

## **Gas Links System**

## **Piercing and Forming Units/Cams**

## **Delayed Return Units**

## **Lifters**



**Safer Choice****7****Chapter 1 - Gas Link Systems****23**

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*In the olden days, vital safety equipment was not an option.*

Can we really keep clear of needless safety risks? Yes!

We help you achieve the safer working environment and reduce unnecessary liability.



# *Today, why compromise...? Reduce risk with The Safer Choice.*

For many decades, personal safety has been a top priority in the development of new car models. The same applies to our KALLER gas springs, which we have supplied to the automotive industry since the early 1980s.

As a gas spring manufacturer, we are responsible for the compliance with Pressure Equipment Directive (PED) 97/23/EC. But responsibility also rests with you, the customer. Failure to comply with the regulations may very well result in personal injuries and costly liability claims.

The Association of German Engineers (VDI) has developed specific safety demands for gas springs, which are being implemented in

company specific standards. As The Safer Choice, we are helping setting these standards.

We care about safety. Do you? Contact us today.

Reduce risk with KALLER – The Safer Choice.



*Customers do business with  
KALLER because they want...*

- safer and more reliable products
- worldwide support and service
- compliance with all major industry standards

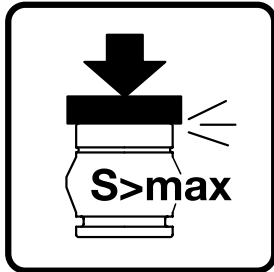
*...to save money and time using  
our innovative gas springs*

KALLER developed the first nitrogen gas spring for press tools during the 1970s and we introduced the first gas spring in 1983. With almost 40 years of experience in the field of safety, today KALLER offers a comprehensive selection of innovative high quality gas springs and gas hydraulic systems for use in tool & die applications.



“KALLER customers want to save money through correct handling of our gas springs. Learning the tricks directly from the people who handle the products daily is highly appreciated,” says Zoltan Pap, Product Manager at KALLER.

# *“KALLER helped us save money and time”*



A KALLER gas spring equipped with the Overstroke Protection System introduced in 2002, suffered an overstroke in a customer's tool.

The customer thought he had a longer stroke set, and as the press moved downwards making its stroke, the spring eventually was over-stroked.

When opening the tool, the customer expected to find a totally damaged tool and worried about the cost for complicated repairs. Instead he faced a deformed gas spring where the gas had simply leaked out in a controlled way.

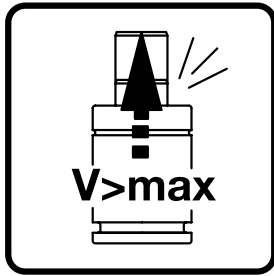
**CUSTOMER:** “This KALLER safety feature helped us to save money and time. We just had to check the tool and then replace the gas spring with the correct stroke length.”





“Due to an incident in the German automotive industry, a discussion about safety in gas springs was triggered. As a result, our safety features are now a standard requirement. For KALLER it has strengthened and confirmed the importance of our work with The Safer Choice,” says Mårten Johansson, Product Manager at KALLER.

# “Safer working environment with KALLER”



In 2005, due to malfunction in a customer's tool a gas spring equipped with the Overload Protection System stopped in the compressed position.

When the press opened, the piston rod suddenly ejected from the compressed position.

The safety system worked as designed to. This allowed the gas to leak out in a controlled manner without any risk of personal injuries.

**CUSTOMER:** “Damage and injuries indeed can be avoided with The Safer Choice. This is a perfect example of how to provide innovative solutions for the safer working environment.”





“KALLER has been working with safety in gas springs for many years in numerous forms, such as product safety approvals in different countries. But safety is more than approvals. It is also about training and risk awareness,” says Sylvia Siljeholm, Quality & Environmental Manager at KALLER.

# *“We feel safer with KALLER gas springs”*



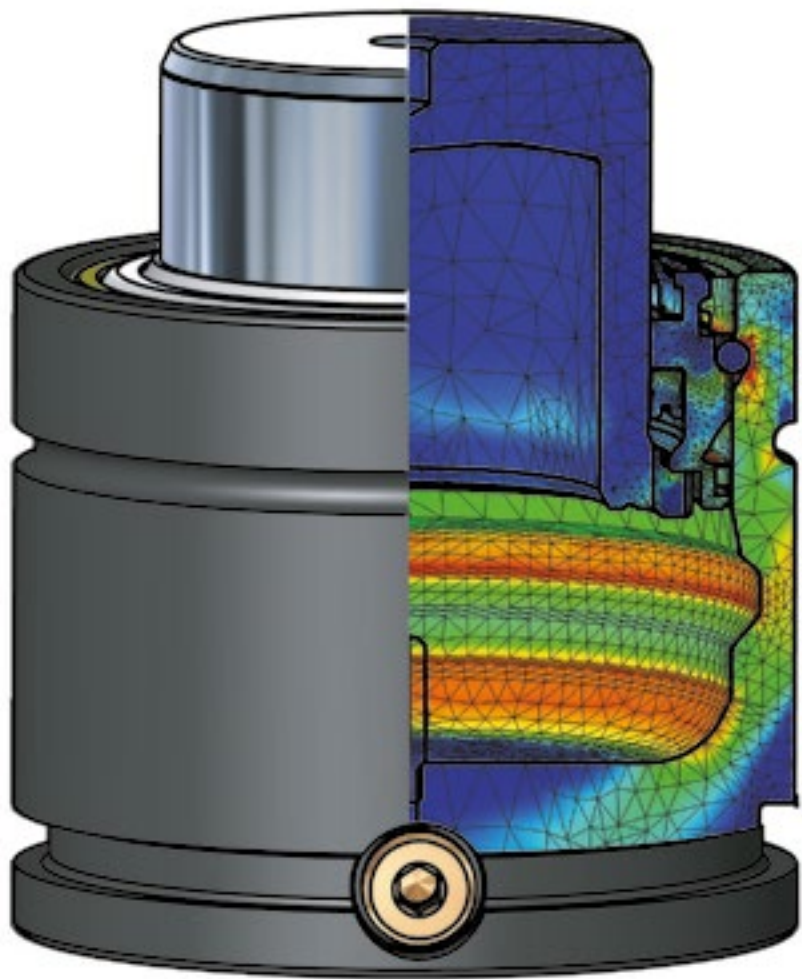
In 2006, the guide in a gas spring equipped with the Overpressure Protection System was subjected to overpressure in a tool.

Drawing fluid had entered the gas spring, causing a dramatic increase in the gas pressure.

After a brief moment, the safety lip in the guide deformed due to abnormal pressure allowing the gas to leak out in a controlled and safe manner.

**CUSTOMER:** “With KALLER gas springs we feel safe. If something should go wrong, and things tend to do that sometimes, The Safer Choice technology is the way to go.”





The advanced FEA (Finite Element Analysis) system is used for the development and validation of our innovative KALLER gas springs.

# *The Safer Choice – on our minds since 1983*



## **KALLER Training Program**

It is of vital importance to have basic gas spring technology knowledge, both in theory and in practice. This combined with training on the more advanced products is the essence of the KALLER Training Program.

### **Your benefits**

Training is a useful tool for maintaining quality, development and revenues. Without doubt the KALLER Training Program is the best and most creative way to fully understand and appreciate the importance of our safety and reliability features.

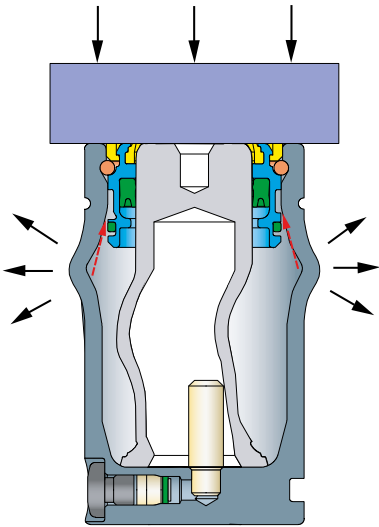


## **KALLER Safety App**

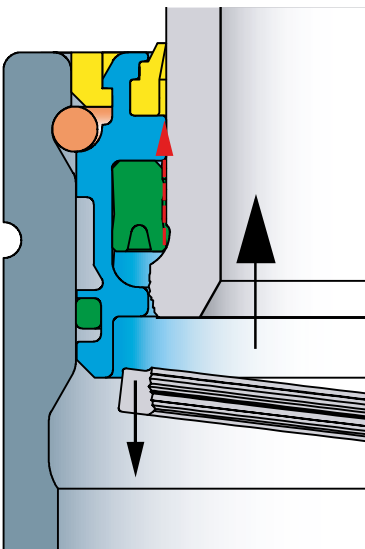
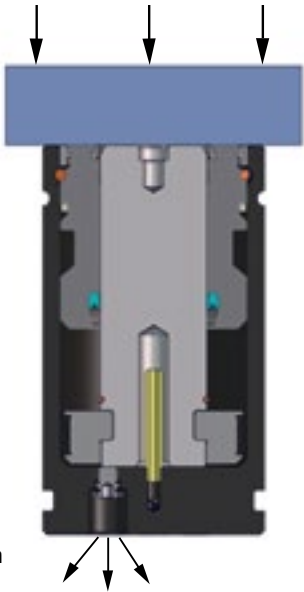
Fake products can be dangerous. With the KALLER Safety App you can identify, verify and manage your KALLER gas springs to avoid unnecessary risks.

### **Your benefits**

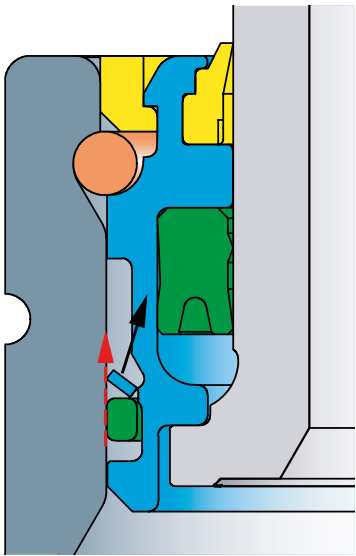
Our KALLER Safety App will help you achieve the safer working environment. For more information, see: [kaller.com/this-is-kaller/the-safer-choice](https://kaller.com/this-is-kaller/the-safer-choice).



Overstroke Protection System



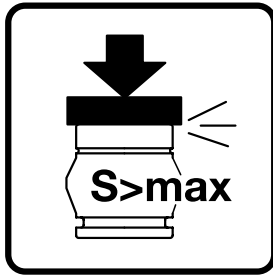
Overload Protection System



Overpressure Protection System

Related Patents:  
EP 1 053 410, EP 1 366 308, EP 0 959 263 US 6.086.059, US 6.971.303

# *KALLER safety features reduce the risk of damage and injuries*

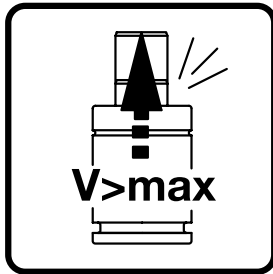


## **Overstroke Protection System**

In the event of an overstroke, the gas spring is designed to deform and release pressure in a predefined way.

### **Your benefits**

When a gas spring is overstroked, this feature reduces the risk of tool damage or injuries due to parts separating under high pressure.



## **Overload Protection System**

Designed for controlled gas venting between the seal and piston rod with an integral safety stop and a specially designed guide.

### **Your benefits**

In case of a jammed cam or tool part being forced by gas springs, this feature reduces the risk of tool damage or injuries.

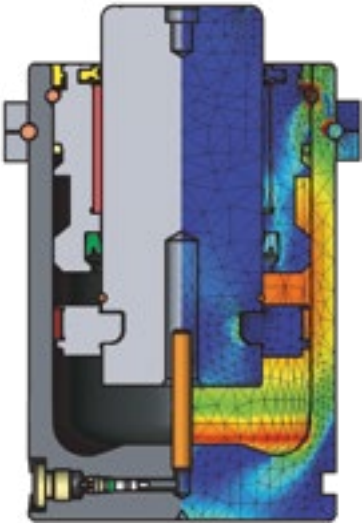


## **Overpressure Protection System**

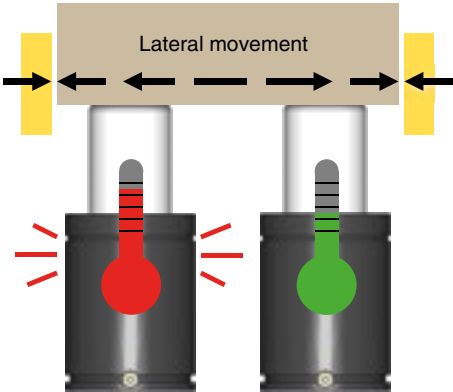
The KALLER Overpressure Protection System is designed to vent excessive gas pressure in a controlled manner.

### **Your benefits**

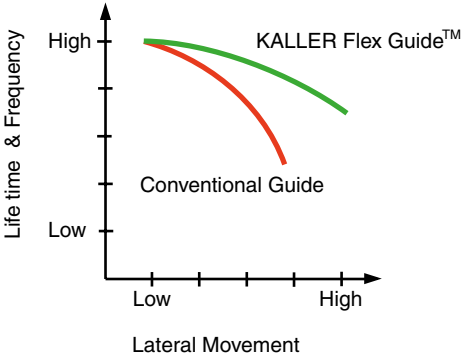
When internal gas pressure exceeds the maximum allowable limit, this feature reduces the risk of tool damage or injuries.



PED approved for a minimum of 2 million strokes



Conventional guide      KALLER Flex Guide™



Flex Guide™ System



Dual Seal™ Link System

# *KALLER reliability features for your safer performance*

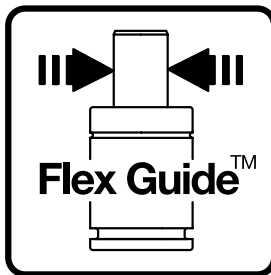


## **PED approved for a minimum of 2 million strokes**

KALLER gas springs are designed, produced and tested to withstand a minimum of 2,000,000 full cycles according to PED 97/23/EC.

### **Your benefits**

The KALLER 2 million stroke PED approval ensures safer component cycle life at maximum operating conditions.

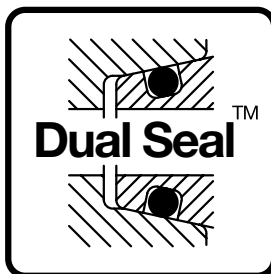


## **Flex Guide™ System**

Our KALLER Flex Guide™ System absorbs lateral piston rod movement, reduces friction, and lowers the operating temperature.

### **Your benefits**

Prolongs service life, allows more strokes per minute, and offers greater tolerance to lateral tool movements.



## **Dual Seal™ Link System**

Our link system uses the KALLER Dual Seal™ solution technology – connecting gas springs using a combination of metal seal and soft seal.

### **Your benefits**

Fewer production interruptions due to leakage caused by vibration. Simplified installation thanks to the non-rotation feature.



“KALLER training is an excellent way for our customers and their employees to ensure efficient production, which in turn translates into improved profitability. Trained employees know what to do and how to do it,” says Jonas Klang, R&D Manager at KALLER.

# *Do you want to save money and time with The Safer Choice?*



Our customers regard us as The Safer Choice.

At KALLER, we develop, manufacture and market gas springs and gas hydraulic systems for stamping dies and accessories.

As a top-of-the-line technology developer since 1876, our innovative KALLER gas springs, PED approved for a minimum of 2 million strokes, have been developed and refined over the last 40 years. Today we remain a world leader with support and service all over the industrialized world.

**KALLER – The Safer Choice.**





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**General precautions**

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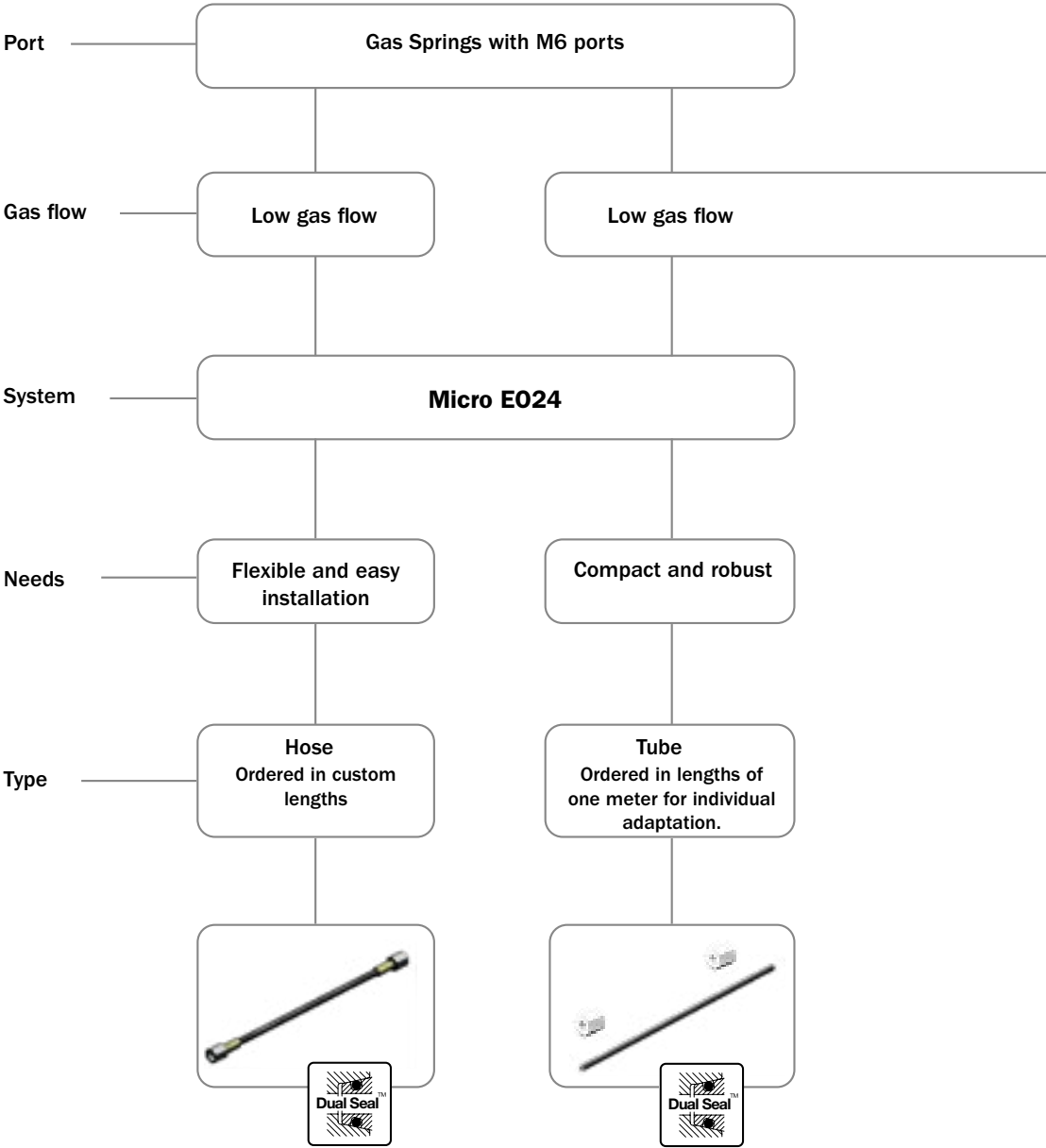
**Fitting assembly guidelines**

**page 28**

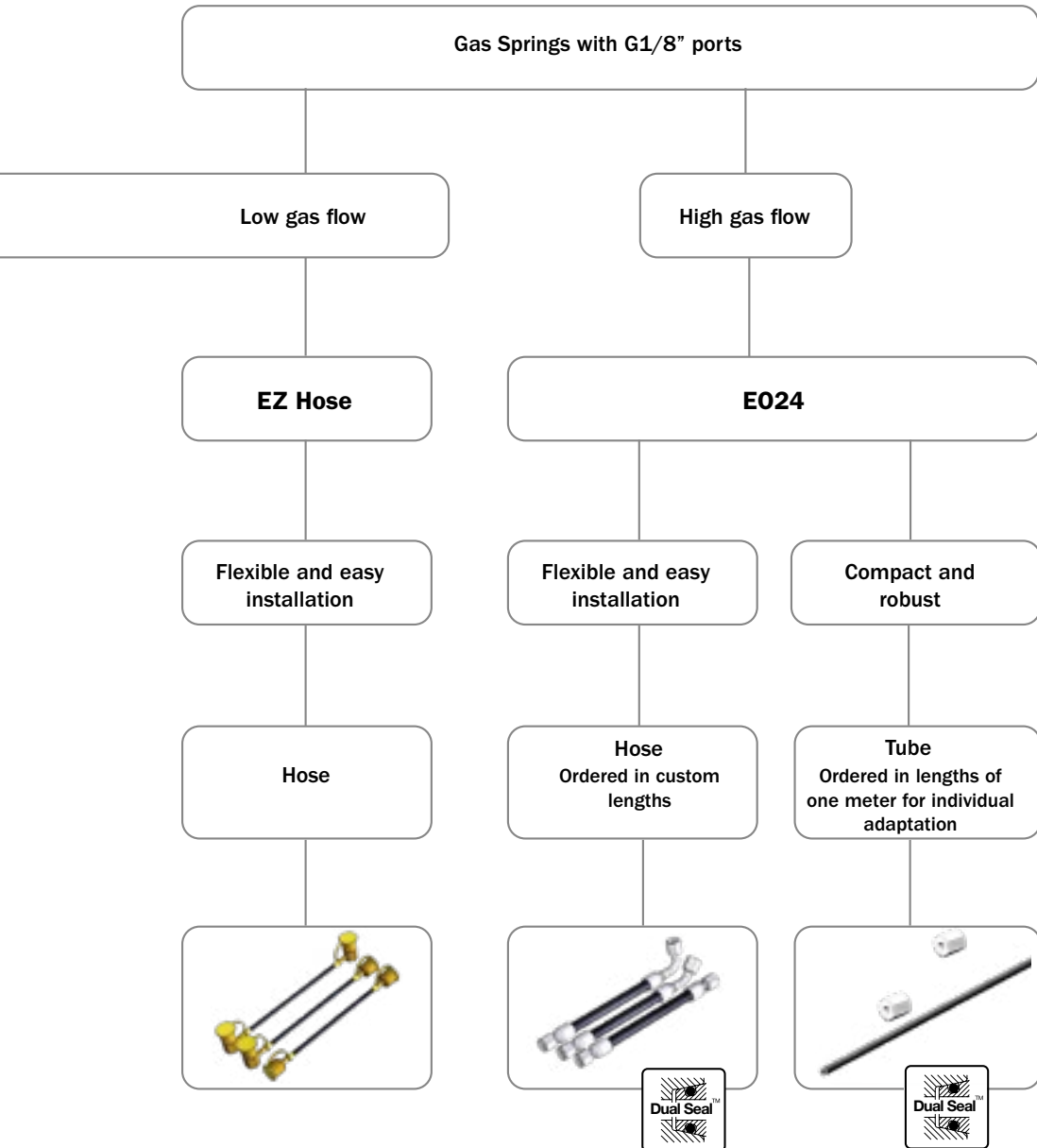
**Hose installation guidelines**

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Linking System Selection



## Linking System Selection

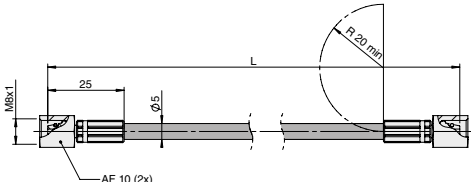
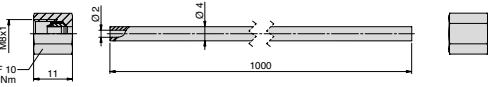
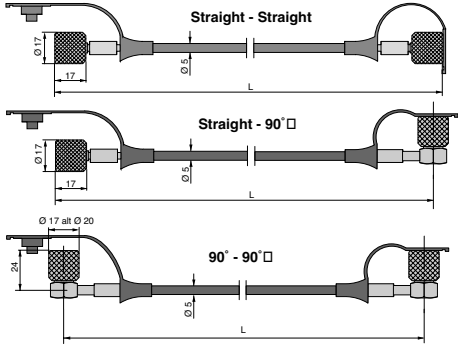


GENERAL INFORMATION

Connecting one or more gas springs to form a Link System with a common gas pressure may often be advantageous from a press technique and/or safety perspective. Gas springs when connected in a Link System to a single Control Block can be easily charged and discharged without needing to open the press tool and remove the individual gas springs. The system pressure can also be remotely monitored and if need be, easily adjusted via the Quick Release Coupling and Discharge Valve.

KALLER offers three different Systems for linking gas springs, namely the **Micro EO24™** Hose and Tube system, **EZ Hose** and **EO24-Hose** systems. Please note: Micro-Hose system has now been replaced by the Micro EO24™ Hose and Tube system. Please contact your local distributor for more details.

KALLER has carefully selected all hoses, couplings and other component parts to ensure that they fully comply with the highest requirement standards. The various components have been subjected to rigorous testing, including endurance tests, static leakage tests and performance tests.

| Gas Link System                                                                                                                           | Description                                                                         |                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Micro EO24™ Hose and Tube System</div> <div></div> |    | The Micro EO24™ is a combined hose and tube system where the Hose System is a Dual Seal System and our most compact hose system, specially designed to allow gas springs with M6 charge ports to be linked together. Please note: Can also be used with G 1/8" charge ports via an adapter.<br>Not interchangeable with old Micro-Hose System. |
|                                                                                                                                           |   | The Micro EO24™ Tube is a system where all connections are soft sealed and self-crimping. This ensures leak-proof tube joints. The tubes are easily cut into correct lengths and can be bent into the desired radius with a tube bending tool or even by hand.                                                                                 |
| EZ Hose                                                                                                                                   |  | The EZ Hose System is based on components that have couplings with O-ring seals, which allow hoses to be attached using only finger strength. The EZ Hose system is a well-proven, robust system that for many years has been the standard used in the French automotive industry.                                                             |

| Gas Link System                                                                                                           | Description |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>E024-Hose and Tube System</b><br><br> |             | <p>The E024 system is mainly for larger gas springs with G 1/8" ports. The E024 hose is recommended whenever high gas flows are required, for example when using the Passive Spring KP in a Controllable Gas Spring system.</p>                                                                                                          |
|                                                                                                                           |             | <p>When using larger gas springs with G1/8" ports for the need of higher gas flow, we recommend use of the E024 system where all connections are soft sealed and self-crimping. This ensures leak-proof tube joints. The tubes are easily cut into correct lengths and can be bent into the desired radius with a tube bending tool.</p> |

## About Control Blocks

KALLER offers a wide range of Control Blocks for gas pressure monitoring and adjustment.  
(For more information, please see page page 40).

## About Hose Crimping equipment

KALLER offers all the necessary equipment to create your Hose System by press fitting hoses to couplings.  
(For more information, please see Hose Crimping equipment, page page 83).

## CAUTION!

Do not modify the product in any way.  
For more information on hoses/linked systems, please contact Strömsholmen ([www.kaller.com](http://www.kaller.com)) or your local KALLER distributor.

## General precautions

For reasons of performance and safety, when designing a Hose System it is important the following points are considered:

- When one or more gas springs are connected to a hoses/linked system, the discharge valve in each spring must first be removed.
- Position the Control Block in the tool where it will be protected from mechanical damage and on a level higher than the gas springs in the system to minimize the loss of lubrication oil when discharging the gas.
- Use only nitrogen (N<sub>2</sub>) gas. The use of other gas types could result in personal injury or failure of the gas spring/Control Block.
- Never exceed the maximum gas charging pressure, which is marked on the side of the gas spring tube.
- Generally, the maximum charging pressure at 20°C is 150 bar for standard press tool gas springs.
- All the valves on the Control Block should be closed during operation.
- All gas springs that are hoses/linked together should be of the same size and type.
- To avoid gas leakage, use only components that have been tested by KALLER.
- **Do not use Control Blocks that are fitted with a Rupture Screw for gas springs with a charging pressure of 180 bar at 20°C or higher.**

## Fitting assembly guidelines E024 and Micro E024™

### Assembly of straight port connections, two-, three- and four-way adapters and port plugs



1. Screw until hand-tight



2. Then tighten wrench-tight  
(if possible apply a torque according to next page)

### Assembly of swivel nut fittings and hose ends

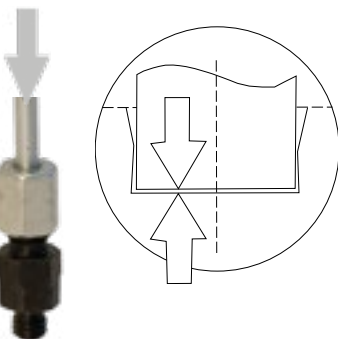


1. Screw on nut until the O-ring is fully compressed (handtight)



2. Then tighten until sharp increase of resistance,  
 $\frac{1}{4}$  to  $\frac{1}{2}$  turn (if possible use a torque according to next page)

### Assembly of steel Functional nut 504589/504047 (see also page page 46 or page page 68 for more information)



1. Press tube end firmly into the assembly cone



2. Then tighten until sharp increase of resistance,  
approximately 1 turn (if possible apply a torque according to next page)

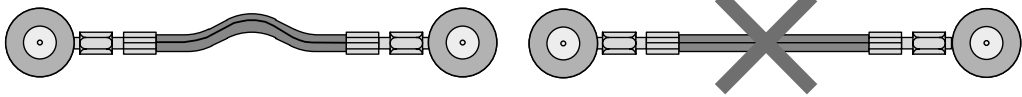
| Component                                                                           |                           | Thread Size | Nominal Torque (Nm) |
|-------------------------------------------------------------------------------------|---------------------------|-------------|---------------------|
|    | Micro EO24 Port adapters  | M6          | 7                   |
|    | Micro EO24 Hose end       | M8          | 7                   |
|    | Micro EO24 Functional nut | M8          | 7                   |
|    | Port plug                 | M6          | 2                   |
|    | EO24/EZ Port adapters     | G1/8"       | 18                  |
|                                                                                     |                           | G1/4"       | 35                  |
|    | EO24 Functional nut       | M12         | 16                  |
|   | EO24 Swivel nut fitting   | M12         | 16                  |
|  | EO24 Hose end             | M12         | 16                  |
|  | EZ Hose end               | S12,65x1.5  | Hand-tight          |
|  | Port plug                 | G1/8"       | 13                  |
|                                                                                     |                           | G1/4"       | 30                  |
|  | Valve                     | M6          | 1                   |
|  | Valve                     | Vg5         | 0.5                 |

Hose installation guidelines

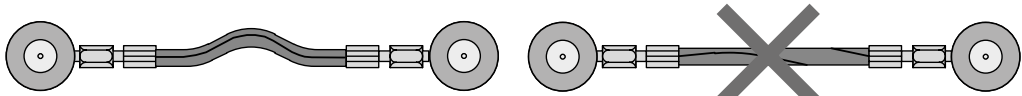
Never exceed the maximum values given for pressure and temperature for the hoses. Make sure all hoses and couplings are perfectly clean before fitting.

Correct

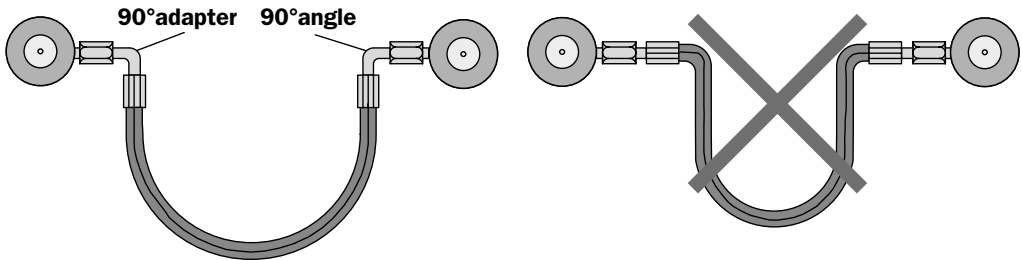
Incorrect



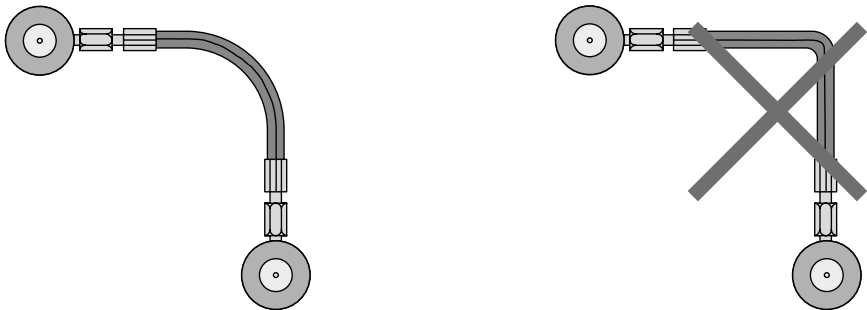
Select a hose length that will allow for a certain amount of play.



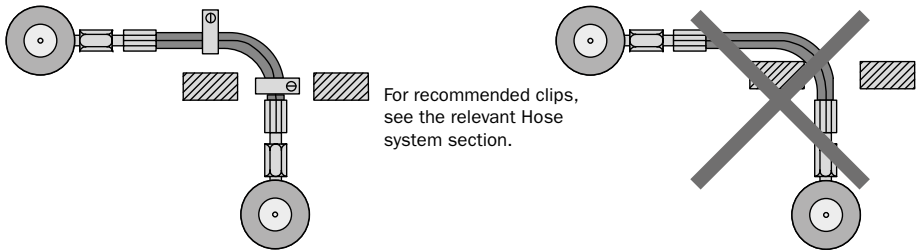
The longitudinal marking on the hose must not be twisted after fitting.



Select hose couplings that avoid sharp bends in the hose.



Never go below the recommended minimum bend radius of the hose.



For recommended clips, see the relevant Hose system section.

Fix the hose correctly to avoid mechanical damage.

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| <b>Micro E024™ Control Block</b> |  | <b>page 52</b> |

Multi Control Block, MCB

Order No.  
2022677-XX

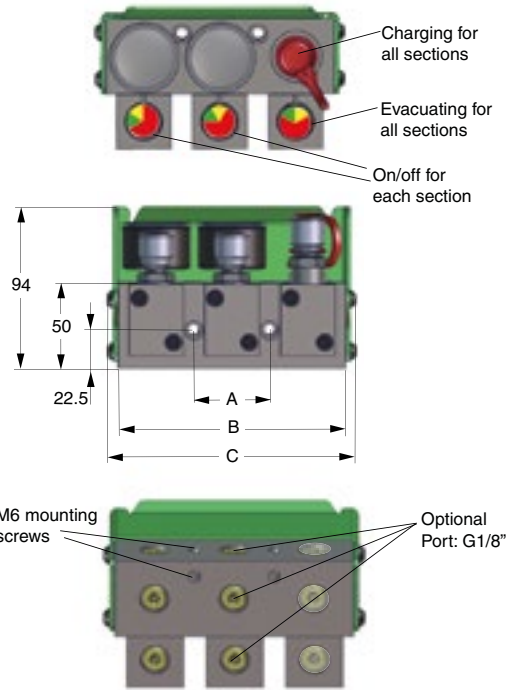


MCB block with two sections.

The new section control block MCB (Multi Control Block) allows the operator to set and check gas pressure in each hose system independently. MCB has a compact design solution which makes it more secure and cost efficient. It is manufactured in steel.

The blocks are available in 2, 4, 5 and 8 modular sections. Each section is provided with three threaded connections (G1/8") for the optional hose connection. The connection type for the inlet gas is a quick release coupling.

The MCB block is replacing the previous Section Control Block



Basic information

Pressure medium .....Nitrogen

Max. charging pressure ..... 180 bar

Min. charging pressure ..... 25 bar

Connections ..... G1/8

| Order No.  | Model                | A   | B   | C   | Weight (kg) |
|------------|----------------------|-----|-----|-----|-------------|
| 2022677-02 | MCB with 2 sections  | 45  | 134 | 146 | 4.0         |
| 2022677-03 | MCB with 3 sections  | 89  | 178 | 191 | 5.4         |
| 2022677-04 | MCB with 4 sections  | 134 | 223 | 235 | 6.8         |
| 2022677-05 | MCB with 5 sections  | 178 | 267 | 280 | 8.1         |
| 2022677-06 | MCB with 6 sections  | 223 | 312 | 324 | 9.5         |
| 2022677-08 | MCB with 8 sections  | 312 | 401 | 413 | 12.3        |
| 2022677-10 | MCB with 10 sections | 401 | 490 | 502 | 15.4        |

## Control Block

### Order No.

**3116114-01** (with 2 pcs EZ Hose G1/4" adapters)

**3116114-02** (with all ports plugged)

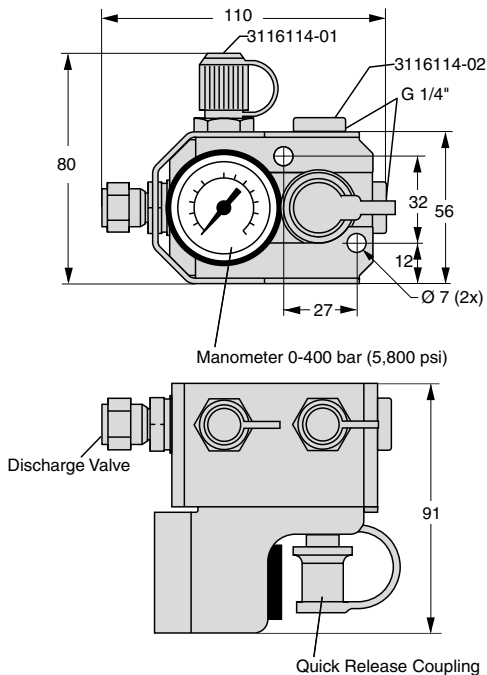


The 3116114 Control Block is a very compact aluminum block with protective stainless steel cover that complies with the CNOMO standard.

This block is intended for continuous monitoring of the gas pressure in the Hose System.

It is fitted with a manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging and a Discharge Valve for gas evacuation.

The block has three G1/4" connection ports, one of which can be used to connect a Pressure Relief Safety Screw or a Pressure Switch.



Control Block

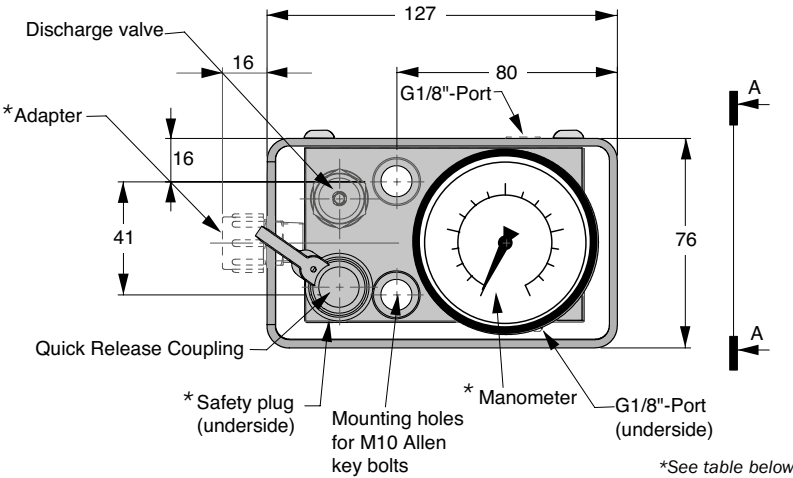
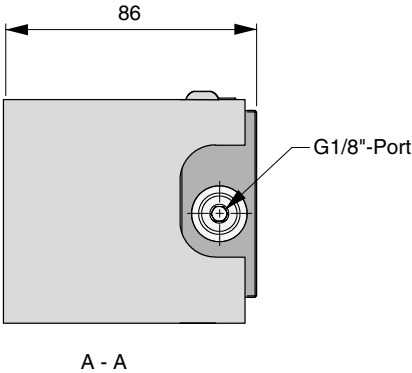
Order No. 4017241



The 4017241 Control Block is a compact block with protective steel cover that complies with different die standards. See below.

This block is intended for continuous monitoring of the gas pressure in the Hose Linked System. It is fitted with a KALLER manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging, a Discharge Valve for gas evacuation.

The block has five G1/8" connection ports. It can be configured in several different ways. Different manometers, with safety plug and for hose systems such as E0, EZ-hose and 9/16"-18 UNF o-ring faced sealed systems. Can be configured according to below table.



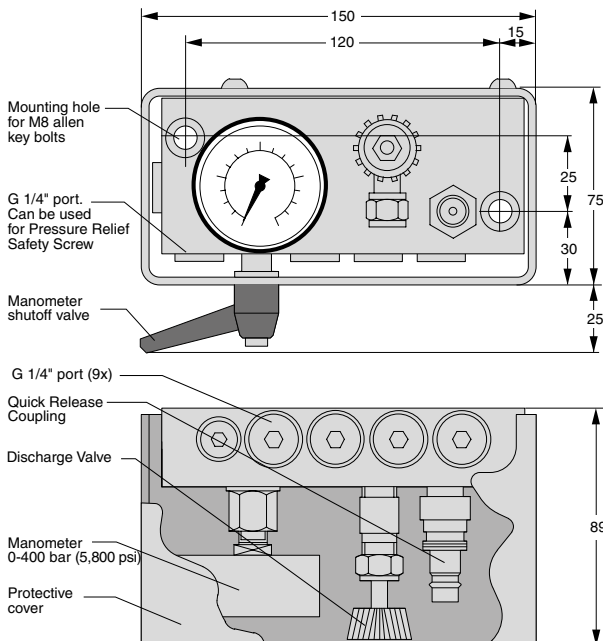
| Order No. | Model                                      | Manometer Scale | Adapter      | Rupture screw |
|-----------|--------------------------------------------|-----------------|--------------|---------------|
| 4017241   | Control block with KALLER manometer CP-100 | bar 0-400       | 9/16"-18 UNF | Yes           |
| 4117241   | Control block with manometer CP-100        | bar / psi 0-400 | 9/16"-18 UNF | Yes           |
| 4217241   | Control block with KALLER manometer CP-100 | bar 0-400       | No           | Yes           |
| 4317241   | Control block with manometer CP-100        | bar / psi 0-400 | EZ-Hose      | Yes           |
| 4417241   | Control block with manometer CP-100        | bar / Mpa 0-400 | 9/16"-18 UNF | Yes           |
| 4717241   | Control block with high pressure manometer | bar / psi 0-600 | No           | No            |

## Control Block

Order No. 2014325



The 2014325 Control Block is a compact aluminum block with protective steel cover and a manometer shutoff valve. This block is intended for continuous monitoring of the gas pressure in the Hose System when the manometer shutoff valve is open. The shutoff valve can subsequently be closed in order to protect the manometer from pressure pulsations during operation, thus extending its service life. The Control Block is fitted with a manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging and a Discharge Valve for gas evacuation. The block has nine G1/4" connection ports, four on the top, four on the bottom and one on the right-hand side.

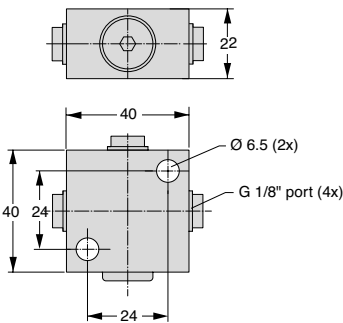


Multi-Coupling Blocks

Order No. 4017032



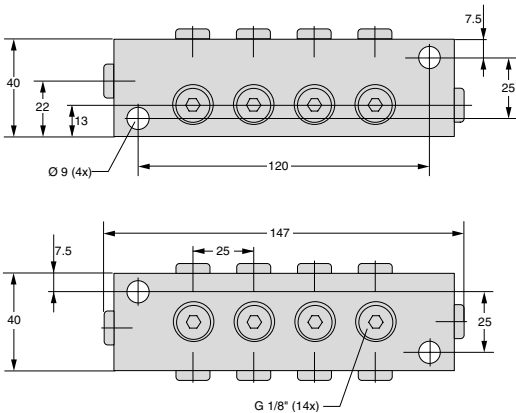
This is a small and compact block for linking hoses. The block has four G1/8" connection ports. On delivery, one of the ports is fitted with a sealing plug, while the other three ports are fitted with plastic protective covers only.



Order No. 3015044

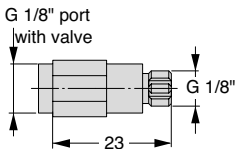


The Multi-Coupling Block 3015044 is manufactured in steel and has fourteen G1/8" connection ports. On delivery, all ports are fitted with sealing plugs.



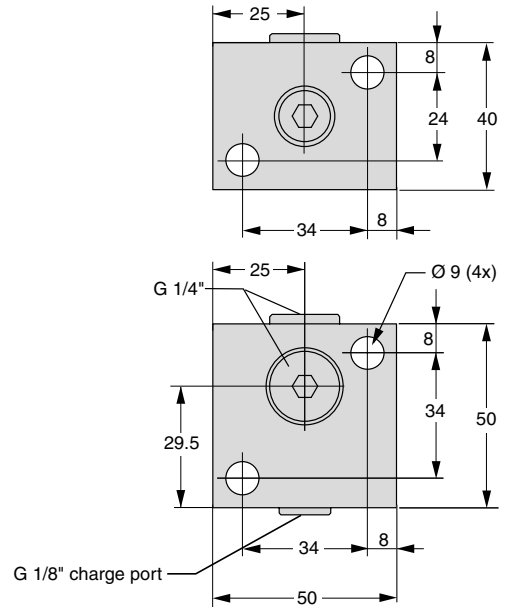
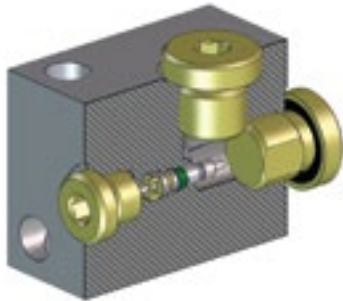
Order No. 3015303-01

This Valve Adapter is available as an accessory and can be fitted to one of the G1/8" connection ports. The adapter has the same G1/8" valve port as found on standard gas springs. The Multi-Coupling Block can then be used as a charging block to enable gas charging and evacuation using gas spring charging equipment.



# Charging Block

Order No. 3014206



The 3014206 Charging Block comes with two G1/4" connection ports and a G1/8" charge port, identical to that found on standard gas springs. The G1/8" charge port allows gas charging of the Hose System using the gas spring charging armature.

The Charging Block can also be used as a connection block if the valve is removed.

One of the G1/4" connection ports can also be used to connect a Pressure Relief Safety Screw or a Pressure Switch.



## Pressure Switch

The Pressure Switch is ideal for gas pressure control and monitoring in hoses/linked systems and can be connected to both control blocks and distribution blocks that have G1/4" connection ports.

If there is no G1/4" port available in the existing hose/tube system, an additional connection block (3022143) with suitable hose/tube has to be connected.

The Pressure Switch contains two separate set-points:

S1 - Normally Open (NO)

S2 - Normally Closed (NC)

These set-points can be easily adjusted to either make or break an electrical circuit if the system pressure should drop below or rise above the set trigger pressures.

For example:

If S1 is set to 100 bar and S2 is set to 200 bar, then S1 will make a circuit connection if the system pressure falls below 100 bar. S2 will break a circuit connection if the system pressure rises above 200 bar. The set-points can be used simultaneously or individually depending what system pressures require monitoring.



## Electronic Pressure Switch

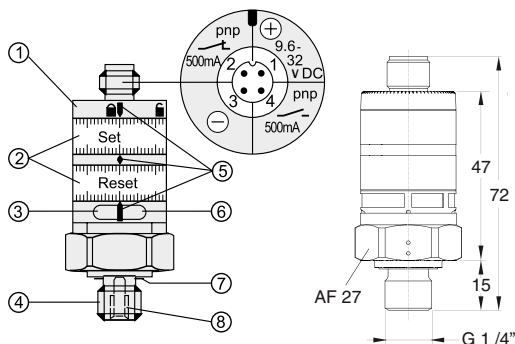
**Order No. 504320**

The electronic pressure switch has a very compact construction and allows for the control and monitoring of two pressure limits. It is recommended to use this switch when it is necessary to stop the process if the pressure in the gas spring is lower or higher than the decided values.

**Note!** The unit must be connected by a suitably qualified electrician. The national and international regulations for the installation of electrical equipment must be observed.

### Electronic Pressure Switch data:

|                       |               |
|-----------------------|---------------|
| Electrical connection | M12x1 (4-pin) |
| Pressure connection   | G1/4"         |
| Protection class      | IP67          |
| Working range         | 0 - 400 bar   |
| Max. pressure         | 600 bar       |
| Burst pressure        | 1,600 bar     |
| Voltage               | 9.6 - 32 VDC  |
| Switching current     | 500 mA        |
| Switching frequency   | 100 Hz        |
| Current consumption   | ≤ 25 mA       |
| Temperature range     | 25 to +80 °C  |
| Weight                | 100 g         |
| Max. deviation        | ≤ ±2.5 %      |



1. Locking ring
  2. Setting rings (manually adjustable after unlocking)
  3. Green LED: supply voltage O.K.
  4. Process connection G $\frac{1}{4}$  A; tightening torque 25 Nm
  5. Setting marks
  6. Yellow LED: set value reached, OUT1 = ON / OUT2 = OFF
  7. Sealing FPM / DIN 3869-14
  8. Internal thread M5
- Minimum distance between Set and Reset = 2% of the final value of the measuring range.
  - To obtain the setting accuracy: Set the rings to the minimum value, then set the requested value.

# Digital Pressure Switch Monitor

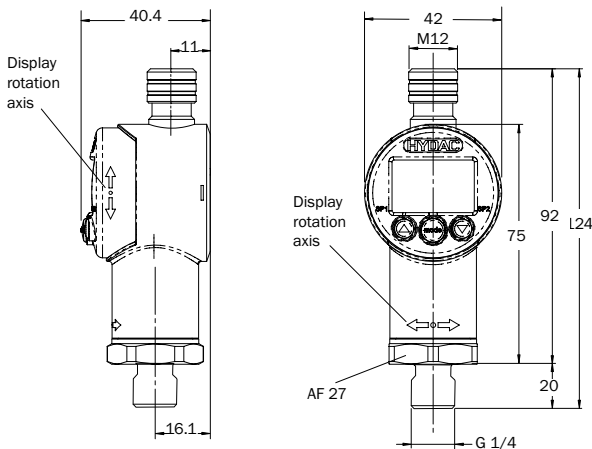
## Order No. 504107

The Digital Pressure Switch has a very compact construction and allows for the control and monitoring of two pressure limits. It is recommended to use this switch when it is necessary to stop the process if the pressure in the gas spring is lower or higher than the decided values.

The Digital Pressure Switch is equipped with a 4 digit digital display which can show the pressure in either bar, PSI or MPa. The display can also be rotated in two axis excluding the need for a swivel adapter to get the display in the direction desired. The switch has two switching outputs that are easily programmed by the keys on the front. Pressure working range is 0 up to 400 bar.

### Digital Pressure Switch data:

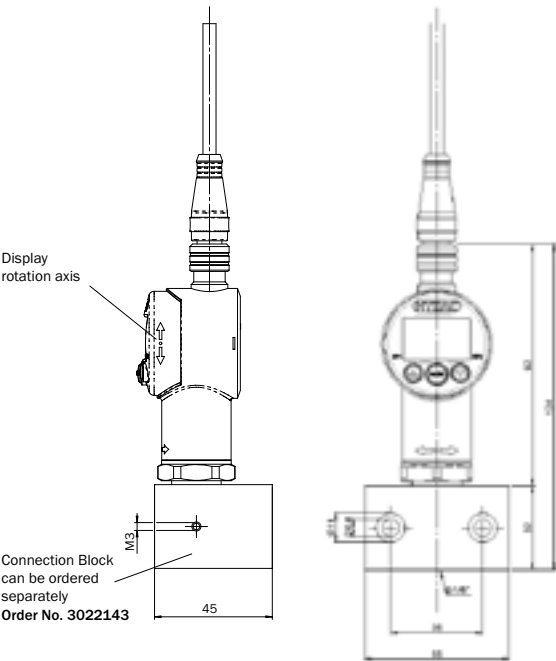
|                             |                                           |
|-----------------------------|-------------------------------------------|
| Set-points .....            | 2 PNP transistor switching outputs        |
| Electrical connection ..... | M12x1 (4-pin)                             |
| Pressure connection .....   | G1/4"                                     |
| Protection class .....      | IP67                                      |
| Working range .....         | 0 - 400 bar                               |
| Max. pressure .....         | 800 bar                                   |
| Burst pressure .....        | 2000 bar                                  |
| Voltage .....               | 9 - 35 VDC                                |
| Switching current .....     | max. 1.2 A                                |
| Current consumption .....   | ≤ 35 mA (inactive switching outputs)      |
| Temperature range .....     | -25 to +80 °C                             |
| Weight .....                | 120 g                                     |
| Max. deviation .....        | ≤ ±1 % (relative to full measuring range) |



**Note!** The unit must be connected by a suitably qualified electrician. The national and international regulations for the installation of electrical equipment must be observed.

Digital monitoring kit

In accordance with GM standard 90.25.225, a Digital Monitoring Kit is available, supplied with a block (3022143) and a 5 m cable with a straight or 90° angled cable contact.



| Order No. | Pressure (Bar) | Type of cable contact |
|-----------|----------------|-----------------------|
| 3021172   | 0-400          | Straight              |
| 3221172   | 0-400          | Angled 90°            |



1. + Current feed 9 - 35 VDC

2. Set-point 1

3. - Current feed (0V)

4. Set-point 2
- Brown

White

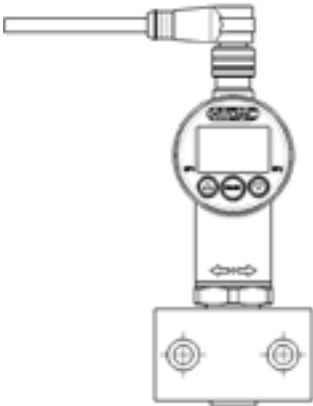
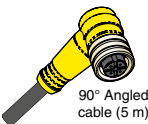
Blue

Black

Cable (5 m) with straight cable contact  
**Order No. 504105**



Cable (5 m) with 90° angled cable contact  
**Order No. 504161**



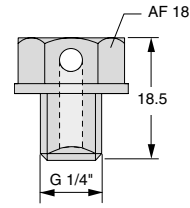
## Pressure Relief Safety Screw

### Order No. 502179

The G1/4" Pressure Relief Safety Screw can be attached to a Hose System to protect hoses and system components from excessively high gas pressures.

The static rupture pressure is 360 bar  $\pm 5\%$  at +20°C, and to achieve maximum service life, the screw should not be exposed to dynamic pressure pulsations exceeding 275 bar.

Note: The G1/4" Pressure Relief Safety Screw is not recommended for Hose Systems where initial gas charging pressure at 20°C exceeds 150 bar.





|                                             | Page           |
|---------------------------------------------|----------------|
| <b>Micro E024™ Hose and Tube System</b>     | <b>page 44</b> |
| <b>Micro E024™ Hose</b>                     | <b>page 45</b> |
| <b>Micro E024™ Tube</b>                     | <b>page 46</b> |
| <b>Adapters for Gas Spring Charge Ports</b> | <b>page 47</b> |
| <b>Micro E024™ Control Block</b>            | <b>page 52</b> |

### Micro E024™ Hose and Tube System

The Micro E024™ Hose and Tube System is our most compact, soft sealed gas link system. It is a flexible system, including both a dual seal hose system and a soft sealed tube system using the same adapters.



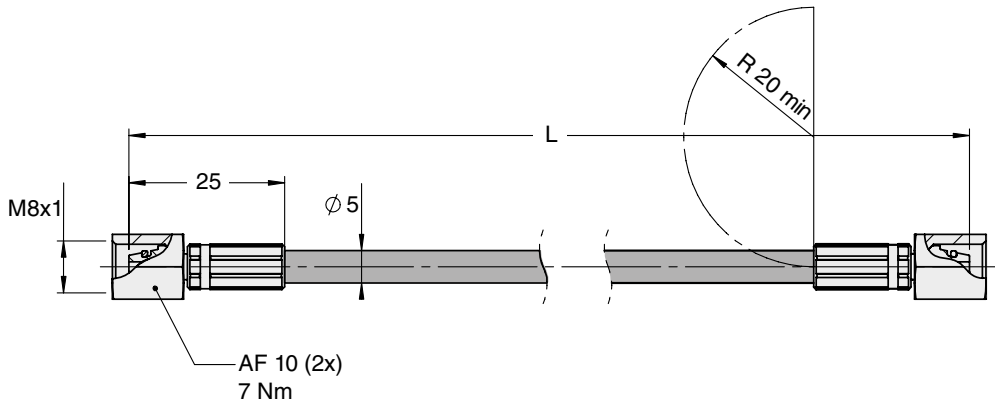
*Micro E024™ Hose and Tube can now be combined in the same gas link system.*

## Micro E024™ Hose

The Micro E024™ Hose is a Dual Seal System and our most compact hose system available and takes full benefit of the two integrated metal and soft sealing systems. This ensures double leak proof joints as well as rotational protection.



The Hose System shares the same adapters and connectors as the Micro E024™ Tube System, resulting in a wide range of flexible installation possibilities. G1/8" and G1/4" ports can also be connected to the Micro E024™ with the use of an appropriate adapter. A number of different standard hose lengths are available (see table below). Custom hose lengths can also be ordered from **100 mm upwards**. Subsequent numbers are added to the order number according to the length required, e.g. hose length 2,500 mm = Order No. 4023500-2500.



### Basic Information

Material ..... Polyamide, black  
 Dimension ..... Ø 5 mm exterior (5/64)  
 Volume ..... 3 ml/metre  
 Outer casing ..... Perforated  
 Min. bend radius ..... 20 mm  
 Max dynamic working pressure ..... 475 bar  
 Min. burst pressure ..... 1900 bar at +20° C  
 Operating temperature ..... -20 - +80° C



Micro/EZ Hose Clip, **Order No. 502646**  
 (Can be used to secure hoses using an M5 screw)

| Order No     | L (mm)* |
|--------------|---------|
| 4023500-0100 | 100     |
| 4023500-0200 | 200     |
| 4023500-0300 | 300     |
| 4023500-0400 | 400     |
| 4023500-0630 | 630     |
| 4023500-0800 | 800     |
| 4023500-1000 | 1000    |
| 4023500-1500 | 1500    |
| 4023500-2000 | 2000    |
| 4023500-XXXX | XXXX**  |

\*\*For customer specified lengths.

\* Minimum recommended L = 75 mm

## Micro EO24™ Tube

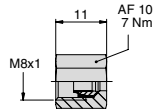
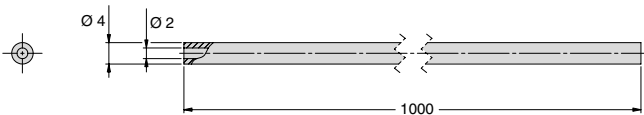
The Micro EO24™ Tube is a system for linking gas springs together. As the name suggests, Micro EO24™ Tube is a tube system where all connections are soft sealed and self-crimping. This ensures leak-proof tube joints. The tubes are easily cut into correct lengths and can be bent into the desired radius with a tube bending tool or even by hand. There are numerous options for connecting tubes to gas springs and Control Blocks. Various adapters are available allowing the Micro EO24™ Tube to connect to almost all KALLER gas springs and Control Blocks. All adapters and their dimensions are presented on the following pages.

Steel Tube  
(supplied in 1 m lengths)  
**Order No. 504594**

Micro/EZ Hose clip,  
**Order No. 502646**  
(Can be used to secure  
hoses using an M5 screw)



Functional nut  
**Order No. 504589**



## Using Micro EO24™ Tube

To cut the tube, a hacksaw can be used.

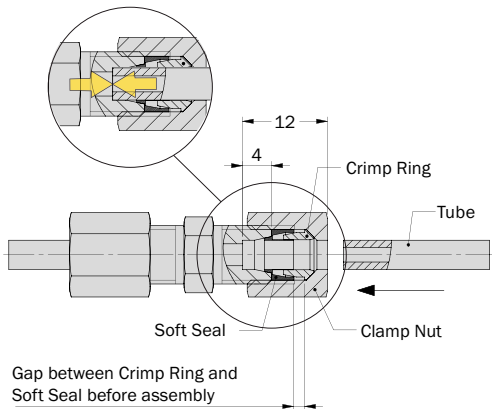
**Note:** Cutting angle  $90^\circ \pm 1^\circ$ . If a regular tube cutter or cutting pliers are used, the tube might become clogged resulting in zero or limited gas flow. After cutting, de-burr the tube both inside and outside (max.  $0.3 \times 45^\circ$  or R0.3) using the Tube De-burring Tool below. Make sure the tube is cleaned after cutting and de-burring. Use compressed air to remove all loose particles. Fit the clamp nut onto the adapter.

## Basic Information

Tube external diameter .....Ø 4 mm  
Tube internal diameter .....Ø 2 mm  
Min. bend radius .....12 mm (3 x e.d.)  
Tube material .....Seamless steel tube St. 37.4  
(Parker Order No. R04X1CF)  
Max. dynamic pressure (system) .....430 bar  
Min. burst pressure (system) .....1100 bar  
Max. working temperature .....100 °C \*  
Tube min. recommended length .....75 mm

\* Micro EO24™ Tube for high temperature applications is available on request.

**Note:** Do not tighten! Run the tube through the nut until it stops (~12 mm from the top surface of the nut). When tightening the nut, use a torque of 7 Nm. Recommended tools to have available: hacksaw, tube cutting fixture, tube bending tool, de-burring tool, compressed air and a torque wrench (AF 10 mm, 7 Nm).



Tube De-burring Tool  
**Order No. 505096**



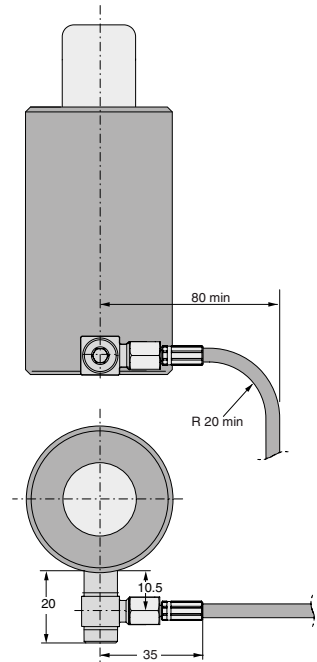
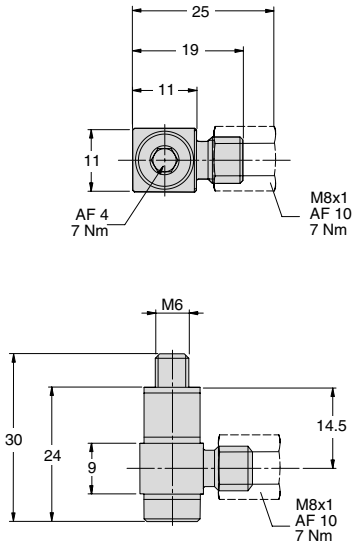
Tube Bending Tool (bend radius 20 mm)  
**Order No. 504711**

# Adapters for Gas Spring Charge Ports

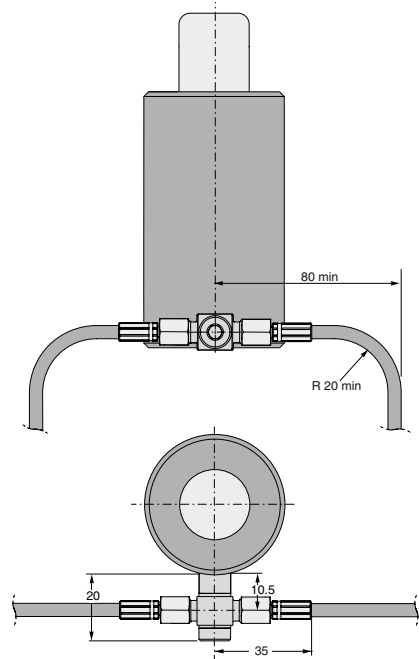
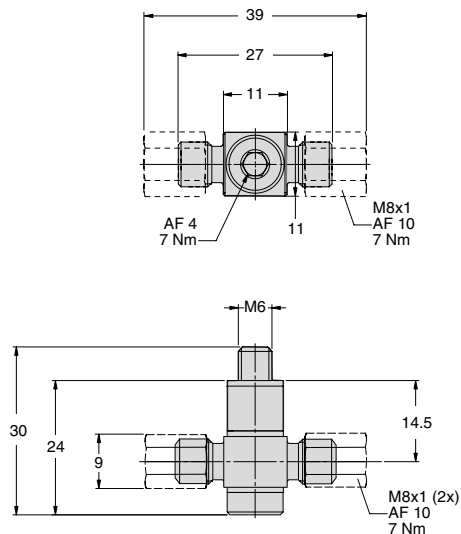
Following adapters are used to connect Micro E024™ hoses and tubes to gas springs with M6 charging port:  
Using G1/8 adapters the M6 adapters can be connected (retrofitted) to springs with G 1/8 ports. All gas springs charge ports adapters fit into our standard mounts.

**Note! When using tubes, please order Functional nut No. 504589 separately.**

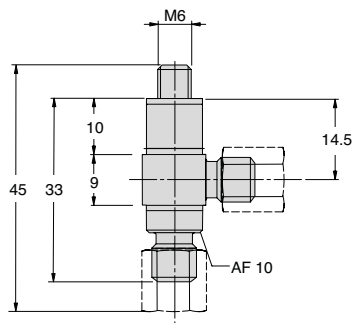
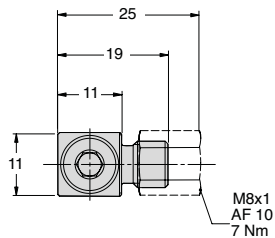
Banjo Elbow M6 **Order No. 4022059**



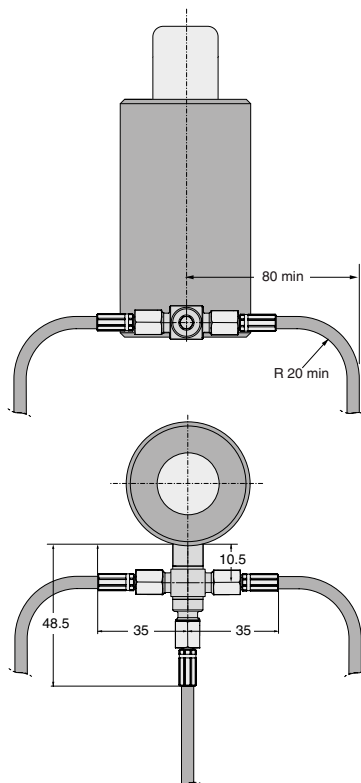
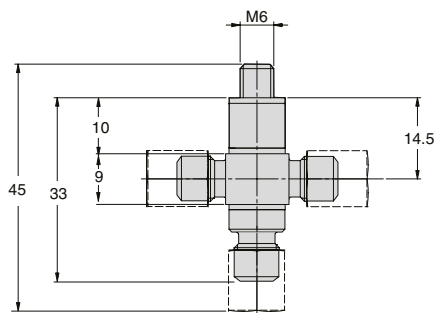
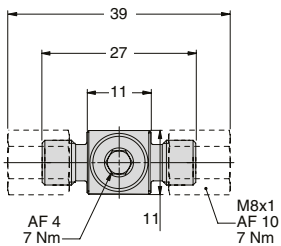
Banjo Tee M6 **Order No. 4022061**



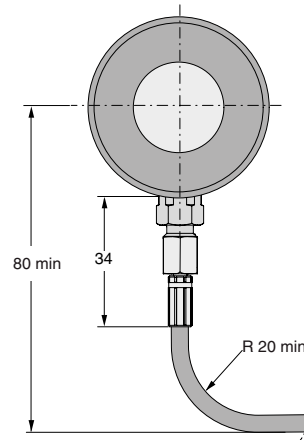
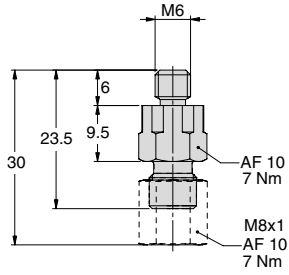
Banjo Run Elbow M6 **Order No. 4024092**



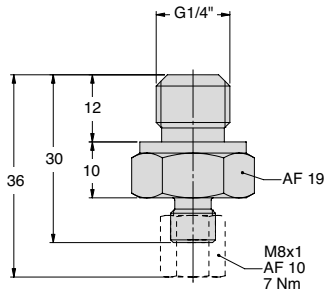
Banjo Run Tee M6 **Order No. 4024348**



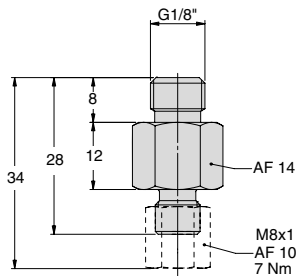
Straight Adapter M6 **Order No. 4022057**



Straight Adapter G1/4" **Order No. 4022063**



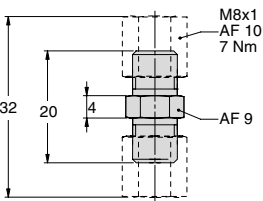
Straight Adapter G1/8" **Order No. 4022058**



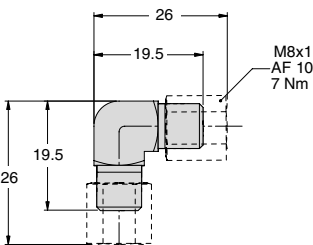
Hose to Hose, Tube to Tube or Hose to Tube Couplings

Note! When using tubes, order Functional nut No. 504589 separately.

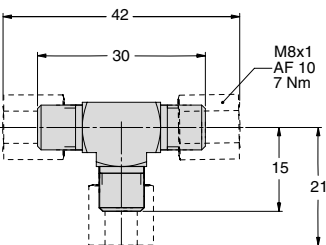
Union Straight **Order No. 504590**



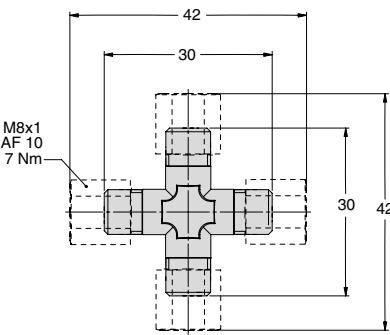
Union Elbow **Order No. 504591**



Union Tee **Order No. 504592**

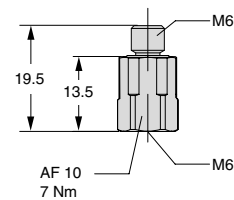


Union Cross **Order No. 504593**

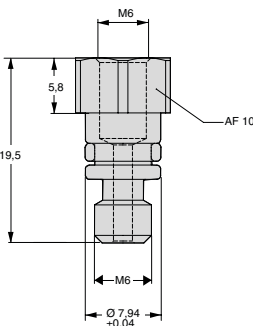


M6 charge port to Micro E024™ Hose and Tube Adapters

Male/Female Connector M6  
**Order No. 503762**  
Extension for gas springs using foot mounts



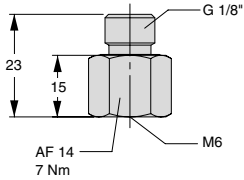
Male/Female Connector M6/M6 for CU4 1000  
**Order No. 4027146**



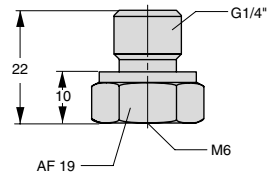
## Micro E024™ Hose and Tube Adapters for G1/8" and G1/4" Connection Ports

**Note!** When using tubes, order Functional nut No. 504589 separately.

Thread Reducer G 1/8" to M6 **Order No. 503764**



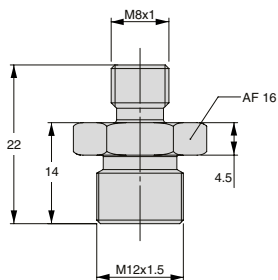
Thread Reducer G 1/4" to M6 **Order No. 503966**



For connection to angled Micro E024™ Hose Adapters

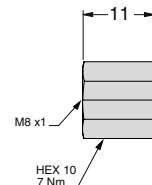
## Micro E024™ Hose and Tube Adapter for E024 M12 hose

Male Stud Connector M8 to M12  
**Order No. 4024351**



## Micro E024™ Cap/Plug

**Order No. 4024353**



Micro EO24™ Control Block

Order No. 3023888 (without Safety plug)

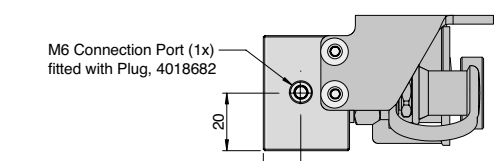
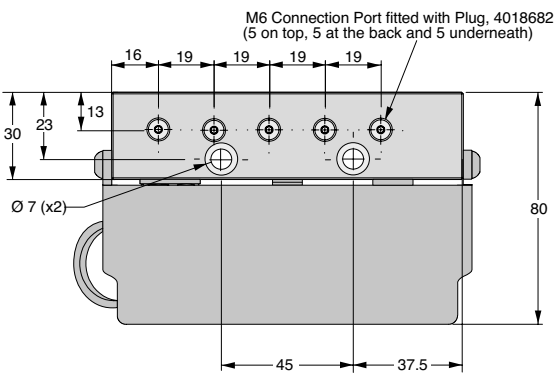
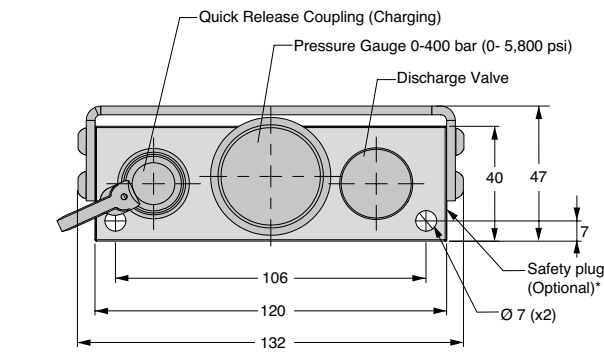
Order No. 3123888 (with Safety plug)

The Micro EO24™ Control Block is a very compact block with protective stainless steel cover specially designed for the Micro EO24™ System.  
This block is intended for continuous monitoring of the gas pressure in the Hose and Tube System.  
It is fitted with a manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging and a Discharge Valve for gas evacuation.  
The block has sixteen M6 connection ports, which are plugged upon delivery, and it is available in two versions:

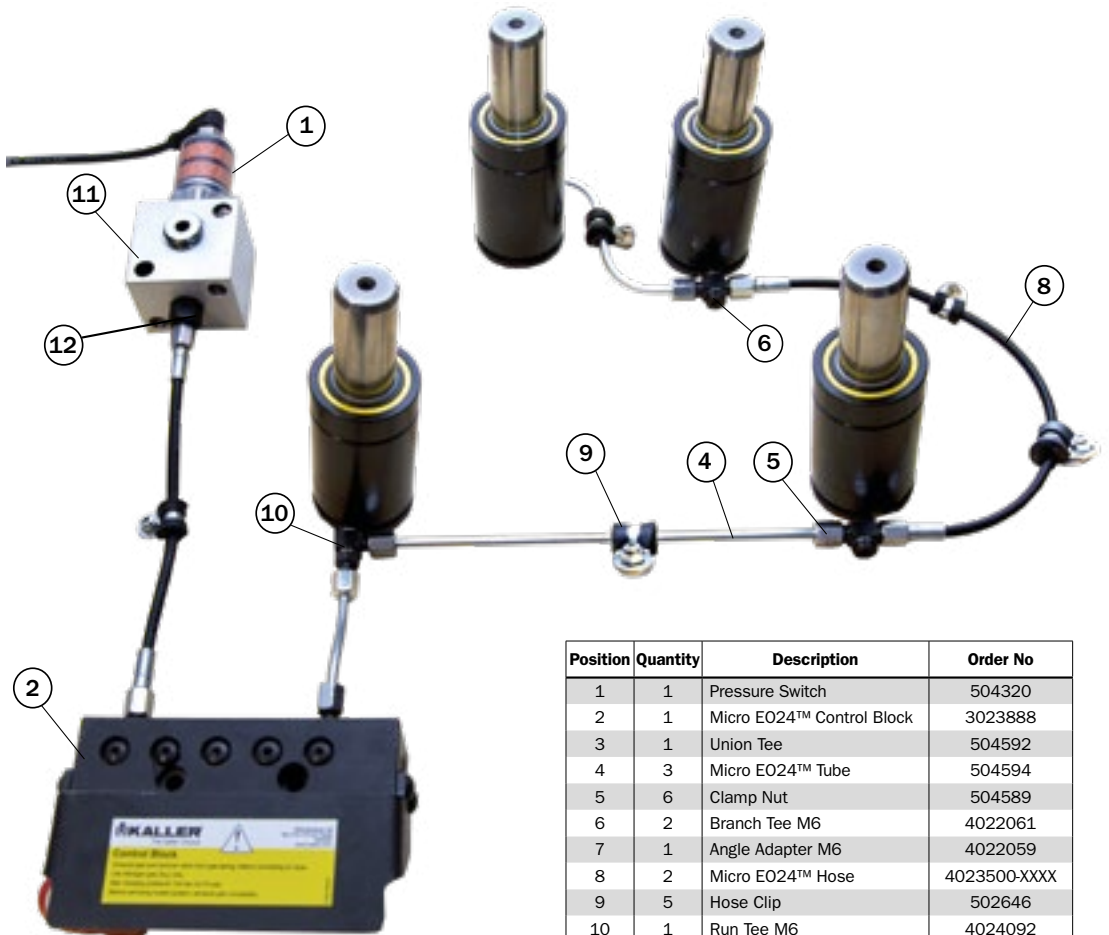
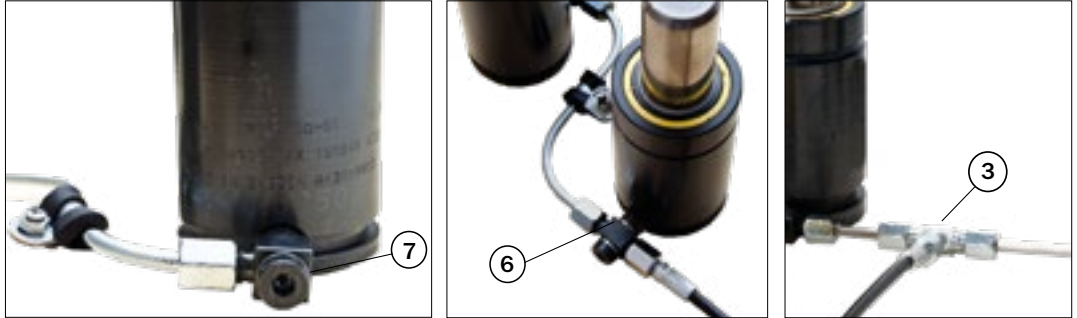
3023888 (without Safety plug)

3123888 (with Safety plug\*)

\* Please note that Safety plug are not recommended where the initial gas charging pressure at 20°C exceeds 150 bar.



## Micro E024™ Hose and Tube System, installation example



| Position | Quantity | Description               | Order No     |
|----------|----------|---------------------------|--------------|
| 1        | 1        | Pressure Switch           | 504320       |
| 2        | 1        | Micro E024™ Control Block | 3023888      |
| 3        | 1        | Union Tee                 | 504592       |
| 4        | 3        | Micro E024™ Tube          | 504594       |
| 5        | 6        | Clamp Nut                 | 504589       |
| 6        | 2        | Branch Tee M6             | 4022061      |
| 7        | 1        | Angle Adapter M6          | 4022059      |
| 8        | 2        | Micro E024™ Hose          | 4023500-XXXX |
| 9        | 5        | Hose Clip                 | 502646       |
| 10       | 1        | Run Tee M6                | 4024092      |
| 11       | 1        | Charging Block            | 3014206      |
| 12       | 1        | Straight Adapter G 1 / 8" | 4022058      |



|                                             | <b>Page</b>    |
|---------------------------------------------|----------------|
| <b>EZ Hose System</b>                       | <b>page 56</b> |
| <b>EZ Hose Adapters</b>                     | <b>page 57</b> |
| <b>Installation Example, EZ Hose System</b> | <b>page 62</b> |

EZ Hose System

The EZ Hose System is our most popular Hose System. It is a very compact and versatile O-ring sealed Hose System that allows connections to be tightened by hand. G1/8" and G1/4" connection ports can be connected to the EZ Hose System with the use of an appropriate adapter.

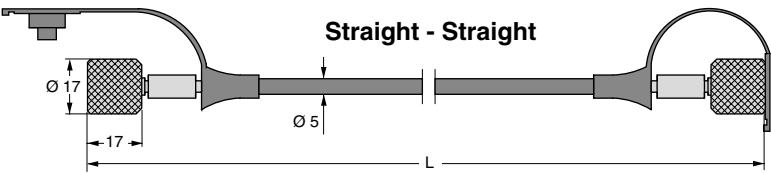
A number of different standard hose lengths are available (see table below). Custom hose lengths can also be ordered from 150 mm upwards. Subsequent numbers are added to the order number according to the length required, e.g. hose length 2,500 mm = Order No. 4014974-2500.

Min. bend radius .....20 mm  
Temp. range .....-20 to + 80°C  
Rupture pressure ..... 2,000 bar  
Max. dynamic working pressure ..... 500 bar



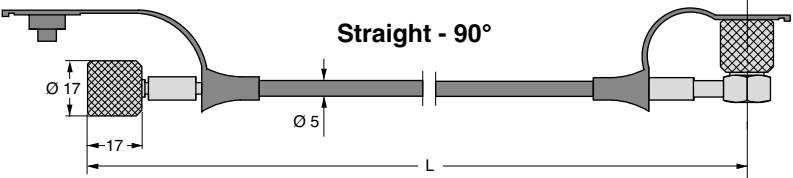
Micro/EZ Hose clip, **Order No. 502646**  
(Can be used to secure hoses using an M5 screw.)

Order No. 4014974-XXXX



| Order No.      | L (mm)* |
|----------------|---------|
| 4014974-0200   | 200     |
| 4014974-0300   | 300     |
| 4014974-0400   | 400     |
| 4014974-0630   | 630     |
| 4014974-0800   | 800     |
| 4014974-1000   | 1000    |
| 4014974-1500   | 1500    |
| 4014974-2000   | 2000    |
| 4014974-XXXX** | XXXX    |

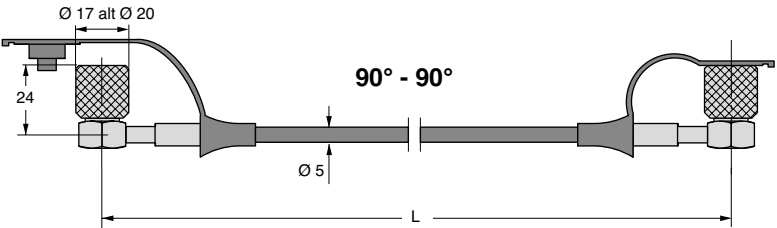
Order No. 4017568-XXXX



| Order No.      | L (mm)* |
|----------------|---------|
| 4017568-0200   | 200     |
| 4017568-0300   | 300     |
| 4017568-0400   | 400     |
| 4017568-0630   | 630     |
| 4017568-0800   | 800     |
| 4017568-1000   | 1000    |
| 4017568-1500   | 1500    |
| 4017568-2000   | 2000    |
| 4017568-XXXX** | XXXX    |

Order No. 4117568-XXXX

(To avoid twisting the hose, we recommend hose **4017568-XXXX** together with angle adapter.)

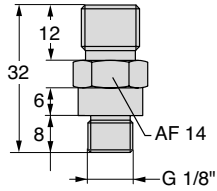


| Order No.      | L (mm)* |
|----------------|---------|
| 4117568-0200   | 200     |
| 4117568-0300   | 300     |
| 4117568-0400   | 400     |
| 4117568-0630   | 630     |
| 4117568-0800   | 800     |
| 4117568-1000   | 1000    |
| 4117568-1500   | 1500    |
| 4117568-2000   | 2000    |
| 4117568-XXXX** | XXXX    |

\* Minimum recommended L=75  
\*\* For customer specified lengths.

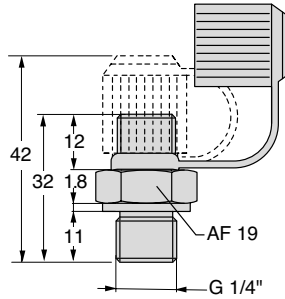
## EZ Hose Adapters

Hose adapters are available with three different connecting threads:



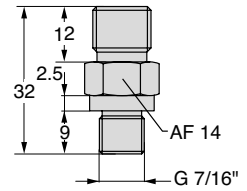
G 1/8" without non-return valve to be used for gas springs, multicoupling blocks and control blocks.

**Order No. 4114973-G1/8**



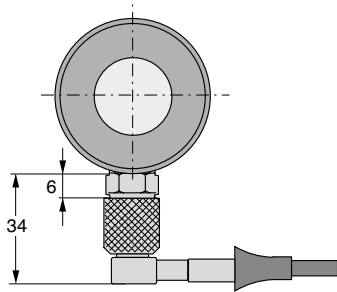
G 1/4" with non-return valve to be used only for control blocks.

**Order No. 4014973-G1/4**

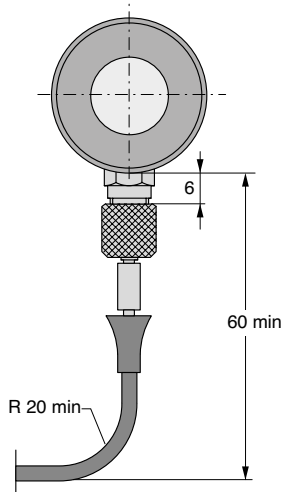


G 7/16-20 without non-return valve to be used only for gas springs with 7/16-20 port.

**Order No. 4114973-7/16-20**

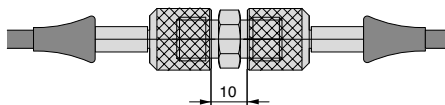
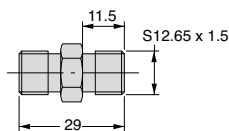


Installation dimensions for hose adapter, with straight and 90° hose



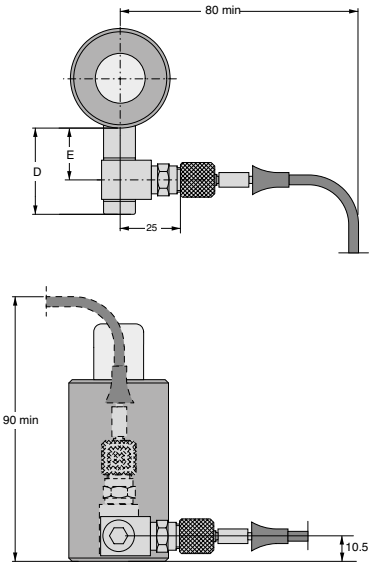
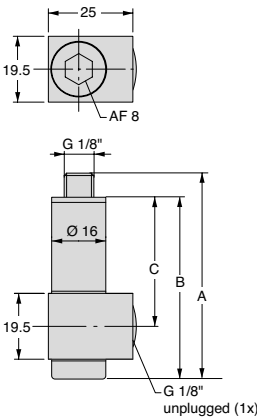
## Joining Coupling

**Coupling for joining of EZ Hoses, Order No. 503674.**



Angle Adapter

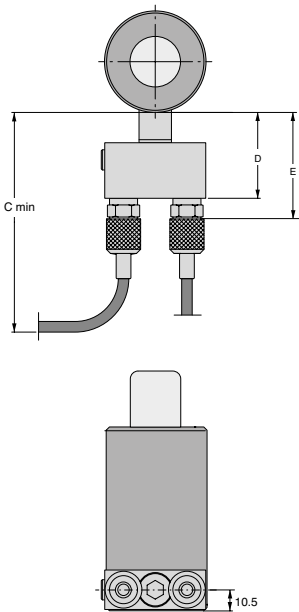
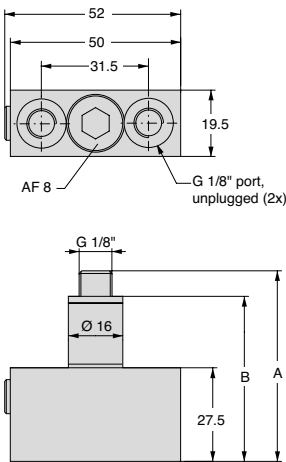
Order No. 4016050-XX



| Order No   | A  | B    | C  | D    | E  | Suitable together with mounts                       |
|------------|----|------|----|------|----|-----------------------------------------------------|
| 4016050-01 | 40 | 32,5 | 17 | 26   | 11 | All applicable mounts, except those mentioned below |
| 4016050-02 | 54 | 46.5 | 31 | 40.5 | 25 | FFC 500, 750, 1500, 3000 + K                        |
| 4016050-03 | 61 | 53.5 | 38 | 47.5 | 32 | FFC 5000, 7500, 10000 + K                           |

Front Adapter

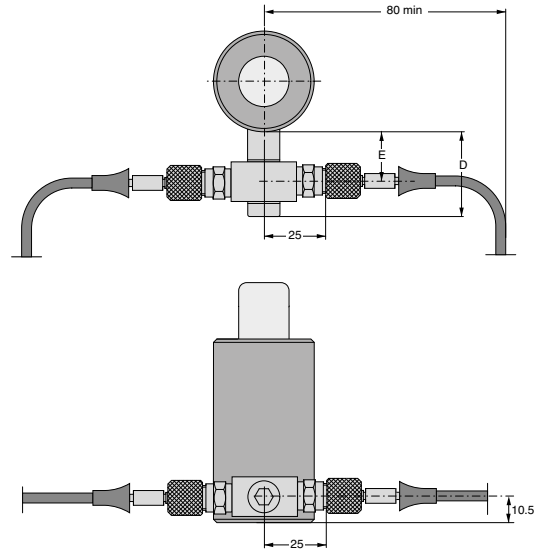
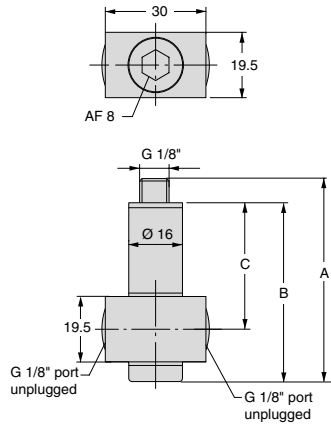
Order No. 4017314-XX



| Order No   | A  | B    | C   | D    | E  | Suitable together with mounts                       |
|------------|----|------|-----|------|----|-----------------------------------------------------|
| 4017314-01 | 42 | 34.5 | 95  | 28.5 | 40 | All applicable mounts, except those mentioned below |
| 4017314-02 | 56 | 48.5 | 110 | 42.5 | 54 | FFC 500, 750, 1500, 3000 + K                        |
| 4017314-03 | 63 | 55.5 | 115 | 49.5 | 61 | FFC 5000, 7500, 10000 + K                           |

## Two-way Adapter

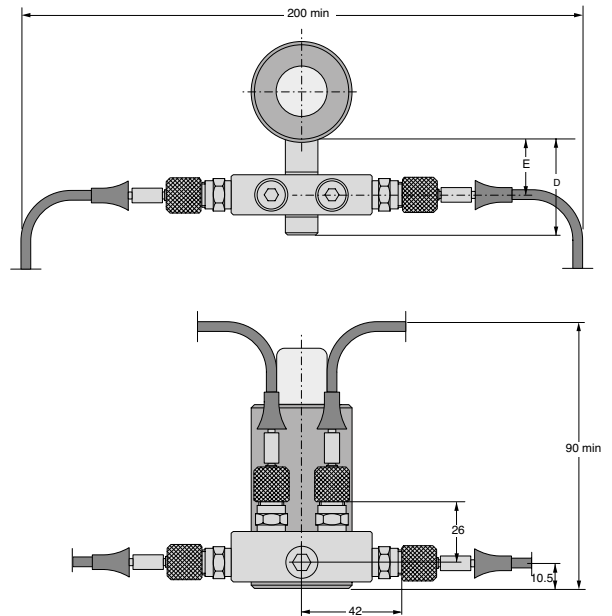
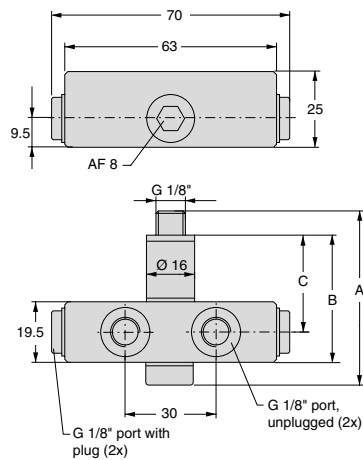
Order No. 4016051-XX



| Order No   | A  | B    | C  | D    | E  | Suitable together with mounts                      |
|------------|----|------|----|------|----|----------------------------------------------------|
| 4016051-01 | 40 | 32.5 | 17 | 26.5 | 11 | All applicable mounts except those mentioned below |
| 4016051-02 | 54 | 46.5 | 31 | 40.5 | 25 | FFC 500, 750, 1500, 3000 + K                       |
| 4016051-03 | 61 | 53.5 | 38 | 47.5 | 32 | FFC 5000, 7500, 10000 + K                          |

## Four-way Adapter

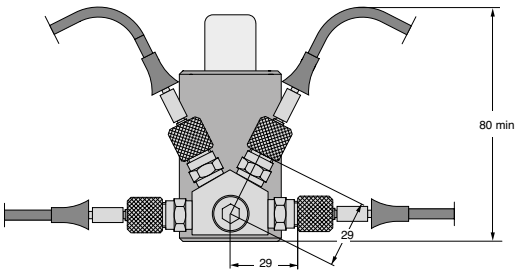
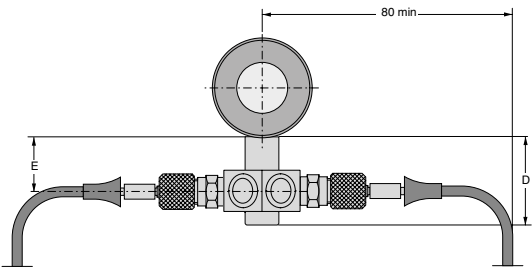
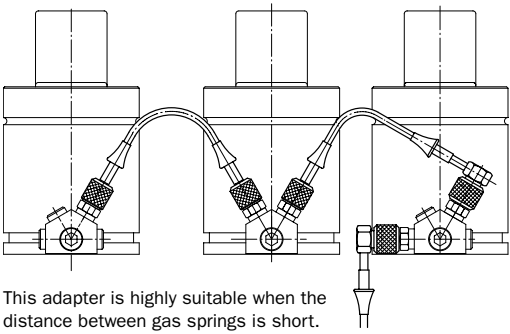
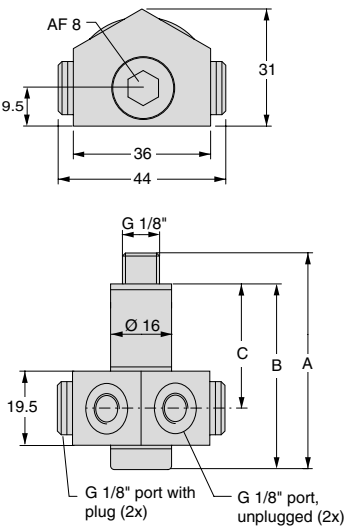
Order No. 4015035-XX



| Order No.  | A  | B    | C  | D    | E  | Suitable together with Mounts                       |
|------------|----|------|----|------|----|-----------------------------------------------------|
| 4015035-01 | 40 | 32.5 | 17 | 26.5 | 11 | All applicable mounts, except those mentioned below |
| 4015035-02 | 54 | 46.5 | 31 | 40.5 | 25 | FFC 500, 750, 1500, 3000 + K                        |
| 4015035-03 | 61 | 53.5 | 38 | 47.5 | 32 | FFC 5000, 7500, 10000 + K                           |

Multi-way Adapter

Order No. 3017191-XX

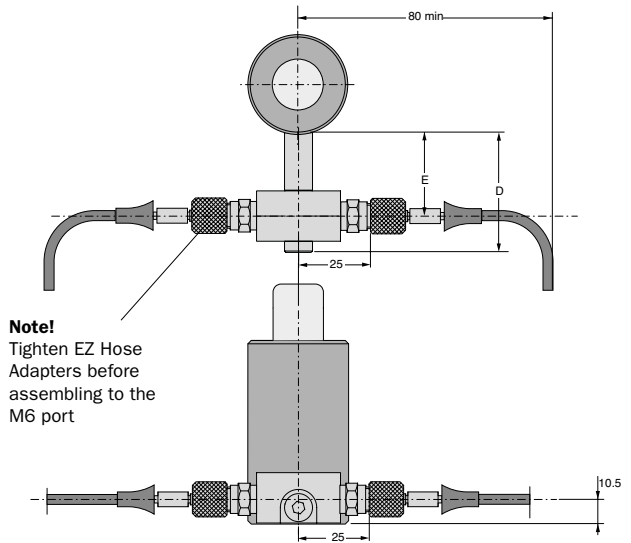
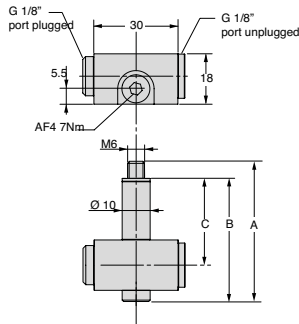


| Order No   | A  | B    | C  | D    | E  | Suitable together with mounts                       |
|------------|----|------|----|------|----|-----------------------------------------------------|
| 3017191-01 | 40 | 32.5 | 17 | 26.5 | 11 | All applicable mounts, except those mentioned below |
| 3017191-02 | 54 | 45.5 | 31 | 40.5 | 25 | FFC 500, 750, 1500, 3000 + K                        |
| 3017191-03 | 61 | 53.5 | 38 | 47.5 | 32 | FFC 5000, 7500, 10000 + K                           |

## Two-way Adapter for gas springs with M6 port

Order No. 4023519

Order No. 4023506

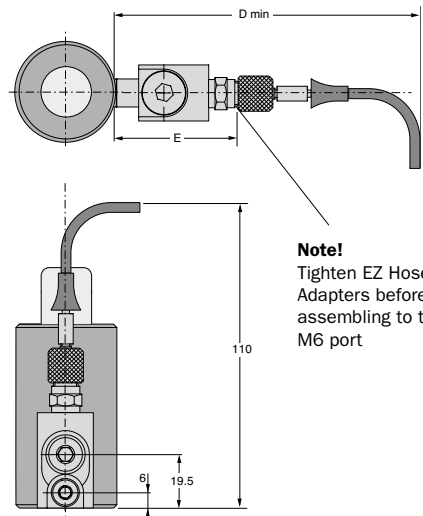
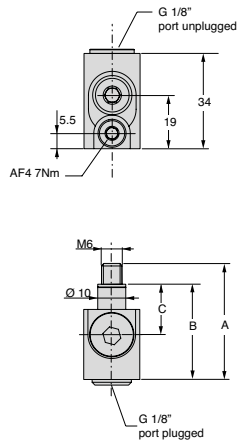


| Order No | A  | B  | C  | D    | E    | Suitable together with mounts                       |
|----------|----|----|----|------|------|-----------------------------------------------------|
| 4023519  | 36 | 30 | 17 | 25.5 | 12.5 | All applicable mounts, except those mentioned below |
| 4023506  | 49 | 44 | 31 | 39.5 | 26.5 | FFC 500, 750, 1500 + K                              |

## Angle Adapter for gas springs with M6 ports

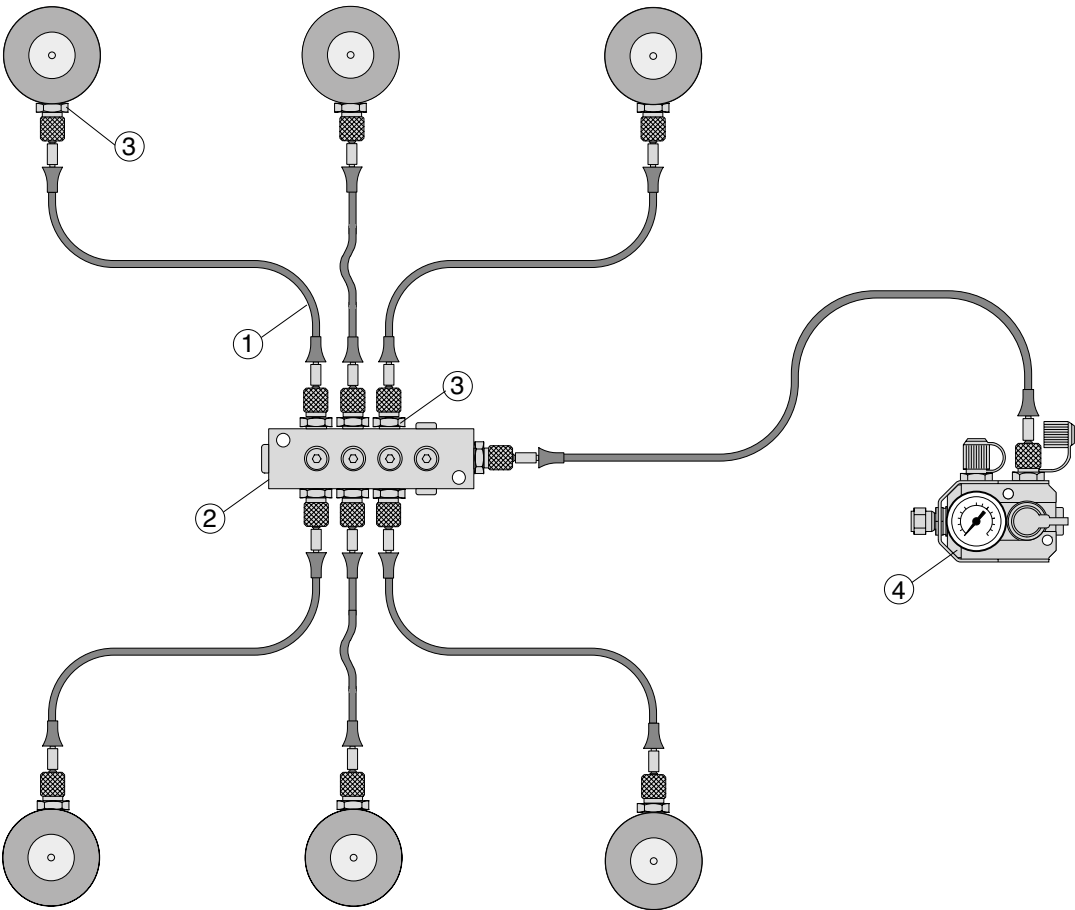
Order No. 4023520

Order No. 4023518



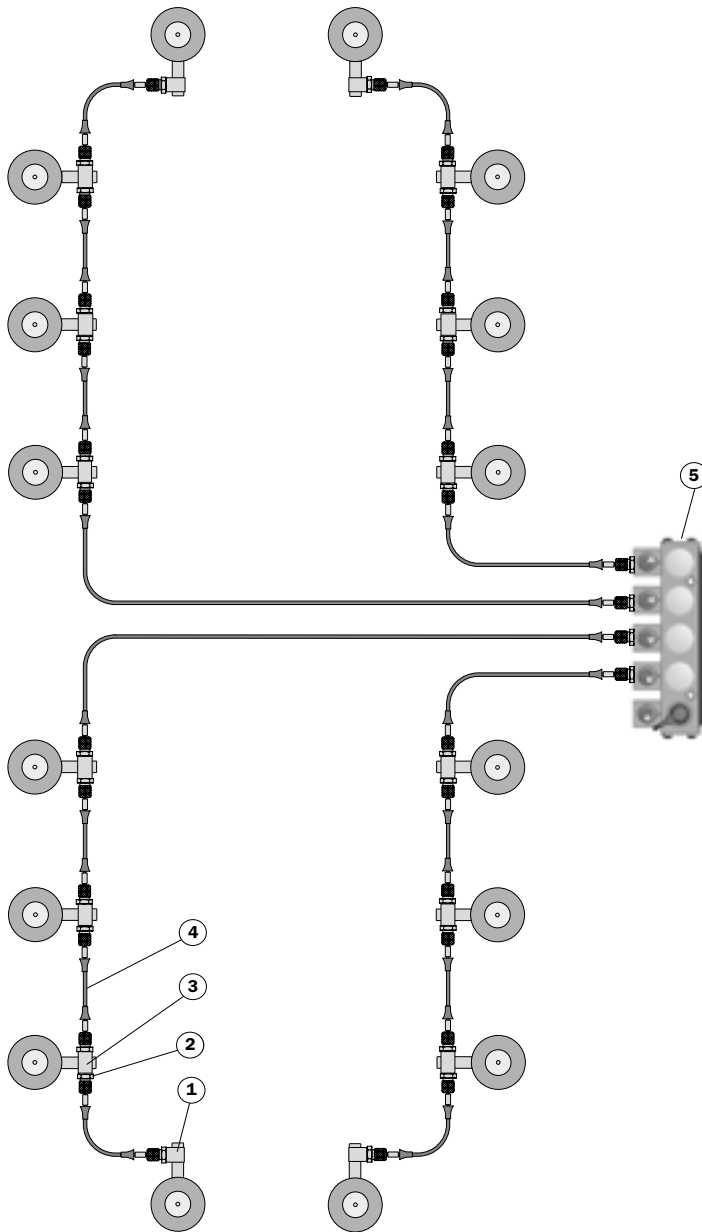
| Order No | A  | B  | C  | D   | E  | Suitable together with mounts                       |
|----------|----|----|----|-----|----|-----------------------------------------------------|
| 4023520  | 39 | 34 | 18 | 110 | 45 | All applicable mounts, except those mentioned below |
| 4023518  | 51 | 46 | 30 | 120 | 57 | FFC 500, 750, 1500 + K                              |

Installation Examples, EZ Hose System



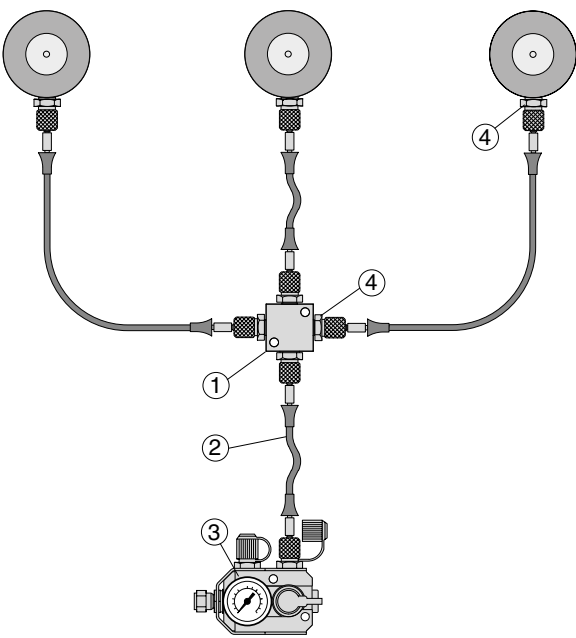
| Position | Quantity | Description           | Order No     |
|----------|----------|-----------------------|--------------|
| 1        | 7        | EZ Hose               | 4014974-XXXX |
| 2        | 1        | Multi-Coupling Block  | 3015044      |
| 3        | 13       | G1/8" EZ Hose Adapter | 4114973-G1/8 |
| 4        | 1        | Control Block         | 3116114-01   |

# Installation Examples, EZ Hose system



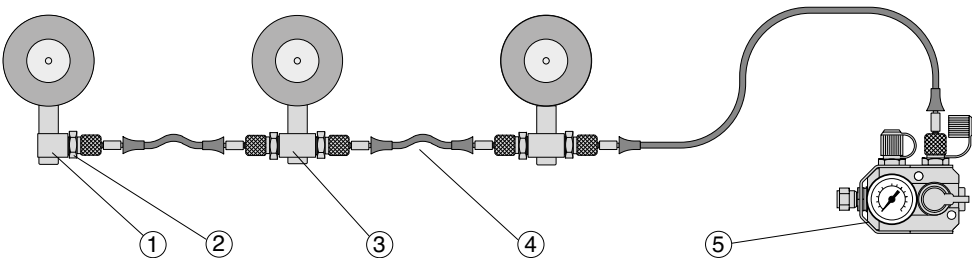
| Position | Quantity | Description           | Order No     |
|----------|----------|-----------------------|--------------|
| 1        | 4        | Angle Adapter         | 4016050-xx   |
| 2        | 32       | G1/8" EZ Hose Adapter | 4114973-G1/8 |
| 3        | 12       | Two-way Adapter       | 4016051-xx   |
| 4        | 16       | EZ Hose               | 4014974-xxxx |
| 5        | 1        | Multi Control Block   | 2022677-04   |

Installation Examples, EZ Hose system



| Position | Quantity | Description           | Order No.    |
|----------|----------|-----------------------|--------------|
| 1        | 1        | Multi-Coupling Block  | 4017032      |
| 2        | 4        | EZ Hose               | 4014974-XXXX |
| 3        | 1        | Control Block         | 3116114-01   |
| 4        | 7        | G1/8" EZ Hose Adapter | 4114973-G1/8 |

Installation Examples, EZ Hose system



| Position | Quantity | Description           | Order No.    |
|----------|----------|-----------------------|--------------|
| 1        | 1        | Angle Adapter         | 4016050-xx   |
| 2        | 5        | G1/8" EZ Hose Adapter | 4114973-G1/8 |
| 3        | 2        | Two-way Adapter       | 4016051-xx   |
| 4        | 3        | EZ Hose               | 4014974-xxxx |
| 5        | 1        | Control Block         | 3116114-01   |

|                                               | <b>Page</b>    |
|-----------------------------------------------|----------------|
| <b>E024 Hose System</b>                       | <b>page 66</b> |
| <b>E024 Tube</b>                              | <b>page 68</b> |
| <b>E024 Adapters</b>                          | <b>page 70</b> |
| <b>Installation Example, E024 Hose System</b> | <b>page 72</b> |

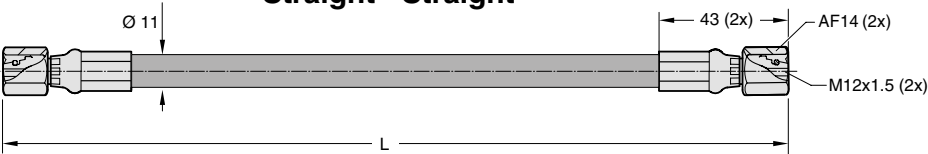
# E024 Hose System

The E024 Hose System is our largest Hose System available. G1/8" and G1/4" connection ports can be connected to the E024 Hose System with the use of an appropriate adapter.  
Custom hose lengths can be ordered **from 120 mm upwards**. Subsequent numbers are added to the order number according to the length required, e.g. hose length 2500 mm = Order No. 3X20857-2500.  
E024 Hose and E024 Hose Couplings for crimping are also sold separately; for information on hose crimping, see Hose Crimping equipment on page page 83.



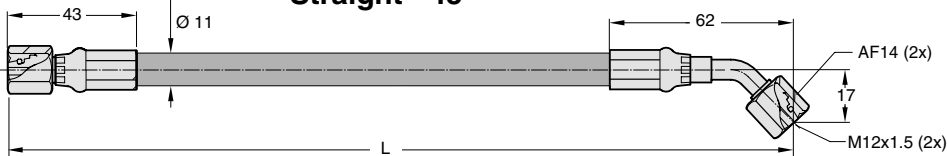
Order No. 3020857-XXXX

## Straight - Straight



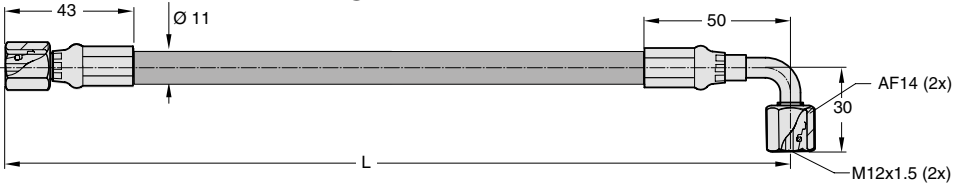
Order No. 3120857-XXXX

## Straight - 45°



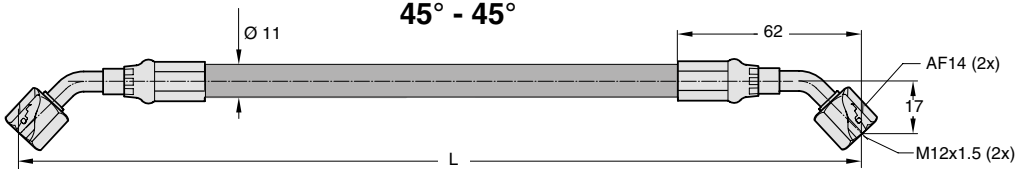
Order No. 3220857-XXXX

## Straight - 90°

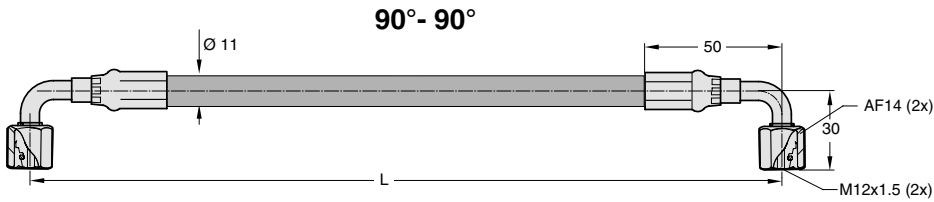


Order No. 3320857-XXXX

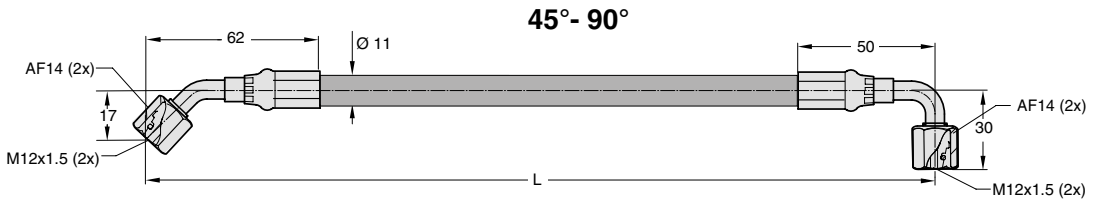
## 45° - 45°



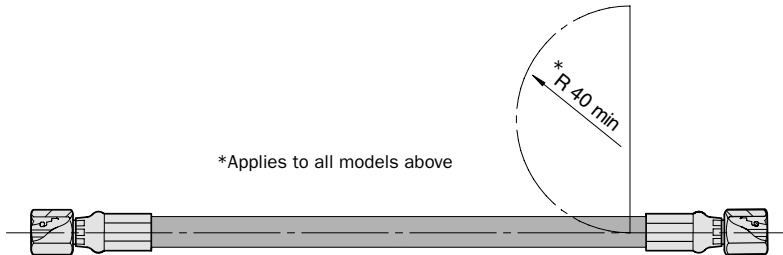
**Order No. 3420857-XXXX**



**Order No. 3520857-XXXX**



\*Applies to all models above



**Order No. 502319 - XX Meters**



E024 hose clip, **Order No. 502322**. Can be used to secure hoses using an M6 screw.

## E024 Hose

**Note!** The hose must be cleaned internally after cutting!

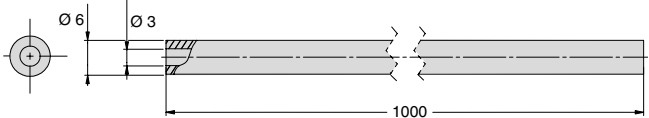
|                                    |                           |
|------------------------------------|---------------------------|
| Material.....                      | Thermoplastic             |
| Dimension.....                     | 3/16" (exterior 11 mm)    |
| Volume.....                        | 18 ml/metre               |
| Standard.....                      | SAE 100 R8 or ISO 3949 II |
| Outer casing.....                  | Perforated                |
| Min. bend radius.....              | 40 mm                     |
| Temp. range.....                   | -40°C to +93°C            |
| Max. dynamic working pressure..... | 345 bar                   |
| Min. rupture pressure.....         | 1380 bar at 20°C          |
| Min. recommended length.....       | 120 mm                    |

## E024 Tube

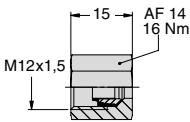
The E024™ Tube is a system for linking larger gas springs together. Springs with G1/8", G1/4" connection and high gas flow requires a large tube. As the name suggests, E024™ Tube is a tube system where all connections are soft sealed and self-crimping. This ensures leak-proof tube joints. The tubes are easily cut into correct lengths and can be bent into the desired radius with a tube bending tool or even by hand. There are numerous options for connecting tubes to gas springs and Control Blocks. Various adapters are available allowing the E024™ Tube to connect to almost all KALLER large gas springs and Control Blocks. All adapters and their dimensions are presented on the following pages.



Steel tube  
(supplied in 1 m lengths)  
**Order No. 505393**



Functional nut  
**Order No. 504047**



E024 clip,  
**Order No. 502322**  
(Can be used to secure hoses using an M6 screw)

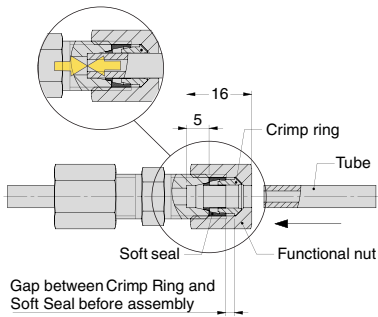


## Using E024 Tube

To cut the tube, a hacksaw can be used.  
**Note:** Cutting angle 90° ±1°. If a regular tube cutter or cutting pliers are used, the tube might become clogged resulting in zero or limited gas flow. After cutting, de-burr the tube both inside and outside (max. 0.3 x 45° or R0.3) using the Tube De-burring Tool below. Make sure the tube is cleaned after cutting and de-burring. Use compressed air to remove all loose particles. Fit the clamp nut onto the adapter.

## Basic Information

|                                |                                                               |
|--------------------------------|---------------------------------------------------------------|
| Tube external diameter         | Ø 6 mm                                                        |
| Tube internal diameter         | Ø 3 mm                                                        |
| Min. bend radius               | 18 mm (3 x e.d.)                                              |
| Tube material                  | Seamless steel tube St. 37.4<br>(Parker Order No. R06X1,5 CF) |
| Max. dynamic pressure (system) | 400 bar                                                       |
| Min. burst pressure (system)   | 1400 bar                                                      |
| Max. working temperature       | 100 °C *                                                      |
| Tube min. recommended length   | 75 mm                                                         |



**Note:** Do not tighten! Run the tube through the nut until it stops (~16 mm from the top surface of the nut). When tightening the nut, use a torque of 16 Nm. Recommended tools to have available: hacksaw, tube cutting fixture, tube bending tool, de-burring tool, compressed air and a torque wrench (AF 14 mm, 16 Nm).

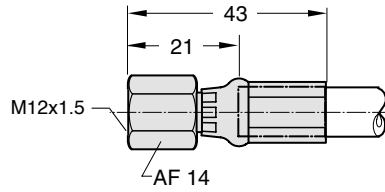


Tube De-burring Tool  
**Order No. 505096**

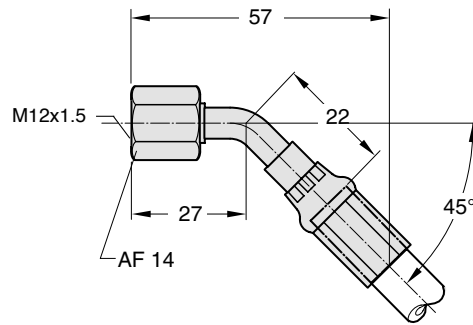


Tube Bending Tool (bend radius 20 mm)  
**Order No. 504711**

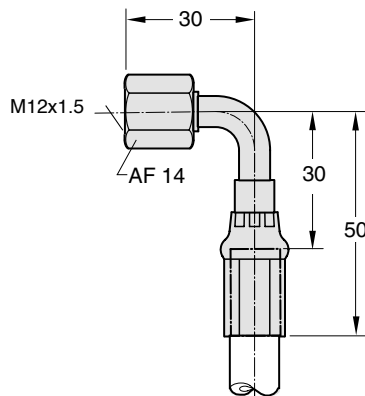
E024 Straight  
Order No. 504141



E024 45° Elbow  
Order No. 504142



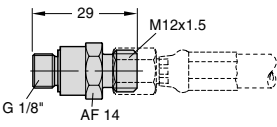
E024 90° Elbow  
Order No. 504143



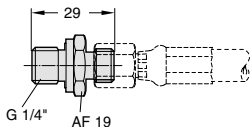
Adapter to Hose Couplings

The E024-Hose coupling system has M12x1.5 threads for connection between hose and adapter. G1/8" or G1/4" are used for connecting to springs and blocks.

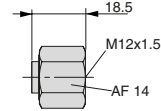
E024-Hose Adapters



Male Stud Connector G1/8"  
(for gas springs and Coupling Blocks)  
**Order No. 503593**

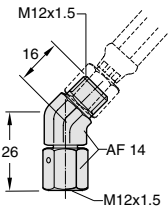


Male Stud Connector G1/4"  
(for Control Blocks)  
**Order No. 504144**

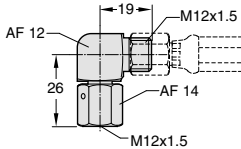


Cap/Plug  
**Order No. 504913**

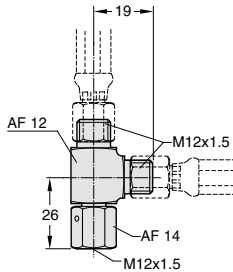
Adapter to Hose Couplings



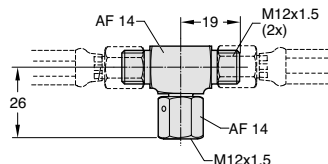
Swivel Nut Elbow 45°  
**Order No. 504145**



Swivel Nut Elbow 90°  
**Order No. 504146**

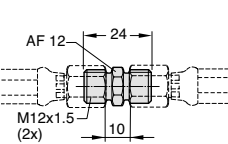


Swivel Nut Run Tee  
**Order No. 504147**

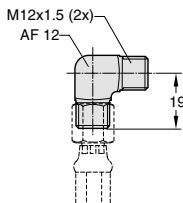


Swivel Nut Branch Tee  
**Order No. 504148**

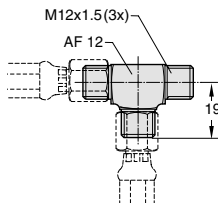
Hose to Hose Couplings



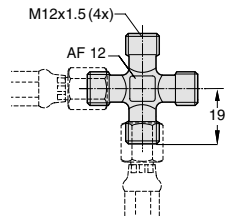
Union Straight  
**Order No. 504149**



Union Elbow  
**Order No. 504150**



Union Tee  
**Order No. 504151**

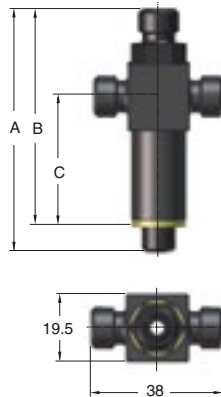


Union Cross  
**Order No. 504152**

# Adapter to Hose Couplings

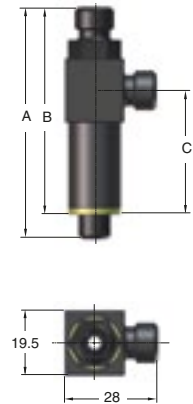
According to GM standard 90.25.

Banjo Run Tee G1/8"  
Order No. 3025594



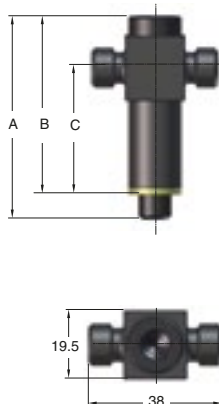
| Order No.  | A  | B    | C  | Weight |
|------------|----|------|----|--------|
| 3025594-01 | 50 | 42.5 | 17 | 0.09   |
| 3025594-02 | 64 | 56.5 | 31 | 0.11   |
| 3025594-03 | 71 | 63.5 | 38 | 0.12   |

Banjo Run Tee G1/8"  
Order No. 3025599



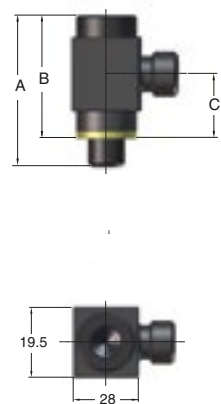
| Order No.  | A  | B    | C  | Weight |
|------------|----|------|----|--------|
| 3025599-01 | 50 | 42.5 | 17 | 0.08   |
| 3025599-02 | 64 | 56.5 | 31 | 0.10   |
| 3025599-03 | 71 | 63.5 | 38 | 0.11   |

Banjo Tee G1/8"  
Order No. 3025551



| Order No.  | A  | B    | C  | Weight |
|------------|----|------|----|--------|
| 3025551-01 | 40 | 32.5 | 17 | 0.09   |
| 3025551-02 | 54 | 46.5 | 31 | 0.11   |
| 3025551-03 | 61 | 53.5 | 38 | 0.12   |

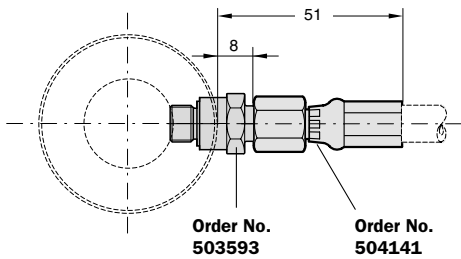
Banjo Elbow G1/8"  
Order No. 3025562



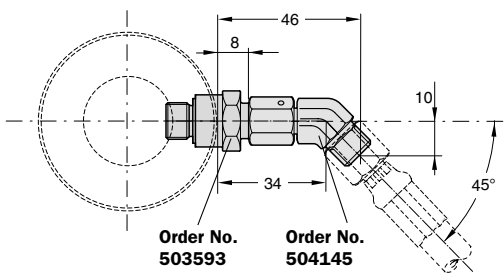
| Order No.  | A  | B    | C  | Weight |
|------------|----|------|----|--------|
| 3025562-01 | 40 | 32.5 | 17 | 0.08   |
| 3025562-02 | 54 | 46.5 | 31 | 0.10   |
| 3025562-03 | 61 | 53.5 | 38 | 0.11   |

# Installation Examples, E024-Hose System

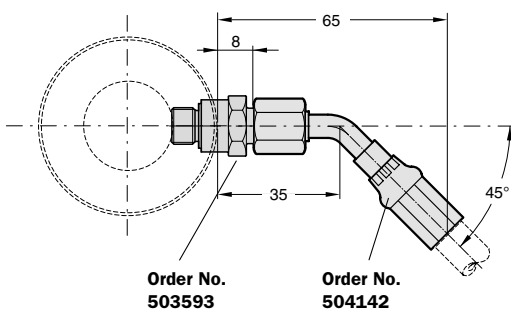
Straight hose coupling



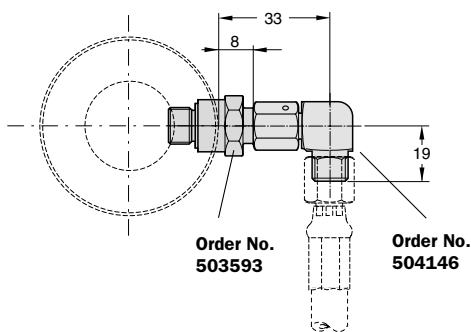
45° angle coupling



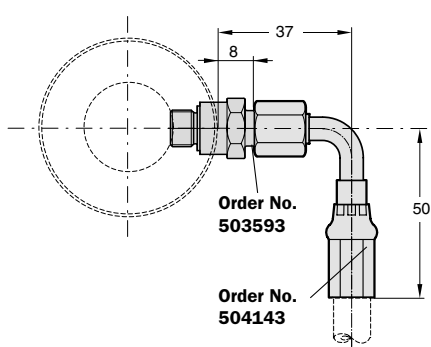
45° hose coupling



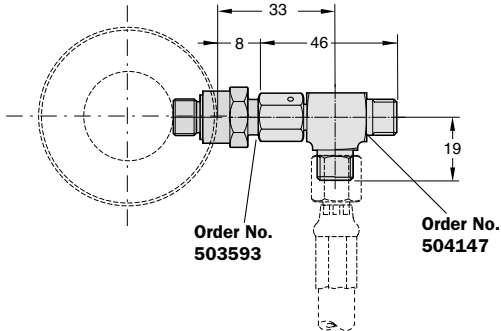
90° angle coupling



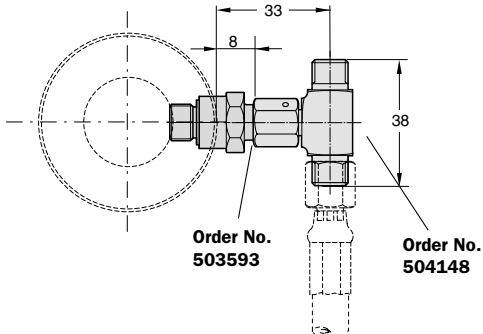
90° hose coupling



L-coupling



T-coupling







|                                               | <b>Page</b>    |
|-----------------------------------------------|----------------|
| <b>Gas Charging Equipment</b>                 | <b>page 76</b> |
| <b>Force Measurement Equipment</b>            | <b>page 79</b> |
| <b>Service Equipment</b>                      | <b>page 80</b> |
| <b>Link System &amp; Charging Spare Parts</b> | <b>page 81</b> |
| <b>Hose Crimping Equipment</b>                | <b>page 83</b> |
| <b>KALLER Nitrogen Gas Booster</b>            | <b>page 85</b> |
| <b>Recommended Tool</b>                       | <b>page 87</b> |

Gas charging equipment

One of the strongest benefits of gas springs in general is the possibility to change the blank holding force by simply altering the charging pressure of the gas spring. With KALLER's Gas Charging Equipment you can do this very easily, not only in self-contained gas springs but in linked systems as well.

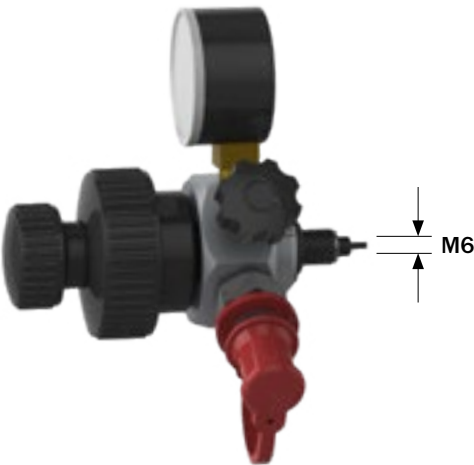
A complete set of Gas Charging Equipment, including everything you need, consists of a Pressure Regulator connected to a gas bottle, a Charging Hose with (QRC) connections, and a Control Armature with port adaptors – preferably contained in a protective carry case.

Control Armature

Control Armature M6

A Control Armature, which is connected to the port of the gas spring, is used to change the nitrogen gas pressure in the spring. The Control Armature M6 is designed to fit the KALLER M6 standard gas ports. By attaching the right adaptor, however, it can be used for any KALLER gas springs.

Order No. 1029335

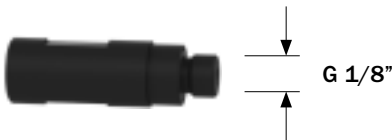


Charge Port Adaptors

As mentioned above, by attaching a suitable charge port adaptor, the Control Armature M6 can be connected to KALLER G1/8" standard gas ports or other special gas ports. Adaptors can be ordered separately, according to the table beside, or as part of a complete set including the control armature.

Complete set  
Control Armature with charge port adaptors  
Order No. 1229335

Charging Port Adaptor G1/8" standard gas port  
Order No. 3014016



Charging Port Adaptor M6 special gas port Special gas port  
example CU4-1000, CX  
Order No. 3014021

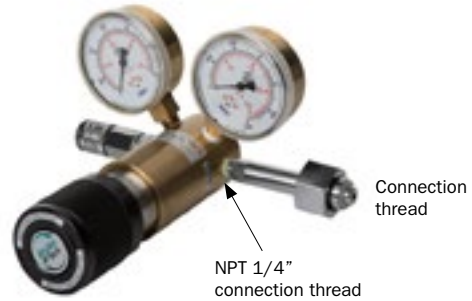


Attached charge port

## Pressure Regulator

To avoid overcharging, and to keep the charging pressure at a constant level, it is important to use a Pressure Regulator when charging gas springs. Due to different gas bottle connections for nitrogen cylinders worldwide, a Pressure Regulator with the right adaptor must be chosen. As different countries have different bottle connections, make sure you select the correct connection code according to the table below.

| Order No.   | Connection thread | Standard        |
|-------------|-------------------|-----------------|
| 1028343-001 | W24.32 x 1/14" RH | DIN 477 No. 10  |
| 1028343-002 | G 5/8             | BS 341 No. 3    |
| 1028343-003 | G 5/8             | ISO 228 (China) |
| 1028343-004 | SI 21.7 x 1.814   | AFNOR NF C      |
| 1028343-005 | 1.040" - 14 NGO   | CGA 680         |
| 1028343-006 | W 21.7 x 1/14"    | UNI 4409        |



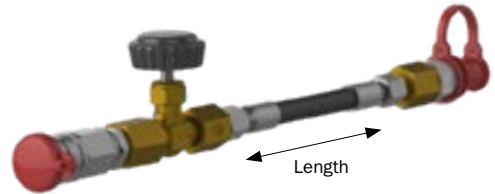
If the right thread cannot be defined, you can order a Pressure Regulator without a connection adaptor. In this case, the right connection adaptor must of course be fitted at the 1/4 NPT thread before use.

**Order No. 1028343-000**

## Charging Hose with Shut-Off Valve and (QRC) Connections

To avoid overcharging, and to keep the charging pressure at a constant level, it is important to use a Pressure Regulator when charging gas springs. Due to different gas bottle connections for nitrogen cylinders worldwide, a Pressure Regulator with the right adaptor must be chosen. As different countries have different bottle connections, make sure you select the correct connection code according to the table below.

| Order No.    | Length (m) |
|--------------|------------|
| 4027471-2000 | 2          |
| 4027471-4000 | 4          |
| 4027471-6000 | 6          |



## Carry case

With a protective carry case you have everything right where you need it.

**Order No. 1028607**



## How to order the complete set

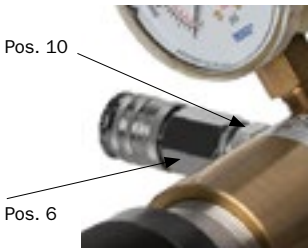
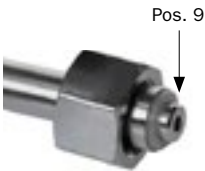
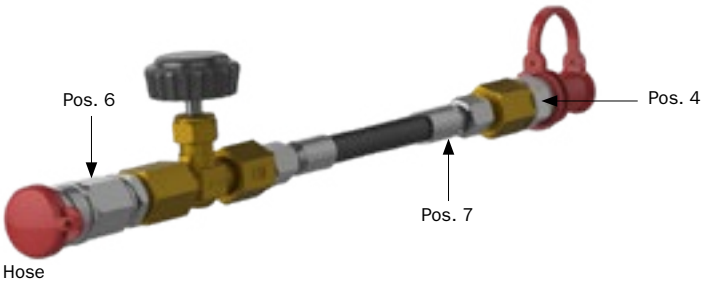
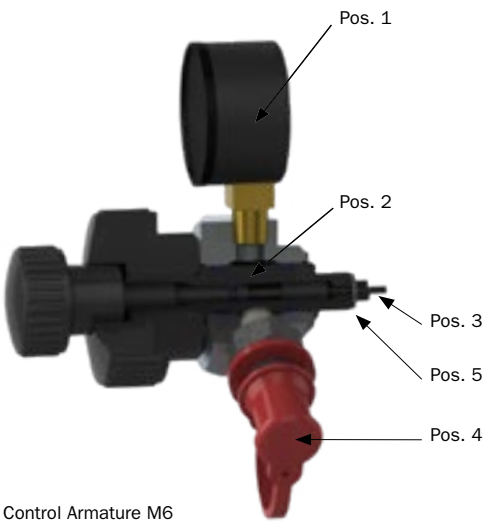
For a complete set of Gas Charging Equipment, including the carry case, order the following items – just make sure to choose the right adaptors, and a suitable length for the Charging Hose.

| Description                       | Order No.    | Note                                        |
|-----------------------------------|--------------|---------------------------------------------|
| Control Armature with Charge Port | 1229335      |                                             |
| Pressure Regulator                | 1028343-003  | Ex. ISO std. Choose right std for your site |
| Charging Hose                     | 4027471-4000 | Choose a suitable length                    |
| Carry case                        | 1028607      |                                             |

Spare parts for Charging Equipment

KALLER offers Spare Parts for all your repair needs, according to the table below.

| Description           | Order No.    | Pos. |
|-----------------------|--------------|------|
| Gauge                 | 40 502467    | 1    |
| M6 Connection rod     | 1029006      | 2    |
| Valve opener rod      | 1028977      | 3    |
| QRC coupling – male   | 502386       | 4    |
| Washer M6             | 501023       | 5    |
| QRC coupling – female | 502176       | 6    |
| Hose – 2 m            | 3020857-2000 | 7    |
| Hose – 4 m            | 3020857-4000 | 7    |
| Hose – 6 m            | 3020857-6000 | 7    |
| Regulator Gauge       | 63 506130    | 8    |
| Sealings tray DIN477  | 506354       | 9    |
| Sealings tray UNI4409 | 506355       | 9    |
| Washer                | 500435       | 10   |



## Force Measurement Equipment



### The 10,000 daN (22.480 lbf) test rig

Can be used for initial force measurements of all KALLER gas springs up to and including the TU 7500 and CU4 7500.

#### Digital version daN

Order No. 1016713-1330

#### Features:

Quick height adjustment  
 Digital or analog force indication  
 Force displayed in kgf or lbf, digital version  
 Accuracy:  $\pm 0.5\%$ , digital version  
 Max. capacity: 10,000 daN (22,480 lbf)  
 Max. spring height: 760 mm (30")  
 Dimensions: w=360 mm, d=260 mm, h=1,300 mm



### The 2,000 daN digital test rig

Can be used for initial force measurements of all KALLER gas springs up to and including the CU4 1800.

Order No. 1018660

#### Features:

Quick height adjustment  
 Digital force and travel indication  
 Force displayed in kgf or lbf  
 Accuracy:  $\pm 0.5\%$   
 Max. capacity: 2,000 kgf (4,500 lbf)  
 Max. spring height: 488 mm (19")  
 Dimensions: w=275 mm, d=255 mm, h=930 mm

## Service Equipment

### KALLER gas spring tool kits

are available in various sets and all come with a protective carry case.

**Order No. 1014779**



## Link System & Charging Spare Parts

| <b>Plugs</b>     |                            |                                                                                      |
|------------------|----------------------------|--------------------------------------------------------------------------------------|
| <b>Order No.</b> | <b>Component</b>           |                                                                                      |
| 4018682          | M6 plug standard           |    |
| 4118682          | M6 plug (with leak groove) |    |
| 4014331          | M6 plug for CU4 1000       |    |
| 500343           | G 1/8" plug                |    |
| 501866           | G 1/4" plug                |    |
| <b>Valves</b>    |                            |                                                                                      |
| <b>Order No.</b> | <b>Component</b>           |                                                                                      |
| 4018112          | M6 valve                   |   |
| 501243           | VG5 valve                  |  |
| 4014007          | Oil bleeding valve         |  |

Link System & Charging Spare Parts

| Washers                            |                                    |                                                                                      |
|------------------------------------|------------------------------------|--------------------------------------------------------------------------------------|
| 500472                             | G 1/8" rubber-steel washer         |     |
| 501023                             | M6 rubber-steel washer             |     |
| Adapters                           |                                    |                                                                                      |
| Order No.                          | Component                          |                                                                                      |
| 3015303-01 L=23<br>3015303-02 L=33 | Gas charging adapter               |     |
| 4024047                            | Gas charging adapter<br>G 1/8 - M6 |     |
| Tools                              |                                    |                                                                                      |
| Order No.                          | Component                          |                                                                                      |
| 3018708                            | Valve tool M6 - M6 valve           |   |
| 3014172-01                         | Valve tool M6 - VG5 valve          |  |
| 3014172-02                         | Valve tool G1/8"-VG5 valve         |  |
| 3022974                            | Gas charging adapter tool          |  |

## Crimping Equipment for Micro E024™, EZ Hose, E024-Hose

Our Hose Crimping Equipment can be used for Micro E024™, EZ and E024 Hose systems

- Pneumatically operated hydraulic pump
- Mechanical stop for accurate hose crimping
- Can be used to crimp straight, 45° and 90° fittings
- Lubrication-free crimping
- Crimping force: 300 kN
- Size: 380 × 305 × 685
- Weight: 32 kg
- Press instructions included No. 8200-1288



Crimp die Micro E024™,  
EZ Hose  
**Order No. 3024010**



Crimp die E024  
**Order No. 504196**



Pneumatic operated crimping press.  
**Order No. 3121381**  
(Crimping die not included)



Stop Tool (for Micro E024™ hose end assembly)  
**Order No. 4024183**



Hose cutting plier  
**Order No. 502839**

Below is a list of the order numbers of the various couplings and hoses that can be ordered from us:

| Micro E024™ Hose system               |           |  |
|---------------------------------------|-----------|--|
| Order No.                             | Component |  |
| Straight Hose Connector Micro E024™   | 505082    |  |
| 45° Hose Connector Micro E024™        | N/A       |  |
| 90° Hose Connector Micro E024™        | N/A       |  |
| Separate Micro E024™ Hose (in meters) | 505081-XX |  |
| EZ Hose system                        |           |  |
| Order No.                             | Component |  |
| Straight Hose Connector EZ hose       | 503962    |  |
| 45° Hose Connector EZ hose            | N/A       |  |
| 90° Hose Connector EZ hose            | 503963*   |  |
| Separate EZ hose Hose (in meters)     | 503810-XX |  |
| E024™ Hose system                     |           |  |
| Order No.                             | Component |  |
| Straight Hose Connector E024™         | 504141    |  |
| 45° Hose Connector E024™              | 504142    |  |
| 90° Hose Connector E024™              | 504143    |  |
| Separate E024™ hose Hose (in meters)  | 502319-XX |  |

Where: -XX is no. of meters of hose required (eg. -10 indicates length 10 meters)

\* You cannot crimp EZ Hose 90° - 90° using Crimp die 3024010

# KALLER Nitrogen Gas Booster

Part No. 1028845-XX, 1028846-XX

## Technical facts

The KALLER compact nitrogen booster was developed for compressing nitrogen gas. Using the booster, a high charging pressure can be achieved and the N<sub>2</sub> gas bottles can be used down to a residual pressure of 30 bar.

The nitrogen booster works according to the principle of a pressure relay valve, where compressed air is

used as the driving force. Low pressure is applied to a large surface, which in turns applies high pressure to a small surface.

The booster is mounted on a holding plate and can easily be hung over the nitrogen bottle neck with the mounting straps.

## Advantages

- Increase in utilization capacity of the bottles
- Time-saving: significantly less gas bottle replacements needed
- Cost-saving: minimizing the number of gas bottles needed
- Lightweight
- Suitable for all KALLER gas springs

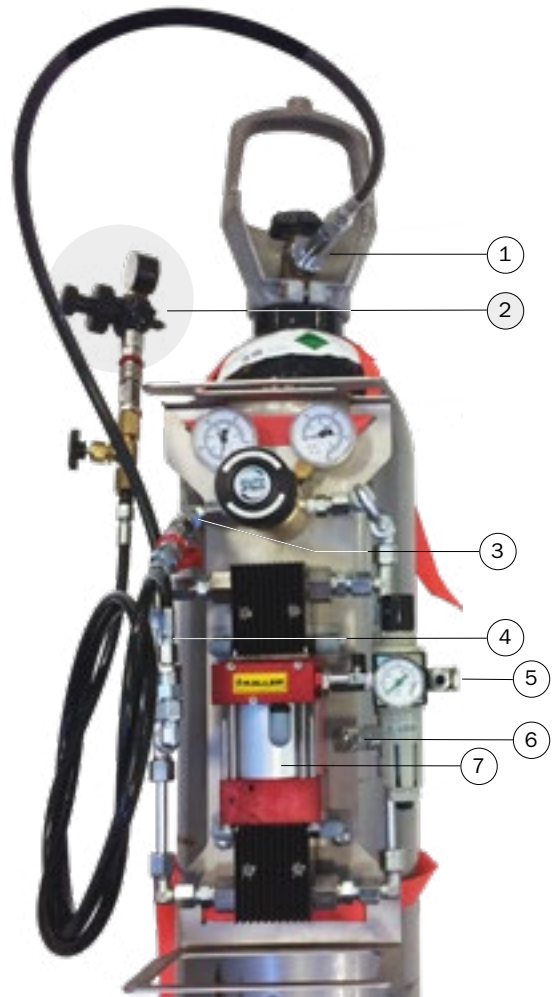
## Nitrogen GAS booster

- ① Gas bottle connection for the nitrogen cylinder
- ② Gas Charging Equipment (ordered separately, see Kaller page 76)
- ③ Nitrogen N2 outlet
- ④ Nitrogen N2 inlet
- ⑤ Compressed air inlet G 1/4" max. 10 bar
- ⑥ Overpressure protection 360 bar
- ⑦ Stationary Nitrogen Booster

## Basic information

|                                |                                                               |
|--------------------------------|---------------------------------------------------------------|
| Pressure medium                | Pure Nitrogen gas N <sub>2</sub> , cleanliness class min. 4.5 |
| Max outlet pressure            | 300 bar (~ 4350 psi)                                          |
| Inlet nitrogen pressure        | 30-300 bar / 435 - 4350 psi                                   |
| Formula for outlet pressure    | 32 x driving supply + inlet Nitrogen pressure                 |
| Pressure ratio                 | 1:32                                                          |
| Driving supply medium*         | Compressed air (max. particle size 5µm)                       |
| Driving supply medium pressure | 0,5 – 8 bar (~ 7,25 – 116 psi)                                |
| Air connection thread          | G 1/4"                                                        |
| Operating temperature          | Maximum +60° C                                                |
| Interim storage*               | +5 - +40° C at maximum humidity 60%                           |
| Weight                         | Approx. 11.5 kg.                                              |

\*For more details see the Nitrogen Gas Booster manual at kaller.com



# KALLER Nitrogen Gas Booster

## Models and gas bottle connection

Depending on your needs, KALLER provides gas boosters for both stationary and mobile use.  
Due to different gas bottle connections for the nitrogen cylinders worldwide, a suitable adapter (pos 1) must be chosen for both booster setups.

KALLER supports the following gas bottle connection standards:

| Order No.<br>Version | Thread            | Standard       |
|----------------------|-------------------|----------------|
| -01                  | W24.32 x 1/14" RH | DIN 477 No. 10 |
| -02                  | G 5/8"            | BS 341 No. 3   |
| -03                  | G 5/8"            | ISO 228        |
| -04                  | SI 21.7 x 1.814   | AFNOR NF C     |
| -05                  | 1.040" - 14" NGO  | CGA 680        |
| -06                  | W 21.7 x 1/14"    | UNI 4409       |



## Stationary gas booster

For a permanent usage in a workshop or maintenance department, a stationary variant is the most cost-efficient. A stationary gas booster is designed for being mounted or used hanging on a nitrogen gas bottle. Order the suitable gas bottle adapter for a stationary gas booster as below:

| Order No.  | Thread            | Standard       |
|------------|-------------------|----------------|
| 1028845-01 | W24.32 x 1/14" RH | DIN 477 No. 10 |
| 1028845-02 | G 5/8"            | BS 341 No. 3   |
| 1028845-03 | G 5/8"            | ISO 228        |
| 1028845-04 | SI 21.7 x 1.814   | AFNOR NF C     |
| 1028845-05 | 1.040" - 14" NGO  | CGA 680        |
| 1028845-06 | W 21.7 x 1/14"    | UNI 4409       |



## Mobile gas booster

the mobile KALLER gas booster is delivered in a special protective carry case, convenient for transport. It does not need to be removed from the protective case before use – on the contrary, using it directly from the protective case is recommended.

| Order No.  | Thread            | Standard       |
|------------|-------------------|----------------|
| 1028846-01 | W24.32 x 1/14" RH | DIN 477 No. 10 |
| 1028846-02 | G 5/8"            | BS 341 No. 3   |
| 1028846-03 | G 5/8"            | ISO 228        |
| 1028846-04 | SI 21.7 x 1.814   | AFNOR NF C     |
| 1028846-05 | 1.040" - 14" NGO  | CGA 680        |
| 1028846-06 | W 21.7 x 1/14"    | UNI 4409       |



## Recommended Tool

The following standard tool can be used to cover all assembling situations.

Please note! This tool is not delivered by KALLER.



### CRC Leak Finder

Water-based gas leak detector, containing surface-active and anti-corrosion agents and stabilizers. Leak Finder detects and locates quickly and reliably gas leaks and pressure losses in pipes, pressurized systems, etc. by forming highly visible bubbles when applied over any leak.

Contributes to protect the environment by locating emissions of toxic and/or polluting gases.



Potential suppliers,  
[www.crceurope.com](http://www.crceurope.com)





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The Flex Cam can be used for piercing, cutting, forming and flanging operations.

The system allows for a flexible distribution of forces with optimal direction and velocity during the operation. Cam Units or Force Cylinders can be coupled together to allow for multiple operations within the same tool to be performed simultaneously. Often by using a Flex Cam, fewer tools are required to produce the part.

The system comprises of a Hydraulic Power Unit, Cam Unit/Force Cylinder and interconnecting hoses. Different types of Cam Units/Force Cylinders are available to suit various types of applications. For technical data and dimensions refer to page 7.1 and 8.1.

For further information contact your local distributor or Strömsholmen AB at [www.kaller.com](http://www.kaller.com) or Phone: +46 140 571 00 and Fax: +46 140 571 98.



### Power Unit (HCP)

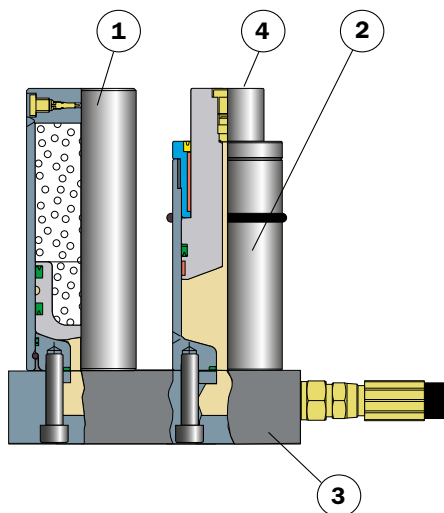
The Power Unit consists of an Accumulator (1), Power Cylinder (2) and a base plate (3). The purpose of the Accumulator is to set the force of the Cam and to prevent over pressurisation of the system. It will also contain some oil once the Cam has reached its stop position.

When the piston of the Power Cylinder is struck by the press (or machine) the Cam Units will then be actuated.

The size of the Power Unit is calculated from the number of Cam Units in the system, their sizes and their length of stroke.

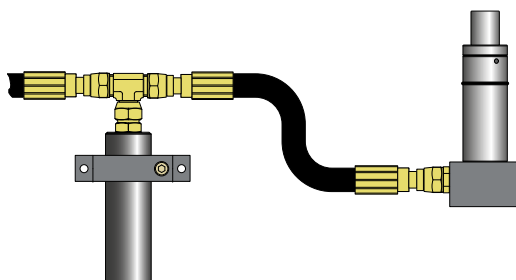
Note that the piston (4) of the Power Cylinder is at the same height as the Accumulator when this system is completely filled with oil.

The strokes specified are -0350, -0600, -1100 and 1600 in the order numbers. 10 mm extra stroke for the Accumulator is included.



### Power Unit (HCP-S)

Where there are space restrictions within the tool, then the Power Unit is also available with separated Power Cylinder and Accumulator. See section "Dimensions for Power and Cam Units" starting at page 113 .



### Mounting orientation

Both HCP and HCP-S Power Units can be mounted at any angle and orientation which best fits the tool.

### Alternative driver

It is also possible to use an electrically powered Hydraulic Pump Unit (EHC) as a driver for the Cam Units. See page 167.



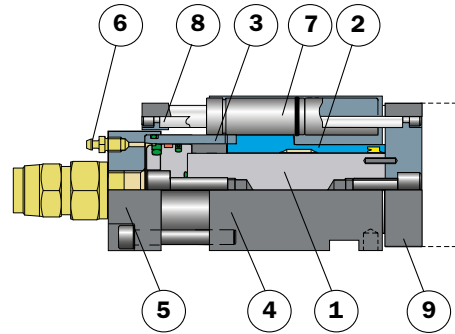
## Compact Cam (CC)

The Compact Cam is a well guided unit, suitable for normal piercing operations with or without a small amount of side loading.

It consists of a piston with a piston rod (1), guide (2), sleeve (3), front housing (4), rear housing (5), bleed nipple (6), gas spring (7), anti rotation rods (8) and a punch adapter plate (9) for the punch holder.

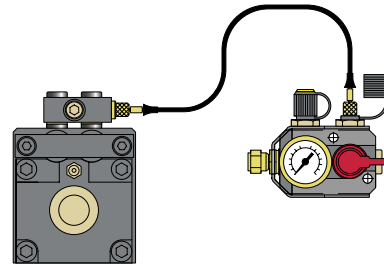
The Power Unit (HCP) or Hydraulic Pump Unit (EHC) can be used to actuate the Compact Cam. The Cam return force is provided by one or two internally installed gas springs. The punch adapter plate is prevented from rotating by the two anti-rotation rods.

The use of a polyurethane stripper is recommended in piercing or cutting operations to hold the panel down and to strip the punch from the panel.



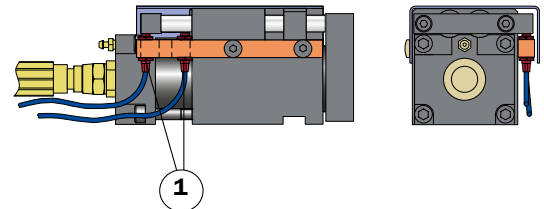
## Compact Cam (CC-H) for Hosed System

The Compact Cam is also available in a version where the gas springs in the unit can be hoses to a control armature. This way the gas pressure in the spring can be monitored from outside the tool. See section "Dimensions for Power and Cam Units/ Force Cylinders".



## Option for CC and CC-H

A complete kit with proximity sensors (1), fittings, screws etc. can be fitted to the Compact Cams so that extended and retracted positions can be monitored. See section "Dimensions for Power and Cam Units/ Force Cylinders".



## Flange Cam (CCF)

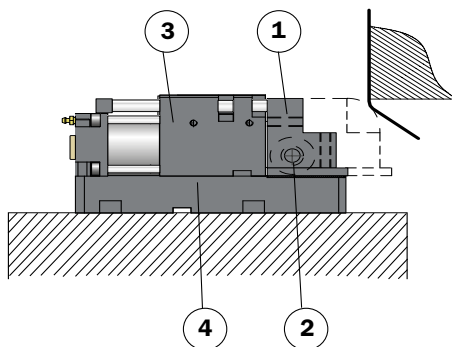
**Patent No. SE 513031,  
EP 1212156**

The Flange Cam is suitable for flanging and other operations with large amounts of side load.

No extra guides are required as the front adapter plate (1) is equipped with two roller bearings (2).

A Compact Cam Unit (3) is used as the driver and a bottom plate (4) provides support for the front adapter plate.

The Power Unit will actuate the Flange Cam and the return movement is provided by two internally installed gas springs. The front adapter plate is prepared with threaded holes to mount any customised flanging tool etc.

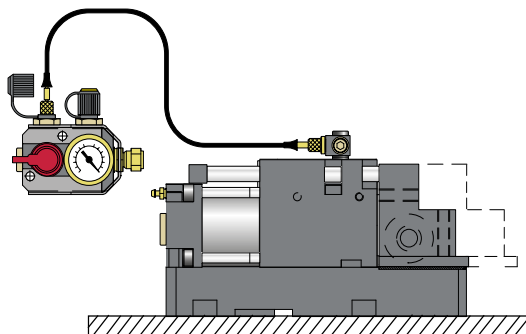


Patent No. SE 513031, EP 1212156

## Flange Cam (CCF - H) for Hose System

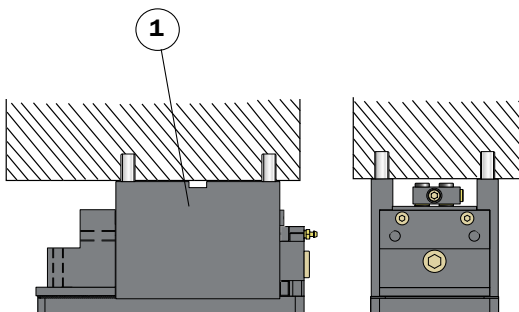
The Flange Cam is also available in a version where the gas springs in the unit can be hoses to a control armature. This way the gas pressure in the spring can be monitored from outside the tool.

See section 8 "Dimensions for Power and Cam Units/ Force Cylinders".



## Flange Cam spacers (optional)

The spacers (1) are required when mounting the Flange Cam from above (top mount) as shown here.



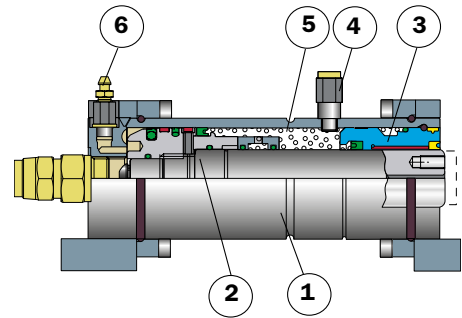
### Force Cylinder (HCF)

The Force Cylinder is suitable for forward and return motion of, for example, a flanging steel or forming punch used for various operations in the tool. Note that it is not possible to mount a punch directly onto the piston rod without a guide in the tool.

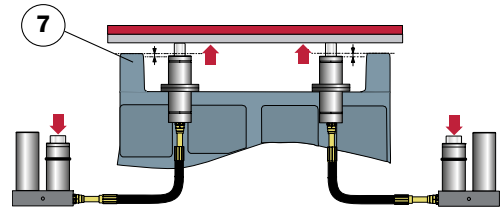
The Force Cylinder consists of a cylinder (1), piston with a piston rod (2), guide (3), gas valve (4), gas for return (5) and a bleed nipple (6).

The Power Unit (HCP) or Electrical Pump Unit (EHC) can be used to actuate the Force Cylinder. The return force is provided by the internal nitrogen pressure within the Force Cylinder.

The Force Cylinder can be mounted using different types of flanges.



External stop (7) is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke.

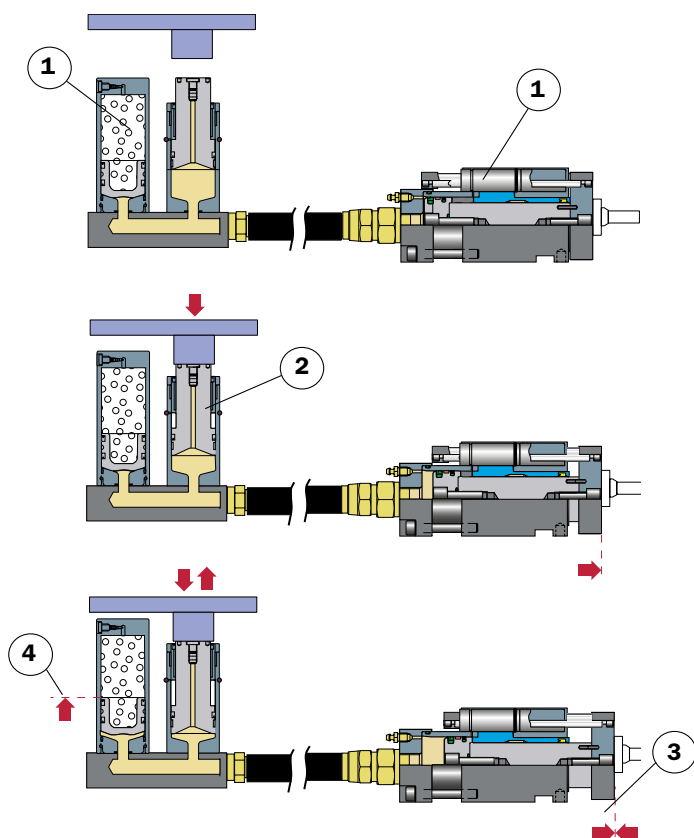


## Function Description

### Normal use

The illustration below shows the Power Unit (HCP) and the Compact Cam (CC). The system works identically for a Compact Cam (CC), Flange Cam (CCF) or a Force Cylinder (HCF). Before the press (or machine) activates the Power Unit the oil pressure is 0 bar but the Accumulator and the return Gas Springs in the Cam (or Force Cylinder) are charged with nitrogen (1). When the press strikes the piston in the Power Unit (2), the Cam will be actuated and the operation will thus be carried out.

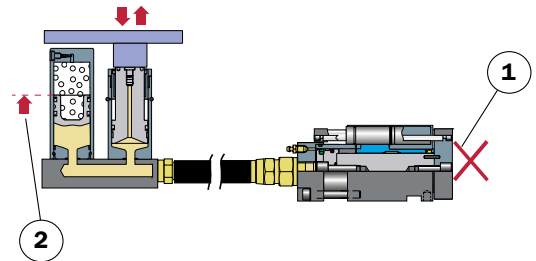
When the press returns upwards the movable parts will return to their original positions due to the return Gas Springs in the Cam (or nitrogen pressure in the Force Cylinder) and Accumulator.



## Safety function

If the movement of the Cam is restricted in the tool (1), the piston in the Accumulator will be raised instead (2). The oil moves into the Accumulator to prevent over pressurisation of the system.

When the restriction has been removed the unit will function normally without needing to be refilled with oil.



## Pressure build up in the system

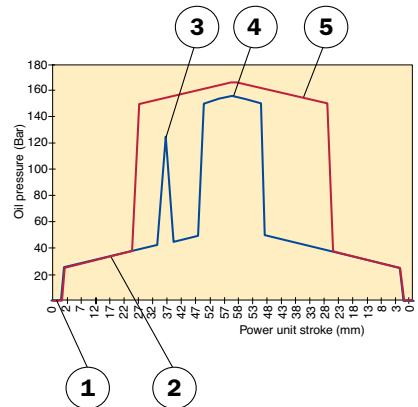
Before the Power Unit is activated the oil pressure is 0 bar (1).

The force from the gas pressure in the Cam Unit causes the oil pressure to increase (2).

The oil pressure will increase to create enough force needed to perform the operation (3).

When the Cam reaches its stop position the oil pressure increases to lift the piston in the Accumulator with a force equal to the nitrogen pressure (4) within the Accumulator.

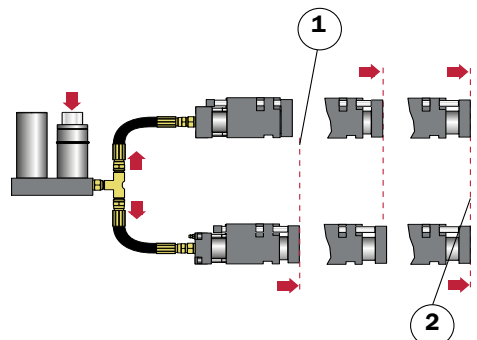
If the movement of the Cam is restricted the oil pressure will follow curve (5).



## Connection of two or more Cam Units to one Power Unit

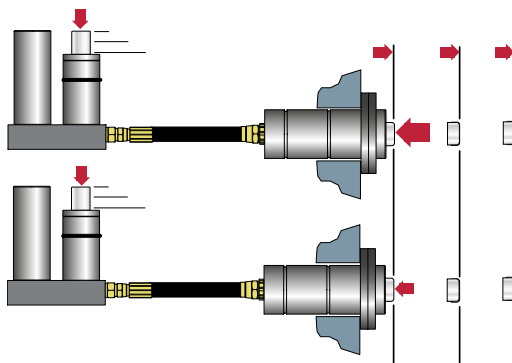
It is possible to connect up to three Cam Units to one Power Unit. Note that the movement of the Cams during the stroke are not synchronised (1) until the Cams are in the fully extended position (2).

If more than three Cams are connected to one Power Unit the velocity in some of the Cams could be too high. The system could also be difficult to bleed and therefore is not recommended.



### Parallel movement with two systems

For parallel movements where different forces may be required, it is recommended that two separate systems are used. For example, in order to move large pads in tools. Here the movement of each Force Cylinder is synchronised regardless of the individual force required by each Force Cylinder.



### Adapting Cam stroke ratios

If you use a large Power Unit (eg. HCP 040) connected to a small Cam Unit (eg. CC 015) the stroke of the Cam Unit will increase in relation to the stroke of the press.

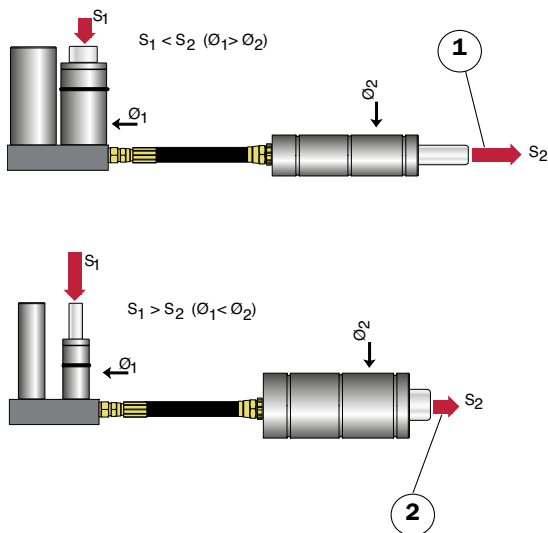
The difference in strokes is related to the stroke difference in piston areas. The stroke of the Cam Units will be faster than the stroke of the press (1).

( $S_{Press} < S_{Cam Unit}$ )

The opposite is also possible, shorter stroke of the Cam in relation to the press stroke (2).

( $S_{Press} < S_{Cam Unit}$ )

It is important that the velocity of the Cam does not exceed the specifications on page 111 "Technical data" See also page 107 "Component selection" step 5.



## Installation Examples

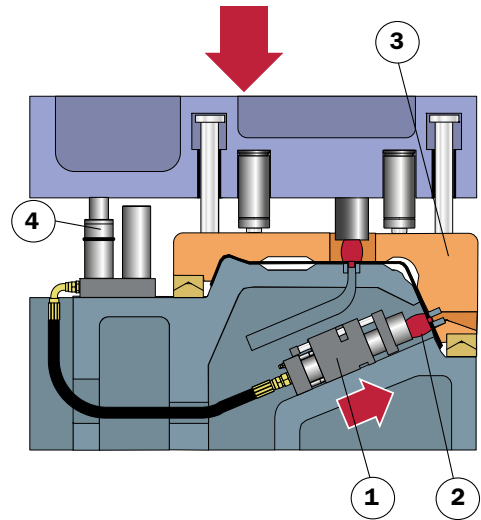
### Application example using the Compact Cam

This example shows how a Compact Cam (1) can be used for piercing. The punch can be attached directly to the Cam Unit and no additional guides are required in the tool. As seen in the picture, the Power Unit can be placed remotely from the Cam Unit. This gives increased flexibility compared to a conventional mechanical solution. A stripper (2) on the punch is recommended.

#### Work cycle

As the upper tool moves downwards the blank holder (3) is activated and will keep the blank in position. The blank holder is guided relative to the lower die using V-blocks. When the blank holder is in position the Power Unit (4) will be activated and the Cam Unit will perform the punch operation.

**Note that the Power Unit can be mounted at any location and orientation to the Cam Unit/Force Cylinder and not just as is depicted in these examples.**

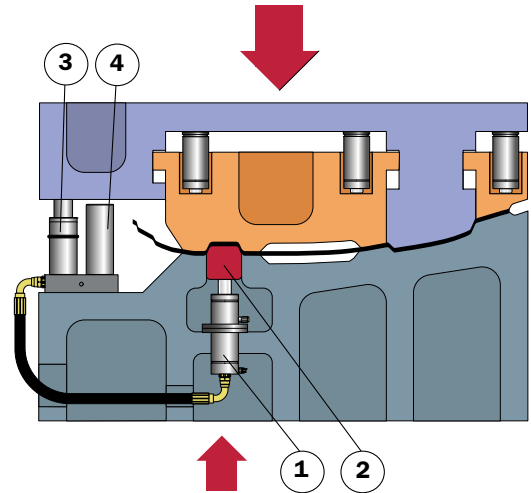


### Application example using the Force Cylinder

This example shows how one or more Force Cylinders (1) can be used to drive forming punches (2) (or cam slides) in a tool. The punch (or slide) is guided in the tool. This method of driving tool 'components' allows for high flexibility in tool design. The Force Cylinder supplies the motion and force. Only pulling and pushing forces are possible.

#### Work cycle

As the upper tool moves downwards the blank holder is activated and will keep the blank in position. When the blank holder is in position the Power Unit (3) is activated thus activating the Force Cylinder. The forming force can be adjusted by simply changing the pressure in the Accumulator (4).



### Installations currently in operation

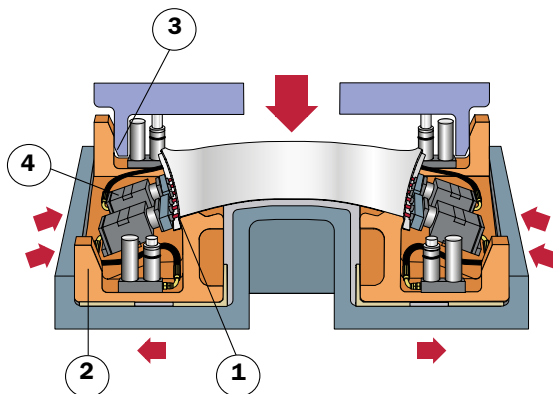
The following examples are of installations now running in production and illustrates some of the different ways the benefits of the Flex Cam are being used.

#### Example 1. Piercing 4 x 3 holes

12 holes are being pierced at an undercut angle (1). In this tool a mechanically driven pad (2) has been equipped with Flex Cams.

During the first part of the operation the pad is moved into position, using the angled part of the drivers (3). Once the pad is in position, the drivers become inoperative by only sliding on their vertical faces. The Power Units are activated and the holes are punched by the Cams (4).

Using this solution there is no longer the need for drivers at the punching position and therefore punching operations can easily be carried out perpendicularly to the blank.

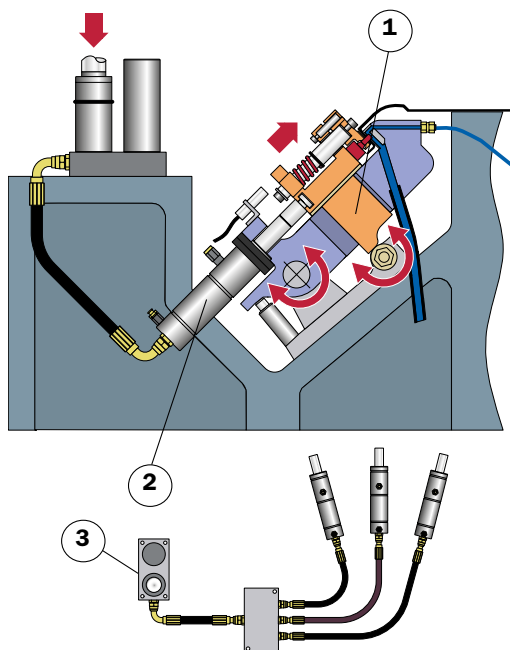


#### Example 2. Piercing 2 x 3 holes

6 holes are being punched at an undercut angle using Force Cylinders activating a pivoting piercing unit (1).

The picture shows the unit in its extended position (press at bottom dead centre). As the Force Cylinder (2) starts to move backwards, the punch retracts from the hole and thereafter the whole unit will pivot down allowing for the part to be removed. The reverse will happen as the press moves back down.

There are two systems in the tool, one on the left side, one on the right. Each system consists of one Power Unit (3) driving three Force Cylinders.

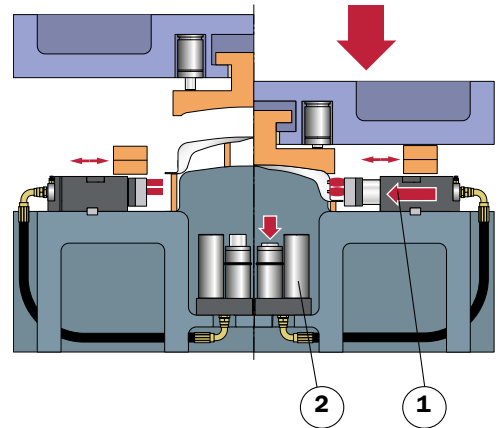


**Example 3. Piercing 2 holes in two parts**

In this tool two parts are being produced simultaneously. The left part of the picture shows the press at its upper position. The right part shows the press in its bottom position. Shown above the Cam Units are the transfer arms.

To allow the flange of the part to pass the punches, before the Cam Units are activated, a smaller size Cam Unit has been connected to a bigger size Power Unit. In this case a 1.5 tonne Cam 015 (1) connected to a 4 tonne Power Unit HCP 040 (2). This will give a stroke ratio of 2.5. (As the press/Power Unit moves 10 mm vertically, the Cam Unit will move 25 mm horizontally)

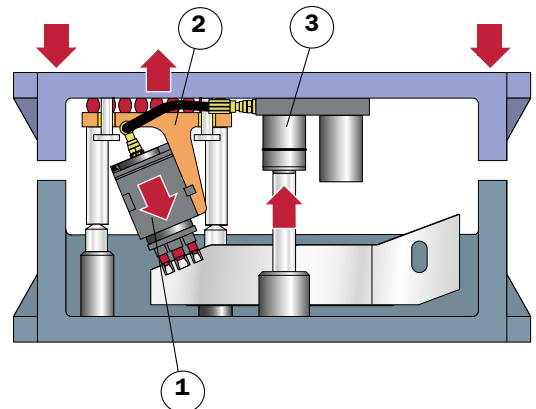
Two versions of the same part are produced, one with holes and one without. For the part without holes, the Power Unit is simply removed from the tool, thus disabling the Cam Units from making the holes.

**Example 4. Piercing 6 holes**

This application uses an hydraulic cam system mounted upside down in the upper tool. The Cam Unit (1) is mounted on a floating die (2). The floating die is centred relative to the lower die using conical pillars and the die is backed up by springs. As the press moves downwards, and the floating die is centered, the Power Unit (3) is activated and the holes are punched.

Prior to the installation of the hydraulic cam system, the holes were being punched at a vertical angle using oval shaped punches.

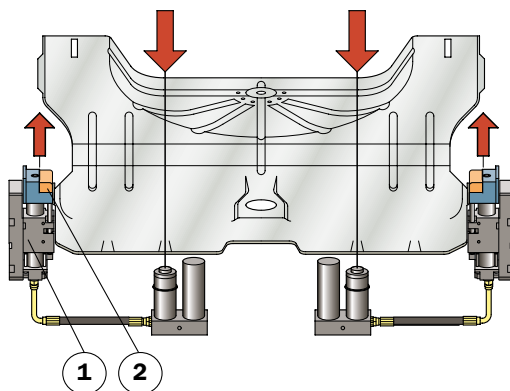
The production and quality enhancements, as a result of the installation of the Flex Cam, resulted in a payback time of three months for the system, including installation.



### Example 5. Flanging

The picture shows a floor panel where Flange Cam Units (1) are being used for flanging upwards (2). All side loading forces associated with the flanging operation are taken up within the Flange Cam Units.

In this case the customer saves the cost of one complete tool, by using the Flex Cam, as these operations could be added to an existing tool. The other option would have been to produce a completely new tool with a floating pad.

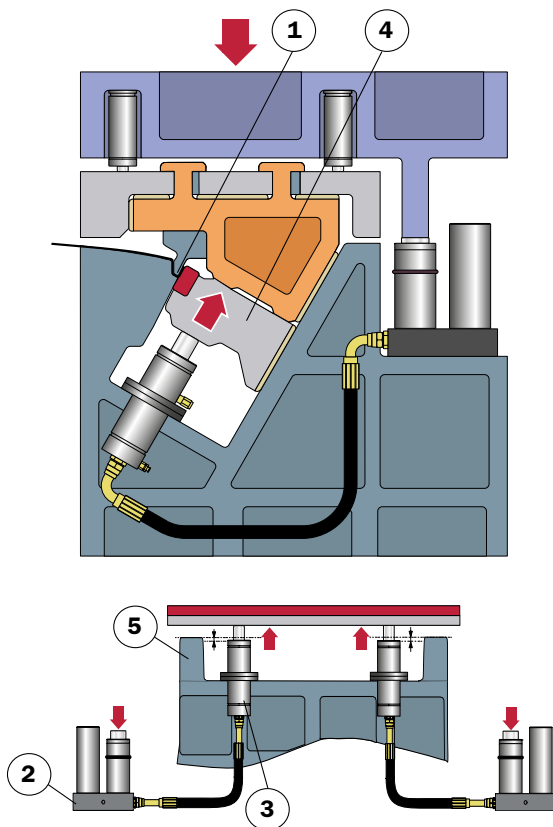


### Example 6. Flanging a wide edge

In this tool two Force Cylinders are being used to drive a 800 mm wide flanging steel. As seen in the picture the flanging (1) is carried out at an angle opposite to the direction of the press motion.

To ensure a parallel movement at both ends of the flanging steel two separate cam systems are being used. Each system containing a Power Unit (2) and a Force Cylinder (3). The flanging steel (4) is well guided in the tool and the Force Cylinders are only subject to axial forces. Using the Flex Cam has simplified the design of the tool and therefore also reduced the tooling cost.

External stop (5) is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke.



## Advantage and Possibilities of Using Flex Cam

1. The number of tools required to produce a part can be reduced since flanging and piercing operations can now easily be performed within the same tool
2. The cost of the tool could be reduced due to a more simplified tool design
3. The system “drivers” do not have to be positioned close to the working Cam Units/ Force Cylinders. Drivers can be seated in any position to suit the design of the tool.
4. It is possible to add operations in existing tools to lower the costs of purchasing new tools
5. All units can be installed at any location and orientation to fit an existing tool, even upside-down
6. Built in safety feature against tool damage or over pressurisation of the system through the use of an Accumulator
7. Side load in the tool could be reduced because the Power Unit always works in a vertical direction
8. Even force distribution possible within the tool due to flexibility of Power Unit location
9. Increased quality of the produced parts and longer life of the punches is possible because the piercing is performed perpendicularly to the panel
10. The force of the Cam Unit/ Force Cylinders can be altered to suit an operation by simply adjusting the nitrogen pressure in the Accumulator

# Component Selection

The following step by step instruction shows how to select the size of the units when taking into consideration the required forces, stroke length and the number of operations.

## Step 1 (For piercing and cutting only)

Shear and stripping force calculations for piercing and cutting operations.

Sheet metal thickness..... : t = \_\_\_\_\_ mm

Tensile strength ..... : = \_\_\_\_\_ N/mm<sup>2</sup>

Shearing strength ( = x 0.8) ..... : = \_\_\_\_\_ N/mm<sup>2</sup>

Diameter of punch ..... : d = \_\_\_\_\_ mm

(or)

Total cut length ..... : l = \_\_\_\_\_ mm

### Piercing force Fp

Piercing a round hole

$F_p = t \times \tau \times d \times \pi$

Piercing or cutting

$F_p = t \times \pi \times l$

Example  
Calculate force needed to pierce a Ø 10.5 mm hole in a 1.2 mm thick panel. Tensile strength is 400 N/mm².  
(Normally between 270 - 400 N/mm²).

$F_p = 1.2 \times 400 \times 0.8 \times 10.5 \times \pi$

$F_p = 12667$

$F_p \approx 12.7 \text{ kN}$

### Stripping force Fs

Fs = Fp x 0.11 (roughly 11% of the required piercing force)

Example

$F_s = 12667 \times 0.11$

$F_s = 1393$

$F_s \approx 1.4 \text{ kN}$

## Step 2 Size of Cam Unit/Force Cylinder

Calculate the force required for the operation in the tool.  
Make sure to choose a Cam Unit/ Force Cylinder with enough force to perform the operation. If the amount of force required is a little uncertain it is better to use a larger size of Cam.

| Required force (kN) | Cam Unit/Force Cylinder |
|---------------------|-------------------------|
| 0-15                | 015                     |
| 15-40               | 040                     |
| 40-60               | 060                     |
| 60-90               | 090                     |
| 90-150              | 150                     |

*Example*

Choose a Cam Unit 040 if the required force is 22 kN.

**Required force:**

\_\_\_\_\_ kN

**Size Cam Unit/ Force Cylinder:**

\_\_\_\_\_

## Step 3 Stroke length of Cam Unit/Force Cylinder

Check the necessary stroke of the Cam Unit/Force Cylinder to perform the operation in the tool. Choose the shortest stroke length but make sure that there is enough room for the produced part in the tool.

| Required stroke length (mm) | Max. stroke length, Cam Unit (mm) | Max. stroke length, force Cylinder (mm) |
|-----------------------------|-----------------------------------|-----------------------------------------|
| 0-24                        | 24                                | 25                                      |
| 24-49                       | 49                                | 50                                      |
| 49-99                       | 99*                               | 100                                     |
| 99-150                      | 124**                             | 150                                     |

\* This stroke length is not available for Compact Cam 015

\*\*This stroke length is only available for Compact Cam 040

*Example*

If the required stroke is 35 mm choose a Cam Unit/Force Cylinder with 50 mm stroke length

**Stroke length Cam Unit/ Force Cylinder:**

\_\_\_\_\_ mm

Step 4 Order number for the Cam Unit/Force Cylinder

Choose the Cam Unit/ Force Cylinder depending on the type of the operation. See also page 93, 99 and 113.

Example  
The order number for the 40kN Compact Cam with 49 mm stroke length will be CC 040-049.

Compact Cam:

CC \_\_\_\_\_ - \_\_\_\_\_

Flange Cam:

CCF \_\_\_\_\_ - \_\_\_\_\_

Force Cylinder:

HCF \_\_\_\_\_ - \_\_\_\_\_

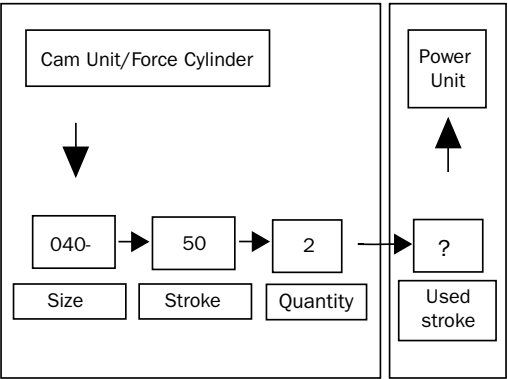
Step 5a Size and stroke of Power Unit

Step 5a is valid when using 1-3 Cam Units/ Force Cylinders of equal sizes connected to one Power Unit. Step 5b is valid when different Cam Units/ Force Cylinders are connected to one single Power Unit.

Use the table next page to choose the Power Unit. Read the table in the following order: Cam Unit/ Force Cylinder – Size – Stroke – Quantity – Power Unit. Check always that your available press stroke = used stroke Power Unit.

More than three Cam Units/ Force Cylinders connected to one Power Unit is not recommended.

Do not exceed the maximum Cam velocity, see also page 111.



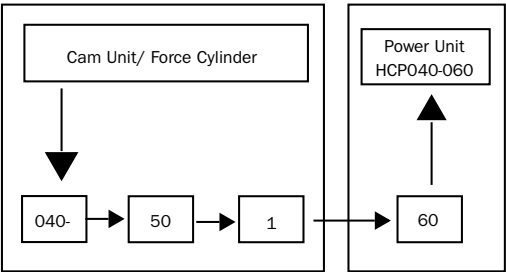
| CAM UNIT / FORCE CYL. |        |     | POWER UNIT / Used stroke / Ratio CAM UNIT or FORCE CYL.-POWER UNIT |        |       |      |        |       |      |        |       |      |        |       |      |        |       |
|-----------------------|--------|-----|--------------------------------------------------------------------|--------|-------|------|--------|-------|------|--------|-------|------|--------|-------|------|--------|-------|
| Size                  | Stroke | Qty | 015-                                                               | Stroke | Ratio | 040- | Stroke | Ratio | 060- | Stroke | Ratio | 090- | Stroke | Ratio | 150- | Stroke | Ratio |
| 015-                  | 25     | 1   | 35                                                                 | 35     | 1.0   | 35   | 20     | 2.5   | 35   | 16     | 4.0   | 35   | 14     | 6.3   | 35   | 13     | 9.8   |
|                       | 25     | 2   | 60                                                                 | 60     | 0.5   | 35   | 30     | 1.2   | 35   | 23     | 2.0   | 35   | 18     | 3.1   | 35   | 15     | 4.9   |
|                       | 25     | 3   | 110                                                                | 85     | 0.3   | 60   | 40     | 0.8   | 35   | 29     | 1.3   | 35   | 22     | 2.1   | 35   | 18     | 3.3   |
|                       | 50     | 1   | 60                                                                 | 60     | 1.0   | 35   | 30     | 2.5   | 35   | 23     | 4.0   | 35   | 18     | 6.3   | 35   | 15     | 9.8   |
|                       | 50     | 2   | 110                                                                | 110    | 0.5   | 60   | 50     | 1.2   | 35   | 35     | 2.0   | 35   | 26     | 3.1   | 35   | 20     | 4.9   |
|                       | 50     | 3   |                                                                    |        |       | 110  | 70     | 0.8   | 60   | 48     | 1.3   | 35   | 34     | 2.1   | 35   | 25     | 3.3   |
|                       | 100    | 1   | 110                                                                | 110    | 1.0   | 60   | 50     | 2.5   | 35   | 35     | 4.0   | 35   | 26     | 6.3   | 35   | 20     | 9.8   |
|                       | 100    | 2   |                                                                    |        |       | 110  | 91     | 1.2   | 60   | 60     | 2.0   | 60   | 42     | 3.1   | 35   | 30     | 4.9   |
|                       | 100    | 3   |                                                                    |        |       | 160  | 131    | 0.8   | 110  | 85     | 1.3   | 60   | 58     | 2.1   | 60   | 41     | 3.3   |
|                       | 150    | 1   | 160                                                                | 160    | 1.0   | 110  | 70     | 2.5   | 60   | 48     | 4.0   | 60   | 34     | 6.3   | 35   | 25     | 9.8   |
|                       | 150    | 2   |                                                                    |        |       | 160  | 131    | 1.2   | 110  | 85     | 2.0   | 60   | 58     | 3.1   | 60   | 41     | 4.9   |
|                       | 150    | 3   |                                                                    |        |       |      |        |       | 160  | 123    | 1.3   | 110  | 82     | 2.1   | 60   | 56     | 3.3   |
| 040-                  | 25     | 1   | 110                                                                | 72     | 0.4   | 35   | 35     | 1.0   | 35   | 26     | 1.6   | 35   | 20     | 2.5   | 35   | 16     | 3.9   |
|                       | 25     | 2   |                                                                    |        |       | 60   | 60     | 0.5   | 60   | 41     | 0.8   | 35   | 30     | 1.3   | 35   | 23     | 2.0   |
|                       | 25     | 3   |                                                                    |        |       | 110  | 85     | 0.3   | 60   | 57     | 0.5   | 60   | 40     | 0.8   | 35   | 29     | 1.3   |
|                       | 50     | 1   |                                                                    |        |       | 60   | 60     | 1.0   | 60   | 41     | 1.6   | 35   | 30     | 2.5   | 35   | 23     | 3.9   |
|                       | 50     | 2   |                                                                    |        |       | 110  | 110    | 0.5   | 110  | 72     | 0.8   | 60   | 50     | 1.3   | 35   | 35     | 2.0   |
|                       | 50     | 3   |                                                                    |        |       | 160  | 160    | 0.3   | 110  | 103    | 0.5   | 110  | 70     | 0.8   | 60   | 48     | 1.3   |
|                       | 100    | 1   |                                                                    |        |       | 110  | 110    | 1.0   | 110  | 72     | 1.6   | 60   | 50     | 2.5   | 35   | 35     | 3.9   |
|                       | 100    | 2   |                                                                    |        |       |      |        |       | 160  | 134    | 0.8   | 110  | 89     | 1.3   | 60   | 60     | 2.0   |
|                       | 100    | 3   |                                                                    |        |       |      |        |       |      |        |       | 160  | 129    | 0.8   | 110  | 86     | 1.3   |
|                       | 150    | 1   |                                                                    |        |       |      |        |       | 110  | 103    | 1.6   | 110  | 70     | 2.5   | 60   | 48     | 3.9   |
|                       | 150    | 2   |                                                                    |        |       |      |        |       |      |        |       | 160  | 129    | 1.3   | 110  | 86     | 2.0   |
|                       | 150    | 3   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 124    | 1.3   |
| 060-                  | 25     | 1   | 110                                                                | 110    | 0.3   | 60   | 50     | 0.6   | 35   | 35     | 1.0   | 35   | 26     | 1.6   | 35   | 20     | 2.4   |
|                       | 25     | 2   |                                                                    |        |       | 110  | 91     | 0.3   | 60   | 60     | 0.5   | 60   | 42     | 0.8   | 35   | 30     | 1.2   |
|                       | 25     | 3   |                                                                    |        |       | 160  | 131    | 0.2   | 110  | 85     | 0.3   | 60   | 58     | 0.5   | 60   | 41     | 0.8   |
|                       | 50     | 1   |                                                                    |        |       | 110  | 91     | 0.6   | 60   | 60     | 1.0   | 60   | 42     | 1.6   | 35   | 30     | 2.4   |
|                       | 50     | 2   |                                                                    |        |       |      |        |       | 110  | 110    | 0.5   | 110  | 74     | 0.8   | 60   | 51     | 1.2   |
|                       | 50     | 3   |                                                                    |        |       |      |        |       | 160  | 160    | 0.3   | 110  | 106    | 0.5   | 110  | 71     | 0.8   |
|                       | 100    | 1   |                                                                    |        |       |      |        |       | 110  | 110    | 1.0   | 110  | 74     | 1.6   | 60   | 51     | 2.4   |
|                       | 100    | 2   |                                                                    |        |       |      |        |       |      |        |       | 160  | 138    | 0.8   | 110  | 92     | 1.2   |
|                       | 100    | 3   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 133    | 0.8   |
|                       | 150    | 1   |                                                                    |        |       |      |        |       | 160  | 160    | 1.6   | 110  | 106    | 1.6   | 110  | 71     | 2.4   |
|                       | 150    | 2   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 133    | 1.2   |
| 090-                  | 25     | 1   |                                                                    |        |       | 110  | 73     | 0.4   | 60   | 49     | 0.6   | 35   | 35     | 1.0   | 35   | 26     | 1.6   |
|                       | 25     | 2   |                                                                    |        |       | 160  | 136    | 0.2   | 110  | 88     | 0.3   | 60   | 60     | 0.5   | 60   | 42     | 0.8   |
|                       | 25     | 3   |                                                                    |        |       |      |        |       | 160  | 127    | 0.2   | 110  | 85     | 0.3   | 60   | 58     | 0.5   |
|                       | 50     | 1   |                                                                    |        |       | 160  | 136    | 0.4   | 110  | 88     | 0.6   | 60   | 60     | 1.0   | 60   | 42     | 1.6   |
|                       | 50     | 2   |                                                                    |        |       |      |        |       |      |        |       | 110  | 110    | 0.5   | 110  | 74     | 0.8   |
|                       | 50     | 3   |                                                                    |        |       |      |        |       |      |        |       | 160  | 160    | 0.3   | 110  | 106    | 0.5   |
|                       | 100    | 1   |                                                                    |        |       |      |        |       |      |        |       | 110  | 110    | 1.0   | 110  | 74     | 1.6   |
|                       | 100    | 2   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 138    | 0.8   |
|                       | 150    | 1   |                                                                    |        |       |      |        |       |      |        |       | 150  | 160    | 1.0   | 110  | 106    | 1.6   |
| 150-                  | 25     | 1   |                                                                    |        |       | 110  | 108    | 0.3   | 110  | 71     | 0.4   | 60   | 49     | 0.6   | 35   | 35     | 1.0   |
|                       | 25     | 2   |                                                                    |        |       |      |        |       | 160  | 132    | 0.2   | 110  | 88     | 0.3   | 60   | 60     | 0.5   |
|                       | 25     | 3   |                                                                    |        |       |      |        |       |      |        |       | 160  | 127    | 0.2   | 110  | 85     | 0.3   |
|                       | 50     | 1   |                                                                    |        |       |      |        |       | 160  | 132    | 0.4   | 110  | 88     | 0.6   | 60   | 60     | 1.0   |
|                       | 50     | 2   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 110  | 110    | 0.5   |
|                       | 50     | 3   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 160    | 0.3   |
|                       | 100    | 1   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 110  | 110    | 1.0   |
|                       | 150    | 1   |                                                                    |        |       |      |        |       |      |        |       |      |        |       | 160  | 160    | 1.0   |

Combinations of Cam Units and Power Unit marked   are normally not recommended as maximum Cam velocities can be exceeded if Power Unit is stroked too quickly. See also the following examples.

See also the following examples:

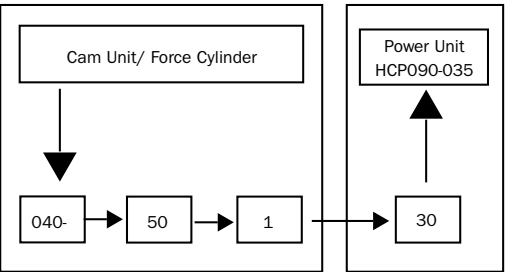
Example 1.

If you have chosen one Compact Cam Unit CC 040-049 the normal Power Unit will be HCP 040-060. The used stroke of the Power Unit is 60 mm. The ratio will be 1.0 which gives the same Compact Cam stroke velocity as the press.  
(Press stroke 10 mm - Cam stroke 10 mm).



Example 2.

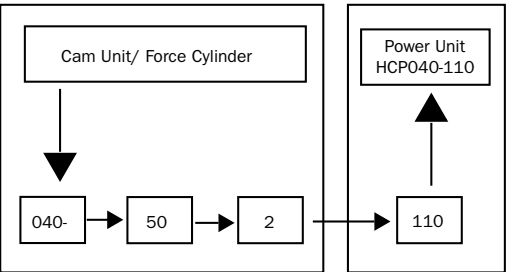
If it is possible to use only 30 mm of stroke from the press to perform an operation, choose a larger Power Unit HCP 090-035 connected to one Cam Unit CC 040-049. The used stroke of the Power Unit will be 30 mm and the ratio 2.5. If the press speed is 0.3 m/s the Cam speed will be  $2.5 \times 0.3 = 0.75$  m/s.  
(Press stroke 10 mm - Cam stroke 25 mm).



The used stroke of the Power Unit and the Cam Unit/ Force Cylinder can always be optimised to suit the situation in the tool. In some installations it is necessary to increase the velocity of the Cam relative to the press. Note that the movement of the Cams during the stroke is not equal when more than one cam is connected to the Power Unit.

Example 3.

If you choose to use two Cam Units of size CC 040-049 and have a possible 110 mm of the press stroke available then use Power Unit HCP 040-110. The used stroke of the Power Unit will be 110 mm and the ratio 0.5.  
If the press speed is 0.3 m/s the medium velocity of the Cams will be  $0.5 \times 0.3 = 0.15$  m/s.  
(Press stroke 10 mm - Cam stroke approximately 5 mm).  
Power Unit order number:  
See also page 99 and 113.



Power Unit:

HCP \_\_\_\_\_ - \_\_\_\_\_

### Step 5b Size and stroke of Power Unit using different sizes of Cam Units/Force Cylinders

Determine first the total oil volume for the Cam Units/ Force Cylinders using the formula below. The total oil volume is the sum of the volumes of all Cam Units/ Force Cylinders. The volume is the piston area times the used stroke. The total oil volume  $V_c$  for the Cam Units/ Force Cylinders = minimum oil volume for the Power Unit in  $dm^3$  as shown in Table 1.  $A_n$  is the piston area in the Cam Units in  $dm^2$  as shown in Table 1.

$$V_c = ((A_1 \times S_1) + (A_2 \times S_2) + \dots + (A_n \times S_n)) / 100$$

$A_n$  = Area, Cam Unit

$S_n$  = Stroke length, Cam Unit

**Table 1. Piston area for the Cam Units/ Force Cylinders**

| CC HCF           | 015  | 040  | 060  | 090  | 150  |
|------------------|------|------|------|------|------|
| $A_n$ ( $dm^2$ ) | 0.13 | 0.31 | 0.50 | 0.79 | 1.23 |

Total oil volume Cam Units/ Force Cylinders:

$$V_c = \text{_____ } dm^3$$

Choose the appropriate Power Unit from Table 2. The Power Unit has to give at least the minimum volume of oil as calculated above. Calculate the used stroke  $S_p$  of the Power Unit using the formula below:

$$S_p = ((V_c / V_{HCP}) * S_{HCP}) + 10$$

$V_c$  = Total oil volume Cam Units/ Force Cyl.

$V_{HCP}$  = Oil volume Power Unit

$S_{HCP}$  = Stroke Power Unit

**Note, the additional 10 mm is required so that a precise Cam stroke is performed. See page 96 for a Function Description.**

See also the following example:

Choose a Power Unit to supply one Compact Cam CC 015-049 and one Force Cylinder HCF 040-050 with only 40 mm used stroke.

$$V_c = ((A_{cc} \times S_{cc}) + (A_{HCF} \times S_{HCF})) / 100$$

$$V_c = ((0.13 \times 49) + (0.31 \times 40)) / 100$$

(See Table 1)

$$V_c = 0.189$$

**Table 2. Oil volume Power Unit  $V_{HCP}$**

| Stroke length<br>$S_{HCP}$ | HCP   |       |       |       |       |
|----------------------------|-------|-------|-------|-------|-------|
|                            | 015   | 040   | 060   | 090   | 150   |
| 25 mm                      | 0.031 | 0.078 | 0.126 | 0.196 | 0.307 |
| 50 mm                      | 0.063 | 0.156 | 0.251 | 0.393 | 0.614 |
| 100 mm                     | 0.126 | 0.312 | 0.502 | 0.785 | 1.227 |
| 150 mm                     | 0.188 | 0.468 | 0.753 | 1.178 | 1.841 |

Used stroke Power Unit:

$$S_p = \text{_____ } mm$$

Choose a Power Unit with more than 0.189 dm3 oil volume for example HCP 060-60 which has 0.251 dm3. (Another alternative HCP 040-110.) Calculate used stroke of the Power Unit:

$$S_p = ((V_c / V_p) \times S_{HCP}) + 10$$
$$S_p = ((0.189 / 0.251) \times 50) + 10$$
$$S_p = 48 \text{ mm}$$

In the above example, a Power Unit HCP 060-060 is recommended with a used stroke of 48 mm. Do not exceed the specified velocity of the Cam Units/ Force Cylinders according to page 111 "Technical data".

Remember also that one of the Cams will move slightly before the other one when using two Cams coupled to one Power Unit.

Step 6

Choose hose and adapters according to page 149 "Dimensions for accessories".

**Maximum hose length between Power Unit and Cam Unit is 2 m.**

The size of the hose is always set by the size of the Power Unit. The size of the hose is adapted for the oil flow according to the velocities in page 111 "Technical data".

If you need a smaller hose than our normal specifications, check your press velocity and refer to Table 1 or page 8.37. It is easiest to choose the correct hose length when the Cam Unit/ Force Cylinder and the Power Unit are installed in the tool.

Make sure that the hose is long enough and is protected against sharp edges and external damage. The hose will flex a little due to the oil pressure pulsation during operation. Make sure the minimum bending radius of the hoses when installed are not below that which is specified.

Table 1

| Power Unit | Hose size - Press velocity                |         |         |         |
|------------|-------------------------------------------|---------|---------|---------|
|            | Standard size<br>Max. velocity<br>0.8 m/s | 0.6 m/s | 0.4 m/s | 0.2 m/s |
| HCP 015    | 1/2"                                      | 3/8"    | 3/8"    | 3/8"    |
| HCP 040    | 3/4"                                      | 3/4"    | 1/2"    | 1/2"    |
| HCP 060    | 1"                                        | 3/4"    | 3/4"    | 1/2"    |
| HCP 090    | 1"                                        | 1"      | 3/4"    | 1/2"    |
| HCP 150    | 1 1/4"                                    | 1 1/4"  | 1"      | 3/4"    |

# Technical Data

## Capacity and performance

The forces in the table below are valid when the following normal gas pressures are used

|                                                |         |
|------------------------------------------------|---------|
| Accumulator .....                              | 150 bar |
| Force Cylinder .....                           | 20 bar  |
| CC 015-040, CCF 040 Return spring M2 200 ..... | 180 bar |
| CC 060 Return springs X 350 .....              | 180 bar |
| CC 090 Return spring TU 500 .....              | 150 bar |
| CC 150 Return spring X 750 .....               | 150 bar |

| Description                | Unit   | Force Cylinder    |    |    |    |     | Compact Cam        |    |    |     |     | Flange Cam        | Power Unit        |    |    |    |     |
|----------------------------|--------|-------------------|----|----|----|-----|--------------------|----|----|-----|-----|-------------------|-------------------|----|----|----|-----|
|                            |        | HCF               |    |    |    |     | CC                 |    |    |     |     | CCF               | HCP               |    |    |    |     |
| Force (size)               | kN     | 15                | 40 | 60 | 90 | 150 | 15                 | 40 | 60 | 90  | 150 | 40                | 15                | 40 | 60 | 90 | 150 |
| Working return force (min) | kN     | 1.5               | 4  | 6  | 9  | 14  | 2                  | 4  | 7  | 10  | 15  | 4                 | —                 | —  | —  | —  | —   |
| Max. frequency             | op/min | 60                |    |    | 30 |     | 60                 |    |    | 30  |     | 60                | 60                |    |    | 30 |     |
| Max. velocity              | m/s    | 1.6               |    |    |    |     | 1.6                |    |    |     |     | 1.6               | 1.6               |    |    |    |     |
| Min. gas pressure          | bar    | 10                |    |    |    |     | 125                |    |    | 105 |     | 125               | 50                |    |    |    |     |
| Max. gas pressure          | bar    | 40                |    |    |    |     | 180                |    |    | 150 |     | 180               | 180               |    |    |    |     |
| Stroke length              | mm     | 25, 50, 100, 150  |    |    |    |     | 24, 49, 99*, 124** |    |    |     |     | 49, 99            | 35, 60, 110, 160  |    |    |    |     |
| Expected life time         | op.    | 1x10 <sup>6</sup> |    |    |    |     | 1x10 <sup>6</sup>  |    |    |     |     | 1x10 <sup>6</sup> | 1x10 <sup>6</sup> |    |    |    |     |
| Surrounding temp           | °C     | 10-40             |    |    |    |     | 10-40              |    |    |     |     | 10-40             | 10-40             |    |    |    |     |

\* not CC 015

\*\* only CC 040

Other values than those specified in the table above could be accepted under special conditions or combinations of stroke length, velocity and frequency.

## Other specifications

The hydraulic oil Shell Tellus TX 32 is the

recommended oil as defined below:

DIN 51524 HVL ISO VG 32

Purity ISO 4406 15/12 (with 10µm filter)

Nitrogen:

Nitrogen N<sub>2</sub> ..... >99.95 vol %

Water H<sub>2</sub>O ..... < 40 ppm

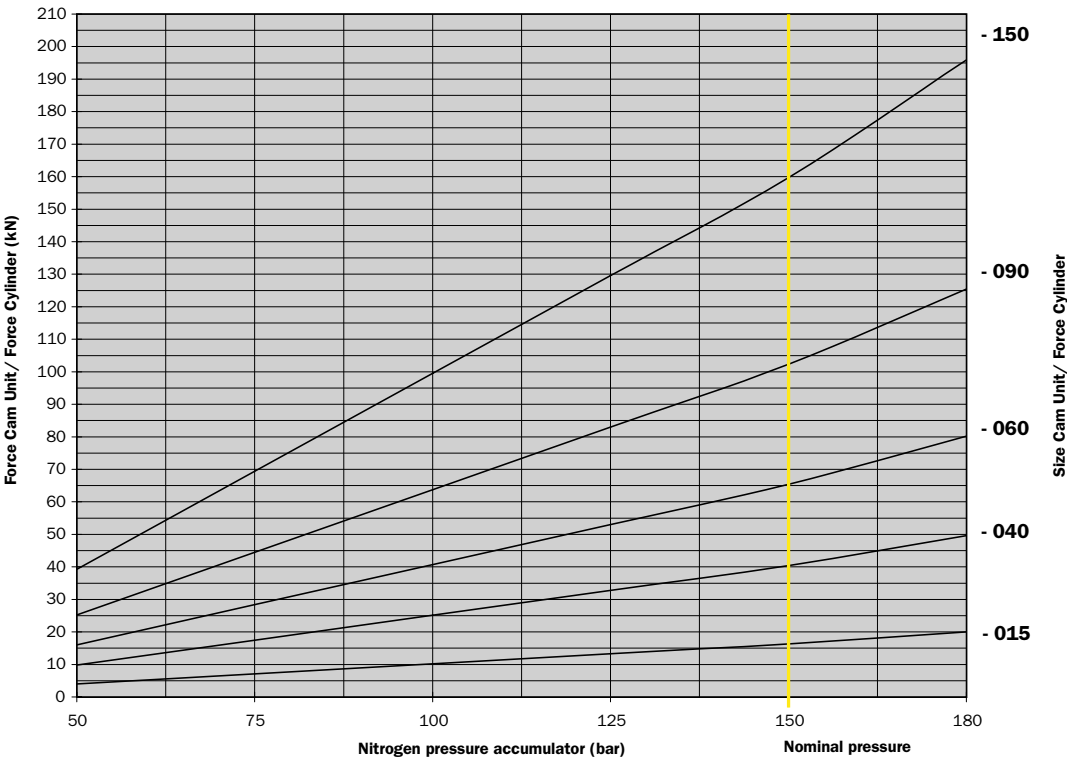
Cam Unit/ Force Cylinder force as a function of nitrogen pressure in the Accumulator

If you need to increase or decrease the force of the Cam Unit/ Force Cylinder, it is possible to change the nitrogen pressure according to the diagram below.

Example.

A Force Cylinder size 040 is used to perform a forming operation. With the normal Accumulator charge pressure of 150 bar, this Force Cylinder gives 40 kN. If 25 kN of force is required then the Accumulator charge pressure should be reduced to 100 bar instead.

Force Cam Unit/ Force Cylinder - Nitrogen Pressure Accumulator

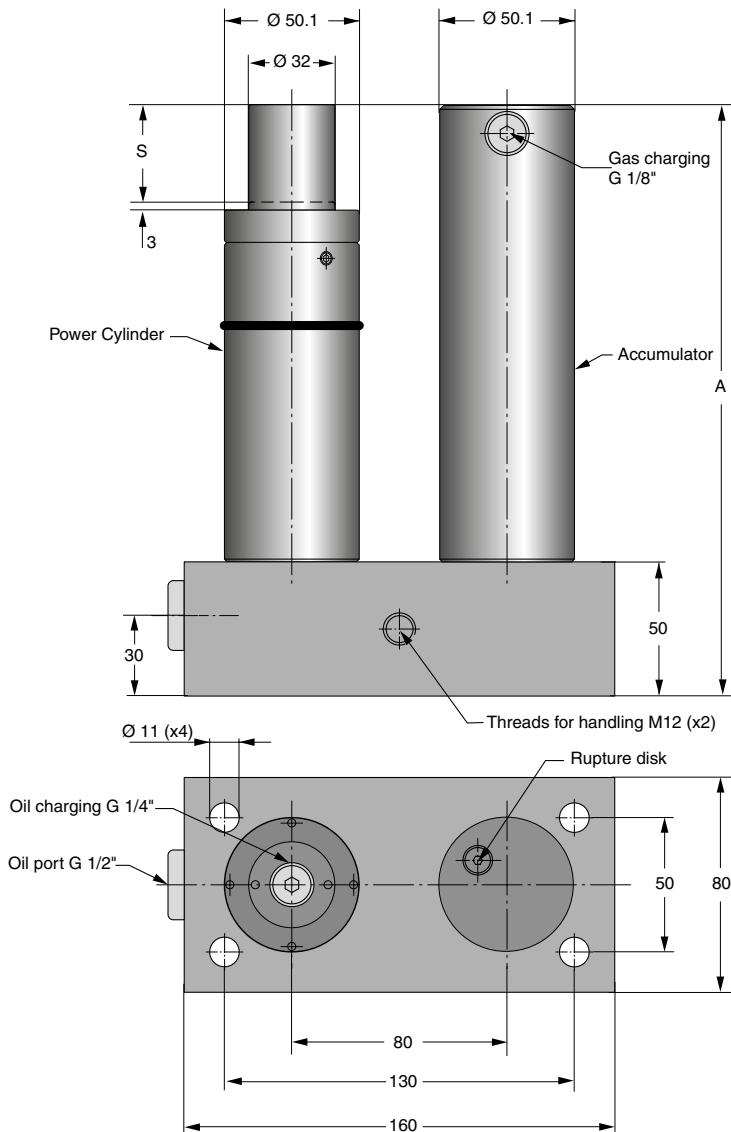


# Dimensions

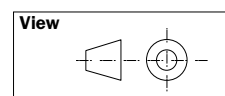
## Power and Cam Units/ Force Cylinder



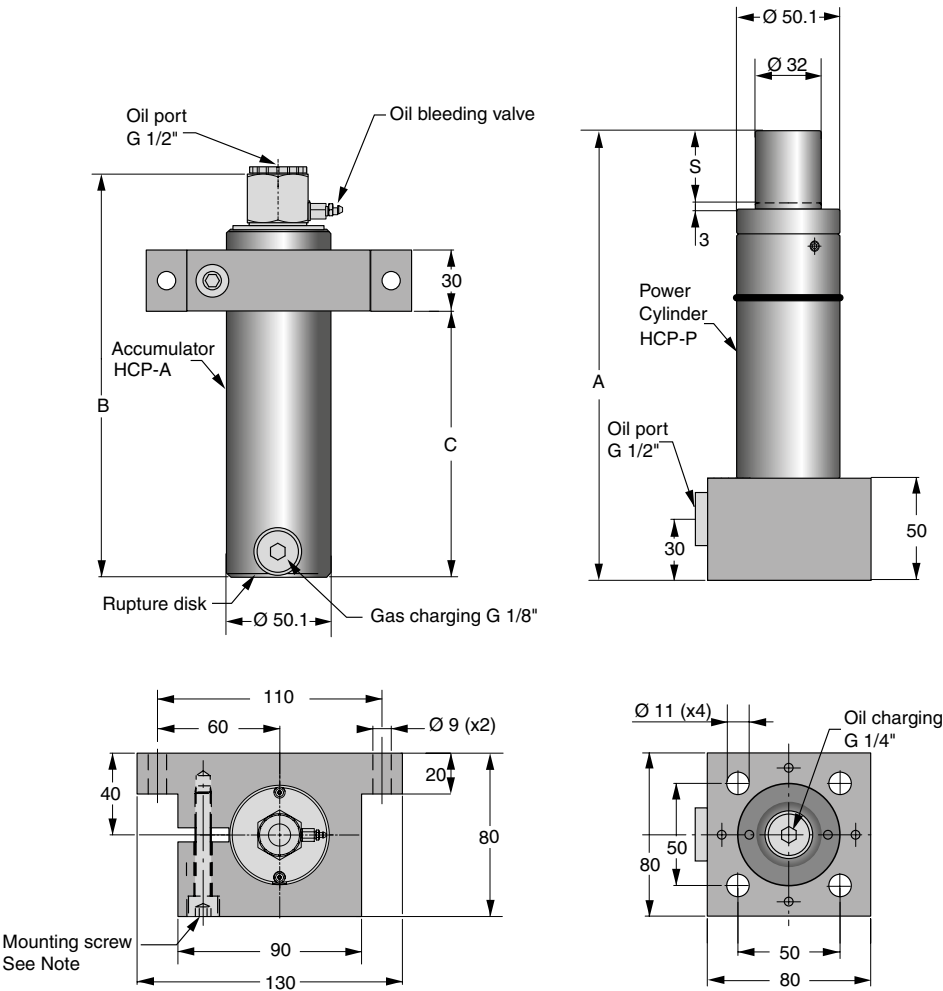
### HCP 015 Power Unit



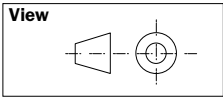
| Order No.   | Force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|------------|---------------|-----|-------------|
| HCP 015-035 | 15         | 35            | 220 | 8.2         |
| HCP 015-060 | 15         | 60            | 270 | 9.1         |
| HCP 015-110 | 15         | 110           | 370 | 10.5        |
| HCP 015-160 | 15         | 160           | 470 | 11.3        |



HCP-S 015 Power Unit, with Separate Accumulator



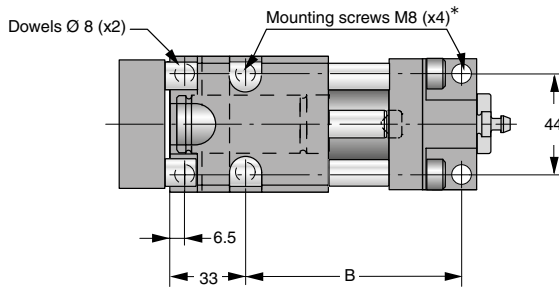
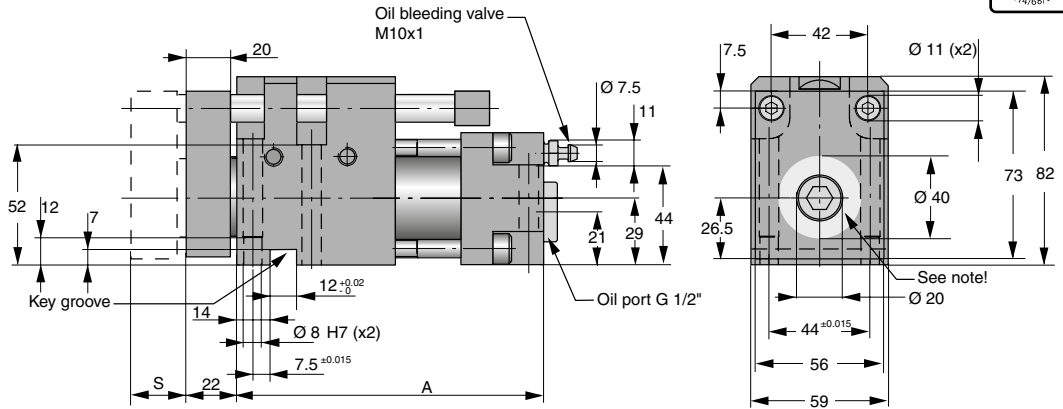
**Note!** The Mounting screw (M8) should be tightened with torque 25Nm



| Order No.<br>Complete<br>Power Unit HCP-S | Weight<br>(kg) | Force<br>(kN) | Stroke<br>S<br>(mm) | A   | B   | C   | Order No.<br>Separate<br>Power Cylinder HCP-P | Weight<br>(kg) | Order No.<br>Separate<br>Accumulator HCP-A | Weight<br>(kg) |
|-------------------------------------------|----------------|---------------|---------------------|-----|-----|-----|-----------------------------------------------|----------------|--------------------------------------------|----------------|
| HCP-S 015 - 035                           | 7.3            | 15            | 35                  | 220 | 213 | 130 | HCP-P 015 - 035                               | 4.3            | HCP-A 015 - 035                            | 3.0            |
| HCP-S 015 - 060                           | 8.1            | 15            | 60                  | 270 | 264 | 180 | HCP-P 015 - 060                               | 4.7            | HCP-A 015 - 060                            | 3.4            |
| HCP-S 015 - 110                           | 9.6            | 15            | 110                 | 370 | 364 | 280 | HCP-P 015 - 110                               | 5.5            | HCP-A 015 - 110                            | 4.1            |
| HCP-S 015 - 160                           | 10.7           | 15            | 160                 | 470 | 464 | 380 | HCP-P 015 - 160                               | 6.0            | HCP-A 015 - 160                            | 4.7            |

**Note!** The Accumulator should always be used in the system.

# CC 015 Compact Cam



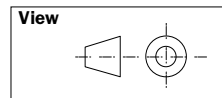
\* 4 pcs mounting screws are included

## Note!

### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

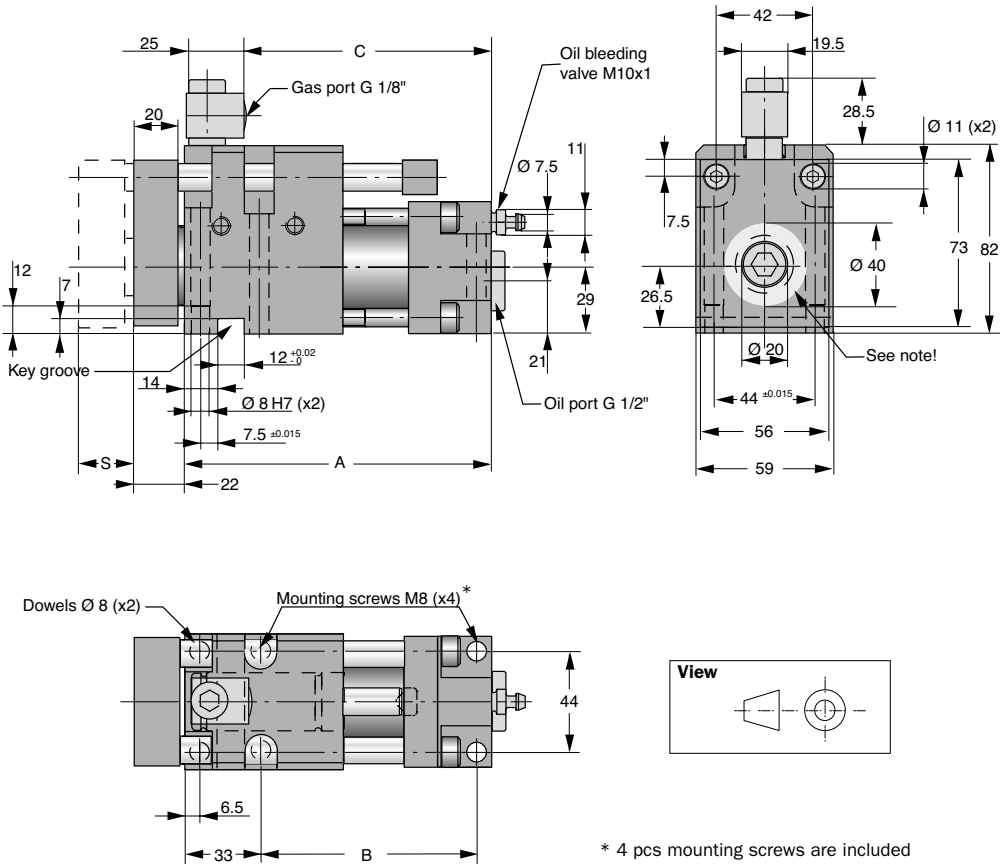


| Order No.  | Working force* (kN) | Return force (kN) | Stroke S (mm) | A     | B   | Weight (kg) |
|------------|---------------------|-------------------|---------------|-------|-----|-------------|
| CC 015-024 | 15                  | 2                 | 24            | 133.5 | 94  | 4.2         |
| CC 015-049 | 15                  | 2                 | 49            | 158.5 | 119 | 4.6         |

\* = Nominal force available for the operation

CC-H 015 Compact Cam for pressure control

This version can only be used together with a hose system as there are no gas charging valves in the springs or adapters



**Note!**  
**Important installation information:**

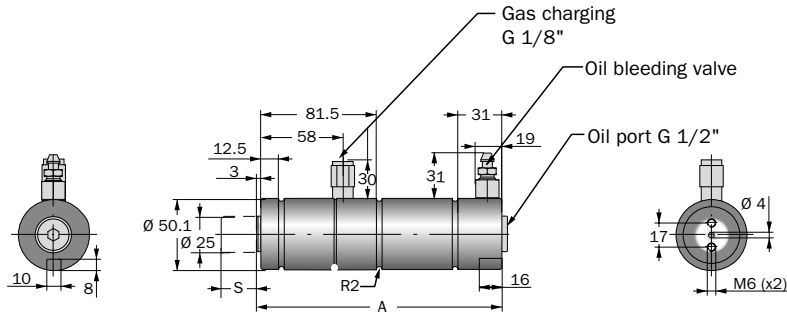
We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

| Order No.    | Working force* (kN) | Return force (kN) | Stroke S (mm) | A     | B   | C   | Weight |
|--------------|---------------------|-------------------|---------------|-------|-----|-----|--------|
| CC-H 015-024 | 15                  | 2                 | 24            | 133.5 | 94  | 107 | 4.3    |
| CC-H 015-049 | 15                  | 2                 | 49            | 158.5 | 119 | 132 | 4.7    |

\* = Nominal force available for the operation

## HCF 015 Force Cylinder



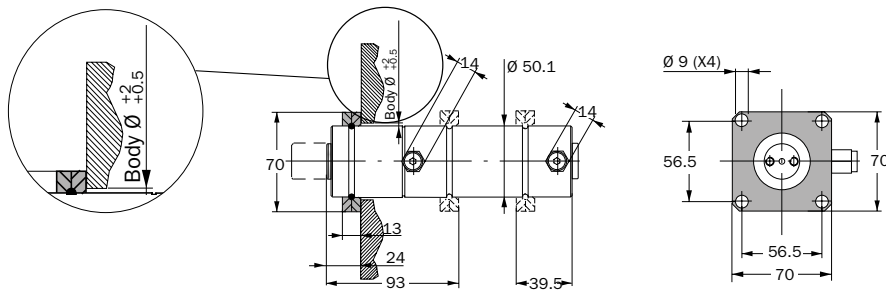
| Order No.   | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|---------------------|-------------------|---------------|-----|-------------|
| HCF 015-025 | 15                  | 1.5               | 25            | 173 | 2.0         |
| HCF 015-050 | 15                  | 1.5               | 50            | 223 | 2.5         |
| HCF 015-100 | 15                  | 1.5               | 100           | 323 | 3.6         |
| HCF 015-150 | 15                  | 1.5               | 150           | 423 | 4.6         |

**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

\* = Nominal force for the operation

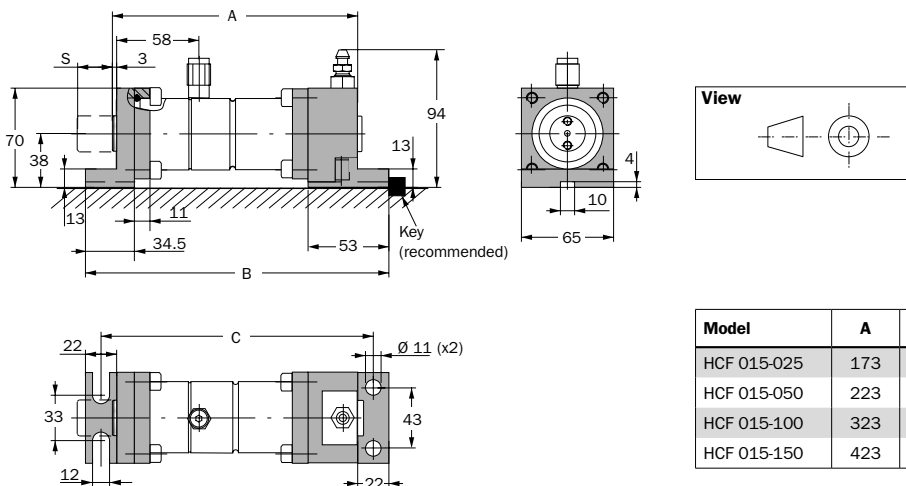
## Flange mount HCF 015

Order No. 2014677-0750 (Mount only)



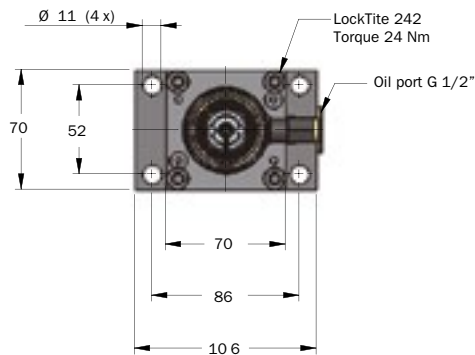
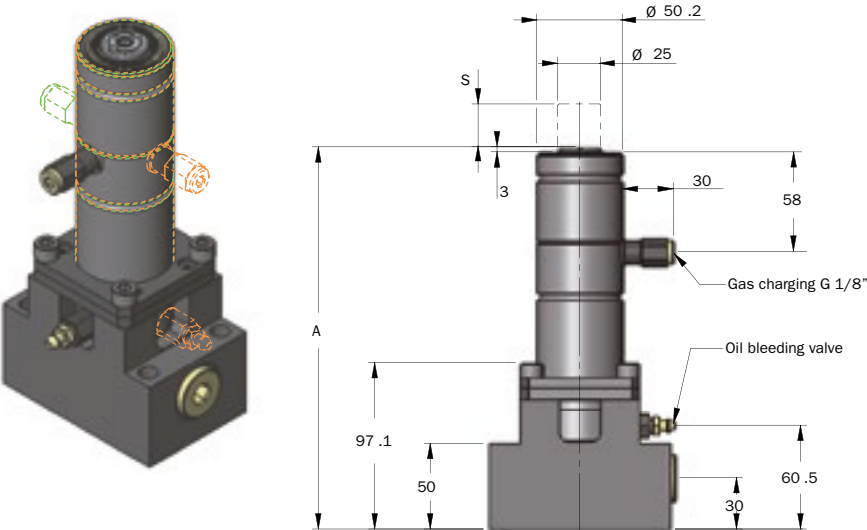
## Foot mount HCF 015

Order No. 3016977-015 (Mounts only)



| Model       | A   | B   | C   |
|-------------|-----|-----|-----|
| HCF 015-025 | 173 | 214 | 192 |
| HCF 015-050 | 223 | 264 | 242 |
| HCF 015-100 | 323 | 364 | 342 |
| HCF 015-150 | 423 | 464 | 442 |

HCF-SP 015 Force Cylinder with Side Port Plate

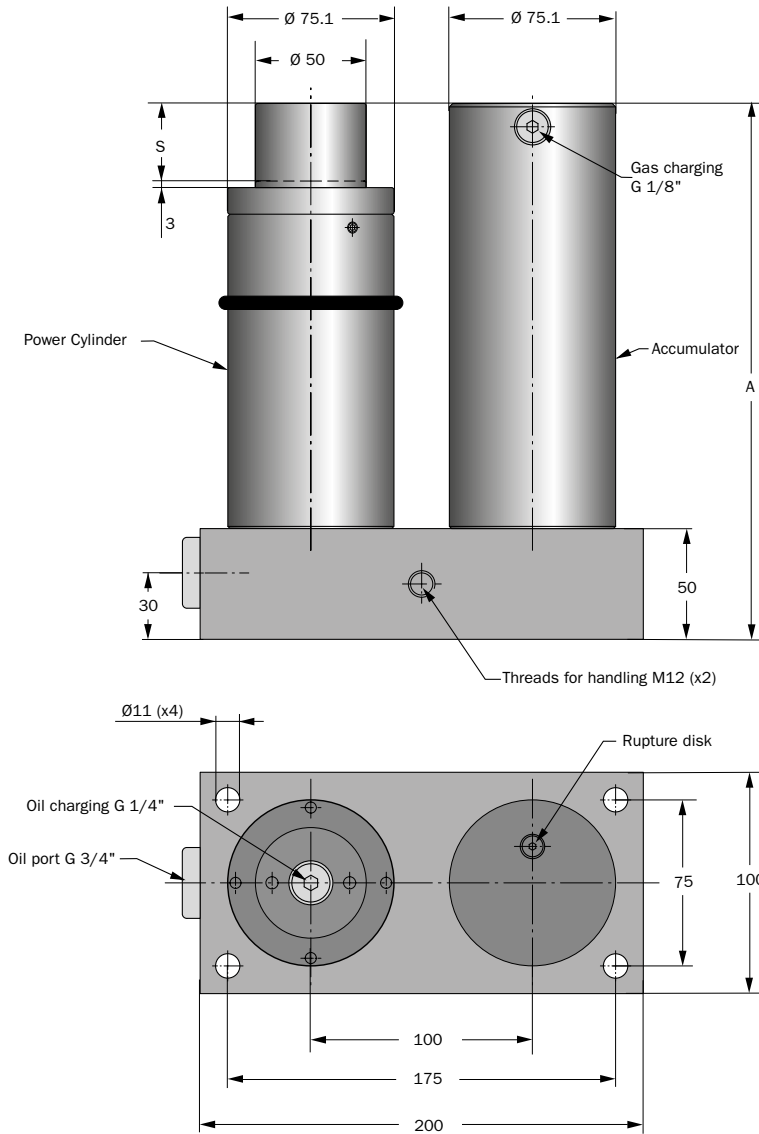


**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

| Order No.      | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight [kg] |
|----------------|---------------------|-------------------|---------------|-----|-------------|
| HCF-SP 015-025 | 15                  | 1.5               | 25            | 223 | 5.6         |
| HCF-SP 015-050 | 15                  | 1.5               | 50            | 273 | 6.1         |
| HCF-SP 015-100 | 15                  | 1.5               | 100           | 373 | 7.1         |
| HCF-SP 015-150 | 15                  | 1.5               | 150           | 473 | 8.2         |

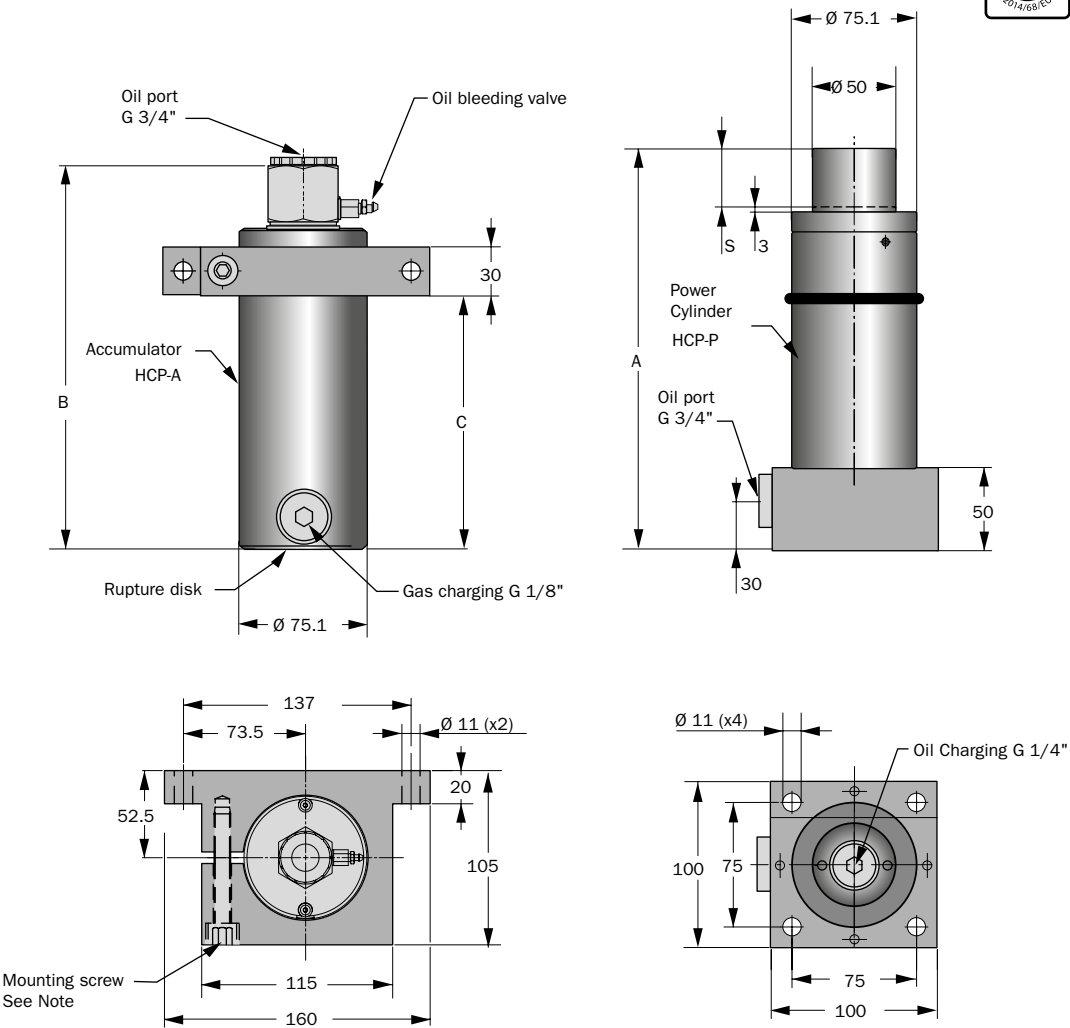
\*= Nominal force for the operation

# HCP 040 Power Unit

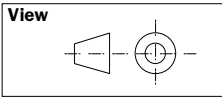


| Order No.   | Force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|------------|---------------|-----|-------------|
| HCP 040-035 | 40         | 35            | 242 | 15.7        |
| HCP 040-060 | 40         | 60            | 292 | 16.8        |
| HCP 040-110 | 40         | 110           | 392 | 19.1        |
| HCP 040-160 | 40         | 160           | 492 | 21.3        |

HCP-S 040 Power Unit, with Separate Accumulator



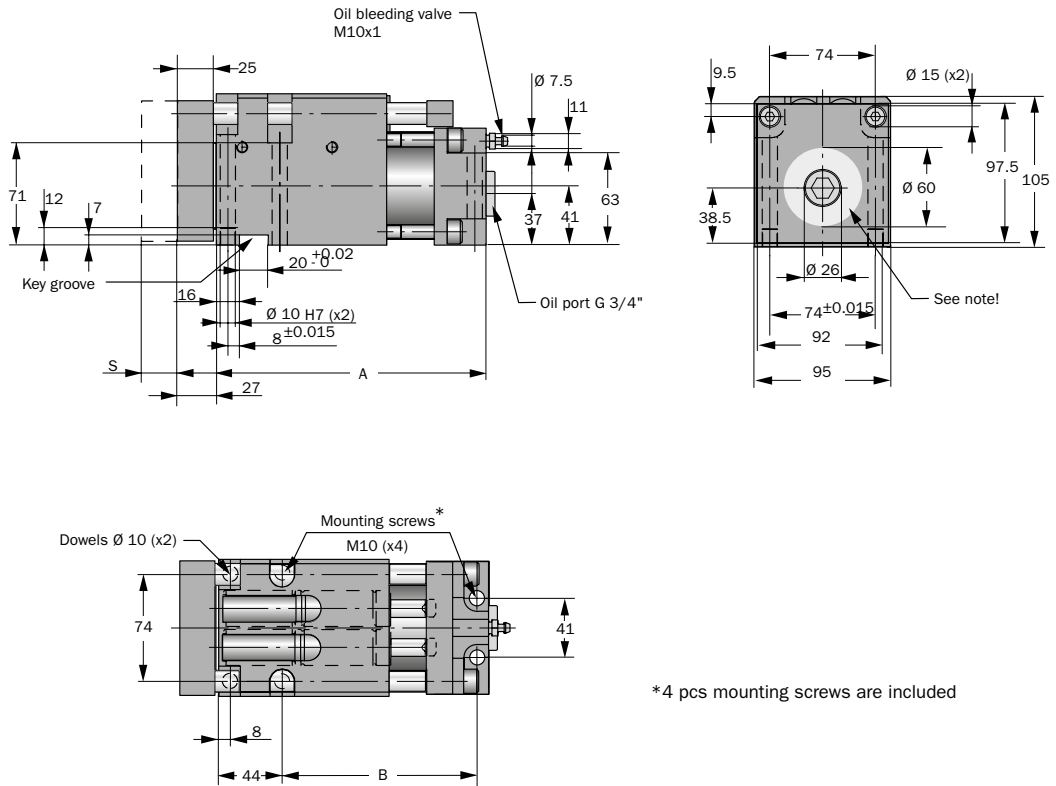
**Note!** The mounting screw (M10) should be tightened with torque 52 Nm.



| Order No. Complete Power Unit HCP-S | Weight (kg) | Force (kN) | Stroke S (mm) | A   | B   | C   | Order No. Separate Power Cylinder HCP-P | Weight (kg) | Order No. Separate Accumulator HCP-A | Weight (kg) |
|-------------------------------------|-------------|------------|---------------|-----|-----|-----|-----------------------------------------|-------------|--------------------------------------|-------------|
| HCP-S 040 -035                      | 14.0        | 40         | 35            | 242 | 231 | 152 | HCP-P 040 -035                          | 8.2         | HCP-A 040 -035                       | 5.8         |
| HCP-S 040 -060                      | 15.0        | 40         | 60            | 292 | 281 | 202 | HCP-P 040 -060                          | 8.7         | HCP-A 040 -060                       | 6.3         |
| HCP-S 040 -110                      | 17.4        | 40         | 110           | 392 | 381 | 302 | HCP-P 040 -110                          | 10.0        | HCP-A 040 -110                       | 7.4         |
| HCP-S 040 -160                      | 19.6        | 40         | 160           | 492 | 481 | 402 | HCP-P 040 -160                          | 11.2        | HCP-A 040-160                        | 8.4         |

**Note!** The Accumulator should always be used in the system.

# CC 040 Compact Cam

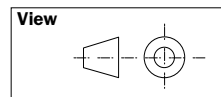


## Note!

### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

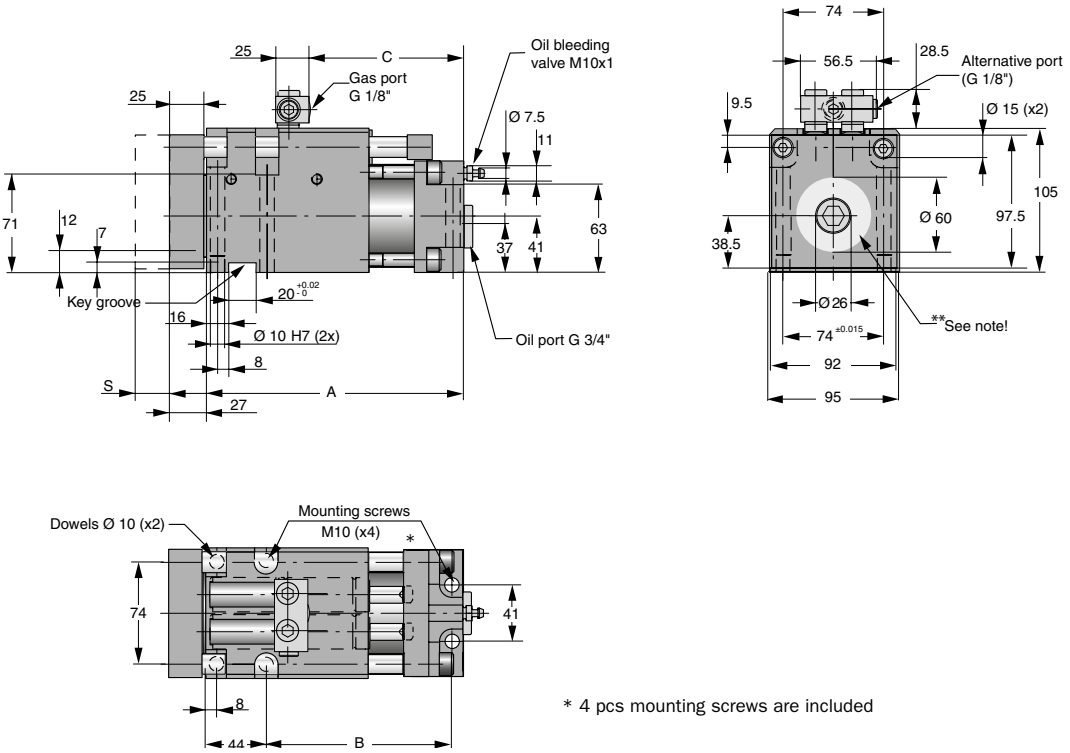


| Order No.  | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | Weight (kg) |
|------------|---------------------|-------------------|---------------|-----|-----|-------------|
| CC 040-024 | 40                  | 4                 | 24            | 187 | 135 | 10.5        |
| CC 040-049 | 40                  | 4                 | 49            | 212 | 160 | 12.8        |
| CC 040-099 | 40                  | 4                 | 99            | 262 | 210 | 15.0        |
| CC 040-124 | 40                  | 4                 | 124           | 287 | 235 | 16.5        |

\* = Nominal force available for the operation

CC-H 040 Compact Cam for pressure control

This version can only be used together with a hose system as there are no Gas Charging valves in the springs or adapters



**\*\*Note!**

**Important installation information:**

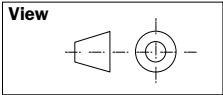
We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against side load.

**Note!** There are two G1/8" gas ports which can be used to couple the hose system to. Use only one of these to connect the hose, the other should remain plugged.

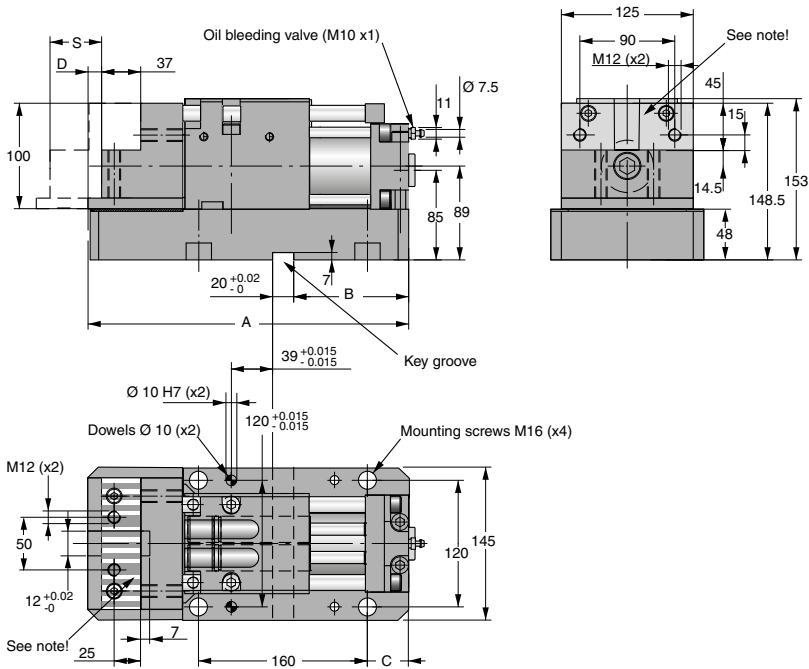
| Order No.    | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C   | Weight (kg) |
|--------------|---------------------|-------------------|---------------|-----|-----|-----|-------------|
| CC-H 040-024 | 40                  | 4                 | 24            | 187 | 135 | 112 | 10.7        |
| CC-H 040-049 | 40                  | 4                 | 49            | 212 | 160 | 162 | 13.0        |
| CC-H 040-099 | 40                  | 4                 | 99            | 262 | 210 | 237 | 15.2        |
| CC-H 040-124 | 40                  | 4                 | 124           | 287 | 235 | 262 | 16.7        |

\* = Nominal force available for the operation



# CCF 040 Flange Cam

Patent No. SE 513031, EP 1212156



## Note!

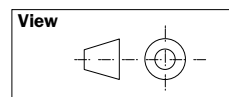
Shaded area marked  can be used for dowel location for the steel insert.

Shaded area marked  is not to be machined for risk of damage to underlying roller bearings.



| Order No.   | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C  | D  | Weight (kg) |
|-------------|---------------------|-------------------|---------------|-----|-----|----|----|-------------|
| CCF 040-049 | 40                  | 4                 | 49            | 304 | 109 | 39 | 13 | 35          |
| CCF 040-099 | 40                  | 4                 | 99            | 404 | 159 | 89 | 63 | 43          |

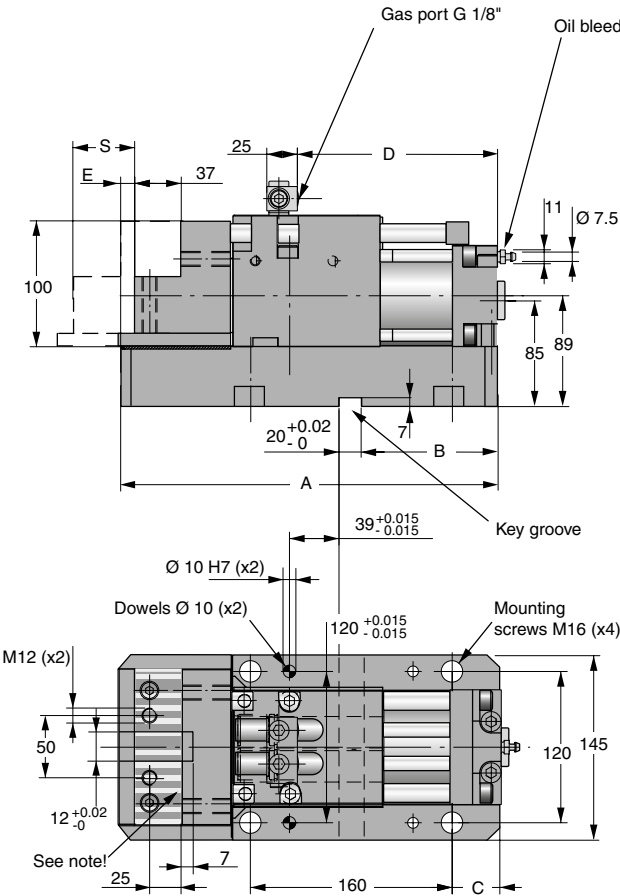
\* = Nominal force available for the operation



CCF-H 040 Flange Cam

Patent No. SE 513031, EP 1212156

This version can only be used together with a hose system as there are no gas charging valves in the springs or adapters



**Note!**

Shaded area marked  can be used for dowel location for the steel insert.

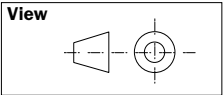
Shaded area marked  is not to be machined for risk of damage to underlying roller bearings.

There are two G 1/8" gas ports which can be used to couple a hose system to. Use only one of these to connect the hose system, the other should remain plugged.



| Order No.     | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C  | D   | E  | Weight (kg) |
|---------------|---------------------|-------------------|---------------|-----|-----|----|-----|----|-------------|
| CCF-H 040-049 | 40                  | 4                 | 49            | 304 | 109 | 39 | 162 | 13 | 35          |
| CCF-H 040-099 | 40                  | 4                 | 99            | 404 | 159 | 89 | 237 | 63 | 43          |

\* = Nominal force available for the operation



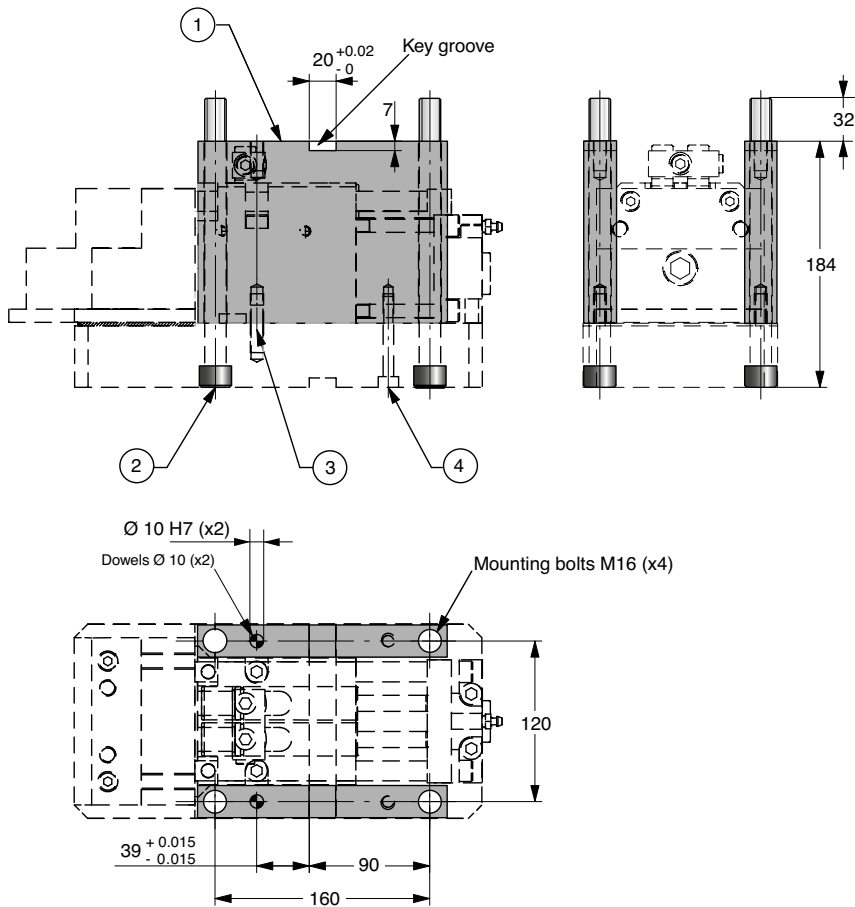
# Top mount kit for Flange Cam

CCF 040-049 and CCF-H 040-049

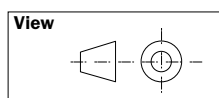
CCF 040-099 and CCF-H 040-099



(Order No. 2018393)

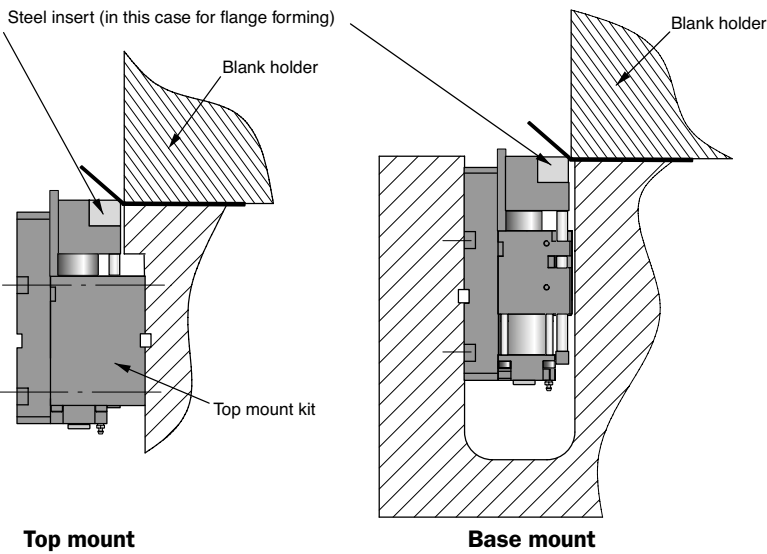


| Position | Quantity | Description         |
|----------|----------|---------------------|
| 1        | 2        | Spacer              |
| 2        | 4        | Bolt M16 x 200      |
| 3        | 2        | Dowel pin Ø 10 x 40 |
| 4        | 2        | Bolt M8 x 60        |

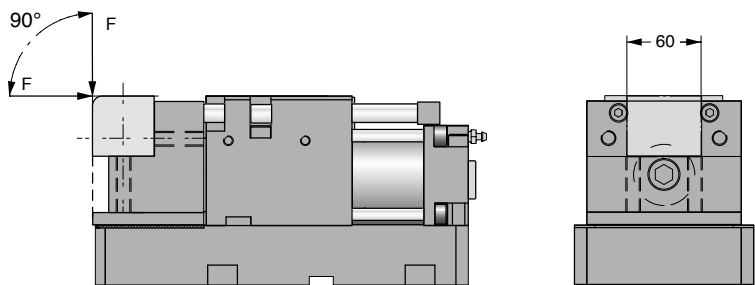


\* = Nominal force available for the operation

Flange Cam installation possibilities

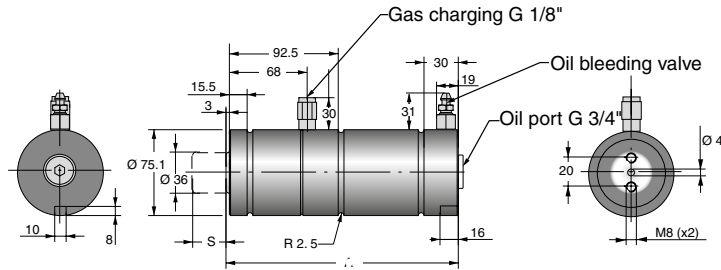


Flange Cam force directions and location



Allowable force directions "F" (within  ) created by the flanging operation.

# HCF 040 Force Cylinder

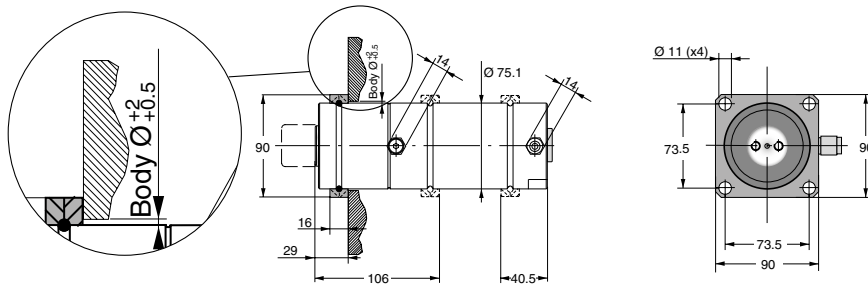


| Order No.   | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|---------------------|-------------------|---------------|-----|-------------|
| HCF 040-025 | 40                  | 4                 | 25            | 195 | 5.5         |
| HCF 040-050 | 40                  | 4                 | 50            | 245 | 6.5         |
| HCF 040-100 | 40                  | 4                 | 100           | 345 | 8.6         |
| HCF 040-150 | 40                  | 4                 | 150           | 445 | 10.7        |

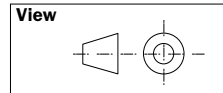
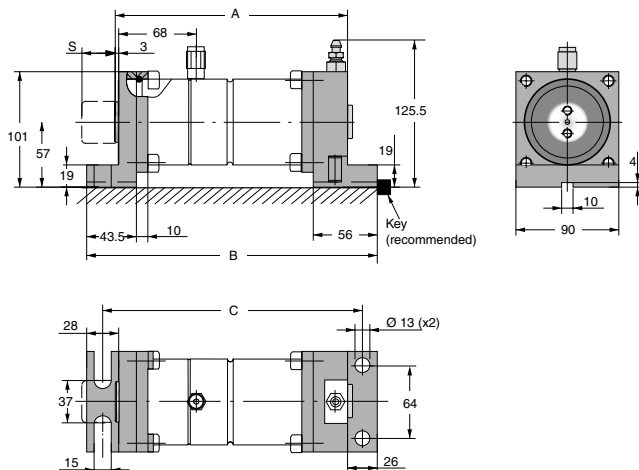
**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

\* = Nominal force for the operation

## Flange mount for HCF 040 Order No. 2014677-1500 (Mount only)

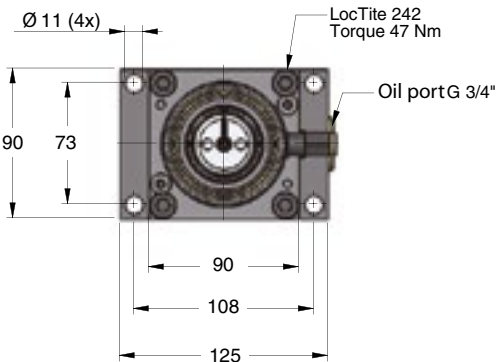
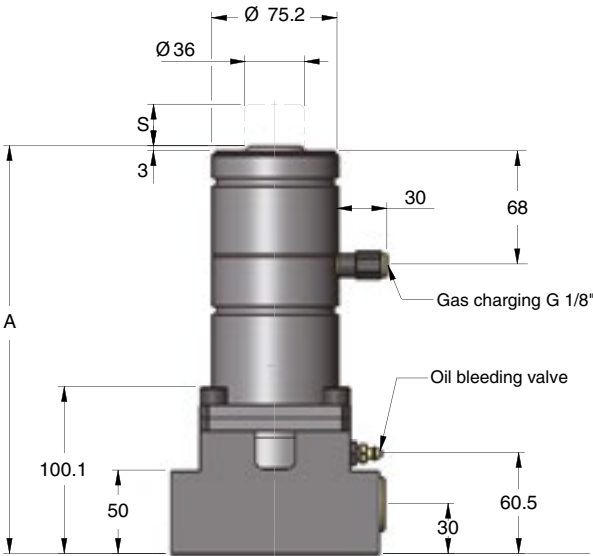
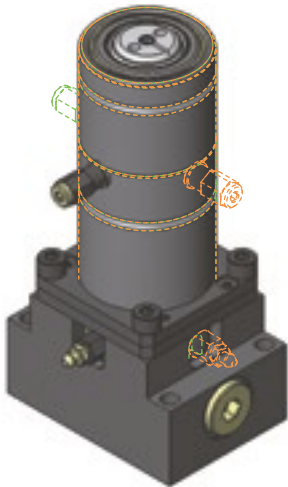


## Foot mount for HCF 040 Order No. 3016977-040 (Mounts only)



| Model       | A   | B   | C   |
|-------------|-----|-----|-----|
| HCF 040-025 | 195 | 246 | 219 |
| HCF 040-050 | 245 | 296 | 269 |
| HCF 040-100 | 345 | 396 | 369 |
| HCF 040-150 | 445 | 496 | 469 |

HCF-SP 040 Force Cylinder with Side Port Plate

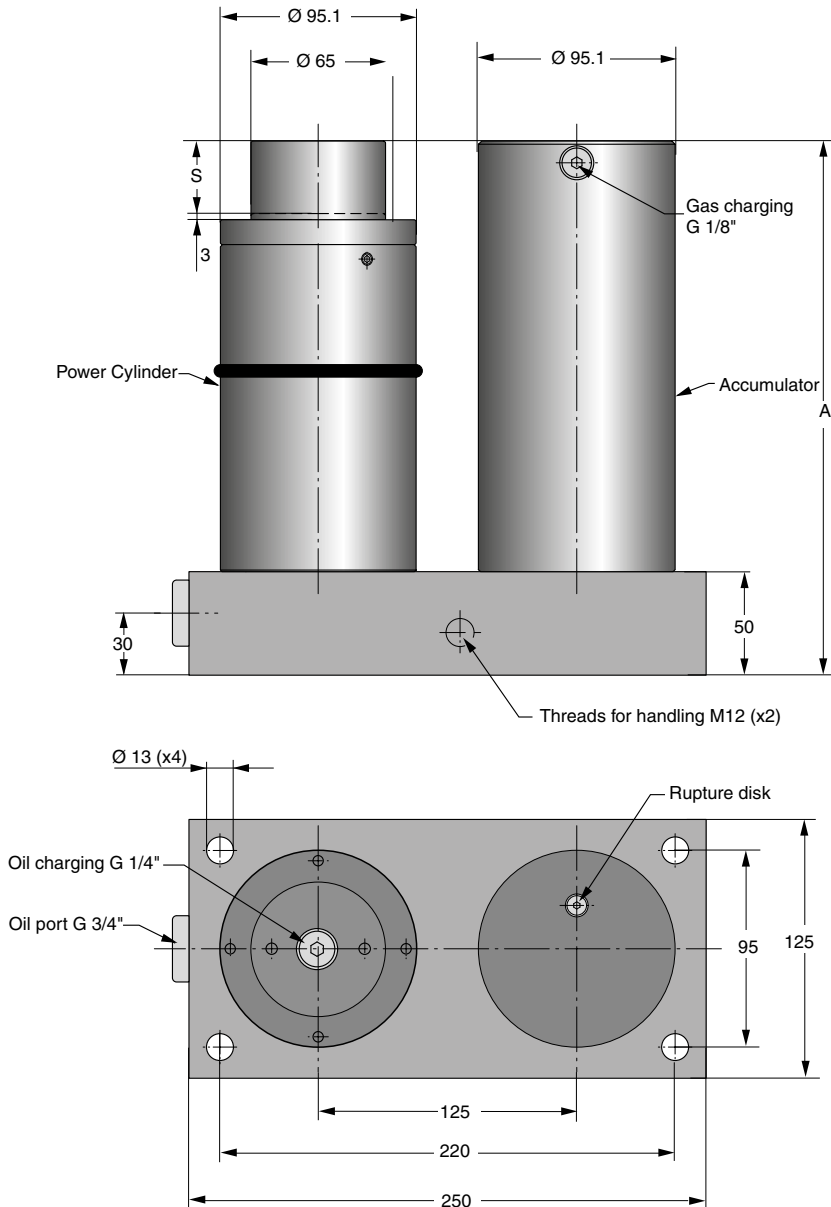


| Order No.      | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight (kg) |
|----------------|---------------------|-------------------|---------------|-----|-------------|
| HCF-SP 040-025 | 40                  | 4                 | 25            | 245 | 10.3        |
| HCF-SP 040-050 | 40                  | 4                 | 50            | 295 | 11.3        |
| HCF-SP 040-100 | 40                  | 4                 | 100           | 395 | 13.4        |
| HCF-SP 040-150 | 40                  | 4                 | 150           | 495 | 15.4        |

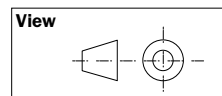
**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

\*= Nominal force for the operation

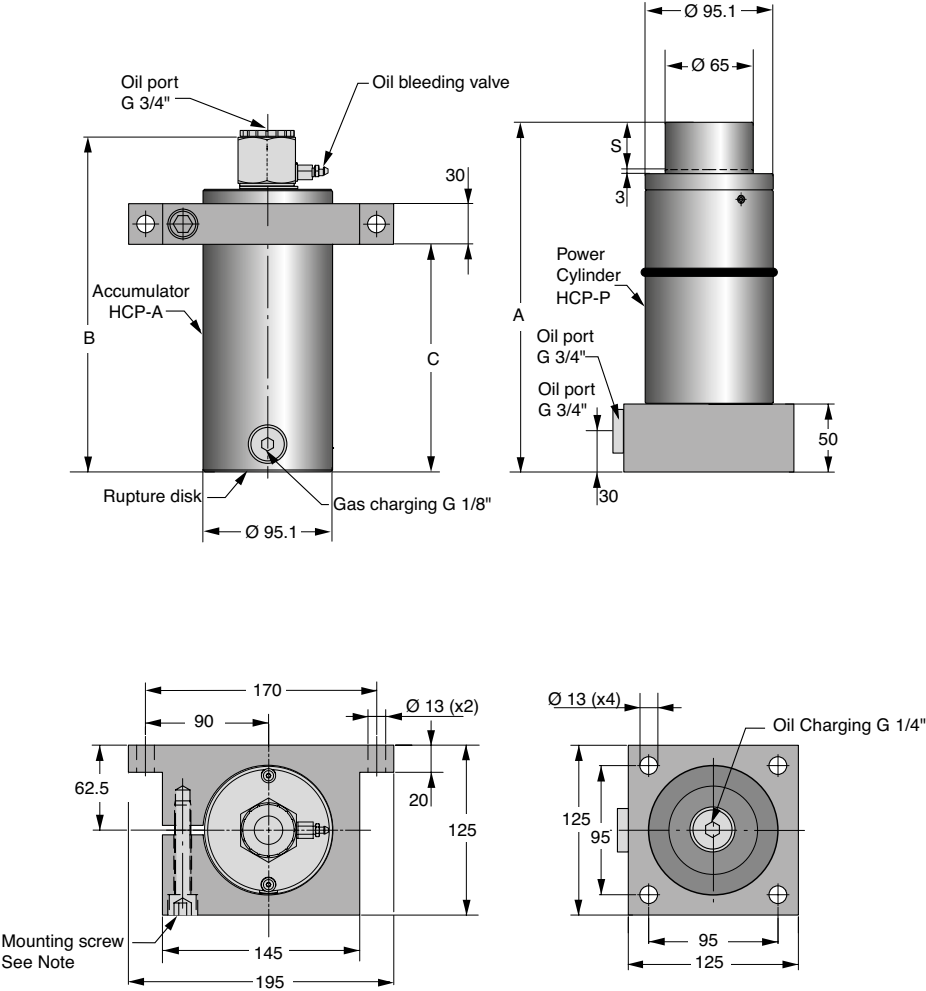
# HCP 060 Power Unit



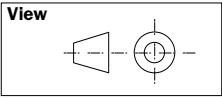
| Order No.   | Force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|------------|---------------|-----|-------------|
| HCP 060-035 | 60         | 35            | 258 | 26.7        |
| HCP 060-060 | 60         | 60            | 308 | 28.4        |
| HCP 060-110 | 60         | 110           | 408 | 32.2        |
| HCP 060-160 | 60         | 160           | 508 | 35.9        |



HCP-S 060 Power Unit, with Separate Accumulator



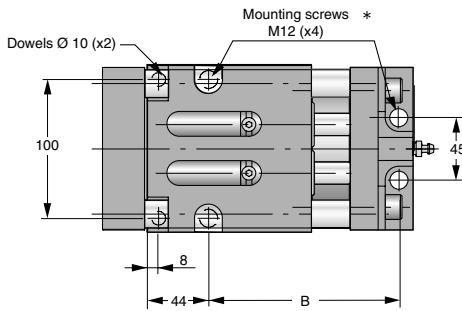
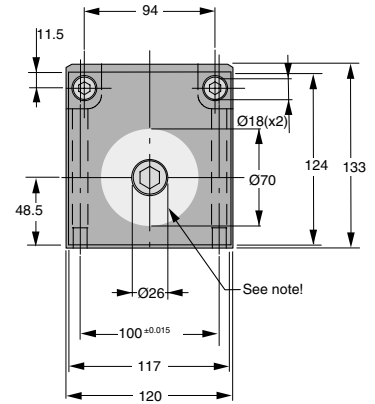
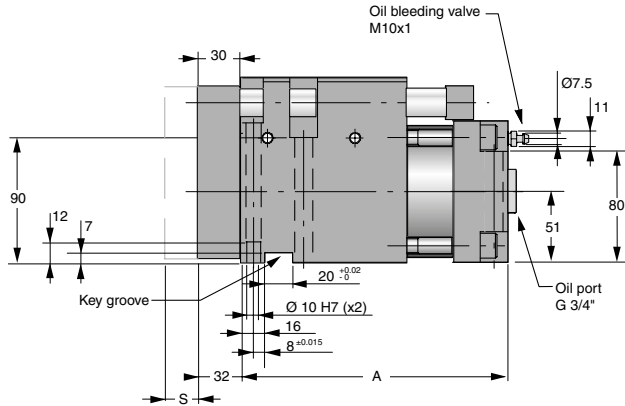
**Note!** The mounting screw (M12) should be tightened with torque 91Nm



| Order No.<br>Complete<br>Power Unit<br>HCP-S | Weight<br>(kg) | Force<br>(kN) | Stroke S<br>(mm) | A   | B   | C   | Order No. Separate<br>Power Cylinder<br>HCP-P | Weight<br>(kg) | Order No.<br>Separate<br>Accumulator<br>HCP-A | Weight<br>(kg) |
|----------------------------------------------|----------------|---------------|------------------|-----|-----|-----|-----------------------------------------------|----------------|-----------------------------------------------|----------------|
| HCP-S 060 -035                               | 23.9           | 60            | 35               | 258 | 247 | 168 | HCP-P 060 -035                                | 13.9           | HCP-A 060 -035                                | 10.0           |
| HCP-S 060 -060                               | 25.7           | 60            | 60               | 308 | 297 | 218 | HCP-P 060 -060                                | 14.8           | HCP-A 060 -060                                | 10.9           |
| HCP-S 060 -110                               | 29.4           | 60            | 110              | 408 | 397 | 318 | HCP-P 060 -110                                | 16.9           | HCP-A 060 -110                                | 12.5           |
| HCP-S 060 -160                               | 33.1           | 60            | 160              | 508 | 497 | 418 | HCP-P 060 -160                                | 19.0           | HCP-A 060 -160                                | 14.1           |

**Note!** The Accumulator should always be used in the system.

# CC 060 Compact Cam



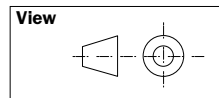
\*4 pcs mounting screws are included

## Note!

### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

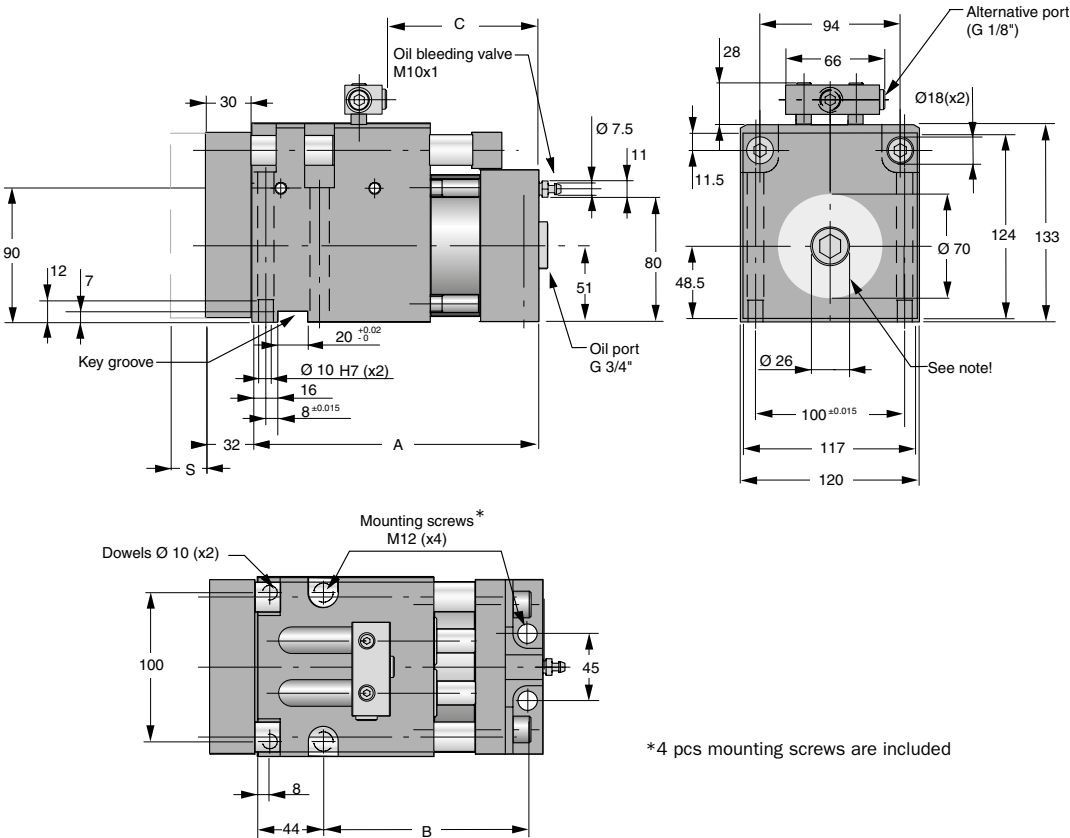


| Order No.  | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | Weight (kg) |
|------------|---------------------|-------------------|---------------|-----|-----|-------------|
| CC 060-024 | 60                  | 7                 | 24            | 191 | 137 | 22.3        |
| CC 060-049 | 60                  | 7                 | 49            | 216 | 162 | 23.4        |
| CC 060-099 | 60                  | 7                 | 99            | 266 | 212 | 26.0        |

\* = Nominal force available for the operation

CC-H 060 Compact Cam for pressure control

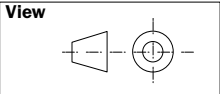
This version can only be used together with a hose system as there are no gas charging valve in the springs or adapters



\*4 pcs mounting screws are included

**Note!**  
**Important installation information:**

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

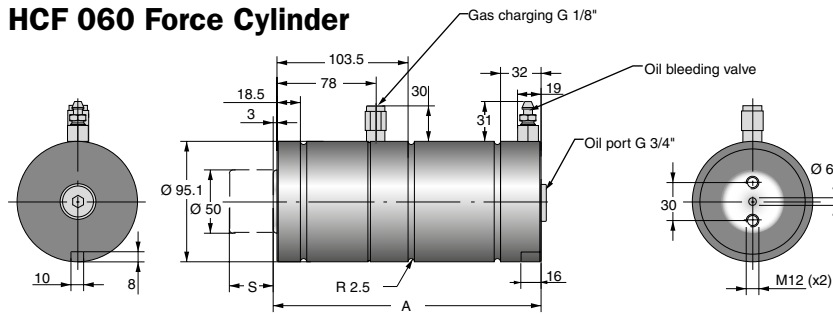


When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

| Order No.    | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C   | Weight (kg) |
|--------------|---------------------|-------------------|---------------|-----|-----|-----|-------------|
| CC-H 060-024 | 60                  | 7                 | 24            | 191 | 137 | 103 | 22.5        |
| CC-H 060-049 | 60                  | 7                 | 49            | 216 | 162 | 153 | 23.6        |
| CC-H 060-099 | 60                  | 7                 | 99            | 266 | 212 | 228 | 26.2        |

\* = Nominal force available for the operation

# HCF 060 Force Cylinder

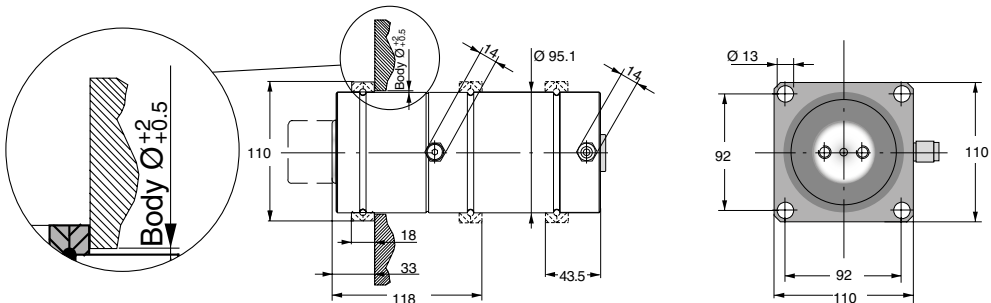


| Order No.   | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|---------------------|-------------------|---------------|-----|-------------|
| HCF 060-025 | 60                  | 6                 | 25            | 211 | 9.8         |
| HCF 060-050 | 60                  | 6                 | 50            | 261 | 11.6        |
| HCF 060-100 | 60                  | 6                 | 100           | 361 | 15.1        |
| HCF 060-150 | 60                  | 6                 | 150           | 461 | 18.6        |

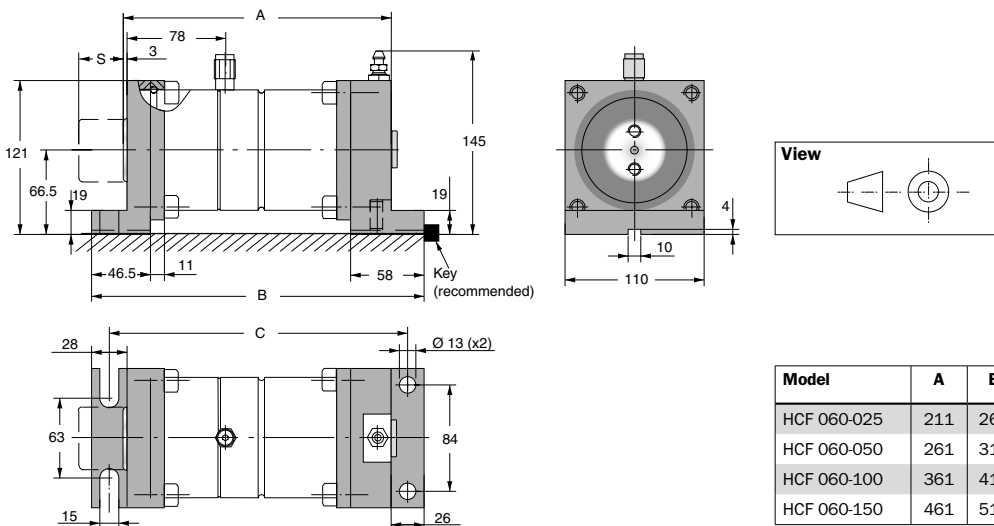
\* = Nominal force available for the operation

**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

## Flange mount for HCF 060 Order No. 2014677-3000 (Mount only)

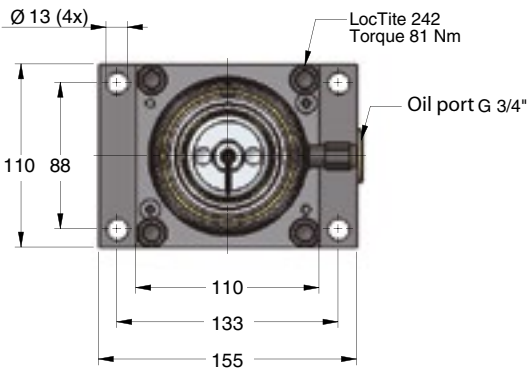
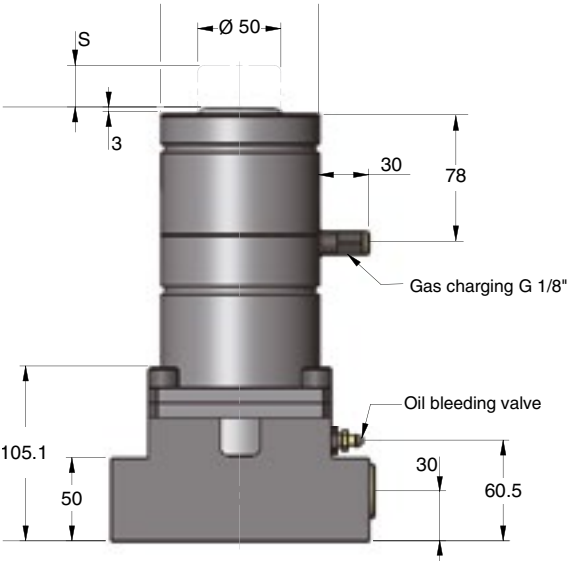
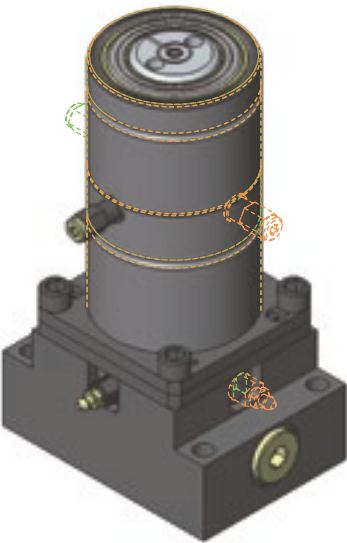


## Foot mount for HCF 060 Order No. 3016977-060 (Mounts only)



| Model       | A   | B   | C   |
|-------------|-----|-----|-----|
| HCF 060-025 | 211 | 262 | 235 |
| HCF 060-050 | 261 | 312 | 285 |
| HCF 060-100 | 361 | 412 | 385 |
| HCF 060-150 | 461 | 512 | 485 |

HCF-SP 060 Force Cylinder with Side Port Plate

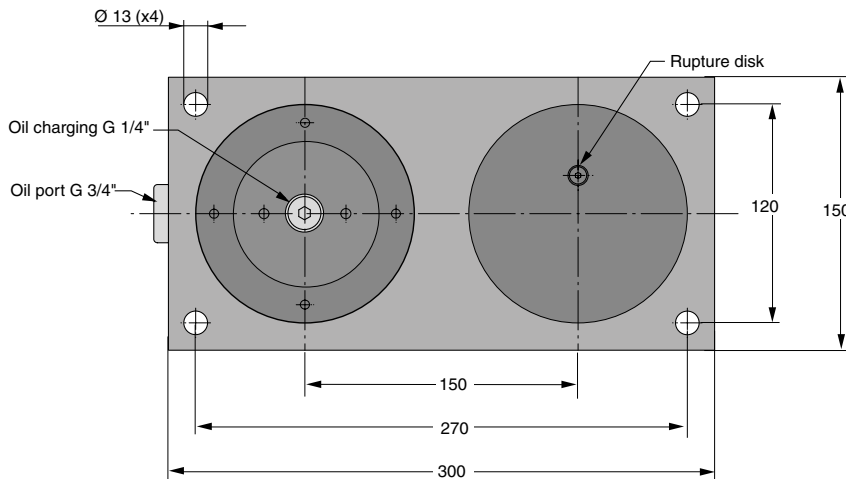
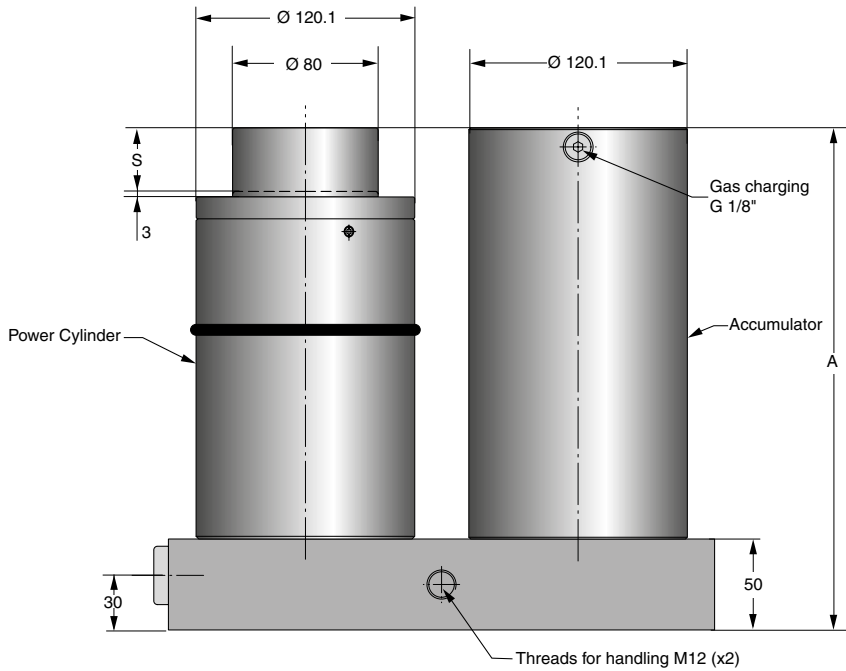


| Order No.      | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight [kg] |
|----------------|---------------------|-------------------|---------------|-----|-------------|
| HCF-SP 060-025 | 60                  | 6                 | 25            | 261 | 17.4        |
| HCF-SP 060-050 | 60                  | 6                 | 50            | 311 | 19.2        |
| HCF-SP 060-100 | 60                  | 6                 | 100           | 411 | 22.7        |
| HCF-SP 060-150 | 60                  | 6                 | 150           | 511 | 26.2        |

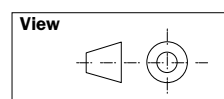
**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

\*= Nominal force for the operation

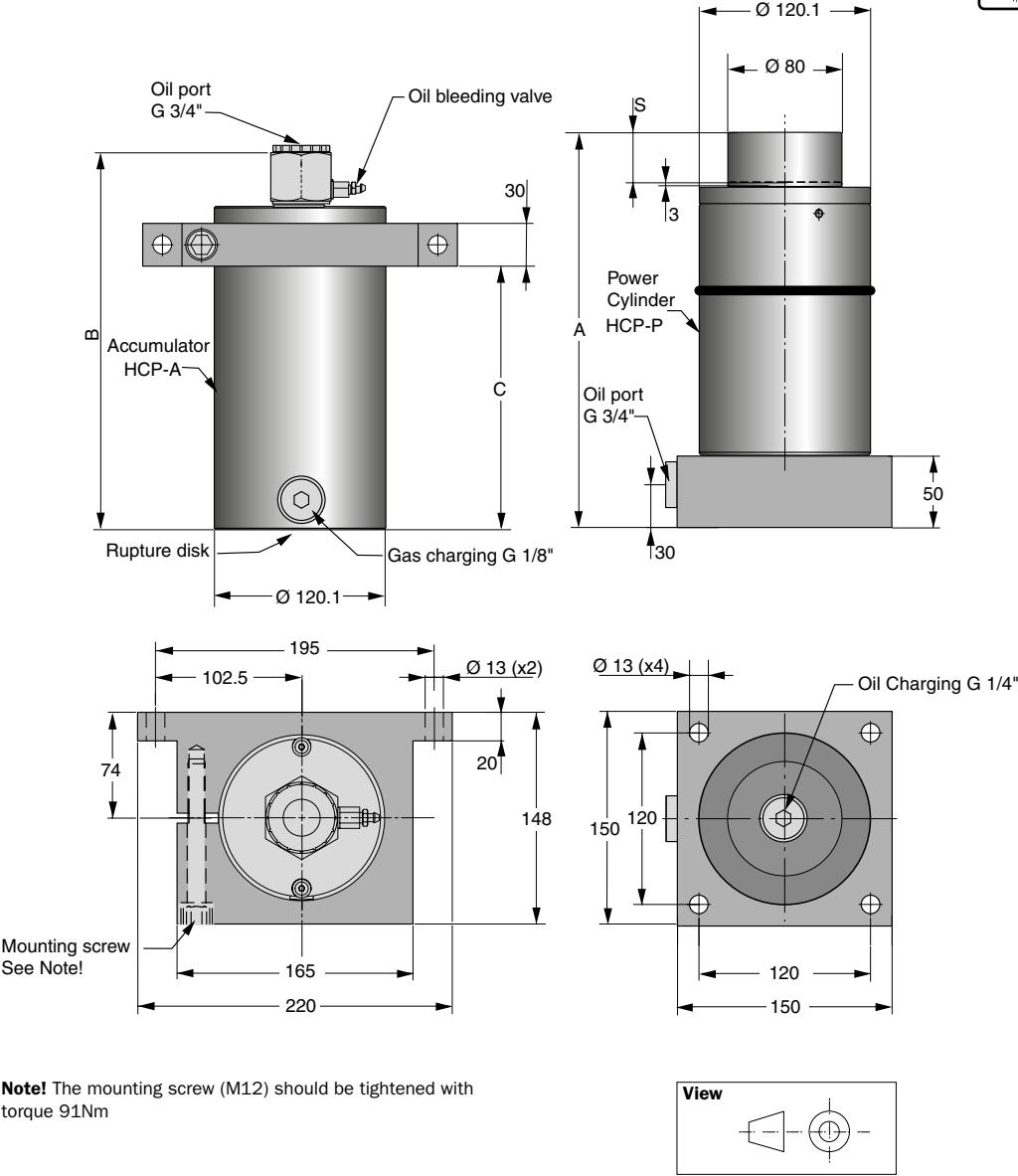
# HCP 090 Power Unit



| Order No.   | Force (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|------------|---------------|-----|-------------|
| HCP 090-035 | 90         | 35            | 276 | 43.1        |
| HCP 090-060 | 90         | 60            | 326 | 46.1        |
| HCP 090-110 | 90         | 110           | 426 | 52.1        |
| HCP 090-160 | 90         | 160           | 526 | 52.8        |



HCP-S 090 Power Unit, with Separate Accumulator

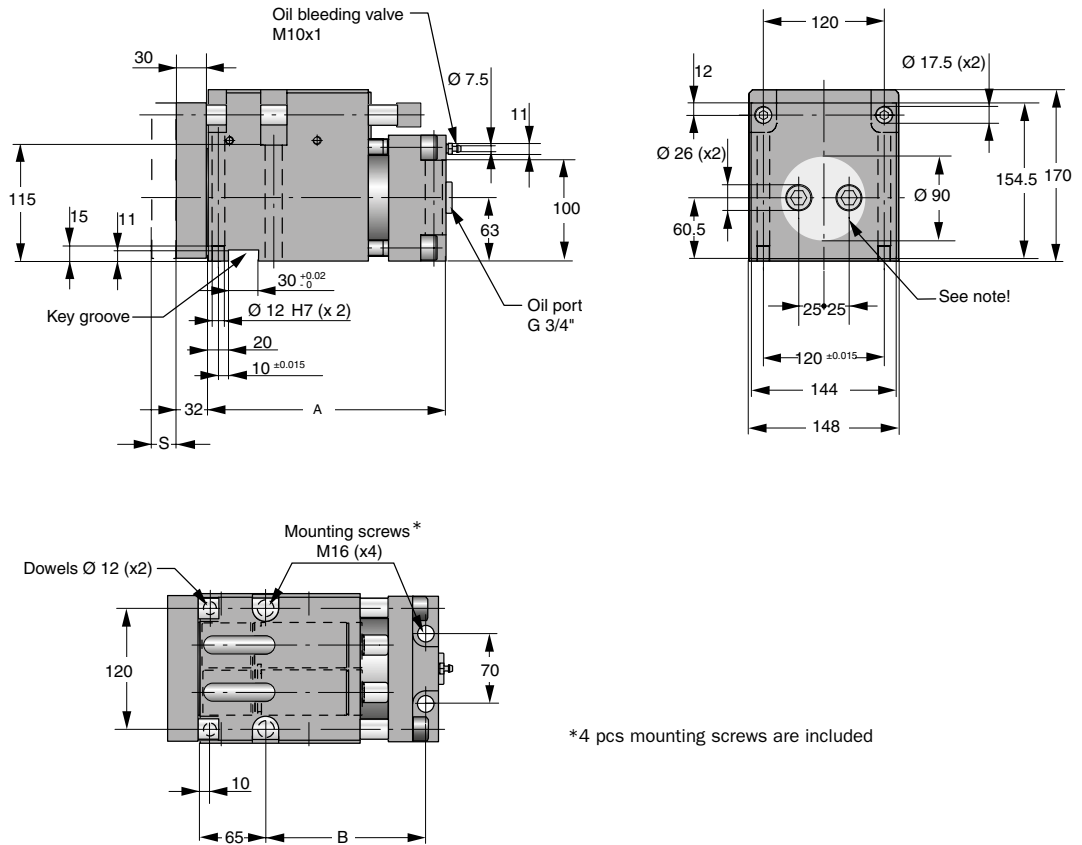


**Note!** The mounting screw (M12) should be tightened with torque 91Nm

| Order No.<br>Complete<br>Power Unit<br>HCP-S | Weight<br>(kg) | Force<br>(kN) | Stroke S<br>(mm) | A   | B   | C   | Order No.<br>Separate<br>Power Cylinder<br>HCP-P | Weight<br>(kg) | Order No. Separate<br>Accumulator<br>HCP-A | Weight<br>(kg) |
|----------------------------------------------|----------------|---------------|------------------|-----|-----|-----|--------------------------------------------------|----------------|--------------------------------------------|----------------|
| HCP-S 090 -035                               | 38.3           | 90            | 35               | 276 | 265 | 186 | HCP-P 090 -035                                   | 22.6           | HCP-A 090 -035                             | 15.7           |
| HCP-S 090 -060                               | 41.2           | 90            | 60               | 326 | 315 | 236 | HCP-P 090 -060                                   | 24.2           | HCP-A 090 -060                             | 17.0           |
| HCP-S 090 -110                               | 47.3           | 90            | 110              | 426 | 415 | 336 | HCP-P 090 -110                                   | 27.5           | HCP-A 090 -110                             | 19.8           |
| HCP-S 090 -160                               | 53.3           | 90            | 160              | 526 | 514 | 436 | HCP-P 090-160                                    | 30.8           | HCP-A 090 -160                             | 22.5           |

**Note!** The Accumulator should always be used in the system.

# CC 090 Compact Cam



## Note!

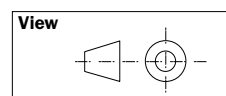
### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

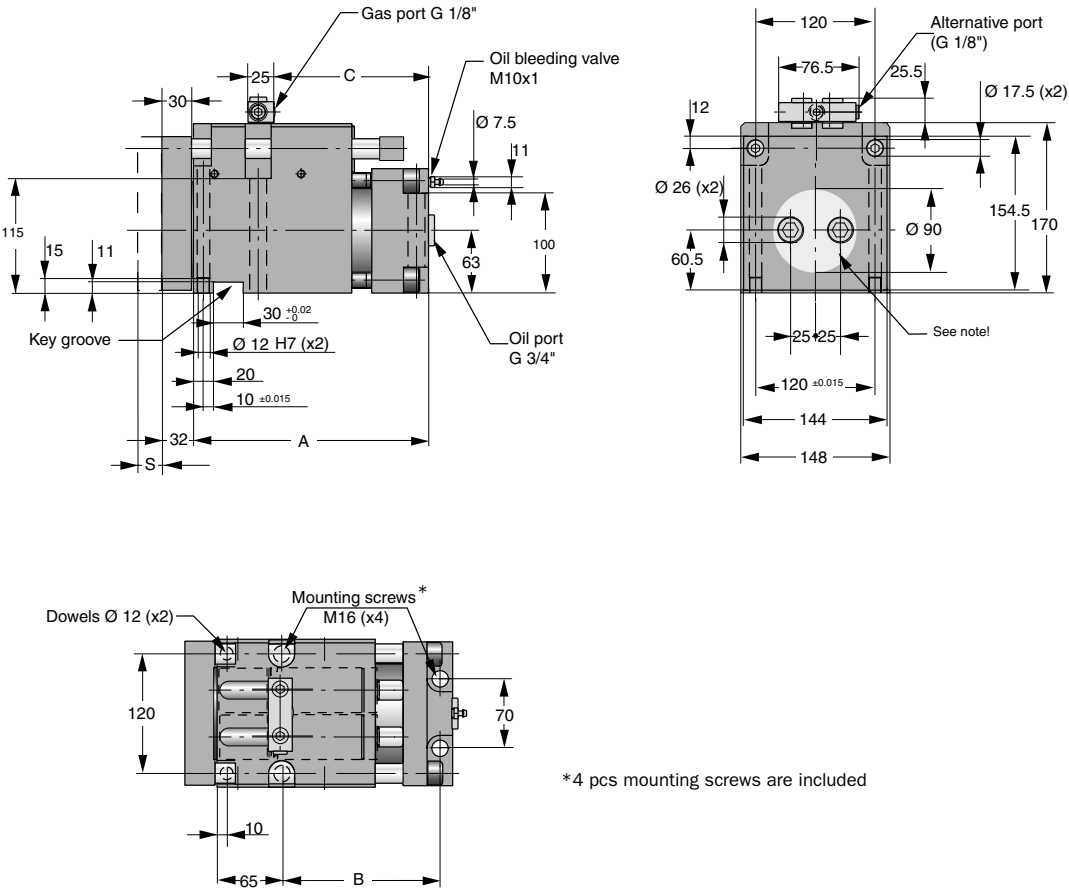
| Order No.  | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | Weight (kg) |
|------------|---------------------|-------------------|---------------|-----|-----|-------------|
| CC 090-024 | 90                  | 10                | 24            | 236 | 159 | 33.5        |
| CC 090-049 | 90                  | 10                | 49            | 261 | 184 | 39.7        |
| CC 090-099 | 90                  | 10                | 99            | 311 | 234 | 44.9        |

\* = Nominal force available for the operation



CC-H 090 Compact Cam for pressure control

This version can only be used together with a hose system as there are no gas charging valves in the springs or adapters



Note!

Important installation information:

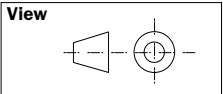
We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

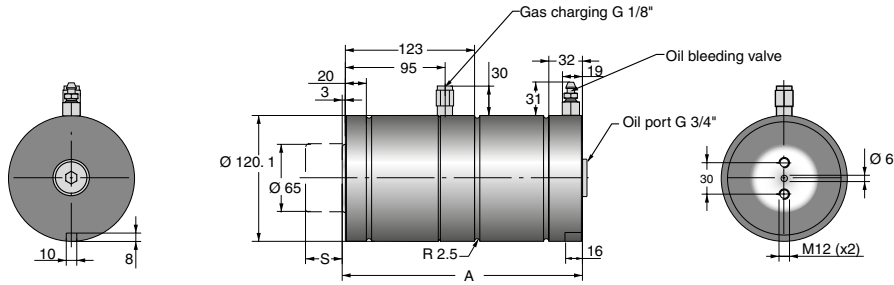
**Note!** There are two G1/8" gas ports which can be used to couple to a hose system. Use only one of these to connect the hose system, the other should remain plugged.

| Order No.    | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C   | Weight (kg) |
|--------------|---------------------|-------------------|---------------|-----|-----|-----|-------------|
| CC-H 090-024 | 90                  | 10                | 24            | 236 | 159 | 158 | 33.7        |
| CC-H 090-049 | 90                  | 10                | 49            | 261 | 184 | 208 | 39.7        |
| CC-H 090-099 | 90                  | 10                | 99            | 311 | 234 | 283 | 44.9        |

\* = Nominal force available for the operation



## HCF 090 Force Cylinder

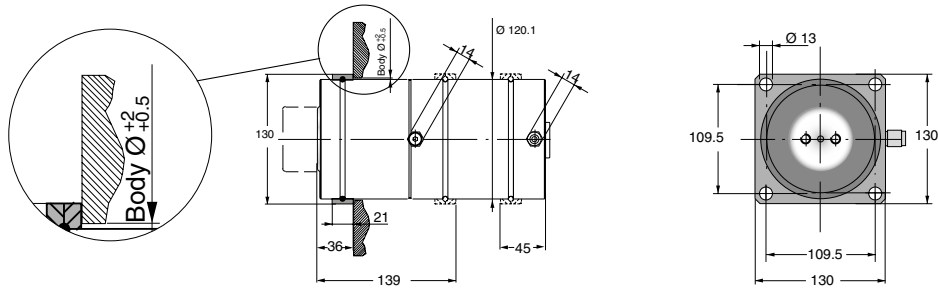


| Order No.   | Working force* (kN) | Return force* (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|---------------------|--------------------|---------------|-----|-------------|
| HCF 090-025 | 90                  | 9                  | 25            | 229 | 15.8        |
| HCF 090-050 | 90                  | 9                  | 50            | 279 | 18.7        |
| HCF 090-100 | 90                  | 9                  | 100           | 379 | 24.5        |
| HCF 090-150 | 90                  | 9                  | 150           | 479 | 30.3        |

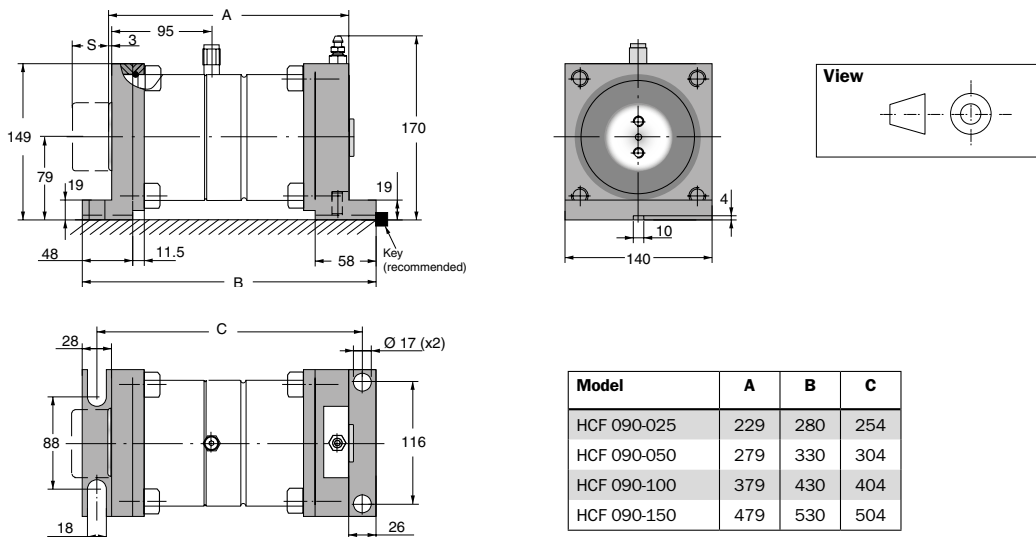
**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

\* = Nominal force for the operation

### Flange mount for HCF 090 Order No. 2014677-5000 (Mount only)

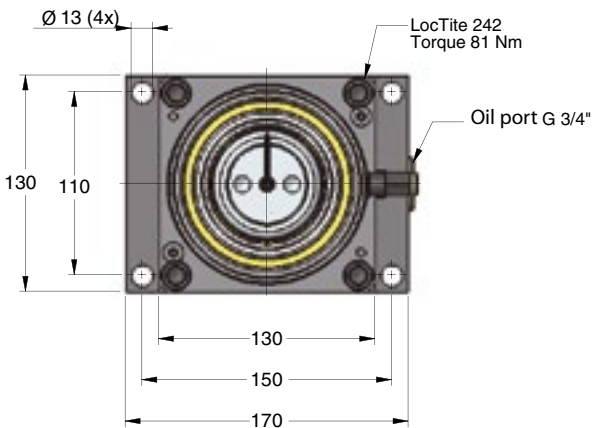
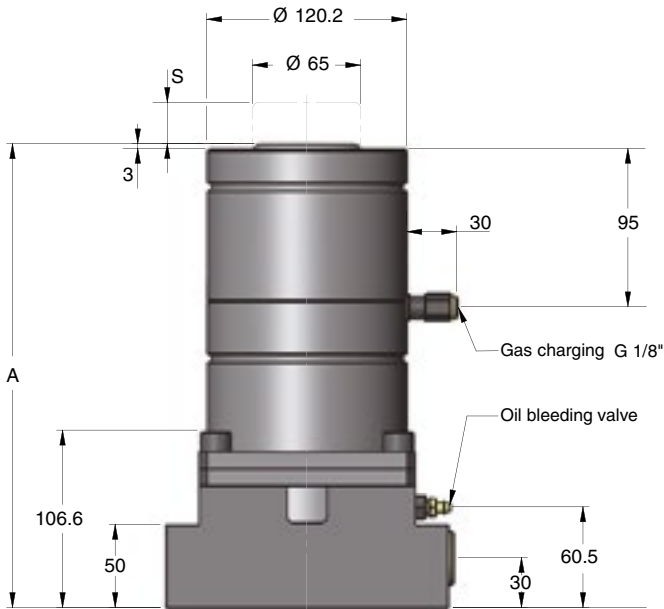
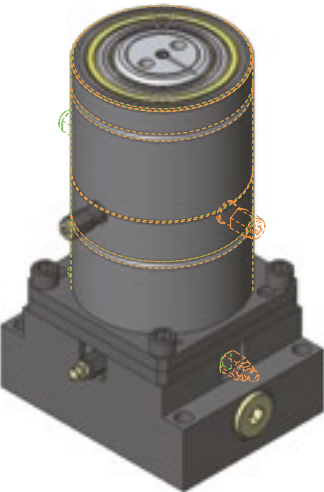


### Foot mount for HCF 090 Order No. 3016977-090 (Mounts only)



| Model       | A   | B   | C   |
|-------------|-----|-----|-----|
| HCF 090-025 | 229 | 280 | 254 |
| HCF 090-050 | 279 | 330 | 304 |
| HCF 090-100 | 379 | 430 | 404 |
| HCF 090-150 | 479 | 530 | 504 |

HCF-SP 090 Force Cylinder with Side Port Plate

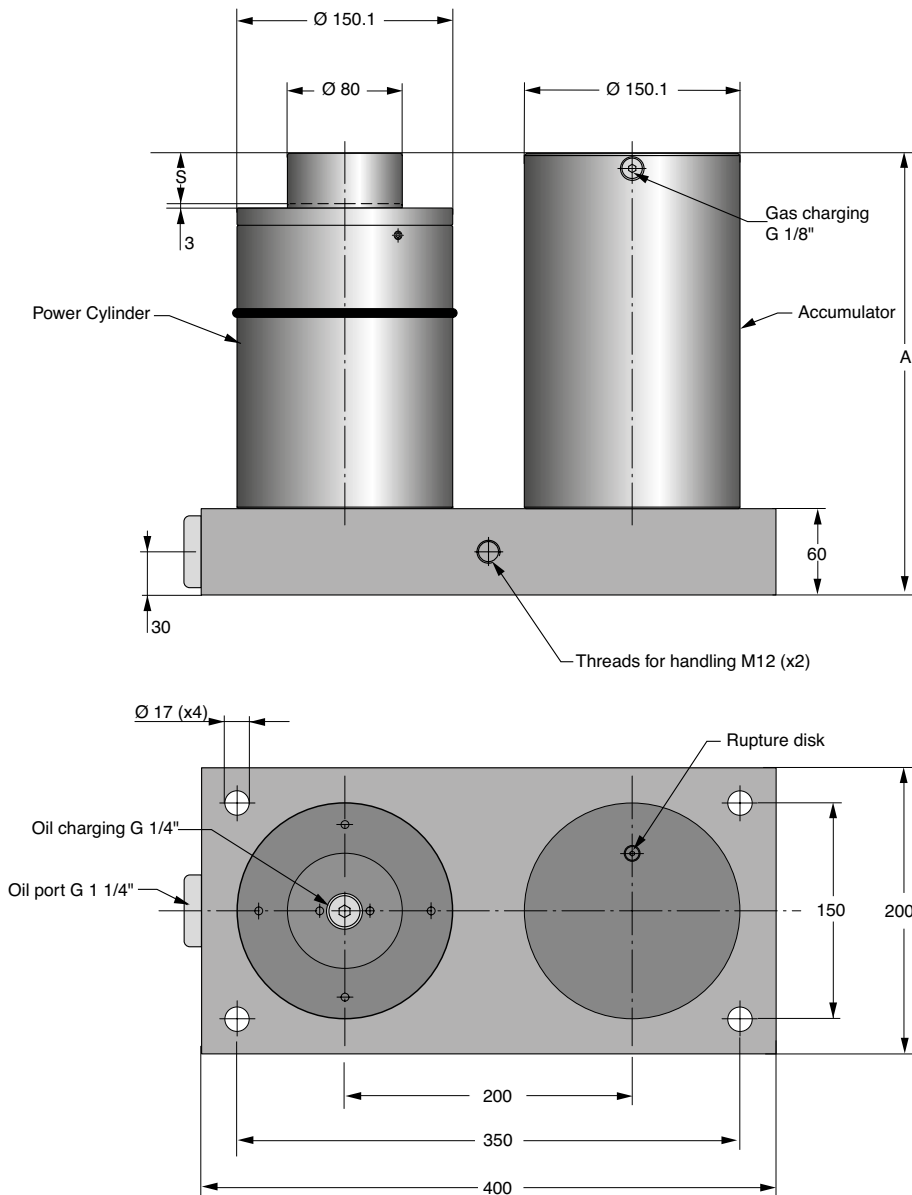


| Order No.      | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight (kg) |
|----------------|---------------------|-------------------|---------------|-----|-------------|
| HCF-SP 090-025 | 90                  | 9                 | 25            | 279 | 28          |
| HCF-SP 090-050 | 90                  | 9                 | 50            | 329 | 30.9        |
| HCF-SP 090-100 | 90                  | 9                 | 100           | 429 | 36.8        |
| HCF-SP 090-150 | 90                  | 9                 | 150           | 529 | 42.6        |

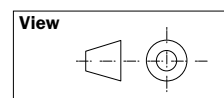
**Note:**  
External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke.  
See picture on page 95.

\* = Nominal force for the operation

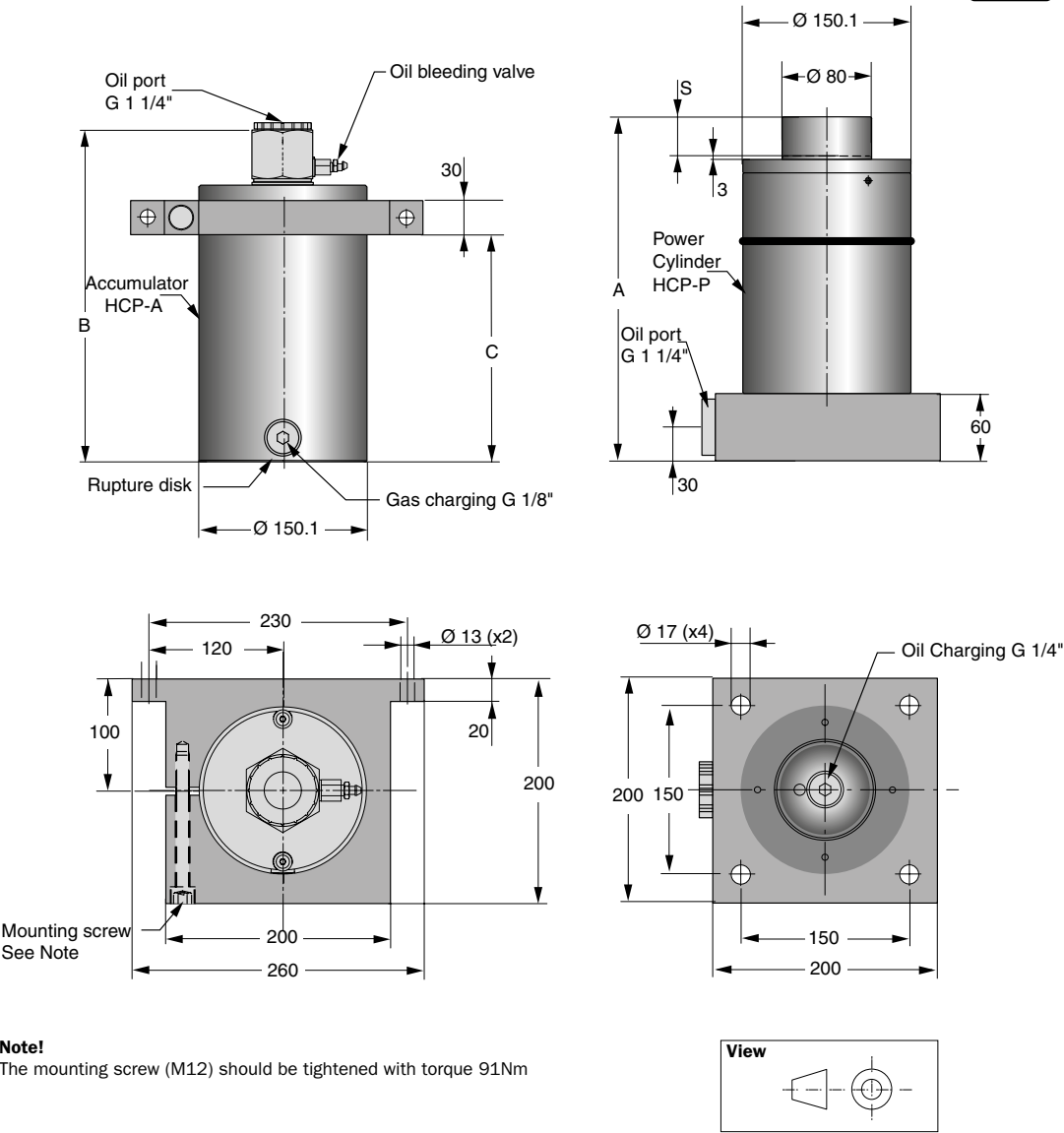
# HCP 150 Power Unit



| Order No.   | Force (kN) | Stroke (mm) | A   | Weight (kg) |
|-------------|------------|-------------|-----|-------------|
| HCP 150-035 | 150        | 35          | 307 | 83.1        |
| HCP 150-060 | 150        | 60          | 357 | 87.7        |
| HCP 150-110 | 150        | 110         | 457 | 97.0        |
| HCP 150-160 | 150        | 160         | 557 | 106.3       |



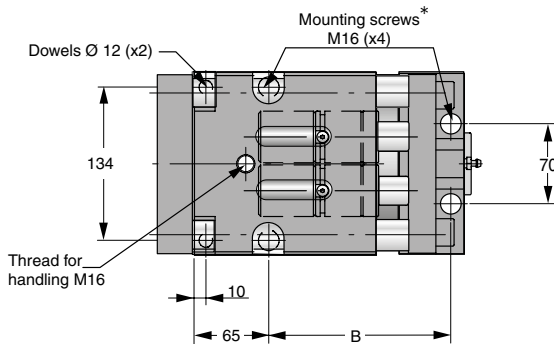
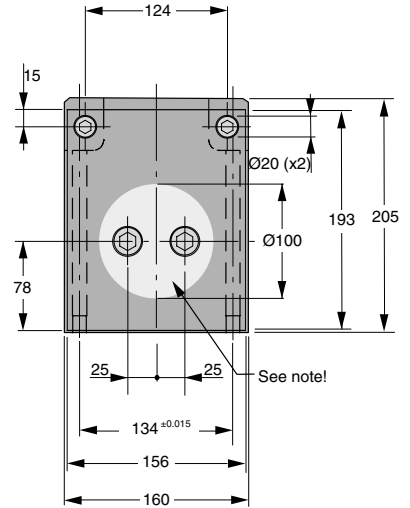
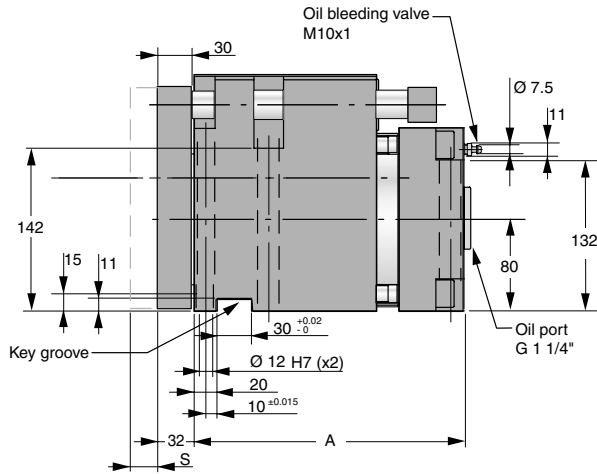
HCP-S 150 Power Unit, with Separate Accumulator



| Order No.<br>Complete Power<br>Unit HCP-S | Weight<br>(kg) | Force<br>(kN) | Stroke<br>S<br>(mm) | A   | B   | C   | Order No.<br>Separate Power<br>Cylinder<br>HCP-P | Weight<br>(kg) | Order No.<br>Separate<br>Accumulator<br>HCP-A | Weight<br>(kg) |
|-------------------------------------------|----------------|---------------|---------------------|-----|-----|-----|--------------------------------------------------|----------------|-----------------------------------------------|----------------|
| HCP-S 150 -035                            | 71.1           | 90            | 35                  | 307 | 294 | 207 | HCPP 150 -035                                    | 43.6           | HCP-A 150 -035                                | 27.7           |
| HCP-S 150 -060                            | 75.5           | 90            | 60                  | 357 | 344 | 257 | HCPP 150 -060                                    | 45.9           | HCP-A 150 -060                                | 29.8           |
| HCP-S 150 -110                            | 85.0           | 90            | 110                 | 457 | 444 | 357 | HCPP 150 -110                                    | 50.9           | HCP-A 150 -110                                | 34.1           |
| HCP-S 150 -160                            | 94.3           | 90            | 160                 | 557 | 544 | 457 | HCPP 150-160                                     | 55.9           | HCP-A 150-160                                 | 38.4           |

**Note!** The Accumulator should always be used in the system.

# CC 150 Compact Cam



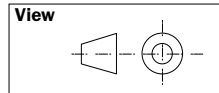
\*4 pcs mounting screws are included

## Note!

### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

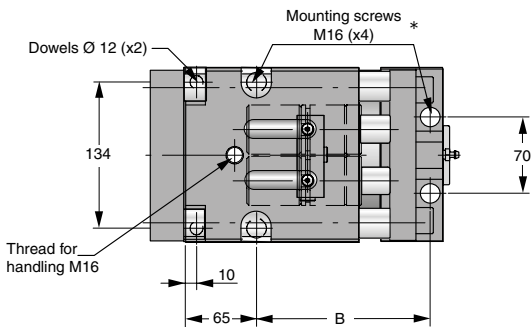
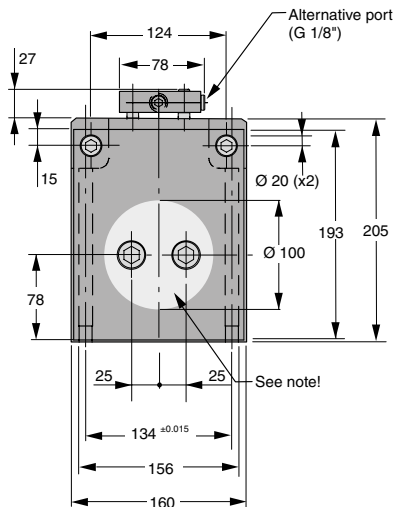
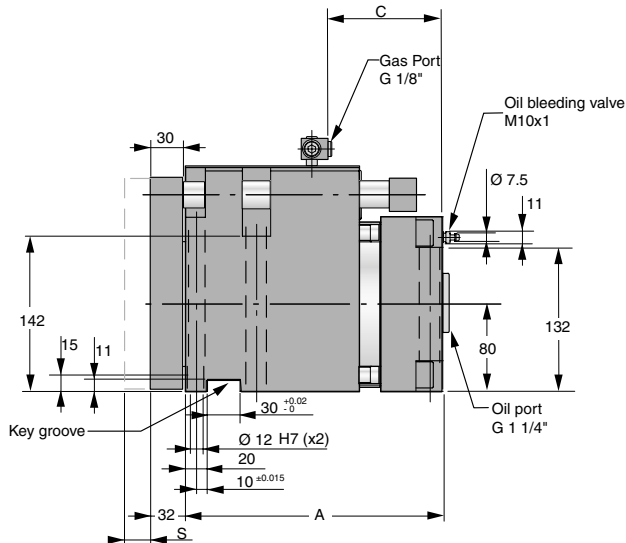


| Order No.         | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | Weight (kg) |
|-------------------|---------------------|-------------------|---------------|-----|-----|-------------|
| <b>CC 150-024</b> | 150                 | 15                | 24            | 236 | 159 | 57.7        |
| <b>CC 150-049</b> | 150                 | 15                | 49            | 261 | 184 | 60.0        |
| <b>CC 150-099</b> | 150                 | 15                | 99            | 311 | 234 | 65.6        |

\* = Nominal force available for the operation

## CC-H 150 Compact Cam for pressure control

This version can only be used together with a hose system as there are no gas charging valves in the springs or adapters



\*4 pcs mounting screws are included

### Note!

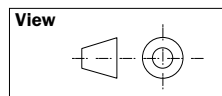
### Important installation information:

We recommend locating the punch in the centre of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked  .

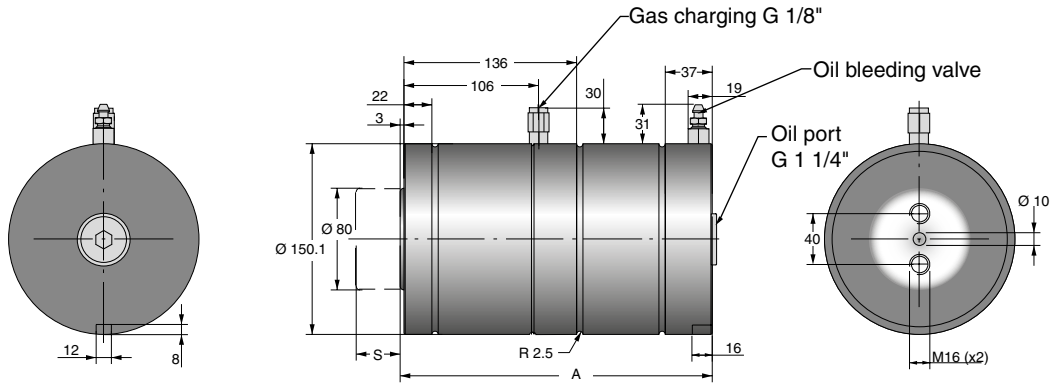
When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against sideload.

| Order No.    | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | B   | C   | Weight (kg) |
|--------------|---------------------|-------------------|---------------|-----|-----|-----|-------------|
| CC-H 150-024 | 150                 | 15                | 24            | 236 | 159 | 109 | 57.9        |
| CC-H 150-049 | 150                 | 15                | 49            | 261 | 184 | 159 | 60.2        |
| CC-H 150-099 | 150                 | 15                | 99            | 311 | 234 | 234 | 65.8        |

\* = Nominal force available for the operation



# HCF 150 Force Cylinder

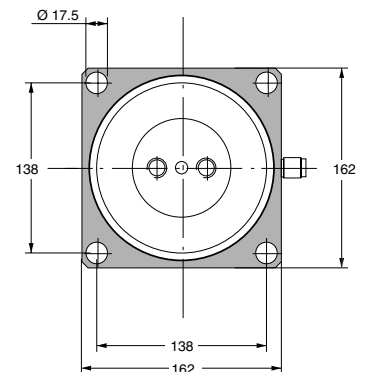
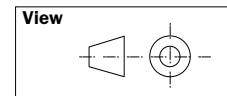
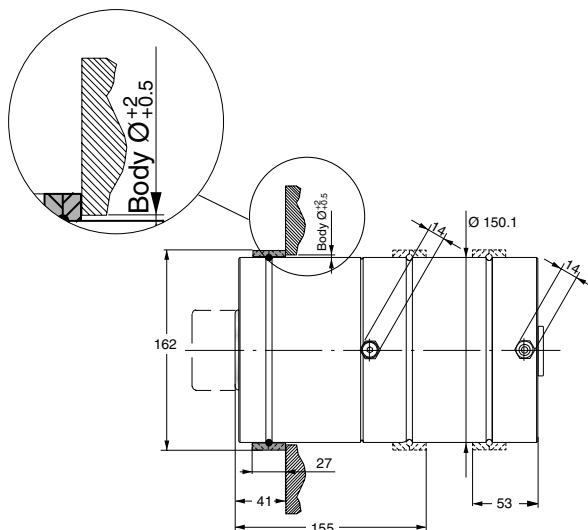


| Order No.   | Working force* (kN) | Return force* (kN) | Stroke S (mm) | A   | Weight (kg) |
|-------------|---------------------|--------------------|---------------|-----|-------------|
| HCF 150-025 | 150                 | 30                 | 25            | 250 | 30.1        |
| HCF 150-050 | 150                 | 30                 | 50            | 300 | 34.7        |
| HCF 150-100 | 150                 | 30                 | 100           | 400 | 43.7        |
| HCF 150-150 | 150                 | 30                 | 150           | 500 | 52.7        |

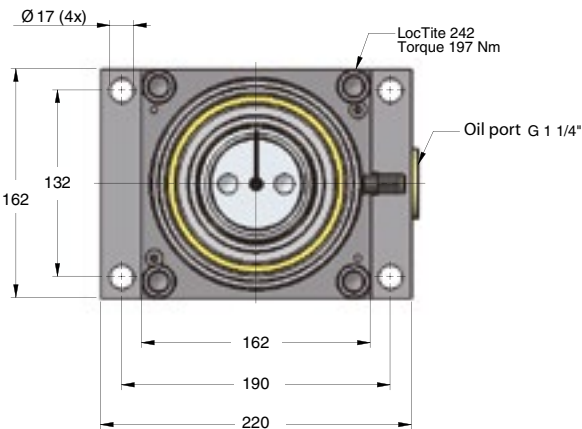
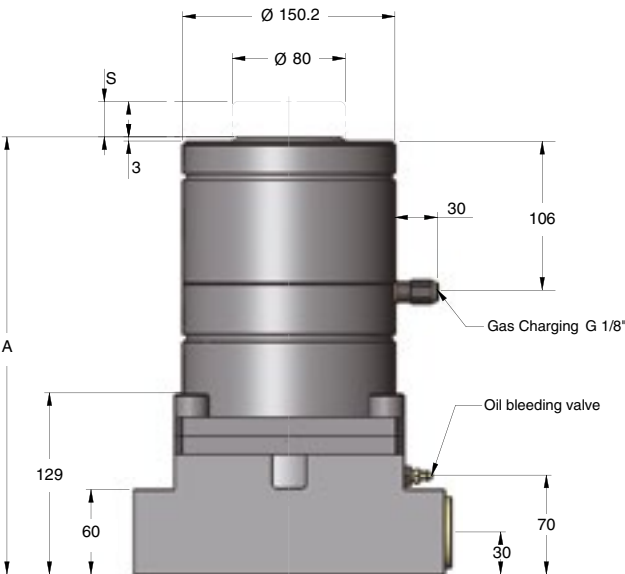
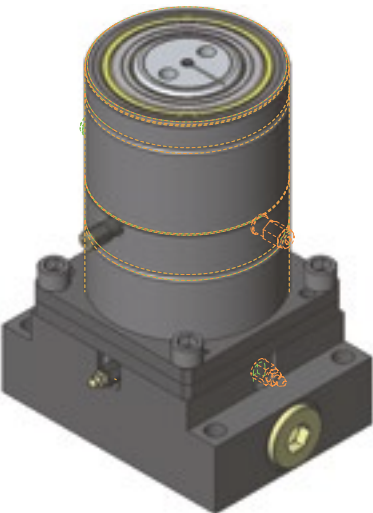
\* = Nominal force for the operation

**Note:** External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

## Flange mount for HCF 150 Order No. 2014677-7500



HCF-SP 150 Force Cylinder with Side Port Plate



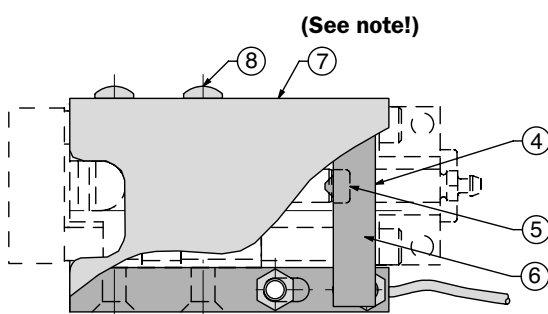
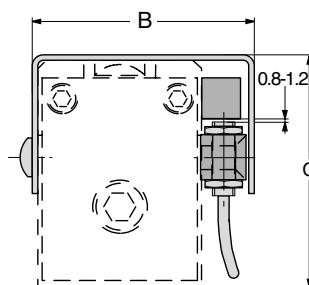
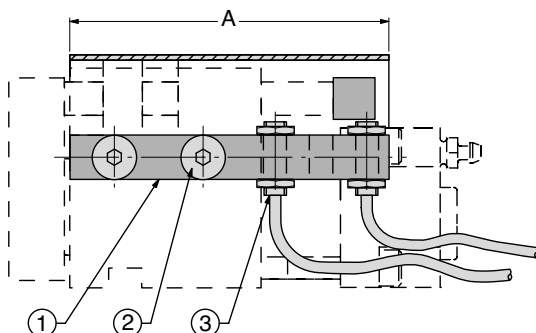
| Order No.      | Working force* (kN) | Return force (kN) | Stroke S (mm) | A   | Weight [kg] |
|----------------|---------------------|-------------------|---------------|-----|-------------|
| HCF-SP 150-025 | 150                 | 14                | 25            | 310 | 48.6        |
| HCF-SP 150-050 | 150                 | 14                | 50            | 360 | 53.2        |
| HCF-SP 150-100 | 150                 | 14                | 100           | 460 | 62.2        |
| HCF-SP 150-150 | 150                 | 14                | 150           | 560 | 71.1        |

\* = Nominal force for the operation

**Note:**  
External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

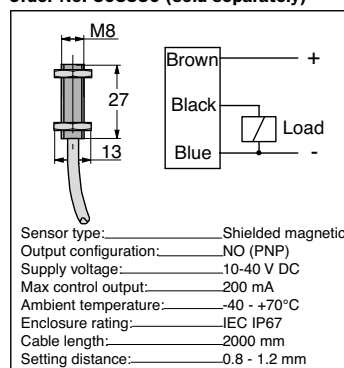
# Dimensions for accessories

Sensor kit, option for Compact Cam, CC and CC-H



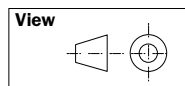
## 2 pcs Sensors

Order No. 503550 (sold separately)



### Note!

The 2 pcs Sensors (Order No. 503550) are sold separately and are not included in the Sensor kits themselves.

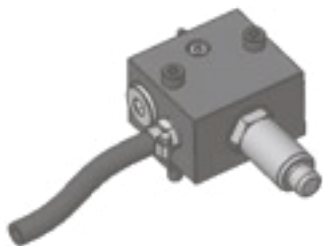
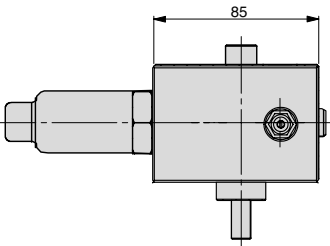
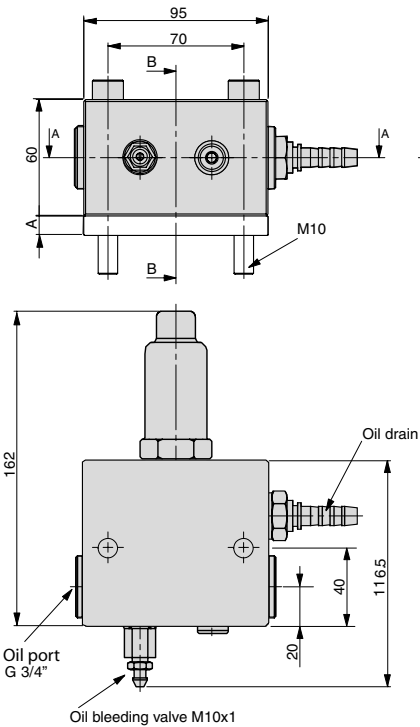


## Sensor kit contents list

| Position | Quantity | Description                                   |
|----------|----------|-----------------------------------------------|
| 1        | 1        | Fixture                                       |
| 2        | 2        | Screws                                        |
| 3        | 2        | Sensors (not incl.)                           |
| 4        | 1        | Triggering block                              |
| 5        | 1 or 2   | Centre location pin (except CC 060, 090, 150) |
| 6        | 2        | Screws                                        |
| 7        | 1        | Cover plate                                   |
| 8        | 2        | Screws                                        |

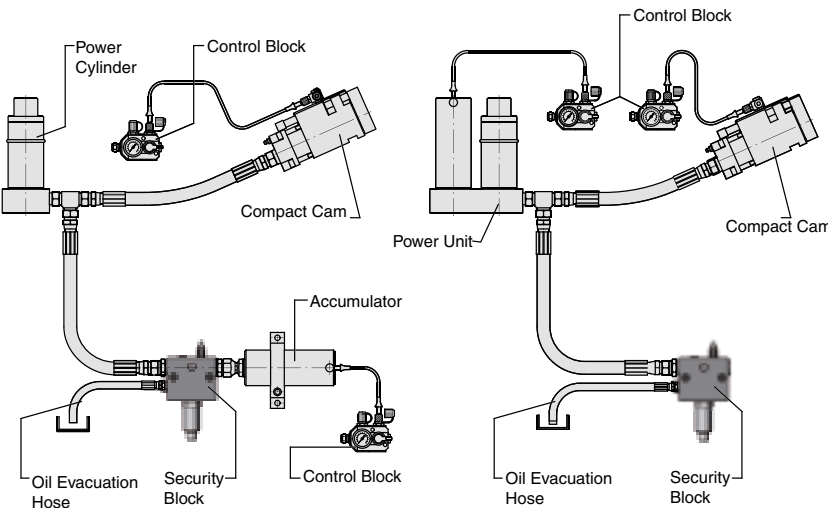
| Compact Cam | Sensor kit Order No. | A   | B   | C   |
|-------------|----------------------|-----|-----|-----|
| CC 015-024  | 30 182 08 -01        | 115 | 81  | 84  |
| CC 015-049  | 30 182 08 -02        | 165 | 81  | 84  |
| CC 040-024  | 30 182 08 -03        | 168 | 117 | 107 |
| CC 040-049  | 30 182 08 -04        | 193 | 117 | 107 |
| CC 040-099  | 30 182 08 -05        | 271 | 117 | 107 |
| CC 040-124  | 30 182 08 -15        | 321 | 117 | 107 |
| CC 060-024  | 30 182 08 -09        | 171 | 142 | 135 |
| CC 060-049  | 30 182 08 -10        | 196 | 142 | 135 |
| CC 060-099  | 30 182 08 -11        | 271 | 142 | 135 |
| CC 090-024  | 30 182 08 -06        | 216 | 170 | 172 |
| CC 090-049  | 30 182 08 -07        | 241 | 170 | 172 |
| CC 090-099  | 30 182 08 -08        | 316 | 170 | 172 |
| CC 150-024  | 30 182 08 -12        | 216 | 182 | 207 |
| CC 150-049  | 30 182 08 -13        | 241 | 182 | 207 |
| CC 150-099  | 30 182 08 -14        | 316 | 182 | 207 |

Security Block according to CNOMO-Standard  
(Renault and Peugeot/Citroen)



| Order No.   | Size | A*   |
|-------------|------|------|
| 3020008-015 | 015  | 10   |
| 3020008-040 | 040  | 22.5 |
| 3020008-060 | 060  | 32.5 |
| 3020008-090 | 090  | 44   |
| 3020008-150 | 150  | 70   |

\*To be used when directly connected to the accumulator, see below.



## System hoses

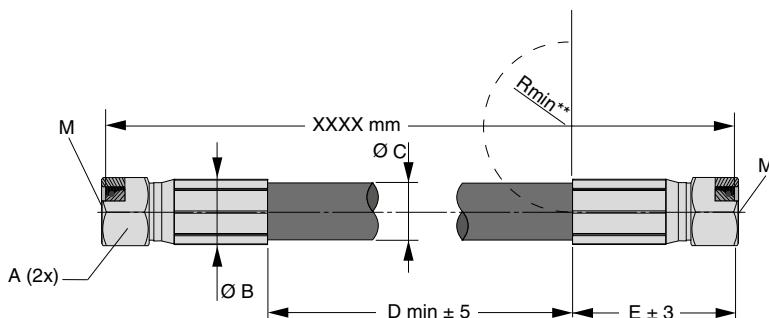
### E024-Hose Dimensions

ISO standard: DIN EN ISO 8434



### Hose, straight – straight

(45-90° hose ends not available, see 45-90° adapters)



| For Power Unit  | Hose size | Thread M | Order No.        | A  | Ø B  | Ø C | D min | E  | Rmin* |
|-----------------|-----------|----------|------------------|----|------|-----|-------|----|-------|
| HCP 015 *       | 3/8" *    | M 20x1.5 | 30 222 15 - xxxx | 24 | 24.5 | 20  | 50    | 56 | 63    |
| HCP 015         | 1/2"      | M 24x1.5 | 30 214 54 - xxxx | 30 | 28.5 | 24  | 50    | 63 | 90    |
| HCP 040         | 3/4"      | M30x2    | 30 214 55 - xxxx | 36 | 35   | 31  | 50    | 72 | 120   |
| HCP 060 and 090 | 1"        | M36x2    | 30 214 56 - xxxx | 46 | 44   | 38  | 50    | 88 | 150   |
| HCP 150         | 1 1/4"    | M42x2    | 30 214 57 - xxxx | 50 | 52   | 47  | 50    | 94 | 210   |

\*\* = Smallest recommended bending radius for the hydraulic hose

\* = Hose size depends on press velocity, see below:

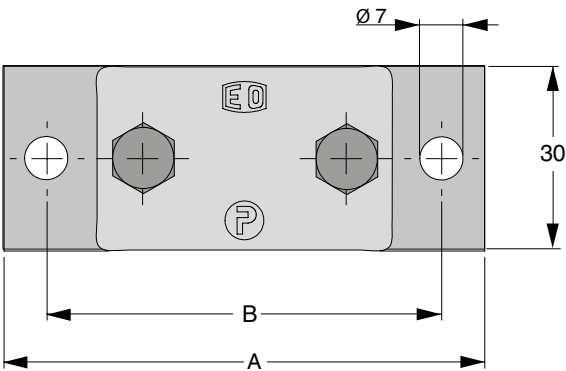
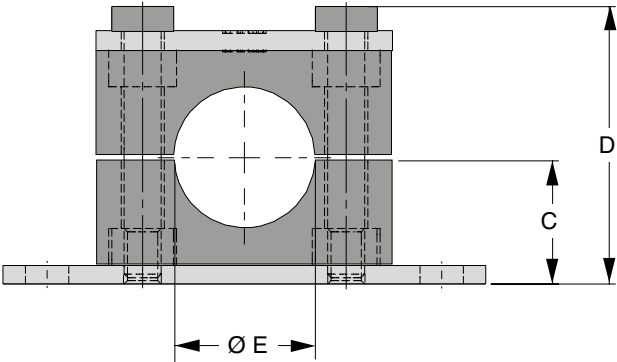
| Power Unit | Standard hose size<br>Max velocity 0.8 m/s | 0.6 m/s | 0.4 m/s | 0.2 m/s |
|------------|--------------------------------------------|---------|---------|---------|
| HCP 015    | 1/2"                                       | 3/8"    | 3/8"    | 3/8"    |
| HCP 040    | 3/4"                                       | 3/4"    | 1/2"    | 1/2"    |
| HCP 060    | 1"                                         | 3/4"    | 3/4"    | 1/2"    |
| HCP 090    | 1"                                         | 1"      | 3/4"    | 1/2"    |
| HCP 150    | 1 1/4"                                     | 1 1/4"  | 1"      | 3/4"    |

Additional Parker hose info:

| Hose size | Inner Ø | Outer Ø | Hose     | Max working pressure | Min burst pressure | Hose fitting |
|-----------|---------|---------|----------|----------------------|--------------------|--------------|
| 3/8"      | 10      | 20      | 722ST-6  | 280 bar              | 1120 bar           | 1C943-12-6   |
| 1/2"      | 12.5    | 24      | 722ST-8  | 280 bar              | 1120 bar           | 1C943-16-8   |
| 3/4"      | 19      | 31      | 722ST-12 | 280 bar              | 1120 bar           | 1C943-20-12  |
| 1"        | 25      | 38      | 722ST-16 | 280 bar              | 1120 bar           | 1C943-25-16  |
| 1 1/4"    | 31.8    | 47      | 487ST-20 | 210 bar              | 840 bar            | 1C977-30-20  |

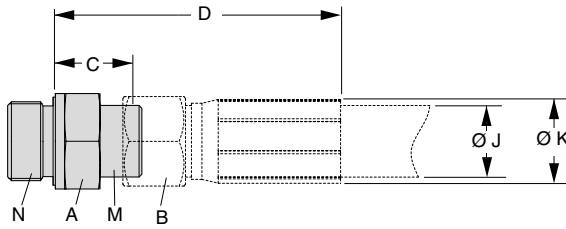
**Note:** When ordering hoses direct from Parker make sure to include inside washing and end plugs. This procedure is included when ordering hoses from KALLER.

Hose Clamp



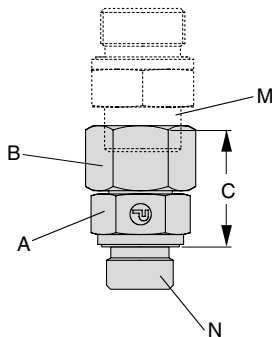
| Hose size | Order No. | A   | B   | C  | D  | $\varnothing E$ |
|-----------|-----------|-----|-----|----|----|-----------------|
| 3/8"      | 504613    | 78  | 64  | 20 | 44 | 20              |
| 1/2"      | 504614    | 78  | 64  | 20 | 44 | 24              |
| 3/4"      | 504615    | 87  | 73  | 24 | 51 | 31              |
| 1"        | 504616    | 100 | 86  | 32 | 67 | 38              |
| 1 1/4"    | 504617    | 116 | 100 | 36 | 75 | 47              |

## Male Stud Connector



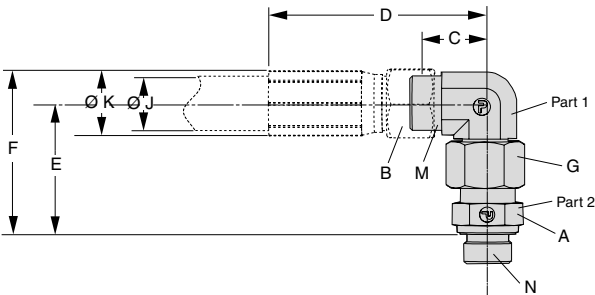
| Hose size | Thread M | Thread N | Order No. | A  | B  | C  | D   | ØJ | ØK   |
|-----------|----------|----------|-----------|----|----|----|-----|----|------|
| 3/8"      | M 20x1.5 | G 1/2"   | 504598    | 27 | 24 | 18 | 74  | 20 | 24.5 |
| 1/2"      | M 24x1.5 | G 1/2"   | 504321    | 27 | 30 | 19 | 82  | 24 | 30   |
| 1/2"      | M24x1.5  | G 3/4"   | 504322    | 32 | 30 | 21 | 84  | 24 | 30   |
| 3/4"      | M30x2    | G 1/2"   | 504323    | 32 | 36 | 21 | 93  | 31 | 37   |
| 3/4"      | M30x2    | G 3/4"   | 504324    | 32 | 36 | 21 | 93  | 31 | 37   |
| 3/4"      | M30x2    | G 1 1/4" | 504325    | 50 | 36 | 23 | 95  | 31 | 37   |
| 1"        | M36x2    | G 1/2"   | 504326    | 41 | 46 | 23 | 111 | 38 | 46   |
| 1"        | M36x2    | G 3/4"   | 504327    | 41 | 46 | 23 | 111 | 38 | 46   |
| 1"        | M36x2    | G 1 1/4" | 504328    | 50 | 46 | 23 | 111 | 38 | 46   |
| 1 1/4"    | M42X2    | G 3/4"   | 504329    | 41 | 50 | 24 | 138 | 46 | 57   |
| 1 1/4"    | M42X2    | G 1"     | 504330    | 46 | 50 | 24 | 138 | 46 | 57   |
| 1 1/4"    | M42X2    | G 1 1/4" | 504331    | 50 | 50 | 27 | 141 | 46 | 57   |

## Swivel Connector



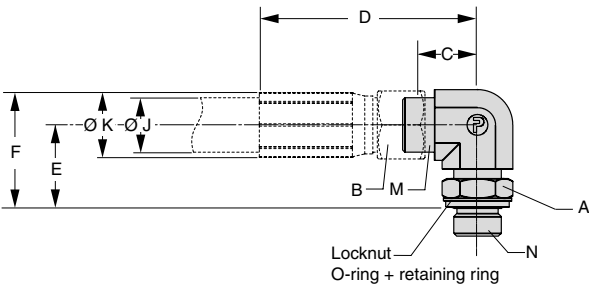
| Thread M | Thread N | Order No. | A  | B  | C  |
|----------|----------|-----------|----|----|----|
| M 20x1.5 | G 1/2"   | 504608    | 27 | 24 | 35 |
| M 24x1.5 | G 1/2"   | 504609    | 27 | 30 | 37 |
| M 30x2   | G 3/4"   | 504610    | 32 | 36 | 43 |
| M 36x2   | G 1"     | 504611    | 41 | 46 | 48 |
| M 42x2   | G 1 1/4" | 504612    | 50 | 50 | 51 |

Swivel Nut Elbow and Male Stud Connector



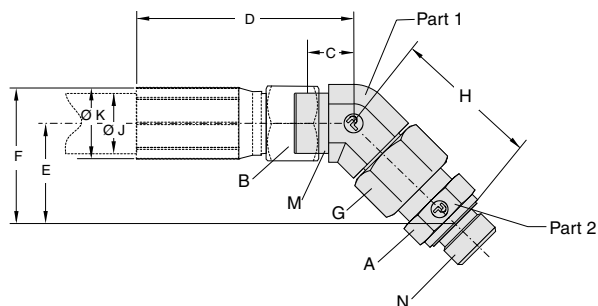
| Hose size | Thread M | Thread N | Order No. Part 1 | Order No. Part 2 | A  | B  | C  | D   | E  | F   | G  | ØJ | ØK   |
|-----------|----------|----------|------------------|------------------|----|----|----|-----|----|-----|----|----|------|
| 3/8"      | M20x1.5  | G 1/2"   | 504599           | 504598           | 27 | 24 | 22 | 78  | 49 | 61  | 24 | 20 | 24,5 |
| 1/2"      | M24x1.5  | G 1/2"   | 504332           | 504321           | 27 | 30 | 25 | 88  | 55 | 70  | 30 | 24 | 30   |
| 1/2"      | M24x1.5  | G 3/4"   | 504332           | 504322           | 32 | 30 | 25 | 88  | 58 | 73  | 30 | 24 | 30   |
| 3/4"      | M30x2    | G 1/2"   | 504333           | 504323           | 32 | 36 | 27 | 99  | 65 | 84  | 36 | 31 | 37   |
| 3/4"      | M30x2    | G 3/4"   | 504333           | 504324           | 32 | 36 | 27 | 99  | 65 | 84  | 36 | 31 | 37   |
| 3/4"      | M30x2    | G 1 1/4" | 504333           | 504325           | 50 | 36 | 27 | 99  | 67 | 86  | 36 | 31 | 37   |
| 1"        | M36x2    | G 1/2"   | 504334           | 504326           | 41 | 46 | 30 | 118 | 73 | 96  | 46 | 38 | 46   |
| 1"        | M36x2    | G 3/4"   | 504334           | 504327           | 41 | 46 | 30 | 118 | 73 | 96  | 46 | 38 | 46   |
| 1"        | M36x2    | G 1 1/4" | 504334           | 504328           | 50 | 46 | 30 | 118 | 73 | 96  | 46 | 38 | 46   |
| 1 1/4"    | M42x2    | G 3/4"   | 504335           | 504329           | 41 | 50 | 36 | 150 | 79 | 108 | 50 | 46 | 57   |
| 1 1/4"    | M42x2    | G 1 1/4" | 504335           | 504331           | 50 | 50 | 36 | 150 | 79 | 108 | 50 | 46 | 57   |

Adjustable Locknut Elbow



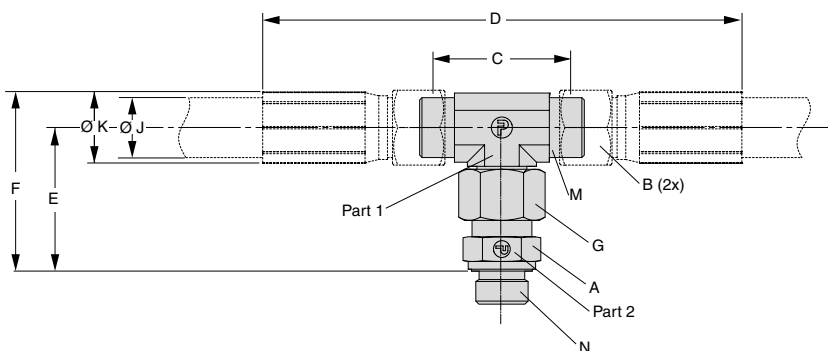
| Hose size | Thread M | Thread N | Order No. | A  | B  | C  | D   | E  | F  | ØJ | ØK   |
|-----------|----------|----------|-----------|----|----|----|-----|----|----|----|------|
| 3/8"      | M20x1.5  | G 1/2"   | 504600    | 27 | 24 | 22 | 78  | 36 | 48 | 20 | 24.5 |
| 1/2"      | M24x1.5  | G 1/2"   | 504336    | 27 | 30 | 25 | 88  | 36 | 51 | 24 | 30   |
| 3/4"      | M30x2    | G 3/4"   | 504337    | 36 | 36 | 28 | 100 | 39 | 58 | 31 | 37   |
| 1"        | M36x2    | G 3/4"   | 504338    | 41 | 46 | 30 | 118 | 44 | 67 | 38 | 46   |
| 1 1/4"    | M42x2    | G1 1/4"  | -         | -  | -  | -  | -   | -  | -  | -  | -    |

## Swivel Nut 45°Elbow and Male Stud Connector



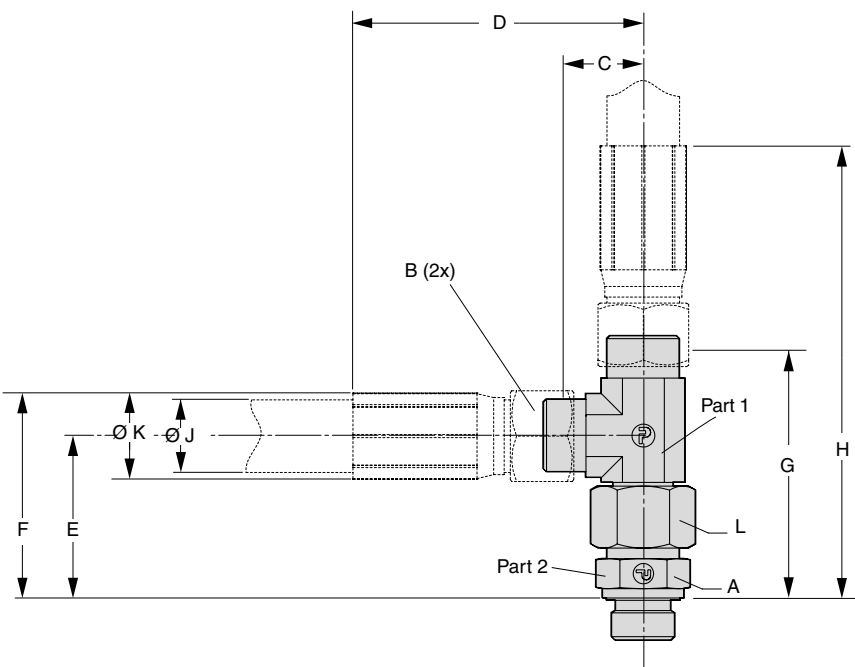
| Hose size | Thread M | Thread N | Order No.<br>Part 1 | Order No.<br>Part 2 | A  | B  | C  | D   | E  | F  | G  | H  | ØJ | ØK   |
|-----------|----------|----------|---------------------|---------------------|----|----|----|-----|----|----|----|----|----|------|
| 3/8"      | M20x1.5  | G 1/2"   | 504601              | 504598              | 27 | 24 | 17 | 73  | 35 | 47 | 24 | 49 | 20 | 24.5 |
| 1/2"      | M24x1.5  | G 1/2"   | 504339              | 504321              | 27 | 30 | 16 | 79  | 39 | 54 | 30 | 55 | 24 | 30   |
| 1/2"      | M24x1.5  | G 3/4"   | 504339              | 504322              | 32 | 30 | 16 | 79  | 40 | 55 | 30 | 57 | 24 | 30   |
| 3/4"      | M30x2    | G 1/2"   | 504340              | 504323              | 32 | 36 | 16 | 88  | 46 | 65 | 36 | 65 | 31 | 37   |
| 3/4"      | M30x2    | G 3/4"   | 504340              | 504324              | 32 | 36 | 16 | 88  | 46 | 65 | 36 | 65 | 31 | 37   |
| 3/4"      | M30x2    | G 1 1/4" | 504340              | 504325              | 50 | 36 | 16 | 88  | 47 | 66 | 36 | 67 | 31 | 37   |
| 1"        | M36x2    | G 1/2"   | 504341              | 504326              | 41 | 46 | 19 | 107 | 52 | 75 | 46 | 73 | 38 | 46   |
| 1"        | M36x2    | G 3/4"   | 504341              | 504327              | 41 | 46 | 19 | 107 | 52 | 75 | 46 | 73 | 38 | 46   |
| 1"        | M36x2    | G 1 1/4" | 504341              | 504328              | 50 | 46 | 19 | 107 | 52 | 75 | 46 | 73 | 38 | 46   |
| 1 1/4"    | M42x2    | G 3/4"   | 504342              | 504329              | 41 | 50 | 24 | 138 | 56 | 85 | 50 | 79 | 46 | 57   |
| 1 1/4"    | M42x2    | G 1 1/4" | 504342              | 504331              | 50 | 50 | 24 | 138 | 56 | 85 | 50 | 79 | 46 | 57   |

## Swivel Nut Branch Tee and Male Stud Connector



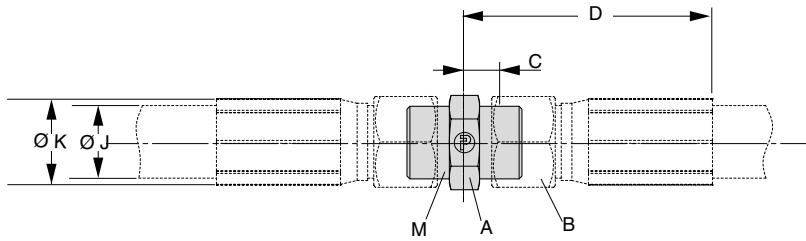
| Hose size | Thread M | Thread N | Order No.<br>Part 1 | Order No.<br>Part 2 | A  | B  | C  | D   | E  | F   | G  | ØJ | ØK   |
|-----------|----------|----------|---------------------|---------------------|----|----|----|-----|----|-----|----|----|------|
| 3/8"      | M20x1.5  | G 1/2"   | 504602              | 504598              | 27 | 24 | 43 | 155 | 49 | 61  | 24 | 20 | 24.5 |
| 1/2"      | M24x1.5  | G 1/2"   | 504343              | 504321              | 27 | 30 | 49 | 175 | 55 | 70  | 30 | 24 | 30   |
| 1/2"      | M24x1.5  | G 3/4"   | 504343              | 504322              | 32 | 30 | 49 | 175 | 58 | 73  | 30 | 24 | 30   |
| 3/4"      | M30x2    | G 1/2"   | 504344              | 504323              | 32 | 36 | 53 | 197 | 65 | 84  | 36 | 31 | 37   |
| 3/4"      | M30x2    | G 3/4"   | 504344              | 504324              | 32 | 36 | 53 | 197 | 65 | 84  | 36 | 31 | 37   |
| 3/4"      | M30x2    | G 1 1/4" | 504344              | 504325              | 50 | 36 | 53 | 197 | 67 | 86  | 36 | 31 | 37   |
| 1"        | M36x2    | G 1/2"   | 504345              | 504326              | 41 | 46 | 60 | 236 | 73 | 96  | 46 | 38 | 46   |
| 1"        | M36x2    | G 3/4"   | 504345              | 504327              | 41 | 46 | 60 | 236 | 73 | 96  | 46 | 38 | 46   |
| 1"        | M36x2    | G 1 1/4" | 504345              | 504328              | 50 | 46 | 60 | 236 | 73 | 96  | 46 | 38 | 46   |
| 1 1/4"    | M42x2    | G 3/4"   | 504346              | 504329              | 41 | 50 | 71 | 299 | 79 | 108 | 50 | 46 | 57   |
| 1 1/4"    | M42x2    | G 1 1/4" | 504346              | 504331              | 50 | 50 | 71 | 299 | 79 | 108 | 50 | 46 | 57   |

Swivel Nut Run Tee and Male Stud Connector



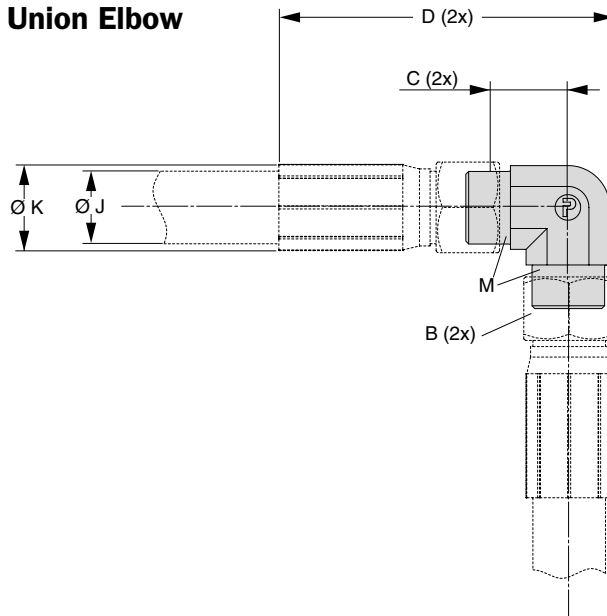
| Hose size | Thread M | Thread N | Order No. Part 1 | Order No. Part 2 | A  | B  | C  | D   | E  | F   | G   | H   | Ø J | Ø K |
|-----------|----------|----------|------------------|------------------|----|----|----|-----|----|-----|-----|-----|-----|-----|
| 3/8"      | M20x1.5  | G 1/2"   | 504603           | 504598           | 27 | 24 | 22 | 78  | 49 | 61  | 71  | 127 |     |     |
| 1/2"      | M24x1.5  | G 1/2"   | 504347           | 504321           | 27 | 30 | 25 | 88  | 55 | 70  | 80  | 143 | 24  | 30  |
| 1/2"      | M24x1.5  | G 3/4"   | 504347           | 504322           | 32 | 30 | 25 | 88  | 58 | 73  | 82  | 145 | 24  | 30  |
| 3/4"      | M30x2    | G 1/2"   | 504348           | 504323           | 32 | 36 | 27 | 99  | 65 | 84  | 92  | 164 | 31  | 37  |
| 3/4"      | M30x2    | G 3/4"   | 504348           | 504324           | 32 | 36 | 27 | 99  | 65 | 84  | 92  | 164 | 31  | 37  |
| 3/4"      | M30x2    | G 1 1/4" | 504348           | 504325           | 50 | 36 | 27 | 99  | 67 | 86  | 94  | 166 | 31  | 37  |
| 1"        | M36x2    | G 1/2"   | 504349           | 504326           | 41 | 46 | 30 | 118 | 73 | 96  | 103 | 191 | 38  | 46  |
| 1"        | M36x2    | G 3/4"   | 504349           | 504327           | 41 | 46 | 30 | 118 | 73 | 96  | 103 | 191 | 38  | 46  |
| 1"        | M36x2    | G 1 1/4" | 504349           | 504328           | 50 | 46 | 30 | 118 | 73 | 96  | 103 | 191 | 38  | 46  |
| 1 1/4"    | M42x2    | G 3/4"   | 504350           | 504329           | 41 | 50 | 36 | 150 | 79 | 108 | 114 | 228 | 46  | 57  |
| 1 1/4"    | M42x2    | G 1 1/4" | 504350           | 504331           | 50 | 50 | 36 | 150 | 79 | 108 | 114 | 228 | 46  | 57  |

## Union Straight



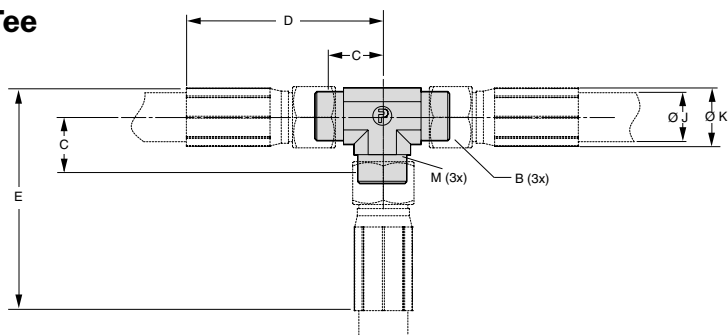
| Hose size | Thread M | Order No. | A  | B  | C  | D   | Ø J | Ø K  |
|-----------|----------|-----------|----|----|----|-----|-----|------|
| 3/8"      | M20x1.5  | 504604    | 22 | 24 | 10 | 66  | 20  | 24.5 |
| 1/2"      | M24x1.5  | 504351    | 27 | 30 | 11 | 74  | 24  | 30   |
| 3/4"      | M30x2    | 504352    | 32 | 36 | 12 | 84  | 31  | 37   |
| 1"        | M36x2    | 504353    | 41 | 46 | 13 | 101 | 38  | 46   |
| 1 1/4"    | M42X2    | 504354    | 46 | 50 | 14 | 128 | 46  | 57   |

## Union Elbow



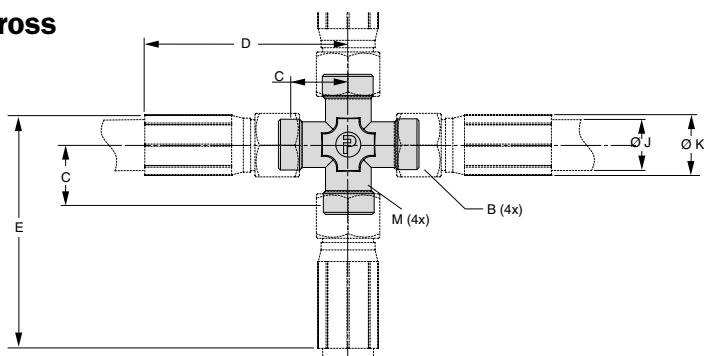
| Hose size | Thread M | Order No. | B  | C  | D   | Ø J | Ø K  |
|-----------|----------|-----------|----|----|-----|-----|------|
| 3/8"      | M20x1.5  | 504605    | 24 | 22 | 90  | 20  | 24.5 |
| 1/2"      | M24x1.5  | 504355    | 30 | 25 | 102 | 24  | 30   |
| 3/4"      | M30x2    | 504356    | 36 | 27 | 117 | 31  | 37   |
| 1"        | M36x2    | 504357    | 46 | 30 | 140 | 38  | 46   |
| 1 1/4"    | M42X2    | 504358    | 50 | 36 | 178 | 46  | 57   |

Union Tee



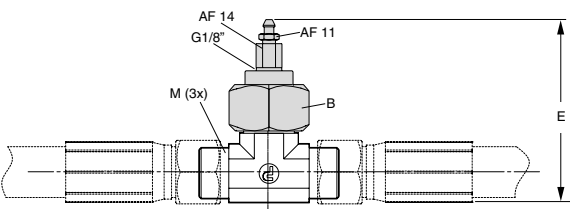
| Hose size | Thread M | Order No. | B  | C  | D   | E   | Ø J | Ø K  |
|-----------|----------|-----------|----|----|-----|-----|-----|------|
| 3/8"      | M20x1.5  | 504606    | 24 | 22 | 78  | 91  | 20  | 24.5 |
| 1/2"      | M24x1.5  | 504359    | 30 | 25 | 88  | 103 | 24  | 30   |
| 3/4"      | M30x2    | 504360    | 36 | 27 | 99  | 117 | 31  | 37   |
| 1"        | M36x2    | 504361    | 46 | 30 | 118 | 140 | 38  | 46   |
| 1 1/4"    | M42X2    | 504362    | 50 | 36 | 150 | 178 | 46  | 57   |

Union Cross



| Hose size | Thread M | Order No. | B  | C  | D   | E   | Ø J | Ø K  |
|-----------|----------|-----------|----|----|-----|-----|-----|------|
| 3/8"      | M20x1.5  | 504607    | 24 | 22 | 78  | 91  | 20  | 24.5 |
| 1/2"      | M24x1.5  | 504363    | 30 | 25 | 88  | 103 | 24  | 30   |
| 3/4"      | M30x2    | 504364    | 36 | 27 | 99  | 117 | 31  | 37   |
| 1"        | M36x2    | 504365    | 46 | 30 | 118 | 140 | 38  | 46   |
| 1 1/4"    | M42x2    | 504366    | 50 | 36 | 150 | 178 | 46  | 57   |

Additional Oil Bleeding Valve



| Hose size | Thread M | Order No.* | B  | E   |
|-----------|----------|------------|----|-----|
| 1/2"      | M24x1.5  | 4026614    | 30 | 96  |
| 3/4"      | M30x2    | 4126614    | 36 | 107 |
| 1"        | M36x2    | 4226614    | 46 | 114 |
| 1 1/4"    | M42x2    | 4326614    | 50 | 128 |

\*Union Tee not included.

## Additional KALLER - Parker adapter reference list:

| KALLER Order No. | Parker Order No. |
|------------------|------------------|
| 504321           | GE16SREDOMD*     |
| 504322           | GE16SR3/4EDOMD*  |
| 504323           | GE20SR1/2EDOMD*  |
| 504324           | GE20SREDOMD*     |
| 504325           | GE20SR11/4EDOMD* |
| 504326           | GE25SR1/2EDOMD*  |
| 504327           | GE25SR3/4EDOMD*  |
| 504328           | GE25SR11/4EDOMD* |
| 504329           | GE30SR3/4EDOMD*  |
| 504330           | GE30SR1EDOMD*    |
| 504331           | GE30SREDOMD*     |
| 504332           | EW16SOMD*        |
| 504333           | EW20SOMD*        |
| 504334           | EW25SOMD*        |
| 504335           | EW30SOMD*        |
| 504336           | WEE16SR0MD*      |
| 504337           | WEE20SR0MD*      |
| 504338           | WEE25SR3/40MD*   |
| 504339           | EV16SOMD*        |
| 504340           | EV20SOMD*        |
| 504341           | EV25SOMD*        |
| 504342           | EV30SOMD*        |
| 504343           | ET16SOMD*        |
| 504344           | ET20SOMD*        |
| 504345           | ET25SOMD*        |
| 504346           | ET30SOMD*        |
| 504347           | EL16SOMD*        |
| 504348           | EL20SOMD*        |
| 504349           | EL25SOMD*        |
| 504350           | EL30SOMD*        |
| 504351           | G16S*X           |
| 504352           | G20S*X           |
| 504353           | G25S*X           |
| 504354           | G30S*X           |
| 504355           | W16S*X           |
| 504356           | W20S*X           |
| 504357           | W25S*X           |
| 504358           | W30S*X           |
| 504359           | T16S*X           |
| 504360           | T20S*X           |
| 504361           | T25S*X           |
| 504362           | T30S*X           |
| 504363           | K16S*X           |
| 504364           | K20S*X           |
| 504365           | K25S*X           |
| 504366           | K30S*X           |

| KALLER Order No. | Parker Order No. |
|------------------|------------------|
| 504598           | GE12SR1/2EDOMD*  |
| 504599           | EW12SOMD*        |
| 504600           | WEE12SR1/20MD*   |
| 504601           | EV12SOMD*        |
| 504602           | ET12SOMD*        |
| 504603           | EL12SOMD*        |
| 504604           | G12S*X           |
| 504605           | W12S*X           |
| 504606           | T12S*X           |
| 504607           | K12S*X           |
| 504608           | EGE12SR1/2ED*    |
| 504609           | EGE16SRED*       |
| 504610           | EGE20SRED*       |
| 504611           | EGE25SRED*       |
| 504612           | EGE30SRED*       |
| 504613           | RAVG6-319        |
| 504614           | RAVG6-323        |
| 504615           | RAVG6-430        |
| 504616           | RAVG6-538        |
| 504617           | RAVG6-648        |

\* **CF** version is Chromium6 free.

**A3C** material is steel, Zink-plated and yellow chromated.

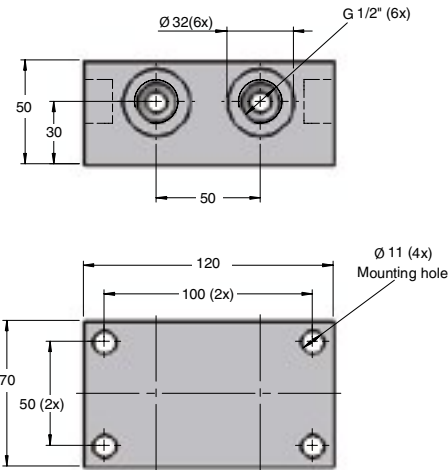
The CF version is recommended when available.

Parker ordering example:

GE16SREDOMD**CF** or GE16SREDOMD**A3C**

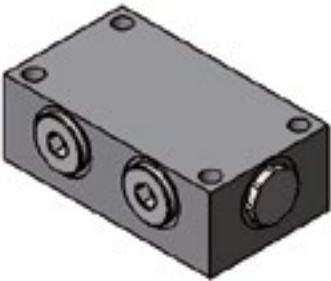
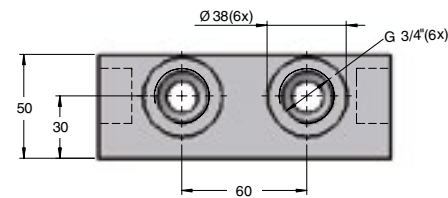
Manifold Block

Order No. 3022834

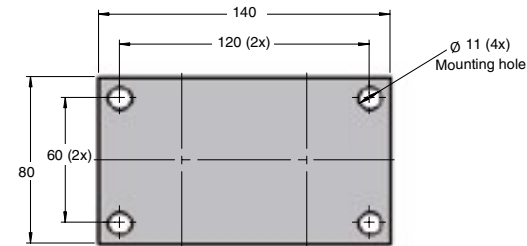


Manifold Block

Order No. 3022835



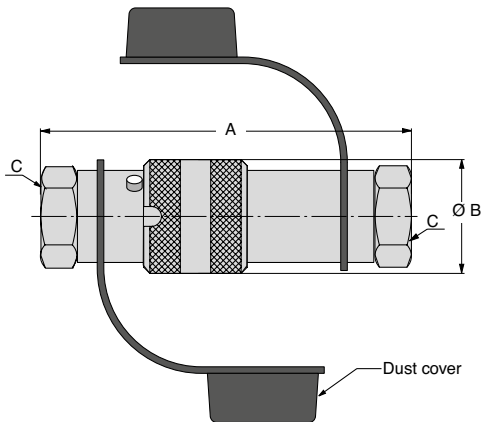
Additional Oil Bleeding Valve



## System adapters

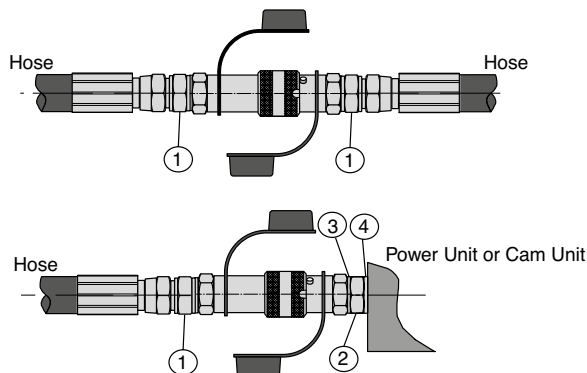
### Quick coupling

The quick coupling can be used to separate the Power Unit and the Cam Unit/Force Cylinder without refilling and bleeding the system.



| Ordering No. | A   | ØB | C      | Max. oil flow | Power Unit / Cam | Max. velocity<br>Power Unit / Cam |
|--------------|-----|----|--------|---------------|------------------|-----------------------------------|
| 3018084-01   | 132 | 40 | G 1/2" | 100 l/min     | 015              | 0.8                               |
| 3018084-02   | 162 | 50 | G 3/4" | 300 l/min     | 040, 060, 090    | 0.8 (090=0.6)                     |
| 3018084-03   | 176 | 57 | G 1    | 500 l/min     | 150              | 0.6                               |

### Installation possibilities



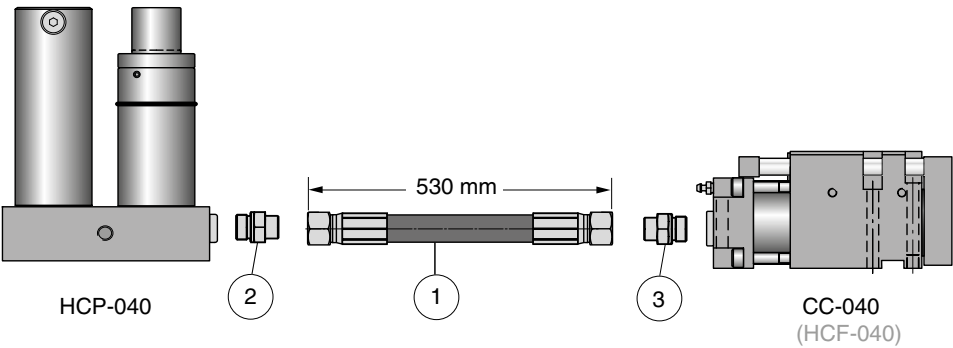
| Ordering number adapter and washers |                   |            |            |            |
|-------------------------------------|-------------------|------------|------------|------------|
| Quick coupling                      | Position 1        | Position 2 | Position 3 | Position 4 |
| 3018084-01                          | 504321            | 503551     | 501271     | 501271     |
| 3018084-02                          | 504324 or 504327* | 503552     | 501270     | 501270     |
| 3018084-03                          | 504330            | 503553     | 500282     | 503554     |

\*for 1" hose size

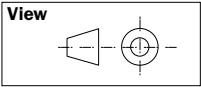
Designing your hosed system

How to design your hosed system

- 1. Choose the right hose size and style from page 149 (the hose size is always dictated by the Power Unit size).
- 2. Choose the right size/style adaptor between hose and Power Unit using page 151-154. The oil connection is found on the respective Power Unit dimension page.
- 3. Choose the right size/style adapter between hose and Cam Unit/ Force Cylinder (CC or HCF) using page 151-154. The oil connection is found on the respective Cam Unit/ Force Cylinder dimension page. You can also connect one hose to an other using adapters (see page 155-156).



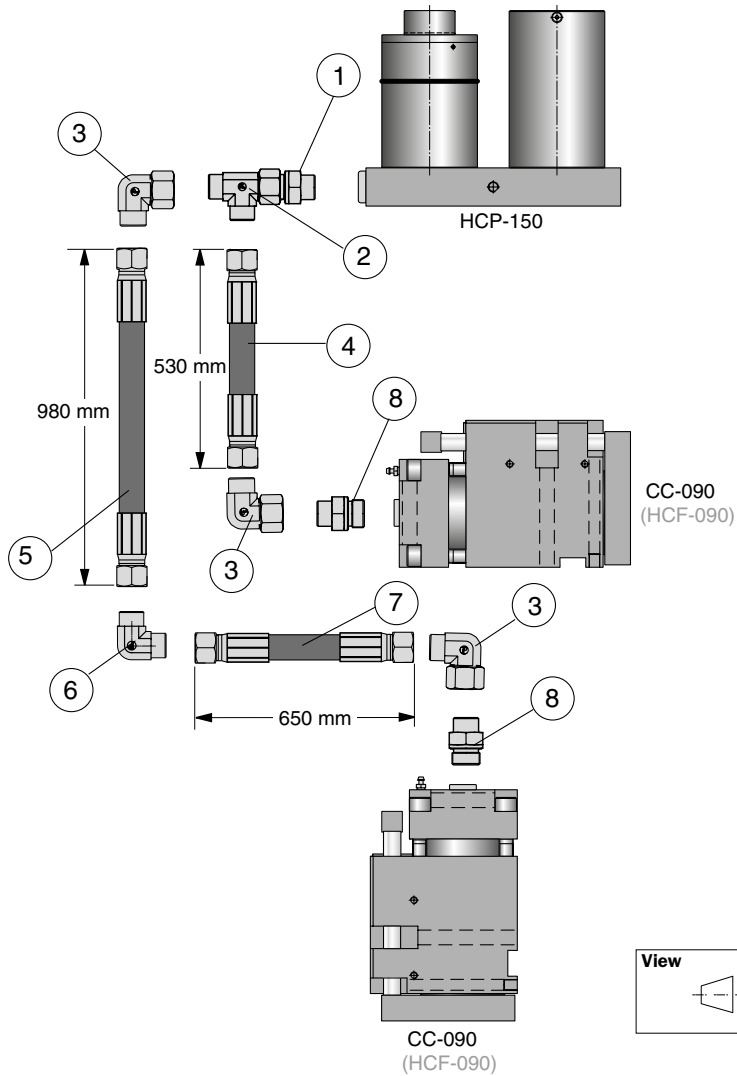
Example above showing how to connect a HCP-040 to a CC-040 (the same principal applies when connecting an HCF).



| Position | Order No.    |
|----------|--------------|
| 1        | 3021455-0530 |
| 2        | 504324       |
| 3        | 504324       |

## Designing your hosed system

Example above showing how to connect a HCP-040 to a CC-040  
(the same principal applies when connecting an HCF).



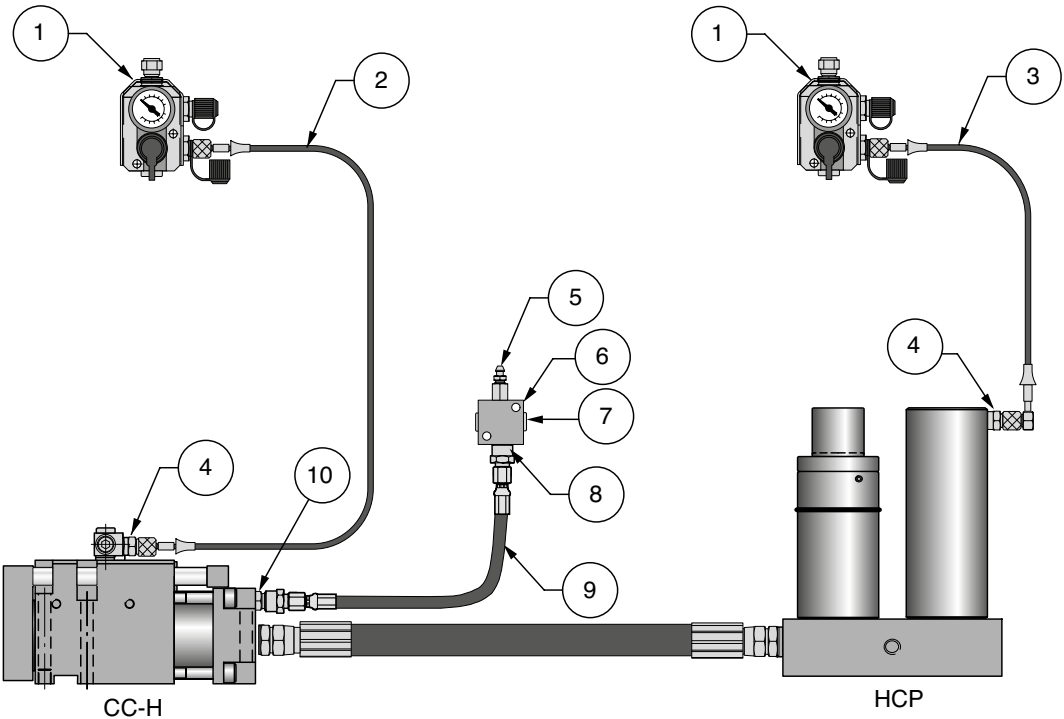
| Position | Quantity | Order No.    |
|----------|----------|--------------|
| 1        | 1        | 504331       |
| 2        | 1        | 504350       |
| 3        | 3        | 504335       |
| 4        | 1        | 3021457-0530 |
| 5        | 1        | 3021457-0980 |
| 6        | 1        | 504358       |
| 7        | 1        | 3021457-0652 |
| 8        | 2        | 504329       |

### Remember!

For synchronized movement of the Cams, connect only one Cam Unit per Power Unit

Hosed systems for Control Units and oil bleeding

CC-H Compact Cam/HCP Power Unit (example)



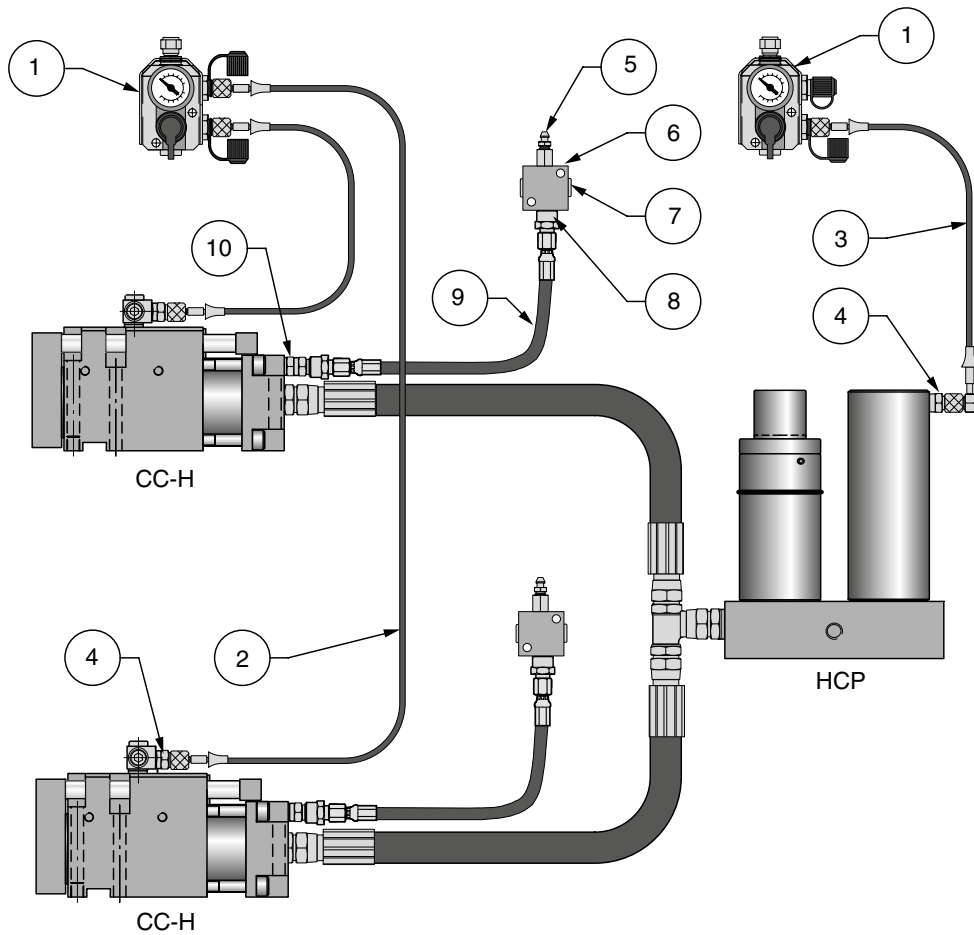
\*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER catalog for further information.

| Hosed system for Control Units * |          |              |                |
|----------------------------------|----------|--------------|----------------|
| Position                         | Quantity | Description  | Order No.      |
| 1                                | 2        | Control Unit | 3116114        |
| 2                                | 1        | EZ-hose      | 4014974-xxxx   |
| 3                                | 1        | EZ-hose      | 4017568-xxxx   |
| 4                                | 2        | Adapter      | 4114973-G 1/8" |

| Hosed system for oil bleeding |          |               |              |
|-------------------------------|----------|---------------|--------------|
| Position                      | Quantity | Description   | Order No.    |
| 5                             | 1        | Bleed nipple  | 4014007      |
| 6                             | 1        | Coupling Unit | 4017032      |
| 7                             | 1        | Plug G 1/8"   | 500343       |
| 8                             | 1        | Adapter       | 503593       |
| 9                             | 1        | E024-hose     | 3020857-xxxx |
| 10                            | 1        | Adapter M10x1 | 504636       |

# Hosed systems for Control Units and oil bleeding

## Two CC-H Compact Cams/HCP Power Unit (example)



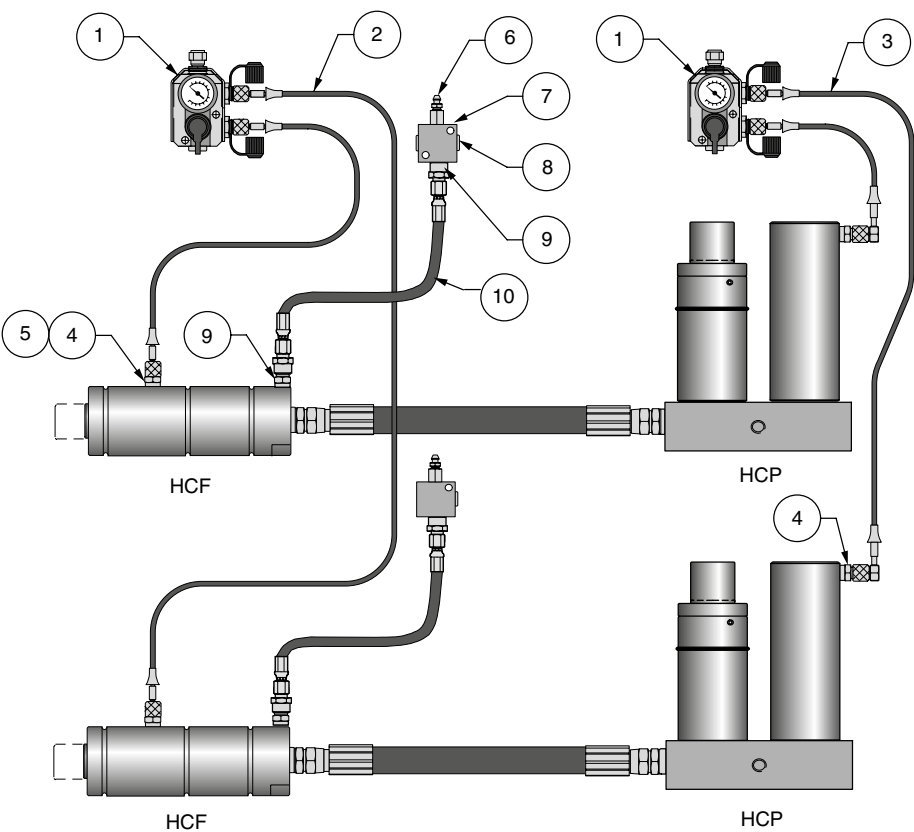
\*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER catalog for further information.

| Hosed system for Control Units * |          |              |                |
|----------------------------------|----------|--------------|----------------|
| Position                         | Quantity | Description  | Order No.      |
| 1                                | 2        | Control Unit | 3116114        |
| 2                                | 2        | EZ-hose      | 4014974-xxxx   |
| 3                                | 1        | Ez-hose      | 4017568-xxxx   |
| 4                                | 3        | Adapter      | 4114973-G 1/8" |

| Hosed system for oil bleeding |          |               |              |
|-------------------------------|----------|---------------|--------------|
| Position                      | Quantity | Description   | Order No.    |
| 5                             | 2        | Bleed nipple  | 4014007      |
| 6                             | 2        | Coupling Unit | 4017032      |
| 7                             | 2        | Plug G 1/8"   | 500343       |
| 8                             | 2        | Adapter       | 503593       |
| 9                             | 2        | E024-hose     | 3020857-xxxx |
| 10                            | 2        | Adapter M10x1 | 504636       |

Hosed systems for Control Units and oil bleeding

Two HCF Force Cylinders to two HCP Power Units (example)



\*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER catalog for further information.

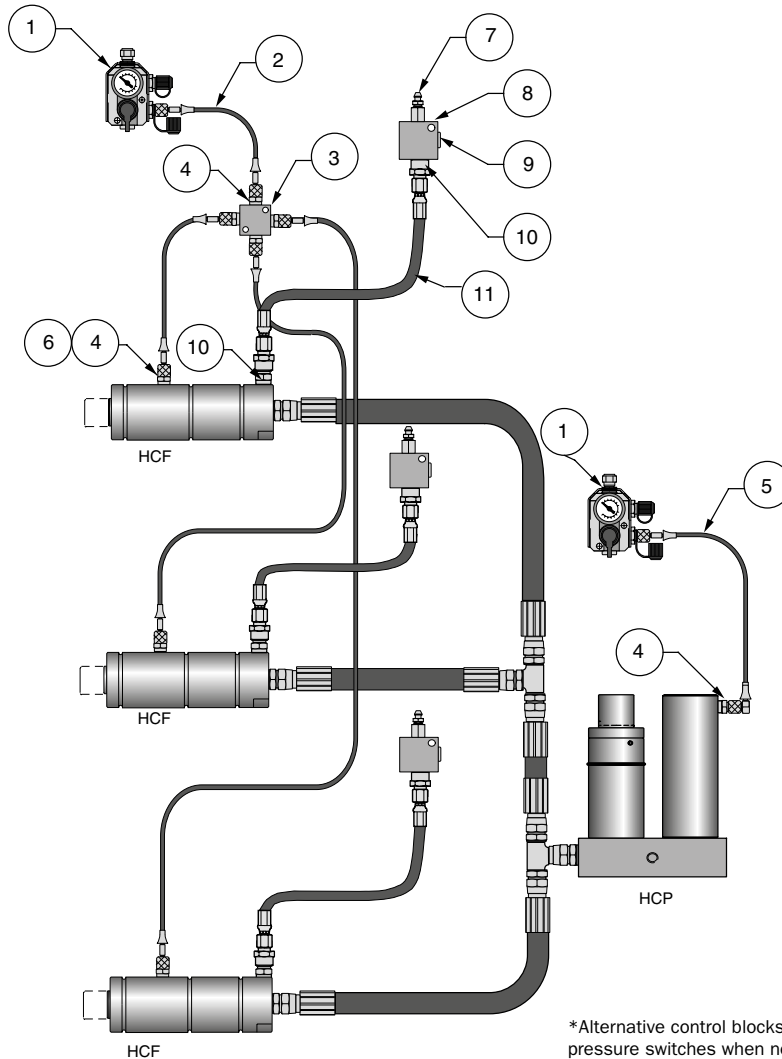
| Hosed system for Control Units * |          |               |                |
|----------------------------------|----------|---------------|----------------|
| Detail                           | Quantity | Description   | Order No.      |
| 1                                | 2        | Control Units | 3116114        |
| 2                                | 2        | EZ-hose       | 4014974-xxxx   |
| 3                                | 2        | EZ-hose       | 4017568-xxxx   |
| 4                                | 8        | Adapter       | 4114973-G 1/8" |
| 5                                | 1*       | Washer        | 500472         |

\*only needed for HCF 015

| Hosed system for oil bleeding |          |                    |              |
|-------------------------------|----------|--------------------|--------------|
| Detail                        | Quantity | Description        | Order No.    |
| 6                             | 2        | Bleed nipple       | 4014007      |
| 7                             | 2        | Distribution block | 4017032      |
| 8                             | 2        | Plug G 1/8"        | 500343       |
| 9                             | 4        | Adapter            | 503593       |
| 10                            | 2        | E024-hose          | 3020857-xxxx |

## Hosed systems for Control Units and oil bleeding

Three HCF Force Cylinders to one HCP Power Unit (example)



\*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER catalog for further information.

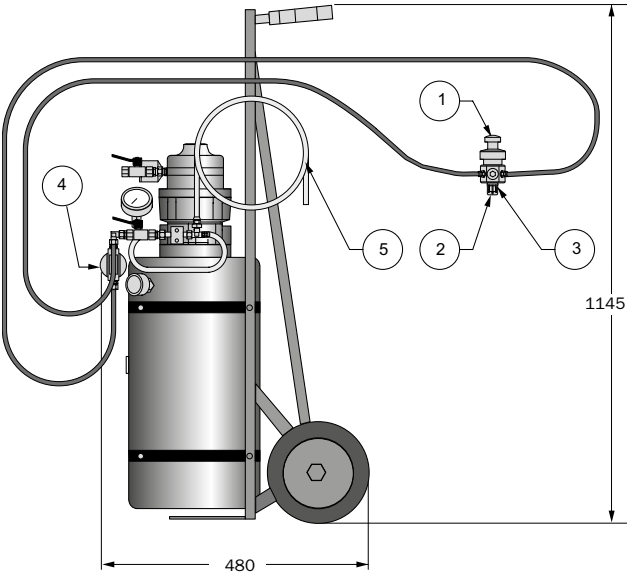
| Hosed system for Control Units * |          |               |                |
|----------------------------------|----------|---------------|----------------|
| Position                         | Quantity | Description   | Order No.      |
| 1                                | 2        | Control Unit  | 3116114        |
| 2                                | 4        | EZ-hose       | 4014974-xxxx   |
| 3                                | 1        | Coupling Unit | 4017032        |
| 4                                | 8        | Adapter       | 4114973-G 1/8" |
| 5                                | 1        | EZ-hose       | 4017568-xxxx   |
| 6                                | 1*       | Washer        | 500472         |

\*only needed for HCF 015

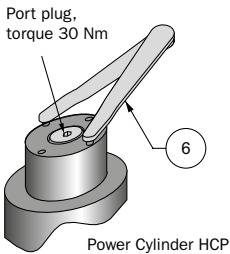
| Hosed system for oil bleeding |          |               |              |
|-------------------------------|----------|---------------|--------------|
| Position                      | Quantity | Description   | Order No.    |
| 7                             | 3        | Bleed nipple  | 4014007      |
| 8                             | 3        | Coupling Unit | 4017032      |
| 9                             | 3        | Plug G 1/8"   | 500343       |
| 10                            | 6        | Adapter       | 503593       |
| 11                            | 3        | E024-hose     | 3020857-xxxx |

Pump Unit

Order No. 3017075



The hook spanner below is used to hold the piston in place when loosening/tightening the port plug.



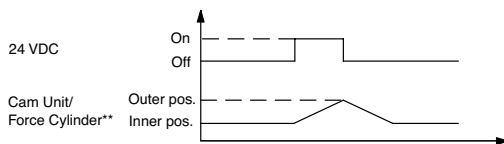
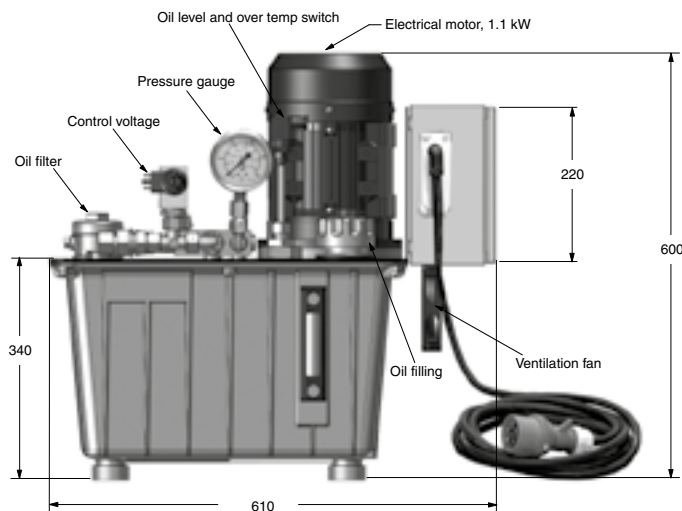
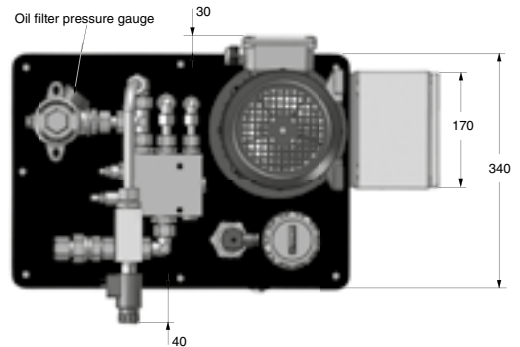
| Spare parts etc. |                                     |           |
|------------------|-------------------------------------|-----------|
| Position         | Description                         | Order No. |
| 1                | Armature (include position 2 and 3) | 3013941   |
| 2                | Plastic plug                        | 502446    |
| 3                | Rubber-steel washer                 | 502160    |
| 4                | Filter                              | 505763    |
| 5                | Transparent hose                    | 503116    |
| 6                | Hook spanner (HCP 015)              | 503417    |
| 6                | Hook spanner (HCP 040-150)          | 503418    |

Technical specifications

Power .....0.7 kW at 7 bar air pressure and 830 l/min  
Oil flow .....2.4 l/min at 1500 rpm  
Max. oil pressure .....55 bar  
Tank volume .....18 liters  
Oil filter .....10 µm  
Air pressure .....5-7 bar  
Weight .....27 kg

# EHC Electrical Pump Unit

Order No. 505776



| Technical data - hydraulic system |                                |
|-----------------------------------|--------------------------------|
| Oil tank volyme                   | 25 l                           |
| Hydraulic oil ISO VG 32           | DIN 51524 HVLP (or equivalent) |
| Min. oil flow at 180 bar          | 1.6 l/min                      |
| Max. oil flow at 25 bar           | 16 l/min                       |
| Oil pressure during cam travel    | 25 bar                         |
| Oil pressure during cam operation | Max. 180 bar                   |

| Technical data - electrical system |                       |
|------------------------------------|-----------------------|
| Main voltage electrical pump       | 3x220-440 VAC 50-60Hz |
| Control voltage solenoid valve     | 24 VDC/22 Watts       |
| Overtmp switch                     | 70° C                 |
| Weight                             | 47 kg                 |

| Cam Unit/Force Cylinder size | Cam Unit/Force Cylinder velocity* |                  |
|------------------------------|-----------------------------------|------------------|
|                              | Forward + return                  | During operation |
|                              | (Low pressure)                    | (High pressure)  |
| 015                          | 212 mm/s                          | 21 mm/s          |
| 040                          | 86 mm/s                           | 9 mm/s           |
| 060                          | 53 mm/s                           | 5 mm/s           |
| 090                          | 34 mm/s                           | 3 mm/s           |
| 150                          | 22 mm/s                           | 2 mm/s           |

\*The table shows approximate values based on a single Cam Unit/ Force Cylinder connected to a single EHC Electrical Pump Unit. When using more Cam Units/Force Cylinders connected to one EHC Unit divide the velocity by the number of Cam Units/ Force Cylinders.

Ex: 212/3 Cam Units/Force Cylinders = 71 mm/s

\*\*Cam Units/Force Cylinders forward: Activated by the control signal (24 VDC)

\*\*Cam Units/Force Cylinders return: Activated by the inbuilt gas return in the Cam Unit/Force Cylinder

# Installation and Service

## Safety Guidelines

### Symbol to observe



This symbol means that special attention is required.

### Personnel

All personnel who operate or maintain this equipment must fully understand how it works. Always wash your hands after working with hydraulic systems.

### Work place

The work place must be kept absolutely clean during installation or maintenance of the Flex Cam.

### Equipment

Use only clean and functional tools and proper protection for your eyes and skin.

### Adapters for hoses

Upon delivery, all connections on the units are plugged. To reduce the risk of contamination from foreign bodies, remove the plugs only when absolutely necessary.

### Nitrogen products

Be very careful when working with nitrogen products. See special instructions for gas springs, because wrong handling could cause personal injury. Make sure that there is enough room for the Accumulator in the tool.

## Hoses

The hoses are washed and plugged to protect them from dirt as this could damage the system. Make sure that the hoses are protected against sharp edges and external damage. The hoses will move a little depending on the oil pressure pulsation during operation.

## Torque settings for screws

Always use a torque wrench when tightening screws. See Table 1 which is valid for oiled screws of 12.9 quality.

| Screw dim. | Allen key | Torque (Nm) |
|------------|-----------|-------------|
| M 6        | 5         | 15          |
| M 8        | 6         | 40          |
| M 10       | 8         | 75          |
| M 12       | 10        | 135         |
| M 16       | 14        | 330         |
| M 20       | 17        | 640         |

Table 1

## Installation

The following information describes only the most important recommendations. If there are any questions about the installation do not hesitate to contact your local distributor or Strömsholmen AB.

Tel +46 140 571 00  
Fax +46 140 571 98  
Web site: [www.kaller.com](http://www.kaller.com)

### Power Unit

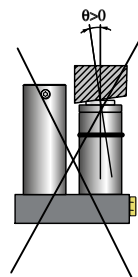
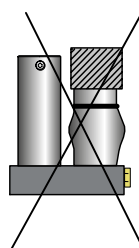
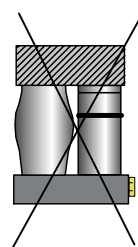
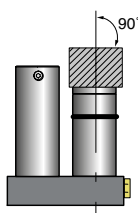
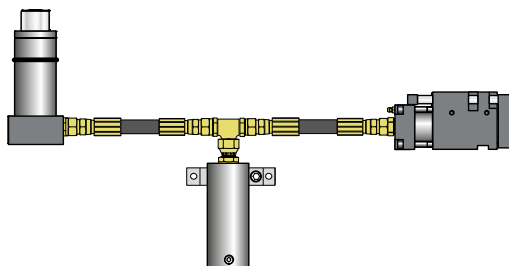
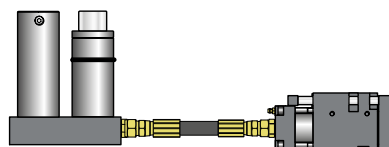
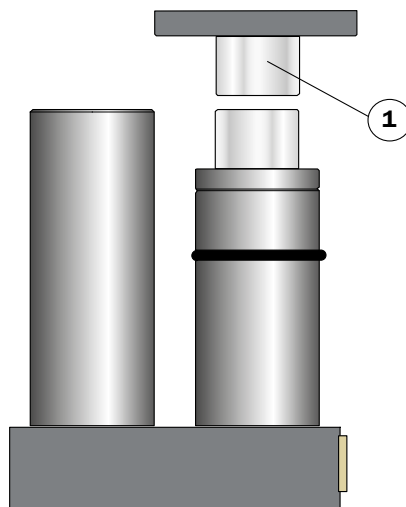
The Power Unit can be mounted in any position in the tool, including upside-down (valid for all units). A driver (1) is often used and adapted to give the right stroke length of the Power Cylinder.



**Make sure the surface which makes contact with the piston on the top of the Power Cylinder is parallel and even. Make sure there is enough room for the Accumulator in the tool.**

### Power Unit Mounting Instructions (HCP, HCP-S)

Mount the Power Unit to a flat surface using four screws, either upright or upside down. To ensure the Cam Unit/Force Cylinder always travels the same stroke length it is customary to stroke the Power Unit an extra 10 mm, which also causes the Accumulator's piston to rise about 10 mm.



## Compact Cam

Use dowel pins and a key to locate the position of the Cam Unit in the tool.

The punch plate (1) can be removed for machining by first removing all three screws (2) from the plate.

The reaction force, created as a result of the forming/piercing operation being performed by the Cam Unit, can be located within any part of the shaded area (3).

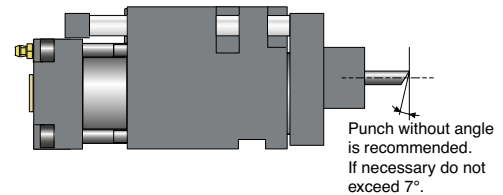
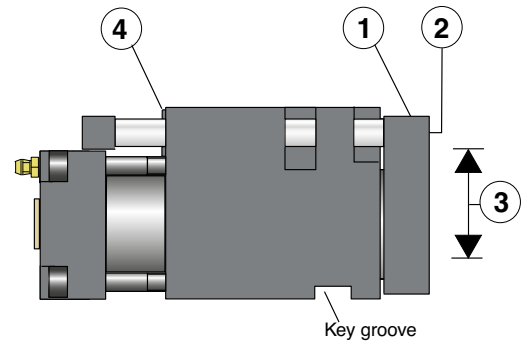
However, it is recommended to position this force directly in the centre of the shaded area (3). For more information, see the respective Cam Unit dimensions page.

Please note, it is not recommended to put any turning moment on the punch plate (1).

When mounting a punch directly onto the punch plate (1), \*or via a ball lock punch retainer, the gas spring (4) should be in place before any final adjustments are made.

Use the Pump Unit (see page 166) together with a thin metal plate or thick piece of paper to check the punch is positioned correctly.

For Installation Examples, please see page 99.

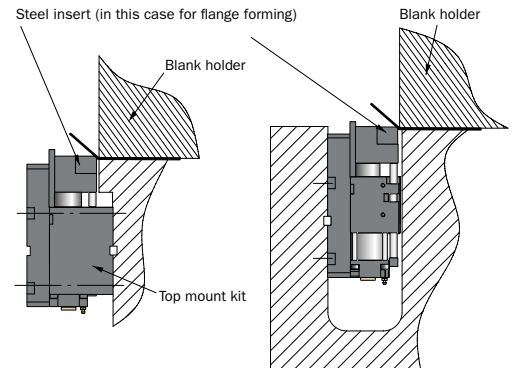
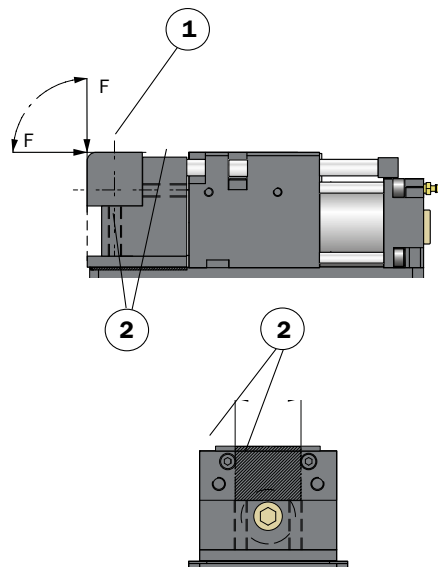


## Flange Cam installation possibilities

The Flange Cam can be mounted at any position in the die. For the top mount, a "top mount kit" is needed but not for the base mount.

## Flange Cam force direction and location

The customized tool (1) (for flanging etc.) should be mounted using two or four bolts (2) within the designated area. The force created by the flanging is allowed in directions "F" within the area marked .

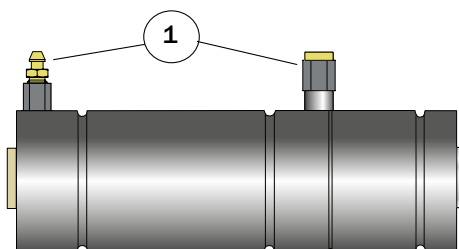


## Force Cylinder

Use only flanges or fittings intended for the Force Cylinder. See also page 111 for "Technical data". The threaded holes at the top of the piston rod can be used to mount the fitting for the tool in a pushing- and pulling application. Note that it is not possible to load any force in an off centre position or as a side load.



**Make sure there is enough room to fill and bleed the force cylinder in the die (1). See also page 164 - 165.**



## Hydraulic hose and adapters



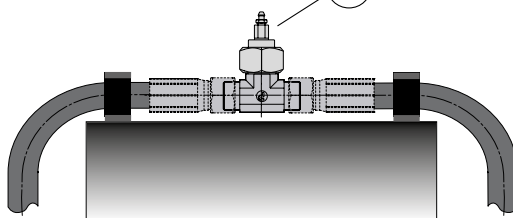
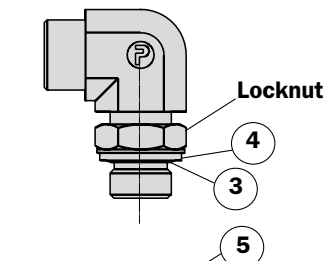
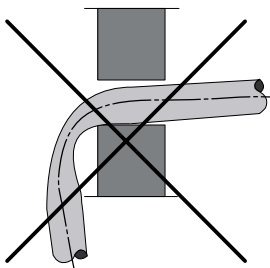
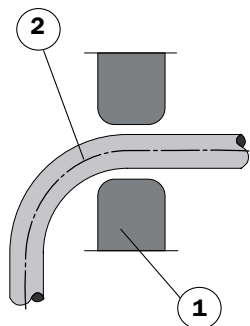
**See page 149 to choose the adapters and the hose. Use as few adapters as possible.**

The hoses are washed and plugged to protect them from dust as this could damage the system. Make sure the hoses are protected from sharp edges and external damage. Sharp edges must be rounded (1).

Hoses will move a little depending on the oil pressure pulsation during the operations. Do not use a smaller bending radius than specified (2).

Adapters for the units have an O-ring (3) and a support washer (4) which must always be used. Check also that no movable parts can touch the units or the hoses. See also DIN 20066 for hose installations.

To simplify oil bleeding in case the hose has to be installed as shown in the picture, depending on the tool design it is possible to install an extra bleeding point. This solution may avoid the need to turn the tool around while bleeding (5).



## Filling of Gas and Oil

### Gas charging for / Force Cylinder and Accumulator

#### Equipment needed:

Nitrogen bottle with .....at least 180 bar  
 Charging armature .....P/N 3015075-2000  
 Allen key .....5 mm

#### Step 1

##### Connect the nitrogen bottle

Connect the Charging armature to the nitrogen bottle which should have at least 180 bar pressure.

#### Step 2

##### Gas charging of the Force Cylinder (Not valid for Compact Cam)

Turn the small knob (1) counterclockwise until the release pin is inside the thread. Connect the adapter (2) to the armature. Remove the plug on the Force Cylinder and connect the armature by turning knob (3) clockwise. Open the gas valve carefully anticlockwise using knob (4). Charge gas until the manometer (5) shows 20 bar (max 40 bar). To empty, open knob (6) and the gas valve of the Force Cylinder by carefully turning knob (1) clockwise. Remove the armature and fit the plug.

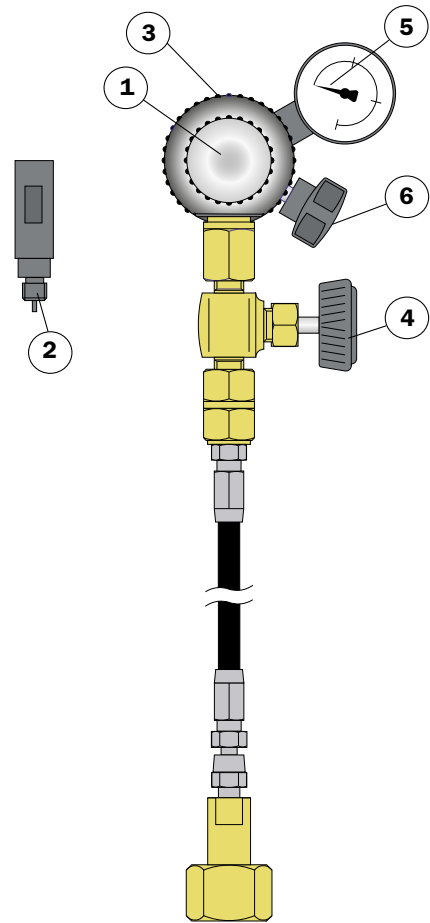
#### Step 3

##### Charging of gas in the Compact Cam CC-H.

If the Compact Cam is connected to a hose system the filling pressure is:

**CC 015 180 bar**  
**CC 040 180 bar**  
**CC 060 180 bar**  
**CC 090 150 bar**  
**CC 150 150 bar**

If there is no hose system then, gas charging is not required.



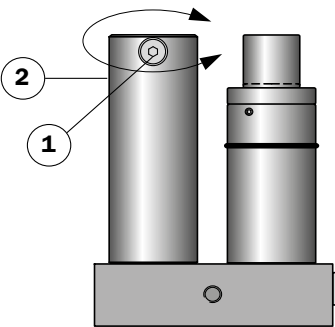
Step 4    Charging of gas in the Accumulator



Charge the Accumulator with 25 bar as per the procedure above. The Accumulator must be charged with 150 bar or to a pressure suitable for the operation after the oil filling procedure. See also page 111.

It is possible to change the gas port location (1) by first emptying the gas pressure then twisting the accumulator tube to position (2).

When not using the charging armature empty the gas by closing the nitrogen bottle valve and opening the gas valve (4) anticlockwise. (See page 173).



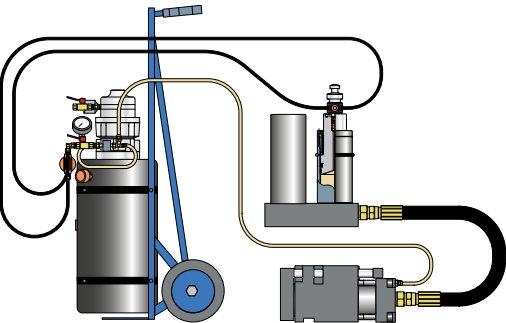
Oil filling and bleeding

| Equipment              | Size  | Order no  |
|------------------------|-------|-----------|
| Pump Unit              |       | 30 170 75 |
| Hook spanner (-015)    | 3 mm  | 503 417   |
| Hook spanner(-040-150) | 5 mm  | 503 418   |
| Allen key              | 6 mm  |           |
| Open-ended spanner     | 11 mm |           |
| Open-ended spanner     | 14 mm |           |

18 litres of oil as per specification on page 111.

Compressed air information

Pressure between 5-7 bars.  
Moisture trap, filter and automatic air line lubricator must be installed in the air line to feed the air motor of the pump.



Step 1    Check the nitrogen pressure

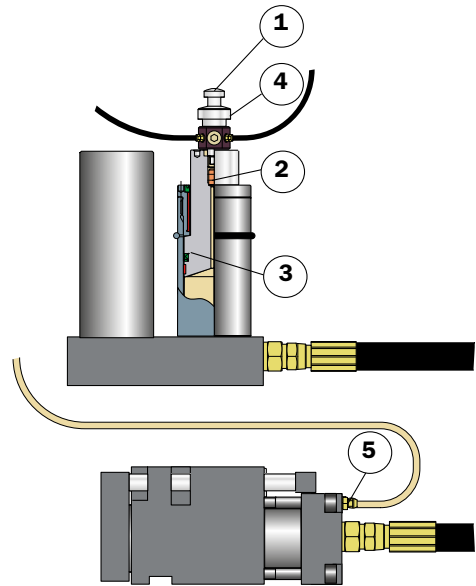


Charge the Cam Unit/Force Cylinder and Accumulator according to this table. Make sure that the area around the units is kept clean and dry.

| Cam Unit/ Force Cylinder |     |     |         |     | Accumulator |        |
|--------------------------|-----|-----|---------|-----|-------------|--------|
| CC-H                     |     |     |         |     | HCF         | HCP    |
| 015                      | 040 | 060 | 090     | 150 |             |        |
| 180 bar                  |     |     | 150 bar |     | 20 bar      | 25 bar |

## Step 2 Connect the Pump Unit

Turn knob (1) anticlockwise until the release pin for the valve (2) is inside the thread. Remove the plug and connect the oil armature on the top of the piston (3) by turning knob (4) clockwise. Open the valve (2) by turning knob (1) clockwise carefully until the stop is reached. Connect the transparent hose between the bleed nipple (5) and the Pump Unit (6). Connect compressed air to the valve (7) (thread G 1/4").



## Step 3 Check the clearance of the Cam Unit/ Force Cylinder



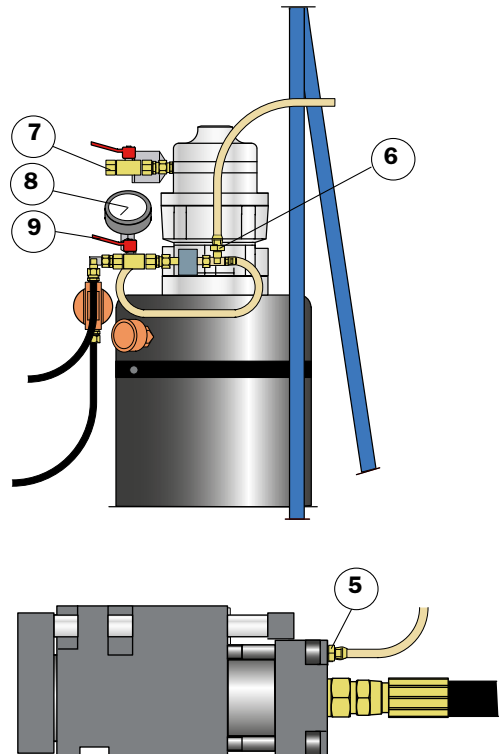
**Check the clearance of the Cam Unit/ Force Cylinder and make sure that there is enough room for a full stroke.**

## Step 4 Pump oil

Open the bleed nipple (5) and close the valve (9). Pump the oil by opening valve (7) until the oil is free from air bubbles. Close the bleed valve (5).

## Step 5 Bleeding the Cam Unit/ Force Cylinder

Pump oil until 50 bar oil pressure (8), open bleed nipple (5) and bleed the Cam Unit/ Force Cylinder. Have a cloth at the ready to collect any oil that may leak out. Note that the Cam Unit/ Force Cylinder will move the full stroke. Close the bleed nipple (5). Repeat this until the oil is free from air bubbles.



### Step 6 Bleeding the Power Unit

Pump until the oil pressure is 50 bar, open the valve (9) and bleed the Power Unit. Close the valve (9). Repeat this until the oil is free from air bubbles.

### Step 7 Check that the oil is free from air



First make sure that the oil pressure is 0 bar, ie. pressureless. Try to push the piston down by hand. If it is possible to push it down a little there is some air left in the system. Repeat step 5 and 6 until the oil is totally free from air or the piston can not be moved.

### Step 8 Check for any leakage



Pump until oil pressure is 50 bar and look for any leakage from the adapters and the units. Make sure that the oil pressure is 0 bar by opening the bleed valve (9).

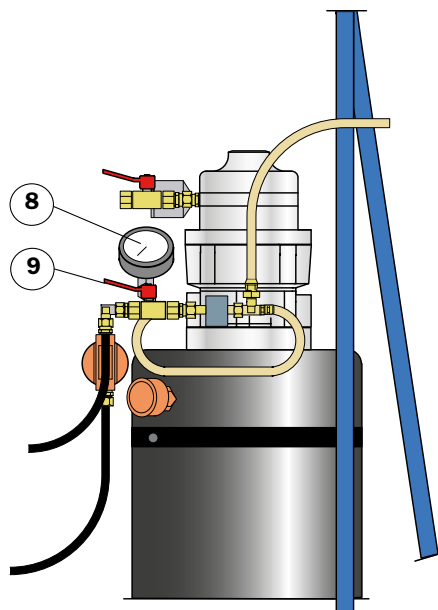
### Step 9 Disconnect the Pump Unit

Uncouple the oil filling armature and the transparent hose. Fit the plug on the top of the Power Cylinder by using the hook spanner to hold the piston. Tighten the bleed valve on the Cam Unit/ Force Cylinder and clean the area.

### Step 10 Charge the Accumulator with Nitrogen

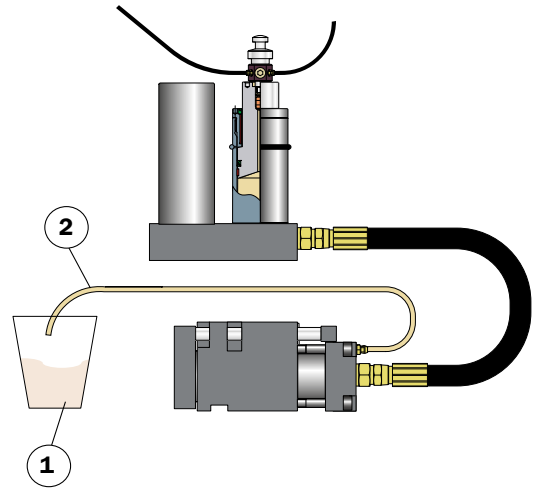
After the oil filling procedure, the Accumulator has to be charged with nitrogen up to 150 bar or to the required gas pressure for the operation. Maximum pressure is 180 bar. See also page 112.

The system is now ready for operation.



### Changing the oil

Follow step 1 to 11 as before but connect the transparent hose to a reservoir for used oil, not to the pump unit. Pump oil until new oil comes out through the transparent hose.



# Service and Maintenance



The life time of the products is normally 1 million operations provided the installation and maintenance is performed correctly. In special conditions or environments the life time may be shorter or longer.

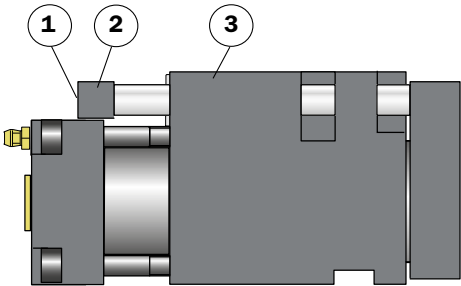
## Power Unit and Force Cylinder (HCP, HCP-S, HCF)

Check the nitrogen pressure in the Accumulator and the Force Cylinder every 200,000 strokes or alternatively twice a year. See also page 112 and 173.

## Compact Cam (CC)/ Flange Cam (CCF)

Check the force of the return springs every 200,000 strokes or twice a year by removing the screws (1) and the spacer (2). Pull out the gas springs and use a test rig to measure the force of the gas springs.

The table below shows the type of gas springs and force for each Cam Unit



| Cam Unit | Gas spring for return | Gas spring force | Min. gas spring force* |
|----------|-----------------------|------------------|------------------------|
| CC 015   | 1 X M2 200 - stroke   | 200 daN          | 140 daN                |
| CC 040   | 2 X M2 200 - stroke   | 200 daN          | 140 daN                |
| CCF 040  | 2 X M2 200 - stroke   | 200 daN          | 140 daN                |
| CC 060   | 2 X X 350 - stroke*   | 350 daN          | 250 daN                |
| CC 090   | 2 X TU 500 - stroke*  | 500 daN          | 350 daN                |
| CC 150   | 2 X X 750 - stroke*   | 750 daN          | 530 daN                |

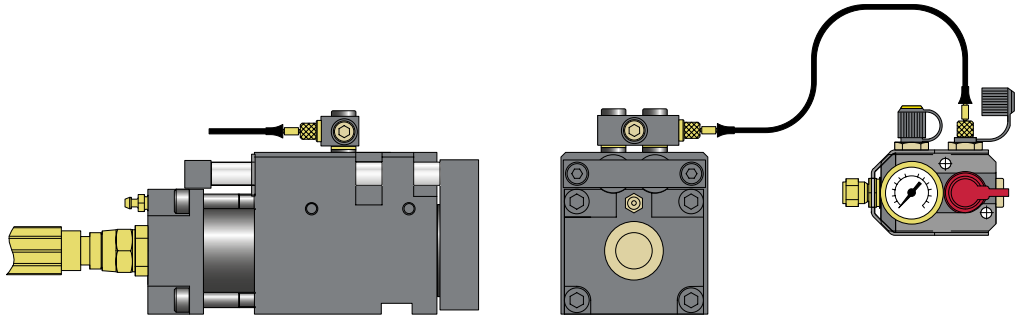
\* If the gas spring force is lower than minimum the gas spring has to be replaced

## Compact Cam (CC-H) and Flange Cam (CCF-H) for Hose Systems

Check the nitrogen pressure in the Compact Cam every 200,000 strokes or twice a year. See also page 173.

When changing the gas spring, do not allow the oil within the spring to escape.

The table below shows the type of gas springs used for each cam unit.



| Cam Unit  | Gas spring for return | Gas spring pressure | Min. gas spring pressure** |
|-----------|-----------------------|---------------------|----------------------------|
| CC-H 015  | 1 x MH 200 - stroke   | 180 bar             | 125 bar                    |
| CC-H 040  | 2 x MH 200 - stroke   | 180 bar             | 125 bar                    |
| CCF-H 040 | 2 x MH 200 - stroke   | 180 bar             | 125 bar                    |
| CC-H 060  | 2 x X 350 - stroke*   | 180 bar             | 125 bar                    |
| CC-H 090  | 2 x TU 500 - stroke*  | 150 bar             | 105 bar                    |
| CC-H 150  | 2 x X 750 - stroke*   | 150 bar             | 105 bar                    |

\* Be sure to remove the nitrogen charging valve in the springs when connecting to a hose system. The MH has no valve.

\*\* If the pressure is lower than minimum check the hose system and if necessary change the gas springs.

### Oil

It is recommended to change the oil after a running-in time of approximately 100-1000 operations. After that the oil is recommended to be changed after 500,000 operations or every two years. When changing the oil, the old oil must be pumped out from the system. See also page 112 and 177.

### Pump Unit

Change the filter (1) and the transparent hose (2) every 200 working hours or every two years.

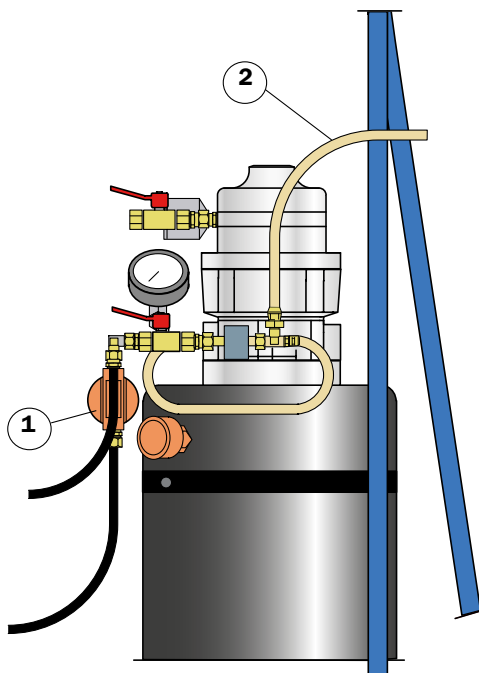
Remove the complete filter by loosening the adapter and the hose. Put the filter in a vice and remove the bottom by turning it counterclockwise. Replace the filter and put the new filter in position together with the washer.

#### Filter

Order No.: 503 419

#### Transparent hose

Order No.: 503 116



## Service



This high precision equipment containing high pressure nitrogen gas N2 must only be maintained or serviced by authorized fully qualified personnel. For any advice about this equipment contact your local KALLER distributor.

## Troubleshooting

| Description of fault                                                          | Possible cause                                                                                                                       | Measure taken                                                                                                                            |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.<br/>Cam Unit/Force<br/>Cylinder does not perform a full<br/>stroke.</b> | 1:1<br>Low gas pressure in the Accumulator                                                                                           | Charge up the gas pressure, see page 173. (max 180 bar)                                                                                  |
|                                                                               | 1:2<br>Power Cylinder does not perform a full stroke                                                                                 | Adjust the stroke length                                                                                                                 |
|                                                                               | 1:3<br>Oil leakage in Power Cylinder<br>A: The port plug has come loose<br>B: Damage on the seal and/or inside of the Power Cylinder | A: Replace the plug and fill the system, see page 173.<br>B: Contact your distributor for service or replacement cylinder                |
|                                                                               | 1:4<br>Oil leakage in Cam Unit<br>A: The bleeding valve has come loose<br>B: Damage on the seal and/or inside of the Cam Unit        | A: Replace the bleed valve and fill the system, see page 173.<br>B: Contact your distributor for service or replacement of the Cam Unit. |
|                                                                               | 1:5<br>Hose or adapter has come loose or been damaged.                                                                               | Replace the defective parts and fill the system, see page 173.                                                                           |

| Description of fault                                         | Possible cause                                                                                      | Measure taken                                                                                                                                                                                                      |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.<br/>Cam Unit/ Force<br/>Cylinder does not retract.</b> | 2:1<br>Low gas pressure in the Force Cylinder (the Force Cylinder has to be in retracted position ) | Check if the gas adapter or the plug have become loose. Charge with gas, see page 173, max. 40 bar. If the gas quickly leaks out again, contact your distributor for service or replacement of the Force Cylinder. |
|                                                              | 2:2<br>Low gas pressure in the return springs of the Compact Cam.                                   | Replace the gas springs, see page 178. If hose system is used, check and see page 179.                                                                                                                             |
|                                                              | 2:3<br>Gas leakage in the Accumulator                                                               | Bleed the oil, see page 174.<br>Contact your distributor for service or replacement of the Accumulator.                                                                                                            |
|                                                              | 2:4<br>The return movement is jammed.                                                               | Contact your distributor for service or replacement of the Cam Unit/ Force Cylinder.                                                                                                                               |





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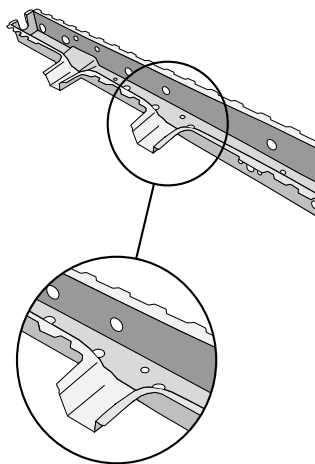
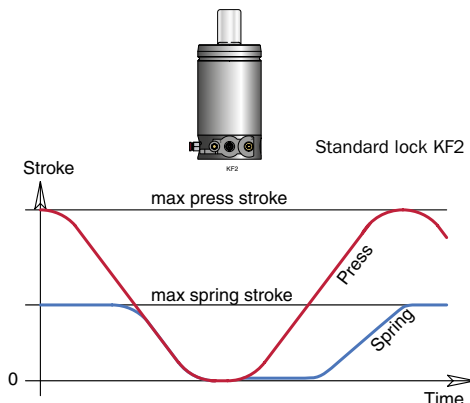
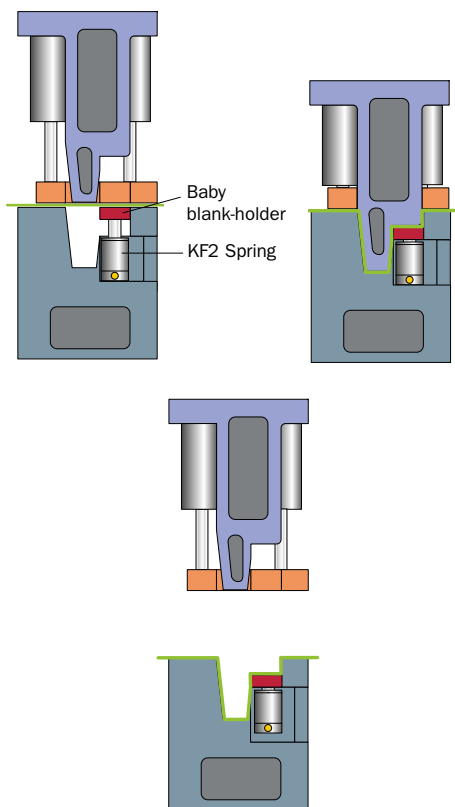
## General Introduction

### 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  $\pm 0.5$  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 193). The springs can either be installed self-contained or connected to a control block through a hose system.

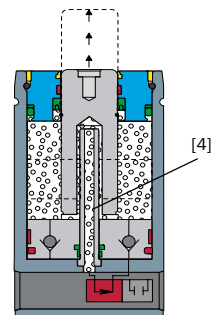
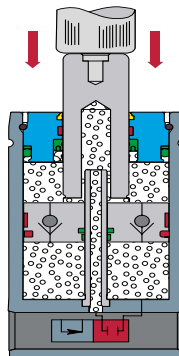
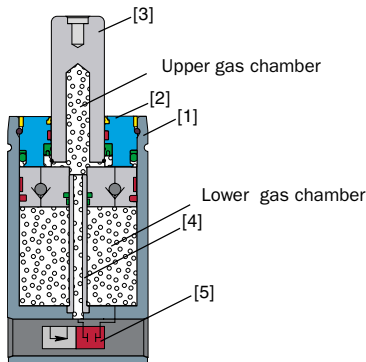
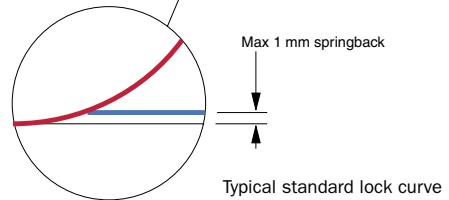
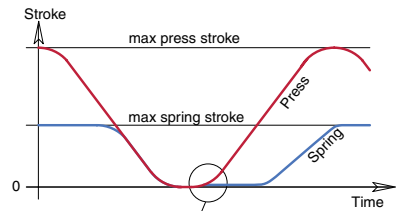
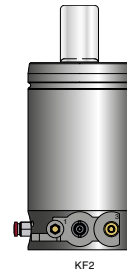
## KF2 – how does it work?

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.



### 3 | Controllable Gas Springs – KF2

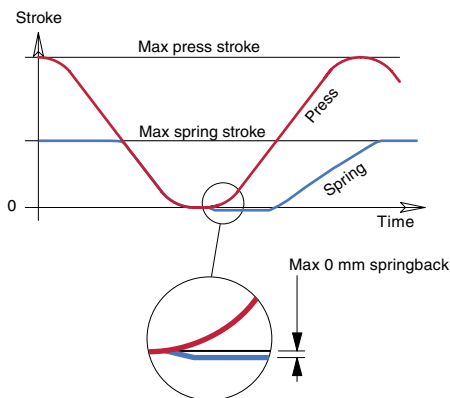
#### Positive Lock System, KF2 + KP

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 block [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.

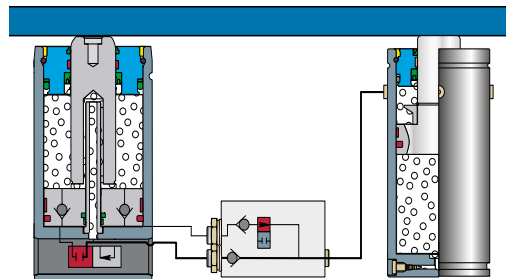
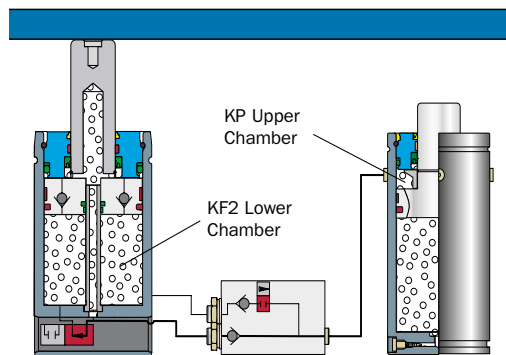
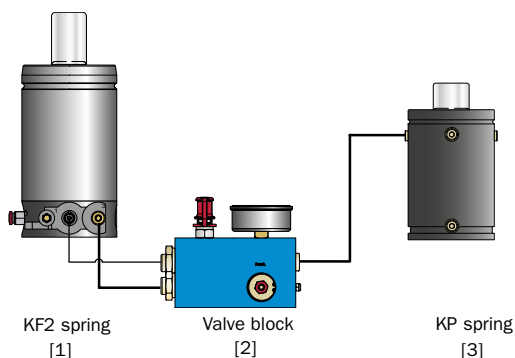


#### Positive Lock System, how does it work?

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 $\pm 0.5$ mm?

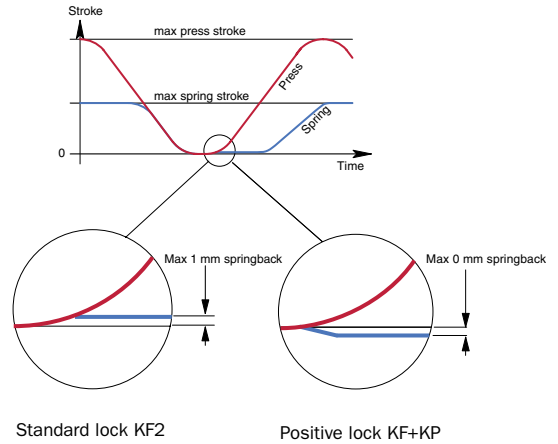
In order to provide optimum locking from the KF2 controllable gas spring, it is important to stroke the spring 100% of the nominal stroke length  $\pm 0.5$  mm.

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  $\pm 0.5$  mm will ensure maximum spring-back 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  $\pm 0.5$  mm is not known until after tool try-outs.

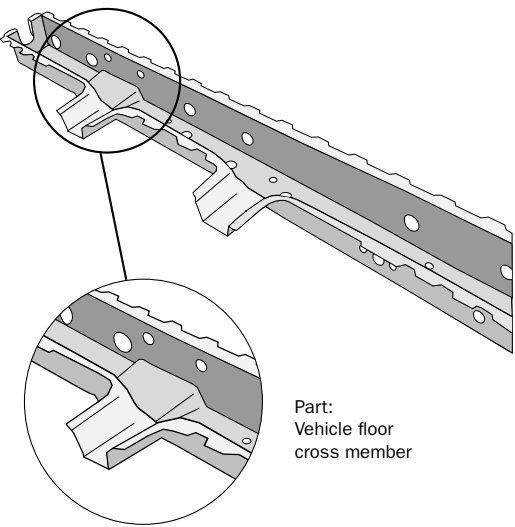
For a positive lock system with KF2 + KP stroking the KF2 spring 100% of the nominal stroke length  $\pm 0.5$  mm is also important, although this also largely depends on the utilized stroke length of the KP passive gas spring.



# Application Examples

## 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.



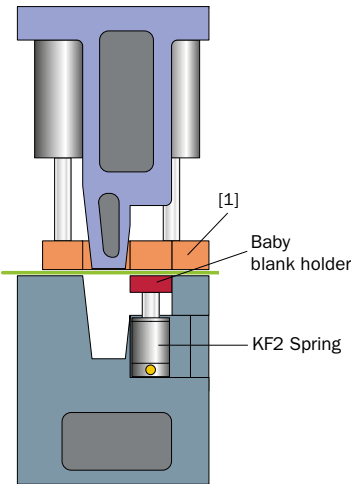
Part:  
Vehicle floor  
cross member

## Work cycle

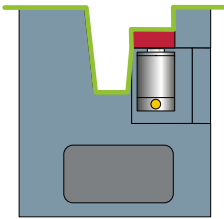
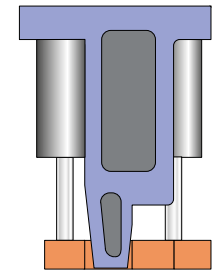
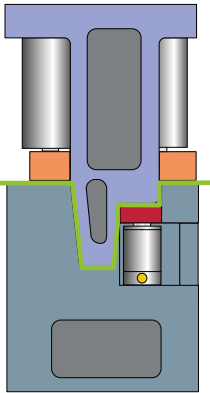
As the upper tool moves downwards, the blank holder [1] is activated to control the flow of the blank in the tool.

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.



Standard Lock, KF2



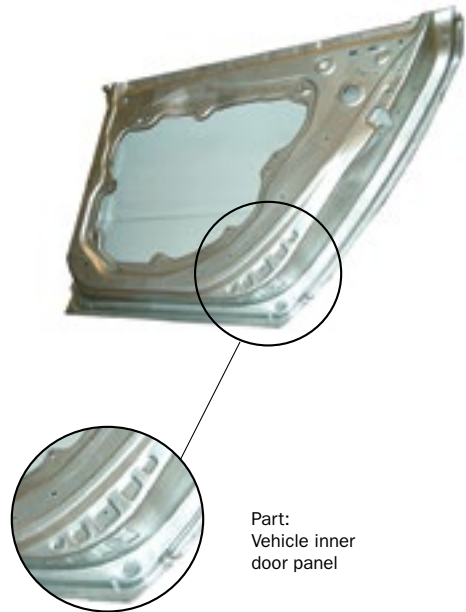
## Positive Lock System, KF2 + KP

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.



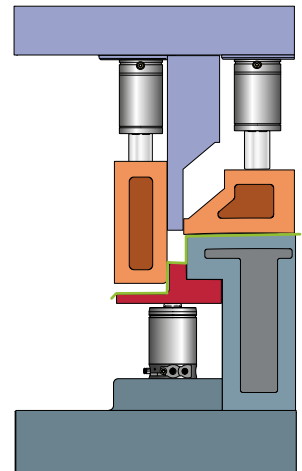
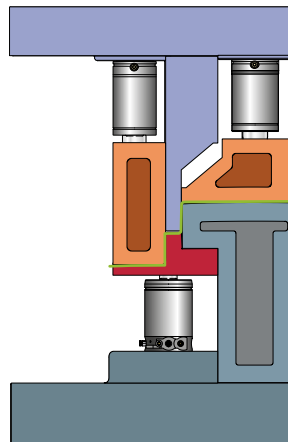
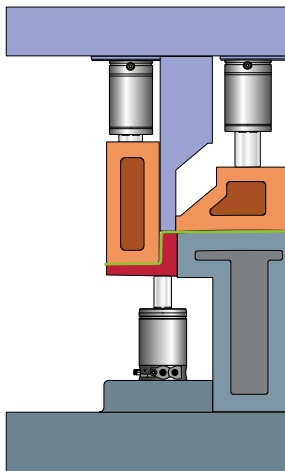
Part:  
Vehicle inner  
door panel

## 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

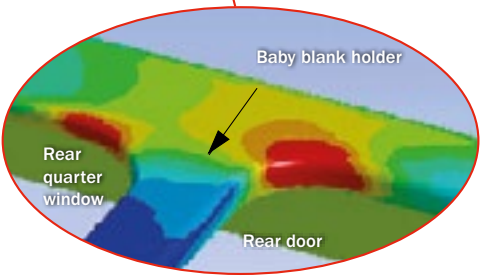
#### Positive Lock System, KF2 + KP

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.



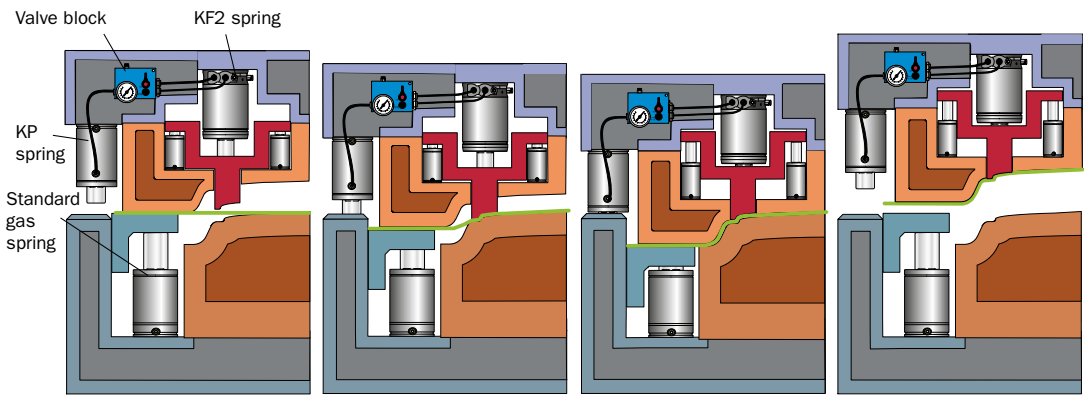
#### Work cycle

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 springback 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.



Positive Lock System, KF2 + KP

# Application Enquiry Form

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: .....

.....

.....

.....

.....

.....

.....

.....

.....

System Configuration

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 193 for more information).

Control system – Standard Lock, KF2

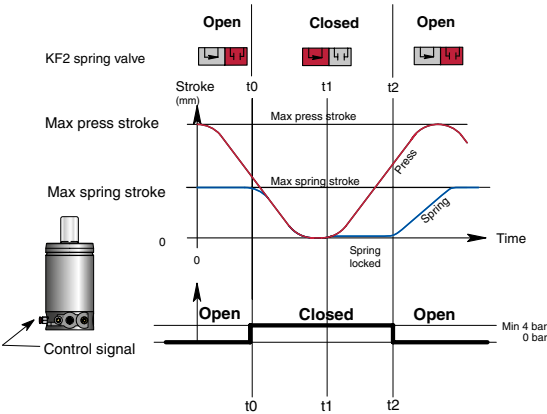
The normally open (NO) valve within the base of the KF2 controllable spring(s) is closed using compressed air (min. 4 bar). With the valve closed at t0-t2 (see diagram), the piston rod of the KF2 spring(s) is prevented from returning to its extended position.

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 electricpneumatic 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 216.

- t0 = Die closed
- t1 = Press Bottom Dead Center
- t2 = Start of spring return stroke



## 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.

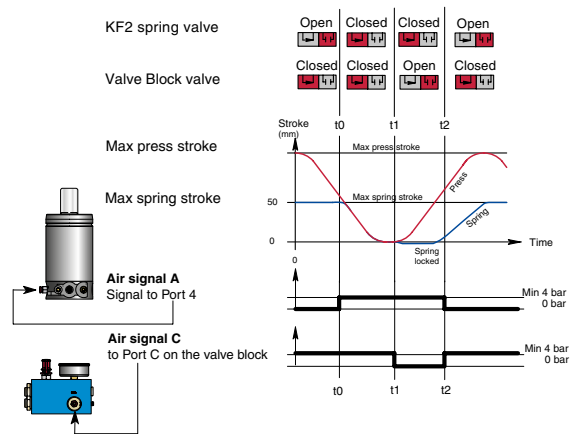
As the valve in the valve block is identical to that used in the KF2 springs, it is normally open (NO). Therefore during the down-stroke of the press, it is important the valve block's valve is closed by applying compressed air (min. 4 bar) to air port C.

### 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 216.

- t0 = Approximately when closing the die
- t1 = Press Bottom Dead Center
- t2 = Start of spring return stroke



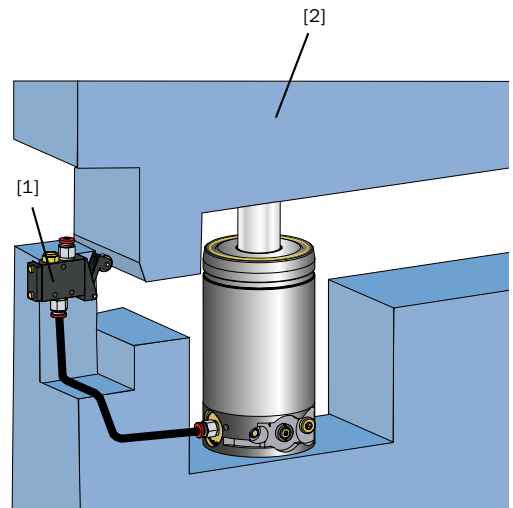
## Tool integrated control system

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.

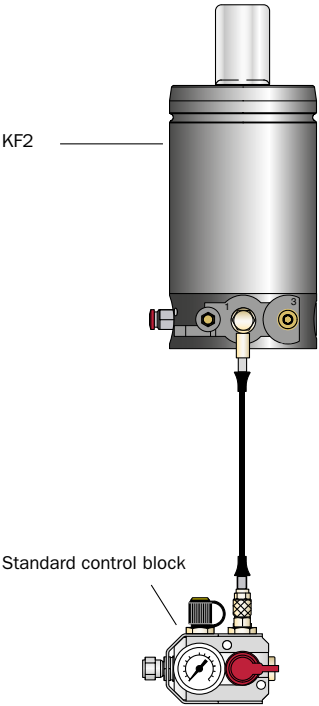
| Controllable gas spring system | Recommended hose system |
|--------------------------------|-------------------------|
| Standard lock                  | EZ hose                 |
| Positive lock system           | EZ hose and E024 hose   |

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 232.

For examples of how to connect KF2 controllable gas springs to a hose system, see the installation examples on page 216.



## 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 E024 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.

### E024 hose connections

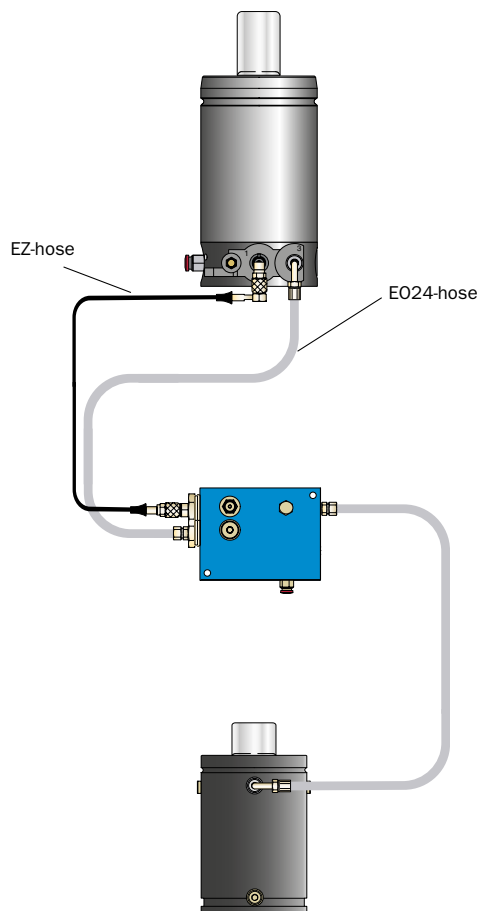
To connect the KF2 controllable gas spring(s) to a KP passive gas spring via the valve block, we recommend using the E024 hose system (or its equivalent) owing to the large internal diameter of the hose. This is especially important when gas flow in the hoses is required.

Gas port 3, which is marked on each KF2 spring, is connected to gas port 3 on the valve block (also marked) using E024 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 E024 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 232.

For examples of how to connect KF2 + KP controllable gas spring systems to a hose system, see the installation examples on page 216.



### 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

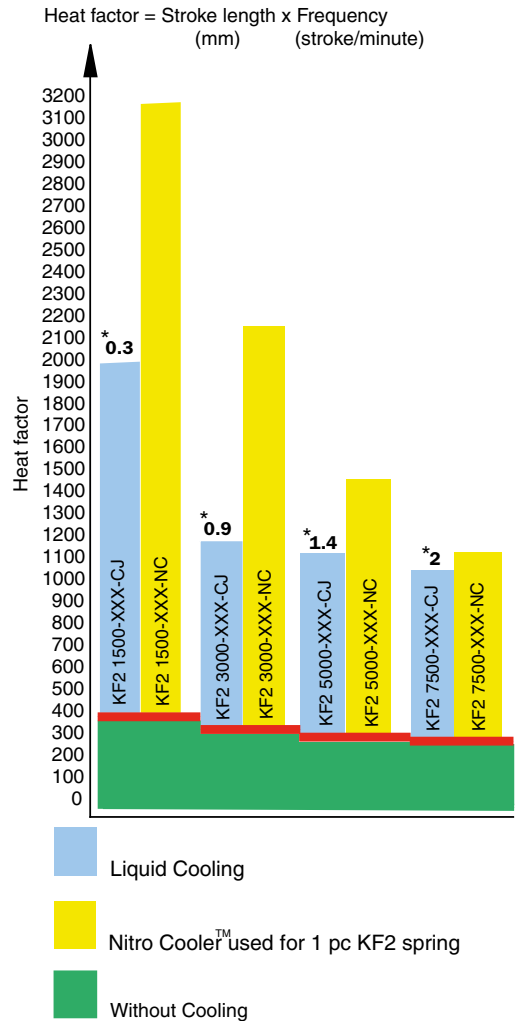
Heat factor = Stroke frequency × Stroke length  
= 15 × 100  
= 1500

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.



\*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 on page 200 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.

$$\begin{aligned}\text{New heat factor} &= \text{Original heat factor} \times \frac{\text{Required net force at reduced pressure}}{\text{Net force at 150 bar}} \\ &= 500 \times (300 / 420) \\ &= 360\end{aligned}$$

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.

$$\begin{aligned}\text{New heat factor} &= \text{Original heat factor} \times \frac{\text{Required net force at reduced pressure}}{\text{Net force at 150 bar}} \\ &= 500 \times (300 / 500) \\ &= 300\end{aligned}$$

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

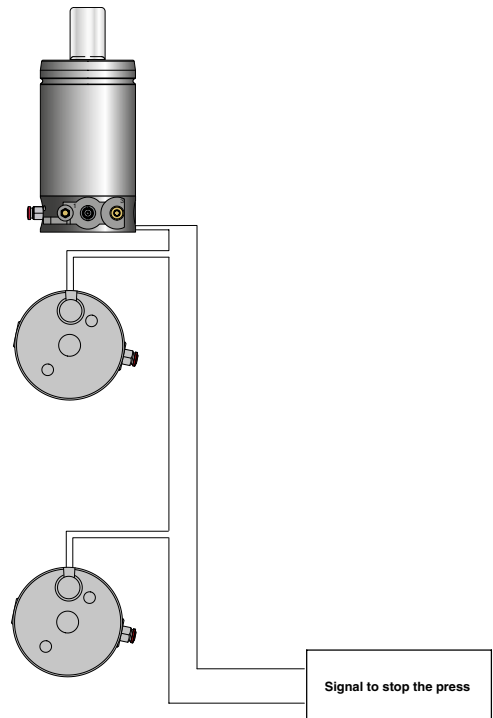
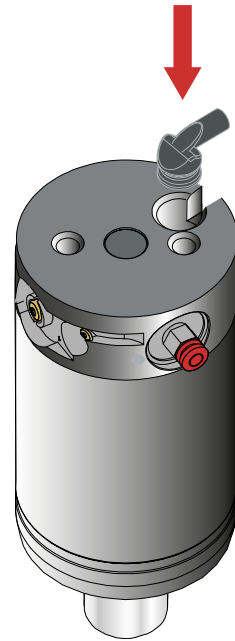


### Thermal Relay

Order No. 503388

### Basic information

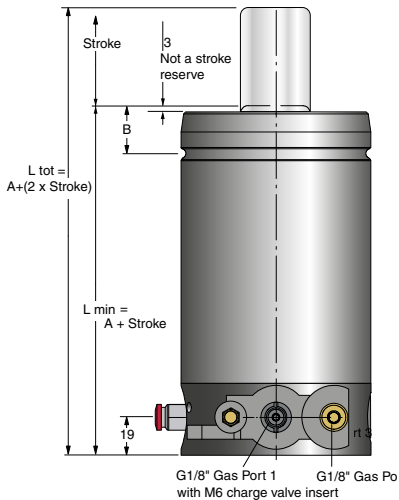
Normally closed  
 Trigger temperature ..... 83 ±3°C  
 Hysteresis ..... < 7°C  
 Max. voltage ..... 250 VAC  
 Max. current ..... 16 A  
 Min. current ..... 50 mA  
 Delivered with 2 m of electric cable



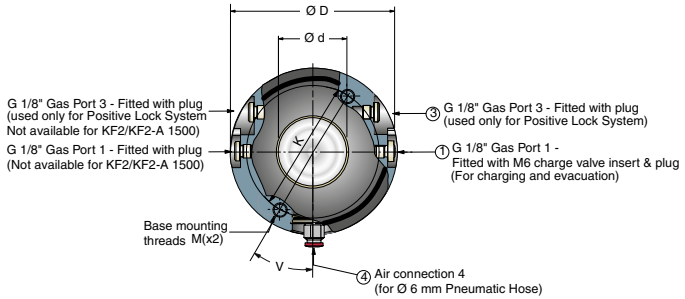
Connection of 3 pcs KF2 (example above)

## Technical Data

## KF2 – Dimensions, standard version



### Top view



| Model    | Stroke | Force in N<br>at 150 bar /+20°C |            | A   | B    | Ø D | Ø d | K   | V   | M      |
|----------|--------|---------------------------------|------------|-----|------|-----|-----|-----|-----|--------|
|          |        | Initial                         | End force* |     |      |     |     |     |     |        |
| KF2 1500 | 5–160  | 15,000                          | 22,000     | 125 | 24   | 95  | 36  | 50  | 60° | M12x15 |
| KF2 3000 | 6–160  | 30,000                          | 42,000     | 135 | 25.5 | 120 | 50  | 95  | 30° | M12x15 |
| KF2 5000 | 6–160  | 50,000                          | 74,000     | 160 | 27.5 | 150 | 65  | 110 | 30° | M16x18 |
| KF2 7500 | 8–160  | 75,000                          | 98,000     | 180 | 33.5 | 195 | 80  | 120 | 30° | M16x18 |

- 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 234 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          |

### How to order:

KF2 3000 - 078

Model -

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  $\pm 0.5$  mm).

**\*Please note:**

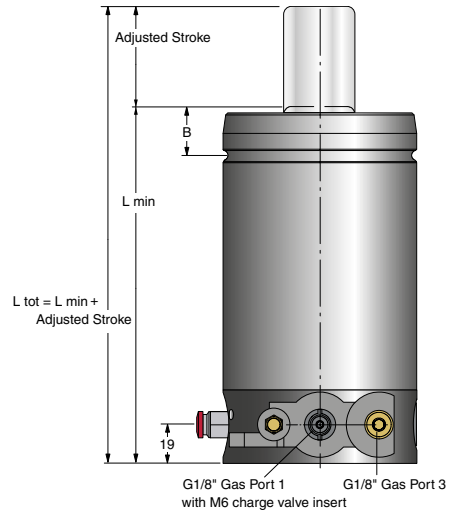
Increased stroke length reduces the speed. Please contact your local KALLER distributor for further information. KF2 springs with even slower return speeds are available on request.

## 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:



| Order No.      | Nominal stroke | Min. stroke length | Max. stroke length | L min. |      |      |      |
|----------------|----------------|--------------------|--------------------|--------|------|------|------|
|                |                |                    |                    | 1500   | 3000 | 5000 | 7500 |
| KF2-A XXXX-010 | 10             | 5*                 | 17                 | 142    | 152  | 177  | 197  |
| KF2-A XXXX-020 | 20             | 12                 | 27                 | 152    | 162  | 187  | 207  |
| KF2-A XXXX-030 | 30             | 22                 | 37                 | 162    | 172  | 197  | 217  |
| KF2-A XXXX-040 | 40             | 32                 | 47                 | 172    | 182  | 207  | 227  |
| KF2-A XXXX-050 | 50             | 42                 | 57                 | 182    | 192  | 217  | 237  |
| KF2-A XXXX-060 | 60             | 52                 | 67                 | 192    | 202  | 227  | 247  |
| KF2-A XXXX-070 | 70             | 60                 | 77                 | 202    | 212  | 237  | 257  |
| KF2-A XXXX-080 | 80             | 72                 | 87                 | 212    | 222  | 247  | 267  |
| KF2-A XXXX-090 | 90             | 82                 | 97                 | 222    | 232  | 257  | 277  |
| KF2-A XXXX-100 | 100            | 92                 | 107                | 232    | 242  | 267  | 287  |
| KF2-A XXXX-110 | 110            | 102                | 117                | 242    | 252  | 277  | 297  |
| KF2-A XXXX-120 | 120            | 112                | 127                | 252    | 262  | 287  | 307  |
| KF2-A XXXX-130 | 130            | 122                | 137                | 262    | 272  | 297  | 317  |
| KF2-A XXXX-140 | 140            | 132                | 147                | 272    | 282  | 307  | 327  |
| KF2-A XXXX-150 | 150            | 142                | 157                | 282    | 292  | 317  | 337  |
| KF2-A XXXX-160 | 160            | 152                | 167                | 292    | 302  | 327  | 347  |

### \*Min. stroke length

|                |   |
|----------------|---|
| KF2-A 1500-010 | 5 |
| KF2-A 3000-010 | 6 |
| KF2-A 5000-010 | 6 |
| KF2-A 7500-010 | 8 |

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 231.

### How to order:

**KF2-A 3000 - 030 - 030**

Model: —  
KF2-A 1500  
KF2-A 3000  
KF2-A 5000  
KF2-A 7500

Nominal Stroke —

Delivered Stroke —

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 196.

| Model                 | KF2<br>C | KF2-A<br>C+7 | Ø H <sub>0</sub> <sup>+5</sup> |
|-----------------------|----------|--------------|--------------------------------|
| KF2/KF2-A 1500-XXX-CJ | 75       | 82           | 110                            |
| KF2/KF2-A 3000-XXX-CJ | 85       | 92           | 135                            |
| KF2/KF2-A 5000-XXX-CJ | 110      | 117          | 165                            |
| KF2/KF2-A 7500-XXX-CJ | 130      | 137          | 210                            |



(Fig. 1)

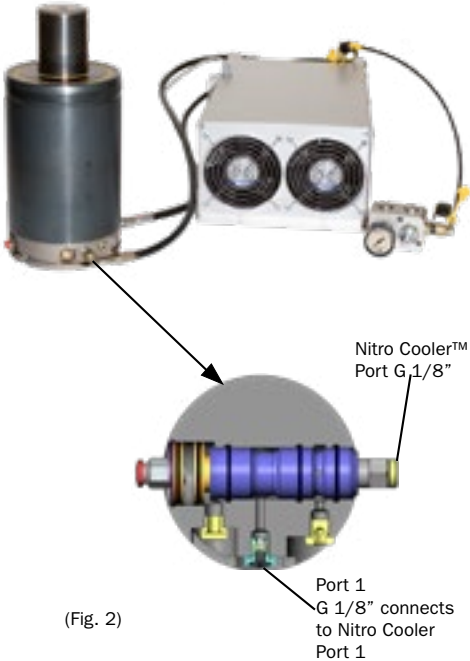
KF2/(KF2-A) for Nitro Cooler™ (NC)

Gas springs with a special cartridge valve are used with nitrogen coolers (NC) (Fig. 2). See page 211.

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.

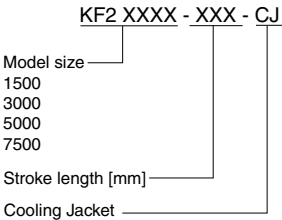
| NC Rebuild Kit Order No. | For gas spring |
|--------------------------|----------------|
| 3021780                  | KF2/KF2-A 1500 |
| 3121780                  | KF2/KF2-A 3000 |
| 3221780                  | KF2/KF2-A 5000 |
| 3321780                  | KF2/KF2-A 7500 |

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

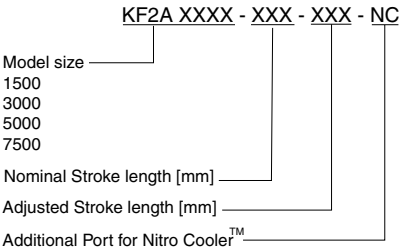


(Fig. 2)

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



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



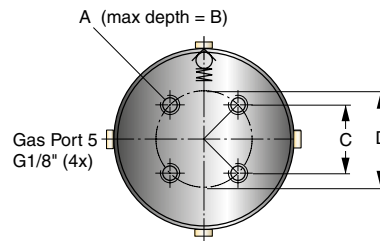
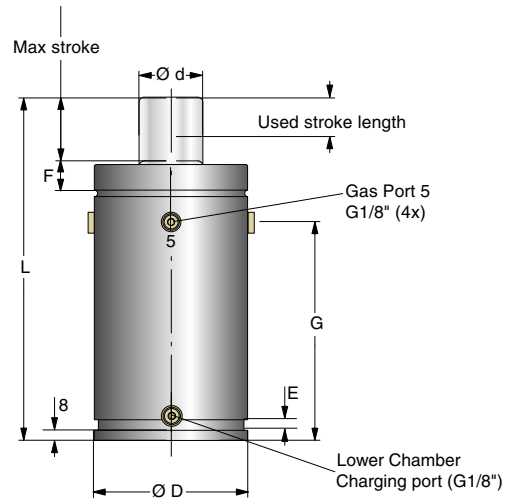
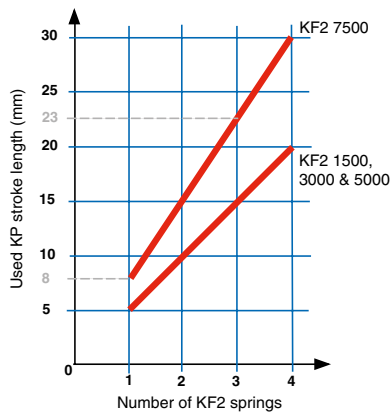
## KP – Dimensions

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 E024 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).



| 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 |

| Force in [daN] at used stroke length [mm]* |       |        |        |        |        |        |        |
|--------------------------------------------|-------|--------|--------|--------|--------|--------|--------|
| Model                                      | 5     | 10     | 15     | 20     | 25     | 30     | 35     |
| KP 1500                                    | 3,600 | 5,200  | 6,700  | 8,200  | 9,900  | 11,900 | -      |
| KP 3000                                    | 6,000 | 8,300  | 10,400 | 12,300 | 14,400 | 16,800 | -      |
| KP 5000                                    | 7,800 | 10,200 | 12,500 | 14,700 | 16,800 | 19,000 | 21,300 |

## 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

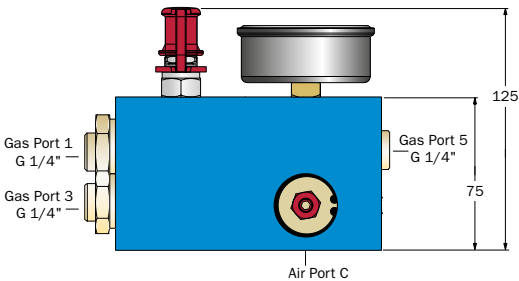
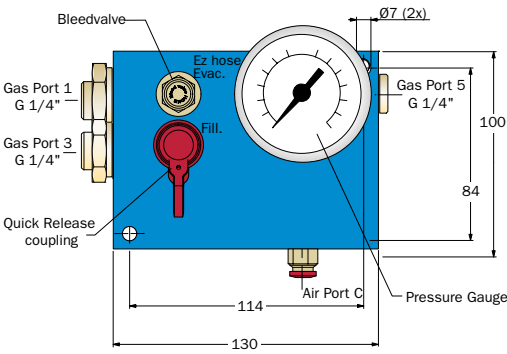
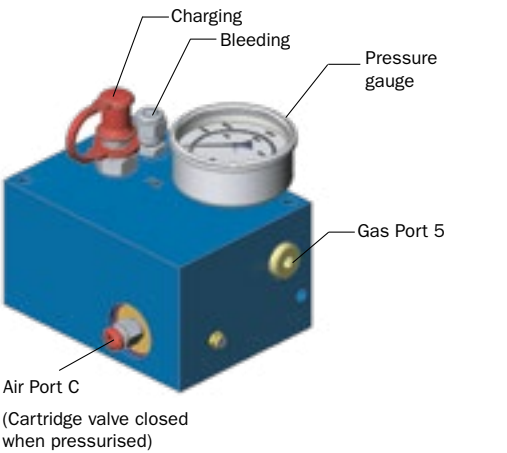
\*The forces are calculated based on a charging pressure of 150 bar in the KF2 and the KP spring(s).

**Please note!** For more information, see "About Gas Springs" in the KALLER main catalog.

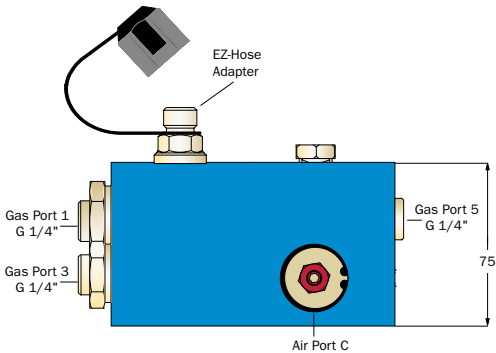
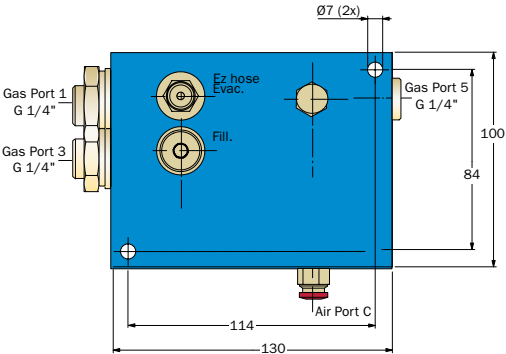
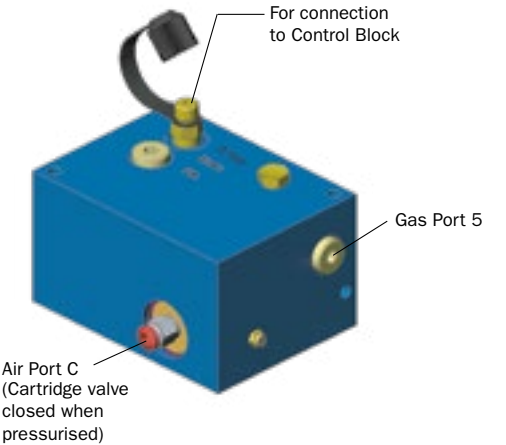
Valve block dimensions

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**



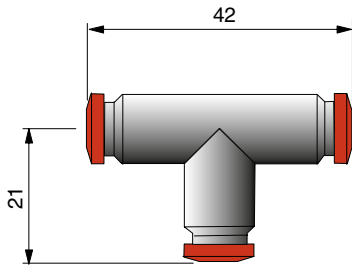
For information about how to connect the different valve blocks to a positive lock system, see the installation examples on pages 217 and 220.



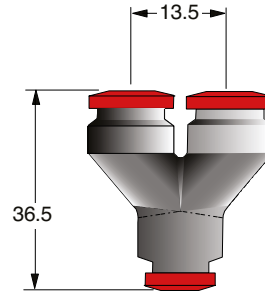
## Control system components

### Hose and fittings for Ø 6 mm Pneumatic Hose

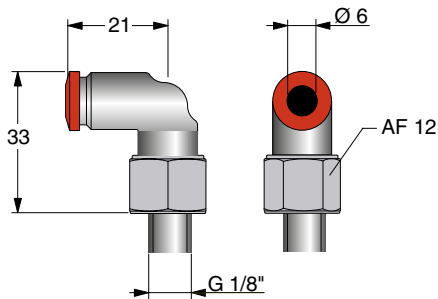
**T Connector (hose to hose)**  
Order No. 503368



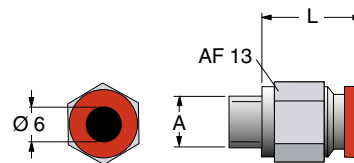
**Y Connector (hose to hose)**  
Order No. 503372



**90° – G 1/8"**  
Order No. 503367



**Straight Connector**  
Order No. (see table)



| Order No. | A      | L    |
|-----------|--------|------|
| 503299    | G 1/8" | 15   |
| 503426    | G 1/4" | 13.5 |

**Pneumatic Hose**  
Ø 6 mm



**How to order**    **503377 - XX**

Order the length in whole meters

### Basic information

Material..... Polyurethane  
Max. temperature..... 60°C  
Max. pressure..... 16 bar  
Color..... Blue  
Min. bend radius..... 20 mm



## Liquid cooling system components

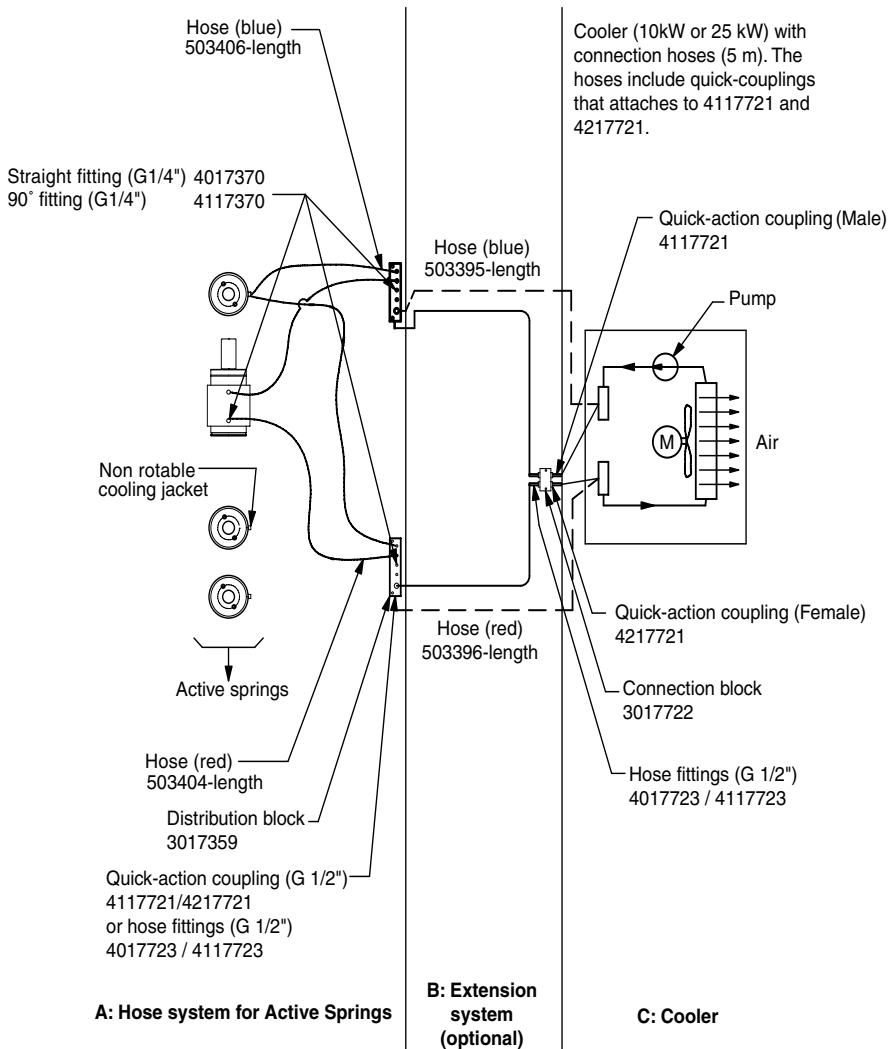
For applications where cooling is required, each KF2 Controllable Gas Spring must be:

- **Fitted with a Cooling Jacket (CJ)**  
(see picture),
- **Fitted with a Thermal Relay**  
(Order No. 503388)  
(see *Overheat Protection* on page 199)
- **Connected in parallel** to the Cooler Unit as shown below.



KF2 spring fitted with Cooling Jacket (CJ)

For How To Order information, see *KF2 Dimensions* on page 200.

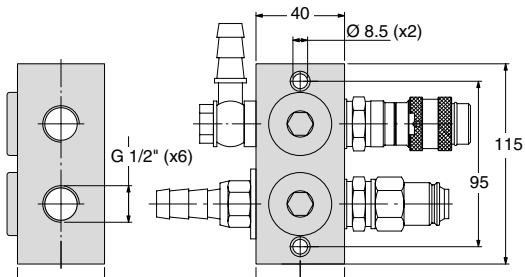


The cooling fluid is circulated within a closed system through the Cooling Jacket(s), to a Cooler Unit (10kW or 25kW), where heat from the KF2 spring(s) is then dissipated.

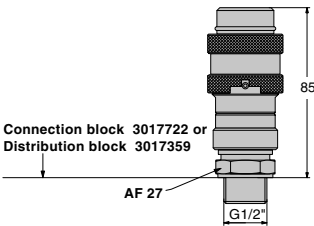
Cooling System – Hose & Fittings



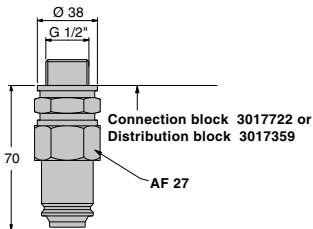
**Connection Block**  
Order No. 3017722



**Female Quick Release Coupling**  
Order No. 4217721

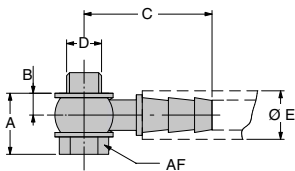


**Male Quick Release Coupling**  
Order No. 4117721



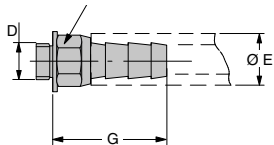
**90° Hose Fitting**

| Order No. | D      | A  | B  | C  | E  | AF |
|-----------|--------|----|----|----|----|----|
| 4117370   | G 1/4" | 23 | 8  | 44 | 16 | 17 |
| 4117723   | G 1/2" | 30 | 12 | 68 | 23 | 27 |



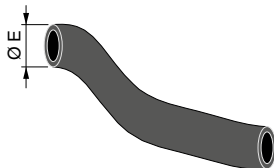
**Straight Hose Fitting**

| Order No. | D      | E  | G  | AF |
|-----------|--------|----|----|----|
| 4017370   | G 1/4" | 16 | 28 | 12 |
| 4017723   | G 1/2" | 23 | 58 | 27 |



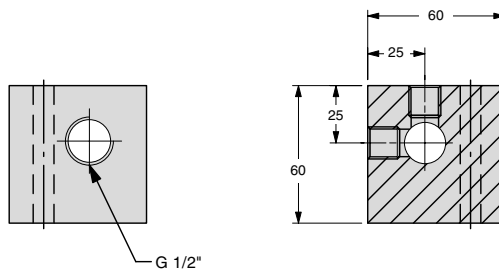
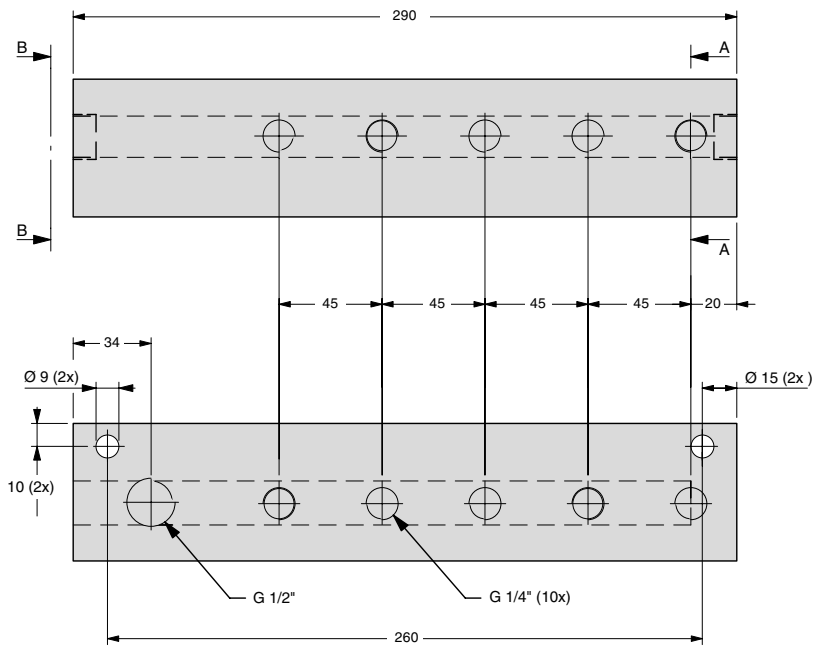
**Cooling Hose**

| Order No. | E  | DN | Color | Min. bend radius |
|-----------|----|----|-------|------------------|
| 503406    | 16 | 10 | Blue  | 75 mm            |
| 503404    | 16 | 10 | Red   | 75 mm            |
| 503395    | 23 | 16 | Blue  | 150 mm           |
| 503396    | 23 | 16 | Red   | 150 mm           |



# Cooling System – Distribution Block

Order No. 3017359



View B-B

View A-A

Liquid Cooling System – Cooler Unit (LC)

Two cooler unit sizes are available:

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

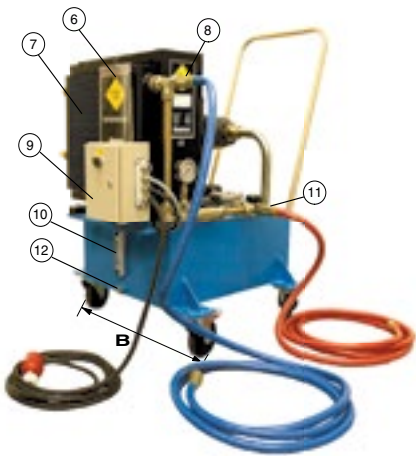
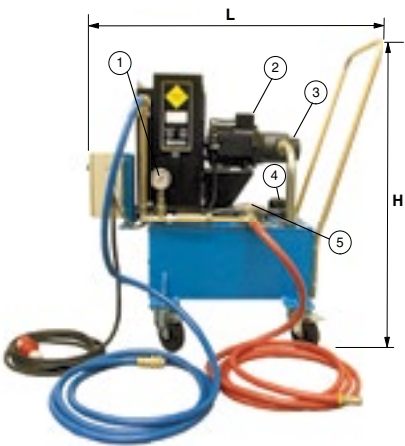
For information on which Cooler Unit is suitable for your application, please fill in the Application Enquiry Form 3.1 and fax it to your local KALLER distributor or directly to Strömsholmen AB.

- 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](http://www.petrofer.com).



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.

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          |

Basic information

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                    |

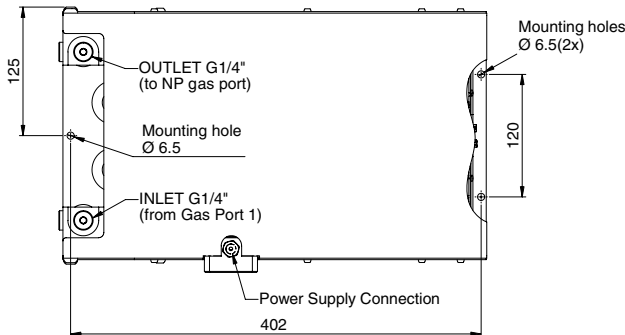
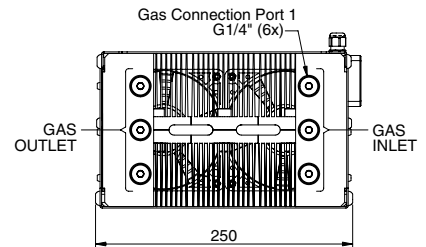
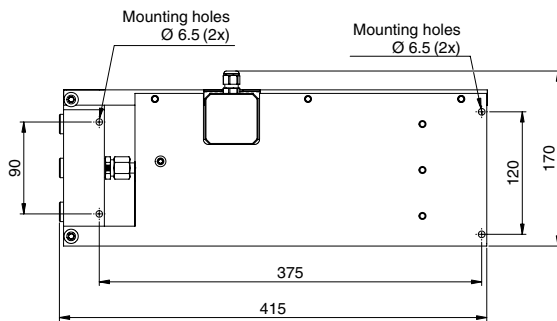
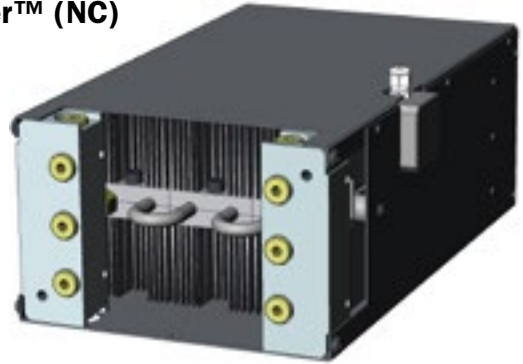
## Nitrogen Cooling System – Nitro Cooler™ (NC)

### Nitro Cooler™ – Order No. 2021641

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).



### 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 |                 |

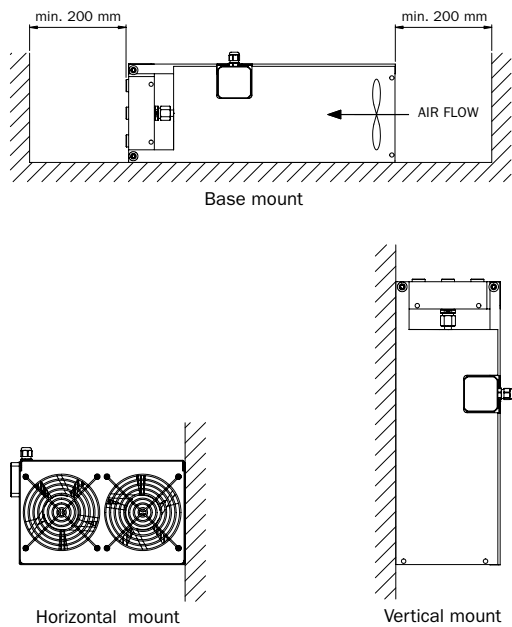
### Nitro Cooler™ Unit (NC) dimensions

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.

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.



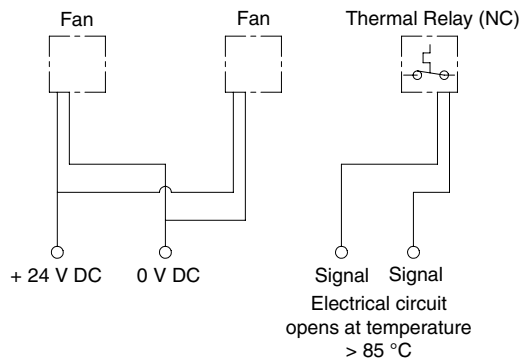
Electrical connections

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 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.

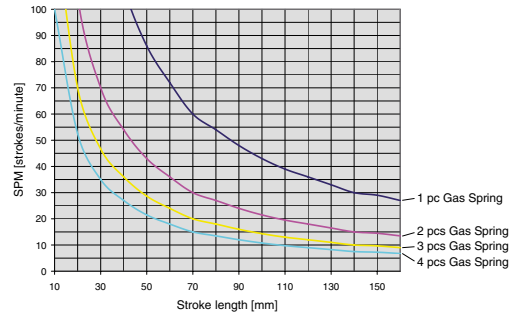
Important! When using the Nitro Cooler™, the return stroke speed of the piston rod decreases by approximately 50%. With a distance of 1 m between the cooler and the gas spring the speeds are as follows:

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

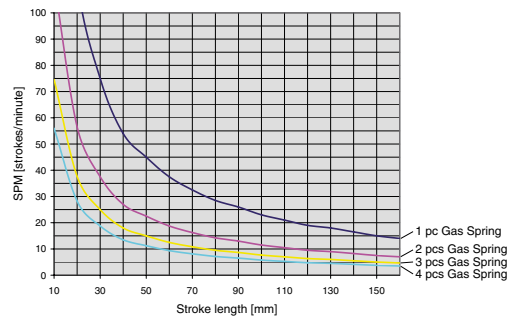
If a higher speed is needed, please contact your local distributor or Strömsholmen AB.

See example on the next page:

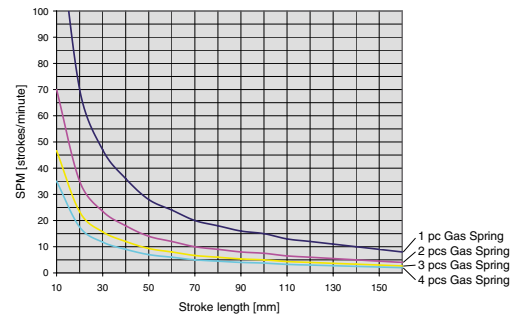
KF2/KF2-A 1500



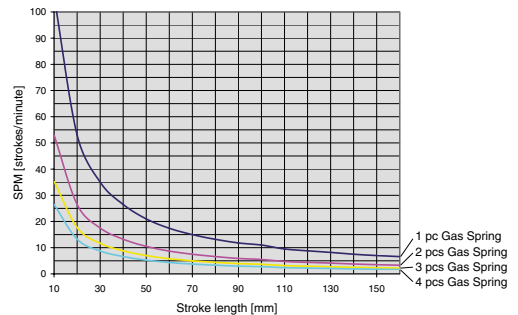
KF2/KF2-A 3000



KF2/KF2-A 5000



KF2/KF2-A 7500



### 3 | Controllable Gas Springs – KF2

#### 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).

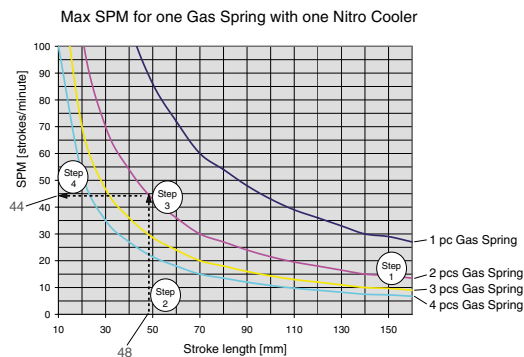
**Step 2** According to the used stroke length, go up vertically to the interception point in the diagram (from point 2 to 3).

**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  $44 \times 150/100 = 66$  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 |             |                          | <br><i>The Safer Choice</i> |     |
|--------------------------------|-------------|--------------------------|---------------------------------------------------------------------------------------------------------------|-----|
| Die No.                        |             |                          |                                                                                                               |     |
| Gas spring model               |             |                          |                                                                                                               |     |
| Stroke length                  |             |                          |                                                                                                               |     |
| Max. frequency                 | strokes/min |                          |                                                                                                               |     |
| Gas spring charge pressure     | Min         | bar                      | Max                                                                                                           | bar |
| Thermal relay connected        | Yes         | <input type="checkbox"/> |                                                                                                               |     |



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

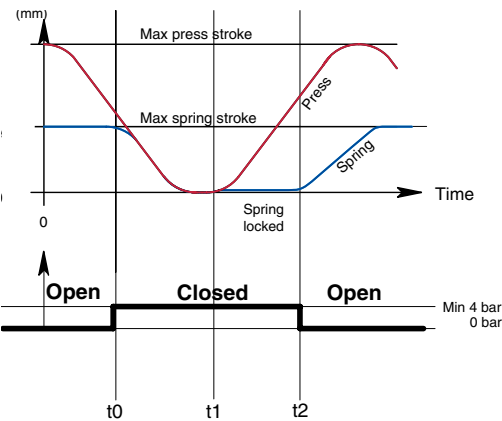
**Standard checks before production run or in the event of malfunction:**

1. Gas spring charge pressure (max. 150 bar at 20°)
2. Air supply pressure (min 4 bar, max. 10 bar)
3. Air signals from press

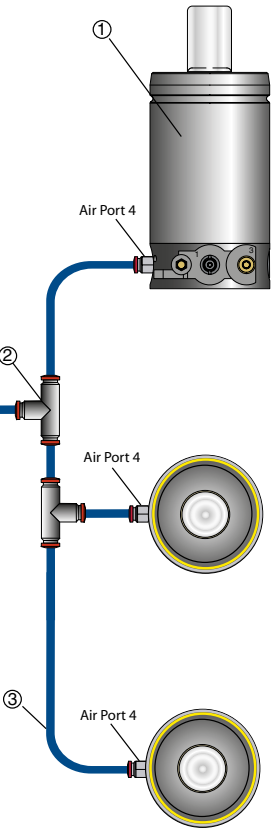
Strömsholmen AB  
Box 216, 573 23 SE-Tranås, Sweden  
www.kaller.com • info@kaller.com

Installation Examples

Control System – Standard Lock, KF2



| Position | Quantity | Description             | Order No.    | Page |
|----------|----------|-------------------------|--------------|------|
| 1        | 3        | Controllable Gas Spring | KF2 XXXX-XXX | 200  |
| 2        | 2        | T - Connector           | 503368       | 205  |
| 3        | 1        | Pneumatic Hose Ø 6 mm   | 503377-XX    | 205  |



A Standard Lock System requires one control signal.

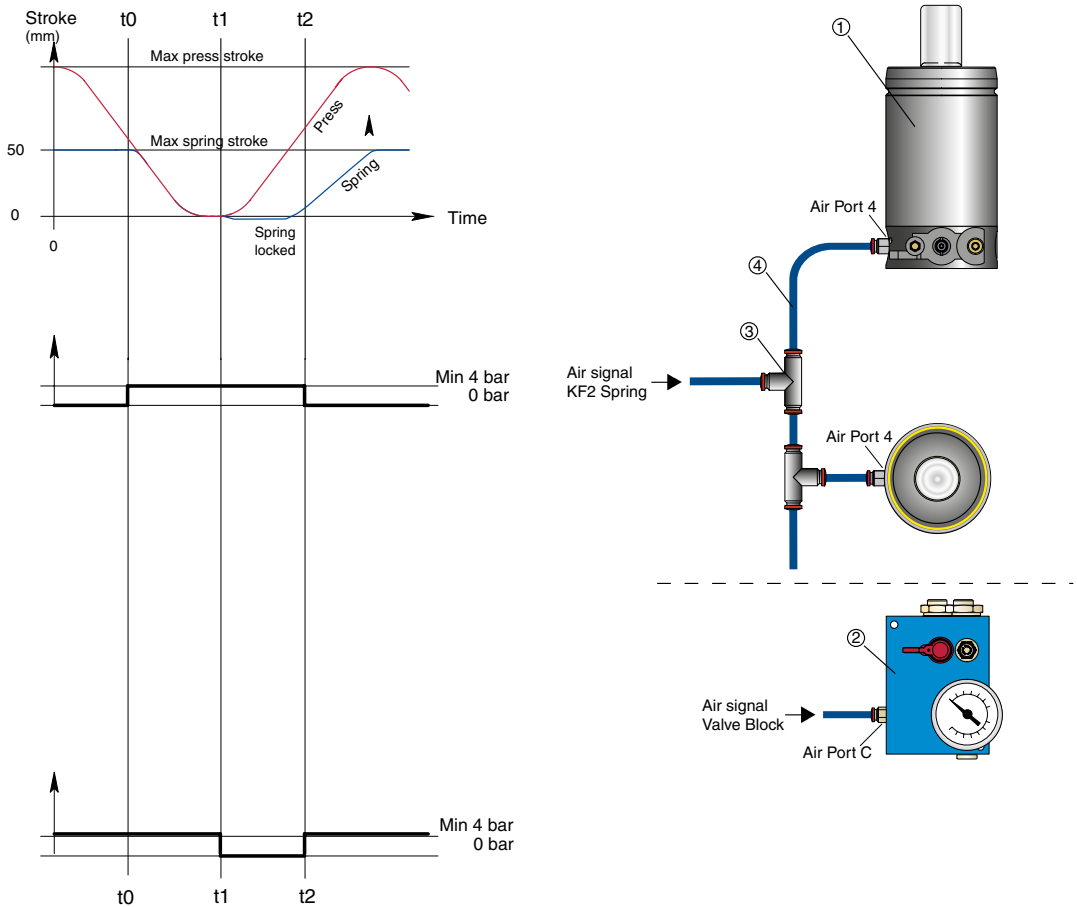
The KF2 gas springs are delivered with air fittings suitable for Ø 6 mm pneumatic hoses.

**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.

## Control System – Positive Lock system, KF2 + KP



| Position | Quantity | Description             | Order No.    | Page |
|----------|----------|-------------------------|--------------|------|
| 1        | 2        | Controllable Gas Spring | KF2 XXXX-XXX | 200  |
| 2        | 1        | All-in-one Valve Block  | 2020801      | 204  |
| 3        | 2        | T Connector             | 503368       | 205  |
| 4        | 1        | Pneumatic Hose Ø 6 mm   | 503377-XX    | 205  |

A Positive Lock System requires two control signals. One to operate the KF2 gas spring(s) and one to operate the Valve Block

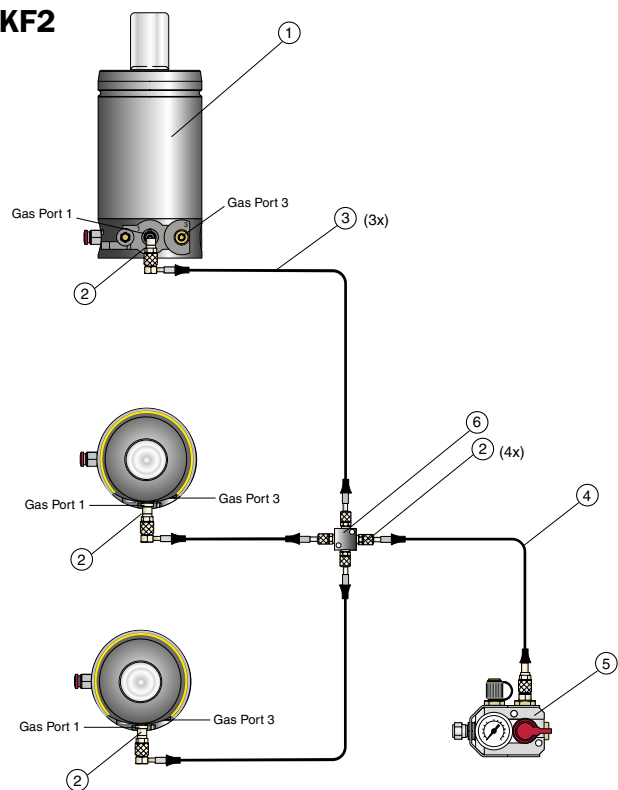
The KF2 gas spring and Valve Block are supplied with air fittings suitable for Ø 6 mm pneumatic hoses.

**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)



| Position | Quantity | Description                 | Order No.      | Page                                 |
|----------|----------|-----------------------------|----------------|--------------------------------------|
| 1        | 3        | Controllable Gas Spring     | KF2 XXXX-XXX   | 200                                  |
| 2        | 7        | Adapter G 1/8"              | 4114973-G 1/8" | Gas Link Systems in the Main Catalog |
| 3        | 3        | EZ Hose straight – 90°      | 4017568-XXXX   | Gas Link Systems in the Main Catalog |
| 4        | 1        | EZ Hose straight – straight | 4014974-XXXX   | Gas Link Systems in the Main Catalog |
| 5        | 1        | Control Block               | 3116114-01     | Gas Link Systems in the Main Catalog |
| 6        | 1        | Multi-Coupling Block        | 4017032        | Gas Link Systems in the Main Catalog |

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).

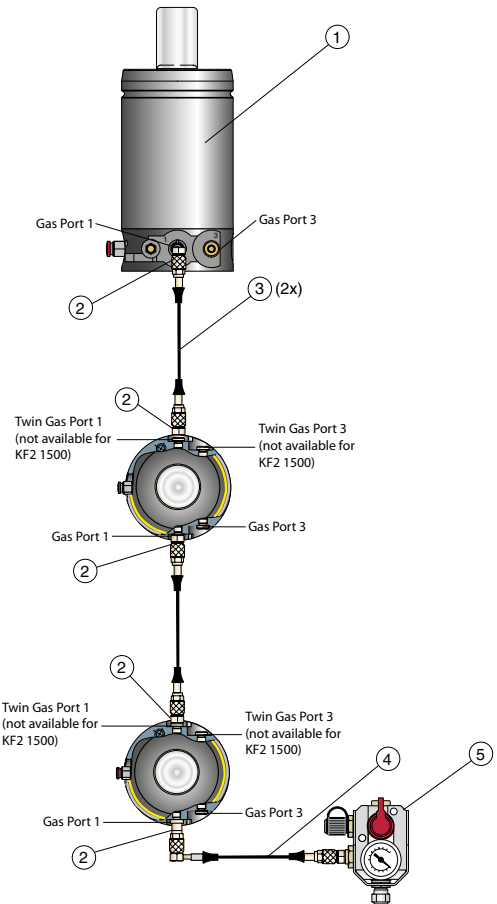
We recommend the EZ Hose system and fittings be used for such systems. The KF2 gas springs are delivered with Gas Ports 1 and 3 plugged. When connecting the EZ Hose system, the charging valve in Port 1 of each KF2 gas spring must first be removed. Each G 1/8" Gas Port, for both the KF2 Gas Spring and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

## Hose System – Standard Lock, KF2

### Method using Twin Ports

(Not valid for KF2 1500)



| Position | Quantity | Description                 | Order No.      | Page                                 |
|----------|----------|-----------------------------|----------------|--------------------------------------|
| 1        | 3        | Controllable Gas Spring     | KF2 XXXX-XXX   | 200                                  |
| 2        | 5        | Adapter G 1/8"              | 4114973-G 1/8" | Gas Link Systems in the Main Catalog |
| 3        | 2        | EZ Hose straight – 90°      | 4017568-XXXX   | Gas Link Systems in the Main Catalog |
| 4        | 1        | EZ Hose straight – straight | 4014974-XXXX   | Gas Link Systems in the Main Catalog |
| 5        | 1        | Control Block               | 3116114-01     | Gas Link Systems in the Main Catalog |

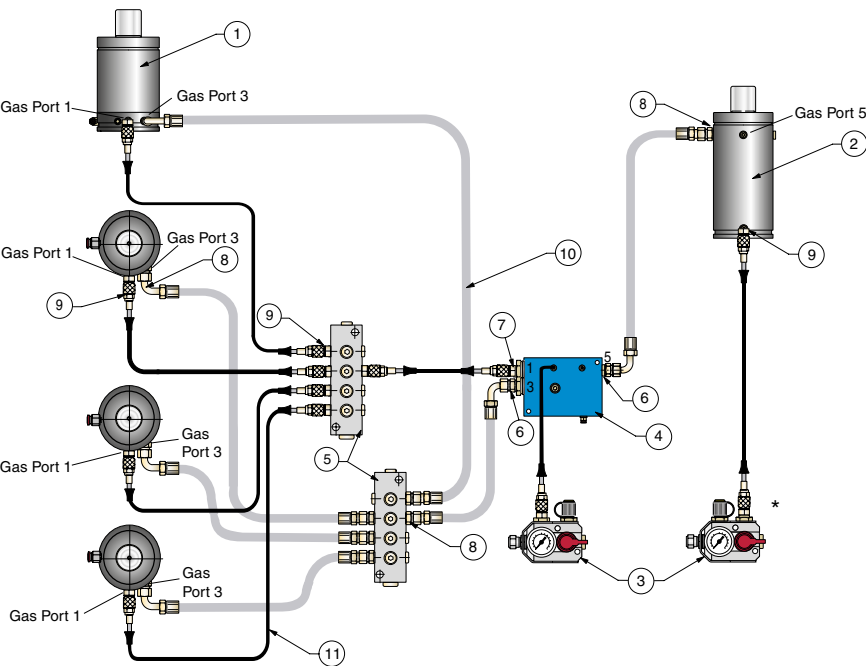
To charge, bleed and check the gas pressure for a Standard Lock in a KF2 gas spring system, all springs should be connected to a standard Control Block. These hoses are connected using the KF2's twin gas ports to the Control Block.

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.

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.

| Position | Quantity | Description                 | Order No.      | Page         |
|----------|----------|-----------------------------|----------------|--------------|
| 1        | 4        | Controllable Gas Spring     | KF2 XXXX-XXX   | 200          |
| 2        | 1        | KP Passive Spring           | KP XXXX        | 203          |
| 3        | 2        | Control Block               | 3116114-01     | Main Catalog |
| 4        | 1        | Standard Valve Block        | 2120801        | 204          |
| 5        | 2        | Multi-Coupling Block G 1/8" | 3015044        | Main Catalog |
| 6        | 2        | EO24 Adapter G 1/4"         | 504144         | Main Catalog |
| 7        | 1        | EZ Adapter G 1/4"           | 4014973-G 1/4" | Main Catalog |
| 8        | 10       | EO24 Adapter G 1/8"         | 503593         | Main Catalog |
| 9        | 10       | EZ Adapter G 1/8"           | 4114973-G 1/8" | Main Catalog |
| 10       | 6        | EO24 Hose straight - 90°    | 3220857-xxxx   | Main Catalog |
| 11       | 7        | EZ Hose straight - straight | 4014974-xxxx   | Main Catalog |

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)\*.

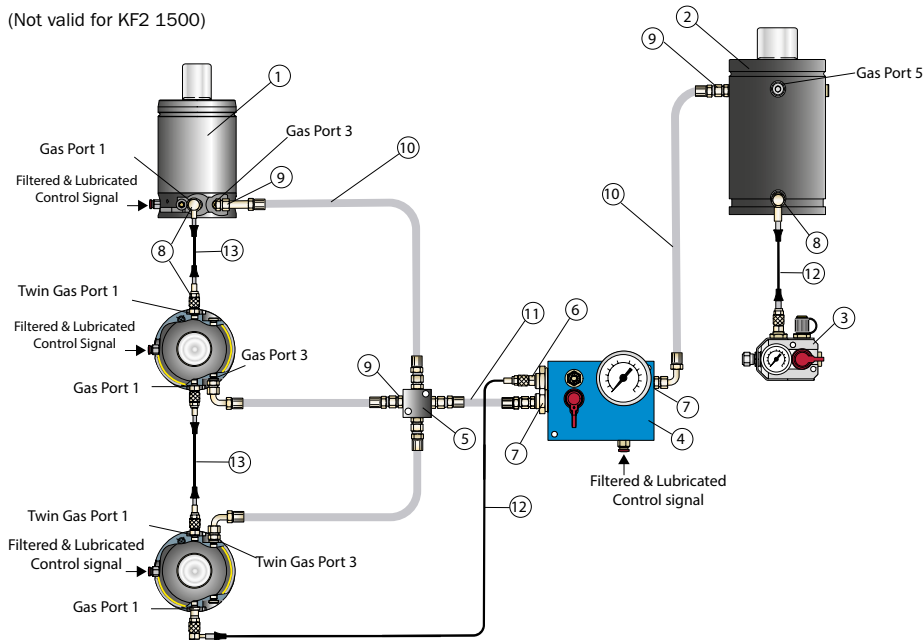
Step 2

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).

## 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.

| Position | Quantity | Description                   | Order No.      | Page         |
|----------|----------|-------------------------------|----------------|--------------|
| 1        | 3        | Controllable Gas Spring       | KF2 XXXX-XX    | 200          |
| 2        | 1        | KP Passive Spring             | KP XXXX        | 203          |
| 3        | 1        | Control Block                 | 3116114-01     | Main Catalog |
| 4        | 1        | All-in-One Valve Block        | 2020801        | 204          |
| 5        | 1        | Coupling Block                | 4017032        | Main Catalog |
| 6        | 1        | EZ Adapter G 1/4"             | 4014973-G 1/4" | Main Catalog |
| 7        | 2        | EO24 Adapter G 1/4"           | 504144         | Main Catalog |
| 8        | 6        | EZ Adapter G 1/8"             | 4114973-G 1/8" | Main Catalog |
| 9        | 8        | EO24 Adapter G 1/8"           | 4014019        | Main Catalog |
| 10       | 4        | EO24 Hose straight – 90°      | 3220857-xxxx   | Main Catalog |
| 11       | 1        | EO24 Hose straight – straight | 3020857-xxxx   | Main Catalog |
| 12       | 2        | EZ Hose 90°– straight         | 4017568-xxxx   | Main Catalog |
| 13       | 2        | EZ Hose straight – straight   | 4014974-xxxx   | Main Catalog |

### Positive Lock, KF2 + KP

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

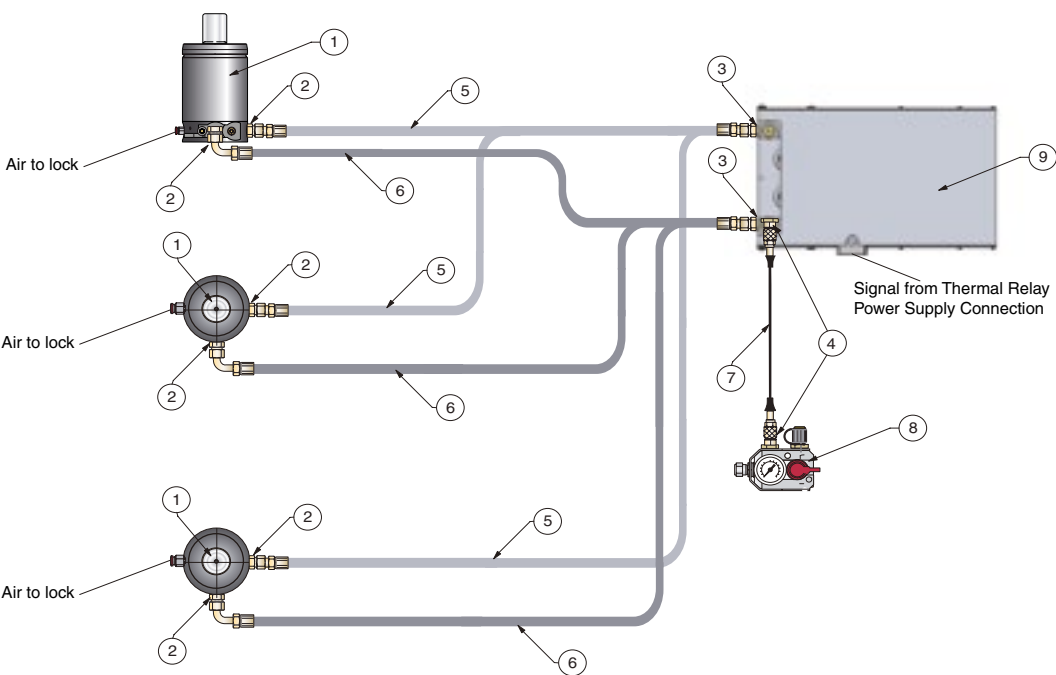
#### Step 1

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™



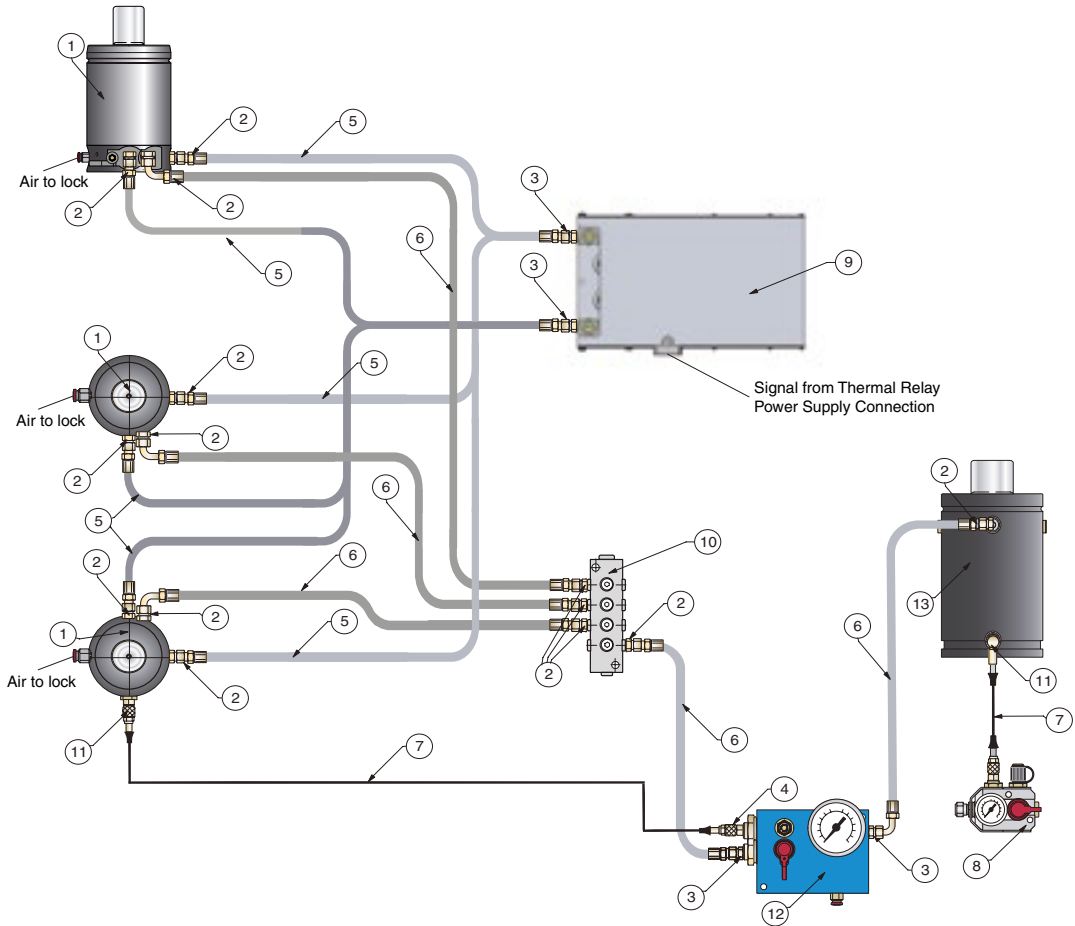
| Position | Quantity | Description                   | Order No.        | Page         |
|----------|----------|-------------------------------|------------------|--------------|
| 1        | 3        | Controllable Gas spring       | KF2 XXXX-XXXX NC | 200          |
| 2        | 6        | E024 Adapter G 1/8"           | 503593           | Main Catalog |
| 3        | 2        | E024 Adapter G 1/4"           | 504144           | Main Catalog |
| 4        | 2        | EZ Adapter G 1/4"             | 4014973-G 1/4"   | Main Catalog |
| 5        | 3        | E024 Hose straight – straight | 3020857-xxxx     | Main Catalog |
| 6        | 3        | E024 Hose straight – 90o      | 3020857-xxxx     | Main Catalog |
| 7        | 1        | EZ Hose straight – straight   | 4014974-xxxx     | Main Catalog |
| 8        | 1        | Control Block                 | 3116114-01       | Main Catalog |
| 9        | 1        | Nitro Cooler Block            | 2021641          | 211          |

When using a Nitro Cooler™, only E024 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™.

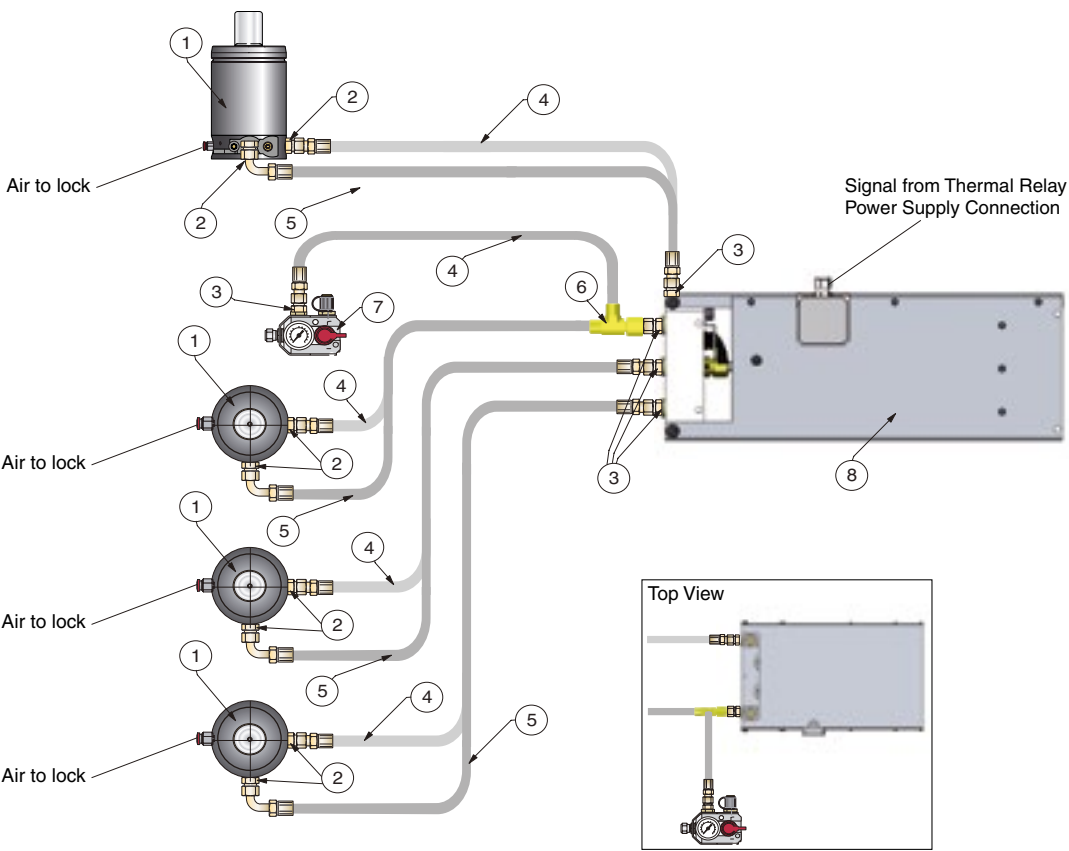
## KF2-NC connection – Positive lock with a Nitro Cooler™



| Position | Quantity | Description                   | Order No.        | Page         |
|----------|----------|-------------------------------|------------------|--------------|
| 1        | 3        | Controllable Gas Spring       | KF2 XXXX-XXXX NC | 200          |
| 2        | 14       | E024 Adapter G 1/8"           | 503593           | Main Catalog |
| 3        | 8        | E024 Adapter G 1/4"           | 504144           | Main Catalog |
| 4        | 1        | EZ Adapter G 1/4"             | 4014973-G 1/4"   | Main Catalog |
| 5        | 6        | E024 Hose straight – straight | 3020857-xxxx     | Main Catalog |
| 6        | 5        | E024 Hose straight – 90o      | 3020857-xxxx     | Main Catalog |
| 7        | 2        | EZ Hose straight - straight   | 4014974-xxxx     | Main Catalog |
| 8        | 1        | Control Block                 | 3116114-01       | Main Catalog |
| 9        | 1        | Nitro Cooler Block            | 2021641          | 211          |
| 10       | 1        | Multi-Coupling Block G 1/8"   | 3015044          | Main Catalog |
| 11       | 2        | EZ Adapter G 1/8"             | 4114973-G 1/8"   | Main Catalog |
| 12       | 1        | All-in-One Valve Block        | 2020801          | 204          |
| 13       | 1        | KP Passive Spring             | KP xxxx          | 203          |

When using a Nitro Cooler™ for a positive lock system, the requirements are the same as for a standard lock system. (See previous page.)

Connection of four KF2-1500-NC Standard Locks with a Nitro Cooler™



| Position | Quantity | Description                   | Order No.        | Page         |
|----------|----------|-------------------------------|------------------|--------------|
| 1        | 4        | Controllable Gas spring       | KF2 XXXX-XXXX NC | 200          |
| 2        | 8        | E024 Adapter G 1/8"           | 503593           | Main Catalog |
| 3        | 9        | E024 Adapter G 1/4"           | 504144           | Main Catalog |
| 4        | 5        | E024 Hose straight – straight | 3020857-xxxx     | Main Catalog |
| 5        | 4        | E024 Hose straight – 90°      | 3020857-xxxx     | Main Catalog |
| 6        | 1        | L Coupling                    | 504147           | Main Catalog |
| 7        | 1        | Control Block                 | 3116114-02       | Main Catalog |
| 8        | 1        | Nitro Cooler Block            | 2021641          | 211          |

## Frequently Asked Questions (Faq's)

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

Frequently Asked Questions (Faq’s)

| Relating to Standard Lock, KF2                                                                                         |                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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? | 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 201.                                                                                                                             |
| How fast can the KF2 spring be stroked?                                                                                | 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 196 for more information.                                                              |
| What can I do to eliminate KF2 springback?                                                                             | If you are using 100% stroke length ±0.5 mm of the KF2 spring, a maximum springback of 1 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. |
| Can I lock a KF2 Controllable Gas Spring at any position?                                                              | 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.                                                                                                            |

## Frequently Asked Questions (Faq's)

| Relating to Positive Lock System, KF2+KP                                                         |                                                                                                                             |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>How many KF2 Controllable Gas Springs can be connected to a single KP Passive Gas Spring?</b> | Up to 4 pcs KF2 can be connected to a single KP spring.                                                                     |
| <b>How many Valve Blocks do I need in the system?</b>                                            | One Valve Block is required for each KP Passive Gas Spring in the system.                                                   |
| <b>Can I use the KP spring in the tool for forming?</b>                                          | No. The KP spring is not to be used for any operation in the tool; use it only to eliminate KF2 springback.                 |
| <b>Can I use just the EZ Hose System to connect to my Positive Lock System?</b>                  | No. The E024 Hose System (or its equivalent) must be used between the KF2 spring(s), Valve Block and KP Passive Gas Spring. |
| <b>Can I use just the E024 Hose System to connect to my Positive Lock System?</b>                | Yes.                                                                                                                        |

Frequently Asked Questions (Faq’s)

| Relating to Liquid Cooling                                                  |                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Is Cooling always required?                                                 | Not always. Generally speaking, longer stroke lengths and faster press stroke frequencies normally require cooling. See Cooling System (optional) on page 196 for more information.                                                                                                                            |
| How many KF2 controllable springs can be connected to a single Cooler Unit? | 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 "Nitro Cooler™ used for 1pc KF2 spring " (see page 197), please secure according to the diagrams on page 213. |
| 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 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.              |

## Frequently Asked Questions (Faq's)

| Relating to Nitro Cooler™                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>How many KF2 can be connected to one Nitro Cooler™?</b>                         | 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 213.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Can we eliminate the decrease in return speed caused by the Nitro Cooler™ ?</b> | <p>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.</p> <p>With a distance of 1 m between the cooler and gas spring the speeds are as follows:</p> <p>KF2/KF2-A 1500 – 0.10 m/sec.<br/> KF2/KF2-A 3000 – 0.08 m/sec.<br/> KF2/KF2-A 5000 – 0.05 m/sec.<br/> KF2/KF2-A 7500 – 0.03 m/sec. return stroke speed.</p> <p>If a higher speed is needed, please contact your local distributor or Strömsholmen AB.</p> |
| <b>How many Nitro Coolers™ can be used in one die?</b>                             | There is no limitation as long as there is sufficiently ventilated places for them in the die.                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Troubleshooting

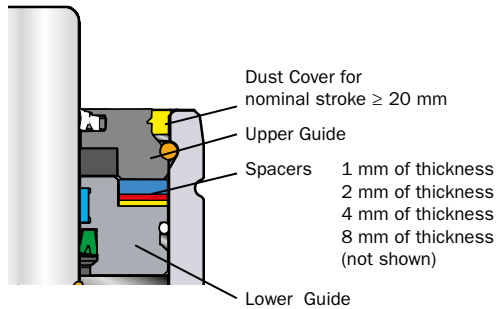
| System             | Problem                                          | Solution                                                                              |
|--------------------|--------------------------------------------------|---------------------------------------------------------------------------------------|
| Standard Lock, KF2 | KF2 spring does not lock                         | Make sure the KF2 spring's Air Port 4 has minimum 4 bar air pressure before press BDC |
|                    |                                                  | Check that all hose connections are correct                                           |
|                    | KF2 piston rod's springback is greater than 1 mm | Make sure 100% of the KF2 spring's nominal stroke length $\pm 0.5$ mm is used         |
|                    |                                                  | Make sure the KF2 spring's Air Port 4 has minimum 4 bar air pressure before press BDC |
|                    | KF2 piston rod does not return                   | Make sure the KF2 spring's Air Port 4 has zero air pressure when required to open     |
|                    |                                                  | Check for any obstructions in the tool preventing piston rod return                   |
|                    |                                                  | Check that there is gas pressure in the KF2 spring                                    |

| System                         | Problem                                           | Solution                                                                                                                                                                       |
|--------------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Positive Lock System, KF2 + KP | KF2 spring does not lock                          | Make sure the KF2 spring's Air Port 4 has minimum 4 bar air pressure before press BDC                                                                                          |
|                                |                                                   | Check that all hose connections are correct                                                                                                                                    |
|                                | KF2 piston rod's spring back is greater than 0 mm | 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 |
|                                |                                                   | Make sure 100% of the KF2 spring's nominal stroke length $\pm 0.5$ mm is used                                                                                                  |
|                                |                                                   | Check that the cartridge valve in the Valve Block opens at BDC                                                                                                                 |
|                                | KF2 piston rod does not return                    | Make sure the KF2 spring's Air Port 4 has zero air pressure when required to open                                                                                              |
|                                |                                                   | Check for any obstructions in the tool preventing piston rod return                                                                                                            |
|                                |                                                   | Check that there is gas pressure in the KF2 spring                                                                                                                             |

# Appendix

## Stroke length adjustment of KF2-A

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

**Table 1**

| To adjust from nominal stroke length |               | Spacer (mm) |   |   |   |
|--------------------------------------|---------------|-------------|---|---|---|
|                                      | Stroke length | 1           | 2 | 4 | 8 |
| Maximum                              | +7            | 0           | 0 | 0 | 0 |
|                                      | +6            | 1           | 0 | 0 | 0 |
|                                      | +5            | 0           | 1 | 0 | 0 |
|                                      | +4            | 1           | 1 | 0 | 0 |
|                                      | +3            | 0           | 0 | 1 | 0 |
|                                      | +2            | 1           | 0 | 1 | 0 |
|                                      | +1            | 0           | 1 | 1 | 0 |
|                                      | *Nominal      | 1           | 1 | 1 | 0 |
|                                      | -1            | 0           | 0 | 0 | 1 |
|                                      | -2            | 1           | 0 | 0 | 1 |
|                                      | -3            | 0           | 1 | 0 | 1 |
|                                      | -4            | 1           | 1 | 0 | 1 |
|                                      | -5            | 0           | 0 | 1 | 1 |
|                                      | -6            | 1           | 0 | 1 | 1 |
|                                      | -7            | 0           | 1 | 1 | 1 |
| Minimum                              | -8            | 1           | 1 | 1 | 1 |

Ex.1

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

### Important!

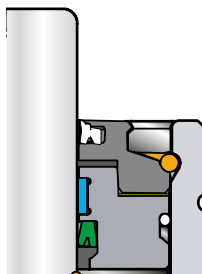
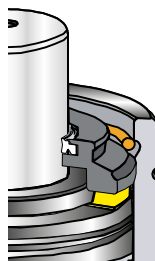
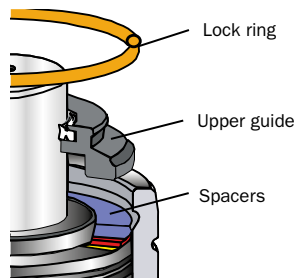
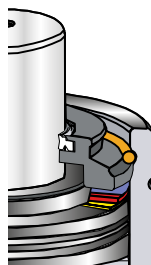
- Only fully trained personnel with experience in servicing gas springs are allowed to adjust to the stroke length.
- Make sure the work surface where you will be working on the KF2-A spring(s) is clean and free from contaminates.
- Make sure there is no gas pressure in the KF2-A spring before proceeding.

Feel free to download an animated guide from our homepage: [www.kaller.com](http://www.kaller.com)

#### Stroke length adjustment of KF2-A

##### Work procedure

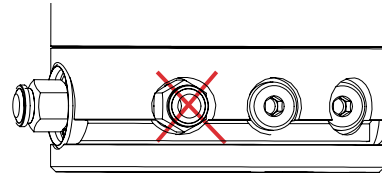
- 1: Make sure the KF2-A gas spring is degassed and remove the dust cover (if applicable).
- 2: Knock down the guide and remove the lock ring by using a mounting sleeve and a plastic hammer.
- 3: Remove the Upper Guide and install the combination of Spacers that will give you the required stroke length.
- 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

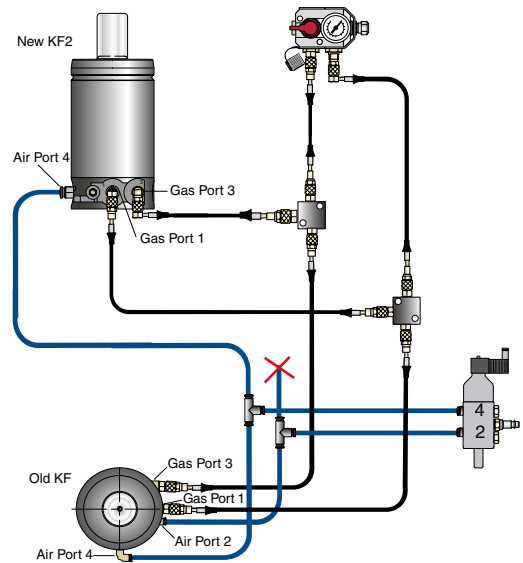


## How to fit the new KF2 to existing KF systems

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

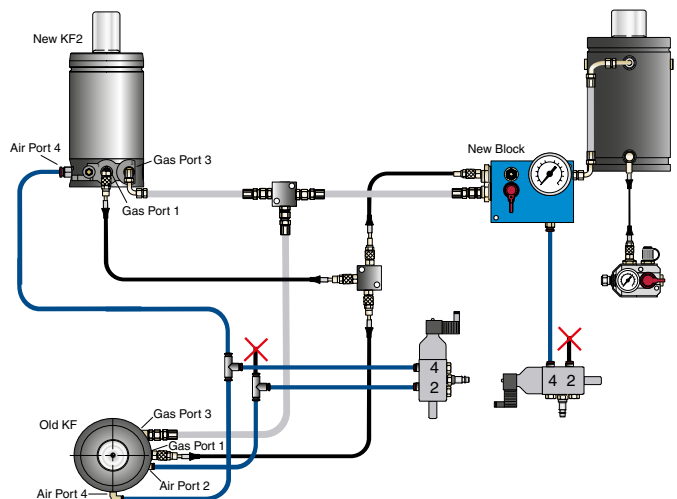
### Standard Lock Example: Replacing an existing KF with a new KF2

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

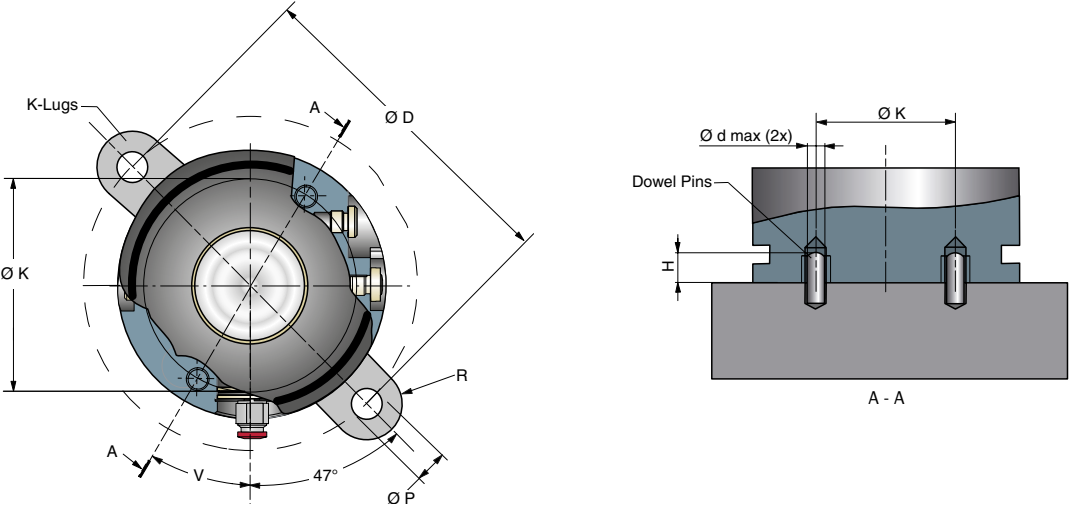
To replace an existing KF spring with a new KF2 spring in a Positive Lock System, simply plug the air signal that went to the KF springs Air Connection Port 2 (shown here by an X).



KF2/KF2-A Alternative Mounting

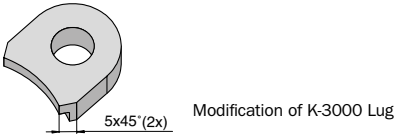
For upside down installations, the threaded holes in the base of the KF2/KF2-A should always be used when mounting the Controllable Gas Springs to the tool.

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.

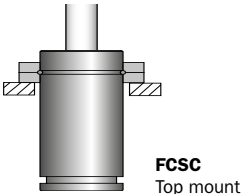


| Model           | Ø D | Ø d max. | H  | Ø K | V  | Ø P  | R  | Order No. K Lug |
|-----------------|-----|----------|----|-----|----|------|----|-----------------|
| KF2/KF2-A -1500 | 130 | 8        | 10 | 50  | 60 | 17.5 | 20 | 2 pcs K-3000*   |
| KF2/KF2-A -3000 | 155 | 8        | 10 | 95  | 30 | 17.5 | 25 | 2 pcs K-5000    |
| KF2/KF2-A -5000 | 195 | 12       | 10 | 110 | 30 | 21.5 | 25 | 2 pcs K-7500    |
| KF2/KF2-A -7500 | 240 | 12       | 10 | 120 | 30 | 21.5 | 29 | 2 pcs K-10000   |

**\*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.



It is also possible to mount the KF2/KF2-A Controllable Gas Springs using an FCSC flange mount if cooling is not required. For more information contact your local KALLER distributor or Strömsholmen AB.







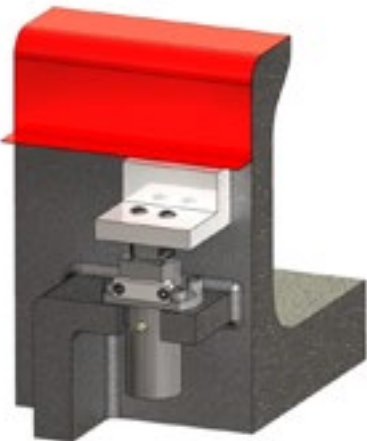


Page

|                                                                    |            |
|--------------------------------------------------------------------|------------|
| <b>Features and benefits of Flange Stripper SLMTS, LTP and LWP</b> | <b>238</b> |
| About Controllable Gas Springs                                     | 238        |
| Standard Lock, KF2                                                 | 239        |
| Positive lock system, KF2 + KP                                     | 239        |

Features and benefits of Flange Stripper SLMTS, LTP and LWP

A Flange Stripper is a stripper that pushes against the bottom edge or surface of a flange to release the part from the tool.



Dimensions SLMTS



| Order No.     | Stroke S | Gas Spring | L   | A   | Weight [kg] |
|---------------|----------|------------|-----|-----|-------------|
| SLMTS 170-025 | 25       | X 170      | 112 | 52  | 0.93        |
| SLMTS 170-038 | 38       | X 170      | 138 | 65  | 1.00        |
| SLMTS 170-050 | 50       | X 170      | 162 | 77  | 1.06        |
| SLMTS 170-080 | 80       | X 170      | 225 | 107 | 1.25        |
| SLMTS 170-100 | 100      | X 170      | 265 | 127 | 1.36        |
| SLMTS 170-125 | 125      | X 170      | 315 | 152 | 1.49        |

KALLER - THE SAFER CHOICE

**Training**

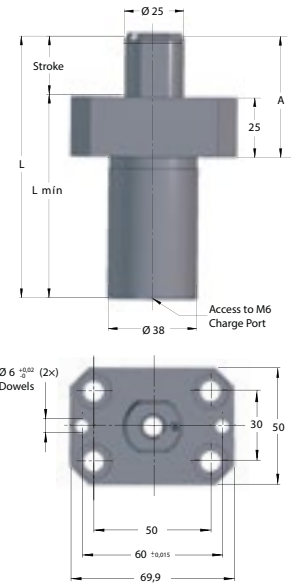
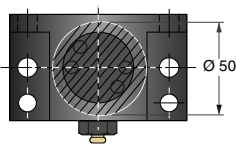
**Safety**

**Reliability**

Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/FAQ](http://www.kaller.com/FAQ)

Attachment - Placement

The center of gravity of the attached mass to the Flange Stripper unit is not to be placed with an offset from the center axis greater than according to the picture below.



| Max. attachment capacity per lifter* Metric |                      |
|---------------------------------------------|----------------------|
| Ram velocity (m/s)                          | Attachment mass (kg) |
| 0.15                                        | 80                   |
| 0.30                                        | 20                   |
| 0.40                                        | 11                   |
| 0.50                                        | 7                    |
| 0.60                                        | 5                    |

\*Determine ram velocity and reference the recommended attachment mass per lifter. For increased capacity, install external positive stops to prevent lifter damage.

Dimensions LTP - Top mount



Note!

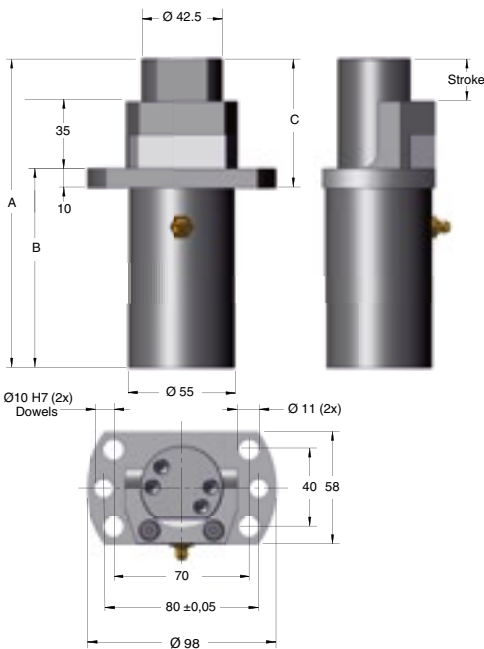
Access to the grease nipple must be provided in the tool.

| Order No.*  | Stroke S | Gas spring | A   | B   | C   |
|-------------|----------|------------|-----|-----|-----|
| LTP 150-050 | 50       | M2 150-050 | 200 | 103 | 107 |
| LTP 150-080 | 80       | M2 150-080 | 260 | 133 | 137 |

\*Available in different forces.

| Max. attachment capacity per lifter* Metric |                      |
|---------------------------------------------|----------------------|
| Ram velocity (m/s)                          | Attachment mass (kg) |
| 0.60                                        | 10                   |
| 0.80                                        | 5.6                  |
| 1.00                                        | 3.6                  |
| 1.20                                        | 2.5                  |

\* Determine ram / press max. velocity and reference the recommended attachment mass per stripper. For increased capacity, install external positive stops and guiding to prevent stripper damage.

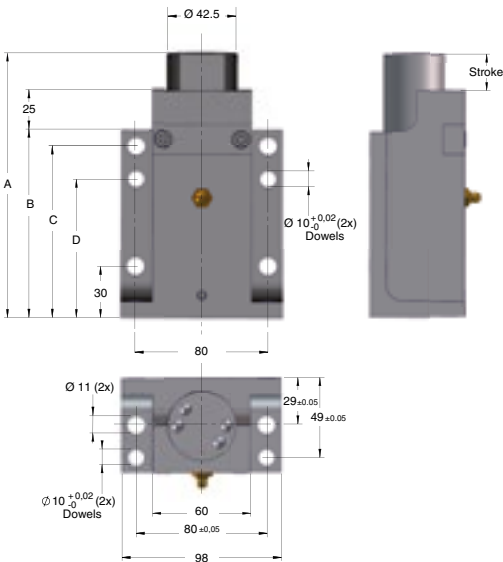


Dimensions LWP - Wall bottom mount



| Order No.*  | Stroke S | Gas spring  | A   | B   | C   | D   |
|-------------|----------|-------------|-----|-----|-----|-----|
| LWP 150-050 | 50       | M2 150-050* | 200 | 113 | 103 | 83  |
| LWP 150-080 | 80       | M2 150-080* | 260 | 143 | 133 | 113 |

\*Available in different forces.







**Page**

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| <b>FEATURES AND BENEFITS FLANGE STRIPPERS LT AND LW</b> | <b>242</b> |
| Mounting options                                        | 242        |
| Dimensions LT - Top mount                               | 243        |
| Dimensions LW - Wall bottom mount                       | 243        |

# Features and benefits Flange Strippers LT and LW

KALLER Flange Strippers LT and LW are for use in flanging dies for stripping the part after the flanging operation. They are available for top mount and wall/bottom mount, with stroke lengths of 50 and 80 mm.

The stripping force in Flange Strippers LT and LW is provided by an M2 Gas Spring with an initial force of 2,000 N. The gas spring is inverted and fitted into the Flange Strippers.

During try-out and maintenance, the Slide and/or gas spring can easily be removed by unscrewing the Guide Bolt. Once the Guide Bolt is unscrewed, the Slide can be lifted up and the gas spring removed. The Slide can now be replaced and operated by hand during try-out.

The two KALLER Flange Strippers are equipped with a grease nipple, which after initial greasing should be greased every 100,000 strokes.

The Stripper Plate and the Blank Stop are to be manufactured to the desired profile by the tool maker and attached to the Flange Strippers using a M6 bolt.

## KALLER - THE SAFER CHOICE

**Training**

**Safety**

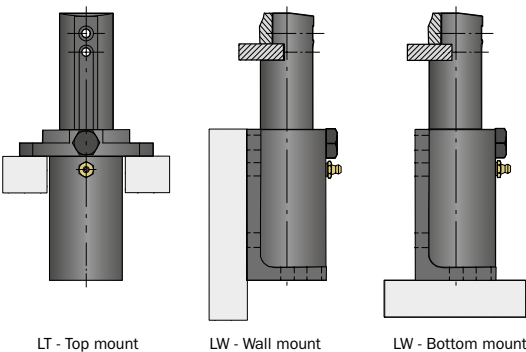
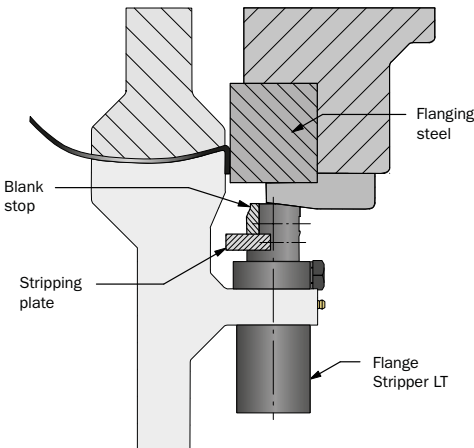
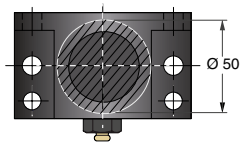
**Reliability**

Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/FAQ](http://www.kaller.com/FAQ)

## Mounting options

### Attachment - Placement

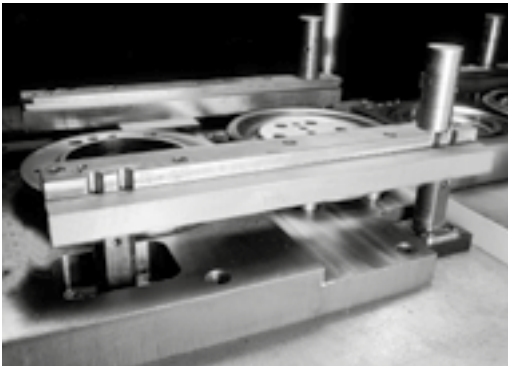
The center of gravity of the attached mass to the Flange Stripper unit is not to be placed with an offset from the center axis greater than according to the picture below.







Stock Lifters - SLME 170 • SLMT 170 • SLM 300 • SPC 800



Page

|                                                                |            |
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| <b>FEATURES AND BENEFITS -</b>                                 |            |
| <b>Stocklifters SLME 170, SLMT 170, SLM 300 and SPC 800</b>    | <b>246</b> |
| KALLER Stocklifters SLME 170, SLMT 170 and SLM 300 gas springs | 246        |
| KALLER Stock Lifter SPC 800 gas springs                        | 246        |
| SLME 170                                                       | 247        |
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| SLM 300                                                        | 248        |
| SPC 800                                                        | 249        |

## Features and benefits

### Stocklifters SLME 170, SLMT 170, SLM 300 and SPC 800

**KALLER Stocklifters SLME 170, SLMT 170 and SLM 300 gas springs** are mainly for use in progressive dies. The extremely robust design can withstand high side loading. SLME 170, SLMT 170 and SLM 300 can also be mounted into upper die and attached directly to stripper plates without additional guide elements.

- Simplify tool design
- Save cost and space
- Eliminate need for additional guide bushings or anti-rotation feature
- Easily adjustable force
- Double tube design isolates the gas spring from side load and fluid contamination
- SLME 170 and SLMT 170 are linkable using hose system for uniform lifting force

**KALLER Stock Lifter SPC 800 gas springs** can be used in progressive dies for multi-point guide rail lifting. These gas springs are engineered with the unique KALLER Speed Control™ technology, which dampens the last 20 mm of return stroke speed to 0.2 m/s. This brings the guide rail to a smooth return stop. Use of a hose system is recommended, as this will provide an even distribution of forces.

- Eliminate strip feed bounce
- Simplify tool design, saving cost and space
- Eliminate need for additional guide bushings
- Easily adjustable force SPC 800 are linkable using hose system for uniform lifting force
- Other mounting possibilities according to TU 1500

### KALLER - THE SAFER CHOICE



Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/FAQ](http://www.kaller.com/FAQ)



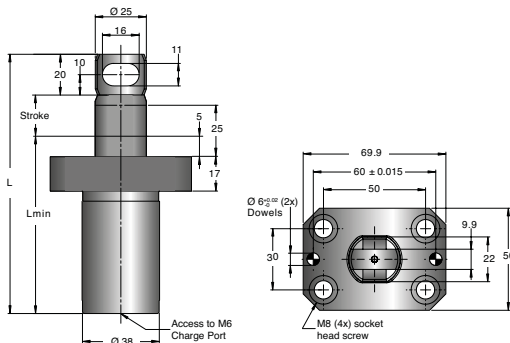
## SLME 170

| Order No.    | S<br>Stroke | Force in N at 180 bar/ + 20°C |             | L<br>±0.25 | L<br>min | Gas<br>volume (l) | Weight<br>(kg) |
|--------------|-------------|-------------------------------|-------------|------------|----------|-------------------|----------------|
|              |             | Initial                       | End force * |            |          |                   |                |
| SLME 170-025 | 25          | 1700                          | 2800        | 127        | 82       | 0.006             | 0.81           |
| SLME 170-038 | 38          |                               |             | 153        | 95       | 0.009             | 0.88           |
| SLME 170-050 | 50          |                               |             | 177        | 107      | 0.012             | 0.94           |
| SLME 170-063 | 63          |                               |             | 203        | 120      | 0.015             | 1.01           |
| SLME 170-080 | 80          |                               |             | 240        | 140      | 0.019             | 1.10           |
| SLME 170-100 | 100         |                               |             | 280        | 160      | 0.024             | 1.21           |
| SLME 170-125 | 125         |                               |             | 330        | 185      | 0.030             | 1.35           |

\*At full stroke

| Max. attachment capacity per lifter*<br>Metric |                         |
|------------------------------------------------|-------------------------|
| Ram velocity<br>(m/s)                          | Attachment mass<br>(kg) |
| 0.15                                           | 80                      |
| 0.30                                           | 20                      |
| 0.40                                           | 11                      |
| 0.50                                           | 7                       |
| 0.60                                           | 5                       |

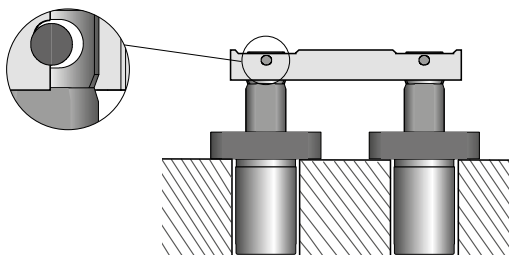
\*Determine ram velocity and reference the recommended attachment mass per lifter. For increased capacity, install external positive stops to prevent lifter damage.



## Mounting examples

### Note!

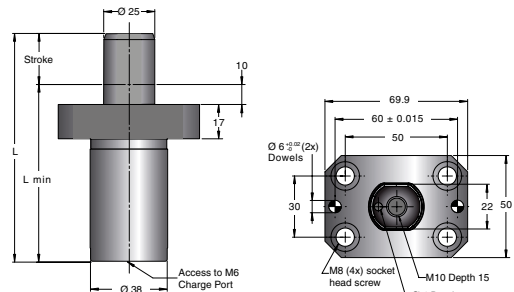
Use Ear Attachment for multi-point lifting.



## SLMT 170

| Order No.    | S<br>Stroke | Force in N at 180 bar/ + 20°C |             | L<br>±0.25 | L<br>min | Gas<br>volume (l) | Weight<br>(kg) |
|--------------|-------------|-------------------------------|-------------|------------|----------|-------------------|----------------|
|              |             | Initial                       | End force * |            |          |                   |                |
| SLMT 170-025 | 25          | 1700                          | 2800        | 112        | 87       | 0.006             | 0.79           |
| SLMT 170-038 | 38          |                               |             | 138        | 100      | 0.009             | 0.86           |
| SLMT 170-050 | 50          |                               |             | 162        | 112      | 0.012             | 0.92           |
| SLMT 170-063 | 63          |                               |             | 188        | 125      | 0.015             | 0.99           |
| SLMT 170-080 | 80          |                               |             | 225        | 145      | 0.019             | 1.09           |
| SLMT 170-100 | 100         |                               |             | 265        | 165      | 0.024             | 1.19           |
| SLMT 170-125 | 125         |                               |             | 315        | 190      | 0.030             | 1.33           |

\*At full stroke

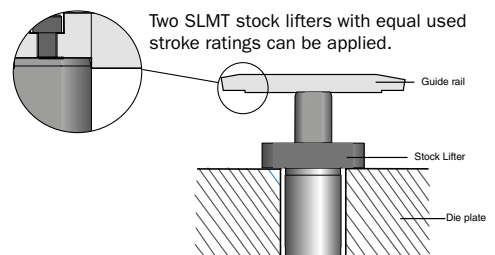


## Basic information

|                                     |                  |
|-------------------------------------|------------------|
| Initial force range .....           | 240-1700 N       |
| Pressure medium .....               | Nitrogen         |
| Charging pressure range .....       | 25-180 bar       |
| Operating temperature range.....    | 0-80° C          |
| Force increase by temperature ..... | ±0.3% / °C       |
| Recommended max. strokes/min.....   | 40-100 (at 20°C) |
| Max. piston rod velocity .....      | 0.6 m/s          |
| Max. utilised stroke.....           | 100%             |
| Internal gas spring .....           | X 170            |

### Note!

Use threaded holes for single point lifting.



SLM 300

| Order No.   | S<br>Stroke | Force in N at 180<br>bar/ + 20°C |            | L<br>±0.25 | L<br>min | Gas<br>volume<br>(l) | Weight<br>(kg) |
|-------------|-------------|----------------------------------|------------|------------|----------|----------------------|----------------|
|             |             | Initial                          | End force* |            |          |                      |                |
| SLM 300-025 | 25          | 3,200                            | 4,300      | 146        | 121      | 0.016                | 2.04           |
| SLM 300-050 | 50          |                                  | 4,300      | 196        | 146      | 0.033                | 2.49           |
| SLM 300-080 | 80          |                                  | 4,350      | 256        | 176      | 0.053                | 3.31           |
| SLM 300-100 | 100         |                                  | 4,350      | 296        | 196      | 0.066                | 3.86           |
| SLM 300-125 | 125         |                                  | 4,350      | 346        | 221      | 0.083                | 4.54           |
| SLM 300-150 | 150         |                                  | 4,350      | 396        | 246      | 0.100                | 5.22           |
| SLM 300-163 | 163         |                                  | 4,350      | 422        | 259      | 0.109                | 5.58           |
| SLM 300-175 | 175         |                                  | 4,350      | 446        | 271      | 0.117                | 5.90           |
| SLM 300-200 | 200         |                                  | 6,350      | 496        | 296      | 0.134                | 6.58           |
| SLM 300-210 | 210         |                                  | 6,350      | 516        | 306      | 0.141                | 6.85           |

\*At full stroke

Order No.  
SLM CAP  
(Sold separately)

SLM CAP option to be  
mounted at top of SLM  
300 and linked to guide  
rails of the die with a  
slotted pin.

| Max. attachment capacity per lifter*<br>Metric |                         |
|------------------------------------------------|-------------------------|
| Ram velocity<br>(m/s)                          | Attachment mass<br>(kg) |
| 0.30                                           | 29                      |
| 0.40                                           | 16                      |
| 0.50                                           | 10                      |
| 0.70                                           | 5.3                     |
| 0.80                                           | 4.1                     |

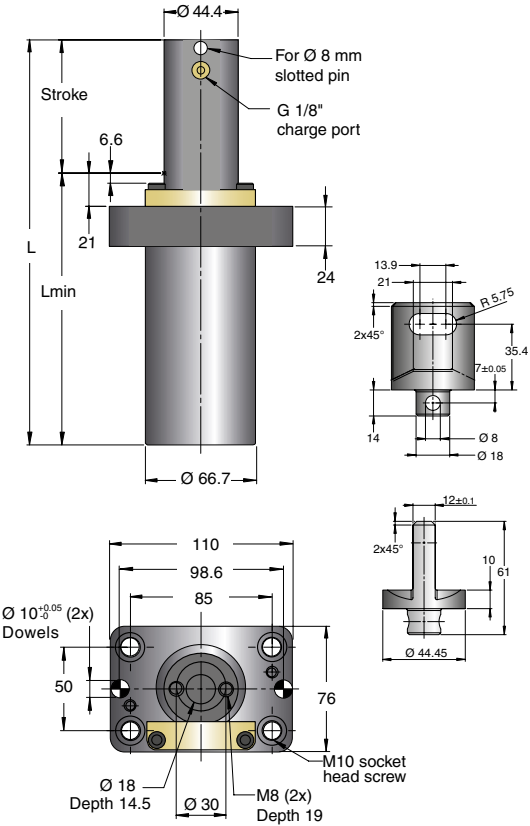
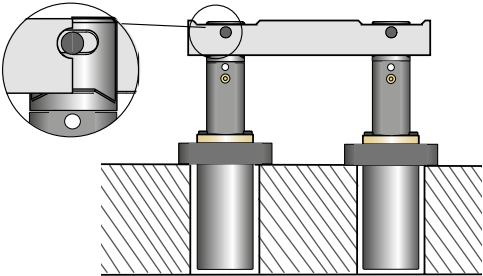
\*Attachment mass assumes balanced  
load and actuation force. For increased  
capacity, install external positive stops  
to prevent lifter damage.

Basic information

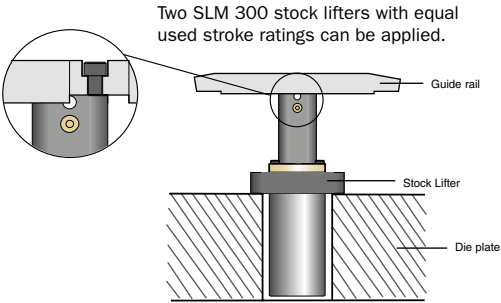
Initial force range .....450-3200 N  
Pressure medium .....Nitrogen  
Charging pressure range .....25-180 bar  
Operating temperature range .....0-80° C  
Force increase by temperature .....±0.3%/°C  
Recommended max. strokes/min .....80-100 (at 20°C)  
Max. piston rod velocity .....0.8 m/s  
Max. utilised stroke .....100%  
Repair kit.....3020870

Mounting examples

**Note!**  
Use SLM CAP for multi-point lifting only.



**Note!**  
Use threaded holes for single point lifting.



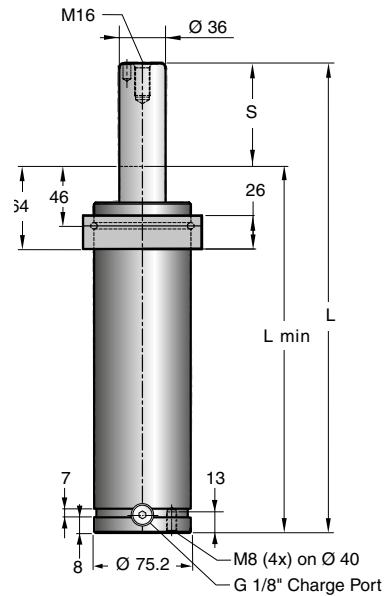
## SPC 800

| Order No.   | S<br>Stroke | Force in N at<br>70 bar/ + 20°C |            | L<br>±0.25 | L<br>min | Gas<br>volume<br>(l) | Weight<br>(kg) |
|-------------|-------------|---------------------------------|------------|------------|----------|----------------------|----------------|
|             |             | Initial                         | End force* |            |          |                      |                |
| SPC 800-050 | 50          | 7,100                           | 8,800      | 304        | 254      | 0.3                  | 5.3            |
| SPC 800-080 | 80          |                                 | 9,200      | 364        | 284      | 0.4                  | 5.8            |
| SPC 800-100 | 100         |                                 | 9,400      | 404        | 304      | 0.5                  | 6.2            |
| SPC 800-125 | 125         |                                 | 9,600      | 454        | 329      | 0.5                  | 6.7            |
| SPC 800-150 | 150         |                                 | 9,700      | 504        | 354      | 0.6                  | 7.1            |
| SPC 800-175 | 175         |                                 | 9,800      | 554        | 379      | 0.7                  | 7.6            |
| SPC 800-200 | 200         |                                 | 9,900      | 604        | 404      | 0.8                  | 8.0            |

\*At full stroke

| Max. attachment capacity per lifter Metric |                      |
|--------------------------------------------|----------------------|
| Ram velocity (m/s)                         | Attachment mass (kg) |
| 0.3                                        | 30                   |
| 0.4                                        | 17                   |
| 0.5                                        | 11                   |
| 0.6                                        | 7                    |

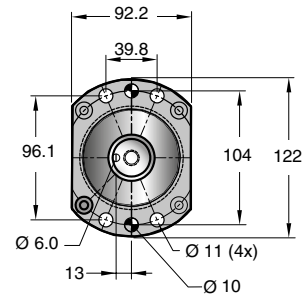
Determine ram velocity and do not exceed recommended attachment mass per lifter. Use multiple lifters to accommodate attachment loads that exceed velocity or mass limits.



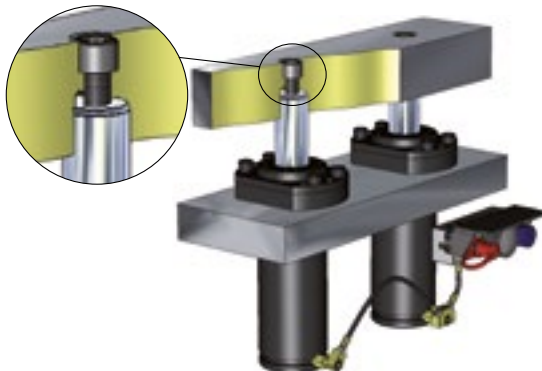
### Basic information

Pressure medium.....Nitrogen  
 Charging pressure .....15-70 bar (at 20°C)  
 Operating temperature .....0 to +80°C  
 Force increase by temperature .....±0.3% / °C  
 Recommended max. strokes/min .....≈ 25 (at 20°C)\*  
 Dampening length .....≈ 20 mm  
 Dampening speed .....0.2 m/s  
 Rod surface .....Nitrided  
 Tube surface .....Black oxide  
 Repair kit.....3026153

\*Note! By halving the initial charge pressure, the number of spm can be doubled.



### Mounting example







**Page**

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**FEATURES AND BENEFITS of KALLER Die Separation Gas Springs**

**252**

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## Features and benefits of KALLER Die Separation Gas Springs

KALLER Die Separation Gas Springs range from model sizes DS 3000 to DS 7500. Using the new DS springs is an excellent way to avoid unnecessary wear of the die, press and gas springs. A 70-80% energy saving compared to using traditional springs is an additional benefit.

- Initial forces from 30,000 to 75,000 N.
- Stroke lengths of 80 mm up to 300 mm
- Upper C-groove, lower U-groove and bottom threaded holes
- allow for various standard mounting possibilities.
- Suitable for both top up and bottom up working position in the tool
- A very slow return speed compared to traditional springs
- All KALLER Safety features included

## KALLER - THE SAFER CHOICE

### Training



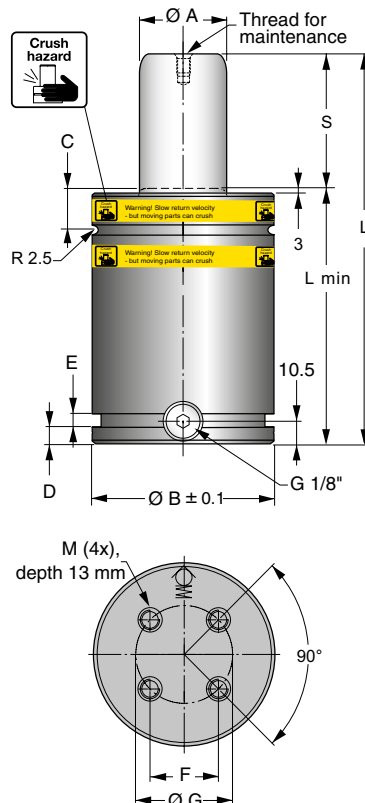
### Safety



### Reliability



Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/FAQ](http://www.kaller.com/FAQ)



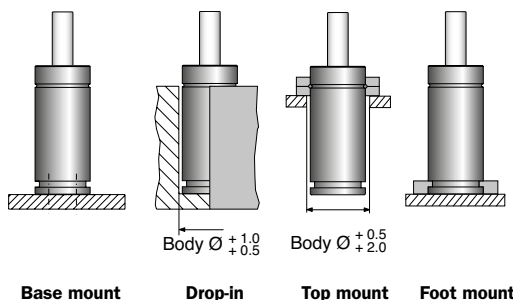
| Model   | Spring force in N<br>at 150* bar/ + 20°C |            | Ø A | Ø B   | C    | D | E | F    | Ø G | M   |
|---------|------------------------------------------|------------|-----|-------|------|---|---|------|-----|-----|
|         | Initial                                  | End force* |     |       |      |   |   |      |     |     |
| DS 3000 | 30,000                                   | 48,000     | 50  | 95.2  | 24   | 8 | 7 | 42.4 | 60  | M8  |
| DS 5000 | 50,000                                   | 82,000     | 65  | 120.2 | 25.5 | 8 | 7 | 56.6 | 80  | M10 |
| DS 7500 | 75,000                                   | 124,000    | 80  | 150.2 | 27.5 | 8 | 8 | 70.7 | 100 | M10 |

\* at full stroke

## Basic information

|                                     |                    |
|-------------------------------------|--------------------|
| Pressure medium .....               | Nitrogen           |
| Max. charging pressure .....        | 150 bar (at 20°C)  |
| Min. charging pressure .....        | 25 bar (at 20°C)   |
| Operating temperature .....         | 0 - +80°C          |
| Force increase by temperature ..... | ±0.3%/°C           |
| Recommended max. strokes/min .....  | ~20 - 50 (at 20°C) |
| Max. piston rod velocity .....      | 1.6 m/s            |
| Return speed variation .....        | ±3%                |
| Tube surface .....                  | Black oxide        |
| Repair kit DS 3000 .....            | 3026825            |
| Repair kit DS 5000 .....            | 3026826            |
| Repair kit DS 7500 .....            | 3026827            |

## Mounting possibilities



| Stroke [ mm ] |       | 80  | 100 | 125 | 160 | 200 | 250 | 300 |
|---------------|-------|-----|-----|-----|-----|-----|-----|-----|
| DS 3000       | L     | 280 | 320 | 370 | 440 | 520 | 620 | 720 |
|               | L min | 200 | 220 | 245 | 280 | 320 | 370 | 420 |
| DS 5000       | L     | 300 | 340 | 390 | 460 | 540 | 640 | 740 |
|               | L min | 220 | 240 | 265 | 300 | 340 | 390 | 440 |
| DS 7500       | L     | 315 | 355 | 405 | 475 | 555 | 655 | 755 |
|               | L min | 235 | 255 | 280 | 315 | 355 | 405 | 455 |

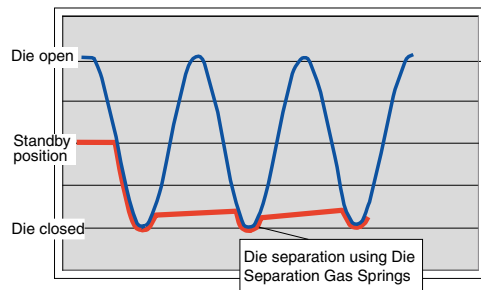
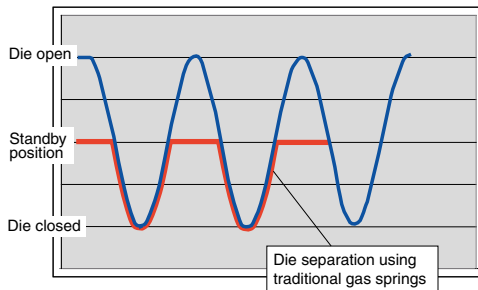
## Application example

When using traditional springs, for example four TU 5000 with a 250 stroke length for die separation in a die, each stroke applies an initial force of 20 ton ending with a force of 30 ton. **Diagram 1.**

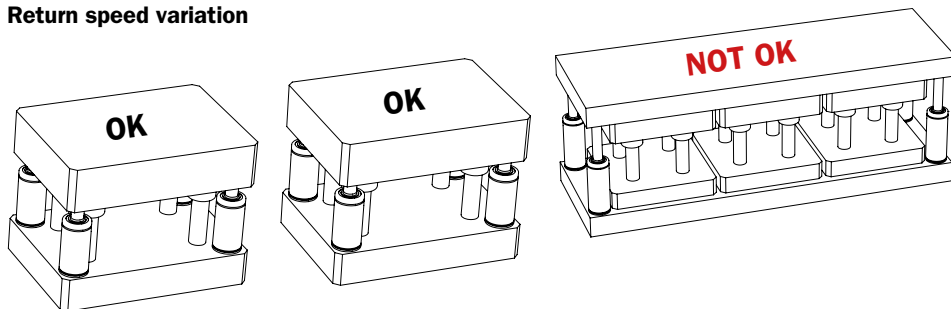
When using Die Separation Gas Springs in the same application, the force of each stroke is merely 10% compared to the TU springs. **Diagram 2.**

The return speed of the DS springs, 1-2 minutes to full return stroke, is very slow. However, this speed does not have a negative impact on the springs to return to the standby position when the production is completed.

Depending on the production rate, the piston rod will oscillate approximately 10% of its total stroke length during production.



## Return speed variation



Since we can not guarantee an absolute equal return speed, the DS gas springs are suitable for line dies, i.e. dies with not more than four pillars. Some progressive dies with multiple die sets are more sensitive to drawer effects and therefore not suitable for DS gas springs.





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| Roller Cam – Sensor Kit        | 257        |
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| Dimensions RCP2 150            | 258        |
| Dimensions RCP2 30 & RCP2 50   | 258        |
| Roller Cam – Driver Plate      | 259        |

# Roller Cam RC2 and RCP2

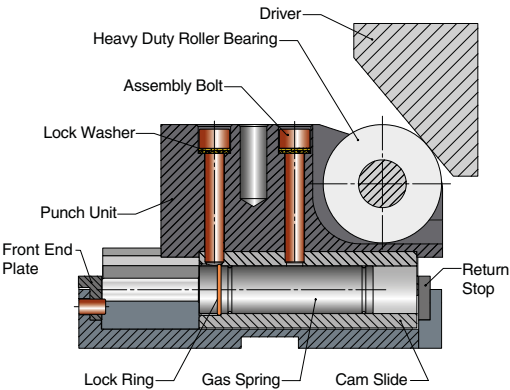
KALLER Roller Cam has been developed to meet the industry’s increasing demands on standard cam units.

This new generation offers:

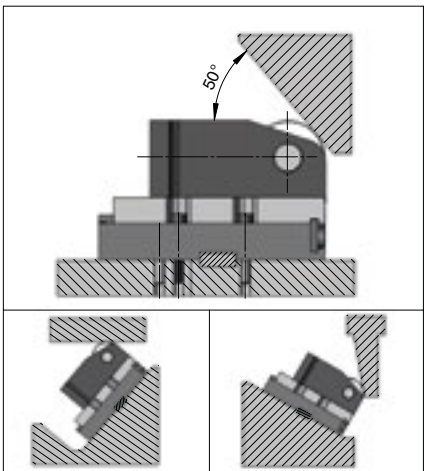
- High precision and maintenance free guiding allowing for more off center loading and upside-down installation
- Long service life
- Built in return stroke dampening
- Easy punch attachment. For other type of application, please contact your local distributor or Strömsholmen AB

The KALLER Roller Cam is available for a maximum piercing force of 30 kN, 50 kN and 150 kN. The driver itself is to be designed by the user to give the required displacement profile. The contact surface on the driver should be hardened to approximately 58-60 HRC. We recommend using KALLER Roller Cam driver plates.

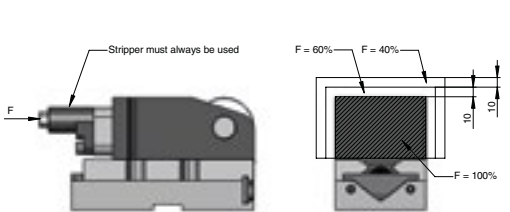
## Design



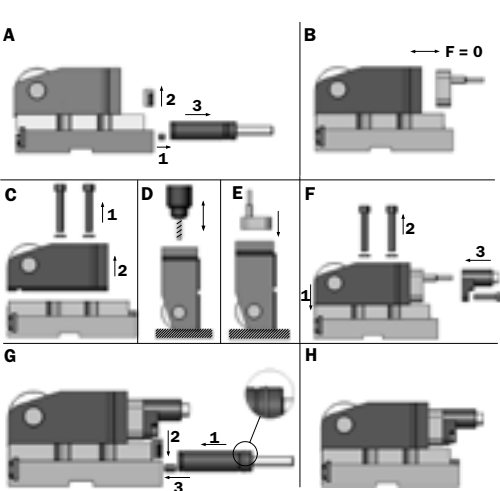
## Mounting options



## Punch location



## Punch attachment



## Basic information

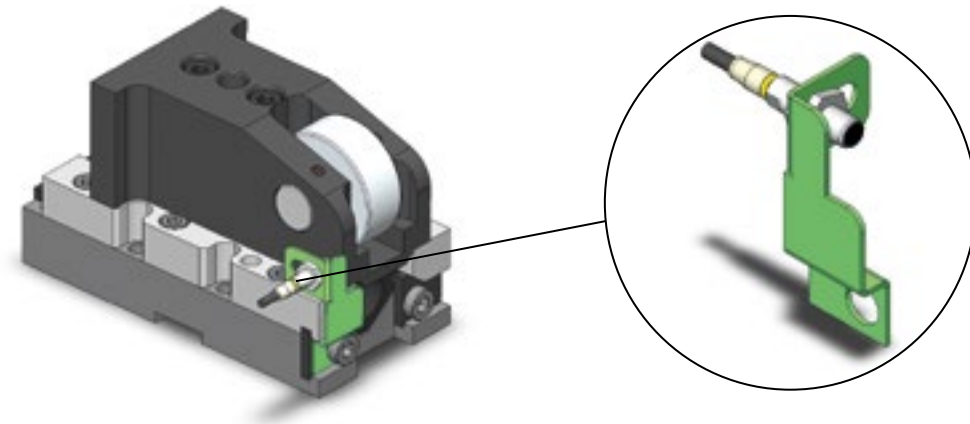
Recommended max. strokes/min ..... 40 spm (at 20°C)  
Max. Roller Cam velocity ..... 0.8 m/s  
Max. play at face of punch unit ..... 0.02 mm

Note! For information about max. attachment weight, please contact your local distributor or Strömsholmen AB.

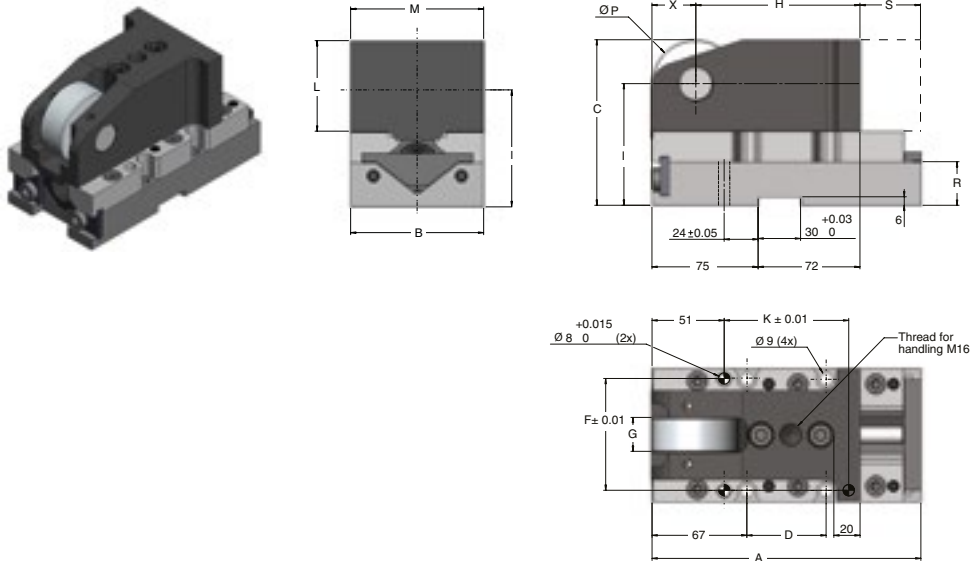
## Roller Cam – Sensor Kit

Roller Cam Sensor Kits are an optional accessory to all Roller Cams, providing a signal to the press when the Roller Cam is in start position. The Sensor Kit can easily be attached to the Roller Cam using return stop screw.

**Note!** For more information, please contact your local distributor or Strömsholmen AB.



## Dimensions RC2 30 & RC2 50

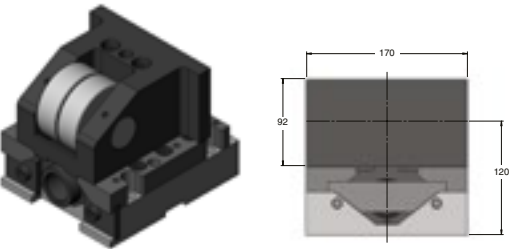


## RC2 30 & 50

| Order No.  | Stroke S<br>(mm) | Nominal<br>force (daN) | Initial return<br>force (daN) | Gas<br>spring | A   | B   | C   | D   | F   | G  | H   | I   | K   | L  | M   | P  | R  | X  | Max. width<br>of the driver |
|------------|------------------|------------------------|-------------------------------|---------------|-----|-----|-----|-----|-----|----|-----|-----|-----|----|-----|----|----|----|-----------------------------|
| RC2 30-050 | 50               | 3,000                  | 200                           | M2 200        | 190 | 94  | 117 | 56  | 79  | 25 | 116 | 86  | 88  | 64 | 94  | 62 | 31 | 31 | 36                          |
| RC2 30-080 | 80               |                        |                               |               | 220 |     |     | 86  |     |    |     | 118 |     |    |     |    |    |    |                             |
| RC2 50-050 | 50               | 5,000                  | 350                           | X 350         | 190 | 120 | 140 | 56  | 105 | 29 | 111 | 103 | 88  | 75 | 120 | 72 | 40 | 36 |                             |
| RC2 50-080 | 80               |                        |                               |               | 220 |     |     | 86  |     |    |     | 118 |     |    |     |    |    |    |                             |
| RC2 50-100 | 100              |                        |                               |               | 240 |     |     | 126 |     |    |     | 120 | 158 |    |     |    |    |    |                             |

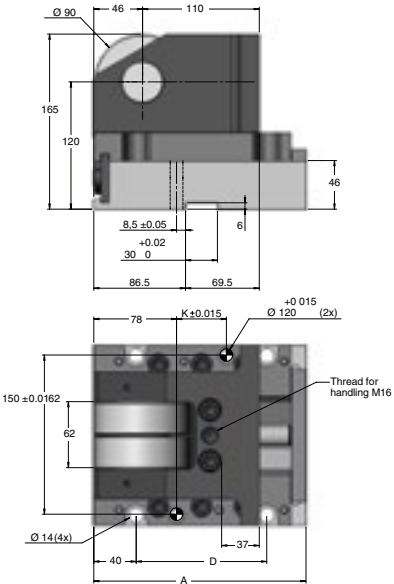
**Note!** For 2D & 3D CAD downloads, see [www.kaller.com](http://www.kaller.com).

Dimensions RCP2 150

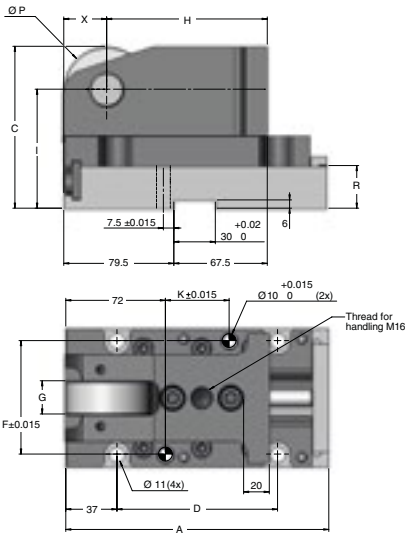
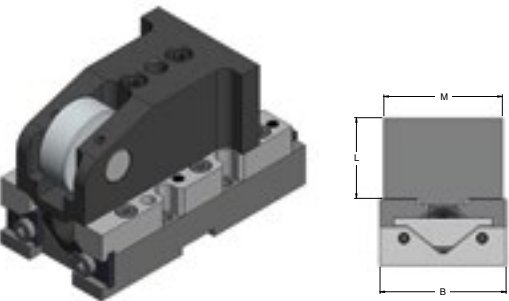


RCP2 150 - Dimensions as per PSA standard

| Order No.    | Stroke S (mm) | Nominal force (daN) | Initial return force (daN) | Gas spring | A   | D   | K  | Max. width of the driver |
|--------------|---------------|---------------------|----------------------------|------------|-----|-----|----|--------------------------|
| RCP2 150-050 | 50            | 15,000              | 500                        | X 500      | 200 | 123 | 47 | 65                       |
| RCP2 150-080 | 80            |                     |                            |            | 230 | 153 | 77 |                          |
| RCP2 150-100 | 100           |                     |                            |            | 250 | 173 | 97 |                          |



Dimensions RCP2 30 & RCP2 50



RCP2 30 & 50 - Dimensions as per PSA standard

| Order No.   | S Stroke (mm) | Nominal force (daN) | Initial return force (daN) | Gas spring | A   | B   | C   | D   | F   | G  | H   | I   | K  | L  | M   | P  | R  | X  | Max. width of the driver |
|-------------|---------------|---------------------|----------------------------|------------|-----|-----|-----|-----|-----|----|-----|-----|----|----|-----|----|----|----|--------------------------|
| RCP2 30-050 | 50            | 3,000               | 200                        | M2 200     | 190 | 100 | 117 | 116 | 82  | 25 | 116 | 86  | 46 | 64 | 94  | 62 | 31 | 31 | 36                       |
| RCP2 30-080 | 80            |                     |                            |            | 220 | 120 | 140 | 146 |     |    |     |     | 76 |    |     |    |    |    |                          |
| RCP2 50-050 | 50            | 5,000               | 350                        | X 350      | 190 |     |     | 116 |     |    |     |     | 46 |    |     |    |    |    |                          |
| RCP2 50-080 | 80            |                     |                            |            | 220 | 120 | 140 | 146 | 102 | 29 | 111 | 103 | 76 | 75 | 120 | 72 | 40 | 36 |                          |
| RCP2 50-100 | 100           |                     |                            |            | 240 |     |     | 166 |     |    |     |     | 96 |    |     |    |    |    |                          |

**Note!** For 2D & 3D CAD downloads, see [www.kaller.com](http://www.kaller.com)

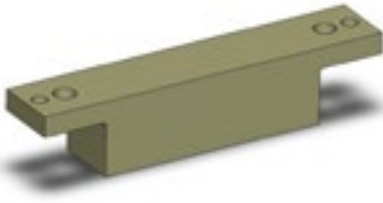
## Roller Cam – Driver Plate

KALLER Roller Cam Driver Plate has been designed to simplify the installation of Roller Cams.

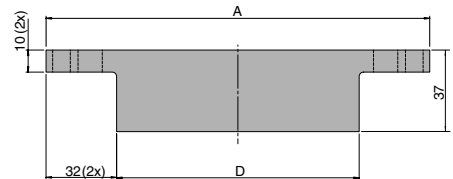
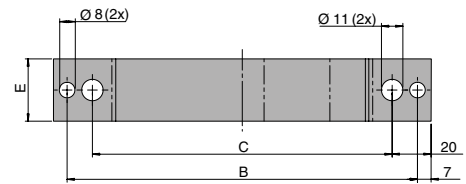
- Ground and hardened contact surface (60 HRC)
- Standardized sizes
- Independent of installation angle



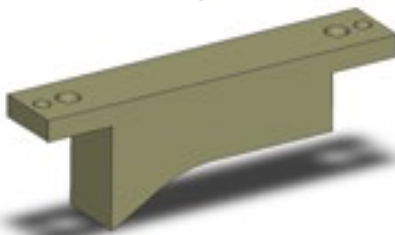
### Driver Plate – Flat



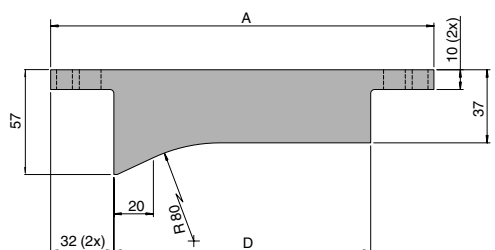
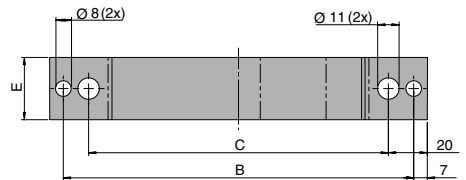
| Order No.  | A   | B   | C   | D   | E  | Weight [kg] |
|------------|-----|-----|-----|-----|----|-------------|
| 3021265-01 | 174 | 160 | 134 | 110 | 32 | 1.16        |
| 3021265-02 | 264 | 250 | 224 | 200 | 32 | 2.00        |



### Driver Plate – Soft Start & Stop



| Order No.  | A   | B   | C   | D   | E  | Weight [kg] |
|------------|-----|-----|-----|-----|----|-------------|
| 3021570-01 | 194 | 180 | 154 | 130 | 32 | 1.43        |
| 3021570-02 | 284 | 270 | 244 | 220 | 32 | 2.27        |
| 3021570-03 | 194 | 180 | 154 | 130 | 65 | 2.91        |
| 3021570-04 | 284 | 270 | 244 | 220 | 65 | 4.61        |







|                                                           | Page       |
|-----------------------------------------------------------|------------|
| <b>Pressure Tank</b>                                      | <b>262</b> |
| About Pressure Tanks                                      | 263        |
| Bracket fixtures for Pressure Tanks                       | 264        |
| Installation Example, Pressure Tank with E024-Hose System | 265        |

## Pressure Tank

Pressure Tanks are used together with the E024-Hose system (or its equivalent) in applications where a low pressure/force build-up in the Hose System is advantageous (e.g. for deep draw tooling applications).

By incorporating a Pressure Tank(s) into your Hose System, the overall gas volume in the Hose System increases, which causes the pressure/force build-up to be kept to a minimum.

Apart from the technical advantage of having a low pressure/force build-up in the Hose System, the service lifetime of the gas springs connected in the Hose System is also improved.

### Please note!

Before incorporating pressure tanks into your Hose System, you may want to consider whether it is possible to use a longer nominal stroke gas spring of the same model.

This method will have the effect of increasing the internal gas volume in your Hose System, thus reducing the pressure/force build-up.

## KALLER - THE SAFER CHOICE

### Training



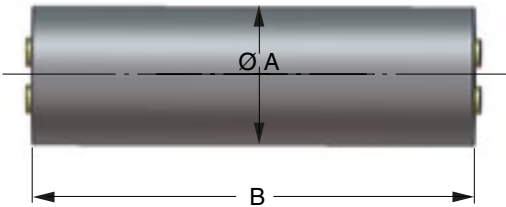
### Reliability



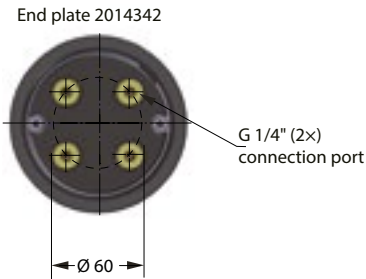
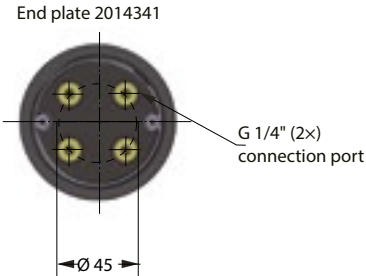
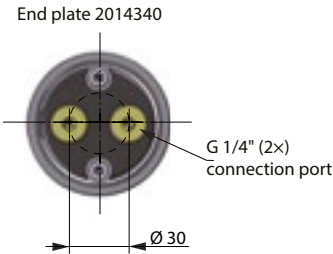
Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/FAQ](http://www.kaller.com/FAQ)



About Pressure Tanks



| Order No.   | Volume L | Ø A | B    |
|-------------|----------|-----|------|
| 2014340-025 | 0.25     | 75  | 170  |
| 2014340-050 | 0.5      | 75  | 250  |
| 2014340-100 | 1.0      | 75  | 410  |
| 2014341-100 | 1.0      | 95  | 300  |
| 2014341-200 | 2.0      | 95  | 500  |
| 2014341-300 | 3.0      | 95  | 700  |
| 2014341-400 | 4.0      | 95  | 900  |
| 2014342-200 | 2.0      | 120 | 360  |
| 2014342-400 | 4.0      | 120 | 615  |
| 2014342-800 | 8.0      | 120 | 1125 |



Approximate calculation of isothermal pressure force build-up:

Pressure force build up  $\approx \frac{VPT_{PT} + (n \cdot VGS_{GS})}{VPT_{PT} + (n \cdot (VGS_{GS} - S \cdot A))}$

VPT = Volume of Pressure Tank (l) (see table above)  
VGS = Gas volume of gas spring (l) (see respective spring model)  
S = Stroke length of gas spring (dm) (see respective spring model)  
A = Piston rod area of gas spring (dm²) (see adjacent table)  
n = Number of gas springs

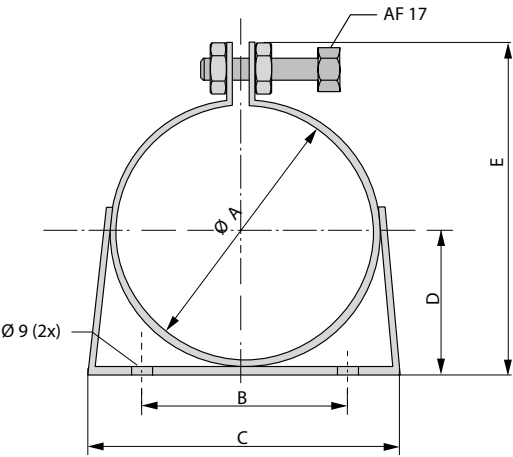
Example:  
Ten TU 5000 gas springs with stroke length 50 mm are connected to a Hose-System with one 8 litre Pressure Tank (2014342-800).

| Gas Spring Size | Piston Rod Area (dm²) |
|-----------------|-----------------------|
| 500             | 0.031                 |
| 750             | 0.049                 |
| 1500            | 0.102                 |
| 3000            | 0.196                 |
| 5000            | 0.332                 |
| 7500            | 0.503                 |
| 10000           | 0.709                 |

Pressure force build up  $\approx \frac{8 + (10 \cdot 0.51)}{8 + (10 \cdot (0.51 - 0.50 \cdot 0.332))} \approx 1.145$

Bracket fixtures for Pressure Tanks

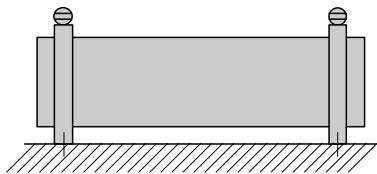
The bracket consists of a rubber-covered ring of galvanised sheet steel and is used to secure the Pressure Tank, preferably with one bracket at each end. If the tank is mounted vertically it should also rest on a solid support, see figures below.



| Order No. | $\varnothing A$ | B   | C   | D    | E   |
|-----------|-----------------|-----|-----|------|-----|
| 500558    | 75              | 80  | 105 | 41.5 | 102 |
| 500559    | 95              | 100 | 145 | 51.5 | 122 |
| 500560    | 120             | 100 | 145 | 64   | 147 |

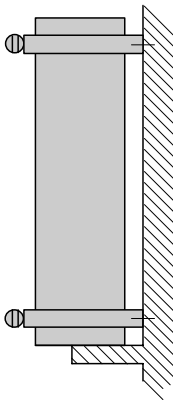
Fixing bracket assembly

Horizontal

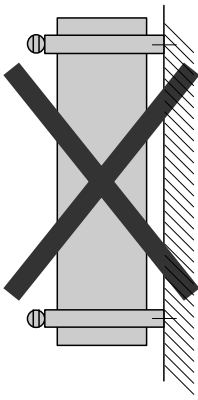


Vertical

Correct



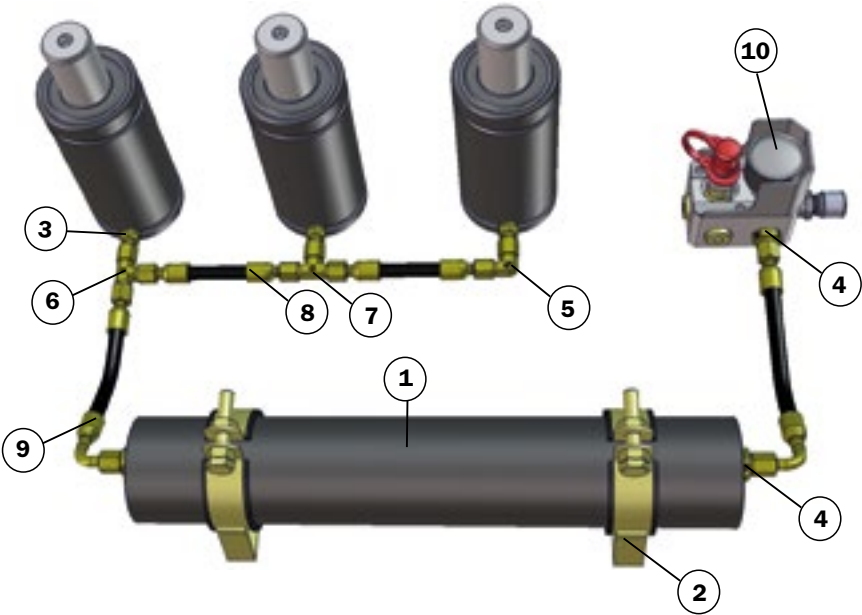
Incorrect



## Installation Example, Pressure Tank with E024-Hose System

Please note the following before installing a Pressure Tank into your Hose System:

- Use only hoses designed to allow for gas flow, such as the E024-Hose system or its equivalent
- Connect a Control Block to one of the Pressure Tank's connection ports
- For optimal function each gas spring should be directly connected to one of the Pressure Tank's connection ports



| Position | QTY. | Order No.    | Description                   |
|----------|------|--------------|-------------------------------|
| 1        | 1    | 3014340-0100 | Pressure tank 1L              |
| 2        | 2    | 500558       | Bracket Pressure tank         |
| 3        | 3    | 503593       | Male Stud Connector G1/8"     |
| 4        | 3    | 504144       | Male Stud Connector G1/4"     |
| 5        | 1    | 504146       | Swivel Nut Elbow 90°          |
| 6        | 1    | 504147       | Swivel Nut Run Tee            |
| 7        | 1    | 504148       | Swivel Nut Branch Tee         |
| 8        | 6    | 3020857-xxxx | E024 Straight - Straight Hose |
| 9        | 2    | 3220857-xxxx | E024 Straight - 90° Hose      |
| 10       | 3    | 4116114-02   | Control Block                 |





**Page**

**Technical Facts**

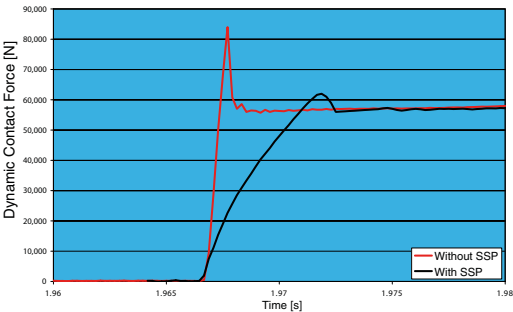
**264**

Technical Facts

Soft-Hit Striker Plates (SSP) have been engineered to address three of the major problems that face metal stampers:

- Excessive shock loads
- High noise levels
- Poor part quality

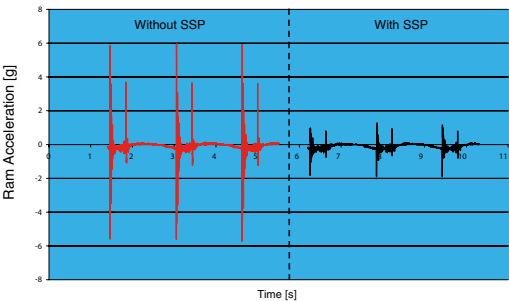
Function



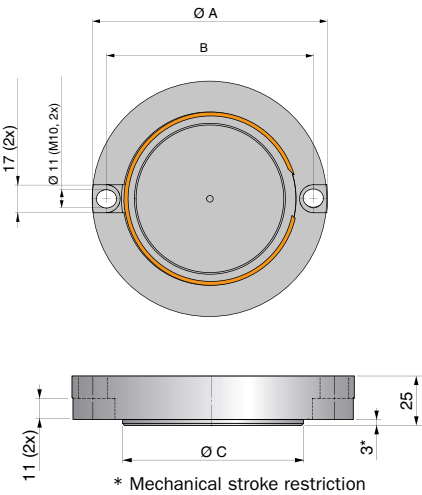
SSP contain a specially developed dampening element that absorbs unwanted shock loads that can lead to high press maintenance, noise pollution and poor part quality.

Features:

- Suitable for mechanical springs, gas springs and air cushion pins
- For spring forces from 7,500 to 10,0000 N
- 1 million hit service life
- Low build height
- Double countersunk mounting holes (M10)
- Hardened contact surface
- Up to 20 strokes per minute

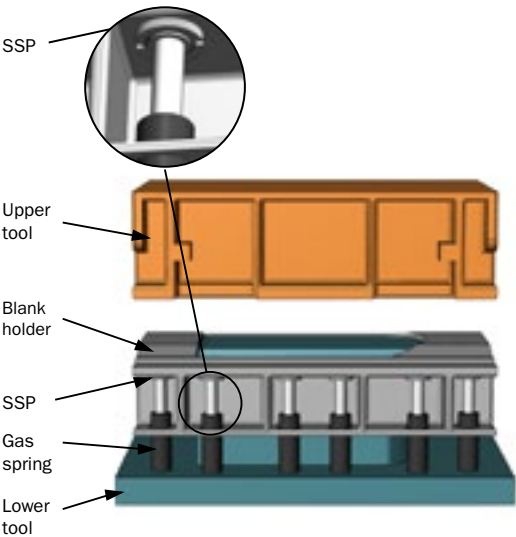


Dimensions



| Model     | Gas spring forces                | $\varnothing A$ | B   | $\varnothing C$ |
|-----------|----------------------------------|-----------------|-----|-----------------|
| SSP 1500  | 750 up to and including 1,500    | 108             | 91  | 58              |
| SSP 5000  | 1,500 up to and including 6,600  | 143             | 126 | 92              |
| SSP 10000 | 6,600 up to and including 10,000 | 167             | 150 | 112             |

Application



Patent SE 526 302, US 7,818, 988 and other patents pending.



**Page**

|                                                                                                   |            |
|---------------------------------------------------------------------------------------------------|------------|
| <b>KALLER HOSE-LESS BASEPLATE™ – the easy-accessible alternative</b>                              | <b>270</b> |
| KALLER Hose-less Baseplate™ is less expensive, has a better performance and is easier to maintain | 271        |
| KALLER gas springs BP adapted to baseplate                                                        | 272        |
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| Recommendations for KALLER Hose-less Baseplate™ layouts                                           | 274        |

## KALLER Hose-less Baseplate™ – the easy-accessible alternative

**KALLER Hose-less Baseplate™ is the increasingly popular easy-accessible alternative to the conventional hoses plate systems on the market. This KALLER product provides all the benefits of self-contained gas springs in a linked system, yet eliminates external plumbing. In addition, fitted with one or more Hose-less Baseplate Tanks (Tank BP) the pressure increase can be reduced resulting for example in press energy savings and more consistent force. With this possibility to reduce the pressure increase KALLER Hose-less Baseplate™ also fits General Motors (GM) standards requirements.**

KALLER Hose-less Baseplate™ utilizes KALLER CU4, CX, TL, TU, TX, X and LCF gas springs mounted to a customer specified base plate through a bottom port. The gas springs are attached to the internally drilled base plate with a sealing washer or adapter and standard mounting hardware. All the connecting passages are drilled within the plate, removing the need for external hose and fittings. >>>

### KALLER - THE SAFER CHOICE

#### Training



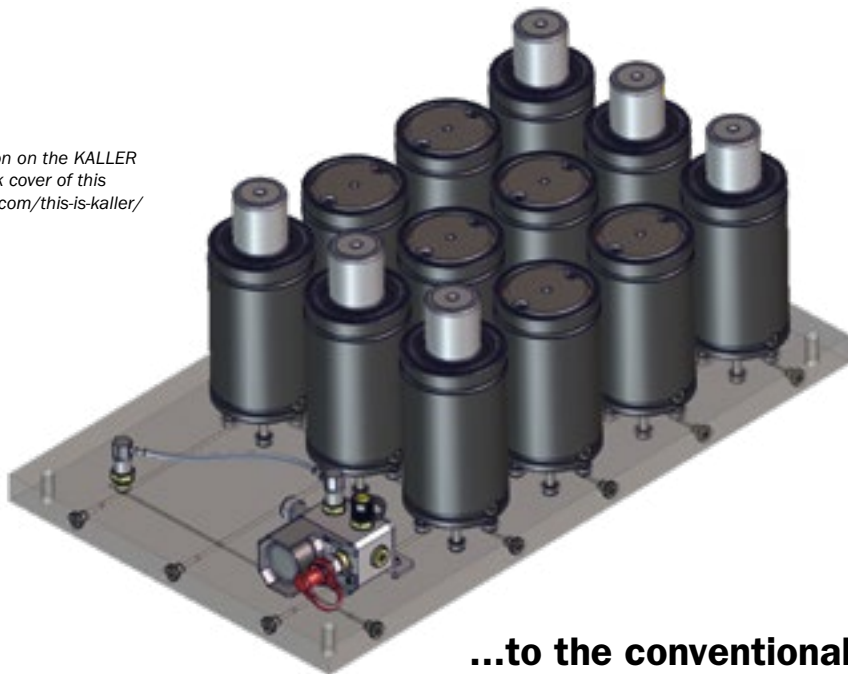
#### Safety



#### Reliability



Need additional information on the KALLER features? Look at the back cover of this brochure or at [www.kaller.com/this-is-kaller/the-safer-choice](http://www.kaller.com/this-is-kaller/the-safer-choice).



Safety features stated for individual KALLER gas springs are valid also when used in a KALLER Hose-less Baseplate™. An external stop for the tool is recommended to prevent overstroke in the springs.

**...to the conventional  
hosed plate systems  
on the market**

## KALLER Hose-less Baseplate™ is less expensive, has a better performance and is easier to maintain

>>>

KALLER Hose-less Baseplate™ facilitates filling, draining and monitoring from one control panel mounted directly to the baseplate or from outside the die using a KALLER standard linking system.

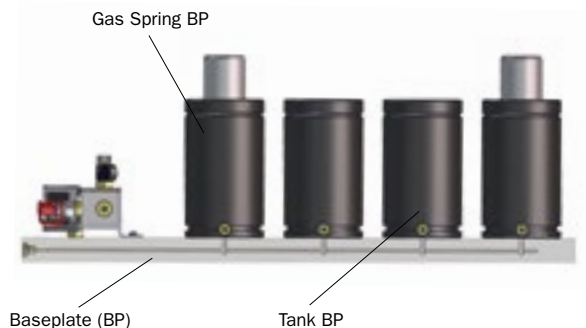
KALLER Hose-less Baseplate™ provides a cleaner die design with the possibility to place more gas springs close together and also eliminate clearance for hoses and connections. This makes the installation easier to maintain compared to other hose linked systems on the market. Each product is factory tested to assure leak-free operation and is shipped ready to install.

To obtain a complete KALLER Hose-less Baseplate™ system you will need:

- KALLER gas springs CU4, CX, TL, TU, TX, X and LCF adapted with square seal or adapter to base-plate
- One or more KALLER Hose-less Baseplate Tanks (Tank BP) to achieve the demanded pressure increase
- A control block with suitable fittings to link to the baseplate
- A customized baseplate produced by the customer or ordered from KALLER offices

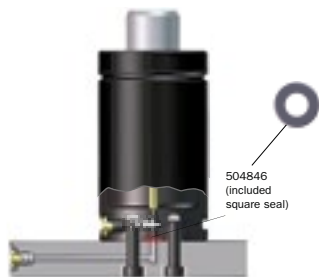
**...with the possibility to reduce pressure increase**

**...and it comes with more power in less space !**



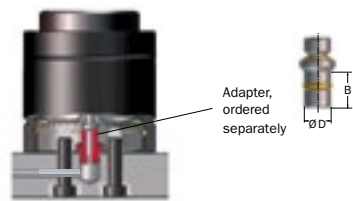
KALLER gas springs BP adapted to baseplate

Hose-less  
Baseplate with  
square seal



Note!  
Installation layout may  
vary between models.

Hose-less Base-  
plate with adapters



| Adapter Model | Order No. | Ø D | B |
|---------------|-----------|-----|---|
| CU 10         | 4016253   | 10  | 8 |
| CU 11         | 4025110   | 11  | 8 |
| CX 6          | 4026218   | 6   | 9 |

KALLER gas springs BP with included square seal

| Series | Square seal | Ø A [m]<br>Hole size | Model       | Thread size | Torque [Nm]<br>12.9 |
|--------|-------------|----------------------|-------------|-------------|---------------------|
| X      | 504847      | 5                    | X BP 500    | M6          | 15                  |
|        |             |                      | X BP 750    |             |                     |
|        |             |                      | X BP 1000   | M8          | 35                  |
|        |             |                      | X BP 1500   |             |                     |
|        | 504846      | 8                    | X BP 2400   | M10         | 70                  |
|        |             |                      | X BP 4200   |             |                     |
|        |             |                      | X BP 6600   | M12         | 115                 |
|        |             |                      | X BP 9500   |             |                     |
| TX     | 504847      | 5                    | TX BP 750   | M8          | 40                  |
|        |             |                      | TX BP 1000  |             |                     |
|        |             |                      | TX BP 1500  |             |                     |
|        |             |                      | TX BP 2400  |             |                     |
|        | 504846      | 8                    | TX BP 4200  | M10         | 79                  |
|        |             |                      | TX BP 6600  |             |                     |
|        |             |                      | TX BP 9500  | M12         | 136                 |
|        |             |                      | TX BP 20000 |             |                     |

| Series | Square seal | Ø A [m]<br>Hole size | Model       | Thread size | Torque [Nm]<br>12.9 |
|--------|-------------|----------------------|-------------|-------------|---------------------|
| TU     | 504847      | 5                    | TU BP 500   | M8          | 40                  |
|        |             |                      | TU BP 750   |             |                     |
|        |             |                      | TU BP 1500  |             |                     |
|        | 505978      | 8                    | TU BP 3000  | M10         | 79                  |
|        |             |                      | TU BP 5000  |             |                     |
|        | 504846      | 8                    | TU BP 7500  | M12         | 136                 |
| TL     | 504847      | 5                    | TL BP 750   | M8          | 40                  |
|        |             |                      | TL BP 1500  |             |                     |
|        | 505978      | 8                    | TL BP 3000  | M10         | 79                  |
|        |             |                      | TL BP 5000  |             |                     |
| LCF    | 504847      | 5                    | LCF BP 3000 | M8          | 40                  |
|        |             |                      | LCF BP 5000 |             |                     |
|        |             |                      | LCF BP 7500 |             |                     |

For more information, see KALLER catalog "Gas Spring Systems and Standard Mounts".

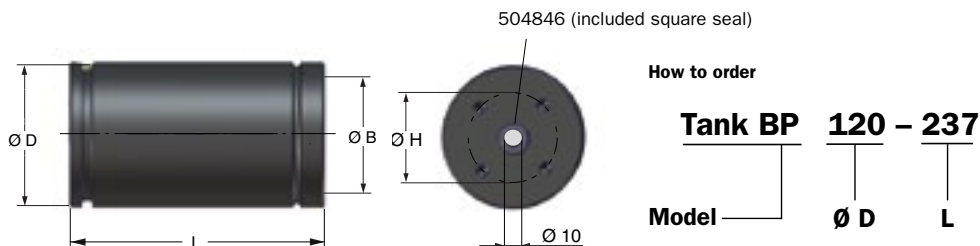
KALLER gas springs BP and adapters

| Series | Model     | Thread size | Torque [Nm]<br>class 12.9 |
|--------|-----------|-------------|---------------------------|
| CU4    | CU4 1800  | M6          | 17                        |
|        | CU4 2900  |             |                           |
|        | CU4 4700  | M8          | 40                        |
|        | CU4 7500  |             |                           |
|        | CU4 11800 | M10         | 79                        |
|        | CU4 18300 |             |                           |
| CX     | CX 500    | M6          | 15                        |
|        | CX 1000   |             |                           |
|        | CX 1900   |             |                           |

| Series | BP adapter         |
|--------|--------------------|
| CU4    | 4025110 or 4016253 |
| CX     | 4026218            |

The adapters above have to be ordered separately when CU4 and CX are used.

## KALLER Hose-less Baseplate Tanks (Tank BP) suitable for base plate mounting



| Model           | Ø D [mm] | L [mm] | Volume [l] | Ø B [mm] | Bottom Thread | Depth | Torque (Nm) Class 12 | Ø H [mm] |
|-----------------|----------|--------|------------|----------|---------------|-------|----------------------|----------|
| Tank BP 95-167  | 95       | 167    | 0.6        | 80       | M8            | 13    | 40                   | 60       |
| Tank BP 95-217  |          | 217    | 0.8        |          |               |       |                      |          |
| Tank BP 95-277  |          | 277    | 1.1        |          |               |       |                      |          |
| Tank BP 95-317  |          | 317    | 1.3        |          |               |       |                      |          |
| Tank BP 95-367  |          | 367    | 1.6        |          |               |       |                      |          |
| Tank BP 95-417  |          | 417    | 1.8        |          |               |       |                      |          |
| Tank BP 95-467  |          | 467    | 2.1        |          |               |       |                      |          |
| Tank BP 95-517  |          | 517    | 2.3        |          |               |       |                      |          |
| Tank BP 120-187 | 120      | 187    | 1          | 100      | M10           | 13    | 79                   | 80       |
| Tank BP 120-237 |          | 237    | 1.4        |          |               |       |                      |          |
| Tank BP 120-297 |          | 297    | 1.9        |          |               |       |                      |          |
| Tank BP 120-337 |          | 337    | 2.2        |          |               |       |                      |          |
| Tank BP 120-387 |          | 387    | 2.6        |          |               |       |                      |          |
| Tank BP 120-437 |          | 437    | 3.0        |          |               |       |                      |          |
| Tank BP 120-487 |          | 487    | 3.4        |          |               |       |                      |          |
| Tank BP 120-537 |          | 537    | 3.8        |          |               |       |                      |          |
| Tank BP 150-202 | 150      | 202    | 1.6        | 125      | M10           | 16    | 79                   | 100      |
| Tank BP 150-252 |          | 252    | 2.2        |          |               |       |                      |          |
| Tank BP 150-312 |          | 312    | 3.0        |          |               |       |                      |          |
| Tank BP 150-352 |          | 352    | 3.5        |          |               |       |                      |          |
| Tank BP 150-402 |          | 402    | 4.1        |          |               |       |                      |          |
| Tank BP 150-452 |          | 452    | 4.7        |          |               |       |                      |          |
| Tank BP 150-502 |          | 502    | 5.4        |          |               |       |                      |          |
| Tank BP 150-552 |          | 552    | 6.0        |          |               |       |                      |          |
| Tank BP 195-207 | 195      | 207    | 2.7        | 160      | M12           | 16    | 136                  | 120      |
| Tank BP 195-257 |          | 257    | 3.7        |          |               |       |                      |          |
| Tank BP 195-317 |          | 317    | 4.9        |          |               |       |                      |          |
| Tank BP 195-357 |          | 357    | 5.7        |          |               |       |                      |          |
| Tank BP 195-407 |          | 407    | 6.7        |          |               |       |                      |          |
| Tank BP 195-457 |          | 457    | 7.7        |          |               |       |                      |          |
| Tank BP 195-507 |          | 507    | 8.8        |          |               |       |                      |          |
| Tank BP 195-557 |          | 557    | 9.8        |          |               |       |                      |          |

To optimize the installation of a base plate, please contact your KALLER Distributor or use the KALLER Force Calculator at [kaller.com](http://kaller.com).

**...offer the possibility to  
reduce pressure increase**

Recommendations for KALLER Hose-less Baseplate™ layouts

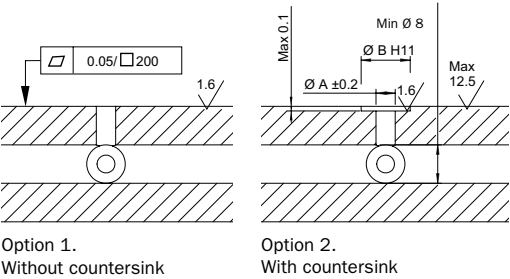
Unless otherwise specified.

A complete customized and factory tested baseplate can be ordered from KALLER Sales & Service Offices.  
(See [kaller.com/contact/](http://kaller.com/contact/))

KALLER Worldwide Guarantee applies to each complete system manufactured by KALLER.

Baseplate hole pattern

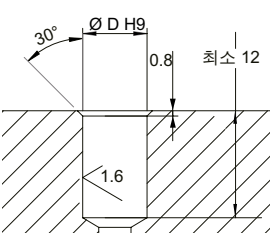
To achieve the most cost efficient machining solution, the following options can be used. The plate thickness depends on the number and size of the gas springs and the gas flow.



| Square Seal | Ø A [mm] | Ø B H11 [mm] |
|-------------|----------|--------------|
| 504847      | 5        | 11.1         |
| 505978      | 8        | 14.3         |
| 504846      | 8 or 10* | 19.0         |

\*Ø 10 mm holes are used for all gas tanks.  
It should be at least two outlets between the gas tank and the gas springs.

Adapter hole pattern



| Adapter Model | Order No. | Ø D H9 [mm] |
|---------------|-----------|-------------|
| CU 10         | 4016253   | 10          |
| CU 11         | 4025110   | 11          |
| CX 6          | 4026218   | 6           |

Basic information

Pressure medium ..... Nitrogen gas (N2)  
Max. charging pressure..... 150 bar  
Min. charging pressure ..... 25 bar\*\*  
Operating temperature..... 0+80°C  
Plate thickness ..... Min. 25 mm, .98"  
Plate edges ..... Burned out and painted  
Fasteners ..... Metric High Grade Bolts  
Drilled holes ..... see table above  
Min. wall thickness..... 2.5 mm

Baseplate O-ring repl. kit..... 3025238  
Plug G 1/4 ..... 501866  
Plug G 1/8 ..... 502508  
For information about adapters and hoses,  
please see KALLER catalog "Hose Link Systems".

\* Varies by system configuration  
\*\* for LCF, see KALLER catalog vol.1

...for a more simple  
and efficient use

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**NOMINAL DIMENSIONS IN MM****276**

ISO Tolerances For Holes and Shafts

276

Metric Socket Head Cap Screws

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Torque wrench settings in Nm for untreated, oiled steel screw fasteners

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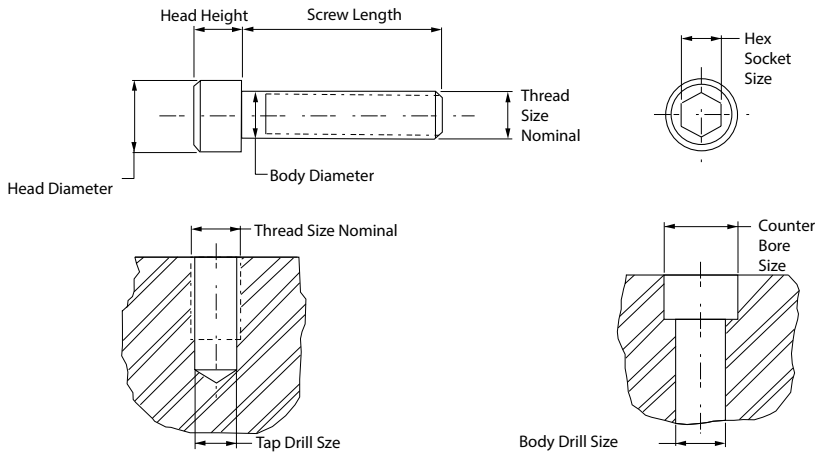
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ISO Tolerances For Holes and Shafts

Nominal Dimensons in mm - Tolerances in micrometers (10 -6 meter)

| External Dimensions (shafts) |                |                   |                    |                     |                     |                     | Internal Dimensions (bores) |              |                   |                    |                     |                     |                     |
|------------------------------|----------------|-------------------|--------------------|---------------------|---------------------|---------------------|-----------------------------|--------------|-------------------|--------------------|---------------------|---------------------|---------------------|
| Symbol                       | 1<br>up to 3   | over 3<br>up to 6 | over 6<br>up to 10 | over 10<br>up to 18 | over 18<br>up to 30 | over 30<br>up to 50 | Symbol                      | 1<br>up to 3 | over 3<br>up to 6 | over 6<br>up to 10 | over 10<br>up to 18 | over 18<br>up to 30 | over 30<br>up to 50 |
| e 8                          | -14<br>-28     | -20<br>-38        | -25<br>-47         | -32<br>-59          | -40<br>-73          | -50<br>-89          | E 8                         | +28<br>+14   | +38<br>+20        | +47<br>+25         | +59<br>+32          | +73<br>+40          | +89<br>+50          |
| g 5                          | -2<br>-6       | -4<br>-9          | -5<br>-11          | -6<br>-14           | -7<br>-16           | -9<br>-20           | F 7                         | +16<br>+6    | +22<br>+10        | +28<br>+13         | +34<br>+16          | +41<br>+20          | +50<br>+25          |
| g 6                          | -2<br>-8       | -4<br>-12         | -5<br>-14          | -6<br>-17           | -7<br>-20           | -9<br>-25           | G 6                         | +8<br>+2     | +12<br>+4         | +14<br>+5          | +17<br>+6           | +20<br>+7           | +25<br>+9           |
| h 3                          | 0<br>-2        | 0<br>-2.5         | 0<br>-2.5          | 0<br>-3             | 0<br>-4             | 0<br>-4             | G 7                         | +12<br>+2    | +16<br>+4         | +20<br>+5          | +24<br>+6           | +28<br>+7           | +34<br>+9           |
| h 5                          | 0<br>-4        | 0<br>-5           | 0<br>-6            | 0<br>-8             | 0<br>-9             | 0<br>-11            | H 5                         | +4<br>0      | +5<br>0           | +6<br>0            | +8<br>0             | +9<br>0             | +11<br>0            |
| h 6                          | 0<br>-6        | 0<br>-8           | 0<br>-9            | 0<br>-11            | 0<br>-13            | 0<br>-16            | H 6                         | +6<br>0      | +8<br>0           | +9<br>0            | +11<br>0            | +13<br>0            | +16<br>0            |
| h 8                          | 0<br>-14       | 0<br>-18          | 0<br>-22           | 0<br>-27            | 0<br>-33            | 0<br>-39            | H 7                         | +10<br>0     | +12<br>0          | +15<br>0           | +18<br>0            | +21<br>0            | +25<br>0            |
| h 9                          | 0<br>-25       | 0<br>-30          | 0<br>-36           | 0<br>-43            | 0<br>-52            | 0<br>-62            | H 8                         | +14<br>0     | +18<br>0          | +22<br>0           | +27<br>0            | +33<br>0            | +39<br>0            |
| h 10                         | 0<br>-40       | 0<br>-48          | 0<br>-58           | 0<br>-70            | 0<br>-84            | 0<br>-100           | H 9                         | +25<br>0     | +30<br>0          | +36<br>0           | +43<br>0            | +52<br>0            | +62<br>0            |
| h 11                         | 0<br>-60       | 0<br>-75          | 0<br>-90           | 0<br>-110           | 0<br>-130           | 0<br>-160           | H 10                        | +40<br>0     | +48<br>0          | +58<br>0           | +70<br>0            | +84<br>0            | +100<br>0           |
| j 6                          | +4<br>-2       | +6<br>-2          | +7<br>-2           | +8<br>-3            | +9<br>-4            | +11<br>-5           | H 11                        | +60<br>0     | +75<br>0          | +90<br>0           | +106<br>0           | +130<br>0           | +160<br>0           |
| js 6                         | +3<br>-3       | +4<br>-4          | +4.5<br>-4.5       | +5.5<br>-5.5        | +6.5<br>-6.5        | +8<br>-8            | H 12                        | +100<br>0    | +120<br>0         | +150<br>0          | +180<br>0           | +210<br>0           | +250<br>0           |
| js 7                         | +5<br>-5       | +6<br>-6          | +7.5<br>-7.5       | +9<br>-9            | +10.5<br>-10.5      | +12.5<br>-12.5      | J 6                         | +2<br>-4     | +5<br>-3          | +5<br>-4           | +6<br>-5            | +8<br>-5            | +10<br>-6           |
| js 8                         | +7<br>-7       | +9<br>-9          | +11<br>-11         | +13.5<br>-13.5      | +16.5<br>-16.5      | +19.5<br>-19.5      | J 7                         | +4<br>-6     | +6<br>-6          | +8<br>-7           | +10<br>-8           | +12<br>-9           | +14<br>-11          |
| js 9                         | +12.5<br>-12.5 | +15<br>-15        | +18<br>-18         | +21.5<br>-21.5      | +26<br>-26          | +31<br>-31          | JS 5                        | +2<br>-2     | +2.5<br>-2.5      | +3<br>-3           | +4<br>-4            | +4.5<br>-4.5        | +5.5<br>-5.5        |
| js 13                        | +70<br>-70     | +90<br>-90        | +110<br>-110       | +135<br>-135        | +165<br>-165        | +195<br>-195        | K 6                         | 0<br>-6      | +2<br>-6          | +2<br>-7           | +2<br>-9            | +2<br>-11           | +3<br>-13           |
| js 14                        | +125<br>-125   | +150<br>-150      | +180<br>-180       | +215<br>-215        | +260<br>-260        | +310<br>-310        | K 7                         | 0<br>-10     | +3<br>-9          | +5<br>-10          | +6<br>-12           | +6<br>-15           | +7<br>-18           |
| k 6                          | +6<br>0        | +9<br>+1          | +10<br>+1          | +12<br>+1           | +15<br>+2           | +18<br>+2           | K 8                         | 0<br>-14     | +5<br>-13         | +6<br>-16          | +8<br>-19           | +10<br>-23          | +12<br>-27          |
| k 7                          | +10<br>0       | +13<br>+1         | +16<br>+1          | +19<br>+1           | +23<br>+2           | +27<br>+2           | M 6                         | -2<br>-8     | -1<br>-9          | -3<br>-12          | -4<br>-15           | -4<br>-17           | -4<br>-20           |
| m 4                          | +5<br>+2       | +8<br>+4          | +10<br>+6          | +12<br>+7           | +14<br>+8           | +16<br>+9           | M 7                         | -2<br>-62    | 0<br>-12          | 0<br>-15           | 0<br>-18            | 0<br>-21            | 0<br>-25            |
| m 5                          | +6<br>+2       | +9<br>+4          | +12<br>+6          | +15<br>+7           | +17<br>+8           | +20<br>+9           | N 7                         | -4<br>-14    | -4<br>-16         | -4<br>-19          | -5<br>-23           | -7<br>-28           | -8<br>-33           |
| n 6                          | +10<br>+4      | +16<br>+8         | +19<br>+10         | +23<br>+12          | +28<br>+15          | +33<br>+17          | P 7                         | -6<br>-16    | -8<br>-20         | -9<br>-24          | -11<br>-29          | -14<br>-35          | -17<br>-42          |

# Metric Socket Head Cap Screws



| Thread Size Nominal | Pitch | Body Diameter Max. | Head Diameter Max. | Head Height Max. | Hex. Socket Size | Counter Bore Size | Body Drill Size | Tap Drill Size |
|---------------------|-------|--------------------|--------------------|------------------|------------------|-------------------|-----------------|----------------|
| M 4                 | 0.7   | 4.0                | 7.0                | 4.0              | 3.0              | 8.5               | 5.0             | 3.3            |
| M 6                 | 1.0   | 6.0                | 10.0               | 6.0              | 5.0              | 11.0              | 6.6             | 5.0            |
| M 8                 | 1.25  | 8.0                | 13.0               | 8.0              | 6.0              | 15.0              | 9.0             | 6.75           |
| M 10                | 1.5   | 10.0               | 16.0               | 10.0             | 8.0              | 18.0              | 11.0            | 8.5            |
| M 12                | 1.75  | 12.0               | 18.0               | 12.0             | 10.0             | 20.0              | 13.5            | 10.25          |
| M 16                | 2.0   | 16.0               | 24.0               | 16.0             | 14.0             | 26.0              | 17.5            | 14.0           |
| M 20                | 2.5   | 20.0               | 30.0               | 20.0             | 17.0             | 33.0              | 22.0            | 17.5           |
| M 24                | 3.0   | 24.0               | 36.0               | 24.0             | 19.0             | 40.0              | 26.0            | 21.0           |

Torque wrench settings in Nm for untreated, oiled steel screw fasteners (torque tolerance ±5%)

| Metric Coarse Thread M.                                            |    |      |       |                                       |       |       |       |        |
|--------------------------------------------------------------------|----|------|-------|---------------------------------------|-------|-------|-------|--------|
| Thread                                                             | d  | P    | As    | Property class according to ISO 898-1 |       |       |       |        |
| M                                                                  | mm | mm   | mm2   | 4.6                                   | 5.8   | 8.8   | 10.9  | 12.9   |
| 4                                                                  | 4  | 0.7  | 8.78  | 1.1                                   | 1.8   | 2.9   | 4.0   | 4.9    |
| 6                                                                  | 6  | 1.0  | 20.1  | 3.7                                   | 6.1   | 9.8   | 14    | 17     |
| 8                                                                  | 8  | 1.25 | 36.6  | 8.9                                   | 15    | 24    | 33    | 40     |
| 10                                                                 | 10 | 1.5  | 58.0  | 17                                    | 29    | 47    | 65    | 79     |
| 12                                                                 | 12 | 1.75 | 84.3  | 30                                    | 51    | 81    | 114   | 136    |
| 16                                                                 | 16 | 2.0  | 157.0 | 74                                    | 123   | 197   | 277   | 333    |
| 20                                                                 | 20 | 2.5  | 245.0 | 144                                   | 240   | 385   | 541   | 649    |
| 24                                                                 | 24 | 3.0  | 353.0 | 249                                   | 416   | 665   | 935   | 1120   |
| $s_s = R_{eL} \text{ or } R_{p0.2} \text{ N/mm}^2 \text{ nominal}$ |    |      |       | 240                                   | 400   | 640   | 900   | 1 080  |
| $k(1+S_F) \frac{k}{F_{Fm}} \cdot s_s \text{ N/mm}^2$               |    |      |       | 26.16                                 | 43.60 | 69.76 | 98.10 | 117.72 |

# 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 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.



## PED approved for a minimum of 2 million strokes

RELIABILITY. Our 2 million stroke PED approval ensures safer component cycle life.



## 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.



## 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.



## 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.

