

Agrofelis Protective Covers Design and Fabrication

Documentation

Agrofelis

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Abstract

The document builds on the Agrofelis frame design and fabrication documentation by detailing the protective covers of the vehicle, including their schematics and the source code files utilized for a CNC plasma cutter. Additionally, photographic material offers insights into the manufactured parts. A list of components and indicative suppliers that comprise the bill and material information for isolating the robot from its external environment, is documented.

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Introduction

To protect the robot from the harsh environment prevalent in agricultural fields, where dust, dirt, rocks and rain are expected, protective covers were designed and fabricated from black iron sheet of 2mm and 3mm thickness. The rigid detachable cover parts, conveniently provide access to the compartments of the robotic vehicle. The covers are secured to the vehicle using 8mm bolts, attaching to its front, back, top, bottom, left, and right sides. While the side covers are quantised by smaller parts, the top and bottom parts were manufactured with fewer and larger parts to provide additional protection by minimizing the number of intersections. The larger parts were fabricated using a grinder, while the remainder were produced with our small DIY plasma cutter.

In the following sections, the details for fabricating the Agrofelis Robot protective covers are documented.

Protective Covers

The vehicle's detachable covers amount to a total of 25 items. Most items of the left and right sides are symmetrical, with two exceptions that feature additional cavities to accommodate the vehicle's main power switch and charging socket. The following diagram visualizes the vehicle's protective covers.

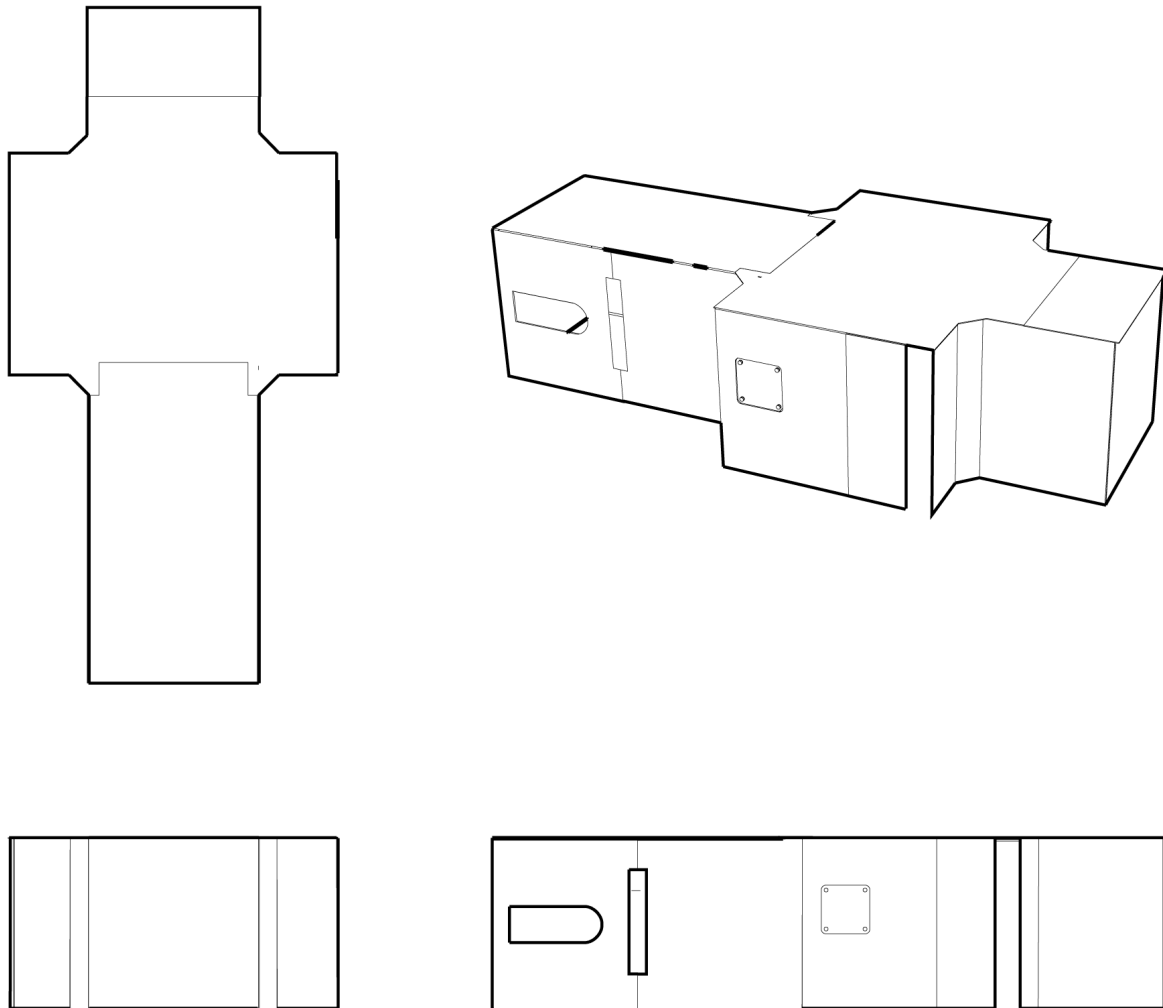


Figure 1: Covers overview

More specifically, the following schematic enumerates all plasma-cut covers. For the sake of simplicity, the symmetric left side items were omitted.

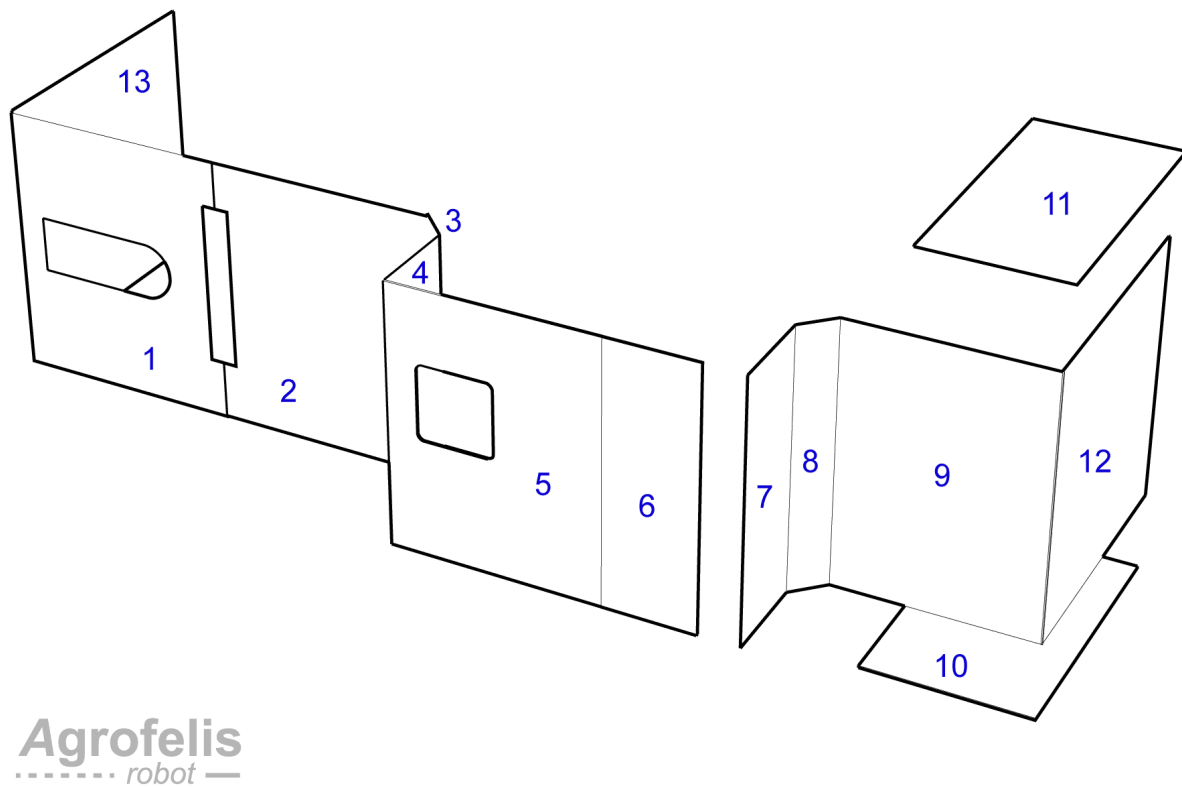


Figure 2: Covers enumeration

The consequent table, following the depicted enumeration, lists the item part, the Scalable Vector Graphic (SVG) design file and its derived Numerical Control (NC) file driving the CNC plasma cutter.

Part	Symmetrical	Side	SVG file	NC file
1	No	Right	cover_r1_normalised.svg	cover_r1_normalised.nc
1	No	Left	cover_l1_normalised.svg	cover_l1_normalised.nc
2	No	Right	cover_r2_normalised.svg	cover_r2_normalised.nc
2	No	Left	cover_l2_normalised.svg	cover_l2_normalised.nc
2	Yes	Right	cover_r2_side_door_normalised.svg	cover_r2_side_door_normalised.nc
3	Yes	Right	cover_r3_normalised.svg	cover_r3_normalised.nc
4	Yes	Right	cover_r4_normalised.svg	cover_r4_normalised.nc
5, 6	Yes	Right	cover_r56_normalised.svg	cover_r56_normalised.nc
7, 8	Yes	Right	cover_r78_normalised.svg	cover_r78_normalised.nc
9	Yes	Right	cover_r9_normalised.svg	cover_r9_normalised.nc
10	Yes	Right	bottom_front_normalised.svg	bottom_front_normalised.nc
11	Yes	Right	top_front_normalised.svg	top_front_normalised.nc
12	Yes	Right	cover_front_normalised.svg	cover_front_normalised.nc
13	Yes	Right	cover_back_normalised.svg	cover_back_normalised.nc

Non-symmetrical parts 1 and 2 are provided for both the left and right sides, while symmetrical parts 3-9 are provided just for the right side since they are identical to their left counterparts.

Part 2 on the right side also includes the design blueprint for fabricating a side door with its sealing cover, as depicted in the following diagram. The side door is used to provide access to the charging socket of the vehicle.

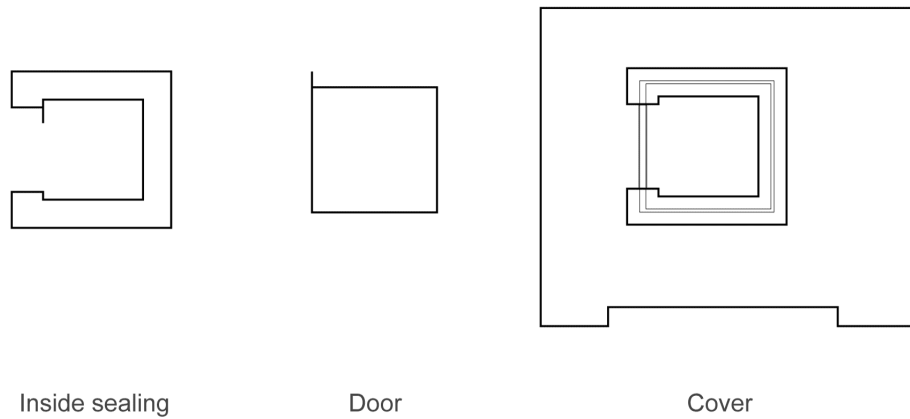


Figure 3: Cover side door

The fabricated side door, as seen from within the vehicle, can be viewed in the following photograph.



Figure 4: Door photo internal

Likewise, the next photograph displays the door from its outer side.

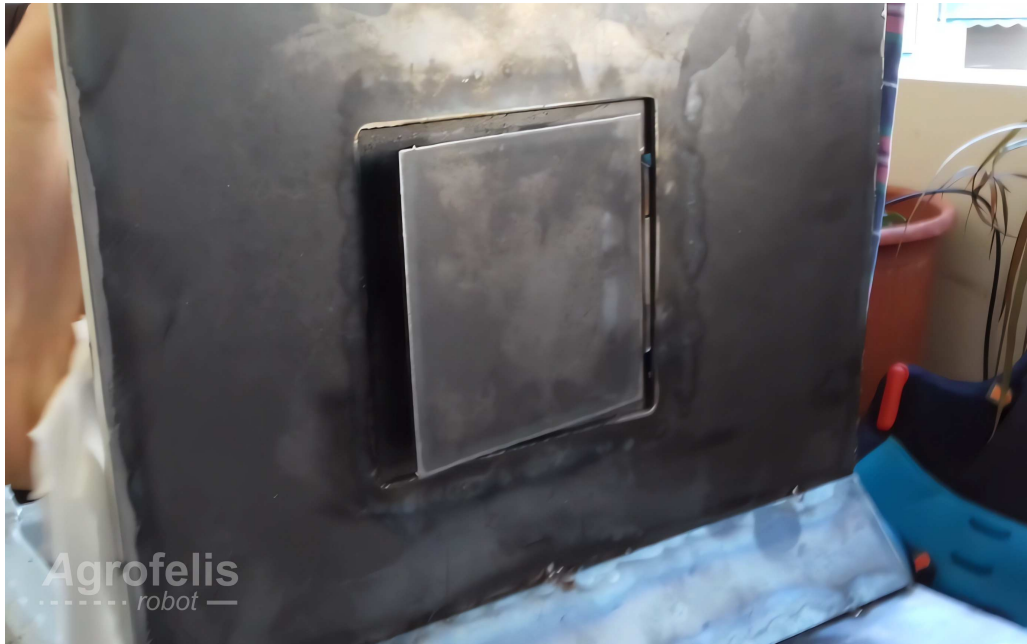


Figure 5: Door photo external

The following diagram lays out all covers made out of a 2mm thickness iron sheet. It also outlines the approximate area these covers occupy within a standard metal sheet profile of 1 by 2 meters.

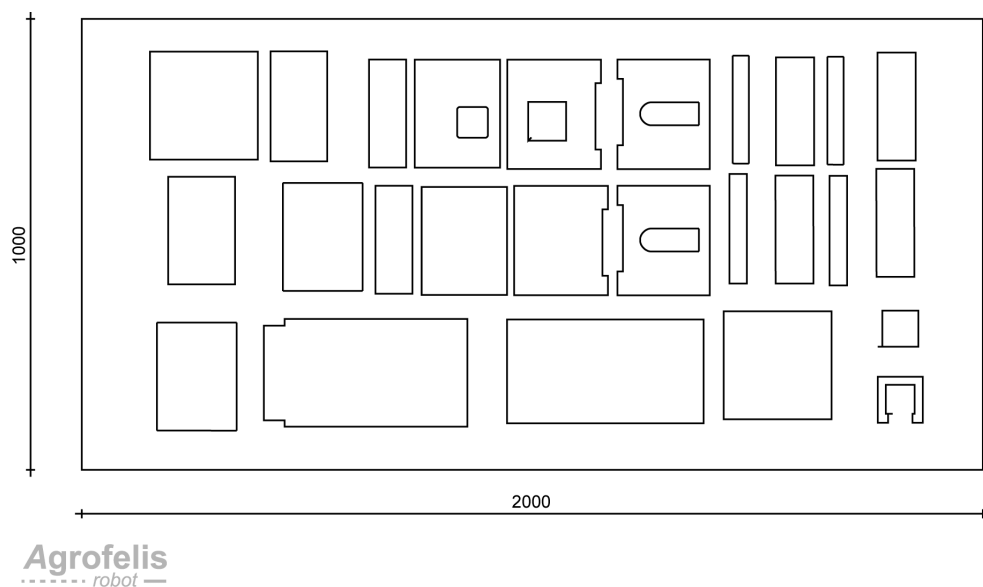


Figure 6: Metal sheet 2mm covers

The following photograph shows the plasma cutter fabricating the left-side part 2 cover.



Figure 7: Plasma cut photo a

To provide additional protection, a 3mm black iron sheet was employed to completely overlay the battery compartment. The following schematic encodes the dimensions for the cover's silhouette, which had to be fabricated manually due to its size exceeding the capacity of our DIY plasma cutter.

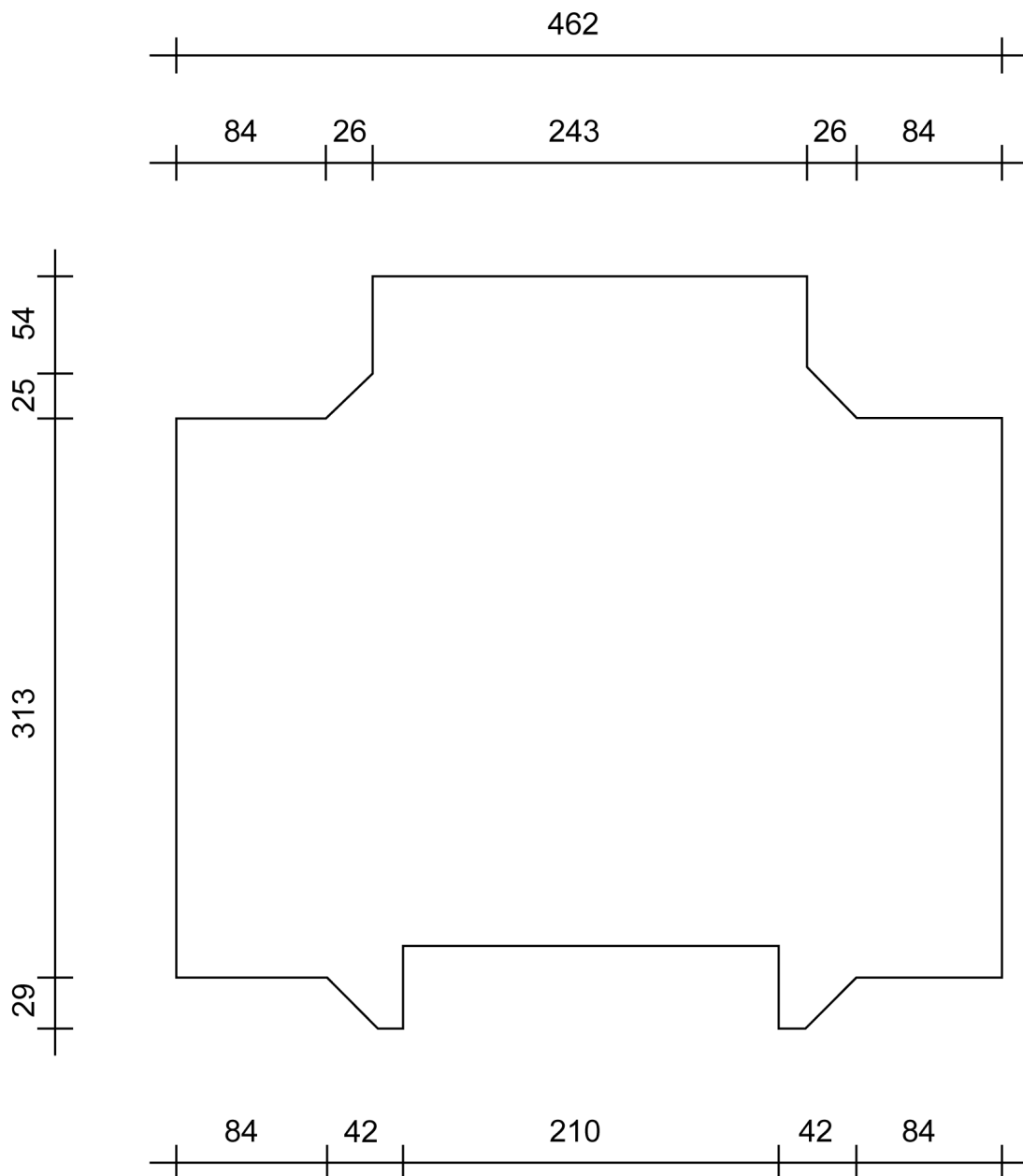


Figure 8: Battery cover 3mm schematic

The top back and bottom back covers were also too large to be produced by our DIY plasma cutter. The silhouette dimensions are annotated in the following schematic.

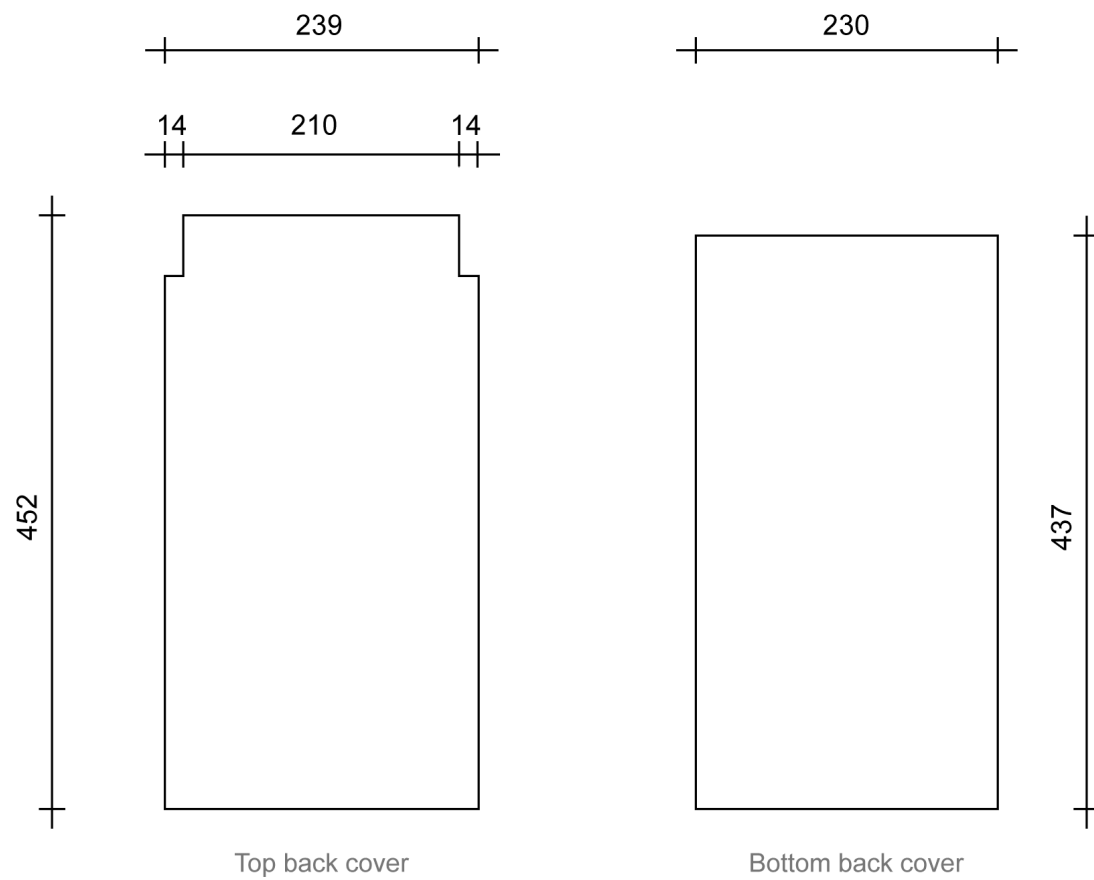


Figure 9: Top bottom back cover

The fabricated details of the battery cover and the top back cover as these are mounted consequently in the vehicle, are showcased by the consequent photo.



Figure 10: Battery cover actual

The fabricated left-side part 1 and 2 covers mounted in the vehicle, are showcased by the following photo.



Figure 11: Covers photo a

The next photograph depicts the detail of the back left-side covers. as these change into the battery compartment, specifically parts 1-6.

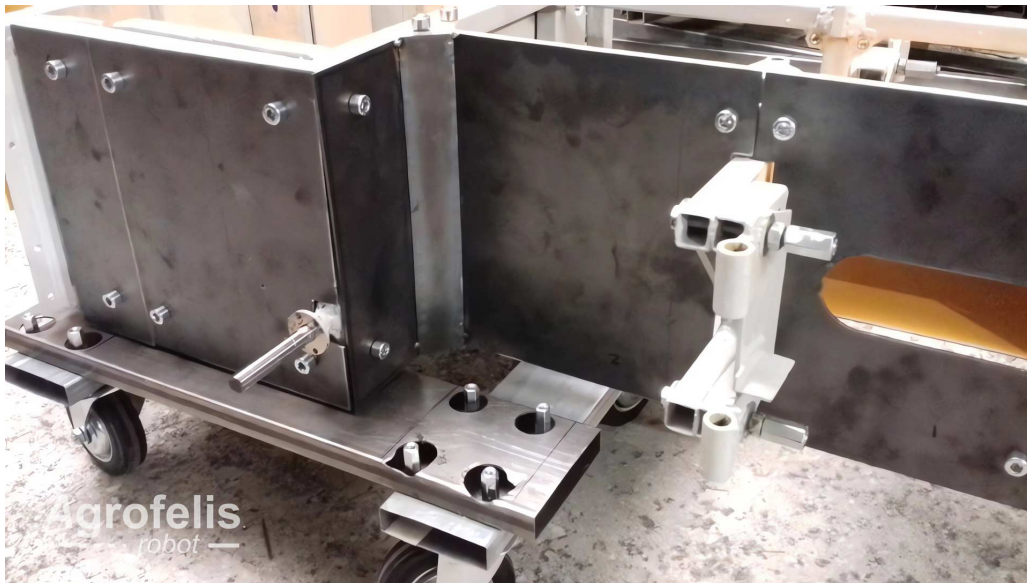


Figure 12: Cover photo b

The following photo snapshots the covers in the process of drying after being coated with primer and orange oil paint.



Figure 13: Covers painted

Covers Material and Indicative Suppliers

The following table lists the individual components employed for manufacturing the Agrofelis frame's protective covers. The index table includes moreover the product URLs, the indicative suppliers, as well as the unit price total amount.

No.	Product	Product URL	Supplier	Used Quantity	VAT Price (€)	Subtotal (€)	Note
#1	Black iron metal sheet 1000x2000x3mm	3mm metal sheet	QOOP Metalworks	0.25	73.85	18.50	-
#2	Black iron metal sheet 1000x2000x2mm	2mm metal sheet	QOOP Metalworks	1	49.23	49.23	-
#3	750ml Vitex Metal Primer	Primer	Stereotiki	0	6.50	0.00	Reused from frame material
#4	Orange oil paint 0,75kg	Metal paint	Bousounis	1	9.70	9.70	-
#5	Brushes	Brush	Nova Ceramica	3	1.00	3.00	-
#6	White spirit	White spirit	Rigatos Shop	1	1.50	1.50	-
#7	Paper sheet	Paint paper	Xromagora	0	0.80	0.00	Reused from frame material
#8	40mm x 40mm hinge	Door hinge	Zalonis	1	0.60	0.60	-
Total						82.53	

Consequently, we observe that the total manufacturing cost of the Agrofelis protective covers, excluding expenses for shipping, cutting, welding and painting, is approximately **83** euros.

Summary

This document has provided a comprehensive illustration and enumeration of all the vehicle's covers. The design blueprints for the cover parts as well as the plasma-cut source files were organized and indexed. Additionally, the raw materials needed to fabricate the vehicle's protective covers were documented and linked to indicative suppliers. To conclude, an image of the vehicle, positioned vertically on a transferring platform with most of its covers attached, is presented below.



Figure 14: Covers established

End of document