

IDEX Challenge 2

Developer Briefing Note: DU-125 Muzzle Angle Measurement Unit

This briefing note provides an overview of the DU-125 optical instrument, a system designed for measuring muzzle angles of 125 mm smooth bore barrels used in T-72 and T-90 tank guns.

Overview

The DU-125 is an optical instrument that determines the **muzzle angle** of tank gun barrels. The muzzle angle is defined as the angle between:

- The **geometrical axis of the barrel bore** (straight line connecting the breech and muzzle cross-sections), and
- The **straight tangent to the virtual axis of the bore** at its muzzle end.

This measurement is critical for assessing barrel alignment and accuracy in armored vehicle weapon systems.

Component Breakdown

1. Breech-End Unit

- Fixed at the breech end of the barrel.
- Contains **cross-hairs** for alignment.
- A **light source** [external also] to project reference illumination through the bore.

2. Muzzle-End Unit

- Fixed at the muzzle end of the barrel.
- Contains a **center-dot** for reference.
- Equipped with a **magnifier lens** functioning as an eye-piece.
- Allows the operator to visually align the projected cross-hairs from the breech with the muzzle reference.

Measurement Principle

- The breech-end light source projects cross-hairs through the bore.
- At the muzzle end, the operator views the projected cross-hairs through the magnifier lens.
- The relative position of the cross-hairs against the center-dot defines the **muzzle angle**.
- This angle represents the deviation between the bore's geometrical axis and its tangent at the muzzle.

Workflow Summary

1. **Setup**
 - a. Attach breech-end unit with crosshairs and light source.
 - b. Attach muzzle-end unit with magnifier lens and center-dot.
2. **Measurement**
 - a. Illuminate crosshairs from breech end.
 - b. Observe alignment at muzzle end.
 - c. Record deviation between bore axis and tangent.
3. **Analysis**
 - a. Translate observed deviation into muzzle angle.
 - b. Use results for barrel alignment and accuracy assessment.

Developer Considerations

- **Optical Precision:** Cross-hair projection and magnifier lens alignment must be finely calibrated.
- **Mechanical Stability:** Units must be securely fixed at breech and muzzle ends to avoid misalignment.
- **Environmental Factors:** Dust, vibration, and lighting conditions can affect visibility and accuracy.
- Any modern equivalent system can also be offered but its efficacy and repeatability would be checked against the legacy equipment