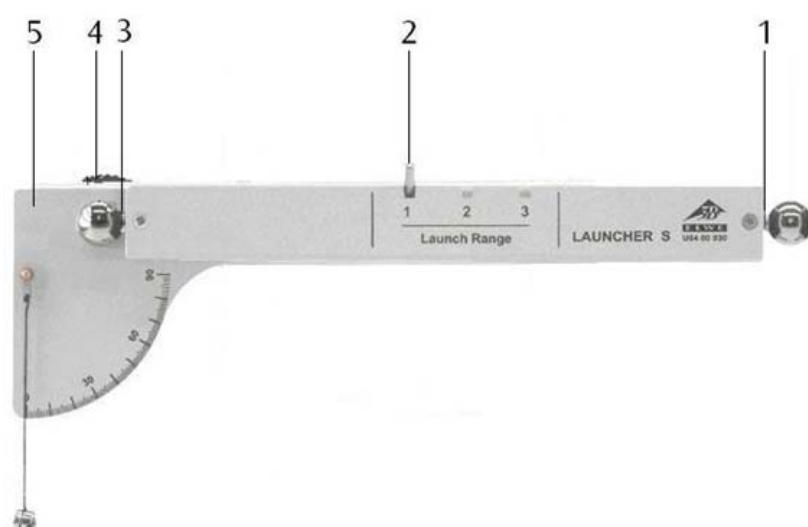


## Launcher S U8400930

### Instruction sheet

04/09 THL/ALF



- 1 Rear magnetic holder with ball
- 2 Release trigger
- 3 Front magnetic holder with ball
- 4 Locking screw
- 5 Angle scale with plumbline

### 1. Safety instructions

The acceleration of the ball is quite small, and therefore there is no risk of injuries. However, the launcher must not be directed towards people when it is loaded.

The target area of the ball must always be uncluttered and clearly visible.

There must be no breakable articles in the target area of the launcher.

- Ensure that there is a clear distance of at least 4 m in front of the launcher.
- Remove all breakable articles from the area in front of the launcher.

When it is released, the trigger flies forward rapidly.

- Only hold the part of the launcher behind the release trigger.

### 2. Description

The launcher S is used for investigating vertical, oblique and horizontal throwing trajectories, and for demonstrating the independent superposition of horizontal and vertical components of motion.

A choice can be made between three different launching accelerations by engaging the release trigger in the corresponding notch. The angle of elevation of the launch is continuously adjustable and can be read on the angle scale by means of a plumb-line.

Until the launch, the ball is held magnetically at the launch position. When the angle is adjusted the launch position remains unchanged, as the fulcrum is on the horizontal axis of the ball. Thus, changing the angle has no effect on the height from which launching occurs. In the case of horizontal launching of a ball, a second ball can be released simultaneously from the rear end of the launcher beam in free fall, and this lands on the table at the same time as the launched ball.

### 3. Equipment supplied

- 1 Launcher S
- 3 Steel balls

### 4. Technical data

Launch angle:	0° – 90°
Maximum range:	4 m
Projectile:	steel ball, 16 mm dia.
Mass of ball:	16.7 g
Approx. dimensions:	280x90x90 mm <sup>3</sup>
Total weight:	approx. 950 g

### 5. Apparatus also required

2 Stainless steel rods, 470 mm	U15002
2 Table clamps	U13260
or	
2 Stand bases, A-shaped	U8611150

### 6. Operation

#### 6.1 General instructions

- Using the clamps or stand bases, set up the launcher securely on a level surface.
- Set the required launch angle by loosening the locking screw slightly, adjusting the angle, and re-tightening the screw.
- Stretch the launching spring by sliding the release trigger and engaging it in notch 1, 2 or 3 according to the desired launching acceleration.
- To release the ball, push the release trigger upward by pressing on the side of it with your thumb.



Fig. 1 Releasing the launch mechanism

#### 6.2 Oblique, vertical and horizontal launching

- Place the ball on the front magnetic holder and set the required launch angle.
- Release the ball.



Fig. 2 Experiment set-up for oblique launching

#### 6.3 Determining the launch velocity

If the launcher is set in the horizontal launching position, the launch velocity can be calculated from the height of the launcher and the range. The change of the horizontal velocity during the flight can be neglected.

$$v = \frac{s}{\sqrt{\frac{2 \cdot h}{g}}}$$

$v$  = launch velocity

$s$  = range (distance reached on table)

$h$  = height of launcher

$g = 9.81 \text{ m/s}^2$

#### 6.4 Comparison between free fall and horizontal throw

- Place balls on both the front and the rear magnetic holders, and set the launch angle to 0°.
- Release both balls simultaneously.
- Listen for the sound of the impact of the two balls.

If the horizontal setting of the launcher is precise, it is hardly possible to detect a difference between the two impacts (i.e., the time of fall is the same for both).