Product Series
Delayed Return Units

Controllable Gas Springs – KF2
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About Controllable Gas Springs

KF2 is the next generation of controllable gas springs, which supersedes the KF springs. The KF2 controllable gas spring series consists of a family of gas springs for use in metal forming dies, whose piston rods can be locked at bottom dead center (BDC). The return stroke of the piston rod is controlled via the valve contained within the base of the spring.

One application example is in drawing dies (see below) where two forming stages are performed with a single press stroke.

More examples illustrating the benefits of using controllable gas springs can be found in section Applications Examples 2/1.

Controllable gas springs are available with:

- Model sizes 1500, 3000, 5000 & 7500 (initial force in daN)
- Stroke lengths from 5 mm to 160 mm

There are two controllable gas spring systems available:

- Standard lock, KF2
- Positive lock system, KF2 + KP

The following is a brief description of these two systems.
**Standard Lock, KF2**

The KF2 is a controllable gas spring whose piston rod can be locked at BDC.

The full stroke length of the KF2 spring must be used within ±0.5 mm for optimal locking function to provide maximum springback of 1 mm, which we refer to as standard lock (for zero springback see Positive lock System).

The return stroke of the piston is either controlled by the control system from the press or can be integrated into the tool itself (for more info, see Tool integrated control system, page 4.2). The springs can either be installed self-contained or connected to a control block through a hose system.

**KF2 – how does it work?**

The KF2 controllable gas spring consists of a cylinder [1], guide assembly [2], piston rod assembly containing check valves [3], internal piston rod [4] and normally open (NO) cartridge valve [5] located in the base of the spring.

The nitrogen gas within the spring is sealed within an upper and a lower gas chamber. When the spring is stroked, nitrogen gas from the lower chamber passes through the check valves in the piston rod assembly and enters the upper chamber.

The cartridge valve is closed by applying compressed air pressure (min. 4 bar). With the cartridge valve closed, the piston rod is prevented from returning to its extended position.

By opening the cartridge valve again, the gas contained within the upper chamber can now return to the lower chamber via the internal piston rod [4], thus allowing the piston rod to return to its extended position.
GENERAL INTRODUCTION

Positive Lock System, KF2 + KP

The KF2 + KP system combines a standard lock, i.e. a KF2 controllable gas spring [1], with a specially designed KP passive gas spring [3] via a valve lock [2], which together forms a positive lock system.

The result is a controllable gas spring system with zero springback.

Please note!
The KP passive gas spring is not to be used for any operation in the tool other than to eliminate springback in the KF2 spring(s). It can be placed anywhere in the tool and can eliminate springback in up to four KF2 controllable gas springs. How much the KP passive gas spring should be stroked depends on the number of KF2 springs in the system. The cartridge valve in the valve block is identical to the one in the KF2 spring.

Positive Lock System, how does it work?
The KF2 is the active spring in the system and provides the required spring force in the tool. The task of the KP passive gas spring is to eliminate the max. 1 mm springback of the KF2 spring(s) at press BDC.

The system works by connecting the lower gas chamber in the KF2 controllable gas spring(s) to the upper chamber of the KP passive gas spring via the valve block. By stroking the KP passive gas spring, the pressure in its upper gas chamber is reduced causing a pressure difference between it and the lower gas chamber in the KF2 controllable gas spring(s).

At BDC, the valve in the valve block is opened, using the control system from the press or a mechanical pressure switch, and the remaining gas in the lower chamber of the KF2 spring is drawn into the upper chamber of the KP passive gas spring.
**Why 100% nominal stroke ±0.5 mm?**

In order to provide optimum locking from the KF2 controllable gas spring, it is important to stroke the spring 100% of the nominal stroke length ±0.5 mm. This is because it is necessary to reduce the gas volume in the lower gas chamber to a minimum.

For a standard lock, stroking the KF2 spring 100% of the nominal stroke length ±0.5 mm will ensure maximum springback of 1 mm.

An adjustable stroke length version of the controllable gas spring, called the KF2-A, is available for those applications where the exact nominal stroke length ±0.5 mm is not known until after tool try-outs.

For a positive lock system with KF2 + KP, stroking the KF2 spring 100% of the nominal stroke length ±0.5 mm is also important, although this also largely depends on the utilized stroke length of the KP passive gas spring.
**Standard Lock, KF2**

When forming this cross member, “baby” blank holders are used to form the circled area. The tool uses two “baby” blank holders, which during the return stroke must be locked in the bottom position to avoid deformation of the part. In this case, one KF2 spring is used to control each “baby” blank holder.

**Work cycle**

As the upper tool moves downwards, the blank holder [1] is activated to control the flow of the blank in the tool. At bottom dead center, the KF2 springs will lock. In this application, a small amount of springback will not damage the formed part. As the press opens, the baby blank holder remains locked until that time when the KF2 spring should be unlocked and eject the part.
Positive Lock System, KF2 + KP

For parts where controllable gas springs with zero springback are required, the positive lock system is ideal.

Here a double-stage draw forming operation is made with a single stroke from the press.

The positive lock system provides a lockable blank holding force that prevents part deformation during the return stroke of the press.

This large die for an inner door panel uses a total of 12 pcs KF2 connected to 3 pcs KP passive gas springs.

**Work cycle**

The lower tool contains the KF2 controllable gas springs that provide the active blank-holding force for the deepest drawn section of the part.

As the tool comes together, the KP passive gas springs (not shown) are stroked, providing the necessary back pressure to lock the KF2 springs at BDC with zero springback.

As the tool opens, the KF2 springs remain locked until a signal from the press is given. The KF2 springs then help eject the undamaged part from the tool.
Positive Lock System, KF2 + KP

Producing side body panels to a high quality often pose challenges to the tool maker. Of particular difficulty are the regions where the side posts connect with the outer frame.

Too much blank-holding force can cause the part to split, while too little can make the part wrinkle.

One solution to this problem now being applied, is to use individual “baby” blank holders in these problem spots and control their spring force using KF2 controllable gas springs.

The result is improved part quality, increased forming control and a reduction of scrapped parts.

Work cycle

The upper tool contains the KF2 controllable gas springs that provide the active blank holding force for the locally situated “baby” blank holders. As the tool begins to close, the “baby” blank holders initially hold the blank in place in the problem regions. At press BDC, the valve in the valve block opens and the KP spring is used to ensure zero spring-back in the KF2 springs. As the tool opens, the KF2 springs remain locked until a signal from the press is given. The KF2 springs then help eject the finished part from the tool.
To make selection of the right system and components for your particular application easier, please fill in the Application Enquiry Form below.

We recommend you make a photocopy of this page, complete the following questions and send it to your local KALLER distributor or to contact us directly at Strömsholmen for further assistance.

If possible, please provide the following information together with a rough sketch of your application.

**General information**

Date: ............................................................................................................... (yy/mm/dd)

Your name: ........................................................................................................

How do you wish to be contacted?

- Via phone: ..................................................................................................... (give details)
- Via fax: ......................................................................................................... (give details)
- Via e-mail: .................................................................................................... (give details)

Country you are contacting us from: .................................................................

**Application information**

1. Does your application require a gas spring with lockable piston rod (Y/N)? .............
2. If you answered Yes to Question 1, is a max. 1 mm springback acceptable (Y/N)? ........
3. How many gas springs does your application require? ............................................. pcs
4. What initial force is required from each gas spring? ......................................................... daN
5. What stroke length is required for each gas spring? ......................................................... mm
6. How many strokes per minute (spm) will your application run at? ................................. spm
7. The springs should be connected together using a Hose System .................................

Additional comments: ..............................................................................................

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Controllable gas springs require at least one of the following systems:
- Control system (mandatory)
- Hose system (optional)
- Cooling system (optional)

Control system (mandatory)
In order to lock and unlock the KF2 controllable gas spring(s), a control system is required to send a pneumatic signal (min. 4 bar) to the normally open (NO) valve in the base of the KF2 spring.

The pneumatic signal can either be provided by the control system from the press, or integrated into the tool itself using mechanical pressure switches (see Tool integrated control system 4.2 for more information).

Control system – Standard Lock, KF2
The normally open (NO) valve within the base of the KF2 controllable spring(s) is closed using compressed air (min. 4 bar). With the valve closed at t0-t2 (see diagram), the piston rod of the KF2 spring(s) is prevented from returning to its extended position.

By connecting the valves in the KF2 springs to each other using pneumatic hoses to the control system of the press, the springs can be easily locked and subsequently unlocked.

If only an electrical control signal is available from the press, then a standard electric-pneumatic control valve can be used.

For examples of how to connect the KF2 controllable gas spring(s) to a control system, see the installation examples on page 6.1.
Control system – Positive Lock System, KF2+KP

When the KP passive gas spring is connected to the active KF2 spring(s) via the valve block, an additional signal from the press (or separate mechanical pressure switch) is required to control the valve within the valve block.

As the valve in the valve block is identical to that used in the KF2 springs, it is normally open (NO). Therefore during the down-stroke of the press, it is important the valve block’s valve is closed by applying compressed air (min. 4 bar) to air port C.

Please note!
The valve in the valve block should be opened exactly at press BDC.

For examples of how to connect the KF2 + KP controllable gas spring system to a control system, see the installation examples on page 6.1.

Tool integrated control system

The control system, required to lock the KF2 spring(s), can be integrated into the tool itself by using a mechanical pressure switch. The control system required to lock and unlock the KF2 spring(s) is then becomes independent of the press’ own control system.

The KF2 spring(s) remain locked as long as the mechanical pressure switch [1] is activated by the tool [2].

When a positive lock system is used, the mechanical switch is recommended to control only the KF2 gas springs (signal A). To obtain the proper signal (C) to valve block an electric pneumatic 3/2 valve is recommended.

As a result, a tool integrated control system only requires a constant supply of compressed air (min. 4 bar) to the mechanical pressure switch.
Hose system (optional)
KF2 controllable gas springs can be installed in the tool as self-contained units or linked together using a hose system for remote gas charging and evacuation.

<table>
<thead>
<tr>
<th>Controllable gas spring system</th>
<th>Recommended hose system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard lock</td>
<td>EZ hose</td>
</tr>
<tr>
<td>Positive lock system</td>
<td>EZ hose and EO24 hose</td>
</tr>
</tbody>
</table>

Hose system – Standard Lock, KF2
With reference to Chapter 4 of the KALLER main catalog, we recommend use of the EZ hose System.

KF2 controllable gas springs are connected to each other in a hose system in just the same way as standard gas springs. For information on connecting the newer KF2 springs with the older KF controllable gas springs, see Appendix “How to fit the new KF2 to existing KF Systems” on page 8.2.

For examples of how to connect KF2 controllable gas springs to a hose system, see the installation examples on page 6.1.
**Hose system – Positive Lock System, KF2+KP**

It is possible to connect up to four KF2 springs to one valve block.

With reference to Chapter 4 of the KALLER main catalog, a KF2+KP controllable gas spring system requires two hose connections:

- One EZ hose connection
- One EO24 hose connection

**EZ hose connections**

Gas port 1, which is marked on each KF2 spring, is connected to gas port 1 on the valve block (also marked) using EZ hose system components.

**EO24 hose connections**

To connect the KF2 controllable gas spring(s) to a KP passive gas spring via the valve block, we recommend using the EO24 hose system (or its equivalent) owing to the large internal diameter of the hose. This is especially important when gas flow in the hoses is required.

Gas port 3, which is marked on each KF2 spring, is connected to gas port 3 on the valve block (also marked) using EO24 hose system components.

Gas port 5, which is marked on the valve block, is connected to gas port 5 (also marked) on the KP passive gas spring also using EO24 hose system components.

For information on connecting the newer KF2 springs together with the older KF controllable gas springs, see appendix “How to fit the new KF2 to existing KF systems” on page 8.2.

For examples of how to connect KF2 + KP controllable gas spring systems to a hose system, see the installation examples on page 6.1.
Cooling System (optional)

About cooling
Currently there are two possible KF2 cooling system solutions to choose between when cooling is required for a KF2 gas spring system. Which particular method to choose depends upon the required cooling effect and the number of controllable gas springs to be cooled.

KF2-NC / KF2-A-NC for use with a Nitro cooler™. Nitro coolers are ideal for a small number of springs that operate at higher production rates and as such require cooling. They are also ideal where there is insufficient space for cooling jackets and a liquid cooler unit.

KF2-CJ / KF2-A-CJ for use with a liquid cooler unit. For applications where a larger number of KF2 springs operate at higher production rates requiring cooling of heat build-up, liquid cooler units rated at 10 kW or 25 kW are available. Each KF2 gas spring is fitted with a cooling jacket, thus allowing efficient circulation of cooling liquid around each KF2 gas spring.

Every time a KF2 controllable gas spring is stroked, energy is transferred from the press to the spring. The amount of energy transferred is a function of the spring force multiplied by its stroke length.

With a conventional gas spring, the piston rod follows the press movement on the return stroke. This means that the energy transferred to the gas spring on the compression stroke is transferred back to the press on the return stroke (with the exception of some losses due to friction, etc.). However since the return stroke of a KF2 controllable gas spring does not follow the return stroke of the press, the transferred energy is generated as heat in the KF2 spring.

Consequently cooling of the KF2 spring(s) is required in some applications to avoid overheating.
**Heat factor**

The need for cooling is determined by calculating the KF2 spring’s heat factor for the application.

The heat factor is calculated by multiplying the stroke frequency in strokes per minute (spm), with the KF2 spring’s stroke length (mm).

Example:

- Stroke frequency: 15 spm
- KF2 stroke length: 100 mm
- Heat factor = Stroke frequency × Stroke length
  \[= 15 \times 100 = 1500\]

If this heat factor exceeds the maximum frequency without cooling values given for the different KF2 spring sizes in the diagram, then cooling is required.

When deciding on a cooling system, the following should be taken into account:

- A liquid cooler should be used for big dies with a large number of springs. The cooling capacity is limited to 25 kW.

- The Nitro cooler™ is suitable for small dies with a limited number of springs (1-6 pcs.) The Nitro cooler™ should be placed as close as possible to the springs. The return speed is lower when a Nitro cooler™ is used. Nitro cooler™ is a die-integrated cooler with a limited cooling capacity of 1.5 kW.

\[\text{Heat factor} = \text{Stroke length} \times \text{Frequency} \quad (\text{mm}) \times \text{(strokes/minute)}\]

*Heat effect (kW) per KF2 gas springs at maximum frequency

**Please note!**

The information in the diagram is based on calculations made for KF2 gas springs operating at a 150 bar charge pressure in a well-ventilated area with an ambient temperature of 24°C.
What can be done to eliminate the need for cooling?

For some applications, the need for cooling can be eliminated by considering one of the following:

**Method 1: Add more KF2 springs**

By adding additional KF2 Controllable gas springs to the system, the charge pressure in each KF2 spring is reduced in order to maintain the same net spring force in the tool. The heat factor reduction for the KF2 spring is directly proportional to the reduction in charge pressure.

For example:

- A tool should run at 10 spm and have a stroke length of 50 mm.
- The net spring force required from the tool is 300 kN.
- Preferred number of springs is 10 pcs.

Solution 1:

The natural choice would be to select 10 pcs of KF2 3000-050 at a 150 bar charge pressure (see Technical data 10.5/1 for more info).

In this case, the Heat Factor would be $10 \times 50 = 500$

With reference to the heat factor diagram, a heat factor of 500 exceeds the allowable limit for a system without cooling by 120.

Instead, by adding an additional 4 pcs KF2 3000-050 to the system, the total net spring force at 150 bar is 420 kN.

Since the charge pressure and initial force are directly related, by applying the ratio of forces the new heat factor can be calculated.

New heat factor = Original heat factor \times \frac{\text{Required net force at reduced pressure}}{\text{Net force at 150 bar}}

Net force at 150 bar

= $500 \times \frac{300}{420}$

= 360

The new heat factor is now 20 below that required for KF2 3000 cooling.

**Method 2: Use larger KF2 springs**

By selecting a KF2 Controllable gas spring of a larger size than originally planned, the charge pressure must be reduced in order to maintain the same net spring force from the tool.

The heat factor reduction for the KF2 spring is directly proportional to the reduction in charge pressure.

With reference to the previous example:

Solution 2:

Selecting 10 pcs KF2 5000-050 at 150 bar would provide a total net spring force of 500 kN.

The heat factor at 150 bar would be $10 \times 50 = 500$ as above.

New heat factor = Original heat factor \times \frac{\text{Required net force at reduced pressure}}{\text{Net force at 150 bar}}

Net force at 150 bar

= $500 \times \frac{300}{500}$

= 300

The new heat factor is now 60 below that required for KF2 5000 cooling.
Over Heat Protection

Thermal Relay
To avoid overheating the KF2 gas spring, a Thermal-Relay (bimetallic) should be used to stop the press. If the KF2 gas spring temperature exceeds 80°C the Thermal Relay will open, sending a signal to the press’s control system to say the springs are overheating. The Thermal Relay will automatically close as the KF2 gas spring temperature returns back to normal. Running the KF2 gas spring at higher temperatures will shorten the service life of the spring.

Please Note!
When ordering KF2-NC / KF2-A-NC, for use with a Nitro Cooler™, the thermal Relay are included in the cooler.

Basic information
- Normally closed
- Trigger temperature: 83 ±3°C
- Hysteresis: < 7°C
- Max. voltage: 250 VAC
- Max. current: 16 A
- Min. current: 50 mA
- Delivered with 2 m of electric cable
TECHNICAL DATA

KF2 – Dimensions, standard version

Top view

<table>
<thead>
<tr>
<th>Model</th>
<th>Stroke</th>
<th>Force in N at 150 bar /+20°C</th>
<th>A</th>
<th>B</th>
<th>Ø D</th>
<th>Ø d</th>
<th>K</th>
<th>V</th>
<th>M</th>
</tr>
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<tbody>
<tr>
<td>KF2 1500</td>
<td>5–160</td>
<td>15,000</td>
<td>22,000</td>
<td>125</td>
<td>24</td>
<td>95</td>
<td>36</td>
<td>50</td>
<td>60°</td>
</tr>
<tr>
<td>KF2 3000</td>
<td>6–160</td>
<td>30,000</td>
<td>42,000</td>
<td>135</td>
<td>25.5</td>
<td>120</td>
<td>50</td>
<td>95</td>
<td>30°</td>
</tr>
<tr>
<td>KF2 5000</td>
<td>6–160</td>
<td>50,000</td>
<td>74,000</td>
<td>160</td>
<td>27.5</td>
<td>150</td>
<td>65</td>
<td>110</td>
<td>30°</td>
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<tr>
<td>KF2 7500</td>
<td>8–160</td>
<td>75,000</td>
<td>98,000</td>
<td>180</td>
<td>33.5</td>
<td>195</td>
<td>80</td>
<td>120</td>
<td>30°</td>
</tr>
</tbody>
</table>

• Upon delivery, all gas ports are fitted with plugs and the internal gas pressure is zero bar.
• We recommend the threaded holes in the base of the KF2 springs be used for mounting.
If mounting from the base is not possible, see the Appendix on page 8.4 for more information.

Basic information

Pressure medium ................. Nitrogen
Max. charge pressure .......... 150 bar
Min. charge pressure .......... 25 bar
Operating temperature ........... 0 – +80°C
Force increase by temperature .......... ±0.3%/°C
Max. piston rod velocity .......... 0.8 m/s
Return speed piston rod 1500° ...... 0.22 m/s
Return speed piston rod 3000° ...... 0.15 m/s
Return speed piston rod 5000° ...... 0.12 - 0.10 m/s
Return speed piston rod 7500° ...... 0.80 - 0.65 m/s
Tube ........................................ Nitrided
Rod ........................................ Nitrided

*Please note:
Increased stroke length reduces the speed. Please contact your local KALLER distributor for further information.
KF2 springs with even slower return speeds are available on request.
**KF2-A – Dimensions, adjustable version**

For certain applications, it is difficult to know in advance exactly what stroke length will be required.

Therefore, the KF2-A Controllable gas spring models offer adjustable stroke lengths within 15 mm, with the use of 4 specially designed spacers built into the guide of the spring.

KF2-A Adjustable stroke controllable gas springs are available according to the following table:

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Nominal stroke</th>
<th>Min. stroke length</th>
<th>Max. stroke length</th>
<th>L min. 1500</th>
<th>L min. 3000</th>
<th>L min. 5000</th>
<th>L min. 7500</th>
</tr>
</thead>
<tbody>
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<td>KF2-A XXXX-010</td>
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<td>KF2-A XXXX-040</td>
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<td>KF2-A XXXX-060</td>
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<td>67</td>
<td>192</td>
<td>202</td>
<td>227</td>
<td>247</td>
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<tr>
<td>KF2-A XXXX-070</td>
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<tr>
<td>KF2-A XXXX-080</td>
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<td>267</td>
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<td>KF2-A XXXX-090</td>
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<td>222</td>
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<tr>
<td>KF2-A XXXX-110</td>
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<td>117</td>
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<td>252</td>
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<tr>
<td>KF2-A XXXX-120</td>
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<td>112</td>
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<td>122</td>
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<td>327</td>
</tr>
<tr>
<td>KF2-A XXXX-150</td>
<td>150</td>
<td>142</td>
<td>157</td>
<td>282</td>
<td>292</td>
<td>317</td>
<td>337</td>
</tr>
<tr>
<td>KF2-A XXXX-160</td>
<td>160</td>
<td>152</td>
<td>167</td>
<td>292</td>
<td>302</td>
<td>327</td>
<td>347</td>
</tr>
</tbody>
</table>

* Min. stroke length

For information on how to adjust the stroke length of the KF2 spring, see Appendix "How to adjust the stroke length of a KF2-A", page 8.1.
Gas springs with cooling

KF2/(KF2-A) with Cooling jacket (CJ)
The following springs are available where cooling is required.

Gas springs with cooling jackets are used with the liquid cooler (Fig. 1). The cooling jacket should be connected to the cooler. See page 4.5

<table>
<thead>
<tr>
<th>Model</th>
<th>KF2 C</th>
<th>KF2-A C+7</th>
<th>Ø H mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF2/KF2-A 1500-XXX-CJ</td>
<td>75</td>
<td>82</td>
<td>110</td>
</tr>
<tr>
<td>KF2/KF2-A 3000-XXX-CJ</td>
<td>85</td>
<td>92</td>
<td>135</td>
</tr>
<tr>
<td>KF2/KF2-A 5000-XXX-CJ</td>
<td>110</td>
<td>117</td>
<td>165</td>
</tr>
<tr>
<td>KF2/KF2-A 7500-XXX-CJ</td>
<td>130</td>
<td>137</td>
<td>210</td>
</tr>
</tbody>
</table>

KF2/(KF2-A) for Nitro Cooler™ (NC)
Gas springs with a special cartridge valve are used with nitrogen coolers (NC) (Fig. 2).
See page 5.12.

Since nitrogen gas travels from the gas spring through the Nitro Cooler™, the return stroke speed of the piston rod is 40%-50% slower compared to a KF2 spring without a Nitro Cooler™ when the Cooler is placed one meter from the springs. If the hose length is longer than 1 meter, a hose with a larger inner diameter may be required.

<table>
<thead>
<tr>
<th>NC Rebuild Kit Order No.</th>
<th>For gas spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>3021780</td>
<td>KF2/KF2-A 1500</td>
</tr>
<tr>
<td>3121780</td>
<td>KF2/KF2-A 3000</td>
</tr>
<tr>
<td>3221780</td>
<td>KF2/KF2-A 5000</td>
</tr>
<tr>
<td>3321780</td>
<td>KF2/KF2-A 7500</td>
</tr>
</tbody>
</table>

NC Rebuild kits are available for simple modification of existing springs.

How to order KF2/KF2-A with a Cooling Jacket (CJ)

<table>
<thead>
<tr>
<th>Model size</th>
<th>Stroke length [mm]</th>
<th>Cooling Jacket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>7500</td>
<td>1500</td>
<td></td>
</tr>
</tbody>
</table>

How to order KF2/KF2-A with Nitro Cooler™ (NC)

<table>
<thead>
<tr>
<th>Model size</th>
<th>Nominal Stroke length [mm]</th>
<th>Adjusted Stroke length [mm]</th>
<th>Additional Port for Nitro Cooler™</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>7500</td>
<td>1500</td>
<td>1500</td>
<td></td>
</tr>
</tbody>
</table>
**KP – Dimensions**

The KP passive gas springs should:

- **not** be used for any operation in the tool other than to eliminate KF2 springback,
- **be** of the same model size as the KF2 spring(s) (except KF2 7500 which uses the KP 5000),
- **be** connected to the Valve Block, using the EO24 Hose System or its equivalent, via one of the four G1/8” Gas Port 5 connection ports,
- **be** stroked according to the table below.

**Please note!**

The KP Passive Gas Spring does not require cooling. The G1/8” charge port at the base of the spring is for gas charging and bleeding the KP spring’s lower gas chamber. The KP spring’s charge pressure should be the same as the KF2 spring(s).

---

### Basic information

- **Pressure medium**: Nitrogen
- **Max. charging pressure**: 150 bar
- **Min. charging pressure**: 25 bar
- **Operating temperature**: 0 to +80°C
- **Force increase by temperature**: ±0.8%/°C
- **Max. piston rod velocity**: 0.8 m/s
- **Tube**: Nitrided
- **Rod**: Nitrided

---

| Order No. | Ø D | Ø d | Max. stroke length | L | A | B | C | D | E | F | G |
|-----------|-----|-----|-------------------|---|---|---|---|---|---|---|---|---|
| KP 1500   | 95  | 36  | 30                | 220| M8| 13 | 42.4| 60 | 7 | 24 | 140|
| KP 3000   | 120 | 50  | 30                | 220| M10| 16 | 56.6| 80 | 7 | 25.5| 140|
| KP 5000   | 150 | 65  | 35                | 300| M10| 16 | 70.7| 100| 8 | 27.5| 193|

---

<table>
<thead>
<tr>
<th>Force in [daN] at used stroke length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>KP 1500</td>
</tr>
<tr>
<td>KP 3000</td>
</tr>
<tr>
<td>KP 5000</td>
</tr>
</tbody>
</table>

The forces are calculated based on a charging pressure of 150 bar in the KF2 and the KP spring(s).

**Please note!** For more information, see “About Gas Springs” in the KALLER main catalog.
Valve block dimensions

There are two valve block models available:

- **All-in-one valve block**, with built-in gas charging and bleeding equipment plus gauge
  
  **Order No. 2020801**

- **Standard valve block**, for use with separate control block
  
  **Order No. 2120801**

For information about how to connect the different valve blocks to a positive lock system, see the installation examples on pages 6.2 and 6.5.
Control system components

Hose and fittings for Ø 6 mm Pneumatic Hose

T Connector (hose to hose)
Order No. 503368

Y Connector (hose to hose)
Order No. 503372

90° – G 1/8”
Order No. 503367

Straight Connector
Order No. (see table)

Pneumatic Hose
Ø 6 mm

Order the length in whole meters

How to order 503377 - XX

Basic information

Material: Polyurethane
Max. temperature: 60°C
Max. pressure: 16 bar
Color: Blue
Min. bend radius: 20 mm
Mechanical Pressure Switch
Order No. 503800
For Tool Integrated Control Systems, the Mechanical Pressure Switch can be used to control the valve in the KF2 Controllable Gas Spring(s) or Valve Block, for Tool Integrated Control Systems. For more information on Tool Integrated Control Systems see Page 4.2.

Mechanical pressure switches:
- **Can** control up to 10 pcs KF2 springs.
- **Require** a constant compressed air supply (min. 4 bar).

Basic information
Fluid .......................................................... Air or inert gas, filtered & lubricated
Pressure ..................................................... 0 to 10 bar
Temperature .............................................. –10°C to +60°C
Functions ................................................... 3/2
Connection ports ................................. G 1/8” (3x)
Flow rate (at 6 bar) .............................. 200 l/min

TECHNICAL DATA

**Fluid** .......................................................... Air or inert gas, filtered & lubricated
**Pressure** ..................................................... 0 to 10 bar
**Temperature** .............................................. –10°C to +60°C
**Functions** ................................................... 3/2
**Connection ports** ................................. G 1/8” (3x)
**Flow rate (at 6 bar)** .............................. 200 l/min
Liquid cooling system components
For applications where cooling is required, each KF2 Controllable Gas Spring must be:

- **Fitted** with a Cooling Jacket (CJ) (see picture).
- **Fitted** with a Thermal Relay (Order No. 503388) (see Overheat Protection 4.8),
- **Connected in parallel** to the Cooler Unit as shown below.

The cooling fluid is circulated within a closed system through the Cooling Jacket(s), to a Cooler Unit (10kW or 25kW), where heat from the KF2 spring(s) is then dissipated.
Cooling System – Hose & Fittings

Connection Block
Order No. 3017722

Female Quick Release Coupling
Order No. 4217721

Male Quick Release Coupling
Order No. 4117721

90° Hose Fitting

<table>
<thead>
<tr>
<th>Order No.</th>
<th>D</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>4117370</td>
<td>G 1/4&quot;</td>
<td>23</td>
<td>8</td>
<td>44</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>4117723</td>
<td>G 1/2&quot;</td>
<td>30</td>
<td>12</td>
<td>68</td>
<td>23</td>
<td>27</td>
</tr>
</tbody>
</table>

Straight Hose Fitting

<table>
<thead>
<tr>
<th>Order No.</th>
<th>D</th>
<th>E</th>
<th>G</th>
<th>AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>4017370</td>
<td>G 1/4&quot;</td>
<td>16</td>
<td>28</td>
<td>12</td>
</tr>
<tr>
<td>4017723</td>
<td>G 1/2&quot;</td>
<td>23</td>
<td>58</td>
<td>27</td>
</tr>
</tbody>
</table>

Cooling Hose

<table>
<thead>
<tr>
<th>Order No.</th>
<th>E</th>
<th>DN</th>
<th>Color</th>
<th>Min. bend radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>503406</td>
<td>16</td>
<td>10</td>
<td>Blue</td>
<td>75 mm</td>
</tr>
<tr>
<td>503404</td>
<td>16</td>
<td>10</td>
<td>Red</td>
<td>75 mm</td>
</tr>
<tr>
<td>503395</td>
<td>23</td>
<td>16</td>
<td>Blue</td>
<td>150 mm</td>
</tr>
<tr>
<td>503396</td>
<td>23</td>
<td>16</td>
<td>Red</td>
<td>150 mm</td>
</tr>
</tbody>
</table>
Cooling System – Distribution Block
Order No. 3017359

TECHNICAL DATA
Liquid Cooling System – Cooler Unit  (LC)

Two cooler unit sizes are available:

- 10 kW – Order No. 4017360
- 25 kW – Order No. 4117360

For information on which Cooler Unit is suitable for your application, please fill in the Application Enquiry Form 3.1 and fax it to your local KALLER distributor or directly to Strömsholmen AB.

1 Pressure gauge
   Displays the system pressure (8-10 bar)
2 Electric motor
   380 VAC (only)
3 Circulation pump
   Check the direction of rotation at start-up
4 Cooling fluid port
5 Filter
6 User’s Guide
7 Cooler
8 Cooling fluid outlet
   Connect with the supplied 5 m hose and female quick release coupling
9 Power switch
   On/Off button
10 Fluid level indicator
11 Cooling fluid inlet
   Connect with the supplied 5 m hose and male quick release coupling
12 Drainage plug
13 Connector 380 V AC, IEC 60309 5 Pin

Cooling fluid

The Cooler Unit is not delivered with cooling fluid. We recommend using only ULTRA Safe 620 Cooling Fluid.

For the location of your nearest supplier, please visit www.petrofer.com.

### Basic information

10 kW Cooler Unit:
Order No. ................................. 4017360  (10 kW)
Quick connection .............................. 1/2"
H ............................................. 1,000
L .............................................. 900
B ............................................. 700
Pump flow .................................... 40 l/min
Tank capacity ............................... 60 l
Electric motor ............................. 1.5 kW
Power supply ................................ 380 V AC
Weight ....................................... 170 kg

25 kW Cooler Unit:
Order No. ................................. 4117360  (25 kW)
Quick connection .............................. 3/4"
H ............................................. 1,070
L .............................................. 1,070
B ............................................. 890
Pump flow .................................... 60 l/min
Tank capacity ............................... 90 l
Electric motor ............................. 3 kW
Power supply ................................ 380 V AC, IEC 60309 5 Pin
Weight ....................................... 220 kg

Please Note!
Do not start the Cooler Unit without cooling fluid in the cooler since this will damage the unit. The unit is equipped with a level/temp switch that will shut down the unit if it leaks or overheats.
Nitrogen Cooling System – Nitro Cooler™ (NC)

The Kaller Nitro Cooler™ unit (NC) has been engineered to provide Tool Integrated Cooling for Controllable Gas Springs (KF2 or KF2-A) when operating at high production rates.

The Nitro Cooler™ Unit (NC) is very compact and provides 1.5 kW of cooling power, with each unit being able to cool up to four KF2 or KF2-A springs.

Gas springs with a special cartridge valve are required to be used with the Nitro Cooler™ unit (NC).

Max. cooling capacity..................... 1.5 kW
Max. charge pressure...................... 150 bar at 20°C
Min. charge pressure...................... 25 bar
Operating temperature...................... 0 to +80 °C
Weight.............................................. 16 kg
Connection ports.............................. G 1/4” (8x)
Power supply................................. 24 VDC (22 W)
Includes a built-in thermal relay

Nitro Cooler™ Unit (NC) dimensions
One Nitro Cooler™ requires a 24 VDC (22 W) power supply and can be mounted both vertically and horizontally, inside or outside the die. Nitro Cooler™ Units are IP64 classed, which makes them resistant to die cleaning.

Basic information
Max. cooling capacity..................... 1.5 kW
Max. charge pressure...................... 150 bar at 20°C
Min. charge pressure...................... 25 bar
Operating temperature...................... 0 to +80 °C
Weight.............................................. 16 kg
Connection ports.............................. G 1/4” (8x)
Power supply................................. 24 VDC (22 W)
Includes a built-in thermal relay
Nitrogen Cooling System – Nitro Cooler™ (NC)

Mounting possibilities
Nitro Coolers can be mounted both vertically and horizontally. When mounting it is important NOT to restrict the air flow through the cooler. If the air flow is restricted through the Nitro Cooler™, this will have a negative effect on the cooler’s performance.

Electrical connections
The wiring diagram for the Nitro Cooler™ is depicted below. This diagram can also be found on the label attached to the side of the Nitro Cooler™ next to the connection box.

Please note! The Nitro Cooler™ contains a built-in thermal relay.

The thermal relay circuit is normally closed and opens if the temperature of the relay exceeds 85°C ±5%.

The thermal relay should be connected to the PLC of the press to prevent overheating of the KF2-NC gas spring(s).
Nitrogen Cooling System – Nitro Cooler™ (NC)

Nitro Cooler™ performance

Depending on how much heat the gas springs in the die generate, it is possible to connect up to four gas springs to one Nitro Cooler™. The charts on the right display the maximum number of strokes per minute (SPM) allowed when 1, 2, 3 or 4 pcs of KF2/KF2A-NC gas springs, with with a charge pressure of 150 bar, are connected to a single Nitro Cooler™. Along the four different gas spring curves, the heat generation of the gas springs is 1.5 kW, which is the maximum cooling effect of the Nitro Cooler™.

Each chart can be used to evaluate how many KF2-NC gas springs can be connected to one Nitro Cooler™. For any given stroke length, the corresponding SPM rate curve for the number of attached KF2-NC springs, must not be exceeded. The time needed for the return stroke also has to be considered when the SPM is determined for an application.

Important! When using the Nitro Cooler™, the return stroke speed of the piston rod decreases by approximately 50%. With a distance of 1 m between the cooler and the gas spring the speeds are as follows:

- KF2/KF2-A 1500 – 0.10 m/sec.
- KF2/KF2-A 3000 – 0.08 m/sec.
- KF2/KF2-A 5000 – 0.05 m/sec.
- KF2/KF2-A 7500 – 0.03 m/sec

If a higher speed is needed, please contact your local distributor or Strömsholmen AB.

See example on the next page:
Example:
How to determine the maximum running speed for an application?

We know:
The size used (KF2-1500-048-NC)
The used stroke length (48 mm)
The used pressure (150 bar) (initial force 1.5 ton)
The used number of Gas Springs (2 Gas Springs in this example)

Using the diagram:

Step 1 Choose the correct curve line according to the number of springs used (purple line).

Step 2 According to the used stroke length, go up vertically to the interception point in the diagram (from point 2 to 3).

Step 3 From point 3, read the SPM stroke/minute on the vertical axis (point 4).

Step 4 The value for the maximum used SPM is 44 stroke/min.

For a lower charging pressure, this value should be increased proportionally.

Example: A charging pressure of 100 bar increases the maximum used SPM from 44 to $44 \times \frac{150}{100} = 66$ strokes/min.
Free Information Sign
Order No. 503613

The following Information Sign should be fitted to all tools containing Controllable Gas Springs. One Information Sign is included with each KF2 order.

Controllable Gas Spring System

<table>
<thead>
<tr>
<th>Die No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas spring model</td>
<td></td>
</tr>
<tr>
<td>Stroke length</td>
<td></td>
</tr>
<tr>
<td>Max. frequency</td>
<td>strokes/min</td>
</tr>
<tr>
<td>Gas spring charge pressure</td>
<td>Min bar</td>
</tr>
<tr>
<td>Thermal relay connected</td>
<td>Yes □</td>
</tr>
</tbody>
</table>

Do not work in the die with the gas springs in locked position. Make sure that the thermal relay is in operation.

Strömsholmen AB
Box 216, 573 23 SE-Tranås, Sweden
www.kaller.com • info@kaller.com

Standard checks before production run or in the event of malfunction:

1. Gas spring charge pressure (max. 150 bar at 20°C)
2. Air supply pressure (min 4 bar, max. 10 bar)
3. Air signals from press
Control System – Standard Lock, KF2

A Standard Lock System requires one control signal.

The KF2 gas springs are delivered with air fittings suitable for Ø 6 mm pneumatic hoses.

Please note! To lock and unlock all KF2 springs simultaneously, the hose lengths from the different springs to the air inlet should all be the same length.

Cut the air hoses to the right length during installation (push-lock system).

The KF2 spring’s control valve should always have a continuous supply of filtered compressed air, with a minimum pressure of 4 bar.

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Controllable Gas Spring</td>
<td>KF2 XXXX-XXX</td>
<td>5.1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>T - Connector</td>
<td>503368</td>
<td>5.6</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Pneumatic Hose Ø 6 mm</td>
<td>503377-XX</td>
<td>5.6</td>
</tr>
</tbody>
</table>
A Positive Lock System requires two control signals. One to operate the KF2 gas spring(s) and one to operate the Valve Block.

The KF2 gas spring and Valve Block are supplied with air fittings suitable for Ø 6 mm pneumatic hoses.

**Please note!** To lock and unlock all KF2 springs simultaneously, the hose lengths from the different springs to the air inlet should all be the same length.

Cut the air hoses to the right length during installation (push-lock system). The control valve should always have a continuous supply of filtered compressed air, with a minimum pressure of 4 bar.
Hose System – Standard Lock, KF2

Method using Coupling Block(s)

To charge, bleed and check the gas pressure for a Standard Lock in a KF2 gas spring system, all springs should be connected to a standard Control Block (here shown connected via a Coupling Block).

We recommend the EZ Hose system and fittings be used for such systems. The KF2 gas springs are delivered with Gas Ports 1 and 3 plugged. When connecting the EZ Hose system, the charging valve in Port 1 of each KF2 gas spring must first be removed. Each G 1/8" Gas Port, for both the KF2 Gas Spring and Coupling Block, requires an adapter (4114973-G 1/8") for connection to EZ Hose.

The Control Block should be placed higher than the KF2 springs to avoid loss of internal oil when bleeding.

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Controllable Gas Spring</td>
<td>KF2 XXXX-XXX</td>
<td>5.1</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Adapter G 1/8&quot;</td>
<td>4114973-G 1/8&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gas Link Systems in the Main Catalog</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>EZ Hose straight – 90°</td>
<td>4017568-XXXX</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gas Link Systems in the Main Catalog</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>EZ Hose straight – straight</td>
<td>4014974-XXXX</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gas Link Systems in the Main Catalog</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Control Block</td>
<td>3116114-01</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Multi-Coupling Block</td>
<td>4017032</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Gas Link Systems in the Main Catalog</td>
<td></td>
</tr>
</tbody>
</table>

We reserve the right to add, delete or modify components without notification.
Hose System – Standard Lock, KF2

Method using Twin Ports
(Not valid for KF2 1500)

To charge, bleed and check the gas pressure for a Standard Lock in a KF2 gas spring system, all springs should be connected to a standard Control Block. These hoses are connected using the KF2’s twin gas ports to the Control Block. We recommend the EZ Hose System and fittings be used for such systems. The KF2 gas springs are delivered with Gas Ports 1 and 3 plugged. When connecting the EZ Hose system, the charging valve in Port 1 of each KF2 gas spring must first be removed. Each G 1/8” Gas Port, for both the KF2 Gas Spring and Coupling Block, requires an adapter (4114973-G 1/8”) for connection to EZ Hose.

The Control Block should be placed higher than the KF2 springs to avoid loss of internal oil when bleeding.

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Controllable Gas Spring</td>
<td>KF2 XXXX-XXX</td>
<td>5.1</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Adapter G 1/8”</td>
<td>4114973-G 1/8”</td>
<td>Gas Link Systems in the Main Catalog</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>EZ Hose straight – 90°</td>
<td>4017568-XXXX</td>
<td>Gas Link Systems in the Main Catalog</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>EZ Hose straight – straight</td>
<td>4014974-XXXX</td>
<td>Gas Link Systems in the Main Catalog</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Control Block</td>
<td>3116114-01</td>
<td>Gas Link Systems in the Main Catalog</td>
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</tbody>
</table>
Hose System – Positive Lock system, KF2 + KP

Example 1

To connect KF2 Controllable Gas Spring(s) to a KP – Passive Gas Spring via the Valve Block, two hose connections are needed:

- One EZ Hose connection
- One EO24 Hose connection.

The Control Block should be placed higher than the springs to avoid loss of internal oil when bleeding.

Positive Lock, KF2 + KP

As indicated above, perform gas charging and bleeding as follows:

Step 1
Charge the lower gas chamber in the KP Passive Gas Spring via the Control Block (3)*.

Step 2
Charge the KF2 Standard spring(s) and upper chamber of the KP gas spring via the Control Block (3) connected to the standard Valve Block (4).

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
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<th>Order No.</th>
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<td>KP Passive Spring</td>
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<td>7</td>
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<td>Main Catalog</td>
</tr>
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</table>
Hose System – Positive Lock System, KF2 + KP

Example 2
(Not valid for KF2 1500)

To connect KF2 Controllable Gas Spring(s) to a KP – Passive Gas Spring via the Valve Block, two hose connections are needed:

• One EZ Hose connection
• One EO24 Hose connection.

The Control Block should be placed higher than the springs to avoid loss of internal oil when bleeding.

Positive Lock, KF2 + KP
As indicated above, perform gas charging and bleeding as follows:

Step 1
Charge the lower gas chamber in the KP Passive Gas Spring via the standard Control Block (3).

Step 2
Charge the KF2 Standard spring(s) and upper chamber of the KP gas spring via the All-In-One Valve Block (4).
KF2 connection – NC Standard lock with a Nitro Cooler™

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>Nitro Cooler Block</td>
<td>2021641</td>
<td>5.12</td>
</tr>
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</table>

When using a Nitro Cooler™, only EO24 hoses should be used. There is a gas transport between the cooler and gas springs with every stroke. Therefore the Nitro Cooler™ should be placed as close as possible to the springs to minimize the length of the hoses.

The Nitro Cooler™ includes heat protection, thus eliminating the need for thermal relays at the springs.

The control block for charging and bleeding can be connected optionally to one of the existing port 2 on the springs or to the Nitro Cooler™.
When using a Nitro Cooler™ for a positive lock system, the requirements are the same as for a standard lock system. (See previous page.)

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
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<th>Order No.</th>
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<tr>
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<td>KP xxxx</td>
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Connection of four KF2-1500-NC Standard Locks with a Nitro Cooler™

<table>
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<tr>
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<tr>
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<tr>
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### General

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What air pressure is required to operate the cartridge valves?</td>
<td>4 bar minimum air pressure is required to close the normally open (NO) cartridge valves.</td>
</tr>
<tr>
<td>What is the maximum air pressure allowed to operate the cartridge valves?</td>
<td>10 bar maximum air pressure is allowed to operate the cartridge valves.</td>
</tr>
<tr>
<td>What service life can I expect from a KF2 Controllable Gas Spring?</td>
<td>As long as the thermal relay is used, the following service lifetimes can be expected:</td>
</tr>
<tr>
<td></td>
<td>For stroke lengths up to 50 mm: 0.5 million strokes.</td>
</tr>
<tr>
<td></td>
<td>For stroke lengths above 50 mm: 50,000 stroke meters.</td>
</tr>
<tr>
<td>Can I use other Hose Systems?</td>
<td>We cannot guarantee the function of the system if Hose Systems other than those mentioned</td>
</tr>
<tr>
<td></td>
<td>in this manual are used. Please contact your local Kaller distributor or Strömsholmen</td>
</tr>
<tr>
<td></td>
<td>AB directly for more information.</td>
</tr>
<tr>
<td>Can I combine different KF2 size springs in the same system?</td>
<td>No. Please contact your local KALLER distributor or Strömsholmen AB directly for more</td>
</tr>
<tr>
<td></td>
<td>information.</td>
</tr>
</tbody>
</table>
### Relating to Standard Lock, KF2

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is it possible to adjust the stroke length of the KF2 spring, or must I always use 100% of the nominal stroke ±0.5 mm?</td>
<td>There are 2 versions of the KF2 Controllable Gas Spring, the standard model KF2 and an adjustable model KF2-A. For more information on the adjustable model, see Technical Data page 5.2.</td>
</tr>
<tr>
<td>How fast can the KF2 spring be stroked?</td>
<td>0.8 m/sec is the maximum allowed compression velocity. The maximum stroke frequency (spm) at which a KF2 spring can operate at depends on the stroke length of the spring and level of cooling. See Cooling (optional) on page 4.5 for more information.</td>
</tr>
<tr>
<td>What can I do to eliminate KF2 springback?</td>
<td>If you are using 100% stroke length ±0.5 mm of the KF2 spring, a maximum springback 11 mm can be expected. It is possible to eliminate this at any time by converting the Standard Lock into a Positive Lock System. Please contact your local Kaller distributor or Strömsholmen AB directly for more information.</td>
</tr>
<tr>
<td>Can I lock a KF2 Controllable Gas Spring at any position?</td>
<td>Basically yes, but the less you stroke the KF2 Controllable Gas Spring, the greater the springback will be. Please contact your local Kaller distributor or Strömsholmen AB directly for more information.</td>
</tr>
</tbody>
</table>
### Relating to Positive Lock System, KF2+KP

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many KF2 Controllable Gas Springs can be connected to a single KP Passive Gas Spring?</td>
<td>Up to 4 pcs KF2 can be connected to a single KP spring.</td>
</tr>
<tr>
<td>How many Valve Blocks do I need in the system?</td>
<td>One Valve Block is required for each KP Passive Gas Spring in the system.</td>
</tr>
<tr>
<td>Can I use the KP spring in the tool for forming?</td>
<td>No. The KP spring is not to be used for any operation in the tool; use it only to eliminate KF2 springback.</td>
</tr>
<tr>
<td>Can I use just the EZ Hose System to connect to my Positive Lock System?</td>
<td>No. The EO24 Hose System (or its equivalent) must be used between the KF2 spring(s), Valve Block and KP Passive Gas Spring.</td>
</tr>
<tr>
<td>Can I use just the EO24 Hose System to connect to my Positive Lock System?</td>
<td>Yes.</td>
</tr>
</tbody>
</table>
## FREQUENTLY ASKED QUESTIONS (FAQ’S)

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is Cooling always required?</strong></td>
<td>Not always. Generally speaking, longer stroke lengths and faster press stroke frequencies normally require cooling. See Cooling System (optional) on page 4.5 for more information.</td>
</tr>
<tr>
<td><strong>How many KF2 controllable springs can be connected to a single Cooler Unit?</strong></td>
<td>The maximum heat effect for all springs combined has to be lower than the cooling effect of the cooler. If a group of springs whose combined heat factor exceeds the maximum heat factor for the &quot;Nitro CoolerTM used for 1pc KF2 spring &quot; (see page 4.6), please secure according to the diagrams on page 5.14.</td>
</tr>
<tr>
<td><strong>Can I use my own cooling system?</strong></td>
<td>Yes. It is possible to use the cooling system from the press or other coolers.</td>
</tr>
<tr>
<td><strong>What different cooling fluids can we use?</strong></td>
<td>We recommend use of Water-glycol fluid (HFC) ULTRA SAFE 620. ULTRA-SAFE 620 is approved by all major equipment manufacturers and is often used for running in new machines. Equivalents to this water-glycol fluid can be used, but Strömsholmen AB cannot be held responsible for poor function.</td>
</tr>
</tbody>
</table>
### Relating to Nitro Cooler™

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many KF2 can be connected to one Nitro Cooler™?</td>
<td>Depending on how much heat is generated in a particular application, up to four gas springs can be connected to one Nitro Cooler™. See table on page 5.14</td>
</tr>
</tbody>
</table>
| Can we eliminate the decrease in return speed caused by the Nitro Cooler™?| No. When using the Nitro Cooler™, gas is transported between the cooler and gas springs for every press stroke, and consequently the return speed will be affected.  
With a distance of 1 m between the cooler and gas spring the speeds are as follows:  
KF2/KF2-A 1500 – 0.12 m/sec.  
KF2/KF2-A 3000 – 0.10 m/sec.  
KF2/KF2-A 5000 – 0.08 m/sec.  
KF2/KF2-A 7500 – 0.05 m/sec. return stroke speed.  
If a higher speed is needed, please contact your local distributor or Strömsholmen AB. |
| How many Nitro Coolers™ can be used in one die?                           | There is no limitation as long as there is sufficiently ventilated places for them in the die.                                                                                                           |
### TROUBLESHOOTING

<table>
<thead>
<tr>
<th>System</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Lock, KF2</strong></td>
<td>KF2 spring does not lock</td>
<td>Make sure the KF2 spring’s Air Port 4 has minimum 4 bar air pressure before press BDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that all hose connections are correct</td>
</tr>
<tr>
<td></td>
<td>KF2 piston rod’s spring back is greater than 1 mm</td>
<td>Make sure 100% of the KF2 spring’s nominal stroke length ±0.5 mm is used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure the KF2 spring’s Air Port 4 has minimum 4 bar air pressure before press BDC</td>
</tr>
<tr>
<td></td>
<td>KF2 piston rod does not return</td>
<td>Make sure the KF2 spring’s Air Port 4 has zero air pressure when required to open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for any obstructions in the tool preventing piston rod return</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that there is gas pressure in the KF2 spring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive Lock System, KF2 + KP</strong></td>
<td>KF2 spring does not lock</td>
<td>Make sure the KF2 spring’s Air Port 4 has minimum 4 bar air pressure before press BDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that all hose connections are correct</td>
</tr>
<tr>
<td></td>
<td>KF2 piston rod’s spring back is greater than 0 mm</td>
<td>Make sure the cartridge valve in the Valve Block is closed during the press’ down-stroke and that the KP-Passive Gas Spring is being stroked sufficiently for this application</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure 100% of the KF2 spring’s nominal stroke length ±0.5 mm is used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that the cartridge valve in the Valve Block opens at BDC</td>
</tr>
<tr>
<td></td>
<td>KF2 piston rod does not return</td>
<td>Make sure the KF2 spring’s Air Port 4 has zero air pressure when required to open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for any obstructions in the tool preventing piston rod return</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that there is gas pressure in the KF2 spring</td>
</tr>
</tbody>
</table>
Stroke length adjustment of KF2-A

The guide in the KF2-A is made up of the following main components:

![Diagram of KF2-A guide components]

The guide length and stroke length of the spring can be adjusted by installing and/or removing spacers between the upper and lower guide. To obtain the correct stroke length, install spacers in the guide according to Table 1.

Example 1:
The stroke length should be increased with 4 mm from the nominal stroke length.

Solution: Open the spring and guide, remove the 4 mm thick spacer. The 1 mm and 2 mm thick spacers should be left in the guide/spring.
The procedure is described on the next page.

Important!
- Only fully trained personnel with experience in servicing gas springs are allowed to adjust to the stroke length.
- Make sure the work surface where you will be working on the KF2-A spring(s) is clean and free from contaminants.
- Make sure there is no gas pressure in the KF2-A spring before proceeding.

Feel free to download an animated guide from our homepage: www.kaller.com

### Table 1: To adjust from nominal stroke length

<table>
<thead>
<tr>
<th>Stroke length</th>
<th>1</th>
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<th>4</th>
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<tr>
<td>Maximum</td>
<td>+7</td>
<td>0</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>+6</td>
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<td>+4</td>
<td>1</td>
<td>1</td>
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<td>+3</td>
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<td>+1</td>
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<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

* The nominal stroke length is always marked on the tube.
Stroke length adjustment of KF2-A

Work procedure

1:  Make sure the KF2-A gas spring is degassed and remove the dust cover (if applicable).

2:  Knock down the guide and remove the lock ring by using a mounting sleeve and a plastic hammer.

3:  Remove the Upper Guide and install the combination of Spacers that will give you the required stroke length.

4:  Install the Upper Guide and use the mounting sleeve and plastic hammer again to knock down the guide to expose the lock ring groove.

5:  Install the lock ring and pull up the piston rod assembly using a T-handle.

6:  Make sure that the guide is flush with the top of the tube. (If not, check the installation of the lock ring.)

7:  Charge the KF2-A spring with nitrogen gas, and fit the dust cover (if applicable).
How does the new KF2 differ from an existing KF

The KF2 is fitted with a normally open (NO) cartridge valve, which has the following advantages:

- Simplified control system
- Combined charge & bleed port
- Low-pressure variant LP is now obsolete
- Only 4 bar air pressure required

How to fit the new KF2 to existing KF systems

KF2 Controllable Gas Springs are completely interchangeable with existing KF springs.

**Standard Lock Example:**
Replacing an existing KF with a new KF2
To replace an existing KF spring with a new KF2 spring in a Standard Lock System, simply plug the air signal that went to the KF springs Air Connection Port 2 (shown here by an X).

**Positive Lock System Example:**
Replacing an existing KF with a new KF2
To replace an existing KF spring with a new KF2 spring in a Positive Lock System, simply plug the air signal that went to the KF springs Air Connection Port 2 (shown here by an X).
**KF2/KF2-A Alternative Mounting**

For upside down installations, the threaded holes in the base of the KF2/KF2-A should always be used when mounting the Controllable Gas Springs to the tool.

For upright installations, an alternative is to mount the Controllable Gas Springs using two K Lugs in combination with dowel pins, as shown below. The dowel pins will engage the threaded holes in the bottom of the spring (M12 and M16, respectively) and will prevent the spring from moving out of position even if the lugs would come loose. The dowel pins will also ensure that the springs are installed in the correct position.

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*Please note,* K-3000 lugs will require a slight modification, according to the sketch before they can be fitted to the KF2/KF2-A 1500.

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It is also possible to mount the KF2/KF2-A Controllable Gas Springs using an FCSC flange mount if cooling is not required.

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Our employees in eight countries – in-house manufacturing and assembly in Europe and North America – and distributors in 46 countries provide a great base for product development, excellent training, service and support to our customers worldwide.

Please visit your local contact at kaller.com/distributors.
The Safer Choice

Introduced in 1983, the KALLER gas spring technology quickly led to worldwide demand. The Safer Choice – Training, Safety and Reliability – has always been a KALLER top priority for providing innovative solutions for the safer working environment. We recommend looking through all available KALLER features when selecting gas springs and gas or hose linked systems.

KALLER Training Program
TRAINING. Without doubt the KALLER Training Program is the best and most creative way to fully understand and appreciate the importance of the safety and reliability features.

KALLER Safety App
SAFETY. Fake or KALLER original? With the KALLER Safety App you can identify and verify your specific KALLER gas springs.

Overstroke Protection System
SAFETY. When a gas spring is overstroked, this helps reduce the risk of tool damage or injury.

Overload Protection System
SAFETY. Jammed cam or tool part being forced by gas springs? This will help reducing such risks.

Overpressure Protection System
SAFETY. Vents the spring if the internal gas pressure exceeds the maximum allowable limit to prevent accidents.

PED approved for a minimum of 2 million strokes
RELIABILITY. Our 2 million stroke PED approval ensures safer component cycle life.

Flex Guide™ System
RELIABILITY. Prolongs service life, allows more strokes per minute, and offers greater tolerance to lateral tool movements.

Dual Seal™ Link Systems
RELIABILITY. Fewer production interruptions due to leakage caused by vibration. Simplified installation thanks to the non-rotation feature.