

NanoStructure 12U Platform

Datasheet
12U platform for nano-satellites

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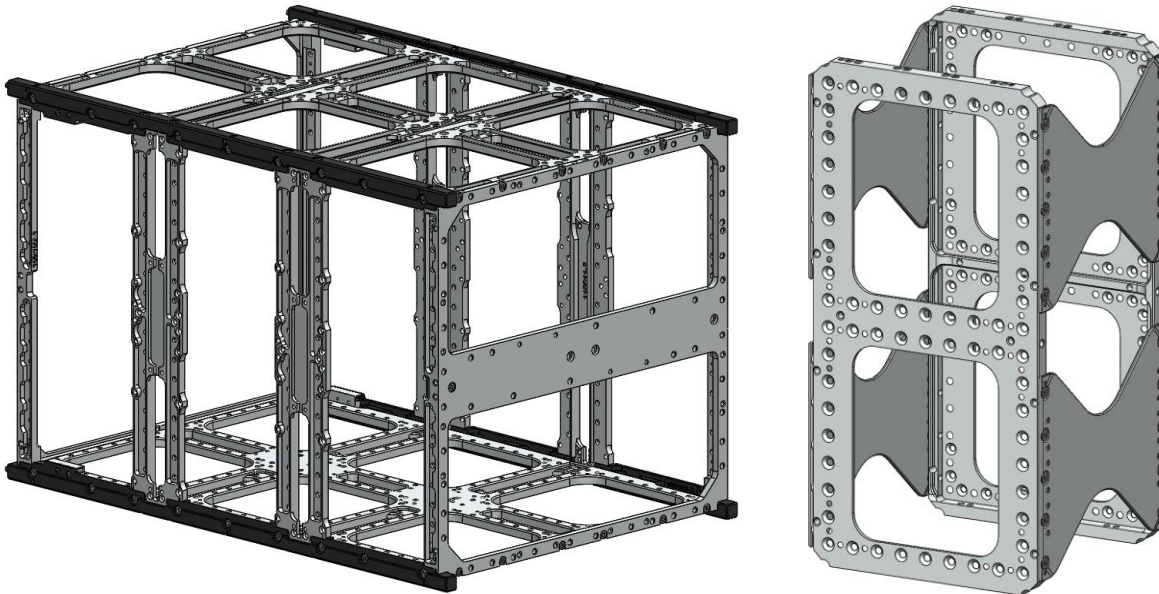
2 Disclaimer

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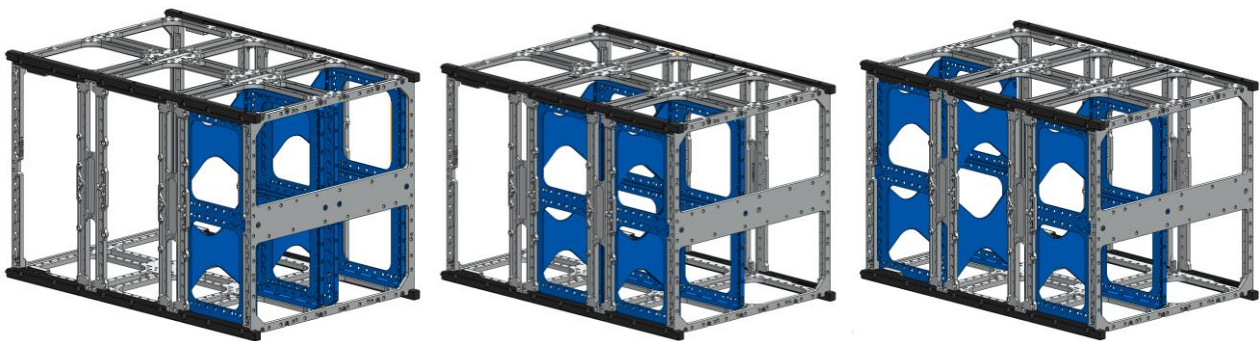
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3 Overview

The GomSpace NanoStructure 12U is a generic structure to be used as framework for a 12U nano-satellite. It consists of a primary structure and a secondary structure kit. At the end of the rails, there are four kill switches to interface with the deployer.



The secondary structure itself can be positioned in different places inside the main structure as shown in the pictures below.



3.1 Highlighted Features

- High degree of freedom for hardware mounting
- Four kill switches at rail ends (with flight heritage from several 6U satellite missions)
- Surface treatment: Rails – hard anodizing; Other structure – Surtec 650 TCP
- Dedicated interface for MGSE (refer to Mechanical Interface section)
- Flat internal walls allowing flexible and accurate positioning of a payload
- Interface for guide pins to increase positioning accuracy
- Threaded holes with screwlock helicoils
- Material: Alu 7075-T7351
- Total mass of default structure: 1496gr
- Outside measurements without kill switches: 340.5 x 226.3 x 226.3 mm

3.2 Compatibility

- Compatible with GomSpace products

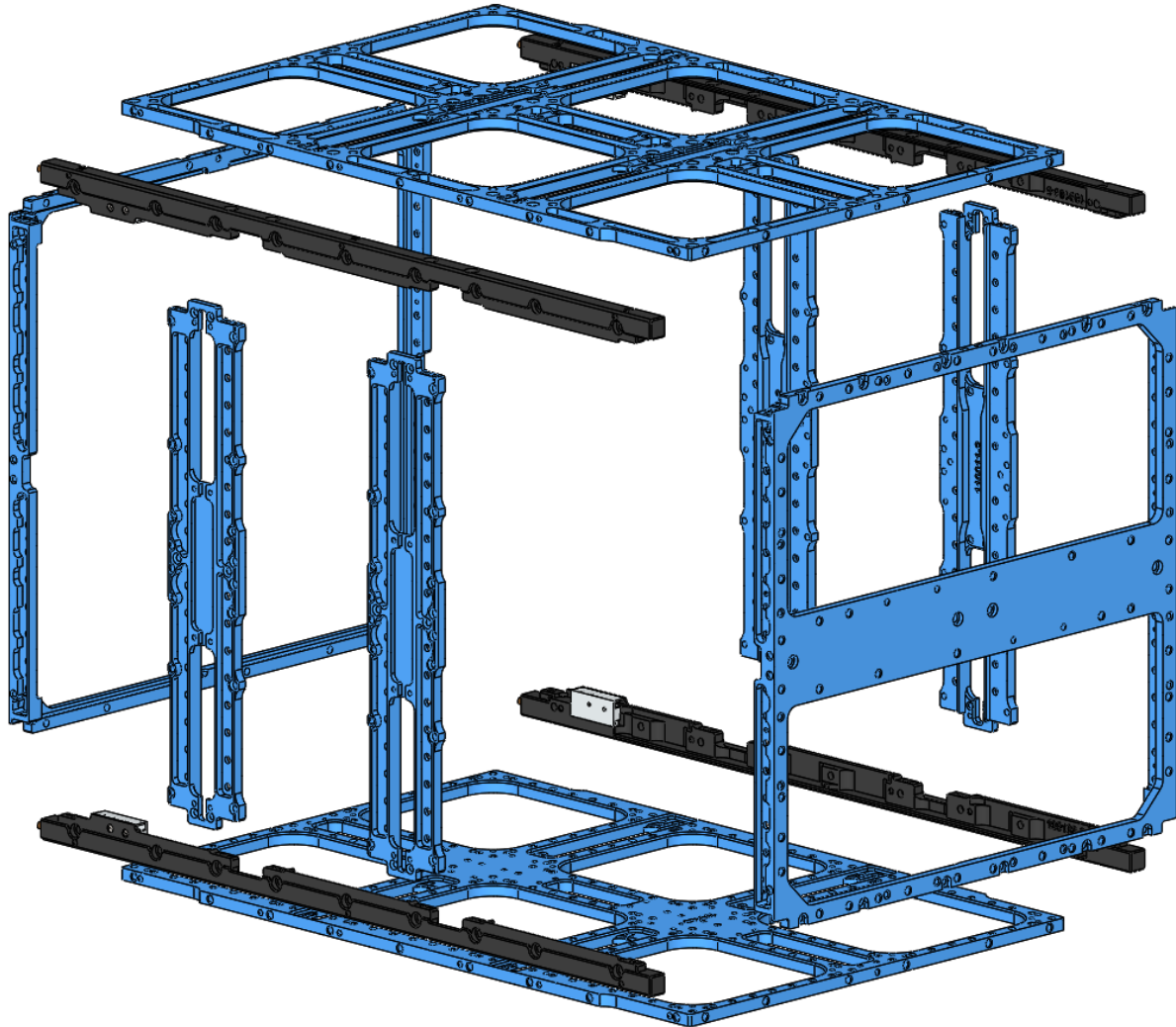
3.3 Product Contents

Structure is delivered partly unassembled. Following components include into package.

- 4x Rails with Kill Switch assembly mounted to it.
- 2x Side walls
- 4x Bridges
- 1x Z+ frame
- 1x Z- frame
- 2x secondary structure kits
- Assembly manual
- Screw and pin kit

4 Main Structure

The main structure is made from 4 rails (highlighted in black) and a number of parts, joining at the rails, forming the structure – highlighted in blue. Guided pins are used in the assembly to ensure accurate and repetitive assembly of the structure.



4.1 Kill Switch and Separation Springs

At the top of the structure frame are four kill switches, which are pressed down while the satellite is placed in its deployer pod and released as the satellite is leaving the pod. The kill switches are intended to be connected to the power system of the satellite, to prevent powering up the satellite during launch.

Depending on how the switches are connected to the power system, they can be set in either a serial or parallel setup e.g., how many switches to release before power up.

From each kill switch runs a 60 cm flying lead. The lead is soldered to the switch pins and then glued inside the housing. As default, the leads are connected to each switch in a Normally Open configuration, meaning that current can run through the switch when it is pressed down, i.e., when the satellite is sitting the deployer pod, while current cannot run through the switch when the switch is released, i.e., when the satellite is deployed.

Regardless of whether any kill switch is connected, the spring plunger is always installed to provide uniform separation force from all four structure feet.

The force from each kill switch is 6N when the switch is pressed down flush with the structure feet.

5 Physical Properties

5.1 Size

With deployment switches stowed

Description	Value	Unit
Size	340.5 x 226.3 x 226.3	mm

5.2 Mass

Total mass for delivered structure

Description	Value	Unit
Total mass (with 2 secondary structures)	~1496	g

Mass for individual components

Description	Value	Unit
Main Structure	~1010	g
Secondary Structure (each)	~230	g
Flying Leads, 60cm	~6	g

5.3 Surface treatment

The rails are hard anodized according to MIL-A-8625F Type III.

The rest of the components are SurTec 650 chromital TCP treated according to MIL-DTL-5541F Type II Class 3 to provide a moderate corrosion resistance while maintaining electrical conductance for leveling electrical potential throughout the structure.

The rails grounding is obtained through the fasteners joining the rails to the rest of the components.

5.4 Material

For all parts of the primary structure, EN AW7075-T7351 is used. The material properties for this material, as specified through its datasheet, can be found bellow.

Typical physical properties:

Density [g/cm ³]	2,80	
Elastic modulus [GPa]	72	
Thermal conductivity [W/m*K]	130 - 160	
Thermal expansion coefficient [K ⁻¹ *10 ⁻⁶]	-50°C - 20°C	21,6
	20°C - 100°C	23,4
	20°C - 200°C	24,3
	20°C - 300°C	25,2
Specific heat J/(kg * K)	862	
Electrical conductivity [m/Ω*mm ²]	19 - 23	
Shear modulus [GPa]	27,1	

Delivery Condition	Tensile strength Rm MPa		Elastic limit R p0.2 MPa		Elongation %	
	min.	max.	min.	max.	A50mm	A
AW7075-T7351	475	-	390	-	-	5

5.5 Grounding

It is advised to keep the structure grounded all the time during an integration process to prevent static charge accumulation.

6 Qualification

The structure has been exposed to several environment tests according to ECSS standards. The overall mass of EQM was 20kg. Levels can be seen in the table below.

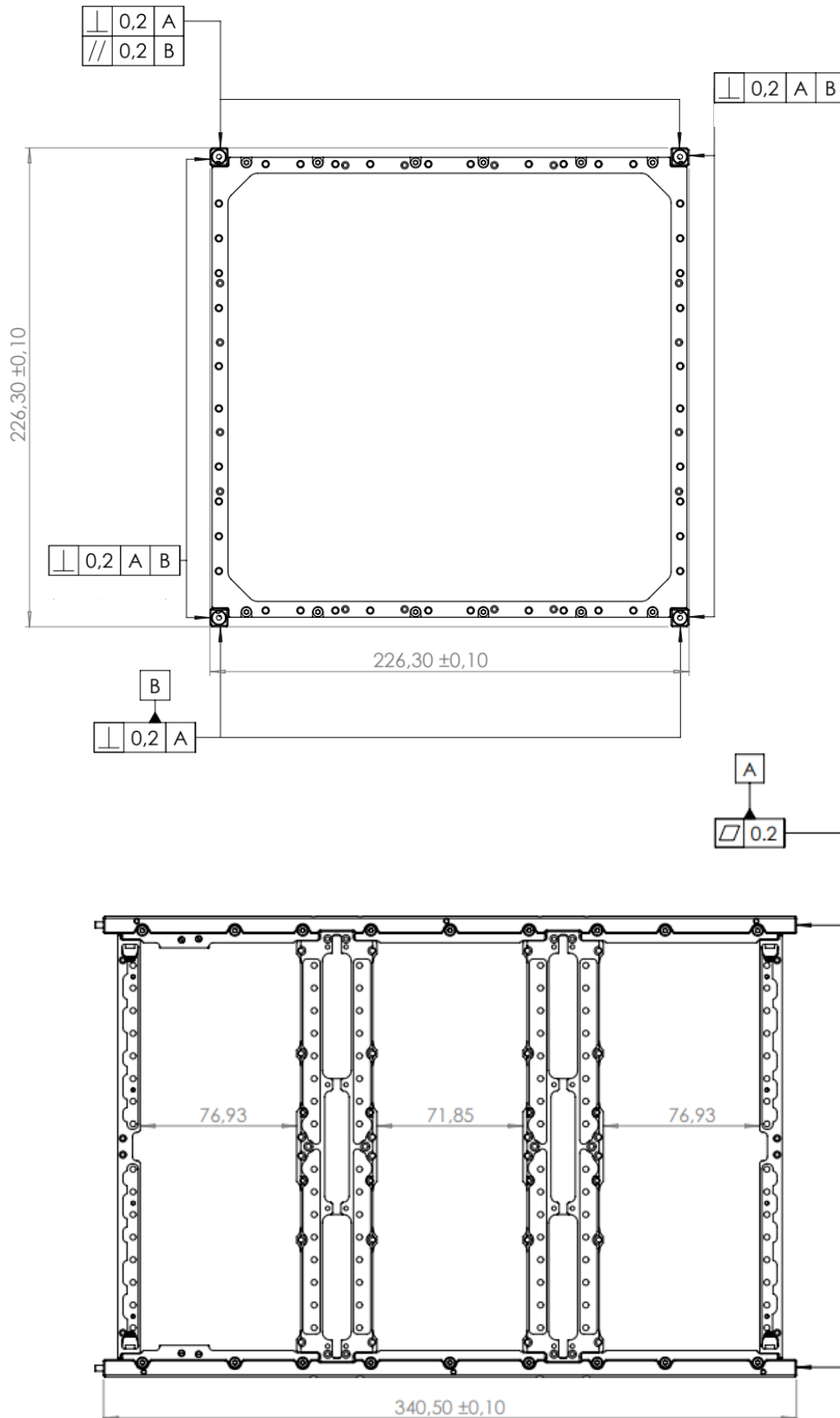
Disclaimer: the overall mass of a s/c and placement of masses might lead different results if changed.

Test	ECSS/ESCC Reference	Major Limits		
Structural and Mechanical	Quasi-static test	ECSS-E-ST-10-03C	Frequency [Hz]	30
			Level [g]	15 (+/-10%)
			No cycles/burst	19
			No of full load cycles/burst	7
			No of burst	1 in each direction
			Directions	X Y Z
	Random Vibration	ECSS-E-ST-10-03C	NASA GEVS levels	
			Frequency [Hz]	ASD Level [g ² /Hz] (+/-3db)
			20	0.026
			20-50	+6 dB/Oct
			50-800	0.16
			800-2000	-6 dB/Oct
			2000	0.026
			Overall	14.1 Grms (+/-10%)
	Sinusoidal Vibration	ECSS-E-ST-10-03C	Sweep rate: 2 octaves / minute	
			Frequency [Hz]	Level
			5-8	10 mm(0-p)
			8-100	4.5G (+/-10%)
	Mechanical Shock	ECSS-E-ST-10-03C	<i>Shock levels based on Q = 10 quality factor</i>	
			Frequency [Hz]	Level [g] (+/- 6db)
100			40	
1000			1000	
2000			1500	
		10000	1500	

7 Mechanical Interface

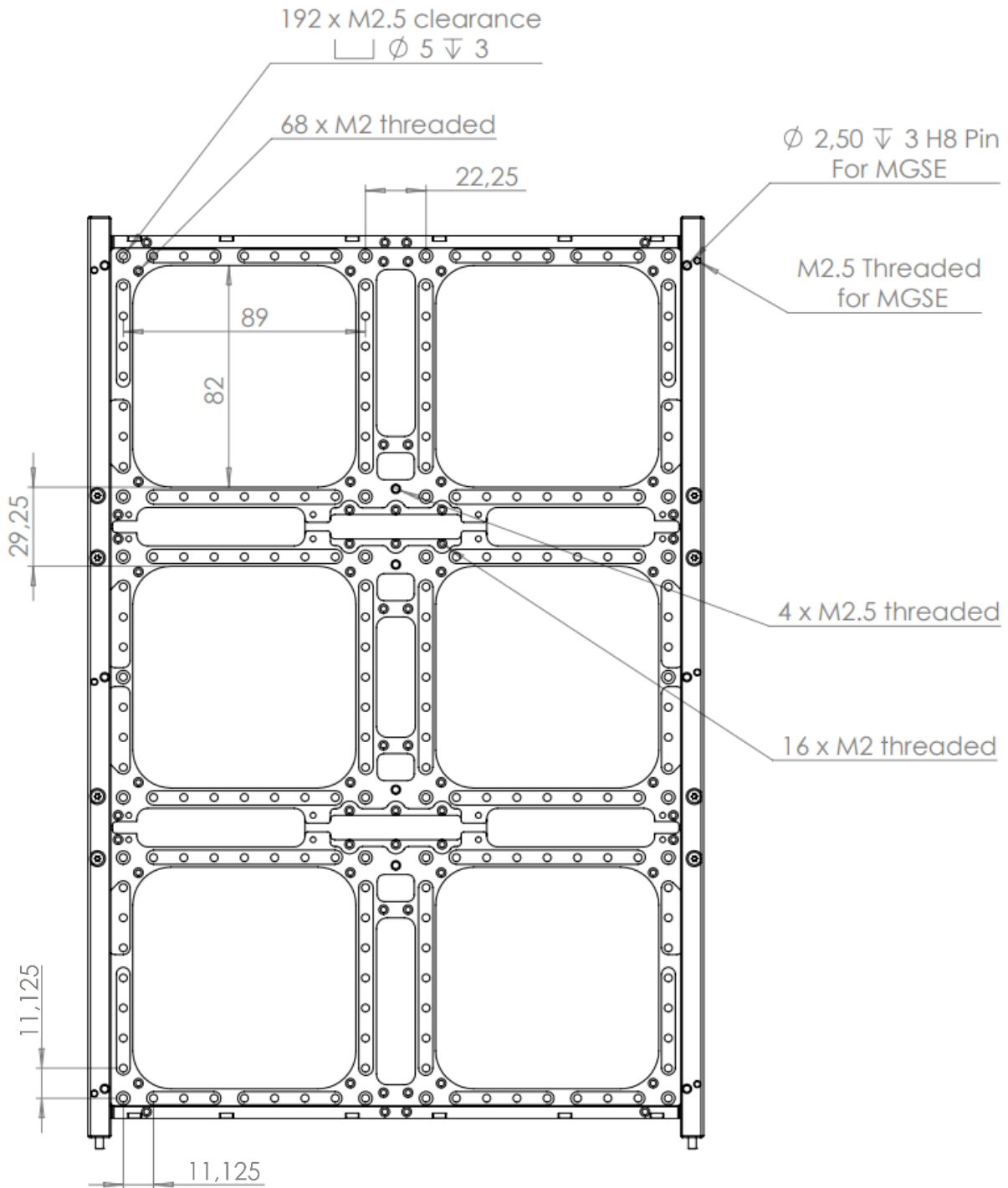
All dimensions in mm.

7.1 Structure Overview

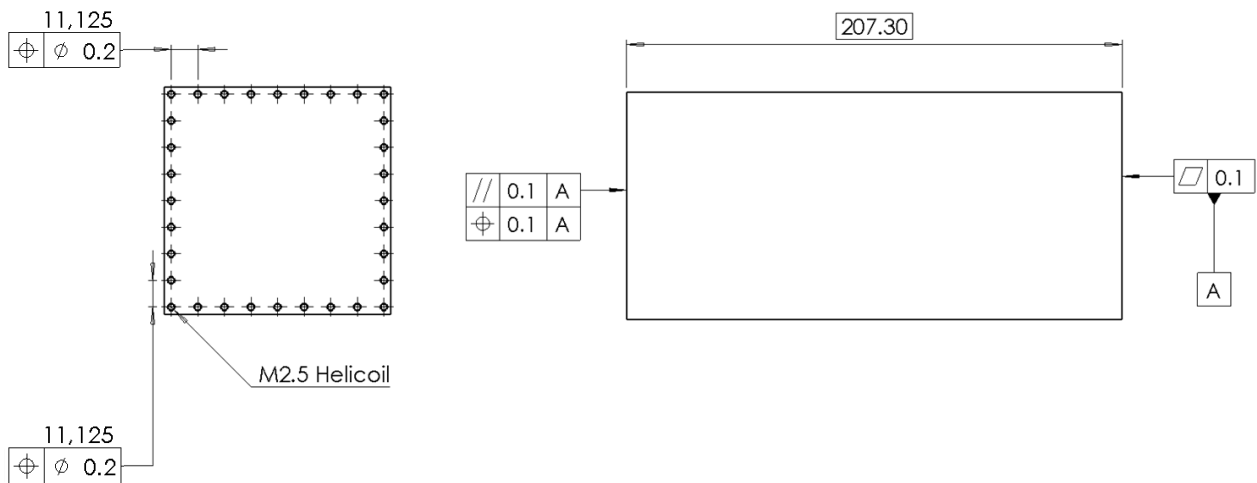
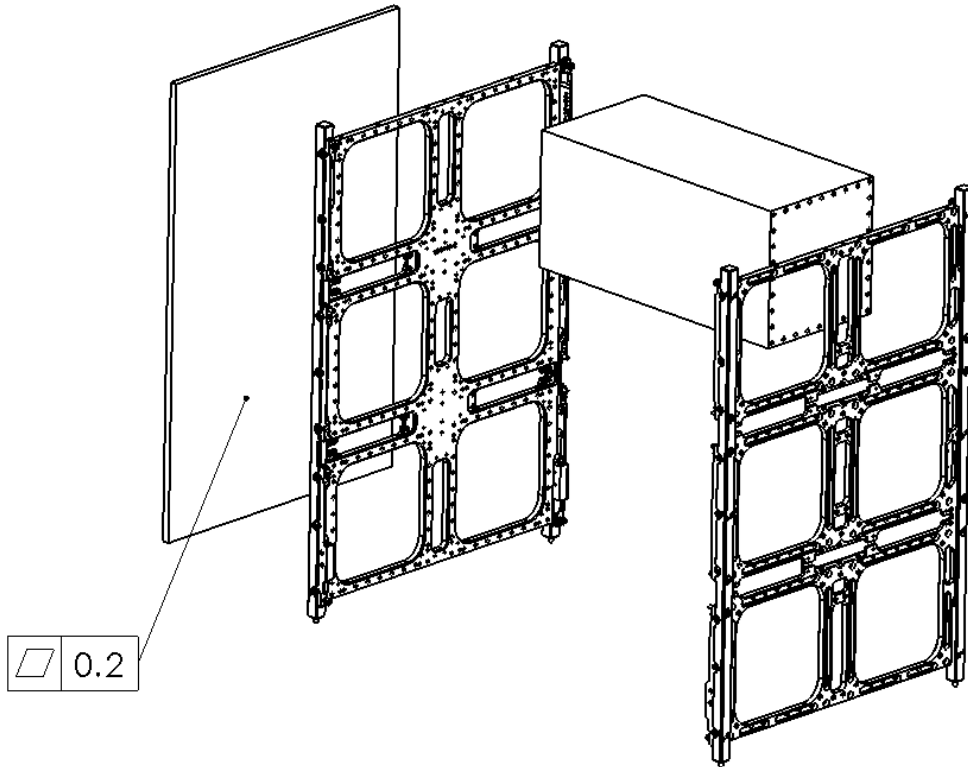


7.2 Main Structure ICD

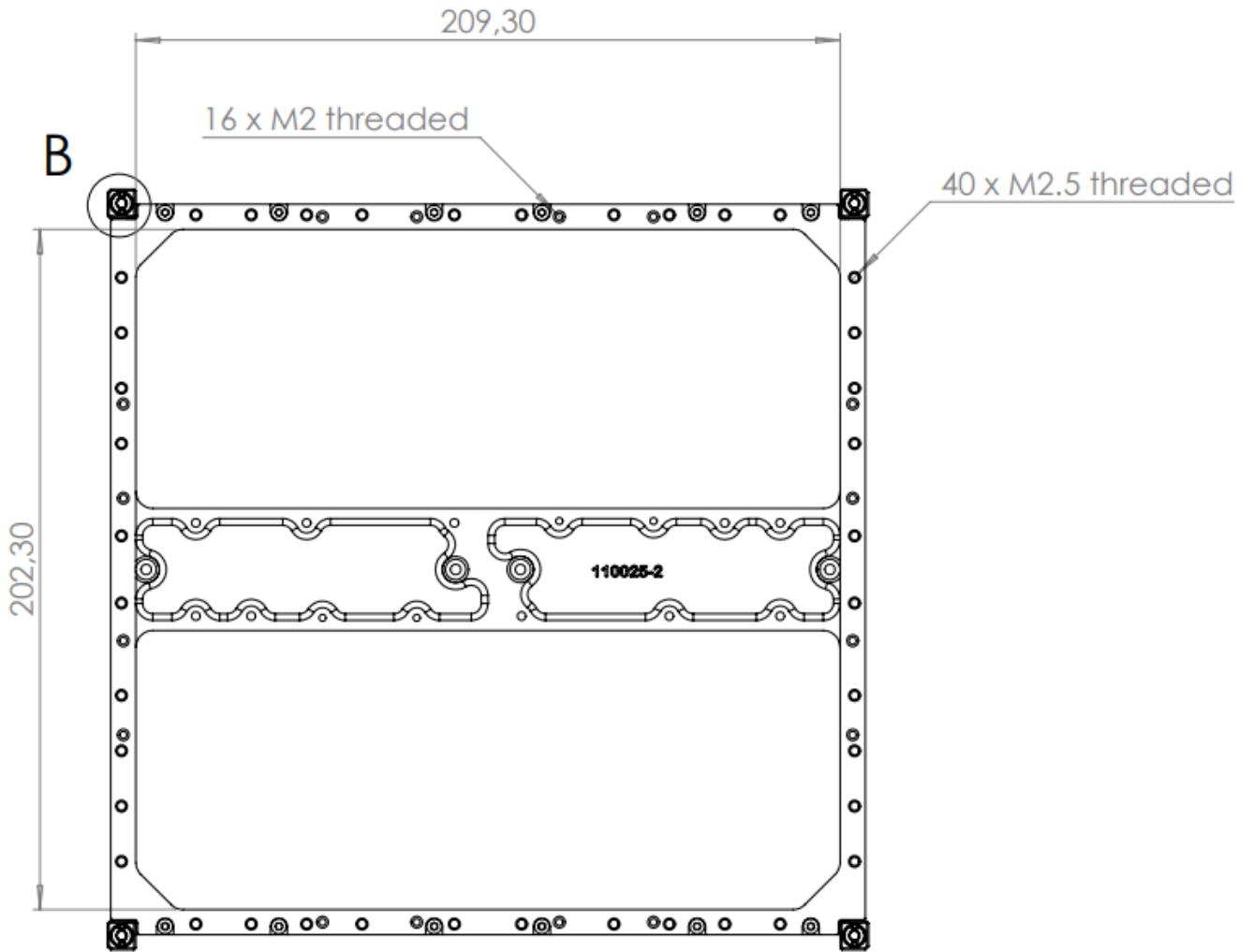
7.2.1 Y+ & Y- face ICD



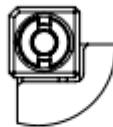
The picture bellow shows ICD for the possible interface between Y+&Y- face and interface to the outside of the face.



7.2.2 Z- face ICD and Kill Switch



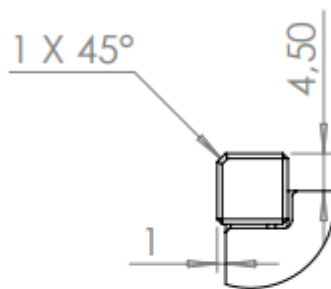
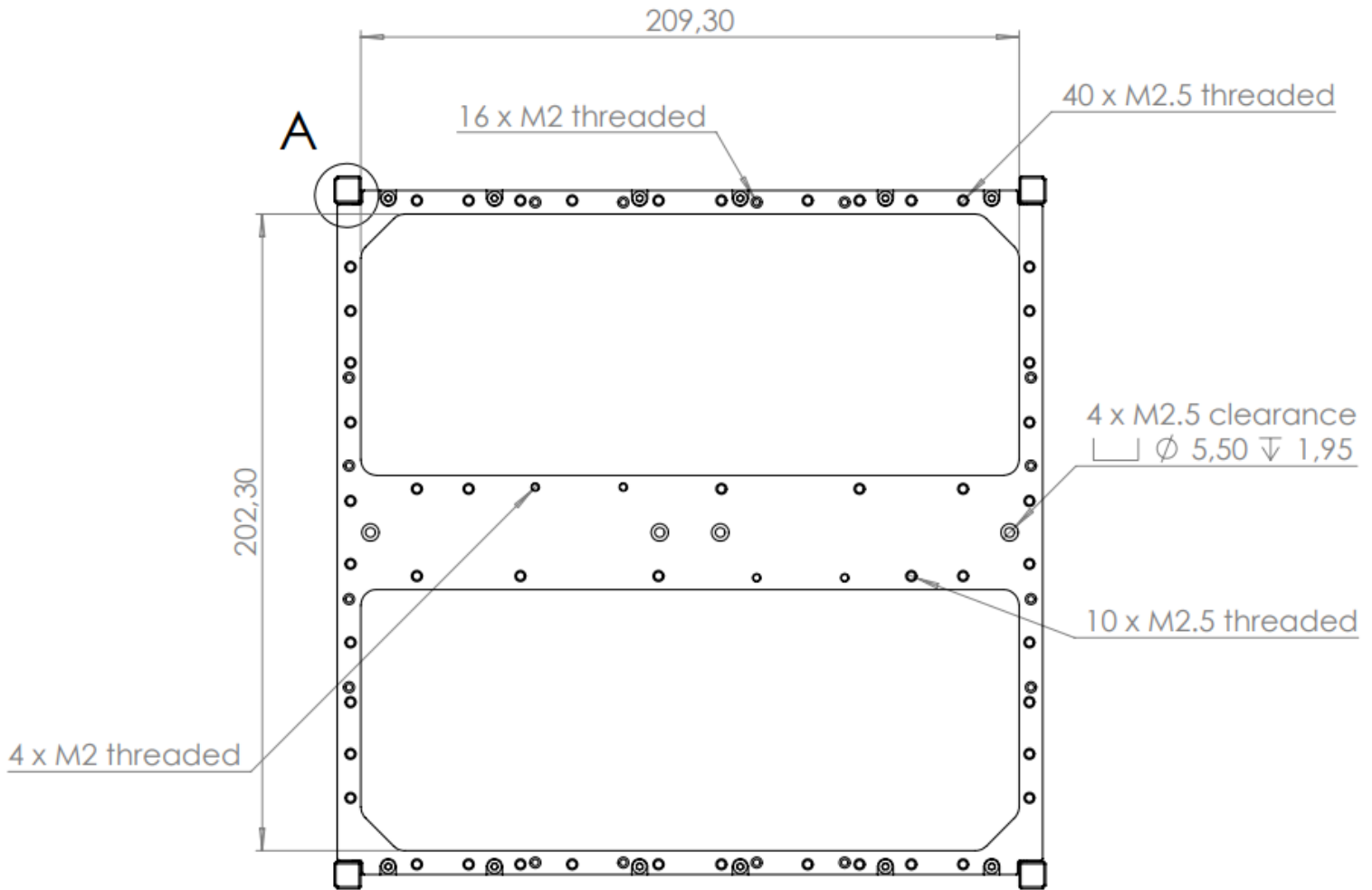
Kill Switch



DETAIL B

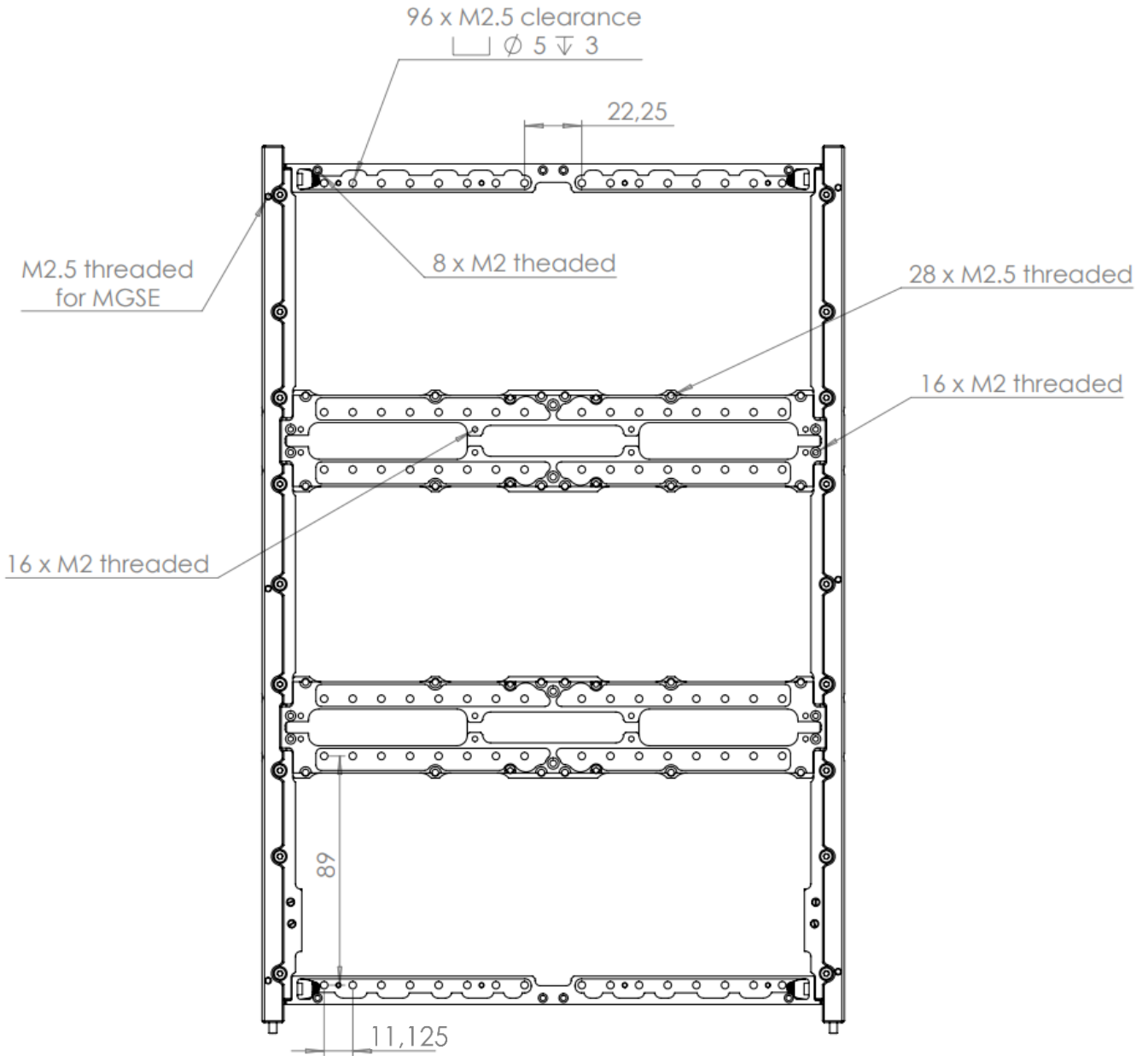
SCALE 1 : 1

7.2.3 Z+ face ICD and envelope

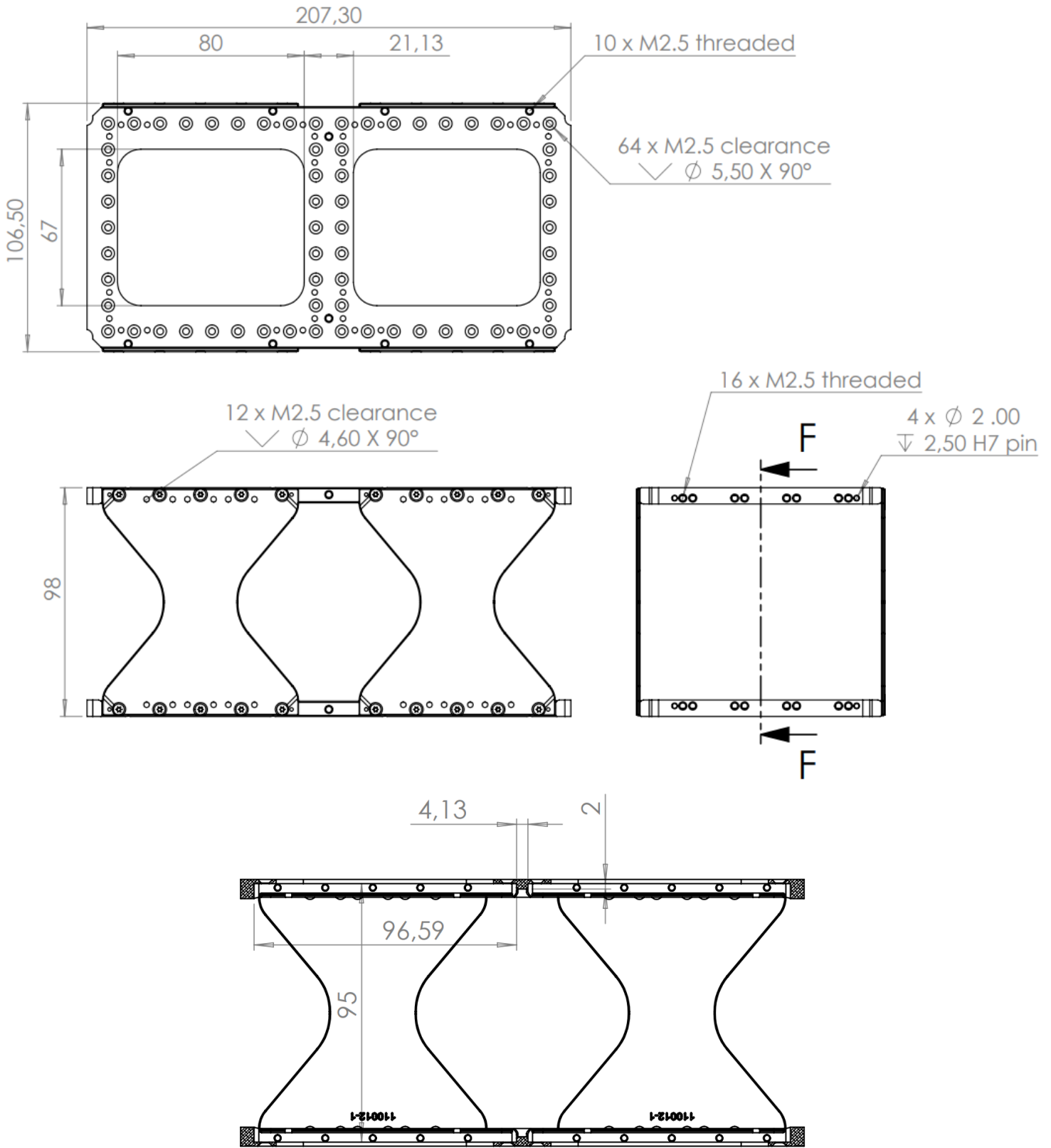


DETAIL A
 SCALE 1 : 1

7.2.4 X+ & X- face ICD



8 Secondary structure ICD



SECTION F-F

The picture bellow shows ICD for the possible interface between secondary structure walls.

