

Tension and Compression Testing Machine for Friction Dampers

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Abstract – The present paper shows the advantages in using this prototype of tension and compression test machine proposed by the authors. The mechanical behaviour of different materials and components can be easily obtained by using this type of device. The equipment enables a simplified change between the types of testing performed. The operators can quickly and easily change elements and accessories used in testing. This equipment is the suitable choice for evaluating different types of friction dampers.

Keywords – compression, force-displacements diagram, tension, testing machine

1. INTRODUCTION

The present paper presents the advantages of the tension and compression machine proposed by authors. This device is a universal instrument used to test the tensile and compressive strength of materials or components.

The evaluation of the mechanical behaviour of a sample under condition of tension and compression can be performed to provide basic material property data, critical for component design.

The machine was proposed to evaluate the hysteretic loop of friction dampers.

2. DEVICE DESCRIPTION

The tension and compression machine proposed by authors, is composed of two principal parts, one fixed and one mobile. The parts are sliding one to another. The tester is equipped with hydraulic pump and cylinder, microcomparator and manometer.

The maximum extension of hydraulic cylinder is 100 mm. The displacement in time can be determinated by electronic microcomparator with maximum value of 50 mm (Fig.1).

The pressure given by the pump is recorded by the manometer and it is transformed into force by the hydraulic cylinder. The maximum pressure value that can be recorded by the manometer is 100 MPa (Fig.2).

The components are made by S235 steel. The fixed part is made from three U80/50x5 profiles welded together. The mobile part is built from four rectangular profiles RHS80x50x5 cuted at 45° and welded together. In Figure 3 is presented the isometric view of the machine. Figure 4 presents a front view of the machine.

A compression/tension test is a method for determining the behavior of materials or components under a certain load. During the test, the element is compressed or stretched, and results can be represented in a force-deformations diagram (Fig. 5).

In order to determine the behavior of materials under an axial force it is necessary to mount the probe on to the device. Two screws are used for fixing the element.

Figure 6 and Figure 7 illustrates the fixed and the mobile parts during the manufacturing process.

The resulting assembly was equipped with a hydraulic pump and cylinder, microcomparator and manometer (Fig. 8).



Fig. 1. Microcomparator



Fig. 2. Manometer

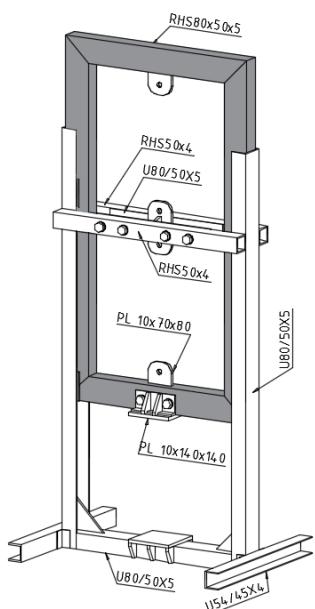


Fig. 3. Isometric view

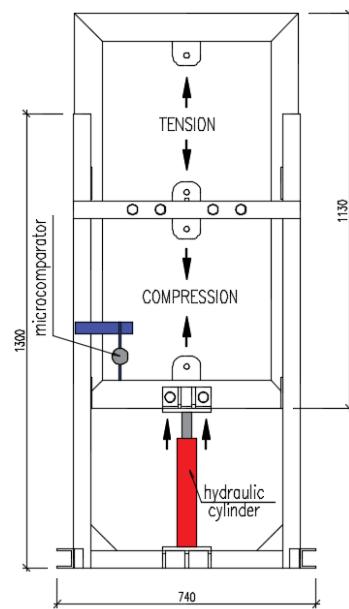


Fig. 4. Tensile and compressive test – front view

Advantages of using the proposed tension and compression machine:

- tensile and compressive tests can be performed on materials or elements in a simplified way, just by changing the position of the probe;
- the equipment enables a simplified change between the type of testing performed, the operators can quickly and easily change elements and accessories used for testing;
- easy design to work with and to obtain the results;

Due to the fixing system proposed, the tests can be performed on a variety of materials, including metals, plastics, concrete, fibers and adhesives.



Fig. 8. Tension and compression machine

3. CONCLUSIONS

Tensile and compressive test machines are universal and are the most commonly used in determining mechanical properties of materials or components.

The prototype enables a simplified change between the type of testing performed, the operators can quickly and easily change elements and accessories used for testing

This equipment is the proper choice in evaluating different types of friction dampers, due to the fact that the test can be performed in quasi-static conditions.

4. REFERENCES

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