Declarations of Performance (DoP)

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ALL DOP ARE AVAILABLE ON INTERNET

- address: www.astron.biz
  then go to “document center”

Declaration of Performance

DOP N°1a

1. ***Product type:*** Astrotherm (Insulation + vapour barrier)

2. ***Article codes:*** Insulation: IN-
   Vapour barrier: ASA, AVS

3. ***Intended use:*** Building insulation (roof and wall)

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** Insulation: glasswool blanket
   Vapour barrier laminated on glasswool blanket.

6. ***System of assessment***: System 1

7. ***Certificate*** 0764 – CPR – 0286

8. ***Manufacturing:*** According to EN 13162

9. ***Declared performances:***

   a. ***Tolerances:*** EN13162
   b. ***Thickness:*** Insulation: 40 - 120mm.
   c. ***Density:*** Insulation 16 kg/m3

d. ***Release of dangerous substances:***
Vapour barrier Adhesive, refer to “National 48267” for Technical Data & Safety Data sheet

e.	***Reaction to fire:***	IN + ASA:	Class A1
		IN + AVS:	Class A2-s1, d0
f.	***Fire resistance:***	NPD	
g.	***Durability:***	NPD	
h.	***Thermal conductivity:***	λ=0,037 W/mK	

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

Signed for and on behalf of the manufacturer by:

Name and function: **René OLY, R&D Manager**

Place and date of issue: **Diekirch, 03th July 2018, rev.4**

Signature:

DOP N°1b

1. ***Product type:*** Astrotherm (Insulation + vapour barrier)

2. ***Article codes:*** Insulation: IN-
Vapour barrier: KAS

3. ***Intended use:*** Building insulation (roof and wall)

4. ***Company:*** Astron Building s.a.
Route d'Ettelbruck
L-9230 Diekirch

5. ***Material:*** Insulation: glasswool blanket
Vapour barrier laminated on glasswool blanket.

6. ***System of assessment***: System 3

7. ***Certificate*** -

8. ***Manufacturing:*** According to EN 13162

9. ***Declared performances:***

   a. ***Tolerances:*** EN13162
   b. ***Thickness:*** Insulation: 40 - 120mm.
   c. ***Density:*** Insulation 16 kg/m3

d. ***Release of dangerous substances:***
Vapour barrier Adhesive, refer to “National 48267” for Technical Data & Safety Data sheet

e. ***Reaction to fire:*** IN + KAS: Class D-s1, d0
f. ***Fire resistance:*** NPD
g. ***Durability:*** NPD
h. ***Thermal conductivity:*** λ=0,037 W/mK

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

Signed for and on behalf of the manufacturer by:

Name and function: **René OLY, R&D Manager**

Place and date of issue: **Diekirch, 04th July 2016, rev.3**

Signature:

Declaration of Performance

DOP N°2

1. ***Product type:*** Galvanized profiles

2. ***Article codes:***
   H profiles: HE-, HS-, XH-.
   L profiles: LC-, LSL-, XL-.
   U profiles: UC-, UF-, UY-, XU-.
   And similar long parts

3. ***Intended use:*** Building Secondary Structure

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** S390GD+Z275 according to EN 10346

6. ***System of assessment***: System 2+

7. ***Certificate*** 1166-CPR-0153, 1166-CPR-0181

8. ***Manufacturing:*** According to EN 1090-2 (EXC2 and/or EXC3)

9. ***Declared performances:***

   a. ***Tolerances:*** EN1090-2
   b. ***Reaction to fire:*** A1
   c. ***Fire resistance:*** NPD
   d. ***Release of dangerous substances:*** NPD
   e. ***Load bearing capacity:*** NPD

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

    This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

    Signed for and on behalf of the manufacturer by:

    Name and function: **René OLY, R&D Manager**

    Place and date of issue: **Diekirch, 15th November 2017, rev.3**

    Signature:

Declaration of Performance

DOP N°3

1. ***Product type:*** Hot Rolled I & 0 profiles

2. ***Article codes:*** I profiles: BK-, CK-, IK-, JK-,

   O profiles: IY-, SB-, SC-.

3. ***Intended use:*** Building Primary Structure

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** Hot Rolled I profiles:
   - S235, S275, S355 according to EN 10025-1 and -2
   - S420M, S460M according to EN 10025-4

   Cold formed pipes:
   - S235JRH according to EN 10219

6. ***System of assessment***: System 2+

7. ***Certificate*** 1166-CPR-0153, 1166-CPR-0181

8. ***Manufacturing:*** According to EN 1090-2 (EXC2 and/or EXC3)

9. ***Declared performances:***

a.	***Tolerances:***	EN1090-2, Class 1
b.	***Reaction to fire:***	A1
c.	***Fire resistance:***	NPD
d.	***Release of dangerous substances:***	NPD
e.	***Load bearing capacity:***	Calculation according to EN 1993-1-1, EN 1993-1-5
f.	***Durability:***	NPD

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

Signed for and on behalf of the manufacturer by:

Name and function: **René OLY, R&D Manager**

Place and date of issue: **Diekirch, 04th Feb 2019, rev.3**

Signature:

Declaration of Performance

DOP N°4

1. ***Product type:*** C, HA, Z profiles

2. ***Article codes :***
   C profiles : CF-, CJ-, CR-, CS-, XC-
   HA profiles : HA-, XH-
   Z profiles : ZF-, ZK-, ZL-, ZM-, ZQ-, ZR-, ZS-, ZU-, ZV-, ZW-, XZ-.

3. ***Intended use:*** Building Secondary Structure

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** S390GD+Z275 according to EN 10346

6. ***System of assessment***: System 2+

7. ***Certificate*** 1166-CPR-0153, 1166-CPR-0181

8. ***Manufacturing:*** According to EN 1090-2 (EXC2 and/or EXC3)

9. ***Declared performances:***

   a. ***Tolerances:*** EN1090-2
   b. ***Reaction to fire:*** A1
   c. ***Fire resistance:*** NPD
   d. ***Release of dangerous substances:*** NPD

e.	***Load bearing capacity:***	Calculation according to EN 1993-1-1, EN 1993-1-5
f.	***Durability:***	NPD

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

    This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

    Signed for and on behalf of the manufacturer by:

    Name and function: **René OLY, R&D Manager**

    Place and date of issue: **Diekirch, 15th November 2017, rev.3**

    Signature:

Declaration of Performance

DOP N°5

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LMR600: LMD

3. ***Intended use:*** Roof enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** S320GD + AZ185

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,66mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)
   e. ***Coating:*** Aluzinc 185g/m2 (AZ185)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°6

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPA900: PAQ, PAS

3. ***Intended use:*** Wall enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S350GD + Z275 or S350GD + ZA255 or S350GD + AZ150

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** PAQ: 0,49mm
      PAS: 0,62mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)
   e. ***Coating*** Outside:
      - 25µ (primer + super polyester SP) or
      - 35µ (Granite: primer + HDS)

      Inside:
      - 10µ (primer + acrylic or polyester) or
      - 8µ (primer + acrylic or polyester)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°7

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPI1200: PII

3. ***Intended use:*** Inside wall enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S320GD + Z140 or S320GD + ZA130

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,47mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)
   e. ***Coating:*** Outside: 15µ (primer + super polyester SP)
      Inside: 8µ (primer + acrylic or polyester)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°8

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPR1000 : LRE
   LPS1000: LSE
   LPG1000: LGE

3. ***Intended use:*** Roof enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S550GD + AZ185

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,55mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)
   e. ***Coating:*** Aluzinc 185g/m2 (AZ185)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°9

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPR1000 : LRE
   LPS1000: LSE
   LPG1000: LGE

3. ***Intended use:*** Roof enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S550GD + Z275 or S550GD + ZA255 or S550GD + AZ150

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,54mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)

e. ***Coating:***

Outside

- 25µ (primer + super polyester SP) or
- 35µ (Granite: primer + HDS)

Inside:

- 10µ (primer + acrylic or polyester) or
- 8µ (primer + acrylic or polyester)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°10

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPR1000 : LRS
   LPS1000: LSS
   LPG1000: LGS

3. ***Intended use:*** Roof enveloppe

4. ***Company:*** Aston Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S350GD + Z275 or S350GD + ZA255 or S350GD + AZ150

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performances:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,62mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)

e. ***Coating:***

Outside

- 25µ (primer + super polyester SP) or
- 35µ (Granite: primer + HDS)

Inside:

- 10µ (primer + acrylic or polyester) or
- 8µ (primer + acrylic or polyester)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°11

1. ***Product type:*** Corrugated profile

2. ***Article codes :*** LPV1000 : LVN, LVQ
   LPD1000: LDN, LDQ

3. ***Intended use:*** Wall enveloppe

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material*** S350GD + Z275 or S350GD + ZA255 or S350GD + AZ150

6. ***System of assessment***: System 3

7. ***Manufacturing:*** According to EN 14782

8. ***Declared performance:***

   a. ***Tolerances:*** EN14782
   b. ***Thickness:*** 0,49mm
   c. ***Reaction to fire:*** A1
   d. ***External fire reaction:*** Broof (t1), Broof (t2) and Broof(t4)

e. ***Coating:***

Outside

- 25µ (primer + super polyester SP) or
- 35µ (Granite: primer + HDS)

Inside:

- 10µ (primer + acrylic or polyester) or
- 8µ (primer + acrylic or polyester)

9. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 8.

   This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

   Signed for and on behalf of the manufacturer by:

   Name and function: **René OLY, R&D Manager**

   Place and date of issue: **Diekirch, 04th July 2016, rev.1**

   Signature:

Declaration of Performance

DOP N°12

1. ***Product type:*** Round bars with threaded ends

2. ***Article codes :*** RB-, RSG-, BA-, BY-

3. ***Intended use:*** Wind Bracing, anchor bolts and building secondary

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** S355J2+N according to EN 10025-1 and -2
   5.8 and 6.8 according EN15048-1

6. ***System of assessment***: System 3

7. ***Certificate*** 1166-CPR-0153, 1166-CPR-0181

8. ***Manufacturing:*** According to EN 1090-2 (EXC2 and/or EXC3)

9. ***Declared performances:***

   a. ***Tolerances:*** EN1090-2
   b. ***Reaction to fire:*** A1
   c. ***Fire resistance:*** NPD
   d. ***Release of dangerous substances:*** NPD
   e. ***Load bearing capacity:*** According to EN 1993-1-1, EN 1993-1-8
   f. ***Durability:*** NPD

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

    This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4.

    Signed for and on behalf of the manufacturer by:

    Name and function: **René OLY, R&D Manager**

    Place and date of issue: **Diekirch, 04th July 2016, rev.2**

    Signature:

Declaration of Performance

DOP N°13

1. ***Product type:*** Welded I profiles

2. ***Article codes:*** BY-, CY-, DY-, EY-, IY-, JY-, RY-, WY-

3. ***Intended use:*** Building primary

4. ***Company:*** Astron Building s.a.
   Route d'Ettelbruck
   L-9230 Diekirch

5. ***Material:*** S355J2+N according to EN 10025-1 and -2

6. ***System of assessment***: System 2+

7. ***Certificate*** 1166-CPR-0153, 1166-CPR-0181

8. ***Manufacturing:*** According to EN 1090-2 (EXC2 and/or EXC3)

9. ***Declared performances:***

   a. ***Tolerances:*** EN1090-2
   b. ***Reaction to fire:*** A1
   c. ***Fire resistance:*** NPD
   d. ***Release of dangerous substances:*** NPD
   e. ***Load bearing capacity:*** Calculation according to EN 1993-1-1, EN 1993-1-5
   f. ***Durability:*** NPD

10. The performances of the product identified in point 1 and 2 is in conformity with the declared performances in point 9.

    This declaration of performance is issued under the sole responsibility of the manufacturer identify in point 4

    Signed for and on behalf of the manufacturer by:

    Name and function: **René OLY, R&D Manager**

    Place and date of issue: **Diekirch, 04th of July 2016, rev.3**

    Signature:

Declaration of Performance – No. 14 (rev.1)

1. Product Type

ASTRON BUILDING SYSTEM
Building Kit according ETA-18/1027

2. Building Kit serial number and basic identification

Project Name: Xxx

Project Number: Xxxx

Job Number(s): xxxxx AJ
xxxxx AI
xxxxx KJ

Execution Class: EXC X
Tolerance Class: 01
Corrosion protection of primary structure according EN 12944: Cx - xxx

Note: the yellow underlined fields are filled case by case with project specific data, allowing to identify the building kit and its components in a unique way.

3. Intended use

Construction of functional or non-residential buildings, either single storey or multi-storey, or industrial structures.

4. Manufacturing Plant

Astron Buildings S.A.
32 Route d'Ettelbruck
L-9230 Diekirch
Luxembourg

5. Company responsible for the building kit design, erection documentation and shop drawings:

Astron Buildings S.A.
32 Route d'Ettelbruck
L-9230 Diekirch
Luxembourg

6. System used for AVCP: 1

7. European Technical Assessment: ETA-18/1027
Date issued: November 19th 2018
Technical Assessment Body: **DIBt** (TAB)
Kolonnenstrasse 30, 10829 Berlin, Germany
European Assessment Document: ETAG 025 *Metal Frame Building Kit* used as EAD

Notified Certification Body: **ÉMI Kft.** (TAB)
Dózsa György út. 26, 2000 Szentendre, Hungary
AVCP: Type testing, initial inspection, continuous surveillance and evaluation according system 1
FPC certificate: 1415-CPR-84-(C-49/2018)
Date issued: March 04th 2019

8. Declared Performances (ref. ETA-18/1027)

Essential characteristic	**Performance** (see annexes for details)	**Harmonised Technical Specification**
Characteristic values of load bearing resistance of bevel washers and web plates with bevels washers	See table 01 & 02	ETA-18/1027 (11/2018) and ETAG 025 (05/2006) used as EAD
Characteristic values of vertical resistance of crane beam brackets	See table 03	
Characteristic values of load bearing resistance of Z-profile purlins	See tables 04 to 14	
Characteristic values of load bearing resistance of ridge purlin supports, rails, spacer clips, and sag system as accessory components of Z-profile purlins	See tables 15 to 18	
Characteristic values of load bearing resistance of profiled sheets and fixing screws	See tables 19 to 26	
Airborne sound insulation, Sound absorption	See table 27	
Reaction to fire	See table 28	EN13501-1 (2013)
External fire performance of the roof covering	$B_{ROOF}(t1)$, $B_{ROOF}(t2)$, $B_{ROOF}(t4)$	EN13501-5 (2016)

9. Declaration: the performances of the products identified in point 1 & 2 are in conformity with the declared performances in point 8.

This declaration of performance has been issued under the sole responsibility of the manufacturer identified in point 4. Signed for and on behalf of the manufacturer by:
René OLY, R&D Innovation and Methods Manager

Diekirch, 12th of February 2019, rev.1

Annexes: detailed declared performances as defined in point 8.
For more details, please refer to ETA-18/1027 Annexes

Table 01:
Load bearing resistance of the bevel washers for wind bracing connections

		Tension resistance $S_{R,k}$ [kN]		
		M18	M24	M30
Number of washers:		2+2	2+2	1+1
Angle α [°]	30	160	215	217
	55	167	250	269
	80	166	251	264

Table 02:
Load bearing resistance of the web plate for wind bracing connection with bevel washers

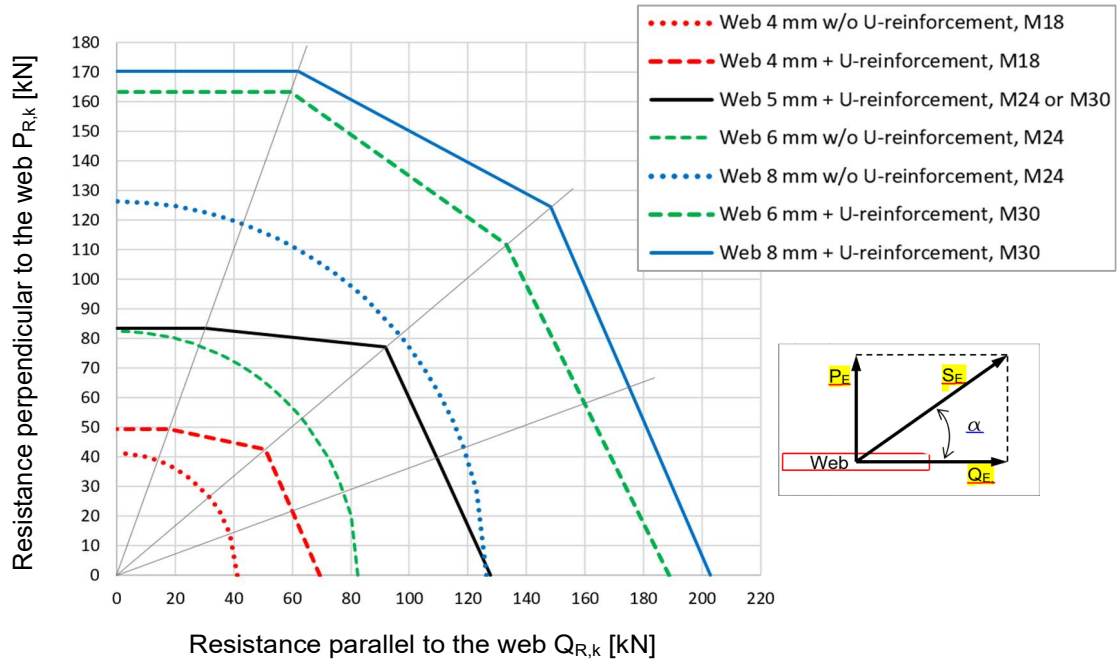

Table 03:
Vertical load bearing resistance of crane beam brackets

	Static verification	Fatigue verification
Type	$V_{R,k}$ [kN]	$V_{F,R,k}$ [kN]
KY 0001	302	232
KY 0002	394	255
KY 0003	636	368

Table 04: V [kN] M [kNm]
Resistances at the end of the purlin overlaps without additional bolts

t_{cor} [mm]	h = 203 mm						t_{cor} [mm]	h = 254 mm					
	Point	1	2	3	4	5		Point	1	2	3	4	5
1,25	$V^i_{ov,Rk}$	0	3,86	4,52	5,28	5,28	1,70	$V^i_{ov,Rk}$	0	6,57	12,30	35,57	35,57
	$M^i_{ov,Rk}$	5,61	5,61	4,52	3,25	0		$M^i_{ov,Rk}$	12,63	12,63	11,36	6,19	0
1,50	$V^i_{ov,Rk}$	0	3,58	7,04	19,48	19,48	2,00	$V^i_{ov,Rk}$	0	8,83	16,40	45,84	45,84
	$M^i_{ov,Rk}$	7,15	7,15	7,04	4,87	0		$M^i_{ov,Rk}$	17,00	17,00	15,15	7,98	0
1,91	$V^i_{ov,Rk}$	0	5,89	10,96	30,98	30,98	2,67	$V^i_{ov,Rk}$	0	14,56	27,15	77,34	77,34
	$M^i_{ov,Rk}$	11,78	11,78	10,96	7,74	0		$M^i_{ov,Rk}$	28,01	28,01	25,09	13,46	0
2,67	$V^i_{ov,Rk}$	0	9,32	17,68	54,08	54,08							
	$M^i_{ov,Rk}$	18,64	18,64	17,68	13,52	0							

Table 05: V [kN] M [kNm]
Resistances under uniform gravity loading at the end of the purlin overlaps with additional bolts

t_{cor} [mm]	h = 203 mm						t_{cor} [mm]	h = 254 mm					
	Point	1	2	3	4	5		Point	1	2	3	4	5
1,50	$V^i_{ov,Rk}$	0	4,23	17,37	28,13	28,13	1,70	$V^i_{ov,Rk}$	0	7,84	15,11	55,61	55,61
	$M^i_{ov,Rk}$	8,46	8,46	8,46	7,03	0		$M^i_{ov,Rk}$	15,09	15,09	13,96	9,68	0
1,91	$V^i_{ov,Rk}$	0	6,59	13,19	52,76	52,76	2,00	$V^i_{ov,Rk}$	0	10,15	18,90	70,13	70,13
	$M^i_{ov,Rk}$	13,19	13,19	13,19	13,19	0		$M^i_{ov,Rk}$	19,53	19,53	17,47	12,20	0
2,67	$V^i_{ov,Rk}$	0	10,34	20,68	81,58	81,58	2,67	$V^i_{ov,Rk}$	0	17,22	31,42	93,33	93,33
	$M^i_{ov,Rk}$	20,68	20,68	20,68	20,40	0		$M^i_{ov,Rk}$	33,13	33,13	29,03	16,24	0

Table 06: V [kN] M [kNm]
Resistances under wind uplift at the end of the purlin overlaps with additional bolts

t_{cor} [mm]	h = 203 mm						t_{cor} [mm]	h = 254 mm					
	Point	1	2	3	4	5		Point	1	2	3	4	5
1,50	$V^i_{ov,Rk}$	0	4,73	8,71	22,45	22,45	1,70	$V^i_{ov,Rk}$	0	8,43	15,65	45,06	45,06
	$M^i_{ov,Rk}$	9,47	9,47	8,71	5,61	0		$M^i_{ov,Rk}$	16,23	16,23	14,46	7,84	0
1,91	$V^i_{ov,Rk}$	0	6,98	13,70	38,09	38,09	2,00	$V^i_{ov,Rk}$	0	10,81	20,49	54,87	54,87
	$M^i_{ov,Rk}$	13,96	13,96	13,70	9,52	0		$M^i_{ov,Rk}$	20,79	20,79	18,93	9,55	0
2,67	$V^i_{ov,Rk}$	0	11,78	21,58	63,71	63,71	2,67	$V^i_{ov,Rk}$	0	17,23	33,98	54,60	54,60
	$M^i_{ov,Rk}$	23,57	23,57	21,58	15,93	0		$M^i_{ov,Rk}$	33,14	33,14	31,40	9,50	0

Table 07: R [kN] M [kNm]
Resistances under uniform gravity loading at the intermediate purlin supports

t_{cor} [mm]	h = 203 mm						t_{cor} [mm]	h = 254 mm					
	Point	1	2	3	4	5		Point	1	2	3	4	5
1,50	$R^i_{B,Rk}$	0	12,33	17,51	24,79	24,79	1,70	$R^i_{B,Rk}$	0	20,91	31,66	38,05	38,05
	$M^i_{Supp,Rk}$	14,32	14,32	11,59	7,11	0		$M^i_{Supp,Rk}$	24,30	24,30	20,96	10,92	0
1,91	$R^i_{B,Rk}$	0	18,72	29,91	37,21	37,21	2,00	$R^i_{B,Rk}$	0	26,40	40,06	50,78	50,78
	$M^i_{Supp,Rk}$	21,75	21,75	19,80	10,68	0		$M^i_{Supp,Rk}$	30,67	30,67	26,52	14,58	0
2,67	$R^i_{B,Rk}$	0	33,27	52,32	69,56	69,56	2,67	$R^i_{B,Rk}$	0	46,13	61,79	108,98	108,98
	$M^i_{Supp,Rk}$	38,65	38,65	34,64	19,96	0		$M^i_{Supp,Rk}$	53,60	53,60	40,90	31,28	0

Table 08: R [kN] M [kNm] Resistances under wind uplift at the intermediate purlin supports

t_{cor} [mm]	h = 203 mm						t_{cor} [mm]	h = 254 mm					
	Point	1	2	3	4	5		Point	1	2	3	4	5
1,50	$R^i_{B,Rk}$	0	12,81	18,83	18,83	18,83	1,70	$R^i_{B,Rk}$	0	21,15	22,14	22,14	22,14
	$M^i_{Supp,Rk}$	14,88	14,88	12,60	5,40	0		$M^i_{Supp,Rk}$	24,58	24,58	15,83	6,36	0
1,91	$R^i_{B,Rk}$	0	19,32	26,04	27,19	27,19	2,00	$R^i_{B,Rk}$	0	26,91	27,63	29,92	29,92
	$M^i_{Supp,Rk}$	22,45	22,45	17,24	7,80	0		$M^i_{Supp,Rk}$	31,26	31,26	18,29	8,59	0
2,67	$R^i_{B,Rk}$	0	30,60	41,84	42,72	42,72	2,67	$R^i_{B,Rk}$	0	40,86	40,86	40,86	40,86
	$M^i_{Supp,Rk}$	35,56	35,56	27,70	12,26	0		$M^i_{Supp,Rk}$	47,48	47,48	27,05	11,73	0

Table 09: Resistances under uniform gravity loading as well as under wind uplift in the field

t_{cor} [mm]	Gravity loads		Wind uplift			
	$M_{Field,Rk}$ [kNm] (single and multispan)		$M_{Field,Rk}$ [kNm] (multispan)		$M_{Field,Rk}$ [kNm] (single span)	
	h = 203 mm	h = 254 mm	h = 203 mm	h = 254 mm	h = 203 mm	h = 254 mm
1,25	5,61	-	- 3,93	-	- 3,16	-
1,52	8,25	-	- 5,88	-	- 5,10	-
1,66	9,90	11,90	- 6,55	- 6,65	-	- 6,30
1,70	-	-	-	-	- 6,19	-
1,78	-	-	-	-	-	- 7,45
1,91	12,92	15,68	- 7,83	- 9,24	- 7,00	-
2,03	-	-	-	-	-	- 9,89
2,21	-	-	-	-	- 8,18	-
2,29	-	-	-	- 12,88	-	- 12,32
2,67	22,69	28,43	- 12,08	- 15,48	- 9,89	- 14,75

Table 10: End support resistances under uniform gravity loading $R_{A,Rk}$ [kN]

	Z-BF rake beam t_{nom} = 1,70 mm		Z-BF rake beam t_{nom} = 2,67 mm	
t_{cor} [mm]	h = 203 mm	h = 254 mm	h = 203 mm	h = 254 mm
1,25	-	-	4,74	-
1,50	11,39	-	11,82	-
1,70	-	17,37	-	15,30
1,91	20,47	-	15,44	-
2,00	-	22,16	-	18,62
2,67	22,86	25,87	30,09	27,91

Table 11: End support resistances under wind uplift $R_{A,Rk}$ [kN] (single section)

h [mm]	t_{cor} [mm]	Z-BF rake beam with washers		Frame rafter	
		1,70 m Z254	2,67 mm Z254	Without washers	With washers
203	1,50	5,54	6,79	5,35	7,40
	1,70	6,08	7,57	6,57	9,06
	1,91	6,65	8,39	7,84	10,81
	2,21	7,46	9,57	10,78	14,12
	2,67	8,71	11,37	15,27	19,19
254	1,70	6,11	7,70	7,47	10,27
	2,03	7,04	8,98	9,54	13,31
	2,29	7,97	10,27	12,34	17,96
	2,67	9,12	11,85	15,81	23,69

Table 12: Effective section surfaces Aef 1 and Aef 2 of the purlins

Nr.	Profile identification	Steel core thick. t_{cor} [mm]	Effective section surfaces A_{ef1} [cm²]	A_{ef2} [cm²]	Gyration radius i_y [cm]
1	1,25Z203	1,25	3,20	1,28	7,88
2	1,52Z203	1,50	4,32	2,40	7,87
3	1,70Z203	1,70	5,06	3,22	7,87
4	1,91Z203	1,91	5,92	3,99	7,86
5	2,21Z203	2,21	7,31	5,08	7,85
6	2,67Z203	2,67	9,67	6,65	7,84
7	1,66Z254	1,66	5,89	2,45	10,0
8	1,78Z254	1,78	6,48	3,01	9,98
9	2,03Z254	2,03	7,73	4,33	9,97
10	2,29Z254	2,29	9,15	5,86	9,96
11	2,67Z254	2,67	11,43	7,89	9,92

Table 13: Elastic restraints offered to Z profiles by the roof elements by the profiled sheets PR/LPR1000

Roof execution		Z height [mm]	$C_{\theta,k}$ [Nmm/mm/rad]	S_k [N/mm/rad]
Single skin	Without insulation	203 / 254	920	3169
	With insulation up to 80 mm without isobloc	203 / 254	860	1146
	With insulation up to 120 mm with isobloc up to 25mm	203 / 254	930	1146
Single skin with Bridge System	With insulation up to 160 mm Bridge clip centers 600mm	203 / 254	217	219
	With insulation up to 200 mm Bridge clip centers 600mm	203 / 254	217	149
	With insulation up to 160 mm Bridge clip centers 1200mm	203 / 254	137	198
	With insulation up to 200 mm Bridge clip centers 1200mm	203 / 254	137	134
Double skin with Omega System with LPR1000 1st skin	With insulation	203 / 254	920	3169
Double skin with Omega System with LPG1000 1st skin	With insulation Omega clip centers 667 mm	203	559	1880
		254	542	
	With insulation Omega clip centers 1000 mm	203	446	
		254	410	
	With insulation Omega clip centers 1333 mm	203	390	
		254	344	

Table 14: Elastic restraints offered to Z profiles by the profiled sheets LMR600

Roof execution		Z height [mm]	$C_{\theta,k}$ [Nmm/mm/rad]	S_k [N/mm/rad]	
				Sliding clips	Fix clips
Single skin with clip type A	Without insulation	203	668	-	364
		254	911		
Single skin with clip type B	With ins up to 120mm isobloc	203	549	-	264
		254	749		
Single skin with clip type A with Bridge System	With insulation up to 200 mm Bridge clip centers 600 mm	203	174	-	200
		254			
	With insulation up to 200 mm Bridge clip centers 1200 mm	203	90	-	120
		254			
Double skin with clip type B with Omega System with LPR1000 1st skin	With insulation Omega clip centers 667 mm	203	911	3169	3532
		254	1142		
	With insulation Omega clip centers 1000 mm	203	836		
		254	1077		
	With insulation Omega clip centers 1333 mm	203	797		
		254	1044		
Double skin with clip type B with Omega System with LPG1000 1st skin	With insulation Omega clip centers 667 mm	203	436	1673	1673
		254	395		
	With insulation Omega clip centers 1000 mm	203	344		
		254	321		
	With insulation Omega clip centers 1333 mm	203	296		
		254	283		

Table 15: Characteristic roof in-plane forces resistances of the ridge purlin supports

Type	Web depth [mm]	Steel thickness t_{cor} [mm]	Unilateral roof in-plane force ($R_{D,ek}$) [kN]		
			Without insulation	With intermediate mineral wool	With intermediate mineral wool and 19 mm thick isobloc
A	203	1,47 > t ≥1,25	10,80	8,84	6,59
A	203	t ≥ 1,47	12,71	10,40	7,76
A	254	t ≥ 1,7	15,35	12,05	7,76
C	254	t ≥ 2,0	21,95	14,85	9,41

			Symmetric roof in-plane force ($R_{D,sk}$) [kN]	
			PR ridge cap	LPR / PR ridge cap
A	203	1,50 > t ≥1,25	27,40	19,41
		t ≥ 1,50	38,00	19,41
	254	t ≥ 2,00	27,40	---
		t ≥ 1,70	---	19,13
B	203	t ≥ 1,50	---	27,88
	254	t ≥ 1,70	---	27,48
C	254	t ≥ 2,00	38,00	---
C	203	1,50	---	27,88
		1,70	---	27,88
		1,91	---	27,88
		2,21	---	36,81
		2,67	---	54,95
C	254	1,70	---	27,48
		2,00	---	27,48
		2,30	---	39,72
		2,67	---	57,00

A. Execution with connectors with thickness 2,7 mm, without washers
B. Execution with connectors with thickness 3,2 mm, without washers
C. Execution as A., but with additional external washers and connectors with thickness 5 mm

Table 16: Resistances of Bridge and Omega System rails under uniform gravity loading and under wind uplift

	t_{cor} [mm]	$M_{Supp,Rk}$ [kNm]		$M_{Field,Rk}$ [kNm]	
		Bridge System	Omega System	Bridge System	Omega System
Gravity loading	1.50	0.709	0.551	0.732	0.539
Wind uplift	1.50	0.397	0.376	0.550	0.784

Table 17: Resistances of Bridge and the Omega System spacer clips under uniform gravity loading, transverse loading and wind uplift

	Spacer clip height [mm]	Bridge System		Omega System	
		C_{Rk} [kN]	B_{Rk} [kN]	C_{Rk} [kN]	B_{Rk} [kN]
Gravity loading	80	0,454	6,52	---	---
	100	0,442	6,35	---	---
	105	---	---	0,286	16,386
	125	---	---	0,305	14,279
	145	---	---	0,325	12,172
	185	---	---	0,236/0,782*	11,119
	235	---	---	0,130/0,681*	8,594
Wind uplift	80	---	3,07	---	---
	100	---	3,07	---	---
	105	---	---	---	2,87/4,53**
	125	---	---	---	2,87/4,53**
	145	---	---	---	2,87/4,53**
	185	---	---	---	3,00 /4,53**
	235	---	---	---	3,00 /4,53**

* Values for connections clip to purlin with 4 screws

** Values for connections rail to spacer clip with 2 screws

Table 18: Resistances of the Sag System

Sag System element t_{cor} = 1.50 mm	Tension resistance $N_{T,Rk}$ [kN]
Element with or without large web hole	12,70
Ridge element, roof slope up to 6%	11,62
Ridge element, roof slope up to 10%	12,52
Ridge element, roof slope up to 20%	13,30
Sag System element t_{cor} = 1.50 mm	**Compression resistance $N_{C,Rk}$ [kN]**
Element with plain web (max. 1,55 m span)	9,32
Element with large web holes (max. 1,55 m span)	6,52
Ridge element, roof slope up to 6%	14,00
Ridge element, roof slope up to 10%	10,67
Ridge element, roof slope up to 20%	5,50

Table 19: Resistances of the PR profiled sheets

Steel thck t_{cor} [mm]	0,50		0,58	
Load case	Dead load & snow	Wind uplift	Dead load & snow	Wind uplift
Field moment $M_{F,Rk}$ [kNm/m]	0,83	1,07	0,72	0,94
Support moment $M_{B,Rk}$ [kNm/m]	1,07	0,99	0,94	0,86
End support reaction $R_{A,Rk}$ [kN/m]	8,25	4,95	7,21	4,32
Int. support reaction $R_{B,Rk}$ [kN/m]	6,60	4,95	5,77	4,32
Eff. moment of inertia I_{eff} [cm^4/m]	4,50	2,80	4,97	3,09
Dead load g [kN/m^2]	0,0493		0,0568	

Table 20: Design verification and charact. resistances of the LPR1000 profiled sheets

	Gravity loading			Wind uplift	
Steel core thickness t_{cor} [mm]	0,50	0,50	0,58	0,50	0,58
Min. intermediate support width b [mm]	50	64	50	---	---
Field moment $M_{F,Rk}$ [kNm/m]	1,18	1,18	1,15	-1,09	-0,992
End support reaction $R_{A,Rk}$ [kN/m]	8,85	8,85	7,88	-9,12	-8,84
Support moment $M_{B,Rk}$ [kNm/m]	1,065	1,065	0,913	-1,37	-1,28
Intermediate support reaction $R_{B,Rk}$ [kN/m]	8,99	8,99	8,59	-12,0	-11,40
Interaction: Support moment $M^0_{B,Rk}$ [kNm/m]	1,214	1,602	1,01	-1,51	-1,61
Interaction: Intermediate support reaction $R^0_{B,Rk}$ [kN/m]	34,60	20,45	57,10	-58,20	-38,80
Effektive moment of inertia I_{eff} [cm^4/m]	11,40	11,40	12,70	8,57	9,73
Dead load g [kN/m^2]	0,0524		0,0601	0,0524	0,0601

Table 21: Load bearing capacity in shear and of PR and LPR1000 profiled sheets

Profile	Steel thickness t_{cor} [mm]	Shear resistance $T_{V,Rd}$ [kN/m]
PR	0,50 / 0,58	8,78 / 11,34
LPR1000	0,50 / 0,58	3,88 / 5,62

Table 22: Resistance of the LPA900 profiled sheets

	Wind pressure		Wind suction	
Steel core thickness t_{cor} [mm]	0,45	0,58	0,45	0,58
Min. intermediate support width b [mm]	64	64	---	---
Min. end support width b [mm]	40	40	---	---
Field moment $M_{F,Rk}$ [kNm/m]	0,5262	0,720	-0,4864	-0,664
End support reaction $R_{A,Rk}$ [kN/m]	3,02	4,85	-13,67	-21,62
Support moment $M_{B,Rk}$ [kNm/m]	0,4864	0,664	-0,5262	-0,72
Intermediate support reaction $R_{B,Rk}$ [kN/m]	7,20	11,51	-13,67	-21,62
Interaction: Support moment $M^0_{B,Rk}$ [kNm/m]	0,6080	0,829	---	---
Interaction: Intermediate support reaction $R^0_{B,Rk}$ [kN/m]	9,00	14,38	---	---
Effektive moment of inertia I_{eff} [cm^4/m]	2,34	3,13	2,58	3,45
Dead load g [kN/m^2]	0,0454	0,0574	0,0454	0,0574

Table 23: Resistances of the LMR600 profiled sheets

	Steel core thck	Dead load	Moment of inertia	Field moment	Support moment for continuous beam		
	t_{cor} [mm]	g [kN/m^2]	$I_{eff,k}$ [cm^4/m]	$M_{F,k}$ [kNm/m]	$M^0_{B,k}$ [kNm/m]	C [1/m]	max $M_{B,k}$ [kNm/m]
Gravity load	0,61	0,0625	26,4	2,26	1,15	11,4	0,904
Uplift load			17,4	1,33	5,0	0,99	1,23

Gravity load	Support resistances LMR 600 clips			
	End support $R_{A,k}$ [kN/m]		Intermediate support $R_{B,k}$ [kN/m]	
	6,8		13,8	
Uplift load	Support resistances standard clips		Support resistances reinforced clips	
	End support $R_{A,k}$ [kN/m]	Intermediate support $R_{B,k}$ [kN/m]	End support $R_{A,k}$ [kN/m]	Intermediate support $R_{B,k}$ [kN/m]
	4,5		8,3	

Table 24: LMR600 support spring stiffnesses

Spring stiffness C [kN/m/m] for ULS					
Gravity load		Gravity load		Uplift	
Standard clips		Reinforced clips		All clips	
max C	805	max C	rigid (∞)	max C	82
min C	220	min C	220	min C	20
Spring stiffness C [kN/m/m] for SLS		Gravity load		Uplift	
		512,5		50,83	

Table 25: Screw resistances

Screw	Element II t_{nom} [mm]	Mineral wool layer	Loading type	Element I t_{cor} = 0,50 mm
HC004 HC005 HC0166	1,25 mm Astron purlins	0 to 80 mm without isobloc	$F_{V,Rk}$	2,30 kN
			$F_{N,Rk}$	1,05 kN
		120 mm with isobloc	$F_{V,Rk}$	2,20 kN
			$F_{N,Rk}$	1,05 kN
	1,52 to 2,67 mm Aastron purlins	0 to 120 mm without isobloc	$F_{V,Rk}$	2,40 kN
			$F_{N,Rk}$	1,05 kN
		0 to 120 mm with isobloc	$F_{V,Rk}$	2,40 kN
			$F_{N,Rk}$	1,05 kN
HC313 HC314	0,55 mm Astron roof element		$F_{V,Rk}$	1,00 kN
			$F_{N,Rk}$	-
HC310 HC311 HC312 HC267 HC268	1,25 mm Astron purlins	0 to 80 mm without isobloc	$F_{V,Rk}$	1,90 kN
			$F_{N,Rk}$	0,91 kN
		120 mm with isobloc	$F_{V,Rk}$	2,00 kN
			$F_{N,Rk}$	0,91 kN
	1,52 to 2,67 mm Astron purlins	0 to 80 mm without isobloc	$F_{V,Rk}$	1,90 kN
			$F_{N,Rk}$	1,40 kN
		0 to 120 mm with isobloc	$F_{V,Rk}$	2,00 kN
			$F_{N,Rk}$	1,40 kN

Table 26: Screw resistances				
Screws	Element II t_{nom} [mm]	Element I t_{nom} [mm]	Loading type	Resistance
HC2022	ASTRON Purlins 1,54 to 2,71 mm	Clips: 2,04 mm	$F_{N,Rk}$	3,14 kN
			$F_{V,Rk}$	5,65 kN
HC310	Connection plate 1,54 mm	Steel sheets: 0,66 mm	$F_{V,Rk}$	1,90 kN
			$F_{N,Rk}$	2,00 kN
HC162	Eave rail or connection plate 1,54 mm	Steel sheets: 0,66 mm	$F_{V,Rk}$	2,75 kN
			$F_{N,Rk}$	2,87 kN
HC163	Steel sheets: 1,54 mm	Clips: 2,04 mm	$F_{V,Rk}$	6,30 kN
			$F_{N,Rk}$	2,30 kN

Table 27: Acoustic performances for installed condition		
Airborne sound insulation according EN ISO 140-3		Rw,P [dB]
Walls	Single skin wall + bridge system, 160 mm Astrotherm +ASA facing, LPA900	33 dB
	Single skin wall 100 mm Astrotherm +ASA facing +Isobloc, LPA900 + LPI1200 sealed inside	40 dB
	Single skin wall 100 mm Astrotherm +ASA facing +Isobloc, Sinutec horizontal + LPI1200 sealed inside	43 dB
	Single skin wall + bridge system, 160 mm Astrotherm +ASA facing, LPA900 + LPI1200 sealed inside	44 dB
Roofs	Single skin roof 120 mm Astrotherm +AVS facing +Isobloc, LPR1000	32 dB
	Single skin roof + bridge system, 160 mm Astrotherm +AVS facing, LMR600	33 dB
	Double skin roof acoustic + omega system 200 mm Astrotherm, LPR1000 + LPG1000 acoustic	37 dB
	Double skin roof + omega system 200 mm Astrotherm, LPR1000 + LPS1000	46 dB

Noise absorption by interior surfaces according EN ISO 354		Evaluation according EN ISO 11654	
		α_w	Noise absorbtion class
Wall	Double skin wall acoustic + omega system, 160 mm Astrotherm, LPA900 + LPG1000 acoustic	0,50 L M	D
Roofs	Single skin roof 120 mm Astrotherm + AVS facing + Isobloc, LPR1000	0,40 L M	D
	Single skin roof + bridge system, 160 mm Astrotherm + AVS facing, LPR1000	0,40 L M	D
	Double skin roof acoustic + omega system, 200 mm Astrotherm, LPR1000 + LPG1000 acoustic	0,50 L M	D

Table 28: Astron Building System elements - reaction to fire according to EN13501-1		
Welded profiles and crane brackets	Flat steel	A1
	Inodek profiles	A1
Hot rolled profiles, tubes, cold formed profiles		A1
Wind bracing	Tension bars	A1
	Washers	A1
	Bevel washers	A1
Connection devices	Anchor bolts	A1
	Bolt assemblies	A1
Cold formed profiles, small parts and angles with thck < 4mm		A1
Small parts and angles with thck ≥ 4mm		A1
Bridge system clip and rail		A1
Omega system clip and rail		A1
Sag bars - profile		A1
Sag rods (tension bars)		A1
Flying sags (tension bars)		A1
Hot rolled profiles and tubes		A1
Connection devices	Bolt assemblies M12	A1
	Bolts and nuts M8, M10, M12, M16	A1
	Anchors for concrete (at base angles)	A1
	Selfdrilling screws HC163	A1
Sheeting profiles	LMR600, LPR1000, LPS1000, LPG1000	A1
	LPA900, LPI1200, LPI1200 acoustic, LPD	A1
TPO laminiated steel sheets	TPO	E
	ABS compression straps	E
	Steel sheets	A1
LMR600	Clip - base profile, end dam, overlap plates	A1
	Clip - tabs	A1
	Alu-compression straps	A1
Corrosion protected coils	HDG coils Z275	A1
	HDG coils Z200	A1
	HDG coils AZ150	A1
	HDG coils AZ185 final coating AZA	A1
Insulation	Insulation λ= 0,037 W/mK	A1
	Insulation λ= 0,035 W/mK or λ= 0,032 W/mK	A1
	Alustrip	A1
	Astrotherm insulation with laminated vapour diffusion retardant foil	ASA: A1 AVS: A2 - s1 d0 KAS: D - s1 d0
	Isobloc 45, 40 or 35 kg/m^3	E
Tightness	Mastic HC17, HC18, profile filler LMR600	E
	EPDM and TPO membrane	E
Connection elements	Self drilling screw, general, HC163	A1
	Pin	A1

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ASTRON
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