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# GUIDE ELEMENTS



## GUIDE ELEMENTS

Faster work machines, more complex tools and the increasing use of tungsten carbide make the issue of the ideal tool guidance system more important than ever in terms of the basic considerations for the designer.

A basic distinction is made between rolling guides and sliding guides. The rolling guide has a very high accuracy and operates almost backlash-free under preload.

As ideal as rolling friction is in terms of friction, the disadvantage will always be a certain amount of guide displacement. This disadvantage is particularly noticeable in tools with unfavourable geometry and pressure distribution. The aforementioned weaknesses of the roller bearing can be countered by oversizing to a certain extent.









Today, sliding guides of any kind can be manufactured with the narrowest tolerances in cylindricity and circularity. When properly paired with selected play, they give the tool greater rigidity than the rolling guide.

An uncertainty factor with sliding guides is always the possibility of tearing off the lubricating film with the associated short transition from liquid friction to mixed and dry friction. Even automatic pressure oil lubrication does not always make it possible to hold the lubricating film securely, especially with short stroke movements.


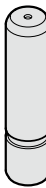

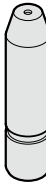

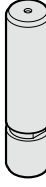
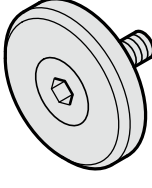
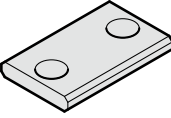


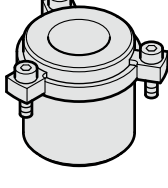
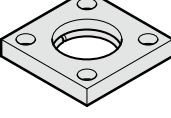
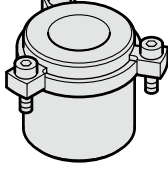



From these and similar problems the FIBRO guide element program has been developed, which is intended make it easier for the design engineer to select suitable and standardised components for solving guide problems in tools, fixtures and special machines.

We reserve the right to make changes, as technology is subject to change due to new findings and further developments.

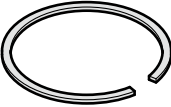
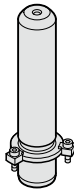
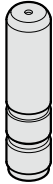

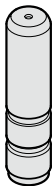
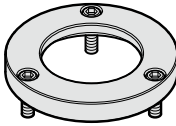
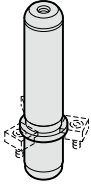
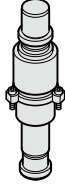
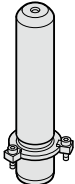

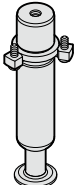

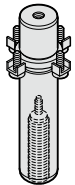
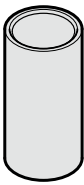
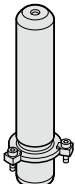

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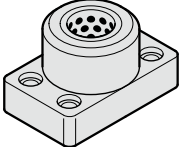

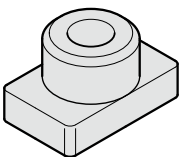

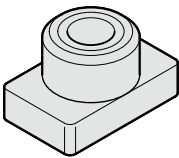
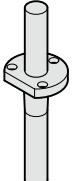
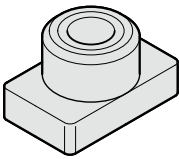
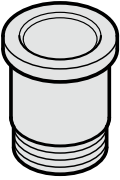
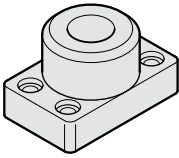
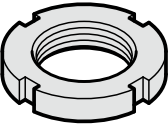
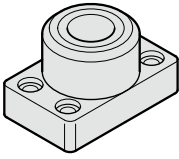
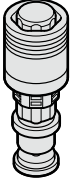
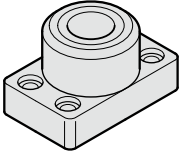
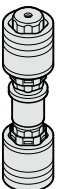
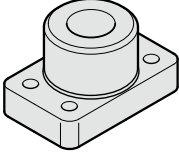
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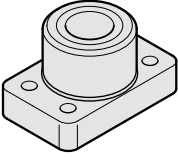

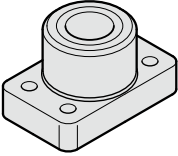

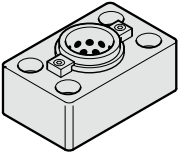
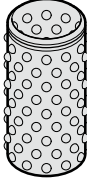
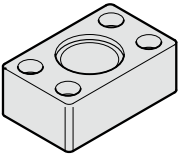
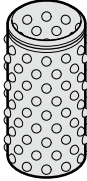
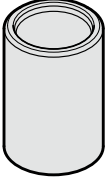

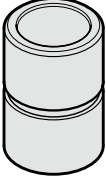

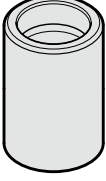
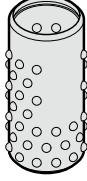

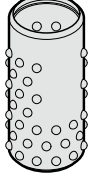
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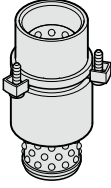
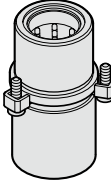
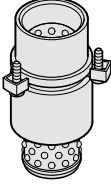
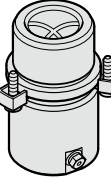
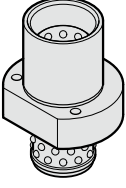
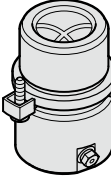
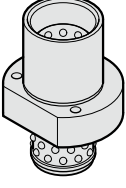
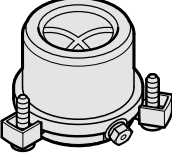
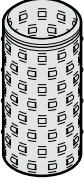
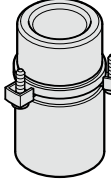

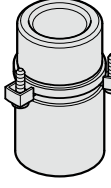
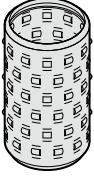
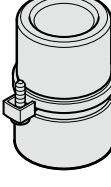
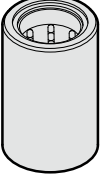
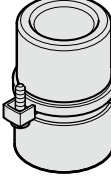
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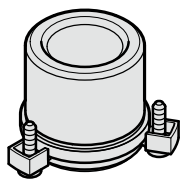
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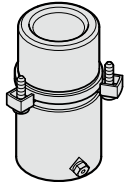
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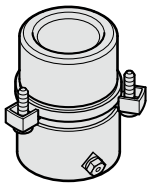
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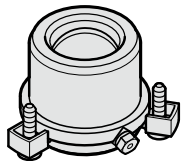
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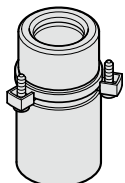
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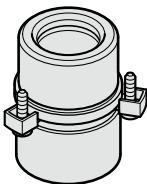
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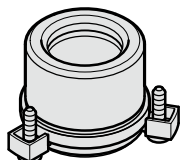
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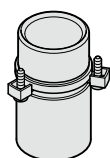
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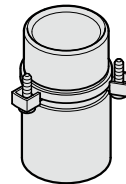
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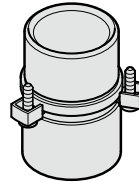
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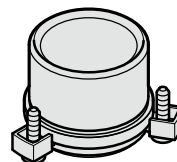
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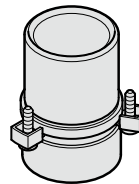
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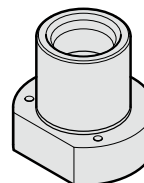
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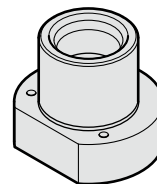
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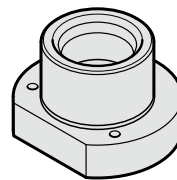
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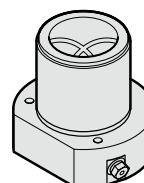
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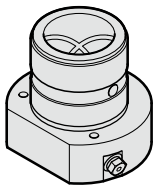
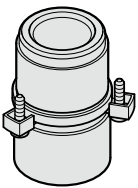
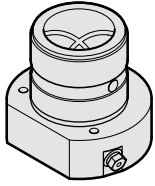
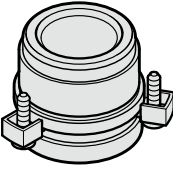
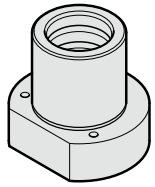
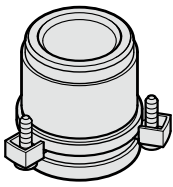
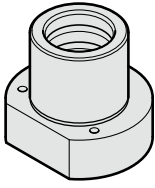
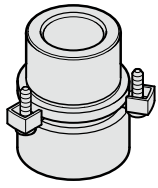
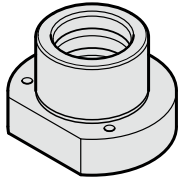
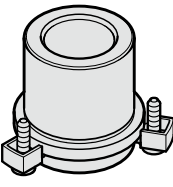
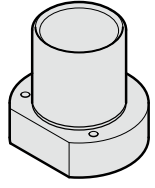
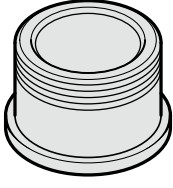
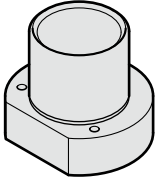
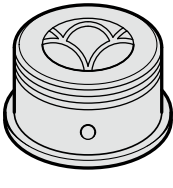
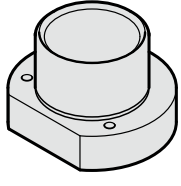
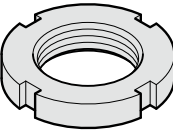
Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4





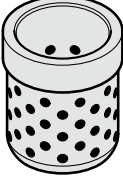







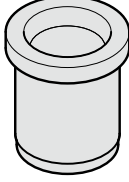
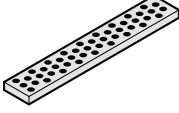
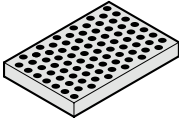
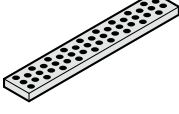
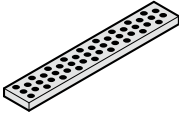
**2091.91.** **D149**

Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

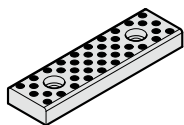
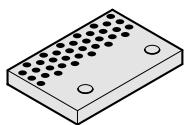
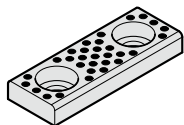
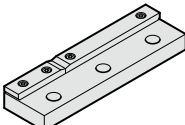
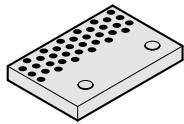
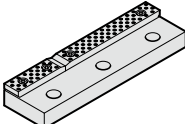
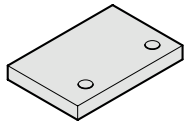
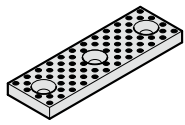
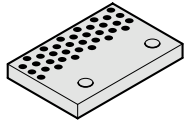
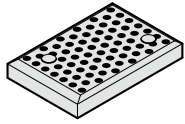
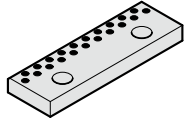
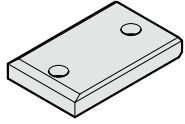
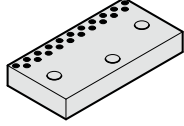
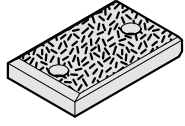
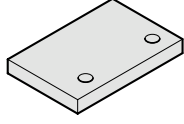
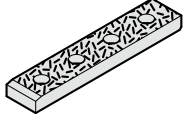
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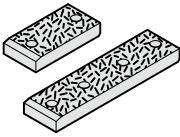
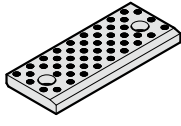
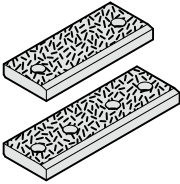
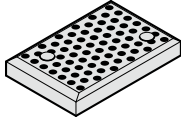
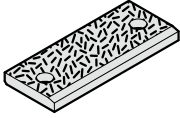
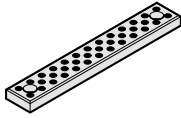
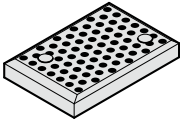
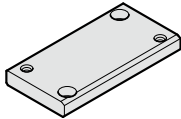
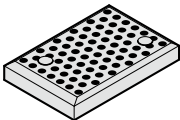
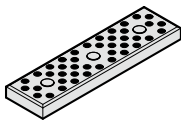
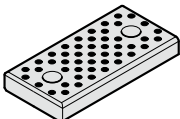
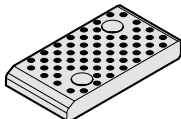
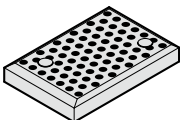
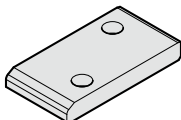
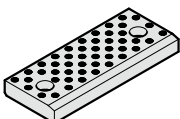
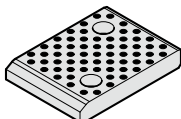
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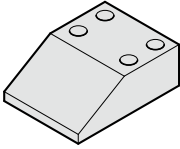
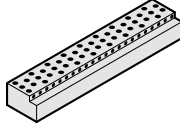
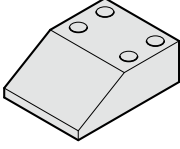
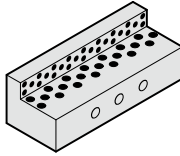
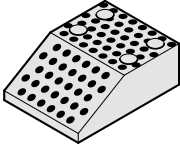
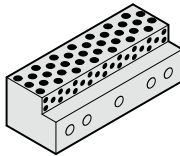
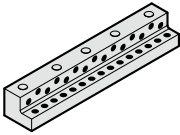
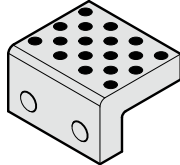
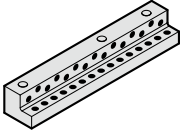
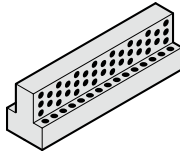
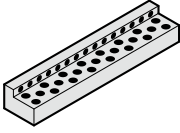
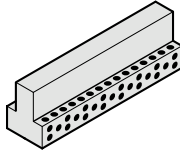
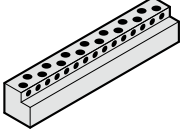
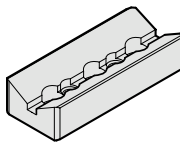
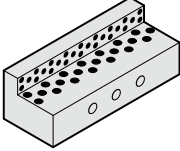
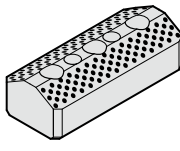
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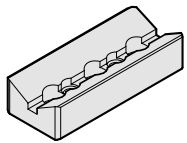
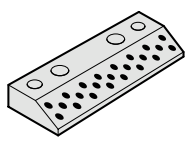
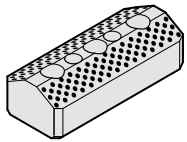
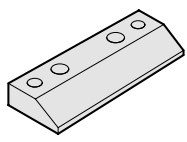
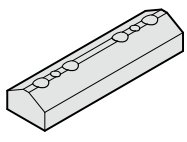
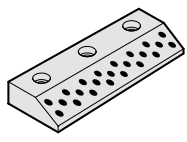
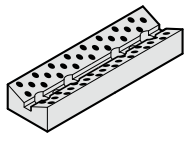
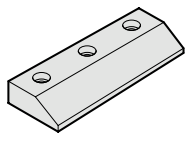
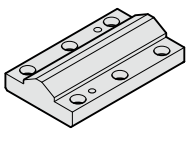
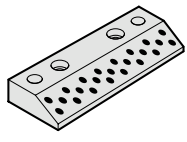
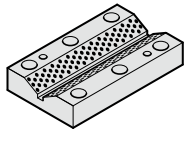
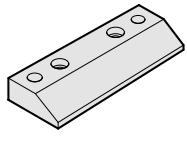
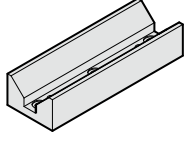
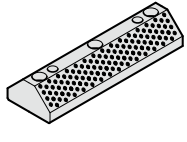
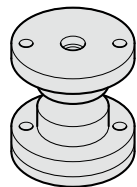
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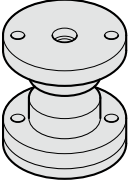
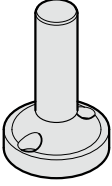
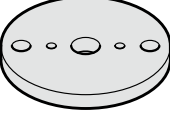
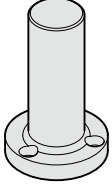
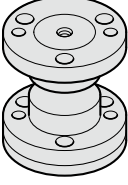

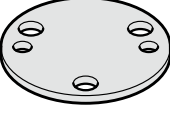
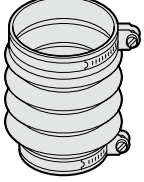
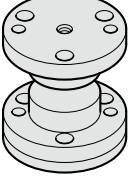
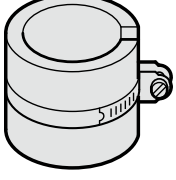
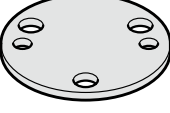
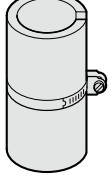
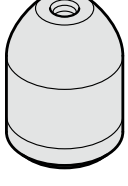
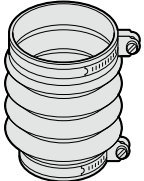
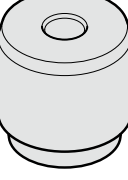
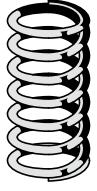
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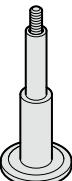
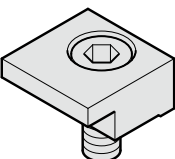
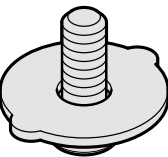
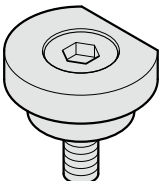
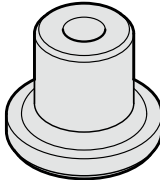
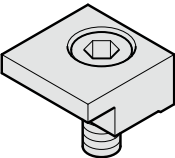
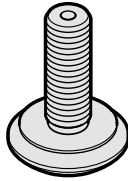
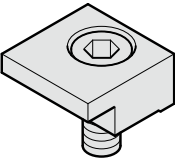
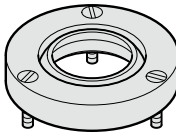
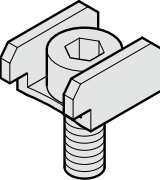
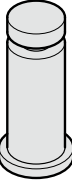
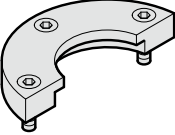
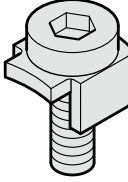
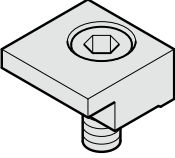
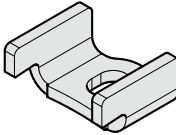
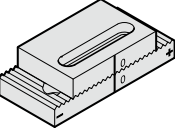
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	<b>2963.71.</b> Sliding block, Steel	<b>D264</b>		<b>2965.80.45.</b> Single-sided prismatic guide, Bronze with solid lubricant, CNOMO	<b>D270</b>
	<b>2963.70.</b> Prismatic guide, Bronze with solid lubricant	<b>D264</b>		<b>2965.82.45.</b> Single-sided prismatic sliding block, Steel, CNOMO	<b>D271</b>
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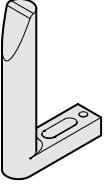
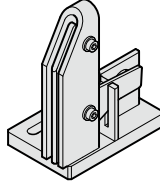
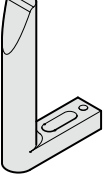
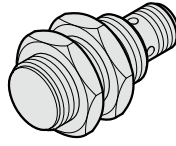
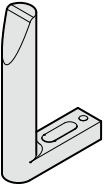
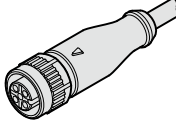
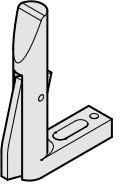
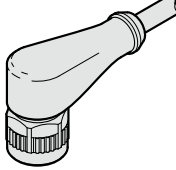
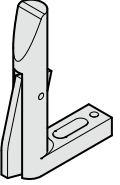
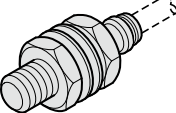
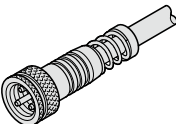
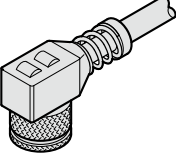
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				Ball guides - load diagram	
				Ball guides - calculation table	
				Guide elements - Installation guidelines, dimension tables	

## NOTES ON GUIDE ELEMENTS

### Precision slide guide, sintered ferrites

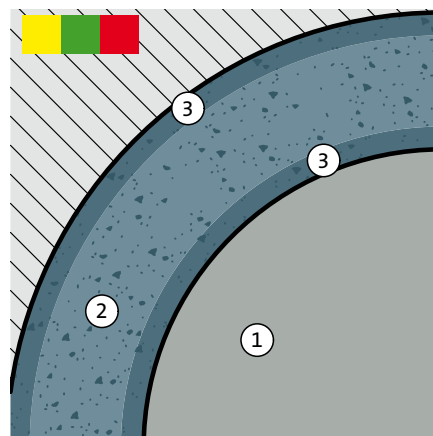
**This guide type consists of self-lubricating sintered ferrites with carbonitrided surface.**

The sintered material used has a porosity content of 18-20 by volume that is filled with an oil under vacuum. In ongoing operation, this oil enters the sliding zone, facilitating long-term lubrication (depending on the usage conditions). As initial and additional lubrication, a suitable grease can be filled into the supply grooves, which reduces the maintenance intervals.

Carbonitriding - a case hardening process - considerably increases the wear resistance of the sliding layer. The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and low roughness. The guidance accuracy can be changed via pairing classification.

 For bearing clearance ranges, see chapter D.

(1) Guide pillar (2) Sintered ferrite guide bush (3) Carbonitriding



### Precision slide guide, bronze-coated

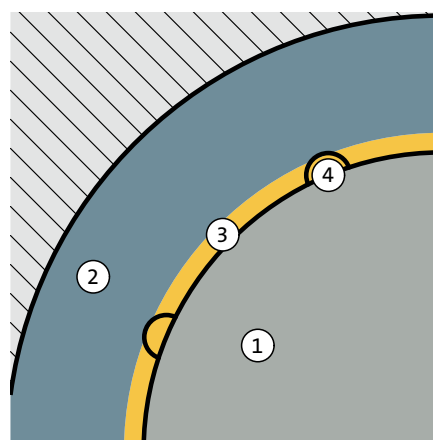
**This guide type consists of a steel body with bronze-coated running surface with helical oil groove and a lubricating nipple for ongoing lubrication.**

The steel body used ensures a high level of intrinsic stability even with high side and edge loads due to its high tensile strength.

The bronze running surface is optimally connected to the steel body and has very good emergency running properties. A permanent lubricant supply with grease is necessary for reliable continuous operation.

The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and low roughness.

(1) Guide pillar (2) Guide bushing (3) Bronze coating (4) Oil groove



### Slide guide, bronzeplated (ECO-LINE)

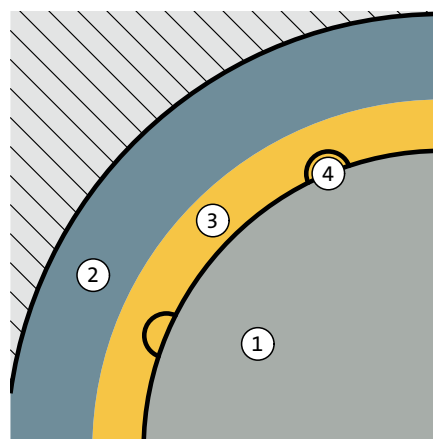
**This guide type consists of a steel body with bronzeplated running surface with helical oil groove and a lubricating nipple for ongoing lubrication.**

The steel body used ensures a high level of intrinsic stability even with high side and edge loads due to its high tensile strength.

The bronze running surface is optimally connected to the steel body and has very good emergency running properties. A permanent lubricant supply with grease is necessary for reliable continuous operation.

The precision ground running surface achieves high quality in terms of dimensional and shape tolerances and low roughness.

(1) Guide pillar (2) Guide bushing (3) Bronze coating (4) Oil groove




### Slide guide with solid lubrication rings (ECO-LINE)

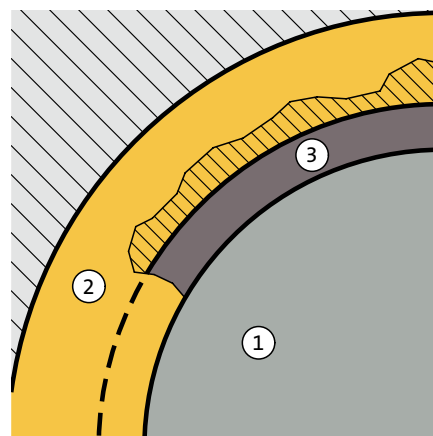
**This low-maintenance guide type consists of a copper alloy with integrated solid lubrication rings.**

The base frame material used offers good guide stability and very good emergency running properties. Following initial lubrication, the solid lubrication is slowly distributed into the sliding zone in ongoing operation of the solid lubrication and provides low-maintenance operation (depending on the usage conditions). The solid lubrication rings take up 25-35% of the total guide surface (depending on the design) and only permit linear movements.

The ground running surface achieves good quality in terms of dimensional and shape tolerances and optimal roughness.

 see low-maintenance sliding elements - description

(1) Guide pillar (2) Guide bushing (3) Solid lubrication ring



## NOTES ON GUIDE ELEMENTS

### Slide guide with non-liquid lubricant pockets

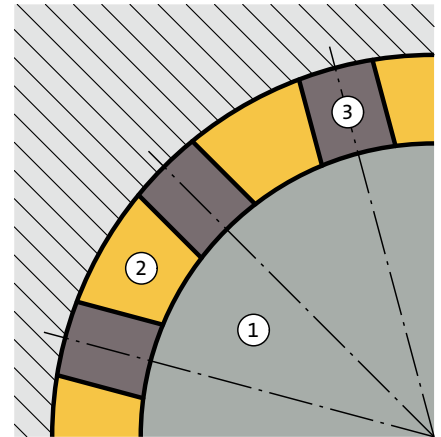
**This low-maintenance guide type consists of a copper alloy with integrated non-liquid lubricant pockets.**

The base frame material used offers good guide stability and very good emergency running properties. Following initial lubrication, the solid lubrication slowly enters the sliding zone in ongoing operation of the solid lubrication and provides low-maintenance operation (depending on the usage conditions). The non-liquid lubricant pockets take up 25-35% of the total guide surface (depending on the design) and permit linear and/or rotational movements (depending on the organisation of the non-liquid lubricant pockets).

The ground running surface achieves good quality in terms of dimensional and shape tolerances and optimal roughness.

see low-maintenance sliding elements - description

(1) Guide pillar (2) Guide bushing (3) Non-liquid lubricant pocket



### Precision ball bearing

**This guide type is backlash-free with high stability due to pre-stressed roll barrels (balls) and suitable for maximum speeds thanks to the low rolling friction.**

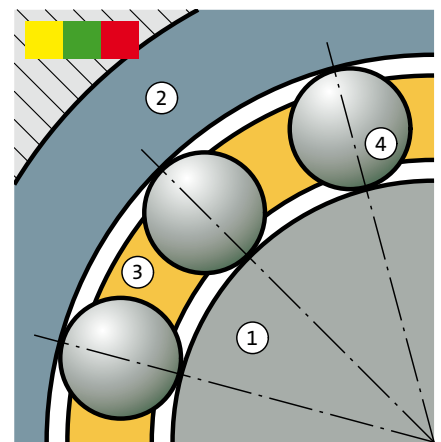
The base frame material used for the guide bushes offers very good guide stability. Together with the hardened precision balls and corresponding gliding pins, this creates smooth-running and precise guidance. Due to the point contact of the rollers, this is not completely rigid under load, however. This can be influenced via the pairing classification.

The ball cages are made from brass or aluminium and due to the high number of rollers have a high dynamic load index – a significant factor for long service life.

The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and minimal roughness.

For bearing clearance ranges, see chapter D.

(1) Guide pillar (2) Guide bushing (3) Brass or aluminium cage (4) Ball



### Precision roller guide

**This guide type is backlash-free with very high stability due to pre-stressed roll barrels (rolls) and suitable for maximum speeds thanks to the low rolling friction.**

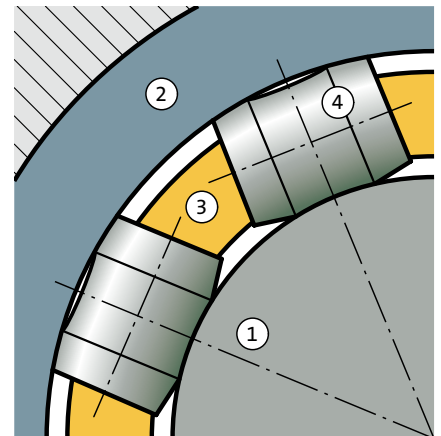
The guide bushes for ball guides are also used here. Together with the hardened precision rollers and corresponding gliding pins, this creates smooth-running and very precise guidance. Due to the linear contact of the rollers this is not completely rigid under load, but is considerably more stable than ball guides.

The roller cages are made from brass and due to the optimum number of rollers have a high dynamic load index – a significant factor for long service life.

The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and minimal roughness.

To achieve optimal bias, only gliding pins red = .30 and gliding pins yellow = .10 are used!

(1) Guide pillar (2) Guide bushing (3) Cage (4) Roller



### Precision needle roller guide (Million Guide)

**This guide type is back-lash free with maximum stability due to pre-stressed roll barrels (needle rolls) and suitable for maximum speeds due to the low rolling friction.**

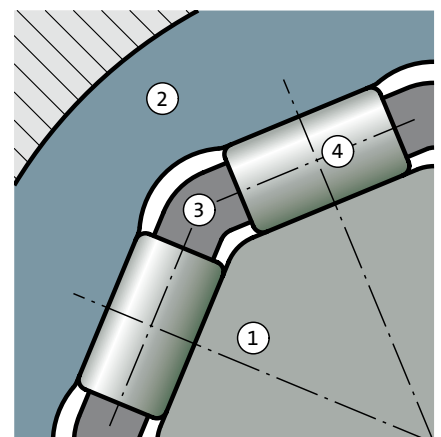
The Million Guide units represent the tip of the guide units. Together with the hardened precision needle rollers and corresponding gliding pins and bushes, this creates smooth-running and maximum precision guidance. Due to the linear contact of the rollers this is not completely rigid under load, but is more stable than roller guides.

The needle roller cages are made from plastic and due to the optimum number of rollers have a high dynamic load index – a significant factor for long service life.

The high-precision ground running surface achieves maximum quality in terms of dimensional and shape tolerances and very low roughness.

The components of this guide unit are coordinated with one another and for optimum bias.

(1) Guide pillar (2) Guide bushing (3) Plastic ball cage (4) Needle roller



## GUIDE TYPE SELECTION AID

Criteria / Guide type	Precision slide guide, sintered ferrites	Precision slide guide, bronze-coated	Slide guide, bronzeplated (ECO-LINE)	Slide guide with solid lubrication rings (ECO-LINE)	Slide guide with non-liquid lubricant pockets	Precision ball bearing	Precision roller guide	Precision needle roller guide (Million Guide)
Load capacity / High stresses	++	++	+	+++	+++	0	++	+++
Impact load / Pulsations	-	++	++	++	++	-	0	0
High stroke speed	0	-	-	-	-	+++	+++	++++
Ease of movement / Low friction	+ <sup>1</sup>	+	+	+	+	+++ <sup>1</sup>	++	++
Resistance to wear / Bearing life	++	+	+	++	++	+++	+++	++++
Low-maintenance operation	++	-	-	+++	+++	-	-	-
Tolerance to contamination and dust	-	0	0	+	++	-	-	-
Tolerance to pillar offset	0	+	+	++	++	-	-	-
Guide behaviour can change due to pairing classification								
Suitable for rotational movements					2			
Low-corrosion designs (on request)								

++++ = Excellent, +++ = very good, ++ = good, + = satisfactory, 0 = adequate, - = Not as good

<sup>1</sup> Variable due to the pairing classification

<sup>2</sup> Depending on the arrangement of the solid lubricant deposits

The selection aid helps with orientation. Depending on the application, installation situation and ambient conditions, an advance check or test is essential.

# PAIRING CLASSIFICATION

## SLIDING GUIDE (SINTERED FERRITE)

### ROLLER BEARING

Recommendation for pairing selection:

Cutting clearance	Sliding guide	Ball bearing guide	Description	Recommendation
small	small	large	Piece parts with small tolerances, closely specified cut edge properties and contours – also parts from thin material	Pairing 1
medium	medium	medium	Piece parts from sheet thicker than 1 mm – also preferably for progression dies	Pairing 2
large	large	small	Where demands on edges and burrs are not stringent; note that large die clearances require smaller shearing forces	Pairing 3

Selection of punch-matrix clearance is largely determined by piece part characteristics: percentage of sheared land versus breakaway, but also by demands on burr formation.

Further criteria are the part piece material, as well as the type and condition of the tooling and the press.

#### Combination possibilities guide pillars, cages and bushings:

	Sliding guide				Ball bearing guide			
	Guide pillar		Guide bushing		Guide pillar		Guide bushing	
	Colour	Order No.	Colour	Order No.	Colour	Order No.	Colour	Order No.
Pairing 1	yellow	.10	yellow	.10	yellow	.10	red	.30
	green	.20	yellow	.10	yellow	.10	green	.20
					green	.20	red	.30
Pairing 2	green	.20	green	.20	yellow	.10	yellow	.10
	red	.30	yellow	.10	green	.20	green	.20
	yellow	.10	green	.20	red	.30	red	.30
Pairing 3	red	.30	red	.30	green	.20	yellow	.10
	green	.20	red	.30	red	.30	green	.20
	yellow	.10	red	.30	red	.30	yellow	.10

Identification for tolerances with colour dots on the outside of the guide pillars and bushings.

Selection Criteria: die clearance – stock thickness – material

#### Note for 4-pillar die sets:

Please be aware that tight bushing clearances or high preloads are generally unsuitable for 4-pillar die sets.

Deviation from the bore geometry and from the perpendicularity requires a pairing classification of pairing 2 or even better pairing 3. The pairing classification does not signify any difference in quality, rather a selection of the optimum bushing clearance in the case of guide pillars or the optimum preloading in the case of ball bearings (see also chart next page).

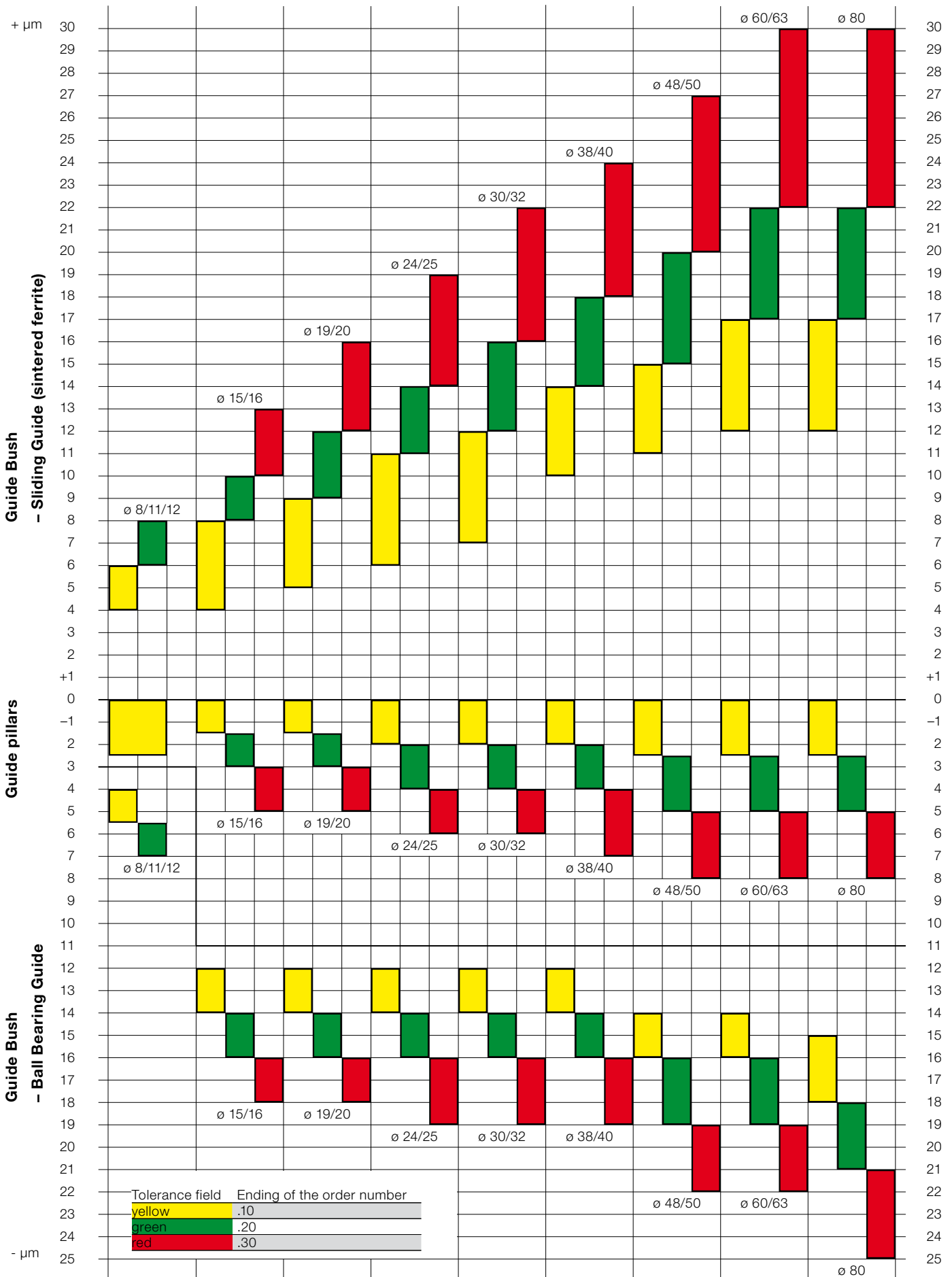
#### Ordering Code (example):

Guide pillar in tolerance code yellow = 202.19.040.260.10

Sintered ferrite bushing with tolerance code green = 2081.31.040.20

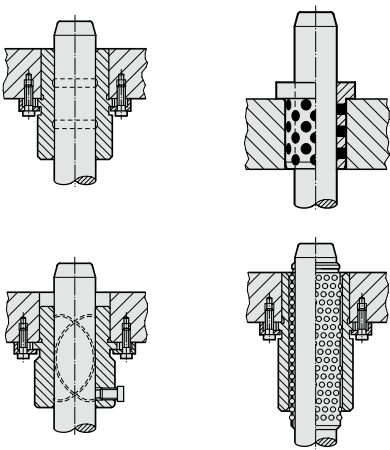


# PAIRING CLASSIFICATION SLIDING GUIDE (SINTERED FERRITE) ROLLER BEARING



# SELECTION MATRIX

## GUIDE PILLARS - GUIDE BUSHES

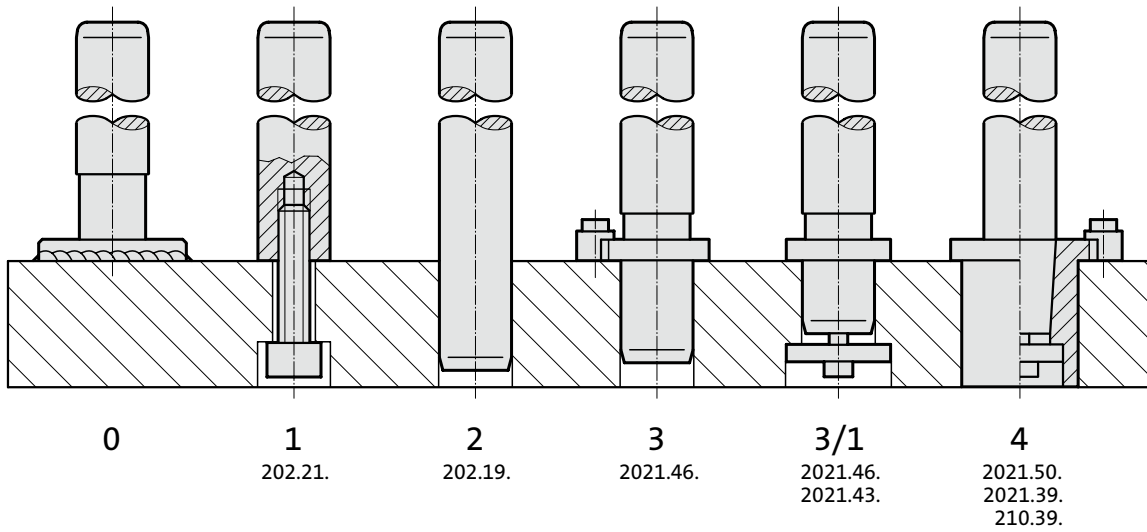


				Guide pillars conforming to DIN 9825				Guide pillars with centre fixing				Guide pillars for large tools				Guide pillars ECO-LINE		
				Guide pillars, bolt-on type				Guide pillars, demountable				Guide pillars with centre fixing				Guide pillars with cage retainer bore		
Guide bushes	Tolerance range	202.17.	202.19.	202.21.	202.22.	202.23.	202.24.	202.61.	202.63.	202.60.	202.62.	202.25.	202.16.45.	202.16.48.	202.17.	202.19.	202.29.	202.31.
		.30	.20	.10	h3	.30	.20	.10	h5	-0.010	-0.025	f6	h4	.30				
Ball guide bushes	206.49. 2081.46.																	
Guide bearing for ball bearing guide	210.44. 2081.47.	.10	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	● <sup>1</sup>	●	
	210.45. 2081.49.																	
	210.46. 2081.67.																	
	2031.41. 2081.68.																	
	2031.42. 2091.44.	.20	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	x	●	
	2031.44. 2091.45.																	
	2061.44. 2091.46.																	
	2061.47. 2091.67.	.30	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	x	●	
	2081.44. 2091.68.																	
	2081.45.																	
Recirculating ball bush	2061.69. 2081.69.	-	●	x	x	x	●	x	x	x	x	x	x	x	x	x	x	
Sintered ferrite guide bushes	210.31. 2081.32.	.10	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	x	●	x	x	
Guide bearing, sintered guide	210.34. 2081.33.																	
	210.35. 2081.34.																	
	2031.31. 2081.35.	.20	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	x	●	x	x	
	2031.34. 2091.31.																	
	2031.38. 2091.32.																	
	2051.32. 2091.34.	.30	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	● <sup>1</sup>	● <sup>1</sup>	● <sup>1</sup>	x	x	x	x	x	●	x	x	
	2081.31.																	
Guide bushes ECO-LINE bronze with solid lubrication rings	2051.72. 2091.71.	H6	●	○	x	x	x	x	x	x	x	x	x	x	●	x	x	
	2081.71. 2091.72.																	
	2081.74. 2091.74.																	
	2081.75.																	
Guide bushes, bronze coated	210.85. 2081.85.	IT5	●	●	○	x	x	x	x	x	x	x	x	x	●	x	x	
	2081.81. 2081.84.																	
Guide bushes ECO-LINE bronze plated	2051.92. 2091.91.	H5	●	○	x	x	x	x	x	x	x	x	x	x	●	x	x	
	2081.91. 2091.92.																	
	2081.94. 2091.94.																	
	2081.95.																	
Guide bushes with solid lubrication	2031.70. 2087.70.	H7	●	x	x	x	x	x	x	●	●	●	●	●	●	x	x	
Guide bearing with solid lubricant	2082.70. 2087.71.																	
	2082.71. 2087.72.																	
	2085.70. 2087.73.																	
	2085.72.																	
Guide bushes with solid lubrication	2085.71.	E7	●	●	●	x	x	x	x	●	●	●	●	●	●	x	x	
Guide bushes with solid lubrication	2032.70. 2086.70.	F7	●	●	x	x	x	x	x	●	●	●	●	●	●	x	x	
	2052.70.																	
Guide bushes with solid lubrication	2102.70. 2102.71.	G7	●	●	x	x	x	x	x	●	●	●	●	●	●	x	x	
Guide bushes with solid lubrication	2086.71.	C9	●	●	●	x	x	x	x	●	●	●	●	●	●	x	x	

● = suitable      ●<sup>1</sup> = suitable (see pairing classification at the beginning of chapter D)  
 ○ = Limited suitability      x = Not suitable

The combinations should be considered as recommendations. Depending on the installation situation and type of use, a previous examination or test is mandatory, since different combinations may result in varying clearance (slide guide) or pretension (ball guides) values.

# DEFLECTION OF PILLARS AND BENDING EQUATION

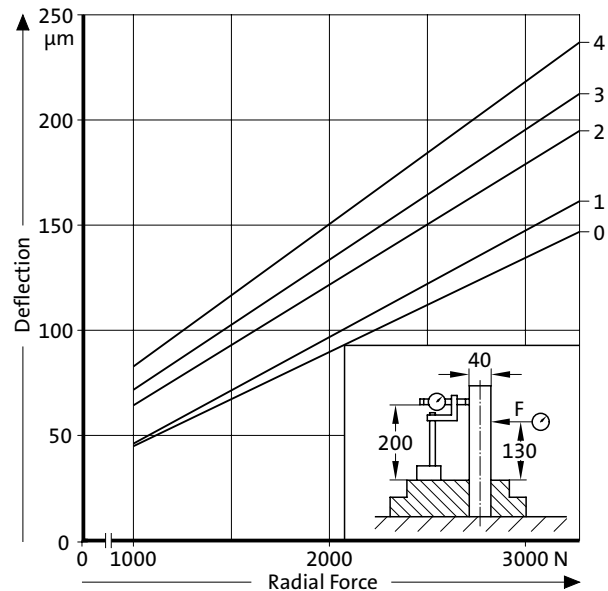


## Deflection of Pillars

The practical use of this type of screw-on column with the technical advantages of bending stiffness shown requires a rethink in the design of the tool.

### Mounting Instructions:

The friction surfaces of the screw connections (bearing surface and thread) must be lubricated with Molykote paste. To compensate for the setting of the screws, the connection should be loosened at least twice and tightened again with a torque wrench (see tightening torque in table).



## Bending equation

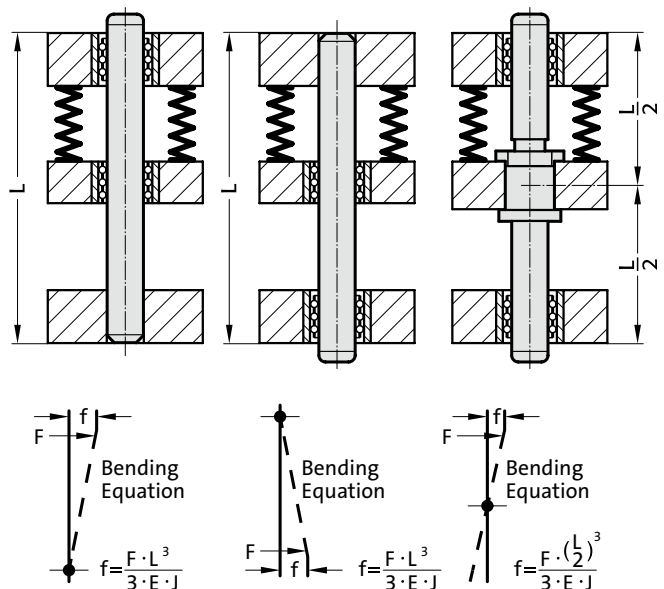
The transverse load resistance to tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

Significantly better pillar bending values can be achieved by fixing the guide pillars in the guide plate, i.e. in the centre of the pillar.

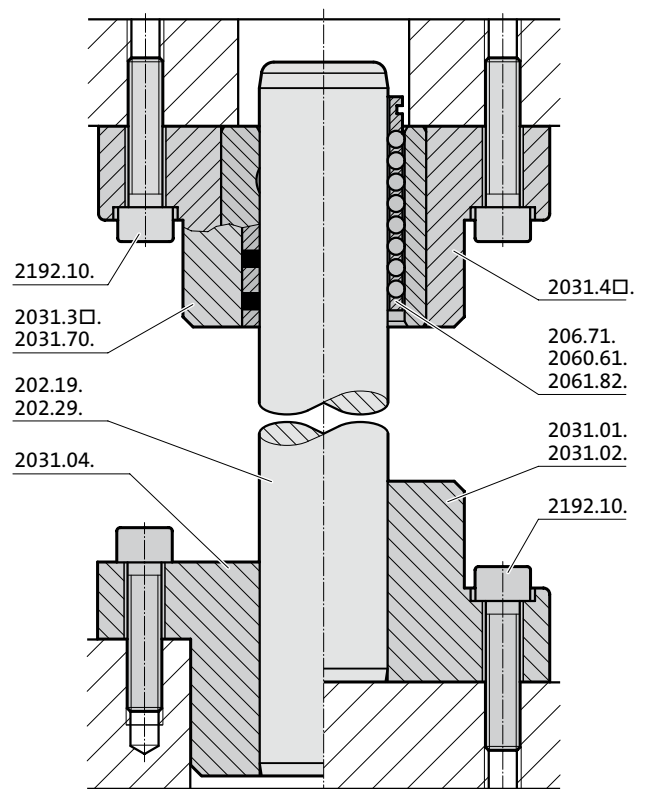
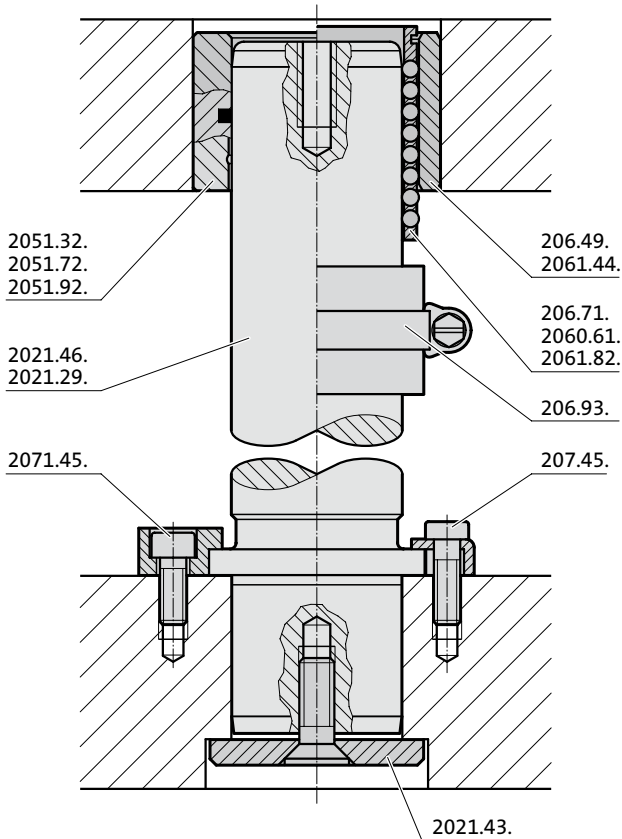
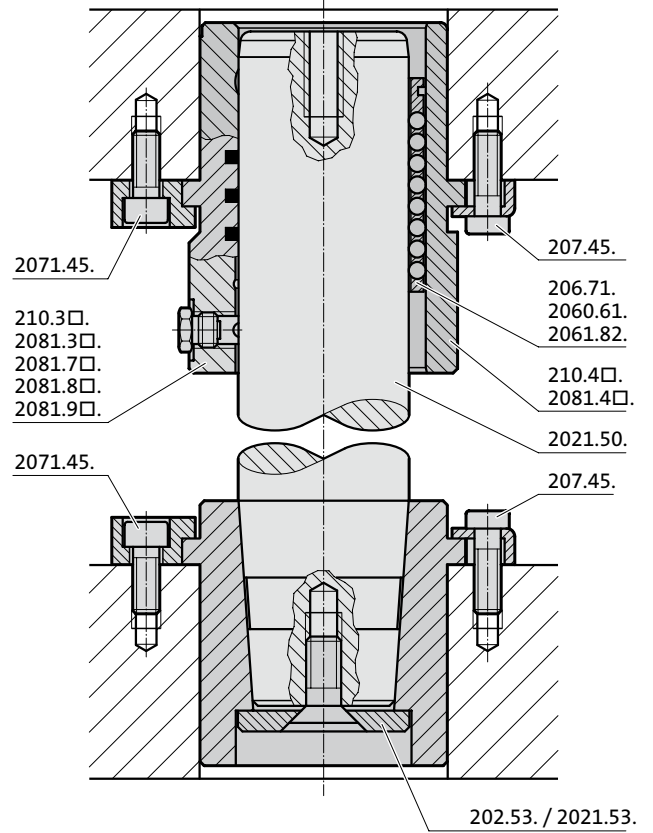
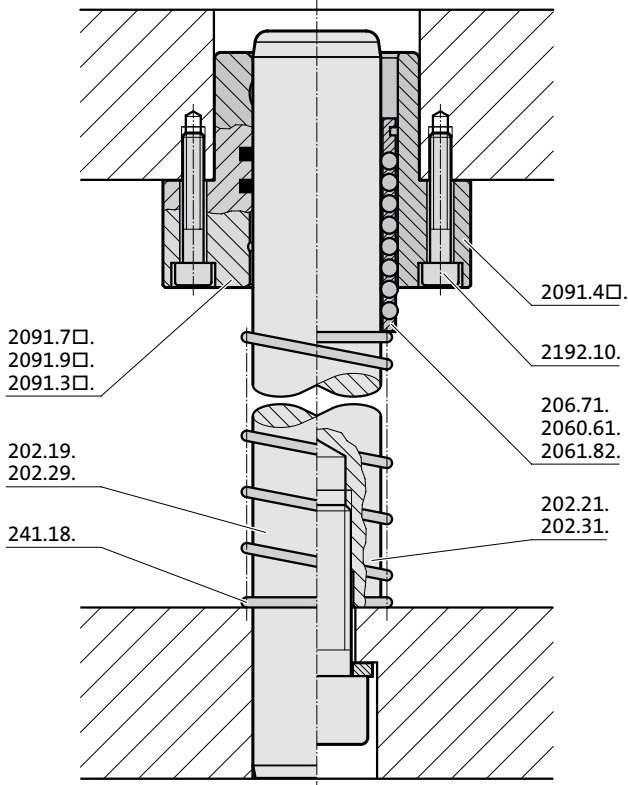
Since the distance (L/2) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.

At stroke rates > 500 strokes/min., increased mass acceleration values arise due to the larger plate weight of the stamp guide plate (incl. weight of the guide pillars). To counteract this negative effect, these guide pillars are designed as hollow pillars.



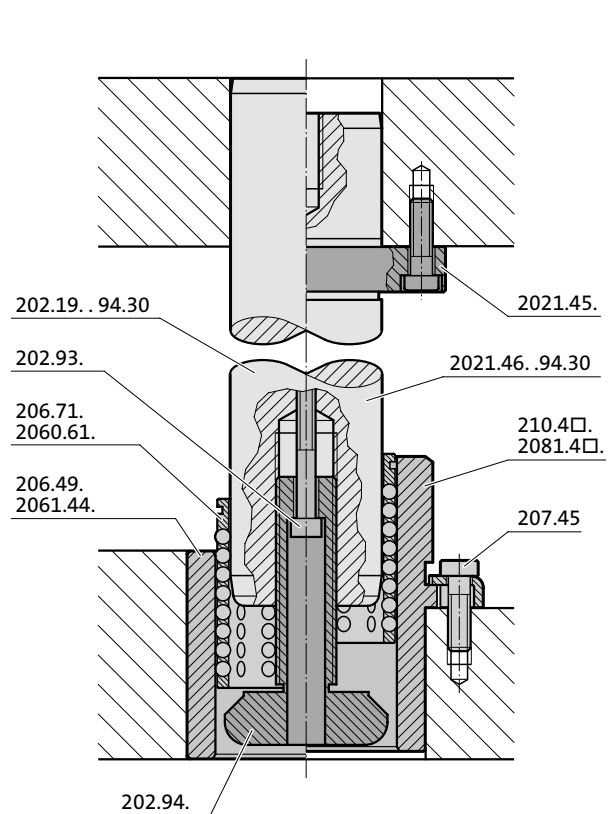
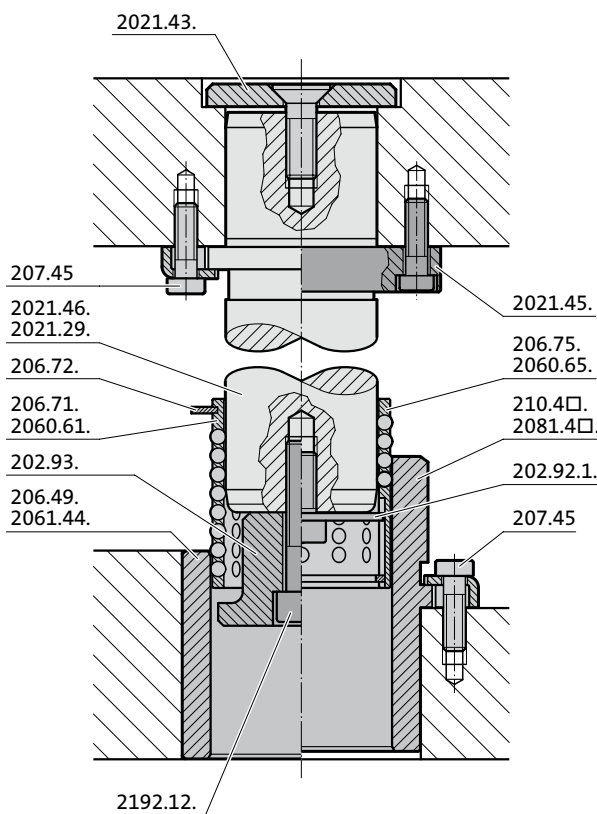
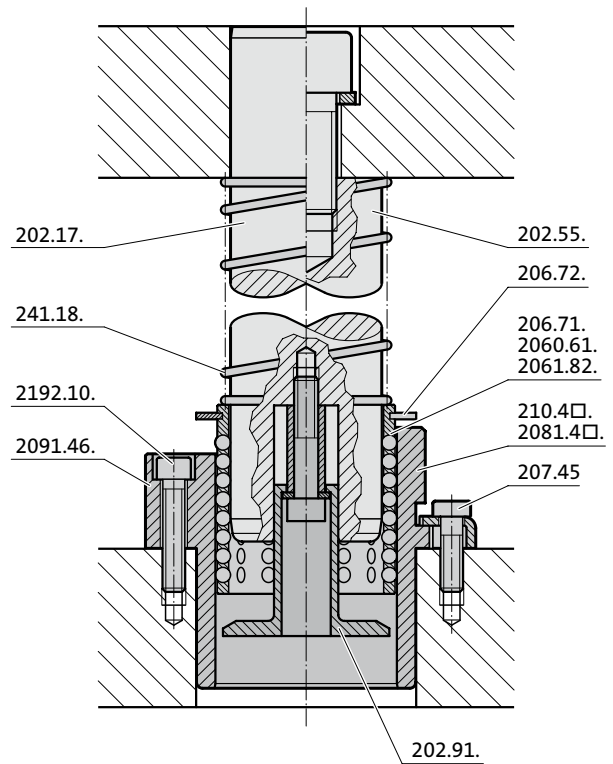
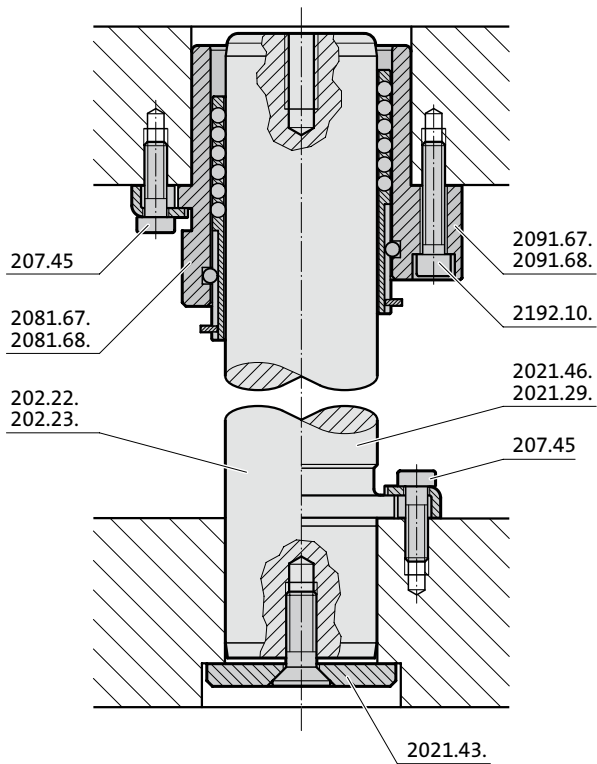
# APPLICATION EXAMPLES

## GUIDE ELEMENTS AND ACCESSORIES



# APPLICATION EXAMPLES

## GUIDE ELEMENTS AND ACCESSORIES



# BALL CAGE, SMALL DIMENSION

## GUIDE BUSH FOR BALL BEARING, SMALL DIMENSION



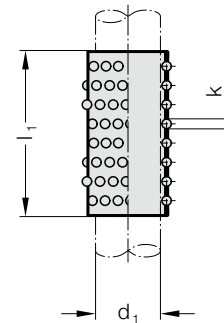
**Material:**

Cage: Brass  
 Balls: Steel hardened (DIN 5401)

**Ordering Code (example):**

Ball cage, small dimension	=	206.51.
Diameter of conduit $d_1$	5 mm =	005.
Length $l_1$	30 mm =	030
Order No	=	206.51. 005. 030

**206.51.**



**206.51. Ball cage, small dimension**

$d_1$	3	4	5	6	8
k	1	1	1	1	1
Total number of balls					
$l_1$					
10	24	30	36	42	
15	40	50	60	70	70
20	56	65	78	78	84
25		80	102	102	112
30		105	126	126	126
35		120	144	144	
40					175



**Material:**

Roller bearing steel 100 Cr 6  
 Hardness: hardened to 60 + 4 HRC  
 Remarks: available in stainless steel on request

**Execution:**

Guide bush bores  $d_2$  fine-honed to IT3

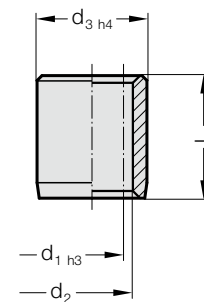
**Note:**

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Ordering Code (example):**

Guide bush for ball bearing, small dimension	=	206.54.
Diameter of conduit $d_1$	5 mm =	005.
Length $l_1$	10 mm =	010
Order No	=	206.54. 005. 010

**206.54.**

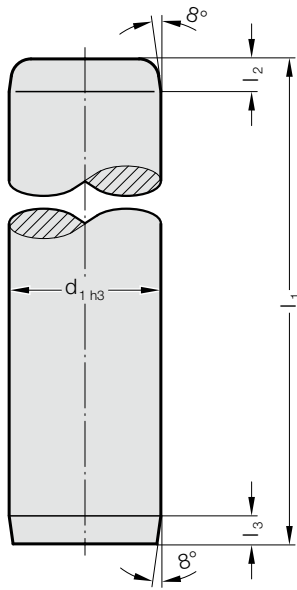


**206.54. Guide bush for ball bearing, small dimension**

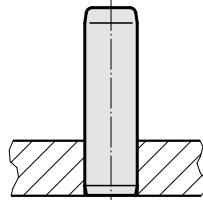
$d_1$	3	4	5	6	8
$d_2$	5	6	7	8	10
$d_3$	7	8	10	11	14
$l_1$					
10	●	●	●		
15	●	●	●	●	●
20	●	●	●	●	●
25		●	●	●	●
30			●	●	●
35				●	●
40					●

# GUIDE PILLAR DIN 9825/ISO 9182-2

202.19.



Mounting example



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$  ( up to  $\phi 12$ , troughhardened)

**Execution:**

fine-ground and superfinished  
 Method of manufacturing entails that centre holes are not concentric with O.D.

**Note:**

$\phi 3$  to  $\phi 8$  are not supplied classified.  
 $\phi 10$  to  $\phi 12$  only available in tolerance range yellow = .10

- Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
  - Matching guide combinations, see selection matrix at the beginning of chapter D.
  - Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
- Tolerance range:  
 yellow = .10; green = .20; red = .30

**202.19. Guide pillar DIN 9825/ISO 9182-2**

$d_1$	3	4 5	6	8	10	11 12	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$l_2$	2	2	2	2	3	3	4	4	6	6	6	8	8	8
$l_3$	2	2	2	2	3	3	3	3	3	3	3	3	3	3
$l_1$														
30	●													
40	●	●	●											
50	●	●	●	●										
60	●	●	●	●										
80	●	●	●	●		●								
90					●	●	●							
100		●	●	●	●	●	●	●	●					
112					●	●	●	●	●					
125			●	●	●	●	●	●	●	●				
140			●	●	●	●	●	●	●	●				
160			●	●		●	●	●	●	●	●			
180							●	●	●	●	●	●		
200							●	●	●	●	●	●	●	
224							●	●	●	●	●	●	●	
250							●	●	●	●	●	●	●	●
280							●	●	●	●	●	●	●	●
315							●	●	●	●	●	●	●	●
355							●	●	●	●	●	●	●	●
400								●	●	●	●	●	●	●
450								●	●	●	●	●	●	●
500								●	●	●	●	●	●	●
550									●	●	●	●	●	●
600										●	●	●	●	●
700											●	●	●	●
800												●	●	●

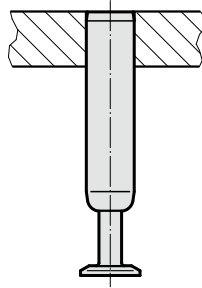
**Ordering Code (example):**

Guide pillar DIN 9825/ISO 9182-2	=	202.19.
Diameter of conduit $d_1$	25 mm	= 025.
Length $l_1$	224 mm	= 224.
Classification TOL	yellow	= 10
Order No	=	202.19. 025. 224. 10

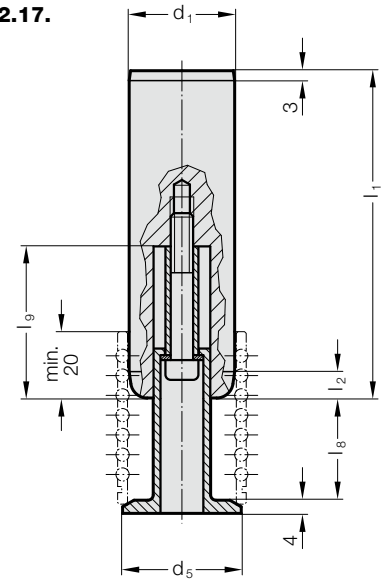
# GUIDE PILLAR WITH BALL CAGE RETAINER



Mounting example



202.17.



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine-ground and superfinished

**Note:**

- ☞ Preloading see pairing classification at the beginning of chapter D
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Dimensions of ball cage retainer see 202.91.

Tolerance range:

yellow = .10

green = .20

red = .30

**202.17. Guide pillar with ball cage retainer**

d <sub>1</sub>	38	40	48	50	60	63
d <sub>5</sub>	42	44	52	54	64	67
l <sub>2</sub>	6	6	8	8	8	8
KG (l <sub>8</sub> / l <sub>9</sub> )						
1 (31/46)	●	●	●	●	●	●
2 (41/56)	●	●	●	●	●	●
3 (51/66)	●	●	●	●	●	●
4 (61/76)	●	●	●	●	●	●
5 (73/89)	●	●	●	●	●	●
l <sub>1</sub>						
160	●	●				
180	●	●	●			
200	●	●	●	●		
224	●	●	●	●		
250	●	●	●	●	●	
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400	●	●	●	●	●	●
450	●	●	●	●	●	●
500	●	●	●	●	●	●
550	●	●	●	●	●	●
600	●	●	●	●	●	●
700	●	●	●	●	●	●
800	●	●	●	●	●	●

**Ordering Code (example):**

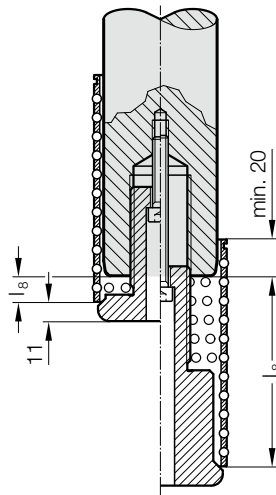
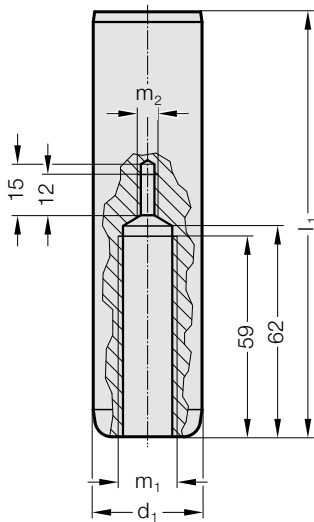
Guide pillar with ball cage retainer		= 202.17.
Diameter of conduit d <sub>1</sub>	48 mm	= 048.
Length l <sub>1</sub>	550 mm	= 550.
Cage unit size KG	1	= 1.
Classification TOL	yellow	= 10
Order No		= 202.17. 048. 550. 1. 10



# GUIDE PILLAR WITH CAGE RETAINER BORE

202.19. .30.94

Mounting example



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine-ground and superfinished

**Note:**

- Preloading see pairing classification at the beginning of chapter D
- Matching guide combinations, see selection matrix at the beginning of chapter D.

Dimensions of ball cage retainer see 202.94.

Tolerance range: red = .30

Delivery without cage retainer, ball cage and head cap screw.

**202.19. .30.94 Guide pillar with cage retainer bore**

	30 32	38 40	48 50	60 63	80
$d_1$	M16x1,5	M16x1,5	M20x1,5	M30x1,5	M30x1,5
$m_1$	M5	M5	M6	M8	M8
$m_2$					
$l_1$					
125	●				
140	●				
160	●	●			
180	●	●	●		
200	●	●	●		
224	●	●	●		
250	●	●	●	●	
280	●	●	●	●	●
315	●	●	●	●	●
355	●	●	●	●	●
400	●	●	●	●	●
450	●	●	●	●	●
500	●	●	●	●	●
550		●	●	●	●
600		●	●	●	●
700		●	●	●	●
800		●	●	●	●

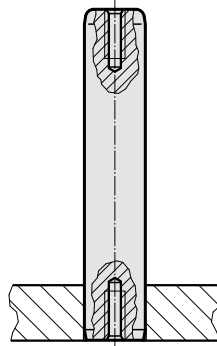
**Ordering Code (example):**

Guide pillar with cage retainer bore	=	202.19.
Diameter of conduit $d_1$	48 mm =	048.
Length $l_1$	224 mm =	224.
Classification red TOL	30 =	30.
Cage unit bore KHB	=	94
Order No	=	202.19. 048. 224. 30.94

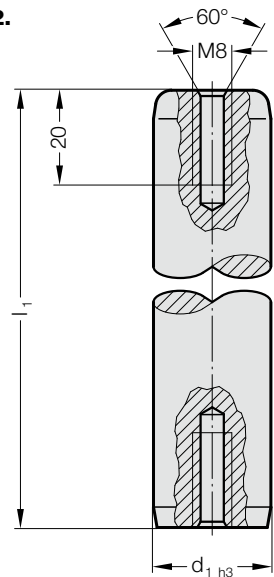
# GUIDE PILLAR WITH INTERNAL THREAD ON BOTH SIDES, ~DIN 9825/~ISO 9182-2



Mounting example



202.22.



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine-ground and superfinished  
 Method of manufacturing entails that centre holes are not concentric with O.D.

**Note:**

☞ Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**202.22. Guide pillar with internal thread on both sides, ~DIN 9825/~ISO 9182-2**

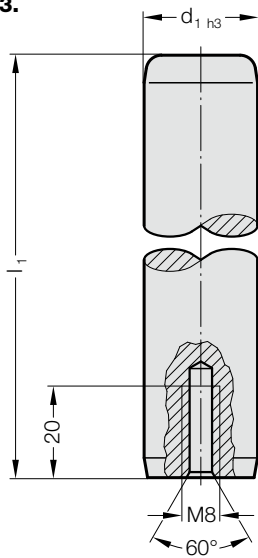
$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$l_2$	4	4	6	6	6	8	8	8
$l_1$								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●	●	
224	●	●	●	●	●	●	●	
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550				●	●	●	●	●
600				●	●	●	●	●
700				●	●	●	●	●
800				●	●	●	●	●

**Ordering Code (example):**

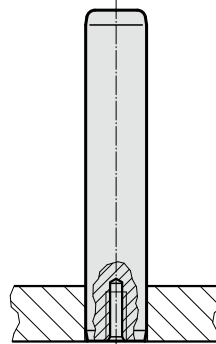
Guide pillar with internal thread on both sides, ~DIN 9825/~ISO 9182-2		= 202.22.
Diameter of conduit $d_1$	32 mm	= 032.
Length $l_1$	200 mm	= 200.
Classification TOL	yellow	= 10
Order No		= 202.22. 032. 200. 10

# GUIDE PILLAR WITH INTERNAL THREAD ON BOTTOM, ~DIN 9825/~ISO 9182-2

202.23.



Mounting example



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine-ground and superfinished  
 Method of manufacturing entails that centre holes are not concentric with O.D.

**Note:**

Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**202.23. Guide pillar with internal thread on bottom, ~DIN 9825/~ISO 9182-2**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$l_2$	4	4	6	6	6	8	8	8
$l_1$								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550				●	●	●	●	●
600				●	●	●	●	●
700				●	●	●	●	●
800					●	●	●	●

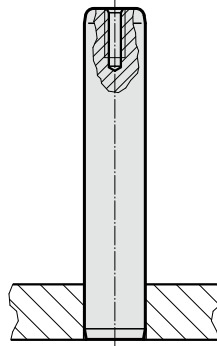
**Ordering Code (example):**

Guide pillar with internal thread on bottom, ~DIN 9825/~ISO 9182-2	= 202.23.
Diameter of conduit $d_1$	32 mm = 032.
Length $l_1$	200 mm = 200.
Classification TOL	yellow = 10
Order No	= 202.23. 032. 200. 10

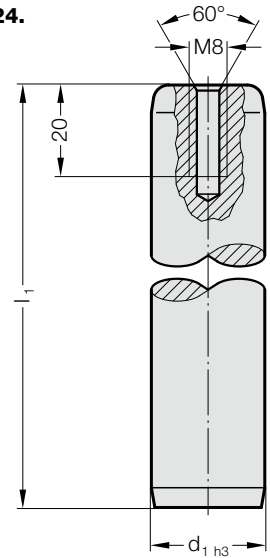
# GUIDE PILLAR WITH INTERNAL THREAD ON TOP, ~DIN 9825/~ISO 9182-2



Mounting example



202.24.



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine-ground and superfinished  
 Method of manufacturing entails that centre holes are not concentric with O.D.

**Note:**

Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**202.24. Guide pillar with internal thread on top, ~DIN 9825/~ISO 9182-2**

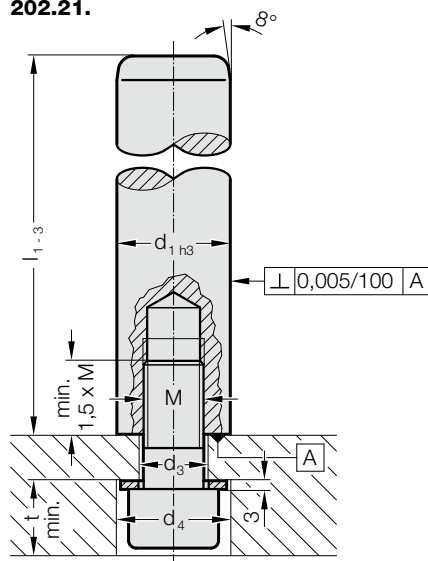
$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$l_2$	4	4	6	6	6	8	8	8
$l_1$								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550				●	●	●	●	●
600				●	●	●	●	●
700				●	●	●	●	●
800				●	●	●	●	●

**Ordering Code (example):**

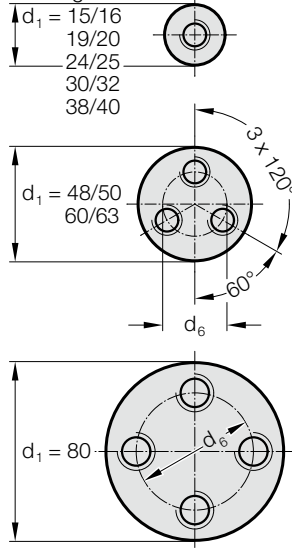
Guide pillar with internal thread on top, ~DIN 9825/~ISO 9182-2	=	202.24.
Diameter of conduit $d_1$	32 mm =	032.
Length $l_1$	200 mm =	200.
Classification TOL	yellow =	10
Order No	=	202.24. 032. 200. 10

# GUIDE PILLAR ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2

202.21.



Hole pattern for column (pillar) fastening



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine precision ground  
 End face square within  $0.005 \text{ mm}$  in  $100 \text{ mm}$

**Note:**

Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:  
 yellow = .10  
 green = .20  
 red = .30

**202.21. Guide pillar endwise bolt-on type, ~DIN 9825/~ISO 9182-2**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	9	11	14	18	18	14	18	18
$d_4$	17	20	22	28	28	22	28	28
$d_6$	-	-	-	-	-	28	34	54
t	12	14	16	20.5	20.5	16	20.5	20.5
M	8	10	12	16	16	12	16	16
Screw	M8x35	M10x40	M12x40	M16x40	M16x40	M12x50	M16x60	M16x60
Tightening torque [Nm]	21	37	85	150	150	85	200	200
$l_1$								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550				●	●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

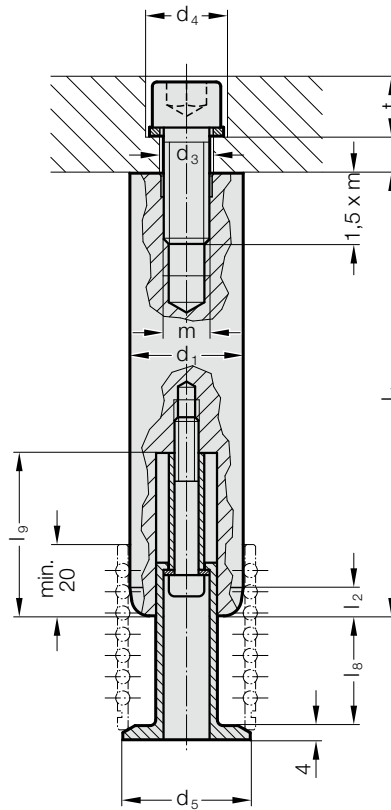
**Ordering Code (example):**

Guide pillar endwise bolt-on type, ~DIN 9825/~ISO 9182-2	=	202.21.
Diameter of conduit $d_1$	32 mm	= 032.
Length $l_1$	200 mm	= 200.
Classification TOL	yellow	= 10
Order No		= 202.21. 032. 200. 10

# GUIDE PILLAR ENDWISE BOLT-ON TYPE WITH BALL CAGE, ~DIN 9825/~ISO 9182-2



202.55.



## Material:

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

## Execution:

fine precision ground  
End face square within  $0.005 \text{ mm}$  in  $100 \text{ mm}$

## Note:

Preloading see pairing classification at the beginning of chapter D

Matching guide combinations, see selection matrix at the beginning of chapter D.

Dimensions of ball cage retainer see 202.91.

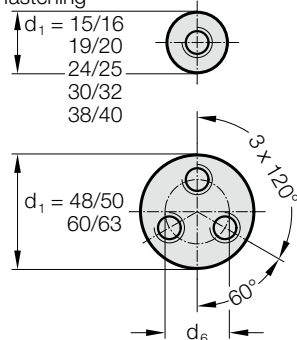
Tolerance range:

yellow = .10

green = .20

red = .30

Hole pattern for column (pillar) fastening



# GUIDE PILLAR ENDWISE BOLT-ON TYPE WITH BALL CAGE, ~DIN 9825/~ISO 9182-2

## 202.55. Guide pillar endwise bolt-on type with ball cage, ~DIN 9825/~ISO 9182-2

d <sub>1</sub>	38	40	48	50	60	63
d <sub>3</sub>	18	18	14	14	18	18
d <sub>4</sub>	28	28	22	22	28	28
d <sub>5</sub>	42	44	52	54	64	67
d <sub>6</sub>	0	0	28	28	34	34
t	20.5	20.5	16	16	20.5	20.5
m	16	16	12	12	16	16
Screw	M16x40	M16x40	M12x50	M12x50	M16x60	M16x60
Tightening torque [Nm]	150	150	85	85	200	200
KG (l <sub>8</sub> / l <sub>9</sub> )						
1 (31/46)	●	●	●	●	●	●
2 (41/56)	●	●	●	●	●	●
3 (51/66)	●	●	●	●	●	●
4 (61/76)	●	●	●	●	●	●
5 (73/89)	●	●	●	●	●	●
l <sub>1</sub>						
160	●	●				
180	●		●	●		
200	●	●	●	●		
224	●	●	●	●		
250	●	●	●	●	●	●
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400	●	●	●	●	●	●
450	●	●	●	●	●	●
500	●	●	●	●	●	●
550	●	●	●	●	●	●
600	●	●	●	●	●	●
700	●	●	●	●	●	●
800	●	●	●	●	●	●

### Ordering Code (example):

Guide pillar endwise bolt-on type with ball cage,  
~DIN 9825/~ISO 9182-2

= 202.55.

Diameter of conduit d<sub>1</sub> 48 mm = 048.

Length l<sub>1</sub> 550 mm = 550.

Cage unit size KG 1 = 1.

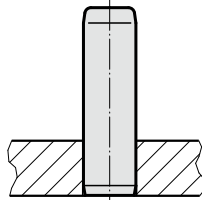
Classification TOL yellow = 10

Order No = 202.55. 048. 550. 1. 10

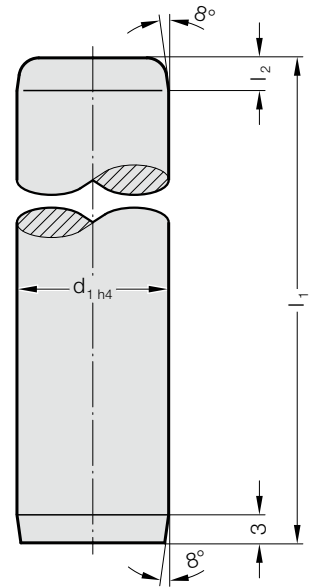
# GUIDE PILLAR ECO-LINE, ~DIN 9825/~ISO 9182-2



Mounting example



202.29.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration  $\geq 1,8$  mm

**Execution:**

ground  
 Method of manufacturing entails that centre holes are not concentric with O.D.

**Note:**

Guide pillars only recommended for use with sliding guides!  
 ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.  
 ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**202.29. Guide pillar ECO-LINE, ~DIN 9825/~ISO 9182-2**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$l_2$	4	4	6	6	6	8	8	8
$l_1$								
90	●							
100	●							
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550				●	●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

**Ordering Code (example):**

Guide pillar ECO-LINE, ~DIN 9825/~ISO 9182-2	=	202.29.
Diameter of conduit $d_1$	32 mm =	032.
Length $l_1$	125 mm =	125
Order No	=	202.29. 032. 125

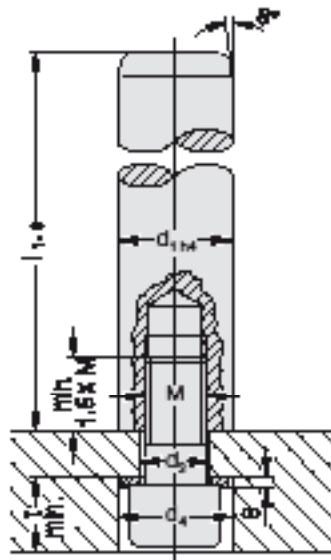




# GUIDE PILLAR ECO-LINE ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2



202511.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration  $\geq 1,8$  mm

**Execution:**

ground

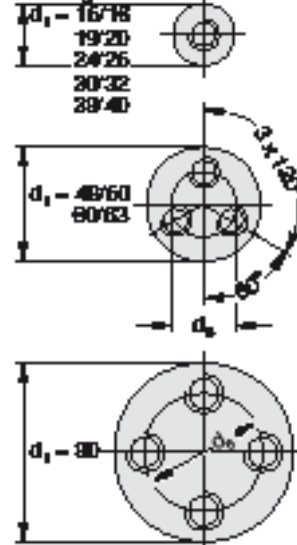
**Note:**

Guide pillars only recommended for use with sliding guides!

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

**Hole pattern for column (pillar)**

teasering



# GUIDE PILLAR ECO-LINE ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2

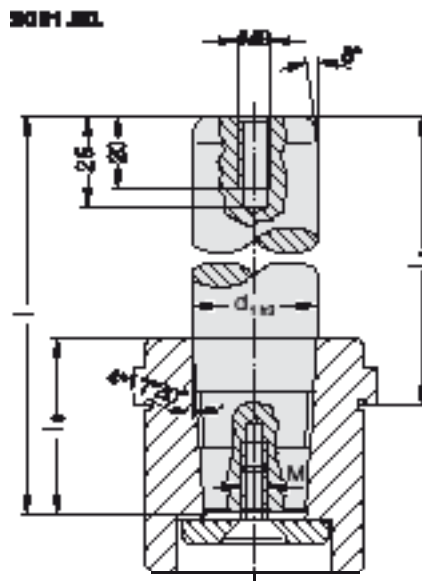
## 202.31. Guide pillar ECO-LINE endwise bolt-on type, ~DIN 9825/~ISO 9182-2

	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>1</sub>	9	11	14	18	18	14	18	18
d <sub>3</sub>	17	20	22	28	28	22	28	28
d <sub>4</sub>	-	-	-	-	-	28	34	54
d <sub>6</sub>	12	14	16	20.5	20.5	16	20.5	20.5
t	8	10	12	16	16	12	16	16
M	M8x35	M10x40	M12x40	M16x40	M16x40	M12x50	M16x60	M16x60
Screw	21	37	85	150	150	85	200	200
Tightening torque [Nm]								
l <sub>1</sub>								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●				
180	●	●	●	●		●		
200	●	●	●	●		●		
224	●	●	●	●		●		
250	●	●	●	●		●	●	
280	●	●	●	●		●	●	●
315	●	●	●	●		●	●	●
355	●	●	●	●		●	●	●
400		●	●	●		●	●	●
450			●	●		●	●	●
500			●	●		●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

### Ordering Code (example):

Guide pillar ECO-LINE endwise bolt-on type, ~DIN 9825/~ISO 9182-2		= 202.31.
Diameter of conduit d <sub>1</sub>	48 mm	= 032.
Length l <sub>1</sub>	550 mm	= 125
Order No		= 202.31. 032. 125

## GUIDE PILLAR, CONICAL, DIN 9825/ISO 9182-4/AFNOR



### Description:

FIBRO demountable pillars with conical shaft 2021.50. are recommended where die sharpening etc. demands frequent demounting and re-fitting.

### Material:

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened

Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$


### Execution:


fine-ground and superfinished

Method of manufacturing entails that centre holes are not concentric with O.D.

### Note:

Matching retaining bushes 2021.39./210.39. and retaining discs 2021.53./202.53. to be ordered separately.

 Preloading see pairing classification at the beginning of chapter D

 Matching guide combinations, see selection matrix at the beginning of chapter D.

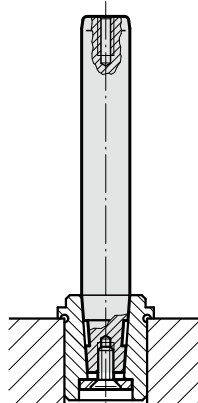
Tolerance range:

yellow = .10

green = .20

red = .30

### Mounting example



# GUIDE PILLAR, CONICAL, DIN 9825/ISO 9182-4/AFNOR

## 2021.50. Guide pillar, conical, DIN 9825/ISO 9182-4/AFNOR

$d_1$	16	19 20	24 25	25	30 32	32	38 40	40	48 50	50	60 63	63	63
$d_6$	22	22	25	25	32	32	40	40	50	50	63	63	63
M	6	6	8	8	8	8	8	8	10	10	12	12	12
$l_3$	28	38	35	45	48	61	48	61	58	78	69	77	97
$l_1$													
82	100												
95	113												
100	126		123										
112	130	138	135	145									
125	143	151	148	158	158								
140	166		163		173	186	173		180				
160	186		183	193	193	206	193	206	200	211			
180	206		203	213	213	226	213	226	220	231	237		
200	226		223	233	233		233		240	260	251	257	
224	247			257	270	257	270	264		275			
250	273			283		283		296	290	310	301	307	327
280	313				313		313		320	340	331	337	
315	348						348		355	375	366	372	392
355	395								395		406		432
400												477	

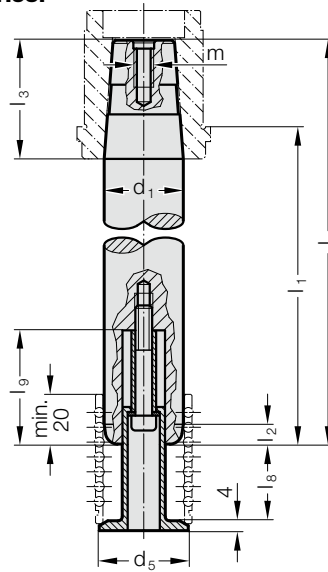
### Ordering Code (example):

Guide pillar, conical, DIN 9825/ISO 9182-4/AFNOR	=	2021.50.
Diameter of conduit $d_1$	38 mm =	038.
Guide length $l_1$	180 mm =	180.
Cone length $l_3$	48 mm =	048.
Classification TOL	yellow =	10
Order No	=	2021.50. 038. 180. 048. 10

# DEMOUNTABLE GUIDE PILLAR, CONICAL, WITH BALL CAGE RETAINER, DIN 9825/ISO 9182-4/AFNOR



2021.58.



## Description:

FIBRO demountable pillars with conical shaft 2021.58. are recommended where die sharpening etc. demands frequent demounting and re-fitting.

## Material:

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened


Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$


## Execution:

fine-ground and superfinished

## Note:

Matching retaining bushes 2021.39./210.39. and retaining discs 2021.53./202.53. to be ordered separately.

 Preloading see pairing classification at the beginning of chapter D

 Matching guide combinations, see selection matrix at the beginning of chapter D.

Dimensions of ball cage retainer see 202.91.

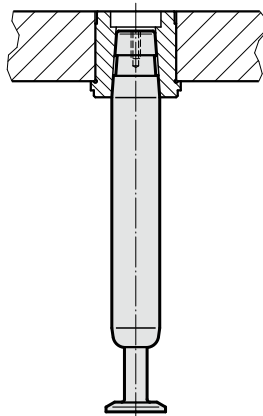
Tolerance range:

yellow = .10

green = .20

red = .30

## Mounting example



# DEMOUNTABLE GUIDE PILLAR, CONICAL, WITH BALL CAGE RETAINER, DIN 9825/ISO 9182-4/AFNOR

## 2021.58. Demountable guide pillar, conical, with ball cage retainer, DIN 9825/ISO 9182-4/AFNOR

d <sub>1</sub>	38	40	40	48	50	50	60	63	63	63
d <sub>5</sub>	42	44	44	52	54	54	64	67	67	67
m	8	8	8	10	10	10	12	12	12	12
l <sub>3</sub>	48	48	61	58	58	78	69	69	77	97
KG (l <sub>8</sub> / l <sub>9</sub> )										
1 (31 / 46)	●	●	●	●	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●	●	●	●	●
l <sub>1</sub>	1									
125	158	158								
140	173	173		180	180					
160	193	193	206	200	200		211	211		
180	213	213	226	220	220		231	231	237	
200	233	233		240	240	260	251	251	257	
224	257	257	270	264	264		275	275		
250	283	283	296	290	290	310	301	301	307	327
280	313	313		320	320	340	331	331	337	
315	348	348		355	355	375	366	366	372	392
355				395	395		406	406		432
400										477

### Ordering Code (example):

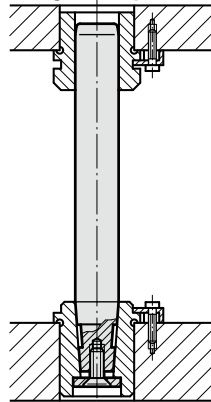
Demountable guide pillar, conical, with ball cage retainer, DIN 9825/ISO 9182-4/AFNOR		= 2021.58.
Diameter of conduit d <sub>1</sub>	50 mm	= 050.
Guide length l <sub>1</sub>	200 mm	= 200.
Cone length l <sub>3</sub>	58 mm	= 058.
Cage unit size KG	1	= 1
Classification TOL	yellow	= 1
Order No		= 2021.58. 050. 200. 058. 1 1

# RETAINING DISC WITH COUNTERSUNK HEAD CAP SCREW, DIN 9825/ISO 9182-4

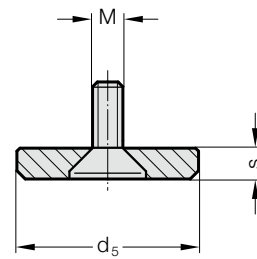
## RETAINING DISC WITH SOCKET CAP SCREW, ~AFNOR



Mounting example



2021.53.



**Material:**

Retaining disc: Steel, burnished  
Countersunk head cap screw DIN 7991/ISO 10642

**Note:**

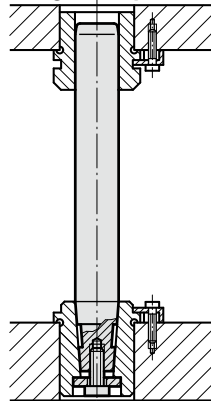
Has to be ordered separately to guide pillar, conical according to DIN 9825 / ISO 9182-4 2021.50. or 2021.58.

**2021.53. Retaining disc with countersunk head cap screw, DIN 9825/ISO 9182-4**

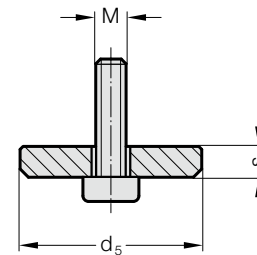
Order No	Nominal-ø	Pillar-ø	d <sub>5</sub>	s	M
2021.53.020	20	19/20	22	3	M6
2021.53.025	25	24/25	25	3	M8
2021.53.032	32	30/32	32	3	M8
2021.53.040	40	38/40	40	5	M8
2021.53.050	50	48/50	50	5	M10
2021.53.063	63	60/63	63	6	M12



Mounting example



202.53.



**Material:**

Retaining disc: Steel, burnished  
Socket head cap screw DIN 6912

**Note:**

Has to be ordered separately to guide pillar, conical according to AFNOR 2021.50. or 2021.58.

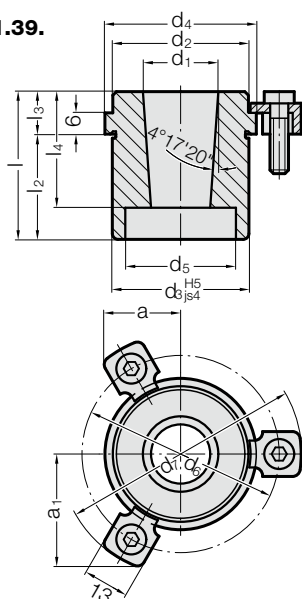
**202.53. Retaining disc with socket cap screw, ~AFNOR**

Order No	Pillar-ø	d <sub>5</sub>	s	M
202.53.016	16	18	3	M6
202.53.020	20	22	3	M6
202.53.025	25	25	4	M8
202.53.032	32	32	4	M8
202.53.040	40	40	4	M8
202.53.050	50	50	5	M10
202.53.063	63	63	6	M12

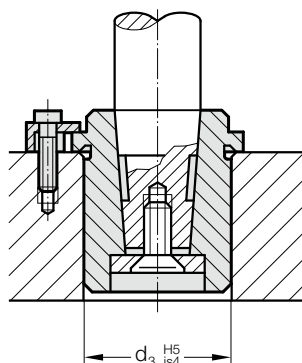


# RETAINING BUSH FOR GUIDE PILLAR CONICAL 2021.50., DIN 9825/ISO 9182-4

2021.39.



Mounting example



**Material:**

16 MnCr5,  
case hardened 58 ± 2 HRC  
Hardness penetration: ≥ 0,8 mm

**Execution:**

Retaining bore, outside diameter and shoulder precision ground.

**Note:**

Outside diameter  $d_3$  same as that of guide bushes 2081. and 2091.  
The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).  
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2021.39. Retaining bush for guide pillar conical 2021.50., DIN 9825/ISO 9182-4**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63
$d_2$	32	40	48	58	70	85
$d_3$	32	40	48	58	70	85
$d_4$	40	48	56	66	80	95
$d_5$	23	26	33	41	51	64
$d_6$	53	60	67	77	91	106
$d_7$	65.7	72.7	79.7	89.7	103.7	118.7
$a$	20.9	22.65	24.4	35.3	40.2	45.5
$a_1$	30.3	33.4	36.4	35.3	40.2	45.5
$l$	42 49	49 59	52 62	62 75	65 78	78 95
$l_2$	30 37	37 47	37 47	47 60	47 60	60 77
$l_3$	12	12	15	15	18	18
$l_4$	39	36	49	49	59	70

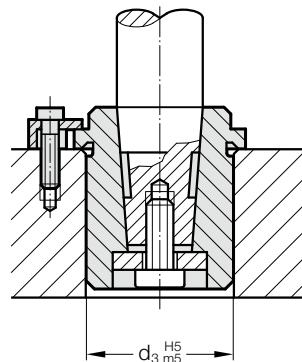
**Ordering Code (example):**

Retaining bush for guide pillar conical 2021.50.,			
DIN 9825/ISO 9182-4		= 2021.39.	
Nominal diameter $d_1$	38 mm	=	038.
Installation length $l_2$	47 mm	=	047
Order No		= 2021.39. 038. 047	

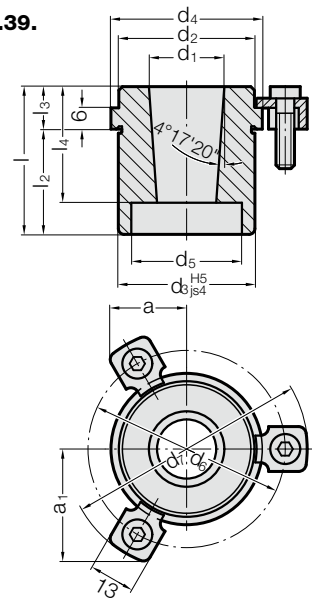
# RETAINING BUSH FOR GUIDE PILLAR CONICAL 2021.50.,~AFNOR



Mounting example



210.39.




**Material:**

16 MnCr5,  
 case hardened  $58 \pm 2$  HRC  
 Hardness penetration:  $\geq 0,8$  mm

**Execution:**

Retaining bore, outside diameter and shoulder precision ground.

**Note:**

Outside diameter  $d_3$  same as that of guide bush 210.  
 The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).  
 Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**210.39. Retaining bush for guide pillar conical 2021.50.,~AFNOR**

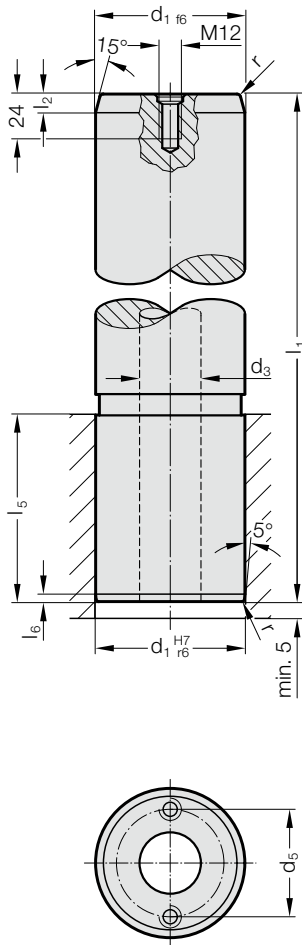
$d_1$	16	20	25	32	40	50	63
$d_2$	29	32	41	51	65	84	100
$d_3$	28	32	40	50	63	80	90
$d_4$	32	36	45	56	70	90	110
$d_5$	19	23	26	33	41	51	64
$d_6$	45	49	57	67	81	101	121
$d_7$	57.7	61.7	69.7	79.7	93.7	113.7	133.7
$a$	18.9	19.9	21.9	24.4	36	43	50.1
$a_1$	26.9	28.6	32.1	36.4	36	43	50.1
$l$	40	50	50 60	63 76	63 76	79 96	98 118
$l_2$	30	38	38 48	48 61	48 61	61 78	78 98
$l_3$	10	12	12	15	15	18	20
$l_4$	30	40	37 47	50 63	50 63	63 80	79 99

**Ordering Code (example):**

Retaining bush for guide pillar conical 2021.50.,~AFNOR	=	210.39.
Nominal diameter $d_1$	40 mm =	040.
Installation length $l_2$	48 mm =	048
Order No	=	210.39. 040. 048

# GUIDE PILLAR FOR LARGE TOOLS, DIN 9833/ISO 9182-3

2022.19.



**Material:**

Steel, surface hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground

up to  $\varnothing d_1 = 80$  without central hole

by  $\varnothing d_1 = 80$  with 1 lifting thread M12

from  $\varnothing d_1 = 100$  with central hole (through) and with 2 lifting threads M12

**Note:**

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2022.19. Guide pillar for large tools, DIN 9833/ISO 9182-3**

$d_1$	25	32	40	50	63	80	100	125	160
$d_3$	-	-	-	-	-	-	50	65	95
$d_5$	-	-	-	-	-	-	72	90	132
$r$	2	2	2	2.5	2.5	3	3	4	4
$l_2$	8	8	8	10	10	10	10	12	12
$l_5$	40	45	56	70	80	100	125	140	180
$l_6$	4	4	4	4	4	4	4	5	5
$l_1$									
125	●	●							
140	●	●							
160	●	●	●	●					
180	●	●	●	●	●				
200	●	●	●	●	●				
224	●	●	●	●	●	●			
250		●	●	●	●	●	●		
280			●	●	●	●	●	●	
315				●	●	●	●	●	●
355				●	●	●	●	●	●
400					●	●	●	●	●
450						●	●	●	●
500						●	●	●	●
560									●

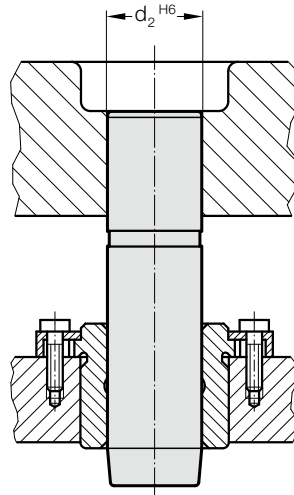
**Ordering Code (example):**

Guide pillar for large tools, DIN 9833/ISO 9182-3	=	2022.19.
Diameter of conduit $d_1$	63 mm	= 063.
Length $l_1$	180 mm	= 180
Order No	=	2022.19. 063. 180

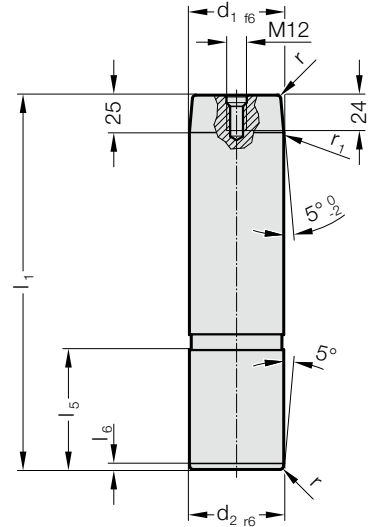
# GUIDE PILLAR WITH 5° PILOT TAPER, TO VW-STANDARD



Mounting example



2022.13.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

precision ground  
 ø d<sub>1</sub> = 80 with 1 lifting thread M12

**Note:**

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Application:**

Floating support in upper half of trimming tools.

**2022.13. Guide pillar with 5° pilot taper, to VW-Standard**

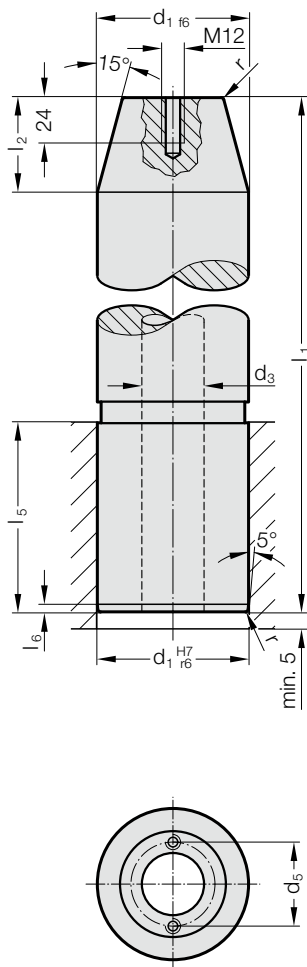
	40	50	63	80
d <sub>1</sub>	40	50	63	80
d <sub>2</sub>	40	50	63	80
l <sub>5</sub>	56	70	80	100
l <sub>6</sub>	4	4	4	4
r	2	2,5	2,5	3
r <sub>1</sub>	3	5	6	8
l <sub>1</sub>				
140	●			
160	●	●		
180	●	●	●	
200	●	●	●	
224	●	●	●	●
250	●	●	●	●
280	●	●	●	●
315		●	●	●
355		●	●	●
400			●	●

**Ordering Code (example):**

Guide pillar with 5° pilot taper, to VW-Standard	=	2022.13.
Diameter of conduit d <sub>1</sub>	63 mm =	063.
Length l <sub>1</sub>	180 mm =	180
Order No	=	2022.13. 063. 180

# GUIDE PILLAR WITH PILOT TAPPER, VDI 3356

2022.15.



**Material:**

Steel, surface hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground

ø d<sub>1</sub> = 80 without central hole with 1 lifting thread M12

from ø d<sub>1</sub> = 100 with central hole (through) and with 2 lifting threads M8

**Note:**

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

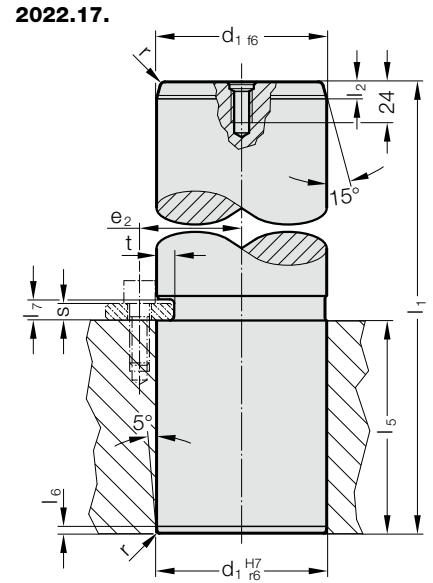
**2022.15. Guide pillar with pilot taper, VDI 3356**

d <sub>1</sub>	80	100	125	160
d <sub>3</sub>	-	50	65	95
d <sub>5</sub>	-	62	82	119
r	3	3	4	4
l <sub>2</sub>	50	50	50	50
l <sub>5</sub>	100	125	140	180
l <sub>6</sub>	4	4	5	5
l <sub>1</sub>				
280	●			
315		●		
355	●	●	●	
400	●	●	●	
450	●	●	●	●
500			●	●
560				●

**Ordering Code (example):**

Guide pillar with pilot taper, VDI 3356	=	2022.15.
Diameter of conduit d <sub>1</sub>	125 mm =	125.
Length l <sub>1</sub>	355 mm =	355
Order No	=	2022.15. 125. 355

# GUIDE PILLAR WITH GROOVE, TO VW



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground  
 ø d<sub>1</sub> = 80 with 1 lifting thread M12

**Note:**

Secure with locating plate 2022.40.1.  
 Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2022.17. Guide pillar with groove, to VW**

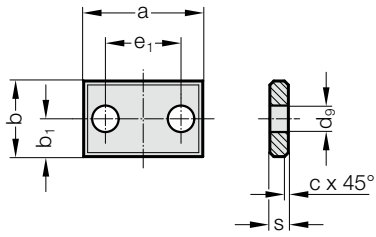
d <sub>1</sub>	25	32	40	50	63	80
l <sub>2</sub>	8	8	8	10	10	10
l <sub>5</sub>	40	45	56	70	80	100
l <sub>6</sub>	4	4	4	4	4	4
l <sub>7</sub>	7	7	10	10	12	12
r	2	2	2	2.5	2.5	3
e <sub>2</sub>	20.5	24	29.5	33.5	43	50
t	3	3	4	4	6.5	8
l <sub>1</sub>						
125	●	●				
140	●	●	●			
160	●	●	●	●		
180	●	●	●	●	●	
200	●	●	●	●	●	
224	●	●	●	●	●	●
250		●	●	●	●	●
280			●	●	●	●
315				●	●	●
355				●	●	●
400					●	●
450						●
500						●

**Ordering Code (example):**

Guide pillar with groove, to VW	=	2022.17.
Diameter of conduit d <sub>1</sub>	50 mm	= 050.
Length l <sub>1</sub>	160 mm	= 160
Order No		= 2022.17. 050. 160

# LOCATING PLATE FOR GUIDE PILLAR, TO VW

2022.40.1.



## 2022.40.1. Locating plate for guide pillar, to VW

Order No	Pillar-ø	a	b	s	c	b <sub>1</sub>	e <sub>1</sub>	d <sub>9</sub>
2022.40.1.02	25 / 32	40	20	5	1	10	20	9
2022.40.1.04	40 / 50	48	25	8	2	12.5	24	11
2022.40.1.06	63 / 80	60	34	10	2	17	30	14

### Material:

Steel

### Note:

Screws are not included.

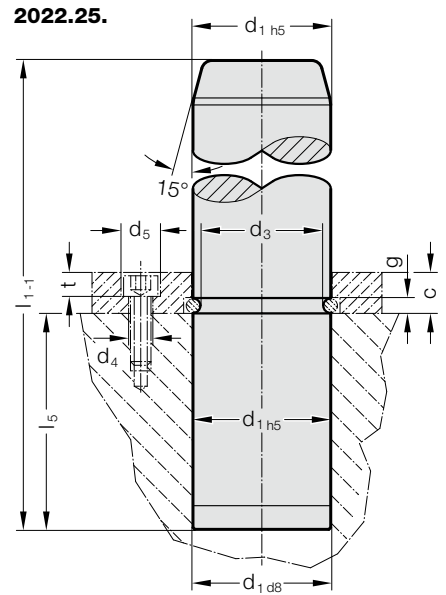
### Fixing:

Use socket cap screws DIN EN ISO 4762.

### Ordering Code (example):

Locating plate for guide pillar, to VW	=	2022.40.1.
Nominal size NENN	04 =	04
Order No	=	2022.40.1.04

# GUIDE PILLAR WITH RETAINING RING GROOVE, ~AFNOR



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground

**Note:**

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Fixing:**

Clamping flange with retaining ring, without screws, 2073.46.□□□ order separately.

**2022.25. Guide pillar with retaining ring groove, ~AFNOR**

d <sub>1</sub>	25	32	40	50	63	80	100
d <sub>3</sub>	22.3	27.8	35.8	45.8	56.8	73.8	93.8
g	2.7	4.2	4.2	4.2	6.2	6.2	6.2
l <sub>5</sub>	25	32	63	80	100	125	160
l <sub>1</sub>							
100	●						
125	●	●					
140	●	●					
160	●	●					
180	●	●	●				
200	●	●	●	●			
220	●	●	●	●	●		
250		●	●	●	●	●	
280			●	●	●	●	
315			●	●	●	●	●
355				●	●	●	●
400				●	●	●	●
450					●	●	●
500					●	●	●

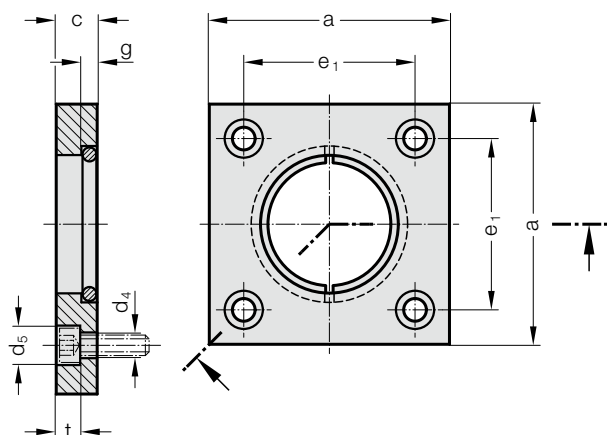
**Ordering Code (example):**

Guide pillar with retaining ring groove, ~AFNOR	=	2022.25.
Diameter of conduit d <sub>1</sub>	50 mm =	050.
Length l <sub>1</sub>	220 mm =	220
Order No	=	2022.25. 050. 220



## CLAMPING FLANGE WITH RETAINING RING, ~AFNOR

2073.46.



### Material:

Clamping flange: Steel

Retaining ring: Spring steel wire

### Note:

For fixing the guide pillar 2022.25.

Order No. for reordering retaining ring: 2073.46.□□□.2

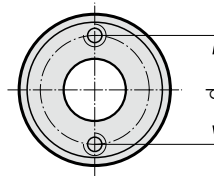
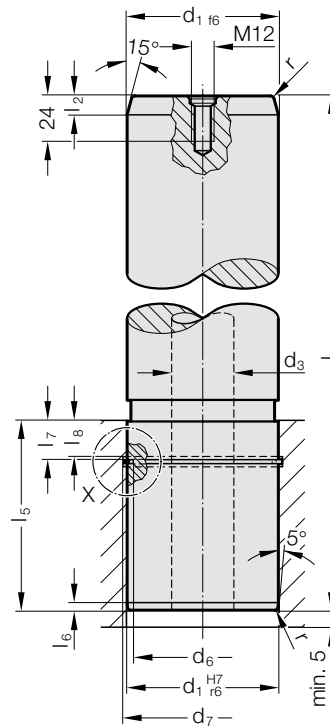
### 2073.46. Clamping flange with retaining ring, ~AFNOR

Order No	Pillar- $\phi$	$d_1$	$d_4$	$d_5$	a	c	g	$e_1$	t
2073.46.025		25	6.6	11	45	10	2.7	31	7
2073.46.032		32	6.6	11	56	10	4.2	36	7
2073.46.040		40	6.6	11	70	12	4.2	50	7
2073.46.050		50	9	15	80	14	4.2	55	9
2073.46.063		63	11	18	100	18	6.2	70	11
2073.46.080		80	13.5	20	110	20	6.2	80	13
2073.46.100		100	13.5	20	140	20	6.2	100	13

# GUIDE PILLAR WITH SNAP RING GROOVE, TO MERCEDES-BENZ STANDARD



2022.16.



## Material:

Steel, surface hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

## Execution:

ground

up to  $\varnothing d_1 = 80$  without central hole

by  $\varnothing d_1 = 80$  with 1 lifting thread M12

from  $\varnothing d_1 = 100$  with central hole (through) and with 2 lifting threads M12

## Note:

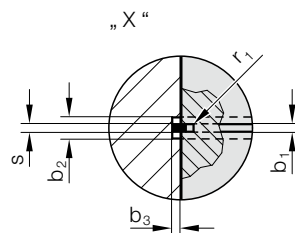
Secure with snap ring 2061.48.

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## Mounting example



# GUIDE PILLAR WITH SNAP RING GROOVE, TO MERCEDES-BENZ STANDARD

## 2022.16. Guide pillar with snap ring groove, to Mercedes-Benz Standard

d <sub>1</sub>	40	50	63	80	100	125	160
d <sub>3</sub>	-	-	-	-	50	65	95
d <sub>5</sub>	-	-	-	-	72	90	132
d <sub>6</sub>	33	43	55.7	71.4	89.9	114.9	148.9
r	2	2.5	2.5	3	3	4	4
r <sub>1</sub>	1	1	1	1.05	1.3	1.3	1.3
l <sub>2</sub>	8	10	10	10	10	12	12
l <sub>5</sub>	56	70	80	100	125	140	180
l <sub>6</sub>	4	4	4	4	4	5	5
l <sub>7</sub>	15	15	15	21	31	31	31
l <sub>8</sub>	14	14	14	20	30	30	30
b <sub>1</sub>	2	2	2	2.1	2.6	2.6	2.6
b <sub>2</sub>	3.2	3.2	3.2	4.2	5.2	5.2	5.2
l <sub>1</sub>							
140	●						
160	●	●					
180	●	●	●				
200	●	●	●				
224	●	●	●	●			
250	●	●	●	●	●		
280	●	●	●	●	●	●	
315		●	●	●	●	●	●
355		●	●	●	●	●	●
400			●	●	●	●	●
450				●	●	●	●
500				●	●	●	●
560							●

### Ordering Code (example):

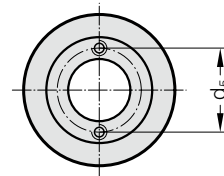
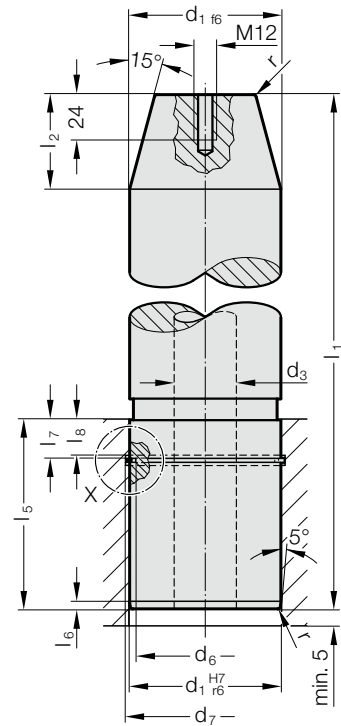
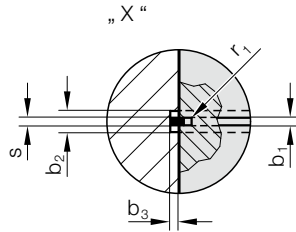
Guide pillar with snap ring groove,  
to Mercedes-Benz Standard = 2022.16.  
Diameter of conduit d<sub>1</sub> 80 mm = 080.  
Length l<sub>1</sub> 224 mm = 224  
Order No = 2022.16. 080. 224

# GUIDE PILLAR WITH PILOT TAPPER AND GROOVE, TO MERCEDES-BENZ STANDARD



Mounting example

2022.12.



## Material:

Steel, surface hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

## Execution:

ground

$\varnothing d_1 = 80$  without central hole with 1 lifting thread M12

from  $\varnothing d_1 = 100$  with central hole (through) and with 2 lifting threads M8

## Note:

Secure with snap ring 2061.48.

Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2022.12. Guide pillar with pilot taper and groove, to Mercedes-Benz Standard

$d_1$	80	100	125	160
$d_3$	-	50	65	95
$d_5$	-	62	82	119
$d_6$	71.4	89.9	114.9	148.9
$r$	3	3	4	4
$r_1$	1.05	1.3	1.3	1.3
$l_2$	50	50	50	50
$l_5$	100	125	140	180
$l_6$	4	4	5	5
$l_7$	21	31	31	31
$l_8$	20	30	30	30
$b_1$	2.1	2.6	2.6	2.6
$b_2$	4.2	5.2	5.2	5.2
$l_1$				
280	●			
315	●			
355	●	●	●	
400	●	●	●	
450	●	●	●	
500			●	●
560				●

## Ordering Code (example):

Guide pillar with pilot taper and groove,  
to Mercedes-Benz Standard

= 2022.12.

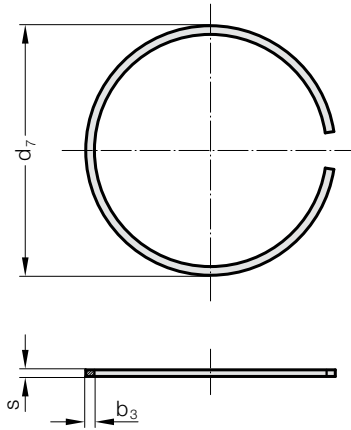
Diameter of conduit  $d_1$  125 mm = 125.

Length  $l_1$  355 mm = 355

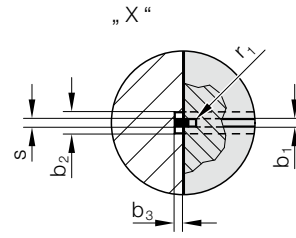
Order No = 2022.12. 125. 355

# SNAP RING

2061.48.



Mounting example



2061.48. Snap ring

Order No	Pillar- $\phi$	$b_1$	$b_3$	$d_7$	$s$
2061.48.040	40	2	2.3	43	1.5
2061.48.050	50	2	2.3	53	1.5
2061.48.063	63	2	2.3	66	1.5
2061.48.080	80	2.1	2.8	83.2	2
2061.48.100	100	2.6	3.4	103.8	2.5
2061.48.125	125	2.6	3.4	128.8	2.5
2061.48.160	160	2.6	4	164.3	2.5

**Material:**

Spring strip steel

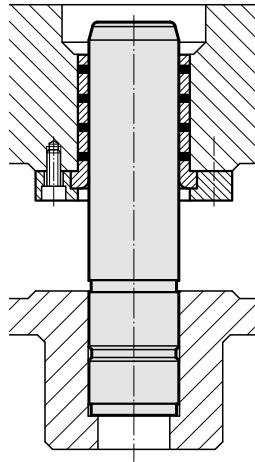
**Note:**

For securing guide pillars 2022.12. and 2022.16.

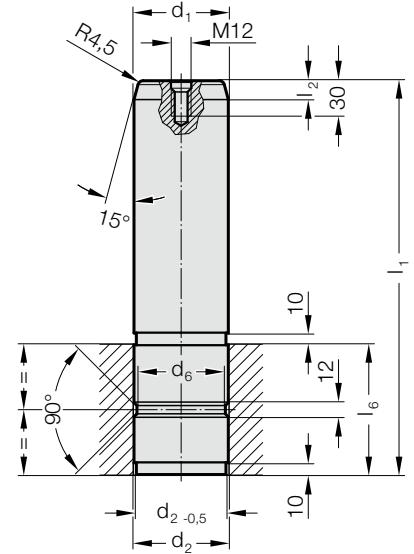
# GUIDE PILLAR WITH GROOVE, TO CNOMO



Mounting example



2022.16.45.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 3 HRC, Hardness penetration 2 + 1,6 mm

**Execution:**

precision ground

**Note:**

Fit for receiving bore H7.  
 Guide pillar is recommended to be used only with guide elements with solid lubricant.  
 ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

**2022.16.45. Guide pillar with groove, to CNOMO**

d <sub>1</sub>	80	100
Tolerance	-0,010/-0,025	-0,010/-0,025
d <sub>2</sub>	80	100
Tolerance	+0,04/+0,05	+0,045/+0,055
d <sub>6</sub>	75	95
l <sub>2</sub>	16	16
l <sub>6</sub>	110	140
l <sub>1</sub>		
350	●	
400	●	●
450		●

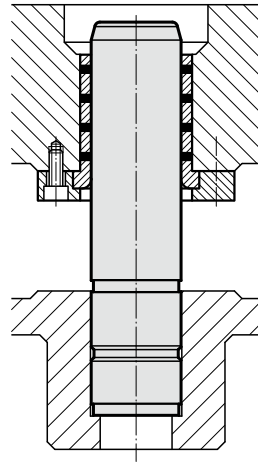
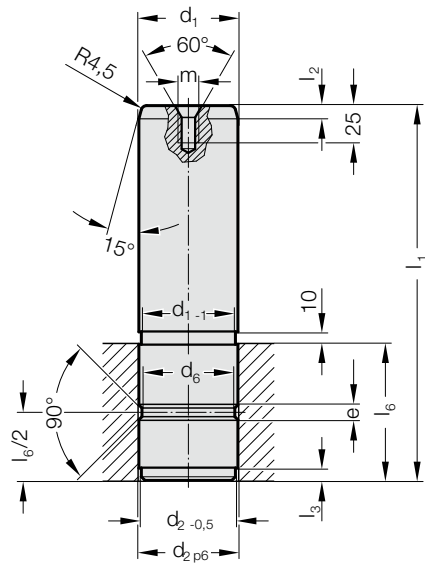
**Ordering Code (example):**

Guide pillar with groove, to CNOMO	=	2022.16.45.
Diameter of conduit d <sub>1</sub>	100 mm =	100.
Length l <sub>1</sub>	400 mm =	400
Order No	=	2022.16.45. 100.400

# GUIDE PILLAR WITH GROOVE

2022.16.48.

Mounting example



**Material:**

Steel, surface hardened  
Surface hardness: 55 + 5 HRC, Hardness penetration 2 + 1,6 mm

**Execution:**

precision ground

**Note:**

Fit for receiving bore H7.  
Guide pillar is recommended to be used only with guide elements with solid lubricant.  
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

**2022.16.48. Guide pillar with groove**

d <sub>1</sub>	25	30	40	50	60	65	80	100
Tolerance	-0,005/-0,015	-0,005/-0,015	-0,005/-0,015	-0,005/-0,015	-0,01/-0,02	-0,01/-0,02	-0,01/-0,025	-0,01/-0,025
d <sub>2</sub>	25	30	40	50	60	65	80	100
Tolerance	+0,022/+0,035	+0,022/+0,035	+0,026/+0,042	+0,026/+0,042	+0,032/+0,051	+0,032/+0,051	+0,032/+0,051	+0,037/+0,059
d <sub>6</sub>	21	26	36	45	55	60	75	95
l <sub>2</sub>	5	5	5	10	10	10	10	10
l <sub>3</sub>	5	5	5	10	10	10	10	10
l <sub>6</sub>	30	40	50	70	90	100	120	150
m	M8	M8	M8	M12	M12	M12	M12	M12
l <sub>1</sub>								
80	●							
100	●	●						
120	●	●	●					
140		●	●					
160		●	●	●				
180		●	●	●	●			
200			●	●	●			
220					●			
250				●	●	●	●	
300				●	●	●	●	●
350					●	●	●	●
400							●	●

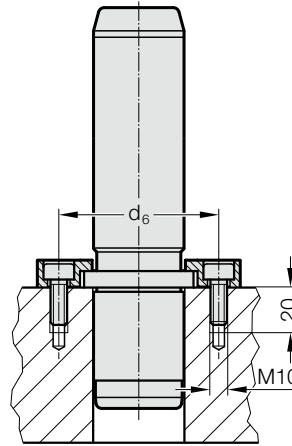
**Ordering Code (example):**

Guide pillar with groove	=	2022.16.48.
Diameter of conduit d <sub>1</sub>	60 mm	= 060.
Length l <sub>1</sub>	200 mm	= 200
Order No	=	2022.16.48. 060. 200

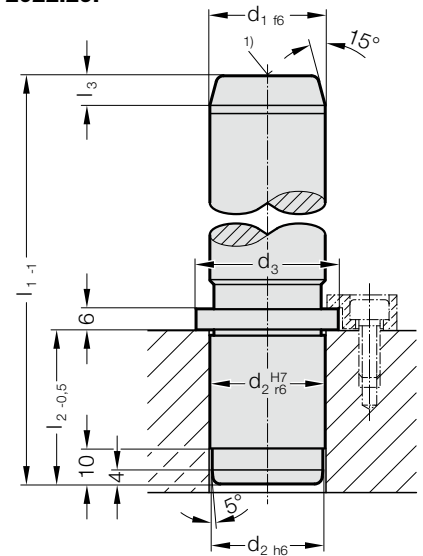
# GUIDE PILLAR WITH COLLAR, TO WDX



Mounting example



2022.29.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

precision ground  
 Method of manufacturing entails that centre holes are not concentric with O.D.  
 1) from  $\varnothing d_1 = 80$  - with thread M12x18 deep

**Note:**

Guide pillar is recommended to be used only with guide elements with solid lubricant.  
 Matching guide combinations, see selection matrix at the beginning of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Order No. for guide pillar with collar, to WDX, with screw clamps: 2022.29.□□□.□□□.A

**Fixing:**

(to be ordered separately)  
 Screw clamps with screws 2072.46 (M10 x 20 DIN EN ISO 4762)  
 up to  $\varnothing d_1 = 50$  - 2 screw clamps  
 from  $\varnothing d_1 = 63$  - 3 screw clamps

**2022.29. Guide pillar with collar, to WDX**

$d_1$	25	32	40	50	63	80	100
$d_2$	25	32	40	50	63	80	100
$d_3$	32	40	50	60	80	90	110
$d_6$	68	75	83	93	106	123	143
$l_2$	40	42	56	70	80	100	125
$l_3$	6	8	8	10	10	10	10
$l_1$							
125	●						
140	●	●					
160	●	●	●	●			
180	●	●	●	●			
200	●	●	●	●	●		
224	●	●	●	●	●	●	
250		●	●	●	●	●	
280			●	●	●	●	●
315				●	●	●	●
355					●	●	●
400					●	●	●
500						●	●

**Ordering Code (example):**

Guide pillar with collar, to WDX	=	2022.29.
Diameter of conduit $d_1$	50 mm =	050.
Length $l_1$	160 mm =	160
Order No	=	2022.29. 050. 160

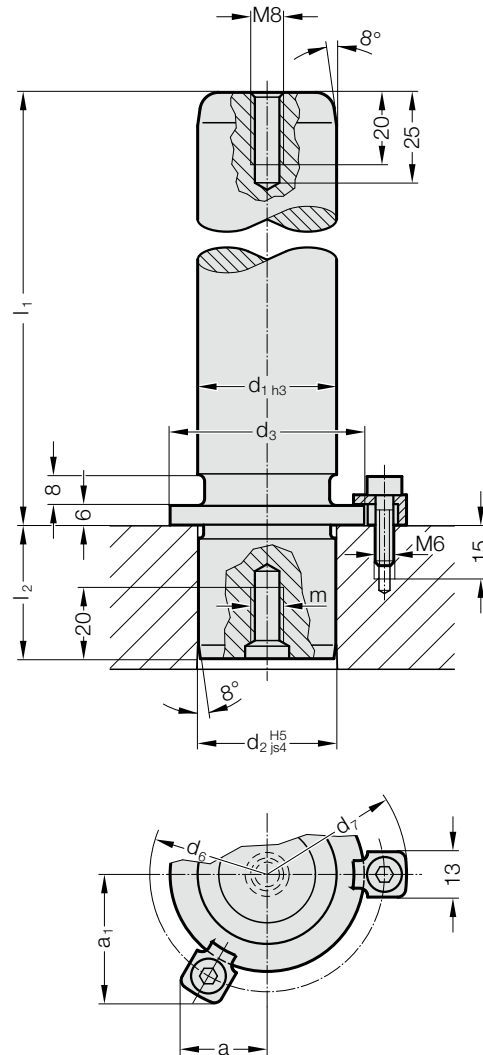




# GUIDE PILLAR WITH COLLAR, SCREW CLAMP RETENTION, DIN 9825/~ISO 9182-5



2021.46.



## Description:

Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

## Material:

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened

Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

## Execution:

fine precision ground

Method of manufacturing entails that centre holes are not concentric with O.D.

## Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head  $\varnothing 13$ ).

Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).

Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

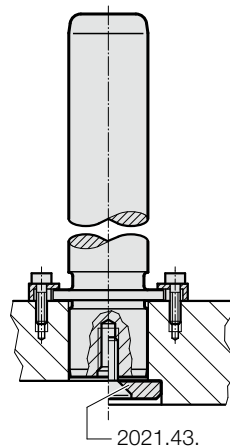
Tolerance range:

yellow = .10

green = .20

red = .30

## Mounting example



# GUIDE PILLAR WITH COLLAR, SCREW CLAMP RETENTION, DIN 9825/~ISO 9182-5

## 2021.46. Guide pillar with collar, screw clamp retention, DIN 9825/~ISO 9182-5

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	22	25	32	40	50	63	80	95
d <sub>6</sub>	33	36	43	51	61	74	91	106
d <sub>7</sub>	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a <sub>1</sub>	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	8	8	8	8	8	8	8	12
l <sub>2</sub>	20	23	30	37	37	47	47	60
l <sub>1</sub>								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

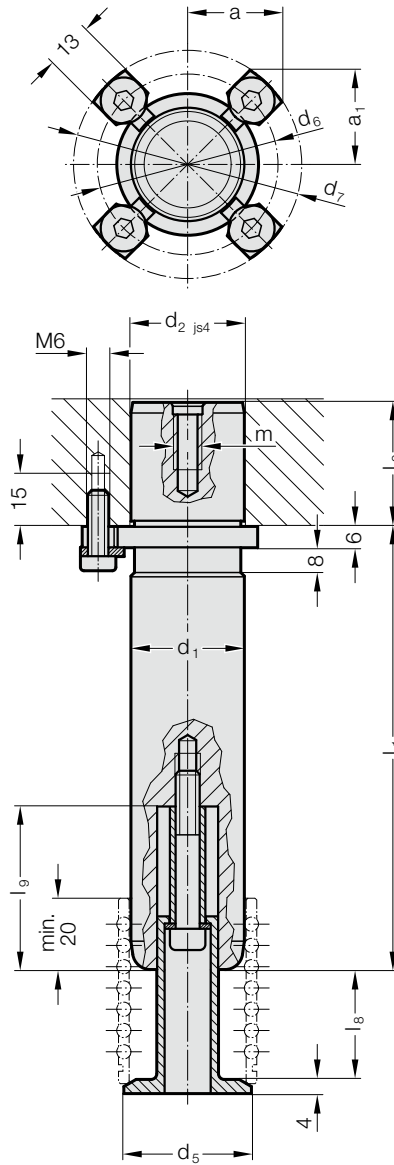
### Ordering Code (example):

Guide pillar with collar, screw clamp retention, DIN 9825/~ISO 9182-5		= 2021.46.
Diameter of conduit d <sub>1</sub>	32 mm	= 032.
Length l <sub>1</sub>	315 mm	= 315.
Classification TOL	yellow	= 10
Order No		= 2021.46. 032. 315. 10

# GUIDE PILLAR WITH COLLAR AND BALL CAGE RETAINER



2021.44.



**Description:**

Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine precision ground

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head  $\varnothing 13$ ).

Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).

☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Dimensions of ball cage retainer see 202.91.

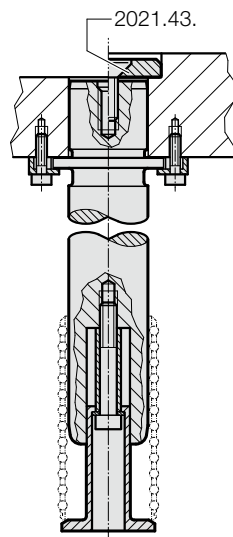
Tolerance range:

yellow = .10

green = .20

red = .30

**Mounting example**



# GUIDE PILLAR WITH COLLAR AND BALL CAGE RETAINER

## 2021.44. Guide pillar with collar and ball cage retainer

d <sub>1</sub>	38	40	48	50	60	63
d <sub>2</sub>	38	40	48	50	60	63
d <sub>3</sub>	50	50	63	63	80	80
d <sub>5</sub>	42	44	52	54	64	67
d <sub>6</sub>	61	61	74	74	91	91
d <sub>7</sub>	73.7	73.7	86.7	86.7	103.7	103.7
a	29.2	29.2	33.8	33.8	39.8	39.8
a <sub>1</sub>	29.2	29.2	33.8	33.8	39.8	39.8
m	M8	M8	M8	M8	M8	M8
l <sub>2</sub>	37	37	47	47	47	47
KG (l <sub>8</sub> / l <sub>9</sub> )						
1 (31 / 46)	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●
l <sub>1</sub>						
125	●	●				
140	●	●	●	●		
160	●	●	●	●	●	●
180	●	●	●	●	●	●
200	●	●	●	●	●	●
224	●	●	●	●	●	●
250	●	●	●	●	●	●
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400			●	●	●	●

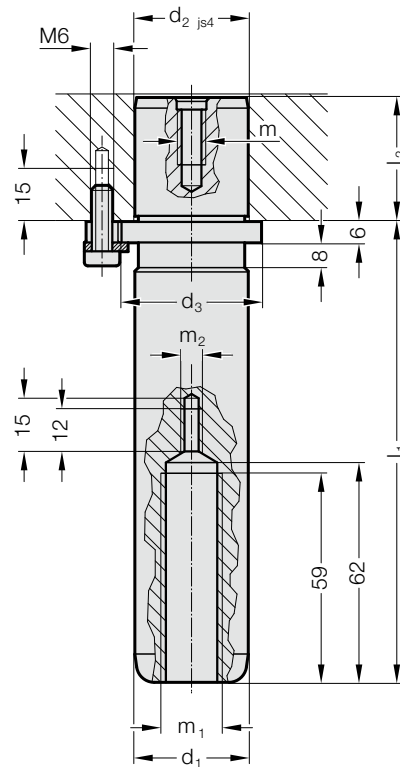
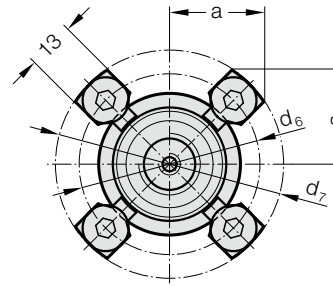
### Ordering Code (example):

Guide pillar with collar and ball cage retainer		=	2021.44.
Diameter of conduit d <sub>1</sub>	48 mm	=	048.
Length l <sub>1</sub>	400 mm	=	400.
Cage unit size KG	1	=	1.
Classification TOL	yellow	=	10
Order No		=	2021.44. 048. 400. 1. 10

# GUIDE PILLAR WITH COLLAR, WITH CAGE UNIT BORE



2021.46. .30.94



**Description:**

Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

fine precision ground

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head  $\varnothing 13$ ).  
 Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).

☞ Preloading see pairing classification at the beginning of chapter D

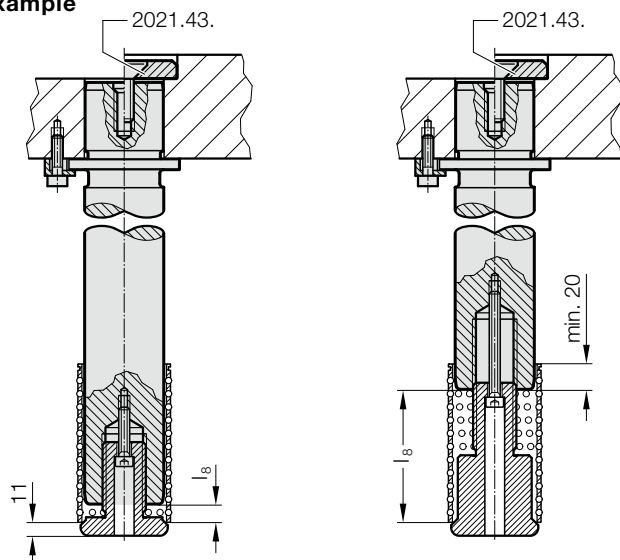
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Dimensions of ball cage retainer see 202.94.  
 Tolerance range: red = .30

Delivery without cage retainer, ball cage and head cap screw.

**Mounting example**



## GUIDE PILLAR WITH COLLAR, WITH CAGE UNIT BORE

### 2021.46. .30.94 Guide pillar with collar, with cage unit bore

d <sub>1</sub>	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	40	50	63	80	95
d <sub>6</sub>	51	61	74	91	106
d <sub>7</sub>	63.7	73.7	86.7	103.7	118.7
a	20.4	29.2	33.8	39.8	46.2
a <sub>1</sub>	29.5	29.2	33.8	39.8	46.2
m <sub>1</sub>	M16x1,5	M16x1,5	M20x1,5	M30x1,5	M30x1,5
m <sub>2</sub>	M5	M5	M6	M8	M8
l <sub>2</sub>	37	37	47	47	60
l <sub>1</sub>					
112	●				
125	●	●			
140	●	●	●		
160	●	●	●	●	
180	●	●	●	●	
200	●	●	●	●	●
224	●	●	●	●	●
250	●	●	●	●	●
280	●	●	●	●	●
315	●	●	●	●	●
355		●	●	●	●
400			●	●	●

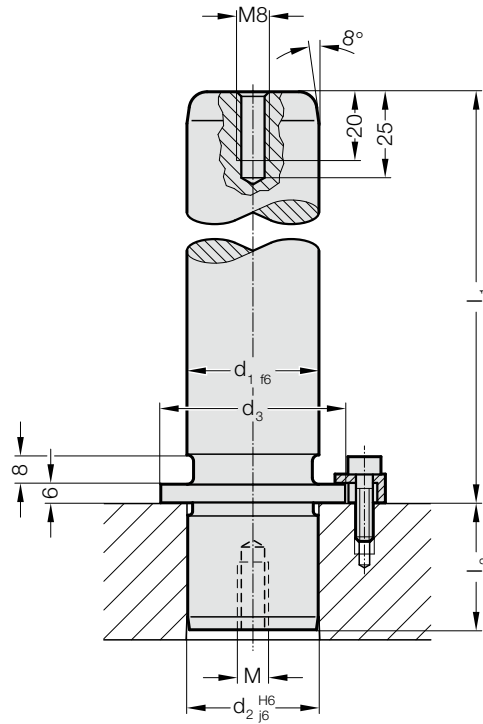
### Ordering Code (example):

Guide pillar with collar, with cage unit bore		=	2021.46.
Diameter of conduit d <sub>1</sub>	48 mm	=	048.
Length l <sub>1</sub>	180 mm	=	180.
Classification red TOL	30	=	30.
Cage unit bore KHB	94	=	94
Order No		=	2021.46. 048. 180. 30.94

# GUIDE PILLAR WITH COLLAR



2021.28.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground  
 Method of manufacturing entails that centre holes are not concentric with O.D.

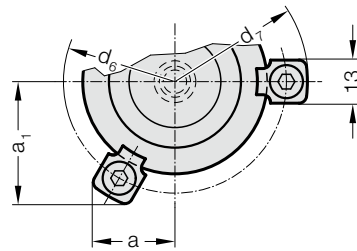
**Note:**

Guide pillars only recommended for use with sliding guides!  
 The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head  $\varnothing 13$ ).

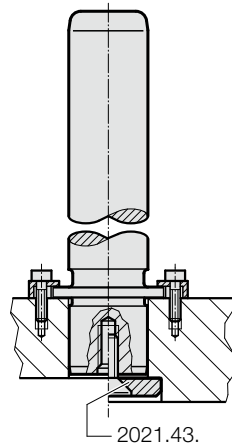
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**Mounting example**





# GUIDE PILLAR WITH COLLAR

## 2021.28. Guide pillar with collar

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	22	25	32	40	50	63	80	95
d <sub>6</sub>	33	36	43	51	61	74	91	106
d <sub>7</sub>	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a <sub>1</sub>	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	M8	M8	M8	M8	M8	M8	M8	M12
l <sub>2</sub>	20	23	30	37	37	47	47	60
l <sub>1</sub>								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

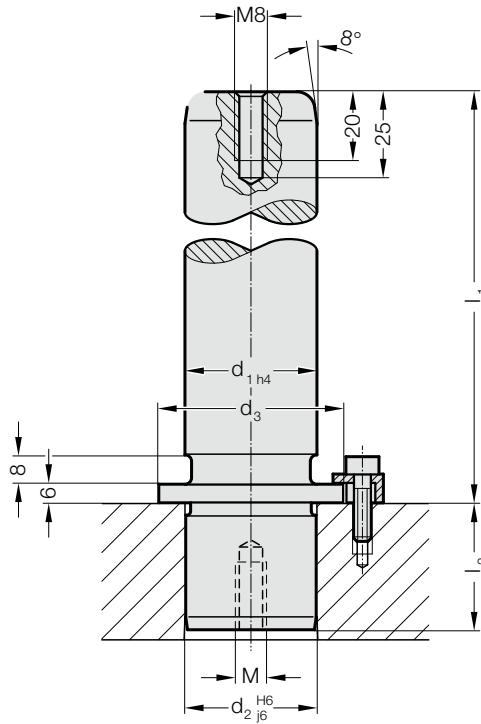
### Ordering Code (example):

Guide pillar with collar	=	2021.28.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Length l <sub>1</sub>	112 mm =	112
Order No	=	2021.28. 032. 112

# GUIDE PILLAR WITH COLLAR ECO-LINE



2021.29.



**Material:**

Steel, surface hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

**Execution:**

ground  
 Method of manufacturing entails that centre holes are not concentric with O.D.

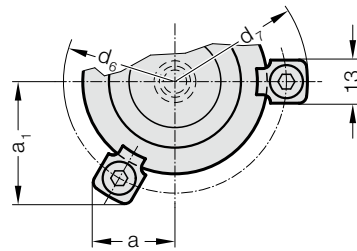
**Note:**

Guide pillars only recommended for use with sliding guides!  
 The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head  $\varnothing 13$ ).

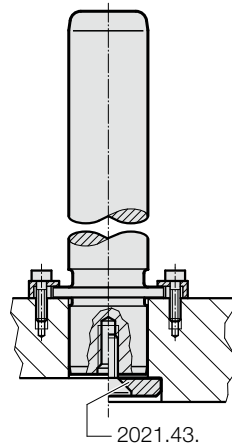
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**Mounting example**



# GUIDE PILLAR WITH COLLAR ECO-LINE

## 2021.29. Guide pillar with collar ECO-LINE

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	22	25	32	40	50	63	80	95
d <sub>6</sub>	33	36	43	51	61	74	91	106
d <sub>7</sub>	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a <sub>1</sub>	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	M8	M8	M8	M8	M8	M8	M8	M12
l <sub>2</sub>	20	23	30	37	37	47	47	60
l <sub>1</sub>								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

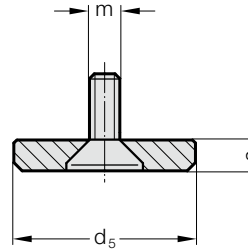
### Ordering Code (example):

Guide pillar with collar ECO-LINE	=	2021.29.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Length l <sub>1</sub>	112 mm =	112
Order No	=	2021.29. 032. 112

# RETAINING DISC WITH SCREW RETAINER RING FOR GUIDE PILLARS WITH COLLAR



2021.43.



**Material:**

Retaining disc: Steel, burnished  
Countersunk head cap screw DIN 7991/ISO 10642

**Note:**

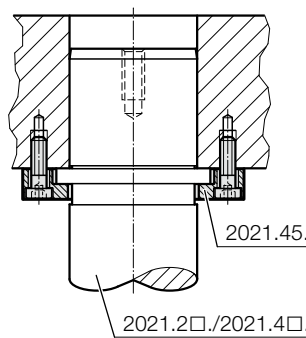
For fixing the guide pillars 2021.28., 2021.29., 2021.44. und 2021.46.  
📄 Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2021.43. Retaining disc with screw**

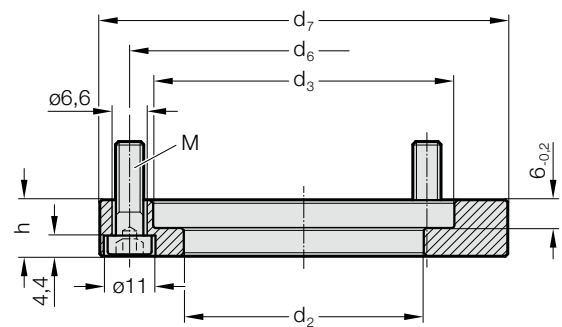
Order No	Nominal-ø	Pillar-ø	d <sub>5</sub>	s	m
2021.43.016	16	15/16	22	6	8
2021.43.020	20	19/20	25	6	8
2021.43.025	25	24/25	32	6	8
2021.43.032	32	30/32	40	6	8
2021.43.040	40	38/40	50	6	8
2021.43.050	50	48/50	60	6	8
2021.43.063	63	60/63	70	6	8
2021.43.080	80	80	93	12	12



**Mounting example**



2021.45.



**Material:**

Steel, burnished

**Note:**

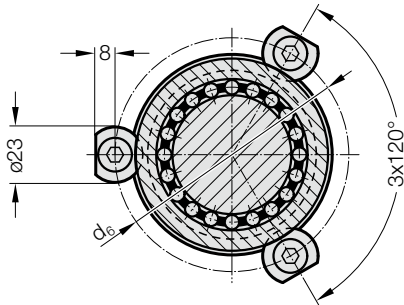
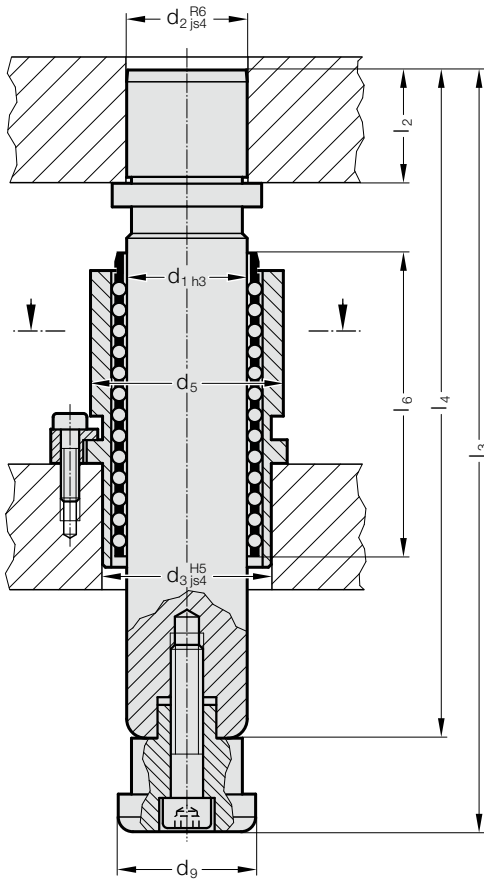
The retainer ring is used to attach guide pillars with collar (2021.28., 2021.29., 2021.44., 2021.46.).  
The attachment is done using head cap screws according to DIN 6912-10.9, which are included in the delivery.  
Same attachment position as for the standard screw clamps 207.45!

**2021.45. Retainer ring for guide pillars with collar**

Order No	Nominal-ø	Pillar-ø	d <sub>2</sub>	d <sub>3</sub>	d <sub>6</sub>	d <sub>7</sub>	h	M	Quantity Screws
2021.45.016	16	15/16	17	23	33	45.7	12	M6x20	3
2021.45.020	20	19/20	21	26	36	48.7	12	M6x20	3
2021.45.025	25	24/25	26	33	43	55.7	12	M6x20	3
2021.45.032	32	30/32	33	41	51	63.7	12	M6x20	3
2021.45.040	40	38/40	41	51	61	73.7	12	M6x20	4
2021.45.050	50	48/50	51	64	74	86.7	12	M6x20	4
2021.45.063	63	60/63	64	81	91	103.7	12	M6x20	4
2021.45.080	80	80	81	96	106	118.7	18	M6x25	4

# BALL GUIDE UNIT TO MERCEDES-BENZ STANDARD

2025.94.



**Material:**

Demountable guide pillar: Steel, surface hardened  
 Guide bush: Tooling steel  
 Cage retainer: Steel  
 Ball cage: Brass

**Execution:**

Ball guide unit 2025.94. consisting of: Demountable guide pillar, guide bush, ball cage, cage retainer, clamps and socket cap screws to DIN EN ISO 4762.

**2025.94. Ball guide unit to Mercedes-Benz Standard**

Column diameter $d_1$	50	80
$d_2$	50	80
$d_3$	70	105
$d_5$	80	118
$d_6$	97	135
$d_9$	57	91
$l_2$	47	75
$l_3$	316	450
$l_4$	271	400
$l_6$	128	160

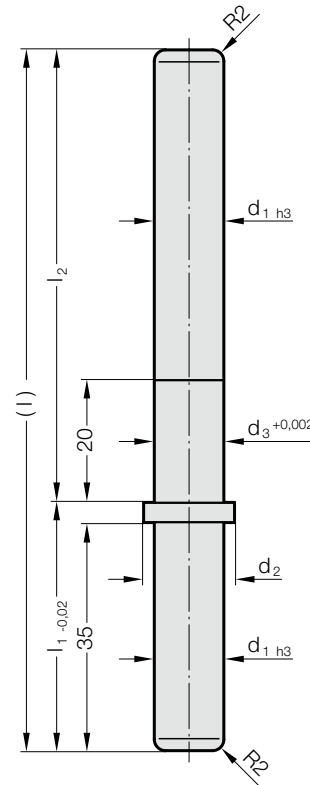
**Ordering Code (example):**

Ball guide unit to Mercedes-Benz Standard	=	2025.94.
Pillar diameter $d_1$	80 mm =	080
Order No	=	2025.94. 080

## GUIDE PILLAR WITH COLLAR



202.61.



### Description:

On small modular die sets the combination plastic ball cage 206.41./ collared guide pillar 202.61. has indeed been successful for several years.

### Material:

Steel, surface hardened  
Surface hardness: 60 + 4 HRC, Hardness penetration 1 ± 0,2 mm

### Execution:

precision ground

### Note:

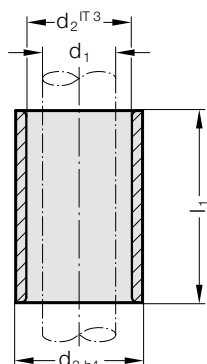
For use with ball cage 206.41. and guide bushes 2062.44.012. or 2061.44.015.

### 202.61. Guide pillar with collar

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l	l <sub>1</sub>	l <sub>2</sub>
202.61.012.041.074	12	15.9	12.02	115	41	74
202.61.015.044.080	15	23.5	15.02	124	44	80

## GUIDE BUSH FOR BALL BEARING, FOR HIGHEST STROKING SPEED GUIDE BUSH FOR BALL BEARING, ISO 9448-3

2062.44.012.



2062.44.012. **Guide bush for ball bearing, for highest stroking speed**

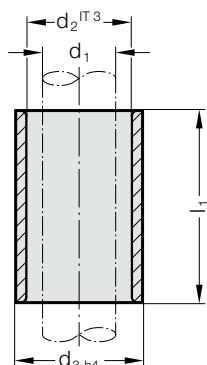
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	For ball Ø
2062.44.012.016.032	12	16	20	32	2
2062.44.012.017.032	12	17	20	32	2.5

**Material:**  
Tool steel, hardened 62 ± 2 HRC

**Execution:**  
Bearing surfaces honed,  
outside diameter precision ground.

**Note:**  
For use with ball cage 206.41. and guide pillar 202.61.

2061.44.015.



2061.44. **Guide bush for ball bearing, ISO 9448-3**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>
2061.44.015.023.10	15	21	28	23
2061.44.015.023.20	15	21	28	23
2061.44.015.030.10	15	21	28	30
2061.44.015.030.20	15	21	28	30
2061.44.015.037.10	15	21	28	37
2061.44.015.037.20	15	21	28	37
2061.44.015.047.10	15	21	28	47
2061.44.015.047.20	15	21	28	47
2061.44.015.060.10	15	21	28	60
2061.44.015.060.20	15	21	28	60

**Material:**  
Tool steel, hardened 62 ± 2 HRC

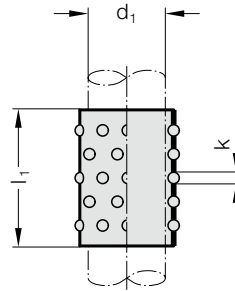
**Execution:**  
Bearing surfaces honed,  
outside diameter precision ground.

**Note:**  
For use with ball cage 206.41. and guide pillar 202.61.  
Tolerance range:  
yellow = .10  
green = .20

## BALL CAGE, PLASTIC, FOR HIGHEST STROKING SPEED



206.41.



### Description:

Owing to its much lower inertia, the plastic ball cage of particular advantage in die sets operating at stroking speed of 1000 SPM and more.

The phenomenon of ball-drag at the reversal point of cage travel, set up by the cage inertia, no longer occurs. The negative influence of this drag is eliminated – and so are the wear symptoms associated with it.

On small modular die sets the combination plastic ball cage 206.41./collared guide pillar 202.61. has indeed been successful for several years.

### Material:

Cage: Plastic tube (Polyacetal - POM)

Balls: Steel hardened DIN 5401- Quality Class 1

### 206.41. Ball cage, plastic, for highest stroking speed

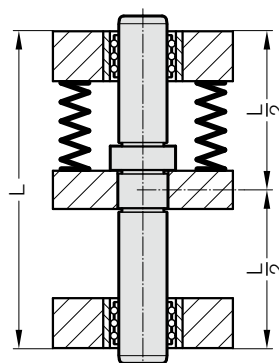
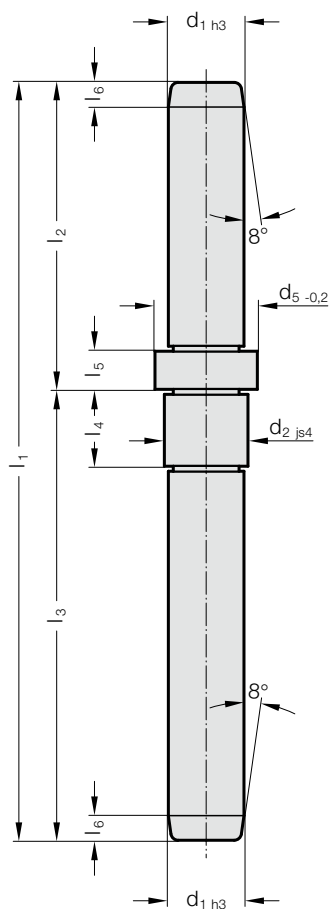
Order No	$d_1$	$l_1$	$k$
206.41.012.020.021	12	21	2
206.41.012.020.042	12	42	2
206.41.012.025.021	12	21	2.5
206.41.012.025.042	12	42	2.5
206.41.015.030.045	15	45	3
206.41.015.030.056	15	56	3
206.41.015.030.063	15	63	3
206.41.015.030.071	15	71	3



# DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING

2020.63.

Mounting example



**Material:**

Steel, surface hardened

Surface hardness: 62 + 2 HRC, Hardness penetration 1 ± 0,2 mm

**Execution:**

precision ground

**Note:**

For press fit into register bore N5.

Bending equation see at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

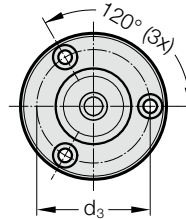
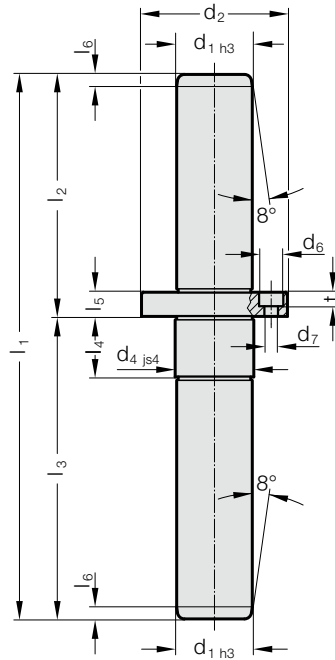
**2020.63. Demountable guide pillar with centre fixing**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>5</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>
2020.63.012.042.074	12	13	15.9	116	42	74	12.5	5	3
2020.63.016.064.094	16	18	21.9	158	64	94	16	8	5

# DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING



2020.62.



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ )  
 surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness  
 penetration  $2 + 1,6 \text{ mm}$

**Execution:**

precision ground

**Note:**

Use socket cap screws DIN EN ISO 4762  
 12.9.

Bearing clearance / Preloading see  
 pairing classification at the beginning of  
 chapter D.

Matching guide combinations, see  
 selection matrix at the beginning of chapter  
 D.

Bending equation see at the beginning  
 of chapter D.

$\varnothing 12$  only available in tolerance range yellow  
 = .10

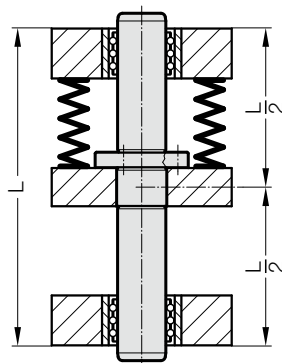
Tolerance range:

yellow = .10

green = .20

red = .30

**Mounting example**



## DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING

### 2020.62. Demountable guide pillar with centre fixing

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>6</sub>	d <sub>7</sub>	t	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>
12	28	20	13	6	3.4	3.4	90	40	50	12	6	3
12	28	20	13	6	3.4	3.4	100	40	60	12	6	3
12	28	20	13	6	3.4	3.4	110	50	60	12	6	3
12	28	20	13	6	3.4	3.4	120	50	70	12	6	3
12	28	20	13	6	3.4	3.4	130	60	70	12	6	3
12	28	20	13	6	3.4	3.4	140	70	70	12	6	3
16	38	28	18	8	4.5	4.6	140	60	80	16	8	4
16	38	28	18	8	4.5	4.6	150	60	90	16	8	4
16	38	28	18	8	4.5	4.6	160	70	90	16	8	4
16	38	28	18	8	4.5	4.6	170	70	100	16	8	4
16	38	28	18	8	4.5	4.6	180	80	100	16	8	4
16	38	28	18	8	4.5	4.6	190	90	100	16	8	4
19	42	32	22	8	4.5	4.6	160	70	90	20	8	4
19	42	32	22	8	4.5	4.6	170	70	100	20	8	4
19	42	32	22	8	4.5	4.6	180	80	100	20	8	4
19	42	32	22	8	4.5	4.6	190	80	110	20	8	4
19	42	32	22	8	4.5	4.6	200	90	110	20	8	4
19	42	32	22	8	4.5	4.6	210	100	110	20	8	4
25	48	38	26	8	4.5	4.6	180	80	100	22	8	6
25	48	38	26	8	4.5	4.6	190	80	110	22	8	6
25	48	38	26	8	4.5	4.6	200	90	110	22	8	6
25	48	38	26	8	4.5	4.6	210	90	120	22	8	6
25	48	38	26	8	4.5	4.6	220	100	120	22	8	6
25	48	38	26	8	4.5	4.6	230	110	120	22	8	6
32	60	48	34	10	5.5	5.7	180	80	100	25	10	7
32	60	48	34	10	5.5	5.7	190	80	110	25	10	7
32	60	48	34	10	5.5	5.7	200	90	110	25	10	7
32	60	48	34	10	5.5	5.7	210	90	120	25	10	7
32	60	48	34	10	5.5	5.7	220	100	120	25	10	7
32	60	48	34	10	5.5	5.7	230	100	130	25	10	7
32	60	48	34	10	5.5	5.7	240	110	130	25	10	7
32	60	48	34	10	5.5	5.7	250	110	140	25	10	7
40	70	56	42	11	6.6	6.8	200	90	110	27	12	7
40	70	56	42	11	6.6	6.8	210	90	120	27	12	7
40	70	56	42	11	6.6	6.8	220	100	120	27	12	7
40	70	56	42	11	6.6	6.8	230	100	130	27	12	7
40	70	56	42	11	6.6	6.8	240	110	130	27	12	7
40	70	56	42	11	6.6	6.8	250	110	140	27	12	7
40	70	56	42	11	6.6	6.8	260	120	140	27	12	7

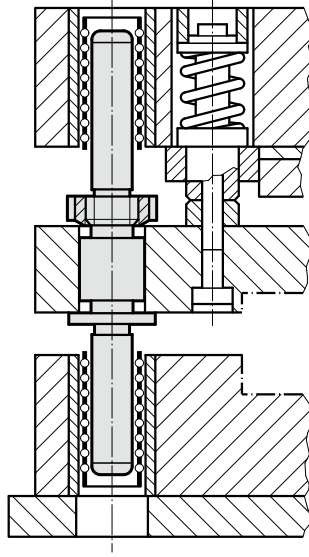
### Ordering Code (example):

Demountable guide pillar with centre fixing	=	2020.62.
Diameter of conduit d <sub>1</sub>	25 mm =	025.
Length with bush (short) l <sub>2</sub>	80 mm =	080.
Length to bush (long) l <sub>3</sub>	110 mm =	110.
Classification TOL	yellow =	10
Order No	=	2020.62. 025.080. 110. 10

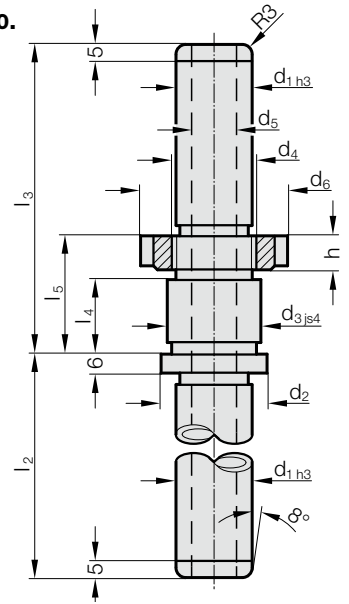
# DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING AND RING NUT



Mounting example



202.60.



**Material:**

Steel, (Core strength:  $\geq 900 \text{ N/mm}^2$ ) surface hardened  
 Surface hardness:  $60 + 3 \text{ HRC}$ , Hardness penetration  $\geq 1,8 \text{ mm}$

**Execution:**

precision ground

**Note:**

- ☞ Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Bending equation see at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**202.60. Demountable guide pillar with centre fixing and ring nut**

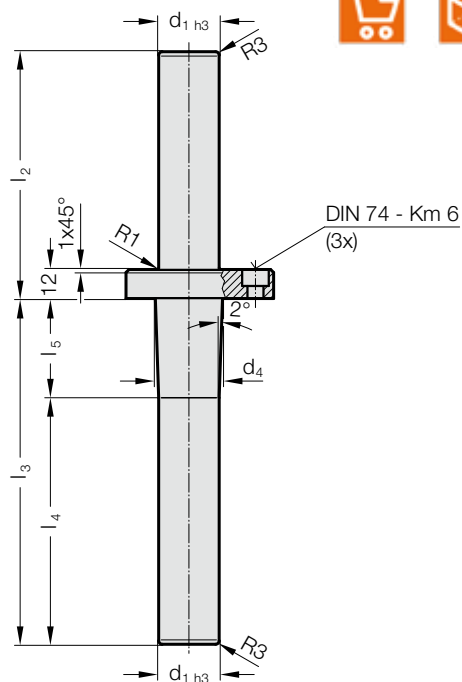
$d_1$	19	25	32	40
$d_2$	32	38	46	56
$d_3$	25	30	36	46
$d_4$	M22x1,5	M28x1,5	M35x1,5	M45x1,5
$d_5$	8	12	20	28
$d_6$	40	50	55	68
$h$	9	10	11	12
$l_2$	80	80	100	100
$l_3$	120	120	140	140
$l_4$	29	29	34	34
$l_5$	45	45	50	50

**Ordering Code (example):**

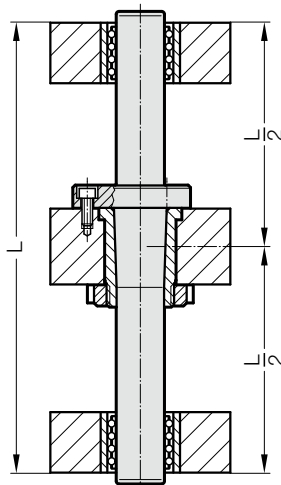
Demountable guide pillar with centre fixing and ring nut	= 202.60.
Diameter of conduit $d_1$	32 mm = 032.
Length with bush $l_2$	100 mm = 100.
Length to bush $l_3$	140 mm = 140.
Classification TOL	yellow = 10
Order No	= 202.60. 032. 100. 140. 10

# DEMOUNTABLE GUIDE PILLAR WITH CONICAL CENTRE FIXING

2020.64.



Mounting example



**Material:**

Steel, hardened  $62 \pm 2$  HRC

**Execution:**

precision ground

**Note:**

Matching retaining bush 2021.64.

Use socket cap screws DIN EN ISO 4762 12.9.

Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Bending equation see at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

**2020.64. Demountable guide pillar with conical centre fixing**

d <sub>1</sub>	25	25	32	32	32	32	32	32
d <sub>2</sub>	70	70	76	76	76	76	76	76
d <sub>3</sub>	55	55	62	62	62	62	62	62
d <sub>4</sub>	27.86	27.86	34.86	34.86	34.86	34.86	34.86	34.86
k	26	26	30	30	30	30	30	30
l <sub>2</sub>	102	122	102	122	122	137	142	162
l <sub>3</sub>	143	143	143	143	153	153	153	153
l <sub>4</sub>	102	102	102	102	112	112	112	112
l <sub>5</sub>	41	41	41	41	41	41	41	41

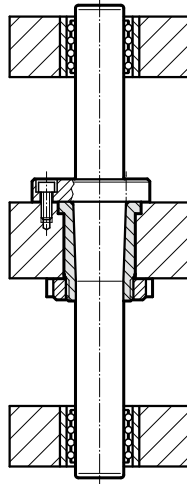
**Ordering Code (example):**

Demountable guide pillar with conical centre fixing	= 2020.64.
Diameter of conduit d <sub>1</sub>	32 mm = 032.
Length with bush (short) l <sub>2</sub>	122 mm = 122.
Length to bush (long) l <sub>3</sub>	153 mm = 153.
Classification TOL	yellow = 10
Order No	= 2020.64. 032. 122. 153. 10

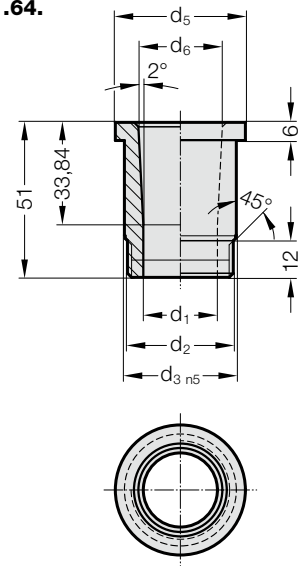
# RETAINING BUSH FOR GUIDE PILLAR CONICAL 2020.64.



Mounting example



2021.64.



**Material:**

16 MnCr5

Surface hardness:  $60 \pm 2$  HRC, Hardness penetration 0,8–1 mm

**Execution:**

Thread not hardened

**Fixing:**

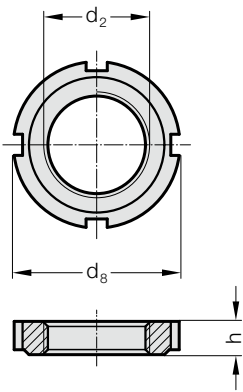
2073.48.□□15 order separately.

**2021.64. Retaining bush for guide pillar conical 2020.64.**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>5</sub>	d <sub>6</sub>
2021.64.025	25.5	M35x1,5	37	43	27.86
2021.64.032	32.5	M40x1,5	44	50	34.86

## SLOTTED NUT DIN 1804

2073.48.



2073.48.      **Slotted nut DIN 1804**

Order No	d <sub>2</sub>	d <sub>8</sub>	h
2073.48.35.15	M35x1,5	48	11
2073.48.40.15	M40x1,5	54	12

**Material:**

Steel, hardened

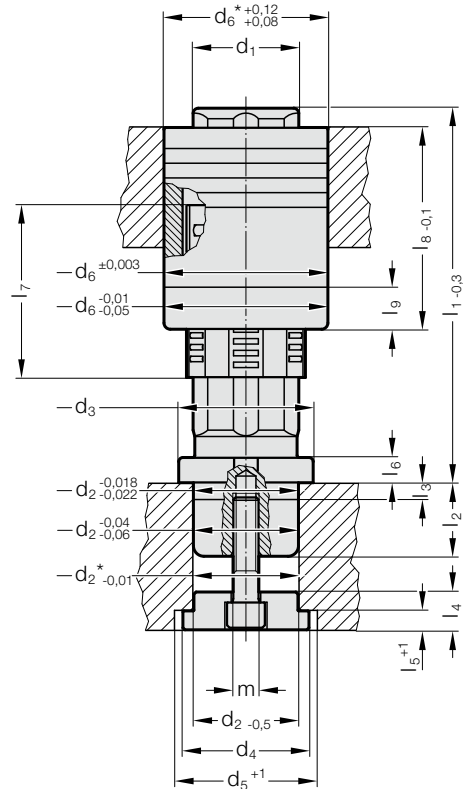
**Note:**

For fixing the retaining bush 2021.64.

# GUIDE UNIT WITH COLLAR MILLION GUIDE



2024.94.



## Description:

FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required.

The large supporting surface of the needle rollers ensures these properties.

For stroke speeds up to 50 m/min and temperatures up to 80°C.

## Material:

Needle roller cage: Plastic

Needle rollers: Steel, hardened

Guide bush: Tool steel alloy, hardened,  
60 ± 2 HRC

Guide pillar: Tool steel alloy, hardened,  
60 ± 2 HRC

Disk: Steel

## Execution:

Guide unit consisting of a paired guide pillar and guide bush, needle roller cage and disk for fixing the guide pillar. The fixing screw (2192.10./12.) is ordered separately as the screw required depends on the thickness of the base plate.

Guide pillar and bushes are executed at:

ø 16 with 4 running surfaces

ø 12, ø 20 - ø 60 with 6 running surfaces

ø 80 with 8 running surfaces

## Note:

Install guide unit in accordance with the instructions.

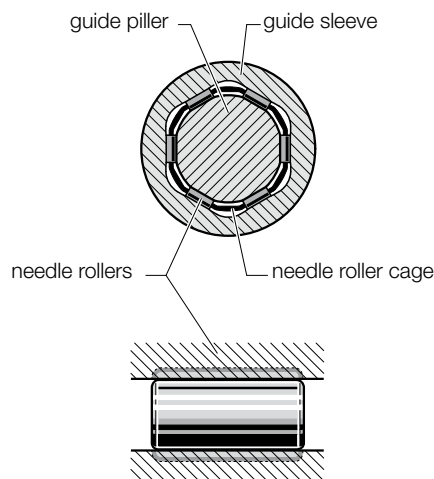
Guide bush must be bonded.

\* Mounting bore

Only the needle roller cage part is replaceable.

For order number for needle roller cage spare part, see table.

## Cross section of guide unit





# GUIDE UNIT WITH COLLAR MILLION GUIDE

## 2024.94. Guide unit with collar MILLION GUIDE

d <sub>1</sub>	12	16	20	25	32	40	50	60	80
d <sub>2</sub>	12	16	20	25	32	40	50	60	80
d <sub>3</sub>	18	24	29	35	42	54	64	74	98
d <sub>4</sub>	16	22	26	32	40	50	60	72	105
d <sub>5</sub>	18	24	28	34	40	50	60	72	105
d <sub>6</sub>	23	30	37	44	54	68	78	95	120
m	M5x8	M6x10	M8x20	M8x20	M10x25	M12x30	M12x30	M14x30	M16x30
l <sub>2</sub>	12	16	20	25	30	35	35	42	45
l <sub>3</sub>	6	6	8	8	8	8	8	15	15
l <sub>4</sub>	7	10	13	13	16	18	18	20	26
l <sub>5</sub>	3	4	5	5	7	9	9	12	13
l <sub>6</sub>	5	6	8	8	9	10	12	15	15
l <sub>7</sub>	29.8	30	52	62	68	78	82	116	132
l <sub>8</sub>	40	40	60	70	78	92	96	120	145
l <sub>9</sub>	-	-	20	20	20	20	20	20	25

Order no.

Needle roller cage	2024.94.012	2024.94.016	2024.94.020	2024.94.025	2024.94.032	2024.94.040	2024.94.050	2024.94.060	2024.94.080
--------------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------

l <sub>1</sub>									
50	●								
60	●								
70	●								
80	●	●	●						
90	●	●	●						
100	●	●	●	●	●				
110	●	●	●	●	●				
120	●	●	●	●	●	●			
130		●	●	●	●	●			
140				●	●	●			
150				●	●	●	●	●	
160				●	●	●	●	●	
170					●	●	●	●	
180					●	●	●	●	●
190					●	●	●	●	●
200					●	●	●	●	●
210						●	●	●	●
220						●	●	●	●
230							●	●	●
240							●	●	●
250							●	●	●
260									●
270									●
280									●

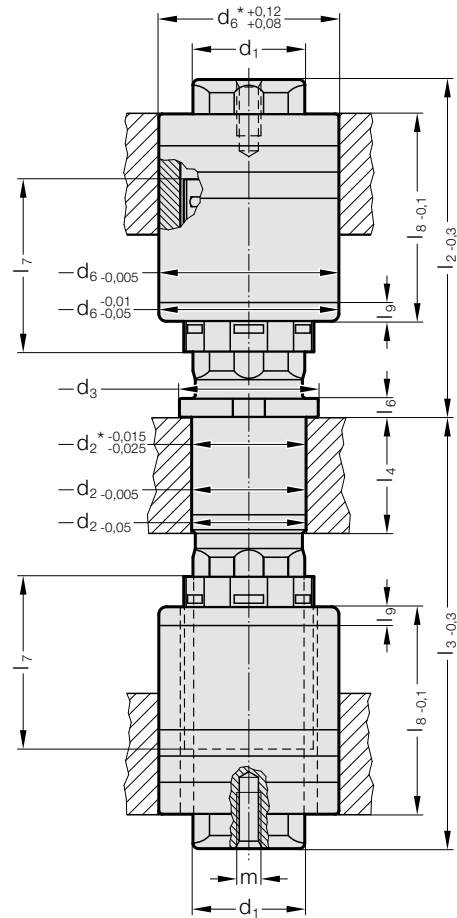
### Ordering Code (example):

Guide unit with collar MILLION GUIDE	=2024.94.
Diameter of conduit d <sub>1</sub>	32 mm = 032.
Guide length l <sub>1</sub>	100 mm = 100
Order No	=2024.94. 032. 100

# GUIDE UNIT WITH CENTER FIXING MILLION GUIDE



2024.96.



## Description:

FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required.

The large supporting surface of the needle rollers ensures these properties.

For stroke speeds up to 50 m/min and temperatures up to 80°C.

## Material:

Needle roller cages: Plastic

Needle rollers: Steel, hardened

Guide bushes: Tool steel alloy, hardened,  
60 ± 2 HRC

Guide pillar: Tool steel alloy, hardened,  
60 ± 2 HRC

Disk: Steel

## Execution:

Guide unit consisting of a paired guide pillar, guide bushes and needle roller cages.

Guide pillar and bushes are executed at:

ø 16 with 4 running surfaces

ø 12, ø 20 - ø 30 with 6 running surfaces

## Note:

Install guide unit in accordance with the instructions.

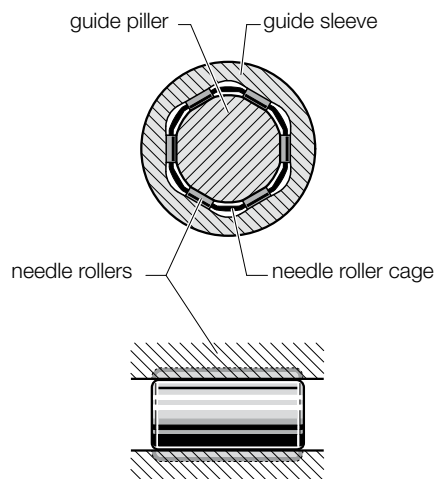
Guide bush must be bonded.

\* Mounting bore

Only the needle roller cage part is replaceable.

For order number for needle roller cage spare part, see table.

## Cross section of guide unit



# GUIDE UNIT WITH CENTER FIXING MILLION GUIDE

## 2024.96. Guide unit with center fixing MILLION GUIDE

d <sub>1</sub>	12	16	20	25	28
d <sub>2</sub>	12.5	16.5	20.5	25.5	28.5
d <sub>3</sub>	19	23	27	32	35
d <sub>6</sub>	22	28	34	40	45
m	M5x8	M6x15	M8x20	M8x20	M8x20
l <sub>4</sub>	12	16	20	25	28
l <sub>6</sub>	4	5	5	5	5
l <sub>7</sub>	30	30	46	56	66
l <sub>8</sub>	30	40	50	60	65
l <sub>9</sub>	-	-	20	20	20
Order no.	2024.94.012	2024.94.016	2024.96.020	2024.96.025	2024.96.028
Needle roller cage					
l <sub>3</sub>	l <sub>2</sub>				
50	40 50 60				
60	40 50 60				
70	40 50 60	40 50 60			
80		40 50 60 70	50 60 70		
90		50 60 70 80	50 60 70 80	60 70 80	70 80 90
100			60 70 80 90	60 70 80 90	70 80 90
110				70 80 90	70 80 90

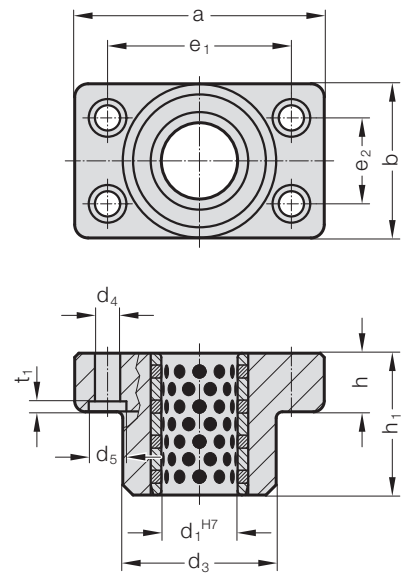
### Ordering Code (example):

Guide unit with center fixing MILLION GUIDE	=	2024.96.
Diameter of conduit d <sub>1</sub>	20 mm =	020.
Length to bush l <sub>3</sub>	80 mm =	080.
Length with bush l <sub>2</sub>	50 mm =	050
Order No	=	2024.96. 020. 080. 050

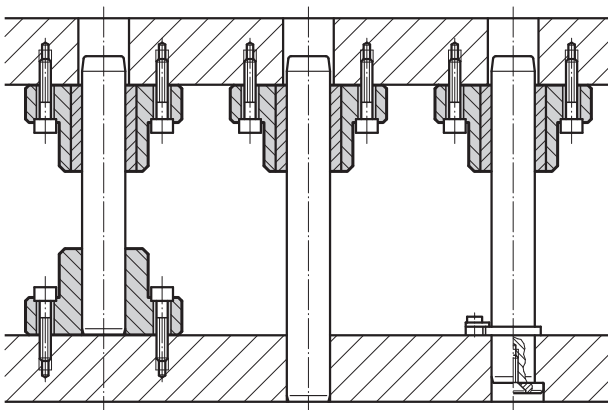
# GUIDE BEARING WITH SOLID LUBRICANT



2031.70.



## Mounting example



## Material:

Basic body: Special cast iron

Guide bush 2052.70.: Bronze with solid lubricant, oilless lubricating

## Execution:

Face and top machined.

## Note:

- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

## 2031.70. Guide bearing with solid lubricant

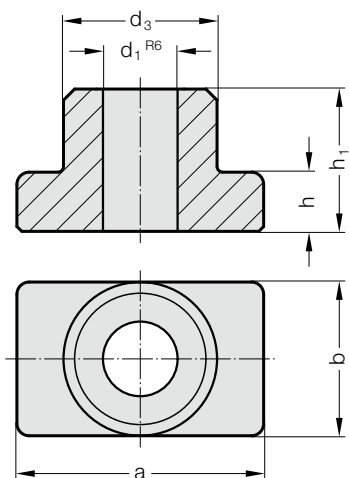
$d_1$	19 20	24 25	30 32	38 40	50	63	80
$d_3$	45	50	65	80	96	110	130
$d_4$	9	9	11	13.5	17.5	17.5	22
$a$	85	90	115	130	160	180	215
$b$	45	50	65	80	96	110	130
$e_1$	64	68	83	95	118	132	160
$e_2$	24	28	34	45	55	62	75
$h$	18	22	25	30	35	35	40
$h_1$	37	47	60	77	95	120	120
$t_1$	3	3	3	3	4	4	10

## Ordering Code (example):

Guide bearing with solid lubricant = 2031.70.  
 Diameter of conduit  $d_1$  32 mm = 032  
 Order No = 2031.70. 032

# RETENTION BEARING

2031.01.



**Material:**

Special cast iron

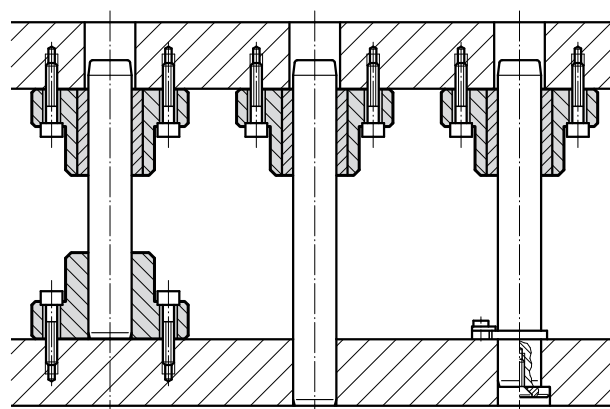
**Execution:**

Face and top machined. Hole fine bored to  $d_1^{R6}$  fit.

**Note:**

Check squareness of pillars after press-fitting.

**Mounting example**



**2031.01. Retention bearing**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	35	45	50	65	80	96	110	130
$a$	70	85	90	115	130	160	180	215
$b$	35	45	50	65	80	96	110	130
$h$	18	18	22	25	30	35	35	40
$h_1$	30	37	47	60	77	95	120	120

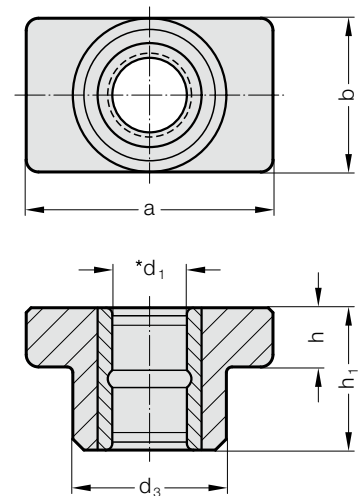
**Ordering Code (example):**

Retention bearing = 2031.01.  
 Diameter of conduit  $d_1$  32 mm = 032  
 Order No = 2031.01. 032

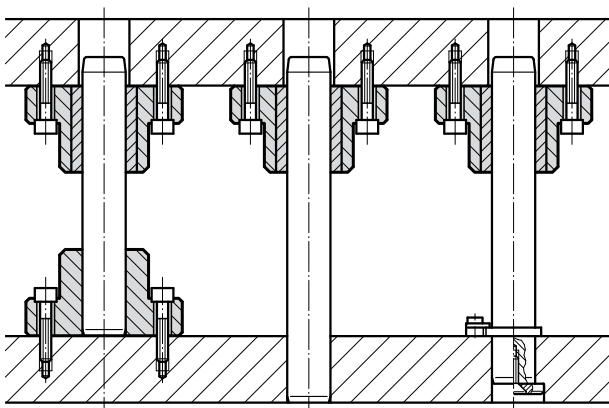
## GUIDE BEARING, SINTERED GUIDE



2031.31.



### Mounting example



### Material:

Basic body: Special cast iron

Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

### Execution:

Face and top machined. Bores honed.

### Note:

- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Bearing clearance see pairing classification at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

### 2031.31. Guide bearing, sintered guide

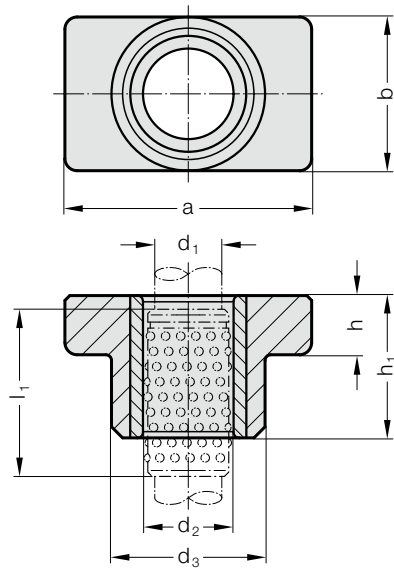
$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	35	45	50	65	80	96	110	130
$a$	70	85	90	115	130	160	180	215
$b$	35	45	50	65	80	96	110	130
$h$	18	18	22	25	30	35	35	40
$h_1$	30	37	47	60	77	95	120	120

### Ordering Code (example):

Guide bearing, sintered guide	=	2031.31.
Diameter of conduit $d_1$	32 mm =	032.
Classification TOL	yellow =	10
Order No	=	2031.31.032.10

# GUIDE BEARING FOR BALL BEARING GUIDE

2031.41.



**Material:**

Basic body: Special cast iron

Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

**Execution:**

Face and top machined. Bores honed.

**Note:**

- Notes on ball bearing type guides at the beginning of chapter D.
- Preloading see pairing classification at the beginning of chapter D
- Matching guide combinations, see selection matrix at the beginning of chapter D.

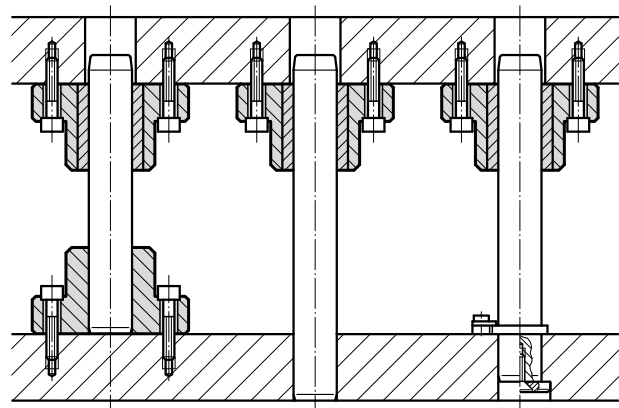
Tolerance range:

yellow = .10

green = .20

red = .30

**Mounting example**



**2031.41. Guide bearing for ball bearing guide**

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>2</sub>	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d <sub>3</sub>	35	45	50	65	80	96	110
a	70	85	90	115	130	160	180
b	35	45	50	65	80	96	110
h	18	18	22	25	30	35	35
h <sub>1</sub>	30	37	47	60	77	95	120
l <sub>1</sub>	44	44	56	71	95	120	140
l*	45	45	56	71	95	120	140

\*l = Nominal ordering length of ball cage - preferred length

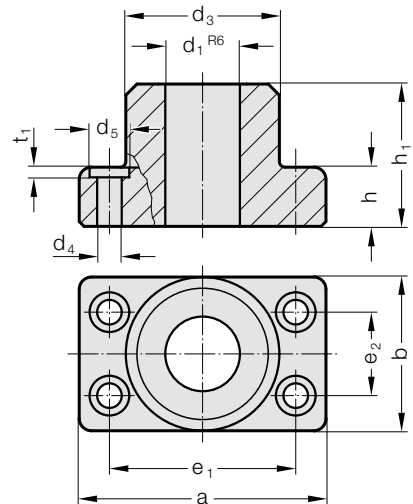
**Ordering Code (example):**

Guide bearing for ball bearing guide	=	2031.41.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Classification TOL	yellow =	10
Order No	=	2031.41. 032. 10

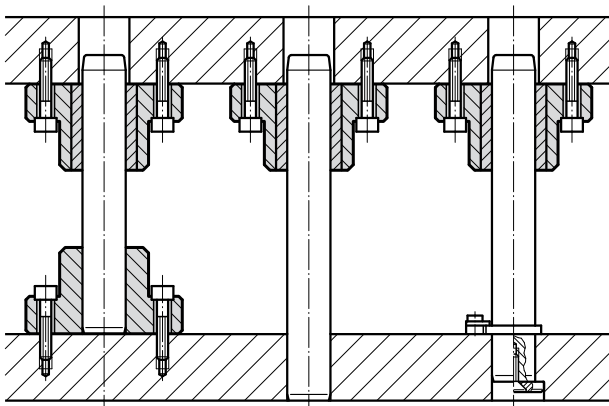
# RETENTION BEARING WITH SCREW HOLES



2031.02.



## Mounting example



### Material:

Special cast iron

### Execution:

Face and top machined. Hole fine bored to  $d_1^{R6}$  fit.

### Note:

Check squareness of pillars after press-fitting.

## 2031.02. Retention bearing with screw holes

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	35	45	50	65	80	96	110	130
$d_4$	6.6	9	9	11	14	18	18	22
$d_5$	11	15	15	18	20	26	26	33
$t_1$	3	3	3	3	3	4	4	4
$a$	70	85	90	115	130	160	180	215
$b$	35	45	50	65	80	96	110	130
$e_1$	53	64	68	83	95	118	132	160
$e_2$	19	24	28	34	45	55	62	75
$h$	18	18	22	25	30	35	35	40
$h_1$	30	37	47	60	77	95	120	120

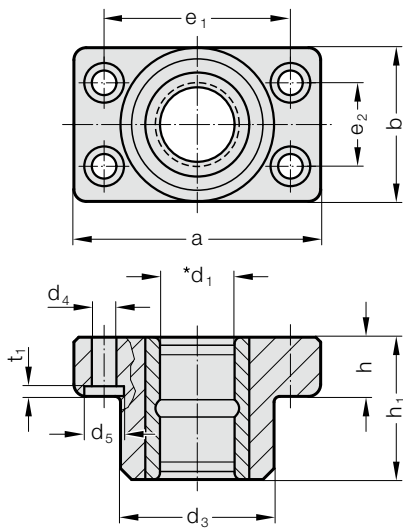
### Ordering Code (example):

Retention bearing with screw holes = 2031.02.  
 Diameter of conduit  $d_1$  32 mm = 032  
 Order No = 2031.02. 032



# GUIDE BEARING WITH SCREW HOLES, SINTERED GUIDE

2031.34.



**Material:**

Basic body: Special cast iron  
 Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

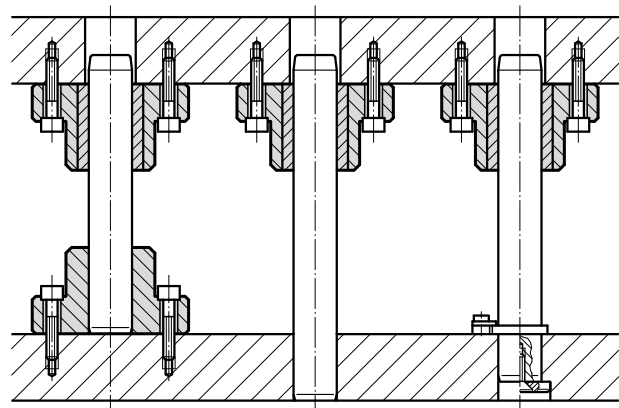
**Execution:**

Face and top machined. Bores honed.

**Note:**

- ☞ Notes on sliding type guides at the beginning of chapter D.
  - ☞ Bearing clearance see pairing classification at the beginning of chapter D.
  - ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- Tolerance range:  
 yellow = .10  
 green = .20  
 red = .30

**Mounting example**



**2031.34. Guide bearing with screw holes, sintered guide**

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	35	45	50	65	80	96	110	130
d <sub>4</sub>	6.6	9	9	11	14	18	18	22
d <sub>5</sub>	11	15	15	18	20	26	26	33
t <sub>1</sub>	3	3	3	3	3	4	4	4
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
e <sub>1</sub>	53	64	68	83	95	118	132	160
e <sub>2</sub>	19	24	28	34	45	55	62	75
h	18	18	22	25	30	35	35	40
h <sub>1</sub>	30	37	47	60	77	95	120	120

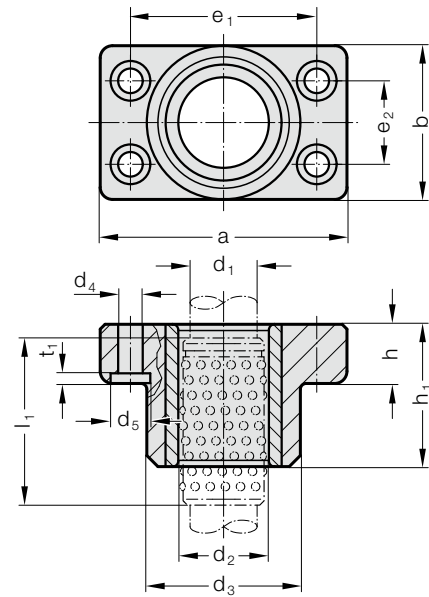
**Ordering Code (example):**

Guide bearing with screw holes, sintered guide	= 2031.34.
Diameter of conduit d <sub>1</sub>	32 mm = 032.
Classification TOL	yellow = 10
Order No	= 2031.34. 032. 10

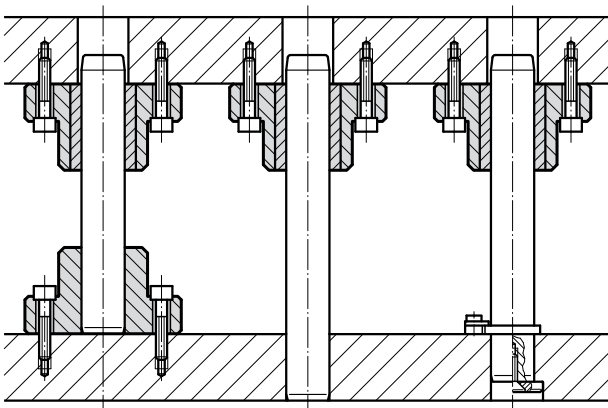
# GUIDE BEARING WITH SCREW HOLES, FOR BALL BEARING GUIDE



2031.42.



## Mounting example



## Material:

Basic body: Special cast iron

Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

## Execution:

Face and top machined. Bores honed.

## Note:

- ☞ Notes on ball bearing type guides at the beginning of chapter D.
- ☞ Preloading see pairing classification at the beginning of chapter D
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2031.42. Guide bearing with screw holes, for ball bearing guide

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>2</sub>	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d <sub>3</sub>	35	45	50	65	80	96	110
d <sub>4</sub>	6.6	9	9	11	14	18	18
d <sub>5</sub>	11	15	15	18	20	26	26
t <sub>1</sub>	3	3	3	3	3	4	4
a	70	85	90	115	130	160	180
b	35	45	50	65	80	96	110
e <sub>1</sub>	53	64	68	83	95	118	132
e <sub>2</sub>	19	24	28	34	45	55	62
h	18	18	22	25	30	35	35
h <sub>1</sub>	30	37	47	60	77	95	120
l <sub>1</sub>	44	44	56	70	95	120	140
l*	45	45	56	71	95	120	140

\*l = Nominal ordering length of ball cage - preferred length

## Ordering Code (example):

Guide bearing with screw holes, for ball bearing guide = 2031.42.

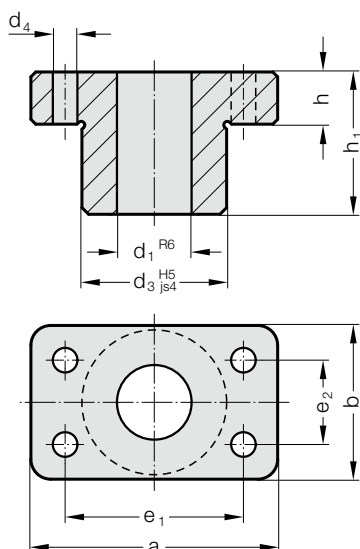
Diameter of conduit d<sub>1</sub> = 32 mm = 032.

Classification TOL = yellow = 10

Order No = 2031.42. 032. 10

# RETENTION BEARING, LOW BUILD HEIGHT

2031.04.



**Material:**

Special cast iron

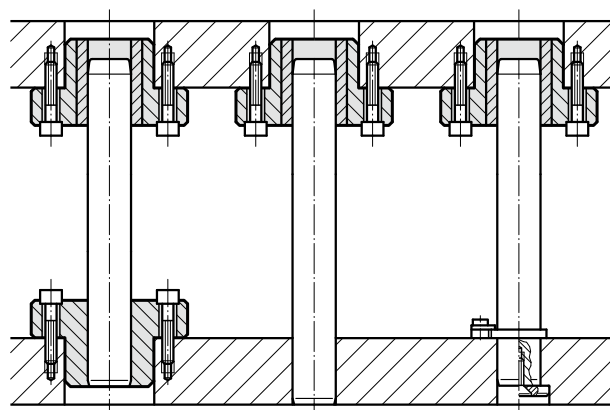
**Execution:**

Both faces machined to dims.  $h$ ; O. D.  $d_3$  turned. Hole fine bored to  $d_1^{R6}$  - fit.

**Note:**

Check squareness of pillars after press-fitting.

**Mounting example**



**2031.04. Retention bearing, low build height**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	42	47	62	77	93	107	127
$d_4$	7	9	9	11	14	18	18	22
$a$	70	85	90	115	130	160	180	215
$b$	35	45	50	65	80	96	110	130
$e_1$	53	64	68	83	95	118	132	160
$e_2$	19	24	28	34	45	55	62	75
$h$	16	16	20	23	28	33	33	38
$h_1$	30	37	47	60	77	95	120	120

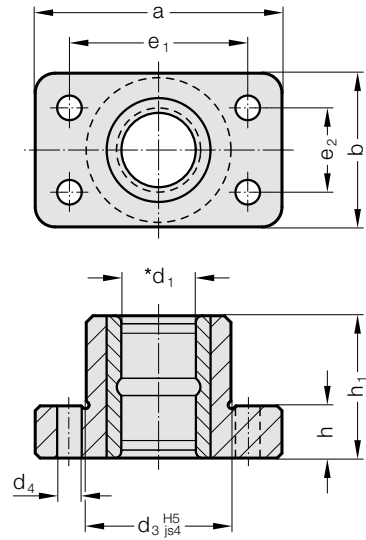
**Ordering Code (example):**

Retention bearing, low build height	= 2031.04.
Diameter of conduit $d_1$	32 mm = 032
Order No	= 2031.04. 032

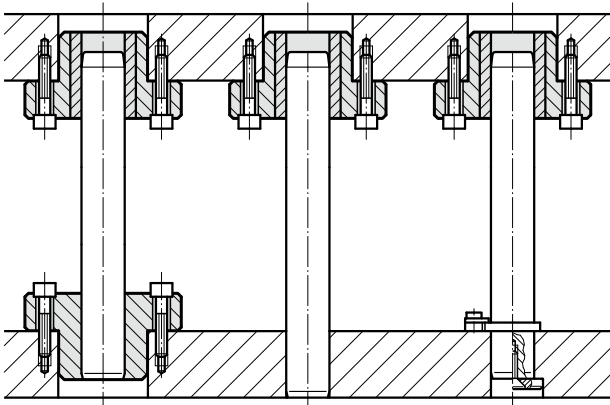
# GUIDE BEARING, LOW BUILD HEIGHT, SINTERED GUIDE



2031.38.



## Mounting example



## Material:

Basic body: Special cast iron

Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

## Execution:

Both faces machined to dims. h; O. D.  $d_3$  turned.

Bores honed.

## Note:

Notes on sliding type guides at the beginning of chapter D.

Bearing clearance see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2031.38. Guide bearing, low build height, sintered guide

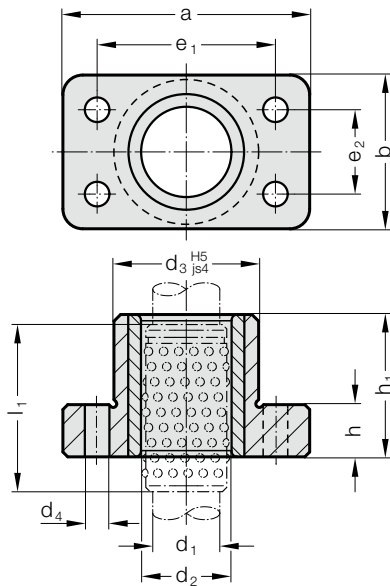
$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	42	47	62	77	93	107	127
$d_4$	7	9	9	11	14	18	18	22
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
$e_1$	53	64	68	83	95	118	132	160
$e_2$	19	24	28	34	45	55	62	75
h	16	16	20	23	28	33	33	38
$h_1$	30	37	47	60	77	95	120	120

## Ordering Code (example):

Guide bearing, low build height, sintered guide = 2031.38.  
 Diameter of conduit  $d_1$  32 mm = 032.  
 Classification TOL yellow = 10  
 Order No = 2031.38. 032. 10

# GUIDE BEARING LOW BUILD HEIGHT, FOR BALL BEARING GUIDE

2031.44.



**Material:**

Basic body: Special cast iron  
 Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

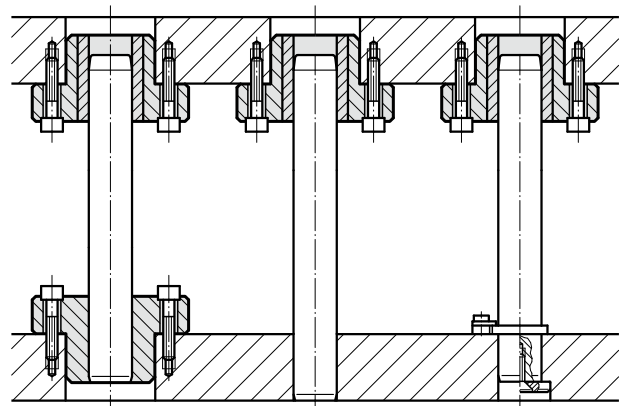
**Execution:**

Both faces machined to dims. h; O. D. d<sub>3</sub> turned.  
 Bores honed.

**Note:**

- ☞ Notes on ball bearing type guides at the beginning of chapter D.
  - ☞ Preloading see pairing classification at the beginning of chapter D
  - ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- Tolerance range:  
 yellow = .10  
 green = .20  
 red = .30

**Mounting example**



**2031.44. Guide bearing low build height, for ball bearing guide**

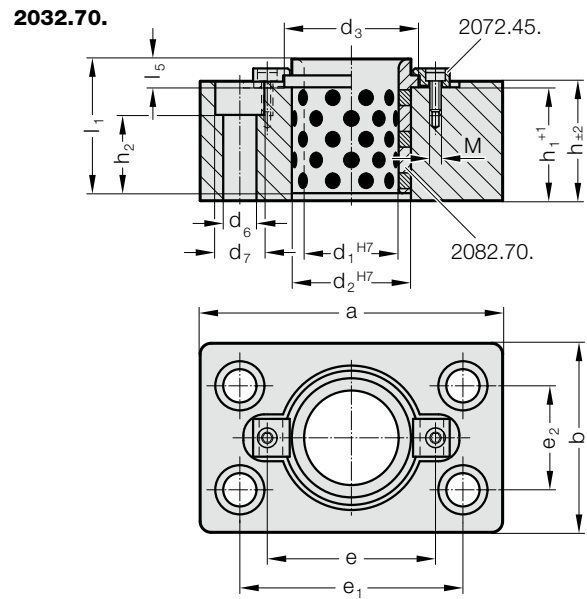
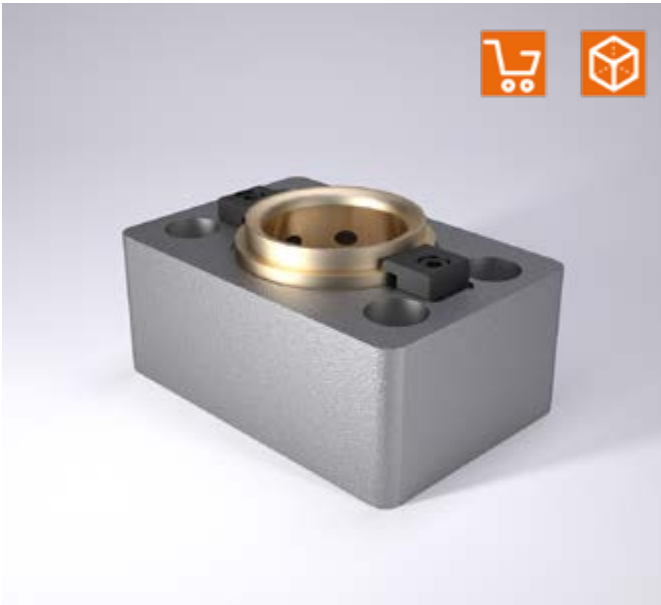
d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58
d <sub>3</sub>	42	47	62	77	93
d <sub>4</sub>	9	9	11	14	18
a	85	90	115	130	160
b	45	50	65	80	96
e <sub>1</sub>	64	68	83	95	118
e <sub>2</sub>	24	28	34	45	55
h	16	20	23	28	33
h <sub>1</sub>	37	47	60	77	95
l <sub>1</sub>	44	56	70	95	120
l*	45	56	71	95	120

\*l = Nominal ordering length of ball cage - preferred length

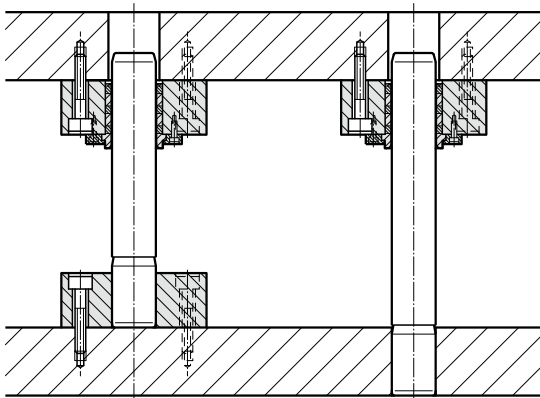
**Ordering Code (example):**

Guide bearing low build height, for ball bearing guide	= 2031.44.
Diameter of conduit d <sub>3</sub>	32 mm = 032.
Classification TOL	yellow = 10
Order No	= 2031.44. 032. 10

# GUIDE BEARING WITH HEADED GUIDE BUSH WITH SOLID LUBRICANT



## Mounting example



## Material:

Basic body: Steel, St 37

Guide bush 2082.70.: Bronze with solid lubricant, oilless lubricating

## Execution:

Face machined.

## Note:

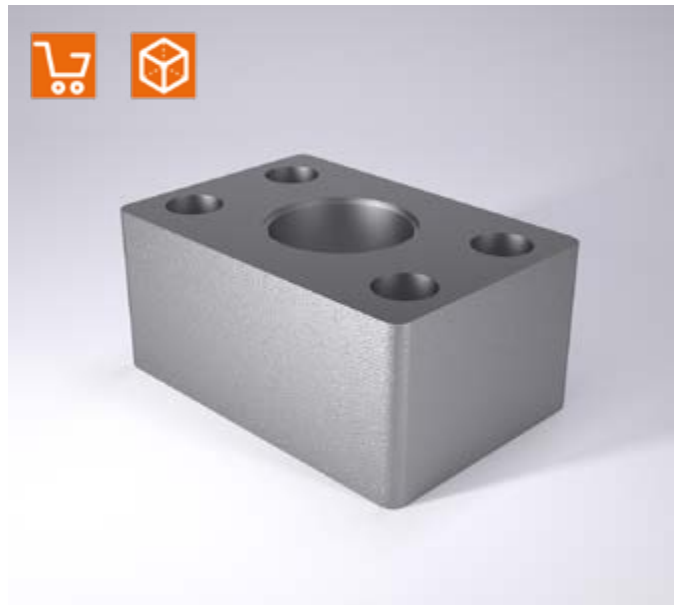
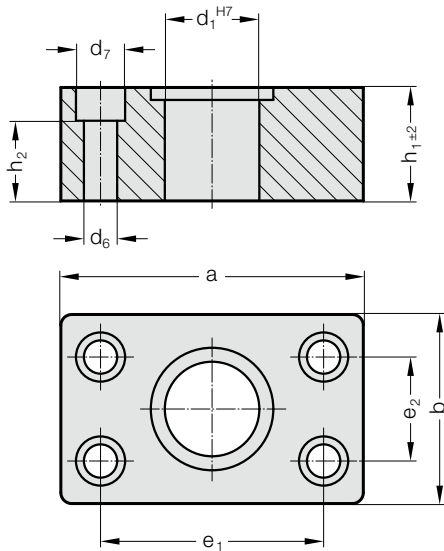
- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

## 2032.70. Guide bearing with headed guide bush with solid lubricant

Order No	d <sub>1</sub>	a	b	h	h <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>5</sub>	d <sub>6</sub>	d <sub>7</sub>	h <sub>2</sub>	e	e <sub>1</sub>	e <sub>2</sub>	M
2032.70.050	50	160	100	60	57	63	71	71	17	17.5	26	40	89	118	55	M6
2032.70.063	63	180	125	70	67	80	90	80	19	17.5	26	50	123	132	62	M10
2032.70.080	80	215	145	90	87	100	112	100	22	22	33	66	143	160	75	M10
2032.70.100	100	230	170	110	107	125	140	125	21	22	33	86	168	168	110	M10
2032.70.125	125	270	205	140	137	160	180	160	30	26	40	112	203	203	142	M10
2032.70.160	160	315	250	180	177	200	220	200	32	26	40	152	243	243	170	M10

## RETENTION BEARING FOR GUIDE PILLARS FOR LARGE TOOLS

2032.02.



**Material:**

Steel, St 37

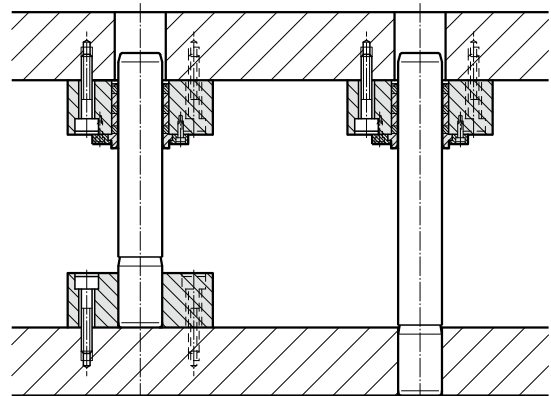
**Execution:**

Face machined. Hole fine bored to  $d_1^{H7}$  fit.

**Note:**

For guide pillars with mounting diameter r6.  
Check squareness of pillars after press-fitting.

**Mounting example**



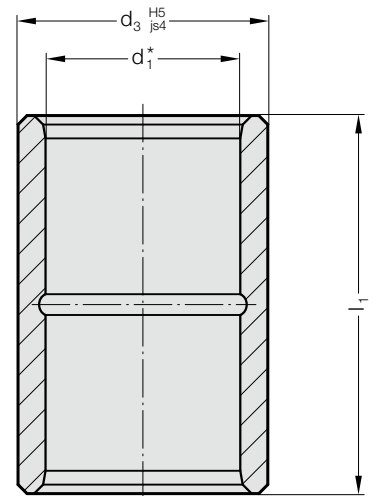
**2032.02. Retention bearing for guide pillars for large tools**

Order No	$d_1$	a	b	$h_1$	$d_6$	$d_7$	$h_2$	$e_1$	$e_2$
2032.02.050	50	160	100	70	17.5	26	40	118	55
2032.02.063	63	180	125	80	17.5	26	50	132	62
2032.02.080	80	215	145	100	22	33	66	160	75
2032.02.100	100	230	170	125	22	33	86	168	110
2032.02.125	125	270	205	140	26	40	112	203	142
2032.02.160	160	315	250	180	26	40	152	243	170

# GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-2



2051.32.



### Material:

Sintered ferrite of high purity, carbonitrided, long-term lubrication

### Execution:

Running surfaces and mounting diameter precision ground.  
Oil groove(s) not until diameter  $d_1 = 15$  mm.

### Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

### Note:

- ☞ Notes on sliding type guides at the beginning of chapter D.
- \*☞ Bearing clearance see pairing classification at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
- ø 8 - ø 12 not available in tolerance range red = .30.
- Tolerance range:  
yellow = .10; green = .20; red = .30

### 2051.32. Guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-2

$d_1$	8	11 12	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	13.7	22	28	32	40	48	58	70	85	95.7
$l_1$										
15	●									
23		●			●					
30		●	●	●	●	●	●			
37		●	●	●	●	●	●	●		
47			●	●	●	●	●	●		
60			●	●	●	●	●	●	●	●
77				●	●	●	●	●	●	●
95						●	●	●	●	
110										●
120							●	●	●	●

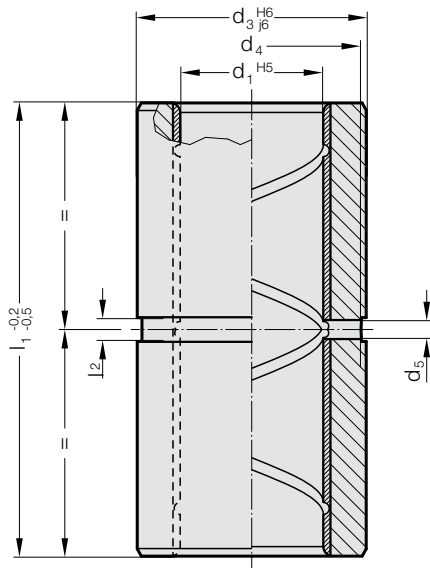
### Ordering Code (example):

Guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-2	= 2051.32.
Diameter of conduit $d_1$	30 mm = 030.
Length $l_1$	30 mm = 030.
Classification TOL	yellow = 10
Order No	= 2051.32. 030. 030. 10



# GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-2

2051.92.



**Material:**

Steel, d<sub>3</sub> induction hardened

**Execution:**

Bronze coated internal bore.

Outside diameter fine-ground.

**Slip-Fit Bonding:**

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

**Note:**

- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

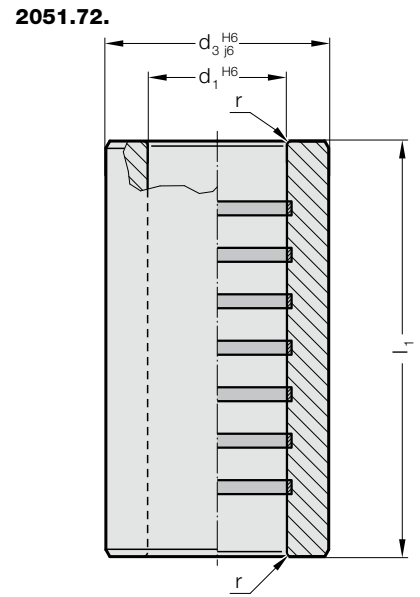
**2051.92. Guide bush ECO-LINE, bronzeplated, ISO 9448-2**

	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	28	32	40	48	58	70	85	105
d <sub>4</sub>	26	30	38	46	56	67	82	101
d <sub>5</sub>	4	4	4	4	4	5	5	8
l <sub>2</sub>	5	5	5	5	5	6	6	9
l <sub>1</sub>								
23	●	●	●					
30	●	●	●	●	●			
37	●	●	●	●	●	●		
47	●	●	●	●	●	●		
60	●	●	●	●	●	●	●	
77		●	●	●	●	●	●	
95				●	●	●	●	
120					●	●	●	●
135								●

**Ordering Code (example):**

Guide bush ECO-LINE, bronzeplated, ISO 9448-2	=	2051.92.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Length l <sub>1</sub>	30 mm =	030
Order No	=	2051.92. 032. 030

# GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICATION RINGS, ISO 9448-2



## Material:

Bronze with solid lubricant, oilless lubricating

## Execution:

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

## Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

## Note:

- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2051.72. Guide bush ECO-LINE, Bronze with solid lubrication rings, ISO 9448-2

	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>1</sub>	28	32	40	48	58	70	85	105
d <sub>3</sub>	2	2	2.5	2.5	3	3	3.5	4
r								
l <sub>1</sub>								
23	●	●	●					
30	●	●	●	●	●			
37	●	●	●	●	●	●		
47	●	●	●	●	●	●		
60		●	●	●	●	●	●	
77			●	●	●	●	●	
95				●	●	●	●	
120						●	●	●
135								●

## Ordering Code (example):

Guide bush ECO-LINE, Bronze with solid lubrication rings,  
ISO 9448-2

= 2051.72.

Diameter of conduit d<sub>1</sub>

32 mm = 032.

Length l<sub>1</sub>

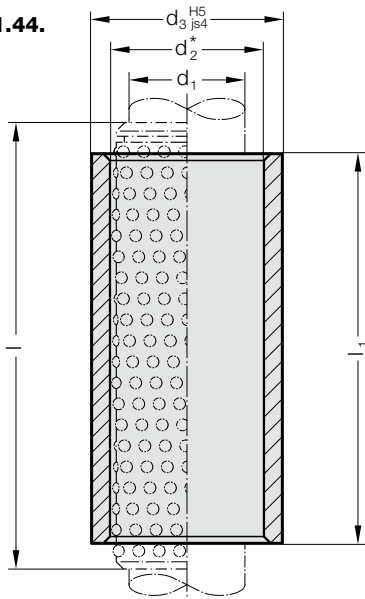
30 mm = 030

Order No

= 2051.72. 032. 030

# GUIDE BUSH FOR BALL BEARING, ISO 9448-3

2061.44.



## Material:

Tool steel, hardened  $62 \pm 2$  HRC

## Execution:

Bearing surfaces honed,  
outside diameter precision ground.

## Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages**:

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned

above.

## Note:

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

$\varnothing 8 - \varnothing 12$  not available in tolerance range red = .30.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2061.44. Guide bush for ball bearing, ISO 9448-3

$d_1$	8	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
$d_2$	11	14	15	16	21	22	25	26	30	31	38	40	46	48	56	58	68	71	92
$d_3$	18	22	22	22	28	28	32	32	40	40	48	48	58	58	70	70	85	85	105
$l_1 / l^*$																			
23 / 45					•	•	•	•	•	•									
23 / 39		•	•	•															
30 / 45					•	•	•	•	•	•	•	•	•	•					
30 / 39	•	•	•	•															
37 / 39		•	•	•															
37 / 45					•	•	•	•	•	•									
37 / 50					•	•	•	•	•	•									
47 / 56					•	•	•	•	•	•	•	•	•	•	•	•			
47 / 65													•	•	•	•			
60 / 80													•	•	•	•			
60 / 72					•	•	•	•	•	•									
60 / 70											•	•							
60 / 95																	•	•	
77 / 95							•	•	•	•	•	•	•	•	•	•	•	•	•
95 / 120											•	•	•	•	•	•	•	•	•
120 / 140													•	•	•	•	•	•	•

\* $l_1$  = Nominal ordering length of ball cage - preferred length

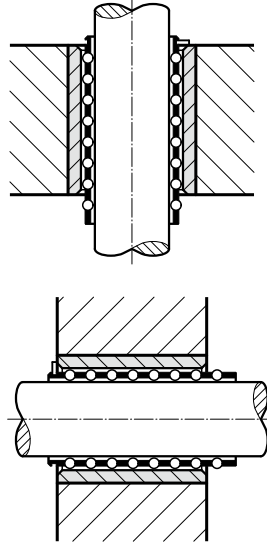
## Ordering Code (example):

Guide bush for ball bearing, ISO 9448-3	=	2061.44.
Diameter of conduit $d_1$	25 mm =	025.
Installation length $l_1$	23 mm =	023.
Classification TOL	yellow =	10
Order No	=	2061.44. 025.023. 10

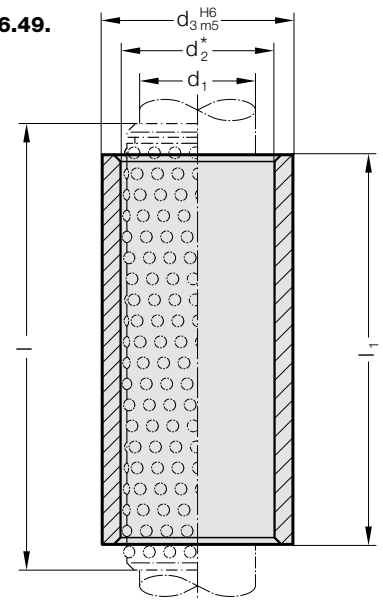
# GUIDE BUSH FOR BALL BEARING, AFNOR



Mounting example



206.49.



**Material:**

Tool steel, hardened 62 ± 2 HRC

**Execution:**

Bearing surfaces honed, outside diameter precision ground.

**Slip-Fit Bonding:**

The position of the bearing is given by push fit holes tolerance H6. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

**Note:**

- ☞ Notes on ball bearing type guides at the beginning of chapter D.
  - \*☞ Preloading see pairing classification at the beginning of chapter D
  - ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
  - ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
- Tolerance range:  
 yellow = .10  
 green = .20  
 red = .30

**206.49. Guide bush for ball bearing, AFNOR**

d <sub>1</sub>	16	20	25	32	40	50
d <sub>2</sub>	22	26	31	40	48	58
d <sub>3</sub>	28	32	40	50	63	80
l <sub>i</sub> / l*						
35 / 45	●	●				
40 / 45	●	●	●			
45 / 56				●		
50 / 56	●	●	●			
55 / 63					●	
60 / 71	●	●	●	●		
70 / 80		●	●	●	●	
80 / 95		●	●	●	●	●
90 / 105				●	●	●
90 / 95			●			
100 / 120				●	●	●
120 / 140					●	●

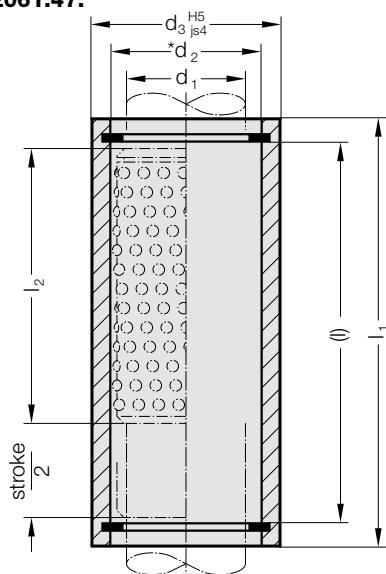
\*l = Nominal ordering length of ball cage - preferred length

**Ordering Code (example):**

Guide bush for ball bearing, AFNOR	= 206.49.
Diameter of conduit d <sub>1</sub>	32 mm = 032.
Installation length l <sub>i</sub>	45 mm = 045.
Classification TOL	yellow = 10
Order No	= 206.49. 032. 045. 10

# GUIDE BUSH FOR BALL BEARING, WITH STROKE LIMITATION

2061.47.



## Material:

Tool steel, hardened  $62 \pm 2$  HRC

## Execution:

Bearing surfaces honed,  
outside diameter precision ground.

## Slip-Fit Bonding:

The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

## Note:

- ☞ Notes on ball bearing type guides at the beginning of chapter D.
- \*☞ Preloading see pairing classification at the beginning of chapter D
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

- yellow = .10
- green = .20
- red = .30

## 2061.47. Guide bush for ball bearing, with stroke limitation

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60	63
$d_2$	21	25	30	38	46	56	68	71
$d_3$	28	32	40	48	58	70	85	85
(l)	55.6	72	70.8	88.2	113.2	112.2	112.2	107.2
$l_1 / l_2^*$								
60 / 44	●							
77 / 44		●	●					
95 / 50				●				
120 / 65					●			
120 / 80						●		
120 / 95							●	●

\* $l_2$  = Manufacturing length of ball cage

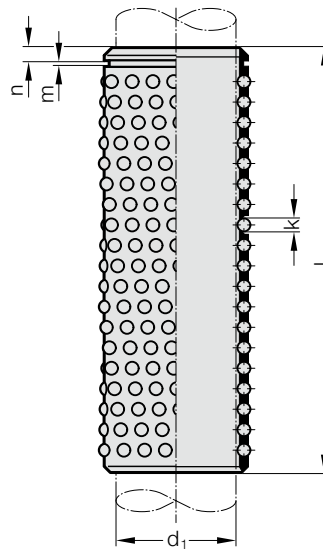
## Ordering Code (example):

Guide bush for ball bearing, with stroke limitation	=	2061.47.
Diameter of conduit $d_1$	32 mm =	032.
Installation length $l_1$	95 mm =	095.
Classification TOL	yellow =	10
Order No	=	2061.47. 032.095. 10

## BALL CAGE WITH CIRCLIP GROOVE, BRASS



206.71.



### Material:

Cage: Brass

Balls: Steel hardened (DIN 5401)

### Note:

Ball cages from  $\varnothing 10$  has a groove for circlip to DIN 471 (206.72.).

☞ Notes on ball bearing type guides at the beginning of chapter D.

☞ Bearing life and dynamic load indexes see at the end of chapter D.

$l$  = Nominal ordering length

$l_1$  = Manufacturing length

### 206.71. Ball cage with circlip groove, Brass

$d_1$	8	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80	
k	1.5	2			3		3		3		4		4		4		4		6	
n		1.1			1.6		1.6		1.6		2.1		2.1		2.1		2.1		3	
m		1.1			1.3		1.3		1.6		1.85		1.85		2.15		2.65		3.15	
$l/l_1$	Total number of balls																			
24 / 24		96			64		80													
28 / 27		112																		
28 / 28					80		100													
31 / 30		128																		
31 / 32					96		120		120											
40 / 39	136	176																		
40 / 40					128		160		160		120									
45 / 44					144		180		180											
45 / 45		208									140		168							
50 / 48		224					200													
50 / 50											160		192		224					
50 / 52					176				220											
56 / 55											180		216		252					
56 / 56					192		240		240											
56 / 57		272																		
63 / 64					224		280		280											
63 / 65											220		264		308					
71 / 70											240		288		336					
71 / 72					256		320		320											
80 / 80							360		360		280		336		392		448			
95 / 95											340		408		476		544			
95 / 96							440		440											
105 / 104									480											
105 / 105											380		456		532		608			
120 / 119																				540
120 / 120									560		440		528		616		704			
140 / 140											520		624		728		832			648
160 / 160											600		720		840		960			
160 / 161																				756
180 / 180													816		952		1,088			
180 / 182																				864
200 / 200													912		1,064		1,216			
200 / 203																				972
240 / 238																				1,152
240 / 240													1,104		1,288		1,472			

### Ordering Code (example):

Ball cage with circlip groove, Brass = 206.71.

Diameter of conduit  $d_1$  30 mm = 030.

Nominal order length for ball cage  $l$  120 mm = 120

Order No = 206.71. 030. 120

# BALL CAGE WITH CIRCLIP GROOVE, ALUMINIUM

## Material:

Cage: Aluminium

Balls: Steel hardened (DIN 5401)

## Note:

Ball cages from  $\varnothing 10$  has a groove for circlip to DIN 471 (206.72.).

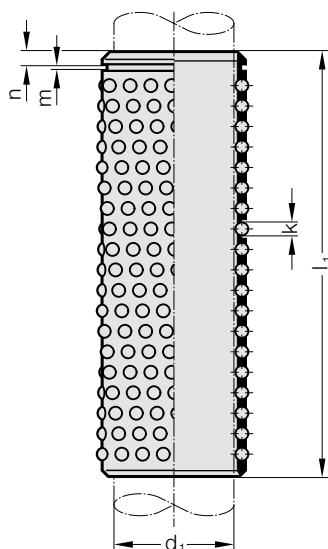
☞ Notes on ball bearing type guides at the beginning of chapter D.

☞ Bearing life and dynamic load indexes see at the end of chapter D.

$l$  = Nominal ordering length

$l_1$  = Manufacturing length

2060.61.



## 2060.61. Ball cage with circlip groove, Aluminium

$d_1$	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
$k$	2	3	3	3	3	3	4	4	4	4	6
$n$	1.1	1.6	1.6	1.6	1.6	1.6	2.1	2.1	2.1	2.1	3
$m$	1.1	1.3	1.3	1.3	1.3	1.6	1.85	1.85	2.15	2.65	3.15
$l/l_1$	Total number of balls										
24 / 24			64		80						
28 / 28			80		100						
31 / 32				120	120	120					
40 / 39	176										
40 / 40						160	120				
45 / 44		144	144	180	180	180					
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56		192	192	240	240	240					
56 / 57	272										
63 / 64		224	224								
63 / 65								264	308		
71 / 70							240				
71 / 72		256	256	320	320	320					
80 / 80				360	360	360	280	336	392		
95 / 95							340	408	476	544	
95 / 96				440	440	440					
105 / 105							380	456	532	608	
120 / 119											540
120 / 120						560	440	528	616	704	
140 / 140							520	624	728	832	648
160 / 160							600	720	840	960	
160 / 161											756
180 / 180								816	952	1,088	
180 / 182											864
200 / 200								912	1,064	1,216	
200 / 203											972
240 / 238											1,152
240 / 240								1,104	1,288	1,472	

## Ordering Code (example):

Ball cage with circlip groove, Aluminium = 2060.61.

Diameter of conduit  $d_1$  38 mm = 038.

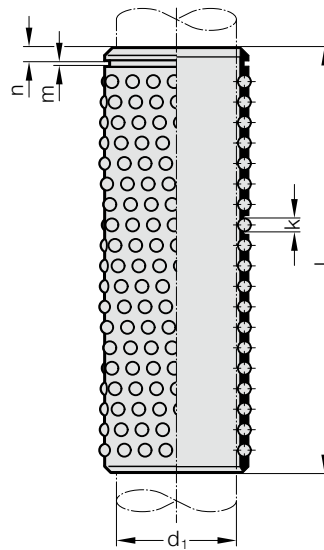
Nominal order length for ball cage  $l$  50 mm = 050

Order No = 2060.61. 038. 050

# BALL CAGE WITH CIRCLIP GROOVE, PLASTIC



2060.41.



**Material:**

Cage: Plastic, POM  
 Balls: Steel hardened (DIN 5401)

**Note:**

Ball cages are implemented with one penetration hole for a lock ring DIN 471 (206.72.).  
 ☞ Notes on ball bearing type guides at the beginning of chapter D.  
 ☞ For lifetime and dynamic load figures, see the end of chapter D.  
 l = Nominal order length  
 l<sub>1</sub> = Production length

**2060.41. Ball cage with circlip groove, plastic**

d <sub>1</sub>	12	15 16	19 20	24 25	30 32	38 40
k	2	3	3	3	4	4
n	1.1	1.6	1.6	1.6	2.1	2.1
m	1.1	1.3	1.3	1.6	1.85	1.85
l / l <sub>1</sub>	Total number of balls					
24 / 24	84	56	64			
31 / 31	112	84	96	108	72	
45 / 45	182	126	144	162	126	140
56 / 56		168	192	216	162	180
71 / 71			256	288	216	240
95 / 95				378	306	340

**Ordering Code (example):**

Ball cage with circlip groove, plastic	=	2060.41.
Diameter of conduit d <sub>1</sub>	24 mm =	024.
Nominal order length for ball cage l	56 mm =	056
Order No	=	2060.41.024.056

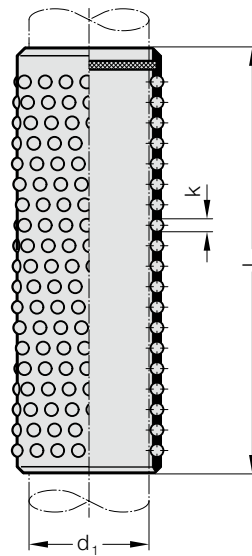




## BALL CAGE WITH ASSEMBLY AID, BRASS



206.73.



### Material:

Cage: Brass

Balls: Steel hardened (DIN 5401)

### Note:

No assistant is needed for their assembly. These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.

☞ Notes on ball bearing type guides at the beginning of chapter D.

☞ Bearing life and dynamic load indexes see at the end of chapter D.

l = Nominal ordering length

l<sub>1</sub> = Manufacturing length

### 206.73. Ball cage with assembly aid, Brass

d <sub>1</sub>	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	3	3	3	3	3	4	4	4	4	6
Total number of balls											
l / l <sub>1</sub>											
24 / 24			64			80					
28 / 28			80			100					
31 / 32					120	120	120				
40 / 39	176										
40 / 40							160	120			
45 / 44			144	144	180	180	180				
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56			192	192	240	240	240				
56 / 57	272										
63 / 64			224	224							
63 / 65							264	308			
71 / 70							240				
71 / 72			256	256	320	320	320				
80 / 80					360	360	360	280	336	392	
95 / 95							340	408	476	544	
95 / 96					440	440	440				
105 / 105							380	456	532	608	
120 / 119											540
120 / 120							560	440	528	616	704
140 / 140							520	624	728	832	648
160 / 160							600	720	840	960	
160 / 161											756
180 / 180									816	952	1088
180 / 182											864
200 / 200									912	1064	1216
200 / 203											972
240 / 238											1152
240 / 240									1104	1288	1472

### Ordering Code (example):

Ball cage with assembly aid, Brass = 206.73.  
 Diameter of conduit d<sub>1</sub> 38 mm = 038.  
 Nominal order length for ball cage l 50 mm = 050  
 Order No = 206.73. 038. 050

## BALL CAGE WITH ASSEMBLY AID, ALUMINIUM

### Material:


Cage: Aluminium


Balls: Steel hardened (DIN 5401)

### Note:

No assistant is needed for their assembly.

These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.

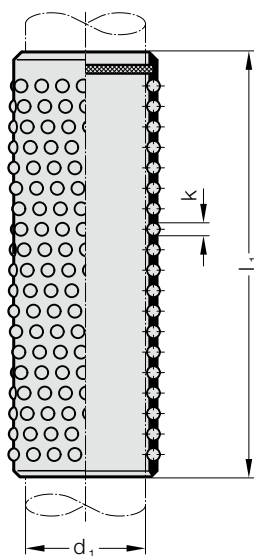
 Notes on ball bearing type guides at the beginning of chapter D.

 Bearing life and dynamic load indexes see at the end of chapter D.

l = Nominal ordering length

l<sub>1</sub> = Manufacturing length

2060.63.



### 2060.63. Ball cage with assembly aid, Aluminium

d <sub>1</sub>	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	3	3	3	3	3	4	4	4	4	6
	Total number of balls										
l / l <sub>1</sub>											
24 / 24			64			80					
28 / 28			80			100					
31 / 32					120	120	120				
40 / 39	176										
40 / 40							160	120			
45 / 44			144	144	180	180	180				
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56			192	192	240	240	240				
56 / 57	272										
63 / 64			224	224							
63 / 65									264	308	
71 / 70											
71 / 72			256	256	320	320	320				
80 / 80					360	360	360	280	336	392	
95 / 95							340	408	476	544	
95 / 96					440	440	440				
105 / 105											
120 / 119											
120 / 120							560	440	528	616	704
140 / 140									520	624	728
160 / 160									600	720	840
160 / 161											960
180 / 180											832
180 / 182											960
200 / 200											756
200 / 203											864
240 / 238											864
240 / 240											972
											1152
											1104
											1288
											1472

### Ordering Code (example):

Ball cage with assembly aid, Aluminium = 2060.63.

Diameter of conduit d<sub>1</sub> 38 mm = 038.

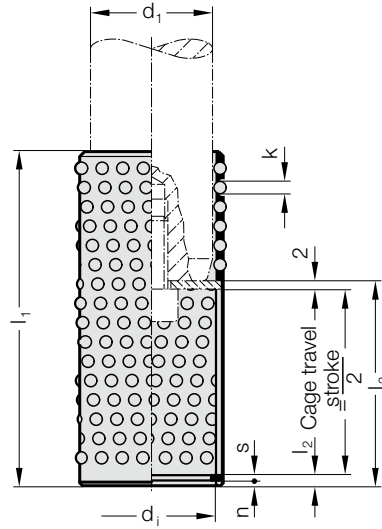
Nominal order length for ball cage l 50 mm = 050

Order No = 2060.63. 038. 050

# BALL CAGE WITH CIRCLIP AND FASTENING RING GROOVE, BRASS



206.75.



**Material:**

Cage: Brass

Balls: Steel hardened (DIN 5401)

**Note:**

☞ Notes on ball bearing type guides at the beginning of chapter D.

☞ Bearing life and dynamic load indexes see at the end of chapter D.

l = Nominal ordering length

l<sub>1</sub> = Manufacturing length

Cage retainer 202.92.1. order separately

**206.75. Ball cage with circlip and fastening ring groove, Brass**

d <sub>1</sub>	19	20	24	25	30	32	38	40	48	50	60	63
d <sub>1</sub> x s	20 x 1	21 x 1	25 x 1.2	26 x 1.2	31 x 1.2	33 x 1.2	39 x 1.5	41 x 1.75	48 x 1.75	51 x 2	60 x 2	63 x 2
k	3	3	3	3	4	4	4	4	4	4	4	4
l <sub>2</sub>	2.6	2.6	2.6	2.6	2.6	2.6	3.45	3.45	4.3	4.3	4.3	4.3
n	1.3	1.3	1.3	1.3	1.3	1.3	1.85	1.6	1.6	2.15	2.15	2.15
l / l <sub>1</sub>	l <sub>3</sub>											
56 / 56	31	31	31	31								
70 / 70					41	41						
72 / 72	41	41	41	41								
80 / 80	51	51	51	51	51	51	51	51	51	51		
95 / 95					61	61	61	61	61	61	61	61
105 / 105					61	61	61	61				
120 / 120							73	73	73	73	73	73
140 / 140											83	83

**Ordering Code (example):**

Ball cage with circlip and fastening ring groove, Brass	=	206.75.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Nominal order length for ball cage l	80 mm =	080.
Slot length l <sub>3</sub>	51 mm =	051
Order No	=	206.75. 038. 080. 051

# BALL CAGE WITH CIRCLIP AND FASTENING RING GROOVE, ALUMINIUM

## Material:

Cage: Aluminium

Balls: Steel hardened (DIN 5401)

## Note:

Notes on ball bearing type guides at the beginning of chapter D.

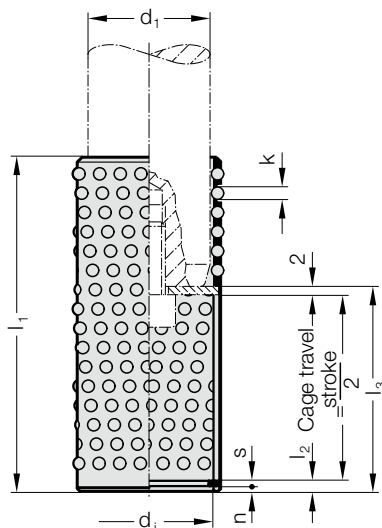
Bearing life and dynamic load indexes see at the end of chapter D.

$l$  = Nominal ordering length

$l_1$  = Manufacturing length

Cage retainer 202.92.1. order separately

2060.65.



## 2060.65. Ball cage with circlip and fastening ring groove, Aluminium

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_1 \times s$	20 x 1	21 x 1	25 x 1.2	26 x 1.2	31 x 1.2	33 x 1.2	39 x 1.5	41 x 1.75	48 x 1.75	51 x 2	60 x 2	63 x 2
$k$	3	3	3	3	4	4	4	4	4	4	4	4
$l_2$	2.6	2.6	2.6	2.6	2.6	2.6	3.45	3.45	4.3	4.3	4.3	4.3
$n$	1.3	1.3	1.3	1.3	1.3	1.3	1.85	1.6	1.6	2.15	2.15	2.15
$l/l_1$	$l_3$											
56 / 56	31	31	31	31								
70 / 70					41	41						
72 / 72	41	41	41	41								
80 / 80	51	51	51	51	51	51	51	51	51	51		
95 / 95					61	61	61	61	61	61	61	61
105 / 105					61	61	61	61				
120 / 120							73	73	73	73	73	73
140 / 140											83	83

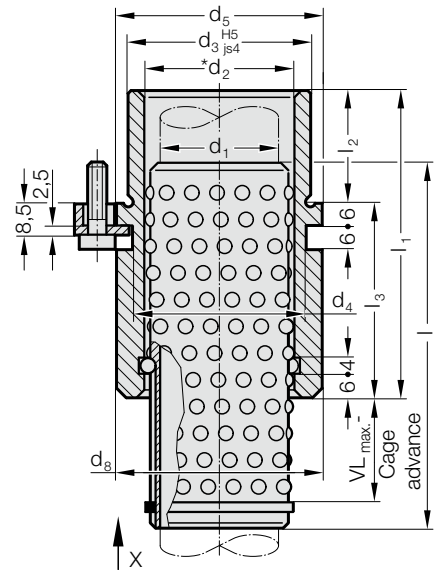
## Ordering Code (example):

Ball cage with circlip and fastening ring groove, Aluminium	=	2060.65.
Diameter of conduit $d_1$	38 mm =	038.
Nominal order length for ball cage $l$	80 mm =	080.
Slot length $l_3$	51 mm =	051
Order No	=	2060.65. 038.080.051

# HEADED GUIDE BUSH WITH BALL CAGE RETAINER



2081.67.



**Material:**

Bush: Tool steel  
 Hardness: 62 ± 2 HRC  
 Cage: Brass  
 Balls: Steel hardened (DIN 5401)

**Note:**

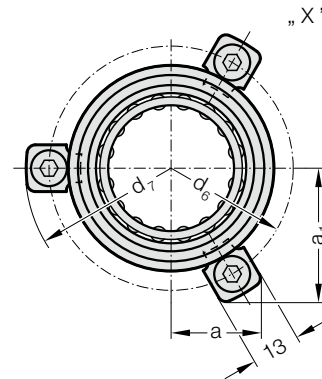
Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length. The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

The attachment is with 3 Screw clamp, from ø d<sub>1</sub> = 38 with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).

\* Preloading see pairing classification at the beginning of chapter D  
 Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:  
 yellow = .10; green = .20; red = .30



**2081.67. Headed guide bush with ball cage retainer**

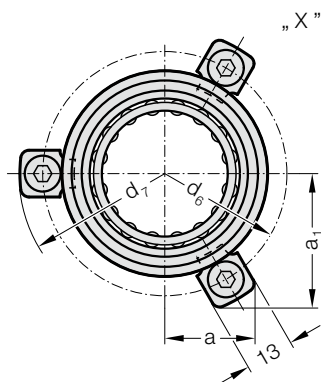
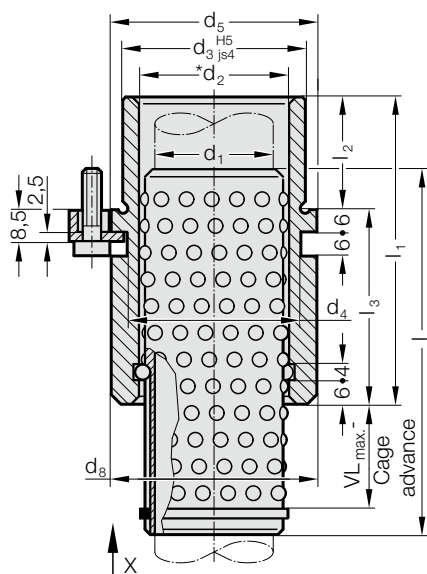
d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71
d <sub>3</sub>	32	40	48	58	70	85
d <sub>4</sub>	32	40	48	58	70	85
d <sub>5</sub>	40	48	56	66	80	95
d <sub>6</sub>	52	60	67	77	91	106
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7
d <sub>8</sub>	38.9	46	53	63	77	92
l <sub>1</sub>	59	79	93	108	127	150
l <sub>2</sub>	23	23	30	37	47	60
l <sub>3</sub>	36	56	63	71	80	90
l	72	96	120	140	140	160
a	20.7	22.65	24.4	35.3	40.2	45.5
a <sub>1</sub>	30	33.4	36.4	35.3	40.2	45.5
VL <sub>max.</sub>	49	68	84	96	86	92

**Ordering Code (example):**

Headed guide bush with ball cage retainer	=	2081.67.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Feed length VL	5 mm =	005.
Classification TOL	yellow =	10
Order No	=	2081.67. 038.005. 10

# HEADED GUIDE BUSH WITH BALL CAGE RETAINER

2081.68.



## Material:

Bush: Tool steel  
 Hardness: 62 ± 2 HRC  
 Cage: Aluminium  
 Balls: Steel hardened (DIN 5401)

## Note:

Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length.

The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

\* Preloading see pairing classification at the beginning of chapter D  
 Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10; green = .20; red = .30

## 2081.68. Headed guide bush with ball cage retainer

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71
$d_3$	32	40	48	58	70	85
$d_4$	32	40	48	58	70	85
$d_5$	40	48	56	66	80	95
$d_6$	52	60	67	77	91	106
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7
$d_8$	38.9	46	53	63	77	92
$l_1$	59	79	93	108	127	150
$l_2$	23	23	30	37	47	60
$l_3$	36	56	63	71	80	90
$l$	72	96	120	140	140	160
$a$	20.7	22.65	24.4	35.3	40.2	45.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5
$VL_{max.}$	49	68	84	96	86	92

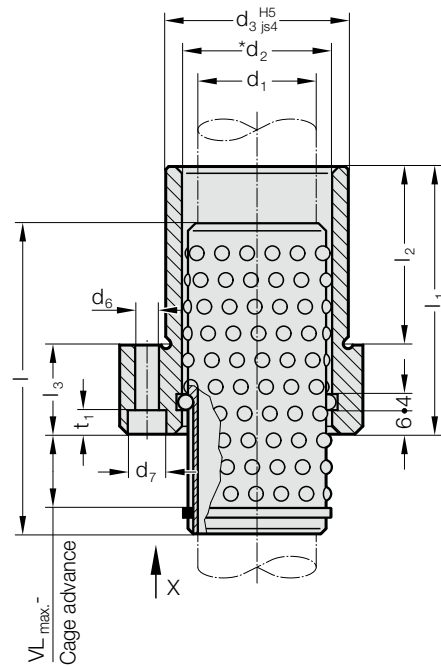
## Ordering Code (example):

Headed guide bush with ball cage retainer	= 2081.68.
Diameter of conduit $d_1$	38 mm = 038.
Feed length VL	5 mm = 005.
Classification TOL	yellow = 10
Order No	= 2081.68. 038. 005. 10

# FLANGED GUIDE BUSH WITH BALL CAGE RETAINER



2091.67.



## Material:

Bush: Tool steel  
 Hardness: 62 ± 2 HRC  
 Cage: Brass  
 Balls: Steel hardened (DIN 5401)

## Note:

Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length.

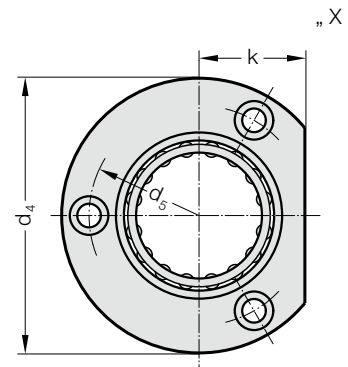
The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

\* Preloading see pairing classification at the beginning of chapter D

Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10  
 green = .20  
 red = .30



## 2091.67. Flanged guide bush with ball cage retainer

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4.5	5.5	5.5	6.6	9	9	11
d <sub>7</sub>	8	10	10	11	15	15	18
t <sub>1</sub>	4.6	5.7	5.7	6.8	9	9	11
k	18	23	28	33	38	46	56
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140
VL <sub>max.</sub>	49	44	44	51	51	52	54

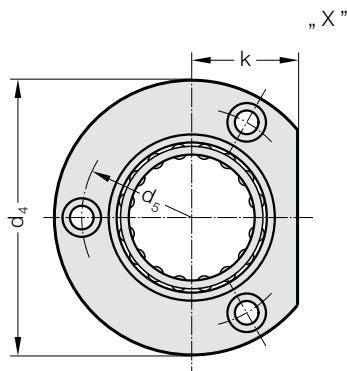
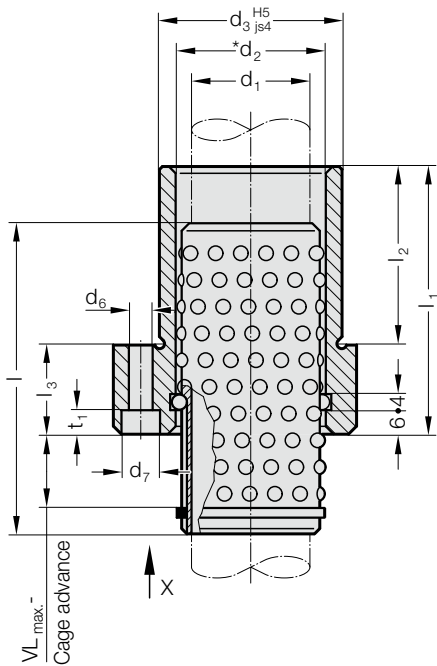
## Ordering Code (example):

Flanged guide bush with ball cage retainer	=	2091.67.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Feed length VL	5 mm =	005.
Classification TOL	gelb =	10
Order No	=	2091.67. 038. 005. 10



# FLANGED GUIDE BUSH WITH BALL CAGE RETAINER

2091.68.



**Material:**

- Bush: Tool steel
- Hardness: 62 ± 2 HRC
- Cage: Aluminium
- Balls: Steel hardened (DIN 5401)

**Note:**

Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.

In this context it is of importance to note the minimum constructional length.

The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

- \* Preloading see pairing classification at the beginning of chapter D
- Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:  
 yellow = .10  
 green = .20  
 red = .30

**2091.68. Flanged guide bush with ball cage retainer**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4.5	5.5	5.5	6.6	9	9	11
d <sub>7</sub>	8	10	10	11	15	15	18
t <sub>1</sub>	4.6	5.7	5.7	6.8	9	9	11
k	18	23	28	33	38	46	56
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140
VL <sub>max.</sub>	49	44	44	51	51	52	54

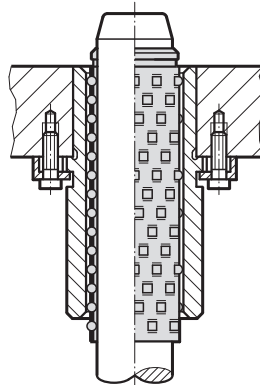
**Ordering Code (example):**

Flanged guide bush with ball cage retainer	=	2091.68.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Feed length VL	5 mm =	005.
Classification TOL	yellow =	10
Order No	=	2091.68. 038. 005. 10

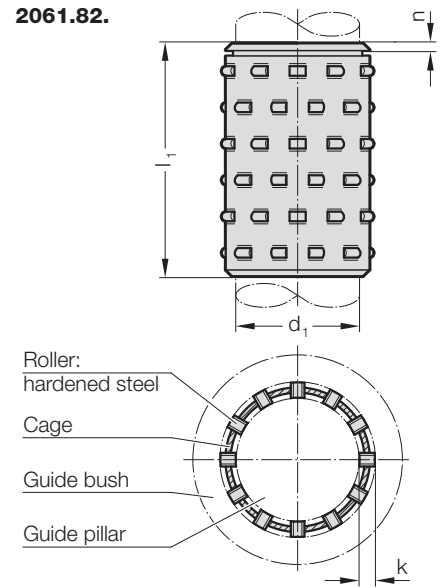
# ROLLER CAGE WITH CIRCLIP GROOVE, BRASS



Mounting example



2061.82.



## Description:

Roller cages make linear contact with the guide bush and the guide pillar. This results in a load carrying capacity for each individual roller which is many times that of a ball of the same diameter. Roller bearings feature a FIBRO specific seal, similar to the ball bearings. The profile rollers are arranged in a spiral layout axially, so that every roller has its own path. The cages are grooved to accept a DIN 471 (206.72.) circlip.

## Material:

Roller Cage: Brass  
Rollers: Steel hardened, 100 Cr6, DIN 5402

## Note:

☞ Preloading see at the beginning of Chapter D  
For roller cages use only pairing class guide pillar red = .30 and guide sleeve yellow = .10.

## 2061.82. Roller cage with circlip groove, Brass

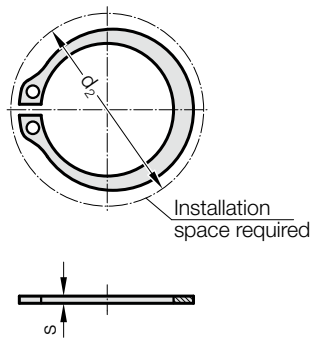
$d_1$	19	20	24 25	30 32	38 40	48 50	63
k	3	3	3	4	4	4	4
n	1.6	1.6	1.6	2.1	2.1	2.1	2.1
$l_1$	Total number of rollers						
45	32	32	40	48			
55	40	40	50	60	70		
65	48	48	60	72	84	108	
75	56	56	70	84	98	126	154
85	64	64	80	96	112	144	176
95	72	72	90	108	126	162	198
105	80	80	100	120	140	180	220
115			110	132	154	198	242
125			120	144	168	216	264
135				156	182	234	286
145				168	196	252	308
155				180	210	270	330
165				192	224	288	352
175					238	306	374
185					252	324	396
205					280	360	440

## Ordering Code (example):

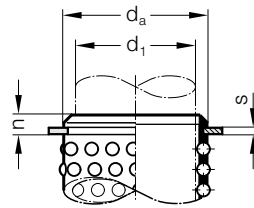
Roller cage with circlip groove, Brass	=	2061.82.
Diameter of conduit $d_1$	38 mm =	038.
Length $l_1$	115 mm =	115
Order No	=	2061.82. 038. 115

# CIRCLIP DIN 471

206.72.



## Mounting example



## 206.72. Circlip DIN 471

d <sub>1</sub>	d <sub>a</sub> x s	d <sub>2</sub>	d <sub>1</sub>	d <sub>a</sub> x s	d <sub>2</sub>
10	13 x 1	20.2	30	37 x 1.75	49
11	14 x 1	21.4	32	39 x 1.75	51.4
12	15 x 1	22.6	38	45 x 1.75	59.1
15	20 x 1.2	28.4	40	47 x 1.75	60.8
16	21 x 1.2	29.6	48	55 x 2	70.2
18	23 x 1.2	32.2	50	57 x 2	72.6
19	24 x 1.2	33.2	60	67 x 2.5	83.1
20	25 x 1.2	34.2	63	70 x 2.5	87
24	29 x 1.5	39.1	80	90 x 3	108.5
25	30 x 1.5	40.5			

## Description:

For securing the ball and roller cages

## Execution:

to DIN 471

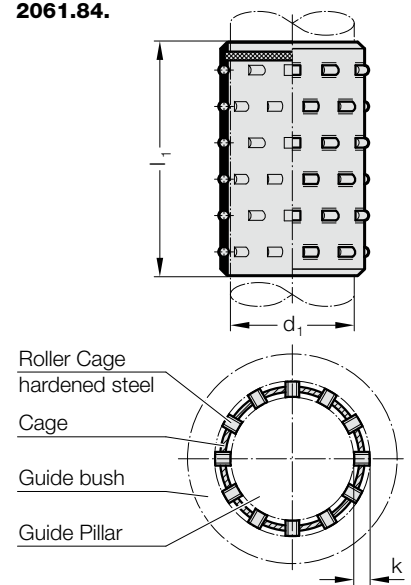
## Ordering Code (example):

Circlip DIN 471	=	206.72.
Diameter of conduit d <sub>1</sub>	25 mm =	025
Order No	=	206.72. 025

## ROLLER CAGE WITH ASSEMBLY AID, BRASS



2061.84.



### Description:

Roller cages make linear contact with the guide bush and the guide pillar. This results in a load carrying capacity for each individual roller which is many times that of a ball of the same diameter. Roller bearings feature a FIBRO specific seal, similar to the ball bearings. The profile rollers are arranged in a spiral layout axially, so that every roller has its own path.

### Material:

Roller Cage: Brass

Rollers: Steel hardened, 100 Cr6, DIN 5402

### Note:

No assistant is needed for their assembly. These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.

☞ Preloading see at the beginning of Chapter D

For roller cages use only pairing class guide pillar red = .30 and guide sleeve yellow = .10.

### 2061.84. Roller cage with assembly aid, Brass

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	63
k	3	3	4	4	4	4
l <sub>1</sub>	Total number of rollers					
45	32	40	48			
55	40	50	60	70		
65	48	60	72	84	108	
75	56	70	84	98	126	154
85	64	80	96	112	144	176
95	72	90	108	126	162	198
105	80	100	120	140	180	220
115		110	132	154	198	242
125		120	144	168	216	264
135			156	182	234	286
145			168	196	252	308
155			180	210	270	330
165			192	224	288	352
175				238	306	374
185				252	324	396
205				280	360	440

### Ordering Code (example):

Roller cage with assembly aid, Brass = 2061.84.

Diameter of conduit d<sub>1</sub> 38 mm = 038.

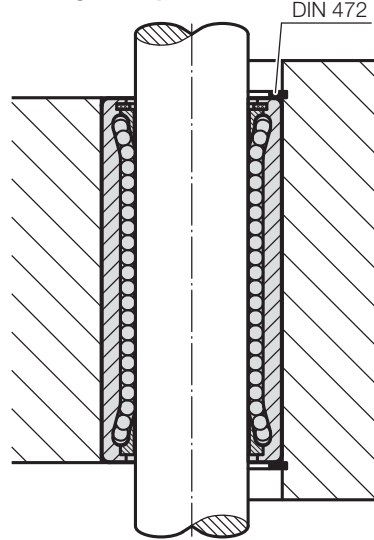
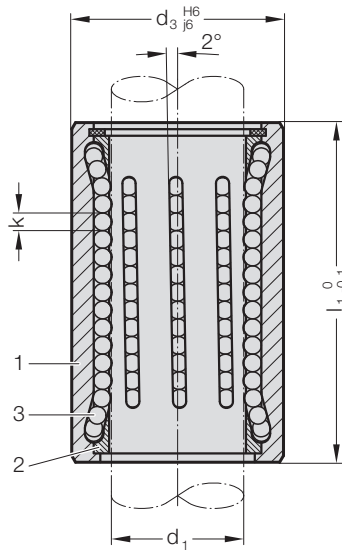
Length l<sub>1</sub> 115 mm = 115

Order No = 2061.84. 038. 115

# RECIRCULATING BALL BUSH ~ISO9448-3

2061.69. .1

Mounting example



## Description:

The recirculating ball bush is used when very large paths (strokes) are travelled. This is only limited by the mounting situation. In comparison to guides with ball cage, however, the lower dynamic load figures (C) should be observed. Despite the high number of ball tracks, fewer balls are in usage.

For optimum service life, a movement path (stroke) of three times the length of the recirculating ball bush is recommended ( $3 \times l_1$ ).

## Material:

Socket (1): Steel, hardened  $62 \pm 2$  HRC  
 Ball carrier (2): Aluminium  
 Balls (3): Steel, hardened, conforming to DIN 5401

## Execution:

Outside diameter precision ground.

## Slip-Fit Bonding:

The bush is accurately positioned by means of H6 slip-fit hole. The slip-fit adhesive (order no. 281.648) is used solely to secure the bond.

## Advantages of slip-fit bonding:

- High accuracy and stability
- Ease of interchangeability

We do not recommend press-fitting the bush since that causes unacceptable alteration to the shape of the bush.

Fastening within the locating hole using DIN 472 locking rings is possible.

## Note:

- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ For service life calculation and dynamic load figures, see the end of chapter D.
- ☞ Assembly guidelines / size tables and tolerances at the end of chapter D.

Recirculating ball bushes only with red guide pillar = .30 combinable.

## 2061.69. .1 Recirculating ball bush ~ISO9448-3

$d_1$	20	25	32	40	50	63
$d_3$	32	40	48	58	70	85
Ball tracks	8	8	8	10	10	12
k	3	3	4	4	4	4
$l_1$						
47	●					
60		●				
77			●			
95				●	●	
120						●

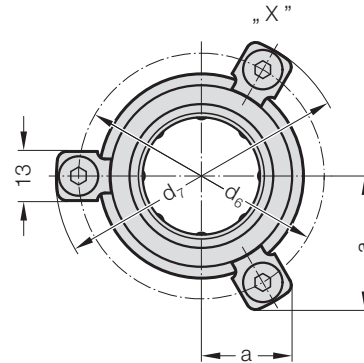
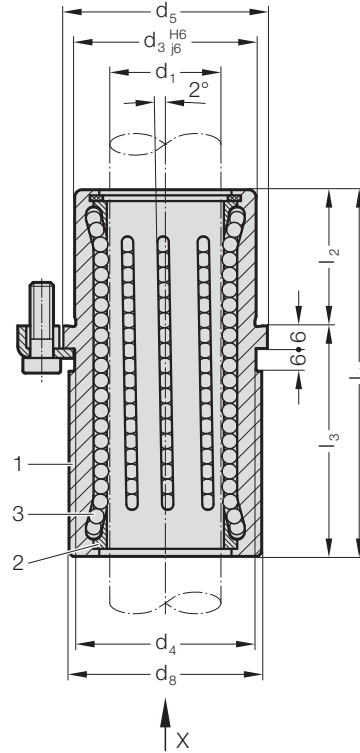
## Ordering Code (example):

Recirculating ball bush ~ISO9448-3	=	2061.69.
Diameter of conduit $d_1$	25 mm	= 025.
Length $l_1$	60 mm	= 060.
Standard design		= 1
Order No		= 2061.69. 025. 060. 1

# RECIRCULATING BALL BUSH WITH COLLAR ~ISO9448-7



2081.69. .1



## Description:

The recirculating ball bush is used when very large paths (strokes) are travelled. This is only limited by the mounting situation. In comparison to guides with ball cage, however, the lower dynamic load figures (C) should be observed. Despite the high number of ball tracks, fewer balls are in usage.

For optimum service life, a movement path (stroke) of three times the length of the recirculating ball bush is recommended ( $3 \times l_1$ ).

## Material:

Socket (1): Steel, hardened  $62 \pm 2$  HRC  
 Ball carrier (2): Aluminium  
 Balls (3): Steel, hardened, conforming to DIN 5401

## Execution:

Outside diameter precision ground.

## Note:

The attachment is with 3 retaining elements, from  $\varnothing d_1 = 38$  with 4 retaining elements, which are included in delivery (Order No: 207.45 - retaining element incl. socket head bolt DIN 6912, M6x20, head  $\varnothing 13$ ).

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ For service life calculation and dynamic load figures, see the end of chapter D.

☞ Assembly guidelines / size tables and tolerances at the end of chapter D.

Recirculating ball bushes only with red guide pillar = .30 combinable.

## 2081.69. .1 Recirculating ball bush with collar ~ISO9448-7

$d_1$	20	25	32	40	50	63
$d_8$	39	46	53	63	77	92
$d_3$	32	40	48	58	70	85
$d_4$	32	40	48	58	70	85
$d_5$	40	48	56	66	80	95
$d_6$	52	60	67	77	91	106
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7
a	20.7	22.65	24.4	35.3	40.2	45.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5
Ball tracks	8	8	8	10	10	12
$l_1$	47	60	77	95	95	120
$l_2$	23	23	30	37	47	60
$l_3$	24	37	47	58	48	60

## Ordering Code (example):

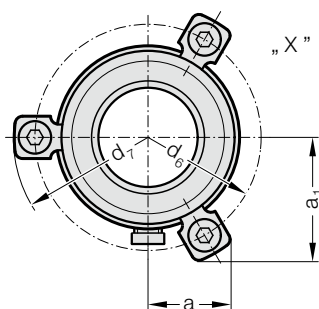
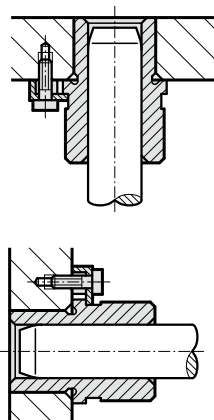
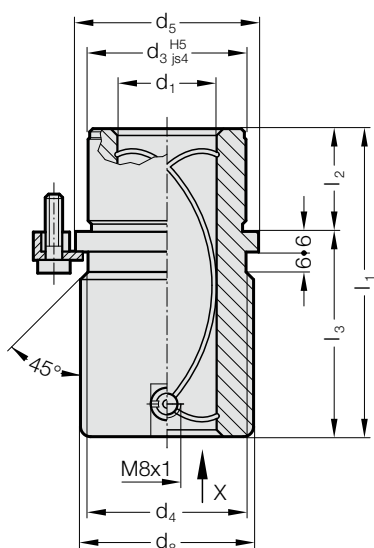
Recirculating ball bush with collar ~ISO9448-7	=	2081.69.
Diameter of conduit $d_1$	25 mm	= 025.
Length $l_1$	60 mm	= 060.
Standard design		= 1
Order No		= 2081.69. 025. 060. 1

# HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6

2081.81.



Mounting example



**Material:**

1.0503  
 $\varnothing d_3$  and  $d_8$  induction hardened to 500+100 HV 10.

**Execution:**

Bronze coated internal bore.  
 Outside diameter fine-ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).  
 Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.  
 ☞ Notes on sliding type guides at the beginning of chapter D.  
 ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.  
 ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2081.81. Headed guide bush, bronze coated, ISO 9448-6**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141
$d_8$	39	46	53	63	77	92	115
a	20.9	22.7	24.4	35.3	40.2	45.5	54.5
$a_1$	30.3	33.4	36.4	35.3	40.2	45.5	54.5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90

**Ordering Code (example):**

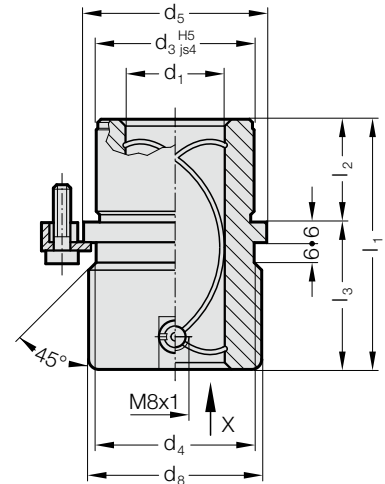
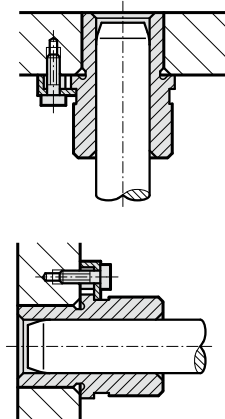
Headed guide bush, bronze coated, ISO 9448-6 = 2081.81.  
 Diameter of conduit  $d_1$  38 mm = 038  
 Order No = 2081.81. 038

# HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6



Mounting example

2081.84.



**Material:**

1.0503

ø d<sub>3</sub> and d<sub>8</sub> induction hardened to 500+100 HV 10.

**Execution:**

Bronze coated internal bore.

Outside diameter fine-ground.

**Note:**

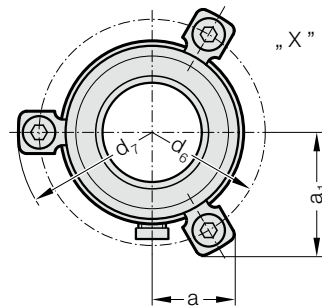
The attachment is with 3 Screw clamp, from ø d<sub>1</sub> = 38 with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2081.84. Headed guide bush, bronze coated, ISO 9448-6**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	65.7	72.7	79.7	89.7	103.7	118.7	141
d <sub>8</sub>	39	46	53	63	77	92	115
a	20.9	22.7	24.4	35.3	40.2	45.5	54.5
a <sub>1</sub>	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l <sub>1</sub>	43	59	75	82	97	116	120
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	20	36	45	45	50	56	60

**Ordering Code (example):**

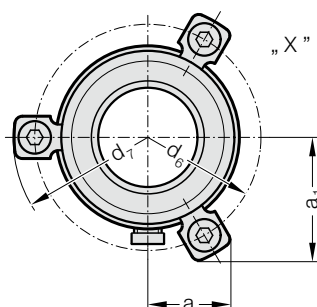
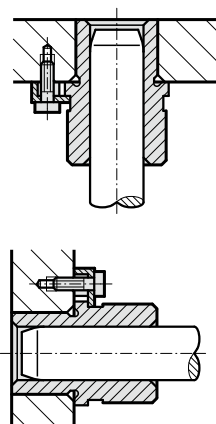
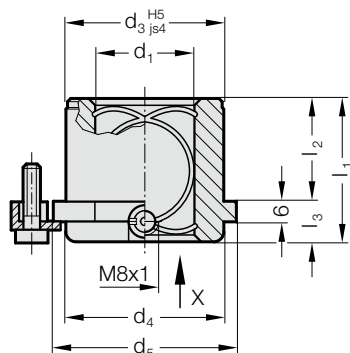
Headed guide bush, bronze coated, ISO 9448-6 = 2081.84.  
 Diameter of conduit d<sub>1</sub> 38 mm = 038  
 Order No = 2081.84. 038



# HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6

2081.85.

## Mounting example



### Material:

1.0503

ø d<sub>3</sub> and d<sub>6</sub> induction hardened to 500+100 HV 10.

### Execution:

Bronze coated internal bore.

Outside diameter fine-ground.

### Note:

The attachment is with 3 Screw clamp, from ø d<sub>1</sub> = 38 with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2081.85. Headed guide bush, bronze coated, ISO 9448-6

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	65.7	72.7	79.7	89.7	103.7	118.7	141
a	20.9	22.7	24.4	35.3	40.2	45.5	54.4
a <sub>1</sub>	30.3	33.4	36.4	35.3	40.2	45.5	54.4
l <sub>1</sub>	35	35	42	52	65	80	80
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	12	12	12	15	18	20	20

### Ordering Code (example):

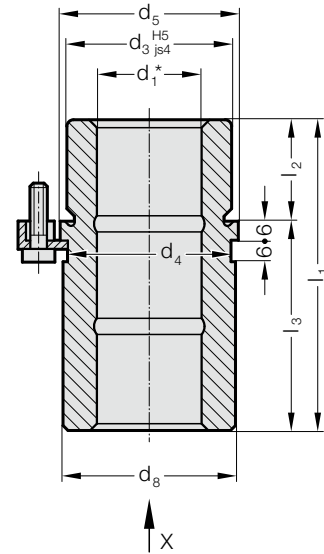
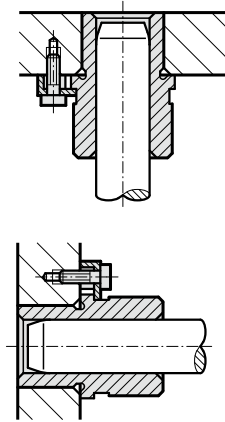
Headed guide bush, bronze coated, ISO 9448-6 = 2081.85.  
 Diameter of conduit d<sub>1</sub> 38 mm = 038  
 Order No = 2081.85. 038

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6



Mounting example

2081.31.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\phi d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\phi 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

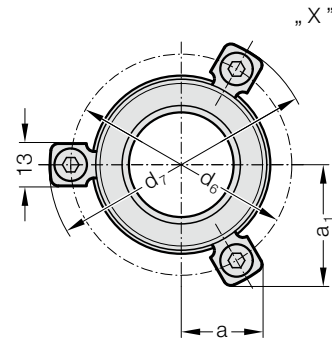
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2081.31. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>3</sub>	32	40	48	58	70	85
d <sub>4</sub>	32	40	48	58	70	85
d <sub>5</sub>	40	48	56	66	80	95
d <sub>6</sub>	52	60	67	77	91	106
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7
d <sub>8</sub>	39	46	53	63	77	92
a	20.7	22.65	24.4	35.3	40.2	45.5
a <sub>1</sub>	30	33.4	36.4	35.3	40.2	45.5
l <sub>1</sub>	59	79	93	108	127	150
l <sub>2</sub>	23	23	30	37	47	60
l <sub>3</sub>	36	56	63	71	80	90

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

= 2081.31.

Diameter of conduit d<sub>1</sub>

38 mm = 038.

Classification TOL

yellow = 10

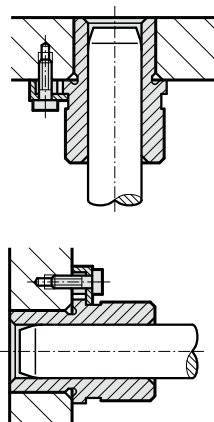
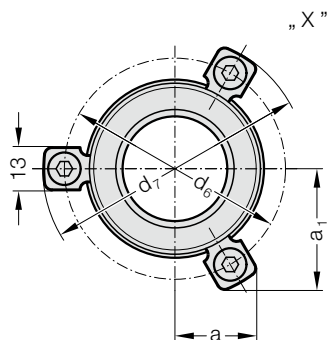
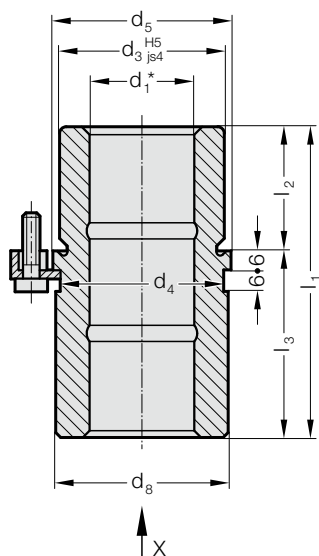
Order No

= 2081.31. 038. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

2081.32.

## Mounting example



### Material:

Sintered ferrite of high purity, carbonitrided, long-term lubrication

### Execution:

Bearing surfaces and outside diameter precision ground.

### Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2081.32. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

$d_1$	24 25	30 32	38 40	48 50
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72.7	79.7	89.7	103.7
$d_8$	46	53	63	77
$a$	22.65	24.4	35.3	40.2
$a_1$	33.4	36.4	35.3	40.2
$l_1$	80	93	110	131
$l_2$	30	37	47	60
$l_3$	50	56	63	71

### Ordering Code (example):

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

= 2081.32.

Diameter of conduit  $d_1$  38 mm = 038.

Classification TOL yellow = 10

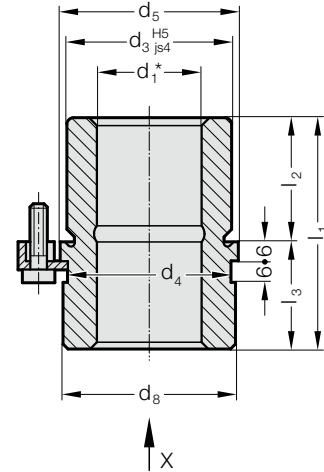
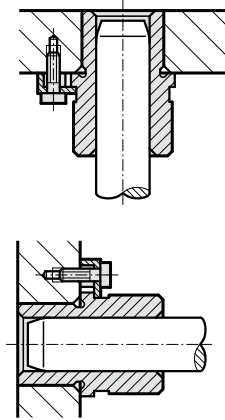
Order No = 2081.32. 038. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6



Mounting example

2081.33.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

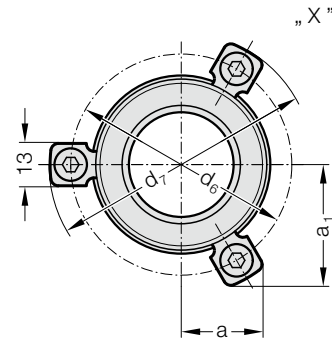
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2081.33. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6**

$d_1$	24 25	30 32	38 40	48 50
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72.7	79.7	89.7	103.7
$d_8$	46	53	63	77
$a$	22.65	24.4	35.3	40.2
$a_1$	33.4	36.4	35.3	40.2
$l_1$	55	69	79	96
$l_2$	30	37	47	60
$l_3$	25	32	32	36

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

= 2081.33.

Diameter of conduit  $d_1$

38 mm = 038.

Classification TOL

yellow = 10

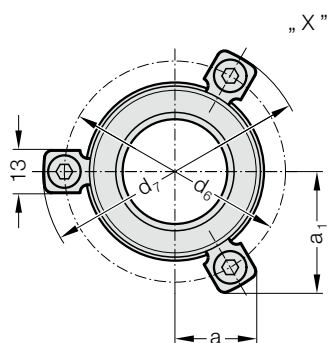
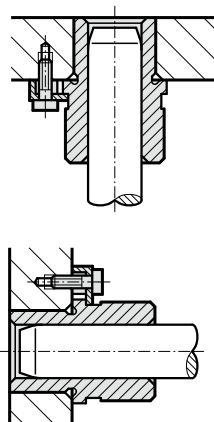
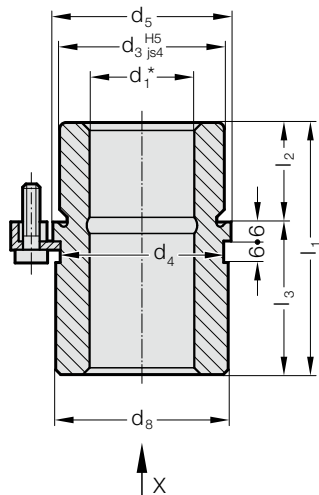
Order No

= 2081.33. 038. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

2081.34.

Mounting example



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**2081.34. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63
d <sub>3</sub>	32	40	48	58	70	85
d <sub>4</sub>	32	40	48	58	70	85
d <sub>5</sub>	40	48	56	66	80	95
d <sub>6</sub>	52	60	67	77	91	106
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7
d <sub>8</sub>	39	46	53	63	77	92
a	20.7	22.65	24.4	35.3	40.2	45.5
a <sub>1</sub>	30	33.4	36.4	35.3	40.2	45.5
l <sub>1</sub>	43	59	75	82	97	116
l <sub>2</sub>	23	23	30	37	47	60
l <sub>3</sub>	20	36	45	45	50	56

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

= 2081.34.

Diameter of conduit d<sub>1</sub> 38 mm = 038.

Classification TOL yellow = 10

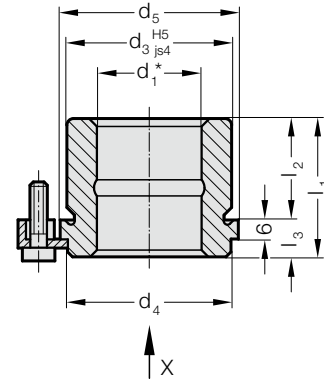
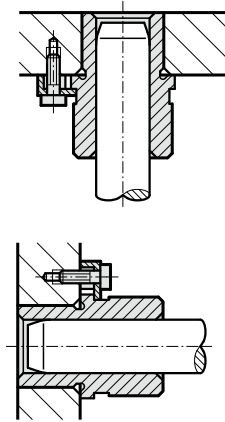
Order No = 2081.34. 038. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6



Mounting example

2081.35.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

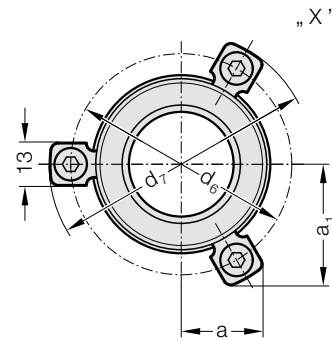
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2081.35. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	32	40	48	58	70	85
$d_4$	32	40	48	58	70	85
$d_5$	40	48	56	66	80	95
$d_6$	52	60	67	77	91	106
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7
a	20.7	22.65	24.4	35.3	40.2	45.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5
$l_1$	35	35	42	52	65	80
$l_2$	23	23	30	37	47	60
$l_3$	12	12	12	15	18	20

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

= 2081.35.

Diameter of conduit  $d_1$

38 mm = 038.

Classification TOL

yellow = 10

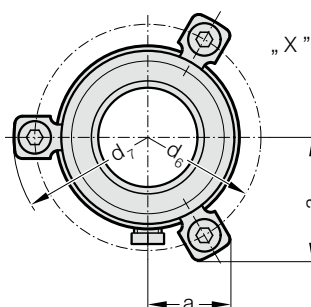
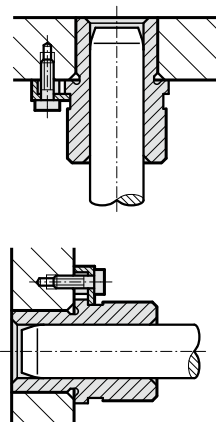
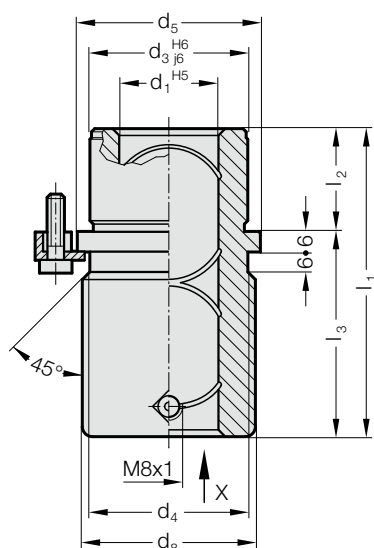
Order No

= 2081.35. 038. 10

# HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6

2081.91.

Mounting example



**Material:**

Steel, d<sub>3</sub> induction hardened

**Execution:**

Bronze coated internal bore.  
Outside diameter fine-ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).  
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.  
☞ Notes on sliding type guides at the beginning of chapter D.  
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.  
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2081.91. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7	141
d <sub>8</sub>	39	46	53	63	77	92	115
a	20.7	22.7	24.4	35.3	40.2	45.5	54.5
a <sub>1</sub>	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l <sub>1</sub>	59	79	93	108	127	150	150
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	36	56	63	71	80	90	90

**Ordering Code (example):**

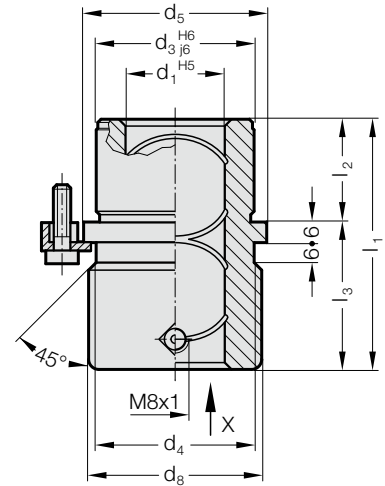
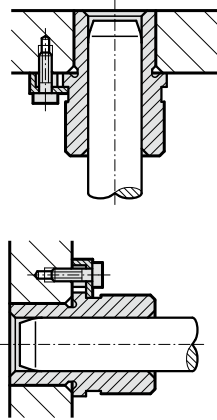
Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6	= 2081.91.
Diameter of conduit d <sub>1</sub>	38 mm = 038
Order No	= 2081.91. 038

# HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6



Mounting example

2081.94.



**Material:**

Steel, d<sub>3</sub> induction hardened

**Execution:**

Bronze coated internal bore.  
Outside diameter fine-ground.

**Note:**

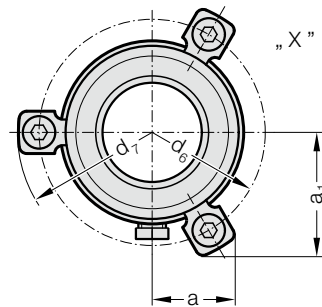
The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2081.94. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7	141
d <sub>8</sub>	39	46	53	63	77	92	115
a	20.7	22.7	24.4	35.3	40.2	45.5	54.5
a <sub>1</sub>	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l <sub>1</sub>	43	59	75	82	97	116	120
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	20	36	45	45	50	56	60

**Ordering Code (example):**

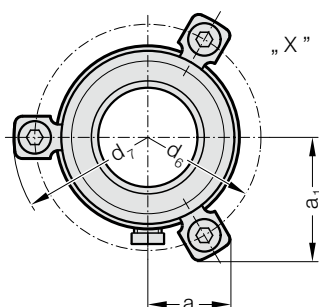
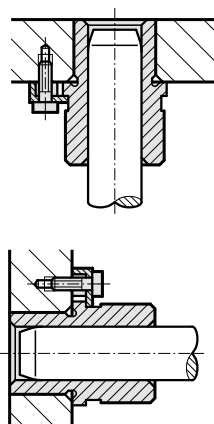
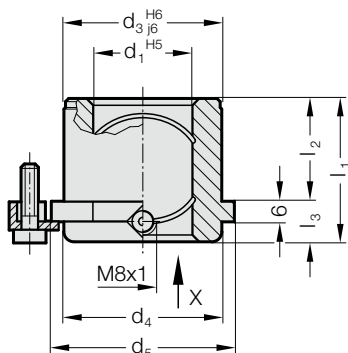
Headed guide bush ECO-LINE,  
bronzeplated, ISO 9448-6 = 2081.94.  
Diameter of conduit d<sub>1</sub> 38 mm = 038  
Order No = 2081.94. 038



# HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6

2081.95.

## Mounting example



### Material:

Steel,  $d_3$  induction hardened

### Execution:

Bronze coated internal bore.

Outside diameter fine-ground.

### Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

Notes on sliding type guides at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2081.95. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141
a	20.7	22.65	24.4	35.3	40.2	45.5	54.4
$a_1$	30	33.4	36.4	35.3	40.2	45.5	54.4
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

### Ordering Code (example):

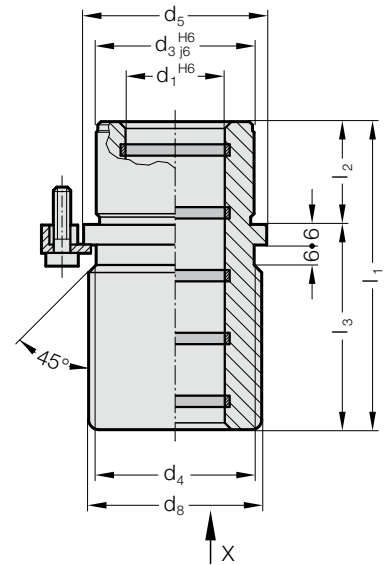
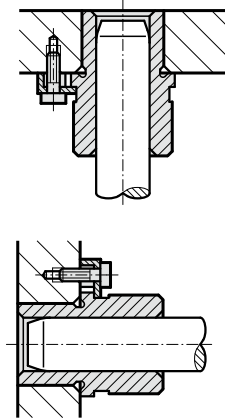
Headed guide bush ECO-LINE,  
bronzeplated, ISO 9448-6 = 2081.95.  
Diameter of conduit  $d_1$  38 mm = 038  
Order No = 2081.95. 038

# HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6



Mounting example

2081.71.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

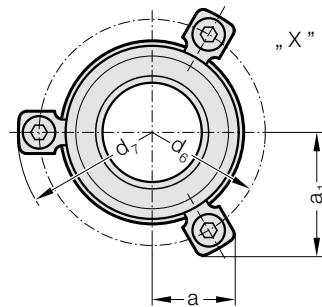
**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2081.71. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141
$d_8$	39	46	53	63	77	92	115
$a$	20.7	22.65	24.4	35.3	40.2	45.5	54.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5	54.5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90

**Ordering Code (example):**

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

= 2081.71.

Diameter of conduit  $d_1$

38 mm = 038

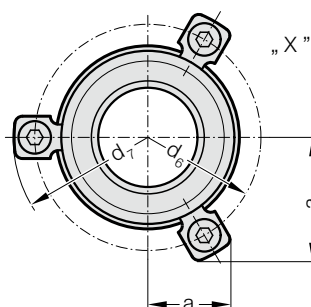
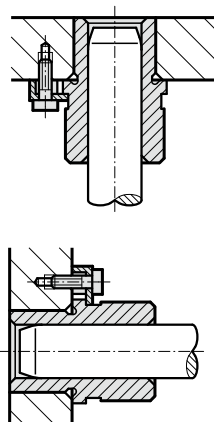
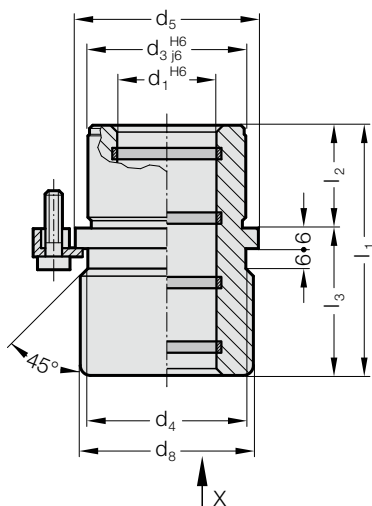
Order No

= 2081.71. 038

# HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6

2081.74.

## Mounting example



### Material:

Bronze with solid lubricant, oilless lubricating

### Execution:

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

### Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

- ☞ Notes on sliding type guides at the beginning of chapter D.
- ☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
- ☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2081.74. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141
$d_8$	39	46	53	63	77	92	115
$a$	20.7	22.65	24.4	35.3	40.2	45.5	54.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5	54.5
$l_1$	43	59	75	82	97	116	120
$l_2$	23	23	30	37	47	60	60
$l_3$	20	36	45	45	50	56	60

### Ordering Code (example):

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

= 2081.74.

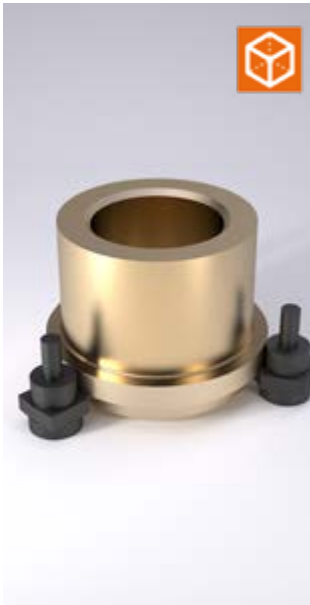
Diameter of conduit  $d_1$

38 mm = 038

Order No

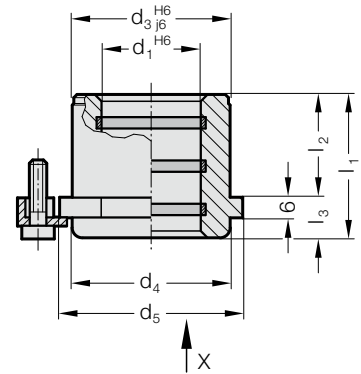
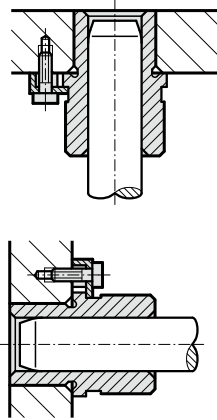
= 2081.74. 038

# HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6



Mounting example

2081.75.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

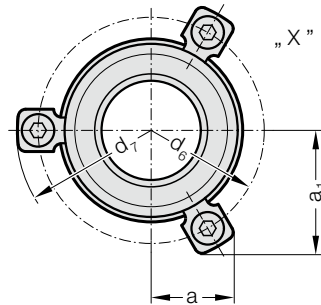
**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2081.75. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6**

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141
$a$	20.7	22.65	24.4	35.3	40.2	45.5	54.4
$a_1$	30	33.4	36.4	35.3	40.2	45.5	54.4
$l_1$	35	35	42	52	65	80	80
$l_2$	23	23	30	37	47	60	60
$l_3$	12	12	12	15	18	20	20

**Ordering Code (example):**

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

= 2081.75.

Diameter of conduit  $d_1$

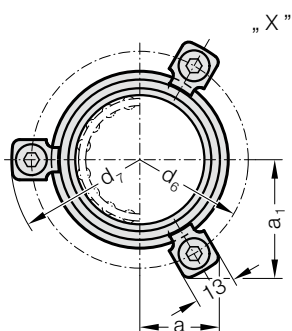
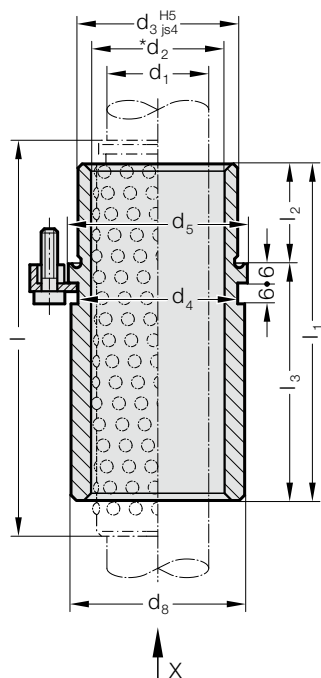
38 mm = 038

Order No

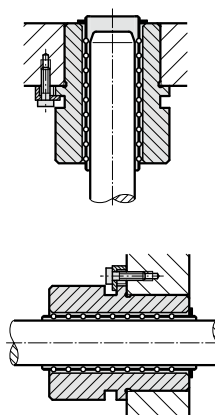
= 2081.75. 038

# HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.44.



## Mounting example



### Material:

Tool steel, hardened  $62 \pm 2$  HRC

### Execution:

Bearing surfaces honed,  
outside diameter precision ground.

### Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

Notes on ball bearing type guides at the beginning of chapter D.

\* Preloading see pairing classification at the beginning of chapter D

Matching guide combinations, see selection matrix at the beginning of chapter D.

Ball guide capacity calculations at the end of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2081.44. Headed guide bush for ball bearing, ISO 9448-7

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_2$	25 26	30 31	38 40	46 48	56 58	68 71	92
$d_3$	32	40	48	58	70	85	105
$d_4$	32	40	48	58	70	85	105
$d_5$	40	48	56	66	80	95	118
$d_6$	52	60	67	77	91	106	129
$d_7$	64.7	72.7	79.7	89.7	103.7	118.7	141.7
$d_8$	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
$a_1$	30	33.4	36.4	35.3	40.2	45.5	54.5
$l_1$	59	79	93	108	127	150	150
$l_2$	23	23	30	37	47	60	60
$l_3$	36	56	63	71	80	90	90
$l^*$	71	95	120	120	140	160	160

\* $l$  = Nominal ordering length of ball cage - preferred length

### Ordering Code (example):

Headed guide bush for ball bearing, ISO 9448-7 = 2081.44.

Diameter of conduit  $d_1$  38 mm = 038.

Classification TOL yellow = 10

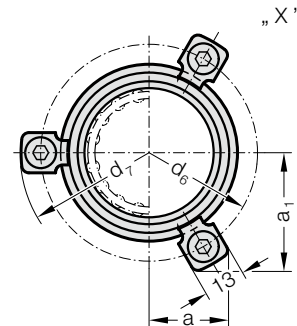
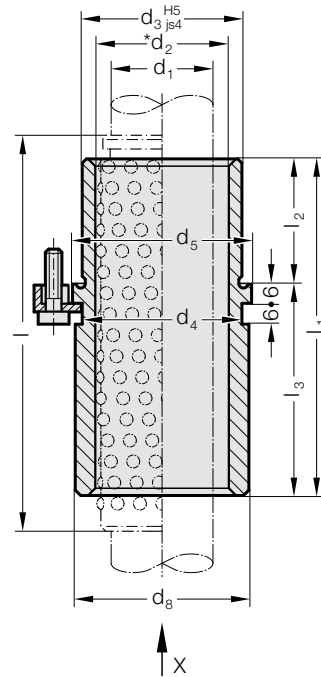
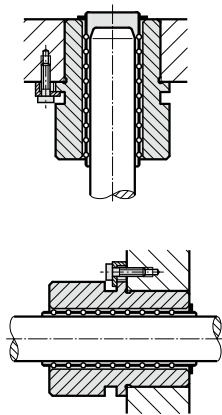
Order No = 2081.44. 038. 10

# HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7



Mounting example

2081.45.



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\phi d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\phi 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**2081.45. Headed guide bush for ball bearing, ISO 9448-7**

$d_1$	24 25	30 32	38 40	48 50
$d_2$	30 31	38 40	46 48	56 58
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72.7	79.7	89.7	103.7
$d_8$	46	53	63	77
a	22.65	24.4	35.3	40.2
$a_1$	33.4	36.4	35.3	40.2
$l_1$	80	93	110	131
$l_2$	30	37	47	60
$l_3$	50	56	63	71
$l^*$	95	120	140	160

\* $l$  = Nominal ordering length of ball cage - preferred length

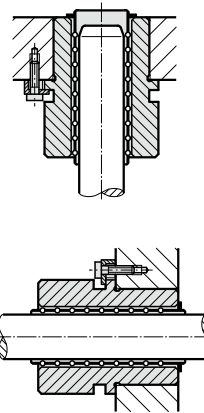
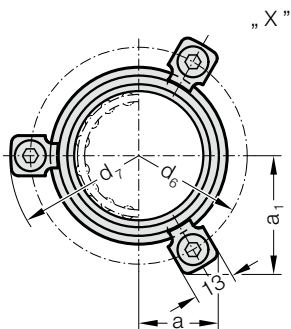
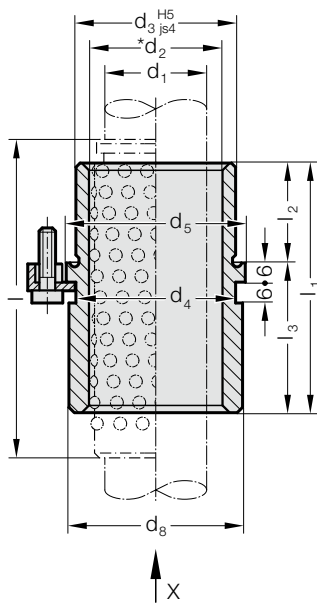
**Ordering Code (example):**

Headed guide bush for ball bearing, ISO 9448-7	=	2081.45.
Diameter of conduit $d_1$	38 mm =	038.
Classification TOL	yellow =	10
Order No	=	2081.45. 038. 10

# HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.46.

Mounting example



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**2081.46. Headed guide bush for ball bearing, ISO 9448-7**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7	141.7
d <sub>8</sub>	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a <sub>1</sub>	30	33.4	36.4	35.3	40.2	45.5	54.5
l <sub>1</sub>	43	59	75	82	97	116	120
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	20	36	45	45	50	56	60
l*	56	71	95	105	120	140	140

\*l = Nominal ordering length of ball cage - preferred length

**Ordering Code (example):**

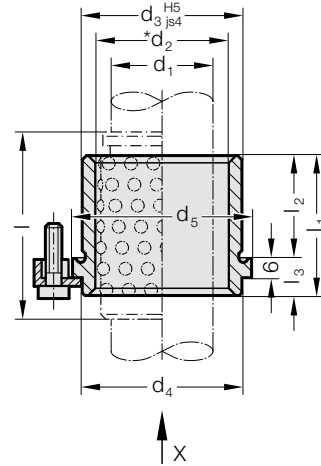
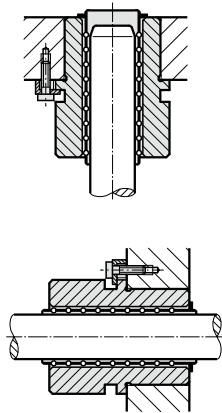
Headed guide bush for ball bearing, ISO 9448-7	=	2081.46.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Classification TOL	yellow =	10
Order No	=	2081.46. 038. 10

# HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7



Mounting example

2081.47.



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\phi d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\phi 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

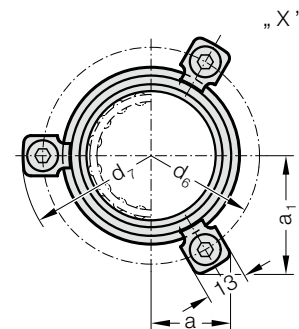
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2081.47. Headed guide bush for ball bearing, ISO 9448-7**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	32	40	48	58	70	85	105
d <sub>5</sub>	40	48	56	66	80	95	118
d <sub>6</sub>	52	60	67	77	91	106	129
d <sub>7</sub>	64.7	72.7	79.7	89.7	103.7	118.7	141.7
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a <sub>1</sub>	30	33.4	36.4	35.3	40.2	45.5	54.5
l <sub>1</sub>	35	35	42	52	65	80	80
l <sub>2</sub>	23	23	30	37	47	60	60
l <sub>3</sub>	12	12	12	15	18	20	20
l*	45	45	56	63	80	95	120

\*l = Nominal ordering length of ball cage - preferred length

**Ordering Code (example):**

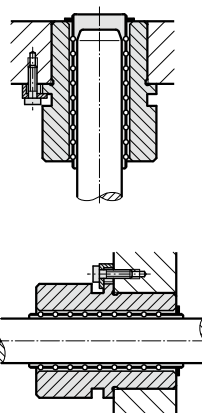
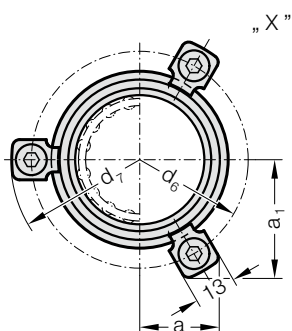
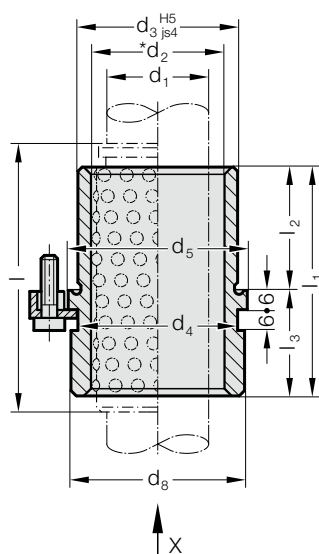
Headed guide bush for ball bearing, ISO 9448-7	=	2081.47.
Diameter of conduit d <sub>1</sub>	38 mm =	038.
Classification TOL	yellow =	10
Order No	=	2081.47. 038. 10



# HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.49.

## Mounting example



### Material:

Tool steel, hardened  $62 \pm 2$  HRC

### Execution:

Bearing surfaces honed,  
outside diameter precision ground.

### Note:

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2081.49. Headed guide bush for ball bearing, ISO 9448-7

$d_1$	24 25	30 32	38 40	48 50
$d_2$	30 31	38 40	46 48	56 58
$d_3$	40	48	58	70
$d_4$	40	48	58	70
$d_5$	48	56	66	80
$d_6$	60	67	77	91
$d_7$	72.7	79.7	89.7	103.7
$d_8$	46	53	63	77
a	22.65	24.4	35.3	40.2
$a_1$	33.4	36.4	35.3	40.2
$l_1$	55	69	79	96
$l_2$	30	37	47	60
$l_3$	25	32	32	36
$l^*$	71	80	95	120

\* $l$  = Nominal ordering length of ball cage - preferred length

### Ordering Code (example):

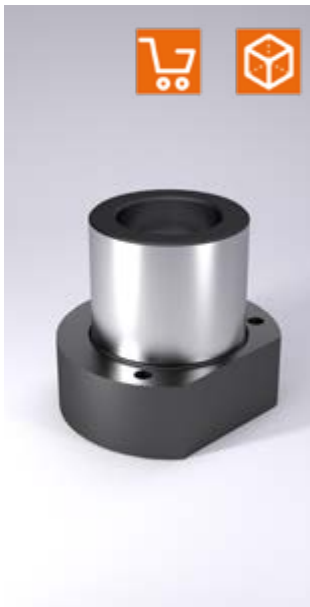
Headed guide bush for ball bearing, ISO 9448-7 = 2081.49.

Diameter of conduit  $d_1$  38 mm = 038.

Classification TOL yellow = 10

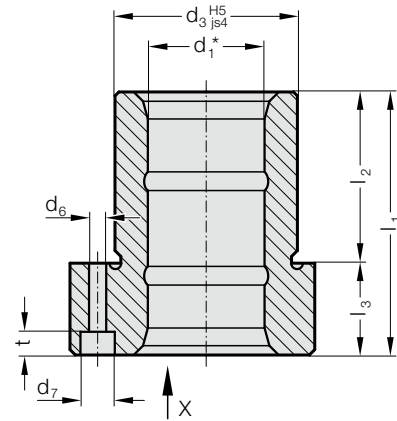
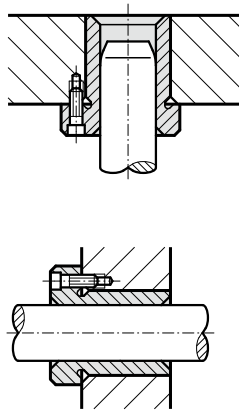
Order No = 2081.49. 038. 10

# FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4



Mounting example

2091.31.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

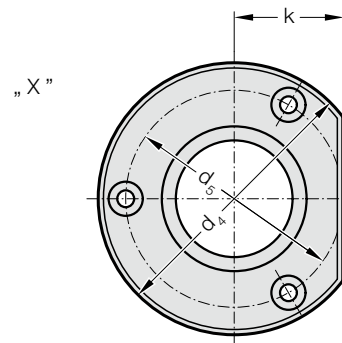
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2091.31. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4.5	5.5	5.5	6.6	9	9	11
d <sub>7</sub>	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
t	4.6	5.7	5.7	6.8	9	9	11

**Ordering Code (example):**

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

= 2091.31.

Diameter of conduit d<sub>1</sub>

38 mm = 038.

Classification TOL

yellow = 10

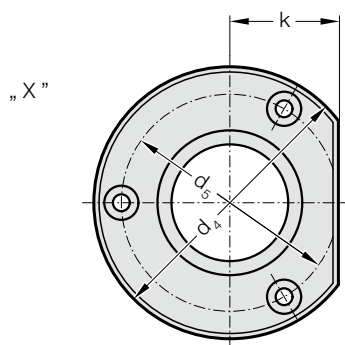
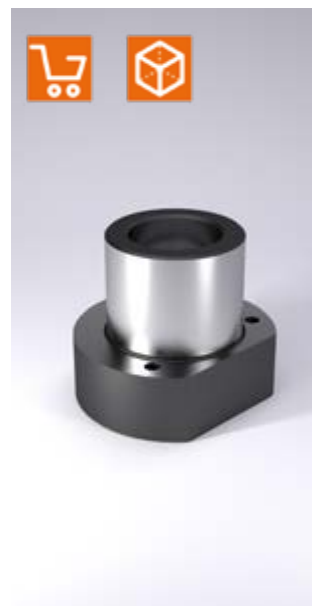
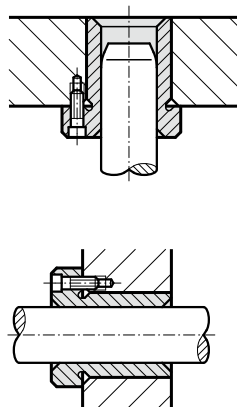
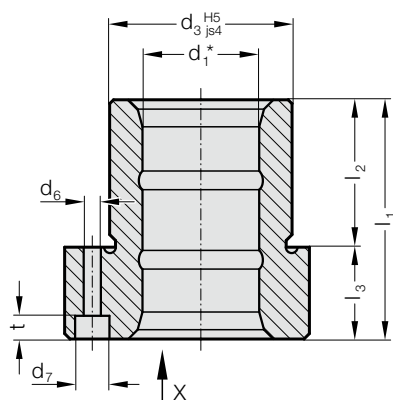
Order No

= 2091.31. 038. 10

# FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4

2091.32.

Mounting example



## Material:

Sintered ferrite of high purity, carbonitrided, long-term lubrication

## Execution:

Bearing surfaces and outside diameter precision ground.

## Note:

The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

Notes on sliding type guides at the beginning of chapter D.

\* Bearing clearance see pairing classification at the beginning of chapter D.

Matching guide combinations, see selection matrix at the beginning of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2091.32. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	28	32	40	48	58	70	85
$d_4$	45	50	63	72	85	104	120
$d_5$	35	40	50	58	70	86	100
$d_6$	4.5	4.5	5.5	5.5	6.6	9	9
$d_7$	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
$l_1$	36	45	55	62	67	89	89
$l_2$	30	30	30	37	37	47	47
$l_3$	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9

## Ordering Code (example):

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

= 2091.32.

Diameter of conduit  $d_1$  32 mm = 032.

Classification TOL yellow = 10

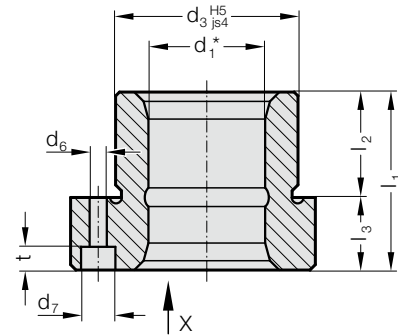
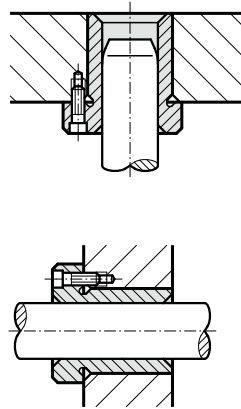
Order No = 2091.32. 032. 10

# FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4



Mounting example

2091.34.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The guide bush is fixed by means of 3 screws up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

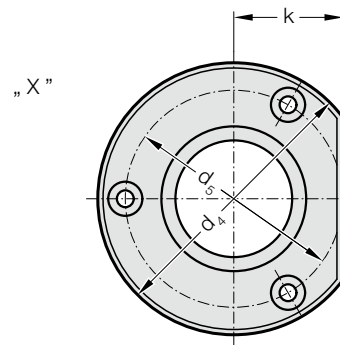
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2091.34. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4**

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50
d <sub>3</sub>	28	32	40	48	58	70
d <sub>4</sub>	45	50	63	72	85	104
d <sub>5</sub>	35	40	50	58	70	86
d <sub>6</sub>	4.5	4.5	5.5	5.5	6.6	9
d <sub>7</sub>	8	8	10	10	11	15
k	15	18	23	28	33	38
l <sub>1</sub>	29	38	38	45	55	62
l <sub>2</sub>	23	23	23	30	30	37
l <sub>3</sub>	6	15	15	15	25	25
t	3.4	4.6	5.7	5.7	6.8	9

**Ordering Code (example):**

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

= 2091.34.

Diameter of conduit d<sub>1</sub> 30 mm = 030.

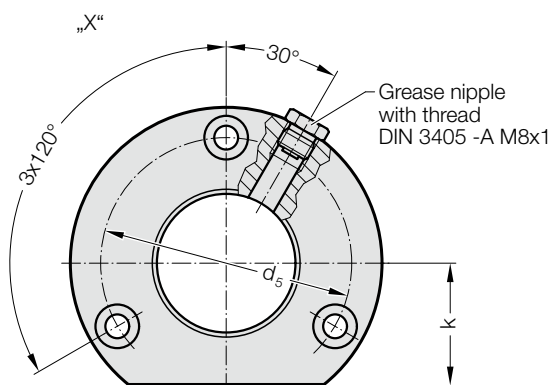
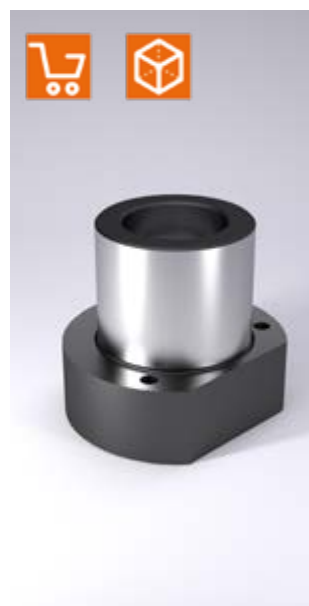
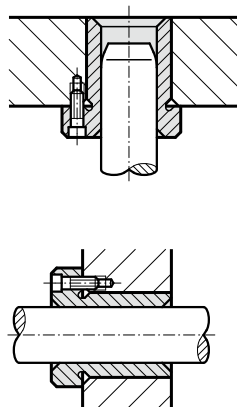
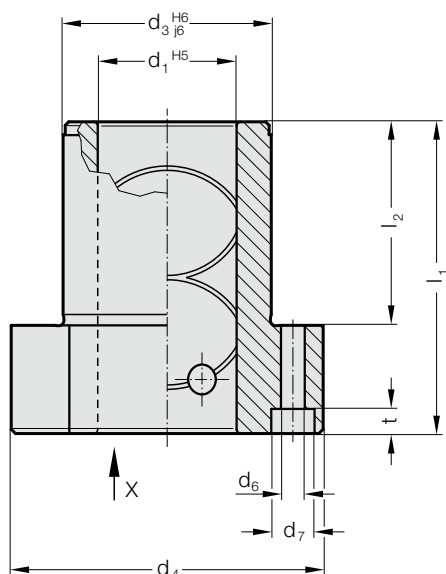
Classification TOL yellow = 10

Order No = 2091.34. 030. 10

# FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

2091.91.

## Mounting example



### Material:

Steel,  $d_3$  induction hardened

### Execution:

Bronze coated internal bore.  
Outside diameter fine-ground.

### Note:

The guide bush is fixed by means of 3 screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2091.91. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

$d_1$	19 20	24 25	30 32	38 40	48 50	60 63	80
$d_3$	32	40	48	58	70	85	105
$d_4$	50	63	72	85	104	120	146
$d_5$	40	50	58	70	86	100	125
$d_6$	4.5	5.5	5.5	6.6	9	9	11
$d_7$	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
$l_1$	52	62	72	77	102	102	125
$l_2$	37	37	47	47	60	60	75
t	4.6	5.7	5.7	6.8	9	9	11

### Ordering Code (example):

Flanged guide bush ECO-LINE, bronzeplated,  
ISO 9448-4

= 2091.91.

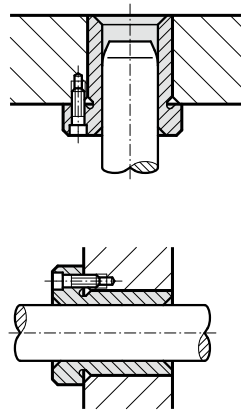
Diameter of conduit  $d_1$  38 mm = 038

Order No = 2091.91. 038

# FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

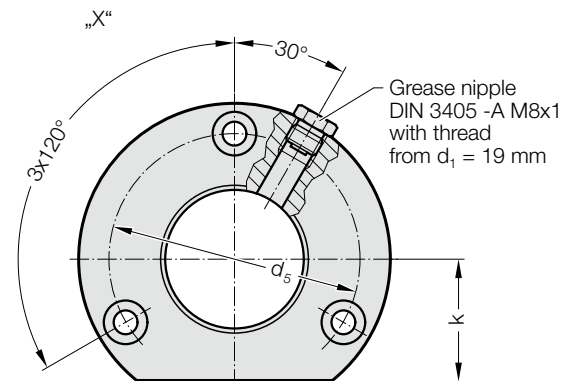
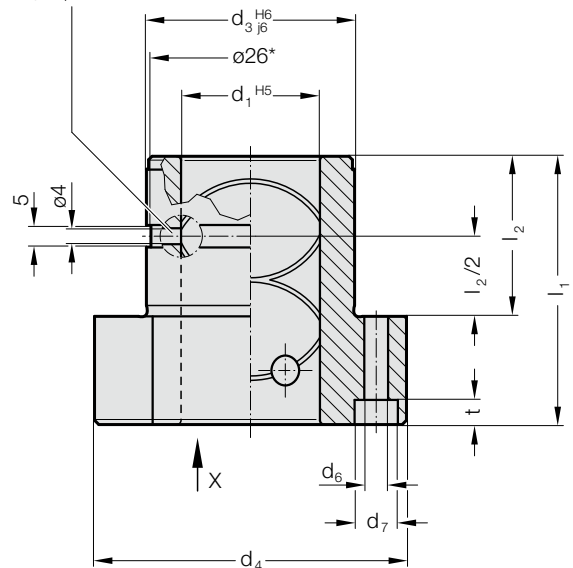


## Mounting example



## 2091.92.

Groove and lubrication hole by  $d_1 = 15/16$  mm



### Material:

Steel,  $d_3$  induction hardened

### Execution:

Bronze coated internal bore.

Outside diameter fine-ground.

### Note:

The guide bush is fixed by means of 3 screws up to  $\phi 16$ : with screws to DIN 6912, from  $\phi 19$ : with screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2091.92. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	28	32	40	48	58	70	85
$d_4$	45	50	63	72	85	104	120
$d_5$	35	40	50	58	70	86	100
$d_6$	4.5	4.5	5.5	5.5	6.6	9	9
$d_7$	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
$l_1$	36	45	55	62	67	89	89
$l_2$	30	30	30	37	37	47	47
t	3.4	4.6	5.7	5.7	6.8	9	9

### Ordering Code (example):

Flanged guide bush ECO-LINE, bronzeplated,  
ISO 9448-4

= 2091.92.

Diameter of conduit  $d_1$

32 mm = 032

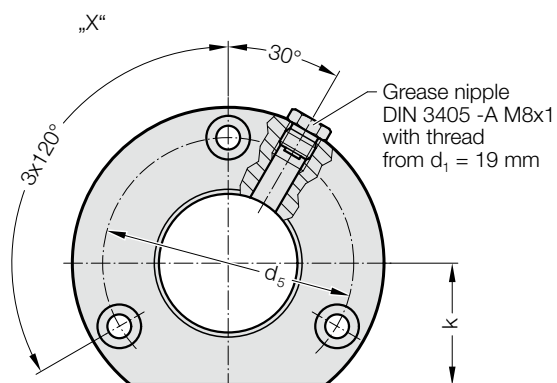
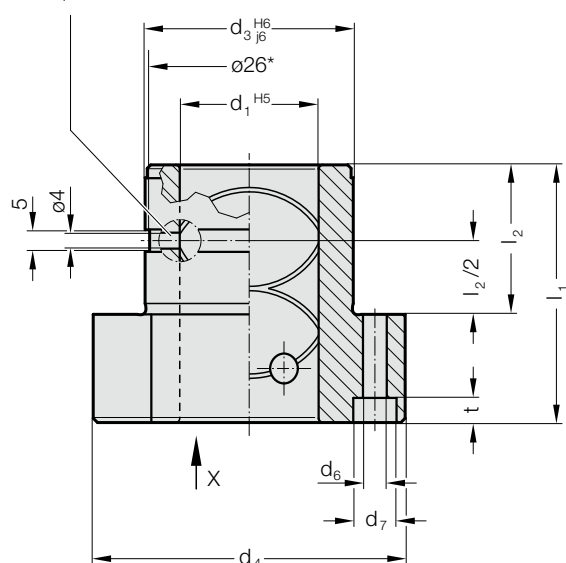
Order No

= 2091.92. 032

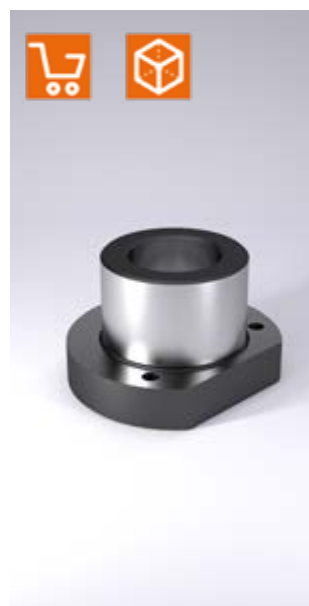
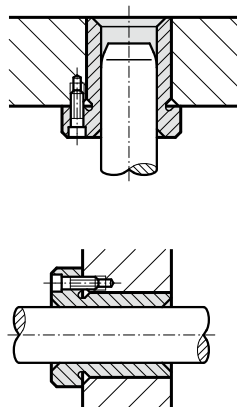
# FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

2091.94.

Groove and lubrication hole by  $d_1 = 15/16$  mm



## Mounting example



### Material:

Steel,  $d_3$  induction hardened

### Execution:

Bronze coated internal bore.  
Outside diameter fine-ground.

### Note:

The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762.

- Notes on sliding type guides at the beginning of chapter D.
- Matching guide combinations, see selection matrix at the beginning of chapter D.
- Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2091.94. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50
$d_3$	28	32	40	48	58	70
$d_4$	45	50	63	72	85	104
$d_5$	35	40	50	58	70	86
$d_6$	4.5	4.5	5.5	5.5	6.6	9
$d_7$	8	8	10	10	11	15
k	15	18	23	28	33	38
$l_1$	29	38	38	45	55	62
$l_2$	23	23	23	30	30	37
t	3.4	4.6	5.7	5.7	6.8	9

### Ordering Code (example):

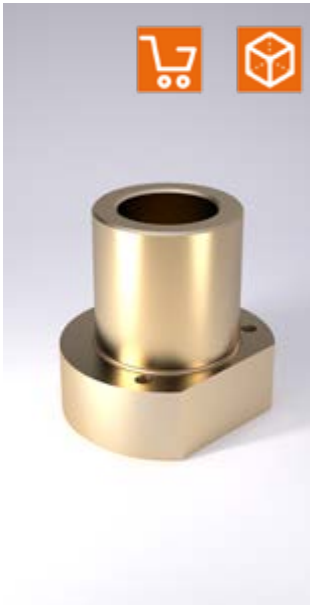
Flanged guide bush ECO-LINE, bronzeplated,  
ISO 9448-4

= 2091.94.

Diameter of conduit  $d_1$  30 mm = 030

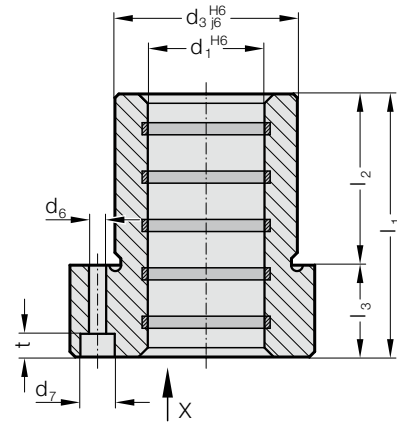
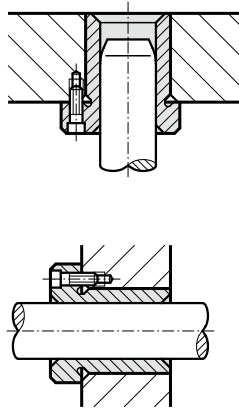
Order No = 2091.94. 030

# FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4



Mounting example

2091.71.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

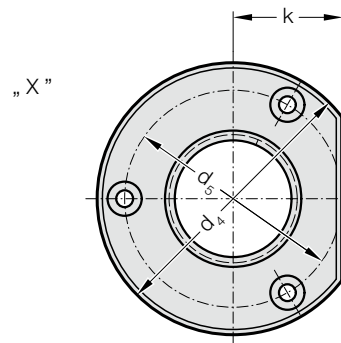
**Note:**

The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.  
The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2091.71. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4**

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4.5	5.5	5.5	6.6	9	9	11
d <sub>7</sub>	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
t	4.6	5.7	5.7	6.8	9	9	11

**Ordering Code (example):**

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

= 2091.71.

Diameter of conduit d<sub>1</sub> 38 mm = 038

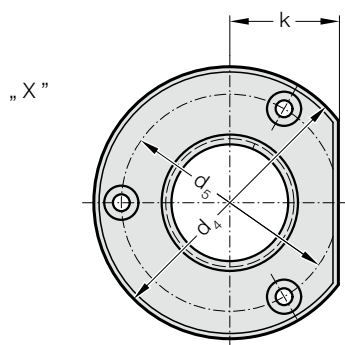
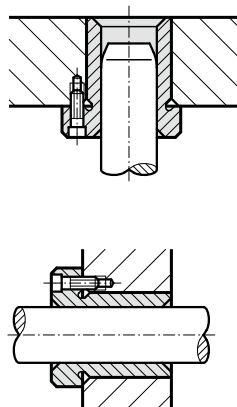
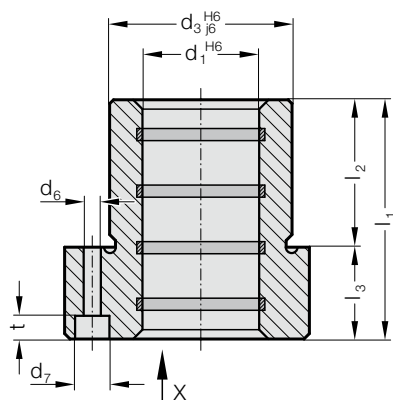
Order No = 2091.71. 038



# FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4

2091.72.

## Mounting example



### Material:

Bronze with solid lubricant, oilless lubricating

### Execution:

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

### Note:

The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## 2091.72. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63
$d_3$	28	32	40	48	58	70	85
$d_4$	45	50	63	72	85	104	120
$d_5$	35	40	50	58	70	86	100
$d_6$	4.5	4.5	5.5	5.5	6.6	9	9
$d_7$	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
$l_1$	36	45	55	62	67	89	89
$l_2$	30	30	30	37	37	47	47
$l_3$	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9

### Ordering Code (example):

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

= 2091.72.

Diameter of conduit  $d_1$  32 mm = 032

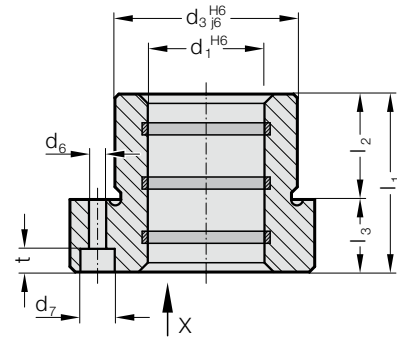
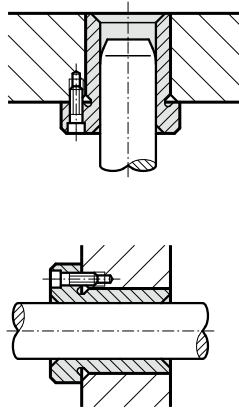
Order No = 2091.72. 032

# FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4



Mounting example

2091.74.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Contact surface with solid lubricant rings.  
Outside diameter precision ground.

**Note:**

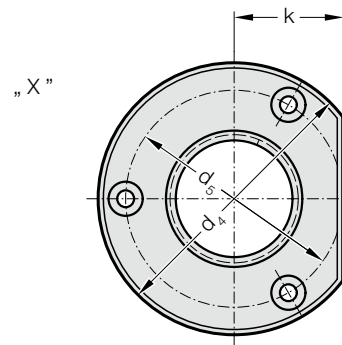
The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



**2091.74. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4**

d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50
d <sub>3</sub>	28	32	40	48	58	70
d <sub>4</sub>	45	50	63	72	85	104
d <sub>5</sub>	35	40	50	58	70	86
d <sub>6</sub>	4.5	4.5	5.5	5.5	6.6	9
d <sub>7</sub>	8	8	10	10	11	15
k	15	18	23	28	33	38
l <sub>1</sub>	29	38	38	45	55	62
l <sub>2</sub>	23	23	23	30	30	37
l <sub>3</sub>	6	15	15	15	25	25
t	3.4	4.6	5.7	5.7	6.8	9

**Ordering Code (example):**

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

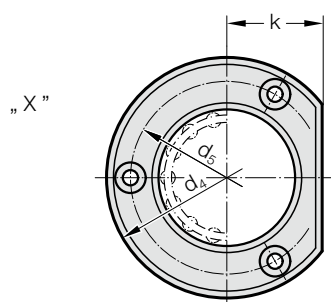
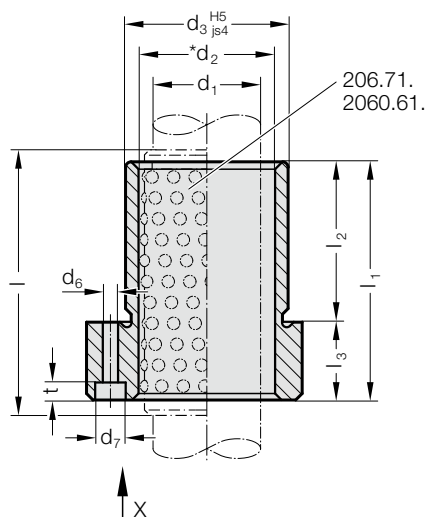
= 2091.74.

Diameter of conduit d<sub>1</sub> 30 mm = 030

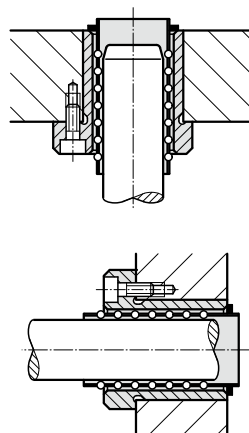
Order No = 2091.74. 030

# FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5

2091.44.



## Mounting example



### Material:

Tool steel, hardened  $62 \pm 2$  HRC

### Execution:

Bearing surfaces honed,  
outside diameter precision ground.

### Note:

The guide bush is fixed by means of 3 screws to DIN EN ISO 4762. The screws are not contained in the scope of delivery.

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2091.44. Flanged guide bush for ball bearing, ISO 9448-5

d <sub>1</sub>	19 20	24 25	30 32	38 40	48 50	60 63	80
d <sub>2</sub>	25 26	30 31	38 40	46 48	56 58	68 71	92
d <sub>3</sub>	32	40	48	58	70	85	105
d <sub>4</sub>	50	63	72	85	104	120	148
d <sub>5</sub>	40	50	58	70	86	100	125
d <sub>6</sub>	4.5	5.5	5.5	6.6	9	9	11
d <sub>7</sub>	8	10	10	11	15	15	18
l <sub>1</sub>	52	62	72	77	102	102	125
l <sub>2</sub>	37	37	47	47	60	60	75
l <sub>3</sub>	15	25	25	30	42	42	50
l*	71	71	80	95	120	120	140

### Ordering Code (example):

Flanged guide bush for ball bearing, ISO 9448-5 = 2091.44.

Diameter of conduit d<sub>1</sub> 38 mm = 038.

Classification TOL yellow = 10

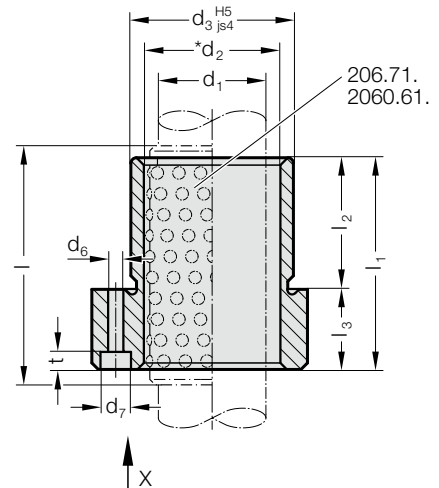
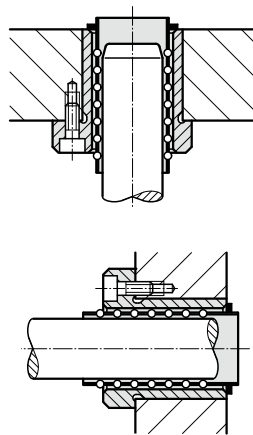
Order No = 2091.44. 038. 10

# FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5



Mounting example

2091.45.



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

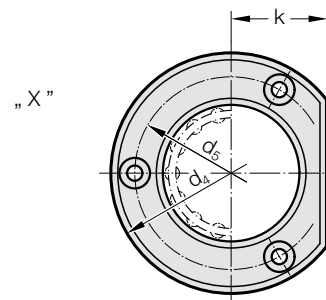
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**2091.45. Flanged guide bush for ball bearing, ISO 9448-5**

$d_1$	15 16	19 20	24 25	30 32	38 40	48 50	60 63
$d_2$	21 22	25 26	30 31	38 40	46 48	56 58	68 71
$d_3$	28	32	40	48	58	70	85
$d_4$	45	50	63	72	85	104	120
$d_5$	35	40	50	58	70	86	100
$d_6$	4.5	4.5	5.5	5.5	6.6	9	9
$d_7$	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
$l_1$	36	45	55	62	67	89	89
$l_2$	30	30	30	37	37	47	47
$l_3$	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9
$l^*$	45	56	71	71	80	95	95

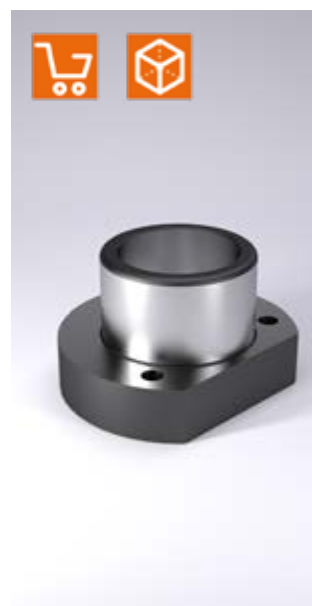
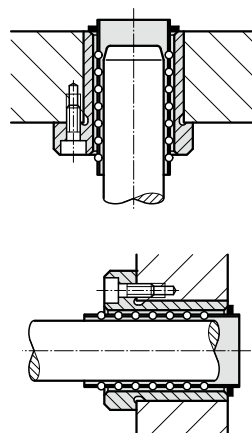
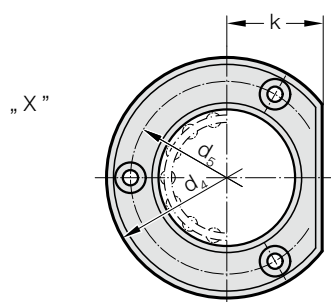
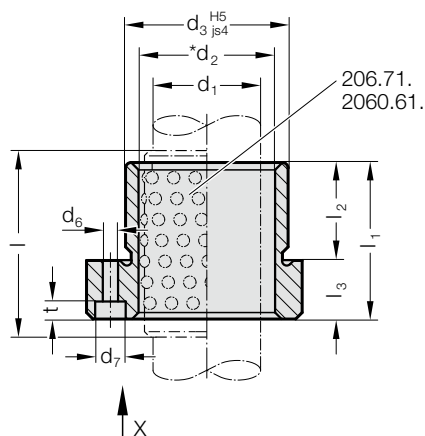
**Ordering Code (example):**

Flanged guide bush for ball bearing, ISO 9448-5 = 2091.45.  
 Diameter of conduit  $d_1$  32 mm = 032.  
 Classification TOL yellow = 10  
 Order No = 2091.45. 032. 10

# FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5

2091.46.

## Mounting example



### Material:

Tool steel, hardened  $62 \pm 2$  HRC

### Execution:

Bearing surfaces honed,  
outside diameter precision ground.

### Note:

The guide bush is fixed by means of 3 screws up to  $\varnothing 16$ : with screws to DIN 6912, from  $\varnothing 19$ : with screws to DIN EN ISO 4762.

The screws are not contained in the scope of delivery.

Notes on ball bearing type guides at the beginning of chapter D.

\* Preloading see pairing classification at the beginning of chapter D

Matching guide combinations, see selection matrix at the beginning of chapter D.

Ball guide capacity calculations at the end of chapter D.

Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

## 2091.46. Flanged guide bush for ball bearing, ISO 9448-5

d <sub>1</sub>	12	15 16	19 20	24 25	30 32	38 40	48 50
d <sub>2</sub>	16	21 22	25 26	30 31	38 40	46 48	56 58
d <sub>3</sub>	26	28	32	40	48	58	70
d <sub>4</sub>	43	45	50	63	72	85	104
d <sub>5</sub>	33	35	40	50	58	70	86
d <sub>6</sub>	4.5	4.5	4.5	5.5	5.5	6.6	9
d <sub>7</sub>	8	8	8	10	10	11	15
k	13	15	18	23	28	33	38
l <sub>1</sub>	25	29	38	38	45	55	62
l <sub>2</sub>	16	23	23	23	30	30	37
l <sub>3</sub>	9	6	15	15	15	25	25
t	4.6	3.4	4.6	5.7	5.7	6.8	9
l*	40	45	45	45	56	63	80

### Ordering Code (example):

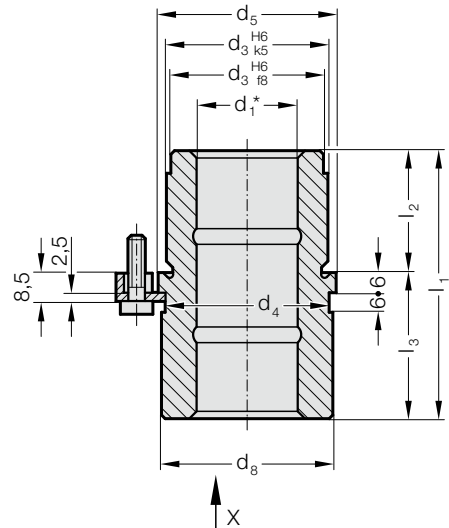
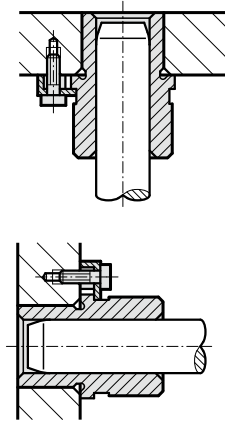
Flanged guide bush for ball bearing, ISO 9448-5	=	2091.46.
Diameter of conduit d <sub>1</sub>	25 mm =	025.
Classification TOL	yellow =	10
Order No	=	2091.46. 025. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR



Mounting example

210.31.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

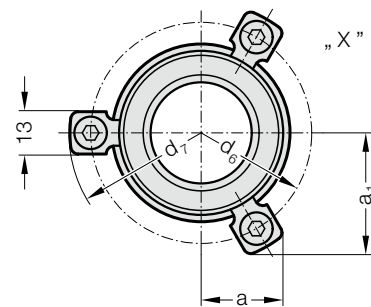
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**210.31. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR**

$d_1$	19.20	25	32	40	50
$d_3$	32	40	50	63	80
$d_4$	32	40	50	63	80
$d_5$	36	45	56	70	90
$d_6$	49	57	67	81	101
$d_7$	61.7	69.7	79.7	93.7	113.7
$d_8$	35	43.5	53	67	87
$a$	19.9	21.9	24.4	36	43
$a_1$	28.6	32.1	36.4	36	43
$l_1$	66	70	83	98	120
$l_2$	30	30	38	48	61
$l_3$	36	40	45	50	59

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR

= 210.31.

Diameter of conduit  $d_1$  32 mm = 032.

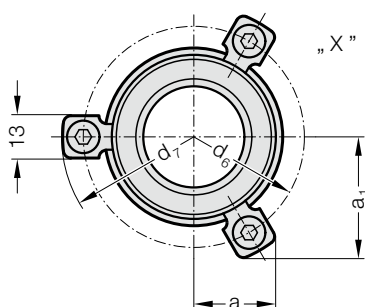
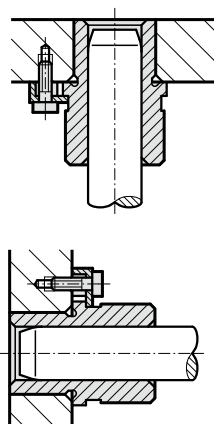
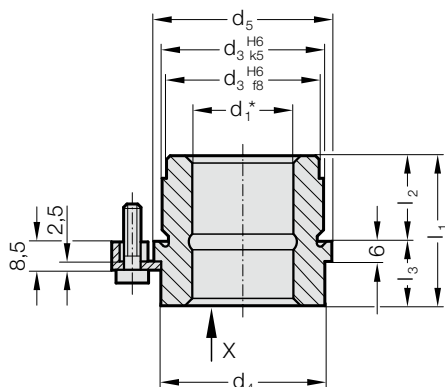
Classification TOL yellow = 10

Order No = 210.31.032.10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR

210.34.

Mounting example



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**210.34. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR**

d <sub>1</sub>	19 20	25	32	40	50
d <sub>3</sub>	32	40	50	63	80
d <sub>4</sub>	32	40	50	63	80
d <sub>5</sub>	36	45	56	70	90
d <sub>6</sub>	49	57	67	81	101
d <sub>7</sub>	61.7	69.7	79.7	93.7	113.7
a	19.9	21.9	24.4	36	43
a <sub>1</sub>	28.6	32.1	36.4	36	43
l <sub>1</sub>	42	50	63	76	96
l <sub>2</sub>	30	38	48	61	78
l <sub>3</sub>	12	12	15	15	18

**Ordering Code (example):**

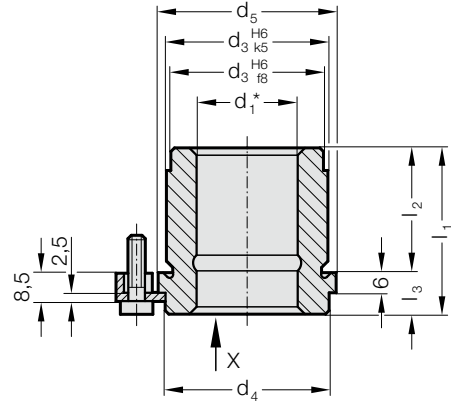
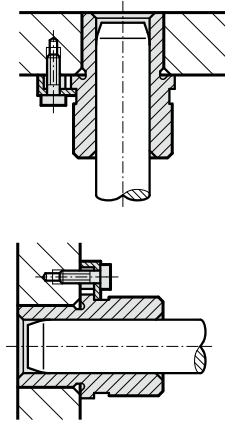
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR	= 210.34.
Diameter of conduit d <sub>1</sub>	32 mm = 032.
Classification TOL	yellow = 10
Order No	= 210.34. 032. 10

# HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR



Mounting example

210.35.



**Material:**

Sintered ferrite of high purity, carbonitrided, long-term lubrication

**Execution:**

Bearing surfaces and outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on sliding type guides at the beginning of chapter D.

\*☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

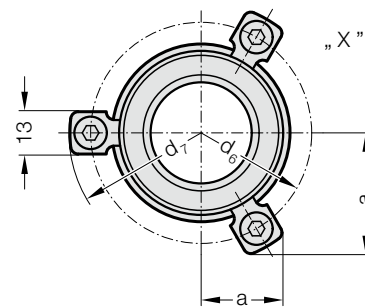
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30



**210.35. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR**

$d_1$	19 20	25	32	40	50
$d_3$	32	40	50	63	80
$d_4$	32	40	50	63	80
$d_5$	36	45	56	70	90
$d_6$	49	57	67	81	101
$d_7$	61.7	69.7	79.7	93.7	113.7
a	19.9	21.9	24.4	36	43
$a_1$	28.6	32.1	36.4	36	43
$l_1$	28	32	37	44	44
$l_2$	16	20	25	32	32
$l_3$	12	12	12	12	12

**Ordering Code (example):**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR

= 210.35.

Diameter of conduit  $d_1$

32 mm = 032.

Classification TOL

yellow = 10

Order No

= 210.35.032.10

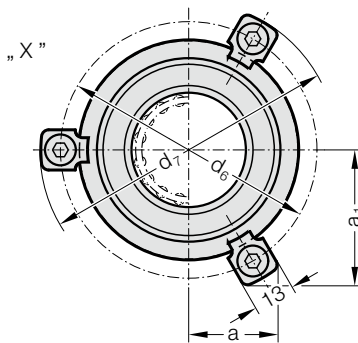
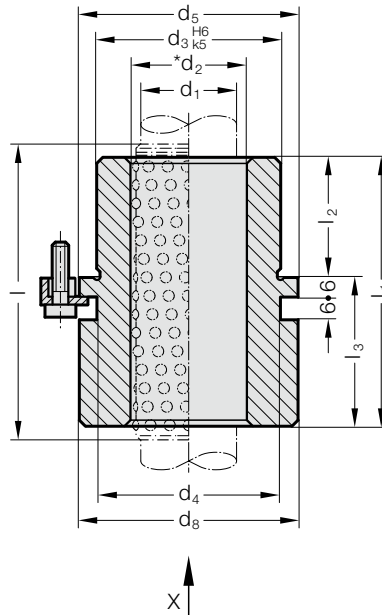




# HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR



210.44.



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

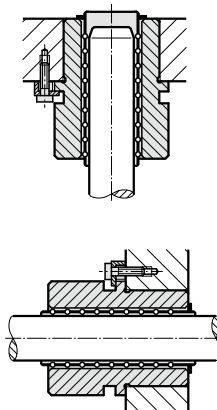
Tolerance range:

yellow = .10

green = .20

red = .30

**Mounting example**



## HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

### 210.44. Headed guide bush for ball bearing, ~AFNOR

d <sub>1</sub>	16	20	25	32	40	50	63
d <sub>2</sub>	22	26	31	40	48	58	71
d <sub>3</sub>	28	32	40	50	63	80	90
d <sub>4</sub>	29	32	40	50	63	80	90
d <sub>5</sub>	32	36	45	56	70	90	110
d <sub>6</sub>	45	49	57	67	81	101	121
d <sub>7</sub>	57.7	61.7	69.7	79.7	93.7	113.7	131.7
d <sub>8</sub>	31	35	43.5	53.5	67	87	107
a	18.9	19.9	21.9	24.4	36	43	50.1
a <sub>1</sub>	26.9	28.6	32.1	36.4	36	43	50.1
l <sub>3</sub>	32	36	40	45	50	63	63
l <sub>2</sub>	l <sub>1</sub> / l						
23	55 / 63		63 / 71		68 / 80		
30	62 / 71		70 / 80		75 / 80		
38	70 / 71		74 / 80		80 / 95		
48			88 / 100		93 / 105		
61			101 / 120		106 / 120		
78					123 / 120		
98					148 / 160		
123					161 / 180		
					186 / 200		

\*l = Nominal ordering length of ball cage - preferred length

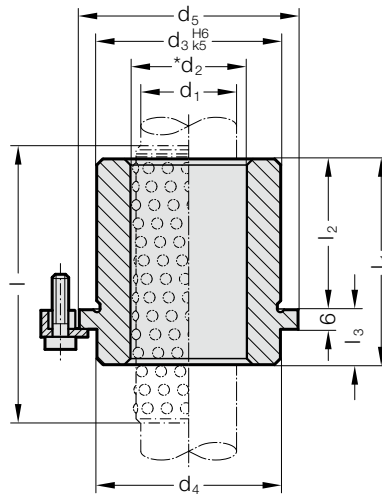
### Ordering Code (example):

Headed guide bush for ball bearing, ~AFNOR	=	210.44.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Installation length l <sub>2</sub>	61 mm =	061.
Classification TOL	yellow =	10
Order No	=	210.44. 032. 061. 10

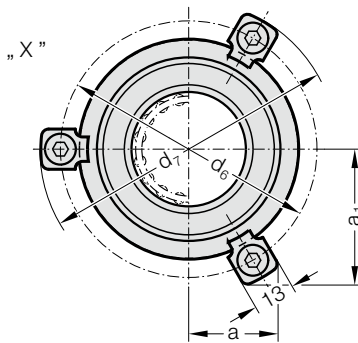
# HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR



210.46.



X



**Material:**

Tool steel, hardened  $62 \pm 2$  HRC

**Execution:**

Bearing surfaces honed, outside diameter fine-ground.

**Note:**

The attachment is with 3 Screw clamp, from  $\varnothing d_1 = 38$  with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head  $\varnothing 13$ ).

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

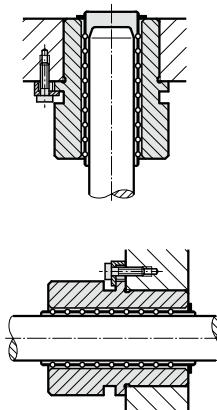
Tolerance range:

yellow = .10

green = .20

red = .30

**Mounting example**



## HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

### 210.46. Headed guide bush for ball bearing, ~AFNOR

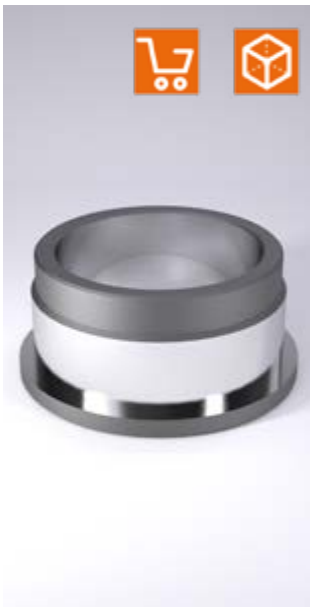
d <sub>1</sub>	16	20	25	32	40	50	63
d <sub>2</sub>	22	26	31	40	48	58	71
d <sub>3</sub>	28	32	40	50	63	80	90
d <sub>4</sub>	29	32	40	50	63	80	90
d <sub>5</sub>	32	36	45	56	70	90	110
d <sub>6</sub>	45	49	57	67	81	101	121
d <sub>7</sub>	57.7	61.7	69.7	79.7	93.7	113.7	131.7
a	18.9	19.9	21.9	24.4	36	43	50.1
a <sub>1</sub>	26.9	28.6	32.1	36.4	36	43	50.1
l <sub>3</sub>	10	12	12	15	15	18	20
l <sub>2</sub> *	l <sub>1</sub> / l						
23	33/45						
30	40/45      42/45      42/45      45/56						
38	48/56      50/56      50/56      53/71						
48	58/63      60/71      60/71      63/71      63/80						
61	73/80      76/80      76/80      79/95						
78	90/105      93/105      93/105      96/105						
98	113/120      113/120      113/120      116/140      118/120						
123	143/160						

\*l = Nominal ordering length of ball cage - preferred length

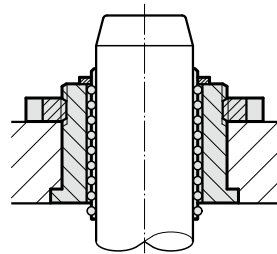
### Ordering Code (example):

Headed guide bush for ball bearing, ~AFNOR	=	210.46.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
Installation length l <sub>2</sub>	38 mm =	038.
Classification TOL	yellow =	10
Order No	=	210.46. 032. 038. 10

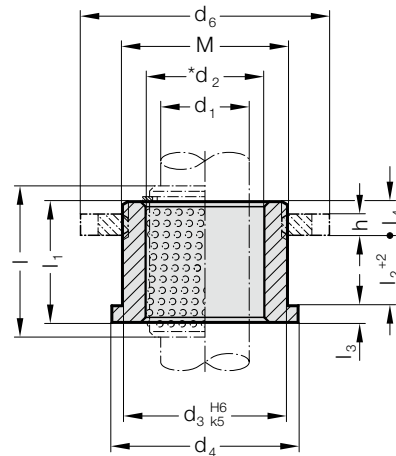
# GUIDE BUSH WITH COLLAR, FOR BALL BEARING, ~AFNOR



Mounting example



210.45.



**Material:**

Tool steel, hardened 62 ± 2 HRC

**Execution:**

Bearing surfaces honed,  
outside diameter precision ground.

**Note:**

The guide bush is fixed with slotted nut 207.48.

☞ Notes on ball bearing type guides at the beginning of chapter D.

\*☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Ball guide capacity calculations at the end of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

**210.45. Guide bush with collar, for ball bearing, ~AFNOR**

d <sub>1</sub>	16	16	20	20	20	25	25	25	32	32	32	40	40	40	50	50
d <sub>2</sub>	22	22	26	26	26	31	31	31	40	40	40	48	48	48	58	58
d <sub>3</sub>	28	28	32	32	32	40	40	40	50	50	50	63	63	63	80	80
d <sub>4</sub>	32	32	36	36	36	45	45	45	56	56	56	70	70	70	90	90
d <sub>6</sub>	40	40	44	44	44	55	55	55	65	65	65	81	81	81	100	100
M	M27x1	M27x1	M30x1	M30x1	M30x1	M39x1	M39x1	M39x1	M48x1	M48x1	M48x1	M60x1	M60x1	M60x1	M76x1	M76x1
h	3	3	4	4	4	4	4	4	5	5	5	6	6	6	8	8
l <sub>1</sub>	16	20	17	21	25	22	26	31	26	31	38	32	39	47	41	49
l <sub>2</sub>	8	12	8	12	16	12	16	21	15	20	27	20	27	35	26	34
l <sub>3</sub>	3	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5
l <sub>4</sub>	5	5	6	6	6	7	7	7	7	7	7	8	8	8	10	10
l*	24	28	24	28	31	31	40	40	40	40	50	50	50	56	50	63

\*l = Nominal ordering length of ball cage - preferred length

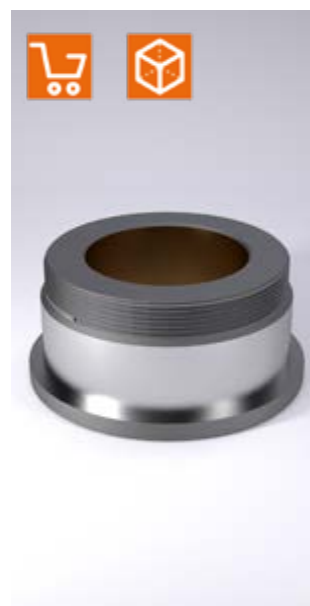
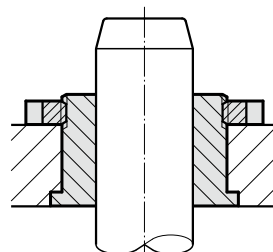
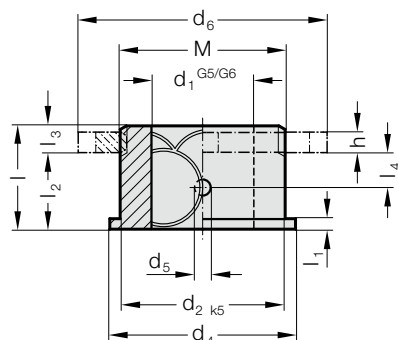
**Ordering Code (example):**

Guide bush with collar, for ball bearing, ~AFNOR	=	210.45.
Diameter of conduit d <sub>1</sub>	32 mm =	032.
total length l <sub>1</sub>	26 mm =	026.
Classification TOL	yellow =	10
Order No	=	210.45.032.026.10

## GUIDE BUSH WITH COLLAR, BRONZE COATED, ~AFNOR

210.85.

Mounting example



### Material:

1.0503

$\varnothing d_2$  induction hardened to 500+100 HV 10

### Execution:

Bronze coated internal bore.

Diameter  $d_2$  and collar face precision ground.


up to  $\varnothing d_1 = 25$  tolerance G6


from  $\varnothing d_1 = 32$  tolerance G5


### Note:

The guide bush is fixed with slotted nut 207.48.

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

 Notes on sliding type guides at the beginning of chapter D.

 Matching guide combinations, see selection matrix at the beginning of chapter D.

 Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

### 210.85. Guide bush with collar, bronze coated, ~AFNOR

$d_1$	Tolerance	$d_2$	$d_4$	$d_6$	h	M	l	$l_1$	$l_2$	$l_3$	$l_4$
16	+0.006/+0.017	28	32	40	3	M27x1	16	3	11	5	5.5
16		28	32	40	3	M27x1	20	3	15	5	7.5
20	+0.007/+0.020	32	36	44	4	M30x1	21	3	15	6	5
20		32	36	44	4	M30x1	25	3	19	6	9.5
25		40	45	55	4	M39x1	26	3	19	7	9.5
25		40	45	55	4	M39x1	31	3	24	7	12
32	+0.009/+0.020	50	56	65	5	M48x1	31	4	24	7	12
32		50	56	65	5	M48x1	38	4	31	7	15.5
40		63	70	81	6	M60x1	39	4	31	8	15.5
40		63	70	81	6	M60x1	47	4	39	8	19.5
50		80	90	100	8	M76x1	41	5	31	10	15.5
50		80	90	100	8	M76x1	49	5	39	10	19.5

### Ordering Code (example):

Guide bush with collar, bronze coated, ~AFNOR = 210.85.

Diameter of conduit  $d_1$  32 mm = 032.

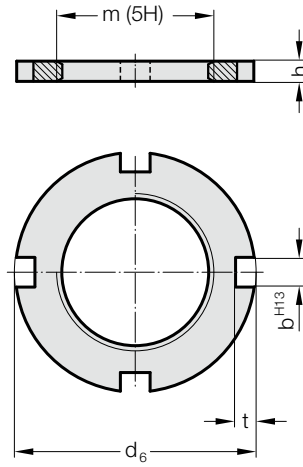
total length l 31 mm = 031

Order No = 210.85. 032. 031

# SLOTTED NUT



207.48.



**Material:**

Steel

**Note:**

For fixing the guide bushes 210.45. and 210.85.

**207.48. Slotted nut**

Order No	$d_6$	b	t	h	m
207.48.016	40	5	3	3	M27 x 1
207.48.020	44	5	4	4	M30 x 1
207.48.025	55	6	4	4	M39 x 1
207.48.032	65	6	5	5	M48 x 1
207.48.040	81	7	6	6	M60 x 1
207.48.050	100	8	8	8	M76 x 1



# OILLESS GUIDE ELEMENTS



# OILLESS GUIDE ELEMENTS

## DESCRIPTION

Low-maintenance sliding elements are used in the tool & die building as well as the machine building industries, for both linear and rotary motion applications. The material for these sliding elements is made of a base material (see chart), and an overlapping network of solid lubricant deposits. These deposits are embedded in a uniform geometric pattern in order to achieve the optimum lubrication coverage in the direction of the movement. The allowable directional movements can be found on the catalogue pages, and are marked with symbols.

The optimum sliding conditions are achieved when the sliding elements are combined with a hardened and ground opposing surface, which are a minimum of 100 HB harder than the base material. A surface roughness of approx. Rz6.3 is optimal. Suitable product combinations of guide pillars and low-maintenance guide bushings can be found in the selection matrix at the beginning of chapter D.

It is recommended to lightly lubricate the sliding surfaces of the low-maintenance sliding elements with lithium saponified grease, before usage. The solid lubricant will only be distributed from the pockets in the sliding zone during operation. In general, 25-35 % of the sliding surface is embedded with solid lubricant deposits, but deviations are possible due to the shape and size of a particular component. The size and arrangement of the solid lubricant deposits may also vary within the various products and sizes.

A repair of the slide elements is possible. The sliding surface is usually re-ground.

### Advantages of oilless guide elements

- Low-maintenance, with optimum conditions maintenance-free
- low friction
- good emergency sliding properties
- „Stick - Slip“ effects are eliminated
- extremely wide temperature resistance – hot and cold
- damping properties in presence of vibration

### Surface pressure, temperature, speed and lubrication

max. surface pressing [N/cm <sup>2</sup> ]	Temperature [C°]	Speed [m/min.]	PV value [N/cm <sup>2</sup> × m/min]	Lubrication
5000	80	30	10000	Initial

### PV value

The permissible bearing load is determined from the pressure and the PV value, which defines the bearing wear.

The PV value is the product of surface pressure (P) and running velocity (V). Please keep in mind, that the maximum allowed speed and surface pressing can not be reached at the same time (see PV diagram)

Calculation for the existing bushing load:

$$PV = P \times V \text{ (N/cm}^2 \times \text{m/min)}$$

$$P = F/A \text{ (N/cm}^2)$$

$$F = \text{Loading force (N)}$$

$$A = \text{Projection surface of the guide bushing/sliding surface [cm}^2]$$

$$V = \text{Sliding speed [m/min]}$$

Sliding speed with lifting motion:

$$V = 2 \times H \times nf/1000 \text{ [m/min]}$$

$$H = \text{Stroke [mm]}$$

$$nf = \text{Number of strokes [H/min]}$$

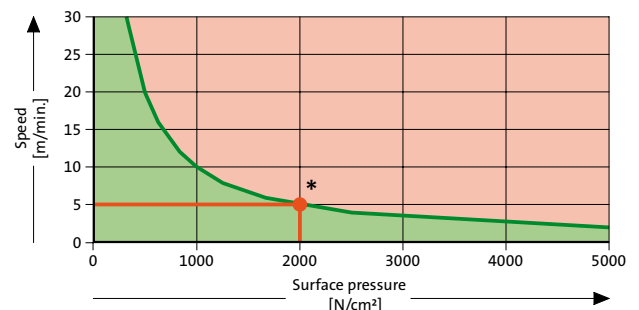
### Characteristics for base material

chemical composition	Cu 60–66%
	Al 5,0–7,5%
	Fe 2,0–4,0%
	Mn 2,5–5,0%
	Zn 17,5–31,5%
specific density [kg/dm <sup>3</sup> ]	8,2
Tensile strength Rm [N/mm <sup>2</sup> ]	750-800
Brinell hardness HB 10	180-210
Yield point Rp 0.2 [N/mm <sup>2</sup> ]	450-550
Elongation to fracture A5 [%]	5-8
Elasticity module [kN/mm <sup>2</sup> ]	105-115
Co-efficient of friction	0,04-0,15
Thermal conductivity [W/(m × K)]	45-55
Heat expansion coefficient [K <sup>-1</sup> ]	1,6-2,0 × 10 <sup>-5</sup>
Electric conductance [m/(Ω × mm <sup>2</sup> )]	7-8
alt. flexural strength [N/mm <sup>2</sup> ]	±150
ratio sliding surface to lubricant deposits (%)	25-30

### Special version

Rebuilds and other specifications and designs upon request.

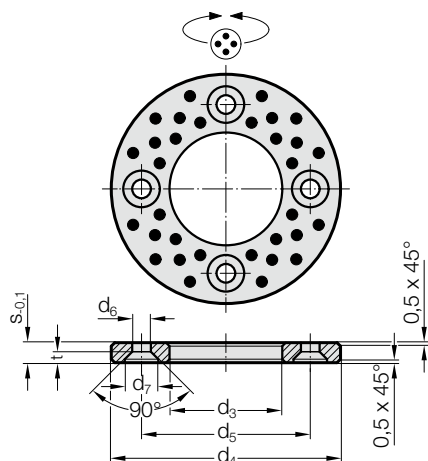
### PV-diagramm



\* Example: At a surface pressing of 2000 N/cm<sup>2</sup> is, because of the maximum PV-value of 10000 N/cm<sup>2</sup> × m/min. the maximum allowed speed 5 m/min.

# THRUST WASHER, BRONZE WITH SOLID LUBRICANT

2053.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

For combination loads use together with Bushes 2052.70.

Screws not included.

**Fixing:**

from  $d_3 = 10,2$  2 X M3

from  $d_3 = 20,2$  2 X M5

from  $d_3 = 40,2$  2 X M6

from  $d_3 = 50,3$  4 X M6

from  $d_3 = 60,3$  4 X M8

from  $d_3 = 90,5$  4 X M10

**2053.70. Thrust washer, Bronze with solid lubricant**

$d_1$	10	12	13	14	15	16	18	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120
$d_3$	10.2	12.2	13.2	14.2	15.2	16.2	18.2	20.2	25.2	30.2	35.2	40.2	45.3	50.3	55.3	60.3	65.3	70.3	75.3	80.3	90.5	100.5	120.5
$d_4$	30	40	40	40	50	50	50	50	55	60	70	80	90	100	110	120	125	130	140	150	170	190	200
$d_5$	20	28	28	28	28	28	35	35	40	45	50	60	67.5	75	85	90	95	100	110	120	140	160	175
$d_6$	3.4	3.4	3.4	3.4	3.4	3.4	3.4	5.5	5.5	5.5	5.5	6.6	6.6	6.6	6.6	9	9	9	9	9	11	11	11
$d_7$	6.9	6.9	6.9	6.9	6.9	6.9	6.9	11.5	11.5	11.5	11.5	13.7	13.7	13.7	13.7	18.3	18.3	18.3	18.3	18.3	22.7	22.7	22.7
$s$	3	3	3	3	3	3	3	5	5	5	5	7	7	8	8	8	8	10	10	10	10	10	10
$t$	1.8	1.8	1.8	1.8	1.8	1.8	1.8	3	3	3	3	3.6	3.6	3.6	3.6	4.6	4.6	4.6	4.6	4.6	5.9	5.9	5.9

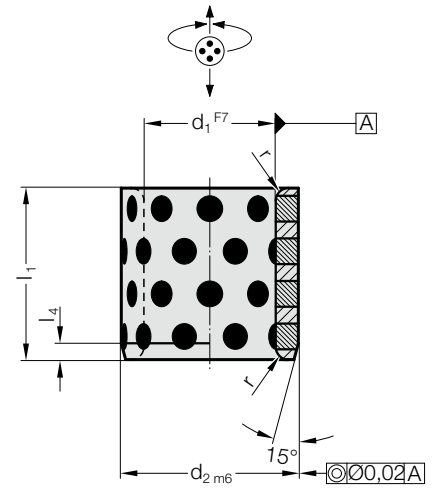
**Ordering Code (example):**

Thrust washer, Bronze with solid lubricant	=	2053.70.
Diameter of conduit $d_1$	40 mm =	040
Order No	=	2053.70. 040

# GUIDE BUSH, BRONZE WITH SOLID LUBRICANT



2052.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Attention:**

Note that press fitment reduces inside bush diameter.

**2052.70. Guide bush, Bronze with solid lubricant**

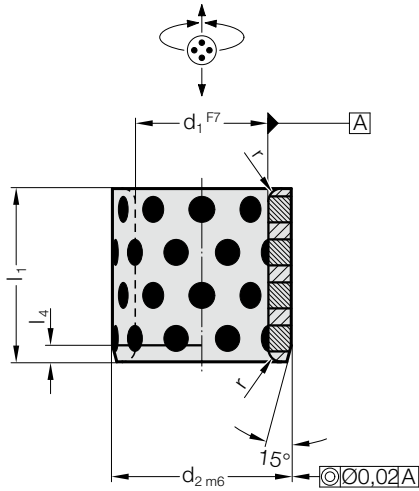
d <sub>1</sub>	8	10	10	12	13	14	15	16	18	19	20	20	20	24	25	25	25	28	30	30	30	31.5	32	35	35	38	40	40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
d <sub>2</sub>	12	14	15	18	19	20	21	22	24	25	26	28	30	32	32	33	35	38	40	38	42	40	42	44	45	48	50	55																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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**Ordering Code (example):**

Guide bush, Bronze with solid lubricant	=2052.70.
Diameter of conduit d <sub>1</sub>	40 mm = 040.
Outer diameter d <sub>2</sub>	55 mm = 055.
Installation length l <sub>1</sub>	25 mm = 025
Order No	=2052.70. 040. 055.025

# GUIDE BUSH, BRONZE WITH SOLID LUBRICANT

2052.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Attention:**

Note that press fitment reduces inside bush diameter.

**2052.70. Guide bush, Bronze with solid lubricant**

d <sub>1</sub>	45	45	45	50	50	50	55	60	60	63	65	70	70	75	75	80	80	85	90	100	110	120	125	130	140	150	160
d <sub>2</sub>	56	55	60	60	62	65	70	74	75	75	80	85	90	90	95	96	100	100	110	120	130	140	145	150	160	170	180
r	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l <sub>4</sub>	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l <sub>1</sub>																											
30	•	•	•	•	•	•		•	•																		
35	•	•	•	•	•	•		•	•			•															
40	•	•	•	•	•	•		•	•			•					•	•									
50	•	•	•	•	•	•		•	•			•	•				•	•									
60	•	•	•	•	•	•		•	•			•	•	•	•	•	•	•		•	•						
70			•	•	•	•		•	•			•	•	•	•	•	•	•		•	•						
80			•	•	•	•		•	•			•	•	•	•	•	•	•		•	•			•			
95			•																								
100						•			•			•	•	•	•	•	•	•		•	•	•	•	•	•	•	•
120											•						•	•		•	•	•	•	•	•	•	•
130																									•		
140																										•	
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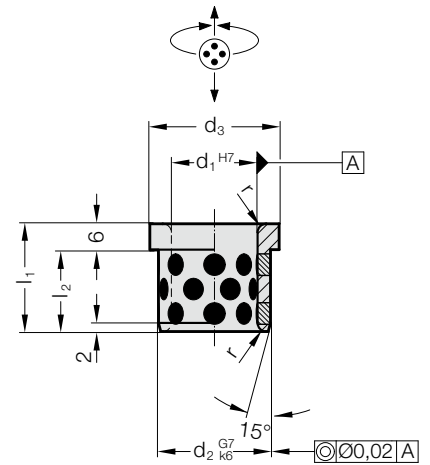
**Ordering Code (example):**

Guide bush, Bronze with solid lubricant	=	2052.70.
Diameter of conduit d <sub>1</sub>	40 mm =	040.
Outer diameter d <sub>2</sub>	55 mm =	055.
Installation length l <sub>1</sub>	25 mm =	025
Order No	=	2052.70. 040. 055. 025

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT



2085.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Bushes can be used with radial or axial motion.

Bushes can also be fitted with Loctite.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**2085.70. Guide bush with collar, Bronze with solid lubricant**

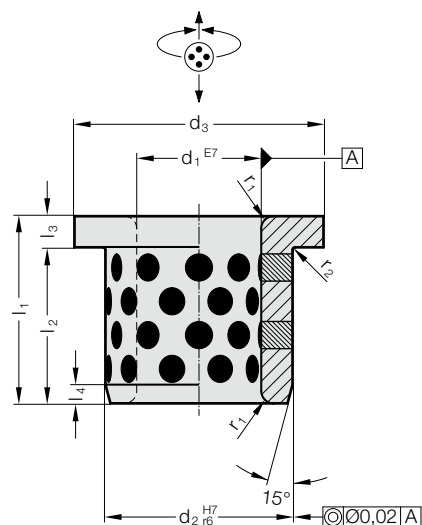
d <sub>1</sub>	12	16	20	24
d <sub>2</sub>	16	20	26	30
d <sub>3</sub>	18	24	28	35
r	2	2	2	2
l <sub>1</sub> l <sub>2</sub>				
20 14	●	●	●	●
25 19	●	●	●	●
30 24	●	●	●	●

**Ordering Code (example):**

Guide bush with collar, Bronze with solid lubricant	=	2085.70.
Diameter of conduit d <sub>1</sub>	20 mm =	020.
Length l <sub>1</sub>	20 mm =	020
Order No	=	2085.70. 020. 020

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2085.71.



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## Attention:

Note that press fitment reduces inside bush diameter.

## 2085.71. Guide bush with collar, Bronze with solid lubricant

d <sub>1</sub>	10	12	13	14	15	16	20	25	30	31.5	35	40	45	50	55	60	63	70	75	80	90	100	120	
d <sub>2</sub>	14	18	19	20	21	22	30	35	40	40	45	50	55	60	65	75	75	85	90	100	110	120	140	
d <sub>3</sub>	22	25	26	27	28	29	40	45	50	50	60	65	70	75	80	90	85	105	110	120	130	150	170	
l <sub>3</sub>	2	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7.5	7.5	7.5	7.5	10	10	10	10	
l <sub>4</sub>	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	
r <sub>1</sub>	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	
r <sub>2</sub>	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	
l <sub>1</sub>	15	13	12	12	12	12	10	10																
20	18	17	17	17	17	17	15	15	15	15	15	15												
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35										30	30													
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50									45		45	45	45	45		42.5		42.5						
60												55	55	55					52.5	50	50			
67.5																	60							
80																			72.5	72.5	70	70	70	70
100																						90	90	90

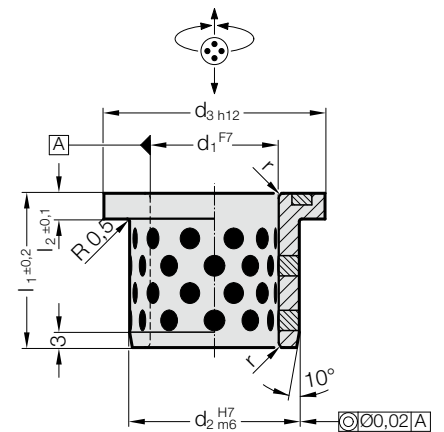
## Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant	=	2085.71.
Diameter of conduit d <sub>1</sub>	35 mm =	035.
Length l <sub>1</sub>	20 mm =	020
Order No	=	2085.71. 035. 020

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT



2086.70.



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## Attention:

Note that press fitment reduces inside bush diameter.

## 2086.70. Guide bush with collar, Bronze with solid lubricant

$d_1$	12	16	20	25	30	40	50	60
$d_2$	18	22	28	33	38	50	62	75
$d_3$	25	30	36	43	48	60	75	90
$r$	1	1	1	1	1	2	2	3
$l_1$	15	20	25	30	35	45	55	65
$l_2$	4	5	5	5	5	5	6	7

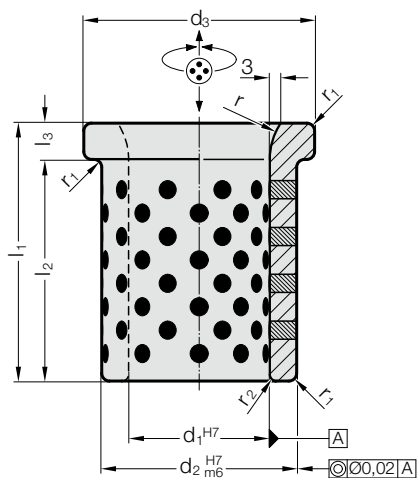
## Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant	=	2086.70.
Diameter of conduit $d_1$	30 mm =	030.
total length $l_1$	35 mm =	035
Order No	=	2086.70. 030. 035



## GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2085.72.



### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

### Attention:

Note that press fitment reduces inside bush diameter.

### 2085.72. Guide bush with collar, Bronze with solid lubricant

d <sub>1</sub>	25	30	40	50	60	65	65	80	80	100	100
d <sub>2</sub>	35	40	55	65	75	80	80	100	100	120	120
d <sub>3</sub>	45	50	65	75	85	90	90	110	110	130	130
r	10	20	20	20	20	20	20	20	20	20	20
r <sub>1</sub>	1	1	2	2	2	2	2	2	2	2	2
r <sub>2</sub>	2	2	2	2	2	2	2	2	2	3	3
l <sub>3</sub>	7	10	10	10	10	10	10	10	10	10	10
l <sub>2</sub>	33	40	60	70	70	70	110	90	130	90	130
l <sub>1</sub>	40	50	70	80	80	80	120	100	140	100	140

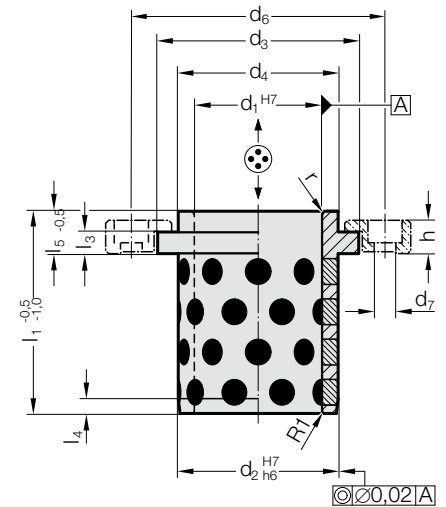
### Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant	=	2085.72.
Diameter of conduit d <sub>1</sub>	60 mm =	060.
Length l <sub>1</sub>	80 mm =	080
Order No	=	2085.72. 060. 080

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, DIN 9834/ISO 9448



2082.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Fixing:**

(to be ordered separately)

Screw clamps with screws,

up to  $\varnothing d_1 = 50$  - 2072.45.10 (M6 X 16 DIN EN ISO 4762)

from  $\varnothing d_1 = 60$  - 2072.45.16 (M10 X 20 DIN EN ISO 4762)

**Attention:**

Bushes can only be used with axial motion!

**2082.70. Guide bush with collar, Bronze with solid lubricant, DIN 9834/ISO 9448**

$d_1$	24 25	30 32	38 40	48 50	60 63	80	100	125	160
$d_2$	32	40	50	63	80	100	125	160	200
$d_3$	40	50	63	71	90	112	140	180	220
$d_4$	32	40	50	63	80	100	125	160	200
$d_6$	58	66	79	89	123	143	168	203	243
$d_7$	7	7	7	7	11.5	11.5	11.5	11.5	11.5
$l_1$	40	50	63	71	80	100	125	160	200
$l_3$	6.3	6.3	6.3	6.3	10	10	10	10	10
$l_4$	3	4	5	6.3	8	10	12.5	16	16
$l_5$	10	12	15	17	19	22	21	30	32
$h$	10	10	10	10	16	16	16	16	16
$r$	3	3	3	5	6	8	10	12	18

**Ordering Code (example):**

Guide bush with collar, Bronze with solid lubricant,  
DIN 9834/ISO 9448

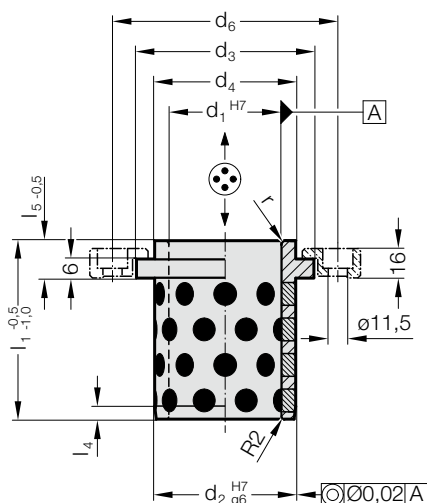
= 2082.70.

Diameter of conduit  $d_1$  50 mm = 050

Order No = 2082.70. 050

## GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, NAAMS

2082.71.



### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

### Fixing:

(to be ordered separately)

Screw clamps with screws 2072.46 (M10 x 20 DIN EN ISO 4762)

### Attention:

Bushes can only be used with axial motion!

### 2082.71. Guide bush with collar, Bronze with solid lubricant, NAAMS

d <sub>1</sub>	25	32	40	50	63	80	100	125
d <sub>2</sub>	32	40	50	63	80	100	125	160
d <sub>3</sub>	40	50	63	71	90	112	140	180
d <sub>4</sub>	32	40	50	63	80	100	125	160
d <sub>6</sub>	75	83	93	106	123	143	168	203
l <sub>1</sub>	40	50	63	71	80	100	125	160
l <sub>4</sub>	3	4	5	6.3	8	10	12.5	16
l <sub>5</sub>	10	10	13	15	17	20	19	28
r	3	3	3	5	6	8	10	12

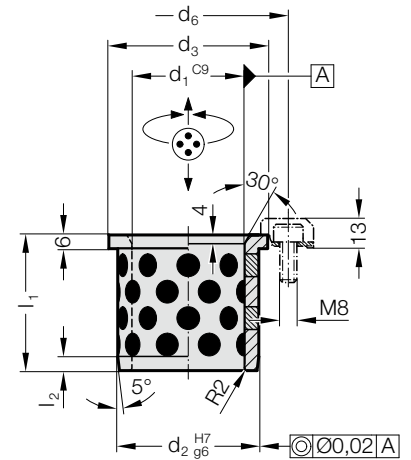
### Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant, NAAMS = 2082.71.  
 Diameter of conduit d<sub>1</sub> 63 mm = 063  
 Order No = 2082.71. 063

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, NAAMS



2086.71.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Bushes can be used with radial or axial motion.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Fixing:**

(to be ordered separately)

Screw clamps with screws 2072.47 (M8 x 20 DIN EN ISO 4762)

**2086.71. Guide bush with collar, Bronze with solid lubricant, NAAMS**

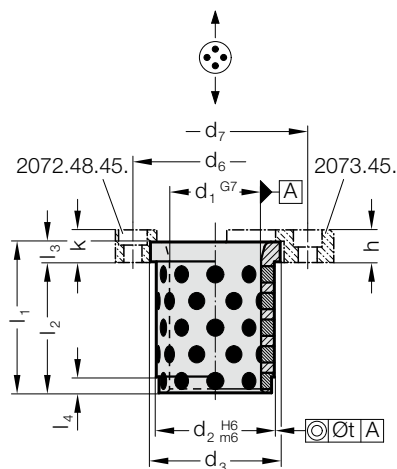
d <sub>1</sub>	25	32	40	50	63	80	100	125
d <sub>2</sub>	32	40	50	63	80	100	125	160
d <sub>3</sub>	40	50	63	71	90	112	140	180
d <sub>6</sub>	29	34	40,5	44,5	54	65	79	99
l <sub>1</sub>	40	50	55	63	75	90	115	138
l <sub>2</sub>	4	4	5	6	8	10	12	12

**Ordering Code (example):**

Guide bush with collar, Bronze with solid lubricant, NAAMS	=	2086.71.
Diameter of conduit d <sub>1</sub>	63 mm =	063
Order No	=	2086.71. 063

# GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, CNOMO

2102.70.



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

## Fixing:

(to be ordered separately)

Screw clamps with screws 2072.48.45. or  
Securing flange 2073.45.

## Attention:

Bushes can only be used with axial motion!

Note that press fitment reduces inside bush diameter.

## 2102.70. Guide bush with collar, Bronze with solid lubricant, CNOMO

d <sub>1</sub>	20	25	32	40	50	63	80	100
d <sub>2</sub>	28	35	44	52	63	80	100	125
d <sub>3</sub>	32	40	50	60	71	90	112	140
d <sub>6</sub>	-	-	-	75	90	111	133	162
d <sub>7</sub>	48	56	65	82	98	115	144	170
l <sub>1</sub>	32	40	50	63	80	100	125	160
l <sub>2</sub>	28	35	44	55	70	88	109	140
l <sub>3</sub>	4	5	6	8	10	12	16	20
l <sub>4</sub>	3	5	8	8	8	10	10	10
h	10	10	12	12	16	20	25	32
k	-	-	-	12	16	20	25	32
t	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02

## Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant, CNOMO = 2102.70.

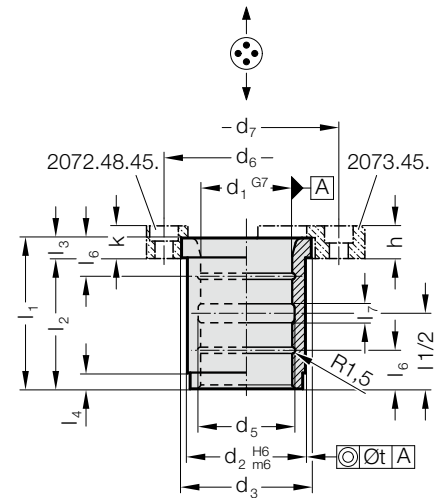
Diameter of conduit d<sub>1</sub> 50 mm = 050

Order No = 2102.70. 050

# GUIDE BUSH WITH COLLAR, BRONZE, CNOMO



2102.71.



**Material:**

Bronze

**Note:**

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

**Fixing:**

(to be ordered separately)

Screw clamps with screws 2072.48.45. or

Securing flange 2073.45.

**Attention:**

Bushes can only be used with axial motion!

Note that press fitment reduces inside bush diameter.

**2102.71. Guide bush with collar, Bronze, CNOMO**

d <sub>1</sub>	20	25	32	40	50	63	80	100
d <sub>2</sub>	28	35	44	52	63	80	100	125
d <sub>3</sub>	32	40	50	60	71	90	112	140
d <sub>5</sub>	22	27	34	42	52	65	82	102
d <sub>6</sub>	-	-	-	75	90	111	133	162
d <sub>7</sub>	48	56	65	82	98	115	144	170
l <sub>1</sub>	32	40	50	63	80	100	125	160
l <sub>2</sub>	28	35	44	55	70	88	109	140
l <sub>3</sub>	4	5	6	8	10	12	16	20
l <sub>4</sub>	3	5	8	8	8	10	10	10
l <sub>6</sub>	-	-	12	16	20	25	32	40
l <sub>7</sub>	5	5	5	8	10	12	16	20
h	10	10	12	12	16	20	25	32
k	-	-	-	12	16	20	25	32
t	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02

**Ordering Code (example):**

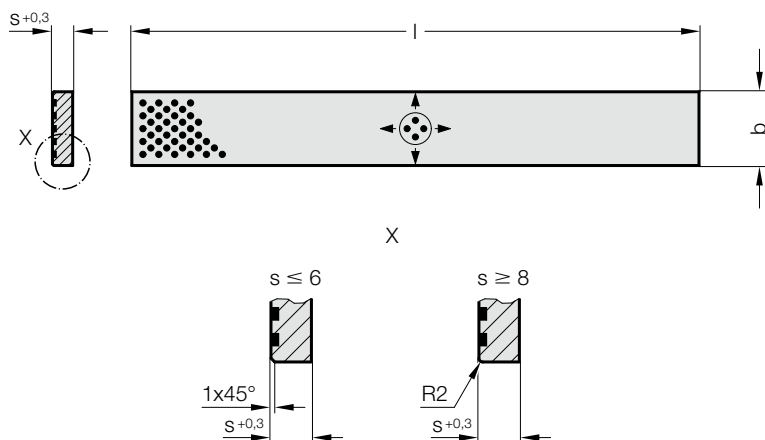
Guide bush with collar, Bronze, CNOMO = 2102.71.

Diameter of conduit d<sub>1</sub> 50 mm = 050

Order No = 2102.71. 050

# FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.71.



## 2961.71. Flat guide bar, Bronze with solid lubricant

Order No	b	s	l	305	605	1,005
2961.71.020.004.	20	4		●		
2961.71.025.005.	25	5		●		
2961.71.030.004.	30	4		●		
2961.71.030.006.	30	6		●	●	
2961.71.030.008.	30	8		●	●	
2961.71.030.010.	30	10		●	●	●
2961.71.030.012.	30	12		●	●	●
2961.71.035.010.	35	10		●	●	●
2961.71.040.005.	40	5		●	●	
2961.71.040.006.	40	6		●	●	
2961.71.040.008.	40	8		●	●	●
2961.71.040.010.	40	10		●	●	●
2961.71.040.012.	40	12			●	●
2961.71.040.016.	40	16			●	●
2961.71.050.010.	50	10		●	●	●
2961.71.050.012.	50	12			●	●
2961.71.050.020.	50	20			●	●
2961.71.060.012.	60	12			●	●
2961.71.060.016.	60	16			●	●
2961.71.080.010.	80	10		●	●	●
2961.71.080.012.	80	12			●	●
2961.71.080.016.	80	16			●	●
2961.71.080.020.	80	20			●	●
2961.71.080.025.	80	25			●	●
2961.71.100.016.	100	16			●	●
2961.71.100.020.	100	20			●	●
2961.71.100.025.	100	25			●	●
2961.71.125.020.	125	20			●	●
2961.71.125.025.	125	25			●	●
2961.71.160.025.	160	25			●	●

### Material:

Bronze with solid lubricant, oilless lubricating

### Execution:

Sliding faces ground.

### Ordering Code (example):

Flat guide bar, Bronze with solid lubricant	=	2961.71.
Width b	50 mm =	050.
Thickness s	10 mm =	010.
Length l	1005 mm =	1005
Order No	=	2961.71. 050. 010. 1005

# FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT



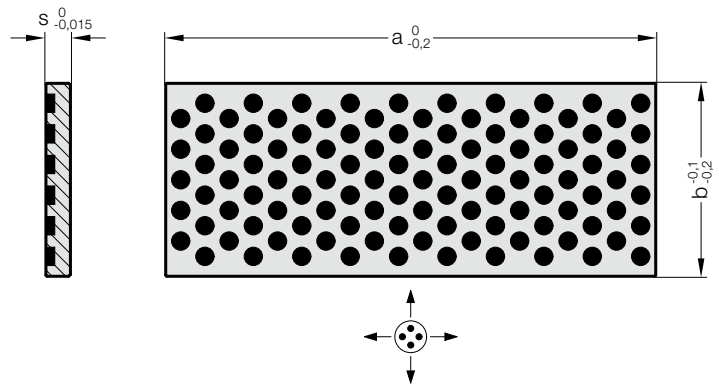
2961.76.

**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Sliding faces ground.



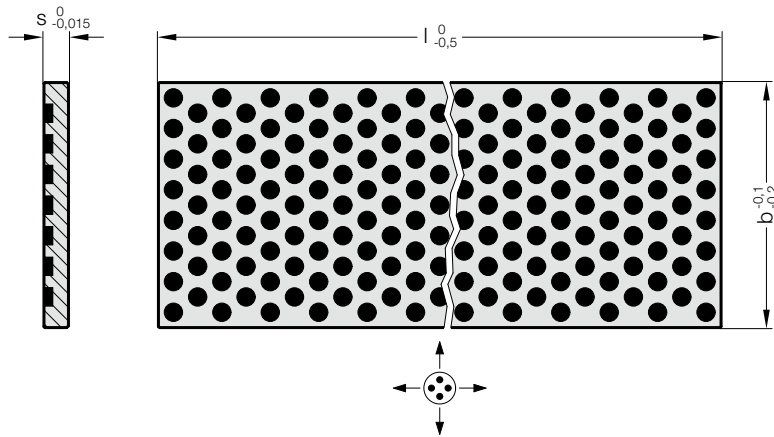
**2961.76. Flat guide bar, Bronze with solid lubricant**

Order No	b	s	a
2961.76.025.005.050	25	5	50
2961.76.025.005.071	25	5	71
2961.76.025.005.090	25	5	90
2961.76.025.006.050	25	6	50
2961.76.025.006.063	25	6	63
2961.76.025.006.080	25	6	80
2961.76.025.006.100	25	6	100
2961.76.025.006.125	25	6	125
2961.76.040.005.050	40	5	50
2961.76.040.005.071	40	5	71
2961.76.040.005.090	40	5	90
2961.76.040.006.080	40	6	80
2961.76.040.006.100	40	6	100
2961.76.040.006.125	40	6	125
2961.76.040.006.160	40	6	160
2961.76.040.006.200	40	6	200
2961.76.063.006.080	63	6	80
2961.76.063.006.100	63	6	100
2961.76.063.006.125	63	6	125
2961.76.063.006.160	63	6	160
2961.76.063.008.125	63	8	125
2961.76.063.008.160	63	8	160
2961.76.063.008.200	63	8	200
2961.76.063.008.250	63	8	250
2961.76.063.008.315	63	8	315



# FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.77.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Sliding faces ground.

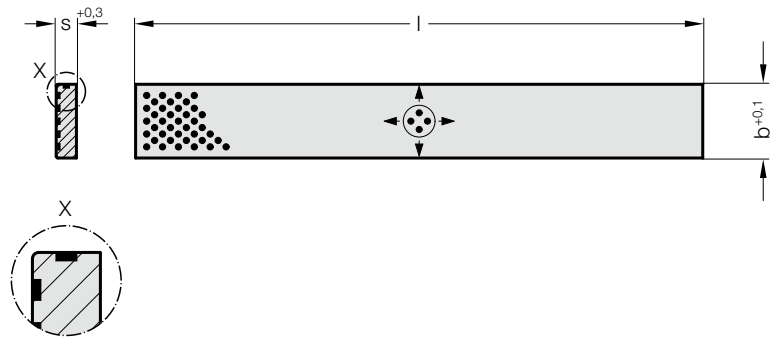
**2961.77. Flat guide bar, Bronze with solid lubricant**

Order No	b	s	l
2961.77.025.006.500	25	6	500
2961.77.040.006.500	40	6	500
2961.77.063.008.500	63	8	500
2961.77.080.010.500	80	10	500

# FLAT GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT



2961.73.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

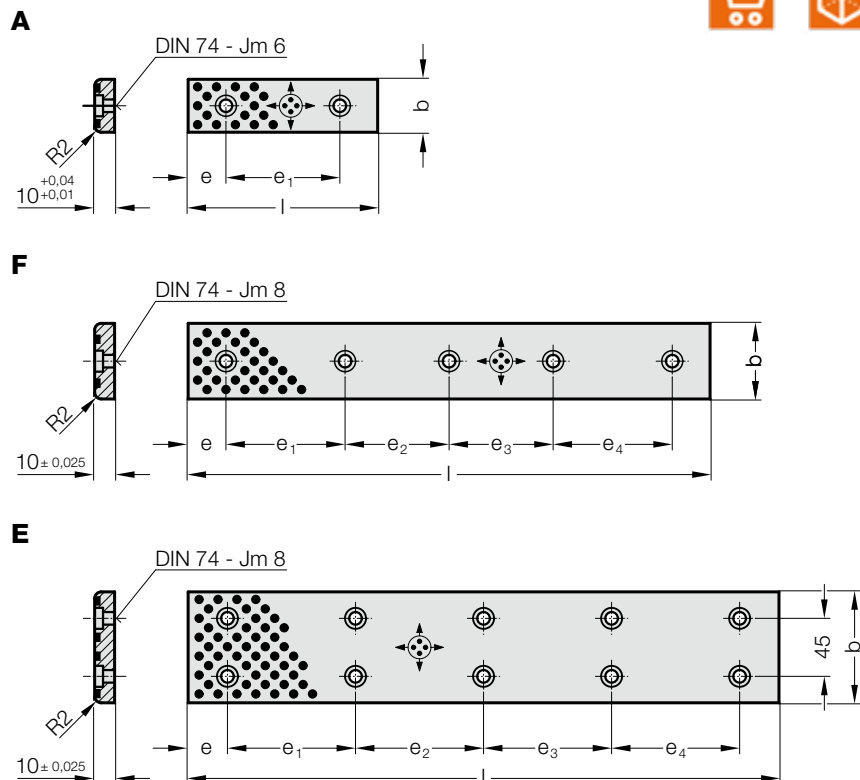
Sliding faces ground.

**2961.73. Flat guide bar with two sliding surfaces, Bronze with solid lubricant**

Order No	b	s	l
2961.73.025.005.0305	25	5	305
2961.73.030.006.0305	30	6	305
2961.73.035.010.0605	35	10	605
2961.73.040.008.0605	40	8	605
2961.73.040.012.0605	40	12	605
2961.73.050.010.0605	50	10	605
2961.73.060.016.0605	60	16	605
2961.73.080.012.0605	80	12	605
2961.73.080.020.0605	80	20	605
2961.73.100.020.0605	100	20	605

# FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Execution:**

Sliding faces ground.

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN 7984.

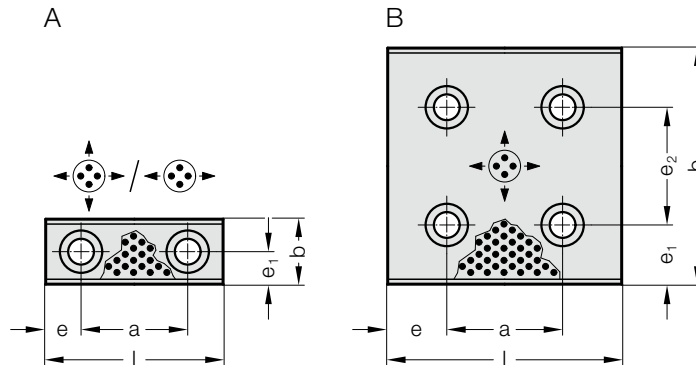
**2961.70. Flat guide bar, Bronze with solid lubricant**

Order No	Shape	b	l	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	Number of screw holes
2961.70.018.075	A	18	75	15	45	-	-	-	2
2961.70.018.100	A	18	100	25	50	-	-	-	2
2961.70.018.125	A	18	125	25	75	-	-	-	2
2961.70.018.150	A	18	150	25	100	-	-	-	2
2961.70.028.075	A	28	75	15	45	-	-	-	2
2961.70.028.100	A	28	100	25	50	-	-	-	2
2961.70.028.125	A	28	125	25	75	-	-	-	2
2961.70.028.150	A	28	150	25	100	-	-	-	2
2961.70.035.100	F	35	100	20	60	-	-	-	2
2961.70.035.150	F	35	150	20	55	55	-	-	3
2961.70.035.200	F	35	200	20	55	50	55	-	4
2961.70.035.250	F	35	250	20	70	70	70	-	4
2961.70.035.300	F	35	300	20	65	65	65	65	5
2961.70.035.350	F	35	350	20	80	75	75	80	5
2961.70.038.075	A	38	75	15	45	-	-	-	2
2961.70.038.100	A	38	100	25	50	-	-	-	2
2961.70.038.125	A	38	125	25	75	-	-	-	2
2961.70.038.150	A	38	150	25	100	-	-	-	2
2961.70.048.075	A	48	75	15	45	-	-	-	2
2961.70.048.100	A	48	100	25	50	-	-	-	2
2961.70.048.125	A	48	125	25	75	-	-	-	2
2961.70.048.150	A	48	150	25	100	-	-	-	2
2961.70.050.100	F	50	100	20	60	-	-	-	2
2961.70.050.150	F	50	150	20	55	55	-	-	3
2961.70.050.200	F	50	200	20	55	50	55	-	4
2961.70.050.250	F	50	250	20	70	70	70	-	4
2961.70.050.300	F	50	300	20	65	65	65	65	5
2961.70.050.350	F	50	350	20	80	75	75	80	5
2961.70.050.400	F	50	400	20	90	90	90	90	5
2961.70.075.150	E	75	150	20	110	-	-	-	4
2961.70.075.200	E	75	200	20	80	80	-	-	6
2961.70.075.250	E	75	250	20	105	105	-	-	6
2961.70.075.300	E	75	300	20	85	90	85	-	8
2961.70.075.400	E	75	400	20	120	120	120	-	8
2961.70.075.500	E	75	500	20	115	115	115	115	10

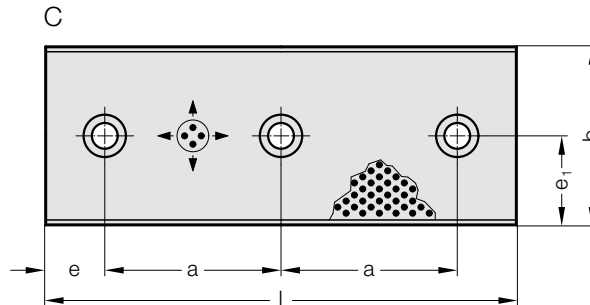
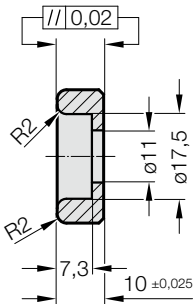
# FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT



2961.75.



2961.75.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Attention:**

Direction of motion of flat guide bars with a width of  $b = 28$  and  $38$  mm only in longitudinal direction.

**Fixing:**

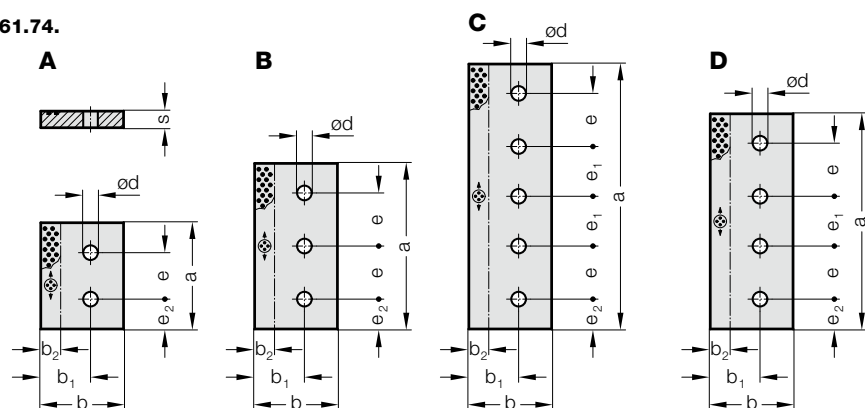
Use socket cap screws DIN 7984 M10.

**2961.75. Flat guide bar, Bronze with solid lubricant**

Order No	Shape	b	l	e	a	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.75.028.075	A	28	75	15	45	14	-	2
2961.75.028.100	A	28	100	25	50	14	-	2
2961.75.028.125	A	28	125	25	75	14	-	2
2961.75.028.150	A	28	150	25	100	14	-	2
2961.75.038.075	A	38	75	15	45	19	-	2
2961.75.038.100	A	38	100	25	50	19	-	2
2961.75.038.125	A	38	125	25	75	19	-	2
2961.75.038.150	A	38	150	25	100	19	-	2
2961.75.048.075	A	48	75	15	45	24	-	2
2961.75.048.100	A	48	100	25	50	24	-	2
2961.75.048.125	A	48	125	25	75	24	-	2
2961.75.048.150	A	48	150	25	100	24	-	2
2961.75.048.200	A	48	200	50	100	24	-	2
2961.75.058.075	A	58	75	15	45	29	-	2
2961.75.058.100	A	58	100	25	50	29	-	2
2961.75.058.125	A	58	125	25	75	29	-	2
2961.75.058.150	A	58	150	25	100	29	-	2
2961.75.058.200	A	58	200	50	100	29	-	2
2961.75.075.075	A	75	75	15	45	37,5	-	2
2961.75.075.100	A	75	100	25	50	37,5	-	2
2961.75.075.125	A	75	125	25	75	37,5	-	2
2961.75.075.150	A	75	150	25	100	37,5	-	2
2961.75.075.200	C	75	200	25	75	37,5	-	3
2961.75.100.100	B	100	100	25	50	25	50	4
2961.75.100.125	B	100	125	25	75	25	50	4
2961.75.100.150	B	100	150	25	100	25	50	4
2961.75.100.200	B	100	200	25	150	25	50	4
2961.75.100.250	B	100	250	25	200	25	50	4
2961.75.125.150	B	125	150	25	100	37,5	50	4
2961.75.125.200	B	125	200	25	150	37,5	50	4
2961.75.125.250	B	125	250	25	200	37,5	50	4
2961.75.150.150	B	150	150	25	100	25	100	4
2961.75.150.200	B	150	200	25	150	25	100	4

# RETAINING PLATE, BRONZE WITH SOLID LUBRICANT, VDI 3357

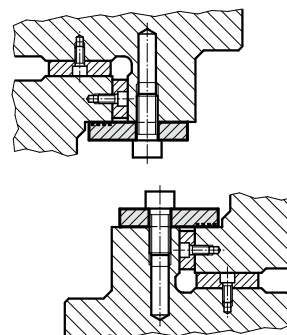
2961.74.



## 2961.74. Retaining plate, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	s	a	b <sub>2</sub>	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.74.035.10.160	A	35	10	160	10	20	11	70	-	45	2
2961.74.035.10.200	A	35	10	200	10	20	11	110	-	45	2
2961.74.035.10.250	B	35	10	250	10	20	11	80	-	45	3
2961.74.045.15.160	A	45	15	160	15	30	13.5	70	-	45	2
2961.74.045.15.200	A	45	15	200	15	30	13.5	110	-	45	2
2961.74.045.15.250	B	45	15	250	15	30	13.5	80	-	45	3
2961.74.055.15.160	A	55	15	160	20	35	17.5	70	-	45	2
2961.74.055.15.200	A	55	15	200	20	35	17.5	110	-	45	2
2961.74.055.15.250	B	55	15	250	20	35	17.5	80	-	45	3
2961.74.075.25.160	A	75	25	160	25	40	17.5	70	-	45	2
2961.74.075.25.200	A	75	25	200	25	40	17.5	110	-	45	2
2961.74.075.25.250	B	75	25	250	25	40	17.5	80	-	45	3
2961.74.085.28.240	B	85	28	240	30	60	22	95	-	25	3
2961.74.085.28.300	D	85	28	300	30	60	22	85	80	25	4
2961.74.085.28.350	D	85	28	350	30	60	22	100	100	25	4
2961.74.085.28.400	D	85	28	400	30	60	22	115	120	25	4
2961.74.085.28.450	C	85	28	450	30	60	22	100	100	25	5
2961.74.085.30.160	A	85	30	160	30	60	22	70	-	45	2
2961.74.085.30.200	A	85	30	200	30	60	22	110	-	45	2
2961.74.085.30.250	B	85	30	250	30	60	22	80	-	45	3
2961.74.085.30.300	B	85	30	300	30	60	22	105	-	45	3
2961.74.085.30.350	B	85	30	350	30	60	22	130	-	45	3
2961.74.085.30.400	C	85	30	400	30	60	22	80	75	45	5
2961.74.100.25.160	A	100	25	160	30	60	17.5	70	-	45	2
2961.74.100.25.200	A	100	25	200	30	60	17.5	110	-	45	2
2961.74.100.25.250	B	100	25	250	30	60	17.5	80	-	45	3
2961.74.100.25.400	C	100	25	400	30	60	17.5	80	75	45	5
2961.74.100.30.160	A	100	30	160	30	60	22	70	-	45	2
2961.74.100.30.200	A	100	30	200	30	60	22	110	-	45	2
2961.74.100.30.250	B	100	30	250	30	60	22	80	-	45	3
2961.74.100.30.400	C	100	30	400	30	60	22	80	75	45	5
2961.74.125.25.160	A	125	25	160	30	75	17.5	70	-	45	2
2961.74.125.25.200	A	125	25	200	30	75	17.5	110	-	45	2
2961.74.125.25.250	B	125	25	250	30	75	17.5	80	-	45	3
2961.74.125.25.300	D	125	25	300	30	80	26	85	80	25	4
2961.74.125.25.350	D	125	25	350	30	80	26	100	100	25	4
2961.74.125.25.400.1	D	125	25	400	30	80	26	115	120	25	4
2961.74.125.25.400	C	125	25	400	30	75	17.5	80	75	45	5
2961.74.125.25.450	C	125	25	450	30	80	26	100	100	25	5
2961.74.125.25.500	C	125	25	500	30	80	26	110	115	25	5
2961.74.125.30.160	A	125	30	160	30	75	22	70	-	45	2
2961.74.125.30.200	A	125	30	200	30	75	22	110	-	45	2
2961.74.125.30.250	B	125	30	250	30	75	22	80	-	45	3
2961.74.125.30.300	B	125	30	300	30	75	22	105	-	45	3
2961.74.125.30.350	B	125	30	350	30	75	22	130	-	45	3
2961.74.125.30.400	C	125	30	400	30	75	22	80	75	45	5
2961.74.125.30.450	C	125	30	450	30	75	22	80	95	50	5
2961.74.125.30.500	C	125	30	500	30	75	22	80	120	50	5

## Mounting example



### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws are not included.

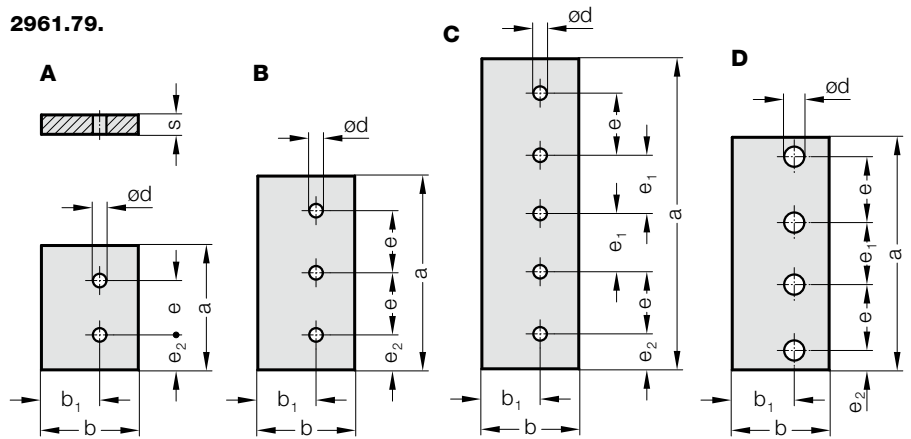
### Fixing:

Use socket cap screws DIN EN ISO 4762.

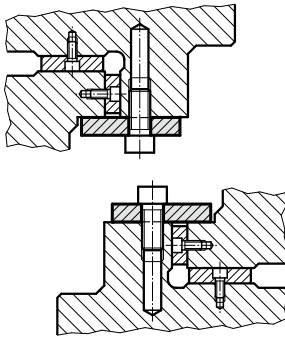
# RETAINING PLATE, STEEL, VDI 3357



2961.79.



## Mounting example



2961.79. Retaining plate, Steel, VDI 3357

Order No	Shape	b	s	a	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.79.035.10.160	A	35	10	160	20	11	70	-	45	2
2961.79.035.10.200	A	35	10	200	20	11	110	-	45	2
2961.79.035.10.250	B	35	10	250	20	11	80	-	45	3
2961.79.045.15.160	A	45	15	160	30	13.5	70	-	45	2
2961.79.045.15.200	A	45	15	200	30	13.5	110	-	45	2
2961.79.045.15.250	B	45	15	250	30	13.5	80	-	45	3
2961.79.055.15.160	A	55	15	160	35	17.5	70	-	45	2
2961.79.055.15.200	A	55	15	200	35	17.5	110	-	45	2
2961.79.055.15.250	B	55	15	250	35	17.5	80	-	45	3
2961.79.075.25.160	A	75	25	160	40	17.5	70	-	45	2
2961.79.075.25.200	A	75	25	200	40	17.5	110	-	45	2
2961.79.075.25.250	B	75	25	250	40	17.5	80	-	45	3
2961.79.085.28.240	B	85	28	240	60	22	95	-	25	3
2961.79.085.28.300	D	85	28	300	60	22	85	80	25	4
2961.79.085.28.350	D	85	28	350	60	22	100	100	25	4
2961.79.085.28.400	D	85	28	400	60	22	115	120	25	4
2961.79.085.28.450	C	85	28	450	60	22	100	100	25	5
2961.79.085.30.160	A	85	30	160	60	22	70	-	45	2
2961.79.085.30.200	A	85	30	200	60	22	110	-	45	2
2961.79.085.30.250	B	85	30	250	60	22	80	-	45	3
2961.79.085.30.300	B	85	30	300	60	22	105	-	45	3
2961.79.085.30.350	B	85	30	350	60	22	130	-	45	3
2961.79.085.30.400	C	85	30	400	60	22	80	75	45	5
2961.79.100.25.160	A	100	25	160	60	17.5	70	-	45	2
2961.79.100.25.200	A	100	25	200	60	17.5	110	-	45	2
2961.79.100.25.250	B	100	25	250	60	17.5	80	-	45	3
2961.79.100.25.400	C	100	25	400	60	17.5	80	75	45	5
2961.79.100.30.160	A	100	30	160	60	22	70	-	45	2
2961.79.100.30.200	A	100	30	200	60	22	110	-	45	2
2961.79.100.30.250	B	100	30	250	60	22	80	-	45	3
2961.79.100.30.400	C	100	30	400	60	22	80	75	45	5
2961.79.125.25.160	A	125	25	160	75	17.5	70	-	45	2
2961.79.125.25.200	A	125	25	200	75	17.5	110	-	45	2
2961.79.125.25.250	B	125	25	250	75	17.5	80	-	45	3
2961.79.125.25.400	C	125	25	400	75	17.5	80	75	45	5
2961.79.125.25.300	D	125	25	300	80	26	85	80	25	4
2961.79.125.25.350	D	125	25	350	80	26	100	100	25	4
2961.79.125.25.400.1	D	125	25	400	80	26	115	120	25	4
2961.79.125.25.450	C	125	25	450	80	26	100	100	25	5
2961.79.125.25.500	C	125	25	500	80	26	110	115	25	5
2961.79.125.30.160	A	125	30	160	75	22	70	-	45	2
2961.79.125.30.200	A	125	30	200	75	22	110	-	45	2
2961.79.125.30.250	B	125	30	250	75	22	80	-	45	3
2961.79.125.30.300	B	125	30	300	75	22	105	-	45	3
2961.79.125.30.350	B	125	30	350	75	22	130	-	45	3
2961.79.125.30.400	C	125	30	400	75	22	80	75	45	5
2961.79.125.30.450	C	125	30	450	75	22	80	95	50	5
2961.79.125.30.500	C	125	30	500	75	22	80	120	50	5

## Material:

Steel, surface hardened

## Note:

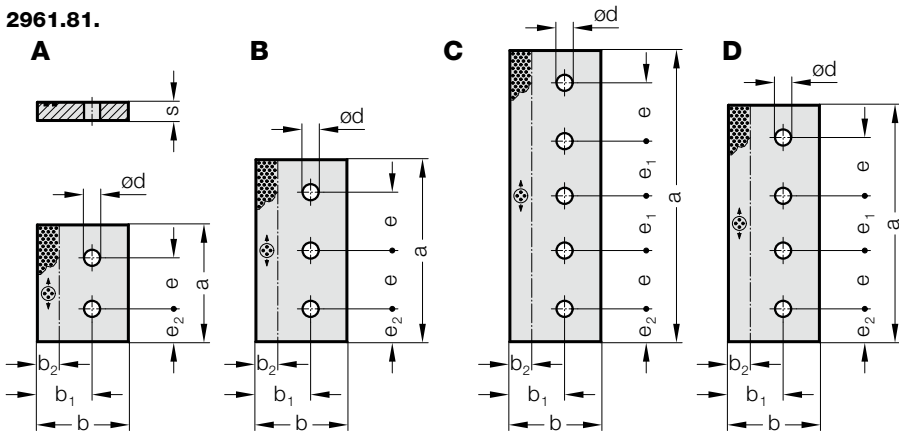
Screws are not included.

## Fixing:

Use socket cap screws DIN EN ISO 4762.

# RETAINING PLATE, STEEL WITH SOLID LUBRICANT, VDI 3357

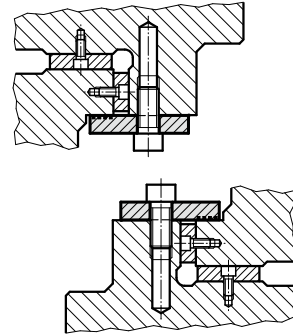
2961.81.



## 2961.81. Retaining plate, Steel with solid lubricant, VDI 3357

Order No	Shape	b	s	a	b <sub>2</sub>	b <sub>1</sub>	d	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2961.81.035.10.160	A	35	10	160	10	20	11	70	-	45	2
2961.81.035.10.200	A	35	10	200	10	20	11	110	-	45	2
2961.81.035.10.250	B	35	10	250	10	20	11	80	-	45	3
2961.81.045.15.160	A	45	15	160	15	30	13.5	70	-	45	2
2961.81.045.15.200	A	45	15	200	15	30	13.5	110	-	45	2
2961.81.045.15.250	B	45	15	250	15	30	13.5	80	-	45	3
2961.81.055.15.160	A	55	15	160	20	35	17.5	70	-	45	2
2961.81.055.15.200	A	55	15	200	20	35	17.5	110	-	45	2
2961.81.055.15.250	B	55	15	250	20	35	17.5	80	-	45	3
2961.81.075.25.160	A	75	25	160	25	40	17.5	70	-	45	2
2961.81.075.25.200	A	75	25	200	25	40	17.5	110	-	45	2
2961.81.075.25.250	B	75	25	250	25	40	17.5	80	-	45	3
2961.81.085.28.240	B	85	28	240	30	60	22	95	-	25	3
2961.81.085.28.300	D	85	28	300	30	60	22	85	80	25	4
2961.81.085.28.350	D	85	28	350	30	60	22	100	100	25	4
2961.81.085.28.400	D	85	28	400	30	60	22	115	120	25	4
2961.81.085.28.450	C	85	28	450	30	60	22	100	100	25	5
2961.81.085.30.160	A	85	30	160	30	60	22	70	-	45	2
2961.81.085.30.200	A	85	30	200	30	60	22	110	-	45	2
2961.81.085.30.250	B	85	30	250	30	60	22	80	-	45	3
2961.81.085.30.300	B	85	30	300	30	60	22	105	-	45	3
2961.81.085.30.350	B	85	30	350	30	60	22	130	-	45	3
2961.81.085.30.400	C	85	30	400	30	60	22	80	75	45	5
2961.81.100.25.160	A	100	25	160	30	60	17.5	70	-	45	2
2961.81.100.25.200	A	100	25	200	30	60	17.5	110	-	45	2
2961.81.100.25.250	B	100	25	250	30	60	17.5	80	-	45	3
2961.81.100.25.400	C	100	25	400	30	60	17.5	80	75	45	5
2961.81.100.30.160	A	100	30	160	30	60	22	70	-	45	2
2961.81.100.30.200	A	100	30	200	30	60	22	110	-	45	2
2961.81.100.30.250	B	100	30	250	30	60	22	80	-	45	3
2961.81.100.30.400	C	100	30	400	30	60	22	80	75	45	5
2961.81.125.25.160	A	125	25	160	30	75	17.5	70	-	45	2
2961.81.125.25.200	A	125	25	200	30	75	17.5	110	-	45	2
2961.81.125.25.250	B	125	25	250	30	75	17.5	80	-	45	3
2961.81.125.25.300	D	125	25	300	30	80	26	85	80	25	4
2961.81.125.25.350	D	125	25	350	30	80	26	100	100	25	4
2961.81.125.25.400	C	125	25	400	30	75	17.5	80	75	45	5
2961.81.125.25.400.1	D	125	25	400	30	80	26	115	120	25	4
2961.81.125.25.450	C	125	25	450	30	80	26	100	100	25	5
2961.81.125.25.500	C	125	25	500	30	80	26	110	115	25	5
2961.81.125.30.160	A	125	30	160	30	75	22	70	-	45	2
2961.81.125.30.200	A	125	30	200	30	75	22	110	-	45	2
2961.81.125.30.250	B	125	30	250	30	75	22	80	-	45	3
2961.81.125.30.300	B	125	30	300	30	75	22	105	-	45	3
2961.81.125.30.350	B	125	30	350	30	75	22	130	-	45	3
2961.81.125.30.400	C	125	30	400	30	75	22	80	75	45	5
2961.81.125.30.450	C	125	30	450	30	75	22	80	95	50	5
2961.81.125.30.500	C	125	30	500	30	75	22	80	120	50	5

## Mounting example



### Material:

Steel, surface hardened. Sliding faces with embedded solid lubricant.

### Note:

Screws are not included.

### Fixing:

Use socket cap screws DIN EN ISO 4762.

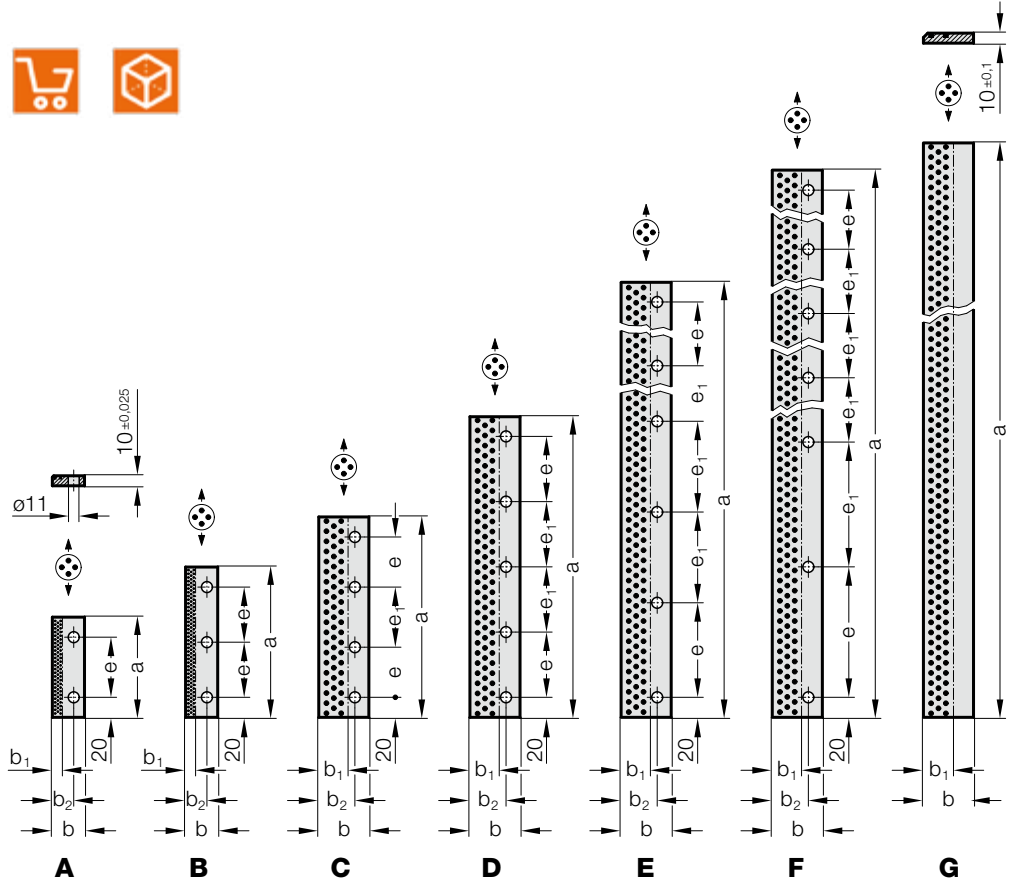
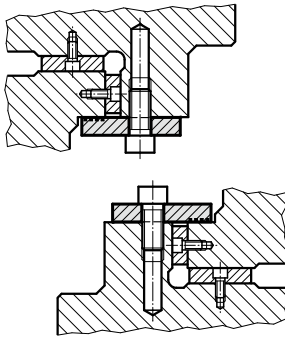
# RETAINING PLATE, BRONZE WITH SOLID LUBRICANT



2961.78.



## Mounting example



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use socket cap screws  
DIN EN ISO 4762 M10.

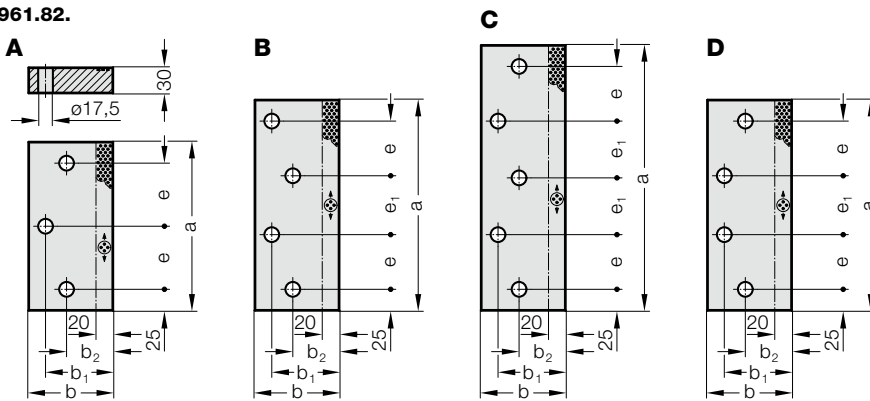
## 2961.78. Retaining plate, Bronze with solid lubricant

Order No	Shape	a	b	b <sub>1</sub>	b <sub>2</sub>	e	e <sub>1</sub>	Number of screw holes
2961.78.032.0100	A	100	32	10	21	60	-	2
2961.78.032.0150	B	150	32	10	21	55	-	3
2961.78.032.0160	B	160	32	10	21	60	-	3
2961.78.050.0200	C	200	50	30	36	50	60	4
2961.78.050.0250	C	250	50	30	36	70	70	4
2961.78.050.0300	D	300	50	30	36	65	65	5
2961.78.050.0350	D	350	50	30	36	80	75	5
2961.78.050.0400	D	400	50	30	36	90	90	5
2961.78.050.0500	E	500	50	30	36	95	90	6
2961.78.050.0600	E	600	50	30	36	115	110	6
2961.78.050.0800	F	800	50	30	36	130	125	7
2961.78.050.0605	G	605	50	30	36	-	-	-
2961.78.050.1005	G	1,005	50	30	36	-	-	-

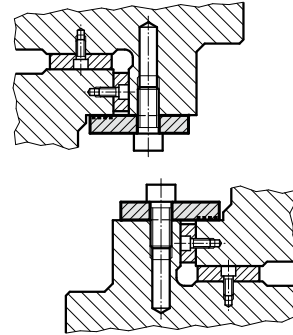


# RETAINING PLATE, STEEL WITH SOLID LUBRICANT, NAAMS

2961.82.



## Mounting example



## 2961.82. Retaining plate, Steel with solid lubricant, NAAMS

Order No	Shape	b	a	b <sub>1</sub>	b <sub>2</sub>	e	e <sub>1</sub>	Number of screw holes
2961.82.075.200	A	75	200	55	40	75		3
2961.82.075.250	B	75	250	55	40	65	70	4
2961.82.075.250.1	D	75	250	55	40	65	70	4
2961.82.075.250.2	A	75	250	55	40	100		3
2961.82.075.315	C	75	315	55	40	65	67.5	5
2961.82.075.350	C	75	350	55	40	75	75	5
2961.82.075.400	C	75	400	55	40	90	85	5
2961.82.075.450	C	75	450	55	40	100	100	5
2961.82.100.200	A	100	200	80	55	75		3
2961.82.100.250	B	100	250	80	55	65	70	4
2961.82.100.250.1	D	100	250	80	55	65	70	4
2961.82.100.250.2	A	100	250	80	55	100		3
2961.82.100.315	C	100	315	80	55	65	67.5	5
2961.82.100.350	C	100	350	80	55	75	75	5
2961.82.100.400	C	100	400	80	55	90	85	5
2961.82.100.450	C	100	450	80	55	100	100	5
2961.82.125.200	A	125	200	105	65	75		3
2961.82.125.250	B	125	250	105	65	65	70	4
2961.82.125.250.1	D	125	250	105	65	65	70	4
2961.82.125.250.2	A	125	250	105	65	100		3
2961.82.125.315	C	125	315	105	65	65	67.5	5
2961.82.125.350	C	125	350	105	65	75	75	5
2961.82.125.400	C	125	400	105	65	90	85	5
2961.82.125.450	C	125	450	105	65	100	100	5
2961.82.150.200	A	150	200	130	65	75		3
2961.82.150.250	B	150	250	130	65	65	70	4
2961.82.150.250.1	D	150	250	130	65	65	70	4
2961.82.150.250.2	A	150	250	130	65	100		3
2961.82.150.315	C	150	315	130	65	65	67.5	5
2961.82.150.350	C	150	350	130	65	75	75	5
2961.82.150.400	C	150	400	130	65	90	85	5
2961.82.150.450	C	150	450	130	65	100	100	5

## Material:

Steel, surface hardened. Sliding faces with embedded solid lubricant.

## Note:

Screws are not included.

## Fixing:

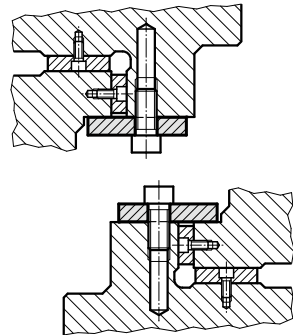
Use socket cap screws

DIN EN ISO 4762 M16.

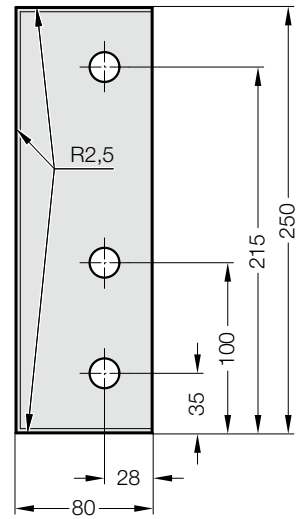
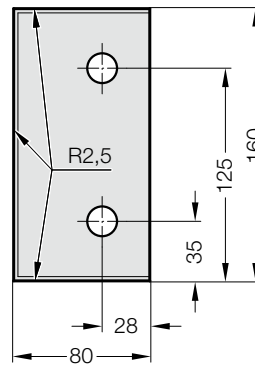
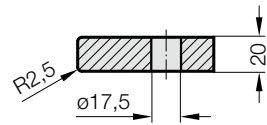
# RETAINING PLATE, STEEL, CNOMO



Mounting example



2961.79.45.



**Material:**

Steel, surface hardened

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M16.

**2961.79.45. Retaining plate, Steel, CNOMO**

Order No

2961.79.45.080.20.160

2961.79.45.080.20.250

Number of screw holes

2

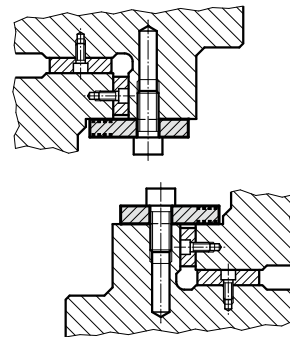
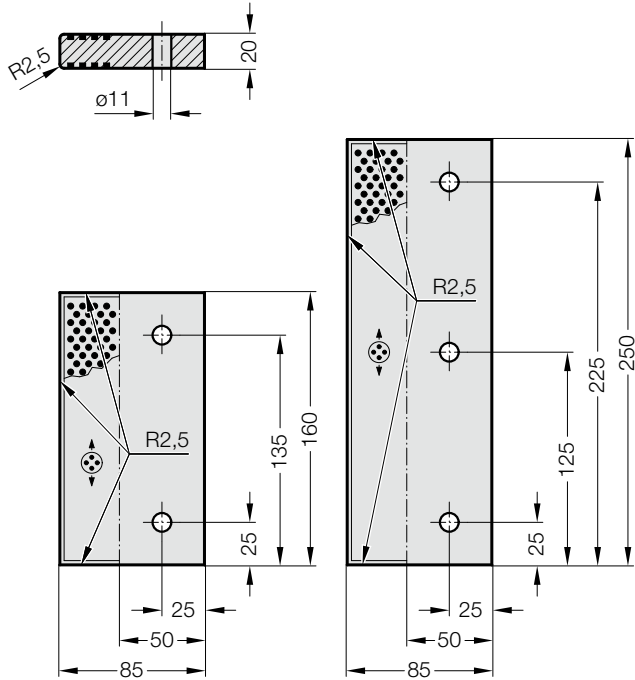
3

# RETAINING PLATE, BRONZE WITH SOLID LUBRICANT, CNOMO

2961.81.45.



Mounting example



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.

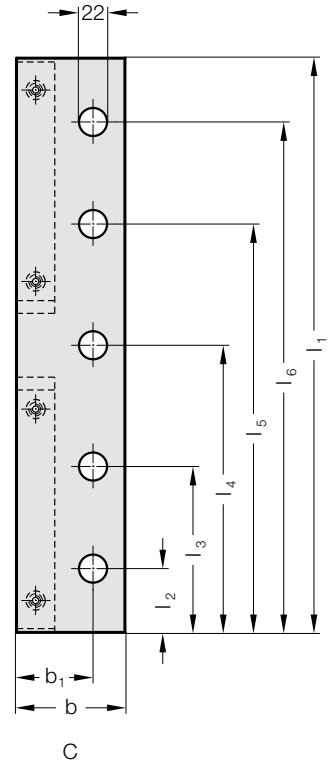
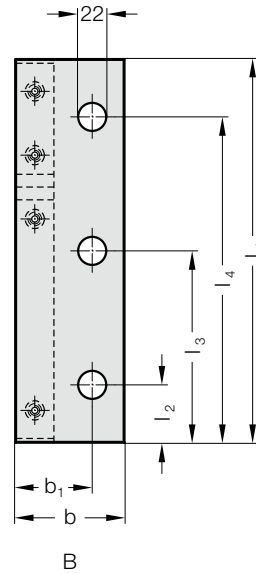
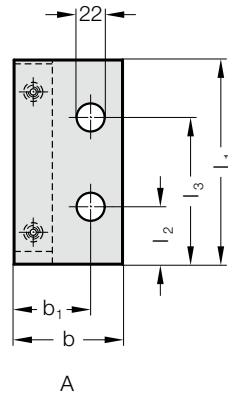
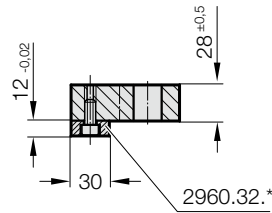
**2961.81.45. Retaining plate, Bronze with solid lubricant, CNOMO**

Order No	Number of screw holes
2961.81.45.085.20.160	2
2961.81.45.085.20.250	3

# RETAINING PLATE WITH SLIDING PAD, STEEL / STEEL WITH SINTERLAYER, ACCORDING TO VW



2961.30.55.



## Material:

Retaining plate: Steel  
Sliding pad: Steel with sinterlayer

## Execution:

The retaining plate with sliding pad consists of:

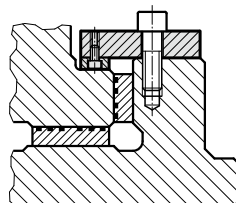
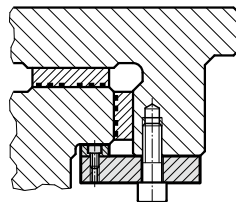
- Retaining plate
- Sliding pad 2960.32.\*
- Cylindrical screw according to DIN EN ISO 4762 M8x16 (x2, x4)

## Note:

Supplied without screws.  
Retaining plate cannot be ordered separately.  
\*Sliding pad 2960.32. can be ordered separately in case of wear.

## Fixing:

Use socket cap screws DIN EN ISO 4762 M20.



## RETAINING PLATE WITH SLIDING PAD, STEEL / STEEL WITH SINTERLAYER, ACCORDING TO VW

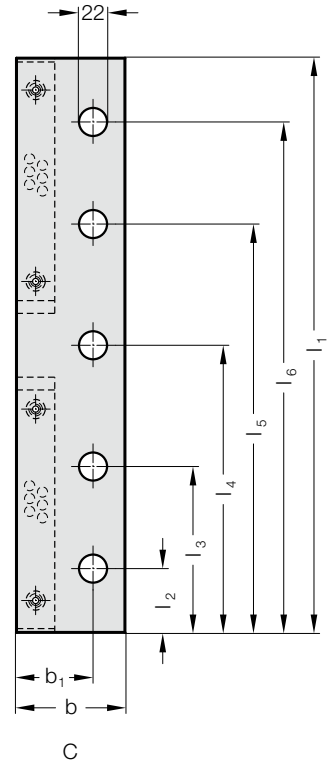
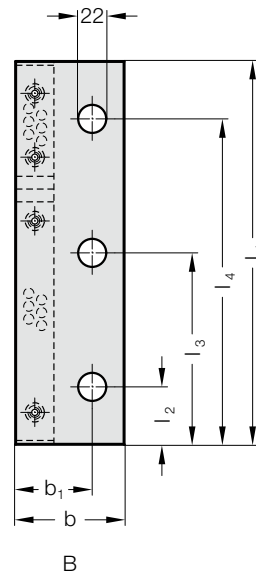
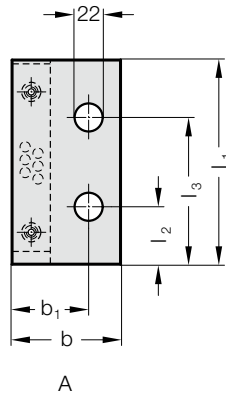
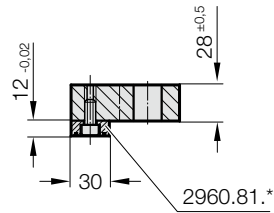
### 2961.30.55. Retaining plate with sliding pad, Steel / Steel with sinterlayer, according to VW

Order No	Shape	b	b <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	Number of screw holes
2961.30.55.085.28.160	A	85	60	160	45	115	-	-	-	2
2961.30.55.085.28.200	A	85	60	200	45	155	-	-	-	2
2961.30.55.085.28.250	B	85	60	250	45	125	225	-	-	3
2961.30.55.085.28.300	B	85	60	300	45	150	255	-	-	3
2961.30.55.085.28.350	B	85	60	350	45	175	305	-	-	3
2961.30.55.085.28.400	C	85	60	400	45	125	200	275	355	5
2961.30.55.085.28.450	C	85	60	450	50	130	225	320	400	5
2961.30.55.085.28.500	C	85	60	500	50	130	250	370	450	5
2961.30.55.125.28.160	A	125	75	160	45	115	-	-	-	2
2961.30.55.125.28.200	A	125	75	200	45	155	-	-	-	2
2961.30.55.125.28.250	B	125	75	250	45	125	225	-	-	3
2961.30.55.125.28.300	B	125	75	300	45	150	255	-	-	3
2961.30.55.125.28.350	B	125	75	350	45	175	305	-	-	3
2961.30.55.125.28.400	C	125	75	400	45	125	200	275	355	5
2961.30.55.125.28.450	C	125	75	450	50	130	225	320	400	5
2961.30.55.125.28.500	C	125	75	500	50	130	250	350	450	5

# RETAINING PLATE WITH SLIDING PAD, STEEL / BRONZE WITH SOLID LUBRICANT, ACCORDING TO VW



2961.74.55.



## Material:

Retaining plate: Steel  
Sliding pad: Bronze with solid lubricant, low-maintenance

## Execution:

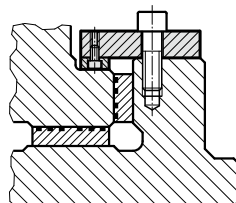
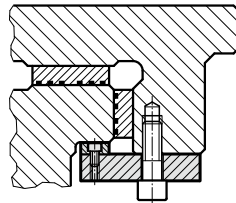
The retaining plate with sliding pad consists of:  
- Retaining plate  
- Sliding pad 2960.81.\*  
- Cylindrical screw according to DIN EN ISO 4762 M8x16 (x2, x4)

## Note:

Supplied without screws.  
Retaining plate cannot be ordered separately.  
\*Sliding pad 2960.81. can be ordered separately in case of wear.

## Fixing:

Use socket cap screws DIN EN ISO 4762 M20.



## RETAINING PLATE WITH SLIDING PAD, STEEL / BRONZE WITH SOLID LUBRICANT, ACCORDING TO VW

### 2961.74.55. Retaining plate with sliding pad, Steel / Bronze with solid lubricant, according to VW

Order No	Shape	b	b <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	Number of screw holes
2961.74.55.085.28.160	A	85	60	160	45	115	-	-	-	2
2961.74.55.085.28.200	A	85	60	200	45	155	-	-	-	2
2961.74.55.085.28.250	B	85	60	250	45	125	225	-	-	3
2961.74.55.085.28.300	B	85	60	300	45	150	255	-	-	3
2961.74.55.085.28.350	B	85	60	350	45	175	305	-	-	3
2961.74.55.085.28.400	C	85	60	400	45	125	200	275	355	5
2961.74.55.085.28.450	C	85	60	450	50	130	225	320	400	5
2961.74.55.085.28.500	C	85	60	500	50	130	250	370	450	5
2961.74.55.125.28.160	A	125	75	160	45	115	-	-	-	2
2961.74.55.125.28.200	A	125	75	200	45	155	-	-	-	2
2961.74.55.125.28.250	B	125	75	250	45	125	225	-	-	3
2961.74.55.125.28.300	B	125	75	300	45	150	255	-	-	3
2961.74.55.125.28.350	B	125	75	350	45	175	305	-	-	3
2961.74.55.125.28.400	C	125	75	400	45	125	200	275	355	5
2961.74.55.125.28.450	C	125	75	450	50	130	225	320	400	5
2961.74.55.125.28.500	C	125	75	500	50	130	250	350	450	5

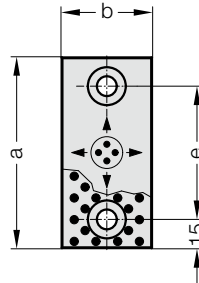
# SLIDING PAD, SMALL DIMENSION, BRONZE WITH SOLID LUBRICANT



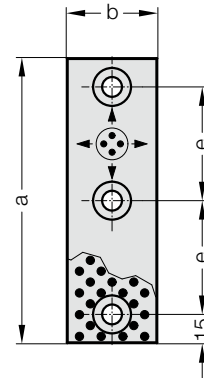
2960.72.



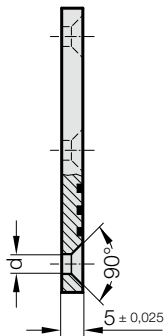
A



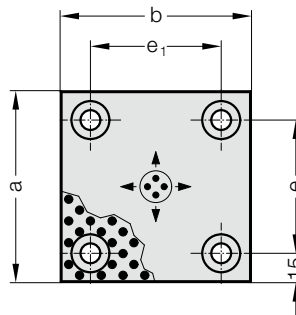
B



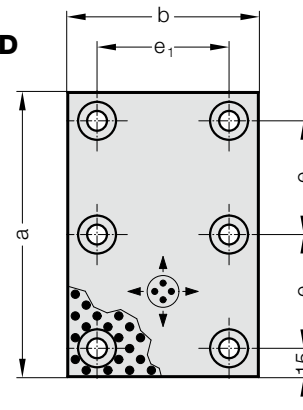
2960.72.



C



D



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use countersunk cap screws  
DIN 7991/ISO 10642.

## 2960.72. Sliding pad, small dimension, Bronze with solid lubricant

Order No	Shape	b	a	e	e <sub>1</sub>	d	Number of screw holes
2960.72.018.050	A	18	50	20	-	6.5	2
2960.72.018.075	A	18	75	45	-	6.5	2
2960.72.018.100	A	18	100	70	-	6.5	2
2960.72.018.150	B	18	150	60	-	6.5	3
2960.72.028.050	A	28	50	20	-	9	2
2960.72.028.075	A	28	75	45	-	9	2
2960.72.028.100	A	28	100	70	-	9	2
2960.72.028.150	B	28	150	60	-	9	3
2960.72.038.050	A	38	50	20	-	9	2
2960.72.038.075	A	38	75	45	-	9	2
2960.72.038.100	A	38	100	70	-	9	2
2960.72.038.150	B	38	150	60	-	9	3
2960.72.048.075	A	48	75	45	-	9	2
2960.72.048.100	A	48	100	70	-	9	2
2960.72.048.125	A	48	125	95	-	9	2
2960.72.048.150	B	48	150	60	-	9	3
2960.72.075.075	C	75	75	45	45	9	4
2960.72.075.100	C	75	100	70	45	9	4
2960.72.075.125	C	75	125	95	45	9	4
2960.72.075.150	D	75	150	60	45	9	6
2960.72.100.100	C	100	100	70	70	9	4
2960.72.100.125	C	100	125	95	70	9	4
2960.72.100.150	D	100	150	60	70	9	6





# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

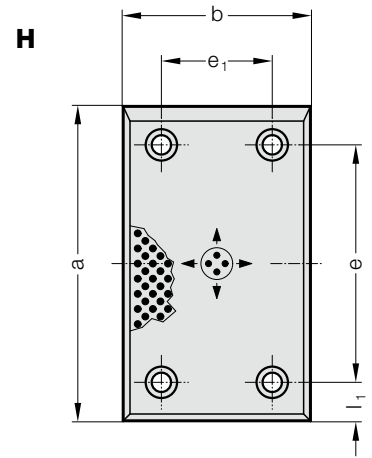
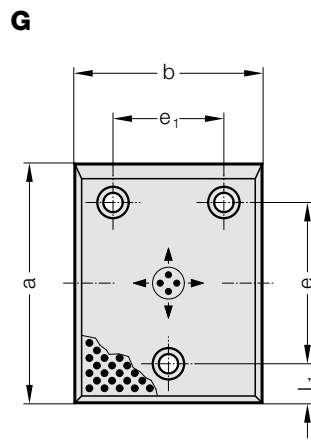
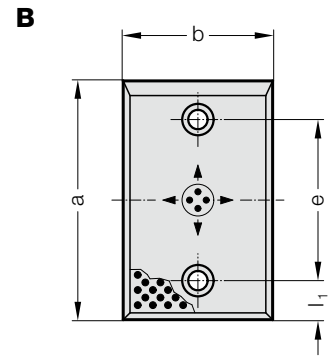
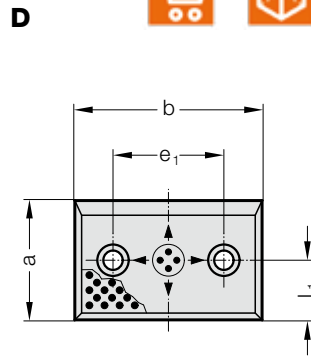


**Material:**  
Bronze with solid lubricant, oilless lubricating

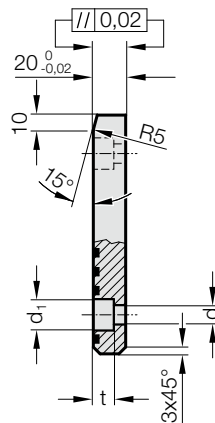
**Note:**  
Screws are not included.

**Fixing:**  
Use socket cap screws DIN EN ISO 4762.

2960.71.



2960.71.



## SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

### 2960.71. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	a	l <sub>1</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.71.050.080	B	50	80	25	30	-	9	15	9	2
2960.71.050.100	B	50	100	25	50	-	13.5	20	13	2
2960.71.050.125	B	50	125	25	75	-	13.5	20	13	2
2960.71.050.160	B	50	160	25	110	-	13.5	20	13	2
2960.71.050.200	B	50	200	25	150	-	13.5	20	13	2
2960.71.080.050	D	80	50	25	-	30	9	15	9	2
2960.71.080.080	B	80	80	25	30	-	13.5	20	13	2
2960.71.080.100	B	80	100	25	50	-	13.5	20	13	2
2960.71.080.125	B	80	125	25	75	-	13.5	20	13	2
2960.71.080.160	B	80	160	25	110	-	13.5	20	13	2
2960.71.080.200	B	80	200	25	150	-	13.5	20	13	2
2960.71.080.250	B	80	250	40	170	-	13.5	20	13	2
2960.71.080.315	B	80	315	40	235	-	13.5	20	13	2
2960.71.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.71.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.71.100.100	B	100	100	25	50	-	13.5	20	13	2
2960.71.100.125	B	100	125	25	75	-	13.5	20	13	2
2960.71.100.160	B	100	160	25	110	-	13.5	20	13	2
2960.71.100.200	B	100	200	25	150	-	13.5	20	13	2
2960.71.100.250	B	100	250	40	170	-	13.5	20	13	2
2960.71.100.315	B	100	315	40	235	-	13.5	20	13	2
2960.71.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.71.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.71.125.100	G	125	100	25	50	75	13.5	20	13	3
2960.71.125.125	G	125	125	25	75	75	13.5	20	13	3
2960.71.125.160	G	125	160	25	110	75	13.5	20	13	3
2960.71.125.200	G	125	200	25	150	75	13.5	20	13	3
2960.71.125.250	G	125	250	40	170	75	13.5	20	13	3
2960.71.125.315	G	125	315	40	235	75	13.5	20	13	3
2960.71.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.71.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.71.160.100	G	160	100	25	50	110	13.5	20	13	3
2960.71.160.125	G	160	125	25	75	110	13.5	20	13	3
2960.71.160.160	G	160	160	25	110	110	13.5	20	13	3
2960.71.160.200	G	160	200	25	150	110	13.5	20	13	3
2960.71.160.250	H	160	250	40	170	110	13.5	20	13	4
2960.71.160.315	H	160	315	40	235	110	13.5	20	13	4

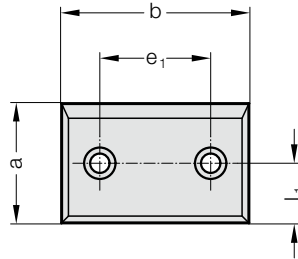
# SLIDING PAD, STEEL, VDI 3357



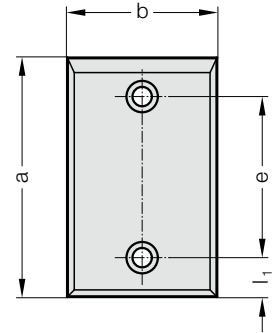
2960.87.



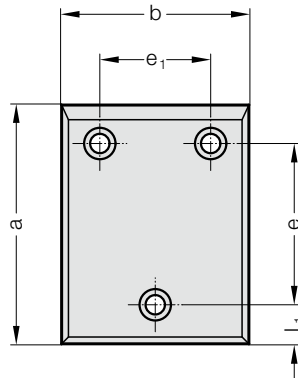
D



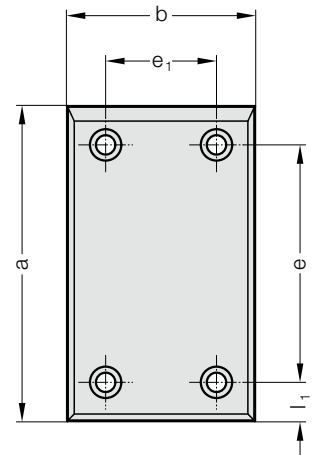
B



G



H



**Material:**

Steel, surface hardened

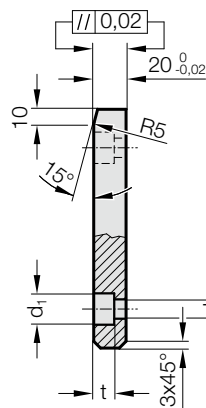
**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

2960.87.



## SLIDING PAD, STEEL, VDI 3357

### 2960.87. Sliding pad, Steel, VDI 3357

Order No	Shape	b	a	l <sub>1</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.87.050.080	B	50	80	25	30	-	9	15	9	2
2960.87.050.100	B	50	100	25	50	-	13.5	20	13	2
2960.87.050.125	B	50	125	25	75	-	13.5	20	13	2
2960.87.050.160	B	50	160	25	110	-	13.5	20	13	2
2960.87.050.200	B	50	200	25	150	-	13.5	20	13	2
2960.87.080.050	D	80	50	25	-	30	9	15	9	2
2960.87.080.080	B	80	80	25	30	-	13.5	20	13	2
2960.87.080.100	B	80	100	25	50	-	13.5	20	13	2
2960.87.080.125	B	80	125	25	75	-	13.5	20	13	2
2960.87.080.160	B	80	160	25	110	-	13.5	20	13	2
2960.87.080.200	B	80	200	25	150	-	13.5	20	13	2
2960.87.080.250	B	80	250	40	170	-	13.5	20	13	2
2960.87.080.315	B	80	315	40	235	-	13.5	20	13	2
2960.87.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.87.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.87.100.100	B	100	100	25	50	-	13.5	20	13	2
2960.87.100.125	B	100	125	25	75	-	13.5	20	13	2
2960.87.100.160	B	100	160	25	110	-	13.5	20	13	2
2960.87.100.200	B	100	200	25	150	-	13.5	20	13	2
2960.87.100.250	B	100	250	40	170	-	13.5	20	13	2
2960.87.100.315	B	100	315	40	235	-	13.5	20	13	2
2960.87.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.87.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.87.125.100	G	125	100	25	50	75	13.5	20	13	3
2960.87.125.125	G	125	125	25	75	75	13.5	20	13	3
2960.87.125.160	G	125	160	25	110	75	13.5	20	13	3
2960.87.125.200	G	125	200	25	150	75	13.5	20	13	3
2960.87.125.250	G	125	250	40	170	75	13.5	20	13	3
2960.87.125.315	G	125	315	40	235	75	13.5	20	13	3
2960.87.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.87.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.87.160.100	G	160	100	25	50	110	13.5	20	13	3
2960.87.160.125	G	160	125	25	75	110	13.5	20	13	3
2960.87.160.160	G	160	160	25	110	110	13.5	20	13	3
2960.87.160.200	G	160	200	25	150	110	13.5	20	13	3
2960.87.160.250	H	160	250	40	170	110	13.5	20	13	4
2960.87.160.315	H	160	315	40	235	110	13.5	20	13	4

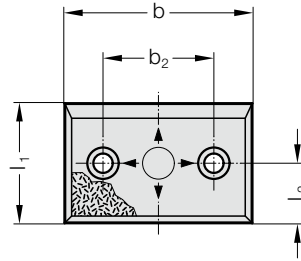
# SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357



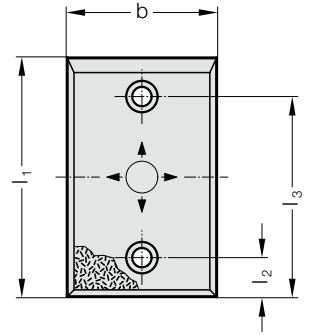
2960.30.



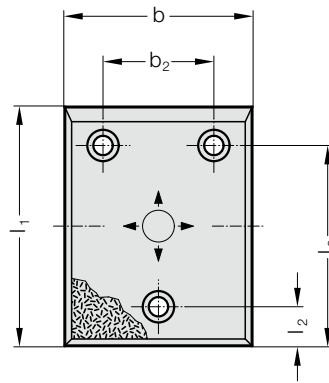
D



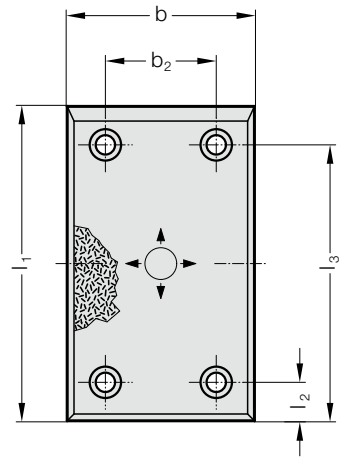
B



G



H



**Description:**

Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

**Material:**

Steel plate with sinterlayer, part of lubricant 20-25%.

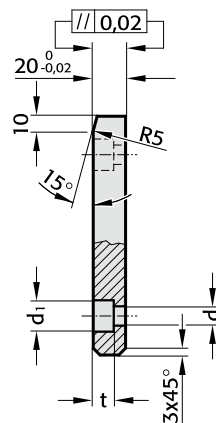
**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

2960.30.



## SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

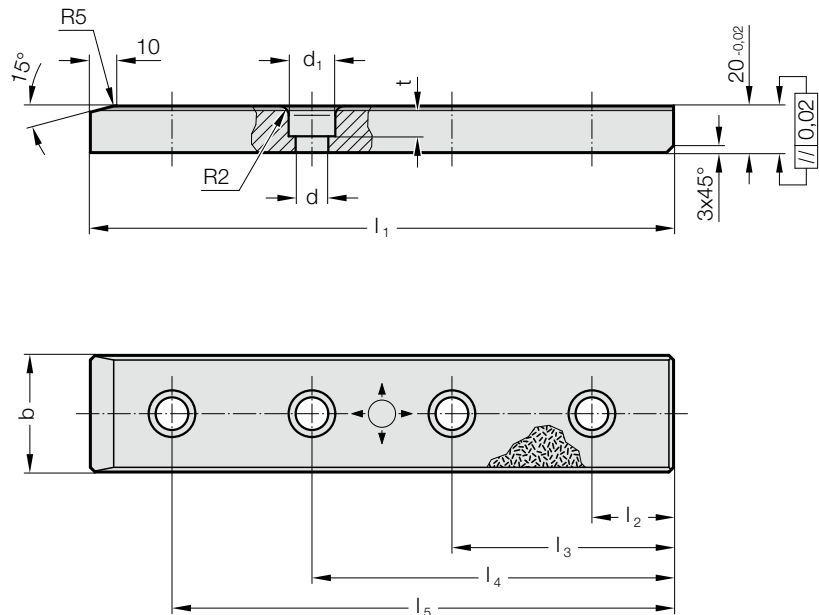
### 2960.30. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	b <sub>2</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.30.050.080	B	50	80	25	55	-	9	15	9	2
2960.30.050.100	B	50	100	25	75	-	13.5	20	13	2
2960.30.050.125	B	50	125	25	100	-	13.5	20	13	2
2960.30.050.160	B	50	160	25	125	-	13.5	20	13	2
2960.30.050.200	B	50	200	25	175	-	13.5	20	13	2
2960.30.080.050	D	80	50	25	-	30	9	15	9	2
2960.30.080.080	B	80	80	25	55	-	13.5	20	13	2
2960.30.080.100	B	80	100	25	75	-	13.5	20	13	2
2960.30.080.125	B	80	125	25	100	-	13.5	20	13	2
2960.30.080.160	B	80	160	25	135	-	13.5	20	13	2
2960.30.080.200	B	80	200	25	175	-	13.5	20	13	2
2960.30.080.250	B	80	250	40	210	-	13.5	20	13	2
2960.30.080.315	B	80	315	40	275	-	13.5	20	13	2
2960.30.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.30.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.30.100.100	B	100	100	25	75	-	13.5	20	13	2
2960.30.100.125	B	100	125	25	100	-	13.5	20	13	2
2960.30.100.160	B	100	160	25	135	-	13.5	20	13	2
2960.30.100.200	B	100	200	25	175	-	13.5	20	13	2
2960.30.100.250	B	100	250	40	210	-	13.5	20	13	2
2960.30.100.315	B	100	315	40	275	-	13.5	20	13	2
2960.30.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.30.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.30.125.100	G	125	100	25	75	75	13.5	20	13	3
2960.30.125.125	G	125	125	25	100	75	13.5	20	13	3
2960.30.125.160	G	125	160	25	135	75	13.5	20	13	3
2960.30.125.200	G	125	200	25	175	75	13.5	20	13	3
2960.30.125.250	G	125	250	40	210	75	13.5	20	13	3
2960.30.125.315	G	125	315	40	275	75	13.5	20	13	3
2960.30.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.30.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.30.160.100	G	160	100	25	75	110	13.5	20	13	3
2960.30.160.125	G	160	125	25	100	110	13.5	20	13	3
2960.30.160.160	G	160	160	25	135	110	13.5	20	13	3
2960.30.160.200	G	160	200	25	175	110	13.5	20	13	3
2960.30.160.250	H	160	250	40	210	110	13.5	20	13	4
2960.30.160.315	H	160	315	40	275	110	13.5	20	13	4

# SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357



2960.31.



## Description:

Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

## Material:

Steel plate with sinterlayer, part of lubricant 20-25%.

## Note:

Screws are not included.

## Fixing:

Use socket cap screws DIN EN ISO 4762 M12.

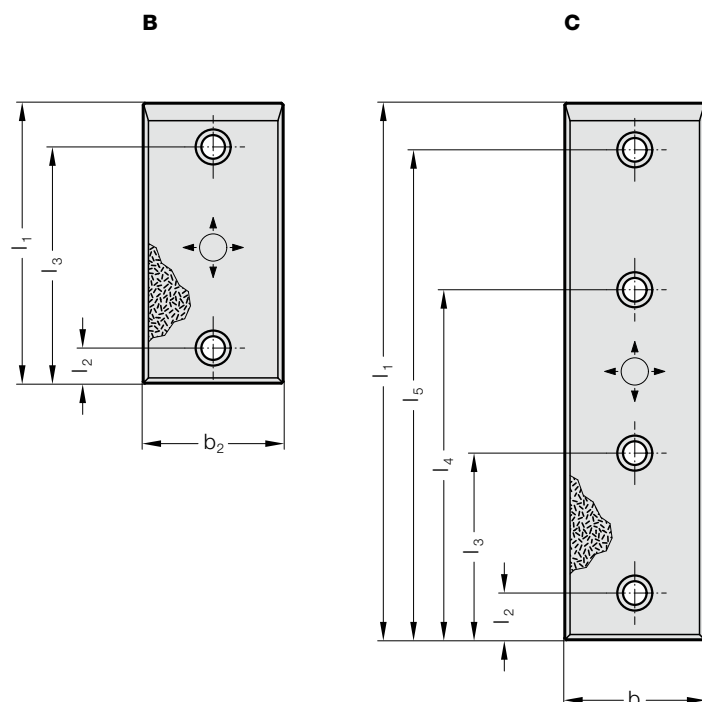
## 2960.31. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.31.050.250	50	250	25	85	165	225	13.5	20	13	4
2960.31.050.300	50	300	25	105	195	275	13.5	20	13	4
2960.31.050.350	50	350	25	125	225	325	13.5	20	13	4
2960.31.050.400	50	400	25	145	255	375	13.5	20	13	4
2960.31.050.450	50	450	25	165	285	425	13.5	20	13	4
2960.31.050.500	50	500	25	175	325	475	13.5	20	13	4
2960.31.080.250	80	250	25	85	165	225	13.5	20	13	4
2960.31.080.300	80	300	25	105	195	275	13.5	20	13	4
2960.31.080.350	80	350	25	125	225	325	13.5	20	13	4
2960.31.080.400	80	400	25	145	255	375	13.5	20	13	4
2960.31.080.450	80	450	25	165	285	425	13.5	20	13	4
2960.31.080.500	80	500	25	175	325	475	13.5	20	13	4
2960.31.100.250	100	250	25	85	165	225	13.5	20	13	4
2960.31.100.300	100	300	25	105	195	275	13.5	20	13	4
2960.31.100.350	100	350	25	125	225	325	13.5	20	13	4
2960.31.100.400	100	400	25	145	255	375	13.5	20	13	4
2960.31.100.450	100	450	25	165	285	425	13.5	20	13	4
2960.31.100.500	100	500	25	175	325	475	13.5	20	13	4
2960.31.125.250	125	250	25	85	165	225	13.5	20	13	4
2960.31.125.300	125	300	25	105	195	275	13.5	20	13	4
2960.31.125.350	125	350	25	125	225	325	13.5	20	13	4
2960.31.125.400	125	400	25	145	255	375	13.5	20	13	4
2960.31.125.450	125	450	25	165	285	425	13.5	20	13	4
2960.31.125.500	125	500	25	175	325	475	13.5	20	13	4
2960.31.160.250	160	250	25	85	165	225	13.5	20	13	4
2960.31.160.300	160	300	25	105	195	275	13.5	20	13	4
2960.31.160.350	160	350	25	125	225	325	13.5	20	13	4
2960.31.160.400	160	400	25	145	255	375	13.5	20	13	4
2960.31.160.450	160	450	25	165	285	425	13.5	20	13	4
2960.31.160.500	160	500	25	175	325	475	13.5	20	13	4

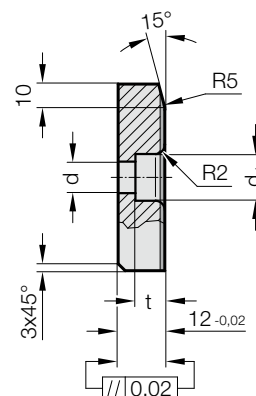


# SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.32.



2960.32.



## 2960.32. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.32.030.080	B	30	80	25	55	-	-	9	15	9	2
2960.32.030.100	B	30	100	25	75	-	-	9	15	9	2
2960.32.030.125	B	30	125	25	100	-	-	9	15	9	2
2960.32.030.160	B	30	160	25	135	-	-	9	15	9	2
2960.32.030.200	B	30	200	25	175	-	-	9	15	9	2
2960.32.040.080	B	40	80	25	55	-	-	9	15	9	2
2960.32.040.100	B	40	100	25	75	-	-	9	15	9	2
2960.32.040.125	B	40	125	25	100	-	-	9	15	9	2
2960.32.040.160	B	40	160	25	135	-	-	9	15	9	2
2960.32.040.200	B	40	200	25	175	-	-	9	15	9	2
2960.32.050.080	B	50	80	25	55	-	-	9	15	9	2
2960.32.050.100	B	50	100	25	75	-	-	9	15	9	2
2960.32.050.125	B	50	125	25	100	-	-	9	15	9	2
2960.32.050.160	B	50	160	25	135	-	-	9	15	9	2
2960.32.050.200	B	50	200	25	175	-	-	9	15	9	2
2960.32.050.250	C	50	250	25	85	165	225	9	15	9	4
2960.32.050.300	C	50	300	25	105	195	275	9	15	9	4
2960.32.050.350	C	50	350	25	125	225	325	9	15	9	4
2960.32.050.400	C	50	400	25	145	255	375	9	15	9	4
2960.32.060.080	B	60	80	25	55	-	-	9	15	9	2
2960.32.060.100	B	60	100	25	75	-	-	9	15	9	2
2960.32.060.125	B	60	125	25	100	-	-	9	15	9	2
2960.32.060.160	B	60	160	25	135	-	-	9	15	9	2
2960.32.060.200	B	60	200	25	175	-	-	9	15	9	2
2960.32.080.080	B	80	80	25	55	-	-	9	15	9	2
2960.32.080.100	B	80	100	25	75	-	-	9	15	9	2
2960.32.080.125	B	80	125	25	100	-	-	9	15	9	2
2960.32.080.160	B	80	160	25	135	-	-	9	15	9	2
2960.32.080.200	B	80	200	25	175	-	-	9	15	9	2

### Description:

Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

### Material:

Steel plate with sinterlayer, part of lubricant 20-25%.

### Note:

Screws are not included.

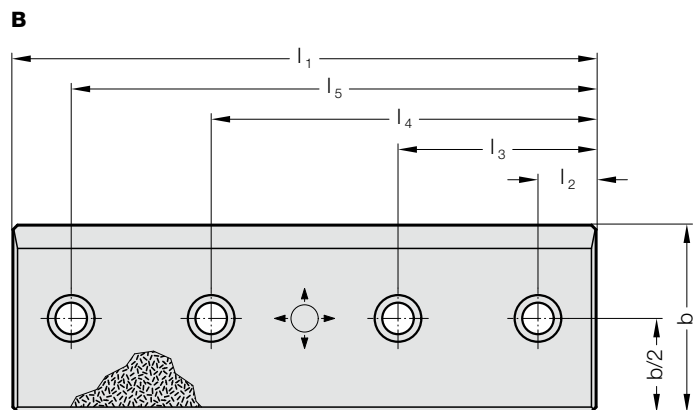
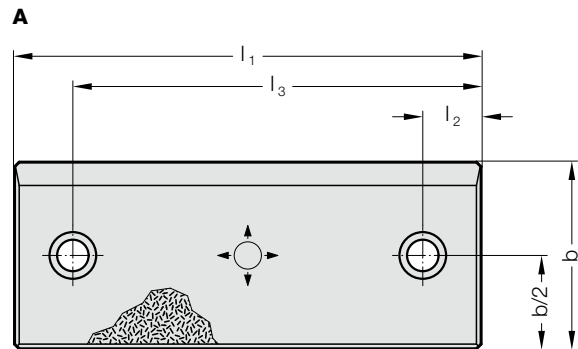
### Fixing:

Use socket cap screws DIN EN ISO 4762 M8.

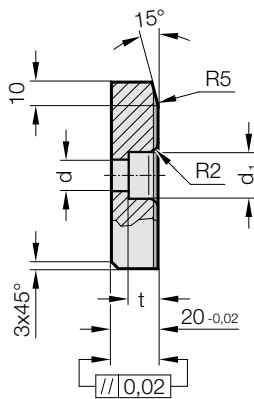
# SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357



2960.33.



2960.33.



**Description:**

Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

**Material:**

Steel plate with sinterlayer, part of lubricant 20-25%.

**Note:**

Screws are not included.

**Fixing:**

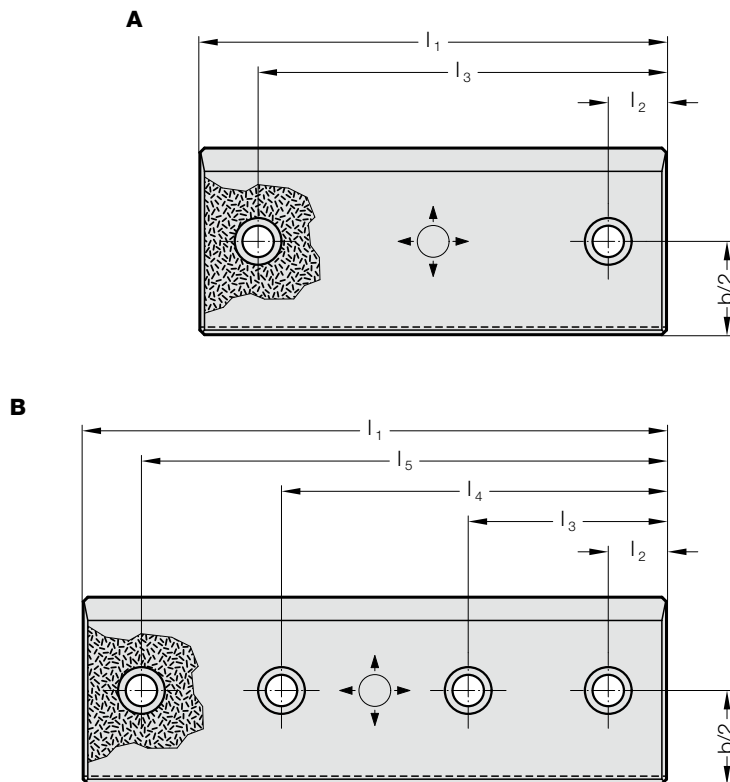
Use socket cap screws DIN EN ISO 4762 M12.

2960.33. Sliding pad, Steel with sinterlayer, VDI 3357

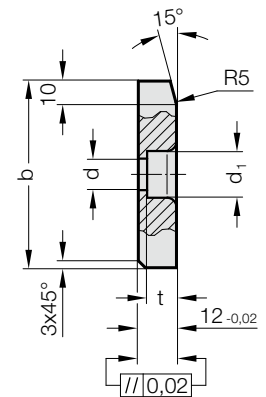
Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.33.080.200	A	80	200	25	175	-	-	13.5	20	13	2
2960.33.080.250	B	80	250	25	85	165	225	13.5	20	13	4
2960.33.080.300	B	80	300	25	105	195	275	13.5	20	13	4
2960.33.080.350	B	80	350	25	125	225	325	13.5	20	13	4
2960.33.080.400	B	80	400	25	145	255	375	13.5	20	13	4
2960.33.080.450	B	80	450	25	165	285	425	13.5	20	13	4
2960.33.080.500	B	80	500	25	175	325	475	13.5	20	13	4

# SLIDING PAD, STEEL WITH SINTERLAYER, ~VDI 3387

2960.34.



2960.34.



## 2960.34. Sliding pad, Steel with sinterlayer, ~VDI 3387

Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.34.080.200	A	80	200	25	175	-	-	9	15	9	2
2960.34.080.250	B	80	250	25	85	165	225	9	15	9	4
2960.34.080.300	B	80	300	25	105	195	275	9	15	9	4
2960.34.080.350	B	80	350	25	125	225	325	9	15	9	4
2960.34.080.400	B	80	400	25	145	255	375	9	15	9	4
2960.34.080.450	B	80	450	25	165	285	425	9	15	9	4
2960.34.080.500	B	80	500	25	175	325	475	9	15	9	4

### Description:

Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

### Material:

Steel plate with sinterlayer, part of lubricant 20-25%.

### Note:

Screws are not included.

### Fixing:

Use socket cap screws DIN EN ISO 4762 M8.

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT



**Material:**

Bronze with solid lubricant, oilless lubricating

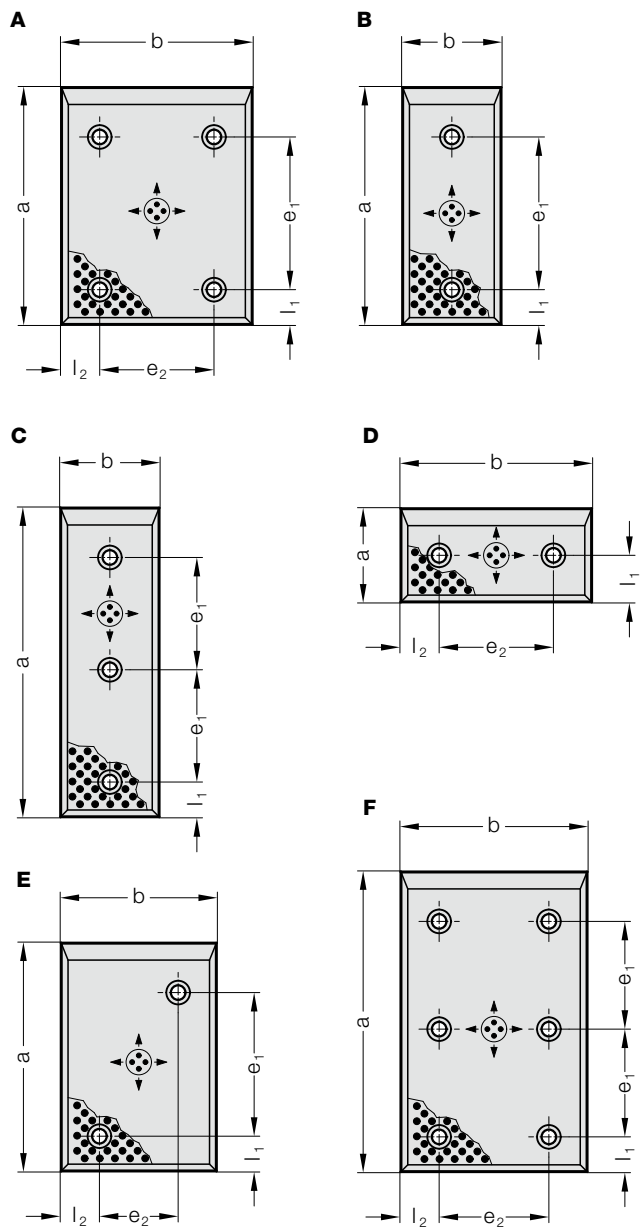
**Note:**

Screws are not included.

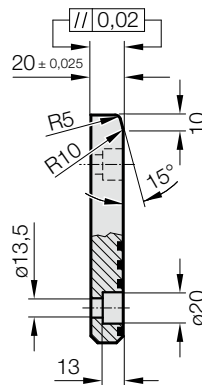
**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.

2960.70.



2960.70.



## SLIDING PAD, BRONZE WITH SOLID LUBRICANT

### 2960.70. Sliding pad, Bronze with solid lubricant

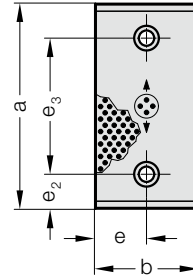
Order No	Shape	b	a	l <sub>1</sub>	e <sub>1</sub>	l <sub>2</sub>	e <sub>2</sub>
2960.70.050.080	B	50	80	20	35	25	-
2960.70.050.100	B	50	100	20	55	25	-
2960.70.050.125	B	50	125	20	80	25	-
2960.70.050.160	B	50	160	20	115	25	-
2960.70.050.200	B	50	200	20	155	25	-
2960.70.050.250	C	50	250	20	100	25	-
2960.70.080.050	D	80	50	25	-	20	40
2960.70.080.080	E	80	80	20	35	20	40
2960.70.080.100	E	80	100	20	55	20	40
2960.70.080.125	E	80	125	20	80	20	40
2960.70.080.160	A	80	160	20	115	20	40
2960.70.080.200	A	80	200	20	155	20	40
2960.70.080.250	F	80	250	20	100	20	40
2960.70.080.315	F	80	315	20	132	20	40
2960.70.100.050	D	100	50	25	-	20	60
2960.70.100.080	E	100	80	20	35	20	60
2960.70.100.100	E	100	100	20	55	20	60
2960.70.100.125	A	100	125	20	80	20	60
2960.70.100.160	A	100	160	20	115	20	60
2960.70.100.200	A	100	200	20	155	20	60
2960.70.100.250	F	100	250	20	100	20	60
2960.70.100.315	F	100	315	20	132	20	60
2960.70.125.050	D	125	50	25	-	20	85
2960.70.125.080	E	125	80	20	35	20	85
2960.70.125.100	A	125	100	20	55	20	85
2960.70.125.125	A	125	125	20	80	20	85
2960.70.125.160	A	125	160	20	115	20	85
2960.70.125.200	A	125	200	20	155	20	85
2960.70.125.250	F	125	250	20	100	20	85
2960.70.125.315	F	125	315	20	132	20	85
2960.70.160.050	D	160	50	25	-	20	120
2960.70.160.080	A	160	80	20	35	20	120
2960.70.160.100	A	160	100	20	55	20	120
2960.70.160.125	A	160	125	20	80	20	120
2960.70.160.160	A	160	160	20	115	20	120
2960.70.160.200	A	160	200	20	155	20	120
2960.70.160.250	F	160	250	20	100	20	120
2960.70.160.315	F	160	315	20	132	20	120

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT

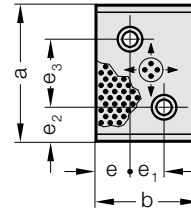


2960.85.

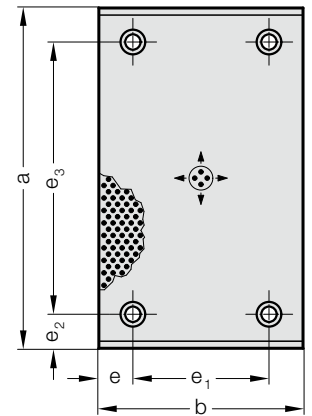
A



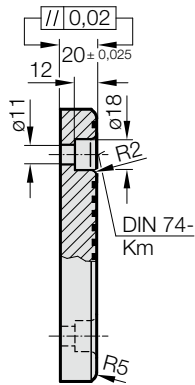
B



C



2960.85.



2960.85. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.85.028.075	A	28	75	14	-	15	45	2
2960.85.028.100	A	28	100	14	-	25	50	2
2960.85.028.125	A	28	125	14	-	25	75	2
2960.85.028.150	A	28	150	14	-	25	100	2
2960.85.038.075	A	38	75	19	-	15	45	2
2960.85.038.100	A	38	100	19	-	25	50	2
2960.85.038.125	A	38	125	19	-	25	75	2
2960.85.038.150	A	38	150	19	-	25	100	2
2960.85.038.200	A	38	200	19	-	25	150	2
2960.85.048.075	A	48	75	24	-	15	45	2
2960.85.048.100	A	48	100	24	-	25	50	2
2960.85.048.125	A	48	125	24	-	25	75	2
2960.85.048.150	A	48	150	24	-	25	100	2
2960.85.048.200	A	48	200	24	-	25	150	2
2960.85.058.075	A	58	75	29	-	15	45	2
2960.85.058.100	A	58	100	29	-	25	50	2
2960.85.058.150	A	58	150	29	-	25	100	2
2960.85.075.075.1	A	75	75	37.5	-	15	45	2
2960.85.075.075	B	75	75	25	25	25	25	2
2960.85.075.100.1	A	75	100	37.5	-	25	50	2
2960.85.075.100	B	75	100	25	25	25	50	2
2960.85.075.125	A	75	125	37.5	-	25	75	2
2960.85.075.150	A	75	150	37.5	-	25	100	2
2960.85.075.200	A	75	200	37.5	-	25	150	2
2960.85.100.100	C	100	100	25	50	25	50	4
2960.85.100.125	C	100	125	25	50	25	75	4
2960.85.100.150	C	100	150	25	50	25	100	4
2960.85.100.200	C	100	200	25	50	25	150	4
2960.85.100.250	C	100	250	25	50	25	200	4
2960.85.100.300	C	100	300	25	50	25	250	4
2960.85.125.125	C	125	125	37.5	50	25	75	4
2960.85.125.150	C	125	150	37.5	50	25	100	4
2960.85.125.200	C	125	200	37.5	50	25	150	4
2960.85.125.250	C	125	250	37.5	50	25	200	4
2960.85.125.300	C	125	300	37.5	50	25	250	4
2960.85.125.350	C	125	350	37.5	50	25	300	4
2960.85.150.150	C	150	150	25	100	25	100	4
2960.85.150.200	C	150	200	25	100	25	150	4
2960.85.150.250	C	150	250	25	100	25	200	4
2960.85.150.300	C	150	300	25	100	25	250	4
2960.85.200.200	C	200	200	25	150	25	150	4
2960.85.200.250	C	200	250	25	150	25	200	4
2960.85.200.300	C	200	300	25	150	25	250	4

**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

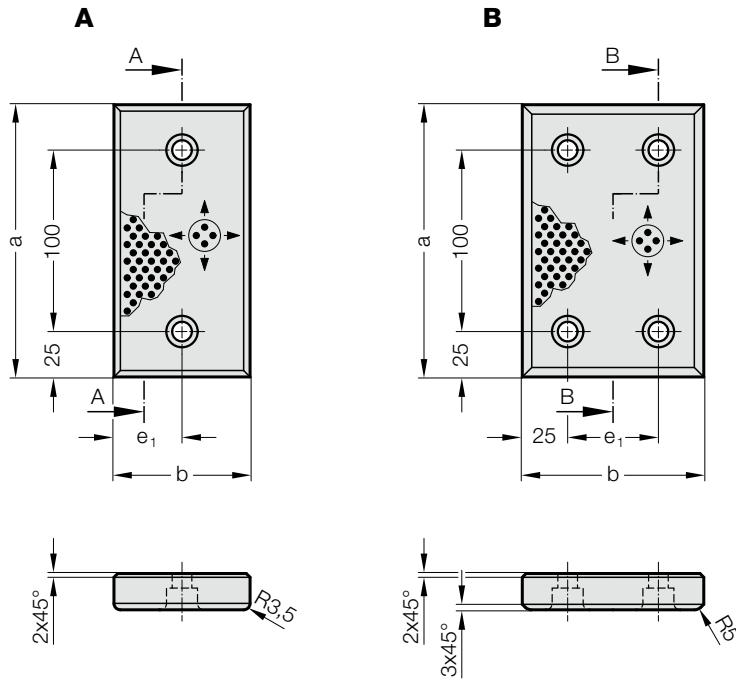
Screws are not included.

**Fixing:**

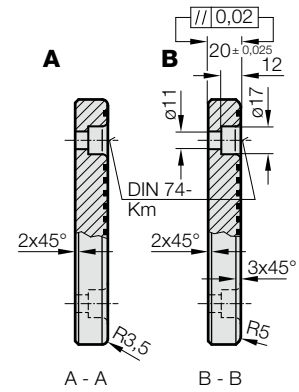
Use socket cap screws DIN EN ISO 4762 M10.

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT

2960.86.



2960.86.



## 2960.86. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	a	e <sub>1</sub>	Number of screw holes
2960.86.038.150	A	38	150	19	2
2960.86.075.150	A	75	150	37.5	2
2960.86.100.150	B	100	150	50	4

### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws are not included.

### Fixing:

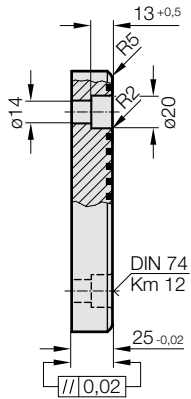
Use socket cap screws DIN EN ISO 4762 M10.

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT

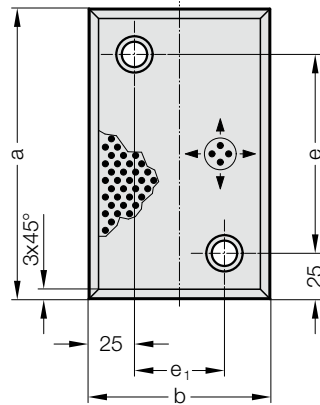


2960.76.

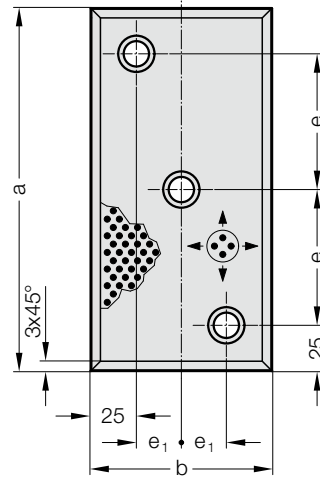
2960.76.



A



B



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M12.

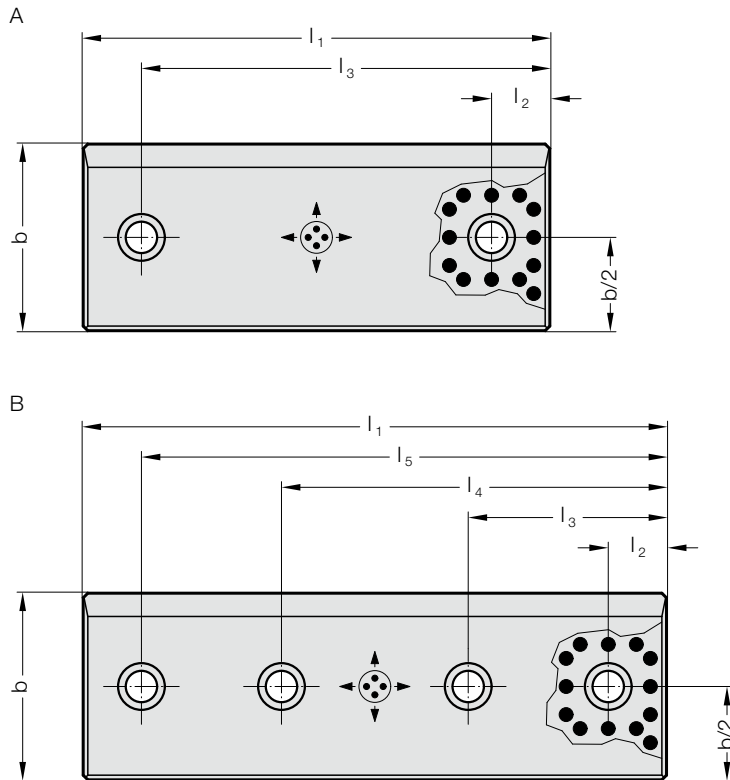
**2960.76. Sliding pad, Bronze with solid lubricant**

Order No	Shape	b	a	e	e <sub>1</sub>	Number of screw holes
2960.76.080.100	A	80	100	50	30	2
2960.76.080.125	A	80	125	75	30	2
2960.76.080.160	A	80	160	110	30	2
2960.76.080.200	B	80	200	75	15	3
2960.76.100.125	A	100	125	75	50	2
2960.76.100.160	A	100	160	110	50	2
2960.76.100.200	B	100	200	75	25	3
2960.76.125.125	A	125	125	75	75	2

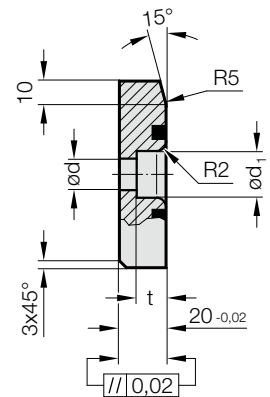


# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.77.



2960.77.



## 2960.77. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.77.080.200	A	80	200	25	175	0	0	13.5	20	13	2
2960.77.080.250	B	80	250	25	85	165	225	13.5	20	13	4
2960.77.080.300	B	80	300	25	105	195	275	13.5	20	13	4
2960.77.080.350	B	80	350	25	125	225	325	13.5	20	13	4
2960.77.080.400	B	80	400	25	145	255	375	13.5	20	13	4
2960.77.080.450	B	80	450	25	165	285	425	13.5	20	13	4
2960.77.080.500	B	80	500	25	175	325	475	13.5	20	13	4

### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws not included.

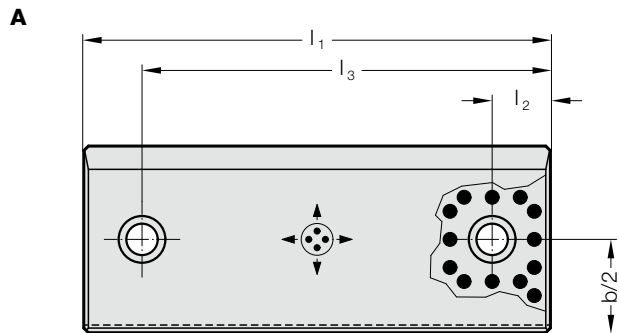
### Fixing:

Use socket cap screws DIN EN ISO 4762 M12.

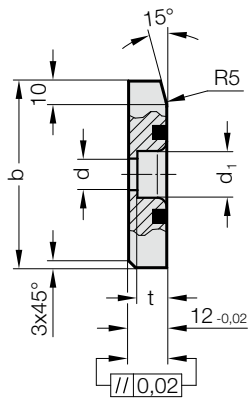
# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, ~VDI 3387



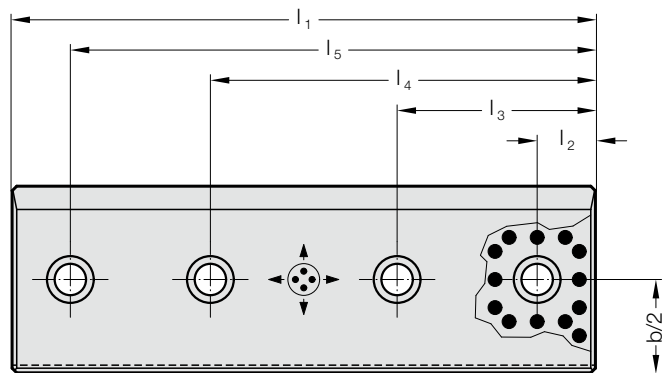
2960.84.



2960.84.



B



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

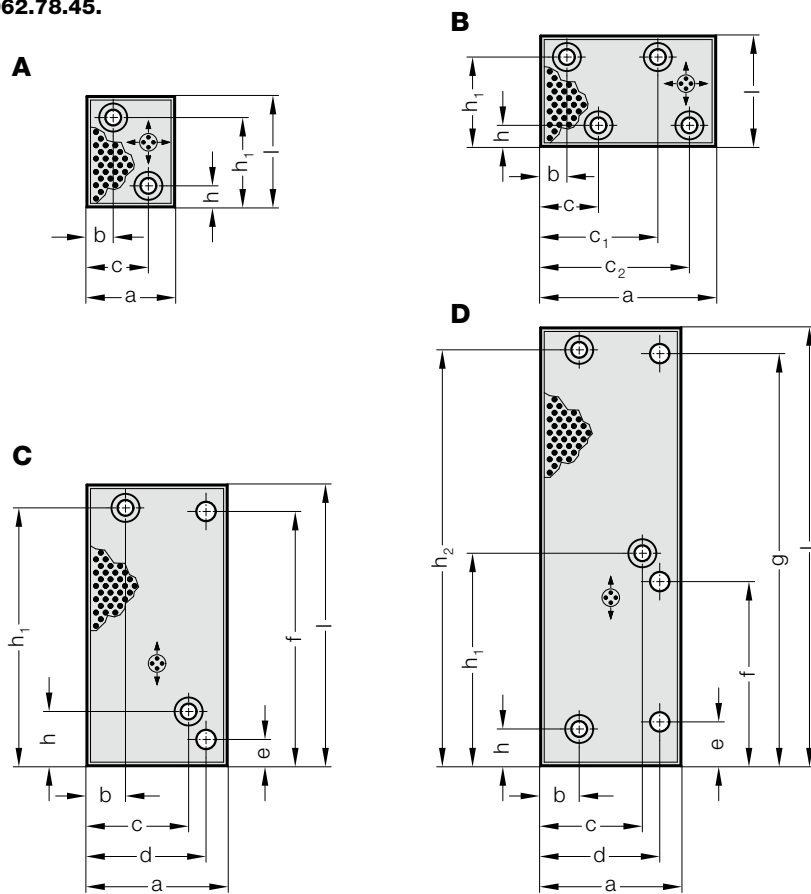
Use socket cap screws DIN EN ISO 4762 M8.

**2960.84. Sliding pad, Bronze with solid lubricant, ~VDI 3387**

Order No	Shape	b	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.84.080.200	A	80	200	25	175	-	-	9	15	9	2
2960.84.080.250	B	80	250	25	85	165	225	9	15	9	4
2960.84.080.300	B	80	300	25	105	195	275	9	15	9	4
2960.84.080.350	B	80	350	25	125	225	325	9	15	9	4
2960.84.080.400	B	80	400	25	145	255	375	9	15	9	4
2960.84.080.450	B	80	450	25	165	285	425	9	15	9	4
2960.84.080.500	B	80	500	25	175	325	475	9	15	9	4

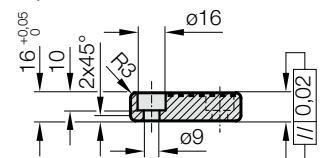
# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, CNOMO

2962.78.45.

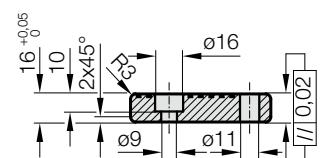


2962.78.45.

A, B



C, D



## 2962.78.45. Sliding pad, Bronze with solid lubricant, CNOMO

Order No	Shape	a	l	b	c	c <sub>1</sub>	c <sub>2</sub>	d	e	f	g	h	h <sub>1</sub>	h <sub>2</sub>	Number of screw counterbores	Number of screw holes
2962.78.45.050.16.063	A	50	63	15	35	-	-	-	-	-	-	12	51	-	2	-
2962.78.45.050.16.160	C	50	160	19	31	-	-	-	-	-	-	21	147	-	2	-
2962.78.45.050.16.250	D	50	250	19	31	-	-	-	-	-	-	21	121	237	3	-
2962.78.45.080.16.160	C	80	160	22	58	-	-	68	15	145	-	31	147	-	2	2
2962.78.45.080.16.250	D	80	250	22	58	-	-	68	25	105	235	21	121	237	3	3
2962.78.45.100.16.063	B	100	63	15	33	67	85	-	-	-	-	12	51	-	4	-

### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws are not included.

### Fixing:

Use socket cap screws

DIN EN ISO 4762 M8.

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT



**Material:**

Bronze with solid lubricant, oilless lubricating

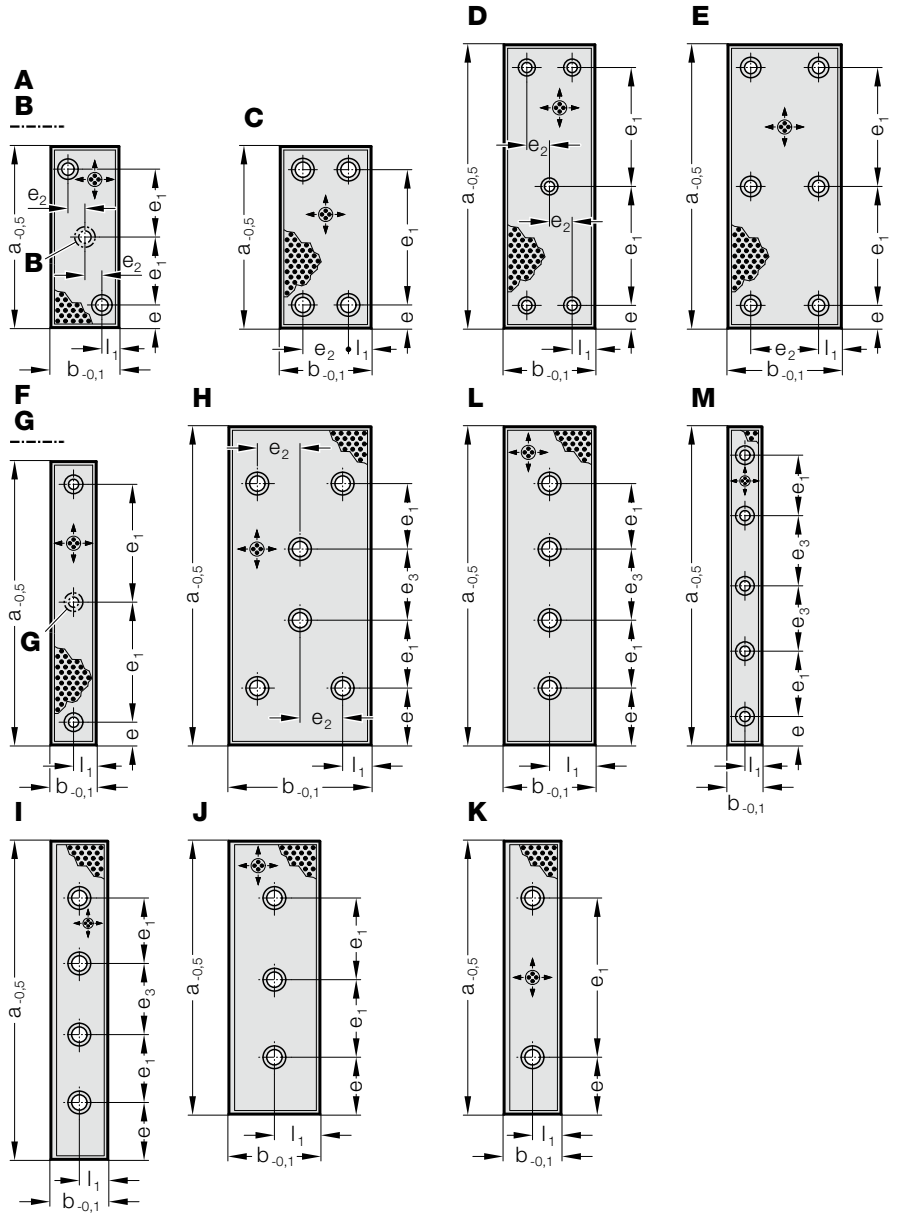
**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762, or countersunk cap screws DIN 7991/ISO 10642.

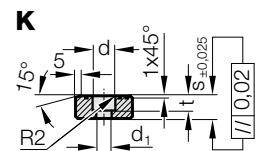
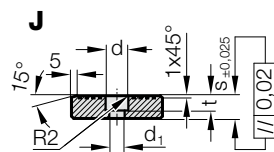
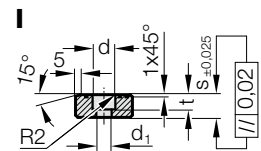
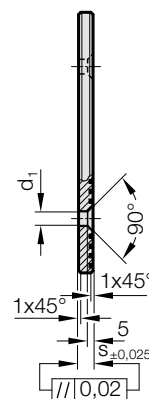
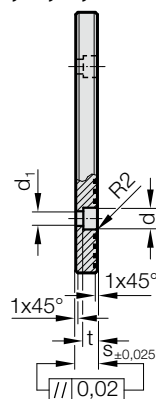
2962.78.



2962.78.

A, B, C, D,  
E, H, L, M

F + G



# SLIDING PAD, BRONZE WITH SOLID LUBRICANT

## 2962.78. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	s	a	l <sub>1</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes	d	d <sub>1</sub>	t
2962.78.030.12.100	A	30	12	100	15	20	60	-	-	2	15	9	9
2962.78.030.12.160	B	30	12	160	15	20	60	-	-	3	15	9	9
2962.78.030.12.240	B	30	12	240	15	25	95	-	-	3	15	9	9
2962.78.030.12.250	B	30	12	250	15	20	105	-	-	3	15	9	9
2962.78.030.12.300	L	30	12	300	15	25	85	-	80	4	15	9	9
2962.78.030.12.350	L	30	12	350	15	25	100	-	100	4	15	9	9
2962.78.030.12.400	L	30	12	400	15	25	115	-	120	4	15	9	9
2962.78.030.12.450	M	30	12	450	15	25	100	-	100	5	15	9	9
2962.78.030.12.500	M	30	12	500	15	25	110	-	115	5	15	9	9
2962.78.040.08.100	F	40	8	100	20	20	60	-	-	2	-	9	5
2962.78.040.08.160	G	40	8	160	20	20	60	-	-	3	-	9	5
2962.78.040.08.250	G	40	8	250	20	20	105	-	-	3	-	9	5
2962.78.040.12.100	A	40	12	100	20	20	60	-	-	2	15	9	9
2962.78.040.12.160	B	40	12	160	20	20	60	-	-	3	15	9	9
2962.78.040.12.250	B	40	12	250	20	20	105	-	-	3	15	9	9
2962.78.040.16.100	A	40	16	100	20	20	60	-	-	2	18	11	11
2962.78.040.16.160	B	40	16	160	20	20	60	-	-	3	18	11	11
2962.78.040.16.250	B	40	16	250	20	20	105	-	-	3	18	11	11
2962.78.050.20.100	A	50	20	100	15	20	60	20	-	2	20	13.5	13
2962.78.050.20.160	B	50	20	160	15	20	60	10	-	3	20	13.5	13
2962.78.050.20.240	A	50	20	240	25	50	140	-	-	2	20	13.5	13
2962.78.050.20.240.1	K	50	20	240	25	50	140	-	-	2	20	13.5	13
2962.78.050.20.250	B	50	20	250	15	20	105	10	-	3	20	13.5	13
2962.78.050.20.300	B	50	20	300	25	50	100	-	-	3	20	13.5	13
2962.78.050.20.300.1	J	50	20	300	25	50	100	-	-	3	20	13.5	13
2962.78.050.20.350	B	50	20	350	25	50	125	-	-	3	20	13.5	13
2962.78.050.20.350.1	J	50	20	350	25	50	125	-	-	3	20	13.5	13
2962.78.050.20.400.1	J	50	20	400	25	50	150	-	-	3	20	13.5	13
2962.78.050.20.450.1	I	50	20	450	25	50	115	-	120	4	20	13.5	13
2962.78.050.20.500.1	I	50	20	500	25	50	135	-	130	4	20	13.5	13
2962.78.060.16.100	A	60	16	100	15	20	60	30	-	2	18	11	11
2962.78.060.16.160	B	60	16	160	15	20	60	15	-	3	18	11	11
2962.78.060.16.250	B	60	16	250	15	20	105	15	-	3	18	11	11
2962.78.080.12.100	A	80	12	100	20	20	60	40	-	2	15	9	9
2962.78.080.12.160	C	80	12	160	20	20	120	40	-	4	15	9	9
2962.78.080.12.250	D	80	12	250	20	20	105	20	-	5	15	9	9
2962.78.080.20.100	A	80	20	100	20	20	60	40	-	2	20	13.5	13
2962.78.080.20.160	C	80	20	160	20	20	120	40	-	4	20	13.5	13
2962.78.080.20.250	D	80	20	250	20	20	105	20	-	5	20	13.5	13
2962.78.080.20.300	B	80	20	300	40	50	100	-	-	3	20	13.5	13
2962.78.080.20.300.1	J	80	20	300	40	50	100	-	-	3	20	13.5	13
2962.78.080.20.350	B	80	20	350	40	50	125	-	-	3	20	13.5	13
2962.78.080.20.350.1	J	80	20	350	40	50	125	-	-	3	20	13.5	13
2962.78.080.20.400	B	80	20	400	40	50	150	-	-	3	20	13.5	13
2962.78.080.20.400.1	J	80	20	400	40	50	150	-	-	3	20	13.5	13
2962.78.080.20.450	L	80	20	450	40	50	115	-	120	4	20	13.5	13
2962.78.080.20.450.1	I	80	20	450	40	50	115	-	120	4	20	13.5	13
2962.78.080.20.500	L	80	20	500	40	50	135	-	130	4	20	13.5	13
2962.78.080.20.500.1	I	80	20	500	40	50	135	-	130	4	20	13.5	13
2962.78.100.16.100	A	100	16	100	20	20	60	60	-	2	18	11	11
2962.78.100.16.160	C	100	16	160	20	20	120	60	-	4	18	11	11
2962.78.100.16.250	E	100	16	250	20	20	105	60	-	6	18	11	11
2962.78.125.20.100	C	125	20	100	20	20	60	85	-	4	20	13.5	13
2962.78.125.20.160	C	125	20	160	20	20	120	85	-	4	20	13.5	13
2962.78.125.20.250	E	125	20	250	20	20	105	85	-	6	20	13.5	13
2962.78.125.20.400	D	125	20	400	25	50	150	37.5	-	5	20	13.5	13
2962.78.125.20.450	H	125	20	450	25	50	115	37.5	120	6	20	13.5	13
2962.78.125.20.500	H	125	20	500	25	50	135	37.5	130	6	20	13.5	13

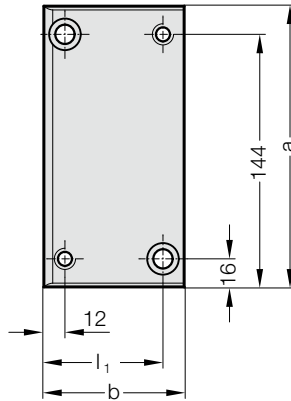
# SLIDING PAD, STEEL, CNOMO



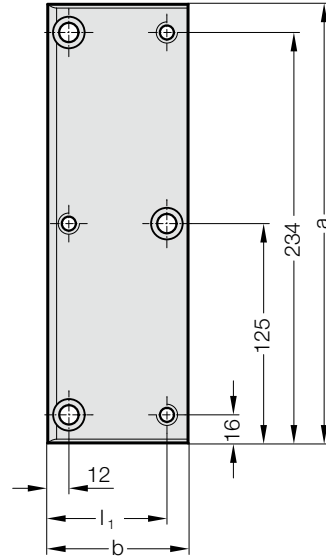
2962.84.45.



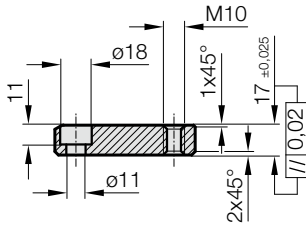
**A**



**B**



2962.84.45.



**Material:**

Steel, surface hardened

**Note:**

Screws are not included.

**Fixing:**

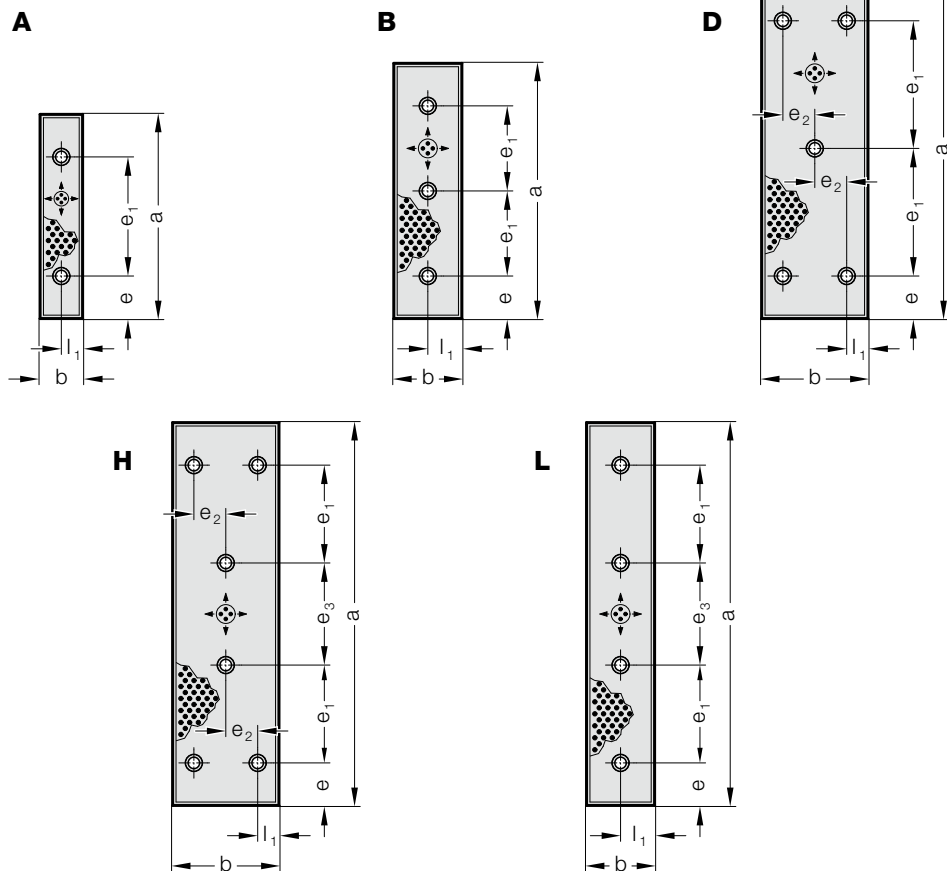
Use socket cap screws  
DIN EN ISO 4762 M10.

**2962.84.45. Sliding pad, Steel, CNOMO**

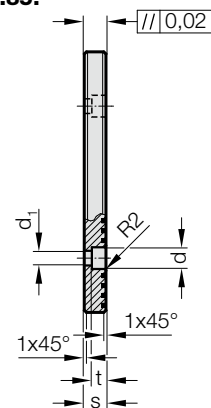
Order No	Shape	b	a	$l_1$	Number of screw counterbores	Number of threads
2962.84.45.050.17.160	A	50	160	38	2	2
2962.84.45.050.17.250	B	50	250	38	3	3
2962.84.45.080.17.160	A	80	160	68	2	2
2962.84.45.080.17.250	B	80	250	68	3	3

# SLIDING PAD, STEEL WITH SOLID LUBRICANT

2962.85.



2962.85.



## 2962.85. Sliding pad, Steel with solid lubricant

Order No	Shape	b	s	a	l <sub>1</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes	d <sub>1</sub>	d	t
2962.85.050.20.240	A	50	20	240	25	50	140	-	-	2	13.5	20	13
2962.85.050.20.300	B	50	20	300	25	50	100	-	-	3	13.5	20	13
2962.85.050.20.350	B	50	20	350	25	50	125	-	-	3	13.5	20	13
2962.85.080.20.300	B	80	20	300	40	50	100	-	-	3	13.5	20	13
2962.85.080.20.350	B	80	20	350	40	50	125	-	-	3	13.5	20	13
2962.85.080.20.400	B	80	20	400	40	50	150	-	-	3	13.5	20	13
2962.85.080.20.450	L	80	20	450	40	50	115	-	120	4	13.5	20	13
2962.85.080.20.500	L	80	20	500	40	50	135	-	130	4	13.5	20	13
2962.85.125.20.400	D	125	20	400	25	50	150	37.5	-	5	13.5	20	13
2962.85.125.20.450	H	125	20	450	25	50	115	37.5	120	6	13.5	20	13
2962.85.125.20.500	H	125	20	500	25	50	135	37.5	130	6	13.5	20	13

### Material:

Steel, surface hardened. Sliding faces with embedded solid lubricant.

### Note:

Screws are not included.

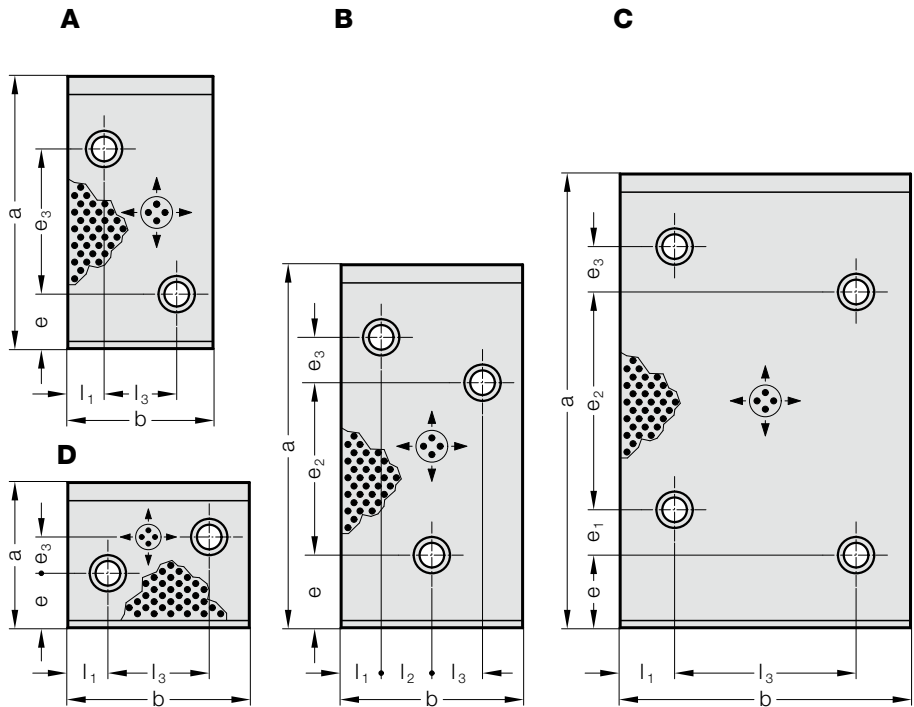
### Fixing:

Use socket cap screws  
DIN EN ISO 4762 M12.

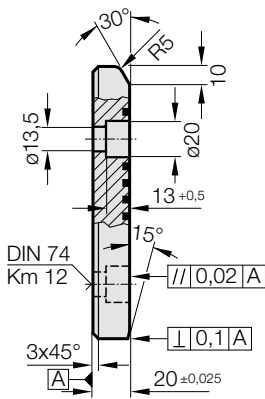
# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, NAAMS



2960.79.



2960.79.



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use socket cap screws  
DIN EN ISO 4762 M12.

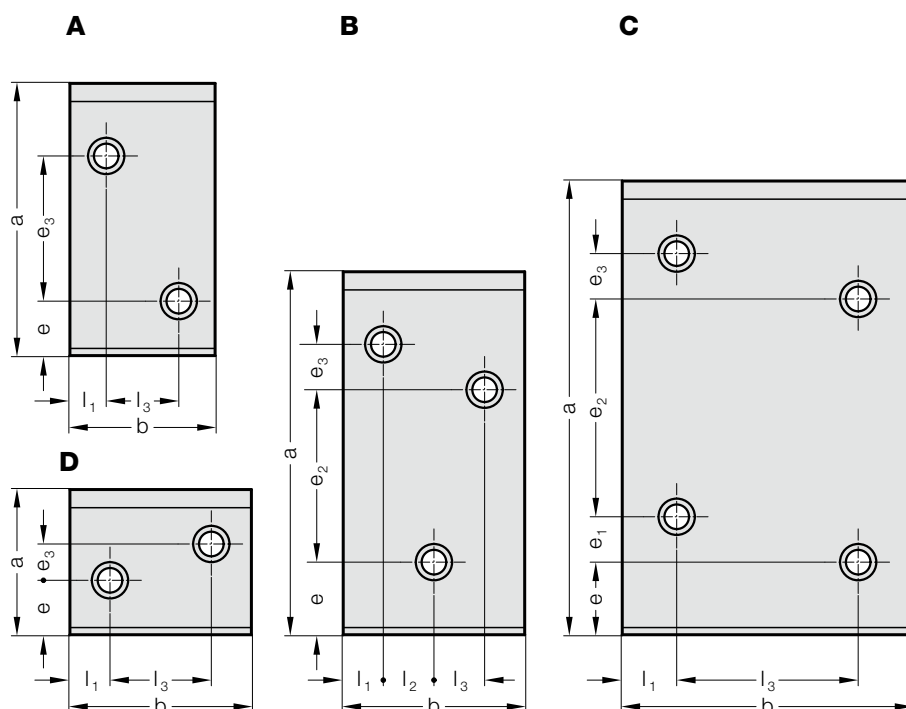
## 2960.79. Sliding pad, Bronze with solid lubricant, NAAMS

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.79.050.100	A	50	100	25	-	-	30	-	-	30	2
2960.79.050.150	A	50	150	25	-	-	30	-	-	80	2
2960.79.050.200	A	50	200	25	-	-	40	-	-	120	2
2960.79.080.100	A	80	100	20	-	40	30	-	-	30	2
2960.79.080.150	A	80	150	20	-	40	30	-	-	80	2
2960.79.080.200	A	80	200	20	-	40	40	-	-	120	2
2960.79.080.250	A	80	250	20	-	40	40	-	-	170	2
2960.79.080.315	B	80	315	20	20	20	40	-	210	25	3
2960.79.100.050	D	100	50	22	-	56	14	-	-	13	2
2960.79.100.080	D	100	80	22	-	56	30	-	-	20	2
2960.79.100.100	A	100	100	22	-	56	30	-	-	30	2
2960.79.100.150	A	100	150	22	-	56	30	-	-	80	2
2960.79.100.200	B	100	200	22	28	28	40	-	95	25	3
2960.79.100.250	B	100	250	22	28	28	40	-	145	25	3
2960.79.100.315	B	100	315	22	28	28	40	-	210	25	3
2960.79.125.080	D	125	80	25	-	75	30	-	-	20	2
2960.79.125.100	A	125	100	25	-	75	30	-	-	30	2
2960.79.125.150	A	125	150	25	-	75	30	-	-	80	2
2960.79.125.200	B	125	200	25	37	38	40	-	95	25	3
2960.79.125.250	B	125	250	25	37	38	40	-	145	25	3
2960.79.125.315	C	125	315	25	-	75	40	25	185	25	4
2960.79.160.100	A	160	100	30	-	100	30	-	-	30	2
2960.79.160.150	A	160	150	30	-	100	30	-	-	80	2
2960.79.160.200	B	160	200	30	50	50	40	-	95	25	3
2960.79.160.250	C	160	250	30	-	100	40	25	120	25	4
2960.79.160.315	C	160	315	30	-	100	40	25	185	25	4

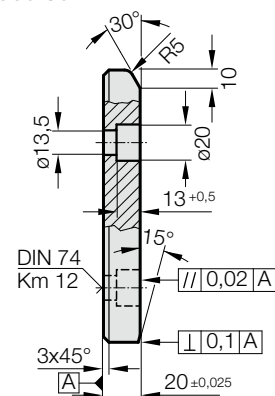


# SLIDING PAD, STEEL, NAAMS

2960.80.



2960.80.



## 2960.80. Sliding pad, Steel, NAAMS

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2960.80.050.100	A	50	100	25	-	-	30	-	-	30	2
2960.80.050.150	A	50	150	25	-	-	30	-	-	80	2
2960.80.050.200	A	50	200	25	-	-	40	-	-	120	2
2960.80.080.100	A	80	100	20	-	40	30	-	-	30	2
2960.80.080.150	A	80	150	20	-	40	30	-	-	80	2
2960.80.080.200	A	80	200	20	-	40	40	-	-	120	2
2960.80.080.250	A	80	250	20	-	40	40	-	-	170	2
2960.80.080.315	B	80	315	20	20	20	40	-	210	25	3
2960.80.100.050	D	100	50	22	-	56	14	-	-	13	2
2960.80.100.080	D	100	80	22	-	56	30	-	-	20	2
2960.80.100.100	A	100	100	22	-	56	30	-	-	30	2
2960.80.100.150	A	100	150	22	-	56	30	-	-	80	2
2960.80.100.200	B	100	200	22	28	28	40	-	95	25	3
2960.80.100.250	B	100	250	22	28	28	40	-	145	25	3
2960.80.100.315	B	100	315	22	28	28	40	-	210	25	3
2960.80.125.080	D	125	80	25	-	75	30	-	-	20	2
2960.80.125.100	A	125	100	25	-	75	30	-	-	30	2
2960.80.125.150	A	125	150	25	-	75	30	-	-	80	2
2960.80.125.200	B	125	200	25	37	38	40	-	95	25	3
2960.80.125.250	B	125	250	25	37	38	40	-	145	25	3
2960.80.125.315	C	125	315	25	-	75	40	25	185	25	4
2960.80.160.100	A	160	100	30	-	100	30	-	-	30	2
2960.80.160.150	A	160	150	30	-	100	30	-	-	80	2
2960.80.160.200	B	160	200	30	50	50	40	-	95	25	3
2960.80.160.250	C	160	250	30	-	100	40	25	120	25	4
2960.80.160.315	C	160	315	30	-	100	40	25	185	25	4

### Material:

Steel, surface hardened

### Note:

Screws are not included.

### Fixing:

Use socket cap screws  
DIN EN ISO 4762 M12.

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, AFNOR/ISO 9183-2



**Material:**

Bronze with solid lubricant, oilless lubricating

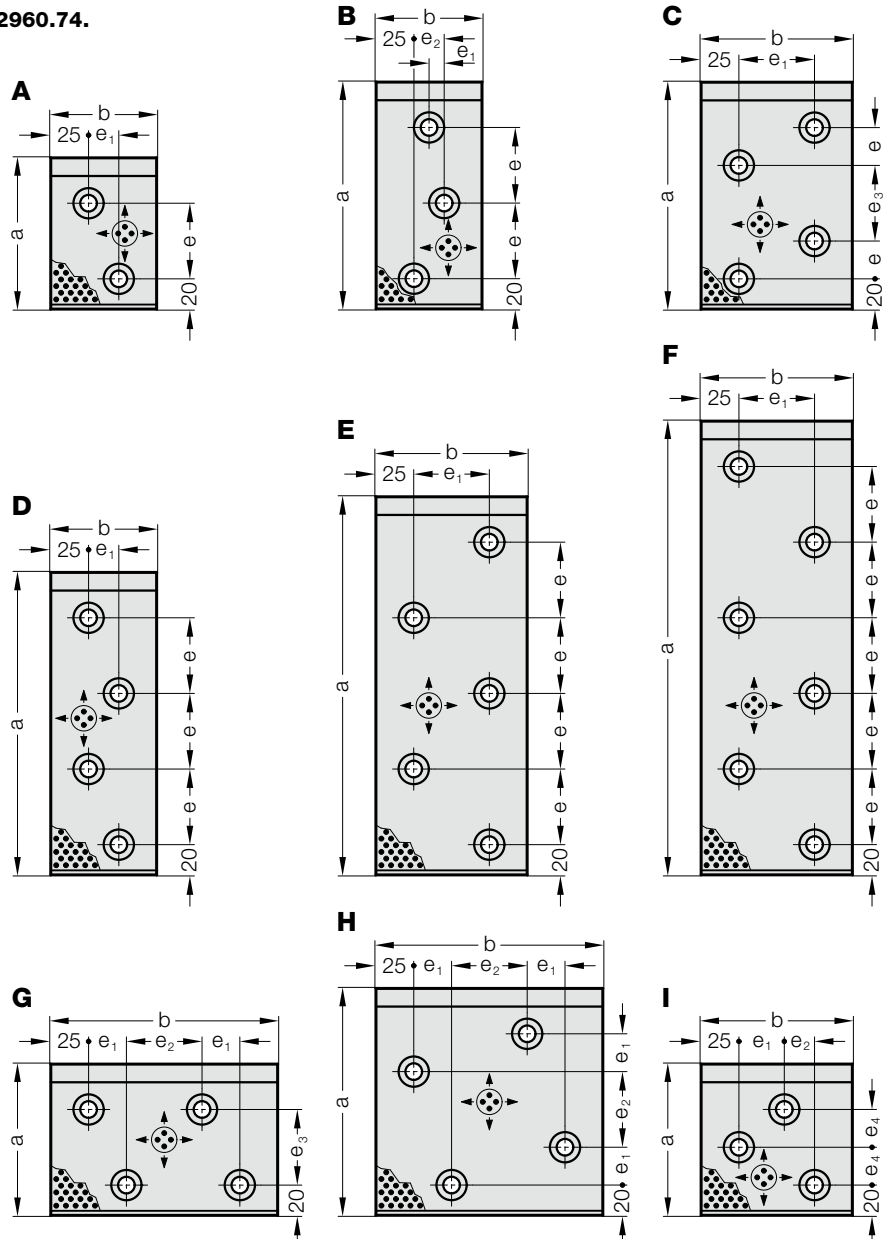
**Note:**

Screws are not included.

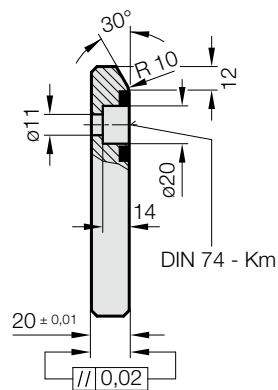
**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.

2960.74.



2960.74.



## SLIDING PAD, BRONZE WITH SOLID LUBRICANT, AFNOR/ISO 9183-2

### 2960.74. Sliding pad, Bronze with solid lubricant, AFNOR/ISO 9183-2

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	Number of screw holes
2960.74.070.100	A	70	100	50	20	-	-	-	2
2960.74.070.150	B	70	150	50	10	20	-	-	3
2960.74.070.200	D	70	200	50	20	-	-	-	4
2960.74.100.100	I	100	100		30	20	-	25	3
2960.74.100.150	C	100	150	25	50	-	50	-	4
2960.74.100.200	D	100	200	50	50	-	-	-	4
2960.74.100.250	E	100	250	50	50	-	-	-	5
2960.74.100.300	F	100	300	50	50	-	-	-	6
2960.74.150.100	G	150	100		25	50	50	-	4
2960.74.150.150	H	150	150		25	50	-	-	4
2960.74.150.200	D	150	200	50	100	-	-	-	4
2960.74.150.250	E	150	250	50	100	-	-	-	5
2960.74.150.300	F	150	300	50	100	-	-	-	6
2960.74.200.100	G	200	100		50	50	50	-	4

# SLIDING PAD, STEEL WITH OIL GROOVE, CNOMO



**Material:**

Steel, surface hardened

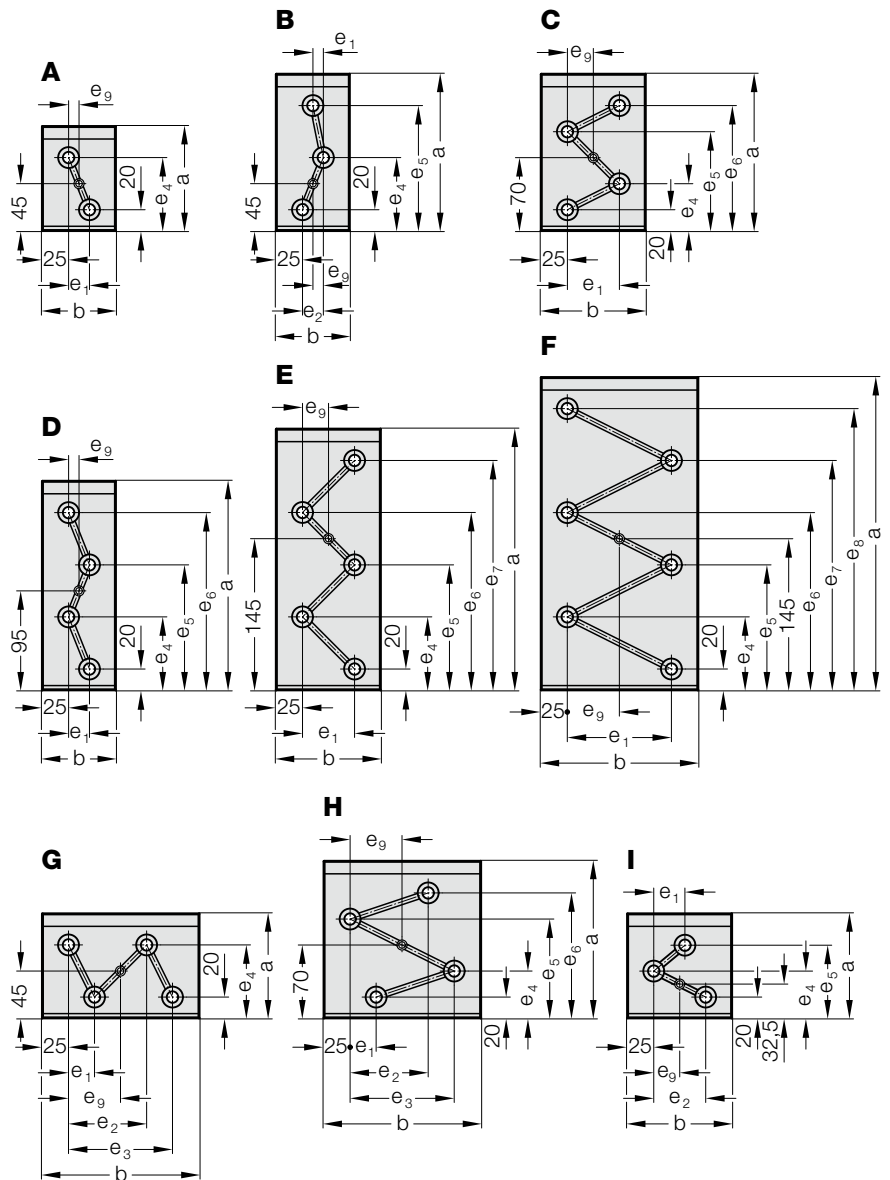
**Note:**

Screws are not included.

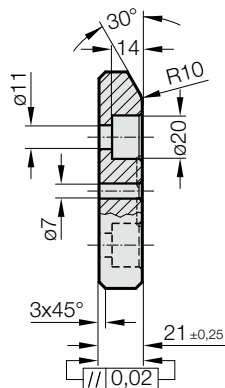
**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.

2960.44.45.



2960.44.45.



## SLIDING PAD, STEEL WITH OIL GROOVE, CNOMO

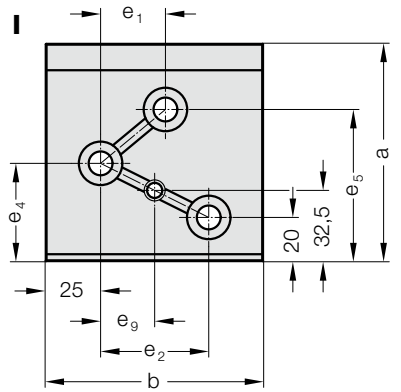
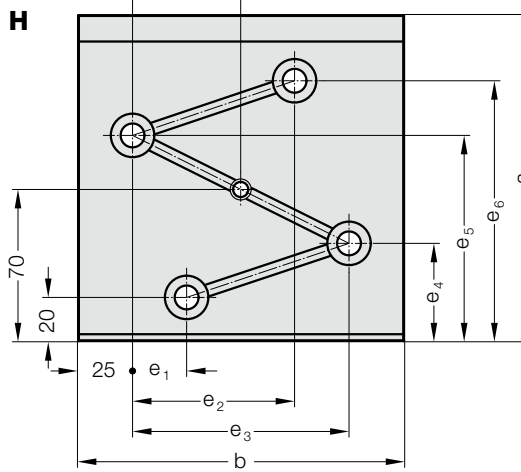
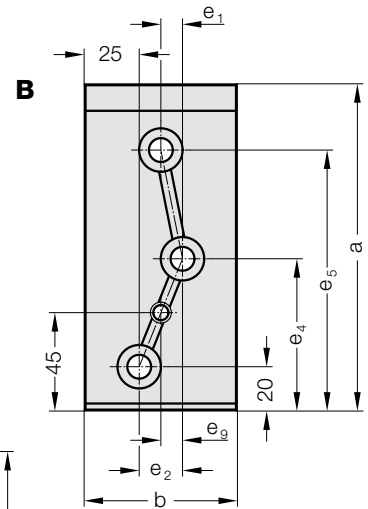
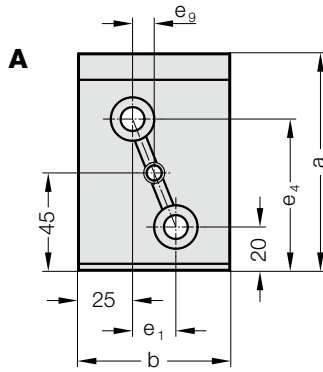
### 2960.44.45. Sliding pad, Steel with oil groove, CNOMO

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	e <sub>5</sub>	e <sub>6</sub>	e <sub>7</sub>	e <sub>8</sub>	e <sub>9</sub>	Number of screw holes
2960.44.45.070.100	A	70	100	20	-	-	-	70	-	-	-	-	10	2
2960.44.45.070.150	B	70	150	10	20	-	-	70	120	-	-	-	10	3
2960.44.45.070.200	D	70	200	20	-	-	-	70	120	170	-	-	10	4
2960.44.45.100.100	I	100	100	30	50	-	-	45	70	-	-	-	25	3
2960.44.45.100.150	C	100	150	50	-	-	-	45	95	120	-	-	25	4
2960.44.45.100.200	D	100	200	50	-	-	-	70	120	170	-	-	25	4
2960.44.45.100.250	E	100	250	50	-	-	-	70	120	170	220	-	25	5
2960.44.45.100.300	F	100	300	50	-	-	-	70	120	170	220	270	25	6
2960.44.45.150.100	G	150	100	25	75	100	-	70	-	-	-	-	50	4
2960.44.45.150.150	H	150	150	25	75	100	45	95	120	-	-	-	50	4
2960.44.45.150.200	D	150	200	100	-	-	-	70	120	170	-	-	50	4
2960.44.45.150.250	E	150	250	100	-	-	-	70	120	170	220	-	50	5
2960.44.45.150.300	F	150	300	100	-	-	-	70	120	170	220	270	50	6
2960.44.45.200.100	G	200	100	50	100	150	-	70	-	-	-	-	75	4

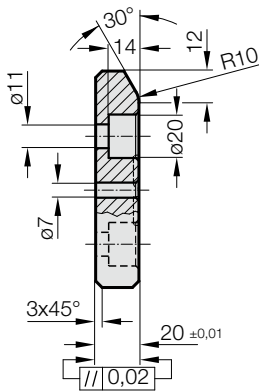
# SLIDING PAD, BRONZE WITH OIL GROOVE, CNOMO



2960.54.45.



2960.54.45.



**Material:**

Bronze

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M10.

**2960.54.45. Sliding pad, Bronze with oil groove, CNOMO**

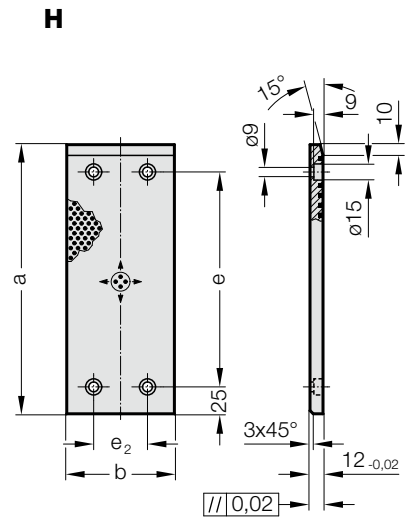
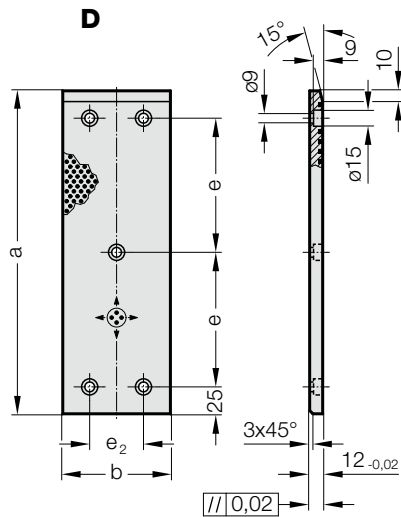
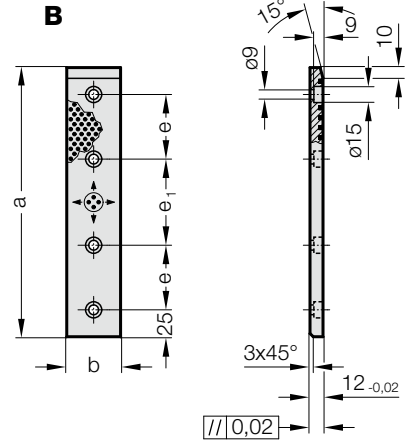
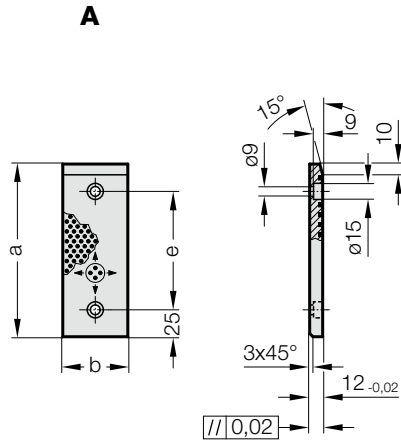
Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	e <sub>5</sub>	e <sub>6</sub>	e <sub>7</sub>	e <sub>8</sub>	e <sub>9</sub>	Number of screw holes
2960.54.45.070.100	A	70	100	20	-	-	-	70	-	-	-	-	10	2
2960.54.45.070.150	B	70	150	10	20	-	-	70	120	-	-	-	10	3
2960.54.45.150.150	H	150	150	25	75	100	45	95	120	-	-	-	50	4
2960.54.45.100.100	I	100	100	30	50	-	-	45	70	-	-	-	25	3



# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357



2960.81.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M8.



## SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

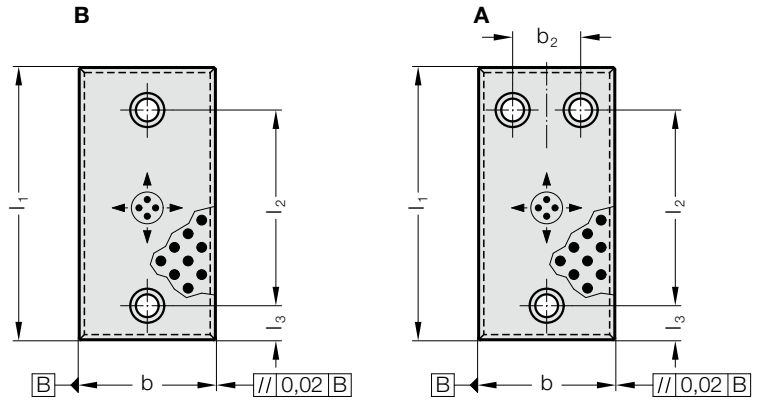
### 2960.81. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2960.81.030.080	A	30	80	30	-	-	2
2960.81.030.100	A	30	100	50	-	-	2
2960.81.030.125	A	30	125	75	-	-	2
2960.81.030.160	A	30	160	110	-	-	2
2960.81.030.200	A	30	200	150	-	-	2
2960.81.030.225	A	30	225	175	-	-	2
2960.81.030.250	B	30	250	60	80	-	4
2960.81.030.260	B	30	260	60	90	-	4
2960.81.030.280	B	30	280	60	110	-	4
2960.81.030.300	B	30	300	80	90	-	4
2960.81.030.320	B	30	320	80	110	-	4
2960.81.040.080	A	40	80	30	-	-	2
2960.81.040.100	A	40	100	50	-	-	2
2960.81.040.125	A	40	125	75	-	-	2
2960.81.040.160	A	40	160	110	-	-	2
2960.81.040.200	A	40	200	150	-	-	2
2960.81.050.080	A	50	80	30	-	-	2
2960.81.050.100	A	50	100	50	-	-	2
2960.81.050.125	A	50	125	75	-	-	2
2960.81.050.160	A	50	160	110	-	-	2
2960.81.050.200	A	50	200	150	-	-	2
2960.81.050.225	A	50	225	175	-	-	2
2960.81.050.250	B	50	250	60	80	-	4
2960.81.050.300	B	50	300	80	90	-	4
2960.81.050.350	B	50	350	100	100	-	4
2960.81.050.400	B	50	400	120	110	-	4
2960.81.060.080	A	60	80	30	-	-	2
2960.81.060.100	A	60	100	50	-	-	2
2960.81.060.125	A	60	125	75	-	-	2
2960.81.060.160	A	60	160	110	-	-	2
2960.81.060.200	A	60	200	150	-	-	2
2960.81.060.225	A	60	225	175	-	-	2
2960.81.060.240	B	60	240	60	70	-	4
2960.81.060.250	B	60	250	60	80	-	4
2960.81.060.260	B	60	260	60	90	-	4
2960.81.060.280	B	60	280	60	110	-	4
2960.81.080.080	A	80	80	30	-	-	2
2960.81.080.100	A	80	100	50	-	-	2
2960.81.080.125	A	80	125	75	-	-	2
2960.81.080.160	A	80	160	110	-	-	2
2960.81.080.200	A	80	200	150	-	-	2
2960.81.080.225	A	80	225	175	-	-	2
2960.81.080.240	B	80	240	60	70	-	4
2960.81.080.250	B	80	250	60	80	-	4
2960.81.080.260	B	80	260	60	90	-	4
2960.81.080.280	B	80	280	60	110	-	4
2960.81.100.125	H	100	125	75	-	50	4
2960.81.100.160	H	100	160	110	-	50	4
2960.81.100.200	H	100	200	150	-	50	4
2960.81.100.240	B	100	240	60	70	-	4
2960.81.100.250	H	100	250	200	-	50	4
2960.81.100.260	B	100	260	60	90	-	4
2960.81.100.280	B	100	280	60	110	-	4
2960.81.100.300	D	100	300	125	-	50	5

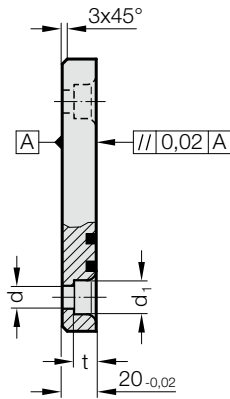
# SLIDING PAD, BRONZE WITH PERMANENT LUBRICANT, IN ACCORDANCE WITH WDX NORM



2960.82.25.



2960.82.25.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.

2960.82.25. Sliding pad, Bronze with permanent lubricant, in accordance with WDX norm

Order No	Shape	b	b <sub>2</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	d	d <sub>1</sub>	t	Number of screw holes
2960.82.25.050.100	B	50	-	100	50	25	13.5	20	13	2
2960.82.25.050.125	B	50	-	125	75	25	13.5	20	13	2
2960.82.25.050.160	B	50	-	160	110	25	13.5	20	13	2
2960.82.25.050.200	B	50	-	200	150	25	13.5	20	13	2
2960.82.25.080.100	B	80	-	100	50	25	13.5	20	13	2
2960.82.25.080.125	B	80	-	125	75	25	13.5	20	13	2
2960.82.25.080.160	B	80	-	160	110	25	13.5	20	13	2
2960.82.25.080.200	B	80	-	200	150	25	13.5	20	13	2
2960.82.25.080.250	B	80	-	250	170	40	13.5	20	13	2
2960.82.25.080.315	B	80	-	315	235	40	13.5	20	13	2
2960.82.25.125.100	A	125	75	100	50	25	13.5	20	13	3
2960.82.25.125.125	A	125	75	125	75	25	13.5	20	13	3
2960.82.25.125.160	A	125	75	160	110	25	13.5	20	13	3
2960.82.25.125.200	A	125	75	200	150	25	13.5	20	13	3
2960.82.25.125.250	A	125	75	250	170	40	13.5	20	13	3
2960.82.25.125.315	A	125	75	315	235	40	13.5	20	13	3
2960.82.25.160.100	A	160	110	100	50	25	13.5	20	13	3
2960.82.25.160.125	A	160	110	125	75	25	13.5	20	13	3
2960.82.25.160.160	A	160	110	160	110	25	13.5	20	13	3
2960.82.25.160.200	A	160	110	200	150	25	13.5	20	13	3
2960.82.25.160.250	A	160	110	250	170	40	13.5	20	13	3
2960.82.25.160.315	A	160	110	315	235	40	13.5	20	13	3



# SLIDING PAD, STEEL, VDI 3357



2960.88.

**Material:**

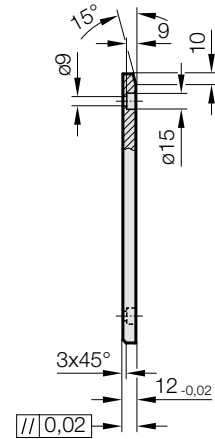
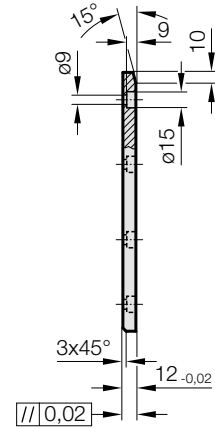
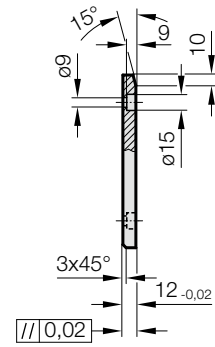
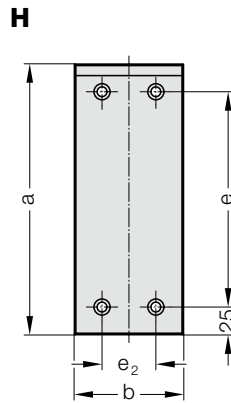
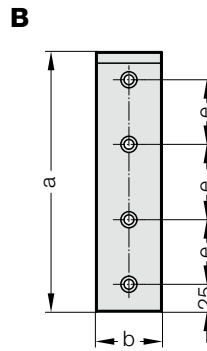
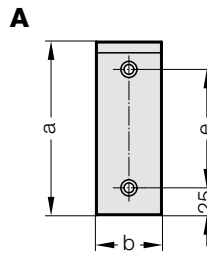
Steel, surface hardened

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M8.



## SLIDING PAD, STEEL, VDI 3357

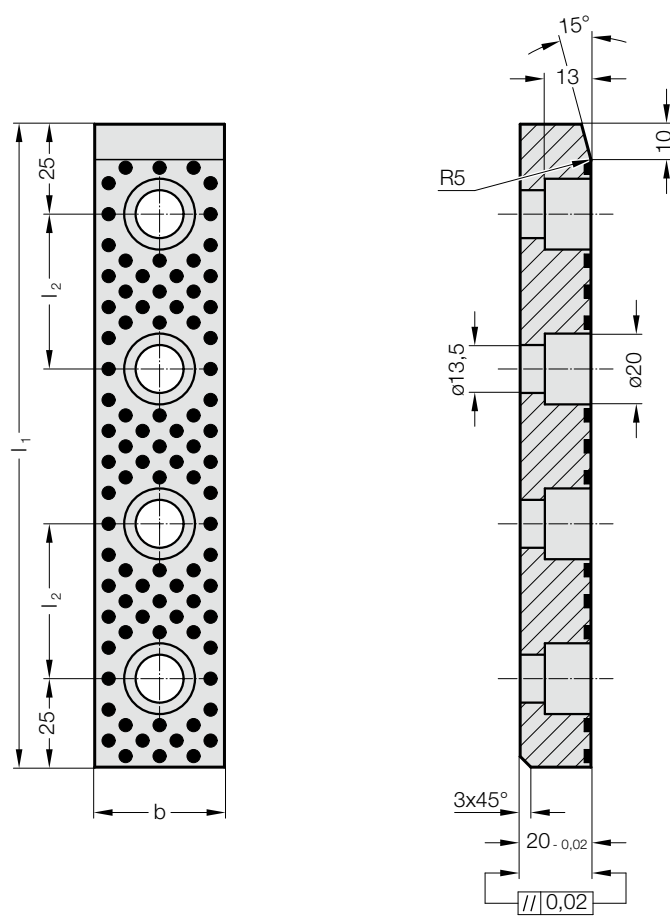
### 2960.88. Sliding pad, Steel, VDI 3357

Order No	Shape	b	a	e	e <sub>1</sub>	e <sub>2</sub>	Number of screw holes
2960.88.030.080	A	30	80	30	-	-	2
2960.88.030.100	A	30	100	50	-	-	2
2960.88.030.125	A	30	125	75	-	-	2
2960.88.030.160	A	30	160	110	-	-	2
2960.88.030.200	A	30	200	150	-	-	2
2960.88.040.080	A	40	80	30	-	-	2
2960.88.040.100	A	40	100	50	-	-	2
2960.88.040.125	A	40	125	75	-	-	2
2960.88.040.160	A	40	160	110	-	-	2
2960.88.040.200	A	40	200	150	-	-	2
2960.88.040.225	A	40	225	175	-	-	2
2960.88.040.240	B	40	240	60	70	-	4
2960.88.040.250	B	40	250	60	80	-	4
2960.88.040.260	B	40	260	60	90	-	4
2960.88.040.280	B	40	280	60	110	-	4
2960.88.050.080	A	50	80	30	-	-	2
2960.88.050.100	A	50	100	50	-	-	2
2960.88.050.125	A	50	125	75	-	-	2
2960.88.050.160	A	50	160	110	-	-	2
2960.88.050.180	A	50	180	130	-	-	2
2960.88.050.200	A	50	200	150	-	-	2
2960.88.050.225	A	50	225	175	-	-	2
2960.88.050.240	B	50	240	60	70	-	4
2960.88.050.250	B	50	250	60	80	-	4
2960.88.050.260	B	50	260	60	90	-	4
2960.88.050.280	B	50	280	60	110	-	4
2960.88.060.080	A	60	80	30	-	-	2
2960.88.060.100	A	60	100	50	-	-	2
2960.88.060.125	A	60	125	75	-	-	2
2960.88.060.160	A	60	160	110	-	-	2
2960.88.060.180	A	60	180	130	-	-	2
2960.88.060.200	A	60	200	150	-	-	2
2960.88.060.225	A	60	225	175	-	-	2
2960.88.060.240	B	60	240	60	70	-	4
2960.88.060.250	B	60	250	60	80	-	4
2960.88.060.260	B	60	260	60	90	-	4
2960.88.060.280	B	60	280	60	110	-	4
2960.88.060.300	B	60	300	80	90	-	4
2960.88.060.320	B	60	320	80	110	-	4
2960.88.060.340	B	60	340	80	130	-	4
2960.88.060.350	B	60	350	100	100	-	4
2960.88.080.080	A	80	80	30	-	-	2
2960.88.080.100	A	80	100	50	-	-	2
2960.88.080.125	A	80	125	75	-	-	2
2960.88.080.160	A	80	160	110	-	-	2
2960.88.080.200	A	80	200	150	-	-	2
2960.88.080.225	A	80	225	175	-	-	2
2960.88.080.240	B	80	240	60	70	-	4
2960.88.080.250	B	80	250	60	80	-	4
2960.88.080.260	B	80	260	60	90	-	4
2960.88.080.280	B	80	280	60	110	-	4
2960.88.080.300	B	80	300	80	90	-	4
2960.88.080.320	B	80	320	80	110	-	4
2960.88.080.340	B	80	340	80	130	-	4
2960.88.080.350	B	80	350	100	100	-	4
2960.88.100.125	H	100	125	75	-	50	4
2960.88.100.160	H	100	160	110	-	50	4
2960.88.100.200	H	100	200	150	-	50	4
2960.88.100.225	H	100	225	175	-	50	4
2960.88.100.250	B	100	250	60	80	-	4
2960.88.100.250.1	H	100	250	200	-	50	4
2960.88.100.280	B	100	280	60	110	-	4
2960.88.100.300	B	100	300	80	90	-	4
2960.88.100.320	B	100	320	80	110	-	4
2960.88.100.340	B	100	340	80	130	-	4
2960.88.100.350	B	100	350	100	100	-	4

# SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357



2960.93.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M12.

**2960.93. Sliding pad, Bronze with solid lubricant, VDI 3357**

Order No	b	l <sub>1</sub>	l <sub>2</sub>
2960.93.050.250	50	250	60
2960.93.050.300	50	300	80
2960.93.050.350	50	350	100
2960.93.050.400	50	400	120
2960.93.050.450	50	450	140
2960.93.050.500	50	500	150
2960.93.080.250	80	250	60
2960.93.080.300	80	300	80
2960.93.080.350	80	350	100
2960.93.080.400	80	400	120
2960.93.080.450	80	450	140
2960.93.080.500	80	500	150
2960.93.100.250	100	250	60
2960.93.100.300	100	300	80
2960.93.100.350	100	350	100
2960.93.100.400	100	400	120
2960.93.100.450	100	450	140
2960.93.100.500	100	500	150
2960.93.125.250	125	250	60
2960.93.125.300	125	300	80
2960.93.125.350	125	350	100
2960.93.125.400	125	400	120
2960.93.125.450	125	450	140
2960.93.125.500	125	500	150
2960.93.160.250	160	250	60
2960.93.160.300	160	300	80
2960.93.160.350	160	350	100
2960.93.160.400	160	400	120
2960.93.160.450	160	450	140
2960.93.160.500	160	500	150

# GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT, VDI 3357

2962.75.



**Material:**

Bronze with solid lubricant, oilless lubricating

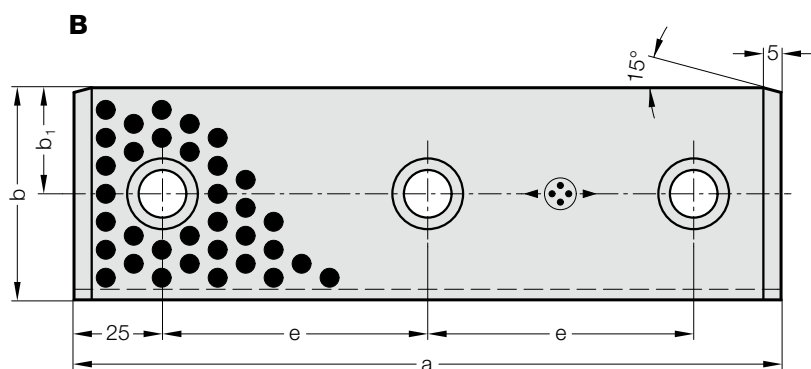
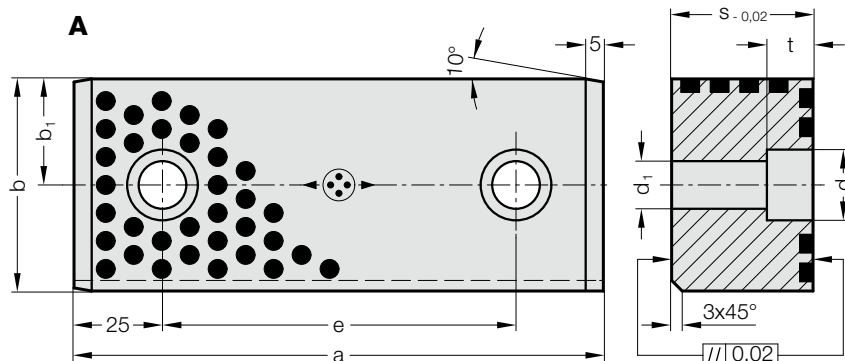
**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws

DIN EN ISO 4762.



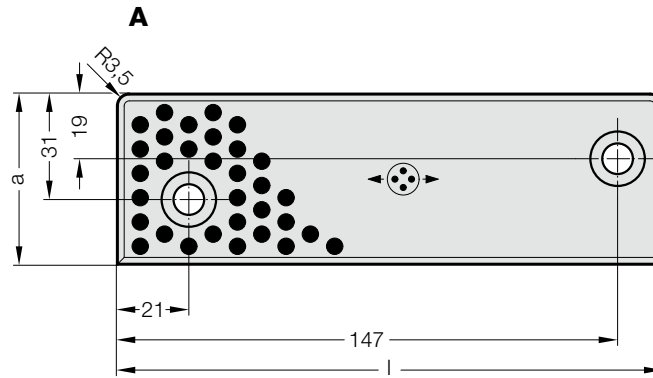
**2962.75. Guide bar with two sliding surfaces, Bronze with solid lubricant, VDI 3357**

Order No	Shape	a	b	s	b <sub>1</sub>	e	d	d <sub>1</sub>	t	Number of screw holes
2962.75.025.012.0110	A	110	25	12	12.5	60	15	9	8.5	2
2962.75.025.012.0120	A	120	25	12	12.5	70	15	9	8.5	2
2962.75.025.015.0110	A	110	25	15	12.5	60	18	11	10.5	2
2962.75.025.015.0120	A	120	25	15	12.5	70	18	11	10.5	2
2962.75.060.030.0125	A	125	60	30	30	75	20	13.5	13	2
2962.75.060.030.0150	A	150	60	30	30	100	20	13.5	13	2
2962.75.060.030.0160	A	160	60	30	30	110	20	13.5	13	2
2962.75.060.030.0200	B	200	60	30	30	75	20	13.5	13	3
2962.75.060.040.0125	A	125	60	40	30	75	20	13.5	13	2
2962.75.060.040.0150	A	150	60	40	30	100	20	13.5	13	2
2962.75.060.040.0160	A	160	60	40	30	110	20	13.5	13	2
2962.75.060.040.0200	B	200	60	40	30	75	20	13.5	13	3

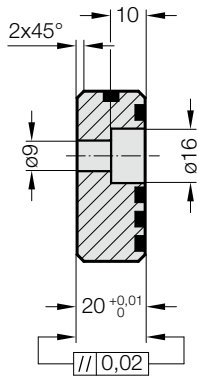
# GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT, CNOMO



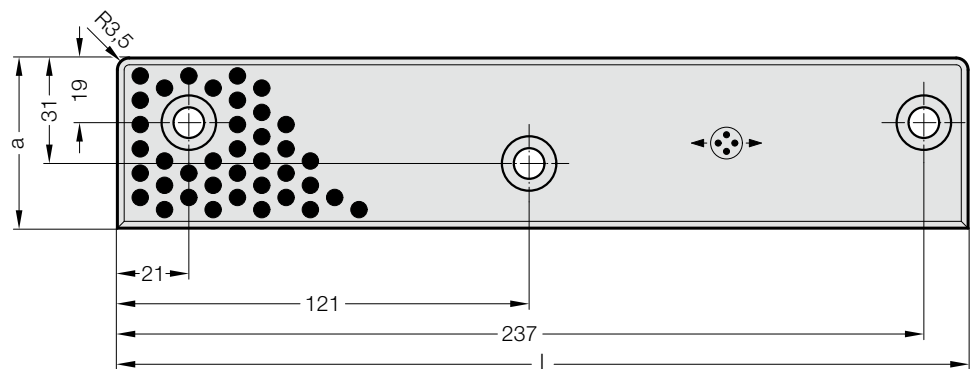
2962.75.45.



2962.75.45.



B



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use socket cap screws  
DIN EN ISO 4762 M8.

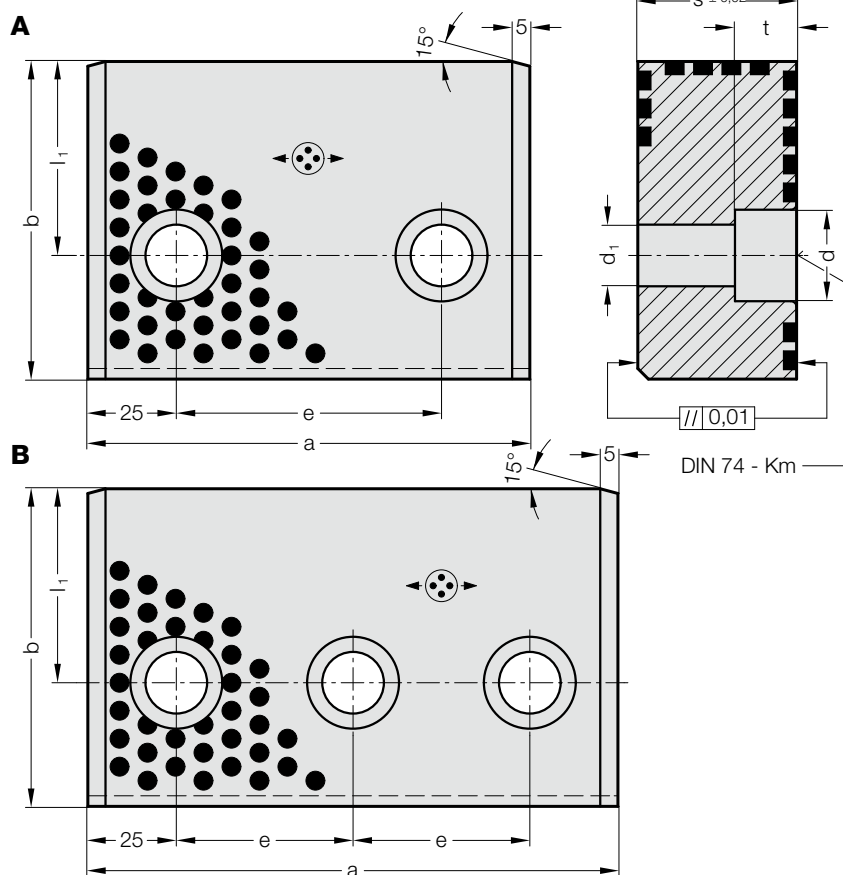
## 2962.75.45. Guide bar with two sliding surfaces, Bronze with solid lubricant, CNOMO

Order No	Shape	a	l	Number of screw holes
2962.75.45.050.20.160	A	50	160	2
2962.75.45.050.20.250	B	50	250	3



## GUIDE BAR WITH THREE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.76.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

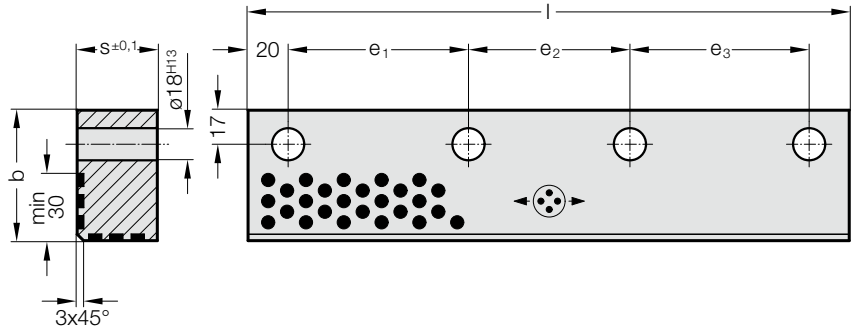
**2962.76. Guide bar with three sliding surfaces, Bronze with solid lubricant**

Order No	Shape	a	b	s	e	$l_1$	d	$d_1$	t	Number of screw holes
2962.76.070.032.0125	A	125	70	32	75	40	20	13.5	13	2
2962.76.070.032.0150	A	150	70	32	100	40	20	13.5	13	2
2962.76.070.032.0200	B	200	70	32	75	40	20	13.5	13	3
2962.76.090.045.0125	A	125	90	45	75	55	26	17.5	17.5	2
2962.76.090.045.0150	B	150	90	45	50	55	26	17.5	17.5	3
2962.76.090.045.0200	B	200	90	45	75	55	26	17.5	17.5	3

# GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT



2962.77.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

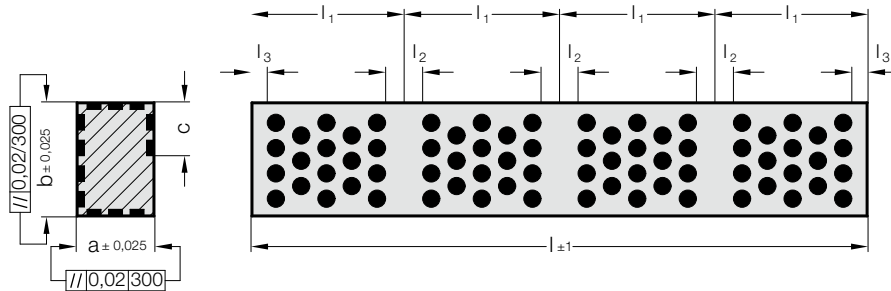
Screws are not included.

**2962.77. Guide bar with two sliding surfaces, Bronze with solid lubricant**

Order No	b	s	l	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	Number of screw holes
2962.77.065.040.0150	65	40	150	110	-	-	2
2962.77.065.040.0200	65	40	200	80	80	-	3
2962.77.065.040.0250	65	40	250	105	105	-	3
2962.77.065.040.0300	65	40	300	90	80	90	4
2962.77.065.040.0350	65	40	350	105	100	105	4
2962.77.065.065.0150	65	65	150	110	-	-	2
2962.77.065.065.0200	65	65	200	80	80	-	3
2962.77.065.065.0250	65	65	250	105	105	-	3
2962.77.065.065.0300	65	65	300	90	80	90	4
2962.77.065.065.0350	65	65	350	105	100	105	4

# GUIDE BAR WITH FOUR SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.74.



## Material:

Bronze with solid lubricant, oilless lubricating

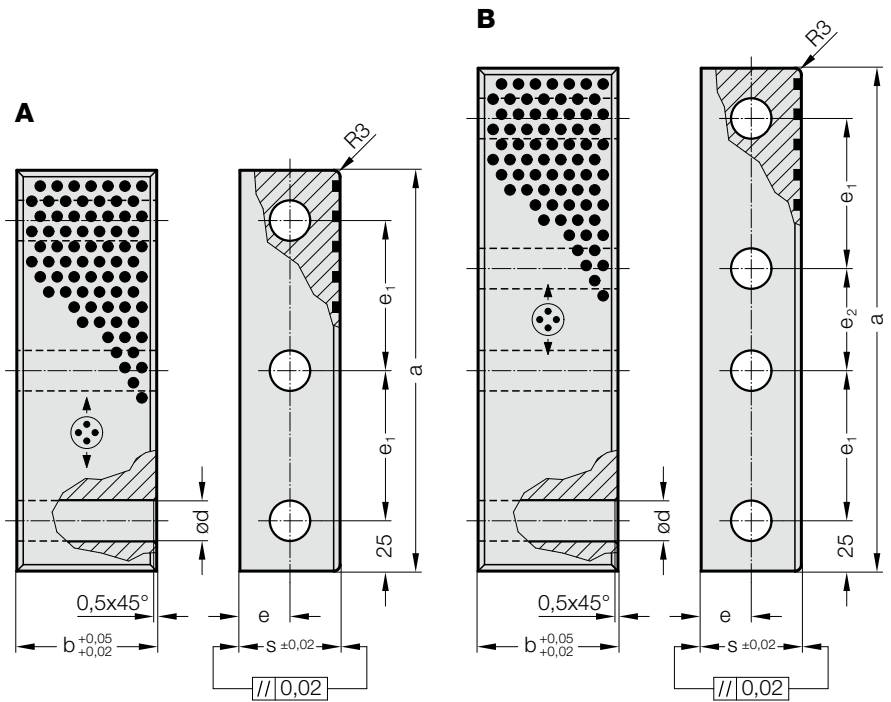
## 2962.74. Guide bar with four sliding surfaces, Bronze with solid lubricant

Order No	a	b	c	l	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>
2962.74.015.010.075	10.3	15.3	6	75	25	6	3
2962.74.015.010.100	10.3	15.3	6	100	25	6	3
2962.74.015.010.125	10.3	15.3	6	125	25	6	3
2962.74.015.010.150	10.3	15.3	6	150	25	6	3
2962.74.015.010.175	10.3	15.3	6	175	25	6	3
2962.74.015.010.200	10.3	15.3	6	200	25	6	3
2962.74.015.010.225	10.3	15.3	6	225	25	6	3
2962.74.015.010.250	10.3	15.3	6	250	25	6	3
2962.74.015.010.275	10.3	15.3	6	275	25	6	3
2962.74.015.010.300	10.3	15.3	6	300	25	6	3
2962.74.025.015.105	15.3	25.3	8	105	35	8	4
2962.74.025.015.140	15.3	25.3	8	140	35	8	4
2962.74.025.015.175	15.3	25.3	8	175	35	8	4
2962.74.025.015.210	15.3	25.3	8	210	35	8	4
2962.74.025.015.245	15.3	25.3	8	245	35	8	4
2962.74.025.015.280	15.3	25.3	8	280	35	8	4
2962.74.025.015.315	15.3	25.3	8	315	35	8	4
2962.74.025.015.350	15.3	25.3	8	350	35	8	4
2962.74.025.015.385	15.3	25.3	8	385	35	8	4
2962.74.025.015.420	15.3	25.3	8	420	35	8	4
2962.74.025.015.455	15.3	25.3	8	455	35	8	4
2962.74.025.015.490	15.3	25.3	8	490	35	8	4
2962.74.035.025.135	25.3	35.3	12	135	45	10	5
2962.74.035.025.180	25.3	35.3	12	180	45	10	5
2962.74.035.025.225	25.3	35.3	12	225	45	10	5
2962.74.035.025.270	25.3	35.3	12	270	45	10	5
2962.74.035.025.315	25.3	35.3	12	315	45	10	5
2962.74.035.025.360	25.3	35.3	12	360	45	10	5
2962.74.035.025.405	25.3	35.3	12	405	45	10	5
2962.74.035.025.450	25.3	35.3	12	450	45	10	5
2962.74.035.025.495	25.3	35.3	12	495	45	10	5
2962.74.045.035.165	35.3	45.3	16	165	55	12	6
2962.74.045.035.220	35.3	45.3	16	220	55	12	6
2962.74.045.035.275	35.3	45.3	16	275	55	12	6
2962.74.045.035.330	35.3	45.3	16	330	55	12	6
2962.74.045.035.385	35.3	45.3	16	385	55	12	6
2962.74.045.035.440	35.3	45.3	16	440	55	12	6
2962.74.045.035.495	35.3	45.3	16	495	55	12	6

# GUIDE BAR WITH ONE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT



2962.79.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

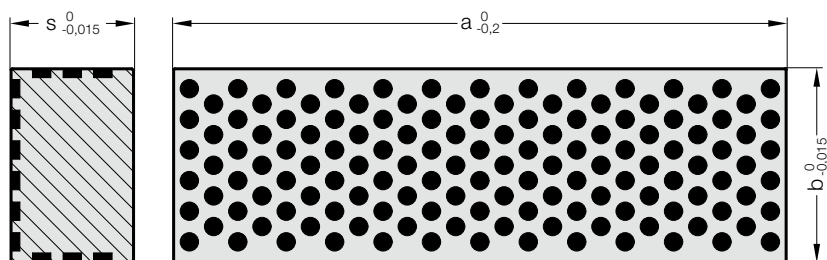
Screws are not included.

**2962.79. Guide bar with one sliding surfaces, Bronze with solid lubricant**

Order No	Shape	b	s	a	e	e <sub>1</sub>	e <sub>2</sub>	d	Number of screw holes
2962.79.030.040.150	A	30	40	150	20	50	-	14	3
2962.79.030.040.200	A	30	40	200	20	75	-	14	3
2962.79.030.040.250	B	30	40	250	20	75	50	14	4
2962.79.040.040.150	A	40	40	150	20	50	-	14	3
2962.79.040.040.200	A	40	40	200	20	75	-	14	3
2962.79.040.040.250	B	40	40	250	20	75	50	14	4
2962.79.045.050.150	A	45	50	150	25	50	-	18	3
2962.79.045.050.200	A	45	50	200	25	75	-	18	3
2962.79.045.050.250	B	45	50	250	25	75	50	18	4
2962.79.055.050.150	A	55	50	150	25	50	-	18	3
2962.79.055.050.200	A	55	50	200	25	75	-	18	3
2962.79.055.050.250	B	55	50	250	25	75	50	18	4
2962.79.060.050.150	A	60	50	150	25	50	-	18	3
2962.79.060.050.200	A	60	50	200	25	75	-	18	3
2962.79.060.050.250	B	60	50	250	25	75	50	18	4
2962.79.070.050.150	A	70	50	150	25	50	-	18	3
2962.79.070.050.200	A	70	50	200	25	75	-	18	3
2962.79.070.050.250	B	70	50	250	25	75	50	18	4

# GUIDE BAR WITH THREE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.80.



## 2962.80. Guide bar with three sliding surfaces, Bronze with solid lubricant

Order No	b	s	a
2962.80.025.016.080	25	16	80
2962.80.025.016.100	25	16	100
2962.80.025.016.125	25	16	125
2962.80.040.025.125	40	25	125
2962.80.040.025.160	40	25	160
2962.80.040.025.200	40	25	200
2962.80.063.040.200	63	40	200
2962.80.063.040.250	63	40	250
2962.80.063.040.315	63	40	315

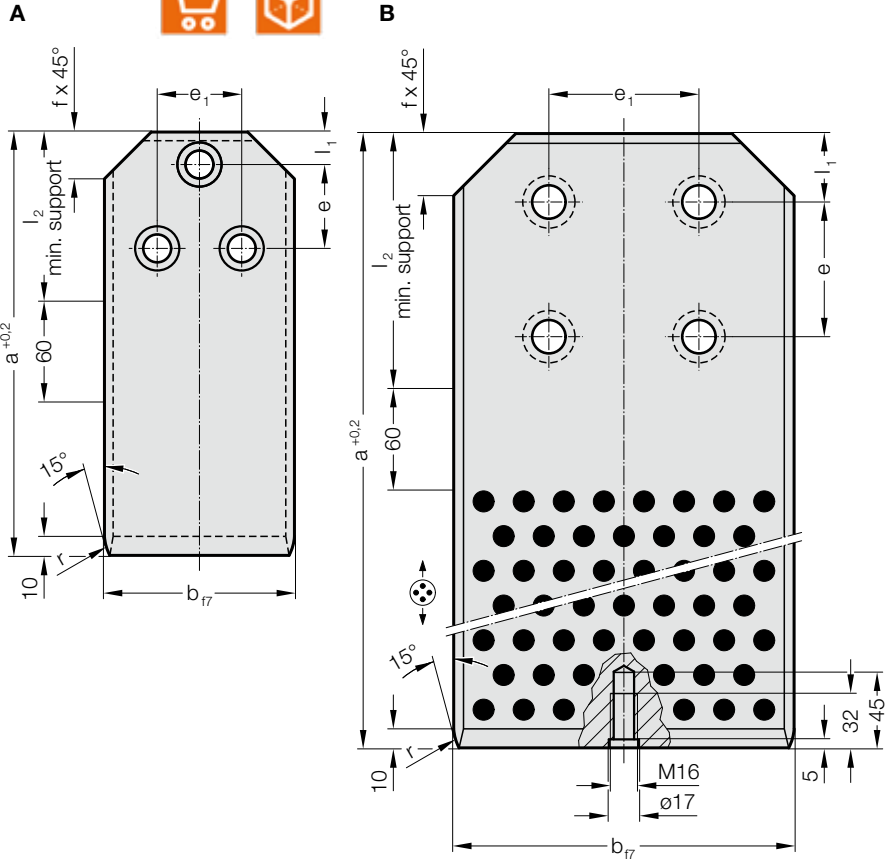
### Material:

Bronze with solid lubricant, oilless lubricating

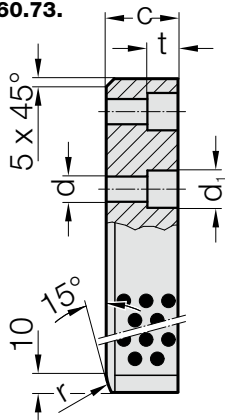
# GUIDE BRACKET, STEEL WITH SOLID LUBRICANT, VDI 3387



2960.73.



2960.73.



## Material:

Steel, surface hardened. Sliding faces with embedded solid lubricant.

## Note:

Screws are not included.

## Fixing:

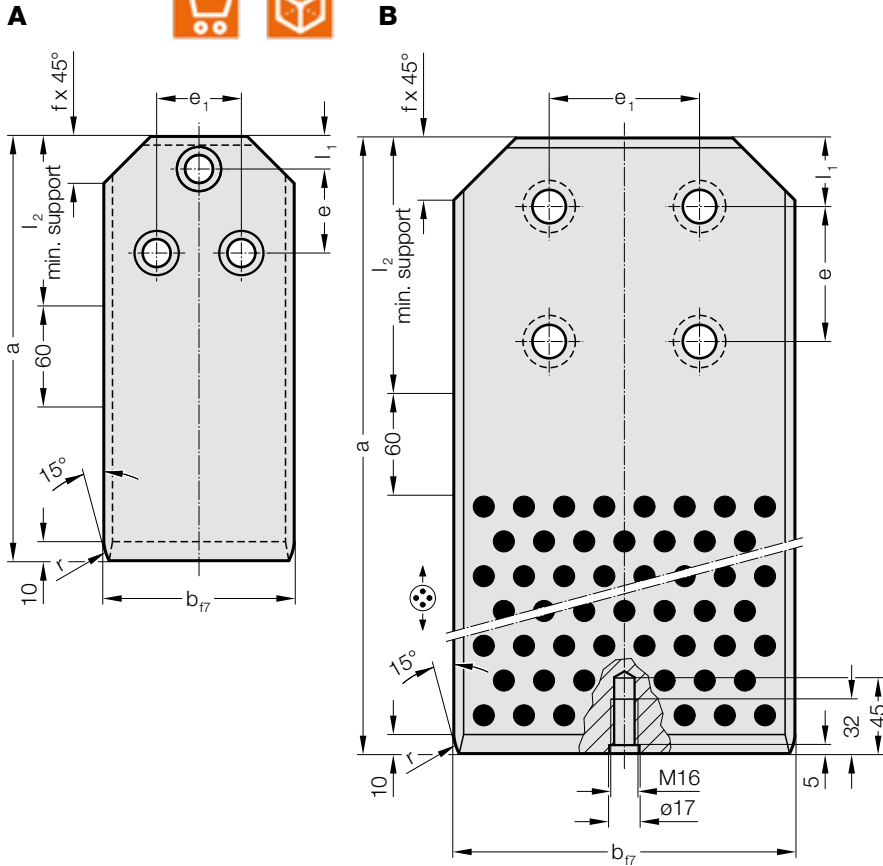
Use socket cap screws  
DIN EN ISO 4762.

## 2960.73. Guide bracket, Steel with solid lubricant, VDI 3387

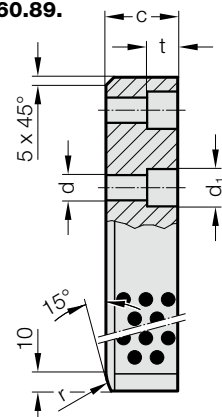
Order No	Shape	b	a	c	l <sub>1</sub>	l <sub>2</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	f	t	r	Number of screw holes
2960.73.063.180.036	A	63	180	36	20	90	50	36	14	20	18	16	16	3
2960.73.063.200.036	A	63	200	36	20	90	50	36	14	20	18	16	16	3
2960.73.063.224.036	A	63	224	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.180.036	A	71	180	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.200.036	A	71	200	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.224.036	A	71	224	36	20	90	50	36	14	20	18	16	16	3
2960.73.090.200.045	A	90	200	45	20	100	50	50	18	26	28	21	25	3
2960.73.090.224.045	A	90	224	45	20	100	50	50	18	26	28	21	25	3
2960.73.090.250.045	A	90	250	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.200.045	A	112	200	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.224.045	A	112	224	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.250.045	A	112	250	45	20	100	50	50	18	26	28	21	25	3
2960.73.140.315.045	B	140	315	45	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.140.400.045	B	140	400	45	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.140.400.056	B	140	400	56	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.190.400.056	B	190	400	56	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.240.500.056	B	240	500	56	40	250	160	160	26	40	36	30.5	31.5	4
2960.73.240.630.056	B	240	630	56	40	250	160	160	26	40	36	30.5	31.5	4

# GUIDE BRACKET, BRONZE WITH SOLID LUBRICANT, VDI 3387

2960.89.



2960.89.



## 2960.89. Guide bracket, Bronze with solid lubricant, VDI 3387

Order No	Shape	b	a	l <sub>1</sub>	l <sub>2</sub>	e	e <sub>1</sub>	d	d <sub>1</sub>	f	c	t	r	Number of screw holes
2960.89.063.180	A	63	180	20	90	50	36	14	20	18	36	16	16	3
2960.89.063.200	A	63	200	20	90	50	36	14	20	18	36	16	16	3
2960.89.063.224	A	63	224	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.180	A	71	180	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.200	A	71	200	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.224	A	71	224	20	90	50	36	14	20	18	36	16	16	3
2960.89.090.200	A	90	200	20	100	50	50	18	26	28	45	21	25	3
2960.89.090.224	A	90	224	20	100	50	50	18	26	28	45	21	25	3
2960.89.090.250	A	90	250	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.200	A	112	200	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.224	A	112	224	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.250	A	112	250	20	100	50	50	18	26	28	45	21	25	3
2960.89.140.315	B	140	315	40	150	80	90	22	33	36	45	25.5	31.5	4
2960.89.190.400	B	190	400	40	150	80	90	22	33	36	56	25.5	31.5	4
2960.89.240.500	B	240	500	40	250	160	160	26	40	36	56	30.5	31.5	4
2960.89.240.630	B	240	630	40	250	160	160	26	40	36	56	30.5	31.5	4

### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws are not included.

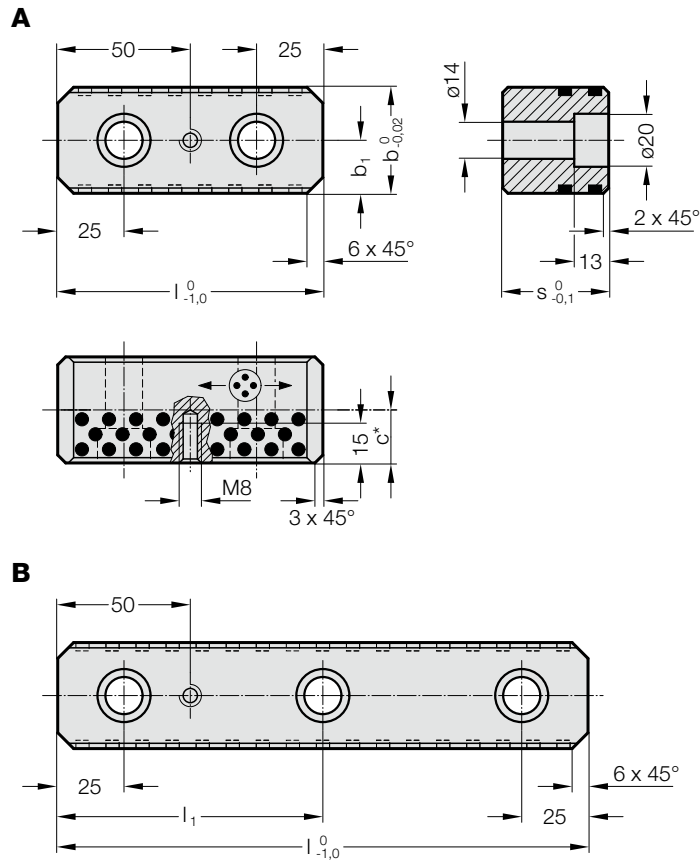
### Fixing:

Use socket cap screws  
DIN EN ISO 4762.

# SLIDE CENTRE GUIDE, BRONZE WITH SOLID LUBRICANT



2966.72.



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use socket cap screws

DIN EN ISO 4762 M12.



## 2966.72. Slide centre guide, Bronze with solid lubricant

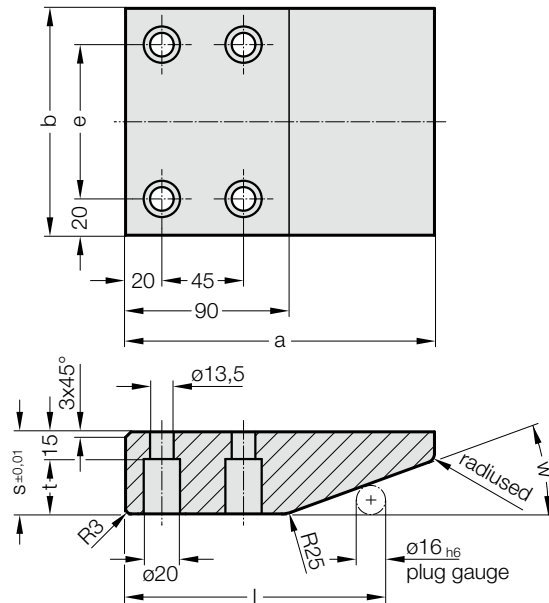
Order No	Shape	b	l	s	b <sub>1</sub>	l <sub>1</sub>	c*	Number of screw holes
2966.72.030.100.030	A	30	100	30	15	-	18	2
2966.72.030.150.030	A	30	150	30	15	-	18	2
2966.72.030.200.030	B	30	200	30	15	100	18	3
2966.72.030.250.030	B	30	250	30	15	125	18	3
2966.72.030.300.030	B	30	300	30	15	150	18	3
2966.72.030.350.030	B	30	350	30	15	175	18	3
2966.72.040.100.030	A	40	100	30	20	-	18	2
2966.72.040.150.030	A	40	150	30	20	-	18	2
2966.72.040.200.030	B	40	200	30	20	100	18	3
2966.72.040.250.030	B	40	250	30	20	125	18	3
2966.72.040.300.030	B	40	300	30	20	150	18	3
2966.72.040.350.030	B	40	350	30	20	175	18	3
2966.72.040.100.040	A	40	100	40	20	-	20	2
2966.72.040.150.040	A	40	150	40	20	-	20	2
2966.72.040.200.040	B	40	200	40	20	100	20	3
2966.72.040.250.040	B	40	250	40	20	125	20	3
2966.72.040.300.040	B	40	300	40	20	150	20	3
2966.72.040.350.040	B	40	350	40	20	175	20	3

\*Solid lubricant area

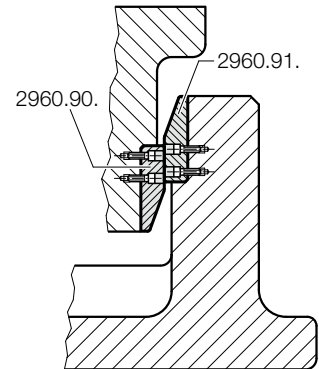


# OVERRUN CAM, STEEL HARDENED, VDI 3357

2960.90.



## Mounting example



## 2960.90. Overrun Cam, Steel hardened, VDI 3357

Order No	b	a	s	e	t	w	l
2960.90.100.170.045	100	170	45	60	30	20	143.37
2960.90.125.170.045	125	170	45	85	30	20	143.37
2960.90.150.170.045	150	170	45	110	30	20	143.37
2960.90.200.170.045	200	170	45	160	30	20	143.37
2960.90.100.150.045	100	150	45	60	30	30	127.86
2960.90.100.170.060	100	170	60	60	45	30	127.86
2960.90.125.150.045	125	150	45	85	30	30	127.86
2960.90.125.170.060	125	170	60	85	45	30	127.86
2960.90.150.150.045	150	150	45	110	30	30	127.86
2960.90.150.170.060	150	170	60	110	45	30	127.86
2960.90.200.150.045	200	150	45	160	30	30	127.86
2960.90.200.170.060	200	170	60	160	45	30	127.86

## Material:

Steel, through-hardened

## Note:

Screws are not included.

## Fixing:

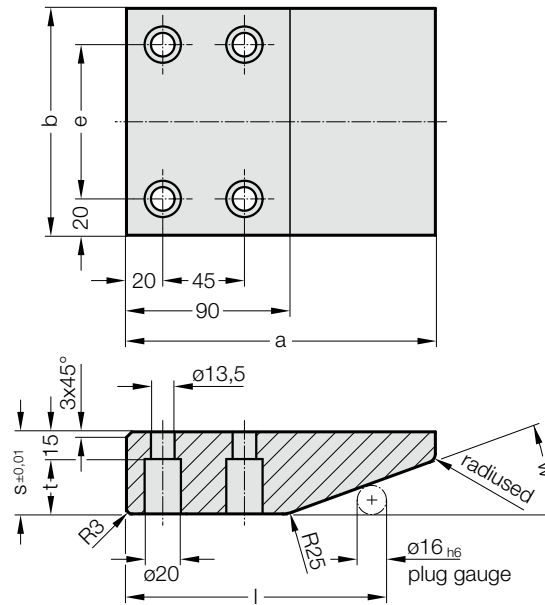
Use socket cap screws

DIN EN ISO 4762 M12.

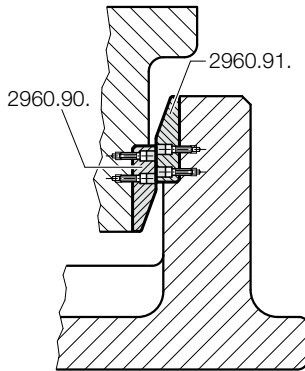
# OVERRUN CAM, STEEL HARDENED AND GAS NITRIDED, VDI 3357



2960.91.



## Mounting example



### Material:

Steel, through-hardened and gas nitrided

### Note:

Screws are not included.

### Fixing:

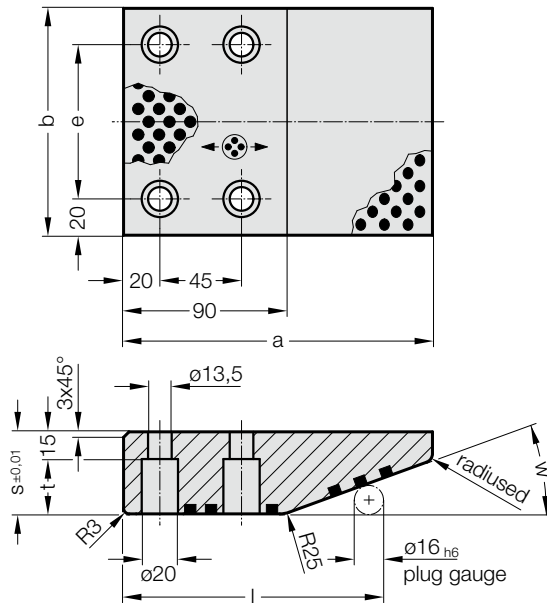
Use socket cap screws  
DIN EN ISO 4762 M12.

## 2960.91. Overrun Cam, Steel hardened and gas nitrided, VDI 3357

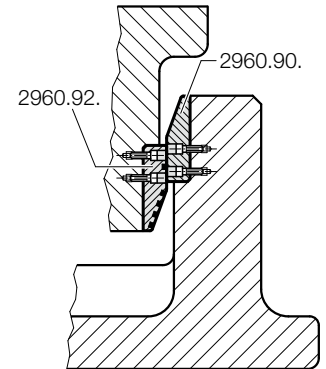
Order No	b	a	s	e	t	w	l
2960.91.100.170.045	100	170	45	60	30	20	143.37
2960.91.125.170.045	125	170	45	85	30	20	143.37
2960.91.150.170.045	150	170	45	110	30	20	143.37
2960.91.200.170.045	200	170	45	160	30	20	143.37
2960.91.100.150.045	100	150	45	60	30	30	127.86
2960.91.100.170.060	100	170	60	60	45	30	127.86
2960.91.125.150.045	125	150	45	85	30	30	127.86
2960.91.125.170.060	125	170	60	85	45	30	127.86
2960.91.150.150.045	150	150	45	110	30	30	127.86
2960.91.150.170.060	150	170	60	110	45	30	127.86
2960.91.200.150.045	200	150	45	160	30	30	127.86
2960.91.200.170.060	200	170	60	160	45	30	127.86

# OVERRUN CAM, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.92.



Mounting example



## 2960.92. Overrun Cam, Bronze with solid lubricant, VDI 3357

Order No	b	a	s	e	t	w	l
2960.92.100.170.045	100	170	45	60	30	20	143.37
2960.92.125.170.045	125	170	45	85	30	20	143.37
2960.92.150.170.045	150	170	45	110	30	20	143.37
2960.92.200.170.045	200	170	45	160	30	20	143.37
2960.92.100.150.045	100	150	45	60	30	30	127.86
2960.92.100.170.060	100	170	60	60	45	30	127.86
2960.92.125.150.045	125	150	45	85	30	30	127.86
2960.92.125.170.060	125	170	60	85	45	30	127.86
2960.92.150.150.045	150	150	45	110	30	30	127.86
2960.92.150.170.060	150	170	60	110	45	30	127.86
2960.92.200.150.045	200	150	45	160	30	30	127.86
2960.92.200.170.060	200	170	60	160	45	30	127.86

### Material:

Bronze with solid lubricant, oilless lubricating

### Note:

Screws are not included.

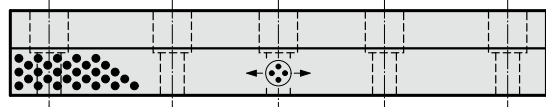
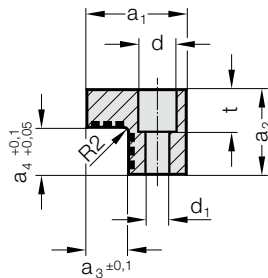
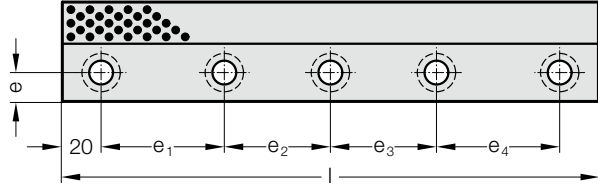
### Fixing:

Use socket cap screws  
DIN EN ISO 4762 M12.

# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT



2962.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

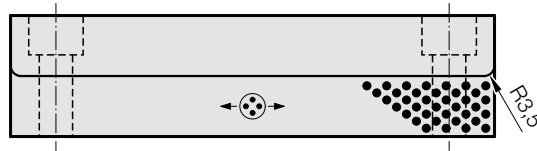
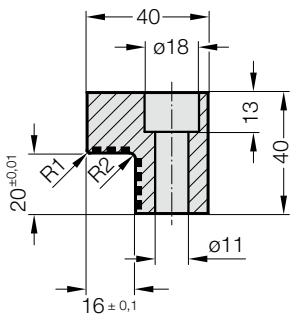
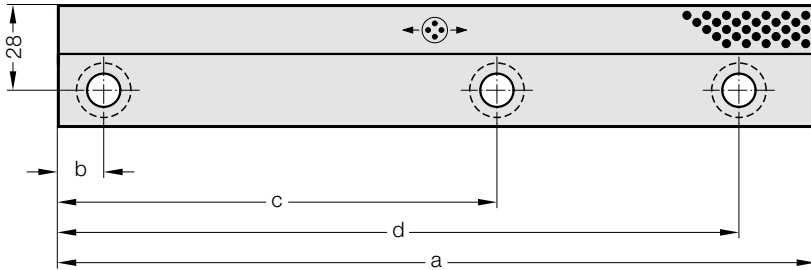
Use socket cap screws DIN EN ISO 4762.

**2962.70. Angled guide gib, Bronze with solid lubricant**

Order No	a <sub>1</sub>	a <sub>2</sub>	l	a <sub>3</sub>	a <sub>4</sub>	e	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	e <sub>4</sub>	d	d <sub>1</sub>	t	Number of screw holes
2962.70.026.100	26	20	100	8	10	9	60	-	-	-	15	9	9.6	2
2962.70.026.150	26	20	150	8	10	9	55	55	-	-	15	9	9.6	3
2962.70.026.200	26	20	200	8	10	9	55	50	55	-	15	9	9.6	4
2962.70.032.100	32	30	100	10	15	11	60	-	-	-	-	11	-	2
2962.70.032.150	32	30	150	10	15	11	55	55	-	-	-	11	-	3
2962.70.032.200	32	30	200	10	15	11	55	50	55	-	-	11	-	4
2962.70.032.250	32	30	250	10	15	11	70	70	70	-	-	11	-	4
2962.70.050.200	50	45	200	22	25	14	55	50	55	-	18	11	25	4
2962.70.050.250	50	45	250	22	25	14	70	70	70	-	18	11	25	4
2962.70.050.300	50	45	300	22	25	14	65	65	65	65	18	11	25	5
2962.70.050.350	50	45	350	22	25	14	80	75	75	80	18	11	25	5

# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT, CNOMO

2962.70.45.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.

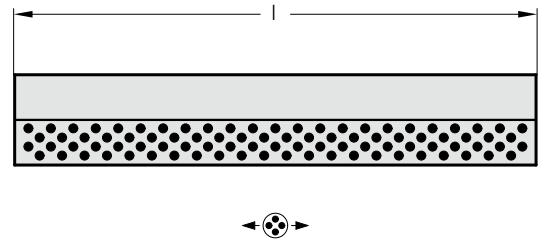
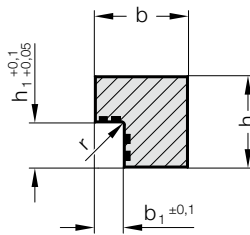
**2962.70.45. Angled guide gib, Bronze with solid lubricant, CNOMO**

Order No	a	b	c	d	Number of screw holes
2962.70.45.040.160	160	15	145	-	2
2962.70.45.040.250	250	15	145	225	3

# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT



2962.71.



**Material:**

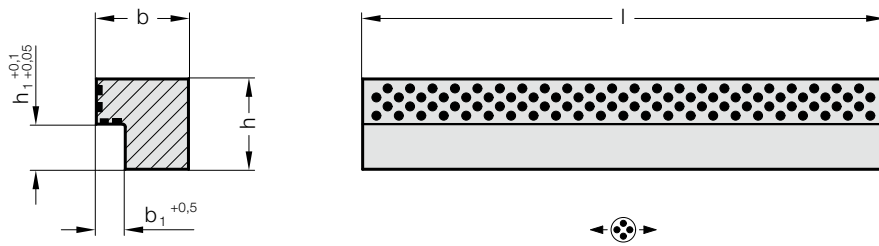
Bronze with solid lubricant, oilless lubricating

**2962.71. Angled guide gib, Bronze with solid lubricant**

Order No	b	h	b <sub>1</sub>	h <sub>1</sub>	l
2962.71.020.012.0305	20	12	5	6	305
2962.71.025.015.0305	25	15	7	8	305
2962.71.030.020.0305	30	20	9	12	305
2962.71.032.030.0605	32	30	10	15	605
2962.71.032.030.1005	32	30	10	15	1005
2962.71.035.035.0605	35	35	12	24	605
2962.71.035.035.1005	35	35	12	24	1005
2962.71.050.045.0605	50	45	22	25	605
2962.71.050.045.1005	50	45	22	25	1005
2962.71.050.050.0605	50	50	16	34	605
2962.71.050.050.1005	50	50	16	34	1005

## ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.72.



**Material:**

Bronze with solid lubricant, oilless lubricating

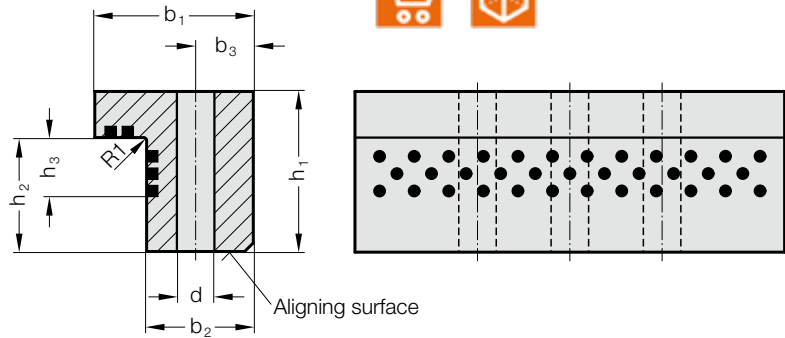
**2962.72. Angled guide gib, Bronze with solid lubricant**

Order No	b	h	b <sub>1</sub>	h <sub>1</sub>	l
2962.72.015.012.0205	15	12	5	5	205
2962.72.020.022.0205	20	22	5	7	205
2962.72.020.017.0205	20	17	5	7	205
2962.72.020.017.0320	20	17	5	7	320
2962.72.020.022.0320	20	22	5	7	320
2962.72.028.027.0205	28	27	8	10	205
2962.72.028.036.0205	28	36	8	10	205
2962.72.028.046.0205	28	46	8	10	205
2962.72.028.027.0320	28	27	8	10	320
2962.72.028.036.0320	28	36	8	10	320
2962.72.028.046.0320	28	46	8	10	320
2962.72.028.027.0605	28	27	8	10	605
2962.72.028.036.0605	28	36	8	10	605
2962.72.028.046.0605	28	46	8	10	605
2962.72.040.066.0205	40	66	12	22	205
2962.72.040.066.0320	40	66	12	22	320
2962.72.040.066.0605	40	66	12	22	605
2962.72.040.086.0205	40	86	12	26	205
2962.72.040.086.0320	40	86	12	26	320
2962.72.040.086.0605	40	86	12	26	605

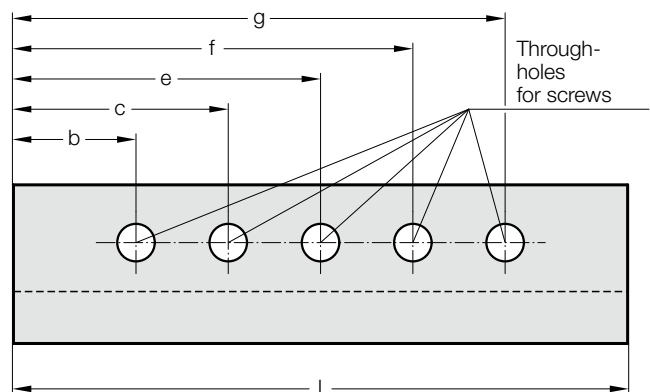
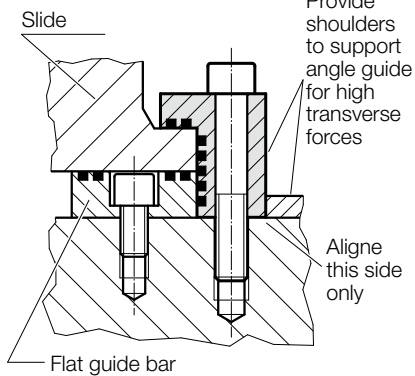
# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT, VDI 3357



2962.73.



## Mounting example



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws are not included.

## Fixing:

Use socket cap screws DIN EN ISO 4762.

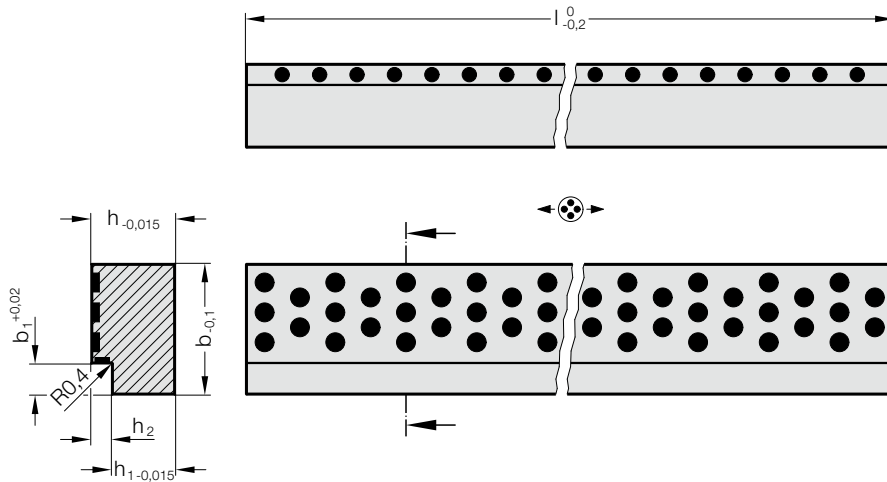
## 2962.73. Angled guide gib, Bronze with solid lubricant, VDI 3357

Order No	b <sub>1</sub>	h <sub>1</sub>	l	b <sub>2</sub>	b <sub>3</sub>	h <sub>2</sub>	h <sub>3</sub>	b	c	e	f	g	d	Number of screw holes
2962.73.025.125	25	15.5	125	18	9	8.5	6	27.5	-	-	-	97.5	9	2
2962.73.025.160	25	15.5	160	18	9	8.5	6	27.5	-	-	-	132.5	9	2
2962.73.032.125	32	30.5	125	22	11	15.5	9	27.5	-	-	-	97.5	11	2
2962.73.032.160	32	30.5	160	22	11	15.5	9	27.5	-	-	-	132.5	11	2
2962.73.032.200	32	30.5	200	22	11	15.5	9	27.5	-	-	-	172.5	11	2
2962.73.045.100	45	50.5	100	30	15	34.5	18	27.5	-	-	-	72.5	13.5	2
2962.73.045.160	45	50.5	160	30	15	34.5	18	27.5	-	-	-	132.5	13.5	2
2962.73.055.100	55	55.5	100	37	20	39.5	23	27.5	-	-	-	72.5	13.5	2
2962.73.055.160	55	55.5	160	37	20	39.5	23	27.5	-	-	-	132.5	13.5	2
2962.73.070.160	70	75.5	160	50	30	55.5	35	35	-	-	-	125	17.5	2
2962.73.070.200	70	75.5	200	50	30	55.5	35	35	-	-	-	165	17.5	2
2962.73.070.250	70	75.5	250	50	30	55.5	35	35	-	125	-	215	17.5	3
2962.73.070.400	70	75.5	400	50	30	55.5	35	35	125	200	275	365	17.5	5
2962.73.085.160	85	90.5	160	63	38	65.5	45	42.5	-	-	-	117.5	22	2
2962.73.085.200	85	90.5	200	63	38	65.5	45	42.5	-	-	-	157.5	22	2
2962.73.085.250	85	90.5	250	63	38	65.5	45	42.5	-	125	-	207.5	22	3
2962.73.085.400	85	90.5	400	63	38	65.5	45	42.5	125	200	275	357.5	22	5



# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.81.



**Material:**

Bronze with solid lubricant, oilless lubricating

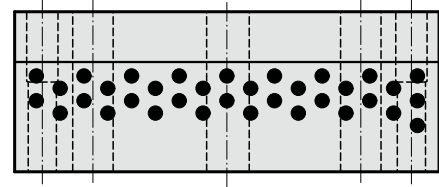
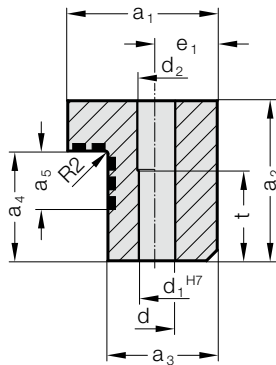
## 2962.81. Angled guide gib, Bronze with solid lubricant

Order No	h	b	l	h <sub>1</sub>	h <sub>2</sub>	b <sub>1</sub>
2962.81.016.115.040	16	11.5	40	12	4	6
2962.81.016.115.050	16	11.5	50	12	4	6
2962.81.016.115.063	16	11.5	63	12	4	6
2962.81.016.115.080	16	11.5	80	12	4	6
2962.81.016.155.050	16	15.5	50	11	5	8
2962.81.016.155.063	16	15.5	63	11	5	8
2962.81.016.155.080	16	15.5	80	11	5	8
2962.81.016.155.100	16	15.5	100	11	5	8
2962.81.020.195.063	20	19.5	63	15	5	8
2962.81.020.195.080	20	19.5	80	15	5	8
2962.81.020.195.100	20	19.5	100	15	5	8
2962.81.020.195.125	20	19.5	125	15	5	8
2962.81.020.245.080	20	24.5	80	15	5	8
2962.81.020.245.100	20	24.5	100	15	5	8
2962.81.020.245.125	20	24.5	125	15	5	8
2962.81.020.245.160	20	24.5	160	15	5	8
2962.81.025.315.100	25	31.5	100	19	6	10
2962.81.025.315.125	25	31.5	125	19	6	10
2962.81.025.315.160	25	31.5	160	19	6	10
2962.81.025.315.200	25	31.5	200	19	6	10
2962.81.025.395.125	25	39.5	125	19	6	10
2962.81.025.395.160	25	39.5	160	19	6	10
2962.81.025.395.200	25	39.5	200	19	6	10
2962.81.025.395.250	25	39.5	250	19	6	10
2962.81.032.495.160	32	49.5	160	24	8	12
2962.81.032.495.200	32	49.5	200	24	8	12
2962.81.032.495.250	32	49.5	250	24	8	12
2962.81.032.495.315	32	49.5	315	24	8	12

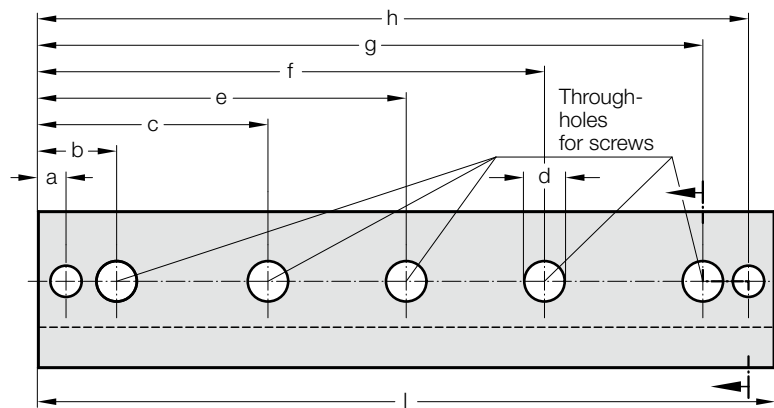
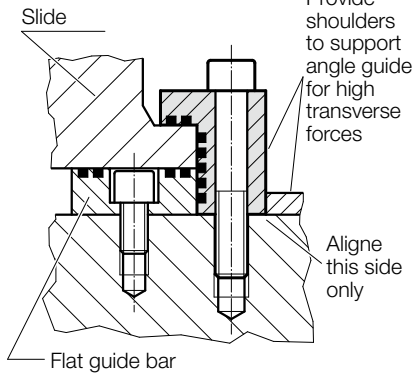
# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT



2962.82.



## Mounting example



## Material:

Bronze with solid lubricant, oilless lubricating

## Note:

Screws and pins are not included.

## Fixing:

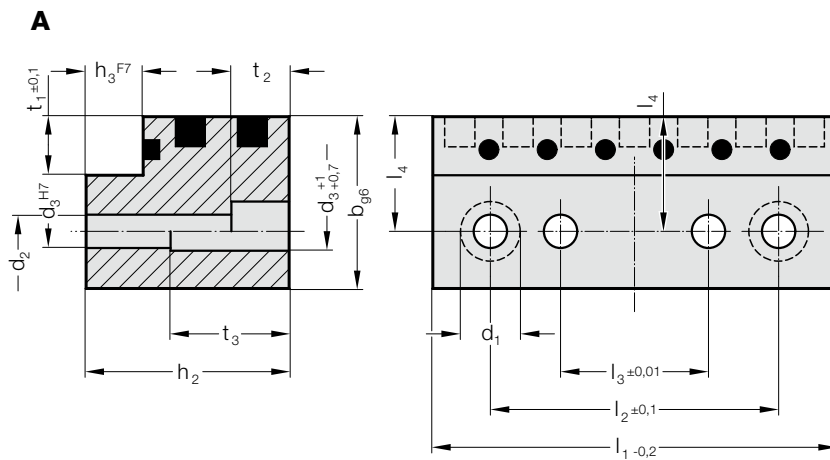
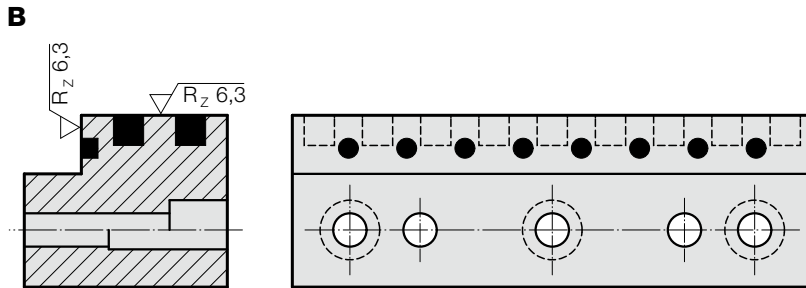
Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

## 2962.82. Angled guide gib, Bronze with solid lubricant

Order No	a <sub>1</sub>	a <sub>2</sub>	l	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	a	b	c	e	e <sub>1</sub>	f	g	h	d	d <sub>1</sub>	d <sub>2</sub>	t	Number of screw holes
2962.82.055.100	55	55	100	37	39	23	10	27.5	-	-	20	-	72.5	90	13.5	10	11	30	2
2962.82.055.160	55	55	160	37	39	23	10	27.5	-	-	20	-	132.5	150	13.5	10	11	30	2
2962.82.070.160	70	75	160	50	55	35	12.5	35	-	-	30	-	125	147.5	17.5	12	13	30	2
2962.82.070.200	70	75	200	50	55	35	12.5	35	-	-	30	-	165	187.5	17.5	12	13	30	2
2962.82.070.250	70	75	250	50	55	35	12.5	35	-	125	30	-	215	237.5	17.5	12	13	30	3
2962.82.070.400	70	75	400	50	55	35	12.5	35	125	200	30	275	365	387.5	17.5	12	13	30	5
2962.82.085.160	85	90	160	63	65	45	15	42.5	-	-	38	-	117.5	145	22	16	17	30	2
2962.82.085.200	85	90	200	63	65	45	15	42.5	-	-	38	-	157.5	185	22	16	17	30	2
2962.82.085.250	85	90	250	63	65	45	15	42.5	-	125	38	-	207.5	235	22	16	17	30	3
2962.82.085.400	85	90	400	63	65	45	15	42.5	125	200	38	275	357.5	385	22	16	17	30	5

# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.83.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

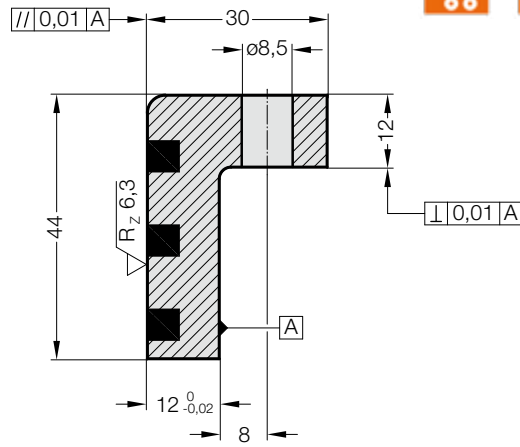
**2962.83. Angled guide gib, Bronze with solid lubricant**

Order No	Shape	b	h <sub>1</sub>	h <sub>2</sub>	l <sub>1</sub>	h <sub>3</sub>	t <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	t <sub>2</sub>	t <sub>3</sub>	Number of screw holes
2962.83.016.012.050	A	16	12	11	50	4	5	34	14	9.5	10	5.5	5	5.7	-	2
2962.83.016.012.071	A	16	12	11	71	4	5	55	35	9.5	10	5.5	5	5.7	-	2
2962.83.016.012.090	B	16	12	11	90	4	5	74	54	9.5	10	5.5	5	5.7	-	3
2962.83.020.020.080	A	20	20	19	80	5	5	64	40	12	11	6.6	6	6.8	9.5	2
2962.83.020.020.100	A	20	20	19	100	5	5	84	60	12	11	6.6	6	6.8	9.5	2
2962.83.020.020.125	B	20	20	19	125	5	5	109	85	12	11	6.6	6	6.8	9.5	3
2962.83.025.032.100	A	25	32	31	100	6	6	80	50	15.5	15	9	8	9	19	2
2962.83.025.032.125	A	25	32	31	125	6	6	105	75	15.5	15	9	8	9	19	2
2962.83.025.032.160	B	25	32	31	160	6	6	140	110	15.5	15	9	8	9	19	3
2962.83.030.050.125	A	30	50	49	125	8	7	95	55	18	18	11	10	11	34	2
2962.83.030.050.160	A	30	50	49	160	8	7	130	90	18	18	11	10	11	34	2
2962.83.030.050.200	B	30	50	49	200	8	7	170	130	18	18	11	10	11	34	3

# ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT



2962.86.



**Material:**

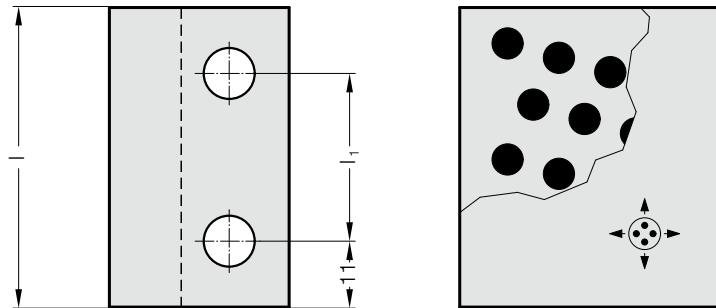
Bronze with solid lubricant, oilless lubricating

**Note:**

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762.

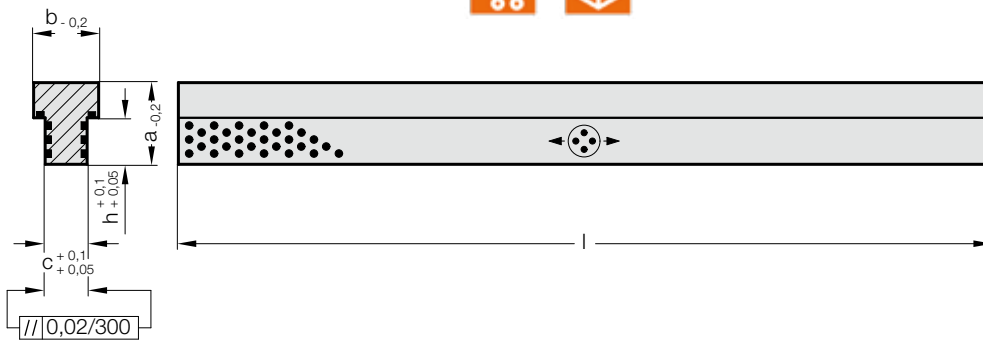


**2962.86. Angled guide gib, Bronze with solid lubricant**

Order No	l	l <sub>1</sub>
2962.86.044.030.050	50	28
2962.86.044.030.100	100	78
2962.86.044.030.150	150	128
2962.86.044.030.200	200	178

## T-GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2964.77.



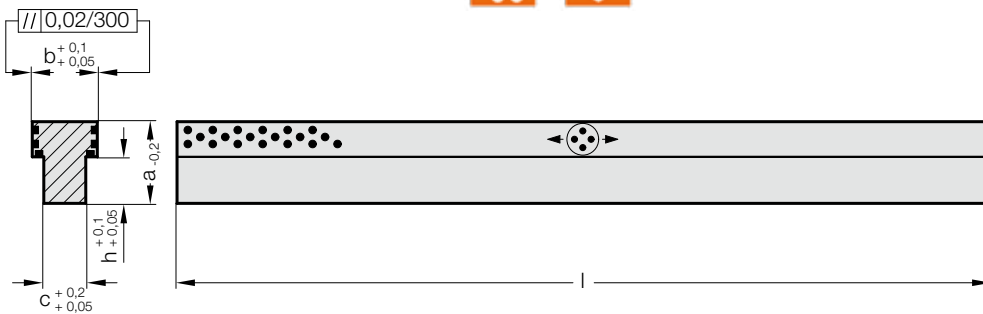
2964.77. T-Guide bar, Bronze with solid lubricant

Order No	a	b	c	h	l
2964.77.012.018.0350	12	18	8	5	350
2964.77.025.022.0350	25	22	12	15	350
2964.77.035.028.0350	35	28	18	20	350

**Material:**

Bronze with solid lubricant, oilless lubricating

2964.78.



2964.78. T-Guide bar, Bronze with solid lubricant

Order No	a	b	c	h	l
2964.78.012.018.0350	12	18	8	5	350
2964.78.025.022.0350	25	22	12	15	350
2964.78.035.028.0350	35	28	18	20	350

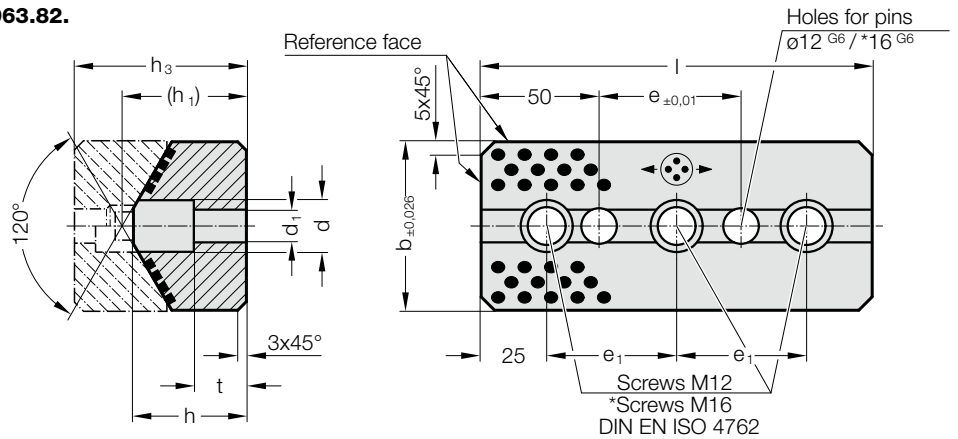
**Material:**

Bronze with solid lubricant, oilless lubricating

# SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT, NAAMS PRISMATIC GUIDE, STEEL, NAAMS



**2963.82.**



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws and pins are not included.

\* at 2963.82.125.

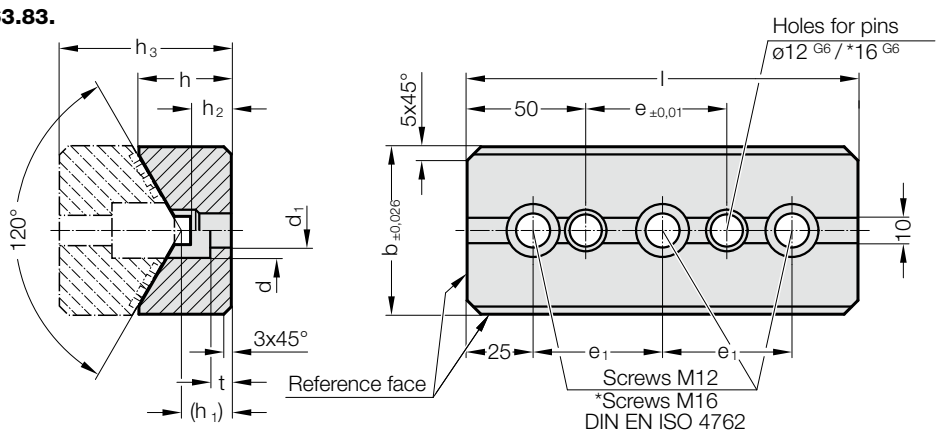


**2963.82. Sliding block, Bronze with solid lubricant, NAAMS**

Order No	b	h	h <sub>1</sub>	h <sub>3</sub>	l	e <sub>1</sub>	e	d	d <sub>1</sub>	t	Number of screw holes
2963.82.065.039.0150	65	39	(42)	65	150	100	50	20	13.5	13	2
2963.82.065.039.0200	65	39	(42)	65	200	150	100	20	13.5	13	2
2963.82.065.039.0250	65	39	(42)	65	250	100	150	20	13.5	13	3
2963.82.065.039.0300	65	39	(42)	65	300	125	200	20	13.5	13	3
2963.82.075.039.0150	75	39	(42)	65	150	100	50	20	13.5	13	2
2963.82.075.039.0200	75	39	(42)	65	200	150	100	20	13.5	13	2
2963.82.075.039.0250	75	39	(42)	65	250	100	150	20	13.5	13	3
2963.82.075.039.0300	75	39	(42)	65	300	125	200	20	13.5	13	3
2963.82.125.052.0150	125	52	(57)	85	150	100	50	26	17.5	15	2
2963.82.125.052.0200	125	52	(57)	85	200	150	100	26	17.5	15	2
2963.82.125.052.0250	125	52	(57)	85	250	100	150	26	17.5	15	3
2963.82.125.052.0300	125	52	(57)	85	300	125	200	26	17.5	15	3



**2963.83.**



**Material:**

Steel, sliding faces surface hardened

**Note:**

Screws and pins are not included.

\* at 2963.83.125.

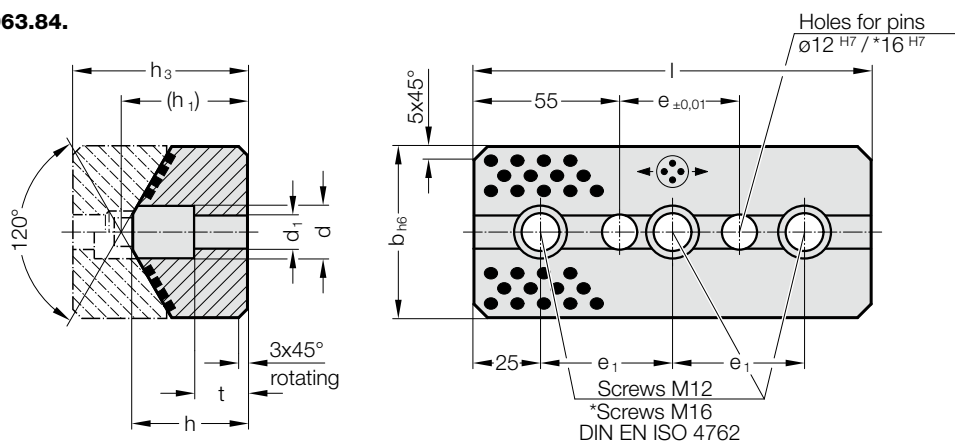


**2963.83. Prismatic guide, Steel, NAAMS**

Order No	b	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2963.83.065.040.0150	65	40	(23)	21	65	150	50	100	20	13.5	10	2
2963.83.065.040.0200	65	40	(23)	21	65	200	100	150	20	13.5	10	2
2963.83.065.040.0250	65	40	(23)	21	65	250	150	100	20	13.5	10	3
2963.83.065.040.0300	65	40	(23)	21	65	300	200	125	20	13.5	10	3
2963.83.075.040.0150	75	40	(23)	21	65	150	50	100	20	13.5	10	2
2963.83.075.040.0200	75	40	(23)	21	65	200	100	150	20	13.5	10	2
2963.83.075.040.0250	75	40	(23)	21	65	250	150	100	20	13.5	10	3
2963.83.075.040.0300	75	40	(23)	21	65	300	200	125	20	13.5	10	3
2963.83.125.060.0150	125	60	(28)	27	85	150	50	100	26	17.5	15	2
2963.83.125.060.0200	125	60	(28)	27	85	200	100	150	26	17.5	15	2
2963.83.125.060.0250	125	60	(28)	27	85	250	150	100	26	17.5	15	3
2963.83.125.060.0300	125	60	(28)	27	85	300	200	125	26	17.5	15	3

# SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT, VDI 3357 PRISMATIC GUIDE, STEEL, VDI 3357

2963.84.



2963.84. Sliding block, Bronze with solid lubricant, VDI 3357

Order No	b	h	h <sub>1</sub>	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2963.84.065.044.0150	65	44	(47)	65	150	45	100	20	13.5	20	2
2963.84.065.044.0200	65	44	(47)	65	200	95	150	20	13.5	20	2
2963.84.065.044.0250	65	44	(47)	65	250	145	100	20	13.5	20	3
2963.84.065.044.0300	65	44	(47)	65	300	195	125	20	13.5	20	3
2963.84.125.047.0150	125	47	(52)	85	150	45	100	26	17.5	15	2
2963.84.125.047.0200	125	47	(52)	85	200	95	150	26	17.5	15	2
2963.84.125.047.0250	125	47	(52)	85	250	145	100	26	17.5	15	3
2963.84.125.047.0300	125	47	(52)	85	300	195	125	26	17.5	15	3
2963.84.125.052.0150	125	52	(57)	85	150	45	100	26	17.5	15	2
2963.84.125.052.0200	125	52	(57)	85	200	95	150	26	17.5	15	2
2963.84.125.052.0250	125	52	(57)	85	250	145	100	26	17.5	15	3
2963.84.125.052.0300	125	52	(57)	85	300	195	125	26	17.5	15	3

**Material:**

Bronze with solid lubricant, oilless lubricating

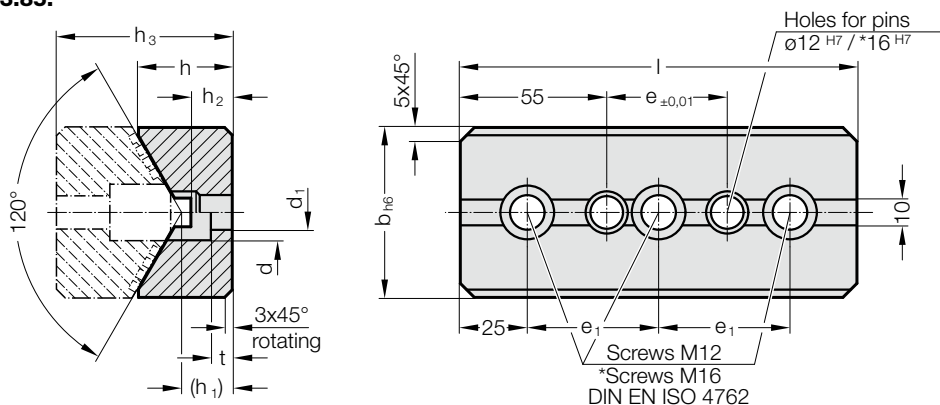
**Note:**

Screws and pins are not included.

\* at 2963.84.125.



2963.85.



2963.85. Prismatic guide, Steel, VDI 3357

Order No	b	h	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l	e	e <sub>1</sub>	d	d <sub>1</sub>	t	Number of screw holes
2963.85.065.035.0150	65	35	(18)	17	65	150	45	100	20	13.5	8	2
2963.85.065.035.0200	65	35	(18)	17	65	200	95	150	20	13.5	8	2
2963.85.065.035.0250	65	35	(18)	17	65	250	145	100	20	13.5	8	3
2963.85.065.035.0300	65	35	(18)	17	65	300	195	125	20	13.5	8	3
2963.85.125.060.0150	125	60	(33)	32	85	150	45	100	26	17.5	15	2
2963.85.125.060.0200	125	60	(33)	32	85	200	95	150	26	17.5	15	2
2963.85.125.060.0250	125	60	(33)	32	85	250	145	100	26	17.5	15	3
2963.85.125.060.0300	125	60	(33)	32	85	300	195	125	26	17.5	15	3
2963.85.125.060.0150.1	125	60	(28)	27	85	150	45	100	26	17.5	15	2
2963.85.125.060.0200.1	125	60	(28)	27	85	200	95	150	26	17.5	15	2
2963.85.125.060.0250.1	125	60	(28)	27	85	250	145	100	26	17.5	15	3
2963.85.125.060.0300.1	125	60	(28)	27	85	300	195	125	26	17.5	15	3

**Material:**

Steel, sliding faces surface hardened

**Note:**

Screws and pins are not included.

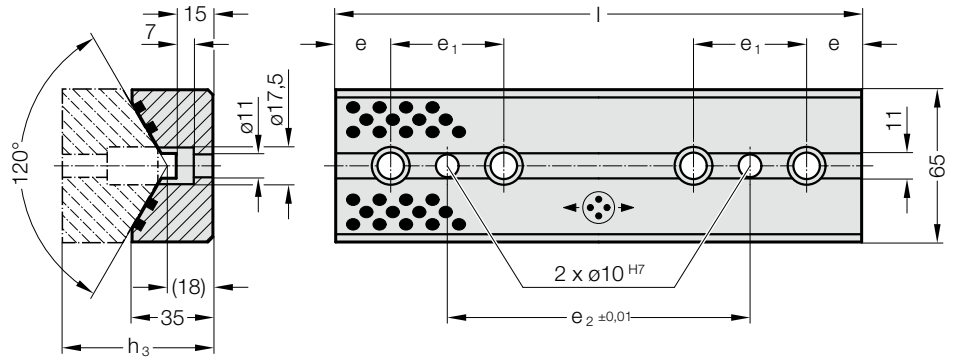
\* at 2963.85.125.



# PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT SLIDING BLOCK, STEEL



2963.70.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws and pins are not included.

**Fixing:**

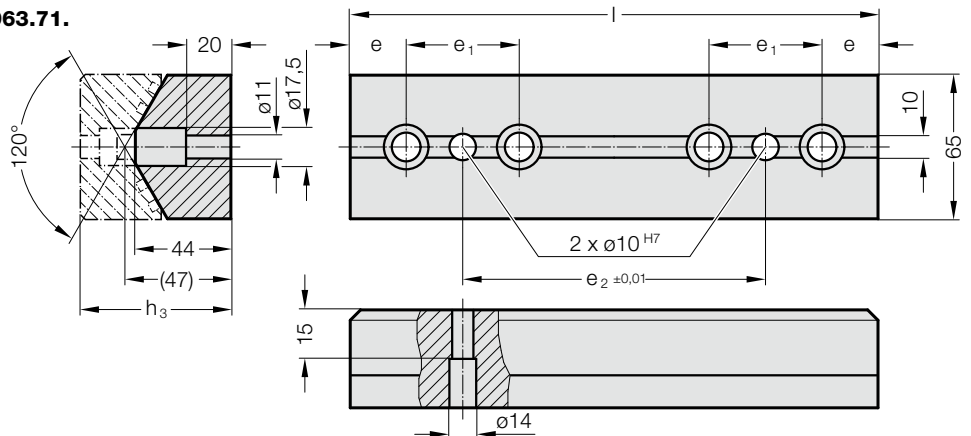
Use socket cap screws  
DIN EN ISO 4762 M10.

2963.70. Prismatic guide, Bronze with solid lubricant

Order No	e	e <sub>1</sub>	e <sub>2</sub>	h <sub>3</sub>	l	Number of screw holes
2963.70.065.035.0100	20	60	20	65	100	2
2963.70.065.035.0150	25	50	50	65	150	3
2963.70.065.035.0200	25	50	100	65	200	4
2963.70.065.035.0250	25	50	150	65	250	5
2963.70.065.035.0300	25	50	200	65	300	6



2963.71.



**Material:**

Steel, sliding faces surface hardened

**Note:**

Screws and pins are not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M10.

2963.71. Sliding block, Steel

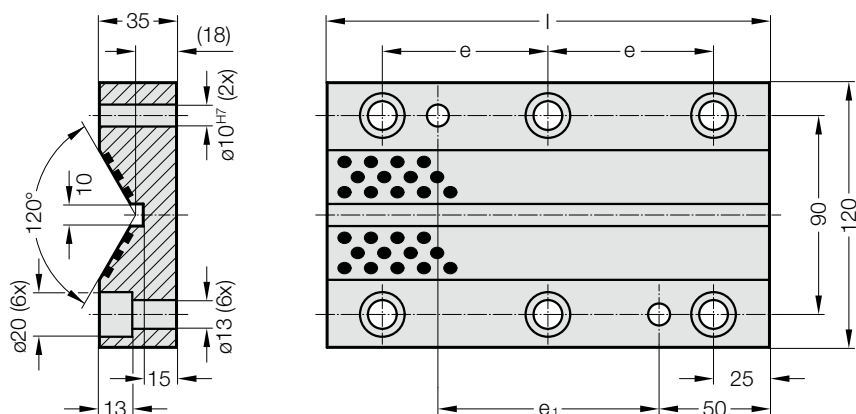
Order No	e	e <sub>1</sub>	e <sub>2</sub>	h <sub>3</sub>	l	Number of screw holes
2963.71.065.044.0100	20	60	20	65	100	2
2963.71.065.044.0150	25	50	50	65	150	3
2963.71.065.044.0200	25	50	100	65	200	4
2963.71.065.044.0250	25	50	150	65	250	5
2963.71.065.044.0300	25	50	200	65	300	6





# PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT SLIDING BLOCK, STEEL

2963.72.



2963.72. Prismatic guide, Bronze with solid lubricant

Order No	l	e	e <sub>1</sub>	Number of screw holes
2963.72.120.035.0150	150	50	50	6
2963.72.120.035.0200	200	75	100	6
2963.72.120.035.0250	250	100	150	6
2963.72.120.035.0300	300	125	200	6

**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

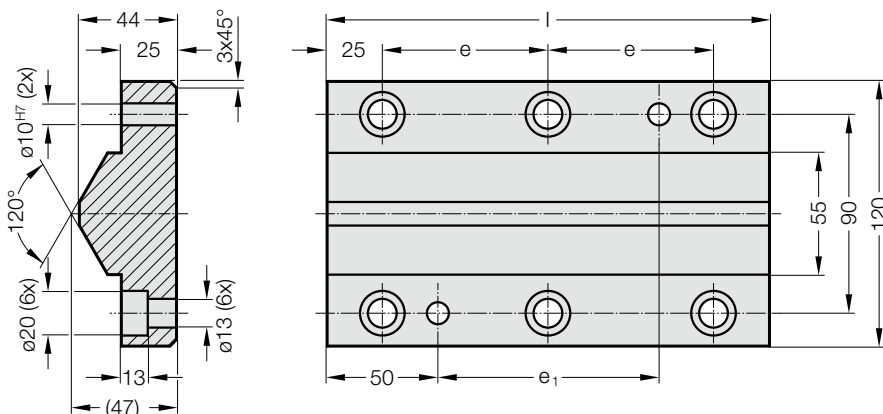
Screws and pins are not included.

**Fixing:**

Use socket cap screws  
DIN EN ISO 4762 M12.



2963.73.



2963.73. Sliding block, Steel

Order No	l	e	e <sub>1</sub>	Number of screw holes
2963.73.120.044.0150	150	50	50	6
2963.73.120.044.0200	200	75	100	6
2963.73.120.044.0250	250	100	150	6
2963.73.120.044.0300	300	125	200	6

**Material:**

Steel, sliding faces surface hardened

**Note:**

Screws and pins are not included.

**Fixing:**

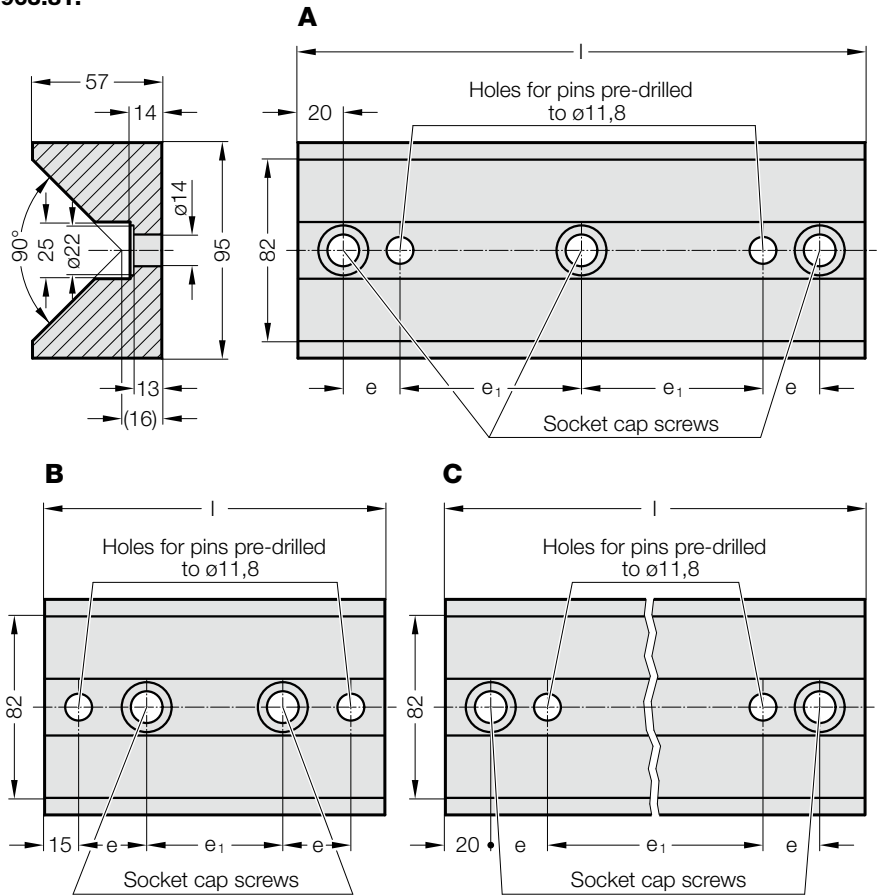
Use socket cap screws  
DIN EN ISO 4762 M12.



# PRISMATIC GUIDE, STEEL



2963.81.



**Material:**

Steel, sliding faces surface hardened

**Note:**

Screws and pins are not included.

**Fixing:**

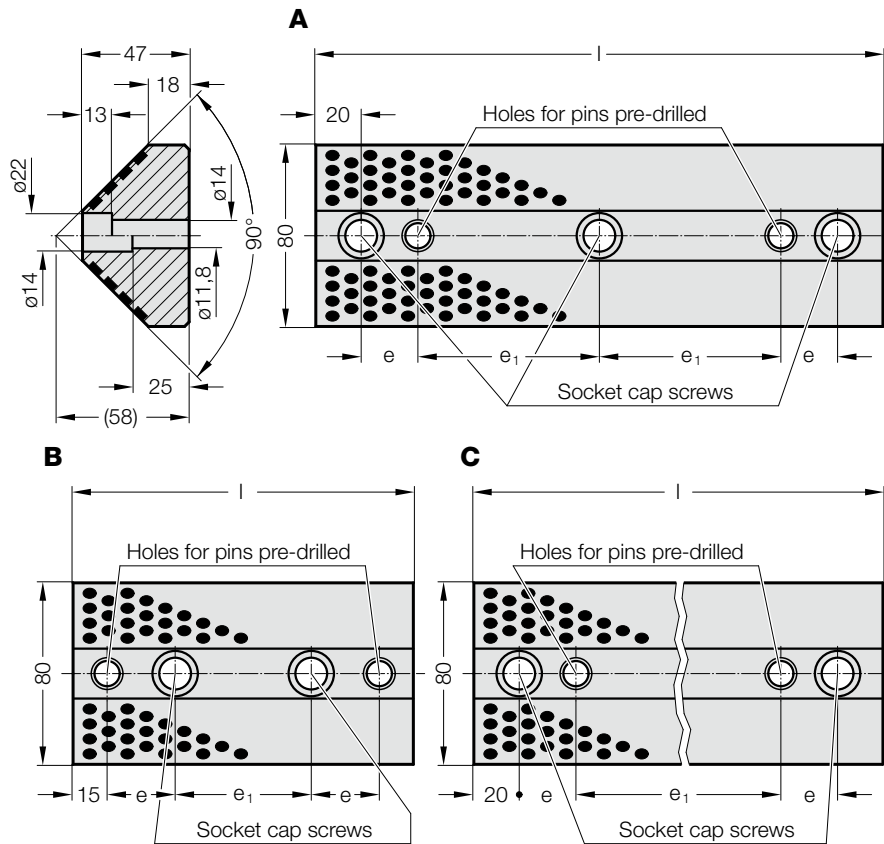
Use socket cap screws DIN EN ISO 4762 M12.

**2963.81. Prismatic guide, Steel**

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2963.81.095.057.0150	B	150	30	60	2
2963.81.095.057.0200	C	200	25	110	2
2963.81.095.057.0250	A	250	25	80	3
2963.81.095.057.0300	A	300	30	100	3

# SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT

2963.80.



**Material:**

Bronze with solid lubricant, oilless lubricating

**Note:**

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.

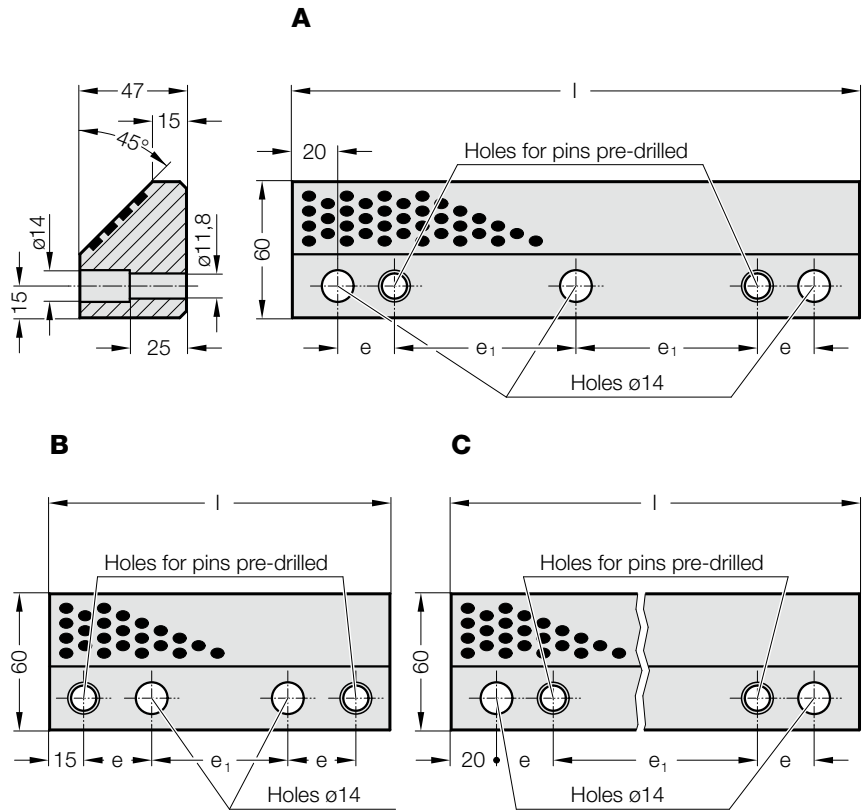
**2963.80. Sliding block, Bronze with solid lubricant**

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2963.80.080.047.0150	B	150	30	60	2
2963.80.080.047.0200	C	200	25	110	2
2963.80.080.047.0250	A	250	25	80	3
2963.80.080.047.0300	A	300	30	100	3

# SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT



2965.81.



**Material:**

Bronze with solid lubricant, oilless lubricating

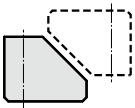
**Note:**

Matching single-sided prismatic sliding blocks 2965.83.

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.

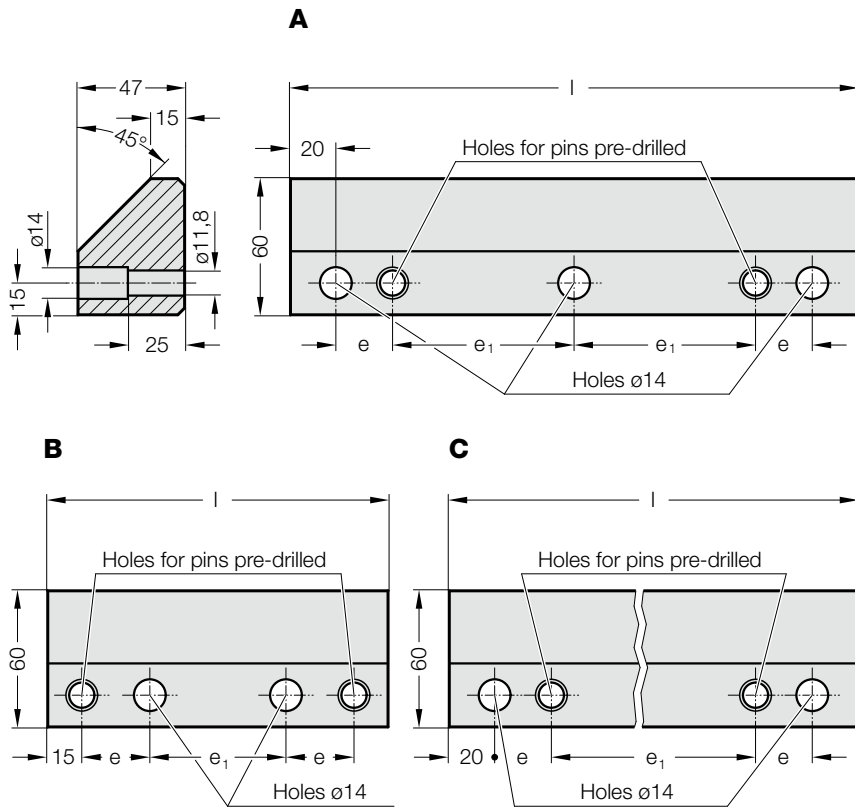


**2965.81. Single-sided prismatic guide, Bronze with solid lubricant**

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.81.060.047.0150	B	150	30	60	2
2965.81.060.047.0200	C	200	25	110	3
2965.81.060.047.0250	A	250	25	80	3
2965.81.060.047.0300	A	300	30	100	3

# SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL

2965.83.



**Material:**

Steel, sliding faces surface hardened

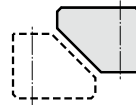
**Note:**

Matching single-sided prismatic guides 2965.81.

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.



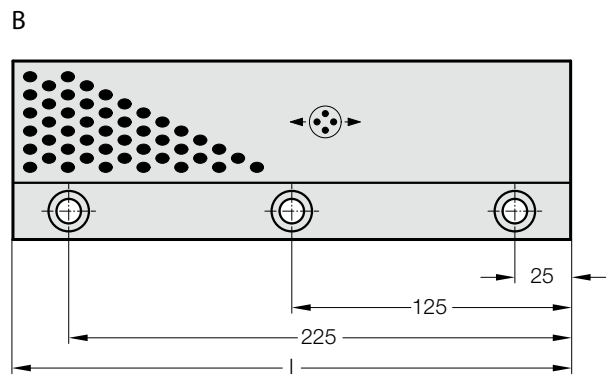
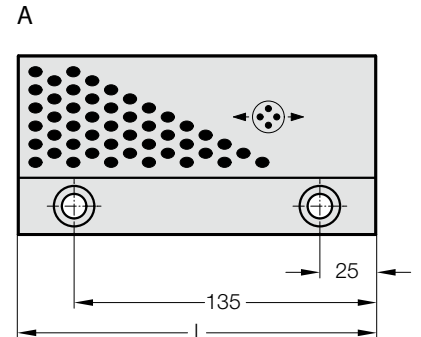
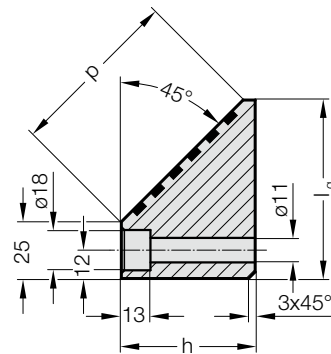
**2965.83. Single-sided prismatic sliding block, Steel**

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.83.060.047.0150	B	150	30	60	2
2965.83.060.047.0200	C	200	25	110	3
2965.83.060.047.0250	A	250	25	80	3
2965.83.060.047.0300	A	300	30	100	3

# SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT, CNOMO



2965.80.45.



**Material:**

Bronze with solid lubricant, oilless lubricating

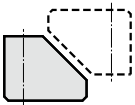
**Note:**

Matching single-sided prismatic sliding blocks 2965.82.45.

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.

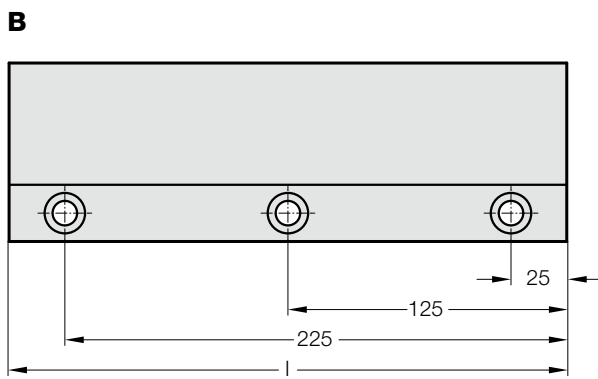
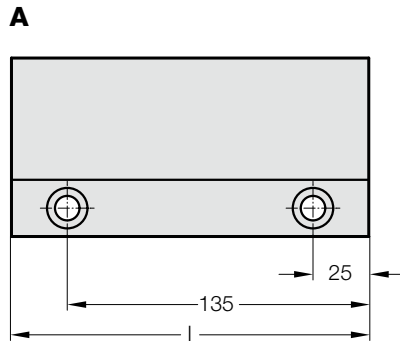
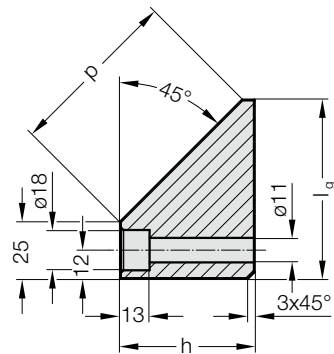


**2965.80.45. Single-sided prismatic guide, Bronze with solid lubricant, CNOMO**

Order No	Shape	$l_g$	$h$	$l$	$p$	Number of screw holes
2965.80.45.060.045.160	A	60	45	160	50	2
2965.80.45.060.045.250	B	60	45	250	50	3
2965.80.45.080.060.160	A	80	60	160	80	2
2965.80.45.080.060.250	B	80	60	250	80	3

# SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL, CNOMO

2965.82.45.



**Material:**

Steel, sliding faces surface hardened

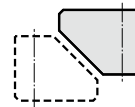
**Note:**

Matching single-sided prismatic guides 2965.80.45.

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M10.



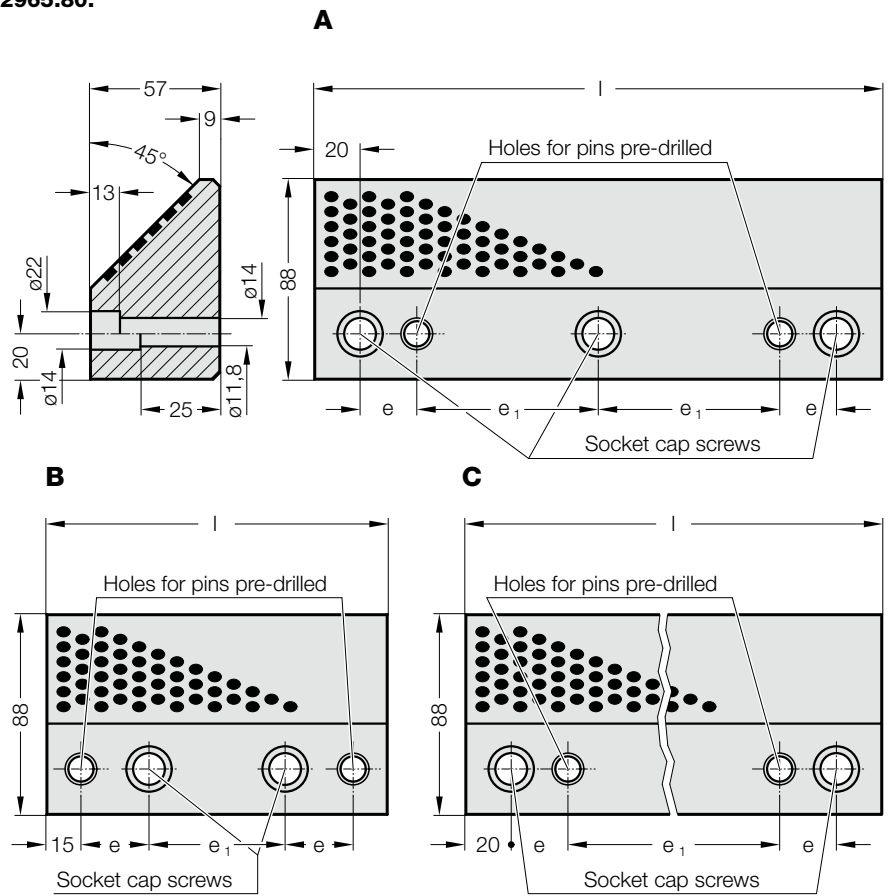
**2965.82.45. Single-sided prismatic sliding block, Steel, CNOMO**

Order No	Shape	lg	h	l	p	Number of screw holes
2965.82.45.060.045.160	A	60	45	160	50	2
2965.82.45.060.045.250	B	60	45	250	50	3
2965.82.45.080.060.160	A	80	60	160	80	2
2965.82.45.080.060.250	B	80	60	250	80	3

# SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT



2965.80.



**Material:**

Bronze with solid lubricant, oilless lubricating

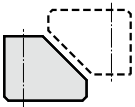
**Note:**

Matching single-sided prismatic sliding blocks 2965.82.

Screws and pins are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 M12.



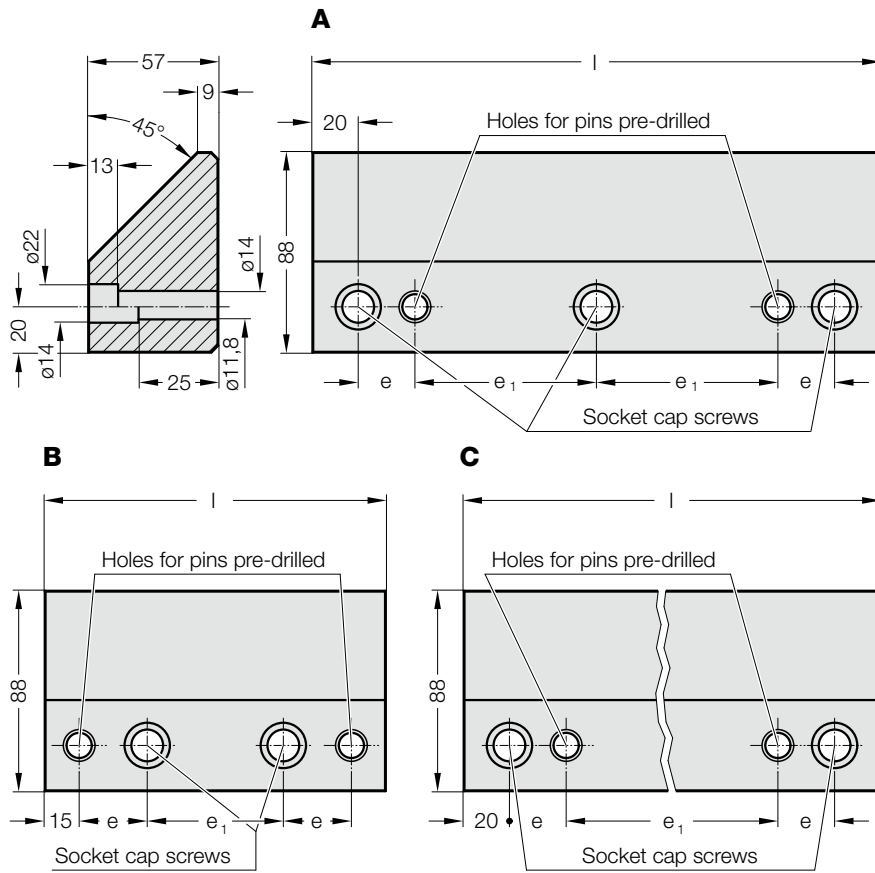
**2965.80. Single-sided prismatic guide, Bronze with solid lubricant**

Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.80.088.057.0150	B	150	30	60	2
2965.80.088.057.0200	C	200	25	110	3
2965.80.088.057.0250	A	250	25	80	3
2965.80.088.057.0300	A	300	30	100	3



# SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL

2965.82.



**Material:**

Steel, sliding faces surface hardened

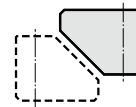
**Note:**

Matching single-sided prismatic guides 2965.80.

Screws and pins are not included.

**Fixing:**

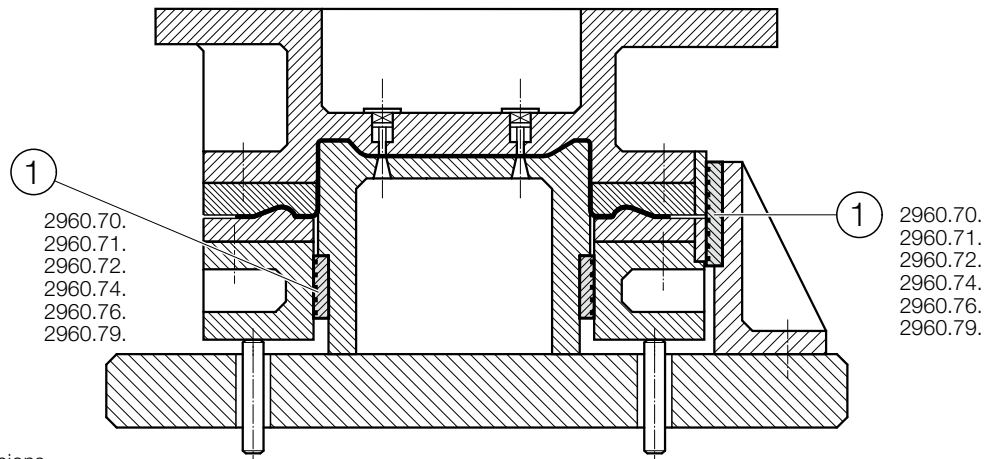
Use socket cap screws DIN EN ISO 4762 M12.



**2965.82. Single-sided prismatic sliding block, Steel**

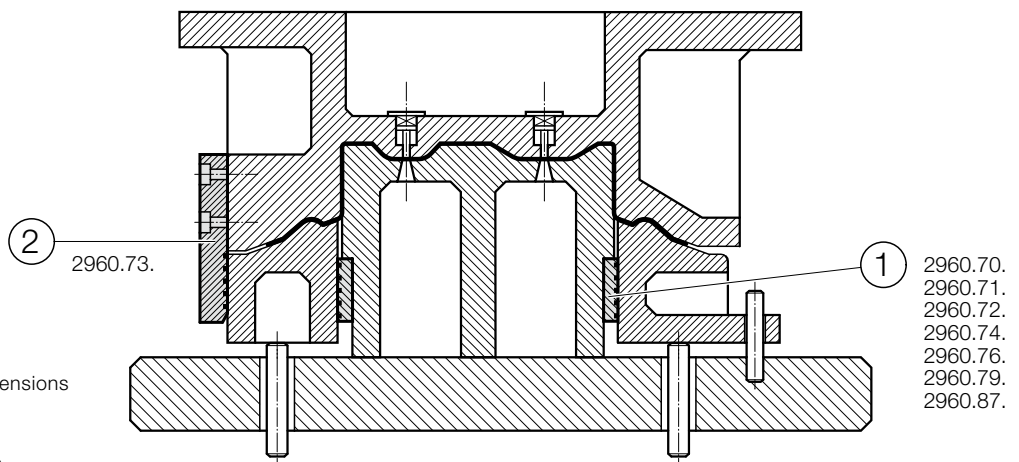
Order No	Shape	l	e	e <sub>1</sub>	Number of screw holes
2965.82.088.057.0150	B	150	30	60	2
2965.82.088.057.0200	C	200	25	110	3
2965.82.088.057.0250	A	250	25	80	3
2965.82.088.057.0300	A	300	30	100	3

# OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES



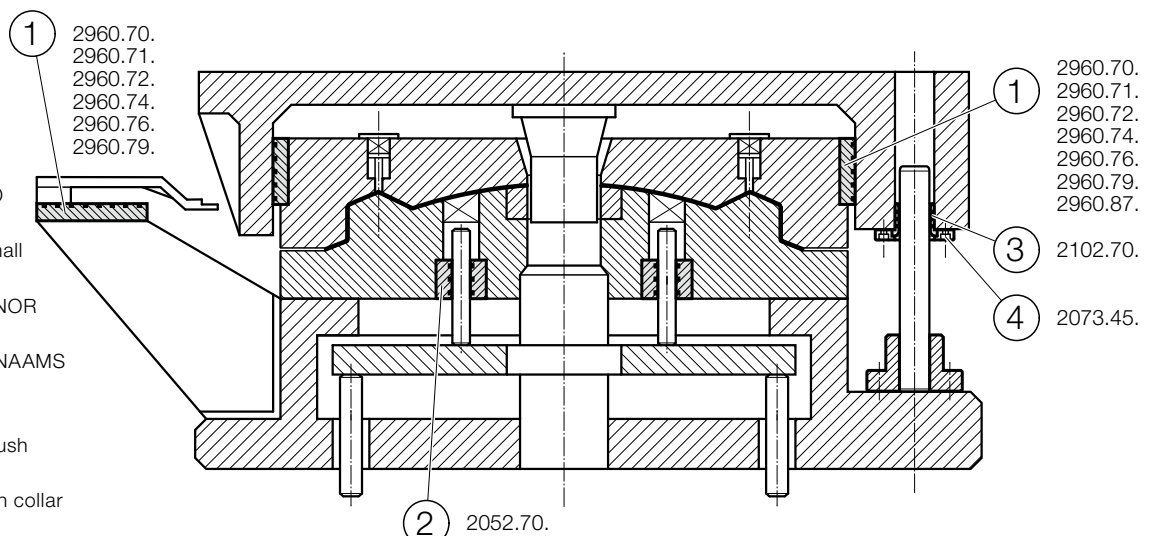
- Pos. 1  
 2960.70. Sliding pad ISO  
 2960.71. Sliding pad VDI  
 2960.72. Sliding pad, small dimensions  
 2960.74. Sliding pad AFNOR  
 2960.76. Sliding pad  
 2960.79. Sliding pad to NAAMS

- 2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.



- Pos. 1  
 2960.70. Sliding pad ISO  
 2960.71. Sliding pad VDI  
 2960.72. Sliding pad, small dimensions  
 2960.74. Sliding pad AFNOR  
 2960.76. Sliding pad  
 2960.79. Sliding pad to NAAMS  
 2960.87. Sliding pad VDI  
 Pos. 2  
 2960.73. Guide Bracket VDI

- 2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.  
 2960.87.

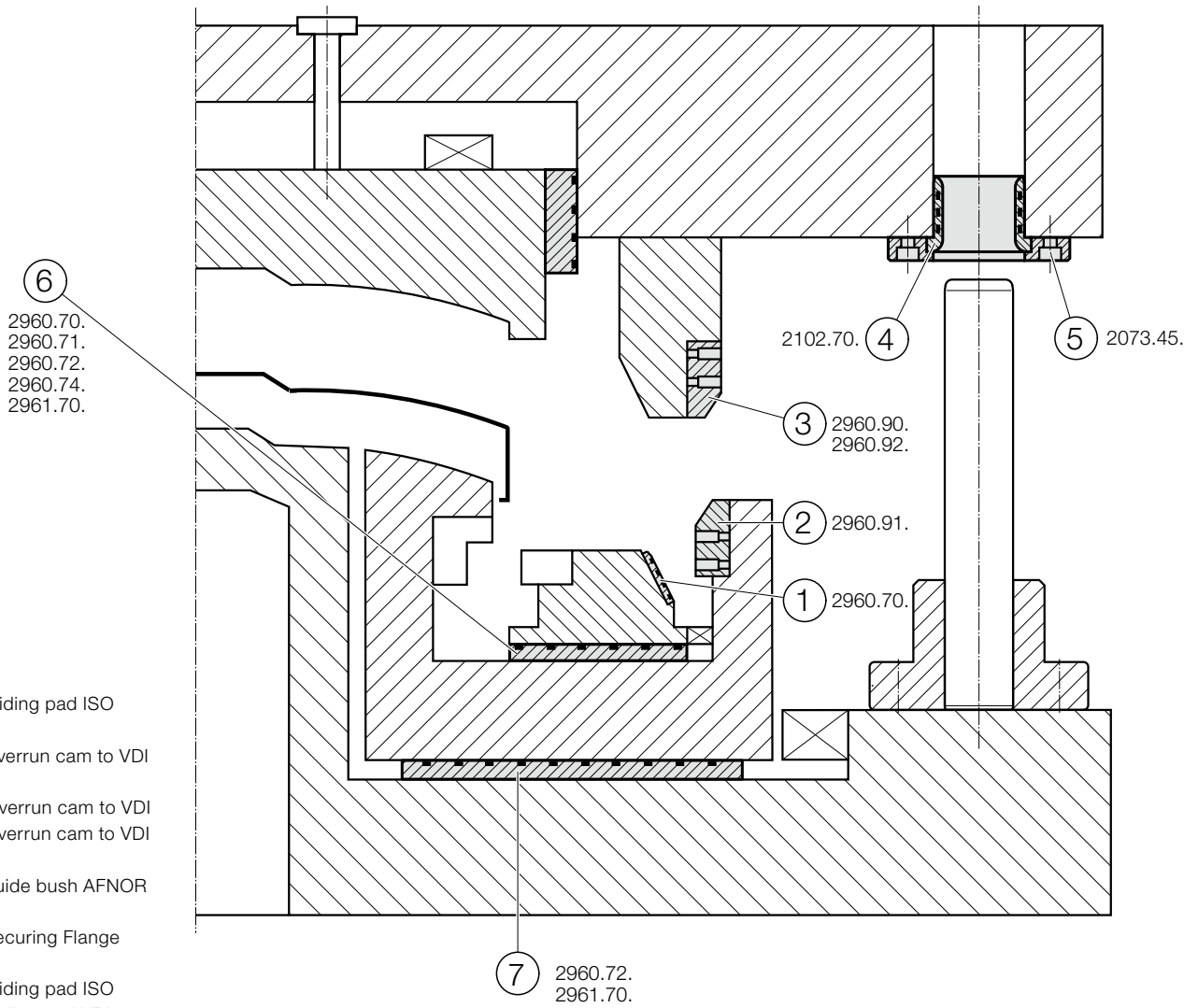


- Pos. 1  
 2960.70. Sliding pad ISO  
 2960.71. Sliding pad VDI  
 2960.72. Sliding pad, small dimensions  
 2960.74. Sliding pad AFNOR  
 2960.76. Sliding pad  
 2960.79. Sliding pad to NAAMS  
 2960.87. Sliding pad VDI  
 Pos. 2  
 2052.70. Oilless guide bush  
 Pos. 3  
 2102.70. Guide bush with collar AFNOR  
 Pos. 4  
 2073.45. Securing flange

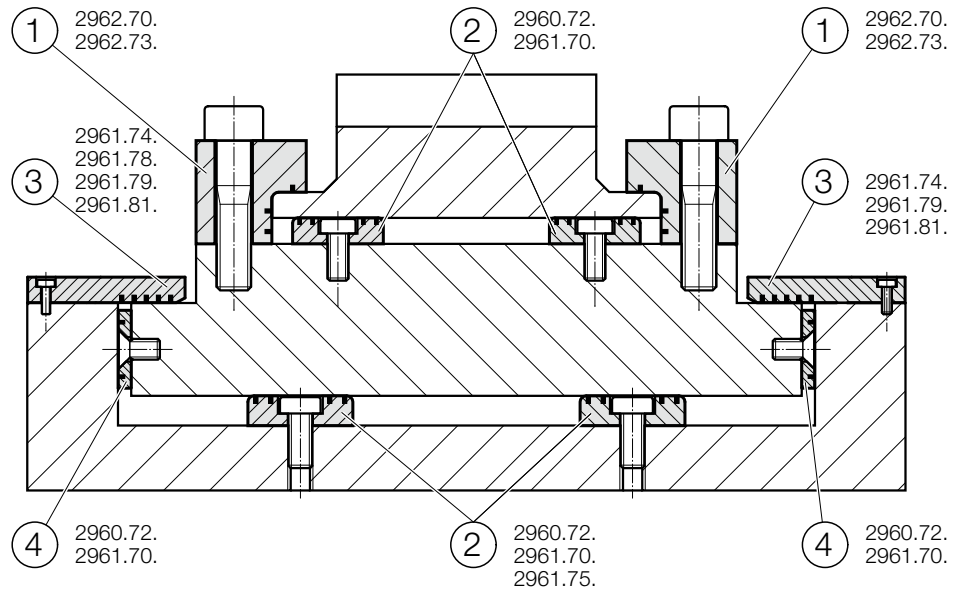
- 2960.70.  
 2960.71.  
 2960.72.  
 2960.74.  
 2960.76.  
 2960.79.  
 2960.87.

- 2102.70.  
 2073.45.

# OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES

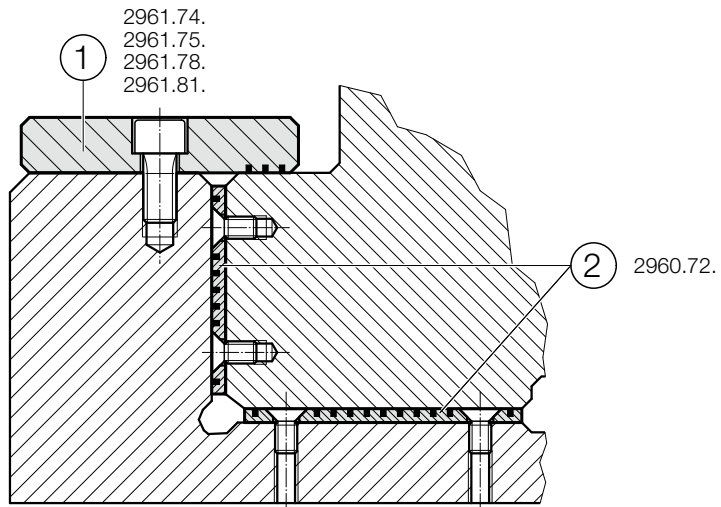


- Pos. 1  
2960.70. Sliding pad ISO
- Pos. 2  
2960.91. Overrun cam to VDI
- Pos. 3  
2960.90. Overrun cam to VDI  
2960.92. Overrun cam to VDI
- Pos. 4  
2102.70. Guide bush AFNOR
- Pos. 5  
2073.45. Securing Flange
- Pos. 6  
2960.70. Sliding pad ISO  
2960.71. Sliding pad VDI  
2960.72. Sliding pad, small dimensions  
2960.74. Sliding pad AFNOR  
2961.70. Flat guide bar
- Pos. 7  
2960.72. Sliding pad, small dimensions  
2961.70. Flat guide bar

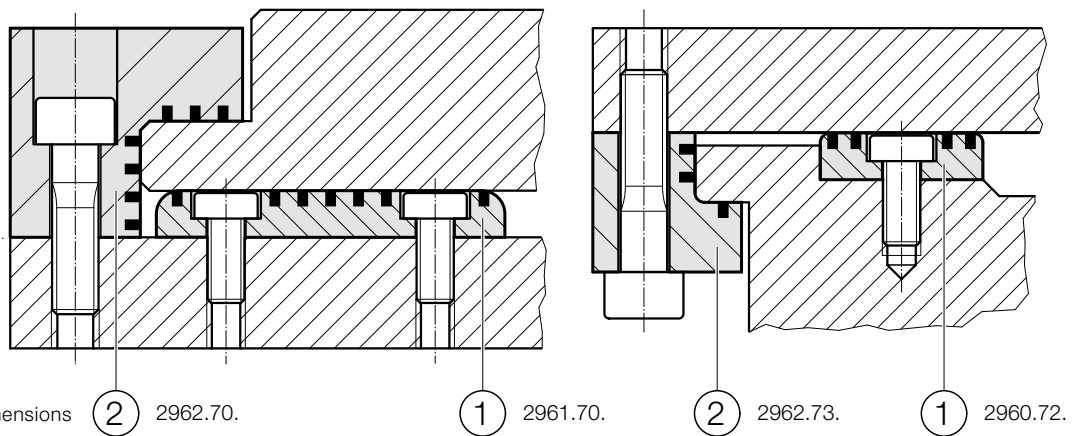


- Pos. 1  
2962.70. Angled guide gib  
2962.73. Angled guide gib
- Pos. 2  
2960.72. Sliding pad, small dimensions  
2961.70. Flat guide bar  
2961.75.
- Pos. 3  
2961.74. Retaining plate to VDI  
2961.79.  
2961.81.
- Pos. 4  
2960.72. Sliding pad, small dimensions  
2961.70. Flat guide bar

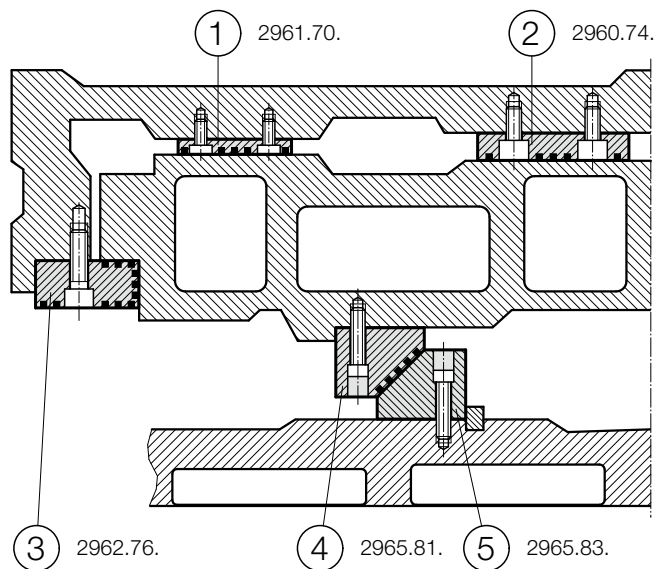
# OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES



- Pos. 1  
2961.74. Retaining plate to VDI
- Pos. 2  
2960.72. Sliding pad, small dimensions

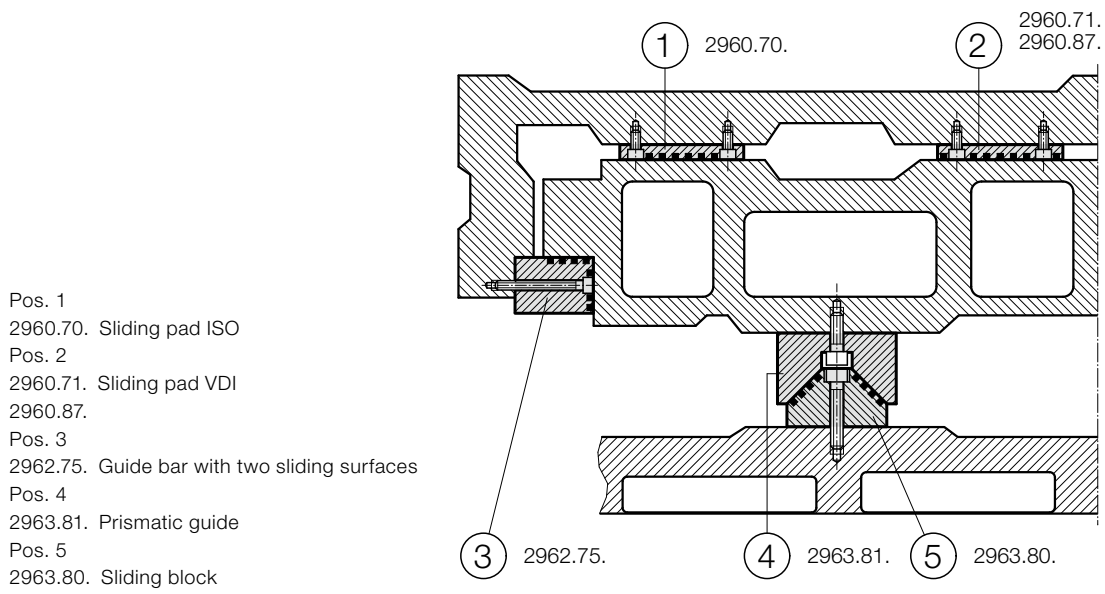


- Pos. 1  
2961.70. Flat guide bar
- Pos. 2  
2962.70. Angled guide gib
- Pos. 2  
2960.72. Sliding pad, small dimensions
- Pos. 1  
2961.70. Flat guide bar
- Pos. 2  
2962.73. Angled guide gib



- Pos. 1  
2961.70. Guide bar
- Pos. 2  
2960.74. Sliding pad AFNOR
- Pos. 3  
2962.76. Guide bar with three sliding surfaces
- Pos. 4  
2965.81. Single-sided prismatic guide (Bronze)
- Pos. 5  
2965.83. Single-sided prismatic sliding block (Steel)

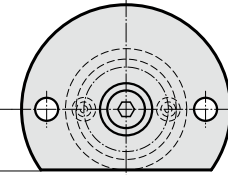
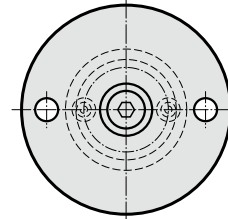
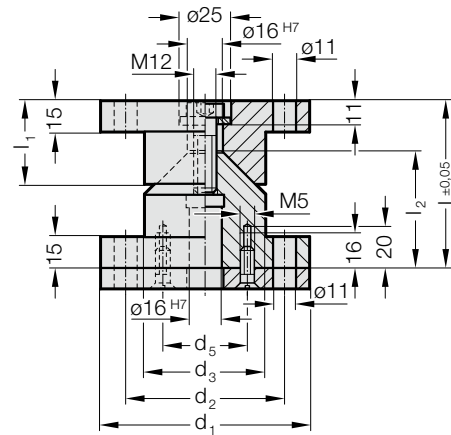
## OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES



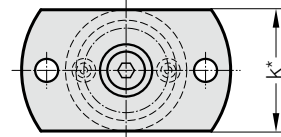
# CENTERING UNIT WITH ADJUSTING WASHER



2441.11.0.



$$k^*/2 = d_3/2$$



$$k^* = d_3$$

**Material:**

Centring Units: 16MnCr5, heat treated  
 Conical surfaces induction hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm  
 Adjusting washer: C45 or similar

**Note:**

Centring unit complete with adjusting washer.  
 Screws are included.

2441.11.0.□□□

Centring unit with adjusting washer

2441.11.0.□□□.1

Centring unit with one flat side with adjusting washer

2441.11.0.□□□.2

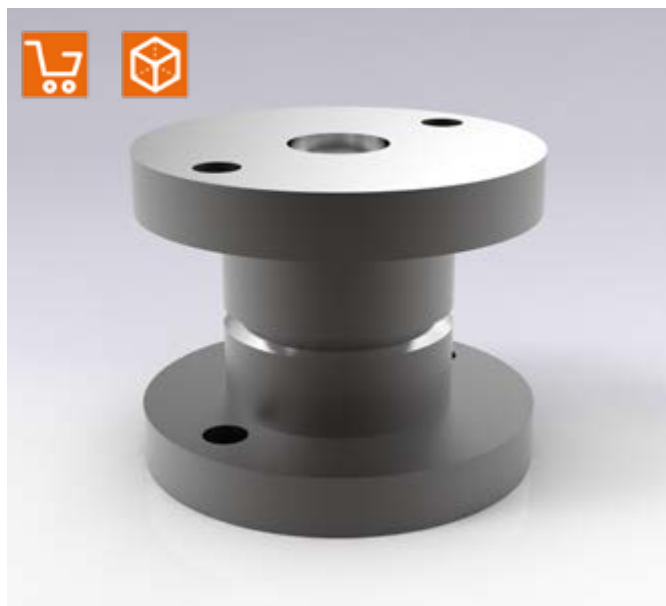
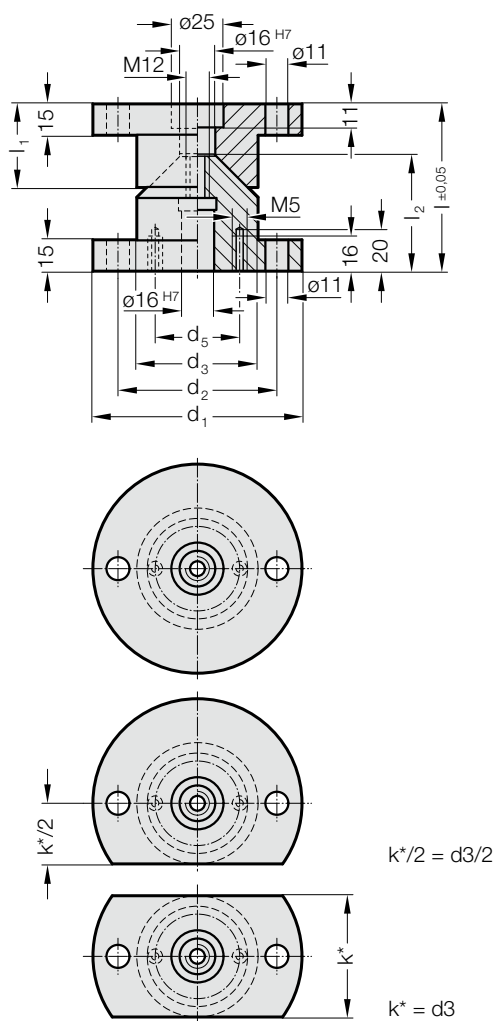
Centring unit with two flat sides with adjusting washer

**2441.11.0. Centering unit with adjusting washer**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>5</sub>	l	l <sub>1</sub>	l <sub>2</sub>
2441.11.0.100	100	76	58	40.5	80	40	55
2441.11.0.100.1	100	76	58	40.5	80	40	55
2441.11.0.100.2	100	76	58	40.5	80	40	55
2441.11.0.120	120	96	78	50.5	90	50	65
2441.11.0.120.1	120	96	78	50.5	90	50	65
2441.11.0.120.2	120	96	78	50.5	90	50	65

# CENTERING UNIT

2441.11.



**Material:**

16MnCr5, heat treated  
 Conical surfaces induction hardened  
 Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

**Note:**

Adjusting washer 2441.11.3. to be ordered separately.  
 Screws are not included.

2441.11.□□□

Centering unit

2441.11.□□□.1

Centering unit with one flat side

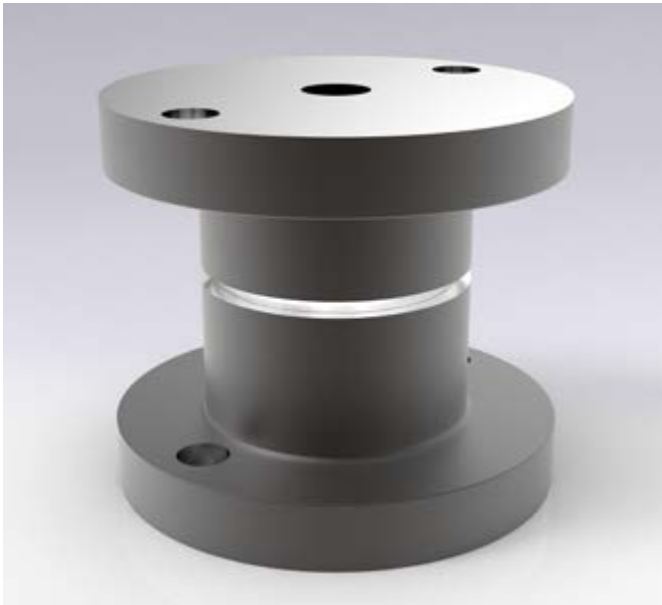
2441.11.□□□.2

Centering unit with two flat sides

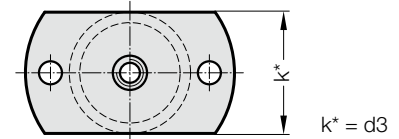
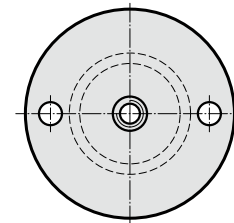
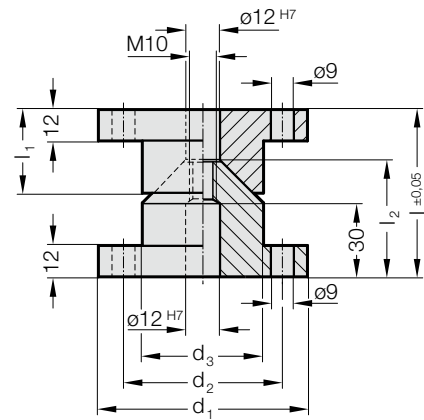
**2441.11. Centering unit**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>5</sub>	l	l <sub>1</sub>	l <sub>2</sub>
2441.11.100	100	76	58	40.5	80	40	55
2441.11.100.1	100	76	58	40.5	80	40	55
2441.11.100.2	100	76	58	40.5	80	40	55
2441.11.120	120	96	78	50.5	90	50	65
2441.11.120.1	120	96	78	50.5	90	50	65
2441.11.120.2	120	96	78	50.5	90	50	65

# CENTERING UNIT, BMW



2441.11.15.



## Material:

16MnCr5, heat treated

Conical surfaces induction hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

## Note:

Spacer, BMW 2441.11.15.3. order separately.

Delivery without screws

2441.11.15..□□□

Centring unit BMW

2441.11.15.□□□.2

Centring unit, BMW with bevel on both sides

## 2441.11.15. Centring unit, BMW

Order No	$d_1$	$d_2$	$d_3$	$l$	$l_1$	$l_2$
2441.11.15.080	80	63	48	70	37	47
2441.11.15.080.2	80	63	48	70	37	47

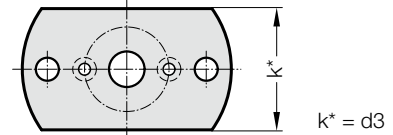
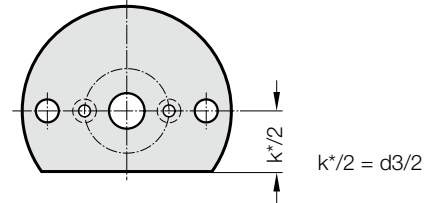
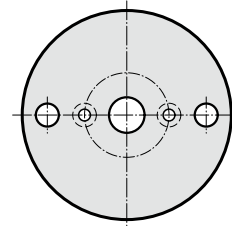
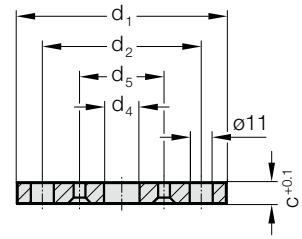




# ADJUSTING WASHER



2441.11.3.



**Material:**

C45 or similar

**Note:**

2441.11.3.□□□  
Adjusting washer

2441.11.3.□□□.1  
Adjusting washer with one flat side

2441.11.3.□□□.2  
Adjusting washer with two flat sides

**2441.11.3. Adjusting washer**

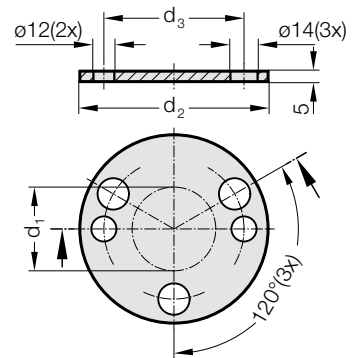
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>4</sub>	d <sub>5</sub>	c	k
2441.11.3.100	100	76	17	40.5	9.8	-
2441.11.3.100.1	100	76	17	40.5	9.8	58
2441.11.3.100.2	100	76	17	40.5	9.8	58
2441.11.3.105	105	76	18	40.5	5.5	-
2441.11.3.120	120	96	17	50.5	9.8	-
2441.11.3.120.1	120	96	17	50.5	9.8	78
2441.11.3.120.2	120	96	17	50.5	9.8	78
2441.11.3.125	125	96	18	50.5	5.5	-



## ADJUSTING WASHER, CNOMO



2441.13.3.45.



**Material:**

Cf 70 (1.1249)

**Note:**

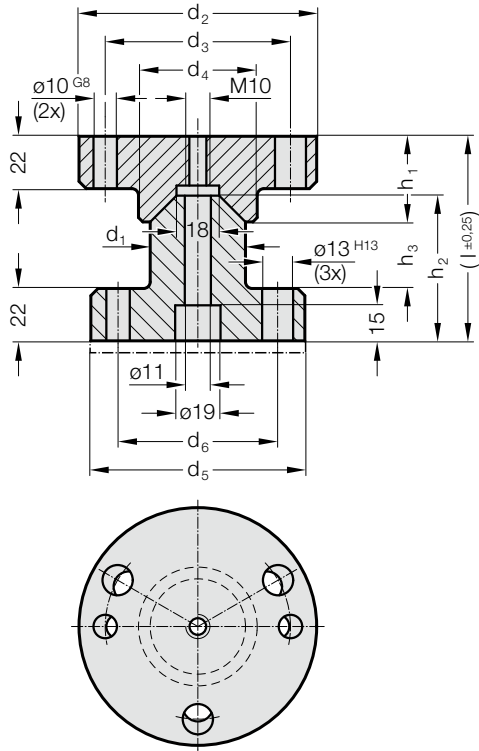
Adjusting washer for centring unit 2441.13.45.

**2441.13.3.45. Adjusting washer, CNOMO**

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>
2441.13.3.45.040	40	90	67
2441.13.3.45.060	60	110	89

# CENTERING UNIT, CNOMO

2441.13.



## Material:

16MnCr5, heat treated

Conical surfaces induction hardened

Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

## Note:

Order No for centring unit to CNOMO with adjusting washer: 2441.13.0.

Screws and pins are not included.

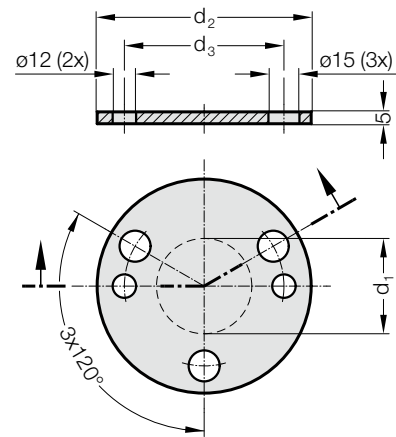
## 2441.13. Centering unit, CNOMO

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	d <sub>6</sub>	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	l
2441.13.040	40	100	79	50	90	67	36	61	28	86
2441.13.060	60	125	104	70	110	89	46	61	18	86

# ADJUSTING WASHER, CNOMO



2441.13.3.



**Material:**

100 Cr 6

**Note:**

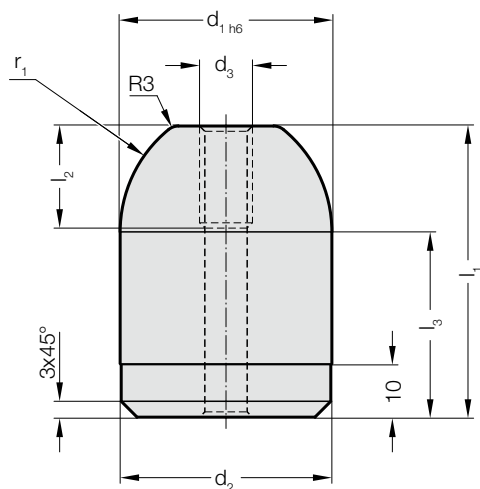
Adjusting washer for centring unit 2441.13.

**2441.13.3. Adjusting washer, CNOMO**

Order No	$d_1$	$d_2$	$d_3$
2441.13.3.040	40	90	67
2441.13.3.060	60	110	89

# CENTERING PIN

2445.10.



## 2445.10. Centering pin

Order No		d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	r <sub>1</sub>
2445.10.022.045	1), 2)	22	21.95	M8	45	16	35	15
2445.10.022.055	2)	22	21.95	M8	55	16	45	15
2445.10.032.050	1)	32	31.95	M10	50	20	35	20
2445.10.040.055	1), 2)	40	39.95	M10	55	20	35	25
2445.10.040.065	2)	40	39.95	M10	65	20	45	25
2445.10.040.085	2)	40	39.95	M10	85	20	65	25
2445.10.050.055	1)	50	49.95	M10	55	20	35	25
2445.10.056.080	1)	56	55.95	M10	80	20	60	30

### Description:

Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

### Material:

Steel, hardened

### Note:

Screws are not included.

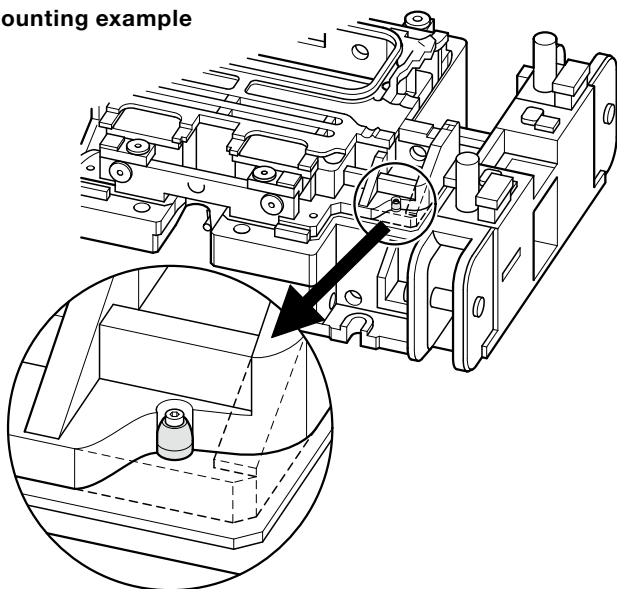
1) to BMW standard

2) to VW standard

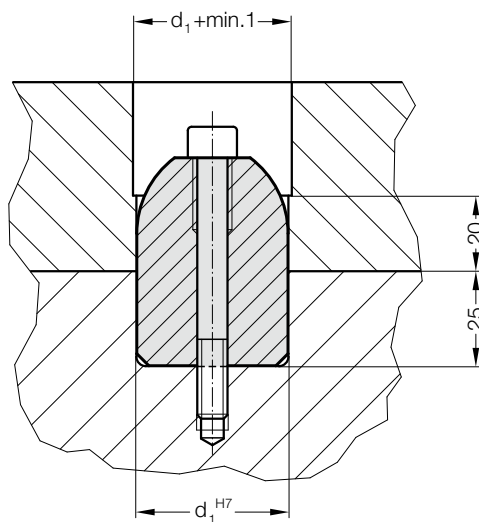
### Fixing:

Use socket cap screws DIN EN ISO 4762 M6/M8.

### Mounting example



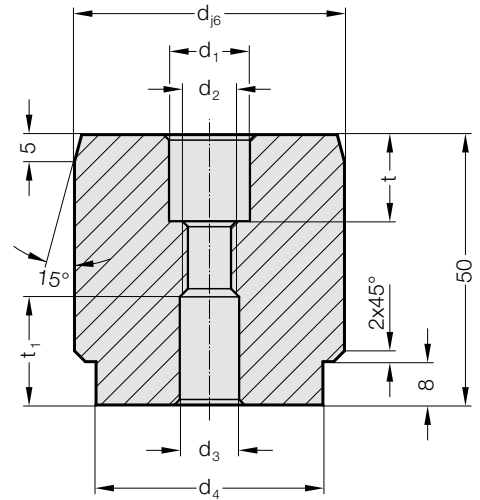
### Mounting example



# CENTERING PIN TO MERCEDES-BENZ STANDARD



2445.11.



**Description:**

Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

**Material:**

Steel, hardened

**Note:**

Screws are not included.

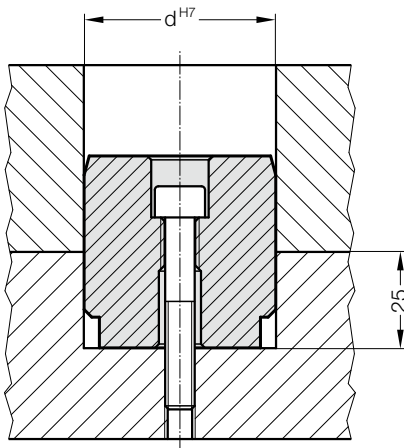
**Fixing:**

Use socket cap screws DIN EN ISO 4762 M6/M8.

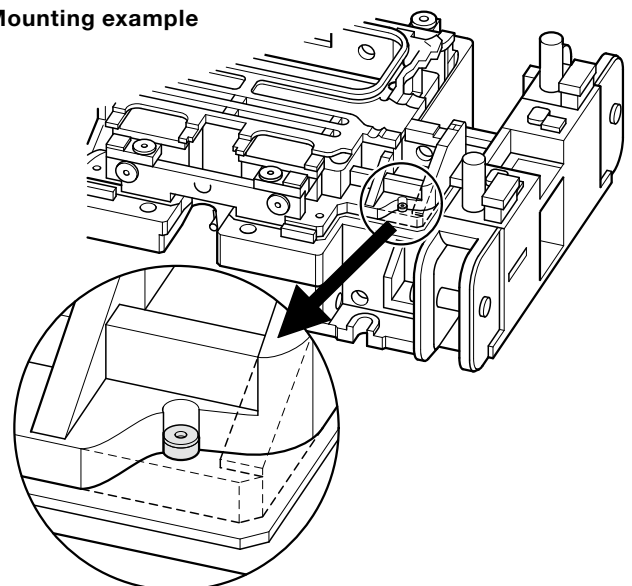
**2445.11. Centering pin to Mercedes-Benz Standard**

Order No	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	t	t <sub>1</sub>
2445.11.022	22	11	M8	9	16	13	16
2445.11.025	25	11	M8	9	18	13	16
2445.11.032	32	11	M8	9	25	13	16
2445.11.040	40	15	M10	11	32	16	20
2445.11.050	50	15	M10	11	42	16	20

**Mounting example**



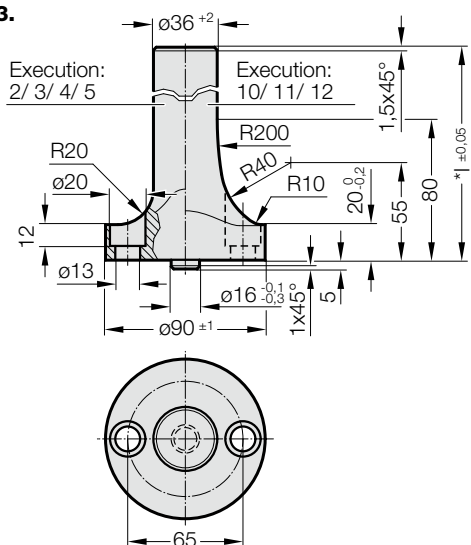
**Mounting example**



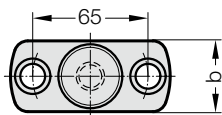


## PRESSURE BOLT WITH BASE, ACCORDING TO VW

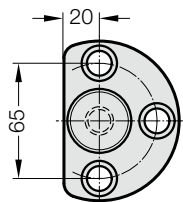
2446.10.55.03.



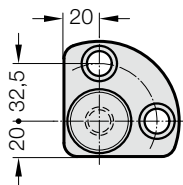
2446.10.55.02. / 2446.10.55.10. / 2446.10.55.11.



2446.10.55.04.



2446.10.55.05. / 2446.10.55.12.



### Description:

Pressure bolts with base are used to transfer force from the pressure cushion of the press to the tool.

### Material:

C45 (1.0503), heat-treated 800 - 1000 N/mm<sup>2</sup>

### Execution:

drop-forged

### Note:

Screws are not included.

### 2446.10.55. Pressure bolt with base, according to VW

Order No	Shape	b	l*	Gradation
2446.10.55.02.150	2	40	150 - 360	1
2446.10.55.03.150	3	-	150 - 360	1
2446.10.55.04.150	4	-	150 - 360	1
2446.10.55.05.150	5	-	150 - 360	1
2446.10.55.10.150	10	60	150 - 360	1
2446.10.55.11.150	11	40	150 - 360	1
2446.10.55.12.150	12	-	150 - 360	1

\*to customer's specifications!

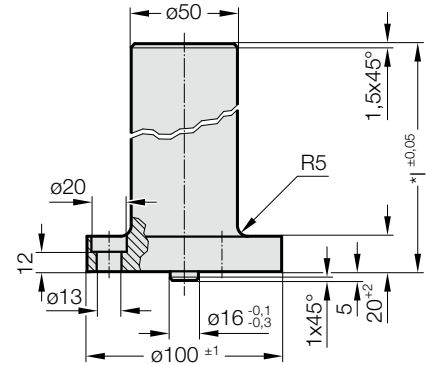
### Ordering Code (example):

Pressure bolt with base, according to VW = 2446.10.55.  
 Execution Shape 4 = 04.  
 Length l 150 mm = 150  
 Order No = 2446.10.55. 04. 150

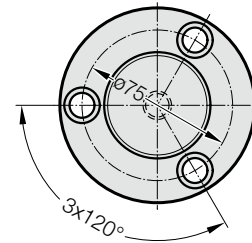
# AIR PIN, ACCORDING TO VW STANDARD



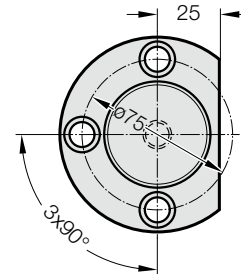
2446.11.55.



2446.11.55.11.



2446.11.55.12.



## Description:

Air pins are used to transfer force from the pressure cushion of the press to the tool.

## Material:

C45 (1.0503), heat-treated 800 - 1000 N/mm<sup>2</sup>  
alternative C60 (1.0601)

## Execution:

drop-forged

## Note:

Screws are not included.

## 2446.11.55. Air pin, according to VW standard

Order No	Execution	l*	Gradation
2446.11.55.11.150	11	150 - 440	1
2446.11.55.12.150	12	150 - 440	1

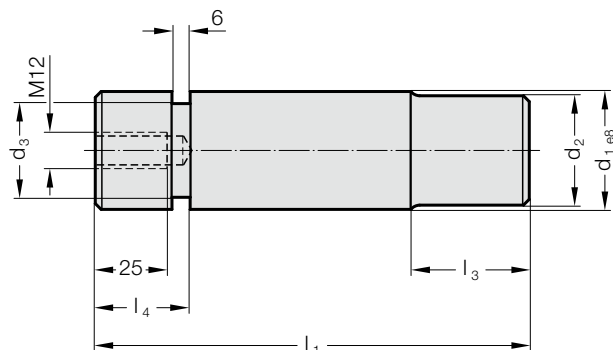
\*to customer's specifications!

## Ordering Code (example):

Air pin, according to VW standard	=	2446.11.55.
Execution Shape	12	= 12.
Length l	150 mm	= 150
Order No	=	2446.11.55. 12. 150

# LOCKING PIN, ACCORDING TO VW

2446.12.55.



## Description:

Locking pins are used to hold and secure the pad in tools

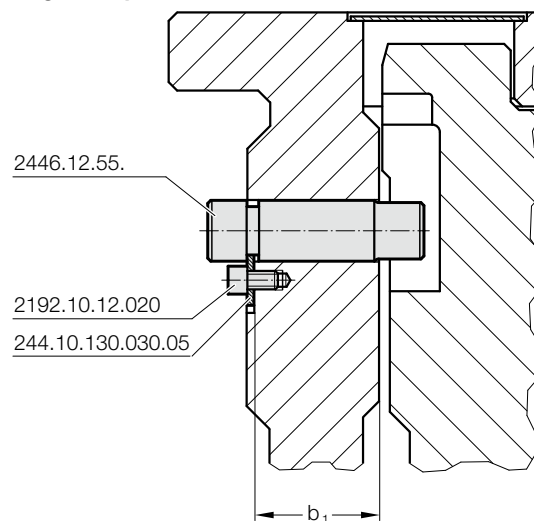
## Material:

C45 (1.0503), heat-treated 800 - 1000 N/mm<sup>2</sup>

## Note:

Supplied with sheave and screw

## Mounting example



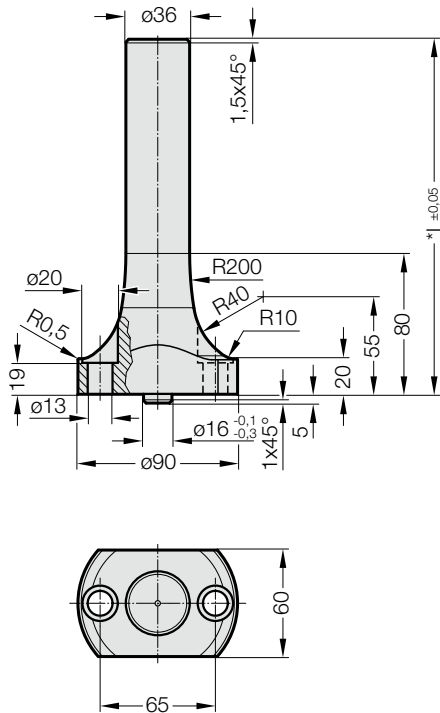
## 2446.12.55. Locking pin, according to VW

Order No	$d_1$	$d_2$	$d_3$	$l_1$	$l_3$	$l_4$	$r$	$b_1$	max. load capacity per stud dyn. loading [kg]
2446.12.55.032.105	32	29	24	105	25	22	4	63	500
2446.12.55.032.122	32	29	24	122	25	22	4	80	500
2446.12.55.040.139	40	37	32	139	32	32	5	80	750
2446.12.55.040.159	40	37	32	159	32	32	5	100	750
2446.12.55.050.167	50	47	42	167	40	32	6	100	1250
2446.12.55.050.192	50	47	42	192	40	32	6	125	1250
2446.12.55.063.202	63	60	55	202	50	32	6	125	2500
2446.12.55.063.237	63	60	55	237	50	32	6	160	2500



# TOP AIR BOLTS, BMW

2446.10.15.



## Description:

Top air bolts are used for transmitting power from the pressure pad of the power press to the tool.

## Material:

C45 (1.0503), heat-treated 800 - 1000 N/mm<sup>2</sup>

## Execution:

drop-forged

## Note:

Delivery with two screws according to DIN EN ISO 4762 - M12x40 - 12.9

## 2446.10.15. Top air bolts, BMW

Order No	$l^*$	Gradation	max. spring loading (kN)
2446.10.15.10.□□□	150 - 250	1	50

\*to customer's specifications!

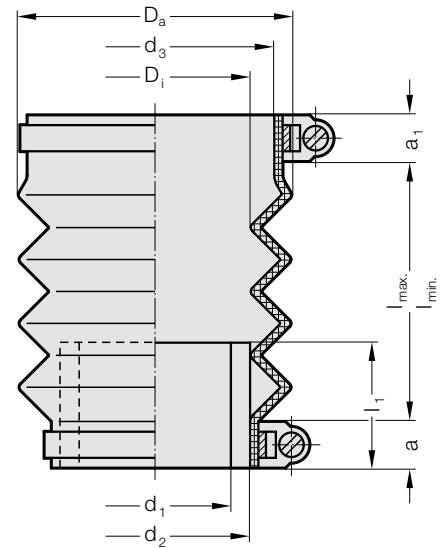
## Ordering Code (example):

Top air bolts, BMW	=	2446.10.15.
Execution Shape	10	= 10.
Length l	150 mm	= 150
Order No	=	2446.10.15. 10. 150

# CONCERTINA SHROUD WITH SPACER BUSH



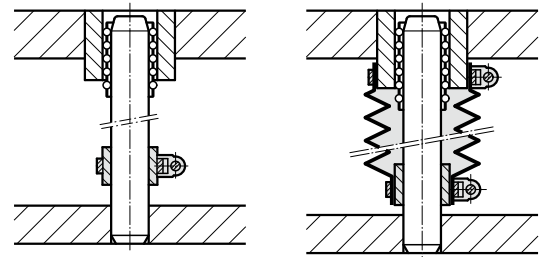
206.91.



## Note:

Concertina Shrouds are supplied complete with spacer bush and two hose clamps.  
Special sizes on request.

## Mounting example



## 206.91. Concertina shroud with spacer bush

for guide bushes	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2081.	2081.	2081.	2081.	2081.	2081.	2081.						
Pillar- $\varnothing$ $d_1$	19	20	24	25	30	32	38	40	48	50	60	63	19	20	24	25	30	32	38	40	48	50	60	63	
$d^*$	20	25	32	38	40	50	60	63	76	76	76	76	39	45	54	63	74	94	94						
$d_2$	25	30	40	50	60	70	70	70	70	70	70	70	25	30	40	50	60	70	70						
$d_3$	32	38	46	55	64	76	76	76	76	76	76	76	39	45	54	63	74	94	94						
$d_4^{**}$	32	38	48	58	68	79	79	79	79	79	79	79	40	45	54	66	80	95	95						
$D_1$	30	30	46	55	62	75	75	75	75	75	75	75	32	32	45	52	62	75	75						
$D_a$	51	56	72	87	86	100	100	100	100	100	100	100	54	56	63	96	84	104	104						
$a$	13	13	20	12	12	12	12	12	12	12	12	12	10	10	10	12	12	10	10						
$a_1$	16	13	20	12	12	10	10	10	10	10	10	10	10	10	10	12	12	10	10						
$l_1$	20	30	30	40	40	40	40	40	40	40	40	40	20	30	30	40	40	40	40						
$l_{min}$	30	25	20	44	25	30	30	30	30	30	30	30	37	35	35	25	45	35	35						
$l_{max}$	170	130	100	119	110	130	130	130	130	130	130	130	145	110	110	225	165	185	185						

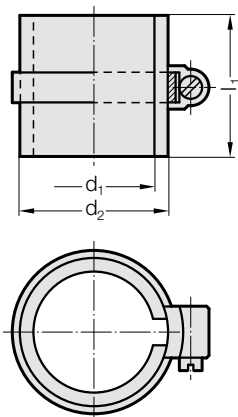
\* $d$  = Nominal diameter, \*\* $d_4$  = Nominal ordering diameter for flange diameter

## Ordering Code (example):

Concertina shroud with spacer bush	=	206.91.
Nominal diameter $d$	20 mm =	020.
Nominal order diameter for flange connection diameter $d_4$	40 mm =	040
Order No	=	206.91. 020. 040

# SPACER BUSH SPACER TUBE

206.93.



## 206.93. Spacer bush

Pillar-ø d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60	63
d*	16	20	25	32	40	50	60	63
d <sub>2</sub>	20	25	30	40	50	60	70	70
l <sub>1</sub>	20	20	30	30	40	40	40	40

\*d = Nominal diameter

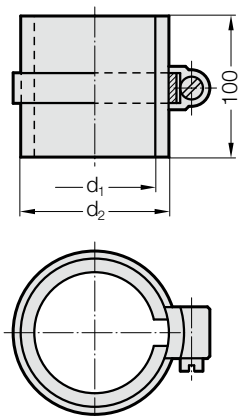
### Material:

PMMA, PLEXIGLAS®

### Ordering Code (example):

Spacer bush	=206.93.
Nominal diameter d 40 mm	= 040
Order No	=206.93. 040

206.94.



## 206.94. Spacer tube

Pillar-ø d <sub>1</sub>	15 16	19 20	24 25	30 32	38 40	48 50	60	63
d*	16	20	25	32	40	50	60	63
d <sub>2</sub>	20	25	30	40	50	60	70	70
l <sub>1</sub>	100	100	100	100	100	100	100	100

\*d = Nominal diameter

### Material:

PMMA, PLEXIGLAS®

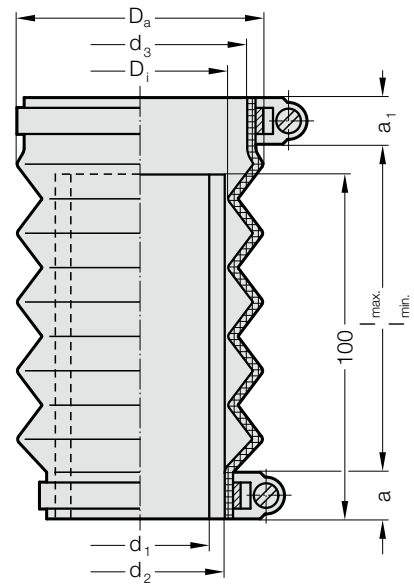
### Ordering Code (example):

Spacer tube	= 206.94.
Nominal diameter d 40 mm	= 040
Order No	= 206.94. 040

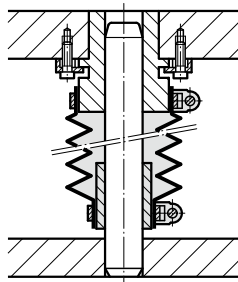
# CONCERTINA SHROUD WITH SPACER TUBE



206.92.



## Mounting example



## Note:

Concertina Shrouds are supplied complete with spacer tube and two hose clamps.  
Special sizes on request.

## 206.92. Concertina shroud with spacer tube

for guide bushes	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2051.	2061.	2081.	2081.	2081.	2081.	2081.	2081.	2081.	2081.					
Pillar- $\varnothing$ $d_1$	19	20	24	25	30	32	38	40	48	50	60	63	19	20	24	25	30	32	38	40	48	50	60	63			
$d^*$	20		25		32		40		50		60		63		20		25		32		40		50		60		63
$d_2$	25		30		40		50		60		70		70		25		30		40		50		60		70		70
$d_3$	32		38		46		55		64		76		76		39		45		54		63		74		94		94
$d_4^{**}$	32		38		48		58		68		79		79		40		45		54		66		80		95		95
$D_1$	30		30		46		55		62		75		75		32		32		45		52		62		75		75
$D_a$	51		56		72		87		86		100		100		54		56		63		96		84		104		104
$a$	13		13		20		12		12		12		12		10		10		10		12		12		10		10
$a_1$	16		13		20		12		12		10		10		10		10		10		12		12		10		10
$l_1$	100		100		100		100		100		100		100		100		100		100		100		100		100		100
$l_{min}$	30		25		20		44		25		30		30		37		35		35		25		45		35		35
$l_{max}$	170		130		100		119		110		130		130		145		110		110		225		165		185		185

\* $d$  = Nominal diameter, \*\* $d_4$  = Nominal ordering diameter for flange diameter

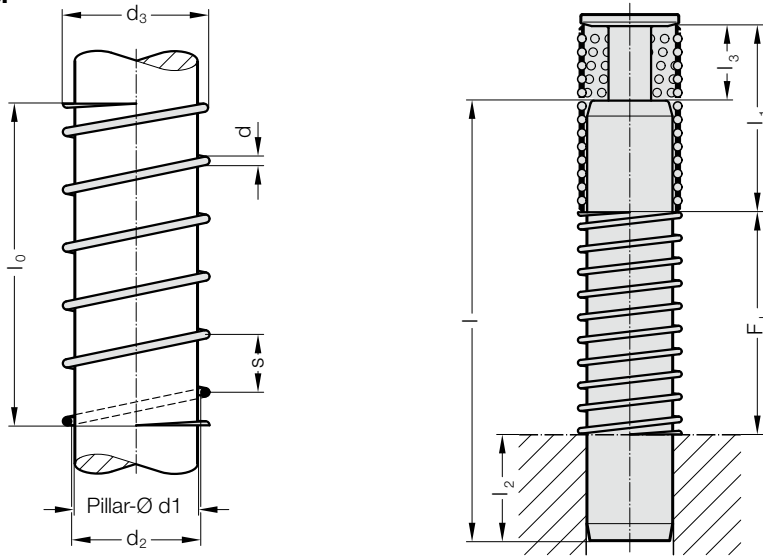
## Ordering Code (example):

Concertina shroud with spacer tube	=	206.92.
Nominal diameter $d$	20 mm =	020.
Nominal order diameter for flange connection diameter $d_4$	40 mm =	040
Order No	=	206.92. 020. 040



# HELICAL SPRING FOR BALL CAGE RETENTION

241.18.



## 241.18. Helical spring for ball cage retention

d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	s	d	l <sub>0</sub>	Gradation l <sub>0</sub>
19/20	20.5	22.5	14	1	40 - 140	10
24/25	25.5	27.9	14	1.2	40 - 160	10
30/32	32.5	35.7	16	1.6	50 - 230	10
38	38.5	42.5	18	2	60 - 230	10
40	40.5	45.1	20	2.3	60 - 230	10
48/50	50.5	55.7	20	2.6	70 - 280	10
60	60.5	66.9	20	3.2	80 - 250	10
63	63.5	69.9	20	3.2	80 - 250	10

## Calculation:

Formula for selecting spring 241.18.:

$$F_L = [l - (l_2 + (l_1 - l_3))] \times 1,1$$

Formula for calculating the block length L<sub>BL</sub> of the selected spring:

$$L_{BL} = (l_0 \times d : s) + 2 \times d$$

F<sub>L</sub> = Length of compressed spring

l = Length of guide pillar (Customer specified)

l<sub>1</sub> = Cage length (Customer specified)

l<sub>2</sub> = Compression length of guide pillar (Customer specified)

l<sub>3</sub> = Cage retainer size (Customer specified)

1.1 = Safety factor

l<sub>0</sub> = Length of uncompressed spring

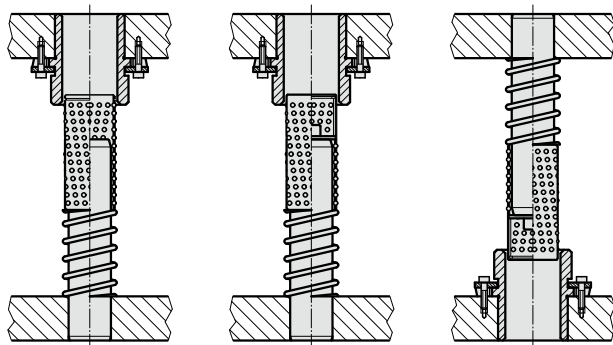
d = Spring wire diameter

s = Pitch

## Ordering Code (example):

Helical spring for ball cage retention	=	241.18.
Inner diameter d <sub>2</sub> 40.5 mm	=	405.
Length l <sub>0</sub> 60 mm	=	060
Order No	=	241.18. 405.060

## Mounting example

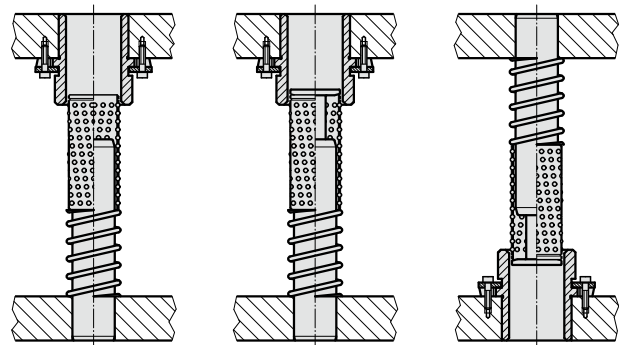


Without ball cage retainer

With ball cage retainer 202.92.1.

With ball cage retainer 202.92.1.

## Mounting example



Without ball cage retainer

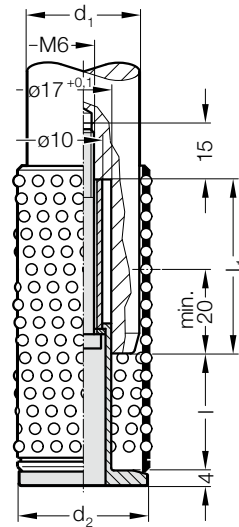
With ball cage retainer 202.91.

With ball cage retainer 202.91.

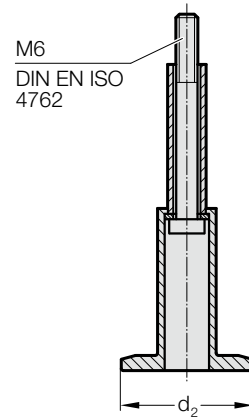
# CAGE RETAINER



Mounting example



202.91.



**Note:**

The following guide pillars are equipped with this cage retainer:

- 202.17.
- 202.55.
- 2021.44.
- 2021.58.

**202.91. Cage retainer**

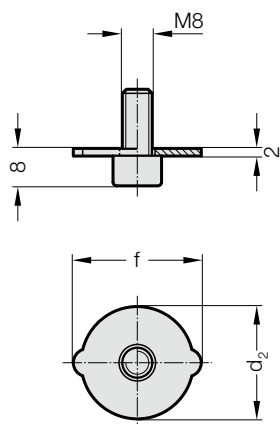
d <sub>1</sub>	38	40	48	50	60	63
d <sub>2</sub>	42	44	52	54	64	67
KG (l / l <sub>1</sub> )						
1 (31 / 46)	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●

**Ordering Code (example):**

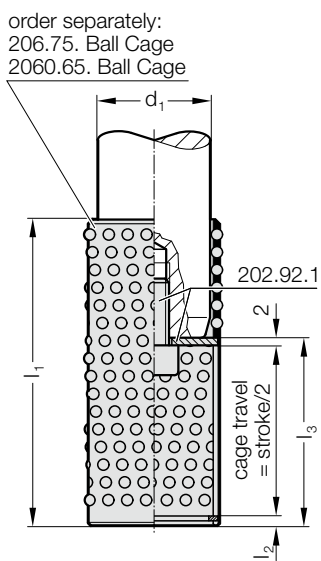
Cage retainer	=	202.91.
Diameter of conduit d <sub>1</sub>	50 mm =	050.
Cage unit size KG	1 =	1
Order No	=	202.91. 050. 1

# CAGE RETAINER

202.92.1.



## Mounting example



order separately:  
206.75. Ball Cage  
2060.65. Ball Cage



### Note:

The following guide pillars can be equipped with this cage retainer:

- 202.22.
- 202.24.
- 2021.46.
- 2021.50.

## 202.92.1. Cage retainer

$d_1$	19	20	24	25	30	32	38	40	48	50	60	63
$d_2$	18	19	23	24	29	31	37	39	47	49	59	62
$f$	22	23	27	28	34	36	42	44	52	54	64	67

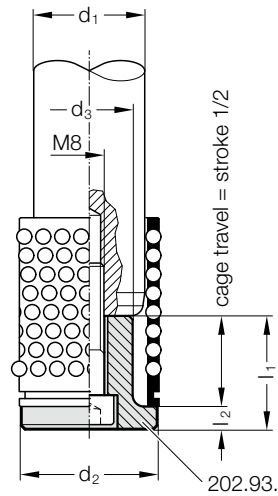
### Ordering Code (example):

Cage retainer	=	202.92.1.
Diameter of conduit $d_1$	38 mm =	038
Order No	=	202.92.1. 038

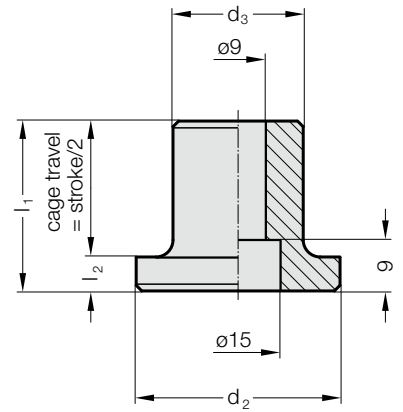
# CAGE RETAINER



Mounting example



202.93.



**Note:**

The following guide pillars can be equipped with this cage retainer:

- 202.22.
- 202.24.
- 2021.46.
- 2021.50.

Screws are not included.

**Fixing:**

Use socket cap screws DIN EN ISO 4762 for ordering size:

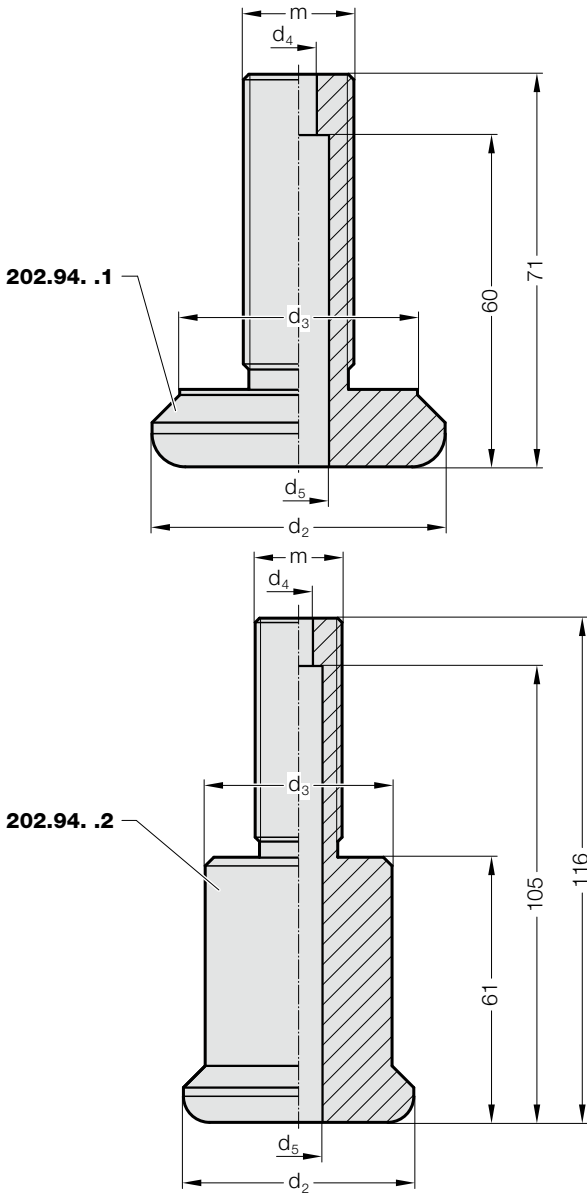
- 03. - 2192.12.08.035
- 04. - 2192.12.08.045
- 05. - 2192.12.08.055
- 06. - 2192.12.08.070
- 08. - 2192.12.08.090

**202.93. Cage retainer**

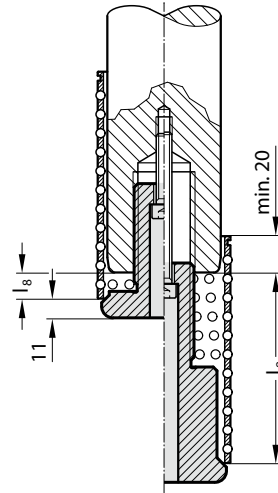
Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>
202.93.03.030	30 32	36	23	30	6
202.93.04.040	38 40	44	31	40	6
202.93.05.050	48 50	54	39	50	8
202.93.06.060	60 63	66	51	60	8
202.93.08.080	80	89	71	80	8

# CAGE RETAINER

202.94.



## Mounting example



## Description:

Cage unit allows both accurate cage centring as well as a variably adjustable cage feed length ( $l_8$ ). The cage feed length can be adjusted by turning the thread  $m$  in the column. A cheese head screw in accordance with DIN EN ISO 4762 serves as anti-rotation device.

## Material:

Steel

## Note:

The following guide pillars can be equipped with this cage retainer:  
202.19. .30.94  
2021.46. .30.94

Screws are not included.

## Fixing:

Socket cap screws DIN EN ISO 4762 for nominal diameter  $\varnothing$  :  
32 / 40 = 2192.12.05.  
50 = 2192.12.06.  
63 / 80 = 2192.12.08.

## Length calculation of the safety screw fastening :

Cage retainer 202.94. .1 : Screw length = Cage feed length + 25 mm  
Cage retainer 202.94. .2 : Screw length = Cage feed length - 20 mm

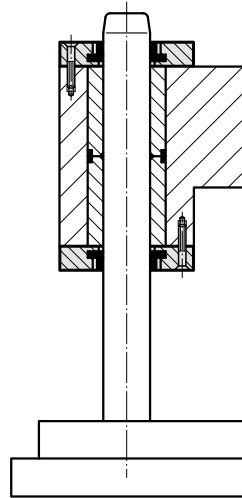
## 202.94. Cage retainer

Order No	Nominal- $\varnothing$	Pillar- $\varnothing$	$d_2$	$d_3$	$d_4$	$d_5$	$m$	$l_8$ - Cage advance length
202.94.032.1	32	30/32	35	25	5.5	10	M16x1,5	5-50
202.94.040.1	40	38/40	43	33	5.5	10	M16x1,5	5-50
202.94.050.1	50	48/50	53	43	6.6	11	M20x1,5	5-50
202.94.063.1	63	60/63	66	56	9	15	M30x1,5	5-50
202.94.080.1	80	80	88	74	9	15	M30x1,5	5-50
202.94.032.2	32	30/32	35	25	5.5	10	M16x1,5	50-100
202.94.040.2	40	38/40	43	33	5.5	10	M16x1,5	50-100
202.94.050.2	50	48/50	53	43	6.6	11	M20x1,5	50-100
202.94.063.2	63	60/63	66	56	9	15	M30x1,5	50-100
202.94.080.2	80	80	88	74	9	15	M30x1,5	50-100

# PILLAR WIPER

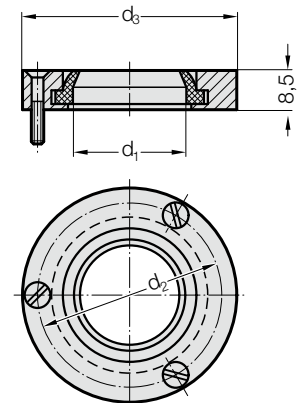


Mounting example



206.95.

2061.95.



## Description:

FIBRO Pillar Wipers protect against premature wear caused by the ingress of dirt into the die set guides. Outside diameters match boss dias. on FIBRO Die Sets (Cast Iron). They can be fitted onto the bolster, or into a counterbore – flush with the bolster surface.

## Note:

Pillar Wipers will be delivered with 3 screws M 4 × 16 DIN 963.

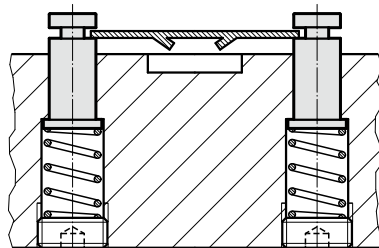
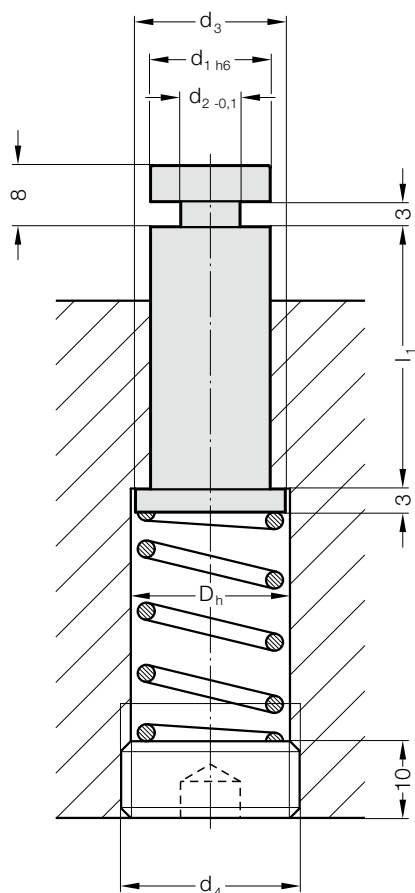
## 206.95./2061.95. Pillar wiper

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>
206.95.024	24	45	55
206.95.025	25	45	55
206.95.030	30	55	65
206.95.032	32	55	65
206.95.038	38	65	75
206.95.040	40	65	75
206.95.042	42	65	75
206.95.048	48	78	94
206.95.050	50	78	94
206.95.052	52	78	94
206.95.060	60	92	110
206.95.063	63	92	110
2061.95.024	24	50	60
2061.95.025	25	50	60

# LIFTER PIN FOR PRESS TOOL STRIPS

244.00.2.

Mounting example



**Description:**

Combination progression dies with certain forming stages can be equipped advantageously with springloaded lifter pins. FIBRO Lifter Pins 244.00.2., available in four sizes, can be used to assume the double function of lifting and guiding the strip. The amount of lift is a function of the counterbore-depth.

**Material:**

No 1.7131, case-hardened

**Execution:**

ground

**Note:**

For ordering code of screw plug 241.00.1. and helical spring see spring range on pages chapter F.

**244.00.2. Lifter pin for press tool strips**

d <sub>1</sub>	8	10	13	16
d <sub>2</sub>	5	6	7	8
d <sub>3</sub>	10	12	16	20
D <sub>h</sub>	10.5	12.5	16.5	20.5
d <sub>4</sub>	M12x1.5	M14x1.5	M18x1.5	M22x1.5
l <sub>1</sub>				
20	●			
25	●		●	
32	●	●	●	●
40	●	●	●	●
50		●	●	●

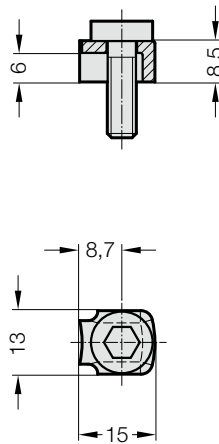
**Ordering Code (example):**

Lifter pin for press tool strips	= 244.00.2.
Diameter of conduit d <sub>1</sub>	13 mm = 13.
Guide length l <sub>1</sub>	25 mm = 025
Order No	= 244.00.2. 13.025

## SCREW CLAMP WITH SCREW



207.45

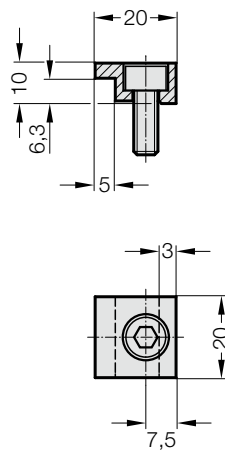


### Screw clamp

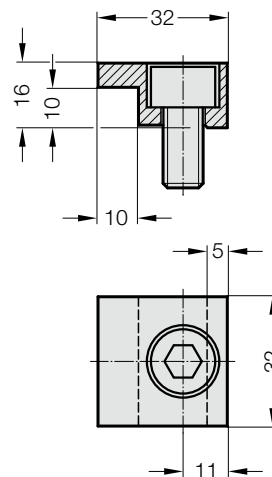
- incl. screw
- steel punched bent component
- clamping height 6 - 6,3 mm
- M6 screw



2072.45.10



2072.45.16

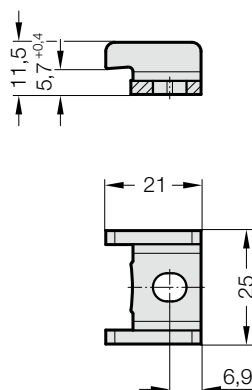


### Screw clamp

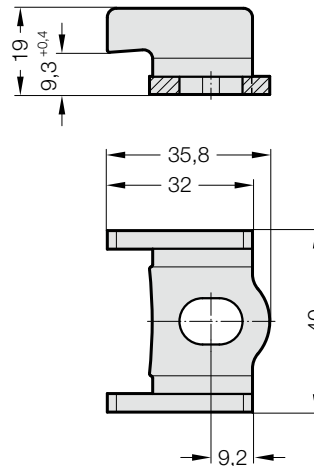
- incl. screw
- 2072.45.10
- Steel, milled
- Clamping height 6 - 6,3 mm
- M6 screw
- 2072.45.16
- Steel, milled
- Clamping height 10 mm
- M10 screw



2072.45.55.12



2072.45.55.14



### Screw clamp

- without screw
- 2072.45.55.12
- Steel plate
- Clamping height 6 - 6,3 mm
- Screw M6
- 2072.45.55.14
- Steel plate
- Clamping height 10 mm
- Screw M10

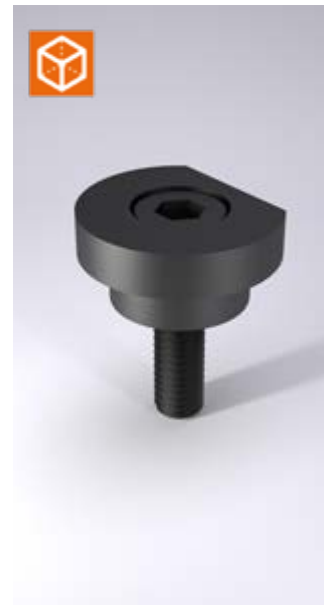
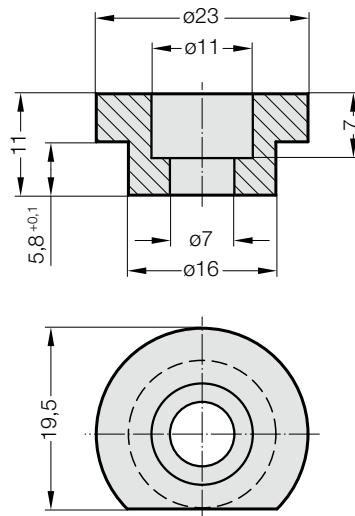
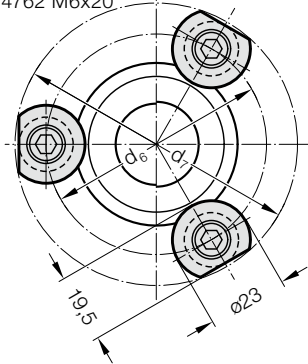


# SCREW CLAMP WITH SCREW

## Screw clamp

2071.45

- incl. screw
- clamping height 6 mm
- Socket cap screw DIN EN ISO 4762 M6x20



### Description:

Strengthened holding piece 2071.45 alternative to holding piece 207.45

### Note:

The fastening of the guide post/guide socket is carried out with 3 holding pieces, from  $\varnothing d_1 = 38$  with 4 holding pieces.

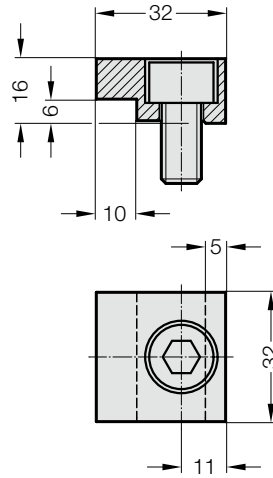
### 2071.45 Screw clamp with screw

Nominal diameter	15/16	19/20	24/25	30/32	38/40	48/50	60/63	80
usable for:	2021.28./ 29./ 44./ 46.							
$d_6$	38	42	49	57	67	80	97	112
$d_7$	56,5	60,3	67,1	74,9	84,6	97,4	114,2	129,1
usable for:	2021.39. - 2081.31./ 32./ 33./ 34./ 35. - 2081.44./ 45./ 46./ 47./ 49. - 2081.71./ 74./ 75. - 2081.81./ 84./ 85. - 2081.91./ 94./ 95.							
$d_6$	--	59	65	73	83	97	112	135
$d_7$	--	76,8	82,7	90,5	100,4	114,2	129,1	152
usable for:	210.31./ 34./ 35. - 210.39. - 210.44./ 46.							
$d_6$	53	56	64	75	87	107	127	--
$d_7$	71	73,9	81,7	92,5	104,3	124,1	144	--

**SCREW CLAMP WITH SCREW**  
**SCREW CLAMP WITH SCREW, GM STANDARD**  
**SCREW CLAMP WITH SCREW, NAAMS**

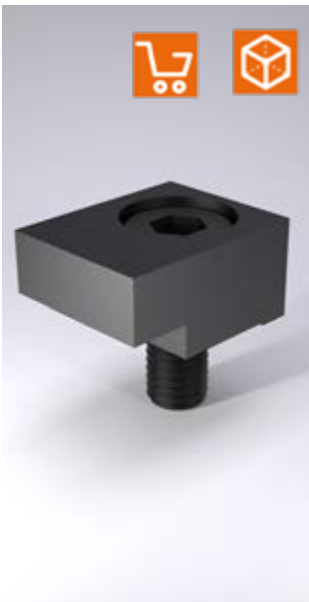


2072.46



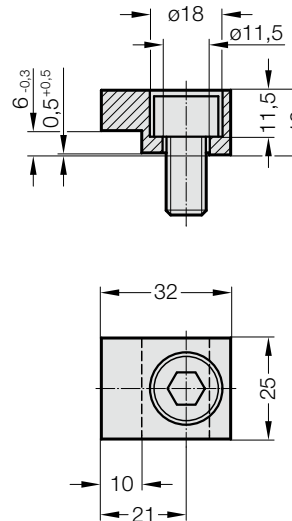
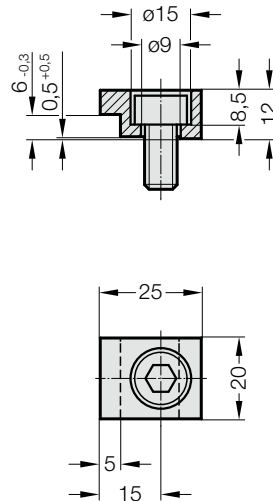
**Screw clamp**

- incl. screw
- steel, milled
- clamping height 6 - 6,3 mm
- M10 screw



2072.46.30.12

2072.46.30.16

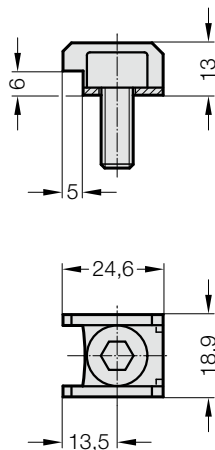


**Screw clamp**

- according to GM, incl. screw
- 2072.46.30.12
- steel, milled
- clamping height 6 mm
- M8 screw
- 2072.46.30.16
- steel, milled
- clamping height 6 mm
- M10 screw



2072.47

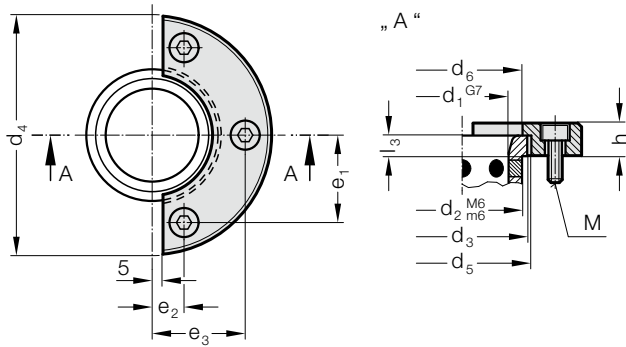


**Screw clamp**

- according to NAAMS, incl. screw
- steel punched bent component
- clamping height 6 - 6,3 mm
- M8 screw

# SECURING FLANGE WITH SCREWS, CNOMO SCREW CLAMP WITH SCREW, CNOMO

2073.45.



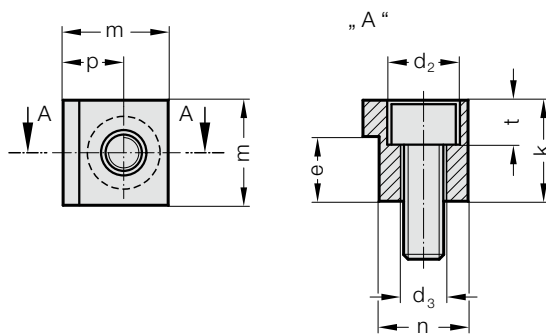
## 2073.45. Securing flange with screws, CNOMO

Order No	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>4</sub>	d <sub>5</sub>	d <sub>6</sub>	h	l <sub>3</sub>	e <sub>1</sub>	e <sub>2</sub>	e <sub>3</sub>	M
2073.45.020	20	28	32	63	25	10	4	16	18	0	6	
2073.45.025	25	35	40	72	32	10	5	20	20	0	6	
2073.45.032	32	44	50	80	40	12	6	25	21	0	6	
2073.45.040	40	52	60	100	50	12	8	38.5	14	41	6	
2073.45.050	50	63	71	125	63	16	10	46	17	49	8	
2073.45.063	63	80	90	140	80	20	12	55	17	57.5	10	
2073.45.080	80	100	112	180	100	25	16	70	20	72	12	
2073.45.100	100	125	140	200	125	32	20	81	25	85	12	

## Securing flange

- according to CNOMO, incl. screws
- steel, turned
  - clamping height 4, 5, 6, 8, 10, 12, 16, 20 mm
  - M6, M8, M10, M12 screws

2072.48.45.



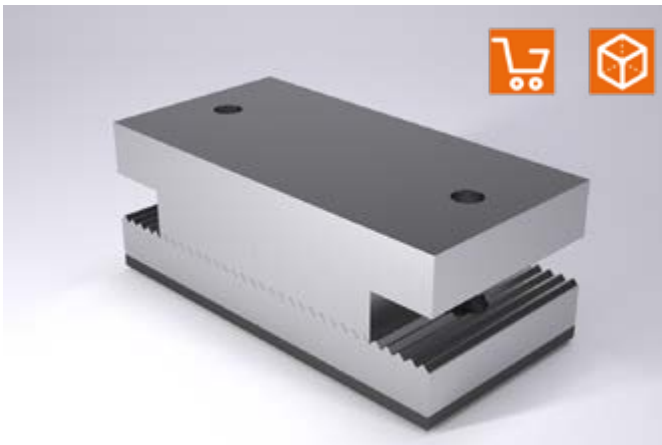
## 2072.48.45. Screw clamp with screw, CNOMO

Order No	k	e	d <sub>2</sub>	d <sub>3</sub>	t	m	p	n	d <sub>1</sub>	M
2072.48.45.12	12	8	11	6.6	6.8	18	9.5	15.5	40	6
2072.48.45.16	16	10	15	9	9	22	12	19	50	8
2072.48.45.20	20	12	18	11	11	26	15	21	63	10
2072.48.45.25	25	16	18	11	11	26	15	21	80	10
2072.48.45.32	32	20	18	11	11	26	15	21	100	10

## Screw clamp

- according to CNOMO, incl. screw
- steel, milled
  - clamping height 8, 10, 12, 16, 20 mm
  - M6, M8, M10 screw

# SPACER PLATE TOOTHED, WITH ADJUSTING PLATE



2444.12 / 2444.13

**Material:**

Spacer plates: X 210 Cr 12 (1.2080), hardened 58 + 2 HRC  
 Adjusting plate: X 153 CrMoV 12 (1.2379)

**Description:**

For spacing out sheet metal retainers in tools for external skin parts.

**Note:**

Screws are not included.

'0' = basic setting in the middle (grinding-in)

'+' = adjustment to the right - plus

'-' = adjustment to the left - minus

**Attention:**

The bolsters are reversible.

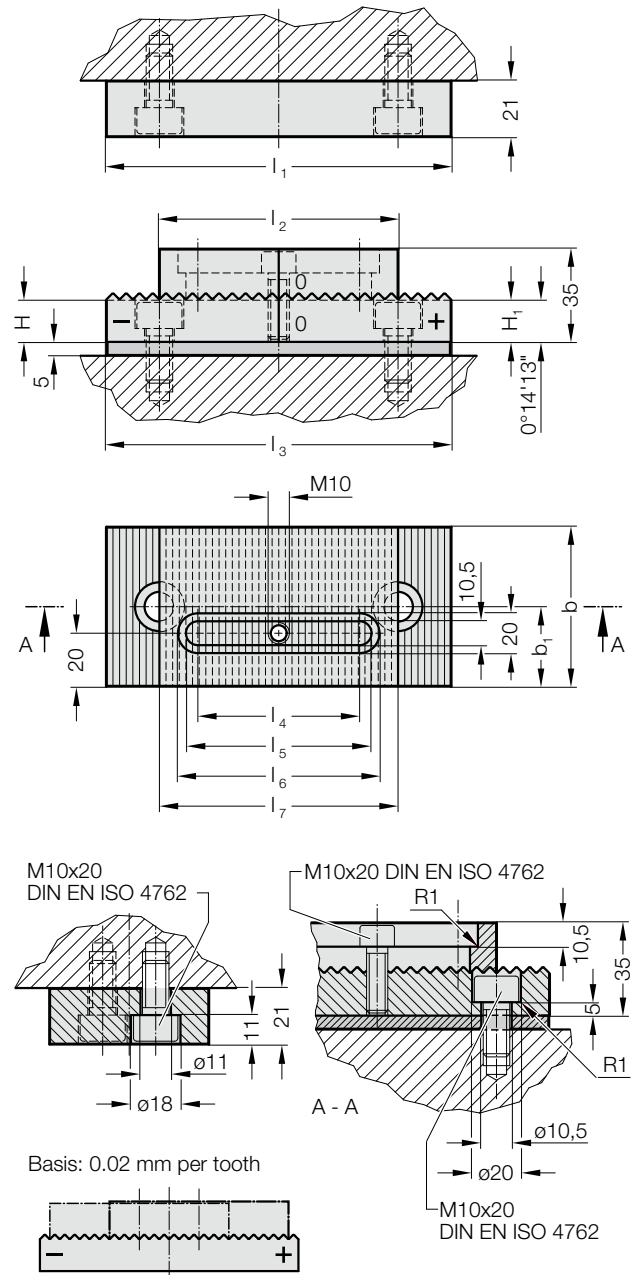
**Adjustment range:**

2444.12

12 increments each of 0.02 mm means an adjusting range of 0.24 mm with a minimum support area of 80 x 60 mm.

2444.13

14 increments each of 0.02 mm means an adjusting range of 0.28 mm with a minimum support area of 100 x 80 mm.

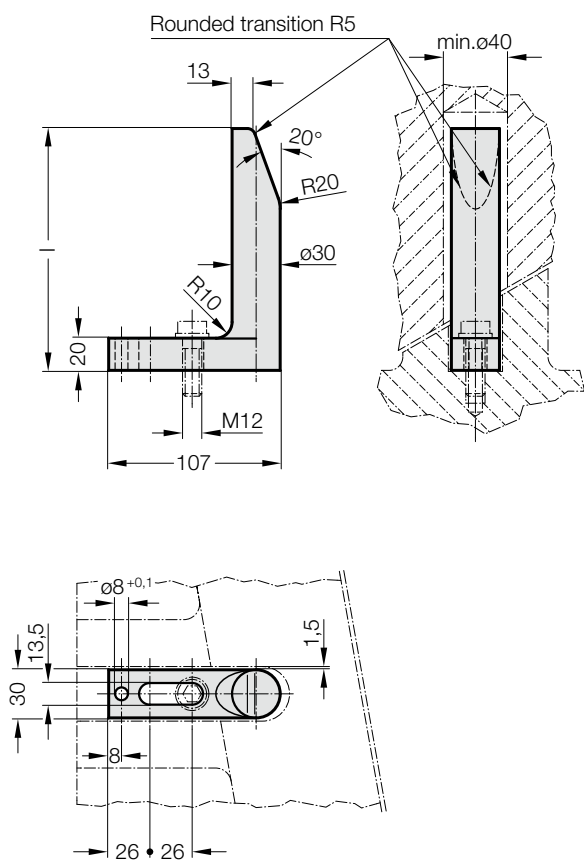


**2444.12 / 2444.13 Spacer plate toothed, with adjusting plate**

Order No	$l_1$	$l_2$	$l_3$	$l_4$	$l_5$	$l_6$	$l_7$	$b$	$b_1$	$H$	$H_1$
2444.12	130	90	130	61	72	79	90	60	30	15.5	16.04
2444.13	160	110	160	71	82	89	120	80	40	15.5	16.16

# GUIDE

2443.10.



**Material:**

Ck 60, area of pilot taper hardened 58 + 2 HRC

**Execution:**

forged

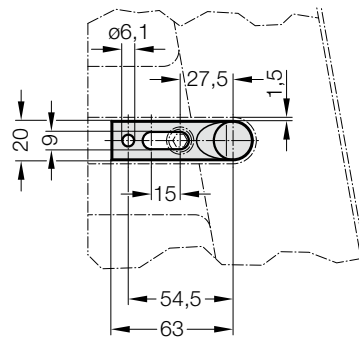
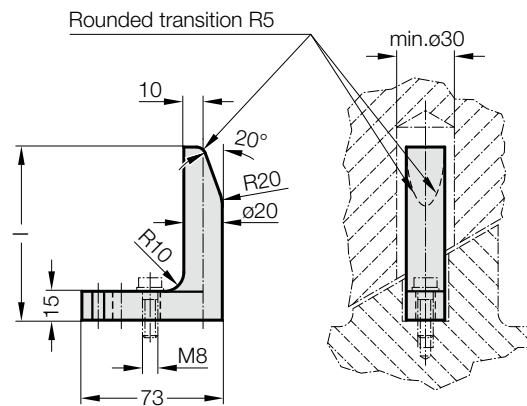
**2443.10. Guide**

Order No	l
2443.10.065	65
2443.10.090	90
2443.10.120	120
2443.10.150	150
2443.10.180	180
2443.10.250	250
2443.10.300	300
2443.10.350	350

# GUIDE TO MERCEDES-BENZ STANDARD - UNHARDENED



2443.10.20.



**Material:**

Ck 60

**Execution:**

forged

**Note:**

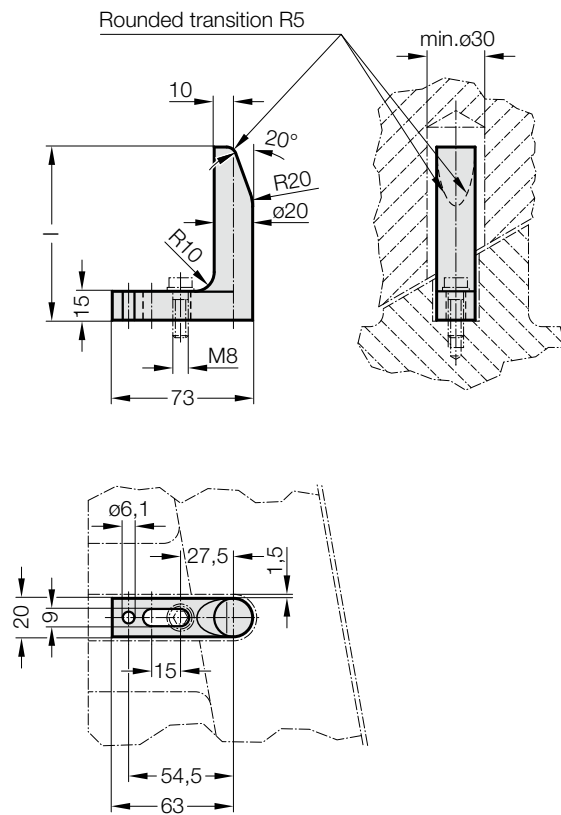
Guides are preferably used in confined spaces in sequential compound dies.

**2443.10.20. Guide to Mercedes-Benz Standard - unhardened**

Order No	I
2443.10.20.065	65
2443.10.20.090	90

# GUIDE TO MERCEDES-BENZ STANDARD - HARDENED

2443.10.20. .1



**Material:**

Ck 60, area of pilot taper hardened 58 + 2 HRC

**Execution:**

forged

**Note:**

Guides are preferably used in confined spaces in sequential compound dies.

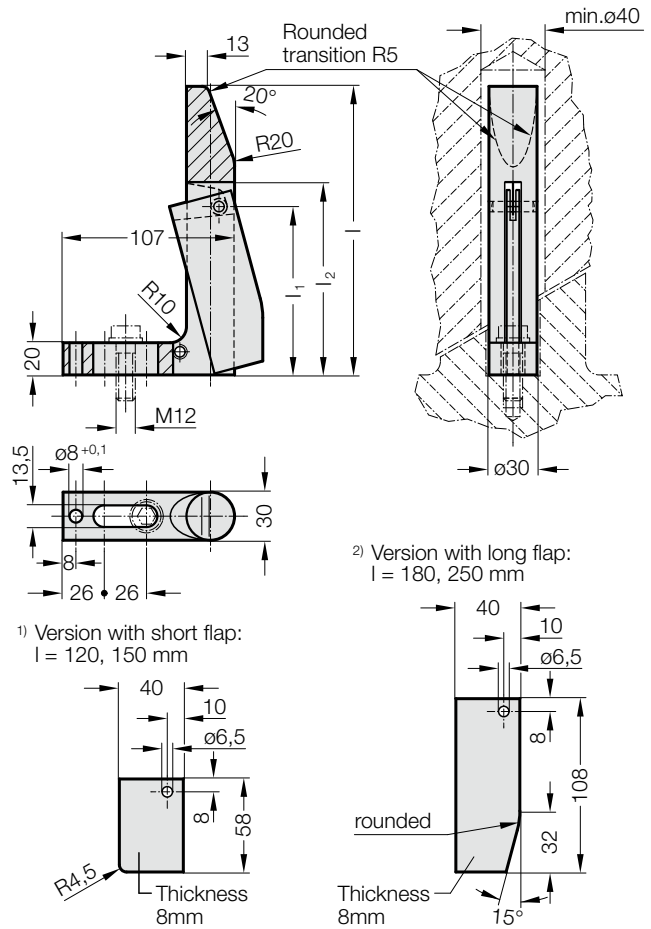
**2443.10.20. .1 Guide to Mercedes-Benz Standard - hardened**

Order No	1
2443.10.20.065.1	65
2443.10.20.090.1	90

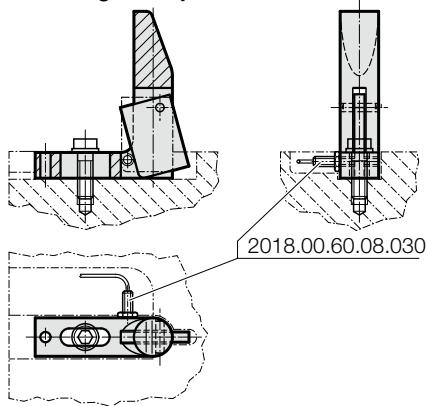
# GUIDE WITH PART POSITION CONTROL AND SPRING



2443.12.



## Mounting example



### Material:

Guide: Ck 60, area of pilot taper hardened 50 + 5 HRC

Flap: St 37

Spring: Spring steel wire

### Execution:

forged

### Note:

See following pages for accessories.

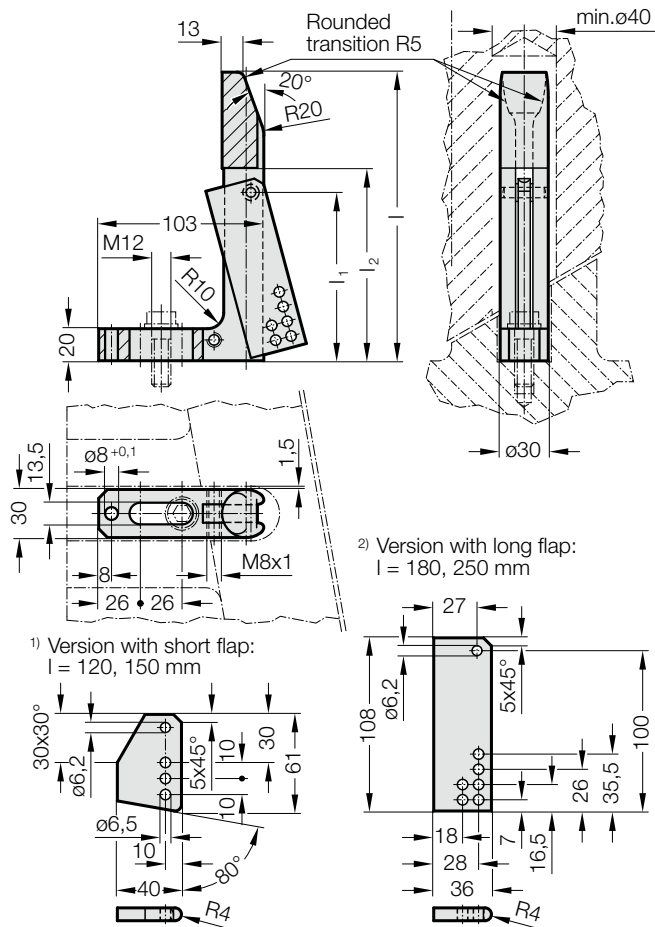
## 2443.12. Guide with part position control and spring

Order No	l	l <sub>1</sub>	l <sub>2</sub>
2443.12.120	120	55	70
2443.12.150	150	55	70
2443.12.180	180	105	120
2443.12.250	250	105	120

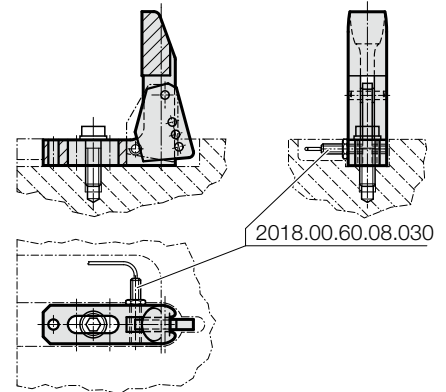


# GUIDE WITH PART POSITION CONTROL, VDI

2443.13.



## Mounting example



### Material:

Guide: Ck 60, area of pilot taper hardened 50 + 5 HRC

Flap: St 37, hardened 58 + 2 HRC

### Execution:

forged

### Note:

See following pages for accessories.

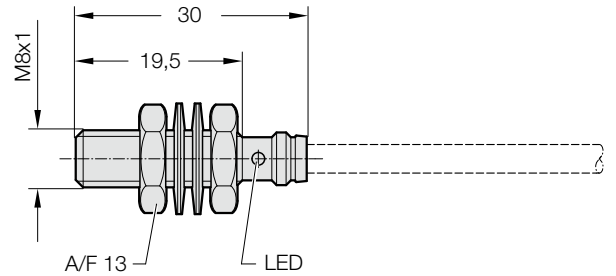
## 2443.13. Guide with part position control, VDI

Order No	l	l <sub>1</sub>	l <sub>2</sub>
2443.13.120	120	55	70
2443.13.150	150	55	70
2443.13.180	180	105	120
2443.13.250	250	105	120

# INDUCTIVE PROXIMITY SWITCH



2018.00.60.08.030



## Technical data:

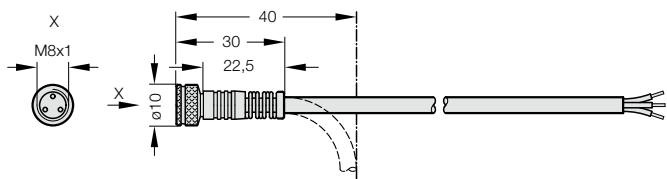
Rated operating voltage  $U_e$ : 24 V DC  
Operating Voltage  $U_s$ : 10 - 30 V DC  
No load current  $I_0$  damped/undamped:  $\leq 8 \text{ mA}/\leq 1 \text{ mA}$   
Repeat accuracy R:  $\leq 5\%$   
Ambient temperature  $T_a$ : -40 to +85 °C  
Switching frequency  $f$ : 3000 Hz  
Degree of protection to IEC 529: IP 67  
Casing material: Stainless steel  
Connection: plug connector  
Approvals: UL

2018.00.60.08.030

**Inductive proximity  
switch**

## CABLE - STRAIGHT CABLE, 90° CONNECTOR

2018.00.60.23.01.5



2018.00.60.23.01.5

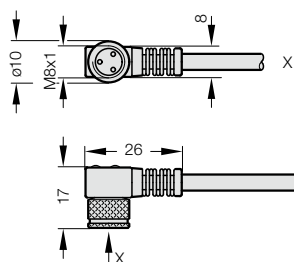
Cable - straight

### Technical data:

Cable type: 3 pole, M8, oil resistant  
Standard length: 5 m

Other lengths on request

2018.00.60.23.02.5



2018.00.60.23.02.5

Cable, 90° connector

### Technical data:

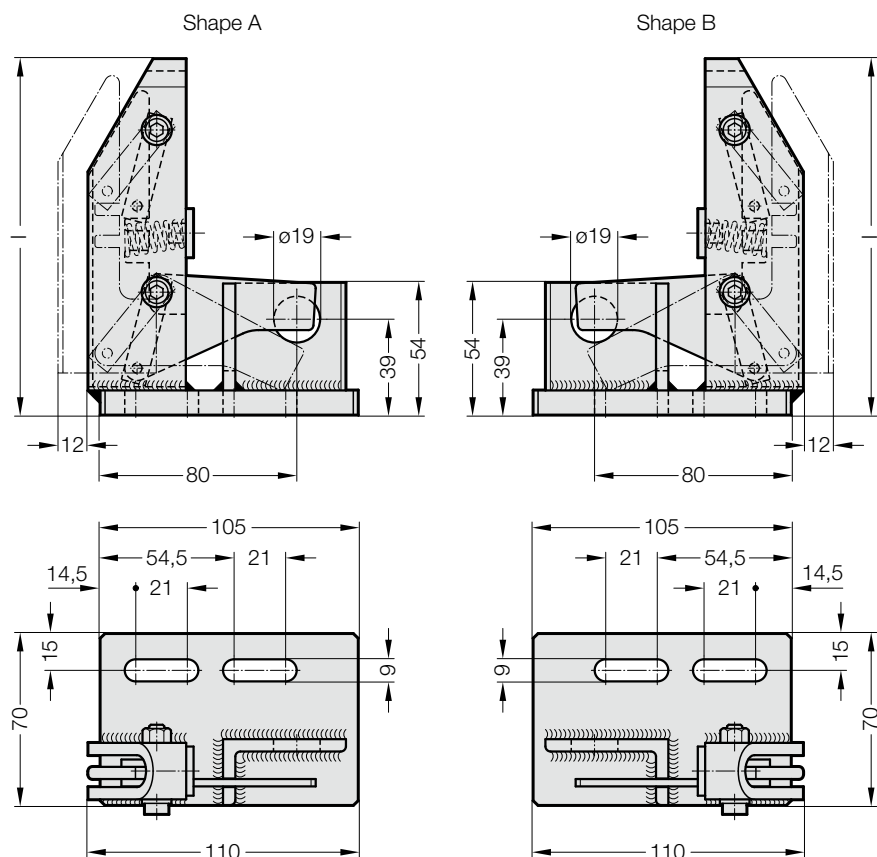
Cable type: 3 pole, M8, oil resistant  
Standard length: 5 m

Other lengths on request

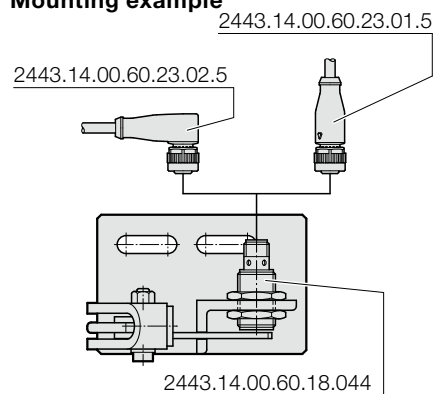


# POSITION MONITOR FOR BOARDS

2443.14.55.



## Mounting example



### Material:

Steel

### Note:

See following pages for accessories.

### Attention:

At least two position monitors must be installed crosswise. In case of large parts, such as the side part, a third position monitor should be placed. The position monitors should be placed in such a way that a perfect querying of the sheet metal part is guaranteed. Position monitors should be arranged a minimum of 5 mm away from the pulling or locking bars and not within the range of strong sheet movement.

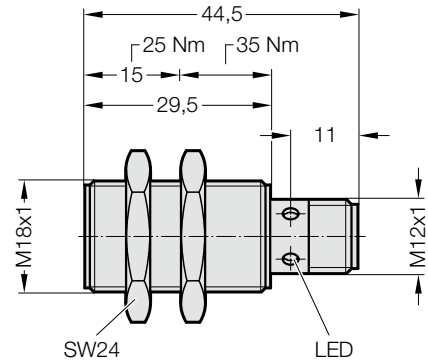
## 2443.14.55. Position monitor for boards

Order No	l	Shape
2443.14.55.1	145	A
2443.14.55.2	145	B
2443.14.55.3	185	A
2443.14.55.4	185	B
2443.14.55.25	225	A
2443.14.55.26	225	B

# INDUCTIVE PROXIMITY SWITCH



2443.14.00.60.18.044



## Technical data:

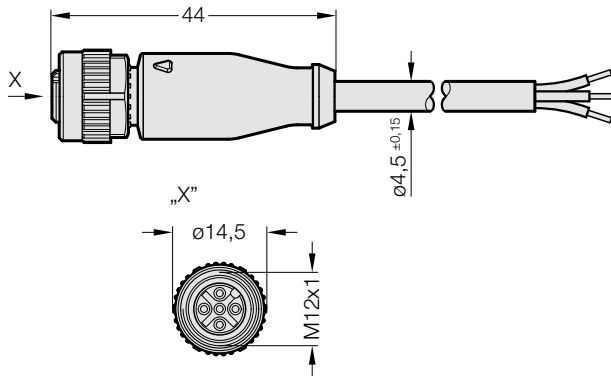
Rated operating voltage  $U_e$ : 24 V DC  
Operating Voltage  $U_s$ : 10 - 30 V DC  
No load current  $I_0$  damped/undamped:  $\leq 10 \text{ mA} / \leq 3 \text{ mA}$   
Repeat accuracy R: max. (% v. Sr) 5%  
Ambient temperature  $T_a$ : -25 to +70°C  
Switching frequency  $f$ : max. 1000 Hz  
Degree of protection to IEC 60529: IP 67  
Casing material: CuZn  
Connection: plug connector  
Approvals: UL

2443.14.00.60.18.044

Inductive proximity switch

## CABLE - STRAIGHT CABLE, 90° CONNECTOR

2443.14.00.60.23.01.5



2443.14.00.60.23.01.5

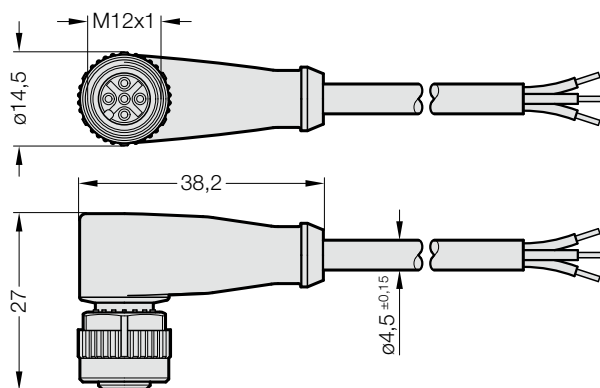
Cable - straight

### Technical data:

Cable type: 3 pole, M12x1  
Standard length: 5m

Other lengths on request

2443.14.00.60.23.02.5



2443.14.00.60.23.02.5

Cable, 90° connector

### Technical data:

Cable type: 3 pole, M12x1  
Standard length: 5m

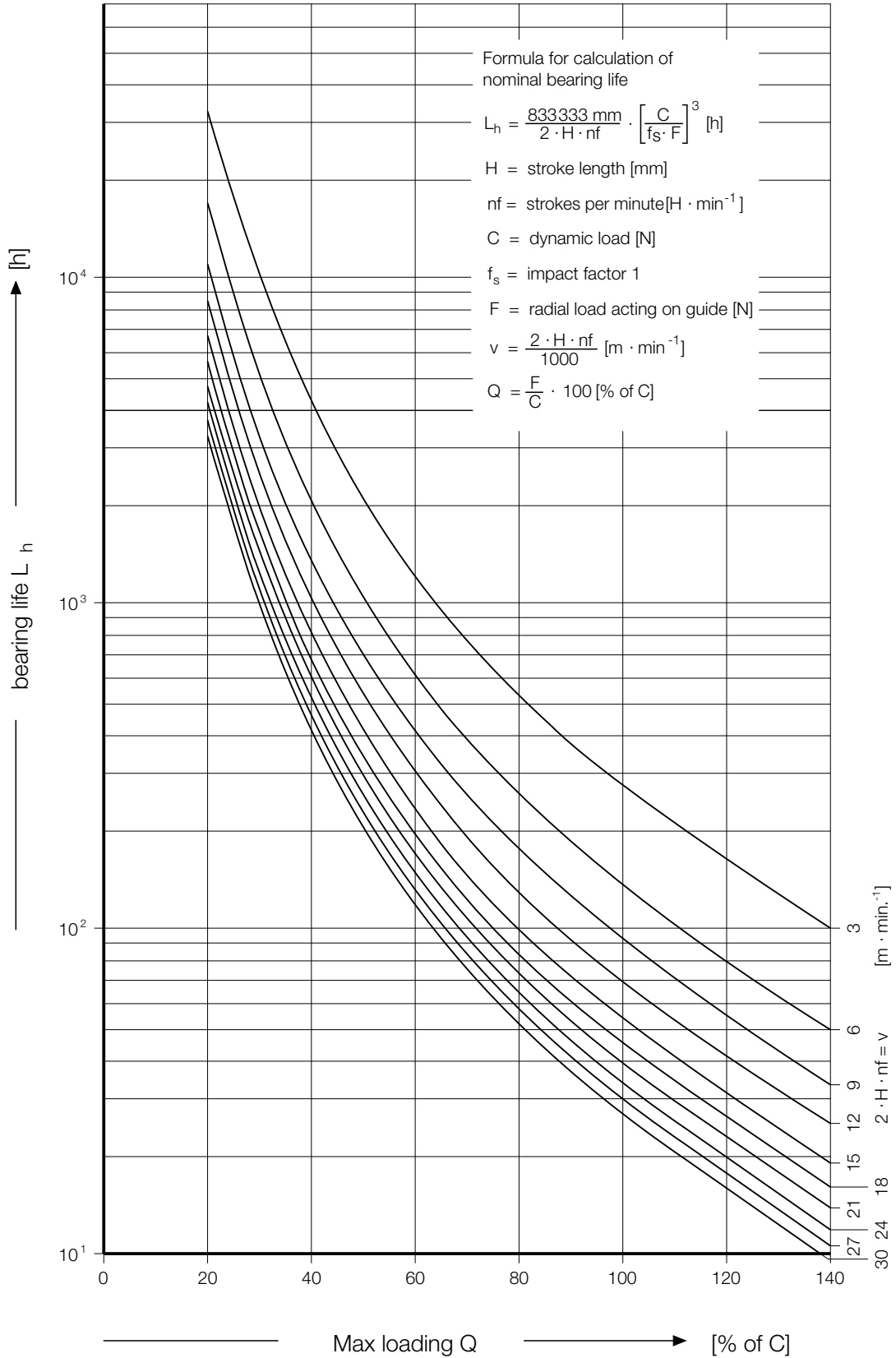
Other lengths on request

# BALL GUIDES - LOAD DIAGRAM

Bearing life versus loading

Values shown are based on the Impact Factor of  $f_s = 1$ :

Application to normal conditions in respect of press and die set, with a maximum bearing temperature of 100 °C.





# BALL GUIDES - CALCULATION TABLE

## DYNAMIC LOAD FIGURES FOR BALL, BRASS OR ALUMINIUM

Definition:

The dynamic load index C in N constitutes a load with constant size and direction, at which 90 % of a sufficiently large quantity of equal bearings achieve a minimum of the service life of  $+10^5$  m. This applies for solely longitudinal movement.

Pillar- $\varnothing$ d <sub>1</sub>	Cage length l <sub>1</sub>	Dynamic Load Index C for whole cage (N)	Pillar- $\varnothing$ d <sub>1</sub>	Cage length l <sub>1</sub>	Dynamic Load Index C for whole cage (N)	Pillar- $\varnothing$ d <sub>1</sub>	Cage length l <sub>1</sub>	Dynamic Load Index C for whole cage (N)
8	40	750	24	120	9300	48	105	17100
10	24	1070	25	31	3200	48	120	19000
10	28	1190	25	40	3900	48	140	21400
10	31	1300	25	45	4200	48	160	23600
10	40	1830	25	50	4850	48	180	26000
10	45	1830	25	56	5200	48	200	28000
10	50	1930	25	63	5700	48	240	32000
10	56	2210	25	71	6300	50	50	9400
11	24	1090	25	80	6900	50	56	10200
11	28	1210	25	95	7900	50	63	11700
11	31	1330	25	105	8400	50	71	12500
11	40	1660	25	120	9300	50	80	13900
11	45	1860	30	40	5700	50	95	15900
11	50	1960	30	45	6400	50	105	17200
11	56	2250	30	50	7000	50	120	19100
12	24	1100	30	56	7600	50	128	19700
12	28	1230	30	63	8800	50	140	21400
12	31	1350	30	71	9300	50	160	23700
12	40	1680	30	75	9800	50	180	26000
12	45	1890	30	80	10400	50	200	28000
12	50	1990	30	95	11900	50	240	32000
12	56	2280	30	105	12800	60	80	15500
15	24	1880	30	120	14200	60	95	17700
15	28	2200	30	140	16000	60	105	19200
15	31	2500	30	160	17700	60	120	21300
15	45	3300	32	40	5800	60	140	23900
15	40	3050	32	45	6400	60	160	26500
15	50	3800	32	50	7100	60	180	29000
15	56	4050	32	56	7700	60	200	31000
15	63	4550	32	63	8800	60	240	35500
15	71	4950	32	71	9400	63	80	15500
16	24	1910	32	75	9900	63	95	17800
16	28	2230	32	80	10500	63	105	19300
16	31	2550	32	95	12000	63	120	21300
16	40	3100	32	105	12900	63	140	24000
16	45	3350	32	120	14300	63	160	26500
16	50	3850	32	140	16100	63	180	29000
16	56	4100	32	160	17800	63	200	31500
16	63	4600	38	45	7500	63	240	35500
16	71	5000	38	50	8200	80	120	41000
19	24	2300	38	56	8900	80	140	46500
19	28	2700	38	63	10300	80	160	52000
19	31	3050	38	71	10900	80	180	57000
19	40	3750	38	80	12100	80	200	62000
19	45	4050	38	95	13900	80	240	70000
19	50	4350	38	105	15000			
19	56	4950	38	120	16700			
19	63	5500	38	140	18700			
19	71	6100	38	160	20700			
19	80	6600	38	180	22600			
19	95	7600	38	200	24400			
20	24	2320	38	240	28000			
20	28	2700	40	45	7500			
20	31	3100	40	50	8200			
20	40	3750	40	56	9000			
20	45	4100	40	63	10300			
20	50	4400	40	71	11000			
20	56	5000	40	80	12200			
20	63	5600	40	95	14000			
20	71	6100	40	105	15100			
20	80	6600	40	120	16700			
20	95	7600	40	140	18800			
24	31	3150	40	160	20800			
24	40	3850	40	180	22700			
24	45	4200	40	200	24600			
24	50	4850	40	240	28000			
24	56	5100	48	50	9400			
24	63	5700	48	56	10200			
24	71	6300	48	63	11700			
24	80	6800	48	71	12400			
24	95	7800	48	80	13800			
24	105	8300	48	95	15900			



## **BALL GUIDES - CALCULATION TABLE**

### **DYNAMIC LOAD FIGURES FOR RECIRCULATING BALL BUSH**

Definition:

The dynamic load index C in N constitutes a load with constant size and direction, at which 90 % of a sufficiently large quantity of equal bearings achieve a minimum of the service life of  $+10^5$  m. This applies for solely longitudinal movement.

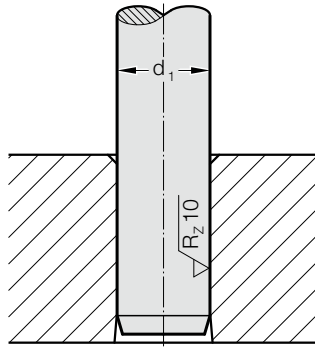
Pillar- $\varnothing$ d <sub>1</sub>	Cage length l <sub>1</sub>	Dynamic Load Index C for whole cage (N)	Pillar- $\varnothing$ d <sub>1</sub>	Cage length l <sub>1</sub>	Dynamic Load Index C for whole cage (N)
20	47	2080	40	95	7600
25	60	2960	50	95	8800
32	77	5450	63	120	11800

# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

202.17. / 202.19. / 202.22. /  
202.23. / 202.24. / 202.29.

**Guide pillar**  
**DIN 9825/ISO 9182-2**  
~DIN 9825/  
~ISO 9182-2  
press fit



202.17. / 202.19. / 202.22. / 202.23. / 202.24. / 202.29.

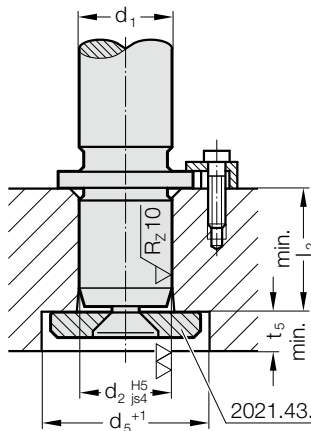
Pillar- $\varnothing$   $d_1^*$  Retaining bore  $d_1$  (recommended values based on experiences)

3-80	in grey cast iron: $d_1$	-0,025
		-0,035
	in steel: $d_1$	-0,015
		-0,025

\*Pillars of  $d_1 = 50$  mm and over should be frozen in dry ice before fitting

2021.46. / 2021.44.

**Guide pillar with collar**  
**DIN 9825/ ~ISO 9182-5**  
transition fit

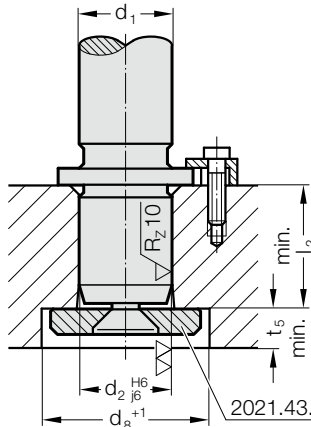


2021.46. / 2021.44.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H5}$	$d_5^{+1}$	$l_2$	$t_5$
15/16	15/16 <sup>+0,008</sup>	24	20,5	6,5
19/20	19/20 <sup>+0,009</sup>	27	23,5	6,5
24/25	24/25 <sup>+0,009</sup>	34	30,5	6,5
30/32	30/32 <sup>+0,011</sup>	42	37,5	6,5
38/40	38/40 <sup>+0,011</sup>	52	37,5	6,5
48/50	48/50 <sup>+0,013</sup>	62	47,5	6,5
60/63	60/63 <sup>+0,013</sup>	72	47,5	6,5
80	80 <sup>+0,013</sup>	95	60,5	12,5

2021.29.

**Guide pillar with collar**  
transition fit

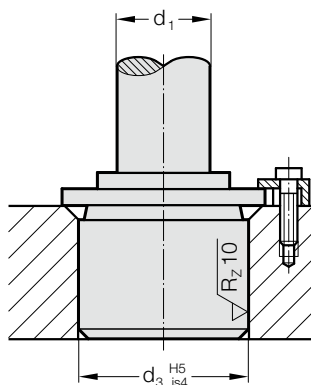


2021.29.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H6}$	$d_8^{+1}$	$l_2$	$t_5$
15/16	15/16 <sup>+0,011</sup>	24	20,5	6,5
19/20	19/20 <sup>+0,013</sup>	27	23,5	6,5
24/25	24/25 <sup>+0,013</sup>	34	30,5	6,5
30/32	30/32 <sup>+0,016</sup>	42	37,5	6,5
38/40	38/40 <sup>+0,016</sup>	52	37,5	6,5
38/40	38/40 <sup>+0,016</sup>	52	37,5	6,5
48/50	48/50 <sup>+0,019</sup>	62	47,5	6,5
60/63	60/63 <sup>+0,019</sup>	72	47,5	6,5
80	80 <sup>+0,019</sup>	95	60,5	12,5

2021.39.

**Retaining bush**  
**DIN 9825/ISO 9182-4**  
transition fit



2021.39.

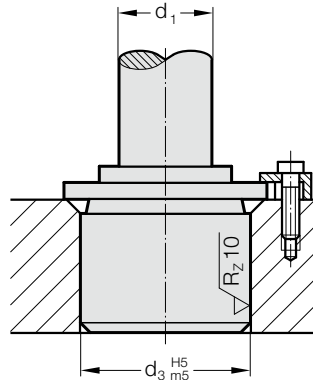
Pillar- $\varnothing$ $d_1$	Retaining bore $d_3^{H5}$
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>

# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

### 210.39.

Pillar-ø d <sub>1</sub>	Retaining bore d <sub>3</sub> <sup>H5</sup>
16	28 <sup>+0,009</sup>
20	32 <sup>+0,011</sup>
25	40 <sup>+0,011</sup>
32	50 <sup>+0,011</sup>
40	63 <sup>+0,013</sup>
50	80 <sup>+0,013</sup>
63	90 <sup>+0,015</sup>



### 210.39.

**Retaining bush, similar  
AFNOR  
transition fit**



### 202.60.

Pillar-ø d <sub>1</sub>	Retaining bore d <sub>3</sub> <sup>H5</sup>	Plate thickness c <sub>3</sub> <sup>-1</sup>
19	25 <sup>+0,009</sup>	33
25	30 <sup>+0,009</sup>	33
32	36 <sup>+0,011</sup>	38
40	46 <sup>+0,011</sup>	38

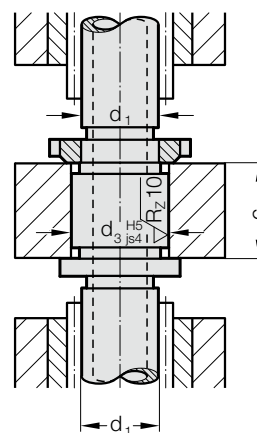
#### \*Slip-Fit Bonding:

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond.

The available component tolerances do not always result in the minimum glue-line gap.

This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.



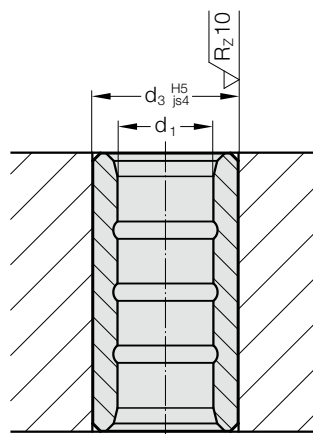
### 202.60.

**Demountable guide pillar  
with centre fixing  
transition fit**



### 2051.32.

Pillar-ø d <sub>1</sub>	Retaining bore d <sub>3</sub> <sup>H5</sup>
8	13,7 <sup>+0,008</sup>
11/12	22 <sup>+0,009</sup>
15/16	28 <sup>+0,009</sup>
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	95,7 <sup>+0,015</sup>



### 2051.32.

**Guide bush, sintered  
ferrite carbonitrided with  
long-term  
lubrication DIN 9831 /  
ISO 9448-2  
Slip-Fit Bonding\***

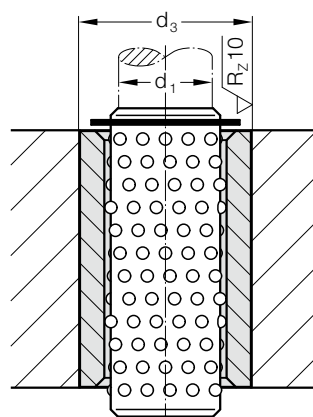


### 206.54.

Pillar-ø d <sub>1</sub>	Retaining bore d <sub>3</sub> <sup>H6</sup>
3	7 <sup>+0,009</sup>
4	8 <sup>+0,009</sup>
5	10 <sup>+0,009</sup>
6	11 <sup>+0,011</sup>
8	14 <sup>+0,011</sup>

### 2061.44. / 2061.47.

Pillar-ø d <sub>1</sub>	Retaining bore d <sub>3</sub> <sup>H5</sup>
8	18 <sup>+0,008</sup>
10	22 <sup>+0,009</sup>
11/12	22 <sup>+0,009</sup>
15/16	28 <sup>+0,009</sup>
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	105 <sup>+0,015</sup>



### 206.54.

**2061.44./2061.47.  
Guide bush for ball  
bearing DIN 9831 /  
ISO 9448-3  
Slip-Fit Bonding\***

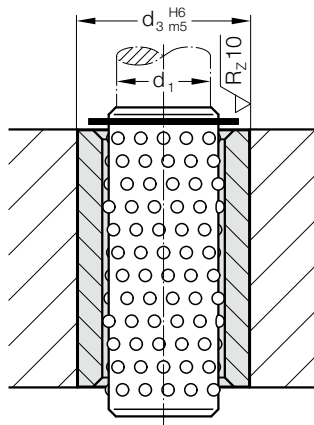


# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

206.49.

Guide bush for ball bearing, AFNOR Slip-Fit Bonding\*



206.49.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_3^{H6}$

16	28 <sup>+0,013</sup>
20	32 <sup>+0,016</sup>
25	40 <sup>+0,016</sup>
32	50 <sup>+0,016</sup>
40	63 <sup>+0,019</sup>
50	80 <sup>+0,019</sup>

**\*Slip-Fit Bonding:**

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond. The available component tolerances do not always result in the minimum glue-line gap. This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.

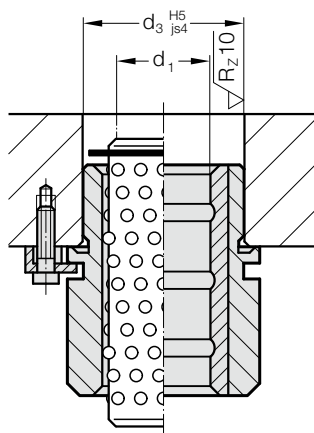
2081.3x. / 2081.4x. / 2081.8x.

Headed guide bush, sintered ferrite carbonitri- ded, bronze coated or for ball bearing

DIN 9831 / ISO 9448-6

DIN 9831 / ISO 9448-7

ISO 9448 transition fit



2081.3x. / 2081.4x. / 2081.8x.

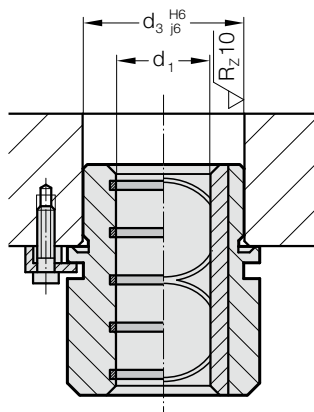
Pillar- $\varnothing$   $d_1$  Retaining bore  $d_3^{H5}$

19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	105 <sup>+0,015</sup>



2081.7x. / 2081.9x.

Headed guide bush, Bronze with solid lubricant rings or bronzeplated transition fit



2081.7x. / 2081.9x.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_3^{H6}$

19/20	32 <sup>+0,016</sup>
24/25	40 <sup>+0,016</sup>
30/32	48 <sup>+0,016</sup>
38/40	58 <sup>+0,019</sup>
48/50	70 <sup>+0,019</sup>
60/63	85 <sup>+0,022</sup>
80	105 <sup>+0,022</sup>

2091.3x. / 2091.4x.

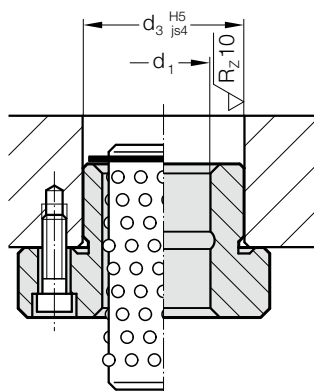
Flanged guide bush, sintered ferrite carbonitri- ded, bronze coated or for ball bearing

DIN 9831 /

ISO 9448-4

DIN 9831 / ISO 9448-5

transition fit



2091.3x. / 2091.4x.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_3^{H5}$

12	26 <sup>+0,009</sup>
15/16	28 <sup>+0,009</sup>
19/20	32 <sup>+0,011</sup>
24/25	40 <sup>+0,011</sup>
30/32	48 <sup>+0,011</sup>
38/40	58 <sup>+0,013</sup>
48/50	70 <sup>+0,013</sup>
60/63	85 <sup>+0,015</sup>
80	105 <sup>+0,015</sup>



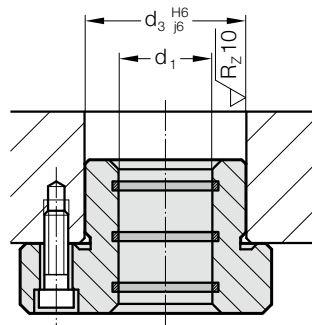
# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

### 2091.7x.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_3^{H6}$

Pillar- $\varnothing$ $d_1$	Retaining bore $d_3^{H6}$
19/20	32 $^{+0,016}$
24/25	40 $^{+0,016}$
30/32	48 $^{+0,016}$
38/40	58 $^{+0,019}$
48/50	70 $^{+0,019}$
60/63	85 $^{+0,022}$
80	105 $^{+0,022}$



### 2091.7x.

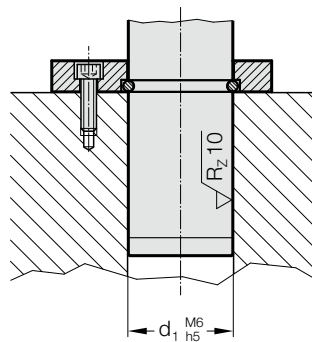
**Flanged guide bush,  
Bronze with solid lubricant  
rings**  
DIN 9831 / ISO 9448-4  
transition fit



### 2022.25.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_1^{M6}$

Pillar- $\varnothing$ $d_1$	Retaining bore $d_1^{M6}$
25	-0,004
32	-0,017
40	-0,004
50	-0,020
63	-0,005
80	-0,024
100	-0,006
	-0,028



### 2022.25.

**Guide pillar with retaining  
ring groove, ~AFNOR**  
transition fit

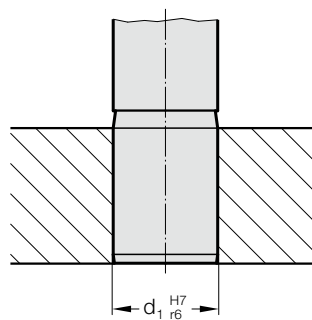


### 2022.12. / 2022.15. / 2022.16. / 2022.17. / 2022.19. / 2022.29.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_1^{H7}$

Pillar- $\varnothing$ $d_1$	Retaining bore $d_1^{H7}$
25	+0,021 0
32	+0,025
40	0
50	0
63	+0,030
80	0
100	+0,035 0
125	+0,040
160	0

Pillars of  $d_1 = 50$  mm and over should be frozen in dry ice before fitting



2022.12. / 2022.15. /  
2022.16. / 2022.17. /  
2022.19. / 2022.29.

**Guide pillar DIN 9833/  
ISO 9182-3**

**Mercedes-Benz / VDI /  
VW / WDX**  
press fit

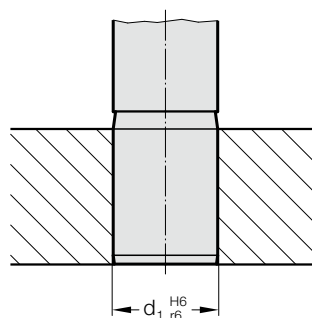


### 2022.13.

Pillar- $\varnothing$   $d_1$  Retaining bore  $d_1^{H6}$

Pillar- $\varnothing$ $d_1$	Retaining bore $d_1^{H6}$
40	+0,016
50	0
63	+0,019
80	0

Pillars of  $d_1 = 50$  mm and over should be frozen in dry ice before fitting



### 2022.13.

**Guide pillar VW**  
press fit



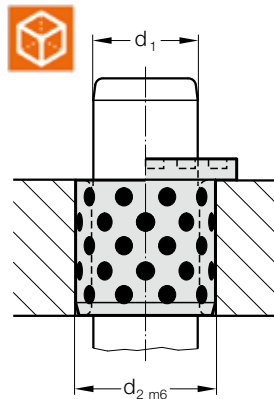
# ASSEMBLY OF GUIDE ELEMENTS DIMENSIONAL REQUIREMENTS AND TOLERANCES



2052.70. <sup>1)</sup> / 2086.70. /  
2085.72.

**Guide bush / Guide bush  
with collar, Bronze with  
solid lubricant**

Slip-Fit Bonding\*:  
Retaining bore  $d_2 = G7$   
transition fit:  
Retaining bore  $d_2 = H7$   
<sup>1)</sup> if required secure with set screw



2052.70.<sup>1)</sup> / 2086.70. / 2085.72.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2$	Slip-Fit Bonding Tolerance $d_2^{G7}$	transition fit Tolerance $d_2^{H7}$
8	12	+0,024	+0,018
10	14/15	+0,006	0
12	18		
13	19		
14	20		
15	21	+0,028	+0,021
16	22	+0,007	0
18/19	24/25		
20	26/28/30		
25	32/33/35		
28	38		
30	38/40/42		
31,5	40	+0,034	+0,025
32	42	+0,009	0
35	44/45		
38	48		
40	50		
40	55		
45	55/56/60		
50	60/62/65	+0,040	+0,030
55	70	+0,010	0
60	74/75		
63	75		
65	80		
70	85/90		
75	90/95		
80	96/100	+0,047	+0,035
85	100	+0,012	0
90	110		
100	120		
110	130		
120	140		
125	145		
130	150	+0,054	+0,040
140	160	+0,014	0
150	170		
160	180		

### \*Slip-Fit Bonding:

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond.

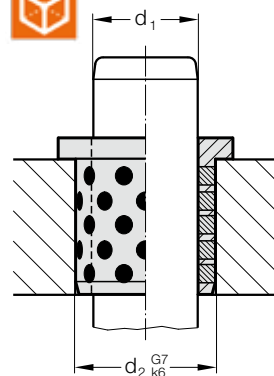
The available component tolerances do not always result in the minimum glue-line gap.

This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.

2085.70.

**Guide bush with collar,  
Bronze with solid  
lubricant**

transition fit



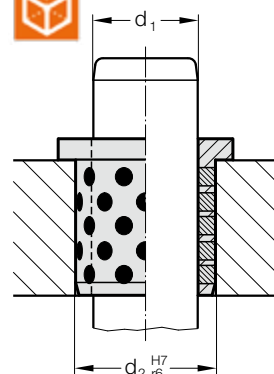
2085.70.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{G7}$	Tolerance $d_2^{G7}$
12	16	+0,024 +0,006
16	20	
20	26	+0,028
24	30	+0,007

2085.71.

**Guide bush with collar,  
Bronze with solid  
lubricant**

press fit



2085.71.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2$	Tolerance $d_2^{H7}$	Pillar- $\varnothing$ $d_1$	Retaining bore $d_2$	Tolerance $d_2^{H7}$
10	14	+0,018	45	55	
12	18	0	50	60	
13	19		55	65	+0,030
14	20		60	75	0
15	21	+0,021	63	75	
16	22	0	70	85	
20	30		75	90	
25	35		80	100	+0,035
30	40		90	110	0
31,5	40	+0,025	100	120	
35	45	0	120	140	+0,040
40	50				0

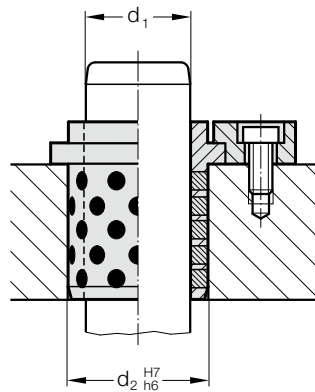


# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

### 2082.70.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H7}$	Tolerance $d_2^{H7}$
24/25	32/35	+0,025
30/32	40/42	0
38/40	50	
48/50	63	+0,030
60/63	80	0
80	100	+0,035
100	125	0
125	160	+0,040
160	200	0
		+0,046
		0



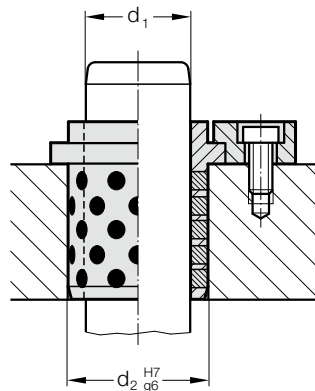
### 2082.70.

**Guide bush with collar,  
Bronze with solid lubricant  
DIN 9834/ISO 9448**

slip fit

### 2082.71. / 2086.71.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H7}$	Tolerance $d_2^{H7}$
25/32/40	32/40/50	+0,025
		0
50/63	63/80	+0,030
		0
80	100	+0,035
		0
100/125	125/160	+0,040
		0



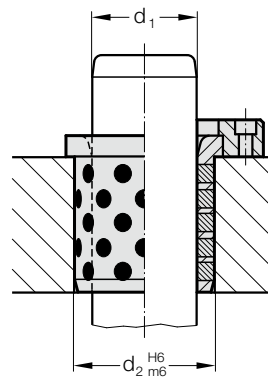
### 2082.71. / 2086.71.

**Guide bush with collar,  
Bronze with solid lubricant,  
NAAMS**

slip fit

### 2102.70. / 2102.71.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H6}$	Tolerance $d_2^{H6}$
25	35	+0,016
32	44	0
40	52	
50	63	+0,019
63	80	0
80	100	+0,022
		0
100	125	+0,025
		0



### 2102.70. / 2102.71.

**Guide bush with collar,  
Bronze with solid lubricant  
/ Bronze, CNOMO**

transition fit

# ASSEMBLY OF GUIDE ELEMENTS

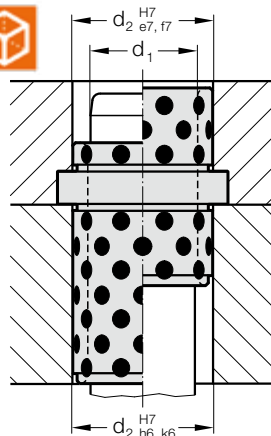
## DIMENSIONAL REQUIREMENTS AND TOLERANCES

2087.70. / 2087.71. /  
2087.73.



**Guide bush with collar,  
Bronze with solid lubricant**

e7 = slip fit  
f7 = slip fit  
h6 = slip fit  
k6 = transition fit



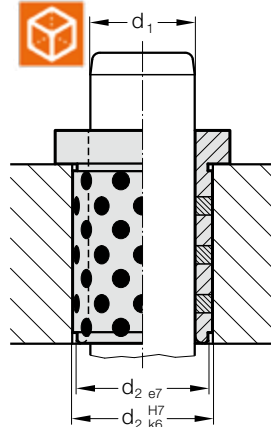
2087.70. / 2087.71. / 2087.73.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H7}$	Tolerance $d_2^{H7}$
9/10	14	+0,018 0
14/15	20	
18/20	26	+0,021 0
22/24	30	
25	35	
30/32	42	+0,025 0
40	50	
40/42	54	
50	63	+0,030 0
60	80	
63	80	

2087.72.

**Guide bush with collar,  
Bronze with solid  
lubricant**

e7 = slip fit  
k6 = transition fit



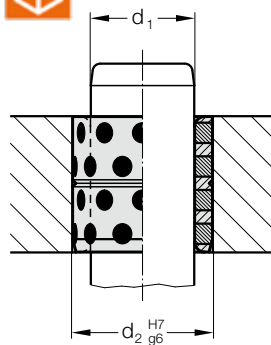
2087.72.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H7}$	Tolerance $d_2^{H7}$
9/10	14	+0,018 0
12	18	
14/15	20	
16	22	+0,021 0
18/20	26	
22/24	30	
25	32	+0,025 0
30/32	42	
40/42	54	+0,030 0
50	66	
60	80	

3120.70. / 3120.71.

**Guide bush with collar,  
Bronze with solid  
lubricant / Bronze**

slip fit  
Bond in or if required secure  
with set screw or flat  
mushroom head screw  
2192.61.



3120.70. / 3120.71.

Pillar- $\varnothing$ $d_1$	Retaining bore $d_2^{H7}$	Tolerance $d_2^{H7}$
8	12	
10	14/15	+0,018 0
12	18	
13	19	
14	20	
15	21	+0,021 0
16	22	
18/19	24/25	
20	26/28/30	
25	32/33/35	
28	38	
30	38/40/42	
31,5	40	+0,025 0
32	42	
35	44/45	
38	48	
40	50	
40	55	
45	55/56/60	
50	60/62/65	
55	70	+0,030 0
60	74/75	
63	75	
65	80	
70	85/90	
75	90/95	
80	96/100	+0,035 0
85	100	
90	110	
100	120	
110	130	
120	140	
125	145	
130	150	+0,040 0
140	160	
150	170	
160	180	

# ASSEMBLY OF GUIDE ELEMENTS

## DIMENSIONAL REQUIREMENTS AND TOLERANCES

### 2061.69. .1

Pillar- $\varnothing$ $d_1$	Retaining bore $d_3^{H6}$
20	32 $^{+0,016}$
25	40 $^{+0,016}$
32	48 $^{+0,016}$
40	58 $^{+0,019}$
50	70 $^{+0,019}$
63	85 $^{+0,022}$

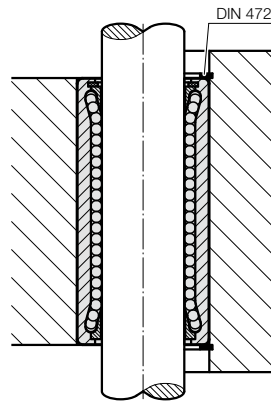
#### \*Slip-Fit Bonding:

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond.

The available component tolerances do not always result in the minimum glue-line gap.

This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.



### 2061.69. .1

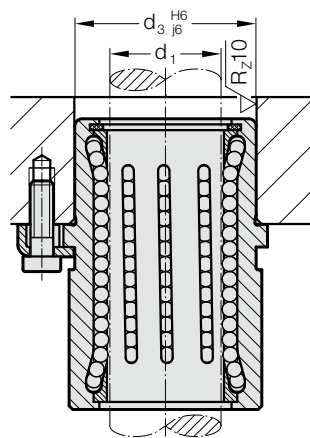
#### Recirculating ball bush

Slip-Fit Bonding\*



### 2081.69. .1

Pillar- $\varnothing$ $d_1$	Retaining bore $d_3^{H6}$
20	32 $^{+0,016}$
25	40 $^{+0,016}$
32	48 $^{+0,016}$
40	58 $^{+0,019}$
50	70 $^{+0,019}$
63	85 $^{+0,022}$



### 2081.69. .1

#### Recirculating ball bush with collar

transition fit



