Assembly Instructions

Z-axis Kit (220 mm)
Alu Line

AL.ZA0001.BL

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Version 1.0.1

Description

This kit contains all the parts for the mechanical construction of a Z-axis, as is also the case with all Sorotec Alu-Line machines. **The second part of this description provides guidelines for constructive integration in environments other than those originally intended.**

The Z-axis of the Alu-Line portal milling machine is a self-contained assembly that can also be easily integrated into other projects. Be it as the core of your own new construction, be it as a suitable completion of a new building that has long been underway. But replacing an older machine is also an option, whether as a repair, to improve rigidity, or to use a milling motor for which no suitable mount is available so far.

Attention!

Construction and use of the Alu-Line Z-axis take place at your own discretion and risk. Sorotec assumes no liability for the technical suitability of the entire system or the consequences of its use.

Technical features:

- Travel 220 mm
- Linear guides size 20
- HIWIN ball screw tolerance class T07

Fig. 1: The Z-axis 220 mm Alu-Line kit

Scope of delivery

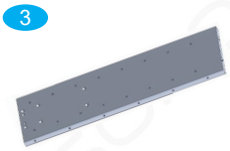
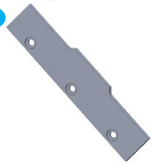
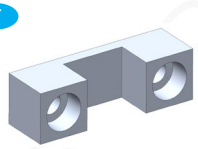
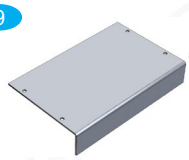
Illustration	Designation	Num.
1 	guide plate	1
2 	motor plate	1
3 	plate	1
4 	bracing on the left	1
5 	bracing on the right	1
6 	stop plate	1
7 	end stop	1
8 	switch plate for reference switch	1
9 	timing belt cover	1
10 	linear guide rail 486 mm	2

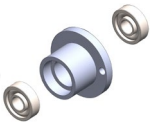
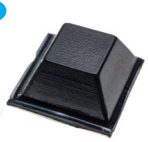
Illustration	Designation	Num.
11 	slide block	4
12 	ball screw	1
13 	recirculating ball nut	1
14 	Fixed bearing housing with 2 ball bearings	1
15 	shaft nut	1
16 	dirt wiper	2
17 	toothed belt wheel 24 teeth	2
18 	timing belt 75 teeth	1
19 	straight pin	2
20 	device foot	2

Illustration	Designation	Num.
21 	cover cap for linear rail	16
22 	reference switch with insert film	1
23 	hook wrench 16 ... 20 mm	1
	cylinder head screw DIN 912	
	M3 x 16 24	2
	M3 x 20 25	2
	M4 x 20 26	4
	M5 x 14 27	34
	M5 x 20 28	22
	M6 x 14 29	4
	M6 x 16 30	8

Illustration	Designation	Num.
31 	cylinder head screw DIN 6912 M6 x 20	4
	flat headed screw DIN 7380	
	M4 x 6 32	2
	M6 x 12 33	3
	washer DIN 125	
	Ø M4 34	4
	Ø M5 35	2
	hex nut DIN 934	
	M4 36	4
	M5 37	2

Preparation of the ball screw

- Pull the circlips (Fig. 1, red arrow) off the assembly sleeve and press a dirt wiper 16 into the recirculating ball nut 13 on both sides.

- Screw the recirculating ball nut onto the recirculating ball screw 12 in such a way that the lubricating nipple points to the fixed bearing side of the recirculating ball screw (Fig. 1).

- Press the fixed bearing unit 14 onto the end of the ball screw and secure it by screwing on the shaft nut 15.

- To adjust the clearance, tighten the locknut until the ballscrew becomes stiff in the bearings. Then carefully loosen the shaft nut slightly (approx. 5°) until the ball screw can be turned easily again.

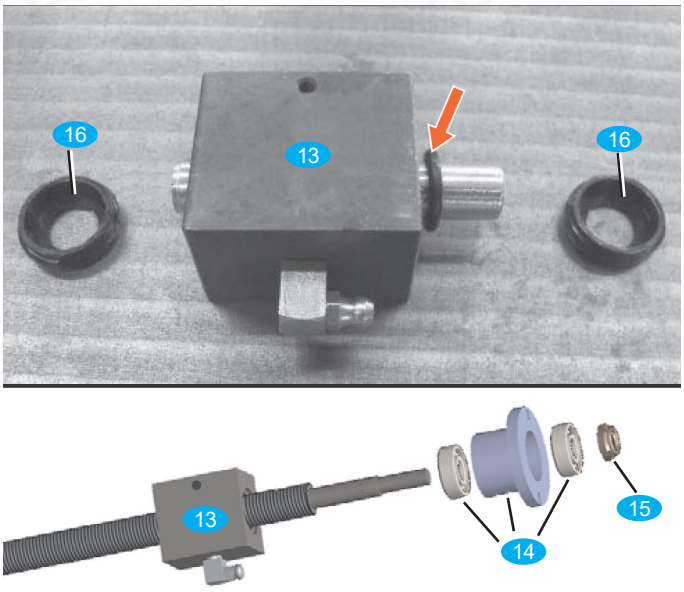


Fig. 1: Assembly of the ball screw

Assembly

- Knock the cylinder pins 19 into the guide plate 1 until they protrude about 3 ... 4 mm on the underside.

- Screw the slide block 11 to the guide plate 1 with cylinder screws; 27 the following should be noted:

  - ground, blank surfaces on the long sides of the carriage point to the center or to the ball screw

  - the lubricating nipples on the carriages point towards each other and outwards. If necessary, turn the lubricating nipples or screw them to the opposite end

- Slightly tighten the screws.

- Attach the recirculating ball nut 13 to the guide plate 1 with cylinder head screws 29.

- Slightly tighten the screws.

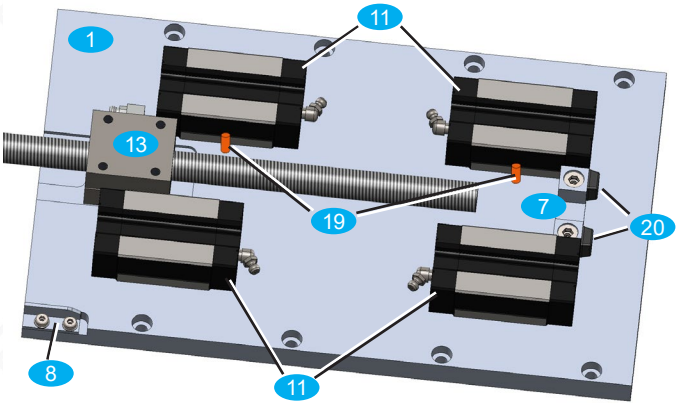


Fig. 2: Assembly of guide carriage and recirculating ball nut

- Screw the end stop 7 to the guide plate 1 with cylinder head screws 31. Tightening torque: 10 Nm

- Degrease the adhesive surfaces and attach two device feet 20 to the end stop 7.

- Mount the switching plate 8 for the reference switch on the guide plate 1 with flat headed screws 31.

- Align the left linear guide 10 flush with the lower edge of the plate 3 and screw it on with cylinder screws 28; the edge (red marking in Fig. 3) of the linear guide must lie against the milled stop edge of the plate 3 over its entire length. Tightening torque: 6 Nm

- Align the right linear guide 10 flush with the lower edge of the plate 3 and screw as described for the left side.

- Only tighten the screws of the right guide lightly.

Note

The fastening screws of the right linear guide are only tightened during the final alignment.

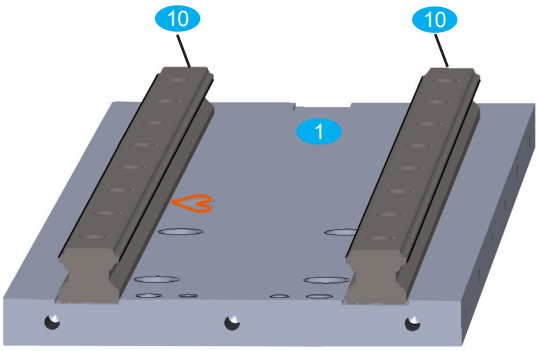


Fig. 3: Align the reference edge

- Slide the carriage of the guide plate 1 aonto the linear guides of the plate 3. Push the guide plate 1 to the side so that the left-hand carriage rests against the cylindrical pins (picture 4, red arrows). Screw the left carriage in this position. Tightening torque: 6 Nm

- Slide the guide plate 1 back and forth several times over the entire travel on the linear guides; while doing so, gradually tighten the fastening screws of the two right-hand carriages. Tightening torque: 6

- Slide the guide plate 1 back and forth several times over the entire travel on the linear guides; while doing so, gradually tighten the fastening screws of the right-hand linear guide. Tightening torque: 6 Nm

- Seal the holes in the linear rails with cover caps 21.

- Screw the stop plate 6 to the plate 3 with pan head screws 33.

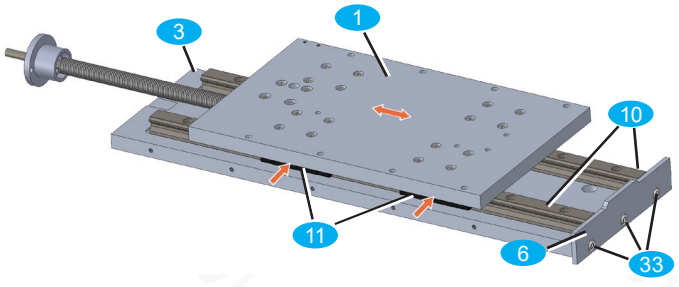


Fig. 4: Assembly of the guide

- Screw motor plate 2 to the plate 3 with cylinder screws 31; Tighten screws slightly.

- Mount the fixed bearing unit 14 on the motor plate 2 with cylinder screws 28; Tighten screws slightly.

- Screw the Z reinforcements 4 / 5 to the plate 3 with cylinder screws 27.
Tightening torque: 6 Nm

Note

If one of the Z reinforcements 4 / 5 cannot be slid onto the panel 3 with light pressure, the corresponding groove of the Z reinforcement must be reworked with a file.

- Tighten the engine plate Z fastening screws to the plate 3 Tightening torque: 6 Nm

- Move the guide plate 1 as far as possible towards the motor plate 2 by turning the ball screw.

- Tighten the fixing screws of the fixed bearing unit. Tightening torque: 6 Nm

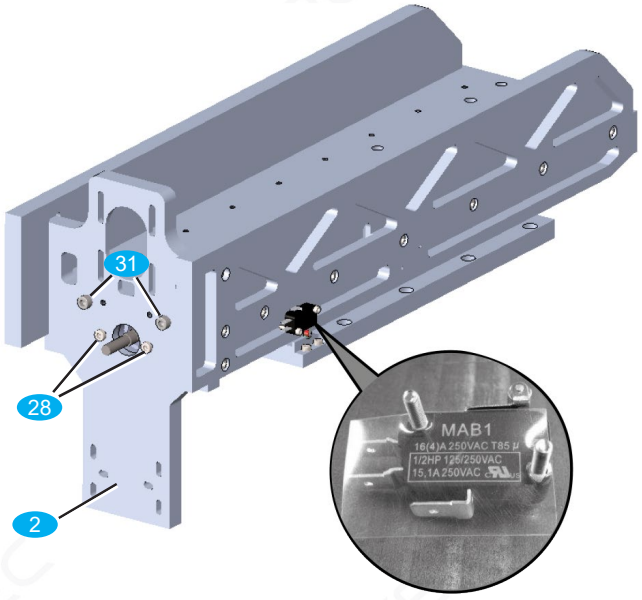


Fig. 5: Mounting of motor plate and reference switch

- Place the insert film between the reference switch 22 and the Z reinforcement and screw on the reference switch as shown in Fig. 5.

- Screw the complete Z-axis assembly to the Y-guide of your machine with cylinder screws 30; Tighten screws slightly.

To align the Z-axis, a dial indicator must be attached to the moving part of the Z-axis and a stop bracket must be attached to the base frame. Rotating the ball screw of the Z-axis moves it up and down.

- Align the Z-axis on the Y-guide in such a way that the dial gauge does not deflect when the Z-axis moves up and down. In this position, tighten the fastening screws. Tightening torque: 10 Nm.

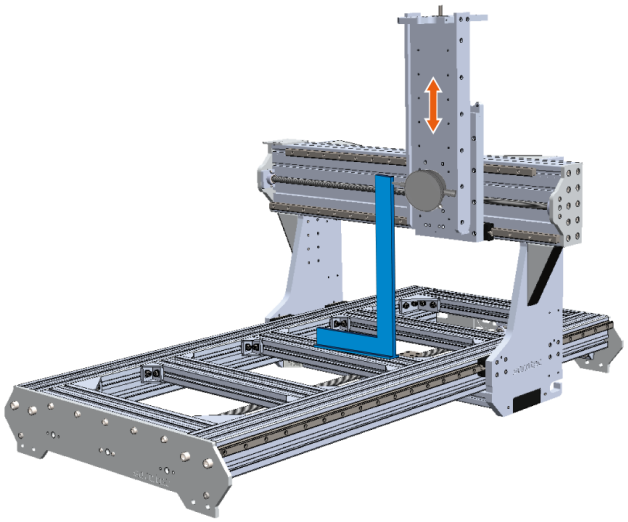


Fig. 6: Aligning the Z axis on the machine.

- Push the toothed belt wheel 17 soweit as far as possible onto the shoulder of the ball screw 12 and fix it with the locking screw.

- Mount the stepper motor* with cylinder screws 26, washers 34 and hex nuts 36; tighten screws slightly.

***Note**
The stepper motor required at this point is not included in the scope of delivery.

- Push the toothed belt wheel 17 onto the output shaft of the stepper motor, align it with the toothed belt wheel on the ball screw and fix it with the locking screw.

- Put on the timing belt 18 and tension it by moving the stepper motor; Tighten the stepper motor mounting screws.

- Screw the timing belt cover 9 (not shown) to the stiffeners 4 and 5 with flat-head screws 32 (red arrows in Figure 7).

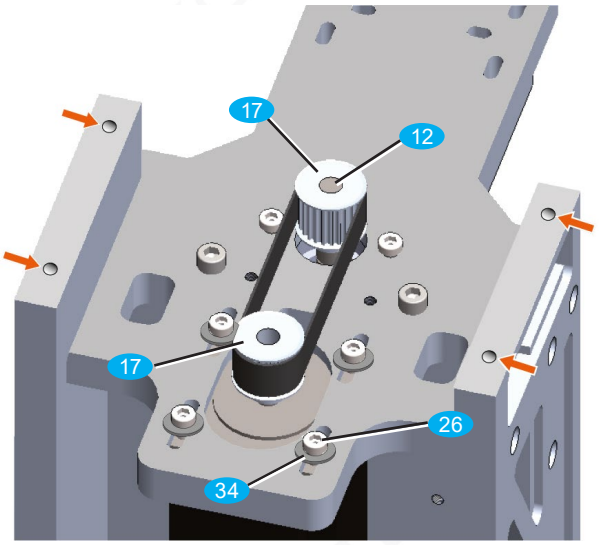


Fig. 7: Assembly of the axis drive

Constructive interfaces

The constructive integration into a machine takes place via two mounting surfaces, the exact dimensions and other properties of which are described in Figs. 9 to 12.

Mounting on the portal slide

Fig. 11 shows the mounting points for screwing the Z-axis to the portal slide. The Y-axis carriages are not directly connected to the Z-axis.

An adapter plate is to be constructed, which is screwed to the guide carriage on the one hand and which creates the connection to the Z-axis screwed on from the front on the other hand (see also front view, Fig. 9).

Mounting the milling spindle

Figure 12 shows the spindle mounting points on the Z-axis. An adapter plate is to be constructed to accommodate the respective spindle. Ready-made holders are available in the Sorotec shop for the popular round spindles (but also for others):
ZSP.HFSH65IS.AL für Ø 65 mm
ZSP.HFSH80.1IS.AL für Ø 80 mm

Fig. 8: The Z-axis of the Alu-Line as a 3D drawing

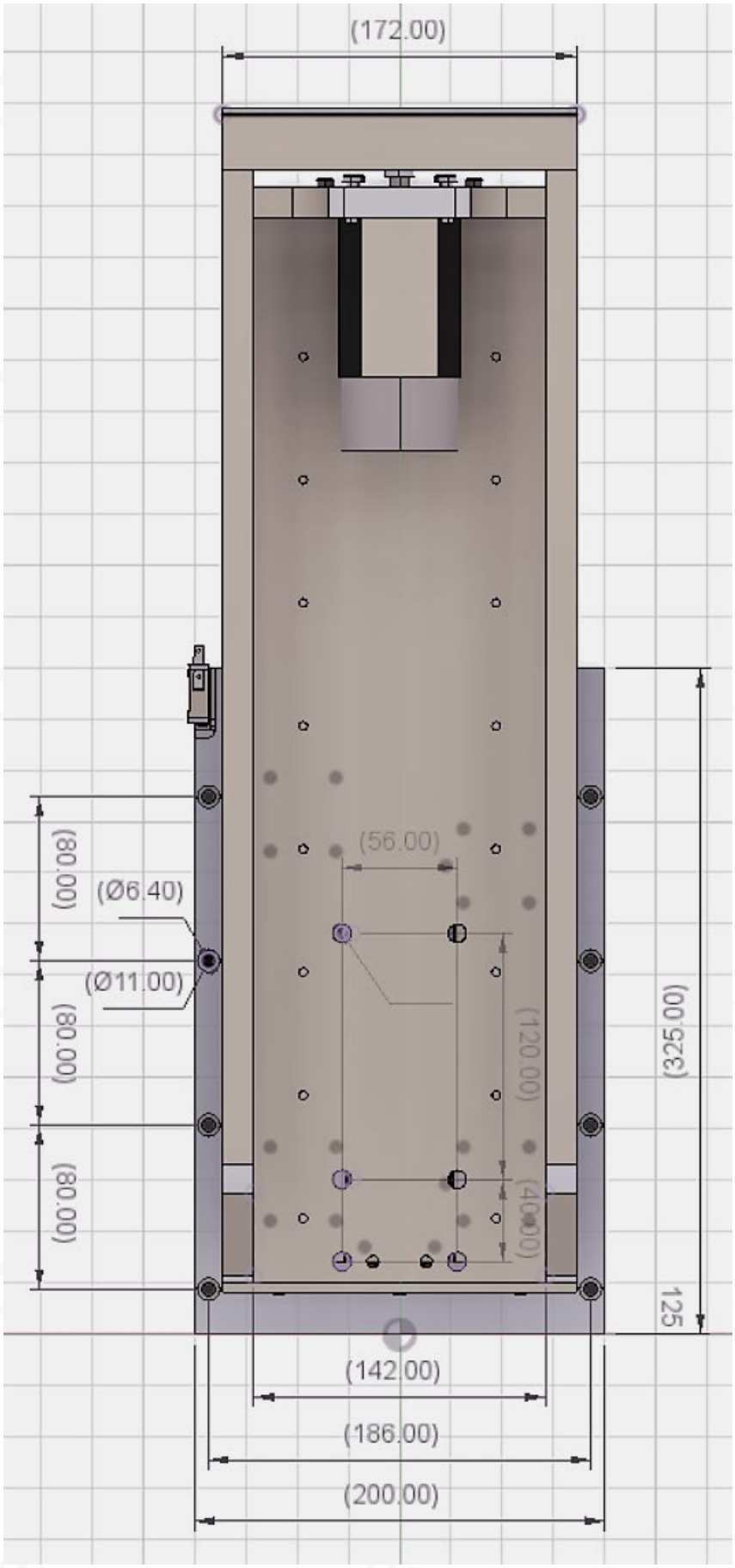


Fig. 9: Front view

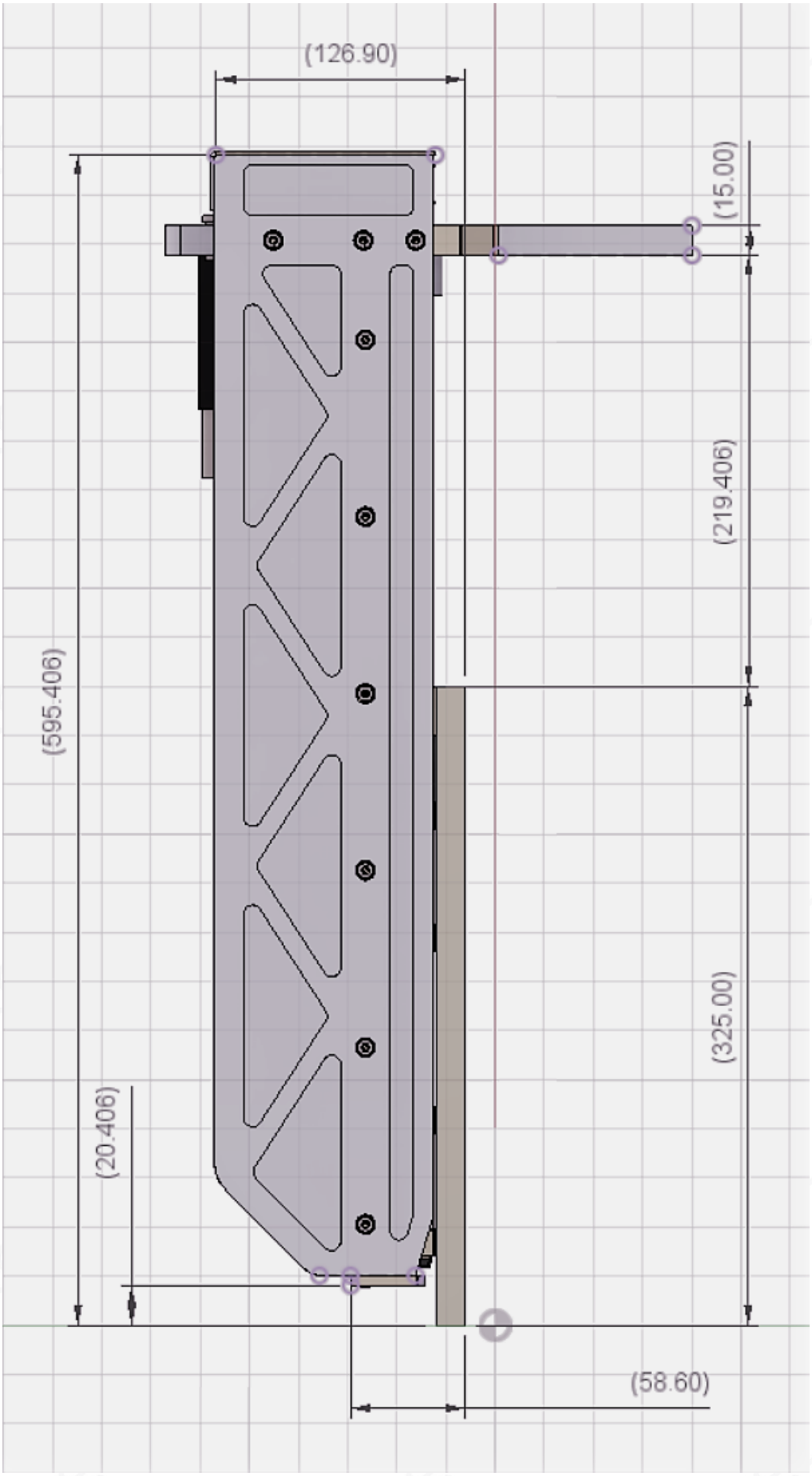


Fig. 10: Side view

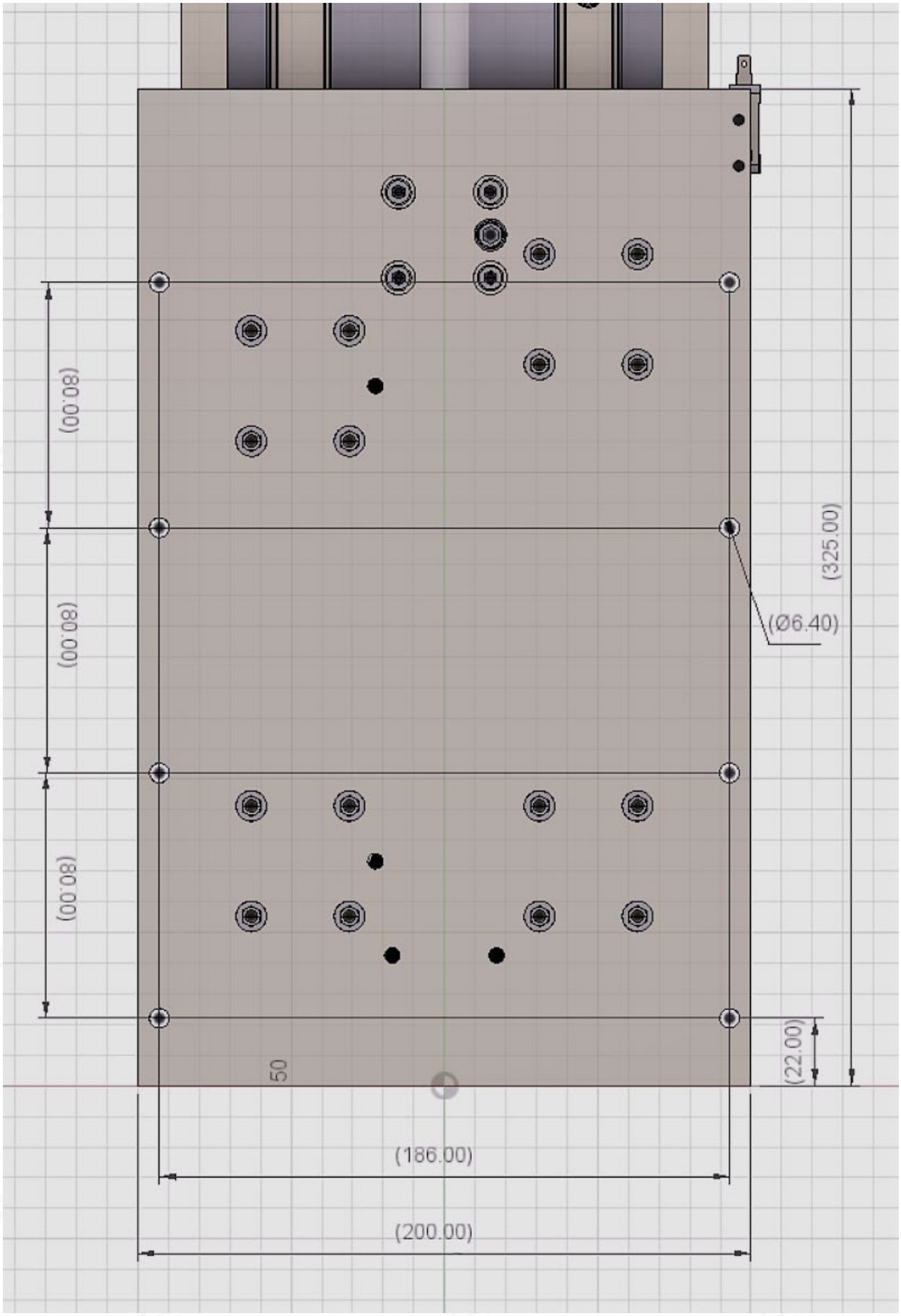


Fig. 11: Mounting points for screwing to the portal slide

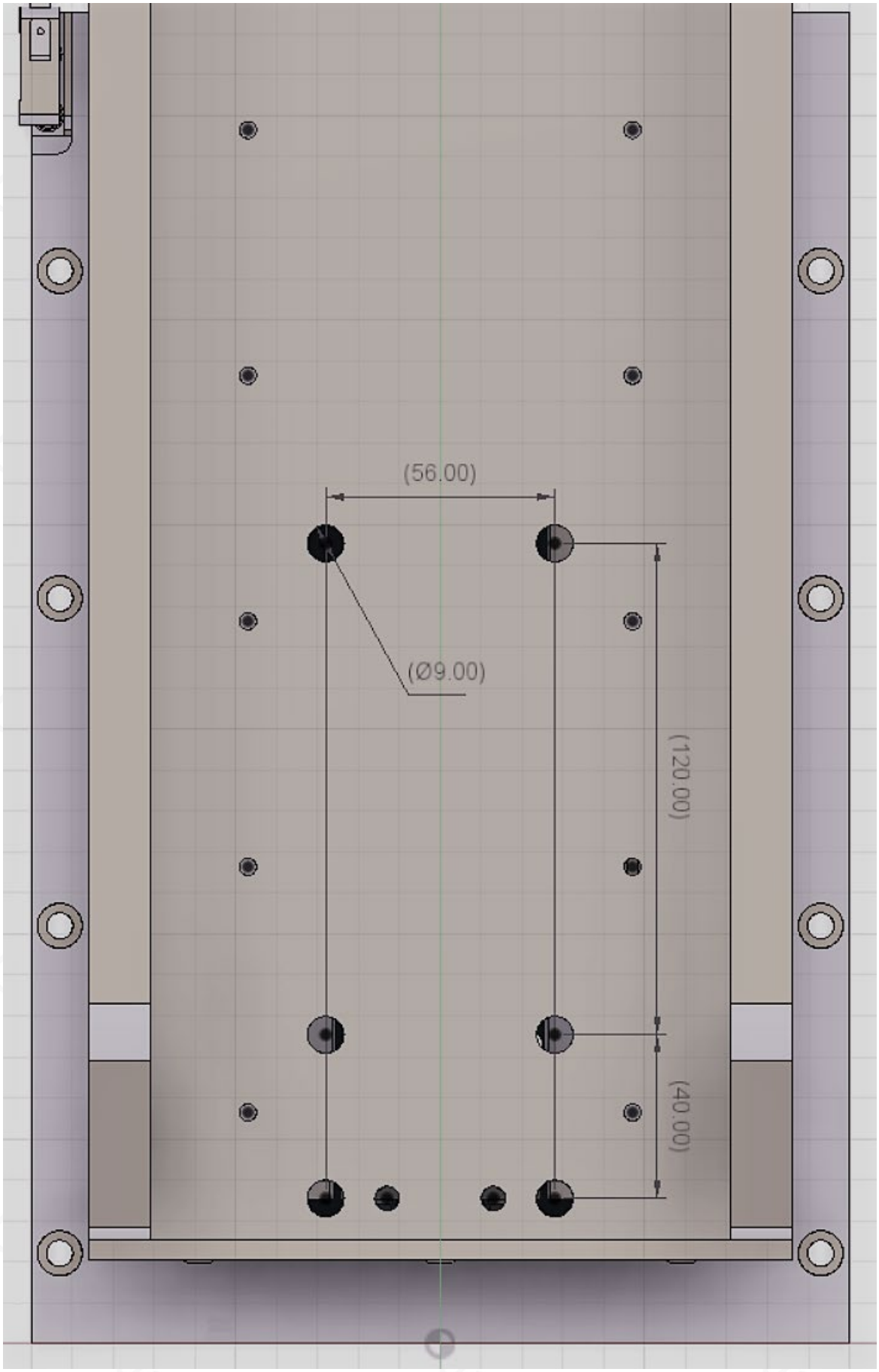


Fig. 12: Spindle mount