Experimental Device

As shown in Figs. 1 and 2, the experimental device consists of a frame, an upper box, a lower box, a divider, and a baseboard. The frame is made of aluminum, while the other components are made of acrylic. A digital camera can be mounted at the top of the frame and was used to capture photographs and videos. The front panel of the lower box can be moved upward by a motor at a constant velocity. The dimensions of each component are shown in Fig. 3, and Fig. 4 presents schematic diagrams of the lower box. The horizontal plane is defined as the x–y plane, and the vertical direction is defined as the z-axis. The acrylic boards used to construct the boxes are generally 10 mm thick, whereas the front panel is 5 mm thick. Beneath the movable part of the front panel, there is a fixed wall with a height of 20 mm. As shown in Fig. 5, the inner wall surface of the lower box is aligned with the y-axis, and a 10 mm grid is marked on the baseboard, which is used to measure the run-out distance of the particles.

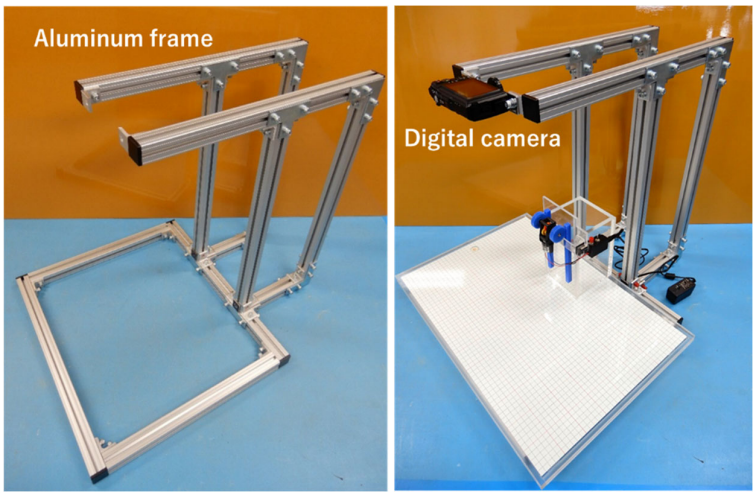


Fig. 1 Experimental device

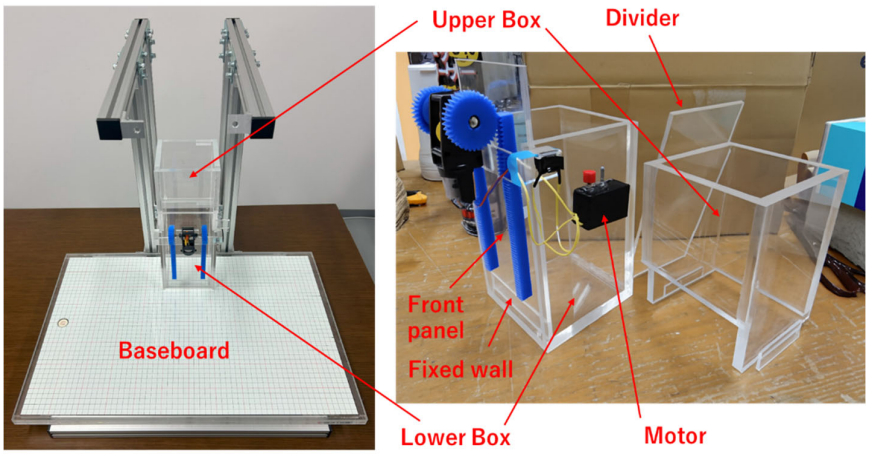


Fig. 2 Names of the components of the experimental apparatus

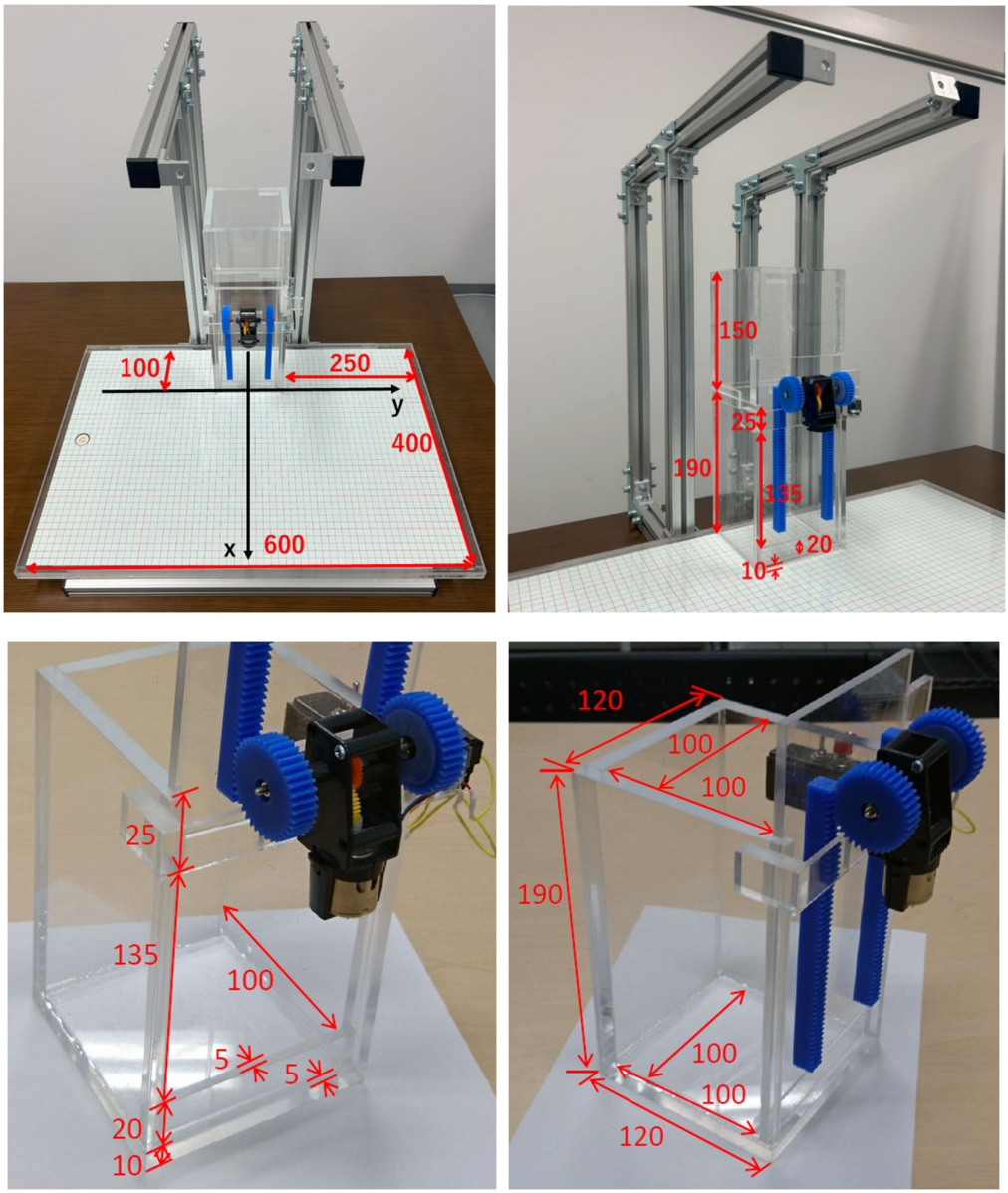
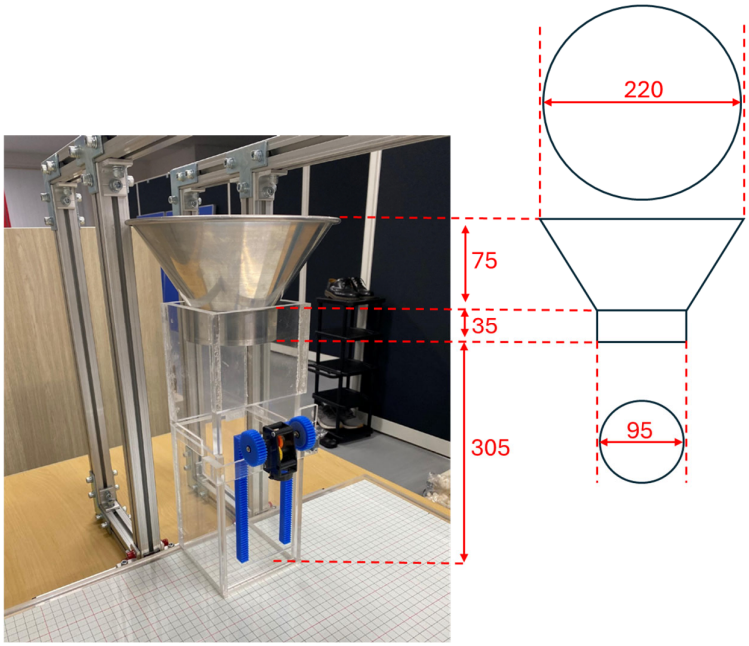
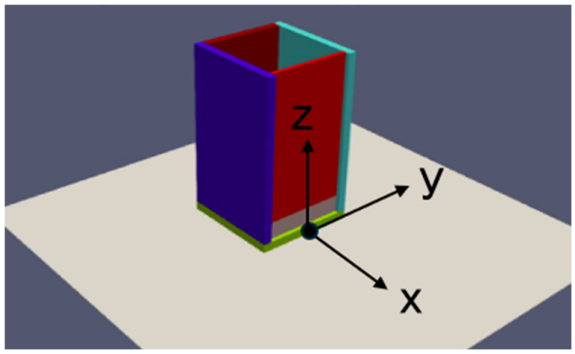


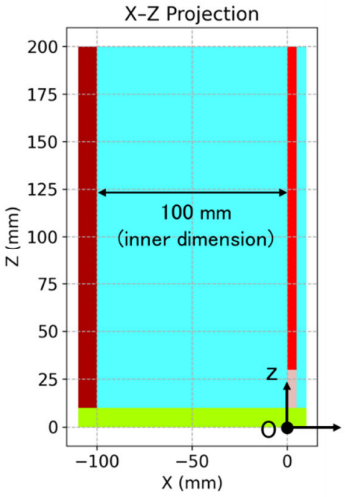
Fig. 3 Dimensions of experimental device (Unite: mm)

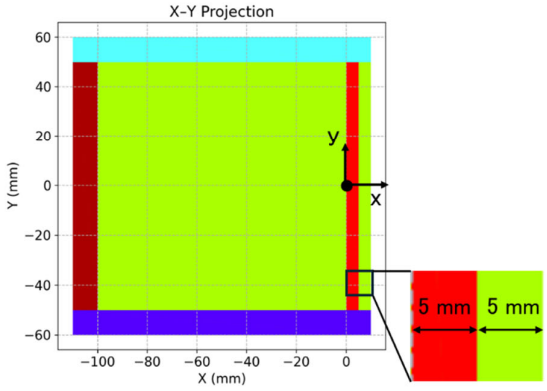


Funnel for pouring the particles to fill the lower box



(a) Bird's-eye view





(b) Side view (X-Z projection) (c) Top view (X-Y projection)

Fig. 4 Schematic images of experimental apparatus

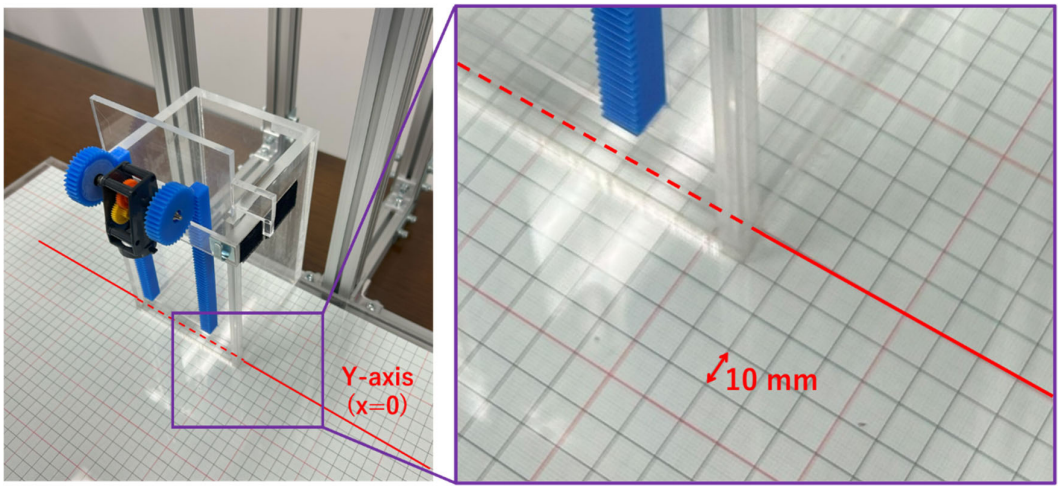


Fig. 5 Positional relationship between the front of the box and the Y-axis