



KOSTYRKA

SUPPORT UNITS

Hydraulic work supports

- Universal version
- Cartridge form
 - Standard series
 - Special versions
- 5330 series
- 5313 series



Product information

Basics for KOSTYRKA® Work Support Units

Since 1969, KOSTYRKA® has been building hydraulically operated support units for the effective support of unstable workpieces, and as a support for redundant clamping locations.

Since being introduced to the market, KOSTYRKA® support units have

been further developed and adapted, in parallel with the increasing demands made on machine and jig construction.

The support units can be attached to pipes, or mounted on blocks; the compact cartridge form can be fitted directly into the jig body.

Hydraulic work supports from the standard series have support pins with diameters from 10–40 mm (0.394-1.575 in.), and withstand axial slippage forces of up to 28 kN (6,160 lb.).

Method of Operation

The heart of every KOSTYRKA® support unit is a KOSTYRKA® clamping sleeve. These sleeves operate without reaction, and the clamped pin is neither pushed axially nor twisted during the clamping process. Until the limit of their load carrying capacity is reached, KOSTYRKA® support

units only yield elastically under compressive load.

The supporting pin is completely released when the clamping pressure has been fully removed, however, it is essential that residual pressure in the oil feeds be avoided.

The support pin can be advanced to the workpiece pneumatically, hydraulically or by spring force. The special design of the KOSTYRKA® hydraulic work support guarantees always a secure engagement, both positive and frictional, between the clamped support pin and the base plate.

Operating Conditions

Every version of the KOSTYRKA® support unit, without exception, is designed for operation with hydraulic oil. As a rule, the working pressure for KOSTYRKA® support units is 50–450 bar (700–6,500 psi). Please make an inquiry to us for working pressures outside this range.

Although the integrated clamping sleeves begin to grip even at low hydraulic pressures, they should not be operated with compressed air.

The plastic jacket of KOSTYRKA® clamping sleeves is resistant to mineral oils, brake fluid and low-inflammability hydraulic liquids up to a temperature of 100 °C (212 °F). Special versions are fitted with plastic jackets of suitable materials for higher operating temperatures.

The seals of the clamping sleeves are resistant to hydraulic liquids and to petroleum-based lubricants, transmission oils, animal and vegetable fats in a temperature range from -30 °C to +110 °C (-86 °F to +230 °F). Higher operating temperatures are made possible by VITON® O-rings, which can be supplied if required.

Abstract from the DIN / ISO Tolerance Zone Table

Tolerances with LARGE characters, like „H“, apply to INNER diameters,

those with small characters, like „g“ were used for outer diameters. They vary with increased nominal size.

Nominal Diameter [mm]	H7 Minimum Deviation to Nominal Diameter [mm]	H7 Maximum Deviation to Nominal Diameter [mm]	g6 Minimum Deviation to Nominal Diameter [mm]	g6 Maximum Deviation to Nominal Diameter [mm]
006 to 010	0.000	+ 0.015	- 0.005	- 0.014
010 to 018	0.000	+ 0.018	- 0.006	- 0.017
018 to 030	0.000	+ 0.021	- 0.007	- 0.020
030 to 050	0.000	+ 0.025	- 0.009	- 0.025
050 to 080	0.000	+ 0.030	- 0.010	- 0.029
080 to 120	0.000	+ 0.035	- 0.012	- 0.034
120 to 180	0.000	+ 0.040	- 0.014	- 0.039
180 to 250	0.000	+ 0.046	- 0.015	- 0.044
250 to 315	0.000	+ 0.052	- 0.017	- 0.049
315 to 400	0.000	+ 0.057	- 0.018	- 0.054
400 to 500	0.000	+ 0.063	- 0.020	- 0.060

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1 KOSTYRKA® Hydraulic work supports

Universal version

With the hydraulic work supports in the 5310 ff. and 5320 ff. series, KOSTYRKA® is presenting a complete set of universally applicable support units. The fundamental construction of the work supports in these series is always the same. It is just the varying arrangement of their springs and connection holes that facilitates the wide range of possible applications:

- Fitting to pipes by means of a threaded connection on the side (5310 ff. series),
- Mounting to blocks through connections in the housing bottom (5320 ff. series),
- Use of either series with sprung support pins,
- Use of either series with support pins that are advanced to the workpiece by means of compressed air; with and without return springs,
- Fitting to the top or bottom flange, in such a way that the screw head does not protrude but is located in the "dead" space between the two flanges and
- Series connection.

1.1 Pipe fitting / block mounting

For **pipe fitting** the hydraulic work supports from the 5310 ff., 5311 ff. and 5312 ff. series are built as shown schematically on the picture to the left. Connections (1) and (2) are closed here by threaded plugs. When the hydraulic work support is used standing or hanging, the connections (6) or (1) are used to clamp the support pin; in this case, (1) or (6) must be vented. Please note section 1.4 "Venting after Assembly" in this connection.

A threaded plug with a sintered metal core is screwed into the ventilation connector (8). It prevents penetration of coarse, dry particles.

In order to advance the support pin with compressed air, the threaded plug (3) is unscrewed and the spring (5) is removed. If the hydraulic work support is then to work without a cap, the threaded plug must be inserted again and sealed with the aid of PTFE tape. The support pin will now no longer be drawn back (5312/5322 series). If, however, it is desired to be able to withdraw the support pin, the fitted screw (7) is exchanged for a longer one, and in this case the return spring is inserted between the bolt head and the support pin recess (5311/5321 series).

Important: If there is a risk that liquids (cutting oils, cooling lubricants) might be sucked in through the ventilation connection, the threaded plug (8) must be removed and a pipe attached that opens outside the hazardous area.

Block mounting

For **block mounting** the hydraulic work supports from the 5320 ff., 5321 ff. and 5322 ff. series are manufactured as shown schematically on the picture to the right. In this case the cylinder (10) is rotated until a hole in its bottom is in true alignment with the ventilation connection (9). This connection is usually covered, to prevent the entry of dirt. The housing has also been given the connection hole (11), through which hydraulic oil acts on the clamping sleeve. The side connections (1), (2), (6) and (8) are now closed by threaded plugs, and ventilation must take place through (1) or (6), according to the fitting orientation (standing or hanging). Please note section 1.4, "Venting after Assembly" in this connection.



1.1.1 Sprung support pin (5310/5320 series)

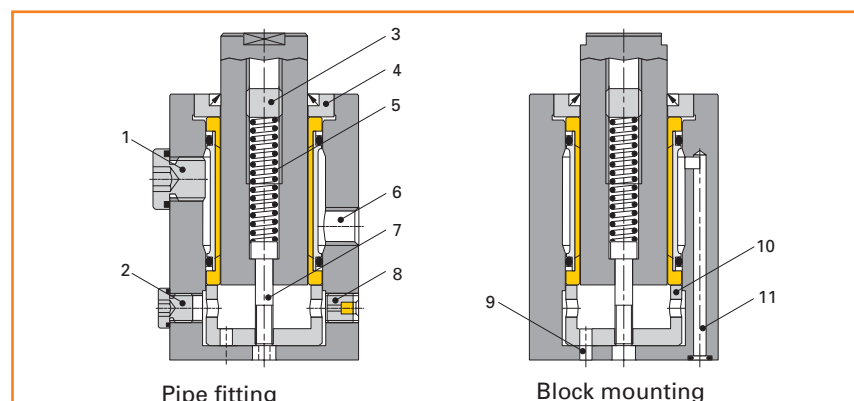
The 5310 ff. and 5320 ff. series of the KOSTYRKA® hydraulic work supports are supplied with sprung support pins. In their initial position the support pins are extended. They are pushed into the necessary support position by the workpiece and then hydraulically clamped.

1.1.2 Support pin with air advance, with return spring (5311/5321 series)

The 5311 ff. and 5321 ff. series of KOSTYRKA® hydraulic work supports are supplied with spring return of the support pins. In their initial position the support pins are retracted. They are pneumatically advanced to the workpiece and then hydraulically clamped. The extremely sensitivity of the support pin adjustment is to some extent lost here.

When the advance and clamping forces are removed, the support pin returns automatically to its home position.

Important: The use of a compressed-air conditioner is strongly recommended for these series.



1.1.3 Support pin with air advance, without return spring (5312/5322 series)

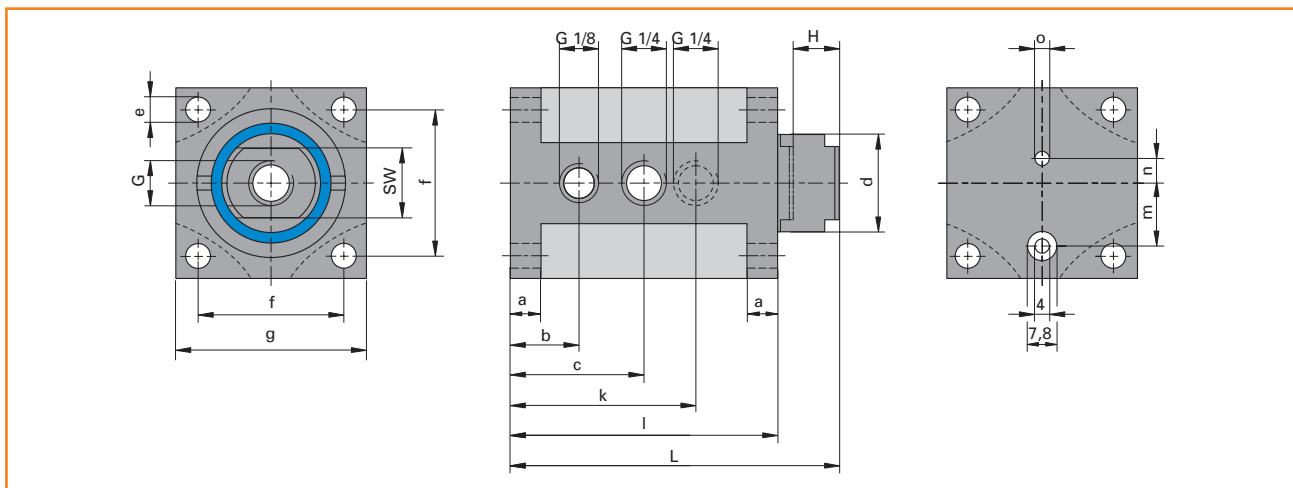
The KOSTYRKA® hydraulic work supports from this series are supplied with support pins advanced by compressed air; this means that

the support pins are retracted in their initial position. This makes it possible to use the compressed air regulation to control the advance and support procedure with great sensitivity; if the support unit has an horizontal orientation, the advance force of the support pins can be

less than 1 N. The support pins are hydraulically clamped once they have contact the workpiece.

Important: The use of a compressed-air conditioner is strongly recommended for these series.

1.2 Dimensions



The dimensions in the table shown below apply to the universal version of the standard series of KOSTYRKA® hydraulic work supports.

Series		5310.10	5310.15	5310.20	5310.30	5310.40
		5312.10	5311.15 5312.15	5311.20 5312.20	5311.30 5312.30	5311.40 5312.40
Support pin diameter	d	10	15	20	30	40
Support pin stroke	H	10	12	15	16	20
Screw thread	G	—*	M 8	M 12	M 12	M 12
Spanner size	SW	—*	12	17	27	36
Overall length	L	71	86	97	112	134
Housing length	l	58	70	78	92	110
Width	g	45	50	55	65	80
Flange thickness	a	6	8	10	12	15
Distance between fixings	f	35	38	43	51	64
Fixing hole Ø	e	5,5	6,6	6,6	9	9
Height of ventilation connection	b	11	18	18	18	18
Height of hydraulic oil connection/ ventilation	c**	35,5	44	46	46	53
Height of hydraulic oil connection/ ventilation	k**	35,5	44	51	64	81
Series		5320.10	5320.15 5321.15	5320.20 5321.20	5320.30 5321.30	5320.40 5321.40
		5322.10	5322.15	5322.20	5322.30	5322.40
Air feed distance	n	—***	6	9	13	18
Hydraulic oil feed distance	m	15	19	21	26	32
Air feed Ø	o	—***	4	4	6	6

Subject to alteration

*) Omitted from the 5310.10 and 5320.10 series

The supporting pin here has a crowned supporting surface without a screw thread G or spanner faces SW.

**) Hydraulic oil connection or ventilation, depending on the fitting orientation. See section 1.4, "Venting after Assembly", in this connection.

***) Omitted from the 5320.10 and 5322.10 series For reasons of construction it is not possible to fit a ventilation connection in the foot flange. If the support pin is to be advanced by means of compressed air in this series, it can only be done by means of the side hole G1/8.

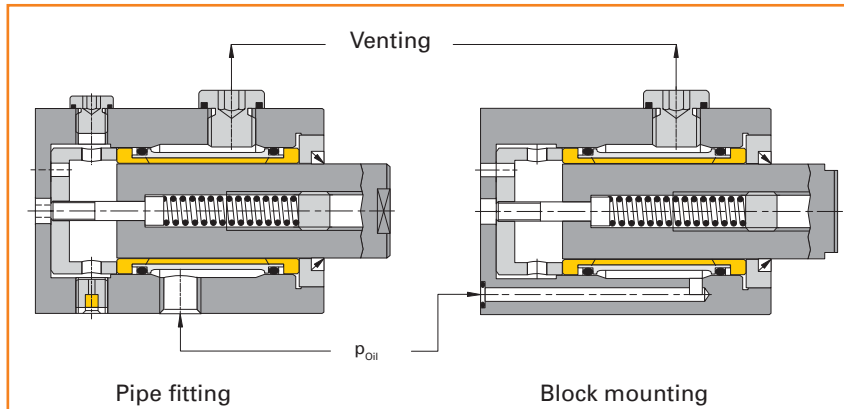
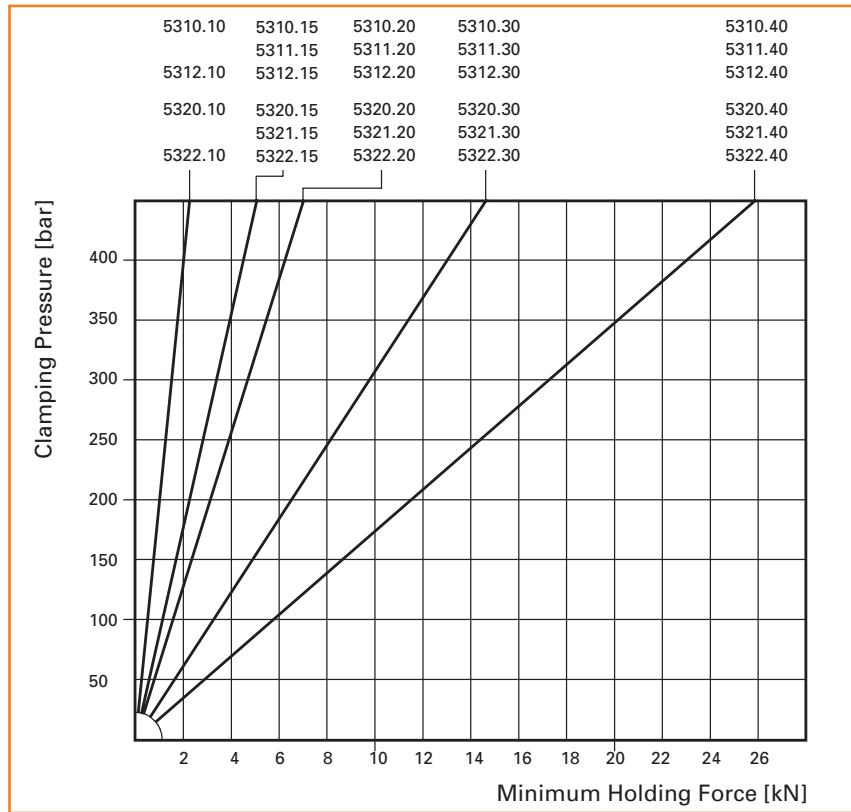
1.3 Support forces

The diagram here illustrates the loading capacity of the universal version of the KOSTYRKA® hydraulic work supports in relation to the clamping pressure. A constant coefficient of friction of $\mu = 0.1$ is assumed for all clamping pressures.

1.4 Venting after Assembly

Compression could heat air to such a degree that the plastic and the seals on the internal KOSTYRKA® clamping sleeve could be burnt.

It is therefore essential that no air pockets can develop either in the feed lines or in the sleeve's fitting area. This means that the universal version of the KOSTYRKA® hydraulic work support must always be vented from whichever point is highest in the particular orientation. The venting hole screw plug must be kept open as long as is necessary for hydraulic oil to emerge without bubbles.

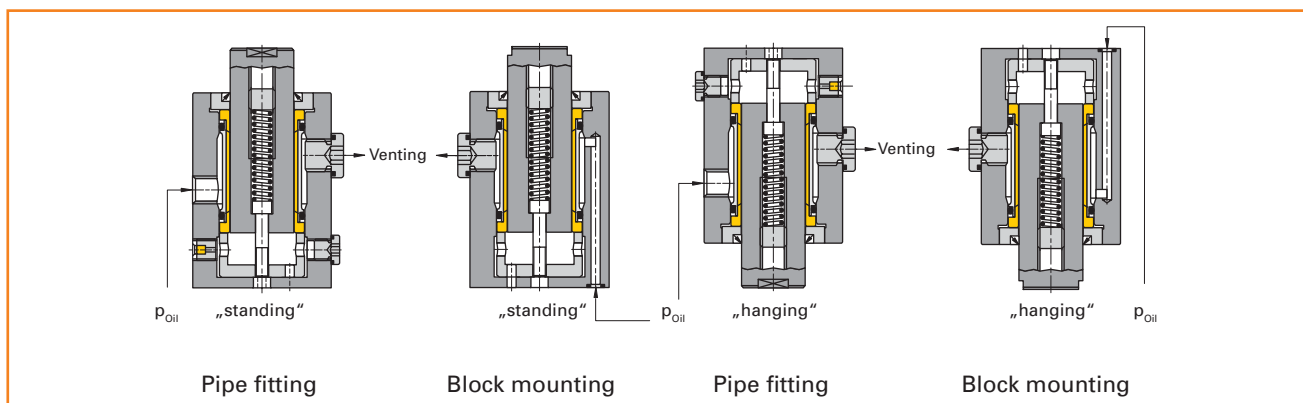


1.4.1 Horizontal fitting/mounting

When the universal KOSTYRKA® hydraulic work supports are mounted horizontally, they are to be vented as shown on the left.

1.4.2 Vertical fitting/mounting

When mounted vertically, universal KOSTYRKA® hydraulic work supports are to be vented as shown below.

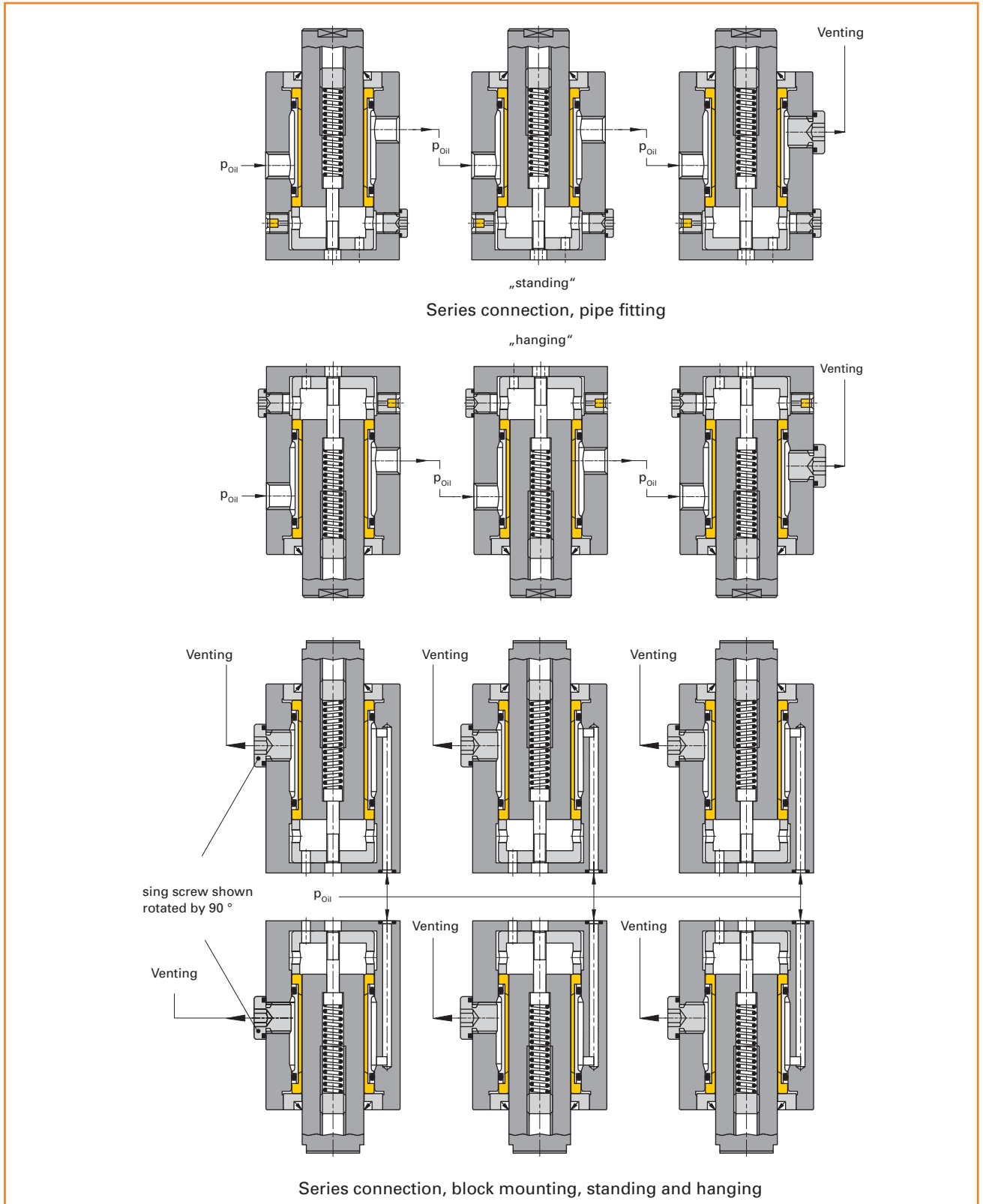


1.4.3 Series Connection

In case of **pipe fitting** the pressure oil line, as shown in the figure above, is to be taken from the upper connection of the first hydraulic work support to the lower connection of the last hydraulic work support to the lower connection of the second hydraulic work support, and so down the line. This means that the entire system can be properly vented at the upper connection of the last hydraulic work support.

In case of **block mounting** each hydraulic work support is individually controlled from a common line, as shown in the figure below, so that each unit must be a separately vented from its highest point.

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2 KOSTYRKA® Hydraulic work supports Cartridge Form, Series

KOSTYRKA® hydraulic work supports in cartridge form are supporting units that neither have a thread connection, nor are designed for block mounting. Rather, they are pushed directly into holes prepared in the fixture body, bolted by means of the flange and thus form part of the fixture.

The both sides flattened flange allows these support units to be placed very close together. Only one continuous hole in the body of the fixture is necessary in order to supply the units with compressed air and hydraulic oil. The possibility of close-packed construction is illustrated in section 2.6.6.3, "Series connection".

KOSTYRKA® hydraulic work supports in Cartridge form were originally developed for use in the aircraft industry, where large numbers are used for supporting light alloy pre-formed parts. The following criteria were of particular importance here:

- high-density of support points,
- lowest possible advance force and
- high reliability through self-cleaning.

Air advancement is of particular assistance for the last point: The slight current of air flowing past the support pin keeps dirt and chips away.

2.1 Sprung support pin (5316 series)

The 5316 series of KOSTYRKA® hydraulic work supports is supplied with a sprung support pin. In its initial position the support pin is extended. It is pushed into the required position by the workpiece and then hydraulically clamped.

Important: In this series, the length of the support unit in its initial position is increased by the dimension "H". The lowest O-ring and the external air supply for advance are not present here.

2.2 Support pin with air advance, with return spring (5317 series)

The series 5317 KOSTYRKA® hydraulic work supports are supplied with spring return of the support pin. In its initial position the support pin is retracted. It is pneumatically advanced to the workpiece and then hydraulically clamped. The extremely sensitivity of the support pin adjustment is to some extent lost here. When the advance and clamping forces are removed, the support pin automatically returns to its home position. For reasons of construction, this series does not include the version with a 10 mm diameter support pin.

Important: For this series the use of a compressed-air conditioner is strongly recommended.

2.3 Support pin with air advance, without return spring (5315 series)

The KOSTYRKA® hydraulic work supports from the 5315 series are supplied with support pins advanced by compressed air; in their initial position the support pins are retracted. This makes it possible to use the compressed air regulation to control the advance and supporting procedure with great sensitivity; if the support unit is horizontally oriented, the advance force of a support pin can be less than 1 N. The support pin is hydraulically clamped once it has contact the workpiece.



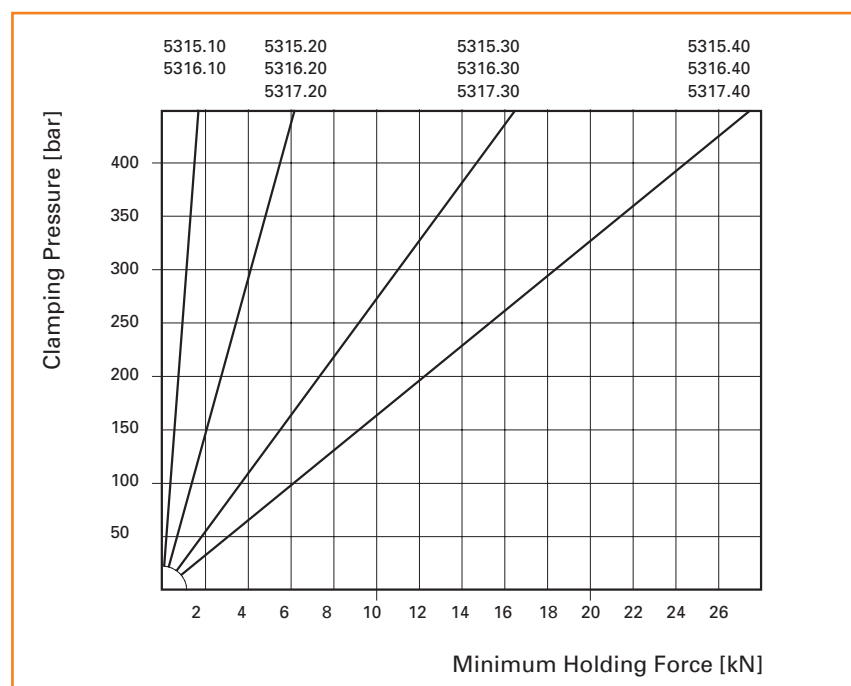
KOSTYRKA® cartridge-form hydraulic work supports

The support pins of this series retain their position when the advance and clamping forces are removed. They can, however, very easily be pushed back by the workpiece.

Important: For this series the use of a compressed-air conditioner is strongly recommended.

2.4 Support forces

The diagram below illustrates the loading capacity of the cartridge-form KOSTYRKA® hydraulic work supports in relation to the clamping pressure. A constant coefficient of friction of $\mu = 0.1$ is assumed for all clamping pressures.



2.5 Dimensions

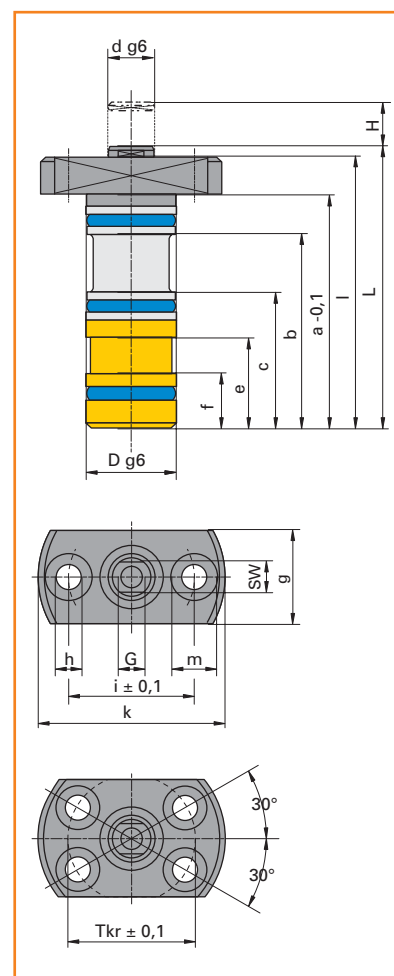
The dimensions in the table shown below apply to the standard cartridge-form series of KOSTYRKA® hydraulic work supports.

Series		5315.10	5315.20	5315.30	5315.40
		5316.10	5316.20 5317.20	5316.30 5317.30	5316.40 5317.40
Support pin diameter	∅ dg6	10	20	30	40
Support pin stroke	H	10	15	20	20
Shaft diameter	∅ Dg6	20	30	40	50
Screw thread	G	*)	M12	M12	M12
Spanner faces	SW	*)	17	24	36
Overall length	L	62	73	93	104
Fitting length	a	52	62	80	90
Length including flange	l	60	70	90	100
Flange dimensions	g	21	31	42	52
	k	40	54	65	75
Fastening	∅ h	5,5	7	7	7
	∅ m	10	11	11	11
	i	28	40	50	-
	Tkr.	-	-	-	60
Space for oil feed and venting	b	43	50,5	68	78
	c	30	30,5	32	32
Space for air feed	e	20	20	21	21
	f	12	12	13	13

Subject to alteration

*) Omitted from the 5315.10/5316.10 series

Crowned supporting face without screw thread G or spanner faces SW.



2.6 Fitting regulations

2.6.1 The most important rule

In order to avoid unacceptable stress on the material in the flange area, KOSTYRKA® cartridge-form hydraulic work supports must either be supported by a shoulder in the location hole, or must be fitted in a blind hole. The form of the location hole is illustrated in section 2.6.5.

2.6.2 Fitting combination of the cartridge and location hole

An effective sliding clearance fit has in practice been found to be provided by the pairing of shaft diameter tolerated to g6 with a bore hole tolerated to H7. The outer diameter of all sizes of the cartridge-form KOSTYRKA® hydraulic work supports have therefore been matched to this pairing. The rule is:
Shaft diameter D of the cartridge: g6
Inner diameter of locating hole: H7

2.6.3 Fitting and Removing

The glide chamfers, the contact area of the location hole and the sealing rings of the cartridge should be lubricated with a little grease, and the cartridge then pushed into the hole without bending it or using excessive force.

2.6.4 Venting after fitting

Compression could heat air to such a degree that the plastic and the seals on the cartridge could be thermally damaged.

It is therefore essential that no air pockets can develop either in the feed lines or in the cartridge's fitting area. The ventilation hole must always be provided at the highest point of the particular orientation of the support unit. The venting hole screw plug must be kept open as long as is necessary for hydraulic oil to emerge without bubbles.

2.6.5 Design of the location holes

Note: Special attention should be paid to this section in order to avoid damaging the seals when fitting cartridge-form KOSTYRKA® hydraulic work supports.

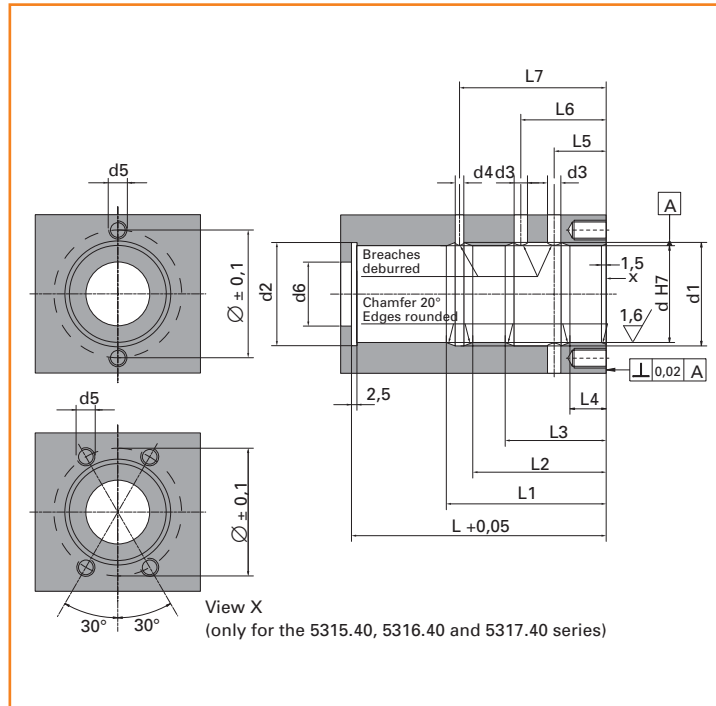
At the start of the location hole and in the area of the depression,

adequately dimensioned, rounded, 20° glide chamfers must be provided. The openings in the oil feed and ventilation holes and in the air supply guides must be carefully deburred.

The surface roughness of the location hole in the area of the seals

may have a maximum value of $R_{max} = 6-10 \mu\text{m}$ ($R_a \leq 1.6 \mu\text{m}$).

The following table shows the dimensions that must be provided for the location holes for all series of the cartridge-form KOSTYRKA® hydraulic work supports.



Series	5315.10	5315.20	5315.30	5315.40
	5316.10	5316.20	5316.30	5316.40
	5317.20	5317.30	5317.40	
d H7	20	30	40	50
d1	21,5	31,5	41,5	51,5
d2	20,5	30,5	40,5	50,5
d3	3	3	4	4
d4	4	4	4	4
d5	M5	M6	M6	M6
d6	10	20	30	40
$\varnothing \pm 0,1$	28	40	50	60
L +0,05	52	62	80	90
L1	40	50	67	77
L2	32	42	59	69
L3	22	31,5	48	58
L4	9	11,5	12	12
L5	13,5	16	16,5	16,5
L6*	17,5	27	43,5	53,5
L7	36	46	63	73

Subject to alteration

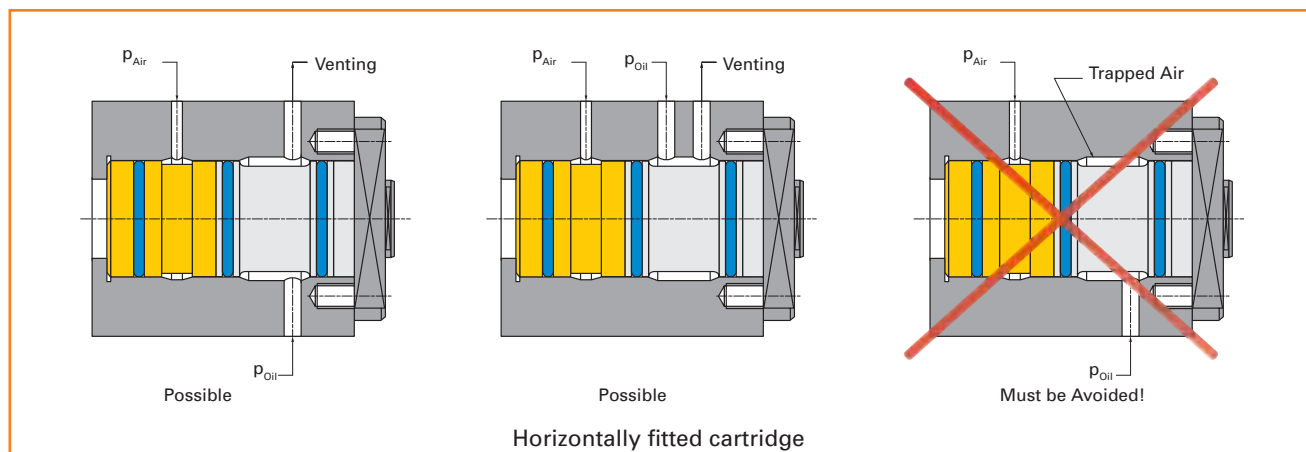
***Note:** The hole at the distance "L6" is only required if space is very restricted or if the support unit is oriented vertically (see section 2.6.6.2).

2.6.6 Position of pressurized oil and venting connections

2.6.6.1 Horizontally fitted cartridge

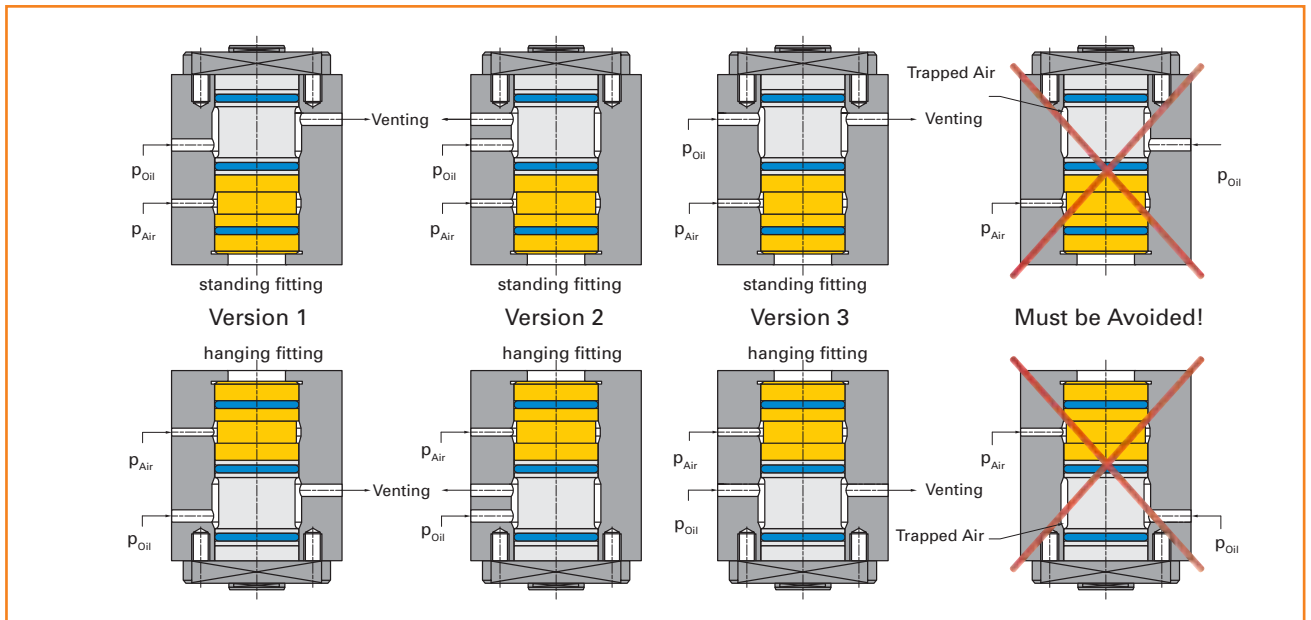
It is possible to feed hydraulic oil to the lowest point of the cartridge location hole, and to provide venting at the highest point (in the figure on the left). The position of the flange (right or left) does not need to be considered here. The

solution shown in the middle picture is also possible. It is essential to avoid a construction such as indicated in the right hand figure, this will inevitably result in damage.



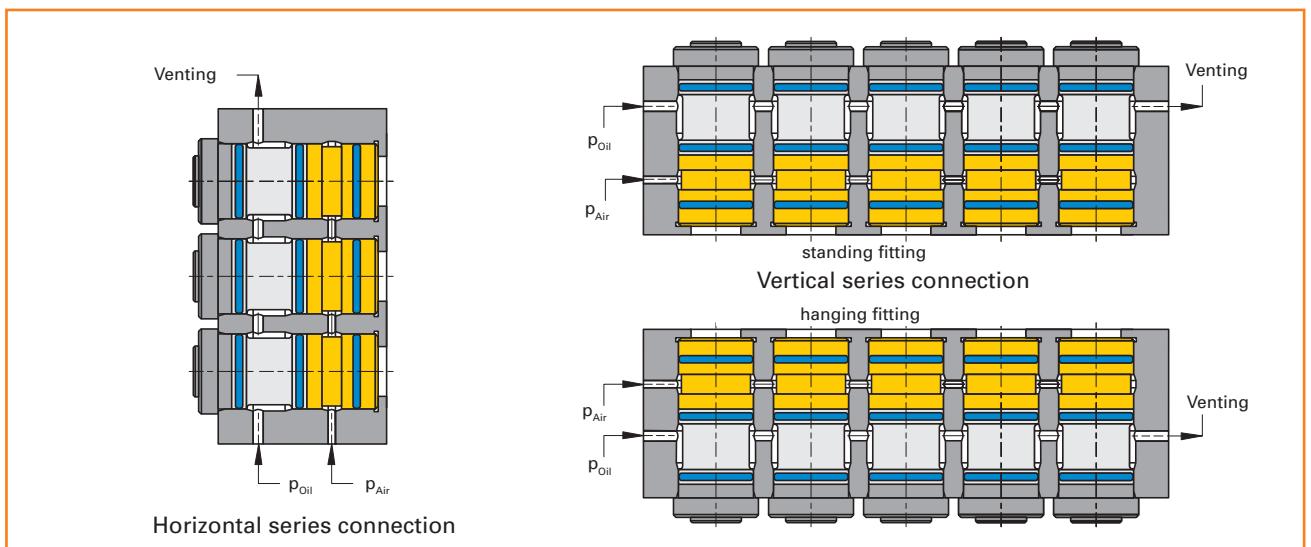
2.6.6.2 Vertically fitted cartridge

The fitting recommendations for horizontal cartridges also apply in general terms to vertically oriented cartridges. The following illustrations will clarify this.



2.6.6.3 Connection in series

Only one continuous bore is needed in the fixture body to supply the units with hydraulic oil and one bore for compressed air. The following diagrams provide more illustrations of the possibilities for close-packed fitting.



3 KOSTYRKA® Hydraulic work supports Cartridge-form, special versions

KOSTYRKA® cartridge-form hydraulic work supports can, of course, be adapted to customers' special requirements.

Please make an inquiry.

The following diagrams show a few special forms of the KOSTYRKA® cartridge-form hydraulic work supports.

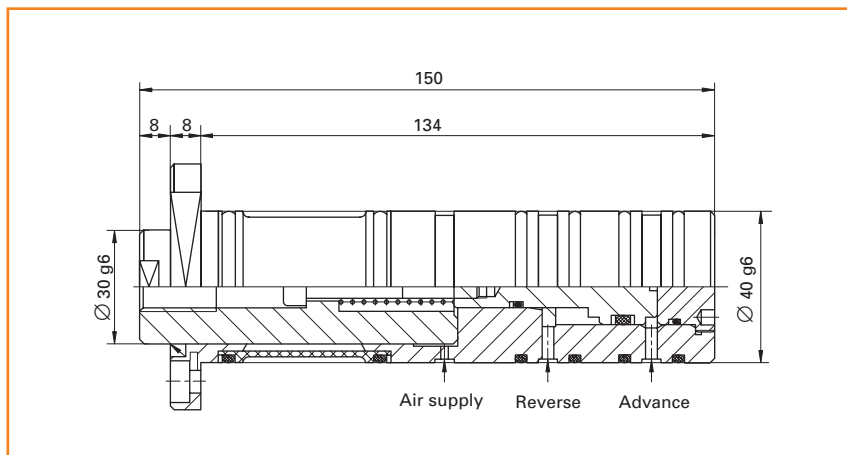


Figure 1

Hydraulic advance and reverse motion (12 mm stroke) in this double-acting hydraulic work support in special length.

The advance force of the support pin is limited by an internal spring to 20-40 N, depending on the position of the support pin.

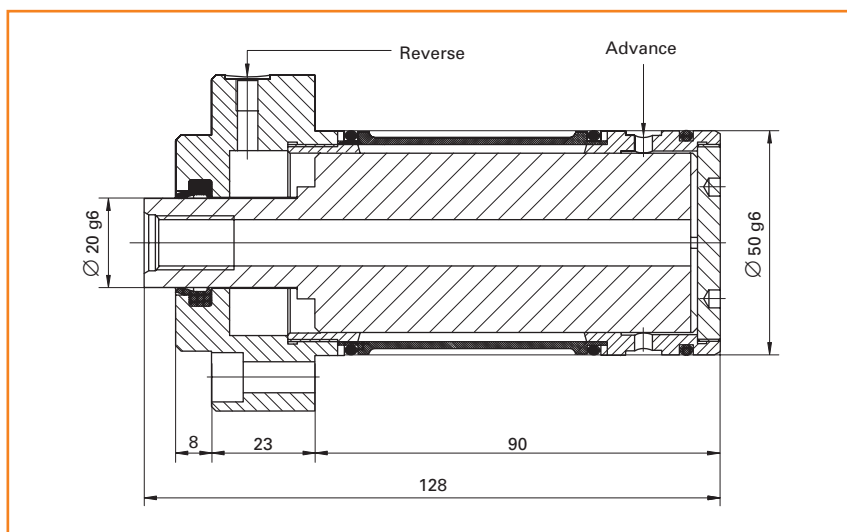


Figure 2

This version permits a stroke of 15 mm. Advance and reverse motion are driven pneumatically, the connection for the reverse stroke being housed in the flange.

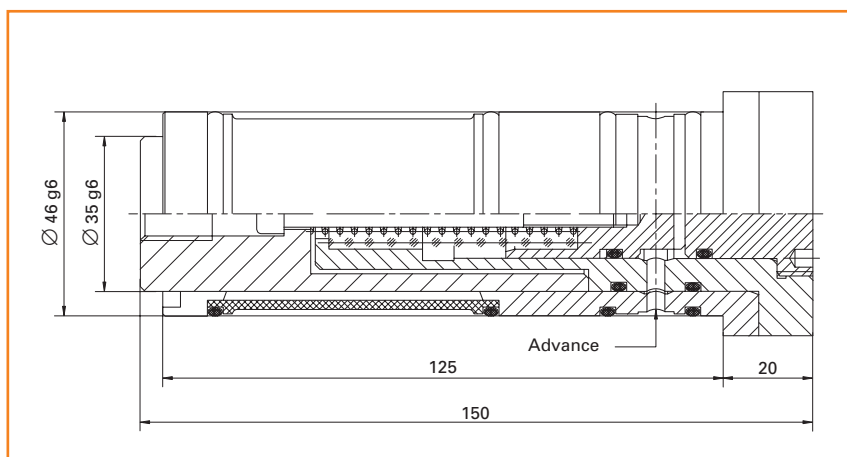


Figure 3

Hydraulic advance (18 mm stroke), advance force of the support pin being limited by an internal spring to between 20 and 110 N, depending on the position of the support pin. Reverse is provided automatically by a second spring.

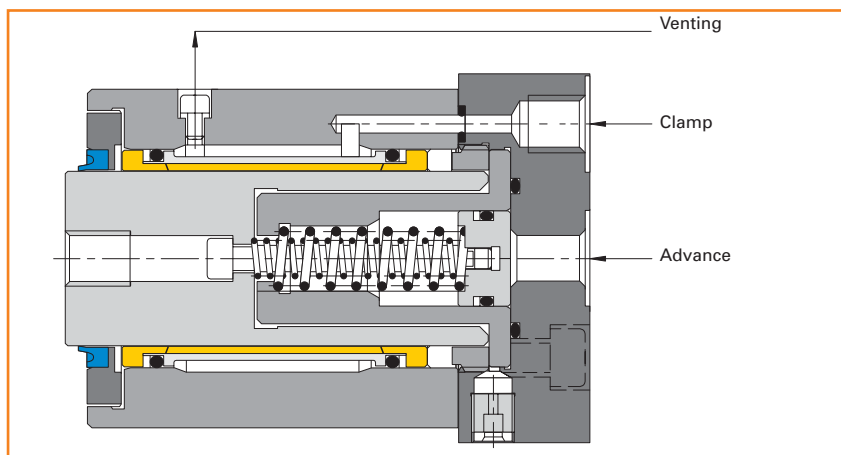
4 KOSTYRKA® Hydraulic Work Supports 5330 series

With the oil-advanced hydraulic work supports of the 5330 series, with single- or double acting support pins, KOSTYRKA® offer two further interesting solutions for effective workpieces support. This

series was developed to meet the strictest requirements for service-free function, even under extremely tough conditions, such as are met in vehicle construction.

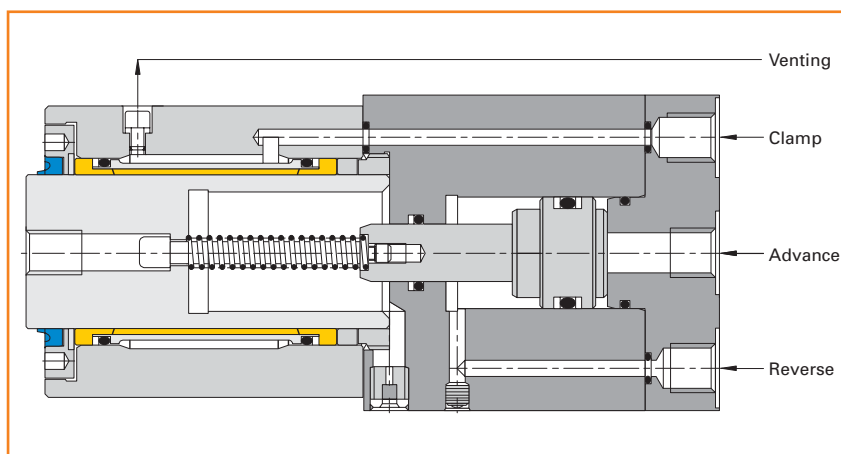
4.1 Oil-advanced support pin; single acting (5330 series)

The support pins in this series are advanced hydraulically to the work-piece. The advance force is restricted by an internal spring between 60 and 110 N, depending on the position of the support pin. Return is provided automatically by a second spring.

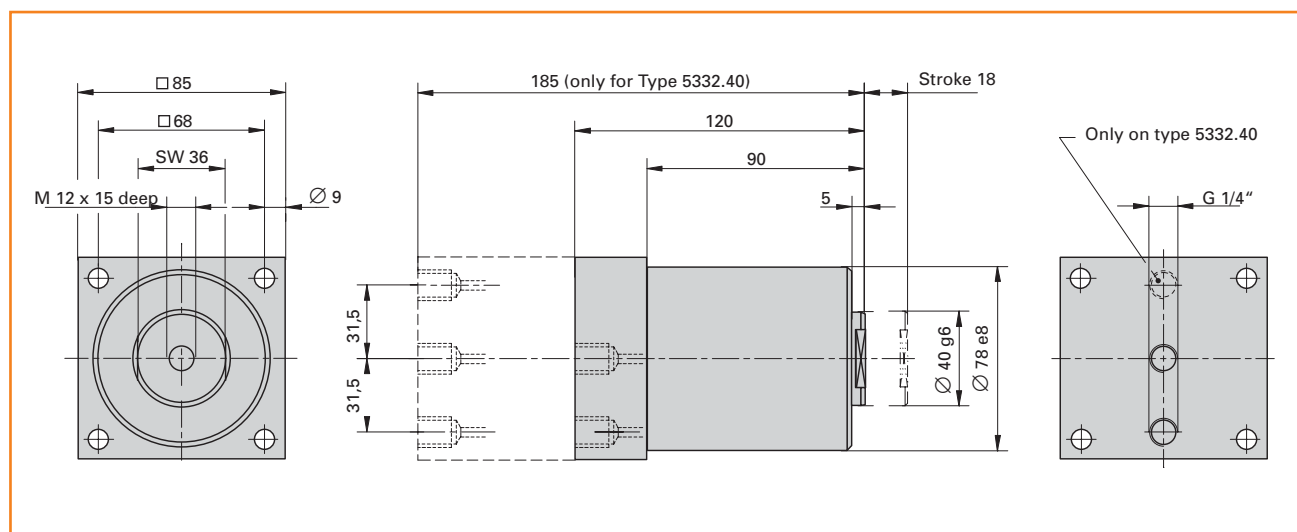


4.2 Oil-advanced support pin; double acting (5332 series)

This support unit has a double acting piston. When oil is fed to its ring surface, it pushes the support pin back to its home position. The support pin of this series is also advanced hydraulically. The advance force is restricted by an internal spring between 60 and 110 N, depending on the position of the support pin.



4.3 Dimensions

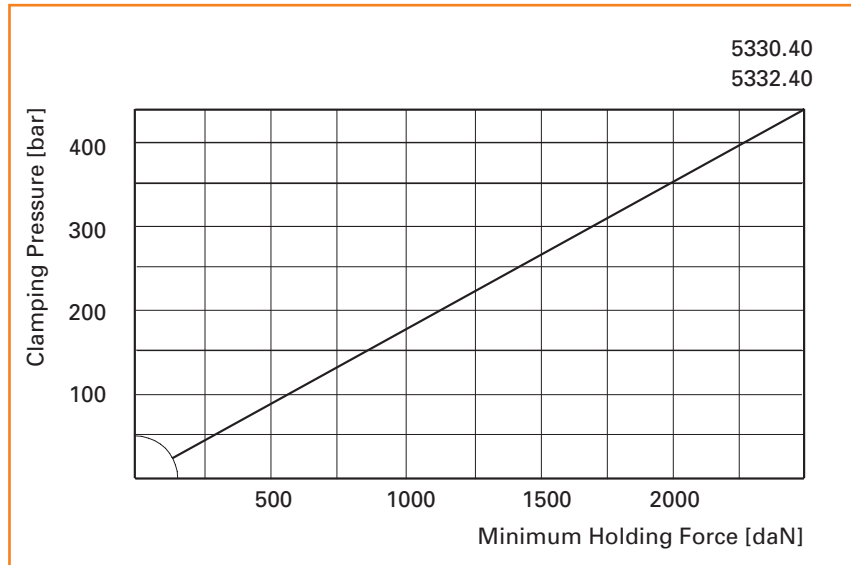


4.4 Support forces

Both versions of the 5330 series are fitted with a KOSTYRKA® 5350.040.070 clamping sleeve.

The diagram here applies to all forms of the 5330 series.

A constant coefficient of friction of $\mu = 0.1$ is assumed for all clamping pressures.



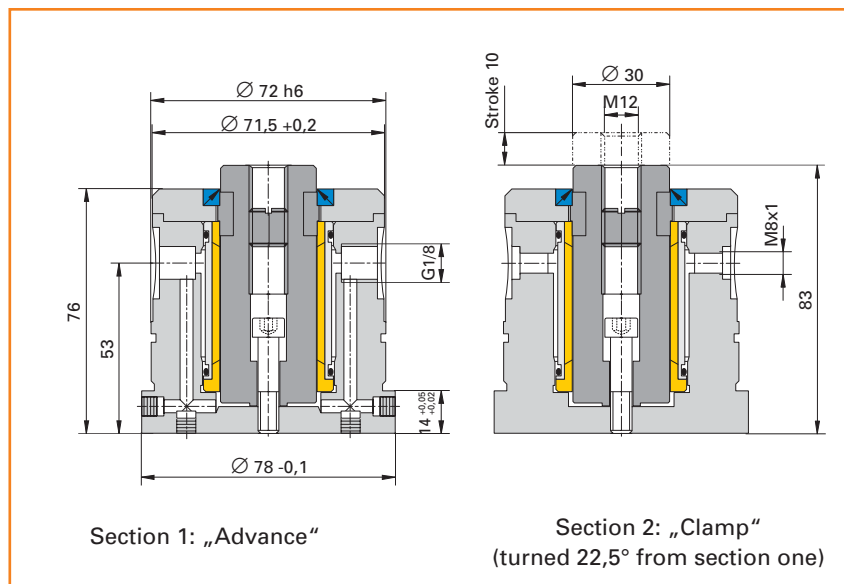
5 KOSTYRKA® Hydraulic work supports 5313 series

These KOSTYRKA® hydraulic work supports were developed for use on NC-controlled heavy milling and portal milling machines. They permit extraordinarily tight manufacturing tolerances and outstanding flatness and surface quality on the finished parts when machining large area workpieces of low rigidity.

In contrast to our other series, the 5313.30 hydraulic work supports have the following special features:

- The 5313.30 hydraulic work supports do not have any fastening holes or threads, but are drawn on to the base with the aid of an adapter using the $\varnothing 78$ shoulder. An example of the use of these hydraulic work supports on a universal clamping plate in a palletted fixture system is sketched in section 5.2.
- The support pin is not pre-tensioned by a spring, but is advanced to the workpiece by compressed air. This causes a small quantity of air to flow between the support pin and the clamping sleeve, and lifts the sealing lip of the wiper slightly, so that almost no friction remains. Through control of the air flow it is now possible to advance the support pin to the workpiece with extreme sensitivity.

5.1 Dimensions



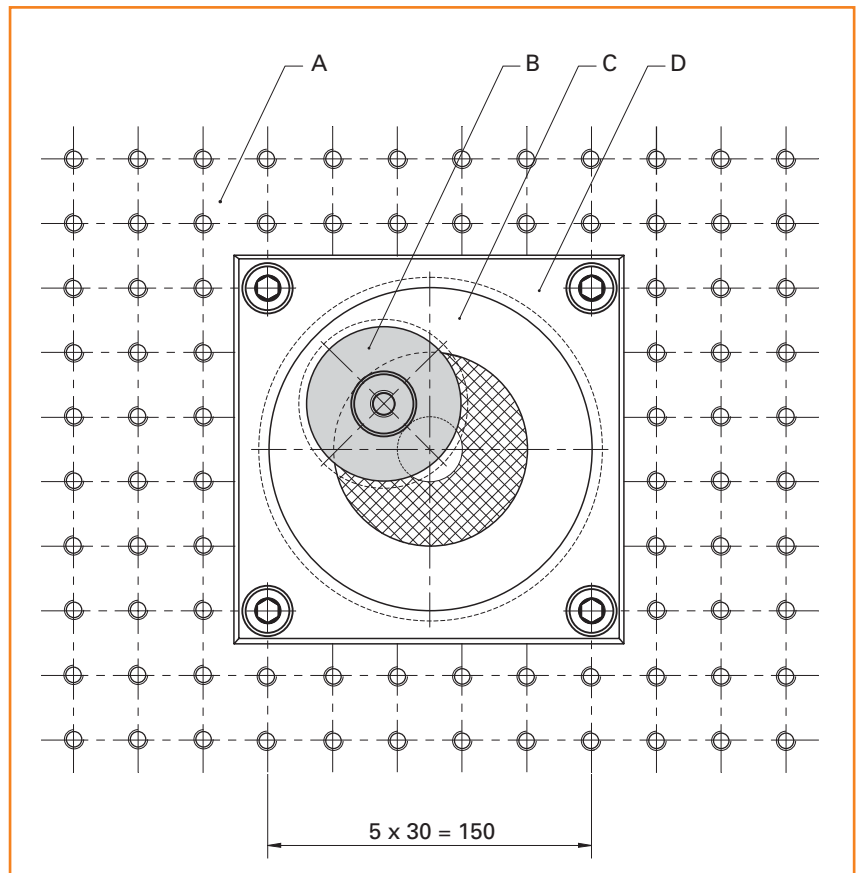
- Both connections for "advance" and "clamp" are present twice apart 180°. This permits a chain of units to be connected in series, which saves on distribution and hose assemblies. We recommend couplings and hoses from the "Minimes" system for the clamping lines, as these have been found to be particularly suitable for this application.

5.2 Application example

Large-area workpieces that are not inherently stable are to be milled and drilled on machining centres. There are very high requirements for evenness and surface quality, while retaining optimal service life for the machining tools. It is also desired that all the clamping and support elements should be able to be used over the full available surface of the clamping plate.

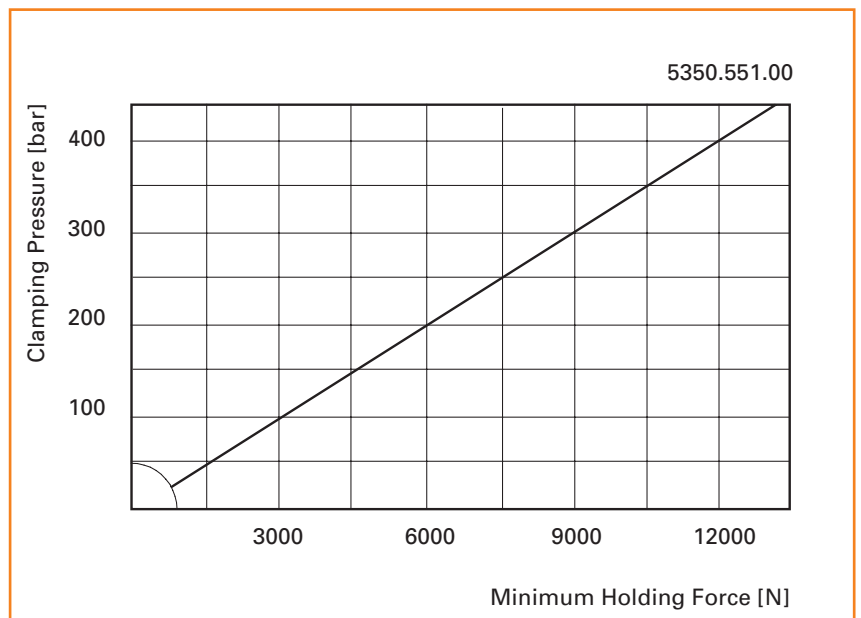
The clamping plate has a size of 1,500 x 2,000 mm, and part of it (A) is shown on the drawing. The plate has about 3,000 M12 threaded holes. The hydraulic work supports (B) are mounted eccentrically on center plates (C), and these are held in clamping frames (D).

In the illustrated clamping frame (D) position, the support pin can reach the ring-shaped shaded area, depending on the angle to which the center plate (C) is rotated. By moving the clamping frame (D) by one grid unit (30 mm in this case), every point of the clamping plate can be reached, which enables any point on various workpieces to be supported.



5.3 Support forces

The support pins of the 5313.30 hydraulic work support are enclosed by a KOSTYRKA® 5350.551.00 clamping sleeve; the achievable support forces are illustrated in the diagram opposite. A constant coefficient of friction of $\mu = 0.1$ is assumed for all clamping pressures.



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