Gas springs are universally accepted, wherever you want to:

- push
- pull
- lift
- lower, or
- position

covers, lids or other components by hand without using an external energy source. ACE gas springs are individually filled to a predetermined pressure to suit a customer’s requirement (extension force F₁). The cross-sectional area of the piston rod and filling pressure determines the extension force \( F = p \cdot A \). During the compression of the piston rod, nitrogen flows through an orifice in the piston from the full bore side of the piston to the annulus. The nitrogen is compressed by the volume of the piston rod. As the piston rod is compressed the pressure increases, so increasing the reaction force (progression). The force depends on the proportional relationship between the piston rod and the inner tube diameter, which is approximately linear.

### Force-Stroke Characteristics of Gas Spring (Push Type)

When compressing the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the compression stroke) \( F_2 \). F₂ is force at the beginning of the compression stroke and \( F_4 = \) force at the end of the compression stroke.

\[
F_1 = \text{nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)}
\]

\( F_2 = \) force in the complete compressed position

### Force-Stroke Characteristics of Traction Gas Spring (Pull Type)

When extending the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the extension stroke) \( F_2 \). F₂ is force at the beginning of the extension stroke and \( F_4 = \) force at the end of the extension stroke.

\[
F_1 = \text{nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)}
\]

\( F_2 = \) force in the complete extended position

---

### Service Life

Filling tolerance: -20 N to +40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.

Effect of temperature: An increase in temperature of each 10 °C will increase force by approx. 3.4%.

Temperature range: -20 °C to +80 °C (special seals from -45 °C to 200 °C)

Mounting: The gas springs should ideally be installed with the piston rod pointing downwards to use the end damping during the extension stroke to smoothly decelerate the motion of the gas spring. Some ACE gas springs have a uniquely designed front bearing with an integrated grease chamber allowing the gas spring to be mounted and operated in any position if required.

When fitting the gas springs ensure that the stroke is fully extended (GZ type fully compressed), this makes assembly and disassembly much easier. Support the moving mass/static during assembly or disassembly to prevent accidents. To avoid twisting or side loading, it is recommended that ball joints or other pivoted mounting attachments are used. The mounting attachments must always be securely tightened onto the threaded studs of the gas spring.

ACE gas springs are maintenance-free. DO NOT oil or grease the piston rod! The piston rod must be protected from any hits, scratches or dirt and especially paint. Damage to the surface finish of the piston rod will destroy the sealing system and cause loss of pressure. The outer body must not be deformed or mechanically damaged.

ACE gas springs can be stored in any position. Experience has shown that long storage periods do not result in loss of pressure. However you may experience some "stiction" requiring a higher effort to move the gas spring for the first time after a long storage period.

Generally, ACE gas springs are tested to 70 000 to 100 000 complete strokes. This is equivalent to the seal lifetime (depending on model size) to a distance travelled of 10 km (for lifetime of traction gas springs see pages 175 to 183). During these tests the gas spring must not lose more than 5% of its pressure. Depending upon the application and operating environment, the service life of these gas springs may be much longer. In practise 500 000 strokes or more have been achieved on some applications.
Adjustment Instructions Valve with ACE DE-GAS

Adjustment instruction
1. Hold gas spring valve up.
2. Insert DE-GAS adjuster knob on thread of the valve.
3. Press the DE-GAS adjuster knob with light hand force until you can hear the nitrogen escaping. Press only briefly to avoid too much nitrogen being discharged.
4. After adjustment, remove the DE-GAS adjuster knob, mount the end fittings and test the gas spring in your application. If necessary repeat the procedure.

If you use 2 gas springs in parallel, both gas springs should have the same force to avoid bending forces or side load on the application. If necessary return to ACE to refill both gas springs to the same (average) force.

If too much nitrogen is discharged, the units can be returned to ACE for re-gassing.

"Easy, safe, reliable!"

Gas Spring Refilling Kit

The ACE gas spring refilling kit offers you the opportunity to fill gas springs on location or adapt them individually. The refilling kit is equipped with all the parts you need to fill gas springs. Very precise filling of the gas springs is possible using the digital manometer. The table for determining the filling pressure of the gas springs is included with the case. The only thing missing from the delivery is the nitrogen.

The refilling kit contains all filling bells and adjuster knobs for the current ACE gas spring range.

Part number for the complete gas spring refilling kit: GS-FK-C

The refilling kit suits 200 bar nitrogen bottles with a thread of W24,32x1/14" (German standard). Other connections are available upon request.

Gas springs filled with the refilling kit must be measured on a calibrated measurement system by ACE for repeat production.
Calculation

To obtain the ideal selection to give the optimum operation for a gas spring it is important to identify the following points:
- gas spring size
- required gas spring stroke
- mounting points on flap and frame
- extended length of the gas spring
- required extension force
- hand forces throughout the complete movement on the flap

With our free calculation service you can eliminate the time-consuming calculation and send us your details by fax or e-mail. Just complete the information shown on the calculation formulae page number 151. Please attach a sketch of your application (a simple hand sketch is sufficient) in side view. Our application engineers will determine the optimum gas springs and mounting points and calculate the ideal situation to satisfy your requirements. You will receive a quotation showing the opening and closing forces and our recommended mounting points to suit your application.

Safety Instructions

Gas springs are filled with pure nitrogen gas. Nitrogen is an inert gas that does not burn or explode and is not poisonous. Please note! the internal pressure of gas springs can be up to 300 bar. Do not attempt to open or modify them.

ACE gas springs will operate in surrounding temperatures from -20 °C to +80 °C. We can equip our springs with special seals to withstand temperatures as low as -45 °C or as high as +200 °C. Gas springs should not be placed over heat or in open fire!

Disposal/Recycling: Gas Springs consist mostly of metal and the metal could be recycled, but first the gas pressure must be removed. Please ask for our disposal recommendations which advise how to depressurize the gas springs and make them safe to recycle.

All gas springs are marked with the part number, the production date and a warning sign “Do not open high pressure”. We are not responsible for any damages of any kind that arises due to goods that are not marked accordingly.

Gas springs should be installed with the piston rod downwards. This position ensures best damping quality. Only ACE gas springs include an integrated grease chamber which allows for alternative mounting opportunities.

Gas springs should not be exposed to tilting or side load forces during operation or whilst static (this can cause bending of the piston rod or early wear).

Gas springs are maintenance-free. Do not grease or oil the piston rod.

The piston rod must not be painted and should be protected against shocks, scratches and dirt. The cylinder should not be deformed as such damage would destroy the sealing system.

ACE gas springs can be stored in any position. Pressure lost through long storage is not to be expected. There are no known negative values, but there may be a sticking effect the first time you compress a spring. This may require a higher initial force to operate the gas spring for the first time (initial breakaway force).

Gas springs of all sizes are classified as pressure vessels according to the pressure device directive 97/23/EC. They have a pressure level of more than 0.5 bar. All ACE gas springs are developed, manufactured and tested according to this directive.

The tolerance for the installation length is generally deemed to be ± 2 mm. If very high demands are placed on durability and stability, please avoid the combination of small diameter + long stroke + high force.

The filling tolerance is -20 N to 40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.
**Industrial Gas Springs**

**Calculation Formulae**

**Push type □  Pull type □**

**Input data**

**Gas spring fixing points**

The fixed point of the frame and the moving point of the flap are critical for the optimum operation. Therefore please attach a sketch of your application (a few lines with their dimensions are sufficient!)

- Moving mass*  $m$ kg
- Number of gas springs in parallel*  $n$ pcs
- Number of movements*  $\text{number per day}$
- Ambient temperature  $T$ °C

**If not shown by the sketch:**

- Radius of centre of gravity  $R_M$ mm
- Radius of hand force  $R_H$ mm
- Starting angle  $\alpha_M$°
- Opening angle  $\alpha$°

* Compulsory information

---

**Desired Mounting Fittings**

**End Fitting**

- □ A
- □ B
- □ C
- □ D
- □ E
- □ F
- □ G

**End Fitting**

- □ A
- □ B
- □ C
- □ D
- □ E
- □ F
- □ G

The end fittings are interchangeable.

e.g.: C = Angle Ball Joint, E = Swivel Eye

---

**Please send us a sketch with dimensions of your application! Without this sketch we won’t be able to calculate.**

**Comments**

___________________________________________________________

___________________________________________________________

**Requirement per year**

___________________________________________________________

- Machine type / reference

___________________________________________________________

**Sender**

**Company**

___________________________________________________________

**Dept.**

___________________________________________________________

**Address**

___________________________________________________________

**Name**

___________________________________________________________

**Telephone**

___________________________________________________________

**Fax**

___________________________________________________________

**Internet**

___________________________________________________________

**E-Mail**

___________________________________________________________

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**Please copy, complete and fax to ACE: Fax (248) 476-2470**

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**Issue 7.20.4 Specifications subject to change**
ACE industrial gas springs are maintenance-free and self-contained. They are available with body diameters from 8 mm up to 70 mm, and forces from 10 N up to 13 000 N ex. stock. ACE gas springs offer a high service life with a wear-resistant coating on the piston rod. Also an integrated low-friction bearing with grease chamber which provides a very low break away force (GS-19 to GS-40). It allows them to be mounted in any orientation, although rod downwards is preferable if you want to take advantage of the built-in end position damping. The valve allows the force to be adjusted to your specific requirements. A wide variety of interchangeable end fittings makes installation easy and versatile. ACE gas springs are universally applicable wherever you have lifting and lowering. They remove the need for “muscle power” and provide controlled motion for lids, hoods, machine guards etc. The free ACE selection software quickly specifies the correct gas spring for your individual application and we can deliver, usually within 24 hours.

Function: ACE industrial gas springs provide a maintenance-free sealed for life system, being filled with high pressure nitrogen gas. The oil zone filling provides end position damping and internal lubrication for a long lifetime. On the extension stroke of the gas spring, for example when opening a car tailgate, the nitrogen gas flows through the metering orifice in the piston to provide a controlled opening speed and the oil zone provides damping at the fully open position to avoid impact damage. The gas spring should be mounted “rod down” for this damping to be effective. On closing the tailgate the gas spring helps support the weight. The metering orifice controls the extension and compression velocities of the gas spring.

Operating fluid: Nitrogen gas and oil

Operating temperature range: -20 °C to 80 °C

On request: Without damping, different end position damping, special force curves, special lengths, alternative end fittings.
Industrial Gas Springs GS-8 (Push Type)

Extension Forces 10 N to 100 N
(when Piston Rod Compressed up to 130 N)

End Fitting | Standard Dimensions | End Fitting
--- | --- | ---
A3,5 | | Eye A3,5
B3,5 | | Stud Thread B3,5
C3,5 | | Angle Ball Joint C3,5
D3,5 | | Clevis Fork D3,5
E3,5 | | Swivel Eye E3,5
G3,5 | | Ball Socket G3,5
Rod Shroud W3,5-8 | | Adjuster Knob DE-GAS-3,5

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L (extended)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-8-20</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-8-30</td>
<td>30</td>
<td>92</td>
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<td>GS-8-40</td>
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<td>112</td>
</tr>
<tr>
<td>GS-8-50</td>
<td>50</td>
<td>132</td>
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<tr>
<td>GS-8-60</td>
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<td>152</td>
</tr>
<tr>
<td>GS-8-80</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

**Ordering Example**

- Type (Push Type)
- Body Ø8 mm
- Stroke (30 mm)
- Piston Rod End Fitting A3,5
- Body End Fitting C3,5
- Nominal Force F₁ 30 N

GS-8-30-AC-30

The end fittings are interchangeable. For mounting accessories see page 185.

**Technical Data**

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

**Available force range F₁ at 20 °C:** 10 N to 100 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 5 mm


**Progression:** Approx. 28 %, F₂ max. 130 N

For mounting accessories see page 185.
Industrial Gas Springs GS-10 (Push Type)

Extension Forces 10 N to 100 N
(when Piston Rod Compressed up to 120 N)

<table>
<thead>
<tr>
<th>End Fitting</th>
<th>Standard Dimensions</th>
<th>End Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3,5</td>
<td></td>
<td>Eye A3,5</td>
</tr>
<tr>
<td>B3,5</td>
<td></td>
<td>Stud Thread B3,5</td>
</tr>
<tr>
<td>C3,5</td>
<td></td>
<td>Angle Ball Joint C3,5</td>
</tr>
<tr>
<td>D3,5</td>
<td></td>
<td>Clevis Fork D3,5</td>
</tr>
<tr>
<td>E3,5</td>
<td></td>
<td>Swivel Eye E3,5</td>
</tr>
<tr>
<td>G3,5</td>
<td></td>
<td>Ball Socket G3,5</td>
</tr>
<tr>
<td>W3,5-10</td>
<td></td>
<td>Adjuster Knob DE-GAS-3,5</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-10-20</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-10-30</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-10-40</td>
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<td>112</td>
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<tr>
<td>GS-10-50</td>
<td>50</td>
<td>122</td>
</tr>
<tr>
<td>GS-10-60</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-10-80</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

Ordering Example

GS-10-80-AC-60

Type (Push Type)
Body Ø10 mm
Stroke (80 mm)
Piston Rod End Fitting A3,5
Body End Fitting C3,5
Nominal Force F₁ 60 N

The end fittings are interchangeable.
For mounting accessories see page 185.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range F₁ at 20 °C: 10 N to 100 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm


Progression: Approx. 20 %, F₂ max. 120 N

For mounting accessories see page 185.
Industrial Gas Springs GS-12 (Push Type)
Extension Forces 10 N to 180 N
(when Piston Rod Compressed up to 225 N)

End Fitting Standard Dimensions End Fitting

A3,5

B3,5

C3,5

D3,5

E3,5

G3,5

Rod Shroud W3,5-12

Eye A3,5

max. force 370 N

Stud Thread B3,5

Angle Ball Joint C3,5

max. force 370 N

Clevis Fork D3,5

max. force 370 N

Swivel Eye E3,5

max. force 370 N

Ball Socket G3,5

max. force 370 N

Adjuster Knob DE-GAS-3,5

See page 149.

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
<th>F₁ max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-12-20</td>
<td>20</td>
<td>72</td>
<td>180</td>
</tr>
<tr>
<td>GS-12-30</td>
<td>30</td>
<td>92</td>
<td>180</td>
</tr>
<tr>
<td>GS-12-40</td>
<td>40</td>
<td>112</td>
<td>180</td>
</tr>
<tr>
<td>GS-12-50</td>
<td>50</td>
<td>132</td>
<td>180</td>
</tr>
<tr>
<td>GS-12-60</td>
<td>60</td>
<td>152</td>
<td>180</td>
</tr>
<tr>
<td>GS-12-80</td>
<td>80</td>
<td>192</td>
<td>150</td>
</tr>
<tr>
<td>GS-12-100</td>
<td>100</td>
<td>232</td>
<td>150</td>
</tr>
<tr>
<td>GS-12-120</td>
<td>120</td>
<td>272</td>
<td>120</td>
</tr>
<tr>
<td>GS-12-150</td>
<td>150</td>
<td>332</td>
<td>100</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type) GS-12-100-AA-30

Body Ø2 mm

Stroke (100 mm)

Piston Rod End Fitting A3,5

Body End Fitting A3,5

Nominal Force F₁ 30 N

The end fittings are interchangeable.

For mounting accessories see page 185.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range F₁ at 20 °C: 10 N to 180 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm


Progression: Approx. 25 %, F₂ max. 225 N

For mounting accessories see page 185.
Industrial Gas Springs GS-15 (Push Type)

Extension Forces 40 N to 400 N
(when Piston Rod Compressed up to 500 N)

End Fitting

- **A5**
- **B5**
- **C5**
- **D5**
- **E5**
- **F5**
- **G5**

### Standard Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-15-20</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>GS-15-40</td>
<td>40</td>
<td>107</td>
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<tr>
<td>GS-15-50</td>
<td>50</td>
<td>127</td>
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<tr>
<td>GS-15-60</td>
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<td>147</td>
</tr>
<tr>
<td>GS-15-80</td>
<td>80</td>
<td>187</td>
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<tr>
<td>GS-15-100</td>
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<td>227</td>
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<tr>
<td>GS-15-120</td>
<td>120</td>
<td>267</td>
</tr>
<tr>
<td>GS-15-150</td>
<td>150</td>
<td>327</td>
</tr>
<tr>
<td>GS-15-200</td>
<td>200</td>
<td>427</td>
</tr>
</tbody>
</table>

### Ordering Example

Type (Push Type)

- Body Ø5.6 mm
- Stroke (150 mm)
- Piston Rod End Fitting A5
- Body End Fitting C5
- Nominal Force \( F_1 \) 150 N

The end fittings are interchangeable.

For mounting accessories see page 185.

### Technical Data

- **On request:** Without damping, strong end position damping, special force curves, special lengths, strokes, alternative end fittings, wiper, stainless steel (see pages 165 to 172).
- **Available force range** \( F_1 \) at 20 °C: 40 N to 400 N
- **Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- **End position damping length:** Approx. 10 mm
- **Progression:** Approx. 27 %, \( F_2 \) max. 500 N
Industrial Gas Springs GS-19 (Push Type)
Extension Forces 50 N to 700 N
(when Piston Rod Compressed up to 970 N)

### End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-19-50</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-19-100</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-19-150</td>
<td>150</td>
<td>364</td>
</tr>
<tr>
<td>GS-19-200</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-19-250</td>
<td>250</td>
<td>564</td>
</tr>
<tr>
<td>GS-19-300</td>
<td>300</td>
<td>664</td>
</tr>
</tbody>
</table>

**Dimensions**

- **Type (Push Type)**
- **Body Ø9 mm**
- **Piston Rod End Fitting A8**
- **Body End Fitting C8**
- **Nominal Force F₁ 600 N**

**Ordering Example**

GS-19-150-AC-600

- **Type**
- **Stroke (150 mm)**
- **Piston Rod End Fitting A8**
- **Body End Fitting C8**

The end fittings are interchangeable.
For mounting accessories see page 186.

---

**Technical Data**

- **On request:** Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).
- **Available force range F₁ at 20 °C:** 50 N to 700 N
- **Mounting:** In any position
- **Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- **End position damping length:** Strong end position damping approx. 20 to 60 mm (depending on the stroke) and slow extension speed.
- **Progression:** Approx. 26 % to 39 %, F₂ max. 970 N
Industrial Gas Springs GS-22 (Push Type)
Extension Forces 80 N to 1300 N
(when Piston Rod Compressed up to 1820 N)

End Fitting

Standard Dimensions

End Fitting

Dimensions

Type | Stroke | \( L \) extended
---|---|---
GS-22-50 | 50 | 164
GS-22-100 | 100 | 264
GS-22-150 | 150 | 364
GS-22-200 | 200 | 464
GS-22-250 | 250 | 564
GS-22-300 | 300 | 664
GS-22-350 | 350 | 764
GS-22-400 | 400 | 864
GS-22-450 | 450 | 964
GS-22-500 | 500 | 1064
GS-22-550 | 550 | 1164
GS-22-600 | 600 | 1264
GS-22-650 | 650 | 1364
GS-22-700 | 700 | 1464

Ordering Example

Type (Push Type)
Body \( \varnothing 3 \) mm
Stroke (150 mm)
Piston Rod End Fitting A8
Body End Fitting E8
Nominal Force \( F_1 \) 800 N

The end fittings are interchangeable.
For mounting accessories see page 186.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range \( F_1 \) at 20 °C: 80 N to 1300 N

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 20 to 70 mm (depending on the stroke) and slow extension speed.


Progression: Approx. 30 % to 40 %, \( F_2 \) max. 1820 N

For mounting accessories see page 186.
Industrial Gas Springs GS-28 (Push Type)
Extension Forces 150 N to 2500 N
(when Piston Rod Compressed up to 4175 N)

End Fitting | Standard Dimensions | End Fitting
---|---|---
A10 | | Eye A10 max. force 10 000 N
B10 | | Stud Thread B10
C10 | | Angle Ball Joint C10 max. force 1800 N
D10 | | Clevis Fork D10 max. force 10 000 N
E10 | | Swivel Eye E10 max. force 10 000 N
F10 | | Inline Ball Joint F10 max. force 1800 N
Rod Shroud W10-28 | | Adjuster Knob DE-GAS-10 See page 149.

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-28-100</td>
<td>100</td>
<td>262</td>
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<tr>
<td>GS-28-150</td>
<td>150</td>
<td>362</td>
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<tr>
<td>GS-28-200</td>
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<tr>
<td>GS-28-250</td>
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<td>GS-28-300</td>
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<td>GS-28-600</td>
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<tr>
<td>GS-28-650</td>
<td>650</td>
<td>1 362</td>
</tr>
<tr>
<td>GS-28-700</td>
<td>700</td>
<td>1 462</td>
</tr>
<tr>
<td>GS-28-750</td>
<td>750</td>
<td>1 562</td>
</tr>
</tbody>
</table>

**Ordering Example**

Type (Push Type)  
Body Ø28 mm  
Stroke (150 mm)  
Piston Rod End Fitting E10  
Body End Fitting E10  
Nominal Force F1 1200 N

**The end fittings are interchangeable.**
**For mounting accessories see page 186.**

**Technical Data**

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range F1 at 20 °C: 150 N to 2500 N

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.


Progression: Approx. 58 % to 67 %, F2 max. 4175 N
**Industrial Gas Springs GS-40 (Push Type)**

Extension Forces 500 N to 5000 N  
(when Piston Rod Compressed up to 7450 N)

### End Fitting

#### A14

- Ø 14.1
- Ø 25
- 14 thick  
- Radius R12.5  
- Stroke 40

#### B14

- M14 x 1.5
- Ø 30
- Ø 22
- 19

#### C14

- Ø 28
- Ø 22
- Ø 14
- 13

#### D14

- Ø 14
- Ø 20
- 13

#### E14

- Ø 14
- Ø 20
- 13

#### F14

- M14 x 1.5
- Ø 22
- ø 56

### Standard Dimensions

#### Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-40-100</td>
<td>100</td>
<td>317</td>
</tr>
<tr>
<td>GS-40-150</td>
<td>150</td>
<td>417</td>
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<tr>
<td>GS-40-200</td>
<td>200</td>
<td>517</td>
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<tr>
<td>GS-40-300</td>
<td>300</td>
<td>717</td>
</tr>
<tr>
<td>GS-40-400</td>
<td>400</td>
<td>917</td>
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<tr>
<td>GS-40-500</td>
<td>500</td>
<td>1117</td>
</tr>
<tr>
<td>GS-40-600</td>
<td>600</td>
<td>1317</td>
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<tr>
<td>GS-40-800</td>
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<td>1717</td>
</tr>
<tr>
<td>GS-40-1000</td>
<td>1000</td>
<td>2117</td>
</tr>
</tbody>
</table>

### Ordering Example

Type (Push Type)  
Body Ø 40 mm  
Stroke (150 mm)  
Piston Rod End Fitting D14  
Body End Fitting D14  
Nominal Force F₁ 3500 N

The end fittings are interchangeable.  
For mounting accessories see page 187.

### End Fitting

#### Eye A14

- max. force 10 000 N

#### Stud Thread B14

- Angle Ball Joint C14  
  - max. force 3200 N

#### Clevis Fork D14

- Swivel Eye E14  
  - max. force 10 000 N

#### Inline Ball Joint F14  
  - max. force 3200 N

#### Adjuster Knob

DE-GAS-14  
See page 149.

---

**Technical Data**

**On request:** Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

**Available force range F₁ at 20 °C:** 500 N to 5000 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.


**Progression:** Approx. 37 % to 49 %, F₂ max. 7450 N

---

For mounting accessories see page 187.
Industrial Gas Springs GS-70 (Push Type)

Extension Forces 2000 N to 13 000 N
(when Piston Rod Compressed up to 16 250 N)

End Fitting | Standard Dimensions | End Fitting
---|---|---
B24 | Stud Thread B24

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-70-100</td>
<td>100</td>
<td>320</td>
</tr>
<tr>
<td>GS-70-200</td>
<td>200</td>
<td>520</td>
</tr>
<tr>
<td>GS-70-300</td>
<td>300</td>
<td>720</td>
</tr>
<tr>
<td>GS-70-400</td>
<td>400</td>
<td>920</td>
</tr>
<tr>
<td>GS-70-500</td>
<td>500</td>
<td>1 120</td>
</tr>
<tr>
<td>GS-70-600</td>
<td>600</td>
<td>1 320</td>
</tr>
<tr>
<td>GS-70-700</td>
<td>700</td>
<td>1 520</td>
</tr>
<tr>
<td>GS-70-800</td>
<td>800</td>
<td>1 720</td>
</tr>
</tbody>
</table>

**Ordering Example**

GS-70-200-EE-8000

Type (Push Type)
Body Ø70 mm
Stroke (200 mm)
Piston Rod End Fitting E24
Body End Fitting E24
Nominal Force F₁ 8000 N

**The end fittings are interchangeable. For mounting accessories see page 187. Standard gas spring with valve.**

Technical Data

**On request:** Without damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Available force range F₁ at 20 °C:** 2000 N to 13 000 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 10 mm

**Material:** Body: Black coated steel or zinc plated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

**Progression:** Approx. 25 %, F₂ max. 16 250 N

ACE Controls Inc. • Tel. 800-521-3320 • (248) 476-0213 • Fax (248) 476-2470 • E-mail: shocks@acecontrols.com • www.acecontrols.com
ACE offers **tandem gas springs** specially for heavy flaps and hoods with a large opening angle. These are characterised by a high initial force and low end force. The tandem gas springs have two pressure tubes with different extension forces and progression curves, and are therefore able to cover two force ranges.

The tandem gas springs are designed individually according to their use — free of charge by the ACE calculation service. They are manufactured especially for your application. The force ranges are aligned precisely to each other and are adjusted to the required kinematics. Tandem gas springs are maintenance free and ready for installation. ACE tandem gas springs offer the best service life based on a piston rod with a hard wearing surface coating as well as an integrated grease chamber, which ensures constant lubrication of the seals. A comprehensive range of fitting parts ensures easy installation.

"Reduce the need for muscle power for comfortably opening heavy flaps!"

---

**Operating fluid:** Nitrogen gas and oil

**Material:** Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.

**Mounting:** According to calculation. Please adopt the mounting points determined by ACE.

**Operating temperature range:** -20 °C to 80 °C

**On request:** Material 1.4301/1.4305, AISI 304/303 (V2A) and material 1.4404/1.4571, AISI 316L/316Ti (V4A).
**End Fitting**

**Standard Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke A (mm)</th>
<th>Stroke B (mm)</th>
<th>L extended (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GST-40-50-100</td>
<td>50</td>
<td>100</td>
<td>885</td>
</tr>
<tr>
<td>GST-40-50-150</td>
<td>50</td>
<td>150</td>
<td>585</td>
</tr>
<tr>
<td>GST-40-50-200</td>
<td>50</td>
<td>100</td>
<td>665</td>
</tr>
<tr>
<td>GST-40-70-250</td>
<td>70</td>
<td>250</td>
<td>825</td>
</tr>
<tr>
<td>GST-40-70-300</td>
<td>70</td>
<td>300</td>
<td>925</td>
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<tr>
<td>GST-40-70-350</td>
<td>70</td>
<td>350</td>
<td>1025</td>
</tr>
<tr>
<td>GST-40-70-400</td>
<td>70</td>
<td>400</td>
<td>1125</td>
</tr>
</tbody>
</table>

**Ordering Example**

GST-40-50-150-AD-900N-2500N

Type (Tandem Gas Spring)
Body Ø (40 mm)
Stroke A (50 mm)
Stroke B (150 mm)
Body A End Fitting, A14
Body B End Fitting, D14
Nominal Force Body A, 900 N
Nominal Force Body B, 2500 N

The end fittings are interchangeable. These gas springs are tailored to the relevant application and are therefore not available ex stock. For mounting accessories see page 187.

**Technical Data**

- **On request:** Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper.
- **Available force range F_{1}, at 20 °C:** 300 N to 5000 N
- **Mounting:** According to calculation. Please adopt the mounting points determined by ACE.
- **End position damping length:** Application-specific end position damping and extension speed.
- **Material:** Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.
- **Progression:** According to calculation relating to your application.
Stainless steel gas springs (push type)
Material 1.4301/1.4305, AISI 304/303 (V2A),
Material 1.4404/1.4571, AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial gas springs made of stainless steel with body diameters from 8 mm to 70 mm. This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas springs universal in use. Stainless steel industrial gas springs are used everywhere that raising and lowering is required. The standard type is filled with a special oil that conforms to the requirements FDA 21 CFR 178.3570 of the food industry. Due to their special properties, non-rusting and low magnetism, they are the preferred equipment for medical and clean-room technology, the foodstuffs industry, electronics and shipbuilding sector.

Operating fluid: Nitrogen gas and HLP oil according to DIN 51 524, part 2
Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A) or material 1.4404/1.4571, AISI 316L/316Ti (V4A).
Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
Operating temperature range: -20 °C to 80 °C
On request: Without damping, strong end position damping, special force curves, wiper, special lengths, alternative end fittings.
Stainless Steel Gas Springs GS-8-V4A (Push Type)
Extension Forces 25 N to 100 N
(when Piston Rod Compressed up to 130 N)

End Fitting | Standard Dimensions | End Fitting
--- | --- | ---
B3,5 | Stud Thread B3,5 | A3,5-V4A
A3,5-V4A | Eye A3,5-V4A max. force 370 N
C3,5-V4A | Angle Ball Joint C3,5-V4A max. force 370 N |
D3,5-V4A | Clevis Fork D3,5-V4A max. force 370 N |
G3,5-V4A | Ball Socket G3,5-V4A max. force 370 N |

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-8-20-V4A</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-8-30-V4A</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-8-40-V4A</td>
<td>40</td>
<td>112</td>
</tr>
<tr>
<td>GS-8-50-V4A</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>GS-8-60-V4A</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-8-80-V4A</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

**Ordering Example**

Type (Push Type) GS-8-30-AC-30-V4A
Body Ø8 mm
Stroke (30 mm)
Piston Rod End Fitting A3,5-V4A
Body End Fitting C3,5-V4A
Nominal Force F3 30 N
Indicated by K-No. on delivery

The end fittings are interchangeable. For mounting accessories see page 188.

**Technical Data**

On request: Without damping, strong end position damping, special force curves, special end fittings.

Available force range F1, at 20 °C: 25 N to 100 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm

Material: Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316/L/316Ti (V4A).

Progression: Approx. 27 %, F2 max. 130 N
Stainless Steel Gas Springs GS-10-V4A (Push Type)
Extension Forces 30 N to 100 N
(when Piston Rod Compressed up to 115 N)

End Fitting

B3,5

A3,5-V4A

C3,5-V4A

D3,5-V4A

G3,5-V4A

Stud Thread B3,5

Eye

A3,5-V4A
max. force 370 N

Angle Ball Joint

C3,5-V4A
max. force 370 N

Clevis Fork

D3,5-V4A
max. force 370 N

Ball Socket

G3,5-V4A
max. force 370 N

Adjuster Knob

DE-GAS-3,5
See page 149.

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-10-20-V4A</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-10-30-V4A</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-10-40-V4A</td>
<td>40</td>
<td>112</td>
</tr>
<tr>
<td>GS-10-50-V4A</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>GS-10-60-V4A</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-10-80-V4A</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type)__________
Body Ø10 mm__________
Stroke (30 mm)__________
Piston Rod End Fitting A3,5-V4A__________
Body End Fitting C3,5-V4A__________
Nominal Force F1 30 N__________
Indicated by K.-No. on delivery__________

The end fittings are interchangeable.
For mounting accessories see page 188.

Technical Data

On request: Without damping, strong end position damping, special force curves, special end fittings.

Available force range F1 at 20 °C: 30 N to 100 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm

Material: Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

Progression: Approx. 12 %, F2 max. 115 N

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ACE Controls Inc. • Tel. 800-521-3320 • (248) 476-0213 • Fax (248) 476-2470 • E-mail: shocks@acecontrols.com • www.acecontrols.com
**Stainless Steel Gas Springs GS-12-V4A (Push Type)**

*Extension Forces 25 N to 200 N (when Piston Rod Compressed up to 235 N)*

### End Fitting

**B3,5**

**A3,5-V4A**

**C3,5-V4A**

**D3,5-V4A**

**G3,5-V4A**

### Standard Dimensions

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L (extended)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-12-2G-V4A</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-12-3G-V4A</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-12-4G-V4A</td>
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<td>112</td>
</tr>
<tr>
<td>GS-12-5G-V4A</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>GS-12-6G-V4A</td>
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<td>152</td>
</tr>
<tr>
<td>GS-12-8G-V4A</td>
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<td>192</td>
</tr>
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<td>GS-12-10G-V4A</td>
<td>100</td>
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</tr>
<tr>
<td>GS-12-12G-V4A</td>
<td>120</td>
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</tr>
<tr>
<td>GS-12-15G-V4A</td>
<td>150</td>
<td>332</td>
</tr>
</tbody>
</table>

### Ordering Example

Type (Push Type)

Body Ø 2 mm

Stroke (100 mm)

Piston Rod End Fitting A3,5-V4A

Body End Fitting A3,5-V4A

Nominal Force F₁ 30 N

Indicated by K.-No. on delivery

The end fittings are interchangeable.

For mounting accessories see page 188.

### Technical Data

**On request**: Without damping, strong end position damping, special force curves, special end fittings.

**Available force range F₁ at 20 °C**: 25 N to 200 N

**Mounting**: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length**: Approx. 10 mm

**Material**: Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Progression**: Approx. 18 %, F₂ max. 235 N
Stainless Steel Gas Springs GS-15-VA (Push Type)
Extension Forces 40 N to 400 N
(when Piston Rod Compressed up to 535 N)

End Fitting | Standard Dimensions | End Fitting
--- | --- | ---
B5 | | Stud Thread B5
A5-VA | | Eye A5-VA
C5-VA | | Angle Ball Joint C5-VA
D5-VA | | Clevis Fork D5-VA
E5-VA | | Swivel Eye E5-VA
G5-VA | | Ball Socket G5-VA
Rod Shroud W5-15-VA | | Adjuster Knob DE-GAS-5

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-15-20-VA</td>
<td>20</td>
<td>74</td>
</tr>
<tr>
<td>GS-15-40-VA</td>
<td>40</td>
<td>114</td>
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<td>GS-15-50-VA</td>
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<td>134</td>
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<td>GS-15-60-VA</td>
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<td>GS-15-80-VA</td>
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<td>GS-15-120-VA</td>
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<td>274</td>
</tr>
<tr>
<td>GS-15-150-VA</td>
<td>150</td>
<td>334</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type)
Body Ø5.6 mm
Stroke (150 mm)
Piston Rod End Fitting A5-VA
Body End Fitting C5-VA
Nominal Force F, 150 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 150 mm ex stock.
For mounting accessories see page 188.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

Available force range F, at 20 °C: 40 N to 400 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

Progression: Approx. 34 %, F, max. 535 N
**Stainless Steel Gas Springs GS-19-VA (Push Type)**

Extension Forces 50 N to 700 N  
*(when Piston Rod Compressed up to 930 N)*

### End Fitting

<table>
<thead>
<tr>
<th>B8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stud Thread</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A8-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye A8-VA</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>C8-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle Ball Joint C8-VA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D8-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clevis Fork D8-VA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E8-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swivel Eye E8-VA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G8-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball Socket G8-VA</td>
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</tbody>
</table>

### Standard Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L (extended)</th>
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<tbody>
<tr>
<td>GS-19-5G-VA</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-19-10G-VA</td>
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<td>264</td>
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<tr>
<td>GS-19-15G-VA</td>
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<td>364</td>
</tr>
<tr>
<td>GS-19-20G-VA</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-19-25G-VA</td>
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<td>564</td>
</tr>
<tr>
<td>GS-19-30G-VA</td>
<td>300</td>
<td>664</td>
</tr>
</tbody>
</table>

### Ordering Example

Type (Push Type)  
Body Ø9 mm  
Stroke (150 mm)  
Piston Rod End Fitting A8-VA  
Body End Fitting C8-VA  
Nominal Force $F_1$ 500 N  
Indicated by K.-No. on delivery

The end fittings are interchangeable.  
Strokes also available up to 300 mm ex stock.  
For mounting accessories see page 189.

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI316L/316Ti (V4A).

**Available force range $F_1$ at 20 °C:** 50 N to 700 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 33 %, $F_2$ max. 930 N

For mounting accessories see page 189.
**Stainless Steel Gas Springs GS-22-VA (Push Type)**

Extension Forces 100 N to 1200 N
(when Piston Rod Compressed up to 1585 N)

### End Fitting

<table>
<thead>
<tr>
<th>End Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B8</strong></td>
</tr>
<tr>
<td><strong>A8-VA</strong></td>
</tr>
<tr>
<td><strong>C8-VA</strong></td>
</tr>
<tr>
<td><strong>D8-VA</strong></td>
</tr>
<tr>
<td><strong>E8-VA</strong></td>
</tr>
<tr>
<td><strong>G8-VA</strong></td>
</tr>
<tr>
<td><strong>W8-22-VA</strong></td>
</tr>
</tbody>
</table>

### Standard Dimensions

#### Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-22-50-VA</td>
<td>50</td>
<td>154</td>
</tr>
<tr>
<td>GS-22-100-VA</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-22-150-VA</td>
<td>150</td>
<td>364</td>
</tr>
<tr>
<td>GS-22-200-VA</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-22-250-VA</td>
<td>250</td>
<td>564</td>
</tr>
<tr>
<td>GS-22-300-VA</td>
<td>300</td>
<td>664</td>
</tr>
<tr>
<td>GS-22-350-VA</td>
<td>350</td>
<td>764</td>
</tr>
<tr>
<td>GS-22-400-VA</td>
<td>400</td>
<td>864</td>
</tr>
<tr>
<td>GS-22-450-VA</td>
<td>450</td>
<td>964</td>
</tr>
<tr>
<td>GS-22-500-VA</td>
<td>500</td>
<td>1064</td>
</tr>
<tr>
<td>GS-22-550-VA</td>
<td>550</td>
<td>1164</td>
</tr>
<tr>
<td>GS-22-600-VA</td>
<td>600</td>
<td>1264</td>
</tr>
<tr>
<td>GS-22-650-VA</td>
<td>650</td>
<td>1364</td>
</tr>
<tr>
<td>GS-22-700-VA</td>
<td>700</td>
<td>1464</td>
</tr>
</tbody>
</table>

#### Ordering Example

Type (Push Type)
Body Ø33 mm
Stroke (150 mm)
Piston Rod End Fitting A8-VA
Body End Fitting E8-VA
Nominal Force $F_1$ 800 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 400 mm ex stock.
For mounting accessories see page 189.

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range $F_1$ at 20 °C:** 100 N to 1200 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 32 %, $F_2$ max. 1585 N
Stainless Steel Gas Springs GS-28-VA (Push Type)
Extension Forces 150 N to 2500 N
(when Piston Rod Compressed up to 3800 N)

End Fitting

<table>
<thead>
<tr>
<th>B10</th>
<th>Stud Thread B10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A10-VA</th>
<th>Eye A10-VA max. force 3800 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 thick</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C10-VA</th>
<th>Angle Ball Joint C10-VA max. force 1750 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D10-VA</th>
<th>Clevis Fork D10-VA max. force 3800 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E10-VA</th>
<th>Swivel Eye E10-VA max. force 3800 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rod Shroud W10-28-VA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>GS-28-100-VA</td>
</tr>
<tr>
<td>GS-28-150-VA</td>
</tr>
<tr>
<td>GS-28-200-VA</td>
</tr>
<tr>
<td>GS-28-250-VA</td>
</tr>
<tr>
<td>GS-28-300-VA</td>
</tr>
<tr>
<td>GS-28-350-VA</td>
</tr>
<tr>
<td>GS-28-400-VA</td>
</tr>
<tr>
<td>GS-28-450-VA</td>
</tr>
<tr>
<td>GS-28-500-VA</td>
</tr>
<tr>
<td>GS-28-550-VA</td>
</tr>
<tr>
<td>GS-28-600-VA</td>
</tr>
<tr>
<td>GS-28-650-VA</td>
</tr>
</tbody>
</table>

Ordering Example
Type (Push Type) GS-28-150-EE-1200-VA
Body Ø8 mm
Stroke (150 mm)
Piston Rod End Fitting E10-VA
Body End Fitting E10-VA
Nominal Force F₁ 1200 N
Indicated by K.-No. on delivery
The end fittings are interchangeable.
Strokes also available up to 400 mm ex stock
and up to 750 mm on request.
For mounting accessories see page 189.

Technical Data
On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).
Available force range F₁ at 20 °C: 150 N to 2500 N
Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
End position damping length: Approx. 20 mm (depending on the stroke)
Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).
Progression: Approx. 52 %, F₂ max. 3800 N

For mounting accessories see page 189.
### Stainless Steel Gas Springs GS-40-VA (Push Type)

Extension Forces 500 N to 5000 N (when Piston Rod Compressed up to 7000 N)

#### End Fitting

<table>
<thead>
<tr>
<th>End Fitting</th>
<th>Standard Dimensions</th>
<th>End Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>B14</td>
<td>Stud Thread B14</td>
<td></td>
</tr>
<tr>
<td>A14-VA</td>
<td>Eye A14-VA max. force 7000 N</td>
<td></td>
</tr>
<tr>
<td>C14-VA</td>
<td>Angle Ball Joint C14-VA max. force 3200 N</td>
<td></td>
</tr>
<tr>
<td>D14-VA</td>
<td>Clevis Fork D14-VA max. force 7000 N</td>
<td></td>
</tr>
<tr>
<td>E14-VA</td>
<td>Swivel Eye E14-VA max. force 7000 N</td>
<td></td>
</tr>
<tr>
<td>W14-40-VA</td>
<td>Adjuster Knob DE-GAS-14 See page 146.</td>
<td></td>
</tr>
</tbody>
</table>

#### Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-40-100-VA</td>
<td>100</td>
<td>317</td>
</tr>
<tr>
<td>GS-40-150-VA</td>
<td>150</td>
<td>417</td>
</tr>
<tr>
<td>GS-40-200-VA</td>
<td>200</td>
<td>517</td>
</tr>
<tr>
<td>GS-40-300-VA</td>
<td>300</td>
<td>717</td>
</tr>
<tr>
<td>GS-40-400-VA</td>
<td>400</td>
<td>917</td>
</tr>
<tr>
<td>GS-40-500-VA</td>
<td>500</td>
<td>1117</td>
</tr>
<tr>
<td>GS-40-600-VA</td>
<td>600</td>
<td>1317</td>
</tr>
</tbody>
</table>

#### Ordering Example

Type (Push Type)  
Body Ø60 mm  
Stroke (150 mm)  
Piston Rod End Fitting D14-VA  
Body End Fitting D14-VA  
Nominal Force F₁ 3500 N  
Indicated by K.-No. on delivery

The end fittings are interchangeable. Strokes also available up to 1000 mm. For mounting accessories see page 190.

#### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range** $F_1$ at $20 \degree C$: 500 N to 5000 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 30 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 40 %, $F_2$ max. 7000 N

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For mounting accessories see page 190.
ACE industrial gas springs make opening and closing doors of rescue helicopters easier.

The maintenance-free, sealed systems are installed in the access doors of helicopters of the type EC 135. There, they allow the crew to enter or exit the helicopter quickly, thus contributing to enhanced safety.

The GS-19-300-CC gas springs provide a defined retraction speed and secure engagement of the door lock. The integrated end position damper allows gentle closing of the door and saves wear and tear on the valuable, lightweight material.

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Doors open and close safely

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Industrial gas springs: For safe entry and exit

---

ACE industrial gas springs prevent injuries during maintenance work on harvesting machines.

The blades of corn pickers are arranged under plastic hoods, which assure proper material flow within the machine. For maintenance purposes, the hoods, weighing about 7 kg, must be lifted up. To protect maintenance personnel from injury by falling hoods, they are kept in the open position by industrial gas springs of the type GS-22-250-DD.

Another advantage they offer is their stability under rough operating conditions due to their wear-resistant coating on the piston rod and the coated housing.

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Protection under the hood

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Enhanced protection: Industrial gas springs secure heavy hoods

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