



DE

Anleitung für Planung, Montage, Betrieb und Wartung

Ein- und zweiflügelige Stahltüren (OD-Türen, H3 G, H3VM, H16 G, HS75, H16 S1)

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1 Zu dieser Anleitung

Bitte lesen und beachten Sie diese Anleitung. Sie gibt Ihnen wichtige Informationen zu Einbau, Wartung und Pflege Ihrer Stahltür und ist ein wichtiges Dokument für die Bauakte. Sprechen Sie mit unserem Kundendienst, wenn Sie nach dem Durcharbeiten dieser Anleitung noch Fragen haben.

1.1 Verwendete Warnhinweise

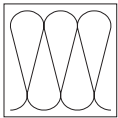
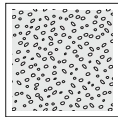
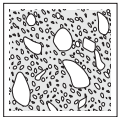
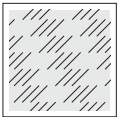
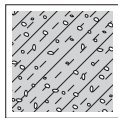
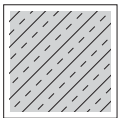
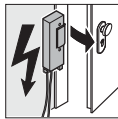
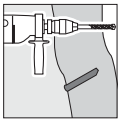


Das allgemeine Warnsymbol kennzeichnet eine Gefahr, die zu **Verletzungen** oder **zum Tod** führen kann. Im Textteil wird das allgemeine Warnsymbol in Verbindung mit den nachfolgend beschriebenen Warnstufen verwendet. Im Bildteil verweist eine zusätzlich Angabe auf die Erläuterungen im Textteil.

⚠ GEFAHR

Kennzeichnet eine Gefahr, die unmittelbar zum Tod oder zu schweren Verletzungen führt.

1.2 Verwendete Symbole



2 Sicherheitshinweise

GEFAHR

Lebensgefahr beim Einbau der Stahltür

Beim Einbau kann die Tür oder der Türrahmen umfallen und dabei Personen erschlagen.

- Sichern Sie Tür und Zarge vor und während der Montagearbeit gegen Umfallen.

- Setzen Sie nur qualifiziertes und unterwiesenes Personal für Montage und Wartung ein.
- Lassen Sie Elektroarbeiten nur von ausgebildeten Fachkräften durchführen.
- Führen Sie keine Veränderungen durch An- und Umbauten durch, die die Sicherheit beeinträchtigen können.
- Schließen Sie die Gefahr durch Feuer, Gas, Staub, Dampf, Rauch, Brand und Explosion bei Schweiß, Brenn- und Schleifarbeiten aus.
- Vermeiden Sie, dass bei Schweißarbeiten aufschäumende Baustoffe durch Wärmeeintrag reagieren und dadurch ihre Wirkung verlieren.

3 Informationen zu den Türeigenschaften

Beachten Sie, dass die Tür einzelne Eigenschaften, eine Kombination aus den Eigenschaften Feuerschutz, Rauchschutz, Schallschutz und Einbruchschutz erfüllen kann oder eine Funktionstür sein kann.

3.1 Feuerschutz- und Rauchschutztüren

- Die jeweilige Zulassung können Sie unter www.hoermann.de/dokumentation/zulassungsbescheide-fuer-feuerschutzabschluesse/ einsehen. Die Zulassung muss an der Verwendungsstelle vorliegen.
- Die angegebenen Informationen sind Mindestanforderungen für den Einbau in Deutschland. Bei Einbau in anderen Ländern gelten die jeweiligen nationalen Zulassungen, wobei die Materialkennwerte mindestens der DIN zugrunde gelegt werden müssen.
- Beachten Sie die DIN 18093 (Einbau von Feuerschutz-türen) und die DIN 18100 (Wandöffnungen für Türen) bzw. die länderspezifischen Vorschriften.
- Der Hersteller kann in Einzelfällen nach § 22 und § 23 der Musterbauordnung eine Übereinstimmungserklärung ausstellen.
- **Der Betreiber ist für den einwandfreien Zustand der Tür verantwortlich.**
- In Deutschland dürfen Federbänder an Türen und Klappen mit folgenden Eigenschaften **nicht** verwendet werden:
 - Flügelgewicht > 80 kg
 - Verglasung
 - Einbau in Montagewände (Ausnahme: Maße < 1000 × 1000 mm)
 - Kombination als Rauchschutztüren nach DIN 18095
 - 2-flügelig

Außerhalb Deutschlands können andere Vorschriften gelten, allerdings empfehlen wir die Einhaltung der deutschen Vorgaben.

- Verwenden Sie Beschläge, Schösser, Schließmittel und Elektroanbauteile nur, wenn sie Bestandteil der Türzulassung sind oder eine Freigabe des Herstellers vorliegt.
- Bauen Sie 3-seitig gefälzte Türen ohne unteren Schachtabschluss, in Schächten auf unterstem Bodenniveau ein.
- Gipskartonwände und Wanddicken: siehe Tab. 1:
- Zulässige Wände und Wanddicken: siehe Tab. 2:
- Hinterfüllen Sie die Zarge mit mineralischem Mörtel auf Zementbasis, z. B. LM21 von Sakret, wenn es in der Einbausituation nicht anders beschrieben wird. Bei T30/El30 muss der Zargenspiegel nicht zwingend mit Mörtel verfüllt werden. Spreizen Sie U-Zargen und Eckzargen (mit und ohne Gegenzargen) vor dem Hinterfüllen ab, damit sie sich durch den Druck des Mörtels nicht verbiegen.
- Verwenden Sie bei Feuerschutz einen Drücker mit Fallverdeck oder einen Schließzylinder und bei Rauchschutz einen Schließzylinder.
- **Rauchschutz:**
 - **RS 65 - 1:** AbP Nr. P - 14 - 001829 - PR01-ift
 - **RS 65 - 2:** AbP Nr. P - 14 - 001829 - PR02-ift
 - Verwenden Sie Bodendichtungen und Dichtungskeile (siehe Bildteil Punkt 3.5 und 4).
 - Wenn die Zarge nicht komplett mit Mörtel hinterfüllt ist, müssen Sie den Zargenanschluss an die angrenzenden Bauteile versiegeln. Versiegeln Sie beide Seiten und den Fußbereich lückenlos mit dauerelastischem Material.
- Setzen Sie Verglasungen von Feuerschutztüren keiner direkten Sonnenstrahlung aus.

Tab. 1: Zulässige F90A Montagewände mit Mindestwanddicken für Feuerschutz- und Rauchschutztüren, Höhe ≤ 5000 mm

Prüfzeugnis-Nr.	Wand	H3 OD H_30 OD	H3-1G H_30 D1	¹⁾ H3-2 VM H_30 D2
P-3310/563/07-MPA BS	Knauf W 112	≥ 100 mm	≥ 100 mm	≥ 100 mm
P-3391/170/08-MPA BS	Knauf W 131	≥ 116 mm	—	—
P-3310/563/07-MPA BS	Knauf W 132	≥ 100 mm	—	—
P-3202/2028-MPA BS	Knauf W 352 / W 353	≥ 100 mm	≥ 100 mm	≥ 100 mm
P-3956/1013-MPA BS	RiGips MW 12 RF, MW 12 RFI, MW 12 HA, MW 12 DH, MW 12 BF, MW 12 RFWF, MW 12 GX	≥ 100 mm	≥ 100 mm	≥ 100 mm
P-3014/1393-MPA BS	RiGips MW 11 DD	≥ 100 mm	≥ 100 mm	≥ 100 mm
P-3020/0109-MPA BS	RiGips BW 13 DDRF	≥ 165 mm	—	—
P-SAC-02/III-681	SW 11 – SW 14	≥ 100 mm	≥ 100 mm	≥ 100 mm
P-3391/0890-MPA BS	SW 18	—	—	—
P-2100/100/17-MPA BS	Promat 450.81	≥ 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: Zulässige Wände und Mindestwanddicken für Feuerschutz- und Rauchschutztüren (mm) siehe 4.2

Wand	Stahltür	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	H6-1 OD	H6-2 OD	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
Beton DIN 1045-1, Festigkeit ≥ C12/15		1) k ≤ 2500	2) k > 2500	1) k ≤ 2500	2) k > 2500						e ≤ 1320	
		100	140	100	140	140	140	140	140	120	140	140
Mauerwerk DIN 1053-1, Steinfestigkeit ≥ 12, Mörtelgruppe ≥ 2		1) k ≤ 2500	k > 2500	1) k ≤ 2500	2) k > 2500						e ≤ 1250 e ≤ 1500 k ≤ 2500 k ≤ 2500	
		115	175	115	175	115	175	115	175	175	115	175
Porenbeton-Block oder Plansteine, DIN 4165-3, Festigkeitsklasse ≥ 4, Porenbetonplatten nach allgemeiner bauaufsichtlicher Zulassung, Festigkeitsklasse ≥ 4.4		k ≤ 2500		k ≤ 2500							e ≤ 1320 e ≤ 2500 k ≤ 2500	
		150		150		175	175	175	240	175	115	175
Montagewand F90-A nach ABP Bild 1.12 beachten, max. Höhe 5000 mm		3)		3)								
Montagewand F90-A DIN 4102-4 / Tab. 10.2, Bild 1.12 beachten, max. Höhe 5000 mm		e ≤ 1320		e ≤ 2500							e ≤ 1320 e ≤ 2500 k ≤ 2500	
		100		100		100	125	100		125	100	150
Montagewand F30-A Bild 2D / 2.3 beachten, max. Höhe 5000 mm		e ≤ 1250		e ≤ 2500								
		100		100								
Montagewand F90-B DIN 4102-4 / Tab. 10.3, max. Höhe 5000 mm		e ≤ 1250 und k ≤ 2500		e ≤ 2500 und k ≤ 2500							e ≤ 1320 e ≤ 2500 k ≤ 2500	
		4) 125 / 9) 130		4) 125 / 9) 130								
Montagewand F30-B AbP Nr.: P – SAC-02 / III-668		e ≤ 1125 und k ≤ 2125										
		185										
Gips-Wandbauplatten VG Orth. P – SAC 02 / III-468, Bild 9/A17 beachten		e ≤ 1250 und k ≤ 2500										
		100										

1) ohne Oberteil 2) mit Oberteil 3) siehe Tab. 1: 4) zweischalige Zarge 5) Dryfix 6) Rauchschutz: keine Zulassung in Deutschland 7) Rauchschutz, e ≤ 1320

3.2 Schallschutztüren

- Die gesamte Schalldämmung ist von den umgebenden Bauteilen abhängig. Die resultierende Schalldämmung von Wand und Tür müssen Sie gesondert nachweisen, da sie nicht aus dem bewerteten Schalldämmmaß R_w bzw. R der Tür allein abgeleitet werden kann.
- Achten Sie auf vollständig anliegende Dichtung(en).
- Der Boden muss glatt sein, damit die vollständige Dichtfunktion der Bodendichtung gewährleistet ist.
- Trennen Sie den Estrich im Schwellenbereich.
- Verwenden Sie Dichtungskeile und Bodendichtung (siehe Bildteil Punkt 3.5 und 4).
- Verwenden Sie einen Schließzylinder.
- Hinterfüllen Sie die Zarge vollständig mit Mörtel.
- Verkleben Sie die auf Gehrung geschnittenen Ecken der Zargendichtung z. B. mit Köratan UC 41.

3.3 Einbruchschutztüren

- Die Tür erfüllt ihre Einbrucheigenschaften nur, wenn der Riegel komplett vorgeschlossen und der Schlüssel abgezogen ist.
- Sichern Sie die Türblätter an allen RC3 und RC4 Türen an den Bändern mit je zwei Schrauben (siehe Bildteil Punkt 3.3)
- Verwenden Sie bei RC3 nur Eckzargen, Eckzargen mit Gegenzargen, U-Zargen und Blockzargen, ausgenommen Einbausituation H1.
- Verwenden Sie bei RC4 nur Eckzargen, Eckzargen mit Gegenzargen und U-Zargen.
- Hinterfüllen Sie die Zarge bei RC2 mindestens im Bereich der Verriegelungspunkte, Bänder, Sicherungsbolzen und Falzluftbegrenzer dauerhaft druckfest. Druckfestigkeit ca. 10 N/mm².
- Hinterfüllen Sie die Zarge bei RC3 und RC4 Türen umlaufend druckfest. Druckfestigkeit ca. 10 N/mm².
- Stützen Sie die Zarge bei RC2 mindestens im Bereich der Verriegelungspunkte, Bänder, Sicherungsbolzen und Falzluftbegrenzer dauerhaft und bei RC3 umlaufend mit druckfestem Material der nachfolgenden Tabelle ab.

Material zur Zargenabstützung	RC2	RC3	Brand-schutz
Beton	ja	ja	ja
Mörtel (M10 nach DIN V 20000-412)	ja	ja	ja
Nadel- oder Laubholz (C oder D nach EN 338)	ja	ja	nein
Promaboard, Firma Promat	ja	nein	ja
Promatect H, Firma Promat	ja	ja	ja
ROKU V2, Firma Rolf Kuhn	ja	ja	ja
Stahlblech	ja	nein	ja

- Montieren Sie an Türen mit Gläsern den Glashalterahmen mit Sicherungsglaschen oder Sicherungswinkeln auf der Angriffsseite.
- Messen Sie bei 2-flügeligen Türen die unteren Spaltmaße von der Bodenbuchse.
- Verwenden Sie bei Antipaniktüren mit Drücker oder Stangengriff unseren L- Winkel mit Höckerschwelle, siehe 3.15.
- Stellen Sie sicher, dass sichtbare Zargen-Befestigungspunkte und Hinterfüllerstücke von der Angriffsseite aus nicht demontierbar sind (z. B. sichtbare Schraubenantriebe nach der Zargen-Montage unbrauchbar machen oder dauerhaft überdecken).

3.3.1 Mindestanforderungen an einbruchhemmende Türen

Widerstandsklasse nach DIN EN 1627	RC2	RC3	RC4
Mauerwerk DIN 1053, Teil 1 [mm] Steinfestigkeit ≥ 12	115	115	240
Stahlbeton, mind. C12/15 [mm]	100	120	140
Porenbetonsteine Klasse 4 [mm]	175, 115 ¹⁾	240	–
Porenbetonplatten Klasse 4 [mm]	150	–	–
Montagewand Knauf W118.de, WK2 [mm]	101	–	–
Holzständerwand nach DIN EN 1627	✓	–	–
Schließzylinder nach DIN 18252:2006-12 ²⁾ 3)	21-, 31-, 71-BZ		42-, 82-BZ
Schutzbeschlag nach DIN 18257:2022-02 ²⁾	ES1 (ZA)	ES2 (ZA)	ES3 (ZA)
Gläser EN 356 (Feuerschutz)	P5A ⁴⁾ P7B ⁵⁾	P5A ⁴⁾	–

1) nur 1-Flügl., wir empfehlen Wanddicken ab 150 mm

2) Schutzbeschlag oder Schließzylinder muss mit Ziehschutz (ZA) ausgeführt sein.

3) nicht zwingend im Lieferumfang enthalten

4) nicht in Flucht- und Rettungswegen

5) in Flucht- und Rettungswegen

3.4 Funktionstüren

Die Zargen müssen nicht zwingend hinterfüllt werden.

3.5 Außenanwendung

Beachten Sie die separate Anleitung Art.-Nr.: 5 04 855 beim Einbau im Außenbereich. Sie finden die Anleitung unter www.hoermann.de.

4 Montage

4.1 Vor der Montage

Klären Sie vor der Montage folgende Fragen:

- Welche Eigenschaften hat die Tür?
- Ist die Wandbauart zum Einbau der Tür geeignet?
- Ist die Höhenlage des Bodens bekannt (Meterriss?)
- In welche Richtung soll die Tür öffnen?
- Sind Bauvorschriften zu beachten?
- Muss die Wand im Bereich der Mauerschutzkästen ausgemauert werden?

4.2 Maße nach EN 12519

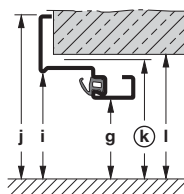
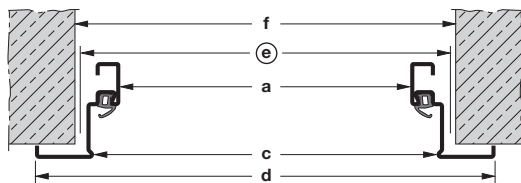


Abb. 1: Maße

$$a = e - 82 \quad g = k - 42$$

$$c = e - 36 \quad i = k - 19$$

$$d = e + 64 \quad j = k + 31$$

$$f = e + 20_0 \quad l = k + 15_0$$

a/g lichte Öffnungsweite/-höhe

c/i lichte Falzbreite/-höhe

- d/j Zargenaußenmaßbreite/-höhe
 e/k Baurichtmaßbreite/-höhe
 f/l lichte Rohbaumaßbreite/-höhe (DIN 18100)

4.3 Bei der Montage

- Beachten Sie die Einbauhinweise in den Zubehörpaketen.
- Verwenden Sie Montageteile, wenn sie mitgeliefert werden, z. B. Dübellaschen, Dübel oder Schrauben.
- Verwenden Sie im Punkt 2 die angegebenen Dübel.
- Verwenden Sie in Verbindung mit Eckzarge und Hochlochziegel bzw. Gipssteinen den Dübel FUR 10 × 80 / 100 mm und beachten Sie Punkt 2 der Einbauanleitung.
- Bohren Sie Hochlochziegel und Hohlkammersteine ohne Schlag.
- Beachten Sie den Mindestrandabstand von 50 mm bei horizontalen bzw. vertikalen Bohrungen und die Spreizrichtung der Dübel.
- Beachten Sie, dass bei Zargen ohne Bodeneinstand der untere Montagewinkel vor der Montage entfernt werden muss.
- Türblattkürzungen sind nicht möglich.

4.4 Hinweise zum Bildteil

siehe Punkt	Beschreibung
1a	Dünnfalz
1b	Dickfalz
1.2a / 1.2b	Anzahl der Befestigungspunkte
1.2c	Einbauablauf
1.3a	Ausbau der Standardtür
1.3b	Ausbau der Sicherheitstür
1.4	Zusammenbau der Eckzarge
1.5	Bodenmulde und Montagewinkel
1.6	Befestigungsteile
1.7	Minimaler Randabstand und Spreizrichtung Dübel
1.8	Einbau Schattennutprofile
1.9	Leerrohre in der Zarge
1.10	Einsetzbare E – Öffner
1.11	Mauerschutzkästen in GKF – Wände
1.12	Aufbau GKF-Wände
2.0	Einbausituationen und Zargenformen
3.1a	Einbau mit Standardbändern
3.1b	Einbau mit 3D-Bändern
3.2	Einstellen der Luftspalte
3.3	Einbau der Sicherheitstür
3.4	Entfernen der Bodenwinkel bei Zargen ohne Bodeneinstand
3.5	Dichtungskeile mit Silikon befestigen
3.6	Einbau der Zargendichtung
3.7	Anheben der Tür
3.8	Spannen des Federbandes Umbau Glasrahmen
3.9	Überprüfung Falleneingriff
3.10	Umbau des Lüftungsgitters
3.11	Umbau Glasrahmen
3.12	Dämmschichtbildner bei Feuer- und Rauchschutz
3.13	Dämmschichtbildner an Sicherungsbolzen
3.14	Kennzeichnung großer Glasflächen
3.15	Paniktüren und RC
3.16	Einbau Blockschloss bei Mehrfachverriegelung
3.17	Einbau Ankerplatte für Türhaftmagnet
4	Bodendichtungen
5	Türschließer
6	Bohrungen für Montage Sensoren Drehflügelantriebe

siehe Punkt	Beschreibung
7a	Schlüssel bei Paniktüren abziehen
7b	Fehlbedienung des Schlosses vermeiden

5 Wartung und Pflege

5.1 Jährliche Wartungsarbeiten

- Kontrollieren Sie Türblatt Zarge und alle Anbauteile wie z. B. Drücker, Schloss, Türschließer und Bänder auf Funktion und korrosive Schäden.
- Fetten Sie Falle, Bandbolzen und Lagerringe mit Mehrzweckfett.
- Schmieren Sie Bolzenschlösser mit Teflonspray.
- Kontrollieren Sie die Spaltmaße.
- Achten Sie auf die Sichtbarkeit der Kennzeichnung.
- Tauschen Sie defekte Teile aus und verwenden Sie nur Original Ersatzteile des Herstellers.



GEFAHR

Lebensgefahr durch abgelöste Dämmschichtbildner

Durch abgelöste Dämmschichtbildner verliert der Feuerschutzabschluss seine Funktion.

- Ersetzen Sie abgelöste Dämmschichtbildner, siehe Bildteil Punkt 3.12.

Wenn Sie Mängel feststellen, die Sie nicht selbst beheben können, beauftragen Sie eine Fachfirma.

5.2 Inbetriebnahme und Wartung von Panikverschlüssen

www.hoermann.de/dokumentation/zulassungsbescheide-fuer-feuerschutzabschluesse/

(siehe Punkt 10)

5.3 Erforderliche Oberflächenbehandlung für Elemente mit Standardgrundierung

Die Oberfläche von Türblatt und Zarge besteht aus einer Pulvergrundbeschichtung auf Epoxidharz Polyester Basis.

1. Entfernen Sie die Dichtung(en).
2. Schleifen Sie, bis auf die Dämmschichtbildner alle zu lackierenden Oberflächen an.
3. Reinigen Sie die Oberflächen gründlich.
4. Kleben Sie das Kennzeichnungsschild ab.
5. Verwenden Sie für die Grund- und Endbeschichtung Lacke, die geeignet und vom Lackhersteller für pulverlackierte Untergründe freigegeben sind. Beachten Sie das BFS Merkblatt Nr. 24 sowie die Verarbeitungshinweise der Lackhersteller und fertigen Sie eine Haftprobe an. Nehmen Sie die Endbehandlung innerhalb von drei Monaten nach Montage vor, um Korrosionsschäden zu vermeiden. Witterungseinflüsse wie z. B. Sonneneinstrahlung können zu vorübergehender Verformung des Türblattes führen. Dunkle Anstriche verstärken diesen Effekt, der keinen Grund zur Beanstandung darstellt. Wir empfehlen helle und / oder reflektierende Anstriche.
6. Bringen Sie die Dichtung(en) nach dem Trocknen der Farbe wieder an.

5.4 Reinigung

- Reinigen Sie die Oberflächen mit klarem Wasser oder handelsüblichem Lackreiniger.

5.5 Pflege von Edelstahlbauteilen

- Reinigen und pflegen Sie regelmäßig Bauteile aus Edelstahl mit der bei Hörmann erhältlichen Edel Glanz Edelstahlpflege und tragen Sie diese mit einem weichen Tuch auf.

6 Etikettierung und Kennzeichnung

Das Etikett der **Türtypen D65-1, D65-2, D65-1 OD, D65-2 OD** ist auf Grundlage der Verordnung (EU) Nr. 305/2011 mit dem CE-Konformitätskennzeichen versehen. Die herangezogene und angewandte harmonisierte europäische Produktnorm ist EN 14351-1:2006 + A1:2010 „Fenster und Türen – Produktnorm, Leistungseigenschaften – Teil 1: Fenster und Außentüren ohne Eigenschaften bezüglich Feuerschutz und/oder Rauchdichtheit.“ Die Nummer der zugehörigen CE-Kennzeichnung bzw. Leistungserklärung ist im Falzbereich der Tür auf dem oben genannten Etikett zwischen dem Herstellerlogo und dem CE-Konformitätskennzeichen angegeben.

Türen, auf deren Etikett kein CE-Konformitätskennzeichen abgebildet ist, fallen nicht in den Anwendungsbereich der oben genannten harmonisierten europäischen Produktnorm und dürfen daher nicht über eine CE-Kennzeichnung bzw. Leistungserklärung verfügen.

7 Allgemeines

Die Inbetriebnahme der Tür ist so lange untersagt, bis festgestellt wurde, dass sie nach unseren Vorgaben montiert und auf ihre ordnungsgemäße Funktion überprüft wurde. Bei einer Veränderung des Produkts verliert die Leistungserklärung ihre Gültigkeit.

8 Demontage und Entsorgung

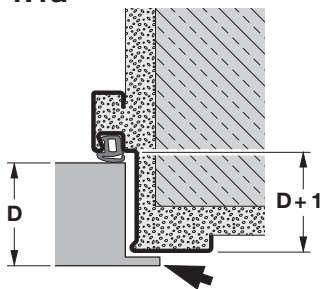
Die Demontage erfolgt analog der Montage in umgekehrter Reihenfolge. Entsorgen Sie das Bauelement nach den örtlichen Vorgaben.

9 Leistungserklärung

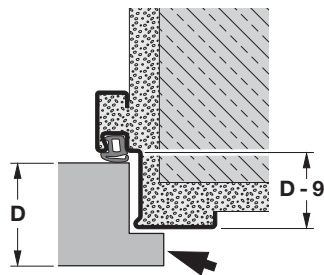
Leistungserklärung siehe Bild 1.3: www.hoermann.com/dop

1

1.1a

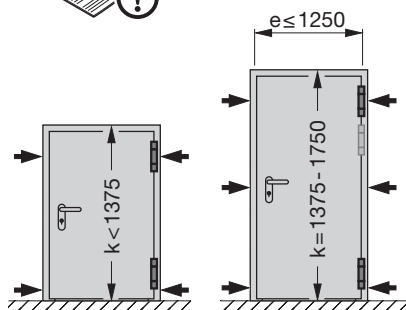


1.1b

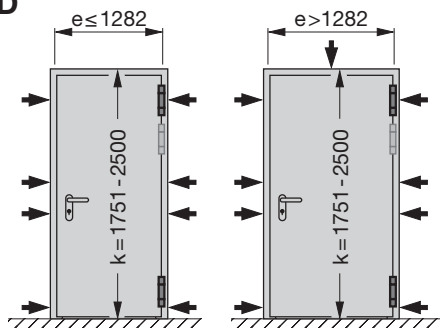


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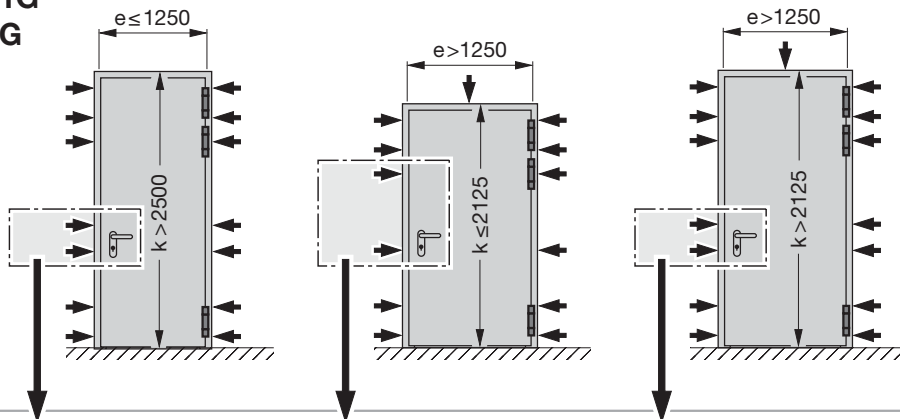
4.2/4.3



**H16-S1
H16-1 OD
HS75**



**H16-1G
H3-1G**

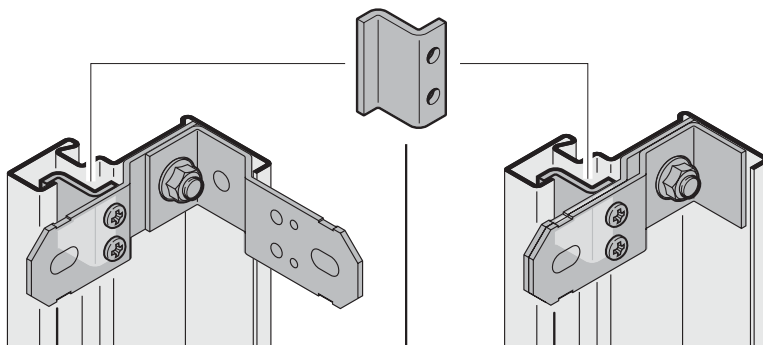


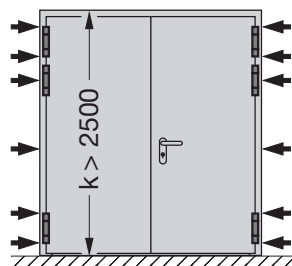
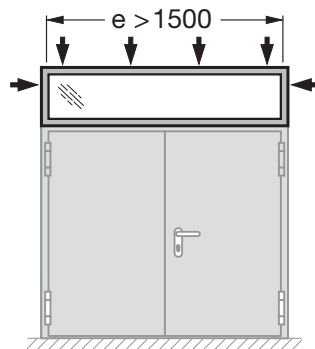
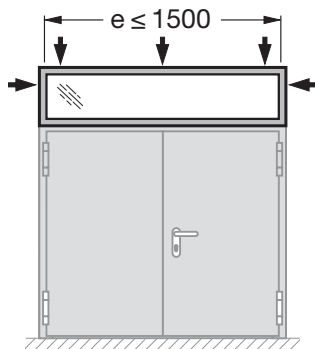
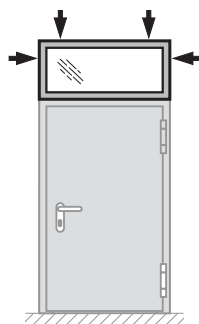
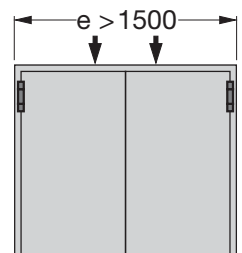
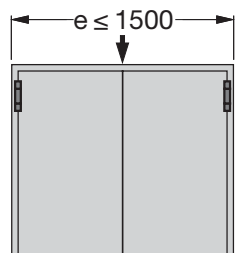
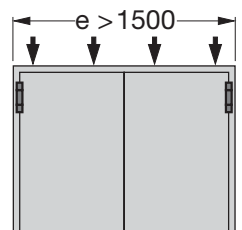
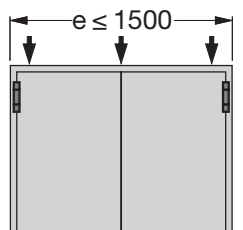
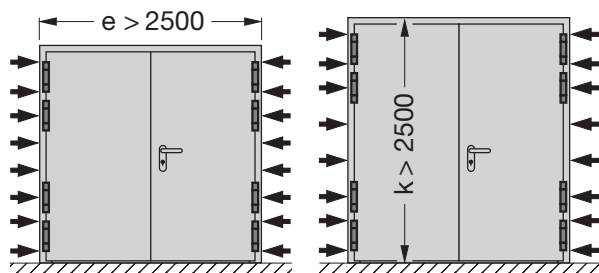
T90-1 / EI₂ 90-1



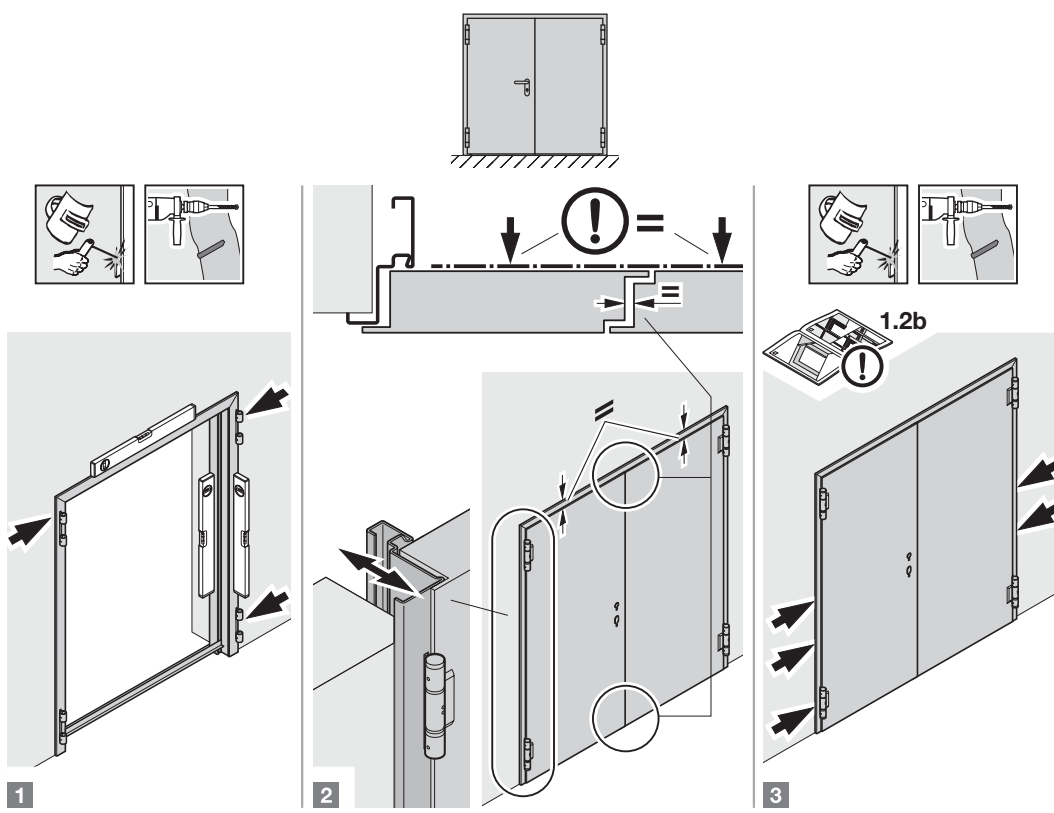
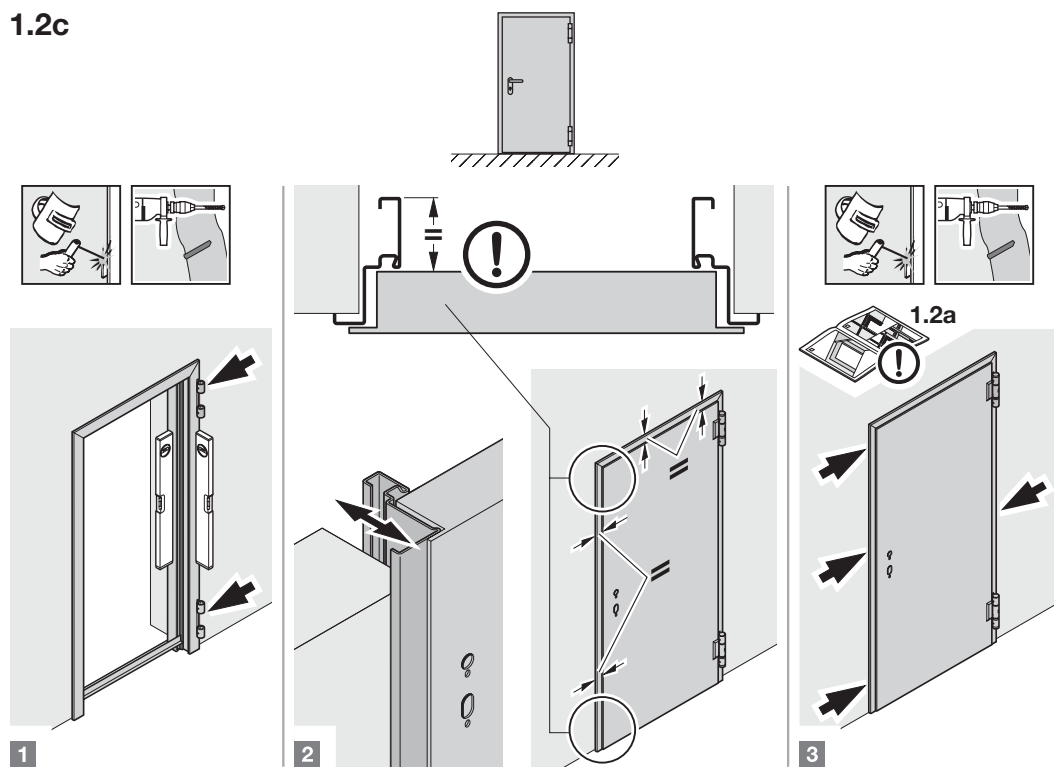
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1.6b

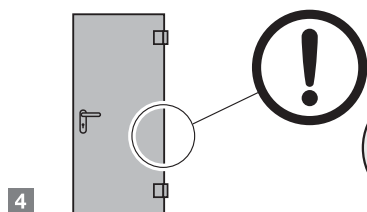
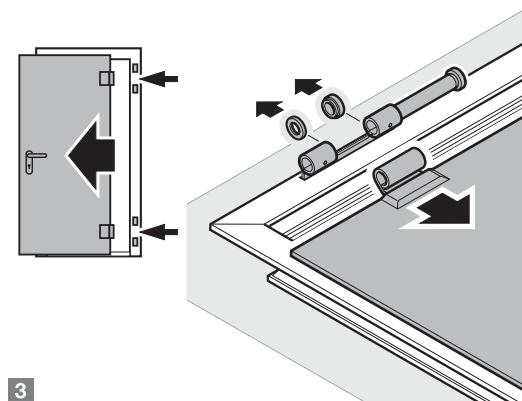
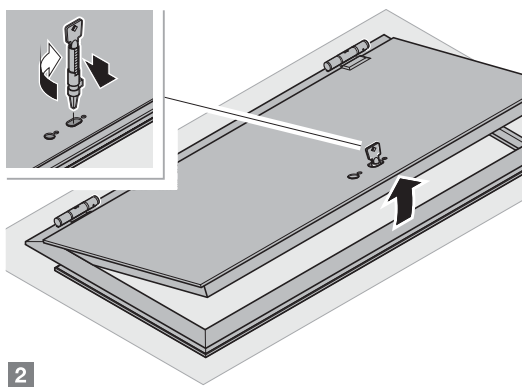
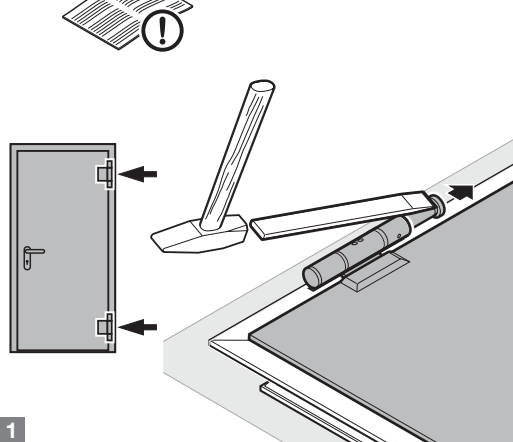


**H3-2 VM****H16-2 G
H_90 F2**

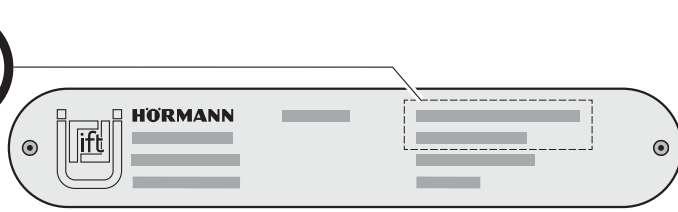
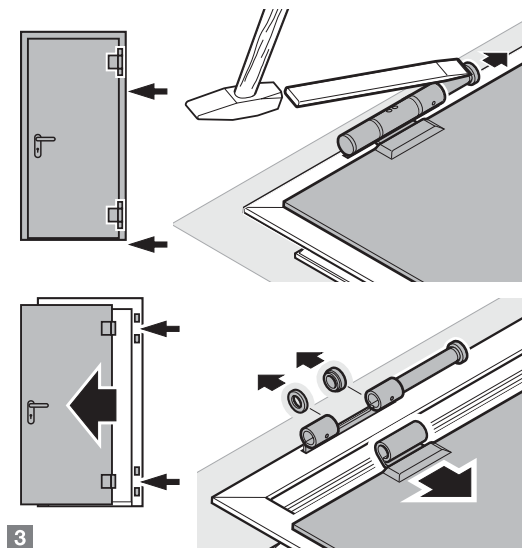
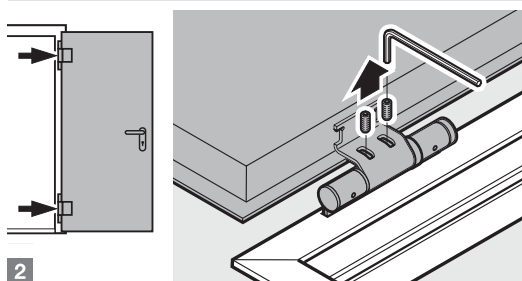
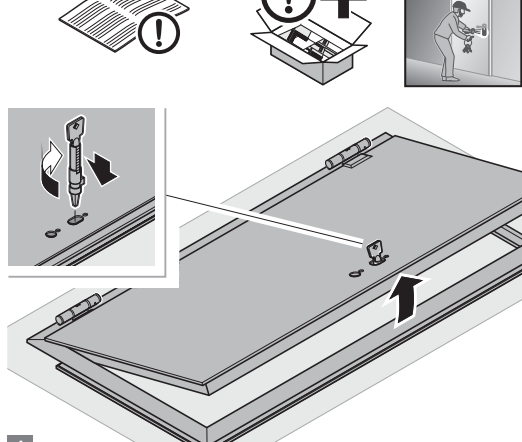
1.2c



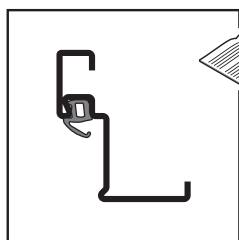
1.3a 4.3



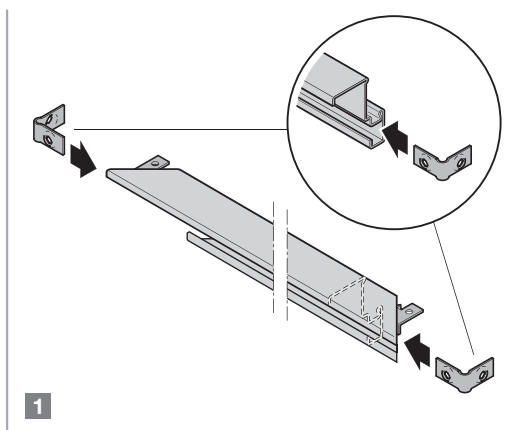
1.3b 4.3



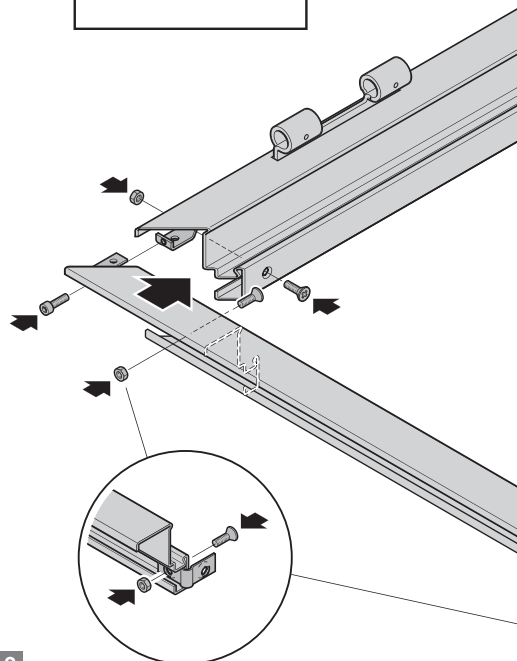
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4.3

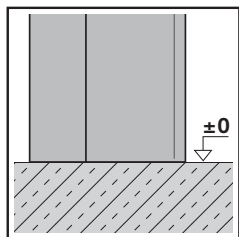


1



2

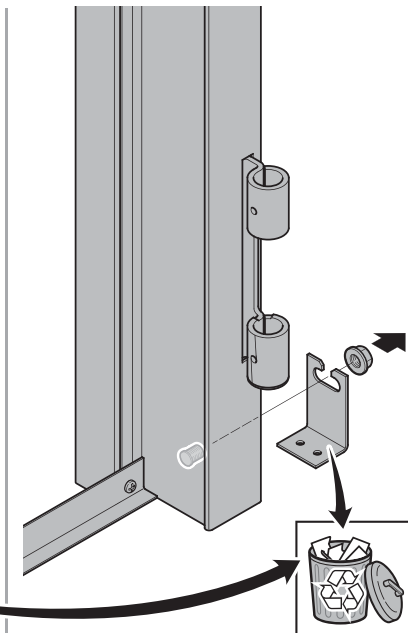
1.5a



4.3



±0

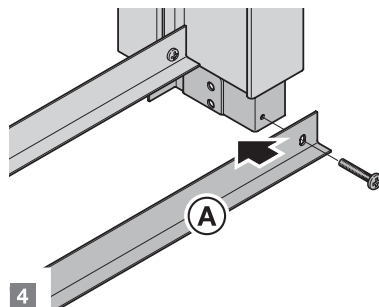
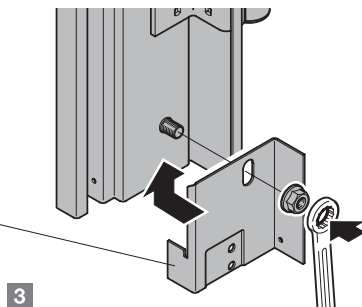
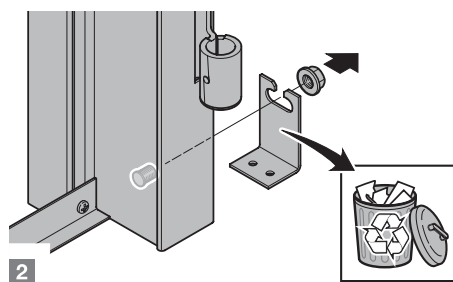
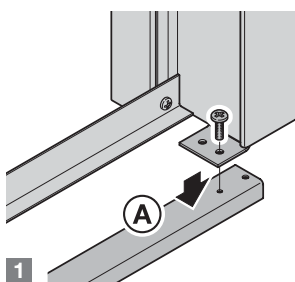
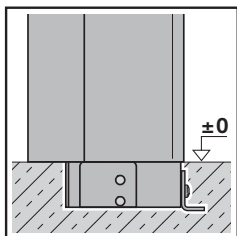


2

1

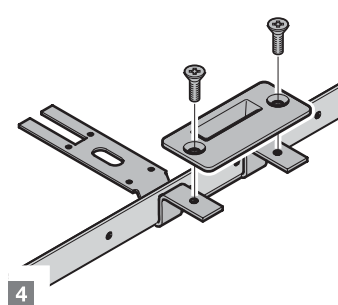
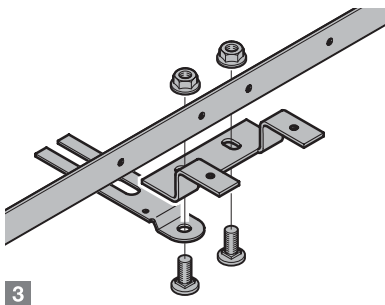
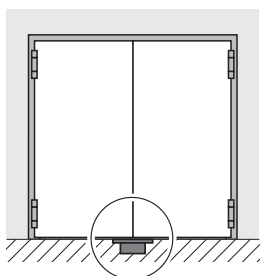
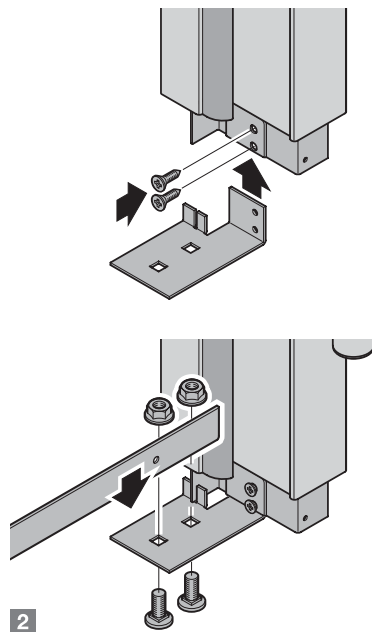
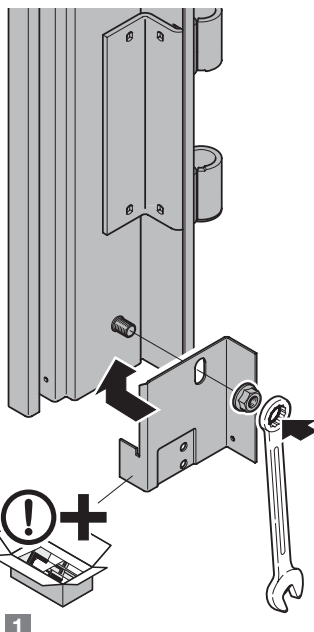
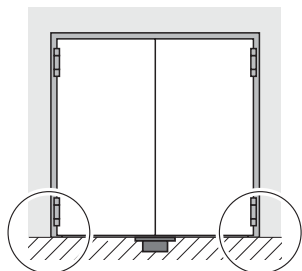
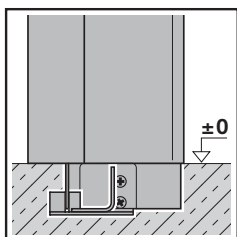
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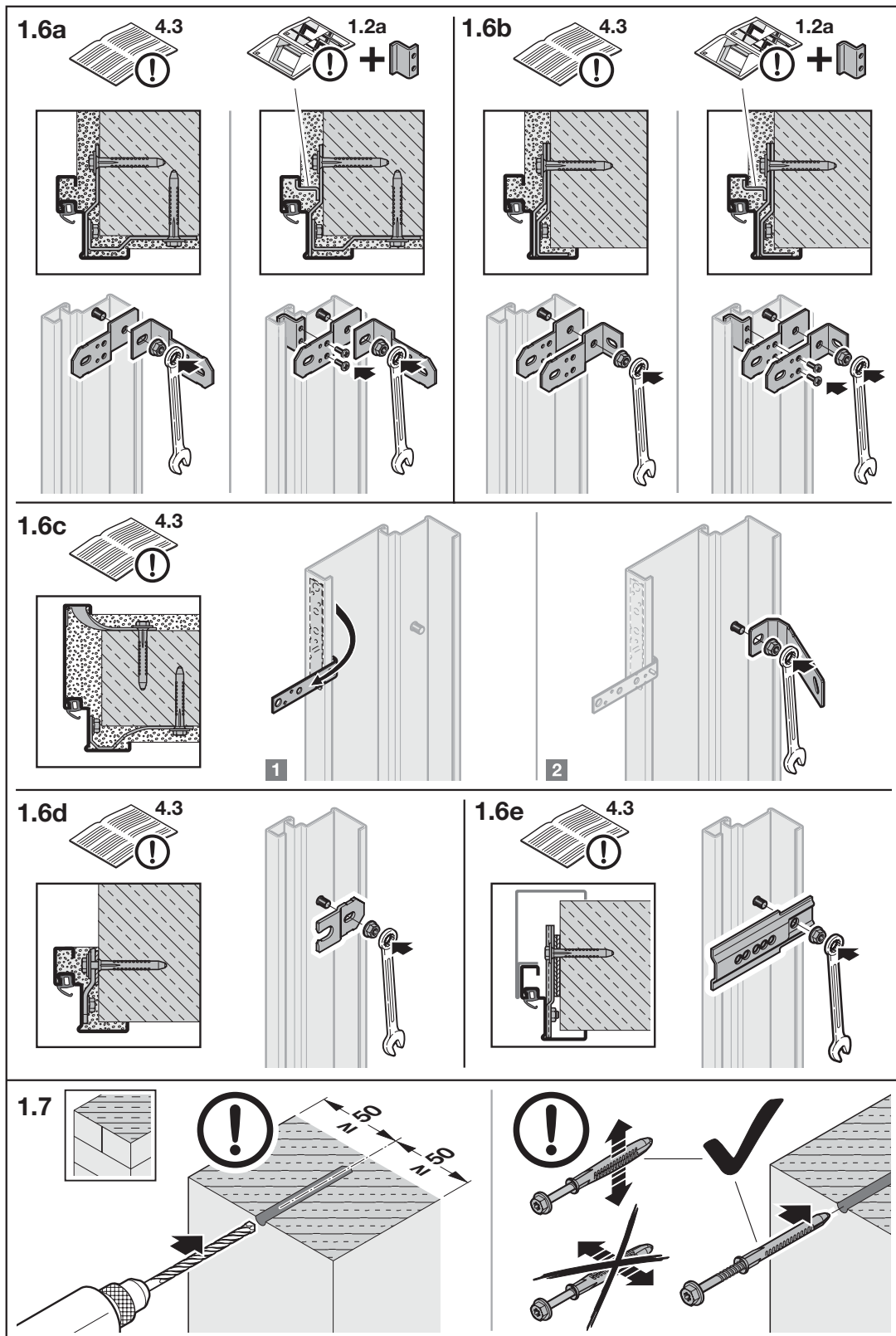
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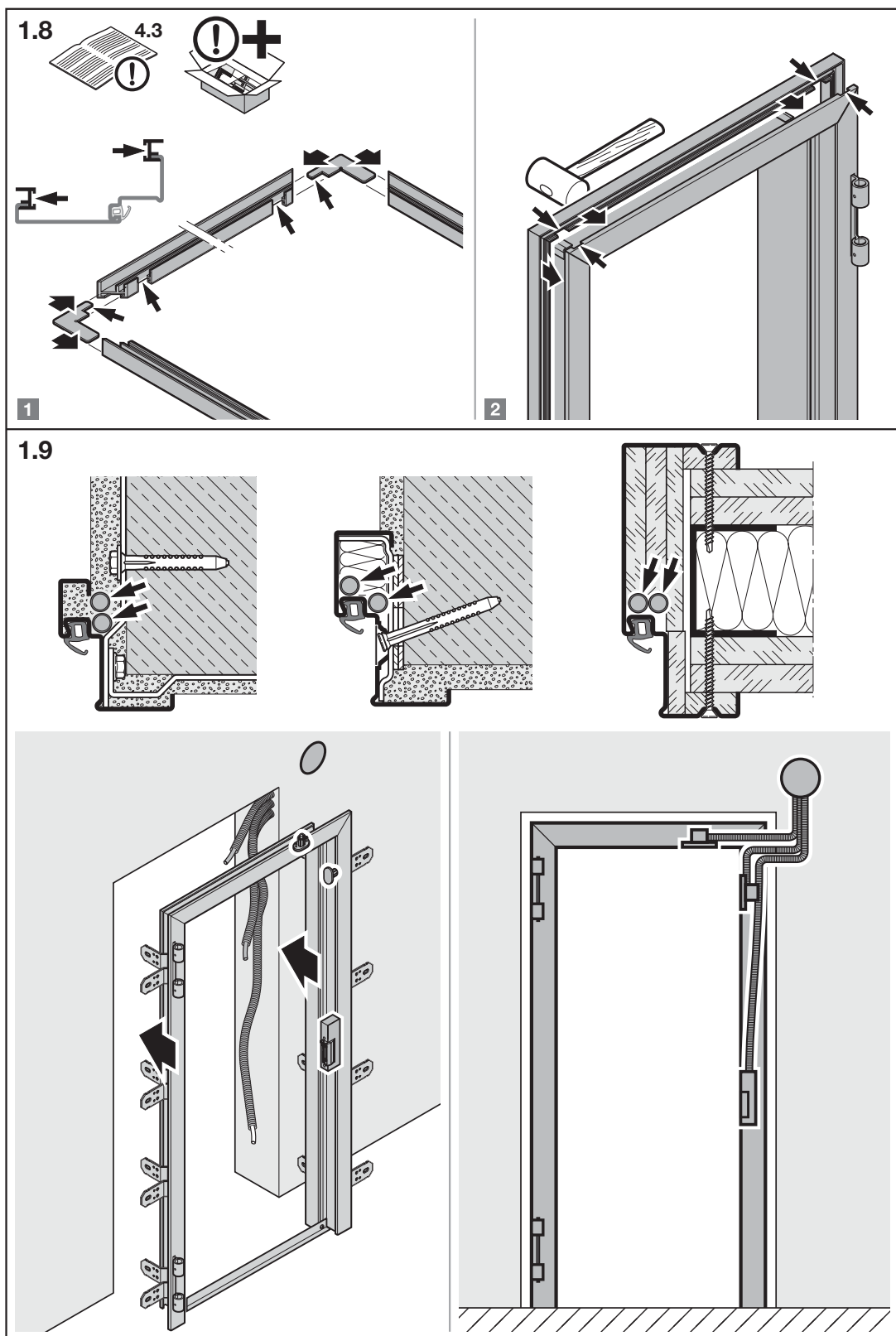


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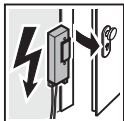
4.3







1.10



O & C

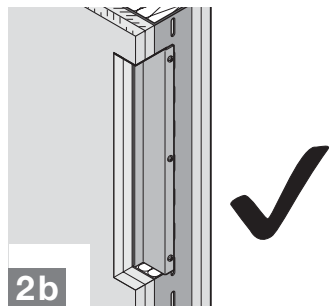
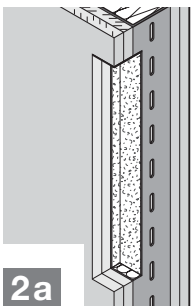
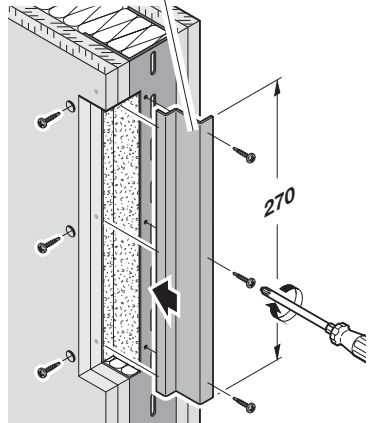
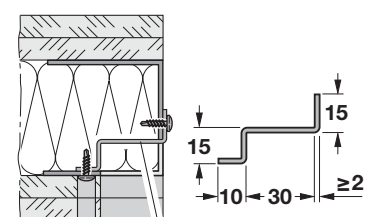
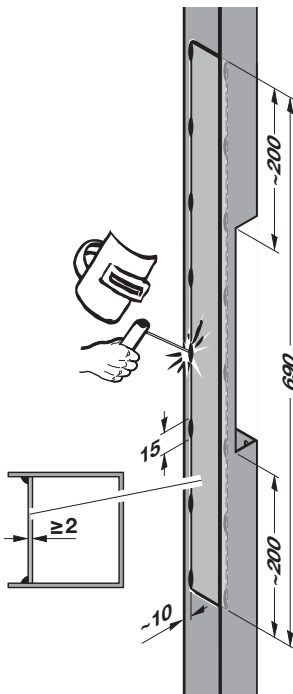
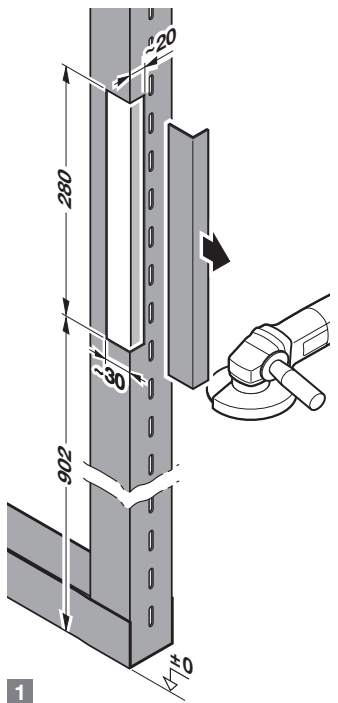
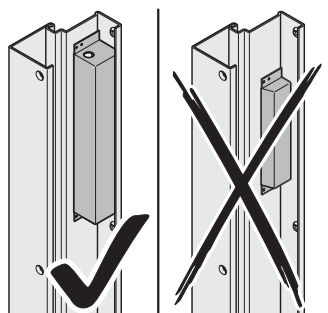
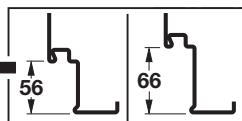
effeff

Dorma

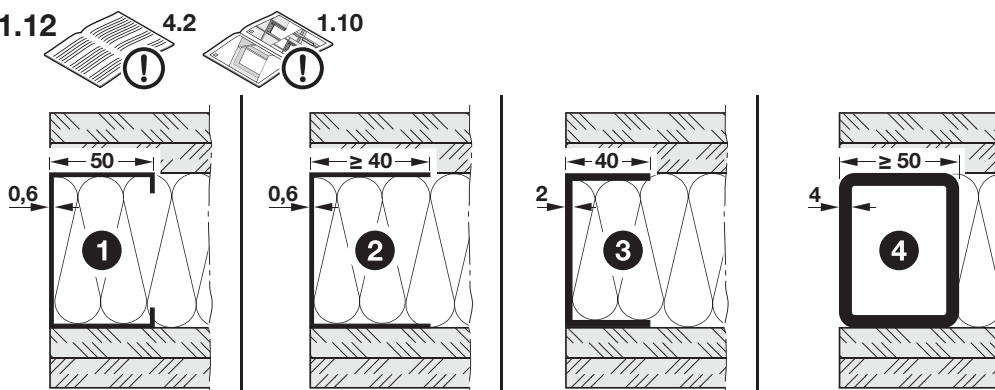
		AC ~	DC ≡					
O & C	8 EF	x	x	x	x	x	x	x
	142 UF	x		x	x	x	x	x
effeff	143 F	x	x	x	x	x	x	x
	14 F/34 F	x				x	x	x
	Basic		x			x	x	x
	Lucky Basic 448		x			x	x	x
	Smoke		x		x	x	x	x
	Lucky Smoke 448		x		x	x	x	x

1.11

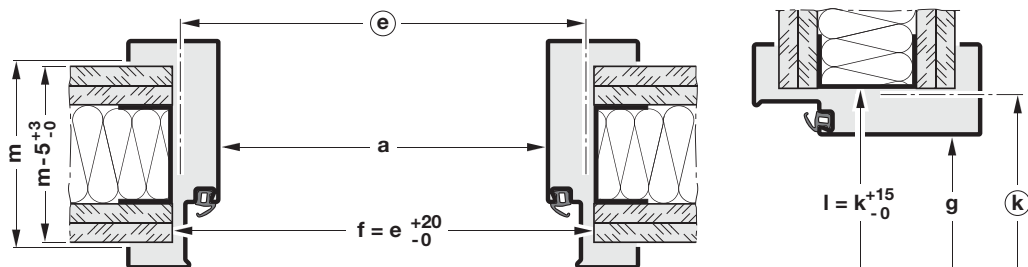
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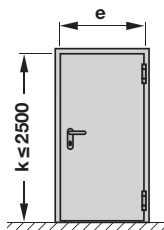
1.12 4.2 1.10



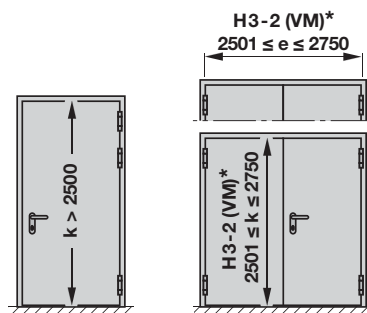
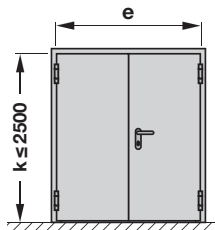
www.felko-systeme.de



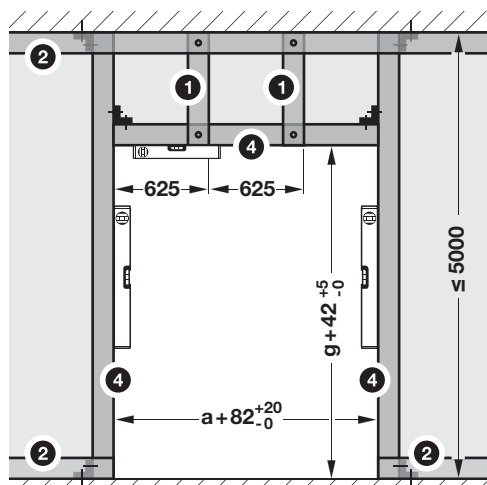
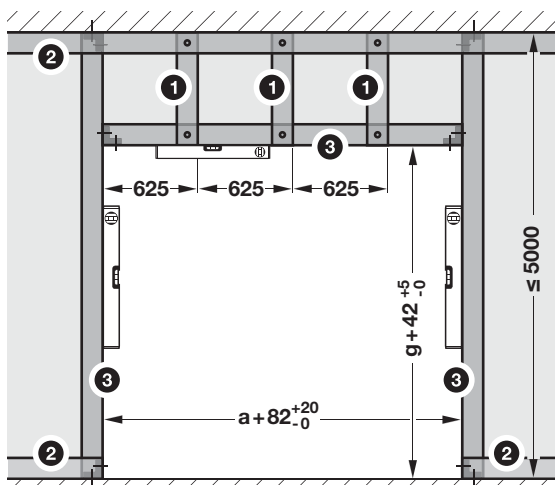
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 $e \leq 3000$ (max. T30/EI₂30)

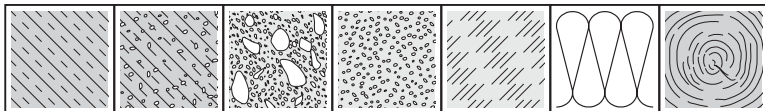


*www.felko-systeme.de



2

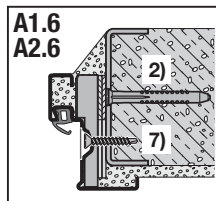
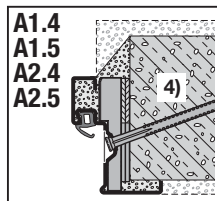
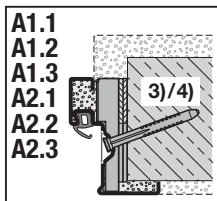
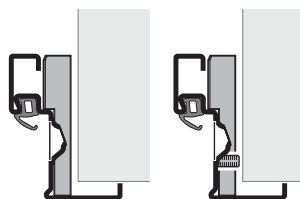
1.2/4



2A

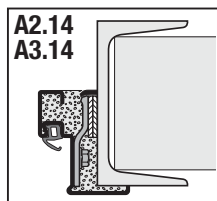
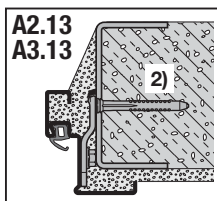
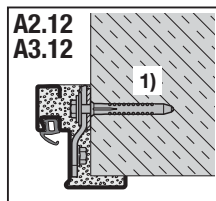
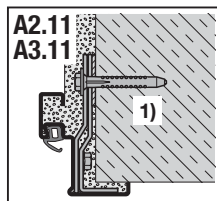
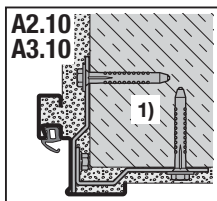
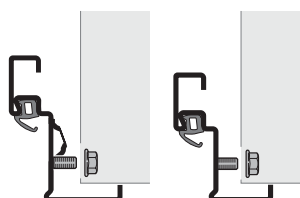
Typ1

Typ2



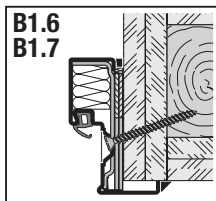
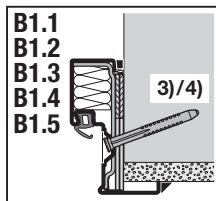
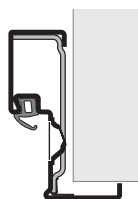
Typ2

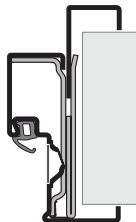
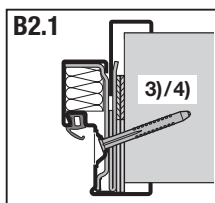
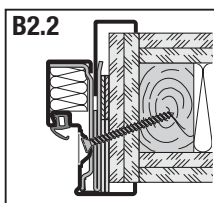
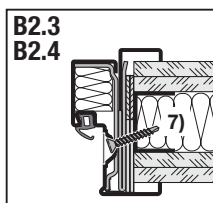
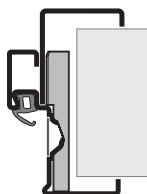
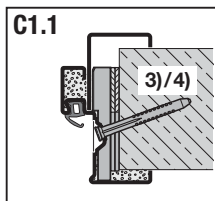
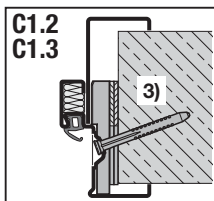
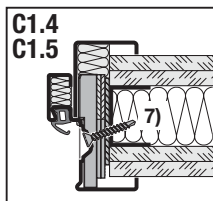
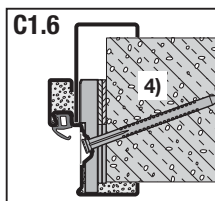
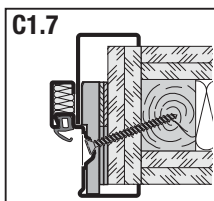
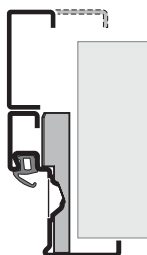
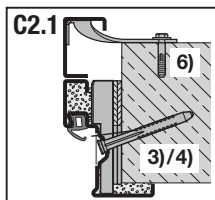
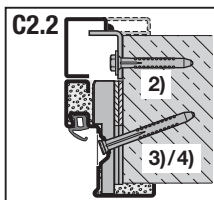
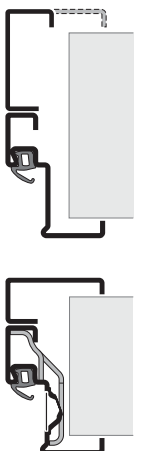
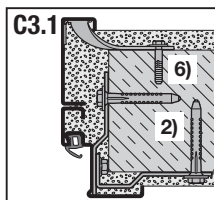
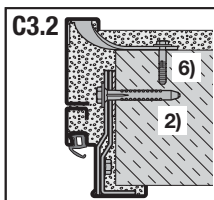
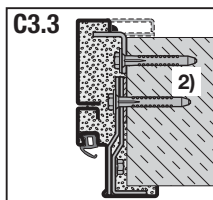
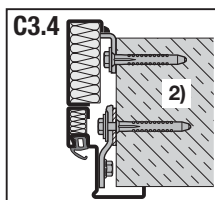
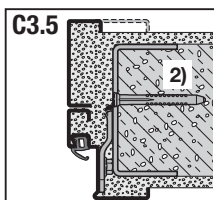
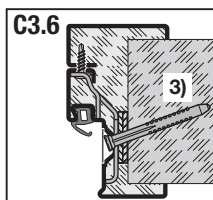
Typ3

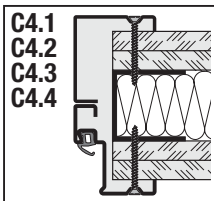
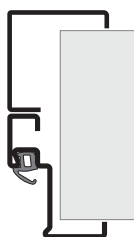
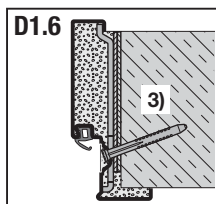
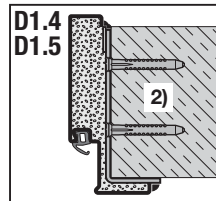
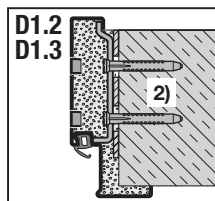
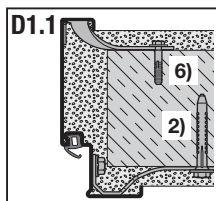
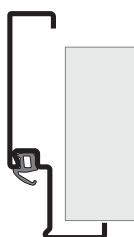
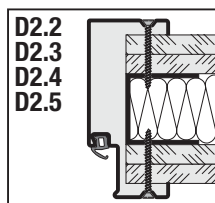
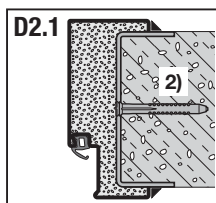
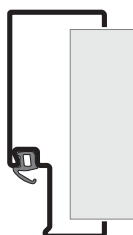
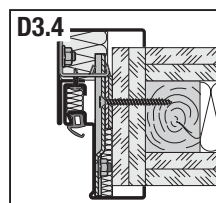
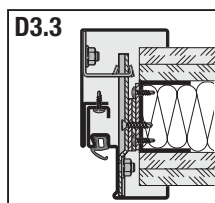
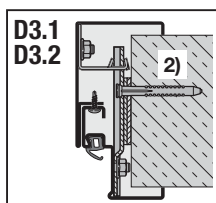
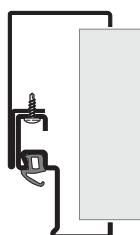


2B

Typ1

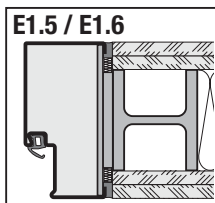
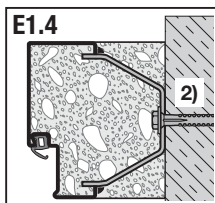
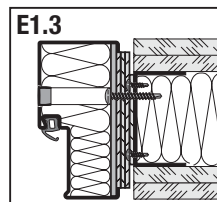
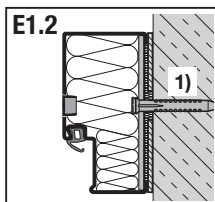
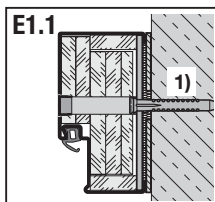
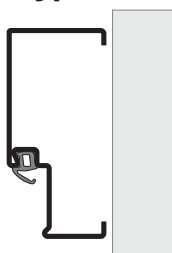


2B**Typ2****B2.1****B2.2****B2.3
B2.4****2C****Typ1****C1.1****C1.2
C1.3****C1.4
C1.5****C1.6****C1.7****Typ2****C2.1****C2.2****Typ3****C3.1****C3.2****C3.3****C3.4****C3.5****C3.6**

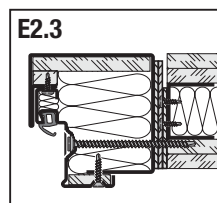
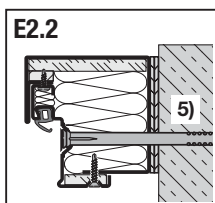
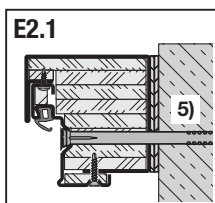
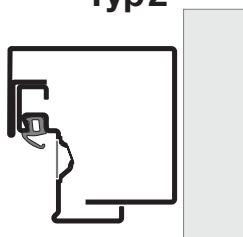
2C**Typ4****2D****Typ1****Typ2****Typ3**

2E

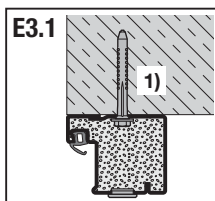
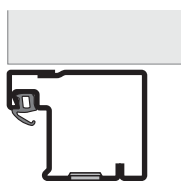
Typ 1



Typ 2



Typ 3



- 1) **Fischer:** FUR 10 × 80/100
Fischer: DuoXpand 10 × 80/100
CELO: HBR 10 × 80/100

- Fischer:** SXS 10 × 80/100 →
Fischer: SXRL 10 × 80/100 →
Hilti: HRD 10 × 80/100 →
CELO: MFR 10 × 80/100 →
Würth: W-UR 10 × 80/100 →



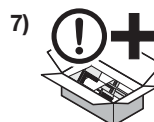
- 2) **Fischer:** FUR 10 × 80/100/115
Fischer: DuoXpand 10 × 80/100/120
Fischer: SXS 10 × 80/100/120
Fischer: SXRL 10 × 80/100/115
Hilti: HRD 10 × 80/100
CELO: MFR 10 × 80/100/115
CELO: HBR 10 × 80/100/115
Würth: W-UR 10 × 80/100/115

- 3) **Fischer:** FUR 10 × 100
Fischer: DuoXpand 10 × 100
CELO: HBR 10 × 100

- 4) **Fischer:** FUR 10 × 160
Fischer: DuoXpand 10 × 160
CELO: HBR 10 × 160

- 5) **Fischer:** FUR 10 × 200
Fischer: DuoXpand 10 × 200
CELO: HBR 10 × 200

- 6) 8 × 40



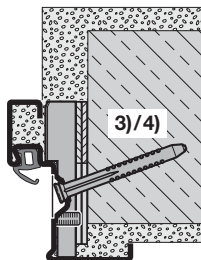
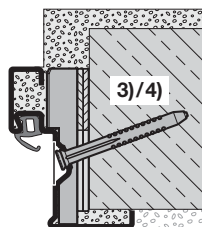
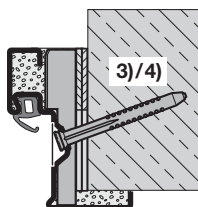
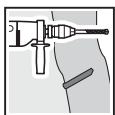
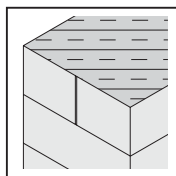
2A

Typ1
Typ2

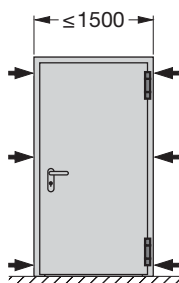
A1.1
A2.1

A1.2
A2.2

A1.3
A2.3

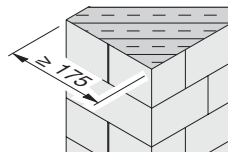
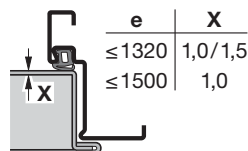
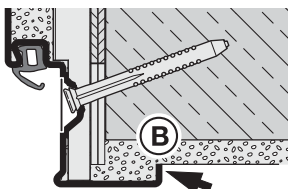
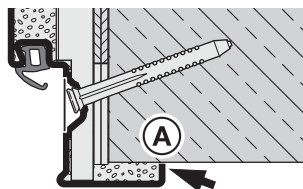
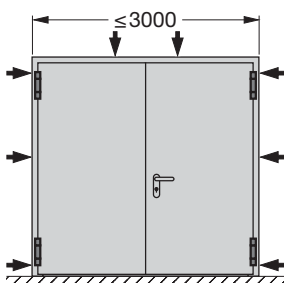


D65 - 1 OD

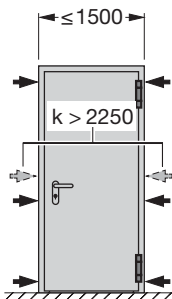


3) Fischer: FUR 10 x 100

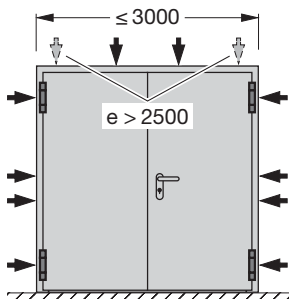
D65 - 2 OD



H3-1 OD



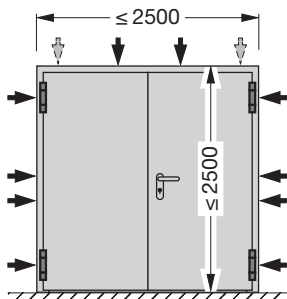
H3-2 OD



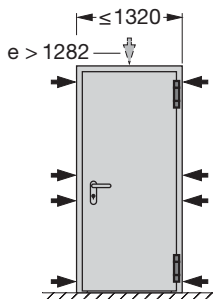
$k \leq 2500 \rightarrow$ 3) Fischer: FUR 10 x 100

$k > 2500 \rightarrow$ 4) Fischer: FUR 10 x 160

**H6-2 OD
H16-2 OD**



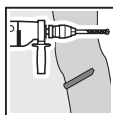
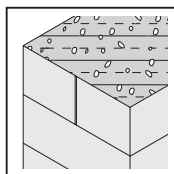
**H6-1 OD
H16-1 OD**



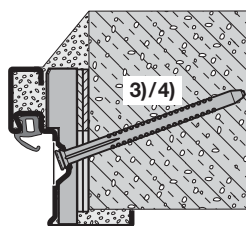
4) Fischer: FUR 10 x 160

➔ A1.1 - A2.5 1 2 3 4

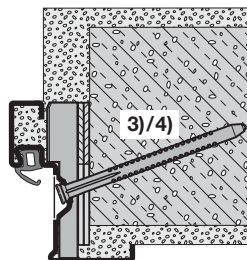
2A Typ 1 Typ 2



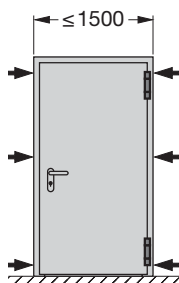
A1.4 A2.4



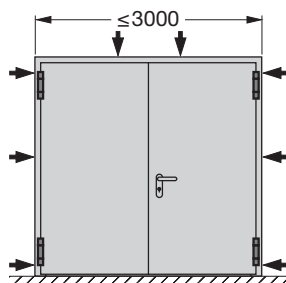
A1.5 A2.5



D65 - 1 OD

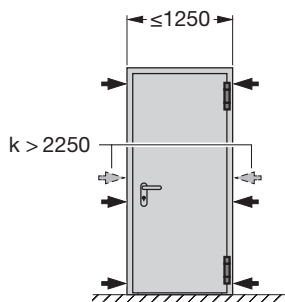


D65 - 2 OD



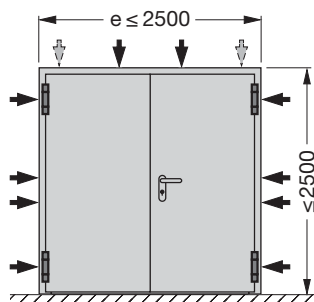
3) Fischer: FUR 10 × 100

H3 - 1 OD



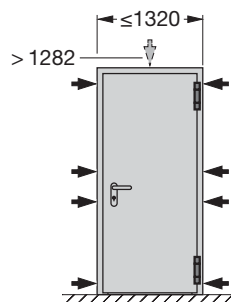
4) Fischer: FUR 10 × 160

H3 - 2 OD



4) Fischer: FUR 10 × 160

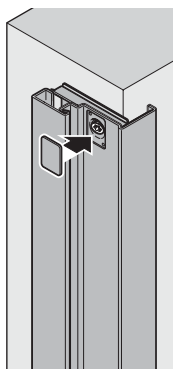
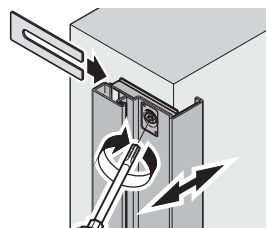
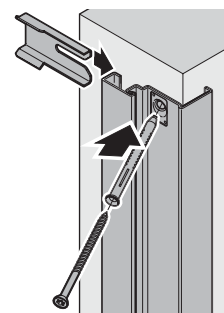
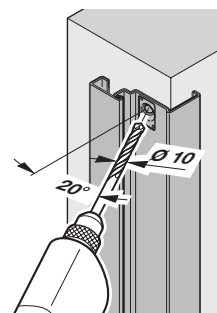
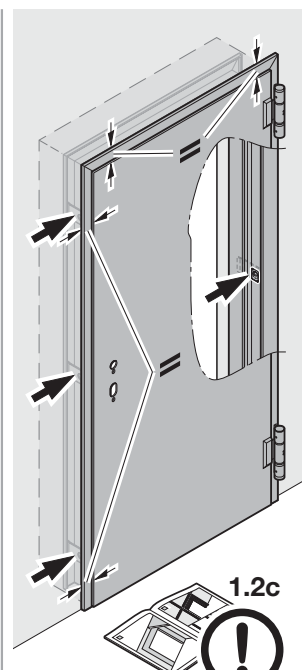
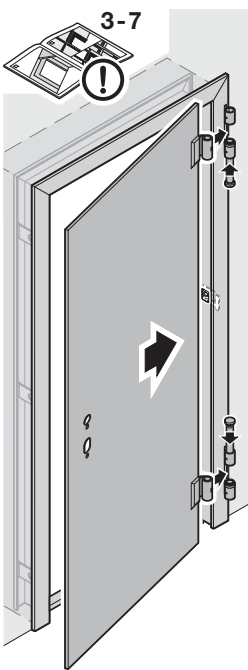
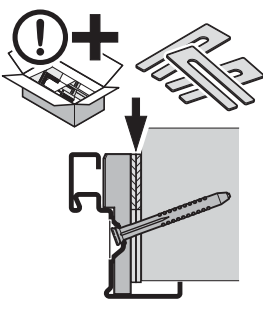
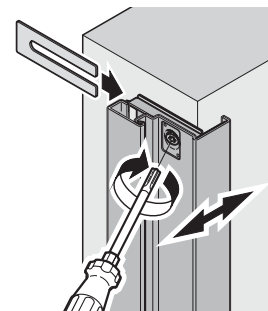
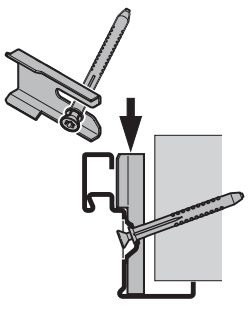
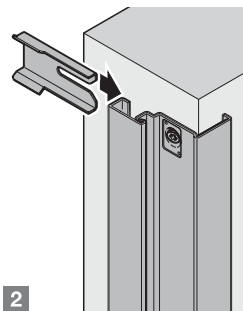
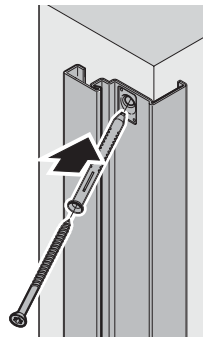
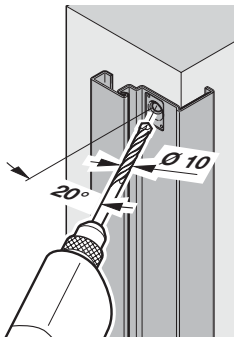
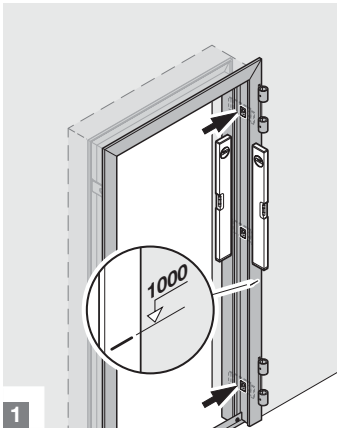
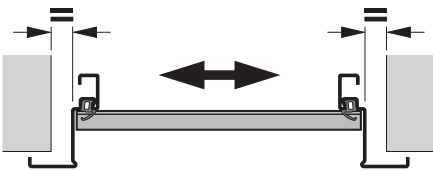
H6 - 1 OD H16 - 1 OD



4) Fischer: FUR 10 × 160

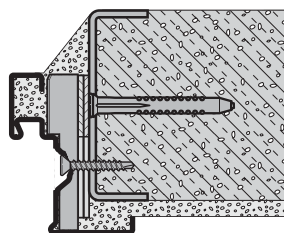
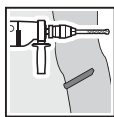
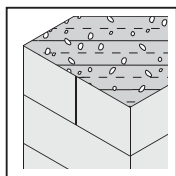
➔ **A1.1 - A2.5** 1 2 3 4

A1.1 - A2.5

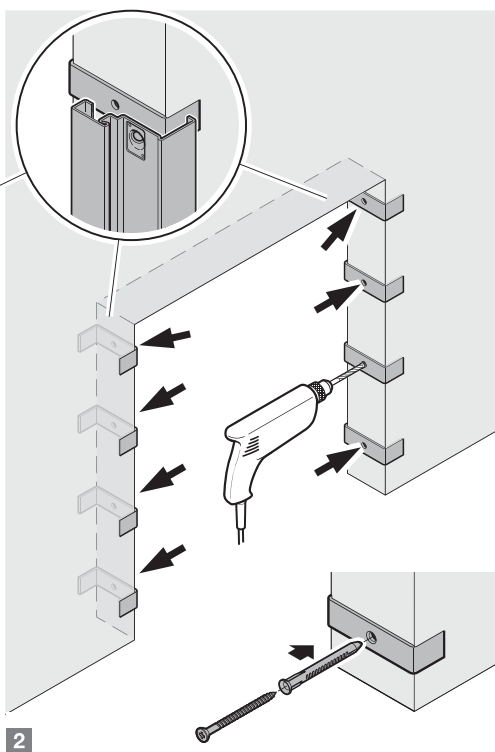
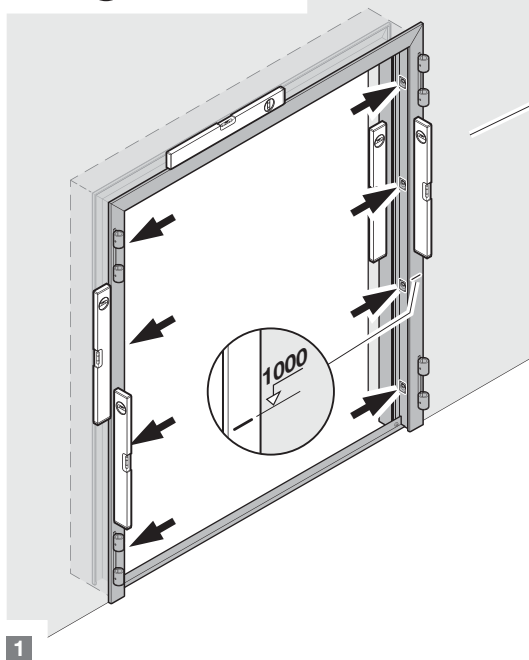
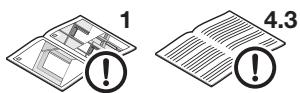
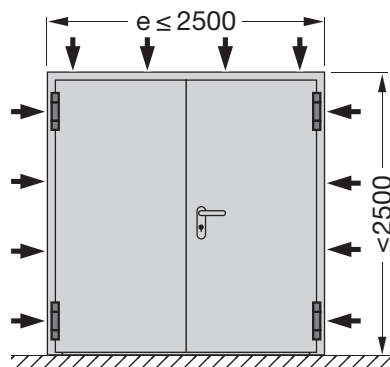


2A Typ 1, Typ 2
max. T90/EI₂90

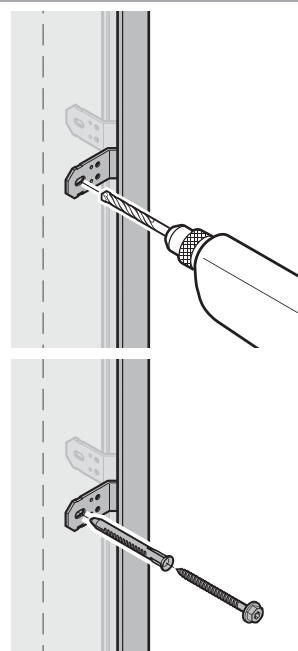
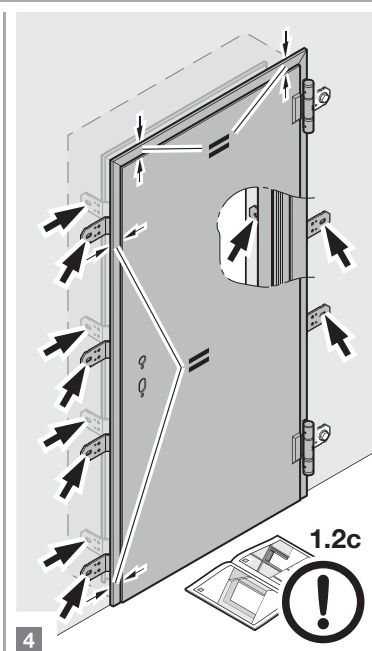
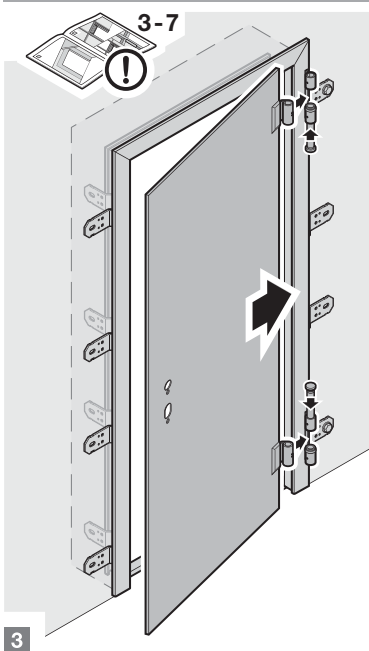
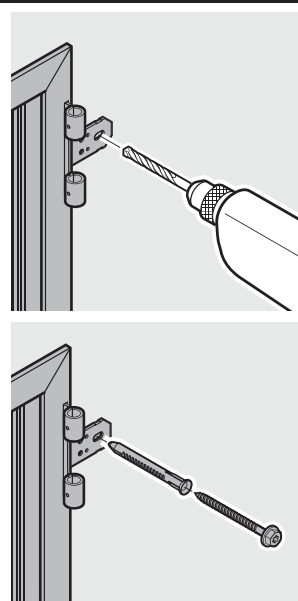
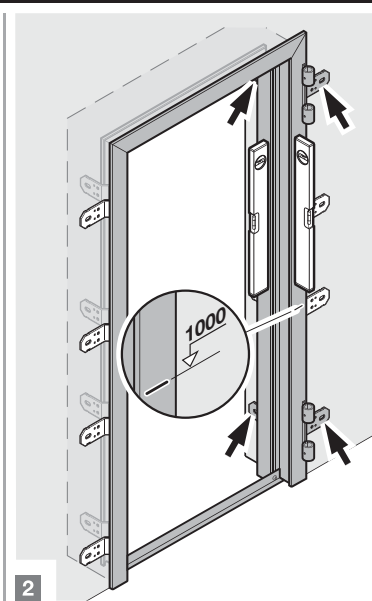
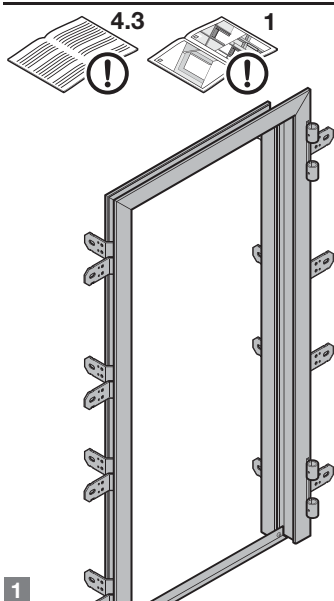
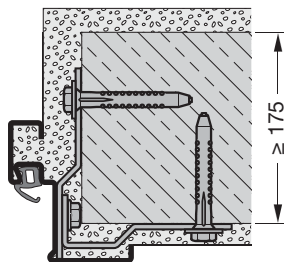
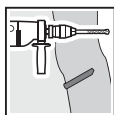
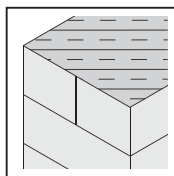
A1.6
A2.6

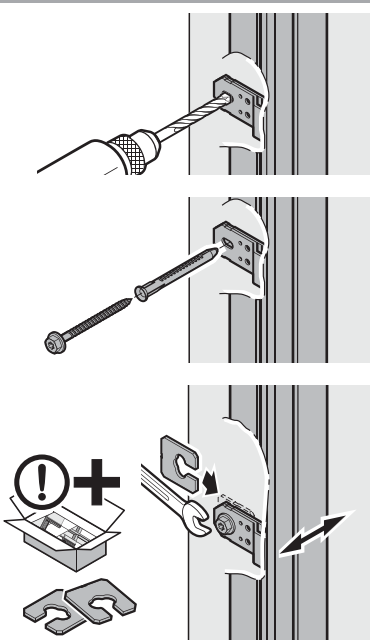
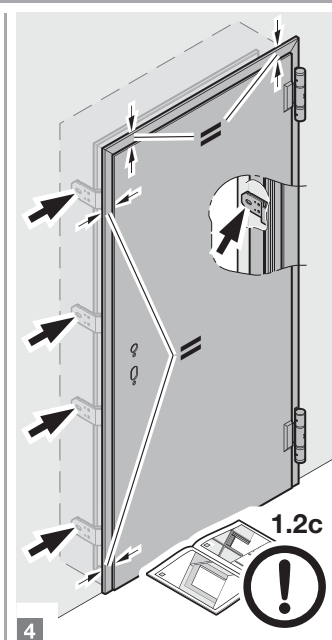
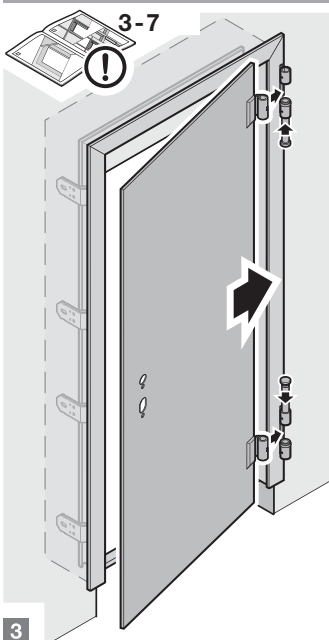
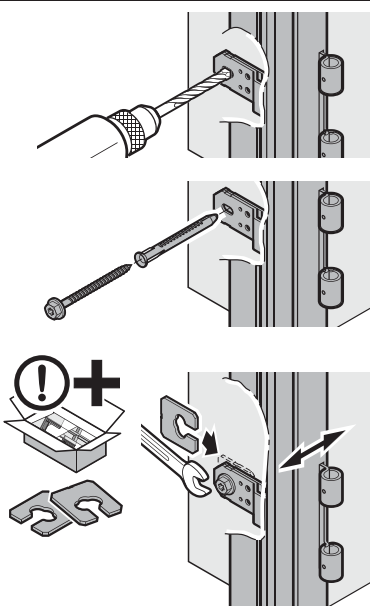
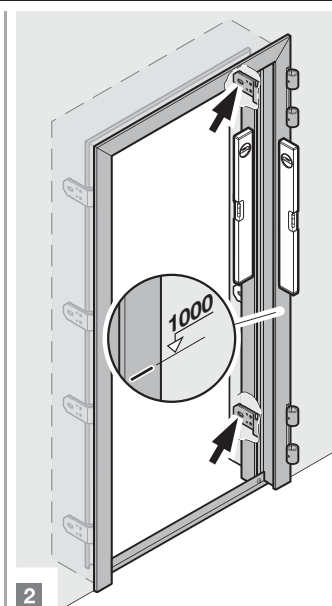
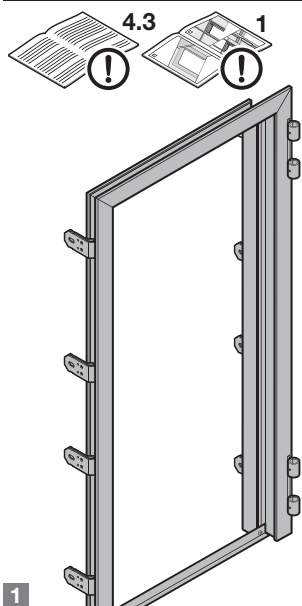
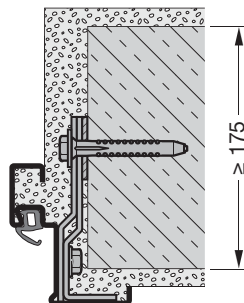
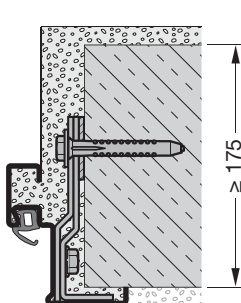
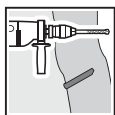
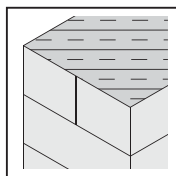


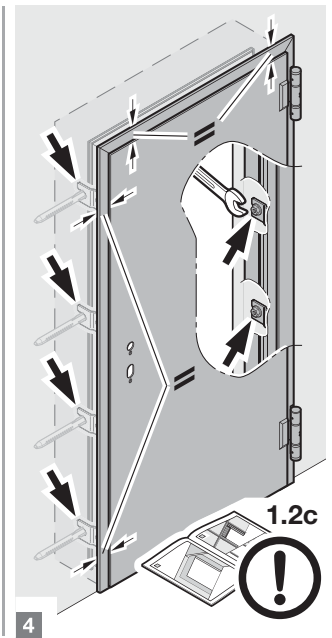
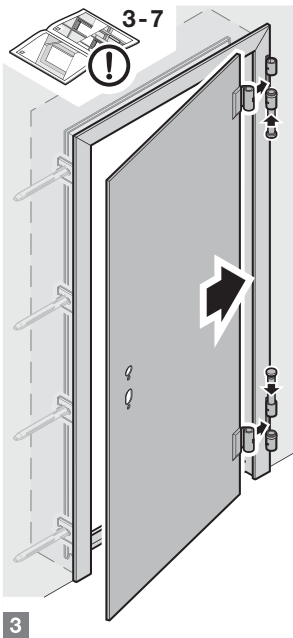
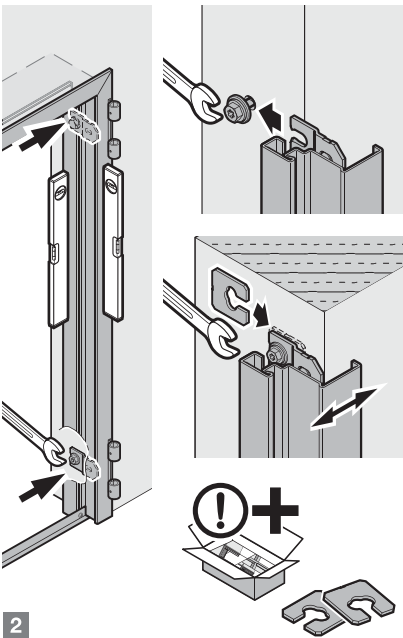
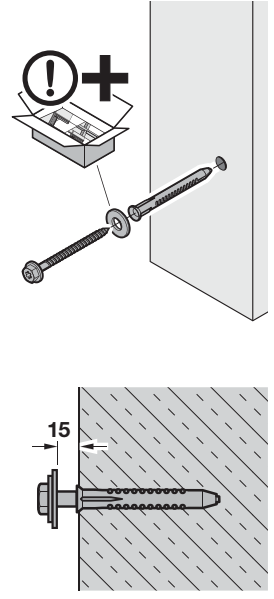
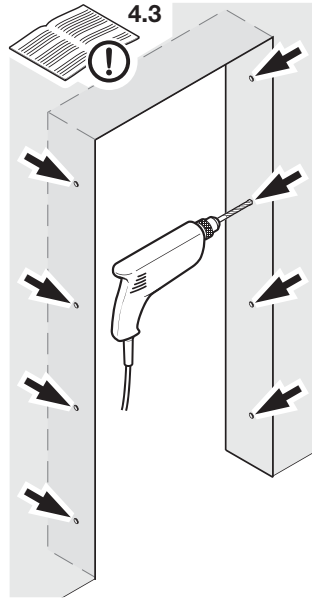
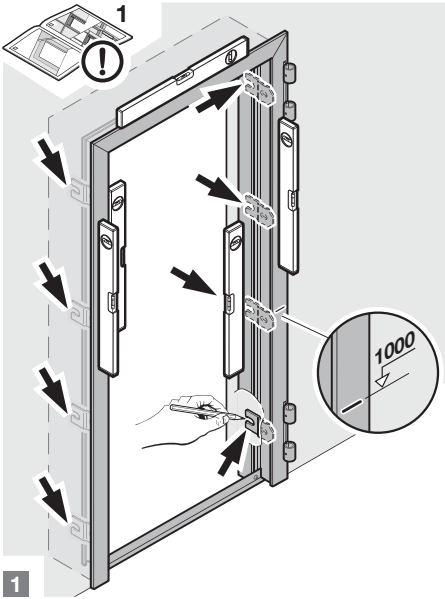
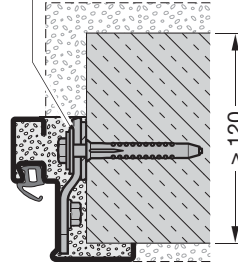
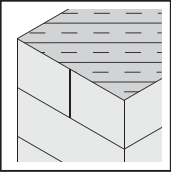
H16-2 OD



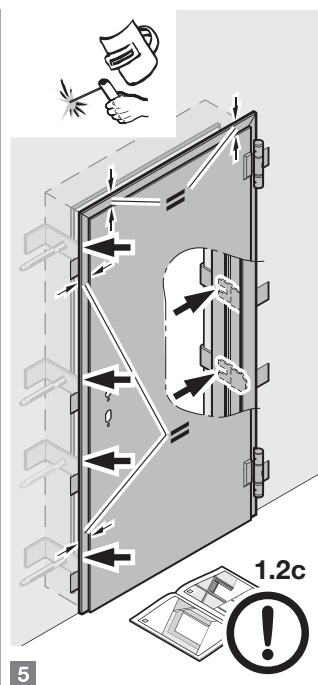
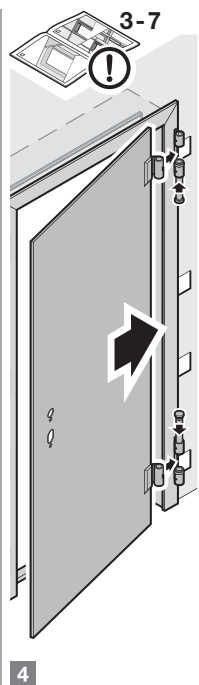
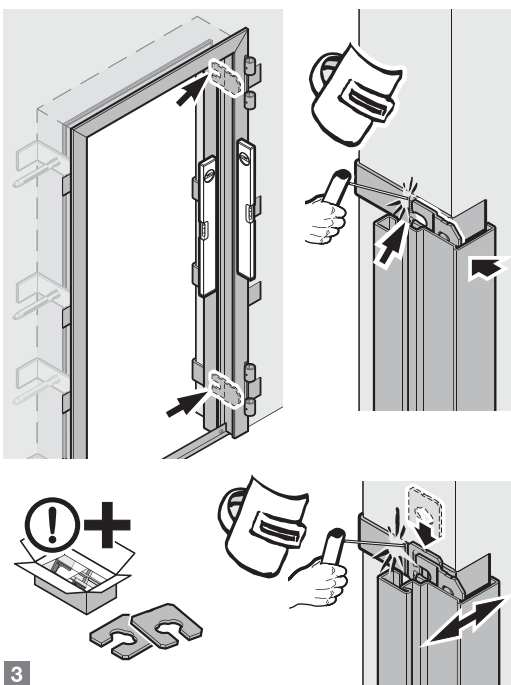
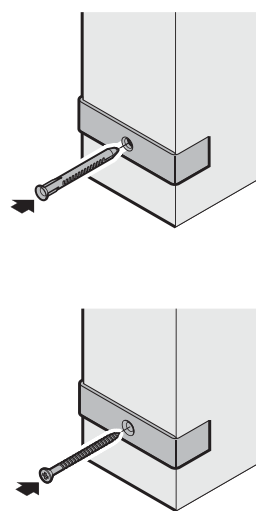
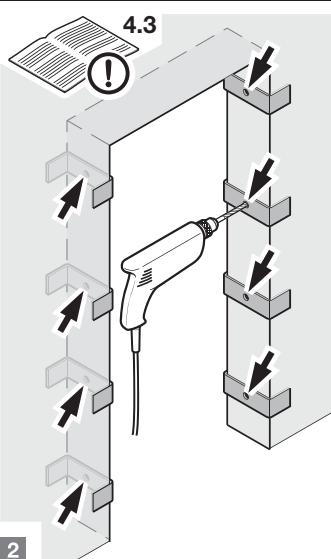
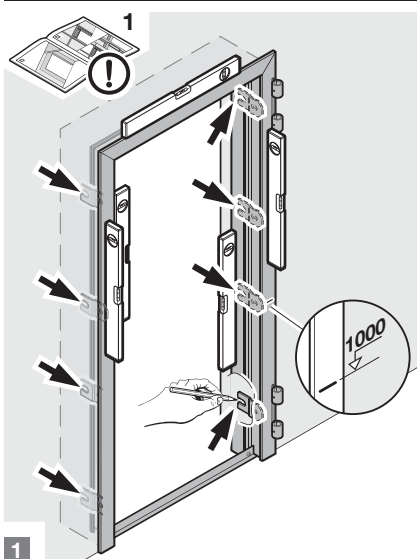
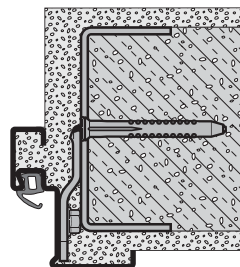
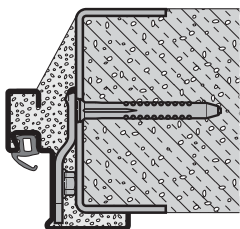
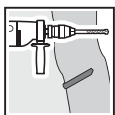
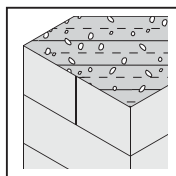
2A Typ2 / A2.10 Typ3 / A3.10



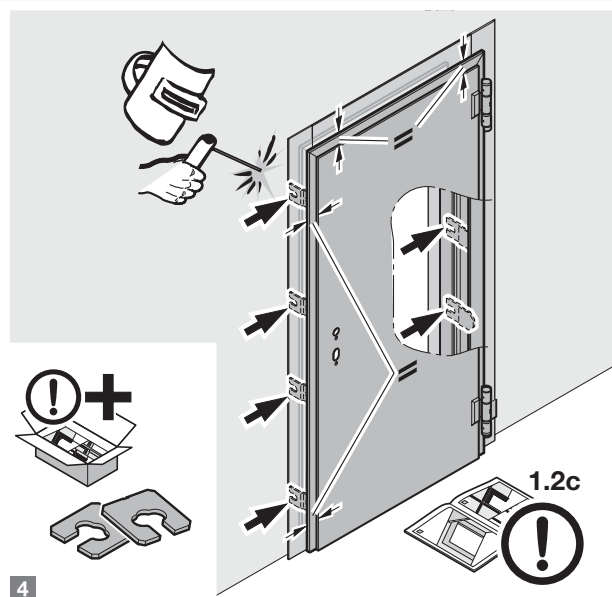
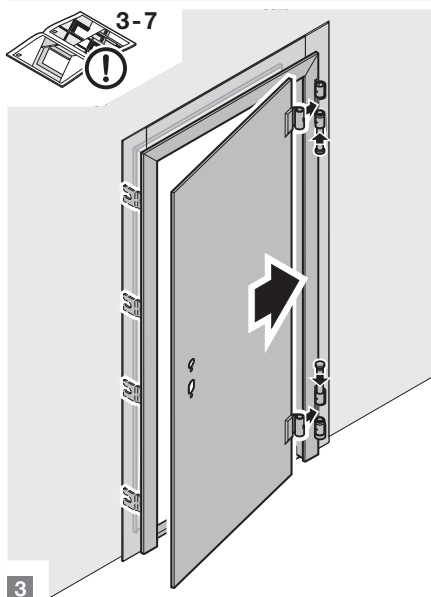
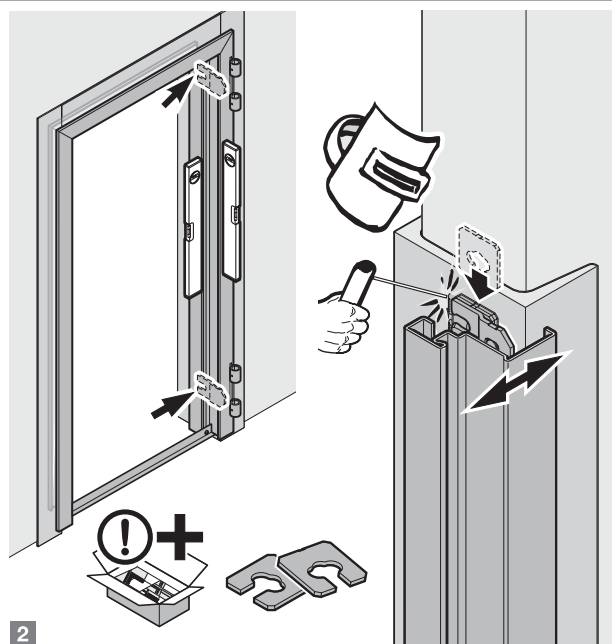
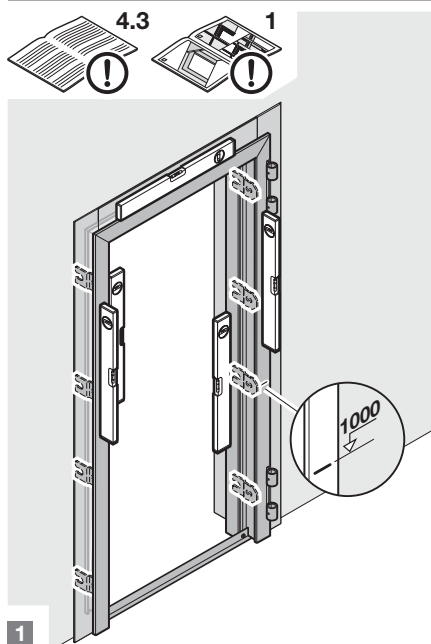
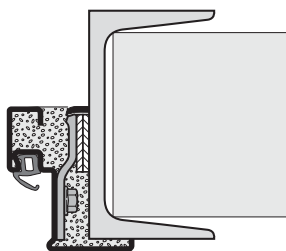
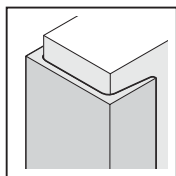
2A**Typ2 / A2.11**
Typ3 / A3.11

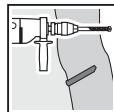
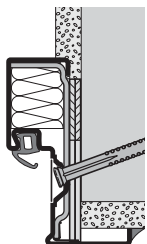
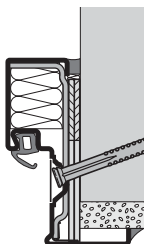
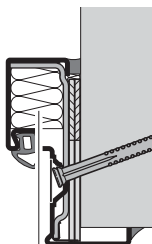
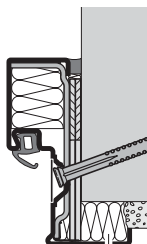
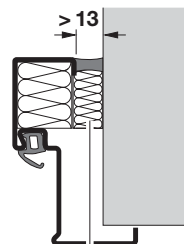
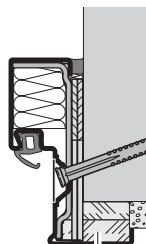
2A**Typ2 / A2.12**
Typ3 / A3.12**DIN 9021 - 8.4 - 140 HV**

2A Typ2 / A2.13 Typ3 / A3.13



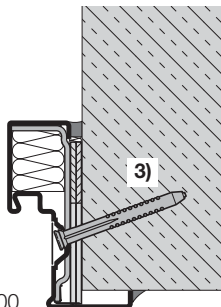
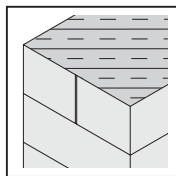
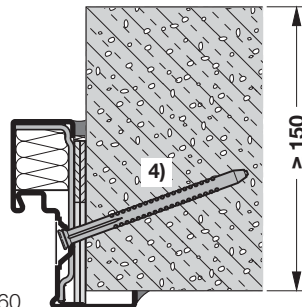
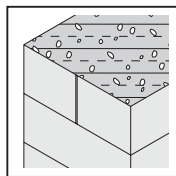
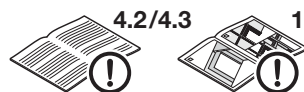
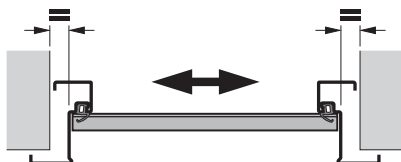
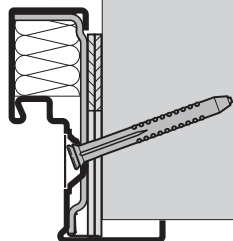
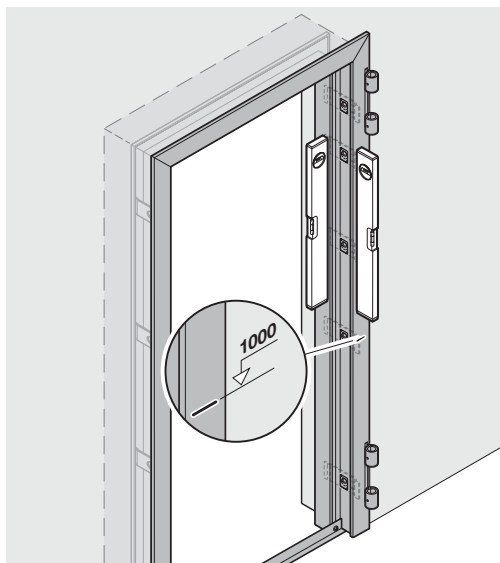
2A Typ2 / A2.14 Typ3 / A3.14

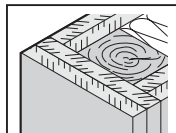


2B**Typ 1****D65****B1.1****B1.2****B1.3****B1.4****B1.5****A-EN 520**

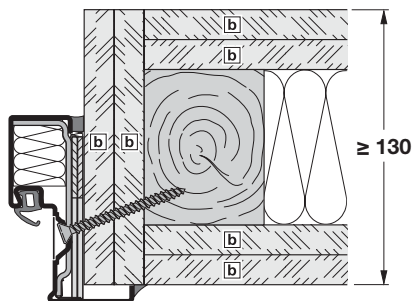
$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
 z.B. Isover BSP100

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

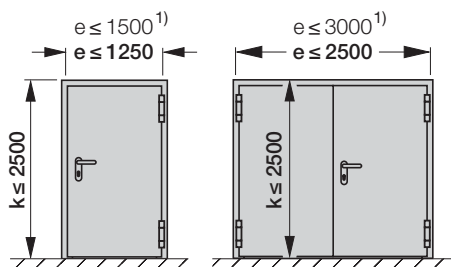
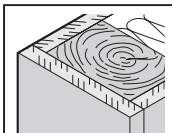
B1.1 - B1.5**3) Fischer: FUR 10 × 100****4) Fischer: FUR 10 × 160**e⁺²⁰
-0**1**

2B**Typ 1**max. T30
EI₂30**D65****B1.6****F90-B**

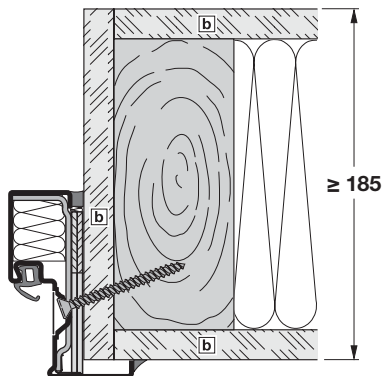
F90-B DIN 4102-4 Tab. 10.3



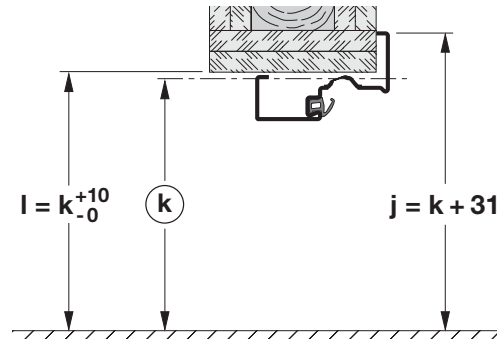
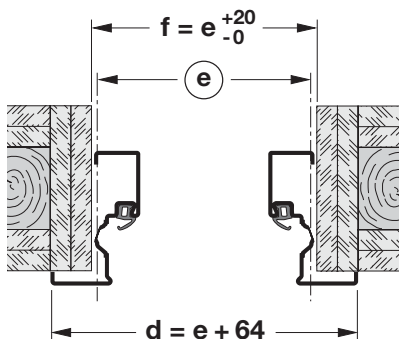
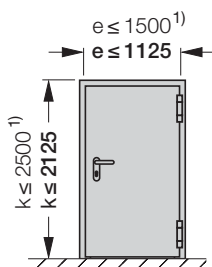
b A-12,5-EN 520

**B1.7****F30-B**

F30-B AbP Nr. P-SAC-02 / III-668



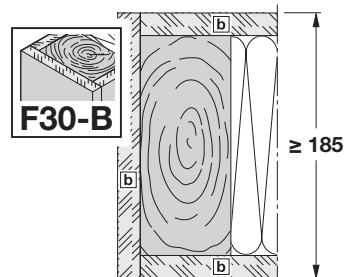
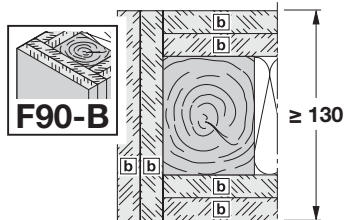
b A-12,5-EN 520

➔ **B1.6 / B1.7** 1 2 3...

B1.6 / B1.7

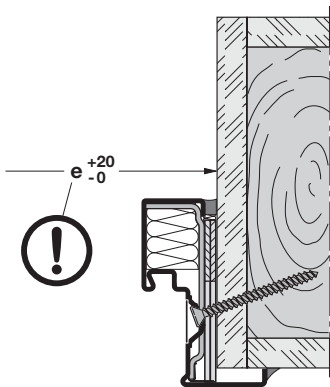
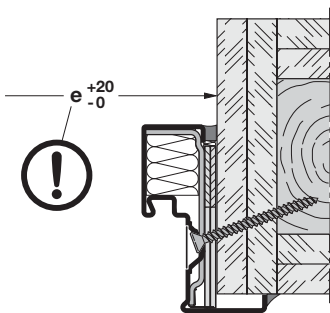
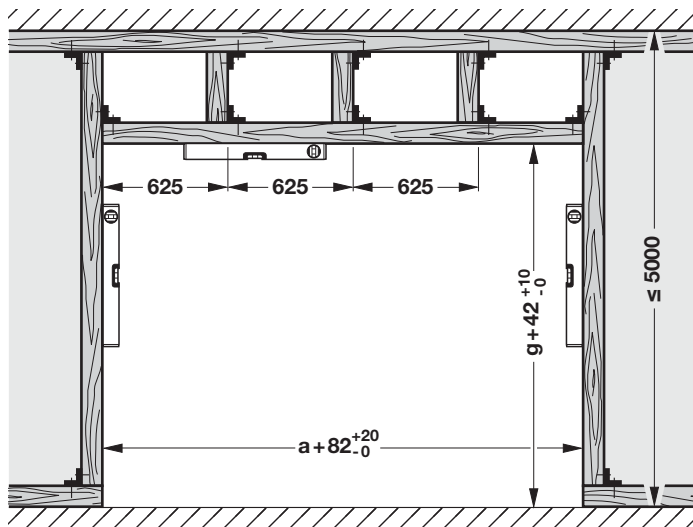
4.2/4.3

1

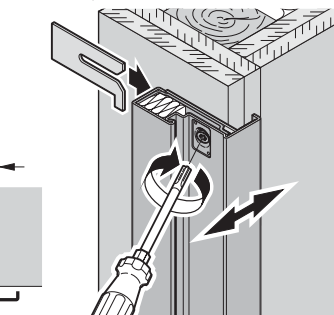
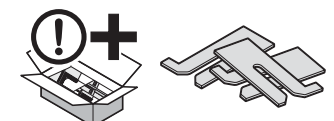
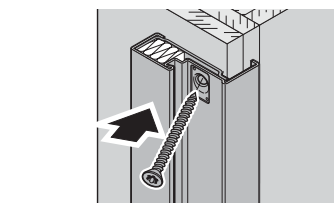
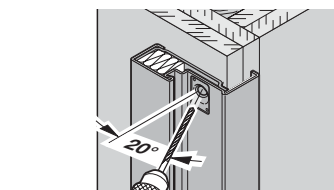
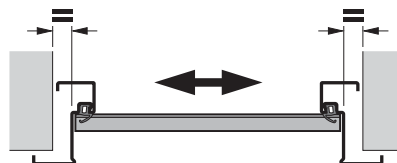
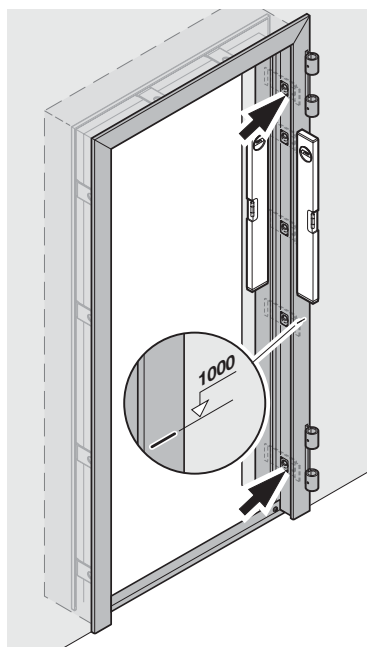


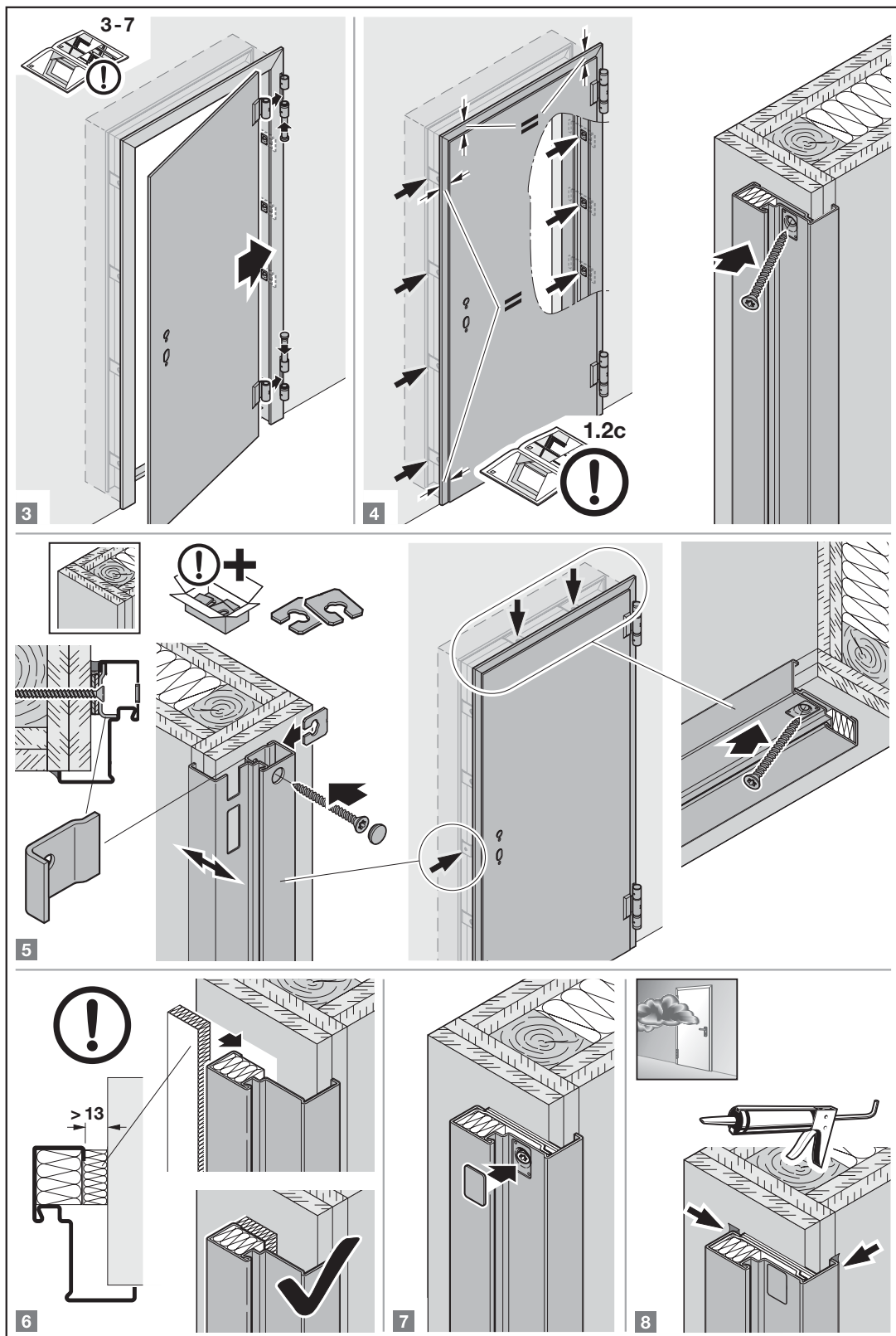
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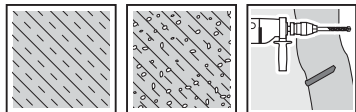
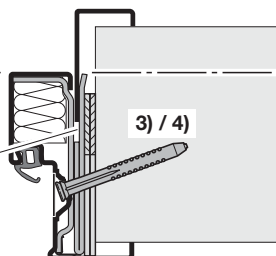
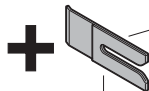
b A-12,5-EN 520



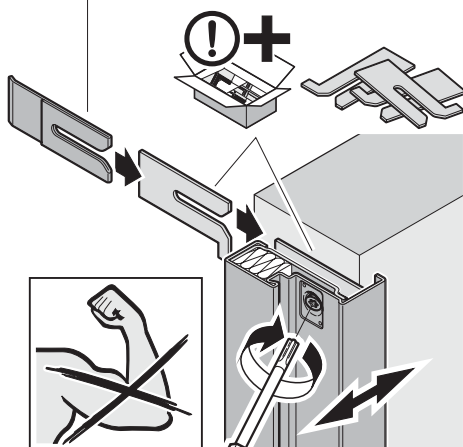
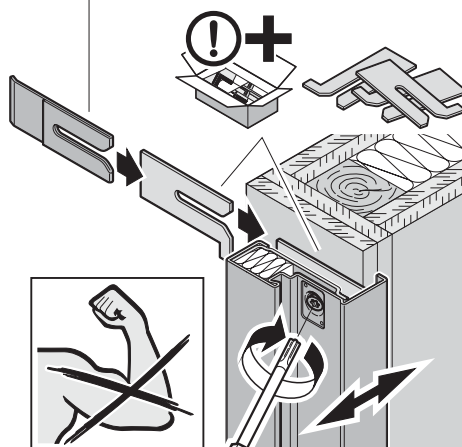
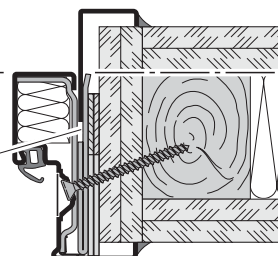
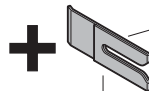
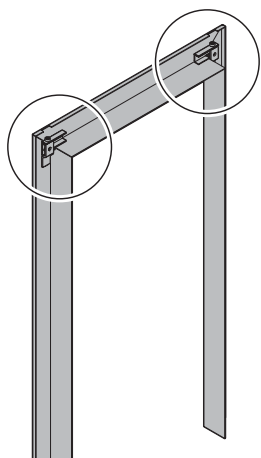
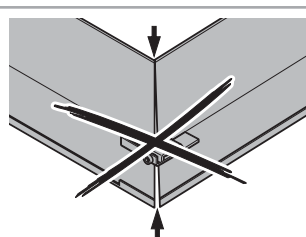
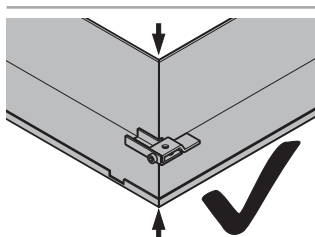
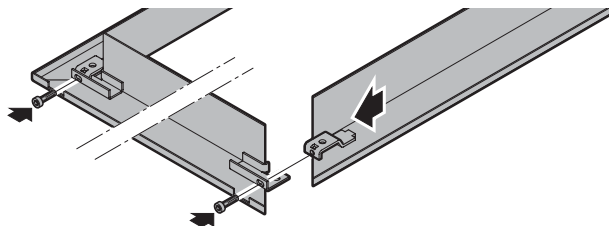
2

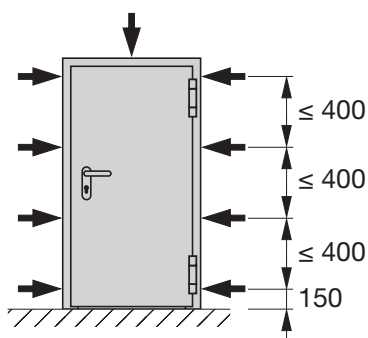
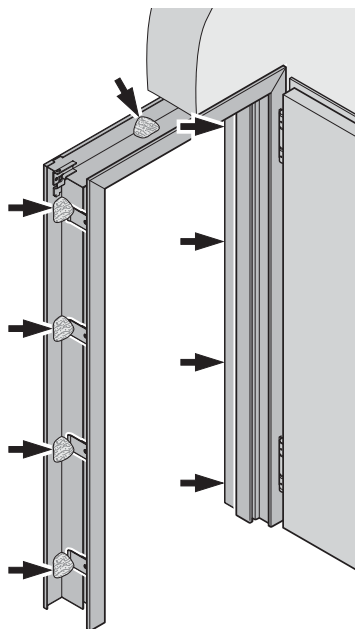




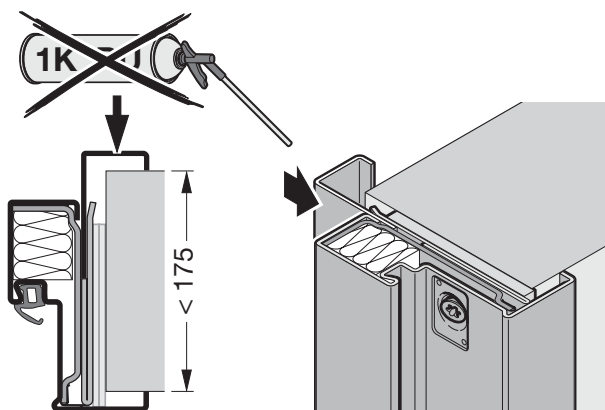
2B**Typ2****max. T30/EI₂30****B2.1****TYP1
B1.1- B1.5**

- 3) Fischer: FUR 10 × 100
4) Fischer: FUR 10 × 160

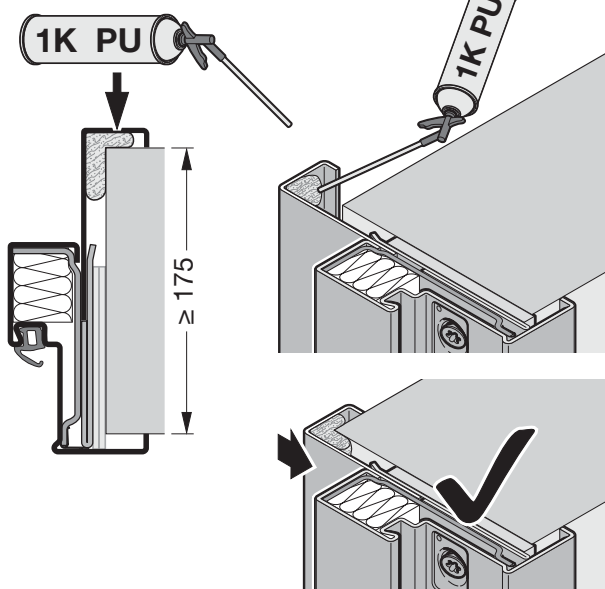
**1****B2.2****TYP1
B1.6 / B1.7****1****2**



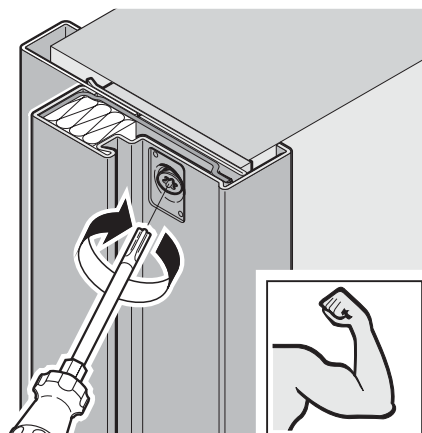
A



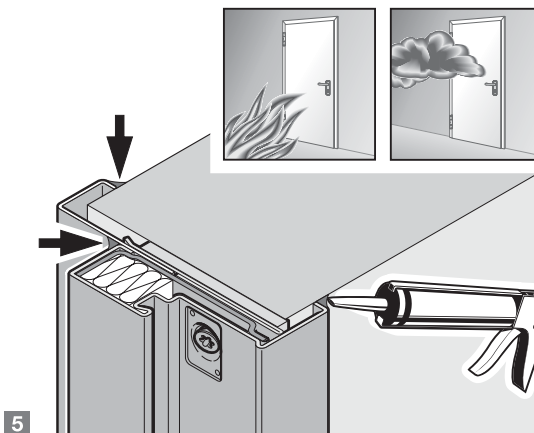
B



3



4

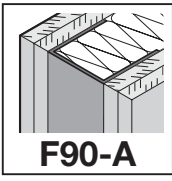


5

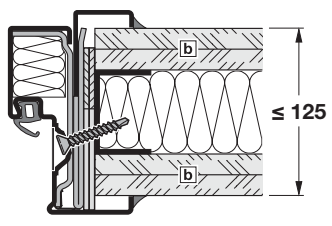
2B Typ2
max. T30/EI₂30



B2.3

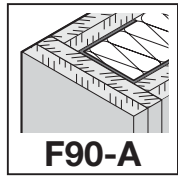


F90-A DIN 4102 Tab. 10.2

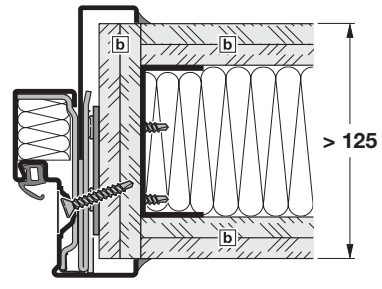


b A-12,5-EN 520

B2.4

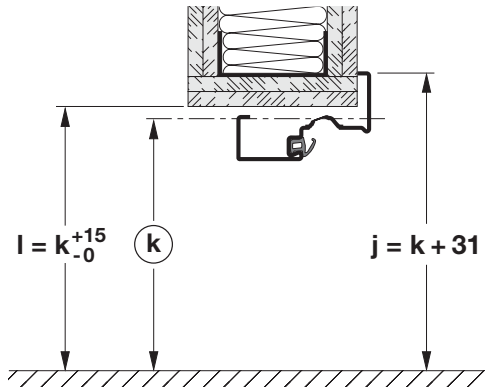
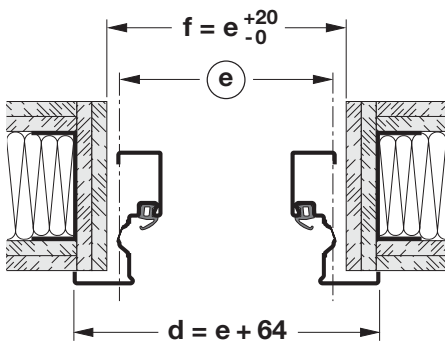
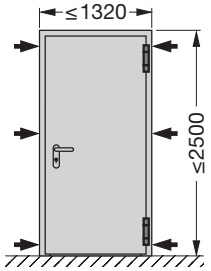


F90-A DIN 4102 Tab. 10.2



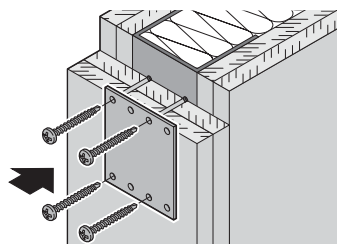
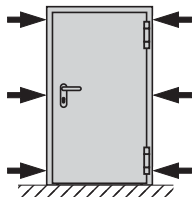
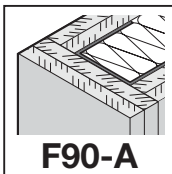
b A-12,5-EN 520

H3-1 OD



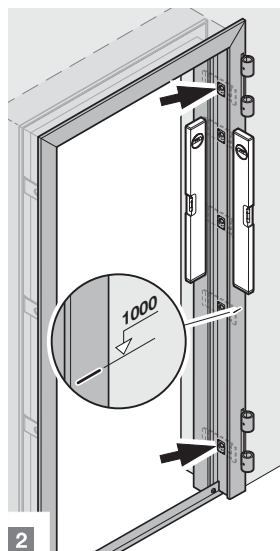
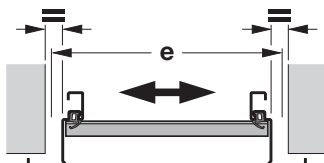
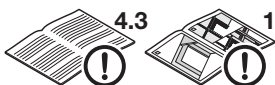
➔ **B2.3 / B2.4** 1 2 3 ...

B2.4



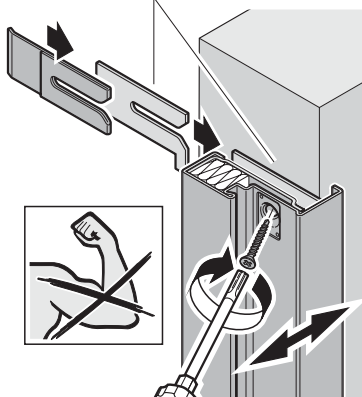
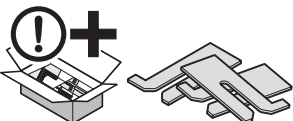
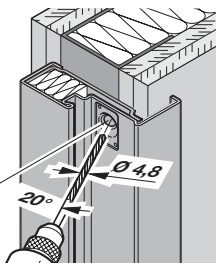
1

B2.3 / B2.4

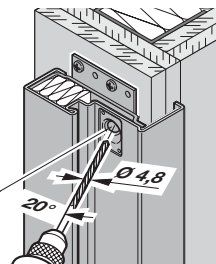
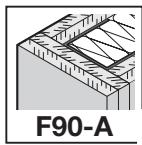


2

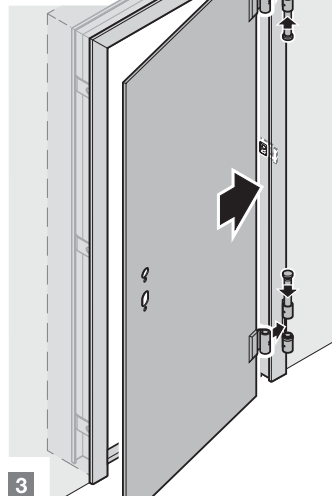
B2.3



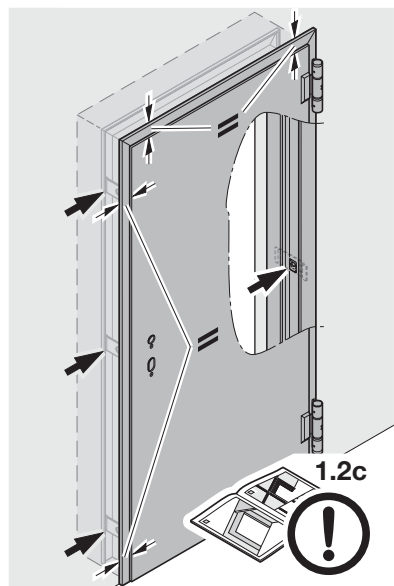
B2.4



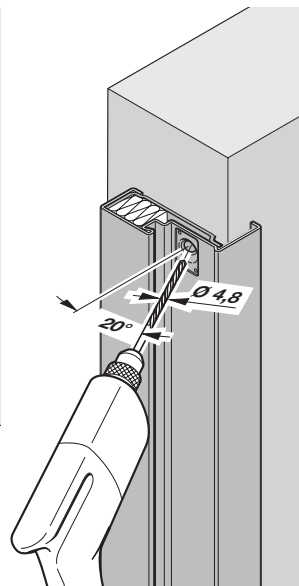
3-7

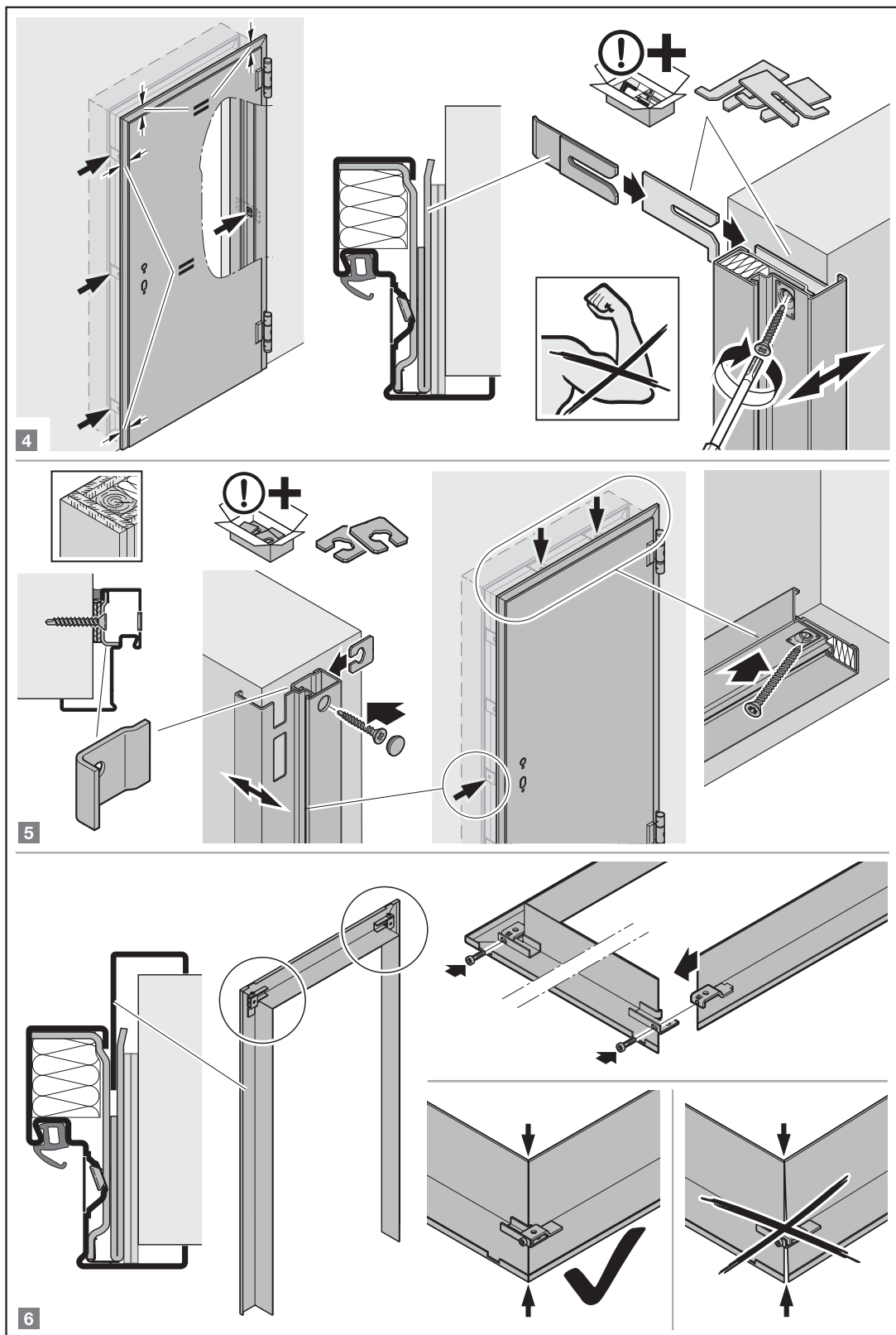


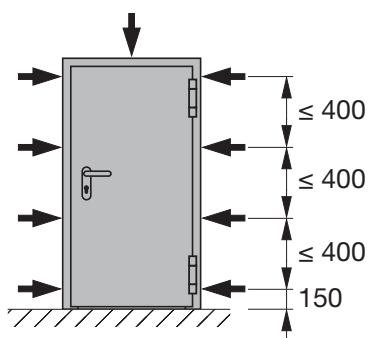
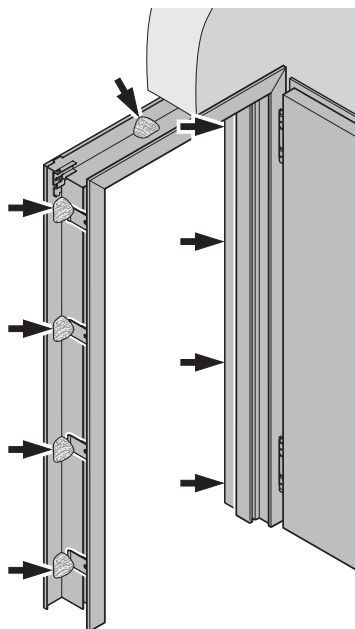
3



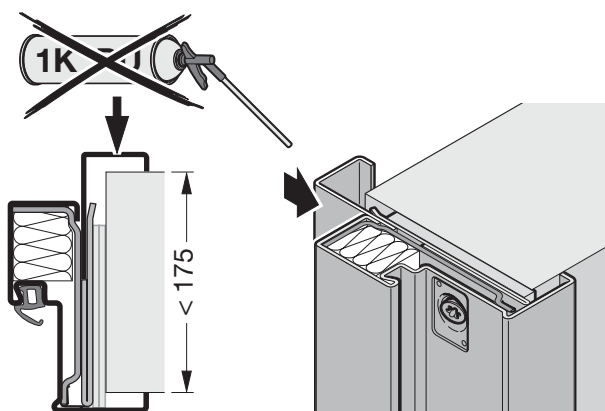
1.2c



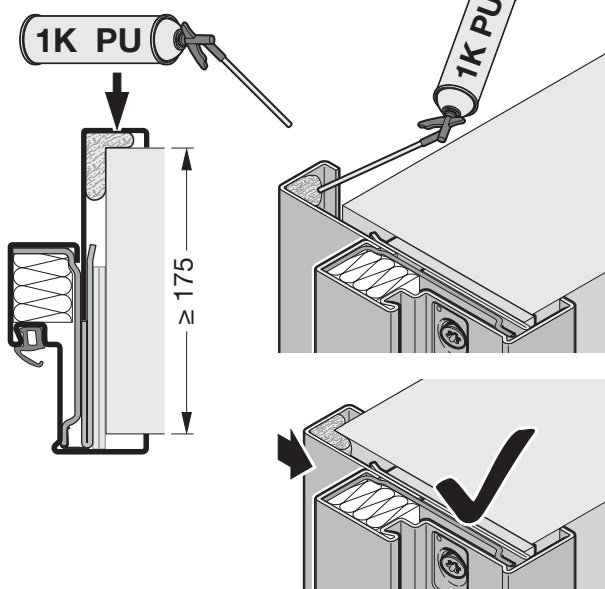




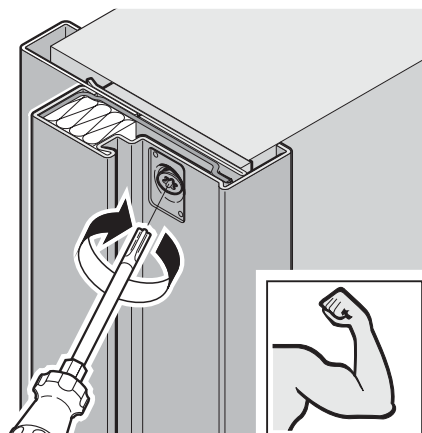
A



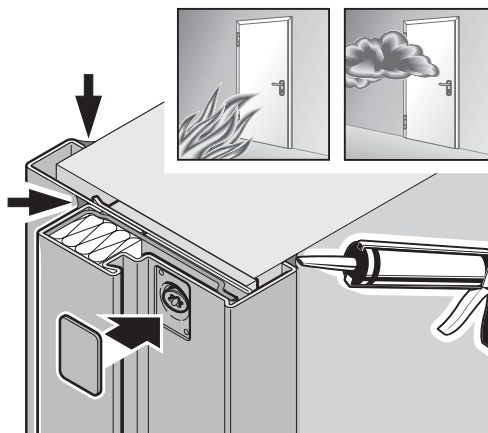
B



7



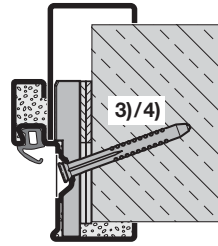
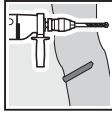
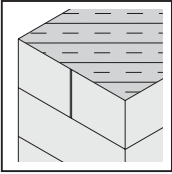
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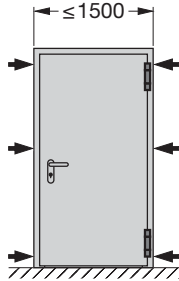
9

2C Typ1

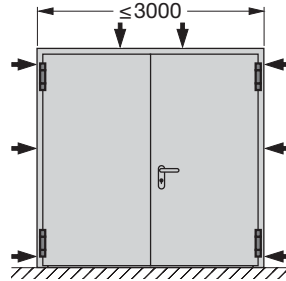
C1.1



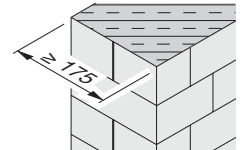
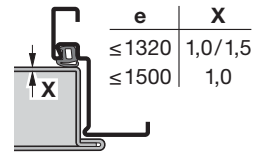
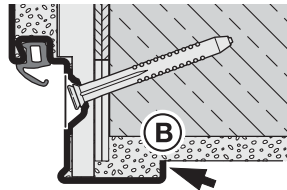
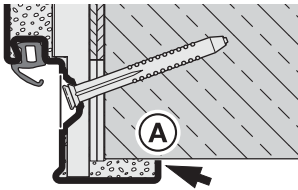
D65 - 1 OD



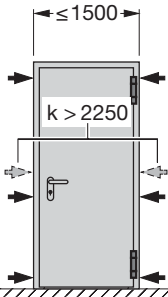
D65 - 2 OD



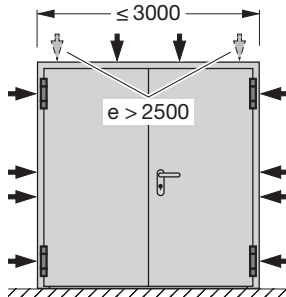
➔ 3) Fischer: FUR 10 x 100



H3-1 OD

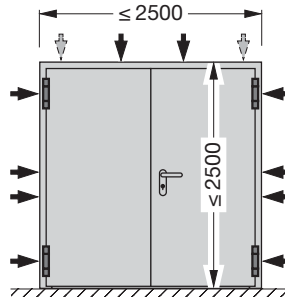


H3-2 OD

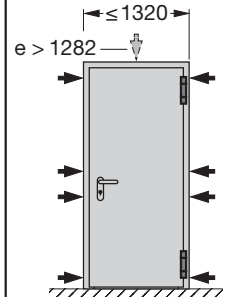


$k \leq 2500$ ➔ 3) Fischer: FUR 10 x 100
 $k > 2500$ ➔ 4) Fischer: FUR 10 x 160

H6-2 OD H16-2 OD



H6-1 OD H16-1 OD



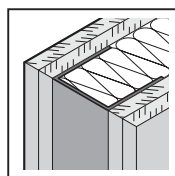
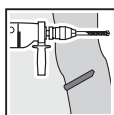
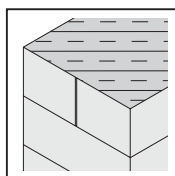
➔ 4) Fischer: FUR 10 x 160

➔ C1.1 - C1.6 1 2 3...

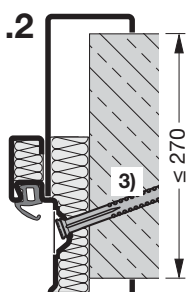
2C

Typ 1

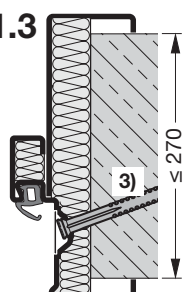
max. T30/EI₂30



C1.2

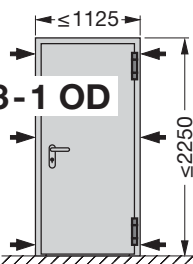


C1.3



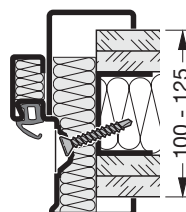
$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

H3-1 OD

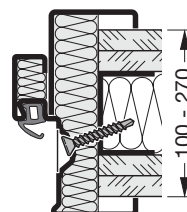


3) Fischer: FUR 10 × 100

C1.4

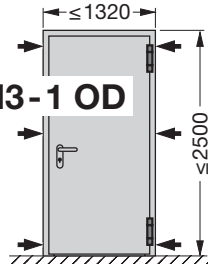


C1.5

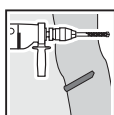
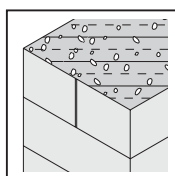


$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

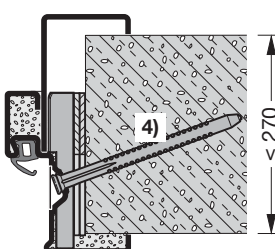
H3-1 OD



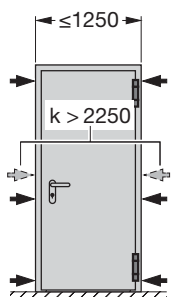
➔ C1.1 - C1.6 1 2 3 ...



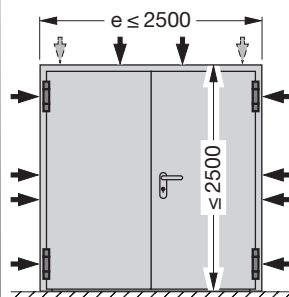
C1.6



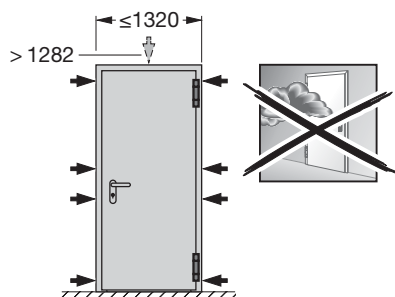
H3-1 OD



H3-2 OD



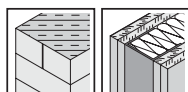
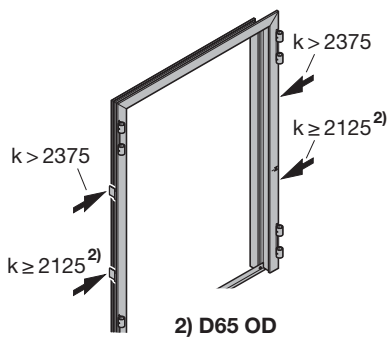
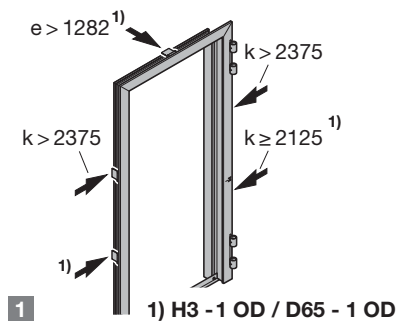
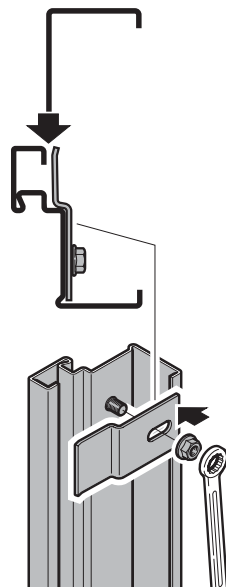
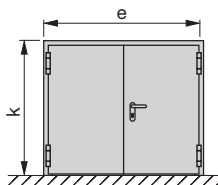
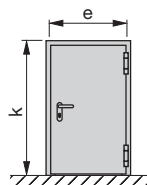
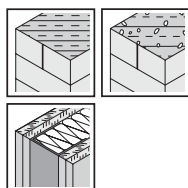
H6-1 OD / H16-1 OD



4) Fischer: FUR 10 × 160

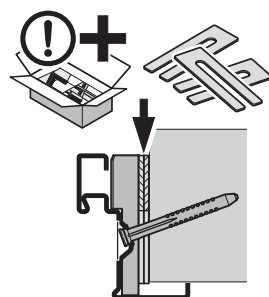
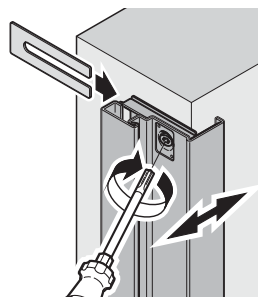
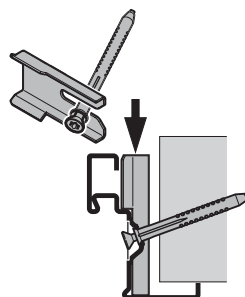
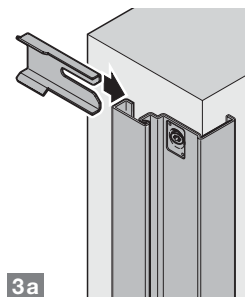
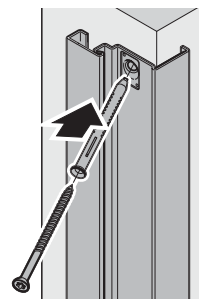
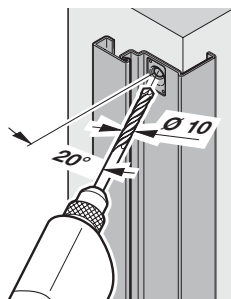
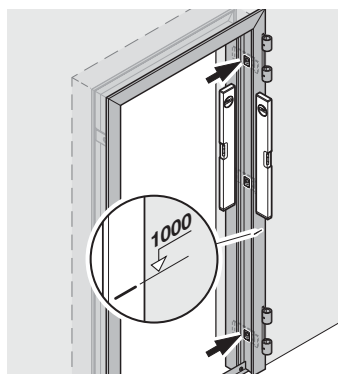
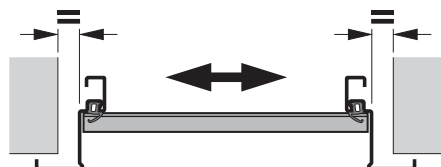
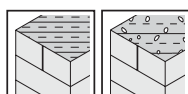
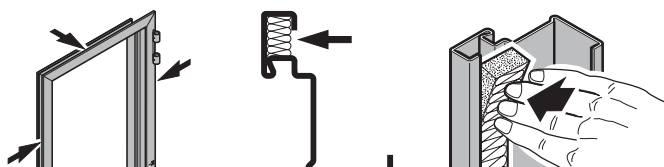
➔ C1.1 - C1.6 1 2 3 ...

C1.1 - C1.6

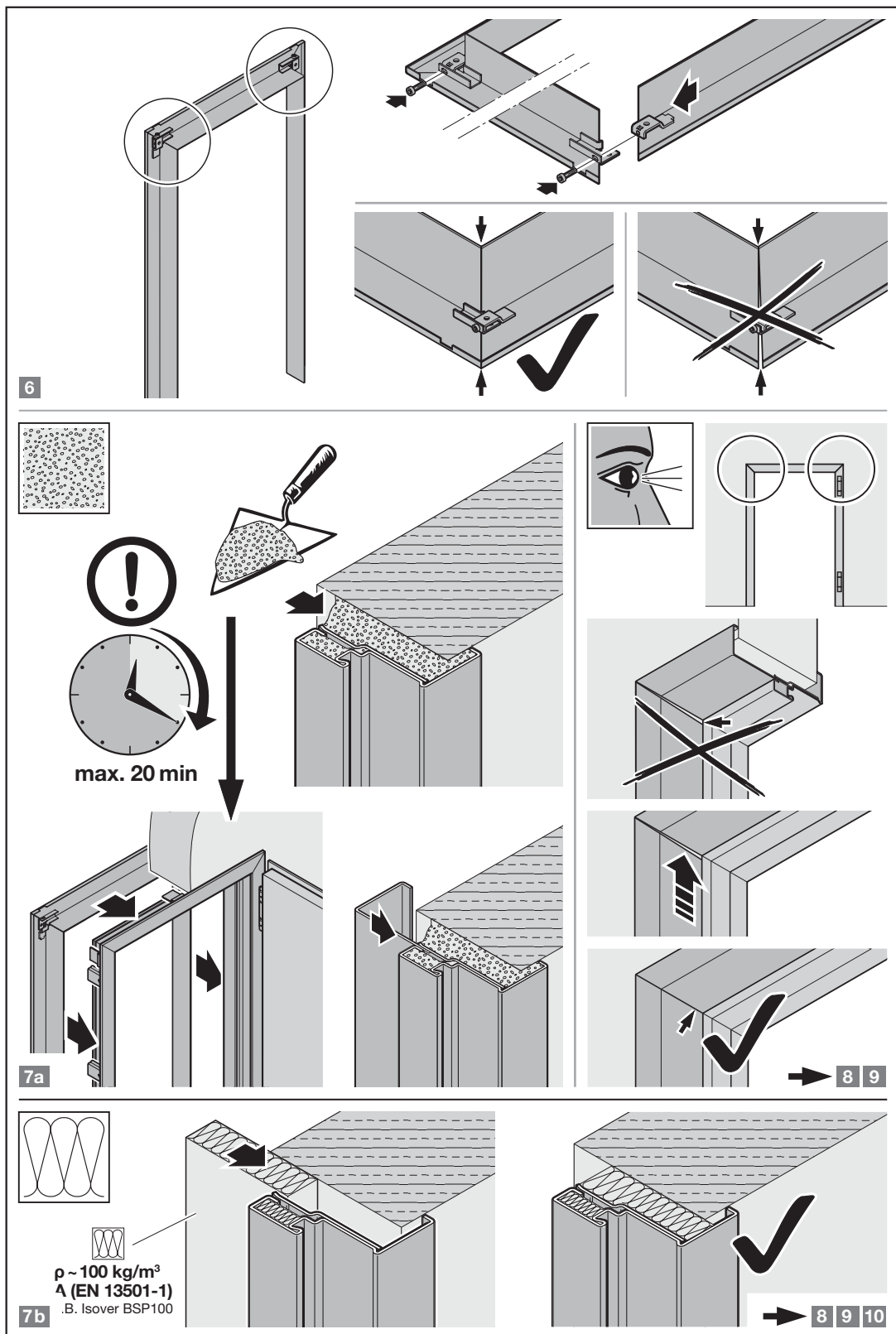


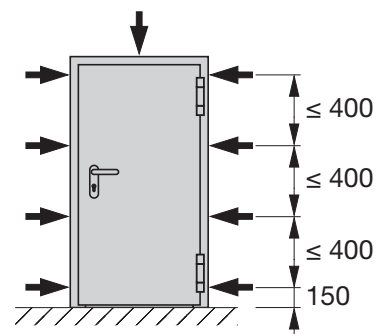
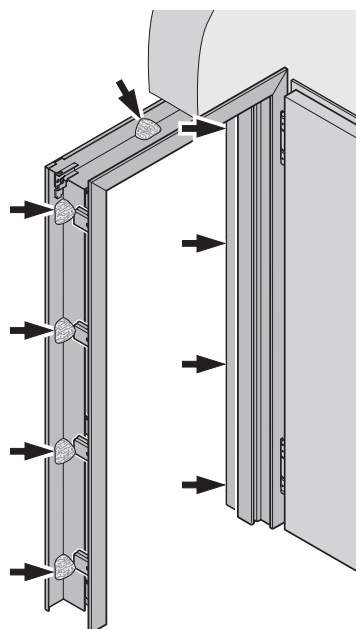
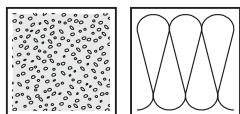
max. T30/EI₂30

2

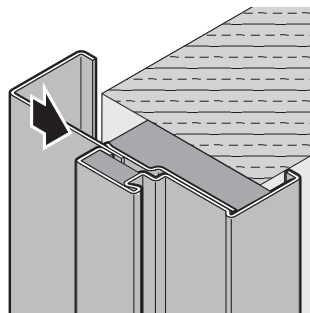
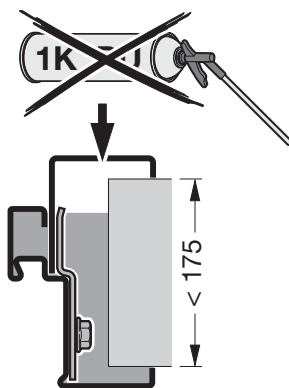


3a

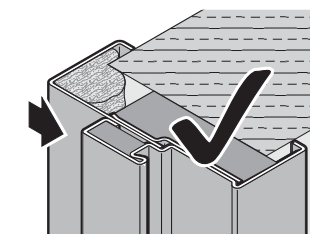
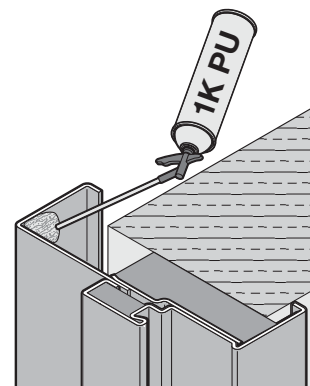
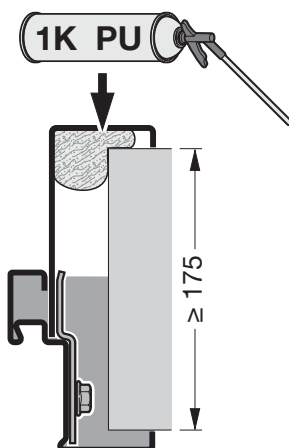




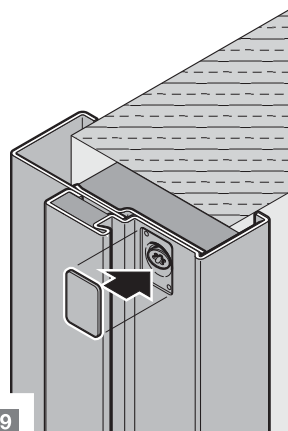
A



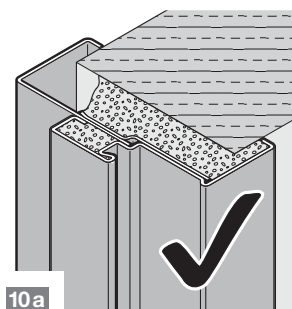
B



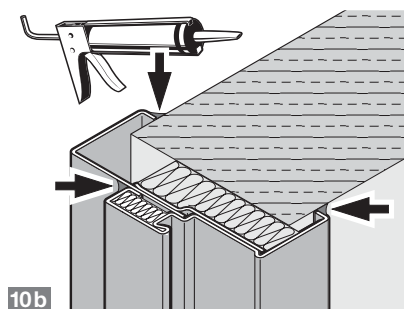
8



9

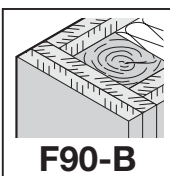


10a



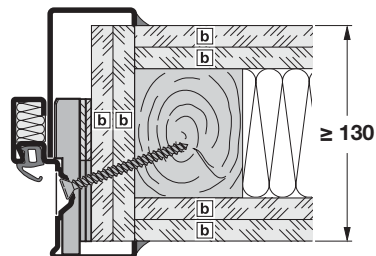
10b

2C Typ1
max. T30/EI₂₃₀

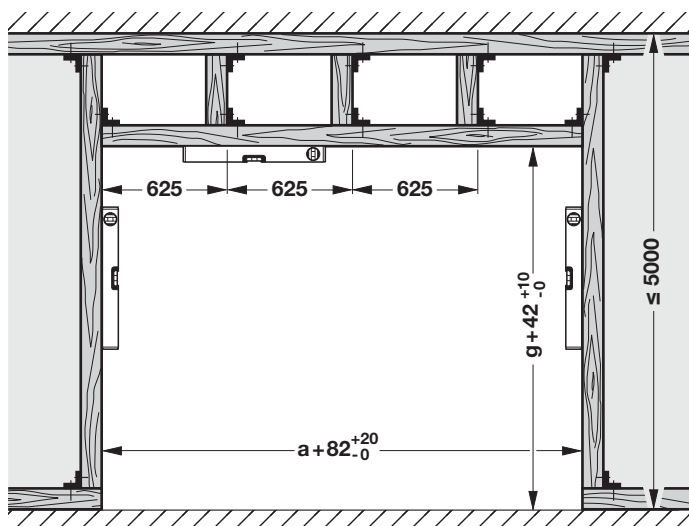
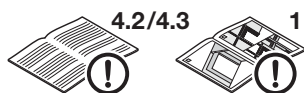
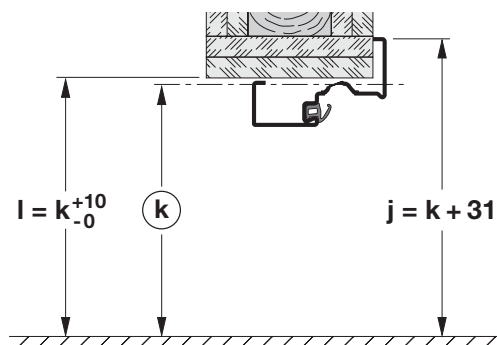
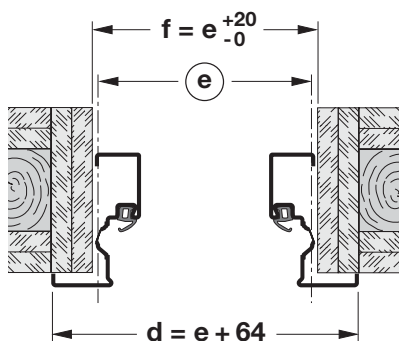
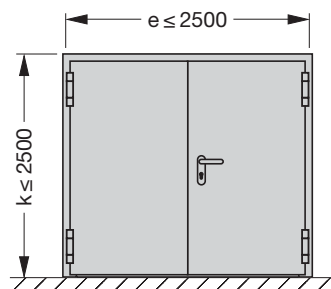
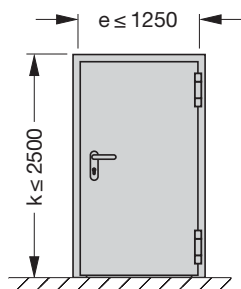


F90-B DIN 4102-4 Tab. 10.3

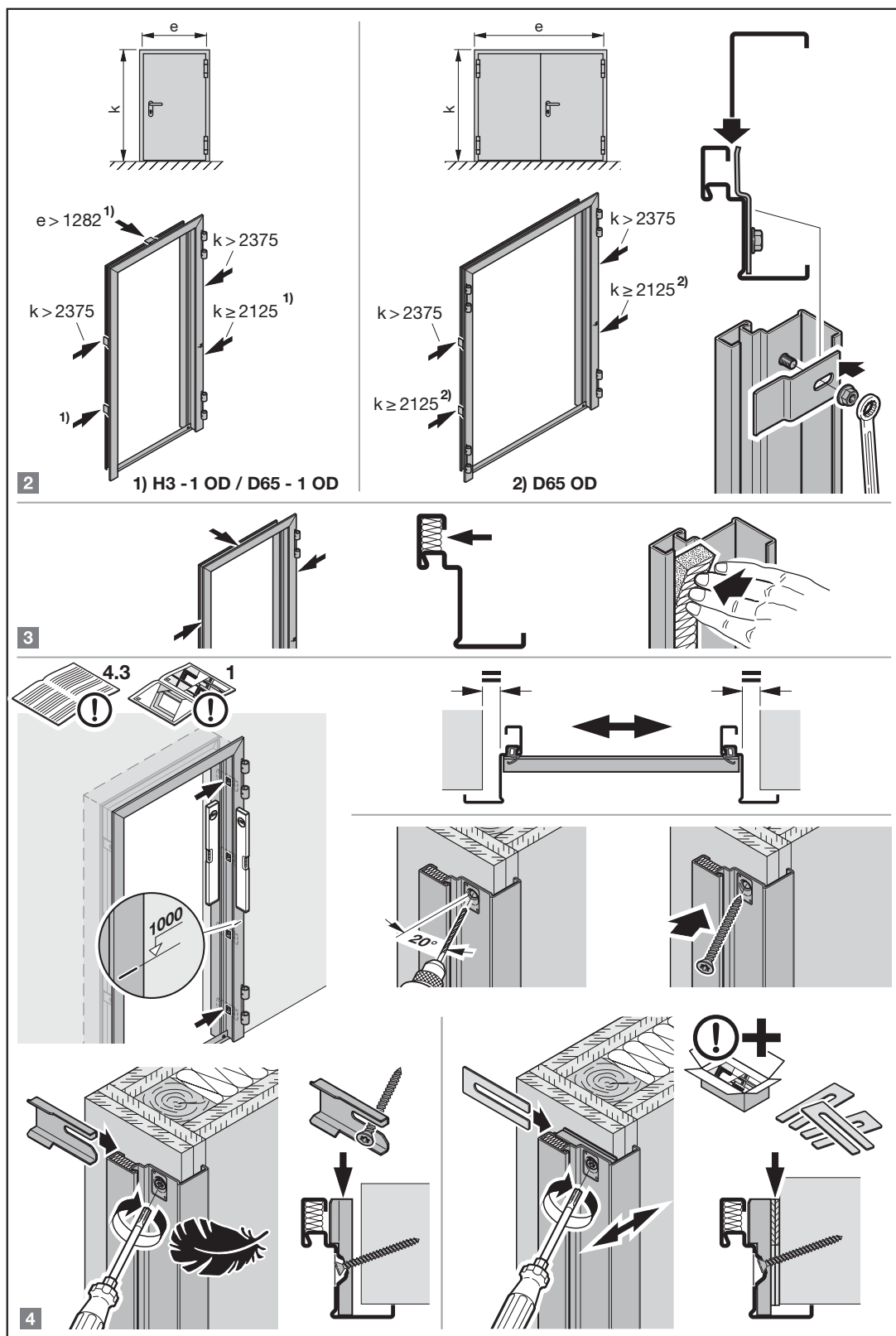
C1.7

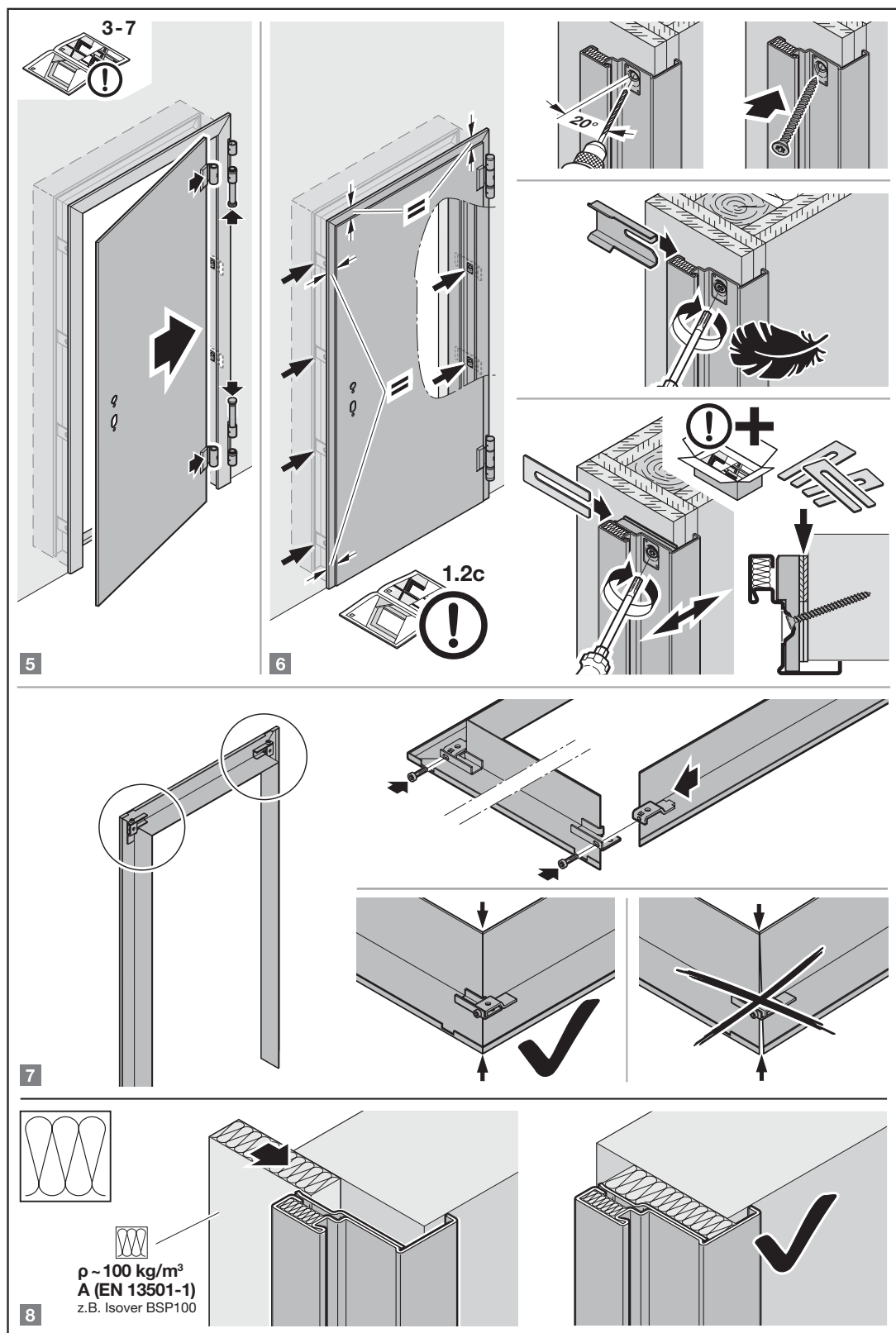


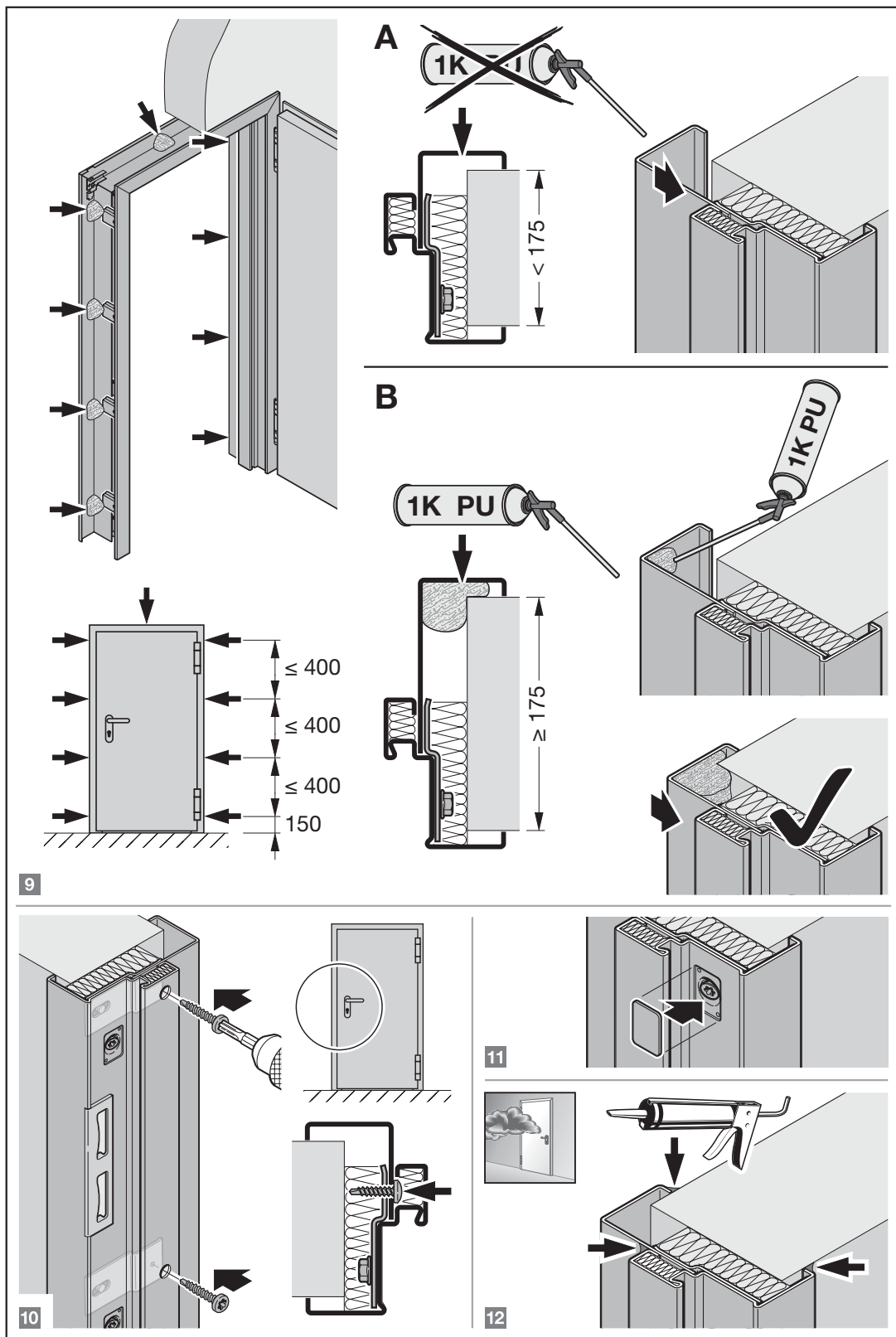
▣ A-12,5-EN 520



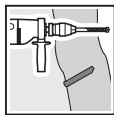
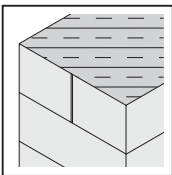
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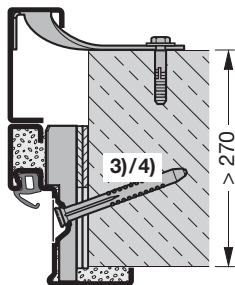




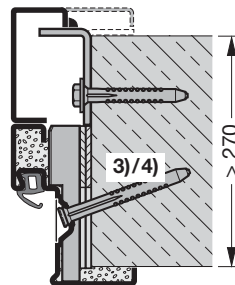
2C Typ2



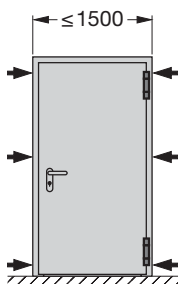
C2.1



C2.2

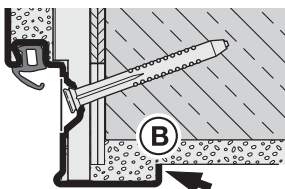
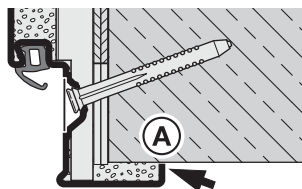
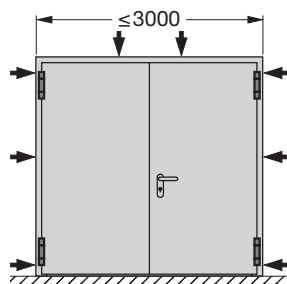


D65 - 1 OD

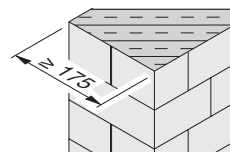


3) Fischer: FUR 10 × 100

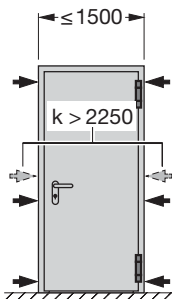
D65 - 2 OD



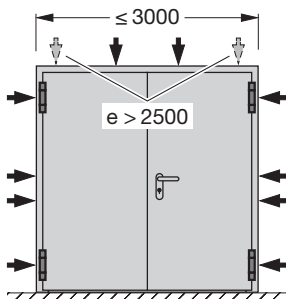
e	X
≤ 1320	1,0/1,5
≤ 1500	1,0



H3 - 1 OD



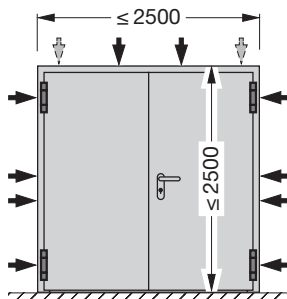
H3 - 2 OD



k ≤ 2500 ➔ 3) Fischer: FUR 10 × 100

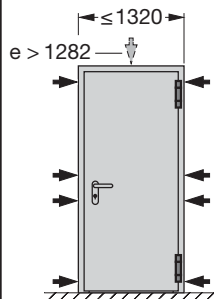
k > 2500 ➔ 4) Fischer: FUR 10 × 160

H6 - 2 OD H16 - 2 OD



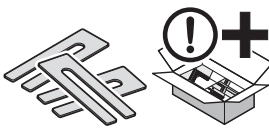
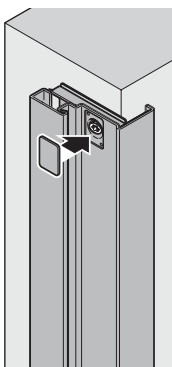
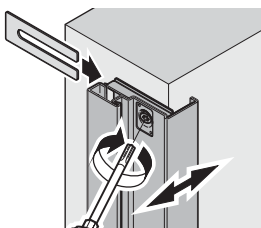
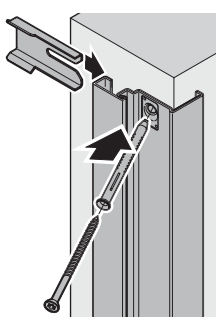
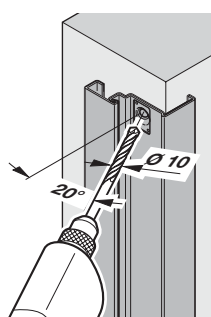
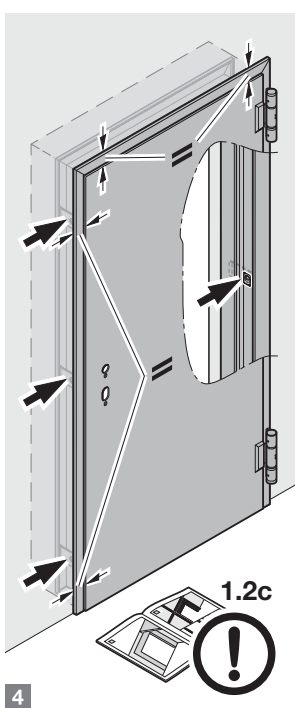
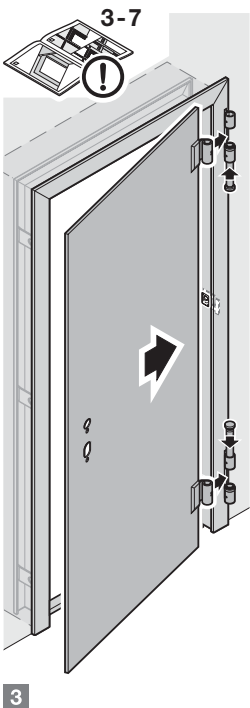
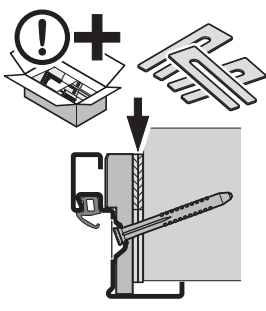
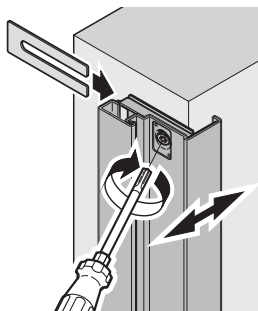
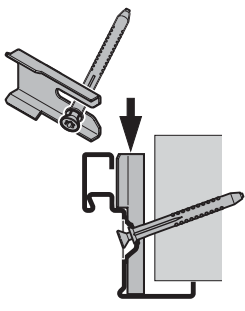
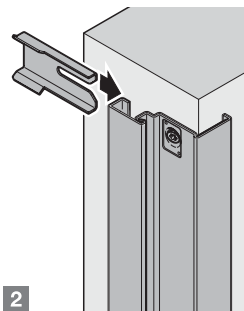
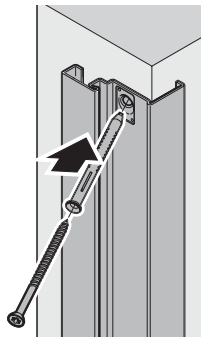
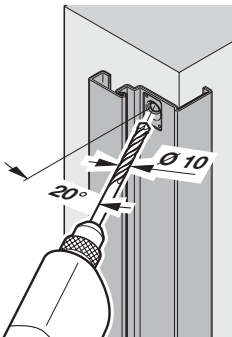
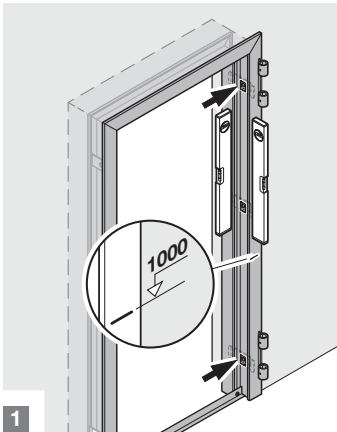
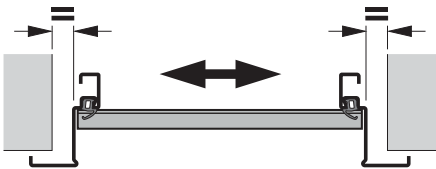
4) Fischer: FUR 10 × 160

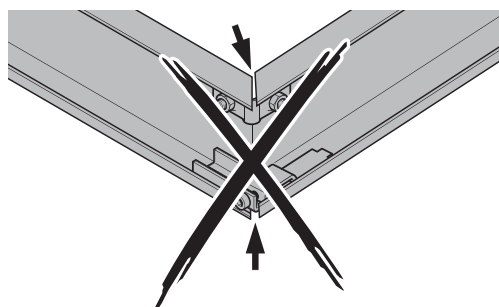
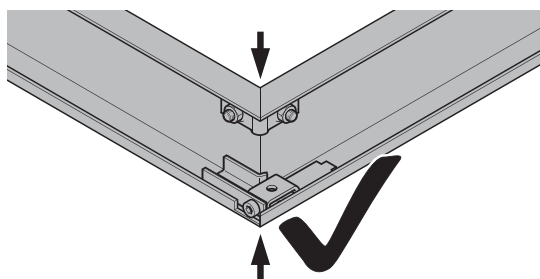
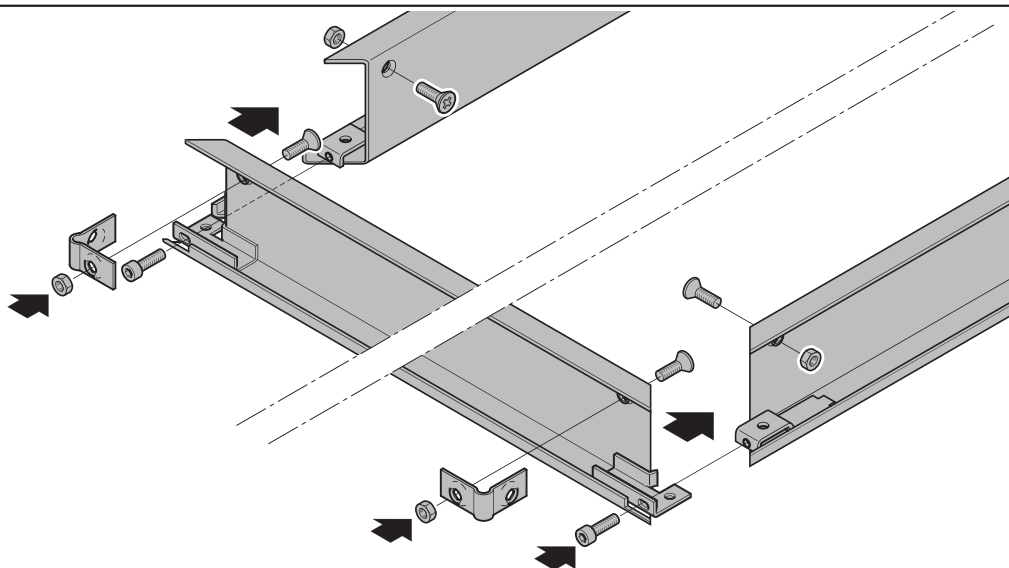
H6 - 1 OD H16 - 1 OD



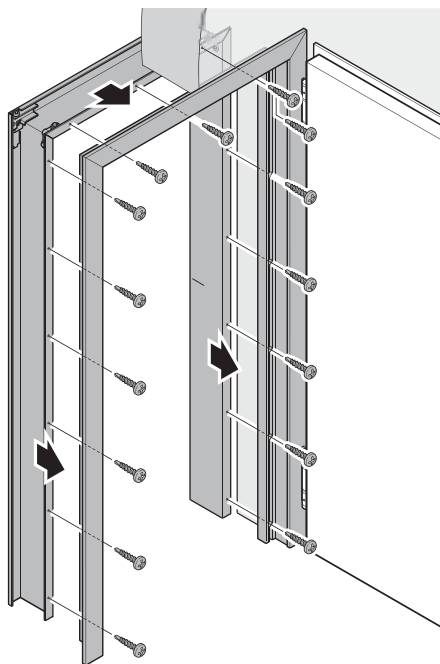
➔ C2.1 / C2.2 1 2 3 ...

C2.1 / C2.2

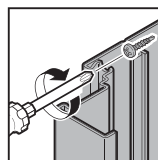




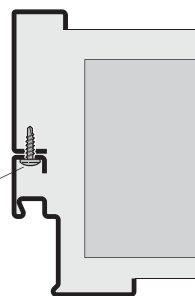
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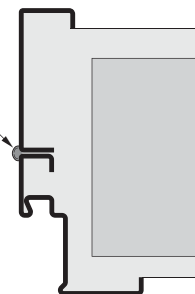
6a



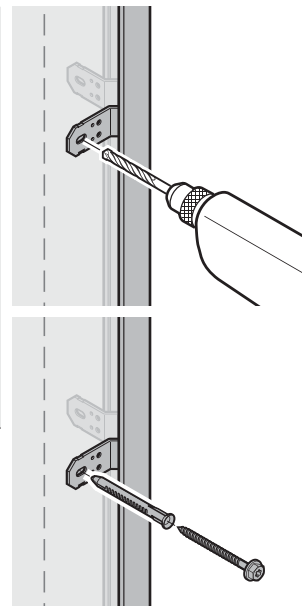
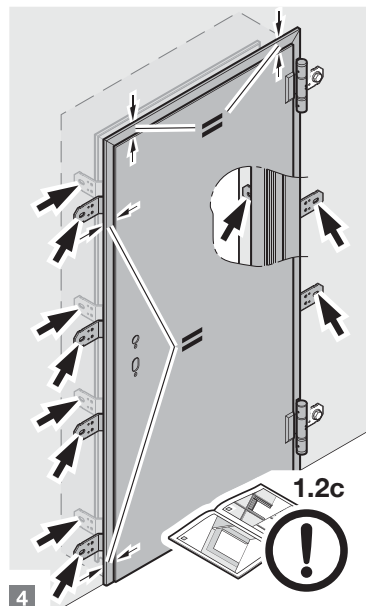
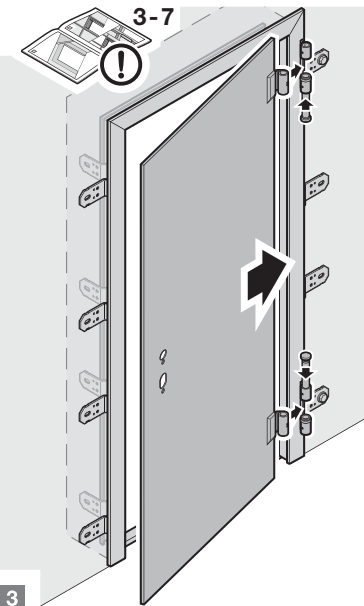
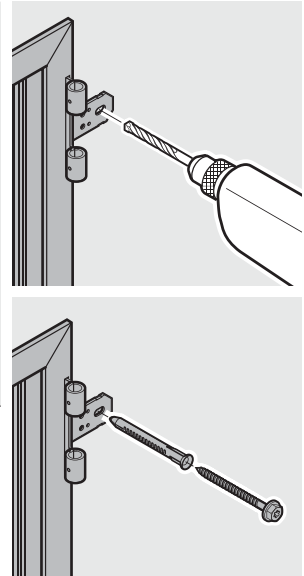
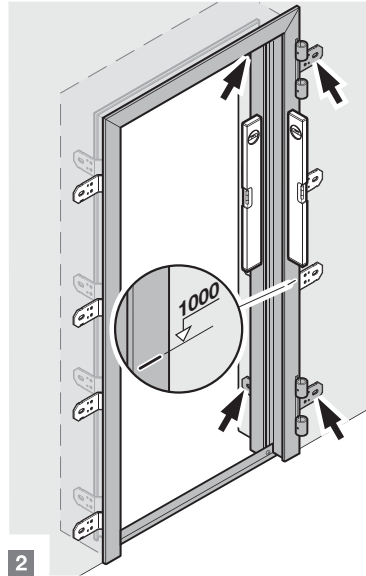
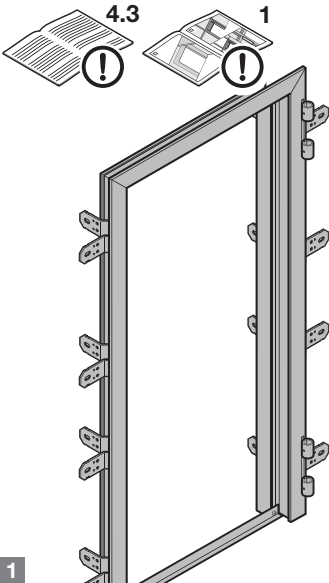
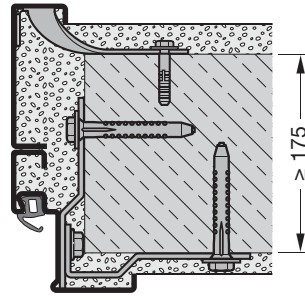
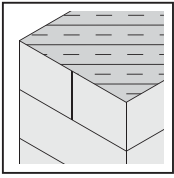
DIN 7504 ST 4,8 × 19-N-H
DIN 7981 4,8 × 16

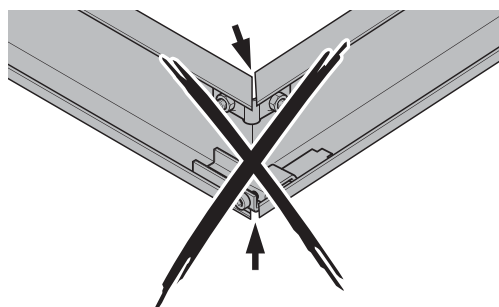
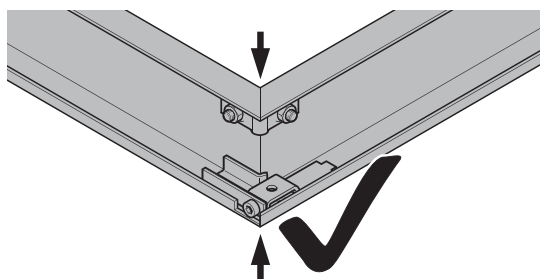
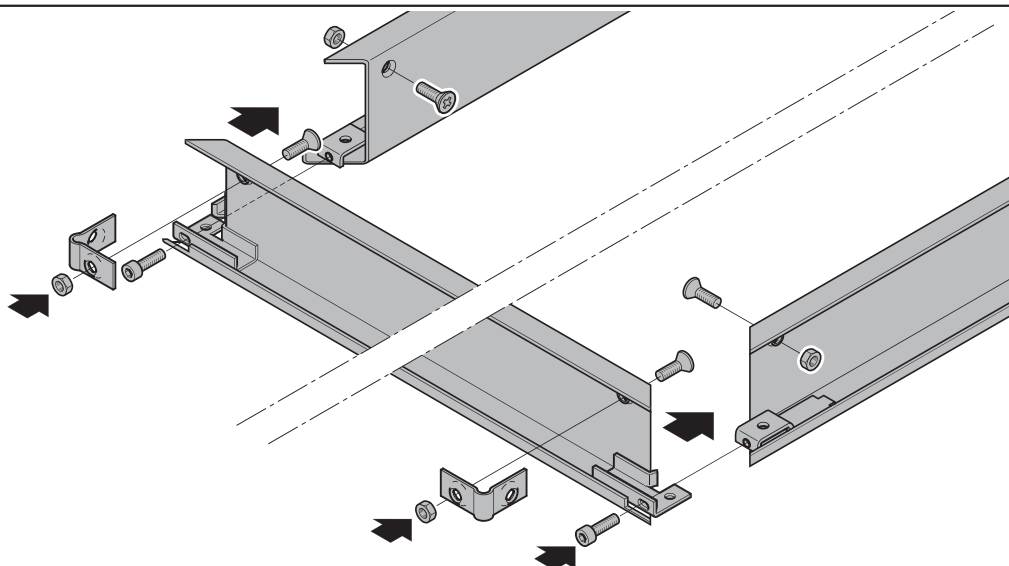


$2\sqrt{x} > 10$

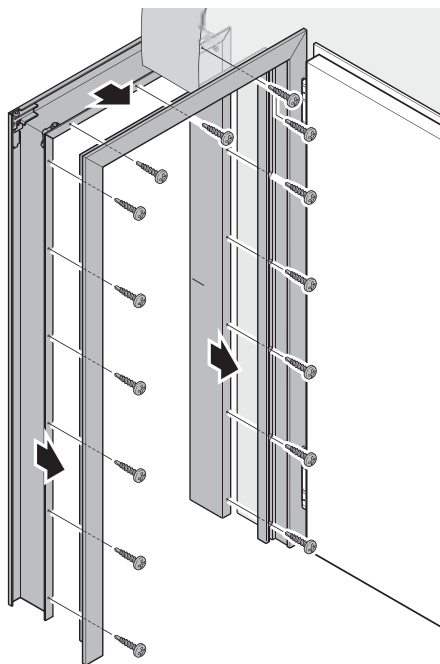


6b

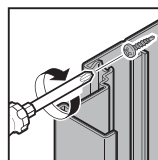
2C**Typ3****C3.1**



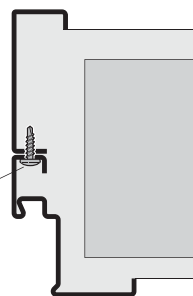
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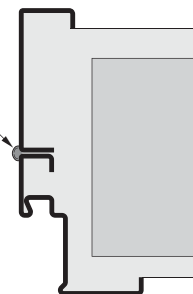
6a



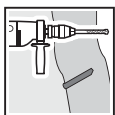
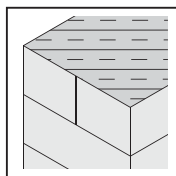
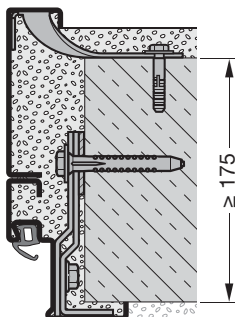
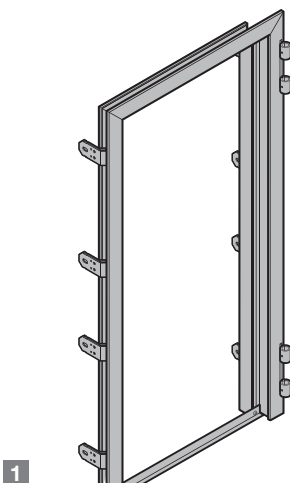
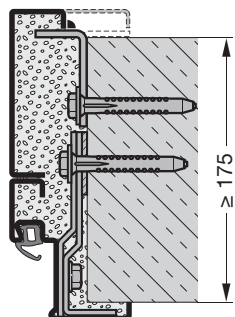
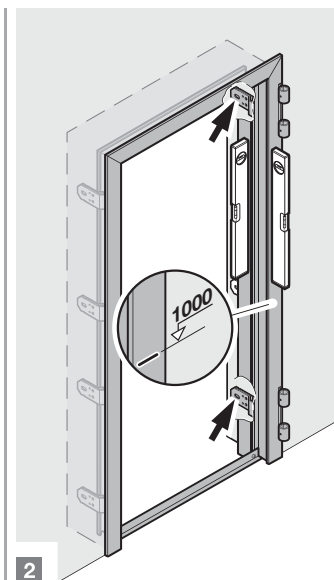
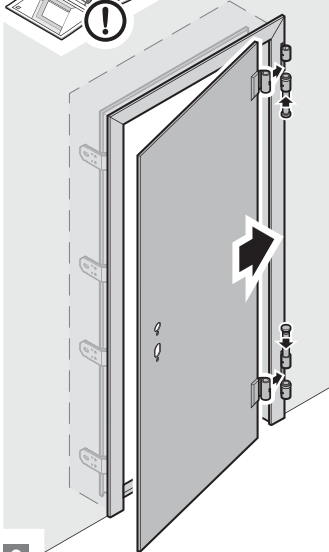
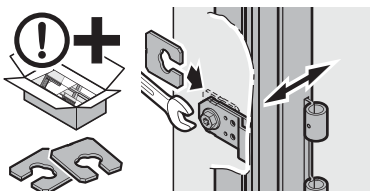
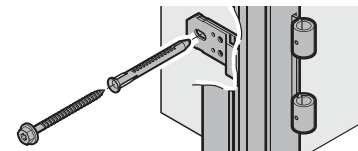
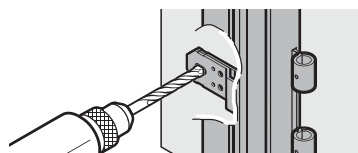
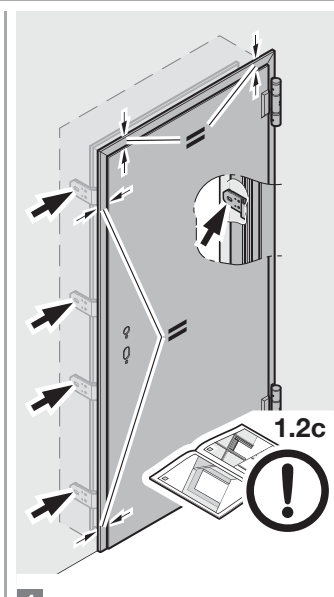
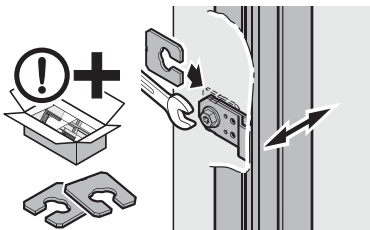
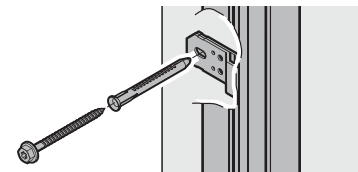
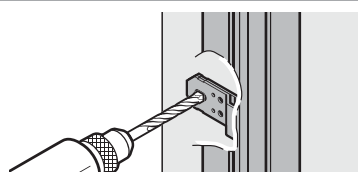
DIN 7504 ST 4,8 × 19-N-H
DIN 7981 4,8 × 16

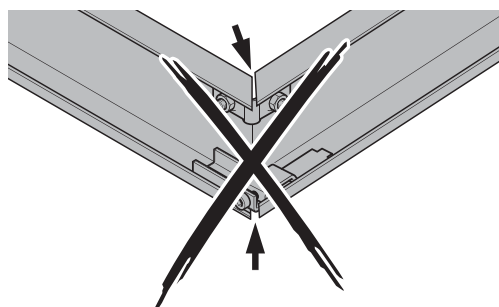
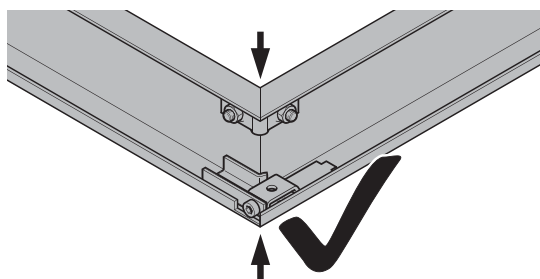
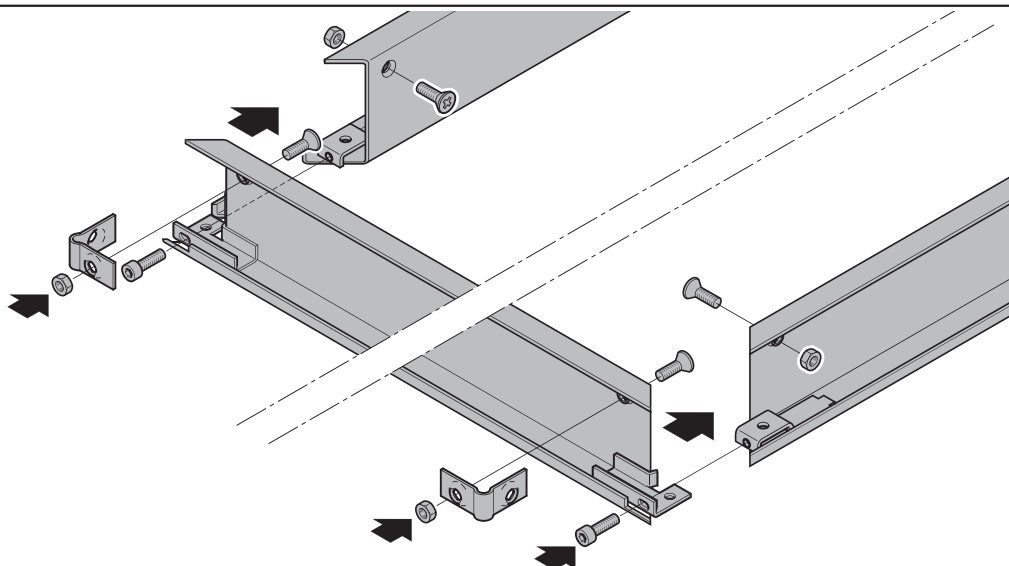


$2\sqrt{x} > 10$

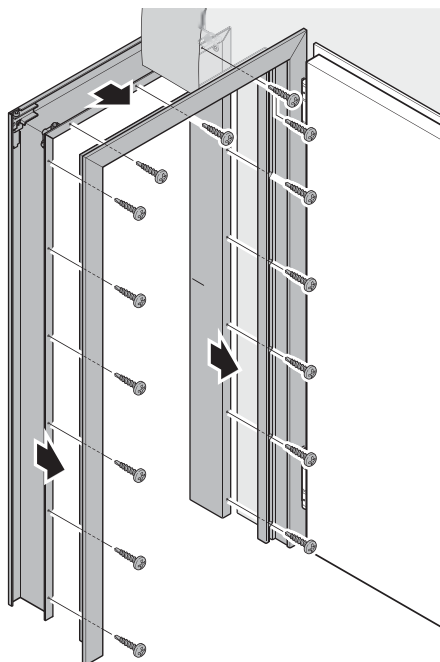


6b

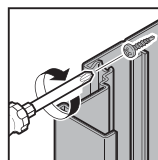
2C**Typ3****C3.2****C3.3****1****2****3****4**



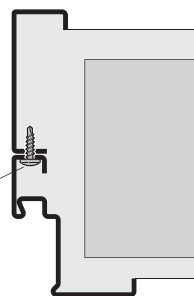
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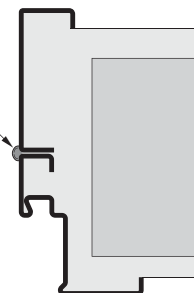
6a



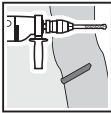
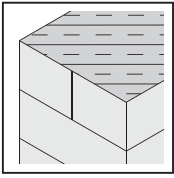
DIN 7504 ST 4,8 × 19-N-H
DIN 7981 4,8 × 16



$2\sqrt{x} > 10$

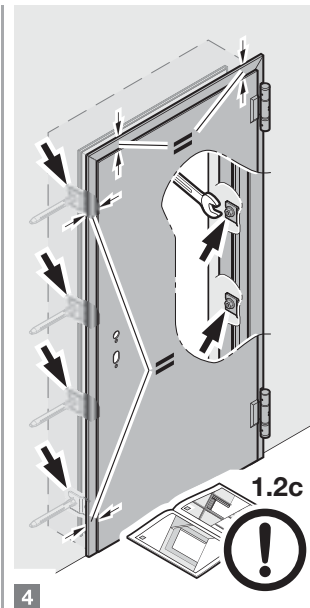
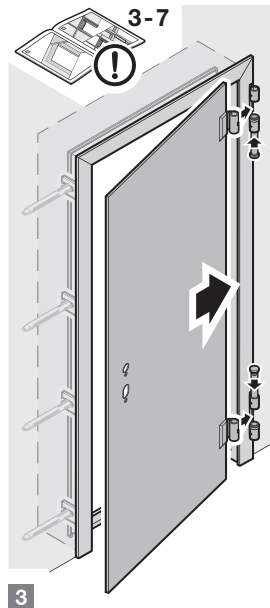
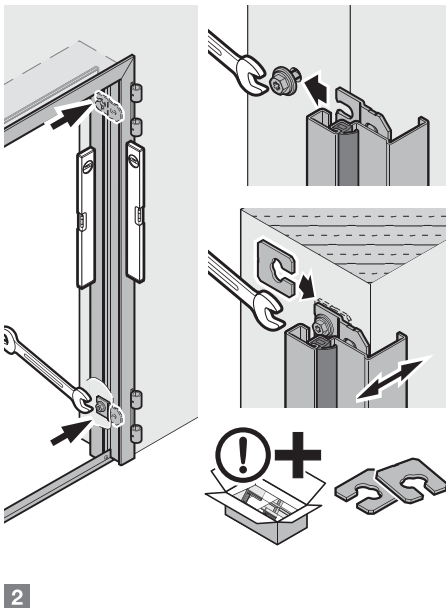
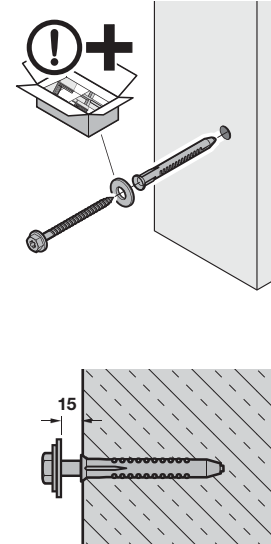
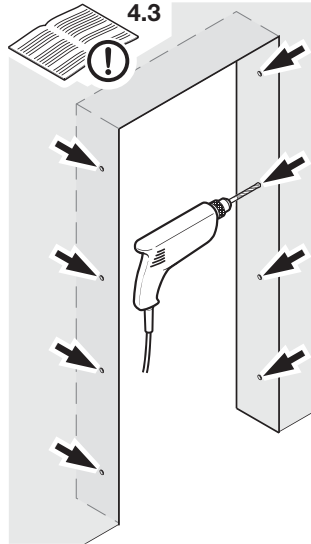
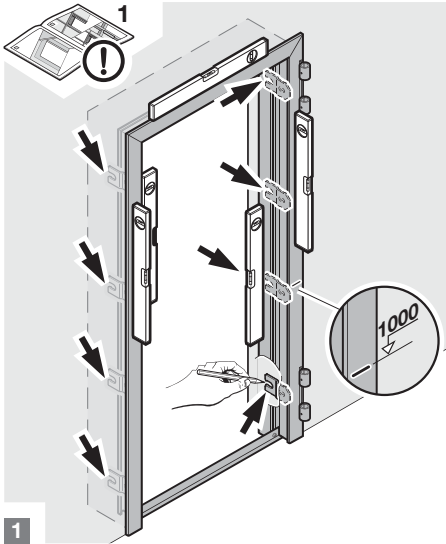
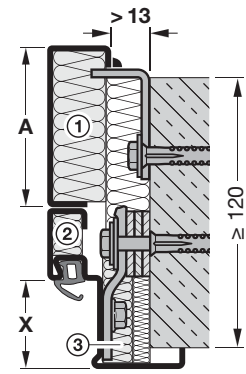
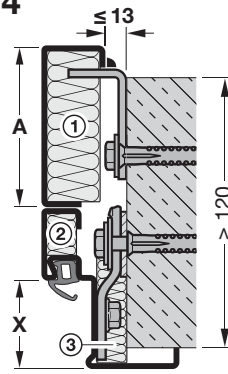


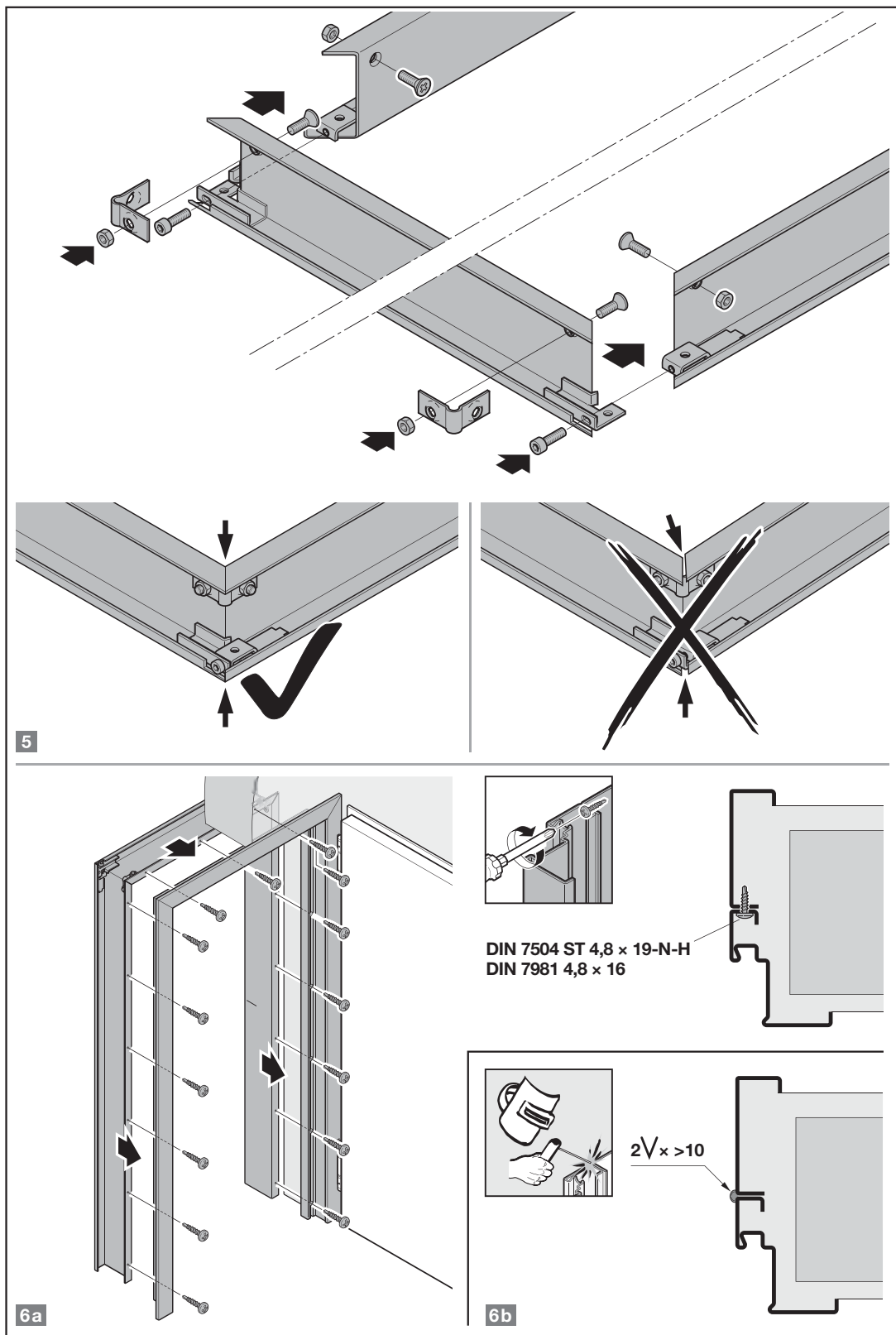
6b

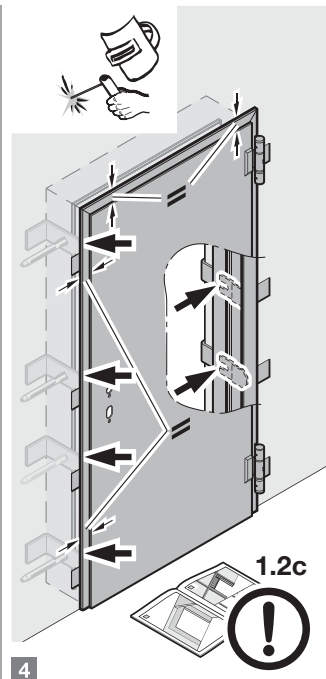
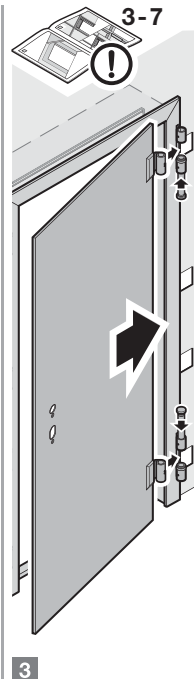
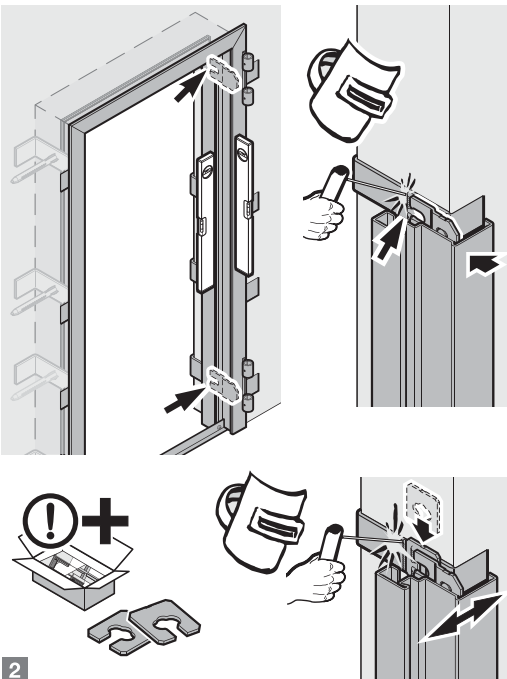
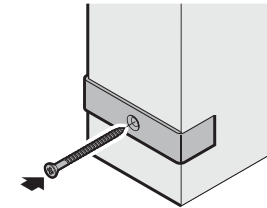
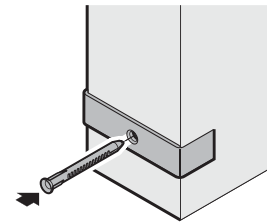
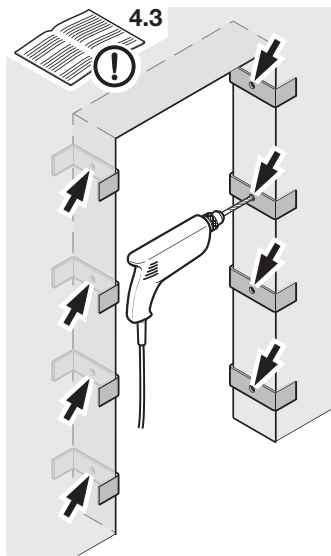
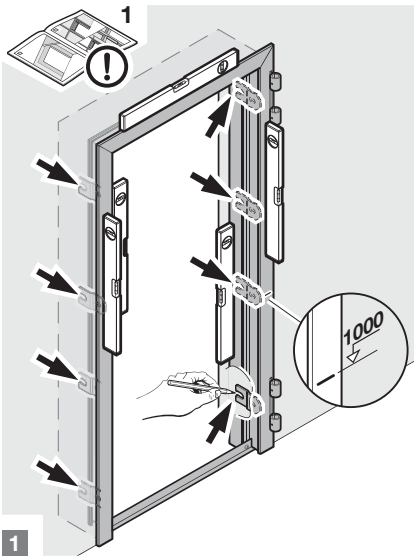
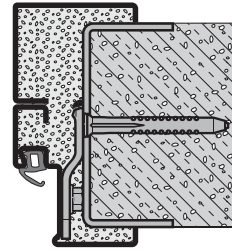
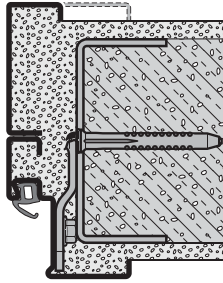
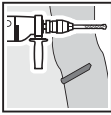
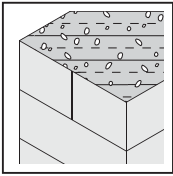
2C**Typ3****max. T30**

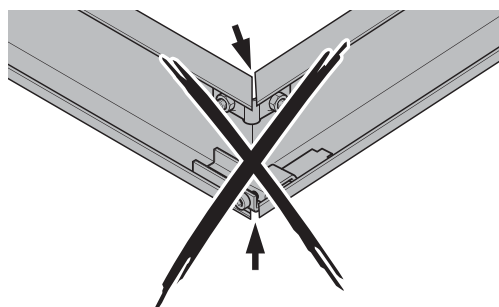
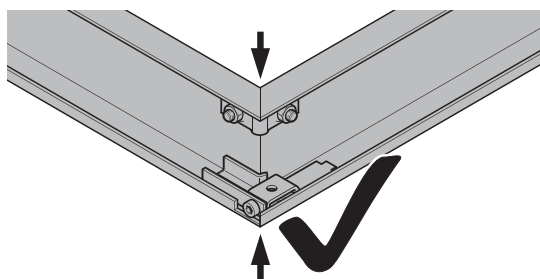
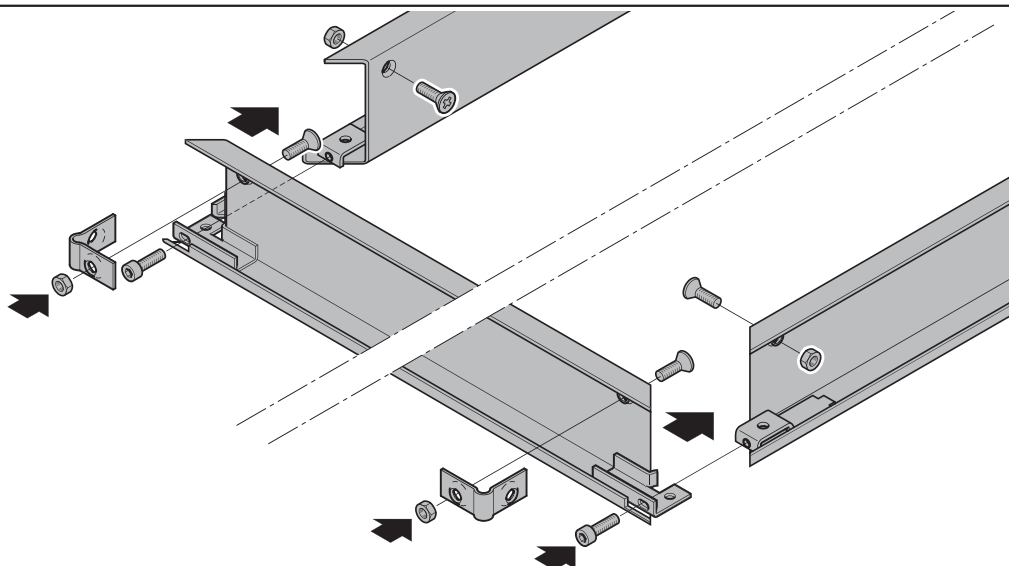
$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
 z.B. Isover BSP100

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

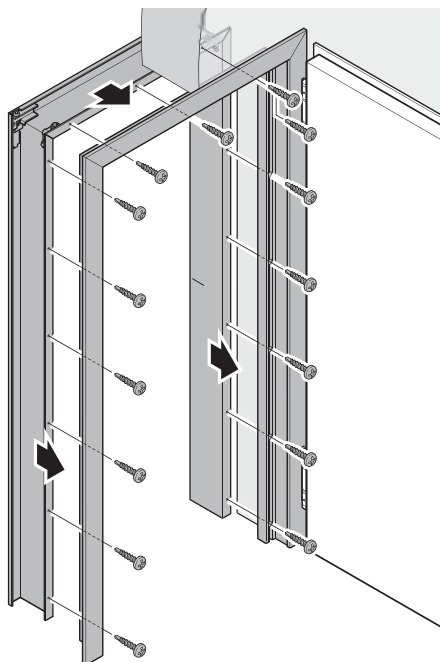
C3.4



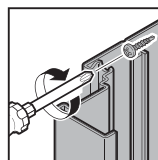
2C**Typ3****C3.5**



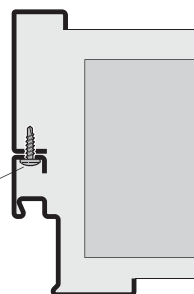
5



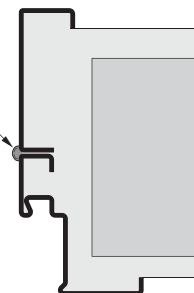
6a



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

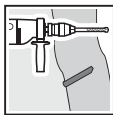
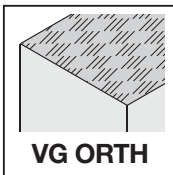


$2\sqrt{x} > 10$

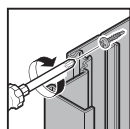


6b

2C Typ3 max. T30



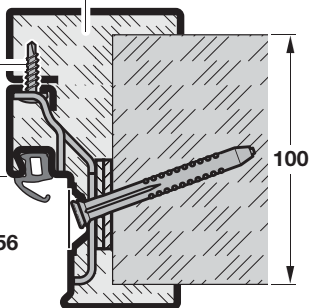
C3.6



DIN 7981
4,8 x 16

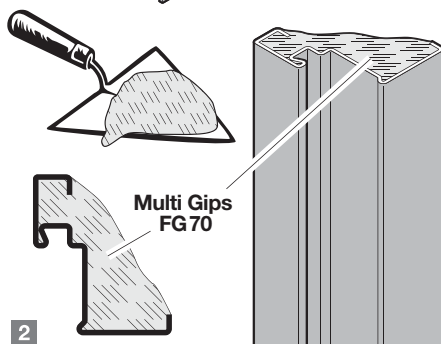
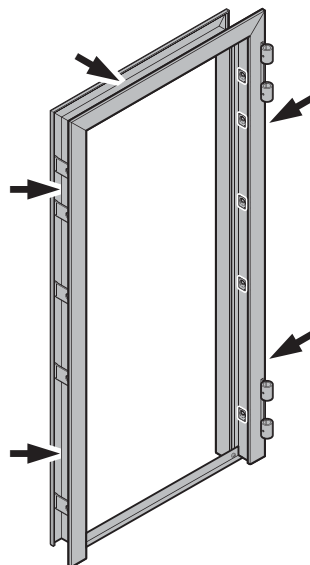
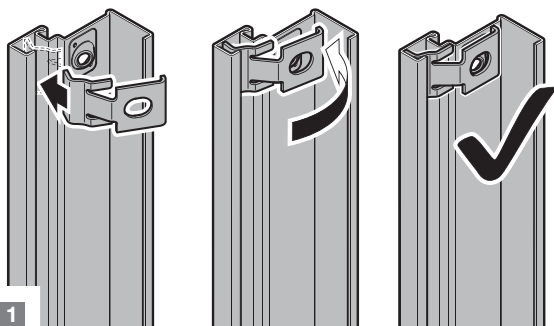
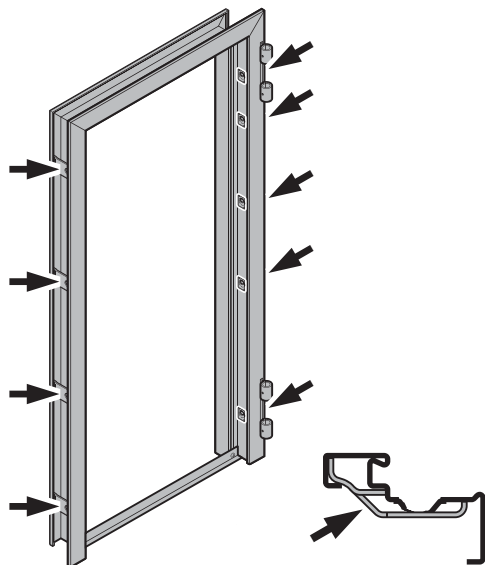
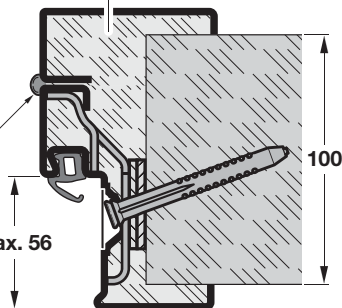
max. 56

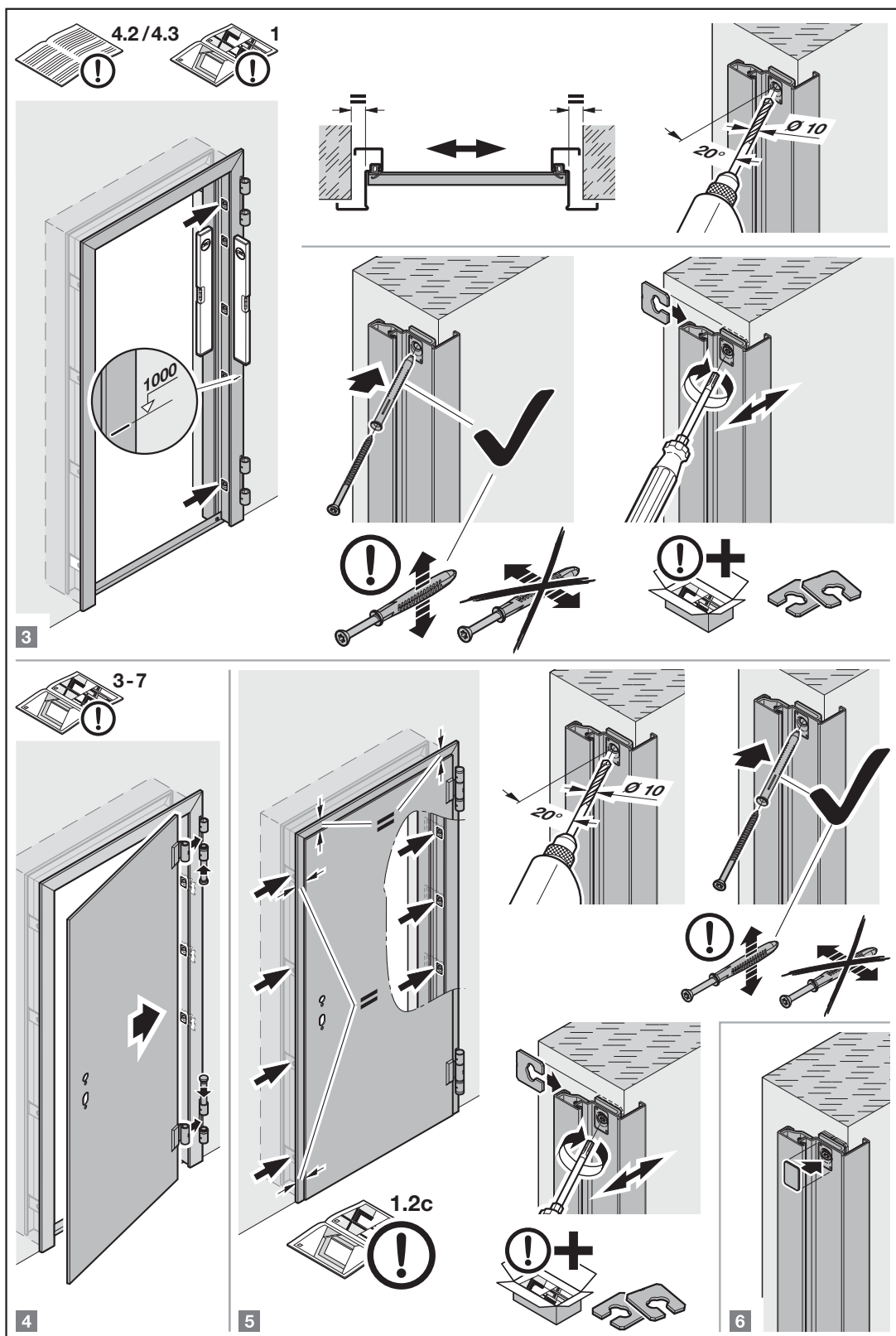
Multi Gips
FG70

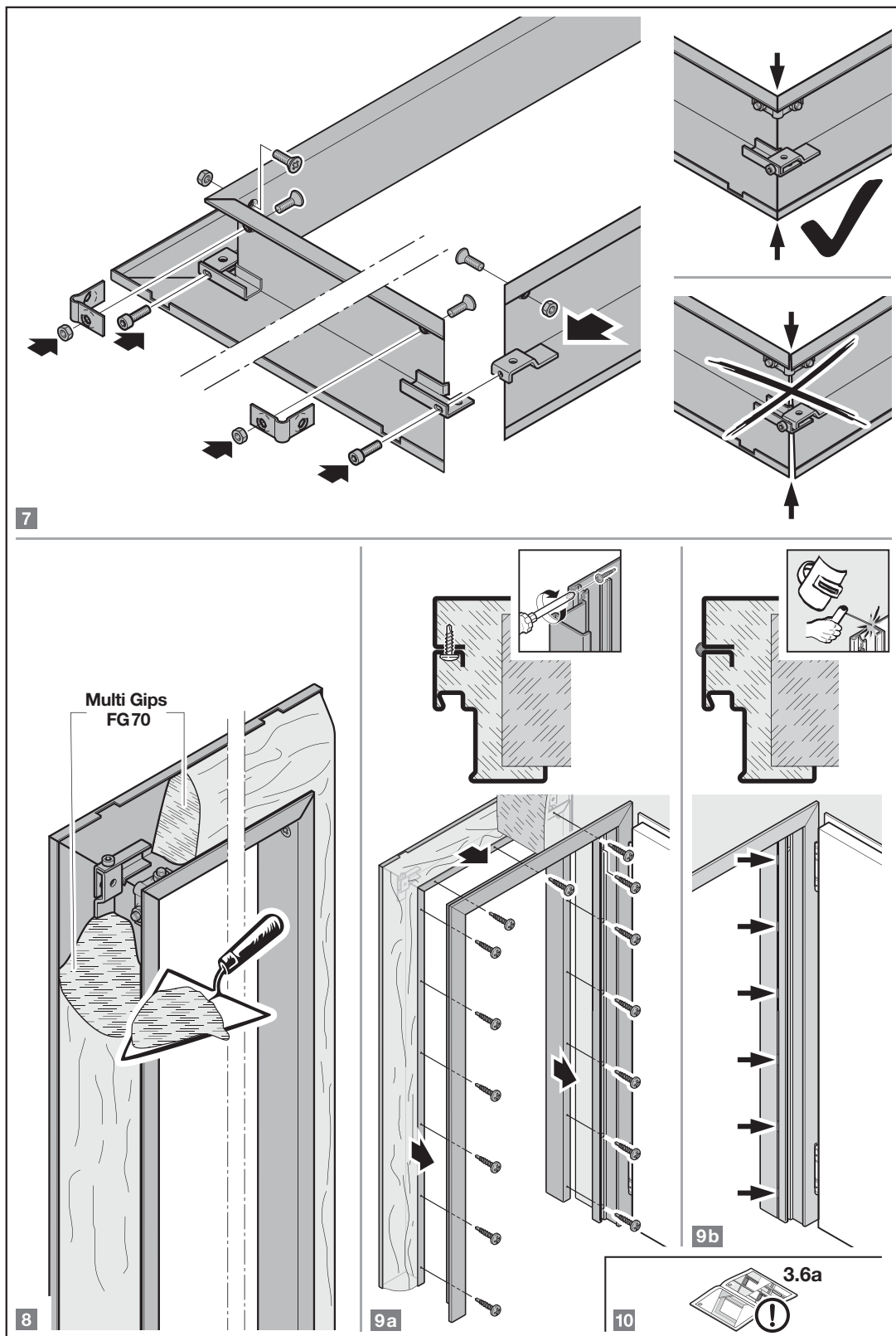


max. 56

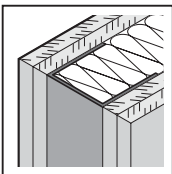
Multi Gips
FG70







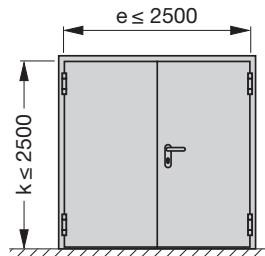
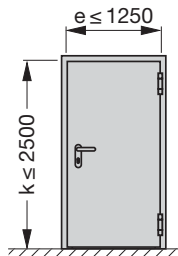
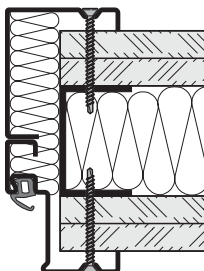
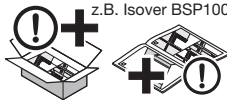
2C Typ4



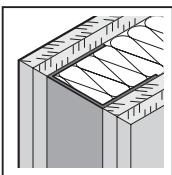
C4.1 max. T30/EI₂30

$\rho \sim 40 \text{ kg/m}^3$
A (EN 13501-1)

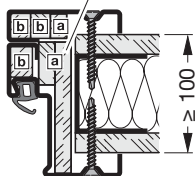
z.B. Isover BSP100



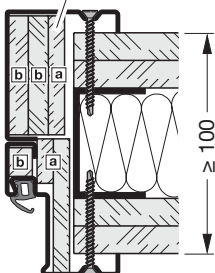
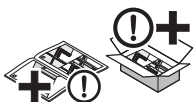
➔ C4.1 - C4.4 1 2 3 ...



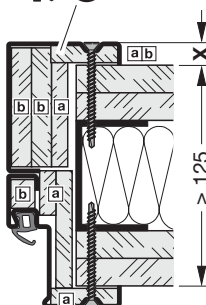
C4.2 T30/EI₂30



C4.3 T30/EI₂30

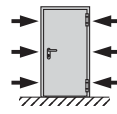
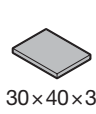
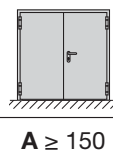
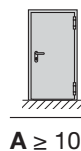
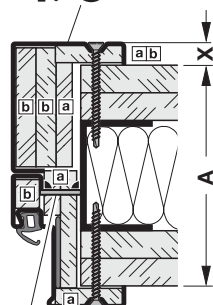


C4.4 T60/EI₂60



X a = 10
X b = 15

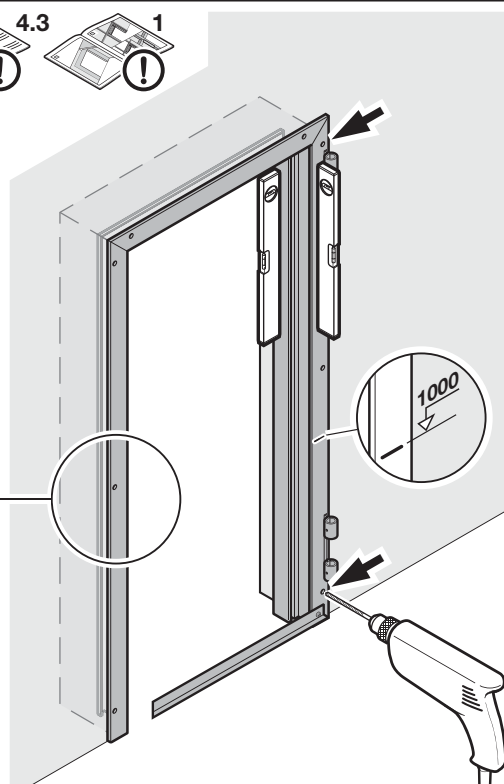
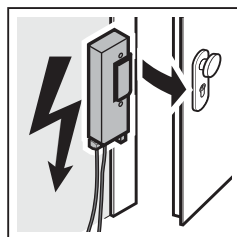
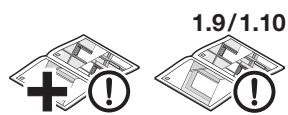
T90/EI₂90



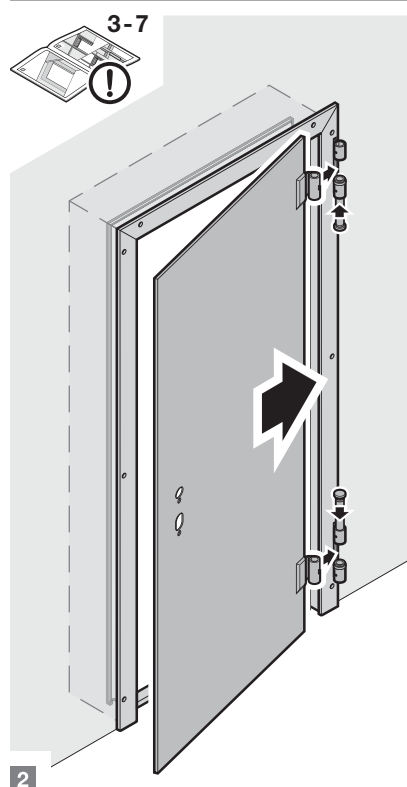
a DF-9,5-EN 520 / b DF-12,5-EN 520

➔ C4.1 - C4.4 1 2 3 ...

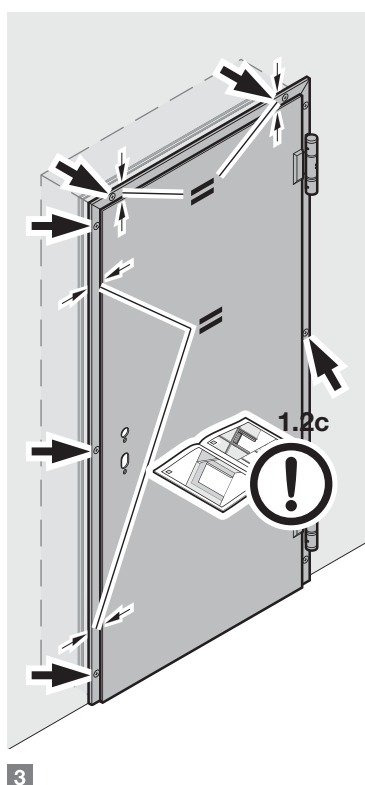
C4.1 - C4.4



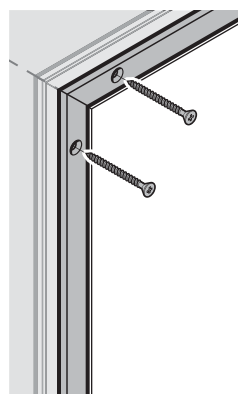
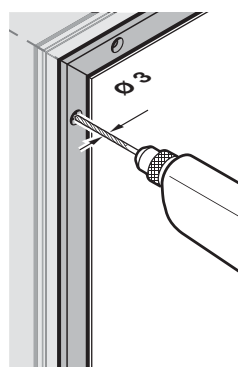
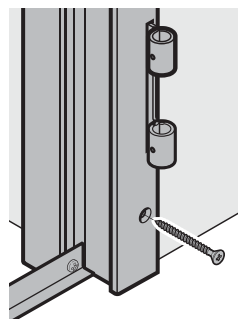
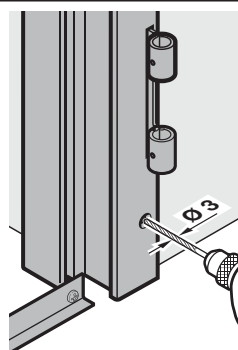
1

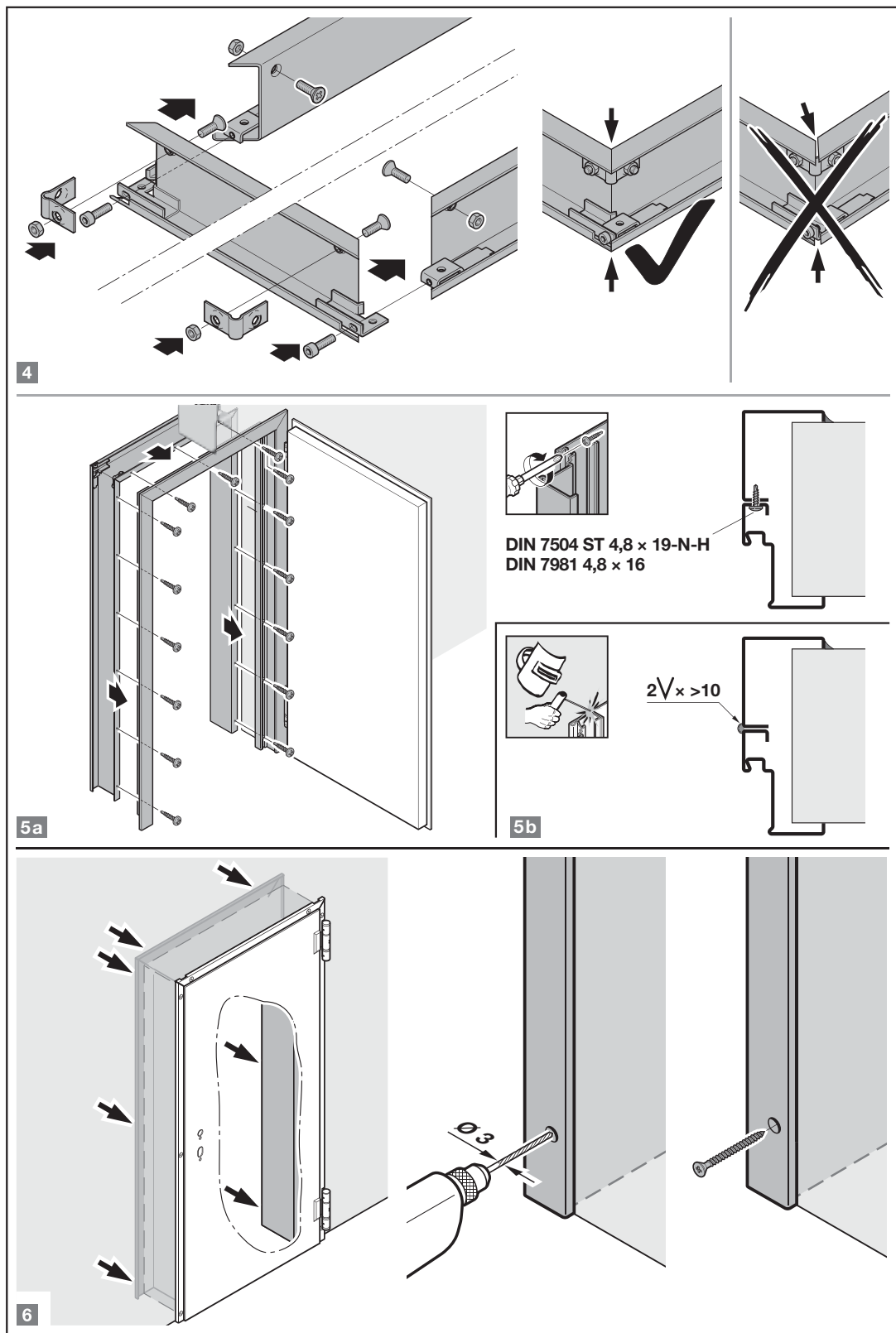


2

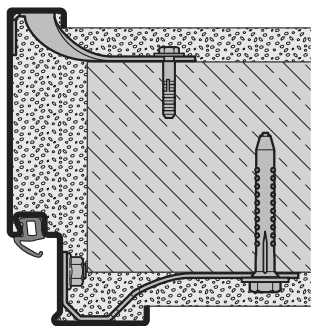
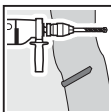


3

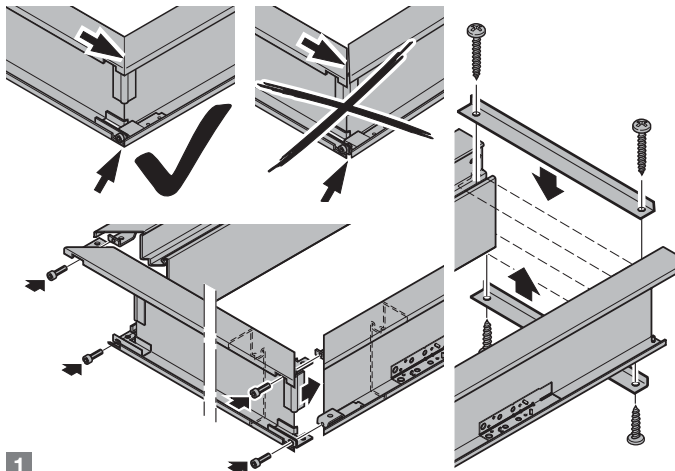




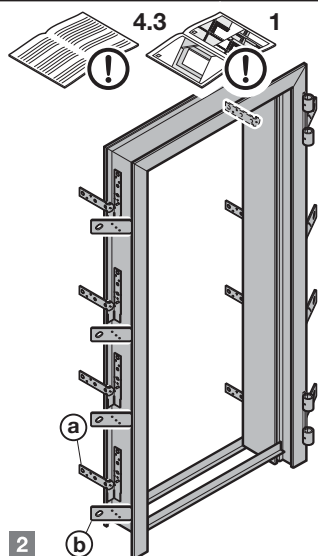
2D Typ 1 D1.1



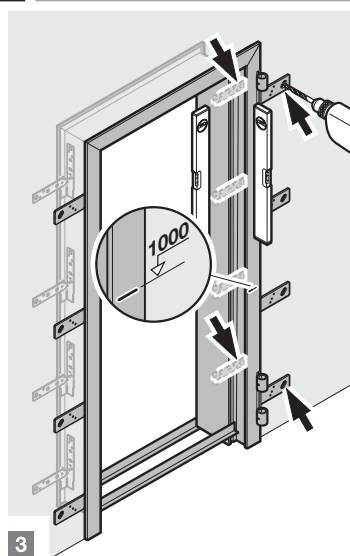
15



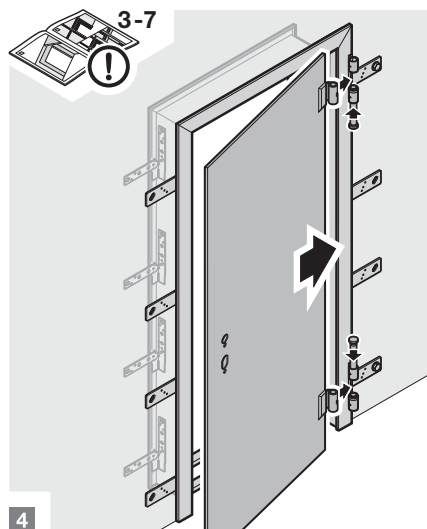
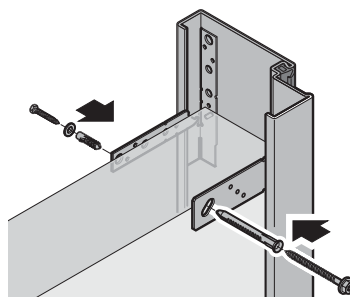
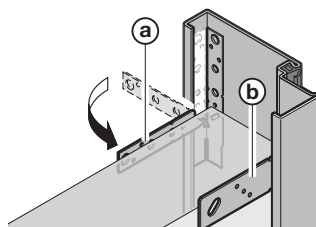
1



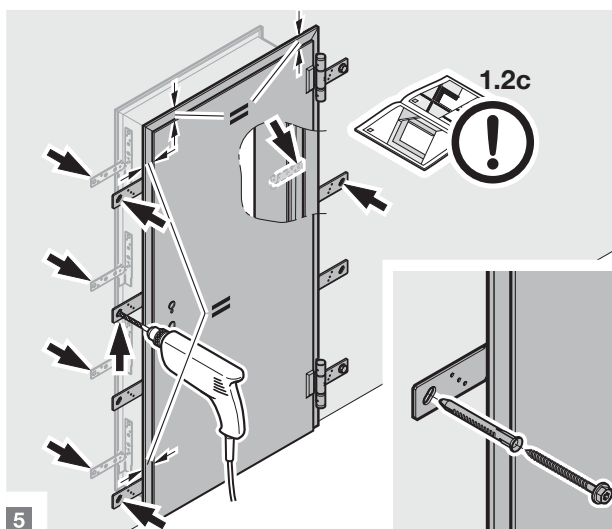
2



3

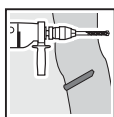
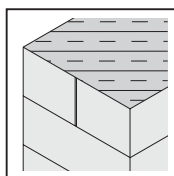


4

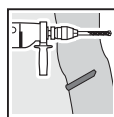
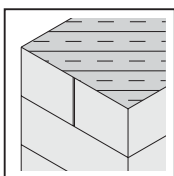
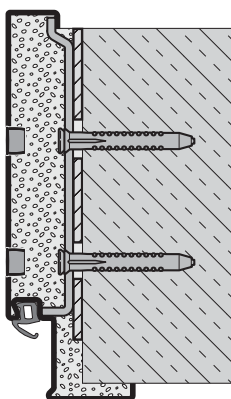


5

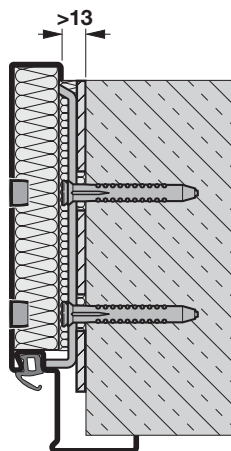
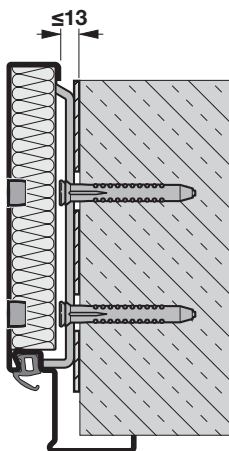
2D Typ 1



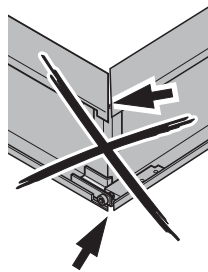
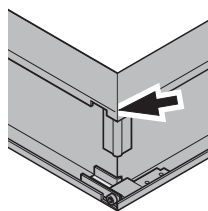
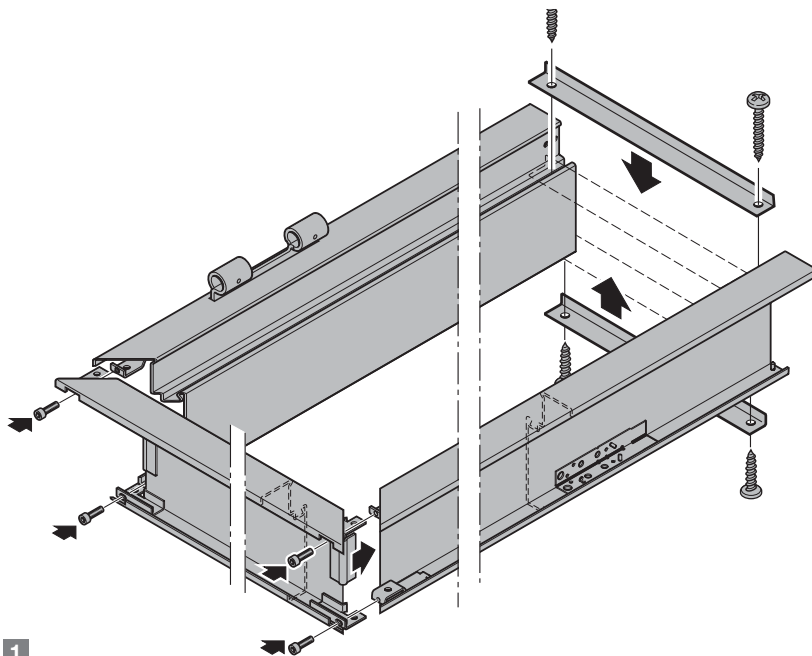
D1.2



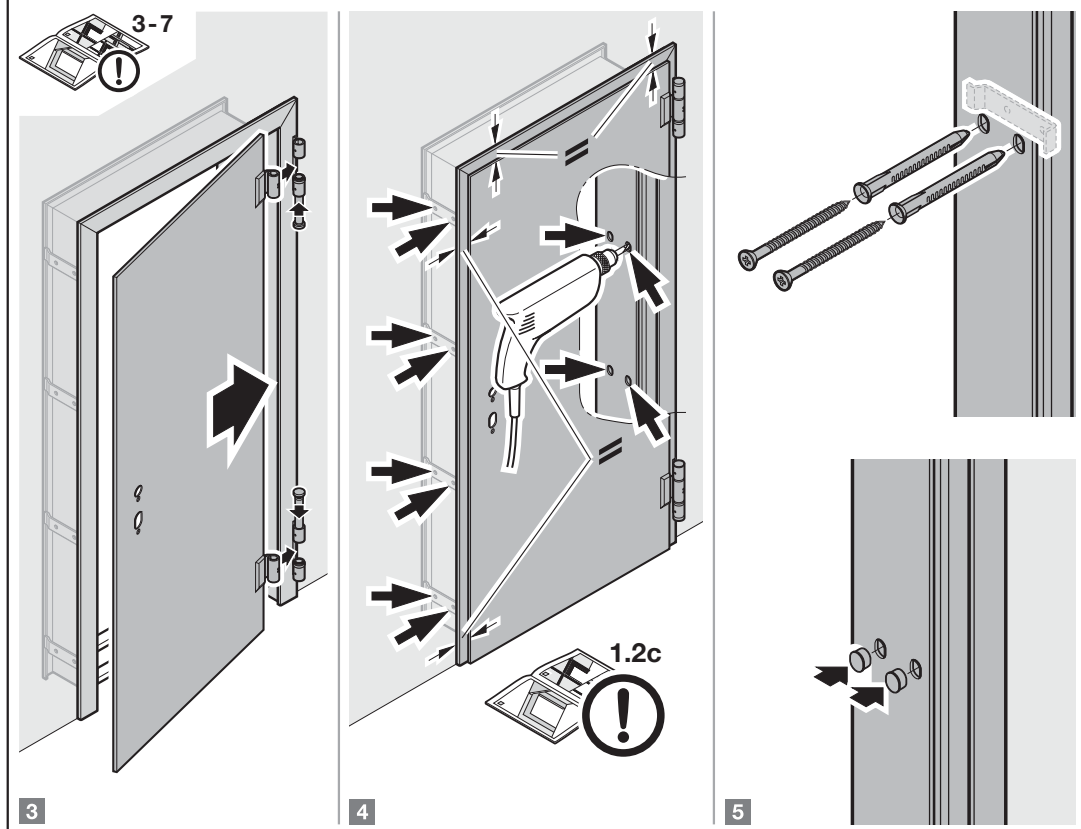
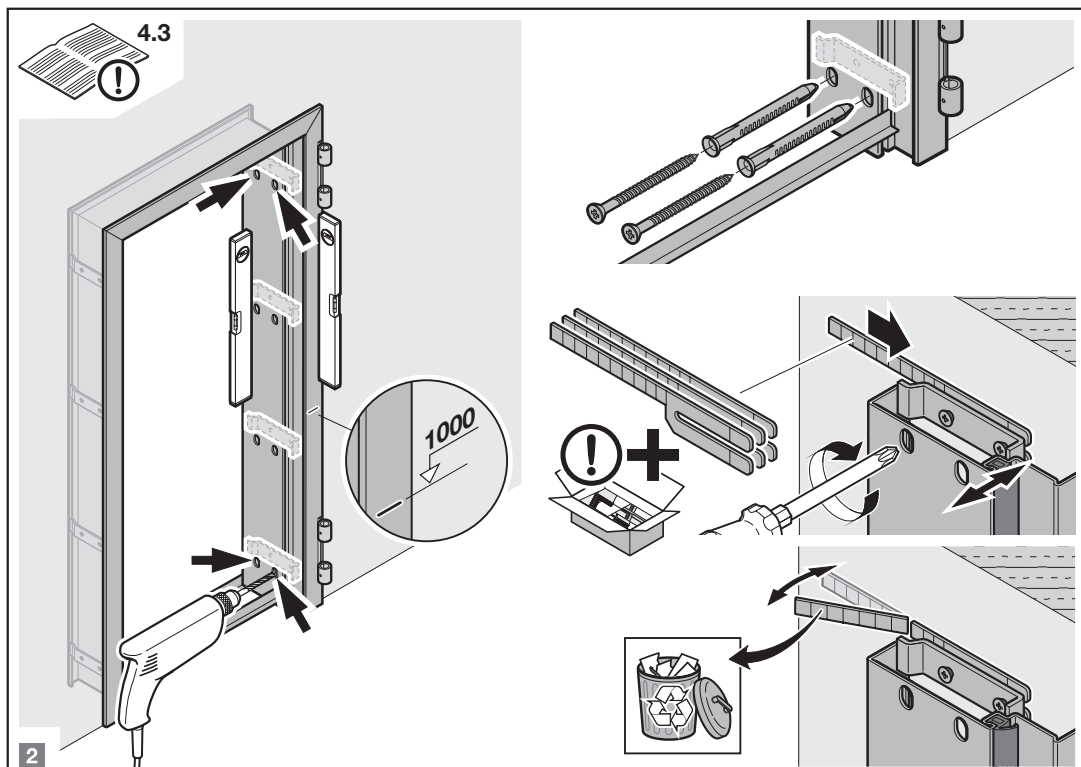
D1.3
max. T30/EI₂30



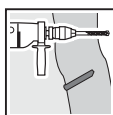
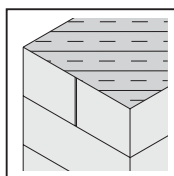
 $\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100



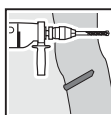
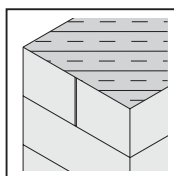
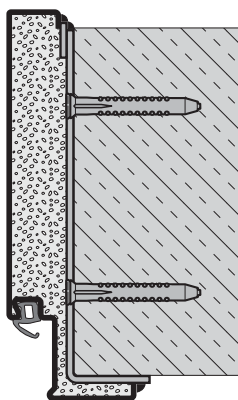
1



2D Typ 1

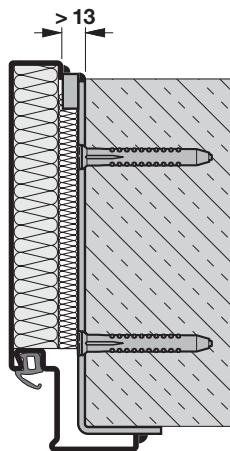
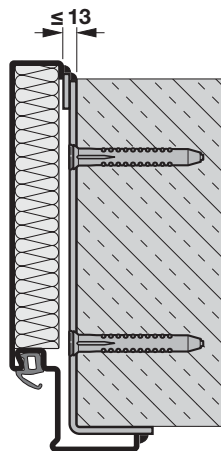


D1.4

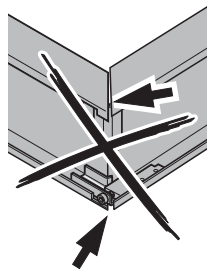
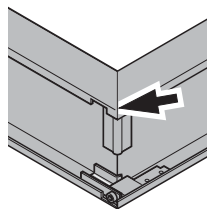
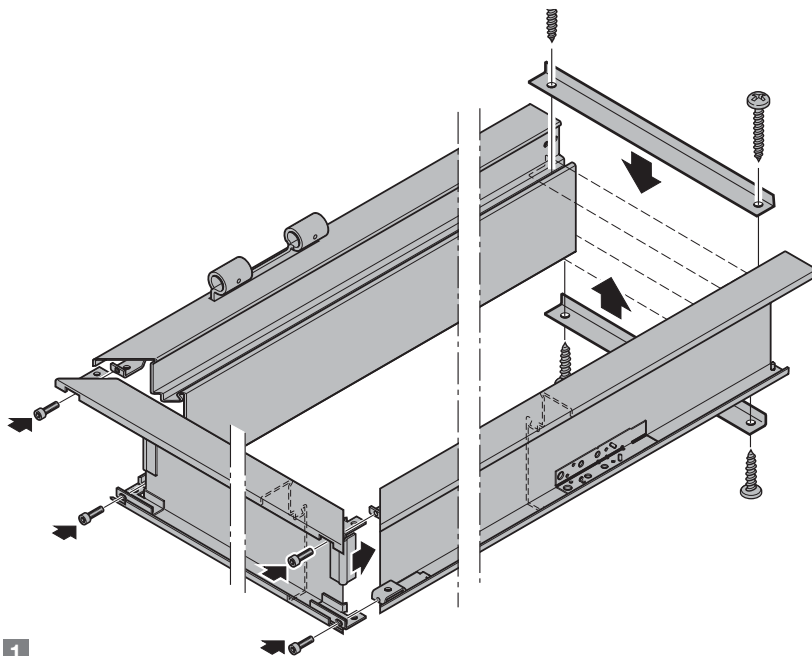


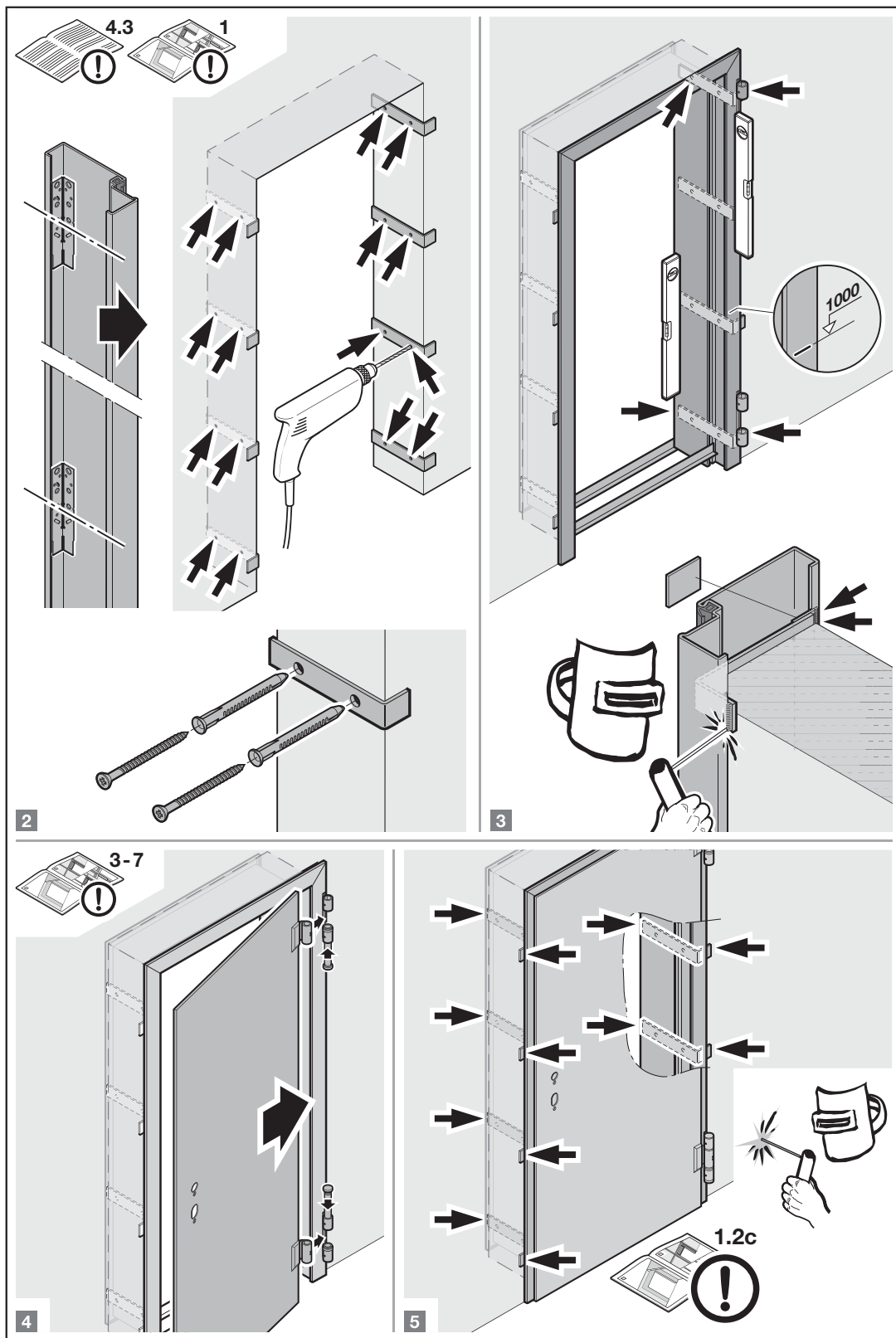
**EPDM+
(CR)**

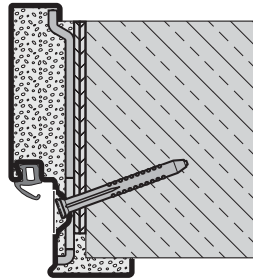
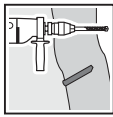
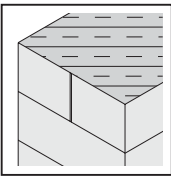
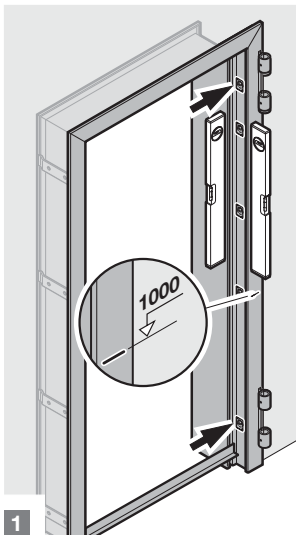
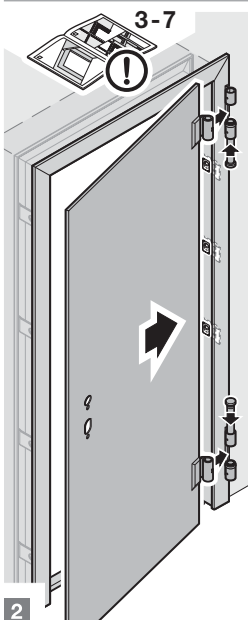
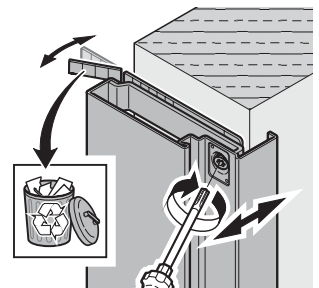
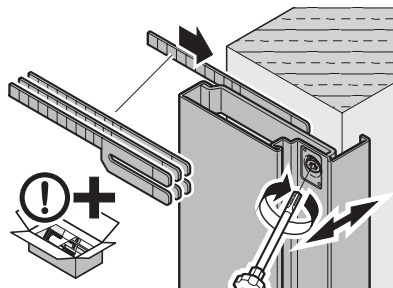
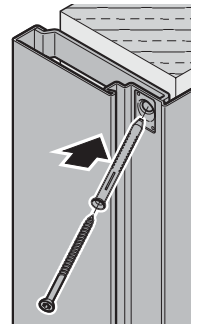
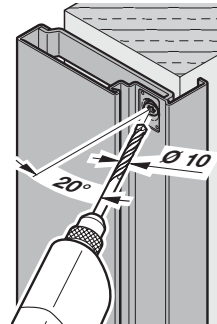
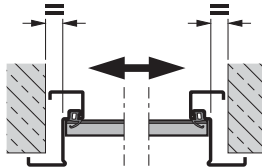
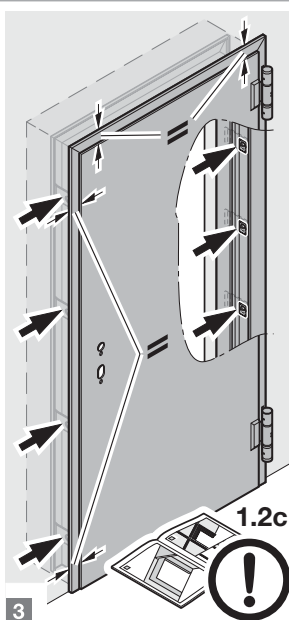
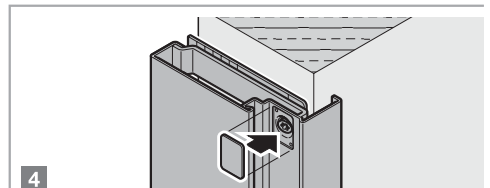
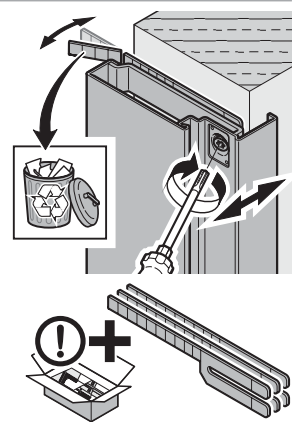
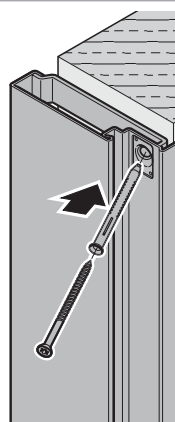
D1.5
max. T30/EI₂30

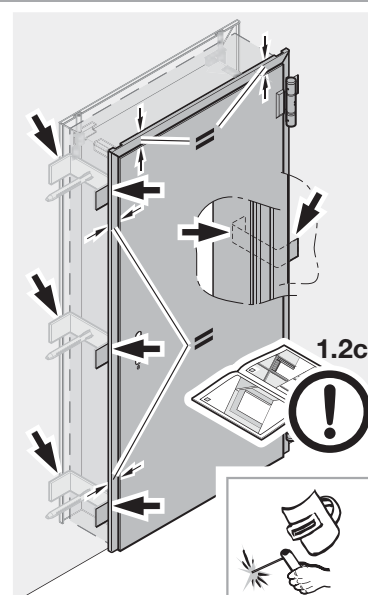
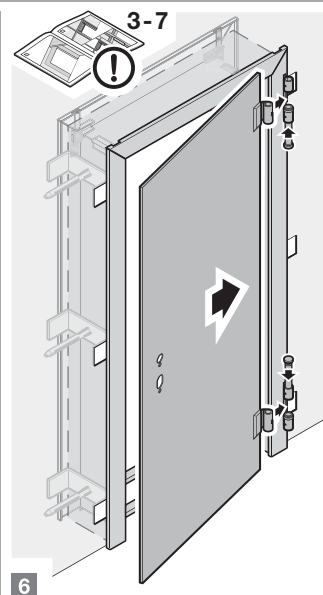
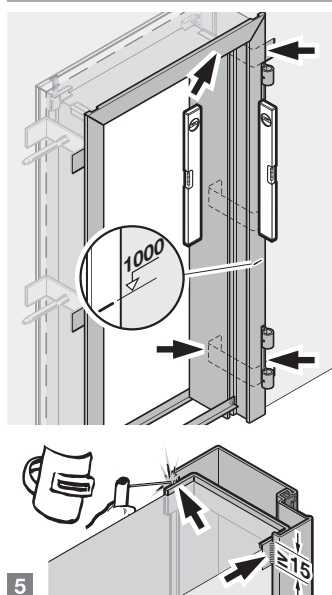
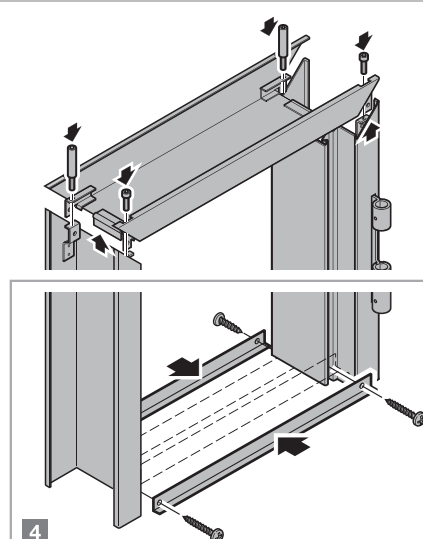
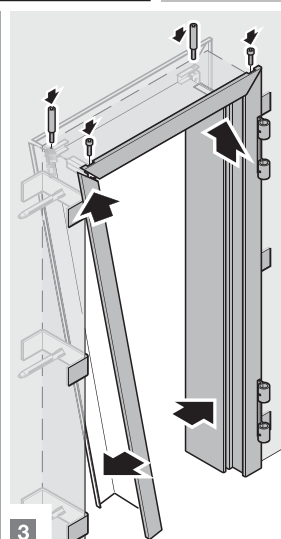
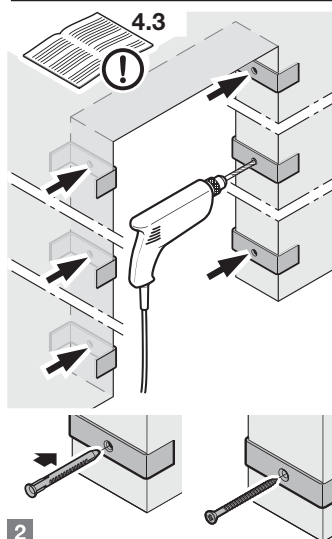
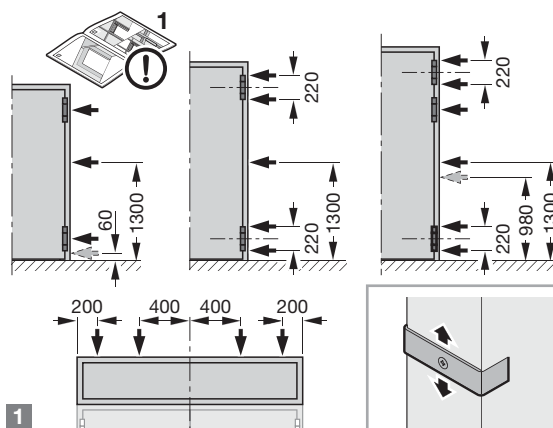
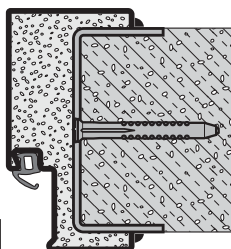
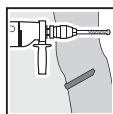
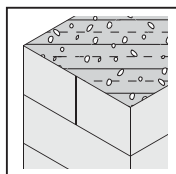


 $\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

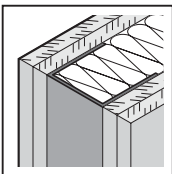




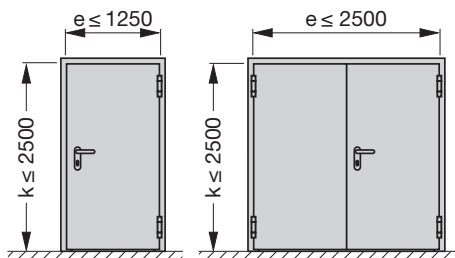
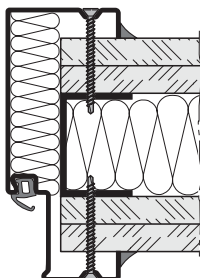
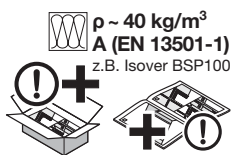
2D**Typ 1****D1.6****4.3****1****1****2****3****4**

2D**Typ2 / D2.1**

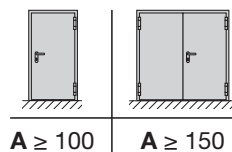
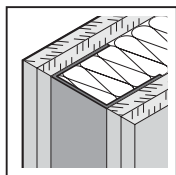
2D Typ2



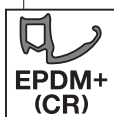
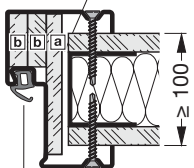
D2.2 max. T30/EI₂30



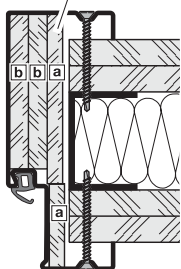
➔ D2.2 - D2.5 1 2 3 ...



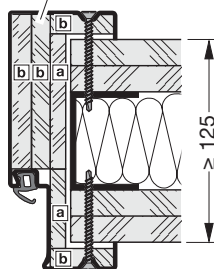
D2.3 T30/EI₂30



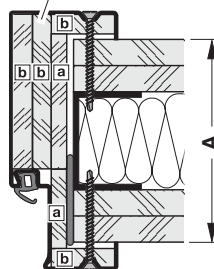
D2.4 T30/EI₂30



D2.5 T60/EI₂60



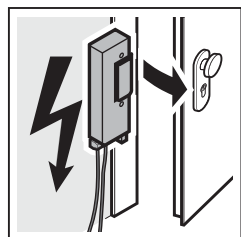
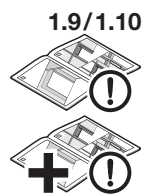
T90/EI₂90



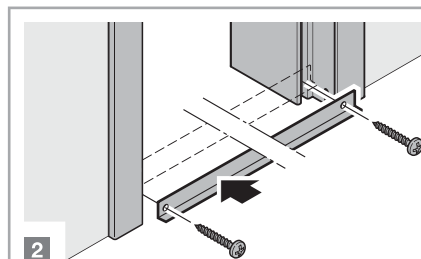
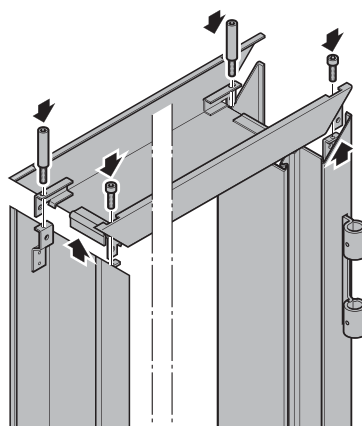
[a] DF-9,5-EN 520 / [b] DF-12,5-EN 520

➔ D2.2 - D2.5 1 2 3 ...

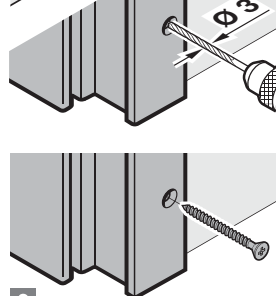
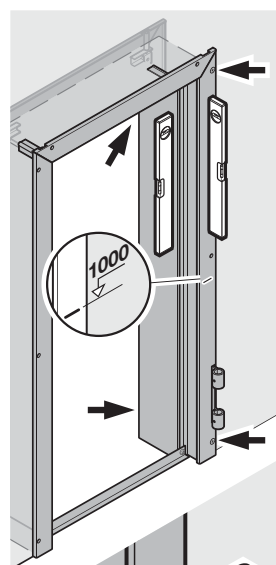
D2.2 - D2.5



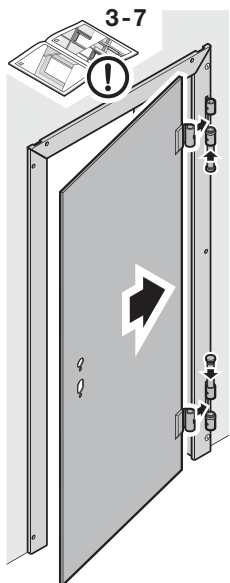
1



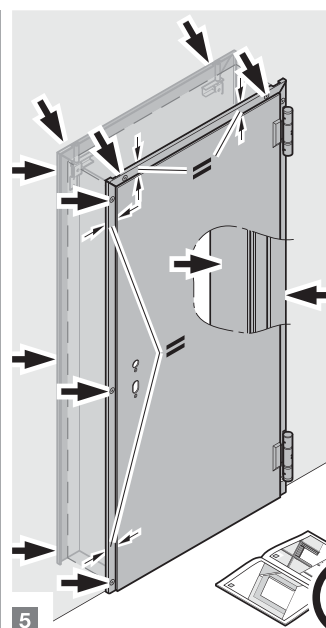
2



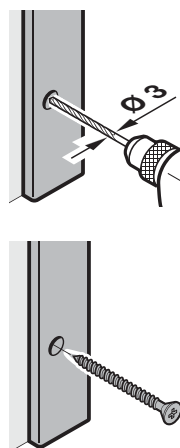
3



4



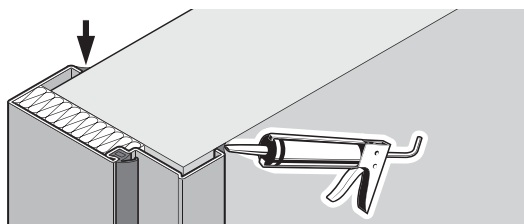
5

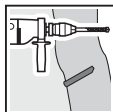
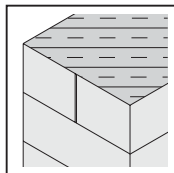
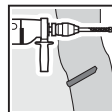
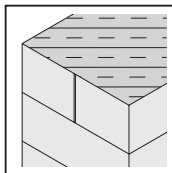


1.2c

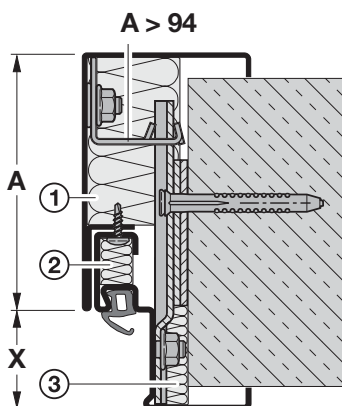


6

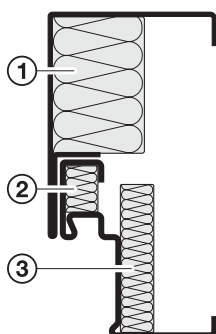
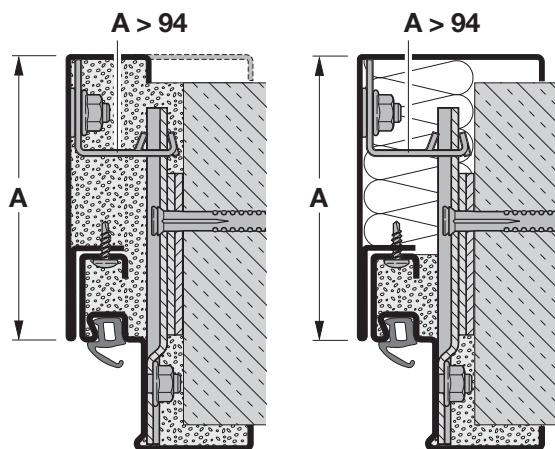


2D**Typ3****EPDM+
(CR)**

D3.1 max. T30/EI₂30



D3.2 max. T90/EI₂90

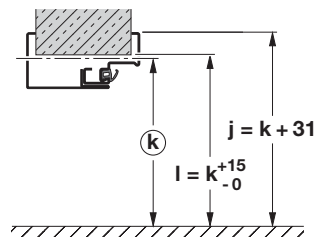
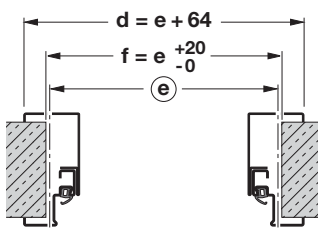
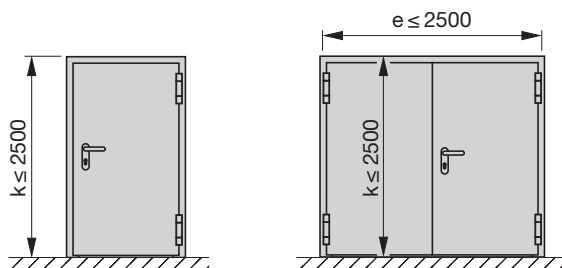


 $\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
 z.B. Isover BSP100

① = $40 \times (A - 42)$

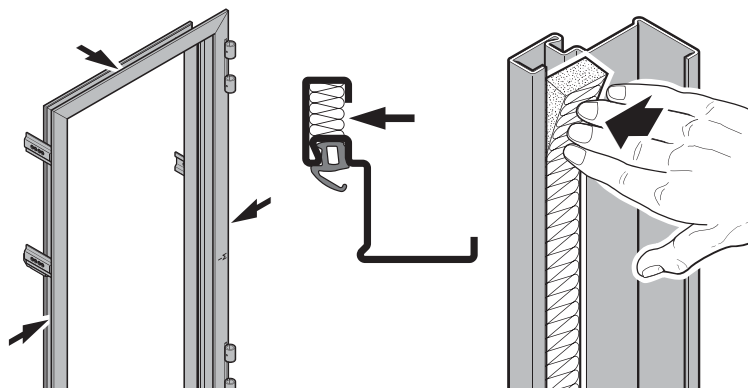
② = $15 \times 22,5$

③ = $15 \times (X + 24)$

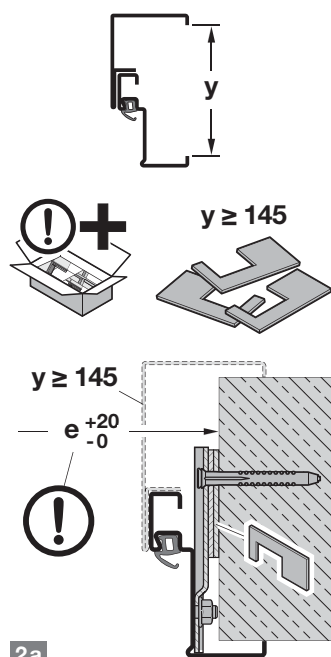


➔ **D3.1 / D3.2** 1 2 3...

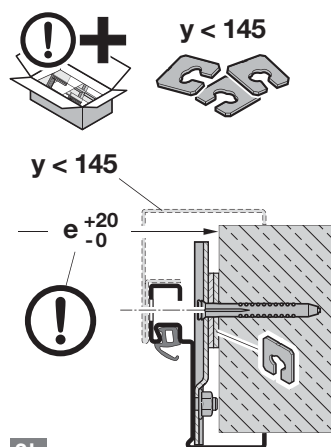
D3.1 / D3.2



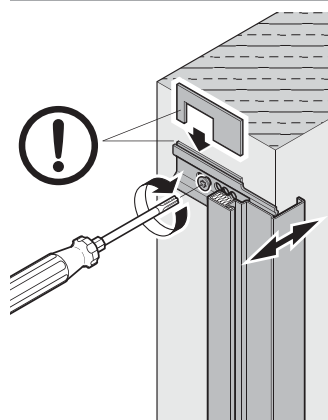
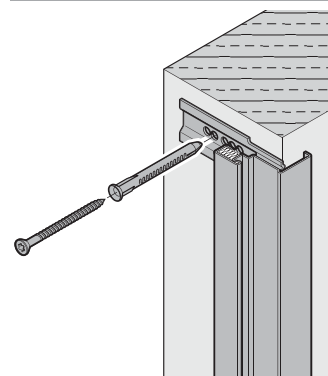
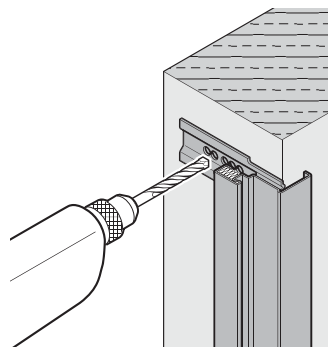
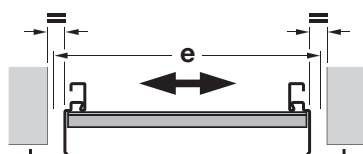
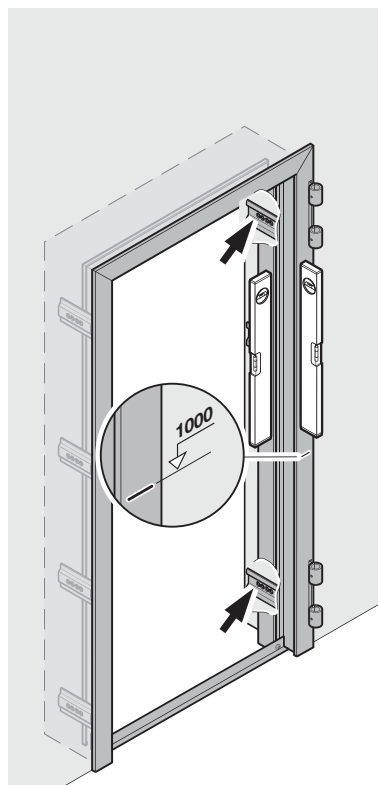
1

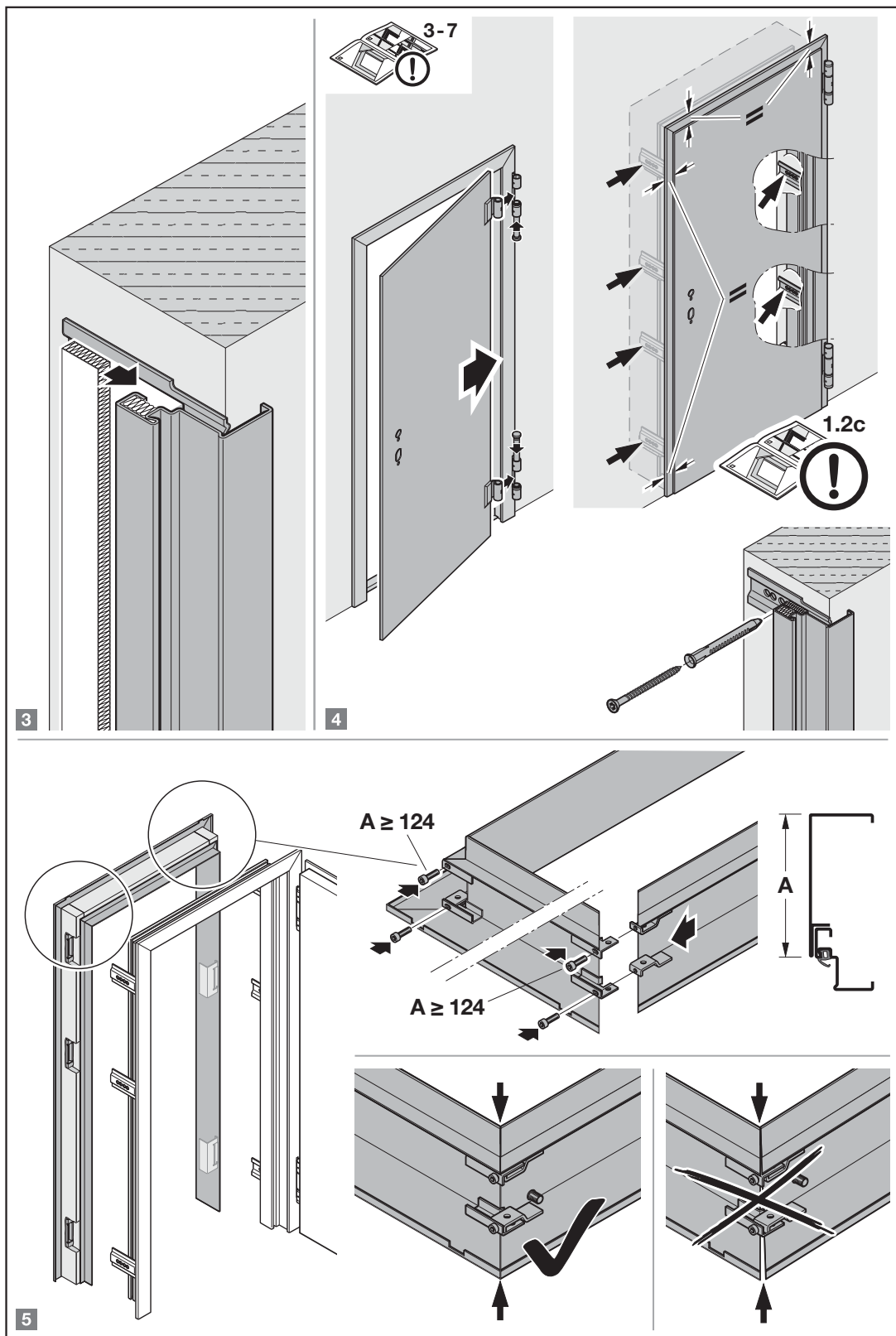


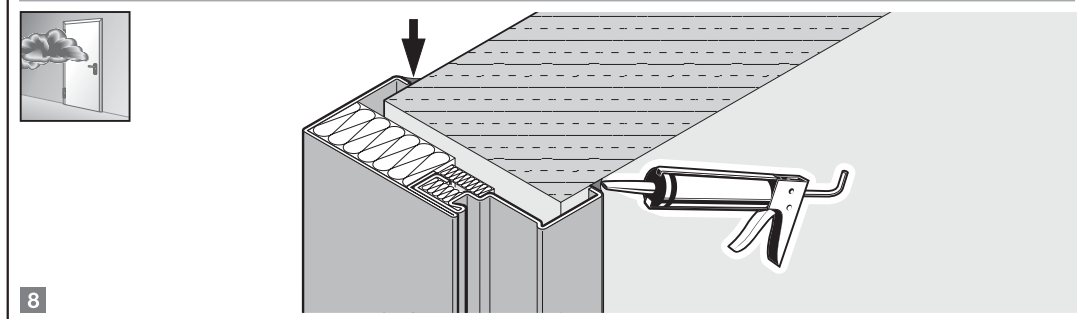
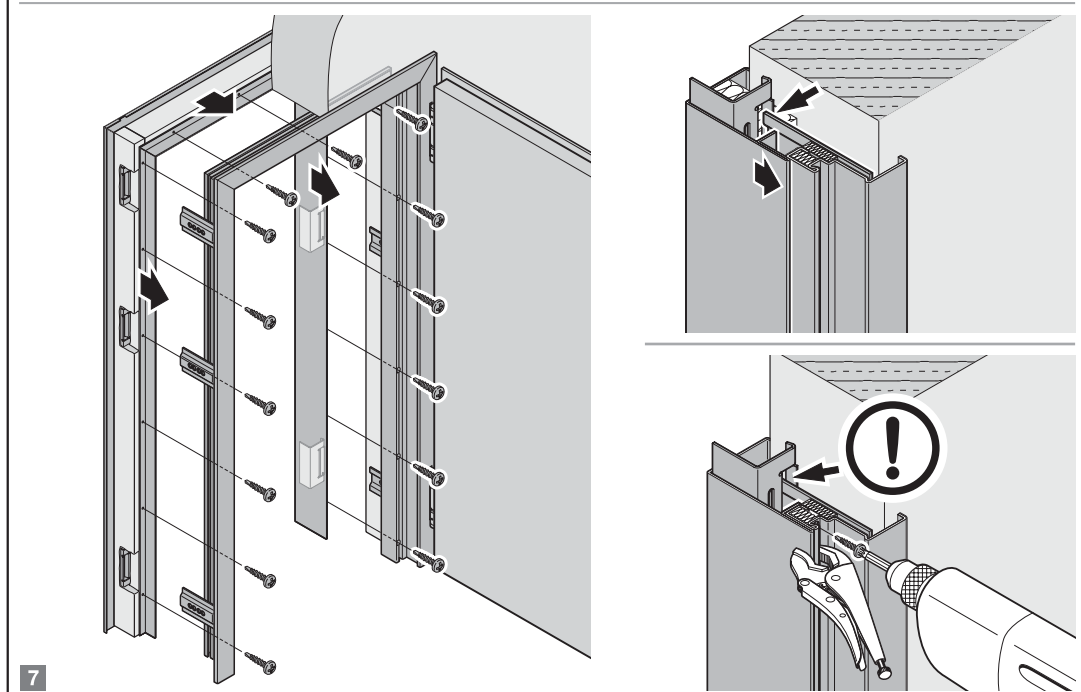
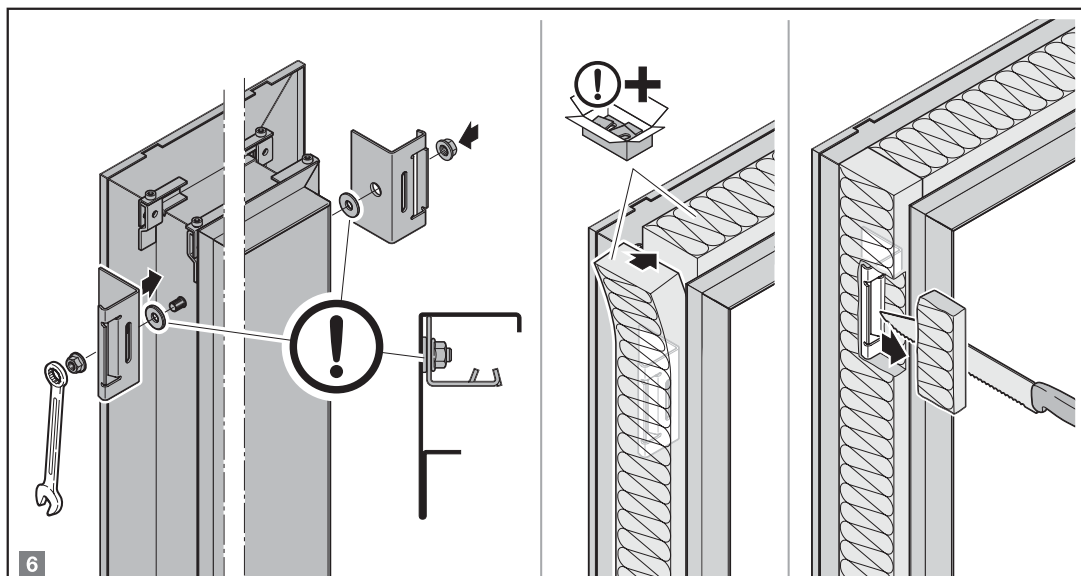
2a

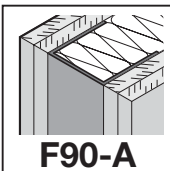
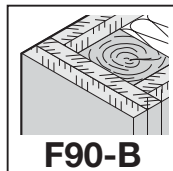
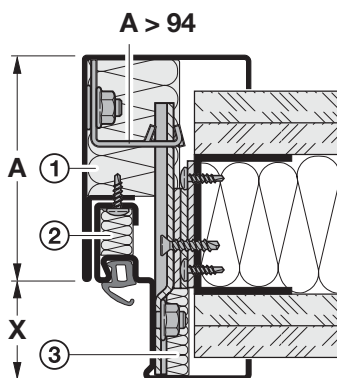
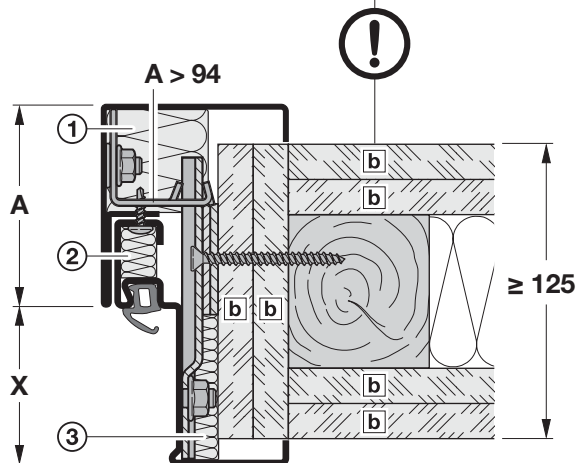
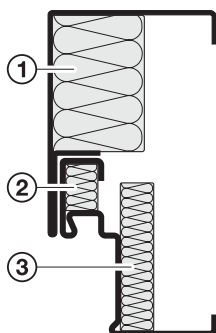


2b

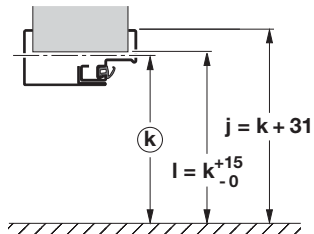
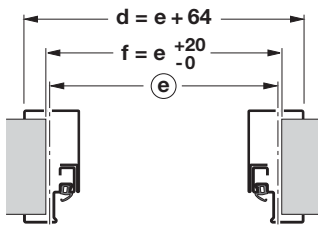
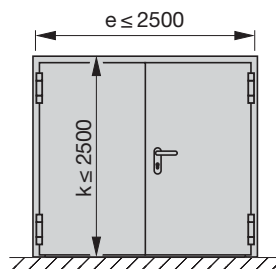
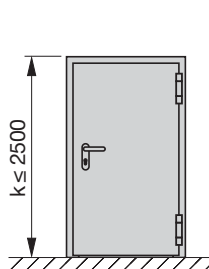




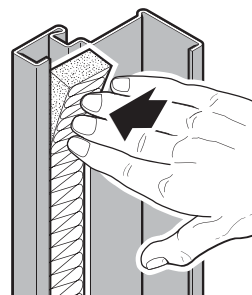
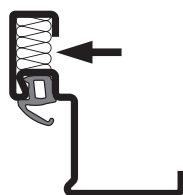
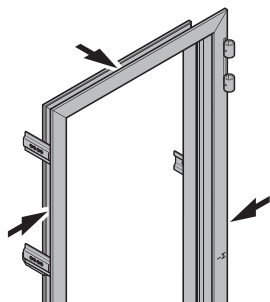
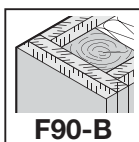
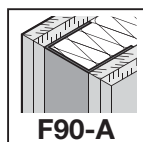


2D**Typ3****max. T30/EI₂30****D3.3****F90-A** DIN 4102-4 Tab. 10.2**D3.4****F90-B** DIN 4102-4 Tab. 10.3**DF-12,5-EN 520**

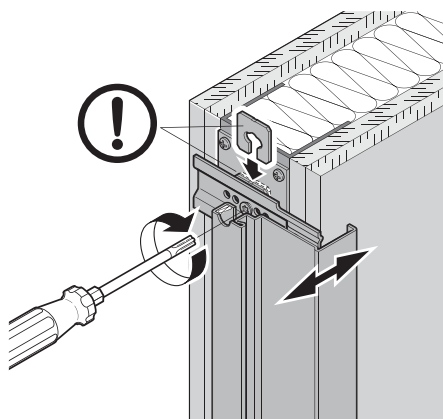
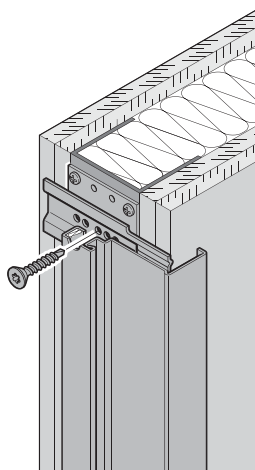
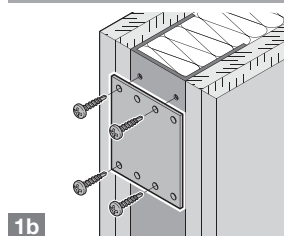
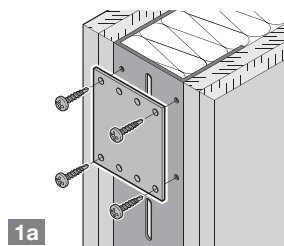
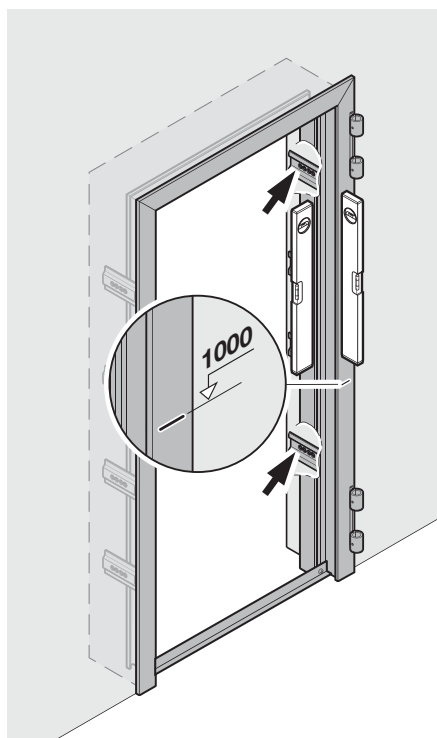
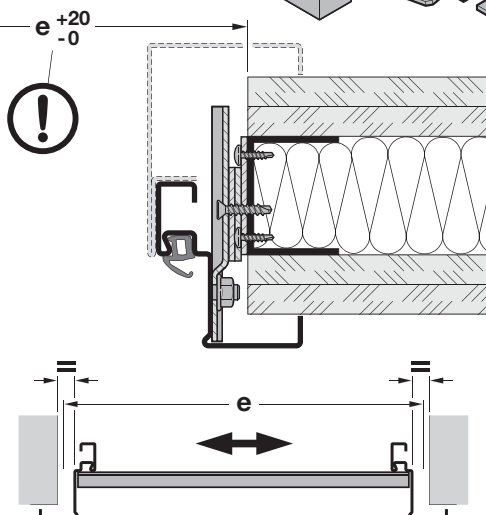
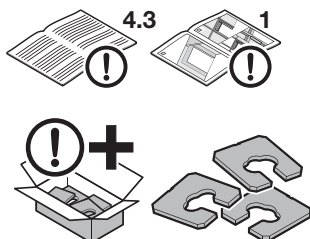
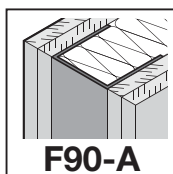
$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
 z.B. Isover BSP100

① = $40 \times (A - 42)$ ② = $15 \times 22,5$ ③ = $15 \times (X + 24)$ ➔ **D3.3 / D3.4** 1 2 3 ...

D3.3 / D3.4

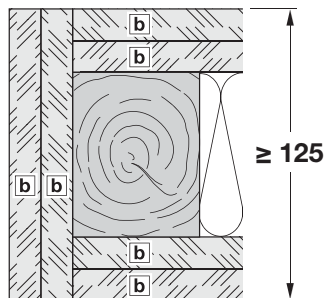
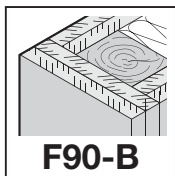


D3.3

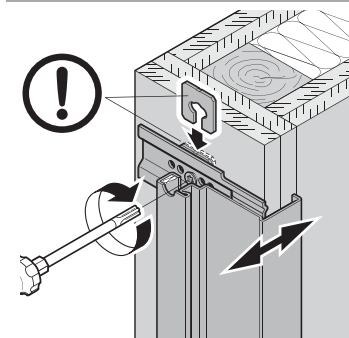
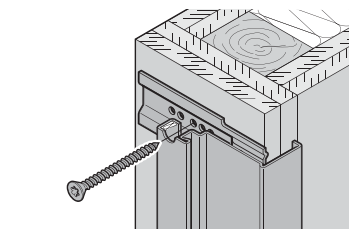
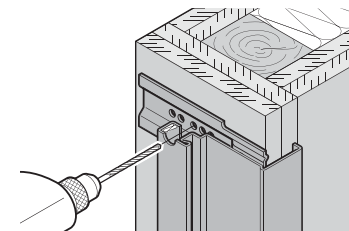
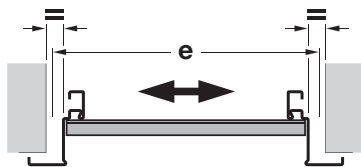
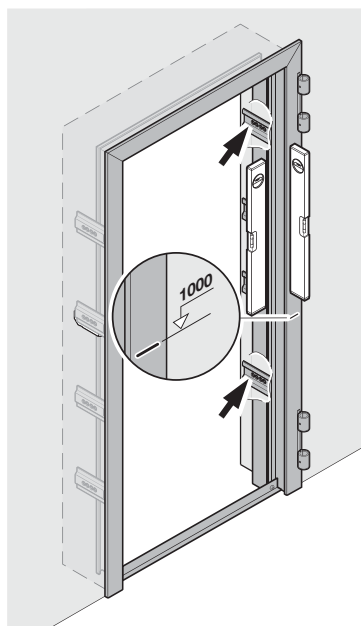
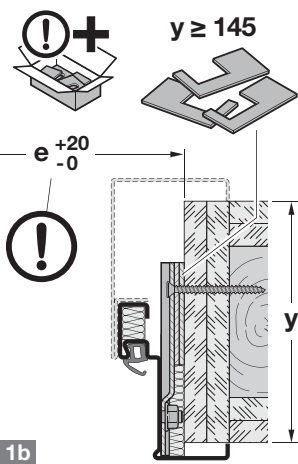
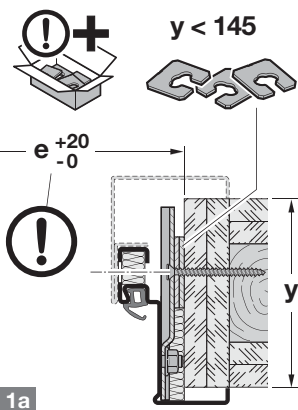
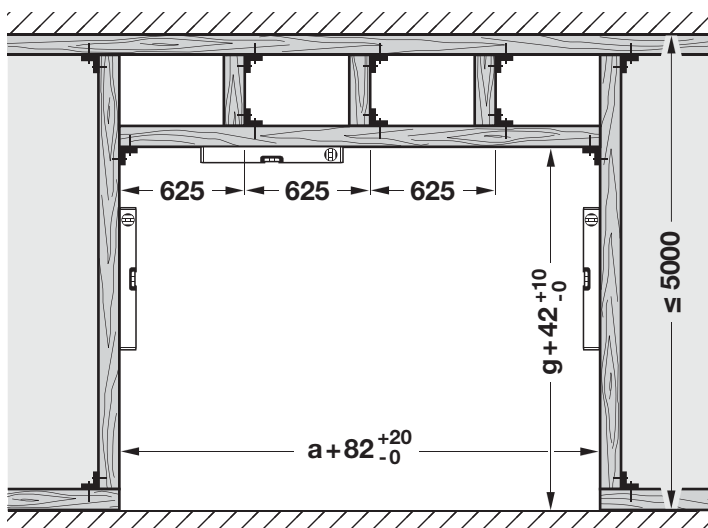


➔ D3.3 / D3.4 2 3 ...

D3.4

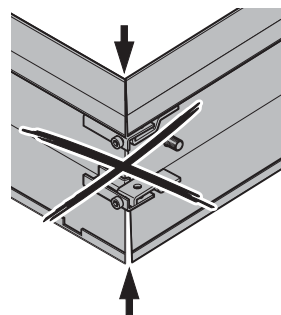
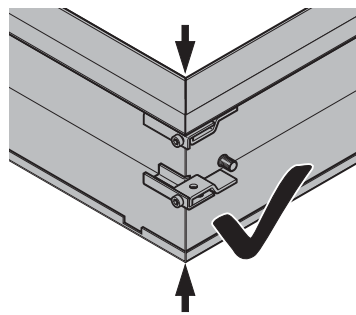
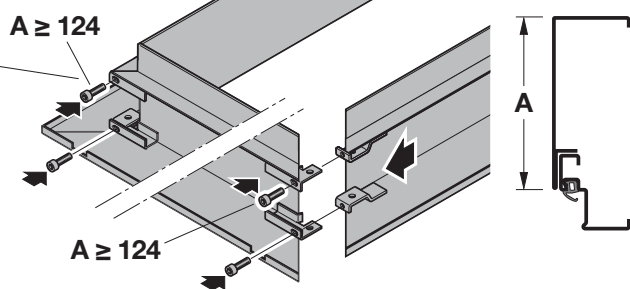
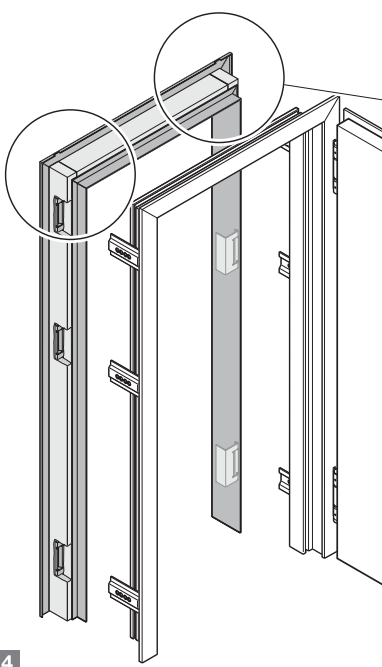
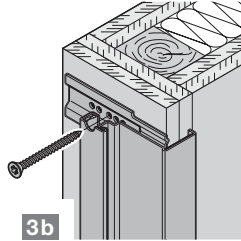
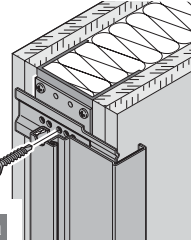
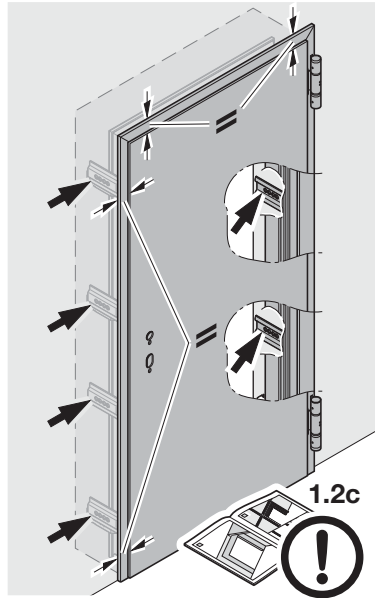
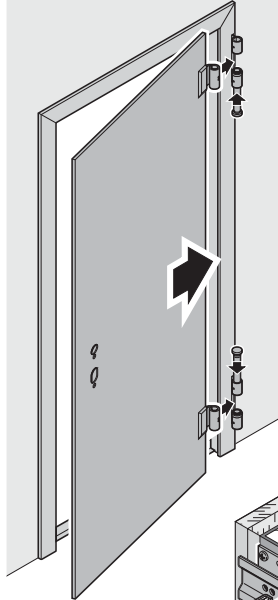
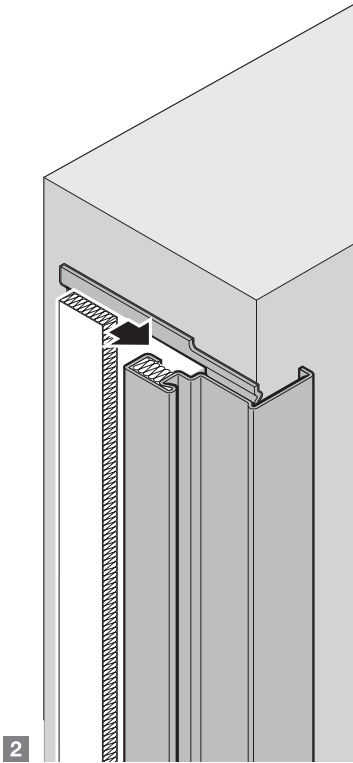


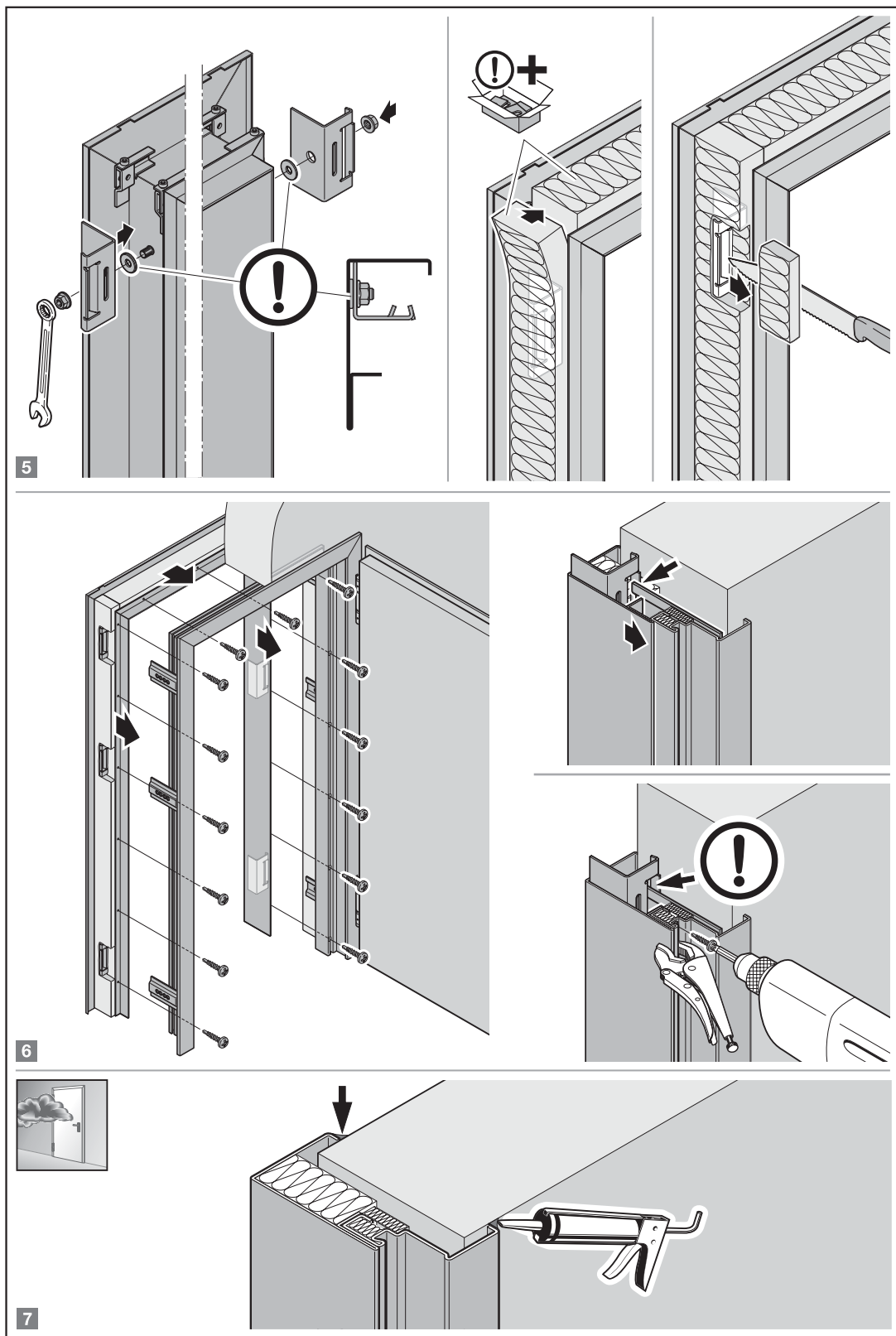
b DF-12,5-EN 520



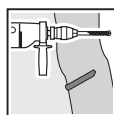
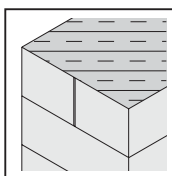
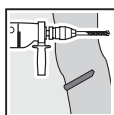
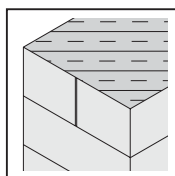
➔ D3.3 / D3.4 2 3 ...

D3.3 / D3.4





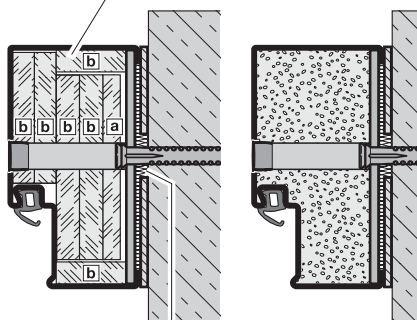
2E Typ1



$e \leq 1500$
max. T30/EI₂30

$e \leq 1320$
max. T60/EI₂60
max. T90/EI₂90

E1.1



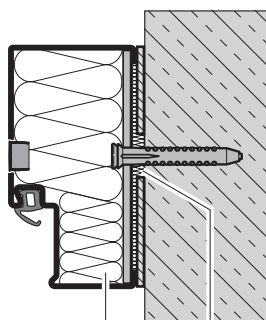
$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

a DF-9,5-EN 520

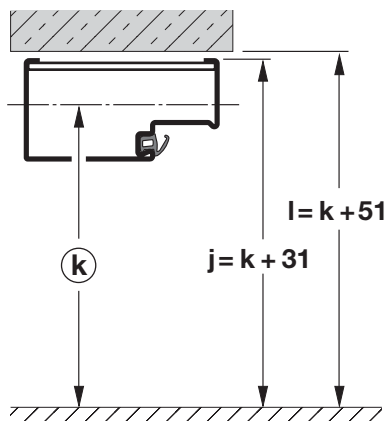
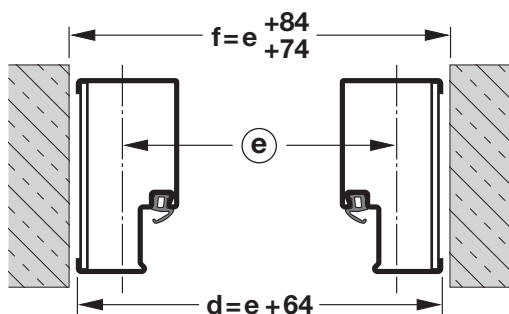
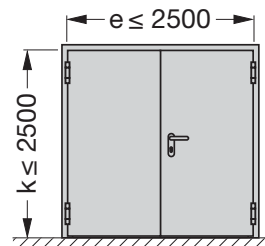
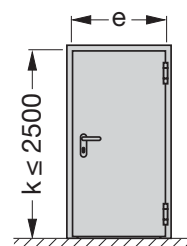
b DF-12,5-EN 520

E1.2

max. T30/EI₂30

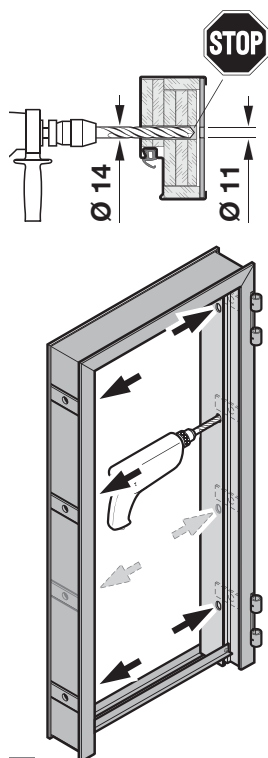


$\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

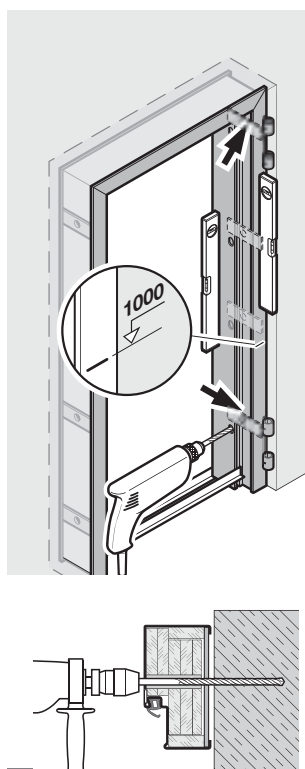


➔ E1.1 / E1.2 1 2 3...

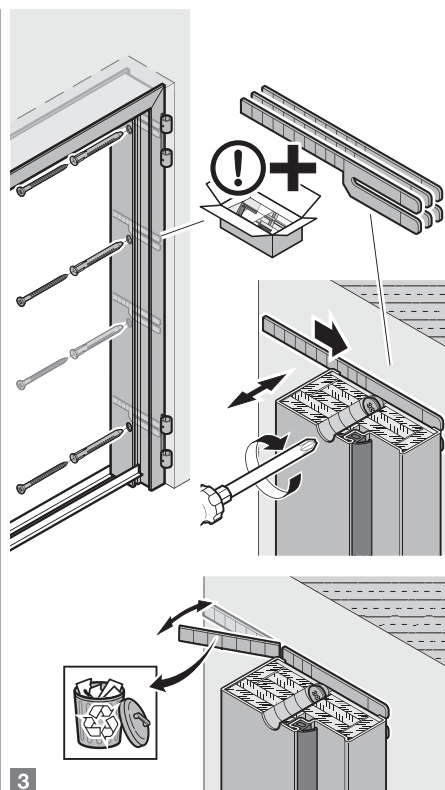
E1.1 / E1.2



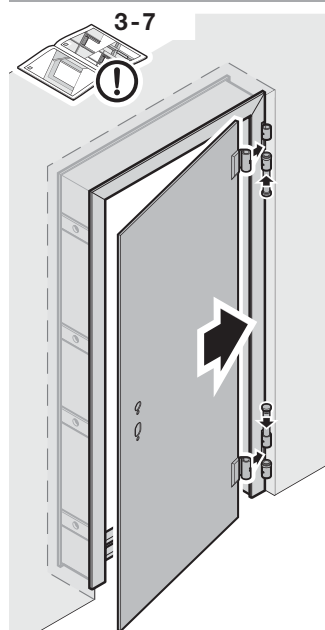
1



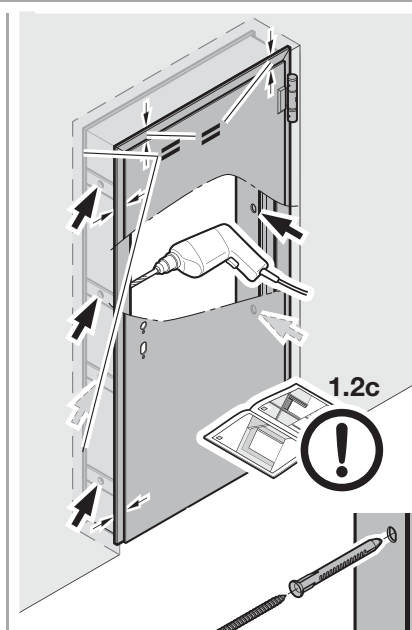
2



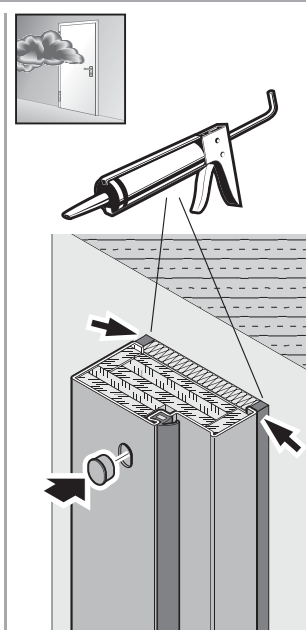
3



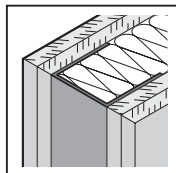
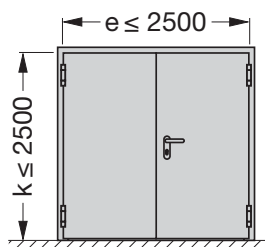
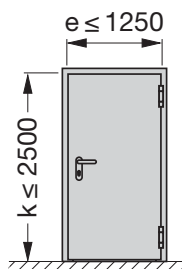
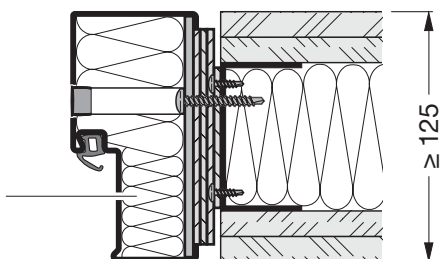
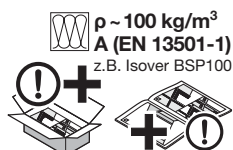
4



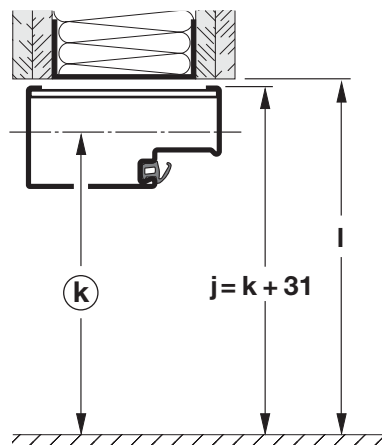
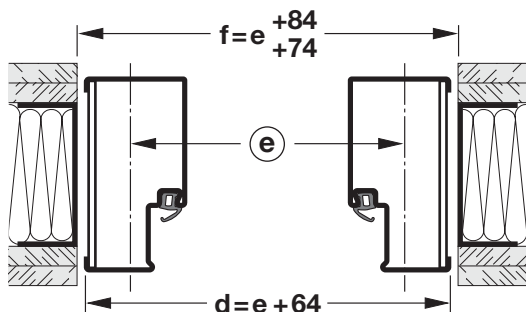
5



6

2E**Typ 1****max. T30/EI₂30****E1.3**

MW	I
≤ 125	k+41
> 125	k+51



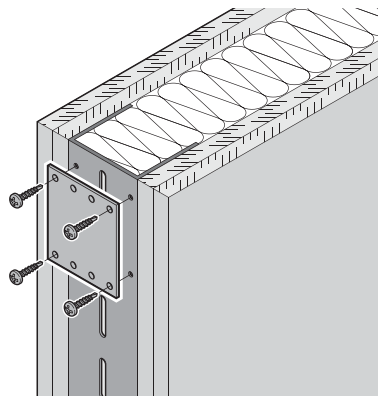
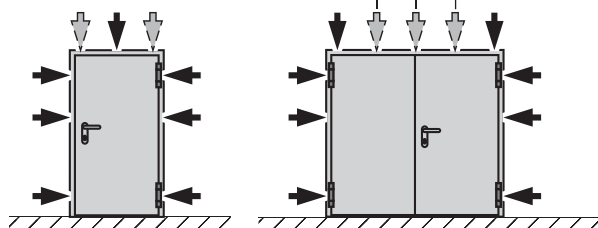
➔ **E1.3** **1 2 3...**

E1.3

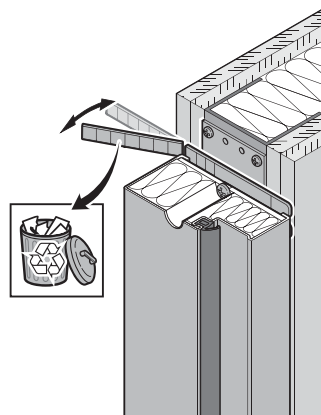
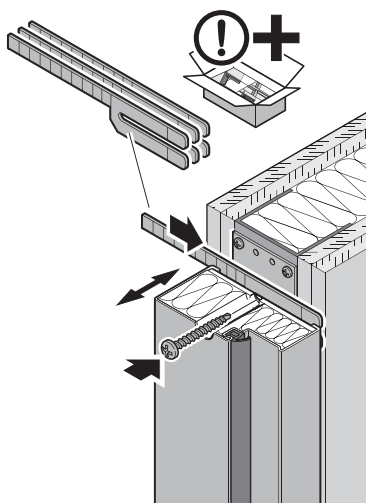
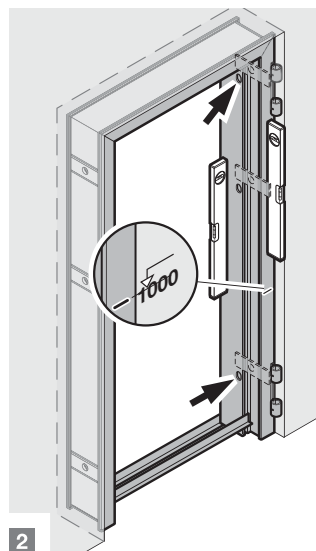


$e > 1500$ $e \leq 1500$

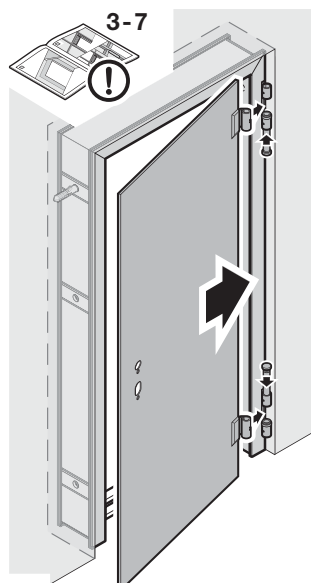
1



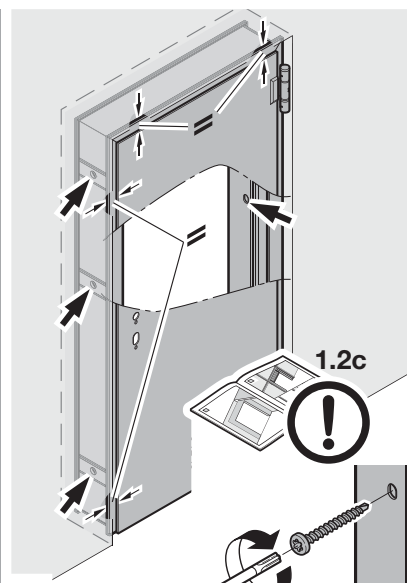
2



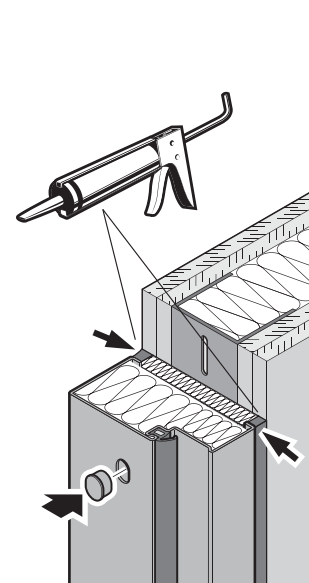
3



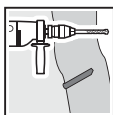
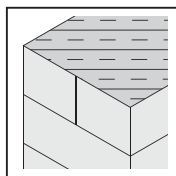
4



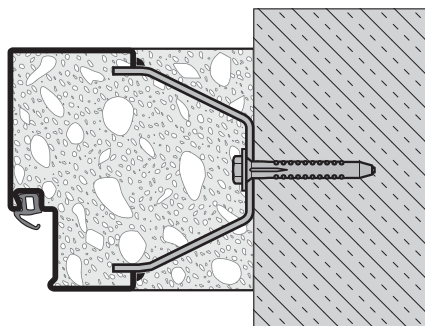
5



2E Typ 1



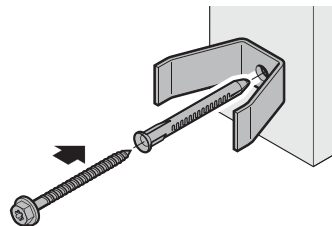
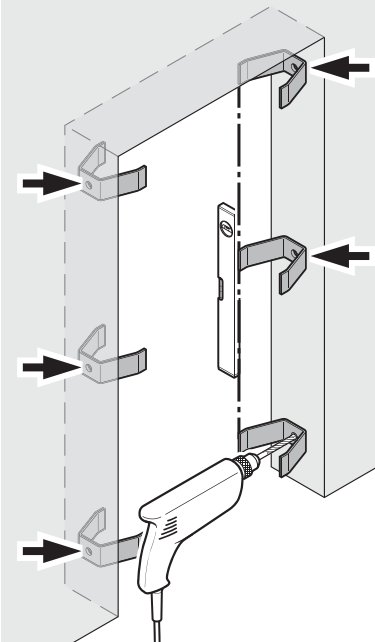
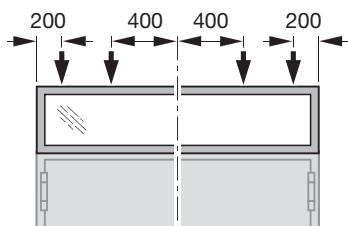
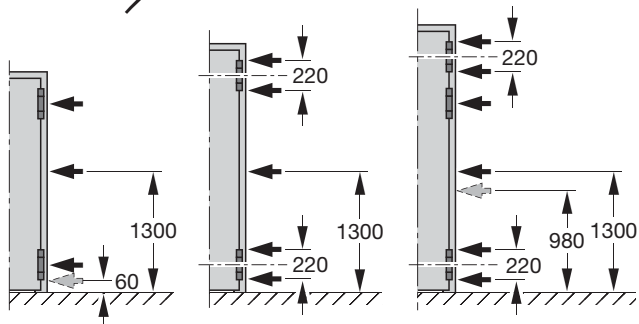
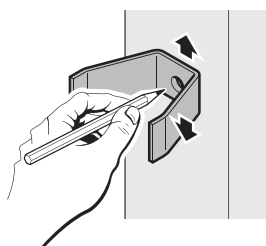
E1.4



4.3

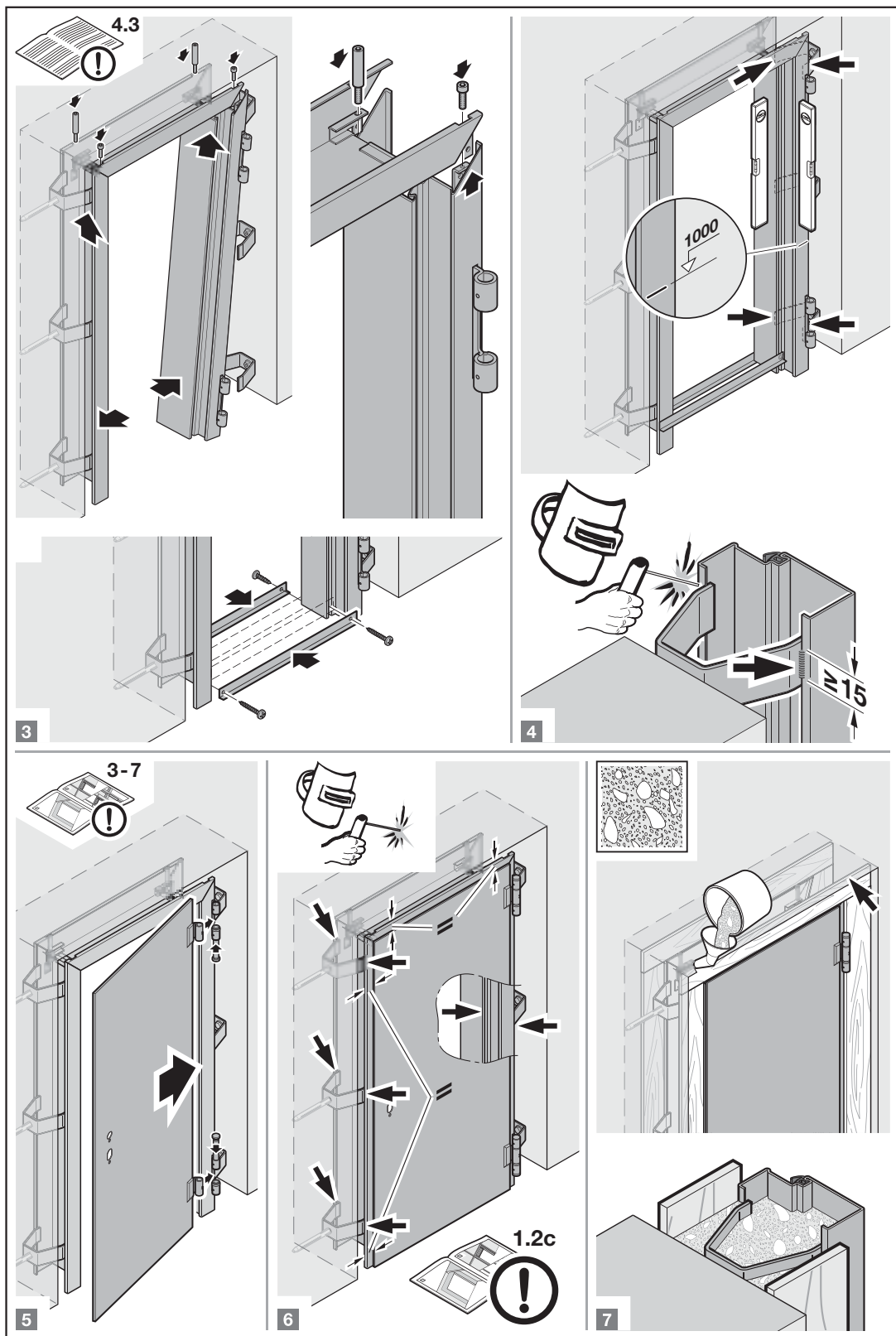


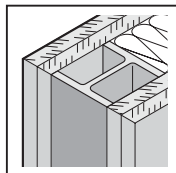
1.2a/1.2b



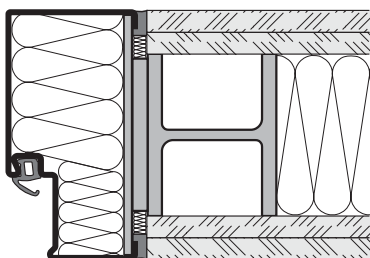
1

2

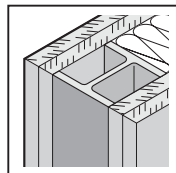


2E**Typ 1**

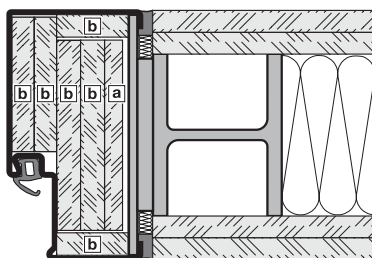
E1.5
max. T30/ EI₂30



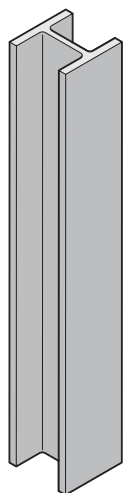
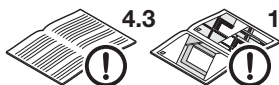
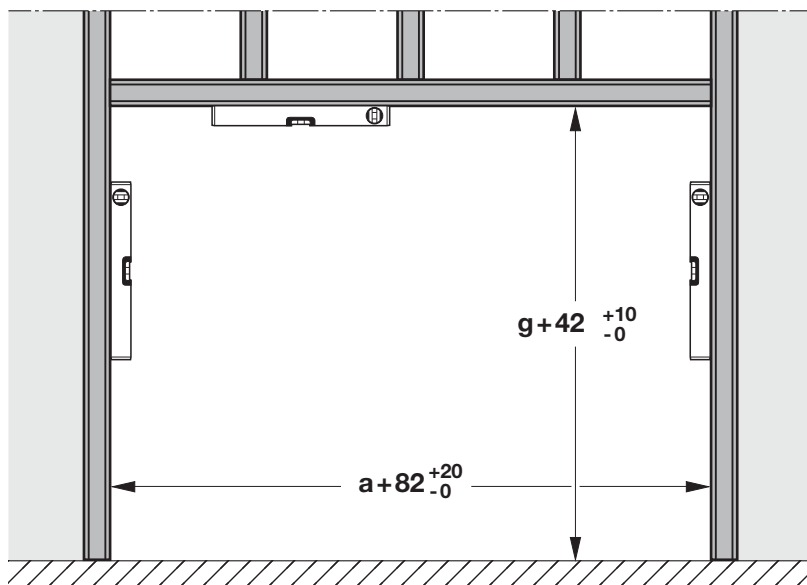
 $\rho \sim 100 \text{ kg/m}^3$
A (EN 13501-1)
z.B. Isover BSP100

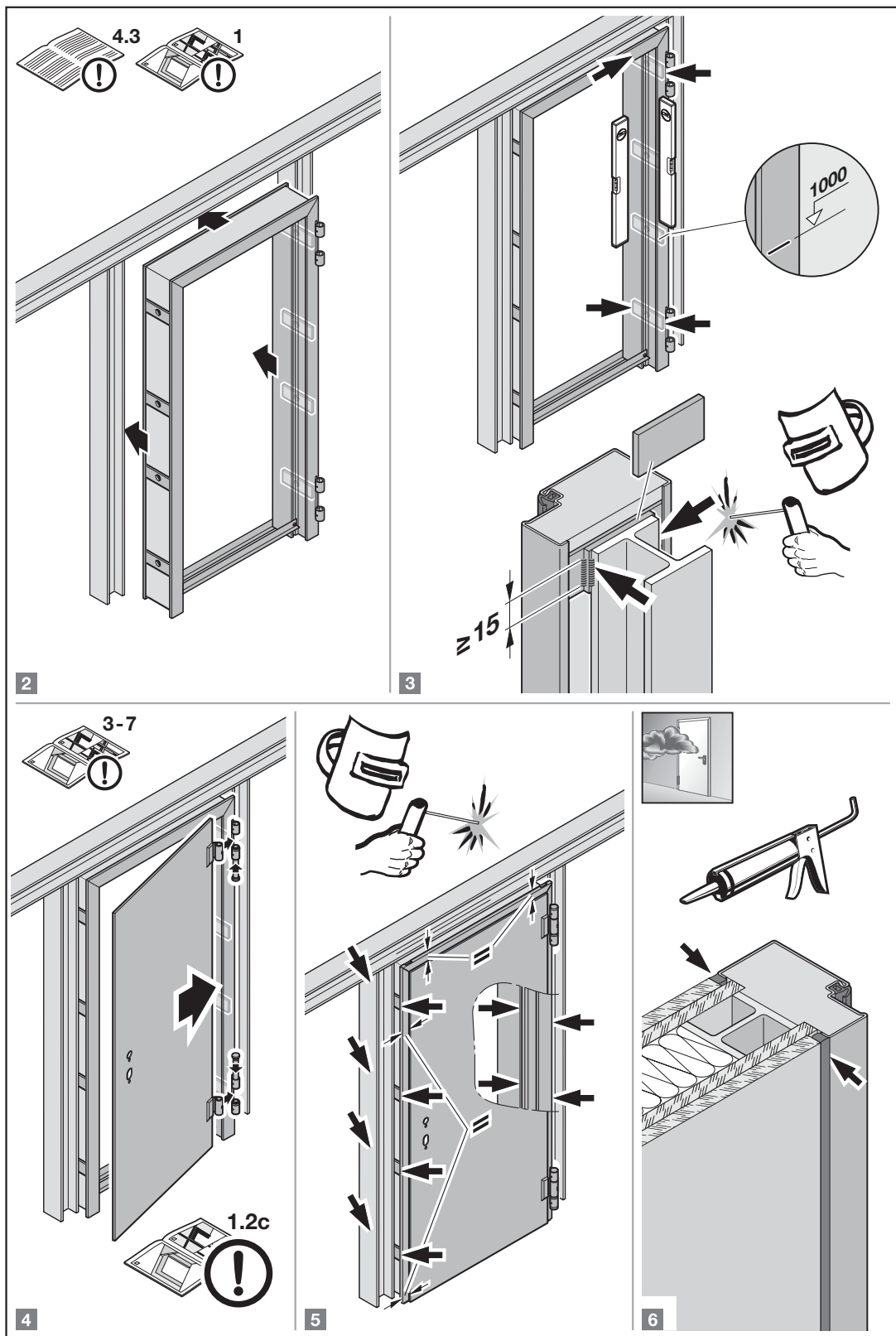


E1.6
max. T90/ EI₂90

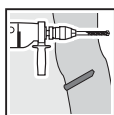
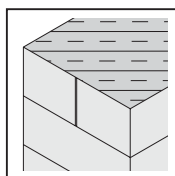


a DF-9,5-EN 520
b DF-12,5-EN 520

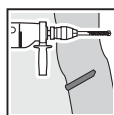
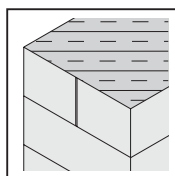
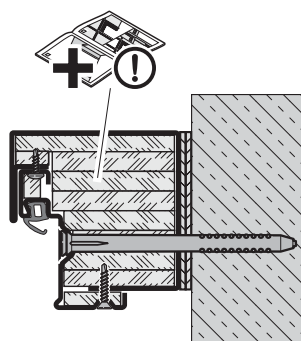
**1**



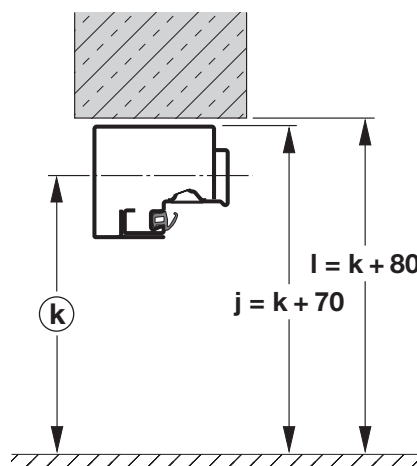
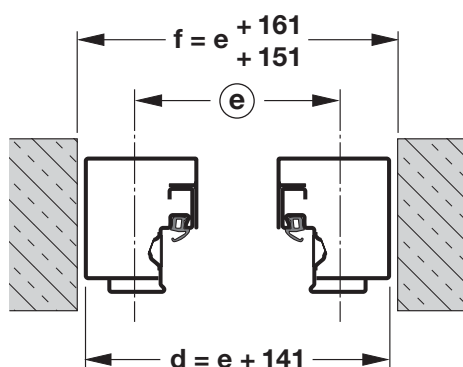
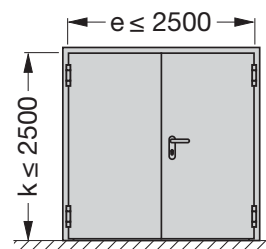
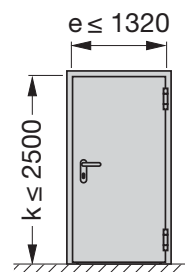
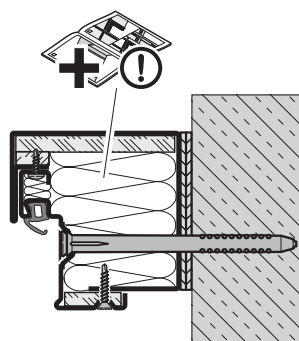
2E Typ2



E2.1
max. T90/EI₂90

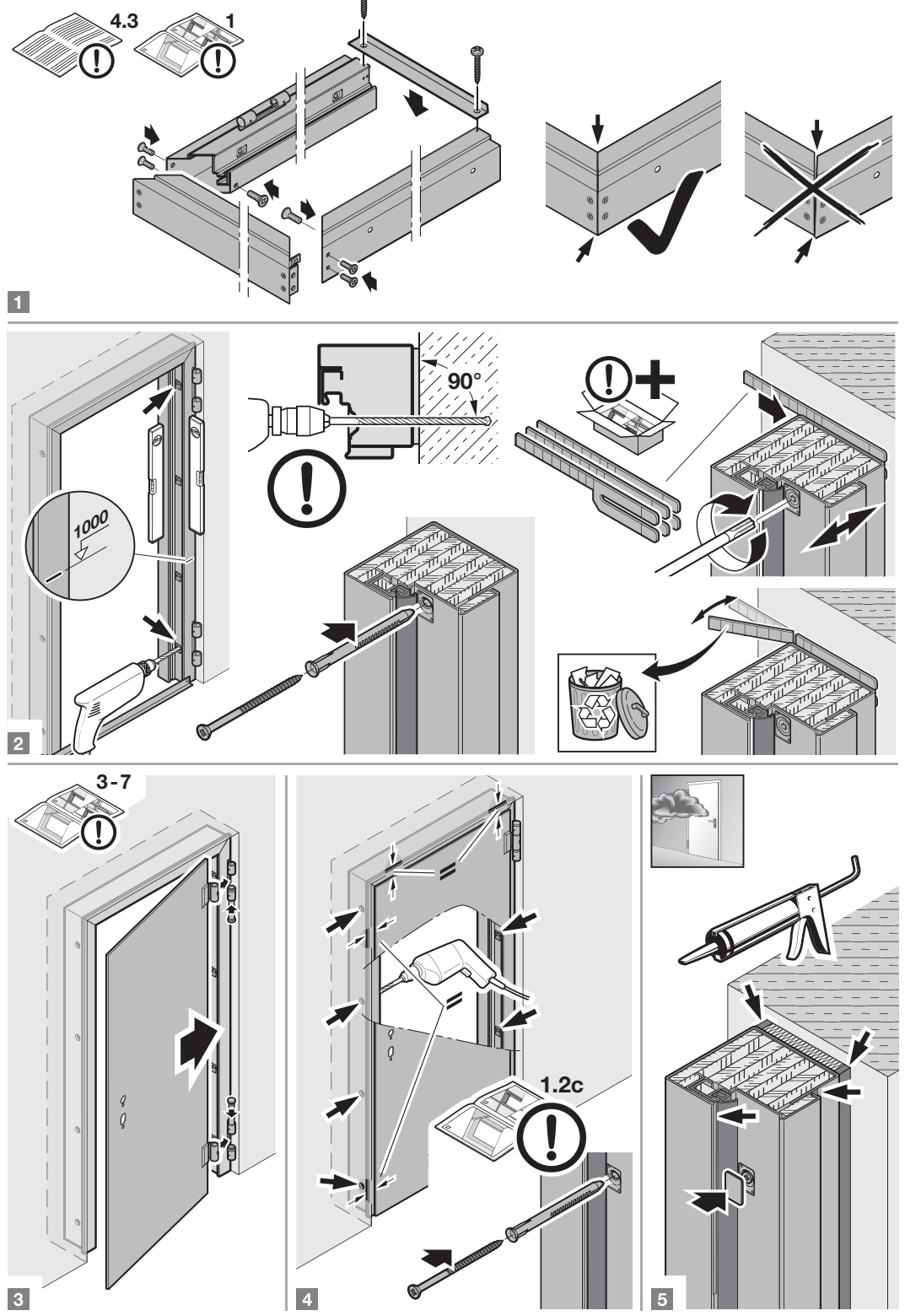


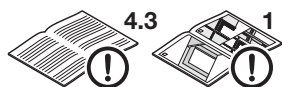
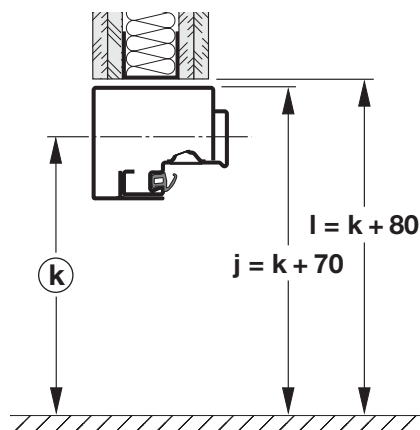
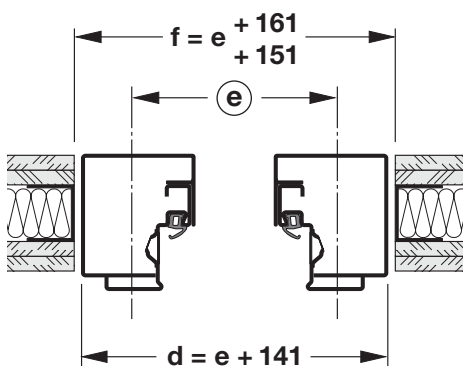
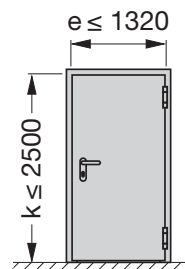
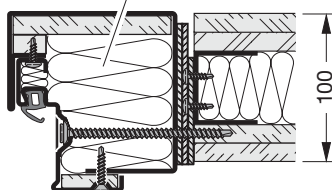
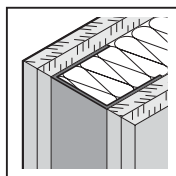
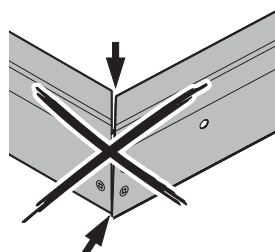
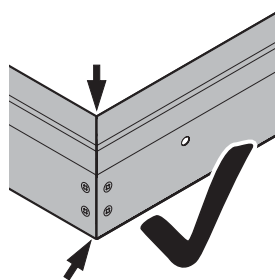
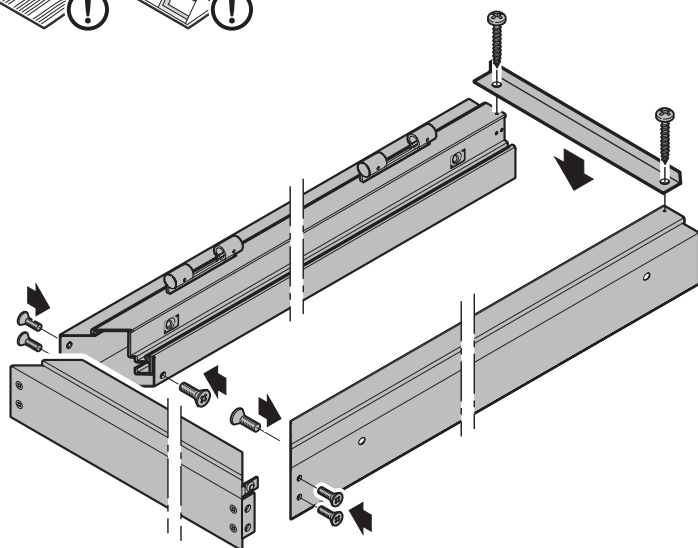
E2.2
max. T30/EI₂30

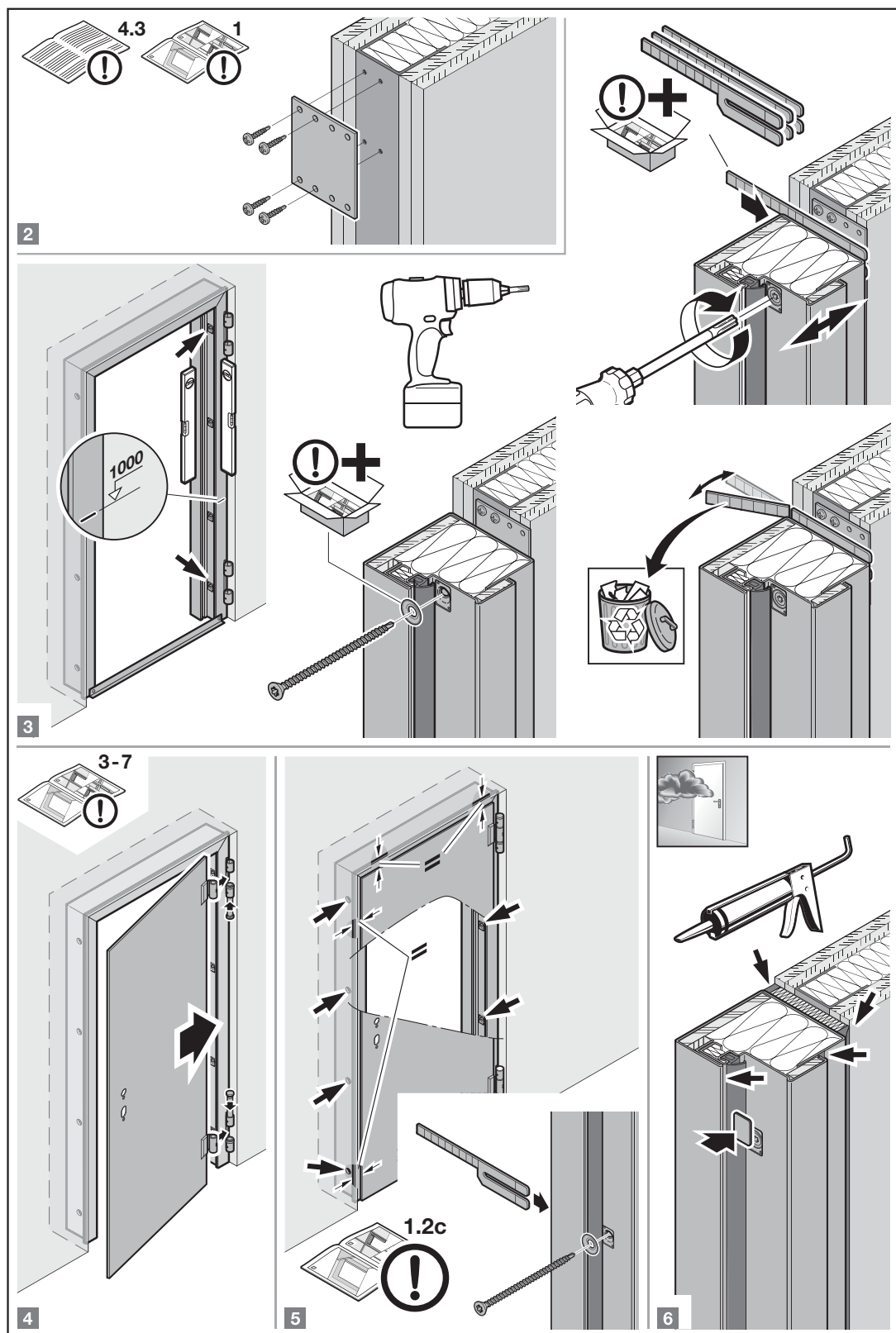


➔ **E2.1 / E2.2** 1 2 3...

E2.1 / E2.2

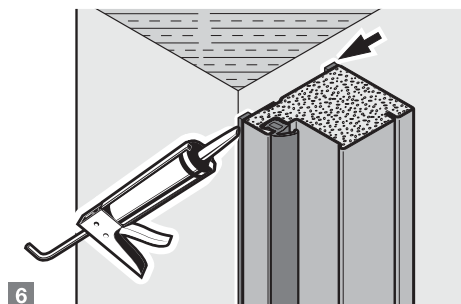
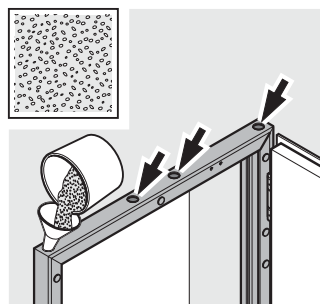
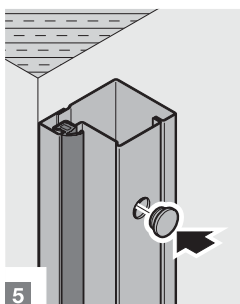
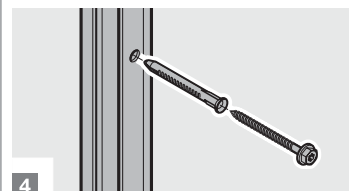
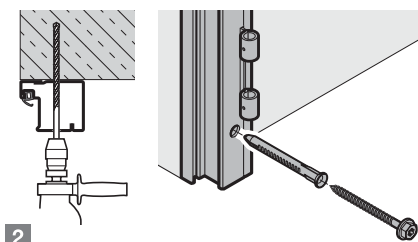
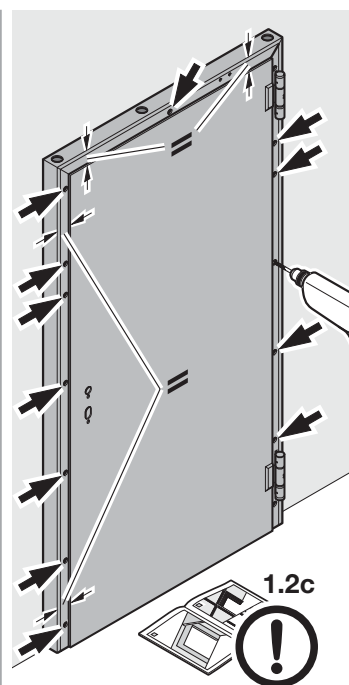
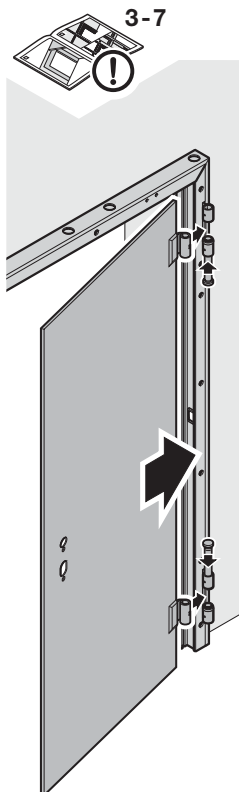
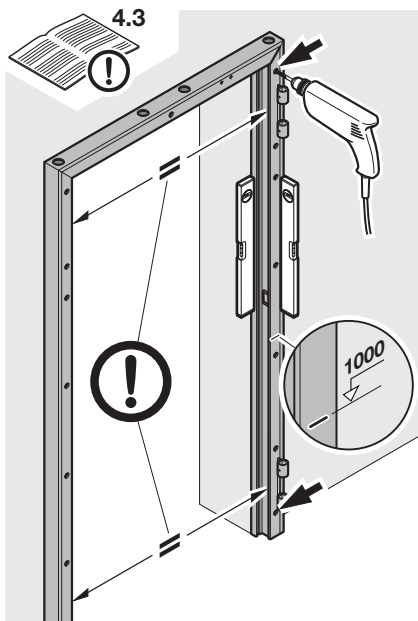
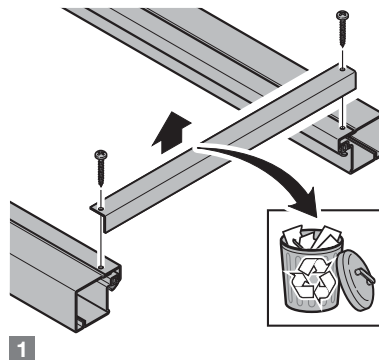
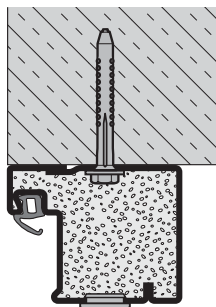
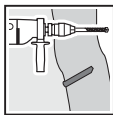
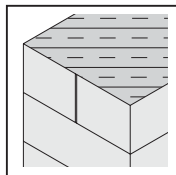


2E**Typ2****max. T30/EI₂30****E2.3****4.3****1****1**



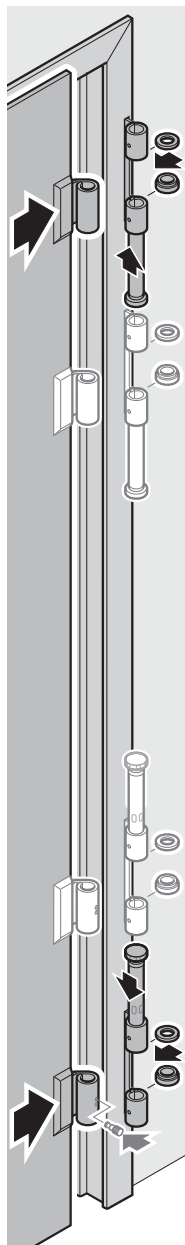
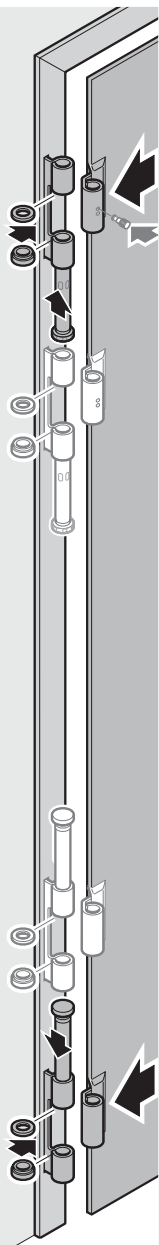
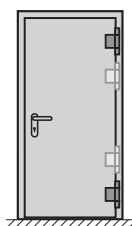
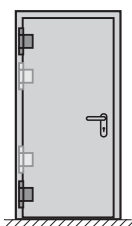
2E Typ3 max. T30/EI₂30

E3.1

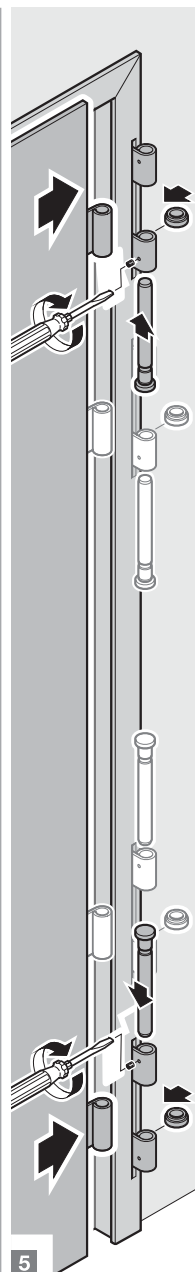
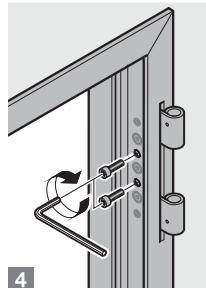
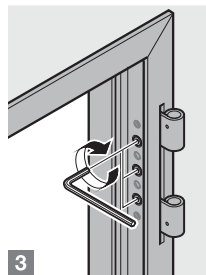
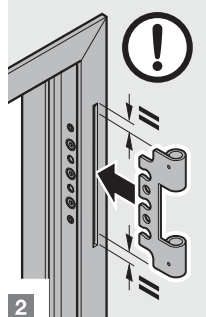
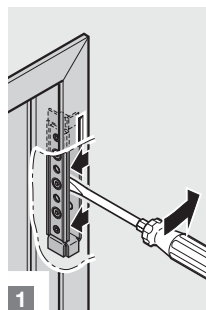
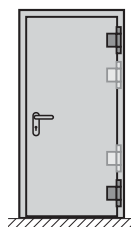


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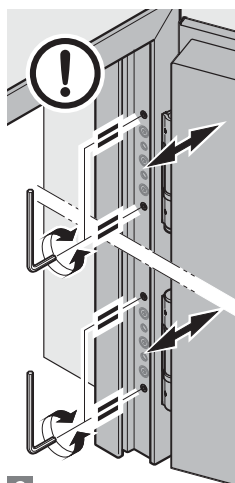
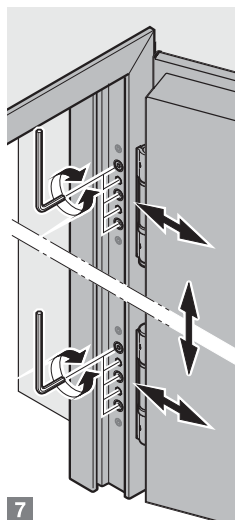
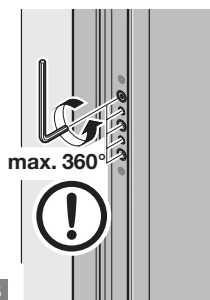
3.1a



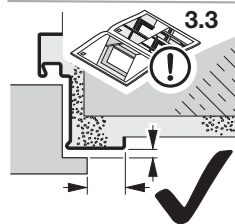
3.1b



6



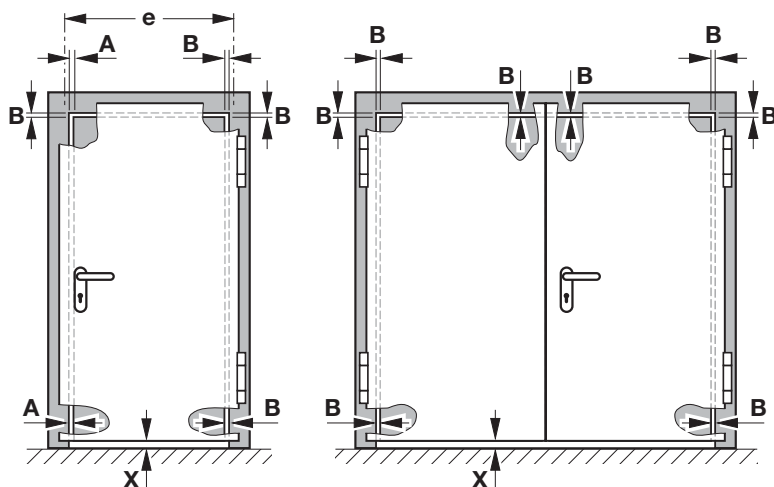
8



3.2 4.2

e	A
≤ 749	6^{+1}_{-2}
750 - 874	6^{+1}_{-2}
≥ 875	5^{+1}_{-2}

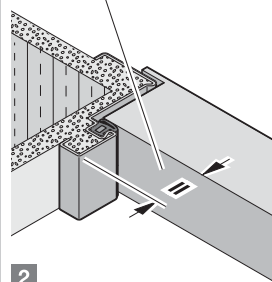
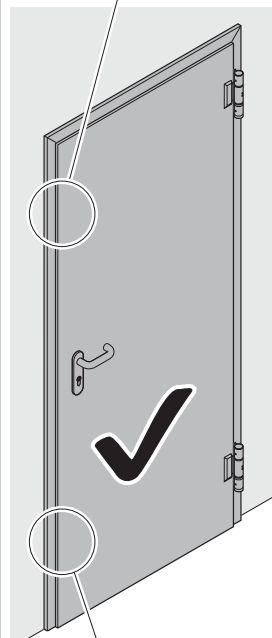
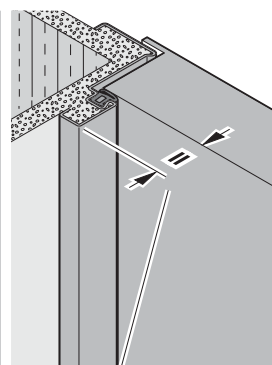
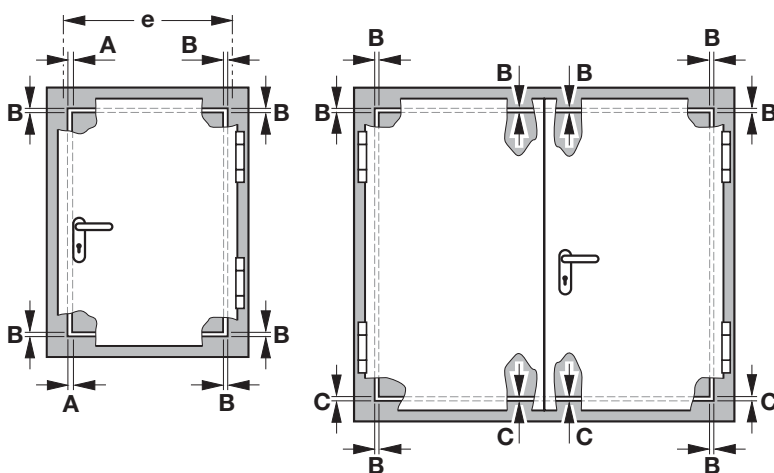
B	C max. T30	C T60, T90, T120
4 ± 2	4 ± 2	10 ± 2



$X = 10 \pm 5$

$X = 10^{+2}_{-5}$

$X = 10 - 5$



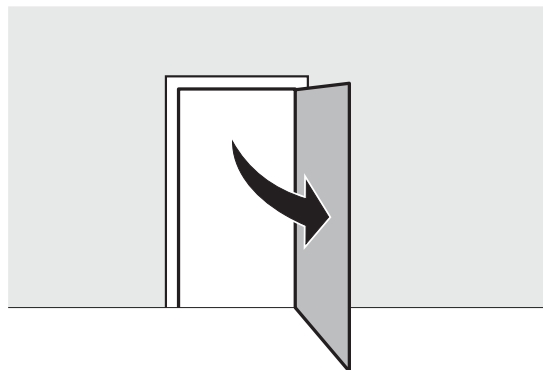
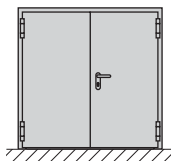
1

2

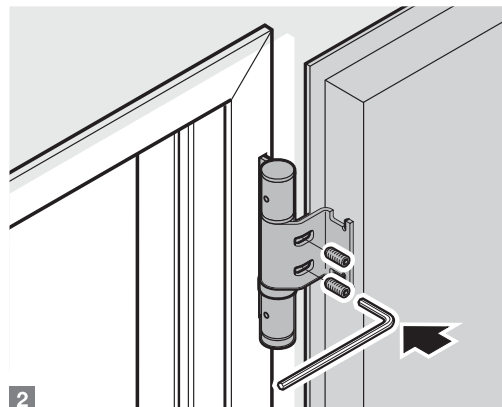
3.3



3.3

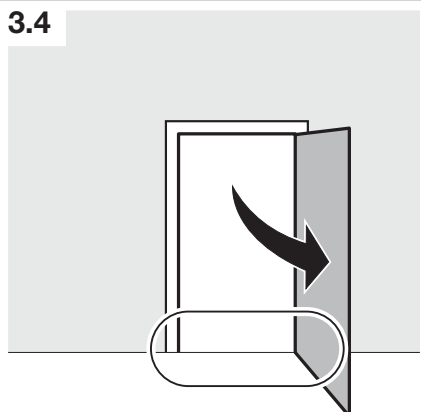


1

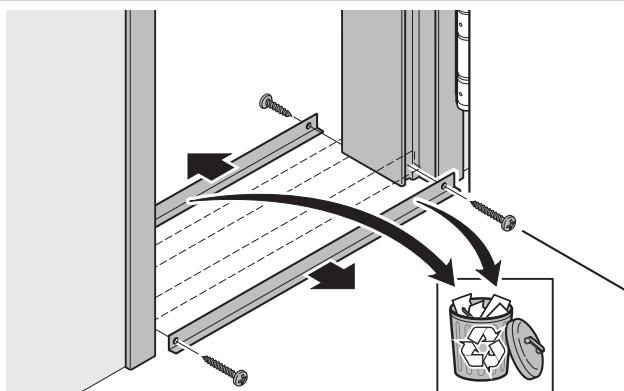


2

3.4



1

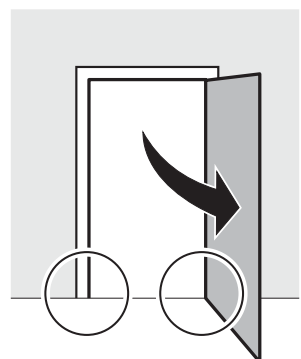


2

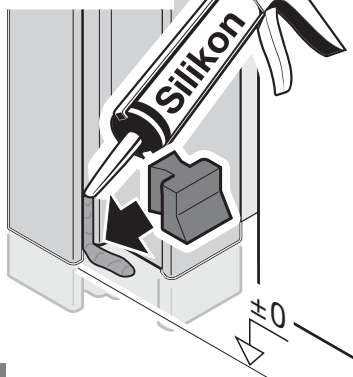
3.5



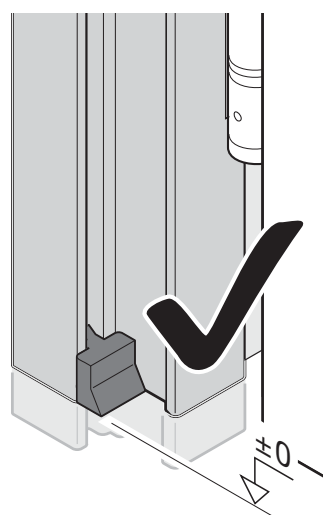
3.1/3.2



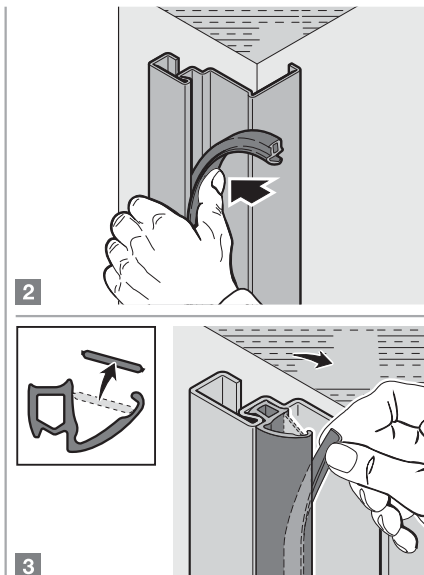
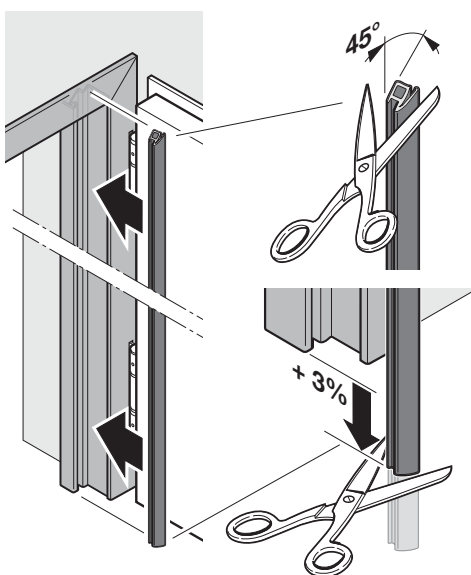
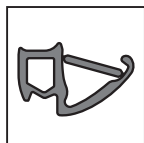
1



2



3.6a



1

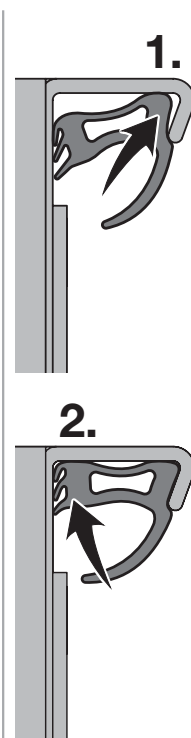
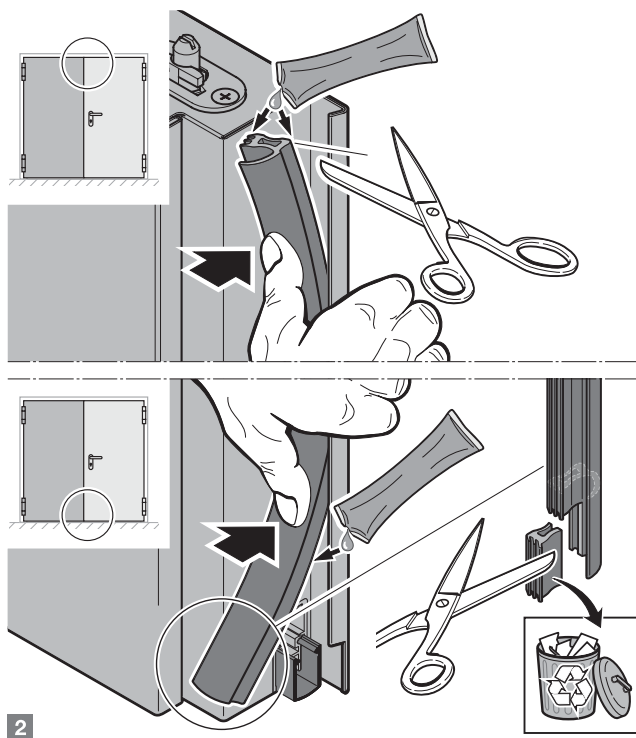
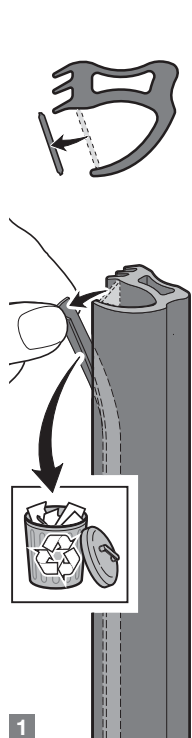
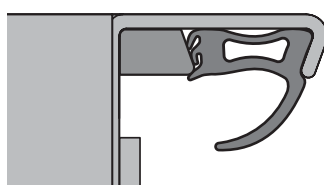
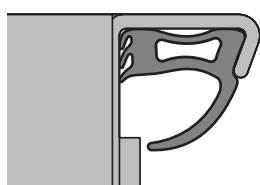
2

3

3.6b

A

B



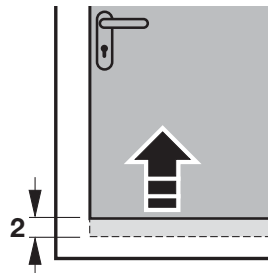
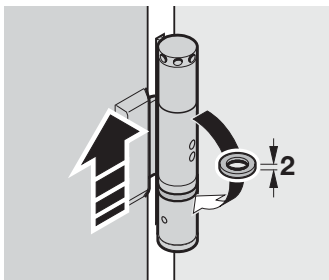
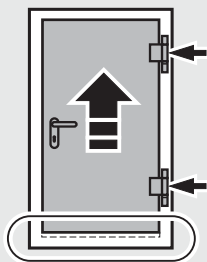
1

2

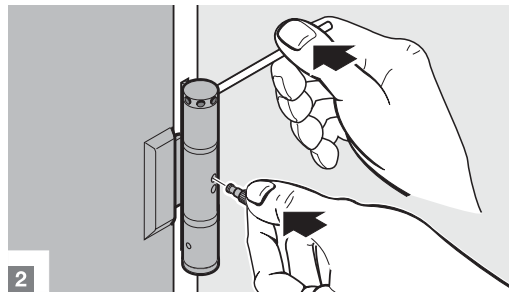
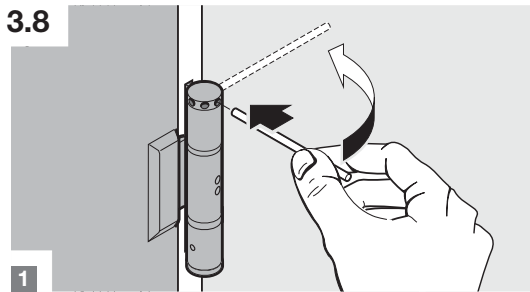
1.

2.

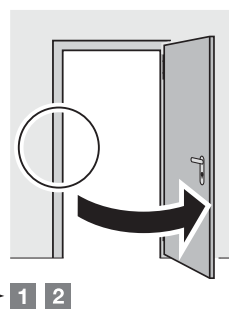
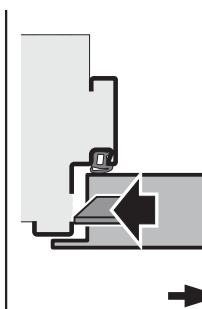
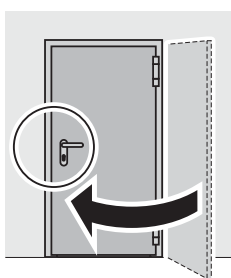
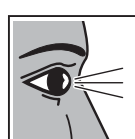
3.7



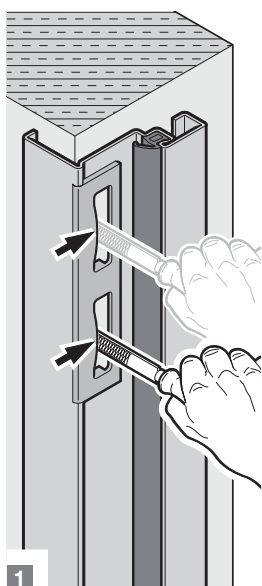
3.8



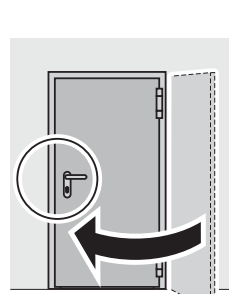
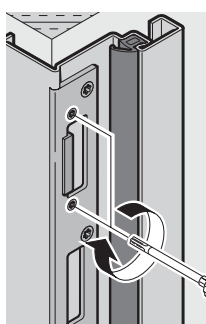
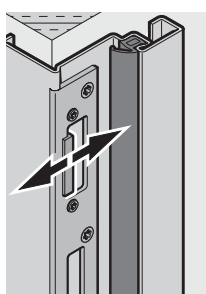
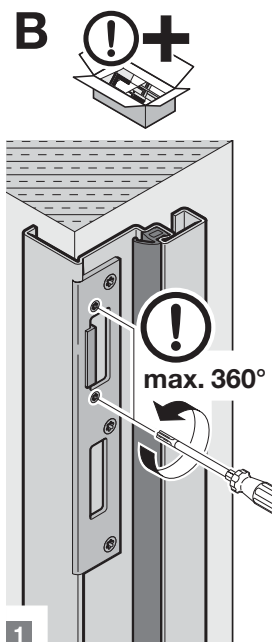
3.9a



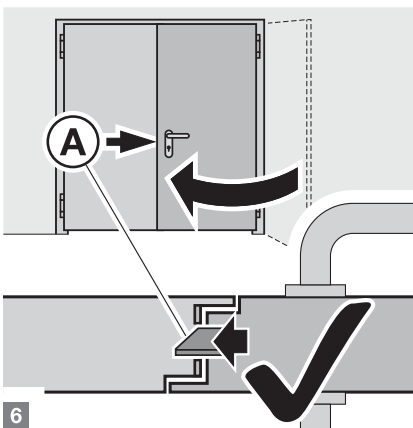
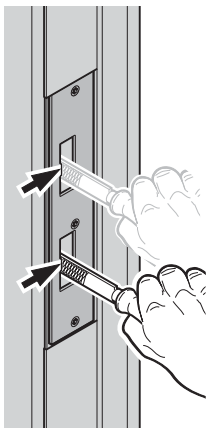
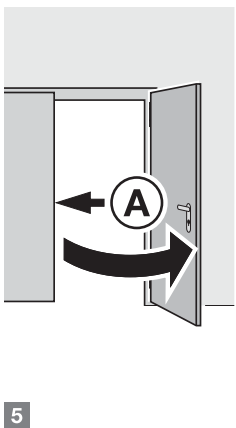
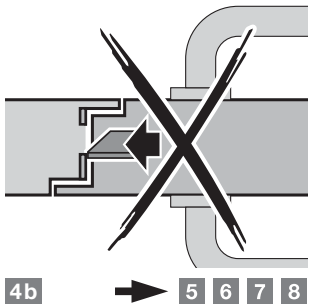
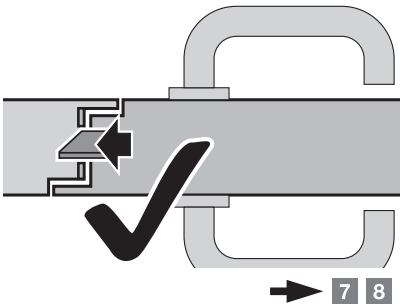
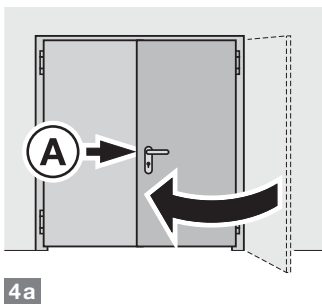
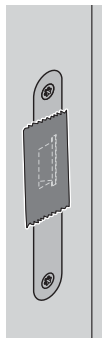
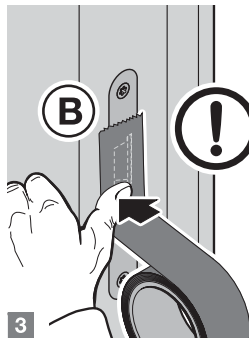
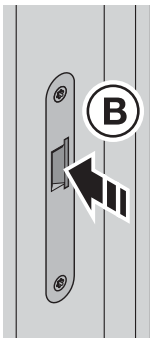
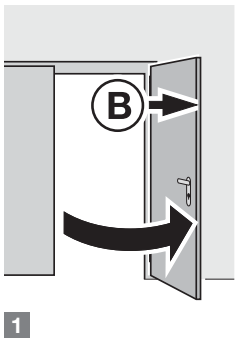
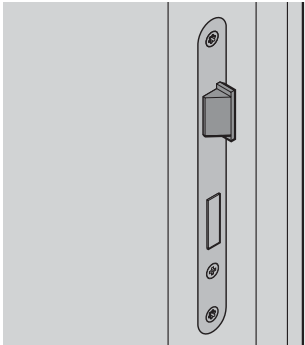
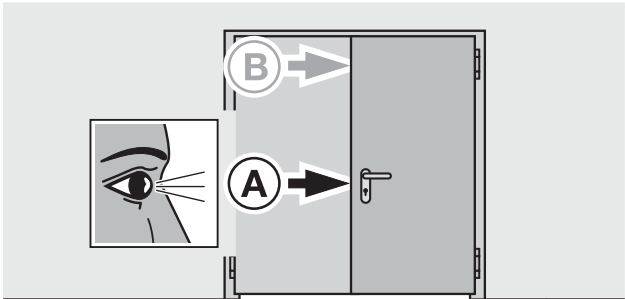
A



B



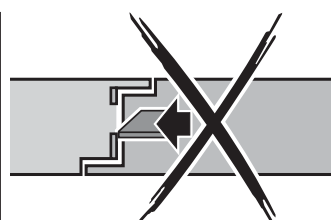
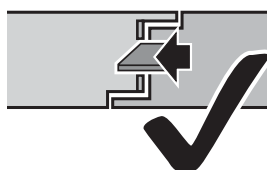
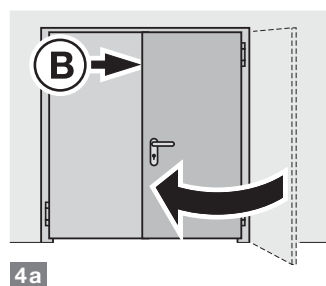
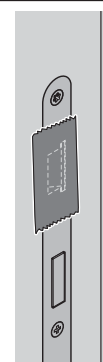
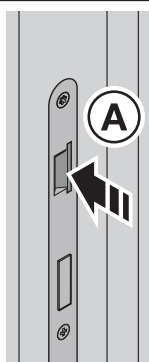
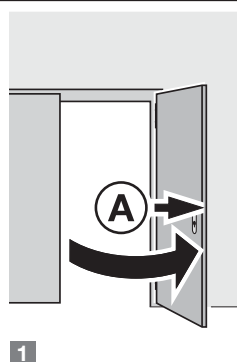
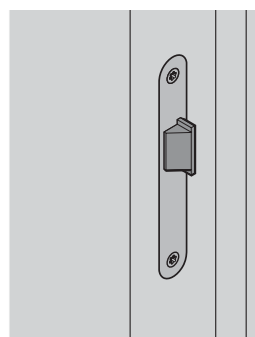
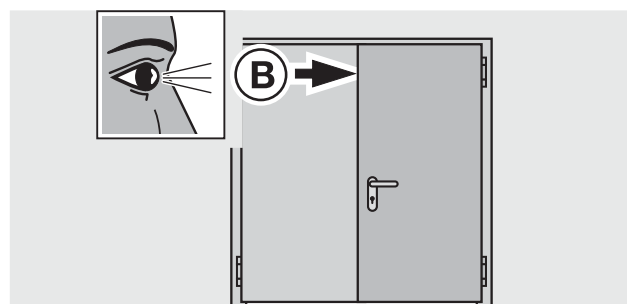
3.9b H16-2 G / H_90 F-2



8

➔ 3.9c

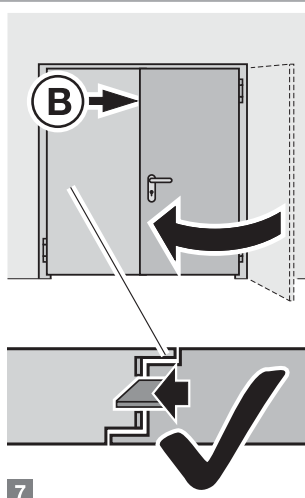
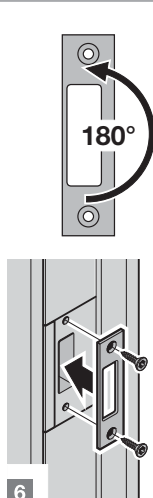
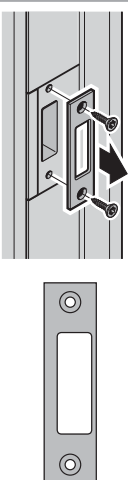
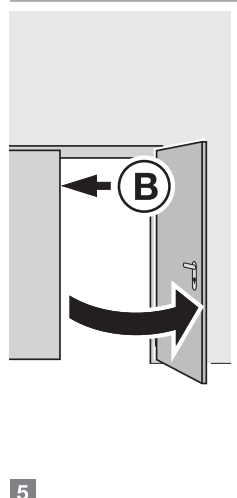
3.9c H16-2 G / H_90 F-2



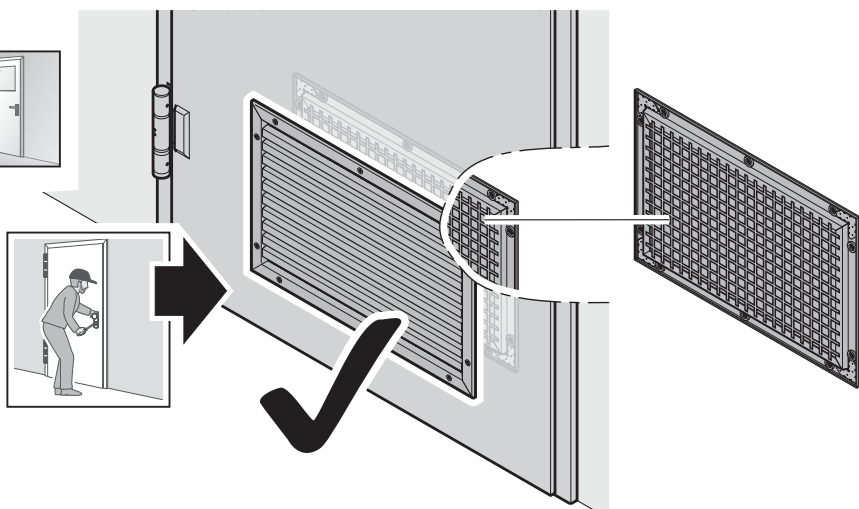
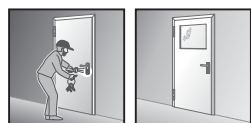
→ 8

4b

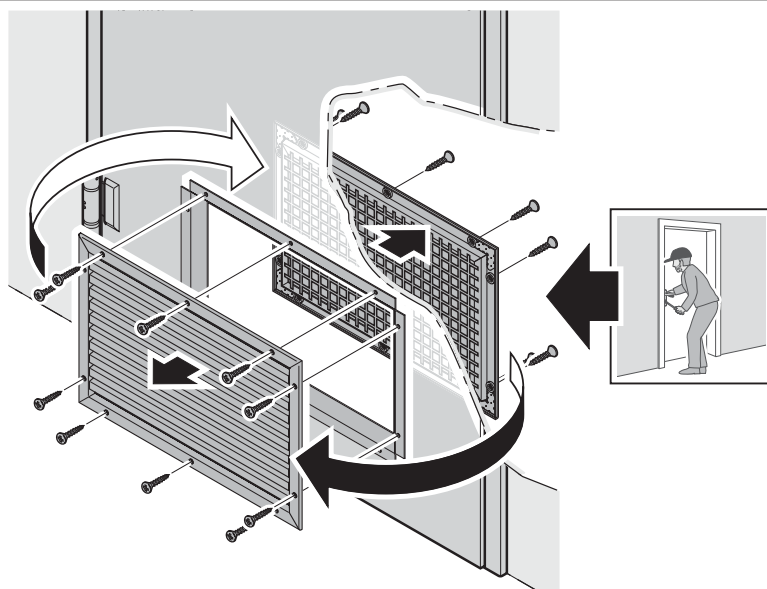
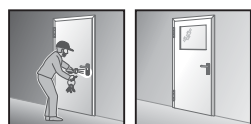
→ 5 6 7 8



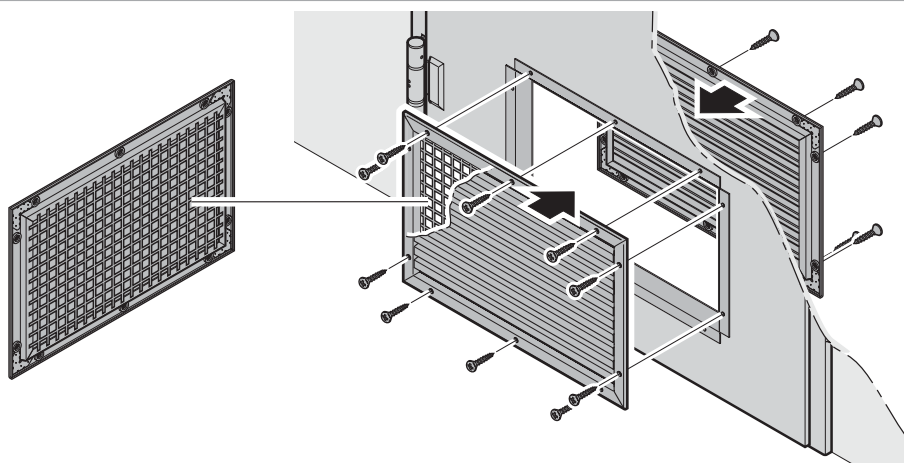
3.10a



3.10b

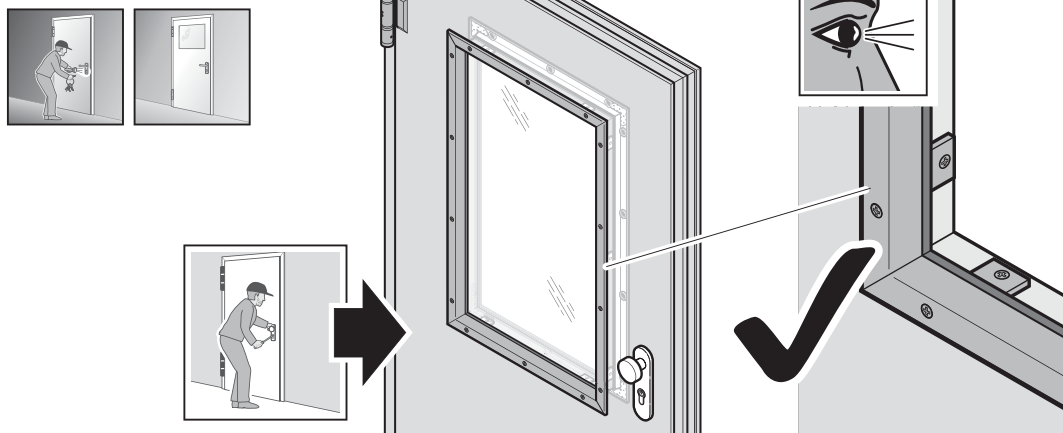


1

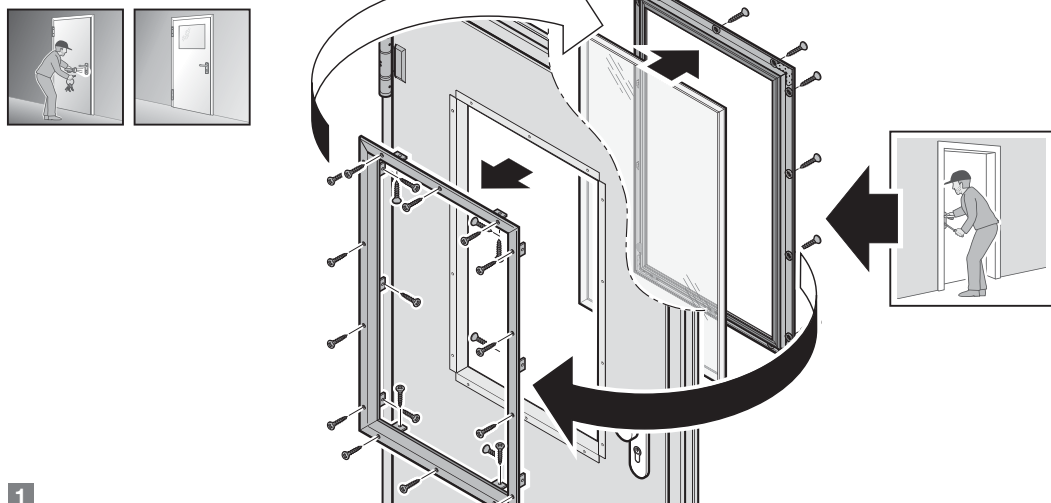


2

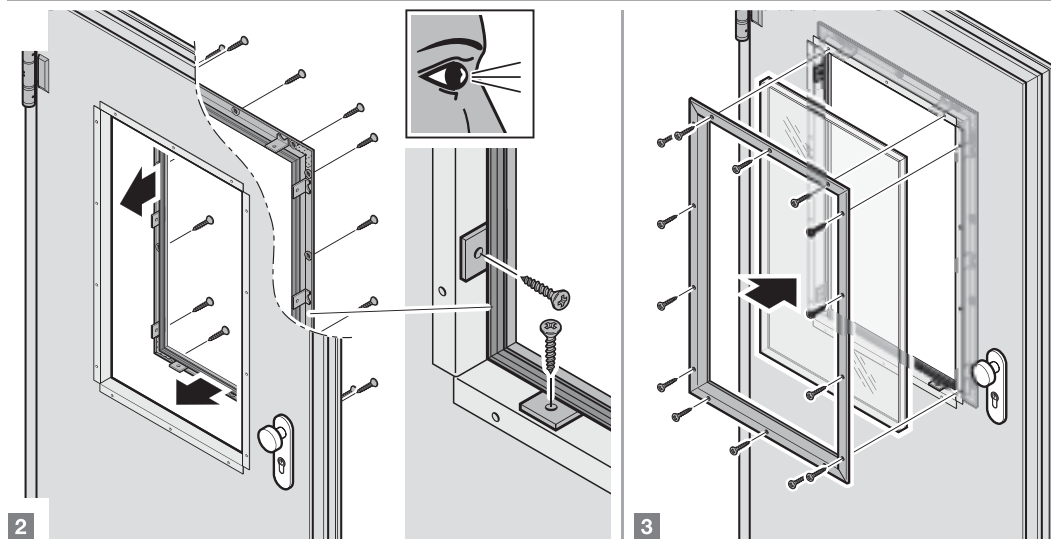
3.11a



3.11b



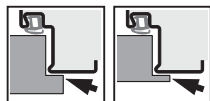
1



2

3

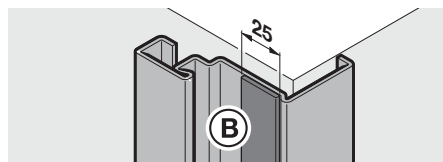
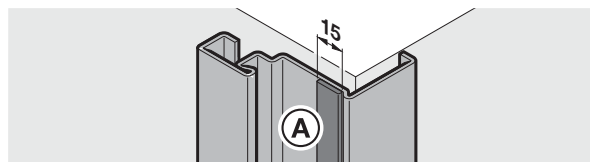
3.12a



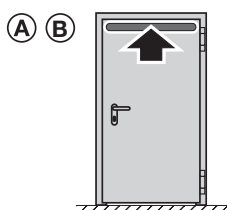
+ H3-1 OD
H3-2 OD



+ H3-1 OD
H3-2 OD

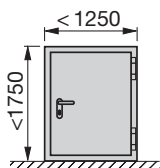


a

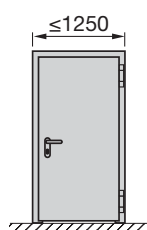


b

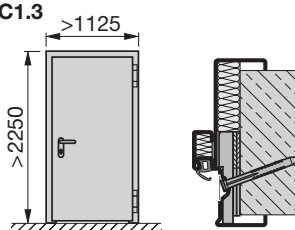
(A) (B)



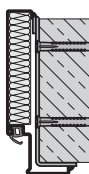
(B)



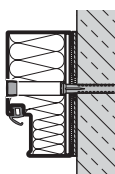
(A) C1.3



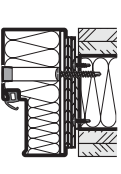
(A) (B)
D1.4 / D1.5



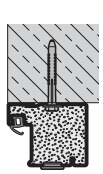
(A) (B) E1.2



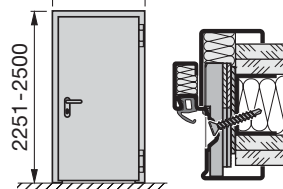
(A) (B) E1.3



(A) (B) E3.1



(A) C1.5
1125 - 1320



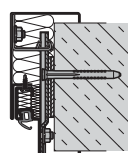
(A) (B) D2.2 / D2.3



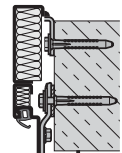
(A) (B) B.1



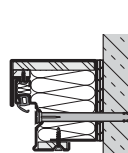
(A) (B) D3.1



(A) (B) C3.4

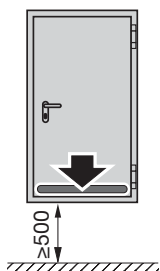


(A) (B) E2.2



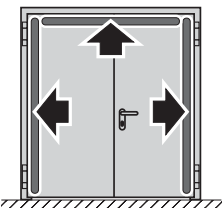
c

(A) (B)



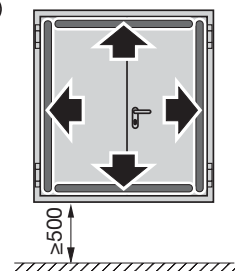
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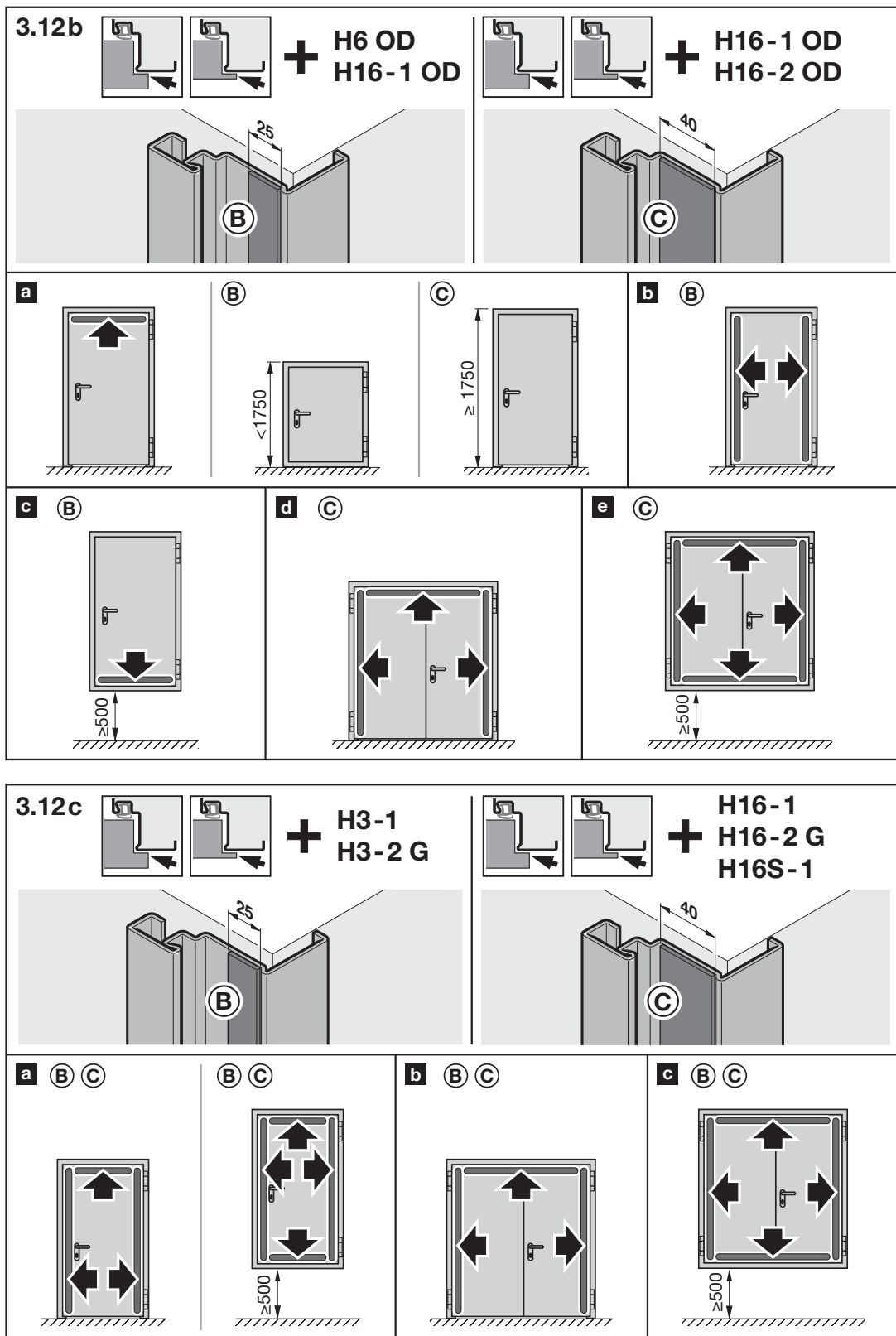
(A) (B)



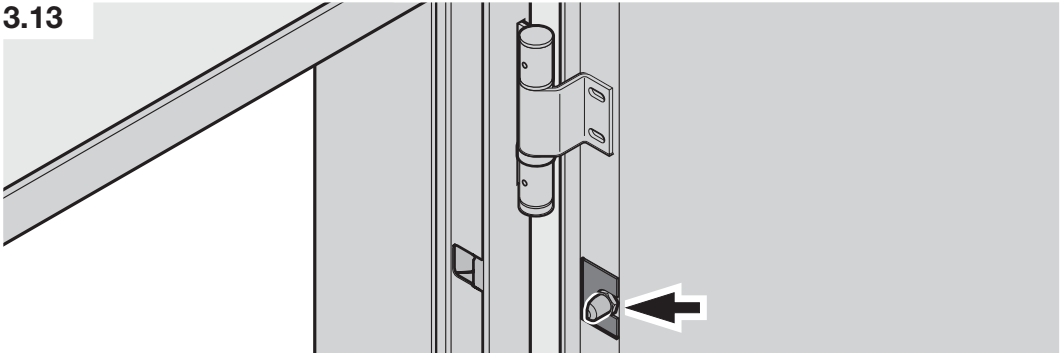
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(A) (B)

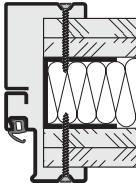




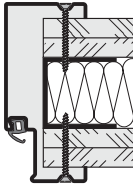
3.13



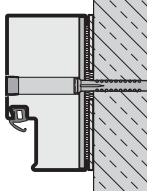
C4.1 - C4.4



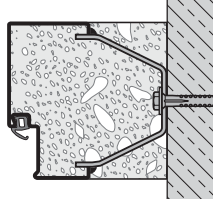
D2.2 - D2.5



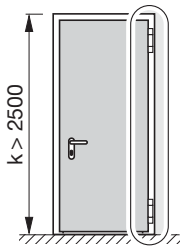
E1.1 / E1.2



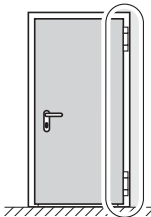
E1.4



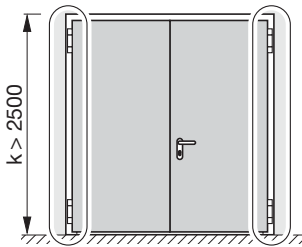
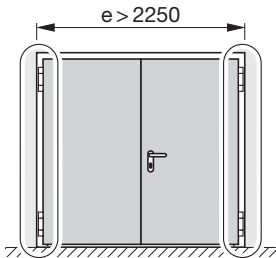
T30-1 / H_30-1



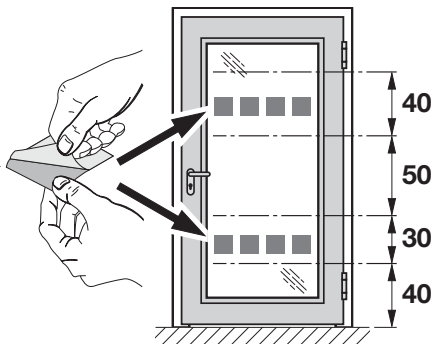
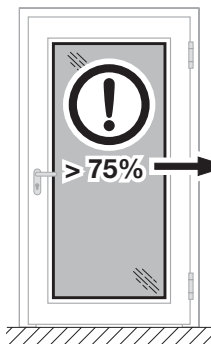
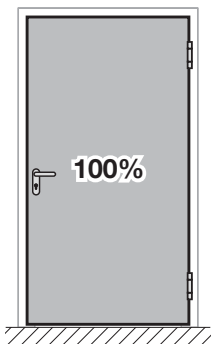
T60-1 / H_60-1
T90-1 / H_90-1



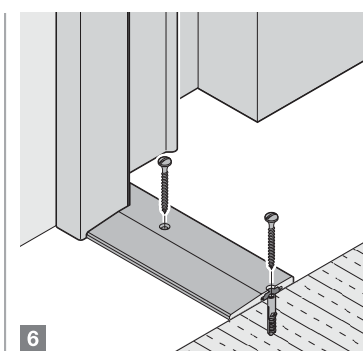
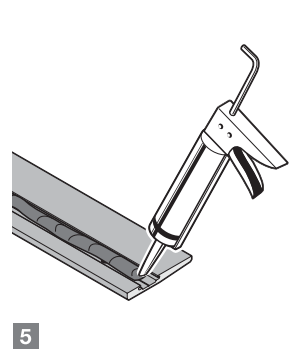
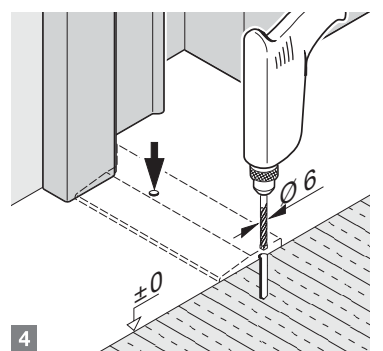
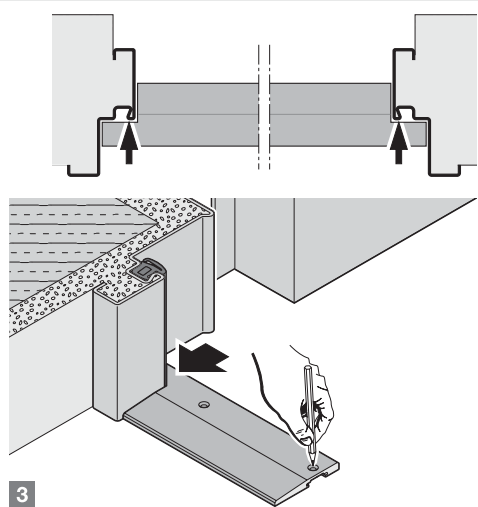
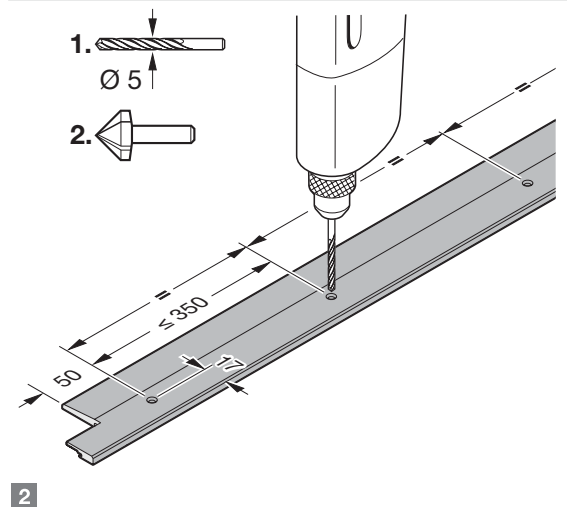
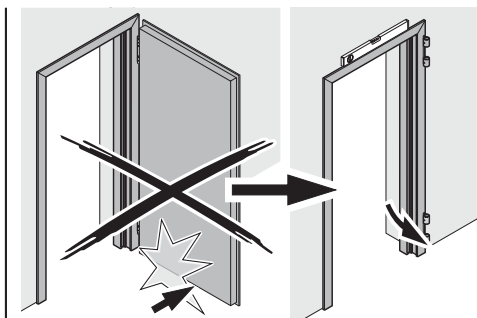
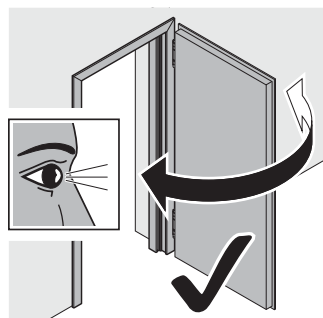
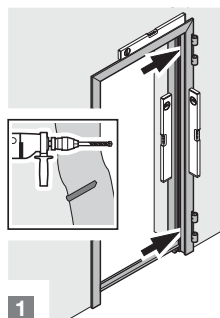
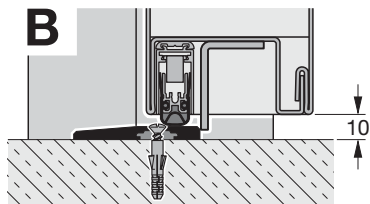
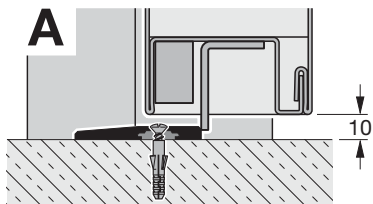
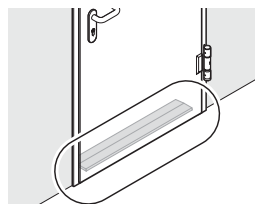
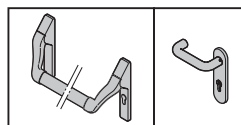
T60-2 / H_60-2
T90-2 / H_90-2



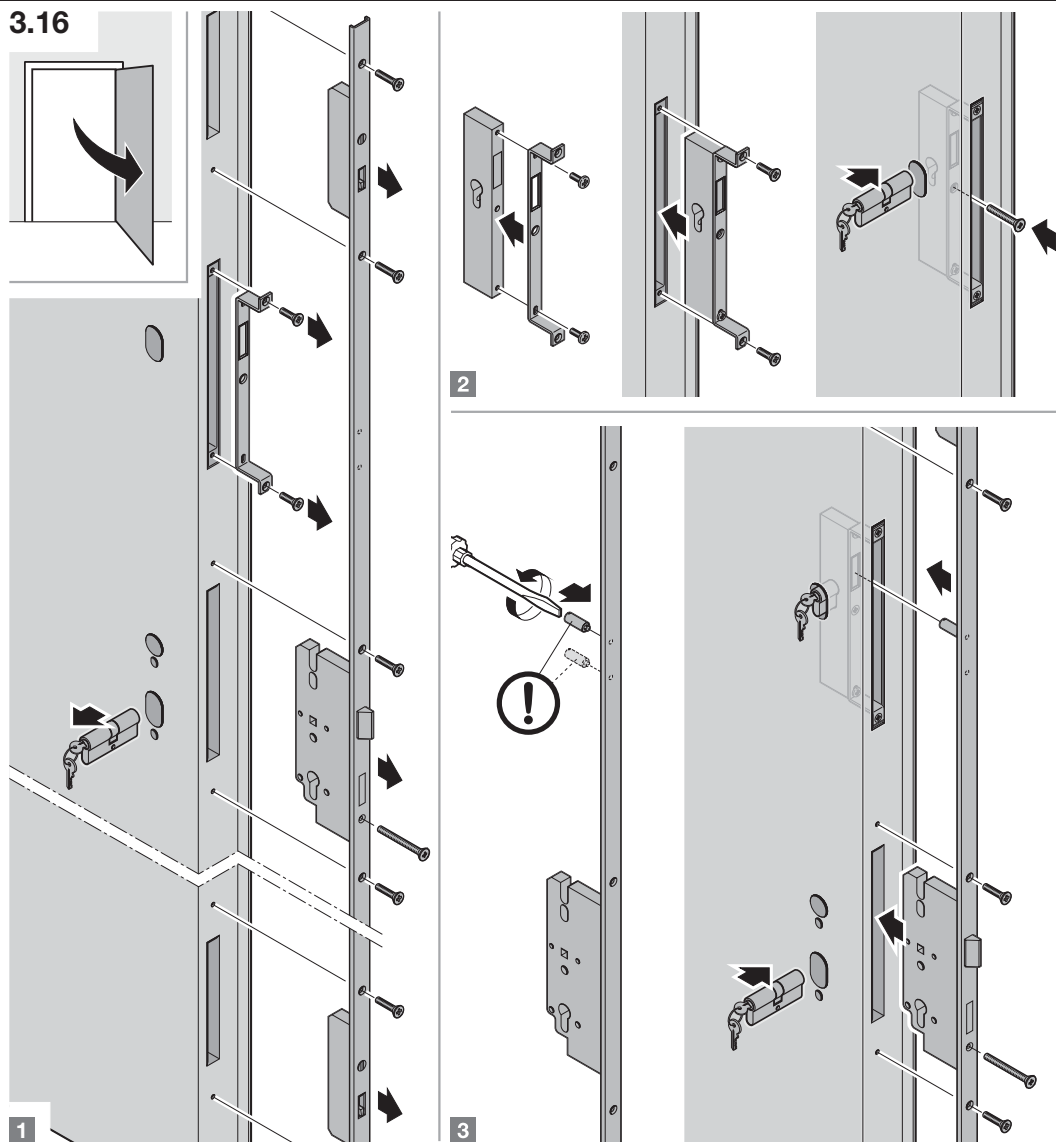
3.14



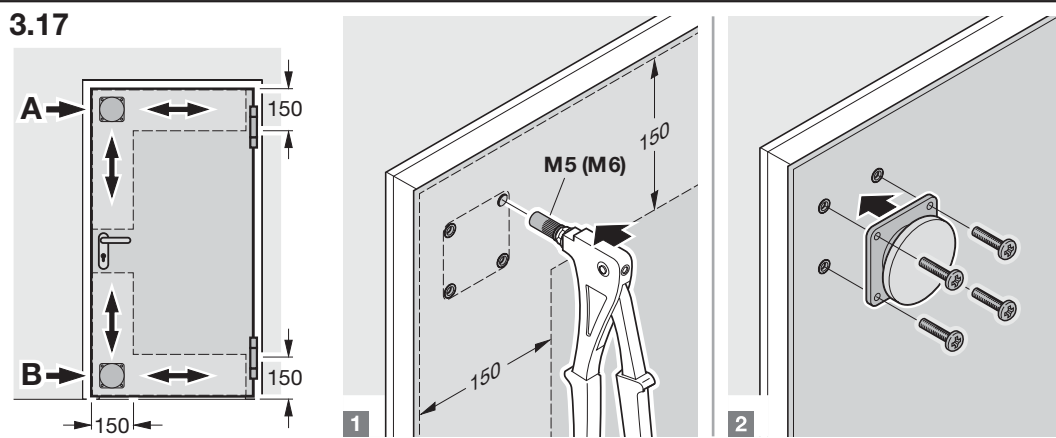
3.15



3.16

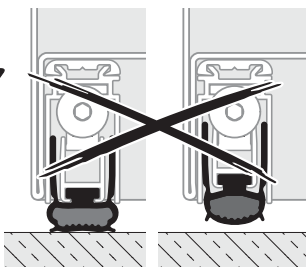
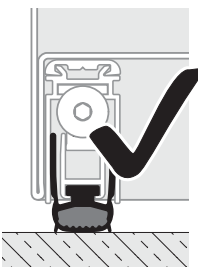
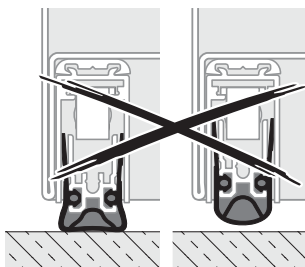
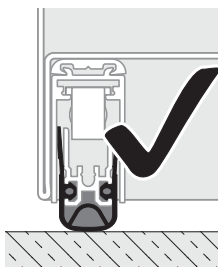
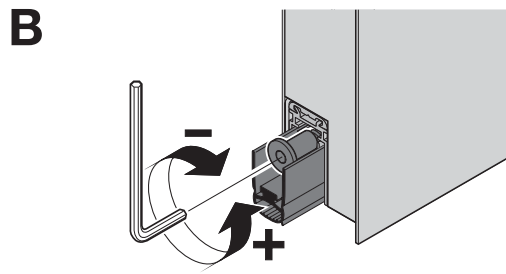
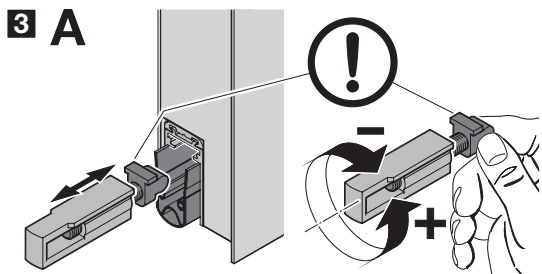
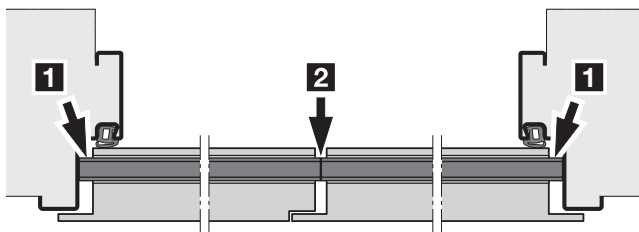
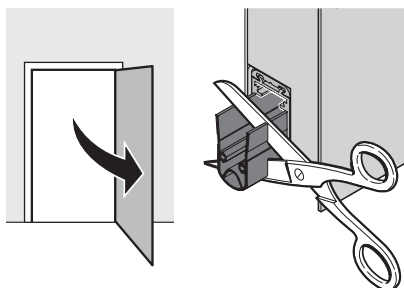
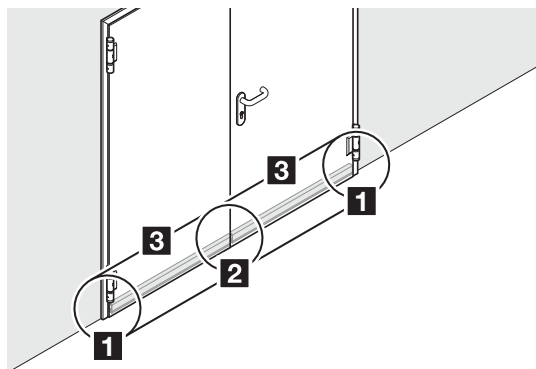
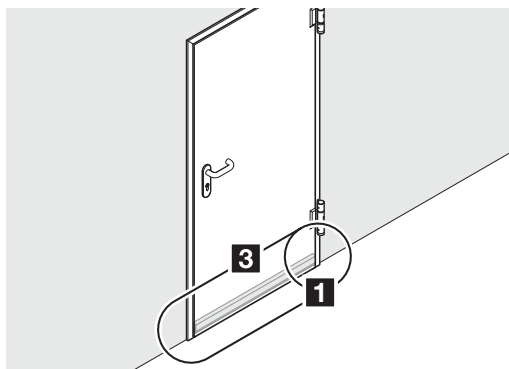
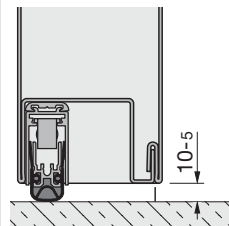
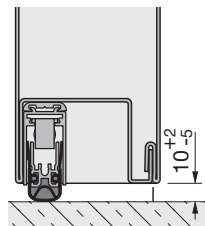
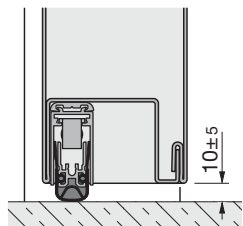
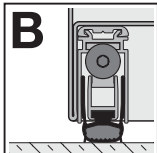
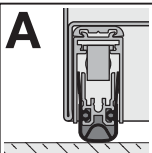


3.17



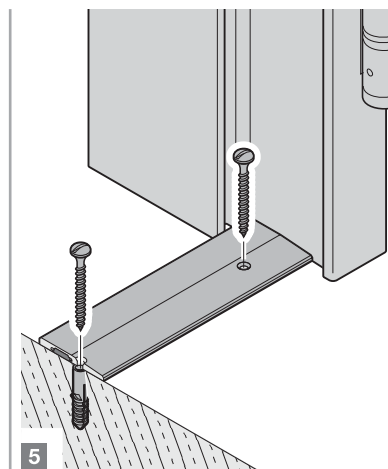
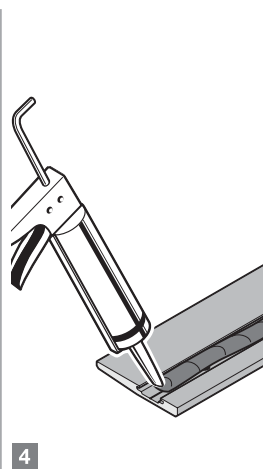
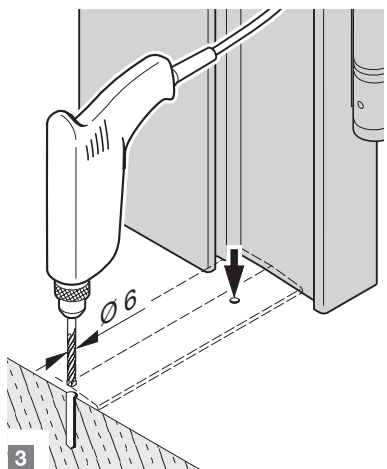
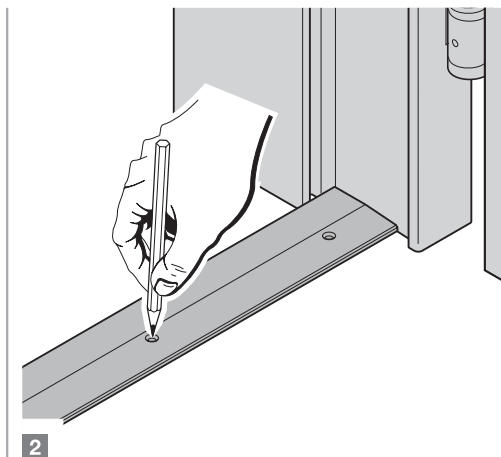
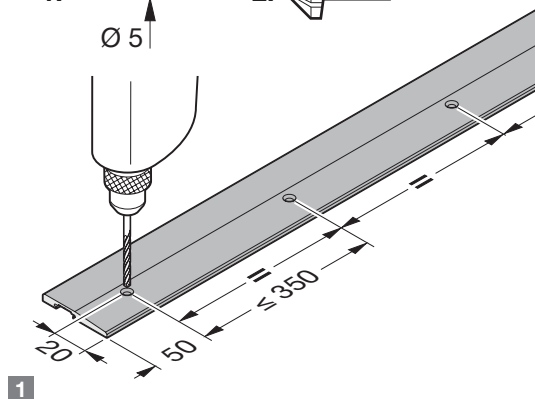
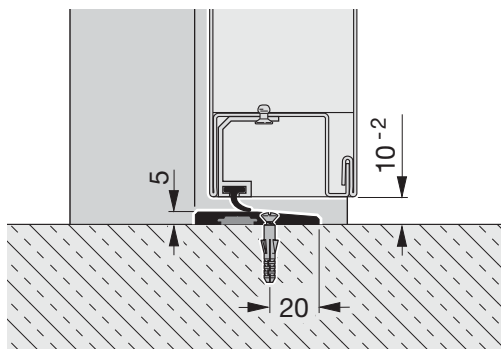
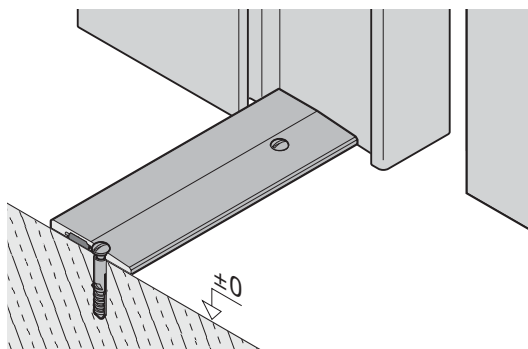
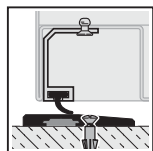
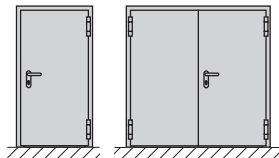
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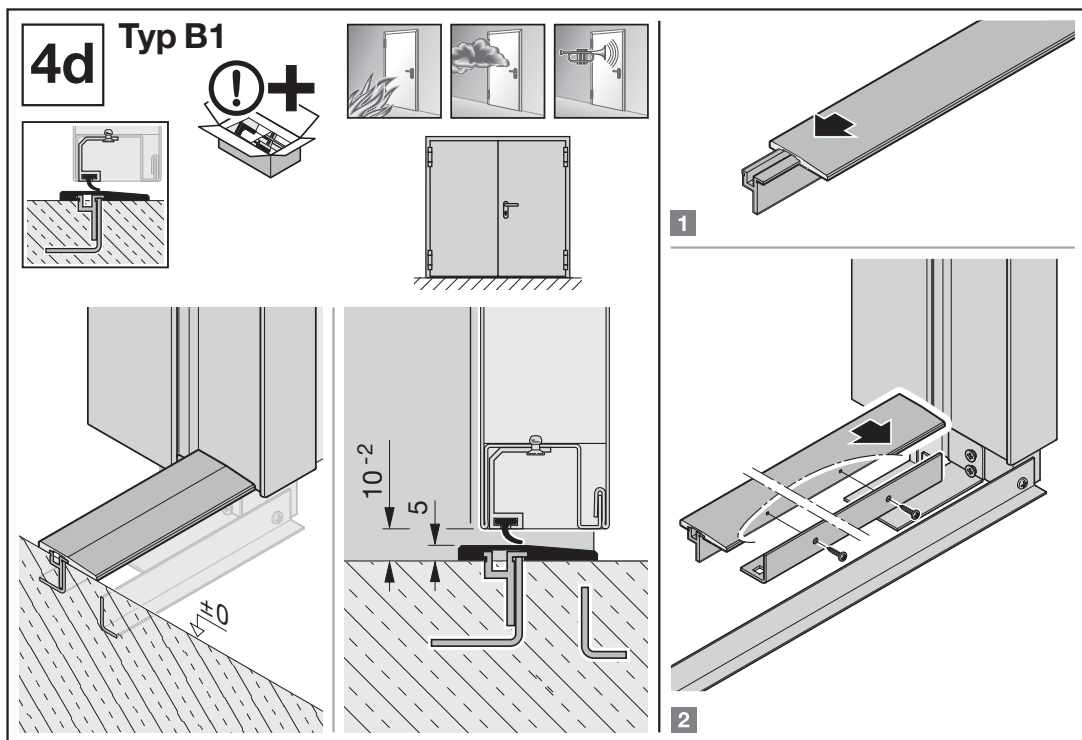
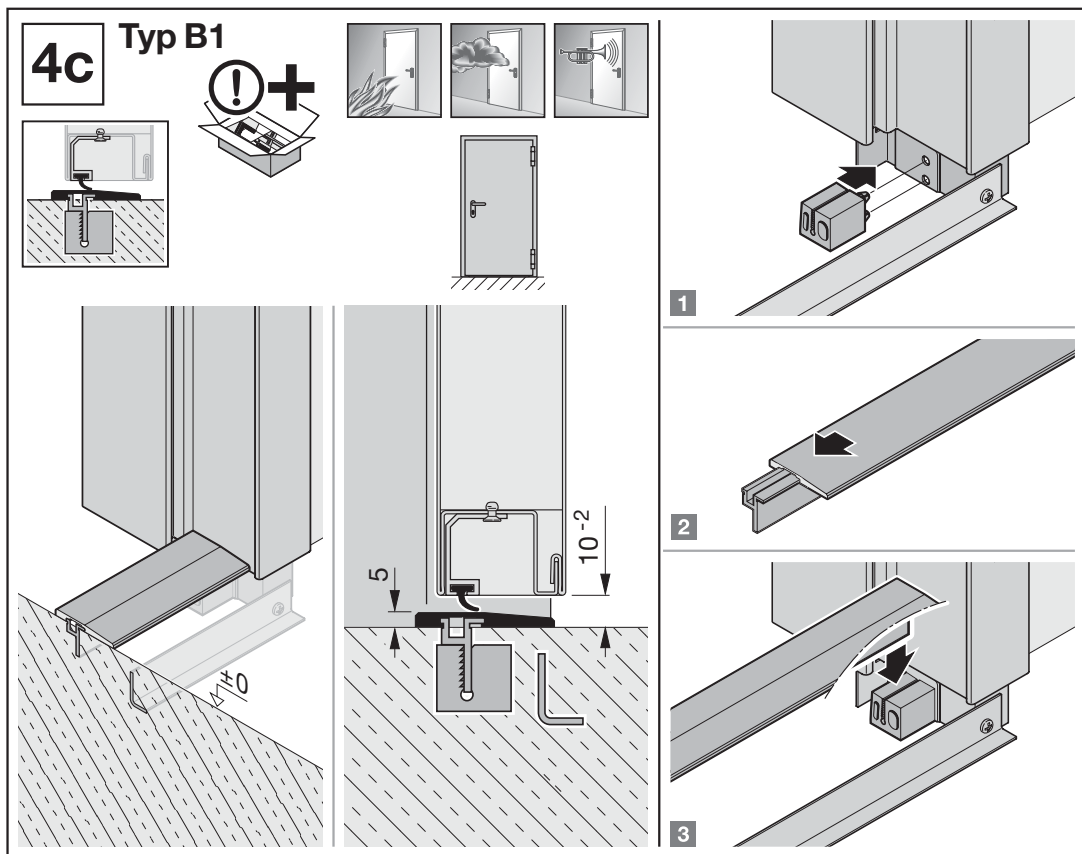
Typ A1 - A4



4b

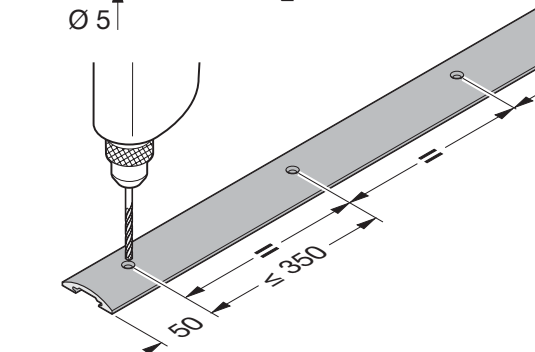
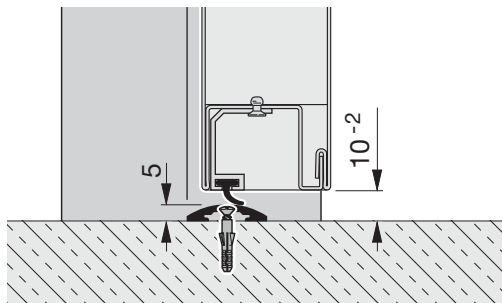
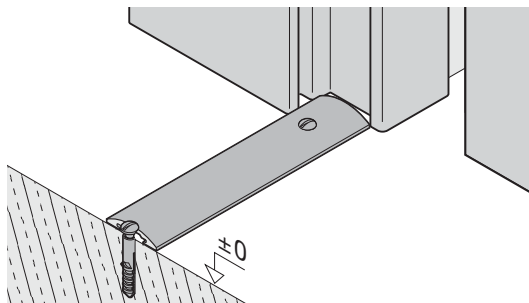
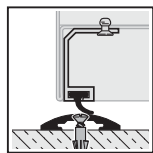
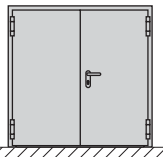
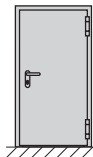
Typ B1



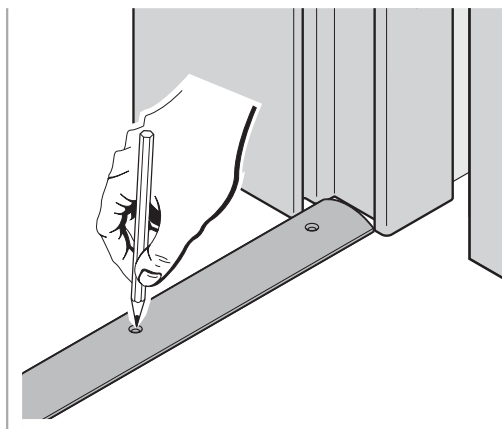


4e

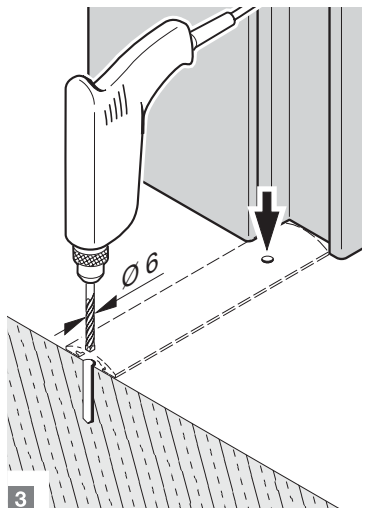
Typ B2



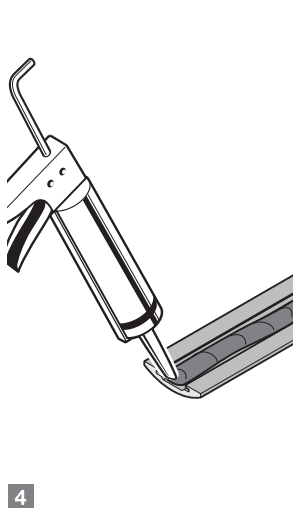
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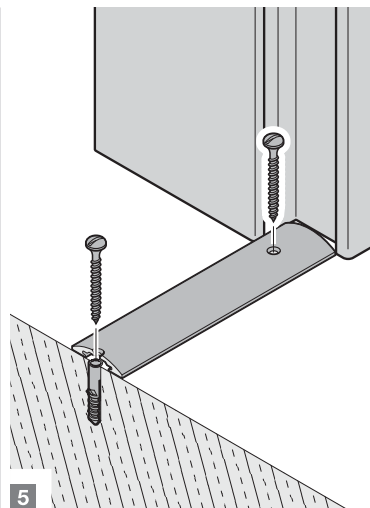
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3

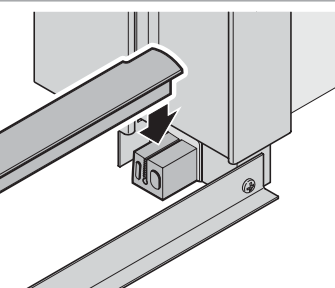
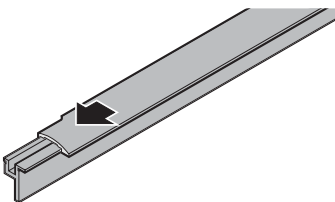
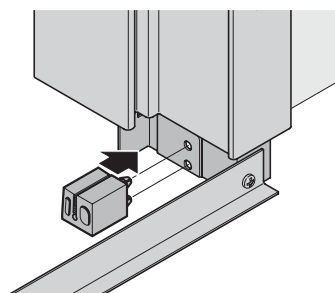
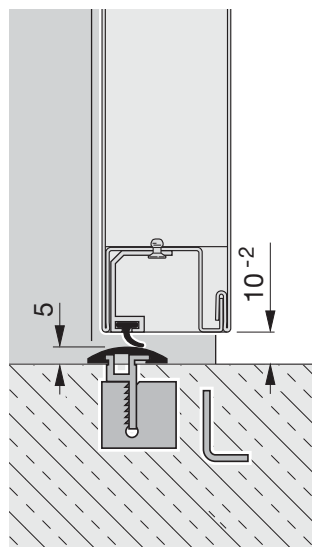
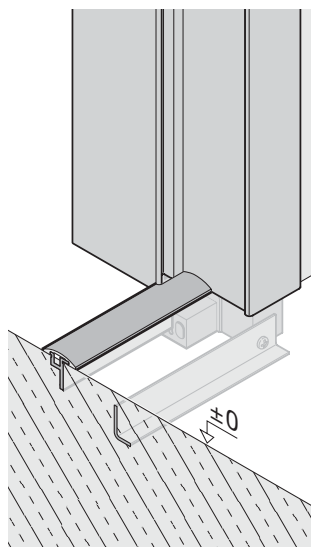
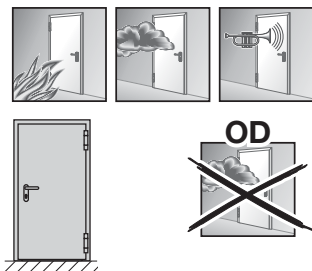
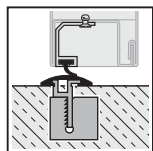


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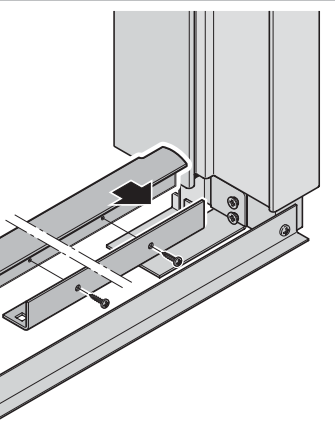
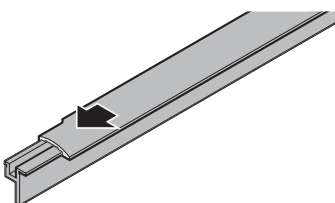
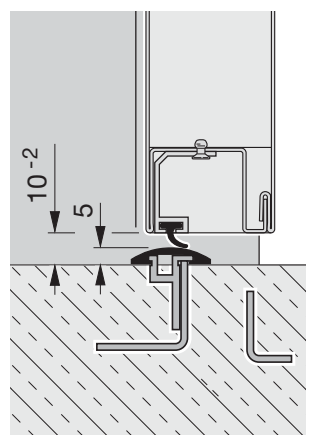
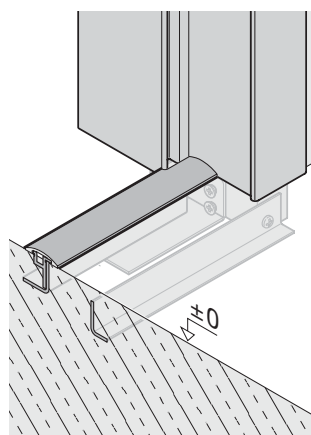
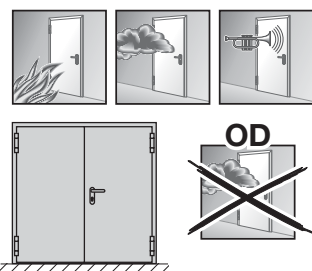
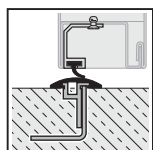


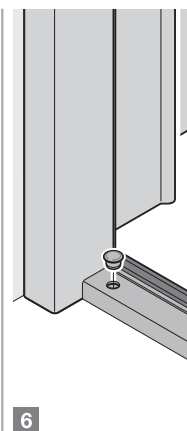
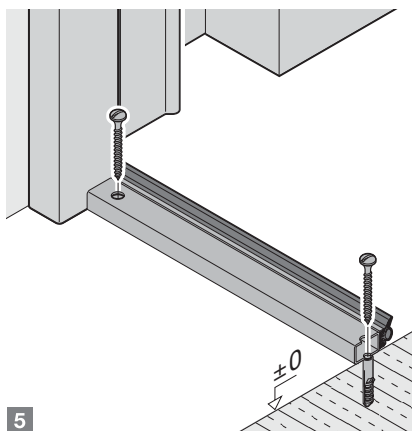
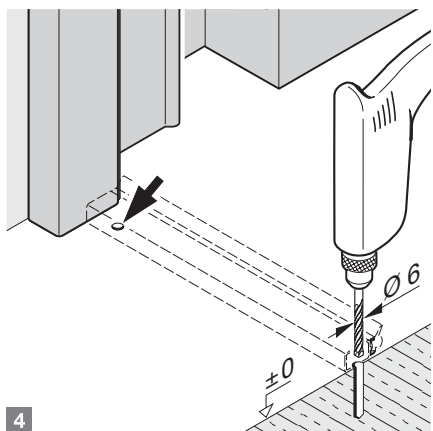
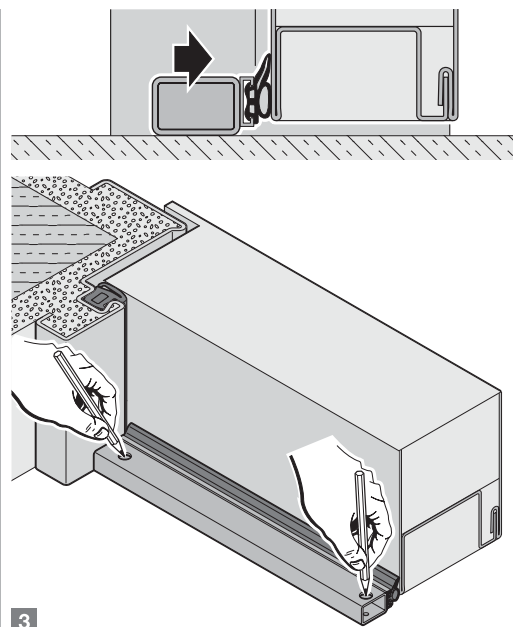
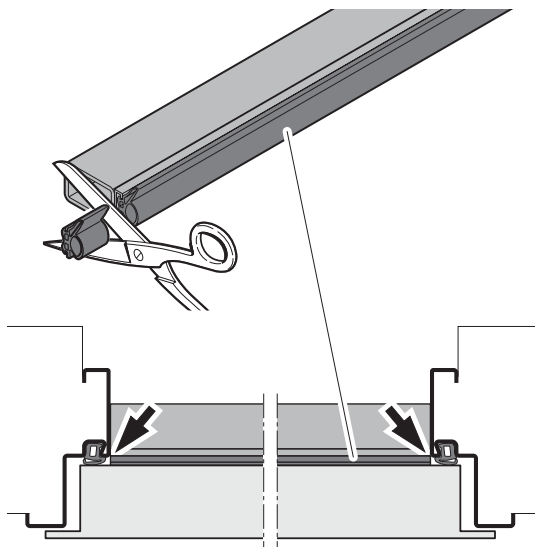
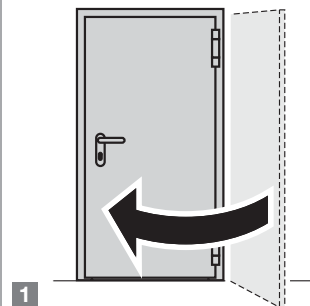
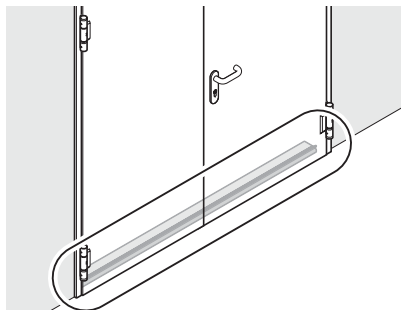
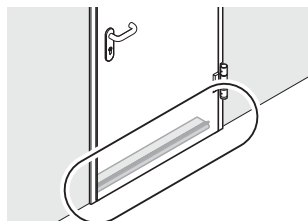
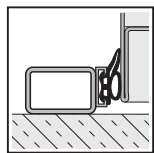
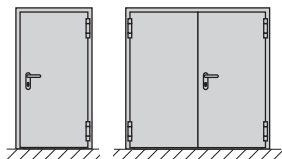
5

Typ B2



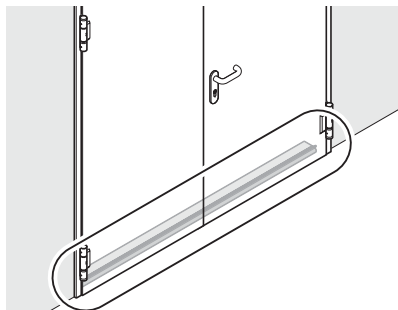
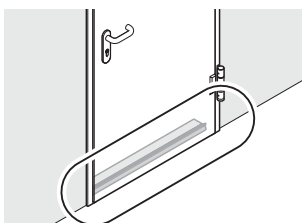
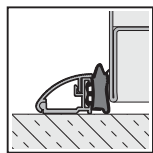
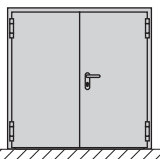
Typ B2



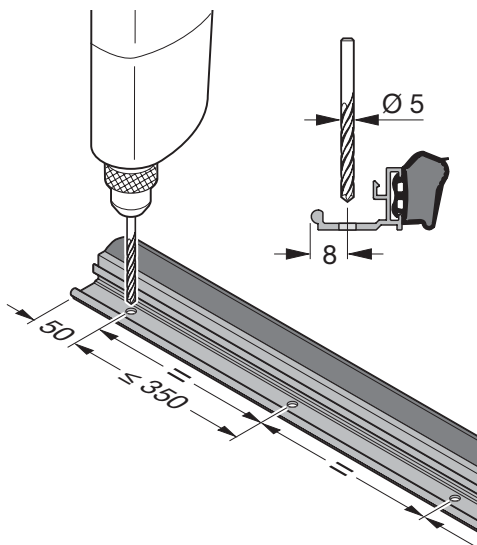
4h**Typ C1**

4i

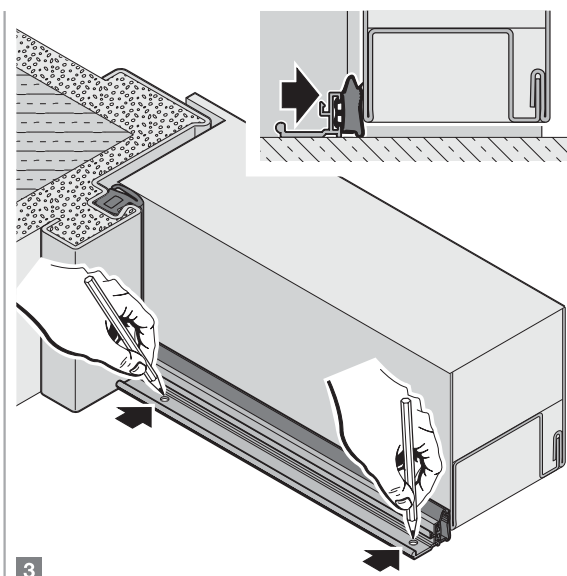
Typ C2



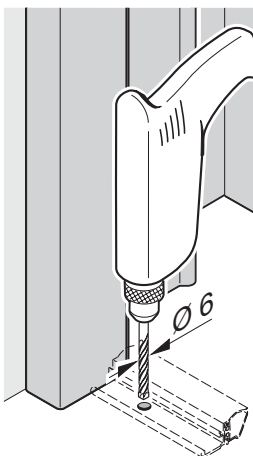
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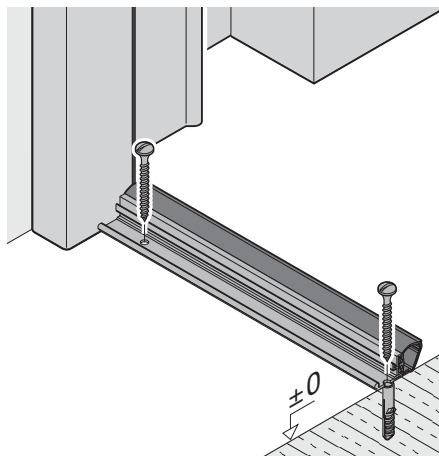
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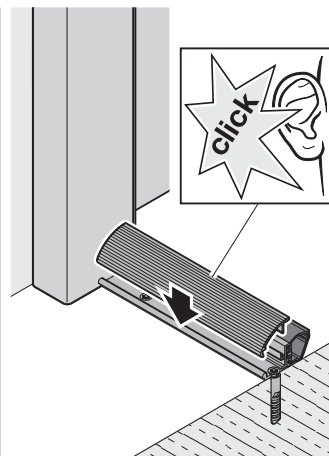
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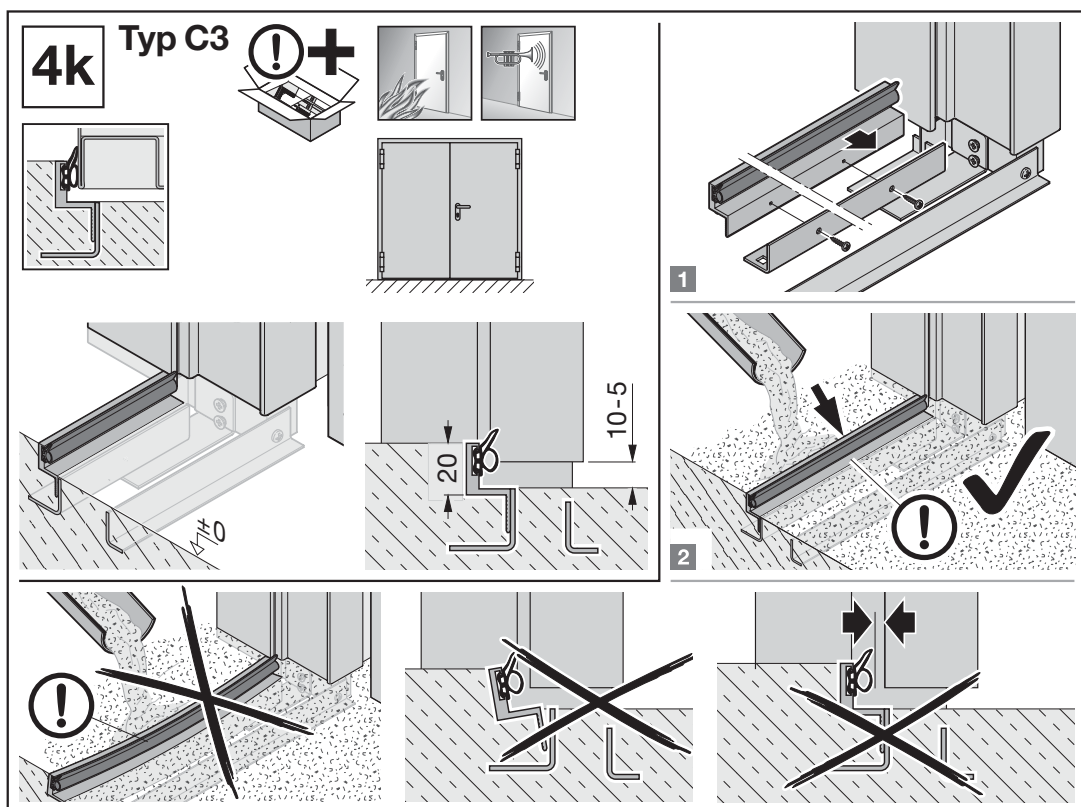
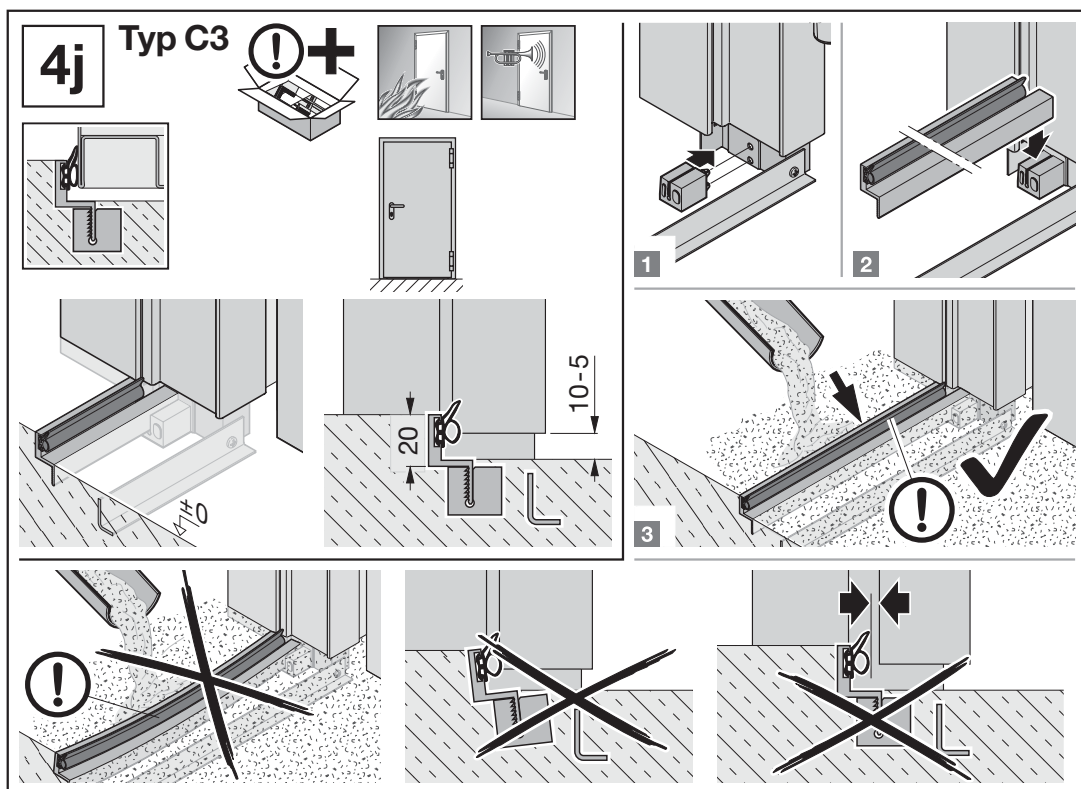
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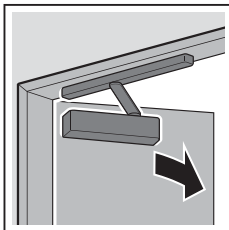
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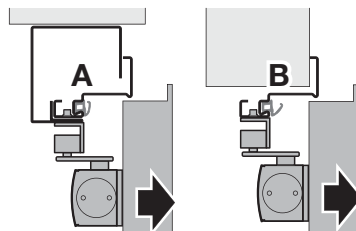
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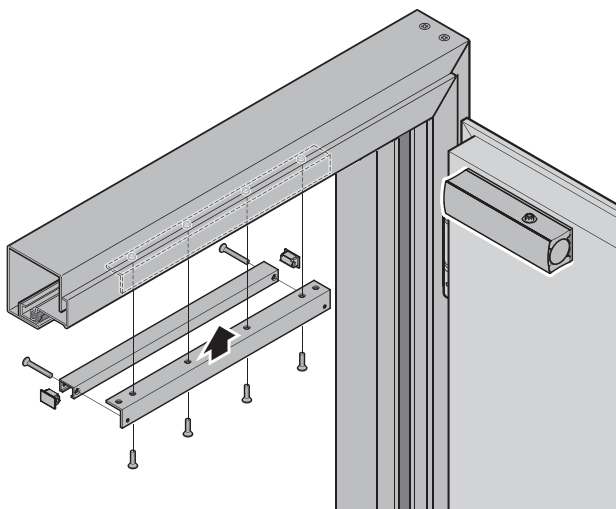
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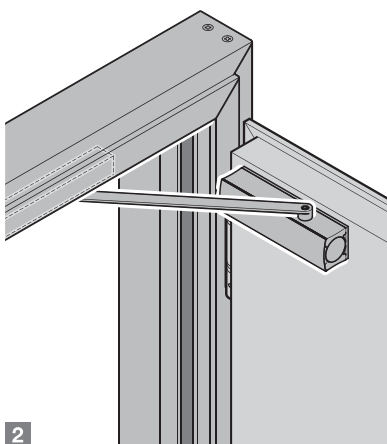
HDC 35 BG



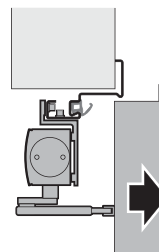
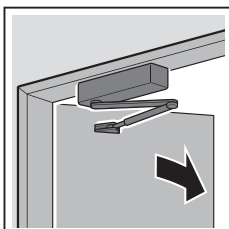
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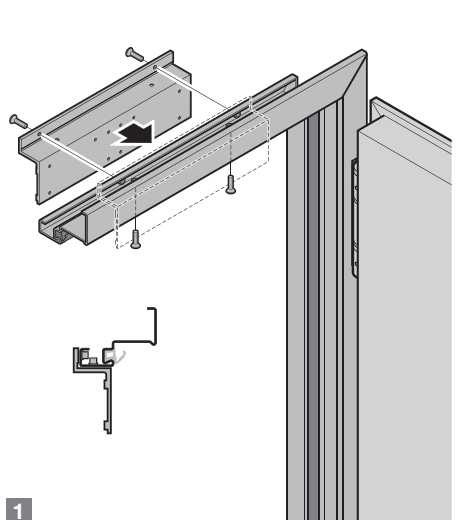
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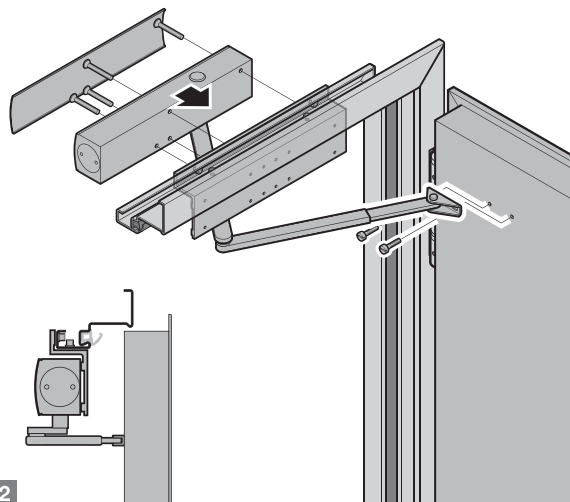
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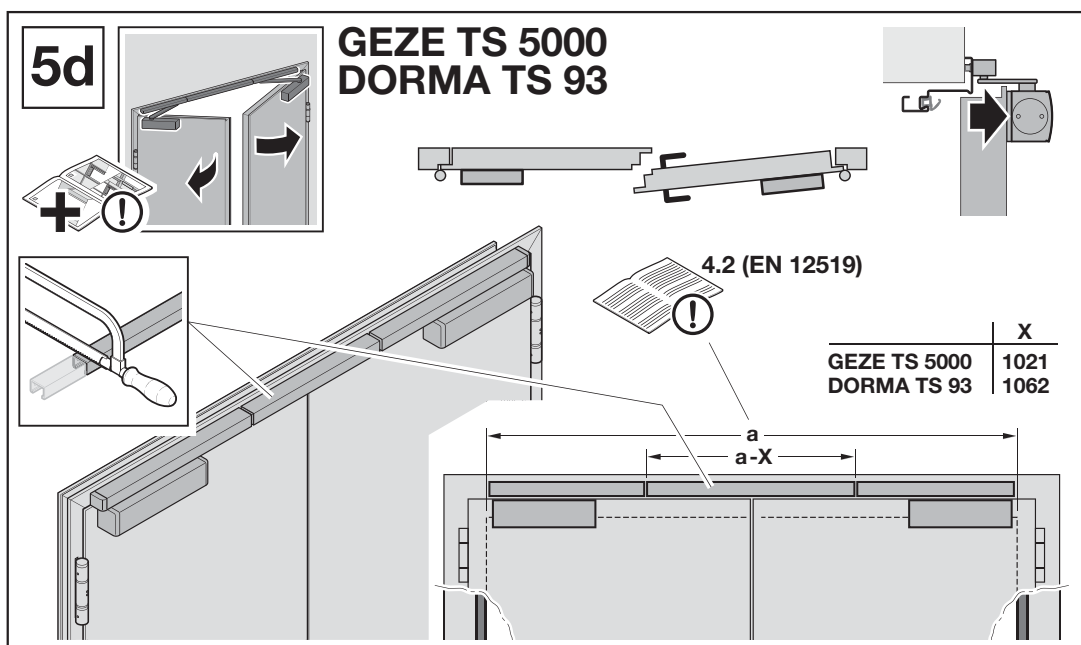
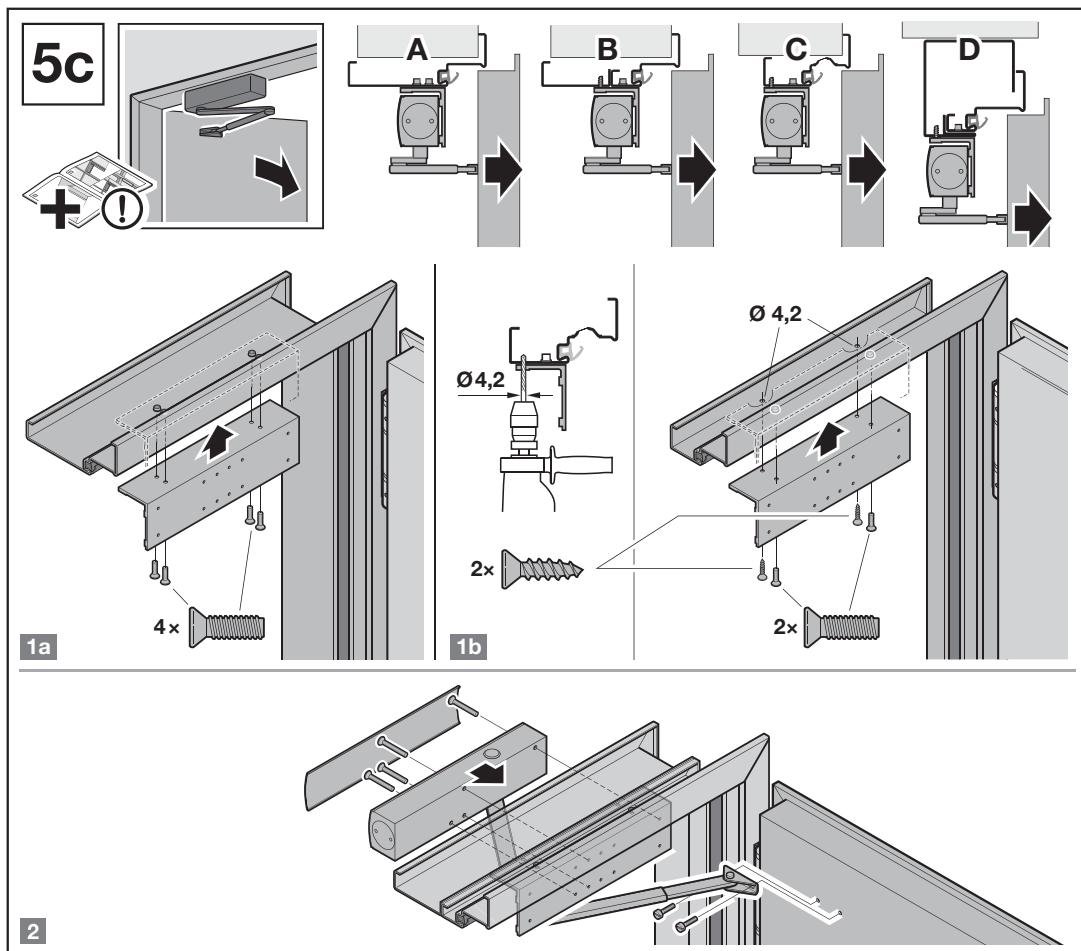


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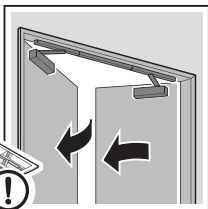


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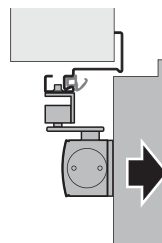
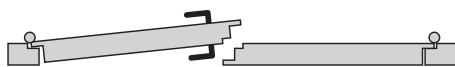




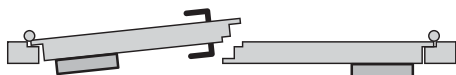
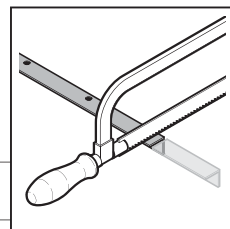
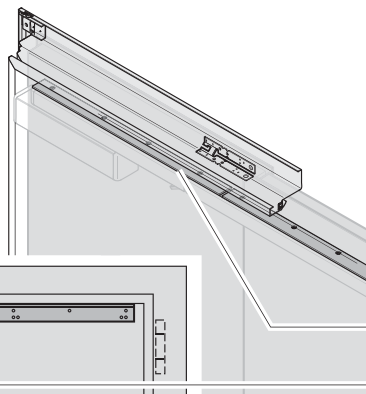
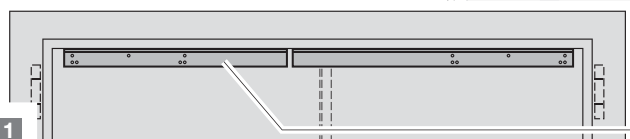
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**GEZE TS 5000
DORMA TS 93**

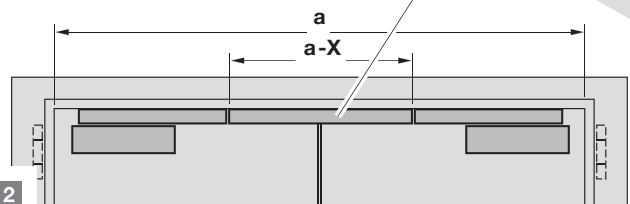


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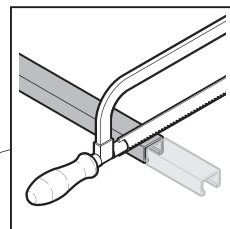
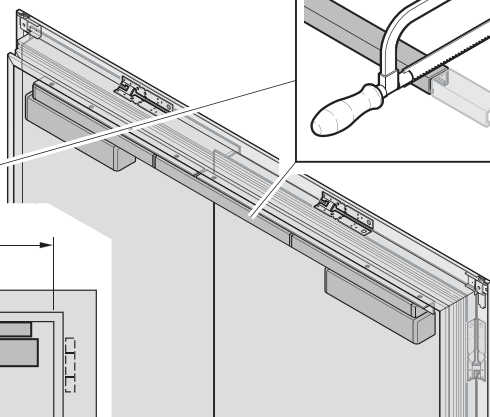


4.2 (EN 12519)

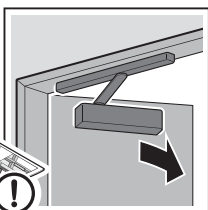
	X
GEZE TS 5000	1130
DORMA TS 93	1179



2

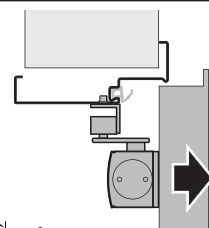
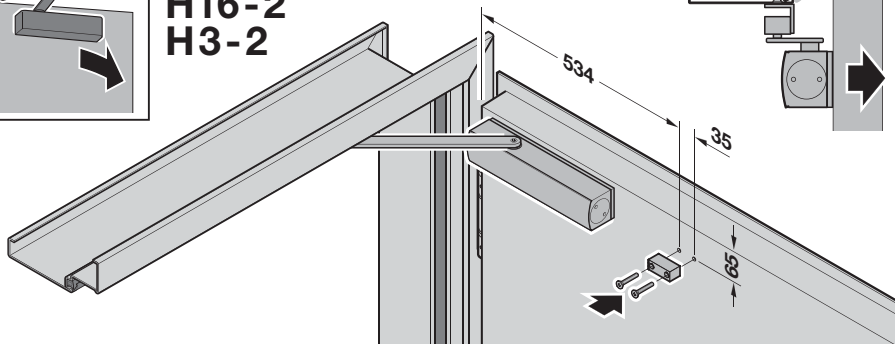


5f

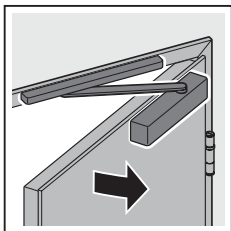


TS 93 GSR BG

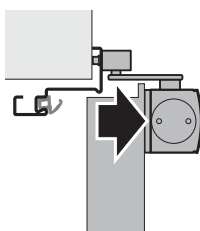
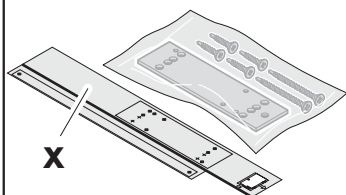
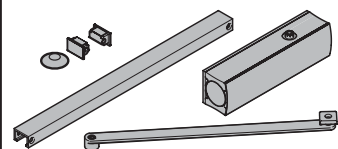
**H16-2
H3-2**



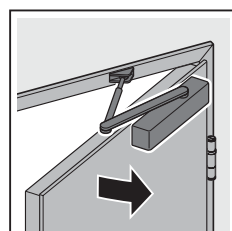
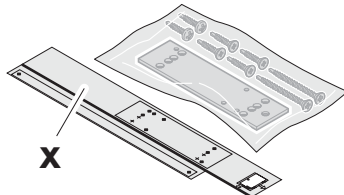
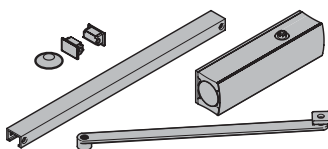
5g



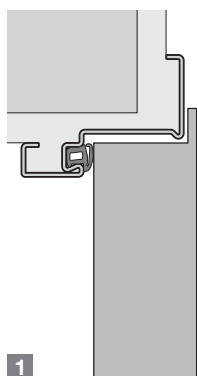
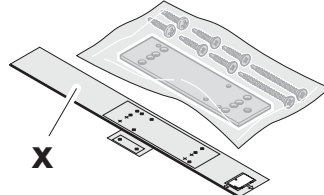
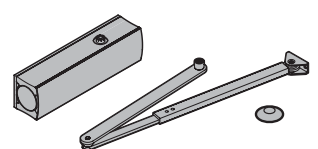
HDC 35



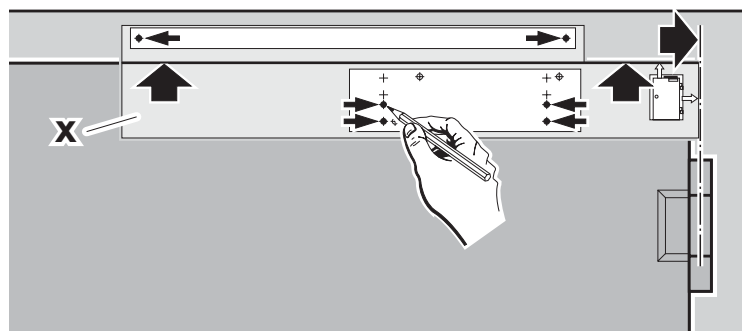
TS 5000



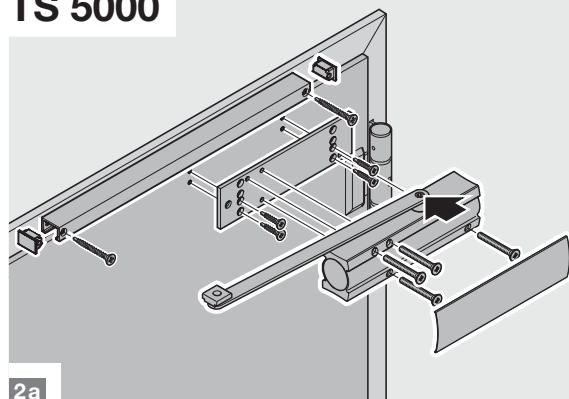
TS 4000



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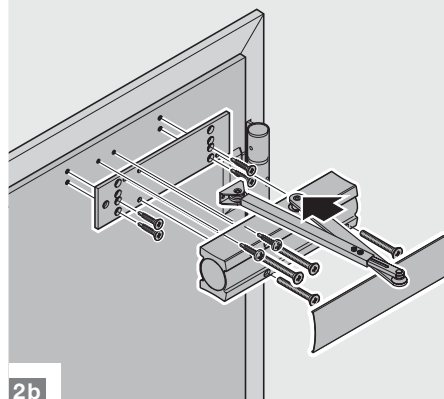


**HDC 35
TS 5000**



2a

TS 4000



2b

