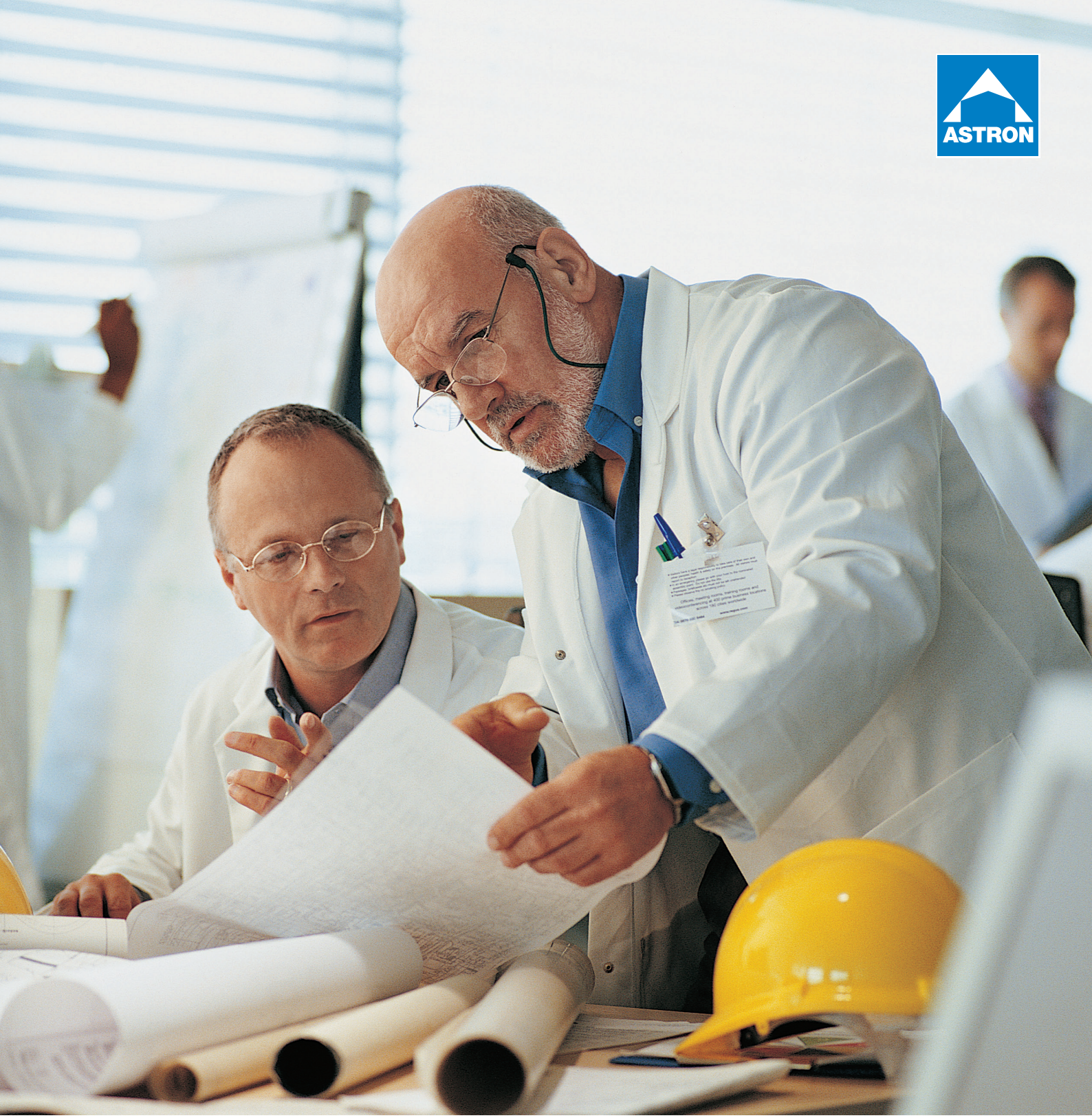

# Product specifications

# 1 GENERAL

## 1.1. Origins of Astron

The name ASTRON defines a system of metal buildings made from elements which are fabricated by the company Astron Buildings S.A. based in Diekirch (Luxembourg) or by the company Astron Buildings s.r.o based in Prerov (Czech Republic) or by the company Astron Buildings LLC based in Yaroslavl (Russia).

## 1.2. The Product

The Astron Building System incorporates all the elements of the structural framework; primary and secondary framing (including bolts, clips, flange bracings, etc.), the building envelope with roof sheeting and wall cladding (including screws, closures, sealants, flashings, etc.), as well as the thermal insulation Astrotherm (see sub-chapter below), and of course all of the relevant flashings for the final finish. Accessories such as translucent panels, doors, windows, monovents, smoke vents, etc. are available. Crane rail beams for overhead traveling cranes, mezzanine structures and car parks also form part of the Astron product range.

## 1.3. The range of Astron

The Astron Building System is used for the construction of functional or non-residential steel buildings, either single storey buildings (SSB) or multi-storey buildings (MSB), or industrial structures.

Astron buildings are optimized to meet the specific requirements of each client. All intermediate dimensions within the limits of the system as defined below (see 1.6.) can be produced; the Astron buildings are tailored dependent on their intended use and the constraints of the site (bay spacing, etc.).

The various product codes given to the range of Astron buildings indicate the configurations of the frame and give an indication of the use. These product codes are defined below, together with their particular characteristics and the usual dimensional limitations (see 1.6.).

**AZM1** Clear span building with tapered columns. The rafters are either completely or partially tapered.

**AZM2,3,4** Modular building having modules of 2, 3 and 4 respectively. The exterior columns are tapered, the interior columns may be pipes or welded beams (H profile). The rafters are usually tapered.

**AS** Buildings with a large clear span, a slope of 20% and having tapered columns.

**AE** Clear span buildings with parallel flange columns. The rafters are usually tapered.

**AL** Clear span single slope buildings with parallel flange columns.

**AP** Wing units which can, in principle, be attached to all other types of buildings. The columns are generally parallel flanged.

**AT** Tennis buildings: the columns are parallel flanged with a single or double pitched roof.

To all these types of buildings the possibility exists, in principle, to add special features, such as; canopies (at roof level or to the wall), roof extensions to the end walls, and/or parapets, either as a direct continuation of the walls, or cantilevered away from the wall, partially or completely, around the building.

## 1.4. Mezzanines

Astron buildings allow the integration of mezzanines; these can be installed in any part or over the whole building and generally have only one floor. Several mezzanine systems are available: metal decking, precast concrete panels, hollow core elements and composite structures.

## 1.5. Terms defining Astron buildings

- The steel line of an Astron building is, by definition, the line representing the outer surface of the secondary framing (purlins and girts, in principle).
- The span of an Astron building is the distance between the sidewall steel lines of the building.
- The length of a building is the distance between the endwall steel lines.
- The eave height is the vertical distance between the level zero (attention: the column base might be at negative level) and the point of intersection of the roof steel line and sidewall steel line.

## 1.6. Common dimensions

Listed below for each type of frame is the range of dimensions most commonly used. It is possible to have frames outside this range; however special studies would be required.

| TYPE | SPAN (m) | Roof slope (%) | Eave height (m) |
|---|---|---|---|
| **AZM1** | 15 - 30<br>30 - 60 | 2 - 33<br>10 - 33 | 4.20 - 9<br>4.20 - 12 |
| **AZM2** | 18 - 30<br>30 - 72 | 2 - 33<br>2 - 33 | 4.20 -7.2<br>4.20 - 12 |
| **AZM3** | 27 - 72 | 2 - 33 | 4.20 - 9 |
| **AZM4** | 36 - 72 | 2 - 33 | 4.20 - 9 |
| **AS** | 42 - 72 | 20 | 5.40 - 9 |
| **AE** | 10 - 20 | 2 - 33 | 3.30 - 6 |
| **AL** | 6 - 12 | 2 - 10 | 3 - 6.6 |
| **AP** | 3 - 15 | 2 - 33 | 3 - 6.6 |

**Remarks:**

- The bay spacing is generally between 5 and 12 meters.
- Roof slope restrictions exist for Aluzinc roof finish in general, LMR600 roof, and in presence of panel overlaps or accessories.
  More details on request

## 1.7. Static calculations, drawings, CE marking, Declaration of Performances (DoP) and guarantees

Astron will supply a complete set of erection drawings, specific to each building. On request, or if local legislation requires it, calculation notes will be supplied for local authorities, insurance companies, etc.
Each set of Astron products is CE marked, either based on EN1090-1 or ETA-18/1027. The corresponding declaration of performance (DoP) are delivered on request.

The guarantees offered are given in detail in the "Terms and Conditions" document.

# 2. DESIGN CALCULATIONS

## 2.1. General

Structural elements of Astron buildings are designed by the Engineering Teams and correspond to the requirements of the national standards. The detailed design methods are defined in the Astron-specific European Technical Assessment ETA-18/1027 “Astron Building System”.
All European countries since 2013 use the EN1090 for Steel structures execution which implicitly involves the reference to the so-called Eurocodes for the structural design part. The Eurocodes were implemented as 58 individual parts under the 10 area headings “EN 1990” to “EN 1999”. The national implementation comprises the full, unaltered text of the particular Eurocode preceded by a national title page and national foreword followed by the National Annex (NA). A series of corrigenda and upgrade versions have been published in the last years.

Astron buildings design in general follows the Eurocode procedures completed by the National Annexes, as wells as the special provisions given in the ETA-18/1027 “Astron Building System”.

As there are some specific national aspects in the Eurocodes implementation in several European countries, R&D follows closely the legal situations in these countries and communicates the usage of the appropriate code.

## 2.2. Loads taken into account

2.2.1. All the loads indicated on the purchase order will be taken into account. However, climatic and service loads described in the relevant national codes will also be taken into account. The determination of the exact loading for a particular geographical location and altitude of a building remains the responsibility of the Builder/Dealer.

2.2.2. The loads generally considered are:

- The dead load of the frame and the structural elements, which it supports (purlins, sheeting, etc.)
- The snow load or even sand load in certain instances
- Wind load

2.2.3. Other additional loads considered if required are:

- Loads produced by the intended occupancy
- Loads due to the storage of material
- Loads due to the accessories and services such as heating, lighting, a false ceiling, insulation...
- Loads produced by traveling cranes, monorails or mezzanines
- Loads produced by seismic activity (earthquakes)
- Impact loads due to accidents

2.2.4. The combinations of the loads considered are given in the relevant national codes.

# 3. THE STRUCTURE

## 3.1. Terminology

A general distinction is made between the primary and secondary framing, as follows:
The primary framing consists of all of the structural elements, which transfer the exterior loading to the foundations. Therefore it includes the intermediate frames, the rafter and columns of the end wall, jack frames and the supported rafters, wind portal frames, crane rail beams, wind bracing, and all of the various components usually associated with the above mentioned, e.g., anchor bolts, crane brackets. Also included under "primary framing" are items such as mezzanines beams and welded beams in general, and wind bracings.

The secondary framing essentially consists of the elements supporting the roof and wall sheeting and which transfers the exterior loads to the primary framing. It consists principally of roof purlins and wall girts as different constructive systems.

## 3.2. Stability

### 3.2.1. Transverse stability of the building

The transverse stability of the building is obtained by the rigidity of the main frame. The frames are built-up from welded steel plates to form I-shaped members. These profiles form the columns and the rafters and consist of web plates of varying depths and thicknesses, and flanges of various widths and thicknesses. The individual members are connected together with bolted connections using high strength bolts. Generally, the column feet of the main frames are pinned. The top of an interior modular frame column is also usually pinned. However, in certain instances (tall buildings, presence of crane load, etc.) where the horizontal deflection of the frame is likely to exceed the required limitation, these joints may be executed as fixed.

### 3.2.2. Longitudinal stability of the building

The longitudinal stability of the building is ensured by the wind bracing, located in the roof and walls, in one or more bays, depending on the magnitude of the present forces and the length of the building.

The bracing generally consists of "ties" made from steel rods, or angles for specific cases, forming crosses, and "struts" in the form of purlins and girts which are reinforced. The latter would be in the form of steel tubes in the case of very high forces.

If it is not possible to have cross bracing in the sidewalls for aesthetic reasons or due to the use of the building, one can replace them by a wind portal frame or by fixed base wind columns located adjacent to, and connected to, the columns of the main frame.

### 3.2.3. Stability of the frames

The flanges of the main frame rafters are laterally stabilized: the outer flange by the attached purlins, which themselves are fixed, in the longitudinal direction of the building, to the wind bracing splits. If possible, the presence of the diaphragm effect of the roof panels is taken into account. The inner flange is stabilized by "flange bracings" in the form of angles, which are attached between the lower flange and the purlin.
The flange bracings are distributed along the length of the rafter in accordance with design requirements.

The exterior columns of the frame are stabilized in the same way: the outer flange by the wall girts, and the inside flange with flange bracings, if required.

It is however possible to have free standing columns, i.e. without lateral support to either outside or inside flange, or none at all.

### 3.2.4. Mezzanines and car park structures

The structure of the mezzanines is executed with hot-rolled beams or welded sections, with or without composite effect, partially supported by the framing of the building, and/ or by additional columns. The mezzanines are stabilized by their connections to the building frames, or by an independent bracing system.

Parkings are executed as traditional hot rolled structures, with decks made of concrete, either with composite effect or pre-cast elements for complete demountability.

### 3.2.5. Crane rail beams for bridge cranes

The crane rail beams are made from hot-rolled profiles; generally they are supported by crane brackets. The crane rail beams can be simply supported or continuous beams. The crane rails can be welded or mechanically fixed.

### 3.2.6. Stability of end walls

As a general rule the end wall frames consist of built-up welded I-sections or hot or cold-rolled columns which support a cold formed Z rafter.
The stability of this frame in its plane is ensured by rod bracing (crosses), or fixed base wind columns.

### 3.2.7. Secondary framing

Purlins and girts with a Z profile are produced by cold roll forming of galvanized steel strips.

The purlins are fixed to the rafters, and due to the bolted overlaps between the purlins above the rafters, act as continuous beams.

The sidewall girts are also generally continuous with overlaps at the mainframe columns, but can also be simply supported between columns. These two conditions also apply to the end wall girts.

Normally a continuous Z purlin or a continuous double Z is used as an eave structural member, depending on the loading and the eave condition.

### 3.2.8. Diaphragm effect

Astron offers various types of panels for the roof and for the walls, as well as different constructive solutions (single skin system, double skin system, bridge system). The performance of these various envelope systems with respect to the diaphragm effect, which they achieve, is quite variable and is not generally taken into account for the building global stabilization. However, for certain roof systems, the diaphragm effect is such that local stabilization of members is allowed, increasing substantially the load bearing capacity of the structure.

## 3.3. Material specifications

In general, the used materials and production methods correspond to the EN1090 series and are defined in the Astron-specific European Technical Assessment ETA-18/1027 “Astron Building System”.
A periodic third-party audit of the Astron Factory Production Control (FPC) is carried out, documented by a certificate of conformity according to EN1090-1, as well as a certificate of constancy of performance according to ETA-18/1027, allowing for the CE-marking of the Astron products.

### 3.3.1. Built up-welded primary framing members

The welded elements which are used principally for the primary framing are made from S355J2+N steel conforming to EN 10025, part 2.

Its main properties, for thicknesses lower than 16 mm, are:

- Yield strength: 355 N/mm²
- Ultimate strength: 470 N/mm²
- Elongation at rupture: 22% minimum

The welding of the elements is carried out in accordance with EN 1090-2. The web to flange welding is done automatically by submerged arc welding (under powder). The welding rod and the powder conform with norm EN ISO 14171 & EN 14174 with quality reference EN ISO 14171-A-S 3T 2 AR S2. The manual welding of connection plates, stiffeners etc. is carried out in accordance with the EN ISO 14341, quality EN ISO 14341-A -G42 2 M G3Si1 or G42 2 M G4Si1.

### 3.3.2. Pipe columns

The interior columns of modular frames are generally made from tubes of steel quality S235JRH in accordance with norm EN 10219.

The main properties are:

- Yield strength: 235 N/mm²
- Ultimate tensile strength: 340 N/mm²
- Elongation at rupture: 22% minimum

### 3.3.3. Beams for mezzanines and crane rail beams

These beams are generally hot-rolled profiles in quality steel S235 or S355 according to norm EN 10025, part 2.

### 3.3.4. Cold formed components

The cold formed components, principally purlins, girts, and the endwall rafters, are made from S390GD + Z 275 steel as defined in norm EN 10346.

The Z profiles have a depth of 203 mm or 254 mm, and the thickness varies from 1.25mm to 3.2mm depending on the loads to be sustained and the use.

3.3.5. Connections

The connection of the various components forming the primary framing generally is made using galvanized high strength bolts of steel quality 10.9, conforming to EN ISO 898-1 and as described in EN 14399, parts 1, 2, 4 and 6. The diameters of the bolts used most commonly are 20, 22 and 24 mm.

The connection of the bearing frame rafter (Z shape) to the endwall the columns is made by using M16 bolts of steel quality 10.9 conforming to EN 14399, parts 1, 2 and 4.
The connection of purlins and girts to each other and to the primary framing is made using M12 bolts of steel quality minimum 4.6 conforming to EN ISO 4018 and 4034 except for the dimensions of the head and the nut which are 19 mm.

3.3.6. Bracing

The steel rods which act as ties in the windbracing are made from steel quality 6.8 for Φ 18 & 24, and 5.8 for Φ 30. The threads on the rods are produced by rolling. Three diameters of rods are used to produce M18, M24 and M30 threads respectively.

3.3.7. Anchor bolts

The anchor bolts are produced from the same material as the wind bracing rods with the same diameters M18, M24 and M30. Special anchors are delivered for specific cases.

3.4. Corrosion protection

3.4.1. Primary framing

The primary framing components are shot blasted in the factory and coated with a protection against rust according to EN ISO 12944.

They are coated with either Primer:

- water based primer: acrylate-copolymer combination
- Nominal dry film thickness: 80 mic.
- Corrosion protection: C2, high
- Colours available: Grey (approx. RAL 7036)
  Red (approx. RAL 8012)
  Blue (approx. RAL 5010)

or corrosion protection paint:

- water based corrosion protection paint: acrylate-copolymer combination
- Nominal dry film thickness: 100 mic.
- Corrosion protection: C3, low
- Colours available: Grey (approx. RAL 7042)
  Blue (approx. RAL 5010)

The anchor bolts are delivered oiled, unprimed and unpainted.
The bracing rods are protected by a metallic coating of 45 microns.

For special applications, the primary framing components can be hot-dip galvanized.

### 3.4.2. Secondary framing

The purlins and girts in Z and C profiles are produced from galvanized material in accordance with EN 10346 The quantity of zinc used is 275 g/m² which correspond to a thickness of about 20 microns on each face, or an equivalent metallic corrosion protection layer is chosen.

The remaining components of the secondary framing are produced from galvanized material, or protected with a coat of grey paint, depending on their thickness. (In general, components of thickness 3.2 mm or less will be galvanized).

# 4. WALL SHEETING AND ROOFING

General

Astron supplies different types of wall and roof sheeting. The various roof and wall types are generally combinable. The choice of one or other combination will depend on criteria such as aesthetics, technical considerations, etc. In addition, Astron offers inside wall sheeting which can be perforated to improve acoustical absorption.

## 4.1. LPA 900 wall type

### 4.1.1. Description

Ribbed steel panel, colour-coated, produced by cold roll forming.

The principal characteristics of this panel are:

- Steel quality: S350GD in accordance with EN 10326
  Yield strength: 350 N/mm²
  Ultimate tensile strength: 420 N/mm²
- Nominal thickness: 0.49 mm
- Modular width: 900 mm (3 modules of 300 mm)
- Depth of ribs: 29 mm

### 4.1.2. Protection and coatings

Exterior face: 25 mic. Superpolyester
*Or 35 mic. Superpolyester (HDS) for the dark and bright colours.*
Steel core with a coat of 275 g/m² zinc or
150 g/m² ALUZINC or
255 g/m² GALFAN
Interior face: 8 mic. back coating

The exterior coating is available in a large range of colours.
The interior face is a light grey colour (approx RAL 7035).

### 4.1.3. Fixing and erection

The panels are fixed to the girt by or self-drilling steel wall screws with nylon heads which are the same colour as the sheeting. The erection is carried out in a continuous operation along the sidewall with individual sheets overlapping each other (normally by one corrugation). The panels are usually supplied in single lengths except when the eave height exceeds 8 m, in which case overlaps of 100mm are created between panels at the level of a girt.

Description of wall screw: self-drilling, full-length thread, with coloured nylon head

- Length: 20 mm for the stitching panel sidelaps screws
  30.5 and 59 mm for the fixing screws
- Diameter: 4.8 mm for the stitching panel sidelaps screws
  5.5 mm for the fixing screws
- Material: surfaced hardened carbon steel, galvanized.

Distribution of screws:

- For fixation to girts: 1 per rib, i.e. 3 per panel
- For stitching panel sidelaps: 1 per 500 mm

4.1.4. The LPA wall

The first girt is located 2.2 m from the ground with successive girts placed at intervals of not more than 1.8 m. One can place ASTROTHERM insulation (See sub-heading below) between the girts and the LPA900 sheeting.

One can also fix interior LPI1200 or LPG1000 sheeting (See sub-headings below) on the other side of the girt resulting in a double skin wall and providing an attractive interior finish, added protection to the insulation and acoustical correction.

4.2. POLAR SA wall type

4.2.1. Definition

Astron's range of sandwich panels includes two types of core, foam (PIR, PUR) and mineral wool. Astron's PUR panels are free from CFCs/HCFCs.

4.2.2. Protection and coatings

The exterior coating is available in different colours and different thickness.

4.2.3. Fixing and erection

The panels are attached to the girts with self-drilling screws with colored heads or with hidden self-drilling screws. The erection is carried out in a continuous operation along the sidewall by slotting the panels into one another.

4.2.4. Girts distribution

The distribution of the girts is a function of the thickness of the sandwich panel and the local design loads.

4.3. LPR1000 roof system

4.3.1. Description

Steel ribbed panel formed by cold roll forming. The panels are fixed from the outside and the water-tightness at the overlaps is achieved by using tape sealer between the panels.

The main properties of this panel are:

- Steel quality: S550GD or S350GD according to EN 10346
  - S550GD: - Yield strength: 550 N / mm²
    - Ultimate tensile strength: 570 N /mm²
  - S350GD: - Yield strength: 350 N / mm²
    - Ultimate tensile strength: 420 N /mm²
- Nominal thickness: S550 GD: 0.55 / 0.54 mm
  S350 GD: 0.62
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm

4.3.2. Protection

LPR panels are available with different coatings, Superpolyester or ALUZINC:

Colour coated panels:

- Exterior face: 25 or 35 mic. Superpolyester
- Steel core with a coat of 275 g/m² zinc or
  150 g/m² ALUZINC or
  255 g/m² GALFAN
- Interior face: 8 mic. back coating

ALUZINC finish (both sides):

25 mic. ALUZINC (*)
Steel core
25 mic. ALUZINC (*)

(*) corresponding to 185g/m²

Other coatings are available on request

4.3.3. Fixing and erection

The normal horizontal purlin spacing can vary from 1.5 to 1.8 meters.

The LPR1000 roof panels are fixed to every purlin by self-drilling screws made out of stainless steel Cr/Ni 18.8. The screws are supplied with a slightly conical steel washer on to which an EPDM sealant is vulcanized. The EPDM is a flexible material in durable plastic. When the screw is tightened, the metal washer squeezes the EPDM creating a reliable seal between the fastener head and the washer thus assuring the water-tightness of the fixation.

(*) EPDM: Ethylene-propylene-terpolymer

Description of the LPR1000 roof screws (Self-drilling):

- Length: variable
- Diameter: 5.5 mm
- Length of stitching screws: 27 mm
- Diameter of stitching screws: 5.5 mm
- Diameter of steel washer: 19 mm (29 mm for use with skylights)
  14 mm for the stitching screws
- Material: stainless steel Cr/Ni 18.8

Distribution of screws:

- above purlins: 1 per 333 mm module, i.e. 3 per panel
  3 per 333 mm module at the eave and at panel overlaps
- side-lap stitching screws: 1 per 750 mm

Two types of tape sealer are available. The first is a special tape sealer with a shallow channel profile. Its dimensions are 5 x 22 mm. The other is a rectangular cross section: 2.6 x 12.5 mm used in certain instances.

These tape sealers are made from a combination of butyl polymer and inert substances.

At the eave, the gap between the panel and the gutter is sealed with a length of polyethylene foam closure strip (or with small blocks) having the same profile as the LPR1000 panel.

## 4.4. LMR600 roof system (LM)

### 4.4.1. Definition

It consists of a 600mm wide factory roll-formed panel with 50mm high major corrugations and 70mm to the top of the formed seam, with mastic in the seam factory applied during process.
The side lap seam is formed on site with a special purpose seaming machine which forms a 360° double-lock seam.
The flat of the panel contains cross flutes at 150mm, perpendicular to the major corrugations that significantly improves the panel's performance under foot traffic.

The principal properties of the panel are:

- Steel quality: S320GD according to EN 10326
  - Yield strength 320 N/mm²
  - Ultimate tensile strength 390 N/mm²
- Nominal thickness: 0.66 mm
- Modular width: 600 mm
- Height of standing seam: 80 mm

### 4.4.2. Protection

One type of finish is available: ALUZINC (both sides):
25 mic. ALUZINC (*)
Steel core
25 mic. ALUZINC (*)

(*): Corresponding to 185 gr/m²

### 4.4.3. Fixing and erection

The usual horizontal distance between the purlins is 1.5 meters.

The panels are attached to the structure with a special clip and tab assembly to create a permanent mechanical connection. The purlin flange is pre-punched to assure complete alignment of the roof system during installation. The tab of the clip is roll-formed into the double-lock seam during the site seaming operation, thus fixing the panel to the structure and allowing for linear expansion and contraction of the roof surface.

End splices (for overlaps and peak) can be incorporated without compromising the integrity of the roof. Factory pre-punched holes and pre-cut notches allow the panels to be nested together and joined via a panel splice plate and reinforcing strap.
The end laps are staggered to avoid a four-panel lap splice condition.

There are no fasteners that pierce the panel membrane except at the eave trim and end splice.

## 4.5. POLAR SR roof system

### 4.5.1. Definition

Astron’s range of sandwich panels includes two types of core, foam (PIR, PUR) and mineral wool.
Astron's PUR panels are free from CFCs/HCFCs.

### 4.5.2. Protection and coatings

The exterior coating is available in different colours.

### 4.5.3. Fixing and erection

The POLAR SR roof panel is fixed to each purlin by self-drilling screws.
The screws are fitted with a light conical metal washer, on to which an EPDM washer has been vulcanized; EPDM is a flexible durable plastic material. When the screw is tightened, the EPDM is compressed by the metal washer thus assuring the water-tightness of the fixation.

## 4.6. Double Skin roof system (DSR)

### 4.6.1. Definition

The inner panel of the Double Skin Roof system, LPS1000 or LPG1000, is fixed directly on to the purlins. The outer skin can be either an Astron LPR1000 or LMR600 roof panel, as required, and is fitted to the omega spacers and rails on top of the lower skin.
ASTROTHERM insulation is placed between the two panels.

Several standard heights of omega spacers create the required spacing between the two skins. These nominal heights are 120, 140, 160, 200 and 260 mm.
According to the type of performance required, acoustical and/or thermal, the lower skin of LPR1000 panel will be non-perforated (LPS1000) or perforated (LPG1000). The percentage of perforation is about 25%.

### 4.6.2. Protection

The characteristics of the metallic protection and the organic coating are identical to those described for the constituent panels of the upper panel of the double skin roof (DSR).
The lower panels are coated and protected, see LPS1000 and LPG1000.

### 4.6.3. Fixing and erection

Please see the description given for each constituent panel of the double skin roof (DSR).

### 4.6.4. Inner panel LPS1000

Steel ribbed panel formed by cold roll forming. The panels are fixed from the outside and the water-tightness at the overlaps is achieved by using tape sealer between the panels.

The main properties of these panels are:

- Steel quality: S550GD or S350GD according to EN 10346
  S550GD: - Yield strength: 550 N / mm²
  - Ultimate tensile strength: 570 N /mm²
  S350GD: - Yield strength: 350 N / mm²
  - Ultimate tensile strength: 420 N /mm²
- Nominal thickness: S550 GD: 0.55 / 0.54 mm
  S350 GD: 0.62-
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm
- Protection

Two types of finish are available: one in colour and one in ALUZINC.

Colour coated panels:

| | |
|---|---|
| Visible face: | 25 mic. Superpolyester |
| Steel core with a coat of | 275 g/m² zinc or |
| | 150 g/m² ALUZINC or |
| | 255 g/m² GALFAN |
| Hidden face: | 8 mic. back coating |

ALUZINC finish (both sides):

25 mic. ALUZINC (*)
Steel core
25 mic. ALUZINC (*)

(*) corresponding to 185g/m²

## 4.7. Bridge system

### 4.7.1. Definition

The bridge system is an insulation spacing system, which provides thermally efficient roof systems with minimal cold bridging. The bridge system comprises of two basic components i.e. the bridge beam and the bridge support bracket.
The bridge beam is a roll formed hot dip galvanized steel section, the bar has a spigot ends which fit neatly into the adjacent bridge beam and when installed form a continuous beam.
The bridge support bracket is a hot dip galvanized steel. A plastic pad is fitted to the bottom of the bridge support bracket, which acts as a thermal break; the bridge support bracket is fixed to the purlins with self-drilling screws.

The skin can be either an Astron LPR1000 or LMR600 roof panel, as required, and is fitted to the bridge beams.
The Bridge System is designed to accommodate insulation thicknesses ranging of 120, 140, 160 and 200 mm with LPR1000 and 140, 160, 200 mm with LMR600.

### 4.7.2. Fixing and erection

Please see the description given for each constituent panel of the bridge system.

## 4.8. LPI1200 – Interior sheeting

### 4.8.1. Definition

Ribbed steel panel, colour-coated, produced by cold roll forming, essentially used for inside sheeting.

The main properties of this panel are:

- Steel quality: S320GD according to EN 10346
  - Yield strength 320 N/mm²
  - Ultimate tensile strength 420 N/mm²
- Nominal thickness: 0.47 mm
- Modular width: 1200 mm
- Depth of ribs: 18.5 mm

4.8.2. Protection and composition

Visible face : 15 mic. Superpolyester
Steel core with a coat of 140 g/m² zinc or
130 g/m² GALFAN
Hidden face : 8 mic. back coating

4.8.3. Fixing and erection

The panels are fixed to the girt by steel wall screws with nylon heads which are the same colour as the sheeting. The erection is carried out in a continuous operation along the sidewall with individual sheets overlapping each other (normally by one corrugation). The panels are usually supplied in single lengths except when the eave height exceeds 7 m, in which case overlaps of 100 mm are created between panels at the level of a girt.

Description of wall screw: self-drilling screws

- Length: 20 mm for the stitching panel sidelaps screws
  32 mm for the fixing screws
- Diameter: 4.8 mm for the stitching panel sidelaps screws
  5.5 mm for the fixing screws
- Material: surfaced hardened carbon steel, galvanized.

Distribution of screws:

- For fixation to girts: 3 per panel
- For stitching panel sidelaps: 1 per meter

4.9. LPG1000 – Interior perforated sheeting

4.9.1. Definition

Ribbed steel panel (LPS1000 profile), colour-coated, perforated, produced by continuous cold roll forming, used for inside sheeting for acoustical applications. The perforation percentage is about 25%.

The main properties of these panels are:

- Steel quality: S550GD according to EN 10346
  S550GD: - Yield strength: 550 N / mm²
  - Ultimate tensile strength: 570 N /mm²
- Nominal thickness: S550GD: 0.54 mm
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm

4.9.2. Protection and composition

Color coated panels:

| | | |
|---|---|---|
| Visible face: | 25 mic. Superpolyester | |
| | Steel core with a coat of | 275 g/m² zinc or |
| | | 150 g/m² ALUZINC or |
| | | 255 g/m² GALFAN |
| Hidden face: | 8 mic. back coating | |

4.9.3. Fixing and erection

The panels are fixed to the girt with stainless steel screws.
The erection is carried out in a continuous operation along the sidewall with individual sheets overlapping each other (normally by one corrugation). The panels are usually supplied in single lengths except when the eave height exceeds 7 m, in which case overlaps of 100 mm are created between panels at the level of a girt.

Description of wall screw: self-drilling screws

- Length: 25 mm for the stitching panel sidelaps screws
  35 mm for the fixing screws
- Diameter: 4.8 mm for the stitching panel sidelaps screws
  5.5 mm for the fixing and stitching screws
- Material: stainless steel

Distribution of screws:

- For fixation to girts: 3 per panel
- For stitching panel sidelaps: 1 per 750 mm

# 5. ASTROTHERM – THERMAL INSULATION

## 5.1. Application

Astrotherm thermal insulation can be used with the LPA900, LPD1000 walls as well as with the LPR1000, LMR600, double skin DSR and bridge system roofs.
It is obligatory with the LMR600 roof, also with double skin DSR and also with bridge system.

## 5.2. Description

It consists of a flexible blanket of fiber glass which is manually stretched over the purlins or the girts.
This blanket is supplied with a facing laminated to the lower surface to form a vapour barrier.
This surface is self-supporting up to 1.8 meters.

### 5.2.1. Properties of insulation

A flexible fiber glass blanket laminated with a thermo-setting synthetic resin

- Density: 16 kg/m³
- Nominal thicknesses: 40, 60, 80, 100 and 120 mm
- Width: 120 cm

### 5.2.2. Vapour barrier

The properties of the various types of vapour-barrier are:

| **Properties of the facing** | **Designation of the lower surface facing** | | |
|---|---|---|---|
| | **AVS** | **KAS** | **ASA** |
| **Composition :** | painted alufoil<br><br>fiber glass scrim reinforcement<br><br>PVC film | alufoil<br><br>fiber glass scrim reinforcement<br><br>craft paper | painted alufoil<br><br>fiber glass scrim reinforcement<br><br>aluminium film |
| **Fire rating acc. to EN 13501-1** | A2-s1, d0 | D-s1, d0 | A1 |
| **Vapour permeability (gr.m².h.mm.Hg)** | < 0.001 | <0.001 | <0.001 |
| | (C.R. of CSTB ref. no 22976) | | CSTB ref. 35295 |

### 5.2.3. Adhesive

The vapour barrier is bonded to the blanket of fiber glass with polyvinyl acetate adhesive which contains a fire retardant.

### 5.2.4. Isoblocks

Isoblocks are delivered in different lengths that can be used to minimize thermal bridges, which occur above purlins and girt. The Isoblocks are placed between the insulation and the panel.

- Density: 45 kg/m³
- Declared thermal conductivity: 0.029 W/(m·K)
- Thickness: 19 mm (25 mm for 120mm insulation thickness)
- Material: Extruded polystyrene

5.2.5. Accessories for insulation

Adequate accessories complete the insulation Astrotherm product range.

- Alustrip,
- Aluminium staples and staplers,
- Double-side adhesive tape,
- Repair-kits

# 6. ACCESSORIES

Astron allows for the integration of all the traditional accessories available on the market. In addition, Astron has its own range of accessories that are specially designed for the various Astron roof and wall systems. Astron accessories currently available are listed here below.

| | LPR1000 | LMR600 | POLAR SR | DSR | BRIDGE | LPA900 | POLAR SA |
|---|---|---|---|---|---|---|---|
| | **ROOF** | | | | | **WALL** | |
| **6.1. WINDOWS** | | | | | | | |
| 1. Windows frame | | | | | | X | X |
| **6.2 DOORS** | | | | | | | |
| 1. Single and double swing door | | | | | | X | X |
| 2. Anti-panic bar | | | | | | X | X |
| 3. Truck-door frame | | | | | | X | X |
| **6.3. SKYLIGHTS** | | | | | | | |
| 1. Translucent panels: | | | | | | | |
| - single | X | | | | | | |
| - double | X | | X | (X) | (X) | | |
| - light curbs | X | X | X | X | X | | |
| 2. Wall translucent (single): | | | | | | X | |
| **6.4. FIRE PROTECTION** | | | | | | | |
| 1. Smoke vent | X | X | X | X | X | | |
| **6.5. VENTILATION** | | | | | | | |
| 1. Wall louvers | | | | | | X | X |
| 2. Circular vents | X | X | X | X | X | | |
| 3. Monovents at peak | X | X | X | X | X | | |
| 4. Roofjacks for circular roof openings | X | X | X | X | X | | |
| 5. Roof opening | X | X | X | X | X | | |
| **6.6. DRAINAGE** | | | | | | | |
| 1. Gutters | X | X | X | X | X | | |
| 2. Downspouts | | | | | | X | X |
| **6.7. SECURITY DEVICE** | | | | | | | |
| 1. Temporary Security Devices | X | | | (X) | (X) | | |

(X) means LPR1000 only

Other specific accessories (wall skylights…) available on request.

## Safety devices

Astron has developed a full system to ensure personnel peripheral collective security on a finished building, when maintenance work or repair is needed. It is formed by 4 components:

- Galvanised base plates, which are directly fixed to the roof panels by means of specially developed screws.
- Galvanised steel posts, which fit into the base plates and are locked by a safety pin.
- Girts and plinths, which are placed on the steel posts.
- Safety nets, which are tightened to the edge posts with bracing ropes on both sides and also fixed to the girts and plinths with the help of special hook.

The entire system has been tested and certified according to EN13374.

The base plates, which have been tested and certified according to EN 795, can also serve as individual anchor points for attaching life lines.

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