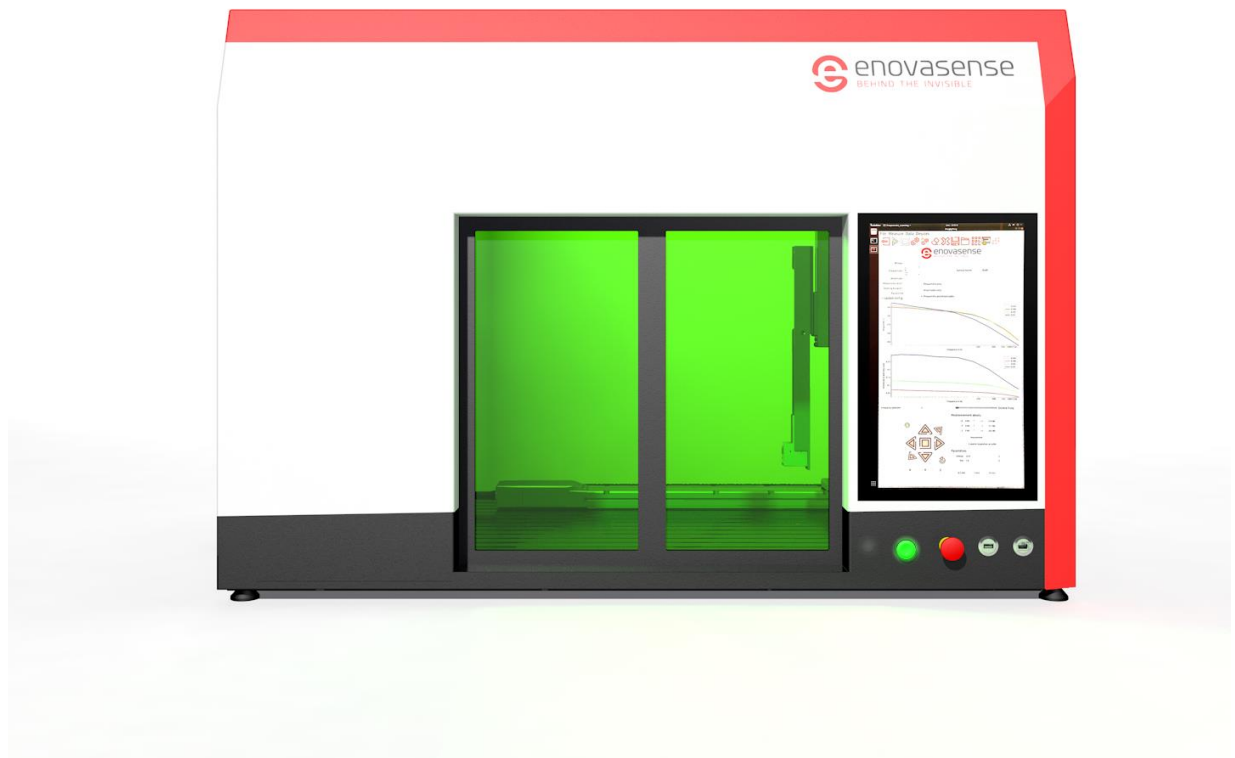


HAKO – L AUTOMATED 3-AXES CONTROL STATION

INT01 -CSL-3AX



This machine allows automated 3D measurements of parts using XYZ axis. Mapping of surfaces and complex shapes is made easy using the configurable software. Automated sliding doors and a touch screen make this machine perfect for by-the-line or lab use.

Optional add-ons include 360 degrees rotating optical probe, rotation stage for the parts and automated part positioning (additional vision system).

Features

- ☐ 3D scanning
- ☐ Real-time thickness control
- ☐ 100% scanning of the part
- ☐ Automated programmable sliding
- ☐ Laser Class 1

Applications

- ☐ Industrial coating
- ☐ Automotive industry
- ☐ Aeronautics
- ☐ Semiconductor
- ☐ Electronics
- ☐ Research

Key values¹

Parameter	Symbol	Value (typical)	Unit
Measurable thickness range	E_p	0.01 - 1000	μm
Accuracy	σ_{E_p}	< 3% of measured thickness	μm
Measurement duration (1 point)	t_m	< 1s	s
Operating temperature	T_n	-5 to +40	$^{\circ}\text{C}$
Maximum part weight	m_m	70	kg
Maximum part size	$X_m * Y_m * Z_m$	0.55*0.5*0.4	m^3
Axis Strokes	$X_s * Y_s * Z_s$	0.45*0.45*0.3	m^3
Screen size	S_d	15.6	inches

Repeatability by thickness range¹

Thickness range (μm)	Typical RMS repeatability in 1 point (μm)		Application process
	Paint, Adhesives, polymer coatings...	Metallic, ceramic... coatings	
0.01-0.1	± 0.01	± 0.01	PVD, CVD, PACVD, Electroplating
0.1-1	± 0.05	± 0.05	PVD, CVD, PACVD, Electroplating, Screen printing
1-5	± 0.1	± 0.3	PVD, CVD, PACVD, Electroplating, Anodizing, Spray, Screen printing
5-50	± 0.3	± 1	Anodizing, Electroplating, Galvanizing, Spray, Screen printing
50-300	± 1	± 2	Thermal spray, Cold spray, Galvanizing, Spray
300-1000	± 3	± 5	Thermal spray, Cold spray

Electrical supply

Parameter	Symbol	Value	Unit
Supply voltage	V_p	1AC 100-240V	V
Supply voltage frequency	f_p	50 - 60	Hz
Supply Power	P_p	1	kW

Optical characteristics ($T_a = 23^{\circ}\text{C}$)

Parameter	Symbol	Value	Unit
Optical power	P	0.01 - 150	W
Wavelength	λ	455 - 1550	nm
Laser class	LC	1	

Mechanical characteristics (Ta = 23°C)

Parameter	Symbol	Value	Unit
Optical probe diameter	Φ_H	66 (T33) 35 (T60)	mm
Machine Weight	M_m	200	Kg
Machine dimensions	$L_m \times W_m \times H_m$	1.2 x 0.9 x 0.85	m
Maximum part size	$X_p * Y_p * Z_p$	0.55*0.5*0.4	m ³
Axis Strokes	$X_s * Y_s * Z_s$	0.45*0.45*0.3	m ³
Axis precision	σ_a	20	μm
Maximum part weight	m_m	70	kg

Available spot sizes and measurement distances

Spot diameter (mm)	Measurement distance (mm)	Reference of the front lens	Typical tolerances on distance (mm) ¹	
			Paint, adhesives, polymer coatings...	Metallic, ceramic... coatings
0.3	20	SP03-FL-WD20-SD0.3	±2	±0.5
0.7	20	SP03-FL-WD20-SD0.7	±2	±0.5
2.5	20	SP03-FL-WD20-SD2.5	±2	±0.5
4.9	20	SP03-FL-WD20-SD4.9	±2	±0.5
6.5	20	SP03-FL-WD20-SD6.5	±2	±0.5
0.8	40	SP03-FL-WD40-SD0.8	±4	±1
2.3	40	SP03-FL-WD40-SD2.3	±4	±1
3.3	40	SP03-FL-WD40-SD3.3	±4	±1
10	40	SP03-FL-WD40-SD10.0	±4	±1
12	40	SP03-FL-WD40-SD12.0	±4	±1
8.8	100	SP03-FL-WD100-SD8.3	±10	±4
11.8	150	SP03-FL-WD150-SD11.8	±20	±10

 Available optical probe references

Reference	T33	T60
		
		
		
Size (mm) $L_c \times W_c \times H_c$	D66 x 93	D35 x 64
Weight (g)	400	150
AS06-OM-TS-MN – Orthogonal module static available	Yes	Yes
AS06-OM-TD-MW – Orthogonal module dynamic available	Yes	No
Shift (mm) to apply to front lens indication $\underline{d}$ to determine effective measurement distance $\underline{D}$	-6.5	-0.5
$\underline{D} = \underline{d} + \text{shift}$		

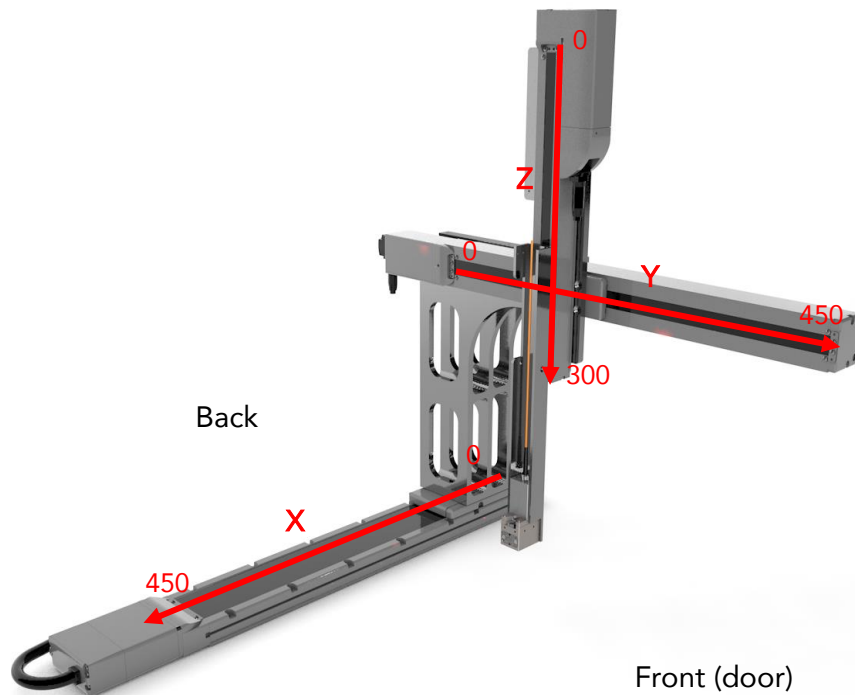
Machine general disposition

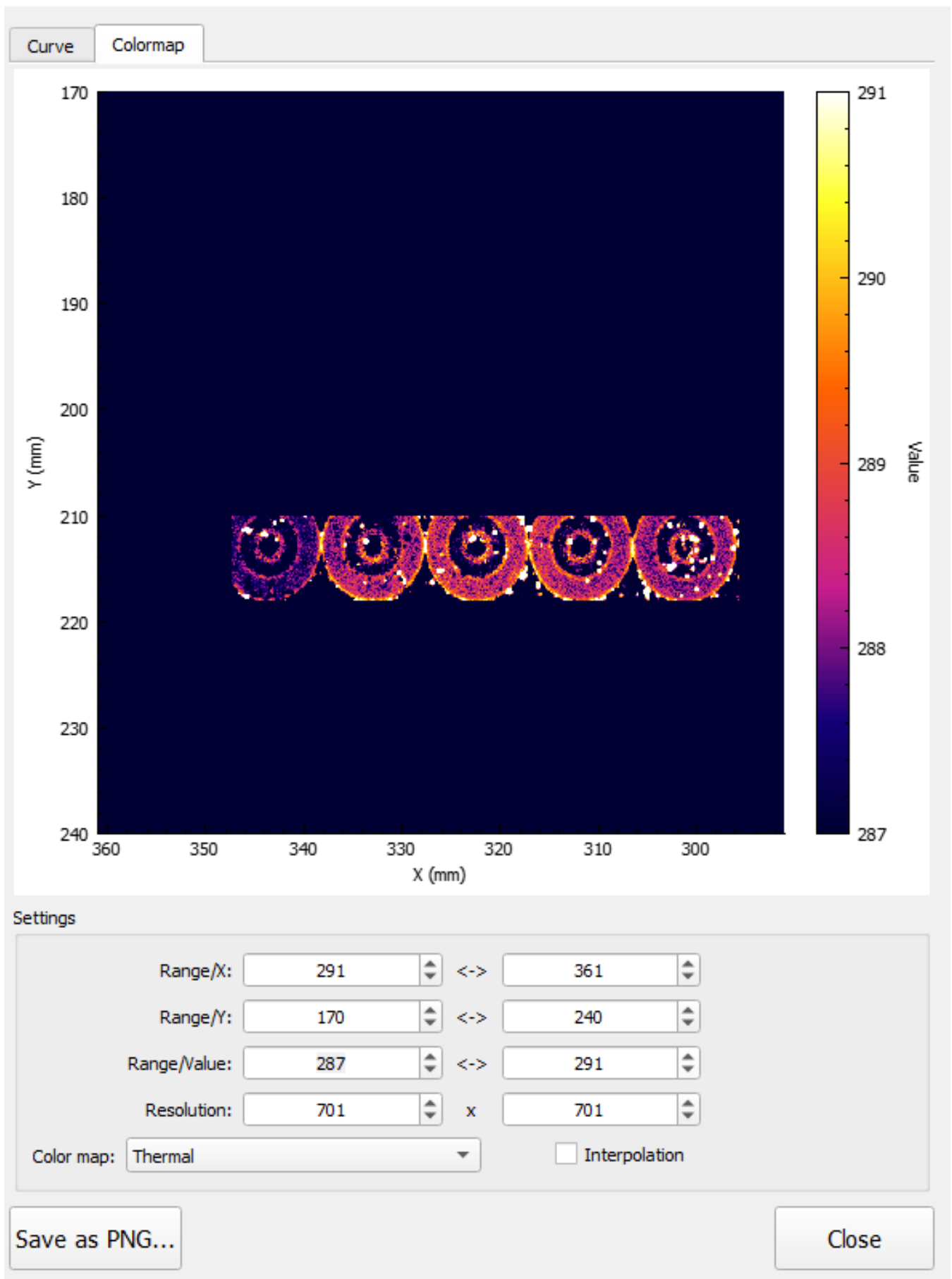
The machine is constituted of 3 main areas described below. The measurement area features a

1. Automated loading door
2. Control HMI
3. Electrical cabinet



3 axes system





Cycle creation software

FilePreferencesHelp

Cycle informationMeasurement tableCamera

#	X	Y	Z	Calibration	Value
41360	347.3	210.91	131.05	TPS13	287.272
41361	347.4	210.01	131.05	106_BO... TPS13	287.579
41362	347.4	210.11	131.05	106_BO... TPS13	288.460
41363	347.4	210.21	131.05	106_BO... TPS13	287.057
41364	347.4	210.31	131.05	106_BO... TPS13	287.586
41365	347.4	210.41	131.05	106_BO... TPS13	287.542
41366	347.4	210.51	131.05	106_BO... TPS13	287.366
41367	347.4	210.61	131.05	106_BO... TPS13	287.112

Quick plot...

Summary

Values:41367

Maximum:322.71

Average:287.50

Minimum:251.81

Std. deviation:3.256

Back to Values

Comments

scan-zoom-0,1mm-3000

G-code program

X: 295.700 ... 360.600

Y: 210.010 ... 217.910

Z: 131.050 ... 131.050

64.900 / 7.900 / 0.000

00:00:00 / 03:25:15

Vertices: 208151

FPS: 63

#	Command	State	Response
82744	X51.70 Y0.70 (NEXT)	Processed	OK
82745	M5 (MEASUREMENT)	Processing	
82746	X51.70 Y0.80 (NEXT)	In queue	

Gcode editor

104000 M5 (MEASUREMENT)
104001 X64.90 Y7.50 (NEXT)
104002 M5 (MEASUREMENT)
104003 X64.90 Y7.60 (NEXT)
104004 M5 (MEASUREMENT)
104005 X64.90 Y7.70 (NEXT)
104006 M5 (MEASUREMENT)
104007 X64.90 Y7.80 (NEXT)
104008 M5 (MEASUREMENT)
104009 X64.90 Y7.90 (NEXT)
104010 M5 (MEASUREMENT)
104011 (GRID XY - END)
104012
104013

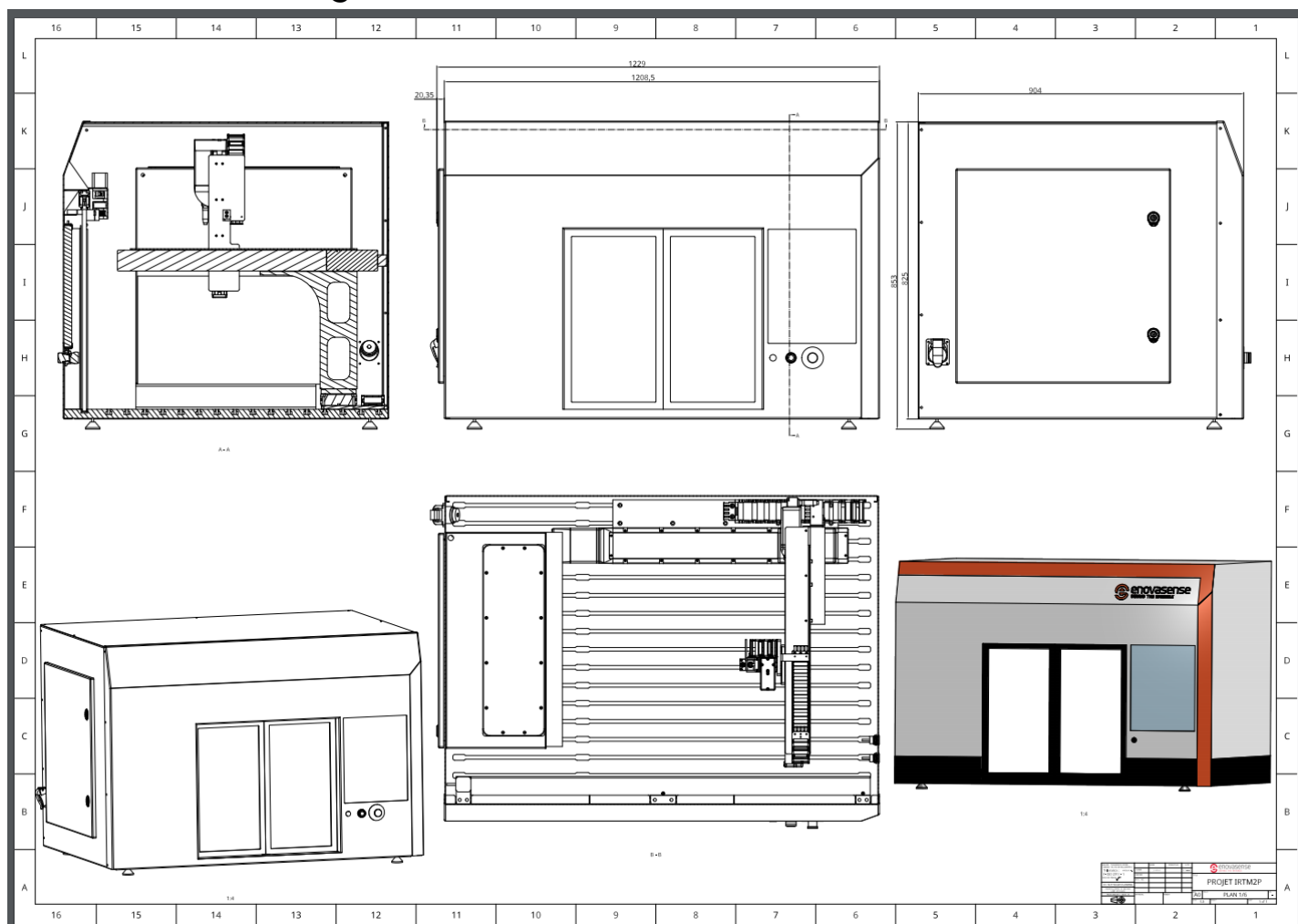
CPMEPARSE

12SHOW ERRORS

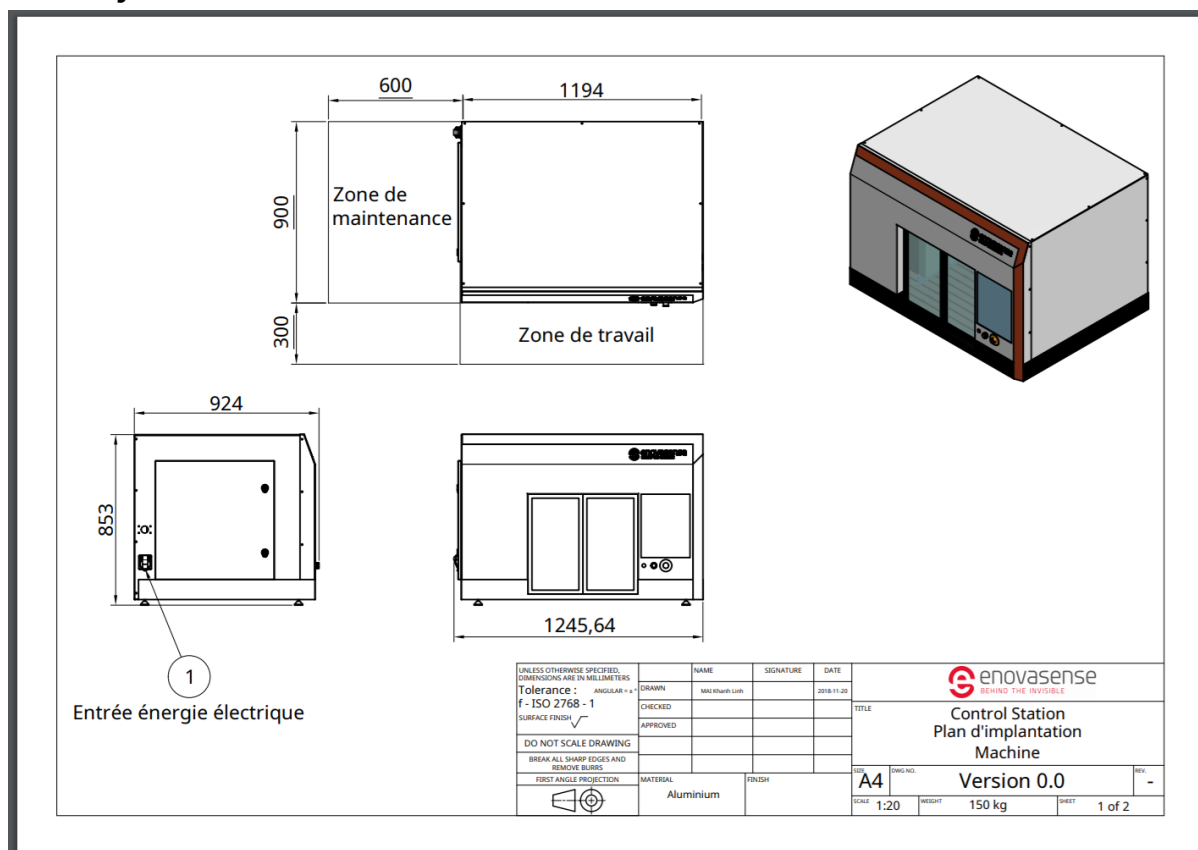
34INSERT

SPHO

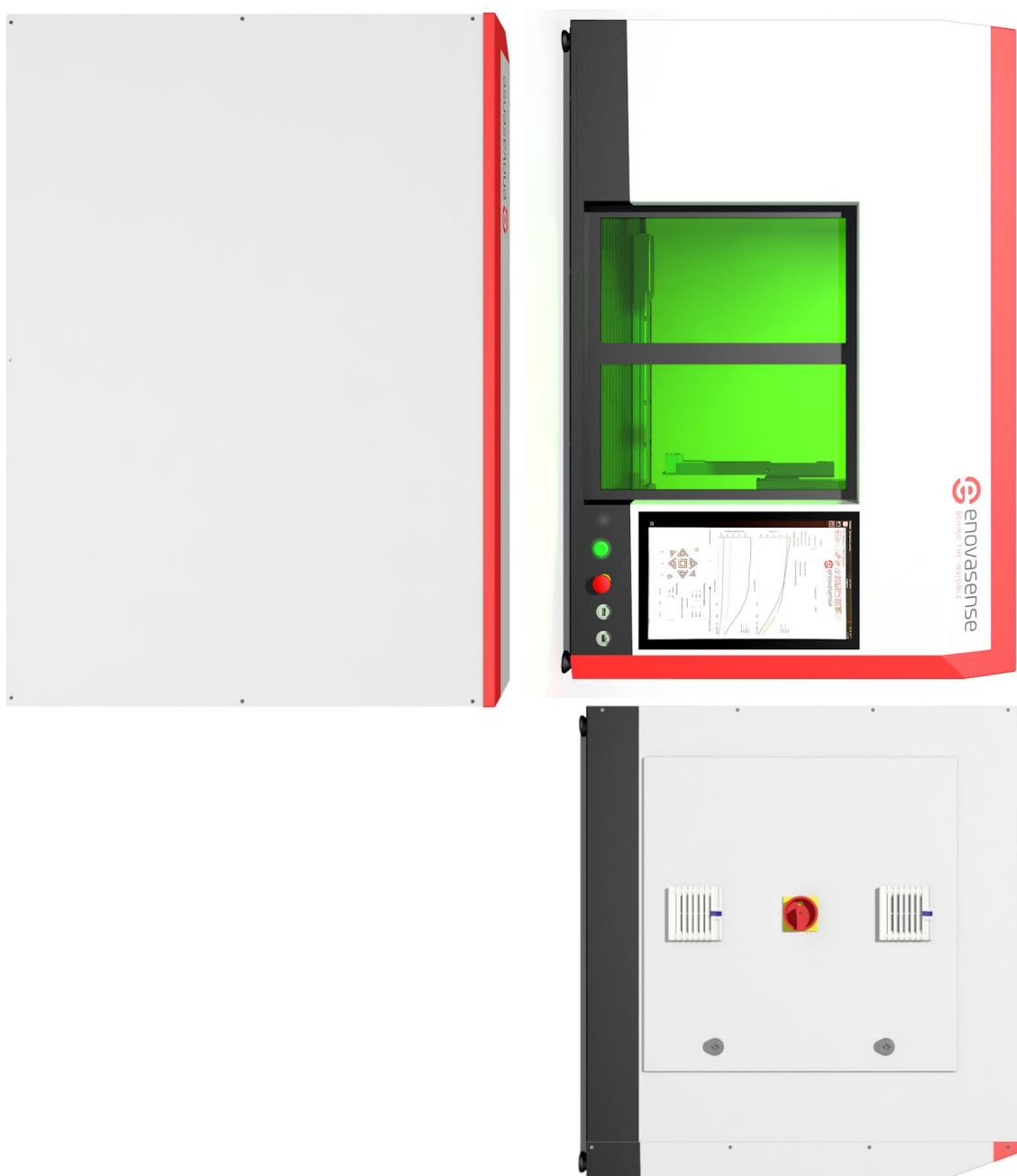
General drawing



Factory Installation



Oriented views



Package content

Designation	Quantity
Laser safety IEC standard 60825-1 compliant class 1 casing	1
Axis with motor and variator	3
Electrical cabinet	1
15.6" Touchscreen	1
Software for 2D scan	1
Software for automation management	1
Enovasense Optical probe TYY	1
Enovasense controller	1
Front lens SP03-FL	1
Enovasense standard software	1
1-year warranty	1
CE certificate	1
Quality control certificate	1

¹Performances values given in this document are typical values obtained with this device but can vary from one application to another. For a diagnosis of those performances on specific samples, please contact Enovasense.

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