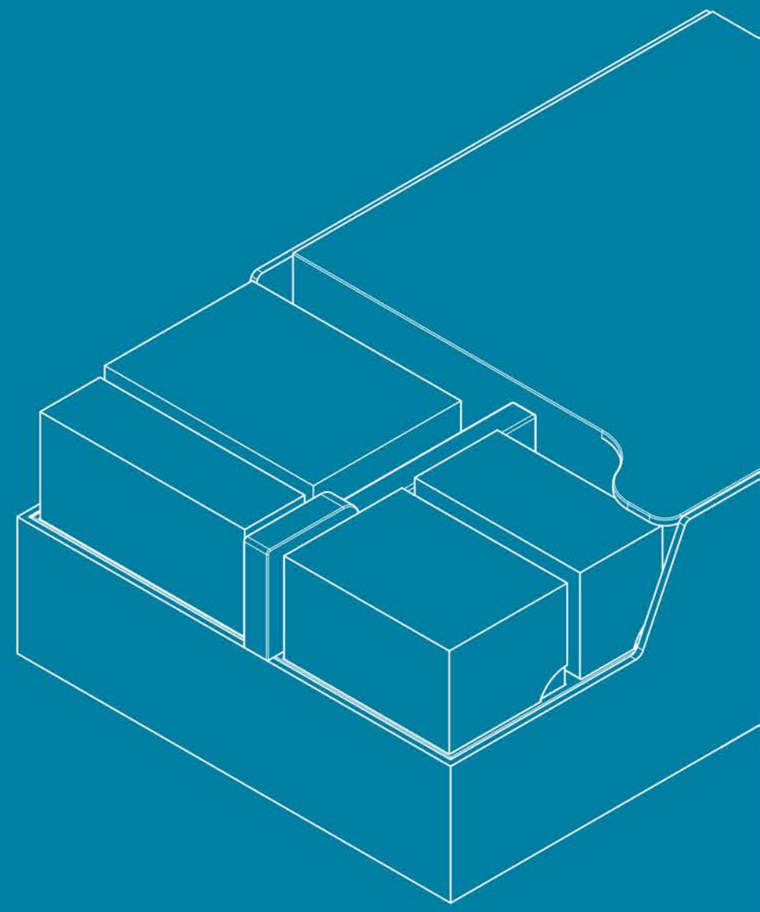
PACKAGING PROJECT



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DESIGN 501

PROJECT 1

UNIVERSITY OF ALBERTA

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Introduction

Abstract

For this project, students were tasked with designing and prototyping packaging for mass spectrometer accessory kits. Students were also given clients to design for, adding real world experience to the scope of the project. The client for this project works for a company that specializes in selling mass spectrometers and additional parts, and is looking to upgrade their packaging to fit a relatively low production of add on kits.

Introduction

Client Requirements

For this project, there were specific requirements that needed to be met to fulfill the client's needs. These requirements were set based on the delicacy of some of the equipment being packaged, as well as the budget the client had set. The requirements are as listed:

Requirement 1:
The package must conform to ISTA 3A (International Safe Travel Association) test standards. This includes a shock test and a vibration test that the package must withstand and succeed in protecting all of its contents (see appendix A for more information on ISTA 3A).

Requirement 2:
The cost of materials per package must be around 30 dollars per unit, this is a loose budget and can go up and down based on the design but must be at least close.

Requirement 3:
The colour palette must only contain black, white, and the client's requested blue (Pantone PQ-314C).

Requirement 4:
Sustainable materials must be considered, and the usage of non-biodegradable plastics should be avoided.

Requirement 5:
The package must be made with high quality materials and must appear and feel somewhat luxurious, as the contents of the kits are worth between $5,000 and $20,000.

Requirement 6:
There are two kits being prioritized for this project, labeled as Kit 1 and Kit 2. The packaging designed for this project should be interchangeable for both kits as they are very similar.

Requirement 7:
The goal of the packaging is for it to be kept by the customer and reused as storage for its contents.

Introduction

Parts to Package

There are several parts that need to be considered for the package design. Each one has a different level of delicacy, and some require extra protection. There are also two main kits involved in this project, and each has a very similar list of components within.

Kit 1:

- *New* Nano heater
- Stand
- Metal Plate
- Cell (very delicate, needs extra protection)
- Probe (x2) (very delicate, needs extra protection)
- D5149 Cartridge (very delicate, needs extra protection)
- Top Adapter
- Box of consumables
- Bag of small parts*
- Assorted small parts (3)*

Kit 2:

- *Old* Nano heater
- Stand
- Metal Plate
- Cell (very delicate, needs extra protection)
- Probe (x2) (very delicate, needs extra protection)
- D5149 Cartridge (very delicate, needs extra protection)
- Top Adapter
- Box of consumables
- Bag of small parts*
- Assorted small parts (3)*

*These parts were left unnamed by the client, but can be grouped together in the packaging.

For pictures of these parts as sent by the client, please reference appendix B.

Introduction

Package Design

For our box design, we started by coming up with initial sketches and generating ideas based on the parameters set by the client. The most crucial part of the project was making sure that each component was protected based on how delicate they were. The box also needed to be organized in an intuitive way, making it easy to navigate for the user, as well as being as compacted as possible to minimize the cost of materials. We landed on a sleek box design that successfully organizes its components inside and utilizes sturdy, well finished materials that invoke a feeling of luxury. The minimal branding and color palette allows the box to retain a sense of professionalism, as the target audience of these kits are scientific institutions. The outside of the box is a very simple rectangular shape, so it can be stored easily making it reusable for the customer. There is also a slider that completes the box, adding a pop of color and a tangible experience for the user since they must pull it off to open the package. The box also incorporates various modular components that house the more delicate parts, as well as group some smaller pieces together.

The main section of the box is contained within a biodegradable vacuum formed plastic tray, and integrates the Stand and Nano Heater, as well as the Cartridge and Consumables contained in separate boxes. The vacuum formed tray is the only part that differs between the packages, as the Nano Heaters are slightly different in shape (although almost the same in size). The second section also has a vacuum formed tray, containing 4 other paper boxes, holding smaller and more delicate components. The paper boxes have graphics printed on them that correspond to the quick start guide as well.

For pictures of the initial sketches of the package design, please reference appendix C.

Introduction

Quick Start Guide

Along with a box design, this project also includes a quick start guide/unboxing manual that furthers the organization of the parts being packaged and ensures that the target user will have no room for questions or error when opening the package. The guide we designed takes inspiration from Ikea instruction manuals and basic orthographic drawings, providing a sleek and professional design language that contributes to the overall design of the box. The secondary goal of the guide was to somehow integrate it within the package, instead of displaying it on a separate piece of paper that would be placed inside the box. Our solution to this was to use the same design language from the guide on other components of the box, relating them back to the start guide and creating an intuitive experience for the user. The guide itself takes the form of a sticker on the inside lid of the box, so one can read it as they begin unpackaging.

The guide is broken into 3 sections, corresponding to the different zones of the box. The main two, section 1 and section 2, are the main zones within the box. Section 1 contains the larger parts, compacted into the largest area of the box. Section 2 contains the modular boxed elements in the other vacuum formed tray, and the third section expands on the “small parts box”, detailing the parts within. The small parts box contains many of the small unnamed parts sent by the client, and can be grouped together in bags within the box for protection. The last feature on the quick start guide is a warning label, encouraging users to take extra care with the most sensitive parts.

Please reference appendix D for an example of Ikea catalogs and inspiration for the manual design.

Introduction

Extra Considerations

Dealing with negative space

There is negative space within the current box layout that requires filling, so the design can pass ISTA drop tests without the parts inside moving around. First of all, the main section's negative space will be filled with a block of Green Cell Foam to stop any parts from moving when vibration or shock is introduced to the package. These inserts are different for both Kit 1 and Kit 2, as in Kit 2, extra space needs to be left to account for the large wire that is permanently attached to the Old Nano Heater. The Probes and Cartridge boxes contain Green Cell Foam cutouts as well that protect their delicate pieces from touching the box or being compressed.

Extra delicate parts

While the Probes and Cartridge can be safely packaged with Green Cell Foam holders within their modular boxes, the Cell component requires extra thought. The Cell is perhaps the most delicate and interestingly shaped part, as there are multiple sensitive, needle-like objects protruding from its base. To deal with this, the Cell is protected with a vacuum formed clear plastic shell that is secured around its circumference and ensures the sensitive pieces sticking off of it won't collide with the lining of the box they are in. This plastic piece is meant for the user to keep, so they can store the Cell component safely.

Renders

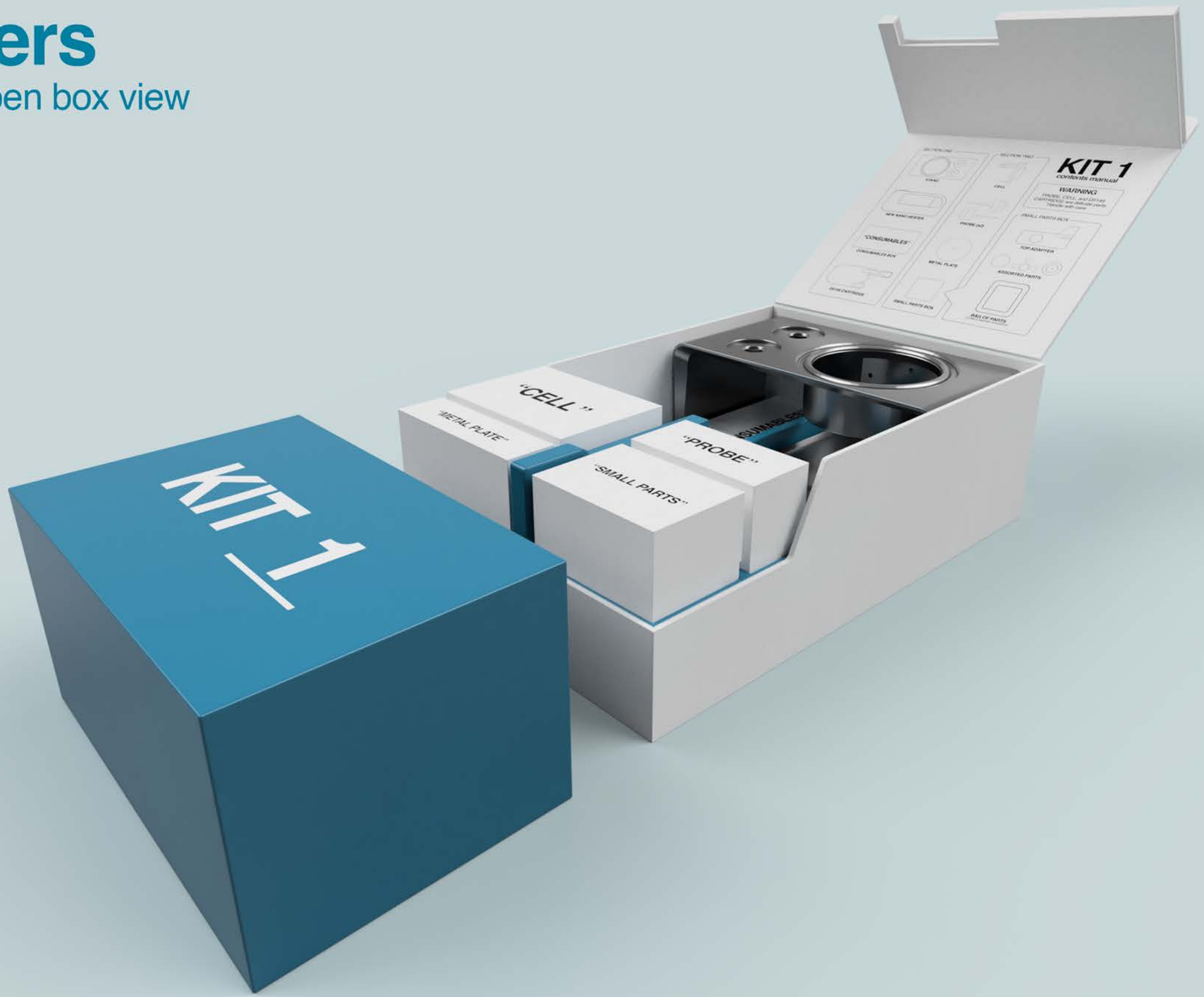
Closed box view

Renders

Slider off closed box view

Renders

Slider off open box view



Renders

Slider off open box top view

Renders

View of inside components

Renders

Open box quick start guide

Renders

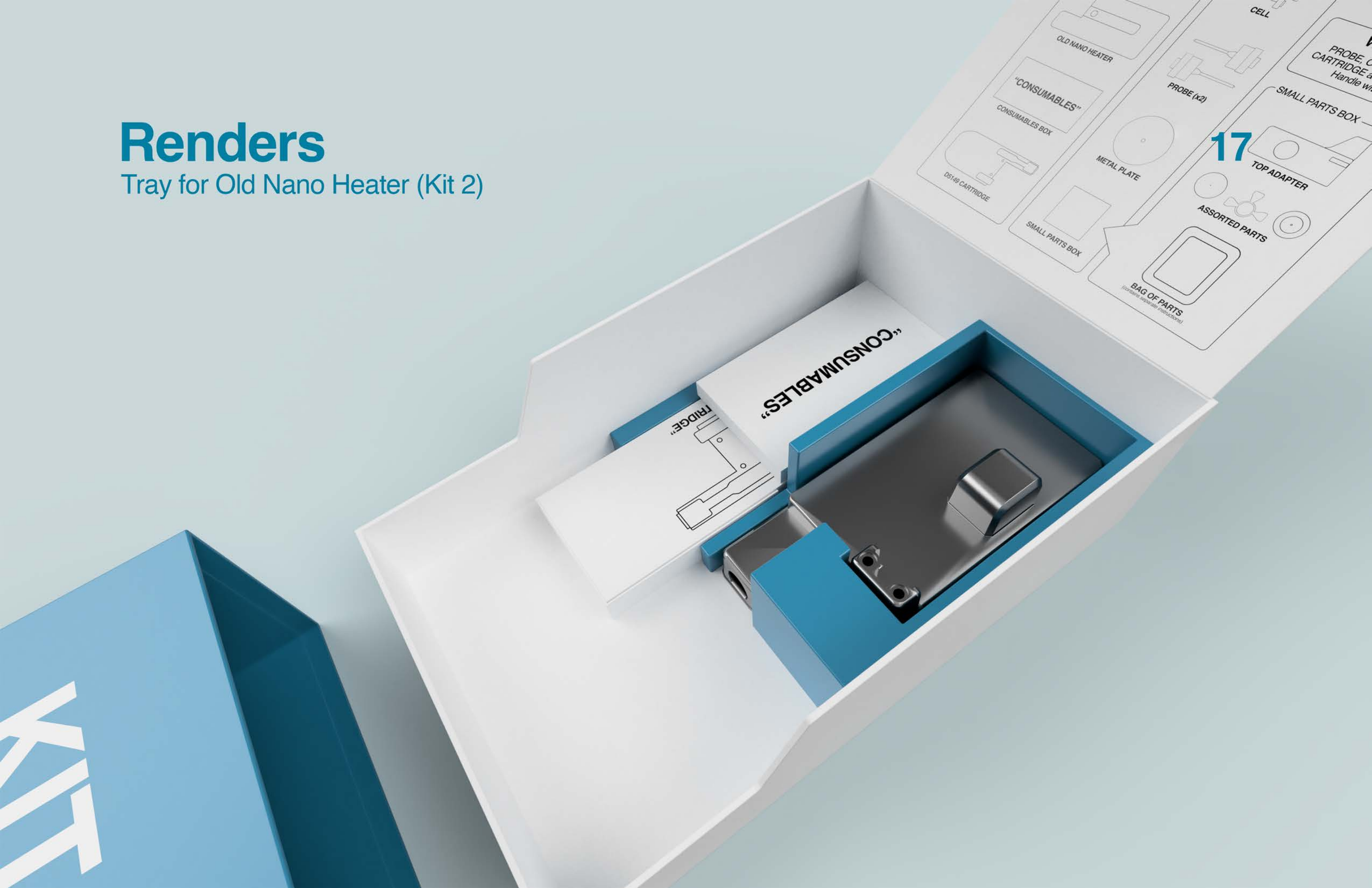
Open box without components

Renders

Up close packaging trays

Renders

Tray for Old Nano Heater (Kit 2)

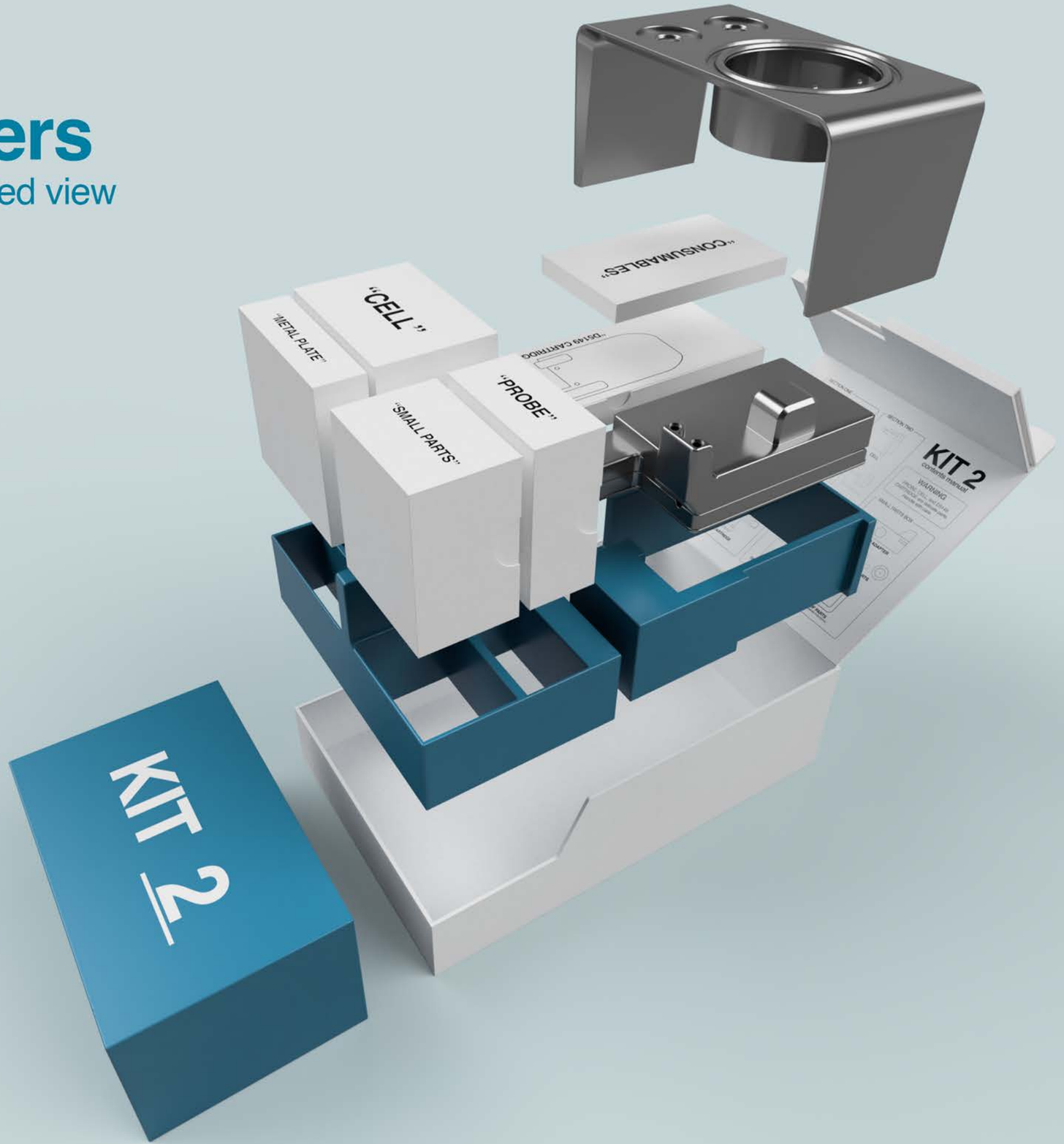


Renders

Kit 2 Quick Start Guide

Renders

Kit 2 exploded view



Renders

Modular boxes exploded view

Renders

All modular part boxes

Renders

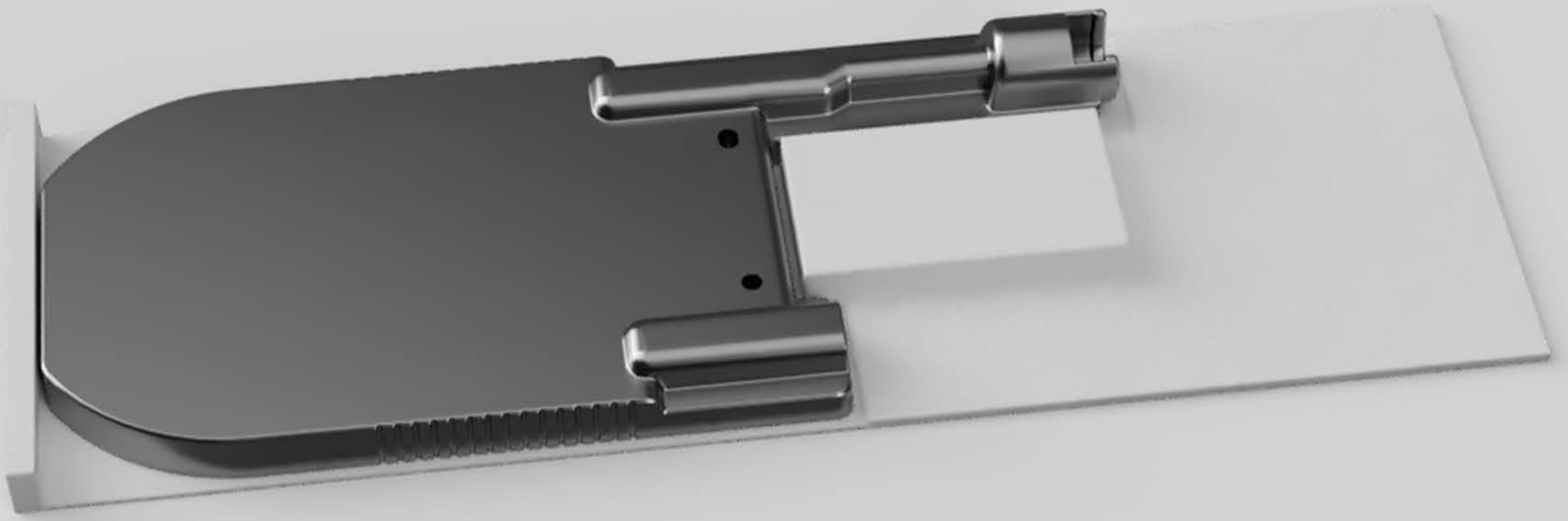
Foam block visualization

Renders

Entire suite, in situ

Renders

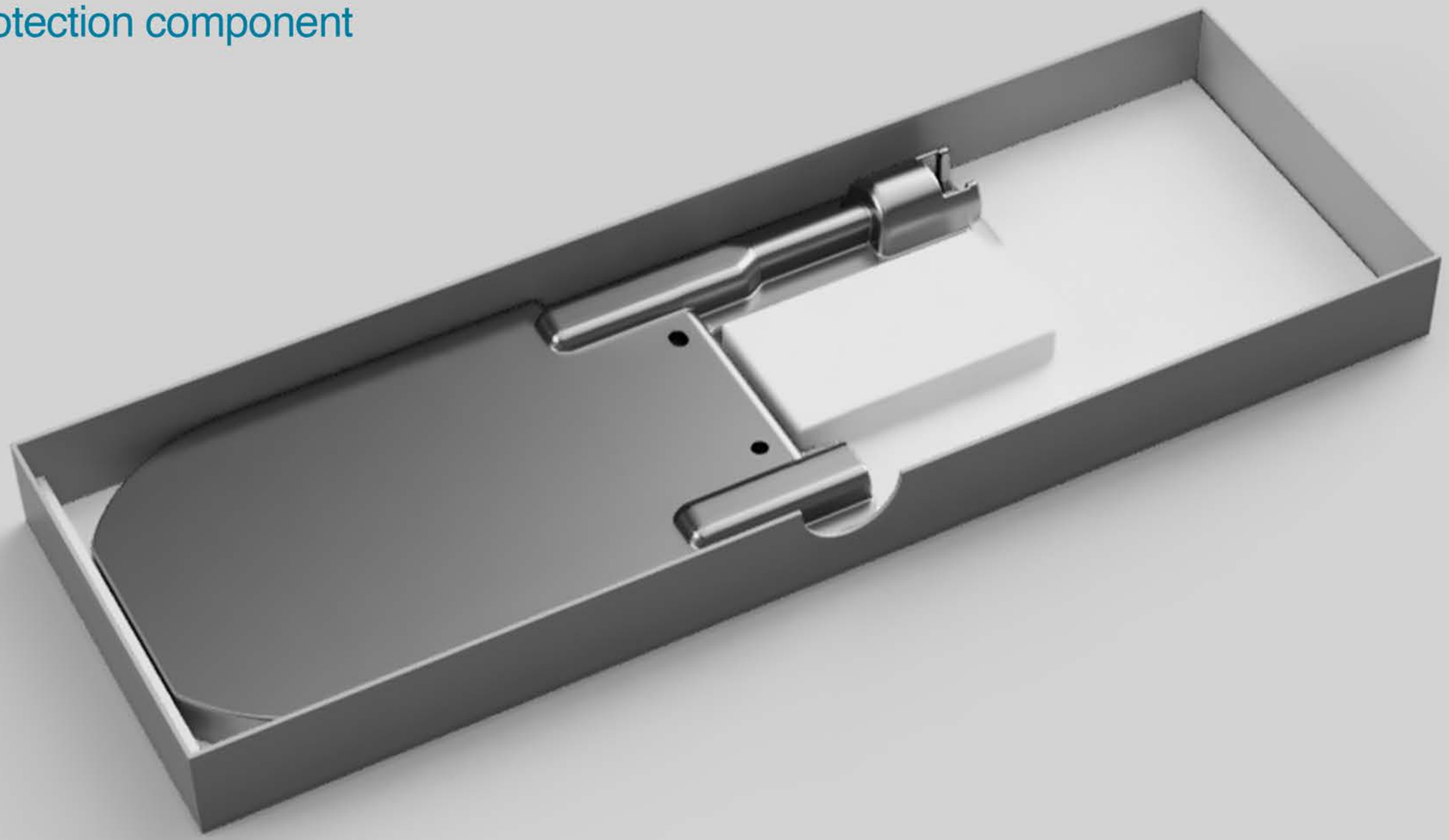
Extra protection component



Cartridge on foam insert; center block prevents the piece from moving and bending its thin wire attachment. (Wire attachment is not visible)

Renders

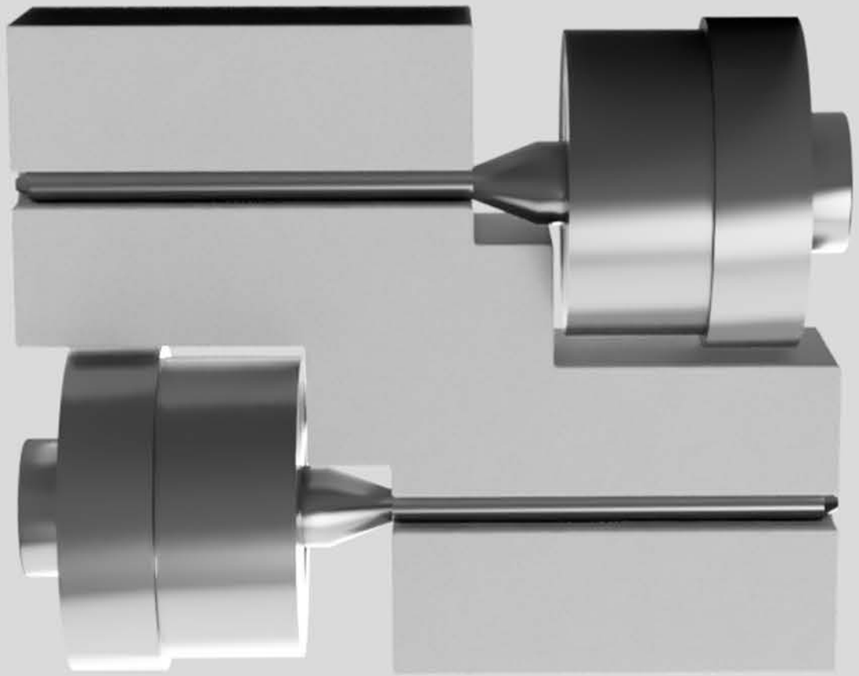
Extra protection component

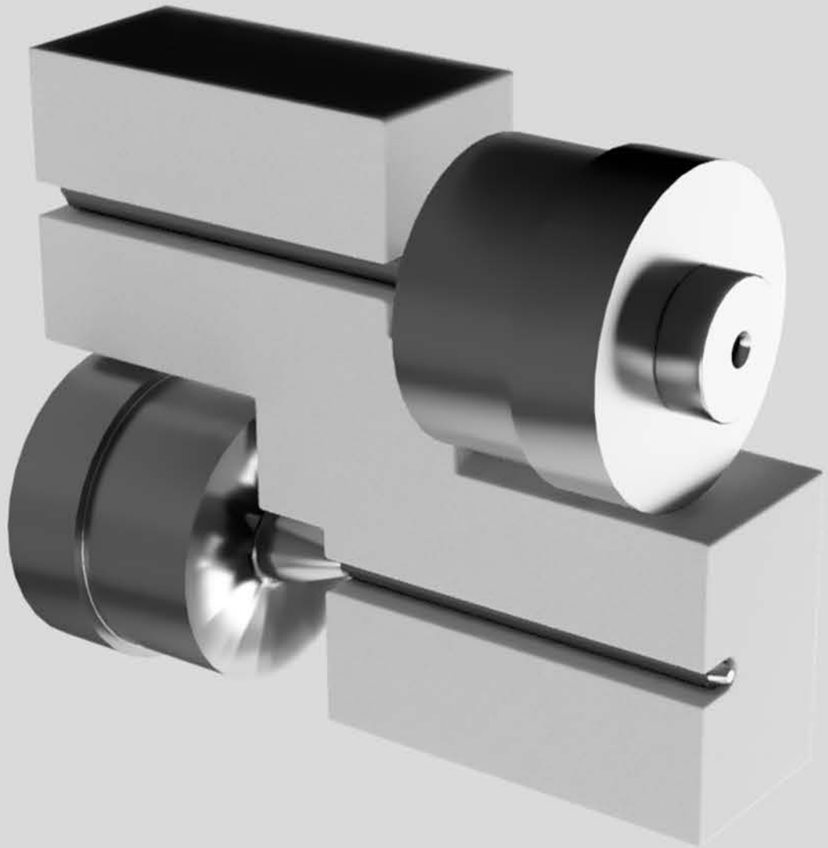


Cartridge and foam insert placed within its modular box component.

Renders

Extra protection component

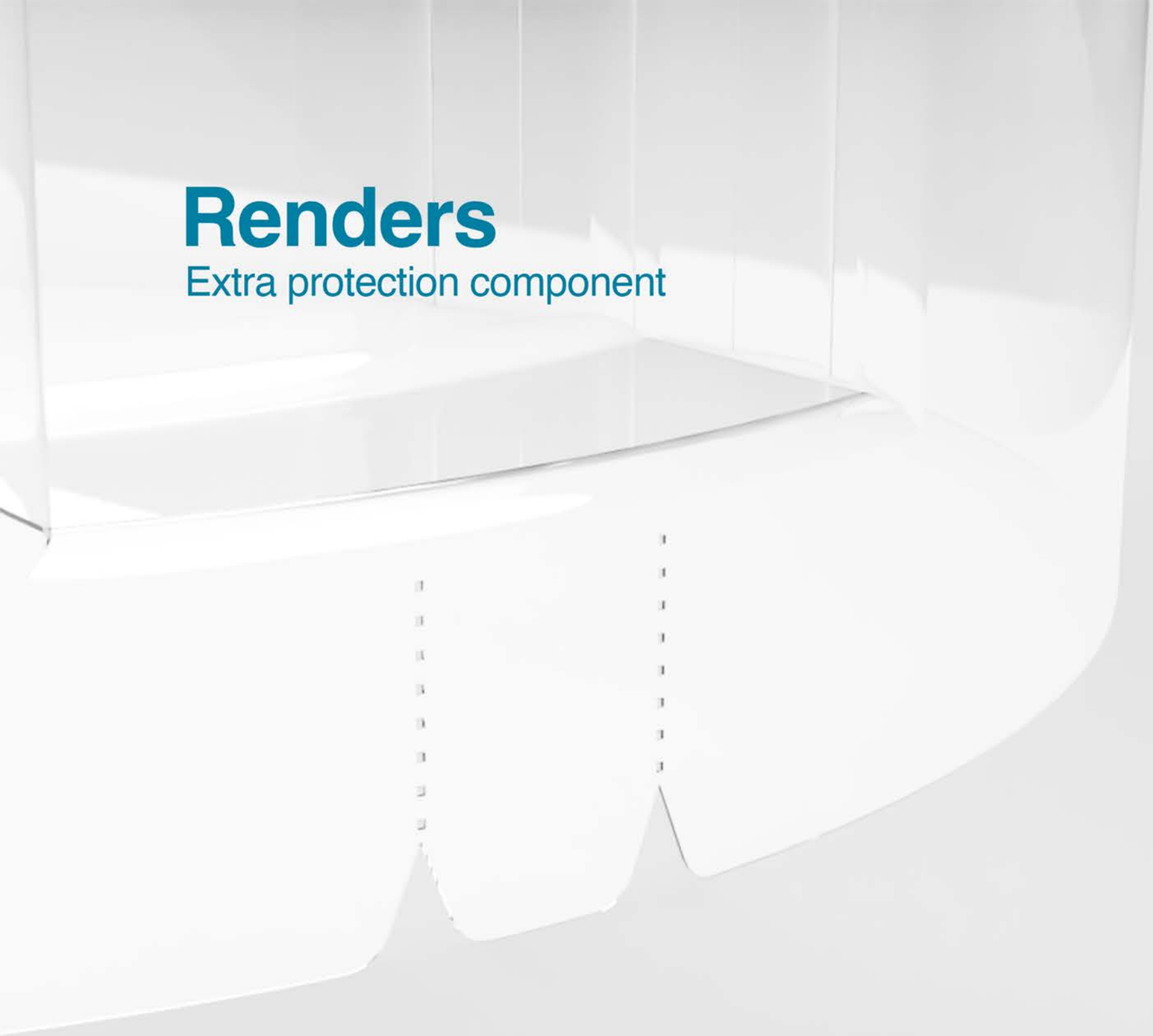


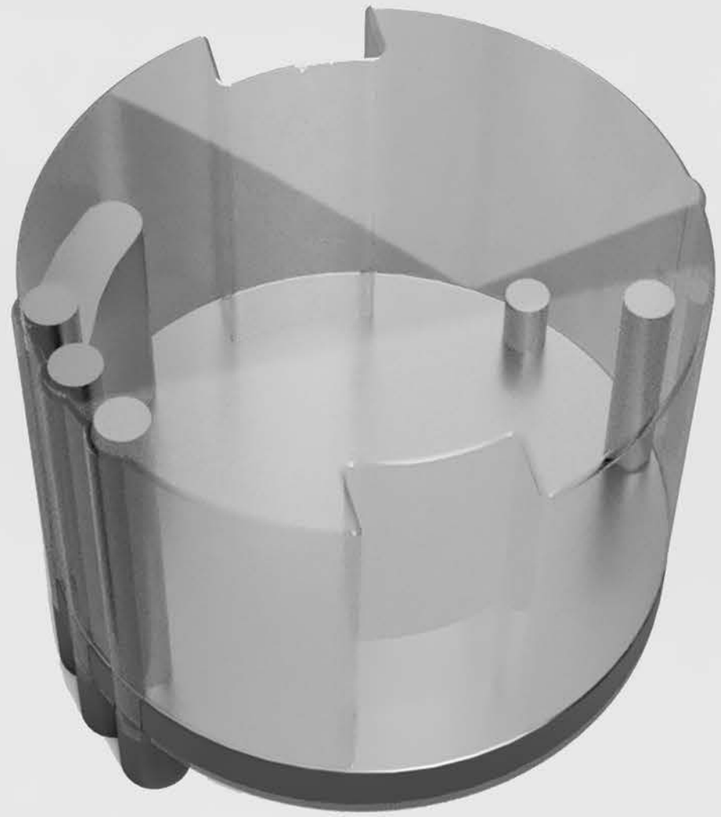


Probes protected by foam inserts, designed to keep them from moving in their box.

Renders

Extra protection component

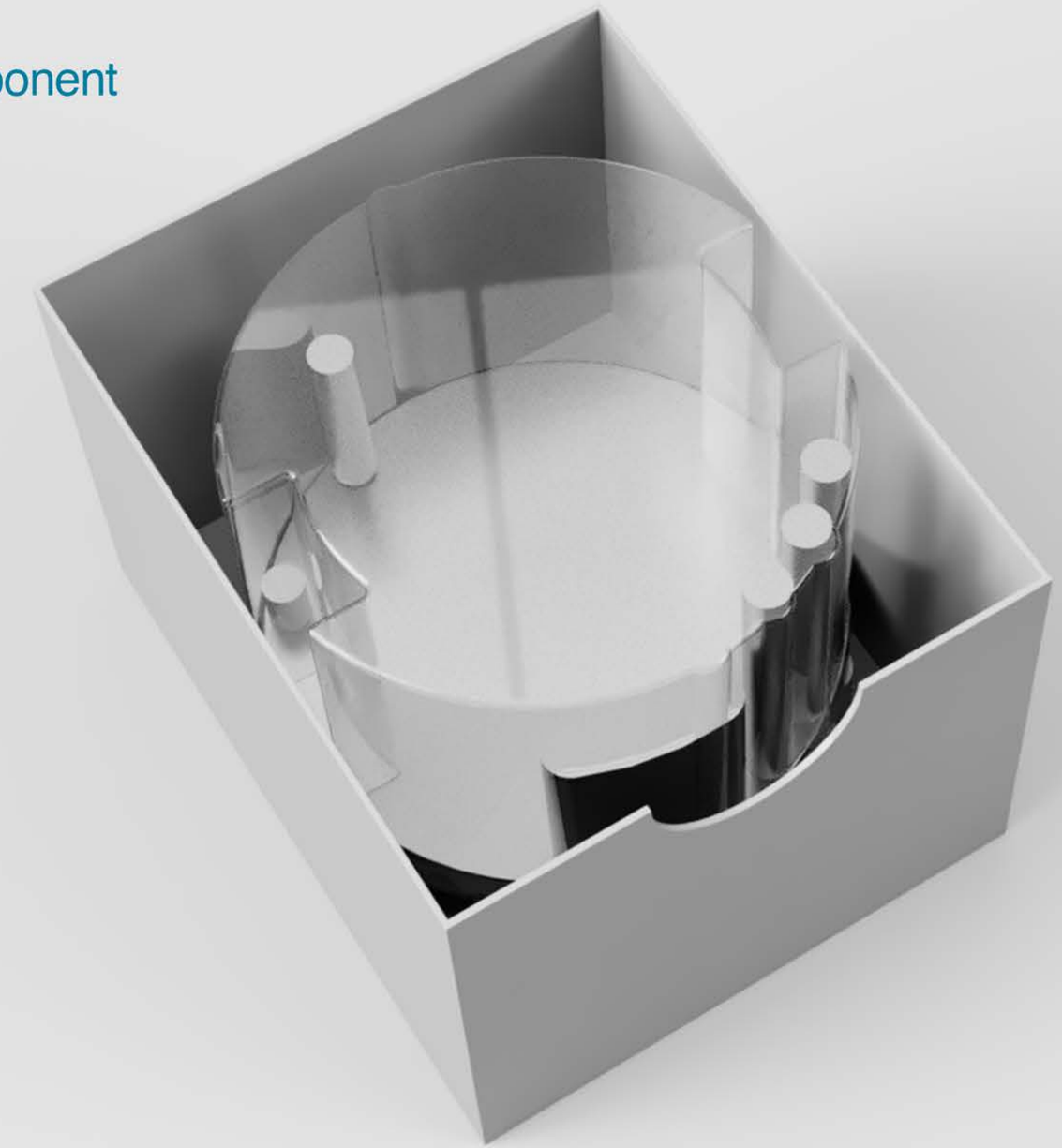




Cell protection component.
Enlarged image of opening
mechanism (left), view of
entire cover over Cell (right).

Renders

Extra protection component



Cell with protection cover
inside of its modular box.
The cover stops the Cell
from touching the edges.

Graphic Design

Visual Branding

The goal with branding on this project was to create a simplistic and consistent feeling between every individual packaging component. Minimal graphics are used, but where they are used, they elevate the packaging suite to a more luxurious and professional standard in a modern scientific workplace.

Colour Palette

PANTONE 11-0601 TCX

PANTONE 19-0303 TCX

PANTONE PQ-314C

KIT 1

KIT 2

Helvetica Bold, tracking of -20

Font Choice

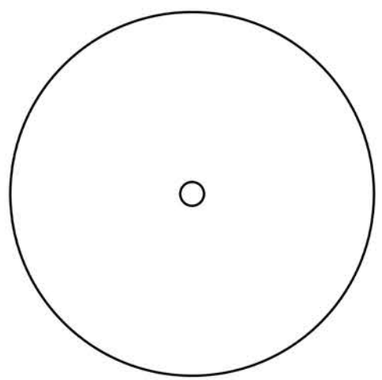
Helvetica Bold seemed like the right choice for the branding on the package, as it is clean and neutral, and does not distract from the function of the packaging.

Graphic Design

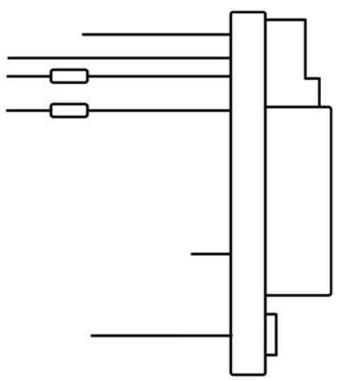
Modular Boxes

The printing on the modular box components is also minimal but informative, and does a good job at adding another layer of consideration to the project. These simple orthographic designs make the organization aspect of the design more intuative, and the additional thought of including these prints can help provide the user with a greater sense of luxury.

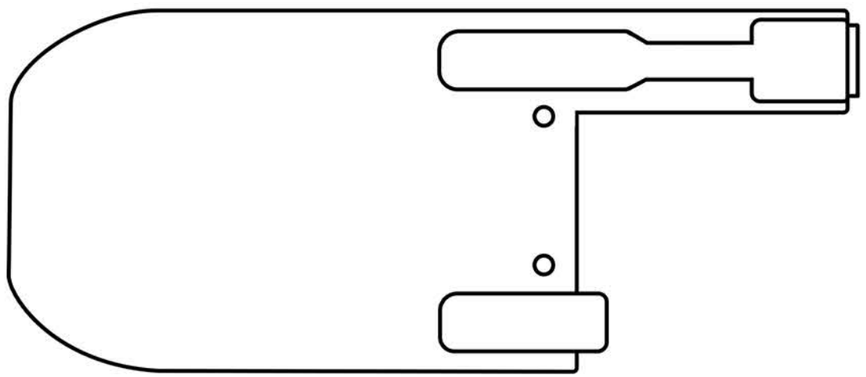
The bold Helvetica font also helps the design pop, making it more readable. Lastly, the quotations add to the utilitarianism of the overall design.



“METAL PLATE”



“CELL”



“D5149 CARTRIDGE”

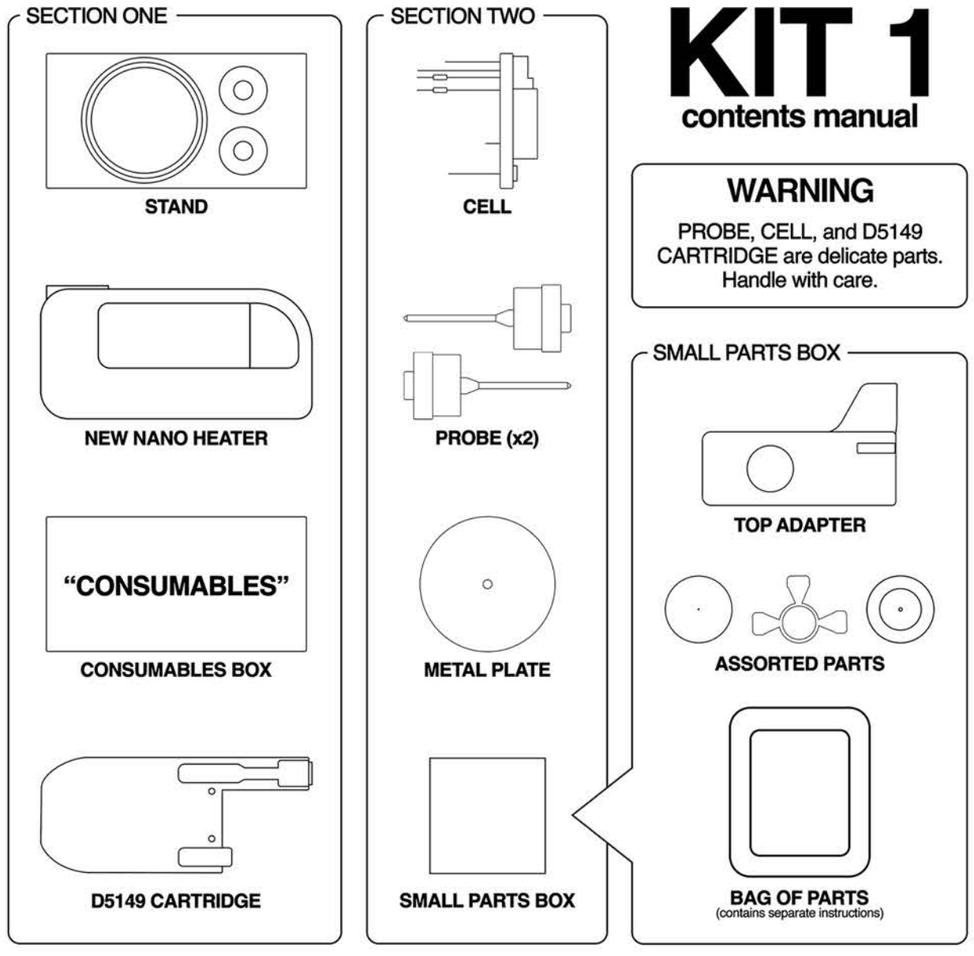
Graphic Design

Quick Start Guide

The design of the quick start guide corresponds to that of the modular box components, and shows each part of the kit layed out. As mentioned before, it organizes the sections and provides users with a warning. This guide would be a sticker applied to the inside of the package lid, as this way the same box could be used for both Kits 1 and 2.

The “Kit _” printing on both boxes is also a print directly on the material, however each number would also be an applied sticker, making the boxes interchangable.

KIT 1



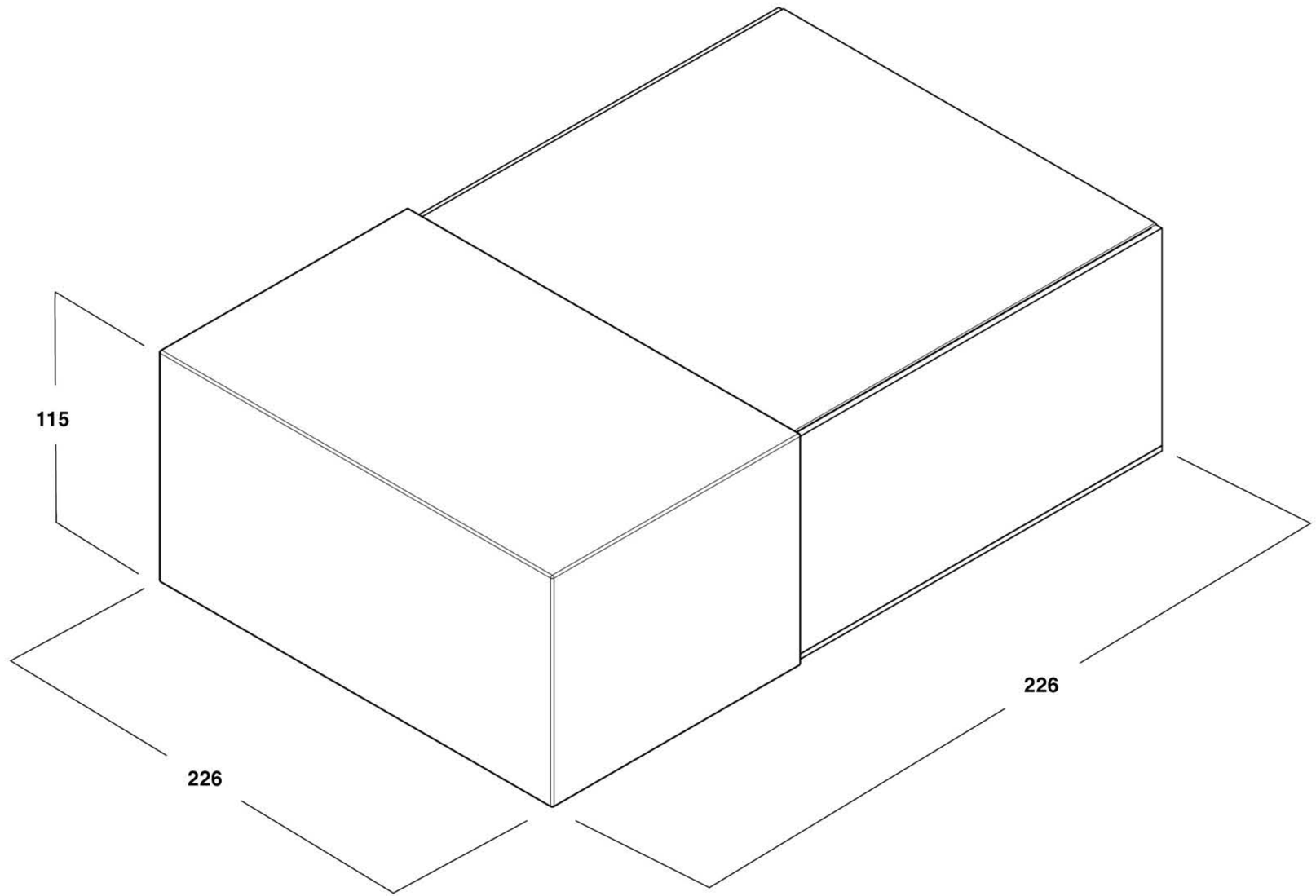
Orthographics

MAIN BOX
CLOSED OUTER VIEW

MAIN BOX IS CONSTRUCTED FROM GLOSSY CARDBOARD.

PAPER IS FOLDED TOGETHER AND HELD WITH ADHESIVE.

MAIN BOX BODY HAS A THICKNESS OF 4 MM.



UNITS: MILLIMETERS
DECEMBER 1ST

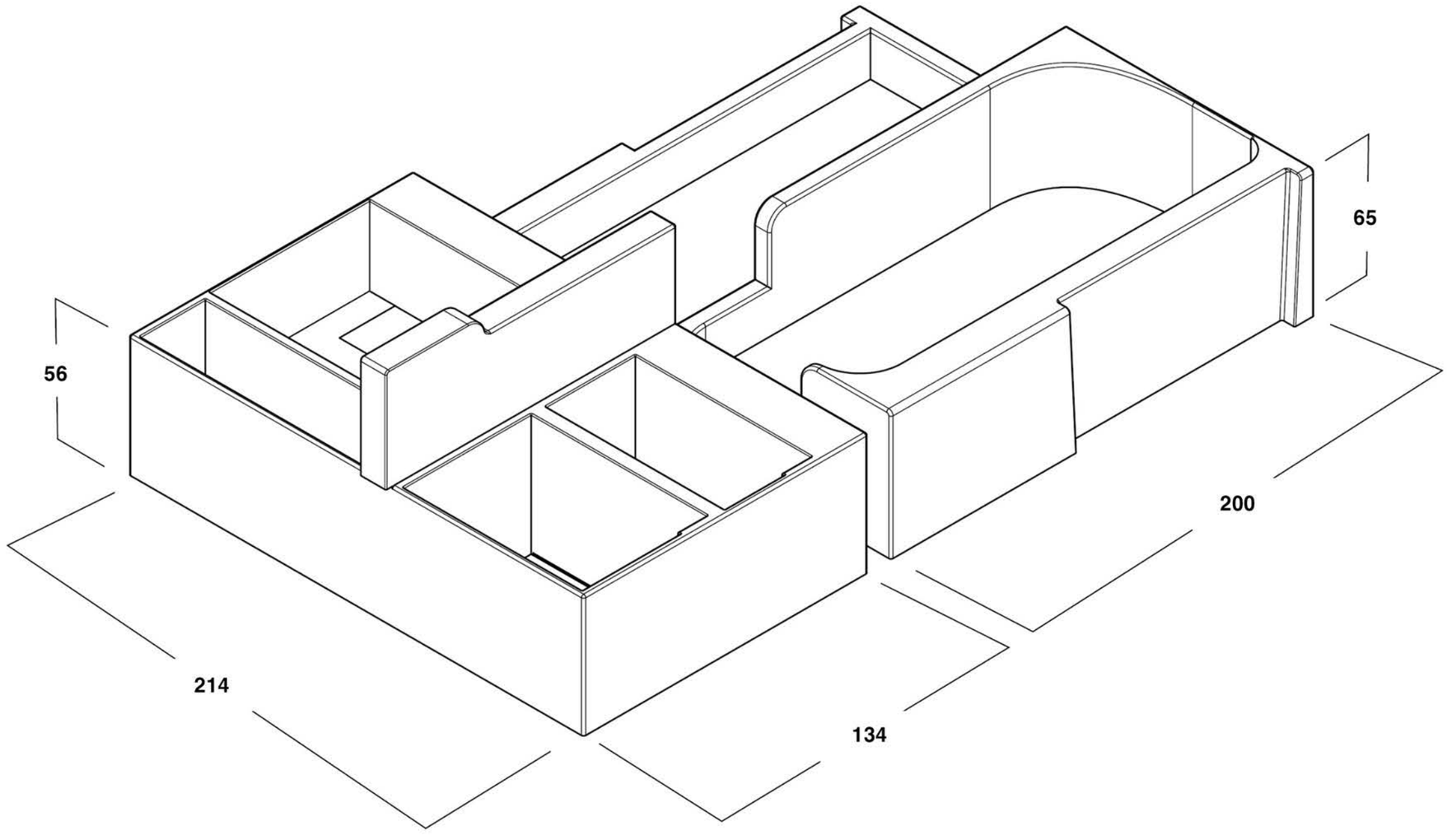
Orthographics

MAIN BOX INLAY
VIEW OF KIT 1 TRAYS

INLAYS ARE MADE WITH BIO-DEGRADABLE PLASTIC.

INLAYS ARE VACUUM FORMABLE.

INLAYS ARE VACUUM FORMED FROM A SHEET WITH THICKNESS OF 3 MM.



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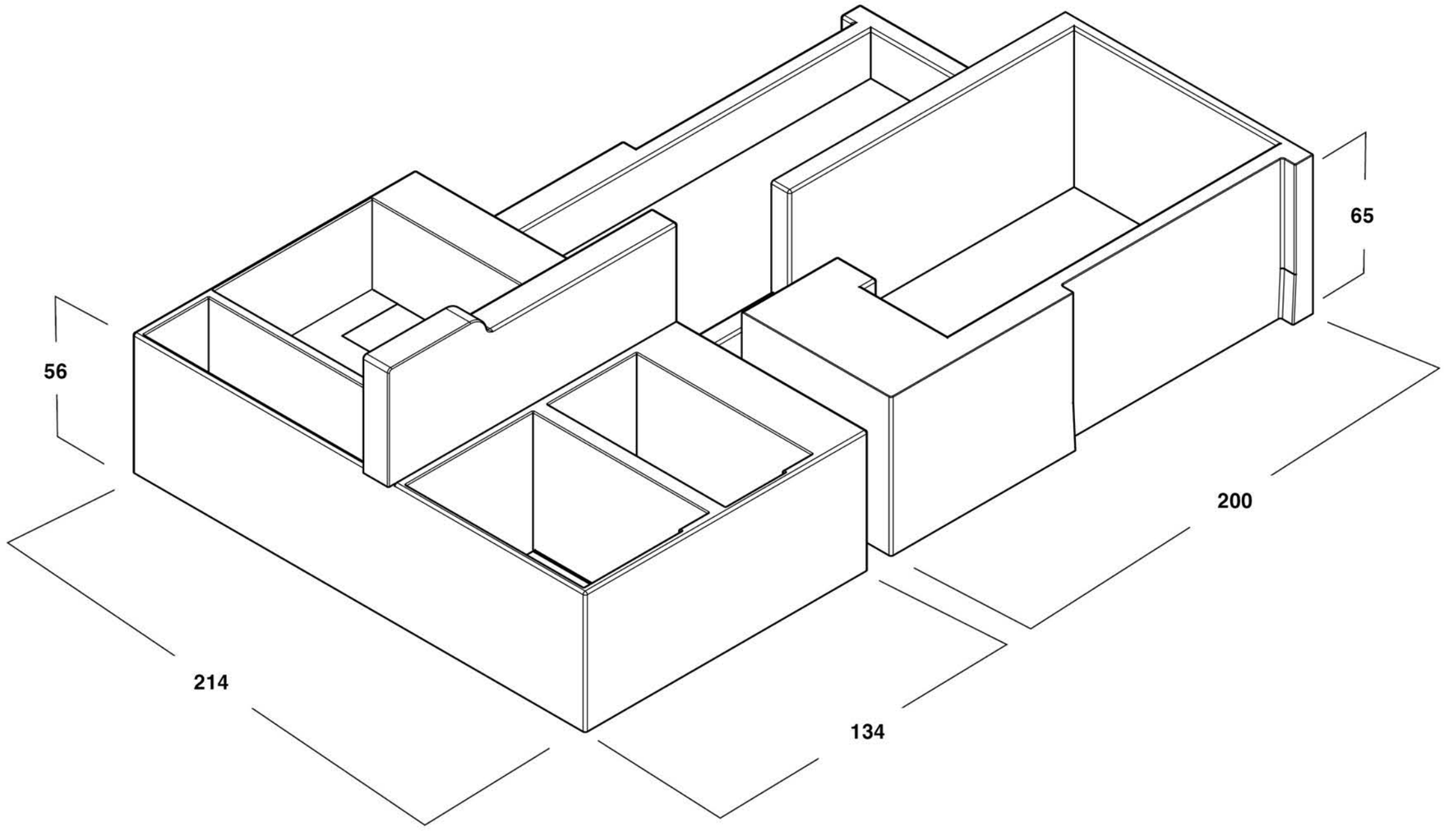
Orthographics

MAIN BOX INLAY
VIEW OF KIT 2 TRAYS

INLAYS ARE MADE WITH BIO-DEGRADABLE PLASTIC.

INLAYS ARE VACUUM FORMABLE.

INLAYS ARE VACUUM FORMED FROM A SHEET WITH THICKNESS OF 3 MM.



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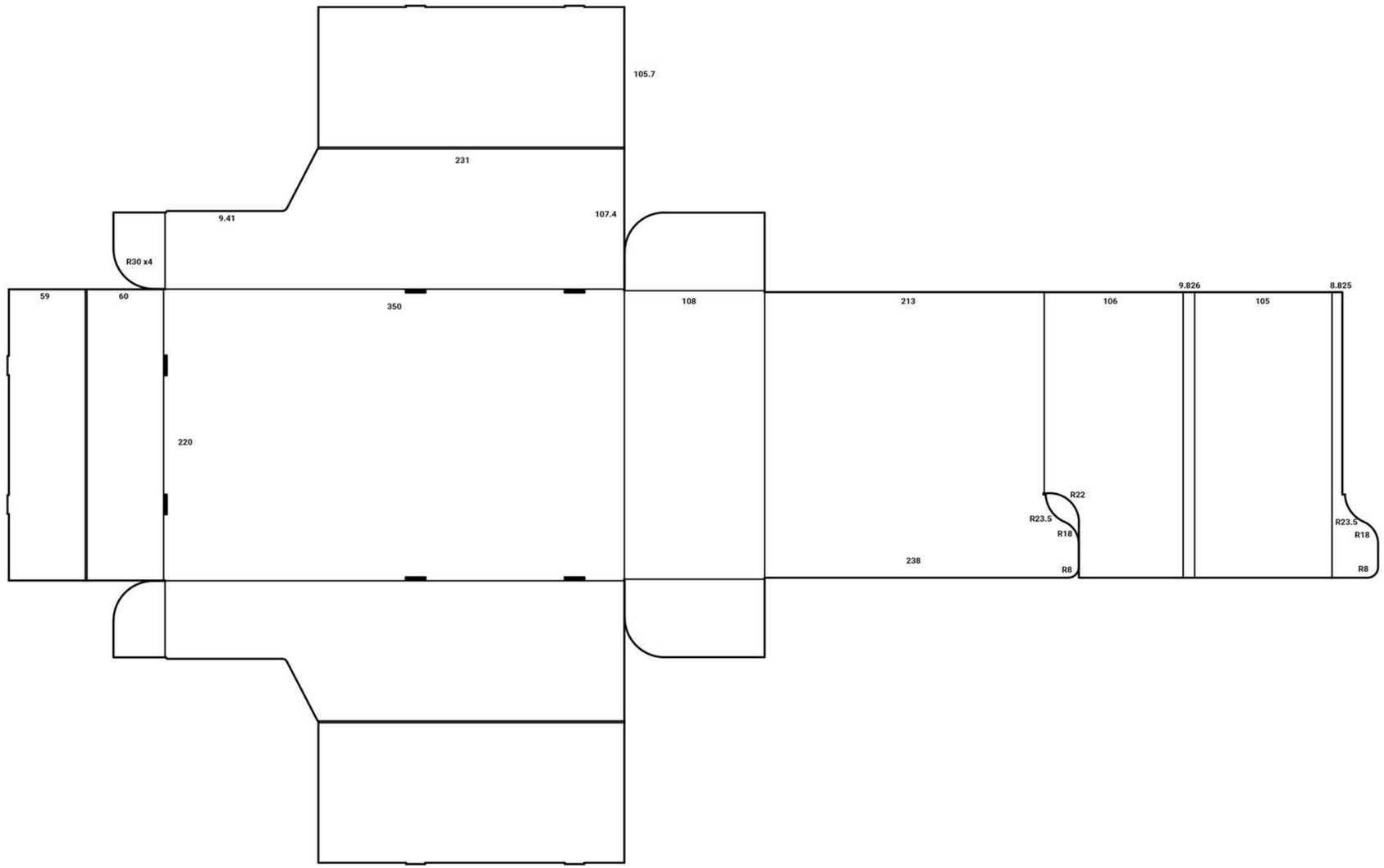
Orthographics

MAIN BOX
FOLDING PLAN

BOX WOULD BE CUT AND SCORED ACCORDINGLY.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

INDENTS ARE CUT TO HELP THE BOX FIT TOGEHER.



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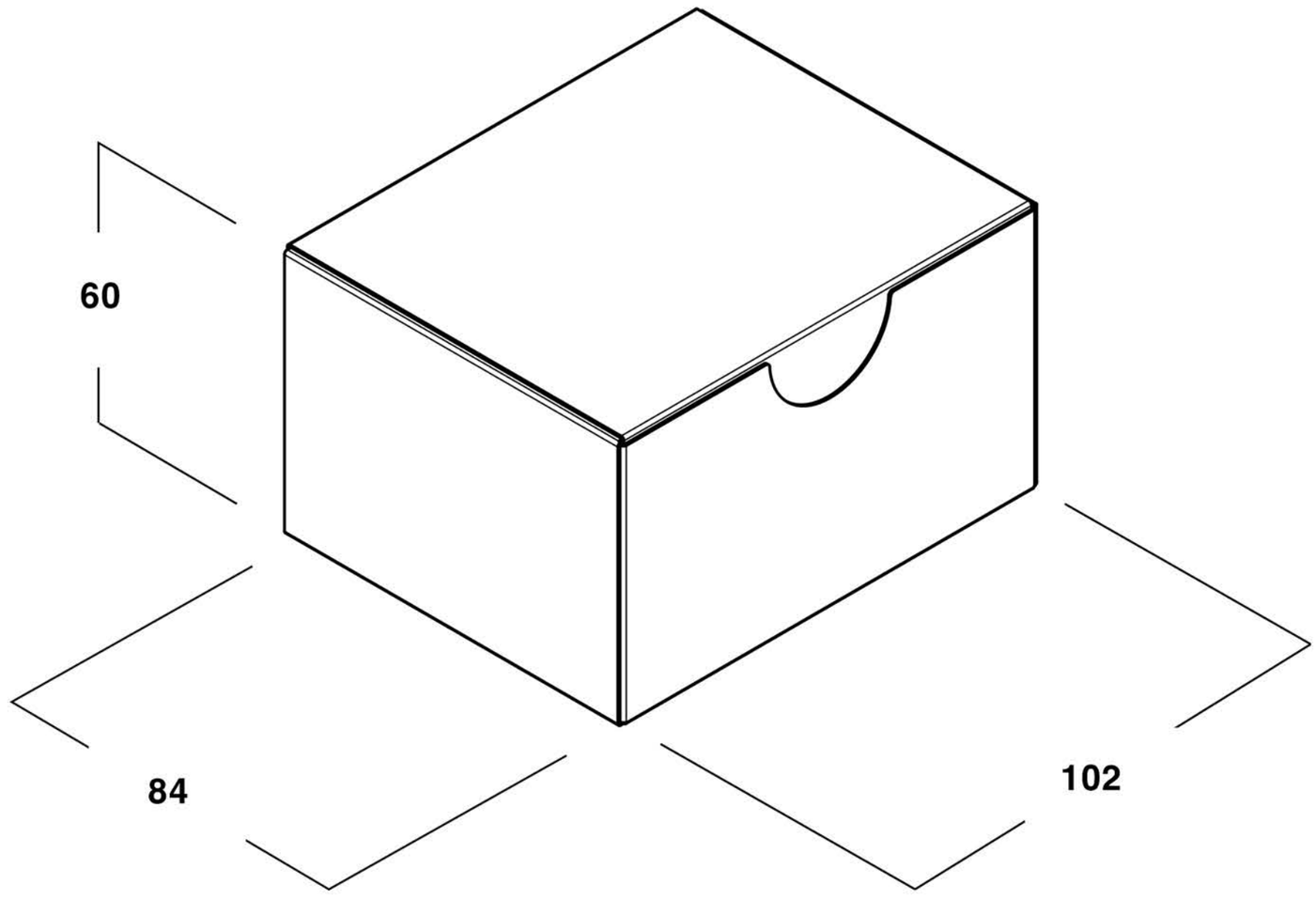
Orthographics

SMALL PARTS BOX
DIMENSIONED VIEW

BOX IS MADE OF WHITE PAPER WITH MINIMAL BLACK INK PRINTING.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.



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Orthographics

SMALL PARTS BOX
FOLDING PLAN

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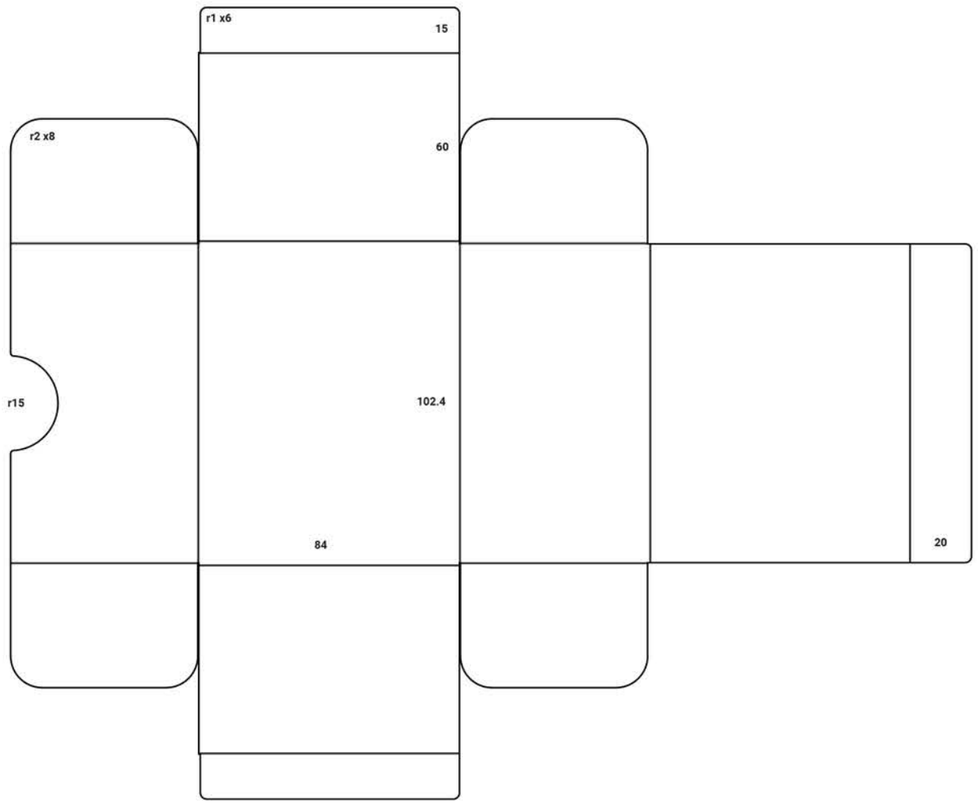

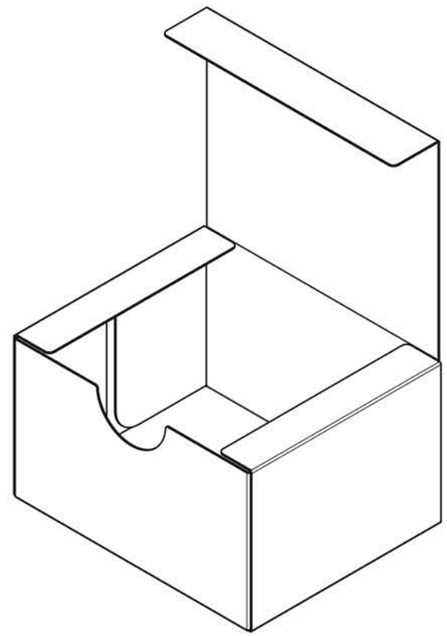

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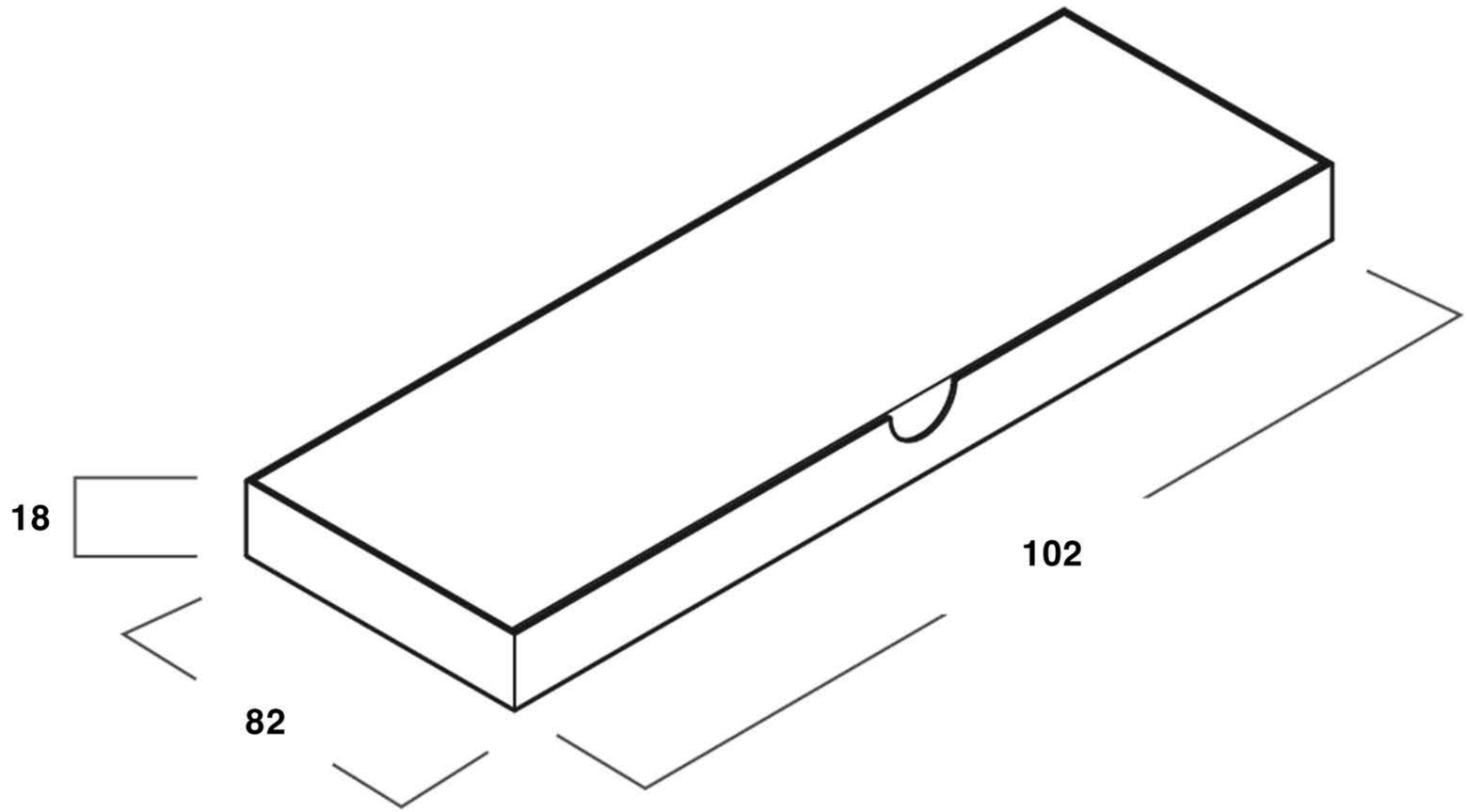
Orthographics

CARTRIDGE BOX
DIMENSIONED VIEW

BOX IS MADE OF WHITE PAPER WITH MINIMAL BLACK INK PRINTING.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.



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Orthographics

CARTRIDGE BOX
FOLDING PLAN

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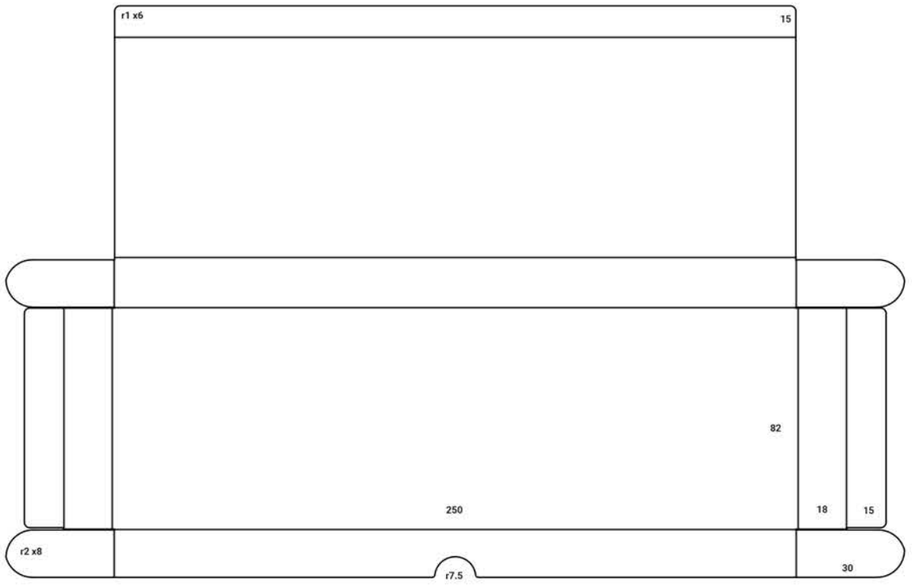

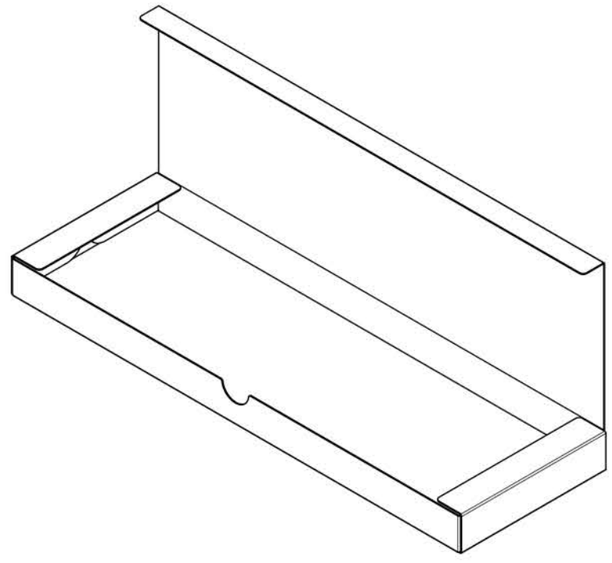

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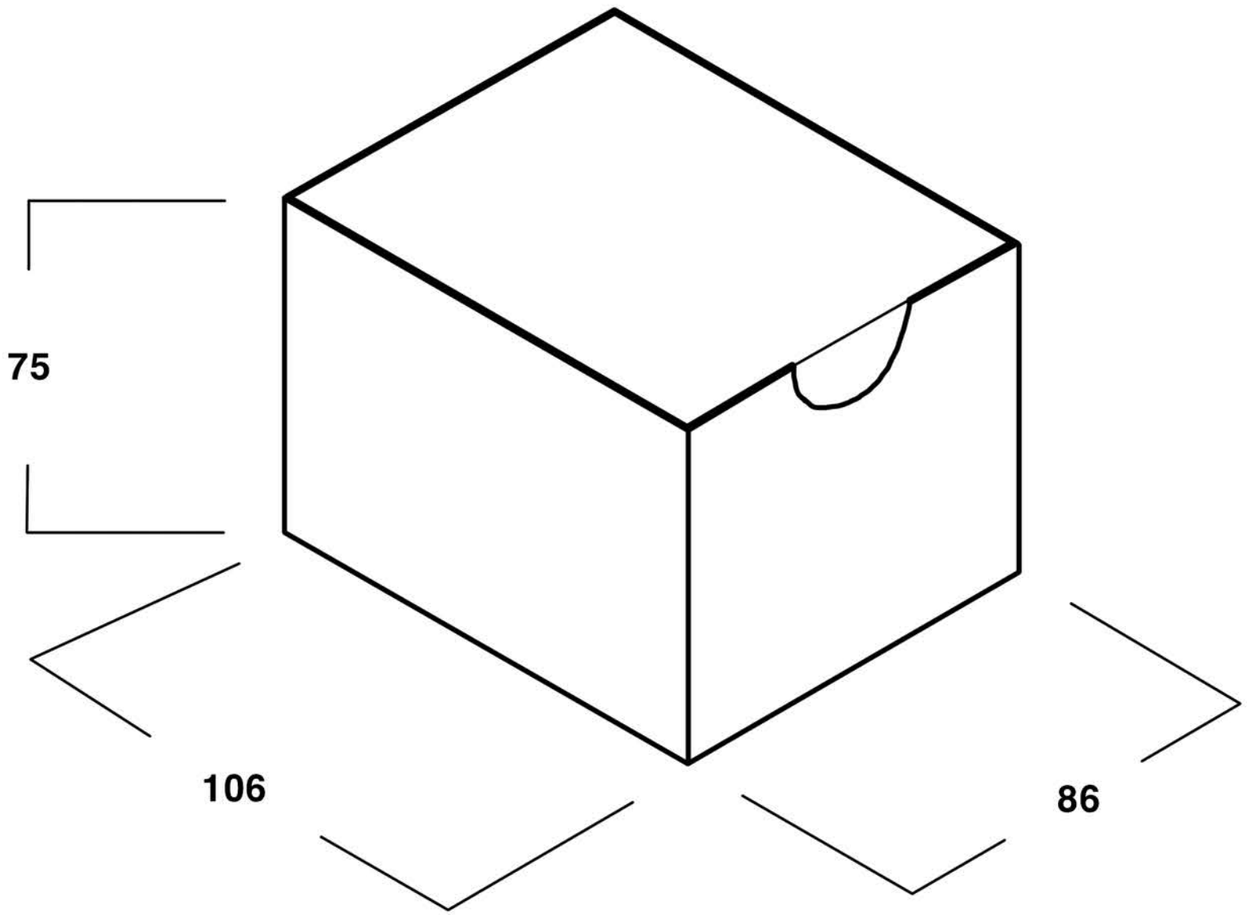
Orthographics

CELL BOX
DIMENSIONED VIEW

BOX IS MADE OF WHITE PAPER WITH MINIMAL BLACK INK PRINTING.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.



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Orthographics

CELL BOX
FOLDING PLAN

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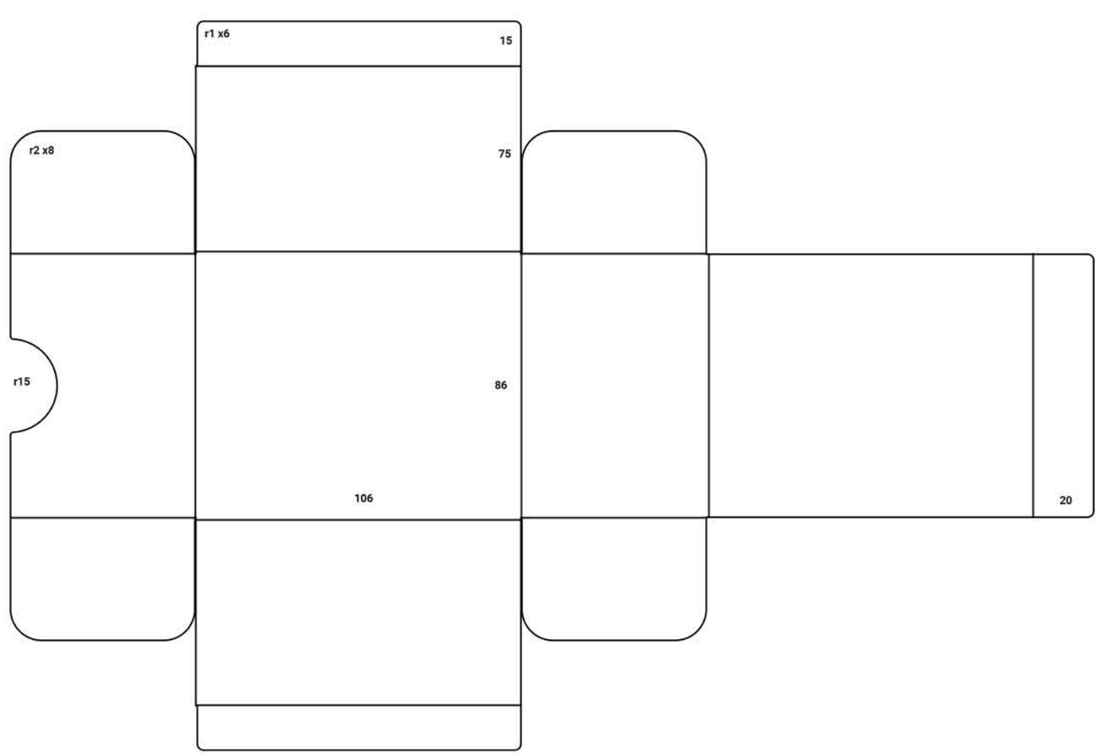
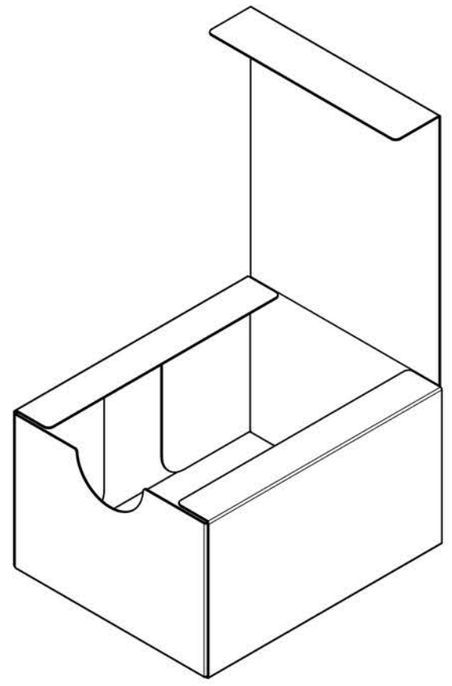




UNITS: MILLIMETERS
DECEMBER 1ST

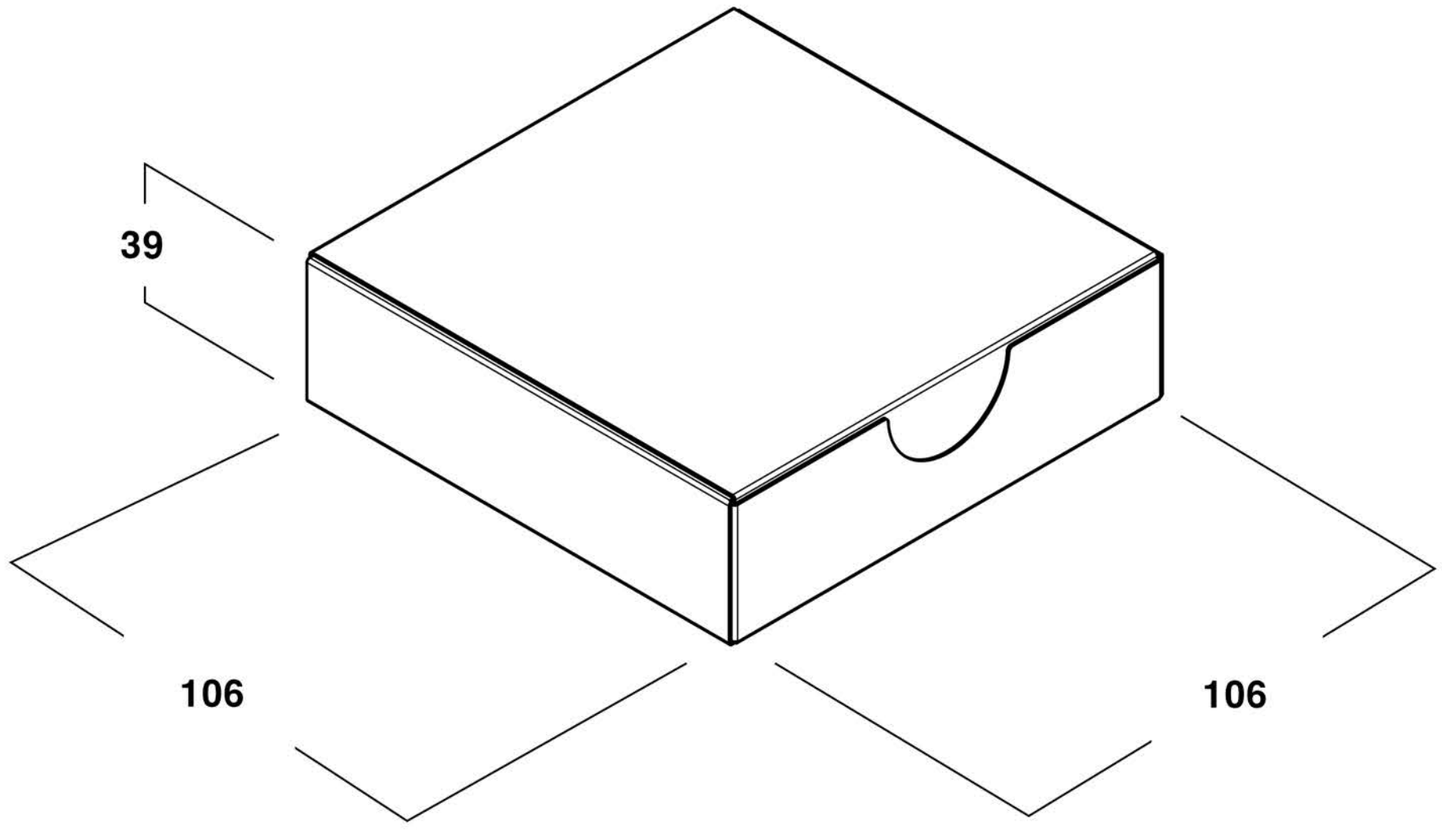
Orthographics

METAL PLATE BOX
DIMENSIONED VIEW

BOX IS MADE OF WHITE PAPER WITH MINIMAL BLACK INK PRINTING.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.



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DECEMBER 1ST

Orthographics

METAL PLATE BOX
FOLDING PLAN

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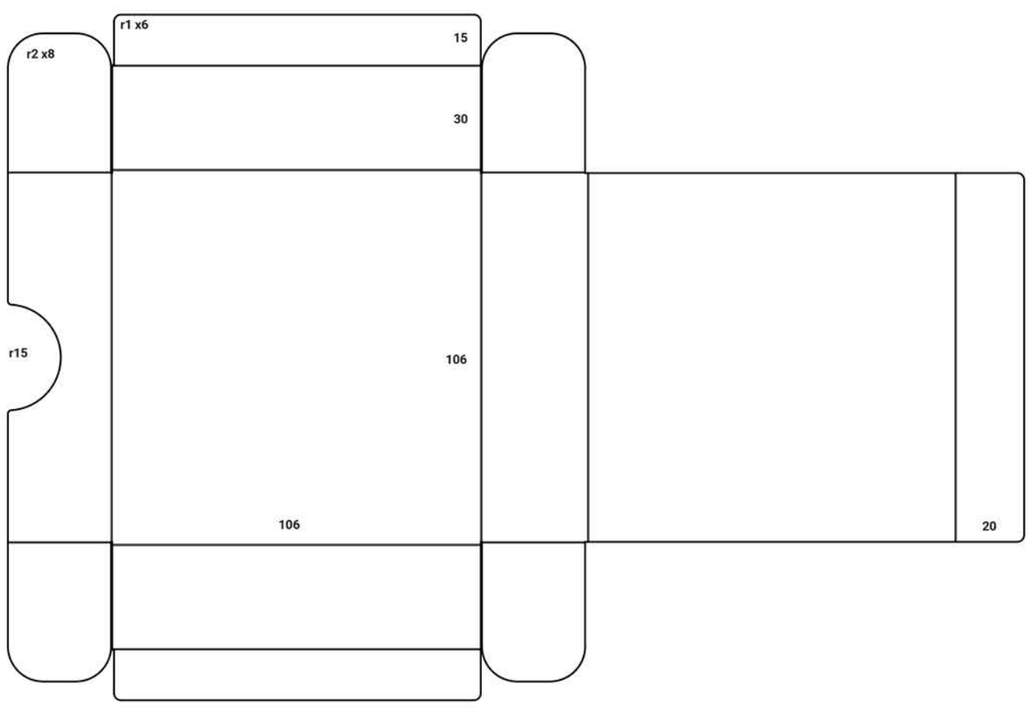
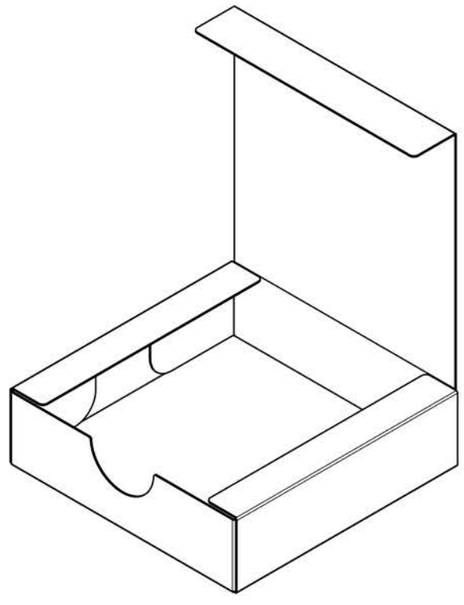




UNITS: MILLIMETERS
DECEMBER 1ST

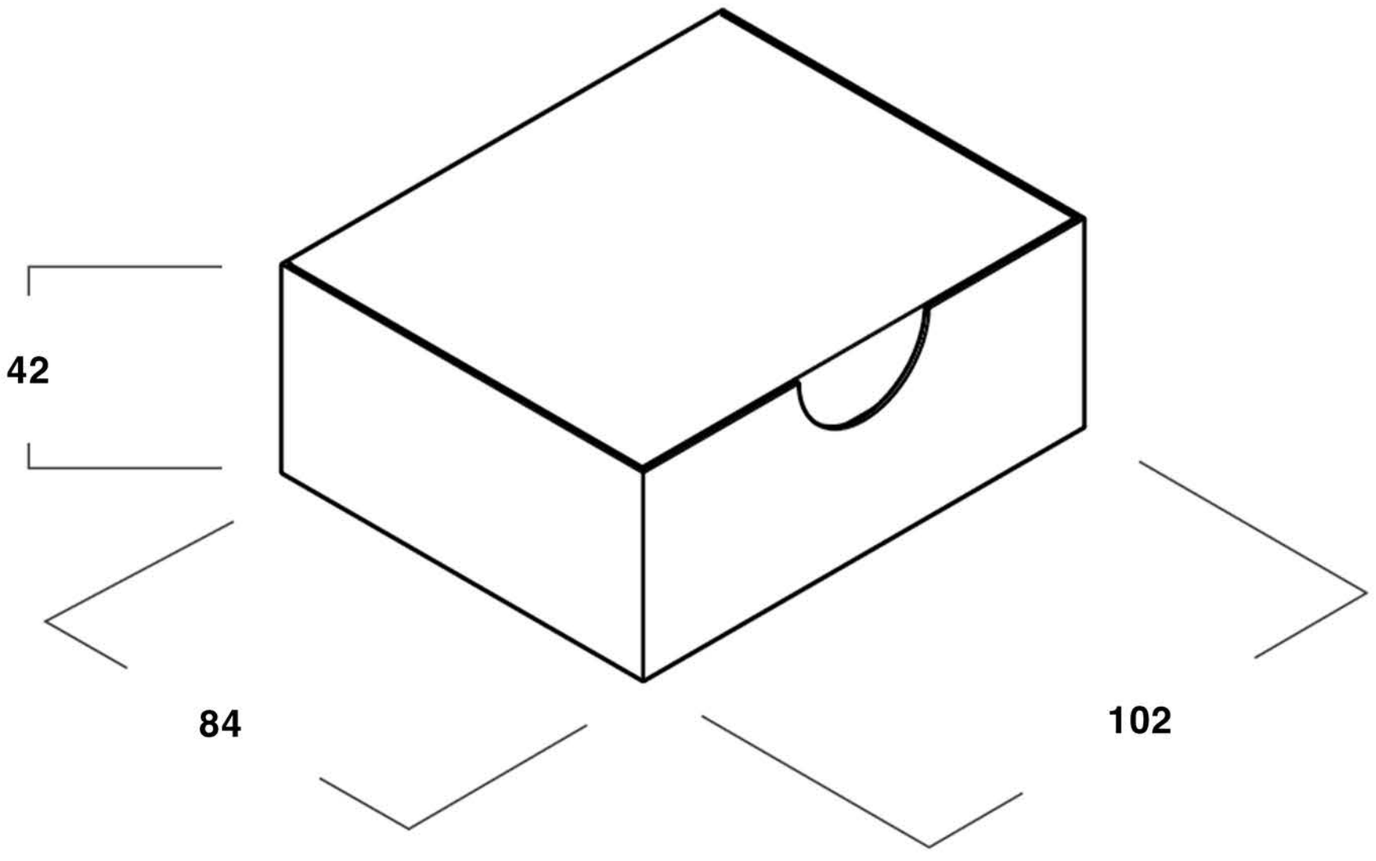
Orthographics

PROBE BOX
DIMENSIONED VIEW

BOX IS MADE OF WHITE PAPER WITH MINIMAL BLACK INK PRINTING.

BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.



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Orthographics

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FOLDING PLAN

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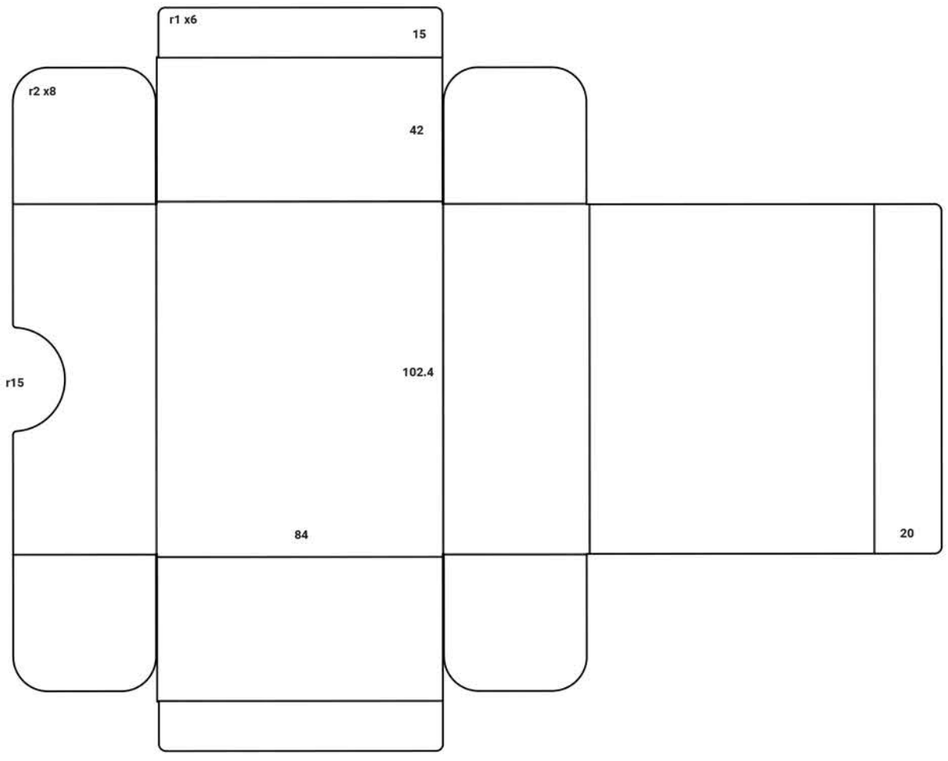
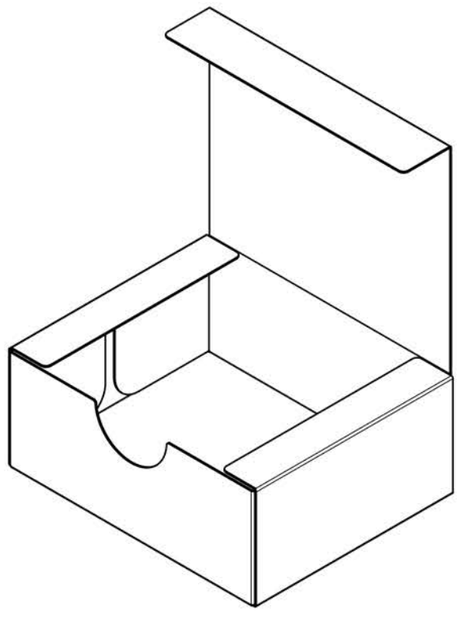
BOX IS FOLDED AND HELD TOGETHER WITH AN ADHESIVE.

THICKNESS OF THE BOX PAPER IS 0.5 MM.





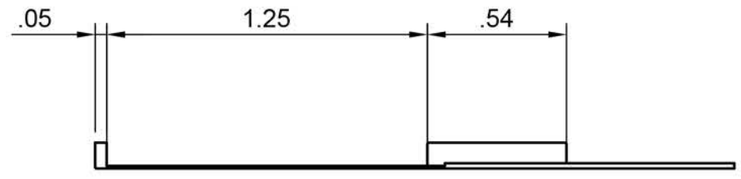
UNITS: MILLIMETERS
DECEMBER 1ST

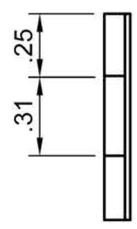
Orthographics

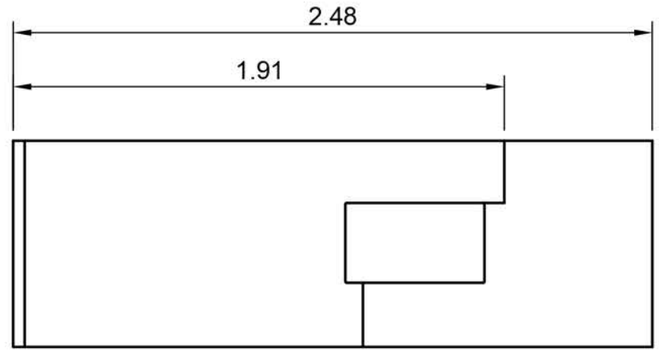
CARTRIDGE TRAY
FULL ORTHOGRAPHIC

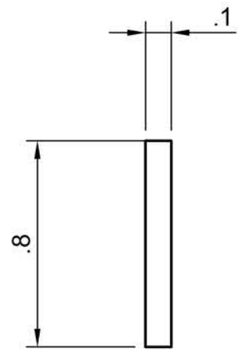
TRAY IS MADE OF GREEN CELL FOAM.

TRAY FITS WITHIN CARTRIDGE MODULAR BOX COMPONENT.









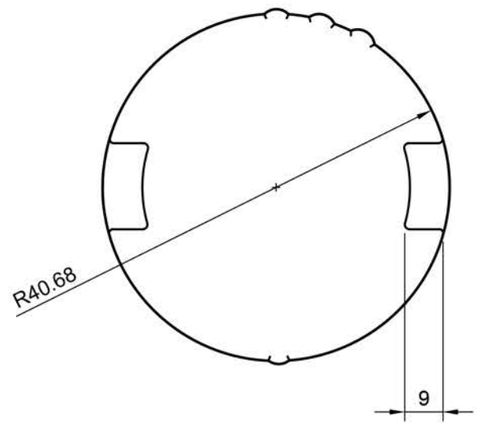
UNITS: MILLIMETERS
DECEMBER 1ST

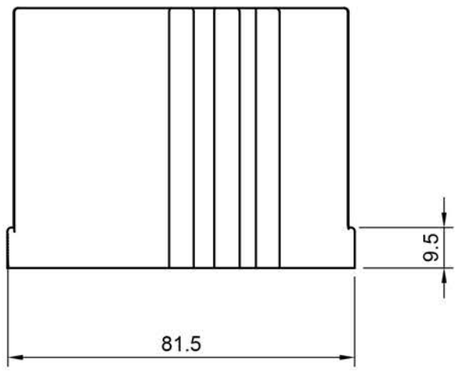
Orthographics

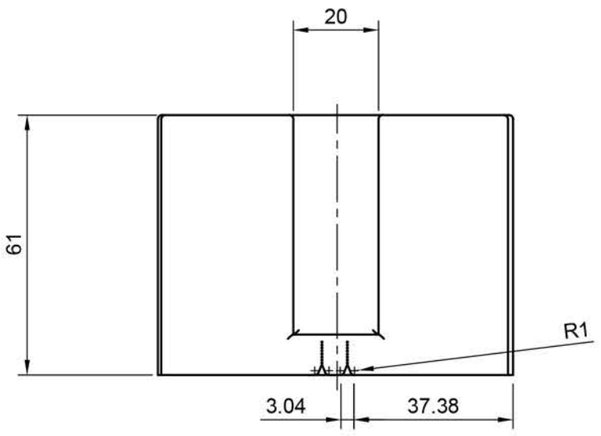
CELL COVER
FULL ORTHOGRAPHIC

COVER IS MADE FROM
VACUUM FORMED
PLASTIC.

COVER FITS PERFECTLY
WITHIN CELL MODULAR
BOX COMPONENT.







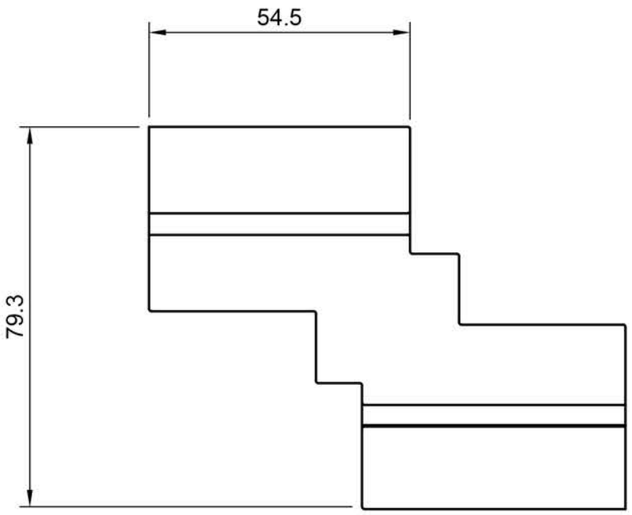
UNITS: MILLIMETERS
DECEMBER 1ST

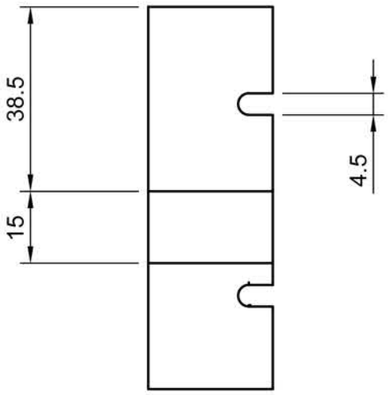
Orthographics

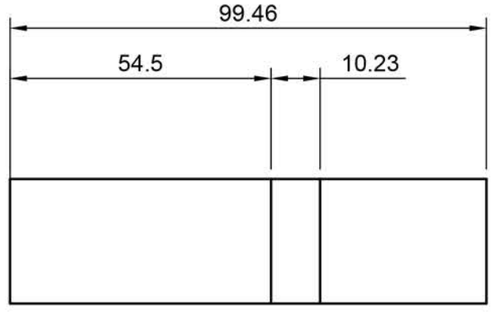
PROBE TRAY
FULL ORTHOGRAPHIC

TRAY IS MADE OF GREEN CELL FOAM.

TRAY FITS WITHIN THE PROBE MODULAR BOX COMPONENT.







UNITS: MILLIMETERS
DECEMBER 1ST

Materials

Main Box Body + Slider

Proposed material: Cardboard with a glossy finish

Cardboard is a durable and lightweight material usually comprised of multiple layers of paper, sometimes featuring a layer of corrugation in the middle.

The cardboard will provide a thickness and sturdiness to the outside of the box.

The glossy finish will serve to enhance the luxury component of the box, as it will give off a shine and will feel smooth in the user's hands.

The main box body will have a glossy white finish.

The box slider will have a glossy blue finish, with minimal white branding printed on top.

Advantages:

Cardboard is relatively inexpensive, making it a favorable material when dealing with multiple distributions of packaging.

Carboard has an excellent strength to weight ratio and is good for keeping packages safe in the shipping stream.

Carboard is also a sustainable material, and a glossy coating will make it desirable for a user to keep it.

Disadvantages:

Cardboard can deform when put under pressure, and become crushed or dented in certain areas.

Cardboard is not weather proof and is at risk of being damaged by rain or snow

Materials

Modular Box Components

Proposed material: Thick cardstock paper

Cardstock is a durable paper that has a greater thickness than regular paper, but is still relatively inexpensive and easily foldable.

The cardstock will provide minimal extra protection to its housed components, while adding almost no weight to the overall box design.

There will be minimal designs printed on the cardstock, making it a great surface to promote the aesthetics of the package.

Cardstock has a naturally smooth texture, providing an extra feeling of luxury.

Advantages:

Cardstock looks visually appealing due to its smooth finish, and is able to provide the appearance of high quality.

Cardstock can be directly printed on, making it easy to add branding to.

Cardstock is also a sustainable material. Recycled paper fibers can be used up to 5 to 7 times to make new products.

Disadvantages:

Cardstock is not super durable as it is just one layer of paper, making it easy to fold under pressure.

Cardstock does not provide a great barrier to light or oxygen as thicker materials do.

Materials

Foam Barriers

Proposed material: Green Cell Foam

Green Cell Foam is a specific company that creates this foam, which is made out of US grown corn. Because of this, Green Cell Foam can revert completely back into corn starch when ran under water, dissolving into an entirely biodegradable form.

The Green Cell Foam will be used as a barrier to fill the negative space in the box design.

The foam does not necessarily match the aesthetic of the package design, but it is meant only as a temporary safety measure to ensure parts arrice to the user without damage. The foam is meant to be dissolved upon arrival.

Advantages:

Green Cell Foam is currently the most sustainable material available for packaging protection.

Green Cell Foam provides great shock absorption, making it favorable for protection.

Green Cell Foam can dissolve easily in one's sink, making it easy to dispose.

Disadvantages:

Green Cell Foam is relatively expensive compared to other cheaper foams.

Materials

Vacuum Formed Trays

Proposed material: Bio-Flex (Bio-degradable PLA)

Bio Flex plastic, made by the company FKuR, is based on renewable resources (including sugarcane) and is certified as compostable and bio-degradable. This plastic is best used for thermoforming, as it can maintain a rigid structure once it is stretched out over a mold.

The Bio Flex will be used to make the inlays for the interior of the box, and will be dyed blue before forming.

This material retains a glossy finish, enabling it to better match the outside of the packaging.

The world is increasingly turning to bio-plastics in many industries, which will cause more limited, expensive materials like Bio Flex to become more readily available.

Advantages:

PLA is very easy to thermoform as it has a high elongation tolerance before it breaks.

PLA is extremely durable and flexible, making it a good material for surrounding delicate parts.

Carbon emissions related to PLA production are 80% lower than other plastics.

Disadvantages:

Although bio-degradable, PLA takes a longer time to biodegrade than most other naturally manufactured materials.

Bio-degradable PLA is not able to be melted down with other plastics when being reused.

Prototype

Prototype

Prototype

Prototype

Prototype

Prototype


KIT 1
contents manual
WARNING
PROBE, CELL, and D5149 CARTRIDGE are delicate parts. Handle with care.
SECTION ONE
SECTION TWO
STAND
CELL
NEW HAND HEATER
PROBE (x2)
"CONSUMABLES"
CONSUMABLES BOX
METAL PLATE
SMALL PARTS BOX
TOP ADAPTER
ASSORTED PARTS
D5149 CARTRIDGE
BAG OF PARTS
"CELL"
"METAL PLATE"
"SMALL PARTS"
"PROBE"


KIT 1
contents manual
WARNING
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SECTION TWO
STAND
CELL
NEW HAND HEATER
PROBE (x2)
"CONSUMABLES"
CONSUMABLES BOX
METAL PLATE
SMALL PARTS BOX
TOP ADAPTER
ASSORTED PARTS
D5149 CARTRIDGE
BAG OF PARTS
"CELL"

Prototype


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contents manual
WARNING
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SECTION ONE
SECTION TWO
STAND
CELL
NEW HAND HEATER
PROBE (x2)
"CONSUMABLES"
CONSUMABLES BOX
METAL PLATE
SMALL PARTS BOX
TOP ADAPTER
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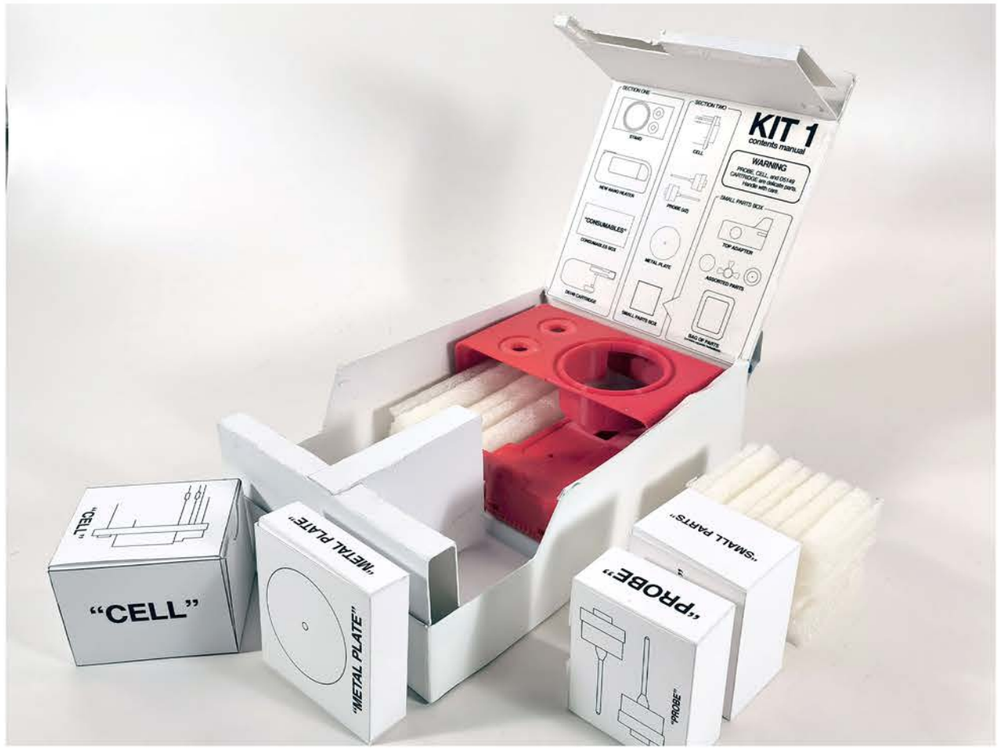
"CELL"
"METAL PLATE"
"SMALL PARTS"
"PROBE"


KIT 1
contents manual
WARNING
PROBE, CELL, and D5149 CARTRIDGE are delicate parts. Handle with care.
SECTION ONE
SECTION TWO
STAND
CELL
NEW HAND HEATER
PROBE (x2)
"CONSUMABLES"
CONSUMABLES BOX
METAL PLATE
SMALL PARTS BOX
TOP ADAPTER
ASSORTED PARTS
D5149 CARTRIDGE
BAG OF PARTS
"CELL"

Prototype

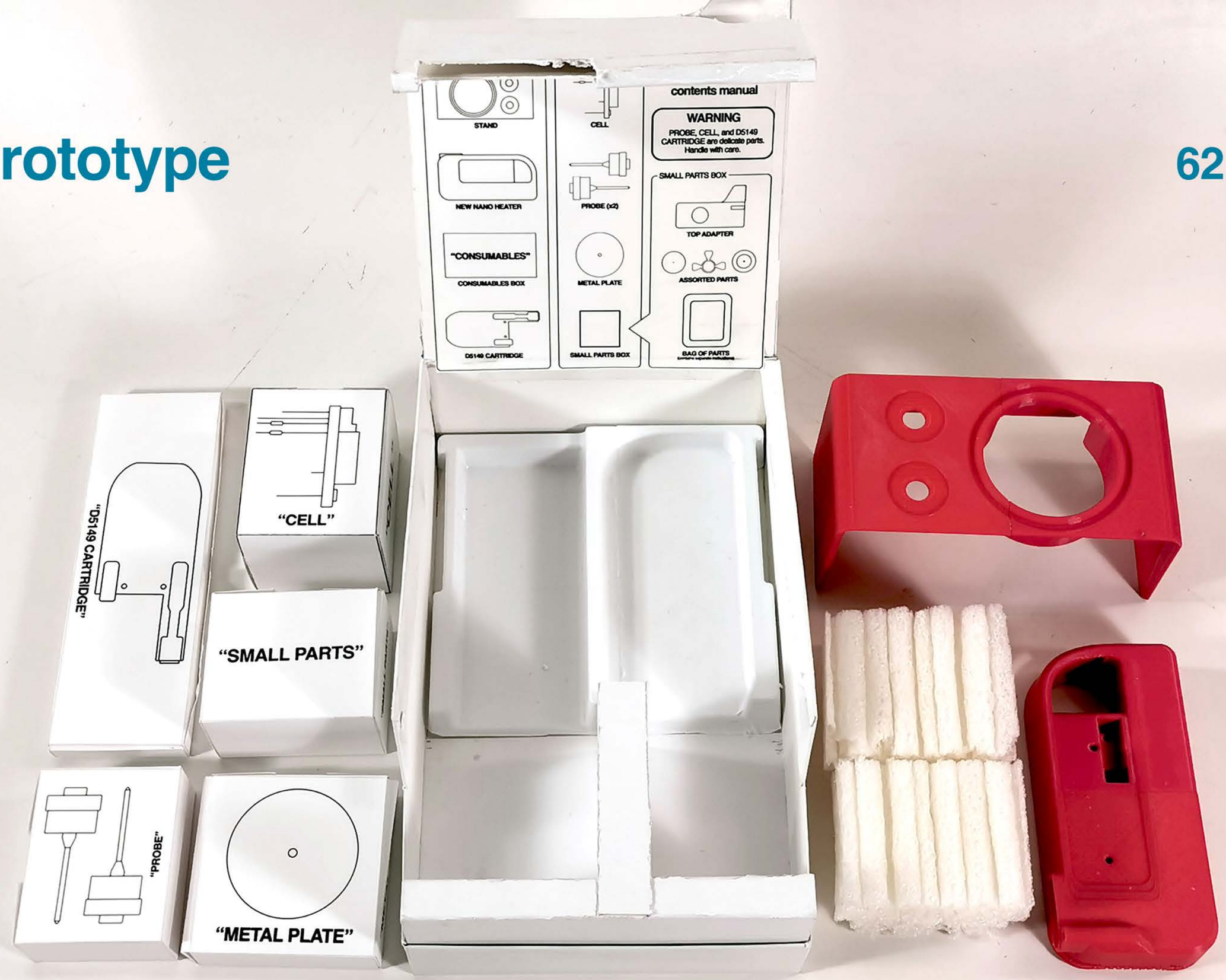

SECTION ONE
STAND
NEW NANO HEATER
"CONSUMABLES"
CONSUMABLES BOX
D5149 CARTRIDGE
SECTION TWO
CELL
PROBE (x2)
METAL PLATE
SMALL PARTS BOX
KIT 1
contents manual
WARNING
PROBE, CELL, and D5149 CARTRIDGE are delicate parts. Handle with care.
SMALL PARTS BOX
TOP ADAPTER
ASSORTED PARTS
BAG OF PARTS
"CELL"
"METAL PLATE"
"PROBE"
"SMALL PARTS"

Prototype

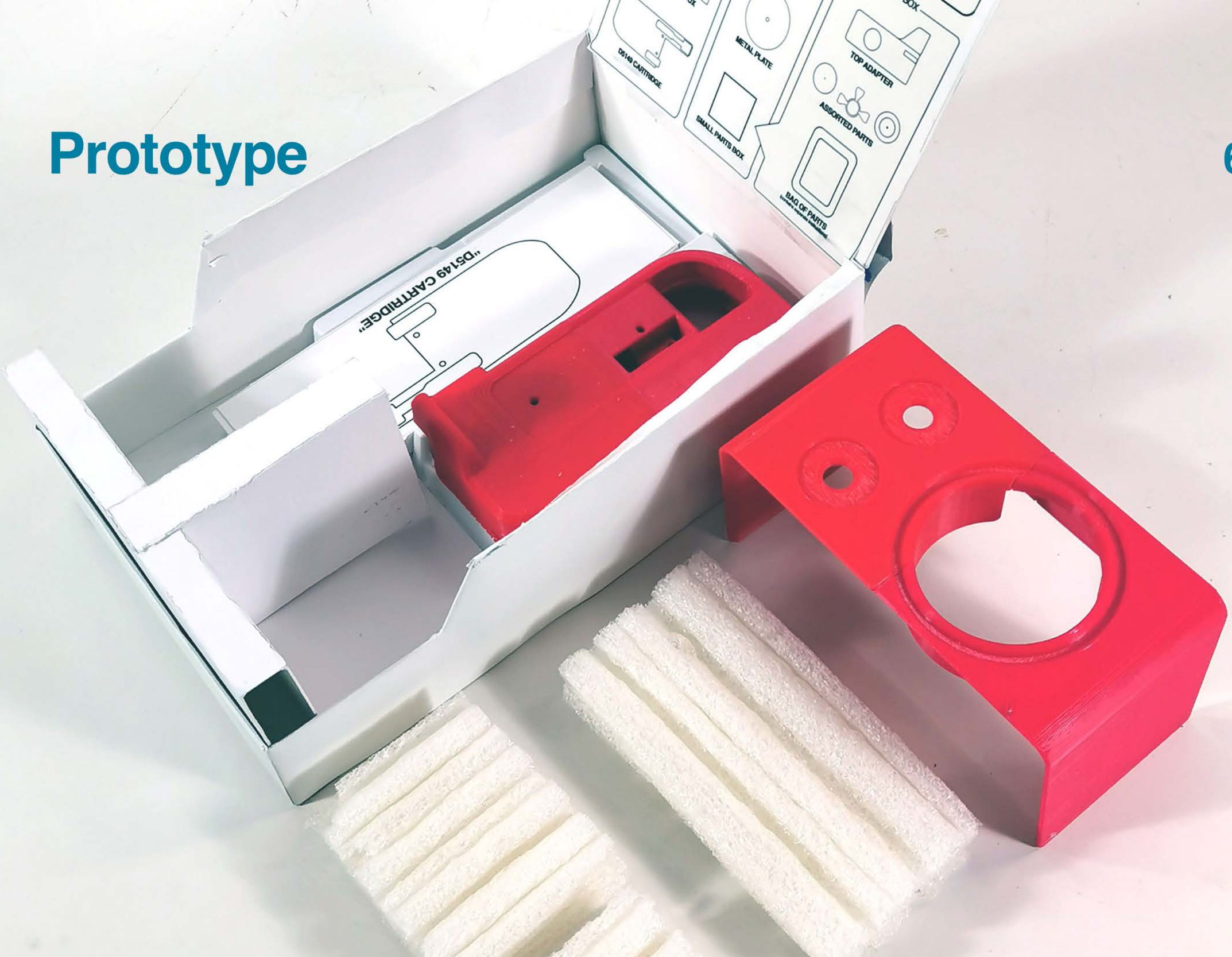

KIT 1
contents manual
WARNING
"CELL"
"METAL PLATE"
"PROBE"
"SMALL PARTS"


"CONSUMABLES"
METAL PLATE
"CELL"
"D5149 CARTRIDGE"
"SMALL PARTS"
"METAL PLATE"

Prototype


contents manual
WARNING
PROBE, CELL, and D5149 CARTRIDGE are delicate parts. Handle with care.
STAND
CELL
NEW NANO HEATER
PROBE (x2)
SMALL PARTS BOX
TOP ADAPTER
"CONSUMABLES"
CONSUMABLES BOX
METAL PLATE
ASSORTED PARTS
D5149 CARTRIDGE
SMALL PARTS BOX
BAG OF PARTS
"D5149 CARTRIDGE"
"CELL"
"SMALL PARTS"
"PROBE"
"METAL PLATE"

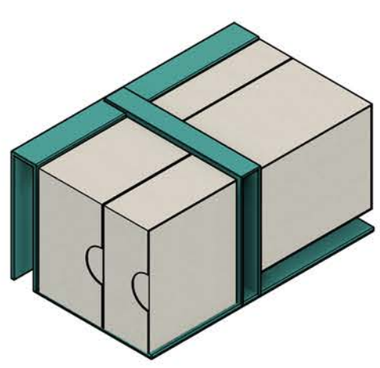
Prototype

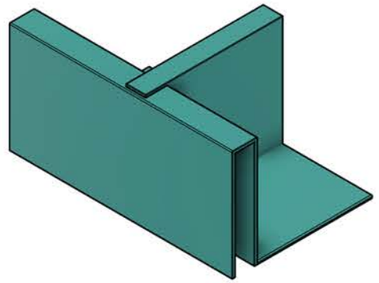

"D5149 CARTRIDGE"
D5149 CARTRIDGE
METAL PLATE
SMALL PARTS BOX
TOP ADAPTER
ASSORTED PARTS
BAG OF PARTS

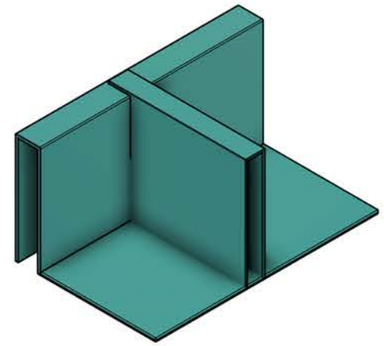
New Additions

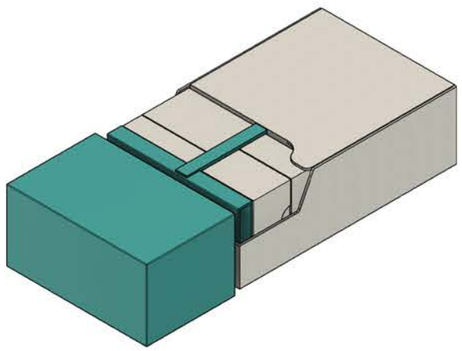
INLAY VERSION 2

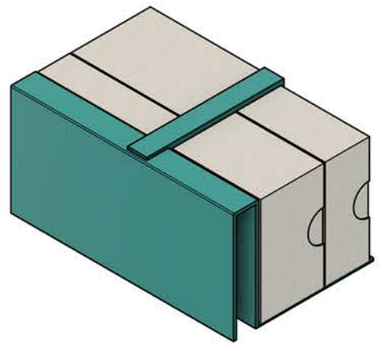
This new design abandons the previous complex shape and uses cardboard as new material, which is more sustainable. The simple shape reduces the difficulty of manufacturing and assembling, and the hollow part can act as a buffer when the package fell.

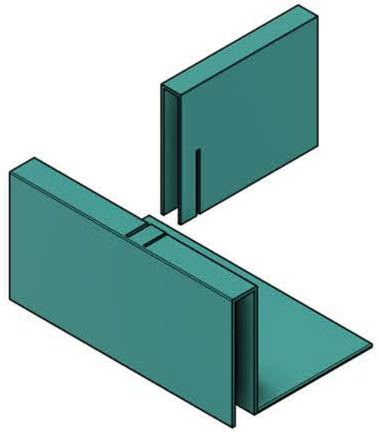


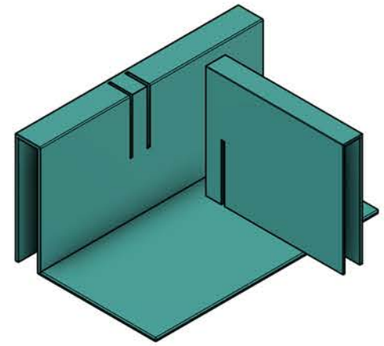












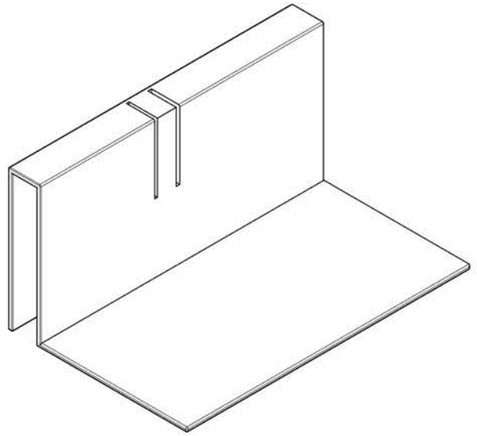
New Additions

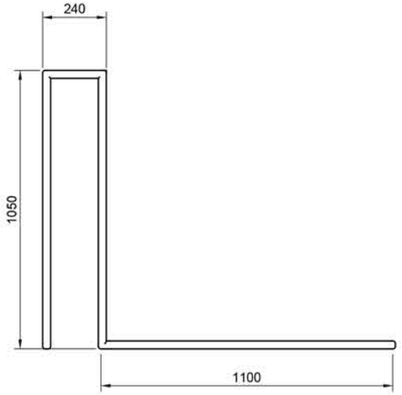
INLAY VERSION 2
DIMENSIONED VIEW

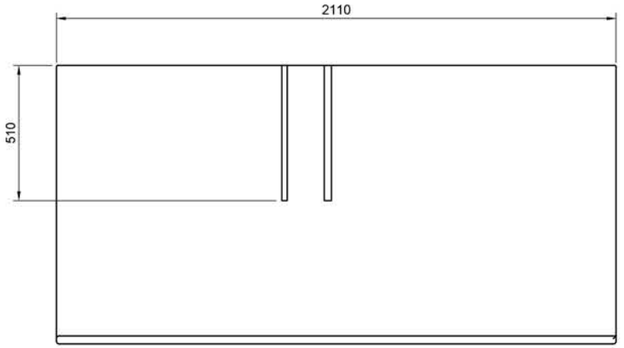
INLAY IS MADE OF CARDBOARD

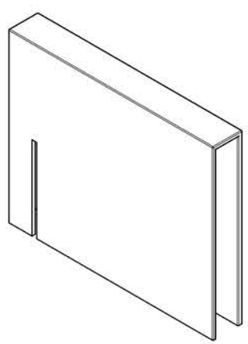
INLAY IS FOLDED INTO SHAPE

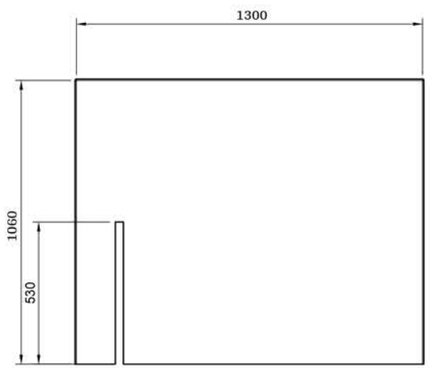
THICKNESS OF THE INLAY IS 2 MM.





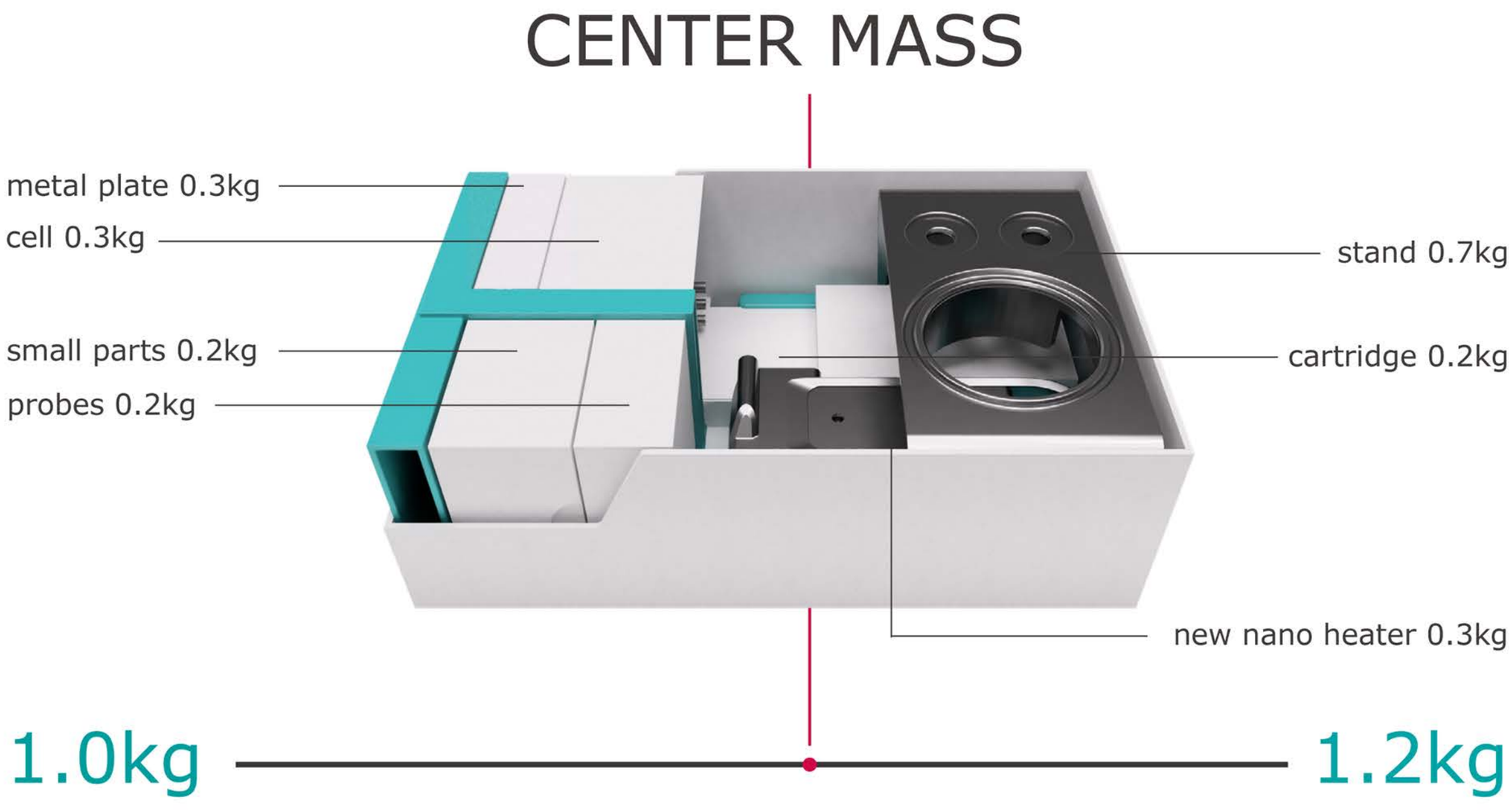






UNITS: MILLIMETERS
MARCH 30

Drop Test


CENTER MASS
metal plate 0.3kg
cell 0.3kg
small parts 0.2kg
probes 0.2kg
stand 0.7kg
cartridge 0.2kg
new nano heater 0.3kg
1.0kg
1.2kg

Drop Test


康師傅
茉莉清茶
Jasmine Tea Drink
500 mL
zéro sucre
XOXOX
baie d'acaï, bleuet
et grenade
vitaminwater
591 mL
Mocha
STARBUCKS
frappuccino
200 g


D5149 CARTRIDGE
SMALL PARTS BOX
BAG OF PARTS
康師傅
茉莉清茶
500 mL
STARBUCKS
frappuccino
Mocha
zero sugar
XOXOX
antioxidants
acai blueberry
pomegranate
Glaceau
vitaminwater
591 mL

Appendix A

3A

TEST BLOCK 3 Shock: First Sequence (Drop)

For STANDARD, SMALL, FLAT and ELONGATED

TEST SEQUENCE FOR PROCEDURE 3A

SHOCK - DROP

Complete the following test sequence for each type of package that has a check in the box:

☑Standard ☑Small (DO NOT test in bag) ☑Flat ☑Elongated

Step	Action
1	Follow the table below to determine the height and orientation for the first 9 drops.

Drop Number	< 32 kg (70 lb)	32-70 kg (70-150 lb)	Standard, Flat, Elongated, Small (not in bag)	Two-Dimensional Envelopes and Mailers (not in bag)
1	460 mm (18 in)	300 mm (12 in)	Edge 3-4	Edge 4
2	460 mm (18 in)	300 mm (12 in)	Edge 3-6	Edge 6
3	460 mm (18 in)	300 mm (12 in)	Edge 4-6	Edge 5
4	460 mm (18 in)	300 mm (12 in)	Corner 3-4-6	Corner 4-6
5	460 mm (18 in)	300 mm (12 in)	Corner 2-3-5	Corner 2-5
6	460 mm (18 in)	300 mm (12 in)	Edge 2-3	Edge 2
7	460 mm (18 in)	300 mm (12 in)	Edge 1-2	Edge 5
8	910 mm (36 in)	600 mm (24 in)	Face 3	Face 3
9	460 mm (18 in)	300 mm (12 in)	Face 3	Face 1

2	Shock test is now complete. Go to TEST BLOCK 4 (Vibration Under Dynamic Load).

3A

TEST BLOCK 4 Vibration Under Dynamic Load (Over-The-Road spectrum)

For STANDARD, FLAT and ELONGATED

TEST SEQUENCE FOR PROCEDURE 3A

VIBRATION - DYNAMIC LOAD, RANDOM (using OVER-THE-ROAD spectrum)

Complete the following test sequence for each type of package that has a check in the box:

☑Standard ☐Small ☑Flat ☑Elongated

Step	Action	Testing Orientation	Vibration Duration
1	**IF the test specimen is…**	**THEN…**	
	An unpackaged pail or short cylinder (not in a box or other outer container)	Go to TEST BLOCK 5 (Vibration for Unpackaged Pails and Short Cylinders).	
	Small	Go to TEST BLOCK 6 (Vibration – Over-the-Road).	
	Standard, Flat or Elongated	Go to Step 2.	
2	Place the packaged-product on the vibration table so that face-3 rests on the center of the platform.	FACE 3 on table surface	60 MINUTES
3	Place the Dynamic Top-Load apparatus as determined in Before You Begin Vibration Under Dynamic Load for TL-H on top of the test specimen.*		
4	Using some form of column stack fixturing, make sure that the stack will maintain its orientation without restricting the vertical motion of the Top-Load apparatus or the test specimen.		
5	Start the vibration machine to produce the Over-the-Road random vibration spectrum indicated in Before You Begin Vibration Testing.		
6	After 60 minutes, stop the vibration testing and remove the Dynamic Top-Load apparatus.		
7	Rotate the test specimen so that face-4 rests on the center of the vibration table platform.	FACE 4 on table surface	30 MINUTES
8	Place the Dynamic Top-Load apparatus as determined in Before You Begin Vibration Under Dynamic Load Testing for TL-W on top of the test specimen.*		
9	Using some form of column stack fixturing to make sure that the stack maintains its orientation without restricting the vertical motion of the Top- Load apparatus or the test specimen.		
10	Start the vibration machine to produce the Over-the-Road random vibration spectrum indicated in Before You Begin Testing.		
11	After 30 minutes, stop the vibration testing and remove the Dynamic Top-Load apparatus.		

* If the test item is an elongated packaged-product with a non-rectangular cross-section (round tube, triangular tube, etc.), **do not** use a Dynamic Top-Load in the large-face-down orientations.

Continued next page

3A

TEST BLOCK 4 CONTINUED Vibration Under Dynamic Load (Over-The-Road spectrum)

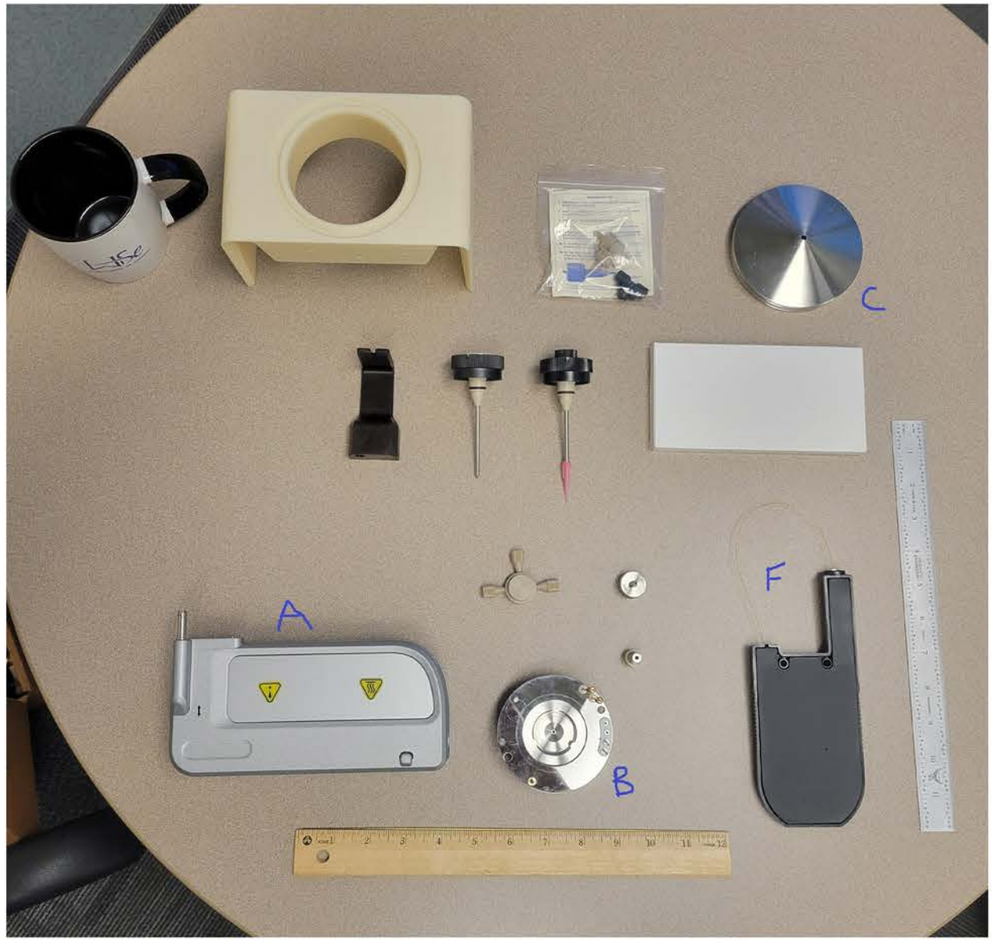
For STANDARD, FLAT and ELONGATED

TEST SEQUENCE FOR PROCEDURE 3A

Continued from previous page

Step	Action	Testing Orientation	Vibration Duration
12	Rotate the test specimen so that face-6 rests on the center of the vibration table platform.	FACE 6 on table surface	30 MINUTES
13	Place the Dynamic Top-Load apparatus as determined in Before You Begin Vibration Under Dynamic Load for TL-L on top of the test specimen.		
14	Using some form of column stack fixturing, make sure that the stack will maintain its orientation without restricting the vertical motion of the Top-Load apparatus or the test specimen.		
15	Start the vibration machine to produce the Over-the-Road random vibration spectrum indicated in Before You Begin Vibration Testing.		
16	After the completion of 30 minutes, stop the vibration testing and remove the Dynamic Top-Load apparatus.		
17	This vibration testing is complete. Go to TEST BLOCK 7 (Vibration – Pick-Up and Delivery).		

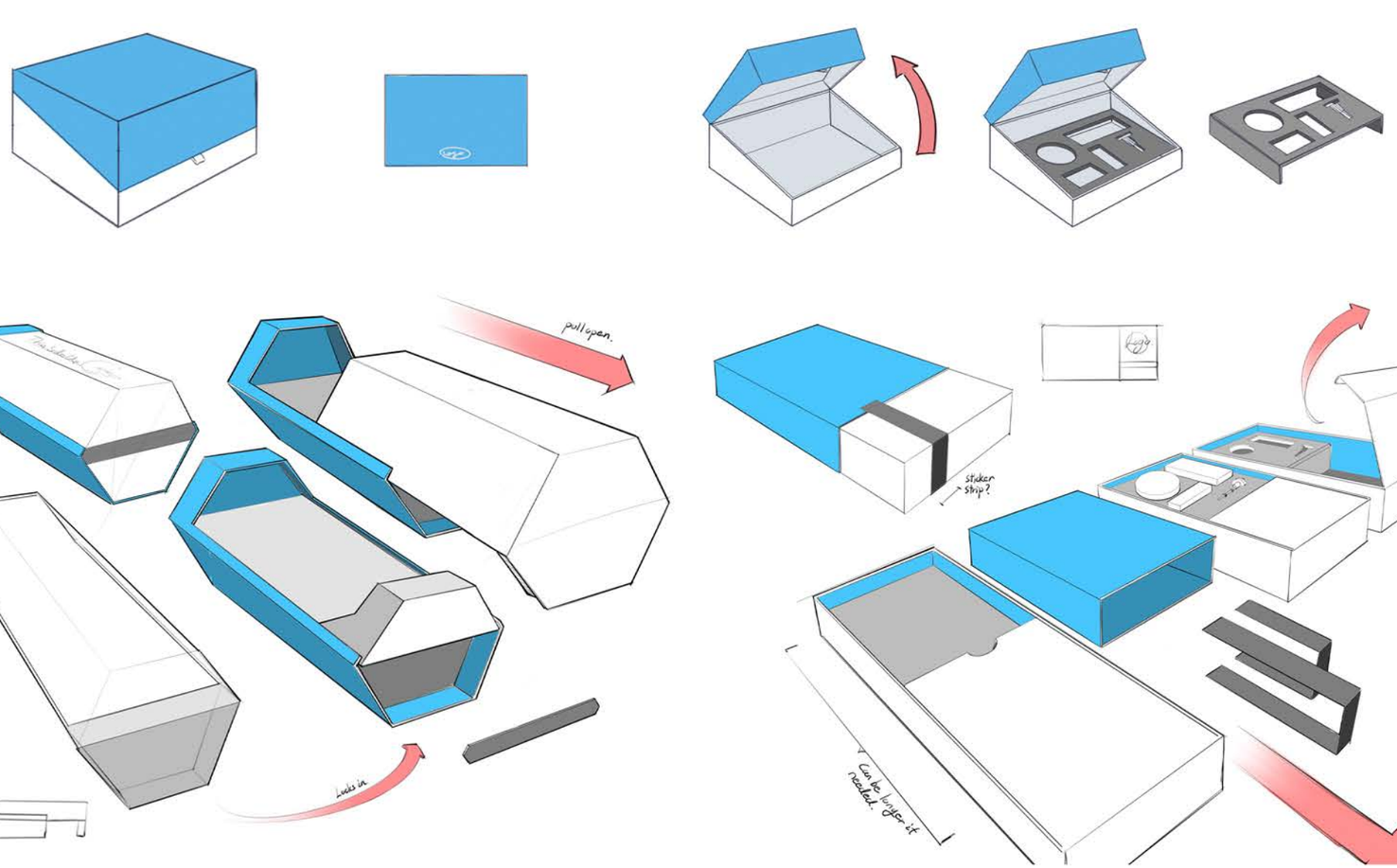
Appendix B



Kit 1 (part A is New Nano Heater)

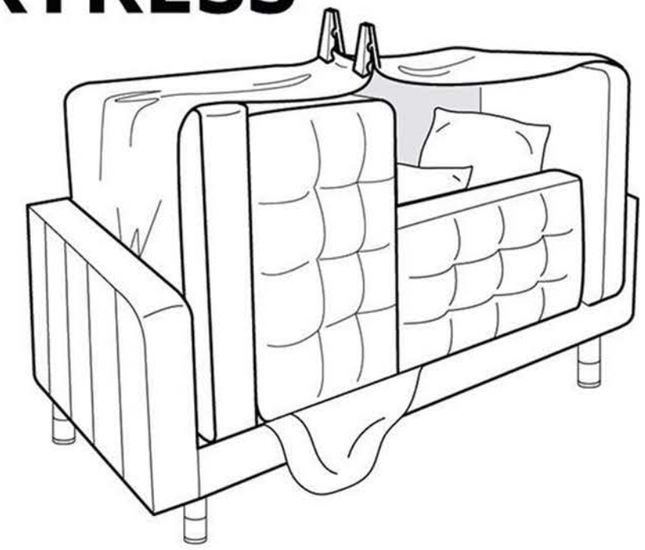
Kit 2 (part D is Old Nano Heater)

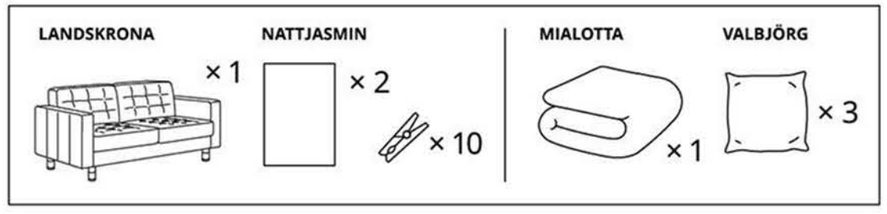
Appendix C



Appendix D

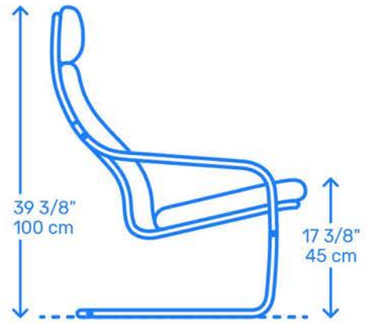
FÖRTRESS

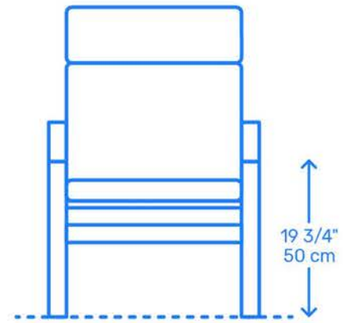


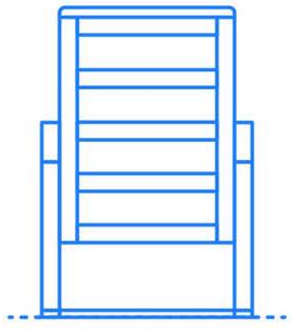


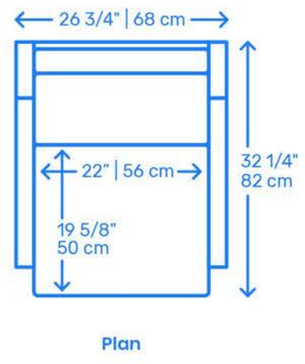
Make sure that the structure is safe. Do not leave children unattended.
The suggested examples are not ofcial IKEA user guides for IKEA products.
If you can't And the products referred to in the instructions, use similar ones.

Dimensions.Guide | IKEA Poäng Armchair

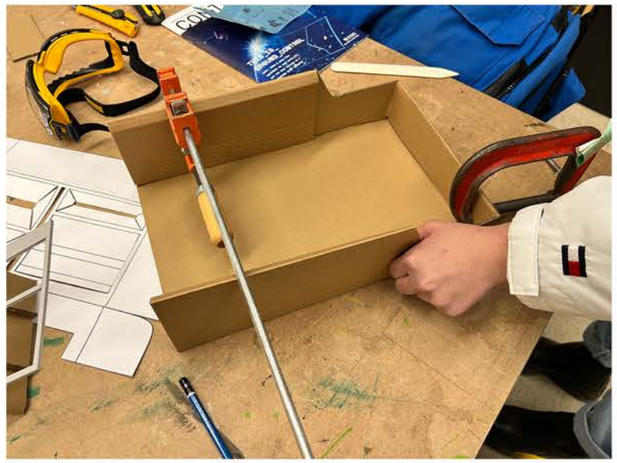


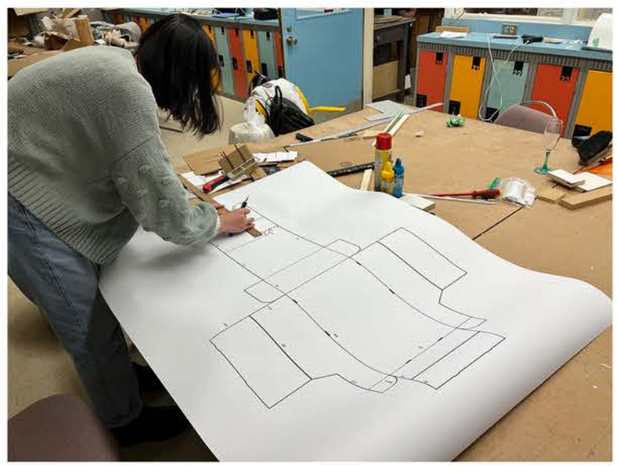






Appendix E





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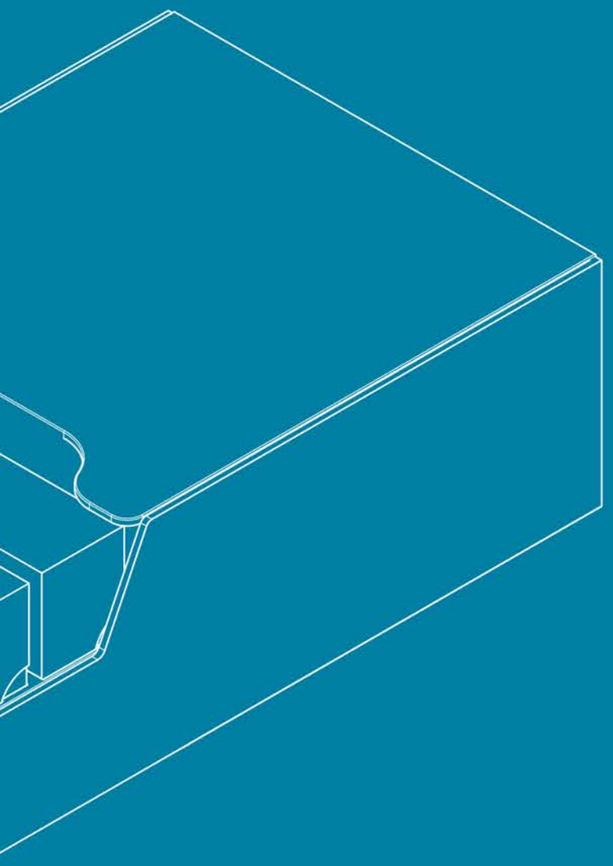

THANKS FOR WATCHING