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TEST STAND

Abstract. The paper discusses the basic features of a stand developed for gunfire-testing of armour plating samples. Reference is made to the results of research carried out at the Research Department of the Zakłady Mechaniczne Tarnów S.A. Conclusions include prospects for further development of the design.

Keywords: armour, protection level, ballistic resistance, ballistic resistance testing.

1. INTRODUCTION

One of the most important features of combat vehicles (wheeled armoured carriers, personnel carriers, tanks, tracked carriers, etc.) is their resistance to gunfire providing safety for the crew in the battlefield. The direct protection means of a combat vehicle include basic armour, supported by additional armour (passive or reactive) and active protection means.

The STANAG 4569 international standard [1], which defines the levels of protection, is used to determine the properties of armour.

The declared parameter values (protection levels) are verified by carrying out special ballistic resistance tests, either using armour plate samples on a test stand, or a test vehicle under real (testing ground) conditions.

The manner of conducting such tests is precisely defined, and is described in NATO publication AEP-55 [2].

In the course of research and development projects, already at an early stage of developing an armour design, introductory tests are performed to verify the adopted parameters by means of firing tests.

2. TEST STAND

A project [3] being implemented with the participation of OBRUM, consisting in the development of additional passive armour, included ballistic resistance tests on additional armour components.

These tests were conducted on a test stand the block diagram of which is depicted in Fig. 1.

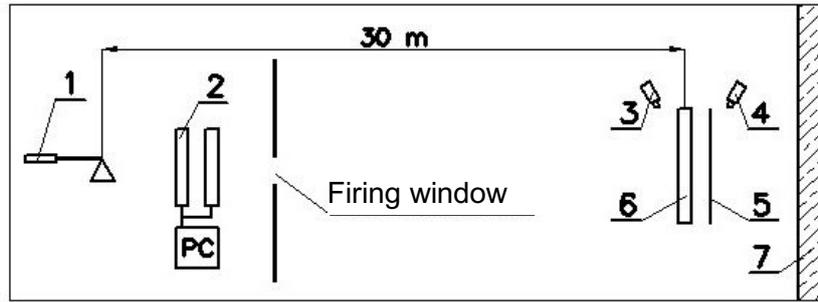


Fig. 1. Block diagram of the firing test stand

1 – firing position; 2 – gate for muzzle velocity measurement with computer; 3 – front camera; 4 – rear camera; 5 – witness plate; 6 – tested element; 7 – backstop

One of the important elements is the instrumentation design of high strength (Fig. 1, item 6) in the form of a special stand (test stand) for mounting sample pieces.

The developed structure [4] enables installing basic armour panels with additional armour of the following dimensions:

- 250 x 250 mm;
- 250 x 500 mm;
- 500 x 500 mm.

The stand also enables installing the so-called witness plate behind the sample piece.

Another feature of the designed and fabricated structure is the ability to position sample pieces at an angle of 0° and 30° to the line of fire, which greatly enhances functionality of the stand. The body of the stand is anchored to the ground or fixed with bolts to a foundation.

The stand is shown in drawings: Fig. 2 and Fig. 3.

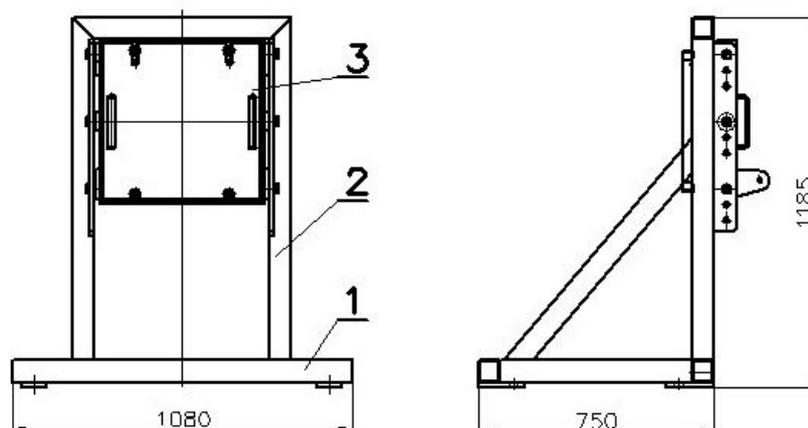


Fig. 2. Stand for gunfire-testing armour plate samples

1 – base frame; 2 – side frame; 3 – replaceable fixing plate



Fig. 3. Stand for gunfire-testing – assembly operations

3. INTRODUCTORY TESTING

The structure of the stand [4] (strength and functional features) was verified during tests of ballistic resistance of additional armour modules conducted in 2014 at Zakłady Mechaniczne Tarnów S.A. [5].

Fig. 4 shows a sample piece of armour installed at the test stand and prepared for gunfire-testing.



Fig. 4. Sample piece of armour installed at the test stand

4. CONCLUSIONS

- The developed test stand design has been shown to be fully suitable for conducting gunfire testing at protection levels 2 and 3.
- The solutions applied can, upon scaling up, be used to design a test stand for other (e.g. larger) sample pieces (500 x 750 mm or 1000 x 1000 mm) or higher protection levels (e.g. 3+).
- The test stand (Figs. 2 and 3) developed at OBRUM will be used at subsequent stages of project [3] implementation.

5. REFERENCES

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Results of the first stage of the project titled "Additional modular armour for wheeled armoured personnel carriers and tracked platforms" financed by NCBiR (National Centre for Research and Development) were used in this paper.