

STABILUS

Gas Springs and Dampers for Industrial Applications

LIFT-O-MAT®

BLOC-O-LIFT®

STAB-O-BLOC®

STAB-O-MAT®

STAB-O-SHOC®

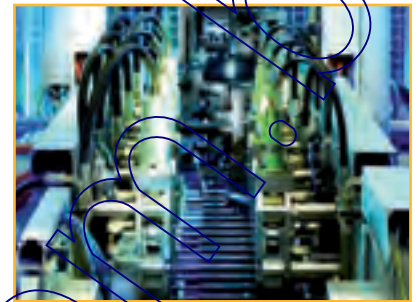


... technology gives comfort

STABILUS - A company with an innovative tradition

Pioneering achievements

STABILUS has over 70 years experience in the manufacture of hydropneumatic equipment. In addition to having produced hydraulic dampers over several decades, STABILUS presented the world's first standard production gas spring in 1962. To date, it has produced over 2 billion gas springs. With its two product lines - gas springs and hydraulic vibration dampers - STABILUS is the world market leader with an annual production of some 140 million units.



Worldwide operations

With a global distribution and service network and 9 production facilities in Europe, USA, Mexico, Brazil, New Zealand, Australia, Korea and China STABILUS supplies and services over 2,400 customers world-wide.

For all business sectors

Having been successfully adopted and incorporated in the automotive and furniture industries for several decades, STABILUS gas springs have now also become an indispensable design element in countless industrial applications in the most diverse sectors.

Gas springs and dampers for industrial applications

Compact design, high level of operating convenience and safety in use continue to expand the field of applications of STABILUS products.

e.g. Furniture

Gas springs and dampers are used to adjust table or chair height, to open lids in kitchen cupboards or to ensure the comfortable lifting of bedding drawers and head sections of beds.

e.g. Medical engineering

Gas springs and dampers are found in hospital beds, theatre couches, massage couches and in the rehabilitation domain.

e.g. Building industry

Gas springs facilitate the opening of roof windows and assist the operation of awnings.

e.g. Mechanical engineering

Service and noise protection panels can be effortlessly and safely opened and closed by gas springs.

Customer satisfaction

Customer service and customer satisfaction are key objectives for the company. STABILUS is known in particular for its technical innovation, quality and competitive pricing in all its business units.

Highest Quality

As the leading gas spring supplier worldwide, our quality management system fulfils without question the high quality requirements of international standards, such as DIN EN ISO 9001, as well as the new world standard ISO/TS 16949 with the regulatory requirements of QS 9000, VDA 6.1, EAQF, and AVSQ.

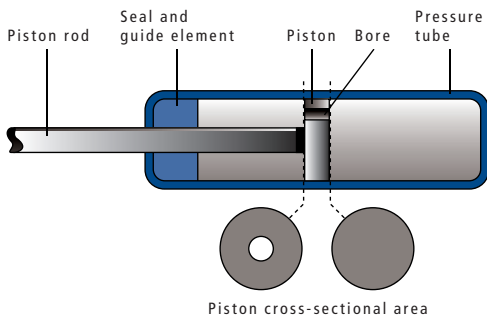
Care for the environment

STABILUS places utmost importance in achieving environmentally friendly production methods. Its success in this area is documented by the certification of its environmental management system in conformity with DIN EN ISO 14001 as well as with EC-environmental management systems (EMAS).

Service and technical application support

STABILUS provides extensive technical, design and installation support in specific applications as a matter of course. The extensive know-how of our application consultants and technicians coupled with our highly efficient installation proposal programmes and practical arrangements, also on site, ensure optimal solutions.

Product characteristics, advantages, uses

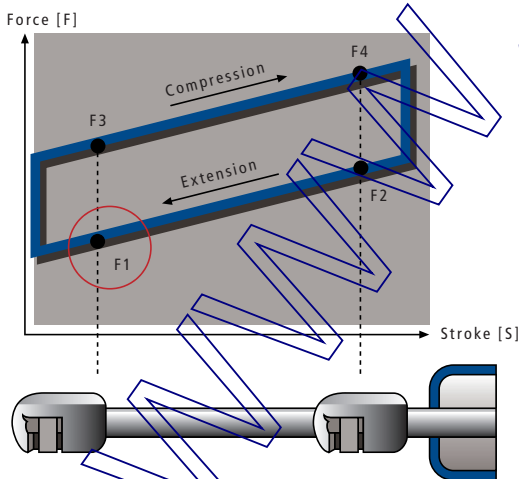


Operating principle

Operating principle of a gas spring

The gas spring is a hydropneumatic adjusting element, consisting of a pressure tube, a piston rod with piston and appropriate connection fittings. It is filled with compressed nitrogen, which acts with equal pressure on differently dimensioned cross-sectional areas of the piston. This produces a force in the extension direction. This extension force can be exactly defined within physical limits through the appropriate selection of the filling pressure.

Spring characteristic curve and F1 force



Spring characteristic curve and F1-force

The spring characteristic curve describes the gas spring progression force over the stroke, i.e. from the extended to the compressed state and vice versa.

Unlike mechanical springs, gas springs have an extremely flat, almost linear characteristic curve and therefore allow a uniform comfortable adjustment or pivoting movement. The spring rate, X , representing the force ratio $F2/F1$, lies between 1.2 and 1.4 with standard gas springs. Other values can be defined on request and according to the application. Together with the dimensions, the $F1$ force is the major descriptive feature for the choice of a gas spring and it is therefore specified in all STABILUS brochures. It defines the value of the spring force and is measured 5mm before the end of the extension movement. The difference between the force lines for the compression and extension direction, F_R , is the result of friction effects.

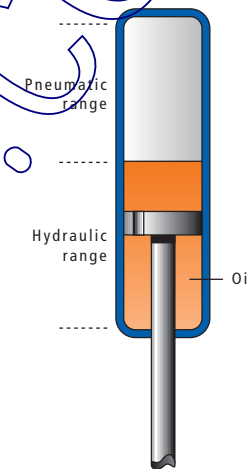
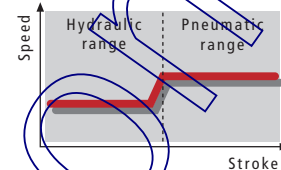
Extending speed and damping

A significant advantage of gas springs over mechanical springs is the definable speedcurve, which allows for a damped and comfortable adjusting movement. Two types of damping can be distinguished:

Hydraulic damping

The extending speed is determined both by the arrangement and the diameter of the bores in the piston and by the viscosity of the oil used. When the gas spring is installed with the piston rod facing down the extending piston first travels through the gas-filled and then

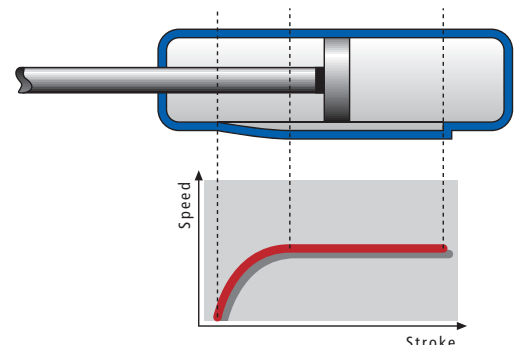
through the oil-filled part of the pressure tube. As soon as it is immersed in the oil the piston rod moves at a considerably lower speed.



Hydraulic damping

Dynamic damping

Here the bore in the piston is replaced with a longitudinal groove in the wall of the pressure tube which serves as a bypass. Its geometry and the length determine the damping curve. This technique allows position-independent damping of the gas springs.



Dynamic damping

Choice and application of gas springs

Dimensions according to choice

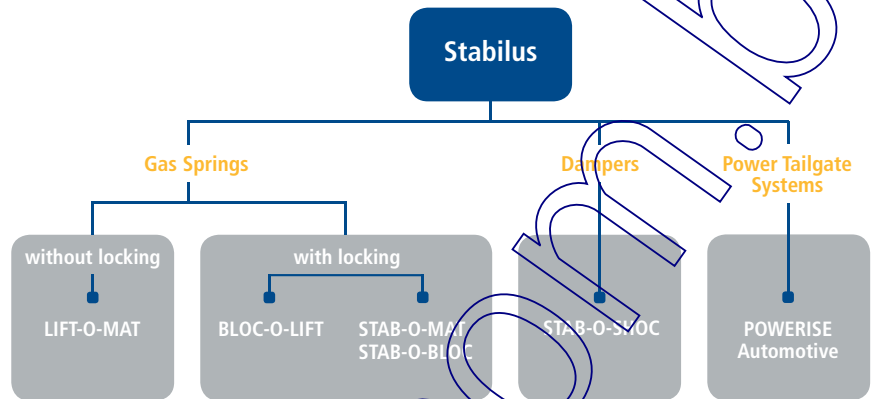
STABILUS offers an extremely wide range of gas spring types, which vary in respect of their external dimensions, speed curves and extension variants, and invariably meet the most stringent requirements. A large selection is included in the STABILUS standard product range and can be delivered at short notice.

Service life and maintenance

Gas springs are maintenance-free! They are designed to specific requirements and operate for years and years without failure when properly installed. Also for particularly high numbers of load alterations special sealing systems are available which allow e.g. specific gas springs in swivel chairs to withstand up to one million load cycles without damage.

Connections

Different connections are available depending on the application. STABILUS therefore offers a wide range of plastic or metal hinge eyes, including the easy-to-mount angle joint that only has to be fitted on the ball socket and allows for twist-free installation.



Installation instructions

Twist-free connection

For maximum service life, gas springs should not be exposed to twists or lateral forces. Suitable connection fittings, e.g. angle joints, can be used for the twist-free connection of the gas springs.

Installation position

Gas springs - except those designed for position-independent installation - are preferably installed with the piston rod facing down so as to maximise the hydraulic damping effect and to ensure optimal lubrication of the guide and seal system.

Temperature behaviour

The temperature of the gaseous nitrogen inside the gas spring influences its extension behaviour within certain limits. The standard temperature range lies between -30°C and $+80^{\circ}\text{C}$. In addition, gas springs with special sealing systems for extreme loads are available.

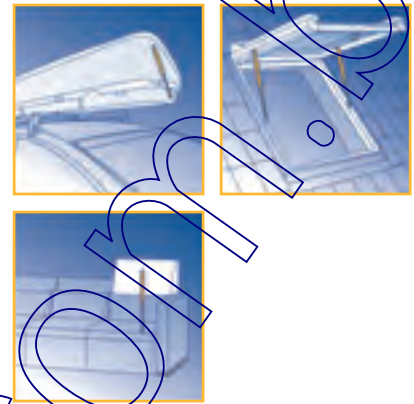
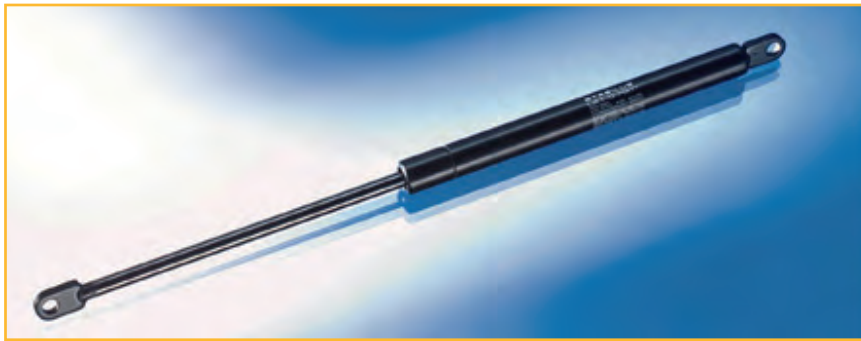
Operational safety

The operational safety of the gas spring is primarily achieved by seals designed to keep the gas pressure inside. For your protection, no bending loads should be exerted on the gas springs. Damage caused by subsequent mechanical operations, including welding, performed on the gas springs, as well as contamination or painting of the piston rod may lead to the failure of the devices.



Small selection of available connections

Non-blocking gas springs – LIFT-O-MAT®

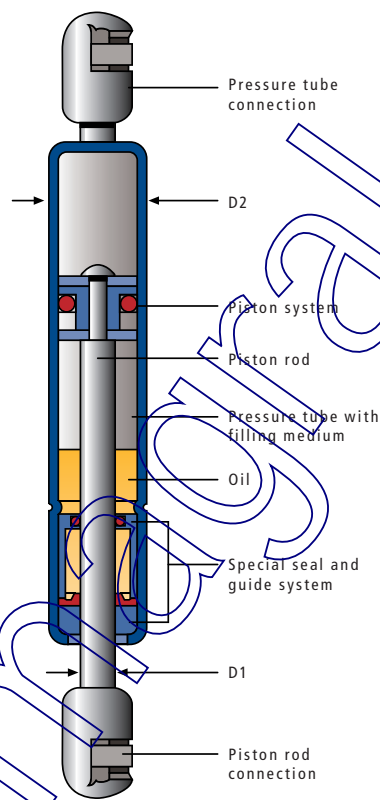


Lifting, lowering, moving and adjusting

With their accurately adjusted extension force and application-specific damping LIFT-O-MAT® gas springs offer optimum weight compensation, force support, they open and close flaps and bonnets and ensure user-friendly movement sequences thanks to their damping characteristic.

Characteristics and benefits

- ▶ Numerous size and force variants available as standard
- ▶ Linear spring curve for uniform force progression over the entire spring travel
- ▶ Available with progressive or degressive spring curve for force support at stroke start or end position
- ▶ Available with dynamic or hydraulic damping according to application and fitting position
- ▶ Various connection systems for practical and swift installation



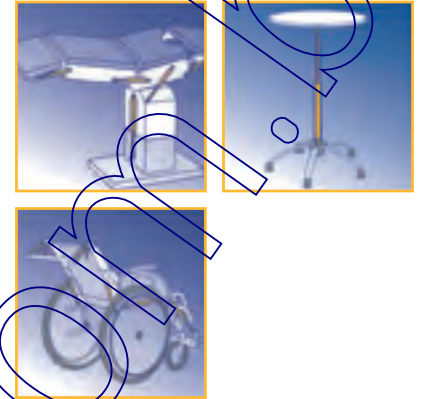
Product variants

- ▶ **Hydro-Lift®:** In addition to the LIFT-O-MAT® function, these gas springs can be positioned at any desired point
- ▶ **LIFT-O-MAT® high friction:** The increased friction of these gas springs allows for stepless positioning
- ▶ **LIFT-O-MAT PTL:** LIFT-O-MAT function with additional mechanical lock in the compressed position, e.g. in recessed connector strips in conference tables, and head-rest adjustments. The lock can be release by a light push.
- ▶ **Inter-Stop®:** The stroke is divided into a number of functional areas to allow manual positioning of the application, e.g. a flap

Standard Series Program

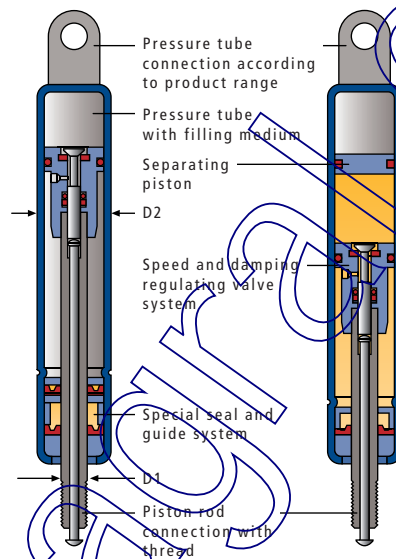
| Piston rod diameter D1 (mm) | Pressure tube outside diameter D2 (mm) | Extension force (N) | Max. stroke (mm) |
|-----------------------------|--|---------------------|------------------|
| 6 | 15 | 50 - 400 | 150 |
| 8 | 19 | 100 - 800 | 250 |
| 10 | 22 | 150 - 1150 | 400 |
| 14 | 28 | 500 - 2100 | 500 |
| 20 | 42 | 2400 - 5200 | 500 |

Blocking gas springs – BLOC-O-LIFT®



Variable positioning, rigid or spring blocking

BLOC-O-LIFT® gas springs raise loads with an accurately tuned extension force and application-specific dampening while ensuring user-friendly movement sequences. In addition, BLOC-O-LIFT® gas springs can be blocked in any position, with springing or rigid blocking in the extension or compression direction depending on the design. Variable blocking is made possible by the valve integrated into the piston which separates both pressure chambers gastight. When the valve is closed, thereby interrupting the gas exchange between both pressure chambers, the BLOC-O-LIFT® gas spring is blocked. The valve closes automatically when the valve tappet is released externally. The resilient blocking variant is ideal for the smooth dampening of e.g. shocks, impacts or pulse-type peak loads (e.g. in seats and office swivel chairs).



Left: Spring blocking BLOC-O-LIFT® gas spring

Right: Rigid blocking BLOC-O-LIFT® gas spring with separating piston for position-independent installation

Characteristics and benefits

- ▶ Spring blocking or rigid blocking in either the extension or compression direction. Rigid blocking can be achieved with an installation dependent or independent version variant
- ▶ On request also suitable for continuous release, e.g. for rocking the backrest of swivel chairs
- ▶ Locking function only in compression direction; self-acting extension of the gas spring
- ▶ Override function for protection in case of maloperation

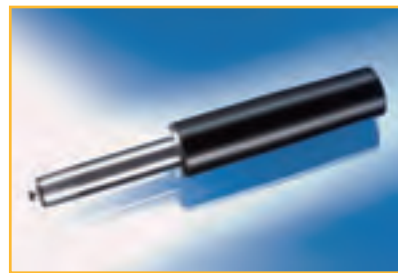
Standard Series Program

| Piston rod diameter D1 (mm) | Pressure tube outside diameter D2 (mm) | Extension force (N) | Max. stroke (mm) |
|-----------------------------|--|---------------------|------------------|
| 8 | 28 | 200 - 1000 | 100 |
| 10 | 28 | 200 - 1500 | 250 |

Blocking gas springs – STAB-O-MAT®, STAB-O-BLOC®

For stepless height adjustment of seats

STAB-O-MAT® and STAB-O-BLOC® gas springs are blocking gas springs specially designed for the stepless and comfortable height adjustment in swivel chairs, stools etc.



Features and advantages

- ▶ Available in various lengths and with strokes of 50 to 300 mm
- ▶ As complete columns with various diameters of upright tube and taper dimensions for mounting into the seat carrier or in the swivel chair base
- ▶ As telescopic column with over-proportional adjustment range
- ▶ With anti-torsion device, e.g. for added operational safety
- ▶ With various surface finishes of upright tube, e.g. enamelled or chromium-plated
- ▶ With additional mechanical deep springing systems for added comfort, also in lowest seat position
- ▶ With adjustable release pins and short release travels and also with reduced release force

Dampers and STAB-O-SHOC®

Hydraulic dampening of vibrations and motions

Dampers are needed to positively influence the nature of movements and vibrations. They are designed to match the particular application. Oil-hydraulic dampers consist of a pressure tube, a piston rod with piston system and a piston rod connection fitting.

The movement of the piston presses the filling medium (oil) through suitably dimensioned bores into the piston, thus producing the desired damping force.

Features and advantages

- ▶ Compact dimensions with maximum reliability and durability



- ▶ Suited for operating temperatures between -40°C and +130°C
 - ▶ Defined linear, progressive or degressive damping force characteristic for optimal results
 - ▶ Variable damping rate e.g. for steering dampers and driver seat dampers
 - ▶ Several connection variants for easy installation
- #### Product range
- ▶ Dampers are designed to optimally match the particular application
 - ▶ For position-dependent or position-independent installation
 - ▶ Dampers with or without extension force
 - ▶ With damping forces in one direction or in the extension and compression direction