TECHNICAL DATA SHEET

SAFETY LADDER

NT 049 – V17 - January 2018

FORTAL®
www.fortal.fr
Made in France

1. INTRODUCTION

This caged ladder is designed specifically for industrial buildings and facilities. The limited number of components makes it easy to assemble, and its delivery as a kit allows you to adapt the set-up of your caged ladder to the surface to which it will be fixed.
Caged ladders comply with EN 14 122-4.

2. DESCRIPTION

Ladder:

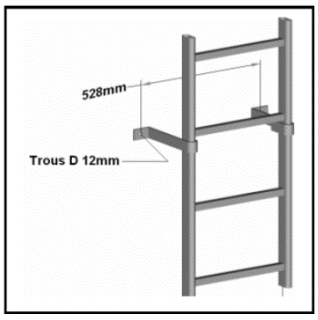
Composed of two vertical stiles (65 x 25 mm aluminum oblong profiles) and serrated, slip resistant aluminum rungs (25 x 25 mm section) joined by crimping. Each end of the ladder has pre-drilled holes for coupling.
Width of the rung: 400 mm - Step height: 280
There is no limit to length of ladder. However, for easy transportation, they are splited into multiple sections measuring a maximum of 3 meters each.
Standard lengths: 1928, 3048, 3888, and 5008 mm
Ladders comply with EN 131 parts 1 et 2;

Test report on 3 meters length ladder N°M021397-C1
Test report on 4 meters length ladder N°M021397-C2
Test report on 5 meters length ladder N°M021397-C2
Test report on 6 meters length ladder N°M021397-C2

Safety Cage:

Composed of hoops made of 40 x 8 aluminum flat bar and 5 vertical bars made of 'C' section.
These elements satisfy the following requirements:
Hoops are assembled so that free surface won't exceed 0,4 m².
Maximum distance between two consecutive hoops is 1500 mm.
Fastened on stiles clamping system.
Test report on 3 meters length ladder with 2 standards hooks and a wide exit N°P118822-3
Test report on 3 meters length ladder with 2 standards hooks and a side exit N°P118822-4
Test report on 3 meters length ladder with 3 standards hooks N°P118822-5

Anchoring:



Drill a Ø 10 hole into the building façade. Insert Ø 10 mm anchor plug.
Screw on wall bracket (bolted to ladder using aluminum brackets).
It is crucial that all anchorage points be verified BEFORE erecting caged ladder.
Ladder anchorages are designed to resist horizontal forces both parallel and perpendicular to the facade. Anchor ladder to wall as you erect it.
Maximum space between anchorage points: 2,3 m.

Wall Brackets:

The standard-length wall bracket (200 mm) clamps onto ladder stiles.
Adjustable brackets are designed to adjust distance from wall from 150 to 300 mm when we meet some obstacles.
A cladding kit is also available for fastening caged ladder to cladding or I-beams.

Landing Platform:

Several types of landing platforms have been designed:

- Parapet landing measuring 400, 600, or 800 mm deep and placed at the same height of the last ladder rung.
- Right or left side exit platform measuring 1500 x 1000. The ladder extends 1100 mm past the platform and is equipped with two three-quarter hoops allowing a lateral exit.
- 200 mm landing platform fitted on front exit.

Landing platforms are composed of a handrail, midrail and 150 mm high baseboard.
To ensure safety, gates opening to the left or right can be installed on any:

- Parapet landing
- Wide exit
- Landing step
- Side exit platform

Capacity of load on platform: 150kg

Ladder change-over:

The ladder change-over is made up of a rest platform and two side-by-side cages joined, height greater than 2 m. It is designed to allow user to go from one ladder section to a second, staggered ladder. If this configuration is not possible on buildings higher than 10 meters because insufficiently wide, FORTAL's solution is to install a fold-up rest platform each 6 meters. The standard indicates that for a ladder height of more than 10 meters, a ladder change-over must be provided each 6 meters.

The ladder change-over is made up of:

- 2 ladders (1928 mm), staggered and horizontally spaced 254 mm apart
- 3 hoops designed for ladder change-over
- 7 vertical bars
- 1 rest platform (700x745 mm)
- 3 pairs of wall brackets
- Hardware to fasten all parts

Type of exit:

Open-end exit:

Cage ends below platform but ladder continues over1100 mm.
For additional protection, peripheral guardrail and gate are available upon request.

Exit through roof hatch:

When the caged ladder ends below a roof hatch, it must be equipped with retractable stile extensions (3 fastening methods available).

Side exit:

Exit to the right or the left. Ladder continues over 1100 mm past the platform and is equipped with 2 half hoops allowing user to exit. Add safety gate for additional protection.

Intermediate side exit:

This side exit to the left or the right, at a height of 2000 mm, allows user to access a platform located within the cage. The opening is made with a hoop to create the openin (one above and one below) as well as a half-hoop in the middle.

Exit platform made of 100 x 30 mm aluminum profile and covered with aluminum sheet or grating. Guardrails are present on both drop edges, 1100 mm high handrail, midrail, and baseboard. Platform is fastened to wall using support brackets. Standard platform dimensions: length 1500 x width 1000. Other dimensions available upon request.

Lower security door

Lower STEEL security doors are not required yet recommended to protect access to caged ladder. (See French Labour Code Article R.233-1-3: Preventing unauthorized workers from entering area – Article R.232-1-4 : Manager responsibilities).
Our security doors, detailed below, fully comply with EN 14 122-4. In addition, the automatic closing mechanism allows user to control who has access to the area while on ladder.

3. ALUMIMUM CHARACTERISTICS

All caged ladder components are made of 6000 series aluminum alloys.
Aluminum alloy is classified by and complies with NF EN 573-3.
Mechanical properties comply with NF EN 755-2.

Alloy used for ladder rungs and bendable 40x8 flat bar: 6060 T5 R19

%	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
Mini	0.30	0.10			0.35			
Maxi	0.60	0.30	0.10	0.10	0.60	0.05	0.15	0.10
+/-	0.20	0.03	0.01	0.01	0.02	0.01	0.20	0.01

Mechanical properties of alloy

Elastic limit R0.2% [N/mm²] 150 min.

Tensile strength [N/mm²] 190 min.

Elongation [min.] 10 min.

Alloy used for ladder stiles: 6106 T6 R24

%	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
Mini	0.30			0.05	0.40			
Maxi	0.60	0.35	0.25	0.20	0.80	0.20	0.10	-
+/-	0.20	0.03	0.01	0.01	0.02	0.01	0.20	-

Mechanical properties of alloy

Elastic limit R0.2% [N/mm²] 195 min.

Tensile strength [N/mm²] 240 min.

Elongation [min.] 10 min.

This alloy was chosen for the following properties:

Weldability: very good

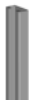
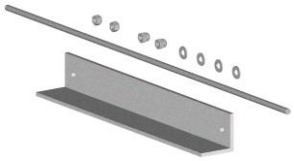
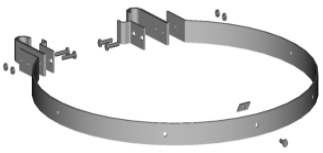
Formability for T5 temper: very good

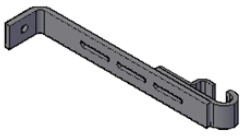
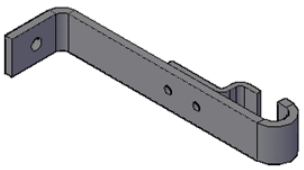
Natural resistance: to atmospheric conditions: very good
to seawater: good
to anodizing: very good

Fire resistance:
Aluminum alloys are classified “MO”, meaning that they are non-combustible.
In a fire, aluminum and its alloys exhibit the following behavior:
Metal is deformed due to the constraints resulting from its expansion under high temperature.
Metal melts at 650°C, without catching fire.
It has been demonstrated that, even at very high temperatures and under oxygen pressure, liquid aluminum does not catch on fire. It therefore does not contribute to the spread of fire.

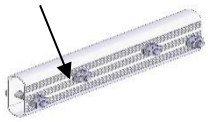
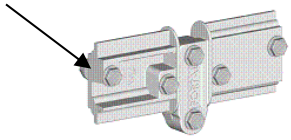
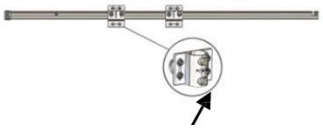
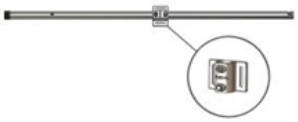
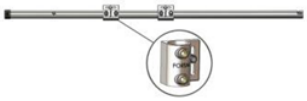
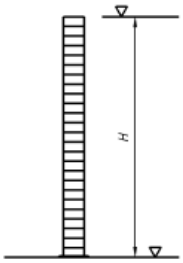
Given that the modulus of elasticity decrease as temperature rises, (70 000MPa at 20° to 40 000MPa at 400°), the elastic limit for aluminum alloy is reduced by half for temperatures ≥ 250° C.

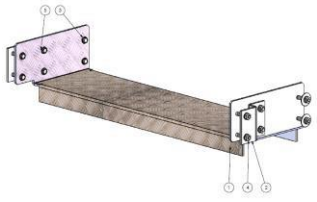
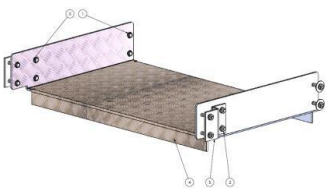
4. COMPONENT LIST

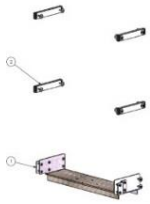
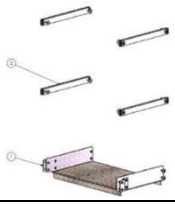
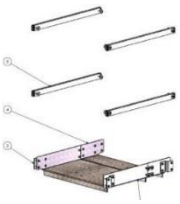
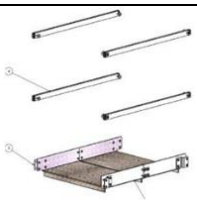
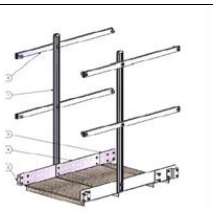
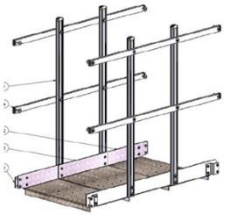
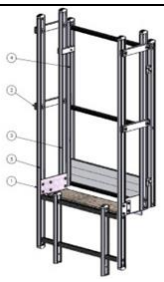
Reference	Description	Image	Component Characteristics: Caged Ladder KIT
R081483000 A851486000	Vertical bar, length 3000 Vertical bar, length 6000		Cage is composed of hoops and 5 Vertical bars fastened together using H M8-20 bolts and nuts (GEOMET coating). Hoops and Vertical bars have been designed so that openings are no larger than 0,4 m².
F600200004	Adaptor set for cladding + I-beams		These accessories ensure that ladder is rigid and guarantee maximum safety when ladder is used under normal conditions. Special bracket for cladding is delivered with threaded rod that must be cut to size according to thickness of cladding. When placed behind an I-beam, ladder must be secured on top as well as fastened to the ground. Requires bracket no. F600200015
F600200005	Floor angle fixation	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Floor mount bracket fastens ladder to the ground. Directly fastened to the outside of ladder stiles. Holes - 8,5 mm <u>Material:</u> 80x80x8 angle
F600200006	Bracket set, length 75 mm	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Brackets fasten upper part of ladder to platform (to avoid installing a landing step). ***Hardware included, Delivered pre-assembled***
F600200008	Vertical bar connection	**Bolt H M8x20 ref. A710920020** **Bevel nut M8 26x12 ref. A710740026** 	Vertical bar splice is designed to connect two Vertical bars. ***Hardware included, Delivered pre-assembled***
F600200010	Standard hoop	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008**  **Bolt H M8x20 ref. A710920020** **Bevel nut M8 26x12 ref. A710740026**	Hoops fastened to stiles using bolts. Vertical bars fastened on inside of hoops. First hoop must be attached at a height of 2200- 3000 mm. Inside clearance: 705 mm <u>Material:</u> 40x8 flat bar Holes are drilled so that distance between Vertical bars does not exceed 300 mm. ***Hardware included, Delivered pre-assembled***

F600200011	Hoop for change-over	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Hoop fastened to ladder stiles using bolts. Vertical bars are fastened on inside of hoops. Material: 40x8 flat bar ***Hardware included, Delivered pre-assembled***
F600200012	Hoop for wide exit	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008**  **Bolt H M8x20 ref. A710920020** **Bevel nut M8 26x12 ref. A710740026**	Hoop fastened to ladder with bolts. Vertical bars are fastened inside of hoops. Holes are drilled so that distance between Vertical bars does not exceed 300 mm. Material: 40x8 flat bar ***Hardware included, Delivered pre-assembled***
F600200013	Hoop for side exit	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008**  **Bolt H M8x20 ref. A710920020** **Bevel nut M8 26x12 ref. A710740026**	Hoop fastened to ladder stiles using bolts. At its narrowest point, clearance measures 465 mm. When measured 140 mm inward from the ladder stile, clearance is 500 mm. Material: 40x8 flat bar ***Hardware included, Delivered pre-assembled***
F600200014	Wall bracket, adjustable from 150 to 300	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Wall brackets fastened to ladder stiles using bolts (13 mm wrench). Ensure anchorage points on building are reliable. Drill Ø 10 mm hole for 10 mm anchor plug. Adjustable from 150 mm to 300 mm. Material: 40x8 flat bar ***Hardware included, Delivered pre-assembled***
F600200015	Wall bracket, length 200	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Wall brackets clamp onto ladder stiles. Clamp is tightened using bolts (13 mm wrench). Maximum distance between two wall brackets: 2,3 m. Distance between wall and backside of rung must measure at least 200 mm. A distance of 150 mm is admissible in certain spots. Ensure anchorage points on building are reliable. Drill Ø 10 mm hole for 10 mm anchor plug. (anchor plug not included) Material: 40x8 flat bar ***Hardware included, Delivered pre-assembled***
F600200003	Adjustable foot for caged ladder KIT	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Foot fastened to ladder stiles using bolts (13 mm wrench) Allows user to adjust ladder base when on uneven ground. Material: 61x21 oblong profile, thickness: 1,6 mm ***Hardware included***

F600200034	Coupler with welded U	 **Bolt H M8x45 ref. A710920035** **Nut H M8 ref. A710930008**	Aluminum part to be fastened on ladder ***Hardware included***

F600200033	Simple coupler for 65x25 profile, step height 280	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Simple coupler is designed to join two ladders. Material: 61x21 oblong profile, thickness: 1,6 mm ***Hardware included, Delivered pre-assembled***
F600200016	Foldable ladder coupler	**Bolt H M8x35 ref. A710920035** **Nut H M8 ref. A710930008** 	Complete coupler with locking joint is designed to join two ladders. Fastened by counter drilling and bolting onto ladder stiles. ***Hardware included, Delivered pre-assembled***
F600200017	Aluminum retractable stile extension, fastened to ladder rung.	 **Stirrup ref. A710990027** **Bolt H M6 ref. A710710006**	Three different stile extensions are available, depending on fastening method: 1. Reference no. F660200017: Fastened onto ladder rungs using stirrups Makes getting off ladder easier, for example when accessing roof hatch. 2. Reference no. F660200018: Fastened to wall using bracket 3. Reference no. F660200019: Fastened to ladder stile
F600200018	Aluminum stile extension, fastened to wall		
F600200019	Aluminum stile extension fastened to ladder stile		
F600200026	Rigid platform (for ladder change-over)		Rest platform for ladder change-over complies with NF E 85 016
F600200028	Ladder change-over		Height of ladder without rest platform ≤ 10 m One rest platform every 6 meters.  To join ladder change-over to ladders, two couplers (ref no. F60020016) are required for both upper and lower ends. Complies with NF E 85 016. ***Hardware included, Delivered pre-assembled***

F600200029	Fold-up rest platform		Fold-up rest platform fits within ladder cage while still complying with size requirements. This is a technical solution designed by FORTAL to use when a ladder change-over is not possible. Platform opens upwards when red strap is pulled, allowing user to pass through safely. Platform closes automatically after user has passed through. ***Hardware included, Delivered pre-assembled***
F600200032	Foot pad 65x25 with hardware		Foot pad with anti-UV treatment for 65x25 ladder stile.
F600200045	Wide exit		700 mm wide exit designed for top section of ladder. Two couplers (ref no. F600200016) required to fasten to ladder.
F600200199	Pole for gate		Poles. Two required per gate Provide poles for the landing parapet.
F600200041	Gate for aluminum ladder KIT	**8 bolts M5x35 A710400035** **1 bolt M5x50 A710400050** **9 brake nuts M5 A710710005** 	Exit into arrival area must include a gate which satisfies the following requirements: Easy to open, Closes automatically using spring-loaded hinge. ***Hardware included, Delivered pre-assembled***
F600600050	Intermediary flat sheet for change-over		1000 and 1200 mm change-over components
F600620200	Parapet landing 200		Single unit parapet landing 200. Fastened to stiles of wide exit. Drilled holes are Ø 8,5 mm. Structure: 40x40x2 square profile Cover: 4,5 mm checkered sheet ***Hardware included***
F600620400	Parapet landing 400		Single unit parapet landing 400. Fastened to stiles of wide exit. Drilled holes are Ø 8,5 mm. Structure: 40x40x2 square profile Cover: 4,5 mm checkered sheet ***Hardware included***

F600650200	Landing step 200 + guardrail 200		Landing step bridges gap between ladder and platform. Landing step must be equipped with a gate and 1500 mm long guardrails on each side. ***Hardware included***
F600650400	Parapet landing 400 + guardrail 400		Parapet landing 400 bridges gap between ladder and platform. ***Hardware included***
F600650600	Parapet landing 600 + guardrail 600		Parapet landing 600 bridges gap between ladder and platform. ***Hardware included***
F600650800	Parapet landing 800 + guardrail 800		Parapet landing 800 bridges gap between ladder and platform. ***Hardware included***
F600651000	Parapet landing 1000 + guardrail 1000		Parapet landing 1000 bridges gap between ladder and platform. ***Hardware included***
F600651200	Parapet landing 1200 + guardrail 1200		Parapet landing 1200 bridges gap between ladder and platform. ***Hardware included***
F600640200	Landing step 200 mm with wide exit fall set		Landing step equipped with guardrail, gate bars, security gate and wide exit. ***Hardware included***
F600640400	Landing step 400 mm fall set		Landing step equipped with guardrail, gate bars, security gate and wide exit. ***Hardware included***

F030800006	Adjustable foot		Adjustable foot is fastened to parapet landing. ***Hardware included***
F600200061	Side exit platform 1000x1000		Side exit platform complies with NF E 85-014. Fasted to the wall with corner brackets and support brackets. ***Hardware included, Delivered pre-assembled***
F600200062	Side exit platform 1500x1000		
F60020063	Gate for side exit platform right or left		Gate for side exit platform opens to the right or to the left. Closes automatically using spring-loaded hinges. Fastened onto guardrail posts of side exit platform. ***Hardware included, Delivered pre-assembled***
F600200009	Standard hoop + safety gate		Standard hoop with safety gate allows you to block lower access to ladder. Please note: This is a technical solution offered by FORTAL. Fastened onto ladder stiles using bolts. ***Hardware included, Delivered pre-assembled***
F600202000	Aluminum ladder 1928 mm		All ladders have holes pre-drilled on each end to facilitate coupling. To join ladders, use couplers (reference no. F600200016 or F600200033) <u>Stiles</u>: 65x25 oblong profile, thickness: 1,4 mm <u>Rungs:</u> 25x25 section, thickness: 1,4 mm ***Ladder useful width 400mm, 450mm***
F600203000	Aluminum ladder 3048 mm (Test report on 3 meters length ladder N°M021397-C1)		
F600204000	Aluminum ladder 3888 mm (Test report on 4 meters length ladder N°M021397-C2)		
F600205000	Aluminum ladder 5008 mm (Test report on 5 meters length ladder N°M021397-C2)		
F600206000	Aluminum ladder 5848 mm (Test report on 6 meters length ladder N°M021397-C2)		

Reference	Description	Image	Component Characteristics:
F600500008	**Lower security door types 1-2-3:** Door + Access opening + pedal to unlock when descending from ladder		Bolt lock Hinges on right side
F600500009			Bolt lock Hinges on left side
F600500010	**Lower security door type 4:** Door + access opening + mechanism to keep door open. Dual mechanism props door open when needed and lock door when closed		Bolt lock Hinges on right side
F600500011			Bolt lock Hinges on left side
F600500012			Padock Hinges on right side
F600500013			Padock Hinges on left side
F600500015	**Lower security door type 5:** Door + mechanism to keep door open. Dual mechanism props door open when needed and lock door when closed		Bolt lock Hinges on right side
F600500016			Bolt lock Hinges on left side
F600500017			Padock Hinges on right side
F600500018			Bolt lock Hinges on left side
F600500005	**Lower security gate type 6:** Simple access opening		Padlock – Hinges on right side
F600500006			Padlock – Hinges on left side

5. TESTING

5.1 – Testing of fixed ladders

The ladder or its components must pass the following tests:

- ➔ Strength test of ladder (see 4.2 of NF EN 131-2:1993);
- ➔ Bend test of ladder (see 4.3 of NF EN 131-2:1993);
- ➔ Lateral bending test of ladder (see 4.4 of NF EN 131-2:1993);
- ➔ Bend test of rungs (see 4.6 of NF EN 131-2:1993);
- ➔ Torsion test of rungs (see 4.7 of NF EN 131-2:1993).

Testing performed on ladder was done in compliance with requirements in section 4.1 of NF EN 131-2:1993 and in the order indicated above.

The distance took into consideration for strength, bend, and lateral bending test, *L,* is the distance, measured in mm, of two consecutive anchorage points of the ladder.

The acceptance criteria for the bend test (see 4.3 of NF EN 131-2:1993) is modified as follows:

The maximum deflection admissible under load shall be no more than 5 x *L*2 x 10-6 in mm without exceeding 50 mm.

The tests performed by the LNE (*Laboratoire Nationale d'essais*, French national testing laboratory) were done on a 450-single ladder. The tests listed in NF EN 131-2 are identical to those described in NF E 85-002, which have been filed under N° 2010432 – Document DMEE/8. For the 450-simple ladder, the distance between wall brackets is > 2 m.

(L = 4435-400=4035)

5.2 – Testing of safety cage

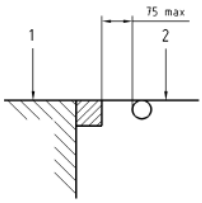
The cage must be fastened to the ladder.

For hoops, a preload (FPL) of 200 N is applied vertically at the most unfavorable point. The preload may be distributed over three horizontal safety cage hoops for one minute. The position of the lowest safety cage hoop after removing the preload is taken into account as a reference position for the test to be carried out for a test load (FT) of 1000 N. The permissible permanent deformation which is measured at the point of application of the load is no more than 10 mm.

For the Vertical bars, a simulated load (FH) of 500 N shall be horizontally applied at the most unfavorable point. The simulated load (FH) may be distributed over three Vertical bars. The permissible permanent deformation measured at the point of application of the load is 10 mm maximum. Test cages recording any permanent deformation shall not be used in service.

6. SAFETY TIPS

The ladder can be guaranteed to comply with EN 14 122-4 only if all ladder components are provided by FORTAL and if all assembly instructions are correctly followed. If these conditions are not respected and the ladder is found to be not in compliance, FORTAL cannot be held responsible.



Distance between departure area and first rung ≤ 280 mm.

Uppermost rung is positioned at the same height as arrival area and no further than 75 mm from wall

Spacing between ladder and any surrounding permanent objects:

In front of ladder: 650 mm, and 600 mm in case of a discontinuous obstacle. Behind ladder (measured from backside of rung): at least 200 mm, and 150 mm in case of a discontinuous obstacle.

Safety cage:

Maximum distance between two consecutive hoops must not exceed 1500 mm. Hoops must be placed perpendicular to Vertical bars. Vertical bars must be fastened on the inside of the cage and spaced evenly.

Guardrail:

When required, guardrails as protective devices against the risk of falling from a height at departure and arrival areas as well as at intermediate platforms shall meet the relevant requirements for guardrails according to NF E 85 015.
Guardrails shall be provided at drop edges of arrival areas, over a length of at least 1500 mm on both sides of the vertical axis of the ladder or over the entire length of the edge, if this is less than 3000 mm.

Gate:

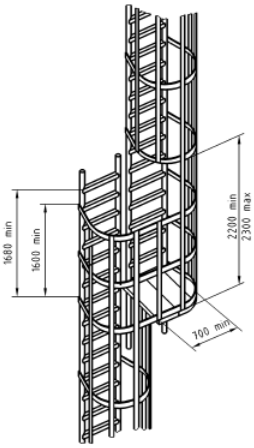
Access opening at arrival areas shall be provided with a gate. Opening direction of this gate shall not be towards the edge of the drop (outwards).

Safe access to and exit from top of fixed ladder:

Handrails shall be fitted connecting the ladder stiles to the handrail of the guardrail. Those handrails shall be fixed to the guardrail at the arrival area. Important: Landing step with gate and guardrail or a parapet crossing covering 400 mm of arrival area is mandatory.

Platform:

Generally, if the climbing height *H* of fixed ladders is more than 6 m, the ladders shall be equipped with one or more platforms.
Where there are several flights, the height *h* of a ladder flight between the departure area and the nearest platform or between consecutive rest platforms shall be no more than 6 m. But in the case of a single flight only (no rest platform), the height *h* between departure area and the arrival area can be extended to no more than 10 m.



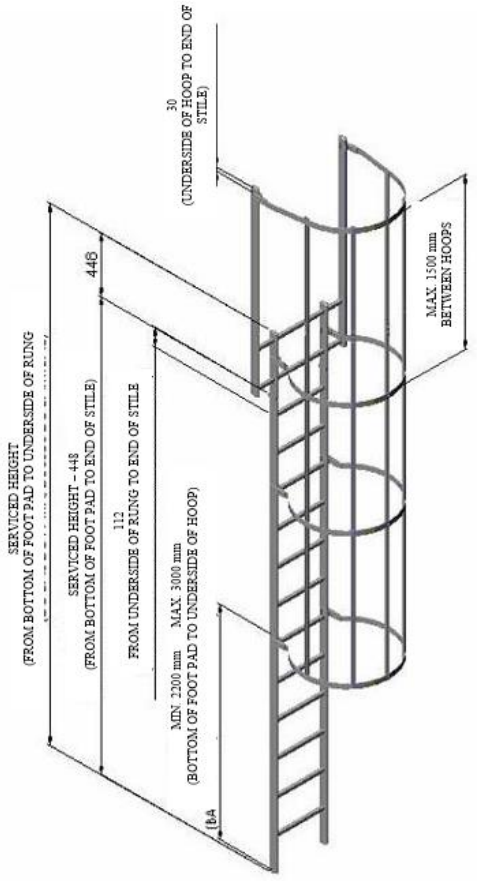
The width of the intermediate platform shall be at least 700 mm installed between the two flights of the ladder.

The clear height for the passage between the platform and the lowest complete hoop of the safety cage on the upper ladder shall be between 2 200 mm and 2 300 mm.

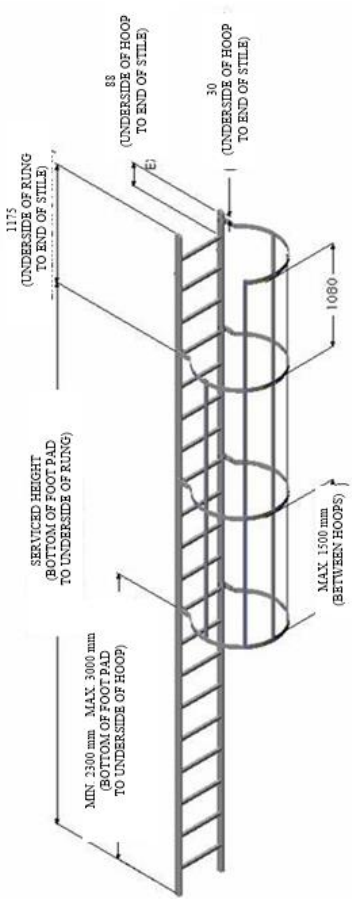
For ladder to be in compliance with standards, all components must be provided by FORTAL. If this is not the case, FORTAL declines all responsibility.

7. ASSEMBLY INSTRUCTIONS

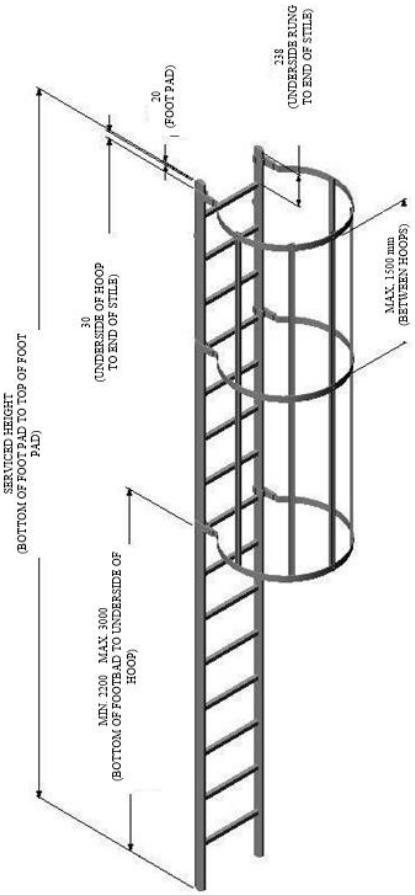
Wide Exit Caged Ladder



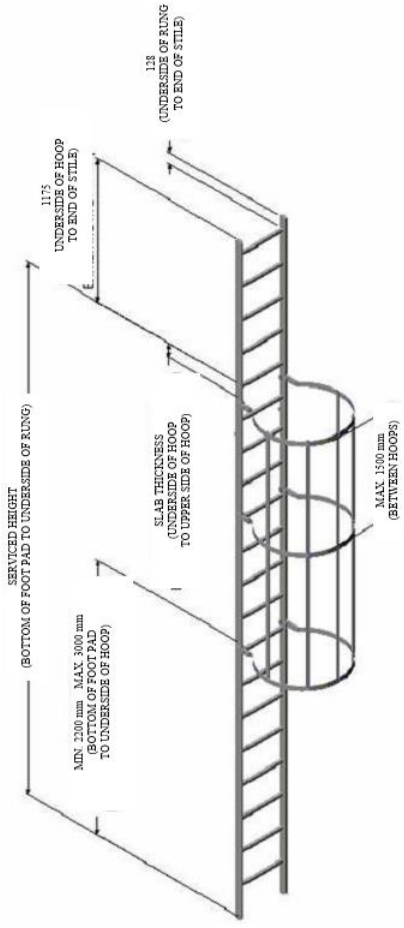
Side Exit Caged Ladder



Caged Ladder with exit through roof Hatch

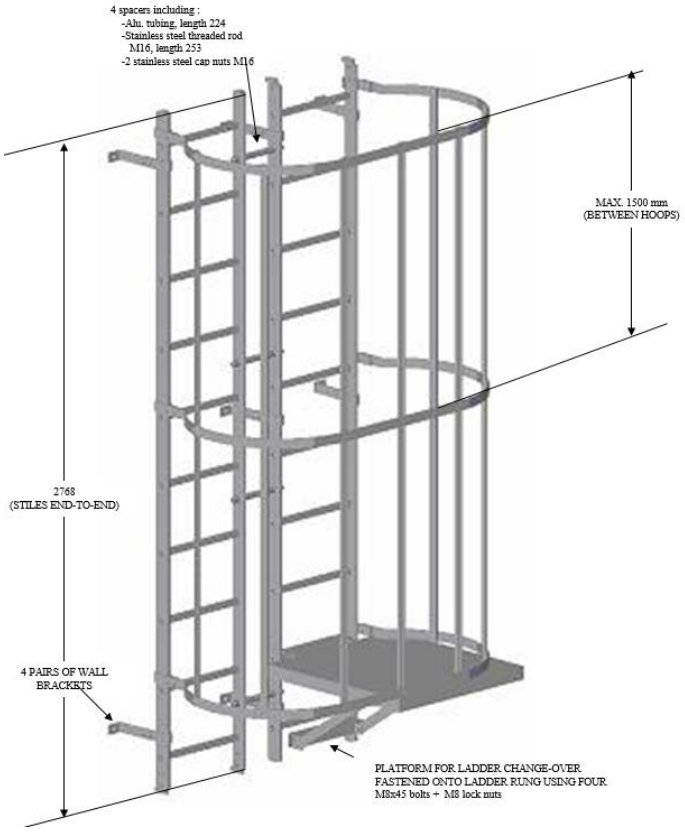


Caged Ladder with Open-end Exit

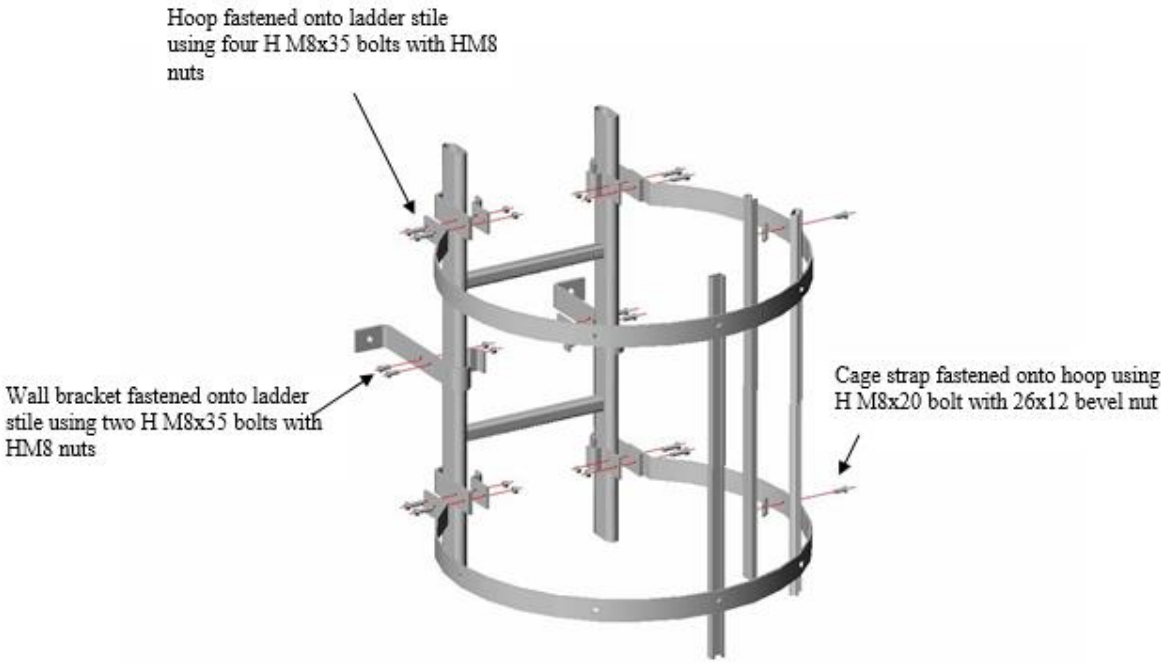


Maximum distance between wall brackets fixation: 2000 mm

Caged ladder with ladder Change-over



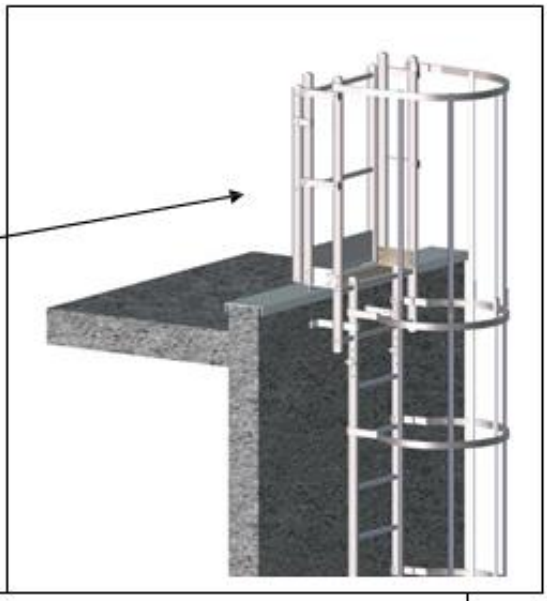
Vertical bar and Hoop Assembly

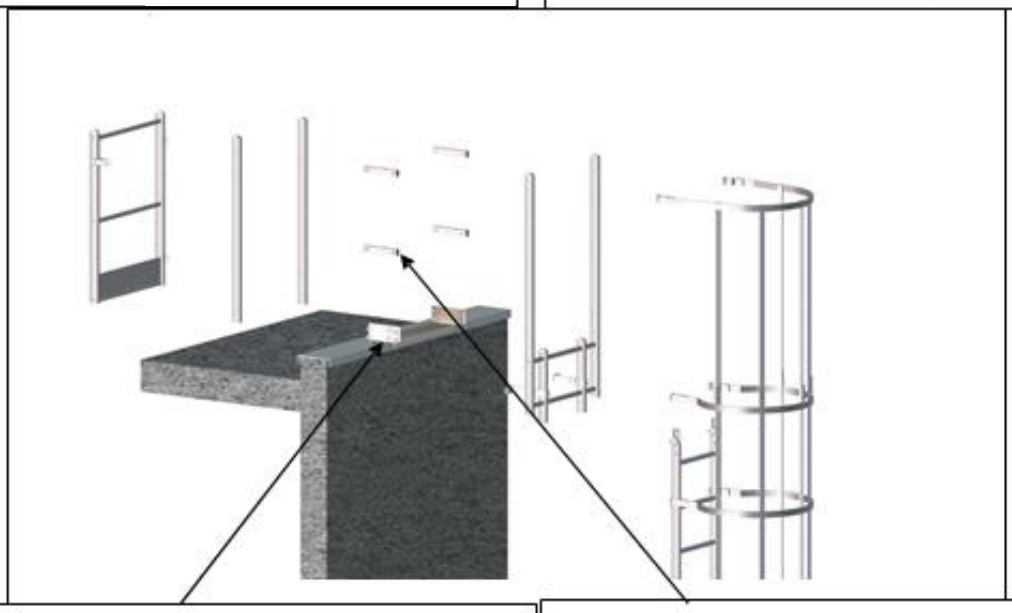


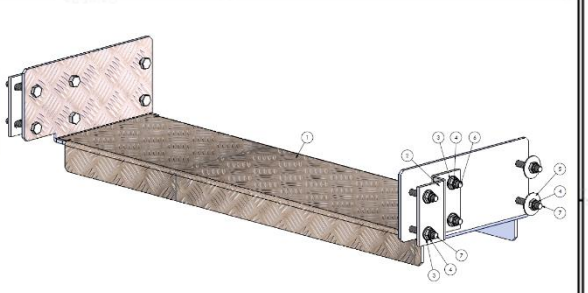
Parapet landing 200 mm assembly

F600640200 : Parapet landing 200 mm

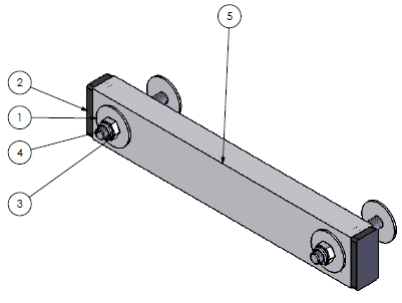
	Reference	Numbers
1	Landing step 200	1
2	Guardrail for landing step 200	4
3	Bars for gate fixing	2
4	Gate for kit parapet crossing	1
5	Wide exit for kit safety ladder	1







	Reference	Numbers
1	Flat sheet landing step 200	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

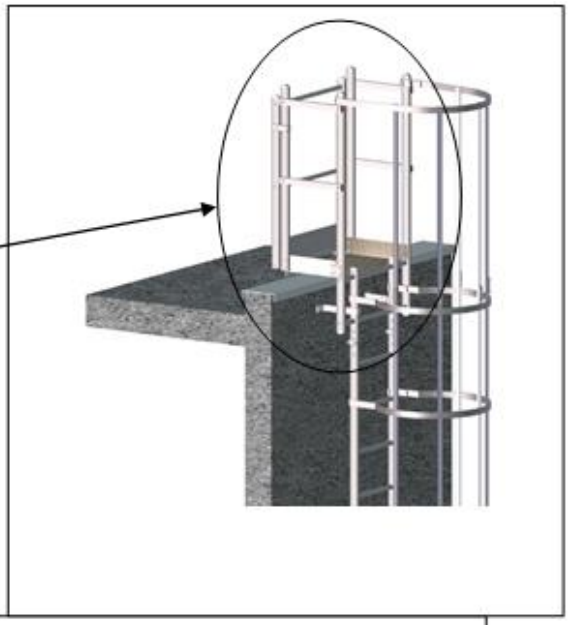


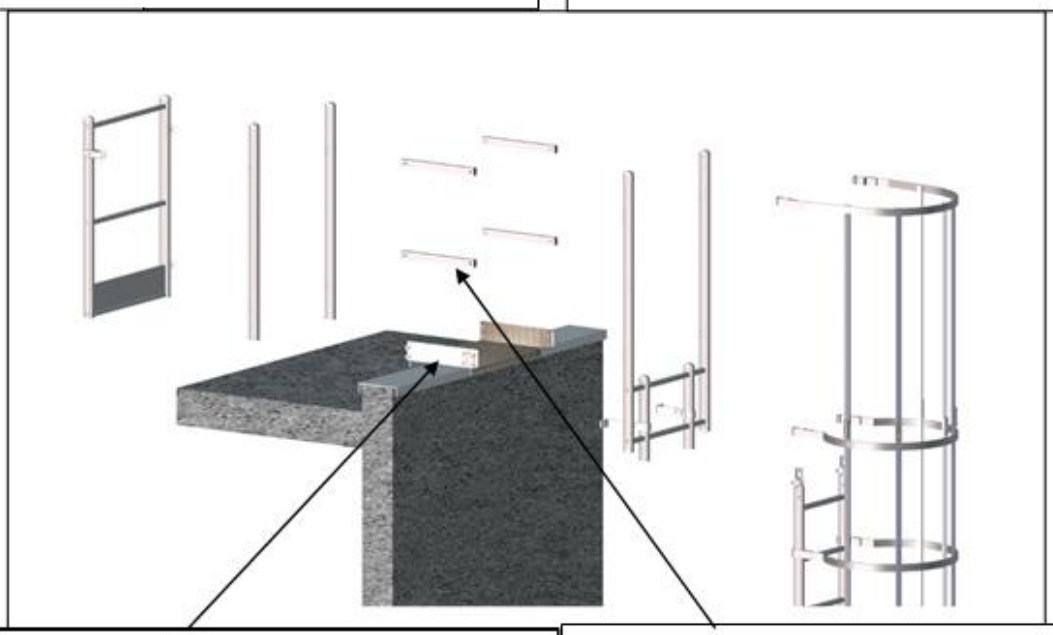
	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 200 guardrail	1

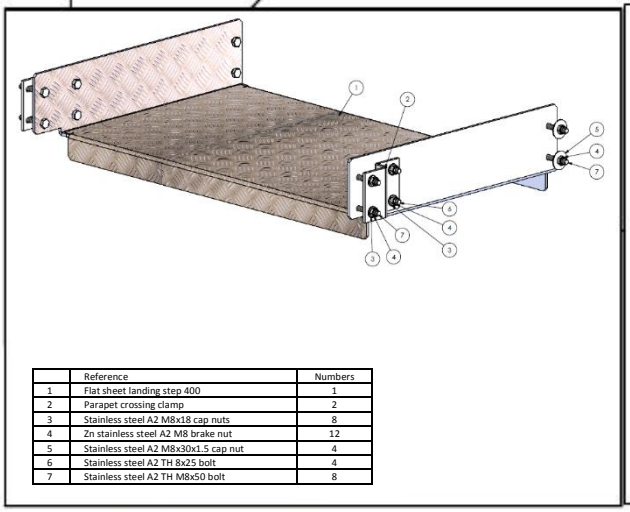
Parapet landing 400 mm assembly

F600640400 : Parapet landing 400 mm

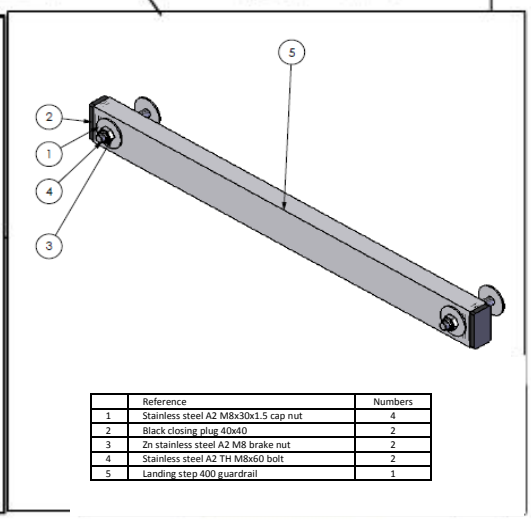
	Reference	Numbers
1	Landing step 400	1
2	Guardrail for landing step 400	4
3	Bars for gate fixing	2
4	Gate for kit parapet crossing	1
5	Wide exit for kit safety ladder	1





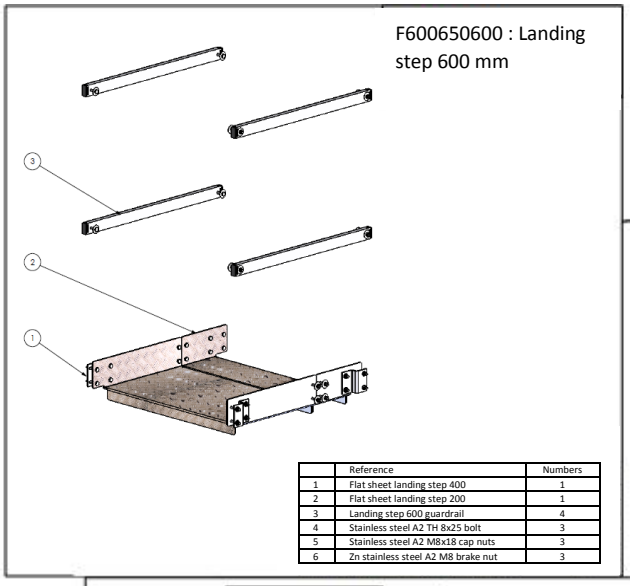


	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

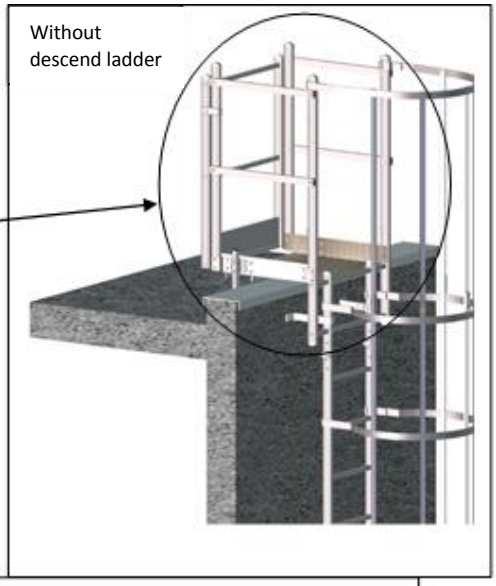


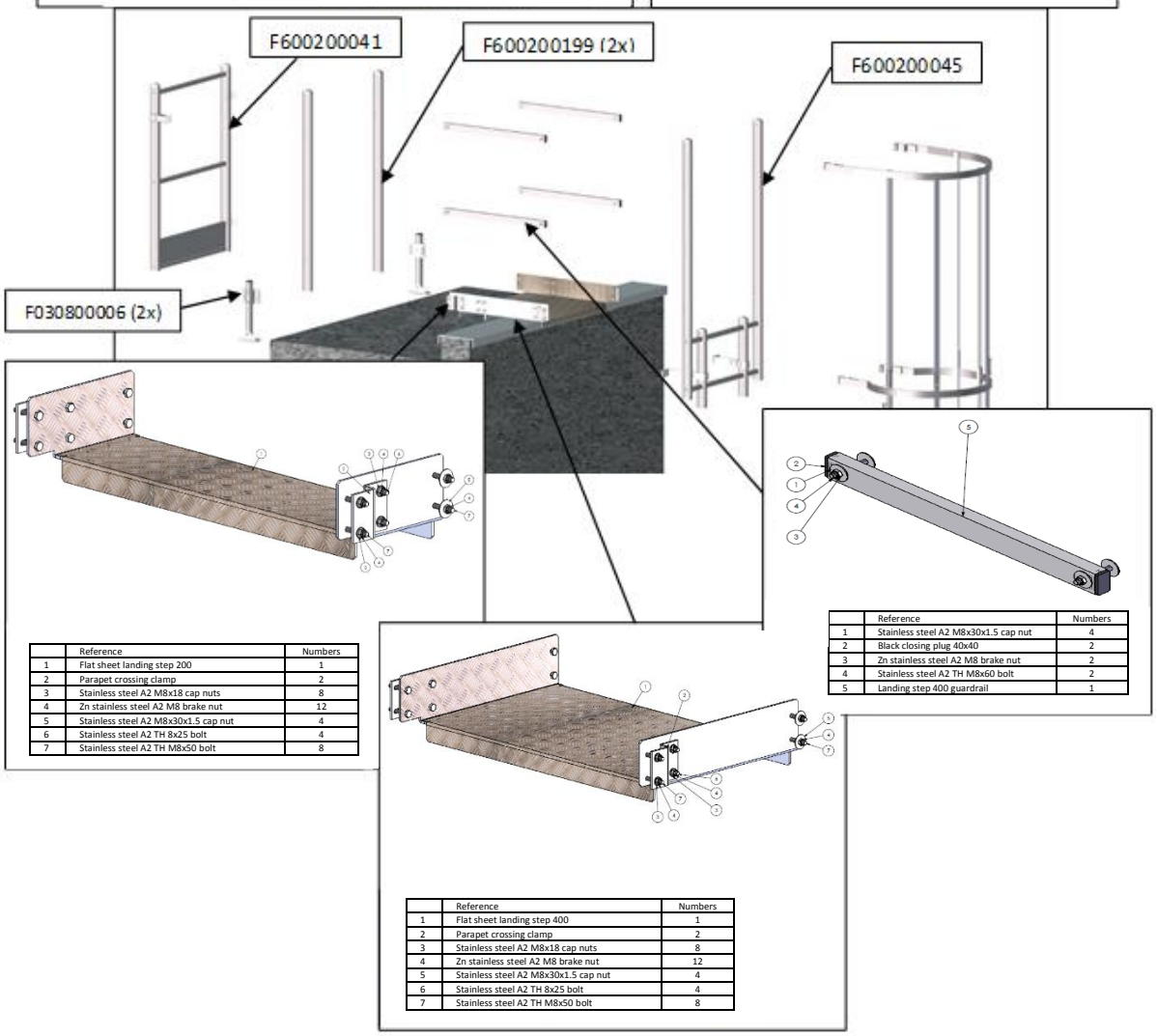
	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 400 guardrail	1

Landing step 600 mm without ladder



	Reference	Numbers
1	Flat sheet landing step 400	1
2	Flat sheet landing step 200	1
3	Landing step 600 guardrail	4
4	Stainless steel A2 TH 8x25 bolt	3
5	Stainless steel A2 M8x18 cap nuts	3
6	Zn stainless steel A2 M8 brake nut	3



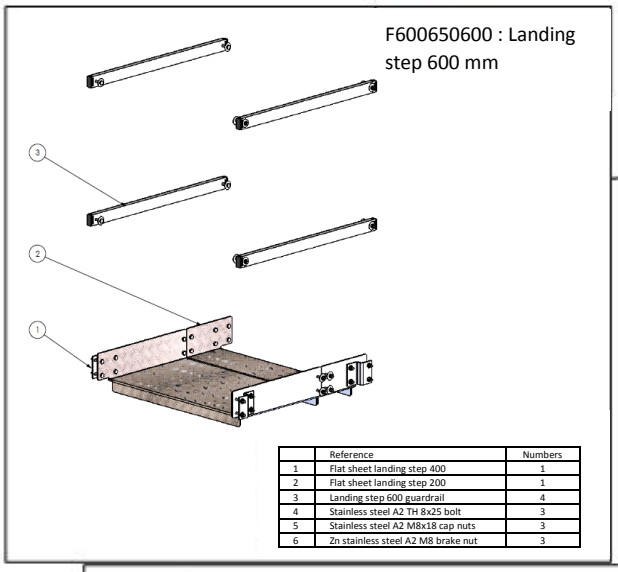


	Reference	Numbers
1	Flat sheet landing step 200	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

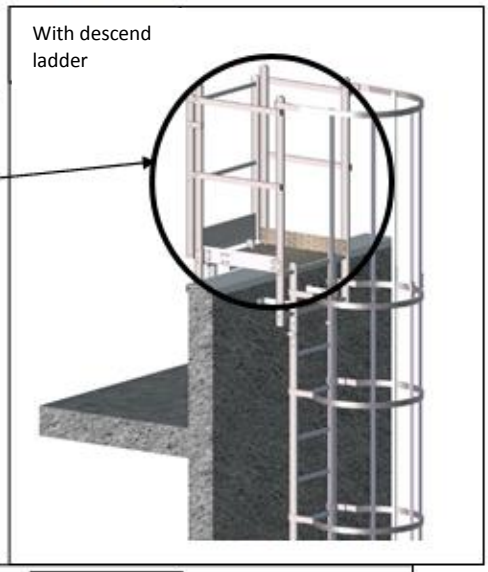
	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 400 guardrail	1

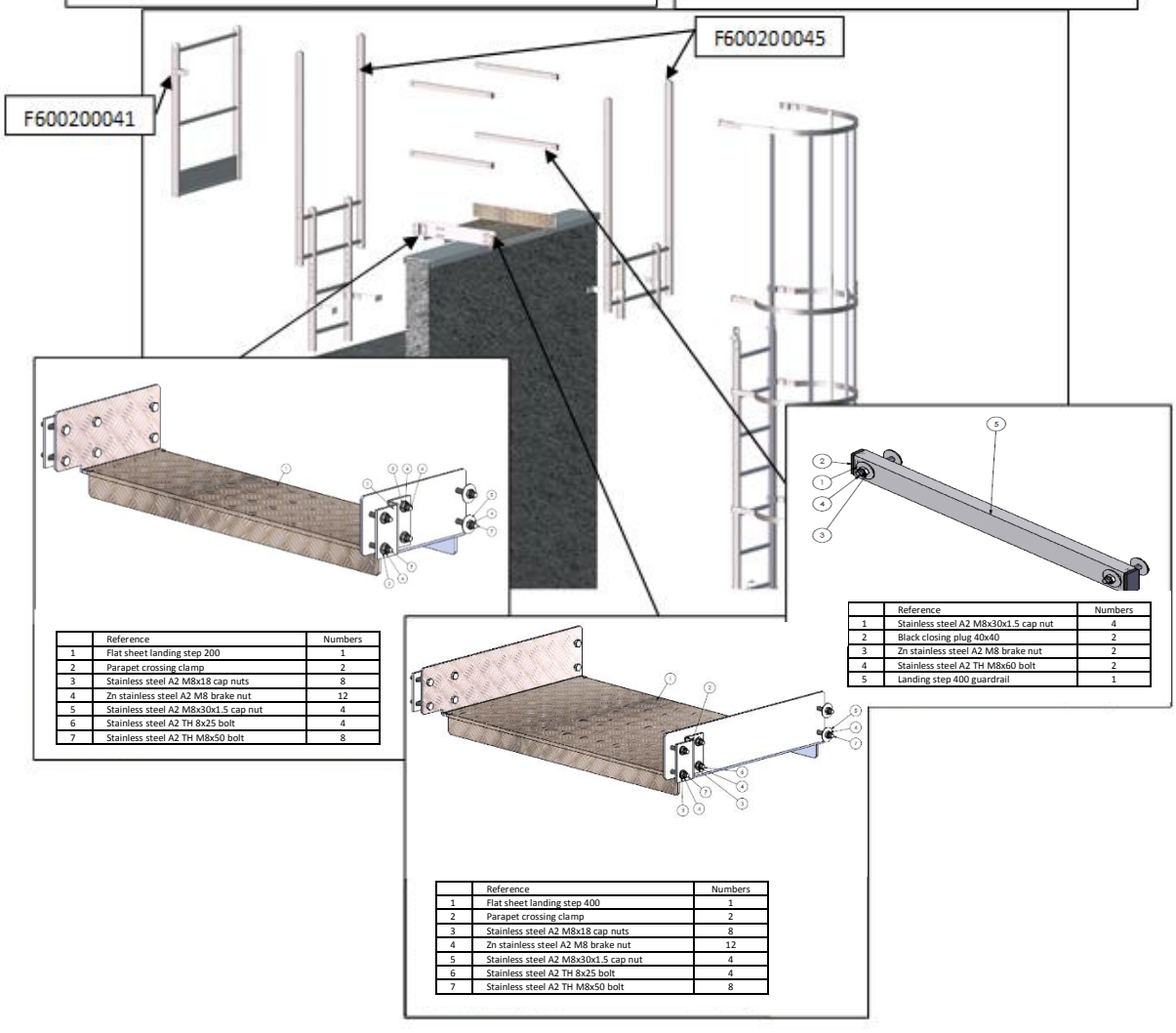
	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

Landing step 600 mm with ladder



	Reference	Numbers
1	Flat sheet landing step 400	1
2	Flat sheet landing step 200	1
3	Landing step 600 guardrail	4
4	Stainless steel A2 TH 8x25 bolt	3
5	Stainless steel A2 M8x18 cap nuts	3
6	Zn stainless steel A2 M8 brake nut	3





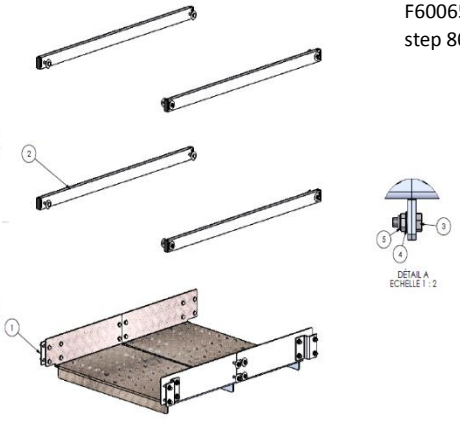
	Reference	Numbers
1	Flat sheet landing step 200	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 400 guardrail	1

	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

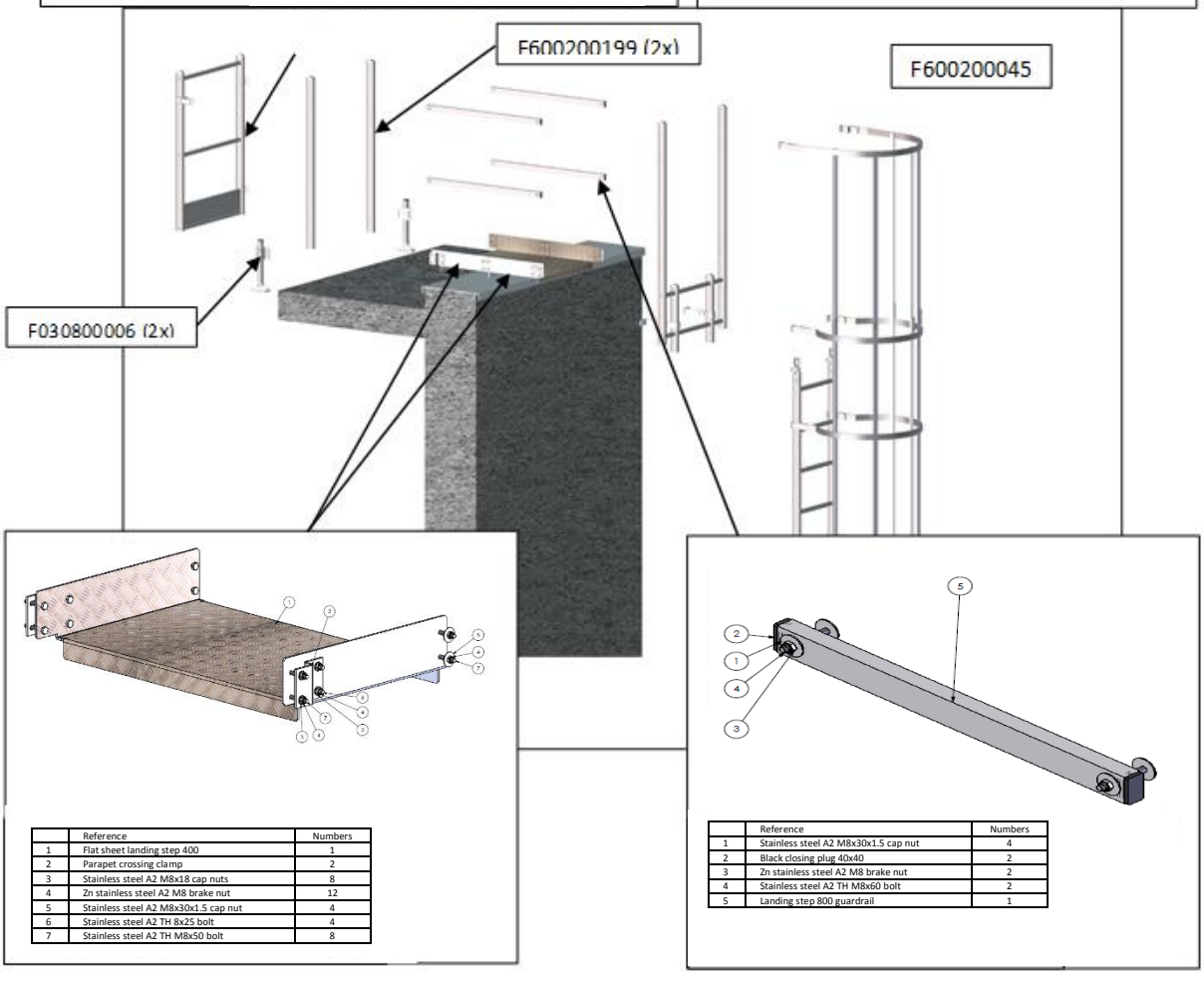
Landing step 800 mm without ladder

F600650800 : Landing step 800 mm



	Reference	Numbers
1	Flat sheet landing step 400	2
2	Landing step 800 guardrail	4
3	Stainless steel A2 TH 8x25 bolt	3
4	Stainless steel A2 M8x18 cap nuts	3
5	Zn stainless steel A2 M8 brake nut	3

Without descend ladder

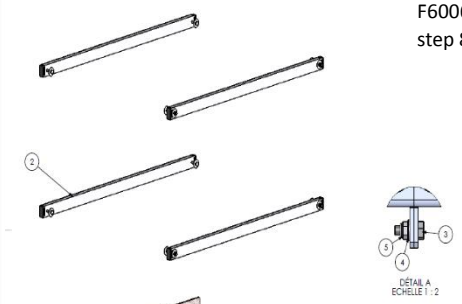


	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 800 guardrail	1

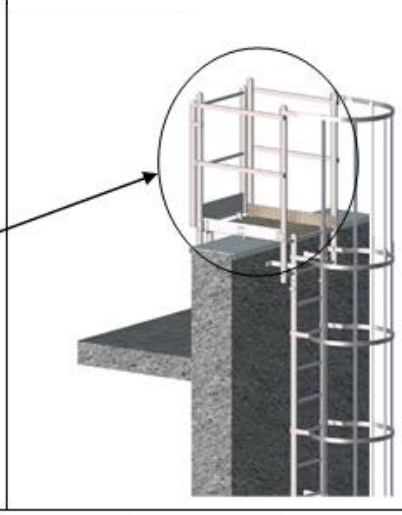
Landing step 800 mm with ladder

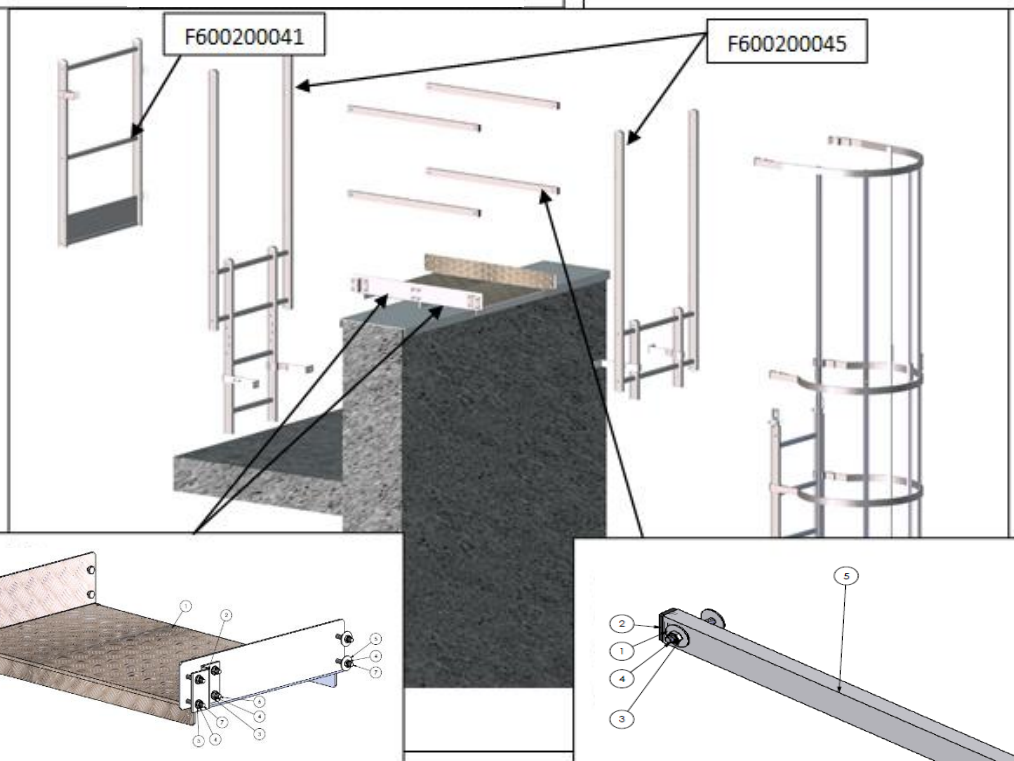
F600650800 : Landing step 800 mm



	Reference	Numbers
1	Flat sheet landing step 400	2
2	Landing step 800 guardrail	4
3	Stainless steel A2 TH 8x25 bolt	3
4	Stainless steel A2 M8x18 cap nuts	3
5	Zn stainless steel A2 M8 brake nut	3

Without descend ladder



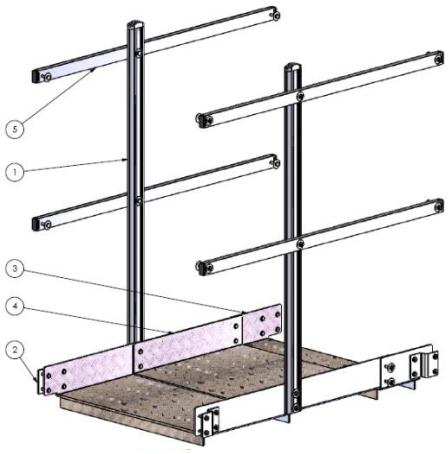


	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 800 guardrail	1

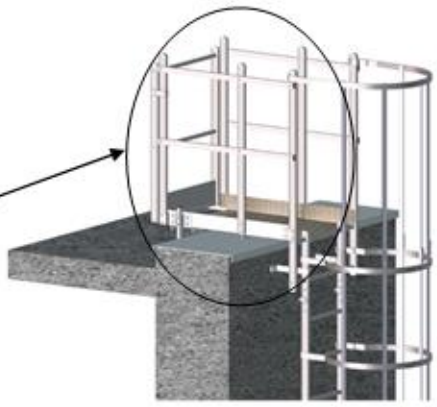
Landing step 1000 mm without ladder

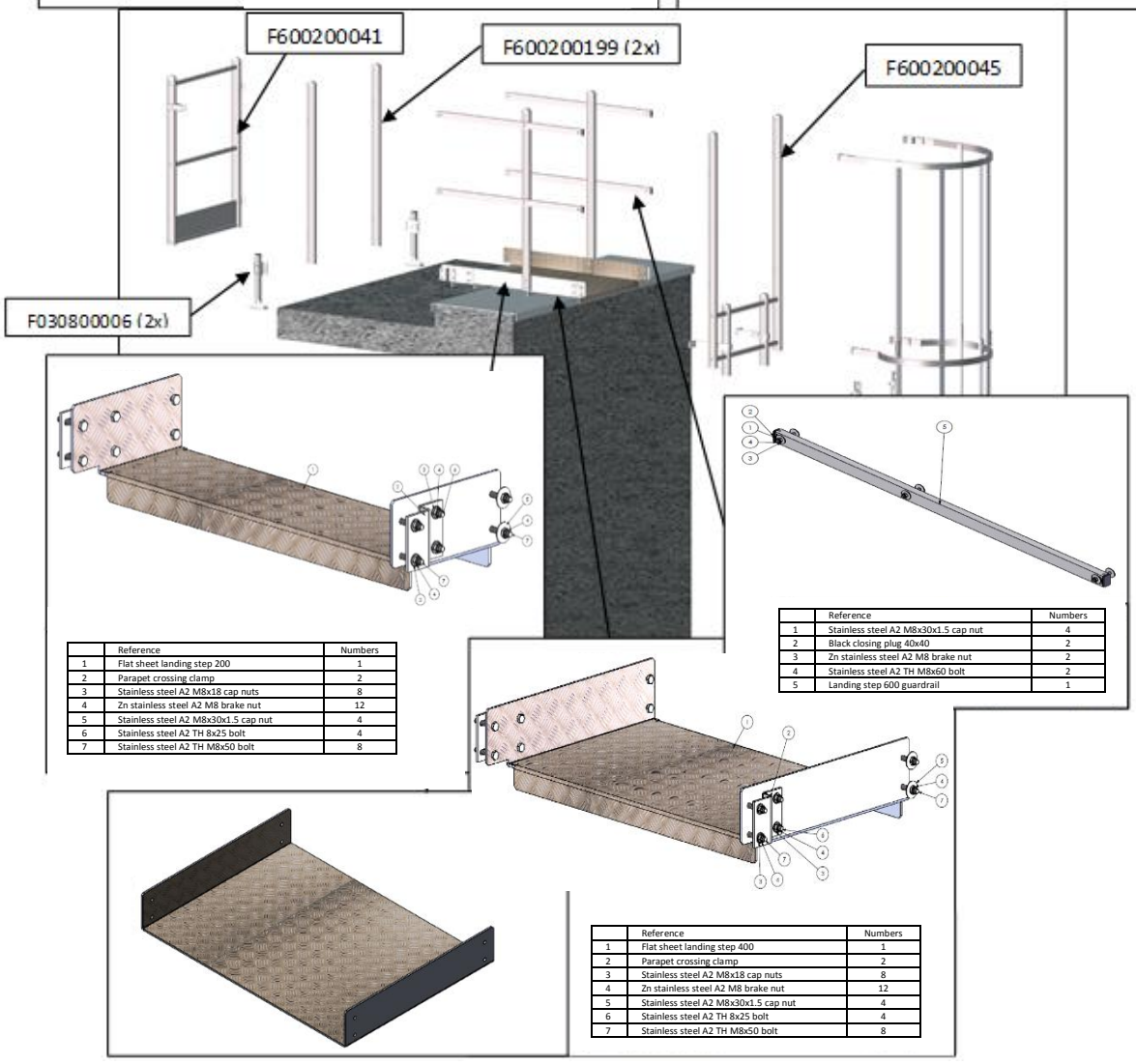
F600651000 : Landing step 1000 mm



	Reference	Numbers
1	Stile for gate fixing	2
2	Flat sheet landing step 400	1
3	Flat sheet landing step 200	1
4	Intermediary flat sheet for changeover	1
5	Landing step 1000 guardrail	4

Without descend ladder





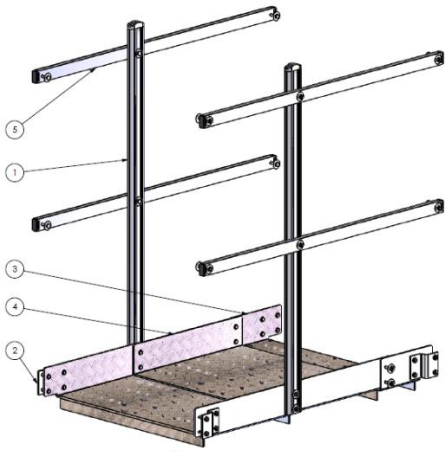
	Reference	Numbers
1	Flat sheet landing step 200	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 600 guardrail	1

	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

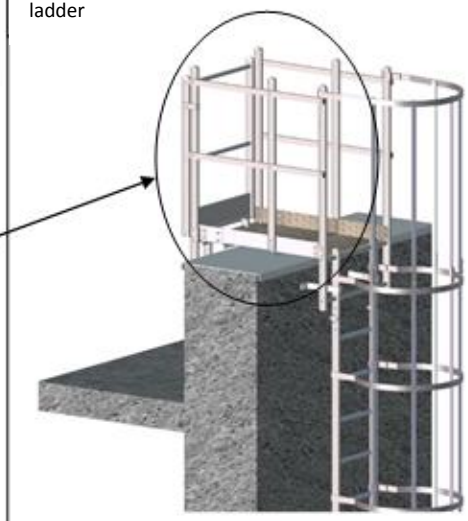
Landing step 1000 mm with ladder

F600651000 : Landing step 1000 mm



	Reference	Numbers
1	Stile for gate fixing	2
2	Flat sheet landing step 400	1
3	Flat sheet landing step 200	1
4	Intermediary flat sheet for changeover	1
5	Landing step 1000 guardrail	4

With descend ladder



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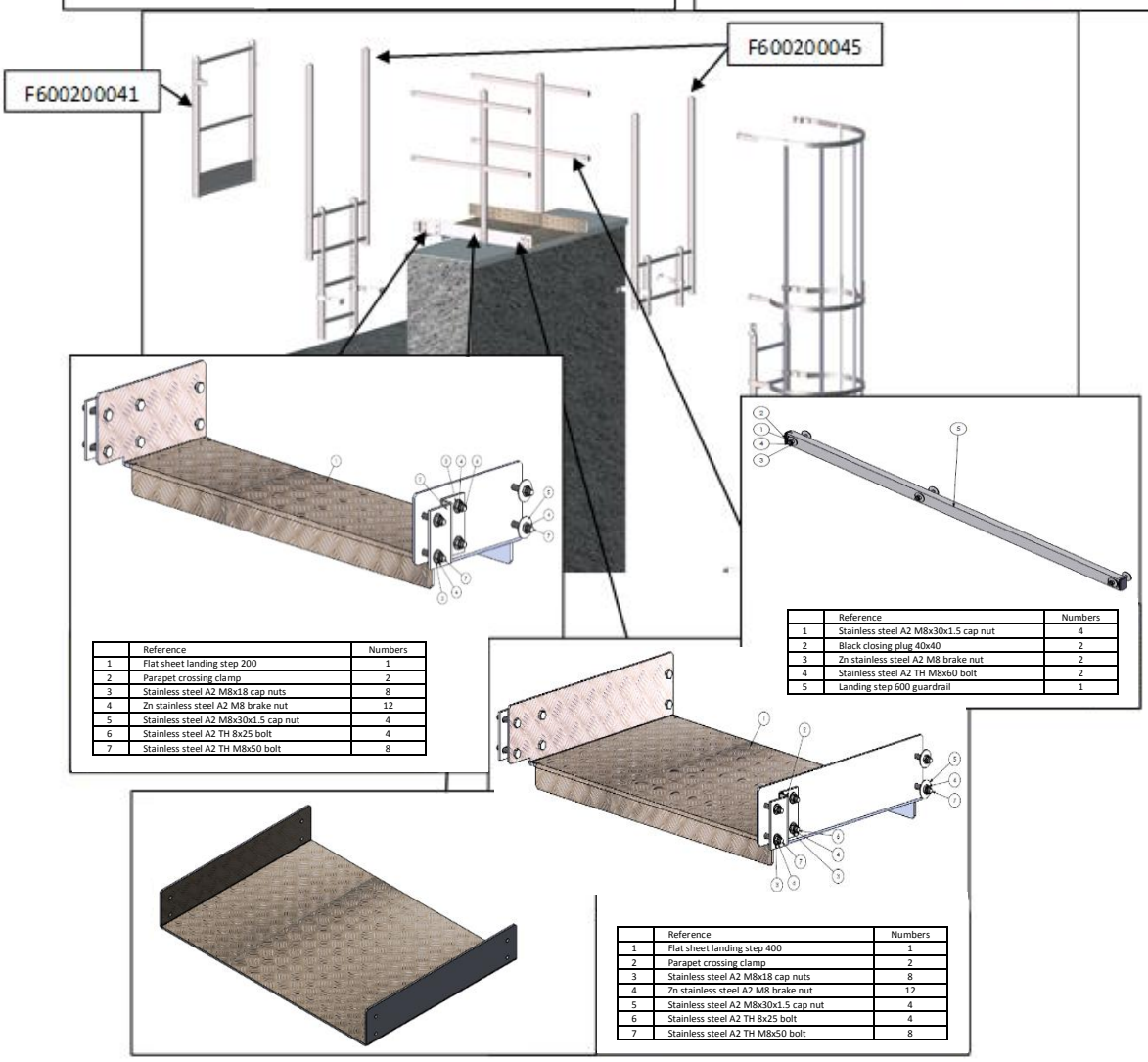
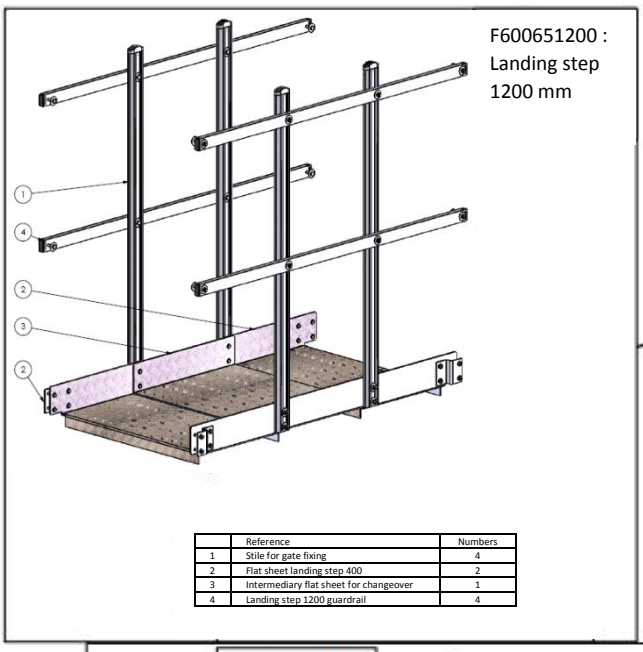


	Reference	Numbers
1	Flat sheet landing step 200	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	4
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	2
4	Stainless steel A2 TH M8x60 bolt	2
5	Landing step 600 guardrail	1

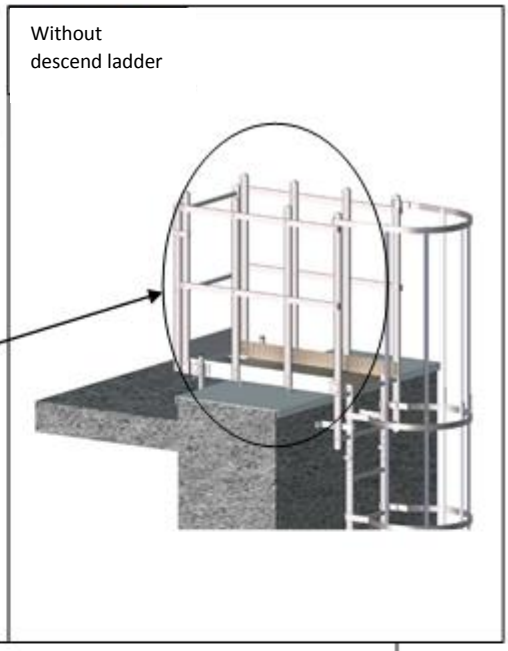
	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

Landing step 1200 mm without ladder

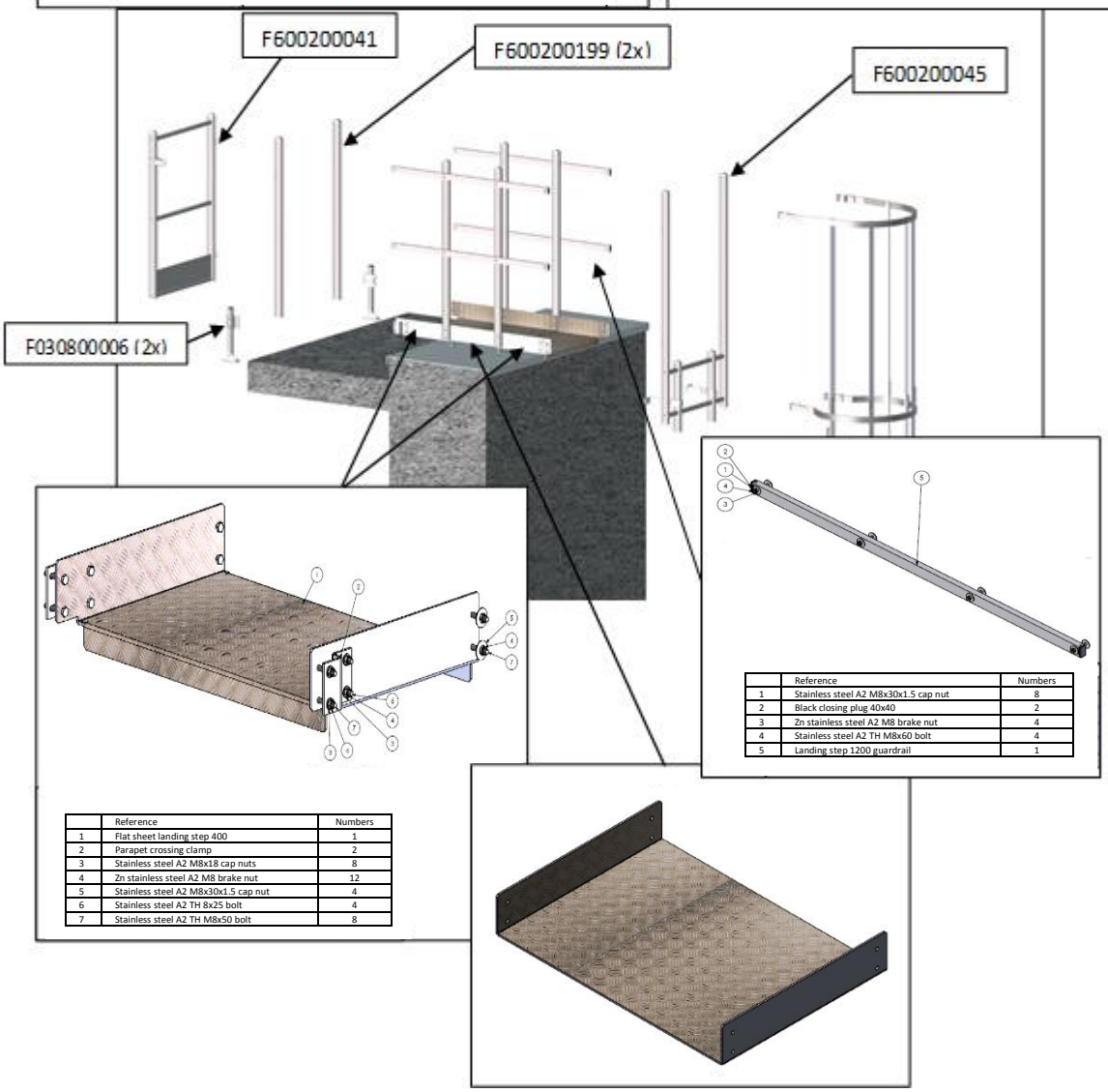


F600651200 : Landing step 1200 mm

	Reference	Numbers
1	Stile for gate fixing	4
2	Flat sheet landing step 400	2
3	Intermediary flat sheet for changeover	1
4	Landing step 1200 guardrail	4



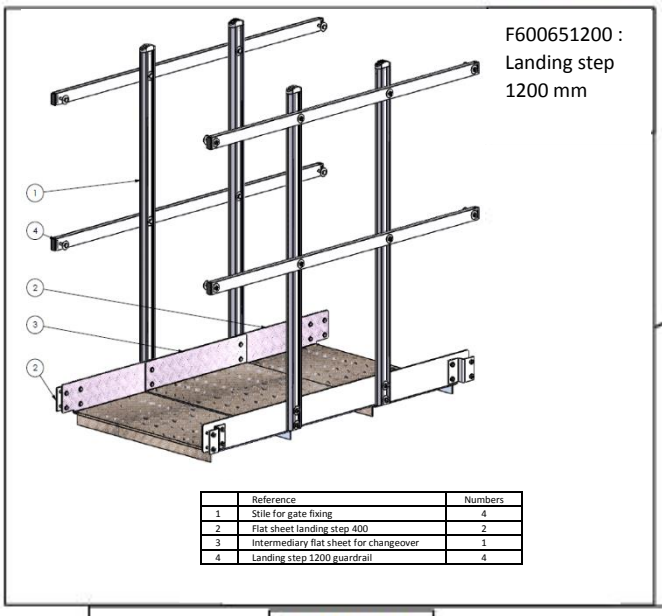
Without descend ladder



	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	8
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	4
4	Stainless steel A2 TH M8x60 bolt	4
5	Landing step 1200 guardrail	1

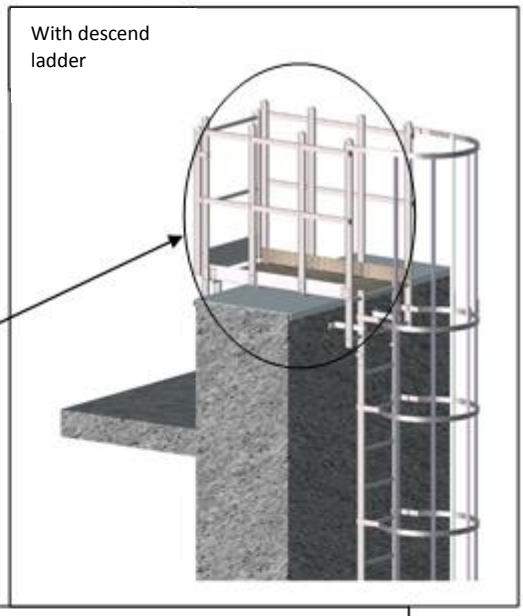
	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

Landing step 1200 mm with ladder

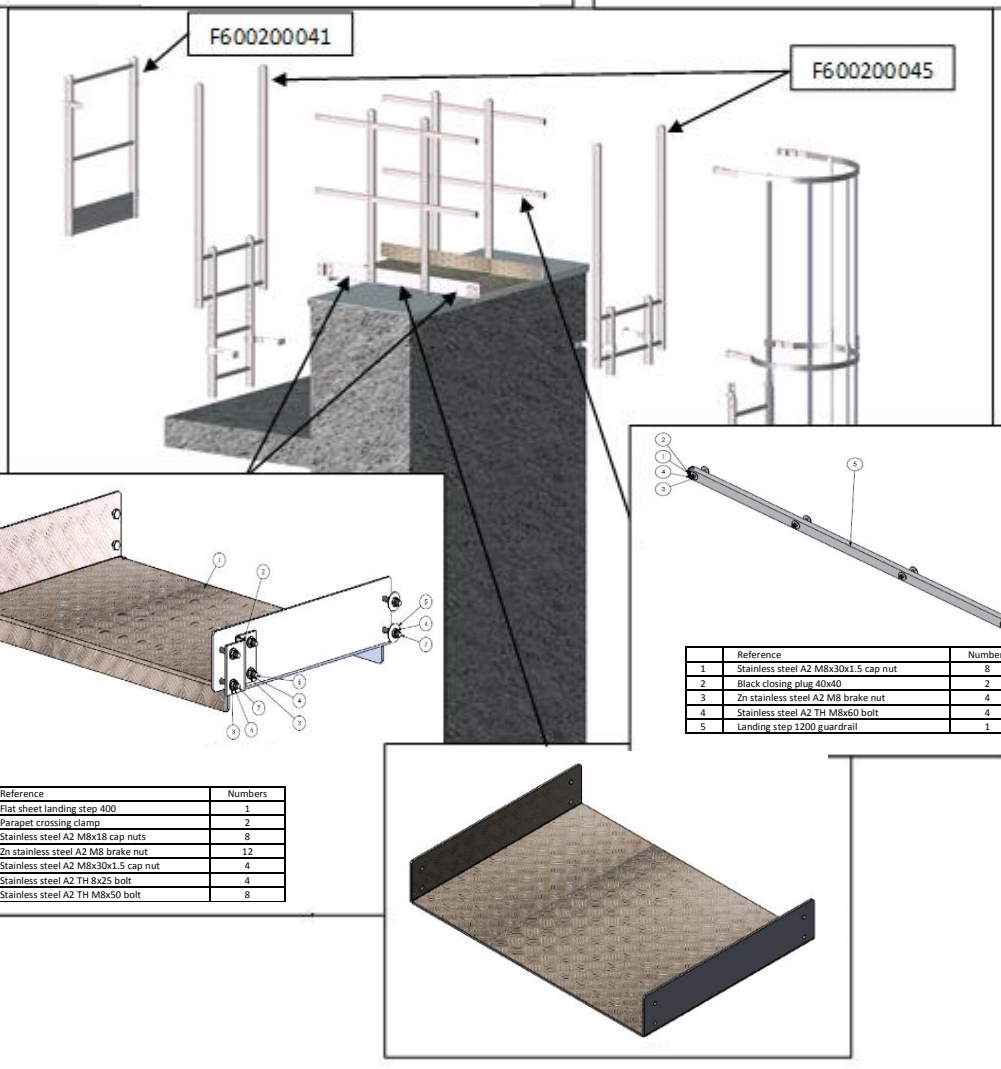


F600651200 : Landing step 1200 mm

	Reference	Numbers
1	Stile for gate fixing	4
2	Flat sheet landing step 400	2
3	Intermediary flat sheet for changeover	1
4	Landing step 1200 guardrail	4



With descend ladder



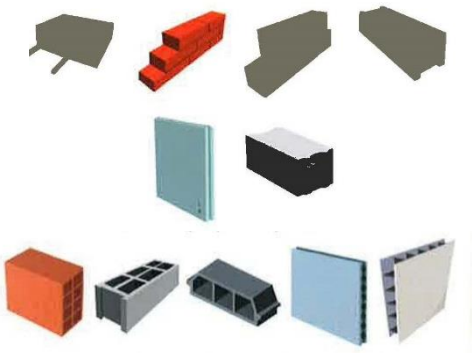
	Reference	Numbers
1	Flat sheet landing step 400	1
2	Parapet crossing clamp	2
3	Stainless steel A2 M8x18 cap nuts	8
4	Zn stainless steel A2 M8 brake nut	12
5	Stainless steel A2 M8x30x1.5 cap nut	4
6	Stainless steel A2 TH 8x25 bolt	4
7	Stainless steel A2 TH M8x50 bolt	8

	Reference	Numbers
1	Stainless steel A2 M8x30x1.5 cap nut	8
2	Black closing plug 40x40	2
3	Zn stainless steel A2 M8 brake nut	4
4	Stainless steel A2 TH M8x60 bolt	4
5	Landing step 1200 guardrail	1

8. DOWEL CHOICES:

Warning: these criteria are indicatives, refer to dowel manufacturer specifications.

➔ Support type, size, function

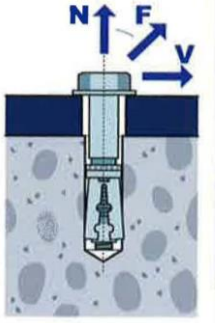


Fixation dowel choose according to:

- Support type and condition for provide an adequate anchoring:
  - Crowded materials: concrete blocks (compression area: non-cracked concrete/tense area: cracked concrete), bricks, stones and building blocks, plaster blocks and aerated concrete.
  - Hollow materials: bricks, building blocks, alveolar slabs, plaster blocks, alveolar partition and plasterboards.
- Support function: it's necessary to be sure that the dowel choice non-impact performances excepted from the support. Example: fire resistance, tightness, thermal and acoustic performances.

It's important to pay attention to mechanical properties would have been possible be alter.

➔ Solitations



There are three load types:

- N: tractive effort for 0° ≤ a < 30°
- F: tractive effort for 30° ≤ a < 60°
- V: shearing effort for 60° ≤ a ≥ 90°

Effort direction is defined by angle formed by the dowel axle and the applied load direction. The dowel type will be chosen according to solicitation types which element to be fixed will subject.

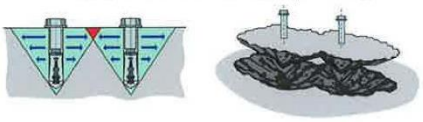
Warning to the metals assemblage. The corrosion can be provided to the improper coupling between dowel and the piece to fix.

➔ Installation conditions

Some installation conditions are required for anchoring characteristics (pullout, shearing resistance, …) corresponding to the supplier announcement.

It's needed to check that following conditions are respected for the anchoring quality be guaranteed.

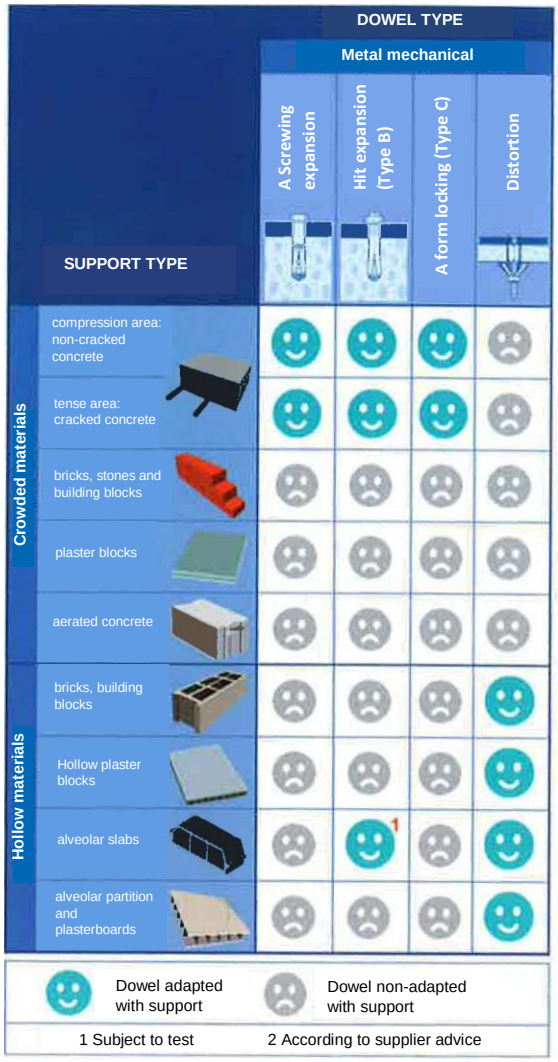
- Distance conditions:
  - Between dowels (between axes)
  - Minimum distance from borders



- Support conditions:
  - Support condition and quality
  - Support thickness

Choose the right dowel

Warning: these criteria are indicatives, refer to dowel manufacturer specifications.



In case of building renovation, it's necessary to check that support is conform

9. WARRANTY

FORTAL guarantees its own manufactured products (excepting specific clauses accepted by the customer and FORTAL) for a period of 2 years from the delivery date (date given on the delivery slip) against all manufacturing defects, except for:

- Labour or travelling damages
- Wear and tear due to impacts, a lack of maintenance, shoks, etc.
- Use in inappropriate conditions or conditions that do not comply with those defined herein or installations that do not comply with the user installation instructions.

Any other compensation is formally excluded from the warranty, including operating loss, damage incurred and any prejudice whatsoever subsequent to using our manufactured products. Any modification, repair or replacement of parts during the warranty period does not extend the period of cover.

Should our manufactured products be modified outside our production site without our prior written agreement, FORTAL's liability cannot be involved.