

SSP-01 testing machine to evaluate the stick-slip risk of material pairs (patented)

suited for leather, plastic, elastomere, metal, glass, rubber or natural materials

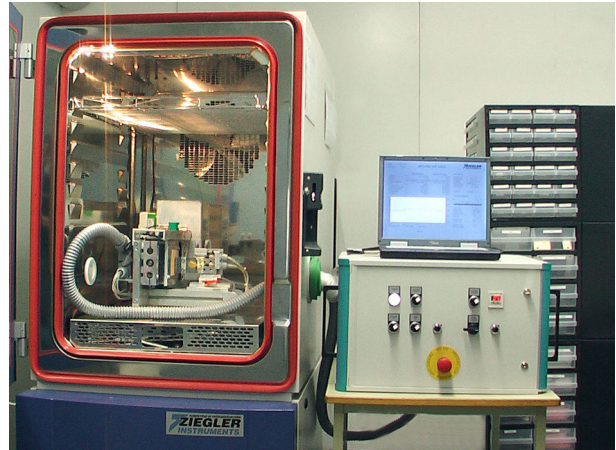
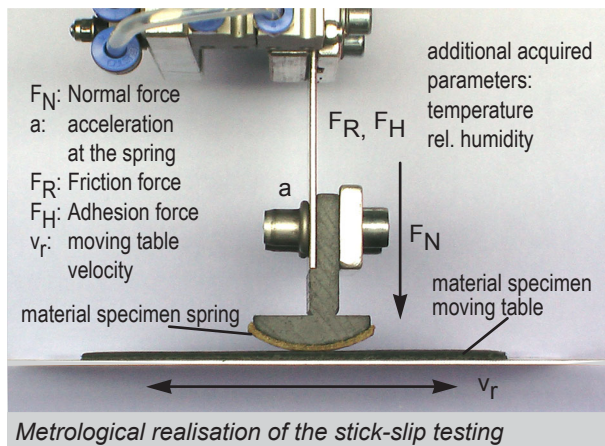
Technical applications

Stick-slip is the root cause for unwanted squeaking and groaning noises. These noises have a typical impulsive and repetitive character and are mostly perceived as interfering. Though a stick-slip risk does not necessarily lead into annoying noise, there is still a potential risk for this. The prevention of the stick-slip effect has therefore high priority to improve the quality of a product.

Originally the stick-slip test stand was developed to preventively select suitable materials, surfaces and coatings for vehicle interiors. Today the machine is used in many different branches, such as white goods, textile industry, medical technology, cosmetics and military.

Illustration of the measurement principle

In technical systems there are numerous contact points, that may cause squeaking or groaning under specific conditions. Examples for this are finisher in cockpits or handles in door covers. The forces occurring at these contact points can be up to 50 N. Stimulated by dynamic excitations a relative movement between the contact partners begins, that may lead by interaction with the contact forces into unwanted noise phenomena based on the stick-slip effect.



The SSP-01 measures the stick-slip-effect and transforms the result into a risk priority number. This number indicates, how critical the chosen material pair with respect to the stick-slip-effect is.

One of the material specimen, that is mounted on a steel spring, gets in contact with the other material specimen, that is mounted on a moving table by an adjustable normal force F_N . With the movement of the table the spring is bended due to the adhesion force between both materials. When the restoring force of the spring becomes greater than the adhesion force, a sudden contact tear-off and a transformation into kinetic friction appears. As soon as the spring restoring force gets zero, a new adhesion force is established. So the material pair alternates periodically between adhesion- and kinetic force. The difference of both forces is essential for the stick-slip-effect (see figure on the bottom left).

Bending and acceleration of the spring is measured and represent important factors in a special evaluation algorithm. This algorithm calculates a risk priority number of all measured parameters, that classifies the risk into the three categories critical (red), uncritical (green) and an in-between stage (yellow). Additionally to this the measurement values for adhesion- and kinetic friction as well as the maximal acceleration and the number and energy-values of the pulses are determined.

For the simulation of most realistic contact geometries flat, round and pointed specimen holders are available. However parts from existing components can also be

used with this machine. Moreover the test stand is applicable to a climatic chamber, so that measurements can be performed under different climatic conditions.

Standardisation, gauge capability, calibration

The test stand is part of the VDA-standard VDA 230-206 and has passed gauge capability.

When the test stand is delivered a factory calibration will be performed, that include all relevant measurement chains. The reference sensors can thereby be retraced to German standards (PTB and NIST). Additionally an optional calibration box can be ordered, that serves to check the functionality of the measurement chain daily. The calibration of the test stand is strongly recommended at least in yearly intervals.

Technical data SSP-01	
Mechanical data:	
Dimensions control unit (WxHxD):	650 x 340 x 650 mm
Weight control unit:	~ 28 kg
Dimensions testing unit (WxHxD):	500 x 360 x 400 mm
Weight testing unit:	~ 22 kg

Supply data	
Electric supply	230 V AC, 50 Hz, 250 VA
Compressed air (Standard outlet Festo):	6 bar not oiled

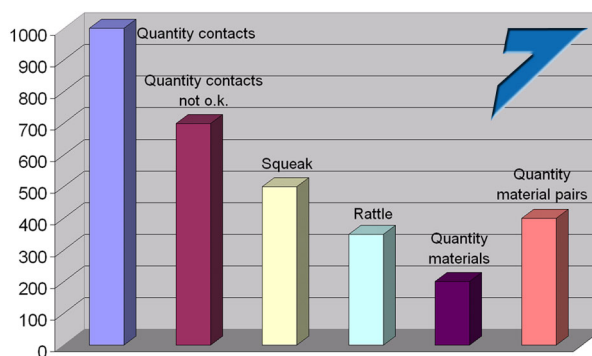
Testing-stand parameter	
Pressing force:	5 .. 50 N
Moving table velocity:	1 .. 10 mm/s
Temperature range:	-30 °C .. +80 °C

Additional options	
SSP-MOB:	Mobile trolley (WxHxD) 700 x 1500 x 700 mm
Elastomere option:	Upgrade about the option for testing of highly deformable materials, like elastomere, foams and composite materials
SSP-DB	Database for storing and evaluation of the measurement results
SSP-CAL	Calibration equipment to test and calibrate the test stand
SSP-Clima	Climatic chamber to simulate extremely climatic conditions

Economisation with respect to warranty costs

A car consists of almost 1000 critical contact points, from which 700 have high noise risk. 500 of them squeak and 350 rattle. In the same car 200 different materials are assembled, which get in contact with each other about 400 times. With warranty costs of roughly 40 mio €/lifespan, this means, that one inadequate material pair will cause costs of 100,000 €.

These costs exceed the acquisition costs of the SSP-01 by far. Thus the testing machine has – viewed over the lifespan of a vehicle – amortised itself, when only one single critical material pair can be avoided.



Voices of our customers

"Basically the benefit to us was protecting our position as the leading supplier to the BMW leather suppliers. With other OEMs now using the same test, we are well positioned to take advantage of this. We are satisfied that BMW have found that the test has led to a significant reduction of noise complaints in the car."

(Mike Tomkin, Stahl)

"The stick-Slip machine was the basic requirement for the development of effective anti-friction-coatings."

(Anthony Bogacki, LIP)

"This machine made an essential contribution for product development and for testing on behalf of our customers, amongst others also with customer complaints."

(Dr. Witan, Ticona GmbH)

"Having purchased the stick-slip machine, we could accelerate the development of stick-slip-optimized products."

(Florian Paland, Carl Bechem GmbH)