CS2 Series
Controllable Gas Springs

Full Product Catalog
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## CS2 Springs

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Introduction

The CS2 Series is the next generation of the original CS Series.

The CS2 Series is a family of gas springs used in metal forming dies; its piston rods can be locked at bottom dead center (BDC). The return stroke of the piston rod is controlled pneumatically by a valve in the base of the spring.

The example below shows a drawing die where two forming stages are performed with a single press stroke.

Controllable gas springs are available in

- Model sizes 1500, 3000, 5000 & 7500.
- Contact forces from 1.6 to 8.4 tons.
- Stroke lengths from 4 mm to 160 mm.

There are two systems available:

- Standard Lock, CS2
- Positive Lock System, CS2 + PS
Standard Lock, CS2

CS2 controllable gas springs feature piston rods that can be locked at BDC.

The full stroke length of the CS2 spring must be used within 0.5 mm for optimal locking function, giving a maximum springback of 1 mm referred 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. The springs can be self-contained or connected to a control panel through a hose system.

How it works

The CS2 controllable gas spring consists of a cylinder [1], guide assembly [2], piston rod assembly containing non-return 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 two gas chambers, an upper and a lower. When the spring is stroked, nitrogen gas from the lower chamber passes through the non-return valves in the piston rod assembly and into 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 fully extended position (taking away min. 4 bar air signal). Opening the cartridge valve, the gas contained within the upper chamber can flow to the lower chamber via the internal piston rod [4], allowing the piston rod to return to its fully extended position.
Positive Lock System, CS2 + PS


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

Note: The PS passive gas spring is not to be used for any operation in the tool other than to eliminate springback in the CS2 spring(s). It can be placed anywhere in the tool except for the area you wish to lock, and can eliminate springback in up to four CS2 controllable gas springs. How much the PS passive gas spring should be stroked depends on the number of CS2 springs in the system. The cartridge valve in the valve block is identical to the one in the CS2 spring.

How it works

The CS2 is the active spring in the system and provides the required spring force in the tool. The PS passive gas spring’s function is to eliminate the max. 1 mm springback of the CS2 spring(s) at BDC.

The system works by connecting the lower gas chamber in the CS2 controllable gas spring(s) to the upper chamber of the PS passive gas spring via the valve block. By stroking the PS 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 CS2 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 CS2 spring is drawn into the upper chamber of the PS passive gas spring.
Stroking within 0.5 mm of full stroke

In order to provide the best locking function from the CS2 controllable gas spring, it is important to stroke the spring 100% of the nominal stroke length at minimum, within 0.5 mm. This reduces the gas volume in the lower gas chamber to a minimum.

For a standard lock CS2 system, stroking the CS2 spring 100% of the nominal stroke length, or within 0.5 mm, will ensure a springback of no more than 1 mm.

An adjustable stroke length version of the controllable gas spring, called the CS2A, is available for those applications where the exact nominal stroke length within 0.5 mm is not known until after tool tryouts.

For a positive lock system CS2 + PS, stroking the CS2 spring 100% of the nominal stroke length or within 0.5 mm is also important, although much depends on the PS passive gas spring's used stroke length.
Applications

Standard Lock, CS2

When forming this beam, baby blank-holders are used to form the circled area. There are two baby blank-holders in the tool that have to be locked in the bottom position to avoid deformation of the part during the return stroke.

In this case, one CS2 spring is used to control each baby blank-holder.

Work cycle

As the upper tool moves downwards, the blank holder [1] will be activated and control the flow of the blank in the tool.

At Bottom Dead Center the CS2 springs will lock. A small spring-back will, for this application, not damage the formed part.

As the press opens, the baby blank holder remains locked until that time when the CS2 spring should be unlocked and eject the part.
Positive Lock System, CS2 + PS

For parts where controllable gas springs are required with zero springback, the Positive Lock System is ideal.

The example at right shows a double-stage draw forming operation 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 CS2 springs connected to 3 PS passive gas springs.

Work cycle

The lower tool contains the CS2 controllable gas springs that provide the active blank-holding force for the deepest drawn section of the part.

As the tool comes together, the PS passive gas springs (not shown) are stroked, providing the necessary back pressure to lock the CS2 springs at BDC with zero springback.

As the tool opens, the CS2 springs remain locked until a signal from the press is given. Then the CS2 springs help eject the undamaged part from the tool.

Part: Vehicle inner door panel
Positive Lock System, CS2 + PS

Producing side body panels of a high quality often provides challenges to the tool maker, especially where the side posts meet the outer frame.

Too much blank-holding force and the part can split, too little and the part can wrinkle.

One solution is to use individual baby blank holders at these areas, whose spring forces are controlled by CS2 controllable gas springs.

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

Work cycle

The upper tool contains the CS2 controllable gas springs that provide the active blank holding force for the locally situated baby blank holders.

The baby blank holders are the first to hold the blank at the problem areas as the tool starts to close.

At press BDC, the valve in the valve block opens and the PS spring is used to ensure zero springback in the CS2 springs.

As the tool opens, the CS2 springs remain locked until a signal from the press is given. Then the CS2 springs help eject the finished part from the tool.
Application Request Form

To make it easier to for you to select the right system and components for your particular application, please complete the Application Request Form.

Please fax the completed form to HYSON Inside Sales Department at 440-526-6807. If possible, include a rough sketch of your application.

Date: _______________________________________________________________________________________________
Name: _______________________________________________________________________________________________
Address: _____________________________________________________________________________________________
City: _____________________________________________ State: _________ Zip/Postal Code: ____________________
Country: _____________________________________________________________________________________________
Phone: ___________________________________________ Fax: ______________________________________________
Email: _______________________________________________________________________________________________

Application Info

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? _____________________________________________________
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. Should the springs be connected together using a hose system (Y/N)? ________________________________

Additional Comments: ___________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
_____________________________________________________________________________________________________
System Configuration

Controllable gas springs require at least one of the following systems:

- Control System (required)
- Hose System (optional)
- Cooling System (optional, depending on requirements)

**Control System**

In order to lock and unlock the CS2 controllable gas spring(s), a control system is required, which provides a pneumatic signal (min. 4 bar) to the normally open (NO) valve in the base of the CS2 spring.

The pneumatic signal can be provided by the control system from the press, or integrated into the tool itself using mechanical pressure switches.

**Control System - Standard Lock, CS2**

The normally open (NO) valve within the base of the CS2 controllable spring(s) is closed using compressed air (min. 4 bar). With the valve closed, t0-t2 (see diagram), the piston rod of the CS2 spring(s) is prevented from returning to its extended position.

By connecting the valves in the CS2 springs together, using pneumatic hoses, to the control system of the press, the springs can be easily locked and unlocked.

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

![Diagram of CS2 spring valve control system](image-url)
Control System - Positive Lock System, CS2 + PS

When the PS passive gas spring is connected to the active CS2 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 CS2 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.

Note: The valve in the valve block is to be opened exactly at press BDC.

For examples showing how to connect the CS2 + PS controllable gas spring system to a control system, see Installations, page 36.

Tool Integrated Control System

The control system required to lock the CS2 spring(s) can be integrated into the tool itself by using a mechanical pressure switch. The control system required to lock and unlock the CS2 spring(s) is therefore independent of the press’s own control system.

The CS2 spring(s) remain locked as long as the mechanical pressure switch [1] is activated by the tool [2].

A tool integrated control system requires a constant supply of compressed air (min. 4 bar) to the mechanical pressure switch.

Note: Can also be used to control the valve block’s valve for positive lock systems.
Hose System (optional)

CS2 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, CS2

For information on recommended hose system, see page 37.

CS2 controllable gas springs are connected together in a hose system in the same way as standard gas springs. For information on connecting the newer CS2 springs together with the older CS controllable gas springs, see page 49.

For examples showing how to connect CS2 controllable gas springs to a hose system, see Installations, page 35.
Hose System

Positive Lock System, CS2 + PS

You can connect up to four CS2 springs to one valve block.

A CS2 + PS controllable gas spring system requires two hose connections:

• One EZ-Hose connection (see page 39)
• One EO24 Hose connection (see page 39)

EZ-Hose connections

Gas port 1, which is marked on each CS2 spring, is connected to gas port 1 on the valve block (also marked) using EZ-Hose system components.

EO24 Hose connections

To connect the CS2 controllable gas spring(s) to a PS passive gas spring via the valve block, use the EO24 Hose System (or its equivalent).

Gas port 3, which is marked on each CS2 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 PS passive gas spring using EO24 hose system components also.

For information on connecting the newer CS2 springs together with the older CS controllable gas springs, see page 49.

For examples showing how to connect CS2 + PS controllable gas spring systems to a hose system, see Installations, page 35.
Cooling System (optional)

About Cooling

There are two methods for cooling a CS2 gas spring system. Which method you choose depends on the required cooling effect and the number of CS2 springs to be cooled.

CS2-NC/CS2A-NC uses a Nitro Cooler, ideal for a small number of springs run at higher production rates and requiring cooling. They are also appropriate when there is insufficient space for cooling jackets and the Liquid Cooler Unit.

CS2-CJ/CS2A-CJ uses a Liquid Cooler Unit, ideal for a larger number of springs run at higher production rates and requiring cooling. Two models, 10kW and 25kW, are available. Each gas spring is fitted with a cooling jacket to allow the cooling liquid to circulate around it.

Every time a CS2 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 times its stroke length.

With a conventional gas spring, the piston rod follows the press movement on the return stroke. Therefore 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.).

Since the return stroke of a CS2 controllable gas spring does not follow the press's return stroke, the transferred energy is dissipated as heat in the CS2 spring.

To avoid overheating in some applications, cooling of the CS2 spring(s) is required.
Heat Factor - Determining if cooling is required

The need for cooling is determined by calculating the heat factor for the application.

The heat factor is calculated by multiplying the stroke frequency in strokes per minute (spm), with the CS2 spring’s stroke length (mm).

For example:

Stroke frequency: 15 spm  
CS2 stroke length: 100 mm  
Heat factor = stroke frequency x stroke length  
= 15 x 100  
= 1500

If this heat factor exceeds the Maximum Without Cooling values given for the different CS2 spring sizes in the diagram to the right, then cooling is required.

Diagram is based on calculations made for CS2 Gas Springs with 150 bar charge pressure, surrounding temperature 24°C, and a well-ventilated area.
How to eliminate the need for cooling

1. Add more CS2 springs

By adding CS2 controllable gas springs to the system, the charge pressure in each CS2 spring is reduced in order to maintain the same net spring force in the tool. The heat factor reduction for the CS2 spring is directly proportional to the reduction in charge pressure.

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

Option 1:
The first choice would be to select 10 CS2-3000-50 springs at 150 bar charge pressure.
In this case, the heat factor would be 10 x 50 = 500.
This is 120 greater than allowed for a system without cooling.
Add 4 CS2-3000-50 springs to the system and reduce nitrogen pressure to get the required force. The total net spring force at 150 bar is 420 kN.

\[
\text{New heat factor} = \text{Original heat factor} \times \left( \frac{\text{Required Net Force at Reduced Pressure}}{\text{Net Force at 150 bar}} \right) \text{ Reduction Factor}
\]

\[
= 500 \times (300/420) = 360
\]

The new heat factor is now 20 below that required for CS2-3000 cooling.
The original heat factor is reduced by 29% so the fill pressure must be reduced by the same amount.
Reduced fill pressure = 71% of 150 bar = 107 bar

2. Use larger CS2 springs

By selecting a larger size of CS2 controllable gas spring 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 CS2 spring is directly proportional to the reduction in charge pressure.

Option 2:
Selecting 10 CS2-5000-50 springs at 150 bar would provide 500 kN total net spring force.
The heat factor at 150 bar would be 10 x 50 = 500 as before.

\[
\text{New heat factor} = \text{Original heat factor} \times \left( \frac{\text{Required Net Force at Reduced Pressure}}{\text{Net Force at 150 bar}} \right) \text{ Reduction Factor}
\]

\[
= 500 \times (300/500) = 300
\]

The new heat factor is now 60 below that required for CS2-5000 cooling.
The original heat factor is reduced by 40% so the fill pressure must be reduced by the same amount.

Choosing a Cooling System

A liquid cooler must be used for large dies with a large number of gas springs. The cooling capacity is limited to 25 kW. The Nitro Cooler is suited to smaller dies with one-six gas springs. The Nitro Cooler must be placed as close to the springs as possible. The return speed will be slower by 40% using the Nitro Cooler. This is a die-integrated system with a cooling capacity of 1.5 kW.
Overheat Protection

Thermal Relay

To avoid overheating the CS2 gas spring, a thermal relay (bimetallic) should be used to stop the press or prevent the CS2 controllable gas spring(s) from locking.

If the CS2 gas spring temperature exceeds 80°C, the thermal relay will open, sending a signal to the press’s control system that the springs are overheating.

The thermal relay will automatically close as the CS2 gas spring temperature returns to normal. Running the CS2 gas spring at higher temperatures will shorten the service life of the spring.

Note: A thermal relay is included with each order.
**Technical Information**

**CS2 - Dimensions, Standard Version**

<table>
<thead>
<tr>
<th>Model</th>
<th>Stroke</th>
<th>Initial</th>
<th>End force*</th>
<th>A</th>
<th>B</th>
<th>ØD</th>
<th>Ød</th>
<th>K</th>
<th>V</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS2-1500</td>
<td>10-160</td>
<td>15000</td>
<td>22000</td>
<td>125</td>
<td>23.8</td>
<td>95</td>
<td>36</td>
<td>50</td>
<td>60°</td>
<td>M12x15</td>
</tr>
<tr>
<td>CS2-3000</td>
<td>10-160</td>
<td>30000</td>
<td>42000</td>
<td>135</td>
<td>25.5</td>
<td>120</td>
<td>50</td>
<td>95</td>
<td>30°</td>
<td>M12x15</td>
</tr>
<tr>
<td>CS2-5000</td>
<td>10-160</td>
<td>50000</td>
<td>74000</td>
<td>160</td>
<td>27.5</td>
<td>150</td>
<td>65</td>
<td>110</td>
<td>30°</td>
<td>M16x18</td>
</tr>
<tr>
<td>CS2-7500</td>
<td>10-160</td>
<td>75000</td>
<td>98000</td>
<td>180</td>
<td>33.5</td>
<td>195</td>
<td>80</td>
<td>120</td>
<td>30°</td>
<td>M16x18</td>
</tr>
</tbody>
</table>

*Note: CS2 springs with even slower return speeds are available on request. Contact Orders@HysonSolutions.com

* = at full stroke

- On delivery all gas ports are fitted with plugs and internal gas pressure is zero bar.
- We recommend the threaded holes in the base of the CS2 springs be used for mounting.

**Product Specifications**

- 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* ........................................... 0.22 m/s for CS2 1500
- Return Speed Piston Rod* ........................................... 0.15 m/s for CS2 3000
- Return Speed Piston Rod* ........................................... 0.10 m/s for CS2 5000
- Return Speed Piston Rod* ........................................... 0.065 m/s for CS2 7500
- Tube ........................................................................... Nitrided
- Rod ............................................................................. Nitrided

**How to order**

**CS2-3000 - 78**

Stroke length [mm] in full mm between 10-160 mm, in increments of 1 mm.
For optimal function the full stroke length of the spring must be used. (Within ± 0.5 mm).
CS2A - Dimensions, Adjustable Version

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

The CS2A controllable gas spring models offer adjustable stroke lengths within 15 mm, with the use of 4 specially designed spacers that are built into the guide of the spring.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Nominal Stroke</th>
<th>Min. stroke length</th>
<th>Max. stroke length</th>
<th>L min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>CS2A-XXXX-10</td>
<td>10</td>
<td>4</td>
<td>17</td>
<td>142</td>
</tr>
<tr>
<td>CS2A-XXXX-20</td>
<td>20</td>
<td>12</td>
<td>27</td>
<td>152</td>
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<td>CS2A-XXXX-30</td>
<td>30</td>
<td>22</td>
<td>37</td>
<td>162</td>
</tr>
<tr>
<td>CS2A-XXXX-40</td>
<td>40</td>
<td>32</td>
<td>47</td>
<td>172</td>
</tr>
<tr>
<td>CS2A-XXXX-50</td>
<td>50</td>
<td>42</td>
<td>57</td>
<td>182</td>
</tr>
<tr>
<td>CS2A-XXXX-60</td>
<td>60</td>
<td>52</td>
<td>67</td>
<td>192</td>
</tr>
<tr>
<td>CS2A-XXXX-70</td>
<td>70</td>
<td>62</td>
<td>77</td>
<td>202</td>
</tr>
<tr>
<td>CS2A-XXXX-80</td>
<td>80</td>
<td>72</td>
<td>87</td>
<td>212</td>
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<tr>
<td>CS2A-XXXX-90</td>
<td>90</td>
<td>82</td>
<td>97</td>
<td>222</td>
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<tr>
<td>CS2A-XXXX-100</td>
<td>100</td>
<td>92</td>
<td>107</td>
<td>232</td>
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<tr>
<td>CS2A-XXXX-110</td>
<td>110</td>
<td>102</td>
<td>117</td>
<td>242</td>
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<tr>
<td>CS2A-XXXX-120</td>
<td>120</td>
<td>112</td>
<td>127</td>
<td>252</td>
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<tr>
<td>CS2A-XXXX-130</td>
<td>130</td>
<td>122</td>
<td>137</td>
<td>262</td>
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<td>CS2A-XXXX-140</td>
<td>140</td>
<td>132</td>
<td>147</td>
<td>272</td>
</tr>
<tr>
<td>CS2A-XXXX-150</td>
<td>150</td>
<td>142</td>
<td>157</td>
<td>282</td>
</tr>
<tr>
<td>CS2A-XXXX-160</td>
<td>160</td>
<td>152</td>
<td>167</td>
<td>292</td>
</tr>
</tbody>
</table>

For information on how to adjust the stroke length of the CS2 spring, see page 46 “How to adjust the stroke length of a CS2A.”

How to order: CS2A-3000 - 30 - 30
Gas Springs with Cooling Systems

**CS2/CS2A with Cooling Jacket (CJ)**

These gas springs are used with the liquid cooler (fig. 1). The Cooling Jacket must be connected to the cooler.

<table>
<thead>
<tr>
<th>Model</th>
<th>CS2 C</th>
<th>CS2A C+7</th>
<th>Ø H $^5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS2/CS2A 1500-XXX-CJ</td>
<td>75</td>
<td>82</td>
<td>110</td>
</tr>
<tr>
<td>CS2/CS2A 3000-XXX-CJ</td>
<td>85</td>
<td>92</td>
<td>135</td>
</tr>
<tr>
<td>CS2/CS2A 5000-XXX-CJ</td>
<td>110</td>
<td>117</td>
<td>165</td>
</tr>
<tr>
<td>CS2/CS2A 7500-XXX-CJ</td>
<td>130</td>
<td>137</td>
<td>210</td>
</tr>
</tbody>
</table>

**CS2/CS2A for Nitro Cooler (NC)**

These gas springs with a special cartridge valve are used with the Nitro Cooler (fig. 2). Since nitrogen gas passes from the gas spring through the Nitro Cooler, the piston rod has a 40% slower return stroke when compared to a CS2 spring without a Nitro Cooler.

<table>
<thead>
<tr>
<th>NC Cartridge Valve Order No.</th>
<th>For Gas Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>3021780</td>
<td>CS2/CS2A 1500</td>
</tr>
<tr>
<td>3121780</td>
<td>CS2/CS2A 3000</td>
</tr>
<tr>
<td>3221780</td>
<td>CS2/CS2A 5000</td>
</tr>
<tr>
<td>3321780</td>
<td>CS2/CS2A 7500</td>
</tr>
</tbody>
</table>

**How to order CS2/CS2A with a Cooling Jacket (CJ)**

CS2 XXXX - XXX - CJ

- Model size: 1500, 3000, 5000, 7500
- Stroke length [mm]
- Cooling Jacket

**How to order CS2/CS2A with Nitro Cooler™ (NC)**

CS2 XXXX - XXX - XXX - NC

- Model size: 1500, 3000, 5000, 7500
- Nominal Stroke length [mm]
- Adjusted Stroke length [mm]
- Additional Port for Nitro Cooler™
PS - Dimensions

PS passive gas springs should:

- **Not** be used for any operation in the tool other than to eliminate CS2 springback.
- Be the same model size as the CS2 spring(s) (except CS2-7500 which uses the PS-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.

**Note:** The PS 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 PS spring’s lower gas chamber. The PS spring’s charge pressure should be the same as the CS2 spring(s).

### Product Specifications

- **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

<table>
<thead>
<tr>
<th>Order No</th>
<th>OD</th>
<th>Od</th>
<th>F</th>
<th>E</th>
<th>L</th>
<th>G</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Max. Stroke Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS-1500</td>
<td>95</td>
<td>36</td>
<td>24</td>
<td>7</td>
<td>220</td>
<td>140</td>
<td>M8</td>
<td>13</td>
<td>42.4</td>
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<td>30</td>
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<tr>
<td>PS-3000</td>
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<td>7</td>
<td>220</td>
<td>140</td>
<td>M10</td>
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<td>PS-5000</td>
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<td>193</td>
<td>M10</td>
<td>16</td>
<td>70.7</td>
<td>100</td>
<td>35</td>
</tr>
</tbody>
</table>

* The forces are calculated based on a charging pressure of 150 bar in the CS2 and the PS spring(s).
Valve Block Dimensions

Two valve block models are available:

- **All-in-One Valve Block**, with built-in gas charging and bleeding equipment, plus gauge.
  Order No. CSPSCP-AI1

- **Standard Valve Block**, for use with separate control panel.
  Order No. CSPSCP-SVB

For information showing how to connect the different valve blocks to a positive lock system, see Installations, page 36.
Control System Components

Hose and fittings for Ø6 mm pneumatic hose

T - Connector (hose to hose)
Order No. CSNF-3500

Y - Connector (hose to hose)
Order No. CSNF-3510

90° - G 1/8
Order No. CSNF-2000-G 1/8

Straight Connector (see Table below)

<table>
<thead>
<tr>
<th>Order No.</th>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSNPF-1000-G1/8</td>
<td>G 1/8</td>
<td>15</td>
</tr>
<tr>
<td>CSNPF-1000-G1/4</td>
<td>G 1/4</td>
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</tr>
<tr>
<td>CSNPF-1000-1/4</td>
<td>1/4 NPT</td>
<td>28</td>
</tr>
</tbody>
</table>

Pneumatic hose
Ø 6 mm

Order No. NH-06 - XX
Order the length in whole meters

Product Specifications

Material: Polyurethane
Max. temperature: 60°C
Max. pressure: 16 bar
Color: Blue
Min. bend radius: 20
Mechanical Pressure Switch

Order No. HMPS-G 1/8

The mechanical pressure switch can be used to control the valve in the CS2 controllable gas spring(s) or valve block for tool integrated control systems.

Mechanical Pressure Switches:
- Can control up to 6 CS2 springs or valve blocks.
- Require a constant compressed air supply (min. 4 bar).

**PRODUCT SPECIFICATIONS**

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

Stroke: 5 mm
Max. stroke: 8 mm

Control Air Signal to CS2 spring(s) or Valve Block(s)
Cooling System Components

For applications where cooling is required, each CS2 controllable gas spring must be:

- **Fitted** with a Cooling Jacket (CJ).
- **Fitted** with a Thermal Relay (see Overheat Protection, page 17).
- **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 25 kW), where heat from the CS2 spring(s) is then radiated to the surroundings.
Cooling System - Hose & Fittings

Connection Block
Order No. CS-MCB-6

Female Quick Release Coupling
Order No. CS-8100-G 1/2

Male Quick Release Coupling
Order No. CS-8000-G 1/2

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>CSBF-2000-G 1/4</td>
<td>G 1/4</td>
<td>23</td>
<td>8</td>
<td>44</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>CSBF-2000-G 1/2</td>
<td>G 1/2</td>
<td>30</td>
<td>12</td>
<td>68</td>
<td>23</td>
<td>27</td>
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Straight Hose Fitting

<table>
<thead>
<tr>
<th>Order No.</th>
<th>D</th>
<th>E</th>
<th>G</th>
<th>AF</th>
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</thead>
<tbody>
<tr>
<td>CSBF-1000-G 1/4</td>
<td>G 1/4</td>
<td>16</td>
<td>28</td>
<td>12</td>
</tr>
<tr>
<td>CSBF-1000-G 1/2</td>
<td>G 1/2</td>
<td>23</td>
<td>58</td>
<td>27</td>
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Cooling Hose

<table>
<thead>
<tr>
<th>Order No.</th>
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<th>Color</th>
<th>Min. bend. radius</th>
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<td>CSH-16-Blue</td>
<td>16</td>
<td>10</td>
<td>Blue</td>
<td>75</td>
</tr>
<tr>
<td>CSH-16-Red</td>
<td>16</td>
<td>10</td>
<td>Red</td>
<td>75</td>
</tr>
<tr>
<td>CSH-23-Blue</td>
<td>23</td>
<td>16</td>
<td>Blue</td>
<td>150</td>
</tr>
<tr>
<td>CSH-23-Red</td>
<td>23</td>
<td>16</td>
<td>Red</td>
<td>150</td>
</tr>
</tbody>
</table>
Cooling System - Distribution Block

Order No. CS-MCB-12

View B-B

View A-A
Cooling System - Cooler Unit

There are 2 sizes of Cooler Unit available:

- **10 KW** - Order No. CS-CU-10KW
- **25 KW** - Order No. CS-CU-25KW

For information on which Cooler Unit is suitable for your application, fill in the Application Request Form and fax it to HYSON Inside Sales Department at 440-526-6807.

1. **Pressure Gauge**
   - to monitor system pressure (8-10 bar)
2. **Electric Motor**
   - 380V AC
3. **Circulation Pump**
   - Check the direction of rotation at start up
4. **Cooling Fluid Port**
5. **Filter**
7. **Cooler**
8. **Outlet-Cooling Fluid**
   - Delivered with 5 m hose and female quick release coupling
9. **Power Switch**
   - On/Off button
10. **Fluid Level Indicator**
11. **Inlet-Cooling Fluid**
    - Delivered with 5 m hose and male quick release coupling
12. **Drainage Plug**

**Cooling Fluid**
The cooler unit is not delivered with cooling fluid. We recommend using only ULTRA Safe 620 Cooling Fluid.

**Note:** Do not use Cooler Unit without cooling fluid! The unit is equipped with a level/ temp switch that will shut down the unit if it leaks or overheats.

### PRODUCT SPECIFICATIONS

#### 10 KW Cooler Unit:

- **Order No.** CS-CU-10KW
- H .............................................................. 1000
- 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.** CS-CU-25KW
- H .............................................................. 1070
- L .............................................................. 1070
- B .............................................................. 890
- Pump flow .............................................. 60 l/min
- Tank capacity ........................................... 90 l
- Electric motor ......................................... 3 KW
- Power supply .......................................... 380 V AC
- Weight ................................................... 220 kg
Nitrogen Cooling System - Nitro Cooler™ (NC)

The Nitro Cooler (NC) is engineered to provide tool-integrated cooling for CS2/CS2A controllable gas springs running at high production rates. It is compact and provides 1.5kW of cooling power. Each unit is able to cool up to four CS2 or CS2A gas springs. Gas springs with special cartridge valves are required for use with the Nitro Cooler.

The Nitro Cooler requires 24 V DC (22W) to operate and conforms to IP64 class. Units can be mounted vertically or horizontally, inside or outside the die.

Product Specifications

- Max. cooling capacity: 1.5kW
- Max. charging pressure: 150 bar
- Min. charging pressure: 25 bar
- Operating temperature: 0 to 80°C
- Weight: 16 kg
- Connection ports: G ¼(8x)
- Power supply: 24 V DC (22W)
- Contains a built-in thermal relay.
Nitrogen Cooling System - Nitro Cooler™ (NC)

Mounting Options
Nitro Coolers can be mounted vertically or horizontally. When mounting, it is important NOT to restrict the air flow through the cooler. If air flow is restricted, it will have a negative effect on the unit’s performance.

Electrical Connections
The wiring diagram (at right) for the Nitro Cooler is also included on the unit’s label next to the connection box. Note: The Nitro Cooler contains a built-in thermal relay. The thermal relay has a normally closed circuit that 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 CS2-NC gas springs.
Nitrogen Cooling System - Nitro Cooler™ (NC)

Nitro Cooler Performance

Depending on the amount of heat generated by the gas springs, up to four gas springs can be connected to each Nitro Cooler. These charts illustrate the maximum number of strokes per minute (SPM) allowed when one to four gas springs, with 150 bar pressure, are connected to a single Nitro Cooler. Along each of the four gas springs curves, the heat generation is 1.5 kW, the maximum cooling effect of the Nitro Cooler.

Each chart can be used to determine how many CS2-NC gas springs can be connected to one Nitro Cooler. For any given stroke length, DO NOT EXCEED the corresponding SPM rate curve for the number of CS2-NC gas springs.

**Note**: When using the Nitro Cooler, the return stroke speed of the piston is decreased by approximately 50%. With a distance of 1 m between the cooler and the gas spring the speeds are as follow:

- CS2/CS2A 1500 – 0.10 m/sec
- CS2/CS2A 3000 – 0.08 m/sec
- CS2/CS2A 5000 – 0.05 m/sec
- CS2/CS2A 7500 – 0.03 m/sec
Nitrogen Cooling System - Nitro Cooler™ (NC)

How to Determine the Maximum Running Speed for an Application

Gas Spring: CS2-1500-48-NC
Used Stroke Length: 48mm
Pressure: 150 bar with 1.5 ton initial force
Number of Gas Springs: 2

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

Step 2 According to the used stroke length, go up vertically until crossing the diagram from 2 to 3.

Step 3 From point 3, go horizontally to the vertical axis SPM stroke/min point 4.

Step 4 Read the value for the maximum used SPM 44 strokes/min.

For lower charging pressure, this value increases proportionately.

For example: a charging pressure of 100 bar increases the maximum used SPM from 44 to $44 \times \frac{150}{100} = 66$ strokes/min.
Electric/Pneumatic Air Control Valve
Order No. CS3W2P24VDC

Note: CS3W2P24VDC comes completely assembled with (2) 1/4-NPT hose connectors for 6mm hose, exhaust muffler and a 3-pin din connector with 6-foot cord. Where extensions to electrical cord are needed, use 20 AWG.

Power Requirement: 24 VDC

Operation
Valve Energized: Pressure at inlet port 1 connected to outlet port 2, exhaust port 3 blocked. Valve must be energized to lock gas spring.

Valve De-Energized: Pressure at inlet port 1 blocked, outlet port 2 connected to exhaust port 3. When valve is not energized, gas spring piston rod will return to fully extended position.
Multi-coupling Blocks

Multi-coupling Block
Order No. CS-MCB-14

This multi-coupling block is manufactured in steel and has thirteen G 1/8 connections and one G 1/4 connection. All connections are plugged on delivery.

Multi-coupling Block
Order No. CS-MCB-4

This is a small and compact block for linking hoses. The block is provided with four G 1/8 ports. On delivery, one of the ports is provided with a sealing plug, while the other ports are provided with protective covers.
Installations

Control System - Standard Lock CS2

A standard lock system requires one air control signal.

The CS2 gas springs are delivered with air fittings suitable for Ø6 mm air hoses.

**Note:** To lock and unlock all CS2 springs simultaneously, the hose lengths from the different springs to the air inlet should be close to the same length.

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

The CS2 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>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>Controllable Gas Spring</td>
<td>CS2-XXXX-XXX</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>T - Connector</td>
<td>CSNF-3500</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Pneumatic Hose Ø6 mm</td>
<td>NH-06-XX</td>
</tr>
</tbody>
</table>
A positive lock system requires two air control signals: one to operate the CS2 gas spring(s) and one to operate the valve block. The CS2 gas springs and valve block are delivered with air fittings suitable for Ø6 mm pneumatic hoses.

**Note:** To lock and unlock all CS2 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 the 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 CS2

Method Using Coupling Block(s)

Position | Quantity | Description                  | Order No.       |
----------|----------|------------------------------|-----------------|
1         | 3        | Controllable Gas Spring     | CS2-XXXX-XXX    |
2         | 7        | Adapter G 1/8               | 4114973-G 1/8   |
3         | 3        | EZ-Hose straight - 90°      | EZH-2-0-90X XXXX|
4         | 1        | EZ-Hose straight - straight | EZH-2X XXXX     |
5         | 1        | Control Panel               | CP-N2 LG G1/8   |
6         | 1        | Multi - Coupling Block      | CS-MCB-4        |

To charge, bleed and check the gas pressure for a standard lock CS2 gas spring system, all springs should be connected to a standard control panel (shown above connected via a coupling block).

We recommend the EZ-Hose system and fittings be used for such systems. The CS2 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 CS2 gas spring must be removed. Each G 1/8 gas port, for both the CS2 gas spring and coupling block, requires an adapter (EZNF-1000-G 1/8) for connection to an EZ-Hose.

The control panel should be placed higher than the CS2 springs to avoid loss of internal oil when bleeding.
Hose System - Standard Lock CS2

Method Using Twin Ports
(Not for use with CS2-1500 because it does not have the additional ports.)

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Controllable Gas Spring</td>
<td>CS2-XXXX-XXX</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Adapter G 1/8</td>
<td>4114973-G 1/8</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>EZ-Hose straight - straight</td>
<td>EZH-2X XXXX</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>EZ-Hose straight - 90°</td>
<td>EZH-2-0-90X XXXX</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Control Panel</td>
<td>CP-N2 LG G 1/8</td>
</tr>
</tbody>
</table>

To charge, bleed and check the gas pressure for a standard lock CS2 gas spring system, all springs should be connected to a standard control panel. We recommend the EZ-Hose system and fittings be used. The CS2 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 CS2 gas spring must first be removed. Each G 1/8 gas port, for both the CS2 gas spring and coupling block, requires an adapter (EZNF-1000-G 1/8) for connection to EZ-Hose. The control panel should be placed higher than the CS2 springs to avoid loss of internal oil when bleeding.
Hose System - Positive Lock System CS2 + PS

Example 1

To connect CS2 controllable gas spring(s) to a PS passive gas spring via the valve block, you need two hose connections:
- One EZ-Hose connection
- One EO24-Hose connection.

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

Positive Lock CS2 + PS
Gas charging and bleeding is carried out as follows:

1. Charge the lower gas chamber in the PS passive gas spring through the control panel (3)∗.
2. Charge the CS2 standard spring(s) and upper chamber of the PS gas spring via the control panel (3) connected to the standard valve block (4).

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>Controllable Gas Spring</td>
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<tr>
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<td>1</td>
<td>PS Passive Spring</td>
<td>PS-XXXX</td>
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<tr>
<td>3</td>
<td>2</td>
<td>Control Panel</td>
<td>CP-N2 LG G 1/8</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Standard Valve Block</td>
<td>CSPSCP-SVB</td>
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<td>Multi Coupling Block G 1/8</td>
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<td>EO24 Adapter G 1/4</td>
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<td>EZ Adapter G 1/4</td>
<td>4014973-G 1/8</td>
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<td>8</td>
<td>10</td>
<td>EO24 Adapter G 1/8</td>
<td>503593</td>
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<tr>
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<td>EZ Adapter G 1/8</td>
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<tr>
<td>10</td>
<td>6</td>
<td>EO24 Hose straight - 90°</td>
<td>3220857-XXXX</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>EZ Hose straight - straight</td>
<td>EZH-2X XXXX</td>
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</tbody>
</table>
Hose System - Positive Lock System CS2 + PS

Example 2

(Not for use with CS2-1500 because it does not have the additional ports.)

To connect CS2 controllable gas spring(s) to a PS passive gas spring via the valve block, you need two hose connections:

- One EZ-Hose connection
- One EO24-Hose connection.

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

Positive Lock CS2 + PS

Gas charging and bleeding is carried out as follows:

1. Charge the lower gas chamber in the PS passive gas spring through the standard control panel (3).

2. Charge the CS2 standard spring(s) and upper chamber of the PS gas spring via the all-in-one valve block (4).
Connecting a CS2-NC Standard Lock Gas Spring with a Nitro Cooler

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
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<td>Controllable Gas spring</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
<td>2</td>
<td>EZ Adapter G 1/4</td>
<td>4014973-G 1/4</td>
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<td>5</td>
<td>3</td>
<td>EO24 Hose straight-straight</td>
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<td>6</td>
<td>3</td>
<td>EO24 Hose straight-90°</td>
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<tr>
<td>7</td>
<td>1</td>
<td>EZ Hose straight-straight</td>
<td>4014974-xxxx</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Control Panel</td>
<td>CP-N2 LG G 1/8</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Nitro Cooler Block</td>
<td>2021641</td>
</tr>
</tbody>
</table>

Use EO24 hoses when using a Nitro Cooler and place the Nitro Cooler as close as possible to the gas springs to minimize the length of the hoses. The Nitro Cooler includes heat protection so thermal relays at the gas springs are not necessary. If desired, a control panel for charging and bleeding can be connected to either port 2 on the gas springs or to the Nitro Cooler.
Connecting a CS2-NC Positive Lock System with a Nitro Cooler

The positive lock system has the same requirements as the standard lock. Use EO24 hoses when using a Nitro Cooler and place the Nitro Cooler as close as possible to the gas springs to minimize the length of the hoses. The Nitro Cooler includes heat protection so thermal relays at the gas springs are not necessary. If desired, a control panel for charging and bleeding can be connected to either port 2 on the gas springs or to the Nitro Cooler.

### Table: Components

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
<th>Order No.</th>
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<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Controllable Gas Spring</td>
<td>CS2 XXXX-XXXX NC</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>EO24 Adapter G 1/8</td>
<td>503593</td>
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<tr>
<td>3</td>
<td>8</td>
<td>EO24 Adapter G 1/4</td>
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<td>EZ Adapter G 1/4</td>
<td>4014973-G 1/4</td>
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<td>5</td>
<td>6</td>
<td>EO24 Hose straight-straight</td>
<td>3020857-xxxx</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
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<td>1</td>
<td>Control Panel</td>
<td>CP-N2 LG G1/8</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Nitro Cooler Block</td>
<td>2021641</td>
</tr>
<tr>
<td>10</td>
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<td>Multi Coupling Block G 1/8</td>
<td>CS-MCB-14</td>
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<tr>
<td>11</td>
<td>2</td>
<td>EZ Adapter G 1/8</td>
<td>4114973-G 1/8</td>
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<tr>
<td>12</td>
<td>1</td>
<td>Standard Valve Block</td>
<td>CSPSCP-SVB</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>PS passive spring</td>
<td>PS xxxx</td>
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Connecting four CS2-1500-NC Standard Lock Gas Springs with a Nitro Cooler™

<table>
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<td>Controllable Gas spring</td>
<td>CS2 XXXX-XXXX NC</td>
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<td>EO24 Adapter G 1/8</td>
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<td>EO24 Adapter G 1/4</td>
<td>504144</td>
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<tr>
<td>4</td>
<td>5</td>
<td>EO24 Hose straight-straight</td>
<td>3020857-xxxx</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>EO24 Hose straight-90°</td>
<td>3220857-xxxx</td>
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<td>1</td>
<td>L-Coupling</td>
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<td>7</td>
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<td>Control Panel</td>
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<tr>
<td>8</td>
<td>1</td>
<td>Nitro Cooler Block</td>
<td>2021641</td>
</tr>
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</table>
Frequently Asked Questions (FAQ’s)

General

**What air pressure is required to operate the cartridge valves?**

4 bar minimum air pressure is required to close the normally open (NO) cartridge valves.

**What is the maximum air pressure allowed to operate the cartridge valves?**

10 bar maximum air pressure is allowed to operate the cartridge valves.

**What service life can I expect from a CS2 controllable gas spring?**

As long as you use the thermal relay the following service life can be expected:

- For stroke lengths up to 50 mm: 0.5 million strokes.
- For stroke lengths above 50 mm: 50,000 strokemeters.

**Can I use other hose systems?**

We cannot guarantee the function of the system if hose systems other than those mentioned in this brochure are used. Please contact Hyson Inside Sales at Orders@Hysonsolutions.com.

**Can I mix different size CS2 springs in the same system?**

No. Please contact Hyson Inside Sales at Orders@Hysonsolutions.com for more information.

**Standard Lock CS2**

**Is it possible to adjust the stroke length of the CS2 spring, or must I always use 100% of the nominal stroke (within 0.5 mm)?**

There are 2 versions of the CS2 controllable gas spring, the standard model CS2 and an adjustable model CS2A.

**How fast can the CS2 spring be stroked?**

0.8 m/sec is the max. allowed compression velocity. The maximum stroke frequency (spm) at which a CS2 spring can run depends on the stroke length of the spring and level of cooling.

**What can I do to eliminate CS2 springback?**

If you are using 100% stroke length (within 0.5 mm) of the CS2 spring, a max. 1 mm of springback can be expected. It is possible to eliminate this by converting the standard lock into a positive lock system. Please contact Hyson Inside Sales at Orders@Hysonsolutions.com for more information.

**Positive Lock System CS2+PS**

**How many valve blocks do I need in the system?**

One valve block is required for each PS passive spring in the system.

**Can I use the PS spring in the tool for forming?**

No. The PS spring is not to be used for any operation in the tool, other than to eliminate CS2 springback.

**Can I use just the EZ-Hose System to connect up my positive lock system?**

Yes.

**Cooling**

**Is cooling always required?**

Not always. Generally speaking, longer stroke lengths and faster press stroke frequencies normally require cooling.

**How many CS2 controllable springs can be connected to a single cooler unit?**

The maximum heat effect for all springs together has to be lower than the cooling effect of the cooler.

**Can I use my own cooling system?**

Yes. It is possible to use the cooling system from the press or other coolers.

**What different cooling fluids can we use?**

We recommend you use water-glycol fluid (HFC) ULTRA SAFE 620. ULTRA-SAFE 620 is approved by all major manufacturers of equipment, and is often used for running-in new machines. Equivalents to this water-glycol fluid can be used, but Hyson Metal Forming Solutions cannot be held responsible for poor performance.

**The Nitro Cooler**

**How many CS2 springs can be connected to one Nitro Cooler?**

Up to four CS2 springs can be connected to one Nitro Cooler, depending on how much heat is generated in the application.

**Can we eliminate the decrease in return speed caused by the Nitro Cooler?**

No. When using the Nitro Cooler, gas passes between the cooler and gas springs with every stroke so the return speed is affected. With a distance of 1m between the cooler and gas spring, the return stroke speed is: 0.12m/sec (CS2/CS2A 1500 & 3000) and 0.06m/sec (CS2/CS2A 5000 & 7500).

**How many Nitro Cooler units can we use in one die?**

There is no limit as long as there is a ventilated area for each cooler in the die.
# Troubleshooting

<table>
<thead>
<tr>
<th>System</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Lock CS2</td>
<td>CS2 spring does not lock.</td>
<td>Make sure CS2 spring’s air port 4 has min. 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>CS2 piston rod’s springback is greater than 1 mm.</td>
<td>Make sure 100% of the CS2 spring’s nominal stroke length (within 0.5 mm) is used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure CS2 spring’s air port 4 has min. 4 bar air pressure before press BDC.</td>
</tr>
<tr>
<td></td>
<td>CS2 piston rod does not return.</td>
<td>Make sure CS2 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 returning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that there is gas pressure in the CS2 spring.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System</th>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Lock System CS2 + PS</td>
<td>CS2 spring does not lock.</td>
<td>Make sure CS2 spring’s air port 4 has min. 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>CS2 piston rod’s springback is greater than 0 mm.</td>
<td>Make sure the cartridge valve in the valve block is closed during the press’s down-stroke and that the PS passive gas spring is being stroked enough for this application.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure 100% of the CS2 spring’s nominal stroke length (within 0.5 mm) is used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that the cartridge valve in the valve block is opened at BDC.</td>
</tr>
<tr>
<td></td>
<td>CS2 piston rod does not return.</td>
<td>Make sure CS2 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 returning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that there is gas pressure in the CS2 spring.</td>
</tr>
</tbody>
</table>
Appendix

Stroke length adjustment of CS2A

The guide in the CS2A is made up of the following main components:

The guide length and stroke length of the spring is adjusted by installing and/or removing spacers between the upper and lower guide. To get the correct stroke length, spacers (Table 1) should be installed in the guide.

Example 1:
The stroke length is to 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 are to be left in the guide/spring.

Table 1.

<table>
<thead>
<tr>
<th>To adjust from nominal stroke length</th>
<th>Spacer (mm)</th>
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</thead>
<tbody>
<tr>
<td>Stroke length</td>
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</tr>
<tr>
<td>Maximum</td>
<td>+7</td>
</tr>
<tr>
<td></td>
<td>+6</td>
</tr>
<tr>
<td></td>
<td>+5</td>
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<tr>
<td></td>
<td>+4</td>
</tr>
<tr>
<td></td>
<td>+3</td>
</tr>
<tr>
<td></td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>+1</td>
</tr>
<tr>
<td>*Nominal</td>
<td>0</td>
</tr>
</tbody>
</table>

*The nominal stroke length is always marked on the tube.

Caution:

- Only fully trained personnel with experience servicing gas springs should make adjustments to the stroke length.
- Make sure the work surface where you will be working on the CS2A spring(s) is clean and free from contaminants.
- Make sure there is no gas pressure in the CS2A spring before proceeding.
Stroke length adjustment of CS2A

Adjustment procedure

1. Make sure the gas spring is emptied of gas 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. Fill the spring with nitrogen gas and replace the dust cover if applicable.
CS2/CS2A Alternative Mounting

For upside down installations, use the threaded holes in the base of the CS2/CS2A for mounting the gas spring to the tool.

For upright installations, an alternative mounting method is to use two LM lug mounts in combination with dowel pins as shown. The dowel pins engage the threaded holes in the base and prevent the spring from moving out of position even if the lugs come loose. The dowel pins also ensure that the spring is installed in the correct position.

### Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Ø D</th>
<th>Ø d max.</th>
<th>H</th>
<th>Ø K</th>
<th>V</th>
<th>Ø P</th>
<th>R</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS2/CS2A -1500</td>
<td>130</td>
<td>8</td>
<td>10</td>
<td>50</td>
<td>60</td>
<td>17.5</td>
<td>20</td>
<td>2 pcs LM-3000*</td>
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<tr>
<td>CS2/CS2A -3000</td>
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<td>10</td>
<td>95</td>
<td>30</td>
<td>17.5</td>
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<td>2 pcs LM-5000</td>
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<td>10</td>
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<td>21.5</td>
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<td>10</td>
<td>120</td>
<td>30</td>
<td>21.5</td>
<td>29</td>
<td>2 pcs LM-10000</td>
</tr>
</tbody>
</table>

**Note:** LM-3000 lugs require a slight modification as shown before they are fitted to the CS2/CS2A 1500 gas spring.
How does the new CS2 differ from the original CS?

CS2 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 CS2 to existing CS systems

CS2 controllable gas springs are completely interchangeable with existing CS springs.

Standard Lock Example: Replacing an existing CS with a new CS2

To replace an existing CS spring with a new CS2 spring in a standard lock system, simply plug the air signal that went to the CS spring’s air connection port 2.

Positive Lock System Example: Replacing an existing CS with a new CS2

To replace an existing CS spring with a new CS2 spring in a positive lock system, simply plug the air signal that went to the CS spring’s air connection port 2.