



Faculteit Ingenieurswetenschappen  
**Departement Werktuigkunde**  
Celestijnenlaan 300 - bus 2420 - B-3001 Heverlee

H01P7A: Ontwerpen in de werktuigkunde: industrieel project

## Project Titel

2024-2025 Bekaert Team \*teamNr\*

Student1 (name + r-number)  
Student2 (name + r-number)  
Student3 (name + r-number)  
Student4 (name + r-number)

## Abstract

The abstract is not the same as the introduction. It should summarize your project clearly and concisely, including your objective, methods, and most important results (preferably with numbers). It must be self-contained and typically around 250 words.

### **Poor example (vague):**

*“We investigated possible grippers and evaluated them.”*

### **Better example (specific):**

*“A mechanical, pneumatic, and magnetic gripper were evaluated using a weighted decision matrix. The pneumatic gripper scored highest due to its low cost (£100) and sufficient load capacity of 1kg for this application.”*

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Abstract i

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        2.1.1 Subsubsection Title . . . . . 2

    2.2 Second Subsection Title . . . . . 2

References 3

A Appendix Title i

# 1 Introduction

Useful background on mechanical design principles can be found in [1, 2]. For KU Leuven’s referencing guidelines, visit: <https://bib.kuleuven.be/training-en-tutorials/citeren>

This section should clearly define the problem or design challenge, the objectives of your project, and the context in which the work was carried out. Include only essential background, and focus on what the reader needs to know to understand the report. Conclude the introduction with a short summary of the report structure.

The final report structure should look similar to:

- **Chapters 1–4:** Revised content from the intermediate report (background, requirement analysis, and concept development).
- **Chapter 5:** Overview of the final selected concept.
- **Chapters 6–9:** Detailed analysis of key subsystems. Examples include:
  - Structural analysis
  - Mechanical calculations (e.g. load, stress, cycle time) → couple back to specifications/product!
  - Kinematics/dynamics
  - Material selection
  - Power and energy consumption
  - Motor/actuator selection
  - ...
- **Chapters 10–11:** Conclusions, evaluation, and recommendations, including:
  - System advantages and disadvantages
  - Cost analysis
  - Safety and risk assessment
  - ...

## 2 Second Chapter Title

You can begin each chapter with a short paragraph summarizing what it will cover. This helps the reader follow the report's structure.

### 2.1 First Subsection Title

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

#### 2.1.1 Subsubsection Title

Avoid making levels deeper than subsubsection (e.g., 2.1.1.1). If needed, restructure your content or use bullet points.

### 2.2 Second Subsection Title

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum ut, massa. Fusce ultrices nulla et nisl.

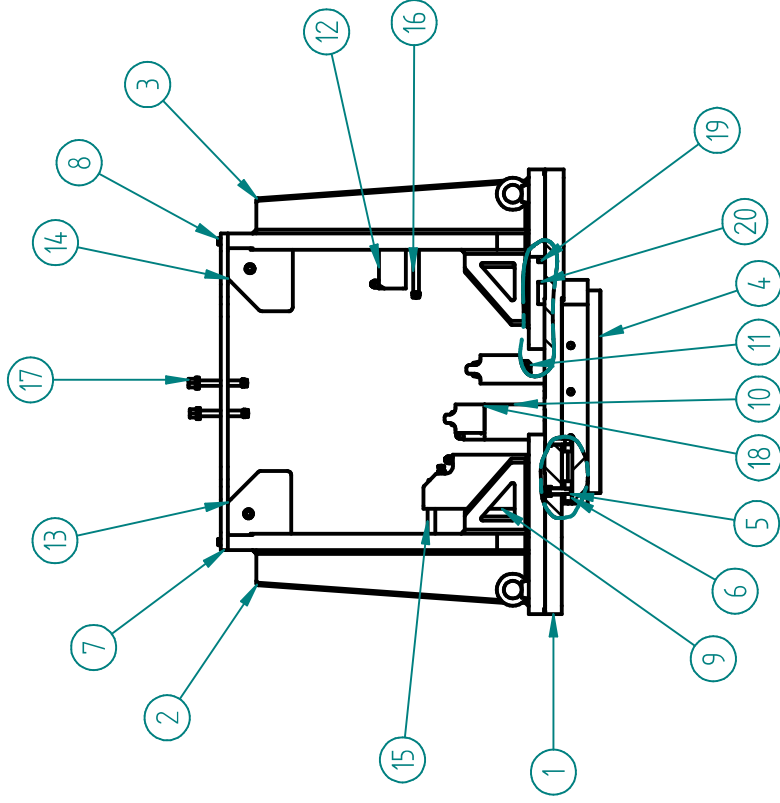
## References

- [1] G. Pahl, *Engineering Design: A Systematic Approach*, third edition ed. London: Springer Nature, 2007.
- [2] P. R. N. Childs, *Mechanical Design Engineering Handbook*, 1st ed. Burlington: Elsevier Science, 2013.

## A Appendix Title

Appendices can include technical drawings, data sheets, simulations, or detailed calculations. You can also insert complete documents using:

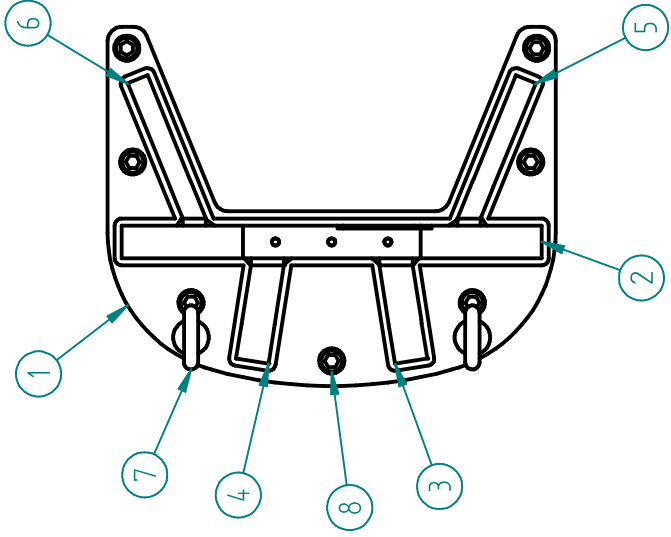
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\includepdf[pages=-]{filename.pdf}
```



1	Base plate	1	12
2	Left post	1	2
3	Oil post	1	3
4	Heckert pallette hydraulic 1060736-0	1	
5	din_912-m16x2-55-12_9	14	
6	07061-16 T-nut Norelem	14	
7	Bridge	1	13
8	din_912-m12x1_75-40-12_9	6	
9	Bottom left module	1	10
10	Bottom mid module	1	8
11	Bottom right module	1	7
12	Oil module	1	6
13	Top left module	1	4
14	Top right module	1	5
15	Locator pin Z6	1	11
16	Side clamp Atlas Copco	1	26
17	Top clamp Atlas Copco	2	25
18	Bottom mid Z5 attachment	1	9
19	Cover post	2	27
20	left base plate cover	1	28
21*	Right base plate cover	1	29
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	File Name	DWG No.
1:20		Fixture mass Z5 configuration: 1336 kg Fixture mass Z6 configuration: 1355 kg	Z5/Z6 BH Fixture	1
<b>KATHOLIEKE UNIVERSITEIT LEUVEN</b> MECHANICAL ENGINEERING Author: Jérémy Dupont, Elia Menten, Thibault Mertens, Olivier Ndiindayino				
Z5/Z6 BH Fixture				A4

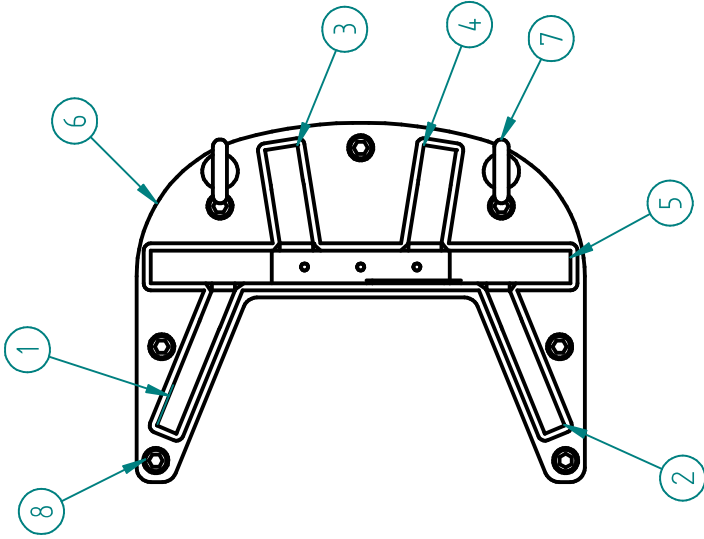





1	U-shaped base left post	1	14
2	Vertical plate left post	1	14
3	Outer rib 1	1	14
4	Outer rib 2	1	14
5	Inner rib 1	1	14
6	Inner rib 2	1	14
7	bolt_m24x3_din_580	2	
8	din_912-m20x2_5-50-12_9	7	
Item Number	Name	Quantity	DWG No.

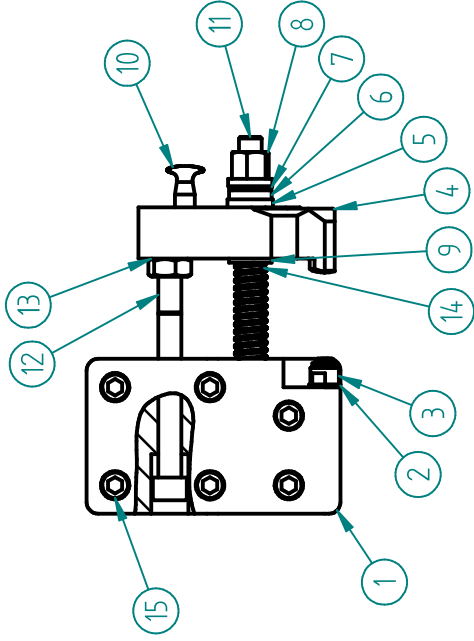
Scale	Projection	Comments	File Name	DWG No.
1:10		The weldment consting of pieces 1, 2, 3, 4, 5 and 6 is shown in drawing number 14. Mass: 282 kg	Z5I26 BH Fixture	2
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING				
Author: Olivier Ndayindayo, Thibault Mertens Date: 22/04/2021 A4				

Left post



1	Inner rib 1	1	15
2	Inner rib 2	1	15
3	Outer rib 1	1	15
4	Outer rib 2	1	15
5	Vertical plate oil post	1	15
6	U-shaped base oil post	1	15
7	bolt_m24x3_din_580	2	
8	din_912-m20x2_5-50-12_	7	
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	File Name	DWG No.
1:10		The weldment consting of pieces 1, 2, 3, 4, 5 and 6 is shown in drawing number 15. Mass: 279 kg	Z5/Z6 BH Fixture	3
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			Oil post	
Author: Olivier Ndayindayo, Thibault Mertens			Date: 22/04/2021	A4



1	Block top left module	1	16
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	Clamp M16 Atlas Copco	1	
5	Clamp sleeve Atlas Copco	1	
6	07420-216 conical seat Norelem	1	
7	07420-116 spherical washer Norelem	1	
8	07242-16 nut with no-loss washer Norelem	1	
9	Clamp washer Atlas Copco	1	
10	Knob clamp Atlas Copco	1	
11	M16 x 200 threaded rod	1	
12	din_912-m16x2-160-12_9	1	
13	nut_din_6915_m16	1	
14	Spring Atlas Copco	1	
15	din_912-m12x1_75-100-12_9	6	
Item Number	Name	Quantity	DWG No.

Scale Projection Comments

1:5

Screw No. 12 must be threaded along the entire shank.

File Name

Z5/Z6 BH Fixture

DWG No.

4

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**LEUVEN**

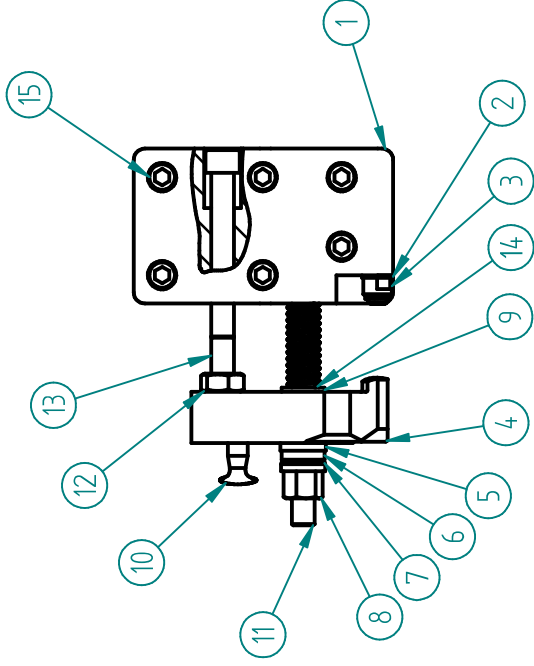
MECHANICAL ENGINEERING

Author: Elia Menten, Thibault Mertens


Top left module

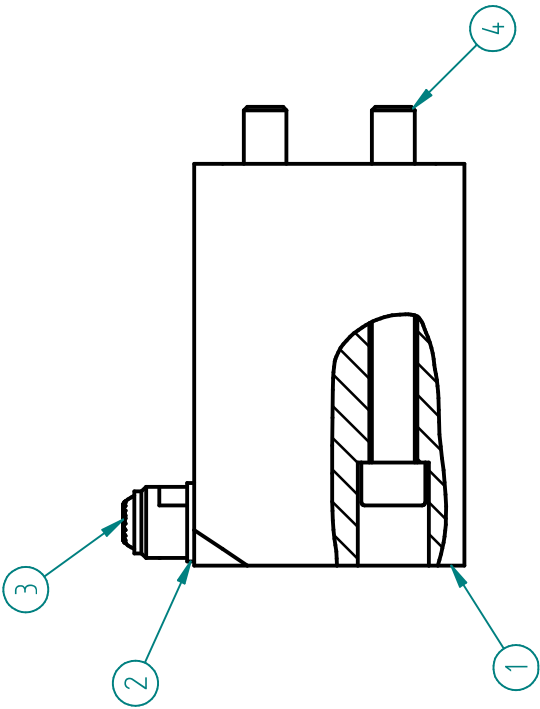
Date: 21/04/2021

A4



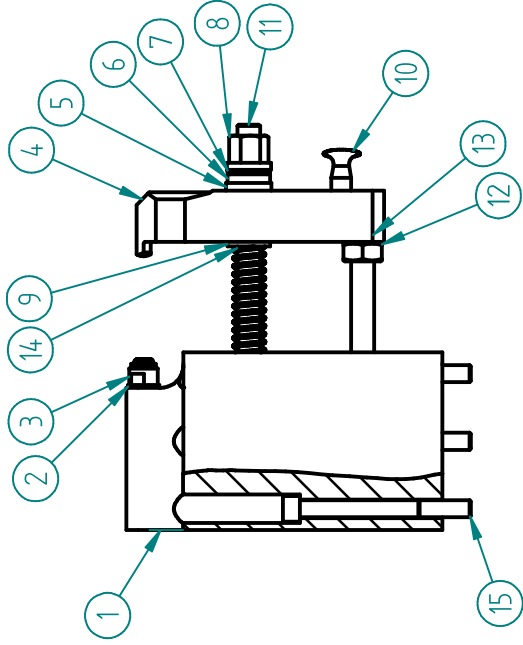
1	Block top right module	1	17
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	Clamp M16 Atlas Copco	1	
5	Clamp sleeve Atlas Copco	1	
6	07420-216 conical seat Norelem	1	
7	07420-116 spherical washer Norelem	1	
8	07242-16 nut with no-loss washer Norelem	1	
9	Clamp washer Atlas Copco	1	
10	Knob clamp Atlas Copco	1	
11	M16 x 200 threaded rod	1	
12	nut_din_6915_m16	1	
13	din_912-m16x2-160-12_9	1	
14	Spring Atlas Copco	1	
15	din_912-m12x1_75-100-12_9	6	
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	File Name	DWG No.
1:5		Screw No. 13 must be threaded along the entire shank.	Z5126 BH Fixture	5
<b>KATHOLIEKE UNIVERSITEIT</b> <b>LEUVEN</b> MECHANICAL ENGINEERING Author: Elia Menten, Thibault Mertens				
Top right module				
Date: 21/04/2021				A4



1	Block oil module	1	18
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	din_912-m12x1.75-100-12_9	4	
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	
1:2			
		File Name	DWG No.
		Z5/Z6 BH Fixture	6
Oil module			
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			
Author: Elia Menten, Thibault Mertens		Date: 21/04/2021	A4



1	Block bottom right module	1	19
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	Clamp M16 Atlas Copco	1	
5	Clamp sleeve Atlas Copco	1	
6	07420-216 conical seat Norelem	1	
7	07420-116 spherical washer Norelem	1	
8	07242-16 nut with no-loss washer Norelem	1	
9	Clamp washer Atlas Copco	1	
10	Knob Clamp Atlas Copco	1	
11	M16 x 200 threaded rod	1	
12	nut_din_6915_m16	1	
13	M16 x 120 threaded rod	1	
14	Spring Atlas Copco	1	
15	din_912-m12x1_75-120-12_9	6	
Item Number	Name	Quantity	DWG No.

Scale Projection Comments



1:5

File Name  
Z5I26 BH Fixture

DWG No.  
7

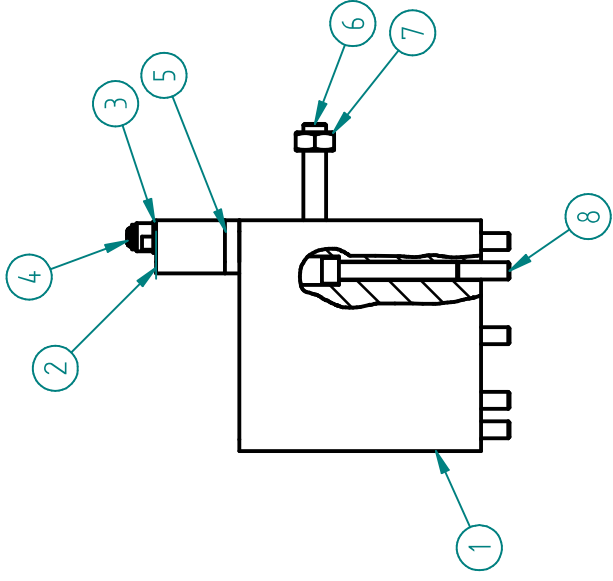
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**LEUVEN**  
MECHANICAL ENGINEERING

Bottom right module

Author: Thibault Mertens, Elia Menten

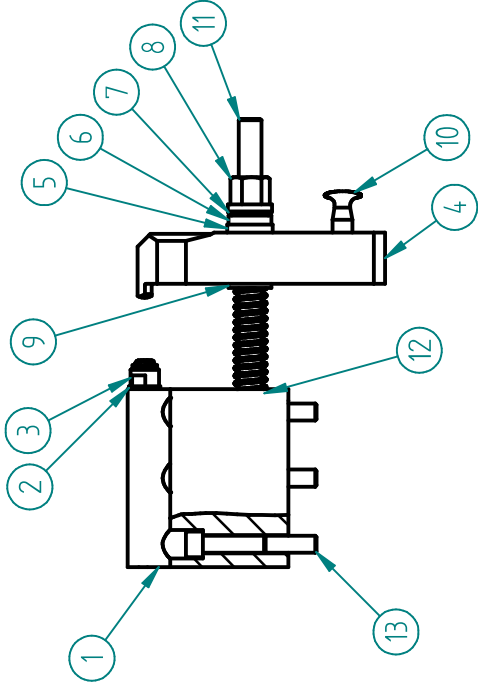
Date: 21/04/2021

A4



1	Block mid module	1	20
2	Mid module L-block	1	21
3	Washer 2 mm Atlas Copco	1	
4	02000-312 self-aligning pad Norelem	1	
5	screw_iso_10642-m10x20-12_9	2	
6	M16 x 105 threaded rod	1	
7	nut_din_6915_m16	1	
8	din_912-m12x1_75-120-12_9	6	
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	
1:5			
		File Name	DWG No.
		Z5/Z6 BH Fixture	8
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			
Author: Thibault Mertens, Elia Menten			
Bottom mid module			Date: 22/04/2021
			A4



1	Z5 attachment block	1	22
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	Clamp M16 Atlas Copco	1	
5	Clamp sleeve Atlas Copco	1	
6	07420-216 conical seat Norelem	1	
7	07420-116 spherical washer Norelem	1	
8	07242-16 nut with no-loss washer Norelem	1	
9	Clamp washer Atlas Copco	1	
10	Knob Clamp Atlas Copco	1	
11	M16 x 230 threaded rod	1	
12	Spring Atlas Copco	1	
13	din_912-m12x1_75-80-12_9	6	
Item Number	Name	Quantity	DWG No.

Scale Projection Comments



1:5

File Name	DWG No.
Z5/Z6 BH Fixture	9

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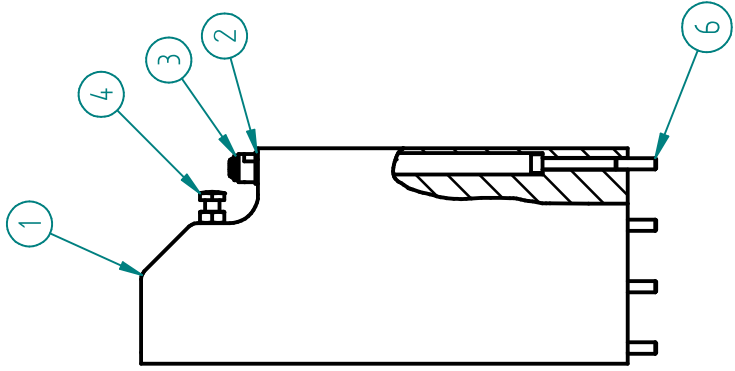
Bottom mid Z5 attachment

Author: Thibault Mertens, Elia Menten

Date: 21/04/2021

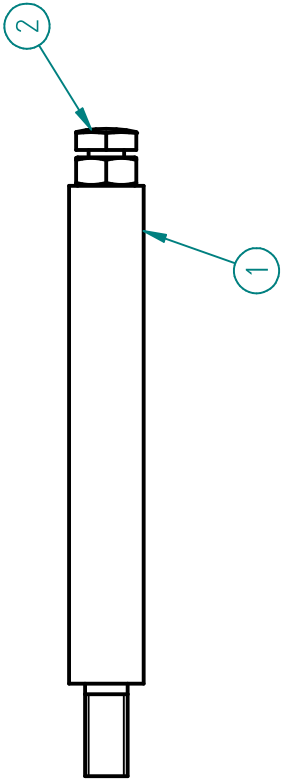
A4





1	Block bottom left module	1	23
2	Washer 2 mm Atlas Copco	1	
3	02000-312 self-aligning pad Norelem	1	
4	02153-10048 rest pad Norelem	1	
6	din_912-m8x1_25-80-12_9	8	
Item Number	Name	Quantity	DWG No.

Scale	Projection	Comments	
1:5			
		File Name	DWG No.
		Z5/Z6 BH Fixture	10
Bottom left module			
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			
Author: Thibault Mertens, Elia Menten		Date: 20/04/2021	A4



1	Pin	1	24
2	02153-10048 rest pad Norelem	1	
Item Number	Name	Quantity	DWG No.

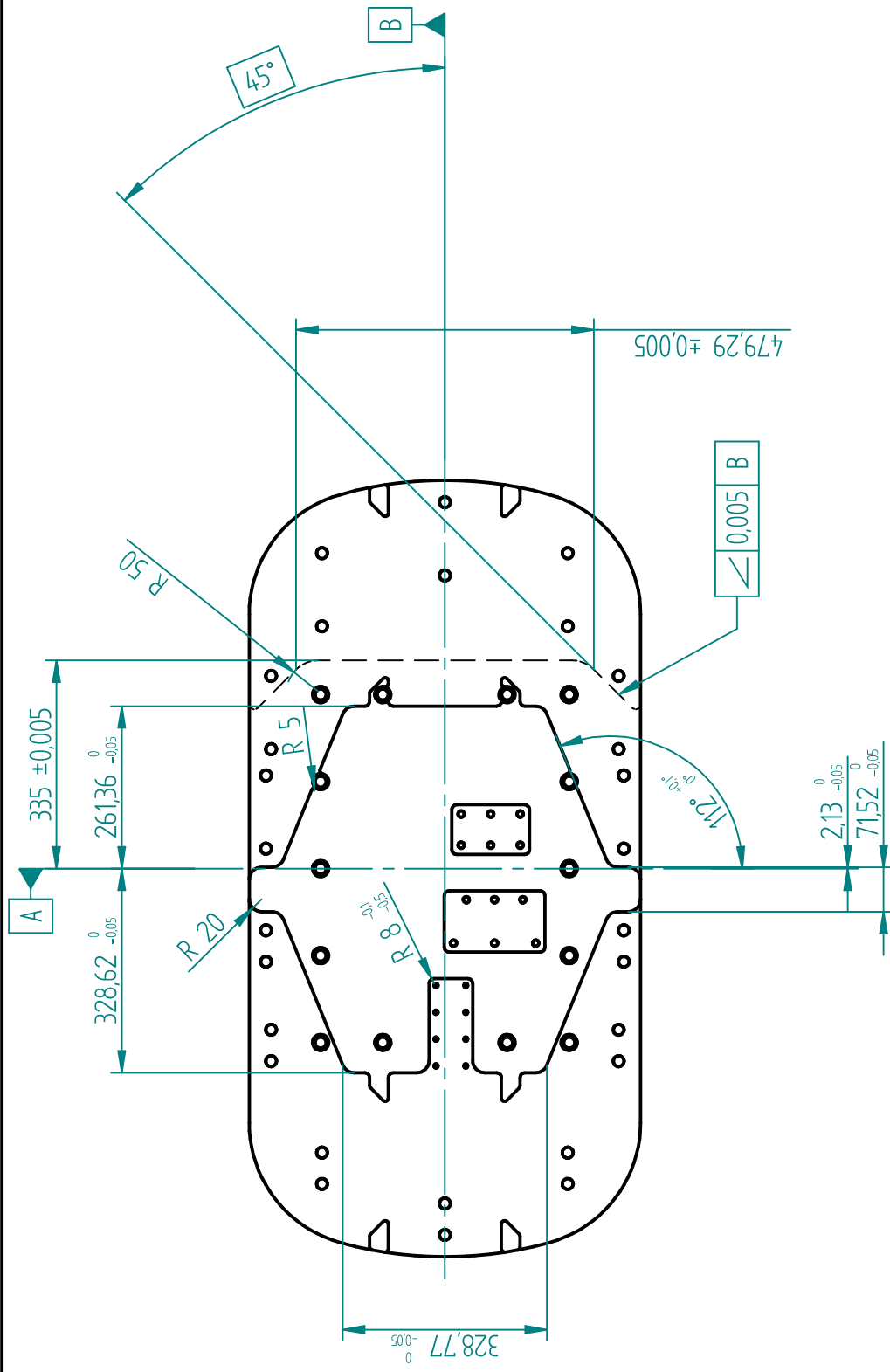
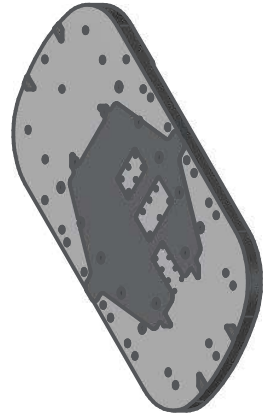
Scale	Projection	Comments	
1:2			
		File Name	DWG No.
		Z5/Z6 BH Fixture	11

KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING	Locator pin Z6
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Author: Thibault Mertens, Elia Menten	Date: 21/04/2021	A4
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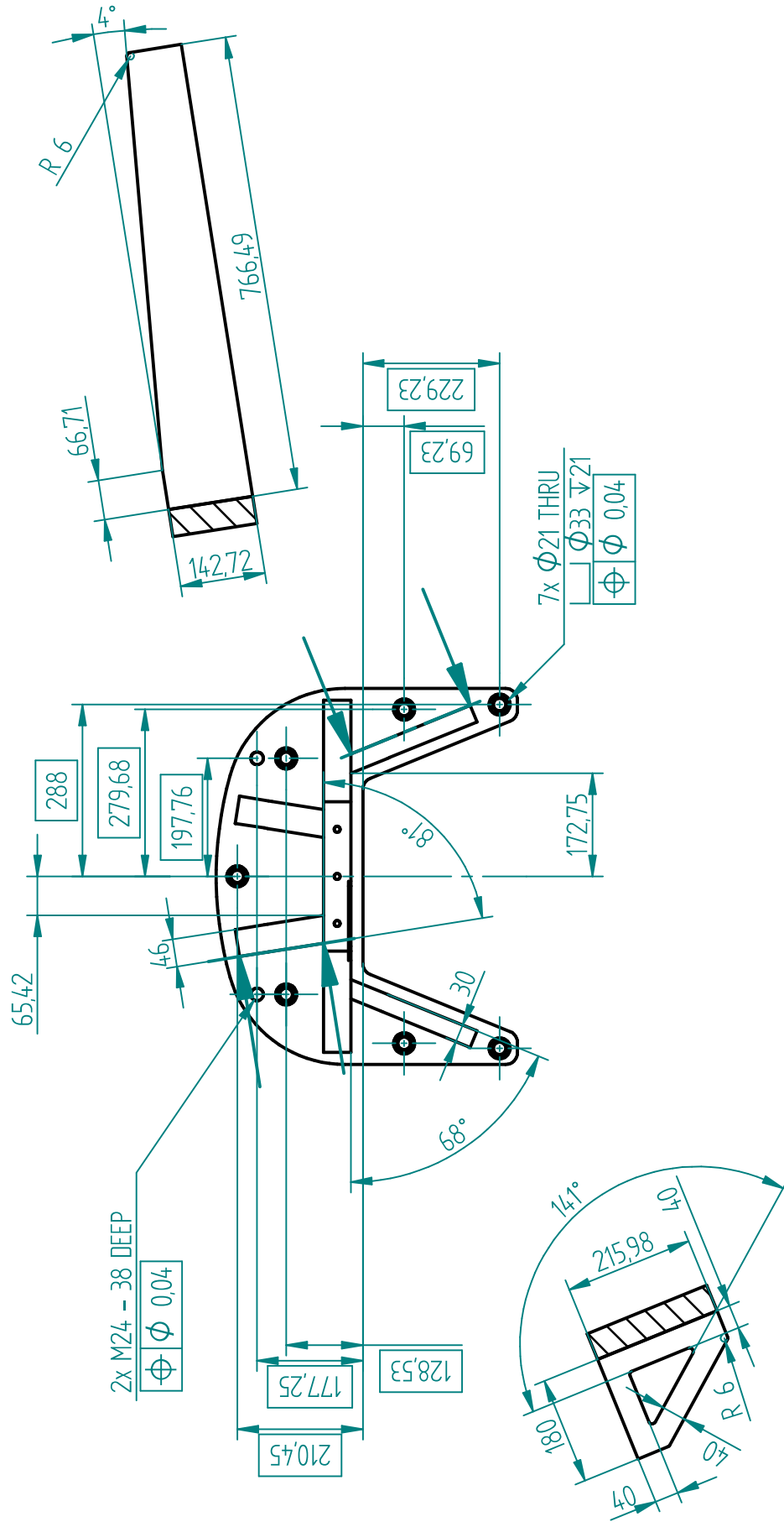














MECHANICAL ENGINEERING

Date: 24/04/2021





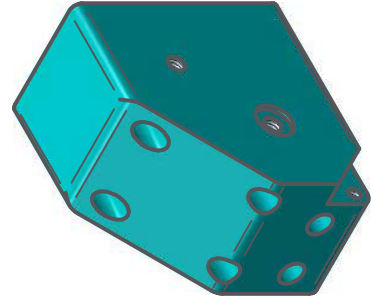
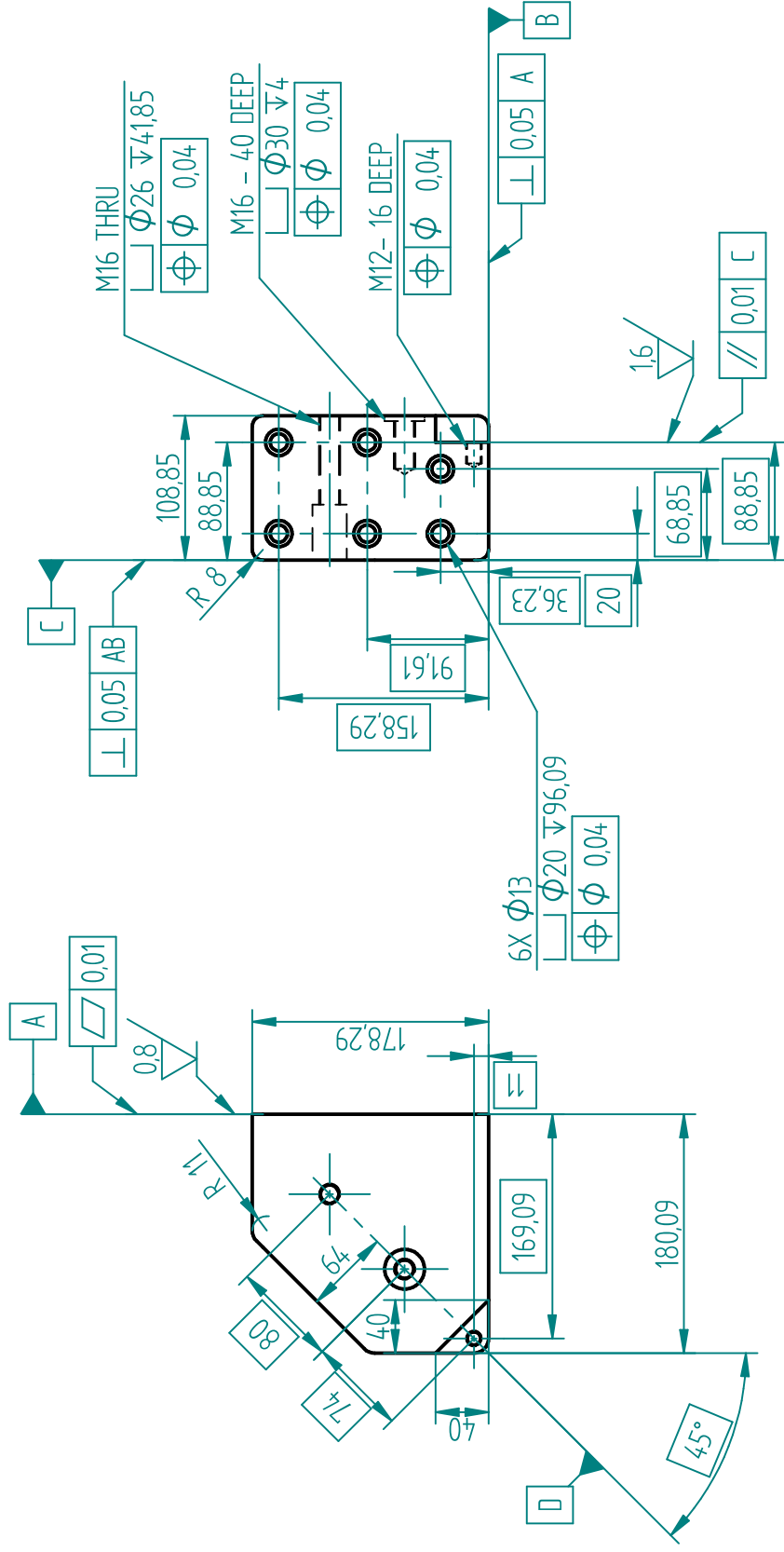
Author: Olivier Ndayino, Thibault Mertens



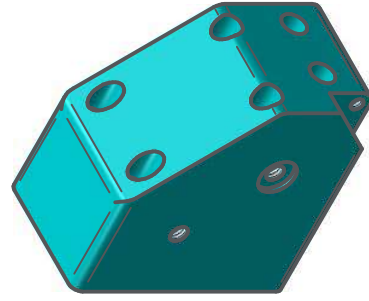
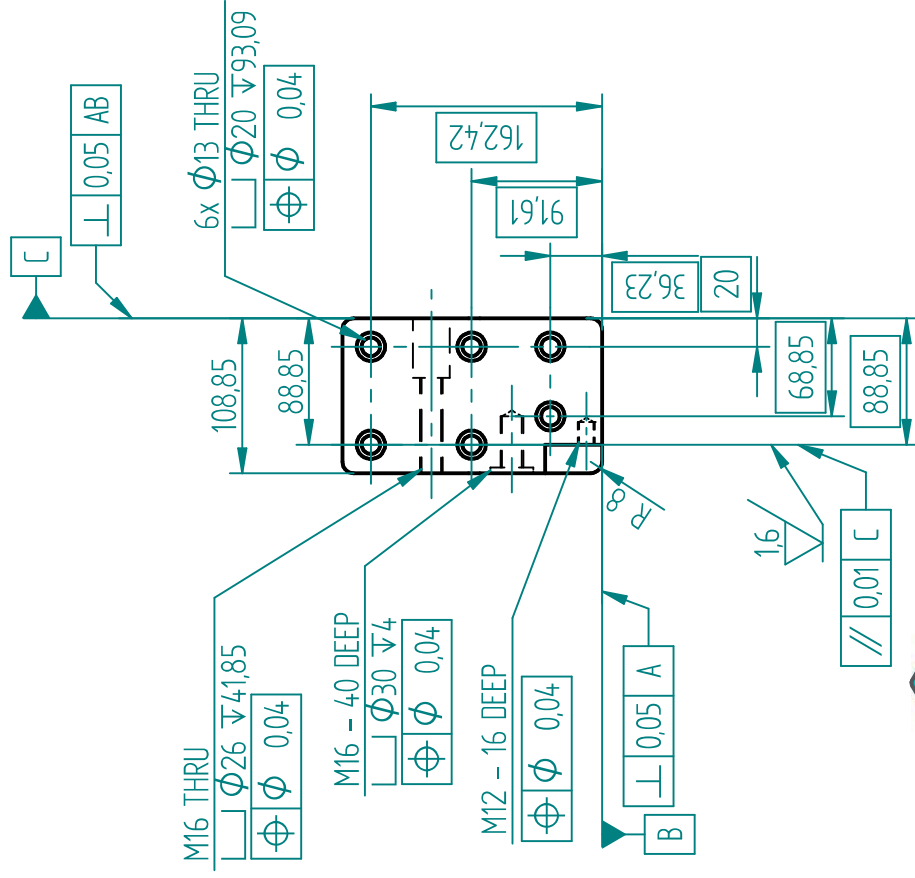
Author: Olivier Ndindayino, Thibault Mertens

Date: 24/04/2021

A4

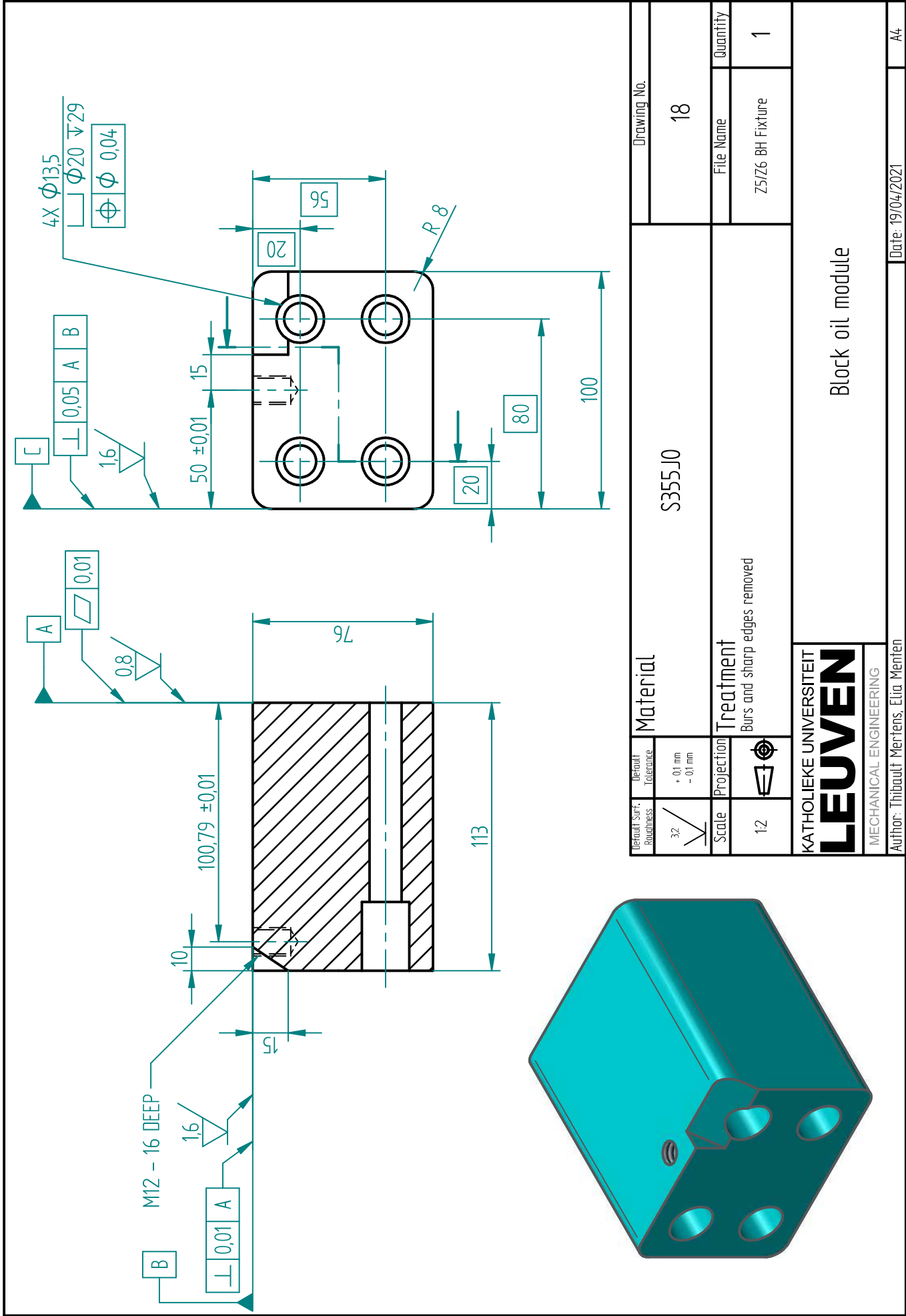


Default Surf. Roughness	Default Tolerance	Material	Drawing No.	
32	+ 01 mm - 01 mm	S355J0	16	
Scale	Projection	Treatment	File Name	Quantity
15		Burs and sharp edges removed.	Z5/Z6 BH Fixture	1
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b>				
MECHANICAL ENGINEERING				
Author: Elia Menten, Thibault Mertens				
Block top left module				
Date: 22/04/2021				A4

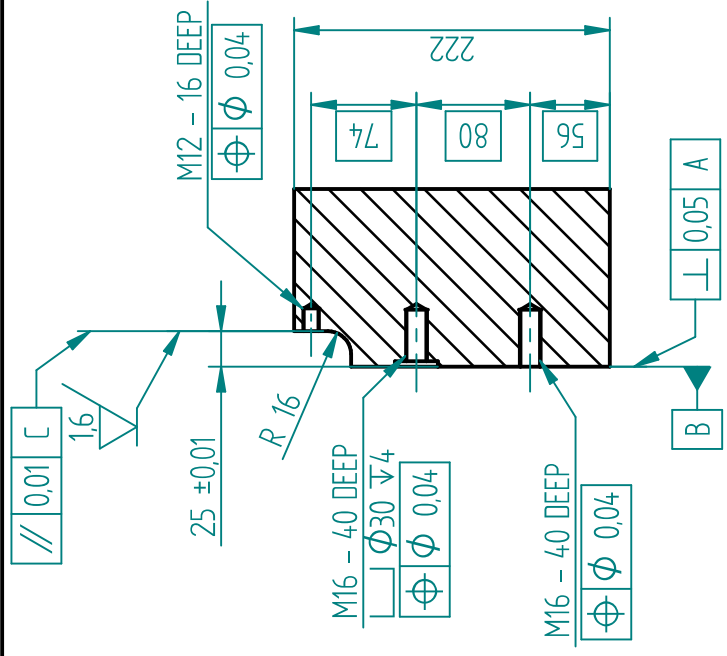
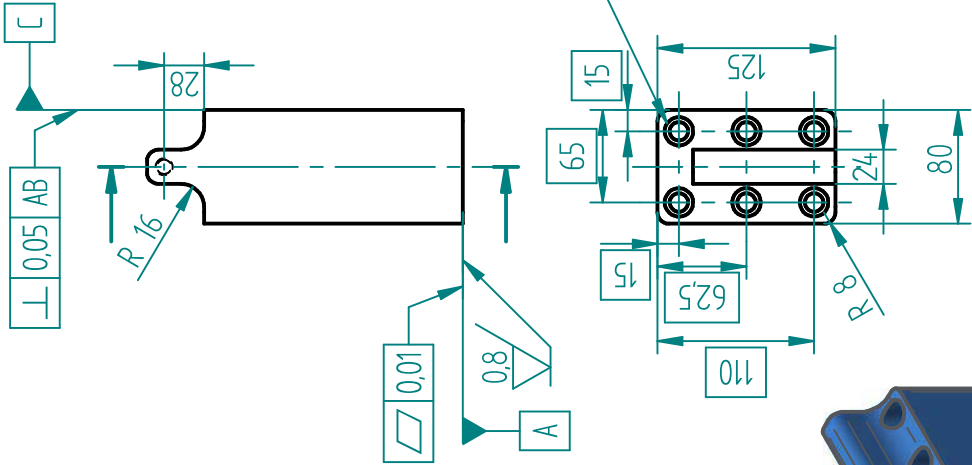


Default Surf. Roughness	Default Tolerance	Material	Drawing No.
32	+ 01 mm - 01 mm	S355J0	17
Scale	Projection	Treatment	File Name
15		Burs and sharp edges removed.	Z5/Z6 BH Fixture
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b>			Quantity
MECHANICAL ENGINEERING			1
Author: Elia Menten, Thibault Mertens			
Date: 22/04/2021			A4

Block top right module

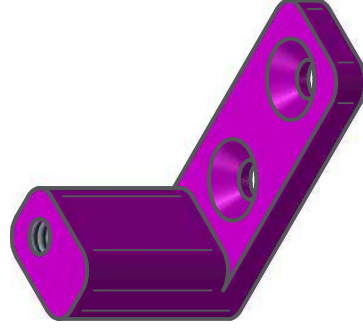
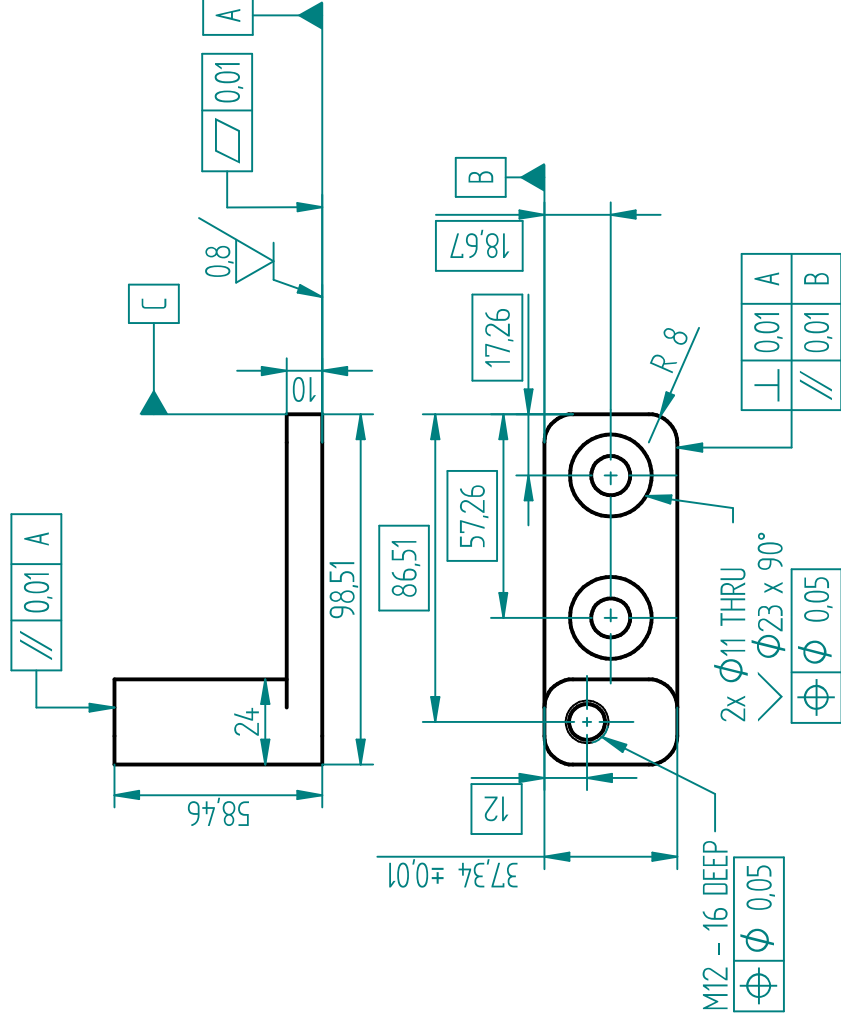






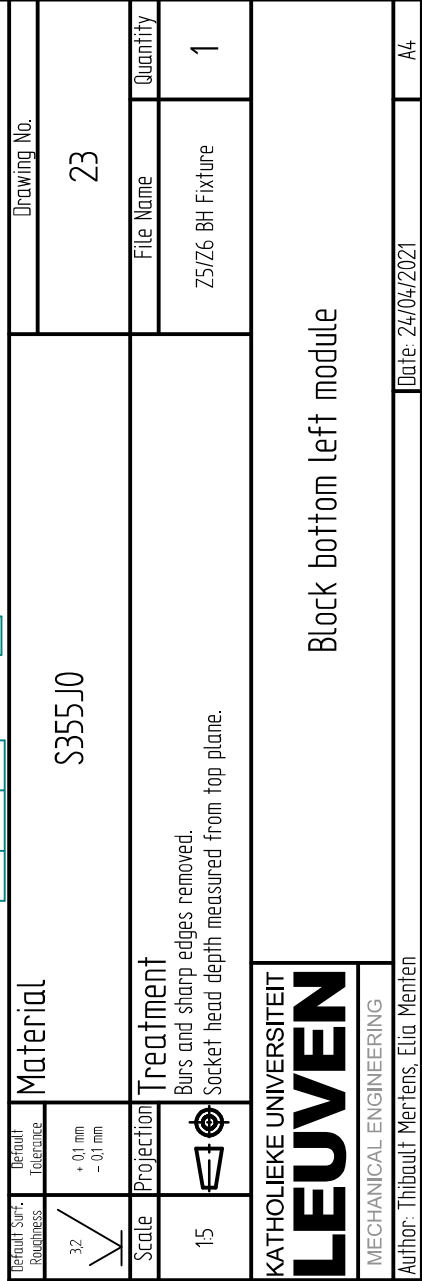
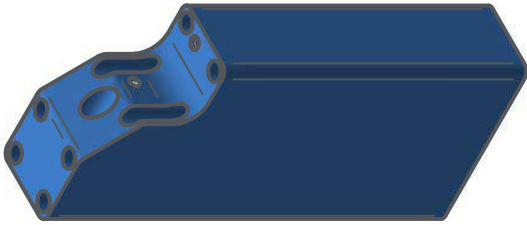
Default Surf. Roughness	Default Tolerance	Material	Drawing No.	
32	+ 01 mm - 01 mm	S355J0	19	
Scale	Projection	Treatment	File Name	Quantity
15		Burs and sharp edges removed. Top round rolled around corner.	Z5/Z6 BH Fixture	1
<div> <div>KATHOLIEKE UNIVERSITEIT</div> <div><b>LEUVEN</b></div> <div>MECHANICAL ENGINEERING</div> </div>				
Block bottom right module			Date: 23/04/2021	
Author: Thibault Mertens, Elia Menten			A4	

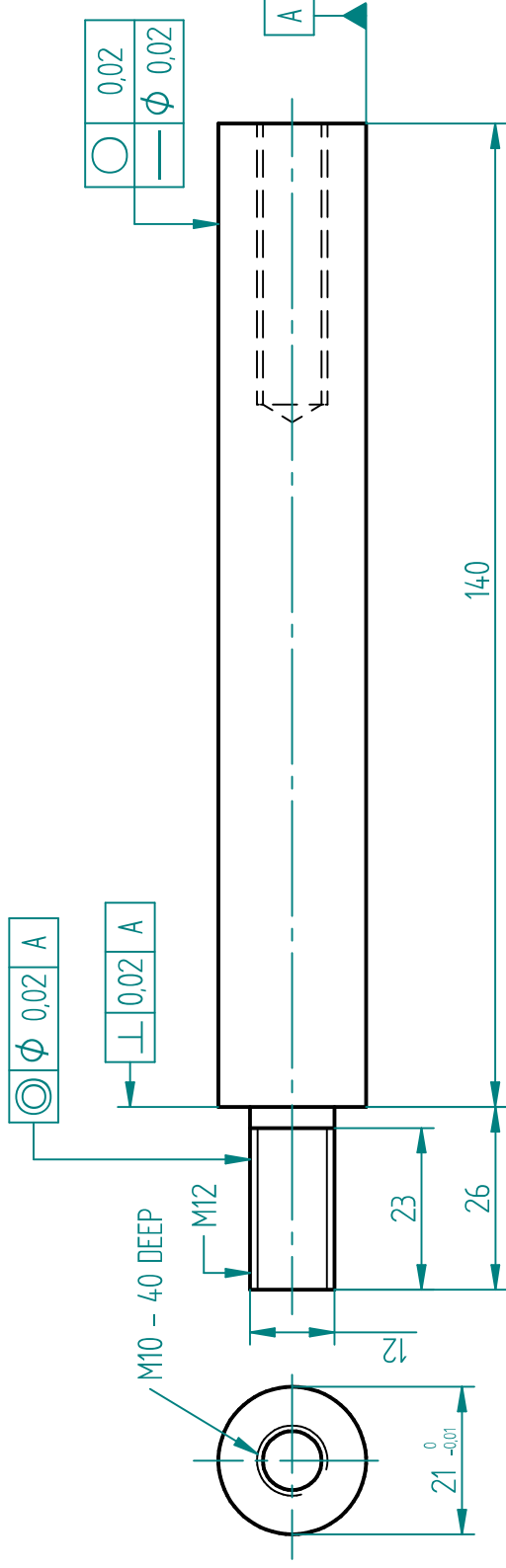




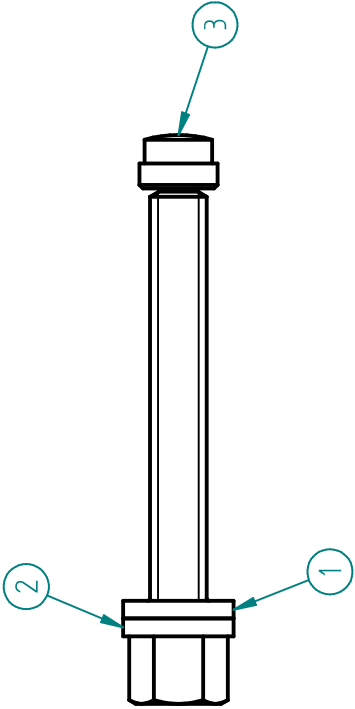
Default Surf. Roughness	Default Tolerance	Material	Drawing No.	
32	+ 01 mm - 01 mm	S355J0	21	
Scale	Projection	Treatment	File Name	Quantity
12		Burs and sharp edges removed	Z5/Z6 BH Fixture	1
Mid module L-block				
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			Date: 20/04/2021	
Author: Thibault Mertens			A4	






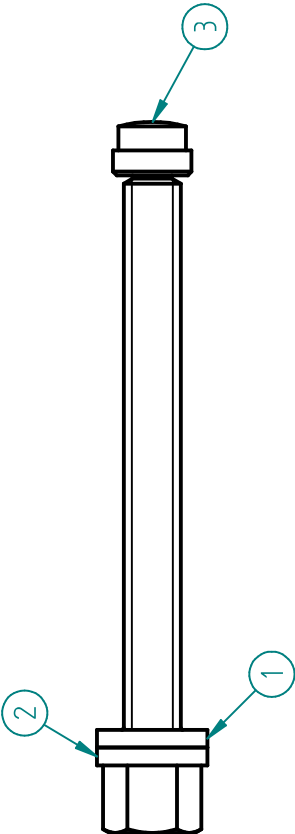


Default Surf. Roughness	3,2	Default Tolerance	+ 0,1 mm - 0,1 mm	Material	S355J0	Drawing No.	24
Scale	1:1	Projection		Treatment		File Name	Z5/Z6 BH Fixture
						Quantity	1
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING				Pin			
Author: Thibault Mertens, Elia Menten				Date: 24/04/2021			
				A4			




1	Claming screw	1
2	Screw cap	1
3	Pressing head	1
Item Number	Name	Quantity

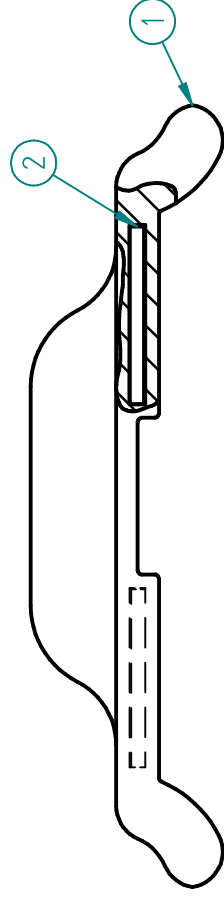
Scale	Projection	Comments	
1:2			
		File Name	DWG No.
		Z5/Z6 BH Fixture	25
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			
Top clamp Atlas Copco			
Author: /			Date: 22/04/2021
			A4



1	Clamping screw long	1
2	Screw cap	1
3	Pressing head	1
Item Number	Name	Quantity

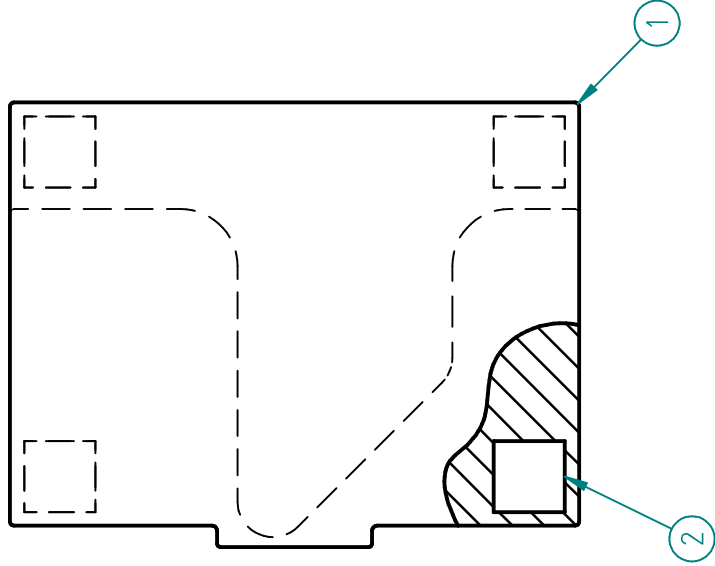
Scale		Projection	Comments	File Name	DWG No.
1:2				Z5/Z6 BH Fixture	26
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING			Side clamp		
Author: /				Date: 22/04/2021	A4





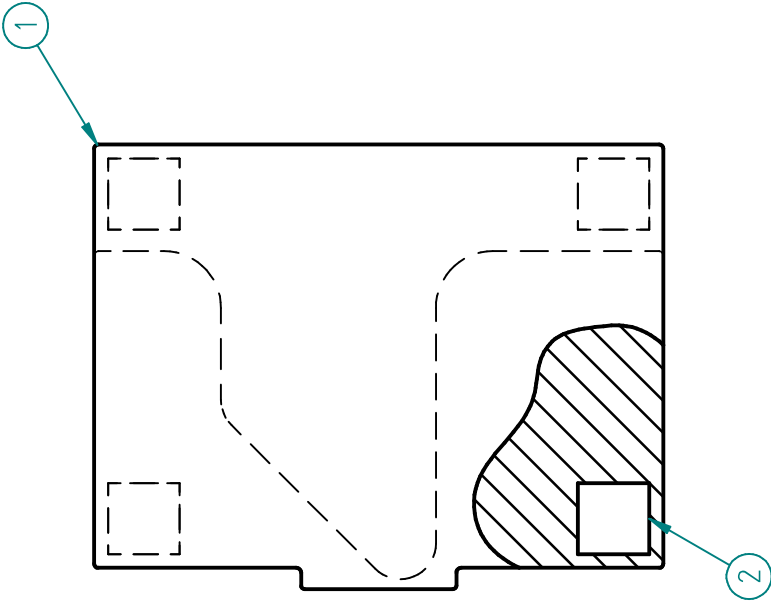
1	Cover	1
2	Magnet 25 x 2 x 6	4
Item Number	Name	Quantity

Scale	Projection	Comments	File Name	DWG No.
1:1		Magnets are embedded in the 3D print.	Z5/Z6 BH Fixture	27
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING				
Cover post				
Author: Elia Menten, Thibault Mertens				Date: 22/04/2021
				A4



1	Left cover	1
2	Magnet 10 x 10 x 10	4
Item Number	Name	Quantity

Scale	Projection	Comments	File Name	DWG No.
1:1		Magnets are embedded in the 3D print.	Z5/Z6 BH Fixture	28
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING				
left base plate cover				
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1	Right cover	1
2	Magnet 10 x 10 x 10	4
Item Number	Name	Quantity

Scale	Projection	Comments	File Name	DWG No.
1:1		Magnets are embedded in the 3D print.	Z5/Z6 BH Fixture	29
KATHOLIEKE UNIVERSITEIT <b>LEUVEN</b> MECHANICAL ENGINEERING				
Right base plate cover				
Author: Elia Menten, Thibault Mertens			Date: 22/04/2021	A4