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# Static Calculation

| | |
|---|---|
| construction project: | Best Eindhoven, Netherlands<br>ZM2V Hybrid<br>3 Modules vertical, α = 15°,EW |
| client: | Zonnestroom<br>Hof van Versailles 30<br>1064 NZ Amsterdam |
| construction location: | Best Eindhoven, Netherlands |
| constructor: | Zimmermann<br>PV-Stahlbau GmbH & Co. KG<br>Petrusstraße 1<br>88436 Oberessendorf |
| compiled on: | 07.11.18 |
| edited by: | M. Eng. Marcos Flores |
| calculated pages: | 1 - 29 |

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# Pos. 1.0 General

## 1.1 Bases of calculation

codes, standards and criteria:

[1] DIN EN 1090-2:2008-12: Ausführung von Stahltragwerken und Aluminiumtragwerken – Teil 1-3: Technische Regeln für die Ausführung von Stahltragwerken; Deutsche Fassung EN 1090-2:2008
[2] DIN EN 1990:2010-12: Eurocode: Grundlagen der Tragwerksplanung; Deutsche Fassung EN 1990:2002 + A1:2005 + A1:2005/AC:2010
[3] DIN EN 1990/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode: Grundlagen der Tragwerksplanung
[4] DIN EN 1991-1-1-:2010-12: Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-1: Allgemeine Einwirkungen auf Tragwerke – Wichten, Eigengewicht und Nutzlasten im Hochbau; Deutsche Fassung EN 1991-1-1:2002 + AC 2009
[5] DIN EN 1991-1-1:2002/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-1: Allgemeine Einwirkungen auf Tragwerke – Wichten, Eigengewicht und Nutzlasten im Hochbau
[6] DIN EN 1991-1-3:2010-12: Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-3: Allgemeine Einwirkungen, Schneelasten; Deutsche Fassung EN 1991-1-3:2003 + AC 2009
[7] DIN EN 19991-1-3/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-3: Allgemeine Einwirkungen – Schneelasten
[8] DIN EN 19991-1-4:2010-12: Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-4: Allgemeine Einwirkungen – Windlasten; Deutsche Fassung EN 19991-1-4:2005 + A1:2010 + AC 2010
[9] DIN EN 19991-1-4/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 1: Einwirkungen auf Tragwerke – Teil 1-4: Allgemeine Einwirkungen – Windlasten
[10] DIN EN 19993-1-1:2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau; Deutsche Fassung EN 1993-1-1:2005 + AC:2009
[11] DIN EN 19993-1-1/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-1: Allgemeine Bemessungsregeln und Regeln für den Hochbau
[12] DIN EN 1993-1-3: 2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-3: Allgemeine Regeln – Ergänzende Regeln für kaltgeformte Bauteile und Bleche; Deutsche Fassung EN 1993-1-3:2006 + AC:2009
[13] DIN EN 1993-1-3/NA:2010-12 Nationaler Anhang – National festgelegte Parameter – Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-3: Allgemeine Regeln – Ergänzende Regeln für kaltgeformte dünnwandige Bauteile und Bleche
[14] DIN EN 19993-1-5:2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-5: Plattenförmige Bauteile; Deutsche Fassung EN 1993-1-5:2006 + AC:2009
[15] DIN EN 1993-1-5/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-5: Plattenförmige Bauteile
[16] DIN EN 1993-1-8:2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-8: Bemessung von Anschlüssen; Deutsche Fassung EN 1993-1- 8:2005 + AC:2009
[17] DIN EN 1993-1-8/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-8: Bemessung von Anschlüssen
[18] DIN EN 1993-1-9:2010-12: Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-9: Ermüdung; Deutsche Fassung EN 1993-1-9:2005 + AC:2009
[19] DIN EN 1993-1-9/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 3: Bemessung und Konstruktion von Stahlbauten – Teil 1-9: Ermüdung
[20] DIN EN 1999-1-1:2007-05: Eurocode 9: Bemessung und Konstruktion von Aluminiumtragwerken – Teil 1-1: Allgemeine Bemessungsregeln; Deutsche Fassung EN 1999-1-1:2007 + A1:2009
[21] DIIN EN 1999-1-1/NA:2010-12: Nationaler Anhang – National festgelegte Parameter – Eurocode 9: Bemessung und Konstruktion von Aluminiumtragwerken – Teil 1-1: Allgemeine Bemessungsregeln
[22] DIN EN 14399-4:2006-06: Hochfeste planmäßig vorspannbare Schraubenverbindungen für den Metallbau – Teil 4: System HV – Garnituren aus Sechskantschrauben und –muttern; Deutsche Fassung EN 14399-4:2005
[23] DIN EN 14399-6:2006-06: Hochfeste planmäßig vorspannbare Schraubenverbindungen für den Metallbau – Teil 6: Flache Scheiben mit Fase; Deutsche Fassung EN 14399-6:2005 + AC:2006
[24] DIN EN ISO 4017:2001-03: Sechskantschrauben mit Gewinde bis Kopf – Produktklassen A und B (ISO 4017:1999); Deutsche Fassung EN ISO 4017:2000
[25] DIN EN ISO 4034:2001-03: Sechskantmuttern – Produktklasse C (ISO 4034:1999); Deutsche Fassung EN ISO 4034:2000
[26] DIN EN ISO 7091:2000-11: Flache Scheiben – Normale Reihe, Produktklasse C (ISO 7091:2000); Deutsche Fassung EN ISO 7091:2000
[27] DIN ISO 261:1999-11: Metrisches ISO-Gewinde allgemeiner Anwendung – Übersicht (ISO 261:1998)

All connections, including nuts and bolts, shall be made of galvanized and/or stainless steel, or must be compliant with other industry standard practices appropriate for the defined application, thus ensuring no risk of corrosion.

## 1.2 Technical description

Calculation of the above ground superstructure for PV-Module tables (ZM2V Hybrid EW, α = 15°) made from cold-formed steel sections, using design parameters from the construction company.

The structural design includes the strength, deformation, and dynamic performance of the purlins, girders and posts for one table each in the corner and edge areas (yellow + blue) and internal areas (red + white). The structural design of the modules is not included and must be performed by the manufacturer. This structural design includes the stability analysis for the tables shown herein.

The table length is 24,60 m. The purlins are connected together in series, so that they can be expected to act cohesively. The post section CS5 will be rammed according to the calculated foundation loads (static Pos. 1.6). The necessary ramming depth needs to be taken from the geotechnical report. The editor of this document is not responsible for the foundation and is not liable for defects which could occur during an improper ramming.

## 1.3 Overall

| | | |
|---|---|---|
| Country: | Netherlands | |
| System: | 3 Modules Vertical, Hybrid, east/west | |
| Table Grade : | α = 15° | 07.11.2018 |

| | | | |
|---|---|---|---|
| Project: | Best Eindhoven, NL | | |
| Standard: | Eurocode | NA NL | $K_{FI}$ = 1,0 |

| | |
|---|---|
| Modul distance to ground: | 800 mm |
| Post distance to ground, high: | 587,1 mm |
| Post distance to ground, low: | 532,7 mm |

| | | |
|---|---|---|
| C-Rail: | C90-60-2 | [HX460LAD] |
| Axle Tube: | RRO80x40x3 | [S355] |
| Rider high side: | QRO30x3 | [S235] |
| Rider low side: | - | - |
| Stand Tube, high side: | QRO60x3 | [S355] |
| Stand Tube, low side: | QRO60x3 | [S355] |
| Ramming Section: | V93x67x3.0 | [S355] |
| Bracing: | FCh5x35 | [DIN763] |

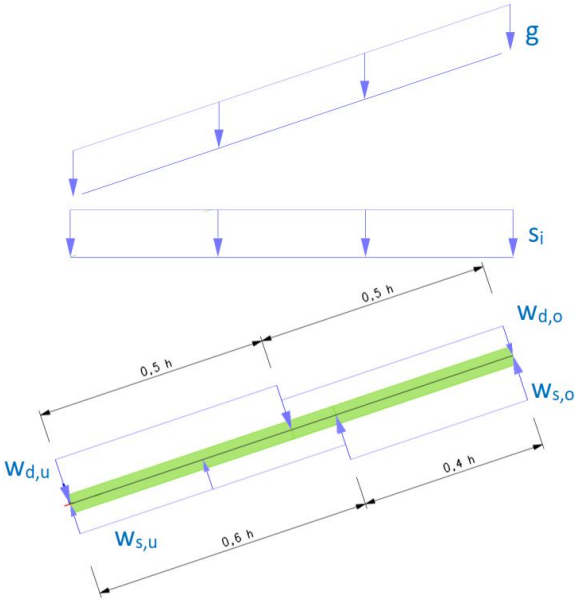
| Module Weight | Height above SL | Snow Zone | Snow Load |
|---|---|---|---|
| [kN/m²] | [m] | - | $s_i$ [kN/m²] |
| 0,111 | < 19 | μ = 0,8 | 0,480 |

| Wind Zone III | terrain category | orography factor | peak velocity pressure |
|---|---|---|---|
| $v_{b,0}$ [m/s] | | $c_0$ | q(ze) [kN/m²] |
| 24,50 | II | 1,00 | 0,446 |

| Grid yellow | Overhang | Grid blue | Overhang |
|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] |
| 5400 | 1500 | 5400 | 1500 |

| Grid red | Overhang | Grid white | Overhang |
|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] |
| 5400 | 1500 | 5400 | 1500 |

## 1.4 Loads




### 1.4.1. Dead Load

considered by programme

### 1.4.2. Steady Loads (modules)

**g** = **0,111** **kN/m²** dead weight of modules from manufacturer´s data

### 1.4.3. Snow Loads according to EN 1991-1-3 + National Annex NL

altitude of the site: 19 m

**$s_i$** = **0,480** **kN/m²**

### 1.4.4. Wind Loads according to EN 1991-1-4 + National Annex NL

wind zone: III
terrain category: II

$v_{b,0}$ = 24,50 m/s

$c_0$ = 1,00 orography factor; according to EN 1991-1-4 annex A.3

**$q_p(z)$** = **0,446** **kN/m²** peak velocity pressure

**$w_H$** = **0,013** **kN/m²** horizontal wind (friction)

factor applicable to actions for reliability differentiation:

$K_{FI}$ = 1,0

partial safety factors:

$\gamma_G$ = 1,20 for unfavourable action

$\gamma_G$ = 0,90 for favourable action

$\gamma_Q$ = 1,50

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BV: System Zimmermann
Best Eindhoven, Netherlands
ZM2V 15°, Hybrid, 3 Module vertical, EW



Wind Load Calculation acc. to Windkanalversuch Ruscheweyh Consult GmbH Aachen, Bericht RC 1752/1113

Table Grade: $\alpha < 15°$

Gust Wind Pressure q(ze): 0,446 kN/m²

## Uplift West

| | GELB | BLAU | ROT | WEIß |
|---|---|---|---|---|
| $w_1$ = | 0,022 | 0,089 | 0,111 | 0,022 |
| $w_2$ = | -0,067 | -0,067 | -0,045 | 0,022 |
| $w_3$ = | -0,223 | -0,223 | -0,223 | -0,111 |
| $w_4$ = | -0,156 | -0,134 | -0,134 | -0,022 |

## Uplift Nord

| | GELB | BLAU | ROT | WEIß |
|---|---|---|---|---|
| $w_1$ = | 0,0 | -0,067 | -0,067 | -0,022 |
| $w_2$ = | 0,0 | -0,111 | -0,111 | -0,022 |
| $w_3$ = | 0,0 | -0,111 | -0,111 | -0,022 |
| $w_4$ = | 0,0 | -0,067 | -0,067 | -0,022 |

## Downforce West

| | GELB | BLAU |
|---|---|---|
| $w_1$ = | 0,156 | 0,111 |
| $w_2$ = | 0,045 | 0,045 |
| $w_3$ = | -0,111 | -0,111 |
| $w_4$ = | -0,022 | -0,022 |

## Shear West

| | GELB | BLAU | ROT | WEIß |
|---|---|---|---|---|
| $w_1$ = | 0,156 | 0,156 | 0,156 | 0,089 |
| $w_2$ = | 0,022 | 0,022 | 0,022 | 0,022 |
| $w_3$ = | -0,268 | -0,223 | -0,178 | -0,111 |
| $w_4$ = | -0,156 | -0,134 | -0,067 | -0,022 |

## Shear Nord

| | GELB | BLAU | ROT | WEIß |
|---|---|---|---|---|
| $w_1$ = | 0,0 | 0,0 | -0,022 | -0,022 |
| $w_2$ = | 0,0 | 0,0 | -0,045 | -0,022 |
| $w_3$ = | 0,0 | 0,0 | -0,156 | -0,089 |
| $w_4$ = | 0,0 | 0,0 | -0,111 | -0,067 |

## Load cases

| Name | Description<br>Spec | Action type<br>Load type | Load group | Direction | Duration | Master load case |
|---|---|---|---|---|---|---|
| LC1 | Dead Load | Permanent<br>Self weight | DeadL | -Z | | |
| LC2 | Steady Load | Permanent<br>Standard | Steady | | | |
| LC3 | Snow<br>Standard | Variable<br>Static | Snow | | Long | None |
| LC4 | Uplift West<br>Standard | Variable<br>Static | Wind | | Short | None |
| LC5 | Uplift Nord<br>Standard | Variable<br>Static | Wind | | Short | None |
| LC6 | Shear West<br>Standard | Variable<br>Static | Wind | | Short | None |
| LC7 | Downforce West<br>Standard | Variable<br>Static | Wind | | Short | None |
| LC8 | Downforce Nord<br>Standard | Variable<br>Static | Wind | | Short | None |
| LC9 | Wind H<br>Standard | Variable<br>Static | Wind | | Short | None |

## Load groups

| Name | Load | Relation | Type |
|---|---|---|---|
| DeadL | Permanent | | |
| Steady | Permanent | | |
| Wind | Variable | Exclusive | Wind |
| Snow | Variable | Standard | Snow |

## Combinations

| Name | Description | Type | Load cases | Coeff. [-] |
|---|---|---|---|---|
| GZT | | EN-ULS (STR/GEO) Set B | LC1 - Dead Load | 1,00 |
| | | | LC2 - Steady Load | 1,00 |
| | | | LC3 - Snow | 1,00 |
| | | | LC4 - Uplift West | 1,00 |
| | | | LC5 - Uplift Nord | 1,00 |
| | | | LC6 - Shear West | 1,00 |
| | | | LC7 - Downforce West | 1,00 |
| | | | LC8 - Downforce Nord | 1,00 |
| | | | LC9 - Wind H | 1,00 |
| GZG | | EN-SLS Characteristic | LC1 - Dead Load | 1,00 |
| | | | LC2 - Steady Load | 1,00 |
| | | | LC3 - Snow | 1,00 |
| | | | LC4 - Uplift West | 1,00 |
| | | | LC5 - Uplift Nord | 1,00 |
| | | | LC6 - Shear West | 1,00 |
| | | | LC7 - Downforce West | 1,00 |
| | | | LC8 - Downforce Nord | 1,00 |
| | | | LC9 - Wind H | 1,00 |

## Result classes

| Name | List |
|---|---|
| Alle GZT | GZT - EN-ULS (STR/GEO) Set B |
| Alle GZG | GZG - EN-SLS Characteristic |
| NLK | NC1 |
| | NC2 |
| | NC3 |
| | NC4 |

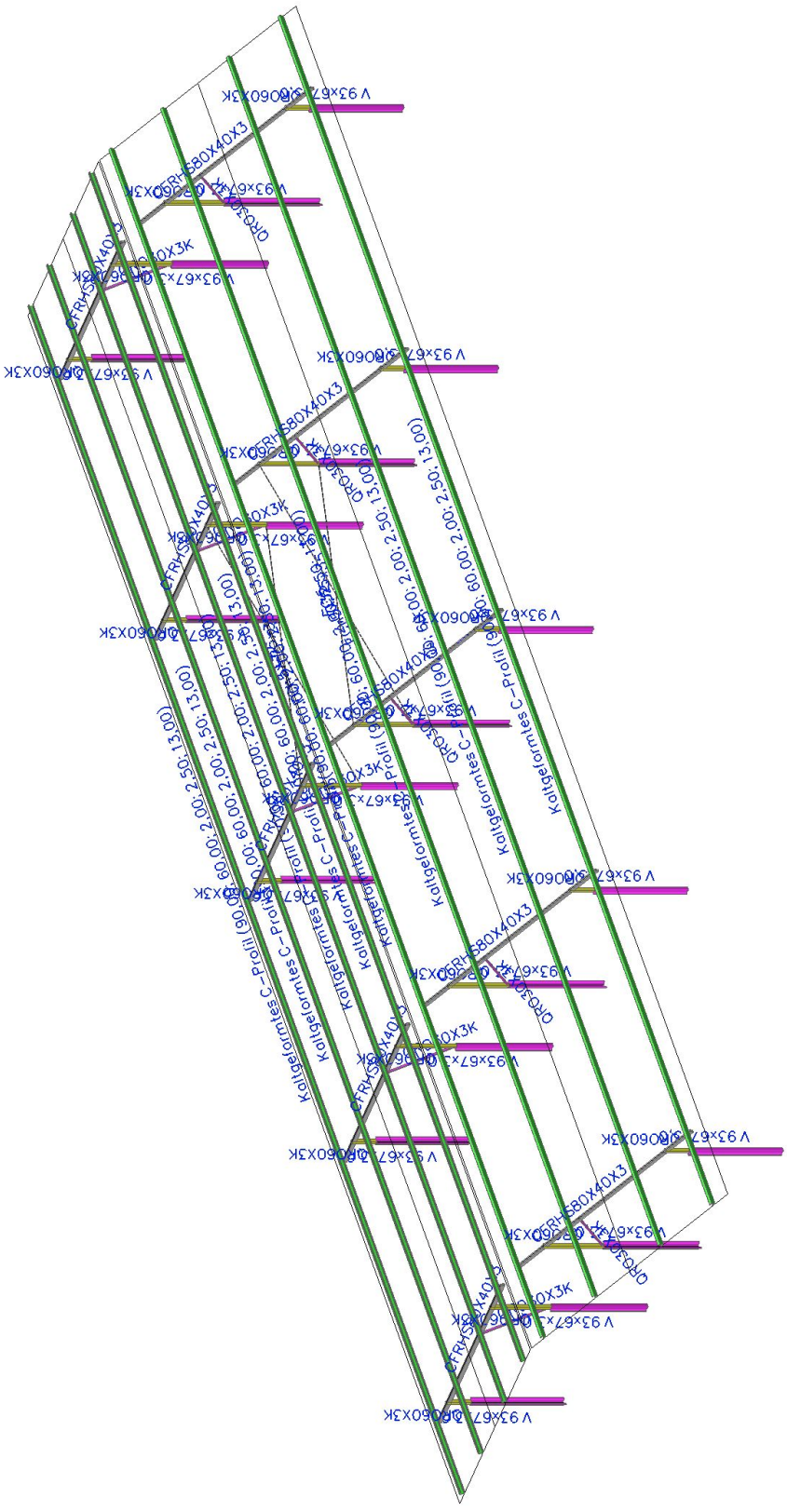
| Name | List |
|---|---|
| | NC5 |
| | NC6 |
| | NC7 |
| | NC8 |
| | NC9 |
| | NC10 |
| | NC11 |
| | NC12 |
| | NC13 |
| | NC14 |
| | NC15 |
| | NC16 |
| | NC17 |
| Alle LF | LC1 |
| | LC2 |
| | LC3 |
| | LC4 |
| | LC5 |
| | LC6 |
| | LC7 |
| | LC8 |
| | LC9 |
| GEO | GZT - EN-ULS (STR/GEO) Set B |

## Nonlinear combinations

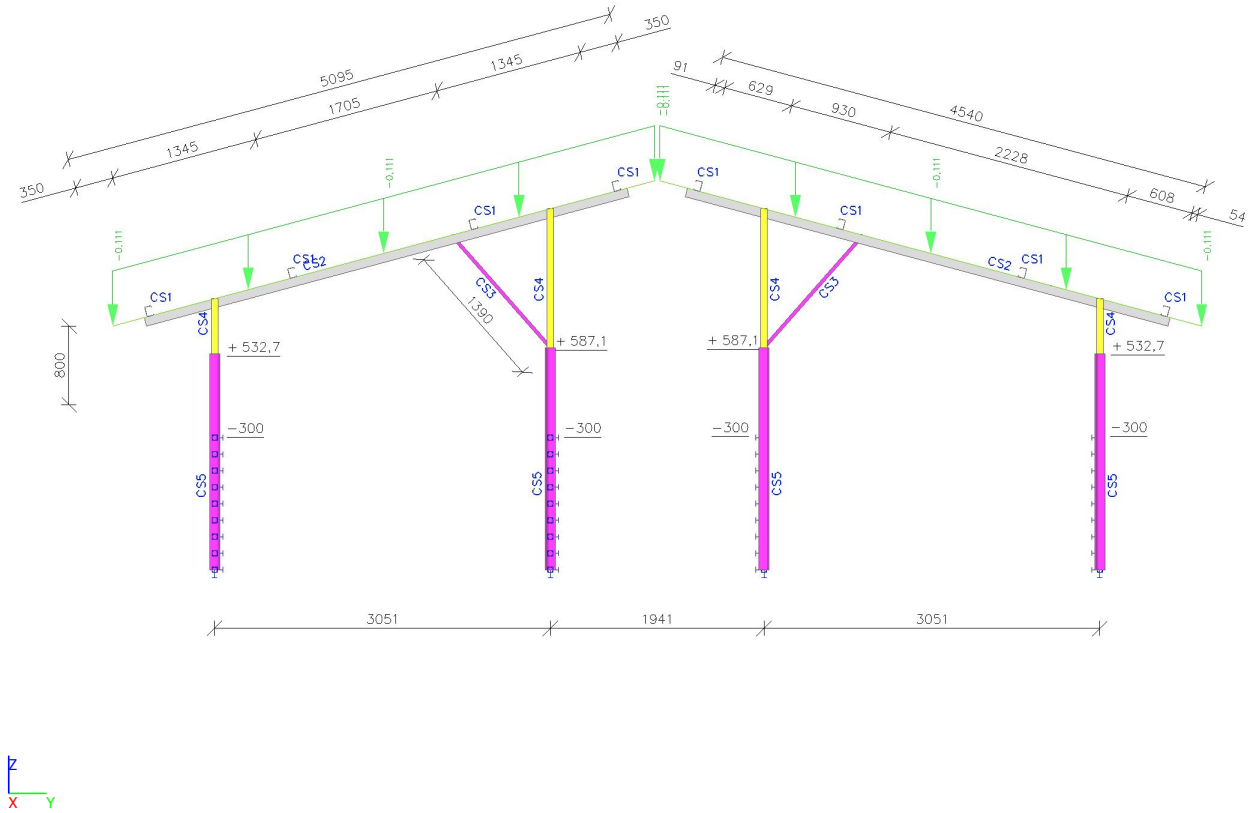
| Name | Type | Load cases | Coeff. [-] |
|---|---|---|---|
| NC1 | Ultimate | LC1 - Dead Load | 1,35 |
| | | LC2 - Steady Load | 1,35 |
| NC2 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| NC3 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| NC4 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC3 - Snow | 1,50 |
| NC5 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC3 - Snow | 1,50 |
| NC6 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC4 - Uplift West | 1,50 |
| NC7 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC7 - Downforce West | 1,50 |
| NC8 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC9 - Wind H | 1,50 |
| NC9 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC6 - Shear West | 1,50 |
| NC10 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC5 - Uplift Nord | 1,50 |
| NC11 | Ultimate | LC1 - Dead Load | 1,20 |
| | | LC2 - Steady Load | 1,20 |
| | | LC8 - Downforce Nord | 1,50 |
| NC12 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC4 - Uplift West | 1,50 |
| NC13 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC7 - Downforce West | 1,50 |
| NC14 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC9 - Wind H | 1,50 |
| NC15 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC6 - Shear West | 1,50 |
| NC16 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC5 - Uplift Nord | 1,50 |
| NC17 | Ultimate | LC1 - Dead Load | 0,90 |
| | | LC2 - Steady Load | 0,90 |
| | | LC8 - Downforce Nord | 1,50 |

$K_{FI}$ = 1,0 (Factor applicable to actions for reliability differentiation)

## 1.5 System


V 93x67x3 OR60X3K
CFRHS80X40X3
OR60X3K
Koltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00)

## view (alpha = 15°)







## Bill of material

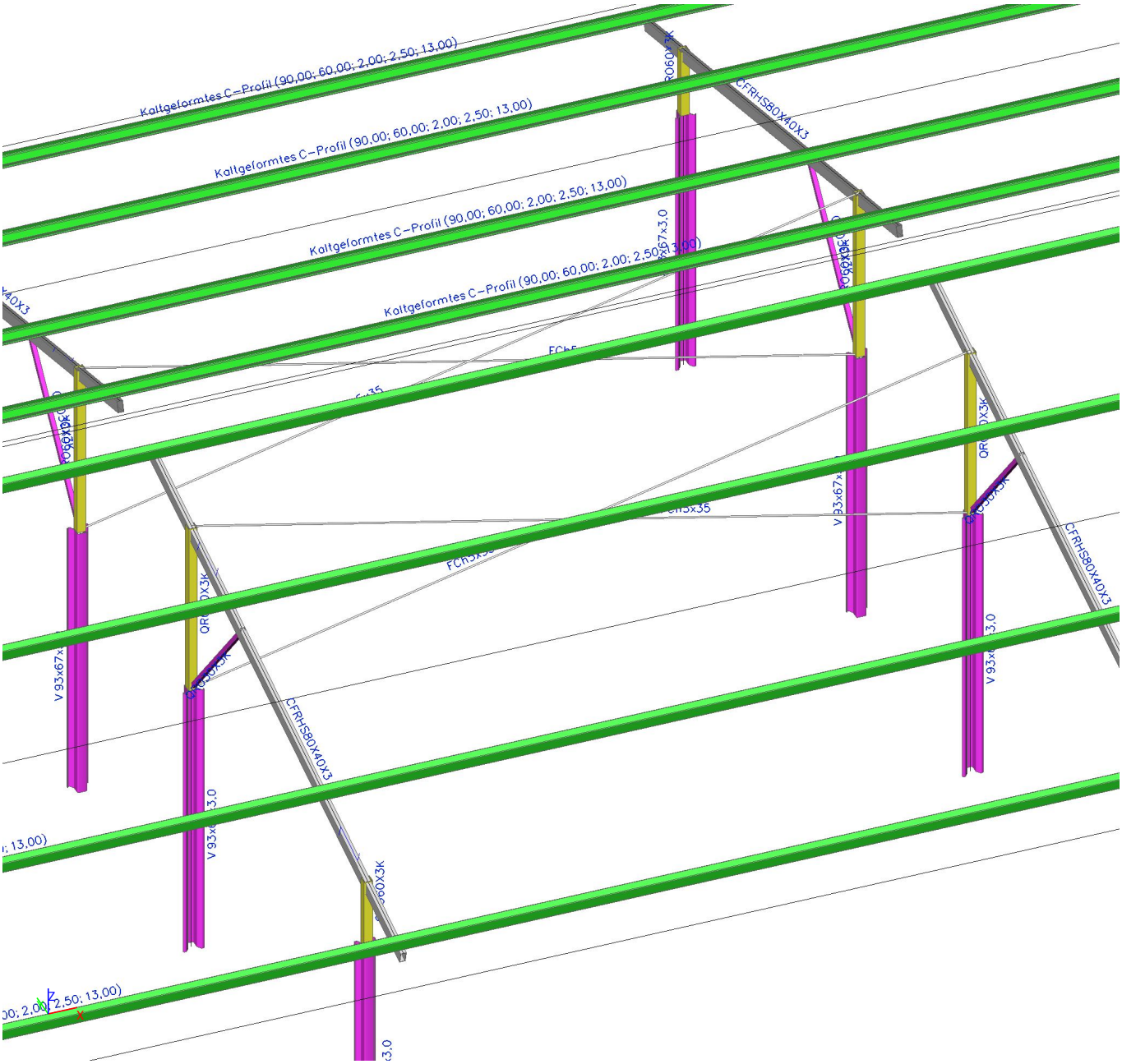
| Name | Mass [kg] | Surface [mm²] | Volume [m³] |
|---|---|---|---|
| Total results : | 5308,61 | 517512927,294 | 6,7626e-01 |

| Explanations of symbols | |
|---|---|
| Surface | Note: only one surface of each 2D member is taken into account for calculation of the surface area. |

| CSS | Material | Unit mass [kg/m] | Length [mm] | Mass [kg] | Surface [mm²] | Unit volume mass [kg/m³] | Volume [m³] |
|---|---|---|---|---|---|---|---|
| CS1 - Kaltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00) | HX460LAD | 3,40 | 787199,829 | 2677,60 | 352944427,490 | 7850,00 | 3,4110e-01 |
| CS2 - CFRHS80X40X3 | S 355 | 5,19 | 181599,945 | 942,29 | 41768020,630 | 7850,00 | 1,2004e-01 |
| CS3 - QRO30X3K | S 235 | 2,36 | 54378,811 | 128,41 | 5965353,012 | 7850,00 | 1,6358e-02 |
| CS4 - QRO60X3K | S 355 | 5,19 | 70365,974 | 365,02 | 16163084,030 | 7850,00 | 4,6499e-02 |
| CS5 - V 93x67x3,0 | S 355 | 7,16 | 159231,918 | 1140,59 | 97884803,772 | 7850,00 | 1,4530e-01 |
| CS6 - FCh5x35 | S 235 | 0,62 | 88724,815 | 54,69 | 2787230,253 | 7850,00 | 6,9670e-03 |

## notice cross sections and material quality !

## cross sections

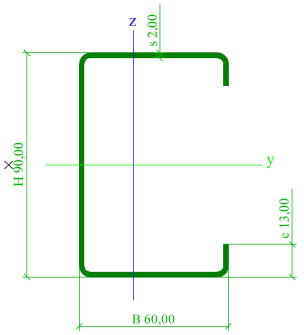



## Materials

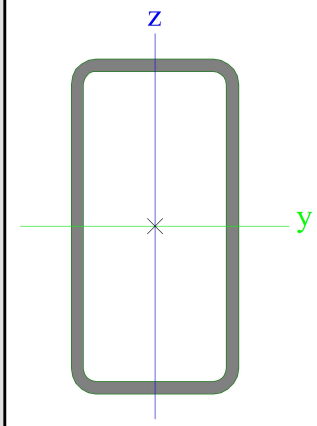
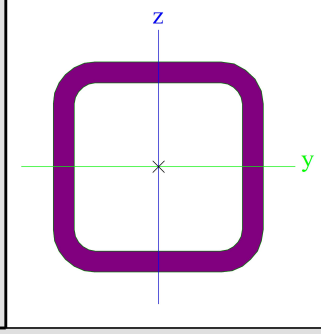
Steel EC3

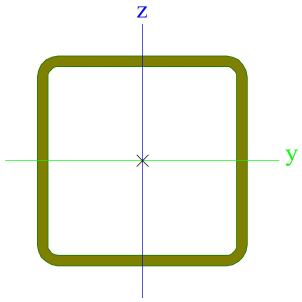
| Name | ρ [kg/m³] | $E_{mod}$ [kN/m²] | $G_{mod}$ [kN/m²] | Fy [N/mm²] | Fu [N/mm²] |
|---|---|---|---|---|---|
| S 235 | 7850,00 | 2,1000e+08 | 8,0769e+07 | 235,0 | 360,0 |
| S 355 | 7850,00 | 2,1000e+08 | 8,0769e+07 | 355,0 | 490,0 |
| HX460LAD | 7850,00 | 2,1000e+08 | 8,0769e+07 | 510,0 | 570,0 |

## Cross-sections

| CS1 | | |
|---|---|---|
| Type | Kaltgeformtes C-Profil | |
| Detailed | 90,00; 60,00; 2,00; 2,50; 13,00 | |
| Formcode | 114 - Cold formed C section | |
| Shape type | Thin-walled | |
| Item material | HX460LAD | |
| Fabrication | cold formed | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | b | b |
| A [m²] | 4,3330e-04 | |
| $A_y$ [m²], $A_z$ [m²] | 2,2973e-04 | 1,9034e-04 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 4,4835e-01 | 4,4835e-01 |
| $c_{Y,UCS}$ [mm], $c_{Z,UCS}$ [mm] | 21,64 | 45,00 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 5,9511e-07 | 2,0743e-07 |
| $i_y$ [mm], $i_z$ [mm] | 37,06 | 21,88 |
| $W_{el,y}$ [m³], $W_{el,z}$ [m³] | 1,3225e-05 | 5,4075e-06 |
| $W_{pl,y}$ [m³], $W_{pl,z}$ [m³] | 1,5010e-05 | 8,2885e-06 |
| $M_{pl,y,+}$ [Nm], $M_{pl,y,-}$ [Nm] | 7655,35 | 7655,35 |
| $M_{pl,z,+}$ [Nm], $M_{pl,z,-}$ [Nm] | 4227,11 | 4227,11 |
| $d_y$ [mm], $d_z$ [mm] | -49,82 | 0,00 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 5,6402e-10 | 3,7313e-10 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 0,00 | 129,23 |
| Picture |  | |

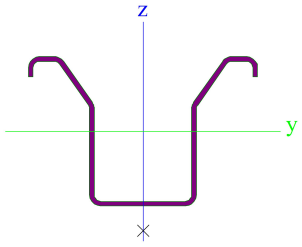
| CS2 | | |
|---|---|---|
| Type | CFRHS80X40X3 | |
| Formcode | 2 - Rectangular hollow section | |
| Shape type | Thin-walled | |
| Item material | S 355 | |
| Fabrication | cold formed | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | c | c |
| A [m²] | 6,6100e-04 | |
| $A_y$ [m²], $A_z$ [m²] | 2,2013e-04 | 4,4026e-04 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 2,3000e-01 | 4,4048e-01 |
| $c_{Y,UCS}$ [mm], $c_{Z,UCS}$ [mm] | 20,00 | 40,00 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 5,2250e-07 | 1,7560e-07 |
| $i_y$ [mm], $i_z$ [mm] | 28,12 | 16,30 |
| $W_{el,y}$ [m³], $W_{el,z}$ [m³] | 1,3060e-05 | 8,7800e-06 |
| $W_{pl,y}$ [m³], $W_{pl,z}$ [m³] | 1,6540e-05 | 1,0160e-05 |
| $M_{pl,y,+}$ [Nm], $M_{pl,y,-}$ [Nm] | 5865,82 | 5865,82 |
| $M_{pl,z,+}$ [Nm], $M_{pl,z,-}$ [Nm] | 3605,23 | 3605,23 |
| $d_y$ [mm], $d_z$ [mm] | 0,00 | 0,00 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 4,3880e-07 | 1,5360e-10 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 0,00 | 0,00 |

| Picture |  | |
|---|---|---|
| **CS3** | | |
| Type | QRO30X3K | |
| Formcode | 2 - Rectangular hollow section | |
| Shape type | Thin-walled | |
| Item material | S 235 | |
| Fabrication | cold formed | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | c | c |
| A [m²] | 3,0082e-04 | |
| $A_y$ [m²], $A_z$ [m²] | 1,5047e-04 | 1,5047e-04 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 1,0970e-01 | 2,0052e-01 |
| $c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm] | 15,00 | 15,00 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 3,5041e-08 | 3,5041e-08 |
| $i_y$ [mm], $i_z$ [mm] | 10,79 | 10,79 |
| $W_{el.y}$ [m³], $W_{el.z}$ [m³] | 2,3361e-06 | 2,3361e-06 |
| $W_{pl.y}$ [m³], $W_{pl.z}$ [m³] | 2,9600e-06 | 2,9600e-06 |
| $M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm] | 695,76 | 695,76 |
| $M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm] | 695,76 | 695,76 |
| $d_y$ [mm], $d_z$ [mm] | 0,00 | 0,00 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 6,0600e-08 | 6,0750e-12 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 0,00 | 0,00 |
| Picture |  | |
| **CS4** | | |
| Type | QRO60X3K | |
| Formcode | 2 - Rectangular hollow section | |
| Shape type | Thin-walled | |
| Item material | S 355 | |
| Fabrication | cold formed | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | c | c |
| A [m²] | 6,6082e-04 | |
| $A_y$ [m²], $A_z$ [m²] | 3,3020e-04 | 3,3020e-04 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 2,2970e-01 | 4,4048e-01 |

| | | |
|---|---|---|
| $c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm] | 30,00 | 30,00 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 3,5135e-07 | 3,5135e-07 |
| $i_y$ [mm], $i_z$ [mm] | 23,06 | 23,06 |
| $W_{el.y}$ [m³], $W_{el.z}$ [m³] | 1,1712e-05 | 1,1712e-05 |
| $W_{pl.y}$ [m³], $W_{pl.z}$ [m³] | 1,3950e-05 | 1,3950e-05 |
| $M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm] | 4948,53 | 4948,53 |
| $M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm] | 4948,53 | 4948,53 |
| $d_y$ [mm], $d_z$ [mm] | 0,00 | 0,00 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 5,6800e-07 | 1,9440e-10 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 0,00 | 0,00 |
| Picture |  | |



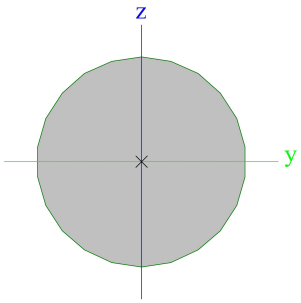
**CS5**

| | | |
|---|---|---|
| Type | V 93x67x3,0 | |
| Shape type | Thin-walled | |
| Item material | S 355 | |
| Fabrication | cold formed | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | c | c |
| A [m²] | 9,1250e-04 | |
| $A_y$ [m²], $A_z$ [m²] | 3,8311e-04 | 5,6589e-04 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 6,1473e-01 | 6,1473e-01 |
| $c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm] | 0,00 | -0,23 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 1,0535e-06 | 1,4637e-06 |
| $i_y$ [mm], $i_z$ [mm] | 33,98 | 40,05 |
| $W_{el.y}$ [m³], $W_{el.z}$ [m³] | 2,2470e-05 | 2,0407e-05 |
| $W_{pl.y}$ [m³], $W_{pl.z}$ [m³] | 2,8032e-05 | 3,3344e-05 |
| $M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm] | 9951,28 | 9951,28 |
| $M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm] | 11837,24 | 11837,24 |
| $d_y$ [mm], $d_z$ [mm] | 0,00 | -61,76 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 2,8800e-09 | 7,5666e-10 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 152,90 | 0,00 |
| Picture |  | |



**CS6**

| | | |
|---|---|---|
| Type | FCh5x35 | |
| Shape type | Thin-walled | |
| Item material | S 235 | |
| Fabrication | general | |
| Colour | | |
| Flexural buckling y-y, Flexural buckling z-z | d | d |
| A [m²] | 7,8524e-05 | |

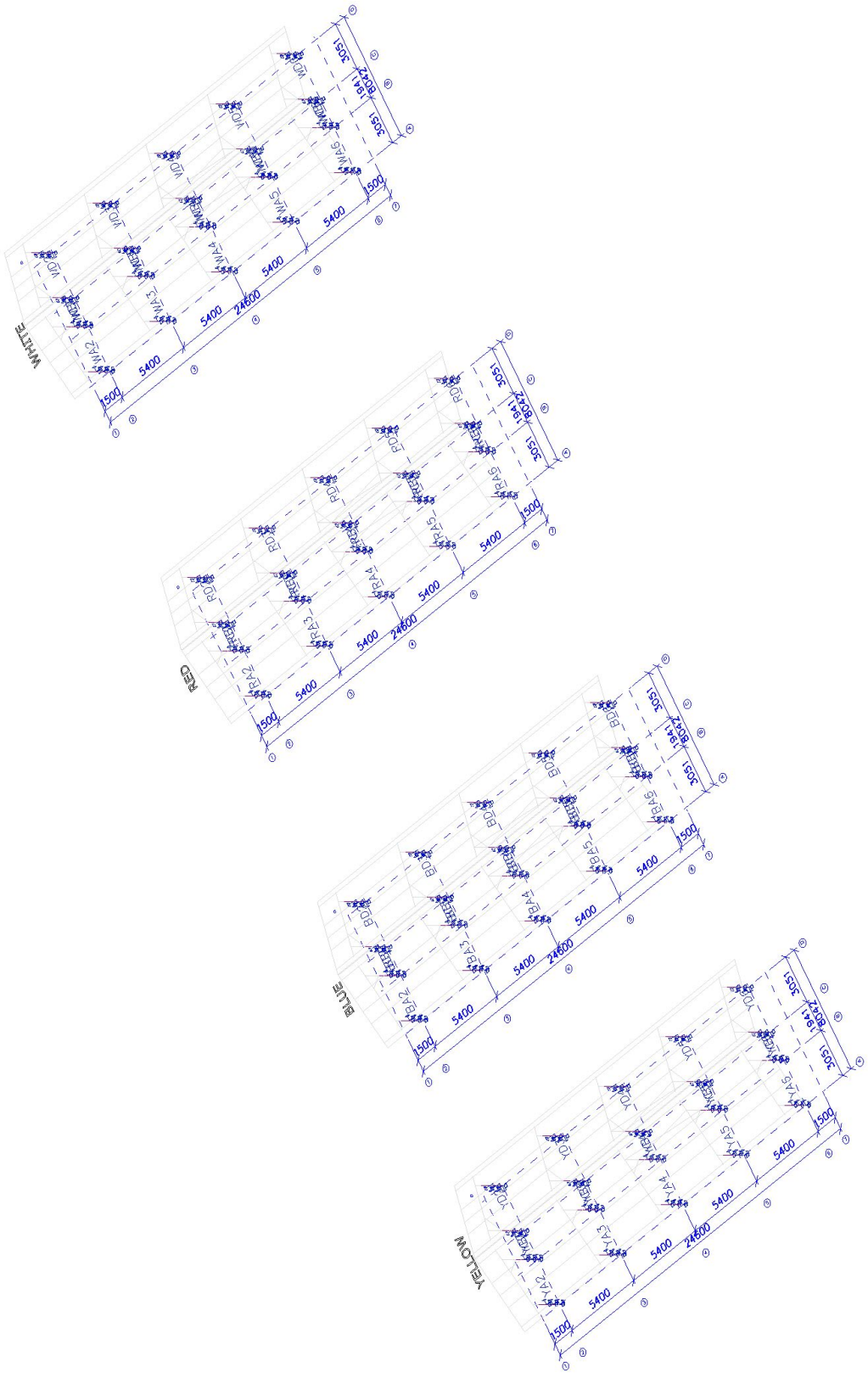
| | | |
|---|---|---|
| $A_y$ [m²], $A_z$ [m²] | 7,0562e-05 | 7,0562e-05 |
| $A_L$ [m²/m], $A_D$ [m²/m] | 3,1414e-02 | 3,1414e-02 |
| $c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm] | 0,00 | 0,00 |
| α [deg] | 0,00 | |
| $I_y$ [m⁴], $I_z$ [m⁴] | 4,9067e-10 | 4,9067e-10 |
| $i_y$ [mm], $i_z$ [mm] | 2,50 | 2,50 |
| $W_{el.y}$ [m³], $W_{el.z}$ [m³] | 9,8135e-08 | 9,8135e-08 |
| $W_{pl.y}$ [m³], $W_{pl.z}$ [m³] | 1,6662e-07 | 1,6662e-07 |
| $M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm] | 39,15 | 39,15 |
| $M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm] | 39,15 | 39,15 |
| $d_y$ [mm], $d_z$ [mm] | 0,00 | 0,00 |
| $I_t$ [m⁴], $I_w$ [m⁶] | 9,8309e-10 | 6,1003e-25 |
| $\beta_y$ [mm], $\beta_z$ [mm] | 0,00 | 0,00 |
| Picture |  | |



| Explanations of symbols | |
|---|---|
| Formcode | s - Thickness<br>r - Inner radius<br>b - Flange width<br>h - Height<br>c - Lip |
| A | Area |
| $A_y$ | Shear Area in principal y-direction |
| $A_z$ | Shear Area in principal z-direction |
| $A_L$ | Circumference per unit length |
| $A_D$ | Drying surface per unit length |
| $c_{Y.UCS}$ | Centroid coordinate in Y-direction of Input axis system |
| $c_{Z.UCS}$ | Centroid coordinate in Z-direction of Input axis system |
| $I_{Y.LCS}$ | Second moment of area about the YLCS axis |
| $I_{Z.LCS}$ | Second moment of area about the ZLCS axis |
| $I_{YZ.LCS}$ | Product moment of area in the LCS system |
| α | Rotation angle of the principal axis system |
| $I_y$ | Second moment of area about the principal y-axis |
| $I_z$ | Second moment of area about the principal z-axis |
| $i_y$ | Radius of gyration about the principal y-axis |

| Explanations of symbols | |
|---|---|
| $i_z$ | Radius of gyration about the principal z-axis |
| $W_{el.y}$ | Elastic section modulus about the principal y-axis |
| $W_{el.z}$ | Elastic section modulus about the principal z-axis |
| $W_{pl.y}$ | Plastic section modulus about the principal y-axis |
| $W_{pl.z}$ | Plastic section modulus about the principal z-axis |
| $M_{pl.y.+}$ | Plastic moment about the principal y-axis for a positive My moment |
| $M_{pl.y.-}$ | Plastic moment about the principal y-axis for a negative My moment |
| $M_{pl.z.+}$ | Plastic moment about the principal z-axis for a positive Mz moment |
| $M_{pl.z.-}$ | Plastic moment about the principal z-axis for a negative Mz moment |
| $d_y$ | Shear center coordinate in principal y-direction measured from the centroid |
| $d_z$ | Shear center coordinate in principal z-direction measured from the centroid |
| $I_t$ | Torsional constant |
| $I_w$ | Warping constant |
| $\beta_y$ | Mono-symmetry constant about the principal y-axis |
| $\beta_z$ | Mono-symmetry constant about the principal z-axis |

## 1.6 Foundation Loads (Reactions)



## Reactions yellow

## High Side Reactions -300 mm (yellow), factored

Nonlinear calculation, Extreme : Global
Selection : YB2..YB6, YC2..YC6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| YB4/B591 | NC8 | 1200,000 | **-0,877** | -0,291 | 2,458 | 0,103 | **-0,726** | 0,000 |
| YC5/B1034 | NC13 | 1200,000 | **0,003** | -1,214 | -4,061 | **1,052** | **0,002** | 0,000 |
| YB5/B595 | NC4 | 1200,000 | 0,000 | **-1,715** | **13,691** | 0,604 | 0,000 | 0,000 |
| YC5/B1034 | NC4 | 1200,000 | 0,000 | **1,715** | 13,691 | **-0,604** | 0,000 | 0,000 |
| YC3/B1030 | NC13 | 1200,000 | 0,000 | -1,214 | **-4,092** | 1,052 | 0,000 | 0,000 |
| YB5/B595 | NC8 | 1200,000 | -0,049 | -0,324 | 3,133 | 0,116 | -0,107 | **0,000** |
| YC5/B1034 | NC8 | 1200,000 | -0,049 | 0,324 | 3,133 | -0,116 | -0,107 | **0,000** |

## Low Side Reactions -300 mm (yellow), factored

Nonlinear calculation, Extreme : Global
Selection : YA2..YA6, YD2..YD6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| YA4/B651 | NC14 | 1200,000 | **-0,249** | 0,220 | 1,750 | -0,279 | -0,315 | 0,000 |
| YA2/B649 | NC4 | 1200,000 | **0,000** | 1,157 | 8,382 | -1,494 | **0,000** | 0,000 |
| YD5/B1047 | NC4 | 1200,000 | 0,000 | **-1,700** | 12,410 | **2,219** | 0,000 | 0,000 |
| YA5/B652 | NC4 | 1200,000 | 0,000 | **1,700** | **12,410** | **-2,219** | 0,000 | 0,000 |
| YD3/B1045 | NC12 | 1200,000 | 0,000 | -1,112 | **-0,930** | 1,398 | 0,000 | 0,000 |
| YA4/B651 | NC8 | 1200,000 | -0,249 | 0,294 | 2,334 | -0,373 | **-0,316** | 0,000 |
| YD6/B1048 | NC8 | 1200,000 | -0,247 | -0,232 | 1,804 | 0,294 | -0,313 | **0,000** |
| YA6/B653 | NC8 | 1200,000 | -0,247 | 0,232 | 1,804 | -0,294 | -0,313 | **0,000** |

# Reactions blue

## High Side Reactions -300 mm (blue), factored

Nonlinear calculation, Extreme : Global
Selection : BB2..BB6, BC2..BC6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| BB4/B1074 | NC8 | 1200,000 | **-0,877** | -0,291 | 2,458 | 0,103 | **-0,726** | 0,000 |
| BC5/B1112 | NC12 | 1200,000 | **0,002** | -0,983 | -3,019 | **0,873** | **0,002** | 0,000 |
| BB5/B1076 | NC4 | 1200,000 | 0,000 | **-1,715** | **13,691** | 0,604 | 0,000 | 0,000 |
| BC5/B1112 | NC4 | 1200,000 | 0,000 | **1,715** | 13,691 | **-0,604** | 0,000 | 0,000 |
| BC3/B1108 | NC12 | 1200,000 | 0,000 | -0,983 | **-3,050** | 0,873 | 0,000 | 0,000 |
| BB5/B1076 | NC8 | 1200,000 | -0,049 | -0,324 | 3,133 | 0,116 | -0,107 | **0,000** |
| BC5/B1112 | NC8 | 1200,000 | -0,049 | 0,324 | 3,133 | -0,116 | -0,107 | **0,000** |

## Low Side Reactions -300 mm (blue), factored

Nonlinear calculation, Extreme : Global
Selection : BA2..BA6, BD2..BD6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| BA4/B1088 | NC14 | 1200,000 | **-0,249** | 0,220 | 1,750 | -0,279 | -0,315 | 0,000 |
| BA2/B1086 | NC4 | 1200,000 | **0,000** | 1,157 | 8,382 | -1,494 | **0,000** | 0,000 |
| BD5/B1125 | NC4 | 1200,000 | 0,000 | **-1,700** | 12,410 | **2,219** | 0,000 | 0,000 |
| BA5/B1089 | NC4 | 1200,000 | 0,000 | **1,700** | **12,410** | **-2,219** | 0,000 | 0,000 |
| BD3/B1123 | NC12 | 1200,000 | 0,000 | -1,060 | **-0,502** | 1,335 | 0,000 | 0,000 |
| BA4/B1088 | NC8 | 1200,000 | -0,249 | 0,294 | 2,334 | -0,373 | **-0,316** | 0,000 |
| BD6/B1126 | NC8 | 1200,000 | -0,247 | -0,232 | 1,804 | 0,294 | -0,313 | **0,000** |
| BA6/B1090 | NC8 | 1200,000 | -0,247 | 0,232 | 1,804 | -0,294 | -0,313 | **0,000** |

# Reactions red

## High Side Reactions -300 mm (red), factored

Nonlinear calculation, Extreme : Global
Selection : RB2..RB6, RC2..RC6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| RB4/B1146 | NC8 | 1200,000 | **-0,877** | -0,291 | 2,458 | 0,103 | **-0,726** | 0,000 |
| RC5/B1184 | NC12 | 1200,000 | **0,002** | -0,983 | -3,019 | **0,873** | **0,002** | 0,000 |
| RB5/B1148 | NC4 | 1200,000 | 0,000 | **-1,715** | **13,691** | 0,604 | 0,000 | 0,000 |
| RC5/B1184 | NC4 | 1200,000 | 0,000 | **1,715** | 13,691 | **-0,604** | 0,000 | 0,000 |
| RC3/B1180 | NC12 | 1200,000 | 0,000 | -0,983 | **-3,050** | 0,873 | 0,000 | 0,000 |
| RB5/B1148 | NC8 | 1200,000 | -0,049 | -0,324 | 3,133 | 0,116 | -0,107 | **0,000** |
| RC5/B1184 | NC8 | 1200,000 | -0,049 | 0,324 | 3,133 | -0,116 | -0,107 | **0,000** |

## Low Side Reactions -300 mm (red), factored

Nonlinear calculation, Extreme : Global
Selection : RA2..RA6, RD2..RD6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| RA4/B1160 | NC14 | 1200,000 | **-0,249** | 0,220 | 1,750 | -0,279 | -0,315 | 0,000 |
| RA2/B1158 | NC4 | 1200,000 | **0,000** | 1,157 | 8,382 | -1,494 | **0,000** | 0,000 |
| RD5/B1197 | NC4 | 1200,000 | 0,000 | **-1,700** | 12,410 | **2,219** | 0,000 | 0,000 |
| RA5/B1161 | NC4 | 1200,000 | 0,000 | **1,700** | **12,410** | **-2,219** | 0,000 | 0,000 |
| RD3/B1195 | NC12 | 1200,000 | 0,000 | -1,060 | **-0,502** | 1,335 | 0,000 | 0,000 |
| RA4/B1160 | NC8 | 1200,000 | -0,249 | 0,294 | 2,334 | -0,373 | **-0,316** | 0,000 |
| RD6/B1198 | NC8 | 1200,000 | -0,247 | -0,232 | 1,804 | 0,294 | -0,313 | **0,000** |
| RA6/B1162 | NC8 | 1200,000 | -0,247 | 0,232 | 1,804 | -0,294 | -0,313 | **0,000** |

## Reactions white

### High Side Reactions -300 mm (white), factored

Nonlinear calculation, Extreme : Global
Selection : WB2..WB6, WC2..WC6
Class : NLK

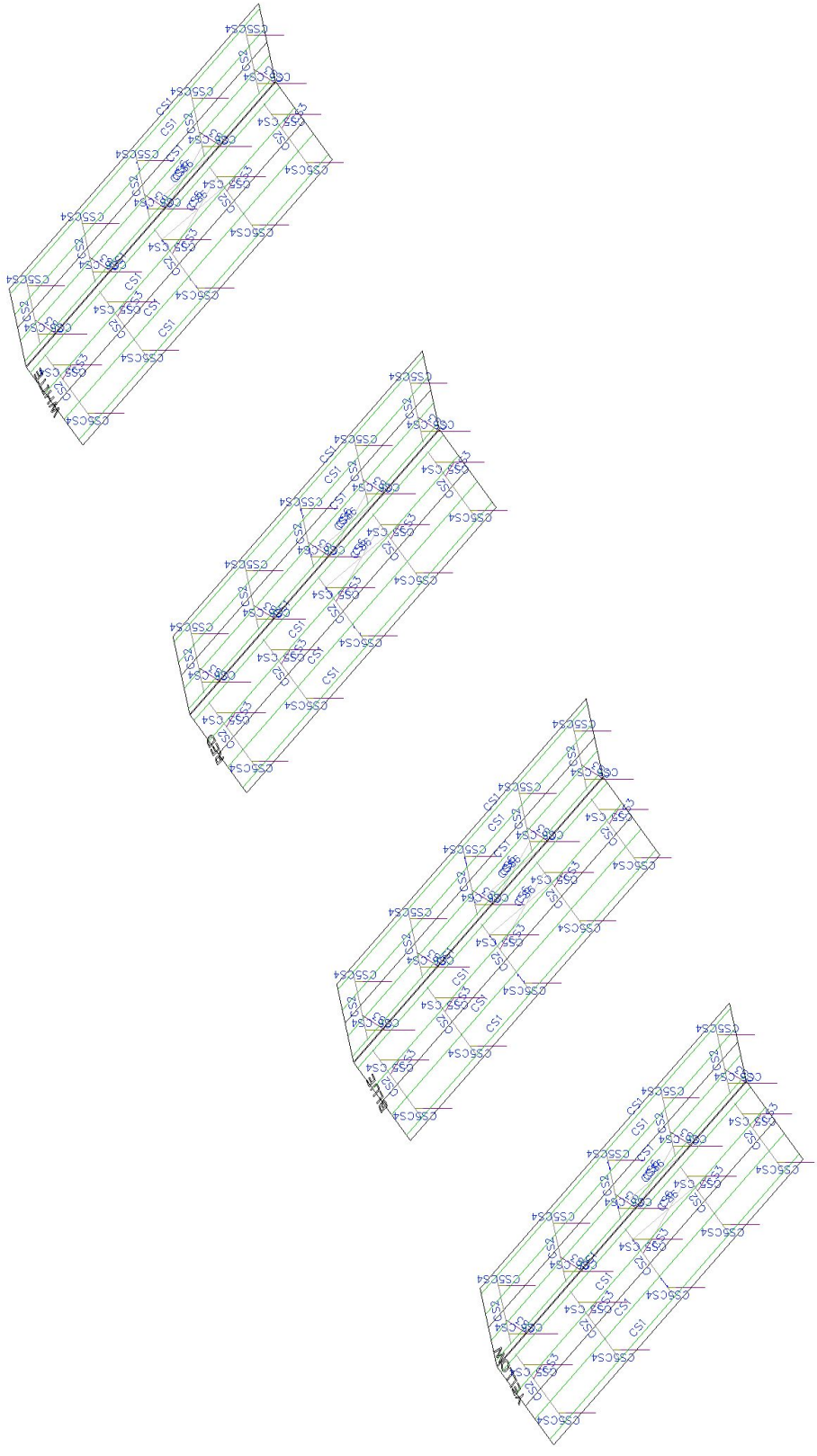
| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| WB4/B1218 | NC8 | 1200,000 | **-0,877** | -0,291 | 2,458 | 0,103 | **-0,726** | 0,000 |
| WC5/B1256 | NC12 | 1200,000 | **0,000** | -0,216 | -0,312 | 0,273 | **0,000** | 0,000 |
| WB5/B1220 | NC4 | 1200,000 | 0,000 | **-1,715** | **13,691** | **0,604** | 0,000 | 0,000 |
| WC5/B1256 | NC4 | 1200,000 | 0,000 | **1,715** | 13,691 | **-0,604** | 0,000 | 0,000 |
| WC3/B1252 | NC12 | 1200,000 | 0,000 | -0,216 | **-0,343** | 0,273 | 0,000 | 0,000 |
| WB5/B1220 | NC8 | 1200,000 | -0,049 | -0,324 | 3,133 | 0,116 | -0,107 | **0,000** |
| WC5/B1256 | NC8 | 1200,000 | -0,049 | 0,324 | 3,133 | -0,116 | -0,107 | **0,000** |

### Low Side Reactions -300 mm (white), factored

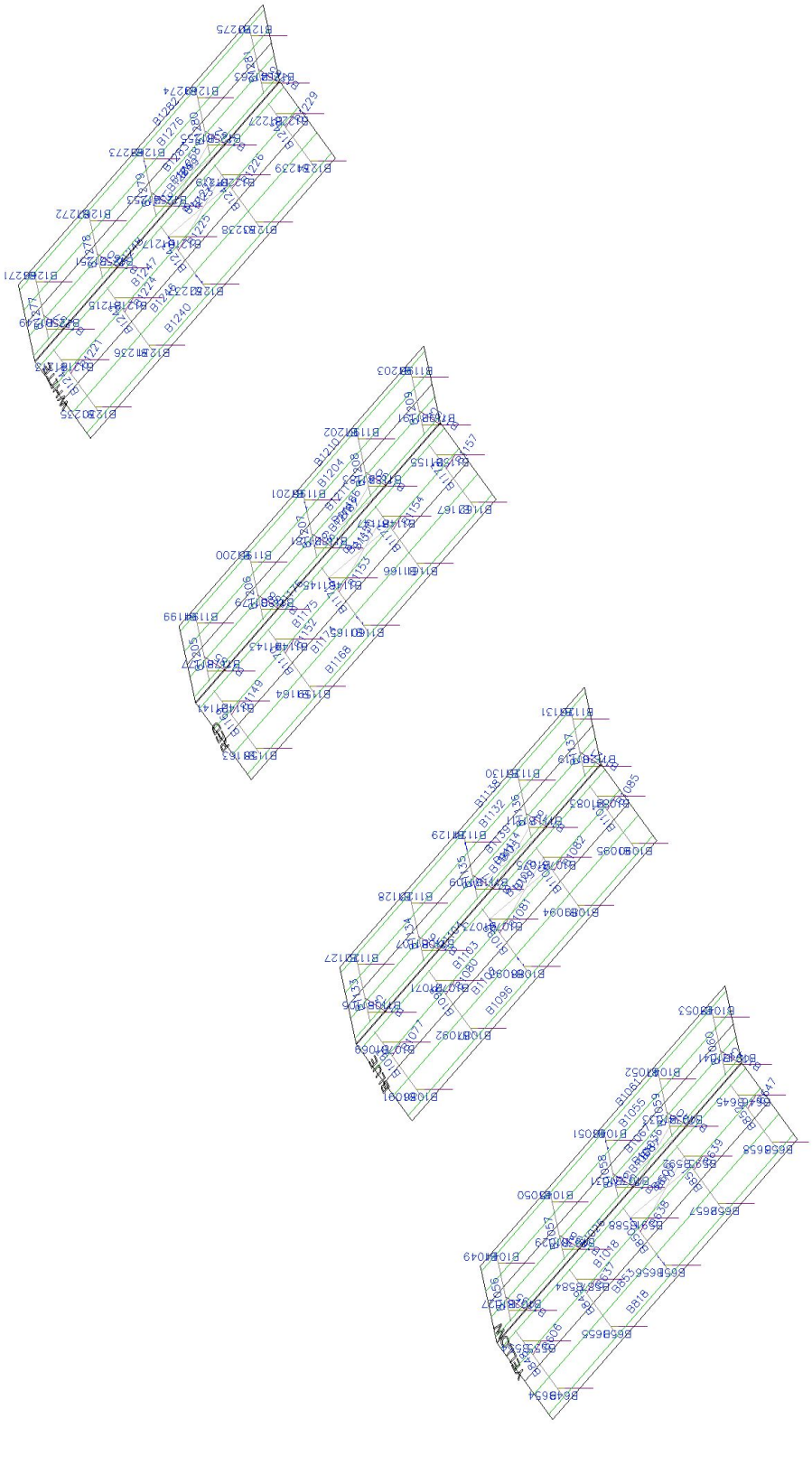
Nonlinear calculation, Extreme : Global
Selection : WA2..WA6, WD2..WD6
Class : NLK

| Support | Case | dx [mm] | Rx [kN] | Ry [kN] | Rz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|
| WA4/B1232 | NC14 | 1200,000 | **-0,249** | 0,220 | 1,750 | -0,279 | -0,315 | 0,000 |
| WA2/B1230 | NC4 | 1200,000 | **0,000** | 1,157 | 8,382 | -1,494 | **0,000** | 0,000 |
| WD5/B1269 | NC4 | 1200,000 | 0,000 | **-1,700** | 12,410 | **2,219** | 0,000 | 0,000 |
| WA5/B1233 | NC4 | 1200,000 | 0,000 | **1,700** | **12,410** | **-2,219** | 0,000 | 0,000 |
| WA2/B1230 | NC2 | 0,000 | 0,000 | 0,000 | **0,004** | 0,000 | 0,000 | 0,000 |
| WA4/B1232 | NC8 | 1200,000 | -0,249 | 0,294 | 2,334 | -0,373 | **-0,316** | 0,000 |
| WD6/B1270 | NC8 | 1200,000 | -0,247 | -0,232 | 1,804 | 0,294 | -0,313 | **0,000** |
| WA6/B1234 | NC8 | 1200,000 | -0,247 | 0,232 | 1,804 | -0,294 | -0,313 | **0,000** |

## Pos. 2.0 Dimensioning cross sections



## 2.1 member



## 2.2 Internal forces on member

Nonlinear calculation, Extreme : Cross-section, System : Principal
Selection : All
Class : NLK

| Member | css | dx [mm] | Case | N [kN] | Vy [kN] | Vz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|---|
| B657 | CS4 - QRO60X3K | 0,000 | NC4 | **-12,330** | 0,000 | 1,766 | 0,000 | **-0,892** | 0,000 |
| B1029 | CS4 - QRO60X3K | 1261,090 | NC13 | **2,915** | 0,000 | -0,050 | 0,000 | 0,000 | 0,000 |
| B656 | CS4 - QRO60X3K | 498,060 | NC8 | -2,231 | **-0,252** | 0,297 | 0,000 | 0,000 | 0,000 |
| B1051 | CS4 - QRO60X3K | 498,060 | NC8 | -2,231 | **0,252** | 0,297 | 0,000 | 0,000 | 0,000 |
| B592 | CS4 - QRO60X3K | 1261,090 | NC4 | -10,913 | 0,000 | **-0,660** | 0,000 | 0,000 | 0,000 |
| B657 | CS4 - QRO60X3K | 498,060 | NC4 | -12,294 | 0,000 | **1,803** | 0,000 | 0,000 | 0,000 |
| B588 | CS4 - QRO60X3K | 0,000 | NC8 | -2,097 | 0,006 | -0,106 | **0,000** | 0,135 | -0,007 |
| B1031 | CS4 - QRO60X3K | 0,000 | NC8 | -2,097 | -0,006 | -0,106 | **0,000** | 0,135 | 0,007 |
| B592 | CS4 - QRO60X3K | 0,000 | NC4 | -10,996 | 0,000 | -0,584 | 0,000 | **0,801** | 0,000 |
| B554 | CS4 - QRO60X3K | 0,000 | NC8 | -1,596 | 0,104 | -0,084 | 0,000 | 0,107 | **-0,132** |
| B1027 | CS4 - QRO60X3K | 0,000 | NC8 | -1,596 | -0,104 | -0,084 | 0,000 | 0,107 | **0,132** |
| B595 | CS5 - V 93x67x3,0 | 1200,001 | NC4 | **-13,686** | 0,000 | 1,715 | 0,000 | -0,604 | 0,000 |
| B1030 | CS5 - V 93x67x3,0 | 2017,600 | NC13 | **4,151** | 0,000 | -1,205 | 0,000 | 0,064 | 0,000 |
| B1032 | CS5 - V 93x67x3,0 | 2017,600 | NC8 | -2,382 | **-0,880** | 0,291 | 0,000 | 0,135 | 0,007 |
| B591 | CS5 - V 93x67x3,0 | 2017,600 | NC8 | -2,382 | **0,880** | 0,291 | 0,000 | 0,135 | -0,007 |
| B1030 | CS5 - V 93x67x3,0 | 1200,001 | NC13 | 4,096 | 0,000 | **-1,214** | 0,000 | 1,052 | 0,000 |
| B652 | CS5 - V 93x67x3,0 | 1963,200 | NC4 | -12,330 | 0,000 | **1,766** | 0,000 | -0,892 | 0,000 |
| B1045 | CS5 - V 93x67x3,0 | 1745,140 | NC8 | -2,528 | 0,247 | 0,323 | **0,000** | -0,232 | -0,177 |
| B650 | CS5 - V 93x67x3,0 | 1745,140 | NC8 | -2,528 | -0,247 | 0,323 | **0,000** | -0,232 | 0,177 |
| B652 | CS5 - V 93x67x3,0 | 1200,001 | NC4 | -12,405 | 0,000 | 1,700 | 0,000 | **-2,219** | 0,000 |
| B1034 | CS5 - V 93x67x3,0 | 1200,001 | NC13 | 4,065 | 0,003 | -1,214 | 0,000 | **1,052** | -0,002 |
| B591 | CS5 - V 93x67x3,0 | 1200,001 | NC8 | -2,453 | 0,877 | 0,291 | 0,000 | -0,103 | **-0,726** |
| B1032 | CS5 - V 93x67x3,0 | 1200,001 | NC8 | -2,453 | -0,877 | 0,291 | 0,000 | -0,103 | **0,726** |
| B1038 | CS3 - QRO30X3K | 1359,470 | NC4 | **-3,467** | 0,014 | 0,000 | 0,000 | 0,000 | 0,000 |
| B1038 | CS3 - QRO30X3K | 0,000 | NC13 | **1,755** | -0,009 | 0,000 | 0,000 | 0,000 | 0,000 |
| B639 | CS3 - QRO30X3K | 1359,470 | NC1 | -0,763 | **-0,015** | 0,000 | 0,000 | 0,000 | 0,000 |
| B1040 | CS3 - QRO30X3K | 1359,470 | NC1 | -0,763 | **0,015** | 0,000 | 0,000 | 0,000 | 0,000 |
| B1221 | CS3 - QRO30X3K | 0,000 | NC8 | -0,461 | 0,013 | **0,000** | 0,000 | 0,000 | 0,000 |
| B1038 | CS3 - QRO30X3K | 1359,470 | NC8 | -0,679 | 0,013 | **0,000** | 0,000 | 0,000 | 0,000 |
| B1043 | CS3 - QRO30X3K | 679,730 | NC8 | -0,476 | 0,000 | 0,000 | **0,000** | 0,000 | -0,004 |
| B1085 | CS3 - QRO30X3K | 679,730 | NC8 | -0,476 | 0,000 | 0,000 | **0,000** | 0,000 | 0,004 |
| B637 | CS3 - QRO30X3K | 679,730 | NC8 | -0,664 | 0,000 | 0,000 | 0,000 | **0,000** | 0,004 |
| B1040 | CS3 - QRO30X3K | 679,730 | NC7 | 1,579 | 0,000 | 0,000 | 0,000 | **0,000** | -0,004 |
| B1040 | CS3 - QRO30X3K | 679,730 | NC1 | -0,747 | 0,000 | 0,000 | 0,000 | 0,000 | **-0,005** |
| B639 | CS3 - QRO30X3K | 679,730 | NC1 | -0,747 | 0,000 | 0,000 | 0,000 | 0,000 | **0,005** |
| B609 | CS6 - FCh5x35 | 0,000 | NC1 | **-0,005** | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| B609 | CS6 - FCh5x35 | 5545,300 | NC8 | **0,902** | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| B1018 | CS1 - Kaltgeformtes C-Profil | 17700,000 | NC8 | **-0,430** | -0,177 | -0,660 | 0,000 | -0,660 | -0,179 |
| B1018 | CS1 - Kaltgeformtes C-Profil | 17700,001 | NC8 | **0,153** | 0,193 | 0,710 | 0,000 | -0,660 | -0,179 |
| B1018 | CS1 - Kaltgeformtes C-Profil | 6900,000 | NC4 | 0,014 | **-1,039** | -3,790 | -0,009 | -3,523 | **-0,961** |
| B1067 | CS1 - Kaltgeformtes C-Profil | 17700,001 | NC4 | 0,014 | **1,039** | 3,790 | 0,009 | -3,523 | -0,961 |
| B853 | CS1 - Kaltgeformtes C-Profil | 6900,000 | NC4 | 0,033 | -0,986 | **-3,802** | -0,009 | **-3,526** | -0,911 |
| B853 | CS1 - Kaltgeformtes C-Profil | 17700,001 | NC4 | 0,033 | 0,986 | **3,802** | 0,009 | -3,526 | -0,911 |
| B1018 | CS1 - Kaltgeformtes C-Profil | 23100,001 | NC4 | -0,055 | 0,516 | 1,881 | **-0,015** | -1,399 | -0,389 |
| B1067 | CS1 - Kaltgeformtes C-Profil | 1500,000 | NC4 | -0,055 | -0,516 | -1,881 | **0,015** | -1,399 | -0,389 |
| B853 | CS1 - Kaltgeformtes C-Profil | 20940,000 | NC4 | 0,011 | -0,078 | -0,288 | 0,007 | **2,165** | 0,563 |
| B1018 | CS1 - Kaltgeformtes C-Profil | 20940,000 | NC4 | -0,007 | -0,081 | -0,286 | 0,007 | 2,155 | **0,588** |
| B851 | CS2 - CFRHS80X40X3 | 661,701 | NC4 | **-3,465** | 0,000 | 6,433 | 0,000 | -3,042 | 0,000 |
| B849 | CS2 - CFRHS80X40X3 | 3308,570 | NC4 | **2,064** | 0,000 | -5,307 | 0,000 | -0,430 | 0,000 |
| B851 | CS2 - CFRHS80X40X3 | 3820,000 | NC8 | 0,409 | **-0,526** | -1,075 | 0,000 | -0,640 | **-0,253** |
| B1059 | CS2 - CFRHS80X40X3 | 3820,000 | NC8 | 0,409 | **0,526** | -1,075 | 0,000 | -0,640 | **0,253** |
| B851 | CS2 - CFRHS80X40X3 | 3820,000 | NC4 | 2,028 | 0,000 | **-5,354** | 0,000 | -3,155 | 0,000 |
| B851 | CS2 - CFRHS80X40X3 | 872,360 | NC4 | -3,433 | 0,000 | **6,436** | 0,000 | -1,686 | 0,000 |
| B1057 | CS2 - CFRHS80X40X3 | 661,701 | NC8 | -0,675 | -0,151 | 1,278 | **-0,001** | -0,617 | 0,059 |

| Member | css | dx [mm] | Case | N [kN] | Vy [kN] | Vz [kN] | Mx [kNm] | My [kNm] | Mz [kNm] |
|---|---|---|---|---|---|---|---|---|---|
| B1242 | CS2 - CFRHS80X40X3 | 661,701 | NC8 | -0,675 | 0,151 | 1,278 | **0,001** | -0,617 | -0,059 |
| B849 | CS2 - CFRHS80X40X3 | 3820,000 | NC4 | 2,028 | 0,000 | -5,354 | 0,000 | **-3,155** | 0,000 |
| B851 | CS2 - CFRHS80X40X3 | 1399,000 | NC4 | -3,425 | 0,000 | 6,404 | 0,000 | **1,698** | 0,000 |

## 2.3 Check of steel (yellow)

Nonlinear calculation
Class: NLK
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: Named selection - YELLOW
**Overall Unity Check**

| Name | dx [mm] | Case | Cross-section | Material | $UC_{Overall}$ [-] | $UC_{Sec}$ [-] | $UC_{Stab}$ [-] |
|---|---|---|---|---|---|---|---|
| B592 | 0,000 | NC4 | CS4 - QRO60X3K | S 355 | **0,54** | 0,16 | 0,54 |
| B652 | 1200,000+ | NC4 | CS5 - V 93x67x3,0 | S 355 | **0,35** | 0,33 | 0,35 |
| B1038 | 1359,467 | NC4 | CS3 - QRO30X3K | S 235 | **0,14** | 0,05 | 0,14 |
| B1037 | 0,000 | NC15 | CS6 - FCh5x35 | S 235 | **0,10** | 0,00 | 0,10 |
| B1018 | 6900,000+ | NC4 | CS1 - Kaltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00) | HX460LAD | **0,99** | 0,99 | 0,78 |
| B849 | 3820,000- | NC4 | CS2 - CFRHS80X40X3 | S 355 | **0,54** | 0,54 | 0,00 |

## 2.4 Check of steel (blue)

Nonlinear calculation
Class: NLK
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: Named selection - BLUE
**Overall Unity Check**

| Name | dx [mm] | Case | Cross-section | Material | $UC_{Overall}$ [-] | $UC_{Sec}$ [-] | $UC_{Stab}$ [-] |
|---|---|---|---|---|---|---|---|
| B1075 | 0,000 | NC4 | CS4 - QRO60X3K | S 355 | **0,54** | 0,16 | 0,54 |
| B1089 | 1200,000+ | NC4 | CS5 - V 93x67x3,0 | S 355 | **0,35** | 0,33 | 0,35 |
| B1116 | 1359,467 | NC4 | CS3 - QRO30X3K | S 235 | **0,14** | 0,05 | 0,14 |
| B1079 | 0,000 | NC16 | CS6 - FCh5x35 | S 235 | **0,10** | 0,00 | 0,10 |
| B1103 | 6900,000+ | NC4 | CS1 - Kaltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00) | HX460LAD | **0,99** | 0,99 | 0,78 |
| B1098 | 3820,000- | NC4 | CS2 - CFRHS80X40X3 | S 355 | **0,54** | 0,54 | 0,00 |

## 2.5 Check of steel (red)

Nonlinear calculation
Class: NLK
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: Named selection - RED
**Overall Unity Check**

| Name | dx [mm] | Case | Cross-section | Material | $UC_{Overall}$ [-] | $UC_{Sec}$ [-] | $UC_{Stab}$ [-] |
|---|---|---|---|---|---|---|---|
| B1147 | 0,000 | NC4 | CS4 - QRO60X3K | S 355 | **0,54** | 0,16 | 0,54 |
| B1161 | 1200,000+ | NC4 | CS5 - V 93x67x3,0 | S 355 | **0,35** | 0,33 | 0,35 |
| B1188 | 1359,467 | NC4 | CS3 - QRO30X3K | S 235 | **0,14** | 0,05 | 0,14 |
| B1187 | 0,000 | NC11 | CS6 - FCh5x35 | S 235 | **0,14** | 0,00 | 0,14 |
| B1175 | 6900,000+ | NC4 | CS1 - Kaltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00) | HX460LAD | **0,99** | 0,99 | 0,78 |
| B1170 | 3820,000- | NC4 | CS2 - CFRHS80X40X3 | S 355 | **0,54** | 0,54 | 0,00 |

## 2.6 Check of steel (white)

Nonlinear calculation
Class: NLK
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: Named selection - WHITE
**Overall Unity Check**

| Name | dx [mm] | Case | Cross-section | Material | $UC_{Overall}$ [-] | $UC_{Sec}$ [-] | $UC_{Stab}$ [-] |
|---|---|---|---|---|---|---|---|
| B1219 | 0,000 | NC4 | CS4 - QRO60X3K | S 355 | **0,54** | 0,16 | 0,54 |
| B1269 | 1208,205+ | NC4 | CS5 - V 93x67x3,0 | S 355 | **0,35** | 0,33 | 0,35 |
| B1260 | 1359,467 | NC4 | CS3 - QRO30X3K | S 235 | **0,14** | 0,05 | 0,14 |
| B1259 | 0,000 | NC12 | CS6 - FCh5x35 | S 235 | **0,10** | 0,00 | 0,10 |
| B1247 | 6900,000+ | NC4 | CS1 - Kaltgeformtes C-Profil (90,00; 60,00; 2,00; 2,50; 13,00) | HX460LAD | **0,99** | 0,99 | 0,78 |
| B1242 | 3820,000- | NC4 | CS2 - CFRHS80X40X3 | S 355 | **0,54** | 0,54 | 0,00 |

# Pos. 3.0 Deformation

## 3.1 Deformation (yellow)

Nonlinear calculation, Extreme : Global
Selection : Named selection - YELLOW
Class : NLK

| Node | Case | Ux [mm] | Uy [mm] | Uz [mm] |
|---|---|---|---|---|
| N2641 | NC13 | **0,0** | 4,2 | 0,0 |
| N1963 | NC8 | **2,5** | -0,9 | -0,9 |
| N2634 | NC4 | 0,0 | **-8,8** | 25,2 |
| N2678 | NC4 | 0,0 | **8,8** | 25,2 |
| N2673 | NC13 | 0,0 | -2,6 | **-8,6** |
| N2586 | NC4 | 0,0 | 8,5 | **26,5** |

## 3.2 Deformation (blue)

Nonlinear calculation, Extreme : Global
Selection : Named selection - BLUE
Class : NLK

| Node | Case | Ux [mm] | Uy [mm] | Uz [mm] |
|---|---|---|---|---|
| N2786 | NC12 | **0,0** | 3,6 | 0,0 |
| N2710 | NC8 | **2,5** | -0,9 | -0,9 |
| N2779 | NC4 | 0,0 | **-8,8** | 25,2 |
| N2816 | NC4 | 0,0 | **8,8** | 25,2 |
| N2811 | NC12 | 0,0 | -2,3 | **-6,6** |
| N2745 | NC4 | 0,0 | 8,5 | **26,5** |

## 3.3 Deformation (red)

Nonlinear calculation, Extreme : Global
Selection : Named selection - RED
Class : NLK

| Node | Case | Ux [mm] | Uy [mm] | Uz [mm] |
|---|---|---|---|---|
| N2924 | NC12 | **0,0** | 3,6 | 0,0 |
| N2848 | NC8 | **2,5** | -0,9 | -0,9 |
| N2917 | NC4 | 0,0 | **-8,8** | 25,2 |
| N2954 | NC4 | 0,0 | **8,8** | 25,2 |
| N2949 | NC12 | 0,0 | -2,3 | **-6,6** |
| N2883 | NC4 | 0,0 | 8,5 | **26,5** |

## 3.4 Deformation (white)

Nonlinear calculation, Extreme : Global
Selection : Named selection - WHITE
Class : NLK

| Node | Case | Ux [mm] | Uy [mm] | Uz [mm] |
|---|---|---|---|---|
| N3021 | NC4 | **0,0** | 8,5 | **26,5** |
| N2986 | NC8 | **2,5** | -0,9 | -0,9 |
| N3055 | NC4 | 0,0 | **-8,8** | 25,2 |
| N3092 | NC4 | 0,0 | **8,8** | 25,2 |
| N3073 | NC4 | 0,0 | 4,6 | **-5,8** |

## Pos. 4.0 Result

The constructor is responsible for checking on site that all assumed loads, cross sections, materials, structural dimensions, and the actual subsoil corresponds to the structural design. If they do not correspond to the structural design, it is necessary to compile a new structural design. Otherwise, there could be damage to the structure, the structural elements, and the modules.

The system was designed following acceptable practice.
The calculated design is possible for the project Best Eindhoven!

07.11.2018

edited by:


statik MICHL engineering

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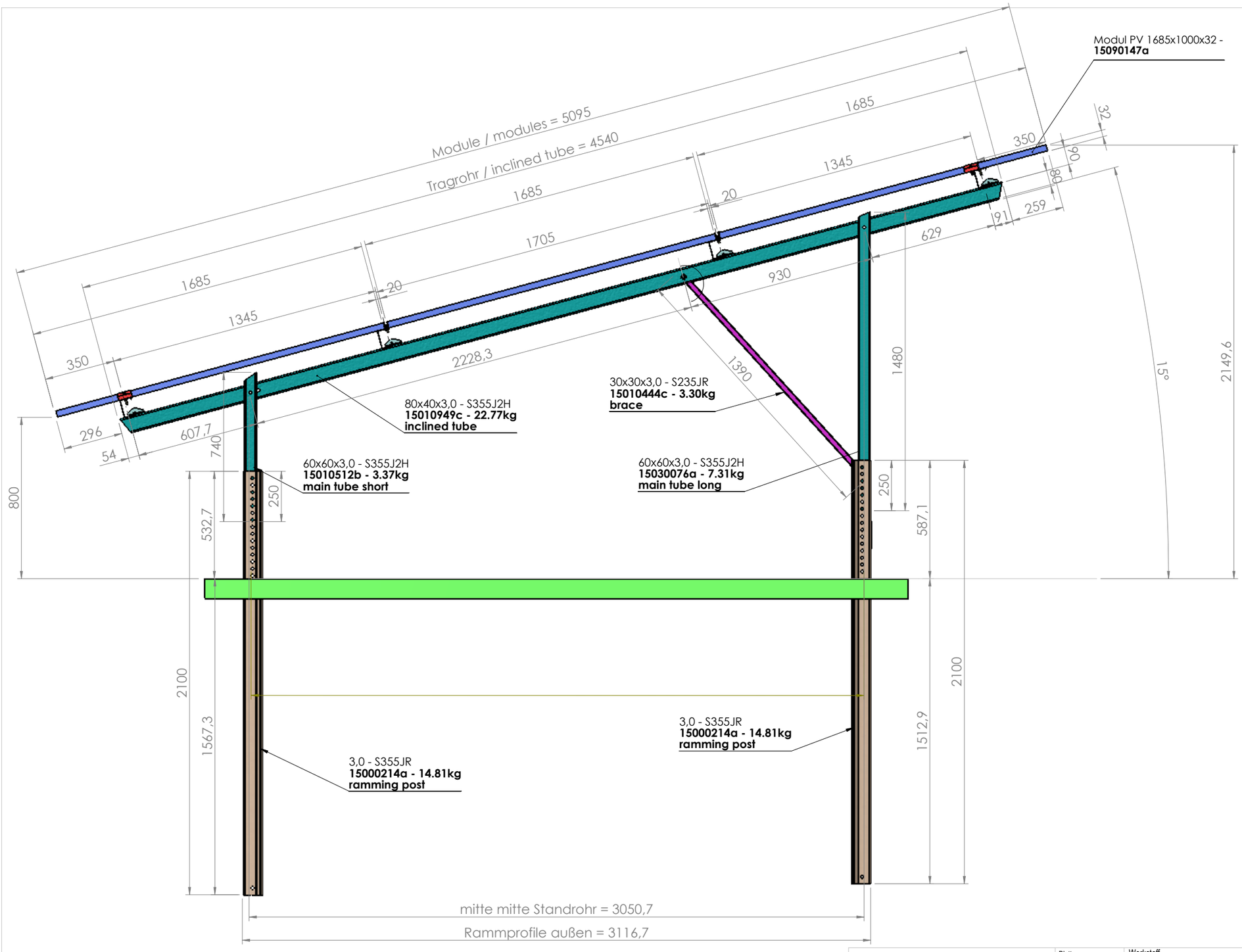



Toleranzen Längenmaße EN ISO 13920-C

| Toleranzklasse | Nennmaßbereich l (in mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 bis 30 | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 |
| | Grenzabmaße t (in mm) | | | | | | | | | | |
| B | ± 1 | ± 2 | ± 2 | ± 3 | ± 4 | ± 6 | ± 8 | ± 10 | ± 12 | ± 14 | ± 16 |

Toleranzen Winkelmaße EN ISO 13920-C

| Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | |
|---|---|---|---|
| | bis 400 | >400 bis 1000 | >1000 |
| | Grenzabmaße (in Minuten) | | |
| B | ± 45´ | ± 30´ | ± 20´ |

| Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | |
|---|---|---|---|
| | bis 400 | >400 bis 1000 | >1000 |
| | gerechnet und gerundet Grenzabmaße (in mm/m) | | |
| B | ± 13 | ± 9 | ± 6 |

Toleranzen Geradheit / Ebenheit / Parallelität EN ISO 13920-G

| Toleranzklasse | Nennmaßbereich l (in mm) (bez. sich auf die längere Seite der Oberfl.) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 |
| | Toleranzen t (in mm) | | | | | | | | | |
| G | 1,5 | 3 | 5,5 | 9 | 11 | 16 | 20 | 22 | 25 | 25 |

Oberfläche
Feuerverzinkt nach
DIN EN ISO 1461
DASt-Richtlinie 022

Blatt 1/3

Maßstab 1:20

Werkstoff

Gewicht ---kg

Querschnitt/ Stärke mm

Spezifikation
**Rohrprofile EN 10219-1, EN 10219-2**
**Walzprofile DIN EN 10346, DIN EN 10143**

EXC 1

Prüfung VT 100%

| Beleg-Nr. | | | |
|---|---|---|---|
| 03 | Höhe und maße angepasst | 22.09.2017 | ts |
| 01 | Startrevision | 06.04.2018 | ts |
| 01 | Startrevision | 31.10.2018 | ts |
| 02 | Standrohr auf lagerstandrohr geändert | 05.11.2018 | ts |
| Index | Änderung | Datum | Name |

| Bearb. | Datum | Name |
|---|---|---|
| | 31.10.2018 | T.Schmid |

Art.-Nr.

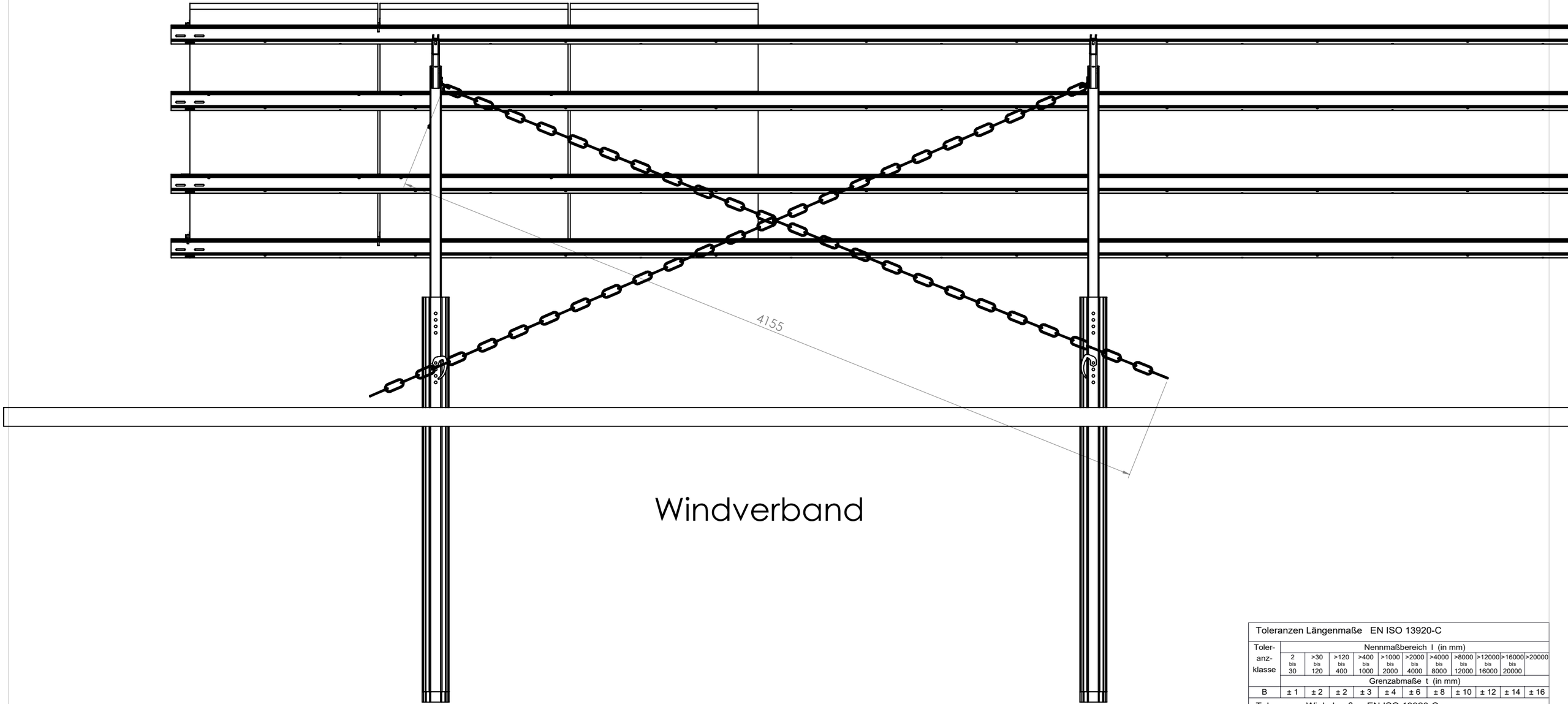
Zeichnungs-Nr.
**25018833-0**



A3

ZIMMERMANN
PV-Stahlbau GmbH & Co. KG
Petrusstraße 1 | D-88436 Oberessendorf | Tel.: +49 7355 9330-0 | Fax: -50
info@pv-stahlbau.de | www.pv-stahlbau.de

Bezeichnung
# Best Eindhoven
ZM2V-3P-HY4-15-60-C




# Windverband

| Toleranzen Längenmaße EN ISO 13920-C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) | | | | | | | | | | |
| | 2 bis 30 | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 |
| | Grenzabmaße t (in mm) | | | | | | | | | | |
| B | ± 1 | ± 2 | ± 2 | ± 3 | ± 4 | ± 6 | ± 8 | ± 10 | ± 12 | ± 14 | ± 16 |

| Toleranzen Winkelmaße EN ISO 13920-C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | | Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | |
| | bis 400 | >400 bis 1000 | >1000 | | bis 400 | >400 bis 1000 | >1000 |
| | Grenzabmaße (in Minuten) | | | | gerechnet und gerundet Grenzabmaße (in mm/m) | | |
| B | ± 45´ | ± 30´ | ± 20´ | B | ± 13 | ± 9 | ± 6 |

| Toleranzen Geradheit / Ebenheit / Parallelität EN ISO 13920-G | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) (bez. sich auf die längere Seite der Oberfl.) | | | | | | | | | | |
| | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 | |
| | Toleranzen t (in mm) | | | | | | | | | | |
| G | 1,5 | 3 | 5,5 | 9 | 11 | 16 | 20 | 22 | 25 | 25 | |

Oberfläche
Feuerverzinkt nach
DIN EN ISO 1461
DASt-Richtlinie 022

Blatt 2/3

Maßstab 1:20

Werkstoff

Gewicht ---kg

Querschnitt/ Stärke
mm

Spezifikation
**Rohrprofile EN 10219-1, EN 10219-2**
**Walzprofile DIN EN 10346, DIN EN 10143**

EXC 1

Prüfung
VT 100%

| Beleg-Nr. | | | |
|---|---|---|---|
| 03 | Höhe und maße angepasst | 22.09.2017 | ts |
| 01 | Startrevision | 06.04.2018 | ts |
| 01 | Startrevision | 31.10.2018 | ts |
| 02 | Standrohr auf lagerstandrohr geändert | 05.11.2018 | ts |
| Index | Änderung | Datum | Name |

| | Datum | Name |
|---|---|---|
| Bearb. | 31.10.2018 | T.Schmid |

Art.-Nr.

Zeichnungs-Nr.
**25018833-0**



A3

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PV-Stahlbau GmbH & Co. KG
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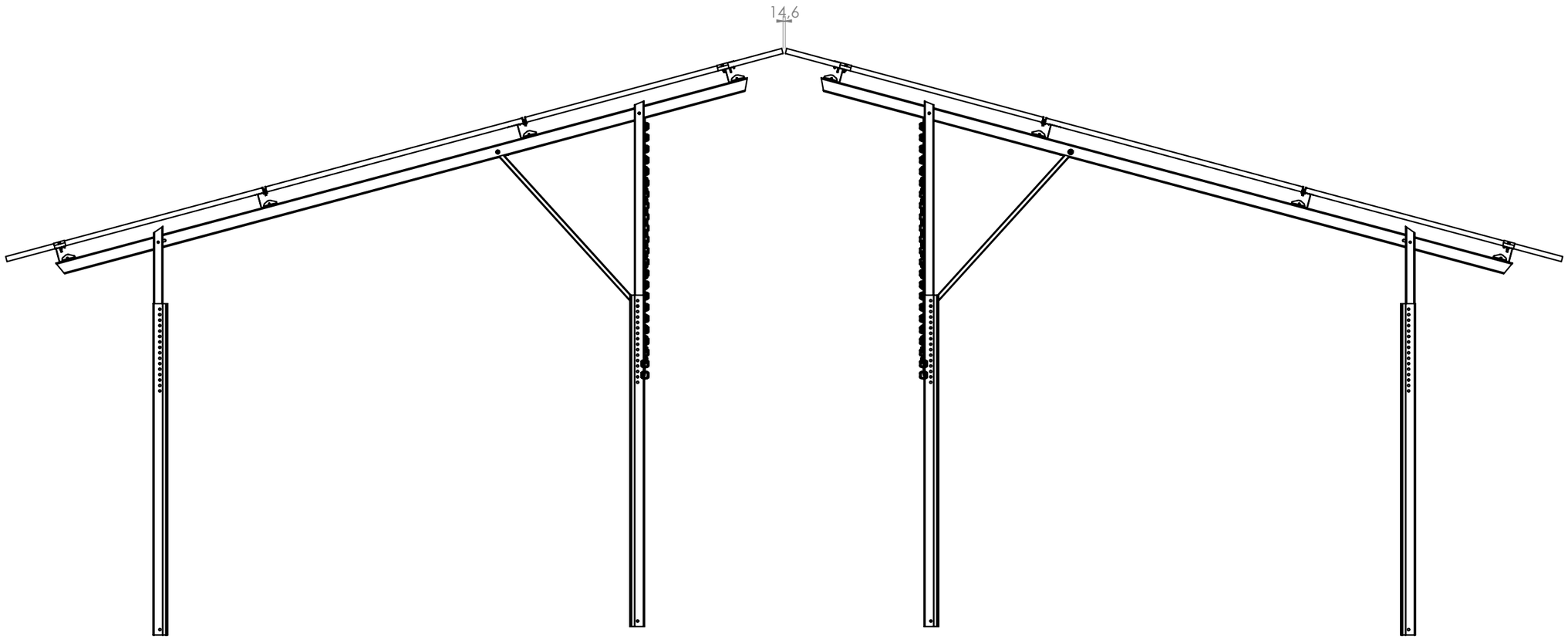
info@pv-stahlbau.de | www.pv-stahlbau.de

Bezeichnung
Best Eindhoven
ZM2V-3P-HY4-15-60-C




| Toleranzen Längenmaße EN ISO 13920-C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) | | | | | | | | | | |
| | 2 bis 30 | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 |
| | Grenzabmaße t (in mm) | | | | | | | | | | |
| B | ± 1 | ± 2 | ± 2 | ± 3 | ± 4 | ± 6 | ± 8 | ± 10 | ± 12 | ± 14 | ± 16 |

| Toleranzen Winkelmaße EN ISO 13920-C | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | | Toleranzklasse | Nennmaßbereich l (in mm) (Länge oder kleinerer Schenkel) | | |
| | bis 400 | >400 bis 1000 | >1000 | | bis 400 | >400 bis 1000 | >1000 |
| | Grenzabmaße (in Minuten) | | | | gerechnet und gerundet Grenzabmaße (in mm/m) | | |
| B | ± 45´ | ± 30´ | ± 20´ | B | ± 13 | ± 9 | ± 6 |

| Toleranzen Geradheit / Ebenheit / Parallelität EN ISO 13920-G | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Toleranzklasse | Nennmaßbereich l (in mm) (bez. sich auf die längere Seite der Oberfl.) | | | | | | | | | | |
| | >30 bis 120 | >120 bis 400 | >400 bis 1000 | >1000 bis 2000 | >2000 bis 4000 | >4000 bis 8000 | >8000 bis 12000 | >12000 bis 16000 | >16000 bis 20000 | >20000 | |
| | Toleranzen t (in mm) | | | | | | | | | | |
| G | 1,5 | 3 | 5,5 | 9 | 11 | 16 | 20 | 22 | 25 | 25 | |

Oberfläche
Feuerverzinkt nach
DIN EN ISO 1461
DASt-Richtlinie 022

Blatt 3/3

Maßstab 1:30

Werkstoff

Gewicht ---kg

Querschnitt/ Stärke mm

Spezifikation
**Rohrprofile EN 10219-1, EN 10219-2**
**Walzprofile DIN EN 10346, DIN EN 10143**

EXC 1

Prüfung VT 100%

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Bezeichnung

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