The ACE gas spring range includes push type and pull type (traction) gas springs all designed for the industrial environment.

**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 hard ceramic coating on the piston rod. Also an integrated low friction bearing with grease chamber which provides a very low break away force (GS-15 to GS-40).

All of which are superior to a conventional gas spring. It also 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 optional valve allows the force to be adjusted to your specific requirements. A wide variety of interchangeable end fittings makes installation easy and versatile. They 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 ACE Selection Software quickly specifies the correct gas spring for your individual application and we can deliver, usually within 24 hours.

**ACE traction gas springs** work in pull direction and are available with body diameters of 19 mm and 28 mm.

**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 (for end damping)

**Mounting:** In any position

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

**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.
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 $F_1$). The cross-sectional area of the piston rod and filling pressure determines the extension force $F = p \times A$. 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.

### Gas Spring Force-Stroke Characteristics

#### Standard Gas Spring (Push Type)

<table>
<thead>
<tr>
<th>Type</th>
<th>Progression $%$</th>
<th>Friction $F_R$ approx. in N</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-8</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>GS-10</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>GS-12</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>GS-15</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>GS-19</td>
<td>36 - 42 $^3$</td>
<td>30</td>
</tr>
<tr>
<td>GS-22</td>
<td>39 - 50 $^3$</td>
<td>30</td>
</tr>
<tr>
<td>GS-28</td>
<td>60 - 95 $^3$</td>
<td>40</td>
</tr>
<tr>
<td>GS-40</td>
<td>47 - 53 $^3$</td>
<td>50</td>
</tr>
<tr>
<td>GS-70</td>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

1. The Progression (the slope of the force line in the diagrams above) is due to the reduction of the internal gas volume as the piston rod moves from its initial position to its fully stroked position.
2. Depending on the filling force.
3. Depending on the stroke.

#### 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) $F_F$

$F_1$ = 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

$F_3$ = force at the beginning of the extension stroke

$F_4$ = force at the end of the extension stroke

**Service Life**

**Filling tolerance:** -20 N to +40 N or 5 % to 7 %

**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/ flap 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 damage to the surface finish of the gas spring. The outer body must not be deformed or mechanically damaged.

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 2 km up to 10 km. 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 may have been achieved on some applications.

Lifetime for traction gas spring see pages 132 and 133.
Industrial Gas Springs

Adjustment Instructions Valve, Filling Kit

Adjustment Instructions Valve

1. Hold gas spring piston rod down.
2. Remove any fitting attached to the body end of the gas spring (GZ version the piston rod).
3. Insert adjuster knob on thread end on the cylinder body (on GZ version thread end on the piston rod). When resistance is felt, proceed slowly and with caution. This opens the valve and you can hear the nitrogen escaping and reducing pressure. Turn back the adjusting knob immediately, to avoid too much nitrogen being discharged.
4. After adjustment, remove the 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.

Gas Spring Refilling Kit

The ACE gas spring refilling kit gives the ability to fill, or adjust pressure (or force) of a Gas Spring on site. You gain independence and flexibility. The refilling kit includes all the parts necessary to fill your ACE gas springs on site. Only the high pressure nitrogen bottle is not included in the kit.

Gas spring refilling kit with one filling bell. Please indicate the thread size.

Ordering Example: gas spring refilling kit GS-19 additional filling bell GZ-19

"Independence and flexibility!"

Available filling bells
M3.5–8: GS-8 GS-15
M3.5–10: GS-10 GS-19 GS-22 GS-28
M3.5–12: GS-12 GZ-19 GZ-28
M5: GS-15
M8: GS-19 GS-22 GS-28 GZ-19
M10: GS-28 GZ-28
M14: GS-40
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 fax us your details. Just complete the information shown on the calculation formulae page number 122. Please attach a sketch of your application (a simple hand sketch is sufficient) in side view. Our application engineers will determine the optimum 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).

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 %.
Calculation Formulae

Case 1 (e.g. Flap)

In this example:
Starting Angle = 270°
Opening Angle = +90°

Case 2 (e.g. Hood)

In this example:
Starting Angle = 348°
Opening Angle = +80°

Push type  Drag type

Input Date
Gas Spring Fixing points
The fixed point $X_F$ and $Y_F$ of the frame and the moving point $X_L$ and $Y_L$ of the flap are critical for the optimum operation. Therefore please attach a sketch of your application on separate paper (a few lines with their dimensions are sufficient!)

Moving mass $m$ kg
No. of gas springs in parallel $n$ pcs
Number of movements 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 (0° to 360°)
Opening angle (–360° to +360°) $\alpha$°
$(\leq$ downwards, $+$ = upwards)
Dimensions of the flap: thickness _______ mm
Distance between flap and pivot:
Upper side $O_K$ = _______ mm, Lower side $U_K$ = _______ mm

Desired Mounting Fittings

End Fitting

End Fitting

$\square$ A

$\square$ B

$\square$ C

$\square$ D

$\square$ E

$\square$ F

$\square$ G

$\square$ A

$\square$ B

$\square$ C

$\square$ D

$\square$ E

$\square$ F

$\square$ G

The end fittings are interchangeable.
e.g.: -CE  C = Angle Ball Joint, E = Swivel Eye

Comments

Requirement per year
Machine type/reference

Sender
Co.
Address
Internet

Please copy, complete and fax to ACE: Fax +49 - (0)2173 - 9226 - 89
**Industrial Gas Springs GS-8 (Push Type)**

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

### End Fitting

<table>
<thead>
<tr>
<th>A3,5</th>
<th>B3,5</th>
<th>C3,5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions</strong></td>
<td><strong>Standard Dimensions</strong></td>
<td><strong>End Fitting</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td><strong>Stroke</strong></td>
<td><strong>L extended</strong></td>
</tr>
<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>
</tr>
<tr>
<td>GS-8-60</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-8-80</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

### Ordering Example

GS-S-30-AC-30

**Type (Push Type)**
- Body Ø (8 mm)
- Stroke (30 mm)
- Piston Rod End Fitting A3.5
- Body End Fitting C3.5
- Nominal Force F1 30 N

The end fittings are interchangeable. For mounting accessories see page 141.

### End Position Damping

**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. 5 mm

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

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


**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

For mounting accessories see page 141.
## Technical Data

**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. 5 mm  
**Progression:** Approx. 20%, F2 max. 120 N  
**Available force range F1 at 20° C:** 10 to 100 N  
**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

### End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended (mm)</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>
<td>40</td>
<td>112</td>
</tr>
<tr>
<td>GS-10-50</td>
<td>50</td>
<td>132</td>
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<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>

### Standard Dimensions

- **Type** (Push Type)  
- **Body Ø (10 mm)**  
- **Stroke (80 mm)**  
- **Piston Rod End Fitting A3.5**  
- **Body End Fitting C3.5**  
- **Nominal Force F1: 60 N**  

### Ordering Example

**GS-10-80-AC-60**  
Type (Push Type)  
Body Ø (10 mm)  
Stroke (80 mm)  
Piston Rod End Fitting A3.5  
Body End Fitting C3.5  
Nominal Force F1: 60 N  

---

**End Fitting**

- **Eye A3.5**  
- **Stud Thread B3.5**  
- **Angle Ball Joint C3.5**  
- **Clevis Fork D3.5**  
- **Swivel Eye E3.5**  
- **Ball Socket G3.5**  
- **Adjuster Knob U3.5**  

**For mounting accessories see page 141.**
Industrial Gas Springs GS-12 (Push Type)

Extension Forces 10 N to 180 N
(when Piston Rod Compressed up to 225 N)

### Technical Data

**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

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

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


**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

### End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
<th>max. F1</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>

### End Fitting

- **A3,5:** Eye
- **B3,5:** Stud Thread
- **C3,5:** Angle Ball Joint
- **D3,5:** Clevis Fork
- **E3,5:** Swivel Eye
- **G3,5:** Ball Socket
- **U3,5:** Adjuster Knob

### Ordering Example

GS-12-100-AA-30

Type (Push Type)

Body Ø (12 mm)

Stroke (150mm)

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 141.

### Standard Dimensions

- **A3,5:** Eye
- **B3,5:** Stud Thread
- **C3,5:** Angle Ball Joint
- **D3,5:** Clevis Fork
- **E3,5:** Swivel Eye
- **G3,5:** Ball Socket
- **W3,5-12:** Rod Shroud

### End Fitting

- **A3,5:** Eye
- **B3,5:** Stud Thread
- **C3,5:** Angle Ball Joint
- **D3,5:** Clevis Fork
- **E3,5:** Swivel Eye
- **G3,5:** Ball Socket
- **U3,5:** Adjuster Knob

For mounting accessories see page 141.
**Industrial Gas Springs GS-15 (Push Type)**

*Extension Forces 20 N to 400 N (when Piston Rod Compressed up to 500 N)*

**End Fitting**

<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>
</tr>
<tr>
<td>GS-15-50</td>
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<td>127</td>
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<td>GS-15-60</td>
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<td>GS-15-80</td>
<td>80</td>
<td>187</td>
</tr>
<tr>
<td>GS-15-100</td>
<td>100</td>
<td>227</td>
</tr>
<tr>
<td>GS-15-120</td>
<td>120</td>
<td>287</td>
</tr>
<tr>
<td>GS-15-150</td>
<td>150</td>
<td>327</td>
</tr>
</tbody>
</table>

**Dimensions**

- **Type (Push Type)**
- **Body Ø (15 mm)**
- **Stroke (150 mm)**
- **Piston Rod End Fitting A5**
- **Body End Fitting C5**
- **Nominal Force F1 150 N**

The end fittings are interchangeable. For mounting accessories see page 141.

**Technical Data**

**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

**Progression:** Approx. 27 %, F2 max. 500 N

**Available force range F1 at 20 °C:** 20 to 400 N


**On request:** Without damping, increased damping action at end of travel, special force curves, special lengths, strokes alternative end fittings, stainless steel (see pages 134 to 139).
Industrial Gas Springs GS-19 (Push Type)

Extension Forces 50 N to 700 N
(when Piston Rod Compressed up to 995 N)

End Fitting

Standard Dimensions

End Fitting

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</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>

Ordering Example

Type (Push Type)
Body Ø (19 mm)
Stroke (150 mm)
Piston Rod End Fitting A8
Body End Fitting C8
Nominal Force F1 600 N

The end fittings are interchangeable. For mounting accessories see page 142.

Technical Data

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. 36-42 %, F2 max. 995 N

Available force range F1 at 20 °C: 50 to 700 N


On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 134 to 139).
Industrial Gas Springs GS-22 (Push Type)

Extension Forces 80 N to 1300 N
(when Piston Rod Compressed up to 1950 N)

End Fitting

A8

B8

C8

D8

E8

F8

G8

W8-22

Rod Shroud

Standard Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-22-50</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-22-100</td>
<td>100</td>
<td>264</td>
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<tr>
<td>GS-22-150</td>
<td>150</td>
<td>364</td>
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<tr>
<td>GS-22-200</td>
<td>200</td>
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<td>GS-22-250</td>
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<td>GS-22-300</td>
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<td>GS-22-400</td>
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<td>1364</td>
</tr>
<tr>
<td>GS-22-700</td>
<td>700</td>
<td>1464</td>
</tr>
</tbody>
</table>

Ordering Example

GS-22-150-AE-800

Type (Push Type)

GS-22-150-AE-800

Body Ø (22 mm)

Stroke (150 mm)

Piston Rod End Fitting A8

Body End Fitting E8

Nominal Force F1 800 N

The end fittings are interchangeable. For mounting accessories see page 142.

Technical Data

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. 39 to 50%, F2 max. 1950 N

Available force range F1 at 20 °C: 80 to 1300 N


On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 134 to 139).
Industrial Gas Springs GS-28 (Push Type)

Extension Forces 150 N to 2500 N
(when Piston Rod Compressed up to 4875 N)

End Fitting Standard Dimensions End Fitting

A10
B10 Stud Thread
C10 Angle Ball Joint
D10 Clevis Fork
E10 Swivel Eye
F10 Inline Ball Joint
U10 Adjuster Knob
W10-28 Rod Shroud

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-28-100</td>
<td>100</td>
<td>262</td>
</tr>
<tr>
<td>GS-28-150</td>
<td>150</td>
<td>362</td>
</tr>
<tr>
<td>GS-28-200</td>
<td>200</td>
<td>462</td>
</tr>
<tr>
<td>GS-28-250</td>
<td>250</td>
<td>562</td>
</tr>
<tr>
<td>GS-28-300</td>
<td>300</td>
<td>662</td>
</tr>
<tr>
<td>GS-28-350</td>
<td>350</td>
<td>762</td>
</tr>
<tr>
<td>GS-28-400</td>
<td>400</td>
<td>862</td>
</tr>
<tr>
<td>GS-28-450</td>
<td>450</td>
<td>962</td>
</tr>
<tr>
<td>GS-28-500</td>
<td>500</td>
<td>1062</td>
</tr>
<tr>
<td>GS-28-550</td>
<td>550</td>
<td>1162</td>
</tr>
<tr>
<td>GS-28-600</td>
<td>600</td>
<td>1262</td>
</tr>
<tr>
<td>GS-28-650</td>
<td>650</td>
<td>1362</td>
</tr>
<tr>
<td>GS-28-700</td>
<td>700</td>
<td>1462</td>
</tr>
<tr>
<td>GS-28-750</td>
<td>750</td>
<td>1562</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type)
Body Ø (28 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 142.

Technical Data

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. 60 to 95%, F2 max. 4875 N.

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


On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 134 to 139).
Large Industrial Gas Springs GS-40 (Push Type)
Extension Forces 500 N to 5000 N
(when Piston Rod Compressed up to 7650 N)

**End Fitting**

**A14**
- Dimensions
- Standard Dimensions
- End Fitting

**B14**
- Dimensions
- Standard Dimensions
- End Fitting

**C14**
- Dimensions
- Standard Dimensions
- End Fitting

**D14**
- Dimensions
- Standard Dimensions
- End Fitting

**E14**
- Dimensions
- Standard Dimensions
- End Fitting

**F14**
- Dimensions
- Standard Dimensions
- End Fitting

**W14-40**
- Rod Shroud

**Technical Data**

**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. 47 to 53%, $F_2$ max. 7650 N.

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


**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 134 to 139).
Large Industrial Gas Springs GS-70 (Push Type)

Extension Forces 2000 N to 13000 N
(when Piston Rod Compressed up to 16250 N)

**End Fitting**

- **B24**
- **D24**
- **E24**
- **W24-70**

### Standard Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</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>1120</td>
</tr>
<tr>
<td>GS-70-600</td>
<td>600</td>
<td>1320</td>
</tr>
<tr>
<td>GS-70-700</td>
<td>700</td>
<td>1520</td>
</tr>
<tr>
<td>GS-70-800</td>
<td>800</td>
<td>1720</td>
</tr>
</tbody>
</table>

### Dimensions

- **Stud Thread B24**
- **Clevis Fork D24**
- **Swivel Eye E24**

**Ordering Example**

GS-70-200-EE-8000

Type (Push Type)
Body Ø (70 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 143. Standard gas spring with valve.

### Technical Data

- **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
- **Progression:** Approx. 25%, F2 max. 16250 N
- **Available force range F1 at 20 °C:** 2000 N to 13000 N
- **Material:** Body: black powder coated steel or zinc plated steel. Piston rod: hard chrome plated. End fittings: zinc plated steel.
- **On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings, stainless steel.

For mounting accessories see page 143.
Traction Gas Springs GZ-19 (Pull Type)

Traction (Pull) Forces 30 N to 300 N
(when Piston Rod Extended up to 330 N)

**End Fitting**

- **A8**
- **B8**
- **C8**
- **D8**
- **E8**
- **G8**
- **WZ8-19**
- **UZ8**

**Standard Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>L retracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>GZ-19-30</td>
<td>30</td>
<td>112</td>
</tr>
<tr>
<td>GZ-19-50</td>
<td>50</td>
<td>132</td>
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<tr>
<td>GZ-19-100</td>
<td>100</td>
<td>182</td>
</tr>
<tr>
<td>GZ-19-150</td>
<td>150</td>
<td>232</td>
</tr>
<tr>
<td>GZ-19-200</td>
<td>200</td>
<td>282</td>
</tr>
<tr>
<td>GZ-19-250</td>
<td>250</td>
<td>332</td>
</tr>
</tbody>
</table>

**Dimensions**

- **Eye A8**
- **Stud Thread B8**
- **Angle Ball Joint C8**
  (Max. permitted force 1200 N)
- **Clevis Fork D8**
- **Swivel Eye E8**
- **Ball Socket G8**
  (Max. permitted force 1200 N)

**Ordering Example**

- **GZ-19-150-AC-250**
  - Type (Pull Type)
  - Body Ø (19 mm)
  - Stroke (150 mm)
  - Piston Rod End Fitting A8
  - Body End Fitting C8
  - Traction Force F1 250 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 142.

**Technical Data**

- **Mounting**: Can be mounted in any position. Install mechanical stop in extended position.
- **End position damping length**: Without damping
- **Progression**: Approx. 10%, F2 max. 330 N
- **Note**: Lifetime approx. 2000 m
- **Available traction force range F1 at 20 °C**: 30 to 300 N
- **On request**: Special force curves, special lengths, alternative end fittings, stainless steel.

---

For mounting accessories see page 142.
### Traction Gas Springs GZ-28 (Pull Type)

Traction (Pull) Forces 150 N to 1200 N
(when Piston Rod Extended up to 1440 N)

### End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L retracted (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GZ-28-30</td>
<td>30</td>
<td>130</td>
</tr>
<tr>
<td>GZ-28-50</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>GZ-28-100</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>GZ-28-150</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>GZ-28-200</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>GZ-28-250</td>
<td>250</td>
<td>350</td>
</tr>
<tr>
<td>GZ-28-300</td>
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<tr>
<td>GZ-28-350</td>
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<tr>
<td>GZ-28-400</td>
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<tr>
<td>GZ-28-450</td>
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<tr>
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<td>650</td>
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<tr>
<td>GZ-28-600</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>GZ-28-650</td>
<td>650</td>
<td>750</td>
</tr>
</tbody>
</table>

### End Fitting

- **Eye A10**
- **Stud Thread B10**
- **Angle Ball Joint C10**
  (Max. permitted force 1800 N)
- **Clevis Fork D10**
- **Swivel Eye E10**

### Dimensions

- **A10**:
  - **Radius R9**: 17
  - **Stroke**: 25
  - **Ø 10**: 12

- **B10**:
  - **M10x1,5**: 12

- **C10**:
  - **Ø 24**: 16
  - **Ø 16**: 18
  - **Ø 13**: 20
  - **Ø 10**: 30
  - **M10x1,5**: 35

- **D10**:
  - **Ø 10**: 12
  - **Ø 8**: 20
  - **Ø 6**: 30
  - **Ø 5**: 50

- **E10**:
  - **Ø 19**: 24
  - **Ø 15**: 18
  - **Ø 13**: 16
  - **Ø 10**: 14

### Ordering Example

- **Type (Pull Type)**: GZ-28-150-EE-800
- **Body Ø (28 mm)**
- **Stroke (150 mm)**
- **Piston Rod End Fitting E10**
- **Body End Fitting E10**
- **Traction Force F1 800 N**

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 142.

### Technical Data

- **Mounting**: Can be mounted in any position. Install mechanical stop in extended position.
- **End position damping length**: Without damping
- **Progression**: Approx. 20 %, F2 max. 1440 N.
- **Note**: Lifetime approx. 2000 m
- **Available traction force range F1 at 20 °C**: 150 to 1200 N
- **On request**: Increased traction force, special force curves, special lengths, alternative end fittings, stainless steel.
Just drill 4 holes – ACE does all the rest!

By taking advantage of the very extensive range of ACE end fittings and mounting brackets you can easily and simply install our gas springs and hydraulic dampers. You profit from the variety of DIN Standard end fittings such as swivel eyes, clevis forks, angle ball joints, inline ball joints, and complementary ball sockets. ACE also offers eye fittings made of wear resistant steel to meet the higher specification requirements found in industrial applications. With over 30 different types available these newly developed mounting accessories provide an extensive range of combinations for optimum installations.

With the ACE Selection Programme you can choose not only your gas springs but also the ideal end fittings and mounting brackets for your individual application example.

The complete range of accessories are also available as individual components.

Interchangeable

Combinable

The wide range of mounting brackets available
### Accessories M3.5x0.6

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Code</th>
<th>Diameter</th>
<th>Width</th>
<th>Length</th>
<th>Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3.5</td>
<td>Eye</td>
<td>GS-8</td>
<td>3.5</td>
<td>1,5</td>
<td>4,5</td>
<td>225 N</td>
</tr>
<tr>
<td>C3.5</td>
<td>Angle Ball Joint</td>
<td>GS-10, GS-12, HB-12</td>
<td>3.5</td>
<td>13</td>
<td>18</td>
<td>225 N</td>
</tr>
<tr>
<td>D3.5</td>
<td>Clevis Fork</td>
<td>GS-8</td>
<td>3.5</td>
<td>12</td>
<td>16</td>
<td>225 N</td>
</tr>
<tr>
<td>E3.5</td>
<td>Swivel Eye</td>
<td>GS-648</td>
<td>3.5</td>
<td>13</td>
<td>18</td>
<td>225 N</td>
</tr>
<tr>
<td>G3.5</td>
<td>Ball Socket</td>
<td>GS-71805</td>
<td>3.5</td>
<td>13</td>
<td>18</td>
<td>225 N</td>
</tr>
</tbody>
</table>

1 max. force 225 N

### Accessories M5x0.8

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Code</th>
<th>Diameter</th>
<th>Width</th>
<th>Length</th>
<th>Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5</td>
<td>Eye</td>
<td>GS-15, HB-15</td>
<td>5</td>
<td>10</td>
<td>18</td>
<td>800 N</td>
</tr>
<tr>
<td>C5</td>
<td>Angle Ball Joint</td>
<td>GS-15, HB-15</td>
<td>5</td>
<td>13</td>
<td>22</td>
<td>500 N</td>
</tr>
<tr>
<td>D5</td>
<td>Clevis Fork</td>
<td>GS-71752</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>800 N</td>
</tr>
<tr>
<td>E5</td>
<td>Swivel Eye</td>
<td>GS-648</td>
<td>5</td>
<td>13</td>
<td>22</td>
<td>500 N</td>
</tr>
<tr>
<td>F5</td>
<td>Inline Ball Joint</td>
<td>GS-71805</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>500 N</td>
</tr>
</tbody>
</table>

1 max. force 500 N

### Notes

- **Accessories M3.5x0.6**
  - GS-8, GS-10, GS-12, HB-12
  - Specifications subject to change

- **Accessories M5x0.8**
  - GS-15, HB-15

1 Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
## Mounting Accessories for Gas Springs and Dampers

### Accessories M8x1.25

<table>
<thead>
<tr>
<th>A8</th>
<th>C8</th>
<th>D8</th>
<th>E8</th>
<th>F8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye</strong></td>
<td><strong>Angle Ball Joint DIN 71802</strong></td>
<td><strong>Clevis Fork DIN 71752</strong></td>
<td><strong>Swivel Eye DIN 648</strong></td>
<td><strong>Inline Ball Joint</strong></td>
</tr>
<tr>
<td><img src="image1" alt="A8" /></td>
<td><img src="image2" alt="C8" /></td>
<td><img src="image3" alt="D8" /></td>
<td><img src="image4" alt="E8" /></td>
<td><img src="image5" alt="F8" /></td>
</tr>
<tr>
<td><strong>max. force 3 000 N</strong></td>
<td><strong>max. force 1 200 N</strong></td>
<td><strong>max. force 3 000 N</strong></td>
<td><strong>max. force 1 200 N</strong></td>
<td><strong>max. force 1 200 N</strong></td>
</tr>
</tbody>
</table>

### Accessories M10x1.5

<table>
<thead>
<tr>
<th>A10</th>
<th>C10</th>
<th>D10</th>
<th>E10</th>
<th>F10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye</strong></td>
<td><strong>Angle Ball Joint DIN 71802</strong></td>
<td><strong>Clevis Fork DIN 71752</strong></td>
<td><strong>Swivel Eye DIN 648</strong></td>
<td><strong>Inline Ball Joint</strong></td>
</tr>
<tr>
<td><img src="image6" alt="A10" /></td>
<td><img src="image7" alt="C10" /></td>
<td><img src="image8" alt="D10" /></td>
<td><img src="image9" alt="E10" /></td>
<td><img src="image10" alt="F10" /></td>
</tr>
<tr>
<td><strong>max. force 10 000 N</strong></td>
<td><strong>max. force 1 800 N</strong></td>
<td><strong>max. force 10 000 N</strong></td>
<td><strong>max. force 10 000 N</strong></td>
<td><strong>max. force 1 800 N</strong></td>
</tr>
</tbody>
</table>

### Notes

1. **Attention!** Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

---

1. **Attention!** Must only be used with compression loads.
### Accessories M14x1.5 GS-40, HB-40

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A14</strong></td>
<td><strong>C14</strong></td>
<td><strong>D14</strong></td>
</tr>
<tr>
<td><strong>Eye</strong></td>
<td><strong>Angle Ball Joint DIN 71802</strong></td>
<td><strong>Clevis Fork DIN 71752</strong></td>
</tr>
<tr>
<td>1 max. force 10 000 N</td>
<td>1 max. force 2 000 N</td>
<td>1 max. force 10 000 N</td>
</tr>
<tr>
<td><img src="image" alt="Eye" /></td>
<td><img src="image" alt="Angle Ball Joint" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
</tr>
</tbody>
</table>

| **E14** | **F14** |
| **Swivel Eye DIN 648** | **Inline Ball Joint** |
| 1 max. force 10 000 N | 1 max. force 3 200 N |
| ![Swivel Eye](image) | ![Inline Ball Joint](image) |

**Attention!** Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

### Accessories M24x2 GS-70, HB-70, HBS-70

<p>| | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>D24</strong></td>
<td><strong>E24</strong></td>
<td><strong>ME24</strong></td>
</tr>
<tr>
<td><strong>Clevis Fork DIN 71752</strong></td>
<td><strong>Swivel Eye DIN 648</strong></td>
<td>1 max. force 50 000 N</td>
</tr>
<tr>
<td><img src="image" alt="Clevis Fork" /></td>
<td><img src="image" alt="Swivel Eye" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
</tr>
</tbody>
</table>

| **ND24** | **ND14** |
| 1 max. force 50 000 N | 1 max. force 10 000 N |
| ![Clevis Fork](image) | ![Clevis Fork](image) |

**Attention!** Must only be used with compression loads.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ME14</strong></td>
<td><strong>ND14</strong></td>
<td><strong>ME14</strong></td>
</tr>
<tr>
<td>1 max. force 10 000 N</td>
<td>1 max. force 10 000 N</td>
<td>1 max. force 10 000 N</td>
</tr>
<tr>
<td><img src="image" alt="Clevis Fork" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
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</tbody>
</table>

**Attention!** Must only be used with compression loads.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ME14</strong></td>
<td><strong>ME24</strong></td>
<td><strong>ND24</strong></td>
</tr>
<tr>
<td>1 max. force 10 000 N</td>
<td>1 max. force 50 000 N</td>
<td>1 max. force 50 000 N</td>
</tr>
<tr>
<td><img src="image" alt="Clevis Fork" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
<td><img src="image" alt="Clevis Fork" /></td>
</tr>
</tbody>
</table>

**Attention!** Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
**Industrial Gas Springs**

**Application Examples**

---

**Doors open and close safely**

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.

---

**Protection under the hood**

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 ceramic hardness structure on the piston rod and the powder-coated housing.

---

Enhanced protection: Industrial gas springs secure heavy hoods