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MEASURMENT METHOD OF THE CHARACTERISTICS PARAMETERS OF THE AUTOMOBILE DAMPER

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Abstract: *The increase of the occupants comfort is a major objective for designers and manufacturers of the vehicles. For all types of vehicles being in exploitation is required to have service parts on the market. Manufacturers of service parts are constrained to sell service parts certificated. The certification of replacement parts is done by the competent authority in the field of road vehicles, road safety, environment protection and quality assurance. In Romania, the competent authority is R.A.R. – Romanian Automobile Register (Registrul Auto Roman), which is the technical specialized body designated by the Ministry of Transport and Infrastructure. The certification enforces, inter alia, also the inspection of constructive and functional parameters of vehicles. In this paper we present the methodology for verifying constructive and functional parameters of the dampers used in car suspension*
Keywords: *damper*

1. INTRODUCTION

In this paper we present for a type of damper, how they inspected the constructive and functional parameters of it, and some results of measurements on triplicate damper. The paper is structured as follows:

- Method of checking the appropriate stages;
- Parameter measurement results of the three dampers;
- Gather and analyze results;
- Conclusions.

2. METHOD OF VERIFICATION

2.1 Stages of inspection

- The fill of the initial sheet, where are provided: the test name, the test objects, the test applicant, the sampling, the test conditions, the place of evidence and equipment used;
- Establish measurements which will be made in accordance with the documentation or company standards of the product. For dampers we accomplish dimensional measurements, check of adjustable and damping characteristics. These checks are according to STAS 9381-88;
- Making the necessary adjustments to grip damper on a stand similar to vehicle grip. Stand is presented schematically in figure 1;
- Making checks – the sheet fill of dimensional measurements, of adjustments diagrams and of dampers;
- Analysis and centralization of measurements and conclusions;
- Perform a verification report

2.2. Equipment used and models for documents of results presentation

In Figure 1 is presented, schematically, the test stand.

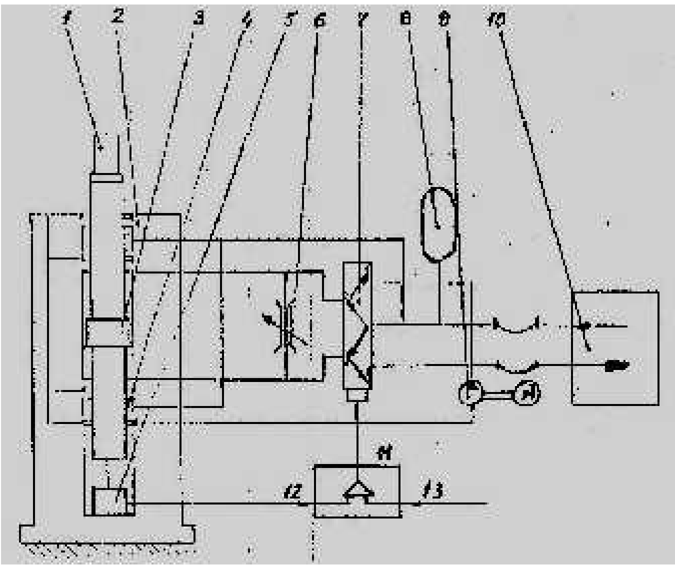

Figure 1: The test stand
1- Cylinder Connectors – damper; 2- Cylinder servo hydraulic; 3- Working pistons;
4- Hydrostatic bearings; 5- Transducer of race; 6- Throttle; 7- Control servo valves;
8- Hydraulic accumulator; 9- Vacuum pump (drainage); 10- Hydraulic aggregate;
11- Command, measure and control cabinet; 12- Input for real signal; 13- Input for imposed signal.

To check the dampers we have use the following equipment: tape 0 to 3000 mm; outdoor caliper 0 to 150 mm; outdoor caliper 0 to 300 mm; outdoor micrometer 0 to 25 mm; outdoor micrometer to 25 ÷ 50 mm; feeler gauge of thread; dynamic tensometer HOTTINGER, KWS type 3073; race transducer embedded in the servo hydraulic cylinder PZ 25 kN, force transducer 25 kN; registered X - Y, servo hydraulic cylinder PZ 25 kN, embedded in the machine with two columns for tensile and compression tests, race ± 100 mm and frequencies of 1.67 Hz and 2.38 Hz required for test.
In the following are presented in Figure 2 a register model of the **F- s** adjustment diagram, in the Figure 3 a model of the amortization diagram, in Figure 4 the dampers and in Figure 5 the test stand and equipment of measure and register.

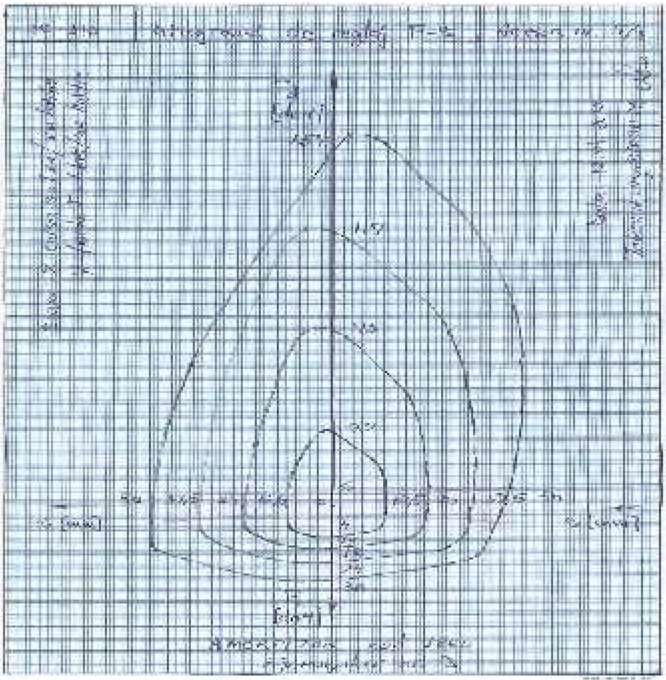

Figure 2: F- s adjustment diagram

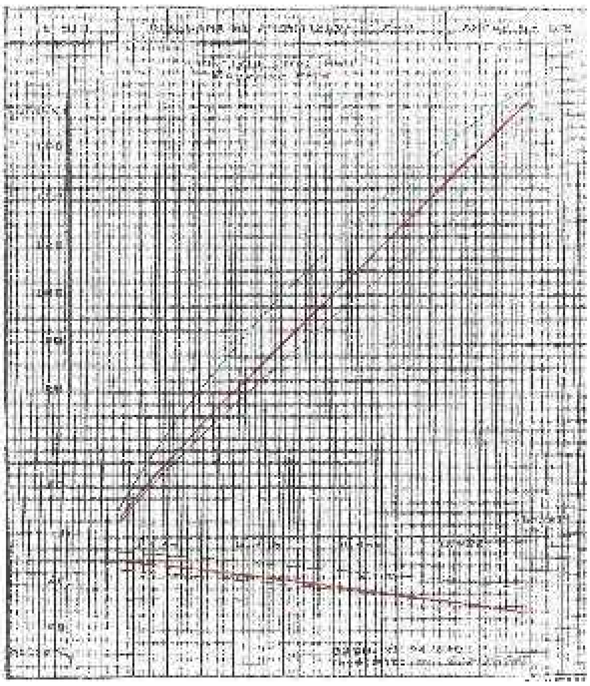

Figure 3: The amortization diagram.

Figure 4: Dampers

Figure 5: The test stand and equipment of measure and register

3. RESULTS OF DAMPER CONTROLS

3.1 Verification of dimensions

In Table 1 are presented the results of dimensional measurements for the three dampers. The tolerances quotas are according to SR EN 22768-1/1995.

Table 1

QUOTAS REQUIRED IN DOCUMENTATION [mm]	QUOTAS MEASURED [mm]		
	DAMPER 1	DAMPER 2	DAMPER 3
$34^{\ 0}_{-0,2}$	33,9	33,9	33,9
25 ± 0,2	24,9	24,9	24,9

$\Phi\ 14{,}5^{+0{,}15}_{0}$	14,5	14,5	14,5
$\Phi\ 21 \pm 0{,}2$	20,9	20,9	20,9
$\Phi\ 40 \pm 0{,}3$	40	40	40
$\Phi\ 40 \pm 0{,}3$	40	40	40
$\Phi\ 48 \pm 0{,}3$	48	48	48
225 ± 2	223,2	224,4	224,2
$\Phi\ 48 \pm 0{,}3$	48,1	48	48
$\Phi\ 25 \pm 0{,}2$	24,8	24,8	24,8
$\Phi\ 14{,}5^{+0{,}15}_{0}$	14,5	14,5	14,5
$38{,}5 \pm 0{,}3$	38,4	38,4	38,4
$58{,}5^{0}_{-0{,}2}$	58,4	58,4	58,4
$26 \pm 0{,}2$	26,1	26,1	26,1
$38 \pm 0{,}3$	38	38	38
271 ± 1	271	271	271
387 ± 3	386	386	386
468 ± 3	466	467	466

3.2 Verification maximum stroke

Check is according to STAS 9381-88, pt. 4.8. For the three dampers were obtained following values: damper 1: 80 mm, damper 2: 81 mm and damper 3: 80 mm.

3.3 Determination of damping characteristic F-v

In Figure 6 are presented the diagrams of control F-s and damping F-V, determined according to pt. 4.19 STAS 9381-88, 1st damper.
In Figure 7 are presented the diagrams of control F-s and damping F-V, determined according to pt. 4.19 STAS 9381-88, 2nd damper.
In Figure 8 are presented the diagrams of control F-s and damping F-V, determined according to pt. 4.19 STAS 9381-88, 3rd damper.

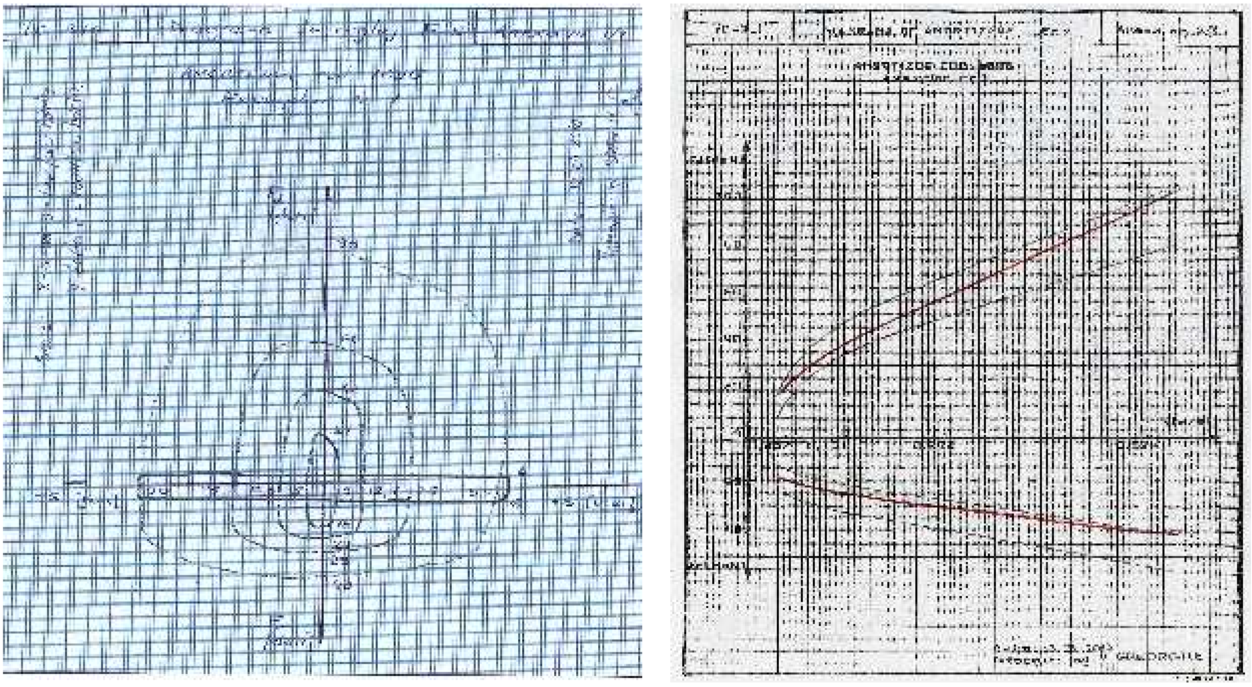

Figure 6: 1st damper, diagrams of control F-s and damping F-V

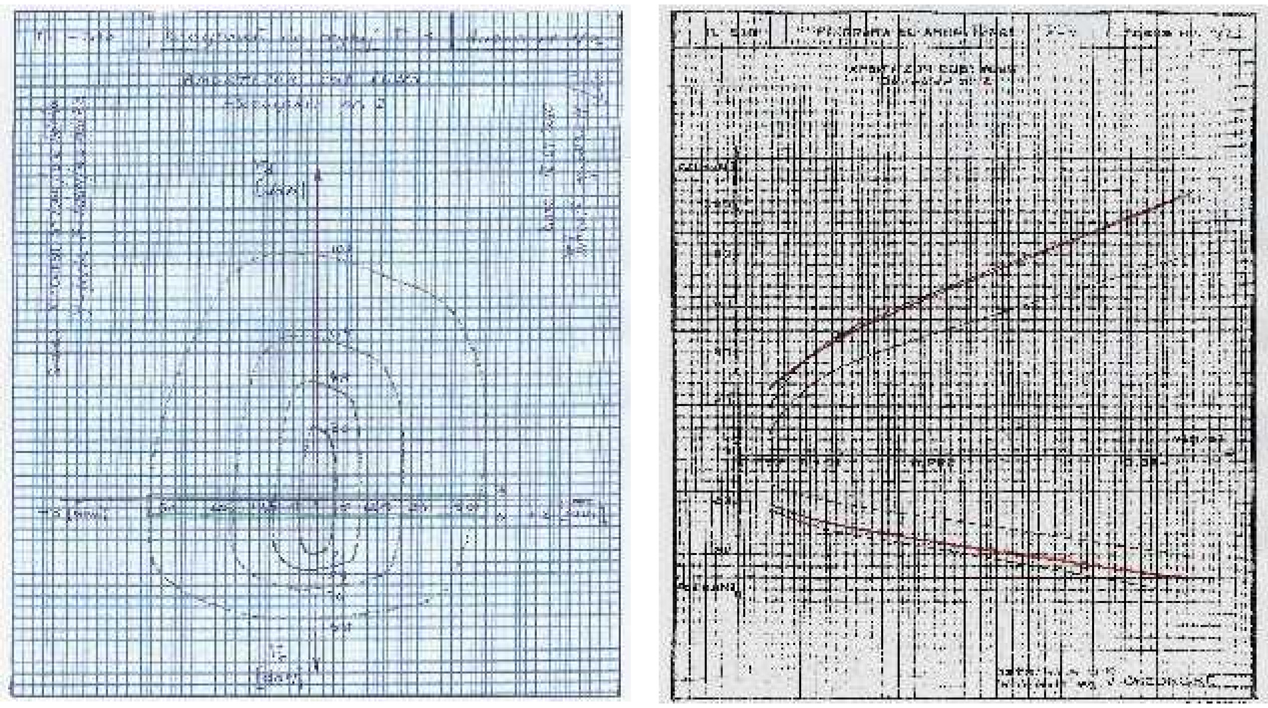

Figure 7: 2nd damper, diagrams of control F-s and damping F-V

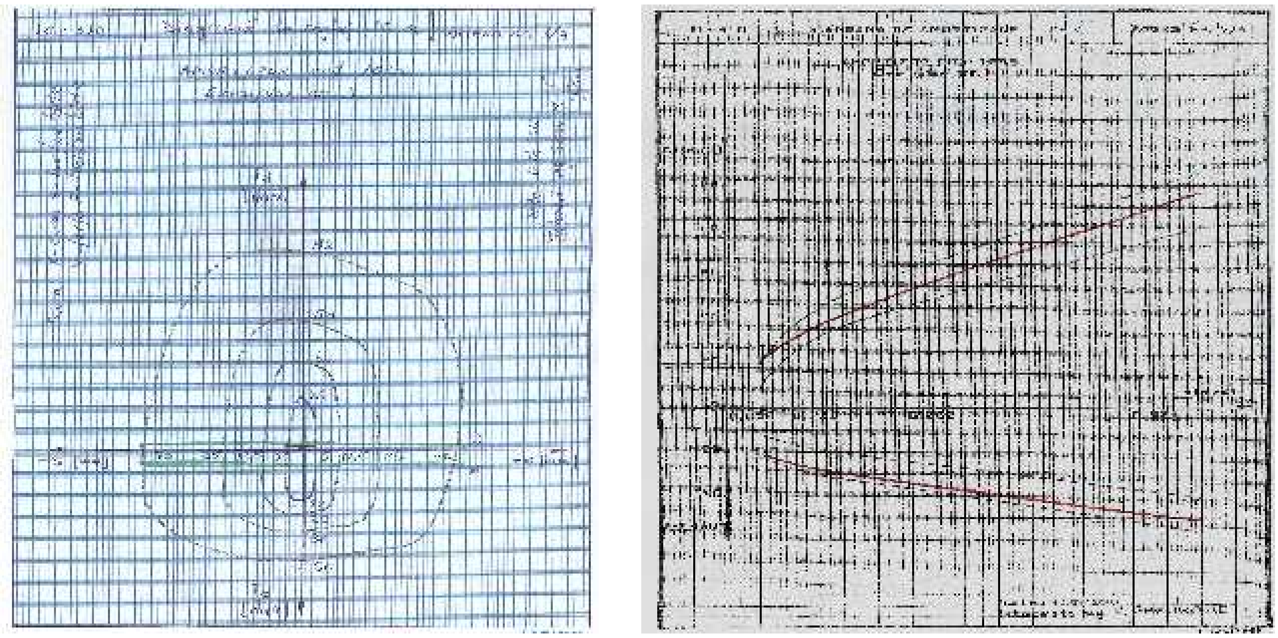

Figure 8: 3rd damper, diagrams of control F-s and damping F-V

4. CENTRALIZATION AND ANALYSIS OF RESULTS

The Table 2 presents the results of checks of the three dampers.

Table 2

VELOCITIES [m/s]	RACE [mm]	FREQUENCIES [Hz]	EXTENSION [daN]				COMPRESSION [daN]			
			Imposed	Achieved			Imposed	Achieved		
				Ex. 1	Ex. 2	Ex. 3		Ex. 1	Ex. 2	Ex. 3
0,524	± 50	1,67	89,5 ± 12	99	101	92	47 ± 7,5	40	49	50
0,262	± 25	1,67	59,5 ± 8,5	60	67	59	32,5 ± 6,5	29	36	36
0,131	± 12,5	1,67	42 ± 7	40	48	40	25,5 ± 5,5	23	29	29
0,052	± 5	1,67	20 ± 5	21	30	24	18,5 ± 5	18	21	22
0,0033	± 50	-	max. 7,8	4	3	3	max. 6,4	6	5	6

5. CONCLUSIONS

Following checks realized on the three dampers, according to check method presented in the paper, establish that:

- From dimensional point of view, dampers fall the documentation of execution;
- Functional, dampers fall the documentation of execution;
- The Damper characteristic fall within the limits imposed by documentation

ACKNOWLEDGEMENT

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[2] STAS 9381-88, *Vehicule rutiere. Amortizoare hidraulice telescopice. Condiţii tehnice generale de calitate.*

[3] SR EN 22768-1/1995 *Tolerante generale. Partea 1: Tolerante pentru dimensiuni liniare si unghiulare fara indicarea tolerantelor individuale*

[3] Standarde de firmă pentru amortizoarele verificate.