Lindab-Astron

Product specifications

1. GENERAL

1.1. ORIGINS OF THE ASTRON PRODUCT

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, in the Grand Duchy of Luxembourg, by the company Lindab Astron s.r.o based in Prerov, in Czech Republic or by Lindab Building Systems Kft. in Nyíregyháza, Hungary.

1.2. THE ASTRON PRODUCT

The ASTRON building incorporates all the elements of the framework; primary and secondary framing (including bolts, clips, flange bracing, etc.), roof and wall cladding (including screws, closures, sealers, flashings, etc.) the thermal insulation ASTROTHERM (see sub-heading 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 beams for overhead traveling cranes and mezzanines also form part of the ASTRON product range.

1.3. THE RANGE OF ASTRON BUILDINGS

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

The ASTRON Building System allows 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 concrete slaps available.

1.5. TERMS DEFINING THE ASTRON BUILDING

- 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 base of the column and the point of intersection of the roof steel line and sidewall steel line, accounting for a purlin depth of 203 mm.

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 30 - 60	2 - 33 10 - 33	4.20 - 9 4.20 - 12
AZM2	18 - 30 30 - 72	2 - 33 2 - 33	4.20 -7.2 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

The bay spacing is generally between 5 and 12 meters.

1.7. STATIC CALCULATIONS, DRAWINGS AND GUARANTEES

ASTRON will supply a complete copy of the 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.

The guarantees offered are given in detail in the price book, principally in the document titled "Terms and Conditions".

2. DESIGN CALCULATIONS

2.1. GENERAL

All the constituent structural elements of an ASTRON building are designed by professional engineers and they conform to the requirements of the National Building Codes which are effective in the country of construction. In the absence of such codes, use will be made of the following American Specifications.

a) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", published by the "American Institute of Steel Construction" (AISC), 1989 edition;
b) "Cold-formed Steel Design Manual"; published by the "American Iron and Steel Institute" (AISI), 1980 edition;
c) "Low Rise Building Systems Manual", published by the "Metal Building Manufacturers Association" (MBMA), 1990 edition.

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 earth-quakes
- Impact due to accidental loading

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 endwall, jackframes 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 exterior loads to the primary framing. It consists principally of purlins and girts.

3.2. STABILITY

3.2.1. TRANSVERSE STABILITY OF THE BUILDING

The transverse stability of the building is assured by the rigidity of the main frame. The frames are built-up from welded steel plates to form H 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 high strength bolts. Generally, the foot of the columns of the main frames is 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 defined limiting values, the former and/or the latter can be fixed.

3.2.2. LONGITUDINAL STABILITY OF THE BUILDING

The longitudinal stability of the building is assured by the wind bracing, located in the roof and walls, in one or more bays depending on the magnitude of the forces generated 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 purlins, which themselves are fixed in the longitudinal direction of the building by the wind bracing, and the presence of the diaphragmatic effect of the roof panels. The inner flange is stabilized by "flange bracing" in the form of angles, which are attached between the lower flange and the purlin.
The flange bracing is distributed along the length of the rafter in accordance with design requirements.

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

It is however possible to have free standing columns, i.e. without lateral support to either outside or inside flange.

3.2.4. MEZZANINES

The structure of the mezzanines is fabricated out of hot-rolled beams or welded sections, 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 wind bracing system.

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 made as simple supported or as continuous beams.

3.2.6. STABILITY OF ENDWALLS

As a general rule the endwall frames consist of built-up welded H and hot or cold-rolled columns which support a cold formed Z rafter.
The stability of this frame in its plane is assured, depending on the magnitude of the forces and with regard to local building codes, by the diaphragm effect of the panels, rod bracing, or fixed base wind columns.

3.2.7. SECONDARY FRAMING

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

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

The sidewall girts are also generally continuous with overlaps adjacent to the main frame columns, but can also be simply supported between columns. These two conditions also apply to the endwall girts.

Normally a continuous Z purlin or a continuous double Z is used as an eave 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. The performance of these various panels with respect to the diaphragm effect which they afford is quite variable and it is not generally taken into account in the design of the building. However, for certain panels the diaphragm effect is such that one finds that the theoretical deflections under the loads are considerably reduced.

3.3. MATERIAL SPECIFICATIONS

3.3.1. BUILT UP-WELDED PRIMARY FRAMING MEMBERS

The welded elements which are used principally for the primary framing are made from S355 J2+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: 20 % minimum

The welding of the elements is carried out in accordance with DIN 18800, part 7. The web to flange welding is done automatically by submerged arc welding (under flux). The welding rod and the flux conform with norm EN 756 with quality reference EN 756-S4T2ARS2. The manual welding of connection plates, stiffeners etc. is carried out in accordance with the EN 440, quality EN 440-G42 2 M G3Si1 or G42 2 M G4Si1.

A periodic check is carried out and verified by a certifying document of conformation called "Grosser Eignungsnachweis" made according to DIN 18800, part 7 and a certification according to EN 729-2 issued by the German Welding Institute "Schweisstechnische Lehr- und Versuchanstalt Duisburg".

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: 24 % minimum

3.3.3. BEAMS FOR MEZZANINES AND CRANE RAIL BEAMS

These beams are generally hot-rolled profiles in quality steel S 235 or S 355 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 S 390 GD + Z 275 steel as defined in norm EN 10326.

The Z profiles have a depth of 203 mm or 254 mm, and the thickness varies from 1.25 mm to 3.2 mm 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 4017 and 4018 except for the dimensions of the head and the nut conforming to the DIN 558 and 933.

3.3.6. BRACING

The steel rods which act as ties in the windbracing are made from quality 5.8 steel. 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-copolymere 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-copolymere 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 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-dipped galvanized.

3.4.2. SECONDARY FRAMING

The purlins and girts in Z and C profiles are produced from galvanized material in accordance with EN 10326. The quantity of zinc used is 275 g/m² which corresponds to a thickness of about 20 microns on each face.

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 five types of wall sheeting and three of 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 and a roof panel specially designed for built-up roof construction.

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: S 350 GD 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 PVDF)
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 (±RAL 7035).

4.1.3. FIXING AND ERECTION

The panels are fixed to the girt by self-tapping 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-tapping, full-length thread, with coloured nylon head

- Length: 19/32/50 mm depending on the thickness of the insulation
- Diameter: 6.3 mm
- Material: surfaced hardened carbon steel, galvanized

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

- Length: 32/38/59 mm depending on the thickness of the insulation
- Diameter: 5.5 mm
- 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 LPA900 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. LPD1000 WALL TYPE

4.2.1. DESCRIPTION

Steel ribbed panel, colour-coated, produced by cold roll forming.

The principal characteristics of this panel are:

- Steel quality: S 350 GD in accordance with EN 10326
  Yield strength: 350 N/mm²
  Ultimate tensile strength: 420 N/mm²
- Nominal thickness: 0.49 mm
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of ribs: 38 mm

4.2.2. PROTECTION AND COATINGS

Exterior face: 25 mic. superpolyester (or PVDF)
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 (±RAL 7035).

4.2.3. FIXING AND ERECTION

The panels are fixed to the girt by self-tapping 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 100 mm are created between panels at the level of a girt.

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

- Length: 19/32/50 mm depending on the thickness of the insulation
- Diameter: 6.3 mm
- Material: surfaced hardened carbon steel, galvanized

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

- Length: 32/38/59 mm depending on the thickness of the insulation
- Diameter: 5.5 mm
- 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 750 mm

4.2.4. THE LPD1000 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 between the girts and the LPD1000 sheeting.

One can also fix interior LPI1200 or LPG1000 sheeting 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.

4.3. POLAR SA WALL TYPE

4.3.1. DEFINITION

Sandwich panel consisting of two profiled steel coated panels, formed, by cold roll forming, between which a polyurethane foam, CFC free, is injected to act as insulation. Different thicknesses of panel are available.

The main characteristics of this panel are:

- Steel quality: S 280 min. according to EN 10326
- Nominal thickness of steel panel: 0.49/0.40 mm
- Overall thickness of panels: 40, 60 or 80 mm
  other thicknesses: please consult ASTRON
- Cover width: according to the supplier
- Rib depth: minimal

4.3.2. PROTECTION AND COATINGS

Exterior face:
25 mic. superpolyester
20 mic. metallic coating
steel core
20 mic. metallic coating
5 mic. epoxy
polyurethane foam (40-45 kg/m³ density)
5 mic. epoxy
20 mic. metallic coating
steel core
20 mic. metallic coating

Interior face: 15 mic. superpolyester

The exterior coating is available in different colours.
The interior coating is in a colour light grey (±RAL 9002)

4.3.3. FIXING AND ERECTION

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

Screw specification: Double threaded self-drilling screws
- Lengths: 60/100 mm, according to panel thickness
- Diameter: 6.3 mm
- Material: galvanized hardened steel

Distribution of screws:
- Fixed to girts: 3 per panel

4.3.4. POLAR SA WALLS

The distribution of the girts is a function of the thickness of the sandwich panel and the local design loads. POLAR walls offer a high degree of insulation, as well as an attractive interior/exterior finish.

4.4. SINUTEC WALL SYSTEM (PT)

4.4.1. DESCRIPTION

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

The principal characteristics of this panel are:
- Installation: horizontal
- Steel quality: S 350 GD in accordance with EN 10326
  - Yield strength 350 N/mm²
  - Ultimate tensile strength 420 N/mm²
- Nominal thickness: 0.75 mm
- Modular width: 988 mm (13 corrugations of 76 mm)
- Depth of corrugation: 18 mm

4.4.2. PROTECTION AND COATINGS

Exterior face: 25 mic. superpolyester or PVDF
Steel core with a coat of 275 g/m² zinc or
150 g/m² ALUZINC or
255 g/m^2 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 (±RAL 7035).

4.4.3. FIXING AND ERECTION

The panels are fixed to subgirts (Z shaped sections of 80 mm depth, which are bolted onto the secondary framing) by self drilling coloured flat-head screws. The installation is done horizontally from sill to eave by overlapping the panels.

Description of wall screw: self-drilling with a thread full length.
- Length: 38/58 mm depending on the thickness of the insulation
- Diameter: 5.5 mm.
- Material: hardened carbon steel (stainless steel as option), colored screw head.

Distribution of screws:
- For fixation to sub girts: 1 each second corrugation.
- For stitching panel overlaps: by means of pop rivets, each 500 mm.

4.4.4. THE SINUTEC WALL

The sub girts on the secondary framing are normally spaced at 2 meters. The ASTROTHERM insulation (see sub-heading below) is installed horizontally between the sub girts and the SINUTEC sheeting (PT).

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.

4.5. SINUTHERM WALL SYSTEM (PQ)

4.5.1. DESCRIPTION

Sandwich panel consisting of two profiled steel coated panels, formed, by cold roll forming, between which a polyurethane foam, CFC free, is injected to act as insulation.

The main characteristics of this panel are:

- Steel quality: S 320 GD + Z 275 according to EN 10326
- Nominal thickness of steel panel: exterior 0.63 mm; interior 0.75 mm
- Overall thickness of panels: 84 mm
- Cover width: 1000 mm
- Corrugation depth: 27 mm

4.5.2. PROTECTION AND COATINGS

Exterior face: 25 mic. PVDF or superpolyester
20 mic. Zinc (or GALFAN)
steel core
20 mic. Zinc (or GALFAN)
5 mic. epoxy
polyurethane foam (40-45 kg/m³ density)
5 mic. epoxy
20 mic. Zinc (or GALFAN)
steel core
20 mic. Zinc (or GALFAN)

Interior face: 15 mic. superpolyester

The exterior coating is available in different colours.
The interior coating is in a colour light grey (±RAL 9002)

4.5.3. FIXING AND ERECTION

The panels are fixed to subgirts (Z-shaped profiles of 80 mm depth, which are bolted to the secondary framing) with hidden fasteners in the longitudinal overlaps. The installation is done horizontally from sill to eave by slotting the panels into one another.

4.5.4. SINUTHERM WALLS

The spacing of the substructure is a function of the local design loads. The SINUTHERM walls (PQ) offer a high degree of insulation, an attractive exterior look as well as a clean interior finish.

4.6. LPR1000 ROOF SYSTEM

4.6.1. 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: S 550 GD or S 350 GD according to EN 10326
  - S 550 GD: - Yield strength: 550 N / mm²
    - Ultimate tensile strength: 570 N /mm²
  - S 350 GD: - Yield strength: 350 N / mm²
    - Ultimate tensile strength: 420 N /mm²
- Nominal thickness: S 550 GD: 0.55 / 0.54 mm
  S 350 GD: 0.62 / 0.63 mm
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm

4.6.2. PROTECTION

Five finishes are available: four in colour and one in 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

4.6.3. FIXING AND ERECTION

The horizontal distance between the purlins is usually 1.5 meters.
The roof slope can vary from 2 to 20%.
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 screws

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

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 foam rubber closure strip (or with small blocks) having the same profile as the LPR1000 panel. These are made from EPDM.

4.7. LMR600 ROOF SYSTEM (LM)

4.7.1. 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 centres, perpendicular to the major corrugations that significantly improves the panel's performance under foot traffic.

The principal properties of the panel are:

- Steel quality: S320 GD 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

4.7.2. PROTECTION

One type of finish is available: ALUZINC (both sides):

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

(*): Corresponding to 185 gr/m²

4.7.3. FIXING AND ERECTION

The usual horizontal distance between the purlins is 1.5 meters.
The roof slopes can vary between 5 and 10%. They can be reduced to a minimum of 2.6% if no overlap and no accessories.

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.

4.8. POLAR SR ROOF SYSTEM

4.8.1. DEFINITION

Sandwich panel consisting of two profiled steel coated panels, formed by cold roll forming, between which polyurethane foam, CFC free, is injected to act as insulation. Different thicknesses of panel are available.

The main characteristics of this panel are:

- Steel quality: S 350 GD according to EN 10326
- Nominal thickness of steel panel: 0.50/ 0.50 mm min.
- Overall thickness of panels: 30, 40, 60 or 80 mm
- Cover width: 1000 mm
- Rib depth: 39 mm

4.8.2. PROTECTION AND COATINGS

Exterior face :	25 mic. Superpolyester
	20 mic. Metallic coating
	Steel core
	20 mic. Metallic coating
	5 mic. Epoxy
	Polyurethane foam (40-45 kg/m³ density)
	5 mic. Epoxy
	20 mic. Metallic coating
	Steel core
	20 mic. Zinc metallic coating
Interior face :	15 mic. Superpolyester

The exterior coating is available in different colours.
The interior colour is in a colour light grey (±RAL 9002)

4.8.3. FIXING AND ERECTION

The normal horizontal purlin spacing is 1.5 or 3 meters, measured horizontally, projected on the ground floor. The acceptable roof slopes are from 6 to 20%.
The POLAR SR roof panel is fixed to each purlin by self-drilling stainless steel (Cr/Ni 18.8) 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.

Screw specification: Self-drilling screws

- Lengths: according to the sandwich panel thickness
- Diameter: 6.3 mm
- Diameter of steel washer: 22 mm
- Material: stainless steel Cr/Ni 18.8

Distribution of screws:

- On the purlins: 1 between ribs, i.e. 3 per panel
  3 between ribs on the eave and at overlaps
- On the longitudinal overlaps: 1 per 500 mm

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

These tape sealers are made from a combination of butyl polymer and inert substances.
The space between the panel and the purlin is closed by a strip of foam filler matching the POLAR SR panel profile. This foam is made from canized ethyl-propylene (EPDM).

4.9. DOUBLE SKIN ROOF SYSTEM (DSR)

4.9.1. DEFINITION

The inner panel of the Double Skin Roof system, LPS1000 or LPG1000, is fixed directly on to the ASTRON 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, 200mm.

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%.

4.9.2. 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.

4.9.3. FIXING AND ERECTION

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

4.9.4. 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: S 550 GD according to EN 10326
  S 550 GD: - Yield strength: 550 N / mm²
  - Ultimate tensile strength: 570 N /mm²
- Nominal thickness: S 550 GD: 0.55, 0.54 mm
- 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

4.9.5. INNER PANEL LPG1000

Ribbed steel panel, 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: S 550 GD according to EN 10326
  S 550 GD: - Yield strength: 550 N / mm²
  - Ultimate tensile strength: 570 N /mm²
- Nominal thickness: S 550 GD: 0.54 mm
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm

PROTECTION

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	

4.10. BRIDGE SYSTEM

4.10.1. 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 and 160mm with LPR1000 and 120, 140, 160 and 200 with LMR600.

4.10.2. FIXING AND ERECTION

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

4.11. LPI1200 - INTERIOR SHEETING

4.11.1. 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: S 320 GD according to EN 10326
  - 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

4.11.2. 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

4.11.3. 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

4.12. LPG1000 - INTERIOR PERFORATED SHEETING

4.12.1. 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: S 550 GD according to EN 10326
  S 550 GD: - Yield strength: 550 N / mm²
  - Ultimate tensile strength: 570 N /mm²
- Nominal thickness: S 550 GD: 0.54 mm
- Modular width: 1000 mm (3 modules of 333 mm)
- Depth of main ribs: 38 mm

4.12.2. 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

4.12.3. 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

5. ASTRON - THERMAL INSULATION

5.1. APPLICATION

ASTROTHERM thermal insulation can be used with the LPA900, LPD1000 and SINUTEC 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).
ASTROTHERM thermal insulation receives the CE marking.

5.2. DESCRIPTION

It consists of a flexible blanket of fibre 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 1.5 meters.

5.2.1. PROPERTIES OF INSULATION

A flexible fibre 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	**MPS**	**KAS**	**ASA**
Composition :	painted alufoil fibreglass scrim reinforcement PVC film	Vinyl film fibreglass scrim reinforcement metalized polyester film	alufoil fibreglass scrim reinforcement craft paper	painted alufoil fibreglass scrim reinforcement aluminium film
Fire rating acc. to EN 13501-1	A2-s1, d0	D-s3, d0	D-s1, d0	A1
Vapour permeability ($gr.m^2.h.mm.Hg$)	< 0.001	<0.003	<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 fibre 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: 40 kg/m3

- Declared thermal conductivity: 0.029 W/(m·K)
- Thickness: 19 mm
- Material: Extruded polystyrene

For an insulation thickness of a 120 mm strips, isoblocks 25 mm or 30mm thickness are used, which have the following characteristics:

- Density: 40 kg/m3
- Declared thermal conductivity: 0.029 W/(m·K)
- Thickness: 25 mm or 30 mm
- Material: Extruded polystyrene

5.2.5. ACCESSORIES FOR INSULATION

Adequate accessories complete the Insulation Product range.

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

6. ACCESSORIES

The ASTRON Building System 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. The ASTRON accessories currently available are listed here below.

	LPR1000	LMR600	POLAR SR	DSR	BRIDGE	LPA900	LPD1000	POLAR SA	SINUTEC	SUNTHERM
	ROOFS					**WALLS**				
6.1. WINDOWS										
1. Windows frame						X	X	X	X	X
6.2 DOORS										
1. Single and double swing door						X	X	X	X	X
2. Anti-panic bar						X	X	X	X	X
3. Truck-door frame						X	X	X	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	X	X	X
6.7. SECURITY DEVICE										
1. Security Devices	X			(X)	(X)					

(X) means LPR1000 only

SECURITY DEVICES

Lindab Astron has developed a full system to ensure personnel peripheral collective security on a finished building with single LPR1000 roof, 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.

NOTE: As Lindab Astron are in process of improving the above mentioned items, Lindab Astron reserve the right to modify any or all of the elements and characteristics without prior notification.

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www.astron.biz

Astron is the brand name of the products sold by the Building Systems Business area of the Lindab group, Europe's largest manufacturer of steel building systems for industrial, office and commercial use.

Lindab-Astron produce up to 1,000 buildings a year, distributed either through a network of 400 certified independent Builders, spanning nearly 40 countries or through our Key Accounts Unit. Our headquarters is located in Diekirch (Luxembourg). Lindab's concept is clear and simple:

We simplify construction

Lindab-Astron: http://www.astron.biz/contact/Astron.html

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