

Technical data. Components and Accessories

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SLOVAKIA, 58,244 m³

SILOS
SYMAGA



NORWAY, 33,136 m³



TECHNICAL SPECIFICATIONS

Circular metallic silo support over a flat or conical concrete floor.

Composed by the following parts: roof and cylinder.

Its height is defined by the diameter and the number of body's rings. The first ring's height is 1190 mm and each additional adds 1140 mm to the total height.

Available till 30 heights on the following diameters: 3.00, 3.50, 4.60, 5.35, 6.10, 6.87, 7.60, 8.40, 9.20, 9.93, 10.7, 11.45, 12.23, 12.98, 13.75, 14.51, 15.28, 16.05, 16.8, 17.57, 18.34, 19.86, 20.63, 21.39, 22.15, 22.92, 23.68, 24.44, 25.98, 27.5 y 32.08.

Includes as standard accessories a roof rung ladder, 1140 mm of simple ladder until the access door, an access door and a roof manhole.

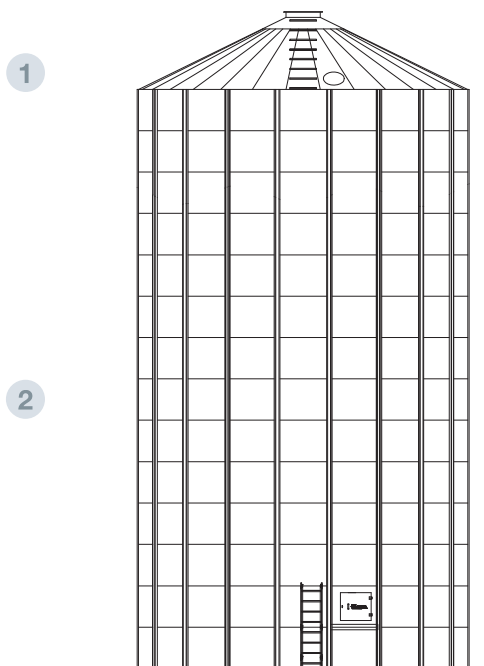
PARTS AND MATERIALS

1 ROOF

- Composed by roof sectors assembled between them through the roof waves.
- Its slope is 30°.
- Self – supporting roof on silos from 4.60 to 9.93.
- Self – supporting roofs are reinforced with wave roofs or beam roof to high snow loads.
- Sectors material : Galvanised steel S280GD ZM310 MAC e= 0.8mm
- Structure material: Galvanised steel S280GD Z600-MAC o S350GD Z600MAC

2 CYLINDER

- Composed by bodysheets screwed between them and with stiffeners.
- Wind rings are installed on the highest zones to avoid its deformation when the silo is empty.
- Into the bottom is located the aeration systems and the sweep auger.
- Bodysheet material: Galvanised steel S350GD Z600
- Reinforcement material: steel HX 500 LAD





TECHNICAL SPECIFICATIONS

Circular metallic silo support over a metallic structure on a concrete floor.

Composed by the following parts: roof, cylinder and hopper.

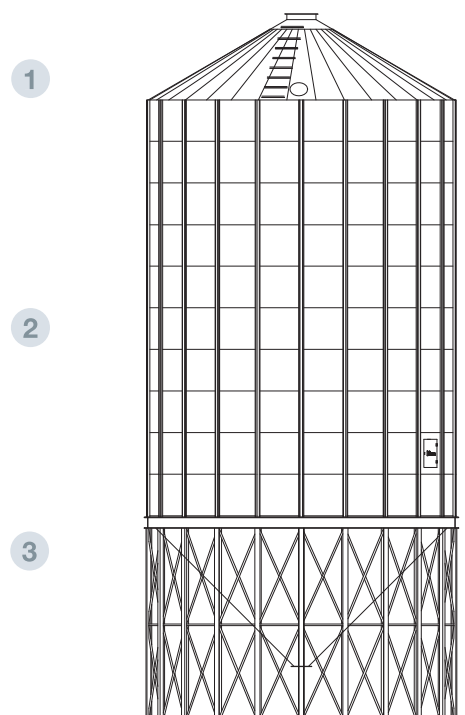
Its height is defined by the number of body's rings and the silo clearance. The first ring's height is 1180 mm and each additional adds 1140 mm to the total height.

Available till 30 heights on the following diameters: 4.60, 5.35, 6.10, 6.87, 7.60, 8.40, 9.20, 9.93, 10.7, 11.45 and 12.23.

Includes as standard accessories a roof rung ladder, an access door and a roof manhole.

PARTS AND MATERIALS

- 1 **ROOF**
 - Composed by roof sectors assembled between them through the roof waves
 - Sectors material : Galvanised steel S280GD ZM310 MAC e= 0.8mm
 - Structure material: Galvanised steel S280GD Z600-MAC o S350GD Z600MAC
- 2 **CYLINDER**
 - Composed by bodysheets screwed between them and with stiffeners
 - Bodysheet material: Galvanised steel S350GD Z600
 - Reinforcement material: steel HX 500 LAD
- 3 **HOPPER**
 - Hopper sheets screwed between them and to the compression ring
 - Material: Galvanised steel S350 GD Z600 MAC
 - Compression ring is supported by the structure joined to the foundation
 - Material: Galvanised steel S275 JR + HDG
 - The structure is composed by HEB pillars and beams ("L" pillars)
 - Its slope can be 45° or 60°. When the slope is 45° the hopper cone diameter is 400 mm (clearance 900 mm) and when is 60° the hopper cone diameter is 400 mm (clearance 900 mm) or 1250 mm (clearance 1650 mm)
 - Material cone: Galvanised steel S275 JR e= 3mm + HDG

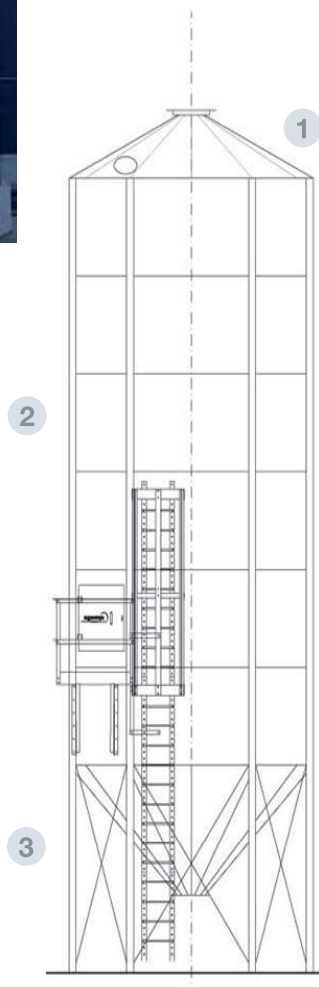


S.C.

MODELS



FILE 1.2
VERSION 2
02/02/2021



TECHNICAL SPECIFICATIONS

Circular metallic silo support over a metallic structure on a concrete floor.

Composed by the following parts: roof, cylinder and hopper.

Its height is defined by the number of body's rings and the silo clearance. Each ring is 1140 mm of height.

Available till 6 heights on the following diameters: 3.00, 3.50, 4.60, 5.35 and 6.10.

Includes as standard accessories a roof rung ladder, an access door and a roof manhole.

PARTS AND MATERIALS

1 ROOF

- Composed by roof sectors assembled between them through the roof waves
- Sectors material : Galvanised steel S280GD ZM310 MAC e= 0.8mm
- Structure material: Galvanised steel S280GD Z600-MAC o S350GD Z600MAC

2 CYLINDER

- Composed by bodysheets screwed between them and with stiffeners
- Bodysheet material: Galvanised steel S350GD Z600
- Reinforcement material: steel HX 500 LAD

3 HOPPER

- Hopper sheets screwed between them and to the cylinder through the clips
- Material: Galvanised steel S350 GD Z600 MAC
- The silo is connected to the lower structure fixed to the foundation
- Structure is composed by Ω profiles (legs) joined between them through "U" profiles
- Hopper slope can be 45° or 60°. When the slope is 45° the hopper cone diameter is 400 mm (clearance 900 mm) and when is 60° the hopper cone diameter is 400 mm (clearance 900 mm) or 1250 mm (clearance 1650 mm)
- Material cone: Galvanised steel S275 JR e= 3mm + HDG



TECHNICAL SPECIFICATIONS

It's a silo S.C. with shorter legs to connect them to an auxiliary structure.

Its commercial name is "Delivery silo" because is used to truck or train loading.

Composed by the following parts: roof, cylinder and hopper. Its total height is defined by the number of body's rings. Each ring has 1140 mm of height.

Available till 6 heights on the following diameters: 3.00, 3.50, 4.60, 5.35 and 6.10.

Includes as standard accessories a roof rung ladder, an access door and a roof manhole.

PARTS

1 ROOF

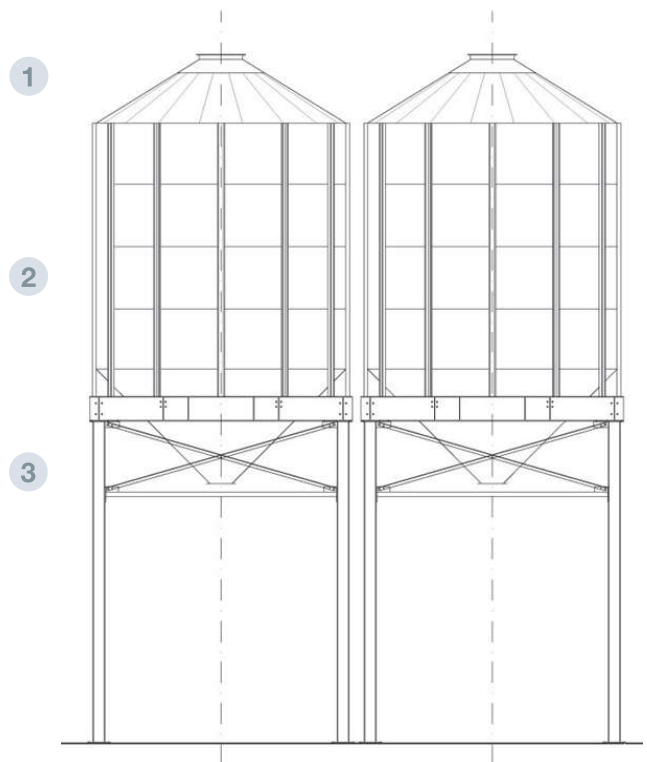
- Composed by roof sectors assembled between them through the roof waves
- Its slope is 30°
- Self – supporting roof on silos from 4.60 to 6.10
- Sectors material : Galvanised steel S280GD ZM310 MAC e= 0.8mm
- Structure material: Galvanised steel S280GD Z600-MAC o S350GD Z600MAC

2 CYLINDER

- Composed by bodysheets screwed between them and with stiffeners
- Bodysheet material: Galvanised steel S350GD Z600
- Reinforcement material: steel HX 500 LAD

3 HOPPER

- Hopper sheets screwed between them and to the compression ring through the clips
- Material: Galvanised steel S350 GD Z600 MAC
- The silo is connected to the lower structure through the auxiliary structure
- Lower structure is composed by Ω profiles (legs)
- Hopper slope can be 45° or 60° and hopper cone diameter Ø400 mm or Ø1250 mm.
- Material cone: Galvanised steel S275 JR e= 3mm + HDG

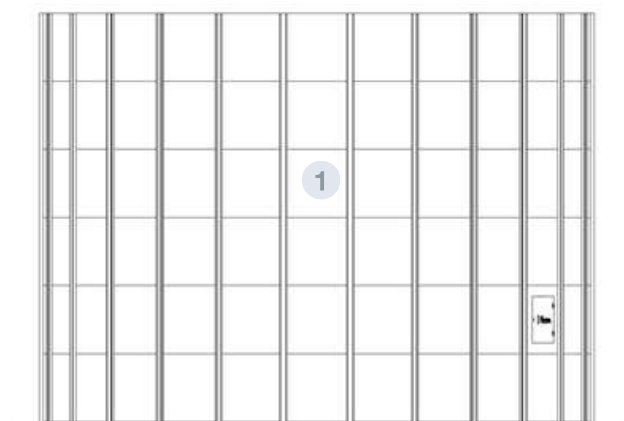


INSIDE SILO

MODELS



FILE 1.5
VERSION 1
05/11/2019



TECHNICAL SPECIFICATIONS

It's a S.B.H. silo located into a building.

It hasn't roof and is available till 10 heights on the following diameters: 3.00, 3.50, 4.60, 5.35, 6.10, 6.87, 7.60, 8.40, 9.20, 9.93, 10.7, 11.45 and 12.23.

PARTS

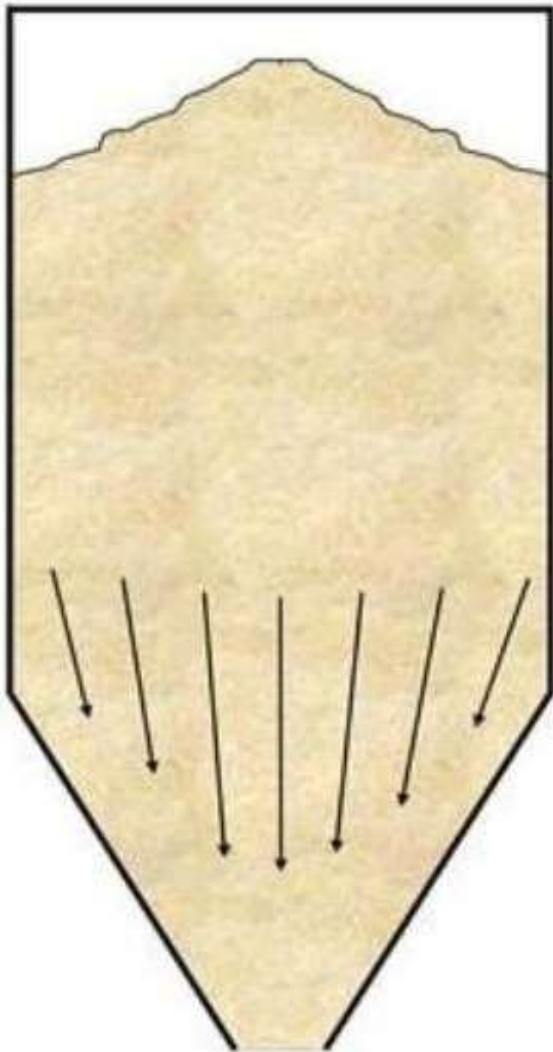
1

CYLINDER

- Composed by bodysheets screwed between them and with stiffeners

MASS DISCHARGE SILOS

CYLINDER



TECHNICAL SPECIFICATIONS

DEFINITION:

It is a type of discharge of the material within the silo. All grain in the silo is in motion. There are no dead zones (or they are minimized). This movement of all the product at the same time causes great stresses on the walls of the silo that we calculate with the NF-P-22-630 standard.

LABEL:

All stored grain moves at the same time.

TECNOLOGICAL EFFECTS:

- First grain to enter - first to exit, FIFO
- Danger of greater abrasion on the hopper wall.

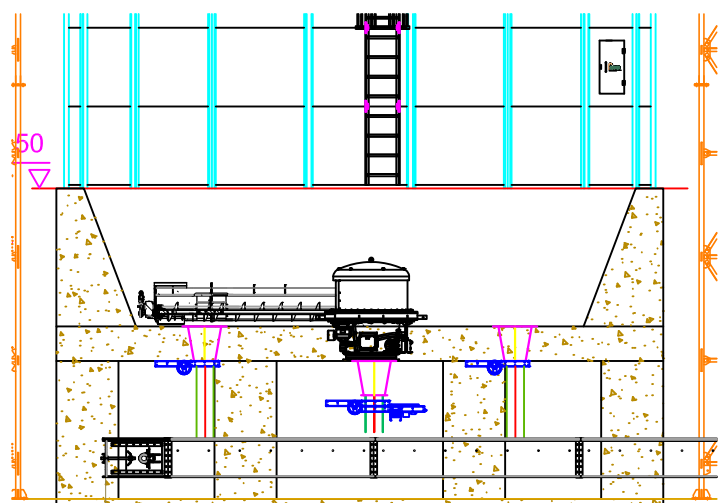
STATICS:

Hopper silo: Tension peaks in the hopper and greater efforts on the cylinder.
Flat Bottom silo: extractor exerts forces against silo wall.

SILO DESIGN:

Mass discharge occurs because the product does not flow freely. For it to flow there are several methods, usually it is to put a 60° hopper and another to put an extraction system.

RECOMMENDED FOUNDATION Ponywall





PANAMA, 20,556 m³

ROOF

COMPONENTS



FILE 2.1
VERSION 1
05/11/2019



TECHNICAL SPECIFICATIONS

Top envelope composed by roof sectors assembled between them.

It has constant material relation: 3 roof sectors/ (bodysheets per ring) y 1 principal beam/ (bodysheets per ring).

According to the Eurocode, on a standard way is calculated to a snow load of 80 Kg/ m2.

Includes as standard accessories a roof rung ladder and a roof manhole.

MODELS

1 SELF – SUPPORTING

- Diameters 460 Ø 1223
- When the snow load is too high or temperature control systems are installed the structure is reinforced through beams

2 STRUCTURAL

- Diameters 1070 Ø 3208
- Composed by resistant webs of principal and transversal webs type SIGMA

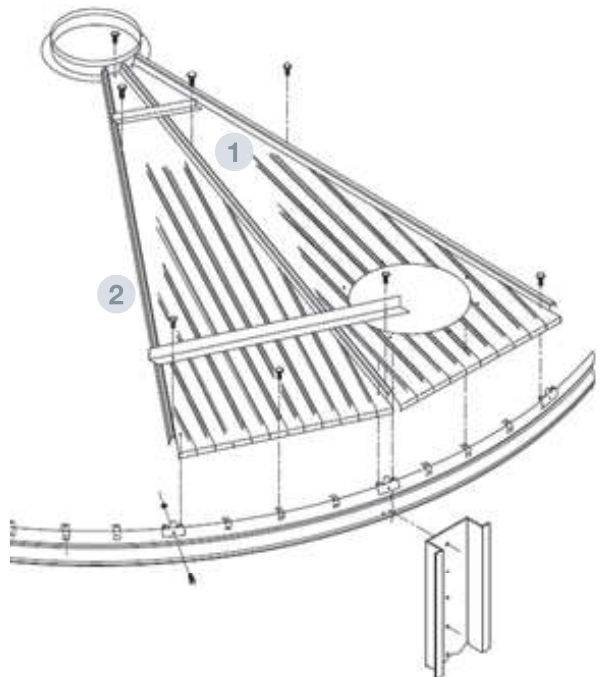
PARTS AND MATERIALS

1 COVER

- Roof sectors assembled between them through the waves
- MATERIAL: Galvanised steel S280GD ZM310 MAC e= 0.8mm

2 STRUCTURE

- Profiles of cold rolled steel type SIGMA (height 250 mm)
- MATERIAL: Galvanised steel S280GD Z600-MAC o S350GD Z600MAC



ROOF SHEET

ROOF
COMPONENTS



FILE 3.1
VERSION 1
24/10/2019



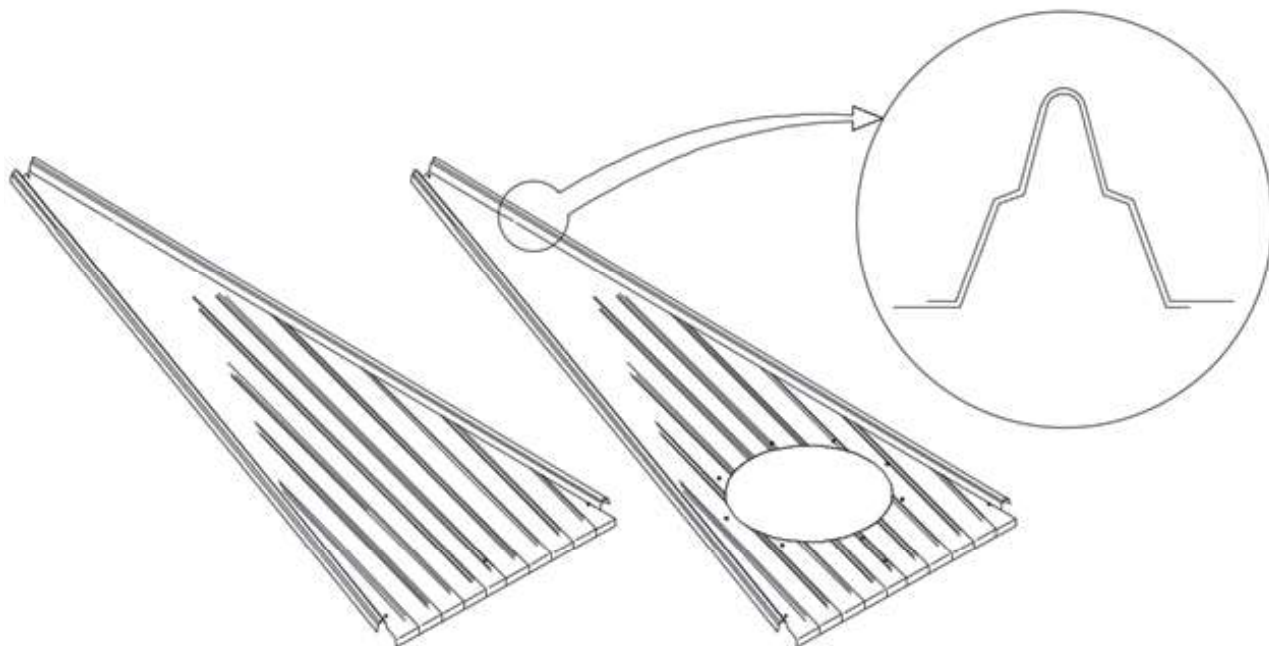
TECHNICAL SPECIFICATIONS

Trapezoidal folded plate with waves on the edges to be assembled between them.
It's the main part of the silo roof.

To install the manhole and the roof aeration they are manufactured with a hole ($\varnothing 420$ mm) and a crease to improve the sealing.

PARTS AND MATERIALS

- 1 SECTOR DE TECHO**
- It has holes on the waves separated 500mm to make the union with other roof sheets
 - MATERIAL: Galvanised steel S280GD ZM310
MAC e= 0.8mm



STRUCTURE

ROOF

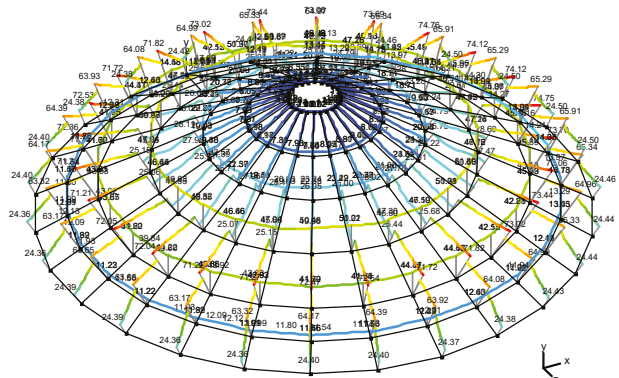
STRUCTURE

ROOF



STRUCTURE

ROOF



TECHNICAL SPECIFICATIONS

It's a structure composed of roof rafters (A), cross rafter (B), "U" purlin, circular rafter (D), and brace rods (E) connected between them from the roof collar to the eave to support the roof loads.

Use for the following diameters: 10.7, 11.45, 12.23, 12.98, 13.75, 14.51, 15.28, 16.04, 16.8, 17.57, 18.34, 19.86, 20.63, 21.39, 22.15, 22.92, 23.68, 24.44, 25.98, 27.5 y 32.08.

PARTS AND MATERIALS

1 ROOF RAFTER

- ### 1 ROOF RAFTER
- SIGMA beam of cold rolled steel
 - It's height can be 250mm or 2x250mm (500mm)
 - Thickness 2, 2.5, 3 ó 3.5 mm
 - To high snow loads are installed double beams
 - MATERIAL: Galvanised steel S280/ 350GD Z600 MAC

2 CROSS RAFTER

- 2 CROSS RAFTER**
- SIGMA beam (height= 250 mm) of cold rolled steel
 - Thickness 2 or 3 mm
 - MATERIAL: Galvanised steel S350GD Z600 MAC

3 "U" PURLIN

- 3 “U” PURLIN**
- “C” profile 60x30 of cold rolled steel
 - Thickness 2 or 3 mm
 - MATERIAL: Galvanised steel S280GD Z600 MAC

4 CIRCULAR RAFTER

- #### 4 CIRCULAR RAFTER
- “Z” profile. Thickness 3 mm
 - Only installed from diameter 17.57 ahead
 - MATERIAL: Galvanised steel S280GD Z600

5 BRACE ROD

- 5 BRACE ROD**
- Threaded rod between roof rafters to stiffen the structure
 - **MATERIAL:** threaded rod 8,8 Ø16 mm galvanised

6 TENSION PLATE

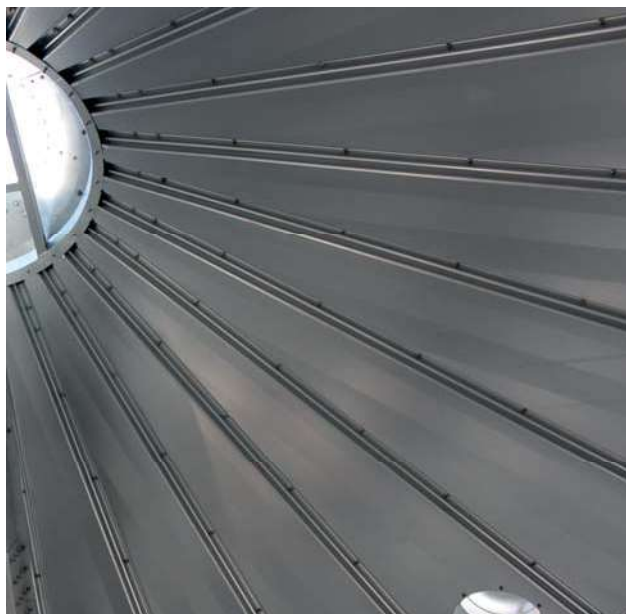
- 6 TENSION PLATE**
- Folded plate located on the eave
 - MATERIAL: Galvanised steel S280GD Z600 MAC

ROOF REINFORCEMENT RIB

ROOF COMPONENT



FILE 3.3
VERSION 1
24/10/2019

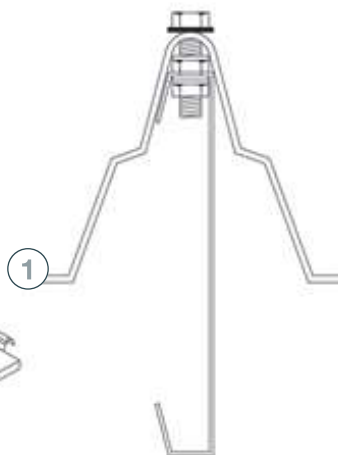
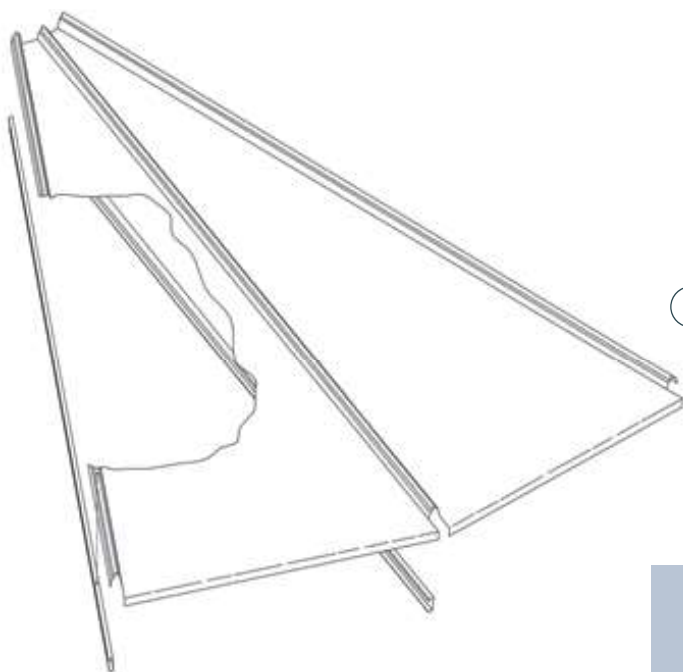


TECHNICAL SPECIFICATIONS

“C” profiles of cold rolled steel located under the roof sheet, from the roof collar to the eave, to increase the steel resistant thickness that support the snow load.

It's connected to the cylinder through a clip.

It's employed on self – supporting roofs (until Ø 9.93), to higher diameters roofs are structural.



PARTS AND MATERIALS

ROOF REINFORCEMENT RIB

- MATERIAL: Galvanised steel S280GD Z600
MAC e= 2.5mm

REINFORCEMENT
WAVE

ROOF
COMPONENT



FICHA 3.2
VERSIÓN 1
25/09/2019

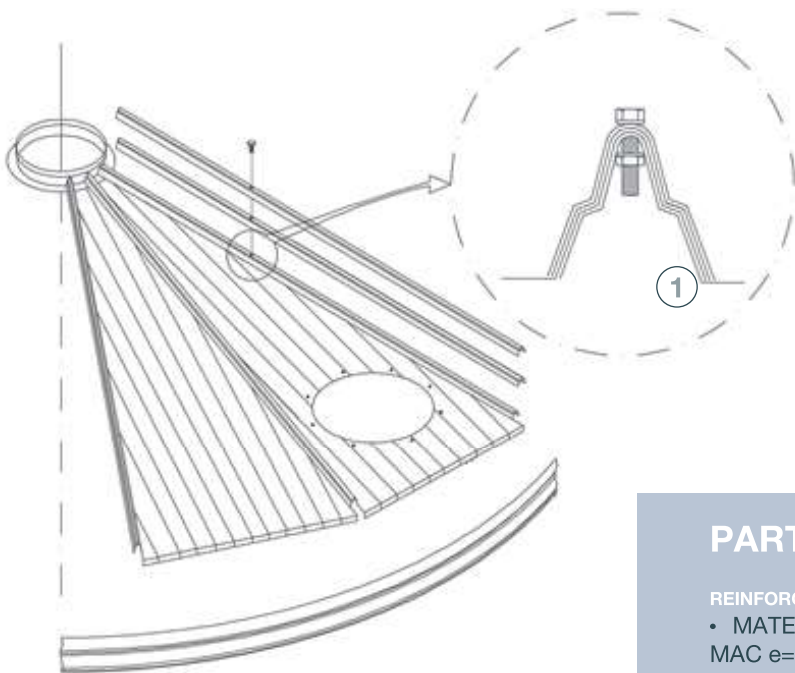


TECHNICAL SPECIFICATIONS

Folded plate with the same shape than the wave of the roof sector.

It's installed over the wave of the roof sector, from the roof collar to the eave, to increase the steel resistant thickness that support the snow load.

The maximum number of reinforcements to be installed are 2, to higher loads is installed a roof reinforcement rib and when this isn't enough it's necessary to install a structural roof.



PARTS AND MATERIALS

REINFORCEMENT WAVE

- MATERIAL: Galvanised steel S280GD Z600
MAC e= 0.8mm

ROOF COLLAR AND TOP COVER

COMPONENTS ROOF



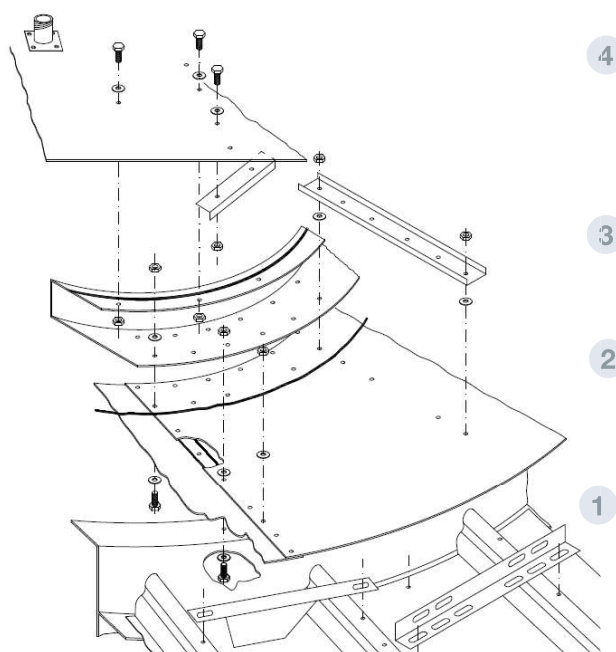
FILE3.5
VERSION 1
24/10/2019



TECHNICAL SPECIFICATIONS

The ROOF COLLAR (1) is a circular structure to join and support beams and roof sectors.

Over it are fixed flashing (2), center collar (3) and TOP COVER (4). During the installation is supported by the roof collar support.

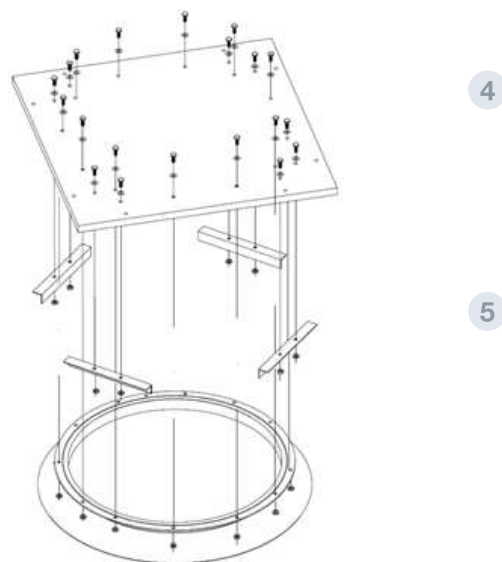


CENTER COLLAR Ø

TYPE	DIAMETER	INITIAL	END
Light range	Ø 870	4,60	16,80
Heavy range	Ø1150	17,57	25,98
Heavy range	Ø1930	27,50	32,08

PARTS AND MATERIALS

- 1 ROOF COLLAR**
 - Curved "Z" profile
 - MATERIAL: Galvanised steel S275 JR e= 3mm
- 2 FLASHING**
 - Circular sector supported by the roof collar and that supports the center collar
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2 mm
- 3 CENTER COLLAR**
 - Folded plate fixed on the flashing and that support the top cover
 - Diameter 800mm (silos 4,60 x 16,80) and 1050mm (silos 17,57 x 25,98)
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3 y 5mm
- 4 TOP COVER**
 - Square plate fixed to the center to close the silo. Over it is located the charge systems
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3 y 5mm
- 5 STIFFENER**
 - "L" profile 40x40x360 mm of cold rolled steel to stiffen the top cover
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm

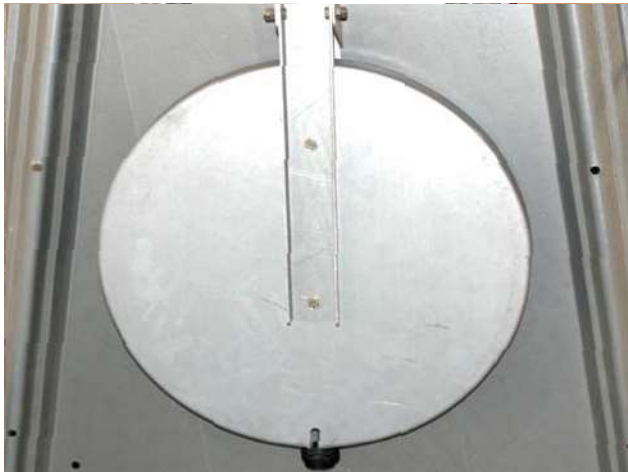


ROOF INSPECTION DOOR

COMPONENT



FILE 4.2
VERSION 2
COD. ASPUERTECH
20/01/2021



TECHNICAL SPECIFICATIONS

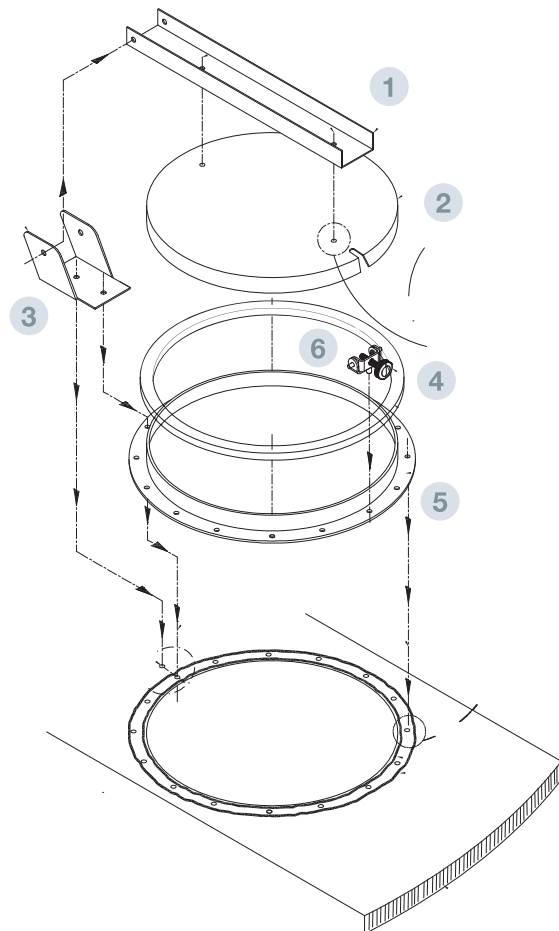
Circular door (Ø 400) to watch the grain onto the silo.
It has a pressure closure to fix the door.

It's installed over special roof sectors. They have a hole (Ø420) and a fold on the edge to improve the sealing.

This roof sectors are the same that are used to the roof aeration.

PARTS AND MATERIALS

- 1 U PROFILE**
 - "U" profile 60x50x430 of cold rolled steel
 - MATERIAL: galvanised steel S 280 GD Z 600 MAC
- 2 COVER**
 - Circular plate (Ø515)
 - MATERIAL: galvanised steel S 280 GD Z 600 MAC e=60mm
- 3 "U" HINGE**
 - To join "U" profile and the roof sector
 - MATERIAL: galvanised steel S 280 GD Z 600 MAC
- 4 WEATHER STRIP**
 - To seal the closure
 - MATERIAL: rubber
- 5 RING**
 - Close frame of the door
 - MATERIAL: galvanised steel S 280 GD Z 600 MAC
- 6 CLOSURE PRESSURE HINGE**
 - Close system of the door with M8 x 35

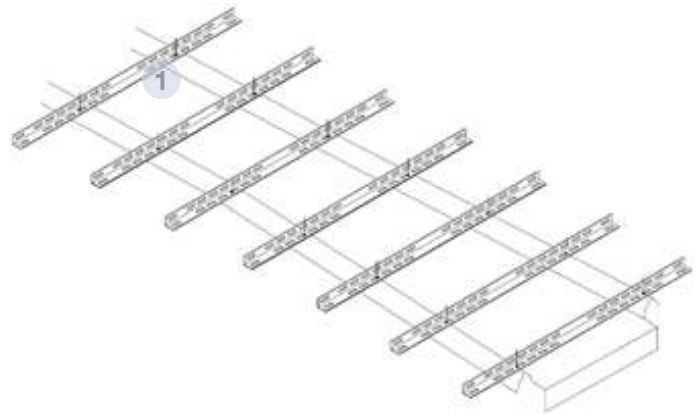


ROOF
STEPS

ROOF
COMPONENT



FILE4.1
VERSION 1
COD. AS0350ESCTECH
03/10/2019



TECHNICAL SPECIFICATIONS

Ladder with steps “L”40x40 to communicate the EAVE – CHARGE SYSTEM and improve the way to the manhole and the catwalks.

Each step is screwed to 2 roof waves.

To improve the security it can be installed with handrails.

It's a standard design to all the silos with universal steps.

A ladder is supplied as standard accessory although it's possible install more to help the ways on the roof.

PARTS AND MATERIALS

1

ROOD LADDER RUNG

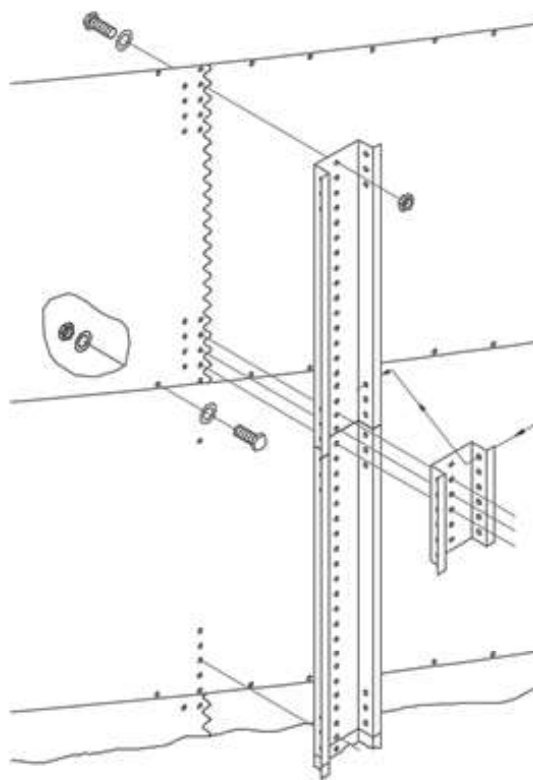
- “L” profiles 40x40x1100mm with holes
- MATERIAL: galvanised steel S280 GD Z600 MAC
e= 3mm

CYLINDER

COMPONENTS



FILE 2.2
VERSIÓN 1
24/10/2019



TECHNICAL SPECIFICATIONS

Composed of bodysheets screwed between them and to the stiffeners type Ω .

Bodysheets are always assembled on anti-clockwise direction

The thickness and the number of stiffeners (2 or 3) depend of the silo's height.

The bodysheets' useful measures are 1140x2400mm.

Includes as standard accessories an screw – on access door.

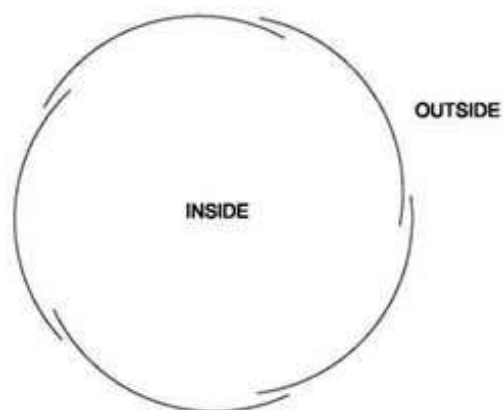
BOLT INSTALLATION (inside to outside)

• Joints with stiffeners:

Bolt + weatherseal washer – BODYSHEET – STIFFENER – Nut

• Free joints:

Nut + flat washer – BODYSHEET – weatherseal washer + bolt



BODYSHEET

CYLINDER COMPONENTS



FILE 3.6
VERSION 1
24/10/2019



TECHNICAL SPECIFICATIONS

Rectangular plates (2400x1140mm) that assembled between them set the cylinder.

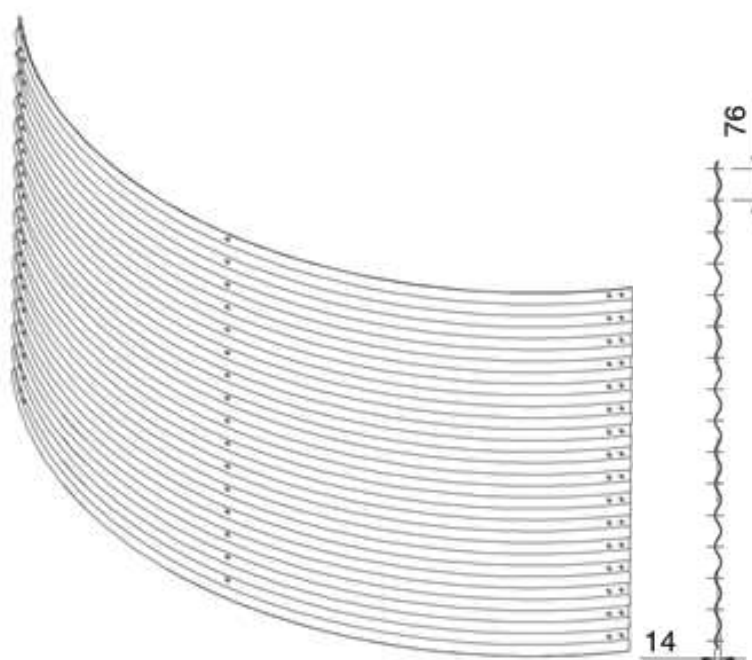
Outside of them are assembled the stiffeners. Each bodysheet can have 2 or 3 stiffeners, separated 1200mm or 800mm respectively.

To install the access door is sent a special bodysheet, with a hole and where is assembled the door.

PARTS AND MATERIALS

1 BODY SHEET

- Bent with waves of 76 x 14mm
- The bodysheet's radio depends of the kind of the silo
- The vertical joint grows from double to octuple according to the requirements
- The horizontal distance between holes is 200 ó 100mm
- The maximum thickness is 4mm ☒ To higher requirements the bodysheets are assembled between them
- MATERIAL: Galvanised steel S350GD Z600 MACO



STIFFENER

CYLINDER
COMPONENT



FILE 3.7
VERSION 1
24/10/2019



TECHNICAL SPECIFICATIONS

Ω profiles (variable length) installed on the bodysheets, out of the silo, to support vertical loads.

To high loads several stiffeners are assembled together to get thickness till 12mm (4+4+4). To higher loads it necessary to use UPN profiles. Material S355 JR + HDG.

On the bottom of the silo (first ring) they are connected to the anchor plates (SBH or SCE silos) or to the legs (SC silos).

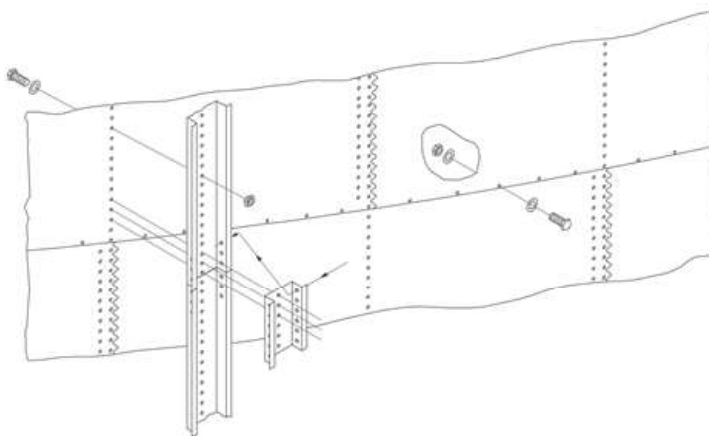


PARTS AND MATERIALS

1

STIFFERNERS

- Maximum thickness 4mm and development 237mm
- To be connected to the bodysheet it has central holes each 76mm
- MATERIAL: Galvanised steel HX500 LAD



WIND RING

CYLINDER COMPONENT



FILE 3.8
VERSION 1
24/10/2019



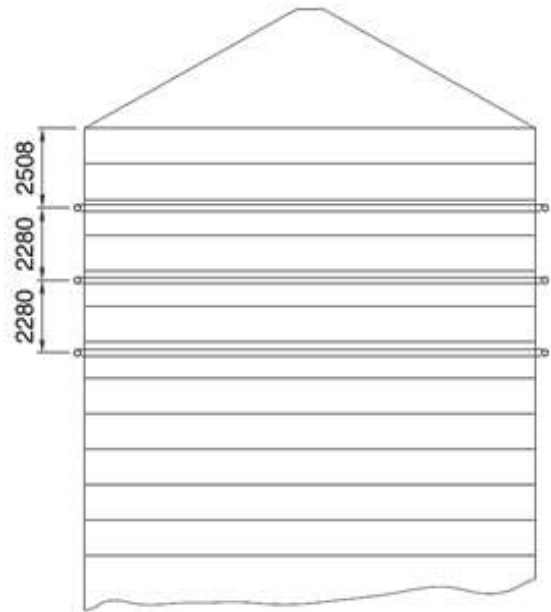
TECHNICAL SPECIFICATIONS

Set of tubes joint to the stiffeners to avoid the deformation on the cylinder due to the wind pressure when the silo is empty. The wind effect is stronger on the highest part of the silo due to:

- High speed wind
- Empty places without grain
- Less bodysheet thickness

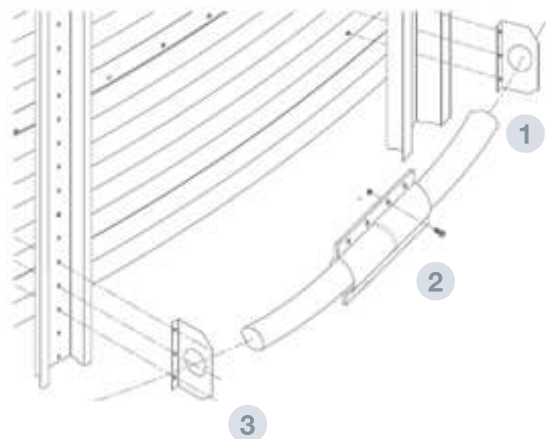
From the eave to the silo's bottom they are located each 2 rings.

According to the requirements it's possible to install as much as necessary. Always outside of the silo to not to stick the grain movement.



PARTS AND MATERIALS

- 1 WIND RING SECTOR**
 - Galvanised tube. $\varnothing = 60\text{mm}$ L= 6000mm e=2mm
 - Material: steel E 220 + Z 275
- 2 TUBE SPLICE**
 - Steel bracket to connect the wind ring sectors
 - Material: galvanised steel
 - S280 GD Z600 e= 2mm
- 3 SUPPORT**
 - Folded plate to support the rings
 - Fixed on all the stiffeners
 - Material: galvanised steel S280 GD Z600 MAC e=3mm



ACCESS DOOR

COMPONENTS CYLINDER



FILE 4.3
VERSION 1
COD.ASGPUERTACIL
24/10/2019



TECHNICAL SPECIFICATIONS

Rectangular access door to go into the silo (1).

It's composed by an inner sheet and an outer sheet screwed over hinge. Both have a closure system with FOAM (10x3mm) to ensure the sealing.

It's install over a special bodysheet with hole (2) located on the second ring, close to the screw auger exit.
Easy to install and it's a standard accessory.

PARTS AND MATERIALS

1

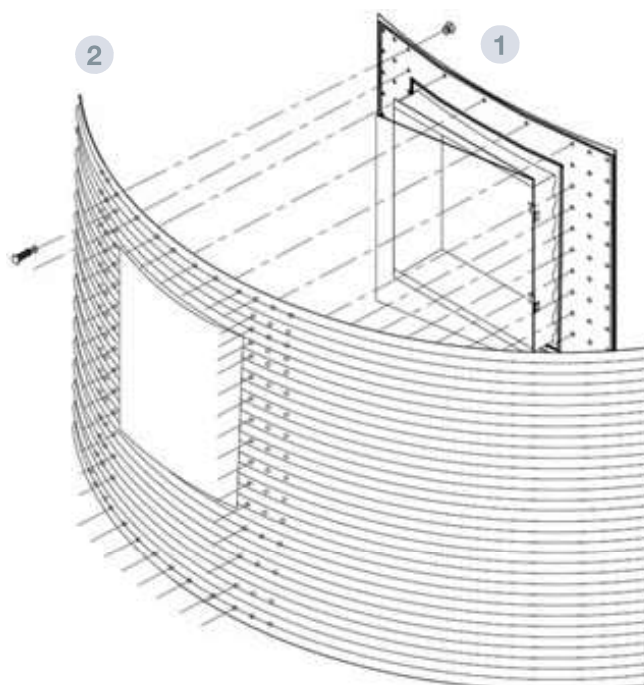
ACCESS DOOR

- Composed for 2 sheets, outside and inside, screwed to a frame
- Dimensions: 630x700 mm and 530x700 mm, according to the n° stiffeners/ ring
- Material: steel S275JR galvanised HDG

2

SPECIAL BODYSHEET WITH HOLE

- Size: 2400 x 1140 mm
- Material: galvanised steel S350GD Z600



SILOS
LOGOTYPE

CYLINDER



FILE 4.5
VERSION 1
COD. ASLOGO01
24/10/2019



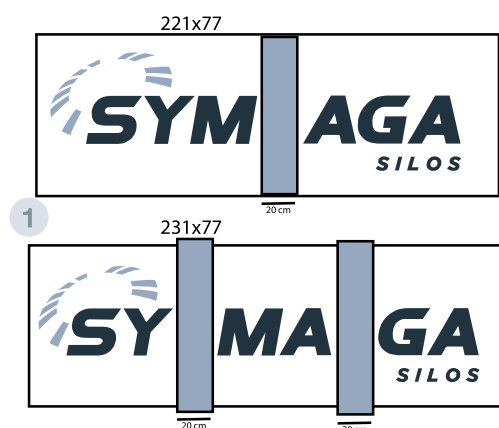
TECHNICAL SPECIFICATIONS

Symaga or customer logo installed over a bodysheet on the last ring.

Logo is divided on several parts:

- 2 on 2 stiffeners/ bodysheet
- 3 on 3 stiffeners/ bodysheet

The customer receive a bodysheet with logo to install on the same way than the others (on the first ring).



PARTS AND MATERIALS

1

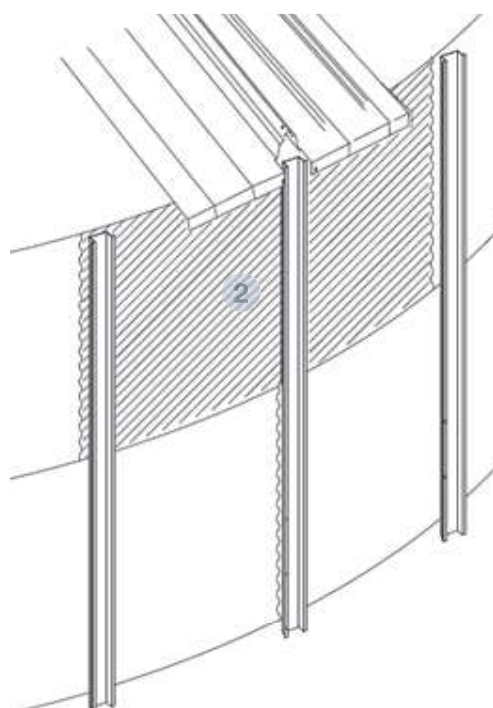
BODY SHHET

- Dimensions: 2400x1140 mm
- Bent with waves of 76 x 14mm
- The bodysheet's radio depends of the kind of the silo
- The vertical joint grows from double to octuple according to the requirements
- The horizontal distance between holes is 200 ó 100mm
- The maximum thickness is 4mm ☒ To higher requirements the bodysheets are assembled between them
- MATERIAL: Galvanised steel S350GD Z600 MACO

2

LOGOTYPE SYMAGA

- It's possible to install customer logo



HOPPER

COMPONENTS



FILE 2.3
VERSION 1
24/10/2019

TECHNICAL SPECIFICATIONS

Composed of hoppersheet (A) joined between them, to the cylinder (B) and to the hopper cone (C).

The union cylinder – hopper change according to the silo model:

1. Silos without compression ring (SC)

- Through clips (D)

2. Silos with compression ring (SCE)

- Through the compression ring (E)

Hopper also change according its slope:

1. Silos T45

- Hoppersheet joined by bolts

2. Silos T60

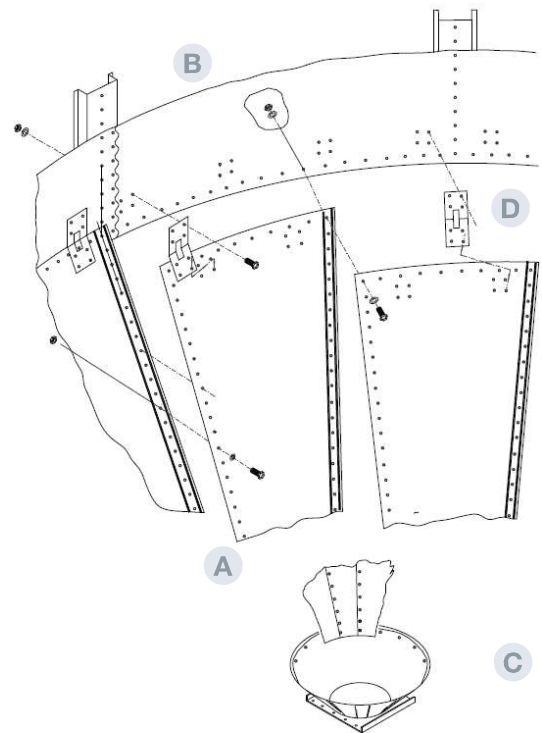
- Hoppersheet joined by bolts and reinforced by hopper stiffeners (F)

The hopper cone is screwed to the hoppersheets. On a standard way:

1. Silos T45: Ø 400 mm

2. Silos T60: Ø 400 mm or 1250 mm

Aeration systems or level detectors are connected to the hopper.



PARTS AND MATERIALS

A HOPPER SHEET

- Trapezoidal plate whose thickness and dimensions depend on the calculation and the silo diameter
- MATERIAL: Galvanised steel S350 GD Z600 MAC

B CYLINDER

C HOPPER CONE

- Discharge gate connected to the lowest part of the hoppersheets
- Defines the diameter of discharge
- It hasn't a closure system
- MATERIAL: Galvanised steel S275 JR e= 3mm + HDG

D CLIPS

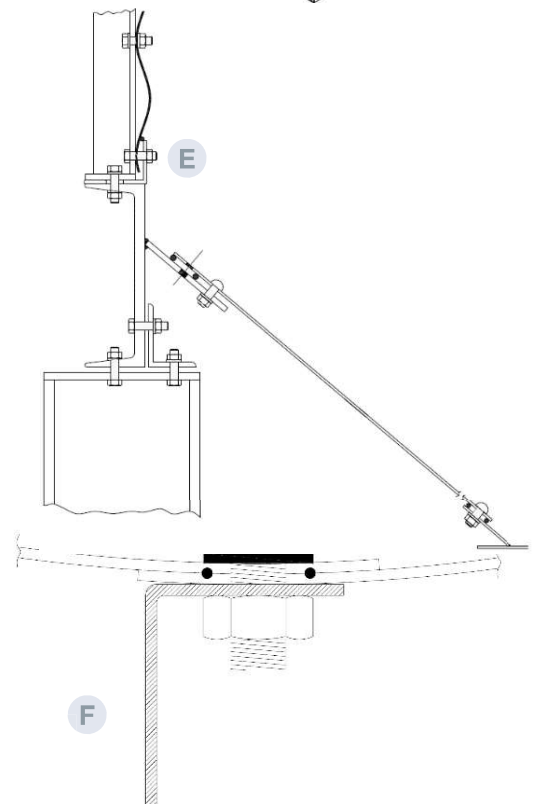
- Folded plate to make the connection cylinder – hopper on silos without compression ring (SC)
- MATERIAL: Galvanised steel S280 GD Z600 MAC

E COMPRESSION RING

- Welded structure whose main part is an UPN profile to the union body – hopper – silo legs
- MATERIAL: Galvanised steel S275 JR + HDG

F HOPPER REINFORCEMENT

- “L” profiles of cold rolled steel
- MATERIAL: Galvanised steel S350 GD Z600 MAC e=3mm



HOPPER SHEET

HOPPER COMPONENT



FILE 3.11
VERSION 1
02/10/2019



TECHNICAL SPECIFICATIONS

Steel trapezoidal sheet that with others assembled are the hopper shape.

On the top is connected to the cylinder and on the bottom to the hopper cone.

The connection change on SCE and SC silos. Silos SCE are connected to the cylinder through the compression ring, silos SC through the clips.

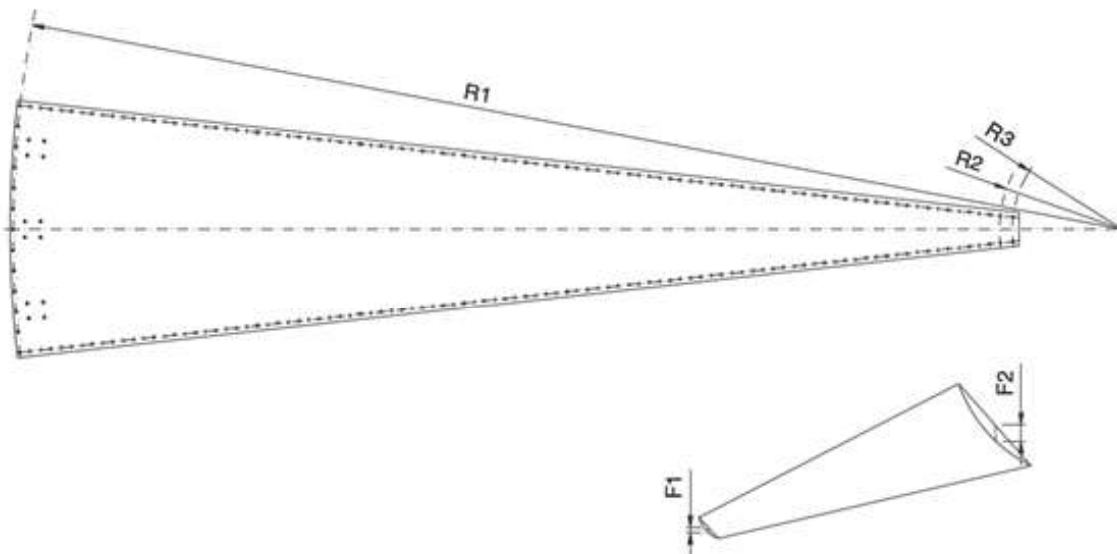
On the biggest diameters it's necessary to break the hopper on several parts (steps).

The maximum hopper thickness is 4 mm, to bigger requirement it's necessary to assemble several hopper sheet.

Over it is connected the level detectors and the aeration. To do it easier when the silo has aeration some hopper sheets have a hole ready to connect the aeration channels and fans.

PARTS AND MATERIALS

- 1 HOPPER SECTOR
 - MATERIAL: galvanised steel S350 GD Z600 MAC





TECHNICAL SPECIFICATIONS

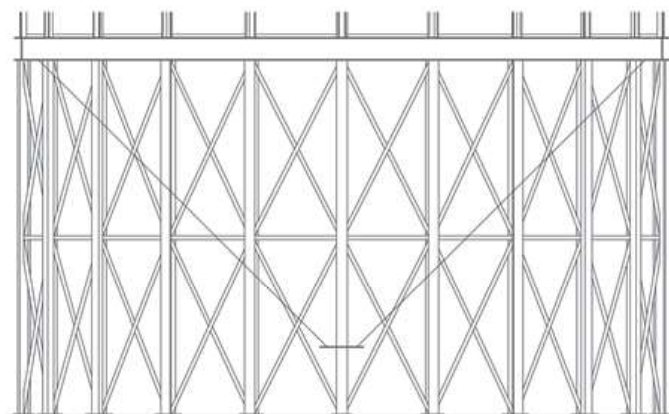
Structure consisted of HEB pillars and “L” bracings to support the silo’s cylinder.

The pillars have anchor plates on their top and lowest part.

On the top are connected to the cylinder and on the bottom on the foundation.

The pillars are connected between them through the bracings.

The number of bracing levels is defined by the silo’s clearance.



PARTS AND MATERIALS

1 LEGS

- HEB profiles with 2 anchor plates
- According to the load requirements are used HEB: 120, 140, 160, 180, 200, 220, 240, 260, 280 y 300
- Anchor plates dimensions change according to the HEB profile, but the thickness is always the same. Upper 15mm and lower 25mm
- MATERIAL: galvanised steel S275 JR + HDG

2 INCLINED BRACING

- “L” profiles of cold rolled steel
- According to the loads requirements there are several sizes: 50x50x5, 60x60x6, 80x80x8, 100x100x10 y 120x120x12
- MATERIAL: galvanised steel S275 JR

3 HORIZONTAL BRACING

- “L” profiles of cold rolled steel
- According to the loads requirements there are several sizes: 50x50x5, 60x60x6, 80x80x8, 100x100x10 y 120x120x12
- MATERIAL: galvanised steel S275 JR

COMPRESSION RING

HOPPER COMPONENT



FILE 3.10
VERSION 1
24/10/2019



TECHNICAL SPECIFICATIONS

UPN bent profiles of structural steel to join cylinder – hopper sector and pillars (legs).

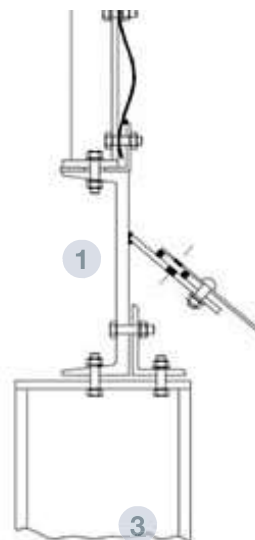
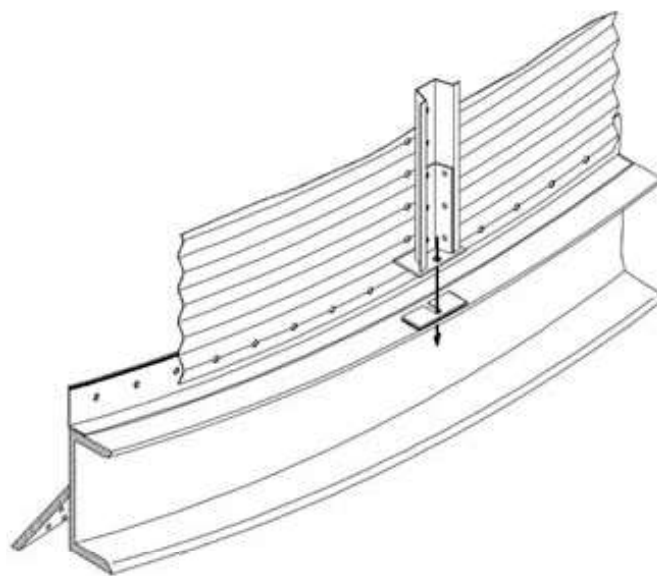
Used on SCE silos to all diameters: 4.60, 5.35, 6.10, 6.87, 7.60, 8.40, 9.20, 9.93, 10.7, 11.45 and 12.23.

According to the requirements the UPN height can be: 200, 220, 240, 260, 300 and 320mm.

On diameters 10.7, 11.45 y 12.23 the compression ring is double.

Over the compression ring are fixed the bodysheets and stiffeners from the lowest level (B), onto its inside sheet are fixed the hopper sheets (C) and all together is supported by the structure (D).

The compression rings has a length of 2400mm, it's necessary to assemble several to complete the silo's circumference.



PARTS AND MATERIALS

- 1 COMPRESSION RING
 - MATERIAL: galvanised steel S275JR + HDG

HOPPER REINFORCEMENT

HOPPER COMPONENTS



FILE 3.12
VERSIÓN 2
28/01/2021

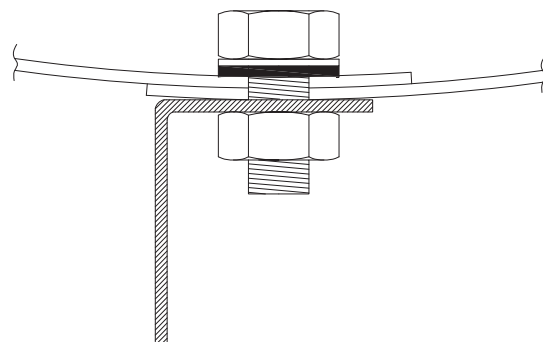
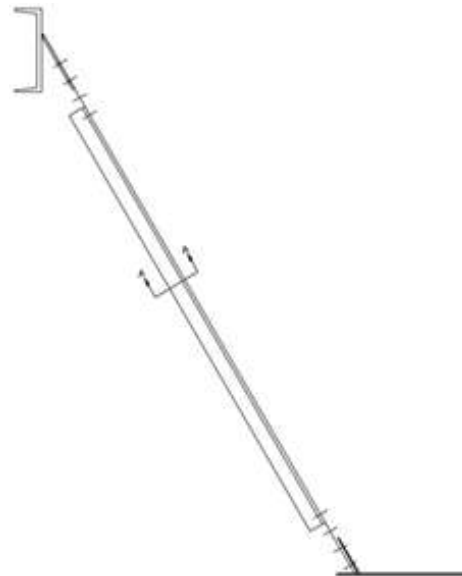


TECHNICAL SPECIFICATIONS

“L” profile of cold rolled steel screwed to the join between hopper sheets to stiffen it. It goes from the compression ring to the hopper cone.

Only it's installed on T60 silos.

When the hopper is divided on steps, the stiffener is divided on the same parts.



PARTS AND MATERIALS

1

HOPPER REINFORCEMENT

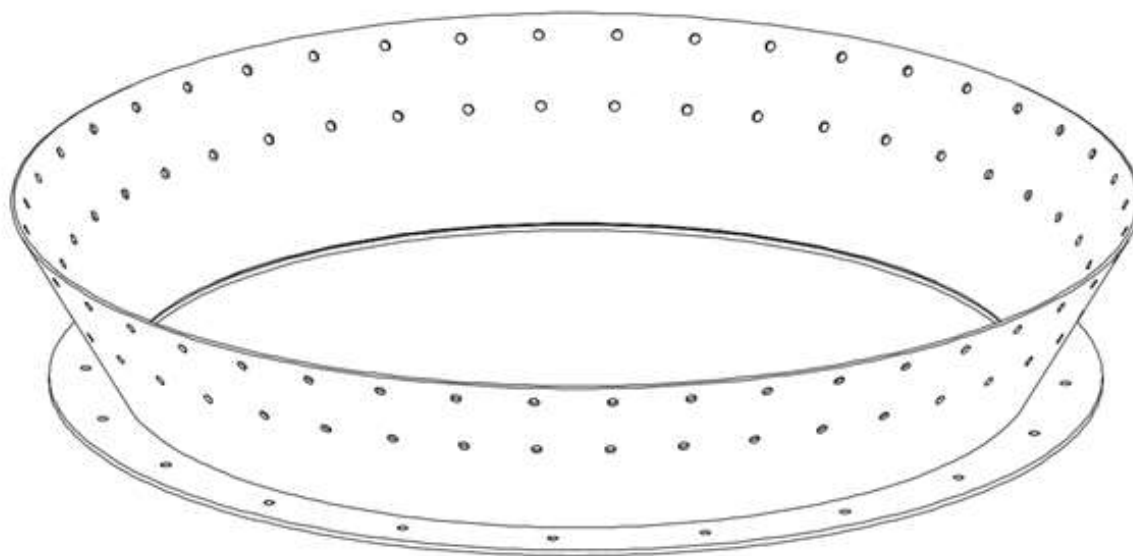
- MATERIAL: galvanised steel S350 GD Z600 MAC
e=3mm

HOPPER CONE

HOPPER
COMPONENT



FILE 3.13
VERSION 1
24/10/2019



TECHNICAL SPECIFICATIONS

The structure consists of a conical plate join to the hopper sheets to funnel the grain flow.

Over its lowest part are installed the discharge systems.

On standard way:

400mm : T45

1250mm : T60.

PARTS AND MATERIALS

1 HOPPER CONE

- MATERIAL: galvanised steel S275 JR + HDG

BOLTS
NUTS
WAHSER

COMPONENTS



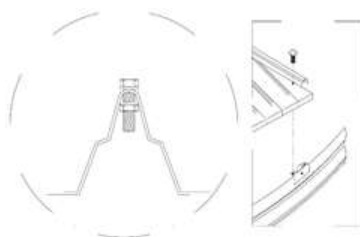
FILE 7.2
VERSION 1
COD.
28/10/2019

TECHNICAL DATA

1 ROOF

ROFF	
SECTORS	M8x30 CAL 8.8
CLIPS	M10x20 CAL 8.8

1



TUERCAS CON VALONA

• Para facilitar el montaje

TORNILLERIA PREMONTADA

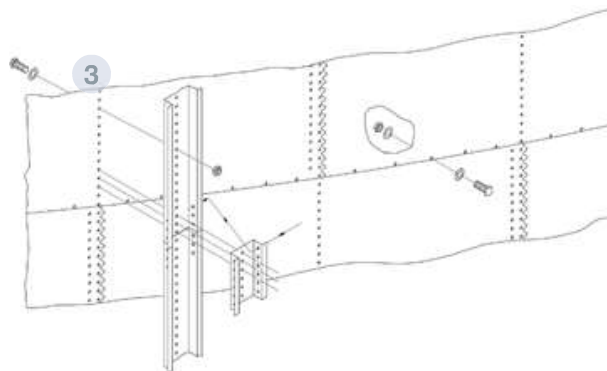
• Con arandela chapa-goma

2 BODYSHEET BOLTING

BODYSHEET BOLTING							
JUNTA	A	B	C	E	F	H	I
BODY SHEET –	M10x20 CAL	M10x25 CAL	M10x30 CAL	M10x30 CAL	M10x35 CAL	M10x40 CAL	M10x40 CAL
BODY SHEET	8.8	8.8	8.8	8.8	10.9	10.9	10.9
BODY SHEET –	M10x25 CAL	M10x30 CAL	M10x40 CAL	M10x40 CAL	M10x40 CAL	M10x50 CAL	M10x50 CAL
– STIFFENER	8.8	8.8	8.8	8.8	8.8	8.8	8.8

3 SPLICES

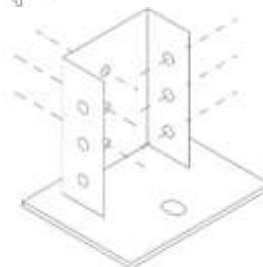
SPLICES	
NORMAL	M10x20 CAL 8.8
INSIDE	M10x25 CAL 8.8
SPECIAL	M10x30 CAL 8.8



4 ANCHORING

ANCHORING			
JOINT	B	C	E
LATERAL	M10x30 CAL 8.8	M10x35 CAL 8.8	M10x40 CAL 8.8
ANCHOR PLATE	M10x35 CAL 8.8	M10x40 CAL 8.8	M10x50 CAL 8.8

4



5 JOINT TYPE

JOINT TYPE								
DENOMINATION	A	B	C	E	F	H	I	J
TYPE	DOuBLE	TRIPLE	QUADRUPLE	QUINTUPLE	QUiNTUPLE	x6	x7	x8
QUALITY BOLTING	CAL 8.8	CAL 8.8	CAL 8.8	CAL 8.8	CAL 10.9	CAL 10.9	CAL 10.9	CAL 10.9



LAVTIA, 14,147 m²

ROOF STEPS HANDRAIL

ACCESSORIES STAIRS



FILE 5.3
VERSION 1
COD. AS030300ESCTECH /
AS030300ESCTECHT
12/11/2019



TECHNICAL SPECIFICATIONS

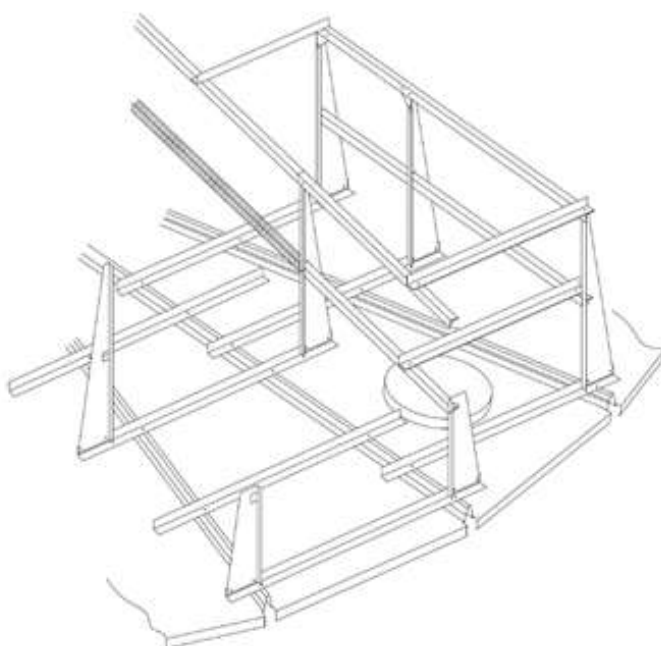
Angular handrail, anchored to the rungs through handrail brackets to increase the safety.

Includes protection around the manhole to and three additional rungs.

The design changes according to the silo's diameter.

PARTS AND MATERIALS

- 1 HANDRAIL**
 - Angular profile (36x36mm) of different lengths. L= 492, 990, 1028, 1488, y 1986 mm
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 1.5mm
- 2 GUSSET**
 - Triangular sheet to join the handrail and the handrail bracket
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 3 HANDRAIL BRACKETEES**
 - Trapezoidal sheet of height 980 mm to fix the handrail
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm



EXTERIOR EAVE
CATWALK

ROOF



FILE 5.11

VERSION 1

COD AS0300PASALE2 AS0300PASALE3

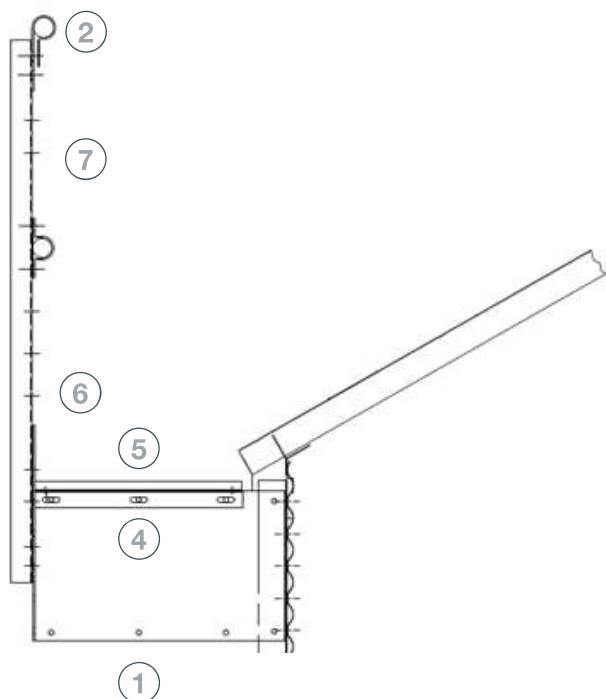
13/11/2019



TECHNICAL SPECIFICATIONS

Walkway on the eave.

To work on maintenance tasks.



PARTS AND MATERIALS

- 1 CLIP FOR HANRAIL BRACKET**
 - Connection between the handrail bracket and the stiffener to support the floor
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 2 HANRAIL BRACKET**
 - "U" profile 60x50x1280 mm of cold rolled steel to support the tubular handrails
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 3 CLIPS**
 - Folded sheet to join the handrail to the handrail brackets
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 FLOOR SUPPORT ANGLE**
 - "L" profile 40x40x494 mm of cold rolled steel
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 5 FLOOR**
 - Sheet with holes or Tramex fixed over the floor support angle
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 6 FOOT PROTECTION EAVE CATWALK**
 - "L" profile 155x100x860 mm located on the platform's edge
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 7 TUBULAR HANDRAIL**
 - Pipe Ø48 mm fixed to the handrail brackets
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm

INTERIOR EAVE
CATWALK

ROOF



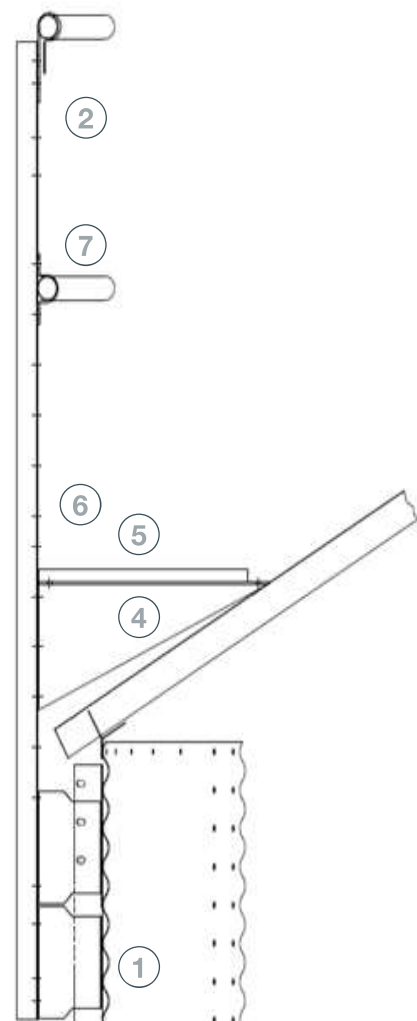
FILE 5.12
VERSION 1
COD
13/11/2019



TECHNICAL SPECIFICATIONS

Walkway on the eave.

To work on maintenance tasks.



PARTS AND MATERIALS

- 1 CLIP FOR HANRAIL BRACKET**
 - Connection between the handrail bracket and the stiffener to support the floor
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 2 HANRAIL BRACKET**
 - "U" profile 60x50x1280 mm of cold rolled steel to support the tubular handrails
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 3 CLIPS**
 - Folded sheet to join the handrail to the handrail brackets
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 HOLDING ANGLE**
 - Folded sheet 550x250 mm to support the floor
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 3mm
- 5 FLOOR**
 - Sheet with holes or Tramex fixed over the floor support angle
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 6 FOOT PROTECTION EAVE CATWALK**
 - Folded sheet 120x2474x1.5 mm located on the edge of the floor
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 7 TUBULAR HANDRAIL**
 - Pipe Ø48 mm fixed to the handrail brackets
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm

EAVE
HANDRAIL

ROOF



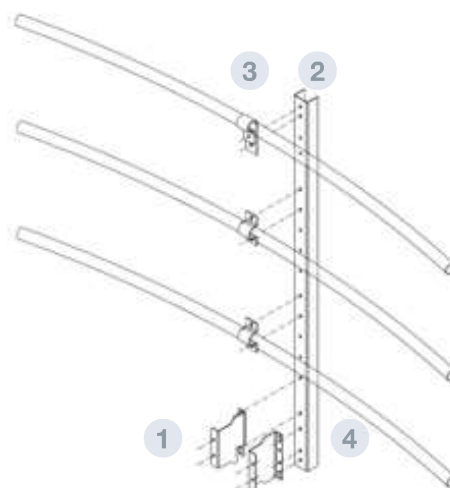
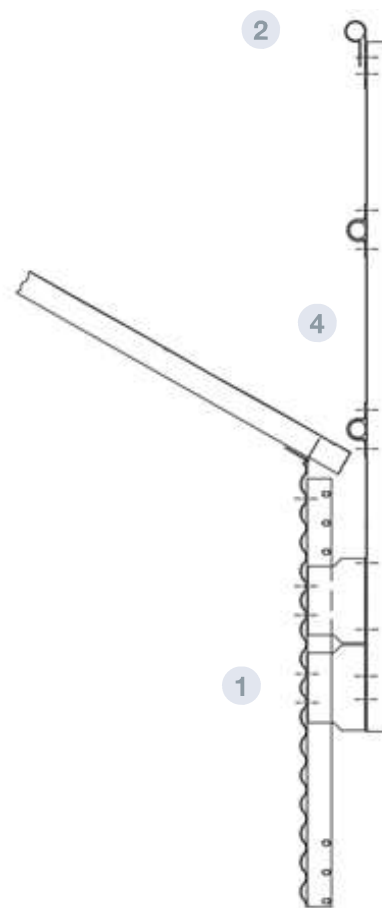
TECHNICAL SPECIFICATIONS

Tubular handrail around the eave.

To improve the safety.

PARTS AND MATERIALS

- 1 CLIP FOR HANDRAIL BRACKET**
 - “U” profile of cold rolled steel to join the handrail bracket to the stiffeners
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 2 HANDRAIL BRACKET**
 - “U” profile of cold rolled steel to support the handrail tubes
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 3 CLIPS**
 - Steel folded sheet to join the handrail tube and the handrail bracket
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 HANDRAIL**
 - Pipe of variable length according to the silo's diameter
 - MATERIAL: Galvanised pipe Ø48x1,5mm



FOAM
EAVE CLOSE

ROOF



FILE 5.1
VERSION 1
COD. AS0460CIALE
03/03/2020



TECHNICAL SPECIFICATIONS

Sealing system composed for insulation parts type FOAM located on silo eave and the roof collar to avoid snow, rain, insects, animals, etc.

- Better waterproofing through full sealing roof – cylinder
- Air movement focused on aeration roof

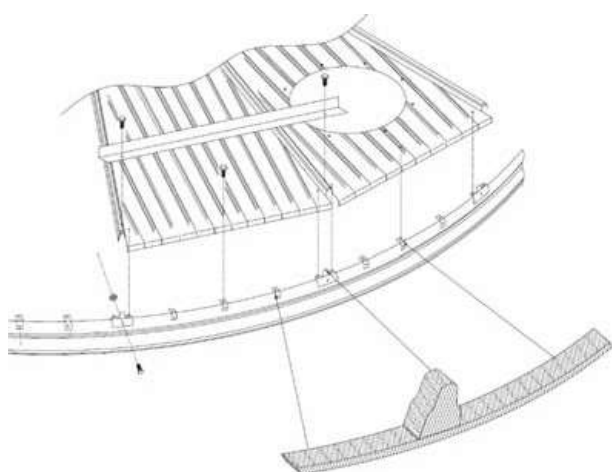
PARTS AND MATERIALS

1 INSULATOR ROOF WAVE

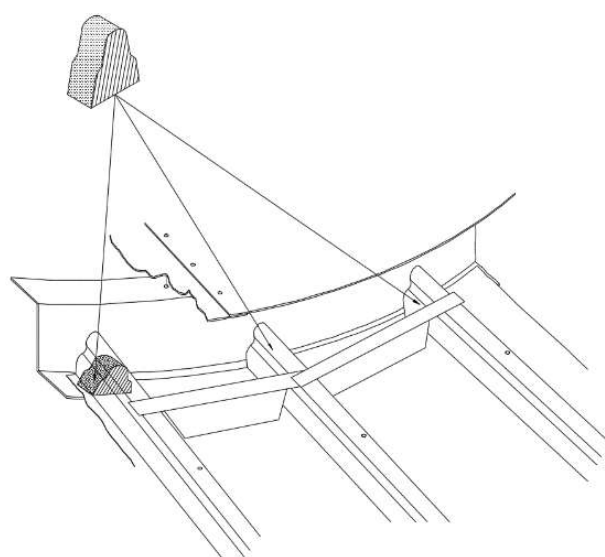
- On the roof collar
- MATERIAL: Cross-linked polyethylene foam
- Density: 28 Kg/ m3
- Lengthening 23°C (longitudinal): 121%
- Lengthening a 23°C (transversal): 115%
- Water capacity: 1%

2 INSULATOR ROOF EAVE

- On the roof eave
- MATERIAL: Cross-linked polyethylene foam
- Density: 28 Kg/ m3
- Lengthening 23°C (longitudinal): 121%
- Lengthening a 23°C (transversal): 115%
- Water capacity: 1%



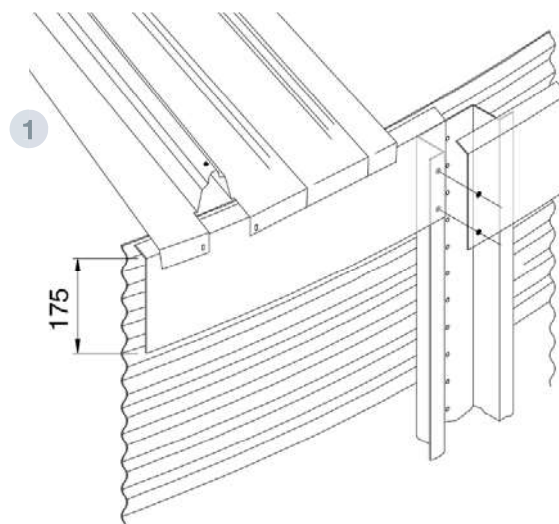
INSULATOR ROOF WAVE



INSULATOR ROOF EAVE

METALLIC
EAVE SKIRT

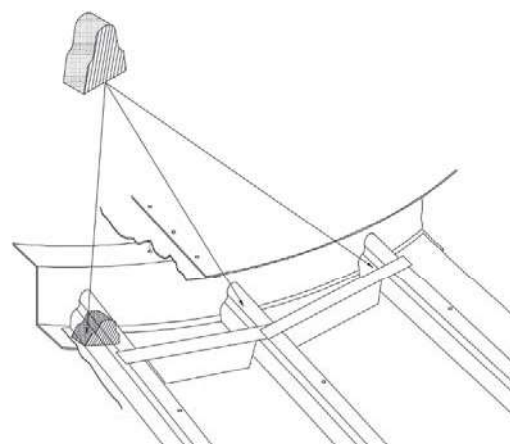
ROOF



TECHNICAL SPECIFICATIONS

Steel folded sheet located on the eave to avoid the rain or snow flow without a full sealing. The natural aeration is possible with this system.

- Air flows on the union ROOF – CYLINDER
- The system includes insulator roof waves



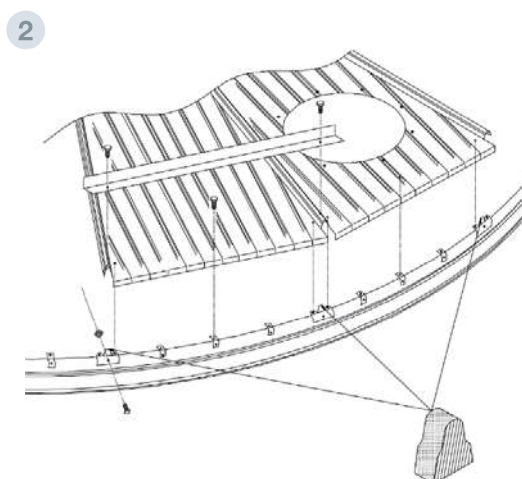
PARTS AND MATERIALS

1 SPECIAL EAVE CLOSE

- Folded sheet. Development length 2250 mm. Variable radius
- MATERIAL: Galvanised steel S280 GD Z600 MAC e= 0.8mm

2 INSULATOR ROOF WAVE

- Settled on the beginning and final of the roof waves
- MATERIAL: Cross-linked polyethylene foam





TECHNICAL SPECIFICATIONS

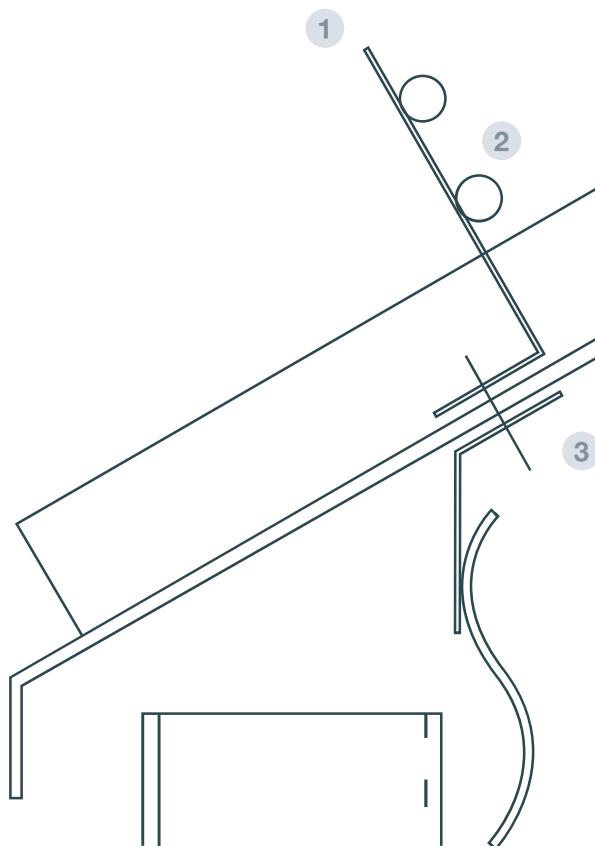
Structural system composed for pipes joined to the roof sectors to avoid water or snow falls.

Its main parts are the clip for eave ring (1) and the protection pipes (2)

To be installed, the clip is fixed to the roof sector and the pipes are joined to it.

PARTS AND MATERIALS

- 1 CLIP FOR EAVE RING**
 - Folded sheet fixed to the roof sector with protection pipes
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 3mm
- 2 PROTECTION TUBE**
 - Tube (Ø18 mm) to join to the clip for eave ring
 - MATERIAL: galvanised steel S275JR
- 3 LARGE ROOF CLIP**
 - Bent sheet to join the roof sector on the eave
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 2mm



ROOF INSPECTION DOOR

ACCESSORIES ROOF



FILE 5.4
VERSION 2
COD ASPUERTECH
18/02/2021



TECHNICAL SPECIFICATIONS

Door to go into the silo. Dimensions 610 x 700mm

To be installed it's necessary to open the hole over a standard roof sector.

It has a block system over the handle.

Usually it's installed with an inside ladder, but the ladder it's not a standard accessory.

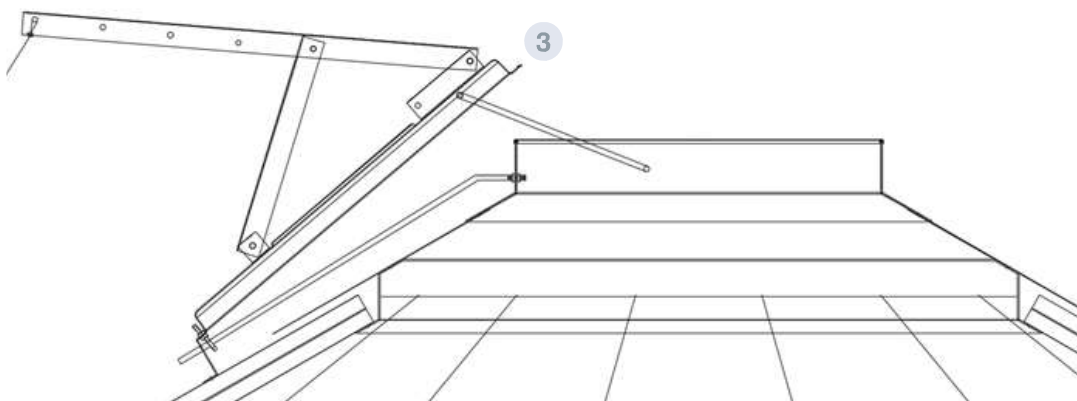
It's a standard accessory that doesn't supply to the manhole.

PARTS AND MATERIALS

- 1 ROOF ACCESS DOOR FLANGE**
 - Access door's frame
 - MATERIAL: Galvanised steel S275 JR e= 3mm
- 2 ROOF ACCESS DOOR COVER**
 - Access door's cover
 - MATERIAL: Galvanised steel S275 JR e= 2mm
- 3 ROOF ACCESS DOOR FLANGE-HINGE**
 - Bent sheet joined to roof access door flange and roof access door cover
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 LOCK SYSTEM**
 - Simple and easy
 - System composed of a wing nut
- 5 WEATHER STRIP**
 - Cover placed on the door leaf, to seal its connection with the lid.
 - MATERIAL: rubber

SEMI-AUTOMATIC GATE

ACCESSORIES ROOF

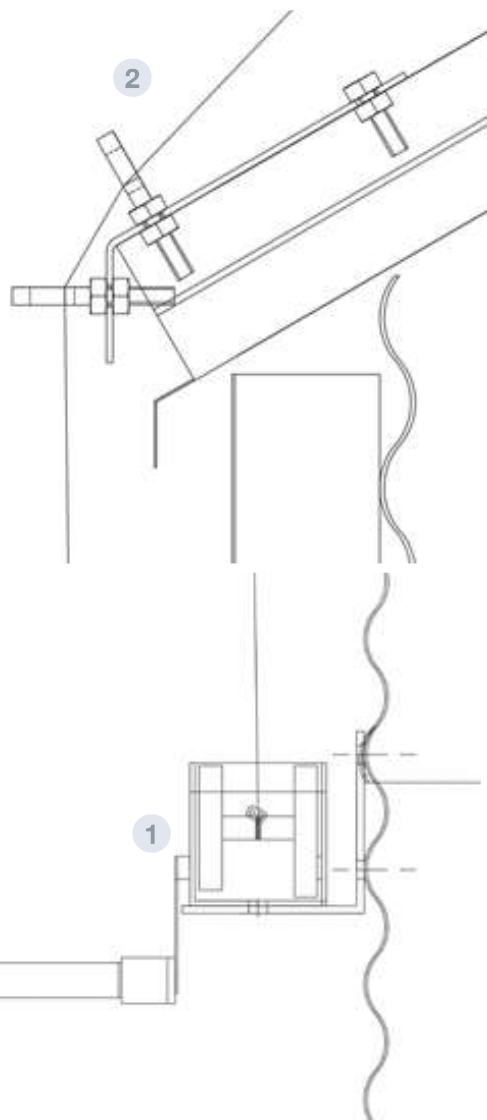


TECHNICAL SPECIFICATIONS

Manual system to open the silo's cover from the ground floor.

It has a lathe to pull over a metallic rope and over the structure on the top cover. Automatically when the forces over the lathe finish the top cover returns to the initial position through the torsion springs.

It's available on diameters between 460 and 1223 and till 10 heights.



PARTS AND MATERIALS

- 1 LATHE**
 - Manual system to pull over the metallic rope
- 2 METALLIC ROPE**
 - Metallic rope (e=2 mm, PLASTICIZED+6x19+1 DIU 30 60) from the lathe to the top cover
- 3 TOP COVER**
 - Top cover of the silo over a structure with automatic return
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 2 y 3mm

PNEUMATIC CHARGE SYSTEM

CYLINDER ACCESSORIES



FILE 5.23
VERSION 1
COD.
25/10/2019



TECHNICAL SPECIFICATIONS

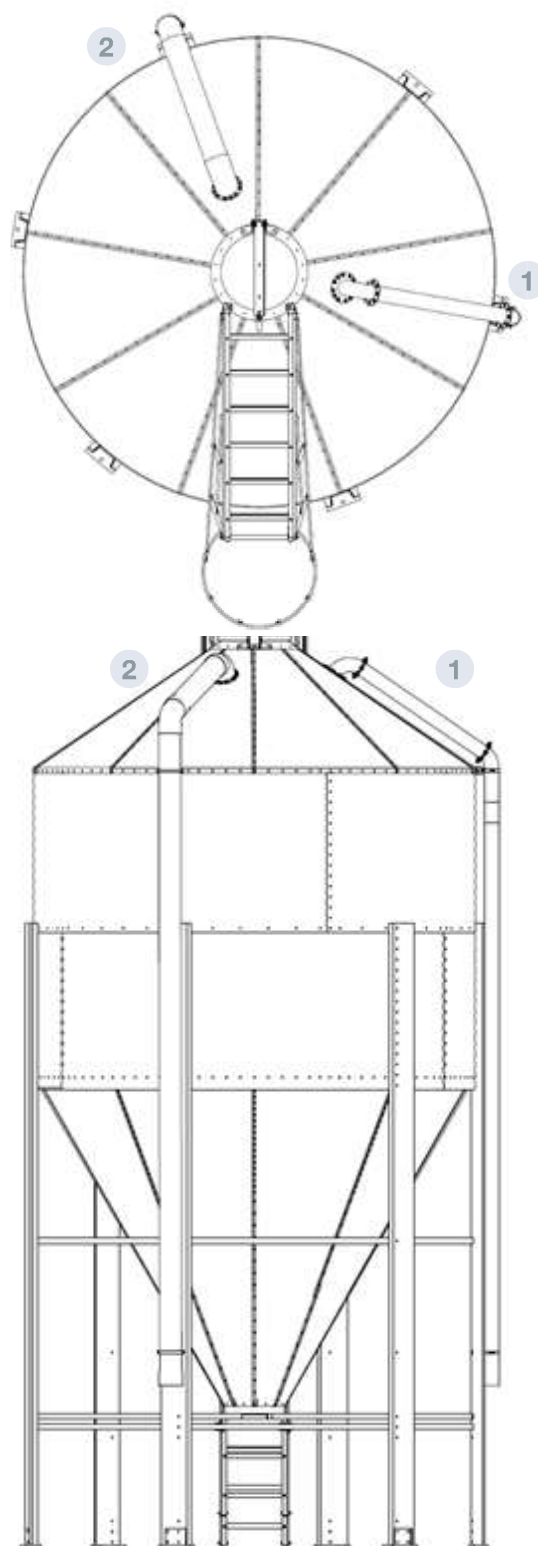
Channel system with charge and decompression pipes to fill the silos with air pressure.

Only available to silos with small diameters.

It's not suitable with roof aeration systems.

PARTS AND MATERIALS

- 1 PNEUMATIC**
 - Ø 100 mm
 - MATERIAL: galvanised steel
- 2 DESCOMPRESSION CHIMNEY**
 - Ø160 mm
 - MATERIAL: PVC



GRAIN FALL SPEED REDUCER

CYLINDER ACCESSORIE



FILE 5.21
VERSION 1
COD AS0460/04AMO
14/11/2019



TECHNICAL SPECIFICATIONS

Load system to avoid the grain break and to create an uniform distribution (advised to rice).

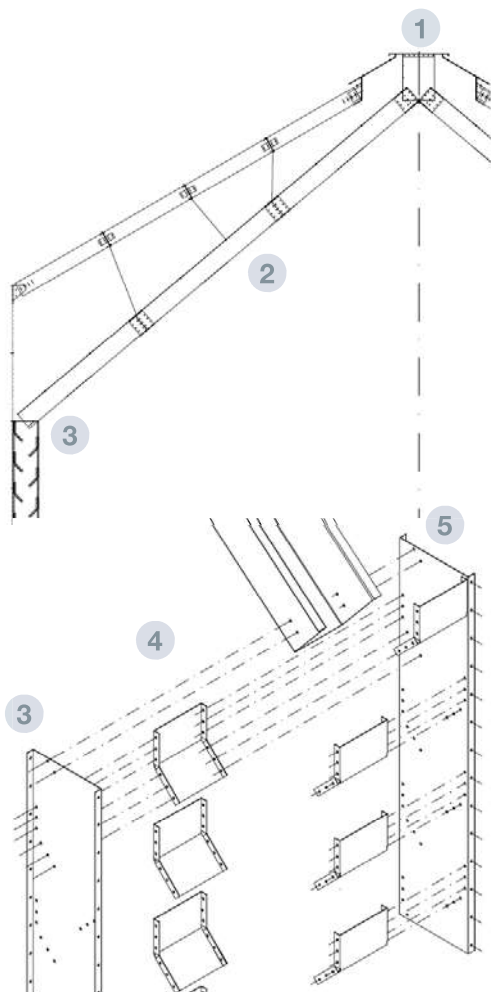
It's composed by a main channel to lead the grain to the wall an to the bottom.

Avoid the grain dispersion.

It's advised to install an inside ladder to maintenance tasks.

There are 2 models:

- 1.Silos 460 x 1223. Sistema con 1 canal
- 2.Silos 1298 x 1680. Sistema con 2 canales



PARTS AND MATERIALS

- 1 REDUCER SUPPORT**
 - Central channel to lead the grain to the inclined conduits
 - There are 2 kinds:
 - 1.Silos 460-1223. Connected to roof collar
 - 2.Silos 1298-1680. Connected to top cover
 - MATERIAL: Galvanised steel S275 JR
- 2 INCLINED CONDUIT**
 - Channel of folded steel sheet from the reducer support to the lateral conduit
 - There are 2 kinds:
 - 1.Silos 460 -1223. Connected to the reducer support
 - 2.Silos 1298 -1680. Connected to the structural roof
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 3 LATERAL CONDUIT**
 - "U" profiles of folded sheet
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 GRAIN DEFLECTORS**
 - To reduce the falling speed
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
 - The first deflector is special (E). Its thickness is bigger (e= 5mm. HDG) to support the first impact of the grain

SIDE DISCHARGE SYSTEM

CYLINDER ACCESSOIRE



FILE 5.20
VERSION 1Q
COD AS05DESLATS AS05DESLATC
14/11/2019



TECHNICAL SPECIFICATIONS

Lateral discharge system composed by buckets to lead the grain flow to the outlet.

Its concave shape create a difference of pressure between the top and the bottom of the buckets that:

- It produces a grain discharge by steps
- It avoids mass discharge

It's necessary to empty the silo fully after the side discharge downloading.

There are 2 kinds:

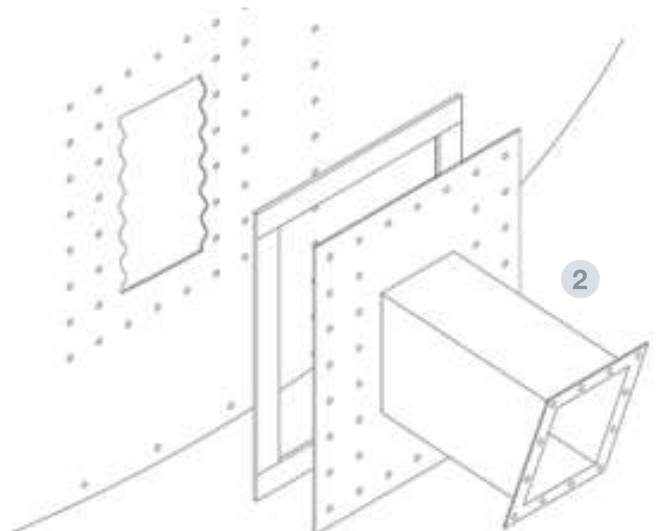
- 1.Truck side discharge: outlet at 4.5 m from the silo's bottom
- 2.Ground floor side discharge: outlet at 1 m from the silo's bottom

Both have a manual rack door and a high

PARTS AND MATERIALS

- 1 BUCKET**
 - Folded sheet channels
 - MATERIAL: galvanised steel S280GD Z600MAC e= 3mm
- 2 CLOSE SHEET**
 - Main connection to discharge the silo
 - MATERIAL: painted steel S275JR e= 3mm + HDG

- 3 RACK DOOR (MANUAL)**
 - Closing tool (250mm)
 - On truck discharge it works with a chain from the ground floor
 - MATERIAL: galvanised steel S280 GD + Z600
- 4 TUBE DISCHARGE (STANDARD ACCESORIE ON TRUCK DISCHARGE)**
 - Extension system of the close sheet (250x250mm)
 - MATERIAL: galvanised steel S280 GD + Z600



INNER
FLAT LINING

CYLINDER
ACCESSORIES



FILE 5.52
VERSION 1
COD. AS0300/01FORRO10
15/01/2020



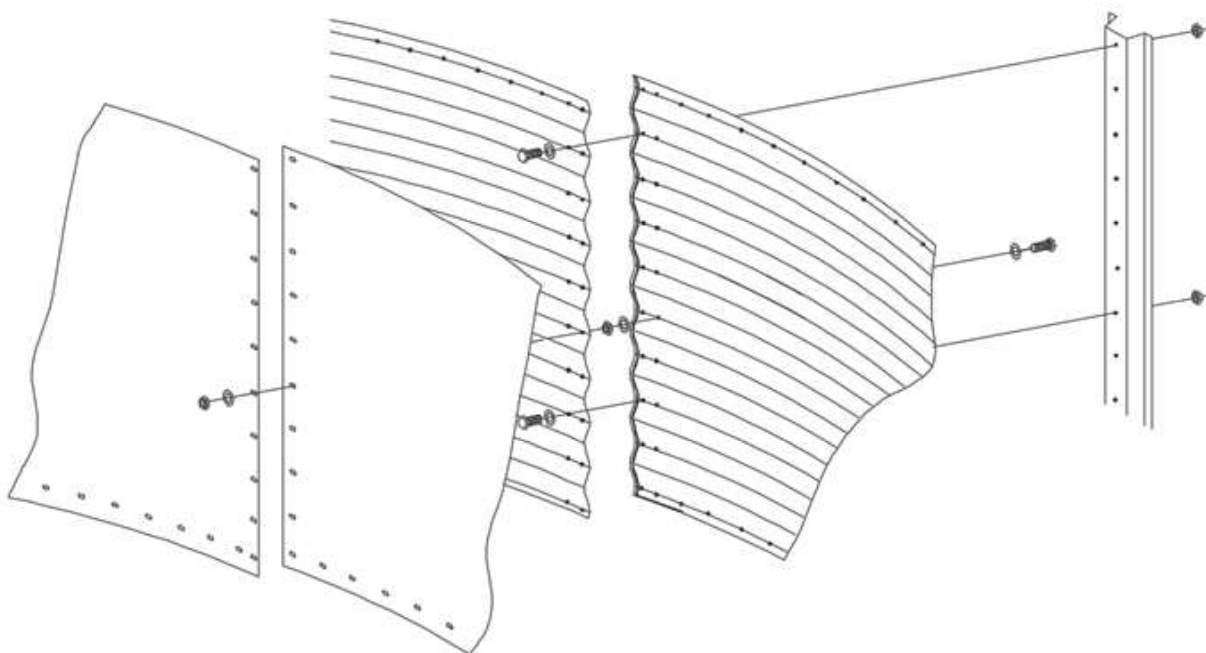
TECHNICAL SPECIFICATIONS

Group of flat sheets located in the inner part of the body, reducing the friction between the product stored and silo walls.

Favors the grain displacement and reduces its effect on the structural elements of the silo.

PARTS AND MATERIALS

- 1 INNER FLAT SHEET
- Flat sheet with dimensions 2400 x 1064 mm
 - Material: Galvanized steel: S280GD Z 600 MAC $t \approx 1.2$ mm



TECHNICAL SPECIFICATIONS

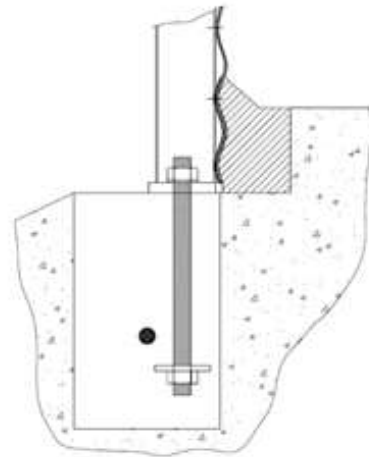
1 MECHANIC

- The main part is a threaded rod (quality 8.8. + HDG) located on a foundation hole with a flat washer and a nut on the lowest part
- The foundation holes have to be filled with self – levelling mortar (SIKA GROUT)

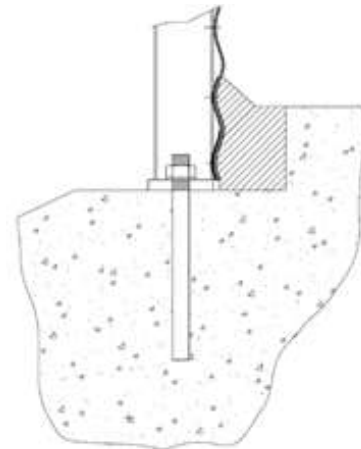
2 CHEMICAL

- The main part is a zinc plated threaded rod with a chemical package of resin
- It has the certification ETA OPTION 1 and the CERTIFICATION C1 to seismic loads

1



2



TYPES OF KITS

1 MECHANIC STANDARD KIT

- SBH: 1 anchor / stiffener
- SCE: 2 anchor / stiffener (Leg)
- SC: 1 anchor / stiffener (Leg)

2 CHEMICAL KIT

- SBH: 1 anchor / stiffener
- SCE: 4 anchor / stiffener (Leg)
- SC: 1 anchor / stiffener (Leg)

CLOSING ANGLE

CYLINDER ACCESSORIES



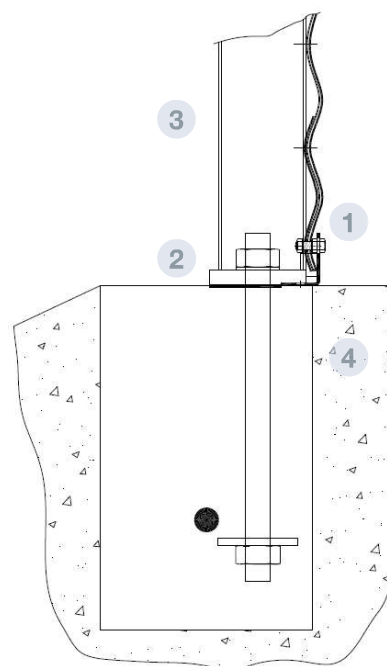
TECHNICAL SPECIFICATIONS

The main part is a bent profile (A) of cold rolled steel to seal the union cylinder, foundations and anchor plates. It's sent with shims (B) to balance the anchor plates. To join and seal closing angle parts (A) are used the splices (C).

On the union closing angle – anchor plate (D) and closing angle – foundation (E) is stalled FOAM to improve the sealing.

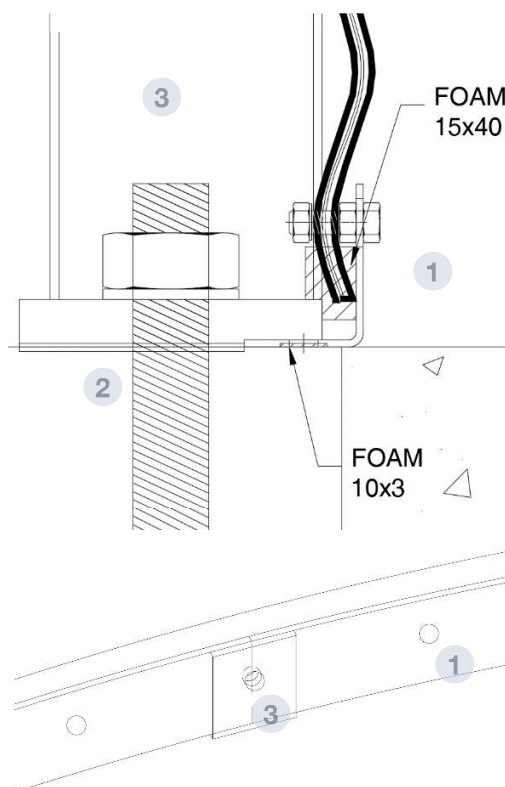
To silos S.B.H. without inside step (inside silos).

To save on the civil construction.



PARTS AND MATERIALS

- 1 CLOSING ANGLE**
 - 1 per bodysheet/ ring
 - Length 2400 mm
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 3mm
- 2 SHIM**
 - Sheets to balance the anchor plate
 - MATERIAL: galvanised steel S280 GD Z600 MAC
- 3 SPLICE**
 - Sheet to join and seal the closing angles union
 - Dimensions: 80x68x3mm
 - MATERIAL: galvanised steel S280 GD Z600 MAC



DOUBLE BODYSHEET ACCESS DOOR

ACCESSORIES CYLINDER



FILE 4.6
VERSION 2
COD. ASPUERV06 -07
18/02/2021



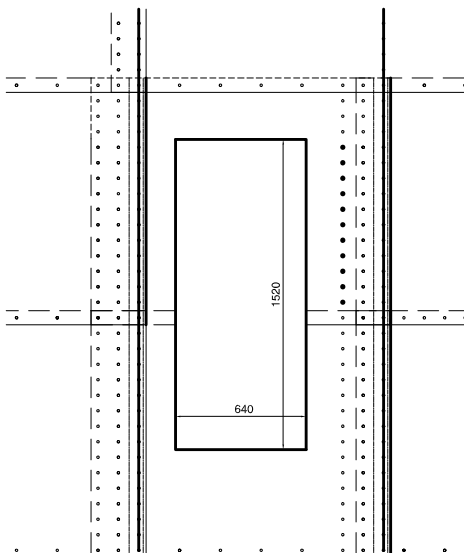
TECHNICAL SPECIFICATIONS

Rectangular door to access the silo (1).
This door can be placed in silos from 4.60 to 16.80 with
a maximum of 15 rings.

It is made up of 3 inner leaves and an outer one screwed
onto a hinged frame. Both have a FOAM closing system
(10x3mm) to guarantee their watertightness. The closing
system has been improved with wing nuts that adjust the
leaves to the frame.

The frame is welded to a corrugated sheet that is part of
the silo cylinder.

It is easy to install and ships as an optional silo acces-
sory.



PARTS AND MATERIALS

- 1 ACCESS DOOR**
 - Formed by two sheets, exterior and interior, bolted to a frame
 - Dimensions: 1520 X 640 mm.
 - MATERIALS: S275JR HDG galvanized steel
- 2 SHEET METAL FRAME**
 - Development: 2400 x 1140 mm
 - Material: S350GD Z600

PNEUMATIC CHARGE SYSTEM

CYLINDER ACCESSORIES



FILE 5.23
VERSION 1
COD.
25/10/2019

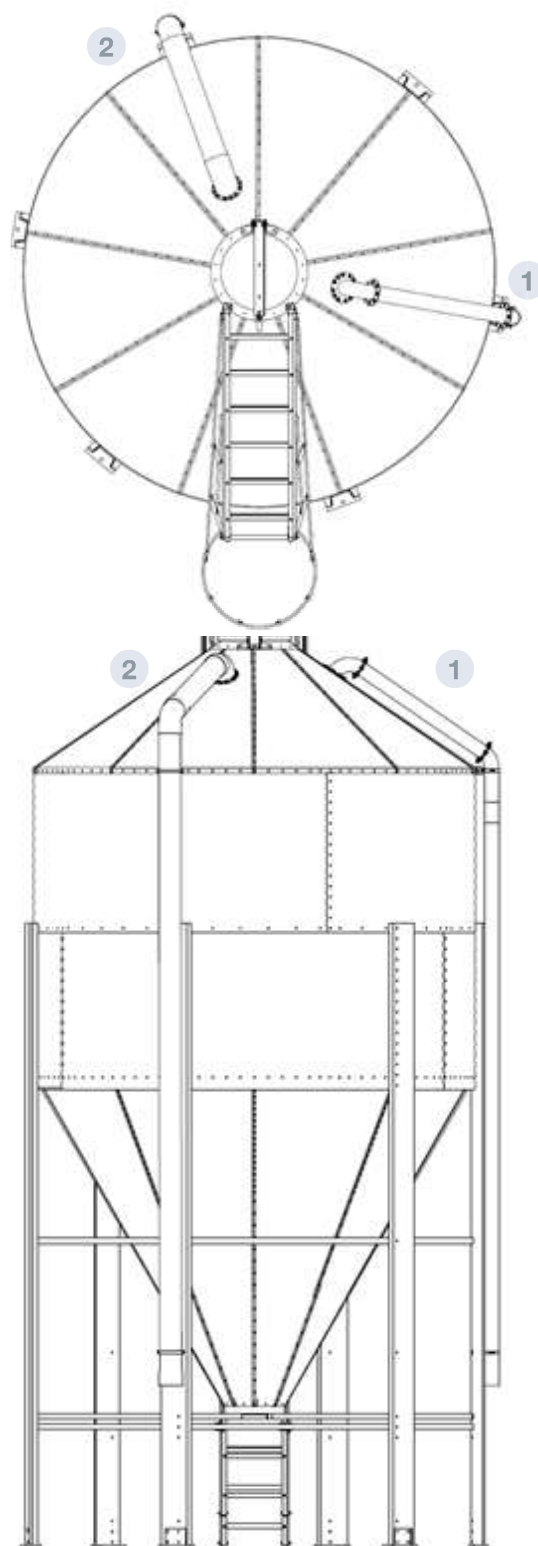


TECHNICAL SPECIFICATIONS

Channel system with charge and decompression pipes to fill the silos with air pressure.

Only available to silos with small diameters.

It's not suitable with roof aeration systems.



PARTS AND MATERIALS

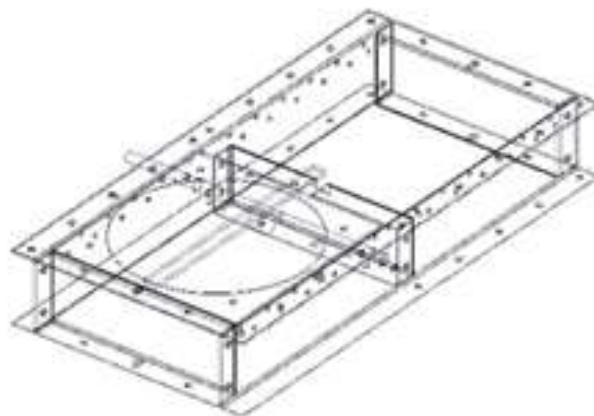
- 1 PNEUMATIC**
 - Ø 100 mm
 - MATERIAL: galvanised steel
- 2 DESCOMPRESSION CHIMNEY**
 - Ø160 mm
 - MATERIAL: PVC

SLIDE GATE
FOR HOPPER
SILOS OUTLET

HOPPER



FILE 5.50
VERSION 1
COD.
14/10/2019



TYPES

DEPENDING ON THE SIZE:

- 1 400x400
· Slide gate for silos
- 2 250x250
· Side discharge gate

DEPENDING ON ITS ACTIVATION:

- 1 Manual
· Slide gate manually activated.
- 2 Electric
· An electric motor activates the gate, with 2 detectors
- 3 Pneumatic
· For opening and closing, pneumatic piston is used.
- 4 Double
· Consists of a manual slide gate and an electric slide gate in the same ensemble.

STANDARD CATWALK

SUPPORTS AND COLUMNS



FILE 6.7
VERSION 2
COD. ASPA5070500
28/01/2021



TECHNICAL SPECIFICATIONS

Beam-formed catwalk consisting of 4/5 cold formed "U" stringers S280 GD Z600

On the stringers, we place the floor and the handrail. Modular system, screw-on, flexible while defining lengths and widths.

In the catwalk, there are a walkway (700 mm width) and the redler side (variable).

Can be open or closed.

The floor can be a grid floor or a simple drilled sheet.



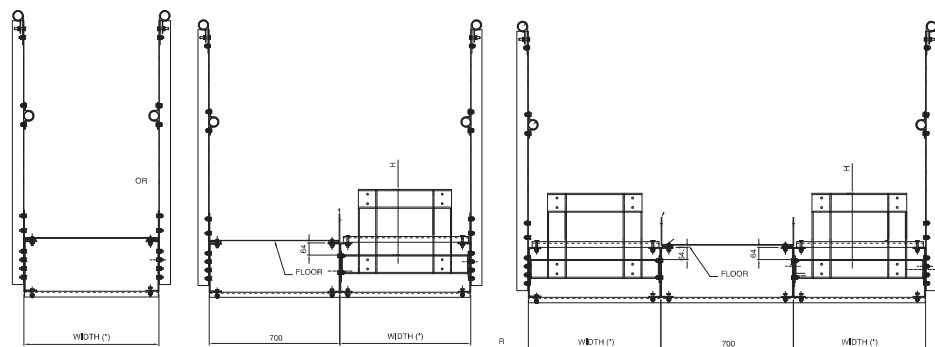
Standard

Tramex

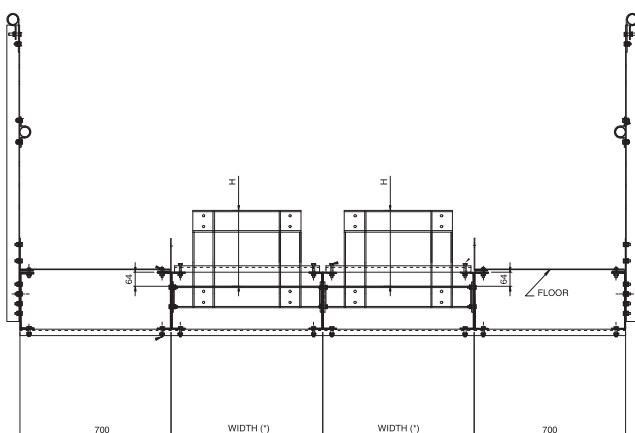
TTYPES:

Depending on the redler width, catwalks can be:

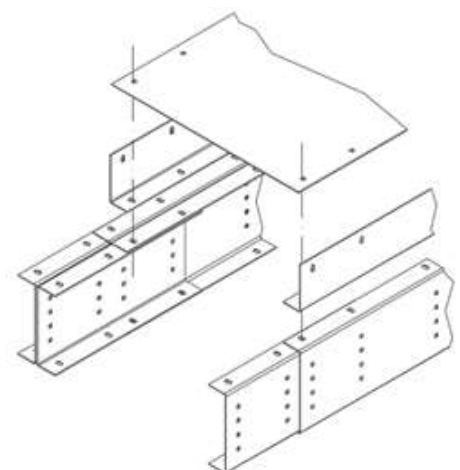
- 700 : (only walkway)
- 1400 : 700 + 700
- 2100 : 700 + 700 + 700
- 1600 : 700 + 900
- 2300 : 700 + 900 + 700
- 1800 : 700 + 1100



WIDTH (mm)
700
900
1100



WIDTH (mm)
700
900
1100
1500

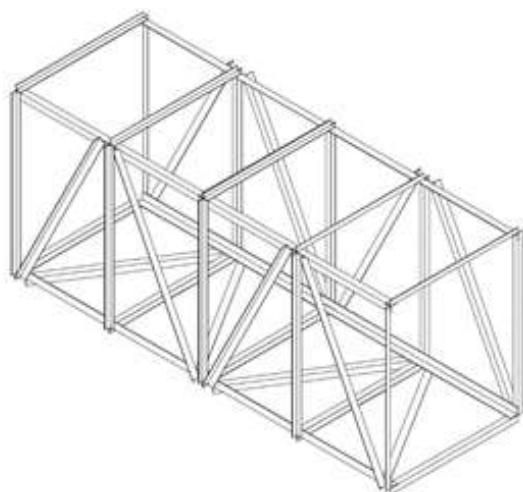


LATTICE CATWALK

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.9
VERSION 1
COD. ASPASCEL170
18/10/2019



TECHNICAL SPECIFICATIONS

Catwalk with a main structure consisting of "L" hot rolled profiles, S275JR galvanized.

Designed for withstanding big loads and big spans:

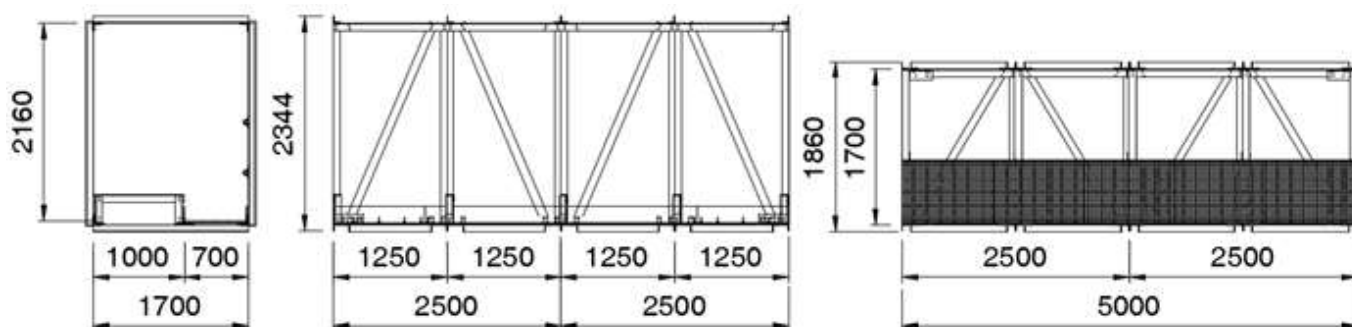
- Max load: 600 Kg/m
- Max span: 20 m

We can determine 2 areas, walkway and the redler side.

Total width is 1700 mm

700 mm (walkway) + 1000 mm (redler side)

Formed by screw-on modules every 5m with end sections of (4,4 m, 3,16 m, 1,91 m y 0,66 m) to make other configurations easier.



CLOSE CATWALK

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.8
VERSION 1
COD. ASAPAS1405CO
20/01/2020



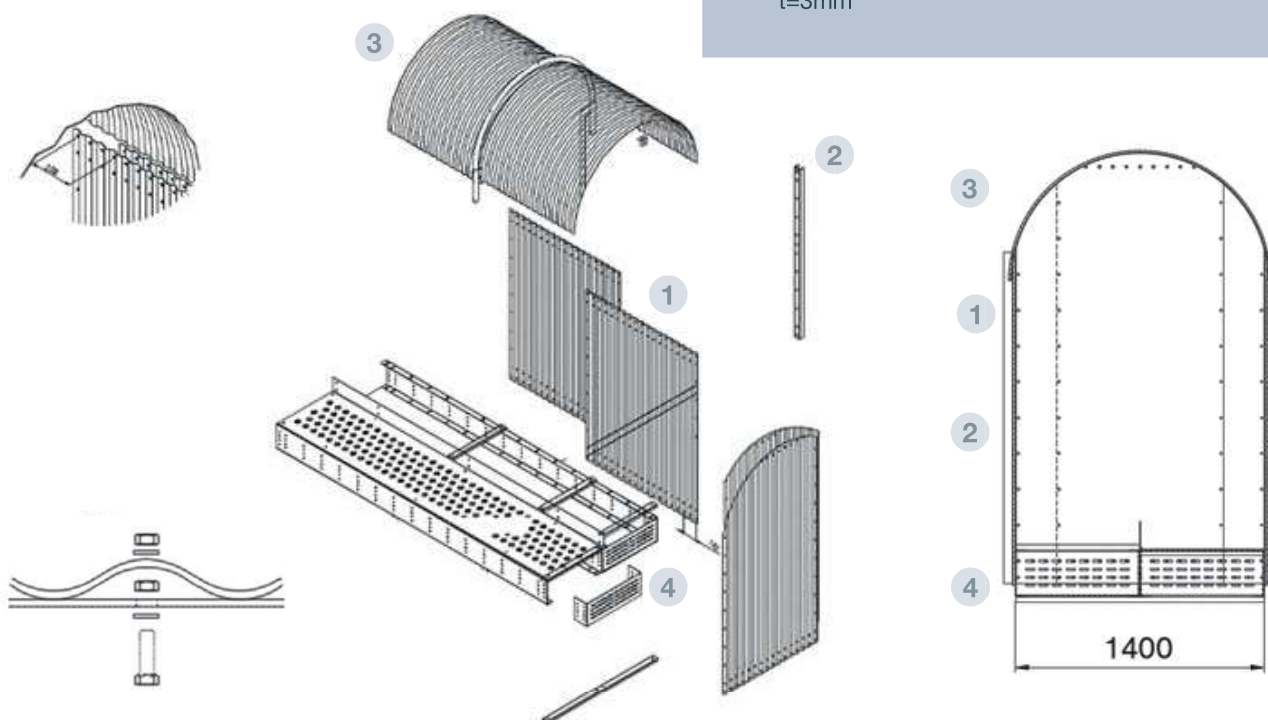
TECHNICAL SPECIFICATIONS

It is a standard catwalk covered by bodysheets.

Available widths: 1400, 1800 or 2100mm.

PARTS AND MATERIALS

- 1 LATERAL WAVY WALL**
 - Rectangular sheet, with dimensions 690x1140mm, connected to other walls forming the wall.
 - Its width is 1,2mm and the waves 76 x 14mm.
 - MATERIAL: Galvanized steel S350GD Z600 MAC
- 2 LATERAL WAVY WALL PILLAR**
 - "U" 60x50x3 cold formed profile located in the wavy walls joint.
 - MATERIAL: Galvanized steel S280GD Z600 MAC
- 3 COVER**
 - Rectangular sheet with width 1140mm connected to the wavy walls.
 - MATERIAL: Galvanized steel S350GD Z600 MAC t=1,2mm
- 4 CLOSE SHEET**
 - Folded sheet, "C" shape for the catwalk close at the beginning and end.
 - MATERIAL: Galvanized steel S280GD Z600 MAC t=3mm



COLUMN WITH COLD ROLLED PROFILES

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.5
VERSION 1
COD. ASCOL01
17/10/2019



PARTS AND MATERIALS

- 1 ANCHOR PLATE**
 - Connecting the pillars to the foundation
 - Material: S275JR Galvanized steel
- 2 "U" 263 PILLAR**
 - "U" 263 profile cold formed profile all along the column height.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 3 SPLICE**
 - "U" 254x5928mm profile, cold formed profile connecting the pillars with the anchor plate.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 4 BRACING**
 - "U" 60x50 cold formed profile.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 5 CONNECTION TO SILO**
 - "L" 50x50x5 profiles connecting the column to the silo.
 - Material: A-42b Galvanized steel
- 6 UPPER "U" PROFILE**
 - "U" 263 cold formed profile, supporting the "C" profile where the catwalk is placed.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 7 LOWER "U" PROFILE**
 - "U" 263 cold formed profile.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 8 DIAGONAL**
 - "U" 263 cold formed profile connecting the upper "U" profile with lower "U" profile.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm

TECHNICAL SPECIFICATIONS

Acting as catwalk support at the same height as the roof Support.

It is used when the double wall support with overhang is not a suitable solution.

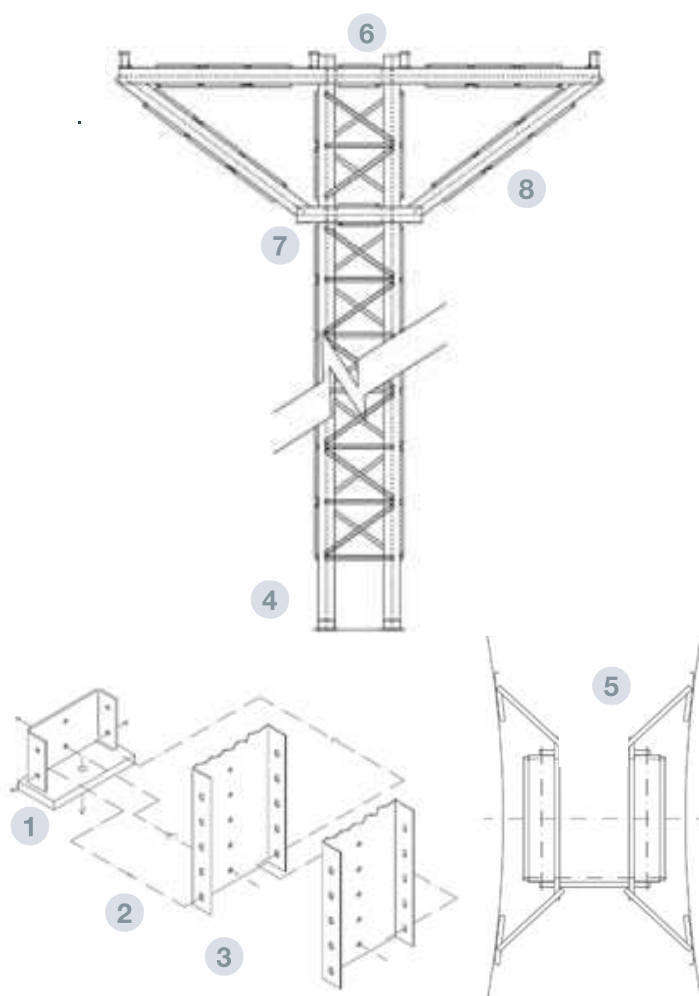
A column from the ground to the height limited by the roof support, it is braced to the silo and an overhang is placed in the upper part.

The overhang is formed by two structural systems (inverted pyramid shape), braced to each other.

When the column is placed at the beginning/end of the silo row, one wing overhang is placed in the upper part.

On the overhang, 4 "C" profiles are placed supporting the catwalk.

The most used base is 1070mm x 1216mm, with overhangs 2128, 3344 and 4560mm.



WALL SUPPORT

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.2

VERSION 1

COD. ASSOPTP1900-A090-A120-ESP

16/01/2020

TECHNICAL SPECIFICATIONS

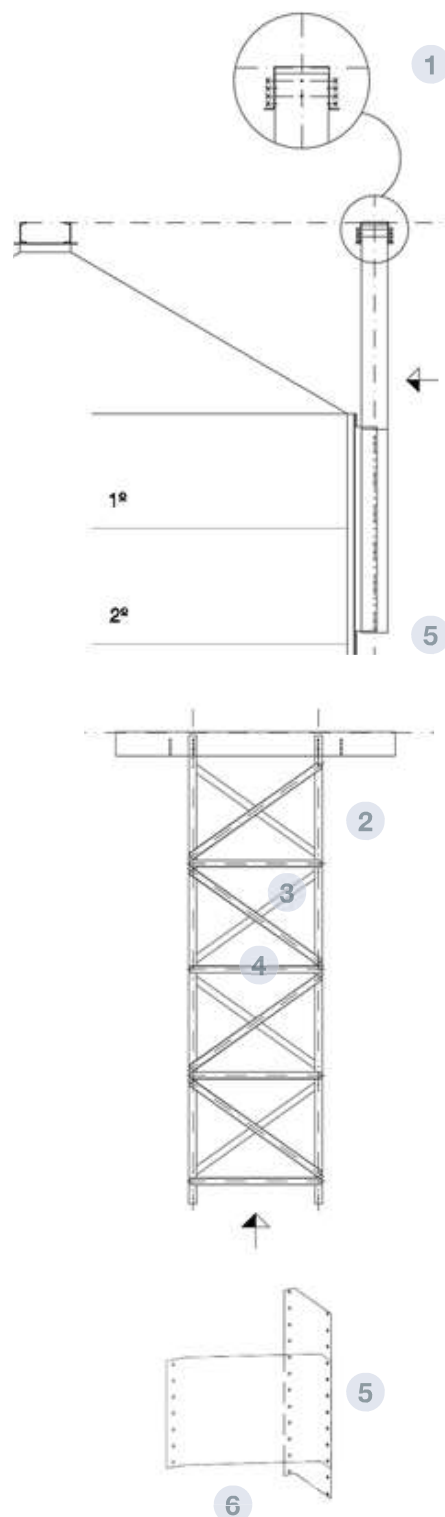
The wall support is a structure that acts as catwalk Support at the same height as the roof support.

The catwalk rests on an omega 273 profile supported by 2 "U" 263 pillars. The pillars are bracings with horizontal and inclined bracings "U" 60x50x3mm.

The whole ensemble is connected to the reinforcements through 2 wall silo angles. From the 10,70 silo model onwards, the wall silo angles are strengthened with bracings.

PARTS AND MATERIALS

- 1 OMEGA 273
 - OMEGA profile 273x210x2400mm cold formed profile.
 - Optionally, its length can be 3000mm
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 2 PILLAR "U" 263
 - "U" 263 profile, cold formed profile.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 3 INCLINED BRACING
 - 4 "U" 60x50 profile, cold formed profile.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 4 HORIZONTAL BRACING
 - "U" 60x50 profile, cold formed profile.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 5 WALL SILO ANGLE
 - Steel sheet, 2000mm long for the pillar-reinforcement connection.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 6 WALL SUPPORT BRACING
 - Steel sheet, 500mm long for the wall silo angle strengthening.
 - Connected between the bodysheet and wall silo angle.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm



WALL SUPPORT WITH INCREASE FOR OVERHANG

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.3
VERSION 1
COD.
16/01/2020

TECHNICAL SPECIFICATIONS

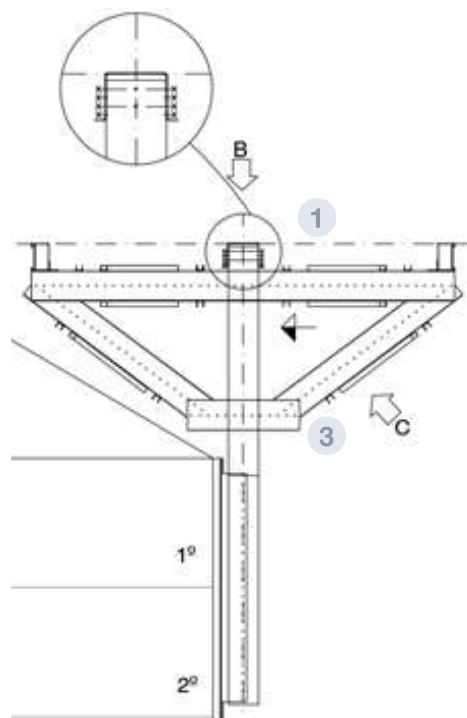
The structure supports the catwalk at the same height as the roof support.

Consists of a standard wall support, adding the overhang structure.

It is used when the standard wall support solution is not enough. Lengths available: 3724mm

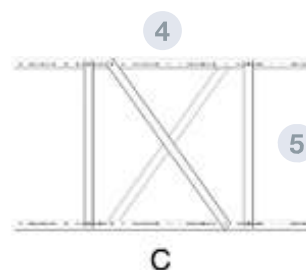
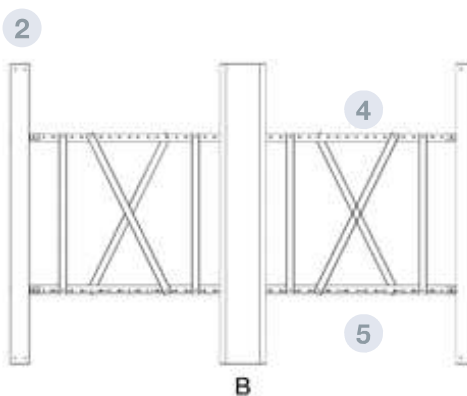
The overhang is formed by 2 structural systems, with inverted pyramid shape, braced between each other.

On the overhang, 2 "C" profiles are supported acting as catwalks support.



PARTS AND MATERIALS

- 1 UPPER "U"
 - "U" 263 3724mm long, supporting "C" reinforcement.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 2 "C" PROFILE
 - Cold formed profile where the catwalk is placed.
 - For its height adjustment, the "C" profile can be 223mm, 232mm, 241mm, 250mm, 259mm, 268mm and 277mm.
 - Can be reinforced with a "U" profile with the same material.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 3 LOWER "U" PROFILE
 - "U" 263x988 cold formed profile connected to the wall support.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 4 DIAGONAL
 - "U" 263 profile, cold formed profile connecting the upper "U" with the lower "U".
 - Can be 1976mm or 2356mm long, depending on the overhang dimension.
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm
- 5 BRACING
 - "U" 60x50 profile cold formed profile, bracing "U" parts between each other.
 - Variable length: 506, 936, 1120, 1266, 1280, 1362 ó 1422mm
 - Material: Galvanized steel S280GD Z 600 MAC t= 3mm



CONVEYOR SUPPORT SCREWABLE

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.10
VERSION 1
COD. ASPLATPASO
20/01/2020



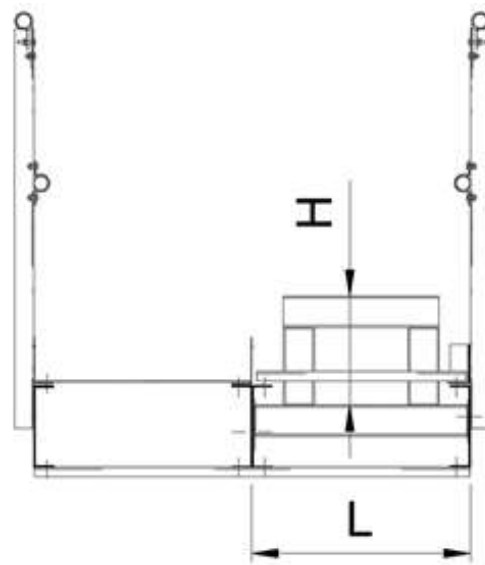
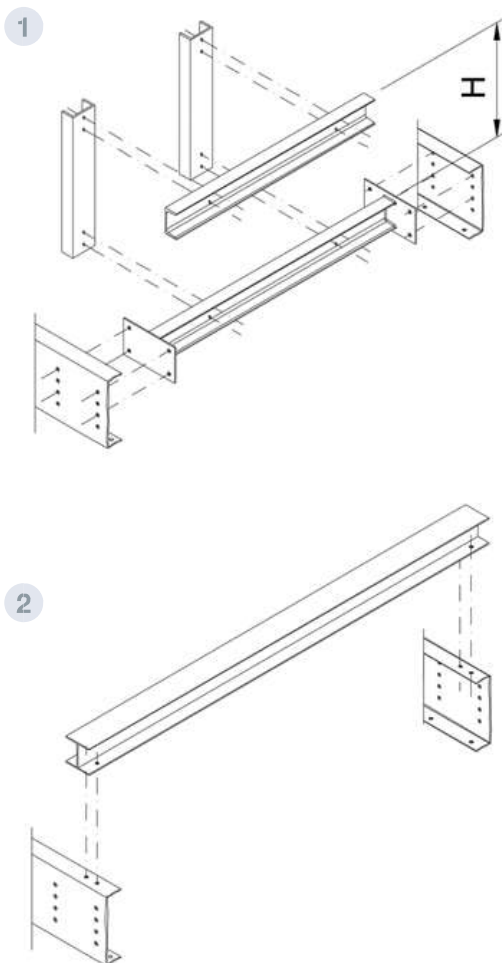
PARTS AND MATERIALS 2 TYPES:

1 CHANGEABLE LOCATION

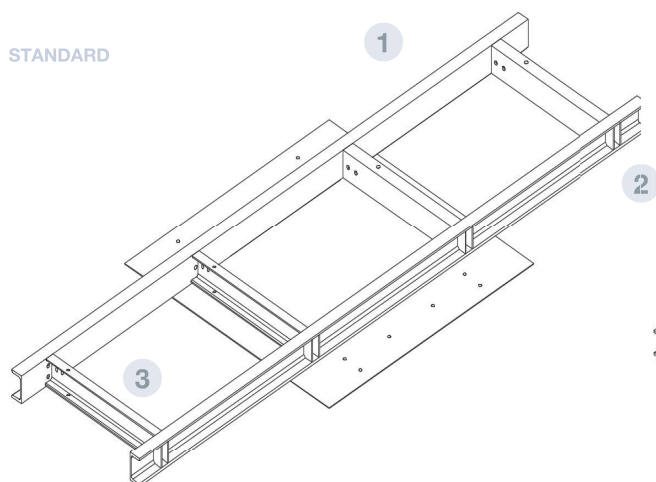
- Porterías formadas con perfiles UPN 100 con una serie de agujeros para poder poner el transportador con una inclinación determinada
- Located every 3 m
- H dimension is variable, although 350mm is the standard value.
- Length "L" is 700, 900 or 1100 mm

2 HEA 100

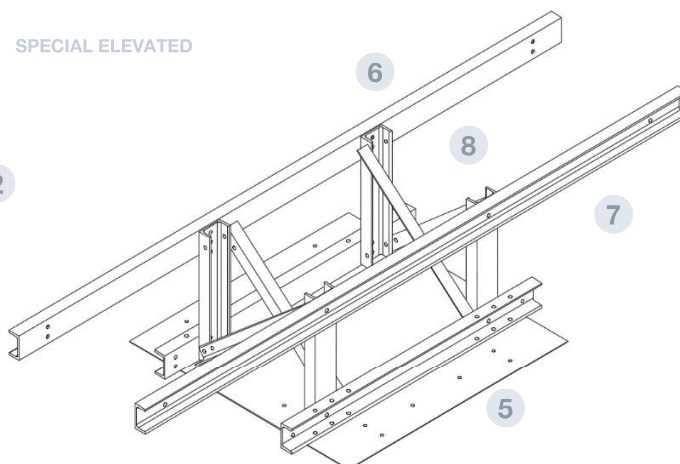
- Supports placed on the flanges of the catwalk stringers in order to install the redler support.
- Already drilled holes for its fixation.



STANDARD



SPECIAL ELEVATED



TECHNICAL SPECIFICATIONS

Formed by "U" profiles, connected to each other and mounted on the roof in order to withstand the catwalk loads.

TYPES

A CENTERED

Formed by 2 "U" 200 profiles, attached to the top cover, braced with 4 reinforcements "U" 200.

B DISPLACED

Centered roof Support not symmetrically installed for non-standard catwalk designs.

C WITH EXTENSION

Centered roof support installed with 1000mm long extensions in both sides.

D ELEVATED

Formed by "U" 100 attached and braced with "L" 50x50 for supporting catwalks at higher levels.

Depending on the height to cover, there are 4 types:

- 1.H : (210 – 530)
- 2.H : (570 – 1050)
- 3.H : (1090 – 1570)
- 4.H : (1610 – 2090)

PARTS AND MATERIALS

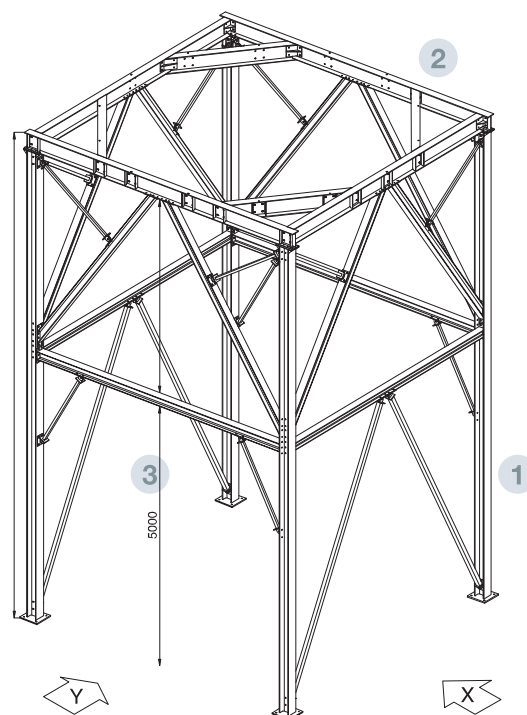
- 1 **STRINGER**
 - "U" 200 profile cold formed profile, 2600mm, 2550mm or 3000mm long, acting as principal element in the structure.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 2 **STRINGER BRACKETS**
 - Brackets system placed on the stringers reinforcing the connections with the reinforcements.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 3 **REINFORCEMENT**
 - 4 "U" 200 profiles cold formed profiles, placed transversely.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 4 **EXTENSION**
 - U200 profiles, 1000mm long, cold formed profiles, to be installed as stringer extensions.
 - Extensions are installed with universal rungs acting as supports in both sides.
 - Material: Galvanized steel S280 GD Z 600 MAC t= 3mm
- 5 **BASE**
 - Perfiles UPN100 hot rolled profiles.
 - Material: Galvanized steel S275 JR L=1200mm
- 6 **SUPPORTING BASE**
 - Profiles UPN100 hot rolled profiles
 - Material: Galvanized steel S275 JR L=2600mm
- 7 **PILLARS**
 - Profiles UPN100 hot rolled profiles forming the max length.
 - Material: Galvanized steel S275 JR
- 8 **BRACING**
 - Perfiles "L"50x50 for pilars bracing.
 - Material: Galvanized steel S275 JR

STRUCTURE FOR DELIVERY SILO

FOUNDATION



FILE 6.11
VERSION 2
COD. ASC300T45ESTRU6
28/01/2021

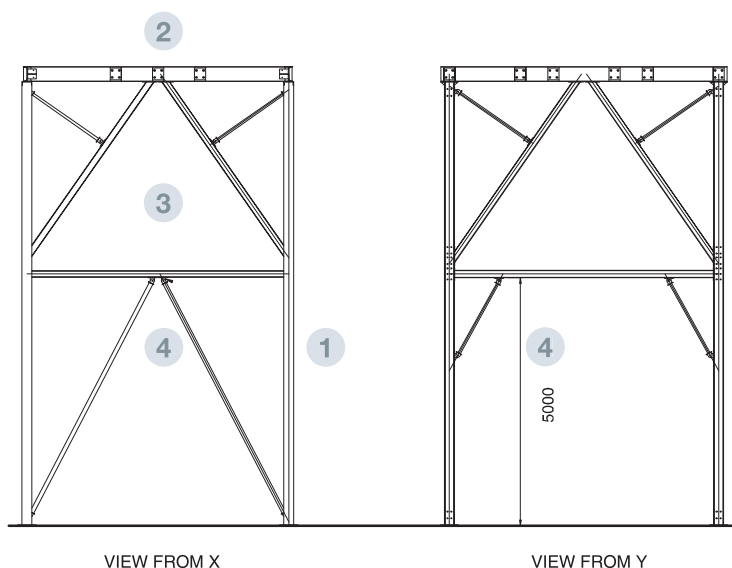


TECHNICAL SPECIFICATIONS

Structure designed to lift the silo up and allow the truck passing below.
Silos with short legs are placed on it.

PARTS AND MATERIALS

- 1 PILLARS**
 - HEB hot rolled profile.
 - Material: Galvanized steel S275 JR
- 2 MAIN BEAMS**
 - IPE hot rolled profile.
 - Material: Galvanized steel S275 JR
- 3 SECONDARY BEAMS**
 - HEB hot rolled profile.
 - Material: Galvanized steel S275 JR
- 4 BRACINES**
 - Tubular Ø80x3 ó 50x3 hot rolled profile.
 - Material: Galvanized steel S275 JR

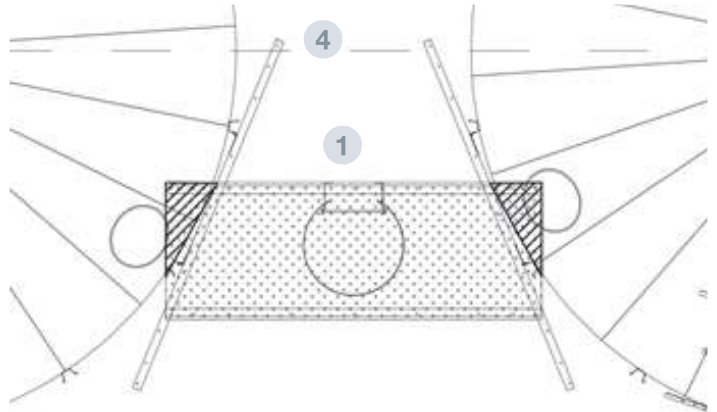


PLATFORM BETWEEN SILOS

ACCESSORIES SUPPLEMENTARY STRUCTURES



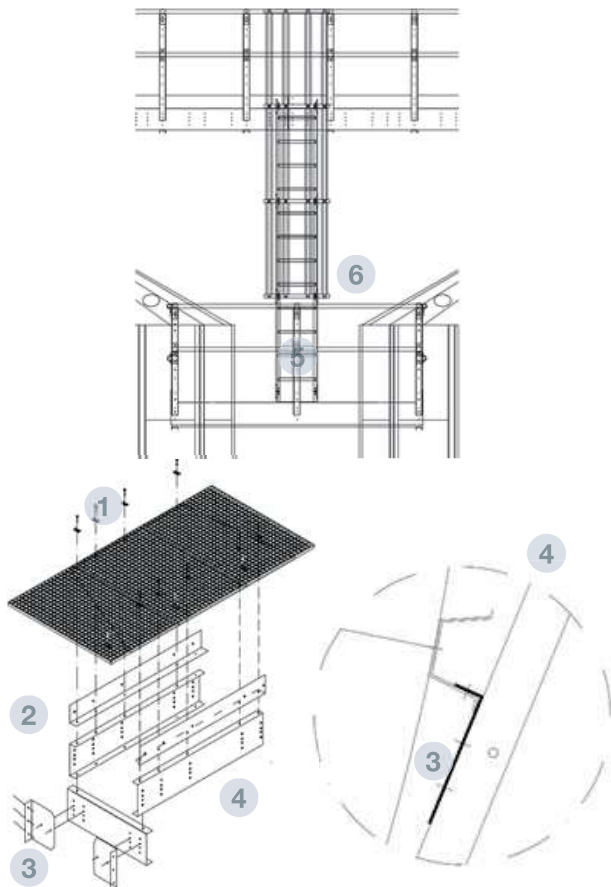
FILE 6.12
VERSION 1
COD. ASPLATENTRE1-2
21/01/2020



TECHNICAL SPECIFICATIONS

Platform supported on 4 stringers, fixed to the silo reinforcements in the penultimate ring.

Can be standard floor or grid floor, handrail is included allowing access to the inspection doors of both silos.

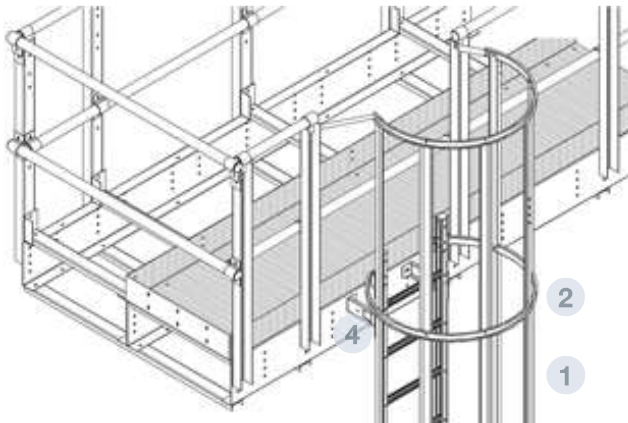


PARTS AND MATERIALS

- 1 FLOOR**
 - Standard or grid floor to be placed on the stringers.
 - Material standard floor: Galvanized steel S280 GD Z600 MAC t= 3mm
 - Material grid: Trammex 30x30-25x2 Galvanized
- 2 FOOT PROTECTION**
 - Folded sheet for the floor-stringer connection.
 - Material: Acero galvanizado S280 GD Z600 MAC t= 3mm
- 3 LEG CLIP**
 - Folded sheet for the rainforce connection.
 - Material: Galvanized steel S280 GD Z600 MAC t= 3mm
- 4 STRINGER**
 - "U" 263x3000 profile, folded sheet, representing the main structure of the platform.
 - Material: Galvanized steel S280 GD Z600 MAC t= 3mm
- 5 HANDRAIL BRACKET**
 - "U" 263x3000 profile, folded sheet, representing the main structure of the platform.
 - Material: Galvanized steel S280 GD Z600 MAC t= 3mm
- 6 HANDRAIL TUBE**
 - TUBE Ø48x3000x1,5mm
 - Material: Galvanized steel
- 7 CLIPS**
 - Handrail tube- handrail bracket connection clips.
 - Material: Galvanized steel S280 GD Z600 MAC t= 3mm
- 8 STOPPER**
 - Used to closet he handrail tbe at the end.
 - Material: Polypropylene

LADDER TO PLATFORM BETWEEN SILOS

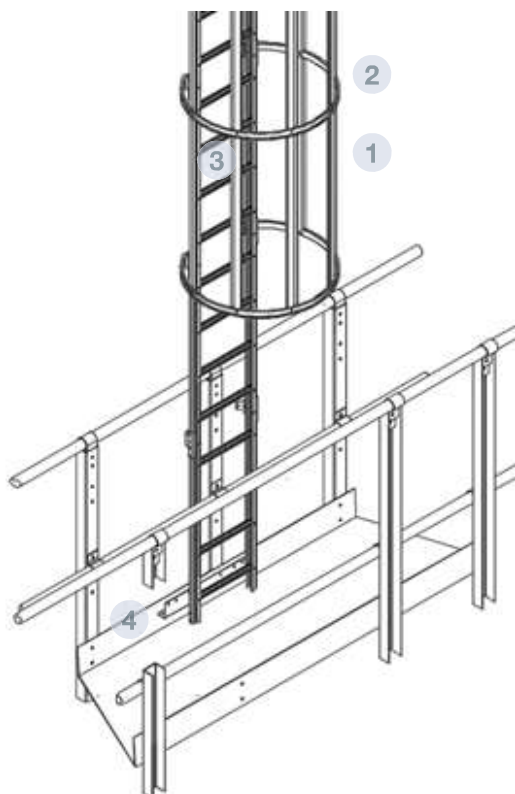
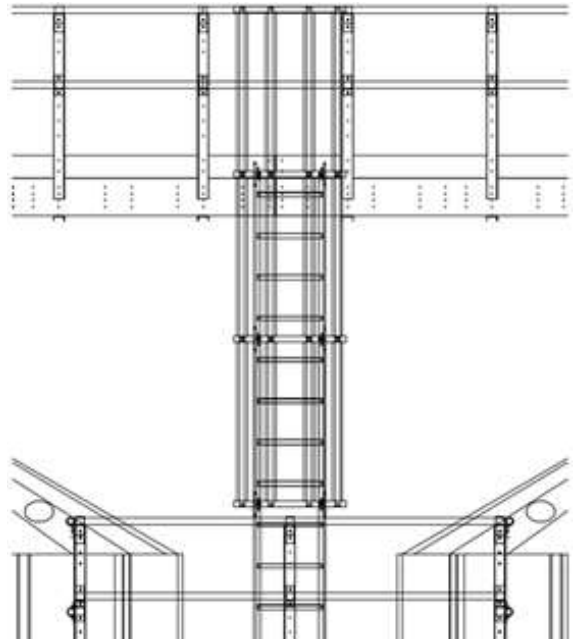
ACCESSORIES SUPPLEMENTARY STRUCTURES



TECHNICAL SPECIFICATIONS

Vertical ladder from the catwalk between silos to the main catwalk, complying with the regulation UNE-EN ISO 14222-1/2/3/4.

The ladder is connected to the platform through an angular profile and to the catwalk through the ladder support.



PARTS Y MATERIALS

- 1 RAIL**
 - 5 rails located every section of 1140mm.
 - MATERIAL: Galvanized steel S 280 GD Z 600 t= 1.5 mm
- 2 SAFETY CAGE**
 - 1 every section of 1140 mm
 - MATERIAL: acero galvanizado S 280 GD Z 600 t= 2 mm
- 3 RUNGS**
 - Connected every 285mm section.
 - Length: 458 mm
 - MATERIAL: Galvanized steel S 280 GD Z 600 t= 1.5 mm
- 4 RAIL SUPPORT**
 - Connecting the catwalk to the silo
 - MATERIAL: Galvanized steel S 280 GD Z 600 t= 3 mm
- 5 CONNECTION TO THE PLATFORM**
 - "L" 60x100x600 cold formed profile for the ladder-platform connection. Galvanized steel S 280 GD Z 600 t= 3 mm

MANTEINANCE PLATFORM

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.17
VERSION 2

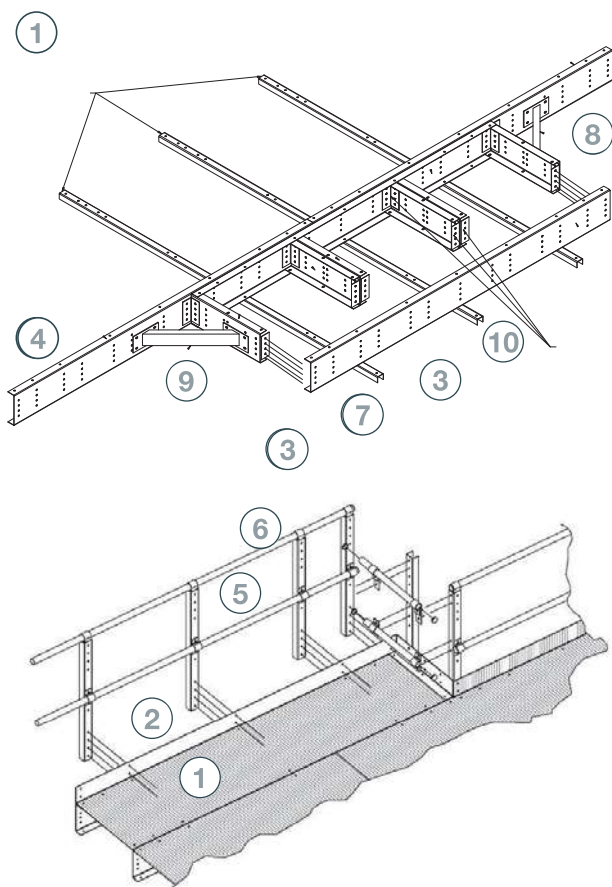
COD. ASPLATMANT1-8 - ASPLATMANTE - ASPLATENTRE
28/01/2021



TECHNICAL SPECIFICATIONS

Platform supported on 3 beams attached to the walkway. It is an extension of the walkway corridor that allows creating more space to maintain the gates and motors.

It can be a floor or grid type, it has a railing and allows passage in the event of equipment in nearby areas.



PARTS AND MATERIALS

- 1 FLOOR**
 - Inlaid sheet metal floor or grid to install on the beams
 - FLOOR MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
 - GRID MATERIAL: Tramex 30x30-25x2 GALVANIZED
- 2 FOOT ANGLE**
 - Folded sheet metal for floor-"U" splice connection
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 3 CLIPS SPLICE**
 - Folded sheet metal for the "U" splice-reinforcement joint
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 4 "U" SPLICE**
 - "U" profile 263x3000 of folded sheet metal that forms the main structure of the platform
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 5 HANDRAIL BRACKET**
 - Cold rolled steel "U" profile 60x60x1370
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 6 HANDRAIL**
 - TUBE Ø48x3000x1,5mm
 - MATERIAL: Galvanized steel
- 7 "U" SPLICE SHORT**
 - "U" profile 263x687 of folded sheet metal forming the main structure of the platform
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 8 MODELING BOARD**
 - Sheet for connecting the "U" profile - Clip splice
 - MATERIAL: Galvanized steel S280 GD Z600 MAC e = 3mm
- 9 PLATFORM DIAGONAL**
 - Available in two sizes: 700 ó 1400mm
- 10 "U" SPLICE LARGE**
 - Measure 254x687 mm
 - Clamped to the main structure by clips

ELEVATOR TOWER

ACCESSORIES SUPPLEMENTARY STRUCTURES



FILE 6.15
VERSION 2
COD. ASTORRE ASCELOSIA
29/01/2021



TECHNICAL SPECIFICATIONS

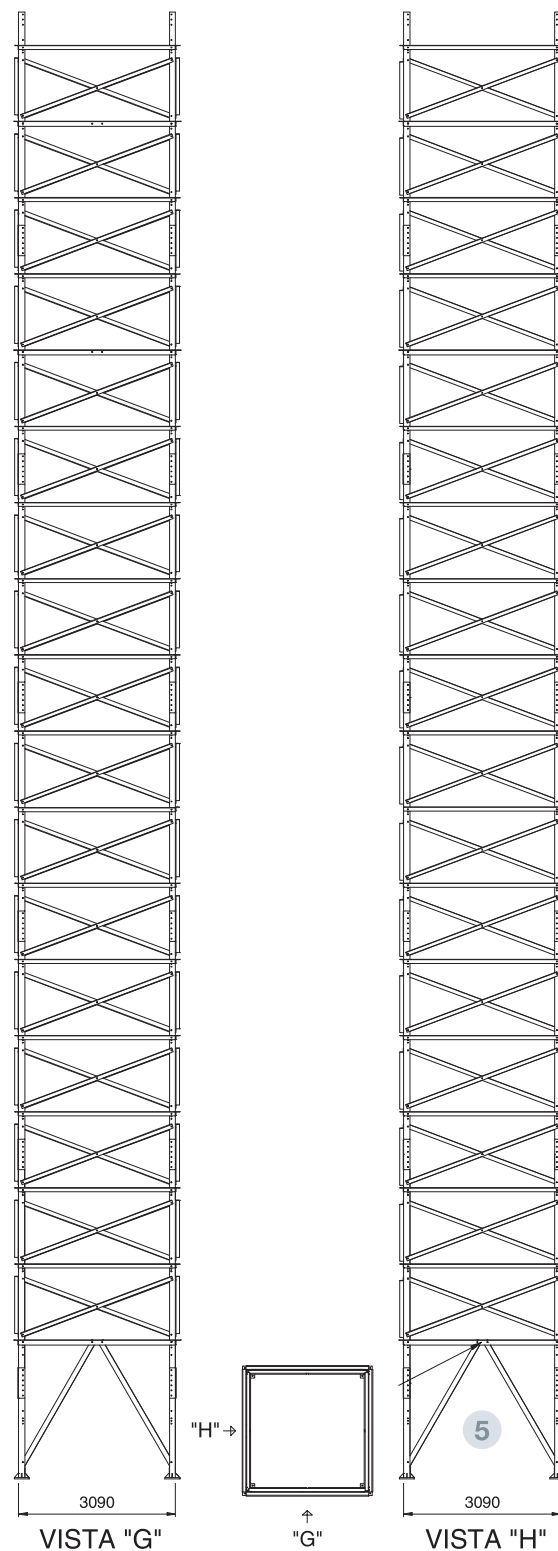
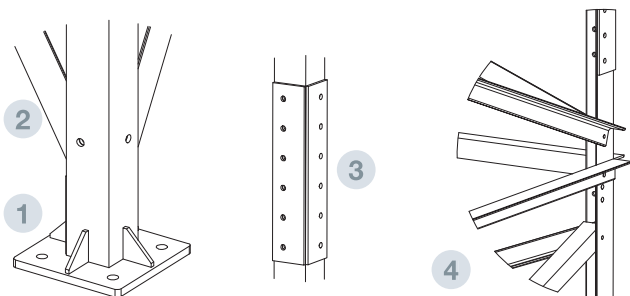
Structure for the vertical grain conveyor.

TYPES

Available in different sizes. Contact us.

PARTS AND MATERIALS

- 1 ANCHOR PLATE**
 - Connecting the pillars to the foundation.
 - Material: Galvanized steel S275JR
- 2 PILLAR "L"**
 - "L" 100x100x10 ó 120x120x12 profile, hot rolled profile, all along the column height.
 - Material: Galvanized steel S275 JR
- 3 SPLICE**
 - Rectangular splice 600x100x10mm or 600x120x10mm for pillars connection.
 - Material: Galvanized steel S275 JR
- 4 BRACING**
 - "L" 50x5 hot rolled profile.
 - Material: Galvanized steel S275 JR



LADDER TO ROOF

ACCESSORIES STAIRS



FILE 5.14
VERSION 1
COD AS0XESC
13/11/2019



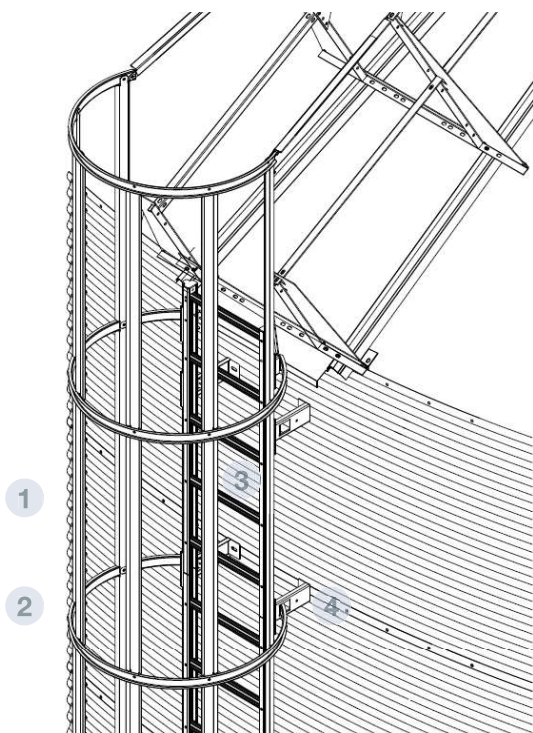
TECHNICAL SPECIFICATIONS

Vertical ladder from the ground floor to the eave, with intermediate platforms and safety bands according to the rule UNE-EN ISO 14222 – 1/2/3/4.

Platform located according the rule:

- Height < 10 m ☒ Without platforms
- Height > 10 m ☒ Platforms each 6 m

The first part of the ladder on silo's bottom doesn't have safety band (between 2.2 – 3 m, according the rule).



PARTS AND MATERIALS

- 1 RAIL**
 - 5 rails each 1140 mm
 - Material: galvanised steel S 280 GD Z 600 e= 1.5 mm
- 2 SAFETY BAND**
 - 1 each 1140 mm
 - Material: galvanised steel S 280 GD Z 600 e= 2 mm
- 3 RUNG**
 - Each 285 mm
 - Length: 458 mm
 - Material: galvanised steel S 280 GD Z 600 e= 1.5 mm
- 4 LADDER SUPPORT**
 - To join the ladder to the bodysheet
 - Material: galvanised steel S 280 GD Z 600 e= 3 mm
- 5 PLATFORM**
 - Dimensions: 1100x800 mm
 - Sheet with holes or Tramex structure
 - Material: galvanised steel S 280 GD Z 600 e= 3 mm

LADDER TO ACCESS DOOR IN NATURAL SLOPE

ACCESSORIES STAIRS



FILE 5.15
VERSION 1
COD ASBH5ESCPUER
13/11/2019



TECHNICAL SPECIFICATIONS

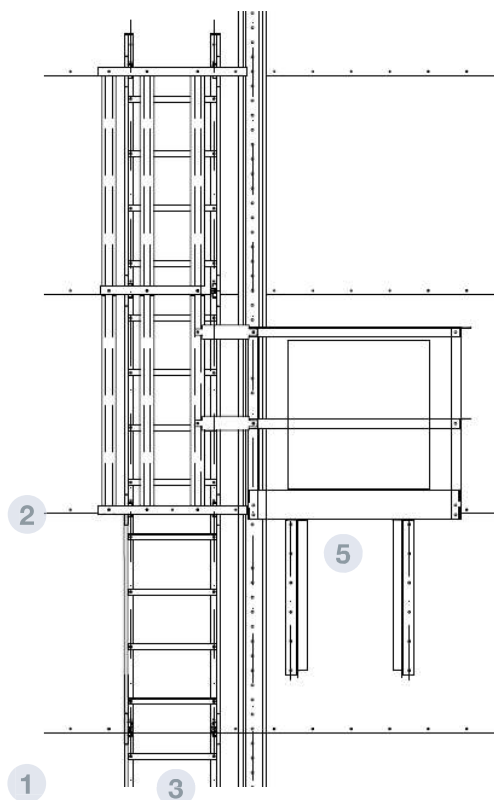
Vertical ladder from the ground floor to the access door.

It has a platform on the access door height to help the way onto the silo.

An inside ladder is supplied till the silo's bottom.

Safety bands are sent according to the rule UNE-EN ISO 14222 – 1/2/3/4.

The first part of the ladder on silo's bottom doesn't have safety band (between 2.2 – 3 m, according the rule).



PARTS AND MATERIALS

- 1 RAIL**
 - 5 rails each 1140 mm
 - Material: galvanised steel S 280 GD Z 600 e= 1.5 mm
- 2 SAFETY BAND**
 - 1 each 1140 mm
 - Material: galvanised steel S 280 GD Z 600 e= 2 mm
- 3 RUNG**
 - Each 285 mm
 - Length: 458 mm
 - Material: galvanised steel S 280 GD Z 600 e= 1.5 mm
- 4 LADDER SUPPORT**
 - To join the ladder to the bodysheet
 - Material: galvanised steel S 280 GD Z 600 e= 3 mm
- 5 PLATFORM**
 - Dimensions: 1100x800 mm
 - Sheet with holes or Tramex structure
 - Material: galvanised steel S 280 GD Z 600 e= 3 mm

INSIDE LADDER

ACCESSORIES LADDERS



FILE 5.16
VERSION 2
COD AS0XESCINT
28/01/2021

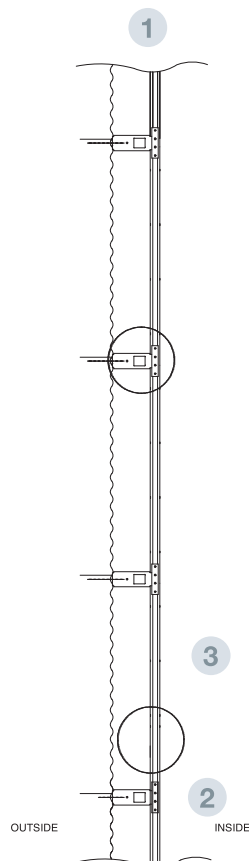
TECHNICAL SPECIFICATIONS

Vertical ladder inside the silo from the manhole to the bottom.

Assembled without platforms and safety bands.

PARTS AND MATERIALS

- 1 RAIL**
 - 5 each 1140 mm
 - Material: galvanised steel S 280 GD Z 600
 - e= 1.5 mm
- 2 LADEE SUPPORT**
 - To join the ladder to the silo
 - Material: galvanised steel S 280 GD Z 600
 - e= 3 mm
- 3 RUNGS**
 - Each 285 mm
 - Length: 458 mm
 - Material: galvanised steel S 280 GD Z 600
 - e= 1.5 mm



ACCESS DOOR LADDER

ACCESSORIES STAIRS



FILE 4.4

VERSIÓN 1

COD. ASBH2ESCPUER

11/11/2019

TECHNICAL SPECIFICATIONS

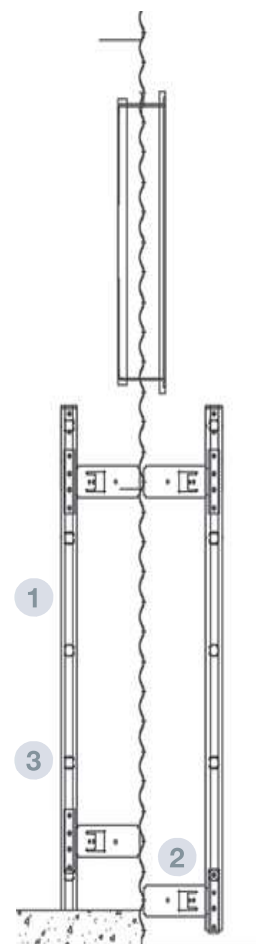
Vertical ladder from the ground floor to the access door on the second ring.

With it is supplied an inside ladder till the silo's bottom.

It's a standard accessory supplied in S.B.H. silos.

PARTS AND MATERIALS

- 1 RAIL**
 - 2 each 1140 mm
 - Material: galvanised steel S 280 GD Z 600
 - e= 1.5 mm
- 2 LADEE SUPPORT**
 - To join the ladder to the silo
 - Material: galvanised steel S 280 GD Z 600
 - e= 3 mm
- 3 RUNGS**
 - Each 285 mm
 - Length: 458 mm
 - Material: galvanised steel S 280 GD Z 600
 - e= 1.5 mm



ROOF STAIRS

ACCESSORIES STAIRS



FILE 5.7
VERSION 1
COD.AS0300ESCTECH
04/10/2019



TECHNICAL SPECIFICATIONS

Stair with platform steps to improve the way eave – charge system.

There are two types of steps: Tramex or standard.

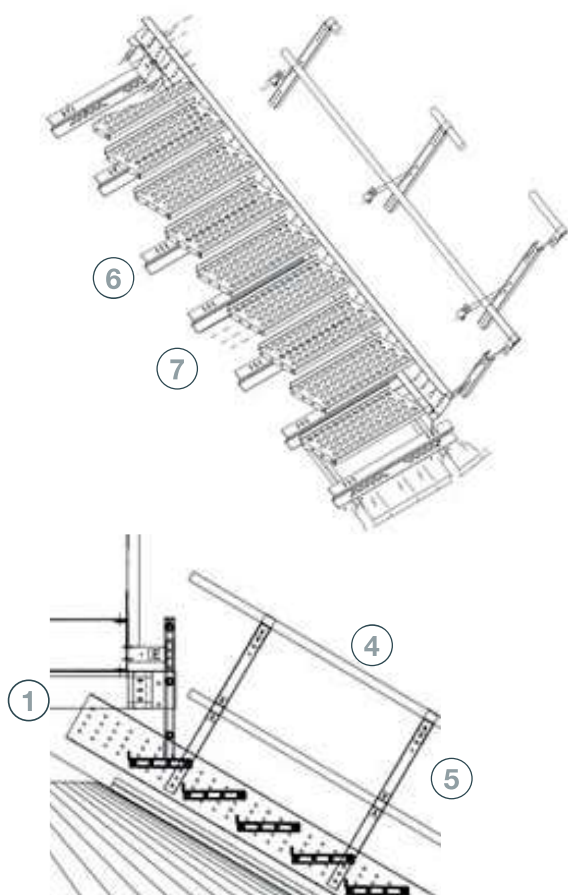
Always according to the rule UNE-EN ISO 14222.
The steep of the stair is 30°.

As standard package is sent with the chair a handrail and a vertical ladder (1140mm) to access to the catwalk.



Standard

Tramex



PARTS AND MATERIALS

- 1 "U" 263
 - "U" 263 profile of cold rolled steel. Lengths 3000, 2000 or 1000 mm
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 3mm
- 2 SPLICE
 - To connect "U"263 parts
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm
- 3 CLIPS
 - To join the handrail tube and the handrail bracket
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 4 HANRAIL TUBE
 - Tube Ø48 mm and length 3000mm
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 1.5mm
- 5 HANDRAIL BRACKET
 - "U" profile of cold rolled steel fixed to "U" 263 and to support the handrail tubes
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 6 Z SUPPORT
 - "Z" profile of cold rolled steel to join "U" 263 profiles to the roof sectors
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 3mm
- 7 RUNG
 - Type Tramex or standard (sheet with holes) its dimensions are 822 x 330mm
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm

SPIRAL LADDER

ACCESSORIES STAIRS



FILE 5.18
VERSION 1
COD AS0XESCESP
14/11/2019



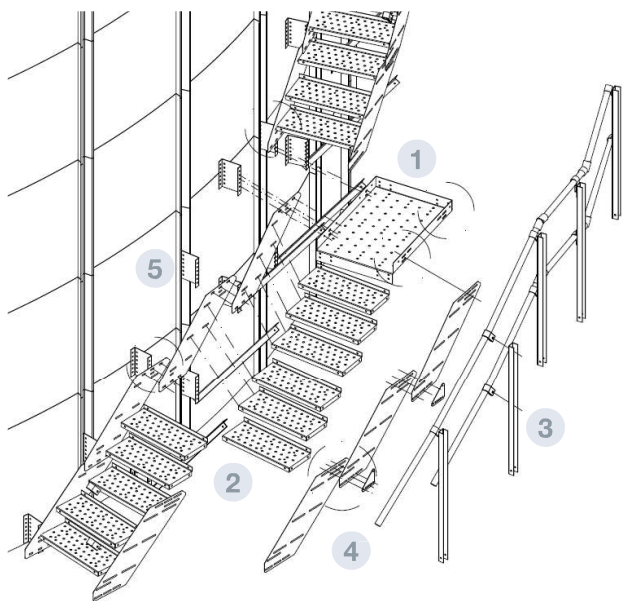
TECHNICAL SPECIFICATIONS

Stairs around the silo's wall composed by horizontal steps and platform to access to the roof without climbing.

It has intermediate platforms each 2 rings (2240mm).

The maximum distance between platforms according to the rule is 3m.

A simple ladder (vertical ladder H=1140mm) to enable the access from the last platform to the roof.



PARTS AND MATERIALS

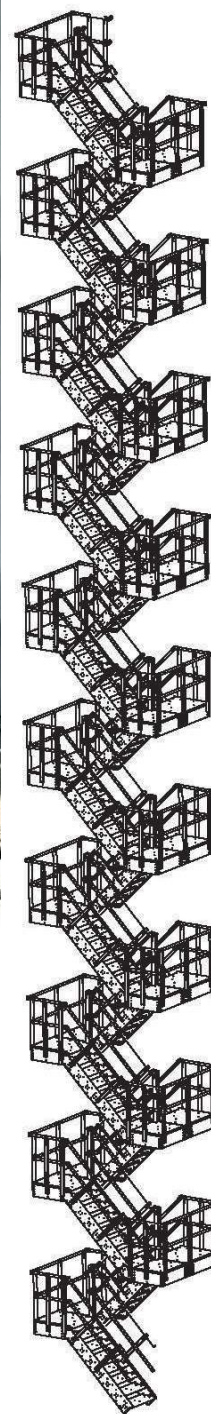
- 1 INTERMEDIATE PLATFORM**
 - Sheet with holes
 - Dimensions: 1200x690 ó 1000x690 mm
 - Each 2280 mm according to the rule EN ISO 14222
 - Material: galvanised steel S280GD Z 600 e= 3 mm
- 2 RUNG**
 - Sheet with holes
 - Dimensions: 270x690 mm
 - Material: galvanised steel S280GD Z 600 e= 2 mm
- 3 CURVE HANDRAIL**
 - Curved pipe Ø48x1.5x3000 mm
 - Material: galvanised steel S280GD Z 275
- 4 OUTSIDE AND INSIDE STRINGER**
 - Material: galvanised steel S280GD Z 600 e= 2 mm
- 5 SUPPORT FOR INSIDE STRINGER**
 - Material: galvanised steel S280GD Z 600 e= 3 mm

ZIG ZAG STAIRS

ACCESSORIES STAIRS



FILE 6.16
VERSION 1
COD.
11/05/2020



TECHNICAL CHARACTERISTICS

Access stairway to the catwalks.

Footprint against footprint ladder with an inclination of 38° and landings every 1500 mm.

It has protection rails and foot angle on the rest platforms.

The height is adjustable as required.

It is a modular system that allows configuring any installation.

VISTA 3D
GENÉRICA

REST
PLATFORM

ACCESSORIES
STAIRS



FILE 5.17
VERSION 1
COD ASPLAT
13/11/2019

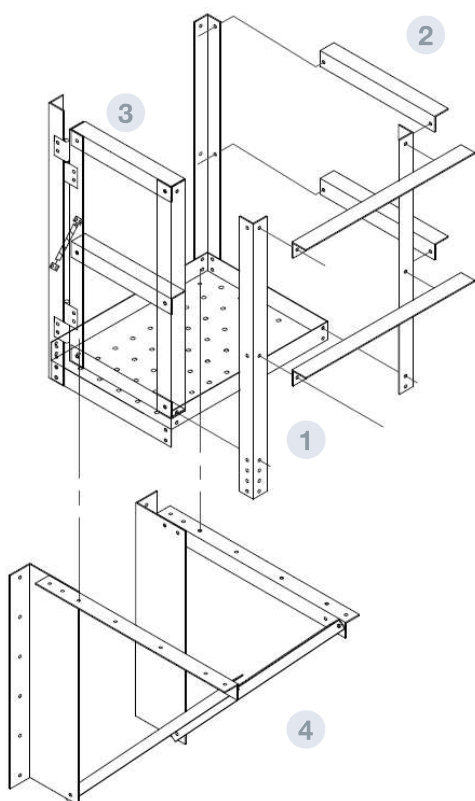


TECHNICAL SPECIFICATIONS

Rectangular platform to go into the silo through the access door or to rest on the vertical way of the ladder (when the ladder is higher than 10m).

The floor can be a sheet with holes or a Tramex structure.

Includes handrail and a door side on it.



PARTS AND MATERIALS

- 1 FLOOR
 - Dimensions: 1100x800 mm
 - Material: galvanised steel S 280 GD Z 600MAC e= 3 mm
- 2 HANDRAIL
 - Material: galvanised steel S 280 GD Z 600MAC e= 3 mm
- 3 DOOR SIDE
 - Material: galvanised steel S 280 GD Z 600MAC e= 3 mm
- 4 SUPPORT
 - Material: galvanised steel S 280 GD Z 600MAC e= 3 mm

TEMPERATURE MONITORING SYSTEM

ACCESSORIES ADDITIONAL SYSTEMS



FILE 5.30

VERSION 1

COD. ASTEMPA,ASTEMPA2,ASTEMSONDA, ASSOFTSCADA,
ASMETEREO, ASRELE, ASTEMPP, ASSOPTEMP01,
ASCONSONA300/5, ASCONSONAD300/5
07/01/2020



TECHNICAL SPECIFICATIONS

Several probes hanging from the roof with thermal sensors along its length.

These detectors communicate with the electronic boxes, named multiplexors, that gain the information provided from some probes and transmit it to the multiplexing boxes to address it directly to the control room by an interface RS232-USB/RS485 that is connected to a PC where the software is. That software manages input and output signals.

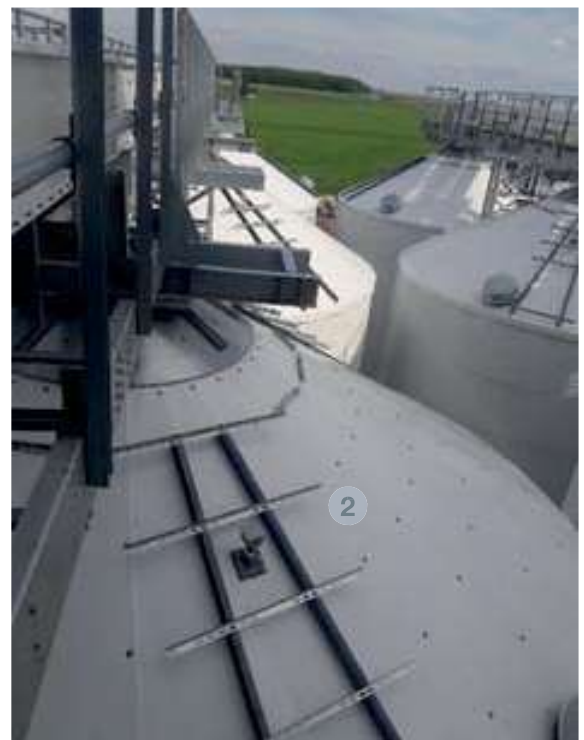
The detectors can be analogic, detecting only temperature. Digital option to detect temperature and humidity. With an error, percentage can check the grain level.

BENEFIT

- Better control of the grain status (temperatura and humidity).
- Better knowledge of the aeration necessities.

PARTS AND MATERIALS

- 1 TEMPERATURE CABLE.
- 2 SUPPORT
- 3 SOFTWARE

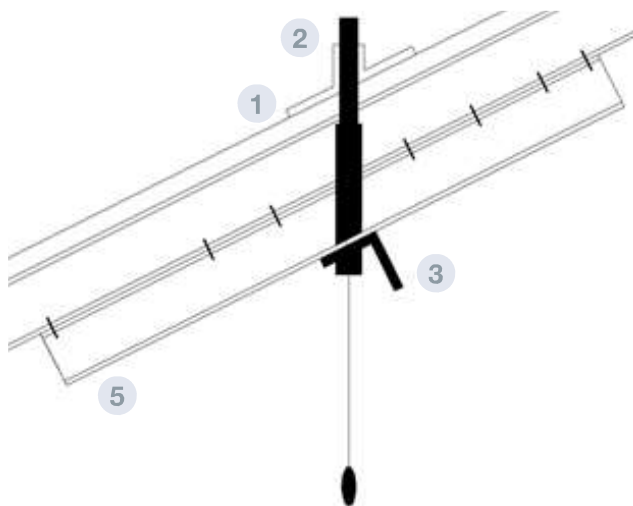


SUPPORT FOR PROBE

ACCESSORIES ADDITIONAL SYSTEMS



FILE 5.31
VERSION 1
COD.
25/10/2019



TECHNICAL SPECIFICATIONS

Structure designed for distributing the loads of the probes between two roof rafters.

For its installation, fixing the support for temp. cable (3) to two roof rafters, install the close sheet (1) on the roof sector and place the tube for temp. cable (2) between the close sheet and the support.

In the self-supporting roofs, the support for the temp. cable is placed between the roofs reinforcements (4), in structural roofs on the rafter reinforcement (5).

When one temperature probe is located on the silo center, one special support is placed on the inlet cover. This kind of support, allows us to take out the probes from the upper part of the roof, making the maintenance easier.

PARTS AND MATERIALS

- 1 CLOSE SHEET**
 - Tube 1 ½" welded to a sloped sheet (30°) for its fixing to the silo roof.
 - MATERIAL: Galvanized Steel S275JR
- 2 TUBE FOR TEMPERATURE CABLE**
 - Welded tube (1") to an anchor plate inclined 60° to be connected to the Support for temp. cable and act as a guide for the probe.
 - This tube is threaded at the end (thread 1" GAS) in order to make the connection to all kind of probes easier.
 - MATERIAL: Galvanized steel S275JR + PAINT
- 3 SUPPORT FOR TEMPERATURE CABLE**
 - Profile "L" 100x100x10
 - MATERIAL: Galvanized steel S275JR + HDG
- 4 ROOF REINFORCEMENT**
 - "C" profile, cold rolled profile.
 - Se coloca bajo la onda de techo para aumentar su resistencia
 - MATERIAL: Galvanized steel S280 GD Z600 MAC t= 2.5 mm
- 5 RAFTER REINFORCEMENT**
 - SIGMA profile 250 mm

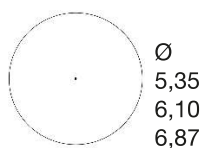
PROBES DISTRIBUTION

ACCESSORIES ADDITIONAL SYSTEMS

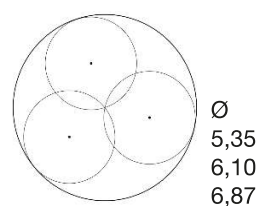


FILE 5.32
VERSION 1
08/10/2019

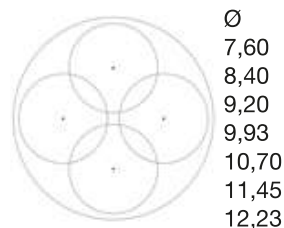
1 CENTRAL PROBE



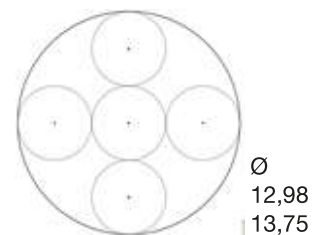
1 CENTRAL PROBE



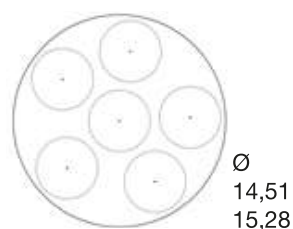
3 LATERAL PROBE



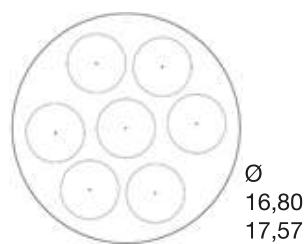
4 LATERAL PROBE



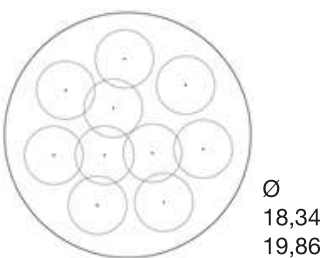
1 CENTRAL PROBE
4 LATERAL PROBE



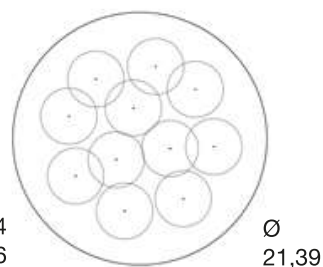
1 LATERAL PROBE
5 LATERAL PROBE



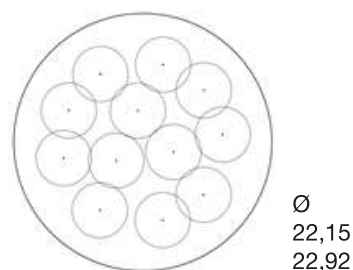
1 Sonda LATERAL
6 SONDAS LATERALES



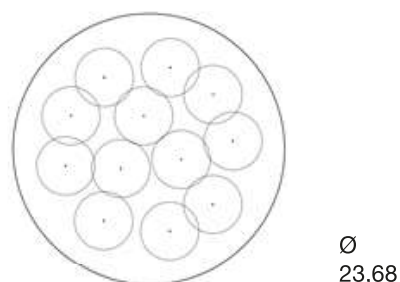
3 PROBES IN 1º RADIUS
7 PROBES IN 2º RADIUS



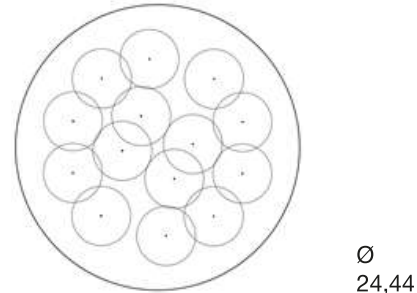
3 PROBES IN 1º RADIUS
8 PROBES IN 2º RADIUS



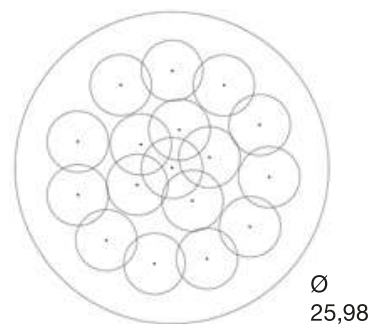
3 PROBES IN 1º RADIUS
9 PROBES IN 2º RADIUS



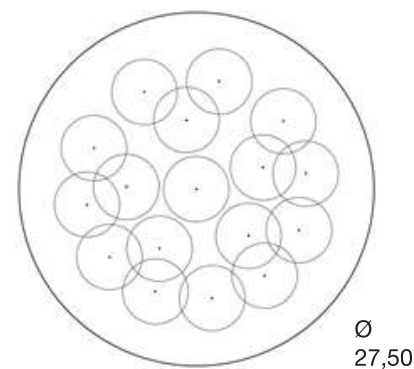
4 PROBES IN 1º RADIUS
0 PROBES IN 2º RADIUS



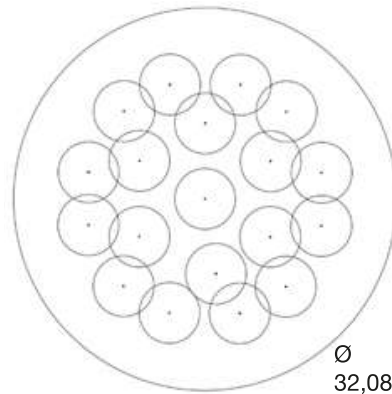
1 CENTRAL PROBE
5 PROBES IN 1º RADIUS
11 PROBES IN 2º RADIUS



1 CENTRAL PROBE
5 PROBES IN 1º RADIUS
11 PROBES IN 2º RADIUS



1 CENTRAL PROBE
5 PROBES IN 1º RADIUS
11 PROBES IN 2º RADIUS



MAXIMUM MINIMUM LEVEL SENSOR

CYLINDER



FILE 5.29

VERSION 1

COD ASNIVELM122-220 ASSOPMEM

ASDETROT ASDETROTTECH ASDETROTPAR

ASDETCAPTECH ASDETCAPPAR ASDETPEN ASDETFIN

07/01/2020

TECHNICAL SPECIFICATIONS

4 types of sensors indicating max-min grain level inside the silo.

A MEMBRANE LEVEL SENSOR:

- Used as min-level detector. It is not recommended as max-level detector.

OPERATION The pressure applied by the grain on a membrane, activates a switch and sends a signal.

- It is installed either on the silo wall or on the hopper.
- The connection to the silo is done with a positioning plate.

B PENDULAR LEVEL SENSORS:

- Used as max-level detector.

OPERATION Due to the slope generated by the grain, the cone is displaced, activating a switch located at the end of the bar.

- Installed on the roof with a flange support.
- Very strong, simple and do not need power.
- The connection to the silo is done with a flange support.

C ROTATIVE LEVEL SENSORS

- Used as max-level and min-level detector (SOLIDO 500)

OPERATION The blade is turning until the grain blocks the movement, and afterwards, sends a signal.

- As max-level detector, it is installed on the roof, with an extension in order to reach the grain, with a threaded level indicator 1 ½".
- Much more sensitive than de membrane ones, but requires power and maintenance.
- Connection to the silo is done by a thread 1 ½".

D CAPACITIVE LEVEL SENSORS

- Used as max-level and min-level detector.

OPERATION Generate a signal while changing the conductivity of the surrounding environment of the device.

- Supplier : Endress Hauser
- Very expensive and power is needed.
- Connection to the silo is done by a thread 1 ½" for the max-level detector and 1" for the min-level detector.

PN 60, PN 100 o PN 200



LEVEL SENSOR SUPPORTS

ACCESSORIES CYLINDER



FILE 5.19

VERSION 1

COD ASSOPBRIDN80 ASSOPMEM

ASSOPROSTECH ASSOPAR

14/11/2019

TECHNICAL SPECIFICATIONS

They are classified according to silo connection.

Supports:

A MEMBRANE DETECTOR

This detector is installed over the bodysheet without any support

B ROTATIVE LEVEL INDICATOR SUPPORT

To connect rotative level detectors (minimum capacity)

PARTS AND MATERIALS

- Painted sheet. S275 JR e= 5mm
- Thread
- $\varnothing(\text{ext}) = 55\text{mm}$
- DIN 2986
- Female thread BSP GAS 1 1/2"

C THREADED SUPPORT FOR ROOF/ HOPPER

To hanging, capacitive or rotative detectors with extension

PARTS AND MATERIALS

- Painted sheet. S275 JR e= 3mm
- Thread
- $\varnothing(\text{ext}) = 55\text{mm}$
- DIN 2986
- Female thread BSP GAS 1 1/2" ó 1"
- To change thread 1 1/2" to 1" it's necessary an adapter

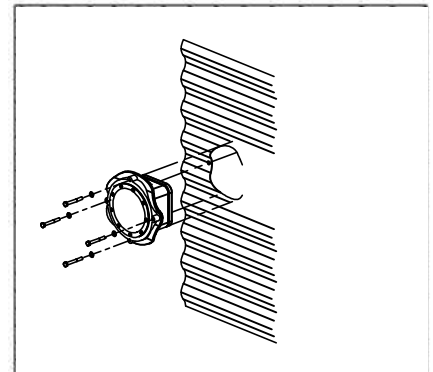
D FLANGE SUPPORT

To radar or special detectors

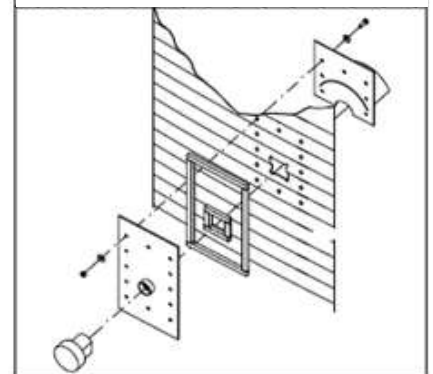
PARTS AND MATERIALS

- Steel sheet fixed on the roof. Galvanised sheet. S275 JR. e= 5mm
- Galvanised steel pipe. S275 JR. $\varnothing(\text{ext}) = 106\text{mm}$. e= 6mm.
- Circular steel sheet defined by the customer. Galvanised steel. S275 JR. e= 5mm
- PN 100 DR 16. Geometry according to PN 60, PN 100 o PN 200

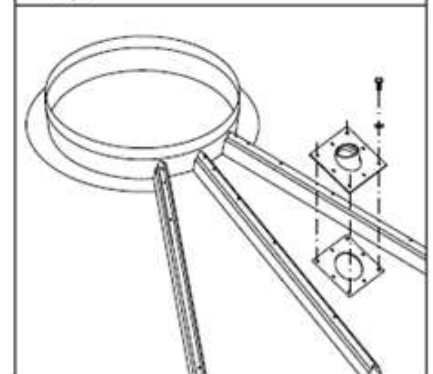
A



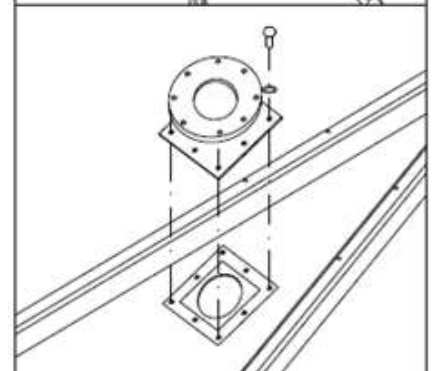
B



C



D



VENTING SYSTEM

ACCESSORIES ADDITIONAL SYSTEMS



FICHA 5.13
VERSIÓN 1
COD ASKITO0460
13/11/2019



TECHNICAL SPECIFICATIONS

System to reduce the damage of an explosion on the silo.

On the roof, 1 of each 3 roof waves are weakened, through polyamide PA66 M8x30(8.8) bolts, to let the silo be opened and lead the explosion outside.

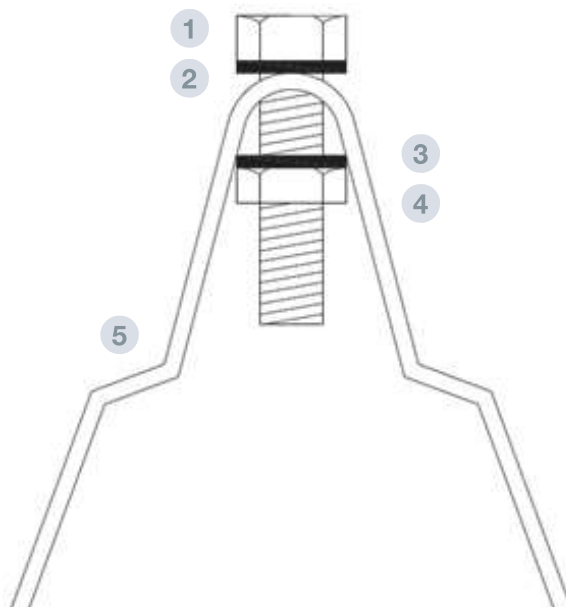
Certificated to diameters lower than 17.57m by the German institute FSA (FSA 15 ATEX 1664X) according the rule EN 14797:2007.

Vented area is calculated according to the rule EN 1449T on wheat.



PARTS AND MATERIALS

- 1 POLYAMIDE PA66 M8X30(8.8) BOLT
- 2 WEATHERSEAL WASHER
- 3 FLAT WASHER
- 4 POLYAMIDE NUT
- 5 ROOF SECTOR
 - Trapezoidal folded plate with waves on the edges to be assembled between them
 - It's the main part of the silo roof
 - MATERIAL: galvanised steel S280GD ZM310 MAC e= 0.8mm



**SWEEP
AUGER**

**ACCESSORIES
ADDITIONAL
SYSTEMS**



FILE 5.49

VERSION 1

COD. ASCLESCR, ASPARKDET, ASNIVDET, ASS1400460, ASS1700460

20/01/2020



TECHNICAL SPECIFICATIONS

Worm screw turning inside of the silo evacuating the natural grain slope remaining inside.

MODELS

- ① **TYPE S**
 - Motor located inside of the silo. ATEX 21
- ② **TYPE SCD**
 - Motor located outside of the silo.
 - Atex 20. Inside of the silo
 - Atex 21. Outside of the silo

TYPES DEPENDING ON THE MATERIAL

- ① **TYPE S**
 - For wheat, maize, barley, oat, colza and sunflower seed
- ② **TYPE SCD**
 - For wheat, maize, barley, oat, colza and sunflower seed
- ③ **TYPE SCD REINFORCE**
 - Reinforced structure with lower rpm so lower capacities as well.
 - Designed for soybeans, green peas, pellets and paddy rice.

ERECTION TOOLS

ACCESSORIES ADDITIONAL SYSTEMS



FICHA 5.53
VERSIÓN 1
COD.
14/10/2019



TECHNICAL SPECIFICATIONS

Set of tools needed for the assembly. Consisting of:

1 CENTRAL POST

- Telescopic tube, variable length depending on the silo model.
- Used in order to Support the roof collar before placing the roof sector or roof rafters.

2 JACKS

- Used for lifting the silo.
- Can be of 3 or 5 Tn. There is one in each bodysheet minimum.
- Fixing parts for lifting are included.

3 CHAIN BLOCK

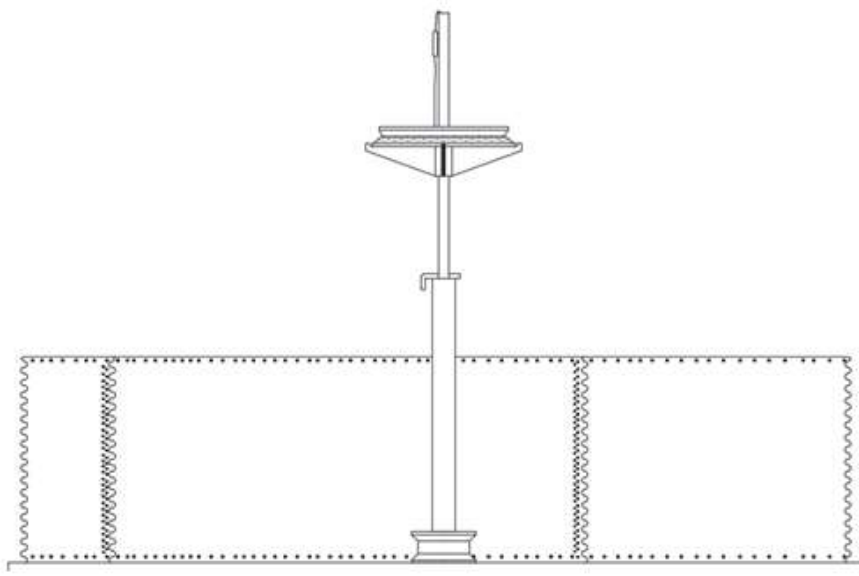
- Pulleys that lift the silo up.
- Manual
- Yale brand. Certificate CE

4 ELECTRONICS TOOLS

- Impact wrench
- Drill

5 MANUAL TOOLS

- Hammer
- Adjustable wrench



AERATION GUTTER SYSTEM SBH

ACCESSORIES AERATION SYSTEM



FILE 5.33

VERSION 2

COD. ASBH0460AY, ASBH1070A, ASBH1451AH, ASBH3208H315,
ASBH0A, ASBH0460AC, ASBH300AT, ASBH0460AY10, ASBH1070AY10,
ASBH1451AH10, ASBH3208AH310, ASBH0460AC10, ASCE0300AT10

12/01/2021

TECHNICAL SPECIFICATIONS

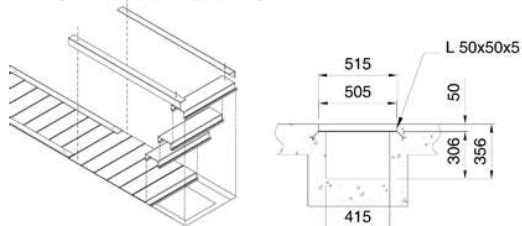
Group of channels and structures located at the silo bottom for its aeration from the bottom to the roof.

Channels are covered by the floor planks (1) drilled with $\varnothing 1.5\text{mm}$ holes (R3T1.5) and $\varnothing 1\text{mm}$ holes (R2T1).

The 1mm floor planks cannot be installed in silo with bottom pressures bigger than 8 Tn/m^2 . The 1,5mm ones are capable of withstanding bigger pressures (12 Tn/m^2).

The drilling percentage is 23%.

Y. STANDARD AERATION



TYPES

A TYPE Y

- Made by a group of Y channels for 1 fan connection only.
- Channels width is 505mm.
- 9% of the aeration surface on the total bottom silo surface.

B TYPE H

- Made by a group of H channels for either 1 or 2 fan connection.
- Channels width is 505mm.
- 12% of the aeration surface on the total bottom silo surface.

C TYPE HA (HIGH PERFORMANCE AERATION SYSTEM)

- Made by a group of H channels for either 1 or 2 fan connection.
- Channels width is 705 mm.
- Floor planks are supported on "V" supports.
- La superficie de ventilación es del 18% sobre el total de la superficie del fondo del silo

D TYPE C

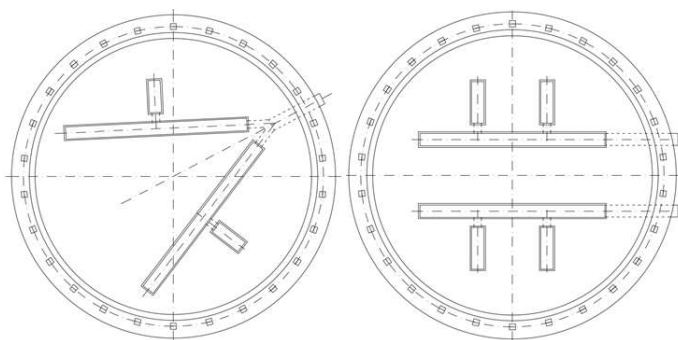
- For conical bottom silos.
- Made by channels with same dimensions as Y and H

G TYPE G: YG, HG, HAG

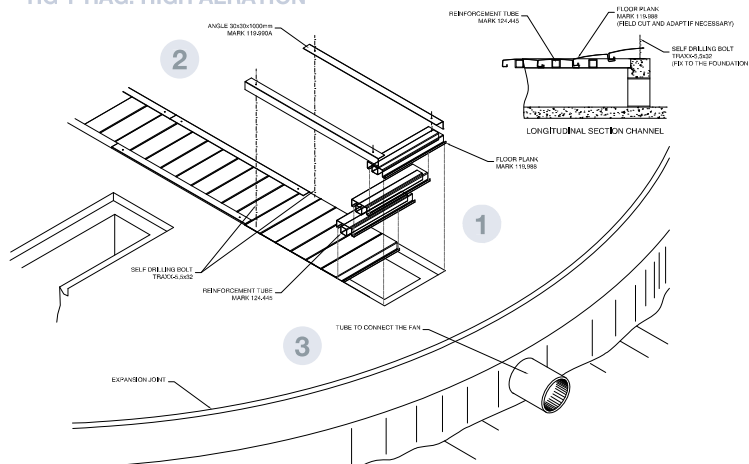
- We have reinforced models that allow higher loads.

CHARGE OF DIFFERENT SYSTEMS

TIPO	H	\varnothing/e	Tn/m2
H	500	1,5	12
HA	700	1,5	12
HAG	700R	1,5	20
H	500	1,0	8
HG	500R	1,0	9
HA	700	1,0	8
HAG	700R	1,0	15



HG Y HAG. HIGH AERATION



PARTS AND MATERIALS

1 FLOOR PLANKS

- Folded sheet structures with 1mm or 1,5mm perforations. L= 500 mm (standard aeration) L= 700 mm (high aeration)
- MATERIAL: Galvanized steel S280 GD Z 275 MACO

2 ANGLES

- Folded steel sheet profiles $t= 1.5 \text{ mm}$
- Dimensions: 30x30x1000 mm
- MATERIAL: Galvanized steel S280 GD Z600 MAC

3 "V" SUPPORTS

- Structure made of angular and rounded profiles for floor planks supporting.
- MATERIAL: Galvanized steel S275 JR

FULL PERFORATED FLOOR

ACCESSORIES AERATION SYSTEM

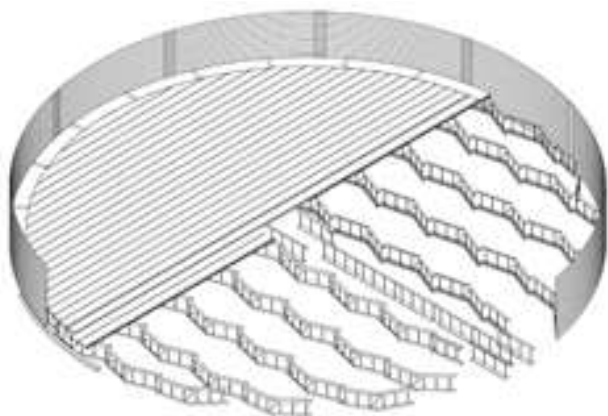


FILE 5.36

VERSION 1

COD. ASBH0300/03FAF15-10

08/01/2020



PARTS AND MATERIALS

- 1 FLOOR PLANK**
 - Folded floor planks with variable lenght and 177 mm effective width connected to each other.
 - Material: Galvanized steel S280 GD Z 275 MACO t= 1 or 1.5mm
- 2 FOOT PROTECTION**
 - Folded steel sheet for the floor plank- bodysheet connection
 - Material: Galvanized steel S280 GD Z 600 MACO t= 2mm
- 3 V SUPPORT**
 - Structure formed by tubular and angular profiles for the floor planks attachment.
 - Material: Galvanized steel S275 JR
- 4 SINGLE SUPPORT**
 - Structure formed by tubular and angular profiles for the floor planks attachment.
 - Material: Galvanized steel S275 JR
- 5 DOUBLE SUPPORT**
 - Structure formed by tubular and angular profiles for the floor planks attachment.
 - Material: Galvanized steel S275 JR
- 6 FLOOR PLANK SHIM**
 - Perforated sheet for floor planks connection closing.
 - Material: Galvanized steel S280 GD Z 600 MAC
- 7 CORRUGATED SHEET WITH TUBE**
 - Rectangular tube bolted to the bodysheet for the fan connection.
 - Material: Galvanized steel S275 JR
- 8 FAN TRANSITION (SUPPLIED WITH THE FAN)**
 - Connection system – fan
 - Material: Galvanized steel S275 JR

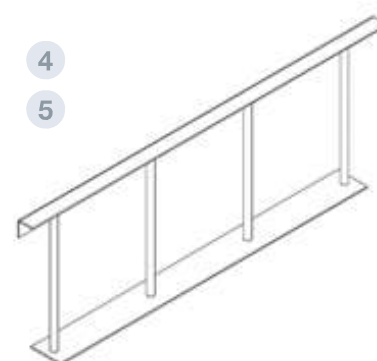
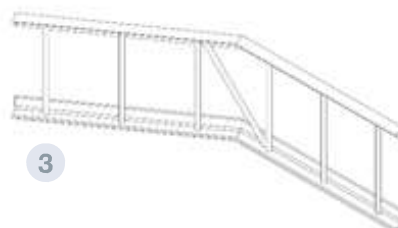
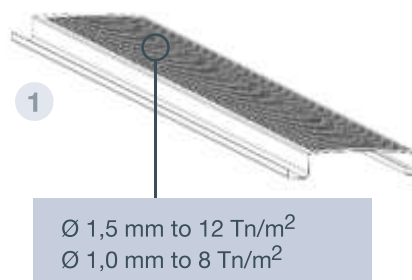
TECHNICAL SPECIFICATIONS

Perforated sheet located over the supports (V supports, single or double) creating an air chamber and gain a better aeration distribution.

Its base is formed by floor planks 351mm above the ground. Adjustable if needed.

Fan connection is done in a bodysheet of the first ring, through a sheet for adjustment.

"V" supports are used on the whole silo base, excepting where the grain conveyors are located. Those ones will be marked out with single and double "V" supports.



VENTILATED CONE

ACCESSORIES AERATION SYSTEM

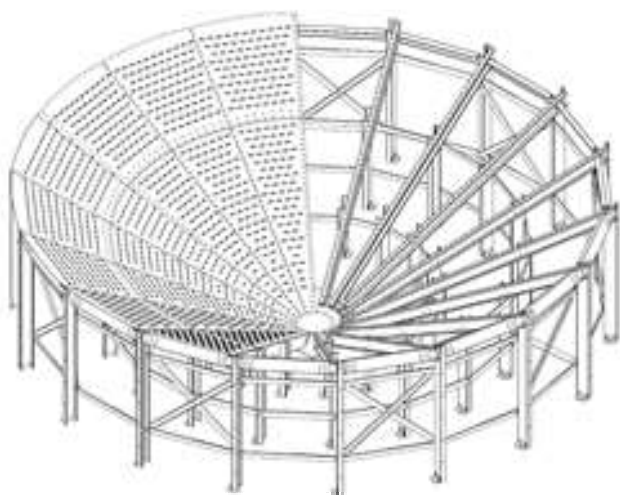


FILE 5.35

VERSION 1

COD. ASBH0300VENCOS530-545

08/01/2020



PARTS AND MATERIALS

1 HOPPER SECTORS

- There are foldings (A) allowing air flowing and avoiding grain penetration.
- MATERIAL: Galvanized steel S280 GD Z600 MAC

2 PILLARS

- "C" profiles $t = 2$ mm
- MATERIAL: Galvanized steel S280 GD Z 600 MAC

3 CROSS BEAMS

- "C" profiles of folded Steel sheets.
- Thickness of 2mm until silo model 6.10 and 3 mm onwards.
- MATERIAL: Galvanized steel S280 GD Z 600 MAC

4 BEAMS T30/T45

- "C" profiles.
- Thickness 2mm until silo model 7.60 and 3 mm onwards.
- MATERIAL: Galvanized steel S280 GD Z 600 MAC

5 TRANSITION SHEET

- Steel sheet with dimensions: 1000x1000x10 mm
- MATERIAL: Galvanized steel S275 JR

6 BRACING

- Folded steel sheet $t = 2$ mm
- MATERIAL: Galvanized steel S280 GD Z600 MAC

7 CENTRAL PILLAR

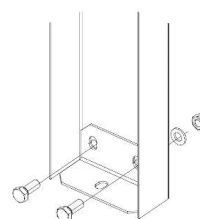
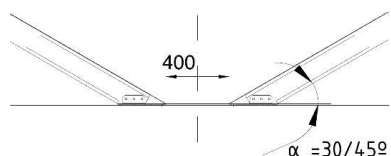
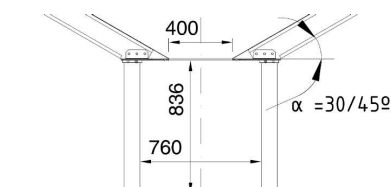
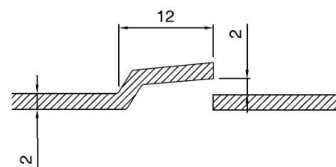
- HEB 100 profiles with anchor plates for its attachment to the foundation and the transition sheet $L = 836$ mm.
- MATERIAL: Galvanized Steel S275 JR

TECHNICAL SPECIFICATIONS

Aeration system consisting of an inner hopper supported by a pillars structure, beams and bracings. It allows a complete aeration of the silo with the unloading conditions of a hopper.

Qualities:

- The hopper is made of aeration sectors, trapezoidal steel sheets with folded parts avoiding gran penetration downwards.
- The slope could be 30° o 45° .
- Outlet diameter 400mm.
- Can be at the ground or elevated.
- When the hopper is elevated, the distance to the ground is 836mm and between supports is 760mm.
- Available diameters for SBH 460, 535, 610, 687, 760, 840, 920 and max height: 14 rings.
- It includes, access door, anchors and close angle. Optionally, sheet with pipe can be supplied for fan connection.



ROOF VENT

ACCESSORIES AERATION SYSTEM



FILE 5.5
VERSION 1
COD ASAIRETC-ASAIREF-
ASAIREFC-ASAIRED
12/11/2019

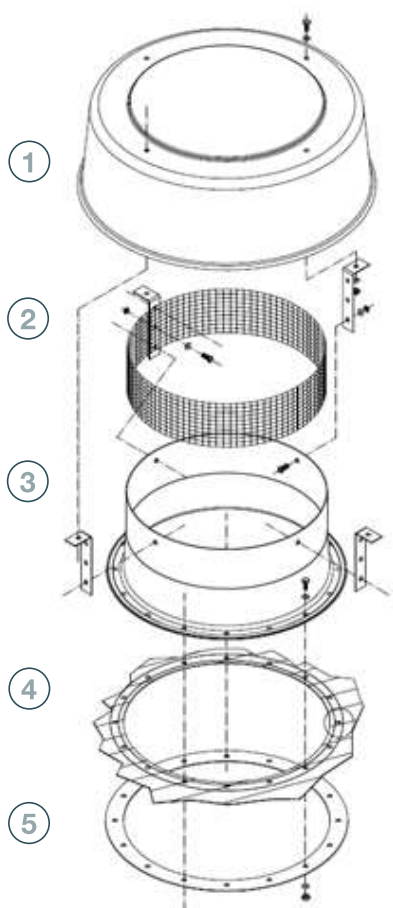


TECHNICAL SPECIFICATIONS

Aeration roof system to make the air flows on the silo's top and stop the rain and snow.

It's designed to maintain a constant flow on all the height with a constant area along its height.

It's installed over special roof sectors, with a hole of Ø420 mm.



PARTS AND MATERIALS

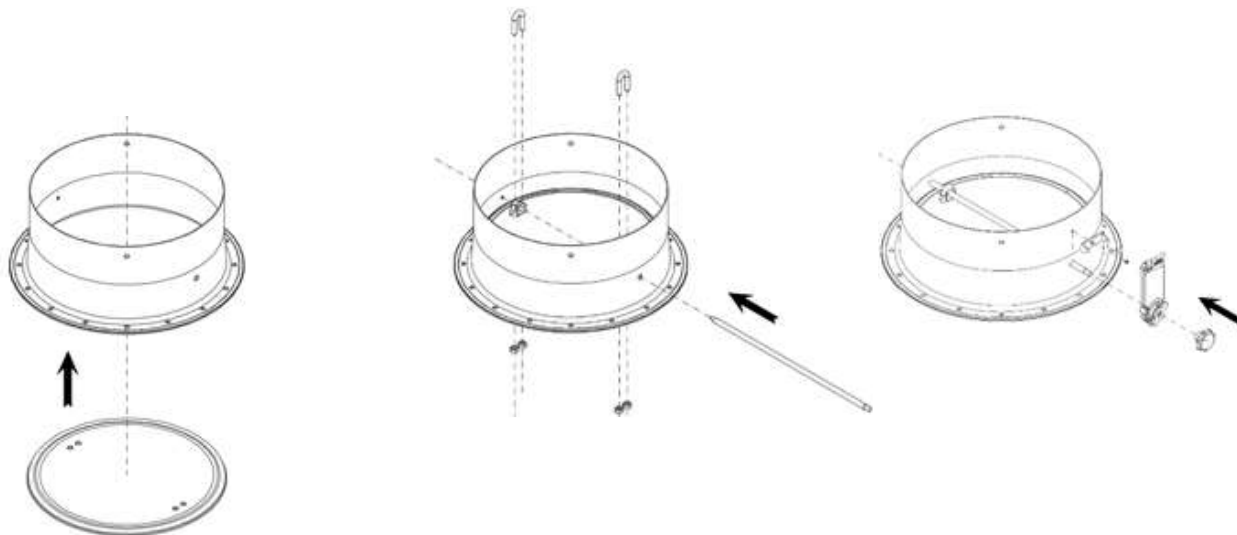
- ① **TOP COVER FOR AERATION**
 - External protection join to the body through the clips
 - MATERIAL: Galvanised steel DDP + HDG e= 2mm
- ② **CLIP**
 - Bent sheet to join the top cover and the body
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm
- ③ **MESH**
 - Galvanised mesh (10x10x0,8) installed over the body
- ④ **BODY**
 - Standard roof sector with a hole (Ø420 mm)
 - MATERIAL: Galvanised steel S280GD ZM310 MAC e= 0.8mm
- ⑤ **FLANGE**
 - Circular sector to ensure the body
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm

ROOF VENT FOR FUMIGATION

ACCESSORIES AERATION SYSTEM



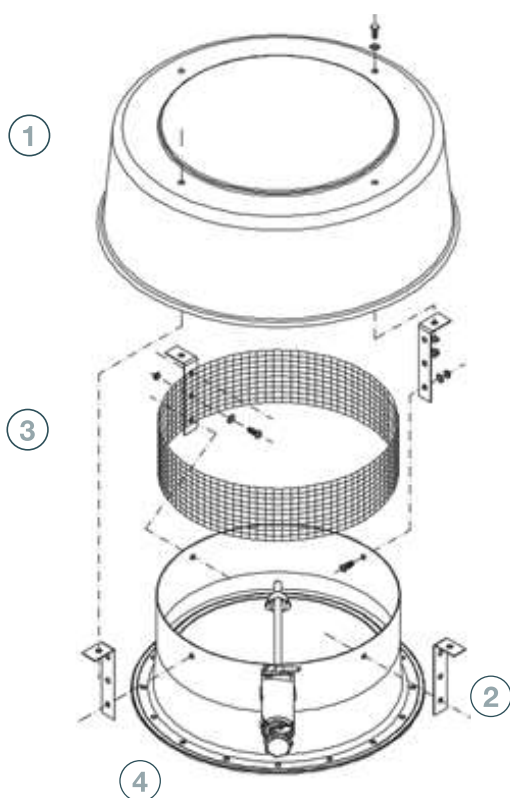
FILE 5.6
VERSION 1
COD ASAIRETC-ASAIREF-
ASAIREFC-ASAIRED
12/11/2019



TECHNICAL SPECIFICATIONS

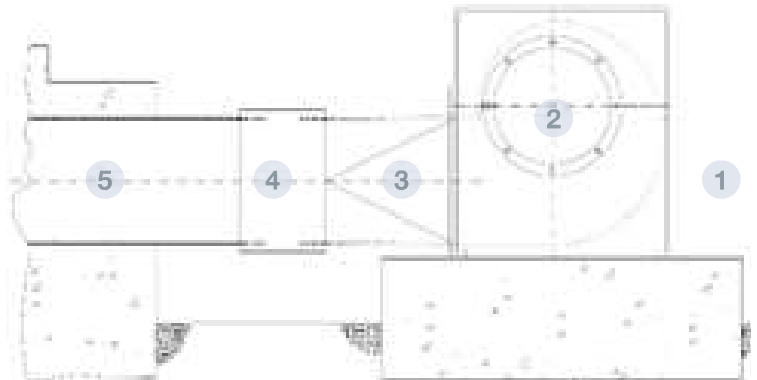
Roof aeration with a motor gate to open and close.

To make fumigation treatments.



PARTS AND MATERIALS

- 1 TOP COVER
 - External protection of the system
 - MATERIAL: galvanised steel S280 GD Z600 MAC e= 1.5mm
- 2 CLIP
 - Bent sheet to join the top cover and the body
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm
- 3 MESH
 - Galvanised mesh (10x10x0,8) installed over the body
- 4 BODY WITH GATE
 - Aeration channel installed over the roof sector
 - It has a gate to open and close the system
 - MATERIAL: galvanised steel DDP + HDG e= 2mm
- 5 ROOF SHEET FOR AERATION
 - Standard roof sector with a hole (Ø420 mm)
 - MATERIAL: Galvanised steel S280GD ZM310 MAC e= 0.8mm
- 6 FLANGE
 - Circular sector to ensure the body
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm
- 7 MOTOR
 - Circular sector to ensure the body
 - MATERIAL: Galvanised steel S280 GD Z600 MAC e= 2mm
- 8 CLOSURE SYSTEME
 - MATERIAL: Galvanised steel S280 GD Z600 MAC



PARTS AND MATERIALS

- 1 FAN**
 - E3 + IP55. There are two types:
 - MEDIUM PRESSURE (CMR)
 - Centrifugal fans with powers: 2, 3, 5.5, 10, 15, 30 CV
 - HIGH PRESSURE (CAS)
 - Centrifugal fans with powers: 7.5, 15, 25, 50 CV
- 2 FAN INLET**
 - Flange placed at the fan inlet avoiding water and snow entrance.
 - Grid located in the whole inlet section.
 - Supplied with the fan.
- 3 TRANSITION**
 - Rectangular to circular shape transition.
 - Supplied with the fan.
- 4 ELASTIC JOINT**
 - It avoids the vibrations transmission from the fan to the foundation.
 - Supplied with the fan.
- 5 FOUNDATION TUBE**
 - Not supplied by Symaga.
- 6 SHEET WITH PIPE**
 - Optionally supplied by Symaga

TECHNICAL SPECIFICATIONS

AIR SUPPLY SYSTEM

Symaga supplies the needed elements for the fan connection to the silo.

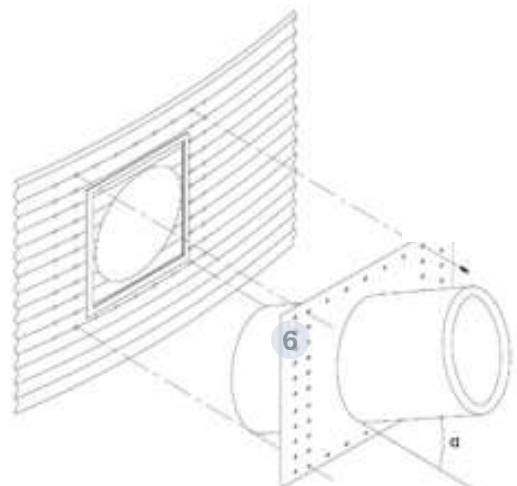
CONNECTIONS

1. SBH AND CONICAL BOTTOM SILO

The fan, supported on an elevated foundation, is connected to the aeration system through an impulsion flange and an elastic joint. Parts: 1,2,3,4 and 5.

2.FULL AERATION FLOOR AND VENTILATED CONE

The fan-silo connection is made in a same way in the silo wall, instead of in the foundation. To do so, a sheet with pipe is installed in the first ring of the silo. Parts: 1,2,3,4 and 6.

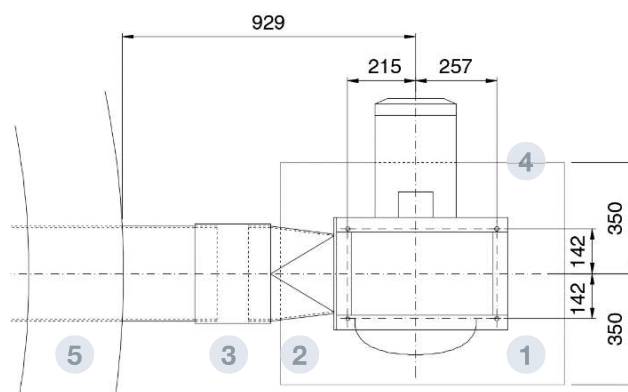
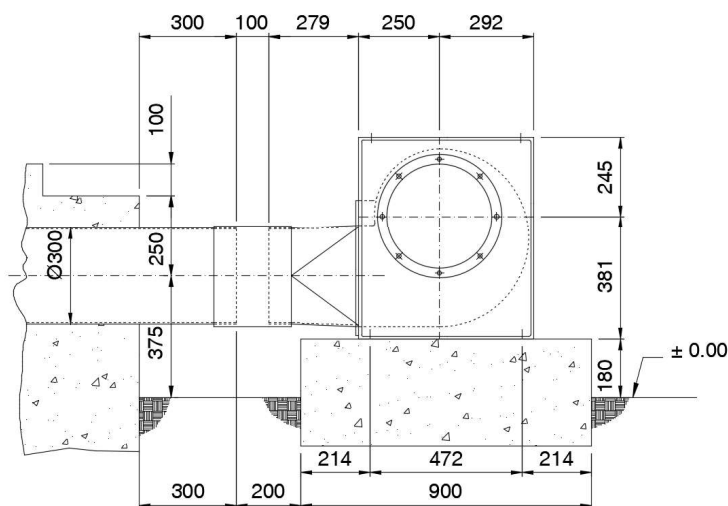


CMR-1031-2T-2HP

ACCESSORIES AERATION SYSTEM



FILE 1.1
VERSION 1
COD. 30CMR10312
05/11/2019



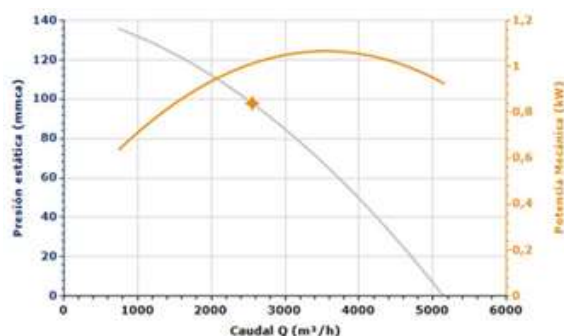
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Performance	54,50%	Nominal Power (kW)	1,5
Performance grade N	64	Hz/phases	50/3
Measurement category	A	Motor (rpm)	2770
Efficiency category	Estático	Poles	2
Specific rete	1,01	Max. Current (A) 230 V	5,34
Flow rate (m³/h)	2553	Max. Current. (A) 400 V	3,07
Pressure (mmca)	98	Motor protection	IP55
Electric power (kW)	1,25	Motor chassis size	90
Speed (rpm)	2845	Motor efficiency	IE3
Speed variator	VSD not	Limit air temperatures	-20 °C →
		Max. Flow rate (m³/h)	5160
		Speed (rpm)	2875
		Approx. weight. (kg)	48
• Established data in max. Efficiency point.		• Data may change. Please check motor	

PARTS

- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FAN INLET
- 5 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)

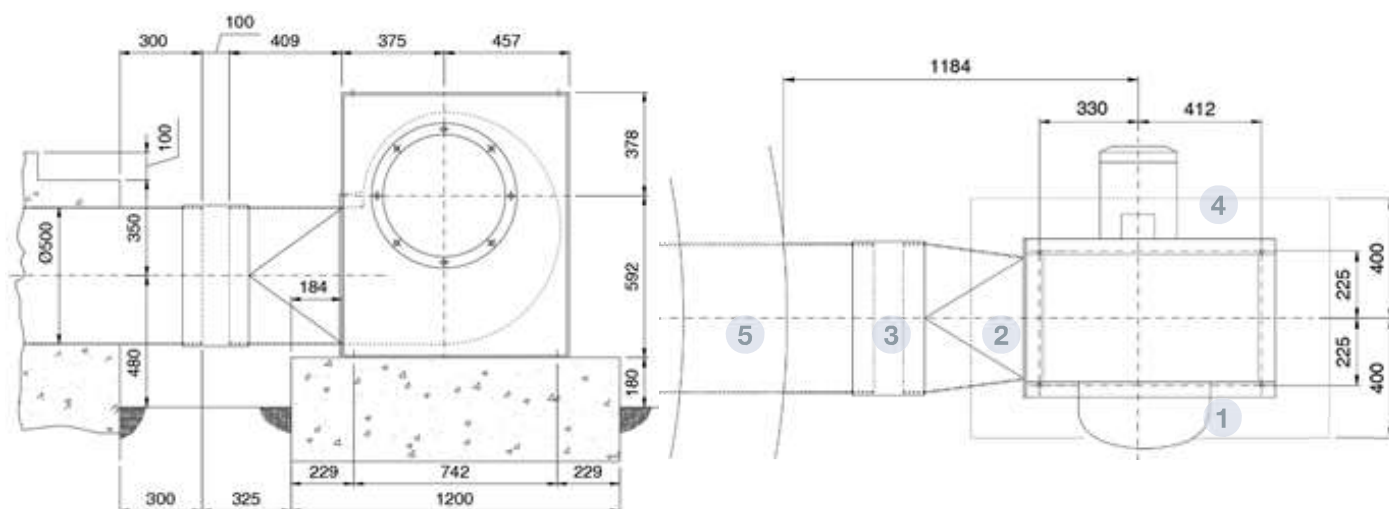


CMR-1650-2T-15HP

ACCESSOIRES
SYSTÈME DE
VENTILATION



FICHE 5.42
VERSION 1
COD. 30CMR14452
14/10/2019



DESCRIPTION

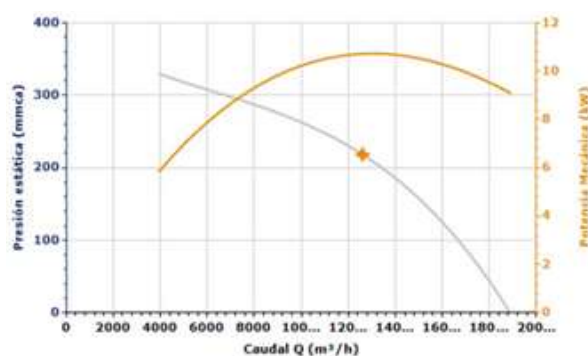
Ventilateur centrifuge à pression moyenne avec une simple aspiration, d'une grande robustesse, équipé d'une turbine à pales arrière. Finition anticorrosive dans la résine de polyester polymérisée à 190 oC.

Dégraissant préalablement avec le traitement nanotechnologique sans phosphate

CARACTÉRISTIQUES TECHNIQUES		DONNÉES MOTEUR	
Performance	67,6%	Puissance mécanique nominale (kW)	11
Classe d'efficacité N	67,5	Hz / phases	50/3
Catégorie de mesure	B	Moteur (rpm)	2940
Catégorie d'efficacité	Total	Polos	2
Relation spécifique	1,02	Courant max (A) 400 V	20,00
Débit (m³ / h)	12602	Courant max (A) 690 V	11,60
Pression (mmca)	237,31	Protection moteur	IP55
Puissance électrique (kW)	12,05	Taille du châssis du moteur	160
Vitesse (tr / min)	2941	Rendement moteur	IE3
Variateur de vitesse	VSD non nécessaire	Limiter les températures de l'air	-20 °C → +120 °C
		Débit maximum (m³/h)	18850
		Vitesse (rpm)	2945
		Poids approx. (kg)	210
		• Données établies au point d'efficacité maximale	

LES PIÈCES

- 1 VENTILATEUR
- 2 TRANSITION
- 3 CONNEXION FLEXIBLE
- 4 JOINT INCLINÉ
- 5 TUBE SUR FONDATION. NON FOURNI PAR SYMAGA

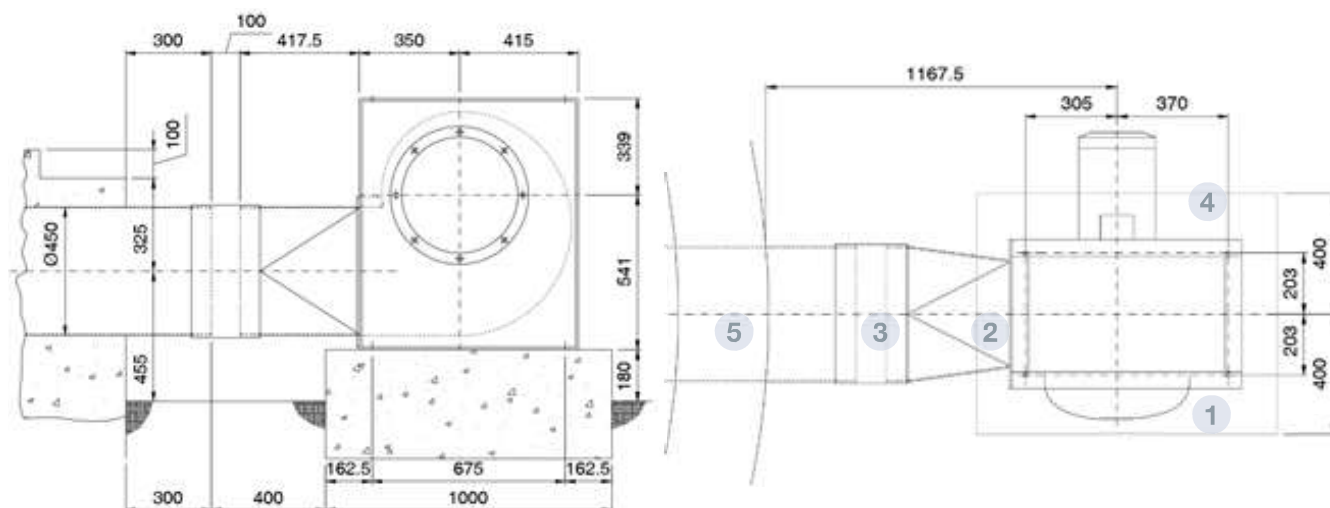


CMR-1445-2T-10HP

ACCESSORIES AERATION SYSTEM

SYMAGA
SILOS

FIILES 5.41
VERSION 1
COD. 30CMR14452
14/10/2019



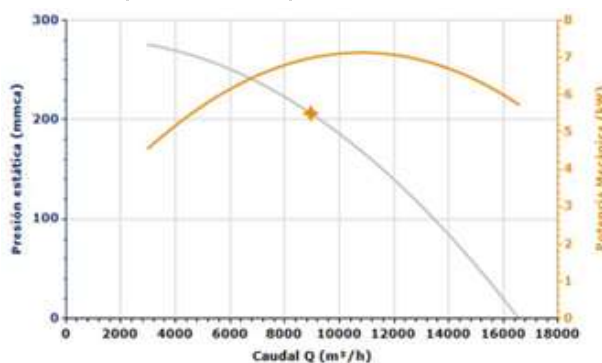
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Performance	63,4%	Nominal Power (kW)	7,50
Performance grade N	64,5	Hz/phases	50/3
Measurement category	A	Motor (rpm)	2870
Efficiency category	Estático	Poles	2
Specific rete	1,02	Max. Current (A) 230 V	14,10,00
Flow rate (m³/h)	8951	Max. Current. (A) 400 V	8,17
Pressure (mmca)	206,50	Motor protection	IP55
Electric power (kW)	7,94	Motor chassis size	132
Speed (rpm)	2879	Motor efficiency	IE3
Speed variator	VSD not	Limit air temperatures	-20 °C →
		Max. Flow rate (m³/h)	16500
		Speed (rpm)	2930
		Approx, weight. (kg)	122
• Established data in max. Efficiency point.		• Data may change. Please check motor	

PARTS

- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FAN INLET
- 5 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)

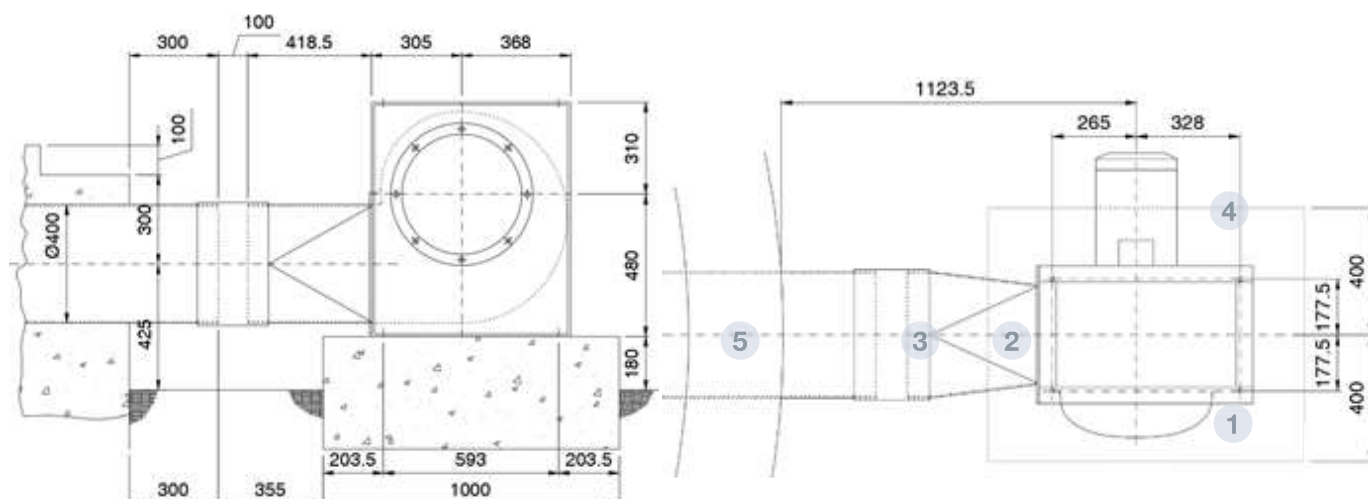


CMR-1240-2T-5,5HP

ACCESSORIES AERATION SYSTEM

SYMAGA
SILOS

FILE 5.40
VERSION 1
COD. 30CMR12402
14/10/2019



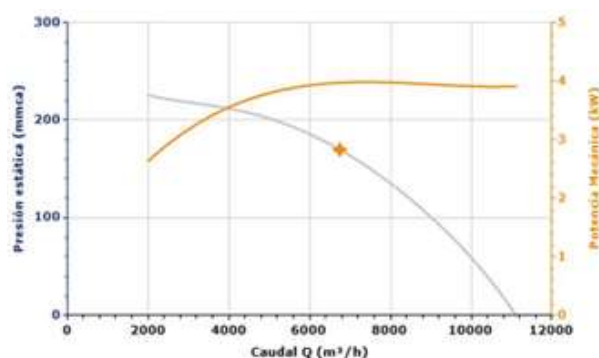
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Performance	67,6%	Nominal Power (kW)	4
Performance grade N	71,1	Hz/phases	50/3
Measurement category	A	Motor (rpm)	2870
Efficiency category	Estático	Poles	2
Specific rete	1,02	Max. Current (A) 230 V	13,00
Flow rate (m³/h)	6744	Max. Current. (A) 400 V	7,50
Pressure (mmca)	169,95	Motor protection	IP55
Electric power (kW)	4,62	Motor chassis size	112
Speed (rpm)	2871	Motor efficiency	IE3
Speed variator	VSD not	Limit air temperatures	-20 °C →
		Max. Flow rate (m³/h)	11100
		Speed (rpm)	2900
		Approx. weight. (kg)	103
		• Data may change. Please check motor	
• Established data in max. Efficiency point.			

PARTS

- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FAN INLET
- 5 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)

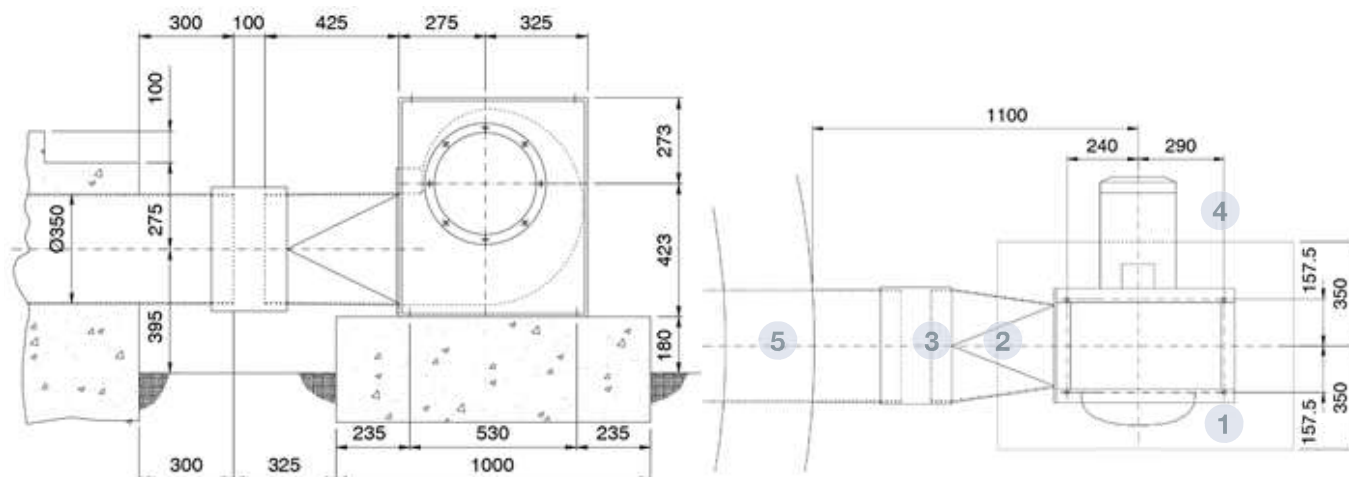


CMR-1135-2T-3HP

ACCESSORIES AERATION SYSTEM



FIILES 5.39
VERSION 1
COD. 30CMR11352
14/10/2019



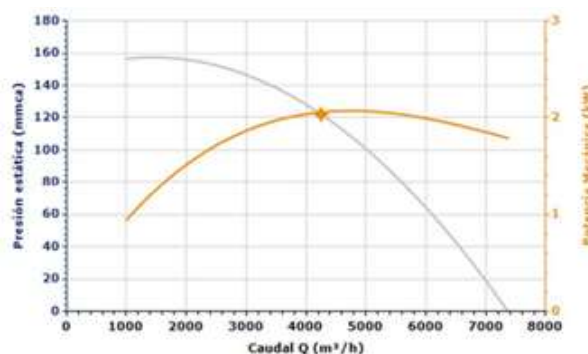
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Performance	57,8%	Nominal Power (kW)	2,20
Performance grade N	64,2	Hz/phases	50/3
Measurement category	A	Motor (rpm)	2885
Efficiency category	Estático	Poles	2
Specific rete	1,01	Max. Current (A) 230 V	7,32
Flow rate (m³/h)	4249	Max. Current. (A) 400 V	4,21
Pressure (mmca)	122,18	Motor protection	IP55
Electric power (kW)	2,45	Motor chassis size	90
Speed (rpm)	2892	Motor efficiency	IE3
Speed variator	VSD not	Limit air temperatures	-20 °C →
		Max. Flow rate (m³/h)	7800
		Speed (rpm)	2910
		Approx. weight. (kg)	59
• Established data in max. Efficiency point.		• Data may change. Please check motor	

PARTS

- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FAN INLET
- 5 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)

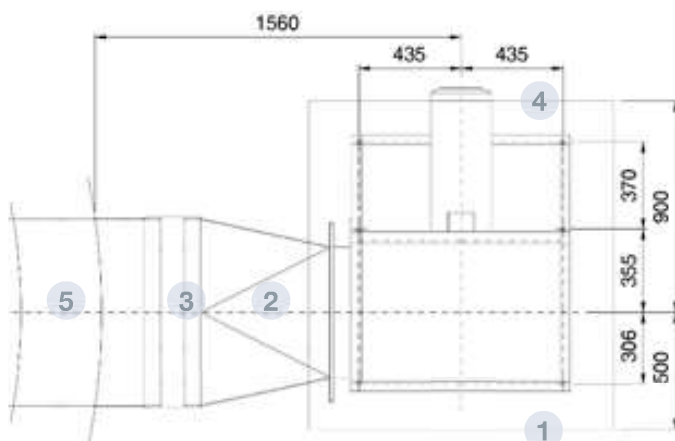
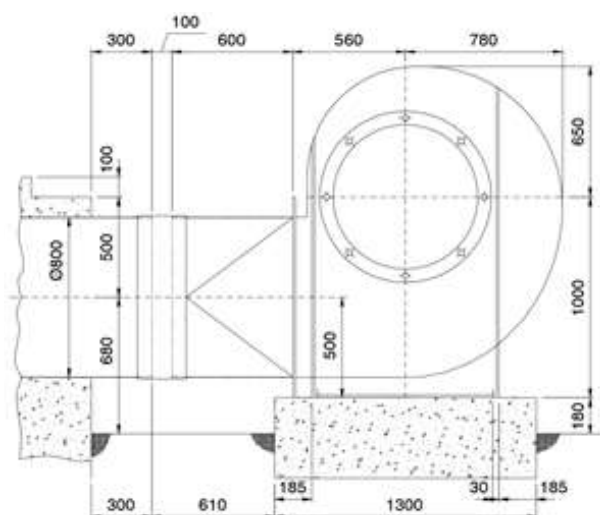


CMR-2380-
800-4T-30HP

ACCESSORIES AERATION SYSTEM

SYMAGA
SILOS

FILE 5.43
VERSION 1
COD. 30CMR23802
14/10/2019



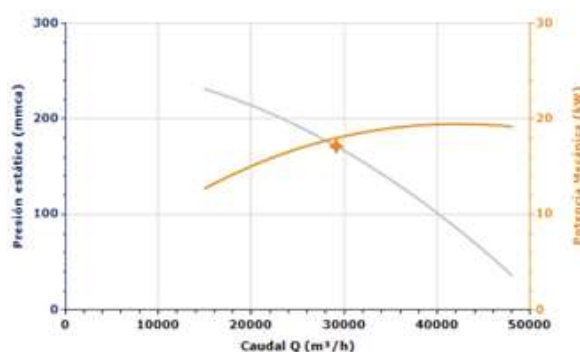
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Performance	78,5%	Nominal Power (kW)	7,50
Performance grade N	77,8	Hz/phases	50/3
Measurement category	B	Motor (rpm)	2870
Efficiency category	Total	Poles	2
Specific rete	1,02	Max. Current (A) 230 V	14,10,00
Flow rate (m³/h)	29118	Max. Current. (A) 400 V	8,17
Pressure (mmca)	1871	Motor protection	IP55
Electric power (kW)	19,351	Motor chassis size	132
Speed (rpm)	1475	Motor efficiency	IE3
Speed variator	VSD not	Limit air temperatures	-20 °C →
Erp	2015	Max. Flow rate (m³/h)	16500
		Speed (rpm)	2930
		Approx. weight. (kg)	122
• Established data in max. Efficiency point.		• Data may change. Please check motor	

PARTS

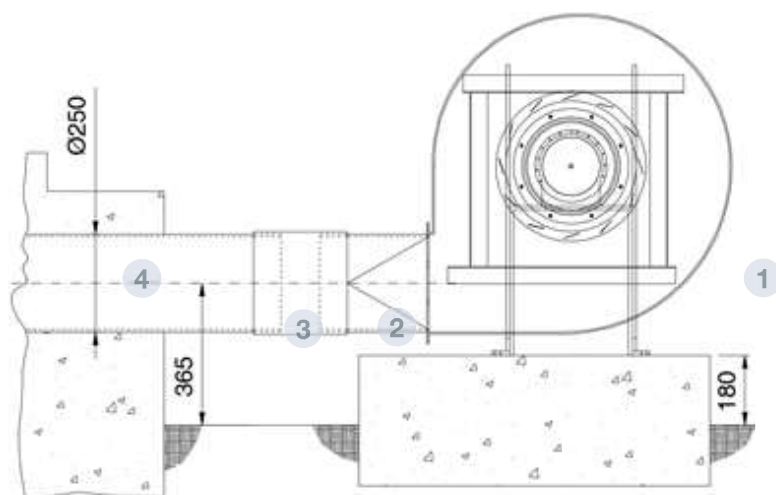
- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FAN INLET
- 5 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)



CAS-1250-2T-15HP

ACCESSORIES
AERATION
SYSTEM


FILE 5.45
VERSION 1
COD. 30CAS12502
14/10/2019



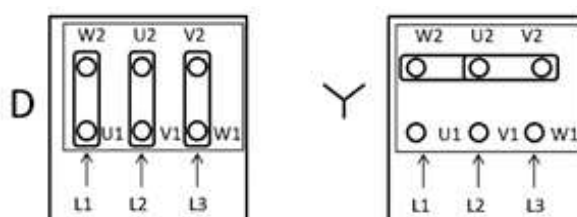
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Flow rate (m³/h)	9274	Nominal Power (kW)	11
Speed (rpm)	2951	Max flow (m³/h)	12000
Performance	69	Hz/phses	50/3
Efficiency grade N	69	Motor (rpm)	2945
Measurements category	B	Max. Current (A) 230 V	20
Efficiency category	Total	Max. Current. (A) 400 V	11,6
Specific rate	1,03	Motor protection	IP55
Pressure (Pa)	2903	Motor efficiency	IE3
Electric power (kW)	10,838	Limit air temperatures	-20 °C → +120 °C
Speed variator	VSD not necessary	Approx. weight. (kg)	252
		Cumplimiento ErP 2015	ErP 2015
• Established data in max. Efficiency point.		• Data may change. Please check motor cover	

PARTS

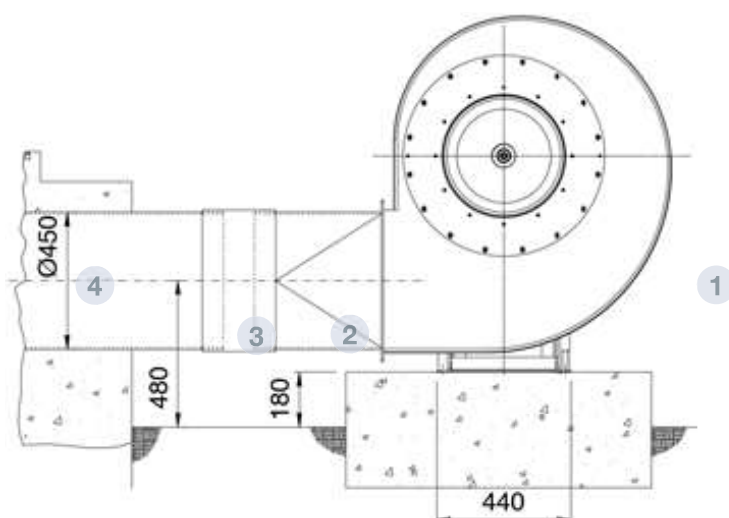
- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONNECTION
- 4 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)



CAS-1456-2T-25HP

ACCESSORIES
AERATION
SYSTEM

FILE 5.46
VERSION 1
COD. 30CAS14562
14/10/2019



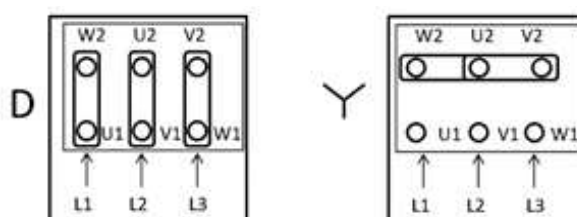
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Flow rate (m³/h)	13007	Nominal Power (kW)	18,5
Speed (rpm)	2949	Max flow (m³/h)	18000
Performance	72	Hz/phses	50/3
Efficiency grade N	71,3	Motor (rpm)	2945
Measurements category	B	Max. Current (A) 230 V	33,9
Efficiency category	Total	Max. Current. (A) 400 V	19,7
Specific rate	1,04	Motor protection	IP55
Pressure (Pa)	3707	Motor efficiency	IE3
Electric power (kW)	18,621	Limit air temperatures	-20 °C → +120 °C
Speed variator	VSD not necessary	Approx. weight. (kg)	303
		Cumplimiento ErP 2015	ErP 2015
• Established data in max. Efficiency point.		• Data may change. Please check motor cover	

PARTS

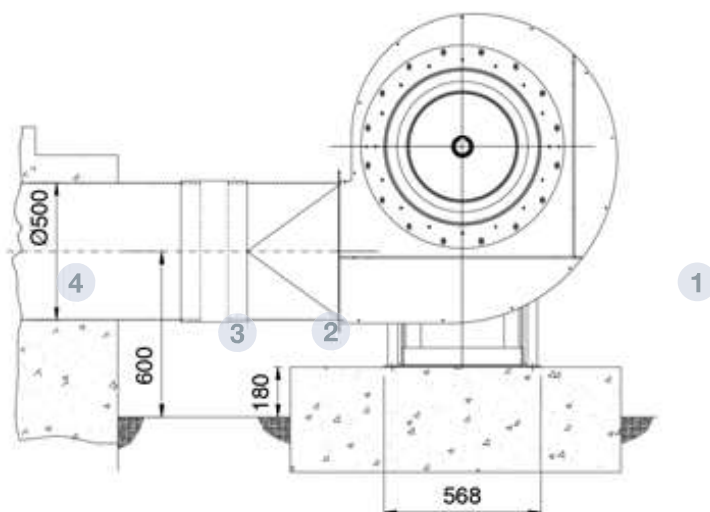
- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONECTION
- 4 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)



CAS-1663-2T-50HP

ACCESSORIES
AERATION
SYSTEM

FILE 5.47
VERSION 1
COD. 30CAS16632
14/10/2019



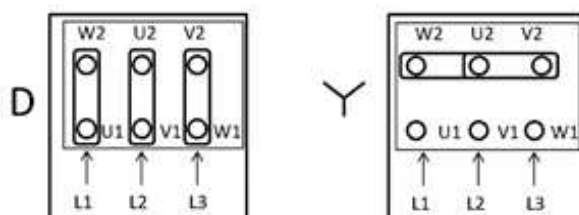
DESCRIPTION

Medium pressure centrifugal fan and single aspiration, big strength, equipped with a turbine.
Anticorrosive finishing process with polymeric polyester resins (190 °C).
Previously, degreasing nanotechnologist treatment free of phosphates.

TECHNICAL SPECIFICATIONS		MOTOR DATA SHEET	
Flow rate (m ³ /h)	25000	Nominal Power (kW)	37
Speed (rpm)	2960	Max flow (m ³ /h)	25000
Performance	78,8	Hz/phses	50/3
Efficiency grade N	77,3	Motor (rpm)	2960
Measurements category	B	Max. Current (A) 230 V	67,8
Efficiency category	Total	Max. Current. (A) 400 V	39,3
Specific rate	1,04	Motor protection	IP55
Pressure (Pa)	4453	Motor efficiency	IE3
Electric power (kW)	39,268	Limit air temperatures	-20 °C → +120 °C
Speed variator	VSD not necessary	Approx. weight. (kg)	420
		ErP 2015	2015
• Established data in max. Efficiency point.		• Data may change. Please check motor cover	

PARTS

- 1 FAN
- 2 TRANSITION
- 3 FLEXIBLE CONECTION
- 4 FOUNDATION TUBE (NOT SUPPLIED BY SYMAGA)

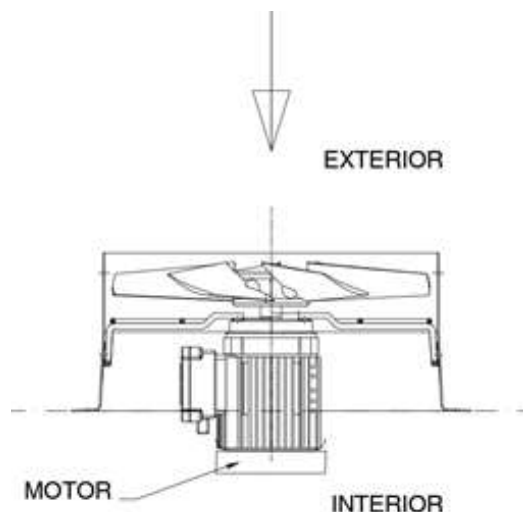


HCDF-40-4T-0.25kW

ACCESSORIES AERATION SYSTEM



FILE 5.48
VERSION 1
COD.
15/10/2019



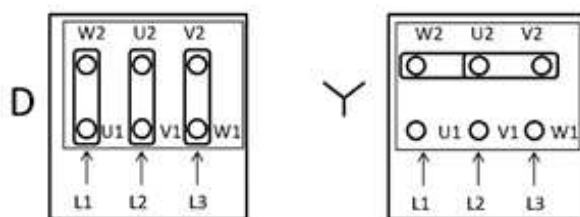
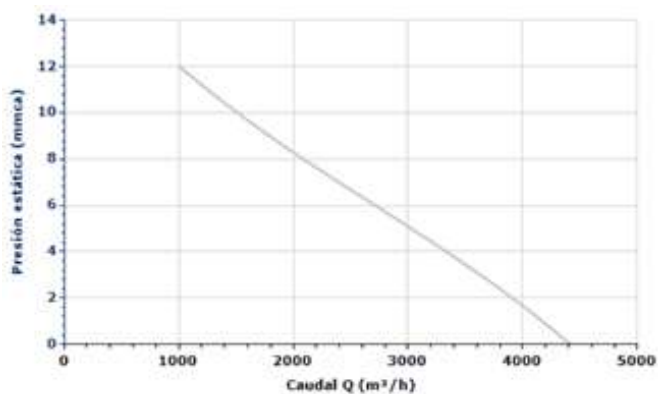
DESCRIPTION

Helicoidal fan for conduct. Ready to be installed in the roof vents.

Anticorrosive finishing with ATEX painting, free of iron components, in polymeric polyester resin (190°C).

Previously, degreasing with nanotechnology treatment free of phosphates.

MOTOR TECHNICAL DATA	
Nominal power (kW)	0,25
Hz/phases	50/3
Motor (rpm)	1420
Poles	4
Max. current (A) 400 V Y	0,75
Max. current (A) 230 V D	1,3
Motor protection	IP55
Motor chassis size	71
Motor efficiency	Excluido IE3
Certification	ATEX 22
Type	F
Air limit temperatures	-20 °C → +50 °C
Max flow (m³/h)	4415
Approx weight. (kg)	12,5
• Technical data may change, please check the	



HOPPER AERATION SYSTEMS SC

ACCESSORIES AERATION SYSTEM



FILE 5.34
VERSION 1
COD. ASCE0300AT10
08/01/2020



TECHNICAL SPECIFICATIONS

Group of channels with Ø1 mm or Ø1.5 mm perforations, installed on the hopper allowing the air flowing.

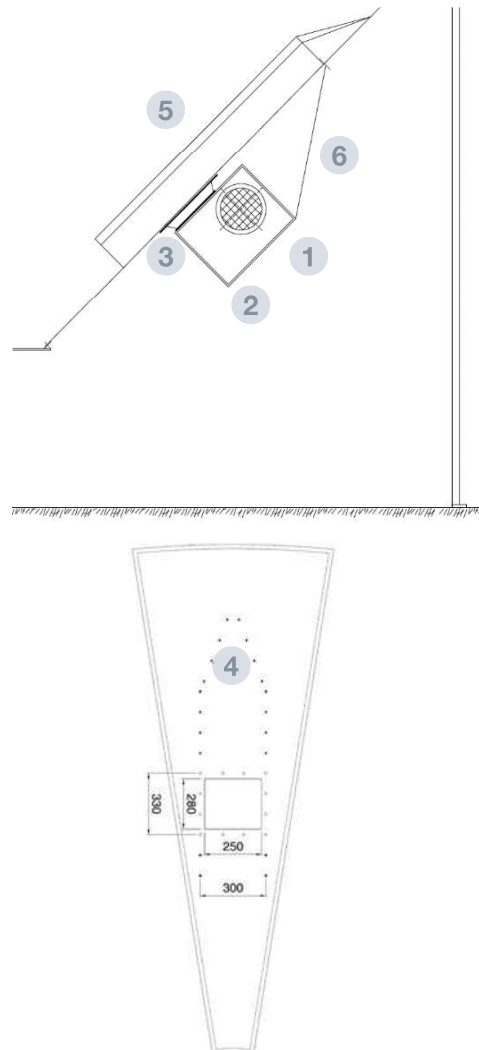
For its assembly, hopper sectors adapted for the fan connections are supplied.

Aeration channels are assembled from the inner part of the silo, while the fans are assembled from the outside.

The fan is connected to the silo through the transition supplied by Symaga. Also, it is needed to attach the fan to the hopper sector with a cable.

PARTS AND MATERIALS

- 1 FAN**
 - Big power centrifugal fans with powers between 2 and 15 C.V.
 - Supplied by Sodeca.
- 2 FAN OUTLET**
 - Admission air conduit with sloped shape that avoids air coming into the system.
- 3 TRANSITION**
 - 4-5mm width steel sheet structures for the fan-aeration channel connection.
 - This accessory is not included by default.
 - MATERIAL: Galvanized Steel sheet S275 JR + HD6
- 4 HOPPER SECTOR FOR AERATION**
 - Hopper silo adapted to allow the fan connection.
- 5 AERATION CHANNEL**
 - Structure designed to make the air access to the silo easier.
 - Parts: Rigid cover avoiding the grain penetration in the channel and 2 perforated sheets at both sides avoiding air flowing inside the silo.
 - MATERIAL: Chapa de acero galvanizado S280 GD Z600 MAC e= 3mm
- 6 CABLE**
 - Not supplied by Symaga (RECOMMENDED)



GRAIN CHILLER

ACCESSORIES AERATION SYSTEM



FILE 6.14
VERSION 1
COD.
21/01/2020



TECHNICAL SPECIFICATIONS

Cooling systems flowing cool air to make grain conservation easier.

The chillers are connected to the aeration system in order to distribute the air-flow to the aeration channels.

Warm air is flowing from the bottom of the silo to the roof for its expulsion.

Highly recommended for rice, maize, barley, bean, sunflower seed, sorghum, cotton seed, green coffee and compound feeds.



ROOF LINING

ACCESSORIES EXTERNAL FINISHES



FILE 5.25
VERSION 1
COD AS0TECHPREB
15/11/2019



TECHNICAL SPECIFICATIONS

Double sheet roof,

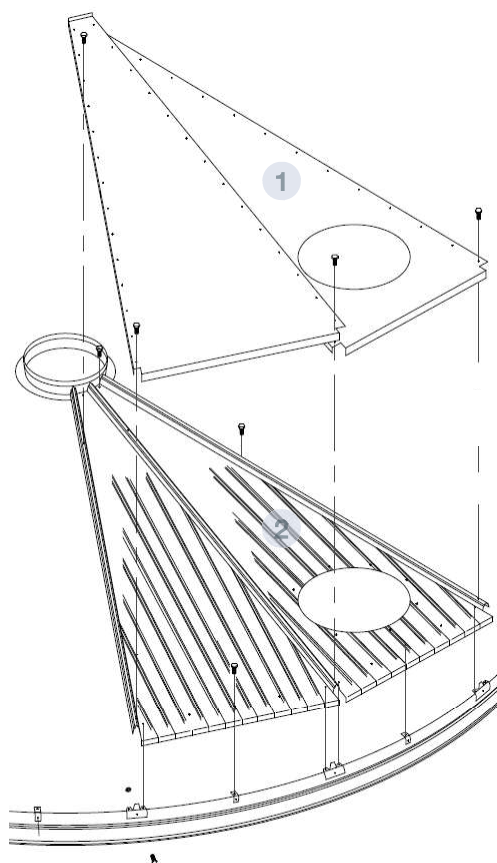
Doble pared de chapa, normalmente prelacada, que crea una cámara de aire de 75 mm entre sectores de techo y forro.

It's a protection of the high solar radiation to the grain close to the roof.

To improve the characteristics the space between roof sector and roof cover can be filled with insulating materials, like rock wool.

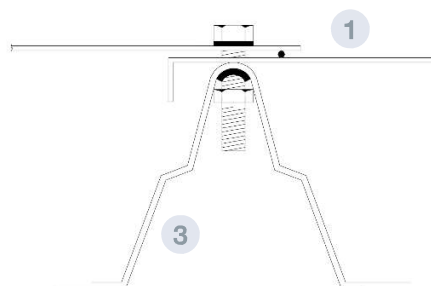
RECOMMENDATIONS

Install on places with high solar radiation.



PARTS AND MATERIALS

- 1 **ROOF COVER**
 - Flat sheet with isosceles triangular shape, like a roof sector, screwed over the roof waves
 - Variable dimensions according to the silo's diameter
 - Colours white, green or blue
 - MATERIAL: steel S280GD Z225 GS 25/7 μm de polyester $e=0.8\text{ mm}$
- 2 **ROOF SHEET**
 - Trapezoidal folded plate with waves on the edges to be assembled between them
 - Material: steel S280 GD ZM310 $e=0.8\text{ mm}$
- 3 **ROOF WAVE**
 - Folded sheet to assemble the roof sectors between them

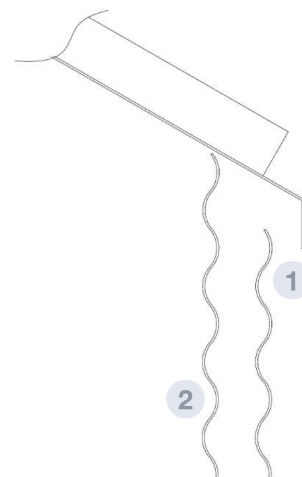


CYLINDER LINING

ACCESSORIES EXTERNAL FINISHES



FILE 5.26
VERSION 1
COD
11/12/2019



TECHNICAL SPECIFICATIONS

Double wall, normally pre-lacquered, that creates a 70mm width air chamber between the cylinder body and cylinder cover in order to improve thermal isolation and silo sealing.

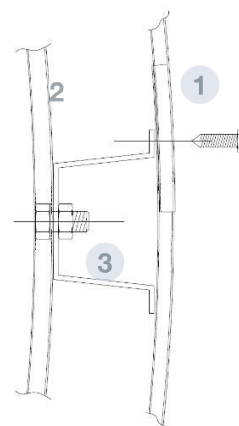
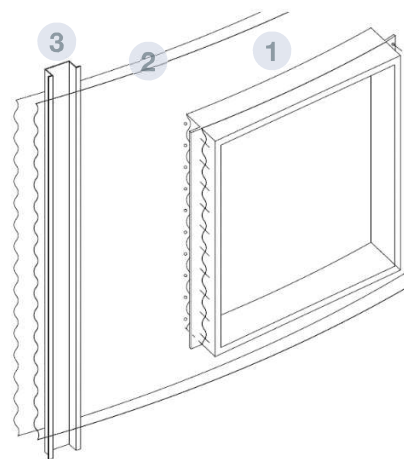
Installed by using self-drilling bolts at reinforcements flanges.

Protection against solar radiation on the grain adhered at the bodysheets.

In order to improve its qualities, filling the air chamber with some insulating material can be done, as stone wool.

RECOMMENDATIONS

Install in high-level solar radiation places or rainy places in order to avoid rice getting yellow (default protection "sandblasting").



PARTS AND MATERIALS

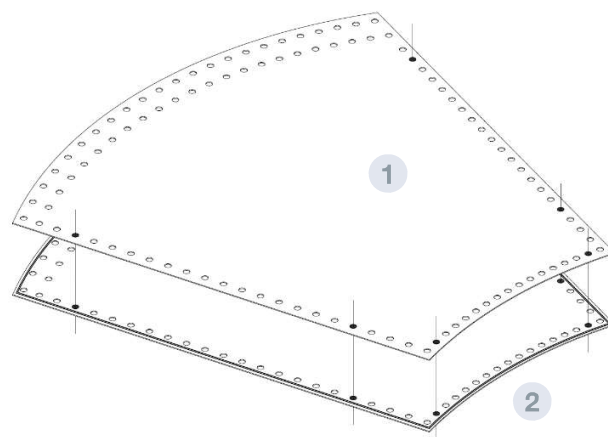
- 1 CYLINDER COVER**
 - Corrugated bodysheet with dimensions: 1140x2600 mm
 - Colors: White, Green or Blue.
 - MATERIAL: S280 GD Z225 GS 25/7 e=0.6 mm
- 2 STANDARD BODYSHEET**
- 3 STANDARD REINFORCEMENT**

HOPPER LINING

ACCESSORIES EXTERNAL FINISHES



FILE 5.27
VERSION 1
COD
03/01/2020



TECHNICAL SPECIFICATIONS

Steel sheet located on the hopper sheets due to aesthetic qualities.

Does not create air chamber.

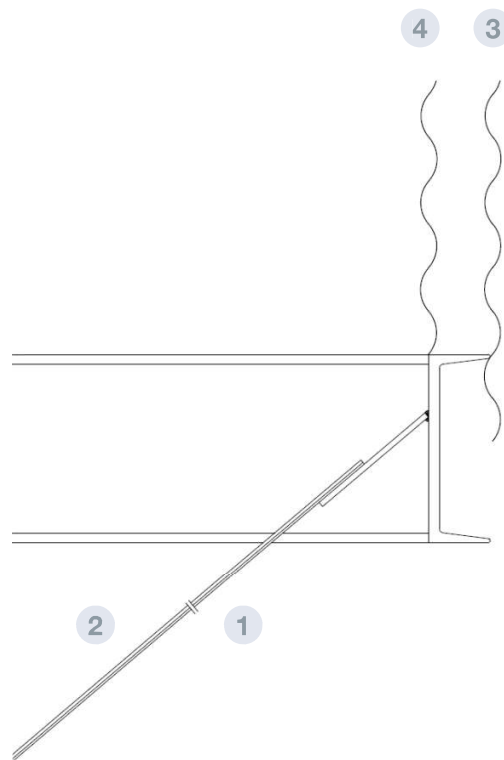
INSTALLATION:

1. Bolted joint hopper sector – hopper cover in several points.

2. Standard installation on the hopper.

PARTS AND MATERIALS

- 1 HOPPER COVER**
 - Steel sheet with trapezoidal shape, similar to a hopper sheet.
 - Colors White, Green or blue.
 - MATERIAL: DX51 Z225 GS 25/7
- 2 HOPPER SHEET**
- 3 CYLINDER COVER**
- 4 BODYSHEET**



PRE-LACQUERED ROOF

ACCESSORIES EXTERNAL FINISHES



FILE 5.24
VERSION 1
COD AS0460TECHPREB-R-V-A
14/11/2019



TECHNICAL SPECIFICATIONS

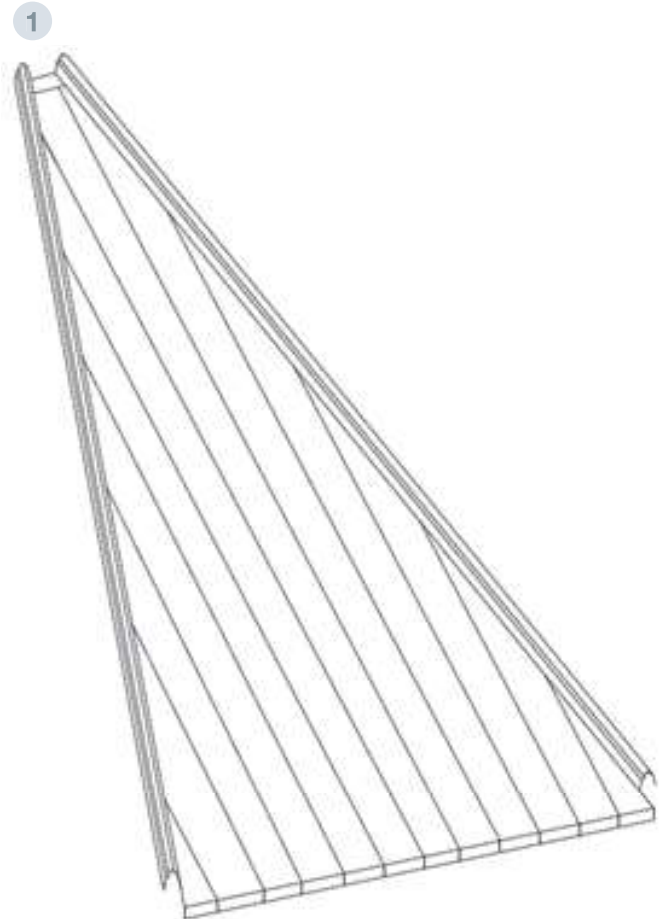
Roof sectors of pre-lacquered steel sheet on colours white, green or blue.

It's utilised to reduce the visual impact or for aesthetic preferences.

The steel is galvanised (Z225) and later painted with EPOXI paint of 25µm outside and 7µm inside.

PARTS AND MATERIALS

- 1** ROOF SHEET
- Trapezoidal folded plate with waves on the edges to be assembled between them
 - Material: steel S280 GD Z225 GS 25/7 of polyester e= 0.8mm



POWDER PAINTING

ACCESSORIES EXTERNAL FINISHES



FILE 5.28
VERSION 1
COD PINTECH0300 PINVIR
03/01/2020



TECHNICAL SPECIFICATIONS

Consists of applying an 80- μ m width sheet (epoxy dust paint) on the galvanized sheet (Z600).

This protection system is called duplex, it gets a corrosion resistance bigger than the aggregate of the galvanization and paint separately.

Expensive solution but provides a C4 or C5 atm corrosion resistance.

Can also be used to protect the galvanization in the inner part of the silo while covering by concrete the first ring or when the inner conditions are very aggressive (high humidity in decomposition grain).

BENEFITS:

Higher corrosion resistance.



SWEDEN, 1,964 m³

PROCEDURE

Symaga makes the calculation of the silos following the next standards:

NORMATIVA	DENSIDAD DEL GRANO	ÁNGULO DE REPOSO
ANSI-ASAE EP 433 2003	834 Kg/m ³	27º
EUROCODE EN 1991-4	918 Kg/m ³	34º

It is a general consideration that the horizontal pressure is held by the bodysheets and the vertical forces supported by the stiffeners. Resistances are calculated according to Eurocode.

LOADS CALCULATION

We analyze four loads for silo calculation:

1 GRAIN

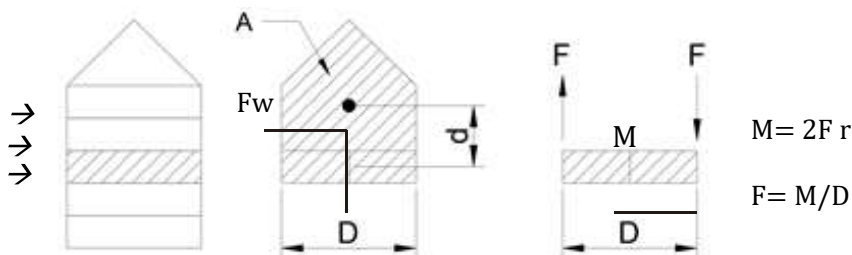
Following the equations given by ANSI EP 433 2003 and EUROCODIGO EN 1991-4 standards, to calculate grain pressure loads in the interior of the silo, we obtain the loads that support the bodysheets and stiffeners.

Basically, grain pressure loads are calculated combining Janssen formula and the specific coefficients corresponding in each case. That way we obtain the horizontal loads held by the bodysheets and the vertical loads to be held by the stiffeners.

2 WIND

Wind force is given by the customer. If it is not the case, Symaga will consider 100 kg/m² and a exposure coefficient of 0.8. The wind pressure in the silo walls is converted in an overturning moment in the base of the structure. It is general consideration that the stiffeners absorb this torque. Half of the stiffeners are considered to be compressed by the effect of this torque and half of the stiffeners are stretched. Sizing of the stiffeners is based on those compression forces.

$$P \text{ 100 Kg/m}^2 \times A \text{ 10 m}^2 = F \text{ 100 Kg} \quad W \rightarrow F_w = W \times A \rightarrow M = F \times d \rightarrow F = M/D$$



3 SNOW

Snow loads are given by the customer. If not the case 80 kg/m². This load acts directly on the roof and is transferred equitably to the stiffeners.

4 EARTHQUAKE

Seismic coefficient is given by the customer. Otherwise, Symaga considers that seismic coefficient is 0. Seismic load is considered as a horizontal load, proportional to the silo weight plus grain load. This load is considered in additional hypothesis that combines seism and other loads.

The seismic acceleration is the data that gives the norm regarding the area (location).

The seismic coefficient is the acceleration due to the different coefficients of increase or decrease. This is why we multiply the mass to obtain the seismic force.

When we are given a UBC zone, we use this norm to calculate CS2. $F_s = M \times C_s$

LOADS SUMMARY		
LOAD	SHORT DESCRIPTION	DESCRIPTION
Permanent loads	$D_L(1)$	Silo permanent loads. It is considered silo weight and redler weight of 150 kg/m in the area supported by the silo
Permanent loads	$D_L(2)$	Silo permanent loads. It is considered silo weight and redler weight of 150 kg/m in the area supported by the silo
Wind	W	Wind load
Snow	S_N	Snow load
Seism	E	Seism load

COMBINATIONS

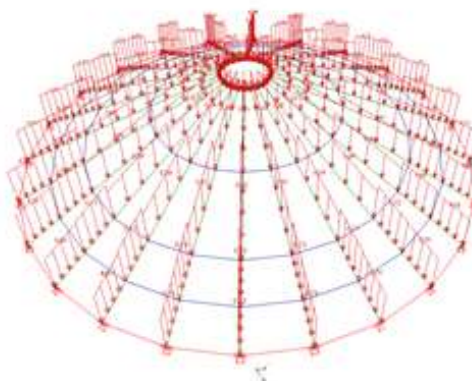
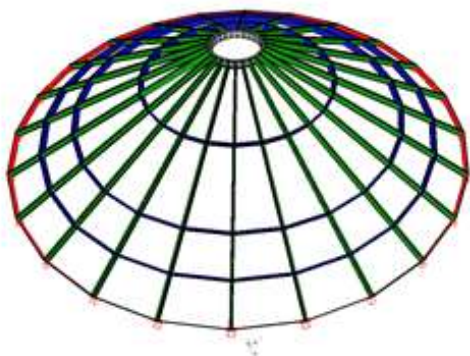
According the corresponding standards the following situations are calculated:

LOAD	SILO STATUS	EARTHQUAKE	COMBINATION
1	Silo vacío	No	$1.35D_L(1) + 1.5W + 1.5 S_N$
2		Si	$D_L(1) + 0.3W + E$
3	Silo lleno	No	$1.35D_L(2) + 1.5W + 1.5 S_N$
4		Si	$D_L(2) + 0.3W + E$

Status 2 it is not considered because: $DL(1) < DL(2)$

ROOF CALCULATION

Roof calculations are run with a finite elements software called Diamonds.



CALCULATION STANDARDS

MODELS

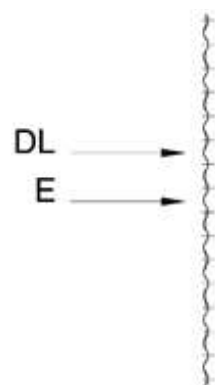


FILE 7.1
VERSION 1
28/10/2019

BODYSHEET CALCULATIONS

We study this three design criteria and size basing in the worst case:

DESIGN CRITERIA	DESCRIPTION	CALCULATIONS
Cross section	Elastic resistance of the bodysheet steel	UNE-EN 1993-1-1:2013
Shear resistance	Shear resistance per shear plane in the bolts.	UNE-EN 1993-1-8:2013
Bearing resistance	Bearing resistance of the sheets surrounding the joint holes when being bended by the loaded bolts.	



This values should be more than these forces:

-Horizontal forces due to grain loads. (DL)

-Seismic force due to load grain and silo weight. (E)

In the bodysheet calculations we always analyze the joint zones, which are the weakest.

STIFFENER CALCULATION

Stiffeners are sized comparing the loads with the cross section resistance.

The calculation of the cold rolled profiles are run according UNE-EN 1993-1-3:2012 Standards. According to this, the load is reduced by a factor. This reduction factor depends on the slenderness of the stiffener.

It can be one of these four types:

1. Plastic
2. Compact
3. Semicompact
4. Slender (Most unfavourable)



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