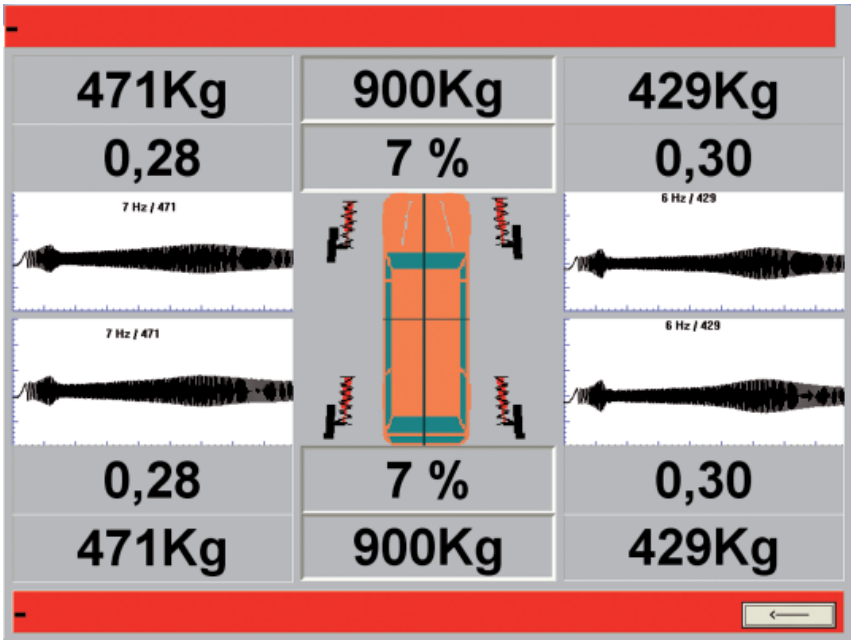
CARTEC®

Suspension Tester FWT 3800 Based on Theta Principle

for Cars, Vans and Light Trucks up to 2.5 t Axle Weight

– **Unmistakable results**
– **Simple and accurate procedure**
– **Determination of Lehr's damping ratio ϑ**
– **No vehicle-specific reference data required**

Simple and accurate determination



Formula to describe the damping ratio ϑ according to Lehr:

$$\vartheta = \frac{k_D}{4\pi * f_{Aufbau} * m_A}$$

Shock absorber function

In a vehicle, the suspension elements provided between wheels and vehicle body absorb the effect of shock or rough ground. None the less it comes to vibrations which are quickly reduced by shock absorbers.

During the life of a shock absorber its damping efficiency is, however, continuously decreasing which results into poor road grip of the wheels and steering issues and consequently also into a reduction of the efficiency of electronic security systems.

Therefore it is very important to unmistakably qualify the safety-related function of a shock absorber – which has been accomplished with the damping ratio ϑ according to Lehr.

Requirements to an unmistakable qualification

The following requirements must be met so that this method can be applied successfully:

- unmistakable procedure for determination of physical values (damping ratio ϑ according to Lehr).
- suitable testing device, operating simply and accurately, to test damping suspension elements under in-situ conditions.
- definition of a limit value at which damping efficiency is no longer sufficient.

Lehr's damping ratio ϑ is a non-dimensional quantity characterising the property of dissipating energy from a vibrating system. It is equally a design variable to describe wheel suspension, hence the road handling of a car, ranging from comfortable at ϑ ~ 0.2 up to sports cars at ϑ ~ 0.35.

Limit value of the damping ratio ϑ to ensure sufficient vehicle safety

The limit value of the damping ratio ϑ where wheel suspension no longer guarantees sufficient vehicle safety is ϑ = 0.1

If the measured value falls short of the limit value, the damping components must be thoroughly checked and replaced, if necessary. Using such an evaluation vehicle-specific reference values are no longer absolutely necessary.

Based on the damping ratio ϑ it is possible to evaluate the difference between values for the left-hand and right-hand vehicle side. Default values for such a difference might vary from country to country.

Simple and accurate determination

The new Theta principle for simple and accurate determination

The new Theta-type suspension tester FWT 3800 has been developed based on the physical-mathematical relations of the resonance principle:
the damping ratio ϑ according to Lehr.

Suspension testers presently in the market are based on different principles. Test results are either read out in graphical form on a monitor, or on analogue displays, but only in principle-related manufacturer-specific quantities.

Consequently the results of different testing techniques cannot be compared with each other.

The decisive improvement of suspension tests based on the Theta principle

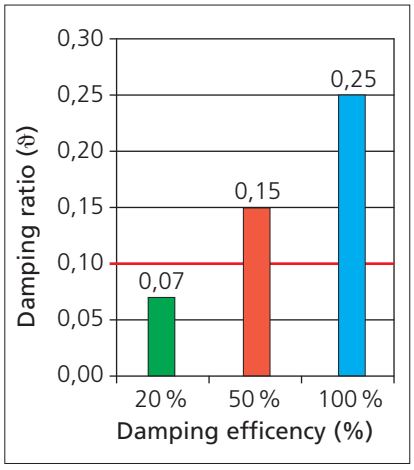
The Theta-type suspension tester FWT 3800 meets the requirement of a determination which is universally valid:

- unmistakable results
- simple and accurate procedure
- good repeatability

The mechanical design of the suspension tester FWT 3800 excludes any side-effects which might adversely affect quality assessment.

The FWT 3800 guarantees testing conditions which correspond to actual road handling, for instance not too low piston speed in the shock absorber, alternating traction and compression on the piston of the shock absorber.

Determination of damping ratio ϑ in shock absorbers with different damping efficiencies



Damping ratios ϑ determined with suspension tester FWT 3800 on shock absorbers having different damping efficiencies; the ratios were determined on a car under in-situ conditions.

Suspension Tester FWT 3800

The Theta principle - Damping ratio according to Lehr

Standard equipment of FWT 3800

- Single-part self-supporting galvanised mechanical frame with two test plates
- PC cabinet with integrated controller for accommodation of the optional PC equipment

Alternative configurations

- Available as stand-alone unit FWT 3800
- Part of the Videoline test lane
- Retrofit on a PC-based roller brake tester

Technical data

Axle weight max.	t	2.5
Dimensions of mechanical structure (WxLxH)	mm	800 x 2320 x 280
Test width min. / max.	mm	800 / 2200
Exciter stroke	mm	3.5
Exciter frequency approx.	Hz	16
Measuring range - max. stroke	mm	70
Accuracy of readings		1% of full-scale reading
Motor power	kW	2 x 1.1
Weight of mechanical structure approx.	kg	500
Power supply		3/N/PE230/400 VAC 50/60 Hz
Fusing	A	16
Dimensions of PC cabinet (WxDxH)	mm	750 x 530 x 1250
Weight of PC cabinet	kg	50

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