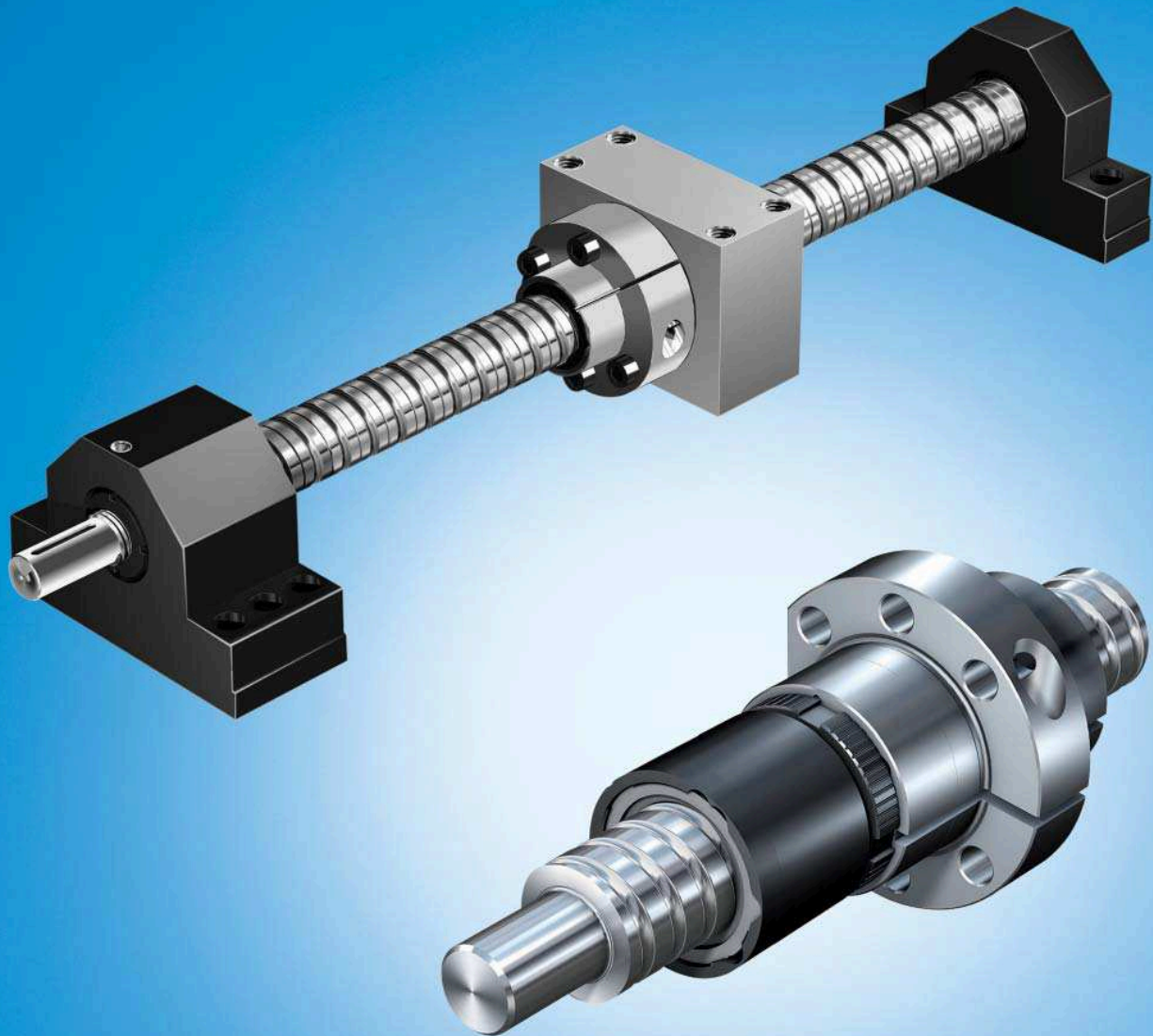


# Precision Ball Screw Assemblies

R310EN 3301 (2009.08)

The Drive & Control Company

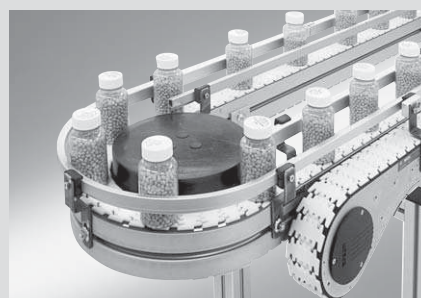
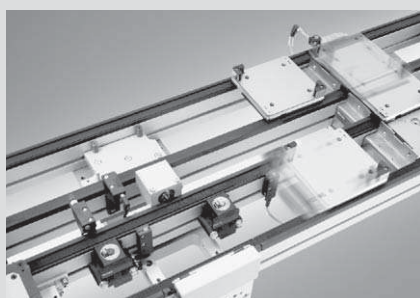
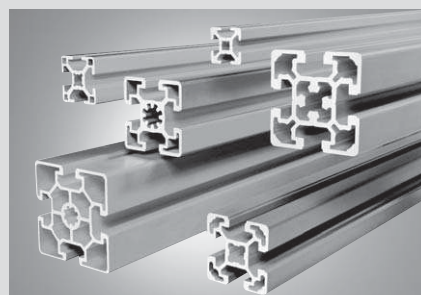
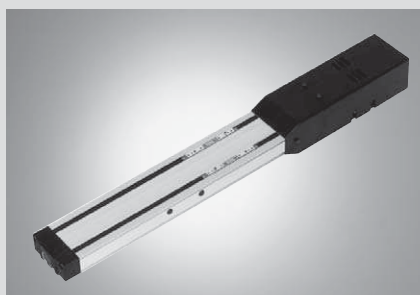
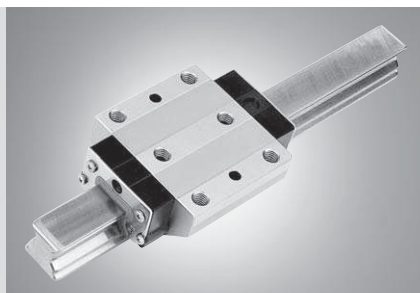
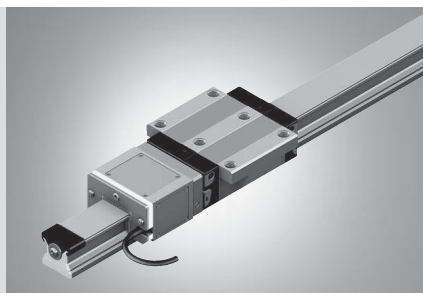


# Linear Motion and Assembly Technologies

Ball Rail Systems  
Roller Rail Systems  
Linear Bushings and Shafts

Ball Screw Drives  
Linear Motion Systems

Basic Mechanical Elements  
Manual Production Systems  
Transfer Systems



# Precision Ball Screw Assemblies

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Product Overview

# Nuts and Nut Housings

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Cylindrical single nut ZEM-E-S	50
2-start single nut with flange FED-E-B	52
Double nut with flange DIN 69 051, Part 5 FDM-E-C	54
Double nut with flange FDM-E-S	56

Diameter $d_0$	Lead P				
	1	2	2.5	5	10
6	■	■			
8	■		■		
12		■		■	■

Diameter $d_0$	Lead P	
	5	10
12	■	■
16	■	
20	■	■
25	■	■
32	■	■

■ Screw-in nut

Diameter $d_0$	Lead P		
	5	10	20
20	■		
25	■	■	
32	■	■	■
40	■	■	■

■ Single nut with flange FBZ-E-S  
■ Single nut with flange FSZ-E-S

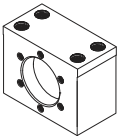
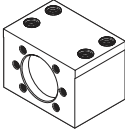
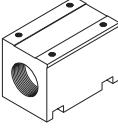
Diameter $d_0$	Lead P			
	25	32	40	64
20			■	
25	■			
32		■		■

Diameter $d_0$	Lead P								
	2.5	5	10	12	16	20	25	32	40
8	■								
12		■	■						
16			■		■				
20						■			
25		■	■						
32			■					■	
40				■	■				■
50						■			
63							■		
80								■	

■ Single nut      ■ Double nut

Diameter $d_0$	Lead P		
	20	25	40
40	■		■
50		■	
63	■		■

■ 2-start single nut with flange FED-E-B

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<b>MGA-Z</b> for cylindrical single nut ZEM-E-S	62
	

Lead P

	2.5	5	10	12	16	20	25	32	40
Diameter $d_0$									
16									
20									
25									
32									
40									
50									
63									
80									

MGD  
 MGS

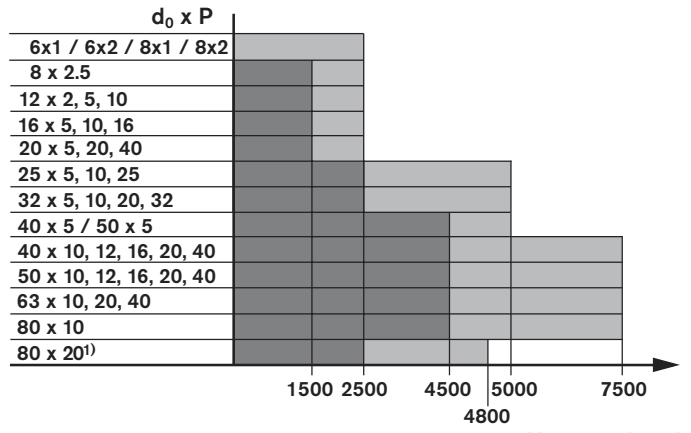
Lead P

	2.5	5	10	12	16	20	25	32	40
Diameter $d_0$									
16									
20									
25									
32									
40									
50									
63									
80									

MGA-Z

# Screws, Bearings and Accessories

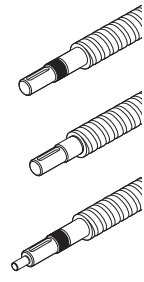
Screws		Page
Precision-rolled screw SN-R		64
Tolerance grades T5, T7, T9 T3 available upon request		
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standard, available at short notice
  available upon request

1) Nuts 80 x 20R x 12.7 - 6 available up to a thread length of 2500 mm, with preload

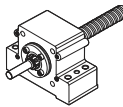
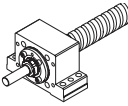
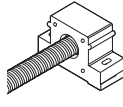
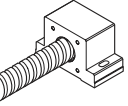
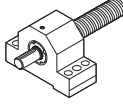
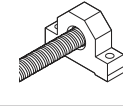
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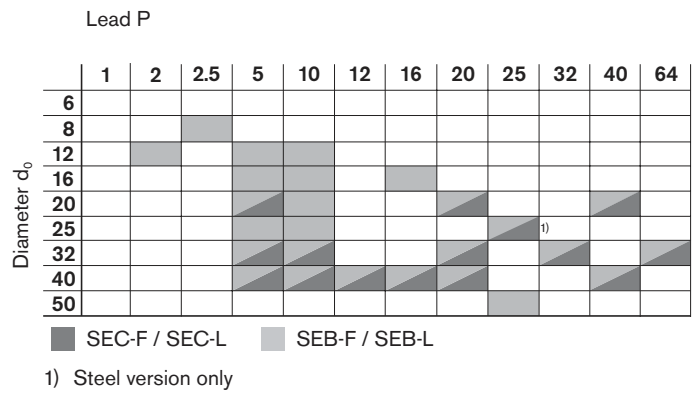


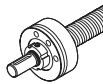
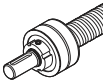


**Lead P**

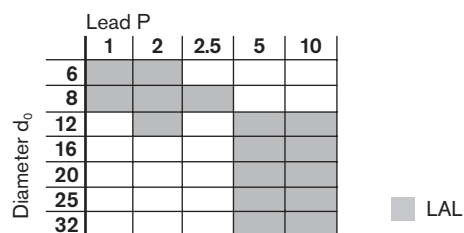
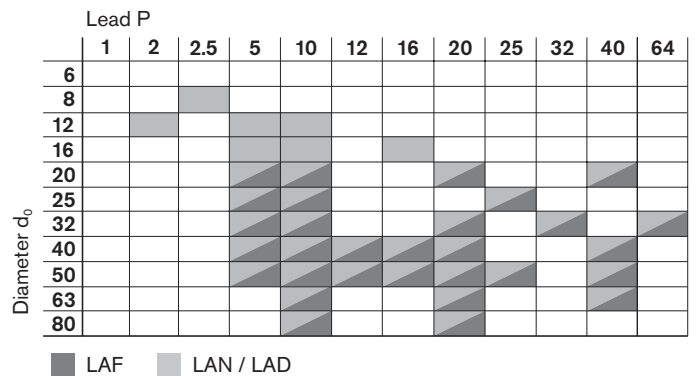
	1	2	2.5	5	10	12	16	20	25	32	40	64
<b>6</b>	Standard	Standard										
<b>8</b>	Standard	Standard										
<b>12</b>		Standard										
<b>16</b>												
<b>20</b>												
<b>25</b>												
<b>32</b>												
<b>40</b>												
<b>50</b>												
<b>63</b>												
<b>80</b>												




**Diameter d<sub>0</sub>**

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eLINE products		Page
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FBZ-E-S		130

## Definition of Precision Ball Screw Assembly

DIN 69 051, Part 1 defines a ball screw as follows:

**An assembly comprising a ball screw shaft and a ball nut and which is capable of converting rotary motion into linear motion and vice versa. The rolling elements of the assembly are balls.**

**As simple as it is to describe the elementary function of a precision ball screw assembly, in practice you are faced with a variety of types and applications.**

**A new nut series, new sizes in right-hand and left-hand versions, as well as a new nut housing as an accessory have increased the scope of the catalog still further.**

Rexroth Precision Ball Screw Assemblies provide technical designers with diverse solutions for positioning and transport tasks with driven screws or also with driven nuts.

With Rexroth, you can be sure of finding products tailored to special applications and uses.

Here are some examples:

- eLINE series: the low-cost solution through to the medium size range in the form of screw-in nut or single nut with flange
- Speed series: maximum linear speeds with simultaneous high load rating and short nut length

The latest 2008 additions to the product range:

- 2-start single nut with flange FED-E-B, provides a distinct increase in the dynamic and static load ratings as a result of two separate ball tracks.
- Single nut with flange, FEM-E-S, left-hand version in several sizes; also available in the size 20x10R
- Nut housing MAG-Z for the cylindrical nut

The nuts with flanges from the Standard series are available in versions with either Rexroth or DIN mounting dimensions. The related standards (DIN 69 051 and ISO 3408) are therefore fully supported by Rexroth.

In order to make it easier for customers to decide between particular series and/or sizes in terms of delivery time as well, we have introduced A, B and C categories for nuts.

Each individual ball nut part number is assigned to a particular category. Category A parts are always stocked in the quantities of average demand. Certain stocks of Category B parts are also kept, but customers should inquire about the availability of these parts. Category C parts are exclusively made to order.

Almost all single nuts in the version with backlash can be easily mounted on the screw by the customer, especially during servicing. In addition, the adjustable-preload single nut of the Standard series allows the customer to perform preload adjustment in-house.

Matching nut housings for the Standard series and several types of end bearings are also stocked.

### Precision-rolled screws

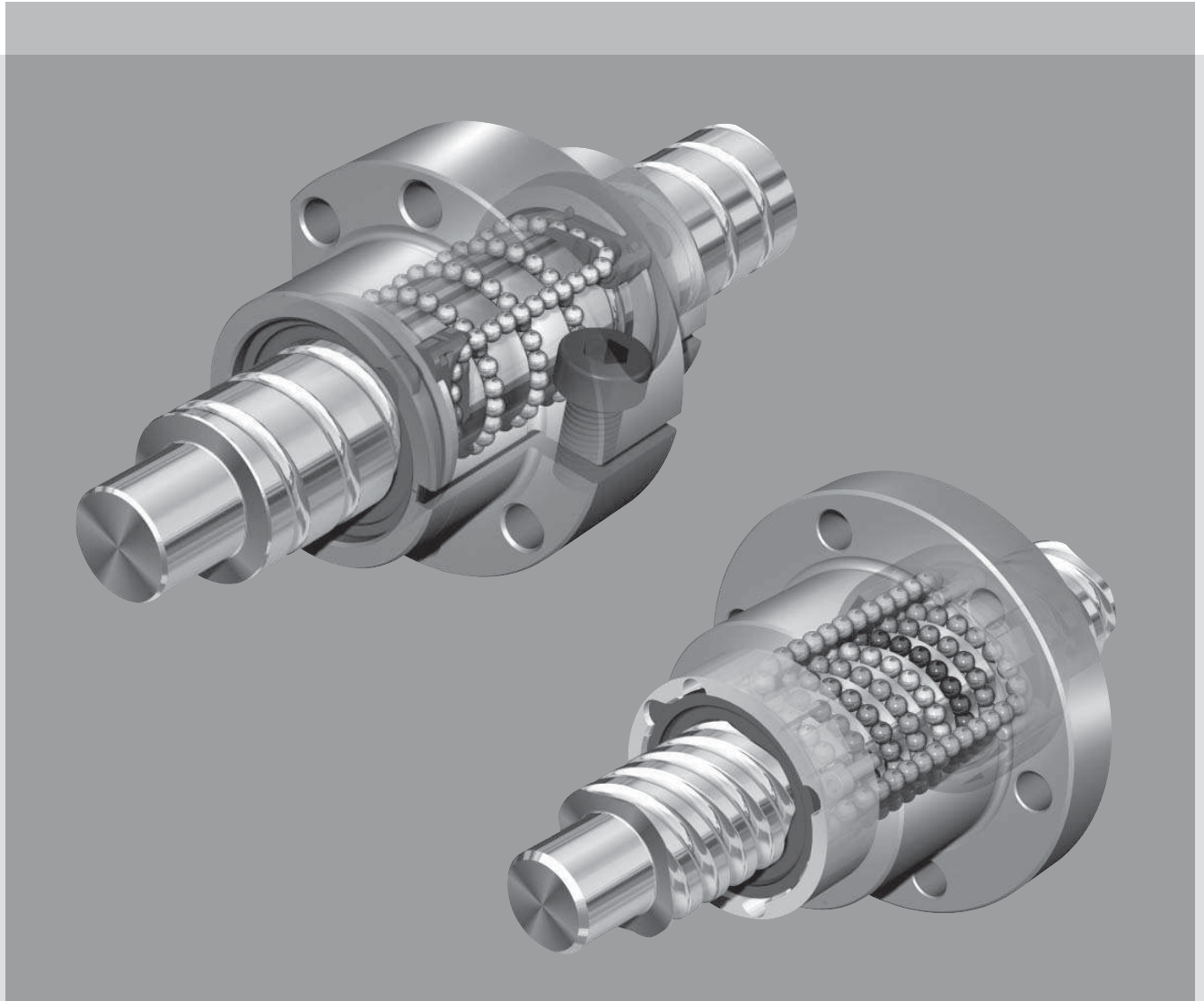
Precision-rolled screws in a variety of sizes and of unequalled quality have long been an essential part of our product range. Our comprehensive, worldwide stocks guarantee fast response times in every location. Availability is one advantage, low prices another. Every nut featured in this catalog can be combined with the precision-rolled screws.

Precision-rolled screws can also be supplied without ball nuts to allow customers to machine the screw ends on their own facilities. Since hard machining has meantime become an established method, we no longer anneal the screw ends, a process which was previously necessary but which lowers the quality of the material. For special servicing cases, please consult us.

### WINKGT calculation software

The WINKGT calculation software for designing and calculating precision ball screw assemblies for the operating system Windows 95 through XP is available on CD-ROM. This makes it very easy for you to perform your own technical calculations.

Alternatively, you can arrange for Rexroth to produce a technical design calculation on your behalf by completing and returning the "Design Calculation Service Form" at the end of the catalog. For the simplified creation of drawings of our precision ball screw assemblies as a CAD file, see the section headed "Inquiries and Orders" and the "Inquiry/Order" form at the end of the catalog.



### Advantages

- Smooth operation due to the design of the internal recirculation and optimal lift-off of balls from the raceway
- High load rating due to large number of balls
- Short nut length
- No protruding parts, nut is easily mounted
- Smooth outer shell
- Effective, wiping sealing
- Large range of series available ex stock
- Adjustable-preload single nut

# Ball Screw Assembly with Front Lube Unit

## Characteristic features

Equipped with Rexroth's efficient, series-made Front Lube Unit, a ball screw assembly can attain an exceptionally long travel life without relubrication. Thanks to intensive development work and thorough testing under realistic conditions, the use of Front Lube Units combined with prelubricated ball nuts enables you to achieve lifelong, optimal lubrication of Rexroth Precision Ball Screw Assemblies. From its built-in oil reservoir, the Front Lube Unit delivers the precise amount of oil required to replenish the depleted reserves of oil in the soap matrix of the grease inside the ball nut. The oil is applied directly to the screw thread via the low-friction point-contact zone of the open-pored foam. This optimized delivery minimizes lubricant consumption and allows you to achieve lifelong lubrication.

## Ecologically sound

The Front Lube Unit ideally combines eco-friendliness with cost-efficiency. It minimizes oil consumption and keeps the surroundings clean, thus helping to conserve resources.

## Further highlights

- Delivered ready-mounted to the Ball Screw Assembly.
- Attaches to the end of the ball nut, thus saving space.
- Can be used in all mounting orientations in both horizontal and vertical installations.
- Available for almost all ball nut designs in diameters 20 to 40.
- Easy integration into existing constructions through installation either on the flange side or on the opposite side of single-start nuts.
- When installed at both ends of the ball nut, also meets the lubrication needs of high-capacity 2-start nuts (FED-E-B).
- Suitable for all normal conditions of use, except for wet or dusty environments.



## Lubrication concept

This logo indicates that Rexroth Precision Ball Screw Assemblies with prelubed ball nut and Front Lube Unit are lubed for life.

Note: The Front Lube Unit is not suitable for use with driven nuts.

## Lifelong lubrication

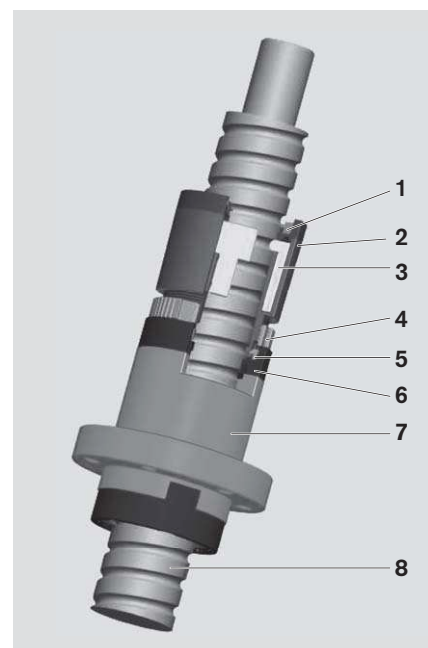
The effective life of the Rexroth Front Lube Unit matches the service life curve of the Ball Screw Assembly. When operated within the recommended load limits, a Ball Screw Assembly equipped with a Front Lube Unit will require no relubrication, thanks to the optimal delivery of lubricant. Based on our extensive tests, the lubrication performance of the Front Lube Unit can now be reliably predicted for the first time. With a Front Lube Unit from Rexroth, a Ball Screw Assembly can run trouble-free for **five years** or **300 million revolutions** without any relubrication.

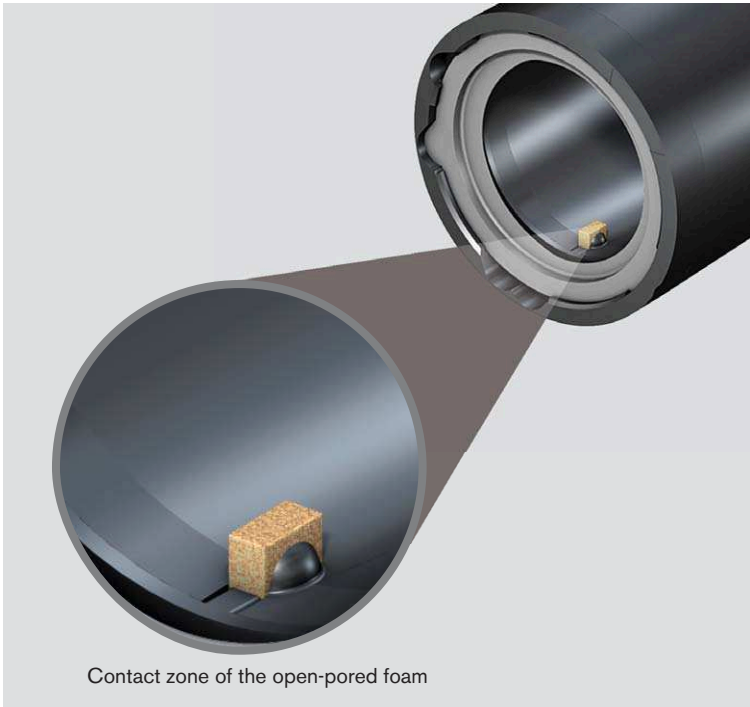
## Structural design of front lube units

- 1 Seal
- 2 Housing and cover
  - Material: special plastic
- 3 Open-pored foam
- 4 Ring nut
- 5 Intermediate ring
- 6 Recirculation cap
- 7 Ball nut
- 8 Ball screw

## Notes

When calculating the stroke, consider the dimensions of the Front Lube Unit (VSE). When setting up a system, do not allow the VSE to collide with a stop or other components.





Contact zone of the open-pored foam

Product Overview

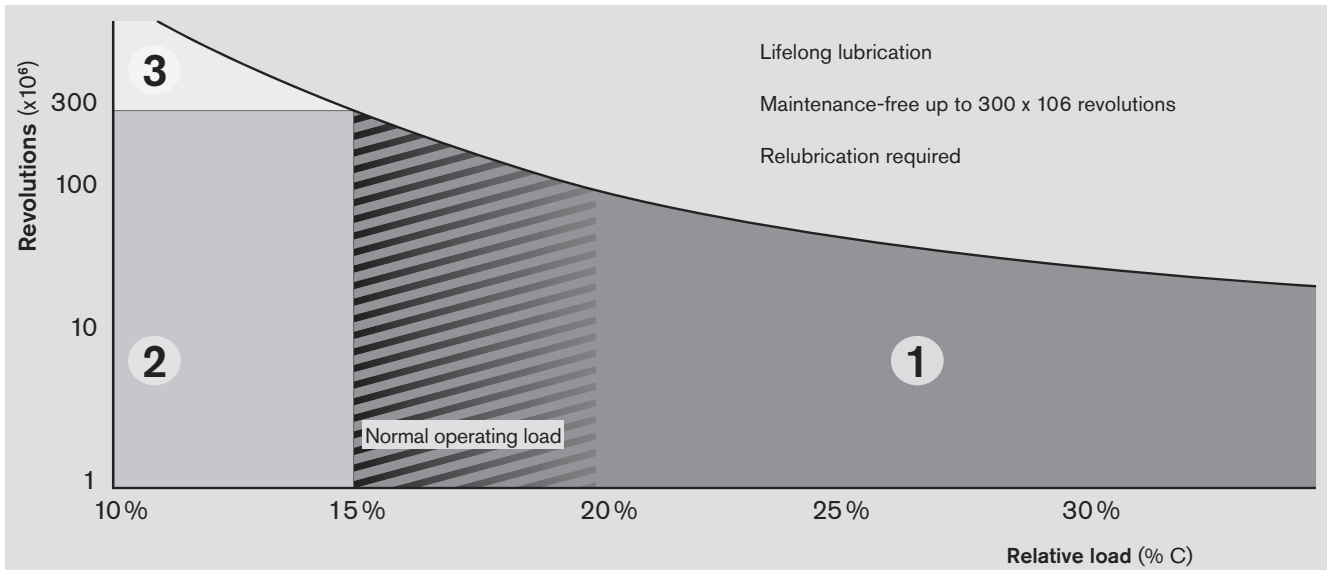
# Ball Nut with Front Lube Unit

## Front Lube Unit

The Front Lube Unit (VSE) has been designed for long-term, maintenance-free operation of Ball Screws. It is attached to the ball nut and delivers lube oil continuously to the rolling elements. For travel up to 300 million revolutions without relubrication.

The Front Lube Unit can be combined with the following ball nut designs:

- FBZ-E-S
- FSZ-E-S
- FEM-E-S
- FEM-E-C
- SEM-E-S
- SEM-E-C
- FED-E-B



Results confirmed by our extensive tests:

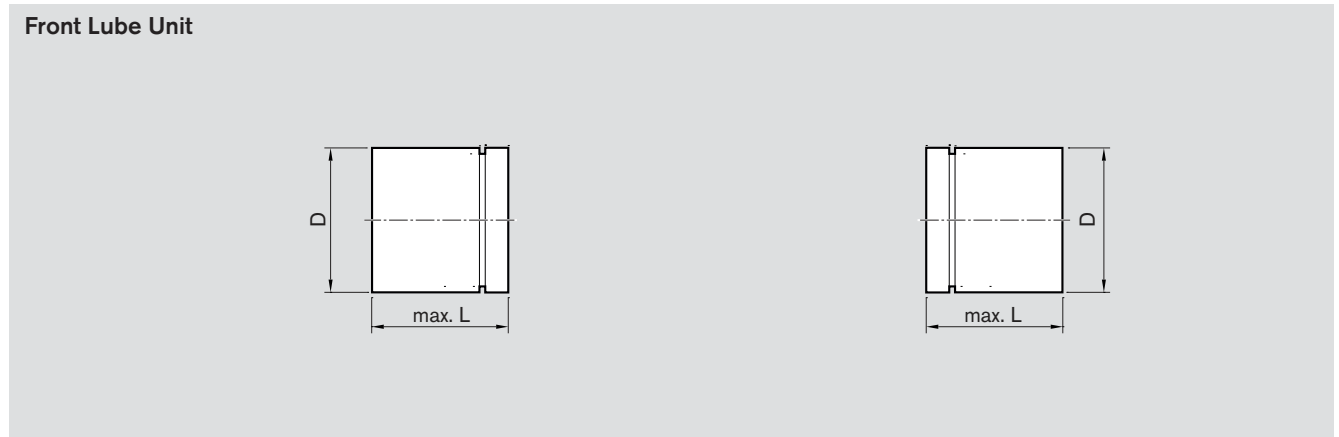
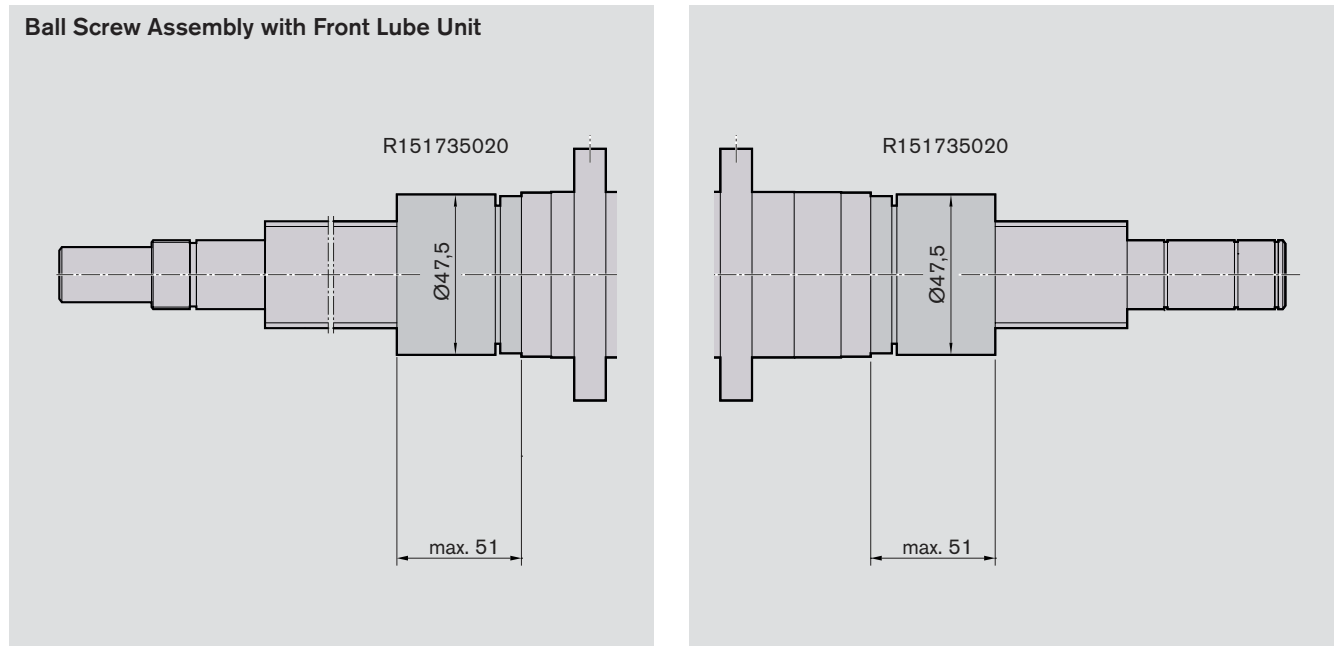
- 1** For axial loads of 15-35% of the dynamic load rating C, the ball nut will be lubed for life.
- 2** For axial loads of < 15% of the dynamic load rating C, the ball screw assembly will require no maintenance for up to 300 million revolutions.

- 3** After 300 million revolutions, the ball nut should be relubricated as usual. The Front Lube Unit does not have to be removed from the ball nut.

Lead (mm)	Travel s with Front Lube Units <sup>1)</sup> (km)
5	1 500
10	3 000
20	6 000
32	9 600
40	12 000

1) max load up to 0.15C

## Technical Data



**Note:** The Front Lube Unit is delivered ready-mounted to the Ball Screw Assembly.

Size of VSE $d_0 \times P$	Part numbers	D (mm)	L (mm)
20 x 5 R	R151715000	32,60	51,00
20 x 20 R		32,60	51,00
25 x 5 R	R151725010	37,50	51,00
25 x 10		37,50	51,00
25 x 25		37,50	51,00
32 x 5	R151735020	47,50	51,00
32 x 10		47,50	51,00
32 x 20		47,50	51,00
32 x 32		47,50	51,00
40 x 5	R151745030	55,50	53,00
40 x 10	R151745040	62,30	51,00
40 x 20		62,30	51,00
40 x 40		62,30	51,00

Product Overview

## eLINE Ball Screw Assemblies

eLINE Ball Screw Assemblies are readily available, configurable assemblies with pre-assembled ball nuts in screw-in or flanged design.

The screw ends are pre-machined for easy combination with LGL end bearings, complete with matching slotted nuts.

Special attention was paid to the load capability of the supporting bearings. By joining the bearing journal to the screw end we were able to enlarge smaller screw diameters and thus increase the load capacity of the end bearings.

This can simplify the choices for many customer-specific transport applications. The reduced design effort and simplified ordering process also offer significant benefits for new applications.

Less stringent tolerances enable very economical solutions. For example, the ball nut is always mounted with clearance.

Seals are integrated as standard.

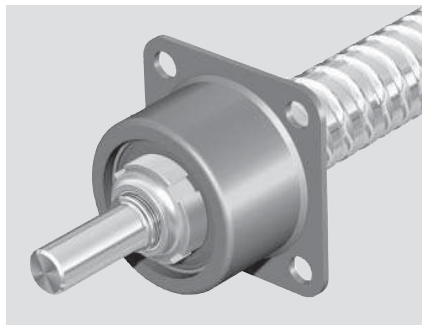
Cost-efficiency is a key consideration throughout.

Economical turnkey solutions made easy.

More information on the individual sub-assemblies can be found in the corresponding sections of this catalog.

### Advantages

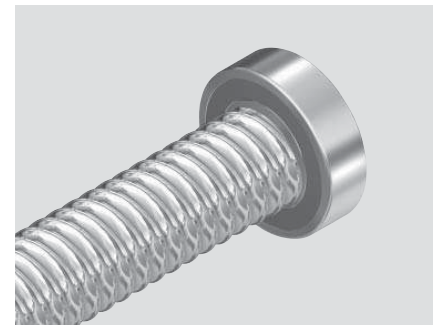
- With seals
- High axial load-bearing capacity
- Readily available
- Ball nuts in flanged or screw-in designs
- Can be supplied complete with end bearings and slotted nuts



#### Angular contact thrust ball bearing unit with slotted nut, LAL

The fixed bearing with angular-contact ball bearings LGL in an X-array and slotted nut makes an ideal accessory.

- High load rating
- Very easy mounting thanks to flanged housing made of drawn sheet-metal
- Corrosion-protected housing
- Seals keep dirt out
- Bearings can be easily preloaded during fixing
- Maintenance-free for most applications due to the large lubricant reservoir with initial greasing



#### Deep-groove ball bearing unit with retaining ring, LAD

Floating bearing with deep-groove ball bearing

## Ball Screw Assemblies with Flanged Single Nut – Miniature Line

### Miniature Line

Miniature Ball Screws are readily available, configurable assemblies with pre-assembled flanged ball nuts.

The screw ends are pre-machined for easy combination with LAL end bearings (angular-contact thrust ball bearings complete with matching slotted nuts).

Special attention was paid to the load capability of the supporting bearings. By joining the bearing journal to the screw end we were able to enlarge smaller screw diameters and thus increase the load capacity of the end bearings. This can simplify the choices for many customer-specific positioning and transport applications.

The reduced design effort and simplified ordering process also offer significant benefits for new applications.

The flanged nut FEM-E-B comes pre-assembled with clearance and seals.

### End bearing LGL

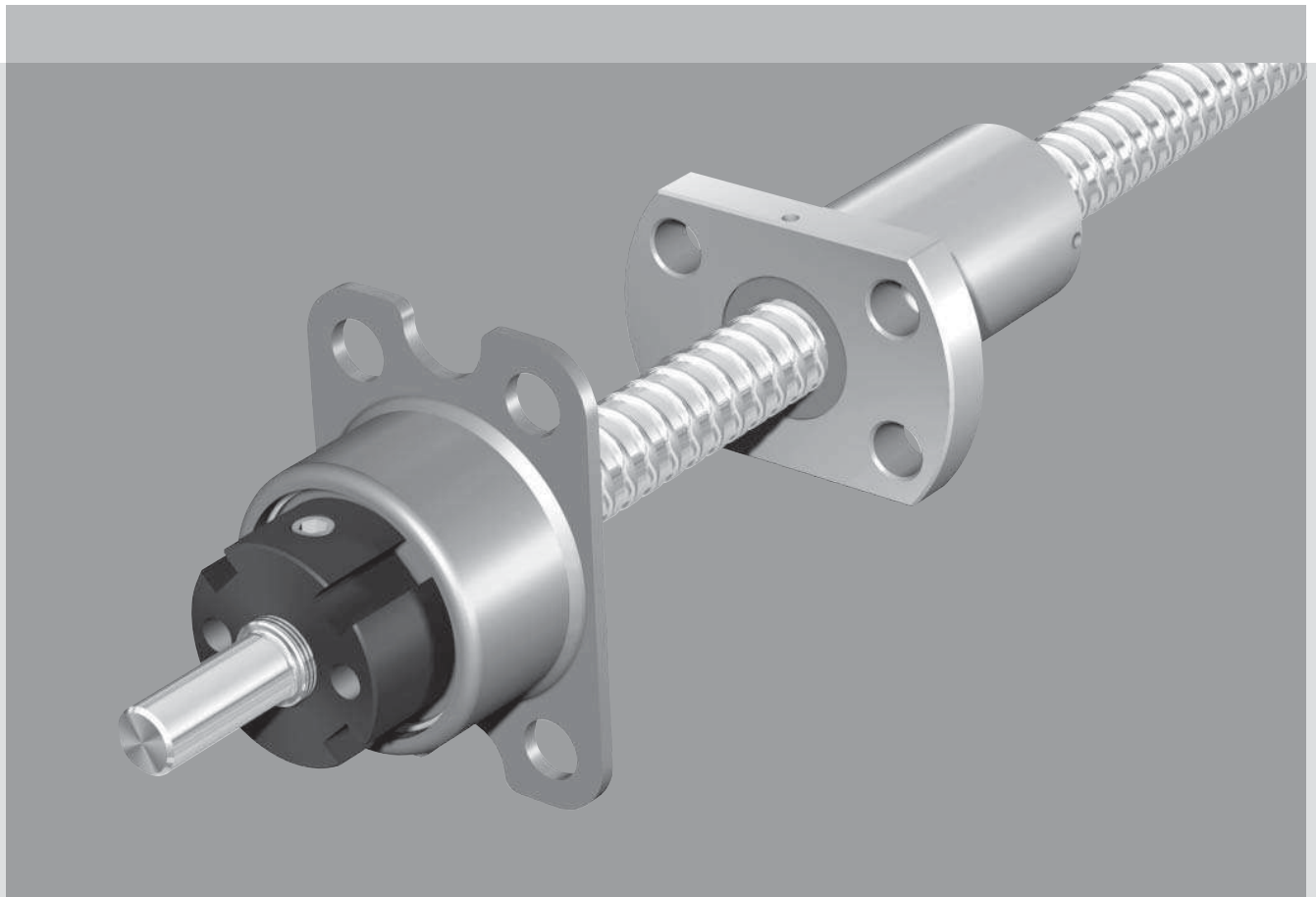
The end bearing LGL with angular contact ball bearing in an X array makes an ideal accessory.

- High load rating
- Very easy mounting thanks to flanged housing made of drawn sheet-metal
- Corrosion-protected housing
- Seals keep dirt out
- Bearings can be easily preloaded during fixing
- Maintenance-free for most applications due to the large lubricant reservoir with initial greasing
- Economical turnkey solutions made easy.

### Ordering Data

For explanations concerning the ordering code, please refer to page 28.

FEM-E-B	6 x 1R x 0.8-4	1	1	T7	R	831K061	00K060	255	0	1
FEM-E-B	6 x 2R x 0.8-4	1	1	T7	R	831K061	00K060	255	0	1
FEM-E-B	8 x 1R x 0.8-4	1	1	T7	R	831K063	00K080	355	0	1
FEM-E-B	8 x 2R x 1.2-4	1	1	T7	R	831K063	00K080	355	0	1
FEM-E-B	8 x 2.5R x 1.588-3	1	1	T7	R	831K063	00K080	355	0	1
FEM-E-B	12 x 2R x 1.2-4	1	1	T7	R	81K061	00K120	400	0	1
FEM-E-B	12 x 5R x 2-3	1	1	T7	R	81K061	00K120	400	0	1
FEM-E-B	12 x 10R x 2-2	1	1	T7	R	81K061	00K120	400	0	1



For technical data on ball nuts, screws and end bearings, please refer to the corresponding sections of this catalog.

$d_0$  = nominal diameter  
 $P$  = lead (R = right-hand, L = left-hand)  
 $D_w$  = ball diameter  
 $i$  = number of ball track turns

Size $d_0 \times P \times D_w - i$	Part number	Load ratings (N)		Linear speed $v_{max}$ (m/min)	Dimensions (mm)	
		dyn. $C$	stat. $C_0$		$L_{tot}$	$L_{thr}$
6 x 1R x 0.8-4	R1530 100 40	900	1290	3	255	191
6 x 2R x 0.8-4	R1530 100 41	890	1280	6	255	191
8 x 1R x 0.8-4	R1530 207 20	1020	1740	3	355	291
8 x 2R x 1.2-4	R1530 207 21	1870	2760	6	355	291
8 x 2.5R x 1.588-3	R1530 207 22	2200	2800	5	355	291
12 x 2R x 1.2-4	R1530 410 90	2240	4160	12	400	359
12 x 5R x 2-3	R1530 410 91	3800	5800	30	400	359
12 x 10R x 2-2	R1530 410 92	2500	3600	60	400	359

Product Overview

## Precision Ball Screw Assemblies with Driven Screws

### End bearings

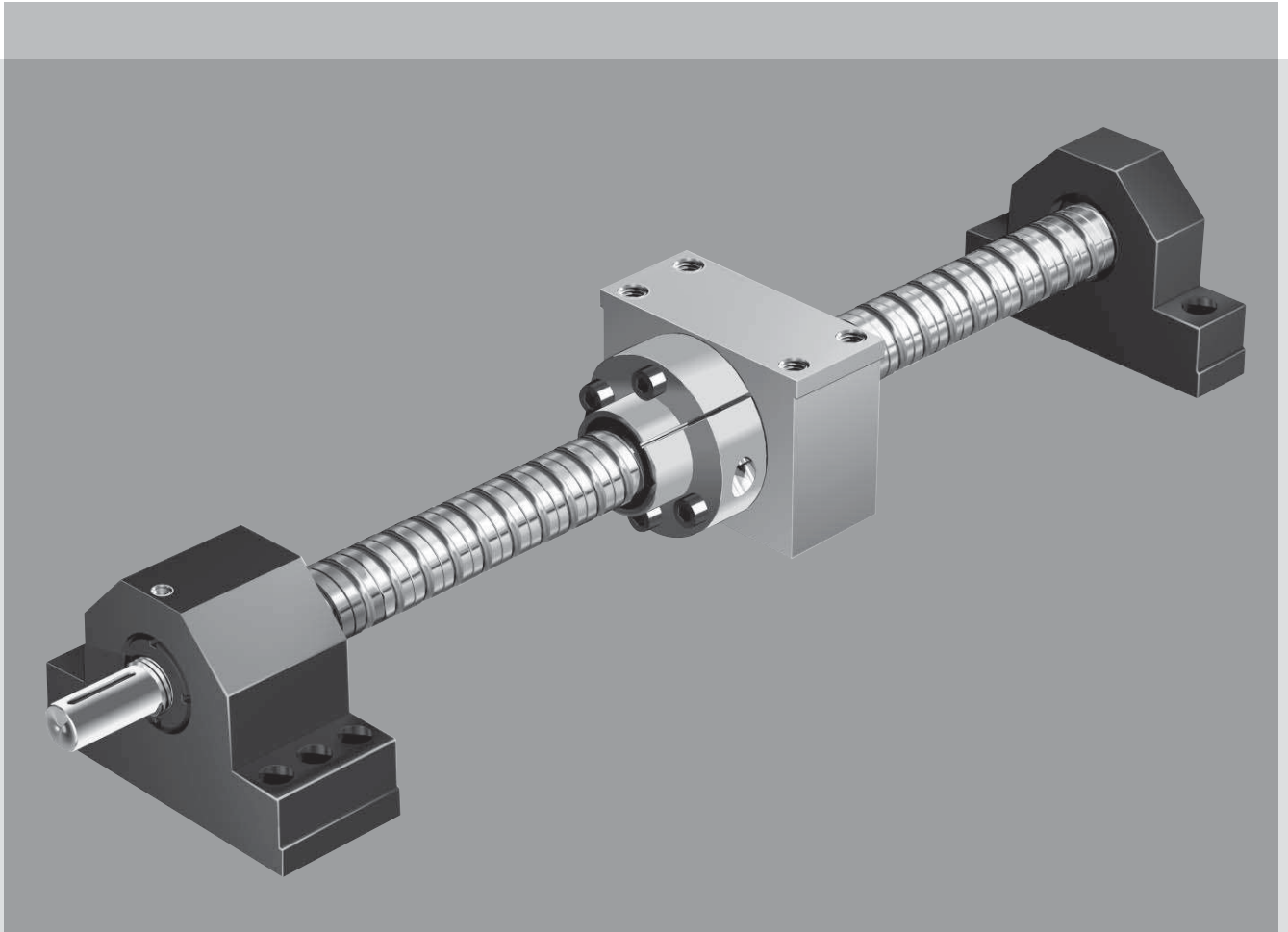
Rexroth precision ball screw assemblies are available with steel or aluminum pillow block units or bearing units complete with matching slotted nuts.

Rexroth precision pillow block units enable:

- Easy installation due to the variable fixture options and reference edges
- Use of premachined pin holes provides increased mounting accuracy

### Nut housings

Rexroth nut housings for various flanged nuts and the cylindrical single nut ZEM-E-S complete the ready-to-install Rexroth product range.

**Advantages**

- High axial load capacity
- High dynamics
- High rigidity
- Low friction
- Available from stock in many versions and sizes
- Nut housing with reference edge (both sides)

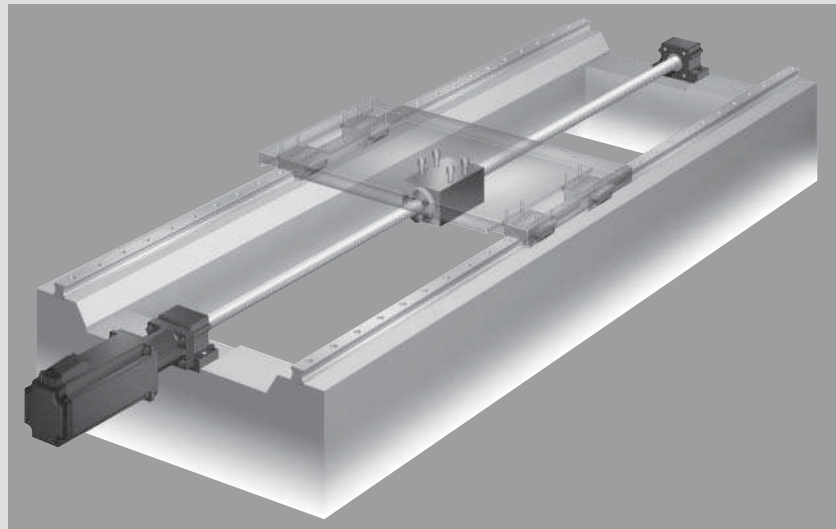
Product Overview

## Precision Ball Screw Assemblies for All Applications

### Drive units

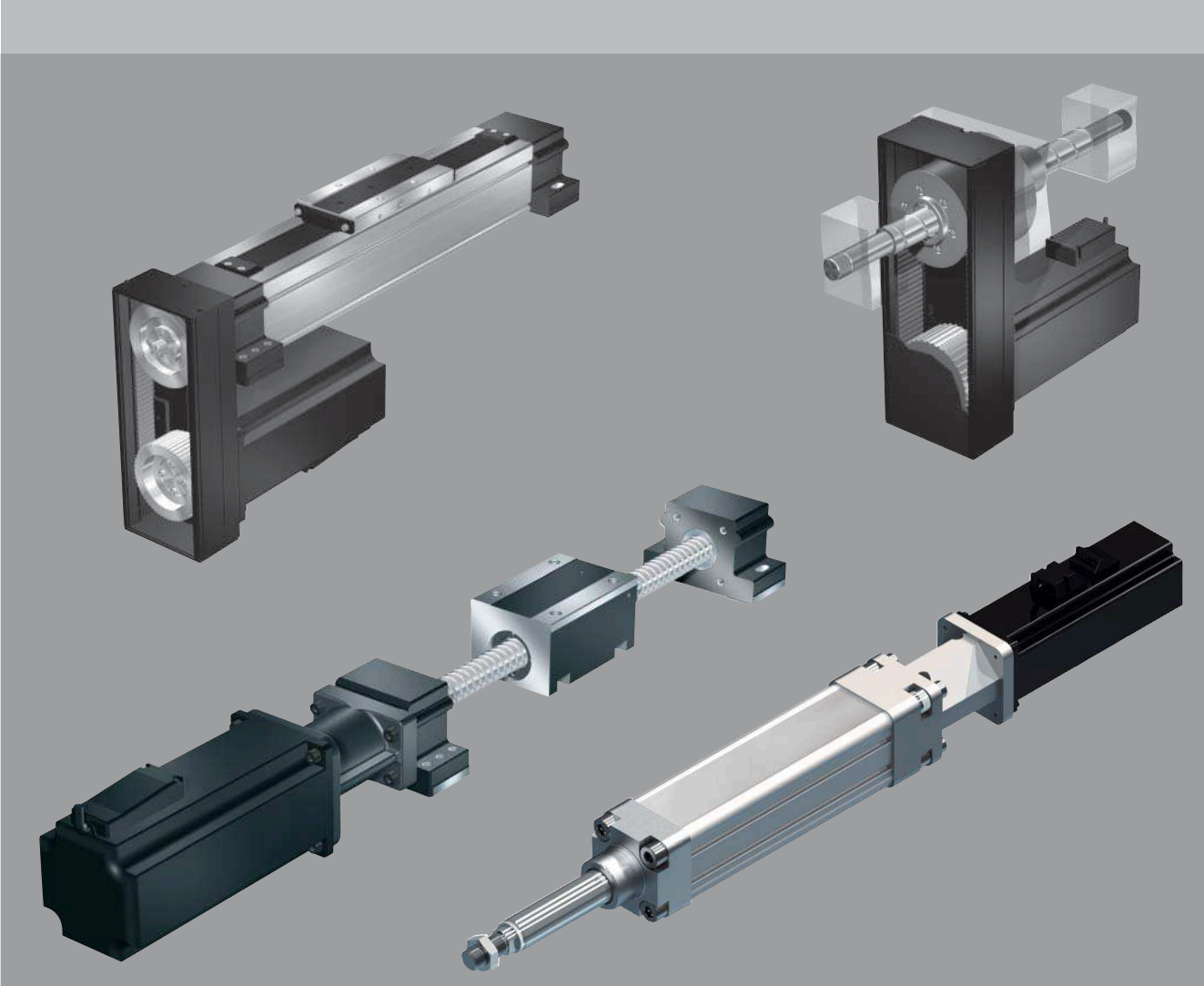
You will find further system solutions in our catalog on Rexroth Drive Units. This catalog contains precision ball screw assemblies with a protecting housing, including versions with integrated screw supports, driven nuts with side drive timing belt and the matching AC servo motors.

To perform particularly demanding positioning tasks we have developed the Integrated Measuring System for Ball Rail and Roller Rail Systems (Catalog R310EN 2350). The linear measuring system in the rail then replaces the positioning information in the ball screw. This way we are able to achieve a maximum of flexibility in design and a maximum of precision in operation.



### Available Precision Ball Screw Assembly catalogs

R310EN 3301	Precision Ball Screw Assemblies
R310EN 3304	Drive Units
R310EN 3306	Electromechanical Cylinder



## Application Examples

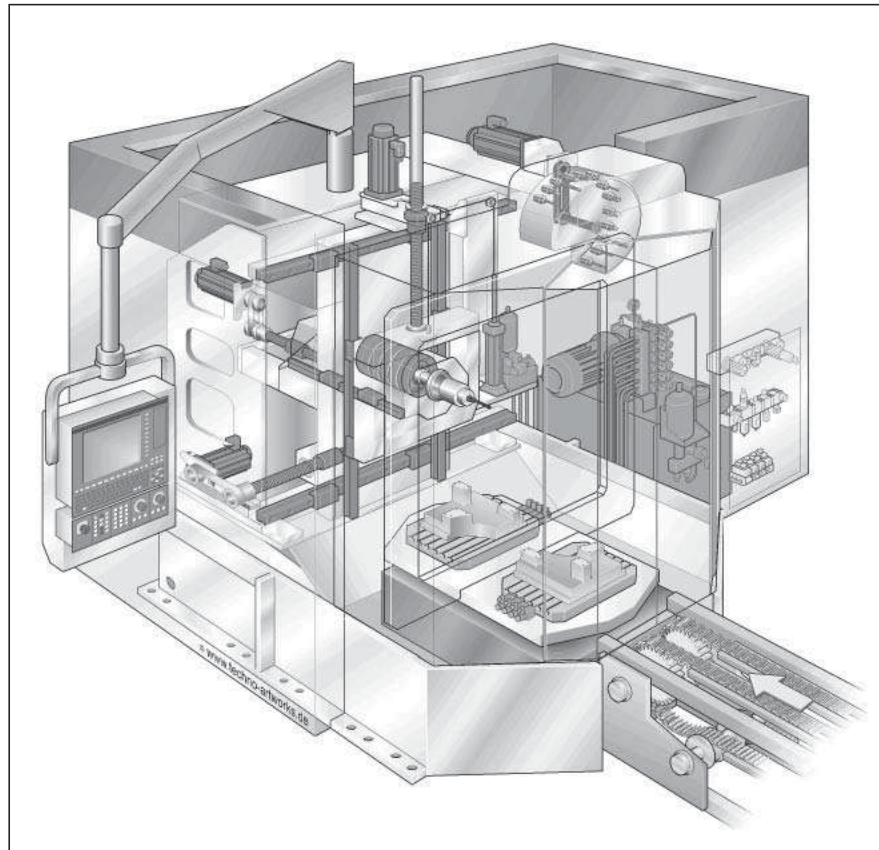
# Application Examples

Rexroth Precision Ball Screw Assemblies have been successfully implemented worldwide in the following areas:

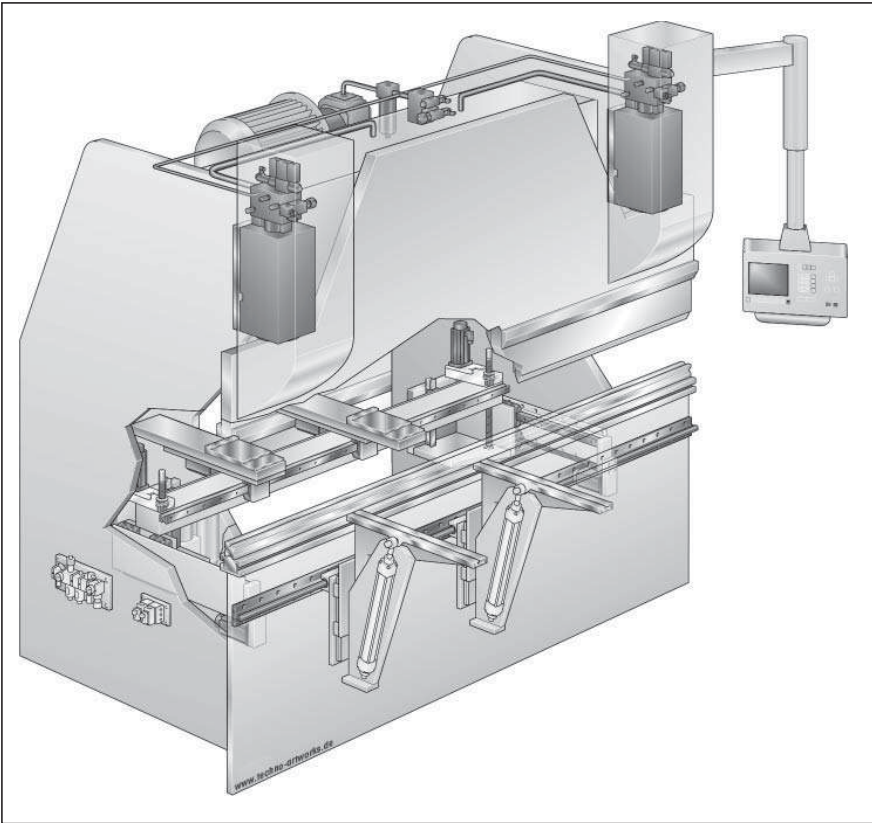
- Cutting machine tools
- Forming machine tools
- Automation and handling
- Woodworking
- Electrical and electronics
- Printing and paper
- Injection molding machines
- Food and packaging industry
- Medical equipment
- Textile industry
- etc.

## Machining center

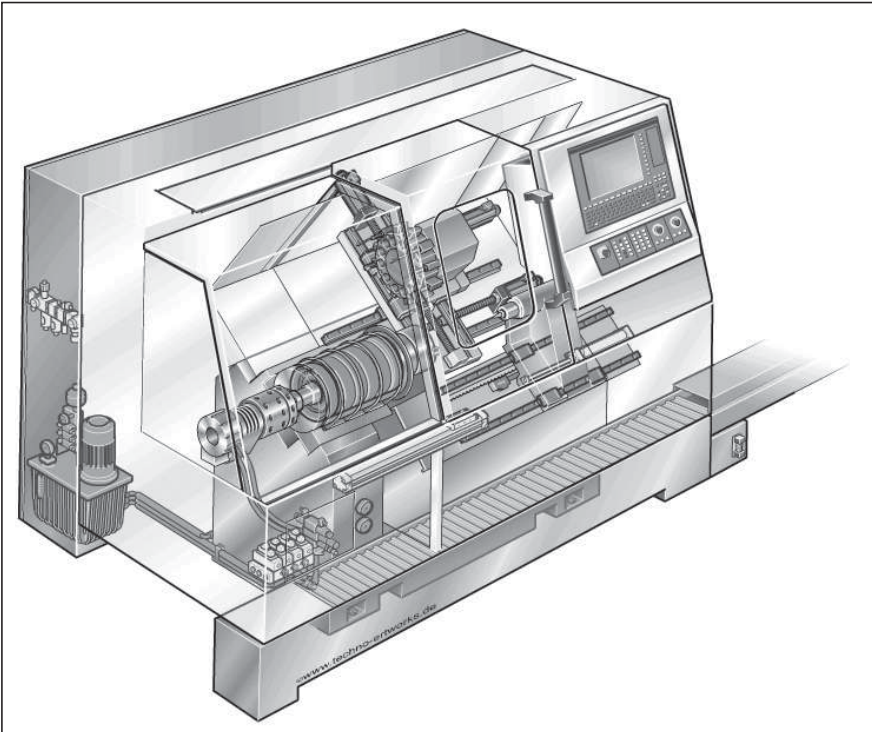
Vertical axis with driven nut



**Press brake**



**Lathe**



Inquiries and Orders

## Inquiries and Orders

All nuts, screws and end machining de-tails can now be defined with the order code (up to screw diameter 80 mm) as a complete precision ball screw assembly.

We have taken account of all former selection criteria as well as adding new ones. The diversity of possible combinations is limitless.

Attention is focused in particular on the definition of end machining details. For many design versions there is a prepared definition, providing you with a suitable solution for practically every application.

If you wish to send us an inquiry, simply complete the form at the end of this catalog. If no drawing is available, please specify your wishes using the variable order code. You will find a summary of the options on page 27.

Should you already have a drawing available as a CAD file in Pro/E, AutoCAD, STEP or DXF, you can send us the data by e-mail to [screws.br@boschrexroth.de](mailto:screws.br@boschrexroth.de).

If the drawing exists on paper only, you can, of course, send it to us by conventional mail.

Each customer-specific precision ball screw assembly is issued with an ID number when an order is placed. If you have any subsequent queries, you need only quote this ID number.

Using the ordering data from the cata-log, you can also easily generate a drawing in AutoCAD format via the functionality provided on our website. A guided dialogue is provided for data input so as to avoid typing errors, and all data selected can be checked within a few minutes against the drawing that has been generated. This drawing can then be used directly by our production departments, which accelerates order processing and delivery. The drawing generation functionality can be used without registering with us or entering a password or customer number. To access this functionality, visit [http://www.boschrexroth.com/ball\\_screws](http://www.boschrexroth.com/ball_screws).

From there, you can access the on-line catalog via the link "CAD files: Select individual types" in the right navigation bar. The menu "Ball screw assemblies" on the left brings you to the desired goal.

Data can be input in two ways. In the default mode, "Configuration of options", the dialog is supported by meaningful default settings to minimize input errors. The "Expert configuration" mode allows much more rapid input of data, but requires a certain amount of experience. When the dialogue is completed, a click on the "CAD-Model" button leads to a further dialog box asking for input of the e-mail address for electronic transmission of the drawing to the user.

Registered customers based in Germany can use further eShop functions such as the shopping cart, the inquiry list and order status and can receive direct offers for the inquired precision ball screw assemblies or check the delivery status of current orders.

The screenshot shows the 'Ball Screw Assemblies' page on the Bosch Rexroth website. The page layout includes a top navigation bar with links for Language, Imprint, Terms of Use, Electric Drives and Controls, Hydraulics, Linear Motion and Assembly Technologies, Pneumatics, and Service. Below this is a search bar and contact information. The main content area is titled 'Ball Screw Assemblies' and features three images of ball screw assemblies. To the right of the images is a sidebar with navigation options: Product Documentation, Product Details in the Online Catalogue, CAD Files: Select individual types, CAD Files: Select all types (ropped files), eShop, Benefits at a Glance, and Information material (order). The footer contains a 'go to top of page' link and a 'Print' button.