MECCANO
human technology for innovation

RELAZIONE ANALISI CAE

“Brackets V600A and V600 B”

DITTA RICHIEDENTE:

BILDKRAFT

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Introduction

These 2 analyses consider 2 types of brackets to support a 110-inch screen with dimensions of:
2,474 × 1,408 × 99 mm.
The brackets can be of 2 types, the first involves fixing to a lattice beam and is called V600A, the second type involves fixing to the wall and is called V600B.
The following figures show the 2 models.

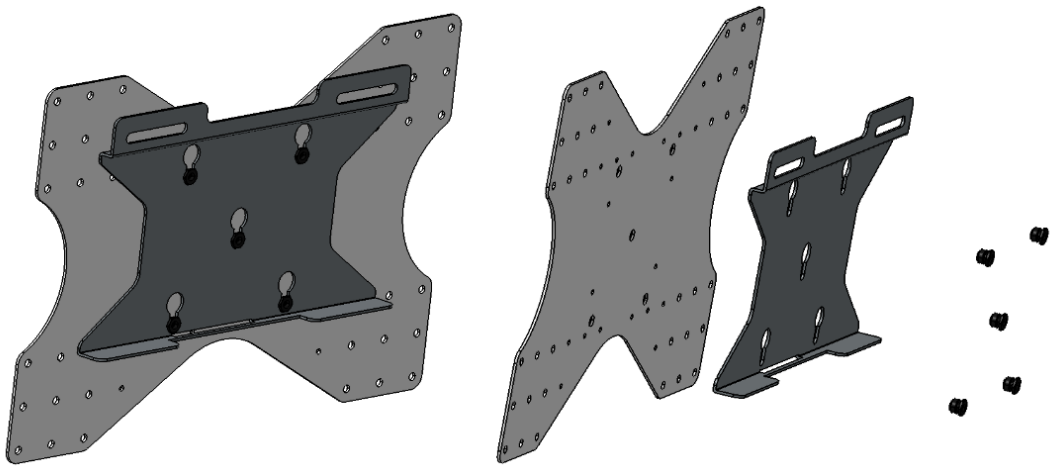

Figura 1 Staffa V600 A

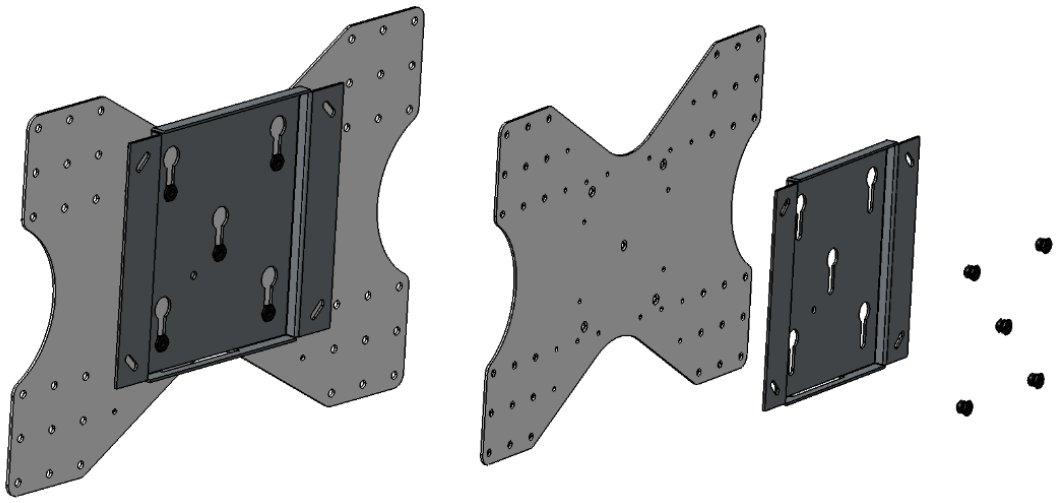

Figura 2 Staffa V600 B

Materials

The material the sheets are made of is S 235 steel, while the material of the PINS is 1.4305 stainless steel. The mechanical characteristics are in table 1.

Materiale	Rm [MPa]	Rp02 [MPa]	Modulo di elasticità E [MPa]	Coefficiente di Poisson ν
S 235	360	235	200000	0,30
CLASS 8.8	460	250	200000	0,30

Tabella 1 Mechanical material characteristics

1) V600A Bracket

In the first case the bracket is fixed to an aluminum truss and is subjected to the following actions;

- weight of the video (110 Kg) of dimensions 2,474 × 1,408 × 99 mm at a distance of 105 mm.

- wind at a speed of 30 Km/h ($p = \frac{1}{2} * \rho * V^2$) .

1.1) FEM Models

For the construction of the FEM model using the ANSYS 19.2 calculation code, a preliminary defeaturing operation of the 3D model was carried out using the CATIA V5 software, purifying the model from geometries that were not significant from a structural point of view; shell elements were considered; the connections with PINS were modelled with beam elements; The boundary conditions are reported in figure 3, in figure 4 the mesh appears to be the same for all models, composed of 32698 nodes and 31907 elements.

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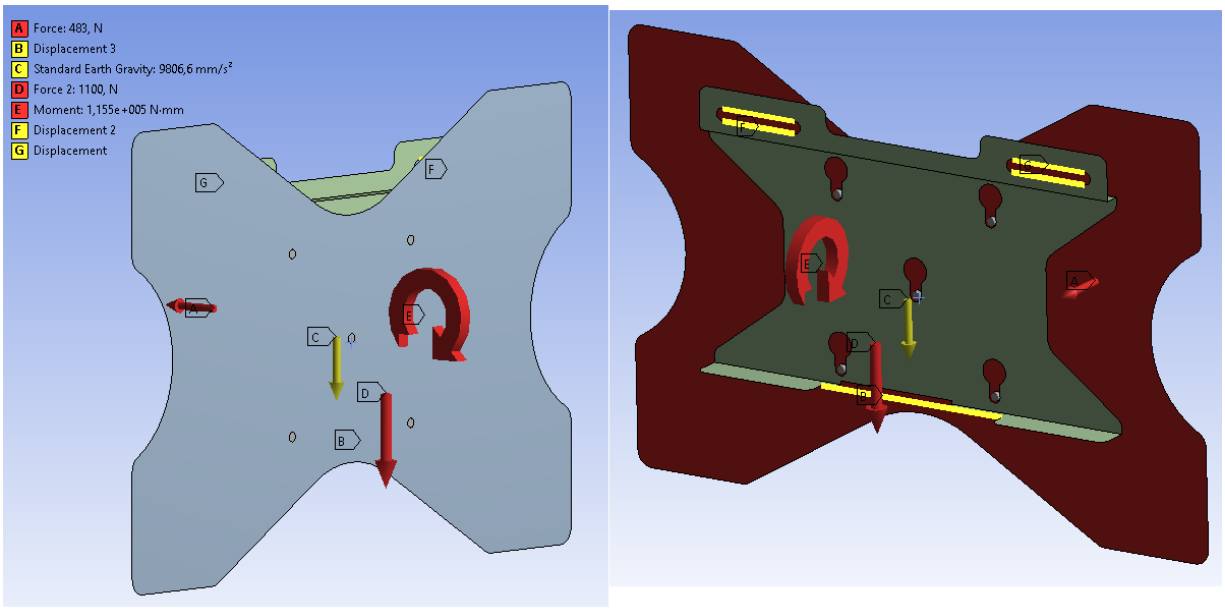

Figura 3 Boundary conditions

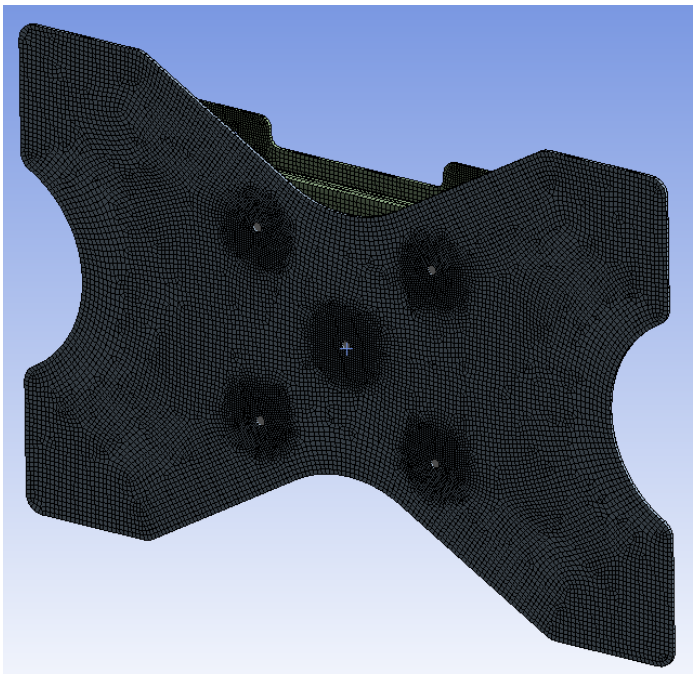

Figura 4 FEM Model

1.2) Calculation procedure

The simulation provides values of stresses resulting from the stresses that will have to be compared with the values of the allowable normal and shear stresses which are respectively;

$\sigma_{am} = \frac{f_{\text{lims}}}{\gamma}$ e $\tau_{amm} = \frac{f_{\text{lims}}}{\sqrt{3} * \gamma}$ where f_{lims} is equal to the yield stress Rp02

and γ a safety coefficient. (UNI EN 13001-3-1 2018).

1.3) Results

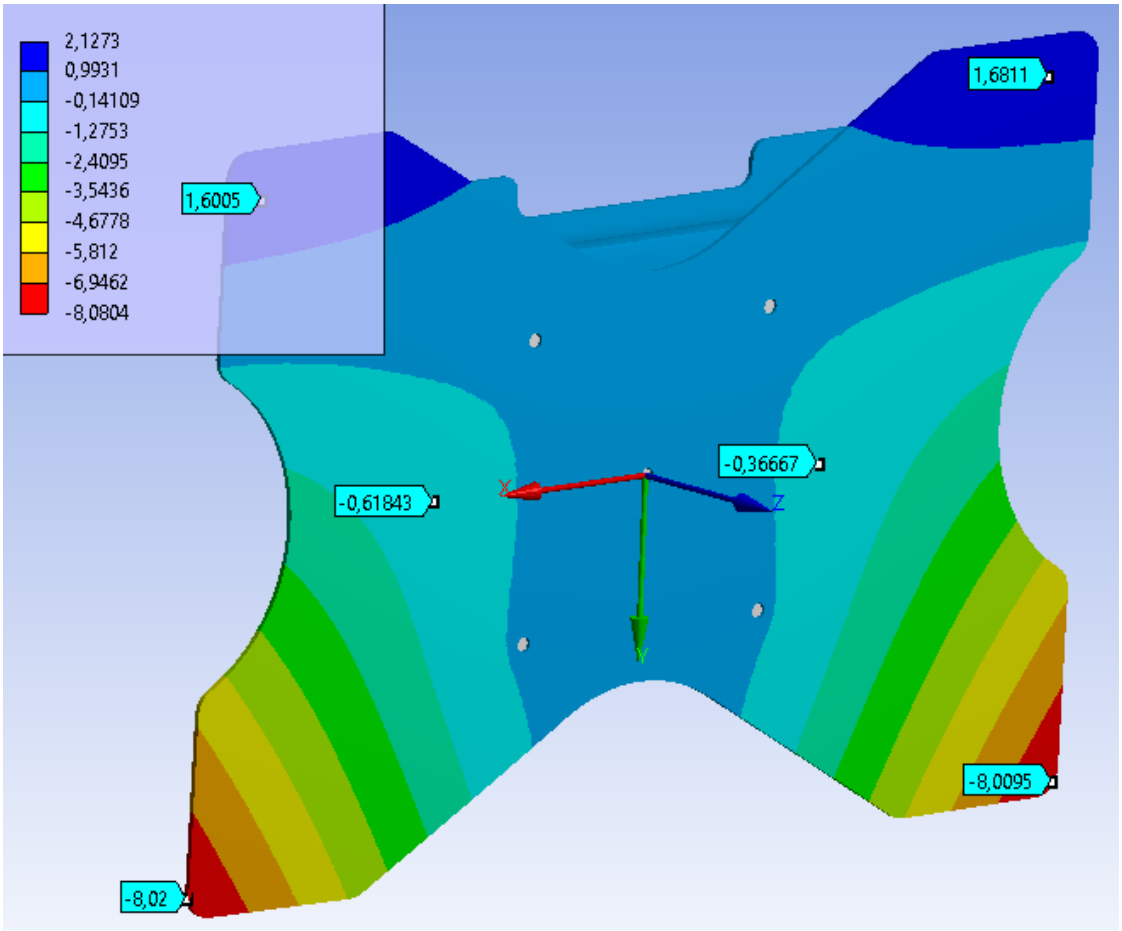

Figura 5 Deformations along Z mm.

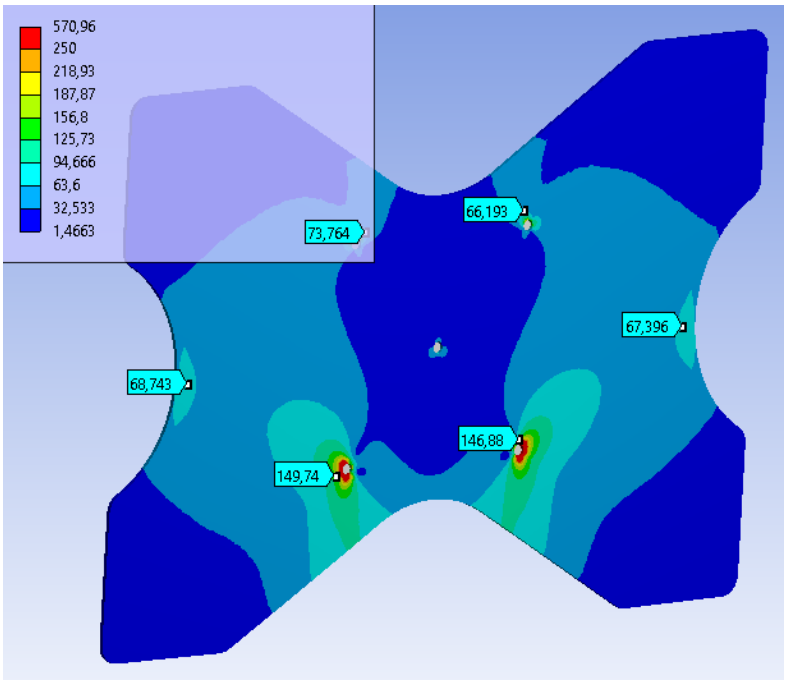

Figura 6 Tensions of Von Mises.

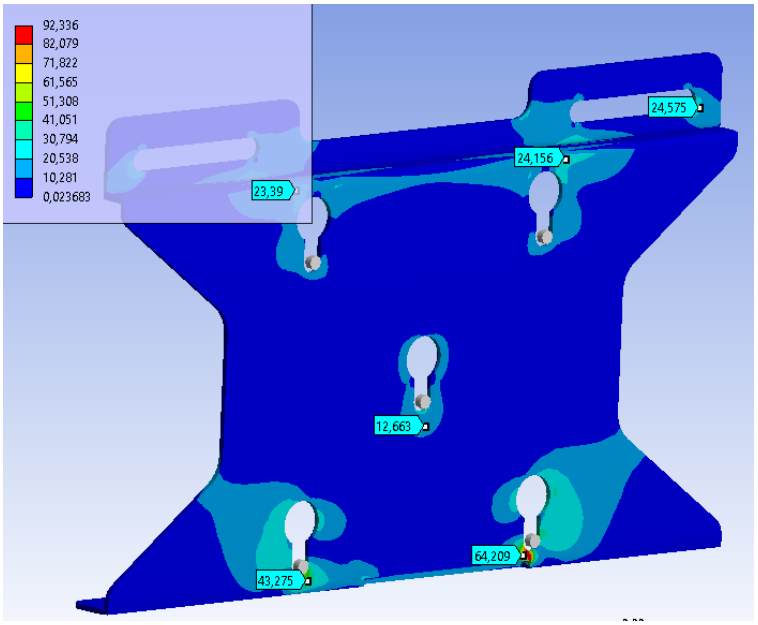

Figura 7 Tensions of Von Mises.

Figure 6 ; $\sigma_{eq\max} = 150MPa$; $R_{p02} = 235MPa$; $\gamma = \frac{R_{p02}}{\sigma_{eq\max}} = 1{,}60$.

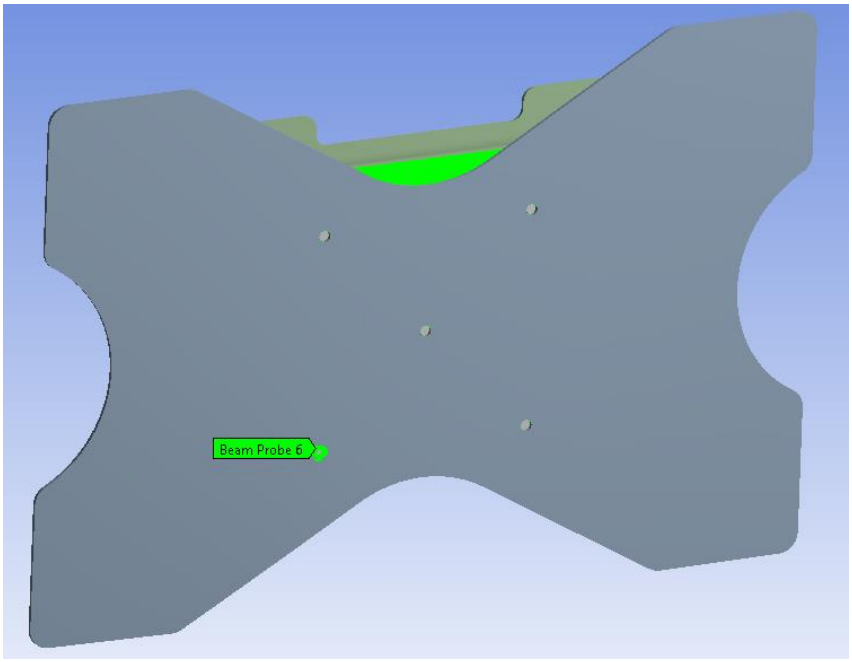

Figura 8 PIN max stress.

For PIN Figure 8;

$$\sigma_{amm} = \frac{\sigma_R}{\sqrt{2}} = \frac{460}{\sqrt{2}} = 326MPa$$

$\sqrt{\left((\sigma)^2 + 2(\tau)^2\right)} \le \sigma_{amm}$ $\sigma = \frac{N}{A_{res}}$ axial tension and $\tau = \frac{T}{A_{res}}$ tangential tension (CNR 10011)

The forces N and T are obtainible from the FEM A_{res} = 50 mm^2

N = -445 N ; T = 1270 N ; $\sqrt{\left((\sigma)^2 + 2(\tau)^2\right)} = 37 \le \sigma_{amm}$ **OK**

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2) V600B Bracket

Second case the bracket is fixed wall and is subjected to the following actions;

- weight of the video (110 Kg) of dimensions 2,474 × 1,408 × 99 mm at a distance of 105 mm.

- wind at a speed of 30 Km/h ($p = \frac{1}{2} * \rho * V^2$) .

2.1) FEM Models

For the construction of the FEM model using the ANSYS 19.2 calculation code, a preliminary defeaturing operation of the 3D model was carried out using the CATIA V5 software, purifying the model from geometries that were not significant from a structural point of view; shell elements were considered; the connections with PINS were modelled with beam elements; The boundary conditions are reported in figure 9, in figure 10 the mesh appears to be the same for all models, composed of 27069 nodes and 26446 elements.

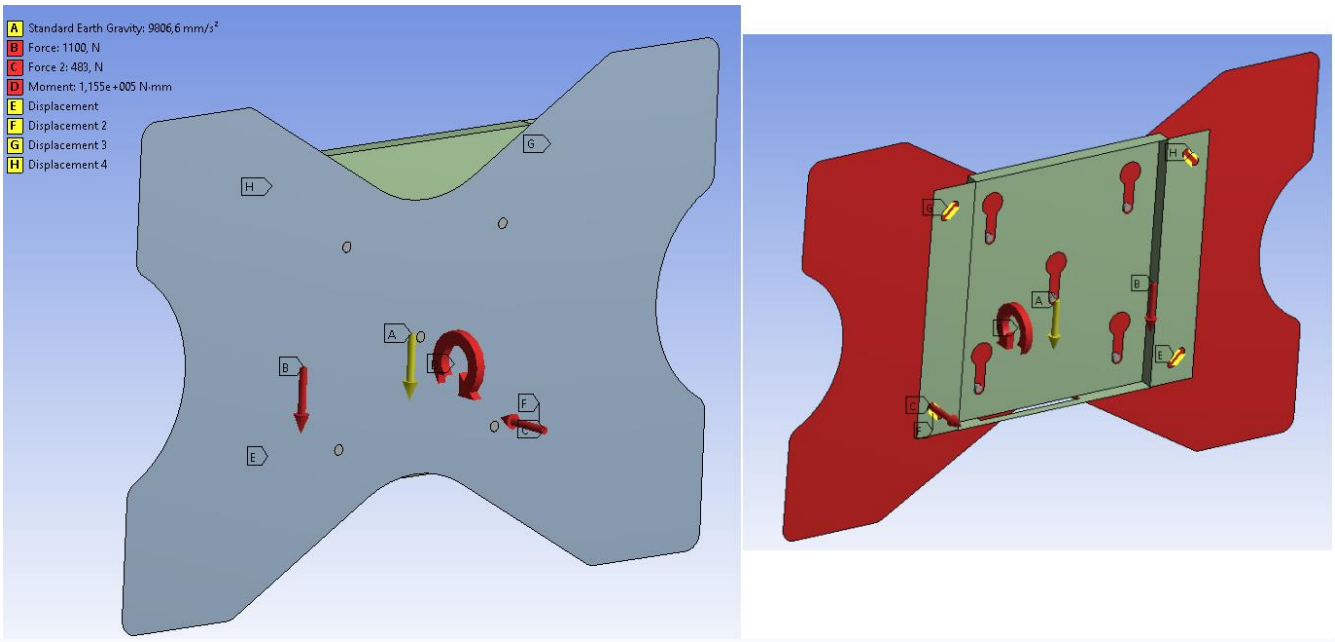

Figura 9 Boundary conditions

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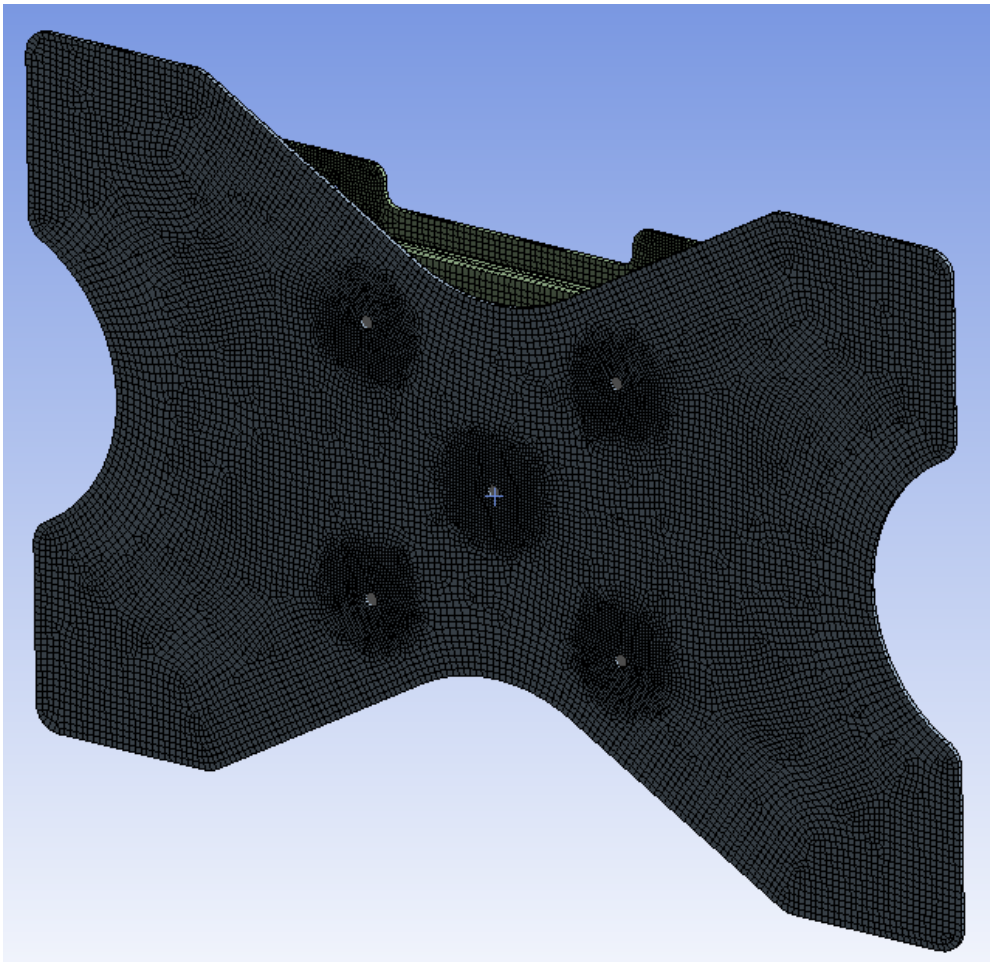

Figura 10 FEM Model

2.2) Calculation procedure

The simulation provides values of stresses resulting from the stresses that will have to be compared with the values of the allowable normal and shear stresses which are respectively;

$\sigma_{am} = \frac{f_{\text{lims}}}{\gamma}$ e $\tau_{amm} = \frac{f_{\text{lims}}}{\sqrt{3} * \gamma}$ where f_{lims} is equal to the yield stress Rp02

and γ a safety coefficient. (UNI EN 13001-3-1 2018).

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2.3) Results

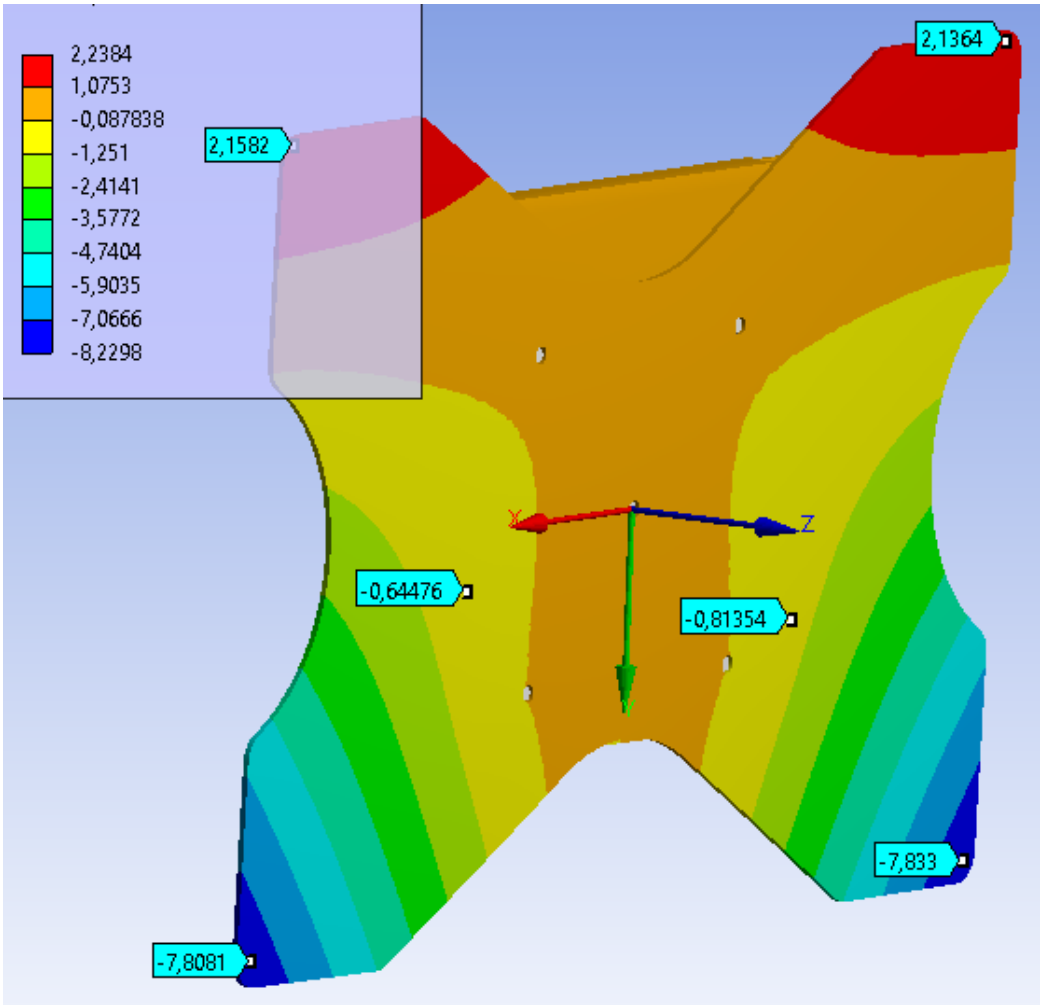

Figura 11 Deformations along Z mm.

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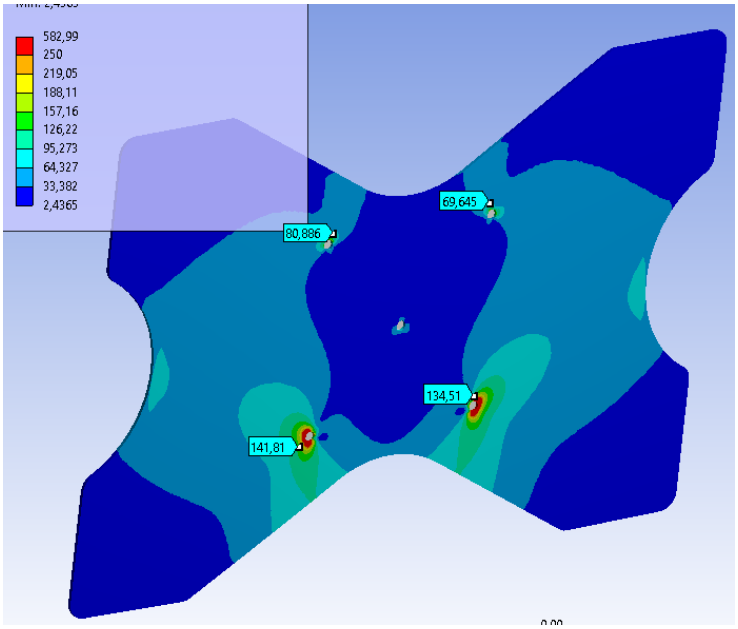

Figura 12 Tensions of Von Mises.

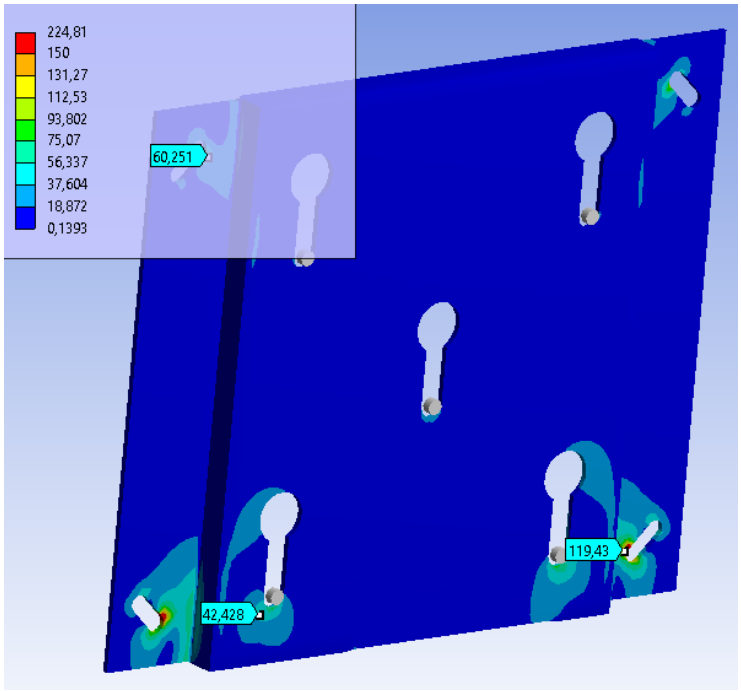

Figura 13 Tensions of Von Mises.

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Figure 6 ; $\sigma_{eq\max} = 142MPa$; $R_{p02} = 235MPa$; $\gamma = \frac{R_{p02}}{\sigma_{eq\max}} = 1{,}65.$

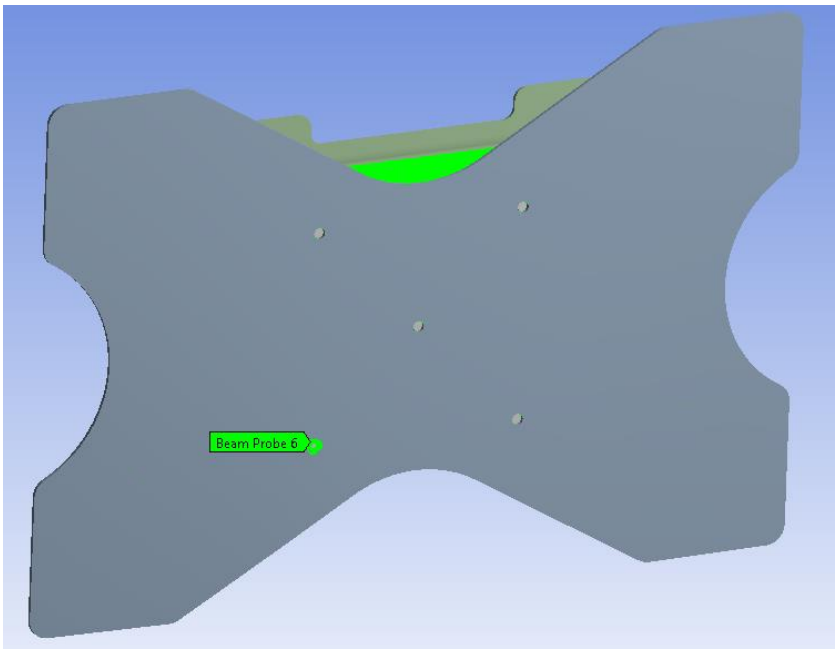

Figura 14 PIN Max stress.

For PIN Figure 8;

$$\sigma_{amm} = \frac{\sigma_R}{\sqrt{2}} = \frac{460}{\sqrt{2}} = 326MPa$$

$\sqrt{\left((\sigma)^2 + 2(\tau)^2\right)} \le \sigma_{amm}$ $\sigma = \frac{N}{A_{res}}$ axial tension and $\tau = \frac{T}{A_{res}}$ tangential tension (CNR 10011)

The forces N and T are obtainible from the FEM A_{res} = 50 mm^2

N = 450 N ; T = 695 N ; $\sqrt{\left((\sigma)^2 + 2(\tau)^2\right)} = 22 \le \sigma_{amm}$

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3) Conclusions

The V 600 A and V600 B devices are suitable for the loads indicated with respective safety coefficients equal to 1.6 and 1.65.

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