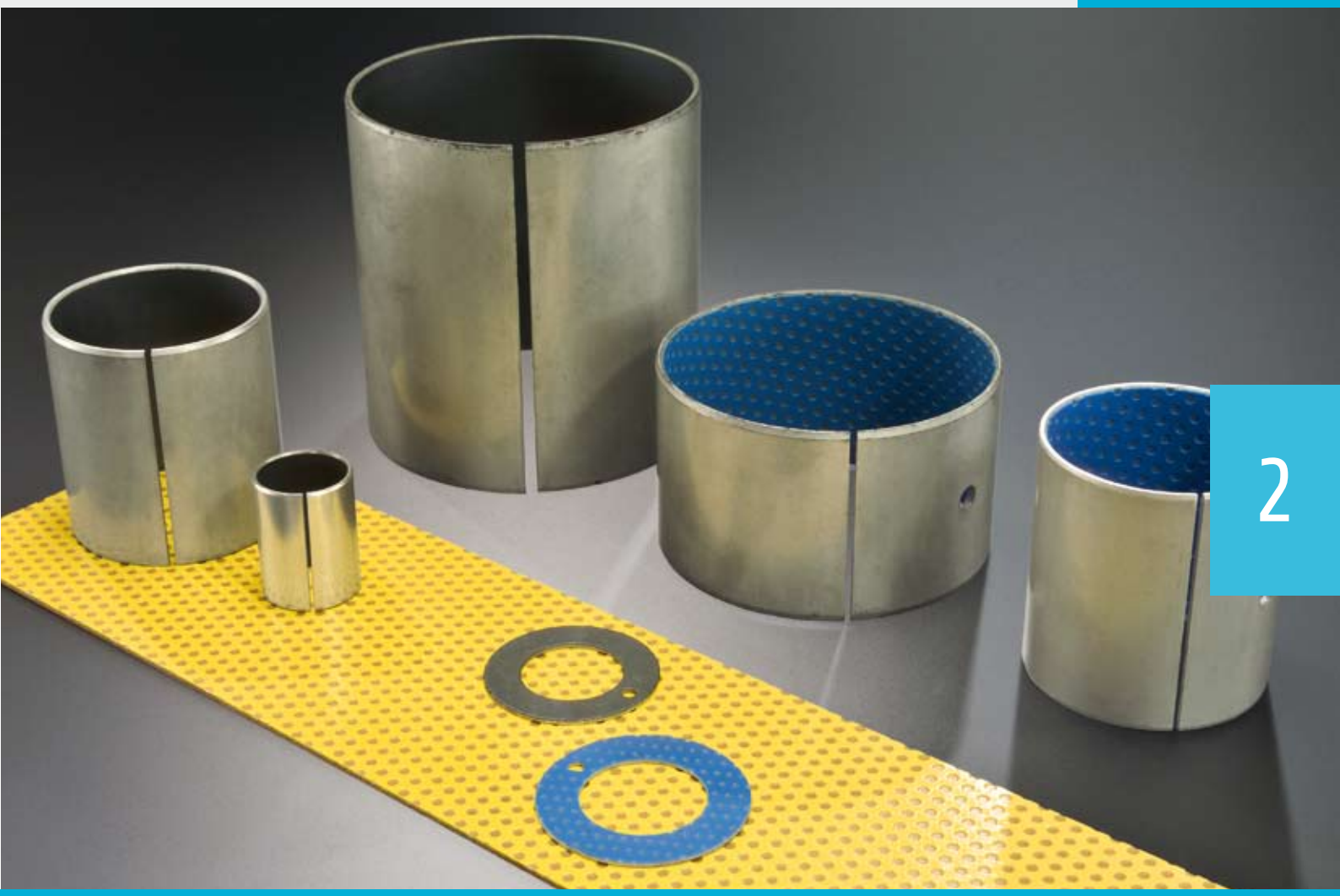


2

Rolled dry sliding bearings

maintenance-free, space-saving

The maintenance-free, space-saving rolled dry sliding bearings are available with two different types of slide layer:

TYPE F
consists of a copper-plated steel shell, onto the inside of which (running surface) a tin bronze layer is sintered, the pores of which are filled with PTFE.
Main characteristics: good mechanical properties in combination with the good sliding and lubrication properties of the PTFE mixture.
Type F on request with either a bronze back or one made of stainless steel.

TYPE A
features the same build-up as type F but on the inner sintered layer an acetal resin top layer is firmly anchored. This layer is provided with lubrication pockets for accommodating additional lubricating grease.
Main characteristics: insensitive to misalignment and the resulting load on edges.

Properties of rolled dry sliding bearings

Rolled dry sliding bearings have many attractive properties and advantages:

- long service life and maintenance-free operation
- high load-bearing capacity
- low wear
- low coefficient of friction
- stick-slip free sliding behaviour
- good chemical resistance of sliding surfaces
- suitable for a large temperature range, especially type F
- good thermal conductivity (type F)
- (ow sensitivity to dirt and edge load (type A).

Technical data

Properties / Requirements of materials in contact	Rolled dry sliding bearings	
	Type F	Type A
Structure	Steel back with sintered tin bronze. Pore filling and top layer (5 – 20 µm) made from PTFE with friction-reducing additions.	Steel back with sintered steel bronze. Pore filling and top layer (0.3 mm) made from acetal resin.
Permissible static load (N/(mm²) max. P	250	250
Reference values for the specific load-bearing capacity under normal operating conditions /N/mm²) max. P	20 to 50	20 to 50
Max. sliding speed (m/s) max. v (N/mm2 · m/s) max. p · v	2 2	3 3
Operating temperature (°C)	– 200 to + 280	– 40 to +100 (for a short time up to +130)
Thermal conductivity (W/mK)	46	2
Coefficient of friction	0,03 to 0,25	0,02 to 0,20
Stick-slip effect	Does not occur	Does not occur
Thickness of wearing coat (mm)	0,2	0,3
Lubrication	not required	initial lubrication required
Load-bearing capacity of edges (e.g. as a result of misalignment)	less good	good
Embedding of dirt and foreign matters	less good	good
Use for longitudinal movements	less good	good
Post-processing of slide surfaces	–	possible
Recommended tolerance of enclosure for bushings	H7	H7
Recommended shaft tolerance for bushings	f 7 (to 75 mm Ø) h 8 (more than 75 mm Ø)	h 8
Required surface quality of the other sliding surface µm	$R_z \leq 3$ $R_a \leq 0,4$	$R_z \leq 6$ $R_a \leq 0,8$
Permissible surface treatment of the other sliding surface	ground (drawn)	ground (drawn)

Information on installation

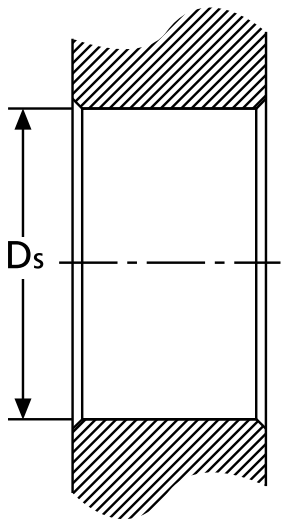
When installing rolled dry sliding bearings, cleanliness is of major importance in order to ensure their proper functioning and to prevent premature wear.

All components of the bearing should be thoroughly cleaned and de-burred before installation. Surfaces inside cast housings which have not been processed must be free from moulding sand. The condition of the shaft must be carefully controlled in order to prevent the sliding layer being damaged by sharp edges, burrs etc. when inserting the shaft into the bearing. Do not use shafts the sliding surfaces of which are already damaged.
It is recommended that rolled dry sliding bearings are installed using press-in mandrels (picture 1). Using a round cord which is fastened to the mandrel the bearings are fastened to the mandrel. In the case of larger radial bearings, installation is facilitated using an auxiliary ring (picture 2), which aligns and pre-centres the bearings to prevent them becoming jammed during pressing-in. Installation is facilitated if the bearing surface in the housing is slightly oiled or greased. In the case of larger bushings, the use of a solid greasing paste with molybdenum disulphide for the reduction of scuffing as well as press-in forces has proved to be excellent.

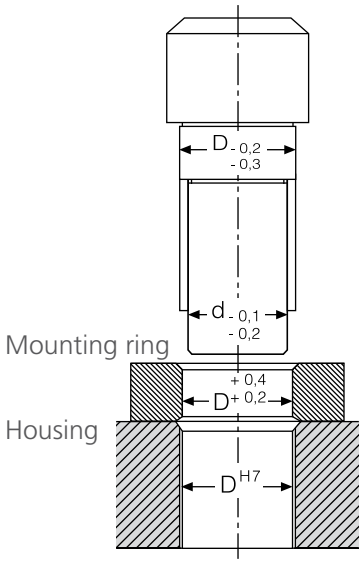
When installing sleeves and flange sleeves which will be subject to high loads during operation, attention must be paid to ensure that the joint is outside the load zone, otherwise the service life may be reduced. When installing the thrust washers, pay attention to their correct installation position (steel back / wall of housing).

If rolled dry sliding bearings are fastened by gluing them to the housing, this can be done using a commercially available adhesive. The suitability of the selected adhesive for the operating temperatures, its expansion and curing behaviour should be checked. If no information is available, it is recommended that the manufacturer of the adhesive is contacted. When gluing the bearing into the housing, attention must be paid to ensure that no adhesive gets onto the sliding surface.

Picture 1

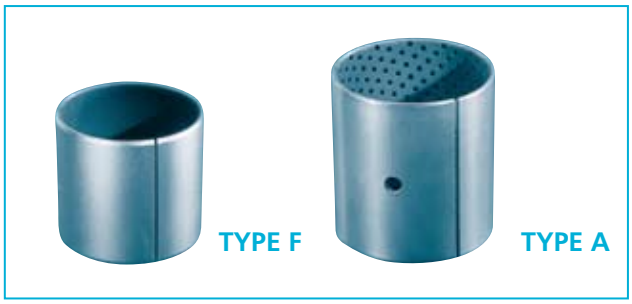


Picture 2



Installation tolerances

Dimensions of bearing holes d
after pressing into housing H 7.



Dimensions mm		TYPE F Ø mm d		TYPE A Ø mm d	
d/	D	max.	min.	max.	min.
3 /	4,5	3,048	3,000		
4 /	5,5	4,048	4,000		
5 /	7	5,053	4,986		
6 /	8	6,053	5,986		
8 /	10	8,053	7,986	8,105	8,040
10 /	12	10,056	9,986	10,108	10,040
12 /	14	12,056	11,986	12,108	12,040
13 /	15	13,056	12,986		
14 /	16	14,056	13,986	14,108	14,040
15 /	17	15,056	14,986	15,108	15,040
16 /	18	16,056	15,986	16,108	16,040
18 /	20	18,059	17,986	18,111	18,040
20 /	22	20,059	19,986	20,111	20,040
20 /	23	20,071	19,986	20,131	20,050
22 /	24	22,059	21,986	22,111	22,040
22 /	25	22,071	21,986	22,131	22,050
24 /	27	24,071	23,986	24,131	24,050
25 /	28	25,071	24,986	25,131	25,050
28 /	32	28,083	27,986	28,155	28,060
30 /	34	30,083	29,986	30,155	30,060
32 /	36	32,083	31,986	32,155	32,060
35 /	39	35,083	34,986	35,195	35,080
37 /	40	37,075	36,986	37,135	37,050

Dimensions mm		TYPE B Ø mm d		TYPE A Ø mm d	
d/	D	max.	min.	max.	min.
40 /	44	40,083	39,986	40,195	40,080
45 /	50	45,101	44,984	45,195	45,080
50 /	55	50,106	49,984	50,200	50,080
55 /	60	55,106	54,984	55,200	55,080
60 /	65	60,106	59,984	60,200	60,080
65 /	70	65,106	64,984	65,260	65,100
70 /	75	70,106	69,984	70,260	70,100
75 /	80	75,106	74,984	75,260	75,100
80 /	85	80,155	80,020	80,265	80,100
85 /	90	85,155	85,020	85,265	85,100
90 /	95	90,155	90,020	90,265	90,100
95 /	100	95,155	95,020	95,265	95,100
100 /	105	100,155	100,020	100,265	100,100
105 /	110	105,155	105,020	105,265	105,100
110 /	115	110,155	110,020	110,265	110,100
115 /	120	115,155	115,020	115,265	115,100
120 /	125	120,210	120,070	120,270	120,100
125 /	130	125,210	125,070	125,270	125,100
130 /	135	130,210	130,070	130,270	130,100
135 /	140	135,210	135,070	135,270	135,100
140 /	145	140,210	140,070	140,270	140,100
150 /	155	150,210	150,070	150,270	150,100

Recommended shaft tolerance

TYPE F

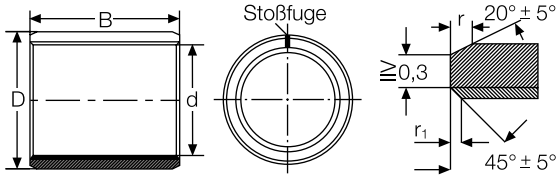
e 7 (up to 18 mm Ø)
f 7 (from Ø 20 - 75 mm)
h 8 (from Ø 80 mm)

TYPE A

h 8

Cylindrical bearings

TYPE F



Dimension mm		
d /	D	L ± 0,25
3/	4,5	3
3/	4,5	5
3/	4,5	6
4/	5,5	3
4/	5,5	4
4/	5,5	6
4/	5,5	10
5/	7	5
5/	7	8
5/	7	10
6/	8	6
6/	8	8
6/	8	10
7/	9	10
8/	10	8
8/	10	10
8/	10	12
10/	12	8
10/	12	10
10/	12	12
10/	12	15
10/	12	20
12/	14	8
12/	14	10
12/	14	12
12/	14	15
12/	14	20
12/	14	25
13/	15	10
13/	15	20
14/	16	10
14/	16	12
14/	16	15
14/	16	20
14/	16	25
15/	17	10
15/	17	12
15/	17	15
15/	17	20

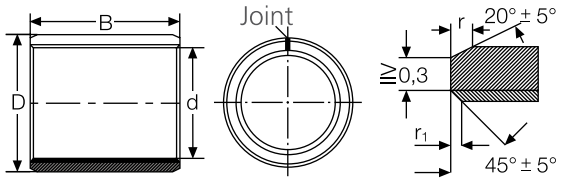
Dimensions mm		
d /	D	L ± 0,25
15/	17	25
16/	18	10
16/	18	12
16/	18	15
16/	18	20
16/	18	25
17/	19	20
18/	20	15
18/	20	20
18/	20	25
20/	22	20
20/	23	10
20/	23	15
20/	23	20
20/	23	25
20/	23	30
22/	25	15
22/	25	20
22/	25	25
22/	25	30
24/	27	15
24/	27	20
24/	27	25
24/	27	30
24/	28	25
25/	28	15
25/	28	20
25/	28	25
25/	28	30
25/	28	50
28/	32	15
28/	32	20
28/	32	25
28/	32	30
30/	34	15
30/	34	20
30/	34	25
30/	34	30
30/	34	40

Dimensions mm		
d /	D	L ± 0,25
32/	36	20
32/	36	30
32/	36	40
35/	39	20
35/	39	30
35/	39	40
35/	39	50
37/	40	20
40/	44	20
40/	44	30
40/	44	40
40/	44	50
45/	50	20
45/	50	30
45/	50	40
45/	50	50
50/	55	20
50/	55	30
50/	55	40
50/	55	50
50/	55	60
55/	60	20
55/	60	25
55/	60	30
55/	60	40
55/	60	50
55/	60	60
60/	65	20
60/	65	30
60/	65	40
60/	65	60
60/	65	70
65/	70	30
65/	70	50
65/	70	70
70/	75	40
70/	75	50
70/	75	70
75/	80	60

Dimensions mm		
d /	D	L ± 0,25
75/	80	80
80/	85	60
80/	85	100
85/	90	30
85/	90	60
85/	90	100
90/	95	60
90/	95	100
95/	100	60
95/	100	100
100/	105	60
100/	105	115
105/	110	60
105/	110	115
110/	115	60
110/	115	115
115/	120	50
115/	120	70
120/	125	50
120/	125	100
125/	130	100
130/	135	60
130/	135	100
135/	140	60
135/	140	80
140/	145	60
140/	145	100
150/	155	60
150/	155	80
150/	155	100
160/	165	80
160/	165	100
180/	185	80
180/	185	100
200/	205	100
210/	215	100
220/	225	100
250/	255	100
300/	305	100

Cylindrical bearings

TYPE A



Dimensions mm		
d /	D	L ± 0,25
8/	10	8
8/	10	10
8/	10	12
10/	12	10
10/	12	12
10/	12	15
10/	12	20
12/	14	10
12/	14	12
12/	14	15
12/	14	20
12/	14	25
14/	16	15
14/	16	20
14/	16	25
15/	17	10
15/	17	12
15/	17	15
16/	18	15
16/	18	20
16/	18	25
18/	20	15
18/	20	20
18/	20	25
20/	22	10
20/	22	20
20/	23	10

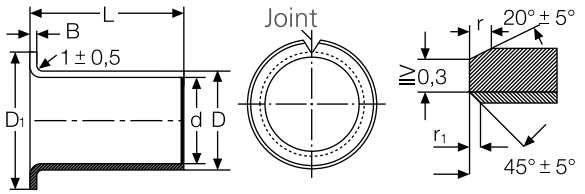
Dimensions mm		
d /	D	L ± 0,25
20/	23	15
20/	23	20
20/	23	25
20/	23	30
22/	24	20
22/	25	15
22/	25	20
22/	25	25
22/	25	30
24/	27	20
25/	28	15
25/	28	20
25/	28	25
25/	28	30
28/	32	20
28/	32	25
28/	32	30
30/	34	20
30/	34	30
30/	34	40
32/	36	20
32/	36	30
32/	36	40
35/	39	20
35/	39	30
35/	39	50
37/	40	20

Dimensions mm		
d /	D	L ± 0,25
40/	44	20
40/	44	30
40/	44	40
40/	44	50
45/	50	20
45/	50	30
45/	50	40
45/	50	50
50/	55	40
50/	55	60
55/	60	20
55/	60	25
55/	60	30
55/	60	40
55/	60	50
60/	65	30
60/	65	40
60/	65	60
65/	70	50
65/	70	70
70/	75	50
70/	75	70
75/	80	40
75/	80	60
75/	80	80
80/	85	60
80/	85	100

Dimensions mm		
d /	D	L ± 0,25
85/	90	30
85/	90	60
85/	90	100
90/	95	60
90/	95	100
95/	100	60
95/	100	100
100/	105	60
100/	105	115
105/	110	60
105/	110	115
110/	115	60
110/	115	115
115/	120	50
115/	120	70
120/	125	100
125/	130	100
130/	135	60
130/	135	100
135/	140	60
135/	140	80
140/	145	60
140/	145	100
150/	155	60
150/	155	80
150/	155	100

Cylindrical bearings

Only TYPE F available



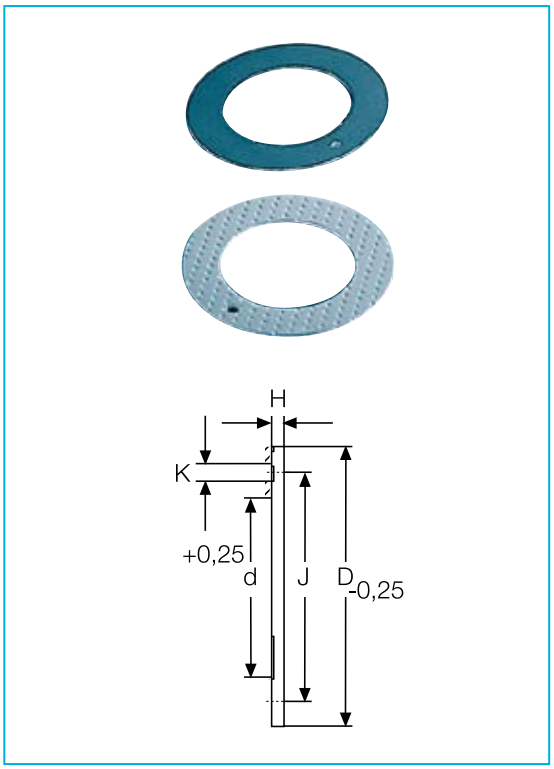
Dimensions (mm)			L ± 0,25	B
d /	D /	D_1		
5/	7/	11,5	4	1
6/	8/	12	4	1
6/	8/	12	8	1
8/	10/	15,5	5,5	1
8/	10/	15	7,5	1
8/	10/	15	9,5	1
10/	12/	18	6	1
10/	12/	18	7	1
10/	12/	18	9	1
10/	12/	18	12	1
10/	12/	18	17	1
10/	12/	18	20	1
12/	14/	20	7	1
12/	14/	20	9	1
12/	14/	20	12	1
12/	14/	20	15	1
12/	14/	20	17	1
14/	16/	22	12	1
14/	16/	22	17	1
15/	17/	23	9	1

Dimensions (mm)			L ± 0,25	B
d /	D /	D_1		
15/	17/	23	12	1
15/	17/	23	17	1
16/	18/	24	12	1
16/	18/	24	17	1
16/	18/	24	26	1
18/	20/	26	12	1
18/	20/	26	17	1
18/	20/	26	22	1
20/	23/	30	11,5	1,5
20/	23/	30	15	1,5
20/	23/	30	16,5	1,5
20/	23/	30	21,5	1,5
25/	28/	35	11,5	1,5
25/	28/	35	16,5	1,5
25/	28/	35	21,5	1,5
30/	34/	42	16	2
30/	34/	42	26	2
30/	34/	42	40	2
40/	44/	53	26	2

Thrust washers

TYPE F and TYPE A

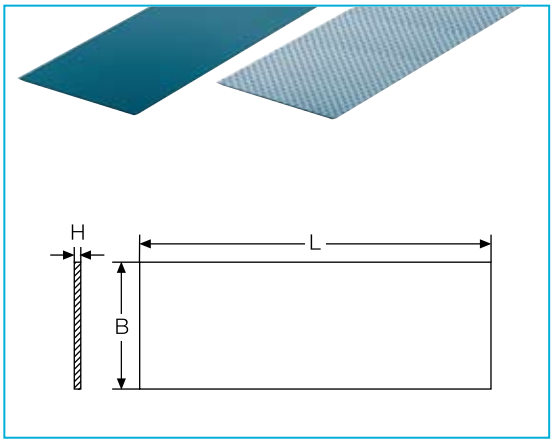
Dimensions (mm)			J	K
d /	D /	H		
12/	24x	1,5	18	1,75
14/	26x	1,5	20	2,25
18/	32x	1,5	25	2,25
20/	36x	1,5	28	3,25
22/	38x	1,5	30	3,25
26/	44x	1,5	35	3,25
28/	48x	1,5	38	4,25
32/	54x	1,5	43	4,25
38/	62x	1,5	50	4,25
42/	66x	1,5	54	4,25
48/	74x	2	61	4,25
52/	78x	2	65	4,25



Flat strips

TYPE F and TYPE A

Dimensions (mm)				
B + 0,5 0	B_1 [1)]	L + 3 0	H + 0,02 - 0,1	
200	182	500	0,75	F
200	182	500	1,00	F
250	232	500	1,50	A
250	232	500	1,50	F
250	232	500	2,00	F
250	500	500	2,00	A
225	207	500	2,50	A
225	207	500	2,50	F
200	200	500	3,06	A
200	200	500	3,06	F



1) Useful strip width (width of sliding surface)

Fields of application

Thanks to their outstanding properties, rolled dry sliding bearings have opened up many new fields of application for which they have proved to be very suitable. They are used in almost all branches of industry, especially when maintenance-free bearings are required or where lubricants are not desirable or inadmissible. Typical fields of application are:

- **Motor vehicles**

(Stub axles, starter pinions, brake rods, brake shafts, brake shoes, spring struts, window lifting mechanisms, foot pedals, throttle linkages, blowers, articulated axles, clutch release levers, steering linkages, steering columns, pendulum carriers, shock absorbers, supporting joints, carburettor flaps etc.)

- **Rail vehicles, railway systems**

(Automatic doors, railway crossing gates, brakes, pantographs, contactor-controllers, power circuit breakers, relay boxes, signal systems, railway cars, switches etc.)

- **Aerospace**

(Brakes, electronic devices, chassis, engines, radar units, control equipment etc.)

- **Construction machines, conveyors**

(Elevators, excavator drives, controls, booms, concrete mixers, fork lift trucks, hydraulic cylinders, chain adjusting wheels, crane drives, controls, booms, compressed air hoisting gear, caterpillars, moving stairways and walkways, vibrating sieves, chutes, heavy load trailers, rope winches, belt conveyors etc.)

- **Office machines and equipment**

(Addressing machines, data processing equipment, dictating machines and tape recorders, swivel chairs, franking machines, photocopying machines, blueprinting machines, drawing boards and drafting machines etc.)

- **Household machines, hospital equipment**

Dental equipment, dishwashers, ironing boards, coffee machines, air conditioning systems, hospital beds, refrigerators, sewing machines, operating tables, X-ray apparatus, vacuum cleaners, washing machines etc.)

- **Machines for food processing**

(Baking machines, filter centrifuges, butchering machines, cellarage machines, mills, packaging machines, scales etc.)

- **Processing machines**

(Sheet metal working machines, briquetting machines, foundry machines, wood working machines, bottle capping machines, injection moulding machines, presses, welding machines, machine tools, crushing machines etc.)

- **Paper and textile machines**

(Trimming machines, printing machines, doubler winders and carding machines, button machines, paper processing machines, sorting machines, spinning and mending machines, knitting machines, weaving machines etc.)

- **Pumps and valves**

(Axial and radial piston pumps, dosing pumps, compressors, ball valves, mixing valves, oil burners, control valves, submersible pumps, vacuum pumps, gear pumps etc.)

- **Automatic machines, tools**

(Charging machines, vending machines, pneumatic and hydraulic tools etc.)

- **Agricultural machines**

(Hay makers, potato diggers, harvester-threshers, planting machines, beet lifters, tractors, straw balers etc.)

- **Other applications**

(Waste disposal equipment and plant, brake magnets, hardening plants, canvas blinds, progressively adjustable gears, drying plants etc.)