



Hegewald & Peschke

Meß- und Prüftechnik GmbH

Application flyer

Testing of springs



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Principles of testing metal springs

The fact that metal springs operate trouble-free is of decisive importance for the functional efficiency of mechanical and mechatronic systems. Within certain limits, they deform selectively under load and return to their original state when the load is released.

In order to design technical springs optimally for their intended use, the spring characteristics must be defined and tested. The spring characteristic curve illustrates the spring travel as a function of the spring force. It can be linear, progressive, degressive or combined.

Characteristic values such as spring force, spring travel, spring work and the spring characteristic curve can be determined using materials testing, which thus plays a major role in the design of springs.

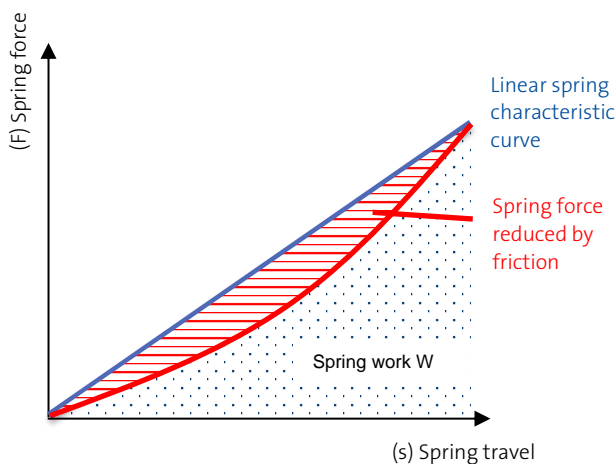


Fig. 1: Linear spring characteristic curve

Parameters influencing the spring characteristic curve:

- 1) Hysteresis
 - Frictional forces prevent the spring from deforming backwards
→ With alternating stress in form of a hysteresis loop
 - The constructive arrangement and design of the springs is intended to prevent the loss of spring energy through conversion to heat.
- 2) Relaxation
 - Plastic deformation under load at higher temperatures, which manifests itself as a loss of force

These factors influencing the spring characteristic can also be determined with the aid of materials testing.

In addition to a suitable arrangement (e.g. single, parallel, series, mixed) and shape of the spring (e.g. conical, cylindrical, barrel-shaped, tapered), the characteristic values can be influenced by the choice of material. The elasticity and sliding moduli determined as the ratio between stress and strain serve as important bases. The value of this characteristic parameters of spring materials should be as high as possible and thus ensure a wide elastic range.

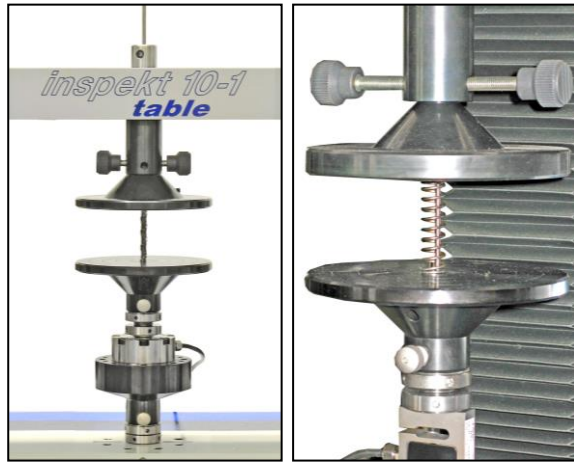
The material parameters must also be tested under the influence of temperature in many applications.

Hegewald & Peschke offers various testing solutions for these material testing tasks. A selection is presented below.



Universal testing machines with compression plates with exchangeable pin

(Item number 14-024-90x)



The compression plates are available with different capacities and for different specimen dimensions, e.g.:

- Capacity: 20 kN*
 - Specimen dimensions compression springs:
 - D= 4 – 87 mm*
 - Max. spring length 100 – 300 mm*
 - Dimension/design: round \varnothing 150 mm*, 2x rigid / steel hardened 60 HRC, black oxide
- * other versions on request

Note: The test setup for spring testing requires the load cell to be mounted on the lower fixed crosshead of the universal testing machine. The respective pin is mounted to the lower compression plate.



Broad range of possibilities with the LabMaster testing software:

- Determination of relevant characteristic values such as spring force, spring travel, spring constant and spring characteristic curve
- Alternating/cyclic load tests and static tests possible
- Free parameterization of the test sequence via the block program
- Free definition of results
- Statistical evaluation of test results
- Individually configurable test report

Universal testing machine with testing device for disc springs

(Item number: 14-029-941)



Testing device for disc springs of motor vehicles with force measurement and spring travel measuring system, $F_{max}=100$ kN.

Various testing possibilities:

1. Testing of the actuation travel of the disc spring:
 - Measurement of the force and the spring travel
 - Non-destructive testing during production as part of quality assurance
2. Checking the uniformity of the bending of the spring tongues by scanning with a measuring probe

Testable spring dimensions:

- Outer diameter: 270 – 440 mm
- Inner diameter: 50 – 150 mm

The test device consists of:

- 3 load cells below the tool holder,
- upper thrust collar holder with block protection
- lower measuring platform with force measurement and adjustable holder for displacement measuring probes.



Gas spring testing

Gas springs are used, among other things, as an opening and retaining mechanism on vehicle trunk lids.

Testing device for gas springs

(Item number: 41-036-xxx)



This system allows the testing of 4 gas springs simultaneously in accordance with the test sequences specified by DIN EN 1335-3.

Technical data:

Test stations	4
Number of cycles	999,999 max.
Test frequency	8 cycles/min
Test load per gas spring	2500 N
Specimen length	324 mm to 600 mm stepless adjustable
Test stroke	200 mm

Characteristics:

- Manual adjustment of the air pressure according to the desired test load
- Test load can be set separately for all test specimens
- Holders for gas spring test specimens are steplessly adjustable in height
- gas springs of different lengths can be tested simultaneously
- Individual setting of the number of cycles for each test specimen and switching off of the corresponding location in the unloaded state when the target number of cycles is reached
- Individual setting of a limit position switch for travel limitation, switching off of the corresponding location in the unloaded state after the sensor has been triggered

Universal testing machines for testing gas springs:

Testing options:

- Load tests
- Life cycle tests by cyclic extension and retraction of the gas spring

inspekt table 50 kN

inspekt solo 2,5 kN



Max. test stroke

1640 mm

1250 mm

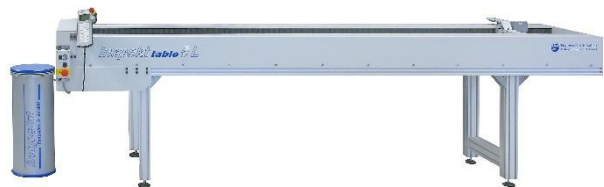
Test speed

0.0005 - 800 mm/min

0.05 - 3,000 mm/min

Horizontal testing machine inspekt table 5 L

(Item number: 10-030-956)



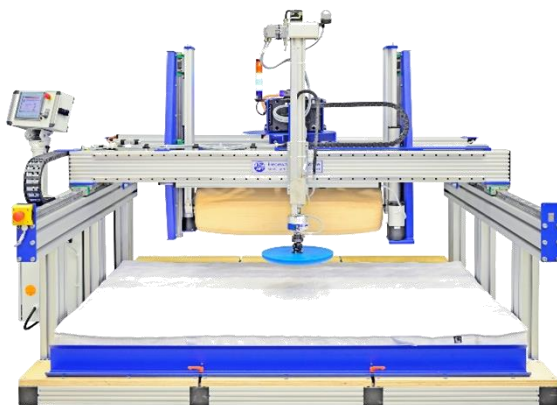
- Testing of gas springs with max. total length of 1500 mm and max. stroke of 650 mm
- F_{max} = 5 kN
- Test speed 0.1 - 2000 mm/min

Testing of spring cores in mattresses

In innerspring mattresses, steel coil springs are located between layers of fleece or felt. Depending on the model, the springs are designed and processed differently, so that the end product has different properties, e.g. in terms of point or surface elasticity.

Testing the durability and hardness of spring cores in mattresses

(Item number 40-830-159)



The testing facility is used for both durability and hardness testing of mattresses and innersprings according to EN 1957 by means of rollers and load pads.

Durability test:

The permanent load is applied by a test roller.

- Static load: 1400 ± 7 N

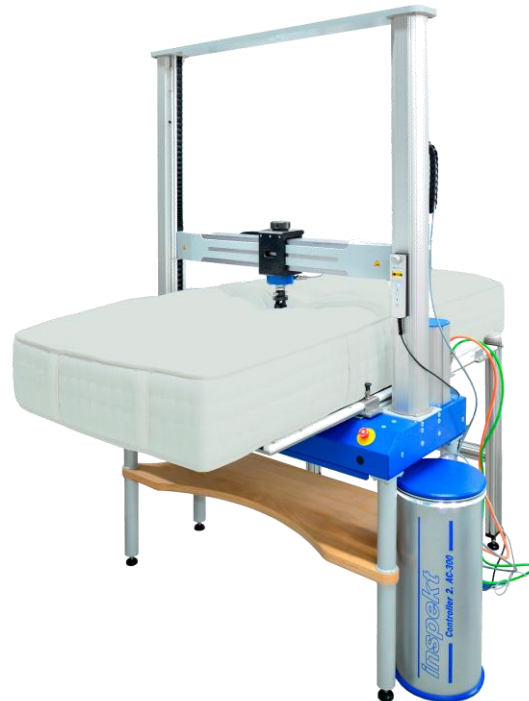
Hardness test:

The hardness measuring unit comprises a servo-electromotive test axis.

- Determination of the hardness value H
- Determination of the classification of the recumbent hardness H_s on a scale from 1 to 10
- Determination of hardness loss after X cycles
- Maximum force 2.5 kN

Universal testing machines for testing mattresses and spring cores

(Item number 10-030-170)



- Advantage: large lower compression plate can be moved; thus compression testing of complete mattresses according to DIN EN 1957 possible



- Also suitable for compression tests on springs e.g. according to DIN 2099-2