KALLER®
The Safer Choice

Product Series
Tool & Die

Gas Link Systems

Piercing and Forming Units/Cams

Delayed Return Units

Lifters

Edition 3.2024

Would you like to order one of these products?
All available information is at www.kaller.com

Page

Page

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) 2014/68/EU 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,”

-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 overstroked.

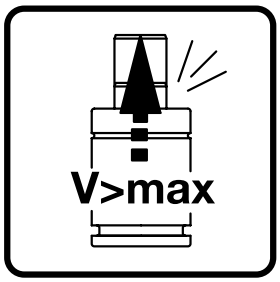
When opening the tool, the customer expected to find a totally damaged tool and worried about the cost for complicated repairs. Instead he faced a deformed gas spring where the gas had simply leaked out in a controlled way.

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.”

-Product Manager at KALLER®

“Safer working environment with KALLER®”



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.”

-Quality & Environmental Manager at KALLER®

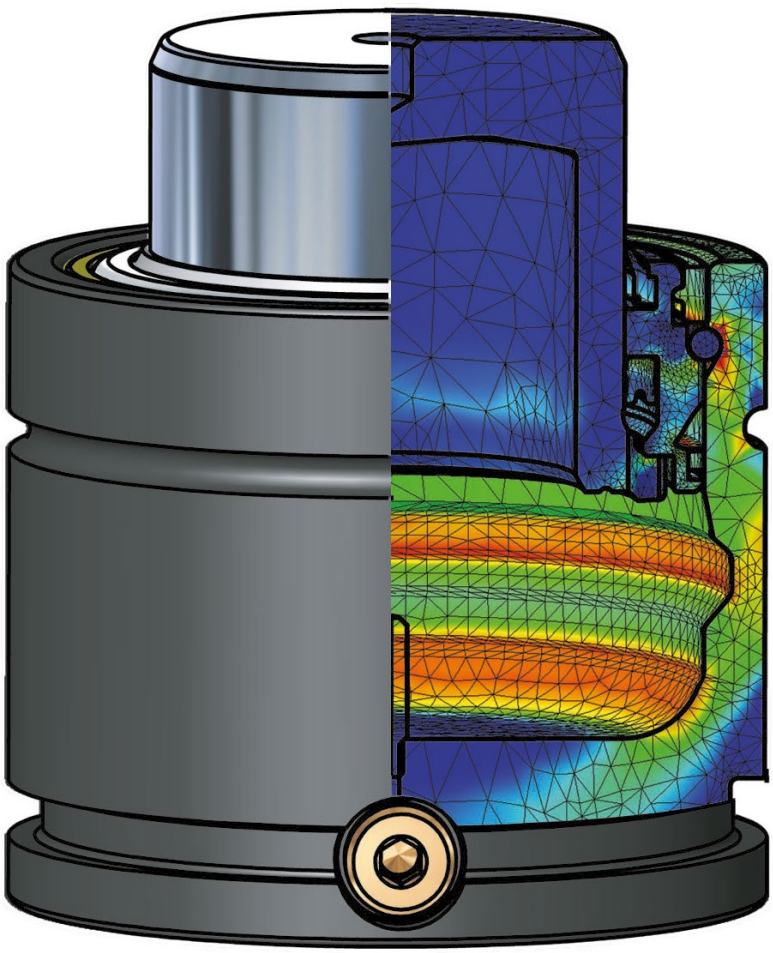
“We feel safer with KALLER® gas springs”

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

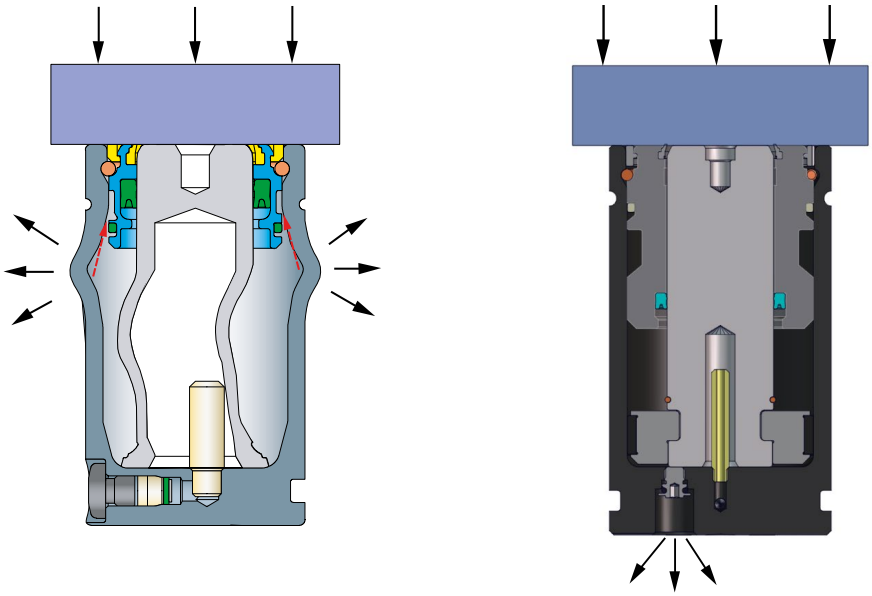
Fake products can be dangerous. With the KALLER® Safety App you can identify, verify and manage your KALLER® gas springs to avoid unnecessary risks.

Your benefits

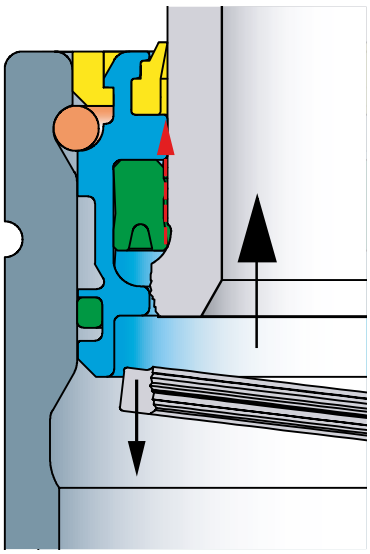
Our KALLER® Safety App will help you achieve the safer working environment.

For more information, see:
KALLER.com

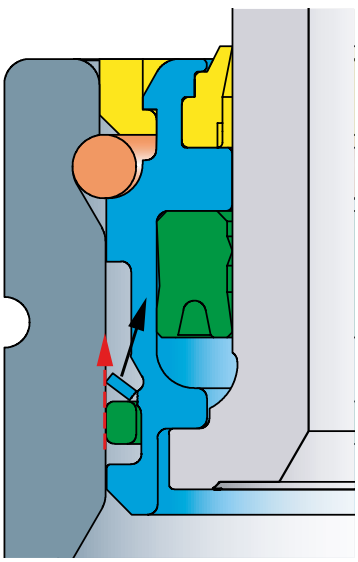
Overstroke Protection System



Overload Protection



Overpressure Protection



Related Patents:
EP 3314144, US 10,428,897, CN 10778741, EP 3158215

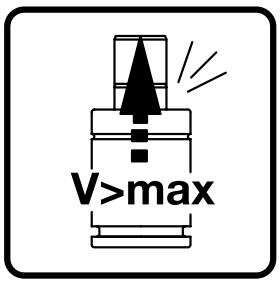
KALLER® safety features reduce the risk of damage and injuries

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.

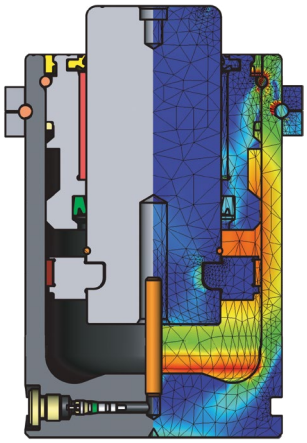
Overpressure Protection System

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

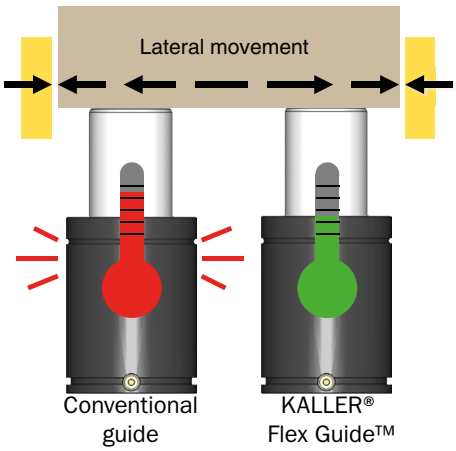
Your benefits

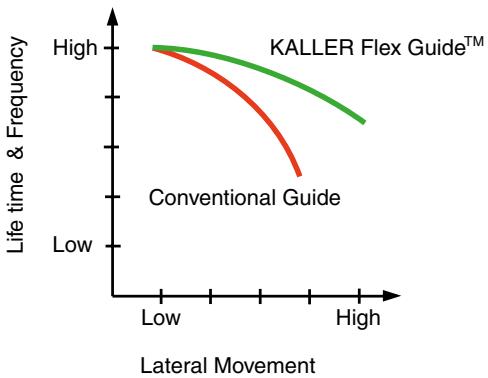
When internal gas pressure exceeds the maximum allowable limit, this feature reduces the risk of tool damage or injuries.

PED approved for a minimum of 2 million strokes

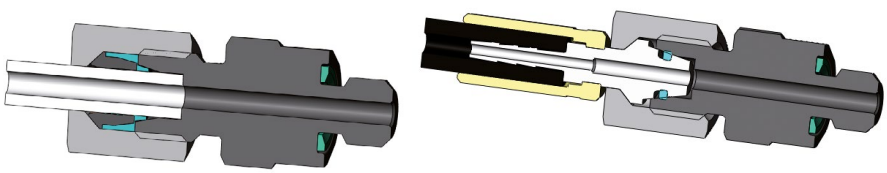


Flex Guide™ System





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 2014/68/EU.

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,”

-R&D Manager at KALLER®.

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

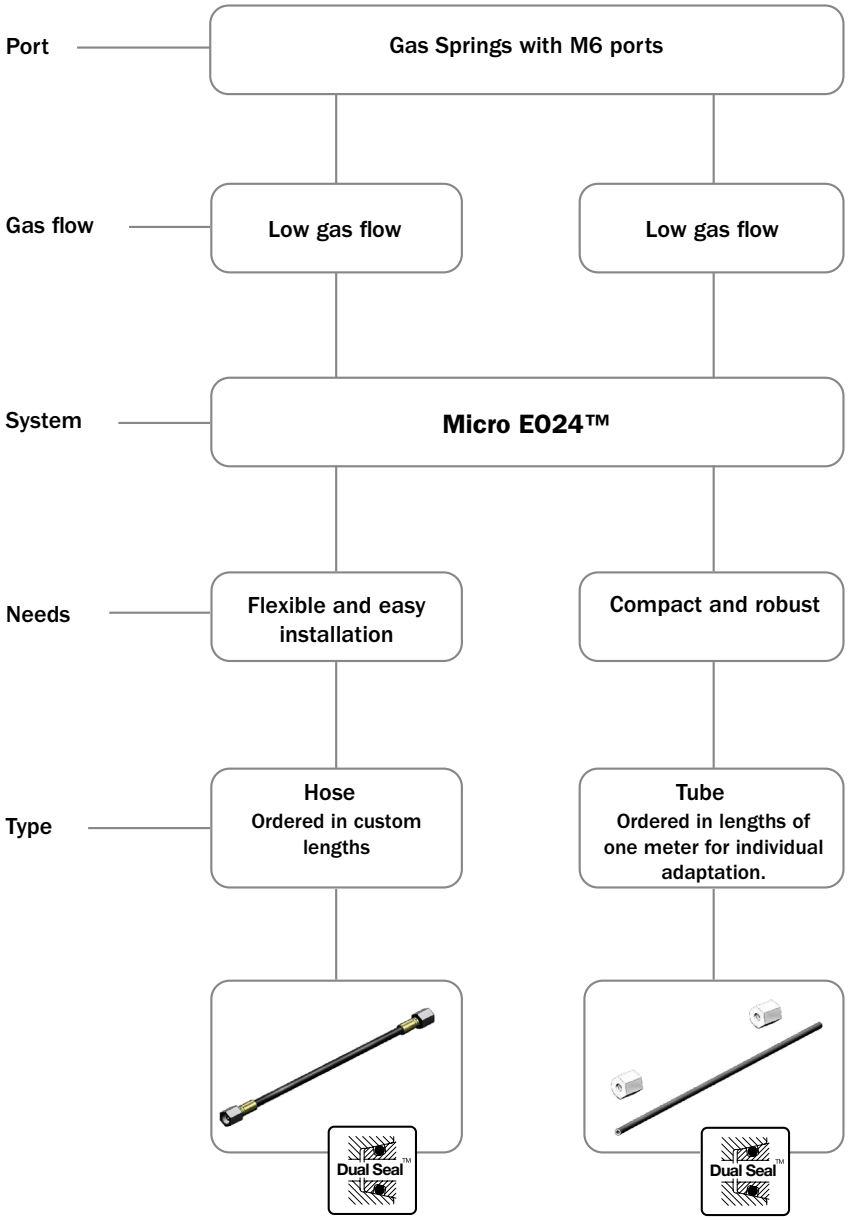
Our customers regard us as The Safer Choice.

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.

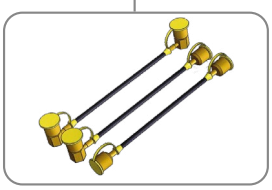
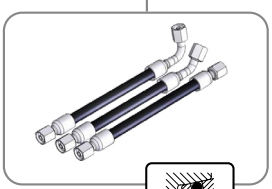
KALLER® – The Safer Choice.

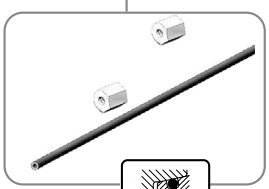
Linking System Selection



Linking System Selection

Gas Springs with G1/8” ports

- Low gas flow
  - **EZ Hose**
    - Flexible and easy installation
      - Hose
        - 
- High gas flow
  - **EO24™**
    - Flexible and easy installation
      - Hose
        Ordered in custom lengths
        - 

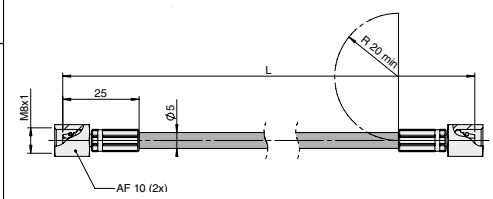
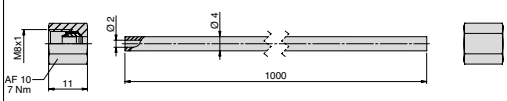
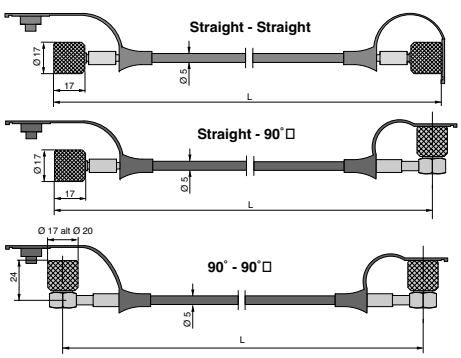
    - Compact and robust
      - Tube
        Ordered in lengths of one meter for individual adaptation
        - 

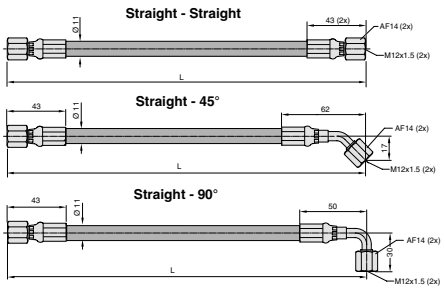
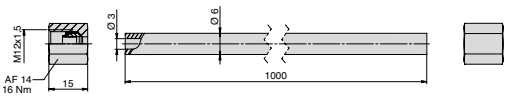
GENERAL INFORMATION

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	
Micro EO24™ Hose and Tube System		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. Not interchangeable with old Micro-Hose System.
Dual Seal™		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	
EO24™-Hose and Tube System 		The EO24™ system is mainly for larger gas springs with G 1/8" ports. The EO24™ hose is recommended whenever high gas flows are required, for example when using the Passive Spring KP in a Controllable Gas Spring system.
		When using larger gas springs with G1/8" ports for the need of higher gas flow, we recommend use of the EO24™ 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.

About Control Blocks

KALLER® offers a wide range of Control Blocks for gas pressure monitoring and adjustment.

(For more information, please see page 31).

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 83).

CAUTION!

Do not modify the product in any way.

For more information on hosed/linked systems, please contact KALLER® (www.KALLER.com) or your local KALLER® distributor.

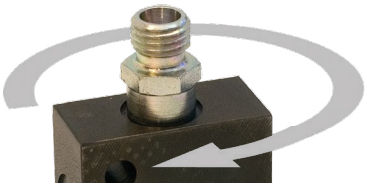
General precautions

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

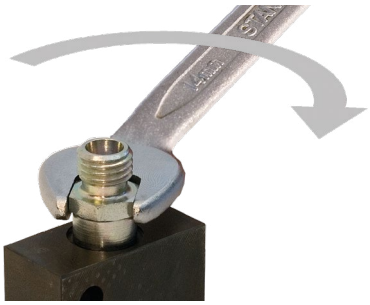
- When one or more gas springs are connected to a hosed/linked system, the discharge valve in each spring must first be removed.
- Position the Control Block in the tool where it will be protected from mechanical damage and on a level higher than the gas springs in the system to minimize the loss of lubrication oil when discharging the gas.
- Use only nitrogen (N_2) 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 hosed/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

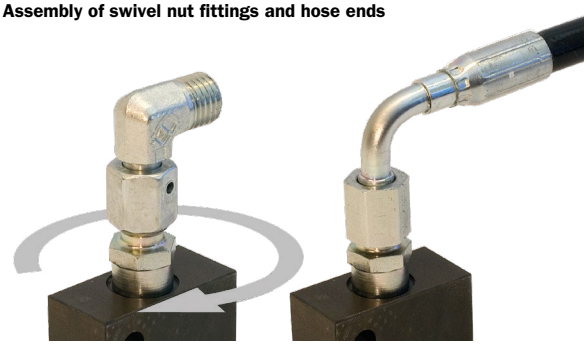


1. Screw until hand-tight



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

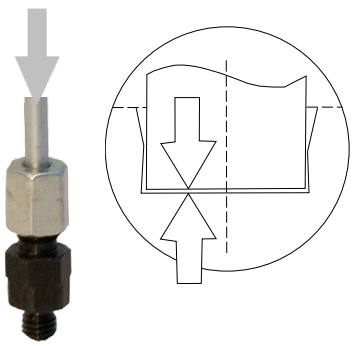
Assembly of swivel nut fittings and hose ends



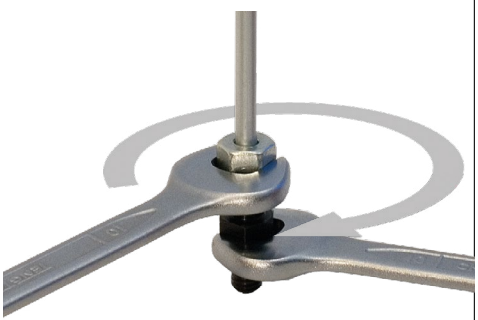
1. Screw on nut until the O-ring is fully compressed (hand-tight)

2. Then tighten until sharp increase of resistance, ¼ to ½ turn (if possible use a torque according to next page)

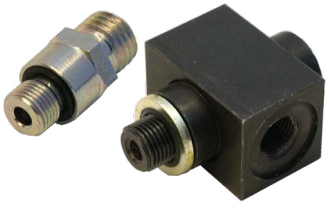
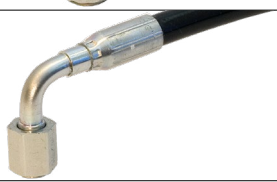
Assembly of steel Functional nut 504589/504047 (see also page 46 or page 68 for more information)



1. Press tube end firmly into the assembly cone

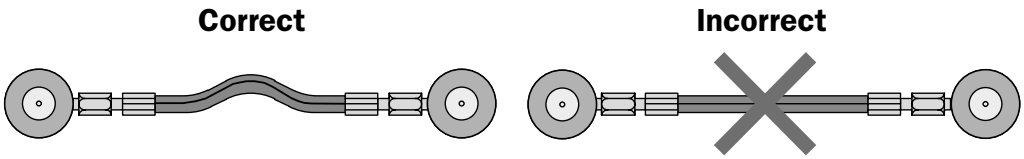


2. Then tighten until sharp increase of resistance, approximately 1 turn (if possible apply a torque according to next page)

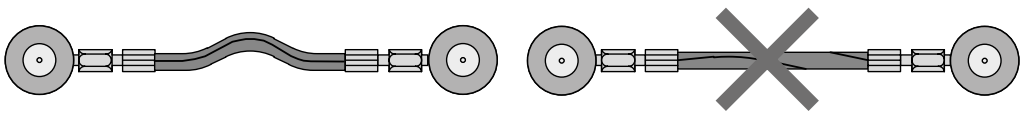
Component		Thread Size	Nominal Torque (Nm)
	Micro EO24™ Port adapters	M6	7
	Micro EO24™ Hose end	M8	7
	Micro EO24™ Functional nut	M8	7
	Port plug	M6	2
	EO24™/EZ Port adapters	G1/8”	18
		G1/4”	35
	EO24™ Functional nut	M12	16
	EO24™ Swivel nut fitting	M12	16
	EO24™ Hose end	M12	16
	EZ Hose end	S12,65x1.5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

Hose installation guidelines

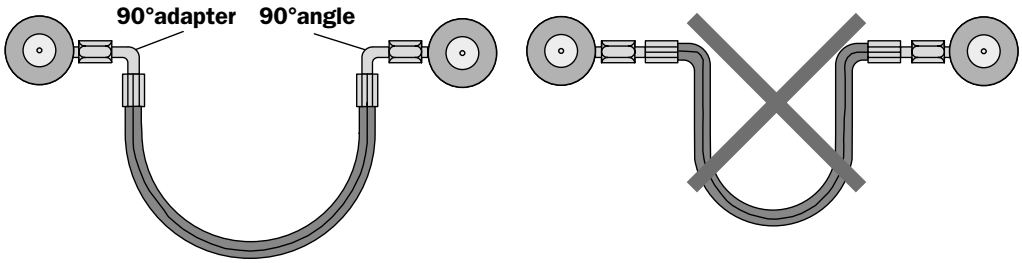
Never exceed the maximum values given for pressure and temperature for the hoses. Make sure all hoses and couplings are perfectly clean before fitting.



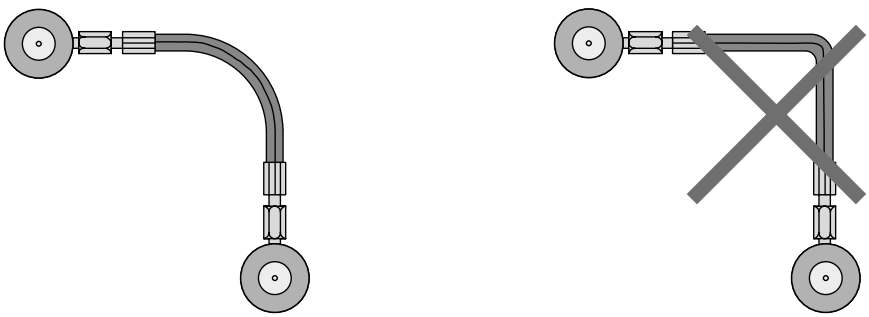
Select a hose length that will allow for a certain amount of play.



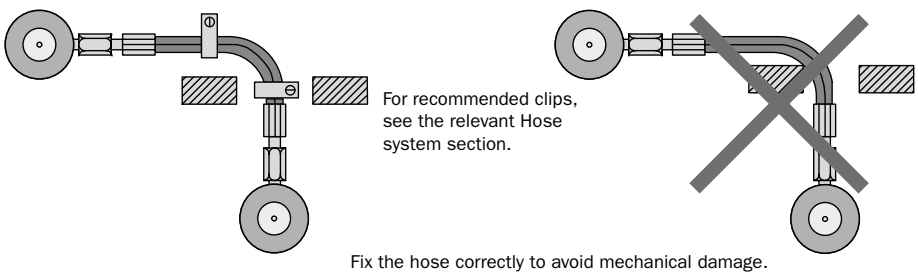
The longitudinal marking on the hose must not be twisted after fitting.



Select hose couplings that avoid sharp bends in the hose.



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



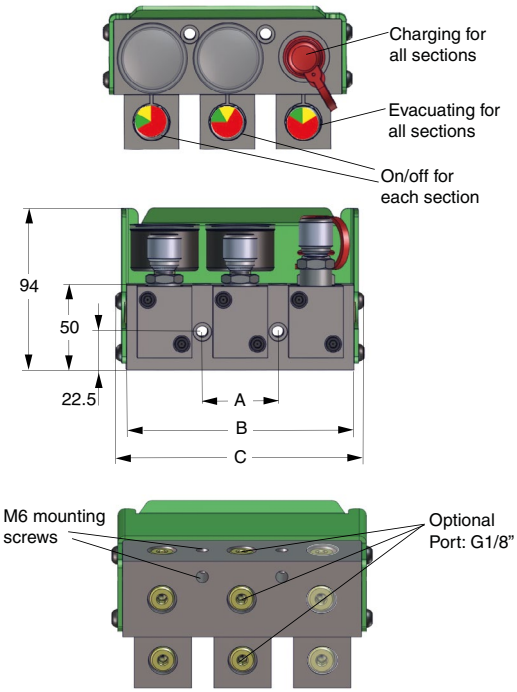
For recommended clips, see the relevant Hose system section.

Fix the hose correctly to avoid mechanical damage.

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, 3, 4, 5, 6, 8 and 10 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.

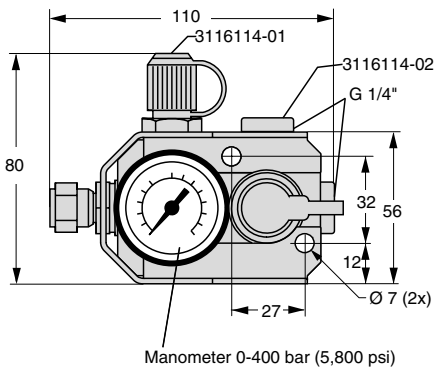
3116114-01 (with 2 pcs EZ Hose G1/4" adapters)

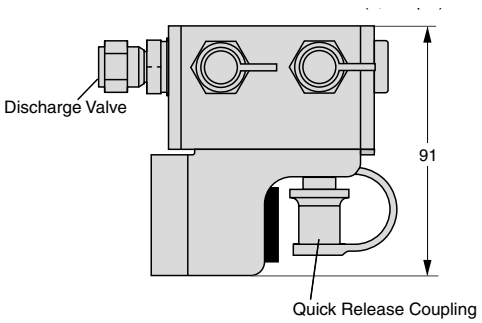
3116114-02 (with all ports plugged)

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.





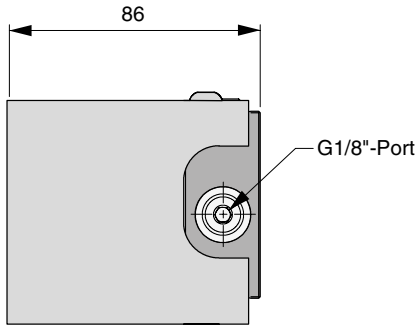
Control Block

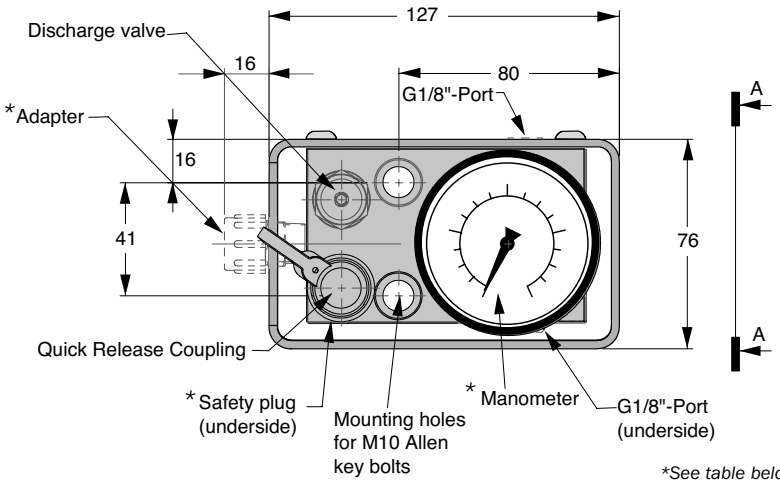
Order No. 1x32979

The 1x32979 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, and a vibration resistant 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 EO24™, EZ-hose and 9/16 ”-18 UNF o-ring faced sealed systems. Can be configured according to below





*See table below

Order No.	Model	Manometer Scale	Adapter	Rupture screw
1032979	Control block with KALLER® manometer CP-100	bar 0-400	No	Yes
1132979	Control block with manometer CP-100	bar / psi 0-400	No	Yes
1232979	Control block with KALLER® manometer CP-100	bar 0-400	9/16”-18 UNF	Yes
1332979	Control block with manometer CP-100	bar / psi 0-400	EZ-Hose	Yes
1432979	Control block with manometer CP-100	bar / Mpa 0-400	9/16”-18 UNF	Yes
1532979	Control block with high pressure manometer	bar / psi 0-600	No	No
1632979	Control block with manometer and HEX valve	bar 0-400	No	Yes

Control Block

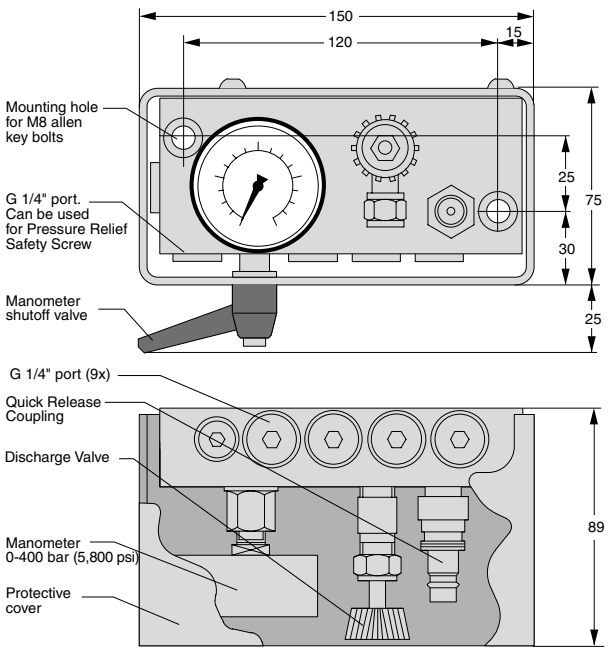
Order No. 2014325

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.

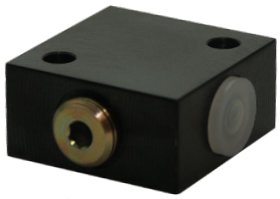
The Control Block is fitted with a manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging and a Discharge Valve for gas evacuation.

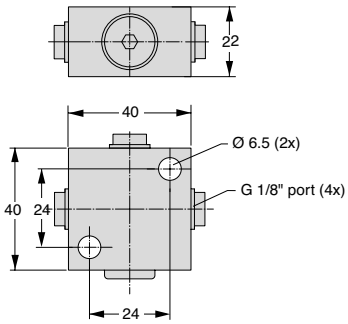
The block has nine G1/4” connection ports, four on the top, four on the bottom and one on the right-hand side.



Multi-Coupling Blocks

Order No. 4017032

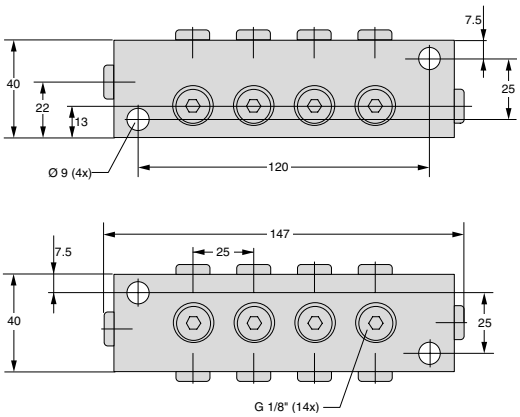




This is a small and compact block for linking hoses. The block has four G1/8” connection ports.

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



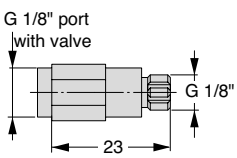
The Multi-Coupling Block 3015044 is manufactured in steel and has fourteen G1/8” connection ports.

On delivery, all ports are fitted with sealing plugs.

Order No. 3015303-01

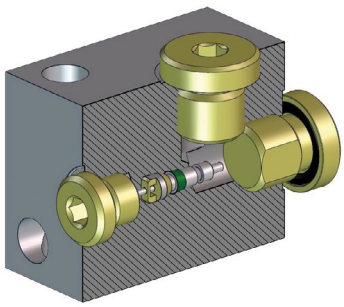
This Valve Adapter is available as an accessory and can be fitted to one of the G1/8” connection ports. The adapter has the same G1/8” valve port as found on standard gas springs.

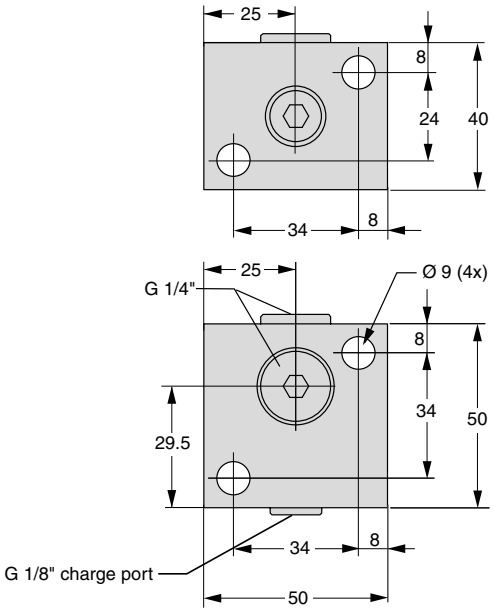
The Multi-Coupling Block can then be used as a charging block to enable gas charging and evacuation using gas spring charging equipment.



Charging Block

Order No. 3014206



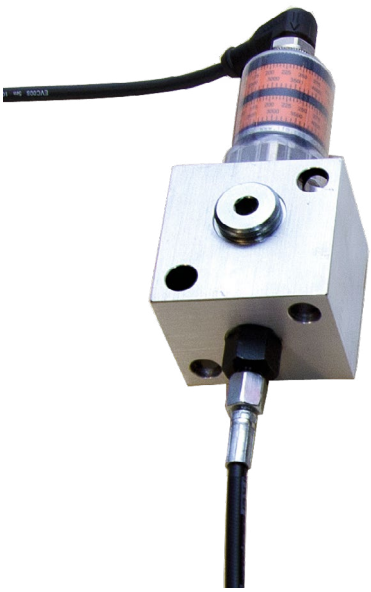


The 3014206 Charging Block comes with two G1/4” connection ports and a G1/8” charge port, identical to that found on standard gas springs.

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 hosed/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

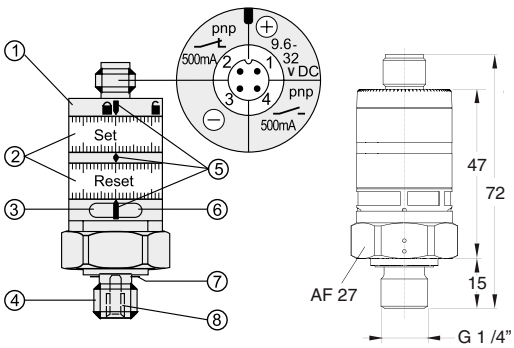
Order No. 504320

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 G¼ 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

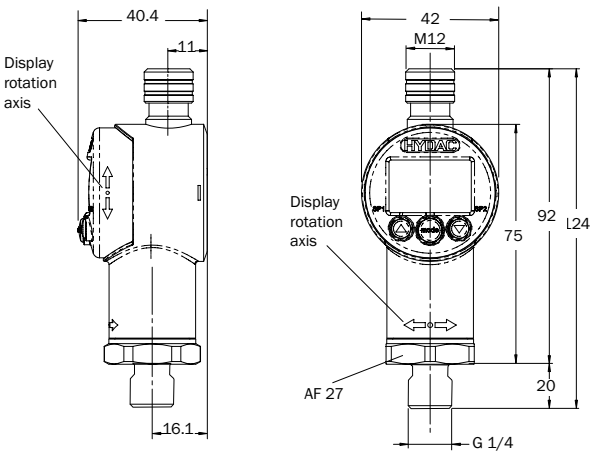
Order No. 504107

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:

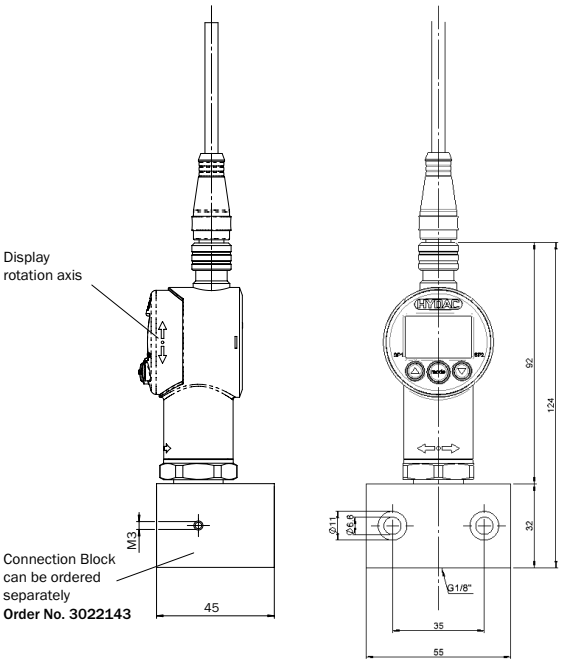
Set-points	2 PNP transistor switching outputs
Electrical connection	M12x1 (4-pin)
Pressure connection	G1/4”
Protection class	IP67
Working range	0 - 400 bar
Max. pressure	800 bar
Burst pressure	2000 bar
Voltage	9 - 35 VDC
Switching current	max. 1.2 A
Current consumption	≤ 35 mA (inactive switching outputs)
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.

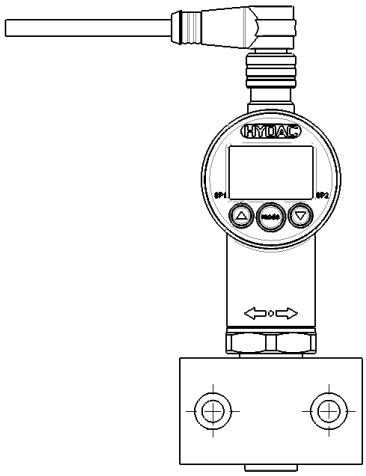
Digital monitoring kit

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.

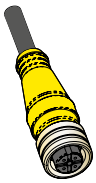


Order No.	Pressure (Bar)	Type of cable contact
3021172	0-400	Straight
3221172	0-400	Angled 90°

1. + Current feed 9 - 35 VDC	Brown
2. Set-point 1	White
3. - Current feed (0V)	Blue
4. Set-point 2	Black

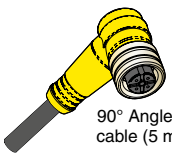


Cable (5 m) with straight cable contact
Order No. 504105



Straight cable (5 m)

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



90° Angled cable (5 m)

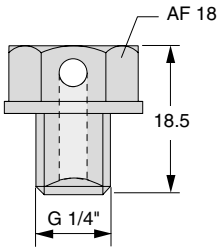
Pressure Relief Safety Screw

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 ±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.



Micro EO24™ Hose and Tube System

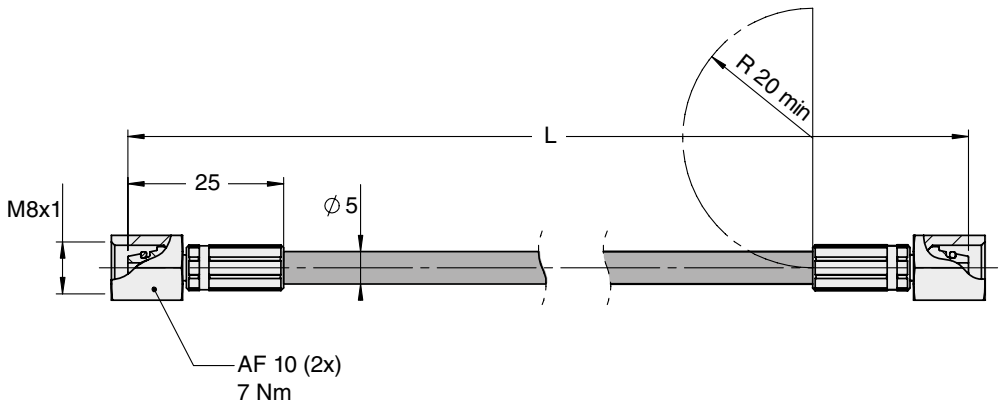
The Micro EO24™ Hose and Tube System is our most compact, soft sealed gas link system. It is a flexible system, including both a dual seal hose system and a soft sealed tube system using the same adapters.

Micro EO24™ 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**

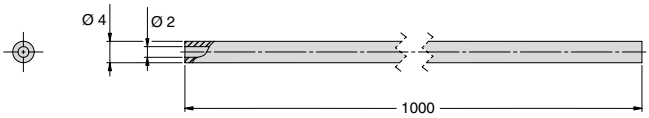
**For customer specified lengths.
* Minimum recommended L = 75 mm

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.

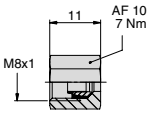
There are numerous options for connecting tubes to gas springs and Control Blocks. Various adapters are available allowing the Micro EO24™ Tube to connect to almost all KALLER® gas springs and Control Blocks. All adapters and their dimensions are presented on the following pages.

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

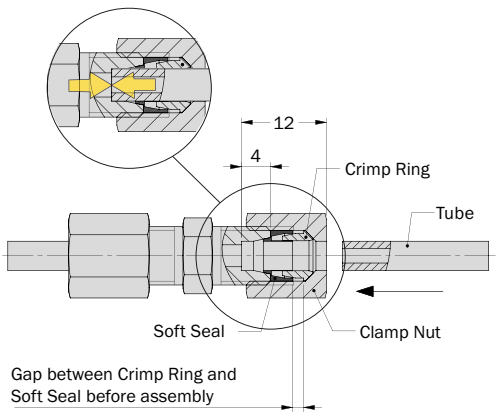
To cut the tube, a hacksaw can be used.
Note: Cutting angle 90° ±1°. If a regular tube cutter or cutting pliers are used, the tube might become clogged resulting in zero or limited gas flow. After cutting, de-burr the tube both inside and outside (max. 0.3 × 45° or R0.3) using the Tube De-burring Tool 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 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

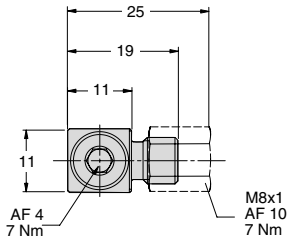
Adapters for Gas Spring Charge Ports

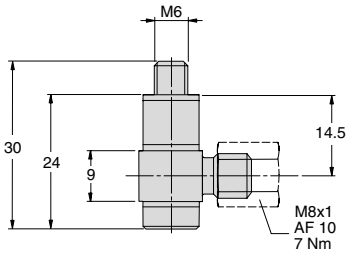
Following adapters are used to connect Micro EO24™ hoses and tubes to gas springs with M6 charging port.

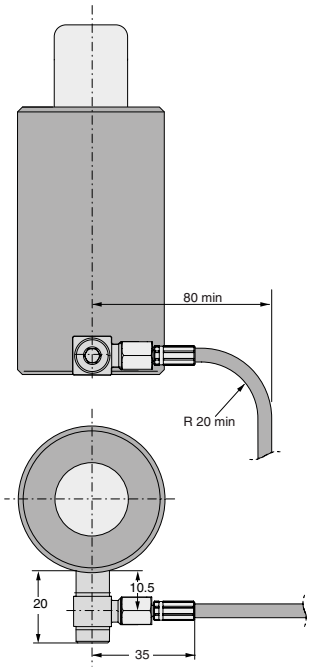
Using G1/8 adapters the M6 adapters can be connected (retrofitted) to springs with G 1/8 ports. All gas springs charge ports adapters fit into our standard mounts.

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

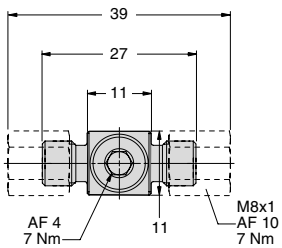
Banjo Elbow M6 **Order No. 4022059**

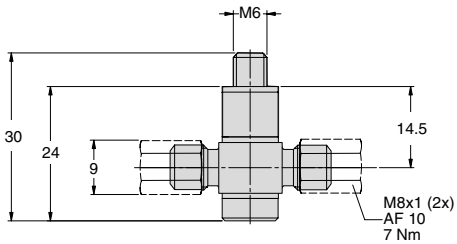


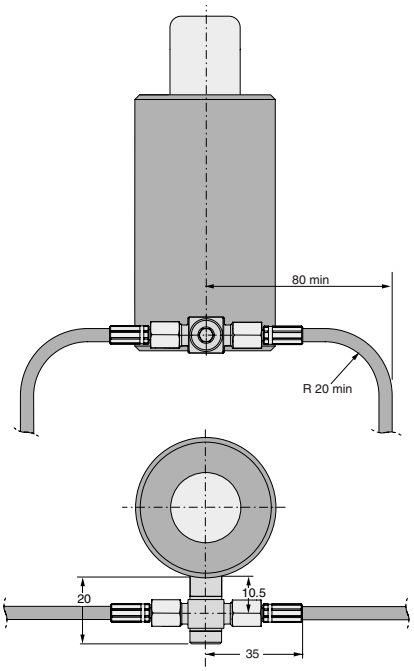




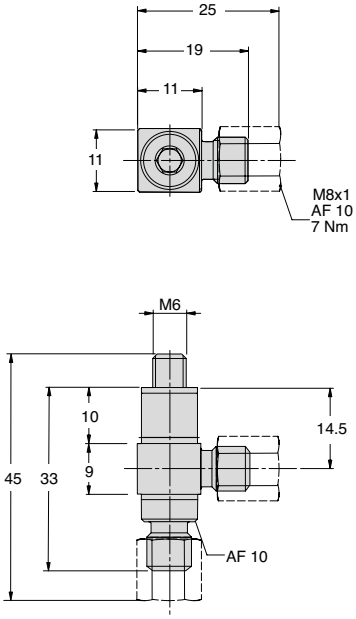
Banjo Tee M6 **Order No. 4022061**



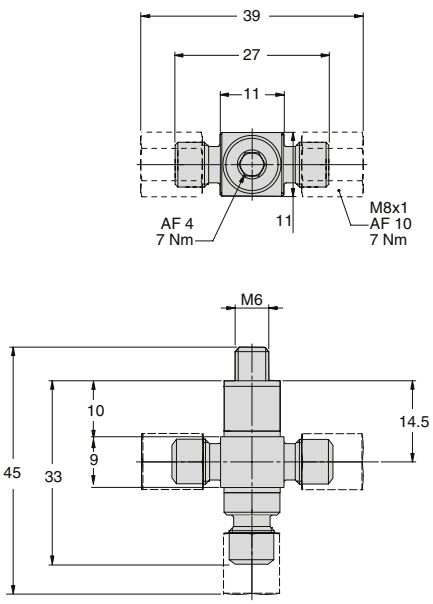


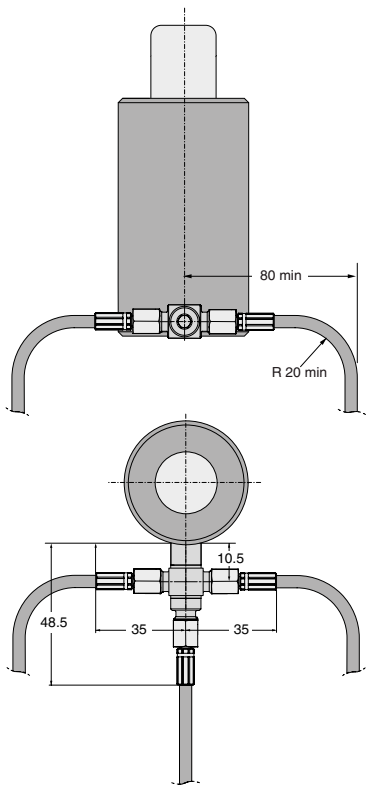


Banjo Run Elbow M6 **Order No. 4024092**

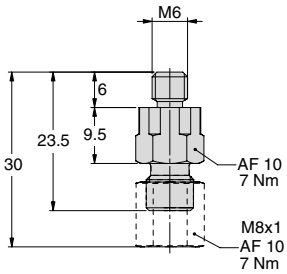


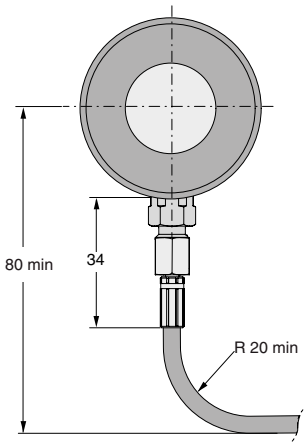
Banjo Run Tee M6 **Order No. 4024348**



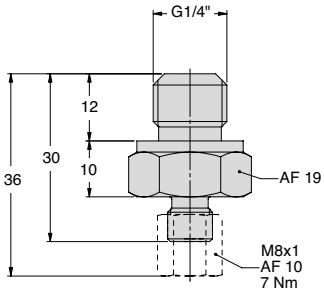


Straight Adapter M6 **Order No. 4022057**

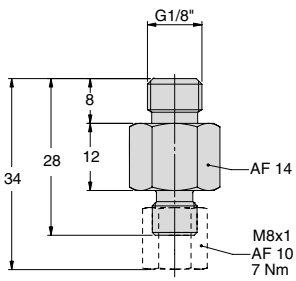




Straight Adapter G1/4" **Order No. 4022063**



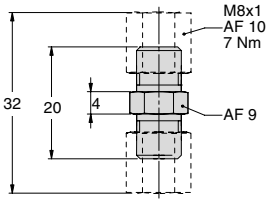
Straight Adapter G1/8" **Order No. 4022058**



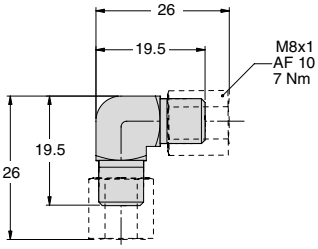
Hose to Hose, Tube to Tube or Hose to Tube Couplings

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

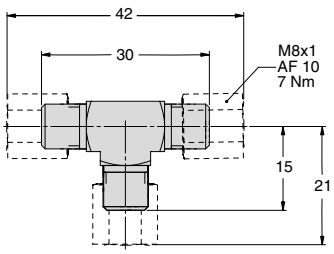
Union Straight **Order No. 504590**



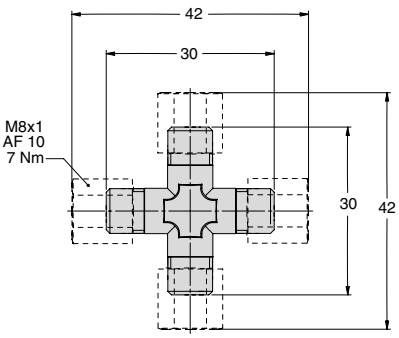
Union Elbow **Order No. 504591**



Union Tee **Order No. 504592**

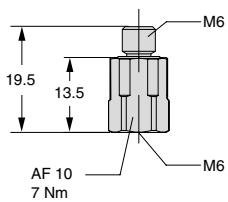


Union Cross **Order No. 504593**

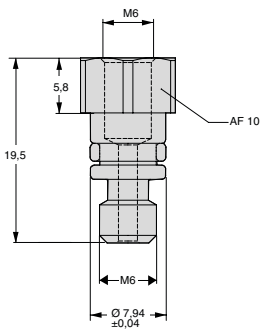


M6 charge port to Micro EO24™ Hose and Tube Adapters

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



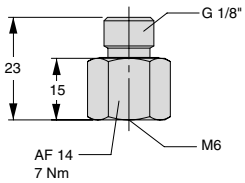
Male/Female Connector M6/M6 for CU4 1000
Order No.4027146



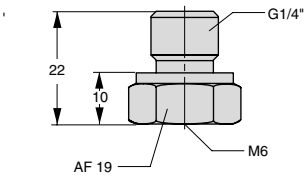
Micro E024™ Hose and Tube Adapters for G1/8” and G1/4” Connection Ports

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

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



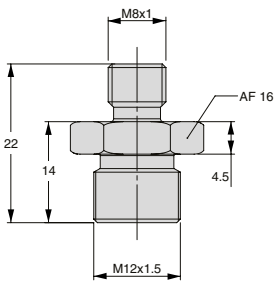
Thread Reducer G 1/4” to M6 **Order No. 503966**



For connection to angled Micro E024™ Hose Adapters

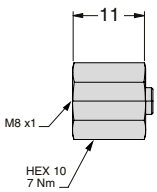
Micro E024™ Hose and Tube Adapter for E024™ M12 hose

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)

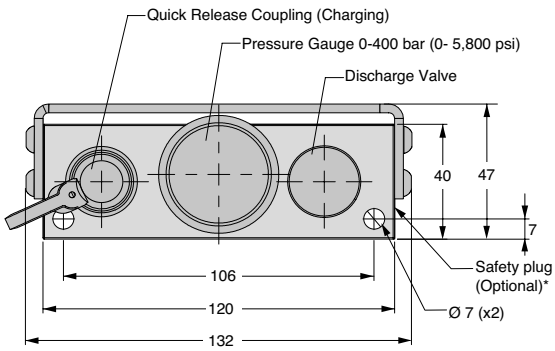
The Micro EO24™ Control Block is a very compact block with protective stainless steel cover specially designed for the Micro EO24™ System.

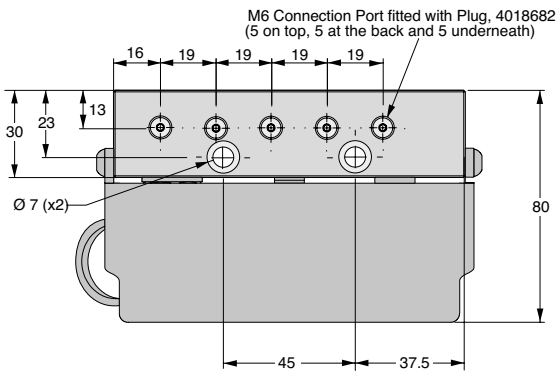
This block is intended for continuous monitoring of the gas pressure in the Hose and Tube System.

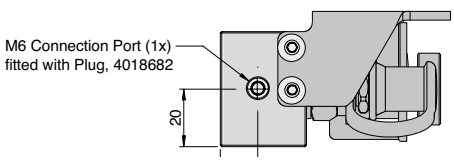
It is fitted with a manometer (0 – 400 bar/5,800 psi), a Quick Release Coupling for gas charging and a Vibration Resistant Discharge Valve for gas evacuation.

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*)

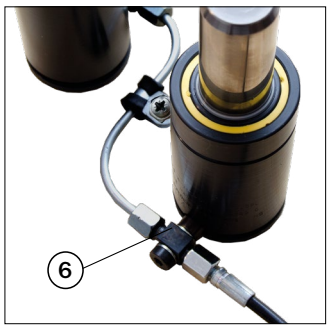
***Please note** that Safety plug are not recommended where the initial gas charging pressure at 20°C exceeds 150 bar.

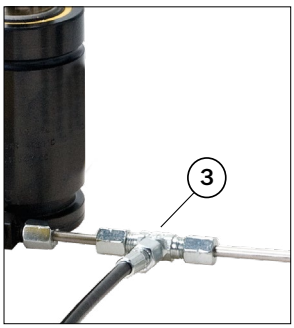


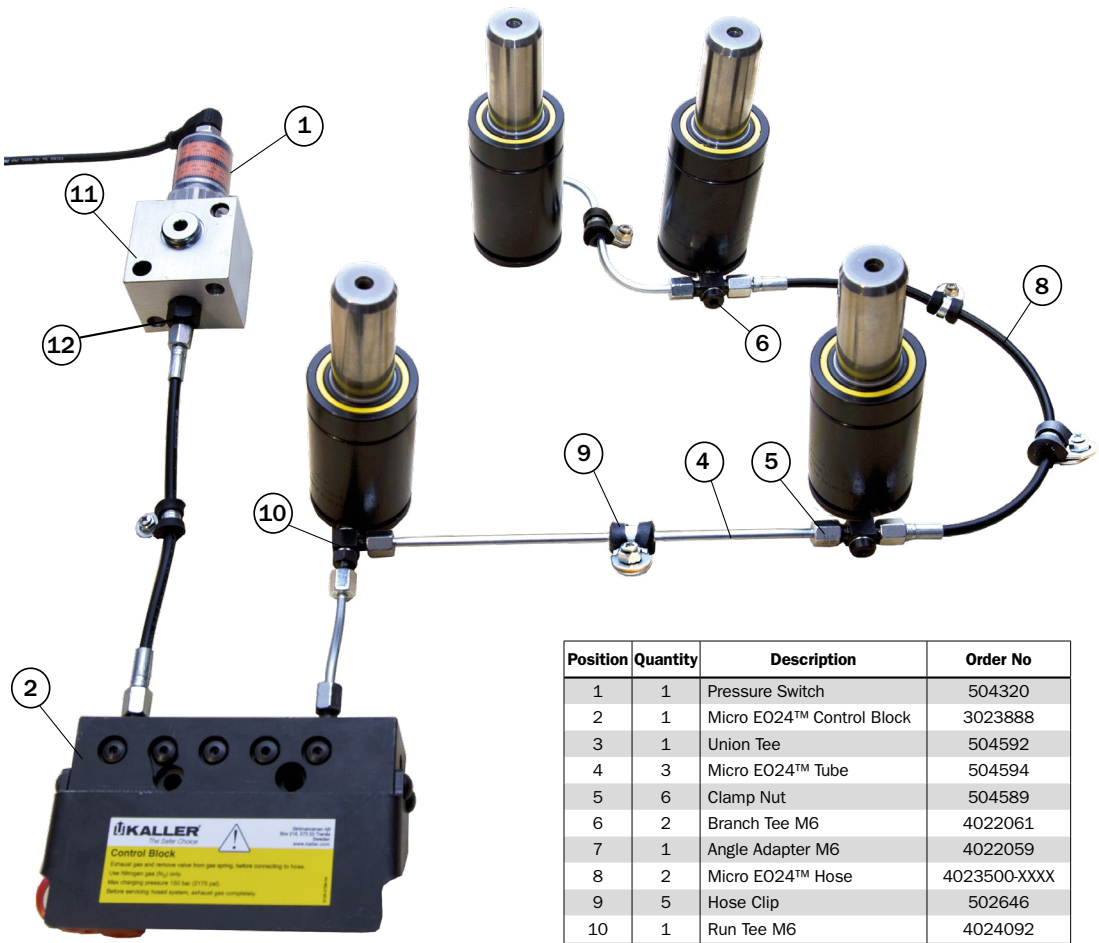




Micro EO24™ Hose and Tube System, installation example







Position	Quantity	Description	Order No
1	1	Pressure Switch	504320
2	1	Micro EO24™ Control Block	3023888
3	1	Union Tee	504592
4	3	Micro EO24™ Tube	504594
5	6	Clamp Nut	504589
6	2	Branch Tee M6	4022061
7	1	Angle Adapter M6	4022059
8	2	Micro EO24™ 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

EZ Hose System

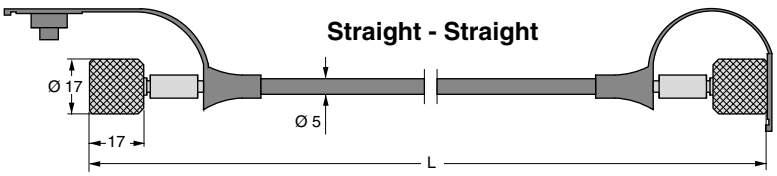
The EZ Hose System is our most popular Hose System. It is a very compact and versatile O-ring sealed Hose System that allows connections to be tightened by hand. G1/8" and G1/4" connection ports can be connected to the EZ Hose System with the use of an appropriate adapter.

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

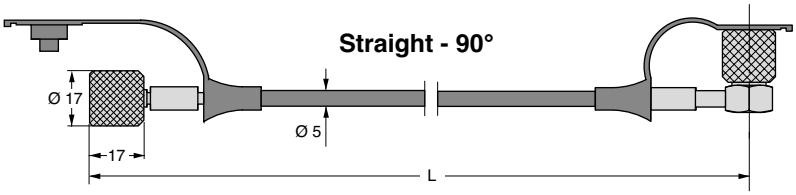
Micro/EZ Hose clip, **Order No. 502646**
(Can be used to secure hoses using an M5 screw.)

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

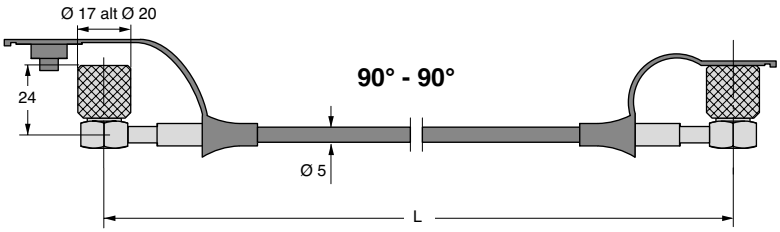
Order No. 4017568-XXXX



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.)



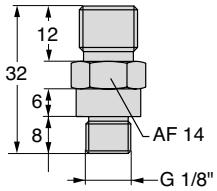
Order No.	L (mm)*
4117568-0200	200
4117568-0300	300
4117568-0400	400
4117568-0630	630
4117568-0800	800
4117568-1000	1000
4117568-1500	1500
4117568-2000	2000
4117568-XXXX**	XXXX

* Minimum recommended L=75

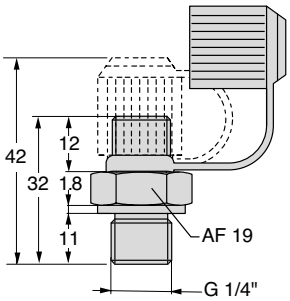
** For customer specified lengths.

EZ Hose Adapters

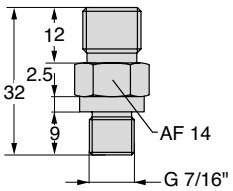
Hose adapters are available with three different connecting threads:



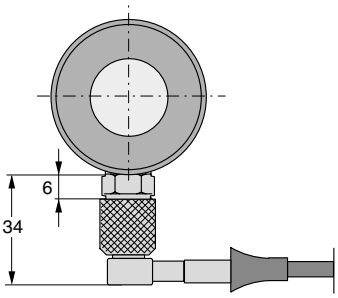
G 1/8” without non-return valve to be used for gas springs, multi-coupling blocks and control blocks.
Order No. 4114973-G1/8



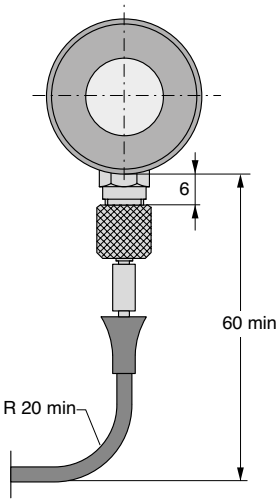
G 1/4” with non-return valve to be used only for control blocks.
Order No. 4014973-G1/4



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

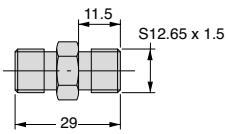


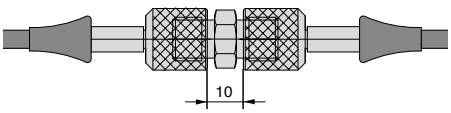
Installation dimensions for hose adapter, with straight and 90° hose



Joining Coupling

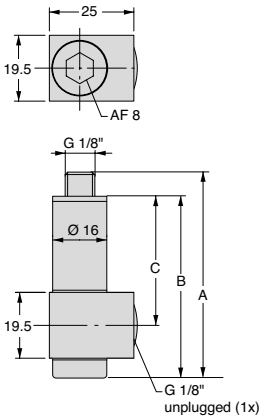
Coupling for joining of EZ Hoses, Order No. 503674.

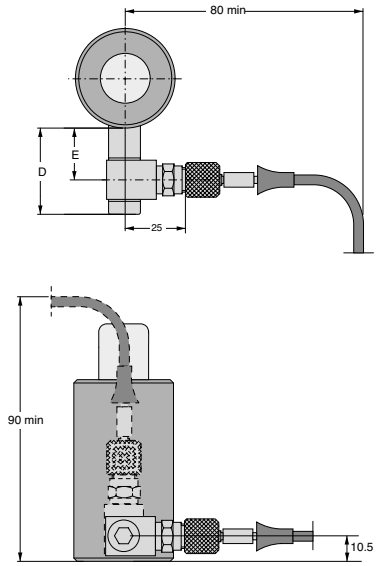




Angle Adapter

Order No. 4016050-XX

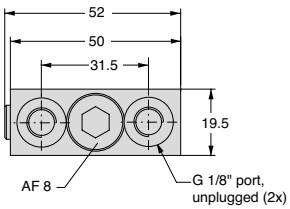


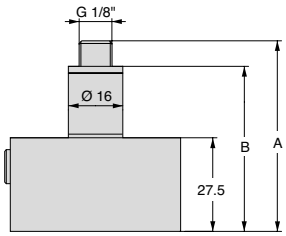


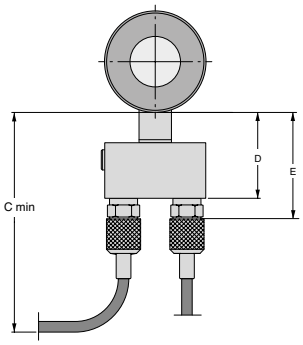
Order No	A	B	C	D	E	Suitable together with mounts
4016050-01	40	32,5	17	26	11	All applicable mounts, except those mentioned below
4016050-02	54	46.5	31	40.5	25	FFC 500, 750, 1500, 3000 + K
4016050-03	61	53.5	38	47.5	32	FFC 5000, 7500, 10000 + K

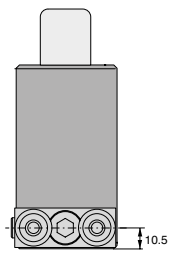
Front Adapter

Order No. 4017314-XX





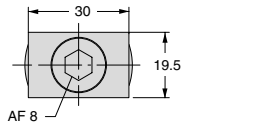


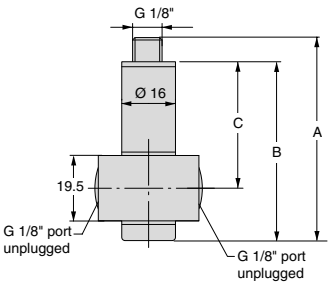


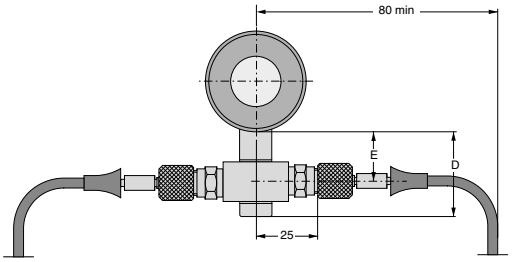
Order No	A	B	C	D	E	Suitable together with mounts
4017314-01	42	34.5	95	28.5	40	All applicable mounts, except those mentioned below
4017314-02	56	48.5	110	42.5	54	FFC 500, 750, 1500, 3000 + K
4017314-03	63	55.5	115	49.5	61	FFC 5000, 7500, 10000 + K

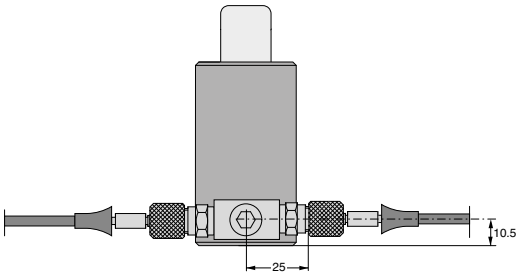
Two-way Adapter

Order No. 4016051-XX





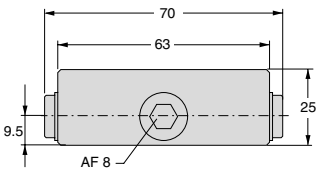


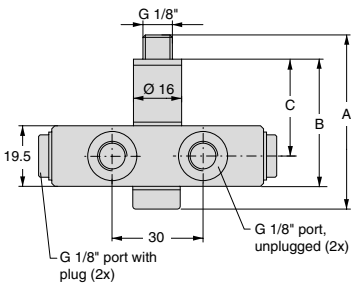


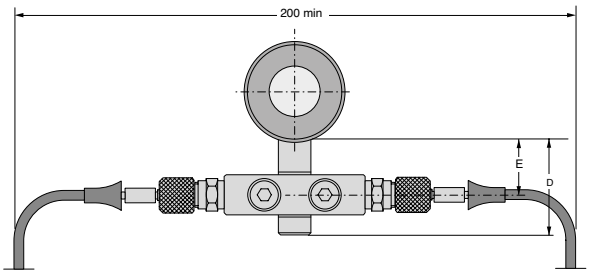
Order No	A	B	C	D	E	Suitable together with mounts
4016051-01	40	32.5	17	26.5	11	All applicable mounts except those mentioned below
4016051-02	54	46.5	31	40.5	25	FFC 500, 750, 1500, 3000 + K
4016051-03	61	53.5	38	47.5	32	FFC 5000, 7500, 10000 + K

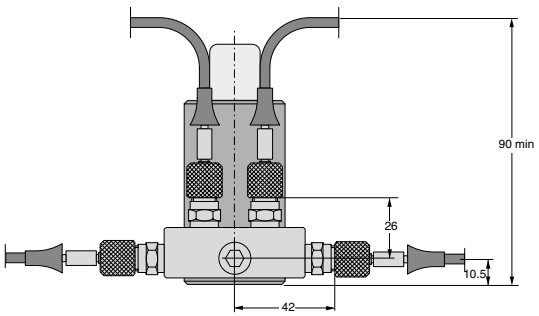
Four-way Adapter

Order No. 4015035-XX





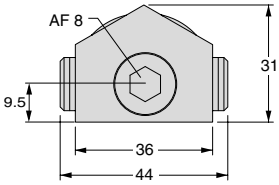


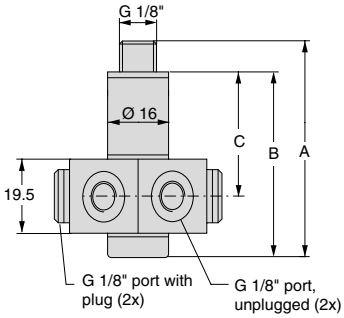


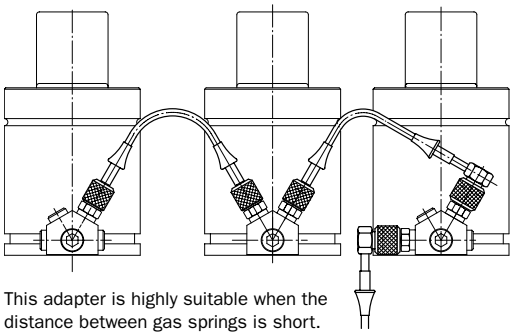
Order No.	A	B	C	D	E	Suitable together with Mounts
4015035-01	40	32.5	17	26.5	11	All applicable mounts, except those mentioned below
4015035-02	54	46.5	31	40.5	25	FFC 500, 750, 1500, 3000 + K
4015035-03	61	53.5	38	47.5	32	FFC 5000, 7500, 10000 + K

Multi-way Adapter

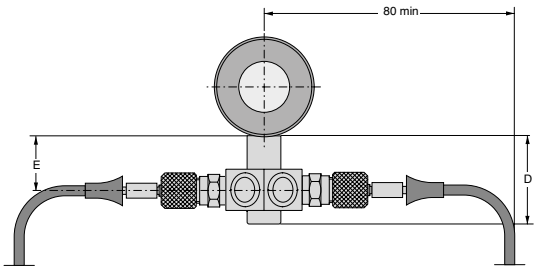
Order No. 3017191-XX

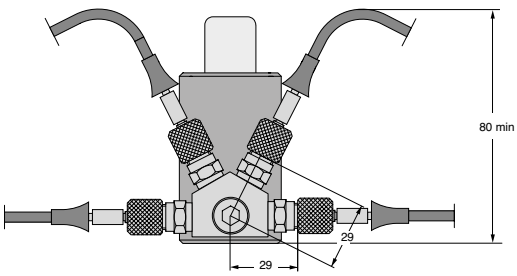






This adapter is highly suitable when the distance between gas springs is short.



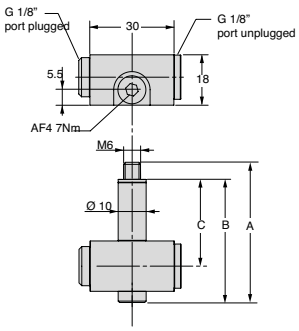


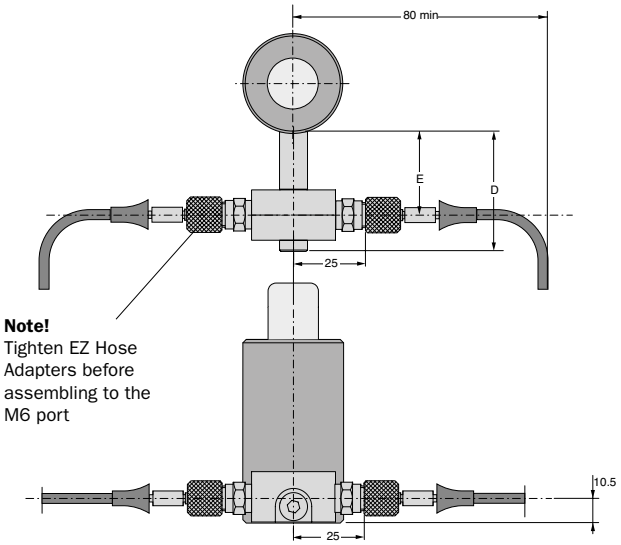
Order No	A	B	C	D	E	Suitable together with mounts
3017191-01	40	32.5	17	26.5	11	All applicable mounts, except those mentioned below
3017191-02	54	45.5	31	40.5	25	FFC 500, 750, 1500, 3000 + K
3017191-03	61	53.5	38	47.5	32	FFC 5000, 7500, 10000 + K

Two-way Adapter for gas springs with M6 port

Order No. 4023519

Order No. 4023506





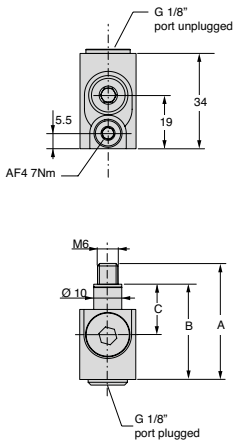
Note!
Tighten EZ Hose Adapters before assembling to the M6 port

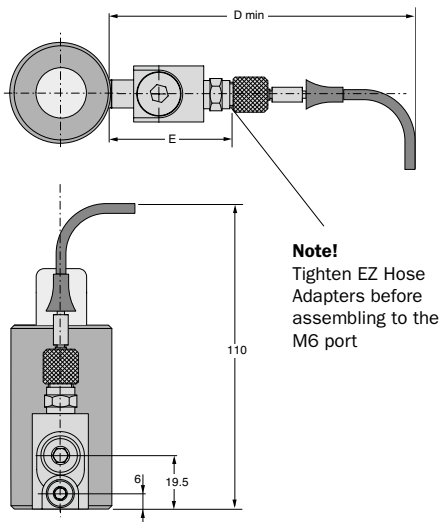
Order No	A	B	C	D	E	Suitable together with mounts
4023519	36	30	17	25.5	12.5	All applicable mounts, except those mentioned below
4023506	49	44	31	39.5	26.5	FFC 500, 750, 1500 + K

Angle Adapter for gas springs with M6 ports

Order No. 4023520

Order No. 4023518

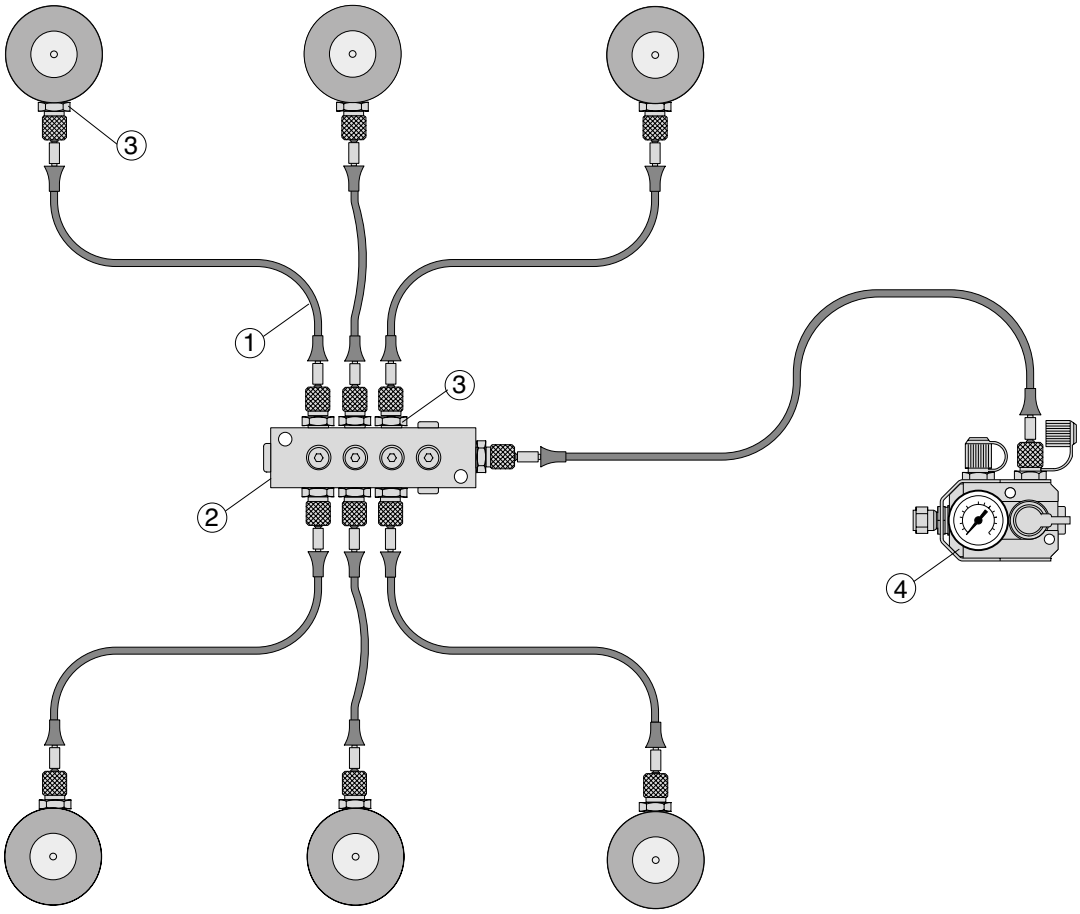




Note!
Tighten EZ Hose Adapters before assembling to the M6 port

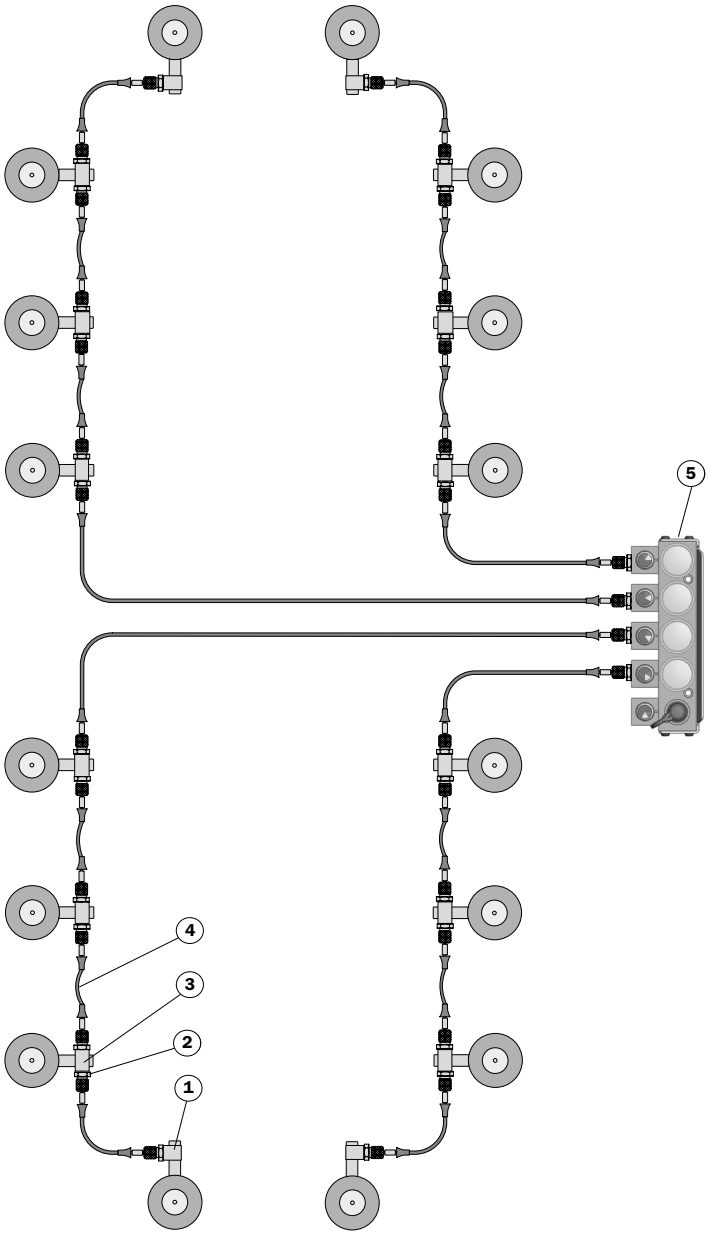
Order No	A	B	C	D	E	Suitable together with mounts
4023520	39	34	18	110	45	All applicable mounts, except those mentioned below
4023518	51	46	30	120	57	FFC 500, 750, 1500 + K

Installation Examples, EZ Hose System



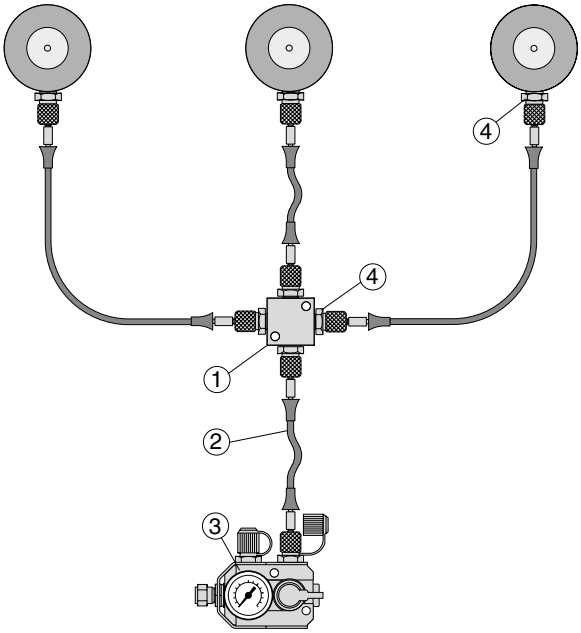
Position	Quantity	Description	Order No
1	7	EZ Hose	4014974-XXXX
2	1	Multi-Coupling Block	3015044
3	13	G1/8" EZ Hose Adapter	4114973-G1/8
4	1	Control Block	3116114-01

Installation Examples, EZ Hose system



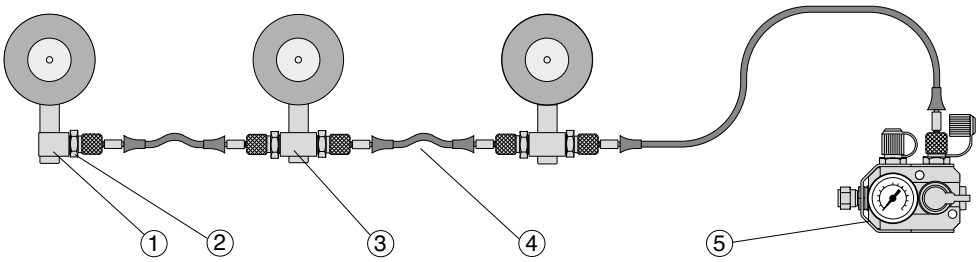
Position	Quantity	Description	Order No
1	4	Angle Adapter	4016050-xx
2	32	G1/8” EZ Hose Adapter	4114973-G1/8
3	12	Two-way Adapter	4016051-xx
4	16	EZ Hose	4014974-xxxx
5	1	Multi Control Block	2022677-04

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

EO24™ Hose System

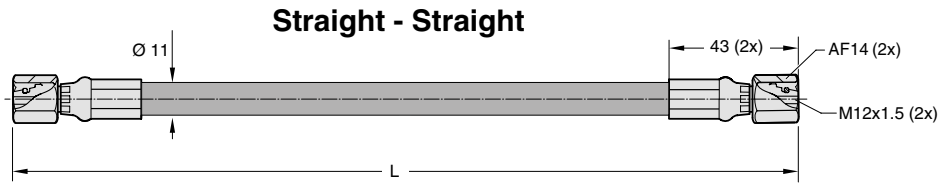
The EO24™ Hose System is our largest Hose System available. G1/8" and G1/4" connection ports can be connected to the EO24™ Hose System with the use of an appropriate adapter.

Dual Seal™

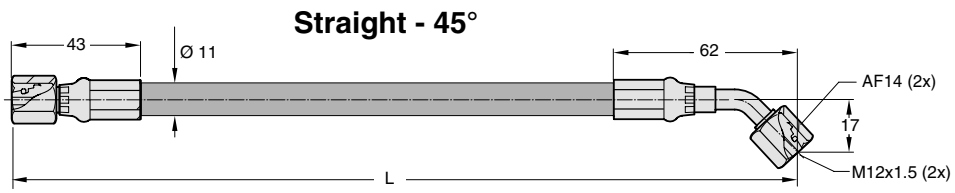
Custom hose lengths can be ordered **from 120 mm upwards**. Subsequent numbers are added to the order number according to the length required, e.g. hose length 2500 mm = Order No. 3**X**20857-2500.

EO24™ Hose and EO24™ Hose Couplings for crimping are also sold separately; for information on hose crimping, see Hose Crimping equipment on page 83.

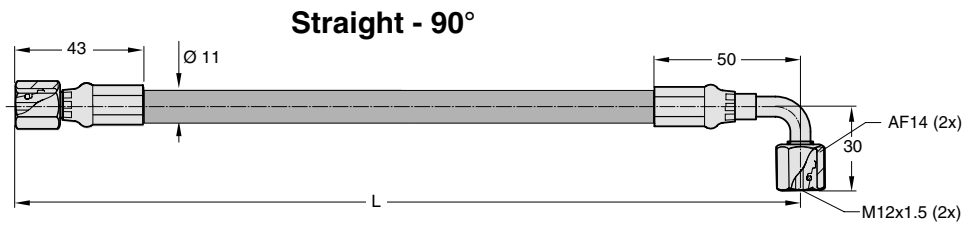
Order No. 3020857-XXXX



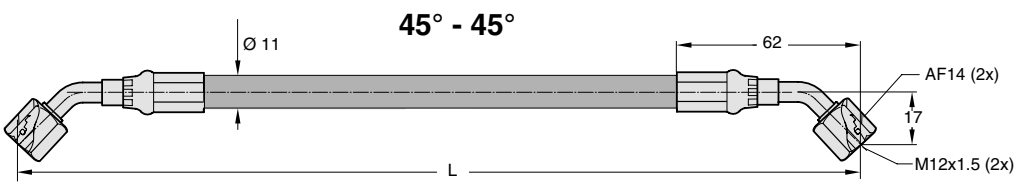
Order No. 3120857-XXXX



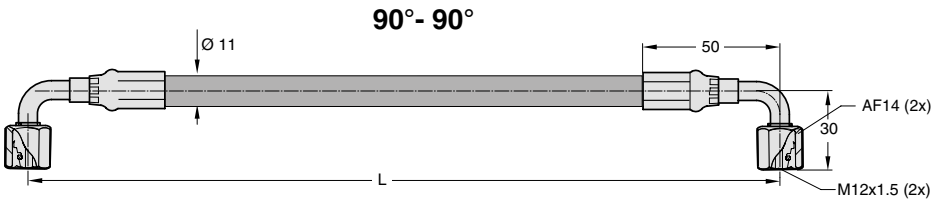
Order No. 3220857-XXXX



Order No. 3320857-XXXX



Order No. 3420857-XXXX



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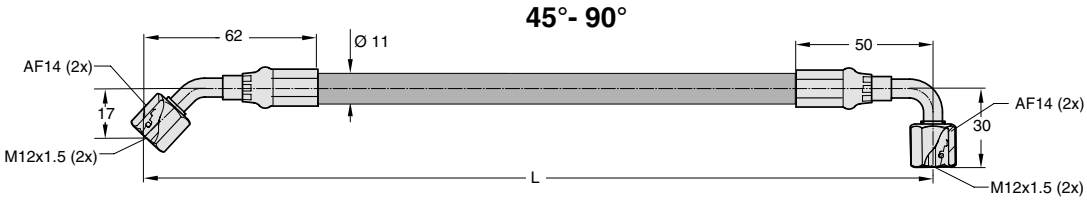
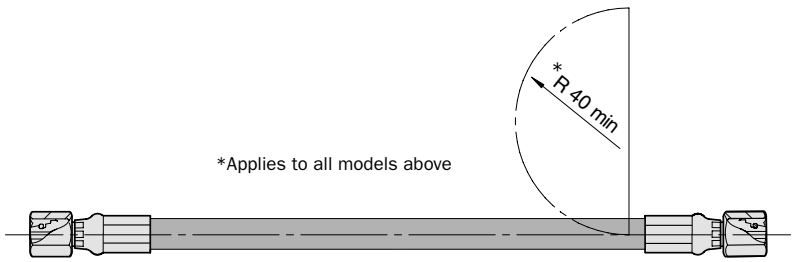




Order No. 502319 - XX Meters

EO24™ hose clip, **Order No. 502322.** Can be used to secure hoses using an M6 screw.

EO24™ Hose

Note! The hose must be cleaned internally after cutting!

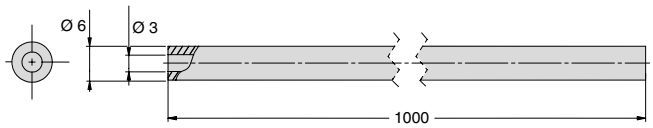
Material	Thermoplastic
Dimension	3/16" (exterior 11 mm)
Volume	18 ml/metre
Standard	SAE 100 R8 or ISO 3949 II
Outer casing	Perforated
Min. bend radius	40 mm
Temp. range	-40°C to +93°C
Max. dynamic working pressure	345 bar
Min. rupture pressure	1380 bar at 20°C
Min. recommended length	120 mm

EO24™ Tube

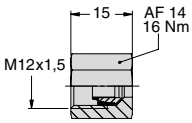
The EO24™ Tube is a system for linking larger gas springs together. Springs with G1/8", G1/4" connection and high gas flow requires a large tube. As the name suggests, EO24™ Tube is a tube system where all connections are soft sealed and self-crimping. This ensures leak-proof tube joints. The tubes are 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 EO24™ 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



EO24™ clip,
Order No. 502322
(Can be used to secure hoses using an M6 screw)

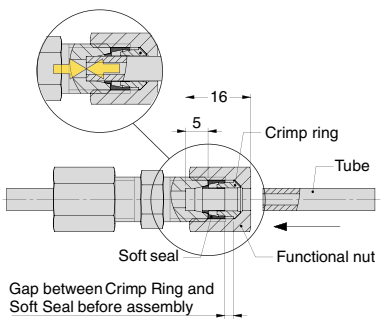
Using EO24™ Tube

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 × 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 (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

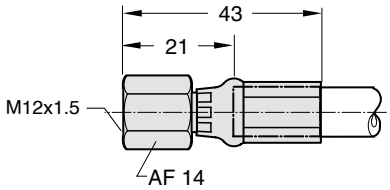


Note: Do not tighten! Run the tube through the nut until it stops (~16 mm from the top surface of the nut). When tightening the nut, use a torque of 16 Nm. Recommended tools to have available: hacksaw, tube cutting fixture, tube bending tool, de-burring tool, compressed air and a torque wrench (AF 14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

Tube De-burring Tool
Order No. 505096

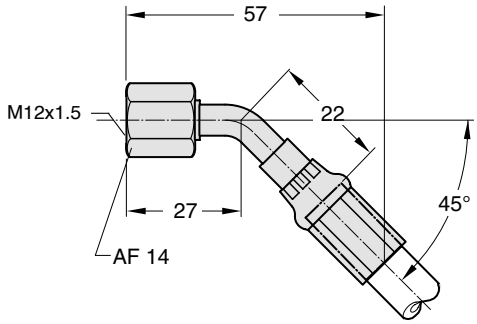
Tube Bending Tool (bend radius 20 mm)
Order No. 504711

EO24™ Straight
Order No. 504141

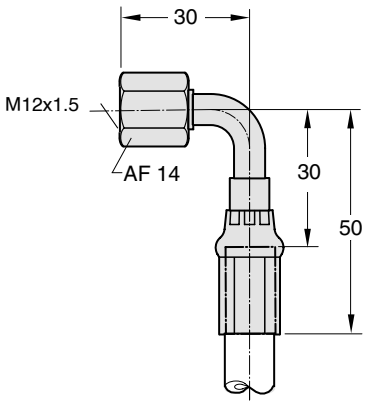


Dual Seal™

EO24™ 45° Elbow
Order No. 504142



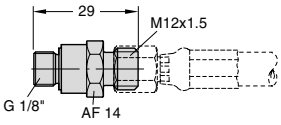
EO24™ 90° Elbow
Order No. 504143



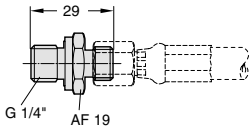
Adapter to Hose Couplings

The EO24™-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.

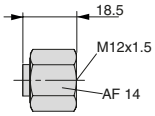
EO24™-Hose Adapt-



Male Stud Connector G1/8”
(For gas springs and Coupling Blocks)
Order No. 503593

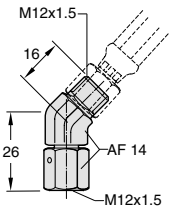


Male Stud Connector G1/4”
(For Control Blocks)
Order No. 504144

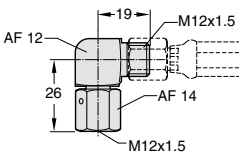


Cap/Plug
Order No. 504913

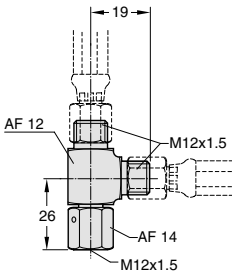
Adapter to Hose Couplings



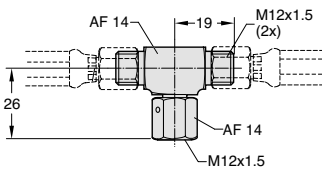
Swivel Nut Elbow 45°
Order No. 504145



Swivel Nut Elbow 90°
Order No. 504146

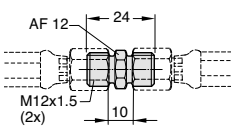


Swivel Nut Run Tee
Order No. 504147

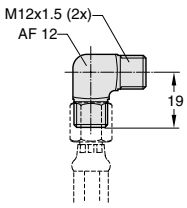


Swivel Nut Branch Tee
Order No. 504148

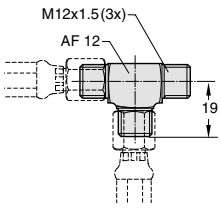
Hose to Hose Couplings



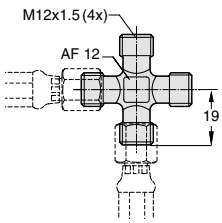
Union Straight
Order No. 504149



Union Elbow
Order No. 504150



Union Tee
Order No. 504151

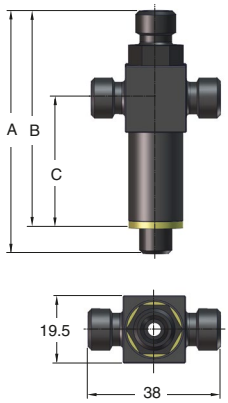


Union Cross
Order No. 504152

Adapter to Hose Couplings

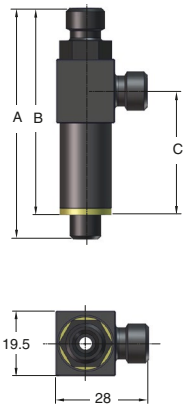
According to GM standard 90.25.

Banjo Run Tee G1/8”
Order No. 3025594



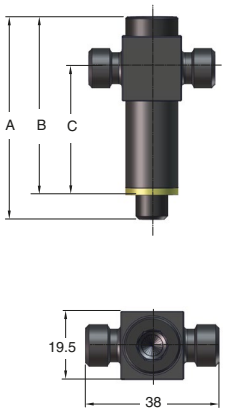
Order No.	A	B	C	Weight
3025594-01	50	42.5	17	0.09
3025594-02	64	56.5	31	0.11
3025594-03	71	63.5	38	0.12

Banjo Run Tee G1/8”
Order No. 3025599



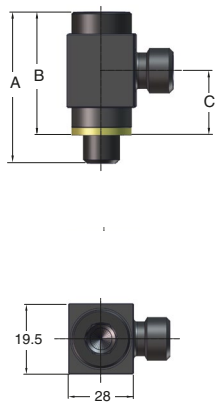
Order No.	A	B	C	Weight
3025599-01	50	42.5	17	0.08
3025599-02	64	56.5	31	0.10
3025599-03	71	63.5	38	0.11

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

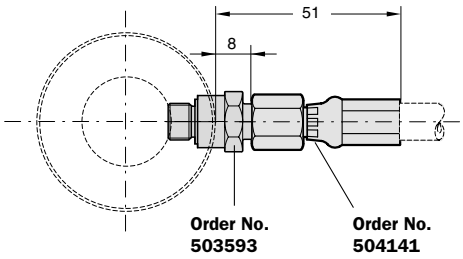
Banjo Elbow G1/8”
Order No. 3025562



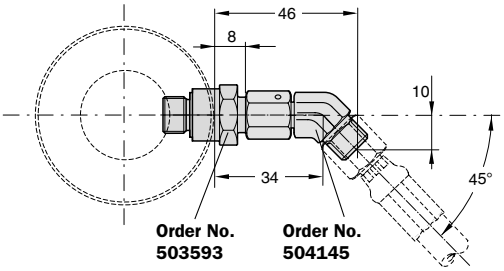
Order No.	A	B	C	Weight
3025562-01	40	32.5	17	0.08
3025562-02	54	46.5	31	0.10
3025562-03	61	53.5	38	0.11

Installation Examples, E024™-Hose System

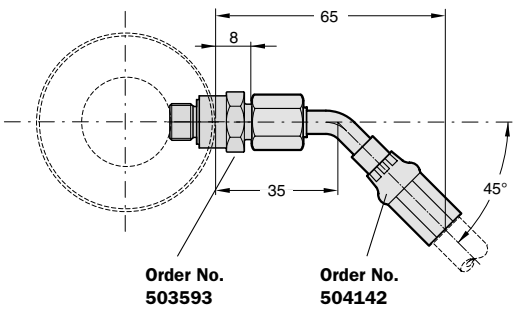
Straight hose coupling



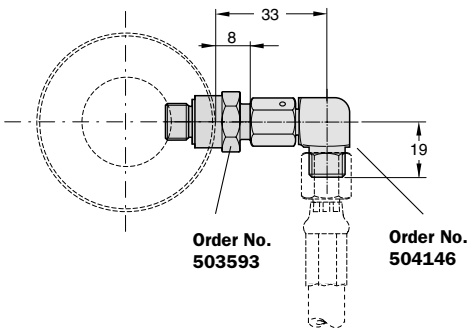
45° angle coupling



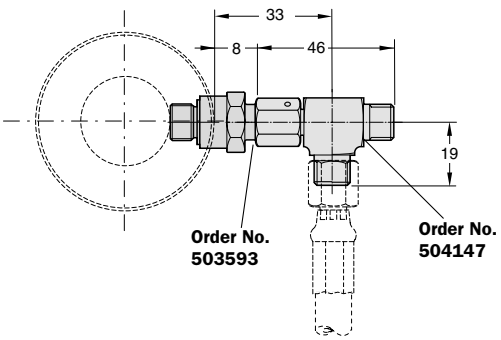
45° hose coupling



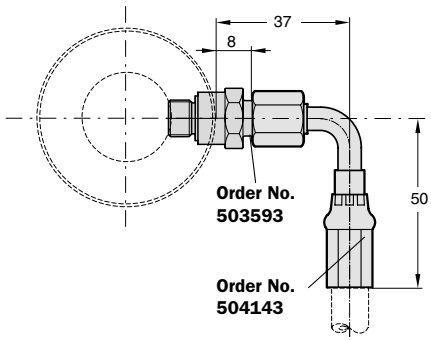
90° angle coupling



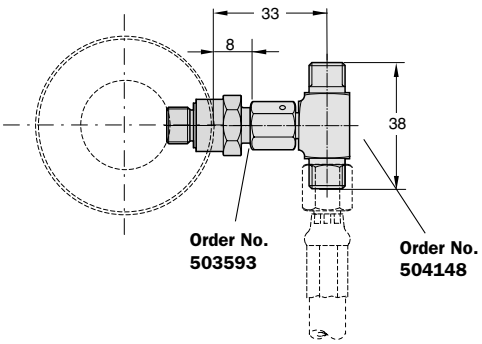
L-coupling



90° hose coupling



T-coupling



Gas charging equipment

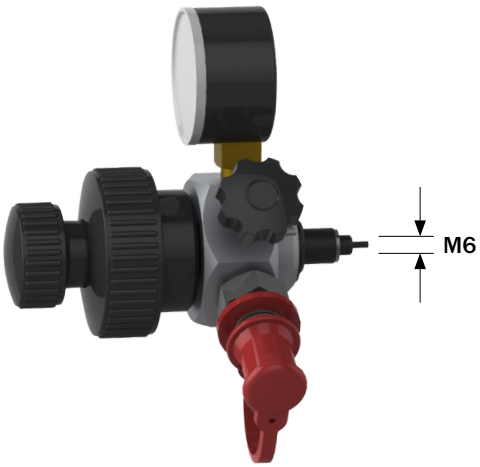
One of the strongest benefits of gas springs in general is the possibility to change the blank holding force by simply altering the charging pressure of the gas spring. With KALLER® 's Gas Charging Equipment you can do this very easily, not only in self-contained gas springs but in linked systems as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

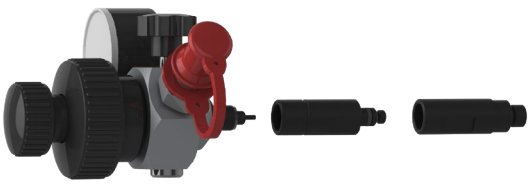
Order No. 1029335



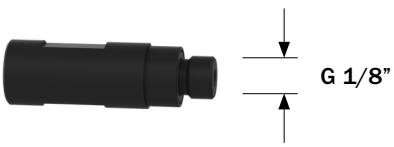
Charge Port Adapters

As mentioned above, by attaching a suitable charge port adapter, the Control Armature M6 can be connected to KALLER® G1/8" standard gas ports or other special gas ports. Adapters 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 adapters
Order No. 1229335



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



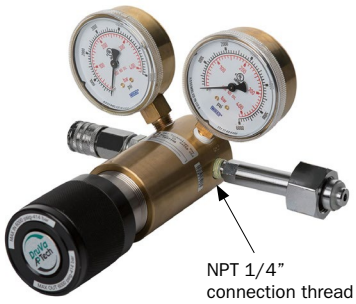
Charging Port Adapter M6 special gas port Special gas port example CU4-1000, CX
Order No. 3014021

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 adapter 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



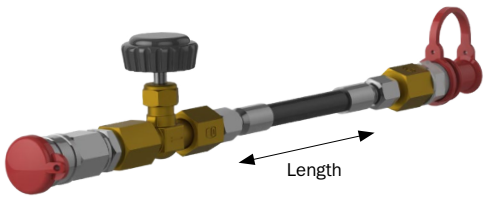
If the right thread cannot be defined, you can order a Pressure Regulator without a connection adapter. In this case, the right connection adapter must of course be fitted at the ¼ NPT thread before use.

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 adapter 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

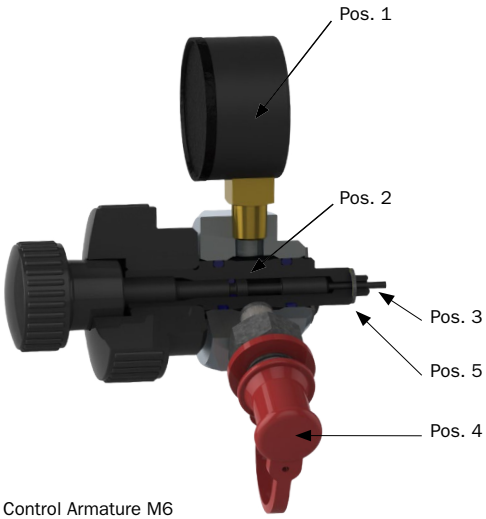
For a complete set of Gas Charging Equipment, including the carry case, order the following items – just make sure to choose the right adapters, and a suitable length for the Charging Hose.

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	

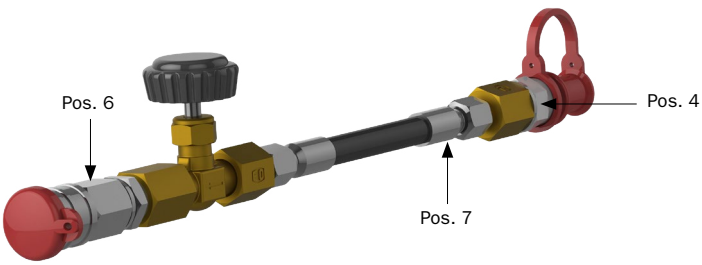
Spare parts for Charging Equipment

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

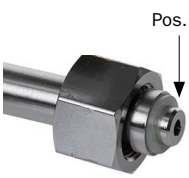
Description	Order No.	Pos.
Gauge	40 502467	1
M6 Connection rod	1029006	2
Valve opener rod	1028977	3
QRC coupling – male	502386	4
Washer M6	501023	5
QRC coupling – female	502176	6
Hose – 2 m	3020857-2000	7
Hose – 4 m	3020857-4000	7
Hose – 6 m	3020857-6000	7
Regulator Gauge	63 506130	8
Sealings tray DIN477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



Control Armature M6



Hose



Pressure Regulator

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 kg or lbf, digital version
- Accuracy: ± 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 kg or lbf
- Accuracy: ± 0.5%
- Max. capacity: 2,000 kg (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

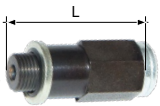
Plugs		
Order No.	**Component**	
4018682	M6 plug standard	
4118682	M6 plug (with leak groove)	
4014331	M6 plug for CU4 1000	
500343	G 1/8” plug	
501866	G 1/4” plug	
Valves		
Order No.	**Component**	
4018112	M6 valve	
501243	VG5 valve	
4014007	Oil bleeding valve	

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 3015303-02 L=33	Gas charging adapter	
4027047	Gas charging adapter 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 EO24™, EZ Hose, EO24™-

Our Hose Crimping Equipment can be used for Micro EO24™, EZ and EO24™ 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 EO24™, EZ Hose
Order No. 3024010

Crimp die EO24™
Order No. 504196

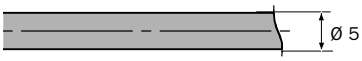
Pneumatic operated crimping press.
Order No. 3121381
(Crimping die not included)

Stop Tool (for Micro EO24™ hose end assembly)
Order No. 4024183

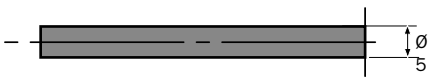
Hose cutting plier
Order No. 502839

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_2 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.

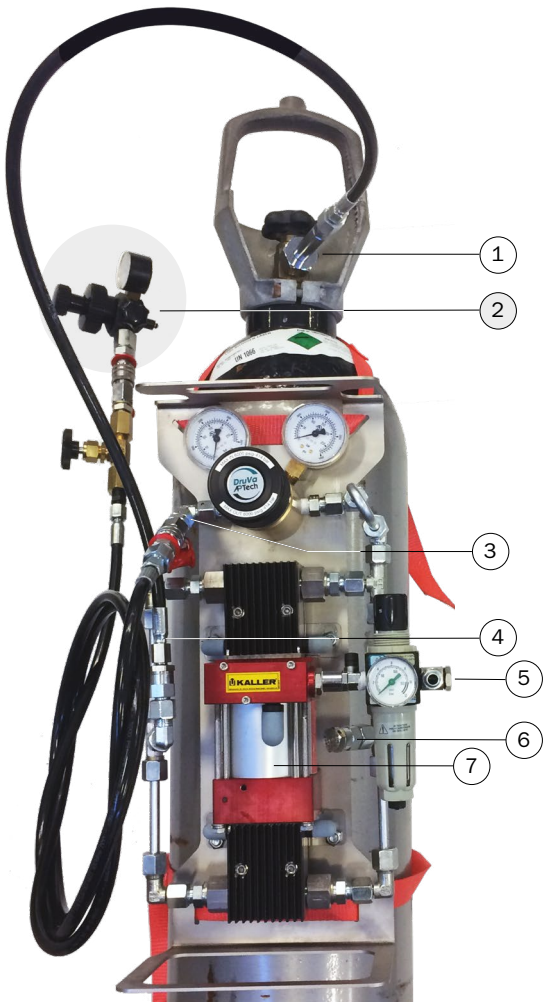
The booster is mounted on a holding plate and can easily be hung over the nitrogen bottle neck with the mounting straps.

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 N2, 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. 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®.

Universal torque wrench
Torofix 2 - 25 Nm

Accessories

Sizes mm: 9, 10, 14, 16, 19

Sizes mm: 3, 4, 5, 8

Potential suppliers,
www.toolstore.com

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

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 111 and 113.

For further information contact your local distributor or KALLER® at www.kaller.com or
Phone: +46 140 571 00.

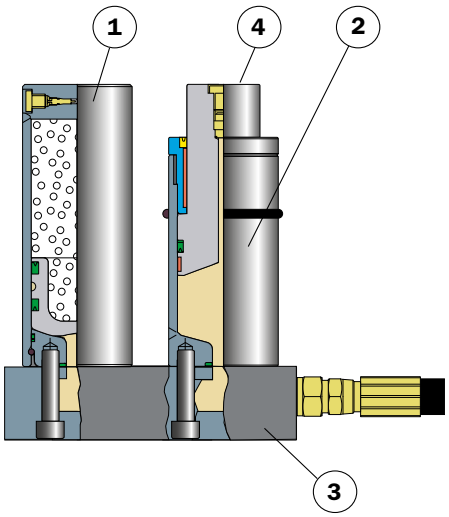
Power Unit (HCP)

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 pressurization 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.

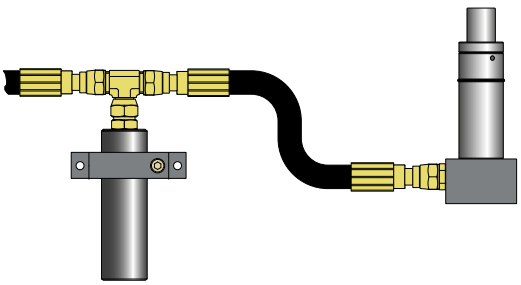
Note that the piston (4) of the Power Cylinder is at the same height as the Accumulator when this system is completely filled with oil.

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.

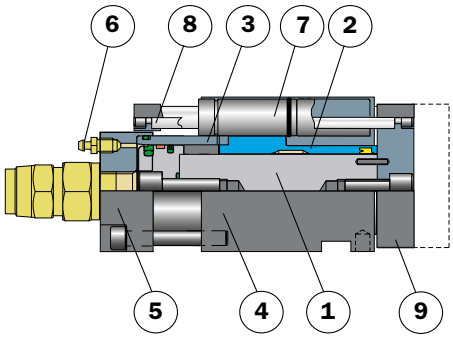
Compact Cam (CC)

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.

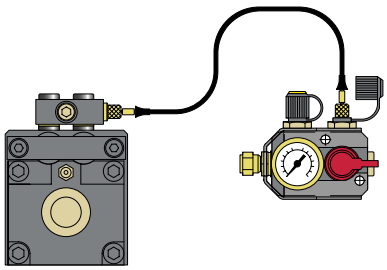
The Power Unit (HCP) or Hydraulic Pump Unit (EHC) can be used to actuate the Compact Cam. The Cam return force is provided by one or two internally installed gas springs. The punch adapter plate is prevented from rotating by the two anti-rotation rods.

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.



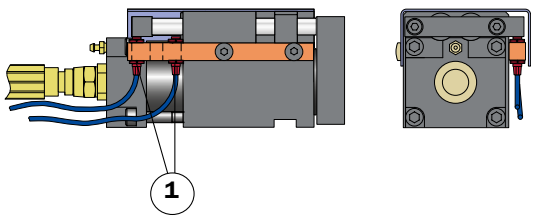
Compact Cam (CC-H) for Hosed System

The Compact Cam is also available in a version where the gas springs in the unit can be hosed 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" starting on page 113.



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" starting on page 113.

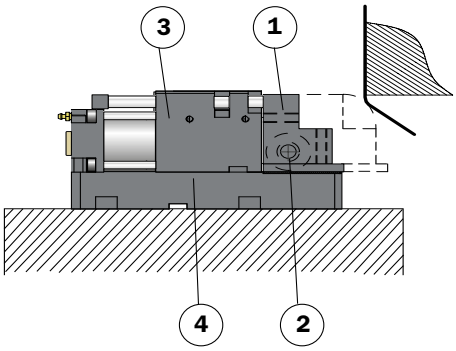


Flange Cam (CCF)

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.

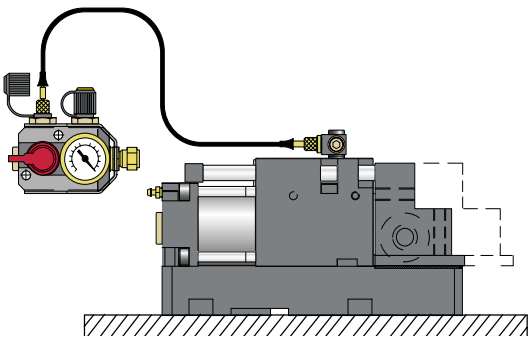
The Power Unit will actuate the Flange Cam and the return movement is provided by two internally installed gas springs. The front adapter plate is prepared with threaded holes to mount any customized flanging tool etc.



Flange Cam (CCF - H) for Hose System

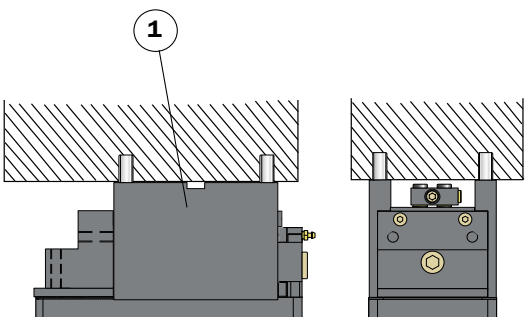
The Flange Cam is also available in a version where the gas springs in the unit can be hosed to a control armature. This way the gas pressure in the spring can be monitored from outside the tool.

See section "Dimensions for Power and Cam Units/ Force Cylinders" starting on page 113.



Flange Cam spacers (optional)

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

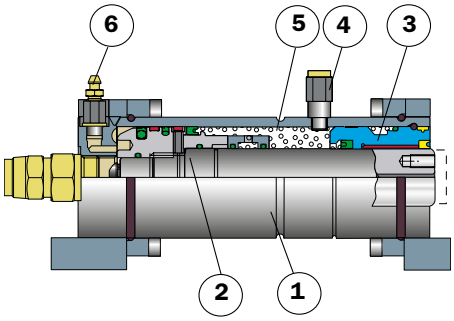


Force Cylinder (HCF)

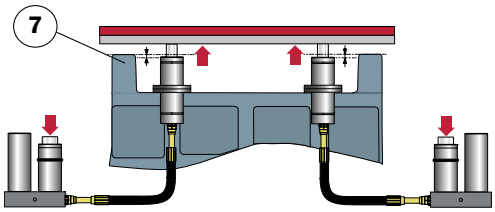
The Force Cylinder is suitable for forward and return motion of, for example, a flanging steel or forming punch used for various operations in the tool. Note that it is not possible to mount a punch directly onto the piston rod without a guide in the tool.

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.



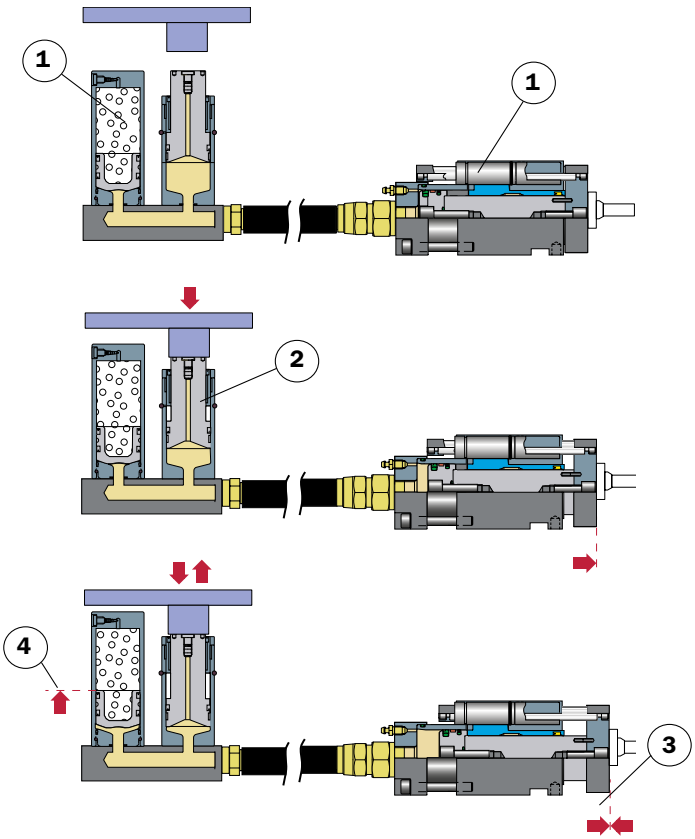
Function Description

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.

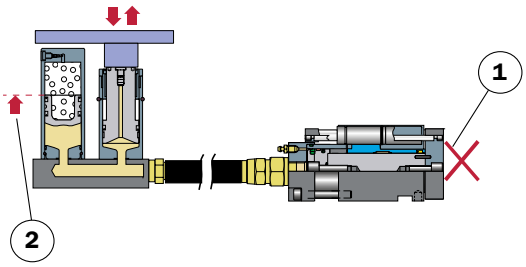
When the press returns upwards the movable parts will return to their original positions due to the return Gas Springs in the Cam (or nitrogen pressure in the Force Cylinder) and Accumulator.



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 pressurization 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

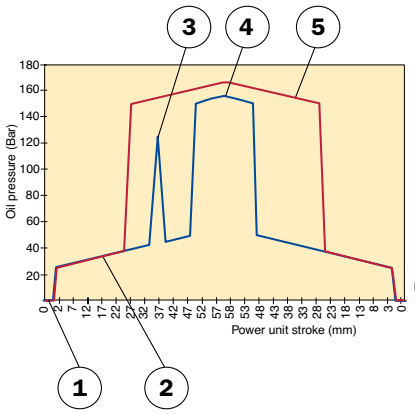
Before the Power Unit is activated the oil pressure is 0 bar (1).

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.

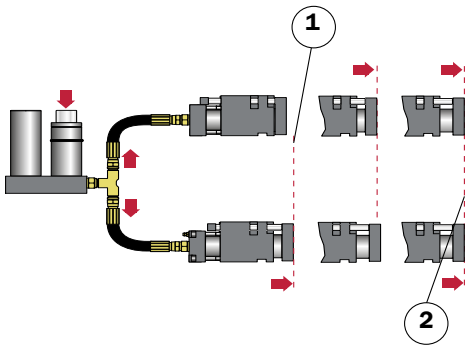
If the movement of the Cam is restricted the oil pressure will follow curve (5).



Connection of two or more Cam Units to one Power Unit

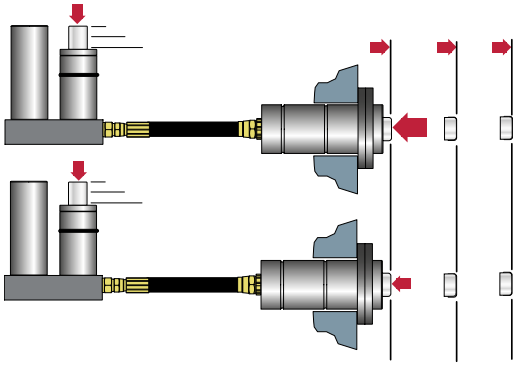
It is possible to connect up to three Cam Units to one Power Unit. Note that the movement of the Cams during the stroke are not synchronized (1) until the Cams are in the fully extended position (2).

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 synchronized regardless of the individual force required by each Force Cylinder.



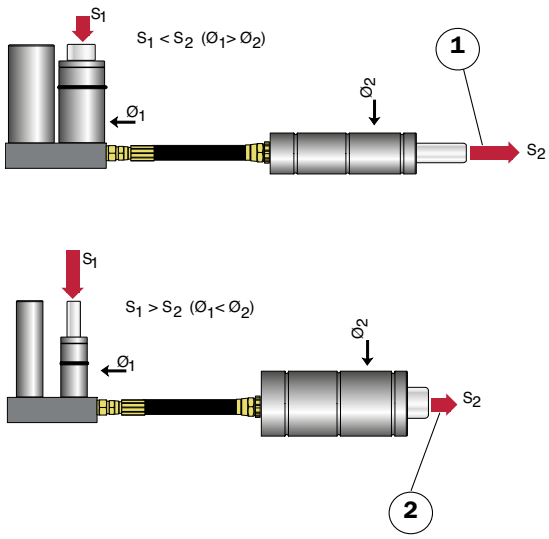
Adapting Cam stroke ratios

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.



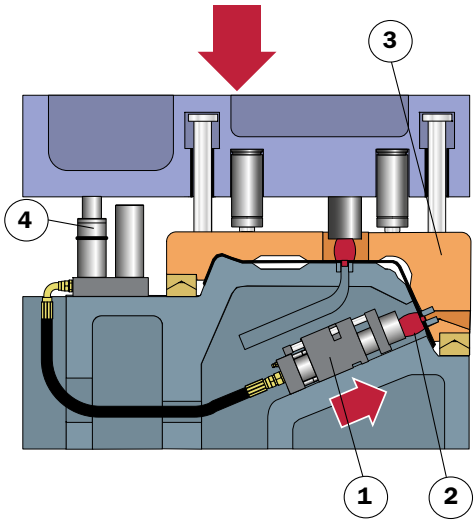
Installation Examples

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.

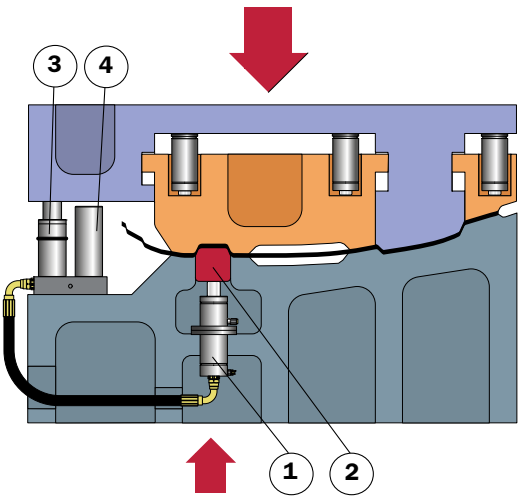
Note that the Power Unit can be mounted at any location and orientation to the Cam Unit/Force Cylinder and not just as is depicted in these examples.



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).



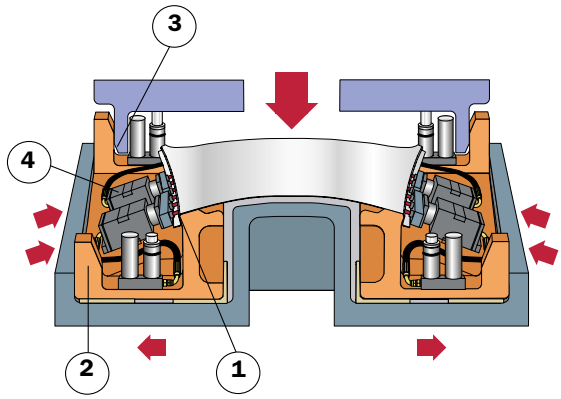
Installations currently in operation

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).

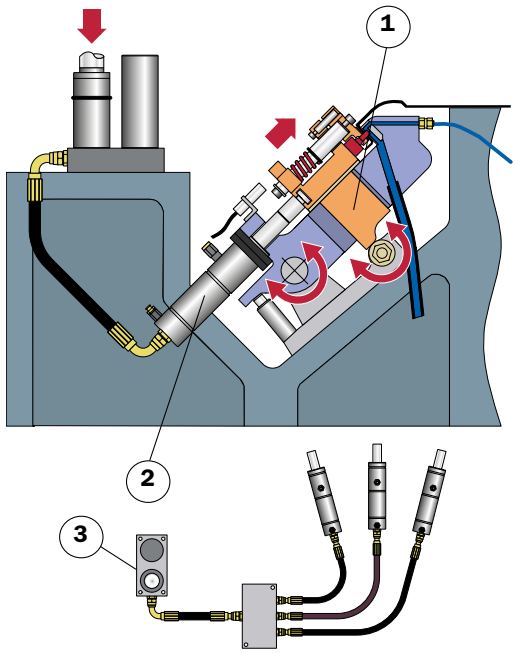
Using this solution there is no longer the need for drivers at the punching position and therefore punching operations can easily be carried out perpendicularly to the blank.



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 center). 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.

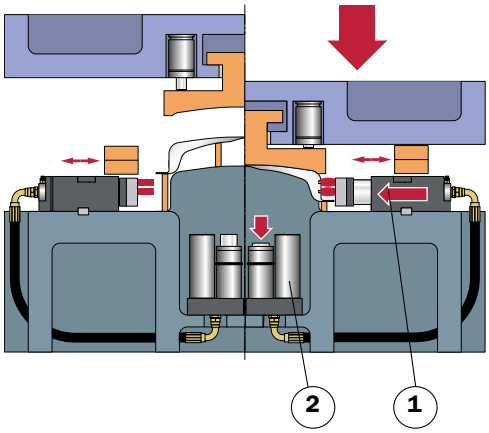
There are two systems in the tool, one on the left side, one on the right. Each system consists of one Power Unit (3) driving three Force Cylinders.



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)

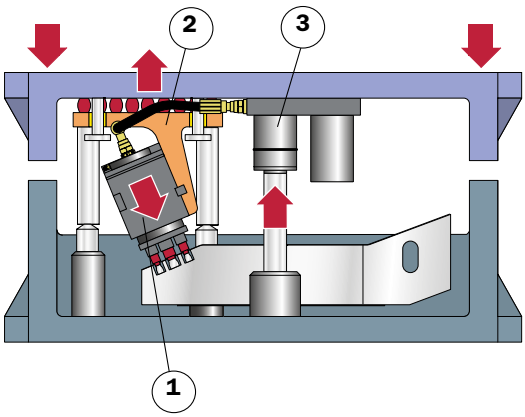
Two versions of the same part are produced, one with holes and one without. For the part without holes, the Power Unit is simply removed from the tool, thus disabling the Cam Units from making the holes.



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 centered 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.

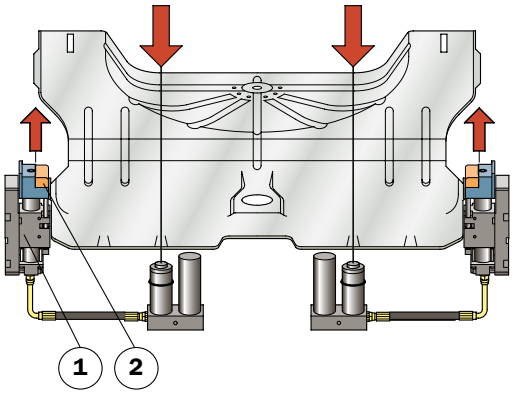
Prior to the installation of the hydraulic cam system, the holes were being punched at a vertical angle using oval shaped punches.

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.

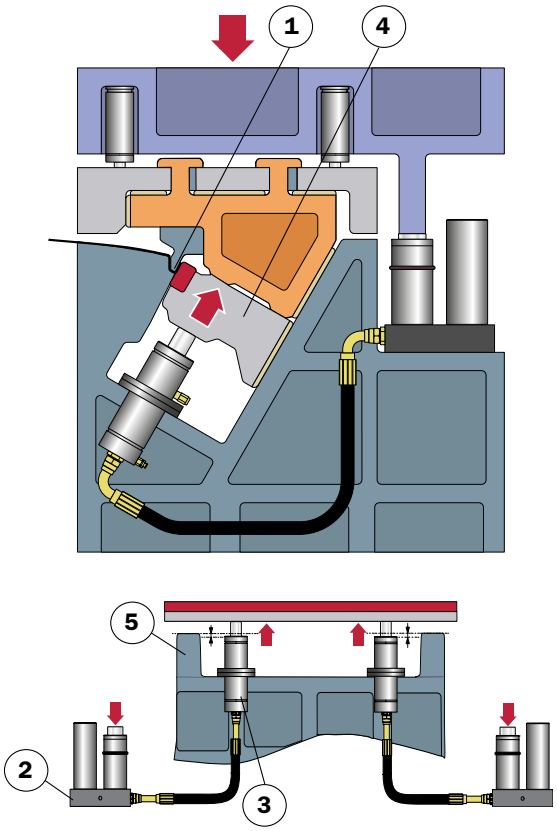


Example 6. Flanging a wide edge
In this tool two Force Cylinders are being used to drive a 800 mm wide flanging steel. As seen in the picture the flanging (1) is carried out at an angle opposite to the direction of the press motion.

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 pressurization 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/mm²

Shearing strength (= x 0.8) ..... : = _____ N/mm²

Diameter of punch ..... : d = _____ mm

(or)

Total cut length ..... : 1 = _____ mm

Piercing force Fp

Piercing a round hole

Fp = t x τ x d x π

Piercing or cutting

Fp = t x π x 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).

Fp = 1.2 x 400 x 0.8 x 10.5 x π
Fp = 12667
Fp ≈ 12.7 kN

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

Example

Fs = 12667 x 0.11
Fs = 1393

Fs ≈ 1.4 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 _____ - _____

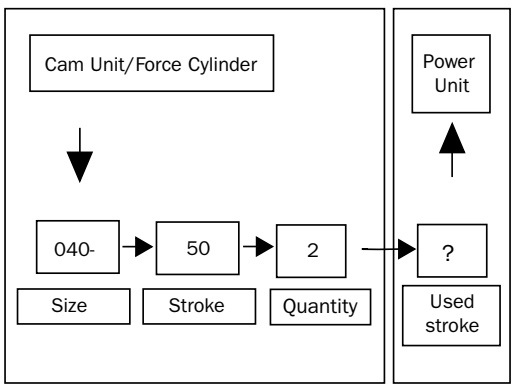
Step 5a Size and stroke of Power Unit

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.

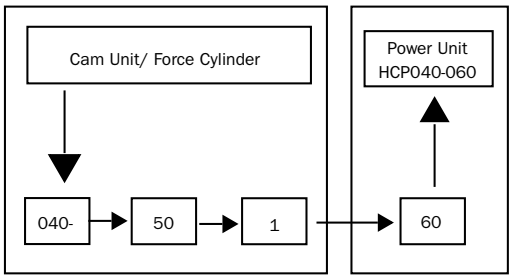


CAM UNIT / FORCE CYL.			POWER UNIT / Used stroke / Ratio CAM UNIT or FORCE CYL.-POWER UNIT														
Size	Stroke	Qty	015-	Stroke	Ratio	040-	Stroke	Ratio	060-	Stroke	Ratio	090-	Stroke	Ratio	150-	Stroke	Ratio
015-	25	1	35	35	1.0	35	20	2.5	35	16	4.0	35	14	6.3	35	13	9.8
	25	2	60	60	0.5	35	30	1.2	35	23	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

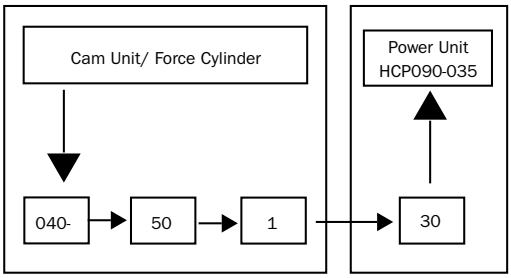
Combinations of Cam Units and Power Unit marked [ ] are normally not recommended as maximum Cam velocities can be exceeded if Power Unit is stroked too quickly. See also the following examples.

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).

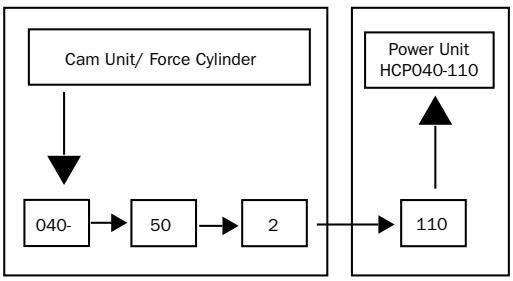


Example 2.
If it is possible to use only 30 mm of stroke from the press to perform an operation, choose a larger Power Unit HCP 090-035 connected to one Cam Unit CC 040-049. The used stroke of the Power Unit will be 30 mm and the ratio 2.5. If the press speed is 0.3 m/s the Cam speed will be 2.5 x 0.3 = 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 optimized 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 x 0.3 = 0.15 m/s.
(Press stroke 10 mm - Cam stroke approximately 5 mm).



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 Vc for the Cam Units/ Force Cylinders = minimum oil volume for the Power Unit in dm3. An is the piston area in the Cam Units in dm^2 as shown in Table 1.

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

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 = _____ 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 Sp 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 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 = _____ 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:
$S_p = ((V_c / V_p) \times S_{HCP}) + 10$
$S_p = ((0.189 / 0.251) \times 50) + 10$
$S_p = 48$ *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 149. 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 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”

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.	$1x10^6$					$1x10^6$					$1x10^6$	$1x10^6$				
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 HVLP ISO VG 32
Purity ISO 4406 15/12 (with 10µm filter)
Nitrogen:
Nitrogen N_2 ..... >99.95 vol %
Water H_2O ..... < 40 ppm

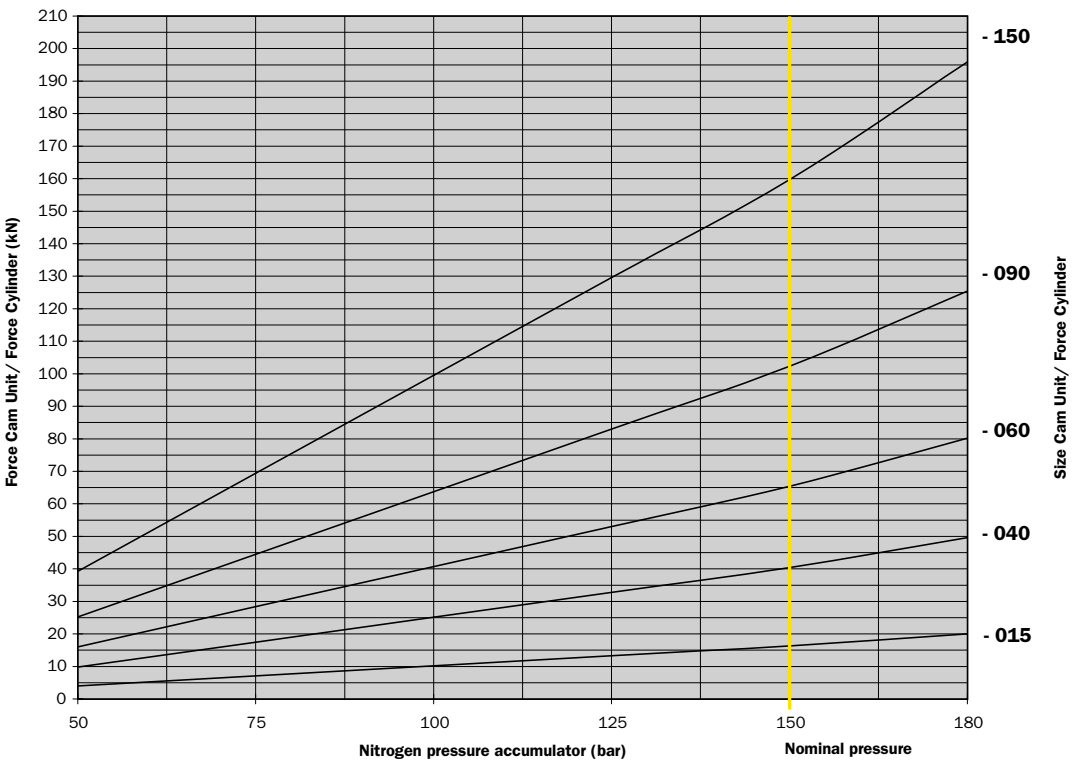
Cam Unit/ Force Cylinder force as a function of nitrogen pressure in the Accumulator

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.

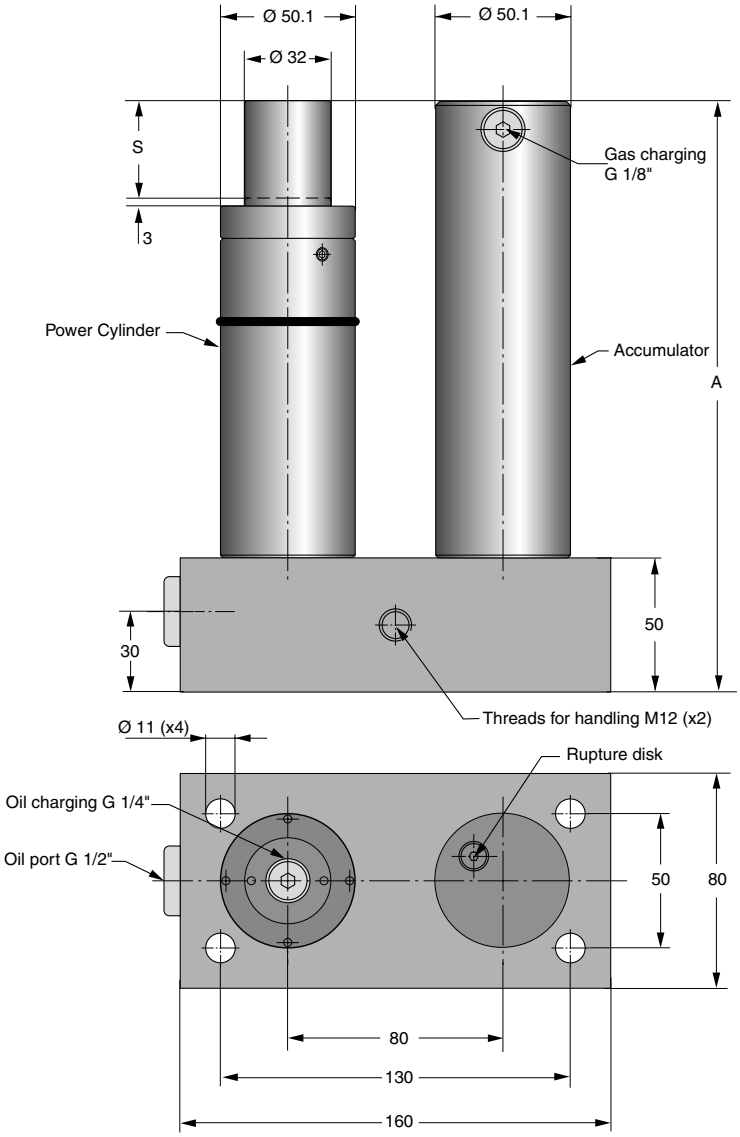
Force Cam Unit/ Force Cylinder - Nitrogen Pressure Accumulator



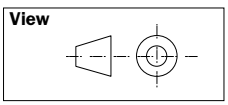
Dimensions

Power and Cam Units/ Force Cylinder

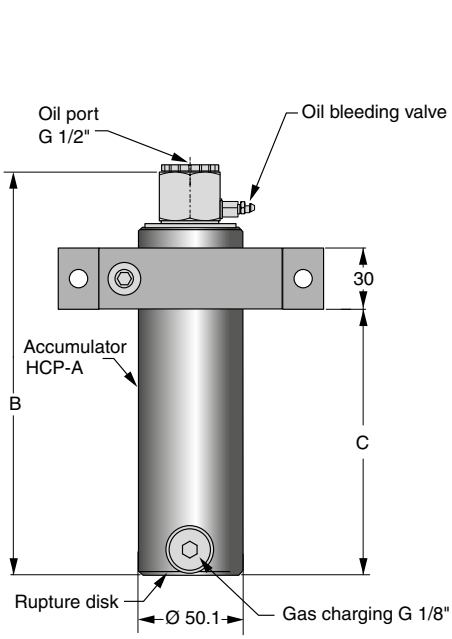
HCP 015 Power Unit

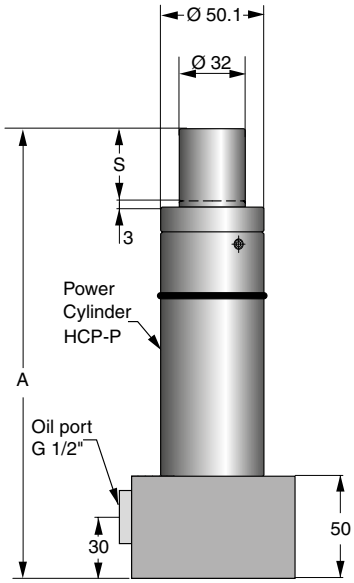


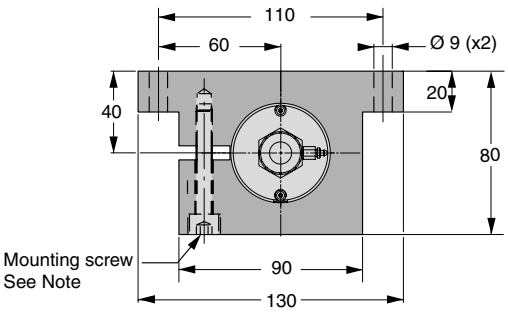
Order No.	Force (kN)	Stroke S (mm)	A	Weight (kg)
HCP 015-035	15	35	220	8.2
HCP 015-060	15	60	270	9.1
HCP 015-110	15	110	370	10.5
HCP 015-160	15	160	470	11.3

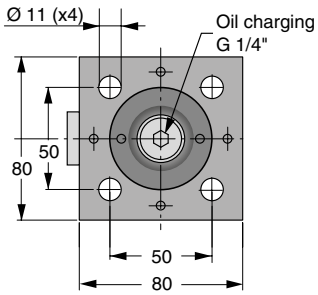


HCP-S 015 Power Unit, with Separate Accumulator



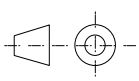






Note! The Mounting screw (M8) should be tightened with torque 25Nm

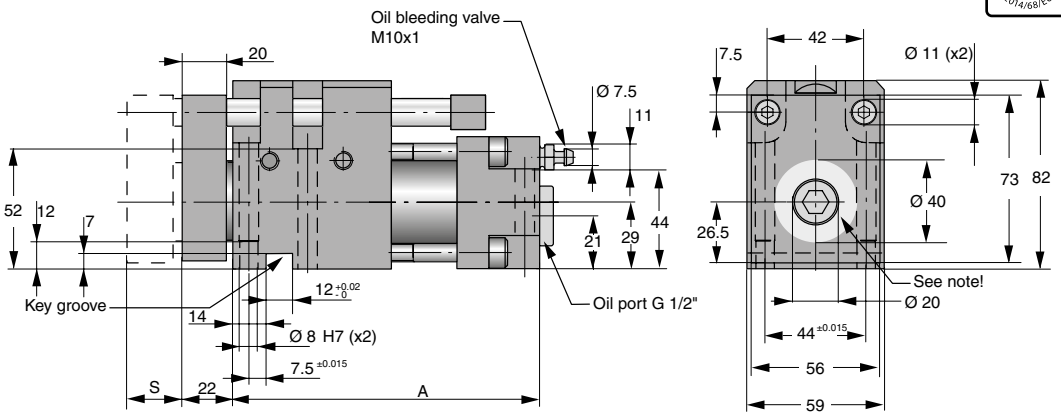
View

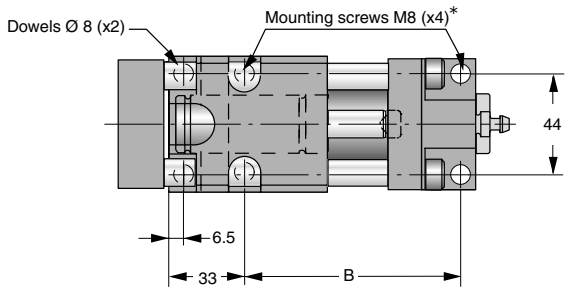


Order No. Complete Power Unit HCP-S	Weight (kg)	Force (kN)	Stroke S (mm)	A	B	C	Order No. Separate Power Cylinder HCP-P	Weight (kg)	Order No. Separate Accumulator HCP-A	Weight (kg)
HCP-S 015 - 035	7.3	15	35	220	213	130	HCP-P 015 - 035	4.3	HCP-A 015 - 035	3.0
HCP-S 015 - 060	8.1	15	60	270	264	180	HCP-P 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



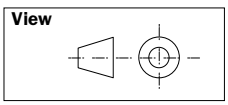


* 4 pcs mounting screws are included

Note!
Important installation information:

We recommend locating the punch in the center 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.

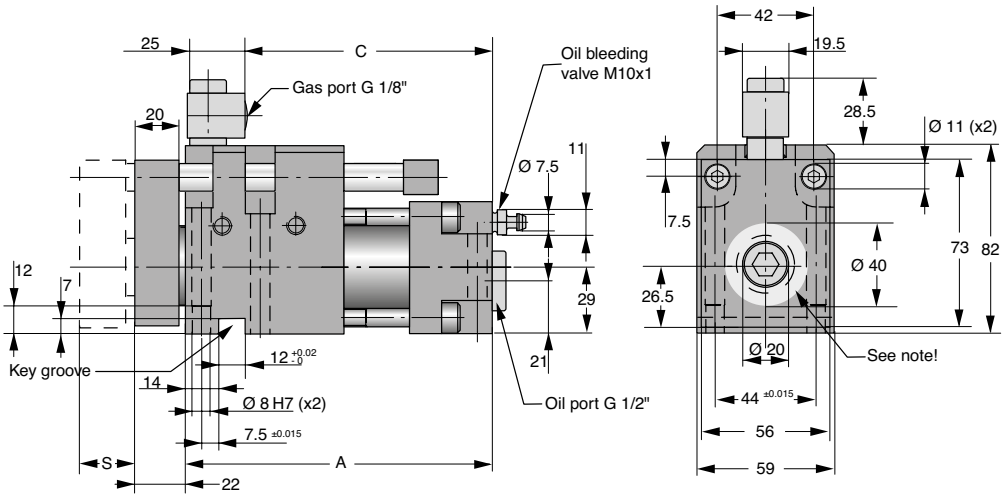


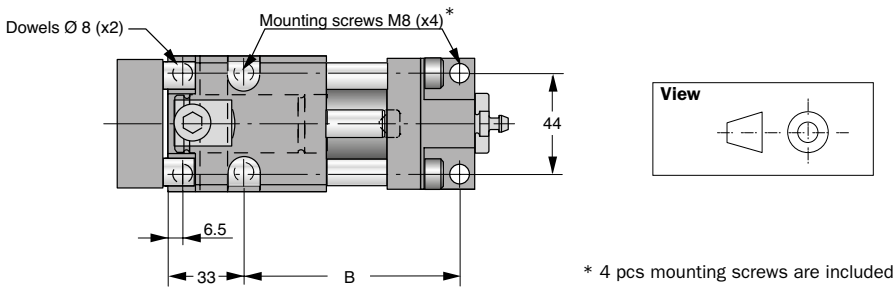
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	Weight (kg)
CC 015-024	15	2	24	133.5	94	4.2
CC 015-049	15	2	49	158.5	119	4.6

* = 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





* 4 pcs mounting screws are included

Note!

Important installation information:

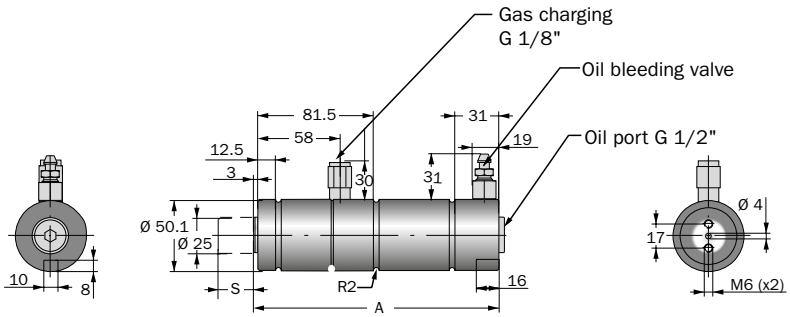
We recommend locating the punch in the center of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

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

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



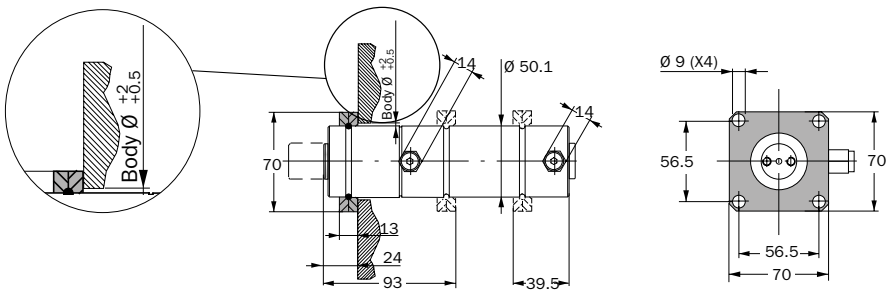
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight (kg)
HCF 015-025	15	1.5	25	173	2.0
HCF 015-050	15	1.5	50	223	2.5
HCF 015-100	15	1.5	100	323	3.6
HCF 015-150	15	1.5	150	423	4.6

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

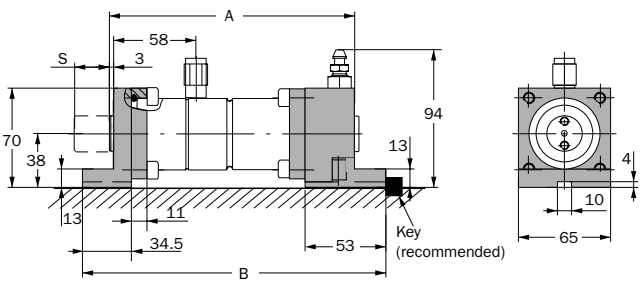
Flange mount HCF 015

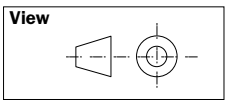
Order No. 2014677-0750 (Mount only)

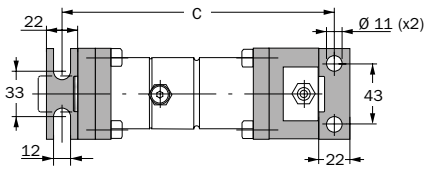


Foot mount HCF 015

Order No. 3016977-015 (Mounts only)

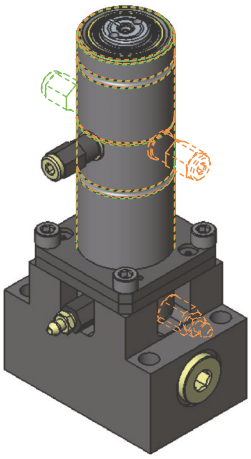


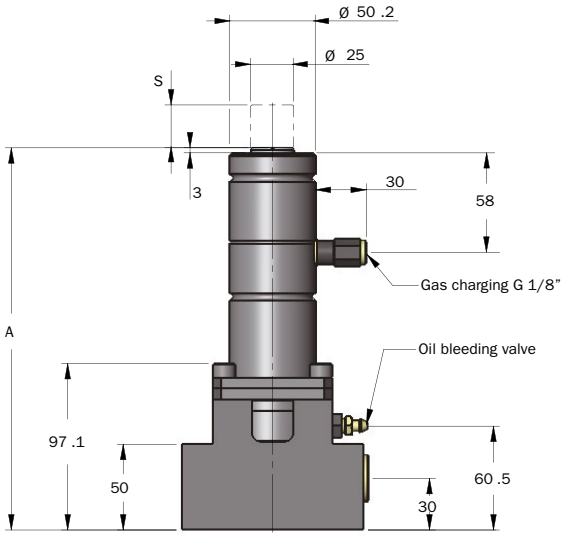


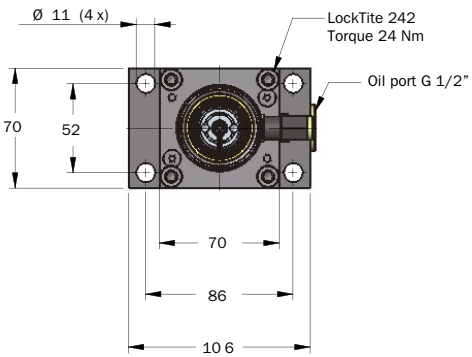


Model	A	B	C
HCF 015-025	173	214	192
HCF 015-050	223	264	242
HCF 015-100	323	364	342
HCF 015-150	423	464	442

HCF-SP 015 Force Cylinder with Side Port Plate





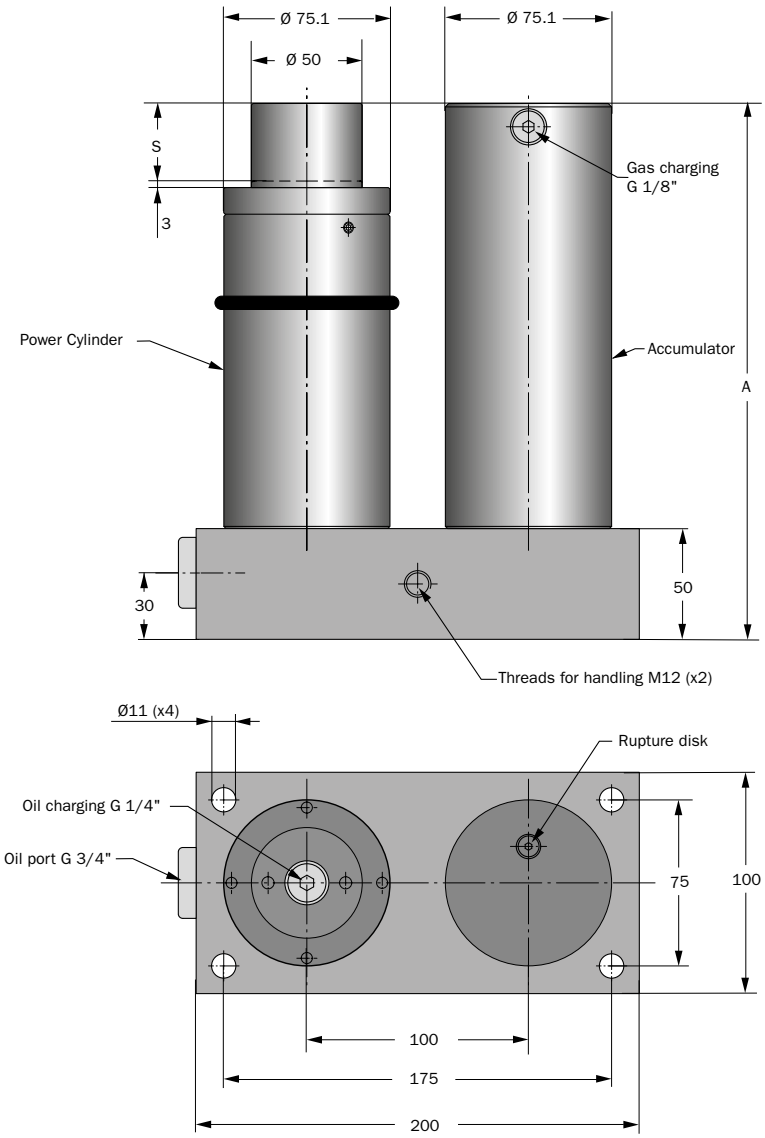


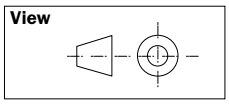
Note: External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

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

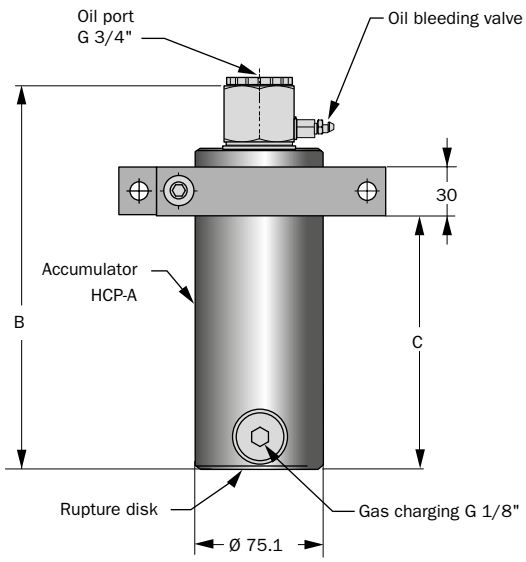
HCP 040 Power Unit

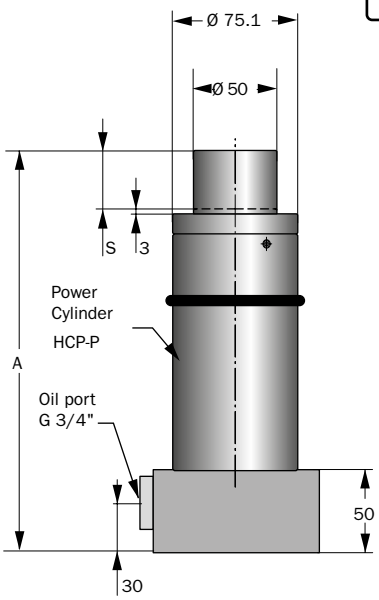


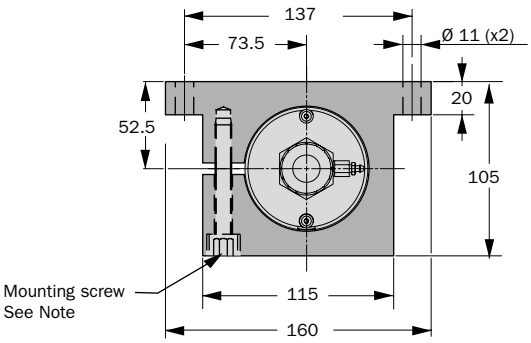


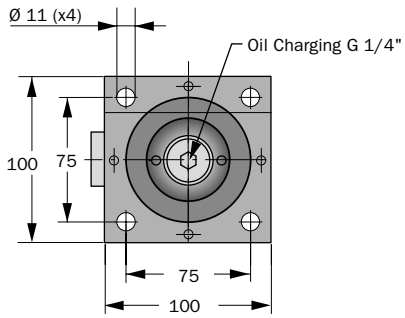
Order No.	Force (kN)	Stroke S (mm)	A	Weight (kg)
HCP 040-035	40	35	242	15.7
HCP 040-060	40	60	292	16.8
HCP 040-110	40	110	392	19.1
HCP 040-160	40	160	492	21.3

HCP-S 040 Power Unit, with Separate Accumulator

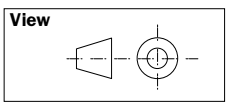








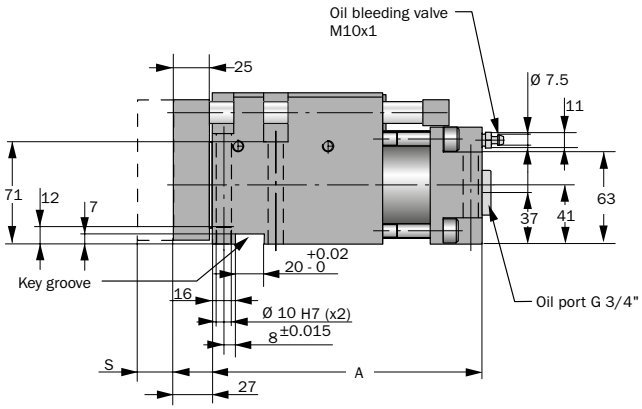
Note! The mounting screw (M10) should be tightened with torque 52 Nm.

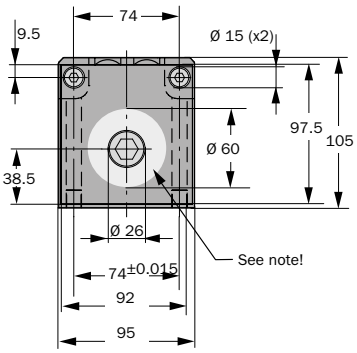


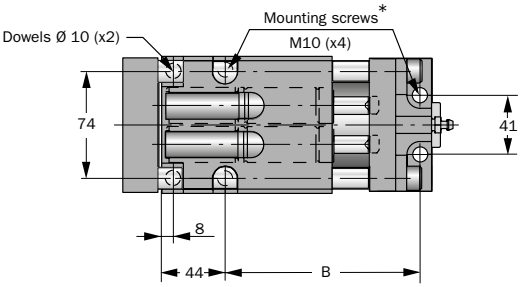
Order No. Complete Power Unit HCP-S	Weight (kg)	Force (kN)	Stroke S (mm)	A	B	C	Order No. Separate Power Cylinder HCP-P	Weight (kg)	Order No. Separate Accumulator HCP-A	Weight (kg)
HCP-S 040 -035	14.0	40	35	242	231	152	HCP-P 040 -035	8.2	HCP-A 040 -035	5.8
HCP-S 040 -060	15.0	40	60	292	281	202	HCP-P 040 -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







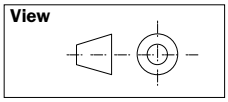
*4 pcs mounting screws are included

Note!

Important installation information:

We recommend locating the punch in the center 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.

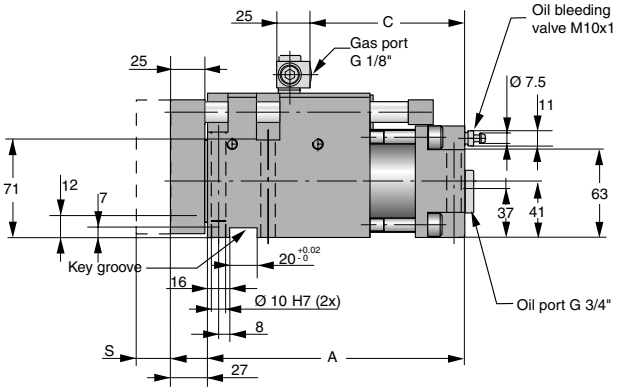


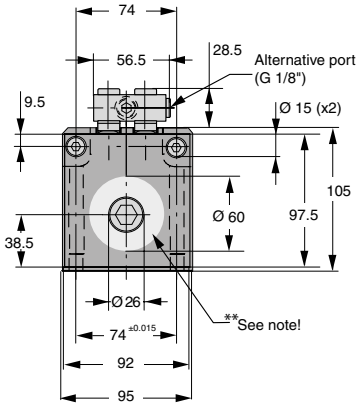
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	Weight (kg)
CC 040-024	40	4	24	187	135	10.5
CC 040-049	40	4	49	212	160	12.8
CC 040-099	40	4	99	262	210	15.0
CC 040-124	40	4	124	287	235	16.5

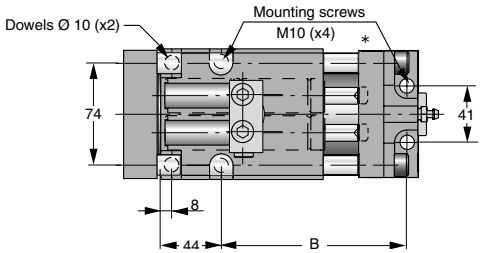
* = Nominal force available for the operation

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







* 4 pcs mounting screws are included

**Note!

Important installation information:

We recommend locating the punch in the center 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 .

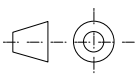
When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against side load.

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.

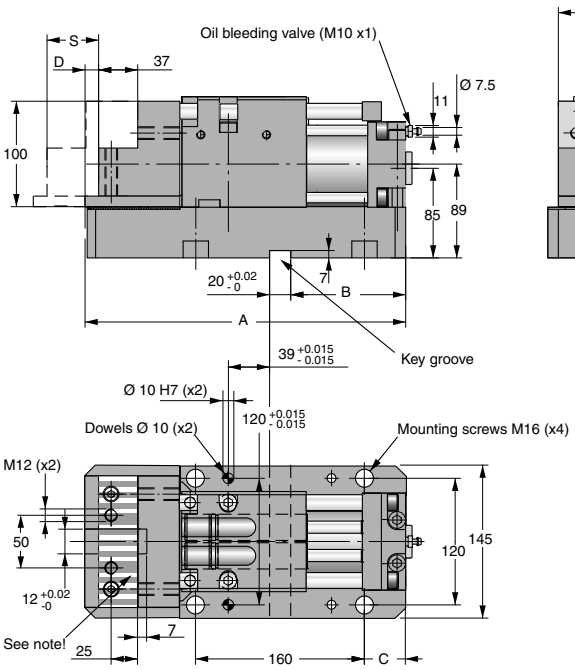
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	C	Weight (kg)
CC-H 040-024	40	4	24	187	135	112	10.7
CC-H 040-049	40	4	49	212	160	162	13.0
CC-H 040-099	40	4	99	262	210	237	15.2
CC-H 040-124	40	4	124	287	235	262	16.7

* = Nominal force available for the operation

View



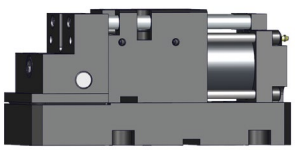
CCF 040 Flange Cam

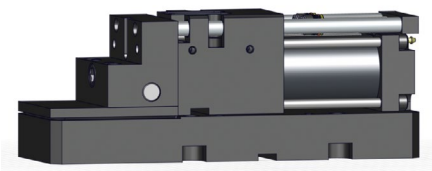


Note!

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

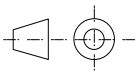
Shaded area marked is not to be machined for risk of damage to underlying roller bearings.





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

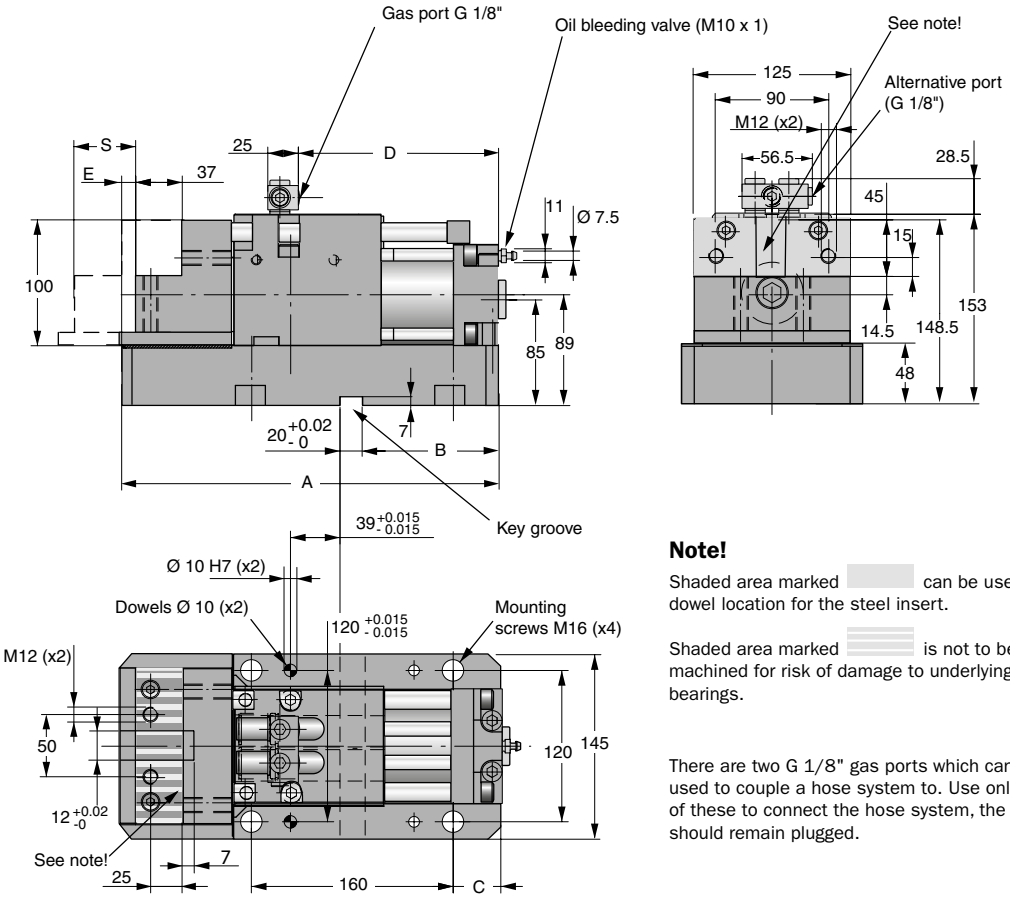
View



* = Nominal force available for the operation

CCF-H 040 Flange Cam

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

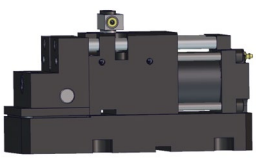


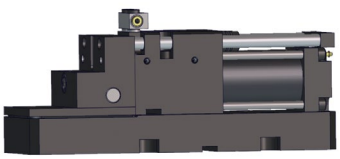
Note!

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.

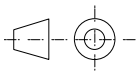




Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	C	D	E	Weight (kg)
CCF-H 040-049	40	4	49	304	109	39	162	13	35
CCF-H 040-099	40	4	99	404	159	89	237	63	43

* = Nominal force available for the operation

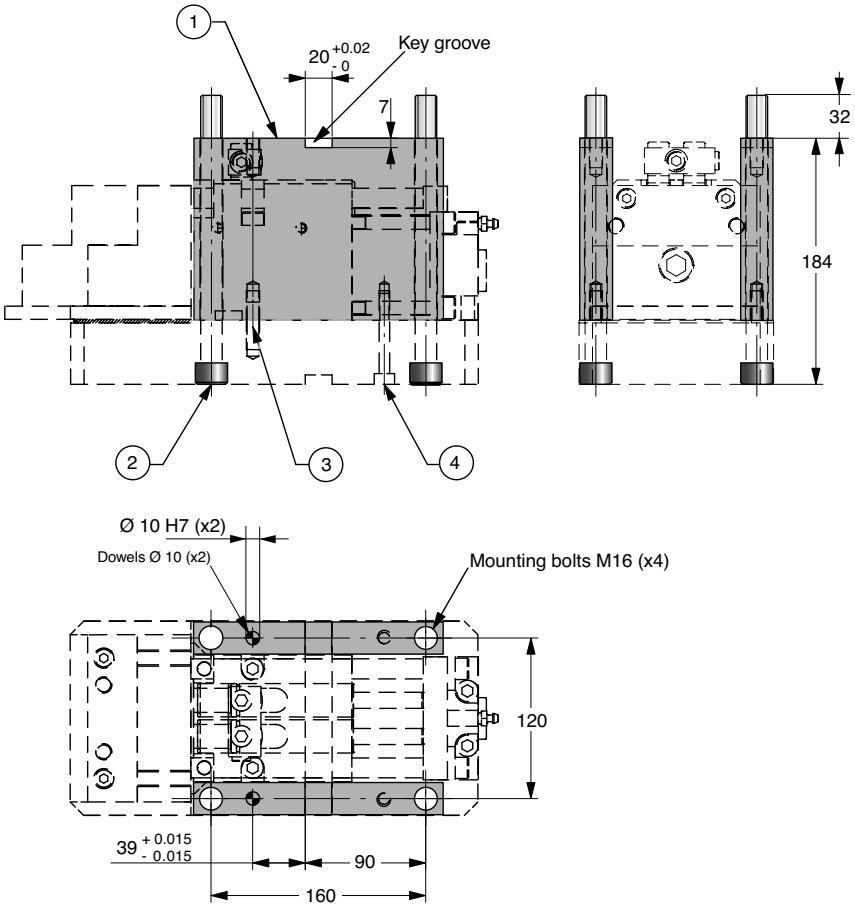
View



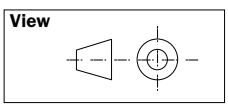
Top mount kit for Flange Cam

CCF 040-049 and CCF-H 040-049
CCF 040-099 and CCF-H 040-099

(Order No. 2018393)

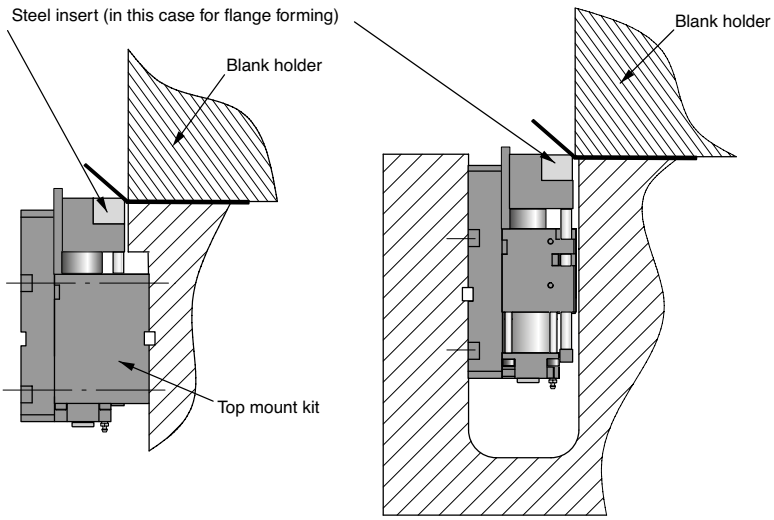


Position	Quantity	Description
1	2	Spacer
2	4	Bolt M16 x 200
3	2	Dowel pin Ø 10 x 40
4	2	Bolt M8 x 60



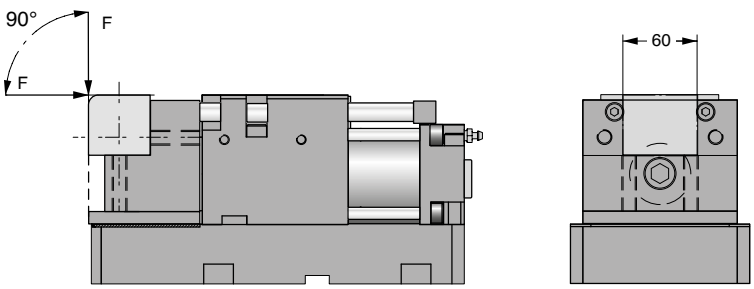
* = Nominal force available for the operation

Flange Cam installation possibilities



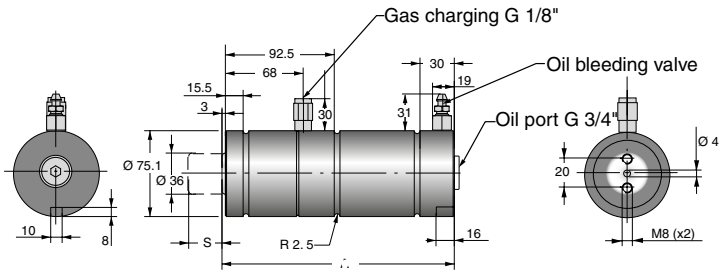
Top mount **Base mount**

Flange Cam force directions and location



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

HCF 040 Force Cylinder

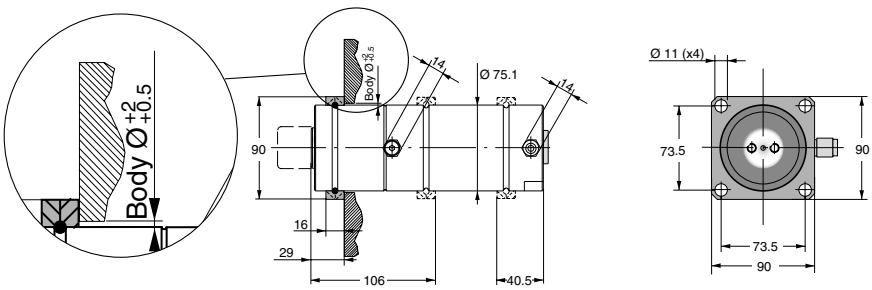


Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight (kg)
HCF 040-025	40	4	25	195	5.5
HCF 040-050	40	4	50	245	6.5
HCF 040-100	40	4	100	345	8.6
HCF 040-150	40	4	150	445	10.7

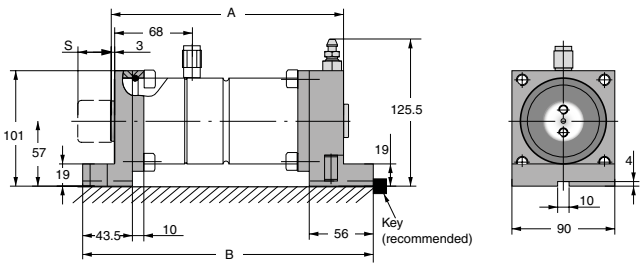
* = Nominal force for the operation

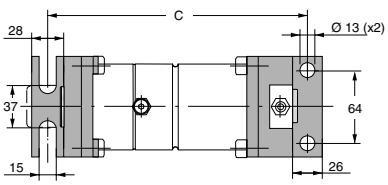
Note: External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

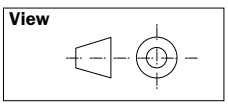
Flange mount for HCF 040 Order No. 2014677-1500 (Mount only)



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

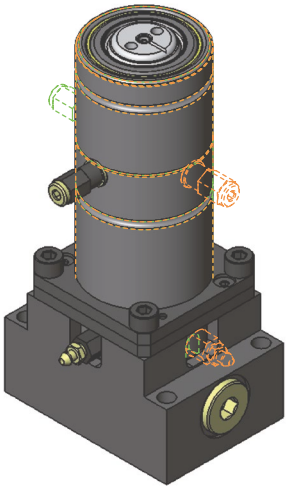


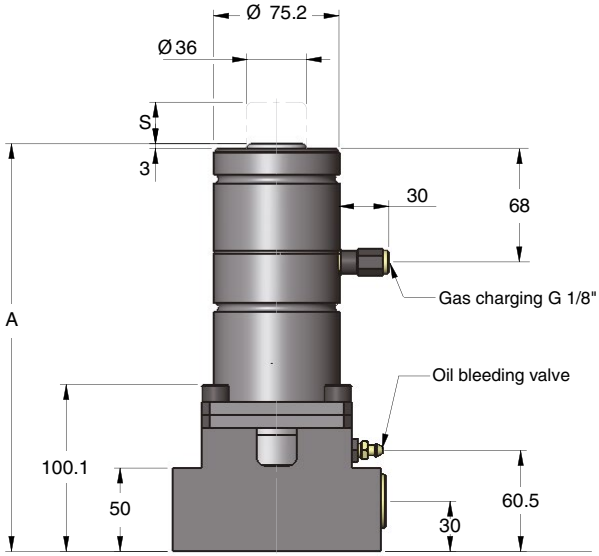


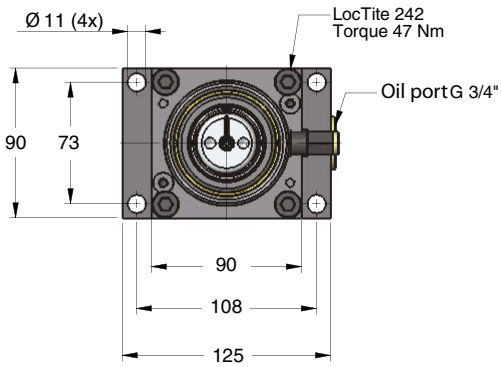


Model	A	B	C
HCF 040-025	195	246	219
HCF 040-050	245	296	269
HCF 040-100	345	396	369
HCF 040-150	445	496	469

HCF-SP 040 Force Cylinder with Side Port Plate





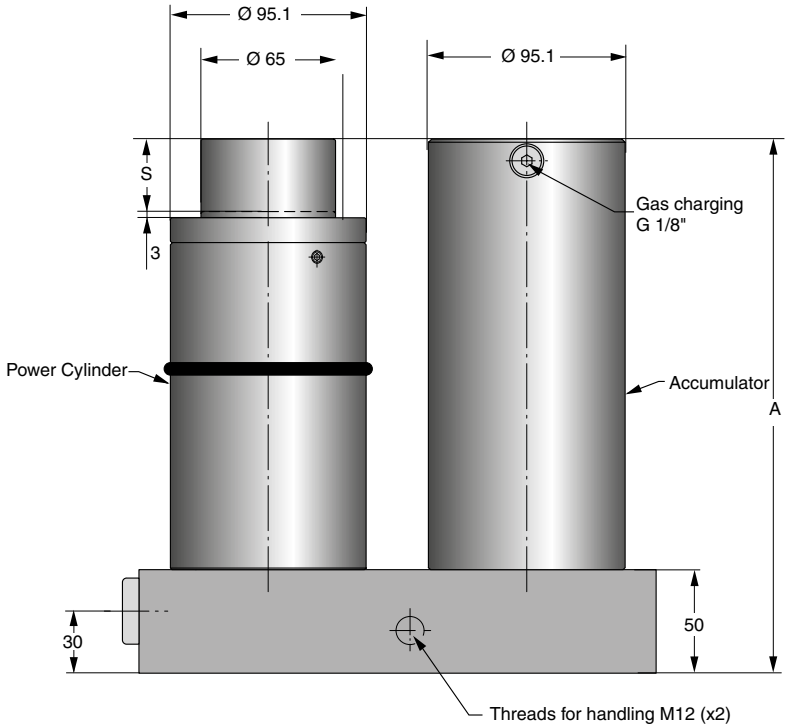


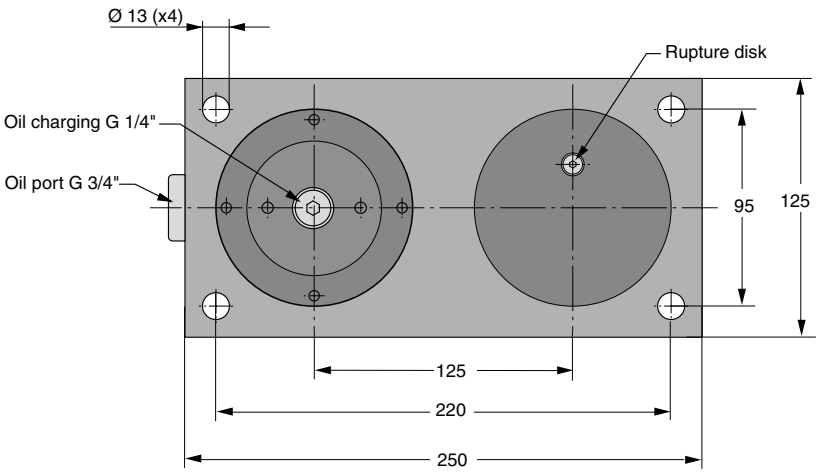
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight (kg)
HCF-SP 040-025	40	4	25	245	10.3
HCF-SP 040-050	40	4	50	295	11.3
HCF-SP 040-100	40	4	100	395	13.4
HCF-SP 040-150	40	4	150	495	15.4

*= 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.

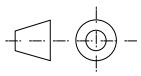
HCP 060 Power Unit



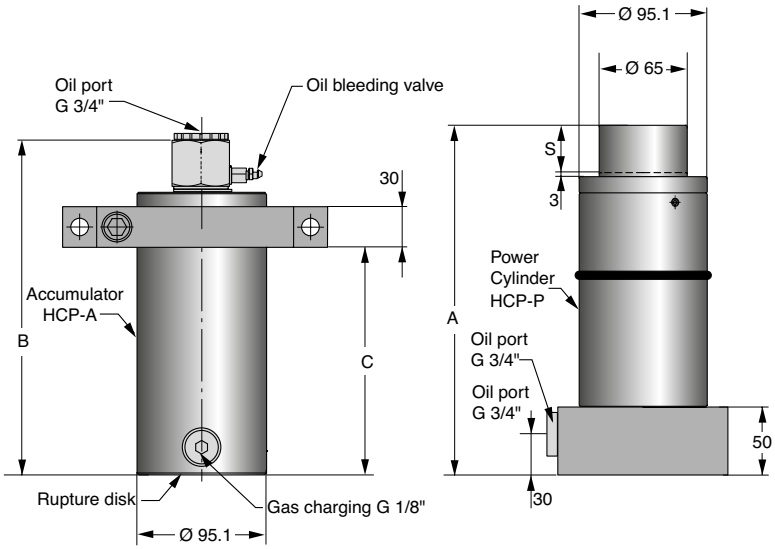


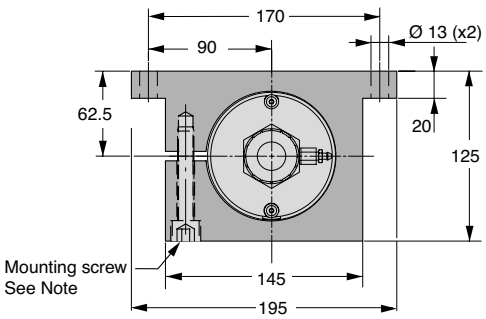
Order No.	Force (kN)	Stroke S (mm)	A	Weight (kg)
HCP 060-035	60	35	258	26.7
HCP 060-060	60	60	308	28.4
HCP 060-110	60	110	408	32.2
HCP 060-160	60	160	508	35.9

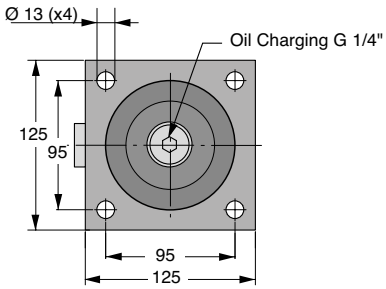
View



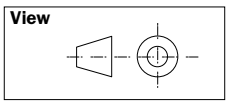
HCP-S 060 Power Unit, with Separate Accumulator







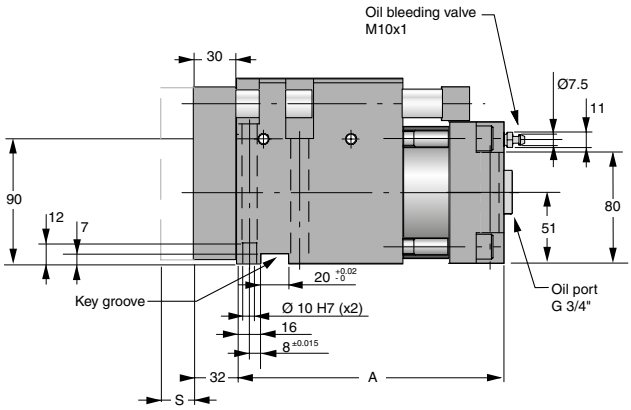
Note! The mounting screw (M12) should be tightened with torque 91Nm

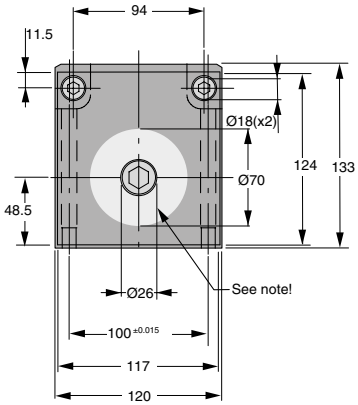


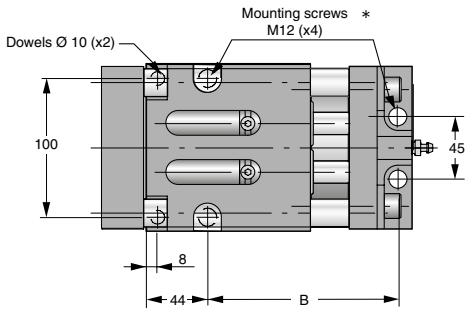
Order No. Complete Power Unit HCP-S	Weight (kg)	Force (kN)	Stroke S (mm)	A	B	C	Order No. Separate Power Cylinder HCP-P	Weight (kg)	Order No. Separate Accumulator HCP-A	Weight (kg)
HCP-S 060 -035	23.9	60	35	258	247	168	HCP-P 060 -035	13.9	HCP-A 060 -035	10.0
HCP-S 060 -060	25.7	60	60	308	297	218	HCP-P 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







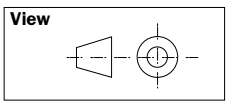
*4 pcs mounting screws are included

Note!

Important installation information:

We recommend locating the punch in the center 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.

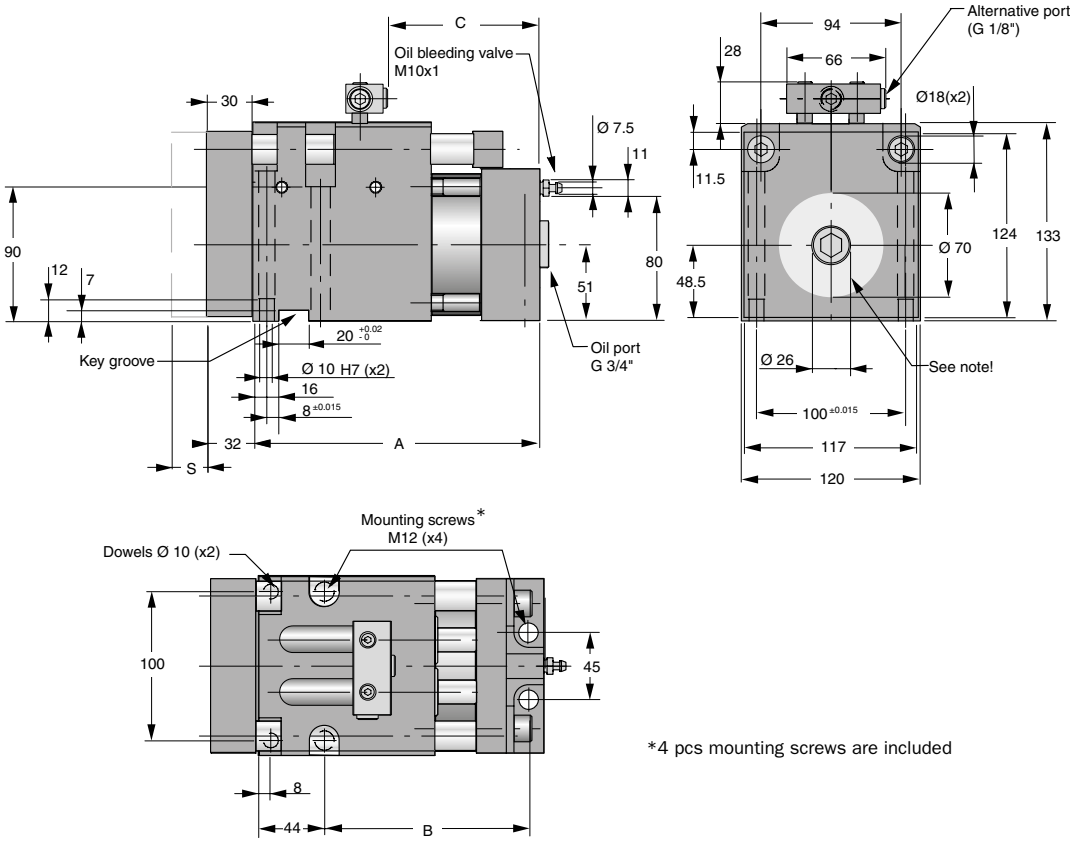


Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	Weight (kg)
CC 060-024	60	7	24	191	137	22.3
CC 060-049	60	7	49	216	162	23.4
CC 060-099	60	7	99	266	212	26.0

* = 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



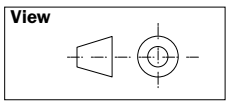
*4 pcs mounting screws are included

Note!

Important installation information:

We recommend locating the punch in the center 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 .

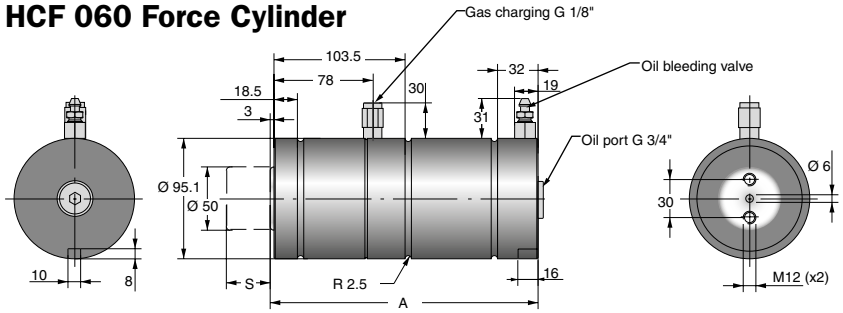
When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against side load.



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

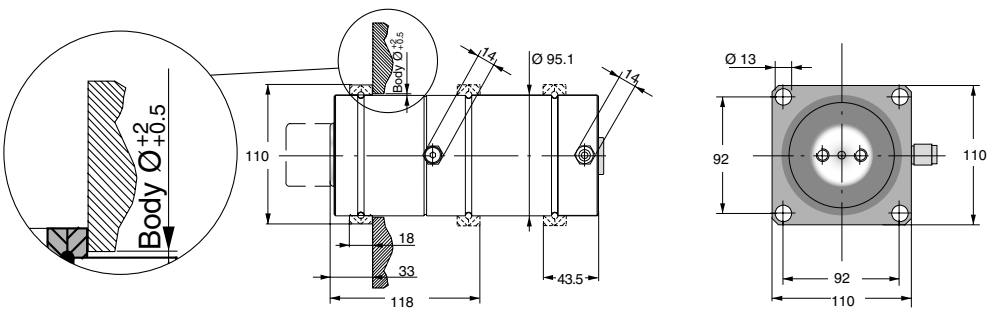


Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight (kg)
HCF 060-025	60	6	25	211	9.8
HCF 060-050	60	6	50	261	11.6
HCF 060-100	60	6	100	361	15.1
HCF 060-150	60	6	150	461	18.6

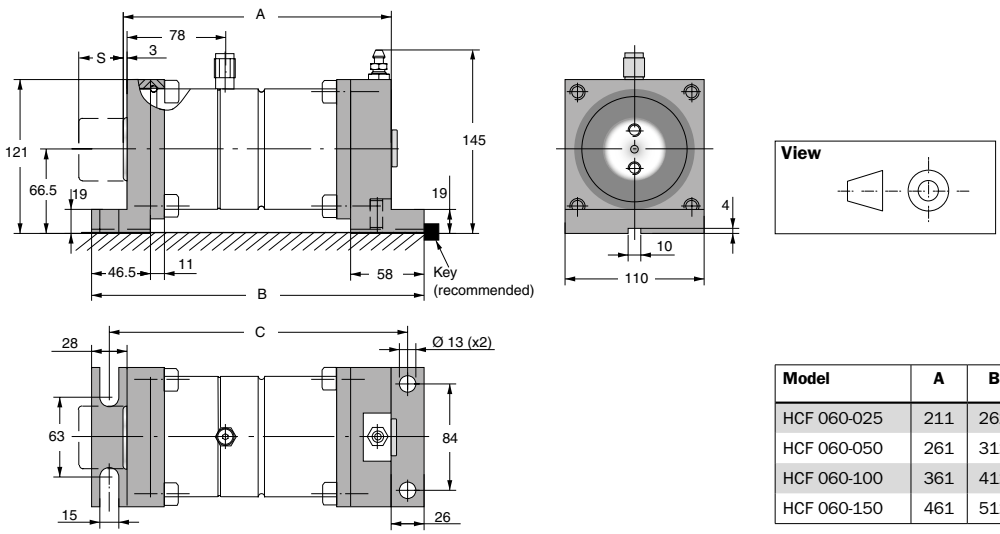
* = Nominal force available for the operation

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)

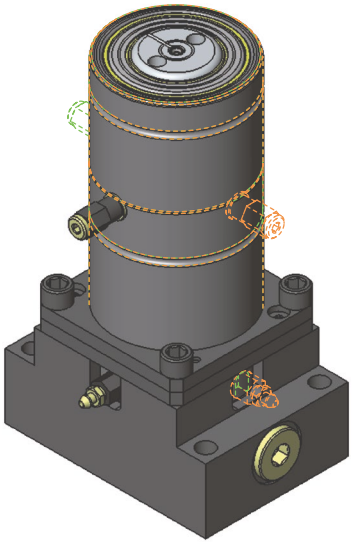


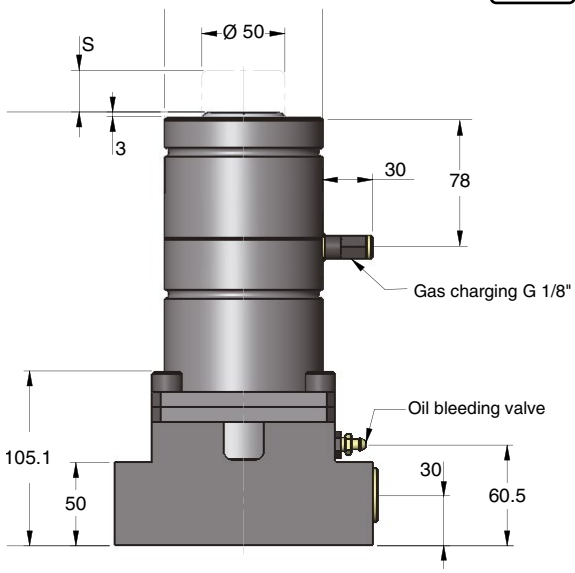
Foot mount for HCF 060 Order No. 3016977-060 (Mounts only)

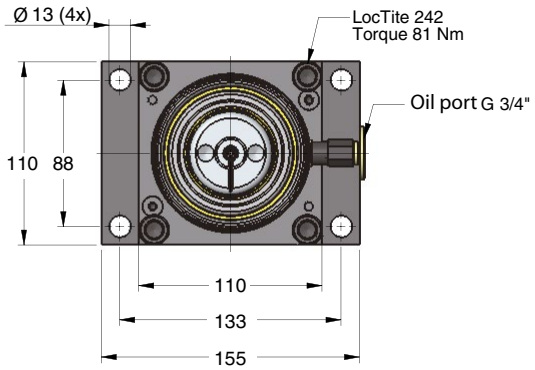


Model	A	B	C
HCF 060-025	211	262	235
HCF 060-050	261	312	285
HCF 060-100	361	412	385
HCF 060-150	461	512	485

HCF-SP 060 Force Cylinder with Side Port Plate





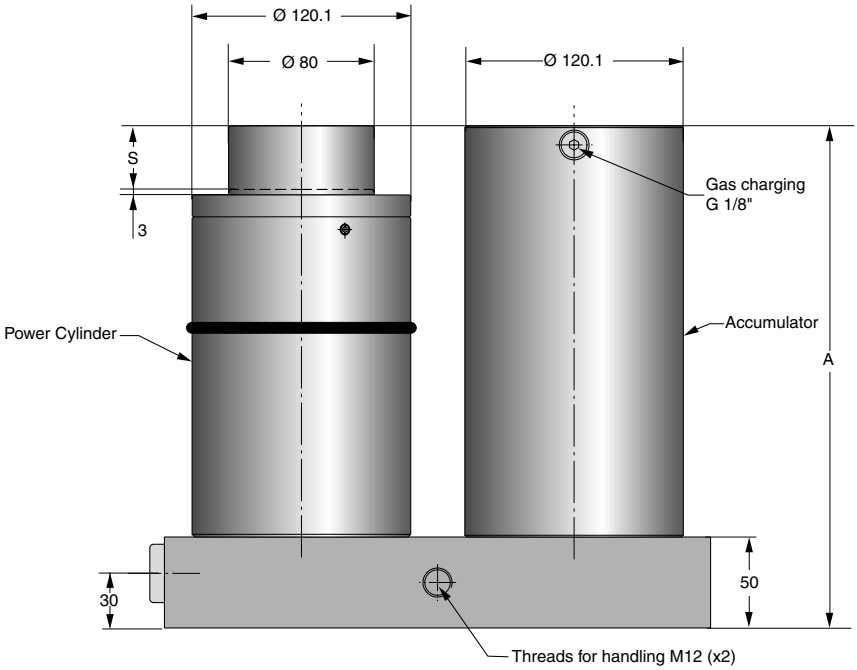


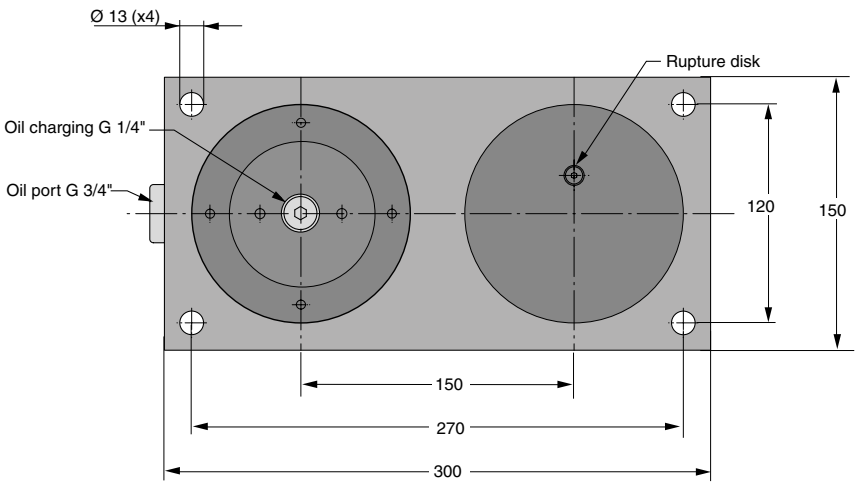
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight [kg]
HCF-SP 060-025	60	6	25	261	17.4
HCF-SP 060-050	60	6	50	311	19.2
HCF-SP 060-100	60	6	100	411	22.7
HCF-SP 060-150	60	6	150	511	26.2

*= 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.

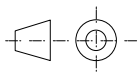
HCP 090 Power Unit



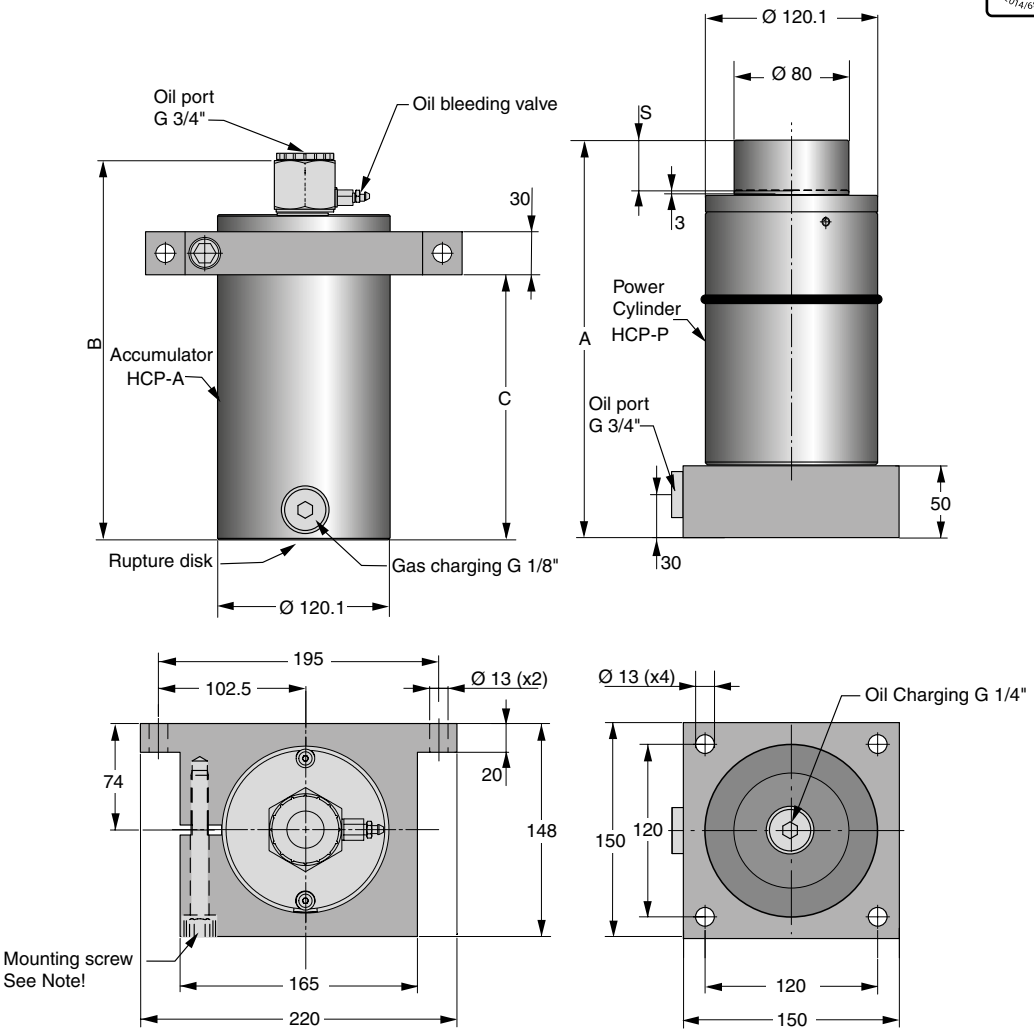


Order No.	Force (kN)	Stroke S (mm)	A	Weight (kg)
HCP 090-035	90	35	276	43.1
HCP 090-060	90	60	326	46.1
HCP 090-110	90	110	426	52.1
HCP 090-160	90	160	526	52.8

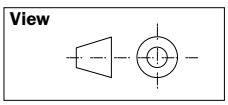
View



HCP-S 090 Power Unit, with Separate Accumulator



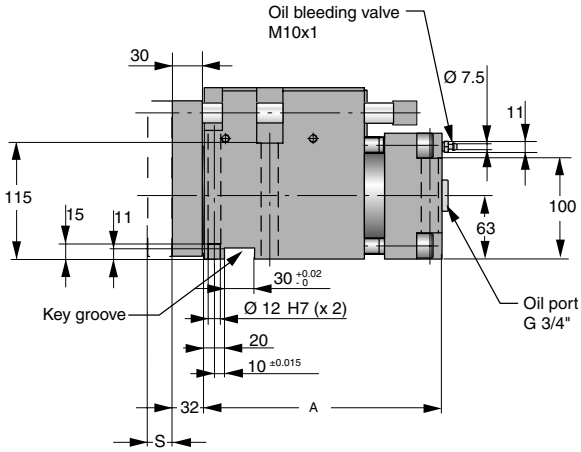
Note! The mounting screw (M12) should be tightened with torque 91Nm

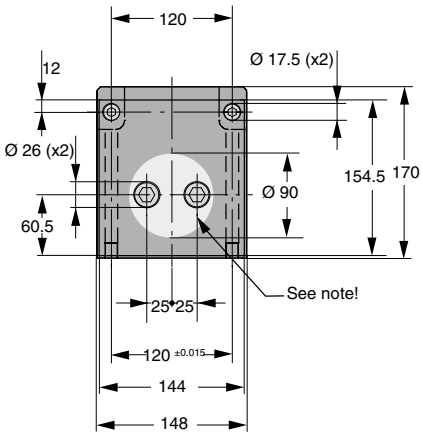


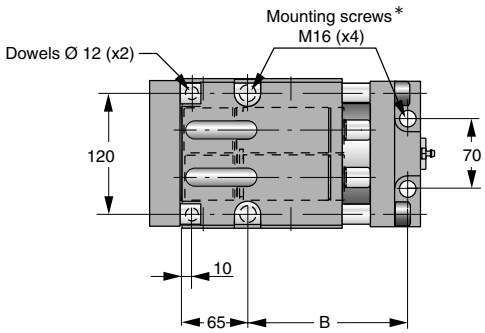
Order No. Complete Power Unit HCP-S	Weight (kg)	Force (kN)	Stroke S (mm)	A	B	C	Order No. Separate Power Cylinder HCP-P	Weight (kg)	Order No. Separate Accumulator HCP-A	Weight (kg)
HCP-S 090 -035	38.3	90	35	276	265	186	HCP-P 090 -035	22.6	HCP-A 090 -035	15.7
HCP-S 090 -060	41.2	90	60	326	315	236	HCP-P 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







*4 pcs mounting screws are included

Note!

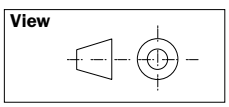
Important installation information:

We recommend locating the punch in the center 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.

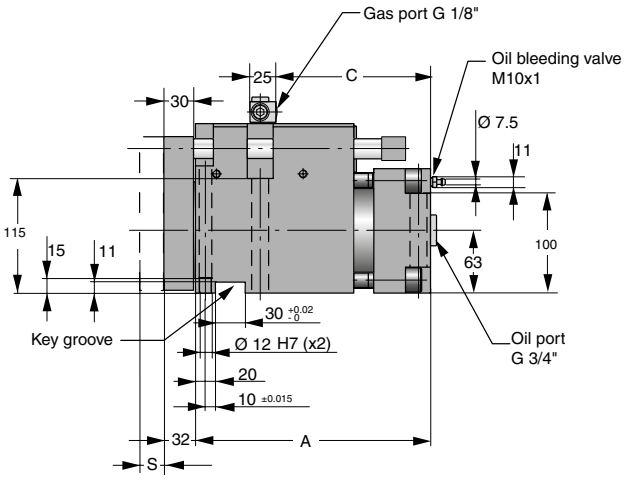
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	Weight (kg)
CC 090-024	90	10	24	236	159	33.5
CC 090-049	90	10	49	261	184	39.7
CC 090-099	90	10	99	311	234	44.9

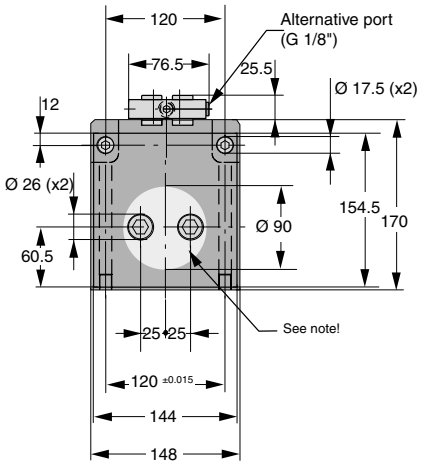
* = Nominal force available for the operation

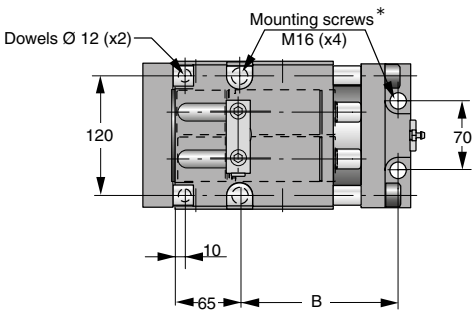


CC-H 090 Compact Cam for pressure control

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







*4 pcs mounting screws are included

Note!
Important installation information:

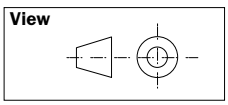
We recommend locating the punch in the center of the piston rod, but it is also possible to locate the force which the punch or punches will create during the operations within the area marked .

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

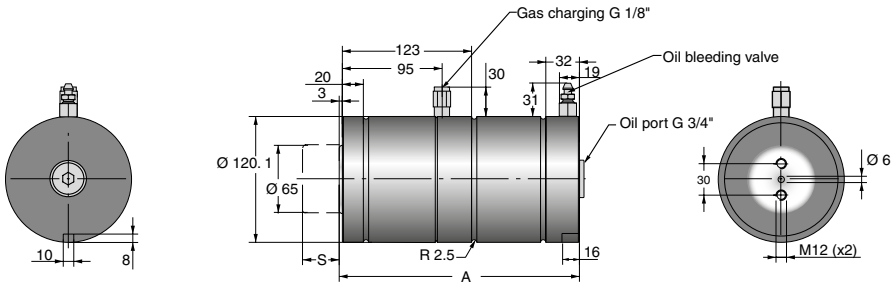
Note! There are two G1/8" gas ports which can be used to couple to a hose system. Use only one of these to connect the hose system, the other should remain plugged.

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

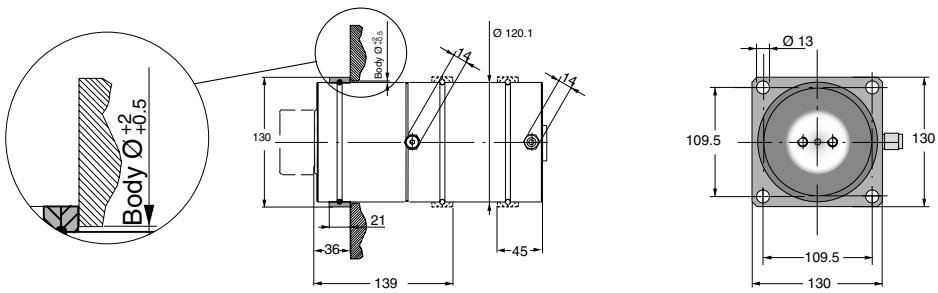


Order No.	Working force* (kN)	Return force* (kN)	Stroke S (mm)	A	Weight (kg)
HCF 090-025	90	9	25	229	15.8
HCF 090-050	90	9	50	279	18.7
HCF 090-100	90	9	100	379	24.5
HCF 090-150	90	9	150	479	30.3

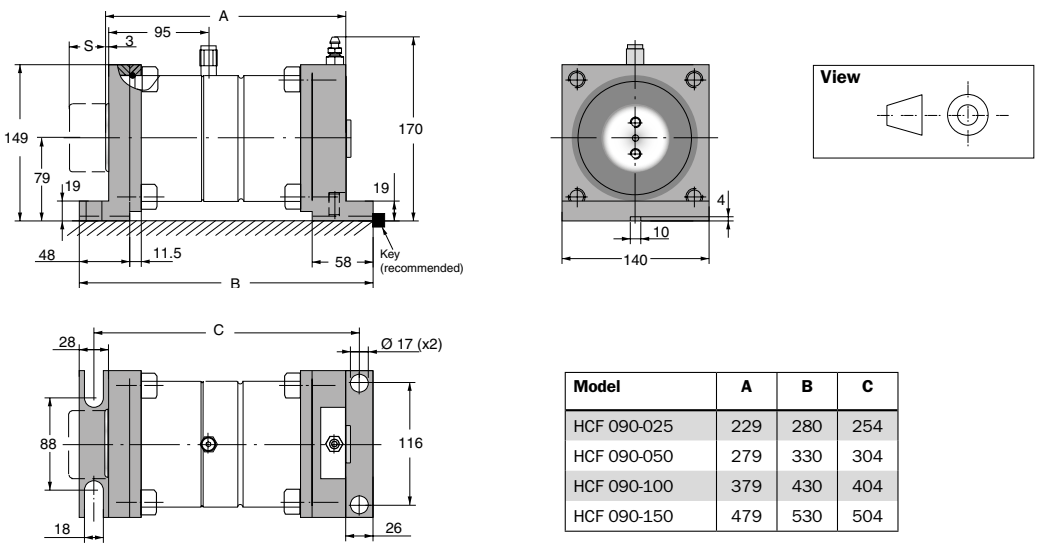
Note: External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

* = Nominal force for the operation

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

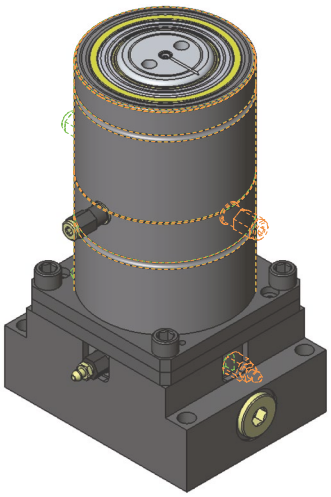


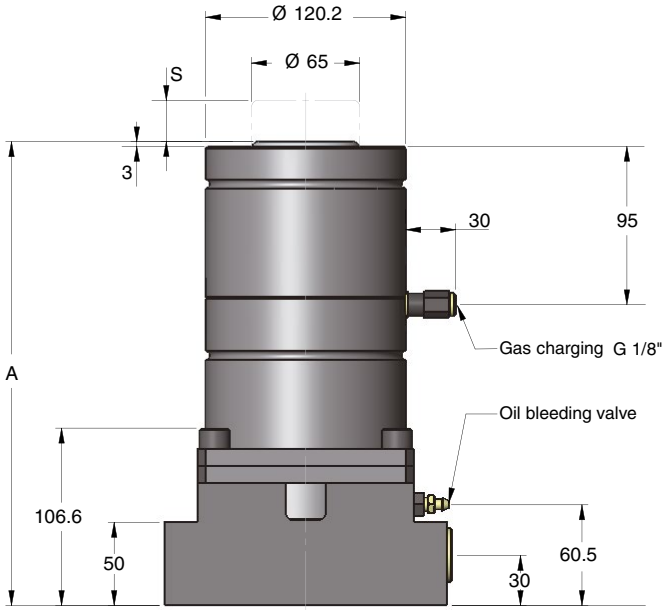
Foot mount for HCF 090 Order No. 3016977-090 (Mounts only)

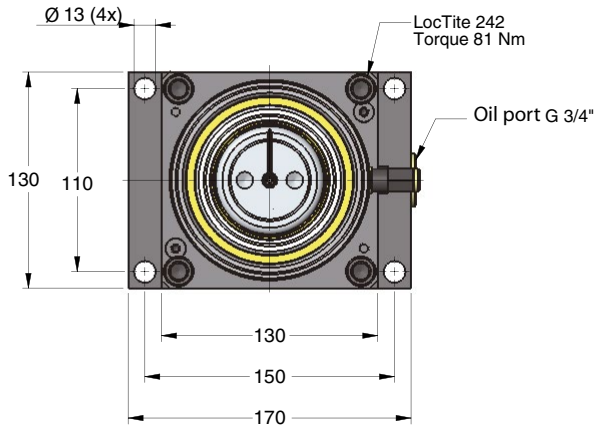


Model	A	B	C
HCF 090-025	229	280	254
HCF 090-050	279	330	304
HCF 090-100	379	430	404
HCF 090-150	479	530	504

HCF-SP 090 Force Cylinder with Side Port Plate





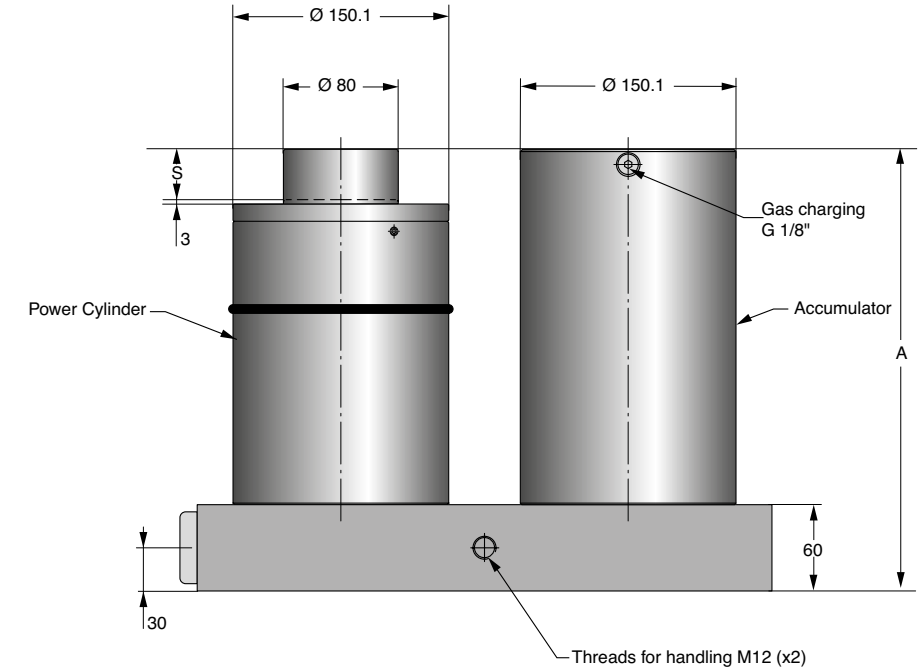


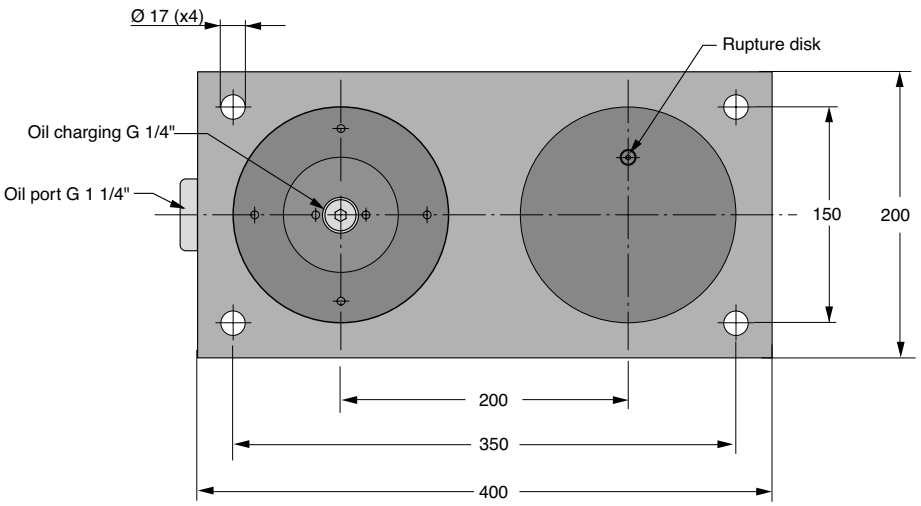
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight (kg)
HCF-SP 090-025	90	9	25	279	28
HCF-SP 090-050	90	9	50	329	30.9
HCF-SP 090-100	90	9	100	429	36.8
HCF-SP 090-150	90	9	150	529	42.6

* = 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.

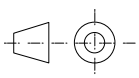
HCP 150 Power Unit



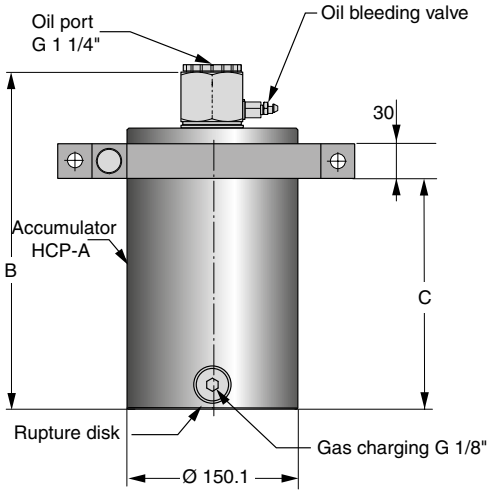


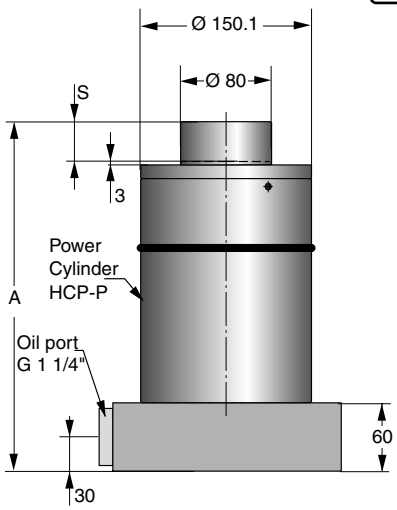
Order No.	Force (kN)	Stroke (mm)	A	Weight (kg)
HCP 150-035	150	35	307	83.1
HCP 150-060	150	60	357	87.7
HCP 150-110	150	110	457	97.0
HCP 150-160	150	160	557	106.3

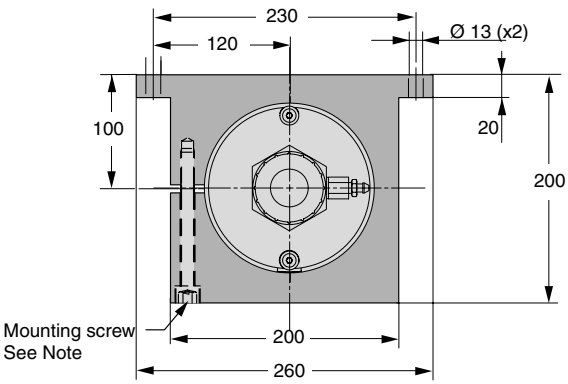
View

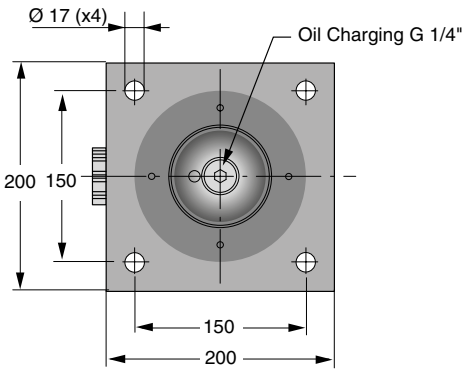


HCP-S 150 Power Unit, with Separate Accumulator

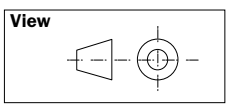








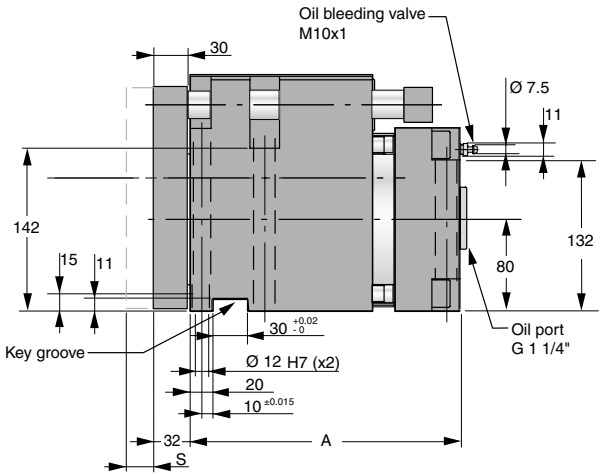
Note!
The mounting screw (M12) should be tightened with torque 91Nm

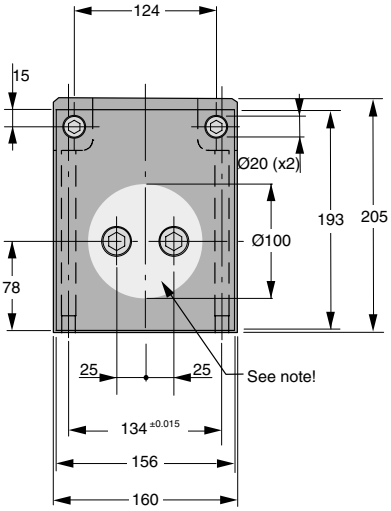


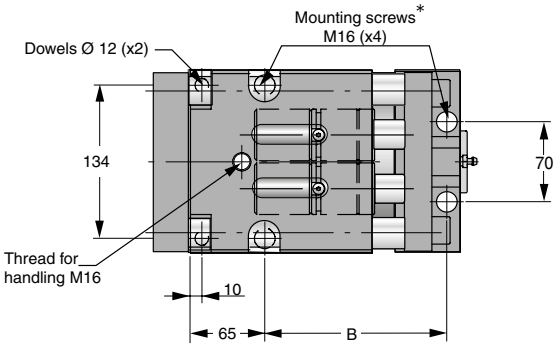
Order No. Complete Power Unit HCP-S	Weight (kg)	Force (kN)	Stroke S (mm)	A	B	C	Order No. Separate Power Cylinder HCP-P	Weight (kg)	Order No. Separate Accumulator HCP-A	Weight (kg)
HCP-S 150 -035	71.1	90	35	307	294	207	HCP-P 150 -035	43.6	HCP-A 150 -035	27.7
HCP-S 150 -060	75.5	90	60	357	344	257	HCP-P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

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

CC 150 Compact Cam







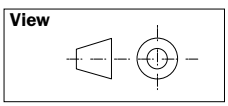
*4 pcs mounting screws are included

Note!

Important installation information:

We recommend locating the punch in the center 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.

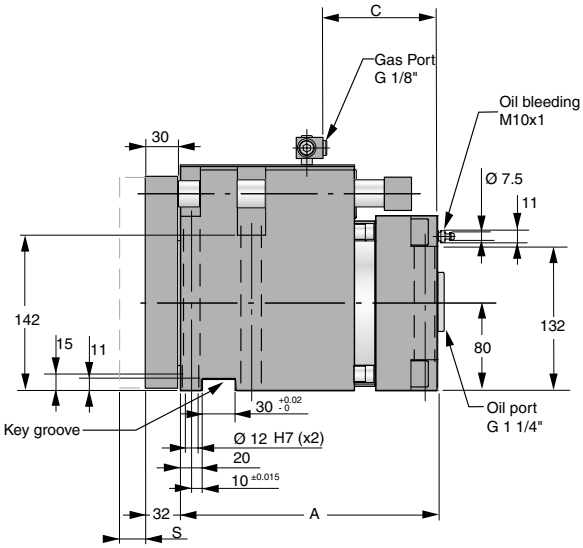


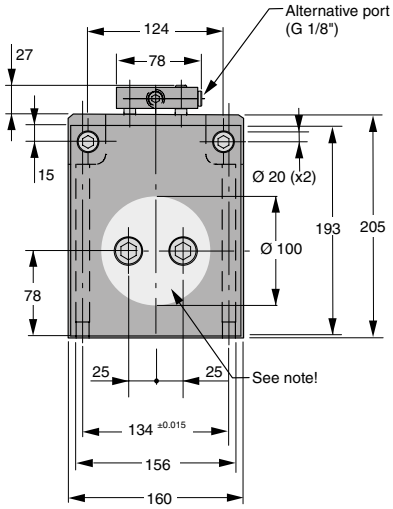
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	B	Weight (kg)
CC 150-024	150	15	24	236	159	57.7
CC 150-049	150	15	49	261	184	60.0
CC 150-099	150	15	99	311	234	65.6

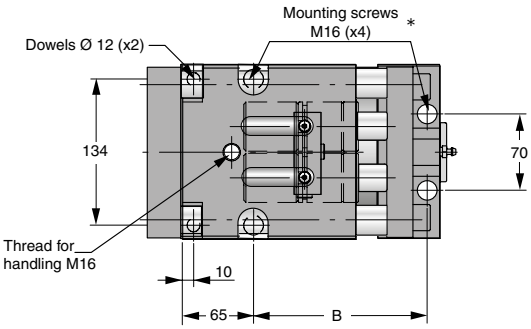
* = Nominal force available for the operation

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

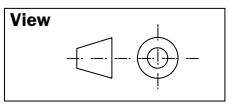
Note!
Important installation information:

We recommend locating the punch in the center 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 .

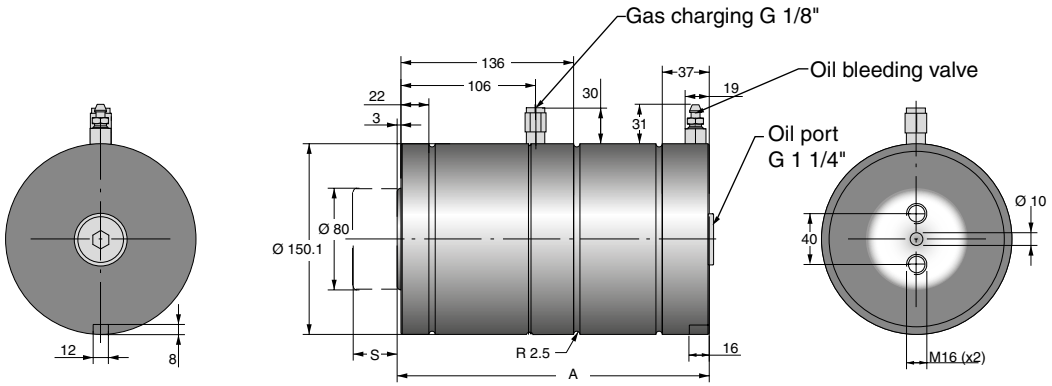
When piercing an opened hole or cutting an edge we recommend that extra guiding is used to prevent the unit against side load.

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

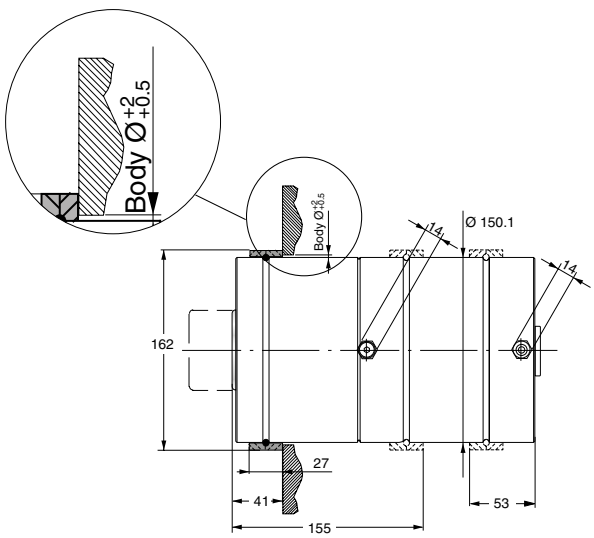


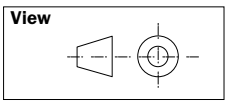
Order No.	Working force* (kN)	Return force* (kN)	Stroke S (mm)	A	Weight (kg)
HCF 150-025	150	30	25	250	30.1
HCF 150-050	150	30	50	300	34.7
HCF 150-100	150	30	100	400	43.7
HCF 150-150	150	30	150	500	52.7

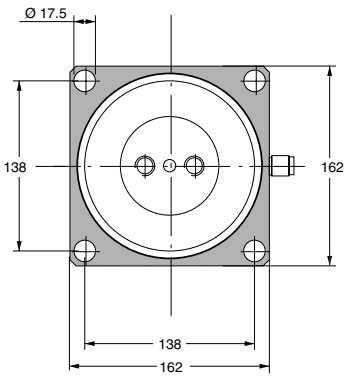
* = Nominal force for the operation

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.

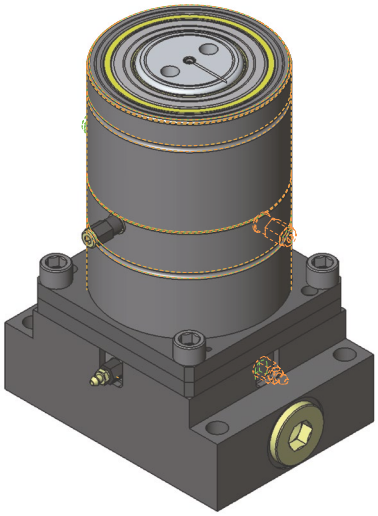
Flange mount for HCF 150 Order No. 2014677-7500

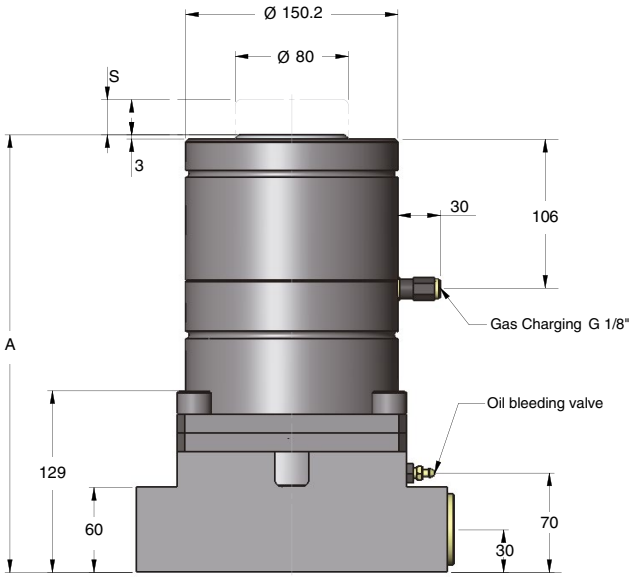


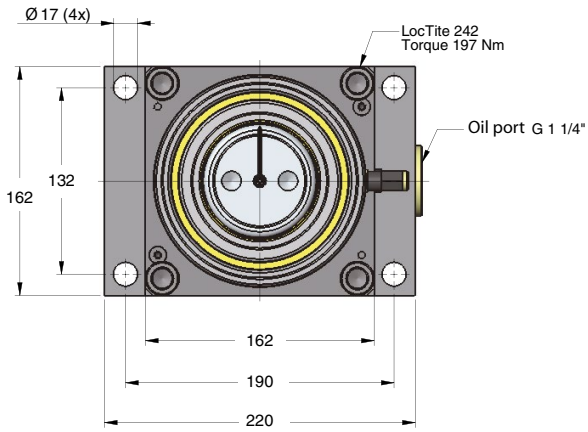




HCF-SP 150 Force Cylinder with Side Port Plate







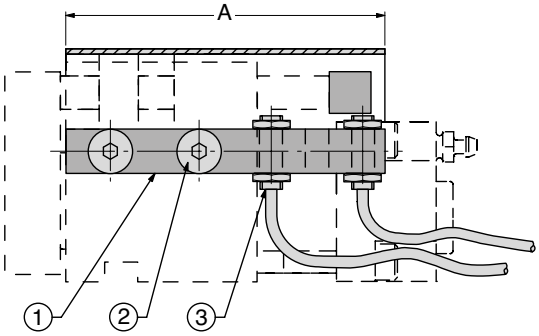
Order No.	Working force* (kN)	Return force (kN)	Stroke S (mm)	A	Weight [kg]
HCF-SP 150-025	150	14	25	310	48.6
HCF-SP 150-050	150	14	50	360	53.2
HCF-SP 150-100	150	14	100	460	62.2
HCF-SP 150-150	150	14	150	560	71.1

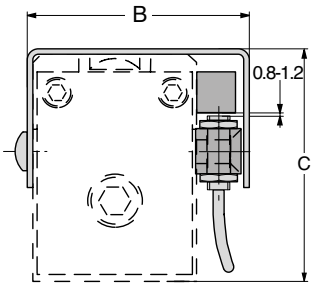
* = Nominal force for the operation

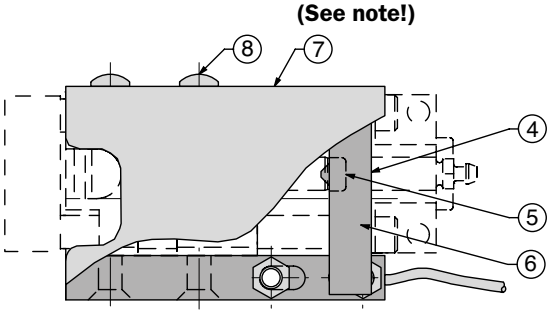
Note:
External stop is recommended for the tool (5-10 mm above cylinder) to avoid high load on the cylinder during the return stroke. See picture on page 95.

Dimensions for accessories

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

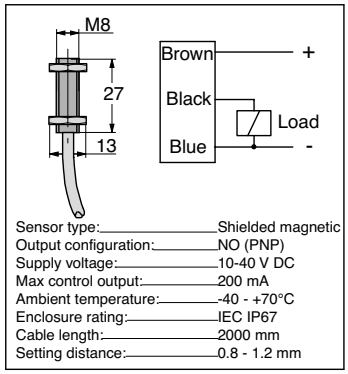






2 pcs Sensors

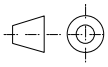
Order No. 503550 (sold separately)



Sensor type:	Shielded magnetic
Output configuration:	NO (PNP)
Supply voltage:	10-40 V DC
Max control output:	200 mA
Ambient temperature:	-40 - +70°C
Enclosure rating:	IEC IP67
Cable length:	2000 mm
Setting distance:	0.8 - 1.2 mm

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

View

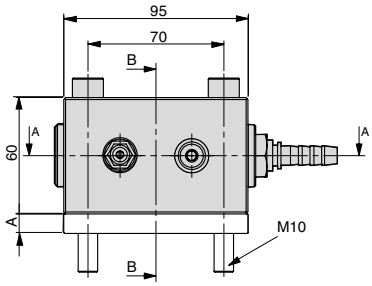


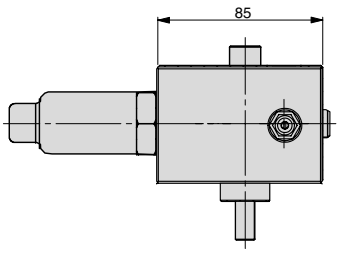
Sensor kit contents list

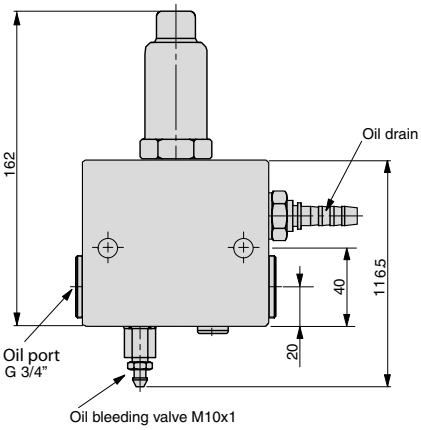
Position	Quantity	Description
1	1	Fixture
2	2	Screws
3	2	Sensors (not incl.)
4	1	Triggering block
5	1 or 2	Centre location pin (except CC 060, 090, 150)
6	2	Screws
7	1	Cover plate
8	2	Screws

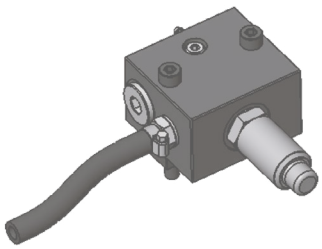
Compact Cam	Sensor kit Order No.	A	B	C
CC 015-024	30 182 08 -01	115	81	84
CC 015-049	30 182 08 -02	165	81	84
CC 040-024	30 182 08 -03	168	117	107
CC 040-049	30 182 08 -04	193	117	107
CC 040-099	30 182 08 -05	271	117	107
CC 040-124	30 182 08 -15	321	117	107
CC 060-024	30 182 08 -09	171	142	135
CC 060-049	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



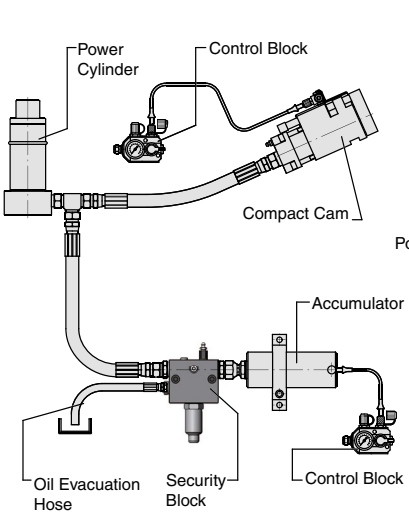


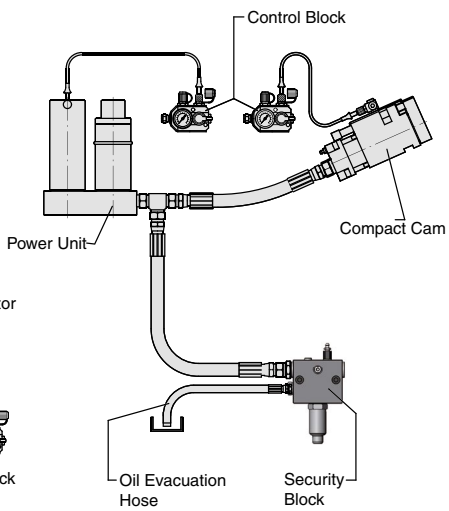




Order No.	Size	A*
3020008-015	015	10
3020008-040	040	22.5
3020008-060	060	32.5
3020008-090	090	44
3020008-150	150	70

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





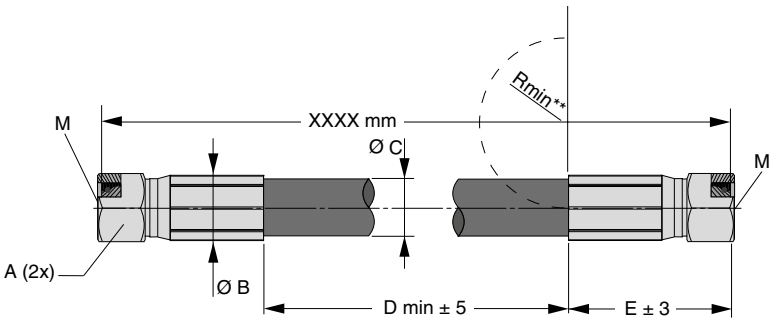
System hoses

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:

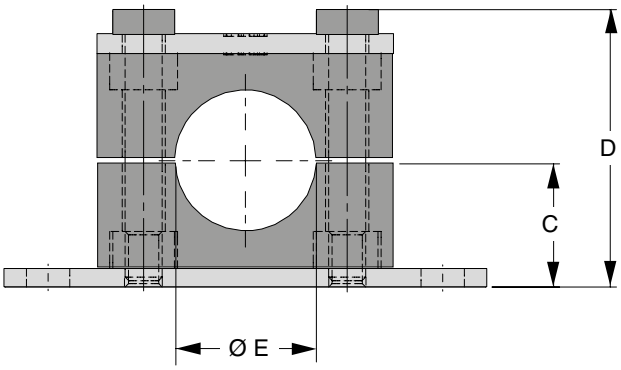
Power Unit	Standard hose size Max velocity 0.8 m/s	0.6 m/s	0.4 m/s	0.2 m/s
HCP 015	1/2"	3/8"	3/8"	3/8"
HCP 040	3/4"	3/4"	1/2"	1/2"
HCP 060	1"	3/4"	3/4"	1/2"
HCP 090	1"	1"	3/4"	1/2"
HCP 150	1 1/4"	1 1/4"	1"	3/4"

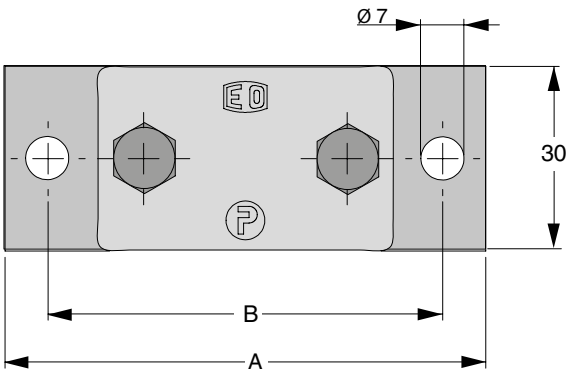
Additional Parker hose info:

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® .

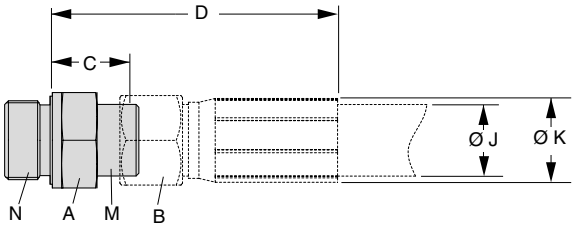
Hose Clamp





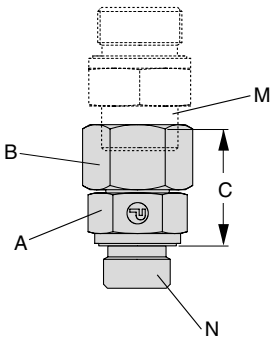
Hose size	Order No.	A	B	C	D	Ø E
3/8”	504613	78	64	20	44	20
1/2”	504614	78	64	20	44	24
3/4””	504615	87	73	24	51	31
1”	504616	100	86	32	67	38
1 1/4””	504617	116	100	36	75	47

Male Stud Connector



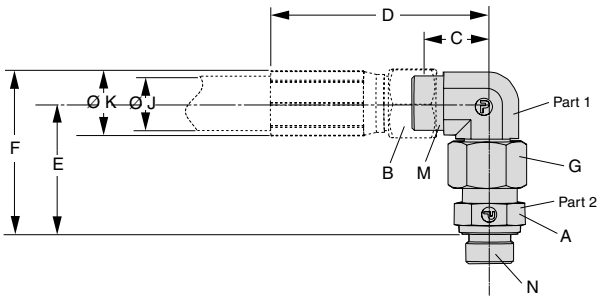
Hose size	Thread M	Thread N	Order No.	A	B	C	D	ØJ	ØK
3/8”	M 20x1.5	G 1/2”	504598	27	24	18	74	20	24.5
1/2”	M 24x1.5	G 1/2”	504321	27	30	19	82	24	30
1/2”	M24x1.5	G 3/4”	504322	32	30	21	84	24	30
3/4”	M30x2	G 1/2”	504323	32	36	21	93	31	37
3/4”	M30x2	G 3/4”	504324	32	36	21	93	31	37
3/4”	M30x2	G 1 1/4”	504325	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



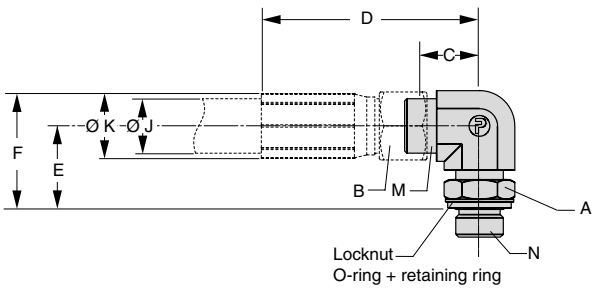
Thread M	Thread N	Order No.	A	B	C
M 20x1.5	G 1/2”	504608	27	24	35
M 24x1.5	G 1/2”	504609	27	30	37
M 30x2	G 3/4”	504610	32	36	43
M 36x2	G 1”	504611	41	46	48
M 42x2	G 1 1/4”	504612	50	50	51

Swivel Nut Elbow and Male Stud Connector



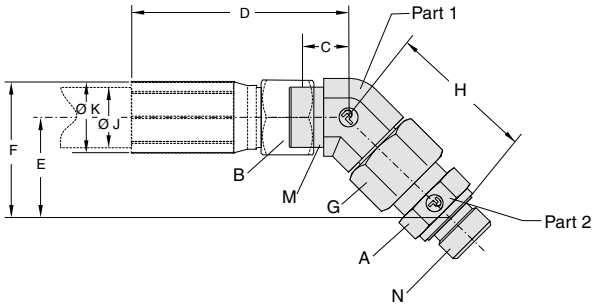
Hose size	Thread M	Thread N	Order No. Part 1	Order No. Part 2	A	B	C	D	E	F	G	ØJ	ØK
3/8"	M20x1.5	G 1/2"	504599	504598	27	24	22	78	49	61	24	20	24,5
1/2"	M24x1.5	G 1/2"	504332	504321	27	30	25	88	55	70	30	24	30
1/2"	M24x1.5	G 3/4"	504332	504322	32	30	25	88	58	73	30	24	30
3/4"	M30x2	G 1/2"	504333	504323	32	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 ¼"	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



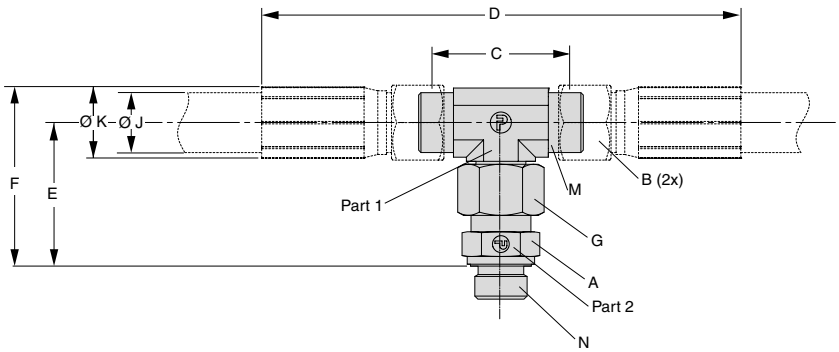
Hose size	Thread M	Thread N	Order No.	A	B	C	D	E	F	ØJ	ØK
3/8"	M20x1.5	G 1/2"	504600	27	24	22	78	36	48	20	24.5
1/2"	M24x1.5	G 1/2"	504336	27	30	25	88	36	51	24	30
3/4"	M30x2	G 3/4"	504337	36	36	28	100	39	58	31	37
1"	M36x2	G 3/4"	504338	41	46	30	118	44	67	38	46
1 1/4"	M42x2	G1 1/4"	–	–	–	–	–	–	–	–	–

Swivel Nut 45°Elbow and Male Stud Connector



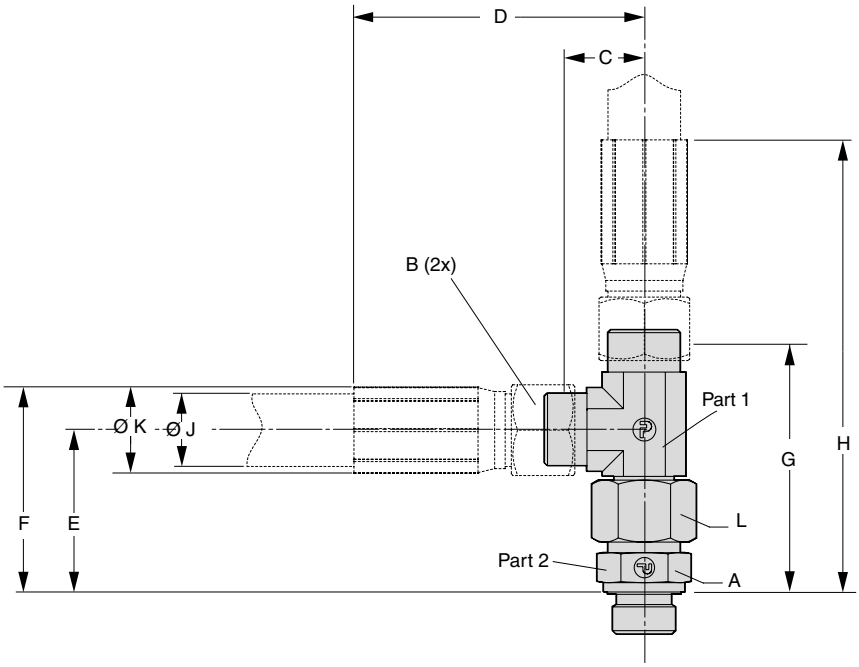
Hose size	Thread M	Thread N	Order No. Part 1	Order No. Part 2	A	B	C	D	E	F	G	H	ØJ	ØK
3/8"	M20x1.5	G 1/2"	504601	504598	27	24	17	73	35	47	24	49	20	24.5
1/2"	M24x1.5	G 1/2"	504339	504321	27	30	16	79	39	54	30	55	24	30
1/2"	M24x1.5	G 3/4"	504339	504322	32	30	16	79	40	55	30	57	24	30
3/4"	M30x2	G 1/2"	504340	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



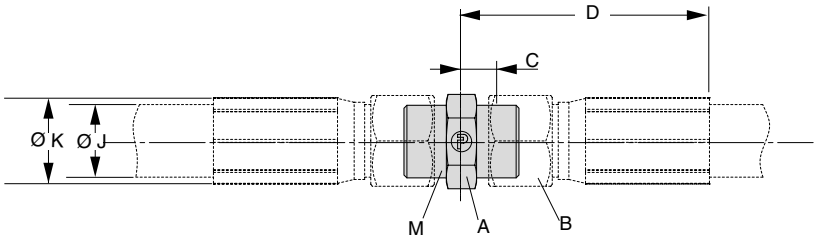
Hose size	Thread M	Thread N	Order No. Part 1	Order No. Part 2	A	B	C	D	E	F	G	ØJ	ØK
3/8"	M20x1.5	G 1/2"	504602	504598	27	24	43	155	49	61	24	20	24.5
1/2"	M24x1.5	G 1/2"	504343	504321	27	30	49	175	55	70	30	24	30
1/2"	M24x1.5	G 3/4"	504343	504322	32	30	49	175	58	73	30	24	30
3/4"	M30x2	G 1/2"	504344	504323	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



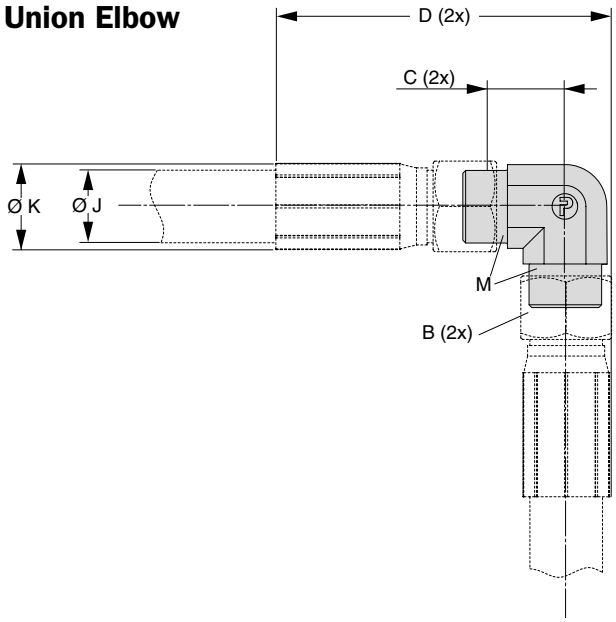
Hose size	Thread M	Thread N	Order No. Part 1	Order No. Part 2	A	B	C	D	E	F	G	H	Ø J	Ø K
3/8"	M20x1.5	G 1/2"	504603	504598	27	24	22	78	49	61	71	127		
1/2"	M24x1.5	G 1/2"	504347	504321	27	30	25	88	55	70	80	143	24	30
1/2"	M24x1.5	G 3/4"	504347	504322	32	30	25	88	58	73	82	145	24	30
3/4"	M30x2	G 1/2"	504348	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



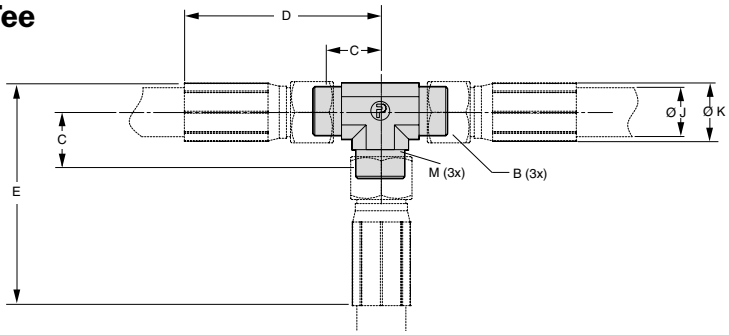
Hose size	Thread M	Order No.	A	B	C	D	Ø J	Ø K
3/8"	M20x1.5	504604	22	24	10	66	20	24.5
1/2"	M24x1.5	504351	27	30	11	74	24	30
3/4"	M30x2	504352	32	36	12	84	31	37
1"	M36x2	504353	41	46	13	101	38	46
1 1/4"	M42X2	504354	46	50	14	128	46	57

Union Elbow



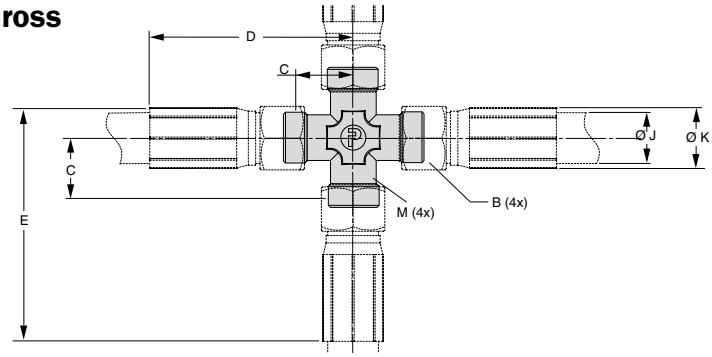
Hose size	Thread M	Order No.	B	C	D	Ø J	Ø K
3/8"	M20x1.5	504605	24	22	90	20	24.5
1/2"	M24x1.5	504355	30	25	102	24	30
3/4"	M30x2	504356	36	27	117	31	37
1"	M36x2	504357	46	30	140	38	46
1 1/4"	M42X2	504358	50	36	178	46	57

Union Tee



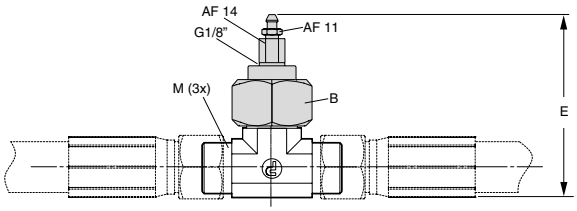
Hose size	Thread M	Order No.	B	C	D	E	Ø J	Ø K
3/8”	M20x1.5	504606	24	22	78	91	20	24.5
1/2”	M24x1.5	504359	30	25	88	103	24	30
3/4”	M30x2	504360	36	27	99	117	31	37
1”	M36x2	504361	46	30	118	140	38	46
1 1/4”	M42X2	504362	50	36	150	178	46	57

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

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	EW16S0MD*
504333	EW20S0MD*
504334	EW25S0MD*
504335	EW30S0MD*
504336	WEE16SR0MD*
504337	WEE20SR0MD*
504338	WEE25SR3/40MD*
504339	EV16S0MD*
504340	EV20S0MD*
504341	EV25S0MD*
504342	EV30S0MD*
504343	ET16S0MD*
504344	ET20S0MD*
504345	ET25S0MD*
504346	ET30S0MD*
504347	EL16S0MD*
504348	EL20S0MD*
504349	EL25S0MD*
504350	EL30S0MD*
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

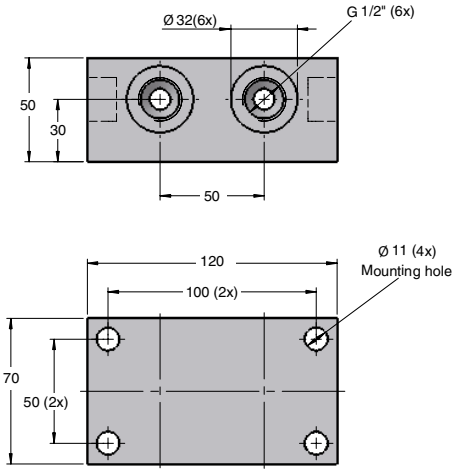
KALLER Order No.	Parker Order No.
504598	GE12SR1/2EDOMD*
504599	EW12S0MD*
504600	WEE12SR1/20MD*
504601	EV12S0MD*
504602	ET12S0MD*
504603	EL12S0MD*
504604	G12S*X
504605	W12S*X
504606	T12S*X
504607	K12S*X
504608	EGE12SR1/2ED*
504609	EGE16SRED*
504610	EGE20SRED*
504611	EGE25SRED*
504612	EGE30SRED*
504613	RAVG6-319
504614	RAVG6-323
504615	RAVG6-430
504616	RAVG6-538
504617	RAVG6-648

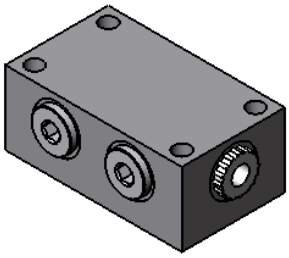
* **CF** version is Chromium6 free.
A3C material is steel, Zink-plated and yellow chromated.

The CF version is recommended when available.
Parker ordering example:
GE16SREDOMD**CF** or GE16SREDOMD**A3C**

Manifold Block

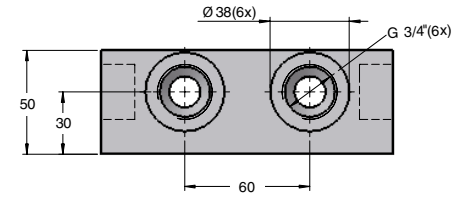
Order No. 3022834

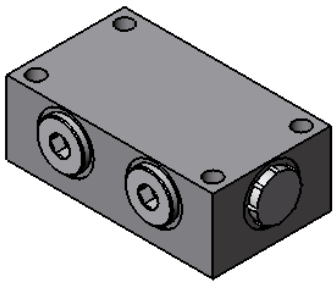




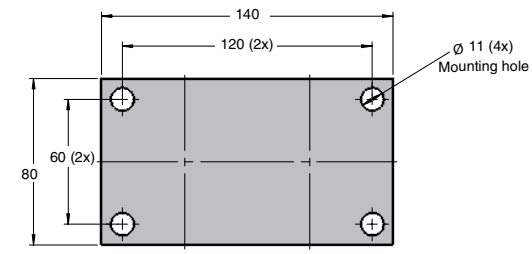
Manifold Block

Order No. 3022835





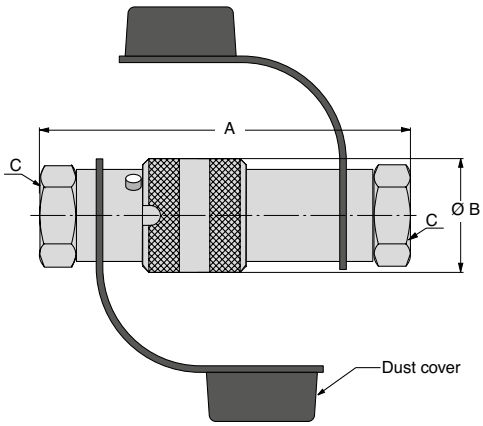
Additional Oil Bleeding Valve



System adapters

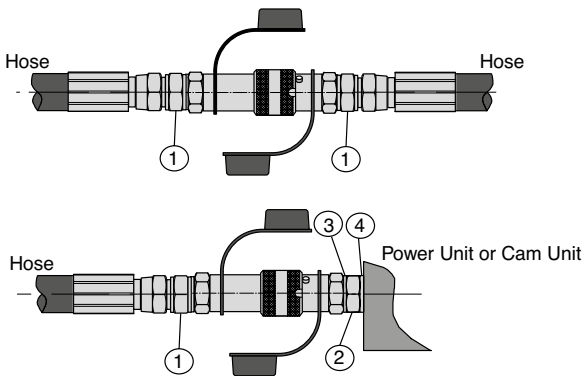
Quick coupling

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 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



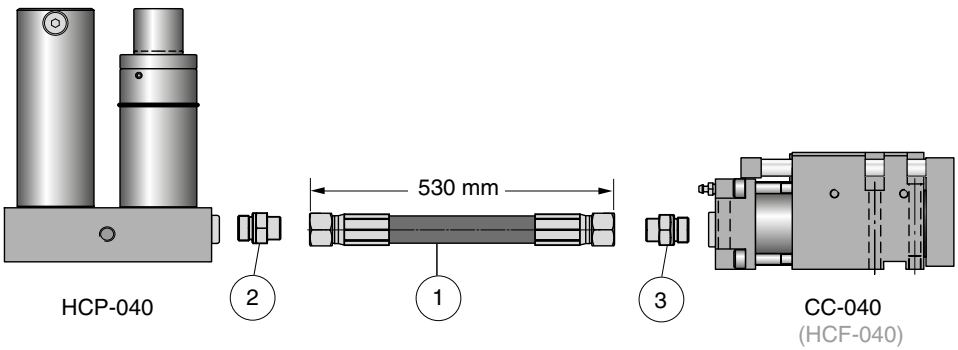
Ordering number adapter and washers				
Quick coupling	Position 1	Position 2	Position 3	Position 4
3018084-01	504321	503551	501271	501271
3018084-02	504324 or 504327*	503552	501270	501270
3018084-03	504330	503553	500282	503554

*for 1" hose size

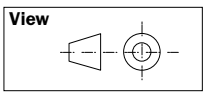
Designing your hosed system

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 adapter 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).



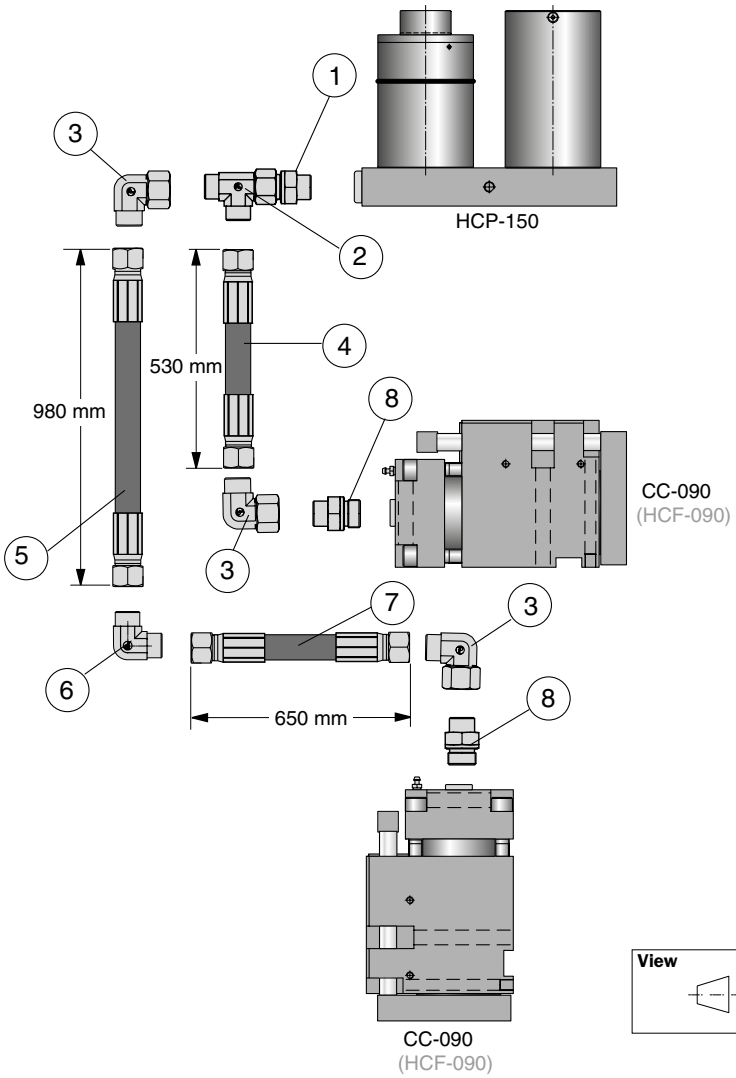
Example above showing how to connect a HCP-040 to a CC-040 (the same principal applies when connecting an HCF).

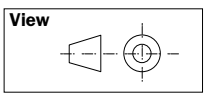


Position	Order No.
1	3021455-0530
2	504324
3	504324

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).



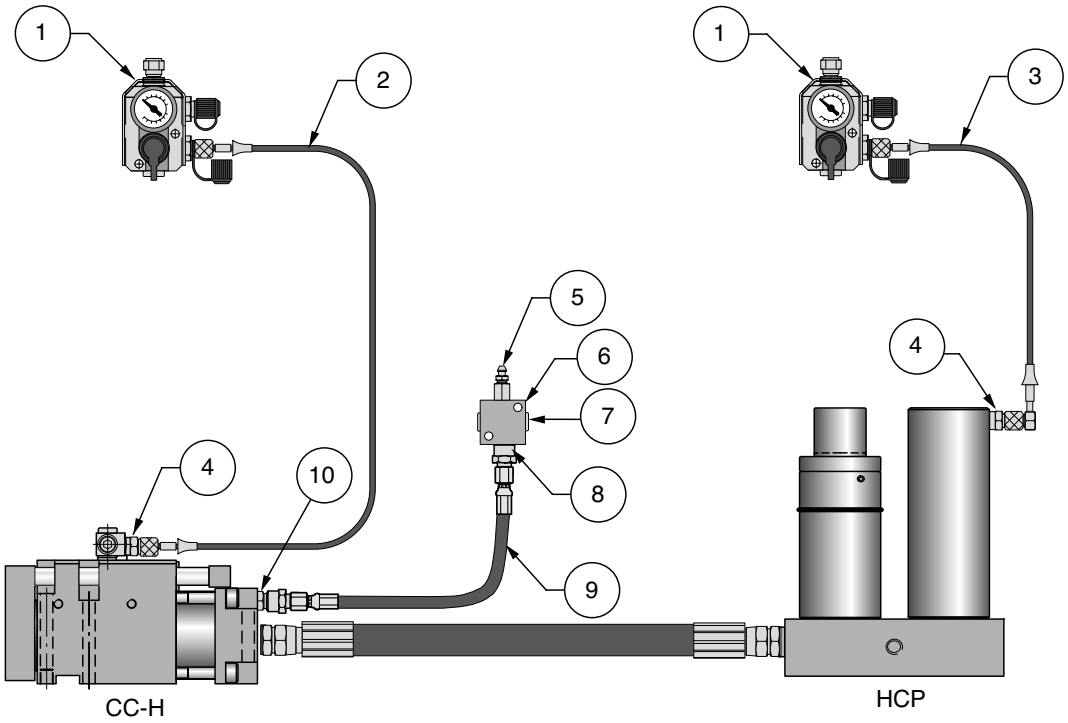


Position	Quantity	Order No.
1	1	504331
2	1	504350
3	3	504335
4	1	3021457-0530
5	1	3021457-0980
6	1	504358
7	1	3021457-0652
8	2	504329

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)



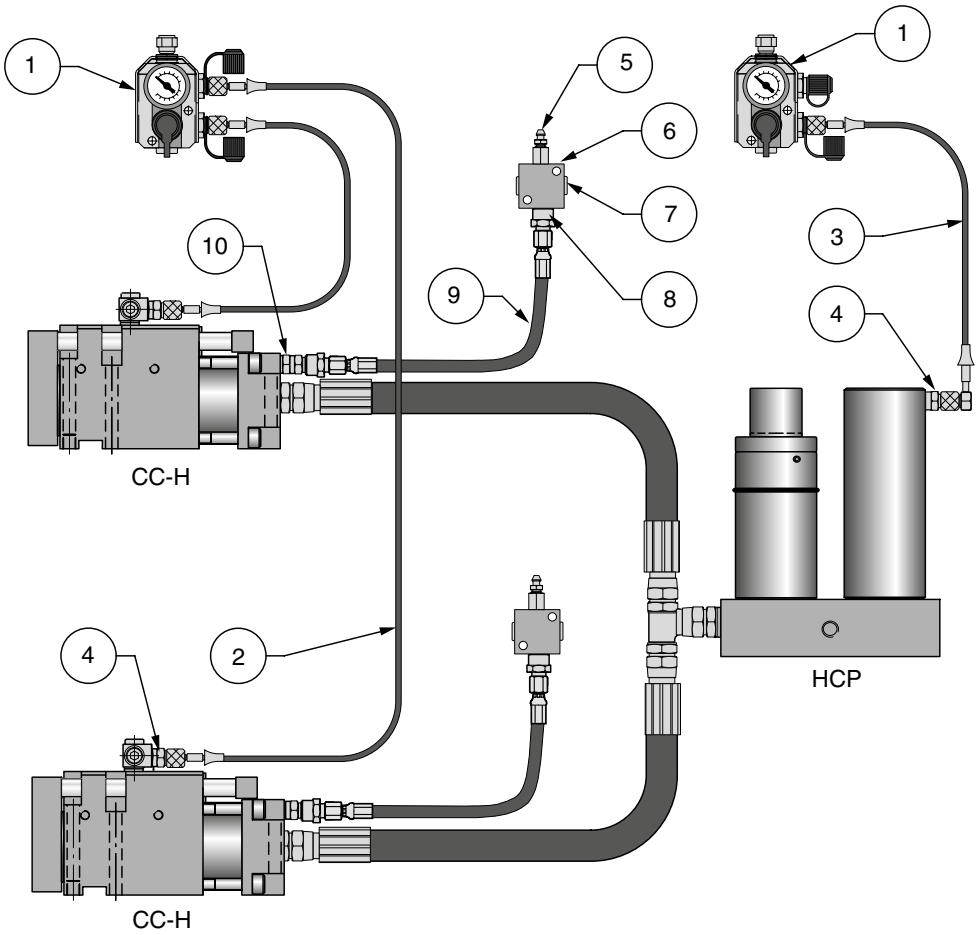
*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER® catalog for further information.

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)



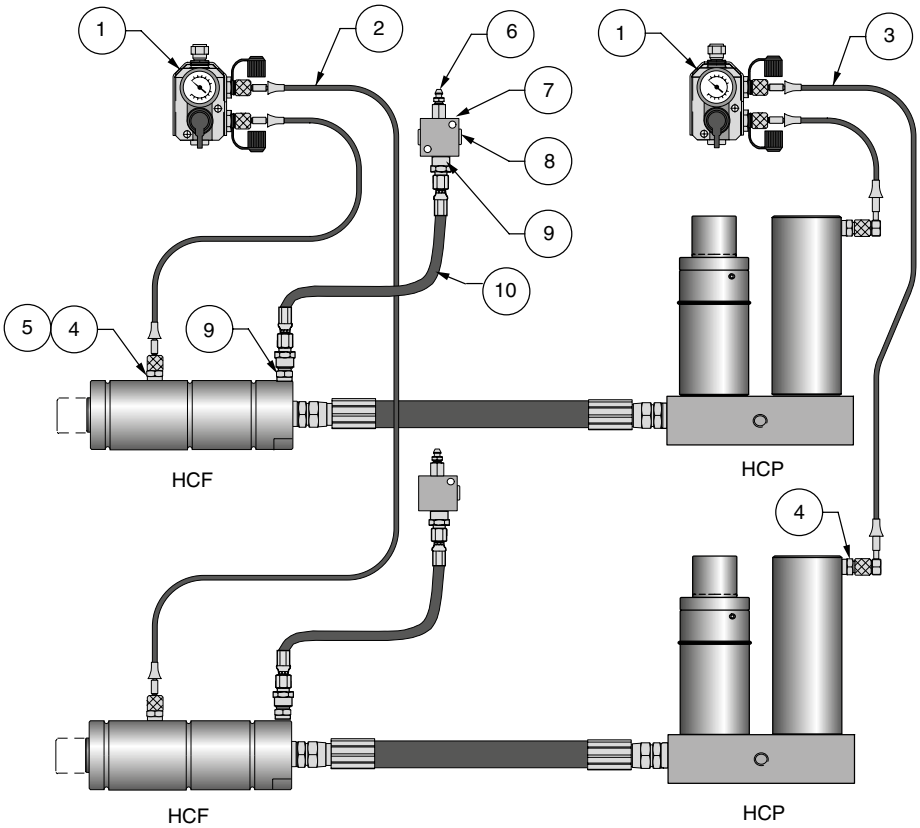
*Alternative control blocks can be used, also electronic pressure switches when needed. See Gas Link Systems in the KALLER® catalog for further information.

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.

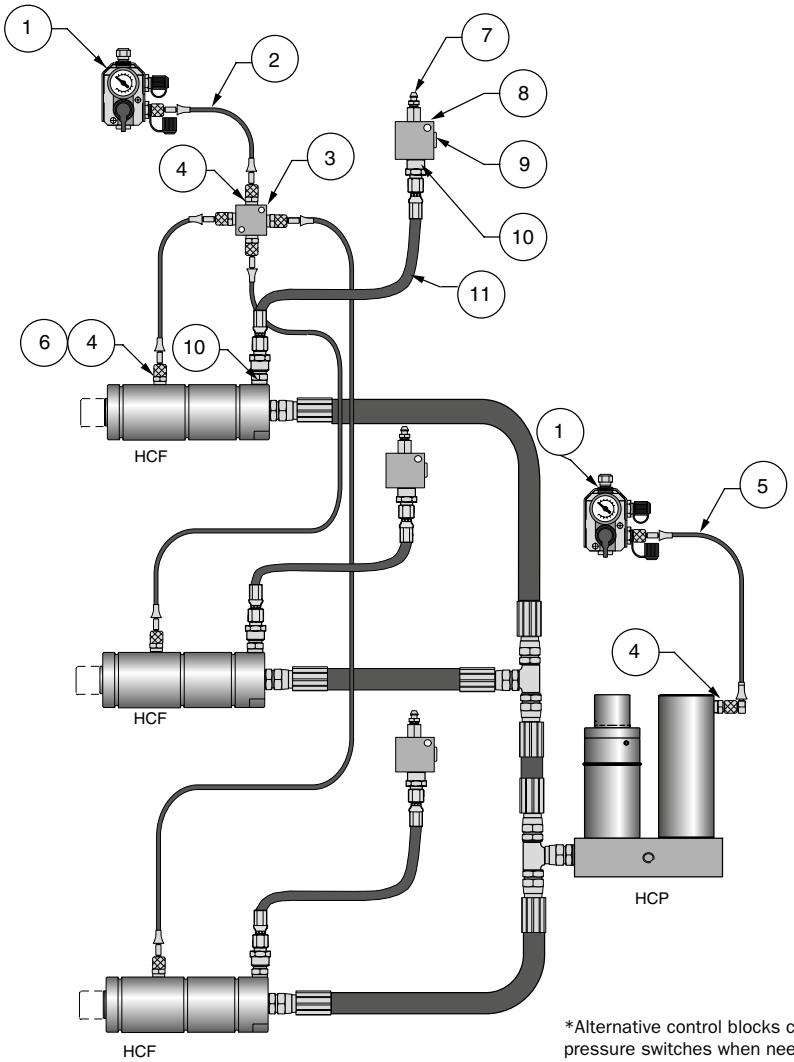
Hosed system for Control Units *			
Detail	**Quantity**	**Desqription**	**Order No.**
1	2	Control Units	3116114
2	2	EZ-hose	4014974-xxxx
3	2	EZ-hose	4017568-xxxx
4	8	Adapter	4114973-G 1/8”
5	1*	Washer	500472

*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.

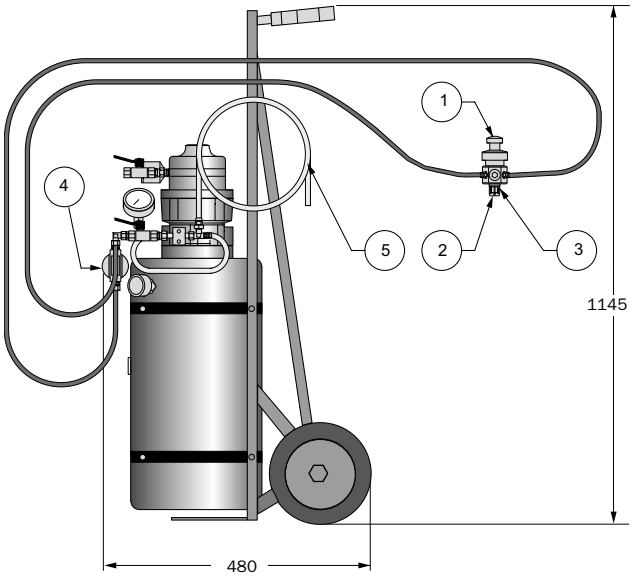
Hosed system for Control Units *			
Position	**Quantity**	**Description**	**Order No.**
1	2	Control Unit	3116114
2	4	EZ-hose	4014974-xxxx
3	1	Coupling Unit	4017032
4	8	Adapter	4114973-G 1/8”
5	1	EZ-hose	4017568-xxxx
6	1*	Washer	500472

*only needed for HCF 015

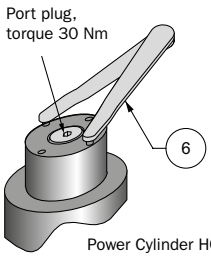
Hosed system for oil bleeding			
Position	**Quantity**	**Description**	**Order No.**
7	3	Bleed nipple	4014007
8	3	Coupling Unit	4017032
9	3	Plug G 1/8”	500343
10	6	Adapter	503593
11	3	E024-hose	3020857-xxxx

Pump Unit

Order No. 3017075



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



Power Cylinder HCP

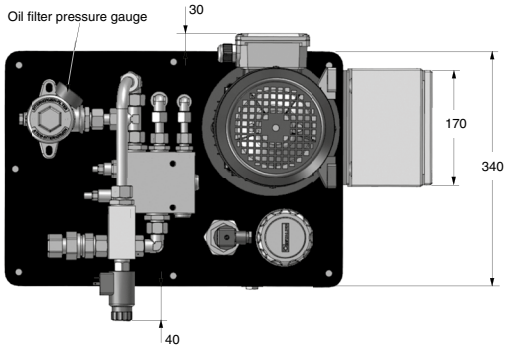
Spare parts etc.		
Position	**Description**	**Order No.**
1	Armature (include position 2 and 3)	3013941
2	Plastic plug	502446
3	Rubber-steel washer	502160
4	Filter	505763
5	Transparent hose	503116
6	Hook spanner (HCP 015)	503417
6	Hook spanner (HCP 040-150)	503418

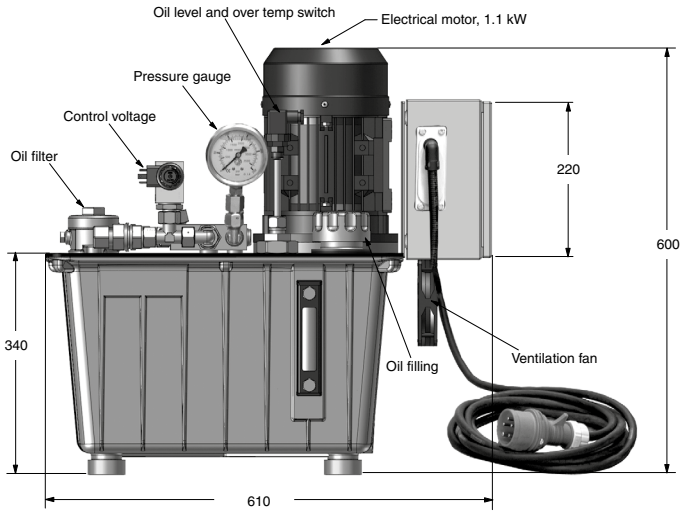
Technical specifications

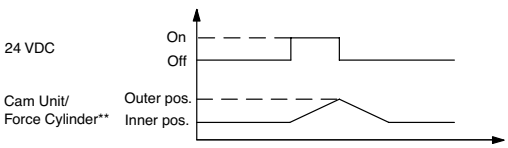
Power ..... 0.7 kW at 7 bar air pressure and 830 l/min
Oil flow ..... 2.4 l/min at 1500 rpm
Max. oil pressure ..... 55 bar
Tank volume ..... 18 liters
Oil filter ..... 10 µm
Air pressure ..... 5-7 bar
Weight ..... 27 kg

EHC Electrical Pump Unit

Order No. 505776







Technical data - hydraulic system	
Oil tank volume	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
Overtemp switch	70° C
Weight	47 kg

	Cam Unit/Force Cylinder velocity*	
	Forward + return	**During operation**
Cam Unit/Force Cylinder size	(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 KALLER® .

Tel +46 140 571 00
Fax +46 140 571 98
Web site: www.kaller.com

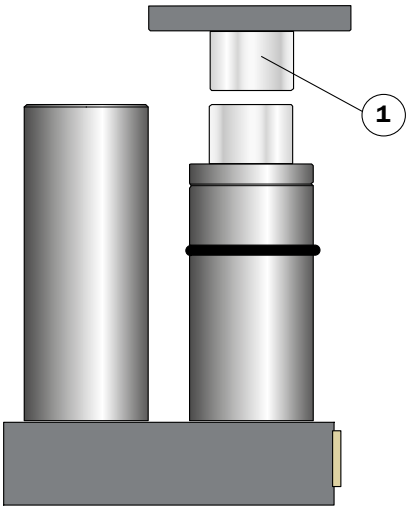
Power Unit

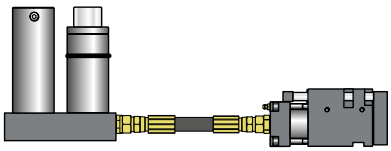
The Power Unit can be mounted in any position in the tool, including upside-down (valid for all units). A driver (1) is often used and adapted to give the right stroke length of the Power Cylinder.

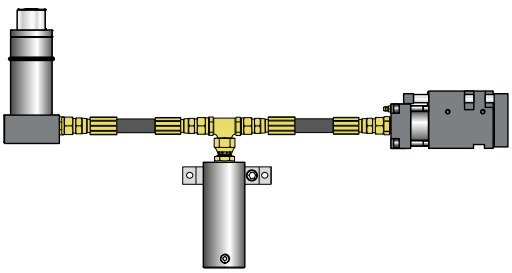
Make sure the surface which makes contact with the piston on the top of the Power Cylinder is parallel and even. Make sure there is enough room for the Accumulator in the tool.

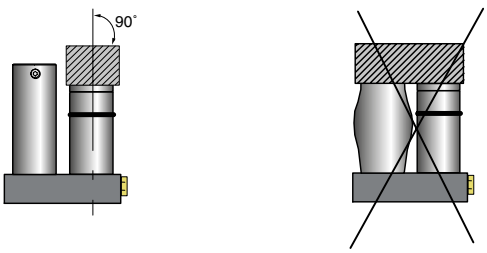
Power Unit Mounting Instructions (HCP, HCP-S)

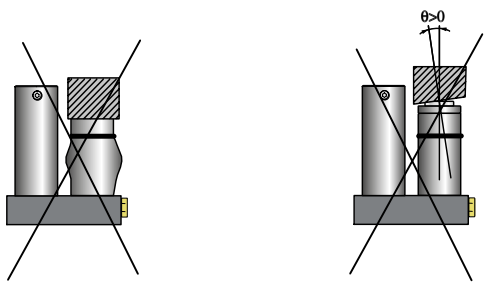
Mount the Power Unit to a flat surface using four screws, either upright or upside down. To ensure the Cam Unit/Force Cylinder always travels the same stroke length it is customary to stroke the Power Unit an extra 10 mm, which also causes the Accumulator´s piston to rise about 10 mm.











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).

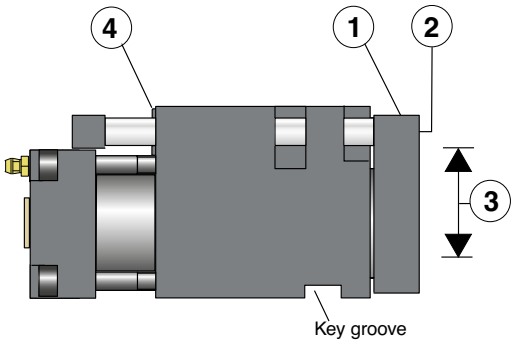
However, it is recommended to position this force directly in the center of the shaded area (3). For more information, see the respective Cam Unit dimensions page.

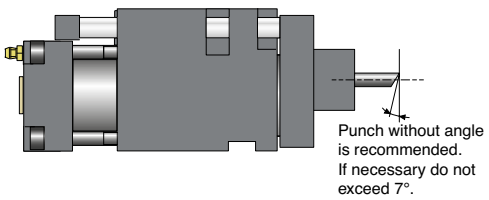
Please note, it is not recommended to put any turning moment on the punch plate (1).

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.

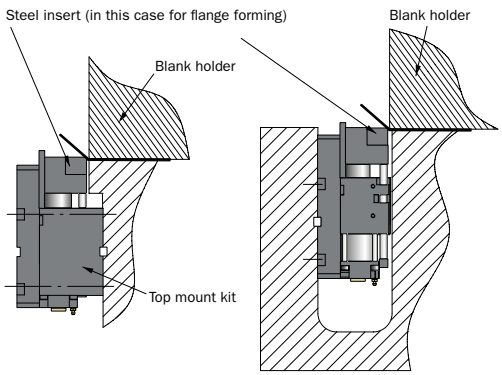
For Installation Examples, please see page 99.





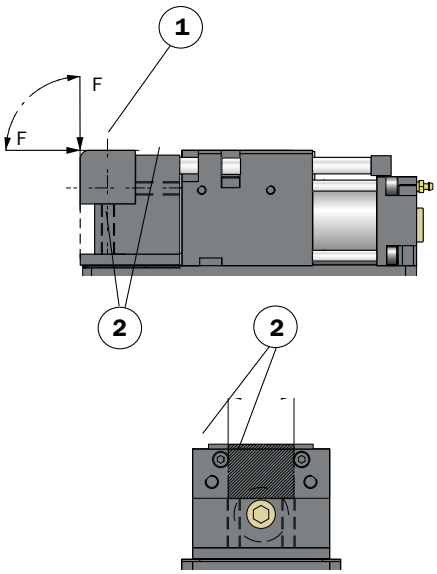
Flange Cam installation possibilities

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

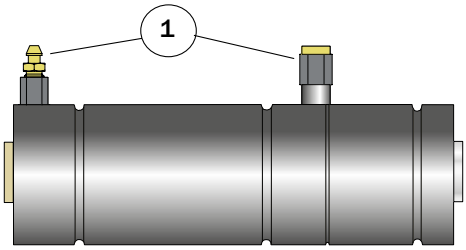
The customized tool (1) (for flanging etc.) should be mounted using two or four bolts (2) within the designated area.
The force created by the flanging is allowed in directions "F" within the area marked ▨ .



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 center 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

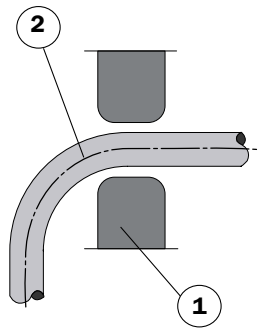
See page 149 to choose the adapters and the hose. Use as few adapters as possible.

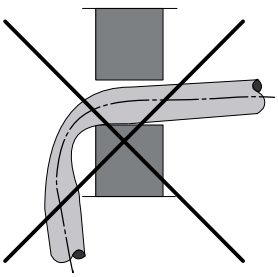
The hoses are washed and plugged to protect them from dust as this could damage the system. Make sure the hoses are protected from sharp edges and external damage. Sharp edges must be rounded (1).

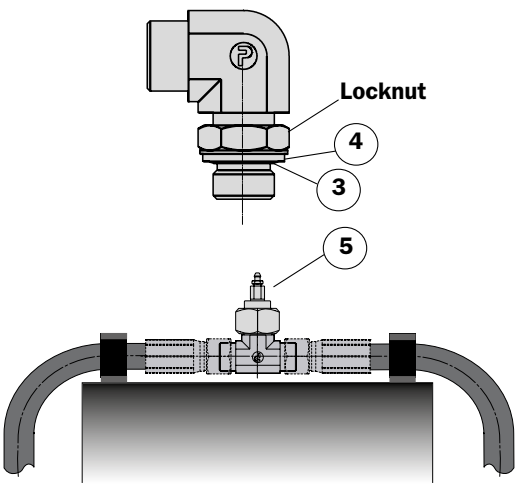
Hoses will move a little depending on the oil pressure pulsation during the operations. Do not use a smaller bending radius than specified (2).

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 .....Order nr. 1029335
Charging hose.....Order nr. 4027471-2000
Charge port adapter .....Order nr. 3014016
Allen key .....5 mm

Step 1
Connect the nitrogen bottle

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

Step 2
Gas charging of the Force Cylinder (Not valid for Compact Cam)

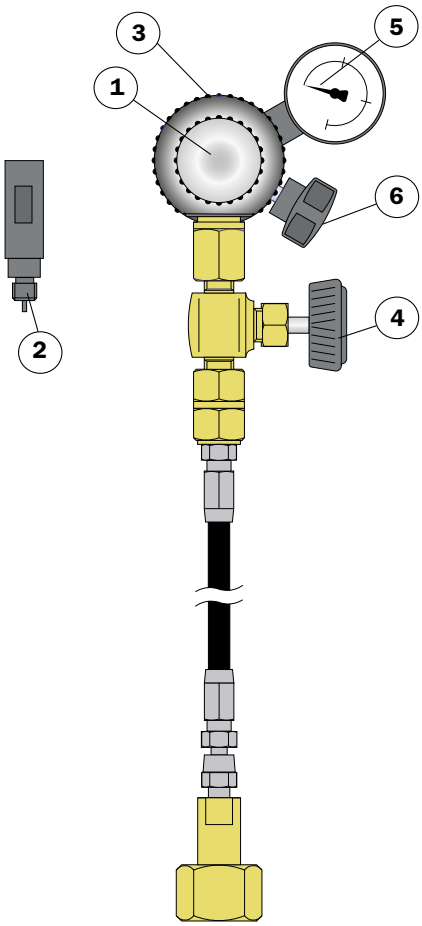
Turn the small knob (1) counterclockwise until the release pin is inside the thread. Connect the adapter (2) to the armature. Remove the plug on the Force Cylinder and connect the armature by turning knob (3) clockwise. Open the gas valve carefully anticlockwise using knob (4). Charge gas until the manometer (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.

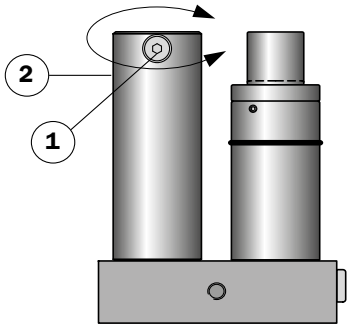


Step 4 Charging of gas in the Accumulator

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).

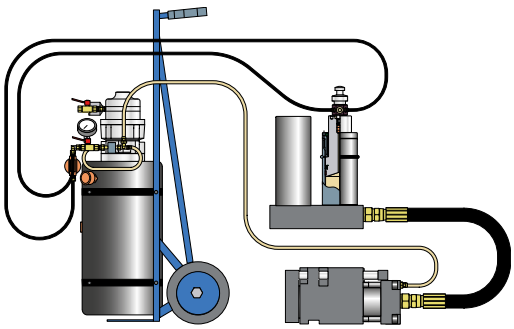
When not using the charging armature empty the gas by closing the nitrogen bottle valve and opening the gas valve (4) anticlockwise. (See page 173).



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 liters 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.

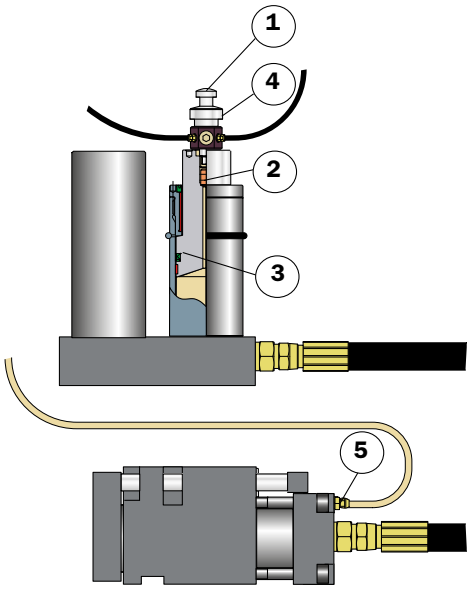
Step 1 Check the nitrogen pressure

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

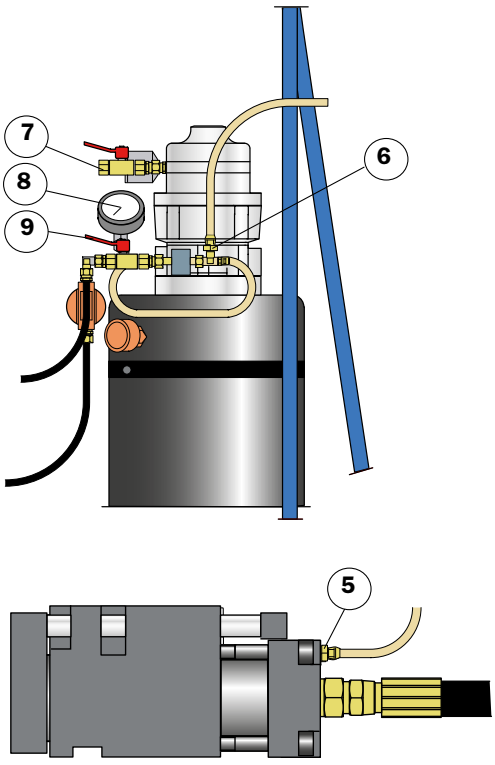
Check the clearance of the Cam Unit/ Force Cylinder and make sure that there is enough room for a full stroke.

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).

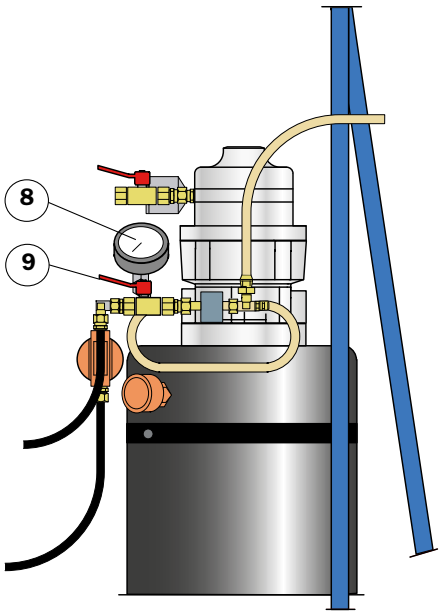
Step 9 Disconnect the Pump Unit

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

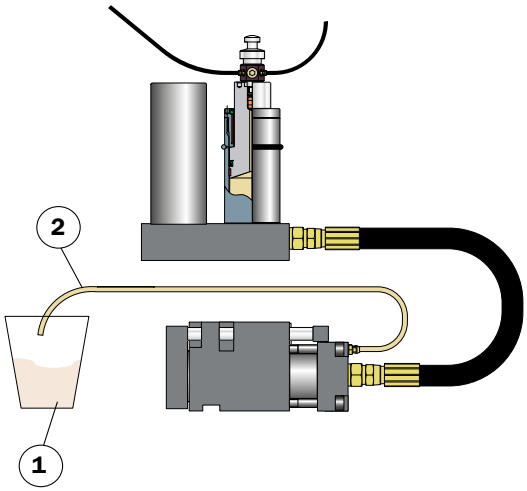
After the oil filling procedure, the Accumulator has to be charged with nitrogen up to 150 bar or to the required gas pressure for the operation. Maximum pressure is 180 bar. See also page 112.

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.

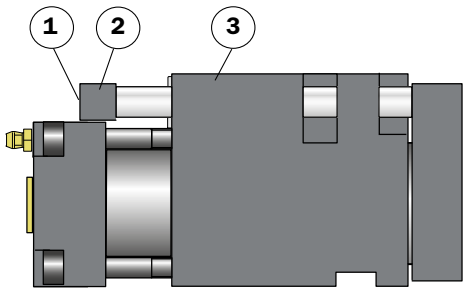
Power Unit and Force Cylinder (HCP, HCP-S, HCF)

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

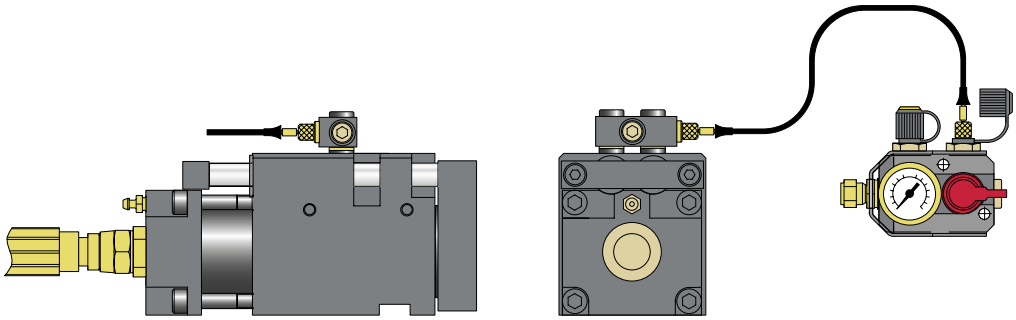
** If the gas spring force is lower than minimum the gas spring has to be replaced*

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.*

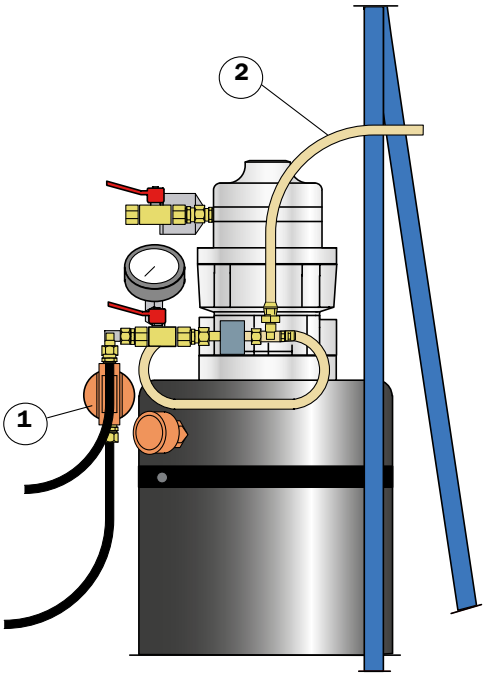
Oil

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.: 505 763**
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
1. **Cam Unit/Force Cylinder does not perform a full stroke.**	1:1 Low gas pressure in the Accumulator	Charge up the gas pressure, see page 173. (max 180 bar)
	1:2 Power Cylinder does not perform a full stroke	Adjust the stroke length
	1:3 Oil leakage in Power Cylinder A: The port plug has come loose B: Damage on the seal and/or inside of the Power Cylinder	A: Replace the plug and fill the system, see page 173. B: Contact your distributor for service or replacement cylinder
	1:4 Oil leakage in Cam Unit A: The bleeding valve has come loose B: Damage on the seal and/or inside of the Cam Unit	A: Replace the bleed valve and fill the system, see page 173. B: Contact your distributor for service or replacement of the Cam Unit.
	1:5 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
2. **Cam Unit/ Force Cylinder does not retract.**	2:1 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 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 Gas leakage in the Accumulator	Bleed the oil, see page 174. Contact your distributor for service or replacement of the Accumulator.
	2:4 The return movement is jammed.	Contact your distributor for service or replacement of the Cam Unit/ Force Cylinder.

Page

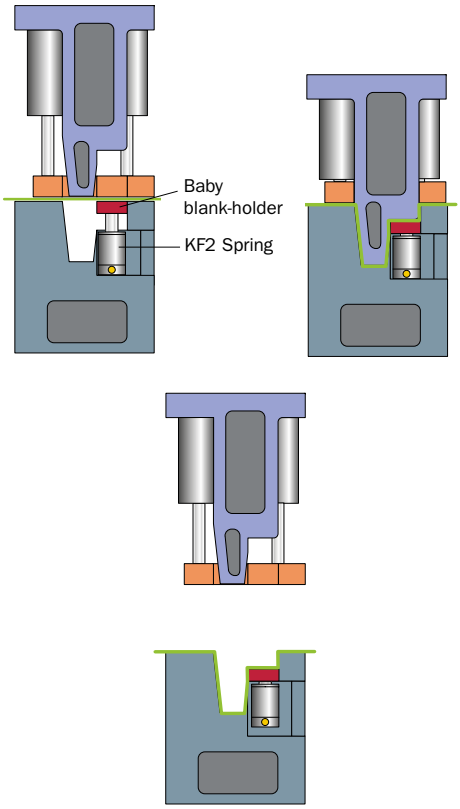
General Introduction

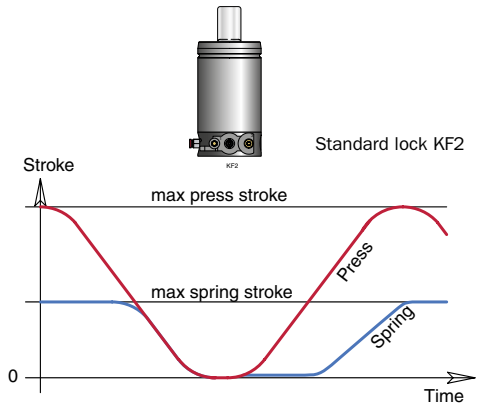
About Controllable Gas Springs

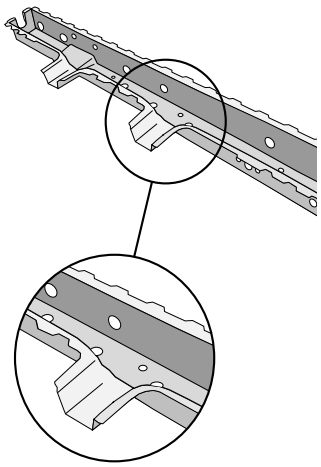
KF2 is the next generation of controllable gas springs, which supersedes the KF springs.

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

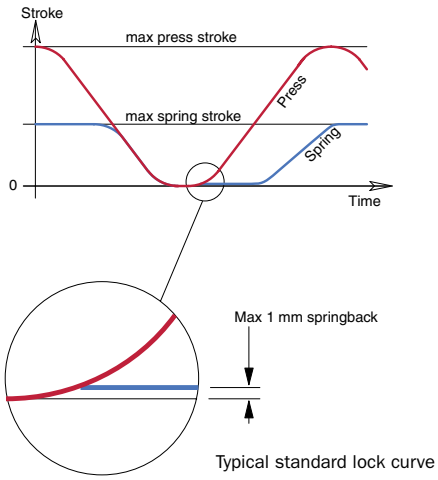
The following is a brief description of these two systems.

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 ±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.



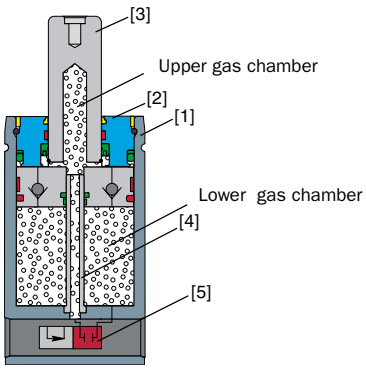
Typical standard lock curve

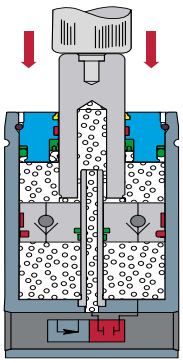
KF2 – how does it work?

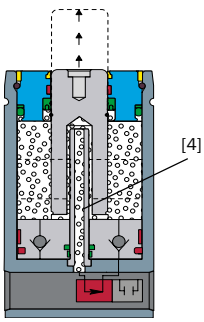
The KF2 controllable gas spring consists of a cylinder [1], guide assembly [2], piston rod assembly containing check valves [3], internal piston rod [4] and normally open (NO) cartridge valve [5] located in the base of the spring.

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.







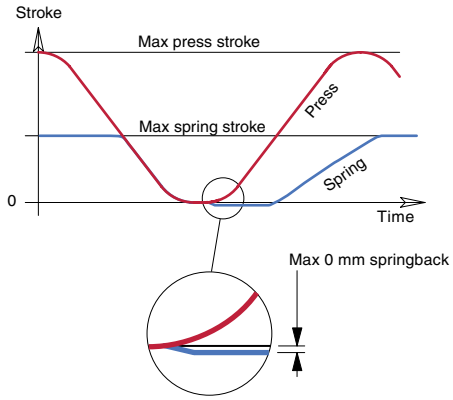
Positive Lock System, KF2 + KP

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

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

Please note!

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

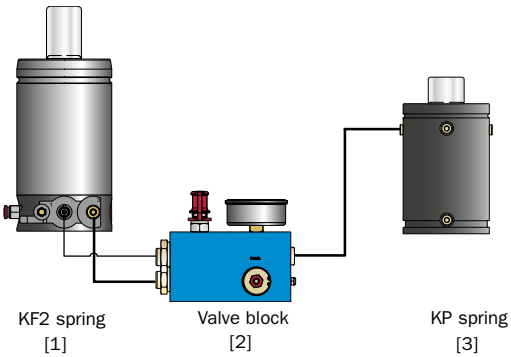


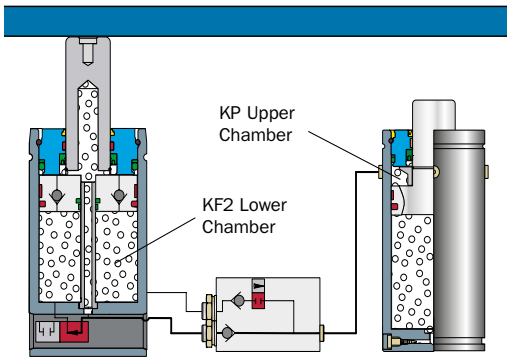
Positive Lock System, how does it work?

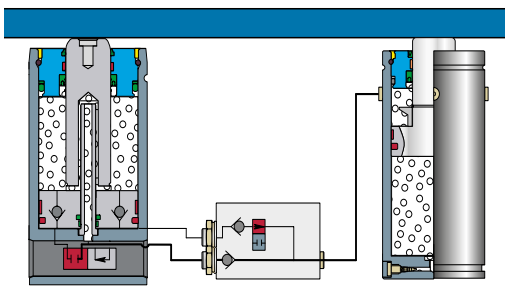
The KF2 is the active spring in the system and provides the required spring force in the tool. The task of the KP passive gas spring is to eliminate the max. 1 mm springback of the KF2 spring(s) at press BDC.

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

At BDC, the valve in the valve block is opened, using the control system from the press or a mechanical pressure switch, and the remaining gas in the lower chamber of the KF2 spring is drawn into the upper chamber of the KP passive gas spring.







Why 100% nominal stroke ±0.5 mm?

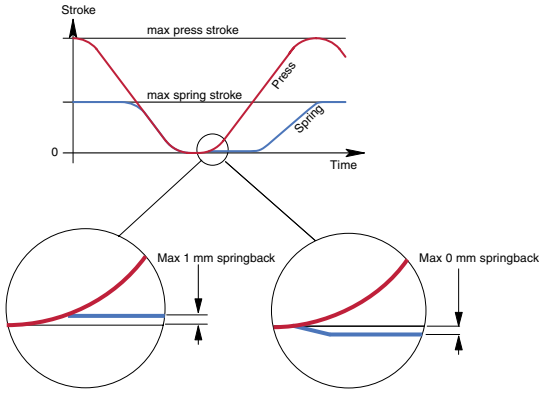
In order to provide optimum locking from the KF2 controllable gas spring, it is important to stroke the spring 100% of the nominal stroke length ±0.5 mm.

This is because it is necessary to reduce the gas volume in the lower gas chamber to a minimum.

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

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

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



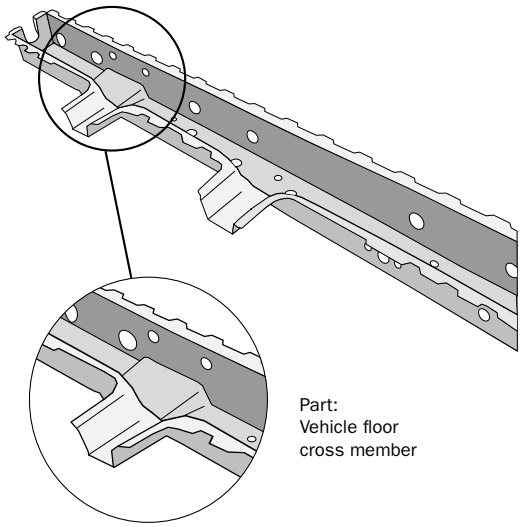
Standard lock KF2

Positive lock KF+KP

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.



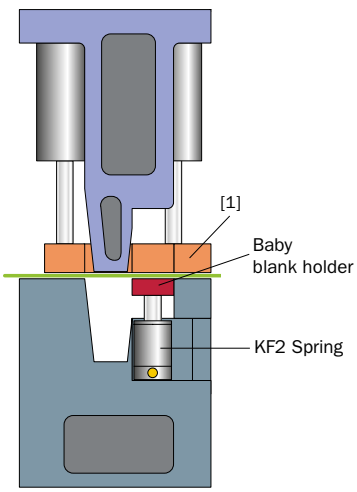
Part:
Vehicle floor
cross member

Work cycle

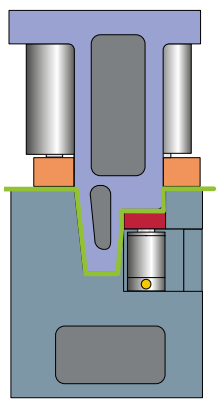
As the upper tool moves downwards, the blank holder [1] is activated to control the flow of the blank in the tool.

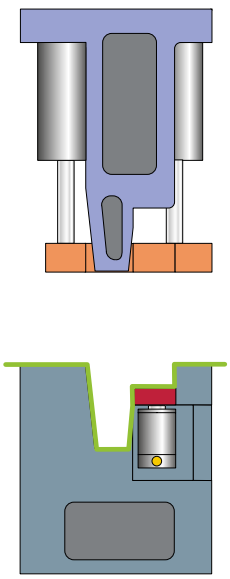
At bottom dead center, the KF2 springs will lock. In this application, a small amount of springback will not damage the formed part.

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





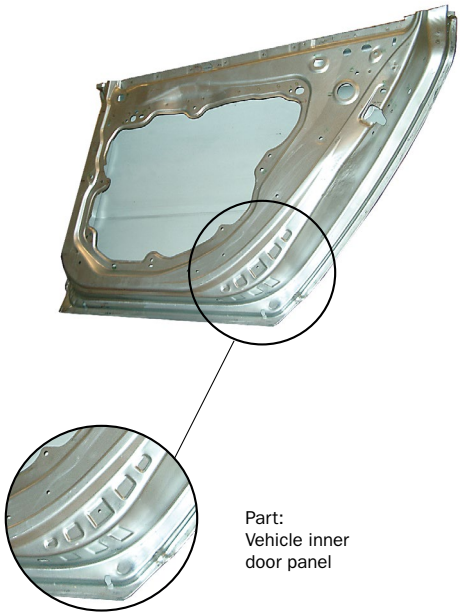
Positive Lock System, KF2 + KP

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.



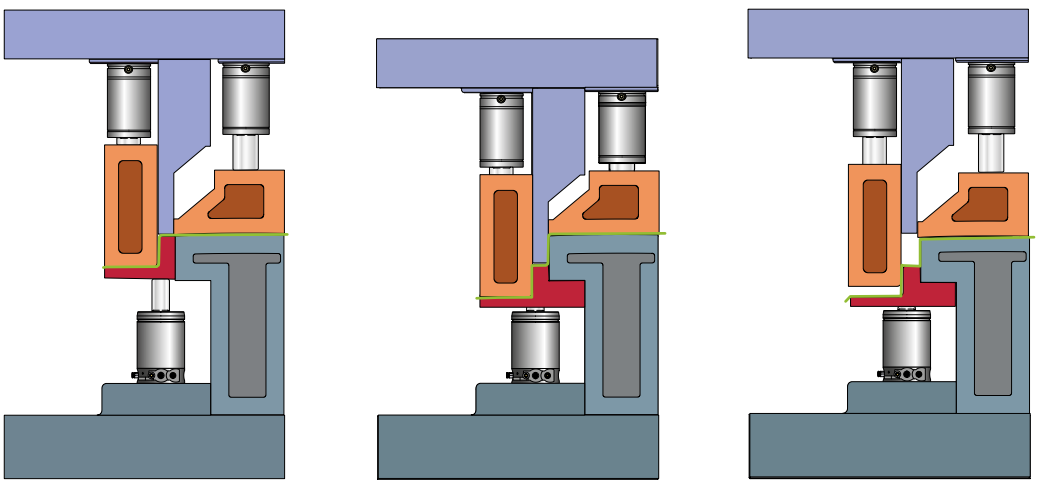
Part:
Vehicle inner door panel

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

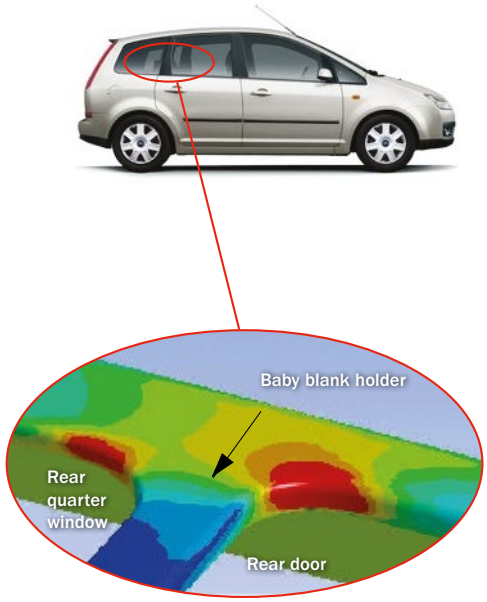
Positive Lock System, KF2 + KP

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.



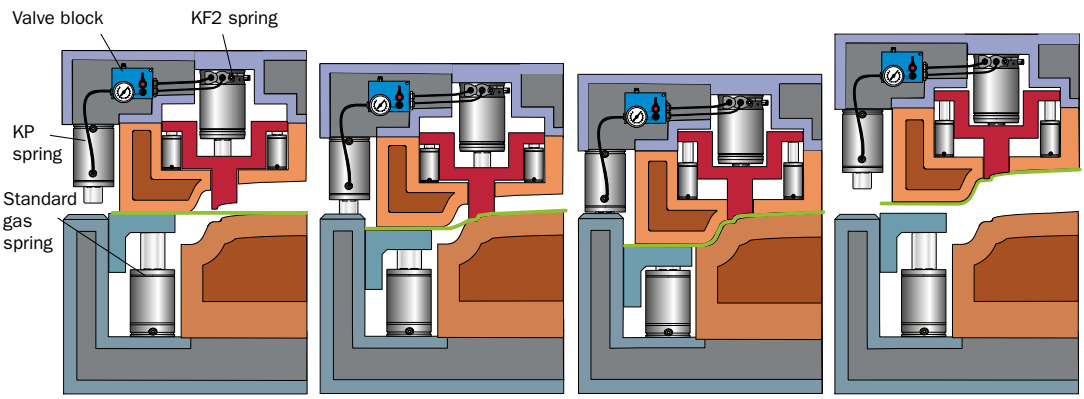
Work cycle

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 Inquiry Form

To make selection of the right system and components for your particular application easier, please fill in the **Application Inquiry 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

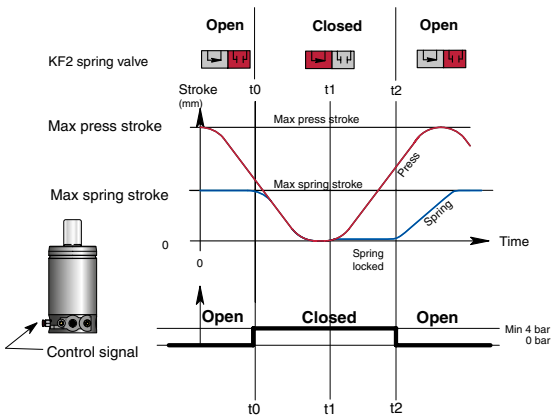
The normally open (NO) valve within the base of the KF2 controllable spring(s) is closed using compressed air (min. 4 bar). With the valve closed at t0-t2 (see diagram), the piston rod of the KF2 spring(s) is prevented from returning to its extended position.

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 electric pneumatic control valve can be used.

For examples of how to connect the KF2 controllable gas spring(s) to a control system, see the installation examples on page 216.

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



Control system – Positive Lock System, KF2+KP

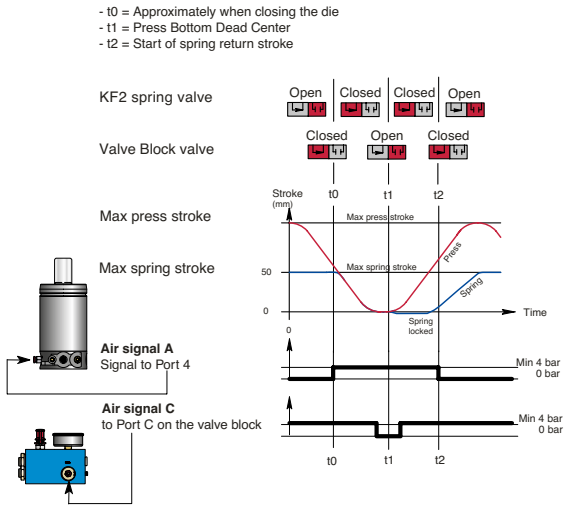
When the KP passive gas spring is connected to the active KF2 spring(s) via the valve block, an additional signal from the press (or separate mechanical pressure switch) is required to control the valve within the valve block.

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.



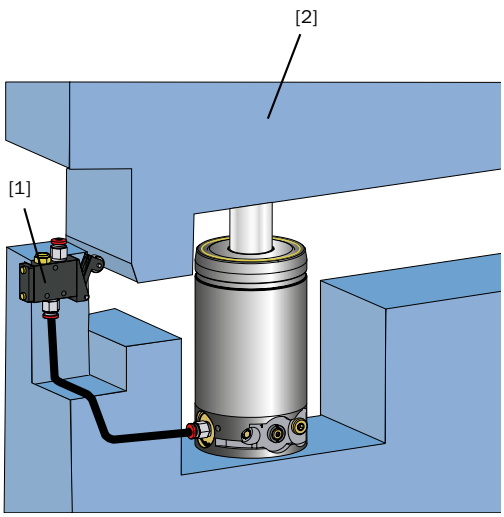
Tool integrated control system

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.

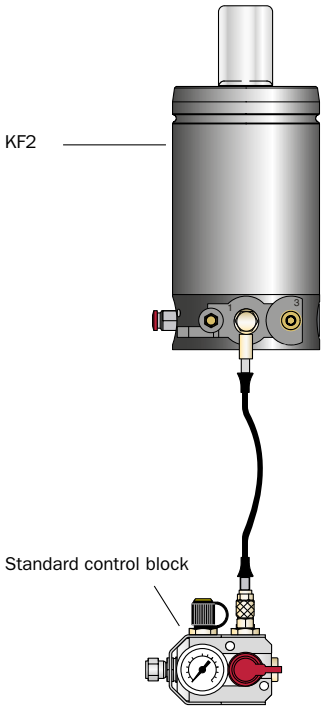
Controllable gas spring system	Recommended hose system
Standard lock	EZ Hose
Positive lock system	EZ Hose and E024 Hose

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 233.

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 EO24 Hose connection

EZ Hose connections

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

EO24 Hose connections

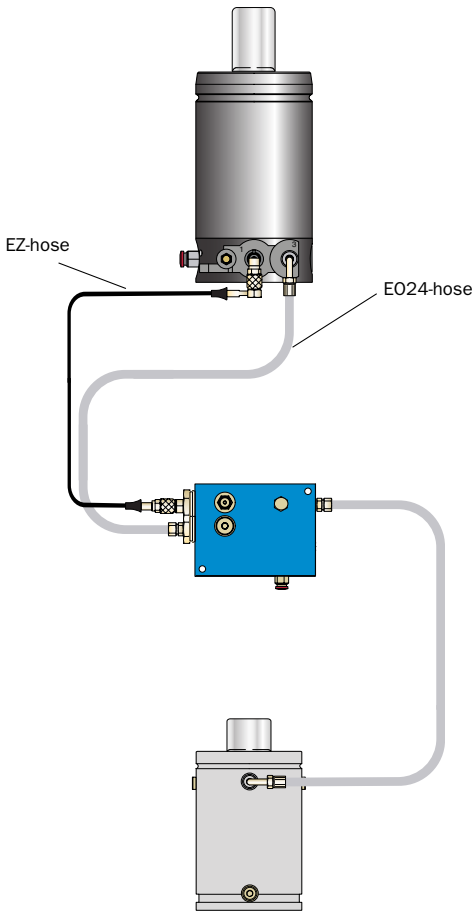
To connect the KF2 controllable gas spring(s) to a KP passive gas spring via the valve block, we recommend using the EO24 Hose system (or its equivalent) owing to the large internal diameter of the hose. This is especially important when gas flow in the hoses is required.

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

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

For information on connecting the newer KF2 springs together with the older KF controllable gas springs, see appendix “How to fit the new KF2 to existing KF systems” on page 233.

For examples of how to connect KF2 + KP controllable gas spring systems to a hose system, see he 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.

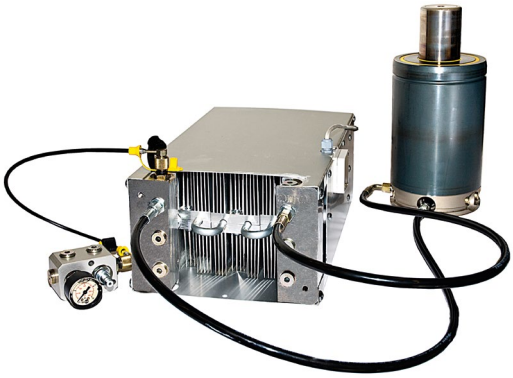
KF2-CJ / KF2-A-CJ for use with a liquid cooler unit. For applications where a larger number of KF2 springs operate at higher production rates requiring cooling of heat build-up, liquid cooler units rated at 10 kW or 25 kW are available. Each KF2 gas spring is fitted with a cooling jacket, thus allowing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

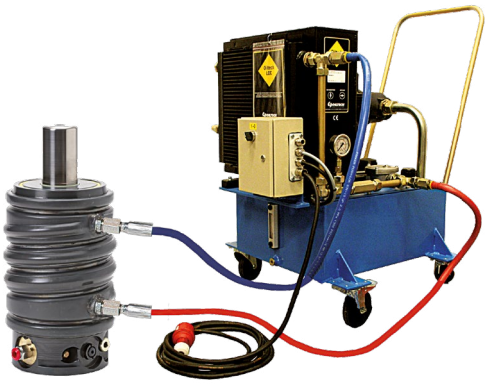
Every time a KF2 controllable gas spring is stroked, energy is transferred from the press to the spring. The amount of energy transferred is a function of the spring force multiplied by its stroke length.

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).

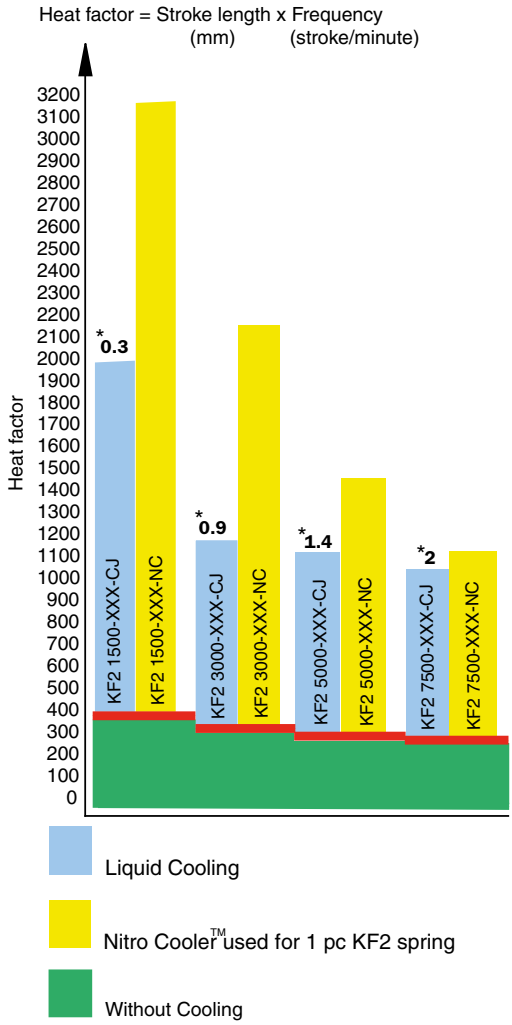
Example:
Stroke frequency: 15 spm
KF2 stroke length: 100 mm

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 × 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.

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

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 × 50 = 500 as above.

$$\text{New heat factor} = \text{Orginal heat factor x} \frac{\text{Required net force at reduced pressure}}{\text{Net force at 150 bar}}$$
$$= 500 \times (300 / 500)$$
$$= 300$$

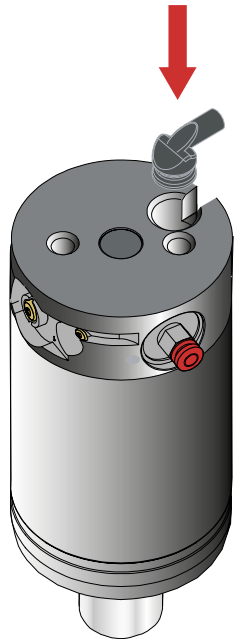
The new heat factor is now 60 below that required for KF2 5000 cooling.

Over Heat Protection

Thermal Relay

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

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

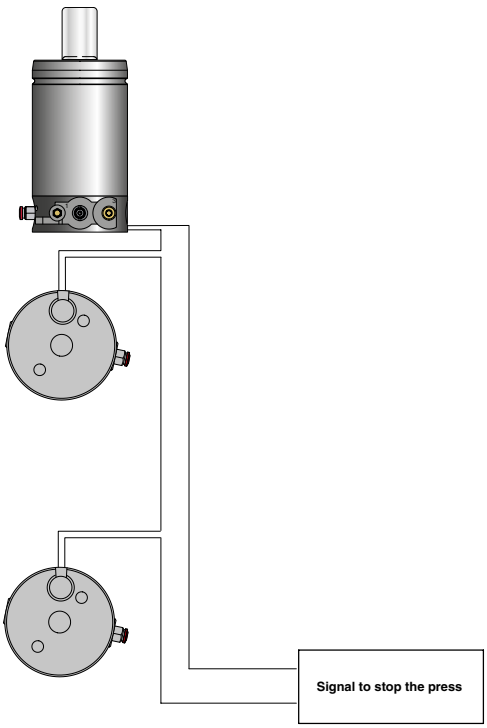


Thermal Relay

Order No. 503388

Basic information

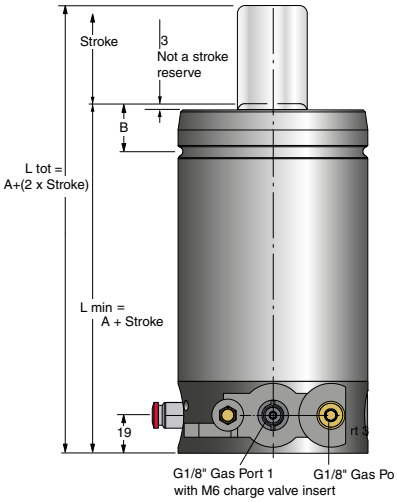
Normally closed
Trigger temperature ..... 83 ±3°C
Hysteresis ..... < 7°C
Max. voltage ..... 250 VAC
Max. current ..... 16 A
Min. current ..... 50 mA
Delivered with 2 m of electric cable



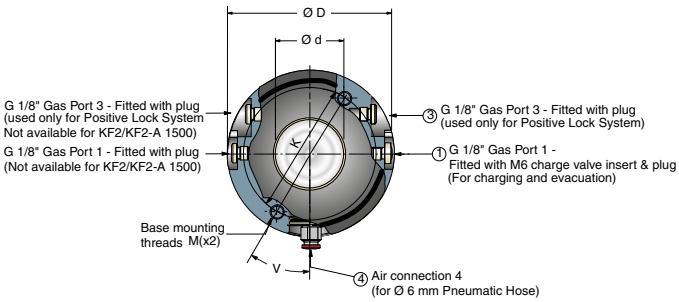
Connection of 3 pcs KF2 (example above)

Technical Data

KF2 – Dimensions, standard version



Top view



Model	Stroke	Force in N 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°	M12×15
KF2 3000	6–160	30,000	42,000	135	25.5	120	50	95	30°	M12×15
KF2 5000	6–160	50,000	74,000	160	27.5	150	65	110	30°	M16×18
KF2 7500	8–160	75,000	98,000	180	33.5	195	80	120	30°	M16×18

- 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* ..... ≈ 0.08 - 0.065 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 ± 0.5 mm).

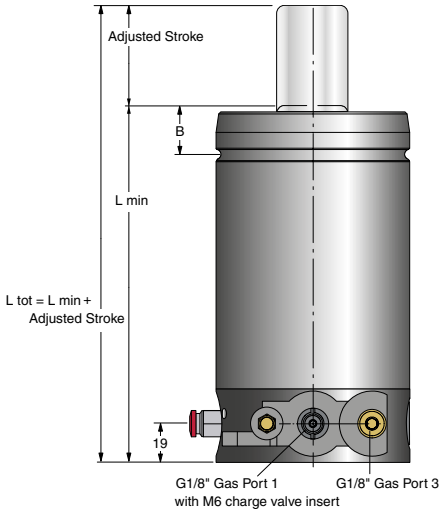
***Please note:**
Increased stroke length reduces the speed. Please contact your local KALLER® distributor for further information.
KF2 springs with even slower return speeds are available on request.

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

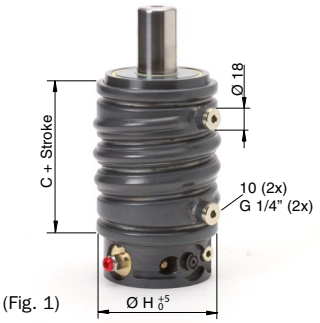
Gas springs with cooling

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 C	KF2-A C+7	Ø H $^{+5}_{0}$
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)

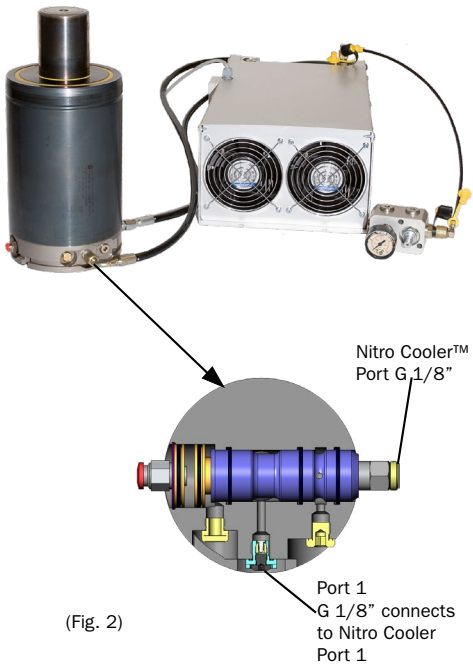
Gas springs with a special cartridge valve are used with nitrogen coolers (NC) (Fig. 2). See page 211.

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
3121780-01	KF2/KF2-A 1500
3121780-01	KF2/KF2-A 3000
3221780-01	KF2/KF2-A 5000
3321780-01	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)

KF2 XXXX - XXX - CJ

Model size
1500
3000
5000
7500

Stroke length [mm]

Cooling Jacket

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

KF2A XXXX - XXX - XXX - NC

Model size
1500
3000
5000
7500

Nominal Stroke length [mm]

Adjusted Stroke length [mm]

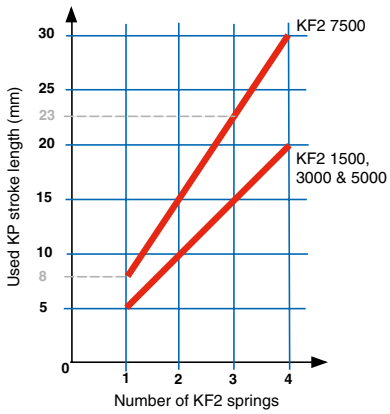
Additional Port for Nitro Cooler™

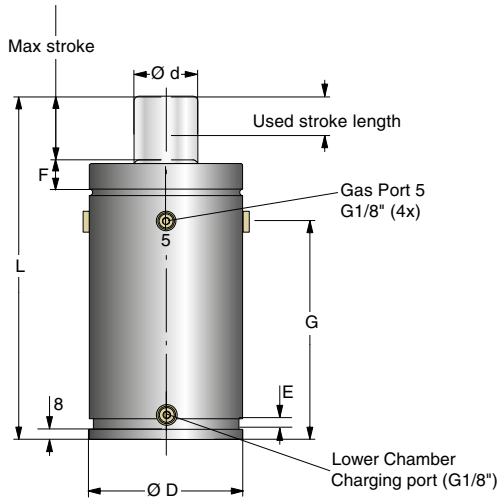
KP – Dimensions

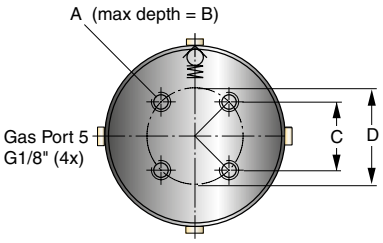
The KP passive gas springs should:

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

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







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

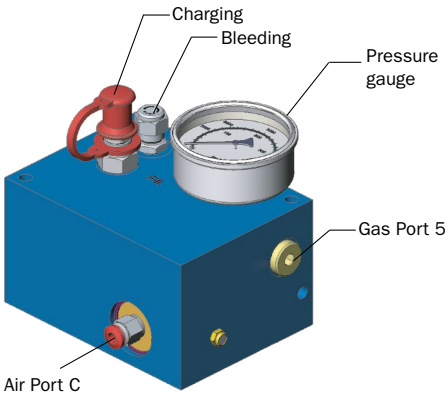
*The forces are calculated based on a charging pressure of 150 bar in the KF2 and the KP spring(s).

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

Valve block dimensions

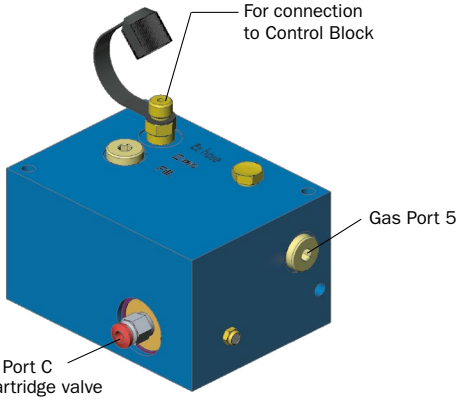
There are two valve block models available:

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

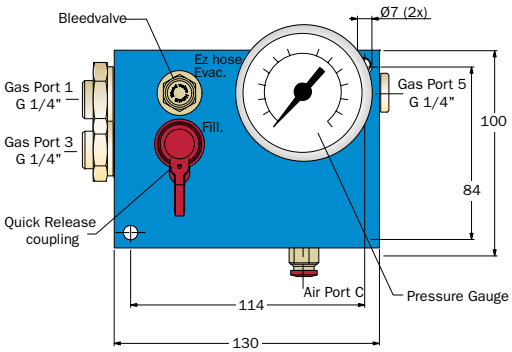


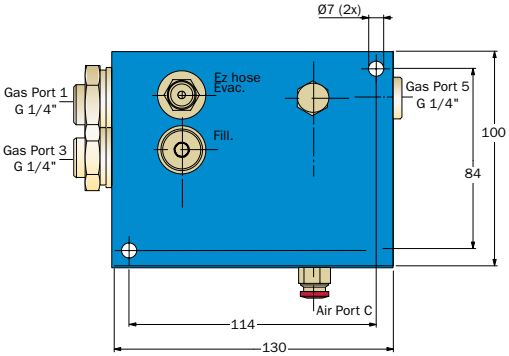
(Cartridge valve closed when pressurized)

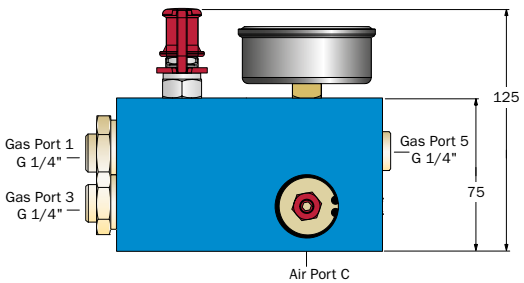
- **Standard valve block,**
  for use with separate control block
  Order No. 2120801

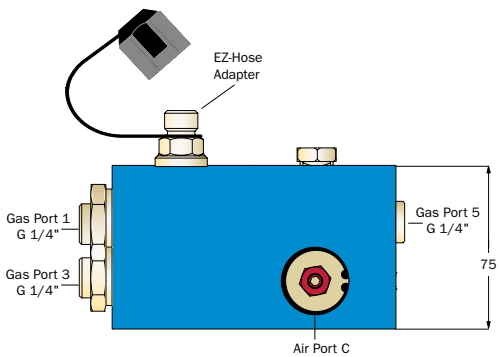


(Cartridge valve closed when pressurized)







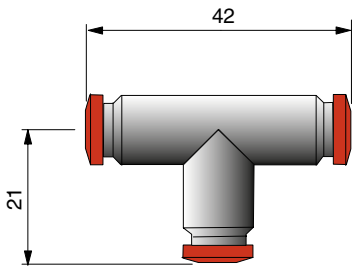


For information about how to connect the different valve blocks to a positive lock system, see the installation examples on pages 217 and 220.

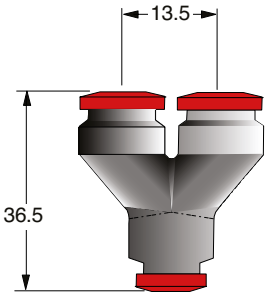
Control system components

Hose and fittings for Ø 6 mm Pneumatic Hose

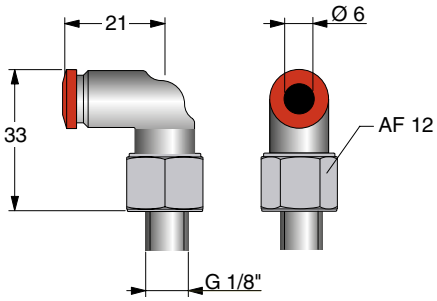
T Connector (hose to hose)
Order No. 503368



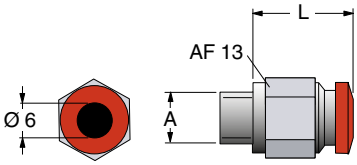
Y Connector (hose to hose)
Order No. 503372



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 **506795- XX**

Order the length in whole meters

Basic information

Material ..... Polyamide
Max. temperature ..... 130°C
Max. pressure ..... 27 bar
Color ..... Blue
Min. bend radius ..... 35 mm

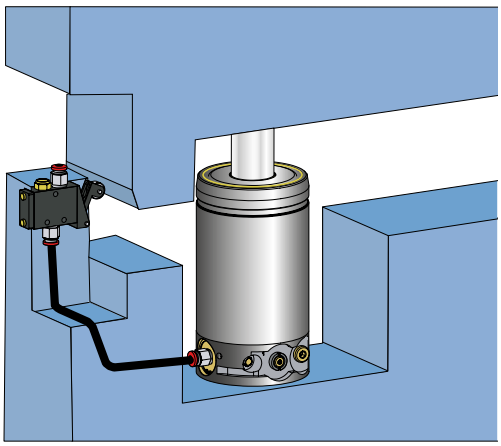
Mechanical Pressure Switch

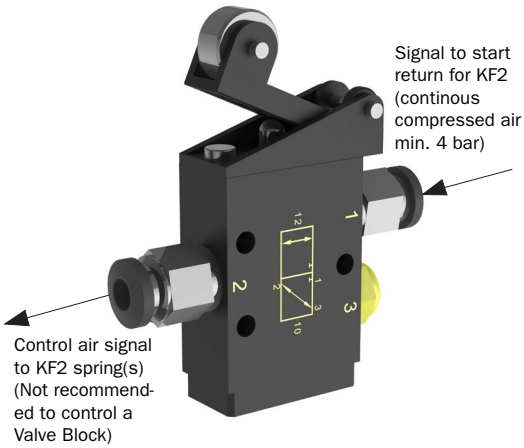
Order No. 503800

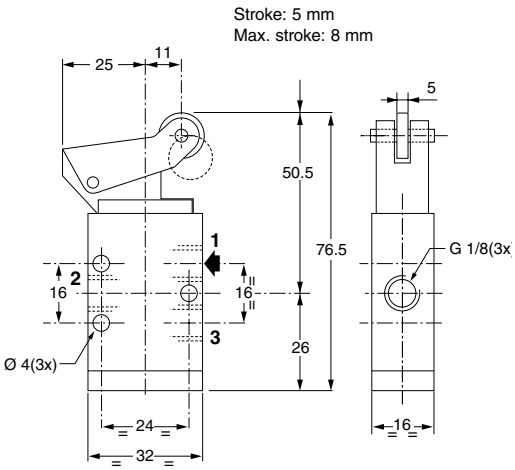
For Tool Integrated Control Systems, the Mechanical Pressure Switch can be used to control the valve in the KF2 Controllable Gas Spring(s) or Valve Block, for Tool Integrated Control Systems. For more information on Tool Integrated Control Systems see Page 193.

Mechanical pressure switches:

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







Basic information

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

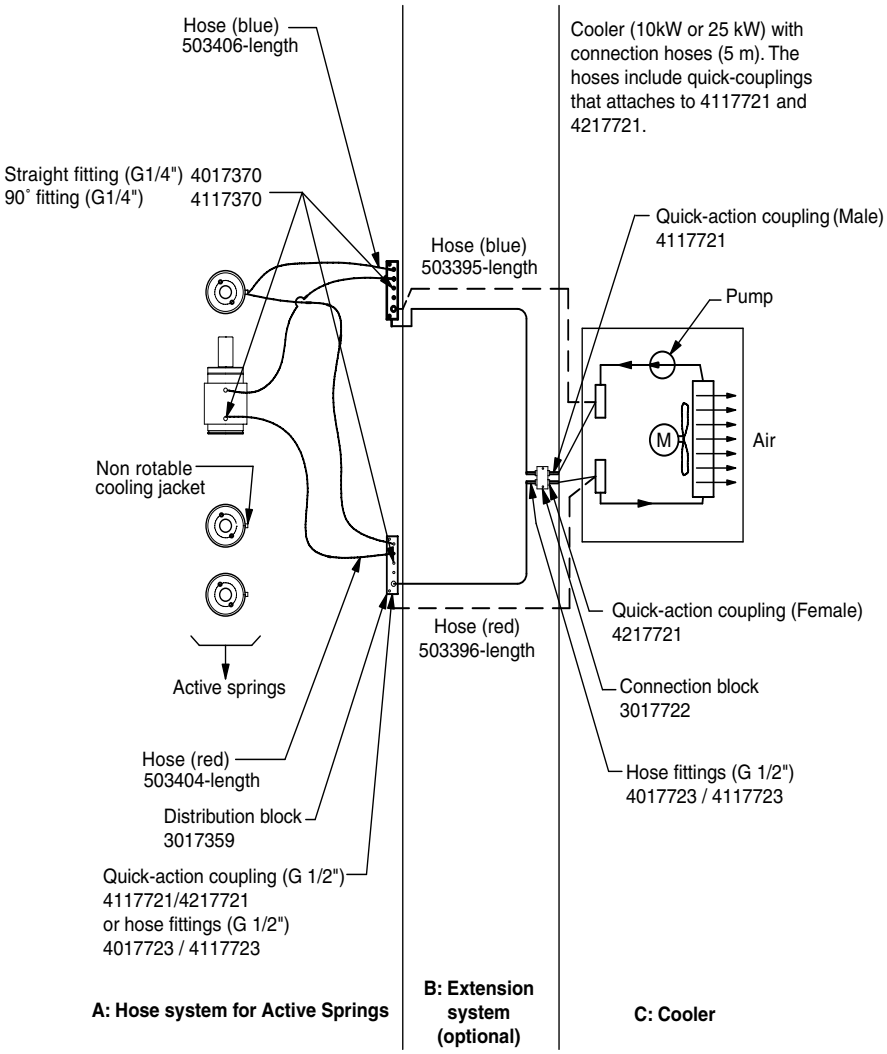
Liquid cooling system components

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

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

KF2 spring fitted with Cooling Jacket (CJ)

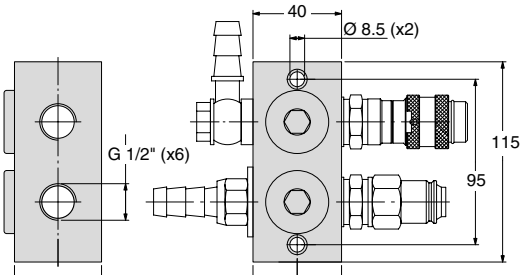
For How To Order information, see *KF2 Dimensions* on page 200.



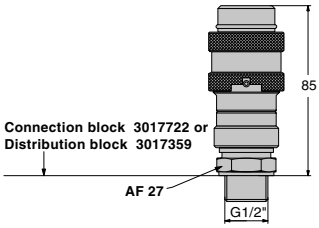
The cooling fluid is circulated within a closed system through the Cooling Jacket(s), to a Cooler Unit (10kW or 25kW), where heat from the KF2 spring(s) is then dissipated.

Cooling System – Hose & Fittings

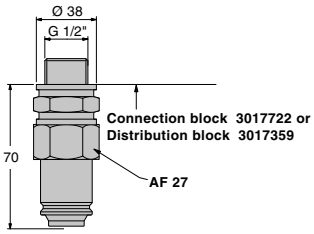
Connection Block
Order No. 3017722



Female Quick Release Coupling
Order No. 4217721

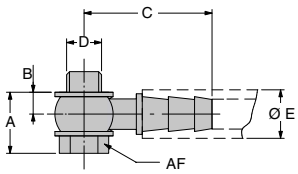


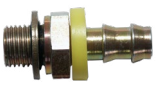
Male Quick Release Coupling
Order No. 4117721



90° Hose Fitting

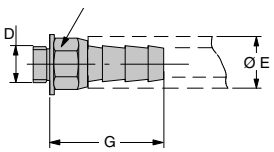
Order No.	D	A	B	C	E	AF
4117370	G 1/4"	23	8	44	16	17
4117723	G 1/2"	30	12	68	23	27





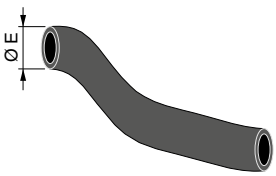
Straight Hose Fitting

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



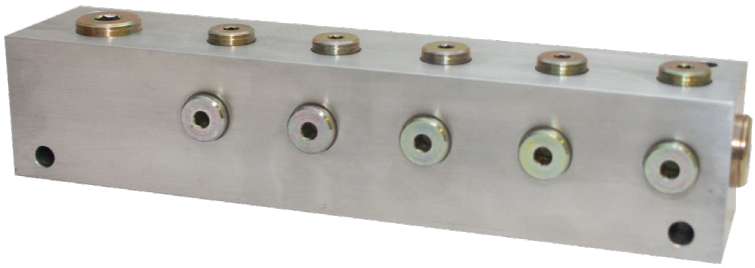
Cooling Hose

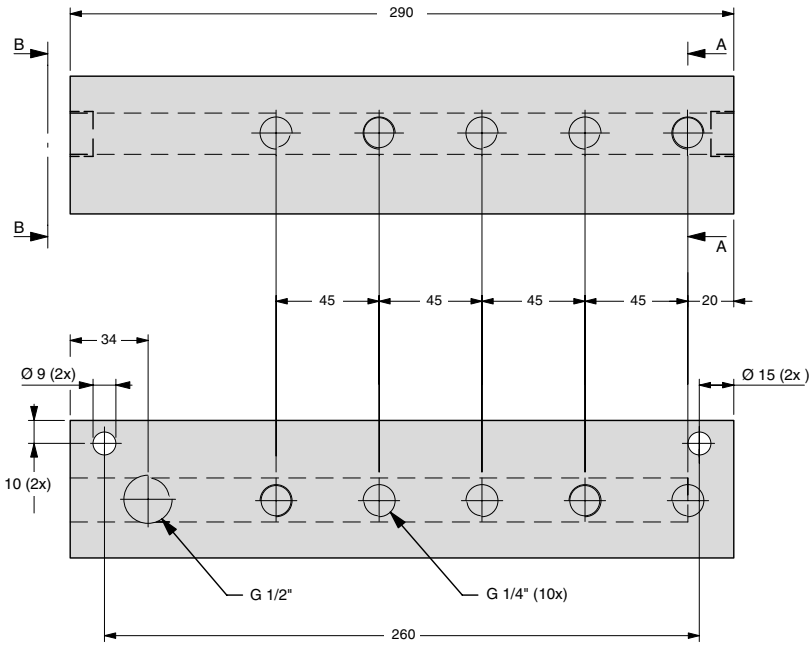
Order No.	E	DN	Color	Min. bend radius
503406	16	10	Blue	75 mm
503404	16	10	Red	75 mm
503395	23	16	Blue	150 mm
503396	23	16	Red	150 mm

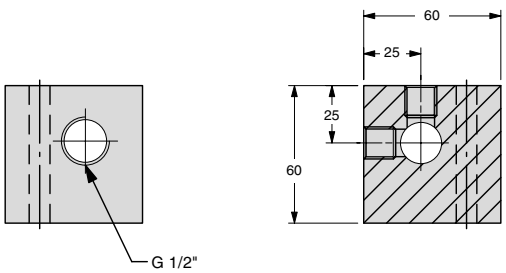


Cooling System – Distribution Block

Order No. 3017359







View B-B

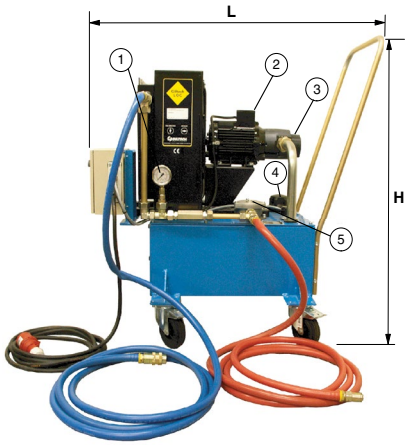
View A-A

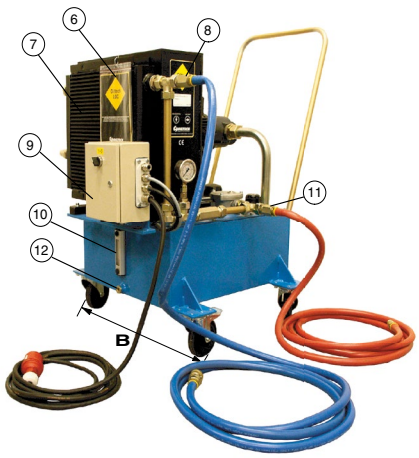
Liquid Cooling System – Cooler Unit (LC)

Two cooler unit sizes are available:

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

For information on which Cooler Unit is suitable for your application, please fill in the Application Inquiry Form on page 191 and fax or email it to your local KALLER® distributor or directly to KALLER® .





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. **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.

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

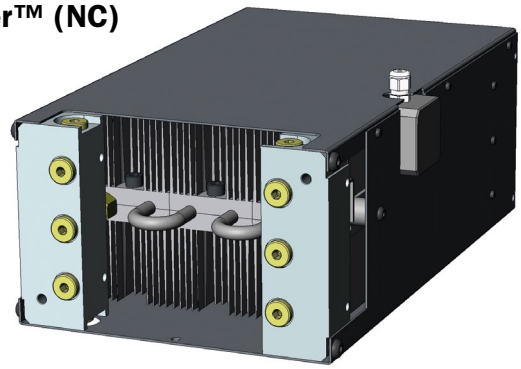
Basic information

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)

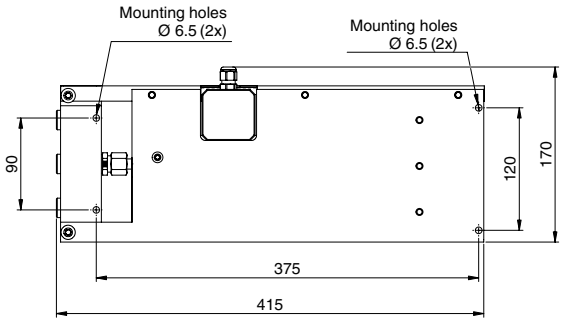
Nitro Cooler™ – Order No. 2021641

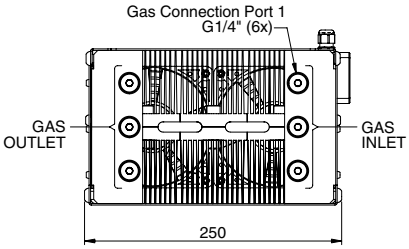


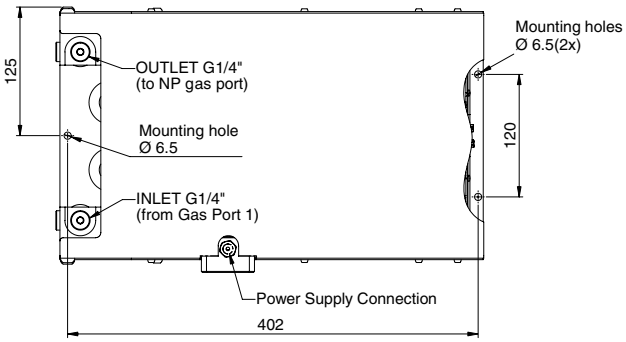
The KALLER® Nitro Cooler™ unit(NC) has been engineered to provide Tool Integrated Cooling for Controllable Gas Springs (KF2 or KF2-A) when operating at high production rates.

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

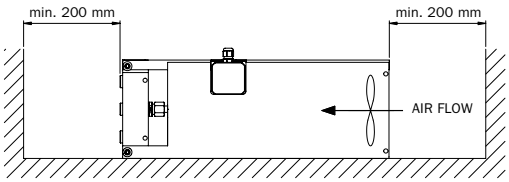
Max. cooling capacity..... 1.5 kW
Max. charge pressure..... 150 bar at 20°C
Min. charge pressure..... 25 bar
Operating temperature..... 0 to +80 °C
Weight..... 16 kg
Connection ports..... G 1/4" (8×)
Power supply..... 24 VDC (22 W)
Includes a built-in thermal relay

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.

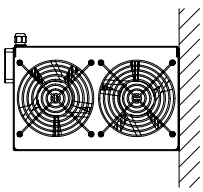
Nitrogen Cooling System – Nitro Cooler™ (NC)

Mounting possibilities

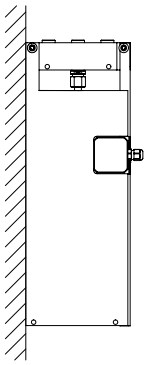
Nitro Coolers can be mounted both vertically and horizontally. When mounting it is important NOT to restrict the air flow through the cooler. If the air flow is restricted through the Nitro Cooler™, this will have a negative effect on the cooler's performance.



Base mount



Horizontal mount



Vertical mount

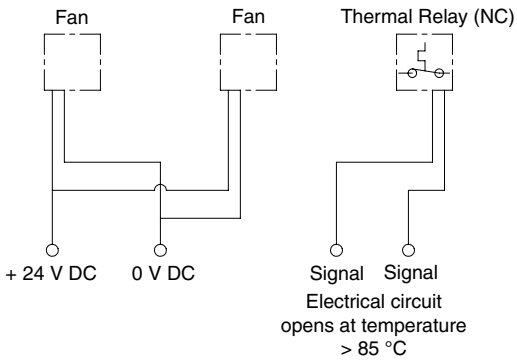
Electrical connections

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

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

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

The thermal relay should be connected to the PLC of the press to prevent overheating of the KF2-NC gas spring(s).



Nitrogen Cooling System – Nitro Cooler™ (NC)

Nitro Cooler™ performance

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

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

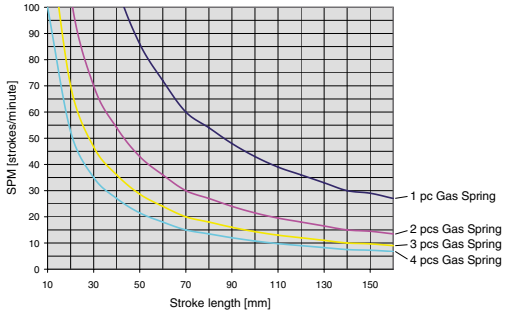
Important! When using the Nitro Cooler™, the return stroke speed of the piston rod decreases by approximately 50%. With a distance of 1 m between the cooler and the gas spring the speeds are as follows:

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

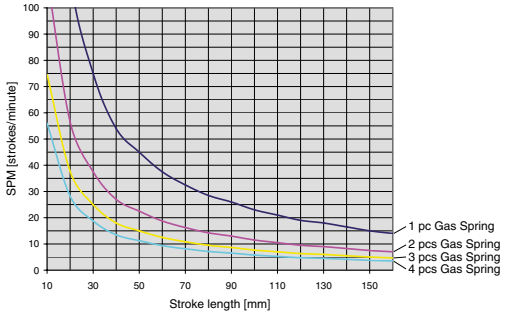
If a higher speed is needed, please contact your local distributor or KALLER® .

See example on the next page:

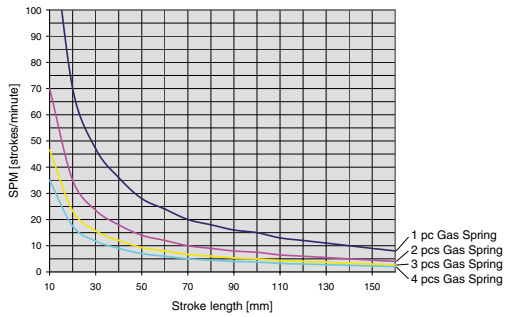
KF2/KF2-A 1500



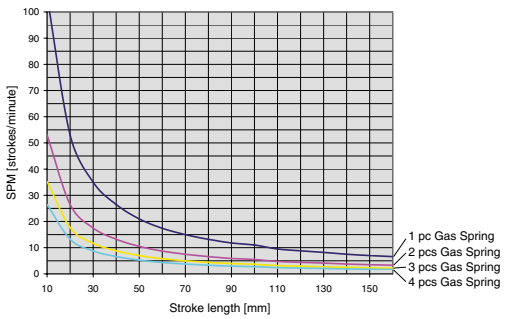
KF2/KF2-A 3000



KF2/KF2-A 5000



KF2/KF2-A 7500



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)

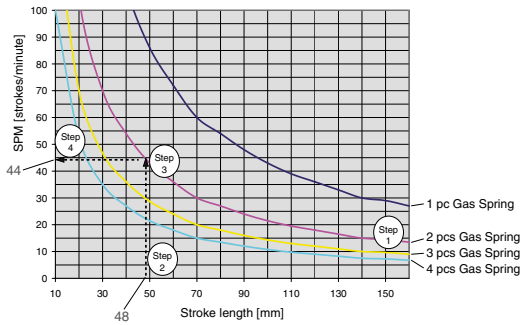
The used number of Gas Springs
(2 Gas Springs in this example)

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 × 150/100 = 66 strokes/min.

Max SPM for one Gas Spring with one Nitro Cooler



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

KALLER®
The Safer Choice

Die No.		
Gas spring model		
Stroke length		
Max. frequency	strokes/min	
Gas spring charge pressure	Min bar	Max bar
Thermal relay connected	Yes ☐	

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

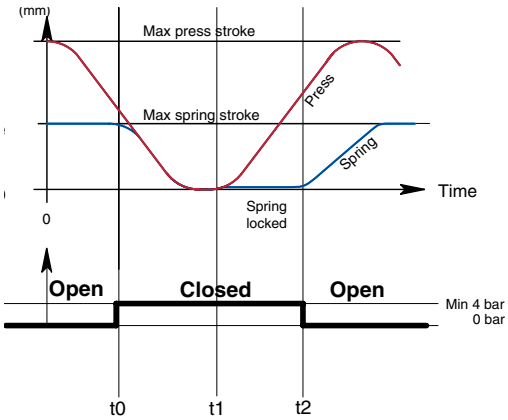
1. Gas spring charge pressure (max. 150 bar at 20°)
2. Air supply pressure (min 4 bar, max. 10 bar)
3. Air signals from press

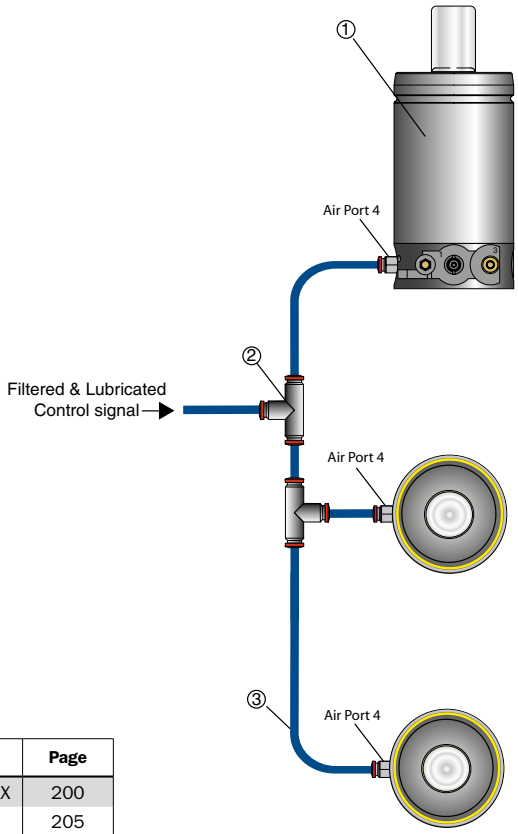
Do not work in the die with the gas springs in locked position. Make sure that the thermal relay is in operation.

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

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.

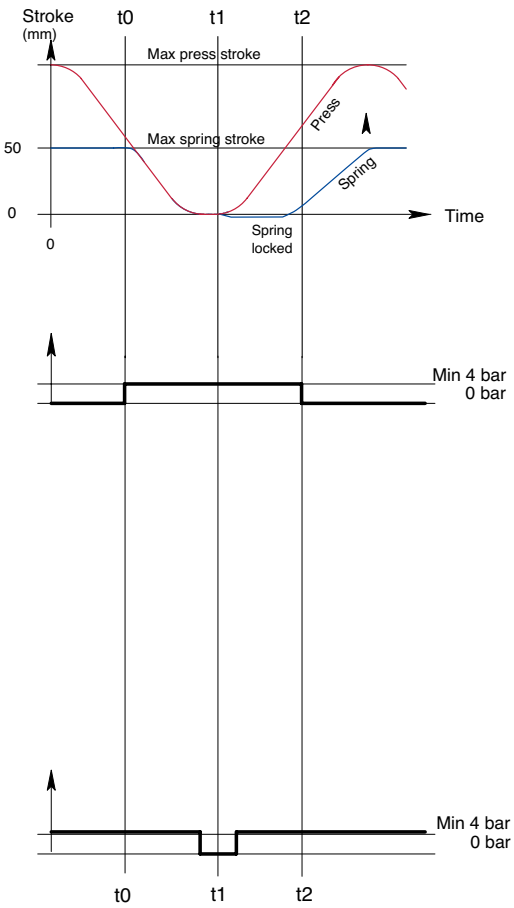
The KF2 gas springs are delivered with air fittings suitable for Ø 6 mm pneumatic hoses.

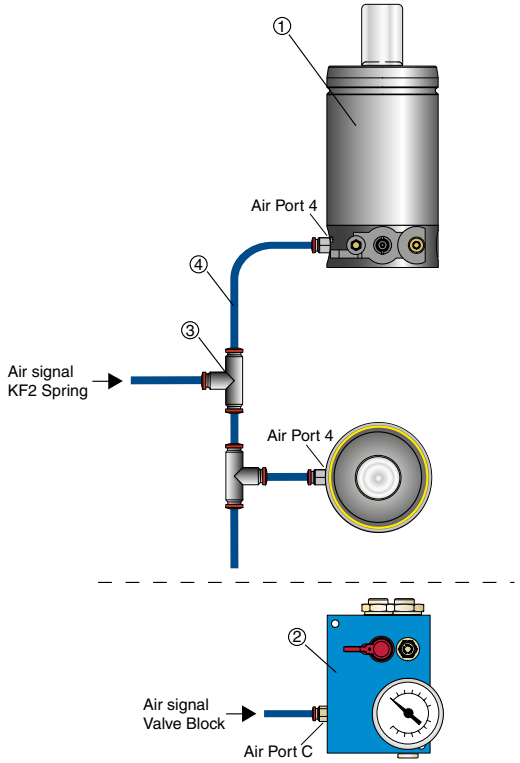
Please note! To lock and unlock all KF2 springs simultaneously, the hose lengths from the different springs to the air inlet should all be the same length.

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

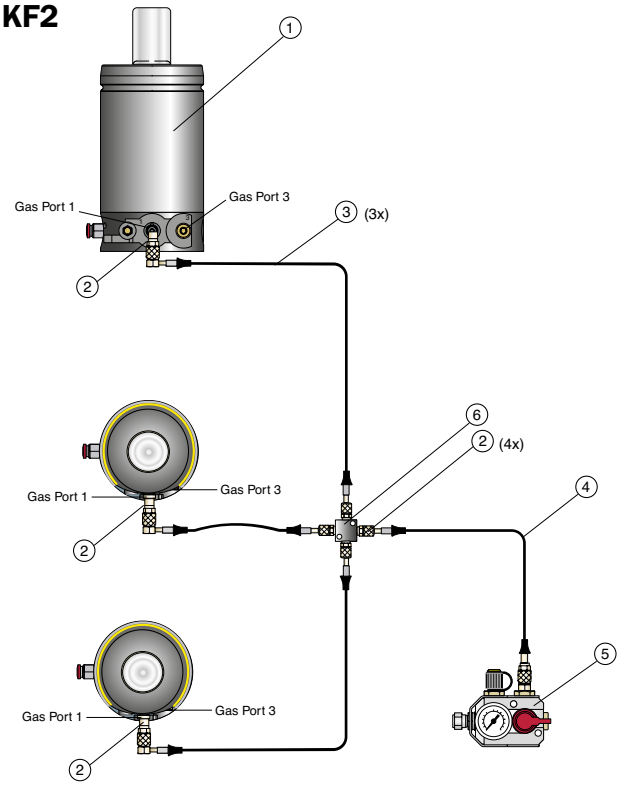
The KF2 gas spring and Valve Block are supplied with air fittings suitable for Ø 6 mm pneumatic hoses.

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).

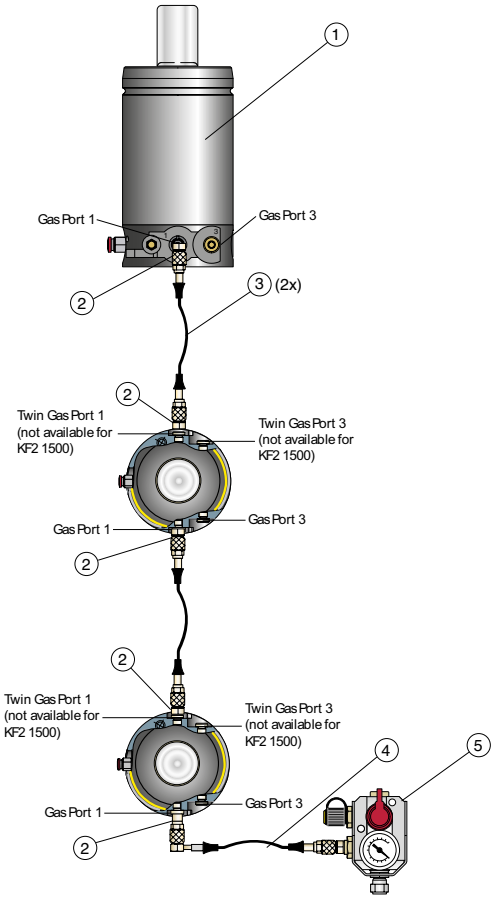
We recommend the EZ Hose system and fittings be used for such systems. The KF2 gas springs are delivered with Gas Ports 1 and 3 plugged. When connecting the EZ Hose system, the charging valve in Port 1 of each KF2 gas spring must first be removed. Each G 1/8” Gas Port, for both the KF2 Gas Spring and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

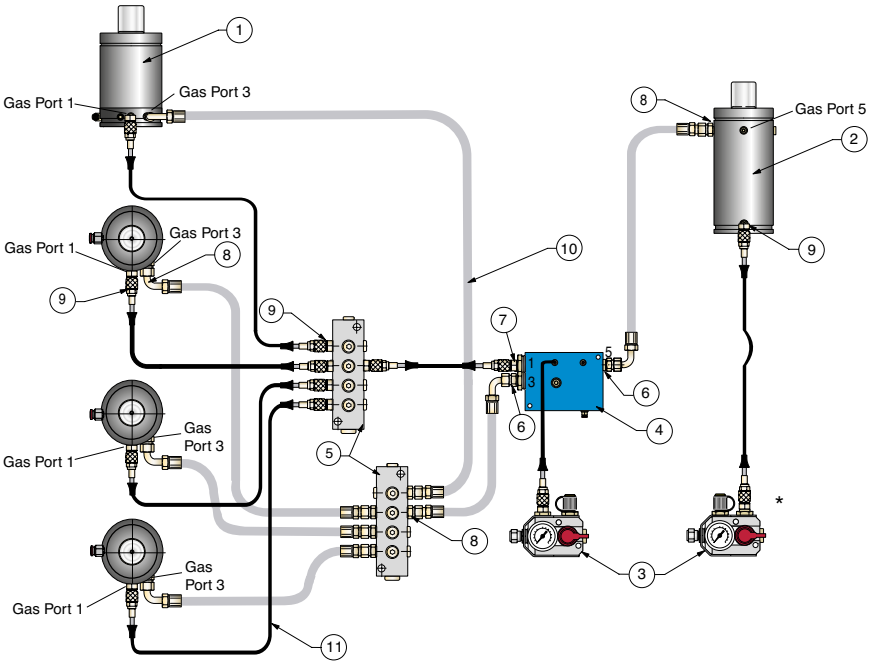
To charge, bleed and check the gas pressure for a Standard Lock in a KF2 gas spring system, all springs should be connected to a standard Control Block. These hoses are connected using the KF2’s twin gas ports to the Control Block.

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

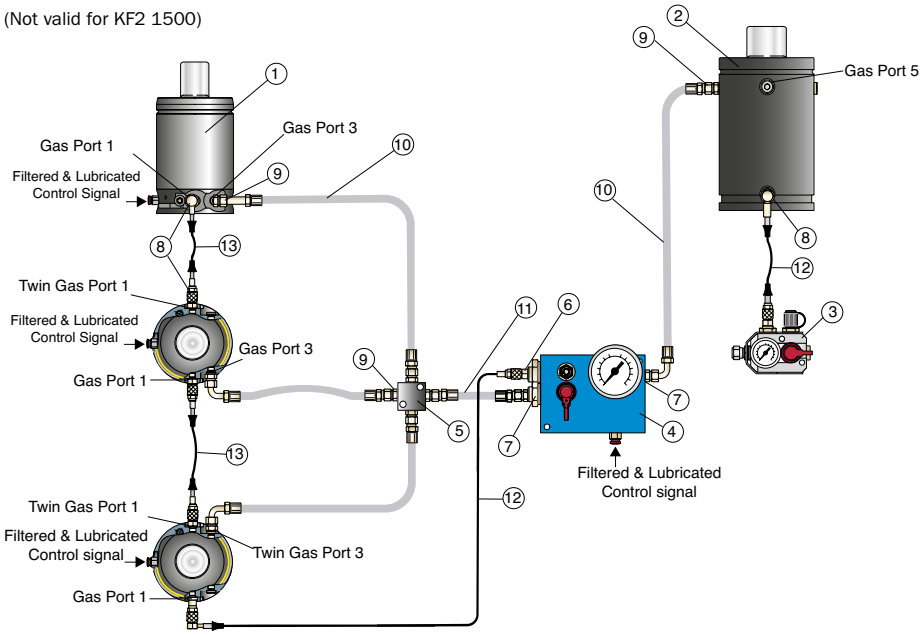
Positive Lock, KF2 + KP
As indicated above, perform gas charging and bleeding as follows:
Step 1
Charge the lower gas chamber in the KP Passive Gas Spring via the Control Block (3)*.

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:

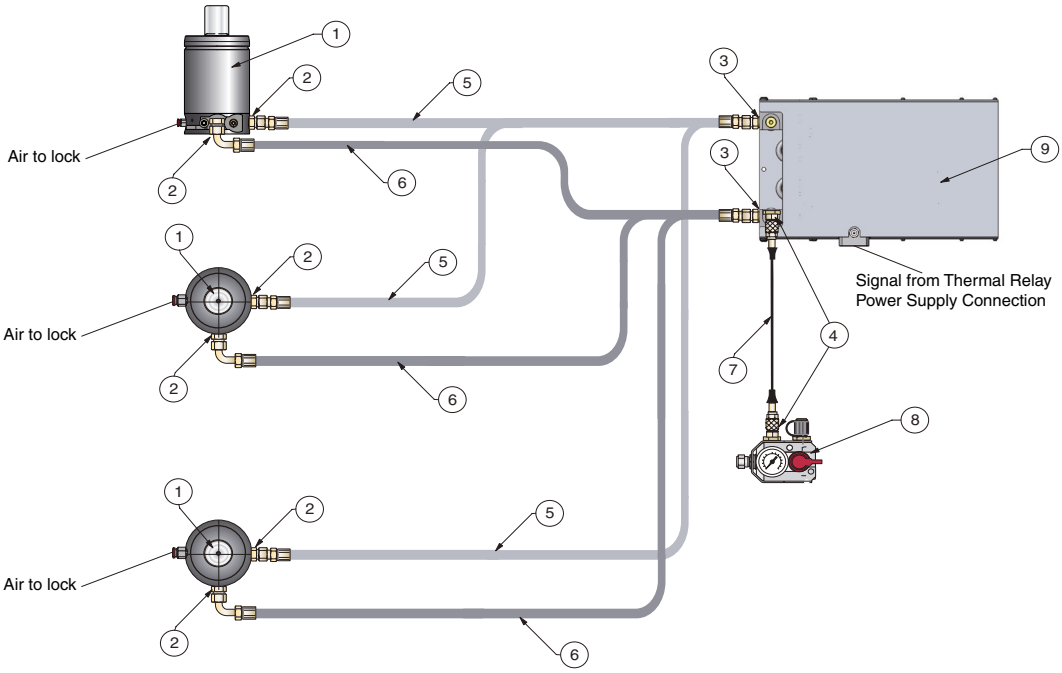
- One EZ Hose connection
- One EO24 Hose connection.

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	Contol 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™



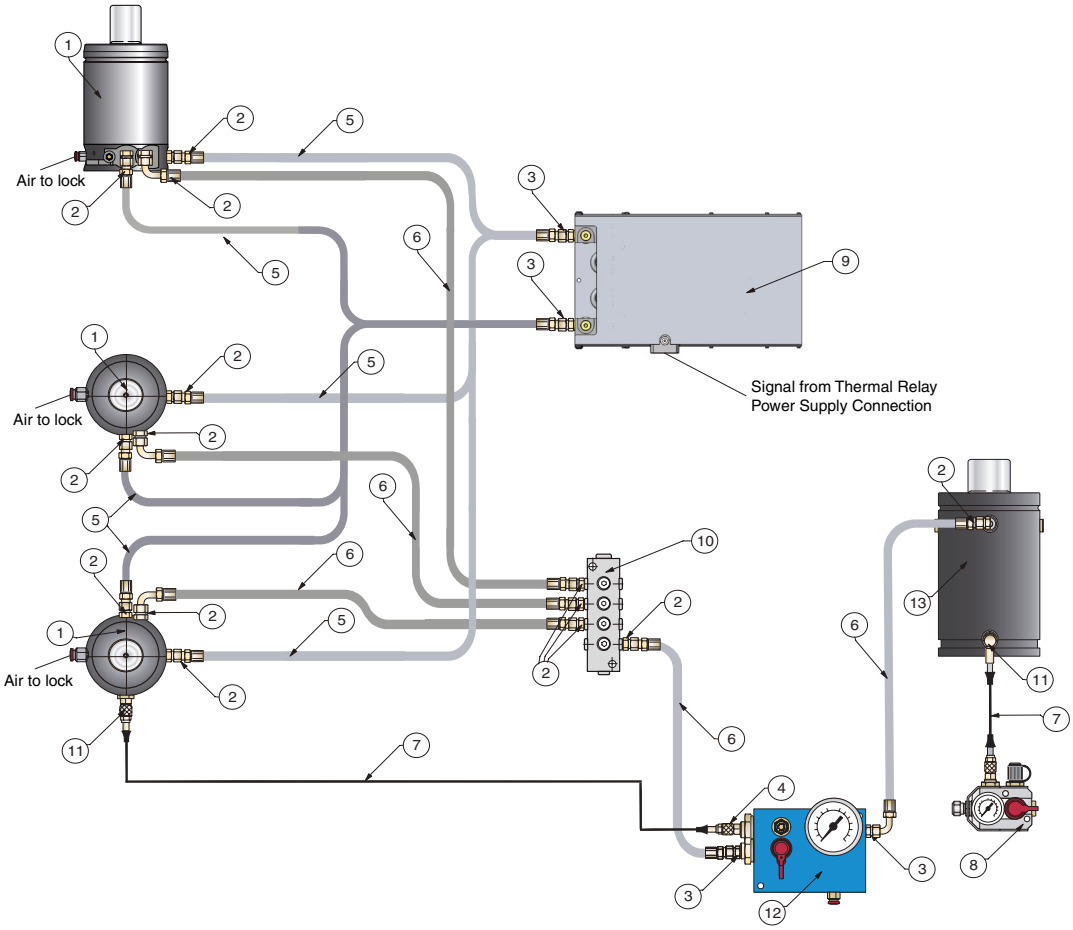
Position	Quantity	Description	Order No.	Page
1	3	Controllable Gas spring	KF2 XXXX-XXXX NC	200
2	6	EO24 Adapter G 1/8”	503593	Main Catalog
3	2	EO24 Adapter G 1/4”	504144	Main Catalog
4	2	EZ Adapter G 1/4”	4014973-G 1/4”	Main Catalog
5	3	EO24 Hose straight – straight	3020857-xxxx	Main Catalog
6	3	EO24 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 EO24 Hoses should be used. There is a gas transport between the cooler and gas springs with every stroke. Therefore the Nitro Cooler™ should be placed as close as possible to the springs to minimize the length of the hoses.

The Nitro Cooler™ includs 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 tto the Nitro Cooler™.

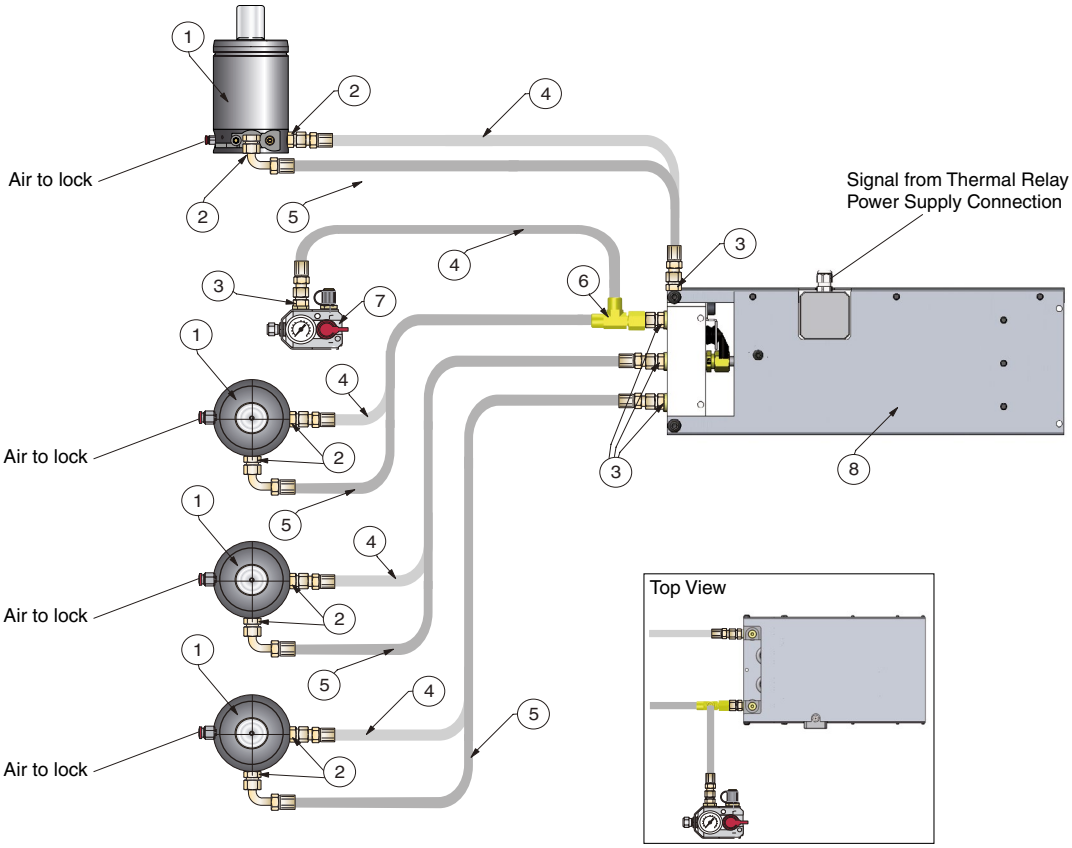
KF2-NC connection – Positive lock with a Nitro Cooler™



Position	Quantity	Description	Order No.	Page
1	3	Controllable Gas Spring	KF2 XXXX-XXXX NC	200
2	14	EO24 Adapter G 1/8”	503593	Main Catalog
3	8	EO24 Adapter G 1/4”	504144	Main Catalog
4	1	EZ Adapter G 1/4”	4014973-G 1/4”	Main Catalog
5	6	EO24 Hose straight – straight	3020857-xxxx	Main Catalog
6	5	EO24 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 requirement 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	
What air pressure is required to operate the cartridge valves?	4 bar minimum air pressure is required to close the normally open (NO) cartridge valves.
What is the maximum air pressure allowed to operate the cartridge valves?	10 bar maximum air pressure is allowed to operate the cartridge valves.
What service life can I expect from a KF2 Controllable Gas Spring?	As long as the thermal relay is used, the following service lifetimes can be expected: For stroke lengths up to 50 mm: 0.5 million strokes. For stroke lengths above 50 mm: 50,000 stroke meters.
Can I use other Hose Systems?	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 KALLER® directly for more information.
Can I combine different KF2 size springs in the same system?	No. Please contact your local KALLER® distributor or KALLER® 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/s 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 f 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 KALLER® 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 KALLER® directly for more information.

Frequently Asked Questions (FAQ's)

Relating to Positive Lock System, KF2+KP	
How many KF2 Controllable Gas Springs can be connected to a single KP Passive Gas Spring?	Up to 4 pcs KF2 can be connected to a single KP spring.
How many Valve Blocks do I need in the system?	One Valve Block is required for each KP Passive Gas Spring in the system.
Can I use the KP spring in the tool for forming?	No. The KP spring is not to be used for any operation in the tool; use it only to eliminate KF2 springback.
Can I use just the EZ Hose System to connect to my Positive Lock System?	No. The EO24 Hose System (or its equivalent) must be used between the KF2 spring(s), Valve Block and KP Passive Gas Spring.
Can I use just the EO24 Hose System to connect to my Positive Lock System?	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 KALLER® cannot be held responsible for poor function.

Frequently Asked Questions (FAQ's)

Relating to Nitro Cooler™	
How many KF2 can be connected to one Nitro Cooler™?	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.
Can we eliminate the decrease in return speed caused by the Nitro Cooler™ ?	No. When using the Nitro Cooler™, gas is transported between the cooler and gas springs for every press stroke, and consequently the return speed will be affected. With a distance of 1 m between the cooler and gas spring the speeds are as follows: KF2/KF2-A 1500 – 0.10 m/s. KF2/KF2-A 3000 – 0.08 m/s. KF2/KF2-A 5000 – 0.05 m/s. KF2/KF2-A 7500 – 0.03 m/s. return stroke speed. If a higher speed is needed, please contact your local distributor or KALLER® .
How many Nitro Coolers™ can be used in one die?	There is no limitation as long as there is sufficiently ventilated places for them in the die.

Troubleshooting

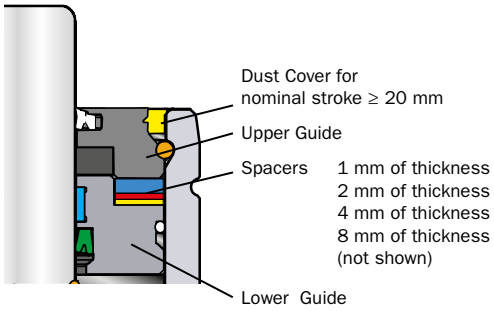
System	Problem	Solution
Standard Lock, KF2	KF2 spring does not lock	Make sure the KF2 spring's Air Port 4 has minimum 4 bar air pressure before press BDC
		Check that all hose connections are correct
	KF2 piston rod's springback is greater than 1 mm	Make sure 100% of the KF2 spring's nominal stroke length ±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 ±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
Ex.1	+4	1	1	0	0
	+3	0	0	1	0
	+2	1	0	1	0
	+1	0	1	1	0
	*Nominal	0	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

* The nominal stroke length is always marked on the tube

Important!

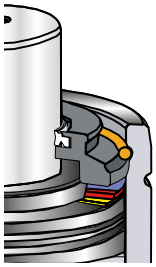
- **Only fully trained personnel with experience in servicing gas springs are allowed to adjust to the stroke length.**
- **Make sure the work surface where you will be working on the KF2-A spring(s) is clean and free from contaminates.**
- **Make sure there is no gas pressure in the KF2-A spring before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

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

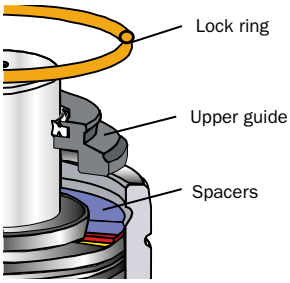
Stroke length adjustment of KF2-A

Work procedure

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

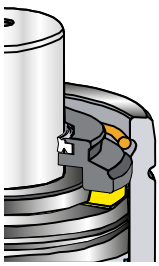


2: **Knock down the guide and remove the lock ring by using a mounting sleeve and a plastic hammer.**



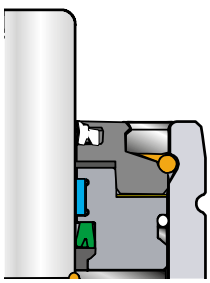
3: **Remove the Upper Guide and install the combination of Spacers that will give you the required stroke length.**

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.)**

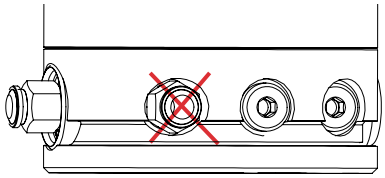


7: **Charge the KF2-A spring with nitrogen gas, and fit the dust cover (if applicable).**

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

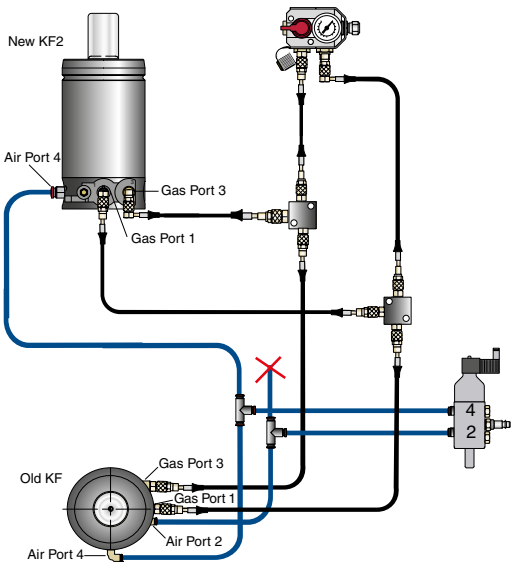


How to fit the new KF2 to existing KF systems

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

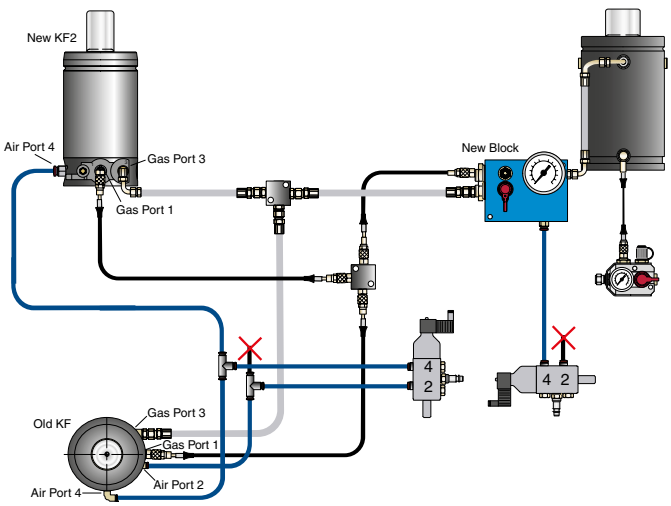
Standard Lock Example: Replacing an existing KF with a new KF2

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

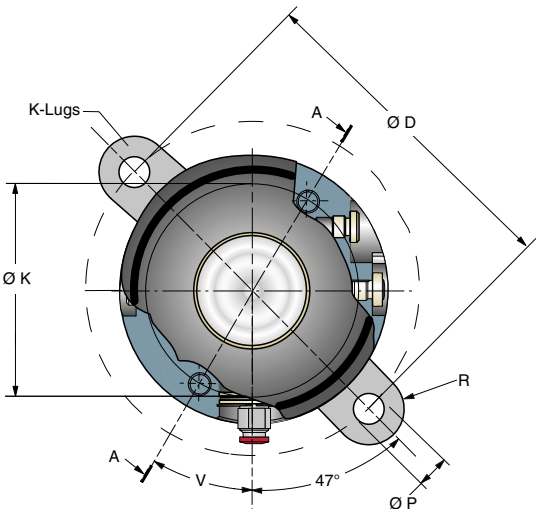
To replace an existing KF spring with a new KF2 spring in a Positive Lock System, simply plug the air signal that went to the KF springs Air Connection Port 2 (shown here by an **X**).

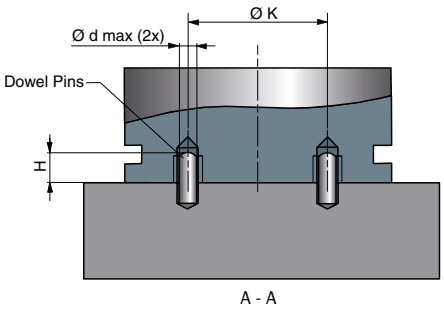


KF2/KF2-A Alternative Mounting

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.

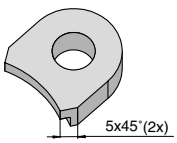
For upright installations, an alternative is to mount the Controllable Gas Springs using two K Lugs in combination with dowel pins, as shown below. The dowel pins will engage the threaded holes in the bottom of the spring (M12 and M16, respectively) and will prevent the spring from moving out of position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





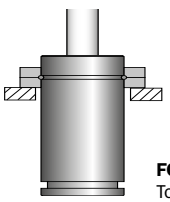
Model	Ø D	Ø d max.	H	Ø K	V	Ø P	R	Order No. K Lug
KF2/KF2-A -1500	130	8	10	50	60	17.5	20	2 pcs K-3000*
KF2/KF2-A -3000	155	8	10	95	30	17.5	25	2 pcs K-5000
KF2/KF2-A -5000	195	12	10	110	30	21.5	25	2 pcs K-7500
KF2/KF2-A -7500	240	12	10	120	30	21.5	29	2 pcs K-10000

***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.

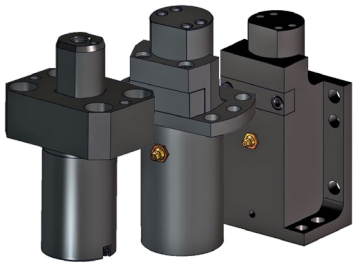


Modification of K-3000 Lug

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 KALLER® .



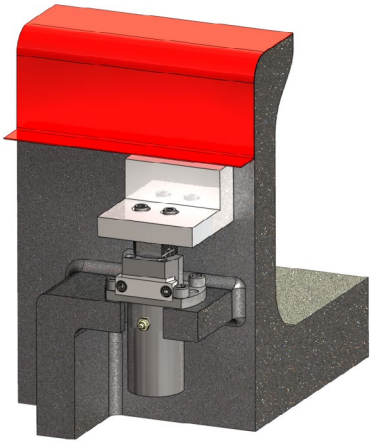
FCSC
Top mount



Page

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.



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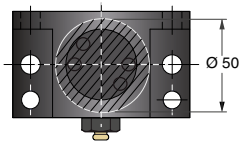
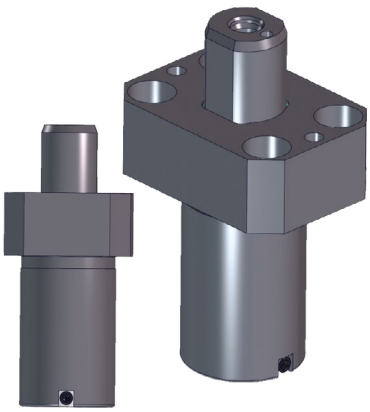
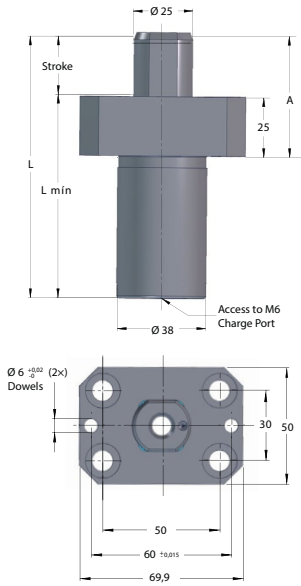
Attachment - Placement

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.



Dimensions SLMTS



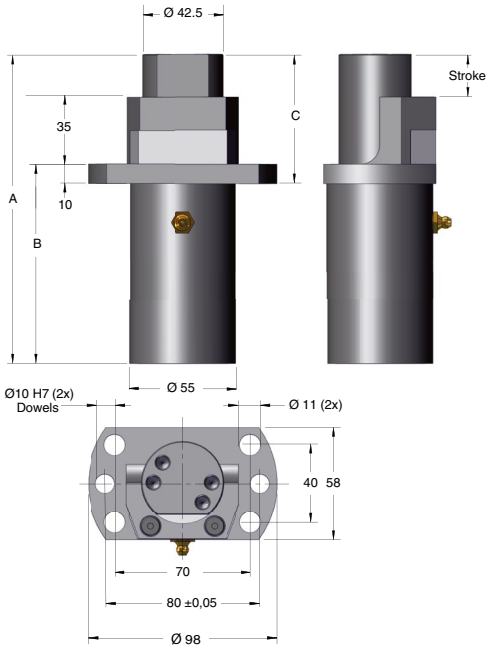


Order No.	Stroke S	Gas Spring	L	A	Weight [kg]
SLMTS 170-025	25	X 170	112	52	0.93
SLMTS 170-038	38	X 170	138	65	1.00
SLMTS 170-050	50	X 170	162	77	1.06
SLMTS 170-080	80	X 170	225	107	1.25
SLMTS 170-100	100	X 170	265	127	1.36
SLMTS 170-125	125	X 170	315	152	1.49

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.

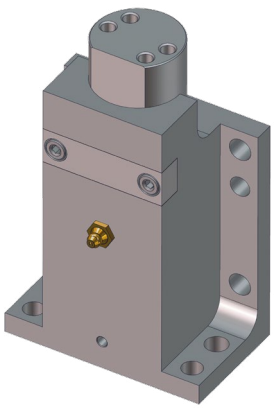
Order No.*	Stroke S	Gas spring	A	B	C
LTP 150-050	50	M2 150-050	200	103	107
LTP 150-080	80	M2 150-080	260	133	137

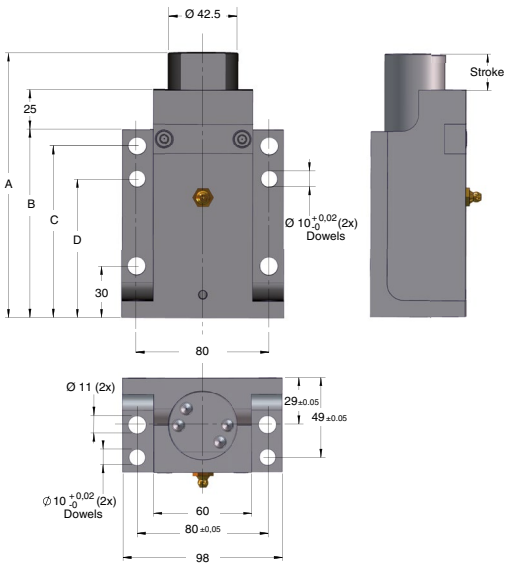
*Available in different forces.

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

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.

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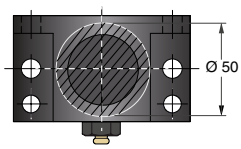
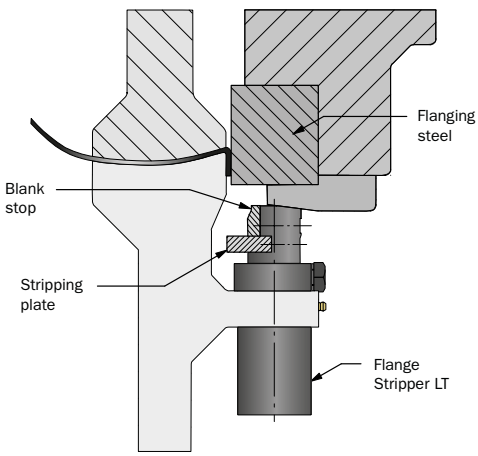
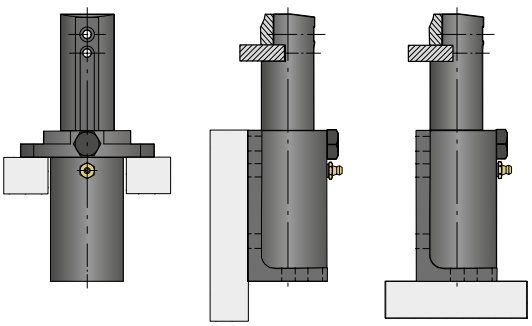
Mounting options

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.

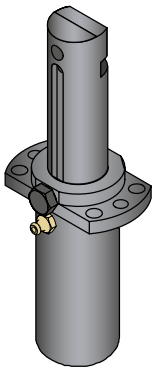


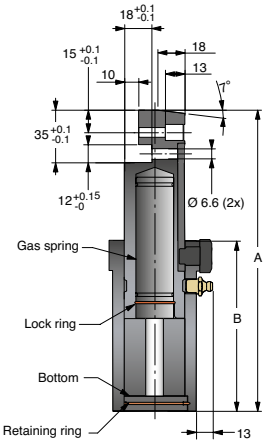


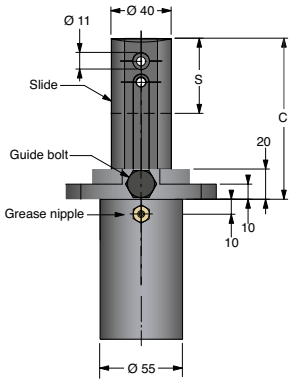


LT - Top mount | LW - Wall mount | LW - Bottom mount

Dimensions LT - Top mount



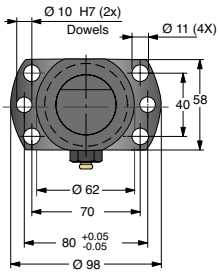




Note!
Access to the grease nipple must be provided in the tool.

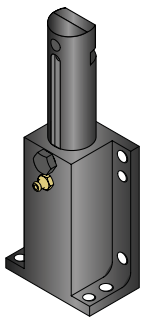
Order No.	Stroke S	Gas spring	A	B	C
LT 050	50	M2 200-050	200	113	107
LT 080	80	M2 200-080	260	143	137

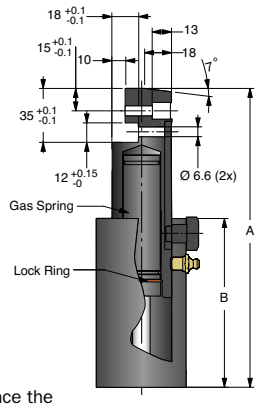
Max. attachment capacity per lifter* Metric	
Ram velocity (m/s)	**Attachment mass (kg)**
0.60	10
0.80	5.6
1.00	3.6
1.20	2.5

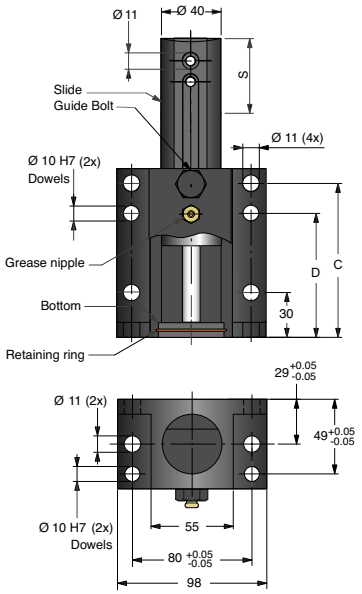


* Determine ram / press max. velocity and reference the recommended attachment mass per stripper. For increased capacity, install external positive stops and guiding to prevent stripper damage.

Dimensions LW - Wall bottom mount







* 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.

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

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

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

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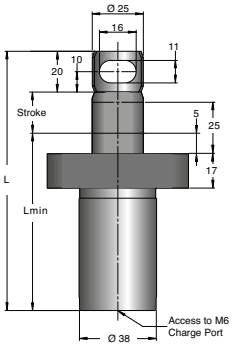
SLME 170

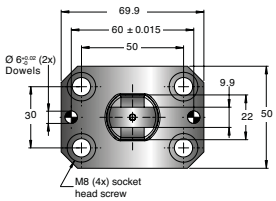
Order No.	S Stroke	Force in N at 180 bar/ + 20°C		L ±0.25	L min	Gas volume (l)	Weight (kg)
		Initial	End force *				
SLME 170-025	25	1700	2800	127	82	0.006	0.81
SLME 170-038	38			153	95	0.009	0.88
SLME 170-050	50			177	107	0.012	0.94
SLME 170-063	63			203	120	0.015	1.01
SLME 170-080	80			240	140	0.019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

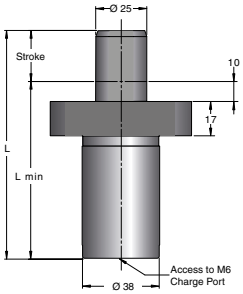


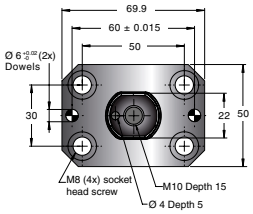


SLMT 170

Order No.	S Stroke	Force in N at 180 bar/ + 20°C		L ±0.25	L min	Gas volume (l)	Weight (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



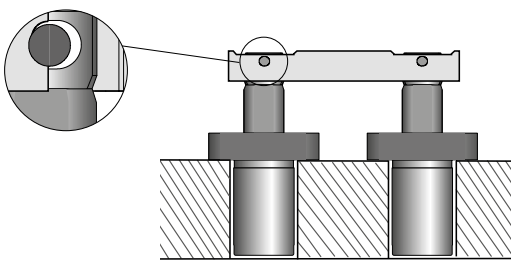


Basic information

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. utilized stroke	100%
Internal gas spring	X 170

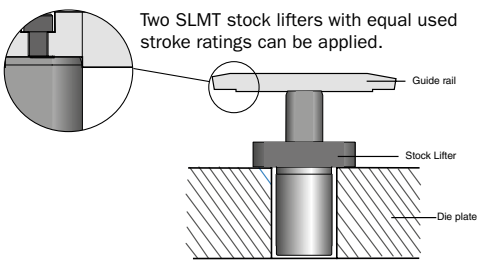
Mounting examples

Note!
Use Ear Attachment for multi-point lifting.



Note!
Use threaded holes for single point lifting.

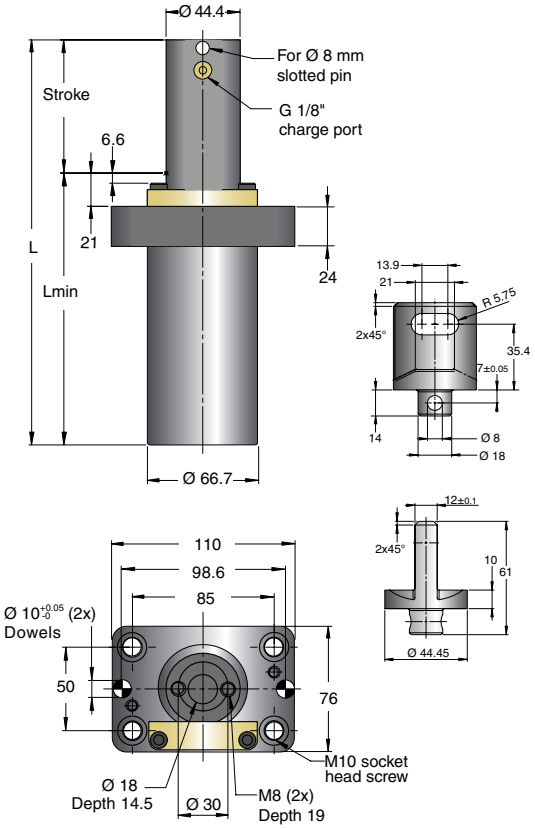
Two SLMT stock lifters with equal used stroke ratings can be applied.



SLM 300

Order No.	S Stroke	Force in N at 180 bar/ + 20°C		L ±0.25	L min	Gas volume (l)	Weight (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* Metric	
Ram velocity (m/s)	Attachment mass (kg)
0.30	29
0.40	16
0.50	10
0.70	5.3
0.80	4.1

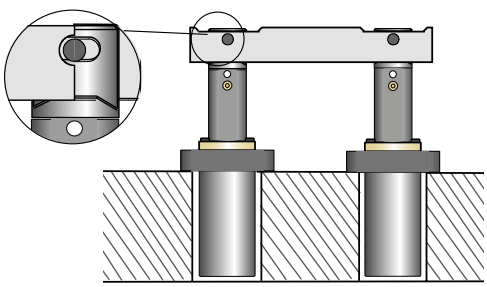
*Attachment mass assumes balanced load and actuation force. For increased capacity, install external positive stops to prevent lifter damage.

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. utilized stroke 100%
Repair kit.....3020870

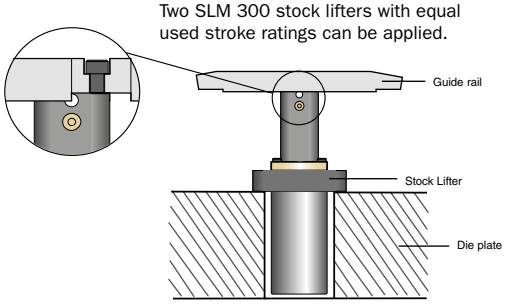
Mounting examples

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



Note!
Use threaded holes for single point lifting.

Two SLM 300 stock lifters with equal used stroke ratings can be applied.



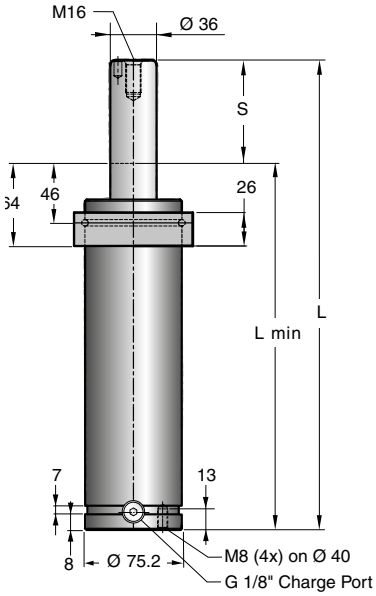
SPC 800

Order No.	S Stroke	Force in N at 70 bar/ + 20°C		L ±0.25	L min	Gas volume (l)	Weight (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

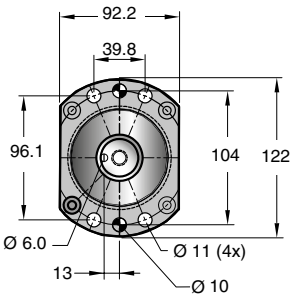
Determine ram velocity and do not exceed recommended attachment mass per lifter. Use multiple lifters to accommodate attachment loads that exceed velocity or mass limits.



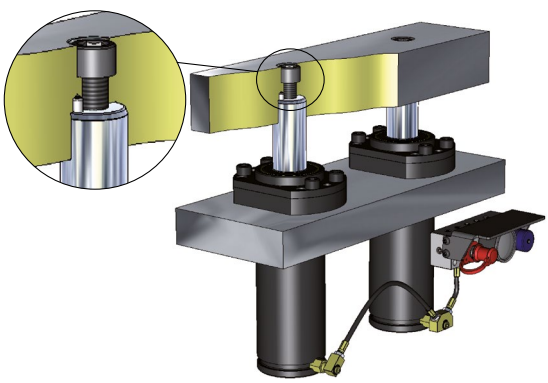
Basic information

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

Features and benefits of KALLER® Die Separation Gas Springs

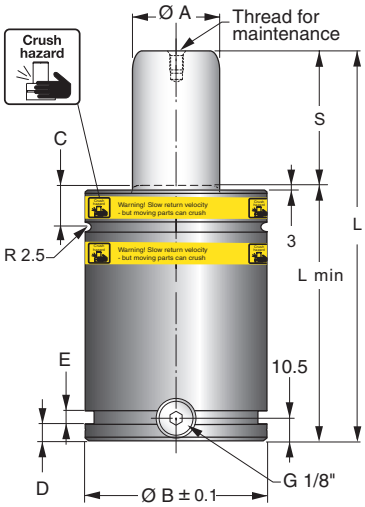
KALLER® Die Separation Gas Springs range from model sizes DS 3000 to DS 7500. Using the new DS springs is an excellent way to avoid unnecessary wear of the die, press and gas springs. A 70-80% energy saving compared to using traditional springs is an additional benefit.

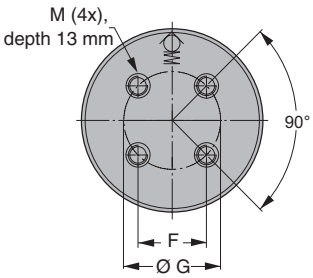
- Initial forces from 30,000 to 75,000 N.
- Stroke lengths of 80 mm up to 300 mm
- Upper C-groove, lower U-groove and bottom threaded holes
- allow for various standard mounting possibilities.
- Suitable for both top up and bottom up working position in the tool
- A very slow return speed compared to traditional springs
- All KALLER® Safety features included

KALLER® - THE SAFER

Training **Safety** **Reliability**

Learn more about KALLER® Training as well as the Safety and Reliability features at kaller.com





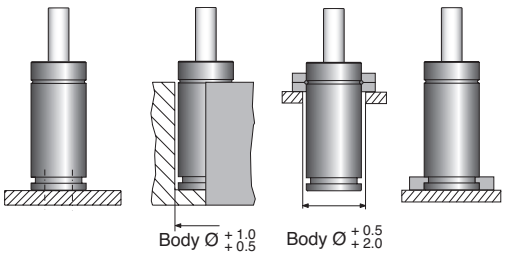
Model	Spring force in N at 150* bar/ + 20°C		Ø A	Ø B	C	D	E	F	Ø G	M
	Initial	End force*								
DS 3000	30,000	48,000	50	95.2	24	8	7	42.4	60	M8
DS 5000	50,000	82,000	65	120.2	25.5	8	7	56.6	80	M10
DS 7500	75,000	124,000	80	150.2	27.5	8	8	70.7	100	M10

* 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



Base mount **Drop-in** **Top mount** **Foot mount**

Stroke [mm]		50	63.5	80	100	125	160	200	250	300
DS 3000	L	220	247	280	320	370	440	520	620	720
	L min	170	183.5	200	220	245	280	320	370	420
DS 5000	L	240	220	300	340	390	460	540	640	740
	L min	190	203.5	220	240	265	300	340	390	440
DS 7500	L	255	282	315	355	405	475	555	655	755
	L min	205	218.5	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.

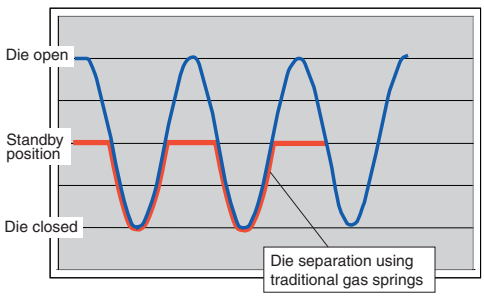


Diagram 1

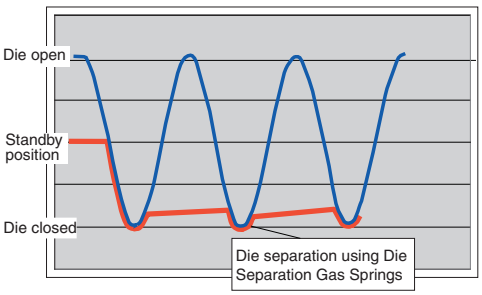
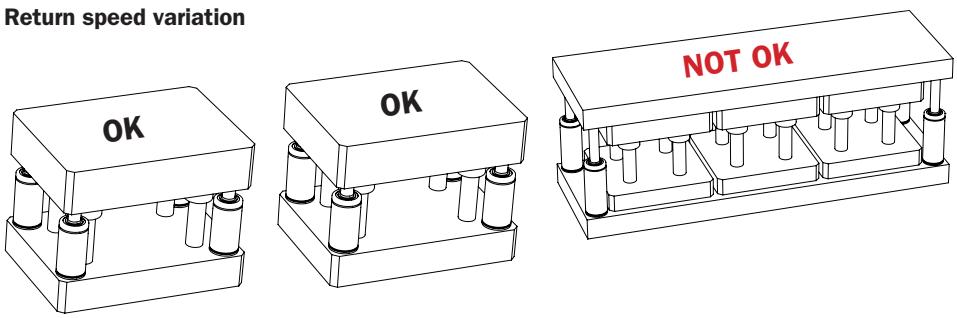


Diagram 2

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.

Page

Roller Cam RC2 and RCP2

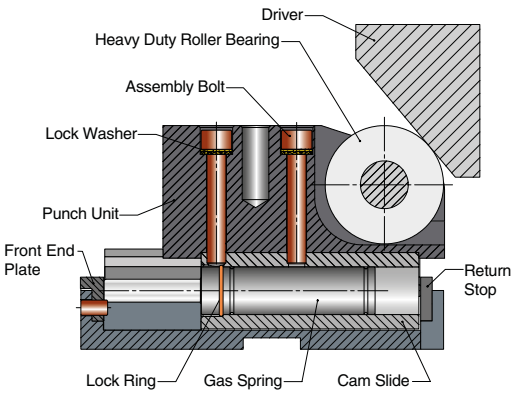
KALLER® Roller Cam has been developed to meet the industry's increasing demands on standard cam units.

This new generation offers:

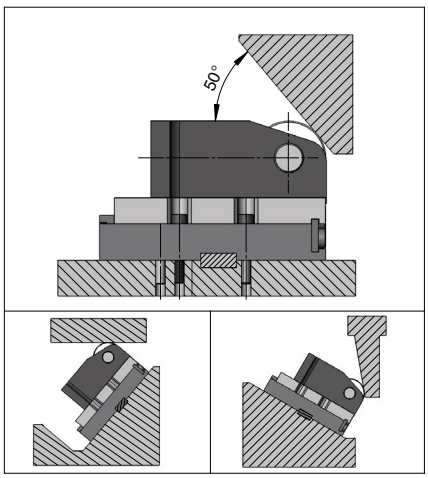
- High precision and maintenance free guiding allowing for more off center loading and upside-down installation
- Long service life
- Built in return stroke dampening
- Easy punch attachment. For other type of application, please contact your local distributor or Strömsholmen AB

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.

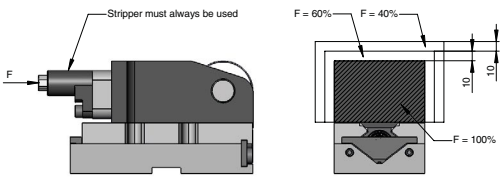
Design



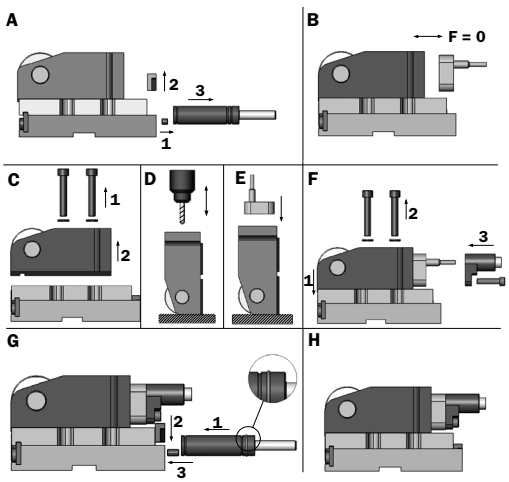
Mounting options



Punch location



Punch attachment



Basic information

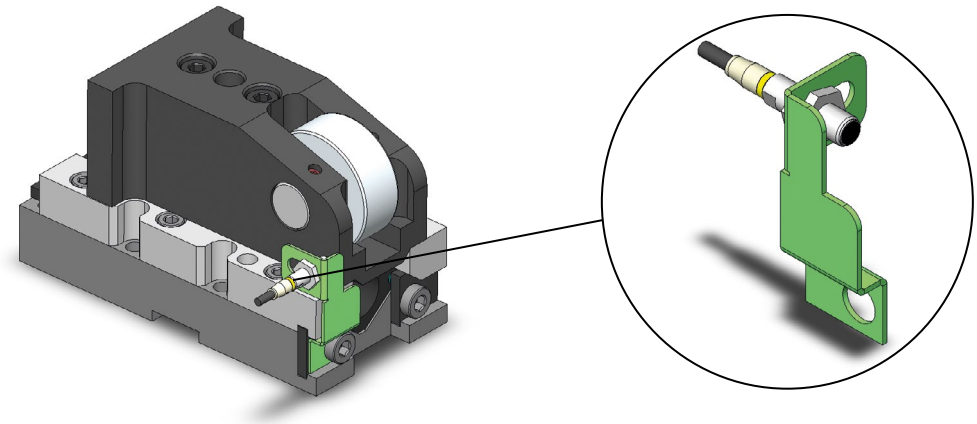
Recommended max. strokes/min ..... 40 spm (at 20°C)
Max. Roller Cam velocity ..... 0.8 m/s
Max. play at face of punch unit ..... 0.02 mm

Note! For information about max. attachment weight, please contact your local distributor or Strömsholmen AB.

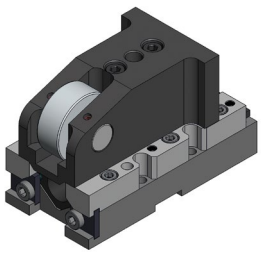
Roller Cam – Sensor Kit

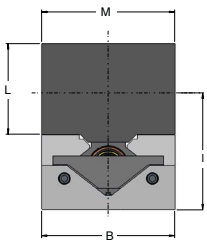
Roller Cam Sensor Kits are an optional accessory to all Roller Cams, providing a signal to the press when the Roller Cam is in start position. The Sensor Kit can easily be attached to the Roller Cam using return stop screw.

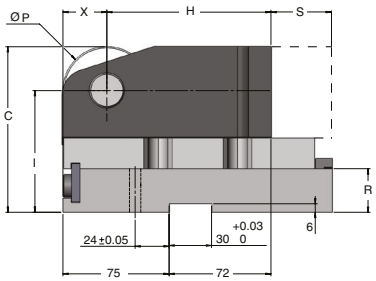
Note! For more information, please contact your local distributor or Strömsholmen AB.

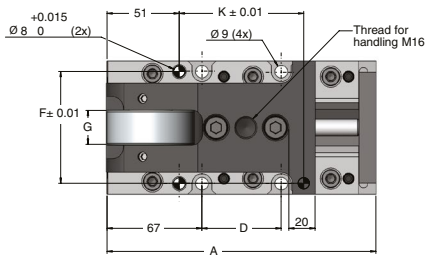


Dimensions RC2 30 & RC2 50







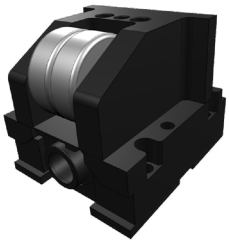


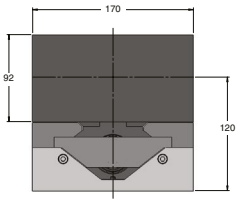
RC2 30 & 50

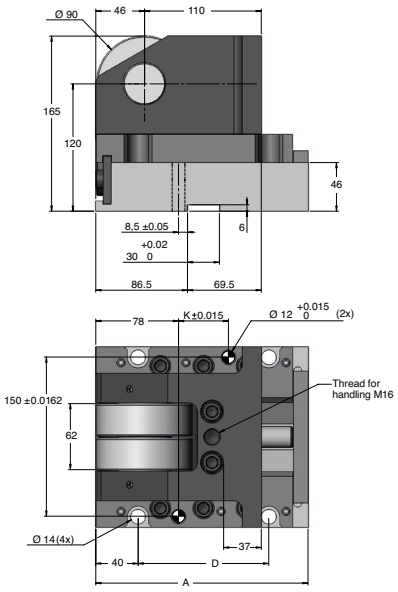
Order No.	Stroke S (mm)	Nominal force (daN)	Initial return force (daN)	Gas spring	A	B	C	D	F	G	H	I	K	L	M	P	R	X	Max. width of the driver
RC2 30-050	50	3,000	200	M2 200	190	94	117	56	79	25	116	86	88	64	94	62	31	31	36
RC2 30-080	80				220			86					118						
RC2 50-050	50	5,000	350	X 350	190	120	140	56	105	29	111	103	88	75	120	72	40	36	
RC2 50-080	80				220			86					118						
RC2 50-100	100				240		157	126				120	158				57		

Note! For 2D & 3D CAD downloads, see www.kaller.com.

Dimensions RCP2 150



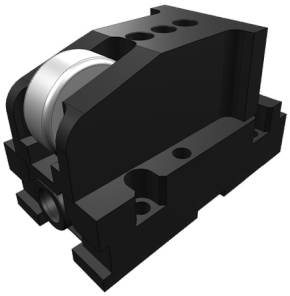


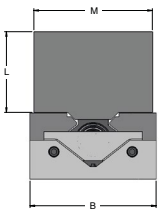


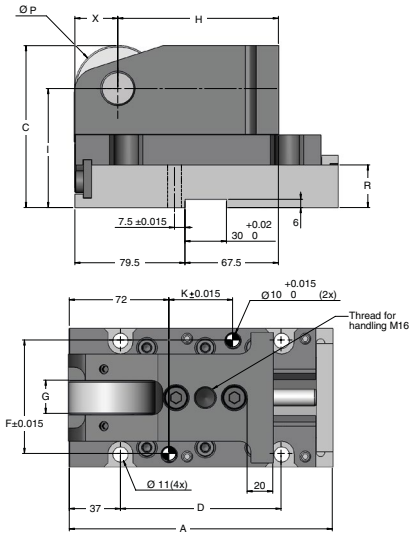
RCP2 150 - Dimensions as per PSA standard

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

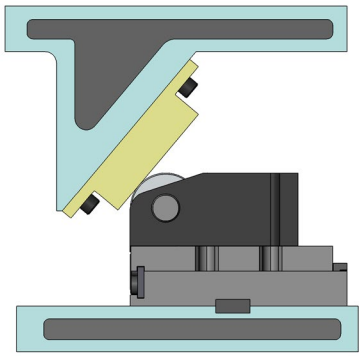
Order No.	S Stroke (mm)	Nominal force (daN)	Initial return force (daN)	Gas spring	A	B	C	D	F	G	H	I	K	L	M	P	R	X	Max. width of the driver
RCP2 30-050	50	3,000	200	M2 200	190	100	117	116	82	25	116	86	46	64	94	62	31	31	36
RCP2 30-080	80				220			146					76						
RCP2 50-050	50	5,000	350	X 350	190	120	140	116	102	29	111	103	46	75	120	72	40	36	
RCP2 50-080	80				220			146					76						
RCP2 50-100	100				240			166					96						

Note! For 2D & 3D CAD downloads, see www.kaller.com

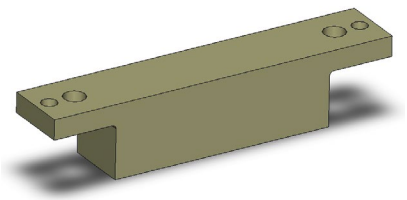
Roller Cam – Driver Plate

KALLER® Roller Cam Driver Plate has been designed to simplify the installation of Roller Cams.

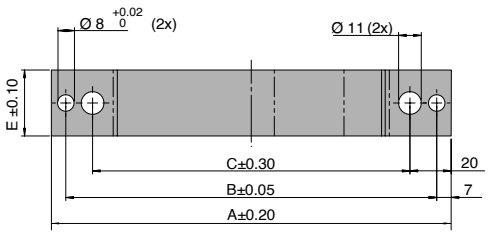
- Ground and hardened contact surface (60 HRC)
- Standardized sizes
- Independent of installation angle



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
3021265-03	174	160	134	110	65	2.38
3021265-04	264	250	224	200	65	4.08



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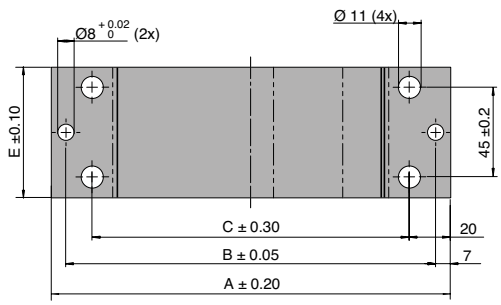
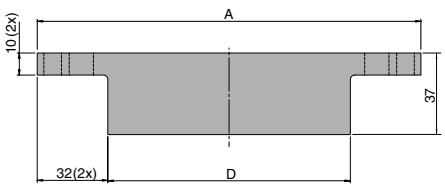
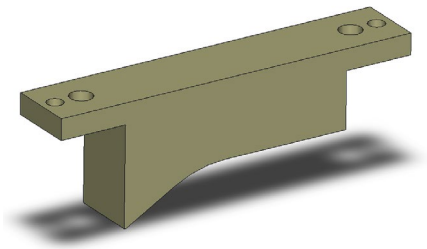
3021265-02

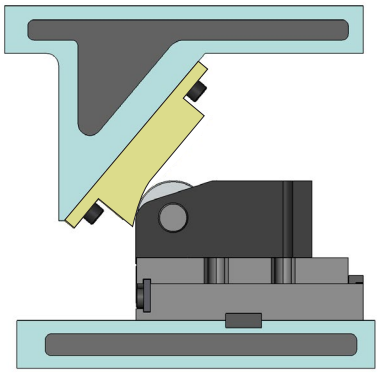


3021265-03
3021265-04

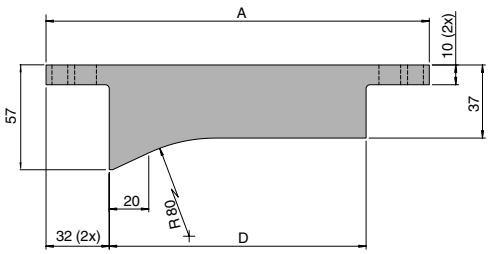


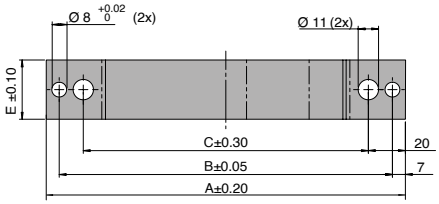
Driver Plate
– Soft Start & Stop



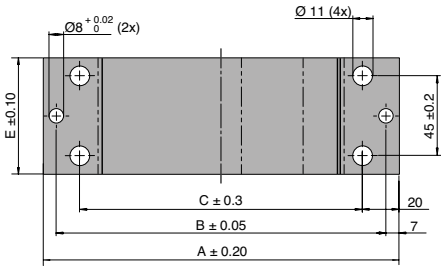


Order No.	A	B	C	D	E	Weight [kg]
3021570-01	194	180	154	130	32	1.43
3021570-02	284	270	244	220	32	2.27
3021570-03	194	180	154	130	65	2.91
3021570-04	284	270	244	220	65	4.61





3021570-01
3021570-02



3021570-03
3021570-04

Page

Pressure Tank

Pressure Tanks are used together with the EO24-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.

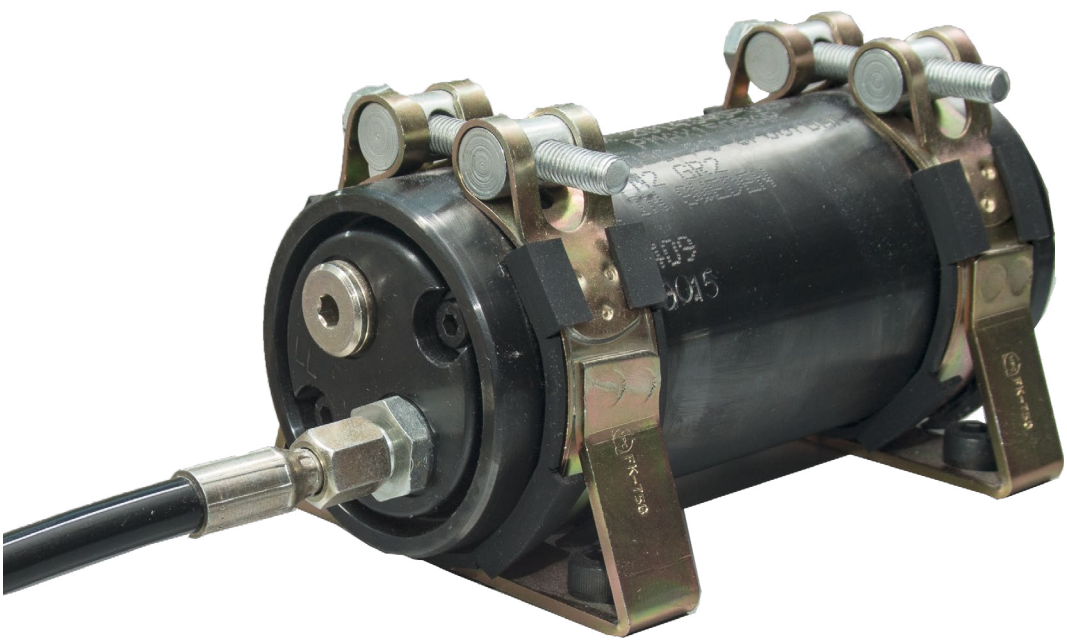
Please note!
Before incorporating pressure tanks into your Hose System, you may want to consider whether it is
possible to use a longer nominal stroke gas spring of the same model.

This method will have the effect of increasing the internal gas volume in your Hose System, thus
reducing the pressure/force build-up.

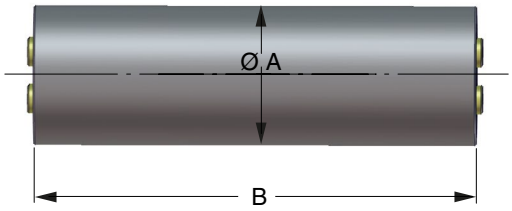
KALLER - THE SAFER CHOICE

Training **Reliability**

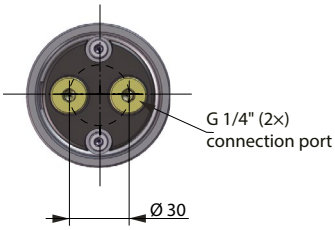
Learn more about KALLER® Training as well as the Reliability features at kaller.com



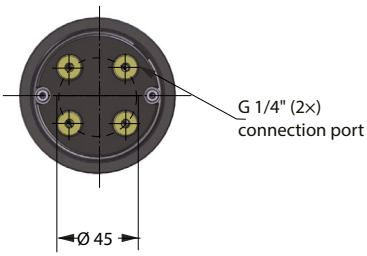
About Pressure Tanks



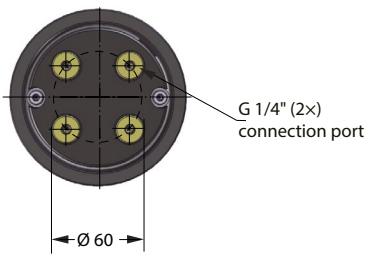
End plate 2014340



End plate 2014341



End plate 2014342



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

Max. charging pressure 150 bar (at 20° C)

Approximate calculation of isothermal pressure force build-up:

$$\text{Pressure force build up} \approx \frac{VPT_{PT} + (n*VGS_{GS})}{VPT_{PT} + (n*(VGS_{GS} - S*A))}$$

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 (dm^2) (see adjacent table)
n = Number of gas springs

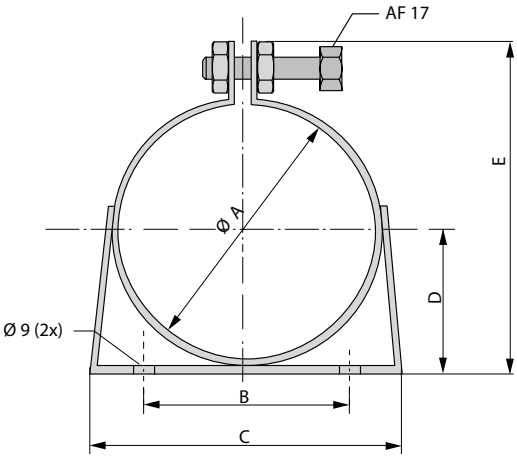
Gas Spring Size	Piston Rod Area (dm^2)
500	0.031
750	0.049
1500	0.102
3000	0.196
5000	0.332
7500	0.503
10000	0.709

Example:
Ten TU 5000 gas springs with stroke length 50 mm are connected to a Hose-System with one 8 liter Pressure Tank (2014342-800).

$$\text{Pressure force build up} \approx \frac{8 + (10.0.51)}{8 + (10.(0.51 - 0.5.0.332))} \approx 1.145$$

Bracket fixtures for Pressure Tanks

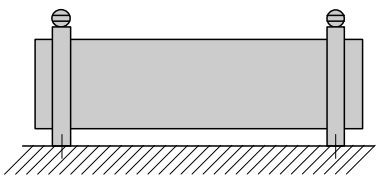
The bracket consists of a rubber-covered ring of galvanized sheet steel and is used to secure the Pressure Tank, preferably with one bracket at each end. If the tank is mounted vertically it should also rest on a solid support, see figures below.



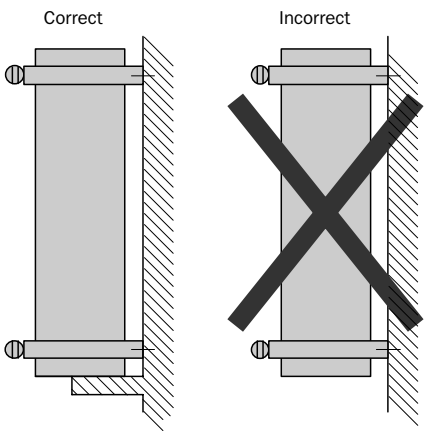
Order No.	Ø A	B	C	D	E
500558	75	80	105	41.5	102
500559	95	100	145	51.5	122
500560	120	100	145	64	147

Fixing bracket assembly

Horizontal



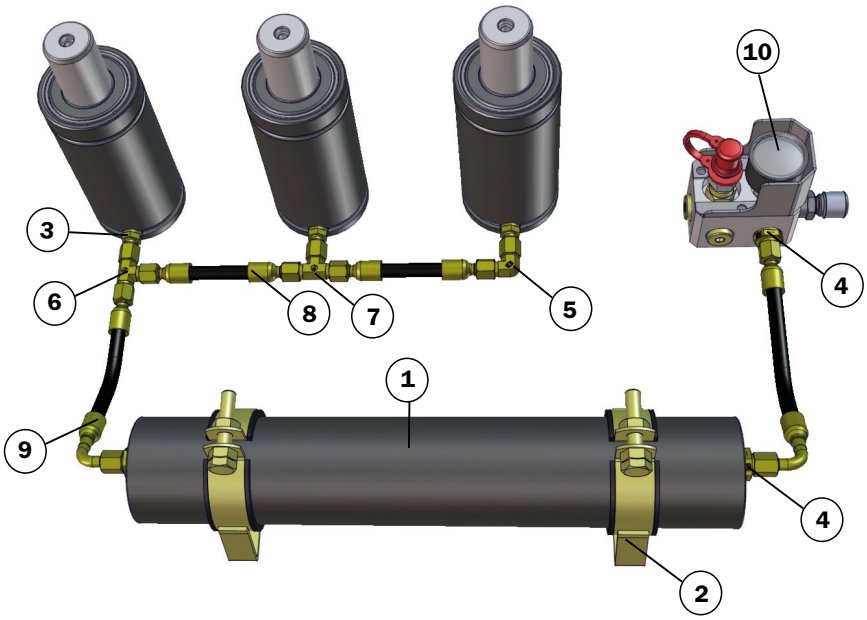
Vertical



Installation Example, Pressure Tank with EO24-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 EO24-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	EO24 Straight - Straight Hose
9	2	3220857-xxxx	EO24 Straight - 90° Hose
10	3	4116114-02	Control Block

Page

Technical Facts

Soft-Hit Striker Plates (SSP) have been engineered to address three of the major problems that face metal stampers:

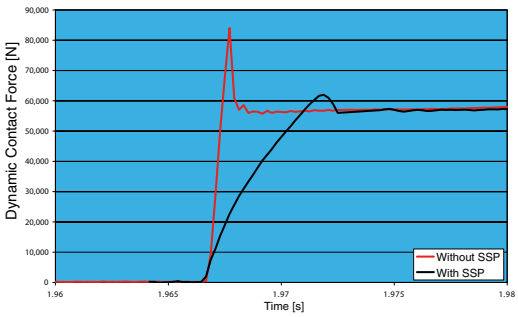
- Excessive shock loads
- High noise levels
- Poor part quality

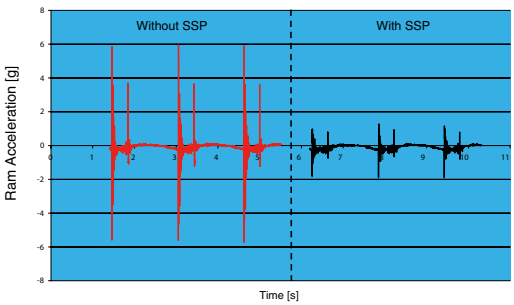
SSP contain a specially developed dampening element that absorbs unwanted shock loads that can lead to high press maintenance, noise pollution and poor part quality.

Features:

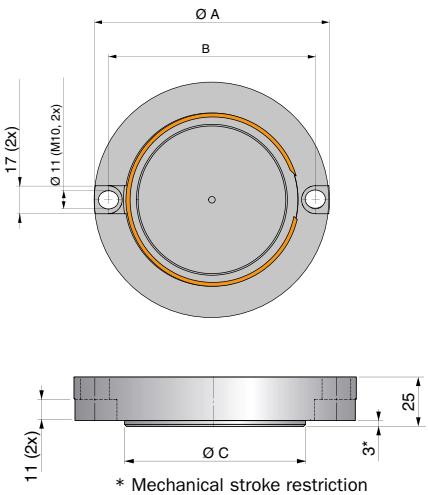
- Suitable for mechanical springs, gas springs and air cushion pins
- For spring forces from 7,500 to 10,0000 N
- 1 million hit service life
- Low build height
- Double countersunk mounting holes (M10)
- Hardened contact surface
- Up to 20 strokes per minute

Function





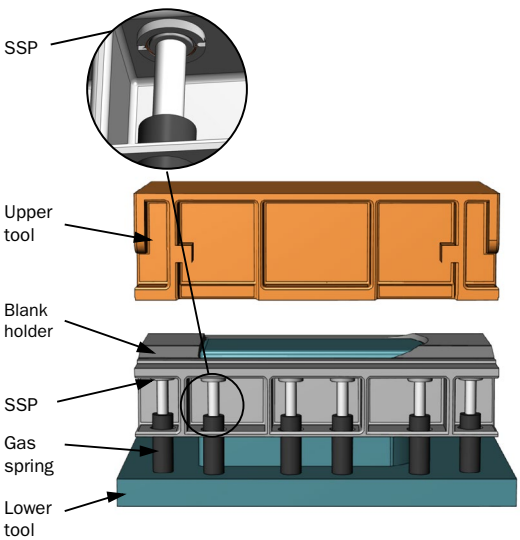
Dimensions



* Mechanical stroke restriction

Model	Gas spring forces	Ø A	B	Ø 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.

KALLER® Hose-less Baseplate™ – the easy-accessible alternative

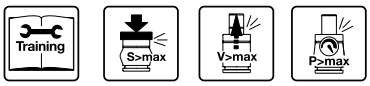
KALLER® Hose-less Baseplate™ is the increasingly popular easy-accessible alternative to the conventional hosed plate systems on the market. This KALLER® product provides all the benefits of self-contained gas springs in a linked system, yet eliminates external plumbing.

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.

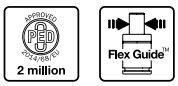
KALLER® Hose-less Baseplate™ utilizes KALLER® CU4, CX, TL, TU, TX, X and LCF gas springs mounted to a customer specified base plate through a bottom port. The gas springs are attached to the internally drilled base plate with a sealing washer or adapter and standard mounting hardware. All the connecting passages are drilled within the plate, removing the need for external hose and fittings.

KALLER® - THE SAFER CHOICE

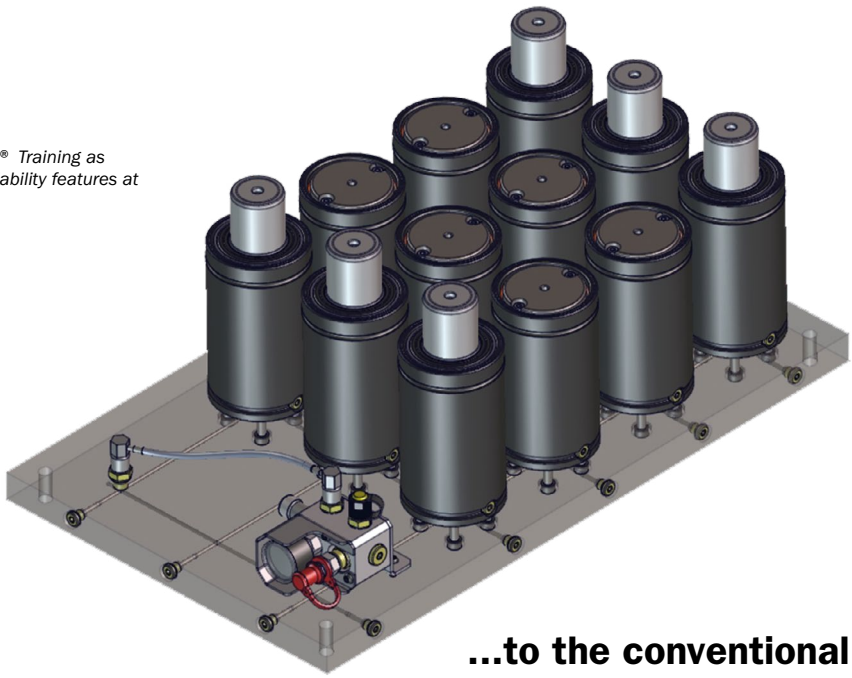
Training **Safety**



Reliability



Learn more about KALLER® Training as well as the Safety and Reliability features at kaller.com



...to the conventional hosed plate systems on the market

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.

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.

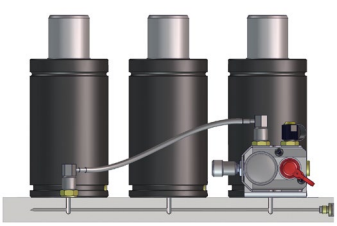
KALLER® Hose-less Baseplate™ provides a cleaner die design with the possibility to place more gas springs close together and also eliminate clearance for hoses and connections. This makes the installation easier to maintain compared to other hose linked systems on the market. Each product is factory tested to assure leak-free operation and is shipped ready to install.

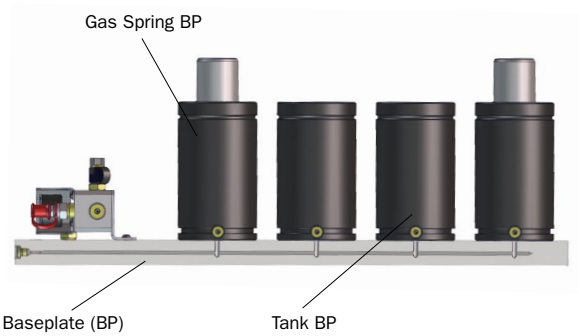
To obtain a complete KALLER® Hose-less Baseplate™ system you will need:

- 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

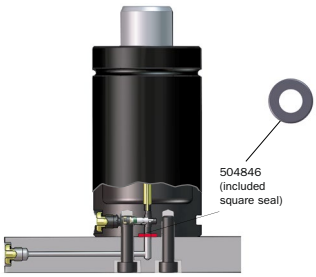
...and it comes with more power in less space !



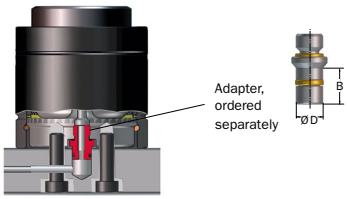


KALLER® gas springs BP adapted to baseplate

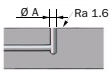
Hose-less Baseplate with square seal

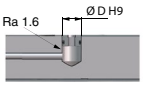


Hose-less Base-plate with adapters



Note!
Installation layout may vary between models.





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] Hole size	Model	Thread size	Torque [Nm] 12.9
X	504847	5	X BP 500	M6	15
			X BP 750		
			X BP 1000		
			X BP 1500		
			X BP 2400	M8	35
	504846	8	X BP 4200		
			X BP 6600	M10	70
			X BP 9500		
			X BP 20000	M12	115
TX	504847	5	TX BP 750	M8	40
			TX BP 1000		
			TX BP 1500		
			TX BP 2400		
	504846	8	TX BP 4200		
			TX BP 6600	M10	79
			TX BP 9500		
			TX BP 20000	M12	136

Series	Square seal	Ø A [m] Hole size	Model	Thread size	Torque [Nm] 12.9
TU	504847	5	TU BP 500	M8	40
			TU BP 750		
			TU BP 1500		
			TU BP 3000		
	505978	8	TU BP 5000	M10	79
			TU BP 7500		
	504846	8	TU BP 10000	M12	136
TL	504847	5	TL BP 750	M8	40
			TL BP 1500		
			TL BP 3000		
	505978	8	TL BP 5000	M10	79
			TL BP 7500		
LCF	504847	5	LCF BP 3000	M8	40
	505978	8	LCF BP 5000	M10	79
			LCF BP 7500		

For more information, see KALLER® catalog "Gas Spring Systems and Standard Mounts".

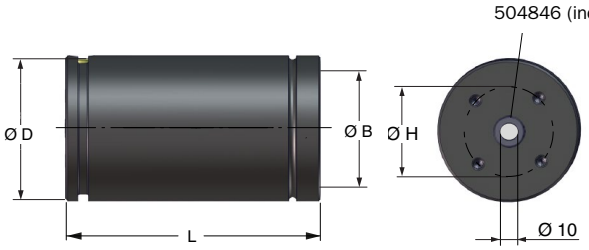
KALLER® gas springs BP and adapters

Series	Model	Thread size	Torque [Nm] class 12.9
CU4	CU4 1800	M6	17
	CU4 2900	M8	40
	CU4 4700		
	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



How to order

Tank BP 120 – 237

Model — **Ø D** — **L**

Model	Ø D [mm]	L [mm]	Volume [l]	Ø B [mm]	Bottom Thread	Bottom 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.

...offer the possibility to reduce pressure increase

Recommendations for KALLER® Hose-less Baseplate™ layouts

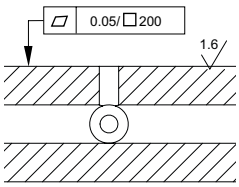
Unless otherwise specified.

A complete customized and factory tested baseplate can be ordered from KALLER® Sales & Service Offices.
(To get started, contact us at kaller.com)

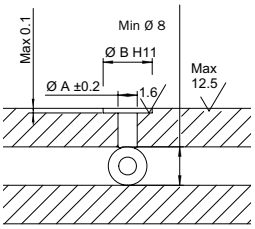
KALLER® Worldwide Guarantee applies to each complete system manufactured by KALLER® .

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.



Option 1.
Without countersink

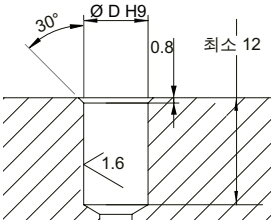


Option 2.
With countersink

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

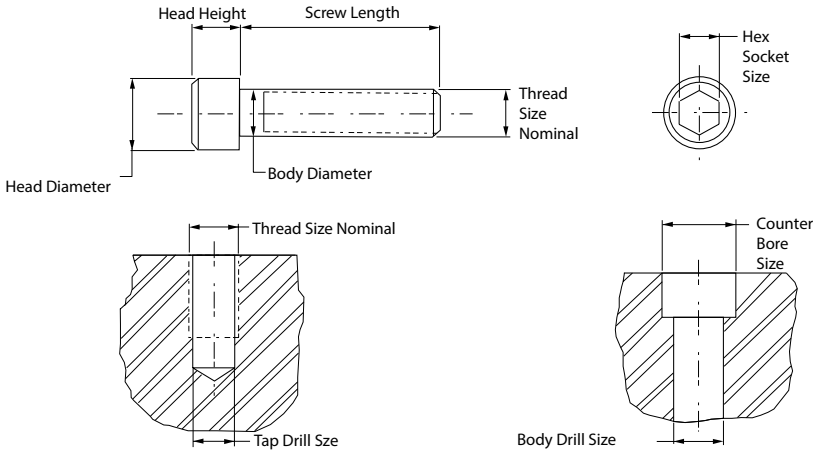
Page

ISO Tolerances For Holes and Shafts

Nominal Dimensons in mm - Tolerances in micrometers (10 -6 meter)

External Dimensions (shafts)							Internal Dimensions (bores)						
Symbol	1 up to 3	over 3 up to 6	over 6 up to 10	over 10 up to 18	over 18 up to 30	over 30 up to 50	Symbol	1 up to 3	over 3 up to 6	over 6 up to 10	over 10 up to 18	over 18 up to 30	over 30 up to 50
e 8	-14 -28	-20 -38	-25 -47	-32 -59	-40 -73	-50 -89	E 8	+28 +14	+38 +20	+47 +25	+59 +32	+73 +40	+89 +50
g 5	-2 -6	-4 -9	-5 -11	-6 -14	-7 -16	-9 -20	F 7	+16 +6	+22 +10	+28 +13	+34 +16	+41 +20	+50 +25
g 6	-2 -8	-4 -12	-5 -14	-6 -17	-7 -20	-9 -25	G 6	+8 +2	+12 +4	+14 +5	+17 +6	+20 +7	+25 +9
h 3	0 -2	0 -2.5	0 -2.5	0 -3	0 -4	0 -4	G 7	+12 +2	+16 +4	+20 +5	+24 +6	+28 +7	+34 +9
h 5	0 -4	0 -5	0 -6	0 -8	0 -9	0 -11	H 5	+4 0	+5 0	+6 0	+8 0	+9 0	+11 0
h 6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16	H 6	+6 0	+8 0	+9 0	+11 0	+13 0	+16 0
h 8	0 -14	0 -18	0 -22	0 -27	0 -33	0 -39	H 7	+10 0	+12 0	+15 0	+18 0	+21 0	+25 0
h 9	0 -25	0 -30	0 -36	0 -43	0 -52	0 -62	H 8	+14 0	+18 0	+22 0	+27 0	+33 0	+39 0
h 10	0 -40	0 -48	0 -58	0 -70	0 -84	0 -100	H 9	+25 0	+30 0	+36 0	+43 0	+52 0	+62 0
h 11	0 -60	0 -75	0 -90	0 -110	0 -130	0 -160	H 10	+40 0	+48 0	+58 0	+70 0	+84 0	+100 0
j 6	+4 -2	+6 -2	+7 -2	+8 -3	+9 -4	+11 -5	H 11	+60 0	+75 0	+90 0	+106 0	+130 0	+160 0
js 6	+3 -3	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+8 -8	H 12	+100 0	+120 0	+150 0	+180 0	+210 0	+250 0
js 7	+5 -5	+6 -6	+7.5 -7.5	+9 -9	+10.5 -10.5	+12.5 -12.5	J 6	+2 -4	+5 -3	+5 -4	+6 -5	+8 -5	+10 -6
js 8	+7 -7	+9 -9	+11 -11	+13.5 -13.5	+16.5 -16.5	+19.5 -19.5	J 7	+4 -6	+6 -6	+8 -7	+10 -8	+12 -9	+14 -11
js 9	+12.5 -12.5	+15 -15	+18 -18	+21.5 -21.5	+26 -26	+31 -31	JS 5	+2 -2	+2.5 -2.5	+3 -3	+4 -4	+4.5 -4.5	+5.5 -5.5
js 13	+70 -70	+90 -90	+110 -110	+135 -135	+165 -165	+195 -195	K 6	0 -6	+2 -6	+2 -7	+2 -9	+2 -11	+3 -13
js 14	+125 -125	+150 -150	+180 -180	+215 -215	+260 -260	+310 -310	K 7	0 -10	+3 -9	+5 -10	+6 -12	+6 -15	+7 -18
k 6	+6 0	+9 +1	+10 +1	+12 +1	+15 +2	+18 +2	K 8	0 -14	+5 -13	+6 -16	+8 -19	+10 -23	+12 -27
k 7	+10 0	+13 +1	+16 +1	+19 +1	+23 +2	+27 +2	M 6	-2 -8	-1 -9	-3 -12	-4 -15	-4 -17	-4 -20
m 4	+5 +2	+8 +4	+10 +6	+12 +7	+14 +8	+16 +9	M 7	-2 -62	0 -12	0 -15	0 -18	0 -21	0 -25
m 5	+6 +2	+9 +4	+12 +6	+15 +7	+17 +8	+20 +9	N 7	-4 -14	-4 -16	-4 -19	-5 -23	-7 -28	-8 -33
n 6	+10 +4	+16 +8	+19 +10	+23 +12	+28 +15	+33 +17	P 7	-6 -16	-8 -20	-9 -24	-11 -29	-14 -35	-17 -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
$s_S = R_{eL}$ or $R_{p0.2}$ N/mm² nominal				240	400	640	900	1 080
$k(1+\frac{S_F}{F_{Fm}}) \cdot s_S$ N/mm²				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.

kaller.com

KALLER
The Safer Choice