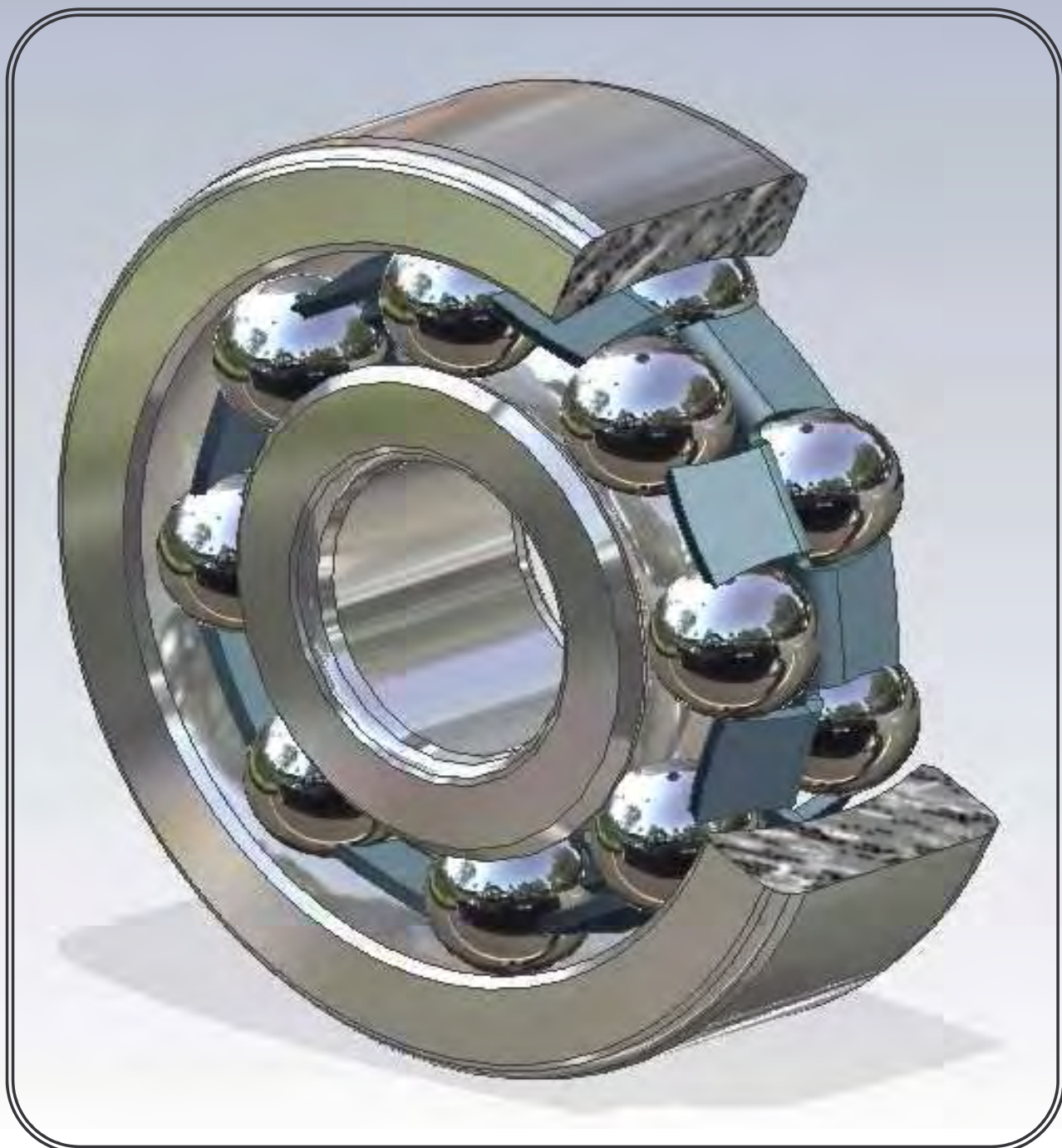




VRL Praha a.s.

MANUFACTURER OF BALL BEARINGS



CATALOG OF BEARINGS

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CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

**VRL Praha a.s.
Prague
Czech Republic**

has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:

ISO 9001:2008

The Quality Management System is applicable to:

**Design and manufacture of rolling and sliding bearings.
Machining of metal parts to customers' specifications.**

This certificate forms part of the approval identified by certificate number PRA 0004120.

Approval Certificate No: PRA 0004120/B Original Approval: 14 February 2002
Current Certificate: 9 November 2010
Certificate Expiry: 28 January 2013

Juditha Hameur
Issued by: Lloyd's Register EMEA, Prague office,
for and on behalf of Lloyd's Register Quality Assurance Limited



This document is subject to the provision on the reverse.
Taborská 31, 140 00 Prague 4, Czech Republic CZ61378721
This approval is carried out in accordance with the UKAS assessment and certification procedures and monitored by UKAS.
The use of the UKAS Accreditation Mark indicates Accreditation in respect of those activities covered by the Accreditation Certificate Number 001.



CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

**VRL Praha a.s.
Ke Kablu 378/24
102 00 Prague
Czech Republic**

has been approved by Lloyd's Register Quality Assurance, Coventry, West Midlands, UK, to the following Quality Management System Standard:

ISO/TS 16949:2009 (excluding product design)

The Quality Management System is applicable to:

Manufacture of rolling and sliding bearings.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

This certificate forms part of the approval identified by certificate number PRA 0004120.

Approval Certificate No: PRA 0004120/A Original ISO/TS 16949 Approval: 2 February 2004
Current Certificate: 9 November 2010
Certificate Expiry: 28 January 2013

Juditha Hameur
Issued by: Lloyd's Register EMEA, Prague office,
for and on behalf of Lloyd's Register Quality Assurance Limited



IATF Certificate No: 0096616

This document is subject to the provision on the reverse.
Taborská 31, 140 00 Prague 4, Czech Republic CZ61378721
This approval is carried out in accordance with the UKAS assessment and certification procedures and monitored by UKAS.

I. History of development VRL Praha a.s.

VRL Praha a.s. is situated in the south-eastern suburbs of Prague and is part of the industrial zone in the area of Hostivař and Dolní Měcholupy.

Foundation of VRL Praha a.s. was laid down by the former employee of SKF Mr. Solman in 1939. He established private company „J.E. Solman - Factory for Ball Bearings“. Main production facility was concentrated on jointed bearings. First ball bearing type 62055 was made in 1940. Products were marked JES (initials of the owner Jan Eugen Solman). Gradually the production of jointed bearings was slowed down and the product range of ball bearings expanded. Production was gradually concentrated mainly on ball bearings.

From the beginning till today the company went through various stages of restructuring, currently the VRL Praha a.s. is a private joint stock company. The ball bearings are produced and sold under the ZKL trade mark from 1953.

II. Production program

Various changes were made in production program. When the Prague based producer was incorporated into association of Czechoslovak producers of bearings, its main production line were single and double row ball bearings with the external diameter under $D = 35\text{mm}$.

This assortment is the central production program till now, however the company is more and more focusing on production of special ball bearings in small and bigger series and on production of accurate rotating parts (rings, washers, etc). These ball bearings and parts are very accurate with almost all functional and connecting surface being ground eventually polished and superfinished. Some special bearings and parts have their diameter larger than $D = 35\text{ mm}$.

III. Technical level of products and quality of production

Ball bearings are in standard version produced in P0 class of tolerance. On customer's request the company is manufacturing ball bearings of higher classes of tolerance (P6, P5). Most ball bearings are produced with shields on one or both sides. Currently are produced with metal cover shields ZR, -2ZR, rubber seals RSR, -2RSR and on customer's request also with plastic shields.

All bearings can be used for temperatures by 120°C . We are offering also stabilised ball bearings for high operating temperatures till 400°C , with shields with lubricants by 300°C and with seals for temperatures by 200°C . Cages are two piece made from steel eventually brass sheet, plastic cages are from various materials, filling usually from glass fibres designated for high speed rotations.

Technology of production is comparable with other important producers as FAG, SKF, NSK, NTN, KOYO etc.

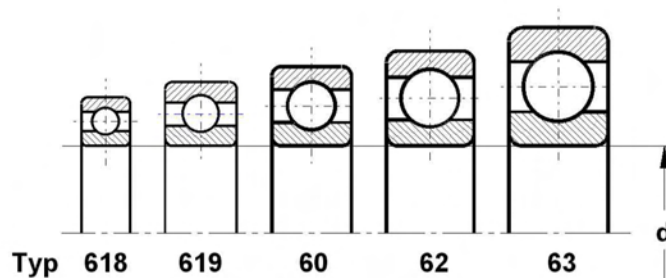
VRL Praha a.s. has its own drawing department. We are doing construction proposals for special ball bearings on customers request. We provide consultations on bedding of ball bearings. Drawing department is closely followed by manufacturing of samples and testing series.

VRL Praha a.s. has implemented system quality according to ČSN EN ISO 9001 and ISO/TS 16949. System quality has been certified by Lloyd's Register Quality Assurance. ISO/TS 16949 is required mainly in automotive industry.

Single Row Ball Bearings

Single row ball bearings are the most spread rolling bearings used all industries being manufactured in large-scale production of hundreds of thousand pieces. They achieve relatively high load capacity thanks to optimum size of balls in the particular profile being pushed against their raceway. They can take up both radial and axial load in both directions and they are appropriate for high overspeed.

VRL Praha is manufacturing single-row ball bearings in standard types of 618, 619, 60, 62 and 63 with bore diameters from 3 to 17 mm. Almost all assortment of ball bearings is also produced in version with metal shield on one or both sides (ZR,-2ZR). Most of all assortment of ball bearings is also produced with seals on one or both sides (RSR,-2RSR).



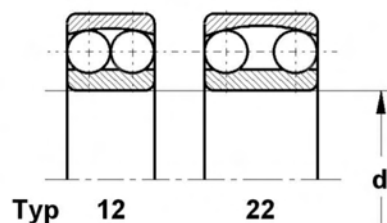
Self-Aligning Ball Bearings

Self-aligning ball bearings have spherical raceways on outer rings which allow appropriate tilting ($\pm 1,5^\circ$) of inner rings, with balls around the center of the bearing without affecting its correct operation. Self-aligning bearings are convenient for bearing arrangements that are presumed to have the bores in bearing housing out of alignment or to achieve shaft deflections and vibrations by the long bearing spacing. Because of their little contact angle and insufficient push on the balls against raceways, they are inconvenient to take up greater axial forces.

VRL Praha manufactures of double row self-aligning bearings in 12 to 22 standard types with bore diameter from 6 to 15 mm.

Special Ball Bearings

Special VRL Praha ball bearings have usually non standard dimensions or design. Such bearings are determined to be used in machines, devices and facilities the design of which does not allow to use standard types.



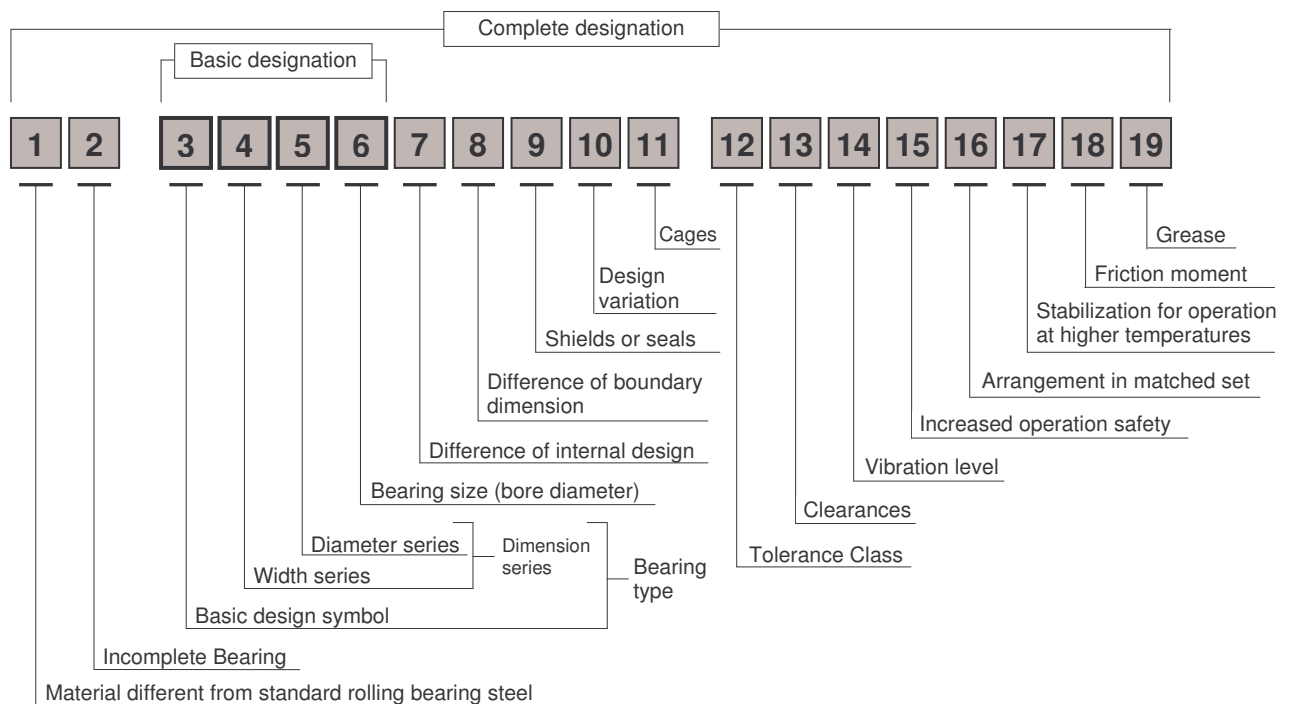
VRL Praha is manufacturing special single row ball bearings the structure of which is mostly based on standard types. Such bearings are usually applied like rollers in machines and devices in various industries. On the other hand, special double row self-aligning ball bearings with larger inner rings are intended for the aircraft industry, i.e. to be used for control rods in planes, etc. PLC 13-8 travelling roller with journal is meant for transport devices.

Basic Dimension

Basic dimensions of all standard VRL Praha ball bearings are contained in the following dimensional tables and correspond to the International Standard ISO 15 that is used as a basis for the Czech Standard ČSN ISO 15 – „*Rolling Bearings. Basic Dimensions.*“ Some dimensions of the special VRL Praha ball bearings are different from these standards.

Identification

The standard VRL Praha ball bearings are designated according to the Czech Standard ČSN 02 4608. The designation consists of digits and letters determining the type, size and design (modification) of the bearing. The basic types of the bearings are classified by basic specification consisting of the bearing type and size (*see Figure*).



The **type specification** consists of a character specifying the bearing construction and of a character specifying a dimension series or diameter series, e.g. 618/8, 624 or 126 respectively. (*see pictures on previous page*).

The **size specification** consists of characters implying the nominal diameter of the bore:

- as to bearings with bore diameter $d < 10$ mm, the digit separated by a slash or the last digit quotes the bore diameter in millimeters, e.g. 618/8, 624 or 126 respectively.
- as to bearings with bore diameter $d = 10$ to 15 mm, the groups of two digits have the following meaning:
 - 00** means the bore diameter $d = 10$ mm, e.g. 6000
 - 01** means the bore diameter $d = 12$ mm, e.g. 6201
 - 02** means the bore diameter $d = 15$ mm, e.g. 2202.

Identification of modified bearings

The modified rolling bearings from the basic type are designated by the complete specification consisting of the basic designation and optional character implying the modified basic version.

The most common characters being used to specify the modification of the VRL Praha bearings are stated in the following review. The characters are assembled into groups according to the sequences that are used by more than two characters.

- Shields and Seals

- RSR - sealing ring pushing on one side against the smooth rib of the inner ring, e.g. 6201RSR
- 2RSR - sealing rings pushing on both sides against the smooth rib of the inner ring, e.g. 6201-2RSR
- ZR - cover shields pushing on one side against the smooth rib of the inner ring, e.g. 625ZR
- 2ZR - cover shield pushing on both sides against the smooth rib of the inner ring, e.g. 625-2ZR

- Snap Ring Groove on Outer Ring

- N - snap ring Groove on outer ring
- NB - groove on outer ring, which is shielded only on one side (on the same side where is the groove)

- Cages

- J - pressed sheet steel cage ball riding (not designated), e.g. 6200
- Y - pressed sheet brass cage ball riding (not designated), e.g. 623
- TNH - one-piece open solid cage of polyamide or similar plastic, ball riding, e.g. 618/8TNH
- TNG - one-piece open solid cage of polyamide or similar plastic with glass fiber, ball riding

- Class of Tolerance

- P0 - standard class of tolerance (not designed), e.g. 2200
- P6 - higher class of tolerance, e.g. 626 P6
- P5 - higher class of tolerance than P6, e.g. 608 P5

- Clearance

- C2 - radial clearance, less than standard, e.g. 608 C2
- - standard radial clearance, e.g. 6000
- C3 - radial clearance, more than standard, e.g. 6201 C3
- C4 - radial clearance, more than C3, e.g. 629 C4
- R... - radial clearance, in non-standard range (μm -range), e.g. 629ZRTNH P6R11-18

- **Vibration Level**

- standard vibration level (not designed), e.g. 607
- C6 - decreased vibration level, e.g. 607 C6

- **Symbol Combination**

The characters of classes of tolerance, clearance and vibration level can be combined, such as:

P6+C2=P62 P6+C3=P63 P6+C6=P66

P6+C2+C6=P626 P6+C3+C6=P636

C2+C6=C26 C3+C6=C36

- **Stabilization for Operation at Higher Temperature**

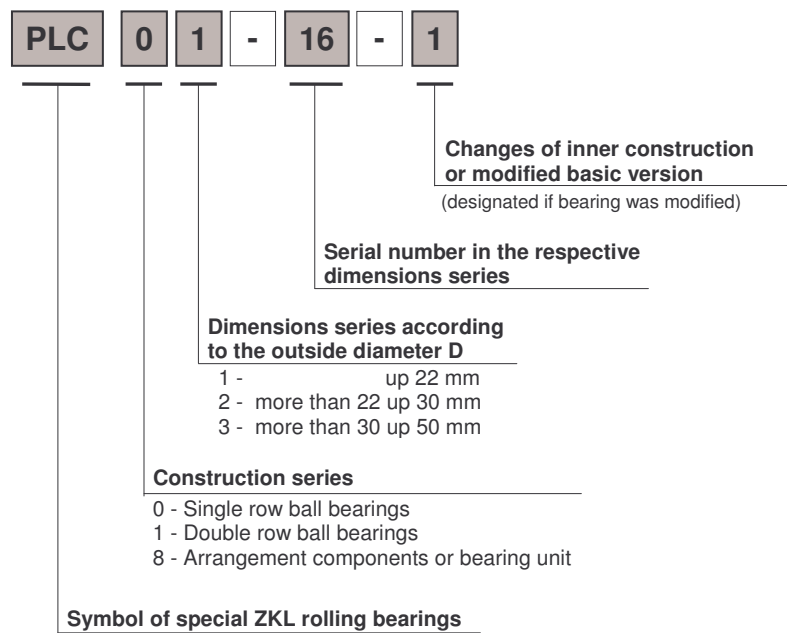
Stabilized bearings for service in higher temperatures have stabilized dimensions of both rings and higher radial clearance. If shielded they are filled with special grease.

- S0 - for operating up to 150°C
- S1 - up to 200°C
- S2 - up to 250°C
- S3 - up to 300°C
- S4 - up to 350°C
- S5 - up to 400°C

Identification of Special Bearings

Special VRL Praha ball bearings are designated by two methods according to the following classification:

1. Identification of PLC



2. Identification of VLM

VRL Praha newly designates special row ball bearing with digits **VLM** and three numbers, where the number means the serial number of special row ball bearing.



3. Identification of accurate rotating parts

These products are marked with digits **ZKO** and three numbers where the number means the serial number of special row ball bearing.

Shields and Sealings

Single or both sides shielded ball bearings are manufactured in the version with smooth ribs of inner rings (ZR or 2ZR respectively). In this version, the shield makes clearance sealing.

Single row seal ball bearings have rubber sealing rings vulcanized on metallic stiffening rings forming more effective friction type seal. The bearings are also manufactured with sealing rings pushing against the smooth ribs of inner rings (RSR or 2RSR respectively). The ball bearings with seals from standard material can be used in operating temperatures from -30 to $+110^{\circ}\text{C}$. On customers request bearings with seals for temperatures from -40 to $+200^{\circ}\text{C}$ can be produced.

In both cases, the shields or sealing rings are firmly fixed in the recess for the outer ring and cannot be taken out. Both sides shielded ball bearings (2ZR,-2RSR) are filled up with first-rate plastic lubricant, the qualities of which allow to lubricate the bearings during their lives under standard conditions. These bearing type cannot be after lubricated.

The delivery of bearings filled up with another than current plastic lubricant should be agreed upon in advance.

Snap Ring Groove

Some bearings (e.g. 6200N, 6200ZRN, 6200ZRNB, 6200-2ZRN, 6200RSRN, 6200RSRNB, 6200-2RSRN) can be produced with groove for snap ring (according ČSN ISO 464) on surface of the outer ring

Cages

Ball bearings produced by VRL Praha are manufactured with two piece cage pressed from steel or brass sheet, guided on balls. The characters J or Y are not mentioned in the designation. For special purposes single row ball bearings are equipped with one-piece open polyamide cage, guided on balls, designated with characters TNH. Bearings with polyamide cage are used when low noise level is required.

The design and material of cages of special ball bearings are listed in the respective dimensional tables.

Accuracy

The accuracy of ball bearings means accuracy of their main dimensions, accuracy of shape and motion. Tolerance of outer dimensions is established by ČSN ISO 492. Ball bearings are produced by VRL Praha in standard version in basic P0-standard class of tolerance (P0-symbol is not designated). For special bearing bedding (complex in accuracy or operating at high speed) the bearings with higher classes of tolerance are produced (P6 or P5, eventually P4). Delivery of bearings with higher accuracy must be negotiated in advance with producer.

The limits of deviations in dimensional accuracy and running according to the standard ČSN 02 4612 are listed in the following table:

Technical section

Used notations and their meaning :

- d - nominal bore diameter
- Δ_{dmp} - mean diameter deviation of a cylindrical bore in respective radial plane
- V_{dp} - dispersion variance of respective bore diameter in respective radial plane
- V_{dmp} - dispersion variance of mean diameter of cylindrical bore
- K_{ia} - radial runout of inner ring in mounted bearing
- Δ_{Bs} - deviation of the respective inner ring width
- V_{Bs} - dispersion variance of the respective inner ring width
- D - nominal outside diameter
- Δ_{Dmp} - mean diameter deviation of the outside surface in the respective plane
- V_{Dp} - dispersion variance of the outside surface diameter in the respective radial plane
- V_{Dmp} - dispersion variance of the mean diameter of the outside cylindrical plane
- K_{ea} - radial runout of outer ring in mounted bearing
- Δ_{Cs} - deviation of the respective outer ring width
- V_{Cs} - dispersion variance of the respective outer ring width

Dimensional and Running Accuracy of Journal Bearings

Inner Ring

ϕd <i>more than to</i>		Class of tolerance	Δ_{dmp}		V_{dp} Diameter series			V_{dmp}	K_{ia}	Δ_{Bs}		V_{Bs}
			<i>max</i>	<i>min</i>	8; 9 <i>max</i>	0; 1 <i>max</i>	2; 3 <i>max</i>			<i>max</i>	<i>max</i>	
[mm]			[μm]									
2,5	10	P0	0	-8	10	8	6	6	10	0	-120	15
		P6	0	-7	9	7	5	5	6	0	-120	15
		P5	0	-5	5	4	4	3	4	0	-40	5
10	18	P0	0	-8	10	8	6	6	10	0	-120	20
		P6	0	-7	9	7	5	7	7	0	-120	20
		P5	0	-5	5	4	4	3	4	0	-80	5

Outer ring

ϕD <i>more than to</i>		Class of tolerance	Δ_{Dmp}		V_{Dp} Diameter series				V_{Dmp}	K_{ea}	Δ_{Cs} V_{Cs}
			<i>max</i>	<i>min</i>	7; 8 <i>max</i>	0; 1 <i>max</i>	2; 3 <i>max</i>	shielded bearings <i>max</i>			
[mm]			[μm]								
6	18	P0	0	-8	10	8	6	10	6	15	*1)
		P6	0	-7	9	7	5	9	5	8	
		P5	0	-5	5	4	4	5	3	5	
18	30	P0	0	-9	12	9	7	12	7	15	
		P6	0	-8	10	8	6	10	6	9	
		P5	0	-6	6	5	5	6	3	6	
30	50	P0	0	-11	14	11	8	16	8	20	
		P6	0	-9	11	9	7	13	7	10	
		P5	0	-7	7	5	5	7	4	7	

*1) This corresponds to Δ_{Bs} and V_{Bs} of the inner ring of the same bearing

Radial Clearance

The radial clearance of currently manufactured VRL Praha ball bearings is standard and, therefore, not designated. As to special bearing arrangements, it is possible to deliver ball bearings with decreased (C2) or increased radial clearances (C3 or C4).

The values of radial clearances according to standard ČSN 02 4609 are listed in the following table. The delivery of bearings with another radial clearance range than stated below is to be agreed upon in advance.

The ranges of radial or axial clearance by special ball bearings are listed in the respective dimensional tables for each bearing separately.

Radial Clearance of Single Row Ball Bearings

Bore diameter		Radial Clearance							
d		C2		Standard		C3		C4	
<i>more than</i>	<i>to</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>
[mm]		[μm]							
2,5	10	0	7	2	13	8	23	14	29
10	18	0	9	3	18	11	25	18	33

Radial Clearance of Double Row Self-Aligning Ball Bearings

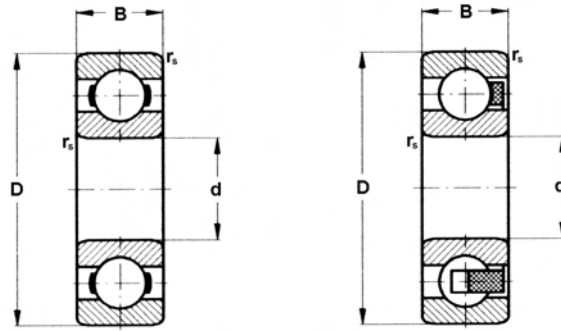
Bore diameter		Radial Clearance							
d		C2		Standard		C3		C4	
<i>more than</i>	<i>to</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>	<i>min</i>	<i>max</i>
[mm]		[μm]							
2,5	6	1	8	5	15	10	20	15	25
6	10	2	9	6	17	12	25	19	33
10	14	2	10	6	19	13	26	21	35
14	18	3	12	8	21	15	28	23	37

Vibration Level

The standard vibration level of currently manufactured VRL Praha ball bearings is fixed by the manufacturer and is not designated. As to special bearing arrangements exacting silent running, it is possible to deliver bearings with decreased level of vibrations (C6).

Other technical data concerning calculations, construction of bearings, recommended bedding, methods of lubrication, installation, removal and maintenance can be found in a complete catalogue "Rolling bearings ZKL, ZVL" issued by the Association of Bearing Industry Slovak and Czech Republic.

Standard Bearings in Tables



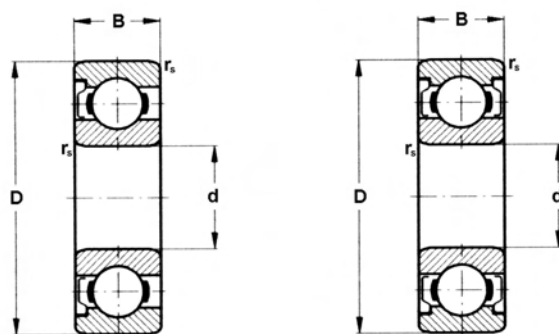
TNH

Single Row Ball Bearings

Dimensions				Load capacity		Speed limit		Bearings identification		Weight
d	D	B	r _{s min}	dynamic C _r	static C _{or}	with plastic lubricant	with oil	Standard	TNH	
[mm]				[N]		[min ⁻¹]				[g]
3	10	4	0,15	490	216	40 000	50 000	623	-	1,5
4	13	5	0,2	900	415	38 000	45 000	624	624TNH	3,2
	16	5	0,3	1 430	735	35 000	42 000	634	634TNH	5
5	16	5	0,3	1 430	735	35 000	42 000	625	625TNH	4,7
	19	6	0,3	2 120	1 160	35 000	42 000	635	-	9
	19	6	0,3	1 890	1 050	35 000	42 000	-	635TNH	9
6	16	4	0,2	1 550	722	35 000	42 000	-	618/6TNH	3,5
	19	6	0,3	2 120	1 160	35 000	42 000	626	-	8
	19	6	0,3	1 890	1 050	35 000	42 000	-	626TNH	8
7	19	6	0,3	2 120	1 160	35 000	42 000	607	-	7,5
	19	6	0,3	1 890	1 050	35 000	42 000	-	607TNH	7,5
	22	7	0,3	2 500	1 340	35 000	42 000	627	627TNH	12,3
8	16	4	0,2	1 550	722	35 000	42 000	-	618/8TNH	3
	22	7	0,3	2 500	1 340	35 000	42 000	608	608TNH	12
9	24	7	0,3	2 800	1 530	35 000	42 000	609	609TNH	14
	26	8	0,3	3 550	1 930	35 000	42 000	629	629TNH	20
10	22	6	0,3	2 080	1 270	34 000	40 000	-	61900TNH♦	9,6
	26	8	0,3	3 910	1 960	28 000	33 000	6000	6000TNH	19
	30	9	0,6	4 500	2 240	25 000	30 000	6200	6200TNH	31
12	28	8	0,3	4 500	2 240	25 000	30 000	6001	6001TNH	22
	30	8	0,3	4 500	2 240	25 000	30 000	16101	16101TNH	25
	32	10	0,6	6 100	3 100	22 000	27 000	6201	6201TNH	37
15	35	11	0,6	7100	3760	13 000	24 000	-	6202TNH	45
17	30	7	0,3	2 460	1 870	22 000	26 000	-	61903TNH♦	18

Note: Marked bearings (♦) are not routinely produced and their delivery is to be negotiated with producer.

Standard Bearings in Tables



ZR (ZRTNH)

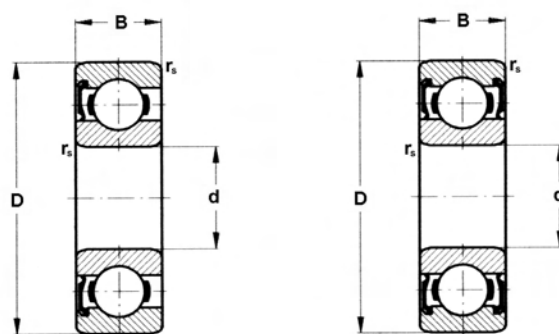
2ZR (2ZRTNH)

Single Row Ball Bearings with Shields

Dimensions				Load capacity		Speed limit		Bearings identification		Weight
d	D	B	r _{s min}	dynamic C _r	static C _{or}	with plastic lubricant	with oil	ZR	2ZR	
[mm]				[N]		[min ⁻¹]				[g]
3	10	4	0,15	490	216	40 000	50 000	623ZR #	623-2ZR #	1,5
4	13	5	0,2	900	415	38 000	45 000	624ZR	624-2ZR	3,2
	16	5	0,3	1 430	735	35 000	42 000	634ZR	634-2ZR #	5
5	16	5	0,3	1 430	735	35 000	42 000	625ZR	625-2ZR #	4,7
	19	6	0,3	2 120	1 160	35 000	42 000	635ZR	635-2ZR	9
6	19	6	0,3	2 120	1 160	35 000	42 000	626ZR	626-2ZR	8
7	19	6	0,3	2 120	1 160	35 000	42 000	607ZR	607-2ZR	7,5
	22	7	0,3	2 500	1 340	35 000	42 000	627ZR	627-2ZR	12,3
8	22	7	0,3	2 500	1 340	35 000	42 000	608ZR	608-2ZR	12
9	24	7	0,3	2 800	1 530	35 000	42 000	609ZR	609-2ZR	14
	26	8	0,3	3 550	1 930	35 000	42 000	629ZR	629-2ZR	20
10	22	6	0,3	2 080	1 270	34 000	40 000	61900ZRTNH♦	61900-2ZRTNH♦	9,6
	26	8	0,3	3 910	1 960	28 000	33 000	6000ZR	6000-2ZR	19
	30	9	0,6	4 500	2 240	25 000	30 000	6200ZR	6200-2ZR #	31
12	28	8	0,3	4 500	2 240	25 000	30 000	6001ZR	6001-2ZR #	22
	32	10	0,6	6 100	3 100	22 000	27 000	6201ZR	6201-2ZR	37
17	30	7	0,3	2 460	1 870	22 000	26 000	61903ZRTNH♦	61903-2ZRTNH♦	18

Note: Marked bearings (♦) are not routinely produced and their delivery is to be negotiated with producer.
Bearings marked (#) are not produced in version with polyamide cage TNH

Standard Bearings in Tables



RSR (RSRTNH)

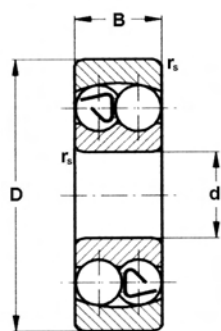
2RSR (2RSRTNH)

Single Row Ball Bearings with Seals

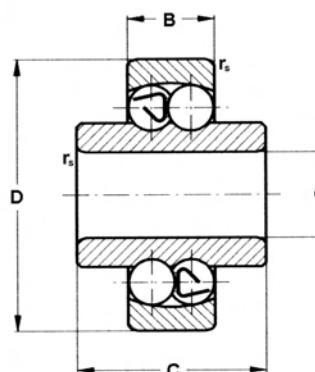
Dimensions				Load capacity		Speed limit		Bearings identification		Weight
d	D	B	$r_{s \min}$	dynamic C_r	static C_{or}	with plastic lubricant	with oil	RSR	2RSR	
[mm]				[N]		[min^{-1}]				[g]
5	19	6	0,3	2 120	1 160	22 000	42 000	635RSR	635-2RSR	9
6	19	6	0,3	2 120	1 160	22 000	42 000	626RSR	626-2RSR	8
7	19	6	0,3	2 120	1 160	22 000	42 000	607RSR	607-2RSR	7,5
	22	7	0,3	2 500	1 340	20 000	42 000	627RSR	627-2RSR	12,3
8	22	7	0,3	2 500	1 340	20 000	42 000	608RSR	608-2RSR	12
9	24	7	0,3	2 800	1 530	20 000	42 000	609RSR	609-2RSR	14
	26	8	0,3	3 550	1 930	19 000	42 000	629RSR	629-2RSR	20
10	22	6	0,3	2 460	1 270	34 000	40 000	61900RSRTNH♦	61900-2RSRTNH♦	9,6
	26	8	0,3	3 910	1 960	19 000	33 000	6000RSR	6000-2RSR	19
	30	9	0,6	4 500	2 240	17 000	30 000	6200RSR	6200-2RSR	31
12	28	8	0,3	4 500	2 240	17 000	30 000	6001RSR	6001-2RSR #	22
	32	10	0,6	6 100	3 100	16 000	27 000	6201RSR	6201-2RSR #	37
15	35	11	0,6	7100	3760	13 000	24 000	6202RSRTNH	6202-2RSRTNH	45
17	30	7	0,3	2 460	1 870	22 000	26 000	61903RSRTNH♦	61903-2RSRTNH♦	18

Note: Marked bearings (♦) are not routinely produced and their delivery is to be negotiated with producer.
Marked bearings (#) are not produced in version with polyamide cage TNH

Standard Bearings in Tables



①



②

Double Row Self-Aligning Ball Bearings

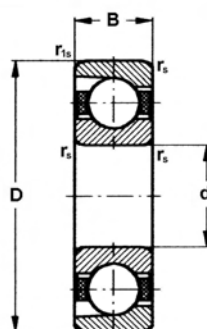
Dimensions				Load capacity		Speed limit		Weight	Bearing identifi- cat.	Fig.
d	D	B	r _{s min}	dynamic C _r	static C _{or}	with plastic lubricant	with oil			
[mm]				[N]		[min ⁻¹]		[g]		
6	19	6	0,3	1 930	520	27 000	32 000	9	126	1
7	22	7	0,3	2 040	562	25 000	32 000	14	127	1
8	22	7	0,3	2 040	562	25 000	32 000	12	108	1
9	26	8	0,6	3 550	920	25 000	30 000	22	129	1
10	30	9	0,6	4 150	1 190	24 000	30 000	35	1200	1
	30	14	0,6	5 600	1 700	25 000	30 000	47	2200	1
12	32	10	0,6	4 300	1 460	24 000	28 000	40	1201	1
15	35	11	0,6	5 700	2 000	21 000	25 000	49	1202	1
	35	14	0,6	5 850	2 160	21 000	25 000	60	2202	1

Special Double Row Self-Aligning Ball Bearings

Dimensions					Load capacity		Speed limit		Axial clearance *1)		Weight	Bearing identifi- cat.	Fig.
d	D	B	C	r _{s min}	dynamic C _r	static C _{or}	with plastic lubricant	with oil	min	max			
[mm]					[N]		[min ⁻¹]		[μm]		[g]		
6	19	6	10	0,3	1 930	482	25 000	32 000	60	160	12	PLC 11-2	2
	19	6	14	0,3	1 930	482	25 000	32 000	60	160	13	PLC 11-3	2
8	22	7	14	0,3	2 040	562	25 000	32 000	60	160	19,5	PLC 11-4	2
	26	8	18	0,3	2 900	810	25 000	32 000	60	160	28,2	PLC 12-2	2
10	30	9	20	0,6	4 150	1 190	24 000	30 000	80	180	46	PLC 12-3	2
12	32	10	24	0,6	4 300	1 260	22 000	28 000	80	180	58	PLC 13-3	2

*1) The bearings consist of pressed sheet steel cages centered by balls.
 The bearings are manufactured in standard P0 class of tolerance.
 The bearings can be also delivered with radial clearance range from 3 to 15 mm with the identification,
 e.g. PLC 11-2-1.

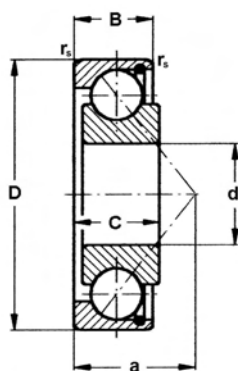
Standard Bearings in Tables



Separable Single Row Ball Bearings (PN 7 4632)

Dimensions					Load capacity		Speed limit		Weight	Bearing identif.
d	D	B	$r_{s \text{ min}}$	$r_{s1 \text{ min}}$	dynamic C_r	static C_{or}	with plastic lubricant	with oil		
[mm]					[N]		[min^{-1}]		[g]	
15	35	8	0,3	0,15	4 470	981	20 000	24 000	34	E15 TNG
20	47	12	1	0,6	8 910	2 030	14 000	17 000	89	E20 TNG•

Note: Marked bearings (•) are not routinely produced and their delivery is to be negotiated with producer.

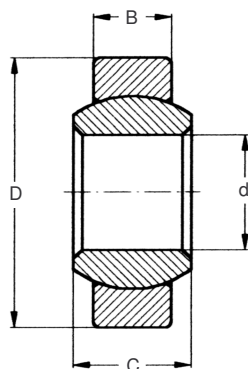


Special Single Row Angular Contact Ball Bearings

Dimensions						Load capacity		Weight	Bearing identification
d	D	B	C	a	$r_{s \text{ min}}$	dynamic C_r	static C_{or}		
[mm]						[N]		[g]	
12	32	9,2	10	14,2	0,6	6 690	4 640	36,4	PLC 03-73
17	35	8,1	9	11	0,3	6 350	4 810	33,7	PLC 03-29-1
18	35	8,1	9	11	0,3	6 350	4 810	32,1	PLC 03-29-2

Note: Bearings have no cage and have full quantity of balls.

Standard Bearings in Tables

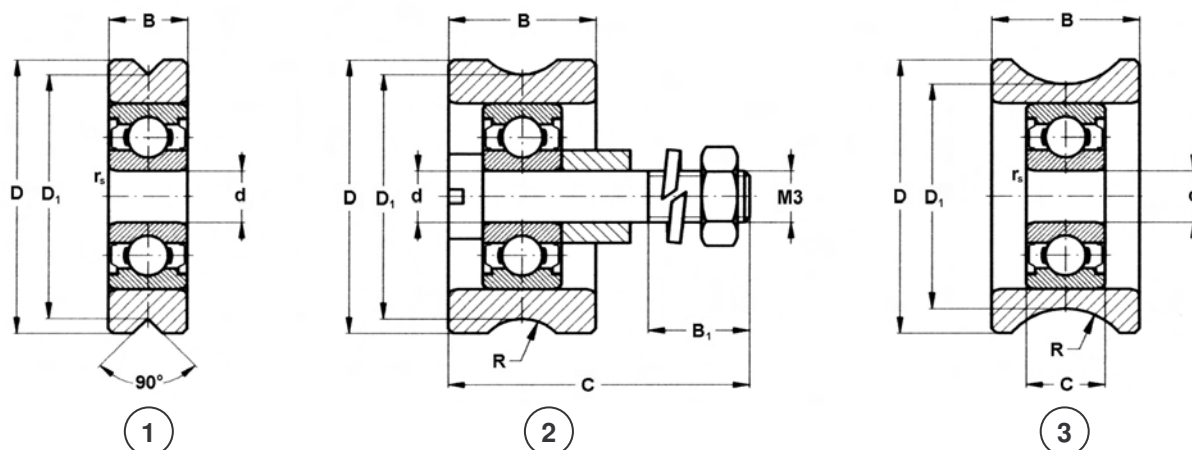


Spherical Plain Bearings (ČSN 02 3515)

Dimensions				Weight	Bearing identification
d	D	B	C		
[mm]				[g]	
4	12	3	5	2,7	GE 4
5	14	4	6	4,7	GE 5
6	14	4	6	4,3	GE 6
8	16	5	8	6,9	GE 8
10	19	6	9	11,3	GE 10♦
12	22	7	10	16,4	GE 12♦
15	26	9	12	27,4	GE 15♦
17	30	10	14	41,6	GE 17♦
20	35	12	16	66,2	GE 20♦

Note: Marked bearings (♦) are not routinely produced and their delivery is to be negotiated with producer.

Special bearings manufactured on order

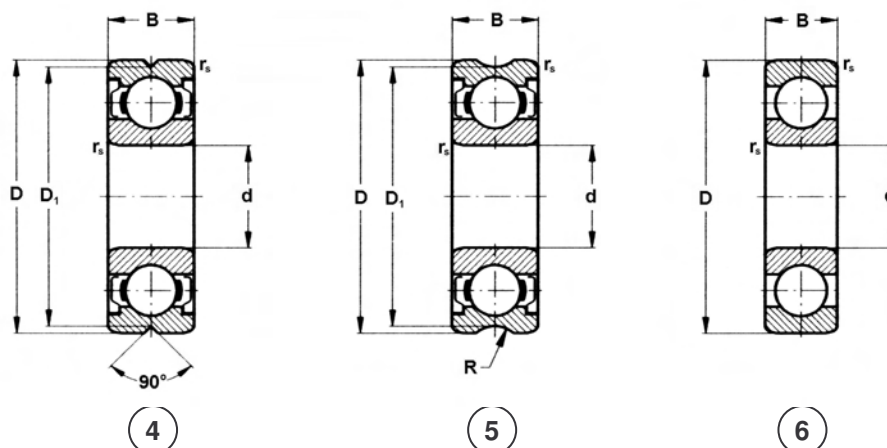


Special Single Row Ball Bearings – Rollers PLC (1)

Designat. of bearing	Fig.	Dimensions								Load capacity		Speed limit	
		d	D	B	C	$r_{s\ min}$	D_1	B_1	R	dynamic $C_r^{*1)}$	static $C_{or}^{*1)}$	with plastic lubricant	with oil
		[mm]								[N]		[min^{-1}]	
PLC 81-4	1	3	15	4	-	0,15	13	-	-	490	216	40 000	-
PLC 81-1	2	3	15,15	16	8	-	13,237	4,5	2,45	490	216	40 000	-
PLC 81-3	3	3	15,15	4	8	0,15	12	-	4	490	216	40 000	-

Designat. of bearing	Fig.	Weight	Shields <small>*2)</small>	Cage	Radial clearance		Accuracy
					min	max	
		[g]			[μm]		
PLC 81-4	1	2,5	2ZR	Y	8	23	P0
PLC 81-1	2	6,7	2ZR	Y	8	23	P0
PLC 81-3	3	5,2	2ZR	Y	8	23	P0

Special bearings manufactured on order

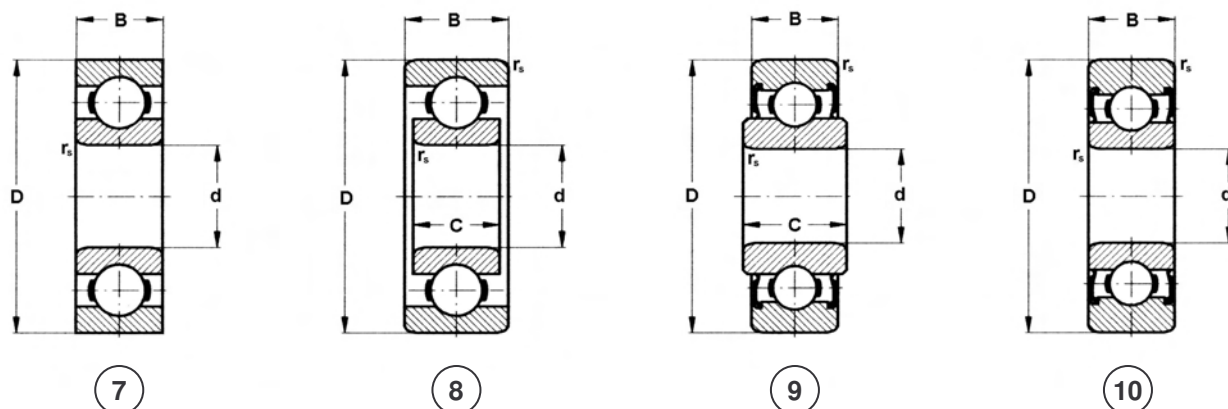


Special Single Row Ball Bearings – Rollers PLC (2)

Designat. of bearing	Fig.	Dimensions								Load capacity		Speed limit	
		d	D	B	C	$r_{s \min}$	D_1	B_1	R	dynamic $C_r^{*1)}$	static $C_{or}^{*1)}$	with plastic lubricant	with oil
		[mm]								[N]		[min^{-1}]	
PLC 01-17	4	5	16	5	-	0,3	15	-	-	1 430	735	35 000	-
PLC 01-17-1	5	5	16	5	-	0,3	14,9	-	2	1 430	735	35 000	-
PLC 01-15	6	7	19	6	-	0,3	-	-	-	2 200	1 160	*3)	-
PLC 01-16	4	8	22	7	-	0,3	21,1	-	-	2 500	1 340	35 000	-
PLC 01-16-1	5	8	22	7	-	0,3	20,9	-	2	2 500	1 340	35 000	-

Designat. of bearing	Fig.	Weight	Shields *2)	Cage	Radial clearance		Accuracy
					min	max	
		[g]			[μm]		
PLC 01-17	4	4,7	2ZR	J	2	13	P0
PLC 01-17-1	5	4,6	2ZR	J	2	13	P0
PLC 01-15	6	6,7	-	-	2	13	P0
PLC 01-16	4	11,5	2ZR	J	2	13	P0
PLC 01-16-1	5	11,3	2ZR	J	2	13	P0

Special bearings manufactured on order

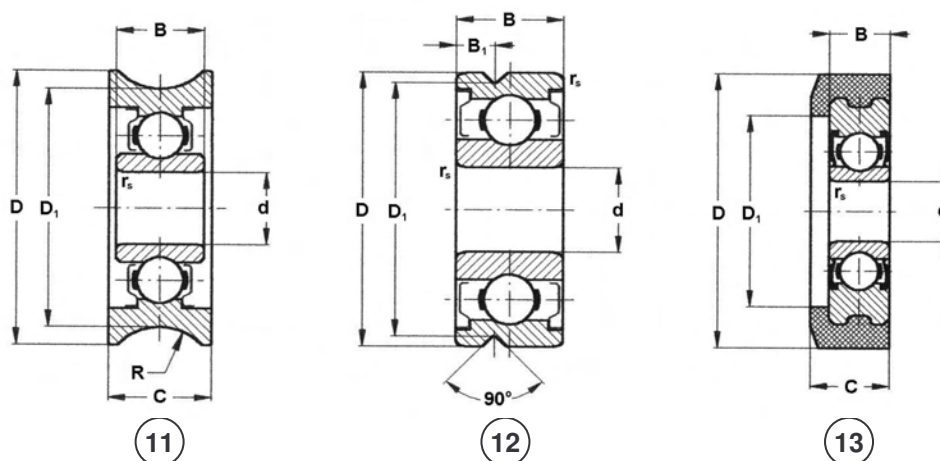


Special Single Row Ball Bearings – Rollers PLC (3)

Designat. of bearing	Fig.	Dimensions								Load capacity		Speed limit	
		d	D	B	C	$r_{s \min}$	D_1	B_1	R	dynamic $C_r^{*1)}$	static $C_{or}^{*1)}$	with plastic lubricant	with oil
		[mm]								[N]		[min^{-1}]	
PLC 01-32	7	7	19	6	-	0,3 *4)	-	-	-	2 200	1 160	35 000	42 000
PLC 02-4	8	8	24	7	8,5	0,3	-	-	-	1 260	944	*3)	
PLC 02-12	9	8	28	10,1	8	0,3	-	-	-	3 550	1 930	24 000	-
PLC 03-21	10	10	32	9	-	0,6	-	-	-	4 500	2 240	17 000	-
PLC 02-24	10	11,1	30	9	-	0,6	-	-	-	4 500	2 240	17 000	-

Designat. of bearing	Fig.	Weight	Shields *2)	Cage	Radial clearance		Accuracy
					min	max	
		[g]			[μm]		
PLC 01-32	7	7,5	-	J	15	30	P0
PLC 02-4	8	17,3	-	J	60	120	*5)
PLC 02-12	9	26,5	2RSR	J	2	13	P0
PLC 03-21	10	36,5	2RSR	J	2	13	P0
PLC 02-24	10	31,8	2RSR	J	8	20	P0

Special bearings manufactured on order



Special Single Row Ball Bearings – Rollers PLC (4)

Designat. of bearing	Fig.	Dimensions								Load capacity		Speed limit	
		d	D	B	C	$r_{s\ min}$	D_1	B_1	R	dynamic $C_r^{*1)}$	static C_{or}	with plastic lubricant	with oil lubricant
		[mm]								[N]		[min^{-1}]	
PLC 01-47	11	5	19	6	7	0,3	16,5	-	4	1 340	735	35 000	-
PLC 01-49	12	4	13	5	-	0,2	12	1,8	-	900	415	38 000	-
PLC 02-10	13	5	32	5	6,5	0,3	16	-	-	1 340	735	22 000	-

Designat. of bearing	Fig.	Weight	Shields ^{*2)}	Cage	Radial clearance		Accuracy
					min	max	
		[g]			[μm]		
PLC 01-47	11	8,1	2ZR	J	2	13	P0
PLC 01-49	12	2,9	2ZR	J	2	13	P0
PLC 02-10	13	8,5	2RSR	J	8	20	P0

Comment:

- *1) If the bearing is used as a roller, the C_r and C_{or} load capacity values as well as speed limits are decreased to 2/3 of the values in the table.
- *2) Both-sides shielded bearings (-2ZR,-2RSR) are filled up with plastic lubricant.
- *3) The bearings are intended for pendulum motions or low speed limits.
- *4) The bearings have outer rings with sharp edges, without fillets.
- *5) The dimension and running accuracy of the bearings are decreased..

Special bearings manufactured on order

Special Bearings and Rollers – designation VLM

Designat. of bearing	Fig.	Dimensions						Cage	Shields	Weight	Load capacity	
		d	D	B	C	d ₁	R				d	D
		[mm]								[g]	[N]	
VLM 003	1	25	42	28	35	8,4	-	2TNH	2RSR	253,8	8 800	6 630
VLM 001		25	36	29	31	8,3	-	2TNH	2RSR	158,7	8 800	6 630
VLM 002 ♦	2	25	47	21	44	-	-	2TNH	2RSR	262,9	20 580	12 430
VLM 006 ♦	3	5	15	5	-	-	-	J	-	4,19	1 880	680
VLM 078	4	8	20	4	-	-	-	TNH	-	5,83	1 890	1 050
VLM 007		9	20	5	-	-	-	TNH	-	5,96	2 270	960
VLM 056		9	21	6	-	-	-	TNH	-	6,96	2 500	1 340
VLM 008	5	10	28	8	9	-	-	J	2RSR	24,8	5 100	2 370
VLM 009 ♦	6	7	24	7	16	6	-	TNH	2ZR	21,2	2 280	990
VLM 010	7	20	42	29	30	-	-	-	2RSR	174,4	15 120	8 350
VLM 011	8	9	24	7	-	-	-	TNH	2RSR	15,6	2 280	990
VLM 012	9	12	36	12	10	-	-	J	2ZR	59,9	6 890	3 090
VLM 013 ♦	10	7	23	7	13	M5	-	J	2ZR	21,6	3 140	1 250
VLM 014 ♦	11	5	22	6	9,5	-	-	TNH	-	6,8	1 880	680
VLM 043	12	5	16	5	-	14,9	1	J	2ZR	4,43	1 430	681
VLM 044		5	16	5	-	14,9	1,5	J	2ZR	4,36	1 430	681
VLM 067		8	22	7	-	21,2	1,25	J	2RSR	12,24	2 500	1 340
VLM 015		8	24	7	-	23,1	1	J	2RSR	15,1	2 500	1 340
VLM 072		8	24	7	-	22,8	1,35	J	2RSR	14,8	2 500	1 340
VLM 096		8	24	7	-	22,8	1,35	J	2ZR	14,8	2 500	1 340
VLM 097		8	24	7	-	23	0,85	J	2ZR	14,8	2 500	1 340
VLM 108		8	24	7	-	22,8	2,05	J	2ZR	15,04	2 500	1 340
VLM 102		8	24	7	-	23,1	1	J	2ZR	15,42	2 500	1 340
VLM 036		10	30	9	-	28,4	1,2	J	2RSR	31,9	5 100	2 370
VLM 045		10	30	9	-	28,4	2	J	2RSR	31,61	5 100	2 370
VLM 082		13	3	10	4	-	9,5	-	J	2ZR	1,52	490
VLM 083	5		16	5	-	15,2	-	J	2ZR	4,61	1 430	735
VLM 125	7		22	7	-	20,2	-	J	2ZR	11,92	2 500	1 340
VLM 047	8		22	7	-	21,1	-	J	2ZR	11,63	2 500	1 340
VLM 055	8		22	7	-	20,2	-	J	2ZR	11,27	2 500	1 340
VLM 084	8		22	7	-	20,7	-	J	2ZR	11,48	2 500	1 340

Special bearings manufactured on order

Special Bearings and Rollers – designation VLM (continuation)

Designat. of bearing	Fig.	Dimensions						Cage	Shields	Weight	Load capacity	
		d	D	B	C	d ₁	R				d	D
		[mm]								[g]	[N]	
VLM 017	13	8	26	7	-	23	-	J	2ZR	18,4	2 500	1 340
VLM 062		10	30	8	-	26,8	-	TNH	2ZR	28,05	4 580	1 970
VLM 074		10	35	9	-	31,8	-	J	2ZR	49,04	4 500	3 370
VLM 121	14	8	22	7	-	20,2	-	J	2RSR	11,18	2 500	1 340
VLM 033		8	23	7	-	21,5	-	J	2RSR	12,9	2 500	1 340
VLM 111		10	30	8	-	26,8	-	J	2RSR	28,02	4 500	3 370
VLM 046		10	30	9	-	28	-	J	2RSR	32,05	5 100	2 370
VLM 051		10	32	9	-	29,7	-	J	2RSR	38,38	5 100	2 370
VLM 052		12	35	10	-	31	-	J	2RSR	45,03	6 100	3 090
VLM 079		15	40	11	-	35,6	-	TNH	2RSR	64,8	5 950	3 730
VLM 065		15	7,8	16	5	50	-	-	TNH	-	22,28	1 430
VLM 066	7,8		16	5	58	-	-	TNH	-	22,28	1 430	735
VLM 018♦	19		35	18	49	-	-	J	2ZR	152,4	6 100	3 100
VLM 019	16	6,1	25	7	10	10,5	-	TNH	2ZR	19,9	2 500	1 340
VLM 099		8	24	7	10	-	-	TNH	2ZR	16,33	2 800	1 530
VLM 020♦		8	32	8	14	13,3	26	TNH	2ZR	40,5	3 350	1 430
VLM 021♦	17	7,2	24	8	9	-	-	-	-	23,6	4 770	2 400
VLM 054	18	6	16	5	-	-	-	TNH	2ZR	4,47	1 480	610
VLM 022♦		12	22	8	-	-	-	TNH	2Z	10,3	2 690	1 290
VLM 023♦	19	16	30	8	-	-	-	TNH	2RSR	21,3	3 190	1 870
VLM 024♦	20	8	22	7	-	-	11	TNH	2RSR	10,7	2 500	1 340
VLM 025♦	21	8,2	28	8	30	-	-	J	2ZR	39	5 100	2 370
VLM 026♦	22	5	21	6	6,5	-	-	TNH	PZ	6,2	2 640	1 130
VLM 109	23	7	19	10	18	-	-	TNH	2ZR	16,7	2 850	1 070
VLM 027♦		7	19	11	18	-	-	TNH	2ZR	16,7	2 850	1 070
VLM 028♦		7	19	11	18	-	-	TNH	2ZR	16,5	2 850	1 070
VLM 029♦	24	10	27	8	32	17	-	TNH	ZR	49,9	5 100	2 370
VLM 030♦	25	12	36	10	-	1,5	-	J	2ZR	53,8	6 890	3 090
VLM 035♦		12	36	10	-	-	-	J	2ZR	54,4	6 100	3 100
VLM 032♦	26	8	22	7	11	14	-	-	-	7,5	3 790	2 120

Special bearings manufactured on order

Special Bearings and Rollers – designation VLM (continuation)

Designat. of bearing	Fig.	Dimensions						Cage	Shields	Weight	Load capacity	
		d	D	B	C	d ₁	R				d	D
		[mm]								[g]	[N]	
VLM 034 ♦	27	6	22	7	15	-	-	TNH	2RSR	17,31	2 500	1 340
VLM 101		16	40	12	18	-	-	TNH	2RSR	70,83	9 260	4 820
VLM 114												
VLM 037	28	6,4	27	9,5	10	19		TNH	2PZ	19,9	2 210	880
VLM 038		6,4	25	6,4	7,2	15,9		TNH	2PZ	9,5	1 480	610
VLM 039 ♦	29	8	22	7	-	21,2	-	J	2ZR	11,4	2 500	1 340
VLM 040	30	9	26	7	-	-	10	J	-	17,22	2 800	1 650
VLM 086		10	26	8	-	-	50	J	-	19,49	3 910	1 960
VLM 048 ♦	31	7,8	19	6	7,2	9,5	-	J	2RSR	6,68	2 200	1 080
VLM 049 ♦		7,8	22	7	8,2	11,5	-	J	2RSR	13,57	2 500	1 340
VLM 094	32	10	20	6	-	13	-	-	-	10,41	5 300	7 400
VLM 050		12	24	10	-	15	-	-	-	24,44	4 900	6 100
VLM 068	32	12	24	10	-	15	500	-	-	24,44	4 900	6 100
VLM 053	33	12	40	18	10	33,5	-	2TNH	2ZR	107,1	7 800	4 400
VLM 057	34	9	22	6	-	-	-	TNH	-	7,83	2 800	1 530
VLM 058		12	24	6	6,8	-	-	TNH	-	9,26	3 910	1 960
VLM 061	35	8	22	7,5	7	20,2	-	TNH	2RSR	11,67	2 500	1 340
VLM 063	36	8	24	7	-	23,1	1	TNH	-	13,95	2 500	1 340
VLM 064 ♦	37	6,4	23	8,4	12	-	-	J	2ZR	18,2	3 280	1 360
VLM 069	38	5	16	10	-	15,2	1	2TNH	2ZR	7,72	2 310	1 320
VLM 070	39	7	23	7	-	-	4,75	J	2ZR	13,62	1 890	1 050
VLM 071	40	8	24	7	-	22,8	1,35	J	-	14,8	2 500	1 340
VLM 073	41	6	19	8	9	-	-	J	-	9,75	2 120	1 160
VLM 075	42	9,1	26	12	14	-	-	J	-	29,5	2 350	1 110
VLM 076	5	5	22	7,5	8,5	-	-	J	2RSR	14,84	2 500	1 340
VLM 077	43	8	22	7	2	20,3	0,85	J	2ZR	11,2	2 500	1 340
VLM 085	44	7	20	10	-	19	-	2TNH	2RSR	14,71	2 670	1 390
VLM 087	45	19	38	11	13	35	-	TNH	RSR	44,55	5 750	3 320
VLM 089	46	7,1	24	6,2	7,2	-	25	TNH	2ZR	14,95	2 270	960
VLM 090	47	8	22	7	1,3	21	-	J	2RSR	13,99	2 500	1 340
VLM 091	48	5	22	5	6	-	-	J	2ZR	6,14	1 430	680

Special bearings manufactured on order

Special Bearings and Rollers – designation VLM (continuation)

Designat. of bearing	Fig.	Dimensions						Cage	Shields	Weight	Load capacity	
		d	D	B	C	d ₁	R				d	D
		[mm]								[g]	[N]	
VLM 092	49	6	24	7	8	-	-	TNH	ZR	16,98	2 500	1 340
VLM 093	50	8	26	7	-	23,6	-	J	2ZR	18,04	2 500	1 340
VLM 100	51	8	24	7	-	-	-	J	2ZR	15,83	2 500	1 340
VLM 095		8	26	7	-	-	-	J	2ZR	20,03	2 500	1 340
VLM 116	52	8	44	10	11	-	-	-	-	88,6	5 860	3 820
VLM 120	53	8	44	10	12	-	-	-	-	91,8	5 860	3 820
VLM 124	54	6	16,5	6	12	-	-	TNH	ZR	8,35	-	-
VLM 117	55	7	40	10	11	-	-	-	-	90,16	5 860	3 820
VLM 118	56	7	40	13	15	-	-	-	-	120,21	5 860	3 820
VLM 122		8	51	11	12	-	-	-	-	165,08	8 260	6 170
VLM 123		8	67	14,5	16	-	-	-	-	386,93	8 260	6 170
VLM 103	57	8	28	8	14	-	-	J	2ZR	33,82	4 500	2 240
VLM 112		12,86	28,6	8	11,1	-	-	J	2ZR	24,42	4 500	2 240
VLM 107	58	12	39	15,9	-	41,3	5	2TNH	2ZR	83,38	7 800	4 400

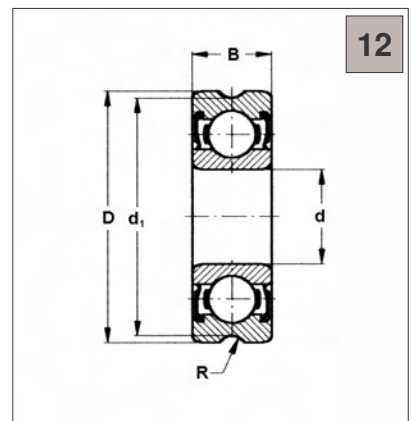
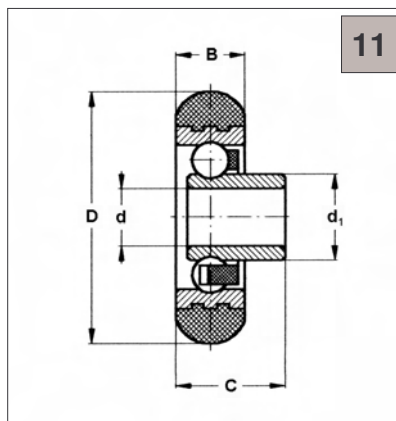
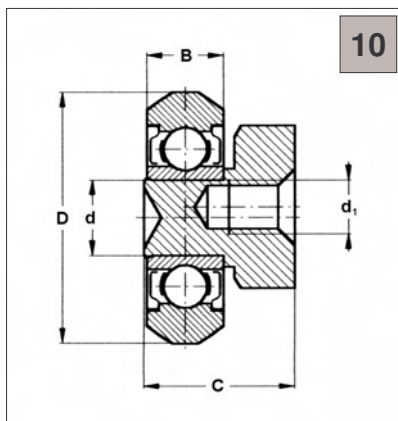
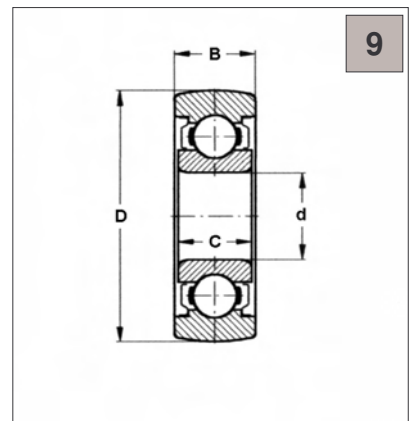
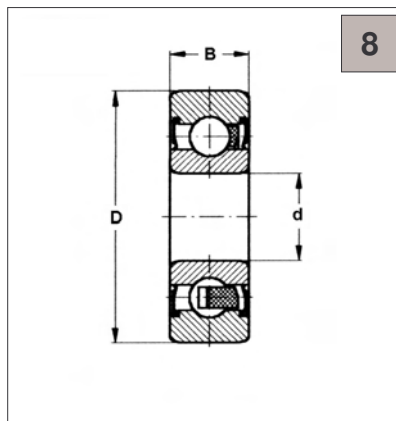
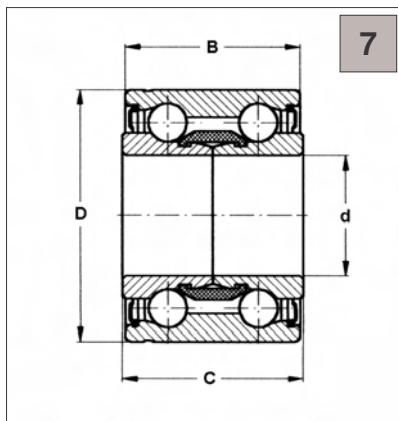
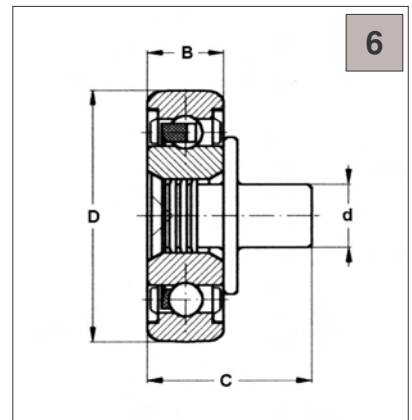
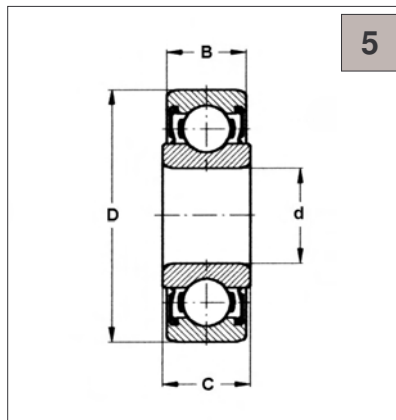
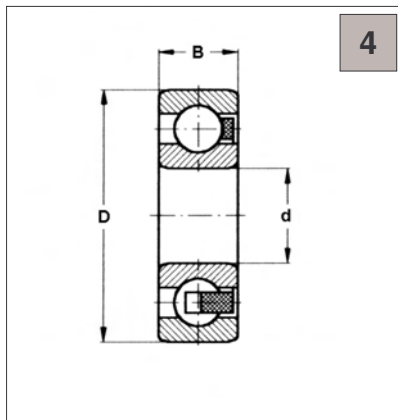
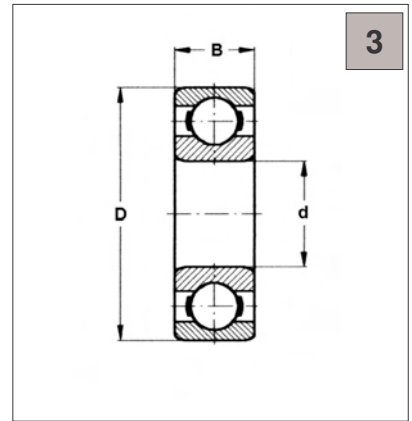
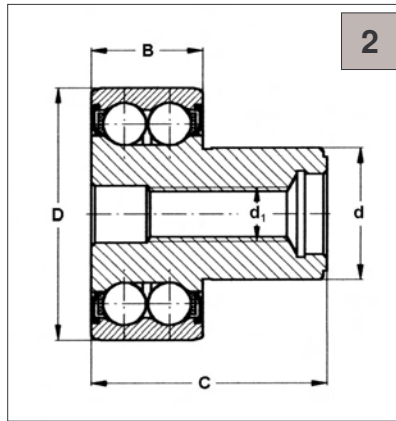
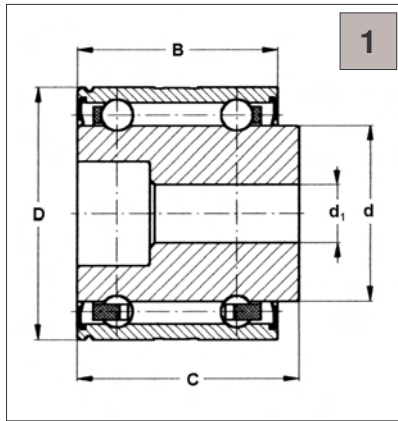
Note: Design of individual rollers is shown on next pages.

Marked rollers (♦) are not routinely produced and their delivery is to be negotiated with producer

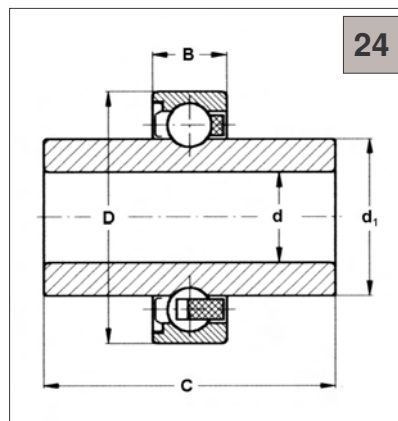
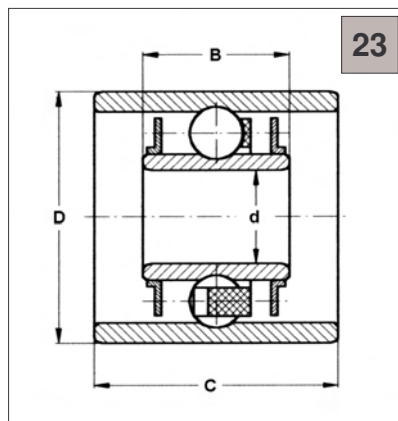
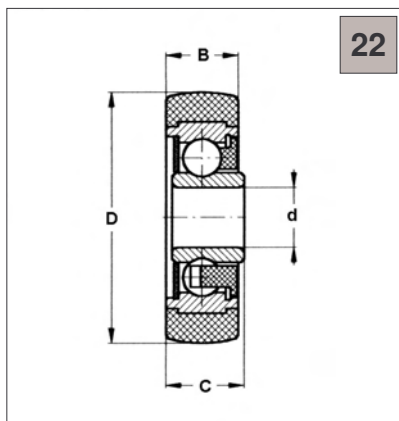
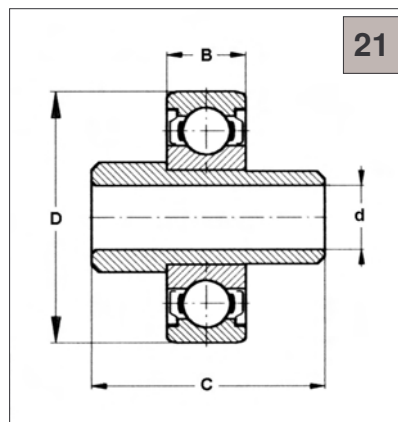
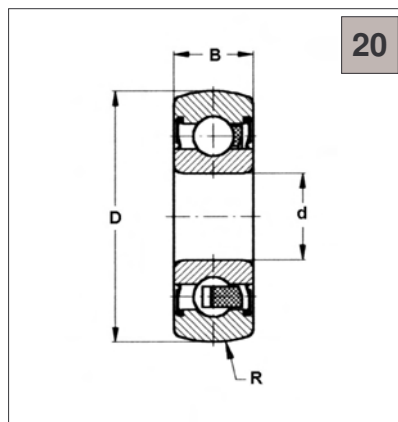
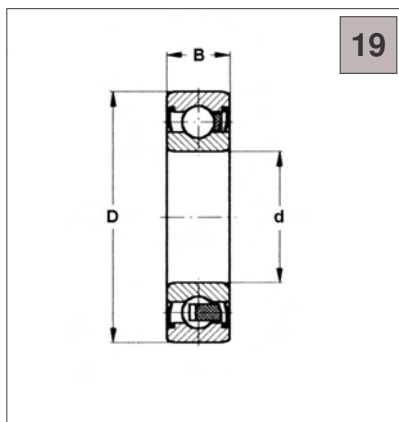
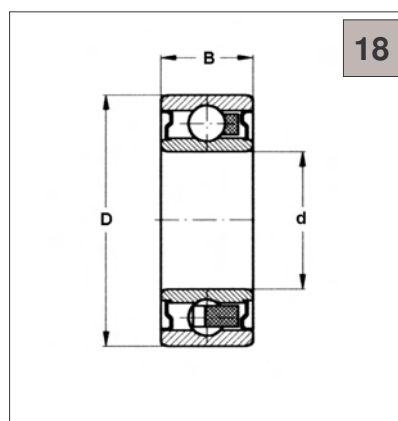
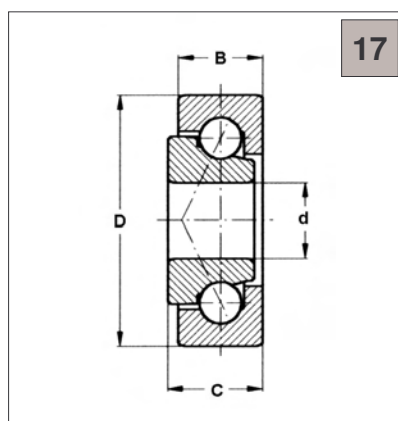
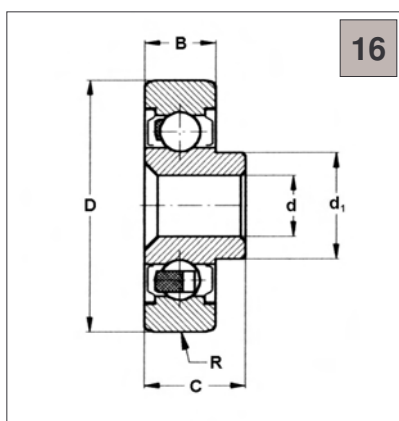
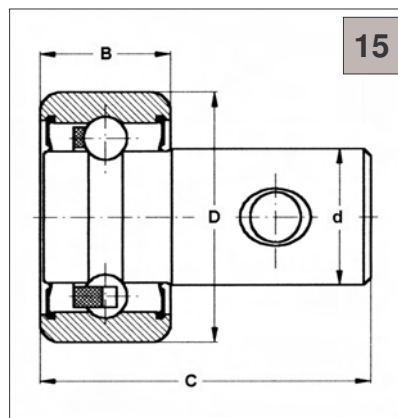
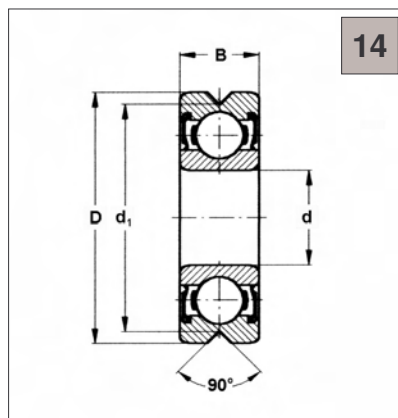
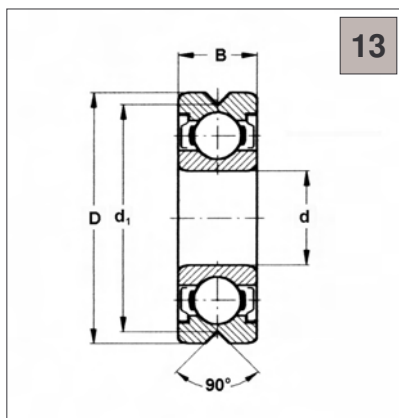
Comment:

- If the bearing is used as a roller, the C_r and C_{or} load capacity values are decreased to 2/3 of the values in the table.
- Both-sides shielded bearings (-2ZR,-2RSR) are filled up with plastic lubricant. The bearings are intended for pendulum motions or low speed limits.
- Most rollers can be equipped with shields or seals

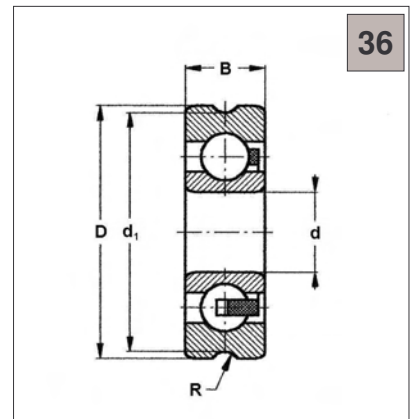
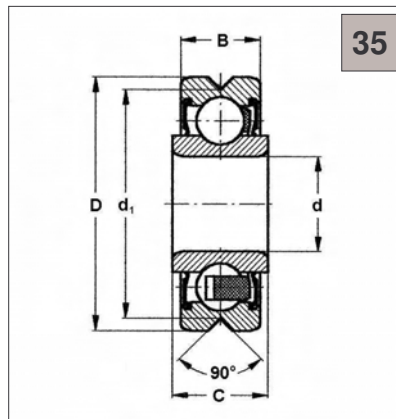
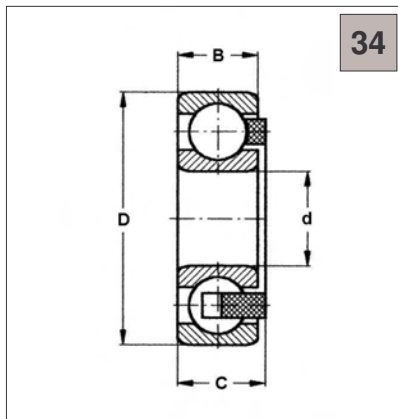
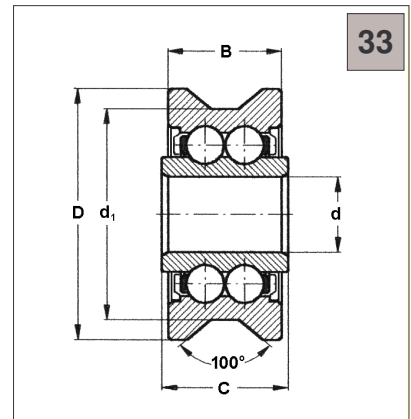
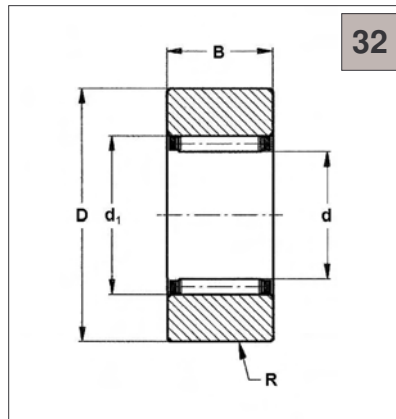
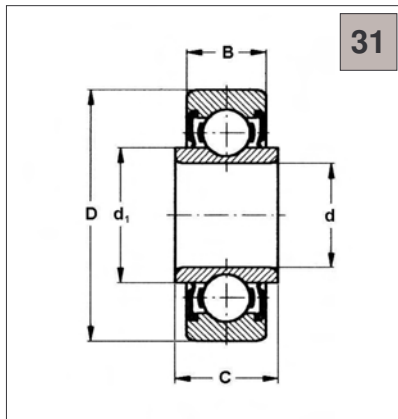
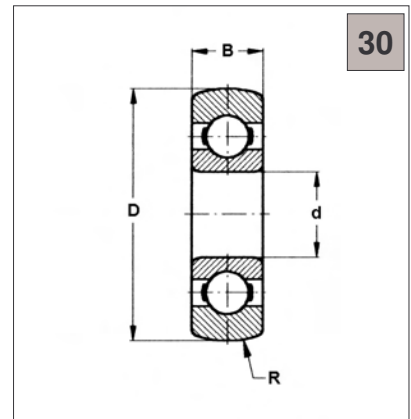
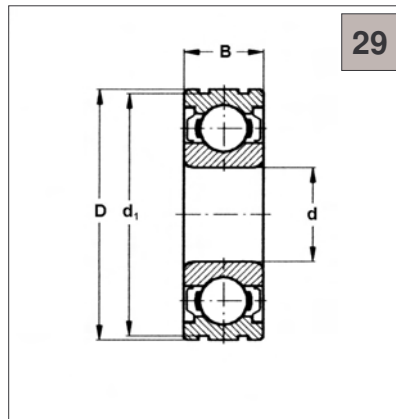
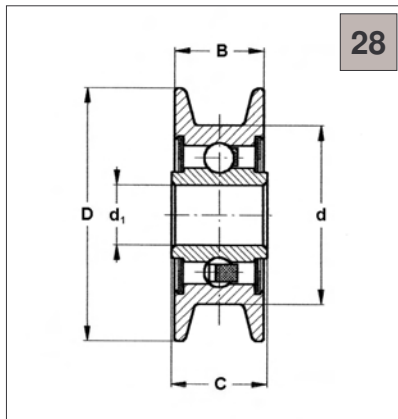
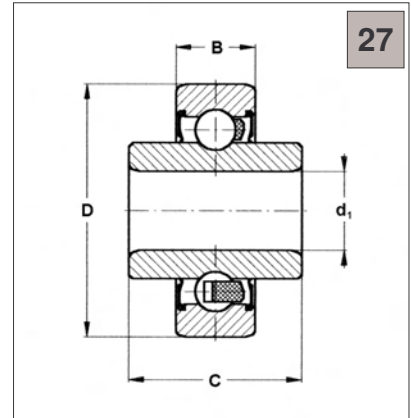
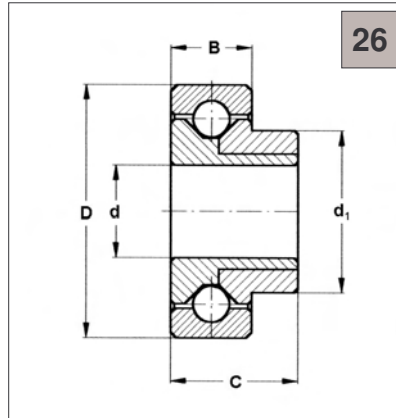
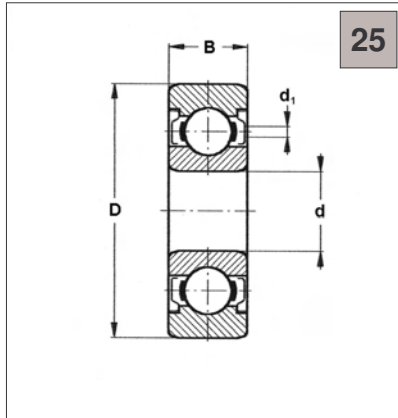
Special bearings manufactured on order



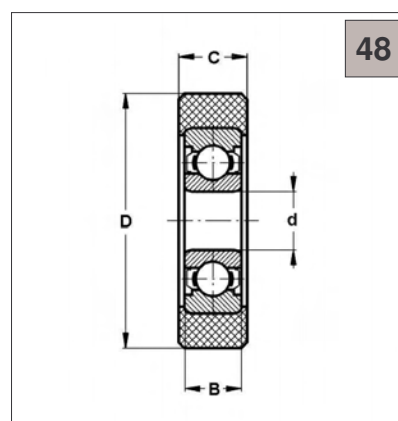
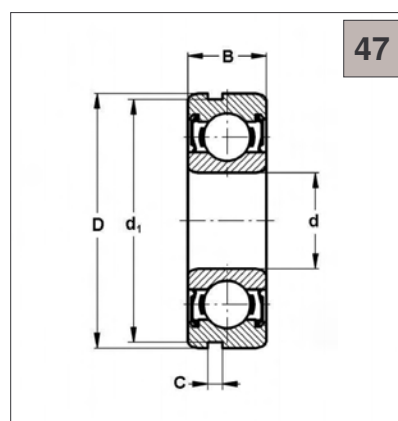
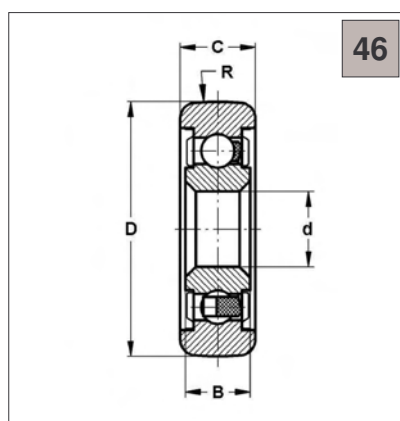
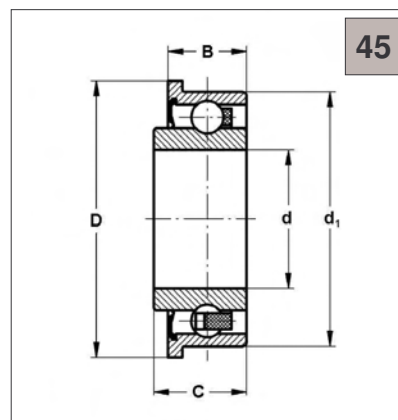
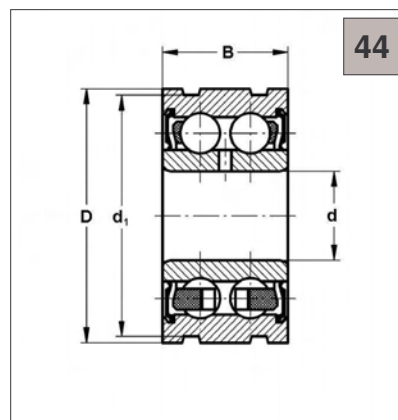
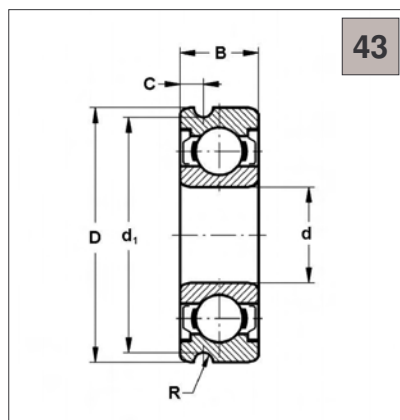
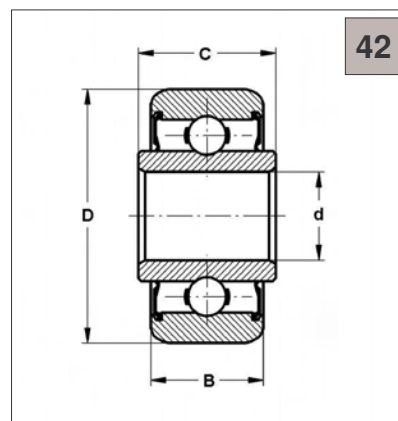
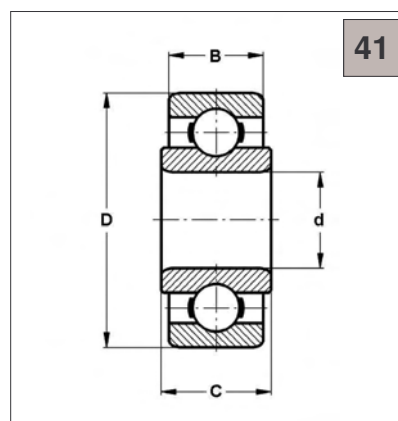
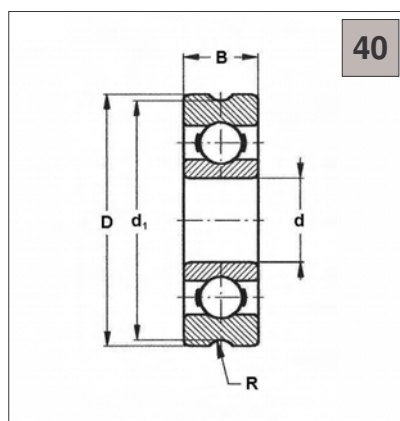
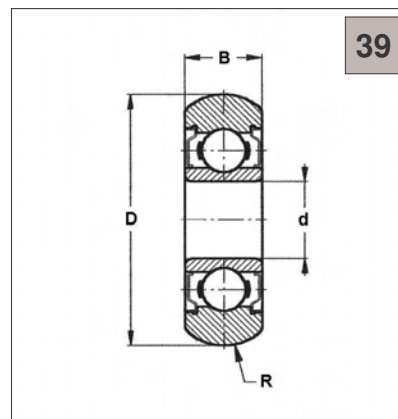
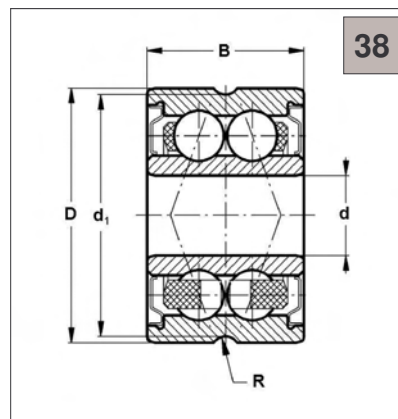
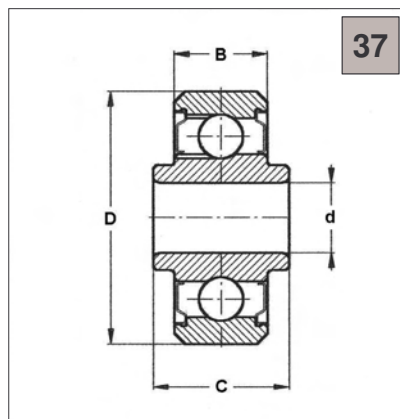
Special bearings manufactured on order



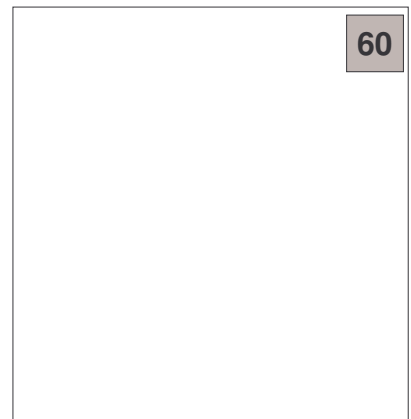
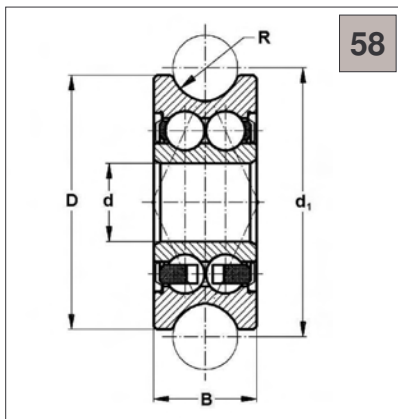
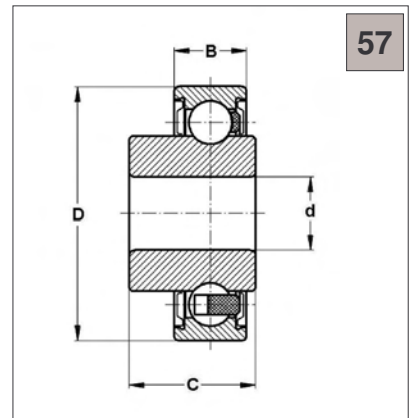
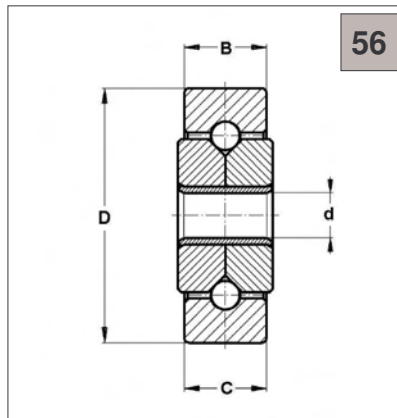
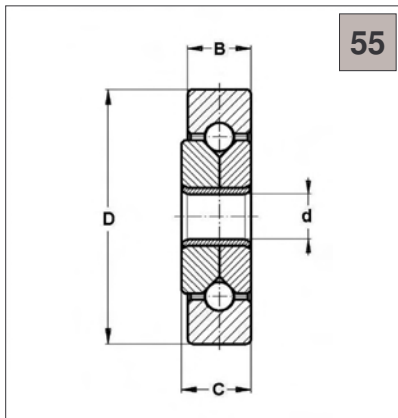
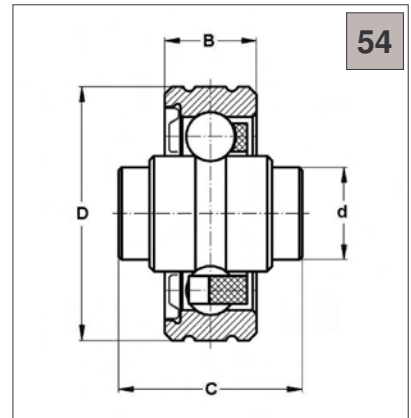
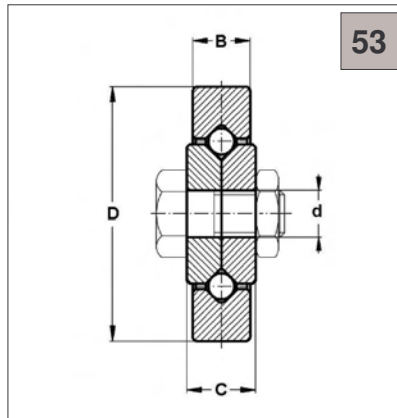
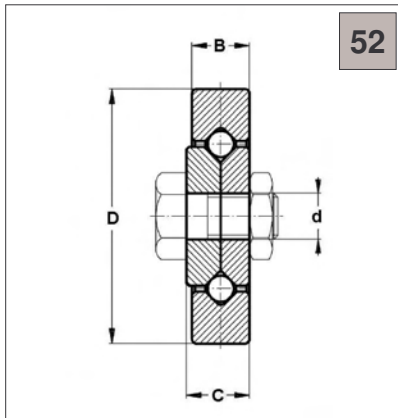
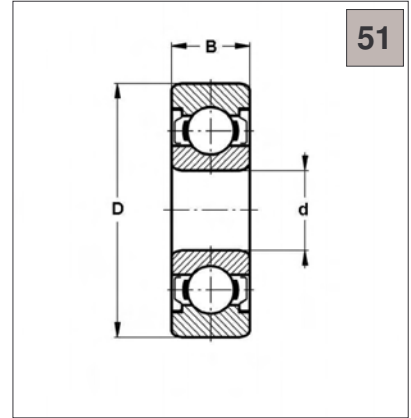
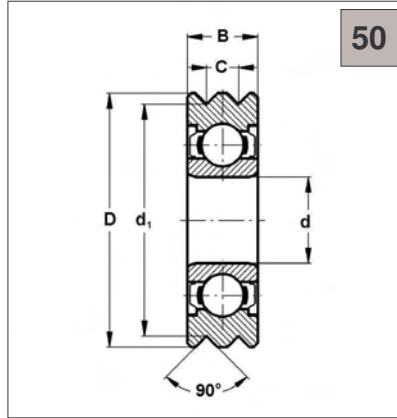
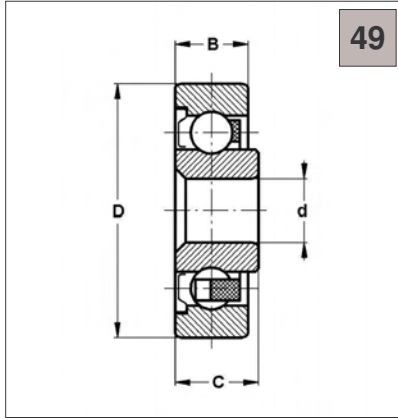
Special bearings manufactured on order



Special bearings manufactured on order

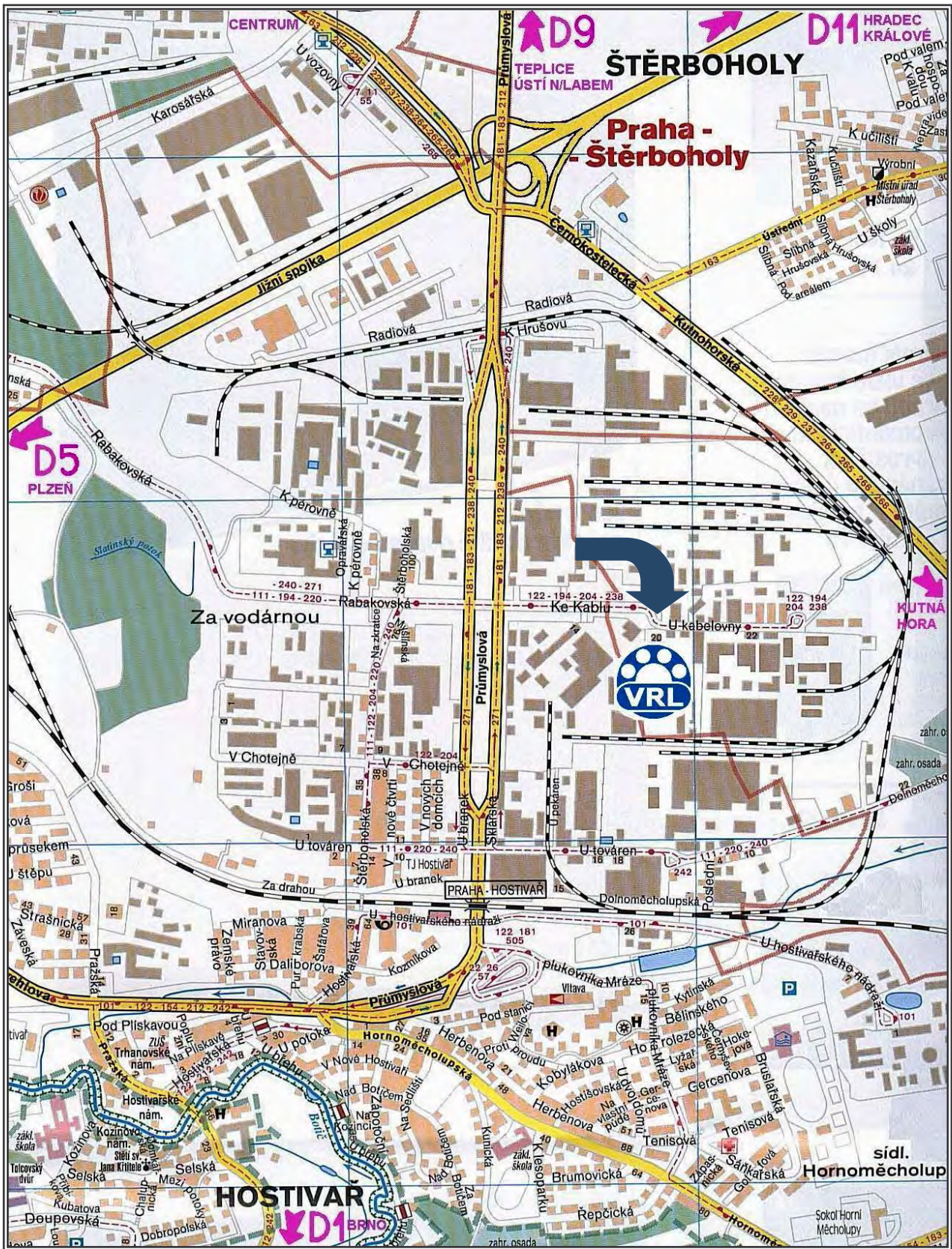


Special bearings manufactured on order



Special bearings manufactured on order

Comments :



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