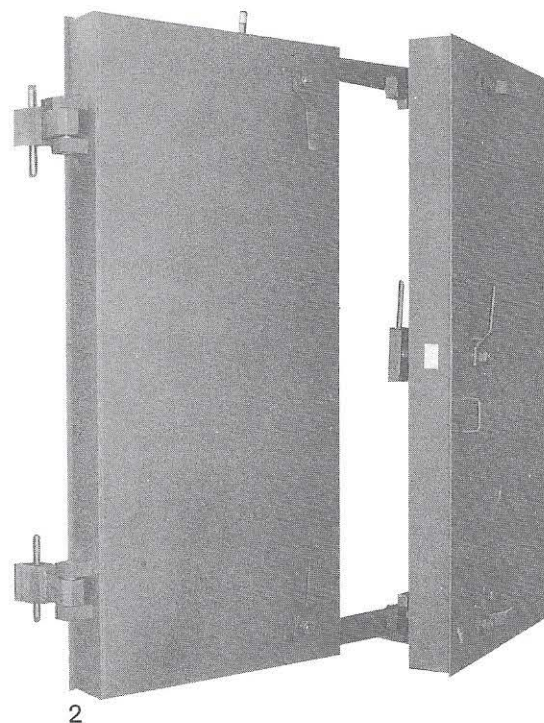
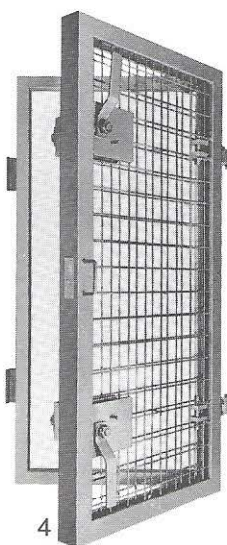
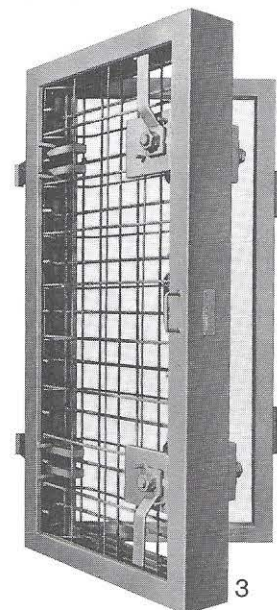
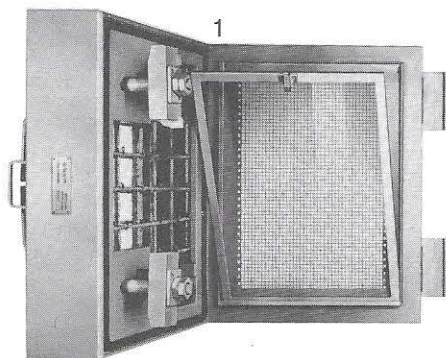




- 1 Blast cover PD
- 2 Blast double door PTO (NATO Type)
- 3 Blast door PT
- 4 Pressure door DT

Admission

Andair doors have been developed according to the technical regulations of the Swiss Civil Defence Organisation (BZS), tested by BZS and released for buildings needing an effective protection level of 3 bars or 11 bars reflected pressure.

Andair supplies also doors with larger dimensions and higher protection levels.

Typical application

Andair doors are designed for civil defence and military shelters. Different types or armour-plated doors PT, PTO, armour-plated covers PD and pressure doors DT are available. These doors and covers are used for entrances through the shelter shell and air locks, for emergency exits and for openings in interior partition walls.

Moreover, these doors are used in various industries in shelters for the protection of personnel or important equipment, e.g. control rooms, fire brigade shelters, test facilities, etc.

Unit description

Door leaf in steel profile frame with rubber seal on all sides and welded-in reinforcement, removable lever locks on both sides. The internal levers of the blast doors PT and covers PD are secured against

accidental opening, air blast and ground shock vibrations.

Door frame in angular profile with massive anchors and double hinges. All steel parts not to be covered by concrete are coated with a corrosion resistant primer.

To ensure escape, even if doors are blocked by debris, a specially designed self-rescue device may be fitted to all outer doors.

Andair doors are concreted on site ensuring an optimum bond with the shelter shell.

Ordering details

Type of door, dimensions, hinged side where necessary, quantity. Details according to the relevant dimensional sketches on the following pages.

Accessories

Andair delivers accessories such as:

- electrical drives
- locking devices
- signalisations
- control boxes
- self rescue devices
- etc. on request.

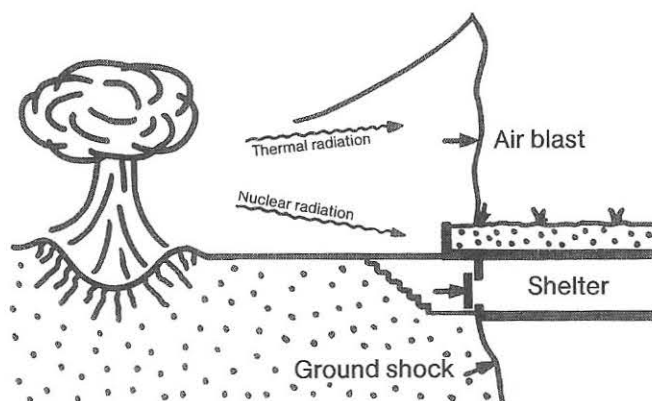
Protection range

Protection level

Andair shelter doors are designed to withstand a wide range of dangerous effects from warfare as well as from industrial accidents.

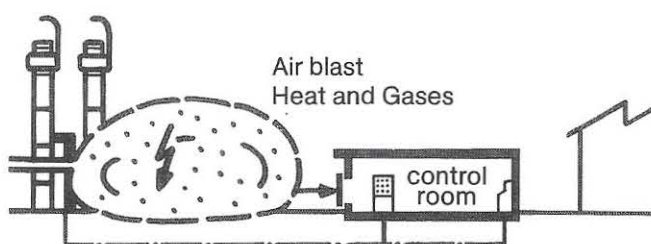
Protection against weapon effects:

- Airblast from conventional or nuclear weapons
- Impact from fragments and debris
- Ground shock, i.e. vibration of shelter which is subjected to pressure wave propagating through the ground
- Heat from fires and thermal radiation from atomic weapons
- Nuclear radiation
- Chemical and biological warfare agents



Protection against effects from accidents in industrial plants:

- Airblast from bursting pressure vessels, vapour, dust or gas-explosion
- Toxic releases
- Heat from fires



Principal data of protection level

Andair doors are designed for high and intermediate levels of protection. It meets the relevant minimum requirements issued by the Swiss Federal Office of Civil Defence. Three levels of protection (SG) are defined which each provide a different degree of protection.

Type of door	Protection level	General description and application
PT PD PTO	SG 3	Highest level of protection; designed for openings in shelter shell. Resists mechanical effects from atomic weapon of 1 KT or 1 MT for ranges larger than 200 m and 1500 m respectively, corresponding to $\sim 0.3 \text{ MN/m}^2$ (3 bars) incident pressure and $\sim 1.1 \text{ MN/m}^2$ (11 bars) reflected pressure. (Long duration) Andair doors can resist much higher effects from conventional weapons. Please indicate pressure/time characteristic to check capability. (Short duration)
PTO	SG 1	Moderate level of protection; designed for large openings in shelter shell. Resists atomic weapon of 1 KT or 1 MT for ranges larger than 300 m and 2600 m respectively, corresponding to $\sim 0.1 \text{ MN/m}^2$ (1 bar) incident pressure and $\sim 0.25 \text{ MN/m}^2$ (2.5 bars) reflected pressure. (Long duration) Andair doors can resist higher effects from conventional weapons. Please indicate pressure/time characteristic to check capability. (Short duration)
DT	SG 0.3	Lowest level of protection; designed for openings in interior partition walls of military and civil defence shelters as well as for outer doors in industrial control centers. Resists deflagration of unconfined gases and dust. Withstands $\sim 30 \text{ KN/m}^2$ (0.3 bar) incident pressure and $\sim 80 \text{ KN/m}^2$ (0.8 bar) reflected pressure.

Technical data

Resistance against mechanical loads

To judge the protection capacity with respect to dynamic loads, the following data shall be used as a basis. The values given below are calculated as ultimate loads by using the yield stress capacity of the reinforcements.

Airblast:

Type of door		Outside loads capacity dyn. pressure load and static ultimate resistance P_{dyn} $r_u \triangleq$	dyn. impulse load i	Rebound inside/outside resistance
PT	1	MN/m ²	10 kNs/m ²	> 30 %
PD	1	MN/m ²	3 kNs/m ² *	100 %
PTO SG 1	0.25	MN/m ²	3 kNs/m ²	> 30 %
PTO SG 3	1	MN/m ²	10 kNs/m ²	> 30 %
DT	80	kN/m ²	300 Ns/m ²	100 %

*Cover PD fastened inside, therefore less permanent deflection allowed.

These values are only valid if the doors have been installed in accordance with the relevant requirements of Andair and if they are cast with concrete of minimum cement content of 250 kg/m³ and $f_{cu} > 30$ N/mm².

Furthermore, the support loads from the doors have to be considered in the design of the supporting structures.

The support loads l_w may be calculated by $l_w = 0.7 \cdot r_u \cdot b$ where r_u is the static ultimate resistance and b represents the interior width of the door.

Note that according to the dynamic design, failure of a closing will only occur if both, the load limits for pressure **and** impulse are exceeded by the same airblast. They will resist any airblast, if either the peak overpressure **or** the pressure impulse is smaller than the relevant capacity.

In case of airblast loads higher than the capacity of the Andair armoured closings, the incident pressure might be reduced by means of a shielding entrance design.

Ground shock:

All doors and covers can resist the acceleration forces up to 80 m/s².

Impact from fragments and debris:

A considerable protection against fragments from near-misses and debris from destroyed structures is provided by all closings. As an example, all door plates in concrete of 20 cm thickness do withstand to the impact from a 5 kg steel ball at 20 m/s without creating dangerous fragmentation from the inner surface.

Absorption of nuclear radiation and heat

The extent of protection of the door against nuclear radiation and heat from fires corresponds to the protection provided by a reinforced concrete slab of the same thickness.

Nuclear radiation:

The absorption is a function of the plate thickness and the angle of incidence. As an example, the absorption of nuclear radiation through a PT-door (door thickness is 0.2 m) is, depending on the angle of incidence, 50 to 80 %. If higher absorption is required for military or civil defence shelters, additional protection can be provided by means of entrance design.

Heat absorption:

Andair doors provide a high heat absorption. A fire with an average flame temperature of 300 °C on the outer surface of a PT-door creates, after two hours, an increase of only 15 °C on the inner surface. For applications with particular requirements on tightness and heat resistance, specially designed seal-materials are available on request.

Protection against nuclear fallout and toxic gases

Andair doors are provided with durable rubber seals fitted into specially designed grooves. The protection against nuclear fallout and toxic gases is achieved by creating an overpressure of filtered air within the shelter. The leakage through the PT-doors and PD-covers by an inside overpressure of e.g. 250 N/m² is less than 20 m³/h (40 m³/h for PTO-doors respectively).

Full scale airblast tests performed with an armoured door 800x1850 mm showed a leakage of only 0.03 m³ produced by a triangular airblast with 0.9 MN/m² peak pressure and 100 ms duration.

Product survey

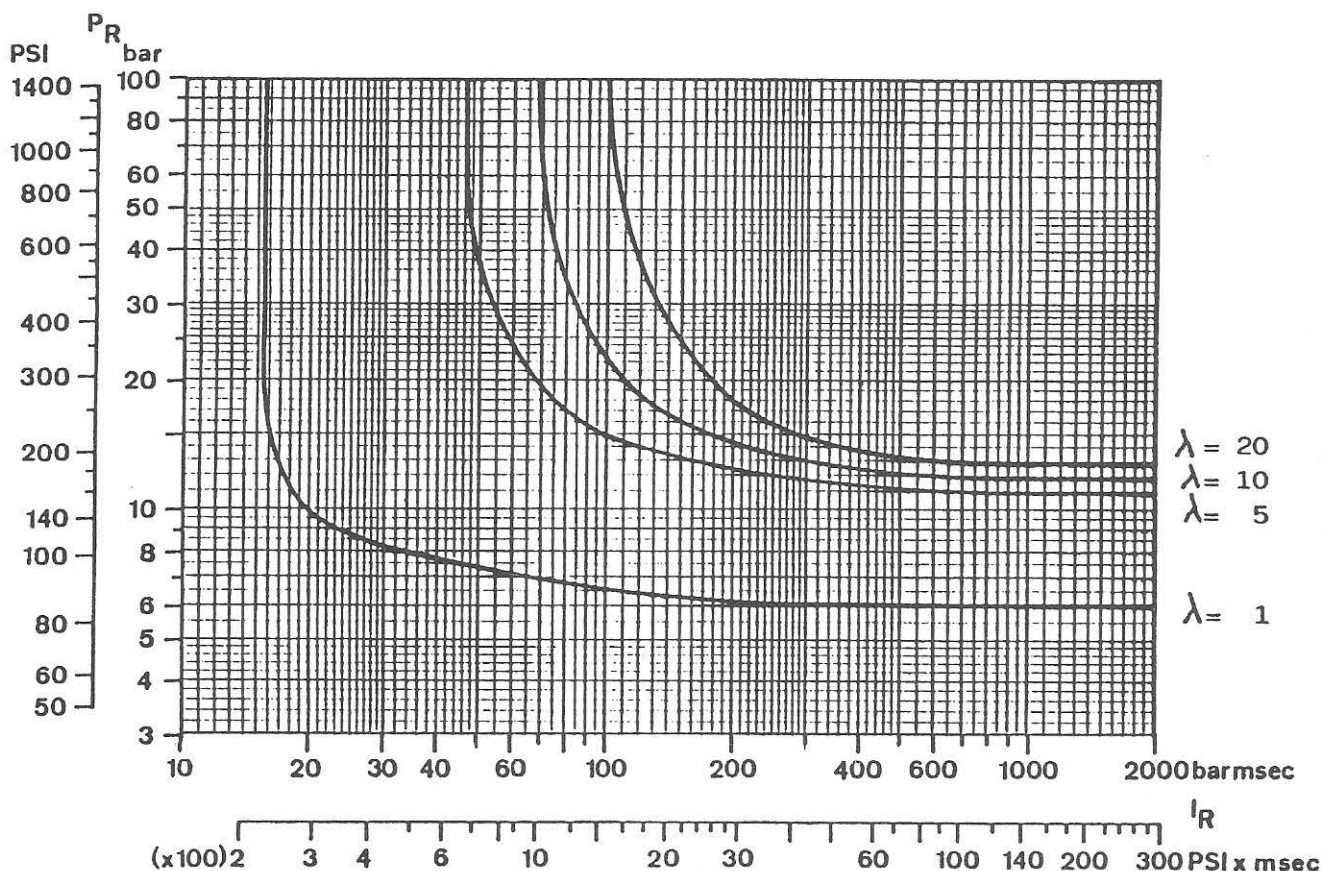
Type		Frame dimension inner width mm	inner height mm	Pro- tec- tion level bar	Door- thick- ness mm	Weight without con- crete approx. kg
Blast door	PT	800	1850	3	200	205
Blast door	PT	1000	1850	3	200	250
Blast door	PT	1400	2200 *	3	200	480
Blast door	PT	600	1200	3	200	170
Blast cover	PD	600	800	3	200	140
Pressure door	DT	800	1850	0,3	100	115
Pressure door	DT	1000	1850	0,3	100	125
Pressure door	DT	1400	2200 *	0,3	200	190
Blast	PTO	2400	2100	1	200	670
double-door	PTO	2400	2100	3	250	1110

*Dimension if threshold removed



Andair blast doors for conventional blasts

Door performance when subject to blasts of varying duration



The ability of the Andair door to withstand blasts of varying reflected pressure and impulse may be determined by reference to the above diagram. As the curves differ depending on the door size, specific final selections should be confirmed by Andair.

$\lambda \leq 1$ = Elastic deformation
 $\lambda > 1$ = Plastic deformation

Is selected to give the order of gas tightness required after the blast load. The higher the value (between 1 and 20) the bigger the leakage.

Extremely near by explosions and fragment hits are not considered in the diagram.

Note:

This method is only applicable for Andair doors.



Schutzraumabschlüsse
Fermetures pour abris
Shelter closures
Chiusure per rifugi

Typ type tipo	Lichtmass vide de passage clearance luce interna b x h cm x cm	Schwelle seuil door sill soglia	Anschlag montage mounting montaggio		Schutzgrad degré de protection protection degree grado di protezione		a	c	d	e min.	Massbild dessin drawing disegno No.
			innen int. inside interno	ausssen ext. outside esterno	1 bar	3 bar					
PT1, PB1	80 x 185	*	-	x	x	x	20	130	50	25	1.20.016
PT2, PB2	100 x 185	*	-	x	x	x	20	150	50	25	1.20.016
PT3, PB3	140 x 220	**	-	x	x	x	20	190	50	25	1.20.017
PT4, PB4	60 x 120	*	-	x	x	x	20	110	50	25	1.20.018
PD, VB	60 x 80	*	x	-	x	x	20	100	45	25	1.20.019
PTO, POB 1 bar	240 x 210	*	-	x	x	-	-	165	55	25	1.20.021
PTO, POB 3 bar	240 x 210	*	-	x	x	x	-	165	55	25	1.20.021
DT1, PP1	80 x 185	*	x	x	-	-	20	130	50	20	1.20.023
DT2, PP2	100 x 185	*	x	x	-	-	20	150	50	20	1.20.023
DT3, PP3	140 x 220	**	x	x	-	-	20	190	50	20	1.20.024

* fest

** wegnehmbar

* fixe

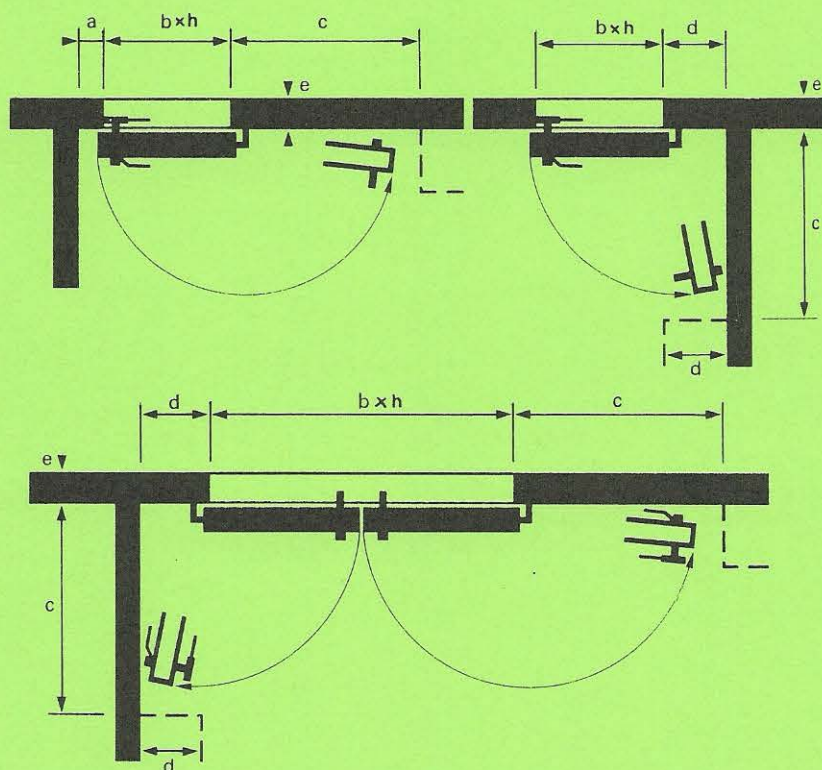
** démontable

* fixed

** detachable

* fisso

** mobile



PT, PB

PD, VB

DT, PP

PTO, POB

Wichtig:

- Versetzvorschriften sind einzuhalten siehe Blatt 1.20.027.
- Die Gummidichtung darf nicht überstrichen werden.
- Während der Bauzeit beschädigte Grundierung muss vom Maler erneuert werden.

Important:

- Les instructions de pose sont à respecter, voir page 1.20.027.
- Les joints en caoutchouc ne doivent pas être vernis.
- Des dommages à la peinture de protection pendant les travaux doivent être retouchés.

Important:

- Mounting instructions have to be observed, see page 1.20.027.
- The rubber seals must not be painted.
- Prime coating damages during construction have to be touched up.

Importante:

- Le istruzioni di montaggio devono essere rispettate, vedere pagina 1.20.027.
- I giunti in gomma non devono essere verniciati.
- Eventuali danni alla verniciatura dovuti al trasporto devono essere ritoccati.



Andair AG

CH-8450 Andelfingen

08.03.95

1.20.015

Drucktüre DT 1
Porte pression PP 1
Pressure door DT 1

Anwendung

Zwischenabschluss für 1 bar und 3 bar Schutzbauten.

Ausschreibungstext

Drucktüre Typ DT 1
 Lieferant Andair AG
 CH-8450 Andelfingen

Ausführung gemäss den Weisungen des Bundesamtes für Bevölkerungsschutz (BABS).

Zulassung BZS SR 08-709
 Lichtmass cm 80 x 185
 Gewicht ohne Beton kg ~ 115

Mit fester Schwelle, links und rechts verwendbar.

Bestehend aus:

Mauerrahmen aus Winkelstahlprofilen mit Ankerplatten. Türblatt mit Nute und Dichtungsgummi, eingeschweisste Armierung, Hebelverschlüsse mit Verschlussicherung, Rostschutzgrundierung

Zubehör: El. Verriegelung, Signalisation, Türspion

Application

Fermeture intermédiaire pour des abris de 1 bar et 3 bar.

Spécification

Porte pression type PP 1
 Fournisseur Andair SA
 CH-8450 Andelfingen

Exécution selon les directives de l'Office fédéral de la protection de la population (OFPP).

Homologation OFPC SR 08-709
 Vide de passage cm 80 x 185
 Poids sans béton kg ~ 115

Avec seuil fixe, ouverture à gauche ou à droite.

Se composant de:

Cadre à sceller en fer cornière avec pattes d'ancrage, vantail en profil d'acier, muni d'une rainure avec joint en caoutchouc, armature soudée, leviers de fermeture avec blocage, peinture de protection

Accessoires: verrouillage électromagnétique, signalisation, regard

Application

Intermediate closure (inside shelter) for shelters with 1 bar and 3 bar protection.

Specification

Pressure door type DT 1
 Supplier Andair AG
 CH-8450 Andelfingen

Design according to the directives of the Swiss Federal Office for Civil Protection (FOCP).

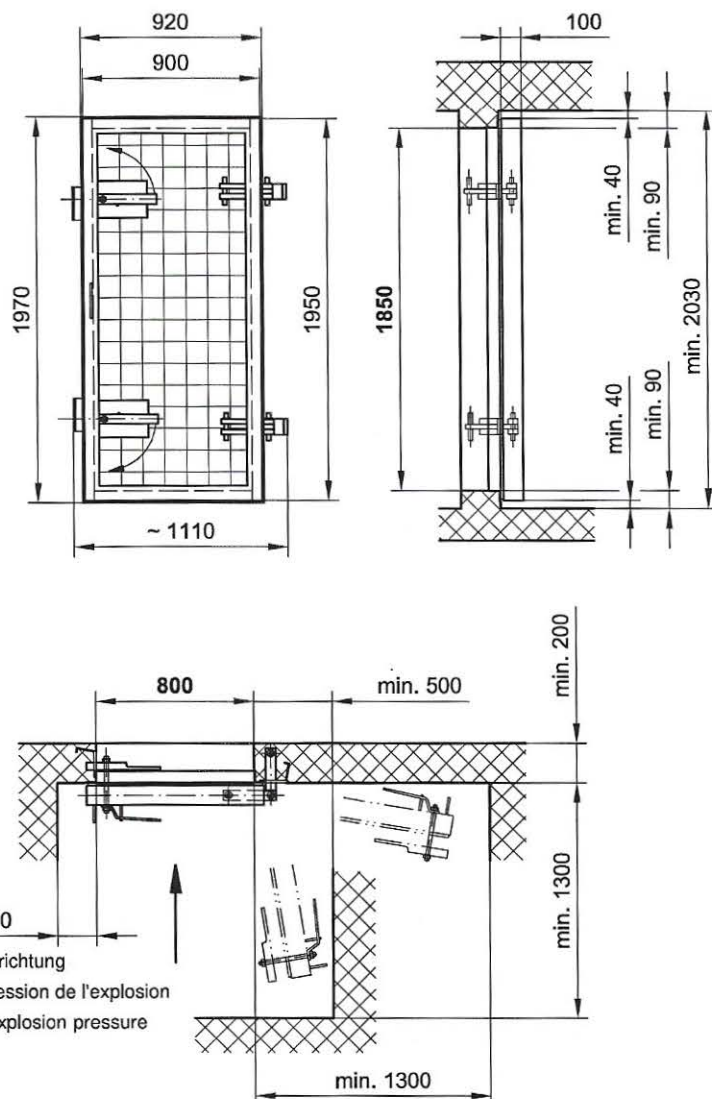
Approval BZS SR 08-709
 Dimension of clearance cm 80 x 185
 Weight without concrete kg ~ 115

With fixed door sill, applicable if hinges on left or right side.

Consisting of:

Steel frame to cast made of angle profile with anchor plates. Door leaf with groove and rubber seal, welded-in reinforcement, lever locks with locking pin, prime coated

Accessories: electromagnetic locking, signalisation, spy hole



Wichtig:
 Versetzvorschriften sind einzuhalten
 (siehe Blatt 1.20.027)

Betonqualität:
 P 250 (300 kg/cm²)

Important:
 Les instructions de pose sont à respecter
 (voir page 1.20.027)

Qualité du béton:
 P 250 (300 kg/cm²)

Important:
 Installation instructions have to be carefully
 observed (see page 1.20.027)

Quality of concrete:
 P 250 (300 kg/cm²)



Drucktüre DT 2
Porte pression PP 2
Pressure door DT 2

Anwendung

Zwischenabschluss für 1 bar und 3 bar Schutzbauten.

Ausschreibungstext

Drucktüre Typ DT 2
 Lieferant Andair AG
 CH-8450 Andelfingen

Ausführung gemäss den Weisungen des Bundesamtes für Bevölkerungsschutz (BABS).

Zulassung BZS SR 08-709
 Lichtmass cm 100 x 185
 Gewicht ohne Beton kg ~ 125

Mit fester Schwelle, links und rechts verwendbar.

Bestehend aus:

Mauerrahmen aus Winkelstahlprofilen mit Ankerplatten. Türblatt mit Nute und Dichtungsgummi, eingeschweisste Armierung, Hebelverschlüsse mit Verschlussicherung, Rostschutzgrundierung

Zubehör: El. Verriegelung, Signalisation, Türspion

Application

Fermeture intermédiaire pour des abris de 1 bar et 3 bar.

Spécification

Porte pression type PP 2
 Fournisseur Andair SA
 CH-8450 Andelfingen

Exécution selon les directives de l'Office fédéral de la protection de la population (OFPP).

Homologation OFPC SR 08-709
 Vide de passage cm 100 x 185
 Poids sans béton kg ~ 125

Avec seuil fixe, ouverture à gauche ou à droite.

Se composant de:

Cadre à sceller en fer cornière avec pattes d'ancrage, vantail en profil d'acier, muni d'une rainure avec joint en caoutchouc, armature soudée leviers de fermeture avec blocage, peinture de protection

Accessoires: verrouillage électromagnétique, signalisation, regard

Application

Intermediate closure (inside shelter) for shelters with 1 bar and 3 bar protection.

Specification

Pressure door type DT 2
 Supplier Andair AG
 CH-8450 Andelfingen

Design according to the directives of the Swiss Federal Office for Civil Protection (FOCP).

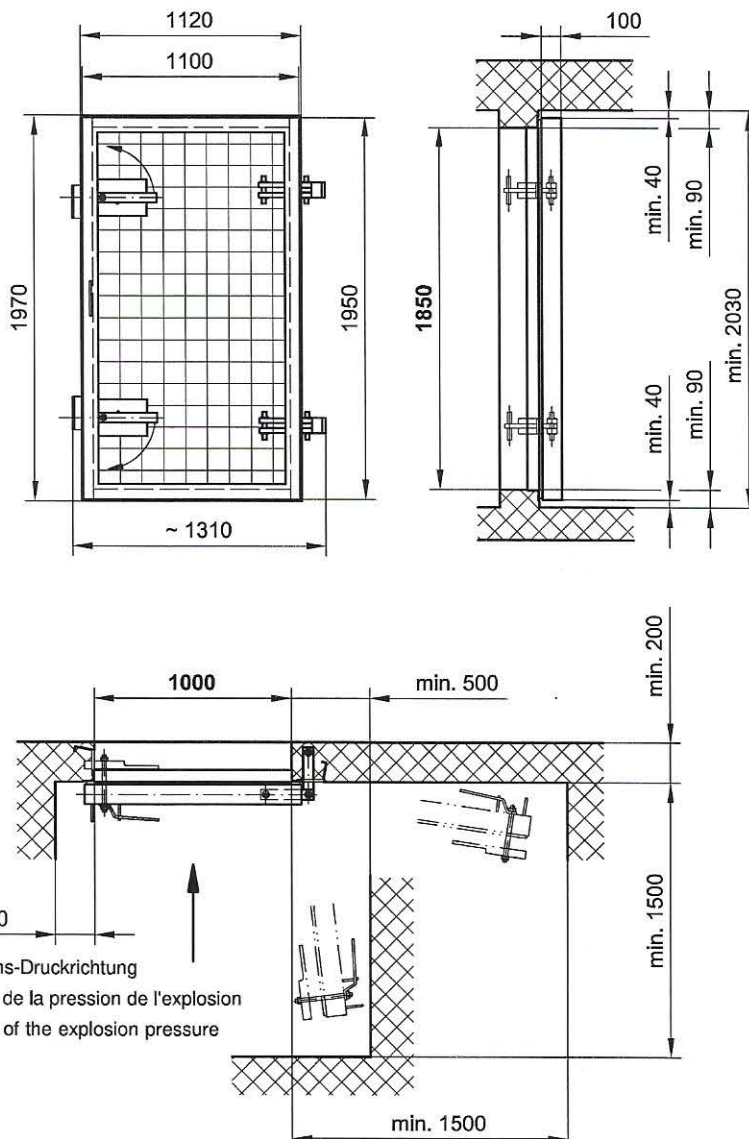
Approval BZS SR 08-709
 Dimension of clearance cm 100 x 185
 Weight without concrete kg ~ 125

With fixed door sill, applicable if hinges on left or right side.

Consisting of:

Steel frame to cast made of angle profile with anchor plates. Door leaf with groove and rubber seal, welded-in reinforcement, lever locks with locking pin, prime coated

Accessories: electromagnetic locking, signalisation, spy hole



Wichtig:
 Versetzvorschriften sind einzuhalten
 (siehe Blatt 1.20.027)

Betonqualität:
 P 250 (300 kg/cm²)

Important:
 Les instructions de pose sont à respecter
 (voir page 1.20.027)

Qualité du béton:
 P 250 (300 kg/cm²)

Important:
 Installation instructions have to be carefully
 observed (see page 1.20.027)

Quality of concrete:
 P 250 (300 kg/cm²)



Andair AG

CH-8450 Andelfingen

06.12.12

1.20.023.2

Drucktüre DT 3
Porte pression PP 3
Pressure door DT 3

Anwendung

Zwischenabschluss für 1 bar und 3 bar Schutzbauten, wenn der Schutzraum in Friedenszeiten zusätzlich genutzt wird (z.B. Lageraum mit Hubstaplerverkehr).

Ausschreibungstext

Drucktüre Typ DT 3
 Lieferant Andair AG
 CH-8450 Andelfingen

Ausführung gemäss den Weisungen des Bundesamtes für Bevölkerungsschutz (BABS).

Zulassung BZS SR 08-709
 Lichtmass cm 140 x 220
 Gewicht ohne Beton kg ~ 170

Mit wegnehmbarer Schwelle. Bandung rechts oder links angeben.

Bestehend aus:

Mauerrahmen aus Winkelstahlprofilen mit Ankerplatten. Türblatt mit Nute und Dichtungsgummi, eingeschweisste Armierung, Hebelverschlüsse mit Verschlussicherung, Rostschutzgrundierung

Zubehör: El. Verriegelung, Signalisation, Türspion

Application

Fermeture intermédiaire pour des abris de 1 bar et 3 bar utilisés en temps de paix comme entrepôt (passage de transpalettes).

Spécification

Porte pression type PP 3
 Fournisseur Andair SA
 CH-8450 Andelfingen

Exécution selon les directives de l'Office fédéral de la protection de la population (OFPP).

Homologation OFPC SR 08-709
 Vide de passage cm 140 x 220
 Poids sans béton kg ~ 170

Avec seuil démontable. Gonds à gauche ou à droite (à indiquer à la commande).

Se composant de:

Cadre à sceller en fer cornière avec pattes d'ancrage, vantail en profil d'acier, muni d'une rainure avec joint en caoutchouc, armature soudée, leviers de fermeture avec blocage, peinture de protection

Accessoires: verrouillage électromagnétique, signalisation, regard

Application

Intermediate closure (inside shelter) for shelters with 1 bar and 3 bar protection, in peacetime used as warehouse etc. (passing of forklifts etc. possible).

Specification

Pressure door type DT 3
 Supplier Andair AG
 CH-8450 Andelfingen

Design according to the directives of the Swiss Federal Office for Civil Protection (FOCP).

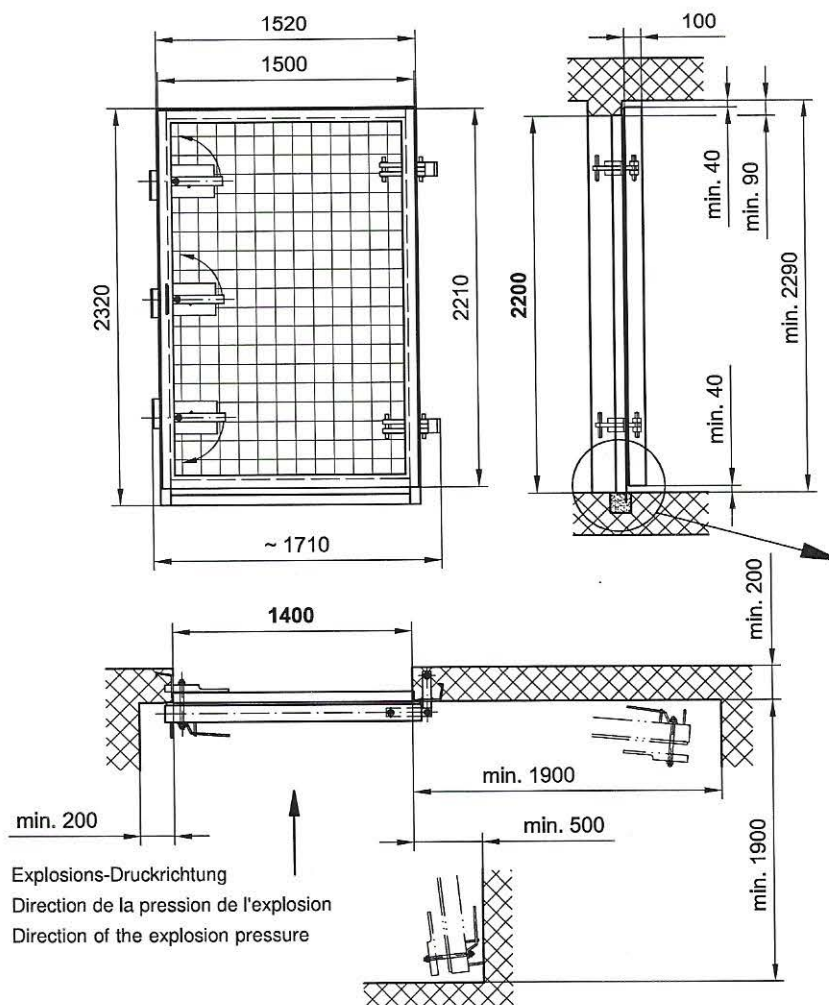
Approval BZS SR 08-709
 Dimension of clearance cm 140 x 220
 Weight without concrete kg ~ 170

With detachable door sill, hinges on left or right side (to be mentioned when ordering).

Consisting of:

Steel frame to cast made of angle-profile with anchor plates. Door-leaf with groove and rubber seal, welded-in reinforcement, lever-locks with locking pin, prime coated

Accessories: electromagnetic locking, signalisation, spy hole



Wichtig:
 Versetzvorschriften sind einzuhalten
 (siehe Blatt 1.20.027)

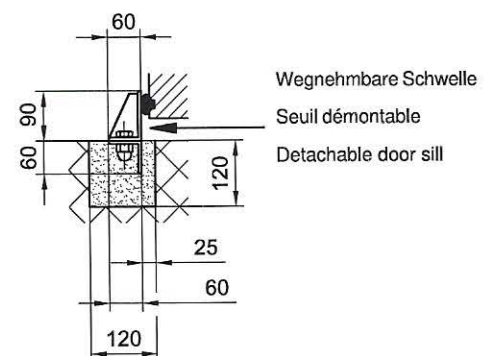
Betonqualität:
 P 250 (300 kg/cm²)

Important:
 Les instructions de pose sont à respecter
 (voir page 1.20.027)

Qualité du béton:
 P 250 (300 kg/cm²)

Important:
 Installation instructions have to be carefully
 observed (see page 1.20.027)

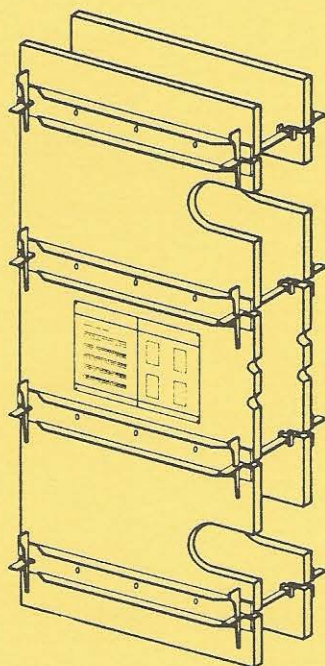
Quality of concrete:
 P 250 (300 kg/cm²)



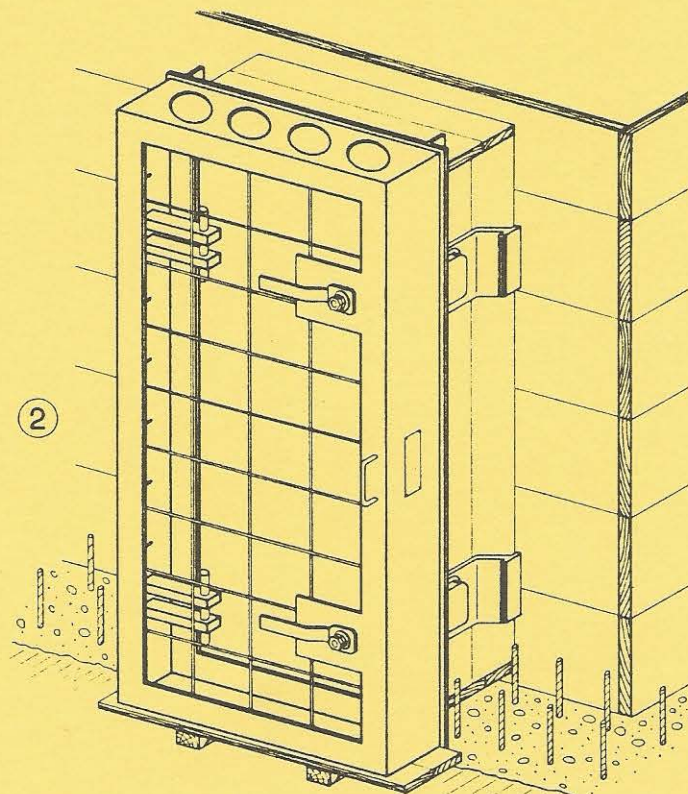
Gezeichnet: Bandung rechts

Dessiné: gonds à droite

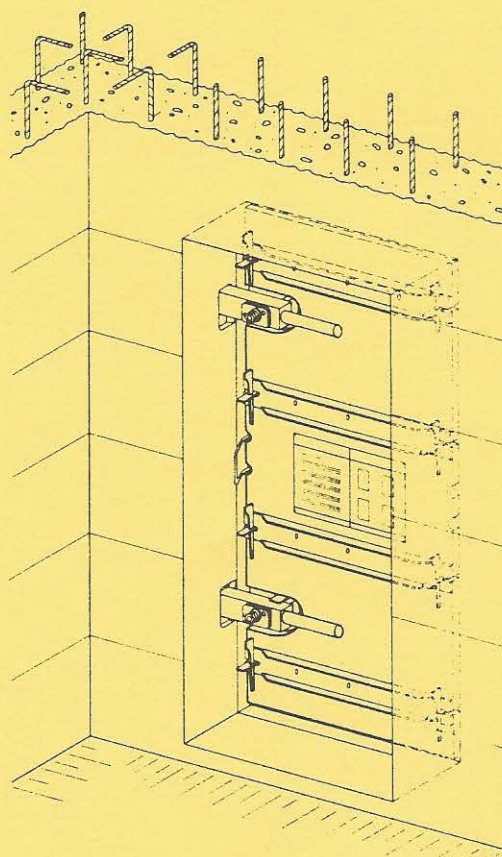
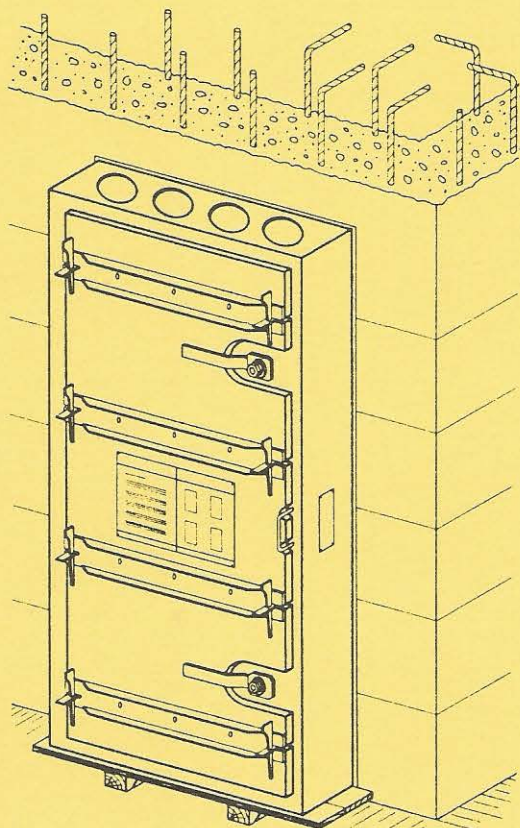
Shown: hinge right-hand side



1



2



Versetzvorschrift für Schutzraumabschlüsse

- Dieser Abschluss ist für die Verwendung einer Normschalung ① geeignet. Sie ist im Handel erhältlich.
- Der Türkörper muss zusammen mit dem Rahmen, im geschlossenen und verriegelten Zustand genau vertikal versetzt und sachgemäss unterkeilt, in der Wandschalung stehen ②. Der Rahmen darf nicht entfernt werden.
- Der Betoniervorgang hat so zu erfolgen, dass **zuerst** die Wände betoniert werden. Erst nachdem der Wandbeton genügend abgebunden hat (nach min. drei Tagen), darf der Türkörper (**die Türe in geschlossenem und verriegeltem Zustand**) ausbetoniert werden.
- Der Abstand zwischen Türkörper und Fertigboden bzw. Fertigdecke muss mindestens **4 cm** betragen.
- Der Dichtungsgummi **darf** beim Versetzen und beim Streichen **nicht entfernt werden**.

Instruction de pose des fermetures d'abri

- Coffrage normalisé ① pour fermetures d'abri. Celui-ci s'obtient dans le commerce.
- Le corps de la porte avec le cadre, en position fermée et verrouillée doivent être placés verticalement et calés correctement dans le coffrage du mur ②. La porte ne doit en aucun cas être démontée de son cadre.
- On procédera **d'abord** au bétonnage du mur. C'est seulement lorsque la prise de béton sera suffisante (après min. trois jours) que le corps de la porte (**la porte en position fermée et verrouillée**) pourra être bétonné.
- On gardera un jeu de **4 cm** au minimum entre le corps de la porte et le sol fini d'une part et entre le corps de la porte et le plafond d'autre part.
- La garniture d'étanchéité en caoutchouc **ne devra pas être extraite** lors du montage ou de la peinture de la porte.

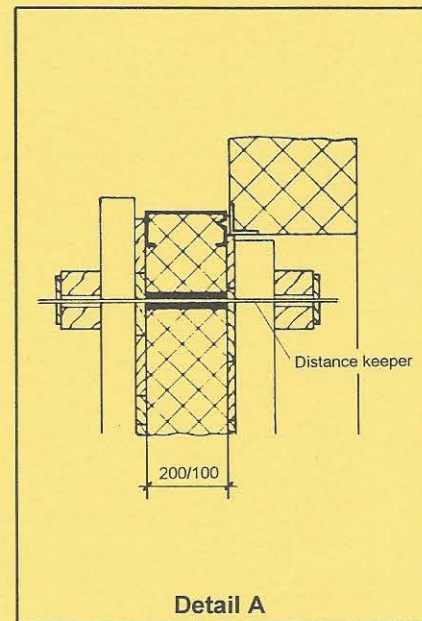
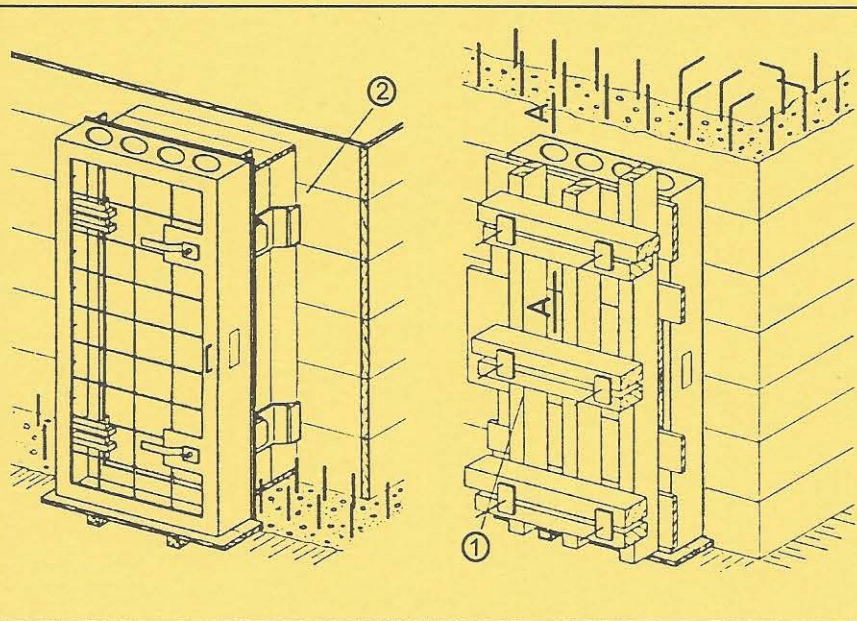
Installation instruction for shelter closures

- Standardised shuttering device ① for shelter closures. Available on the market.
- Door body and frame in closed and locked position have to be placed vertically and accurately wedged to the wall shuttering boards ②. Door and frame must not be separated.
- The wall has to be cast **first**, only once the concrete has cured enough (after a minimum of three days) the door can be cast, **in fully closed and locked position**.
- Between top edge of door body and finished ceiling and bottom edge of door body and finished floor the minimum clearance has to be **4 cm**.
- While casting and painting the rubber seal **must not be removed**.



Shelter closures types DT, PD, PT Installation instruction

Single leaf doors DT, PD, PT



Description

Andair PT single leaf doors must always be fitted to open towards the outside (against the blast). PD hatches generally open towards the inside. DT doors may open in either direction. The leaves of armoured doors and hatches are integral with the frames and they must be installed into the wall during the wall shuttering work. Their operation cannot be guaranteed if fitted later into a prepared recess in the wall.

The door must be fitted in two separate phases:

- the frame is first cast into the wall
- the leaf is then filled with concrete.

To meet its specified performance the door must be cast with concrete of minimum 250 kg/m^3 density and $\text{fcu} > 30 \text{ N/mm}^2$.

Care must be taken to prevent any sagging or movement of the door after the forms are removed and before the concrete is properly cured. (For example, wedges could be fitted under the leaf).

Fitting procedure

- 1) Close the leaf against the frame and ensure that all the handles are properly secured. Align the assembly carefully, ensuring it is vertical in both planes and that the top of the leaf is horizontal. At this stage the door leaf does not need to be encased with shuttering. Tie the unit securely to the reinforcing and underpin the leaf with wedges. Leave at least 4 cm clearance between the leaf and the finished floor and ceiling.
- 2) Pour the wall.
- 3) When the wall concrete is properly set (after a minimum of three days) the door leaf is to be encased with shuttering (see illustration A). Care should be taken to close off the concrete pour holes on the bottom face of the door leaf during the wedging of the leaf. Close the leaf and ensure that all handles are properly secured. It can then be filled with concrete using the holes provided on the top face of the leaf.
- 4) Open and remove the shuttering after a minimum of three days (when the concrete is properly cured).
- 5) All sealing faces must be cleaned of concrete, taking care not to damage the gasket which must not be removed from its groove in the door.