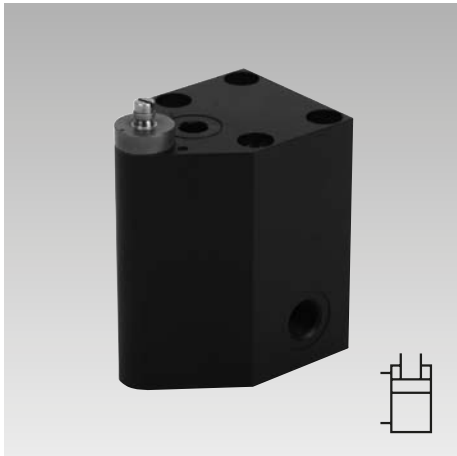




## Bore Clamp

Block-type eccentric, double acting, for bore diameter 6.6 to 13.8 mm, max. operating pressure 250 bar



### Application

The patented bore clamp is particularly suitable for positioning and clamping of workpieces with bore holes from diameter 6.6 to 13.8 mm in the support face.

The workpiece is directly put onto the bore clamp, so that the remaining surfaces are free for 5-sided machining.

Due to its small and eccentric design the bore clamp can be placed very close to the workpiece contour.

The variants with centring and compensation can compensate side loads.

According to the load additional clamping forces can be necessary, since the axial clamping force is relatively small (see page 3).

### Description

In the body of the bore clamp a double-acting hydraulic cylinder is mounted. By screwing in the clamping screw the piston actuates via a dowel pin a drive pin that is eccentrically arranged at the edge of the housing.

The clamping ring is centred on a taper sleeve and held by the head of the clamping screw. The clamping screw is secured by means of a thread coating against loosening.

Penetration of liquids and swarf is avoided by the connection of positive air pressure protection.

### Important notes

If liquids or swarf can penetrate, e.g. due to an open clamping bore, positive air pressure protection must be continuously switched on. In addition, the hardened support surface and the clamping ring should be blast cleaned before every clamping process.

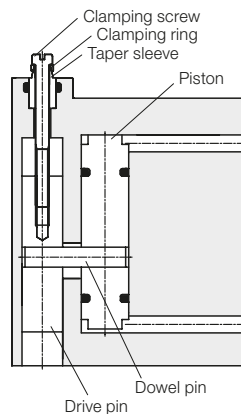
Clamping ring and clamping screws are wear parts and should be exchanged after approx. 10,000 actuations (see page 3).

The axial pulling force is non-positively transmitted, since the exterior diameter of the clamping ring is not profiled. Therefore the clamping bores should not be tapered.

### Advantages

- Axial clamping in simple and smooth bore holes
- Low bore depths
- 5-sided machining possible
- 3 different clamping inserts "With centring" "With compensation" "Without centring"
- Additional centring elements are not required
- Compensation of side loads (with centring and compensation)
- Repetitive accuracy 0.003 mm (with centring and compensation)
- Compact eccentric design
- Hardened support surface
- Pneumatic seat check
- Connection for positive air pressure protection
- Oil supply alternatively via pipe thread or drilled channels

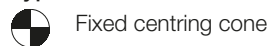
### Function



### Centring function

- Bore clamp with centring

#### Type 4319-X1



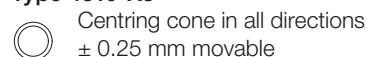
- Bore clamp with compensation

#### Type 4319-X2

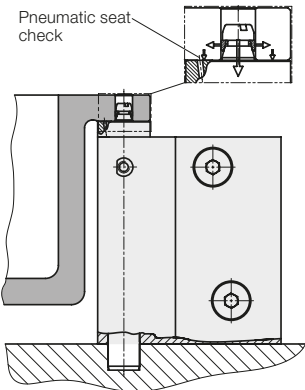


- Bore clamp without centring

#### Type 4319-X3

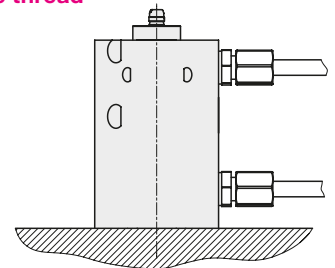


Operating conditions and other data see data sheet A 0.100.

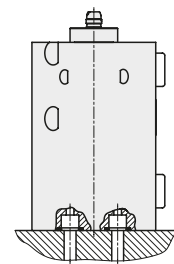


### Connecting possibilities

#### Pipe thread

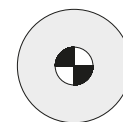


#### Drilled channels

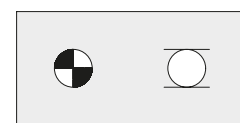


### Applications

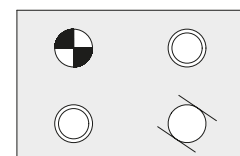
- Centre and clamp in 1 bore hole



- Centre and clamp in 2 bore holes

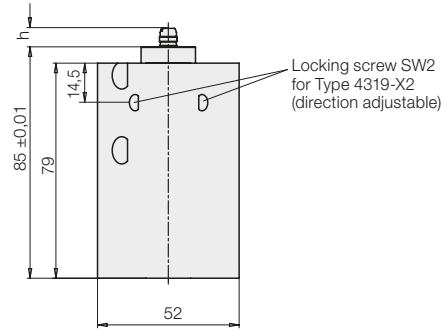
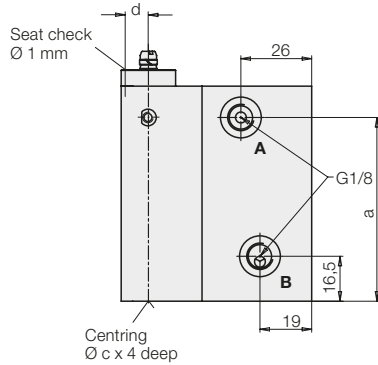
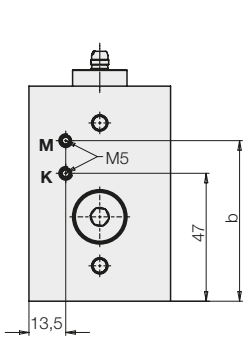
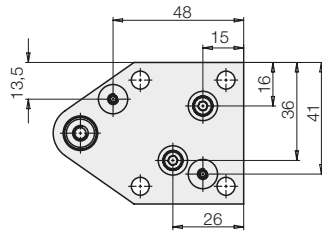


- Centre and clamp in more than 2 bore holes



# Dimensions Technical data

- A = Clamping
- B = Unclamping
- K = Positive air pressure protection
- M = Pneumatic seat check  
(if required)



**Connecting scheme for manifold mounting**  
Connection bore holes max. Ø 5 mm

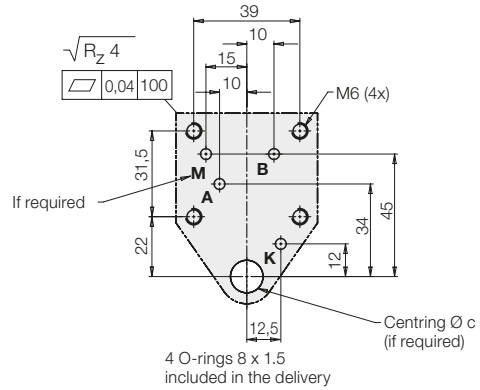
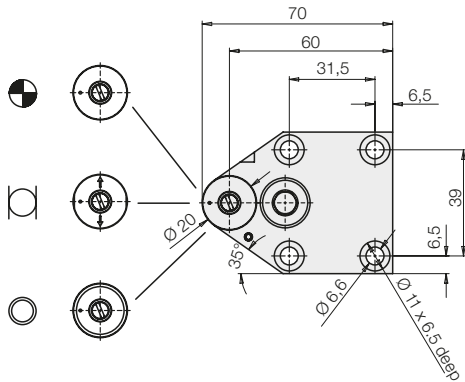
Type 4319-X1  
With centring



Type 4319-X2  
With compensation  
(direction adjustable)



Type 4319-X3  
Without centring



Clamping range Ø dsp	[mm]	6.6 - 6.8	9.0 - 9.2	11.0 - 11.3	13.5 - 13.8
Through hole Ø H13 as per DIN EN 20273-m	[mm]	6.6	9	11	13.5
for screw thread		M6	M8	M10	M12
Clamping screw		M4	M5	M6	M6
Max. pulling force (250 bar)	[kN]	3.8	3.8	6.3	6.3
Radial expansion force approx. *)	[kN]	3	3	5	5
Axial clamping force approx. *)	[kN]	see clamping force diagram page 3			
Axial retention force approx. *)	[kN]	see clamping force diagram page 3			
Max. operating pressure	[bar]	250	250	250	250
Min. operating pressure	[bar]	50	50	50	50
Oil volume clamping/unclamping	[cm <sup>3</sup> ]	0.2	0.2	0.3	0.3
Max. flow rate	[cm <sup>3</sup> /s]	25	25	25	25
a	[mm]	67.5	67.5	58	58
b	[mm]	59	59	66	66
Ø c	[mm]	12 <sup>H7</sup>	12 <sup>H7</sup>	14 <sup>H7</sup>	14 <sup>H7</sup>
d	[mm]	7.3	7.3	8.1	8.1
h	[mm]	7.5	8.5	9.5	11
Weight approx.	[kg]	1.65	1.65	1.7	1.7
<b>Part no.</b>	<b>With centring</b>	<b>4319-21A-066</b>	<b>4319-21A-090</b>	<b>4319-31A-110</b>	<b>4319-31A-135</b>
	<b>With compensation</b>	<b>4319-22A-066</b>	<b>4319-22A-090</b>	<b>4319-32A-110</b>	<b>4319-32A-135</b>
	<b>Without centring **)</b>	<b>4319-23A-066</b>	<b>4319-23A-090</b>	<b>4319-33A-110</b>	<b>4319-33A-135</b>
For manifold-mounting connection:					
<b>O-ring 8 x 1.5 (NBR)</b>		<b>3000-343</b>	<b>3000-343</b>	<b>3000-343</b>	<b>3000-343</b>
<b>Screw plug G 1/8</b> (with hexagon socket)		<b>3610-158</b>	<b>3610-158</b>	<b>3610-158</b>	<b>3610-158</b>

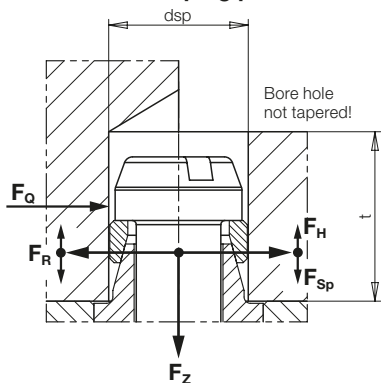
\*) Forces at the clamping point and important notes see page 3

\*\*) Cannot compensate side loads (see explanation page 3)

# Clamping force

## Clamping bore hole • Spare parts

### Forces at the clamping point



- F<sub>z</sub>** Pulling force of the clamping screw see chart page 2
- F<sub>R</sub>** Radial expansion force of the clamping ring see chart page 2
- F<sub>Sp</sub>** Axial clamping force (support force) see clamping force diagram
- F<sub>H</sub>** Axial retention force = workpiece lifting force see clamping force diagram
- F<sub>Q</sub>** Side load = workpiece displacement force see displacement force diagram

### Effective clamping force F<sub>Sp</sub>

The pulling force of the clamping screw acts onto the clamping ring, that will be expanded on the clamping taper and moves approx. 0.2-1 mm downwards.

As soon as the clamping ring gets in contact with the bore hole diameter a pull-down effect onto the support surface of the bore clamp results due to the sliding friction. The axial clamping force also depends on the friction coefficient  $\mu$ .

### Axial retention force F<sub>H</sub>

The clamping ring contacts the bore diameter with the expansion force F<sub>R</sub>. The axial clamping force also depends on the friction coefficient  $\mu$ . The axial retention force is a little bit higher with "soft" materials (Al) than the clamping force F<sub>Sp</sub>. However when planning the system the values indicated in the clamping force diagram should not be exceeded for safety reasons.

### Side load F<sub>Q</sub>

Bore clamps with centring



compensate side loads from all directions.

Bore clamps with compensation



compensate only side loads square to the compensation direction.

Bore clamps without centring



do not compensate side loads.

The displacement force diagram shows the displacement of the workpiece in mm in case of side loads per bore clamp.

### Spare parts

Clamping range $\varnothing$	dsp [mm]	6.6-6.8	9-9.2	11-11.3	13.5-13.8
Min. clamping ring $\varnothing$	*) [mm]	6.5	8.9	10.9	13.4
Max. clamping ring $\varnothing$	** [mm]	6.9	9.3	11.4	13.9
Min. bore depth	tmin [mm]	8	9	10	11.5

Part no. (spare part)

<b>Clamping ring</b>	<b>3548-815</b>	<b>3548-633</b>	<b>3548-634</b>	<b>3548-639</b>
<b>Clamping ring + clamping screw</b>	<b>0354-245</b>	<b>0354-246</b>	<b>0354-247</b>	<b>0354-248</b>
<b>Adjusting sleeve</b>	<b>3410-1193</b>	<b>3410-1194</b>	<b>3410-1195</b>	<b>3410-1196</b>

\*) New condition      \*\*) Max. diameter of adjusting sleeve

### Adjust clamping ring

New bore clamps are adjusted to the ordered clamping range. (Do not adjust the clamping screw)!

After approx. 10,000 workpieces the clamping ring and the clamping screw should be replaced as a precaution.

Required parts:

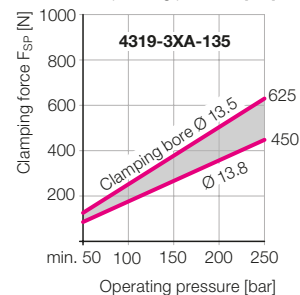
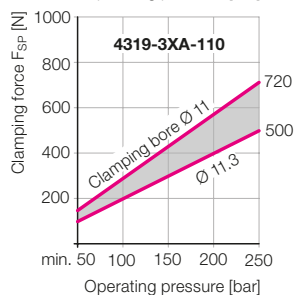
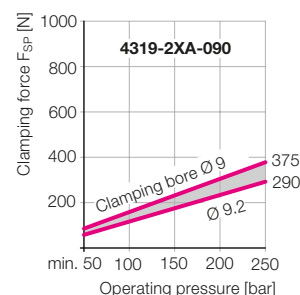
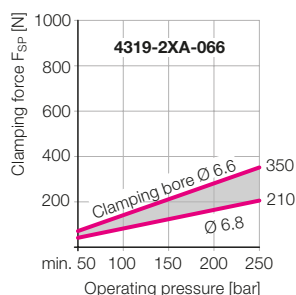
New clamping ring and clamping screw as well as the appropriate adjusting sleeve (see chart).

1. Hydraulically move the bore clamp to clamping position.
2. Put the clamping ring onto the clamping taper. Pay attention to the correct position of the taper angle! (see drawing above).
3. Screw in the clamping screw just before getting in contact with the clamping ring.
4. Put on the adjusting sleeve.
5. Screw in the clamping screw until the clamping ring contacts the interior diameter of the adjusting sleeve. Tighten the clamping screw only slightly! (The thread is secured against loosening by means of the Tuflok coating).
6. Move the bore clamp to the unclamping position and remove the adjusting sleeve.

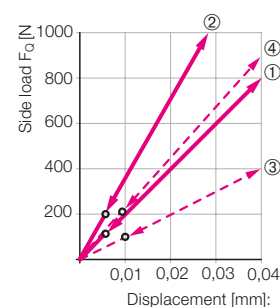
### Measuring conditions

Material C45+C  
Wet machining

### Clamping force diagram



### Verschiebekraftdiagramm



➤ Remaining displacement after omission of the side load

- ① 4319-21 with centring ———
- ② 4319-31 with centring ———
- ③ 4319-22 with compensation - - - - -
- ④ 4319-32 with compensation - - - - -

### Important!

In case of hardened workpieces and in very smooth and greased clamping bore holes, the clamping force can be close to zero. Remedy: Provide additional clamping elements, as e.g. swing clamps.