

## Setup for testing cells exposed to peristaltic induced flow shear stresses

The setup is intended for:

1. To generate the peristaltic movement of the elastic wall and to produce in such a way the peristaltic flow shear stresses
2. To expose various kinds of cells to peristaltic stresses.

General scheme of the setup is shown in Figure 1. It consists of two main parts: test chamber and peristaltic mechanism.

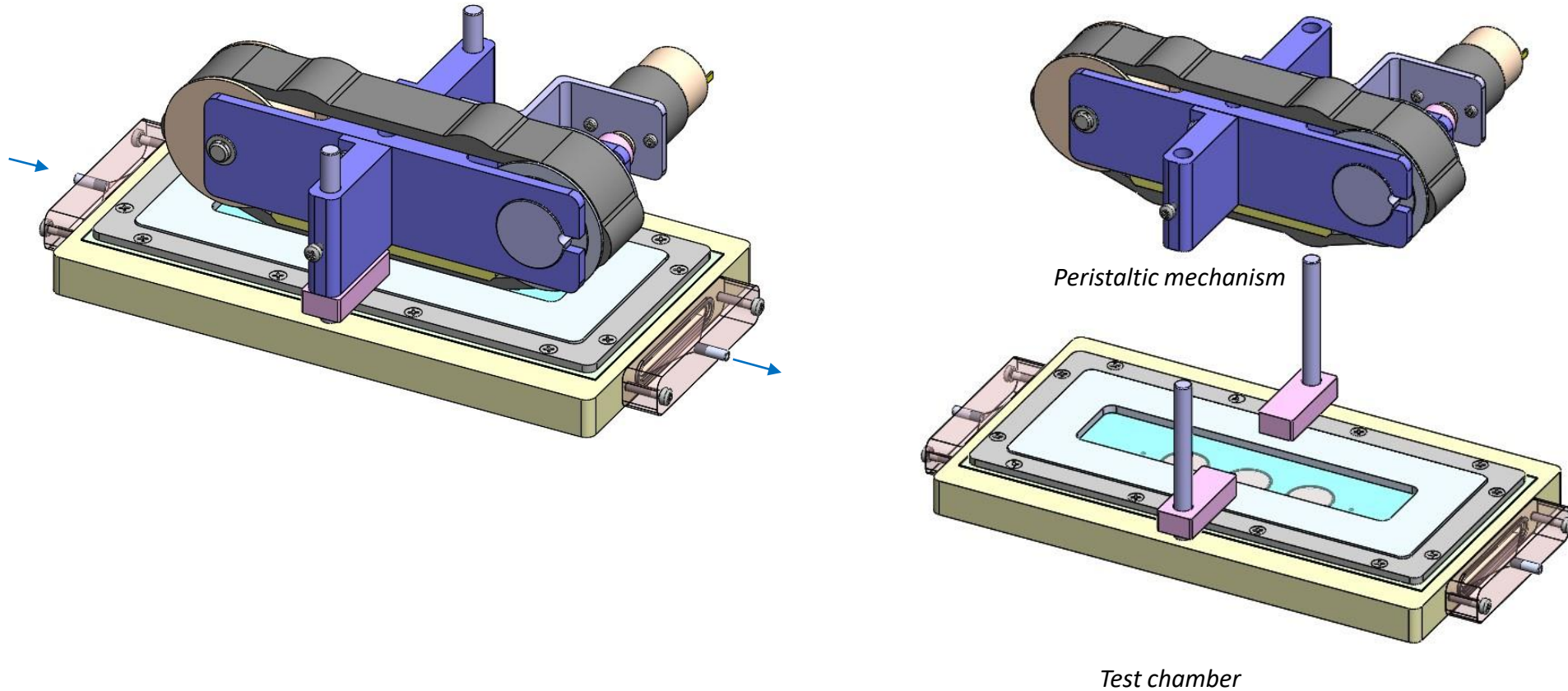


Fig. 1. General view of the setup

**Test chamber** could contain three big wells with a membrane of 24-mm diameter and cells layer (or multilayer) on it. The membranes surfaces are in the same plane as the supporting plate inside the flow channel. The test chamber is covered by elastic wall (1-mm silicon). The general and section views of the test chamber are shown in Figure 2. Exploded view is shown in Figure 3.

Test chamber body, inner parts, cover and flanges are made from Polycarbonate. External parts are made from Aluminum alloys.

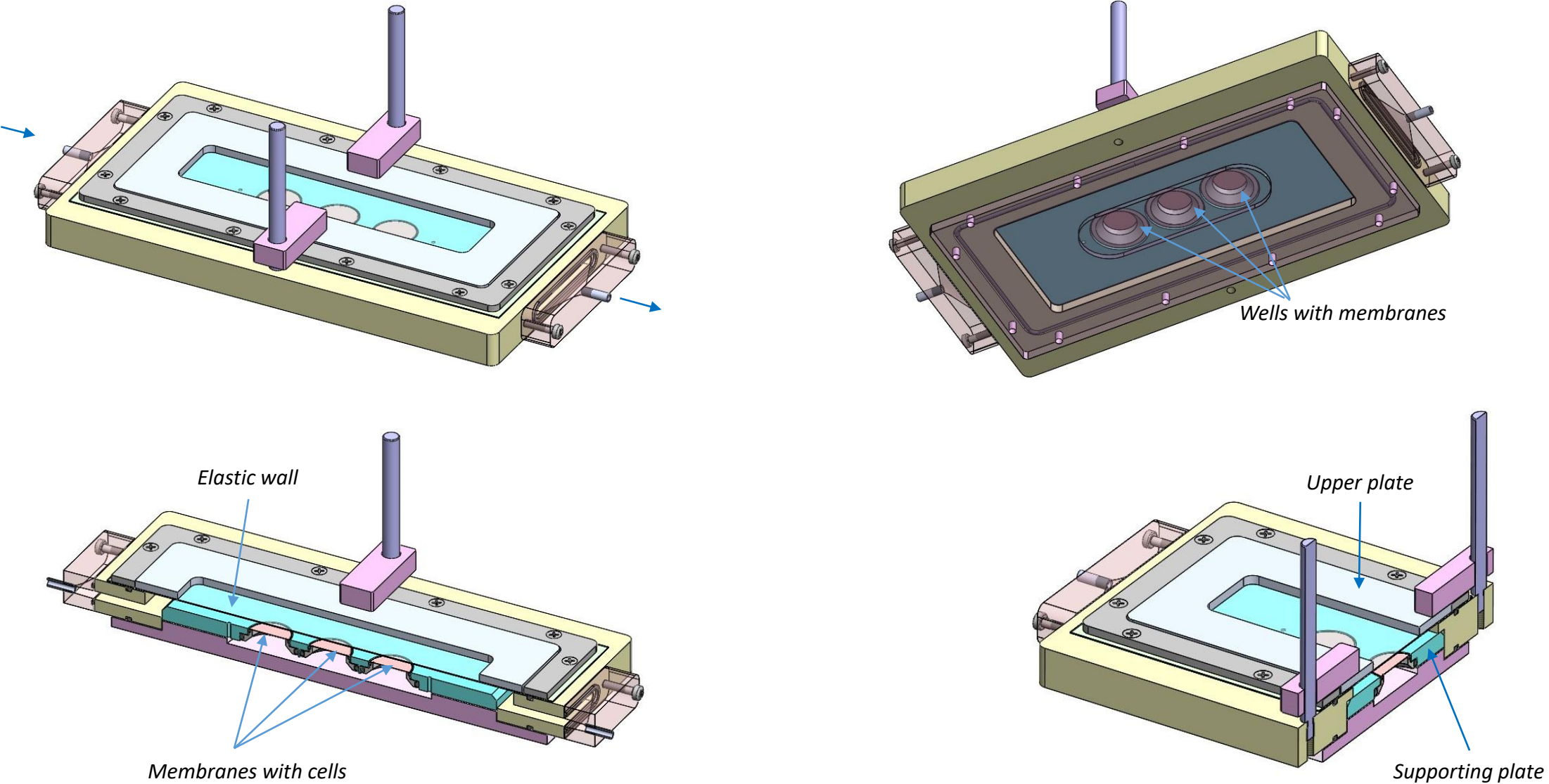


Fig. 2. General and sections view of the test chamber

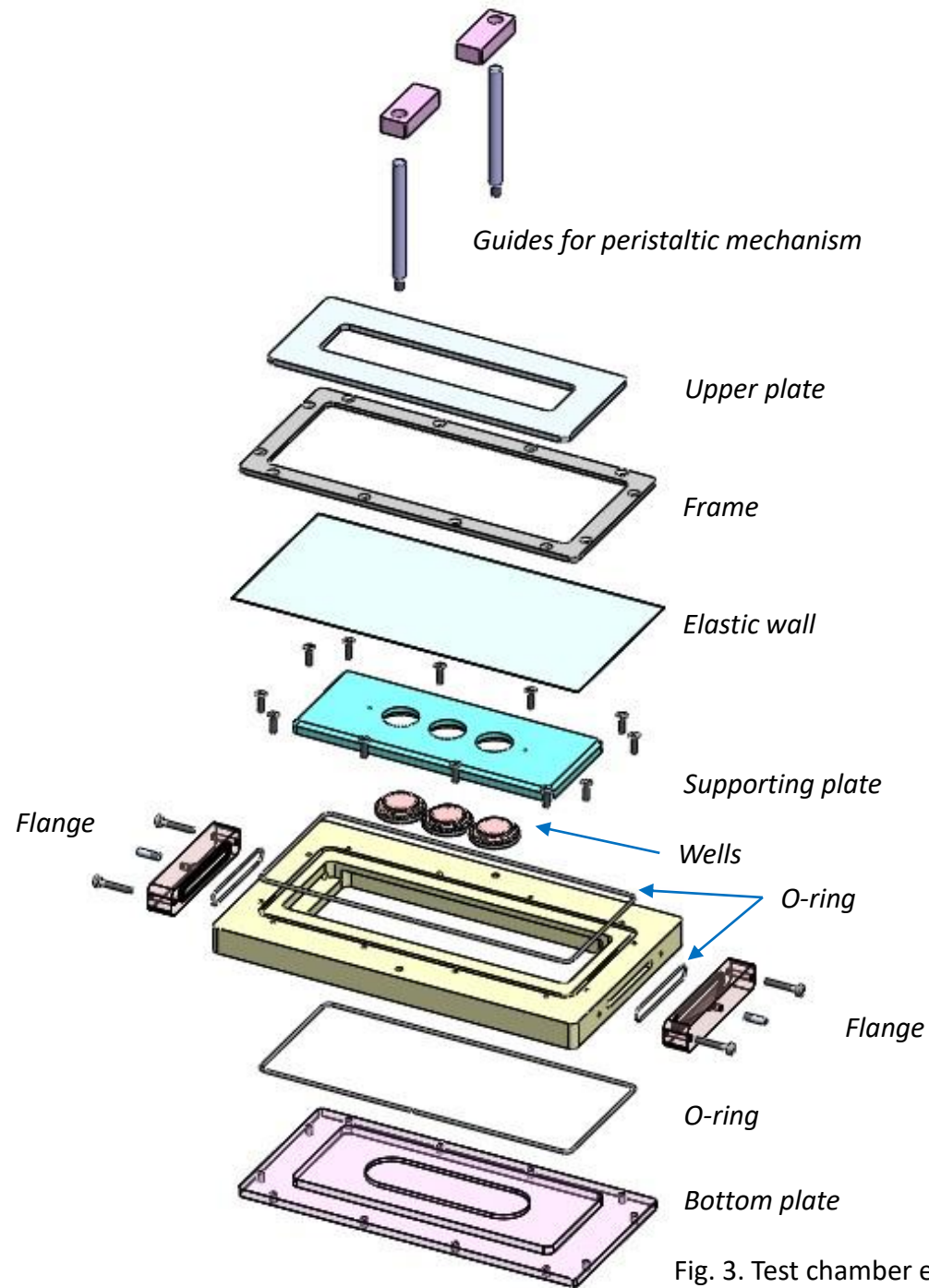


Fig. 3. Test chamber exploded view

Upper plate prevents elastic wall bulging because of the internal pressure. So the upper wall is flat during the peristaltic movement. Flow channel cross-section dimensions are 70x5 mm. General dimensions of the test chamber are given in Figure 5.

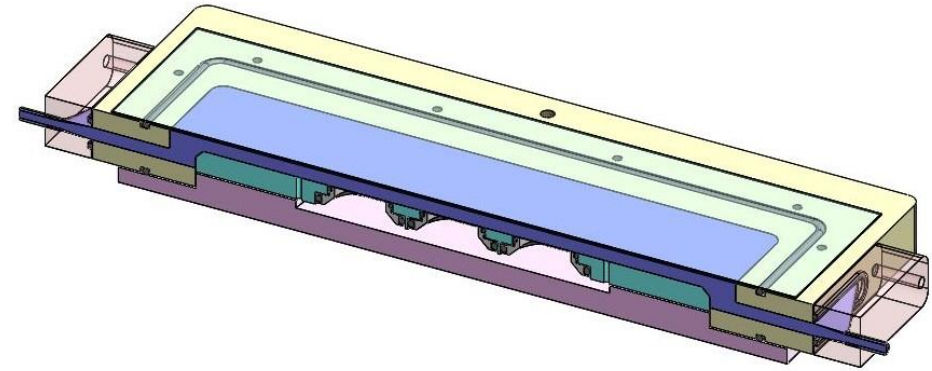


Fig. 4. Test chamber flow channel

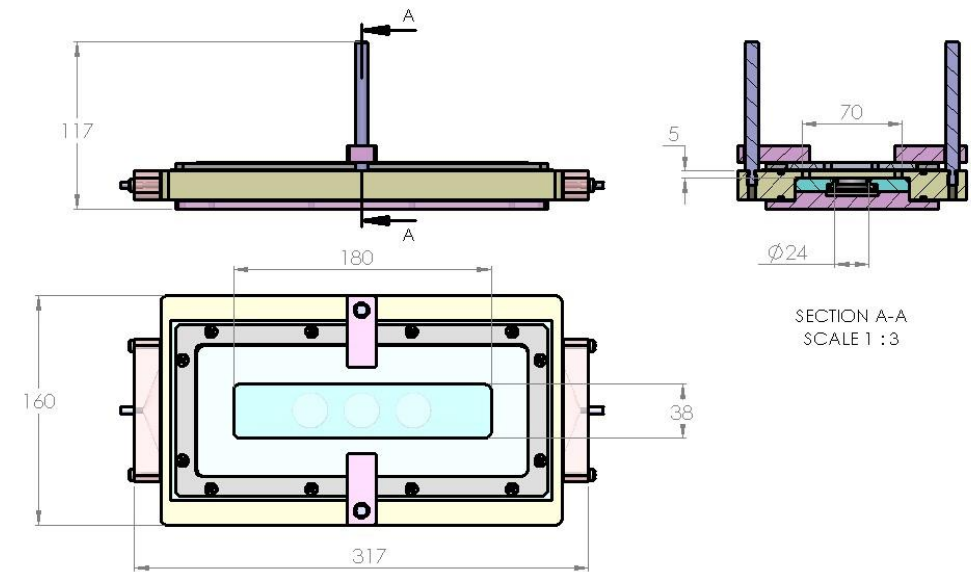


Fig. 5. Test chamber dimensions

**Peristaltic mechanism.** The main part of this mechanism is a custom designed elastic band. The belt is actually synchronous drive belt with a number of bumps on its external side. Bump heights is 3.7 mm, length is 25 mm, spaced in a distance of about 90 mm one from another. There are total 6 bumps on the belt of about 555 mm circumference. The belt was printed by 3D-printer from POLYFLEX.

The movements of these bumps above the elastic wall produces peristaltic flow. The belt is rotated by gearwheel that in turn rotated by DC motor. Motor rotational speed is 4 rpm at 12 V DC. The linear velocity of the bumps above the elastic wall is about 10 mm/sec.

The general view is shown in Figure 6, exploded view is shown in Figure 7. Section views of the peristaltic mechanism and test chamber are shown in Figure 8. The belt and its dimensions are shown in Figure 9.

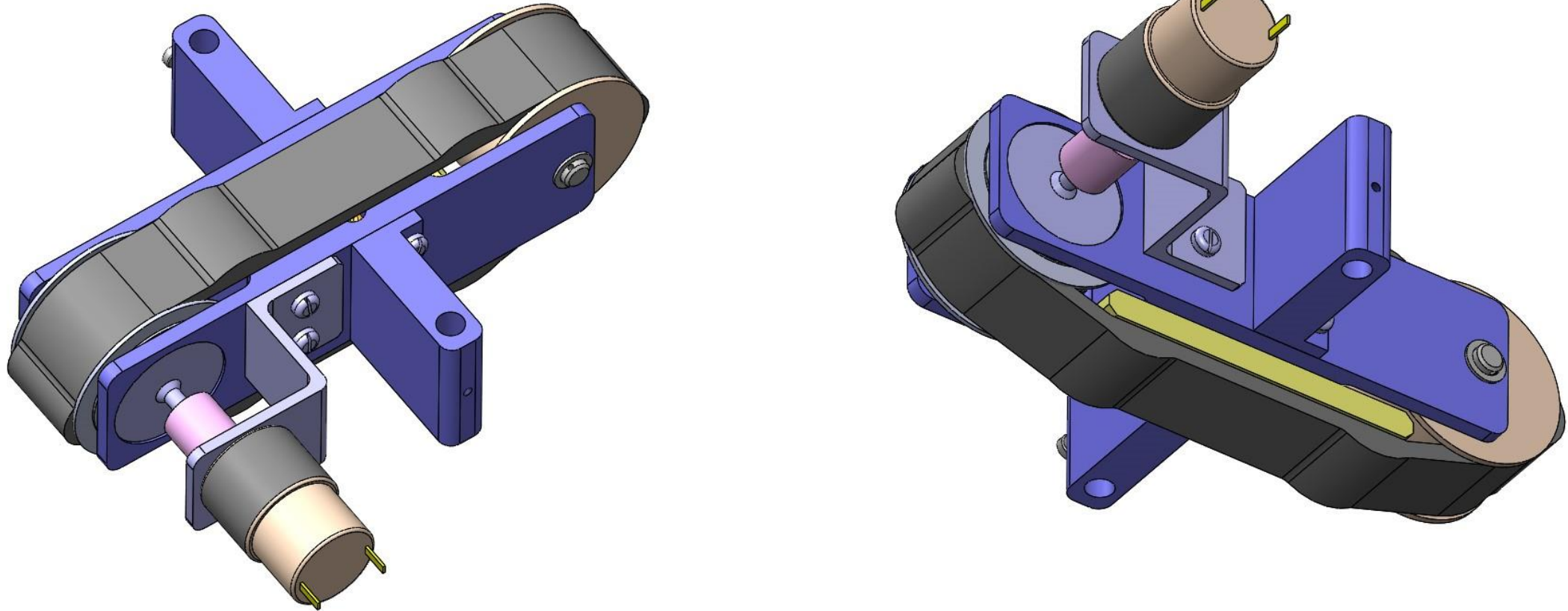


Fig. 6. Peristaltic mechanism general view

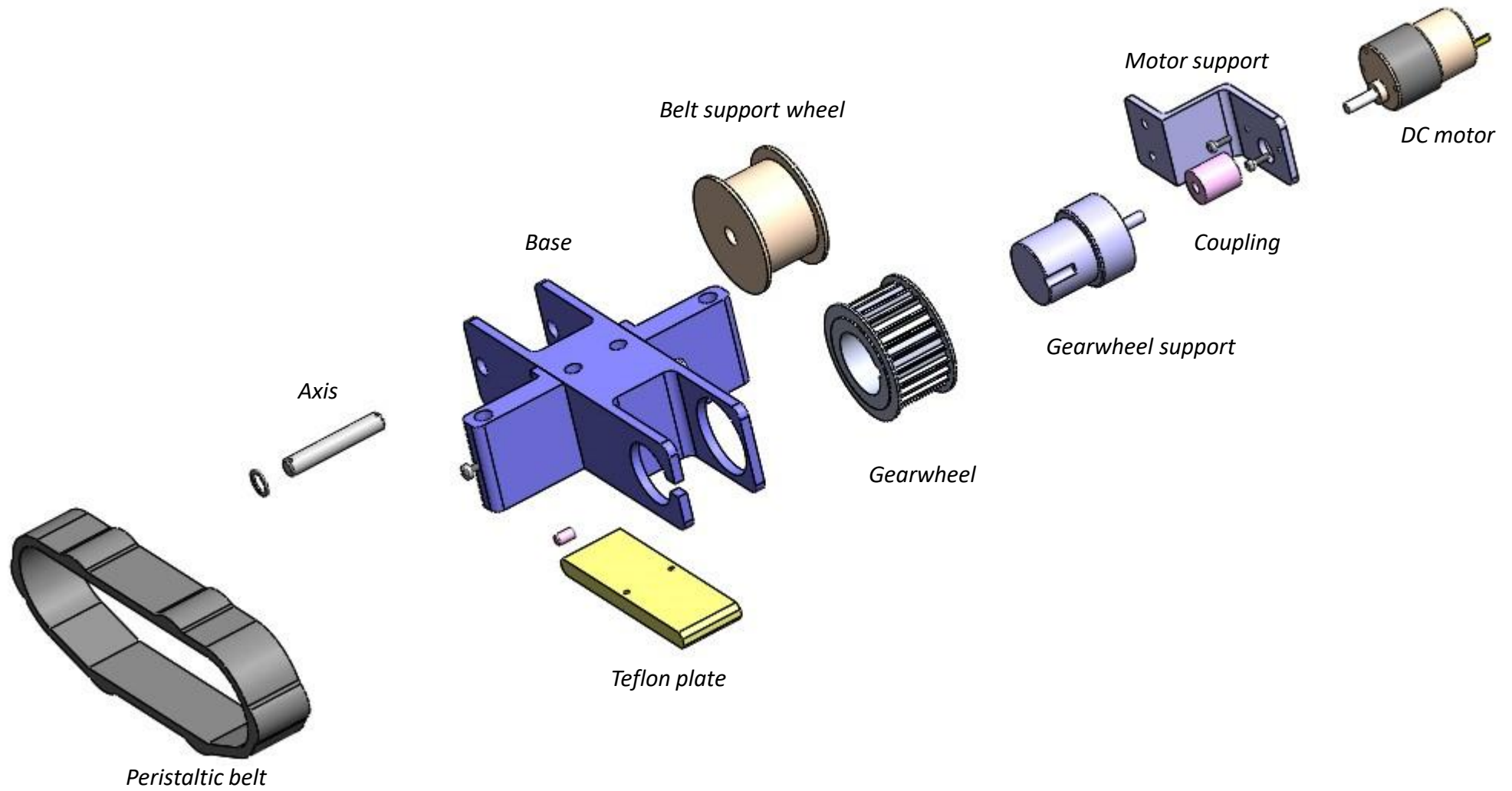


Fig. 7. Peristaltic mechanism exploded view

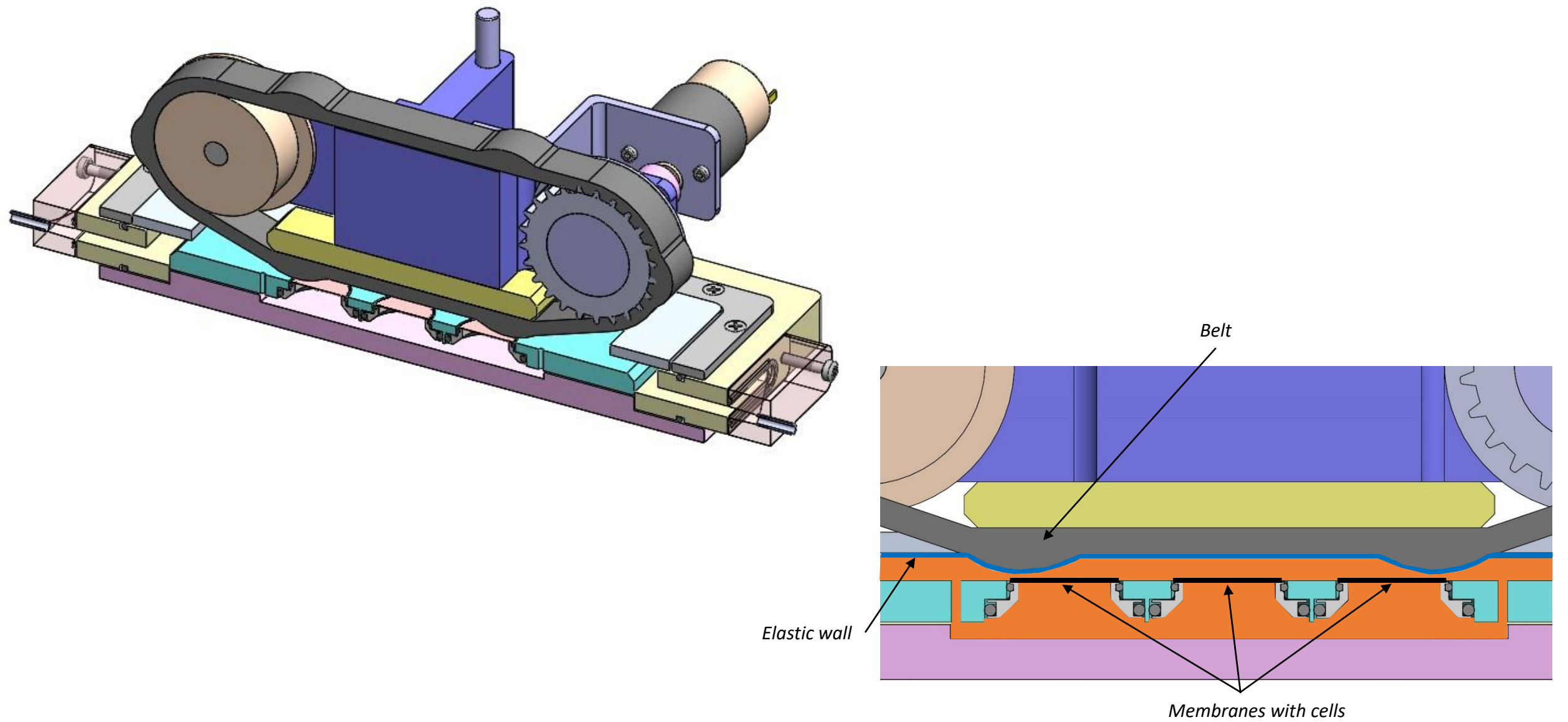


Fig. 8. Section view of the setup

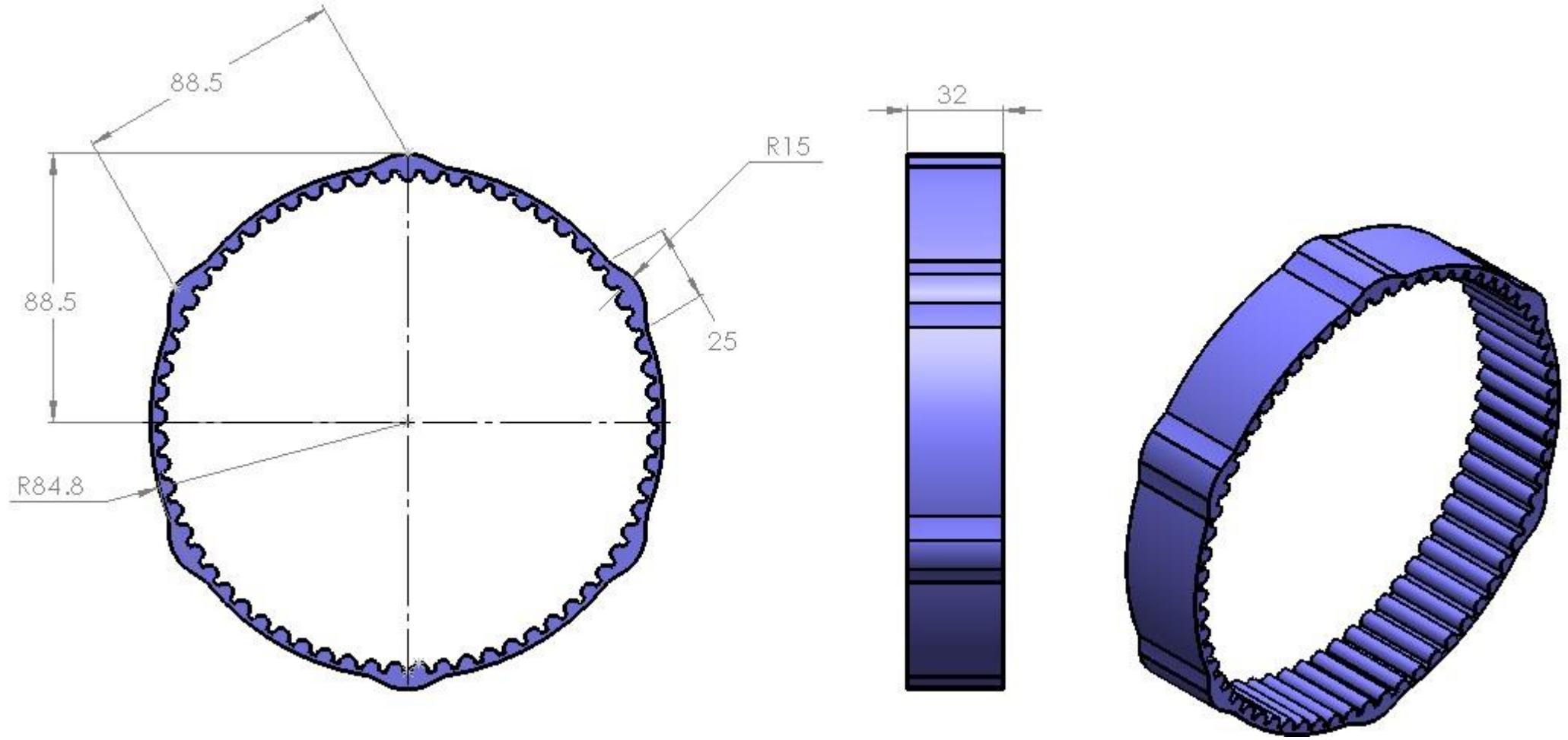


Fig. 9. Belt general view and dimensions

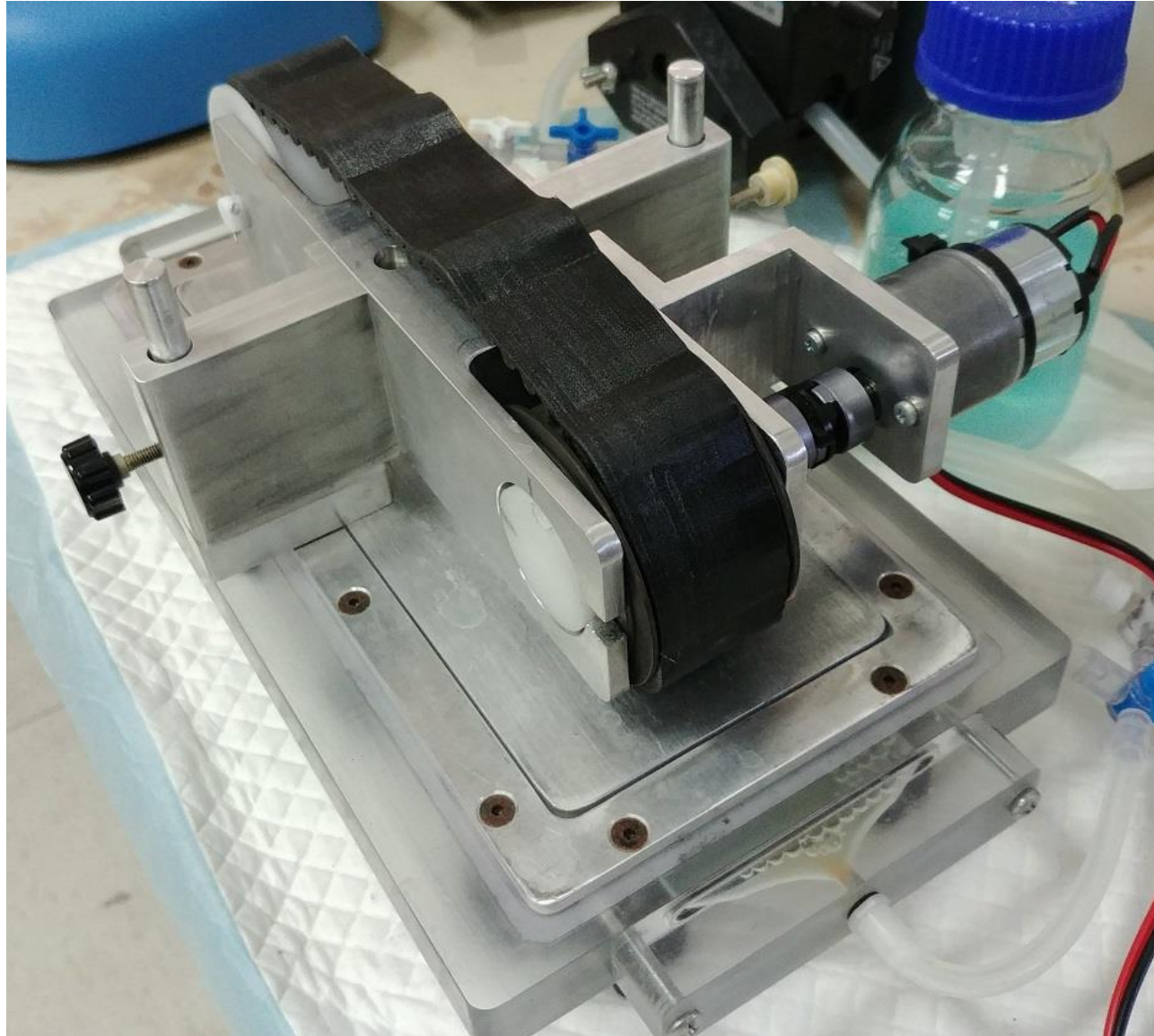


Fig. 9. Photo of the setup