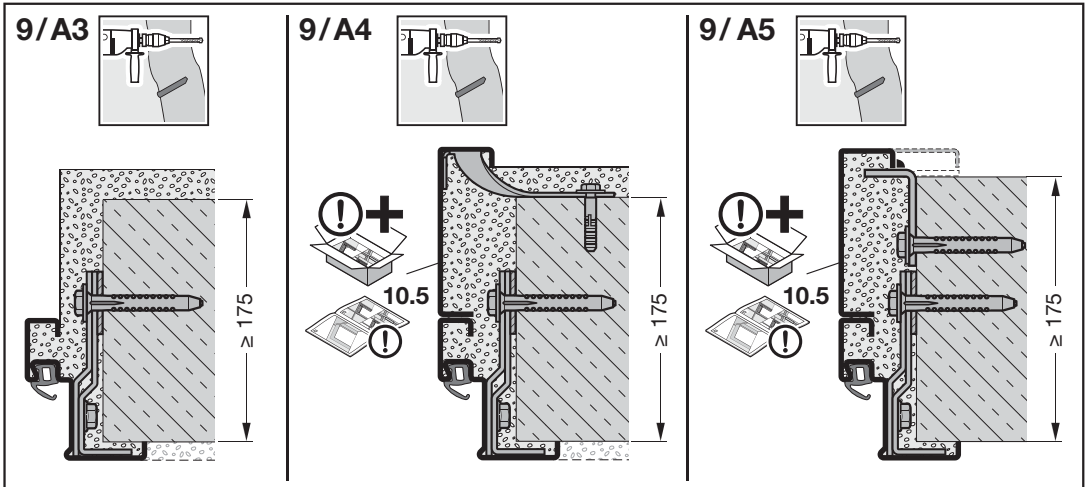


3

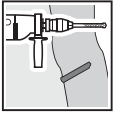


4

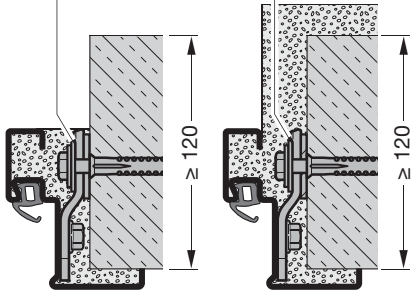




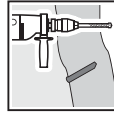
9/A6



DIN 9021-8.4-140 HV

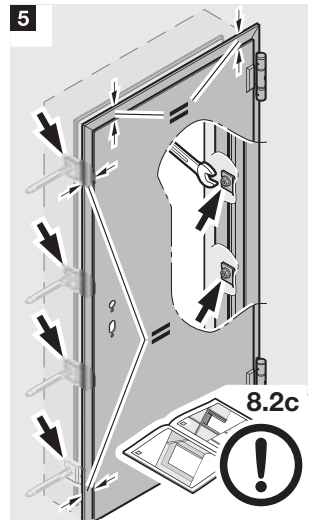
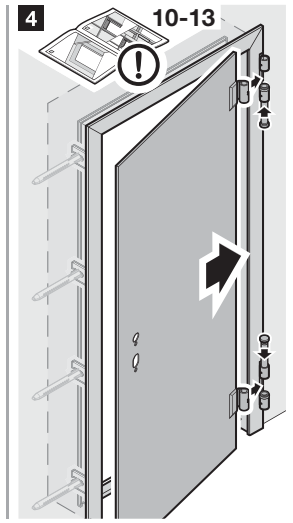
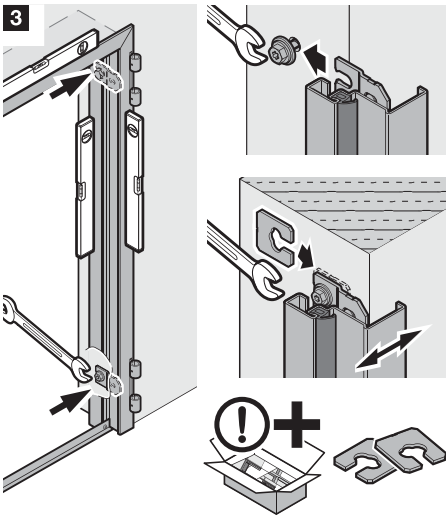
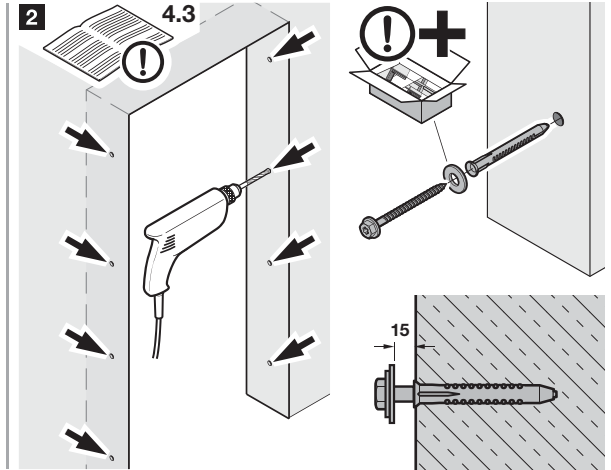
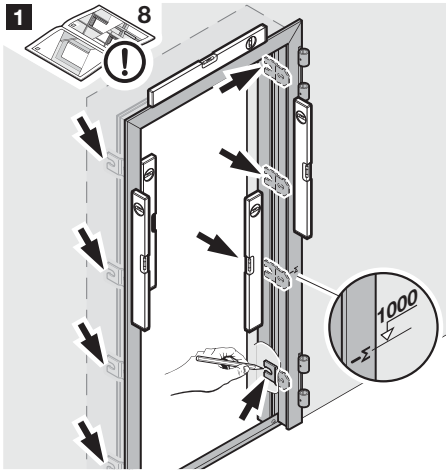
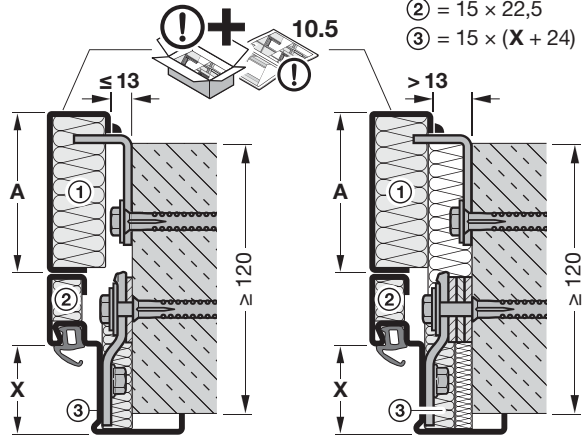


9/A7  
max. T30

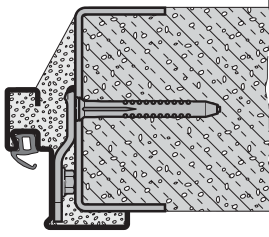


$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

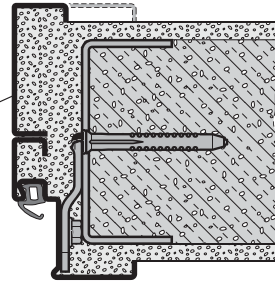
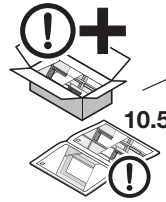
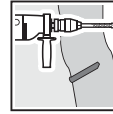
- ① = 30 x (A - 5)
- ② = 15 x 22,5
- ③ = 15 x (X + 24)



9/A8

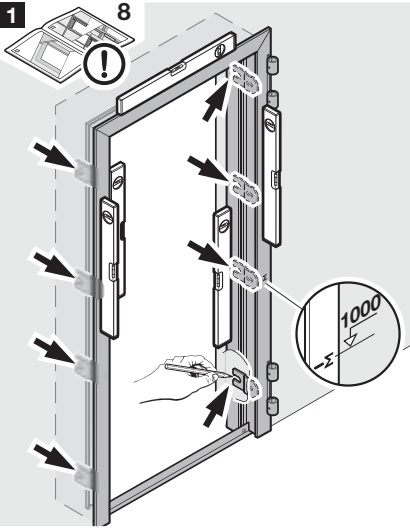


9/A9



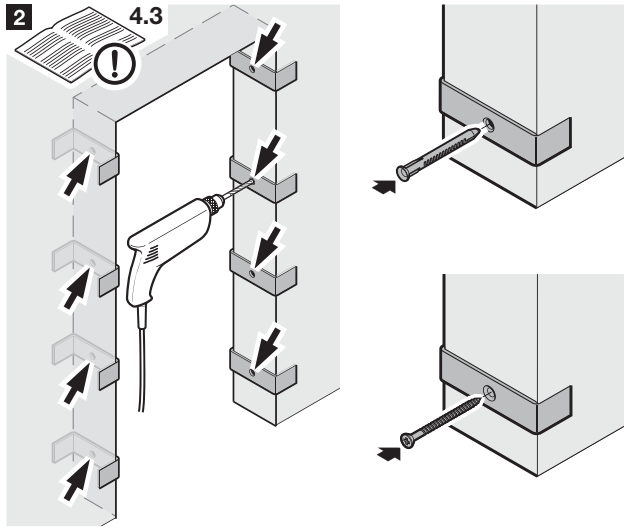
1

8

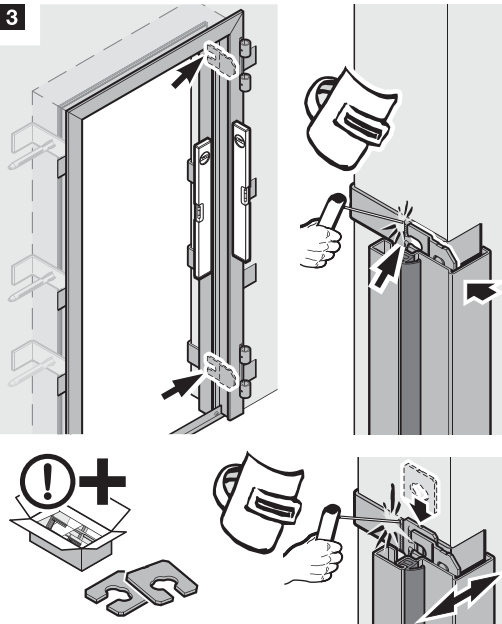


2

4.3

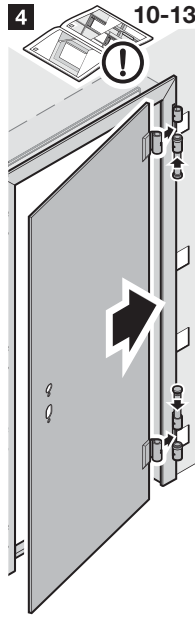


3

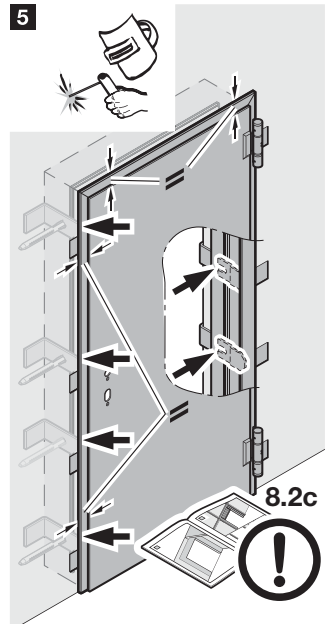


4

10-13

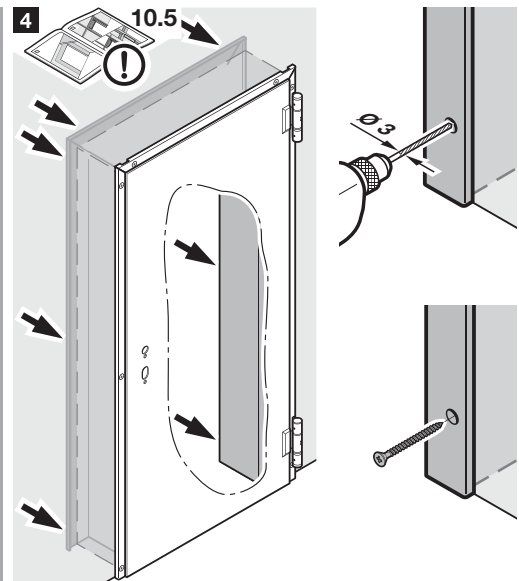
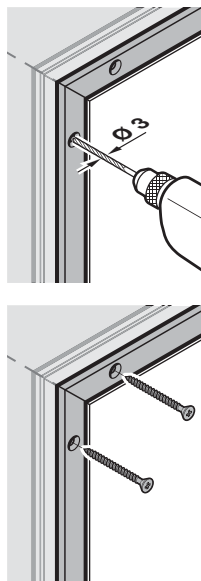
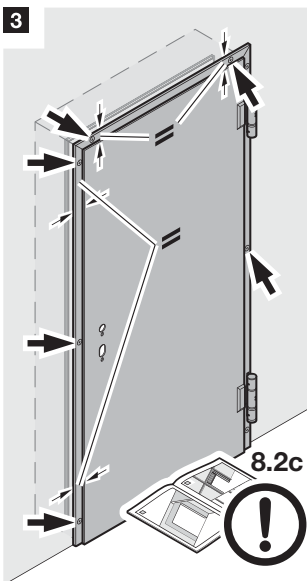
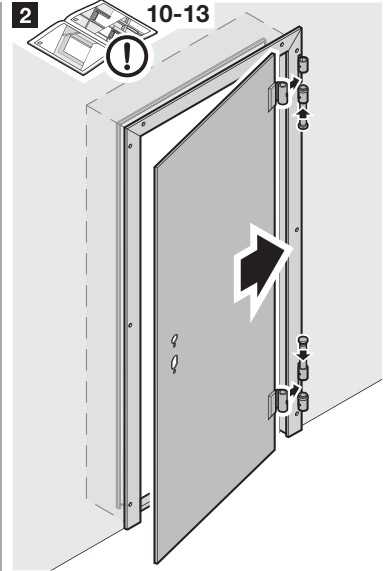
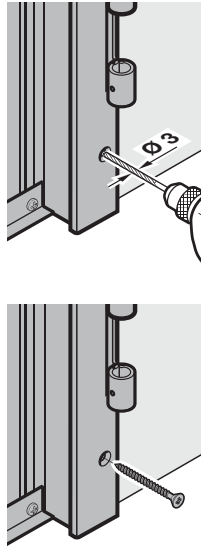
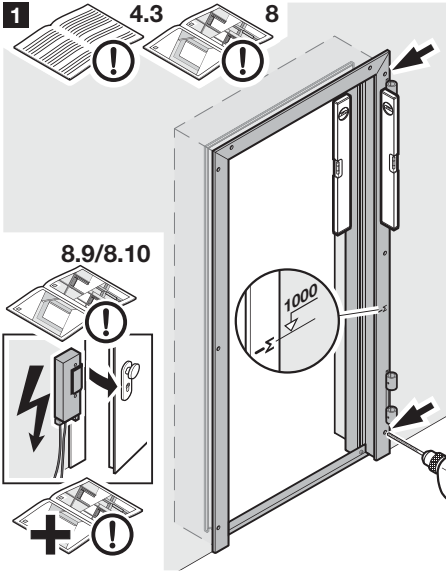
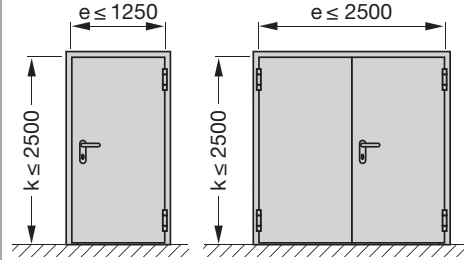
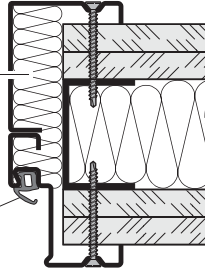
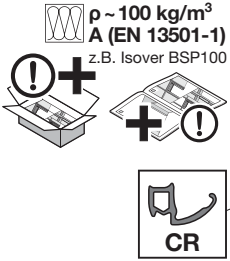
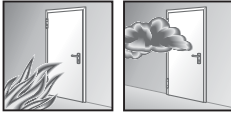


5



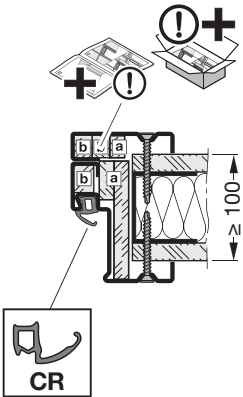
9/A10

max. T30/  
EI<sub>2</sub>30

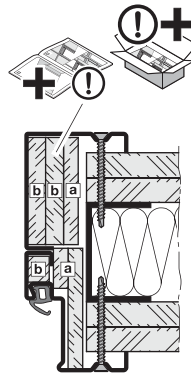




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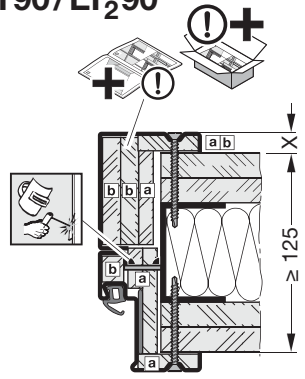


9/A12

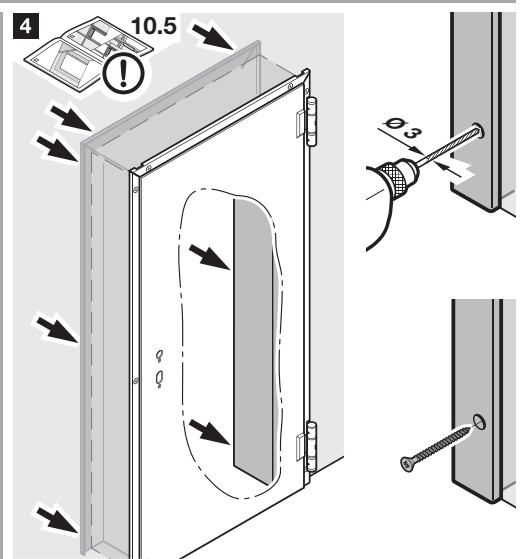
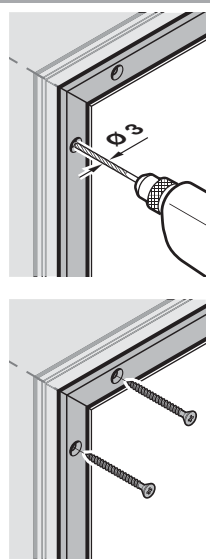
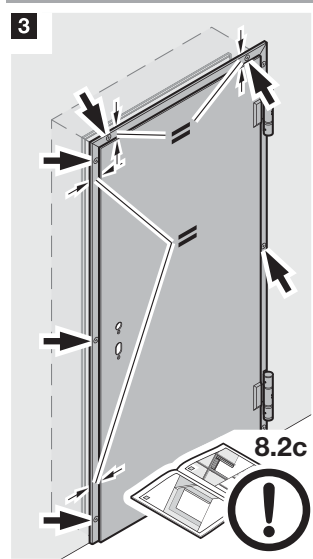
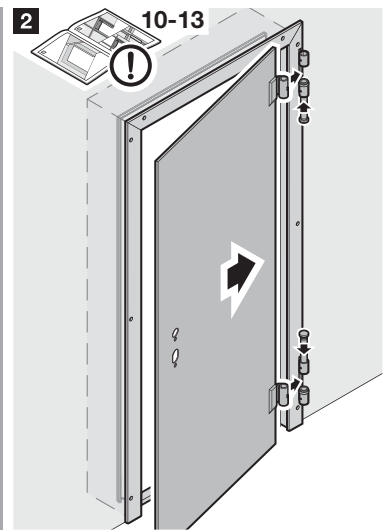
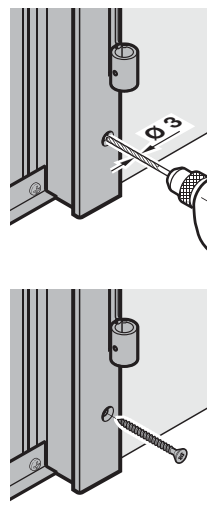
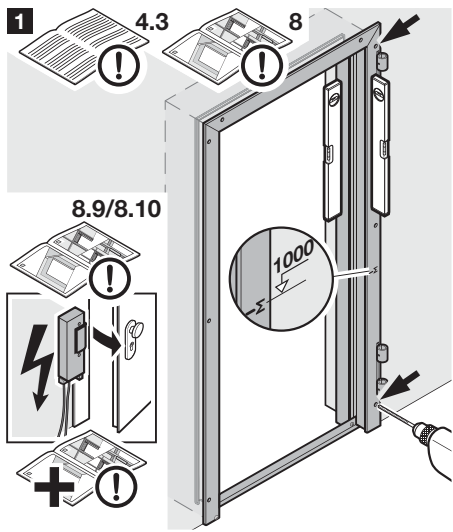


9/A13

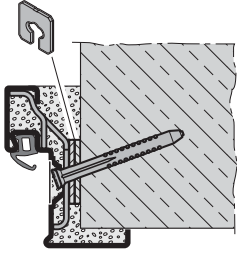
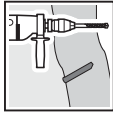
T90/EI<sub>2</sub>90



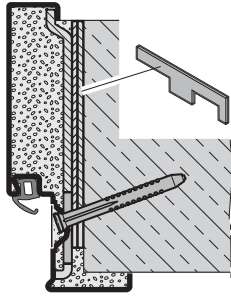
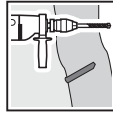
a A-9,5-EN 520 / b A-12,5-EN 520 / X = 10 → a / X = 15 → b



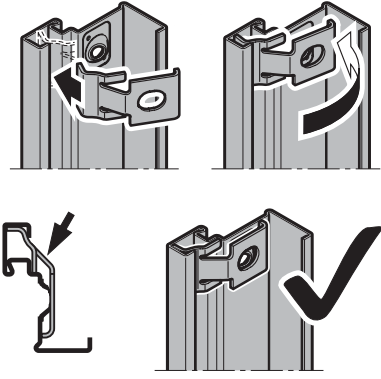
9/A14  
max. T30/  
EI<sub>2</sub>30



9/A15  
max. T90/  
EI<sub>2</sub>90



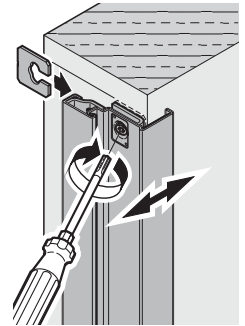
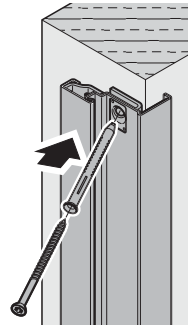
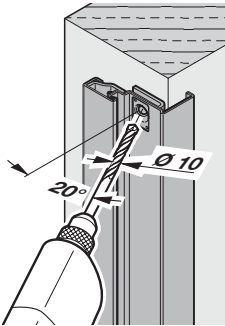
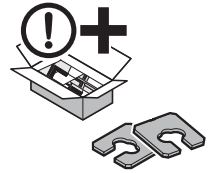
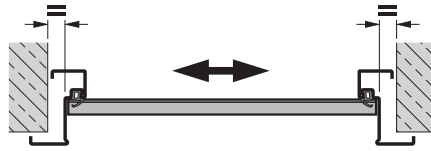
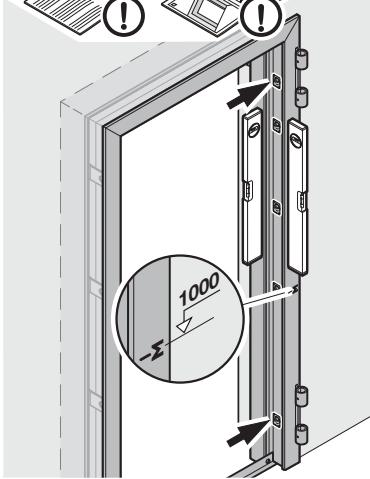
1



2

4.3

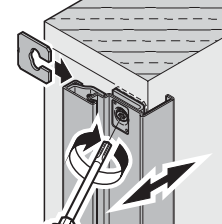
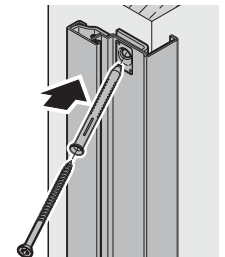
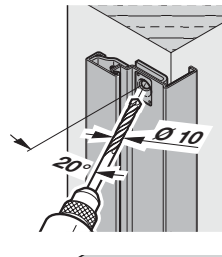
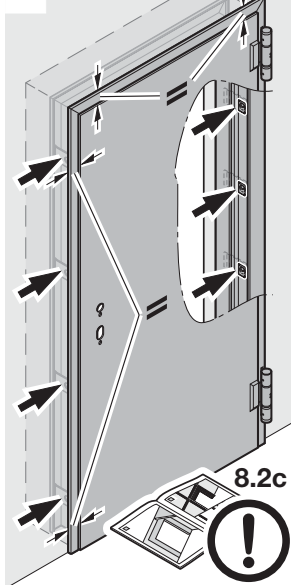
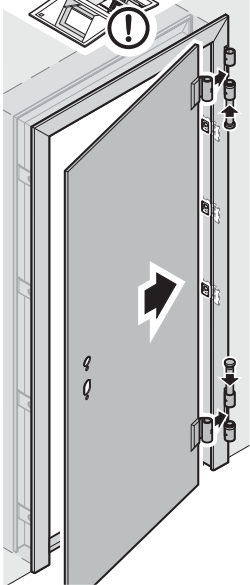
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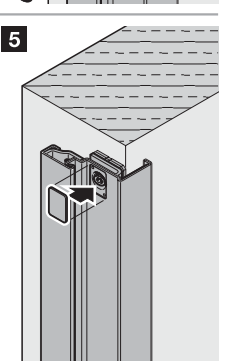
3

10-13

4

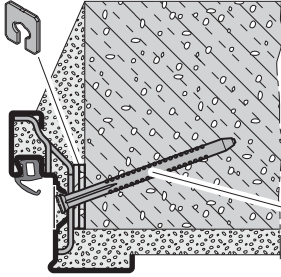
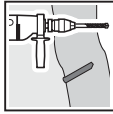


5



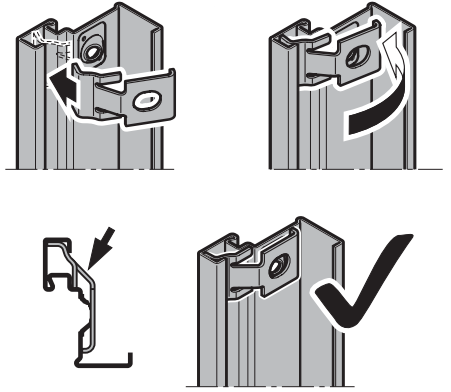
8.2c

9/A16  
max. T30



FUR 10 x 160

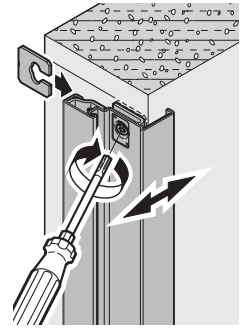
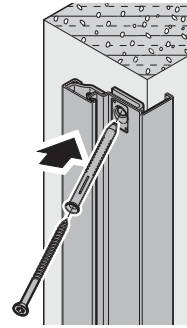
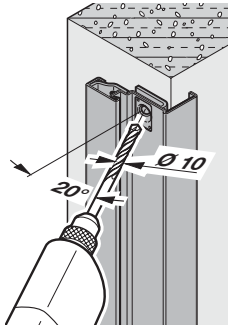
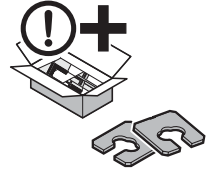
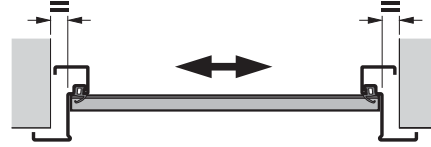
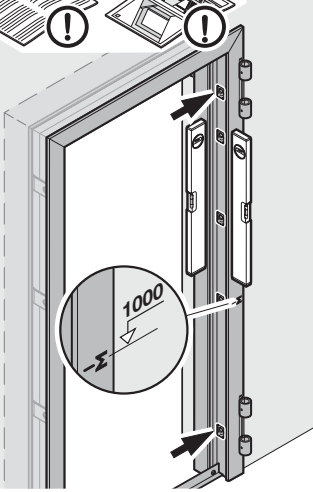
1



2

4.3

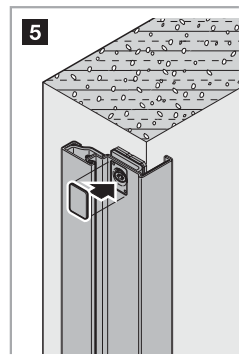
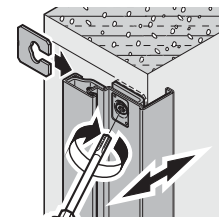
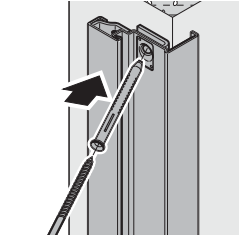
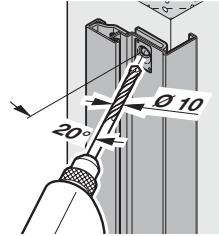
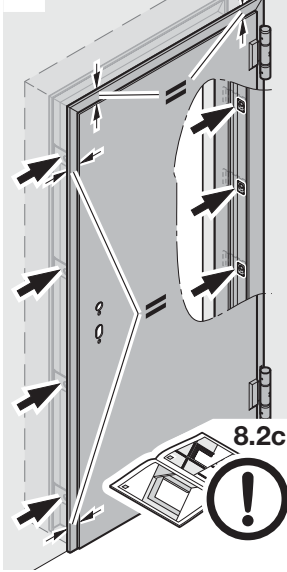
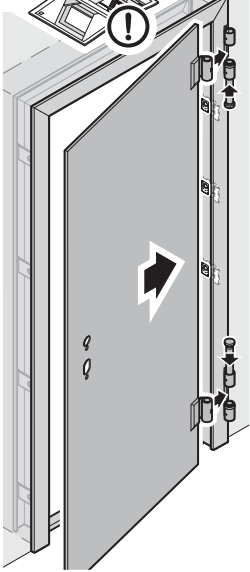
8



3

10-13

4

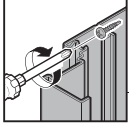


9/A17



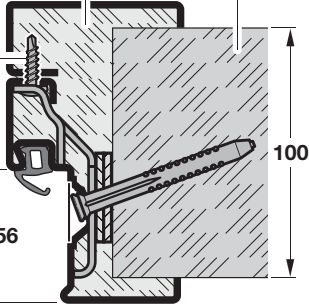
Multi Gips  
FG 70

VG ORTH



DIN 7504 ST  
4,8 x 19-N-H  
DIN 7981  
4,8 x 16

max. 56

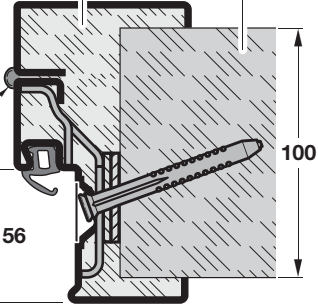


$2V \times > 10$

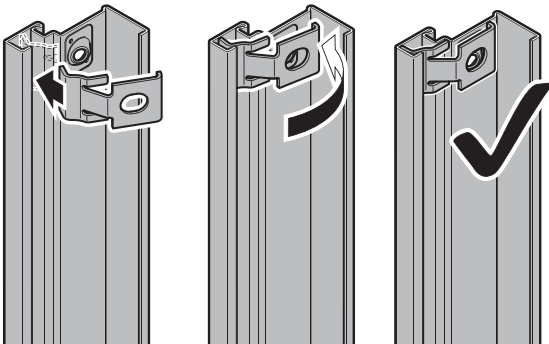
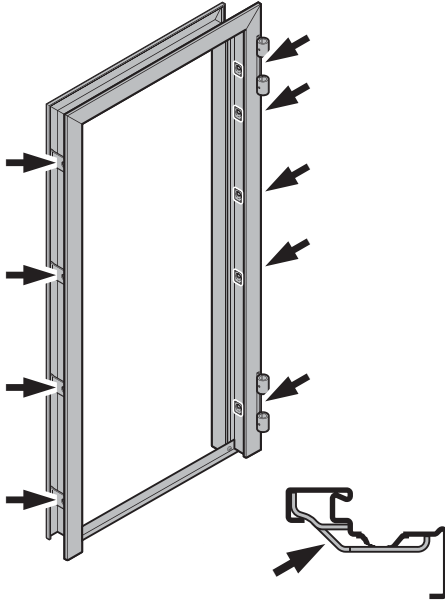
Multi Gips  
FG 70

VG ORTH

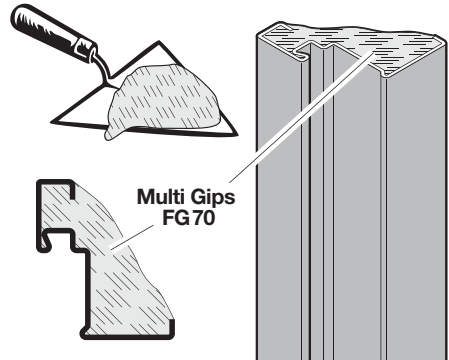
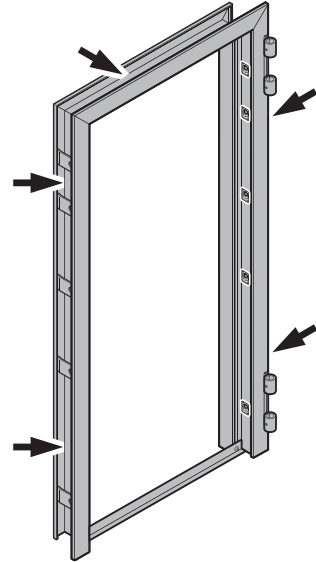
max. 56

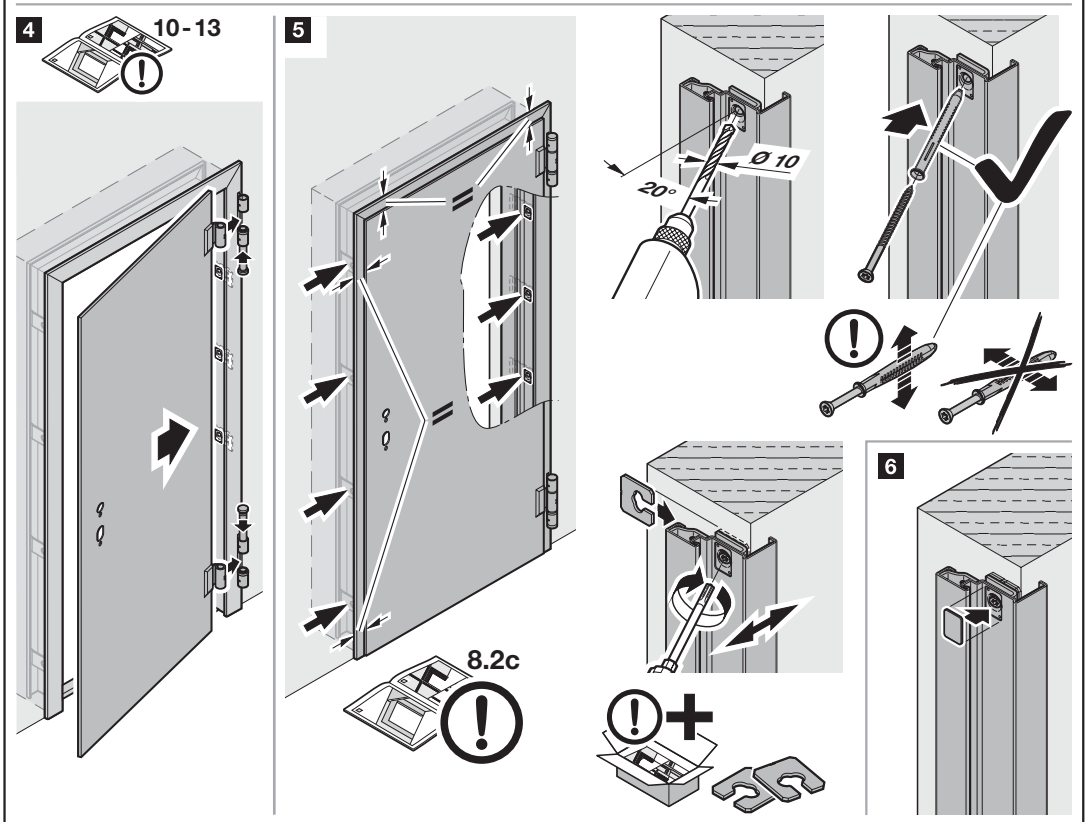
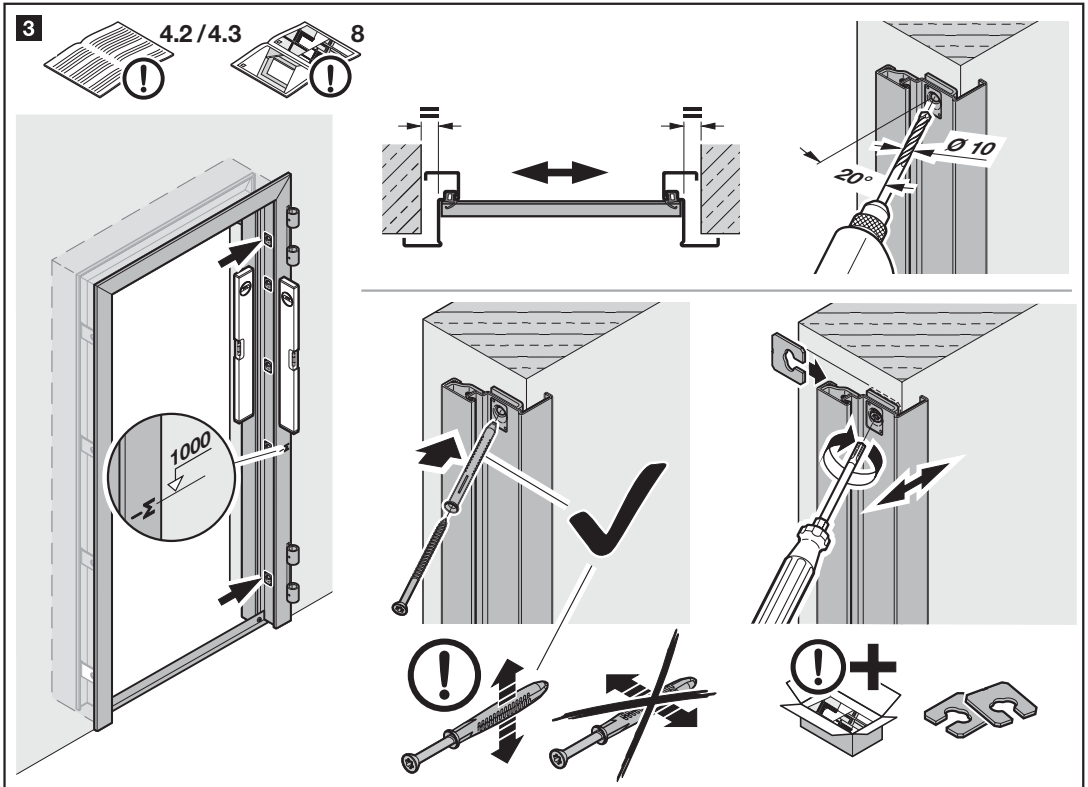


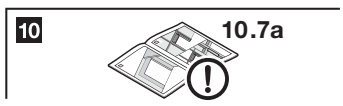
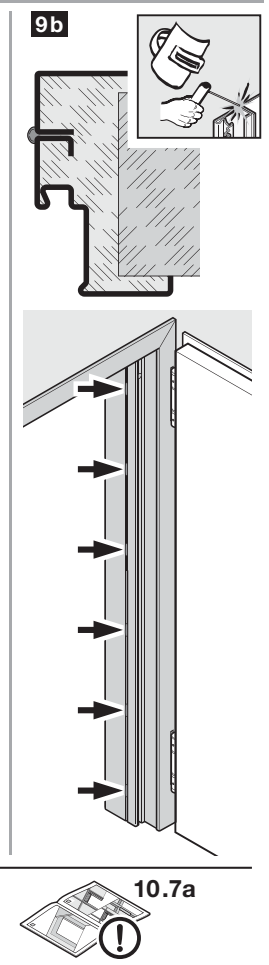
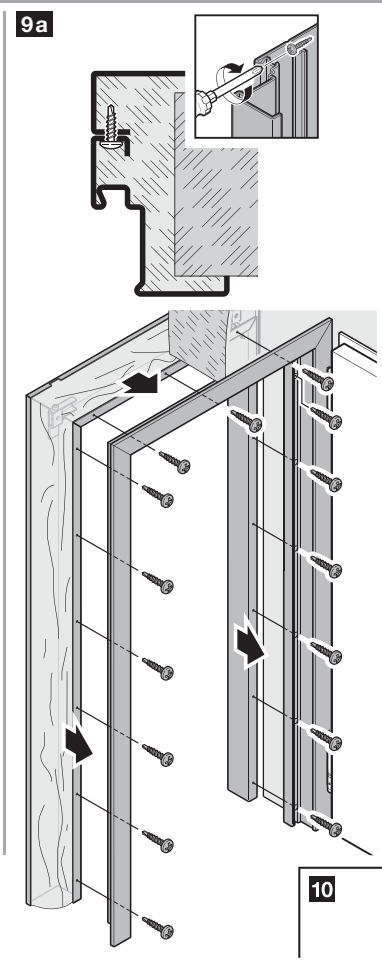
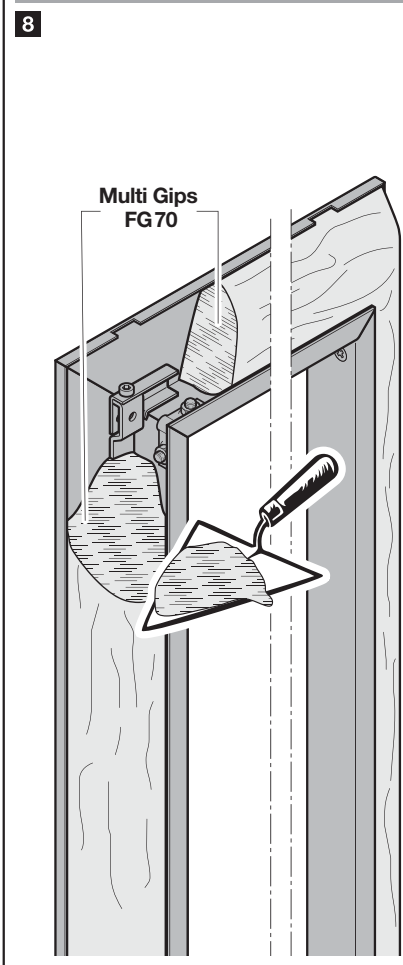
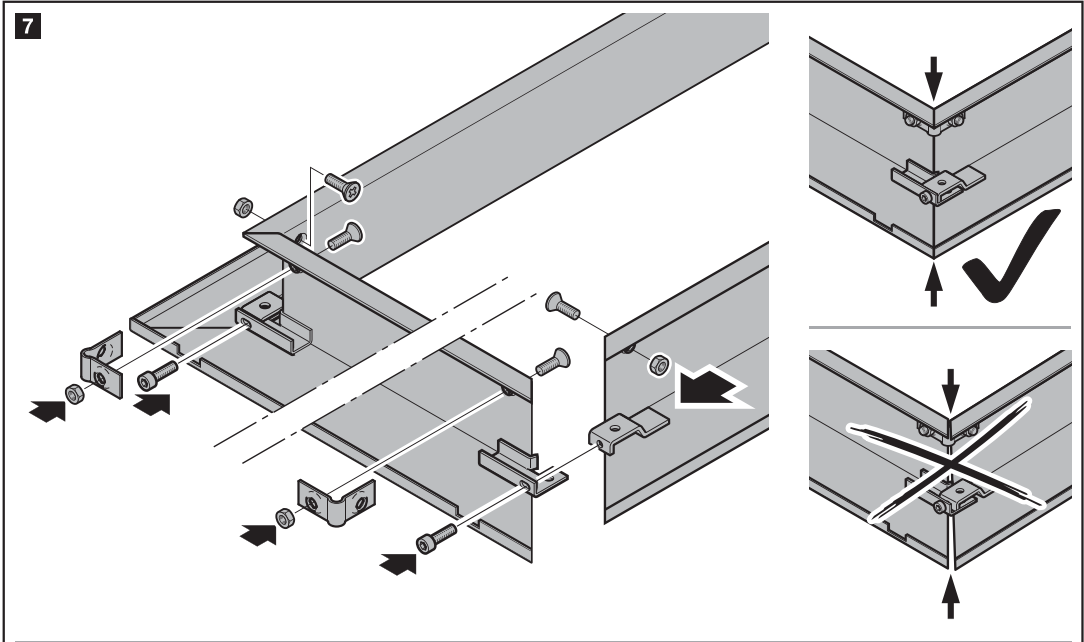
1



2

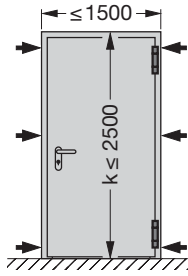




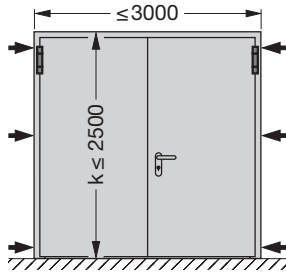


9/B1-B14

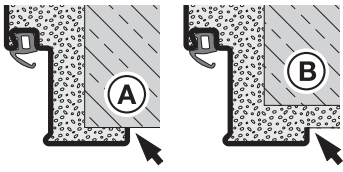
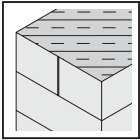
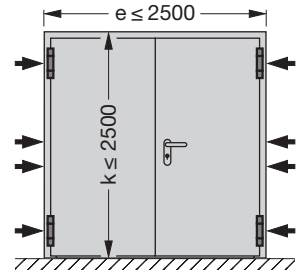
D65 - 1 OD



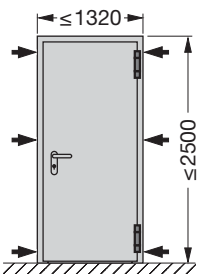
D65 - 2 OD



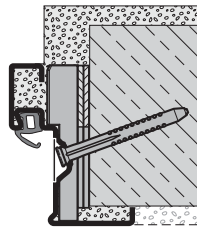
H3 - 2 OD



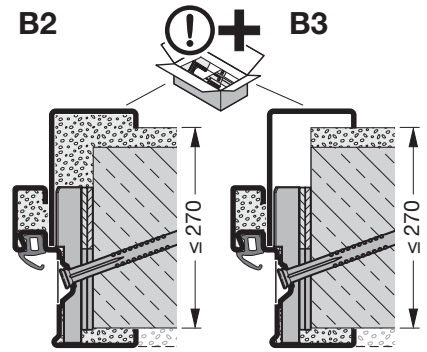
H3 - 1 OD



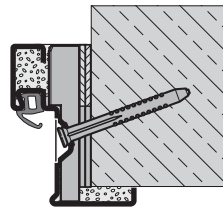
B1



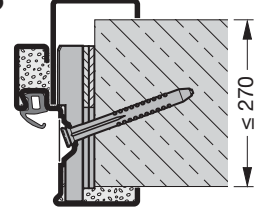
B2



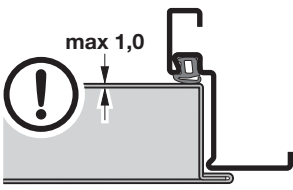
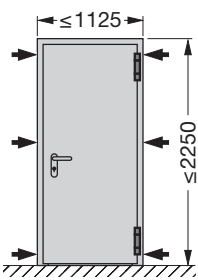
B4



B5



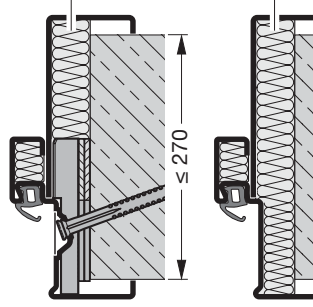
H3 - 1 OD



B6



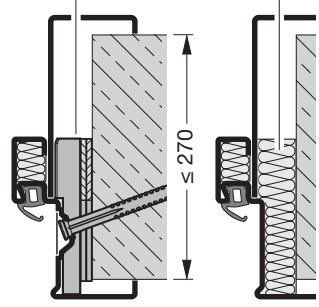
$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

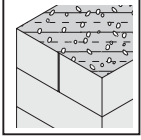


B7

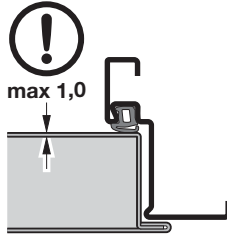
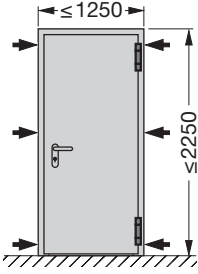


$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

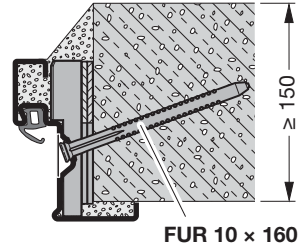




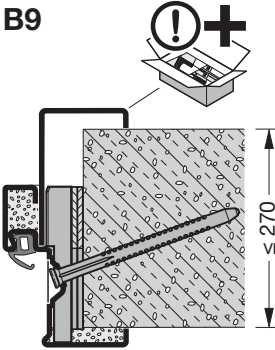
### H3-1 OD



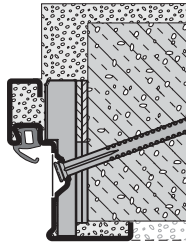
### B8



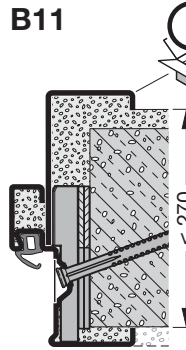
### B9



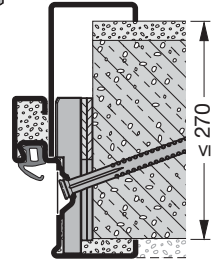
### B10



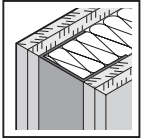
### B11



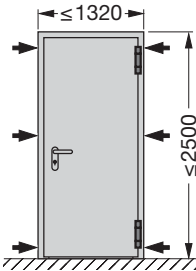
### B12



➔ 1 2 3a 4 ...



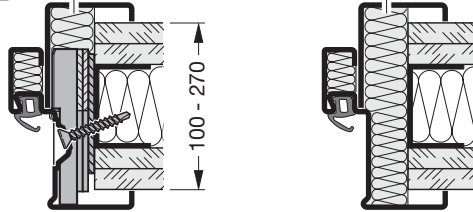
### H3-1 OD



### B13



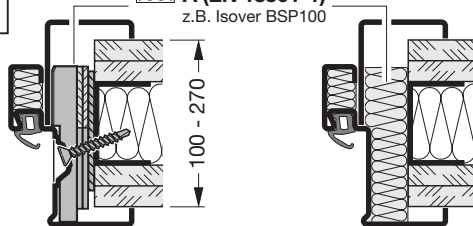
$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100



### B14

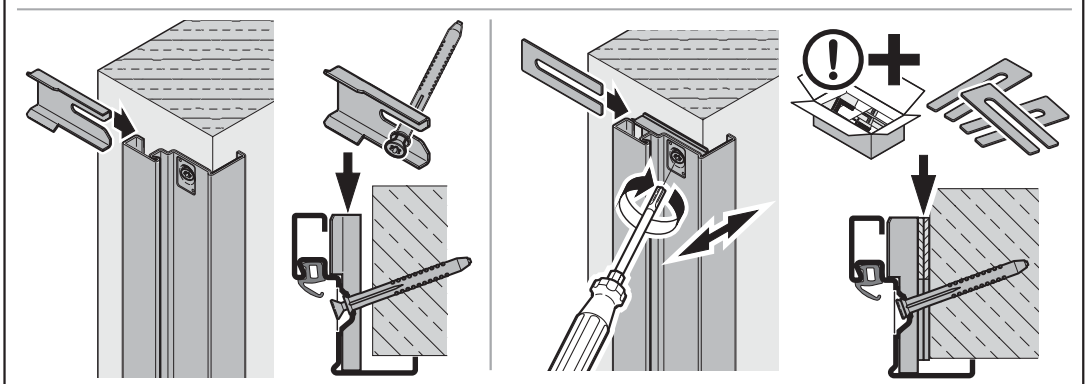
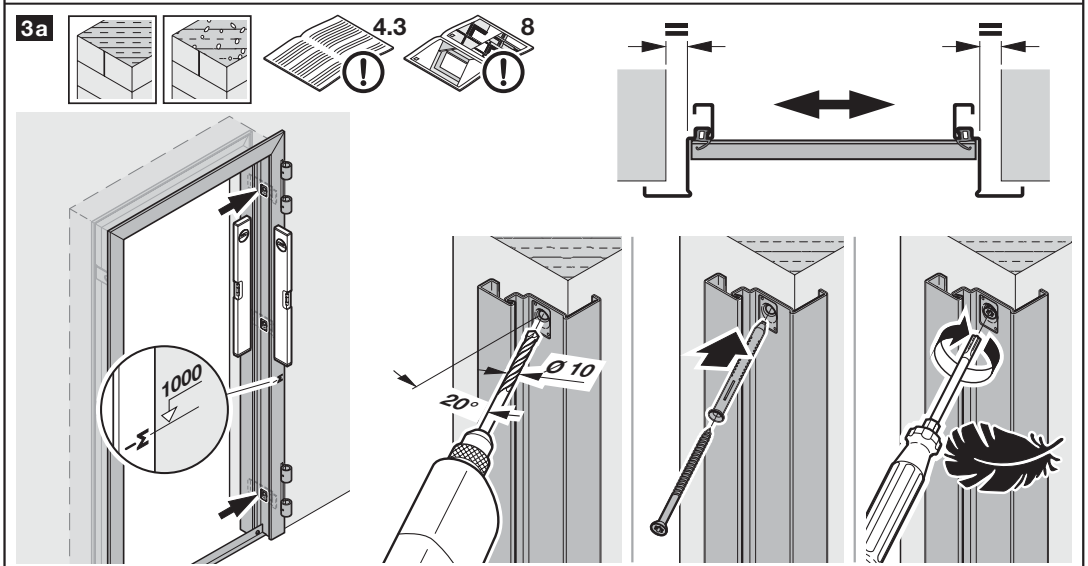
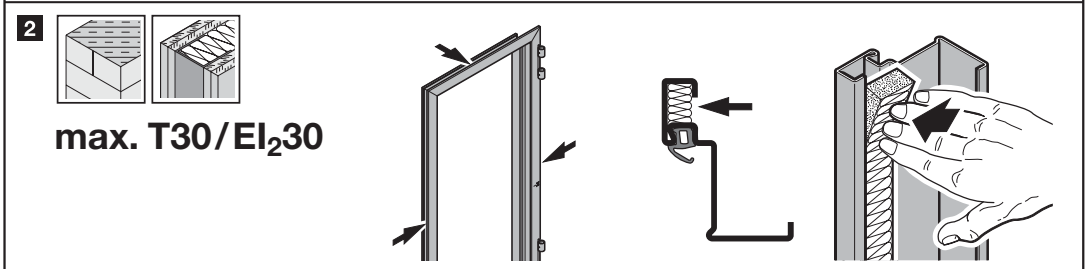
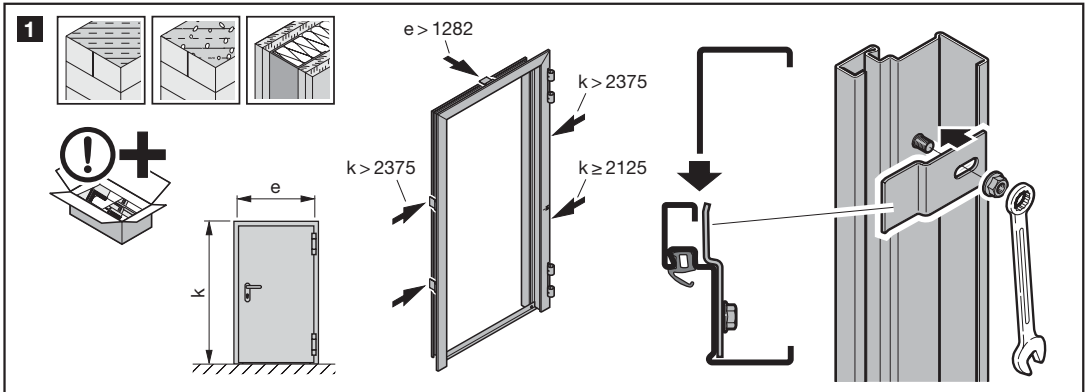


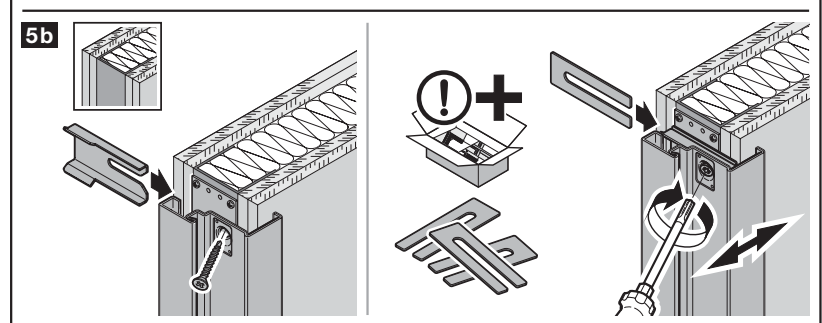
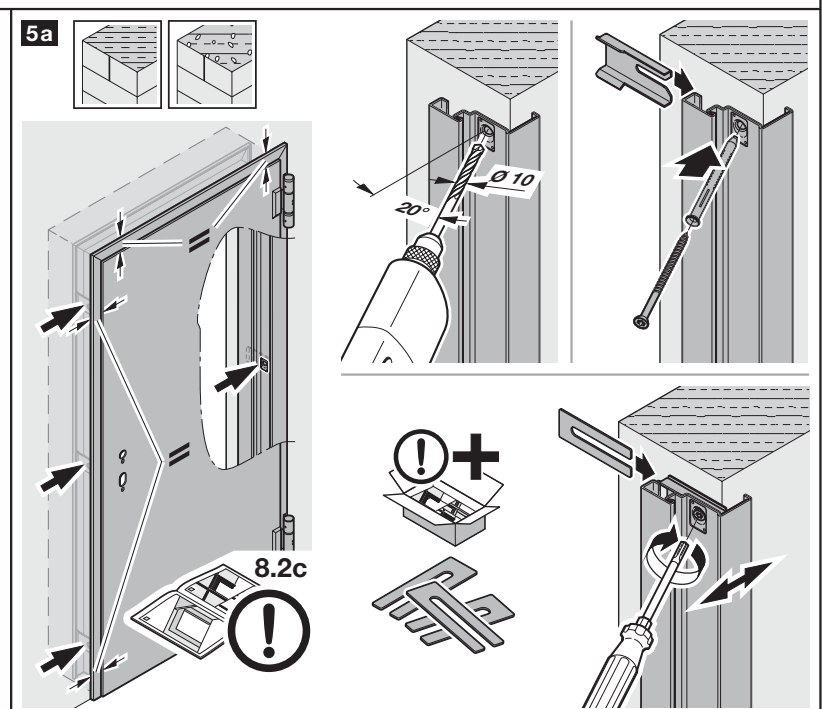
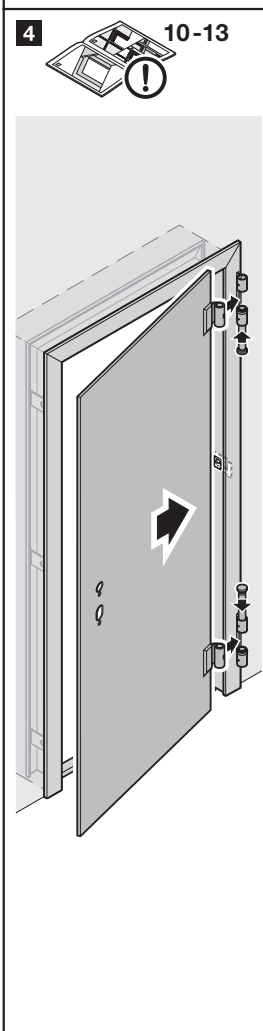
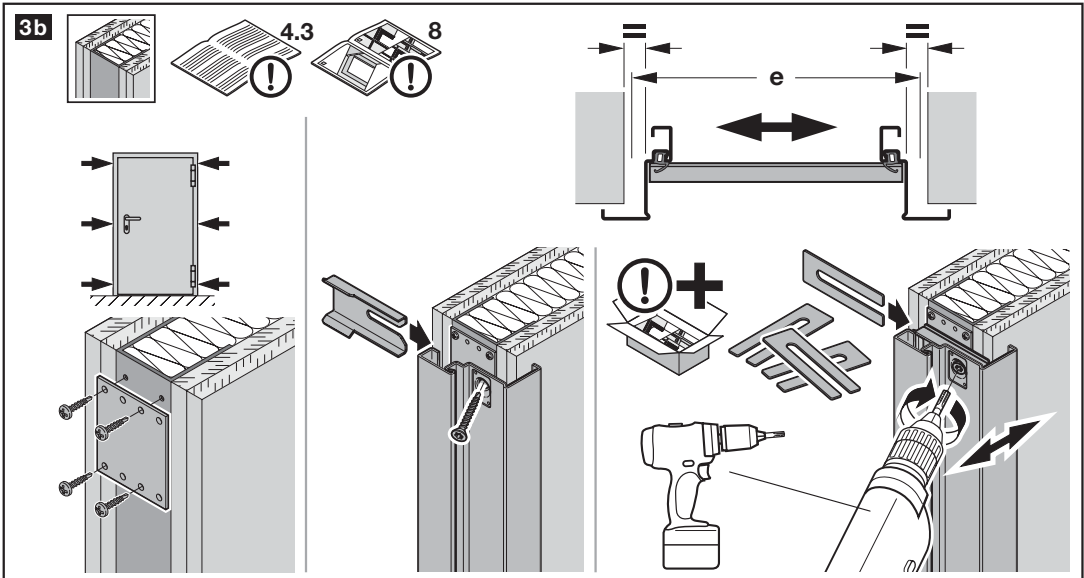
$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

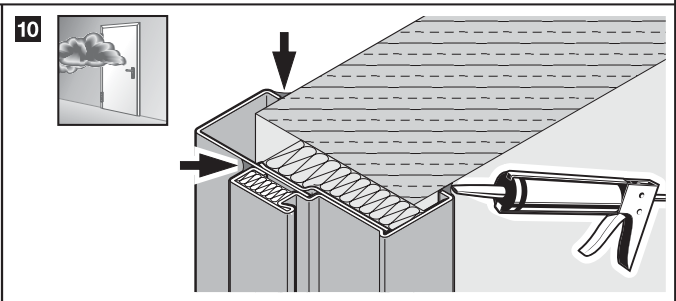
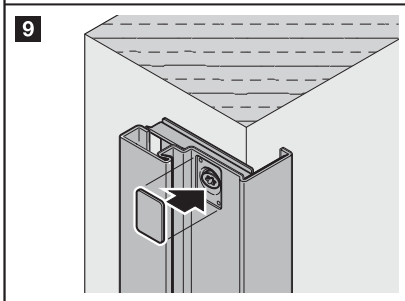
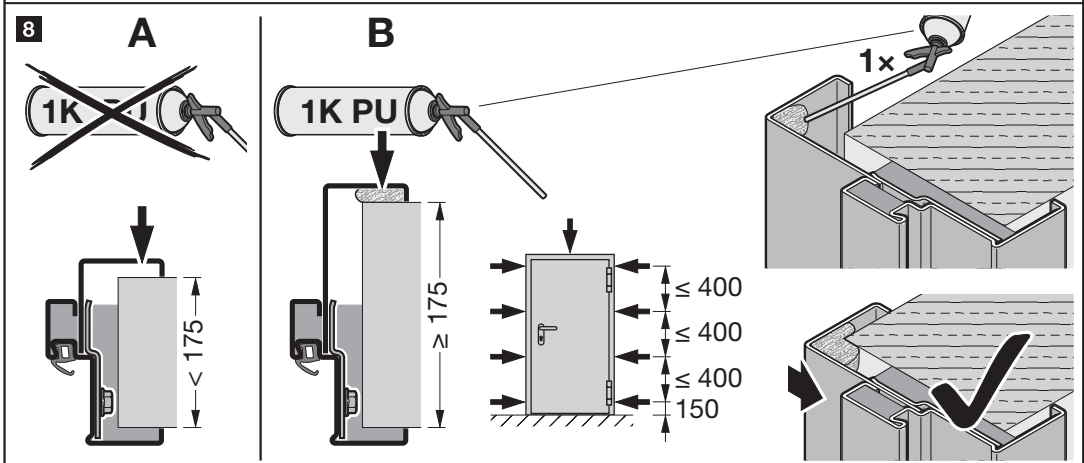
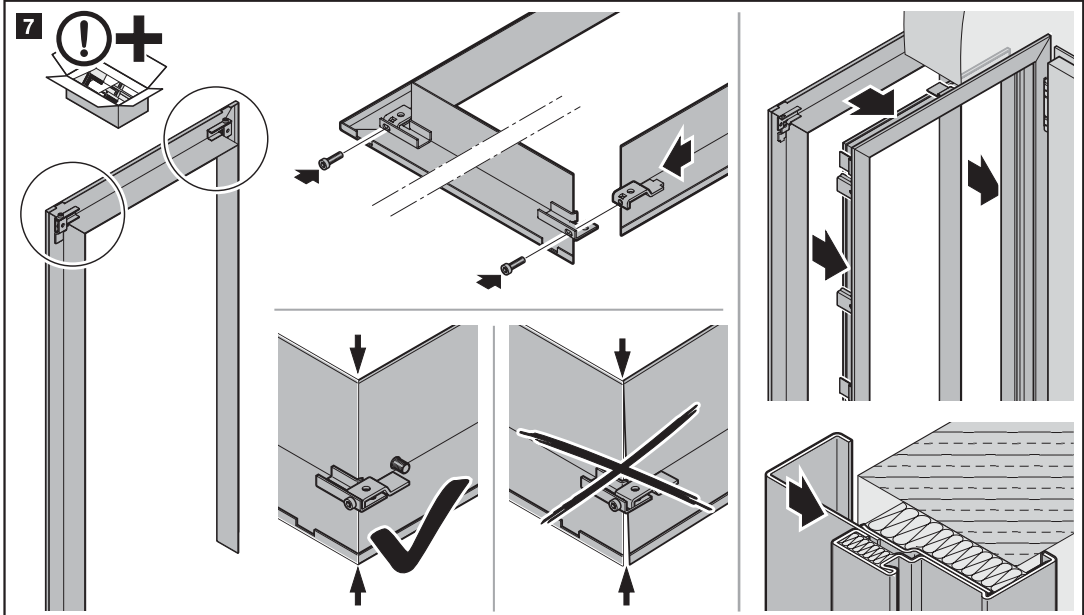
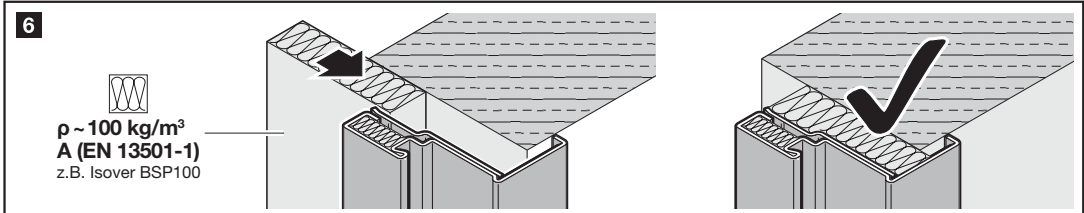


➔ 1 2 3b 4 ...

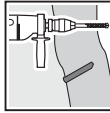
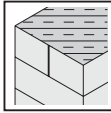




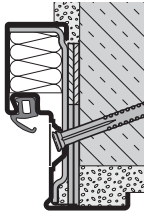




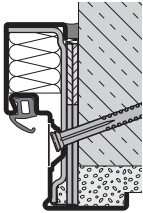
9/C1-C8  
max. T30/  
EI<sub>2</sub>30



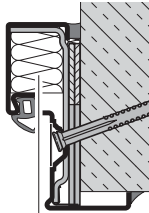
C1



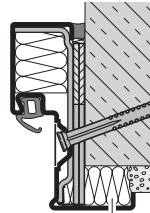
C2



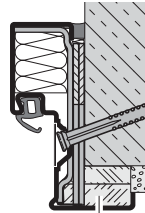
C3



C4

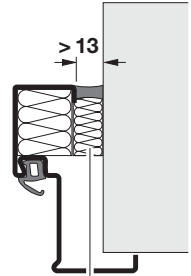


C5



  $\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

A-EN 520

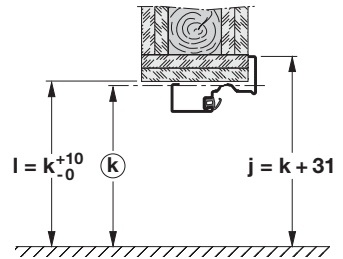
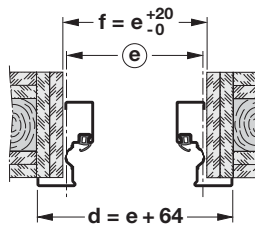


  $\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100

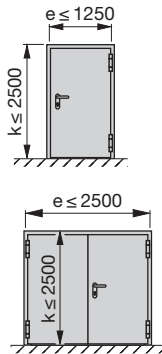
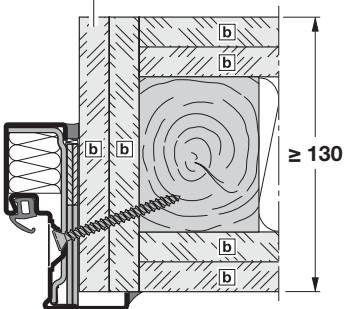
➔ 1a 2 ...


➔ 6

max. T30/  
EI<sub>2</sub>30

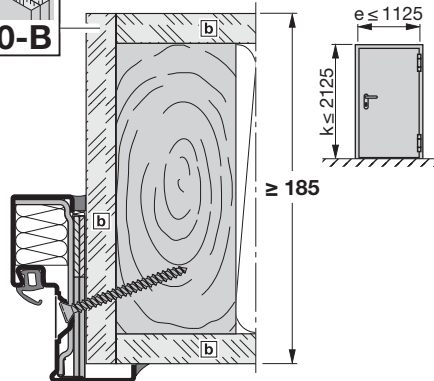


C6 F90B DIN 4102-4 Tab. 49



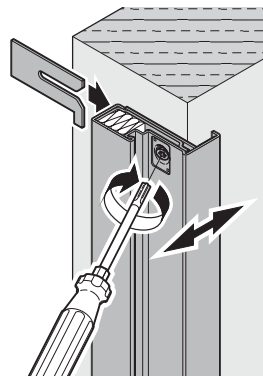
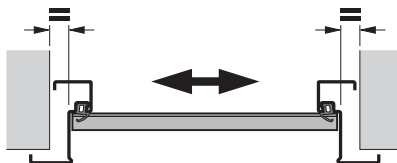
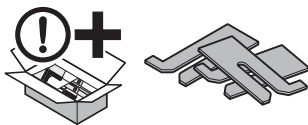
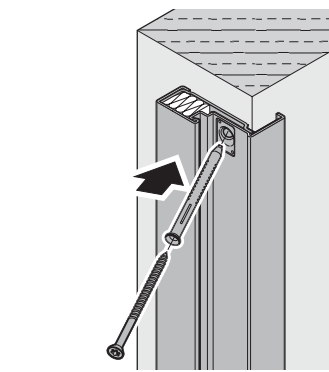
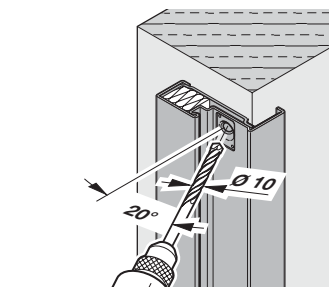
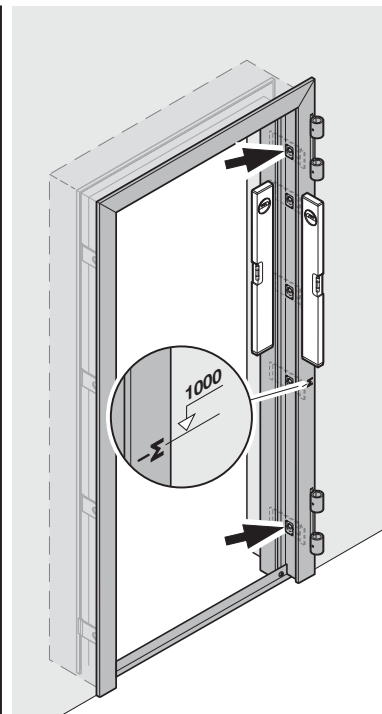
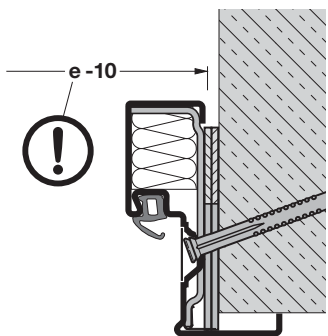
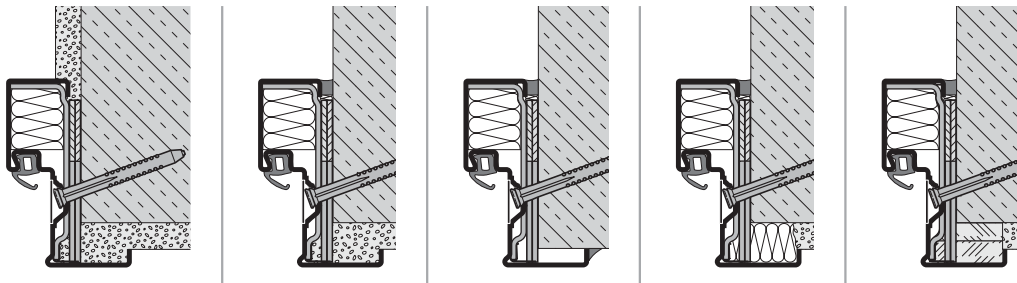
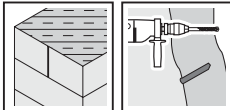
 A-12,5-EN 520

C7 F30B DIN 4102-4 Tab. 49



➔ 1b 2 ...

1a

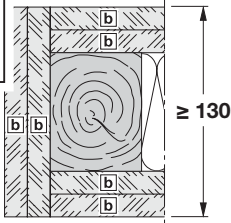


➔ 2

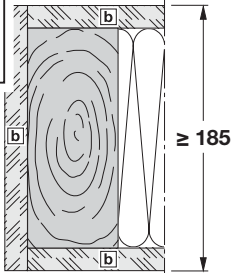
1b



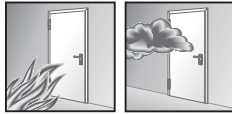
F90-B



F30-B

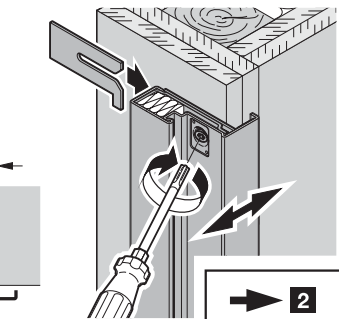
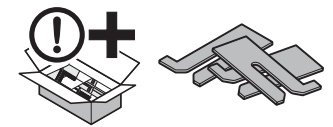
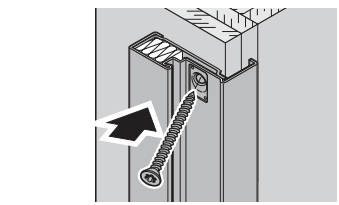
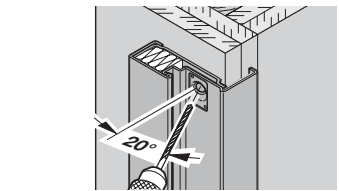
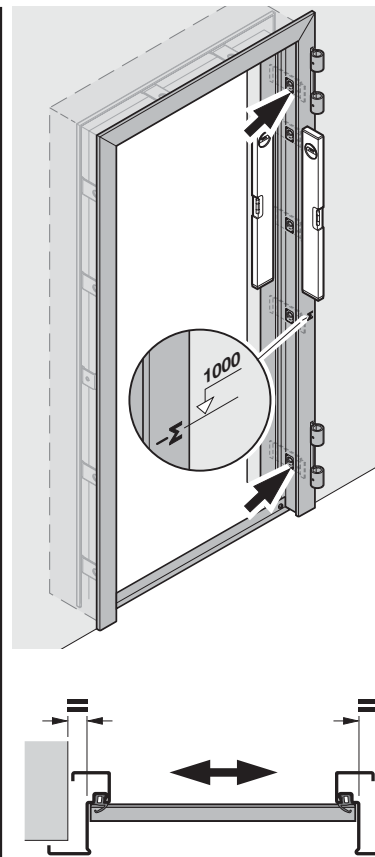
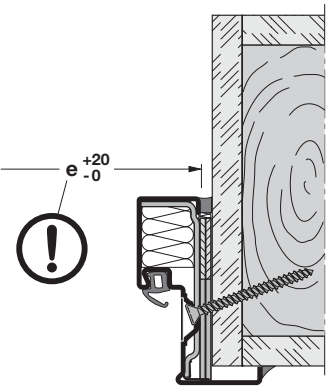
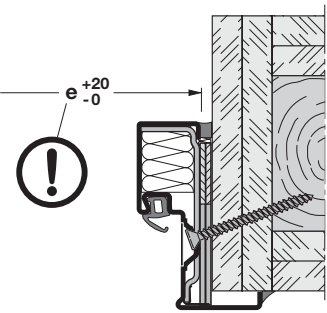
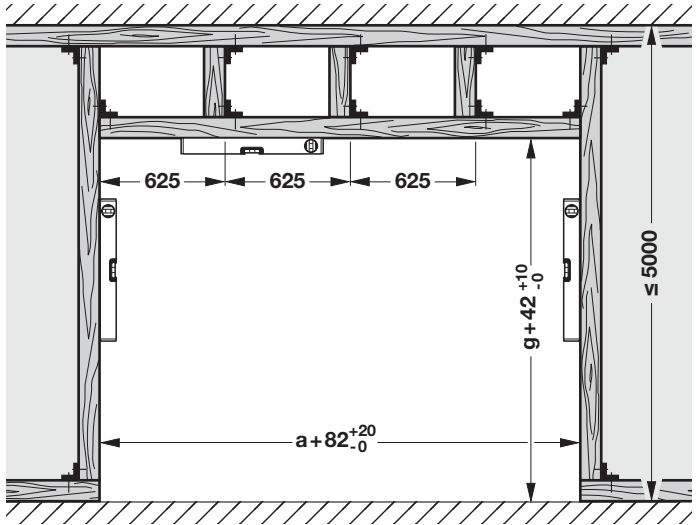


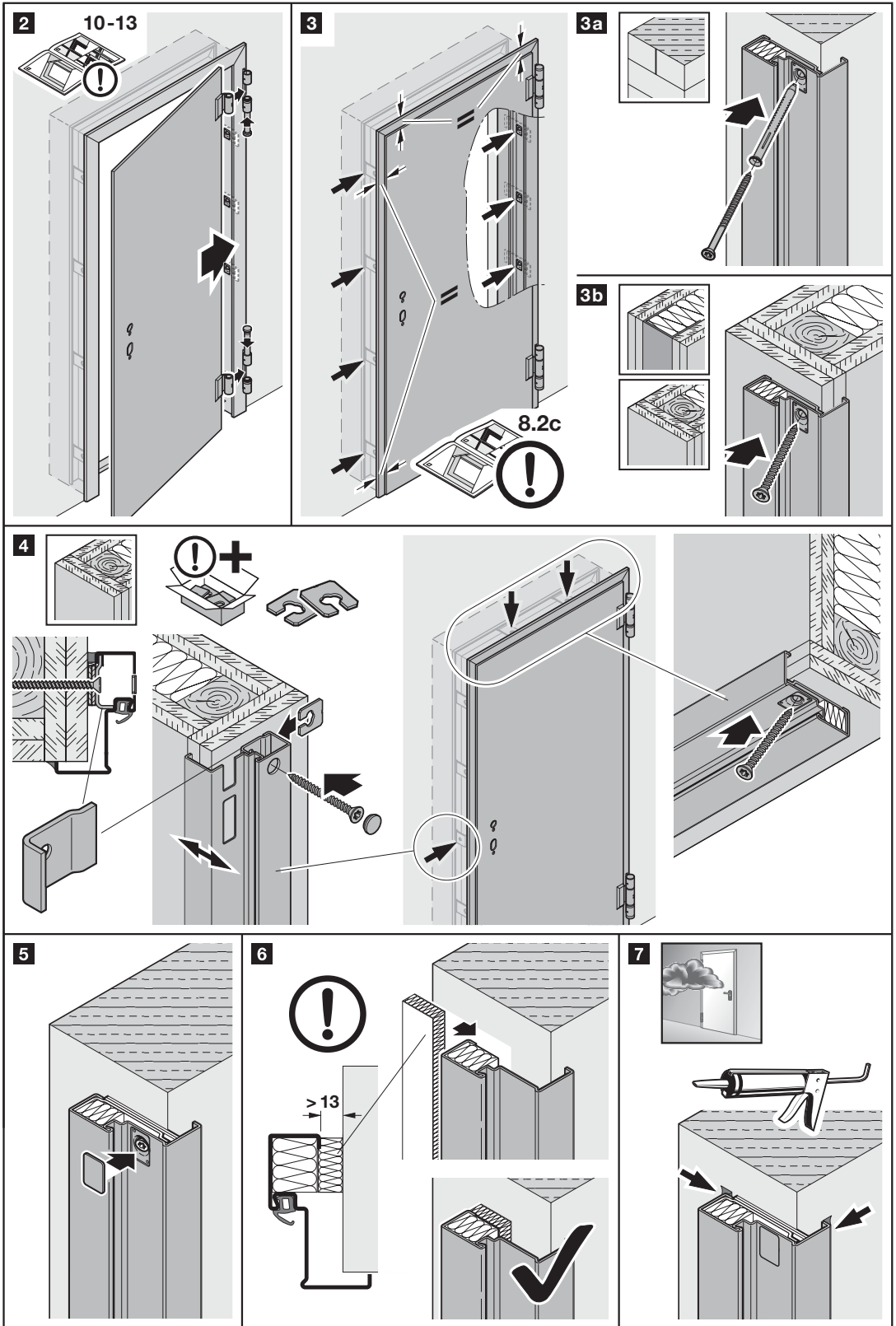
b) A-12,5-EN 520



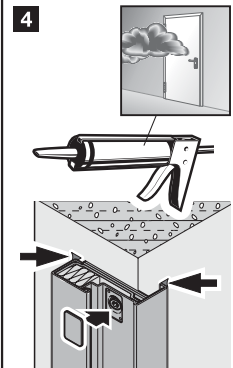
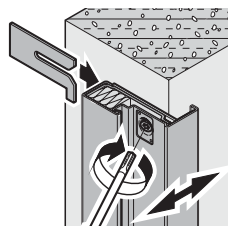
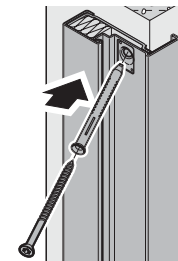
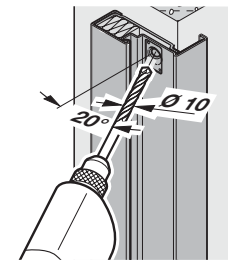
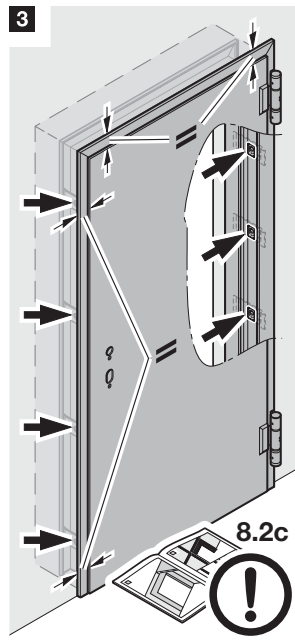
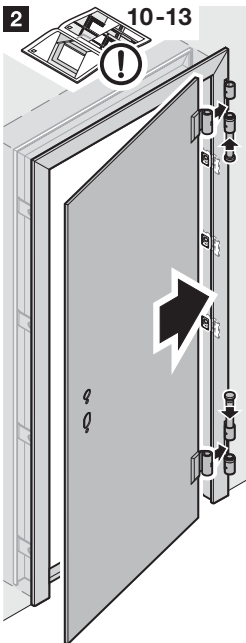
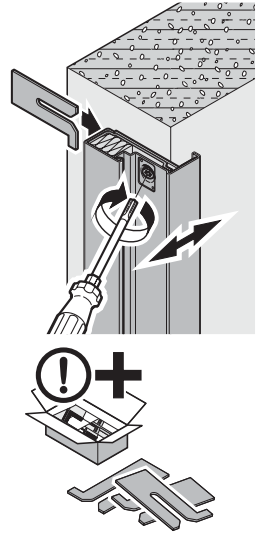
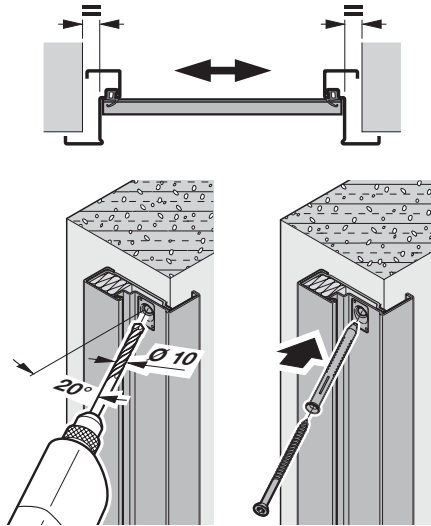
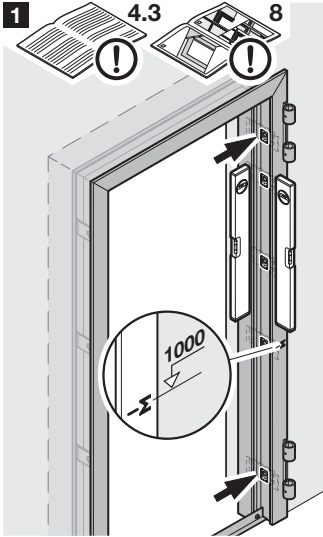
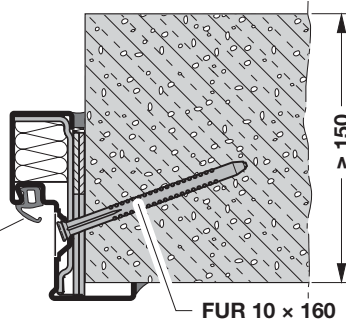
4.2/4.3

8

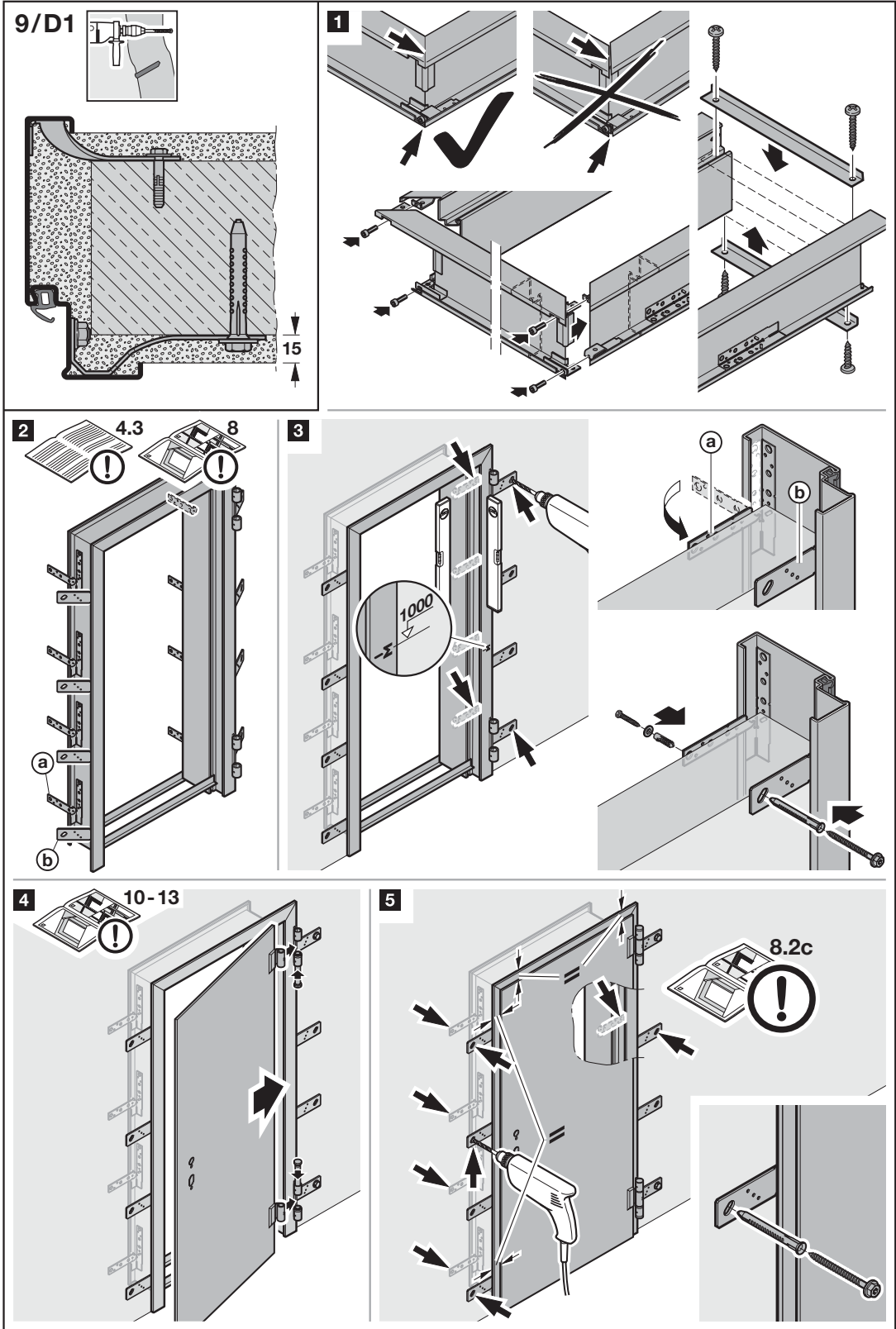




9/C8  
max. T30







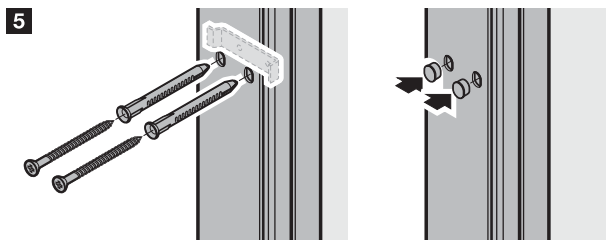
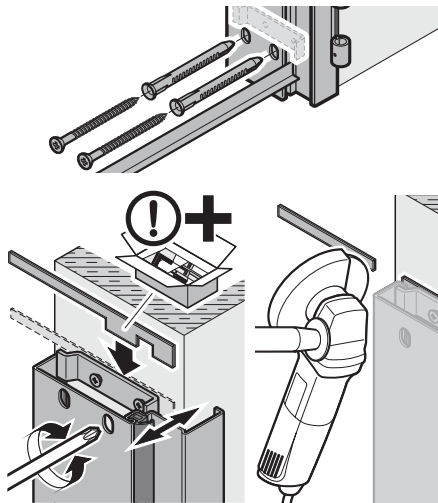
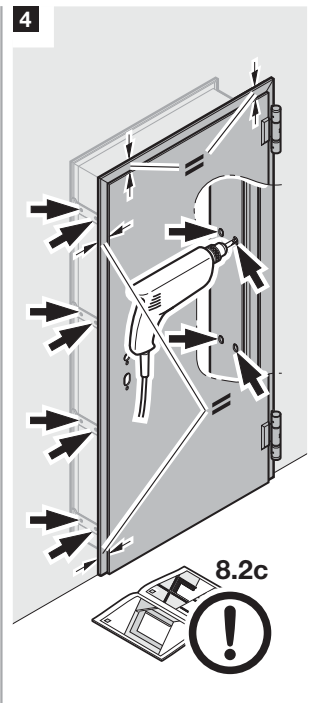
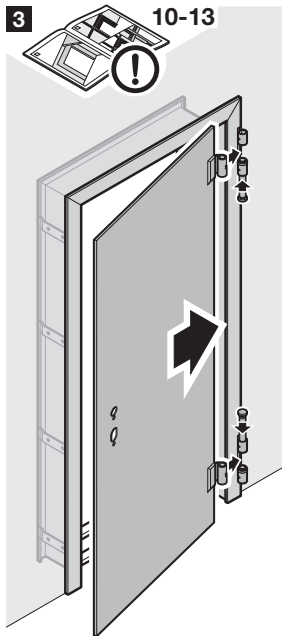
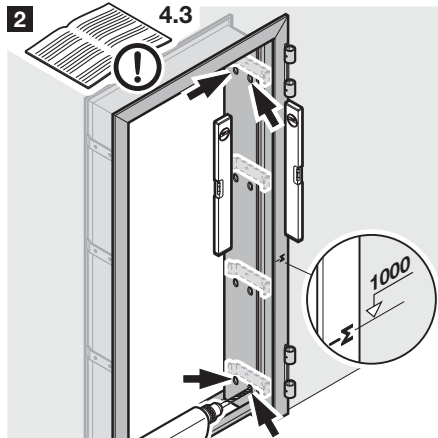
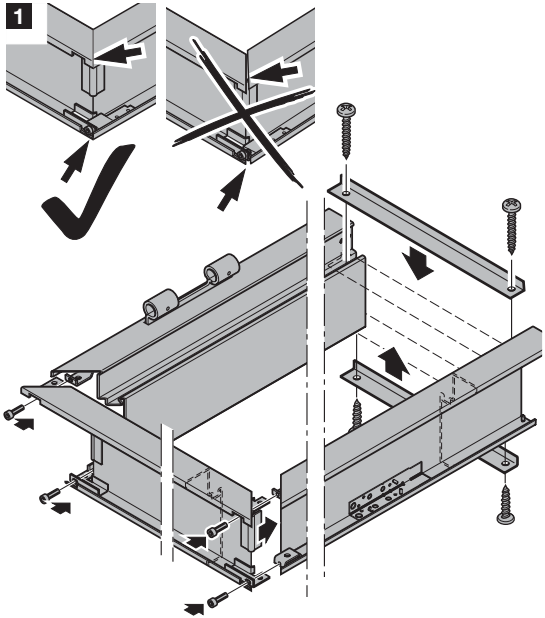
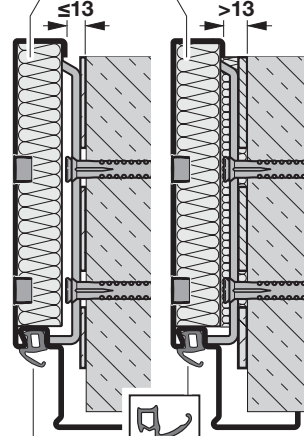
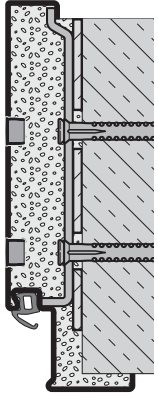
9/D2

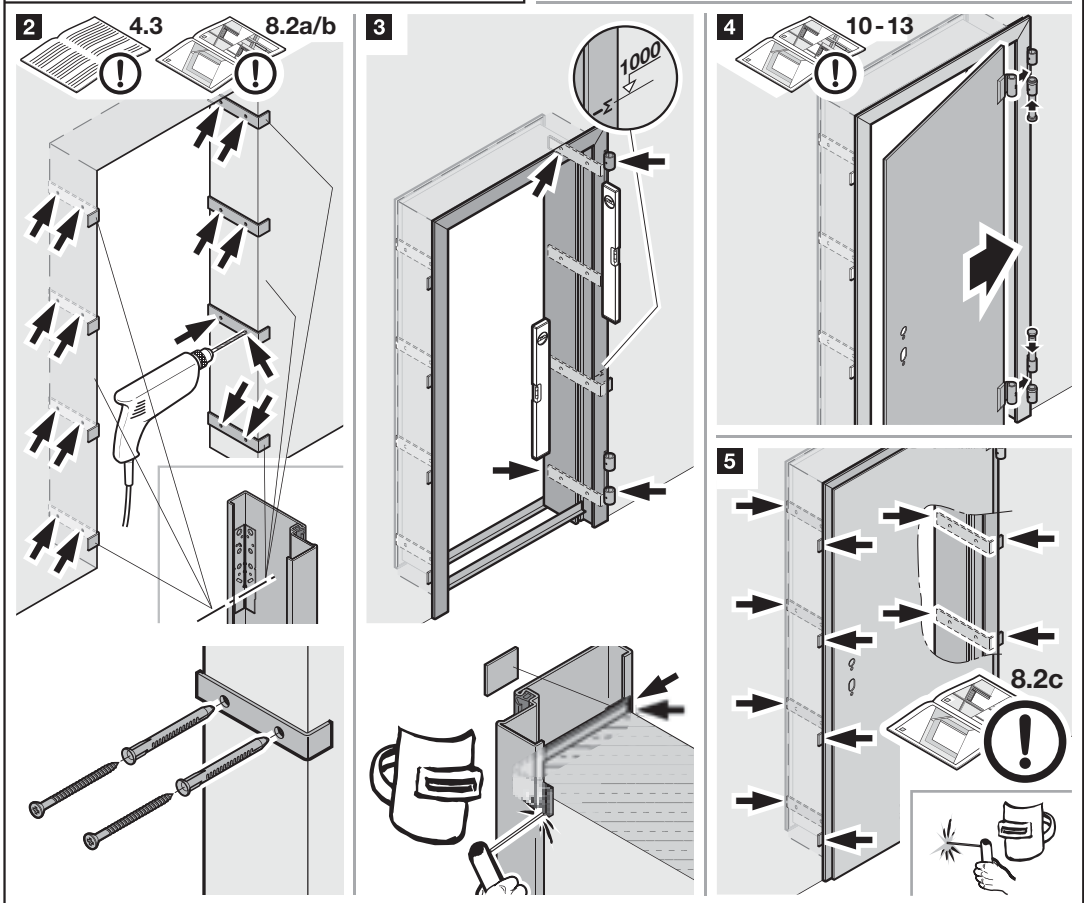
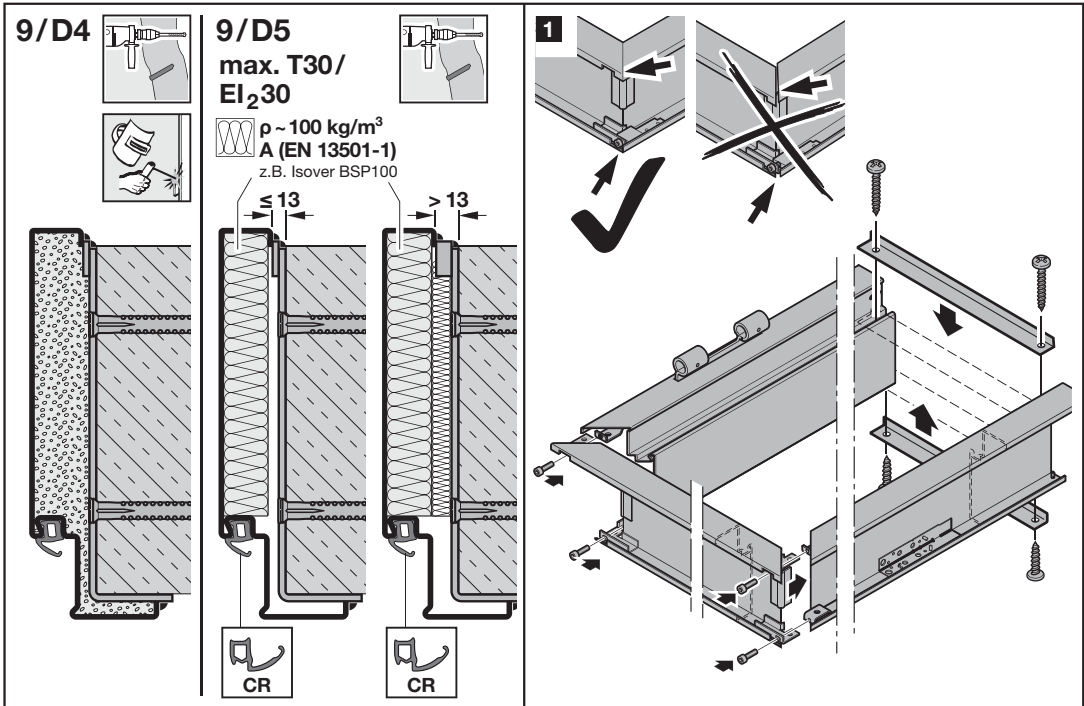


9/D3

max. T30/EI<sub>2</sub>30

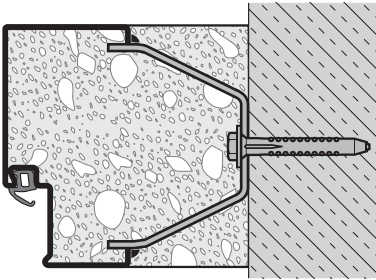
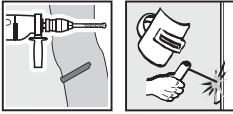
$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100



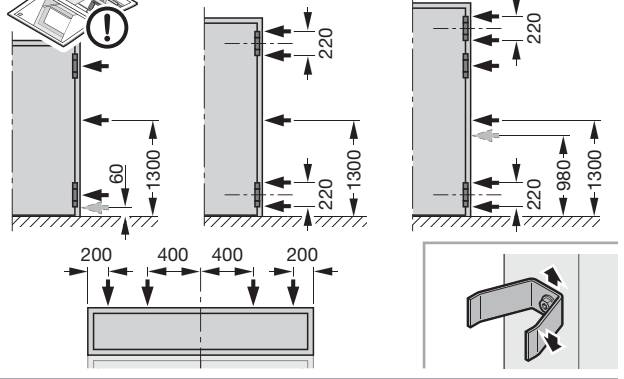




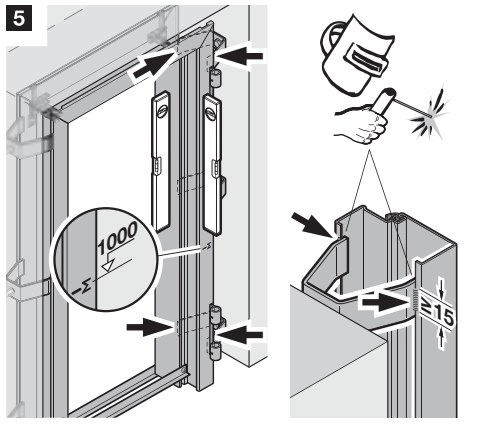
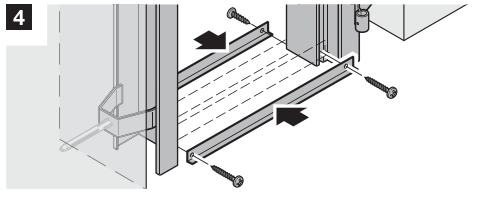
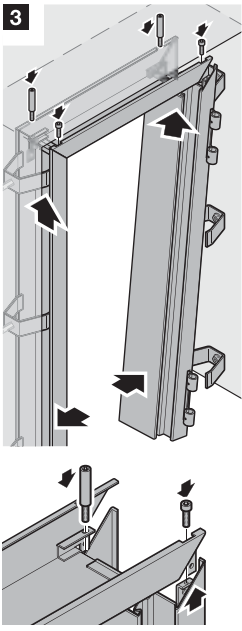
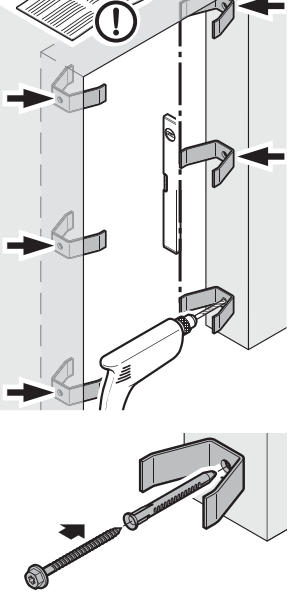
9/E3



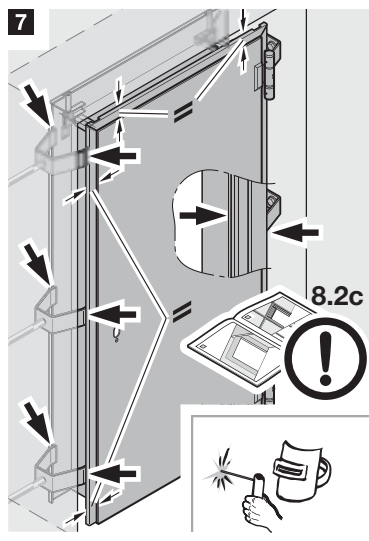
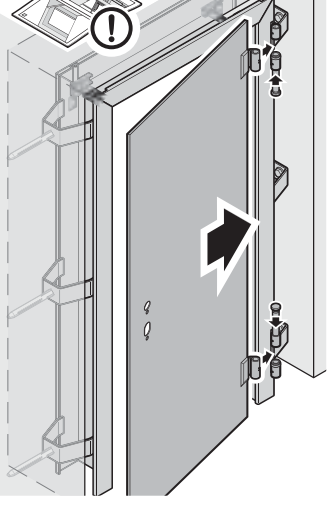
1 8.2a/b



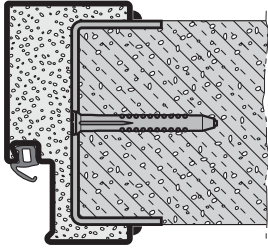
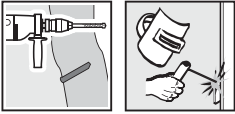
2 4.3



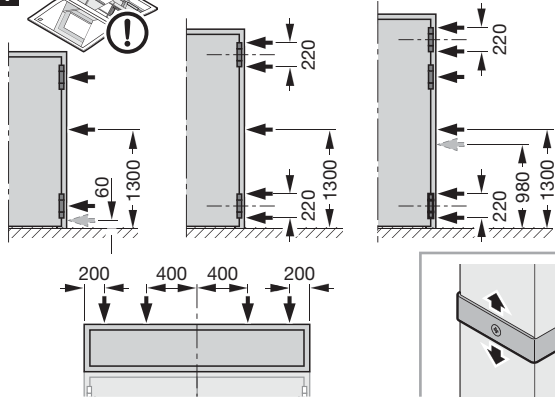
6 10-13



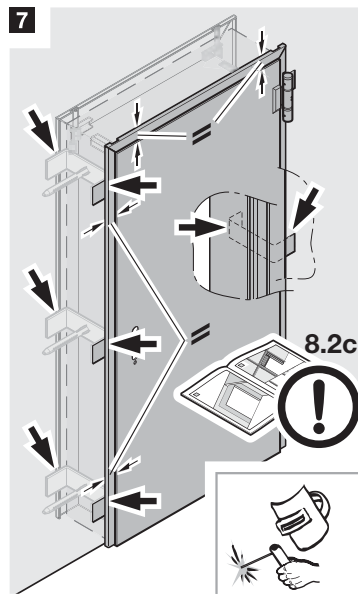
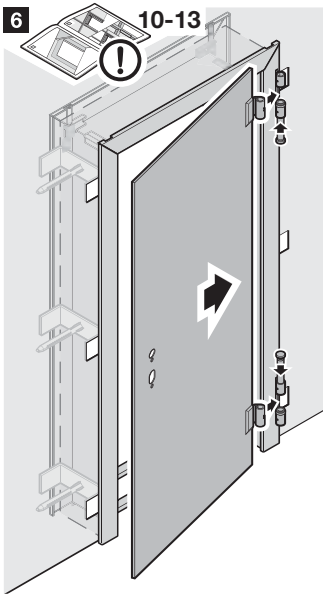
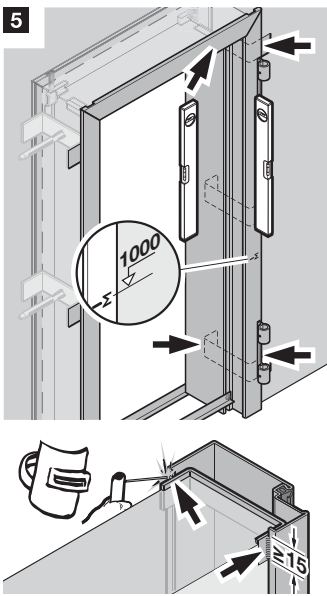
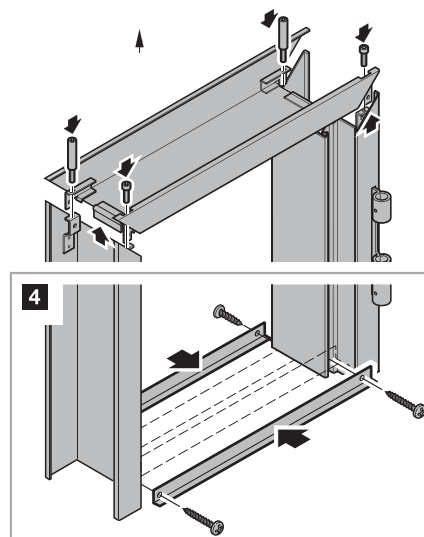
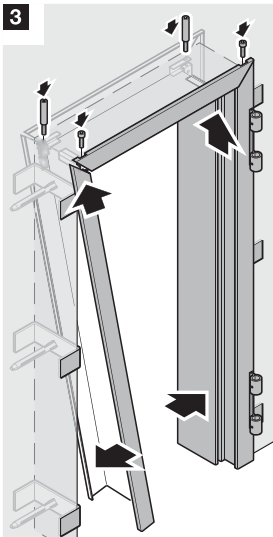
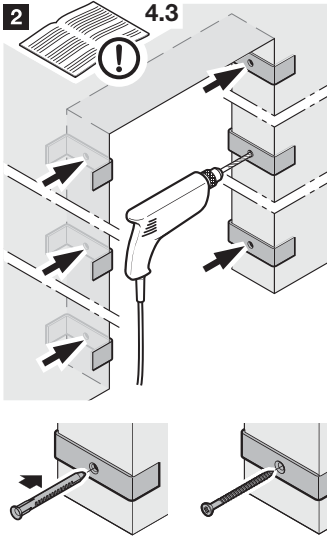
9/E4



1 8.2a/b



2 4.3

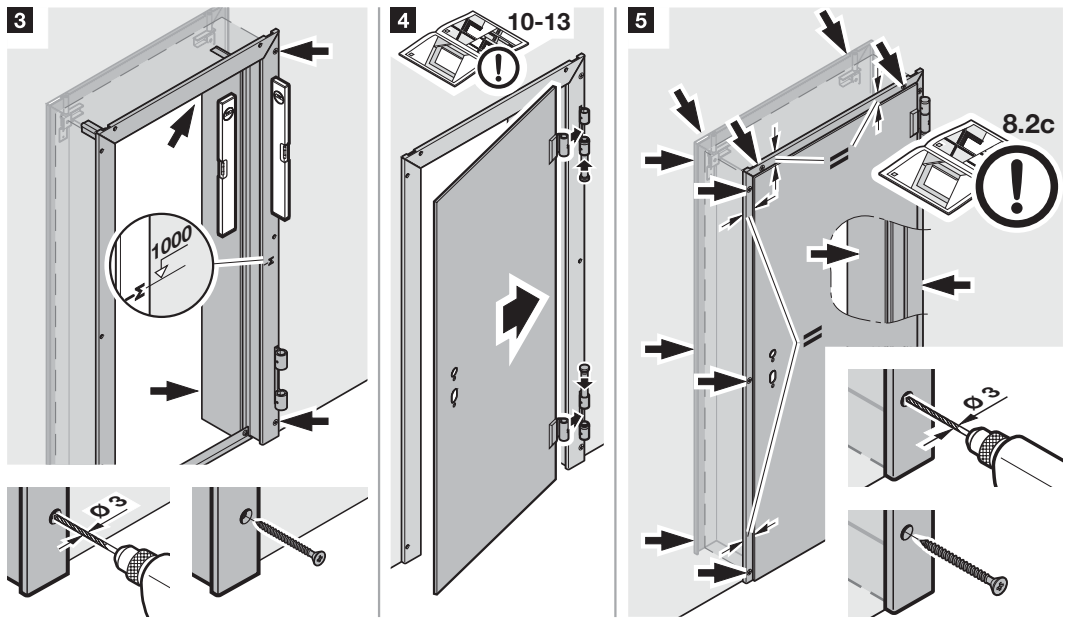
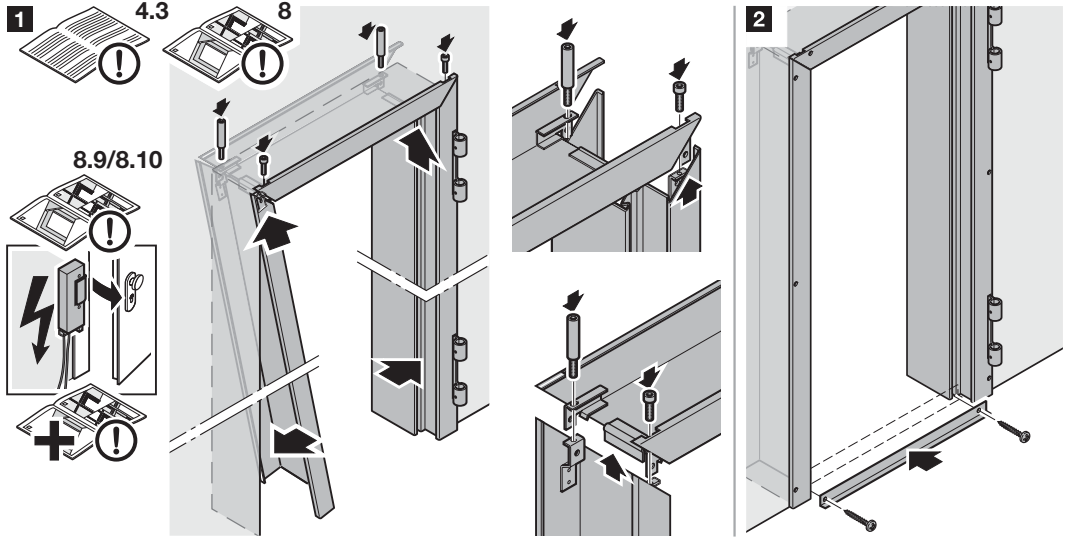
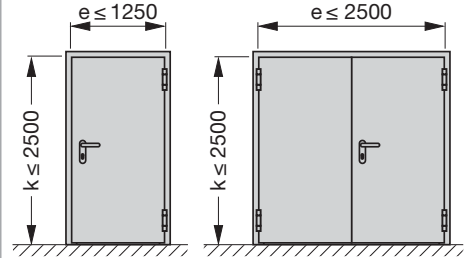
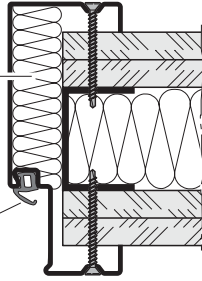
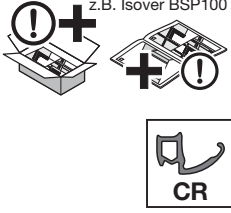


9/E5

max. T30/  
EI<sub>2</sub>30

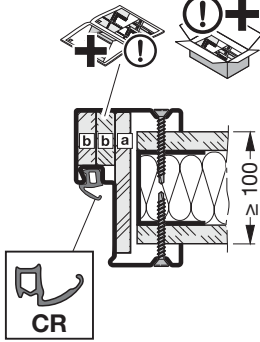


$\rho \sim 100 \text{ kg/m}^3$   
A (EN 13501-1)  
z.B. Isover BSP100



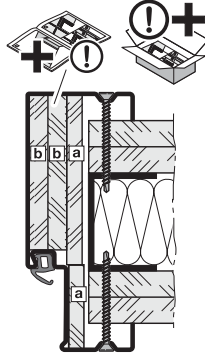
9/E6

max T30/EI<sub>2</sub>30



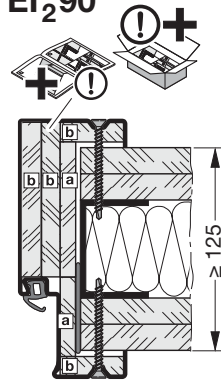
9/E7

max T30/EI<sub>2</sub>30

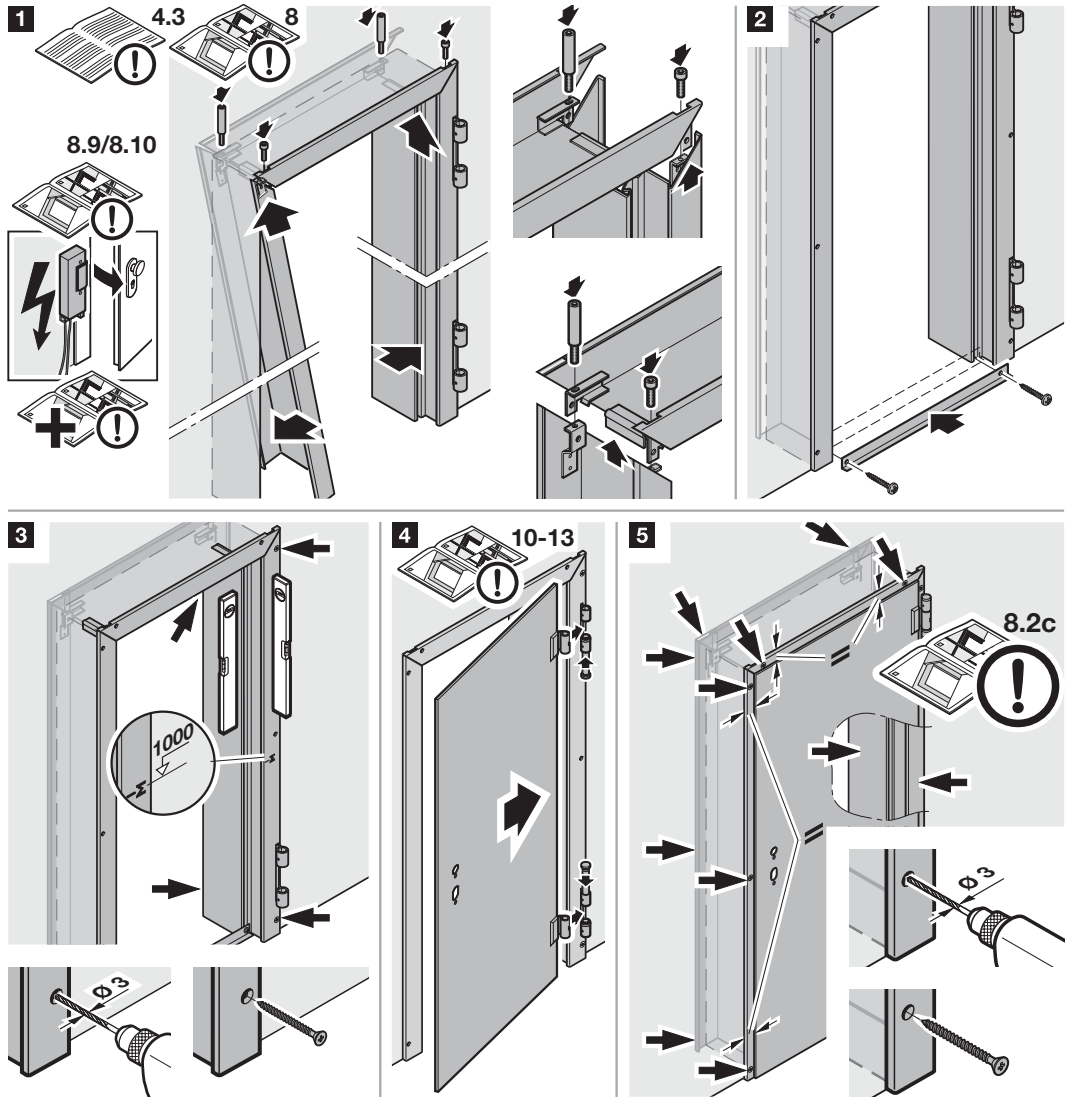


9/E8

T90/EI<sub>2</sub>90



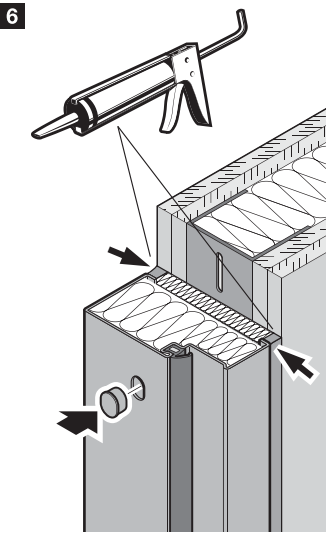
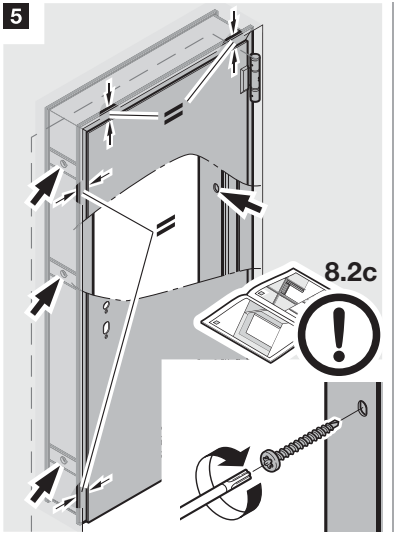
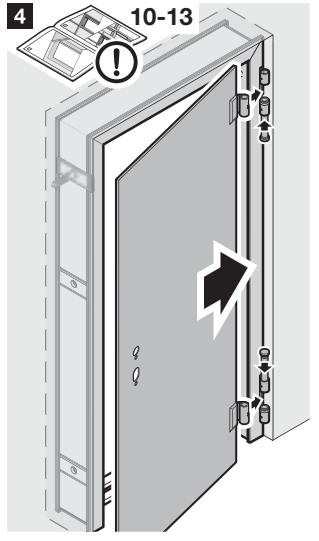
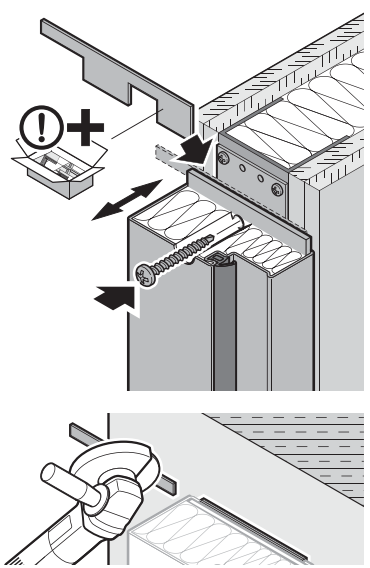
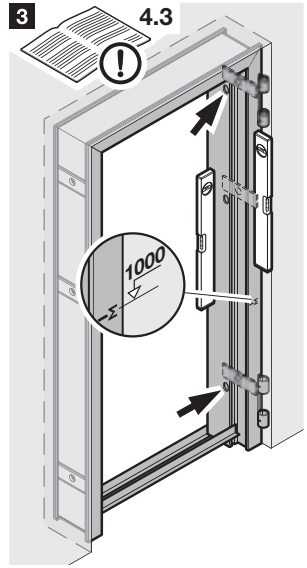
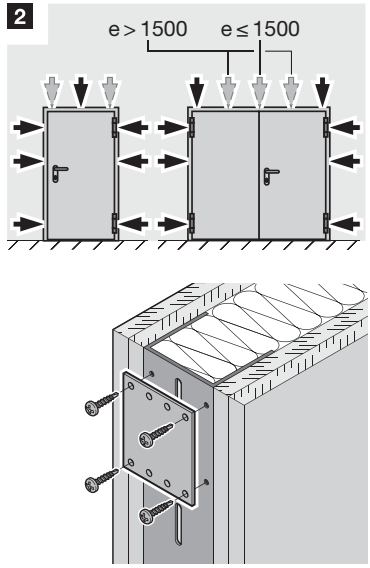
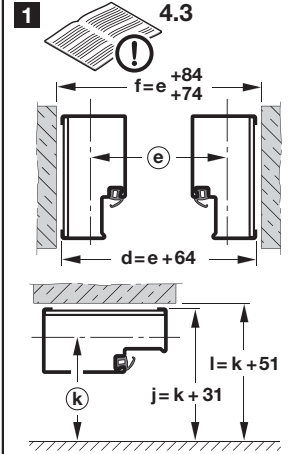
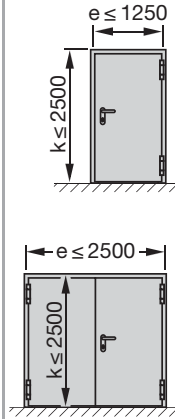
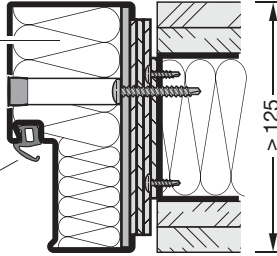
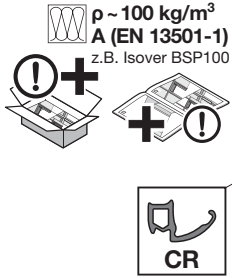
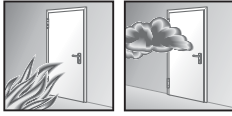
a A-9,5-EN 520 / b A-12,5-EN 520





9/E9

max. T30/  
EI<sub>230</sub>

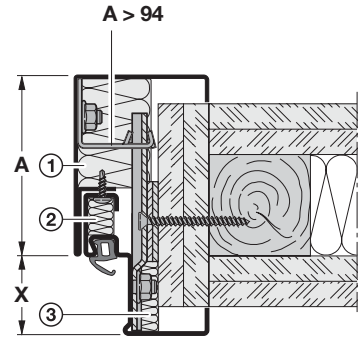
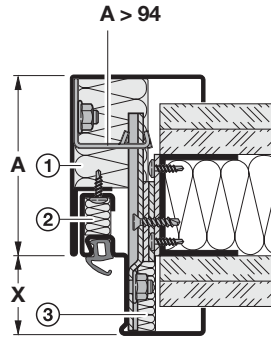
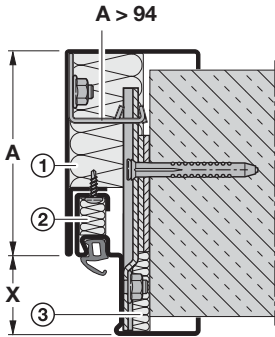
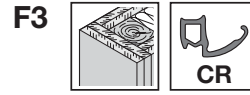
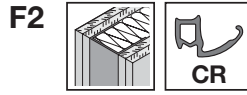
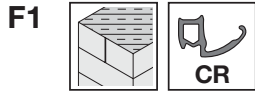
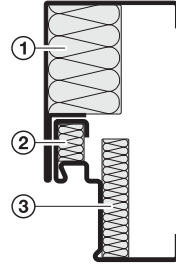


9/F1-F4

max. T30/ EI<sub>2</sub>30

  $\rho \sim 100 \text{ kg/m}^3$   
**A (EN 13501-1)**  
 z.B. Isover BSP100

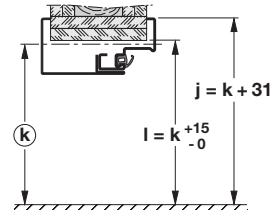
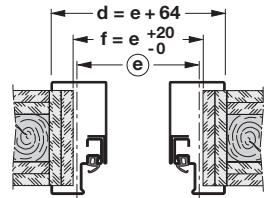
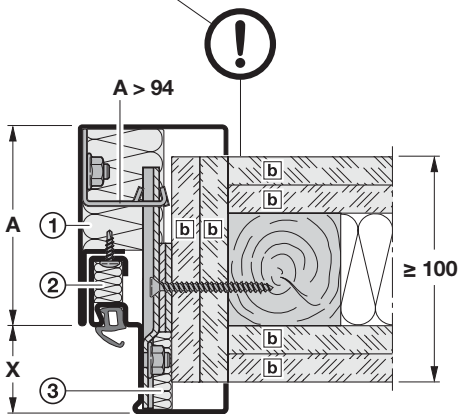
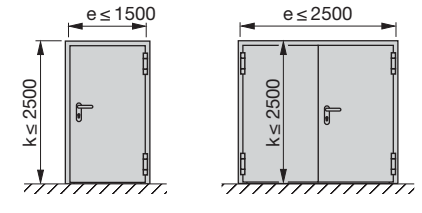
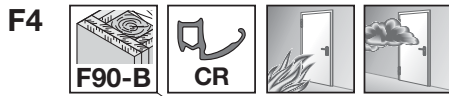
- ① =  $40 \times (A - 42)$
- ② =  $15 \times 22,5$
- ③ =  $15 \times (X + 24)$



➔ **1 2a 2b 3 ...**

➔ **1 2c 3 ...**

➔ **1 2d 3 ...**



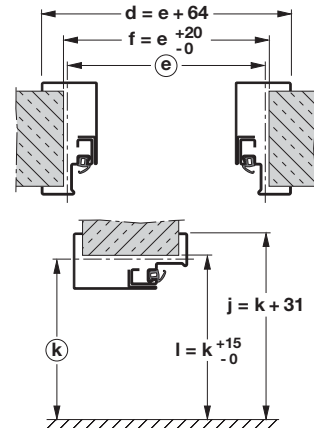
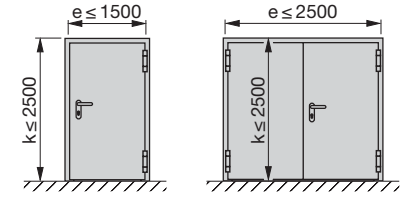
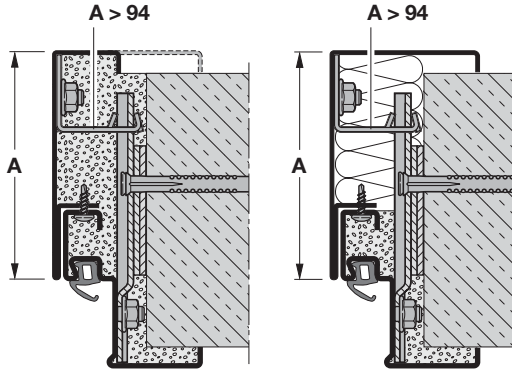
F90B DIN 4102-4 Tab. 49      **b** A-12,5-EN 520

➔ **1 2e 3 ...**

9/F5-F6

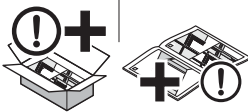
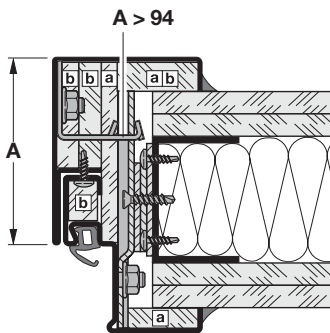
max. T90/ EI<sub>2</sub>90

F5

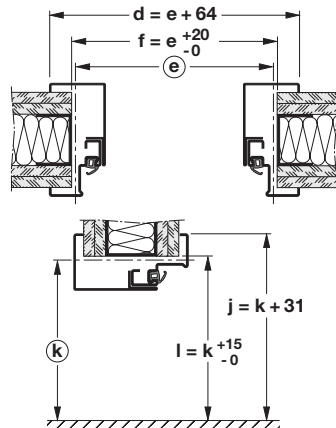
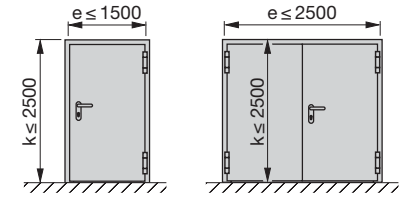


➔ 2a 2b 3 ...

F6

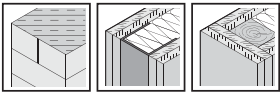


[a] A-9,5-EN 520 / [b] A-12,5-EN 520

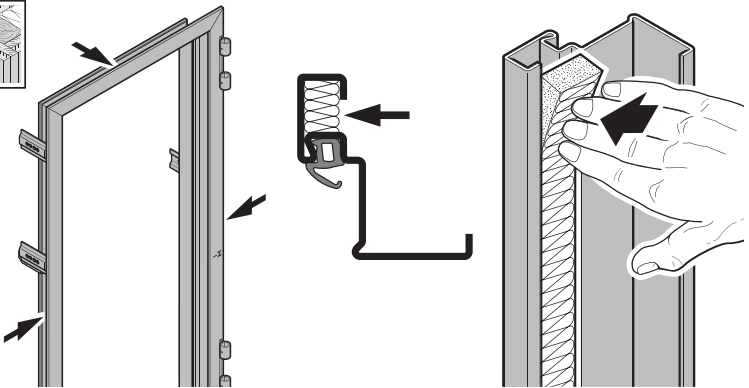


➔ 2c 3 ...

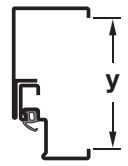
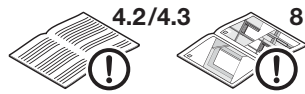
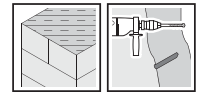
1



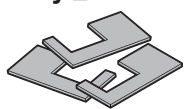
max. T30/EI<sub>2</sub>30



2a

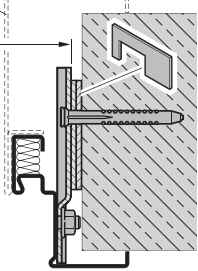


$y \geq 175$

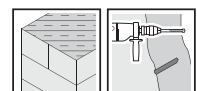


$y \geq 175$

e-10



2b

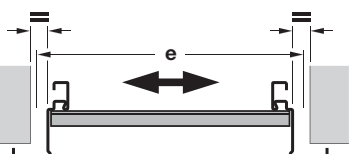
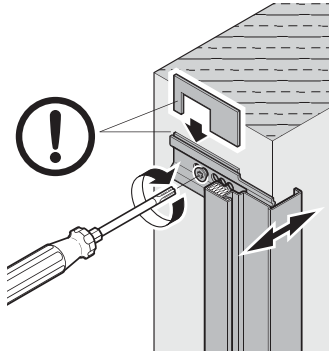
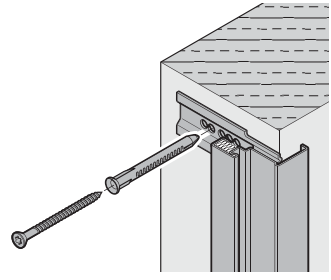
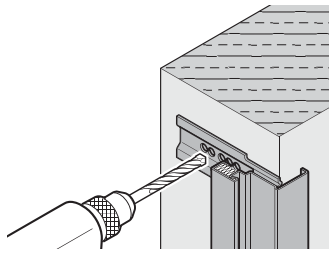
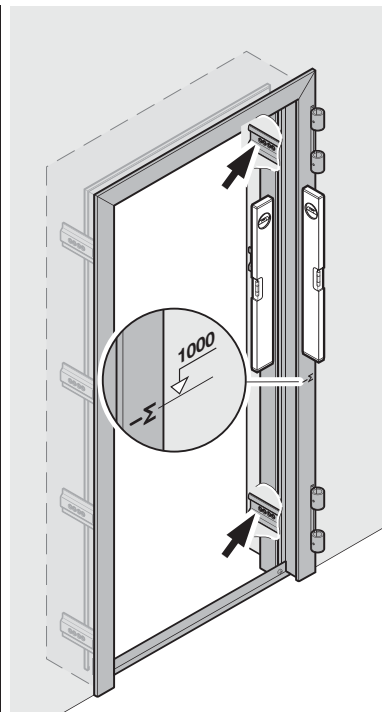
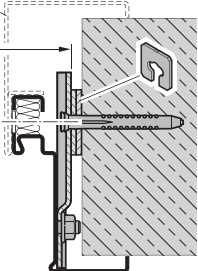


$y < 175$

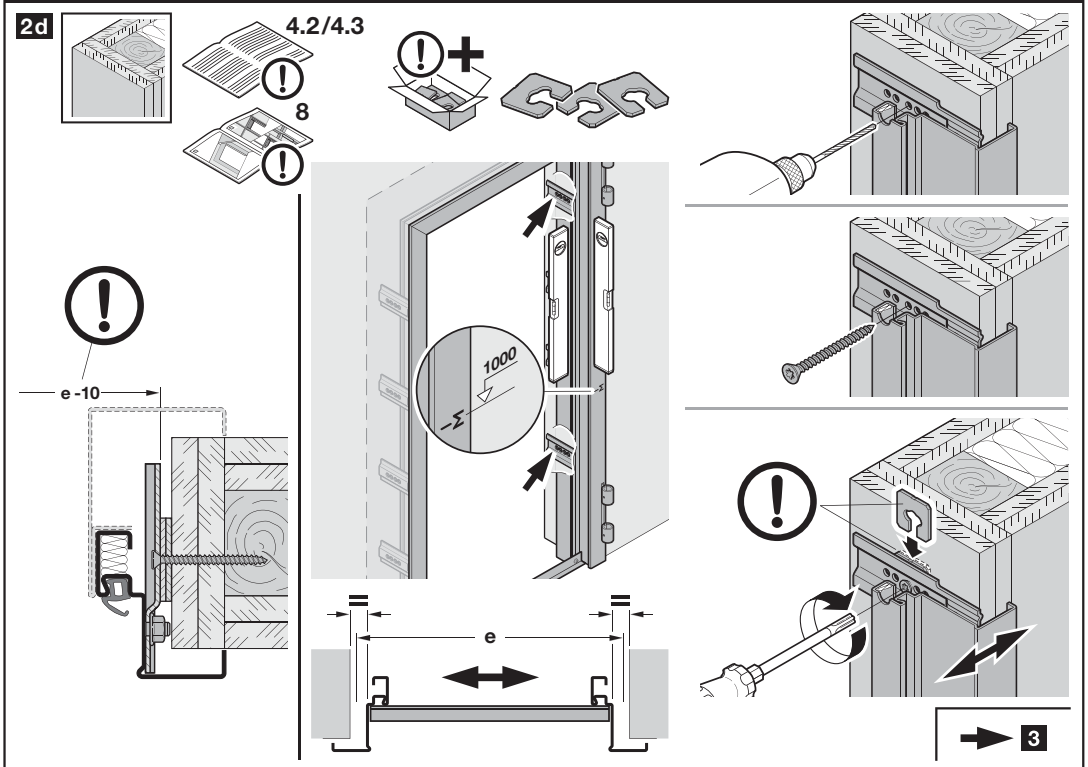
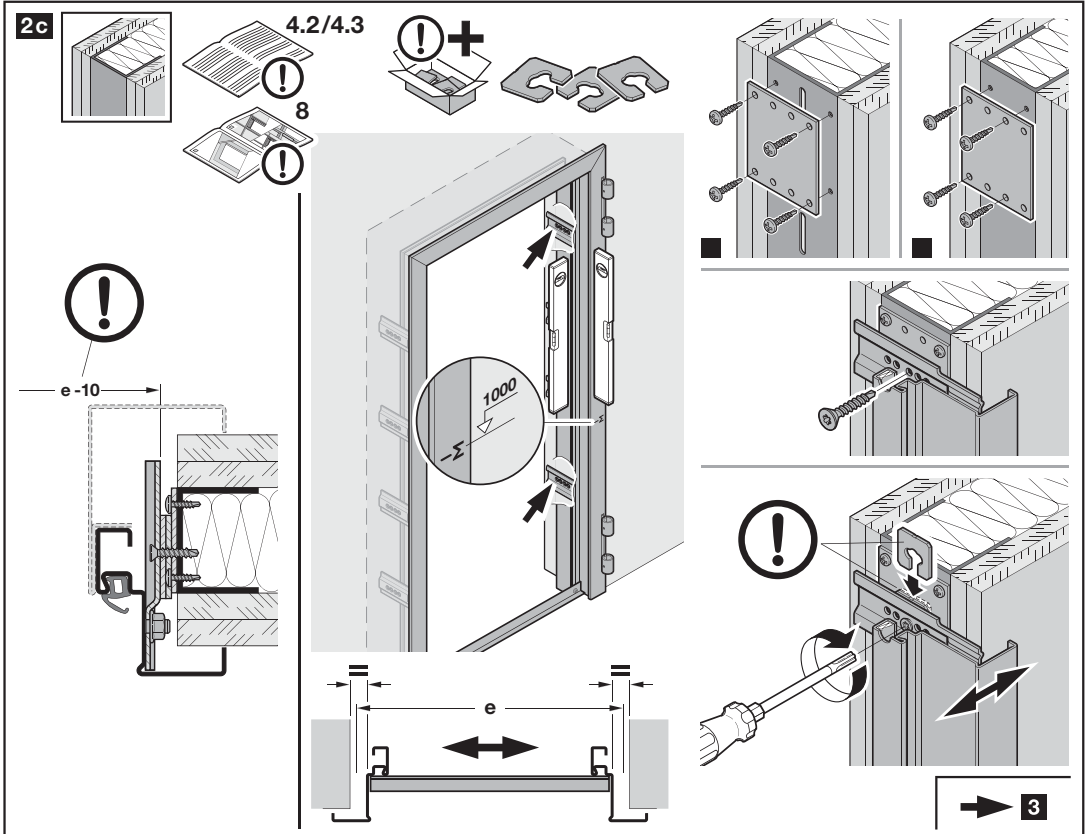


$y < 175$

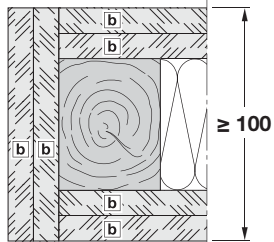
e-10



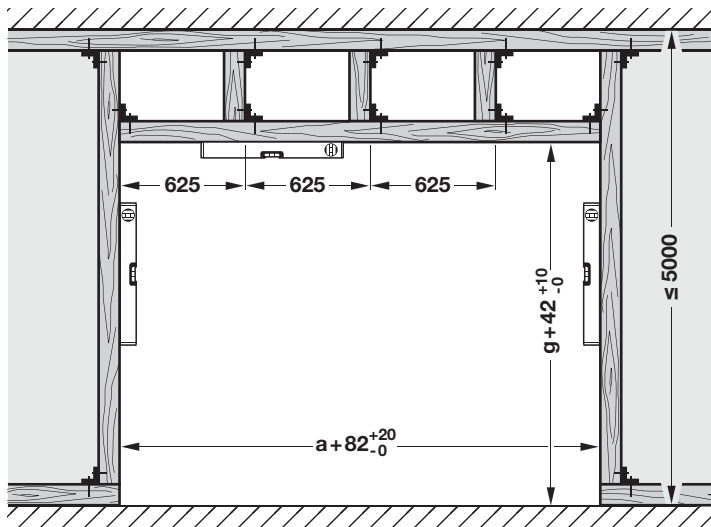
➔ 3



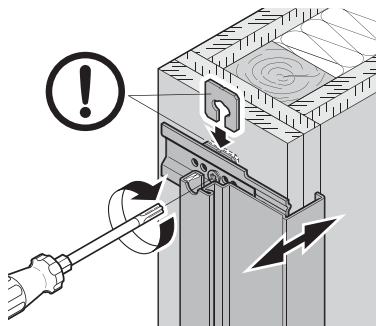
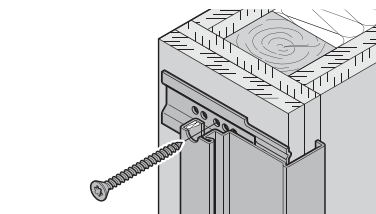
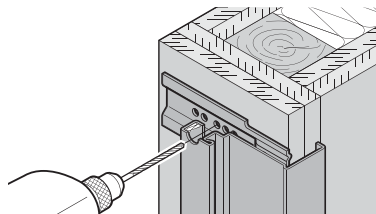
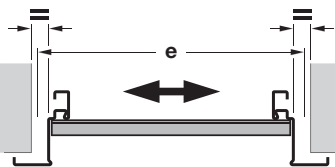
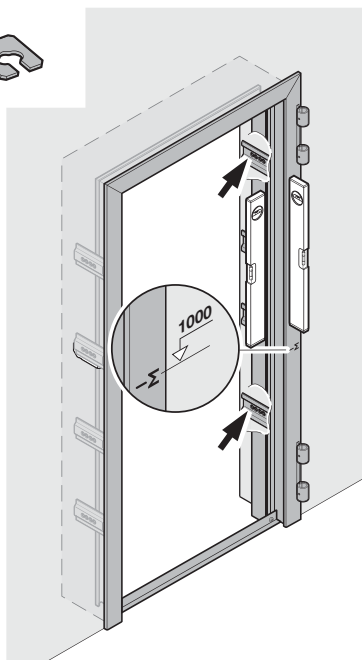
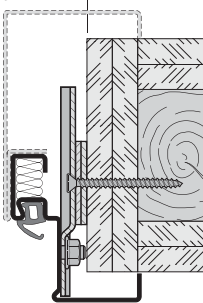
2e



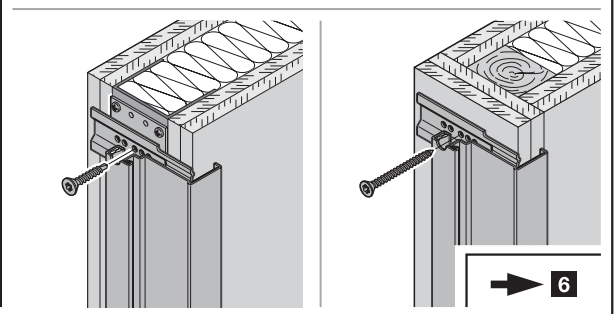
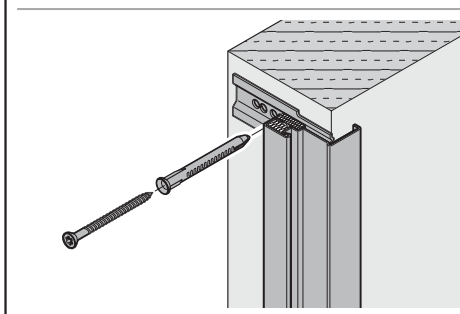
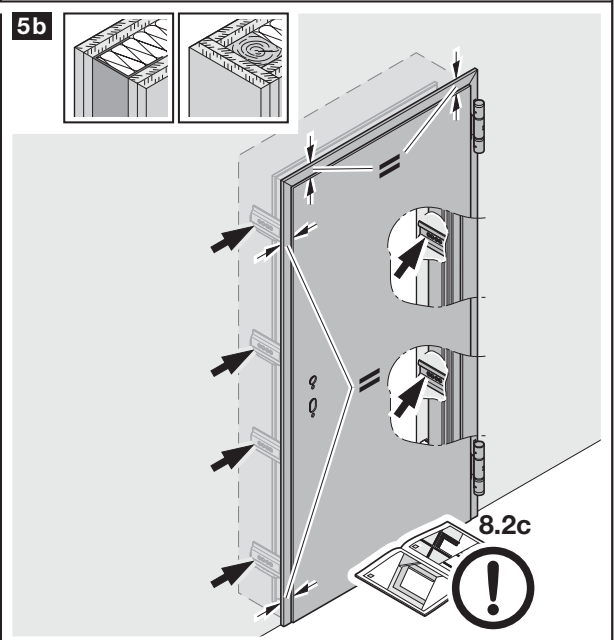
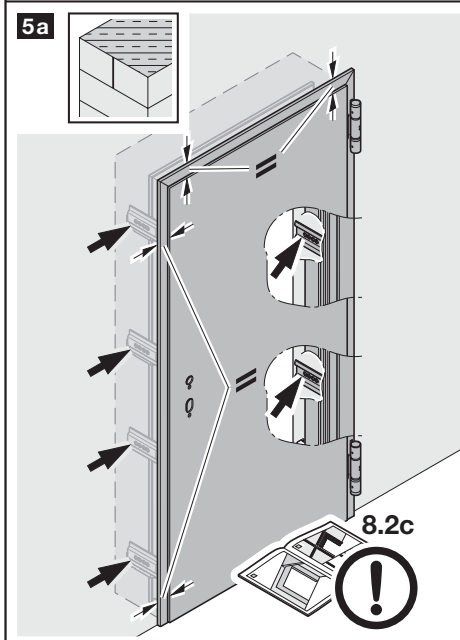
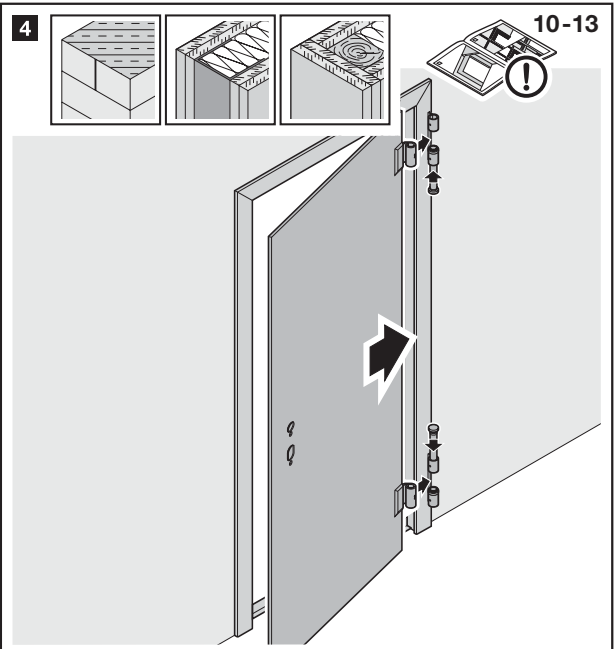
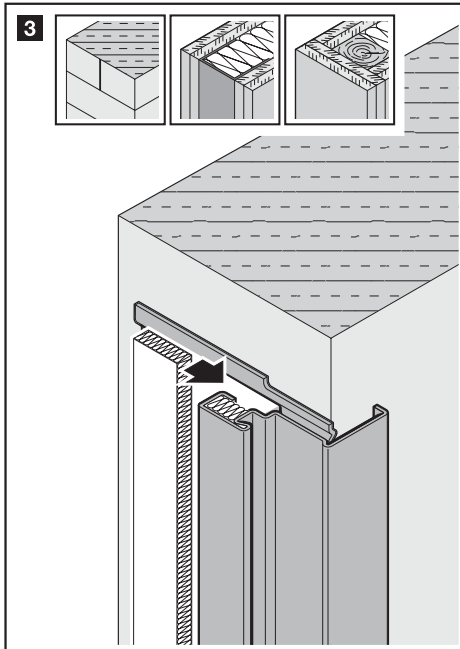
b A-12,5-EN 520

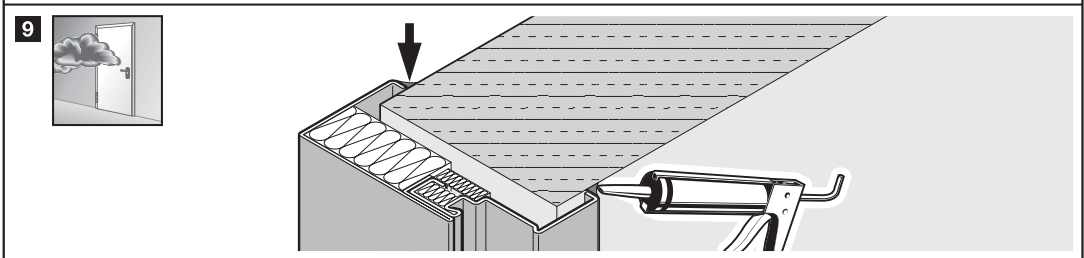
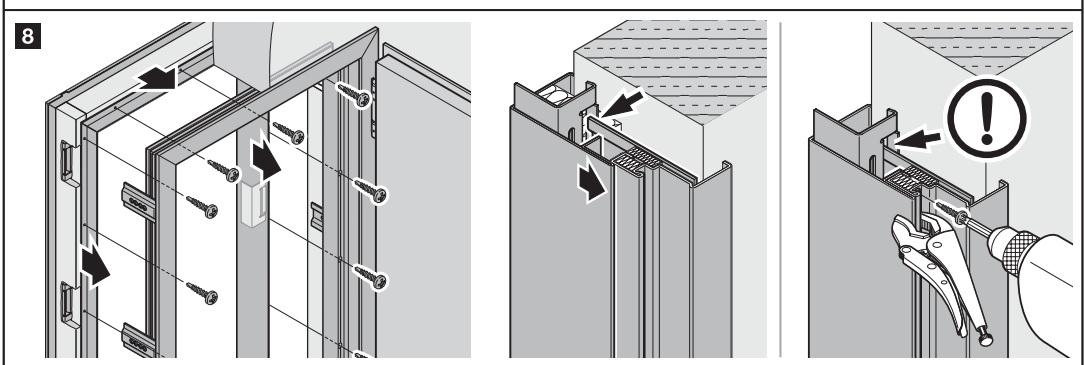
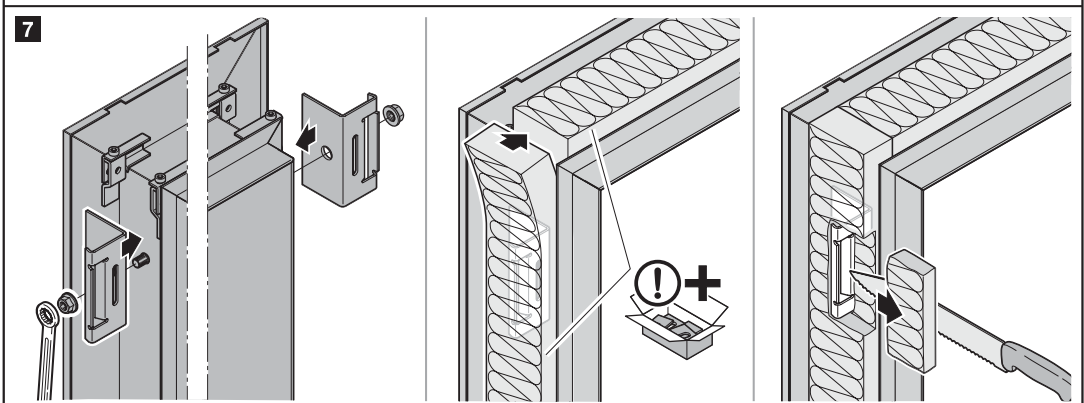
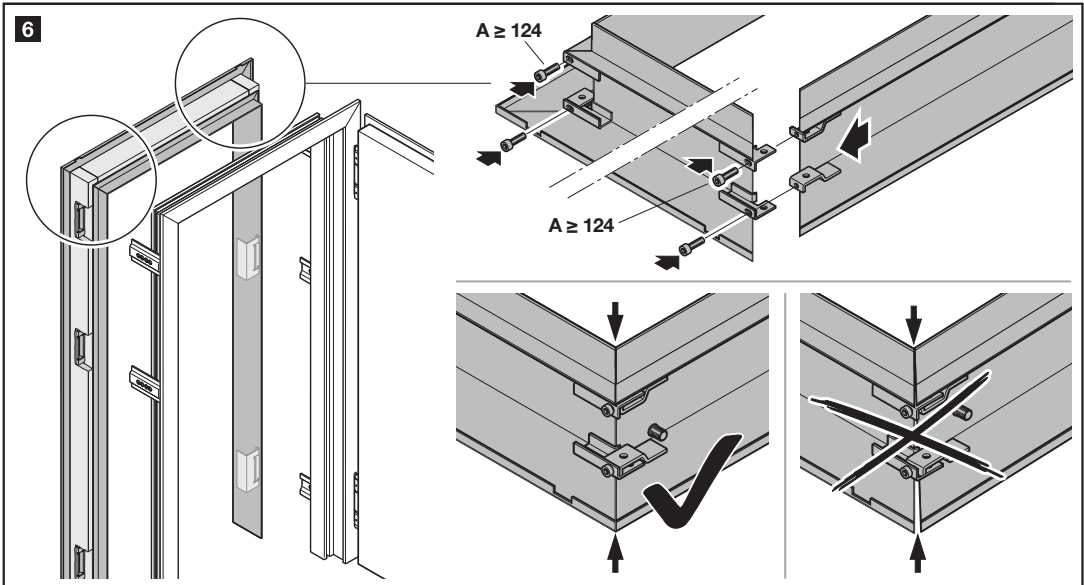


$e +20 -0$



➔ 3

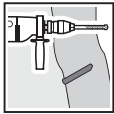






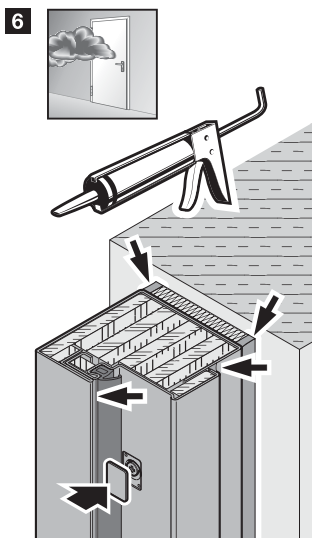
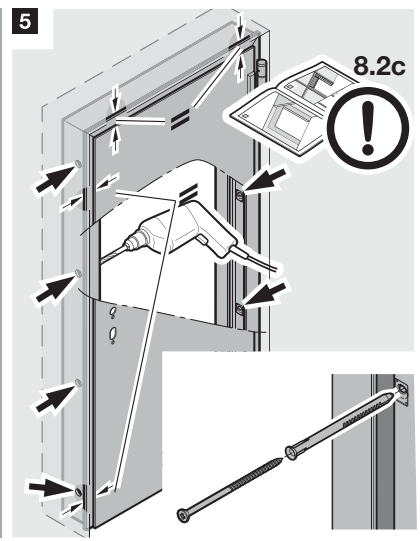
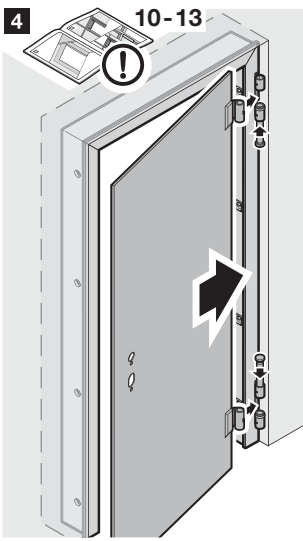
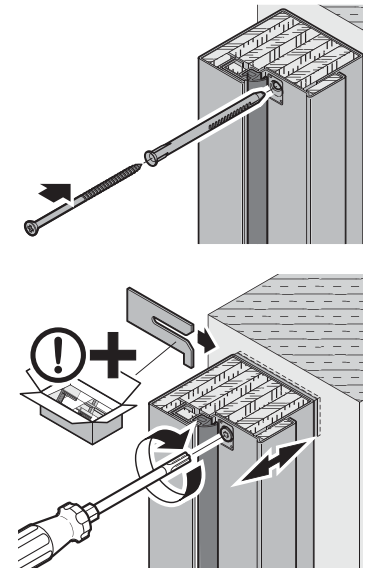
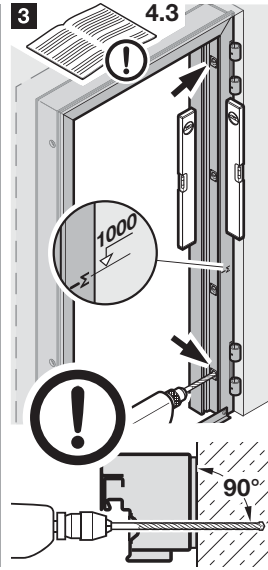
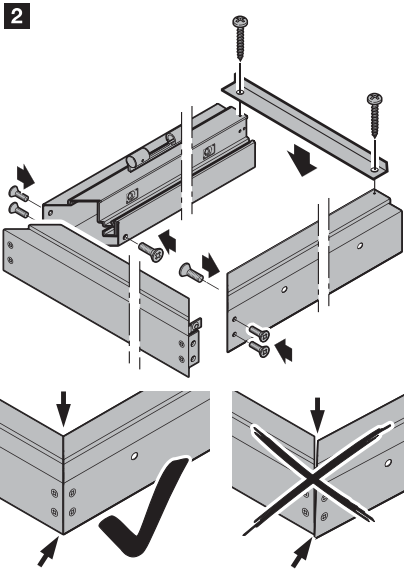
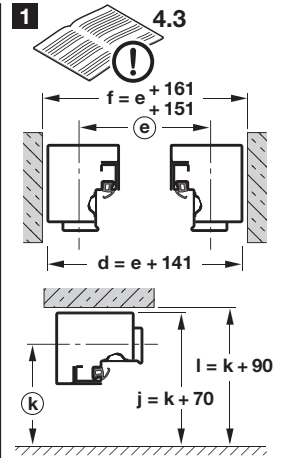
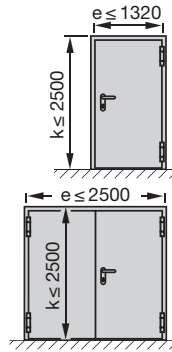
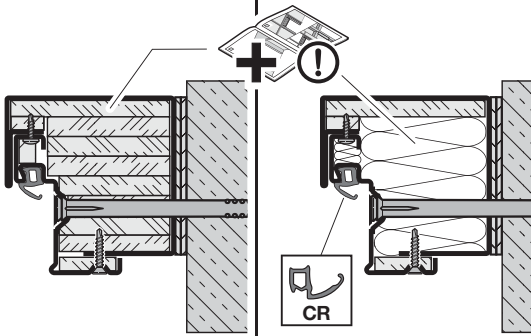
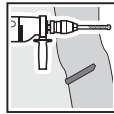
9/G1

max. T90/  
EI<sub>2</sub>90

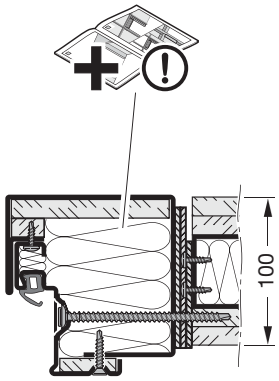


9/G2

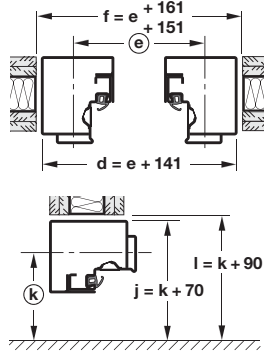
max. T30/  
EI<sub>2</sub>30



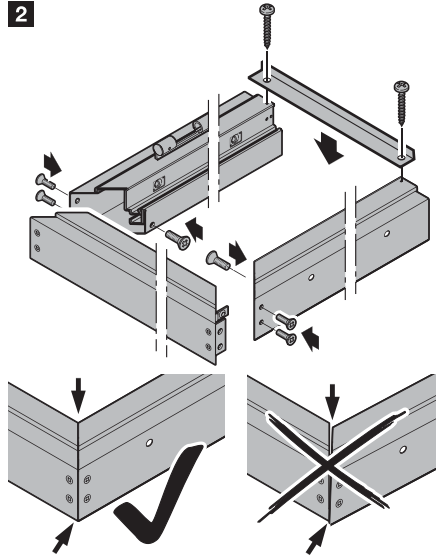
9/G3



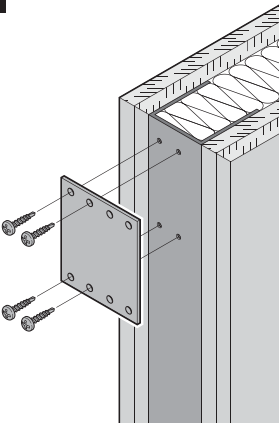
1 4.3



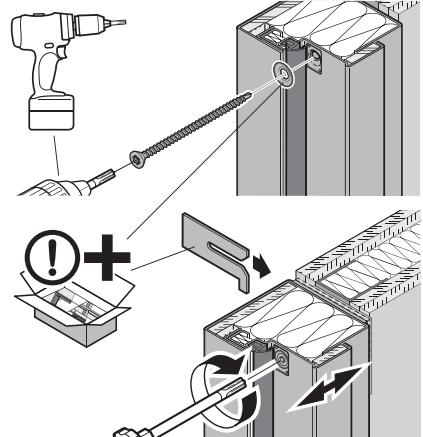
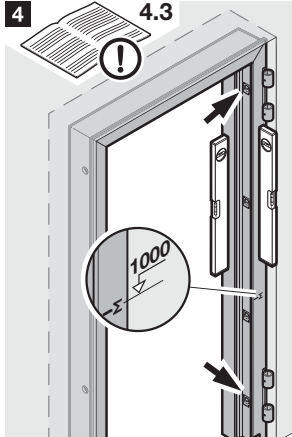
2



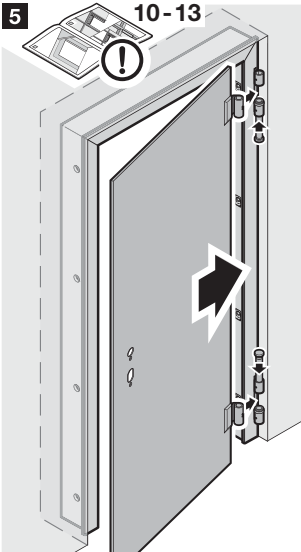
3



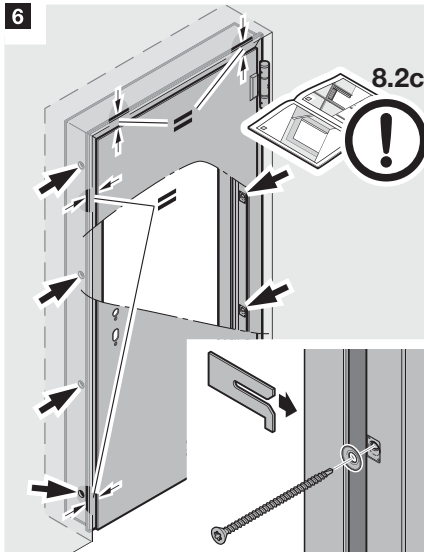
4 4.3



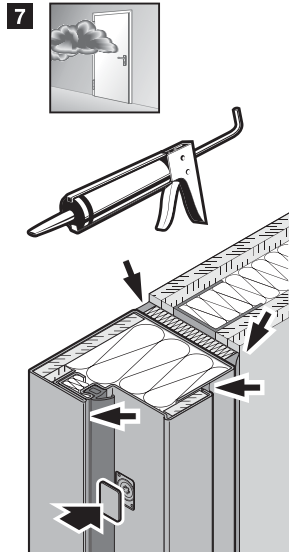
5 10-13



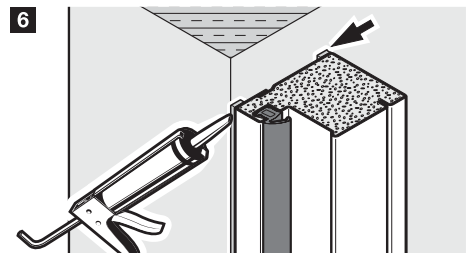
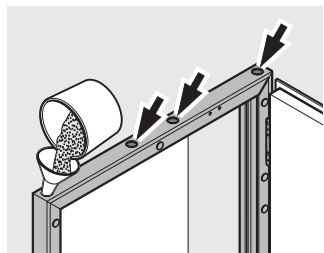
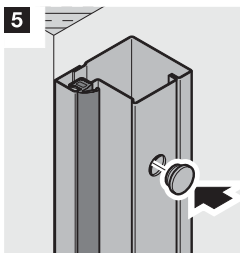
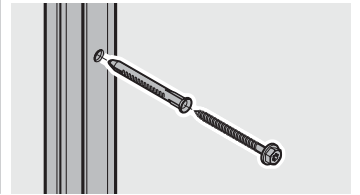
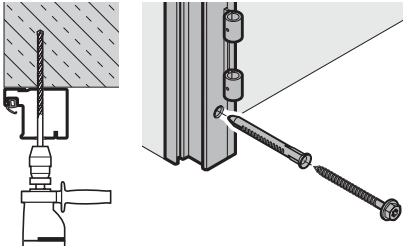
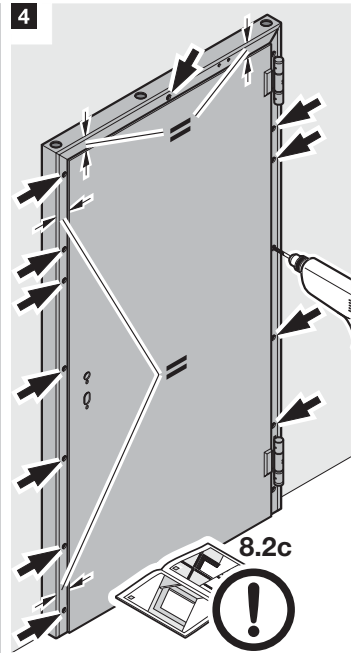
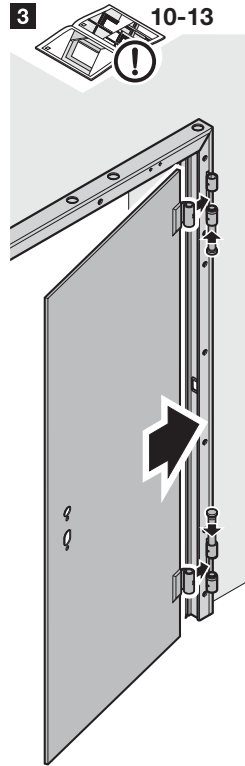
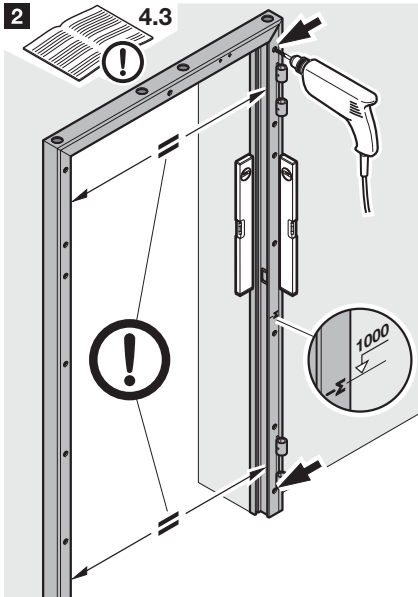
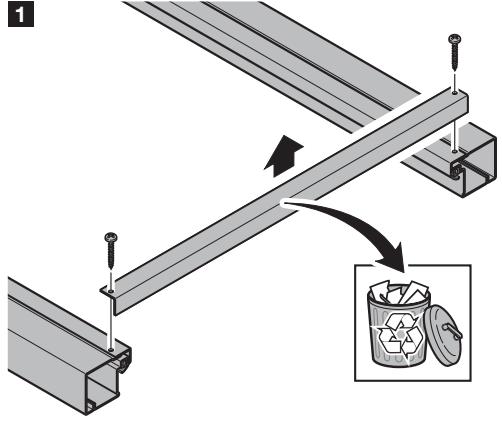
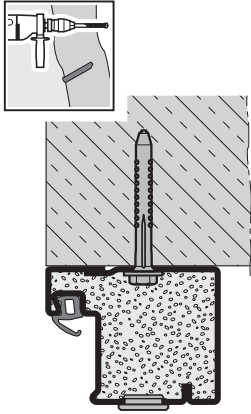
6



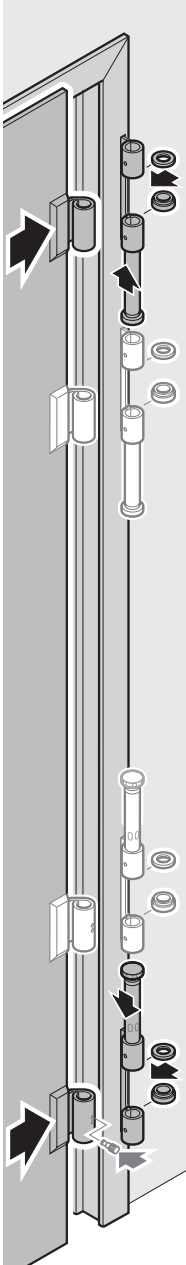
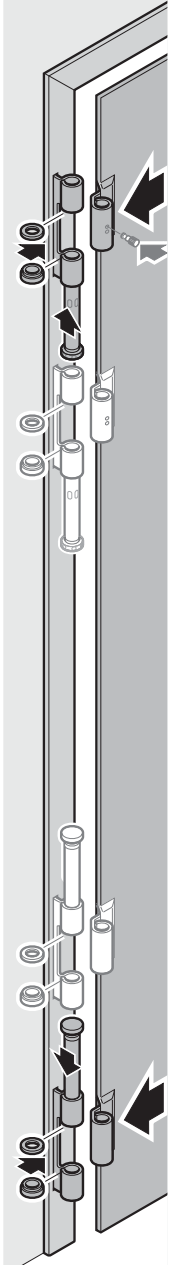
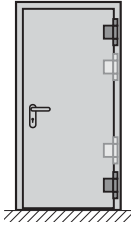
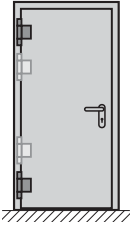
7



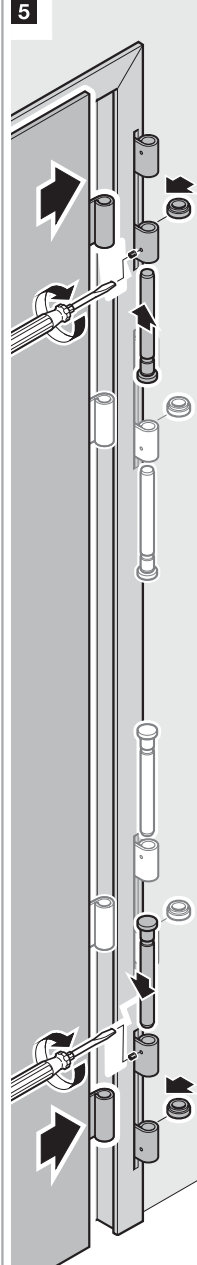
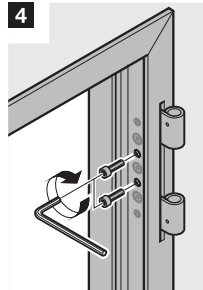
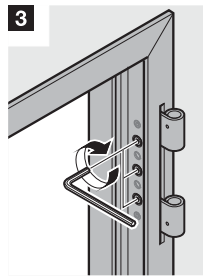
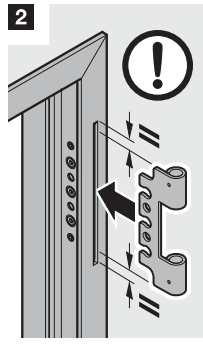
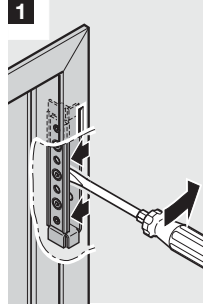
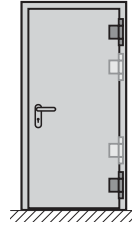
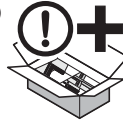
9/H1  
max. T30/  
EI<sub>2</sub>30



10.1a



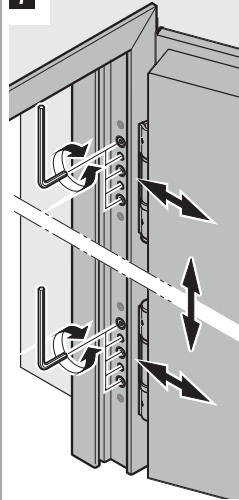
10.1b



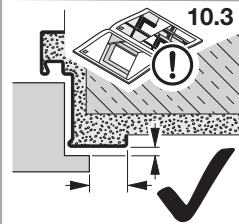
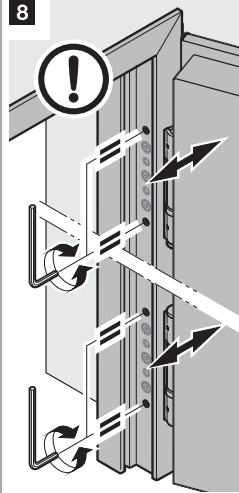
6



7

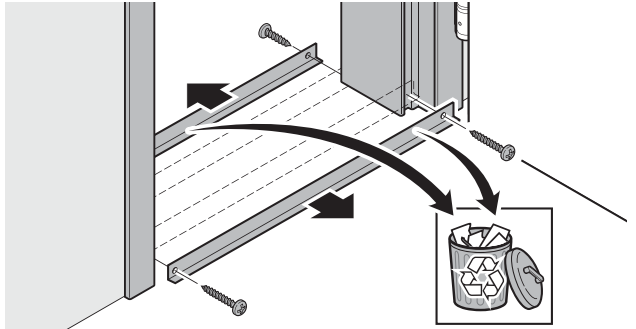
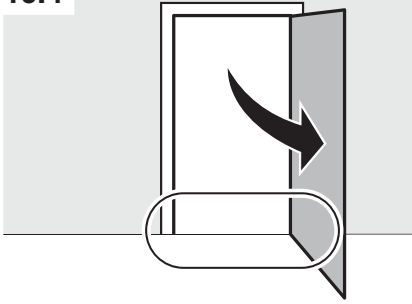


8



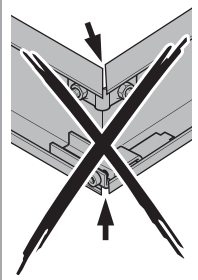
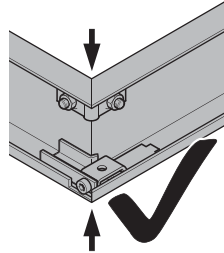
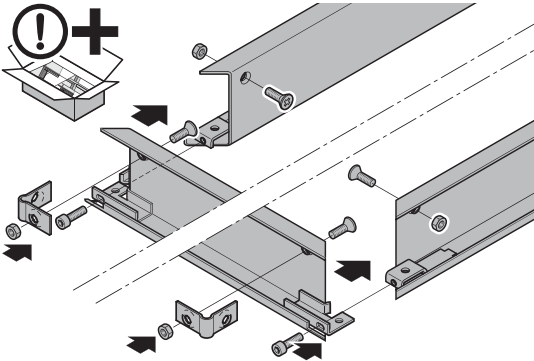


10.4

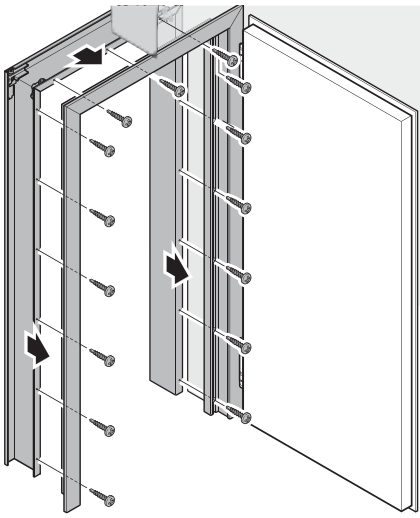


10.5

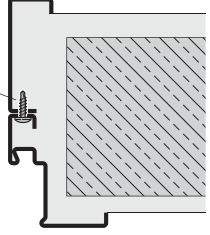
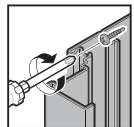
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2a



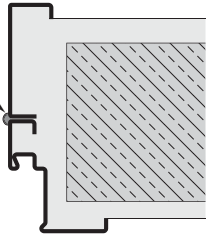
DIN 7504 ST 4,8 x 19-N-H  
DIN 7981 4,8 x 16



2b



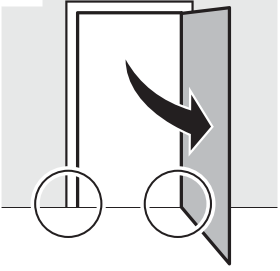
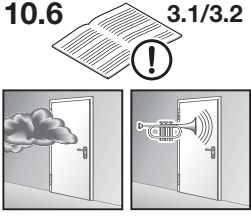
$2\sqrt{x} > 10$



10.6

3.1/3.2

1

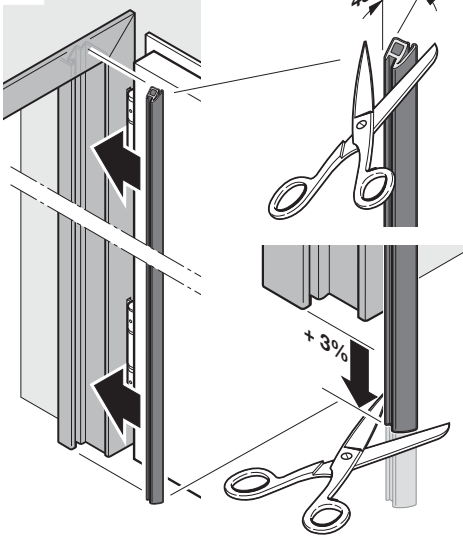


2

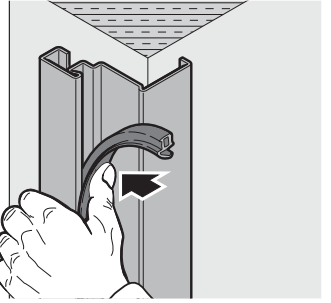


10.7a

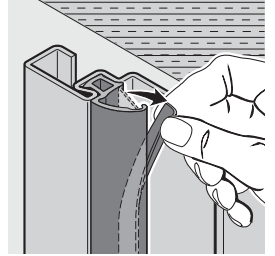
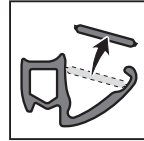
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2



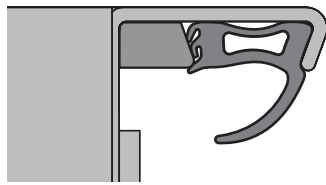
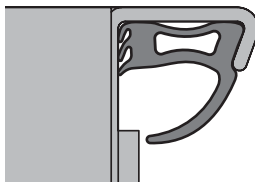
3



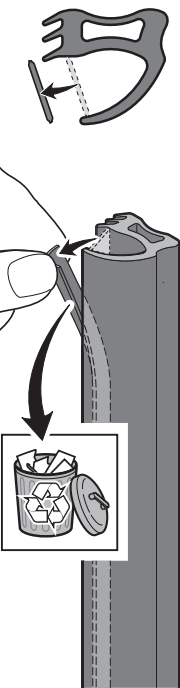
10.7b

A

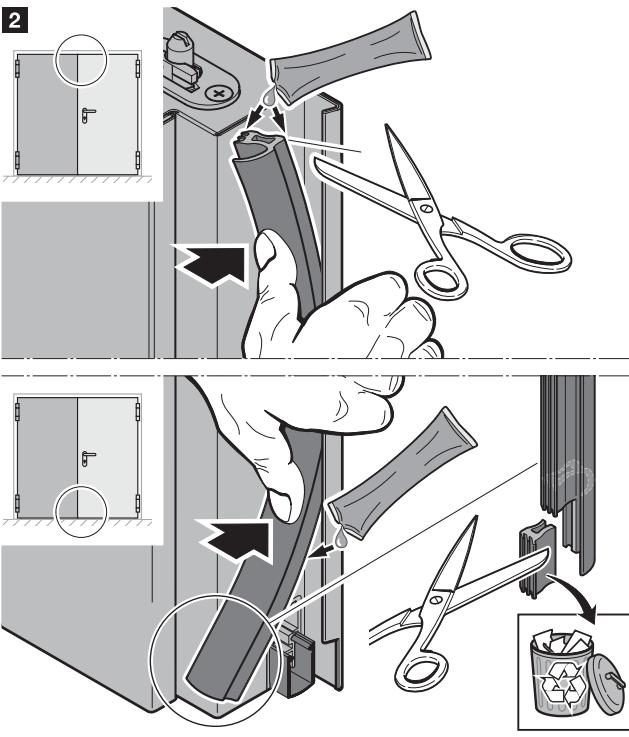
B



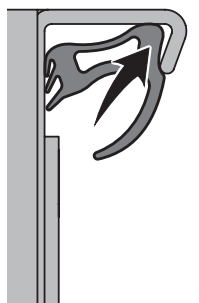
1



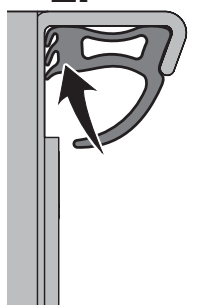
2



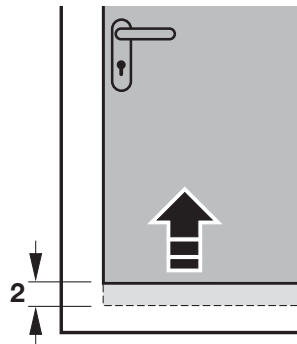
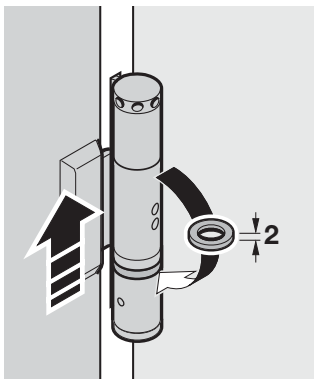
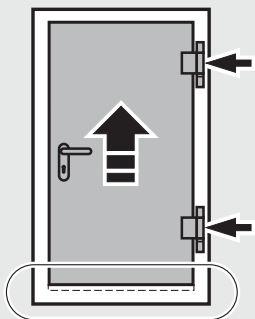
1.



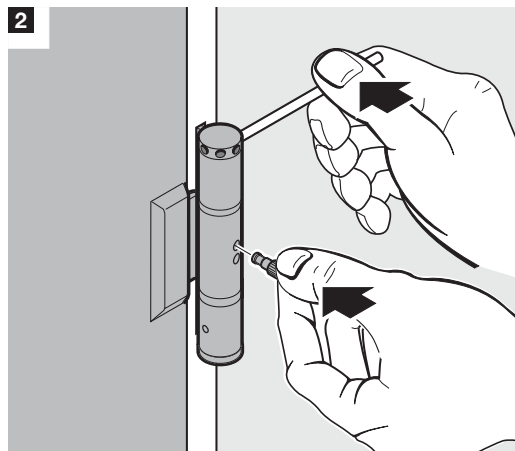
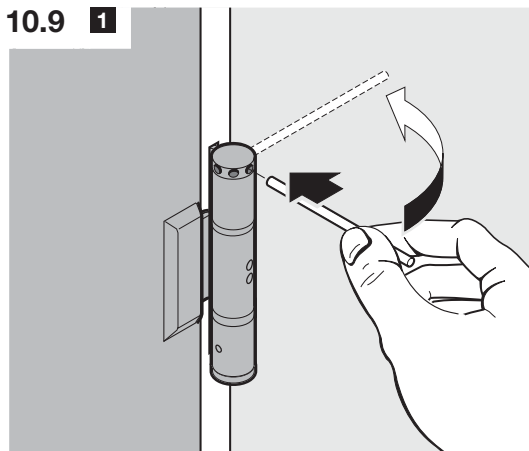
2.



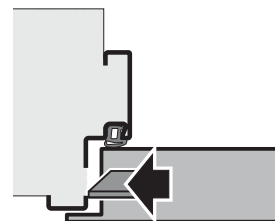
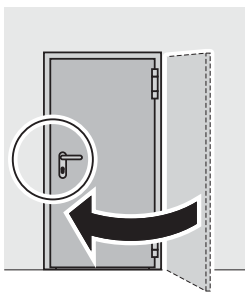
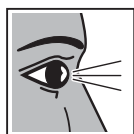
10.8



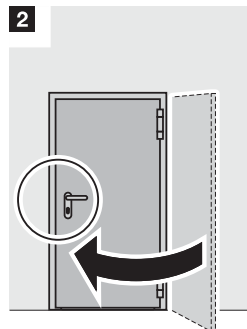
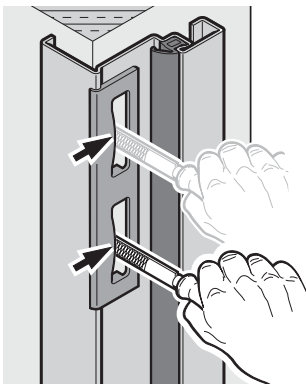
10.9 1



10.10a

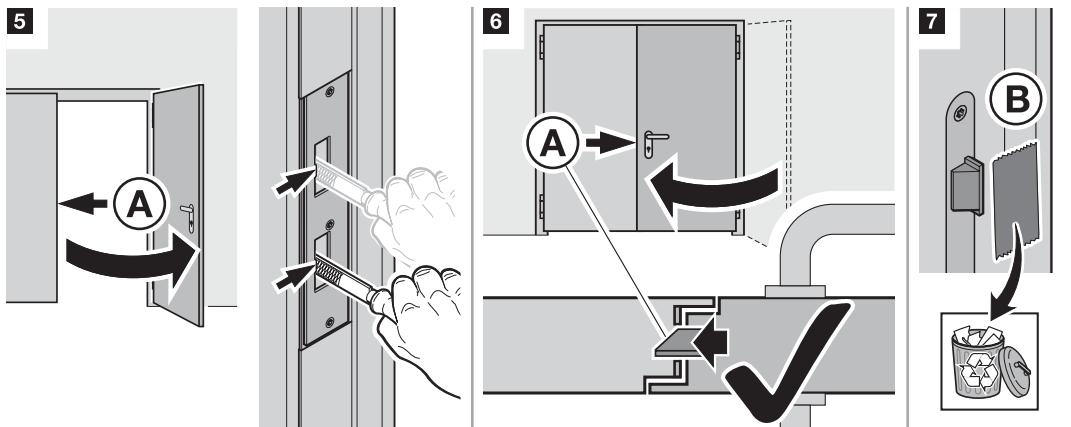
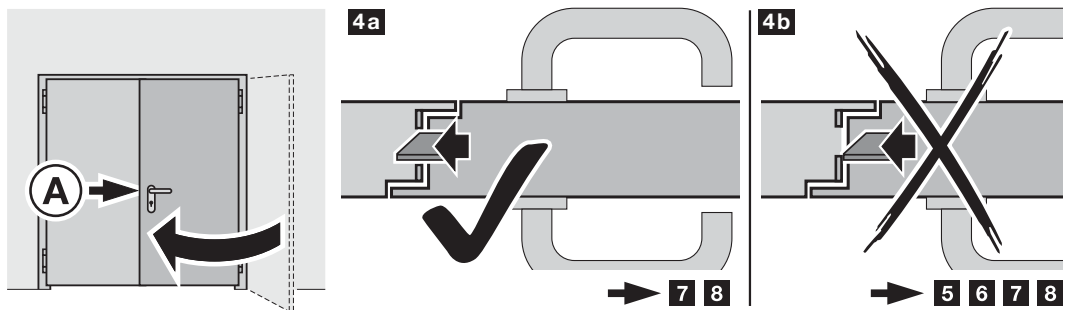
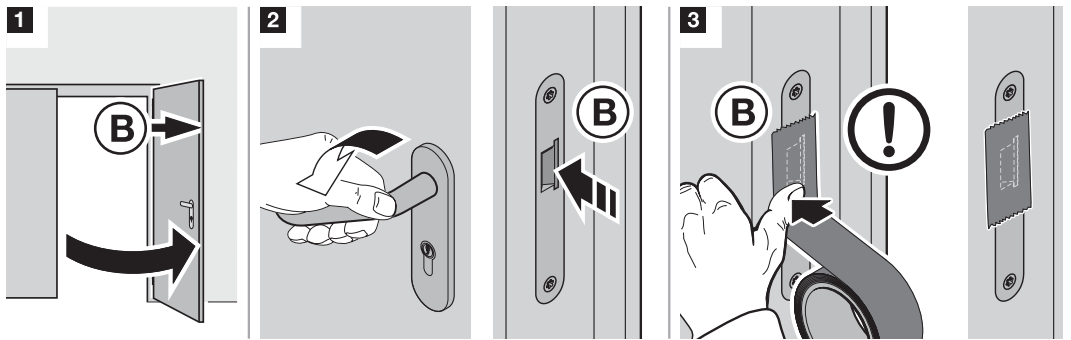
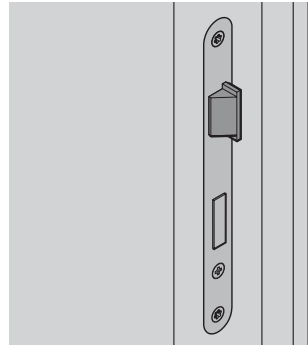
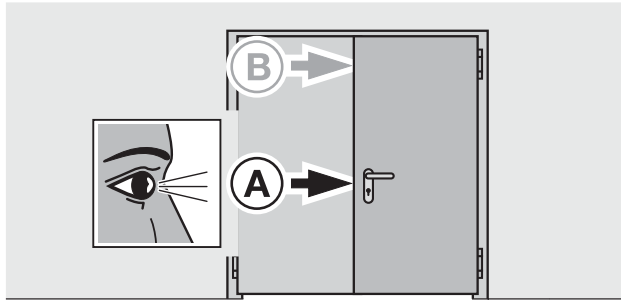


→ 1 2



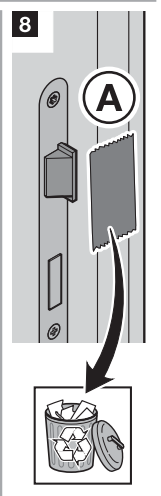
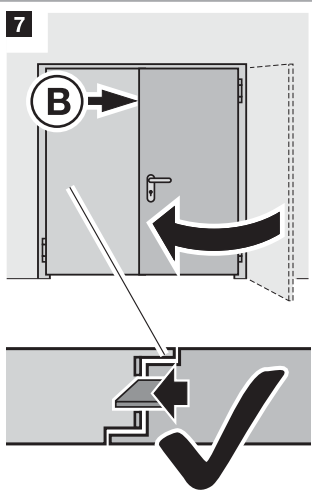
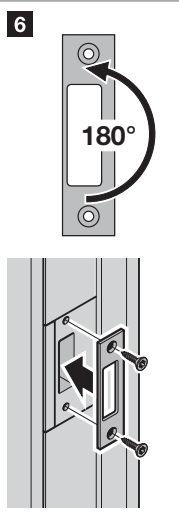
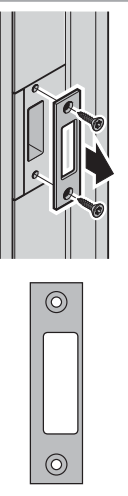
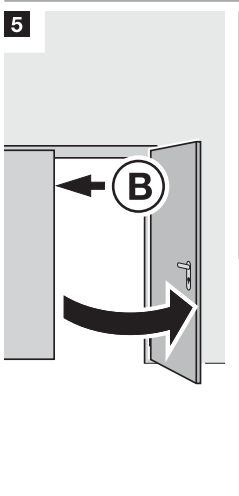
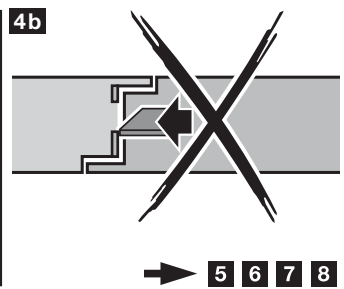
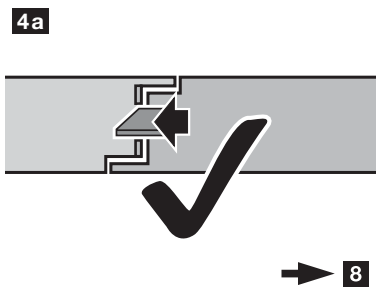
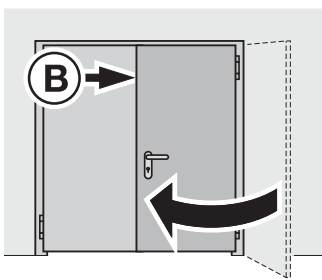
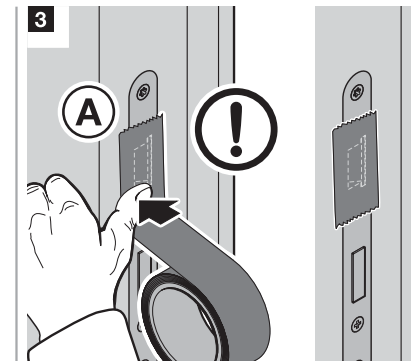
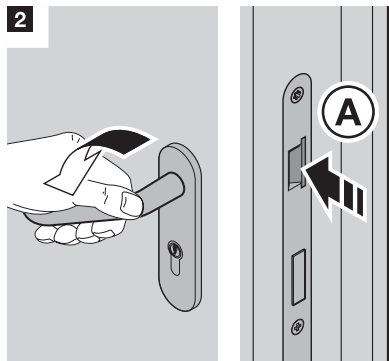
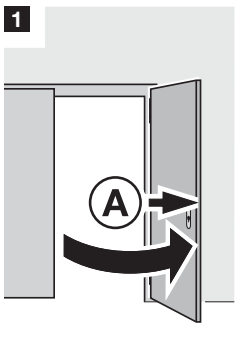
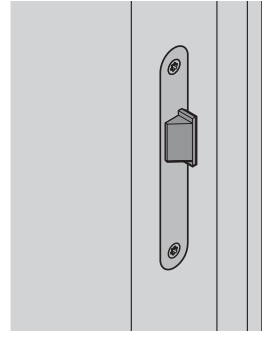
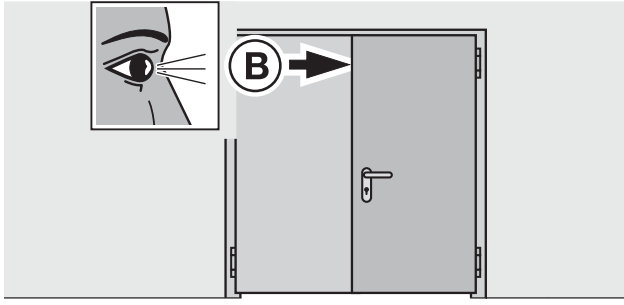


10.10b H16-2 G / H\_90 F-2

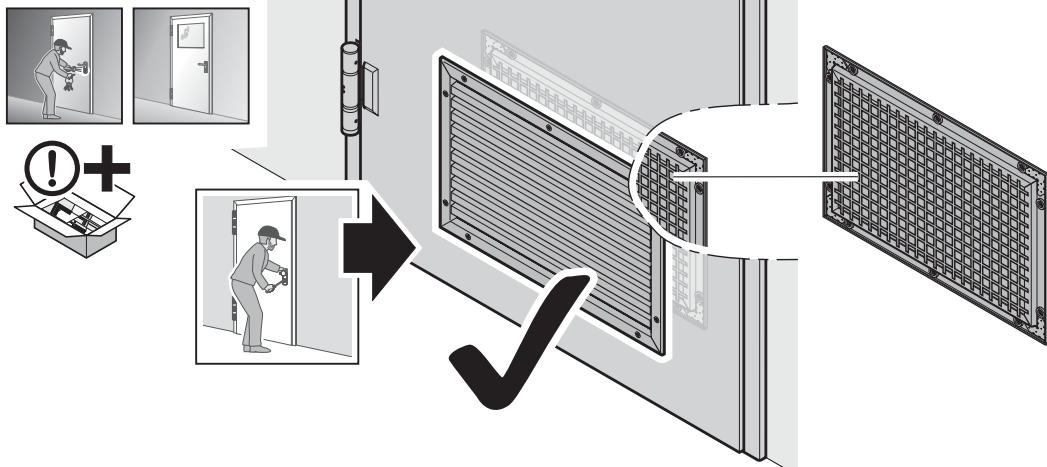


8 → 10.10c

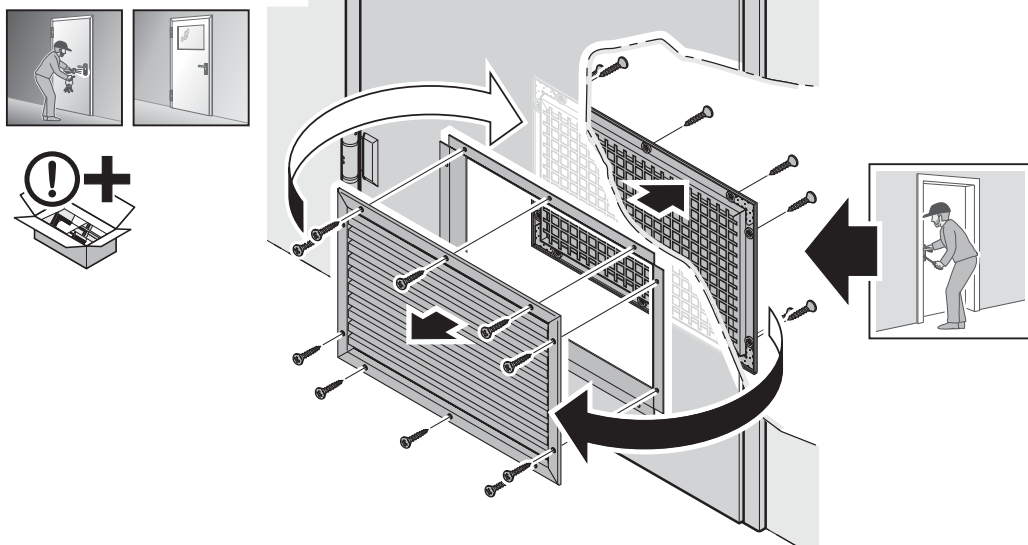
10.10c H16-2 G / H\_90 F-2



### 10.11a

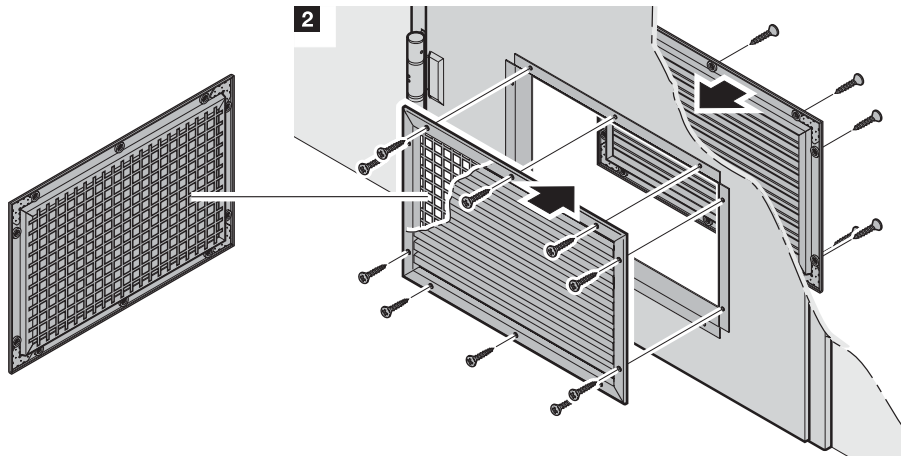


### 10.11b

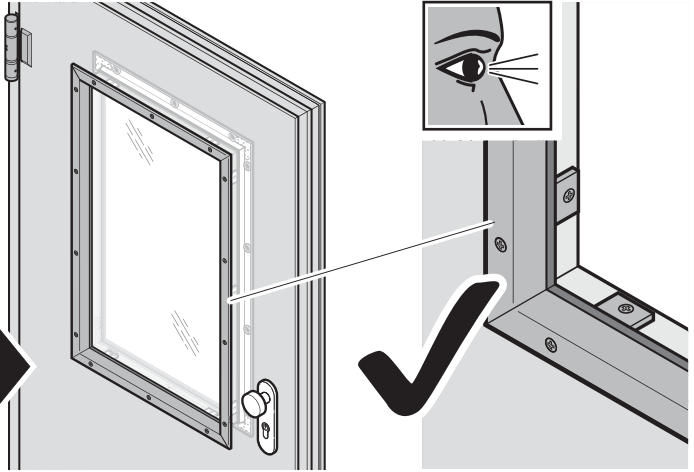
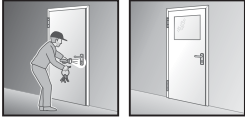


1

2

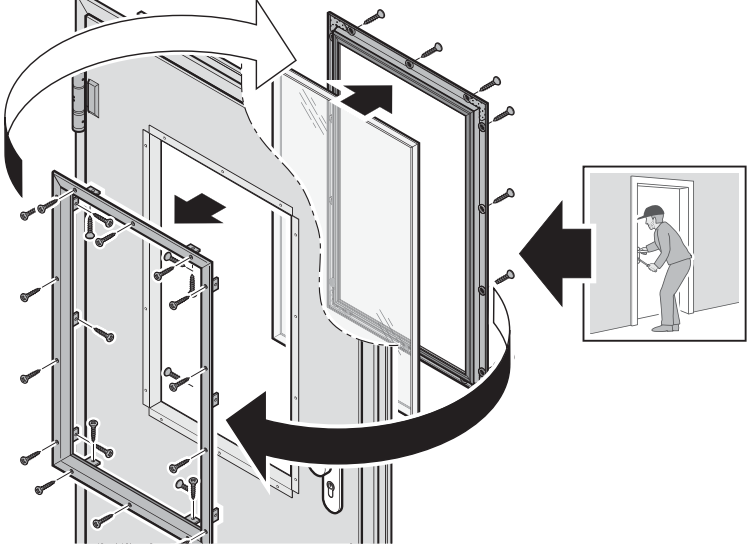
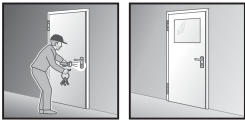


10.12a

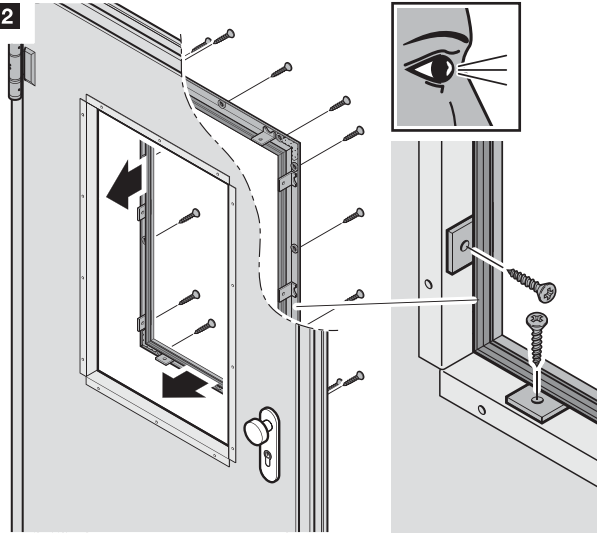


10.12b

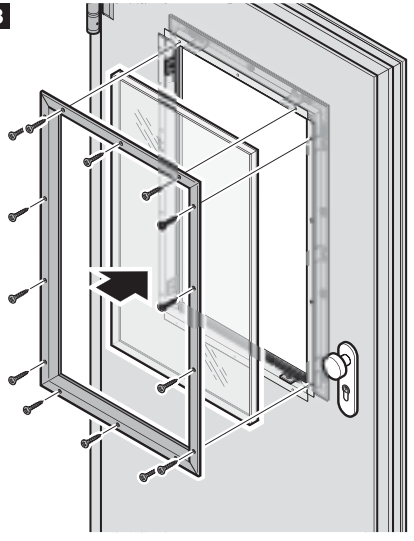
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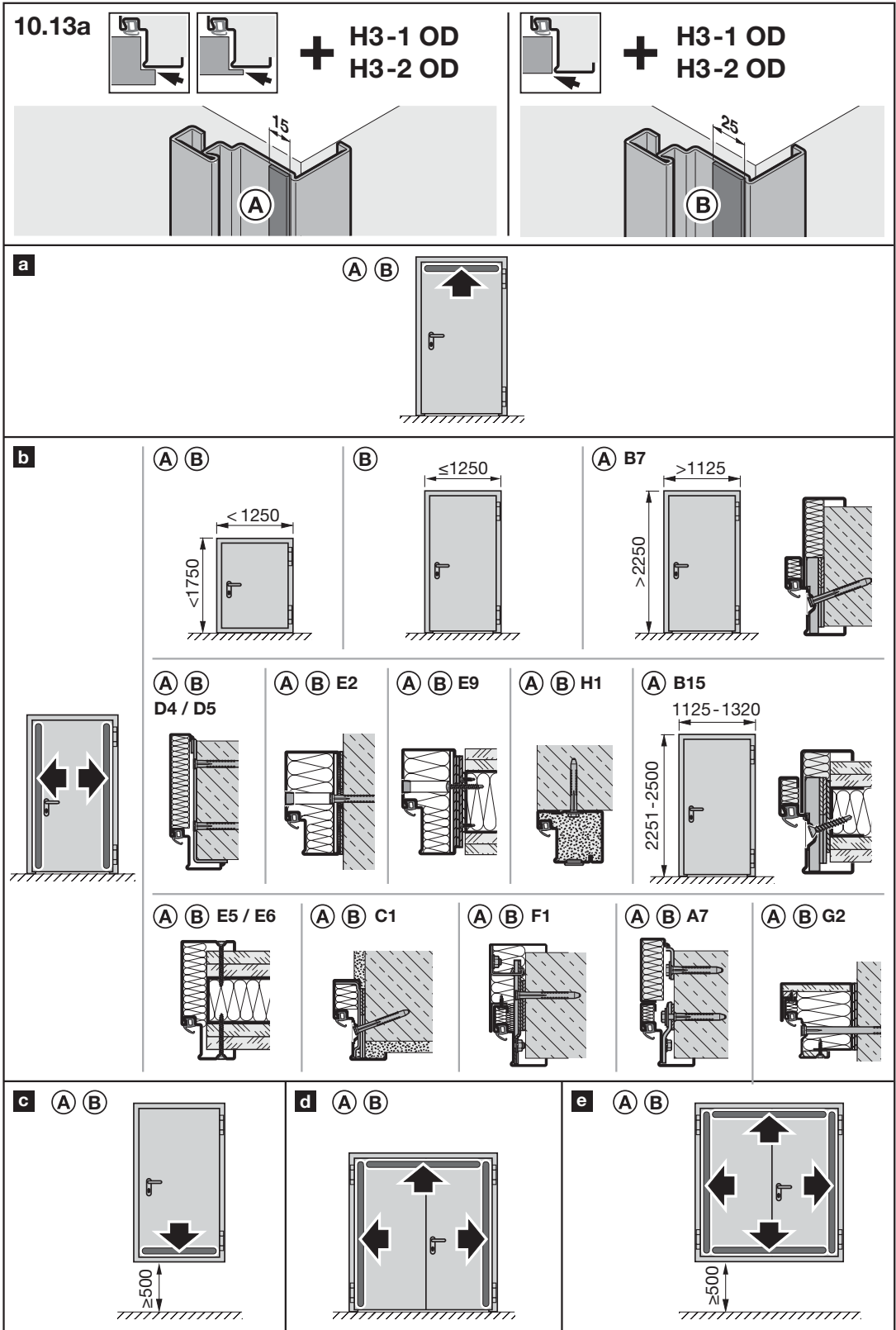


2

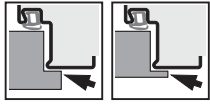


3

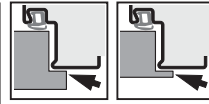




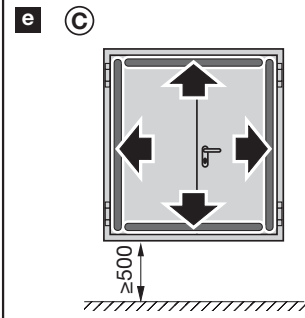
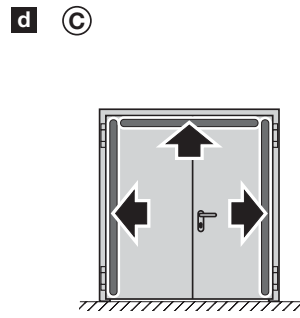
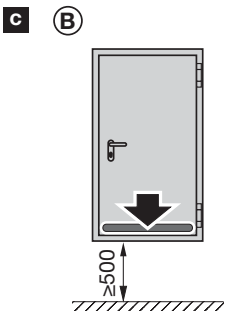
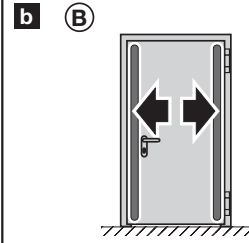
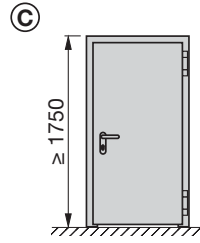
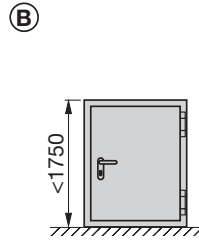
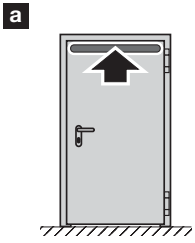
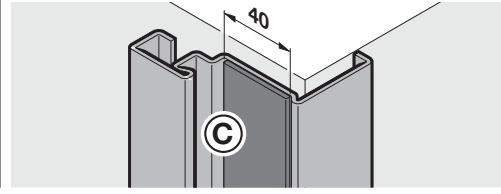
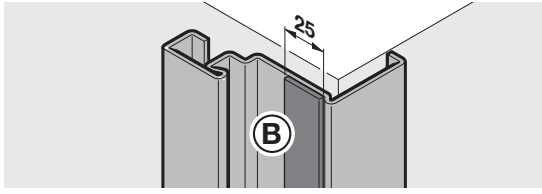
10.13b



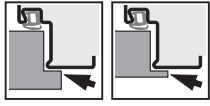
+ H16-1 OD



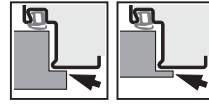
+ H16-1 OD  
+ H16-2 OD



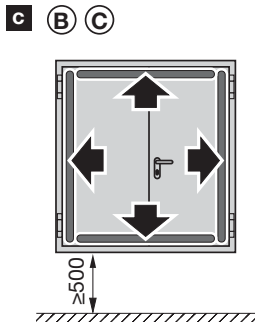
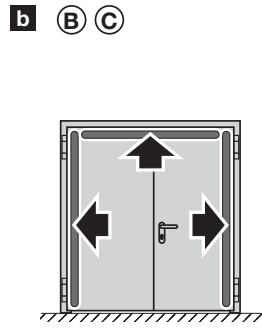
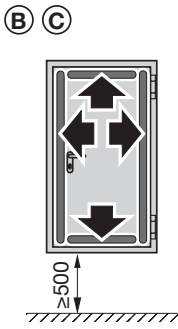
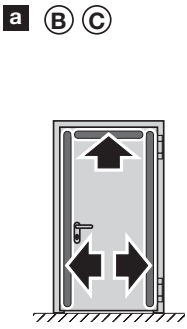
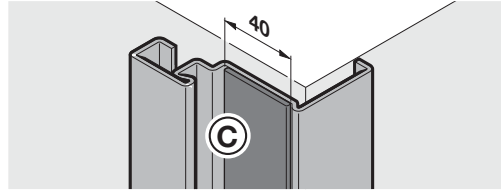
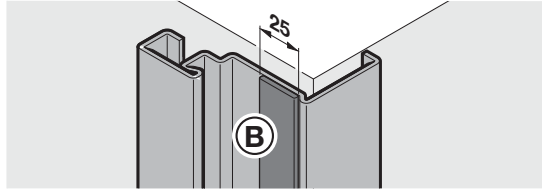
10.13c



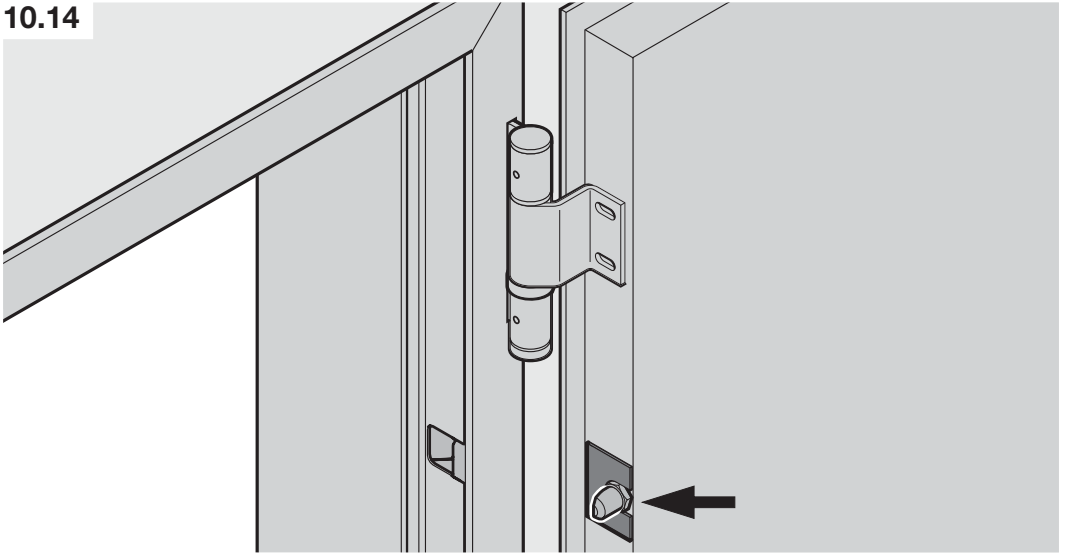
+ H3-1  
+ H3-2 G



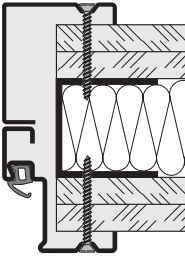
+ H16-1  
+ H16-2 G  
+ H16S-1



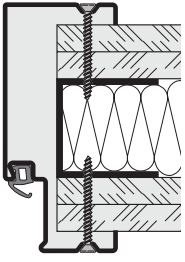
10.14



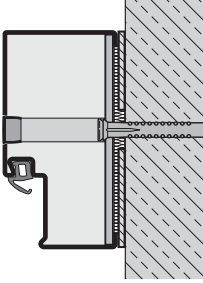
A10-A13



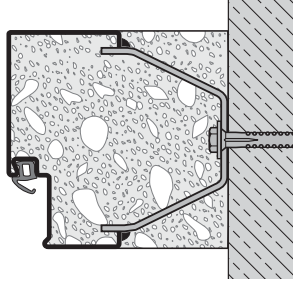
E5-E8



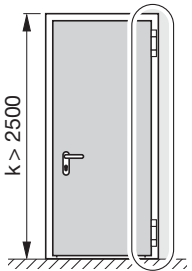
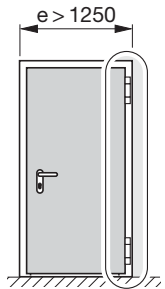
E1, E2



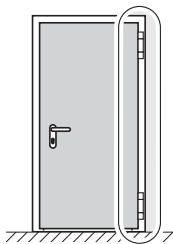
E3



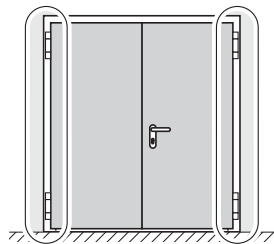
T30-1 / H\_30-1



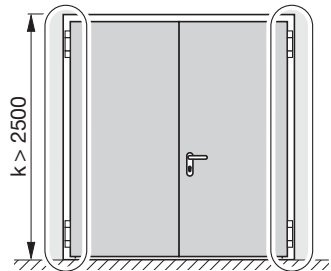
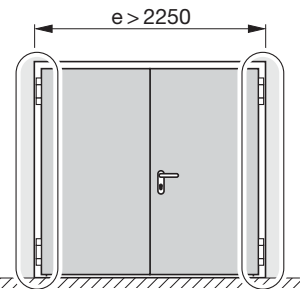
T90-1 / H\_90-1



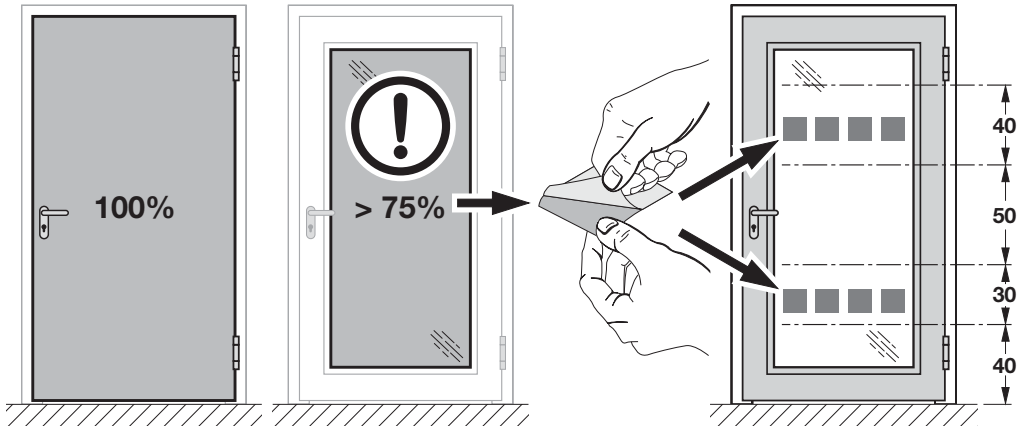
T30-2 RC3 / H\_30-2 RC3



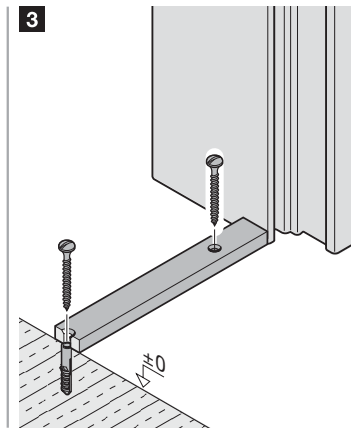
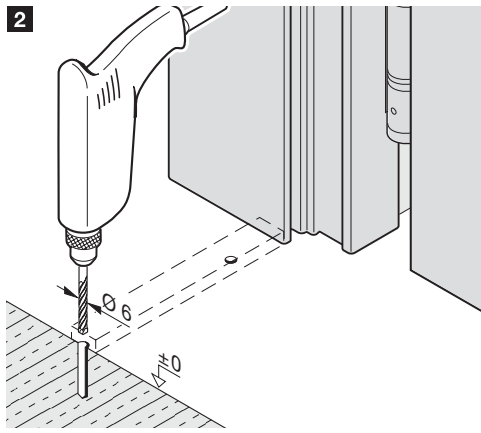
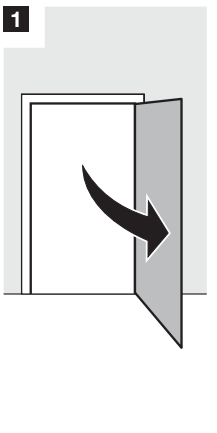
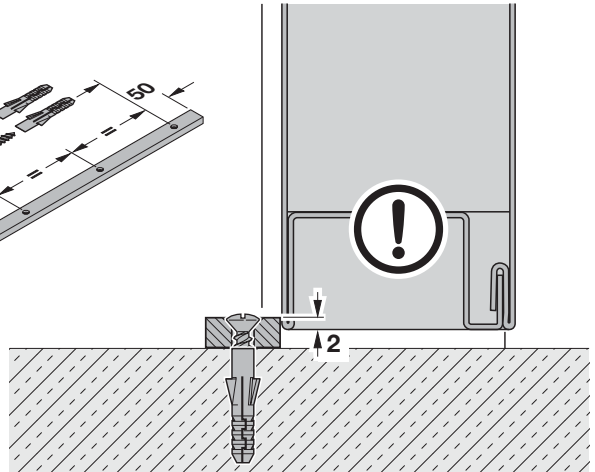
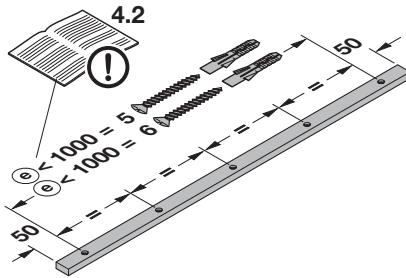
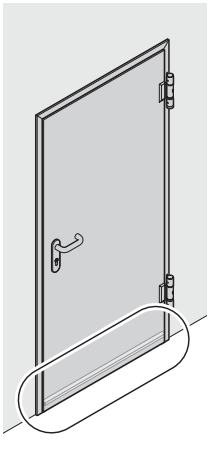
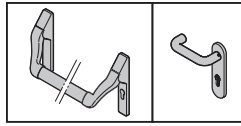
T90-2 / H\_90-2



10.15



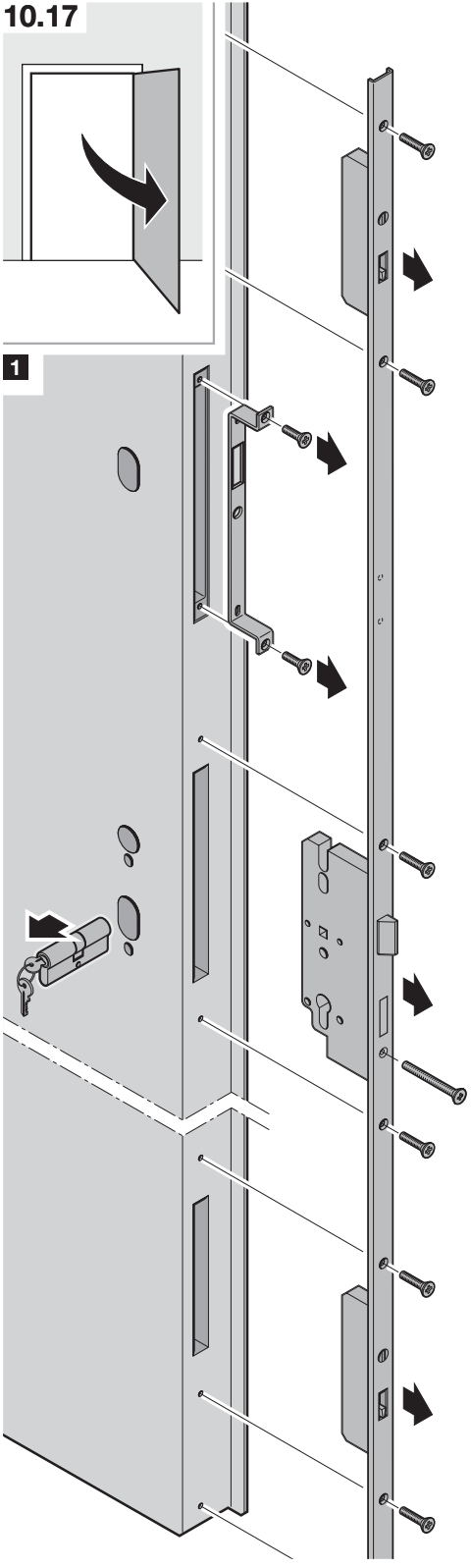
10.16



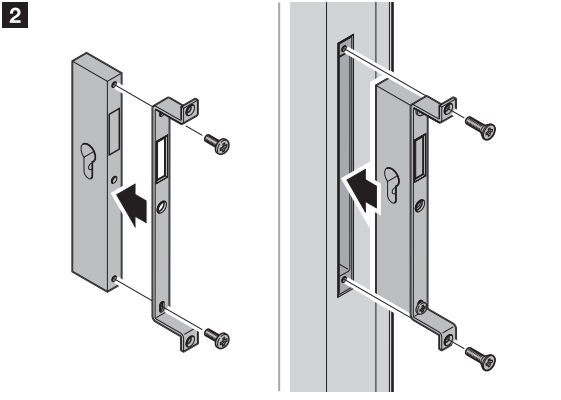


10.17

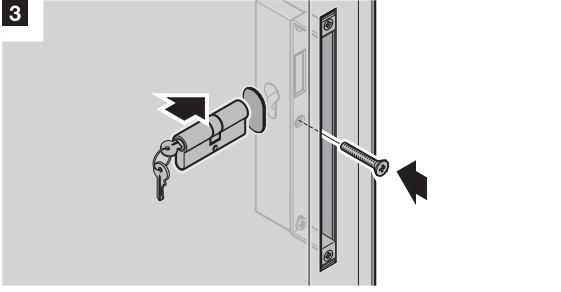
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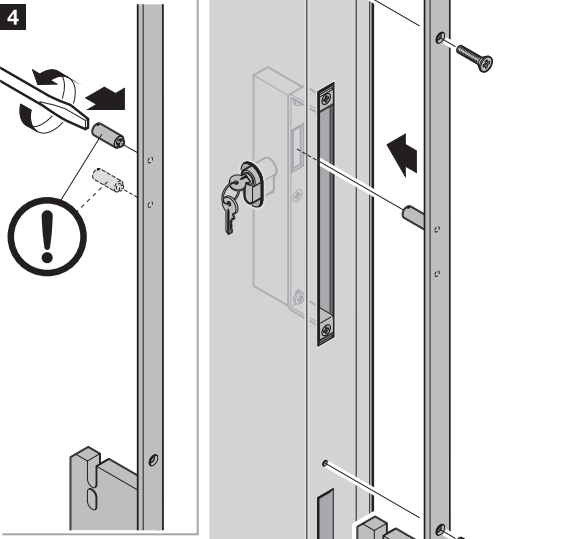
2



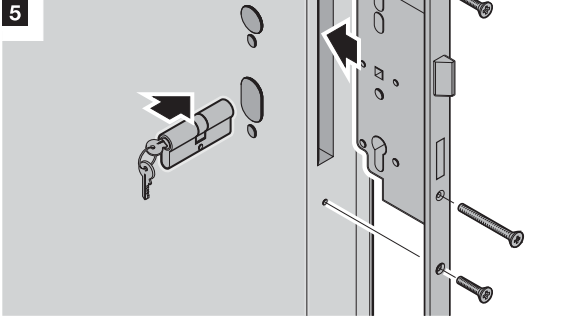
3



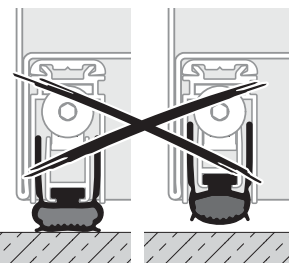
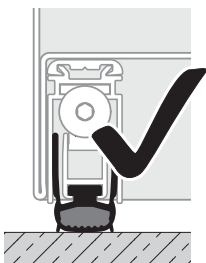
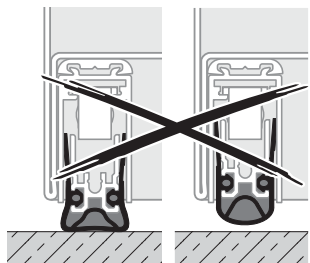
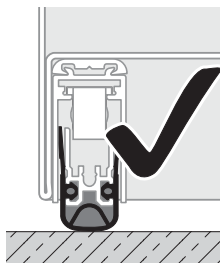
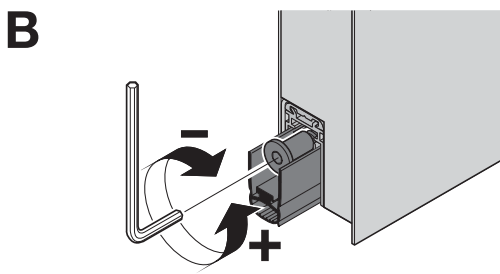
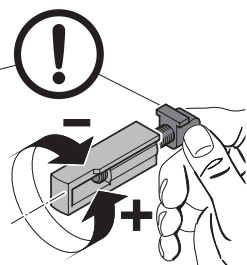
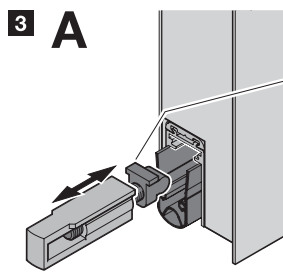
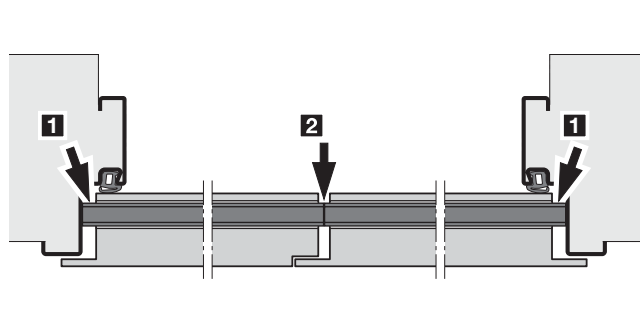
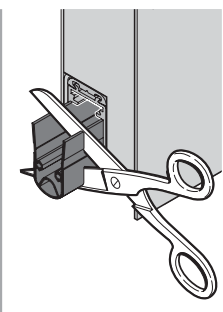
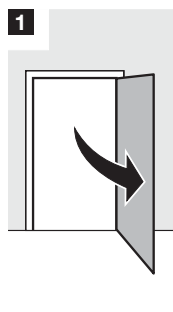
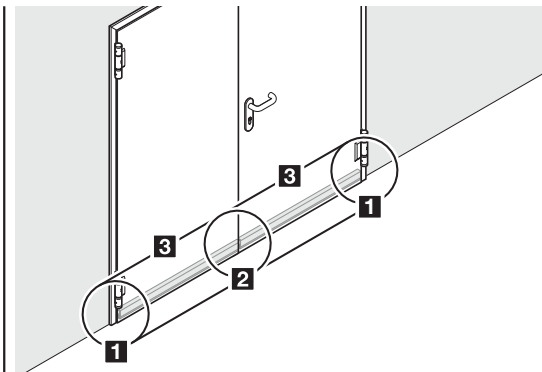
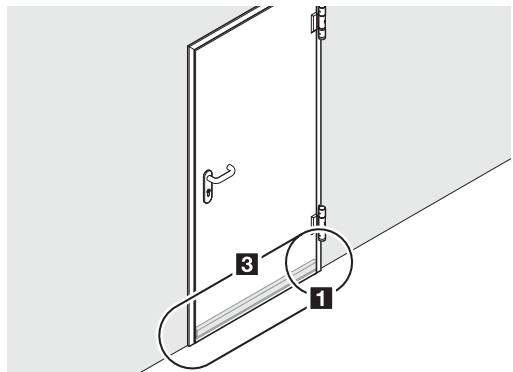
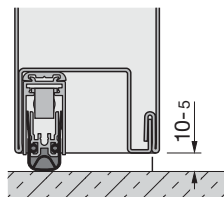
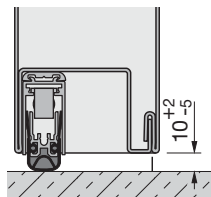
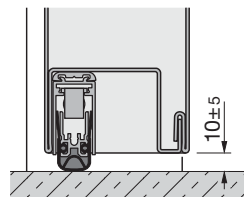
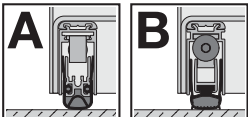
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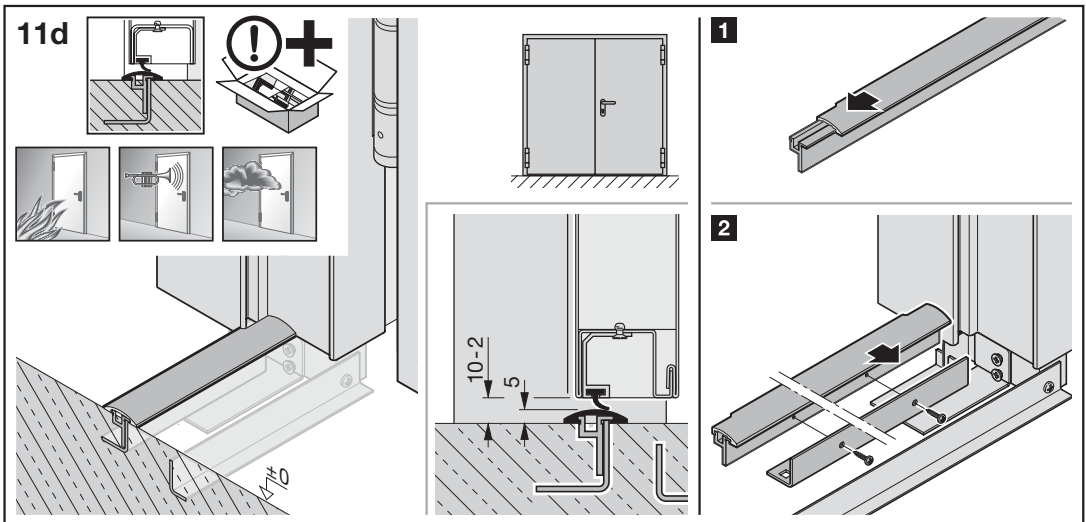
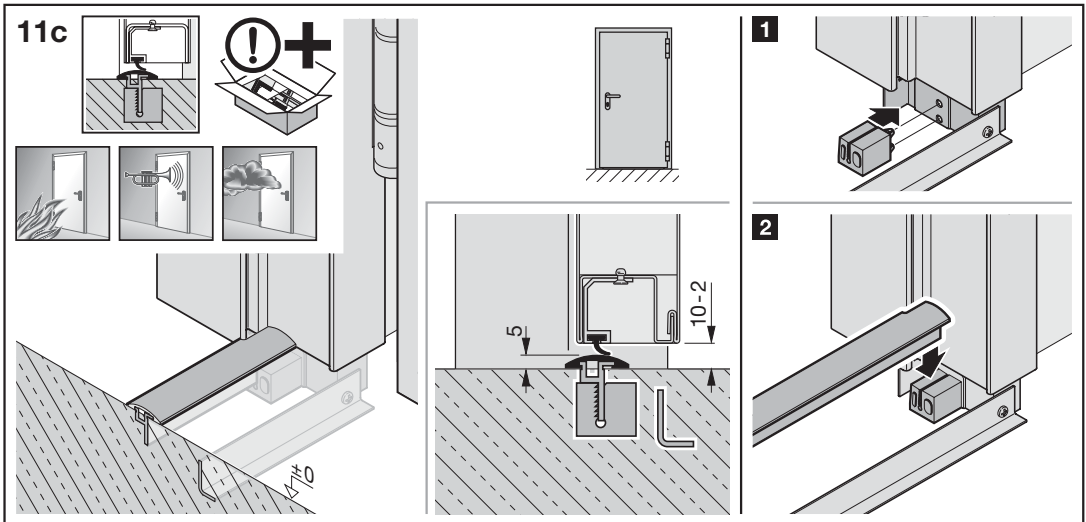
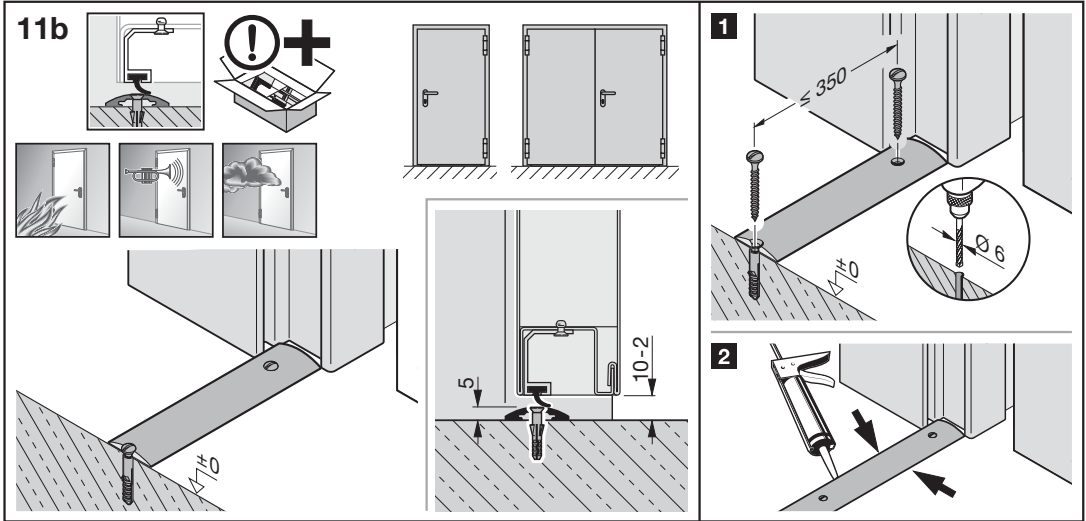


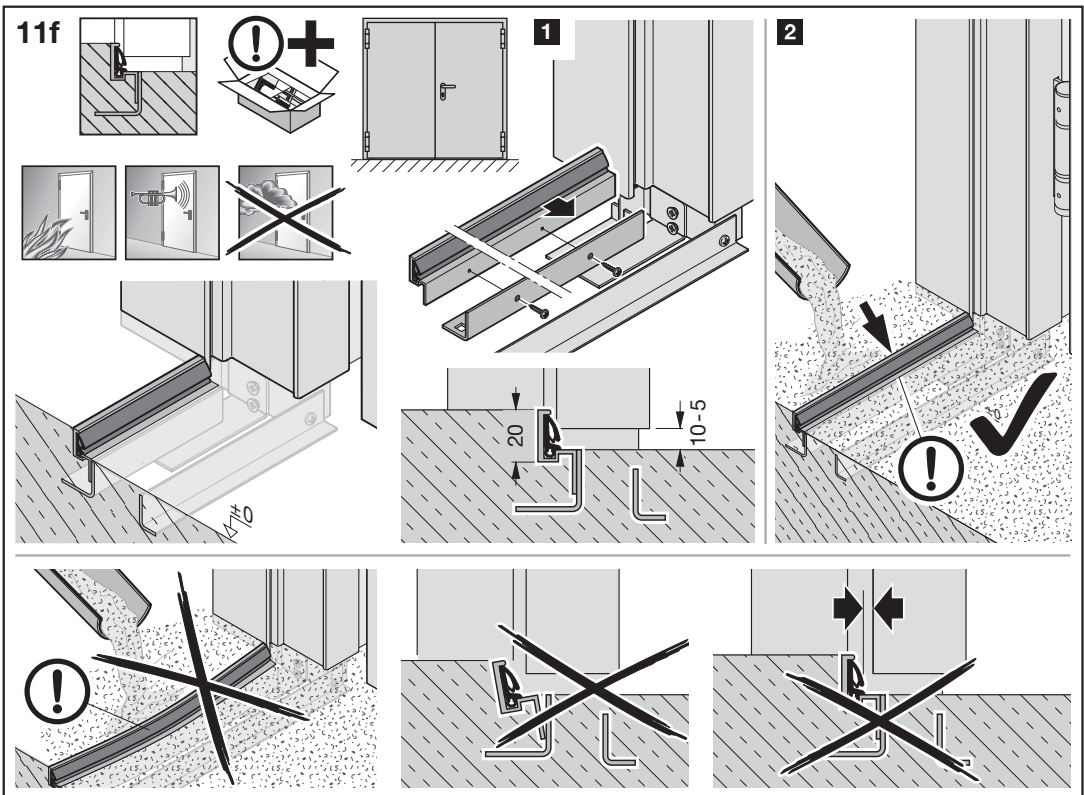
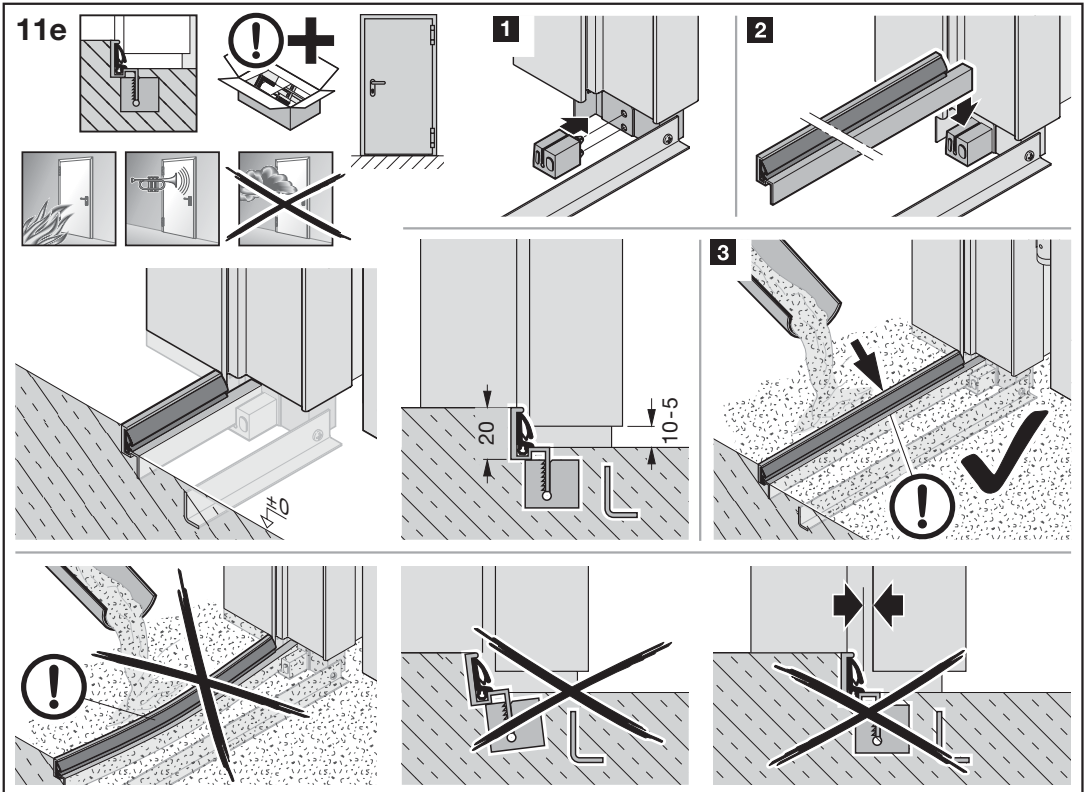
5



11a

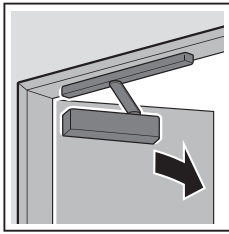




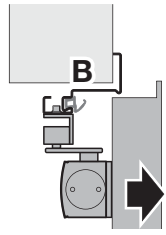
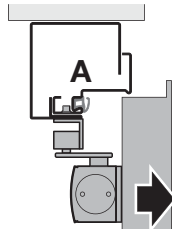




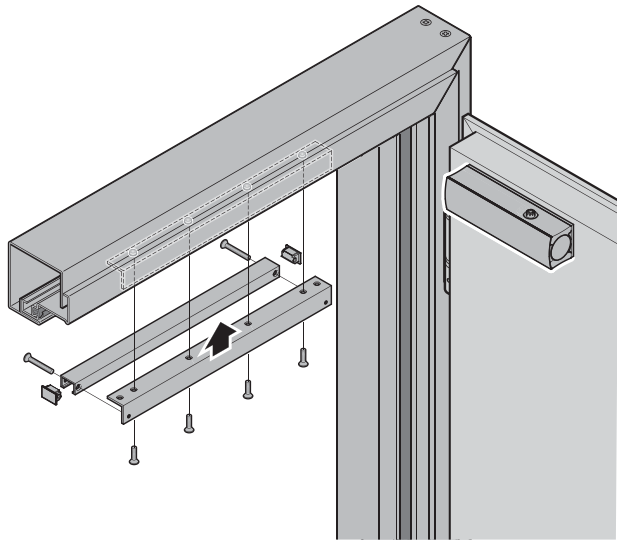
12a



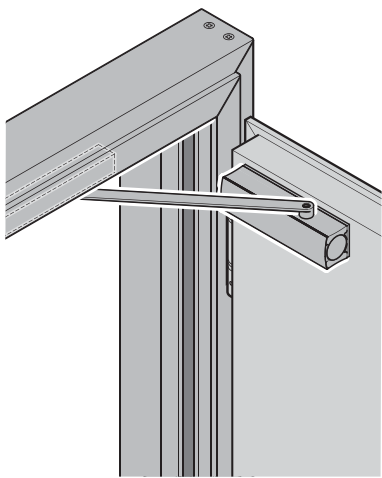
# HDC 35 BG



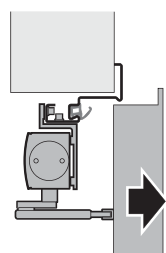
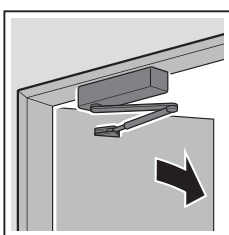
1



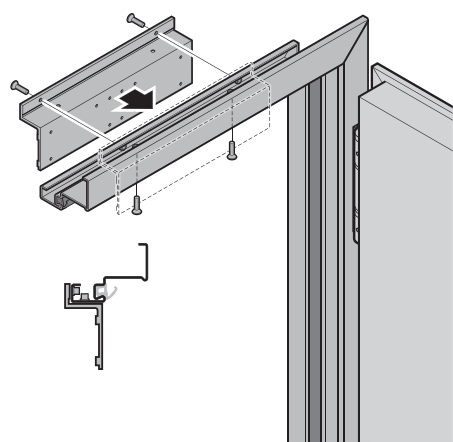
2



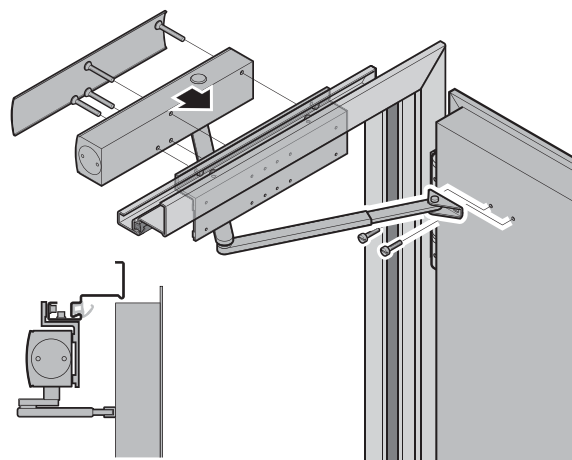
12b

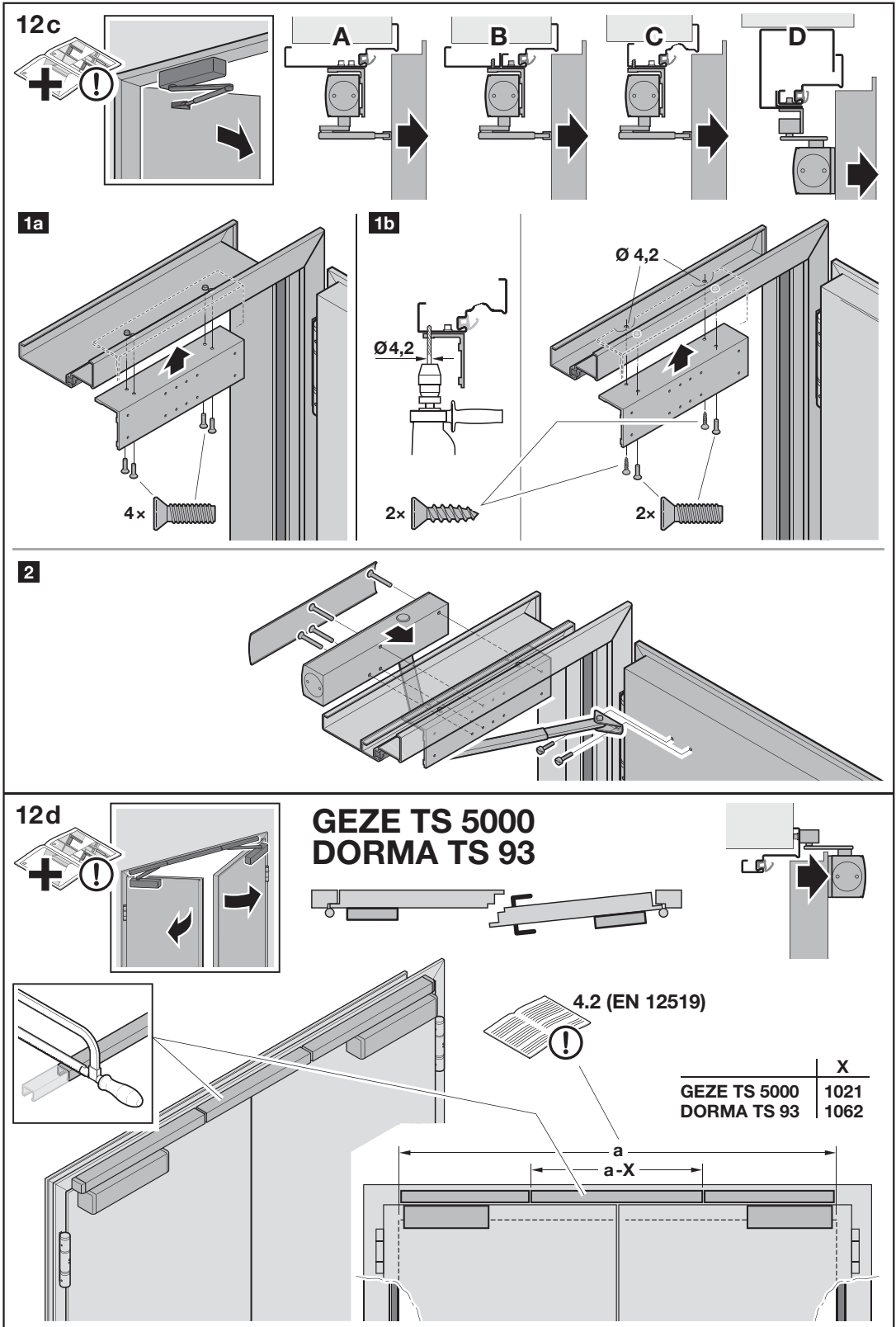


1

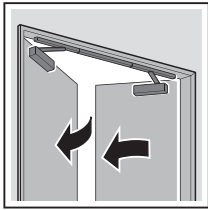


2

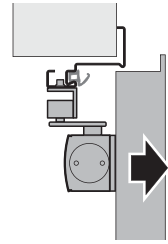
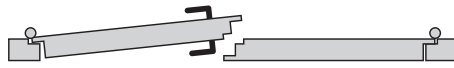




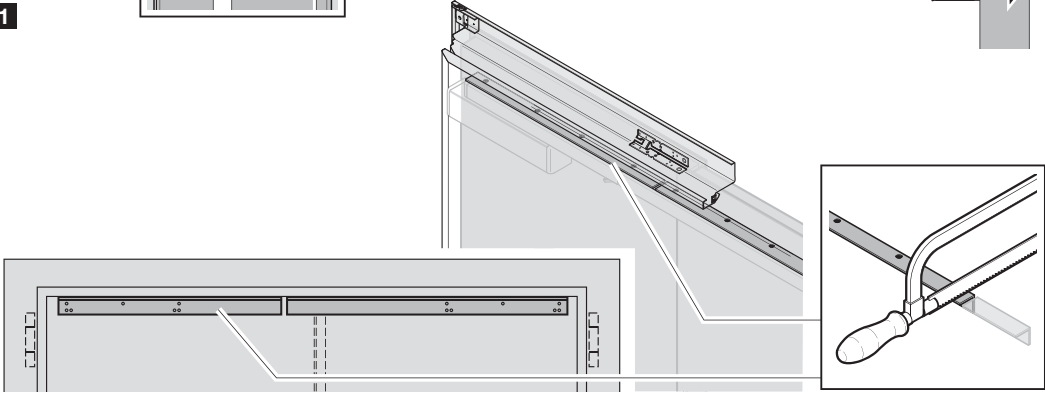
12e



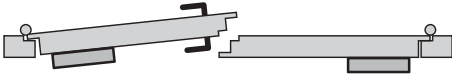
**GEZE TS 5000  
DORMA TS 93**



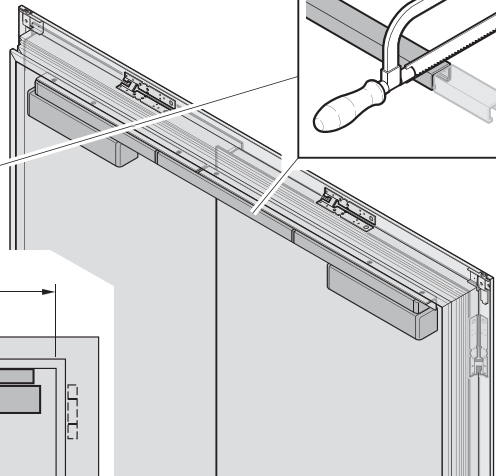
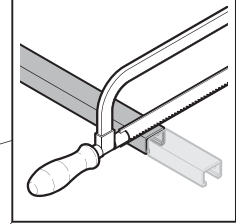
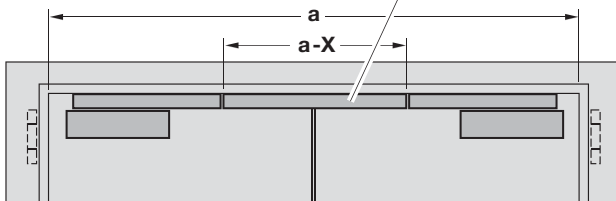
**1**



**2**

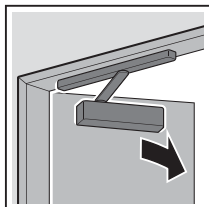


	X
GEZE TS 5000	1130
DORMA TS 93	1179

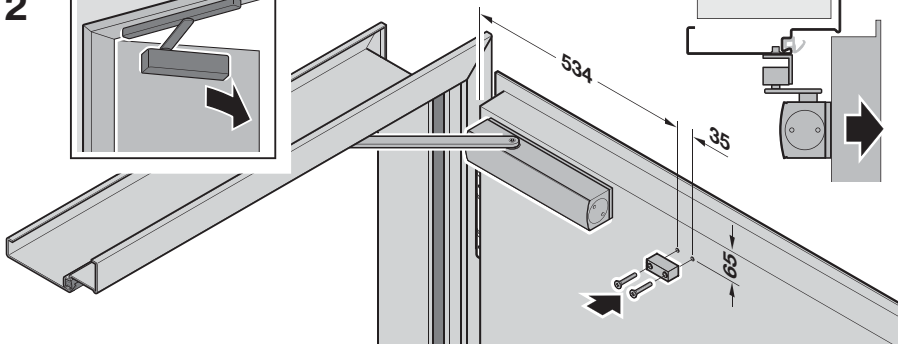


12f

**H16-2  
H3-2**

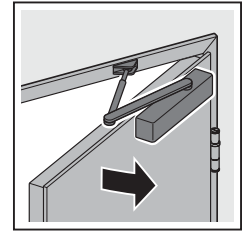
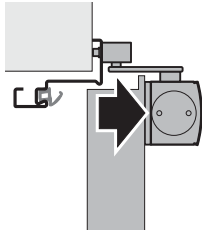
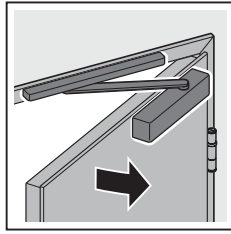


**TS 93 GSR BG**





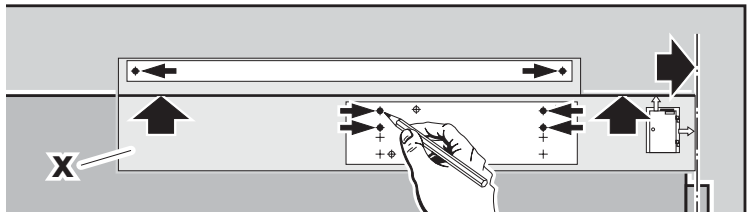
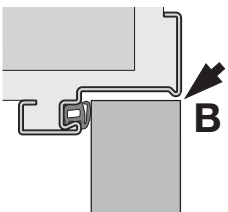
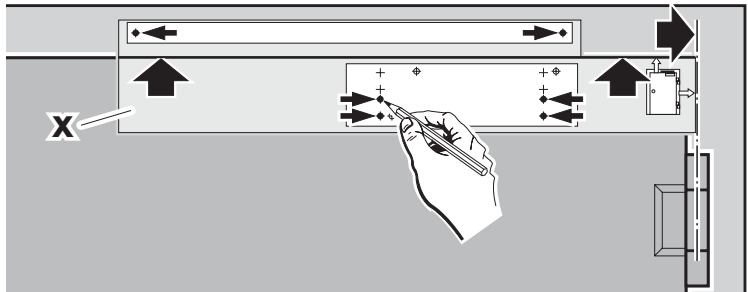
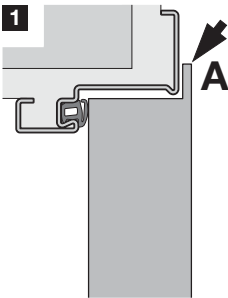
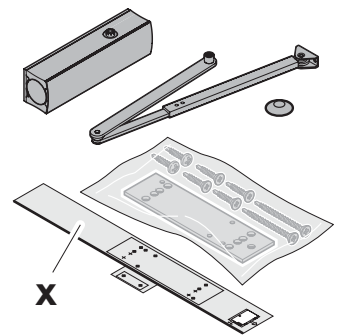
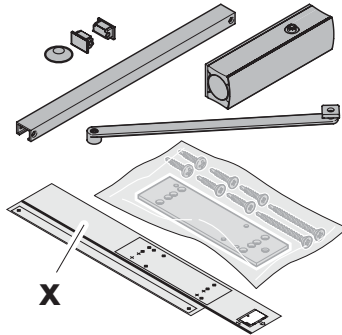
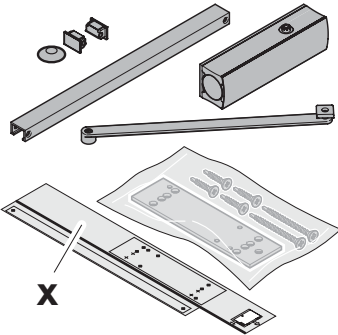
12g



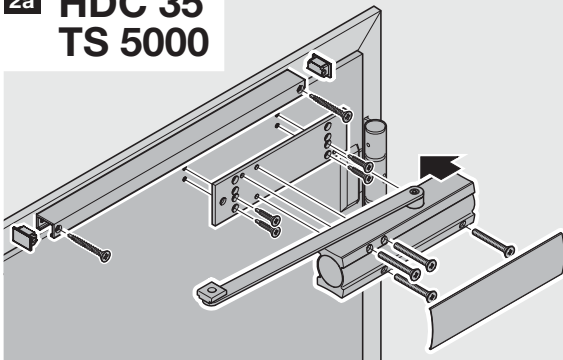
**HDC 35**

**TS 5000**

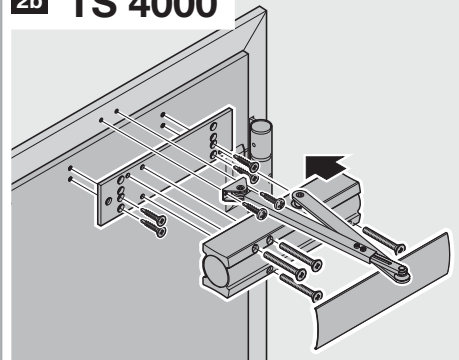
**TS 4000**



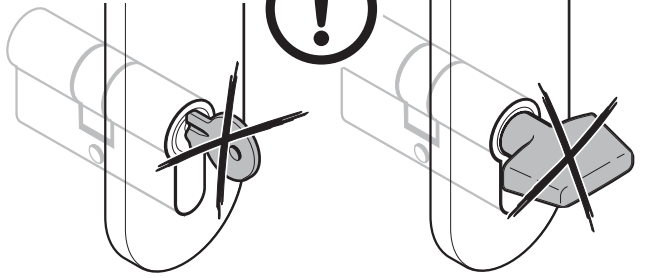
**2a HDC 35  
TS 5000**



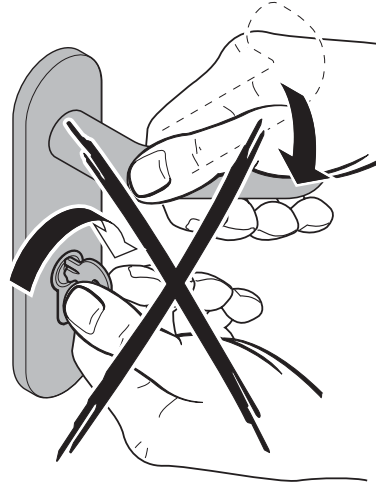
**2b TS 4000**



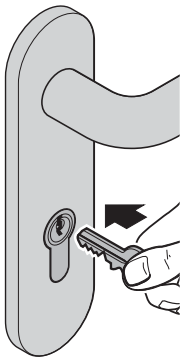
13.1a



13.1b



1



2

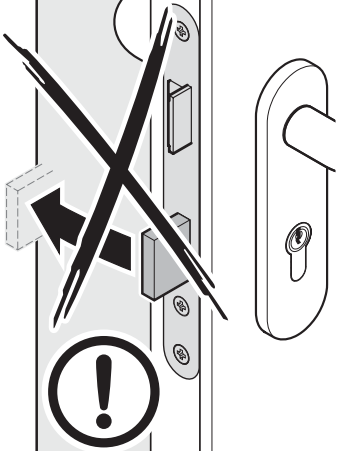


3

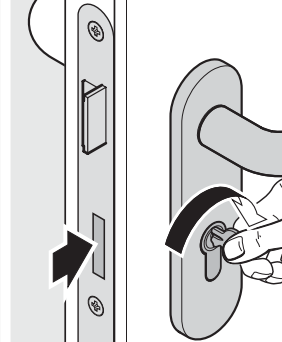


13.2

1



2



3

