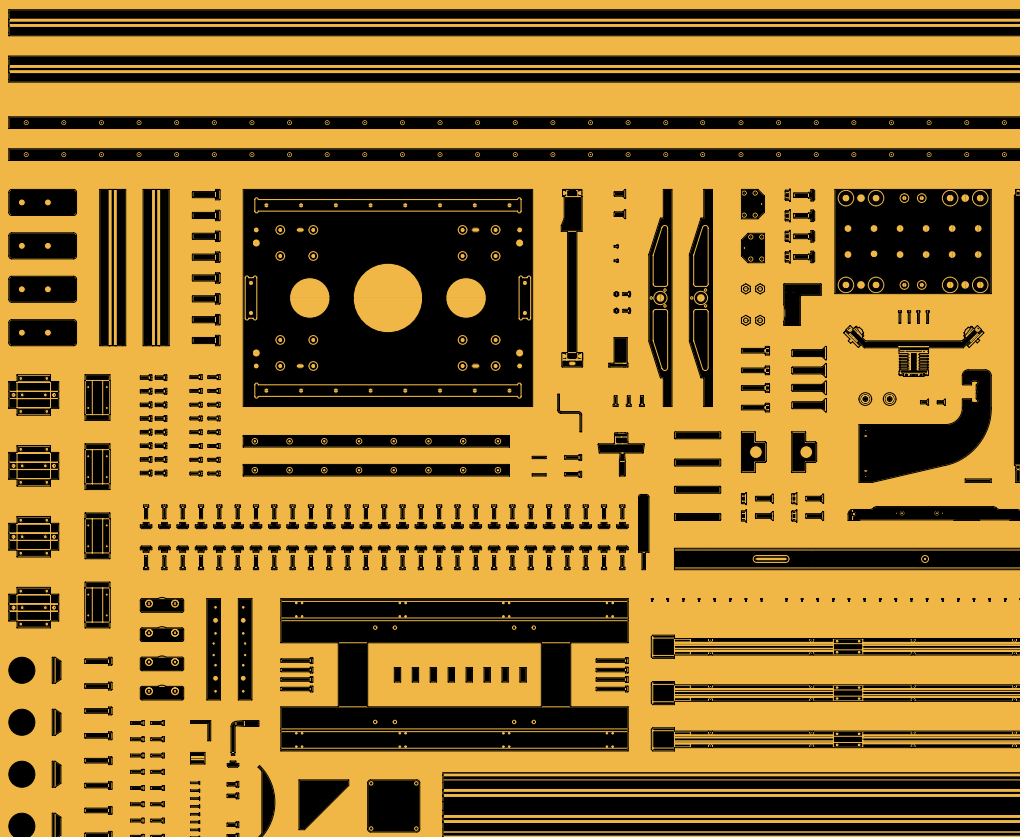


Lucida 3D Scanner

Factum Foundation



Training guide I: Assembly instructions



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1

**Welcome.
Let's get started**

<<<

Virgin, anonymous, oil on canvas, 82 x 110 cm (detail).
3D scanned in 2011 in Factum Arte, Madrid.

Specifications

Laser diode

Manufacturer and model: Laser Components ADL-65075TA2

Type: Auto Power Controlled Laser Diode. Stable light power output, compact size, high brightness laser light source

Wavelength: 650 nm

Power: 5 mW

Cameras

Manufacturer and model: IDS UI-1221LE-M-GL

Type of cameras: Monochrome

Sensor: CMOS Mono by Aptina Imaging

Lens: Sunex DSL-300 EFL=17.1 f/4.2

Data transmission speed: max 25 Mbytes/s per camera

Interface: USB 2.0

Resolution: 752 x 480 pixels

Microcontroller

Chip: 8-bit Atmel AVR Atmega 328

Clock speed: 16MHz

Operating Voltage: 5V

Linear motion

Manufacturer and model: Haydon Kerk RGS06 Motorized hybrid linear rails & actuators

Data features

File formats: 3D (RIS), 3D (32 bit-TIFF), 3D (16 bit-TIFF), 2D render (8-bit TIFF), raw video (AVI)

Point resolution: 10,000 points per cm²

Megabytes per m²: RIS (420 MB), 3D depthmap 32bit-TIFF (420 MB), 2D render 8bit-TIFF (88 MB), AVI (272 GB)

How does it work?

Designed and developed by the artist Manuel Franquelo, Lucida has been created to obtain contact-free, high-resolution 3D data out of the surface of paintings and low-relief objects.

The system projects a thin beam of red light onto the surface of the painting. As the beam moves across the object the distortions caused by the surface fluctuation are recorded by two video cameras positioned either side of the laser. The video footage is archived as raw data as well as processed as a tonal depthmap.

Scanning features

Depth of field: 25 mm

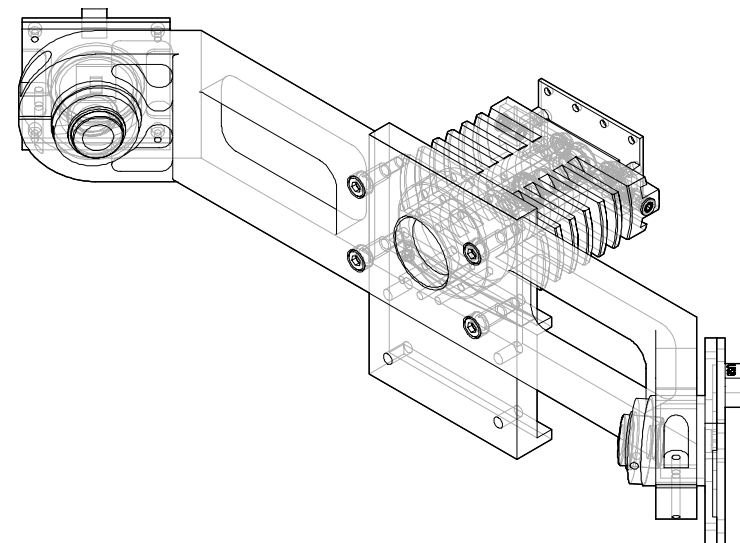
Maximum scanning depth using Z axis: 200 mm

Distance to the target: 65-90 mm

Maximum scanning area (m²):

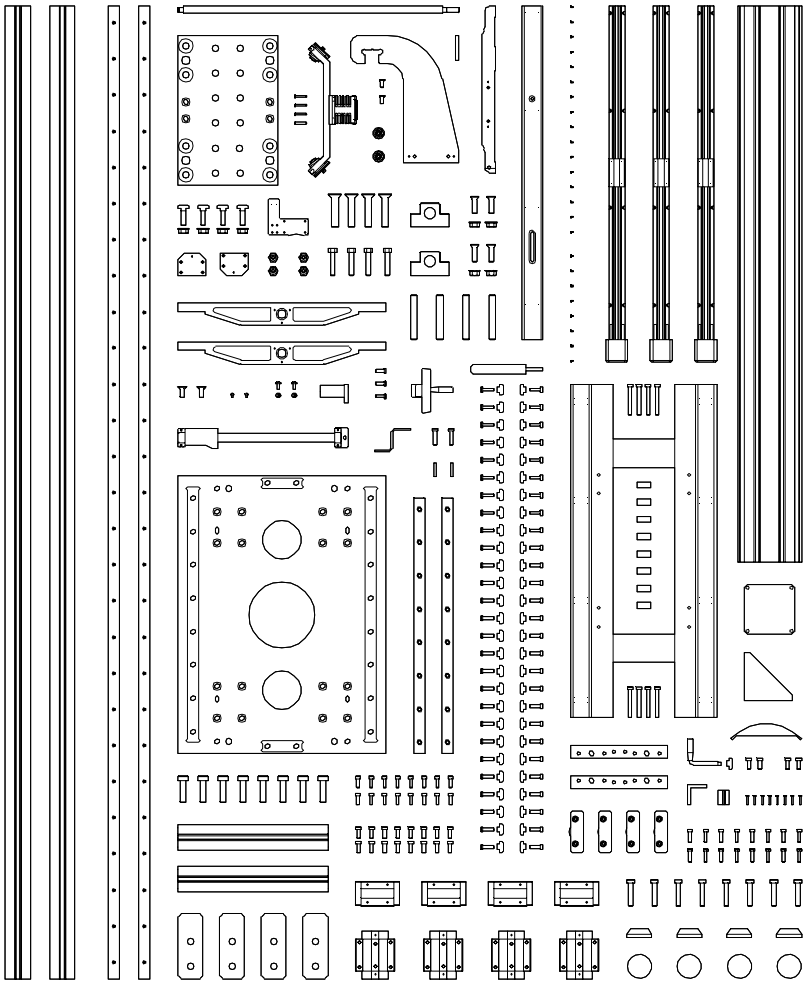
Only limited by storage capacity and structural frame

Scanning speed (m²/h): ca. 0.25



Components

What's in the case?



Components

Ref.	Units	Component
01	1	Calibration arm
02	1	Calibration stand
03	1	Calibration dowel pin
04	1	Calibration threaded handle
05	1	Scanner head
06	1	Shim plate
07	1	Horizontal linear guide
08	1	Horizontal channel
09	2	Carriage connection plate
10	2	Vertical linear guide
11	1	Backing frame
12	8	Stand-off
13	4	Carriage
14	2	Carriage plate
15	1	Brake connecting profile
16	1	Brake connecting plate
17	1	Brake handle
18	1	Tower profile 1000 mm + Profiles + Guide rods
19	1	Tower cap
20	1	Square
21	1	Square cap
22	1	Tower plate
23	2	Beam
24	1	Threaded plastic piece
25	1	Lead screw
26	2	Bearing
27	2	Bearing mount
28	1	Hand wheel
29	4	Carriage
30	2	Guide

Components

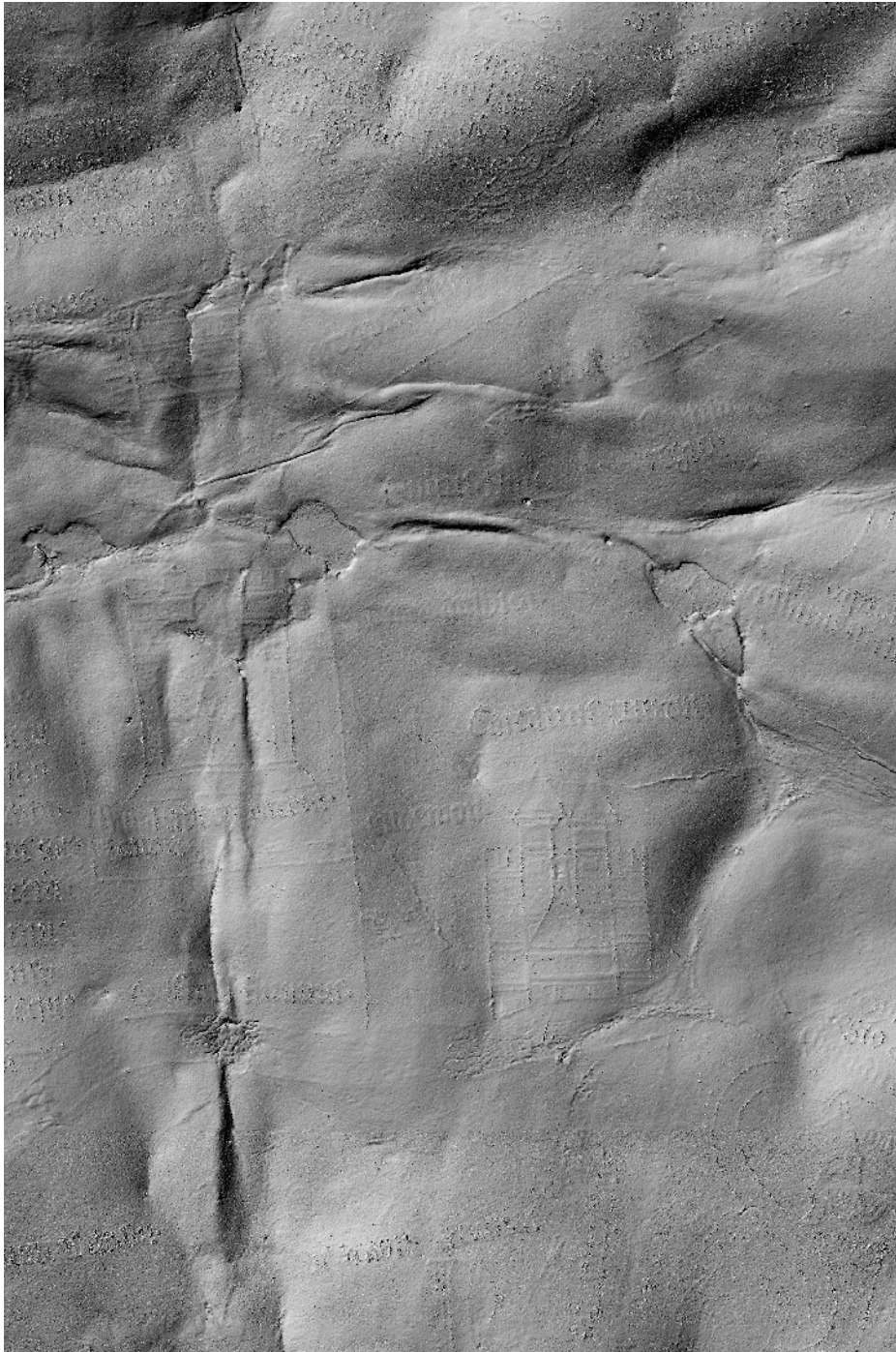
Ref.	Units	Component
31	1	Digital caliper
32	1	Digital caliper connecting plate
33	1	Base plate
34	4	Carriage
35	2	Guide 1750 mm
36	4	Profile 1750 mm
37	4	Profile 270 mm
38	4	End plate
39	4	Adjustable foot
40	4	Foot cap

Components. Accessories

Ref.	Units	Component
41	1	Controllers box and wires
42	1	Controllers AC adaptor
43	1	Power cable
44	1	USB cables set
45	1	USB extensions set
46	1	Allen keys set
47	1	Spanners set
48	1	Micro-screwdrivers set
49	1	Laptop
50	1	Laptop AC adaptor
51	1	Laptop mouse
52	1	Laptop bag
53	1	Long rectangular case
54	1	Large square case

Components. Screws and nuts

Ref.	Units	Component
A	2	M6 x 24 Socket head cap screw
B	2	4.5 x 24 mm Cylindrical dowel pin
C	4	No 6-32 x 1/2 Socket head cap screw
D	8	M3 x 0.5 Socket head cap screw
E	2	M6 x 5 Socket countersunk head screw + nuts
F	8	No 6-32 x 1/2 Socket head cap screw
G	16	M3 x 5 Socket head cap screw
H	8	M6 x 45 Socket head cap screw
I	2	M6 x 15 Socket head cap screw
J	2	M6 x 15 Socket head cap screw
K	4	M12 x 50 Socket countersunk head screw
L	8	M8 x 25 Bosch FS7 + Nuts
M	4	M8 x 25 Bosch FS7 + Nuts
N	4	M12 x 22 Socket countersunk head screw
O	3	M5 x 14 Socket head cap screw
P	4	M8 x 40 Hexagonal head
Q	16	M5 x 20 Socket head cap screw
R	2	M5 x 10 Pan cross head + Nuts
S	2	M5 + Nuts
T	2	M3 + Nuts
U	16	M5 x 20 Socket head cap screw
V	16	M6 x 15 Socket countersunk head screw
W	58	M6 x 20 Socket countersunk head screw
X	8	M8 x 40 Socket head cap screw
Y	4	B12 x 40 Socket head cap screw
Z	4	M12 x 90 Threaded rod + Nuts



2

Setting up


<<<


Hereford Mappa Mundi, c. 1300, ink on vellum, 158 x 133 cm (detail).
3D scanned in 2012 in Hereford Cathedral, England.

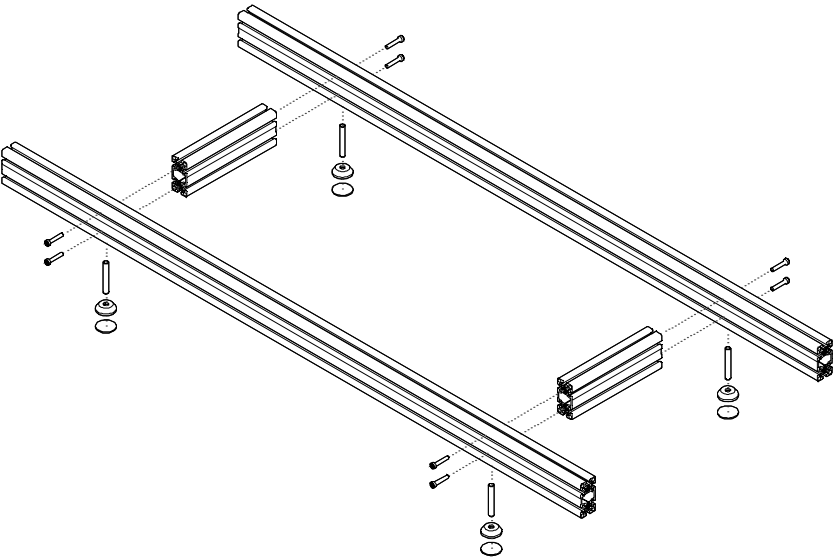
Step 01/16

Components:

- 40 (4x) Foot cap
- 39 (4x) Adjustable foot
- 37 (2x) Profile 270 mm
- 36 (2x) Profile 1750 mm

X	
	8 units M8 x 40


Z	
	4 units M12 x 80

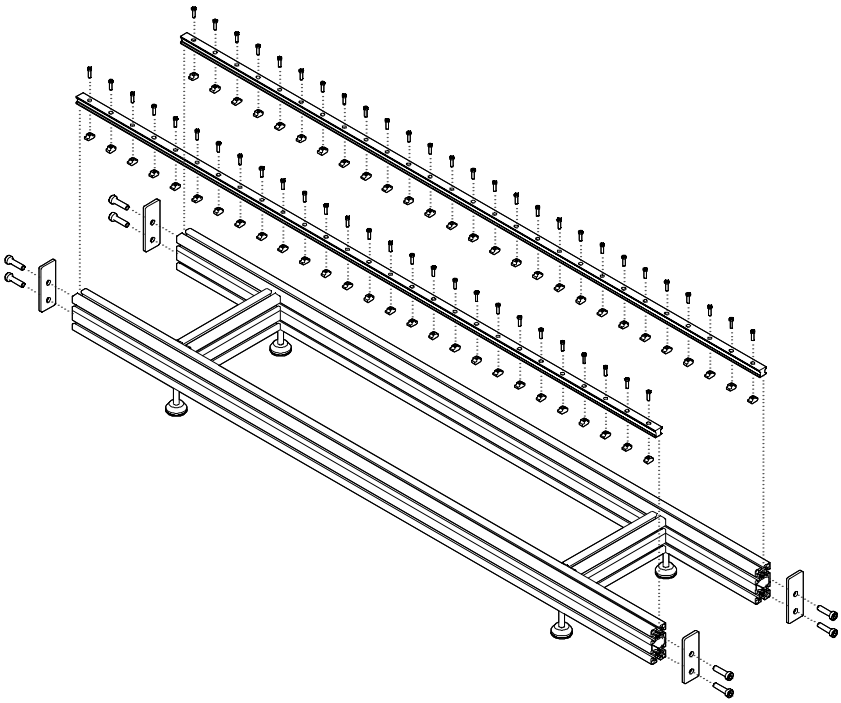


Step 02/16

Components:



- 38 (4x) End plate
- 35 (2x) Guide 1750 mm
- 34 (4x) Carriage

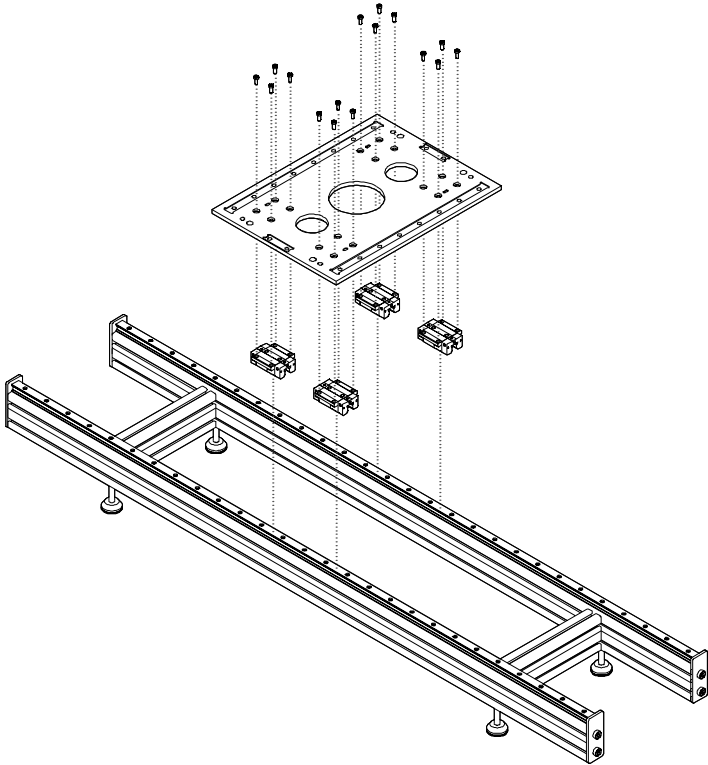
W	
	58 units M6 x 20



Step 03/16



Components.
33 (1x) Base plate

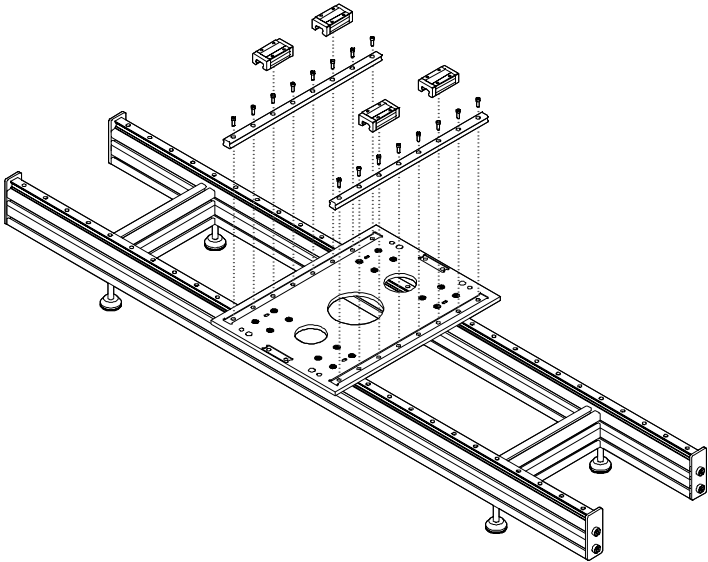
	V
	16 units M6 x 15
	



Step 04/16




Components:
30 (2x) Guide
29 (4x) Carriage




	U
	16 units M5 x 20
	

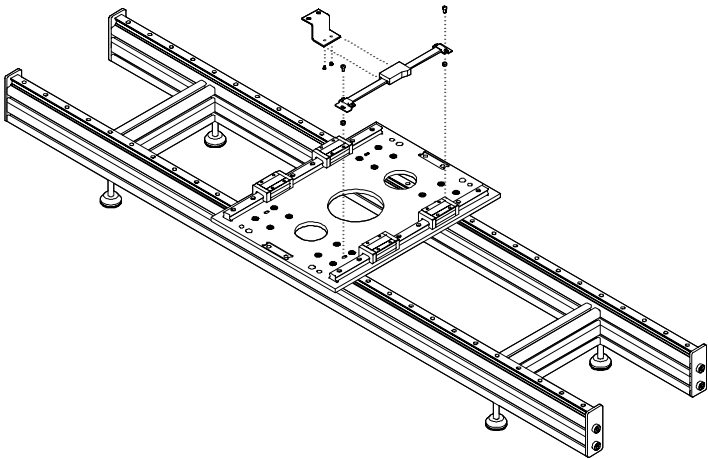


Step 05/16

- Components:
- 32 (1x) Digital caliper connecting plate
 - 33 (1x) Digital caliper




	R
	2 units
	M5 x 10




	S
	2 units
	M3 x 5

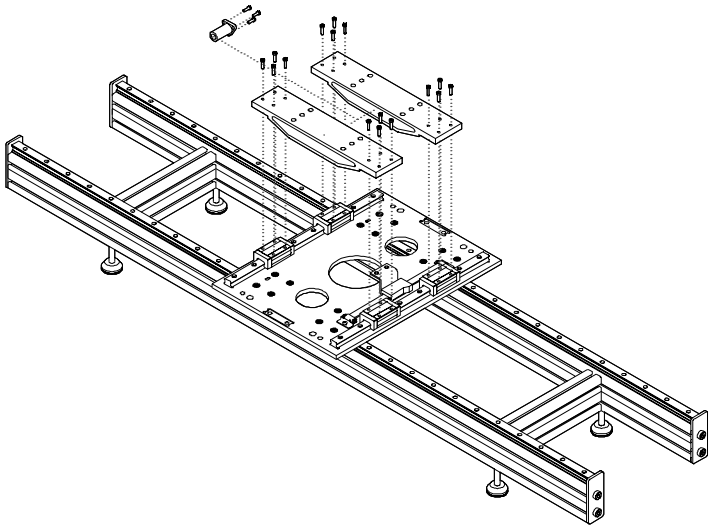


Step 06/16

- Components:
- 24 (1x) Threaded plastic piece
 - 23 (2x) Beam

	O
	3 units
	M5 x 14

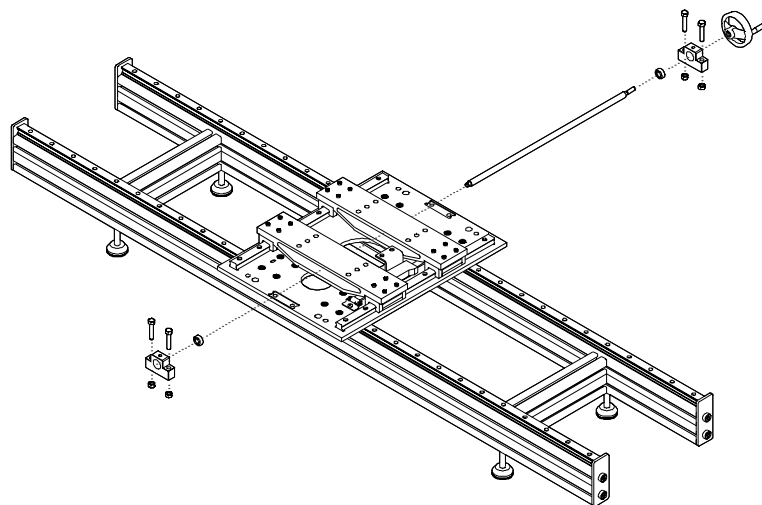
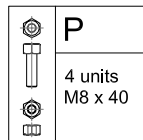
	Q
	4 units
	M5 x 20



Step 07/16

Components:

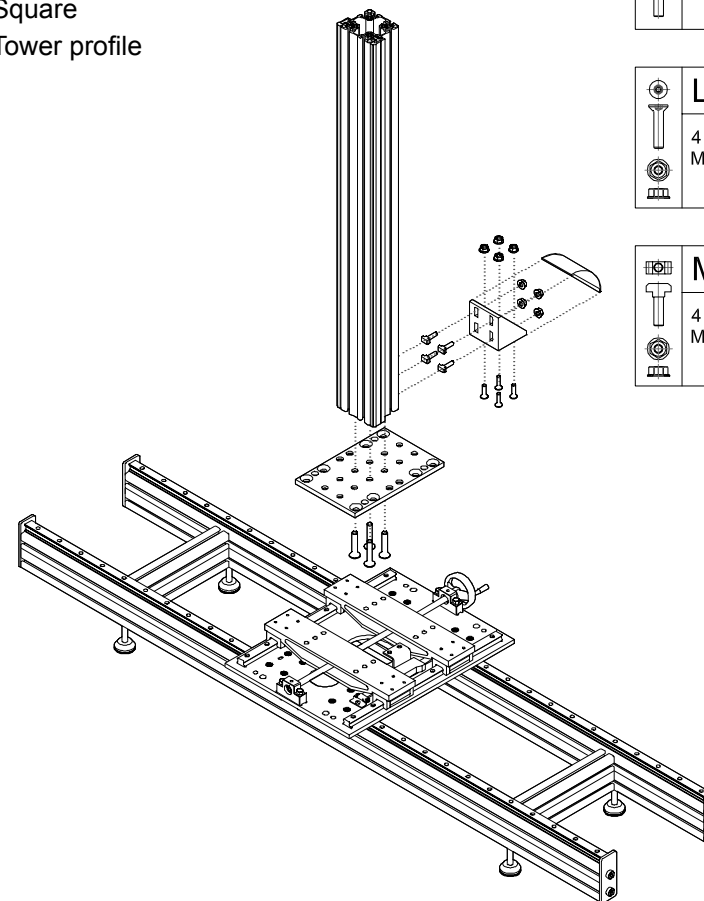
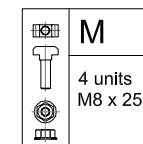
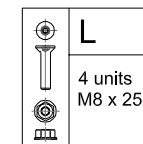
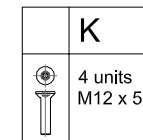
- 28** (1x) Handwheel
- 27** (2x) Bearing mount
- 26** (2x) Bearing
- 25** (1x) Leadscrew



Step 08/16

Components:

- 22** (1x) Tower plate
- 21** (1x) Square cap
- 20** (1x) Square
- 18** (1x) Tower profile



Step 09/16


Components:


22 (1x) Tower plate

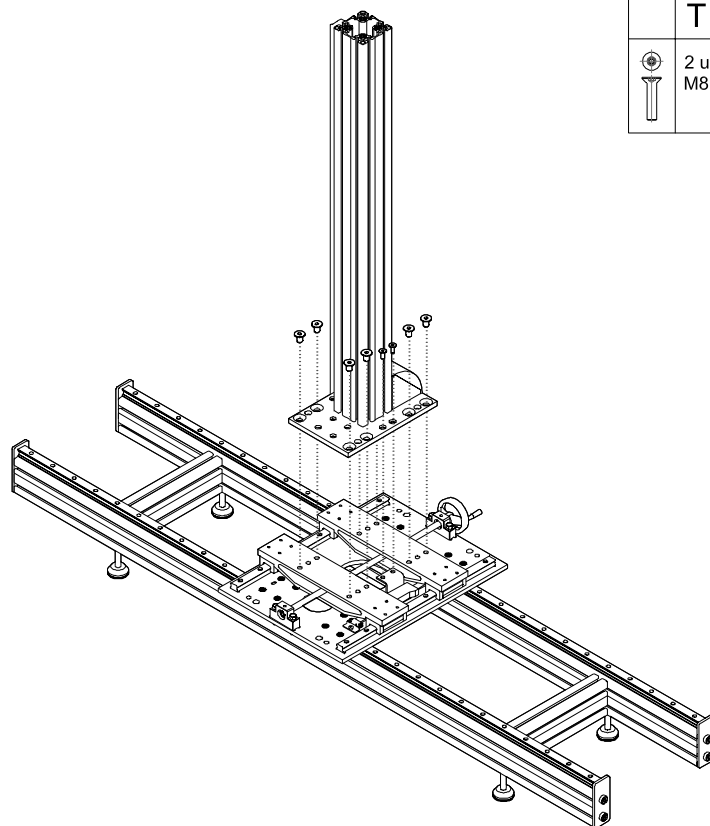
21 (1x) Square cap

20 (1x) Square

18 (1x) Tower profile

	N
	8 units M12 x 12

	T
	2 units M8 x 20




Step 10/16

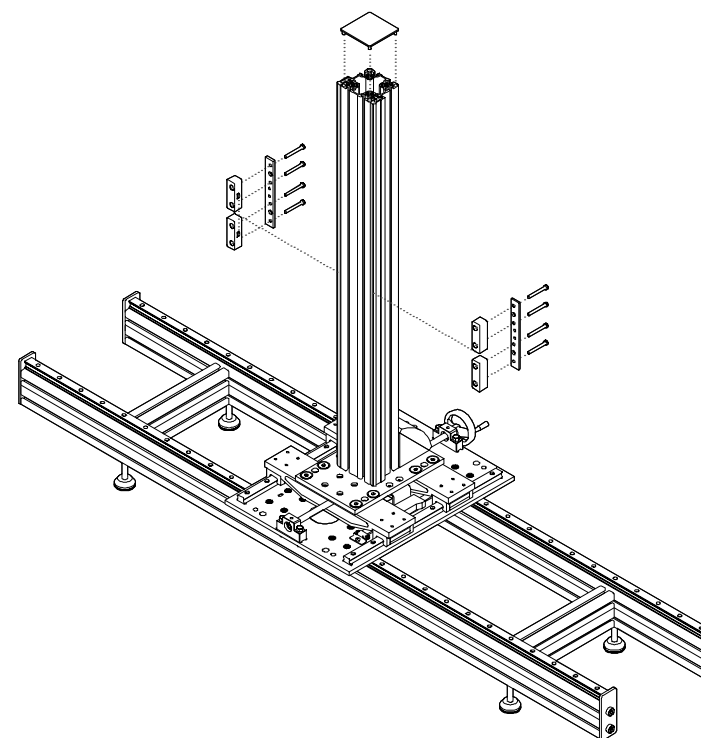
Components:

19 (1x) Tower cap

14 (2x) Carriage plate

13 (4x) Carriage

	H
	8 units M6 x 50




Step 11/16


Components:

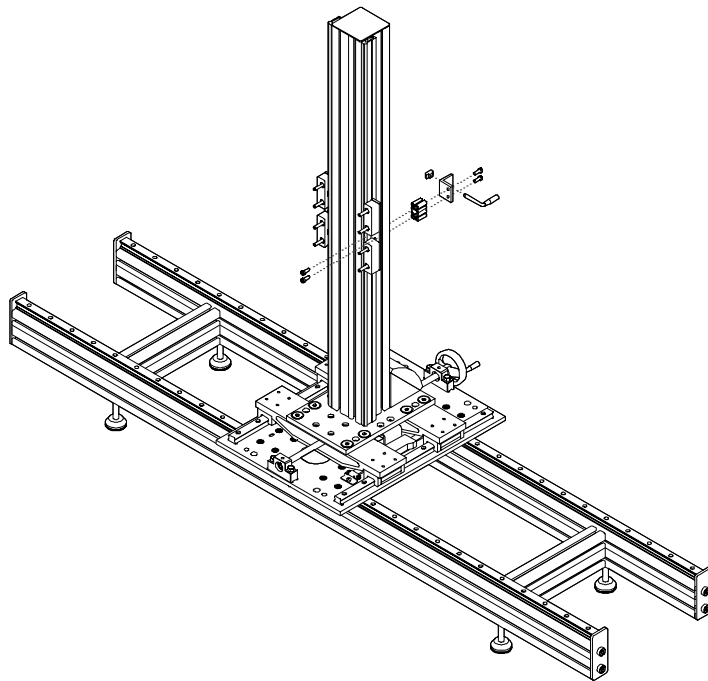
17 (1x) Break handle

16 (1x) Break connecting plate

15 (1x) Break connecting profile

	J
	2 units M6 x 15

	I
	2 units M6 x 15

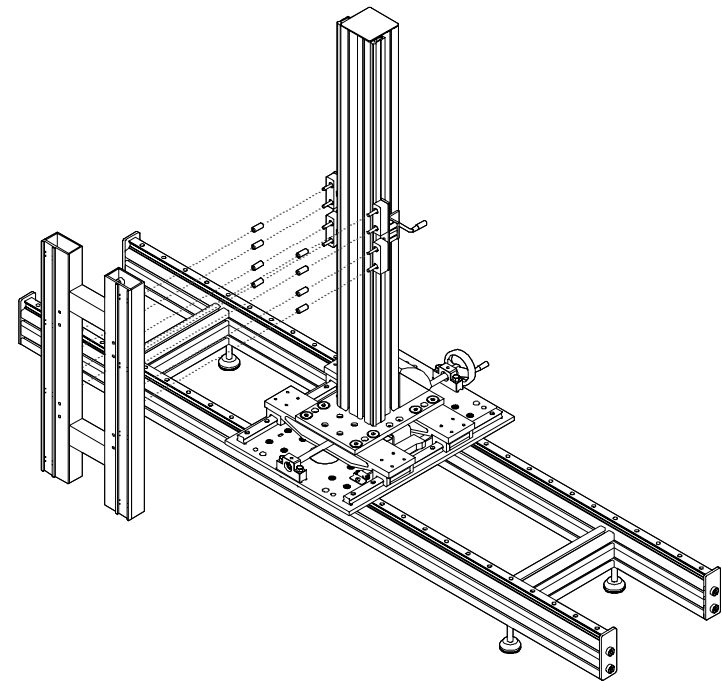


Step 12/16

Components:

12 (8x) Stand-off

11 (1x) Backing frame





Step 13/16

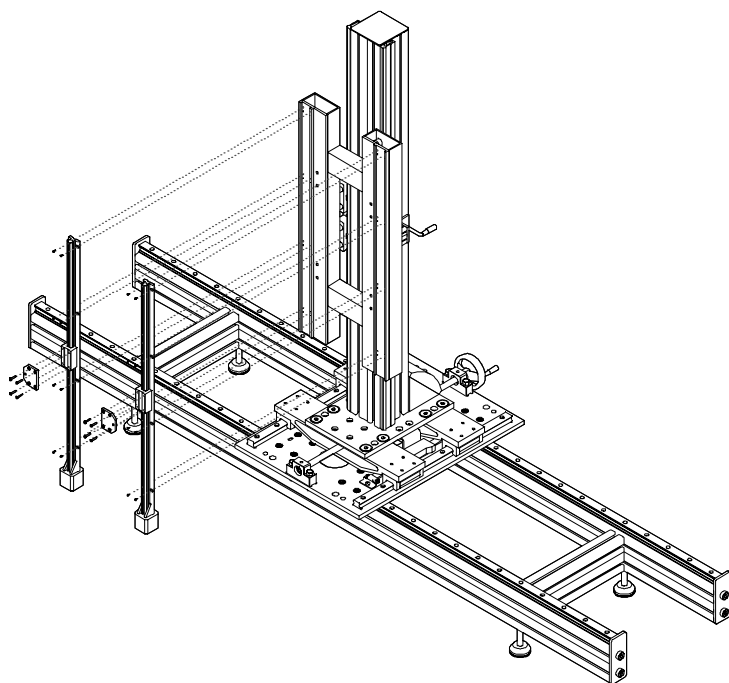
Components:

10 (2x) Vertical linear guide

09 (2x) Carriage connection plate

F	
	8 units No 6-32

G	
	16 units M3 x 5





Step 14/16

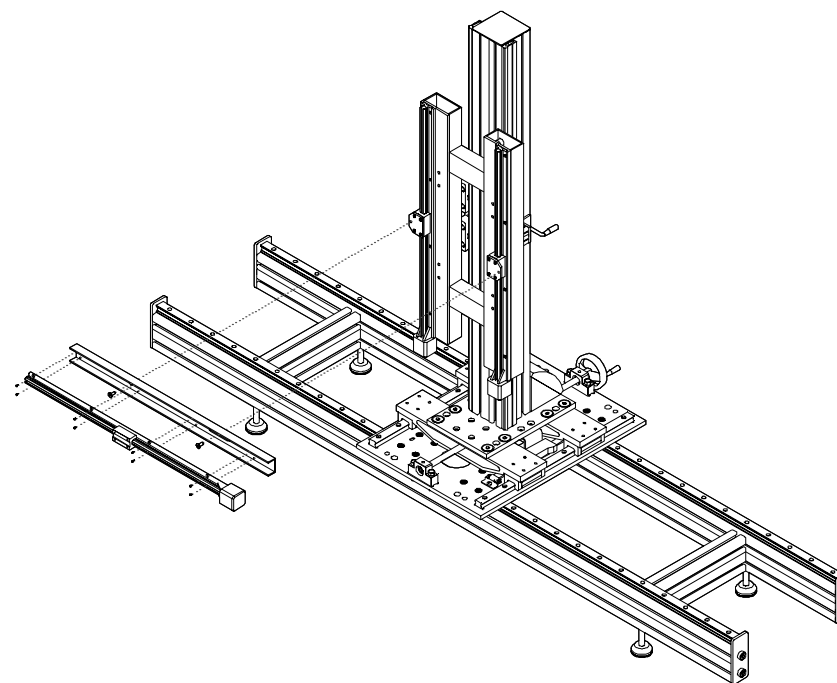
Components:

08 (1x) Horizontal channel

07 (1x) Horizontal linear guide

D	
	8 units M3 x 5

E	
	2 units M6 x 5




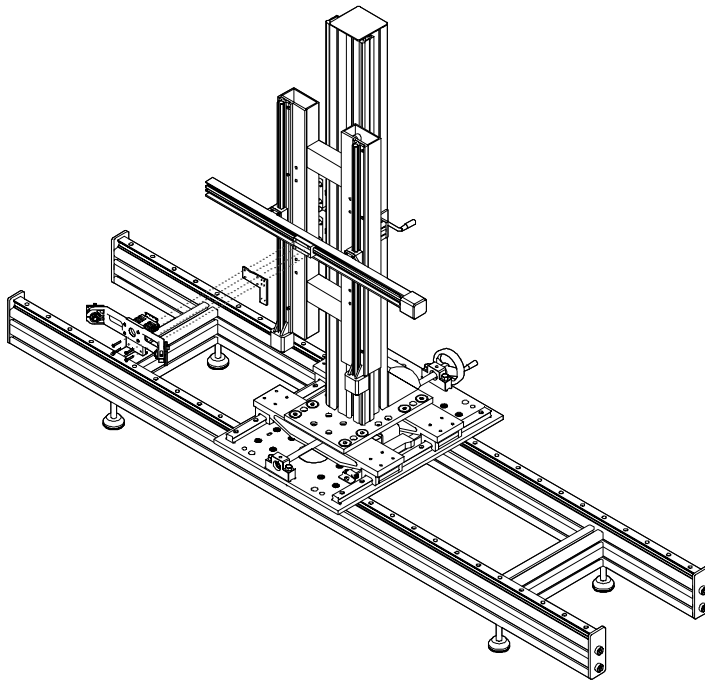
Step 15/16

Components:

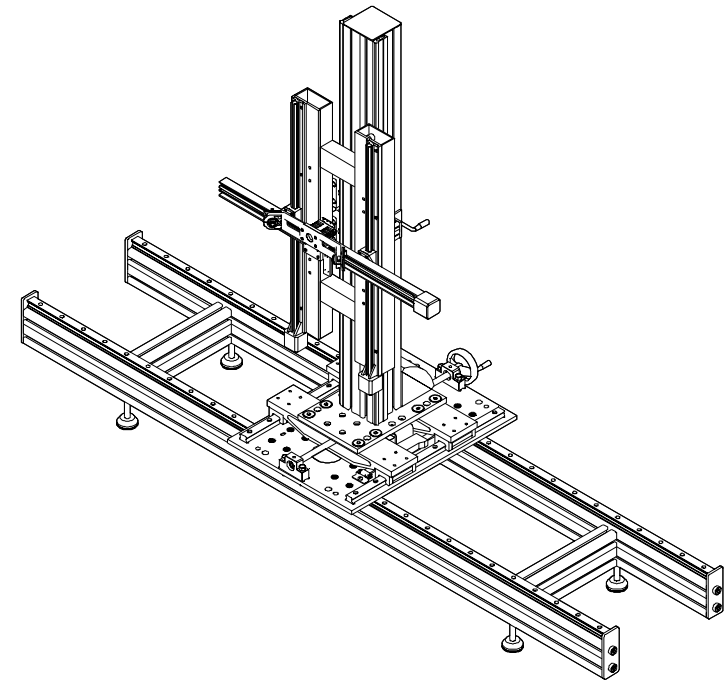
06 (1x) Shim plate

05 (1x) Scanner head

	C
	4 units No 6-32



Step 16/16



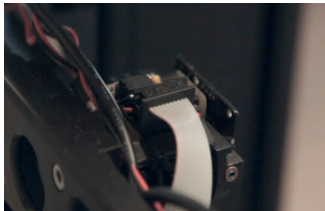
Wiring



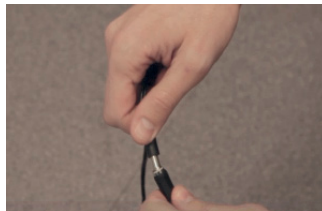
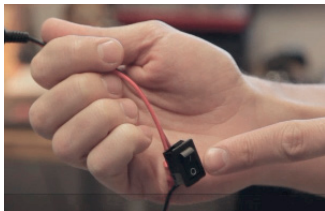
- 01. Connect the vertical slide motors, connections are interchangeable
- 02. Connect the horizontal slide motor



- 03. Connect the USB cable to Camera 1, note the orientation
- 04. Connect the USB cable to Camera 2

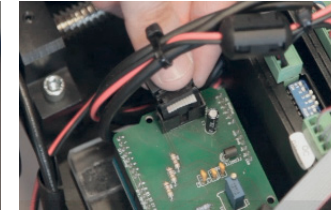


- 05. Connect the ribbon cable to the PCB on top of the scanner head
- 06. Plug in the AC transformer, do not connect it to the control box yet

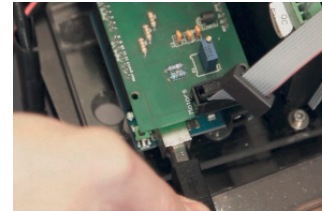


- 07. Make sure the power switch is turned off
- 08. Connect the control box to the AC transformer

Wiring



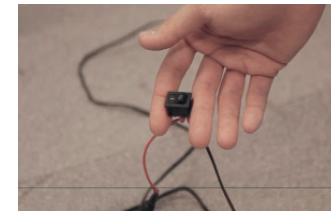
- 09. Connect the USB cables of the cameras to the extensions
- 10. Connect the ribbon cable to the PCB of the control box



- 11. Connect the USB cable to the Arduino Proto Shield
- 12. Connect one camera USB cable to one of the USB 2 ports



- 13. Connect the other camera USB cable to one of the USB 3 ports
- 14. Connect the Arduino USB cable to another USB 3 port



- 15. Connect the mouse to the free USB-SATA port
- 16. Switch power on, the drivers' status LED will turn green



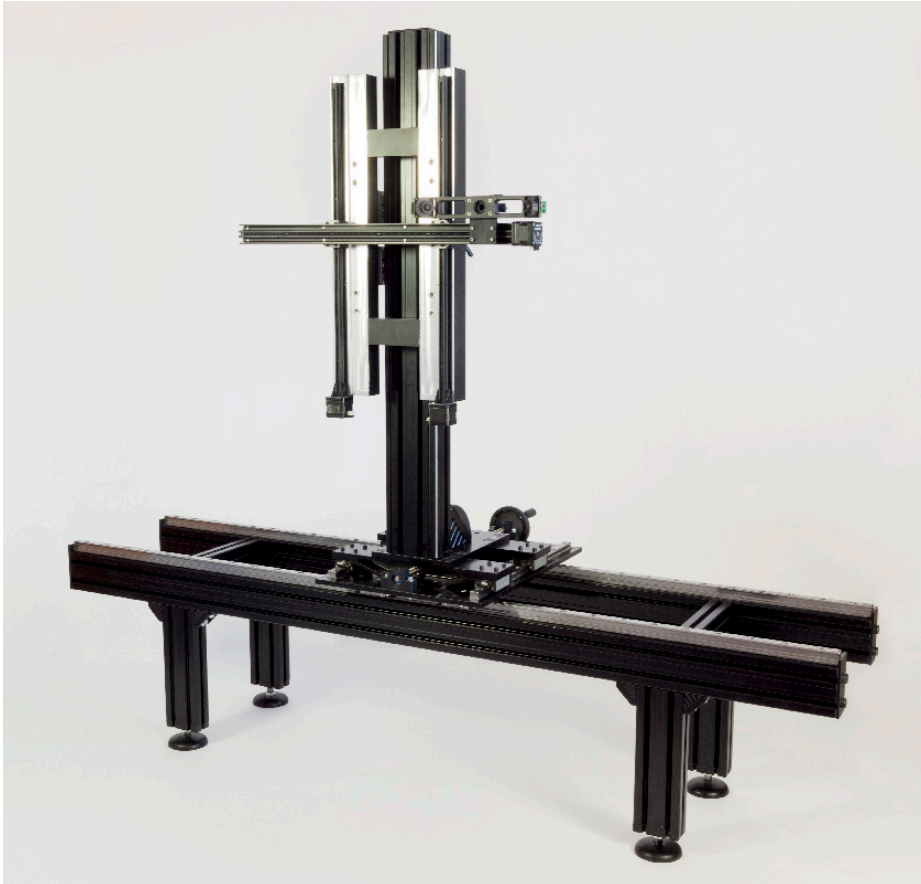
3

Startup process

<<<

Ercole de' Roberti, *San Giorgio (Polittico Griffoni)*,
1472-1473, tempera on poplar, 26.3 x 9.3 cm (detail of the back).
3D scanned in 2012 in Fondazione Giorgio Cini, Venice.

Quick start guide



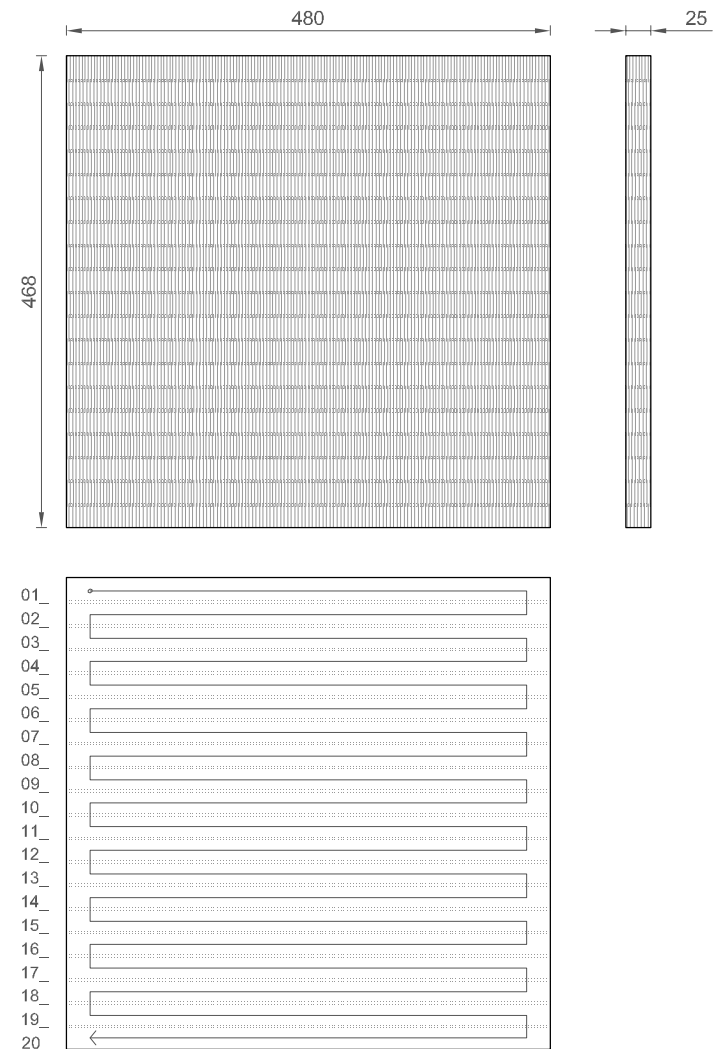
<https://vimeo.com/8261186>
password: factum53

See this video for a step-by-step tutorial covering these areas:

Positioning; Wiring; The Scanning Application; Configuring Arduino's COM Port; How to attach the calibration tool; Calibration; Planning a New Session; New Session.

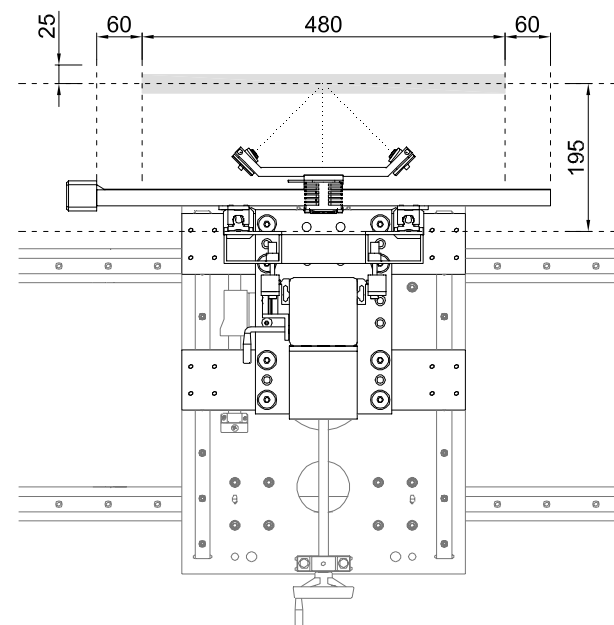
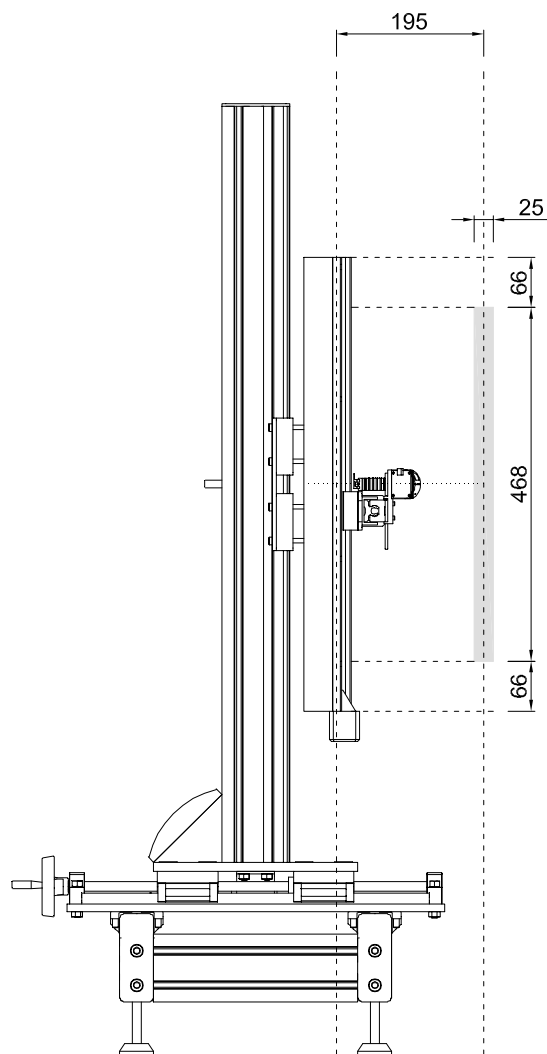
The scanning tile

The scanning tile consists of a standard area of data composed of 20 horizontal stripes 26 mm wide with a merged overlap of 10%.



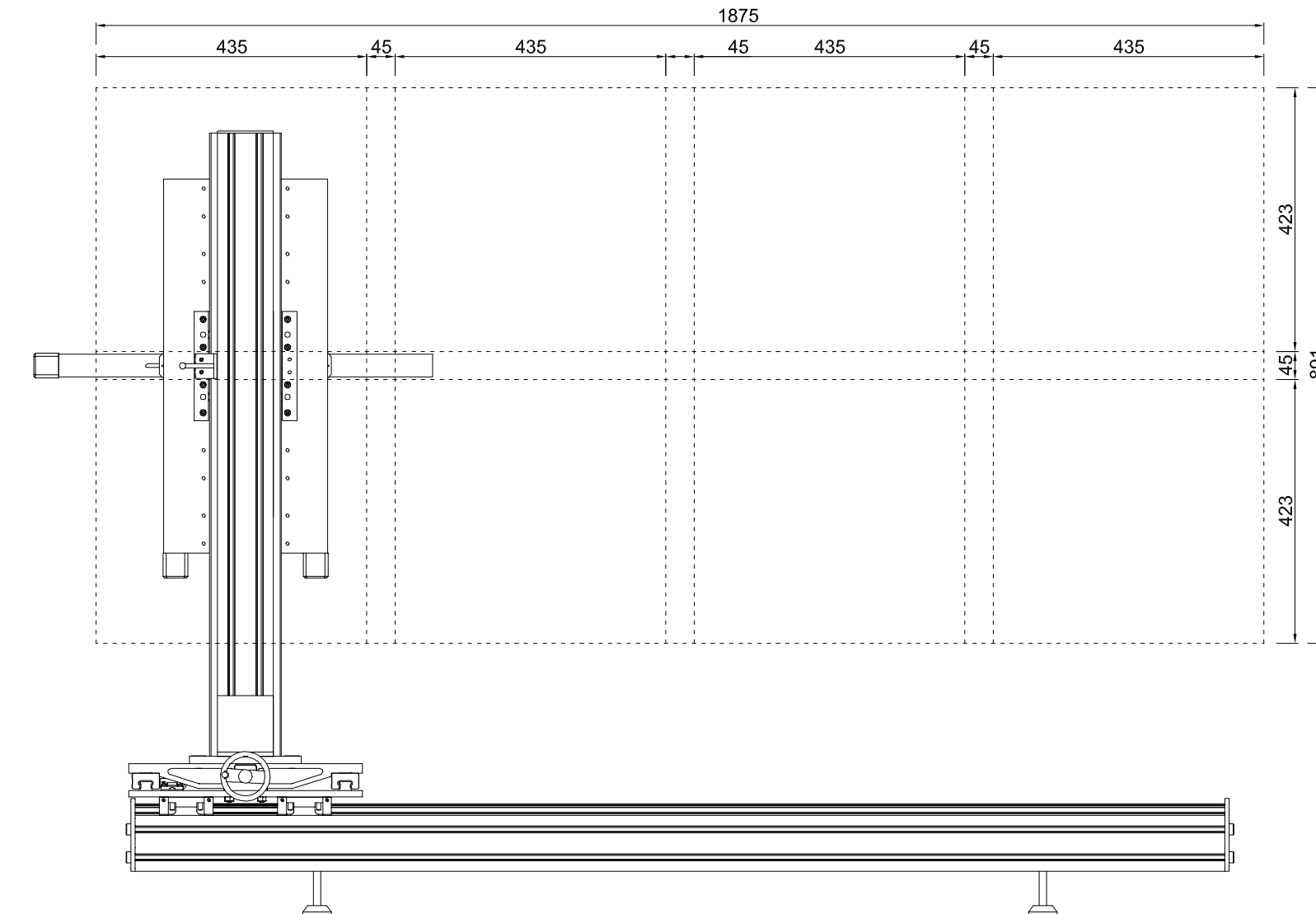
Positioning the scanner

Distance to the target, from the front of the backing frame to the center of the depth of field: 195 mm.



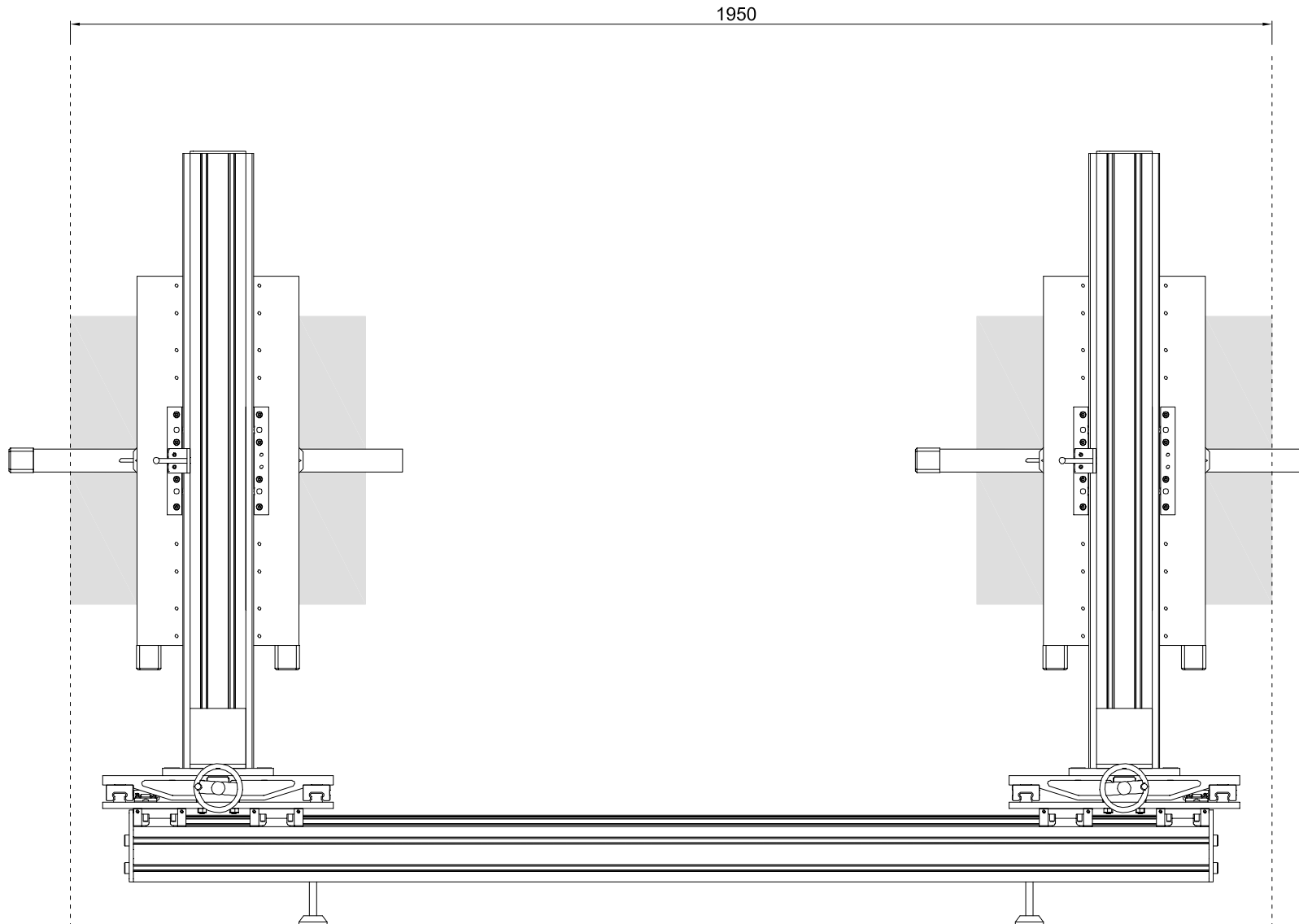
Scanning area

8 full scanning tiles with an approx. 10% overlap: 891 x 1875 mm.



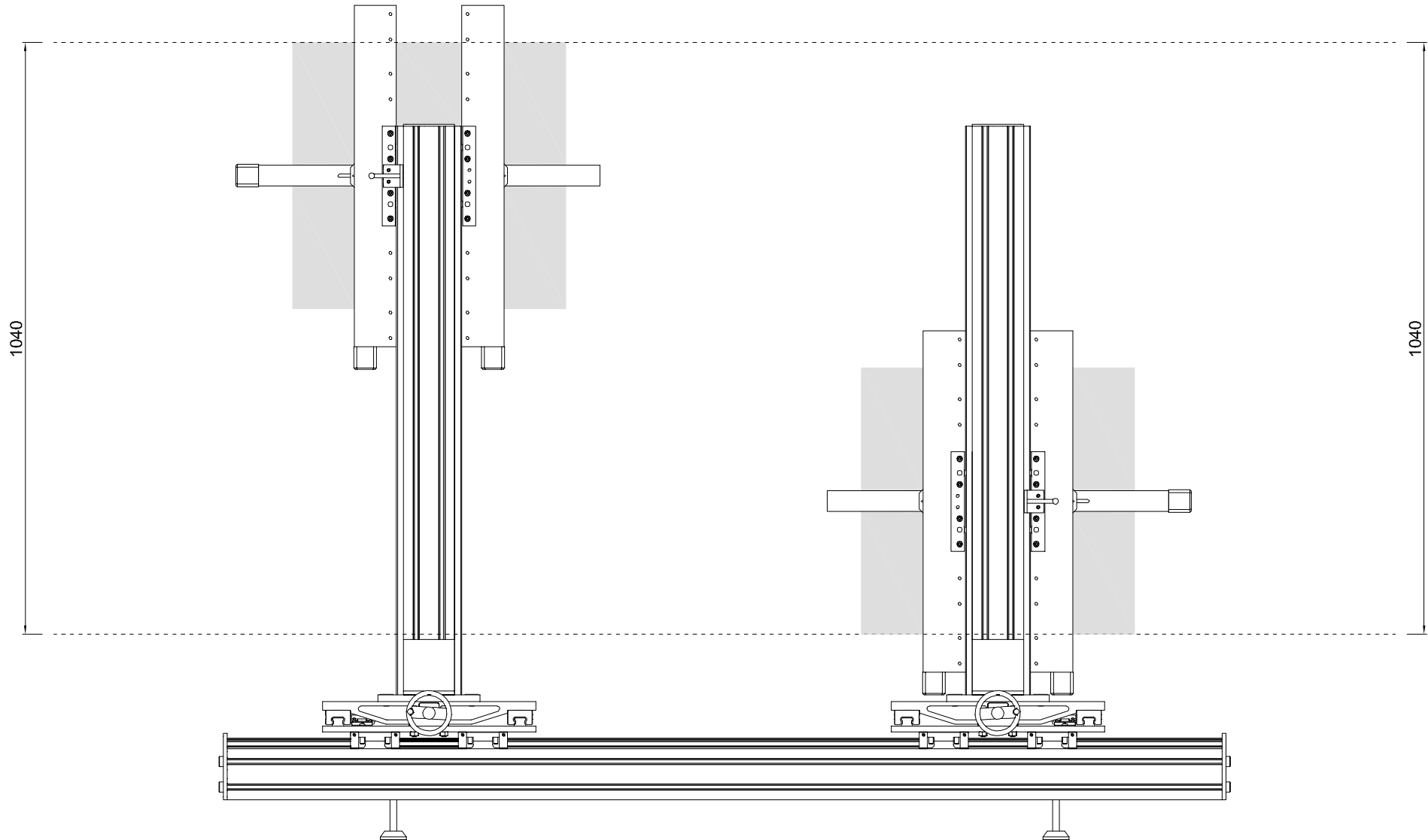
X axis movement

Maximum extent on the X axis: 1950 mm.



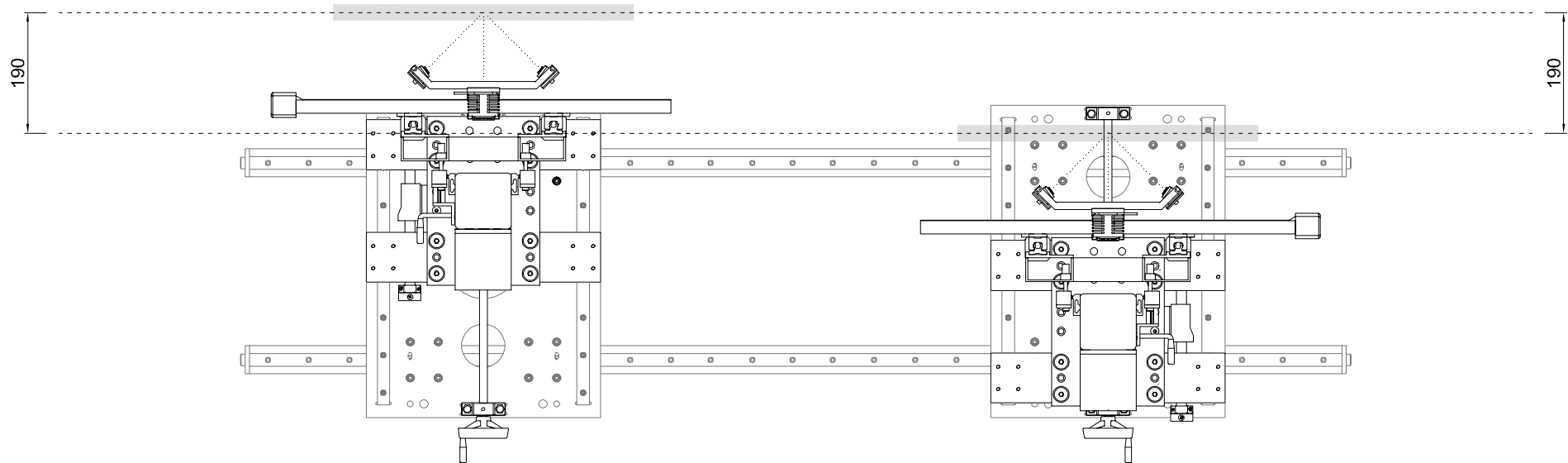
Y axis movement

Maximum extent on the Y axis: 1050 mm.



Z axis movement

Maximum extent on the Z axis: 200 mm.



Contact us

Support

factum@factum-arte.com

If you ever need help with your Lucida, email the address above. To help us understand the problem it is very helpful to include pictures or a video as attachments with your email.

You can also telephone us: +34 915 500 978

Feedback

factum@factum-arte.com

For general questions or for your comments and ideas send an email to the address above.

For more information

www.factum-arte.com

www.factumfoundation.org

Resources

Lucida user's manuals can be downloaded from Factum Arte's website:

Assembly Instructions

factum-arte.com/lib/kcfinder/upload/files/Lucida/manuals/2015_Lucida_A5_Assembly_Final.pdf

<https://vimeo.com/8261186> (password: factum53)

Operator's manual

factum-arte.com/lib/kcfinder/upload/files/Lucida/manuals/2015_Lucida_A5_Operator_Final.pdf

Processing applications

factum-arte.com/lib/kcfinder/upload/files/Lucida/manuals/2017_Lucida_A5_processing_Final.pdf



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