

BALL CAGE, SMALL DIMENSION GUIDE BUSH FOR BALL BEARING, SMALL DIMENSION



Material:

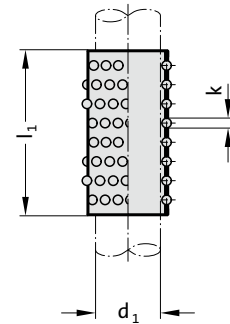
Cage: Brass

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

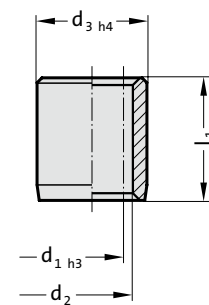
Note:

☞ 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.



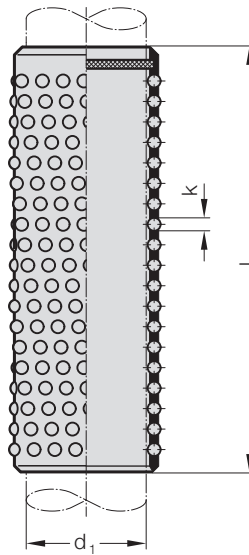
206.54. Guide bush for ball bearing, small dimension

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					●

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.

I = Nominal ordering length

I₁ = Manufacturing length

206.73. Ball cage with assembly aid, Brass

d ₁	10	11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	2	3	3	3	3	3	4	4	4	4	6
I / I ₁	Total number of balls											
24 / 24				64		80						
28 / 28				80		100						
31 / 32					120	120	120					
40 / 39	176	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	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	
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 assembly aid, Brass	=	206.73.
Diameter of conduit d ₁	38 mm =	038.
Nominal order length for ball cage I	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.

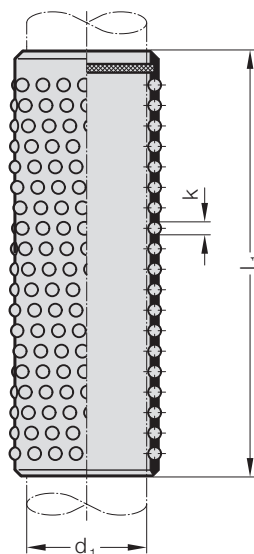
☞ Notes on ball bearing type guides at the beginning of chapter D.

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

l = Nominal ordering length

l₁ = Manufacturing length

2060.63.



2060.63. Ball cage with assembly aid, Aluminium

d ₁	10	11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	2	3	3	3	3	3	4	4	4	4	6
Total number of balls												
l / l ₁												
24 / 24			64		80							
28 / 28			80		100							
31 / 32			120		120							
40 / 39	176	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	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	
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 assembly aid, Aluminium = 2060.63.

Diameter of conduit d₁ 38 mm = 038.

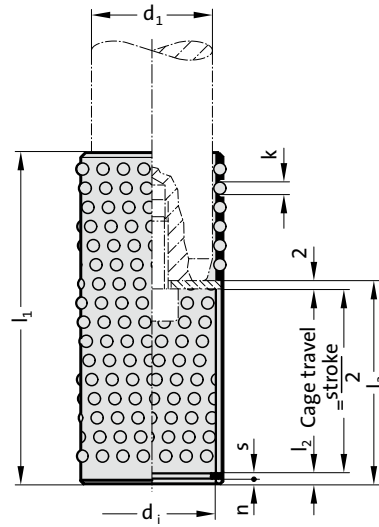
Nominal order length for ball cage l 50 mm = 050

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

l₁ = Manufacturing length

Cage retainer 202.92.1. order separately

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

d ₁	19	20	24	25	30	32	38	40	48	50	60	63
d ₁ 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 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	2.15	2.15	2.15	2.15
l / l ₁	l ₃											
56 / 56	31	31	31	31								
70 / 70												
72 / 72	41	41	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 ₁	38 mm =	038.
Nominal order length for ball cage l	80 mm =	080.
Slot length l ₃	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.

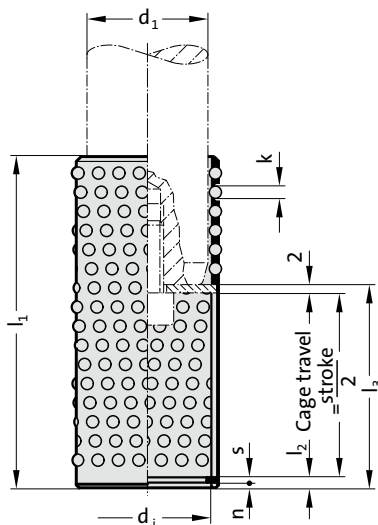
Bearing life and dynamic load indexes see at the end of chapter D.

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
$d_i \times s$	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	2.15	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

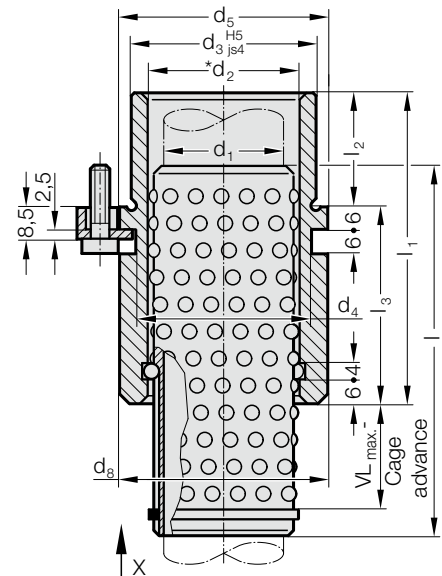
Ordering Code (example):

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.

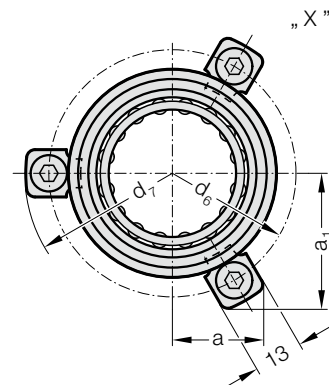
The attachment is with 3 Screw clamp, from $\varnothing d_1 = 38$ with 4 Screw clamp, which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head $\varnothing 13$).

* 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



2081.67. Headed guide bush with ball cage retainer

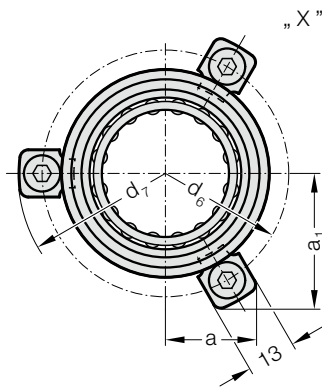
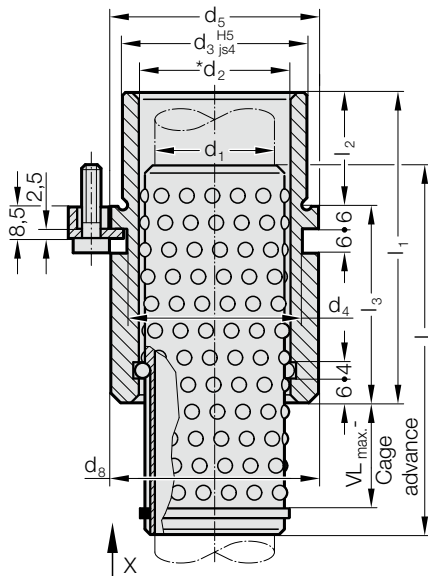
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_2	25 26	30 31	38 40	46 48	56 58	68 71
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
d_8	38.9	46	53	63	77	92
l_1	59	79	93	108	127	150
l_2	23	23	30	37	47	60
l_3	36	56	63	71	80	90
l	72	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 = 2081.67.
 Diameter of conduit d_1 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

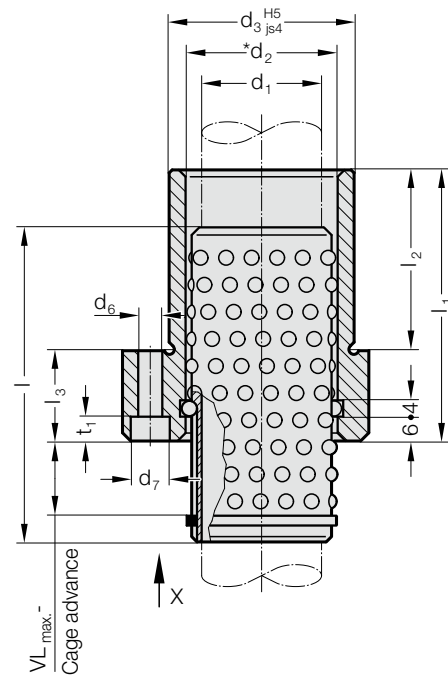
Ordering Code (example):

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.

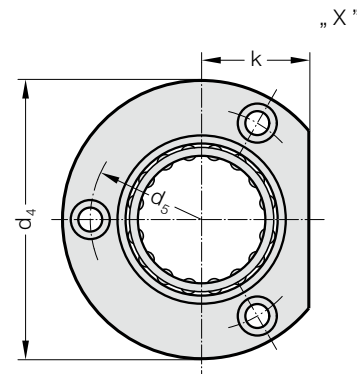
The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.

* 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

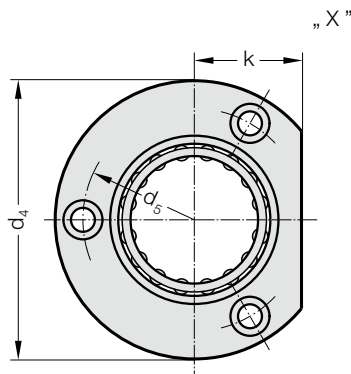
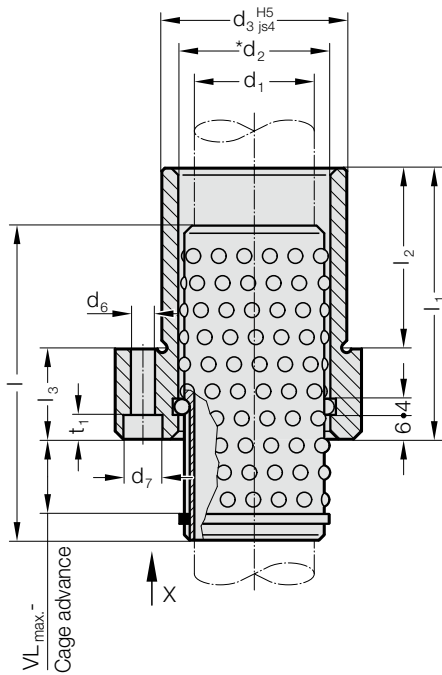
d ₁	19 20	24 25	30 32	38 40	48 50	60 63	80
d ₂	25 26	30 31	38 40	46 48	56 58	68 71	92
d ₃	32	40	48	58	70	85	105
d ₄	50	63	72	85	104	120	148
d ₅	40	50	58	70	86	100	125
d ₆	4.5	5.5	5.5	6.6	9	9	11
d ₇	8	10	10	11	15	15	18
t ₁	4.6	5.7	5.7	6.8	9	9	11
k	18	23	28	33	38	46	56
l ₁	52	62	72	77	102	102	125
l ₂	37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

Ordering Code (example):

Flanged guide bush with ball cage retainer	=	2091.67.
Diameter of conduit d ₁	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 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	50	63	72	85	104	120	148
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
t ₁	4.6	5.7	5.7	6.8	9	9	11
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
l ₃	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140
VL _{max.}	49	44	44	51	51	52	54

Ordering Code (example):

Flanged guide bush with ball cage retainer = 2091.68.
 Diameter of conduit d₁ 38 mm = 038.
 Feed length VL 5 mm = 005.
 Classification TOL yellow = 10
 Order No = 2091.68. 038. 005. 10