

Radial gate cylinder technology

First Selection Civil Engineering



Table of content

Content	Page	Content	Page
Introduction	2	Enduroq 2000/2200	9
Drive & control system integration / Life cycle management	3	Cylinder integrated measuring system	10
Radial gate cylinder technology	4	Chevron sealing technology	11
Type code	5	Sealing system of spherical bearings	12
Standard dimensions	6	Deflection simulation	13
Scope of supply / Oil connections	7	Inquiry list general data	14
Mounting style	8	Inquiry list technical data	15

Introduction

First selection

The First Selection is a range of brochures that provides information regarding the technical possibilities of Bosch Rexroth's large hydraulic cylinders' products. Each "First Selection" brochure provides you with necessary information that helps you determine the required specifications of your cylinder. Please note that your cylinder can only be produced with the correct input of these technical specifications.

The perfect fit

At Bosch Rexroth, your project is our challenge. We design and manufacture custom built cylinders, high pressure piston accumulators and pressure vessels for your individual applications. Our large hydraulic cylinders are produced in The Netherlands, Brasil and China. They range from bore 200 mm up to 1.500 mm and strokes up to 24.000 mm. Our highly skilled specialists have a unique expertise in a large variety of industry sectors and understand the special requirements of your application.

Bosch Rexroth's large hydraulic cylinders are globally used in the following application fields:

- Civil engineering
- General industry & presses
- Heavy industry
- Bulk material handling & mining
- Offshore
- Marine and dredge
- Special projects

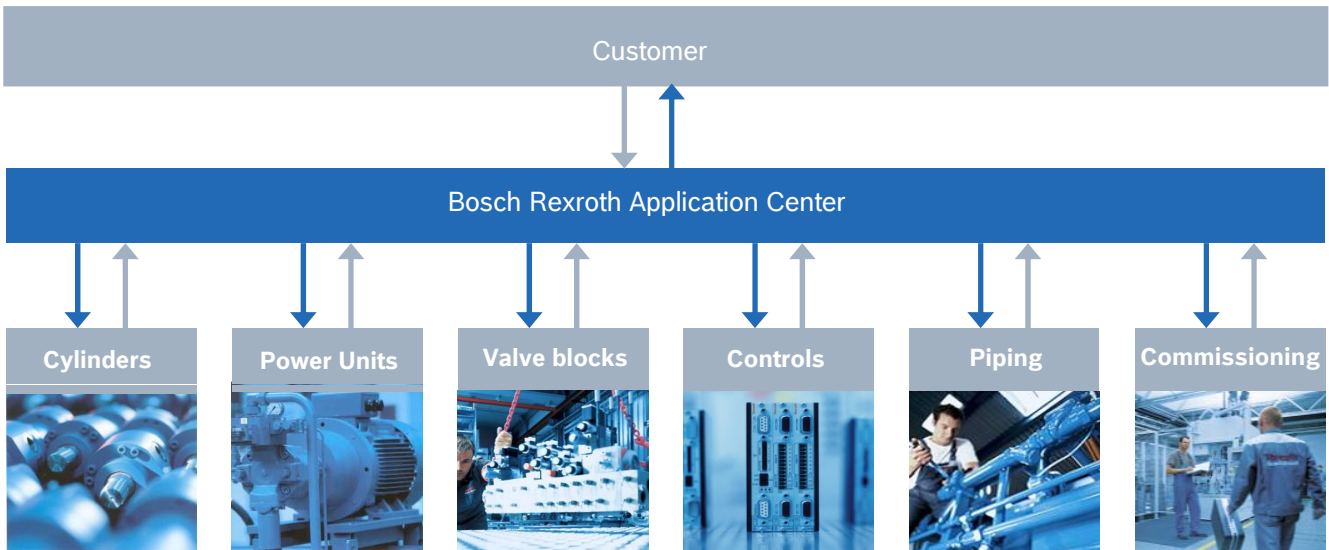
Engineering and production

Large hydraulic cylinders are used to transmit heavy forces in often extreme environments. Additionally, they must operate reliably and safely over a long period of time. Only systemized engineering and production processes can make sure that cylinders always meet the individual requirements. Bosch Rexroth has developed sophisticated design tools and unique in-house research facilities for a reliable and cost-efficient cylinder design.



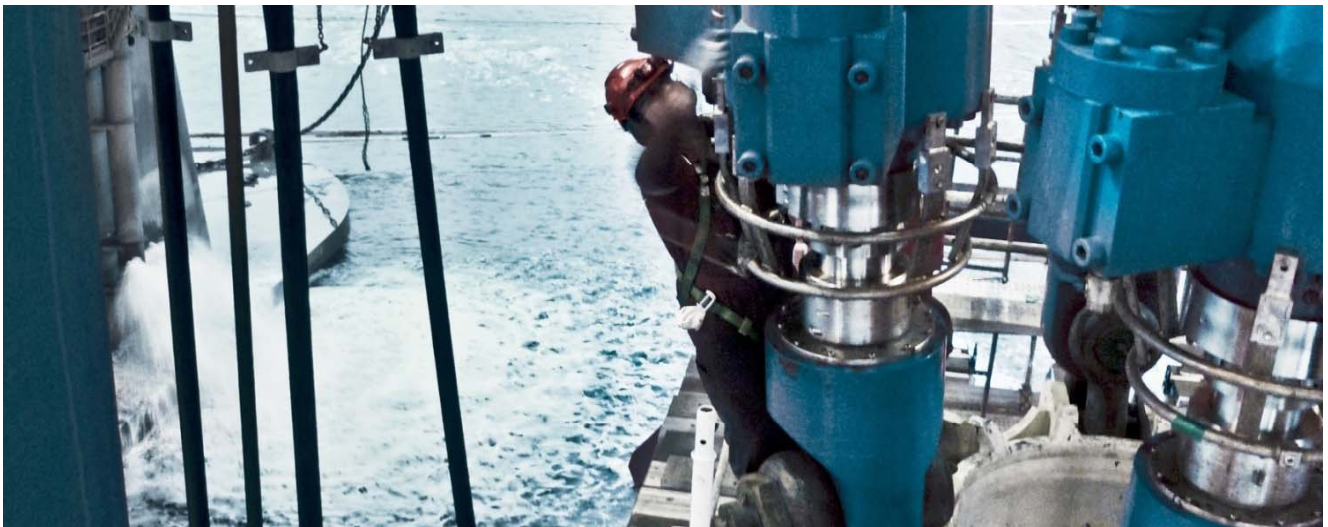
Drive & control system integration

By means of our Bosch Rexroth Application Centres in Lohr Am Main, Germany and Boxtel, the Netherlands, all the integrated drive & control knowhow is available. Our Application Centre consults in complete drive & control packages consisting of: cylinders, power packs, gear boxes, controls, piping, and installation & commissioning. This wide range of knowhow offers you the best complete drive system solution, specifically designed for your application.



Life cycle management:

More than 90% of the life cycle costs are determined during the design phase. As a partner already involved in the engineering phase of the hydraulic installation, Bosch Rexroth can reduce your maintenance time and costs. This also leads to improved availability over the complete lifetime, further reducing your total costs of ownership. If however a problem occurs, Bosch Rexroth offers a wide range of repair and maintenance services. Our maintenance concept consists of: spare part management and delivery, field service, regular health checks and inspections, repair and overhaul services and technology upgrades. With numerous specialized service centers around the world, Bosch Rexroth is able to cover global support for your maintenance operations.



Radial gate cylinder technology

A controlled spillway in a dam has radial gates to regulate the water flow through the dam. This gate design allows nearly the full height of the dam to be used for water storage year-round, and flood waters can be released as required by opening one or more gates. Opening and closing of the gates will be done mechanically, by winches or by large hydraulic cylinders.

Radial Gate Cylinder

Radial gate cylinders are used for lifting, lowering and holding the radial gate, which rotates around a central pivot point. Due to the natural tendency for lowering by its own weight, the cylinders are designed only for pulling to open the gate. The synchronized cylinders can subsequently control the lowering in an accurate way.

Radial gates and their drives are built for a long operation lifetime with a low movement frequency (average radial gate opens once a month). The cylinders are facing an outside environment, water and dirt. To prevent these elements from influencing their performance, your cylinders have to be robust. Important features are: a suitable surface technology for both the piston rod and external preservation. A good tribological system ensures the right sealing configuration and lowers wear, friction and decreases friction problems.

With over 1,250 reference radial gate cylinders in the field, we use our wide experience range to develop the perfect solutions for every new project.

Standards and design rules

Your cylinder's design is based on the applicable design rules, such as DIN, IS, JADEE, ASME and our own Bosch Rexroth design standard, together with the expected lifetime, demands on serviceability and environmental limitations.

Next to these items, Bosch Rexroth is able to optimize the design based on extensive application know-how and available engineering tools (partly in-house designed) such as Pro Engineer, deflection analysis, MathCad calculations and if possible, a FEM analysis. Besides in-house development of engineering tools, Bosch Rexroth has done combined research with TNO, Max Planck Institute, several international Technical Universities and the Bosch Engineering Group BEG.



Technical data (most common projects)

Fluids: Mineral oil / bio degradable oil
Pressure range 140 to 220 bar
Operation temperature -20 °C to 60°C
Stroke velocity (advised) 0,8 mm/s to 20 mm/s



Type code

The following table shows the type code that creates the basis for your specific large hydraulic cylinder. Each code marks a basic specification. All specifications applicable in your cylinder are explained below.

For further questions, do not hesitate to contact your Bosch Rexroth country unit.

Type code																		
Field	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Type	CY	CRR					A	10					U	A				

Field 1 **Type designation**
CY Cylinders with a single rod

Field 2 **Application code**
CRR Radial gate cylinder

Field 3 **External mounting shell side**
MP5 Clevis on bottom with spherical bearing
MT4 Trunnion on shell

Field 4 **Bore dimension**
Bore range from 200 mm – 700 mm
Specific dimensions on request.

Field 5 **Rod dimension**
Rod range from 90 mm – 400 mm
Specific dimensions on request.

Field 6 **Stroke length**
On request. References up to 16,500 mm

Field 7 **Cylinder construction**
A Bolted connection

Field 8 **Revision index**
10

Field 9 **Oil connections rod and bottom side**
B BSP
D SAE, 6000 PSI)
X Others

Field 10 **Position oil connection**
1 0°
2 90°
3 180°
4 270°
5 X (Other)

Field 11 **Piston rod surface**
Q Enduroq 2000
R Enduroq 2200
C Chromium (only for stainless steel piston rod material)

Field 12 **Mounting rod side**
L Male clevis with spherical bearing
R Female clevis
X Other

Field 13 **Cushioning**
U Not applicable

Field 14 **Sealing system**
A Chevron seals

Field 15 **Position sensor system**
C CIMS
T Other positioning sensor
W No option

Field 17 **Option 2**
A Maintenance free bearing
Y Rod extension
W None
X Other

Field 18 **Country code**
N Netherlands
C China

Standard dimensions

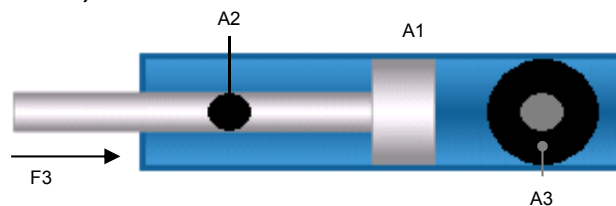
Based on our technical knowhow and experience we have defined the table below to help you select the size of your cylinder. This table shows the approximate sizes of hydraulic cylinders along with the pulling force they can deliver at a nominal pressure of 200 bar. The results are applicable to trunnion mounted cylinders and bottom eye mounted cylinders and are independent of stroke- and built-in length.

Please note this is not a catalogue. To calculate the sizes and forces of the hydraulic cylinder for your application, please contact your local Bosch Rexroth sales department.

Piston Ø mm	Piston rod Ø mm	Area ratio $\varphi A_1/A_3$	Areas			Force at 200 bar ¹ Pulling F ₃ kN
			Piston A ₁ mm ²	Rod A ₂ mm ²	Annulus A ₃ mm ²	
220	100	1,48	38.013	7.854	30.159	603
250	125	1,46	49.087	12.272	36.816	736
280	140	1,48	61.575	15.394	46.181	924
320	160	1,46	80.425	20.106	60.319	1.206
360	180	1,45	101.788	25.447	76.341	1.527
400	200	1,43	125.664	31.416	94.248	1.885
450	220	1,45	159.043	38.013	121.030	2.421
500	250	1,46	196.350	49.087	147.262	2.945
550	300	1,42	237.583	70.686	166.897	3.338
600	320	1,40	282.743	80.425	202.319	4.046
650	340	1,38	331.831	90.792	241.039	4.821
700	360	1,36	384.845	101.788	283.057	5.661

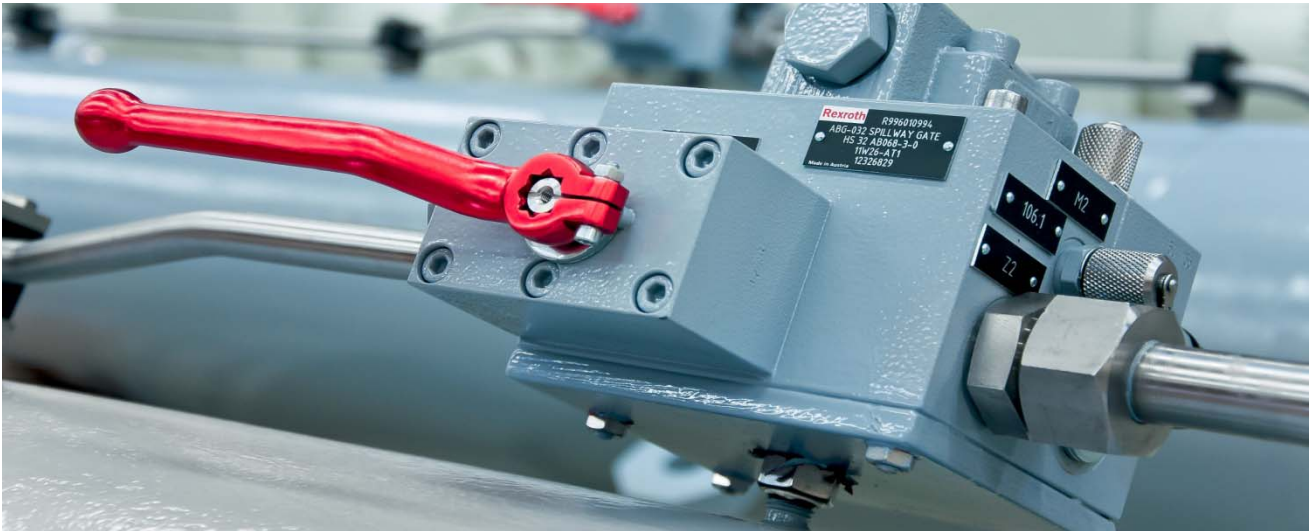
¹ Theoretical force (efficiency not taken into account)

Pressure: 20 Mpa



Scope of supply

In most cases the radial gate cylinder is delivered including manifold and stainless steel piping, all produced and designed by Bosch Rexroth. Together with position measurement equipment (integrated or external) the movement of the cylinder can be controlled in detail. Although the system and its components are reliable and robust, they also need care and attention after installation. Therefore, installation, operation and maintenance manuals are part of the standard delivery from Bosch Rexroth.



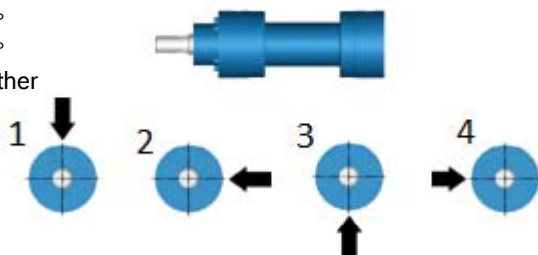
Oil connections

Transportation of hydraulic fluids into the cylinder is an important issue. The oil connection has to be suitable for the oil flow rate and pressure, required for the application.

Connection angle

Hydraulic piping is mounted on the cylinder on rod and shell side. The angle of the connection is adjusted to the customer's wishes. The picture below shows the cylinder from rod-side. The angle of the connection can be filled in on the inquiry list.

- 1 0°
- 2 90°
- 3 180°
- 4 270°
- 5 X Other



Connection type

To install the hydraulic piping on the cylinder, Bosch Rexroth has two standard oil connections used in radial gates: the BSP and SAE 6000 PSI connection. Both types of connections are reliable and highly serviceable. The best fit for your application depends on the pressure range and size of the oil connection.

We advise you to use a speed limiting orifice in the rod side connection to limit the gate lowering speed in case of a pipe or hose rupture.

Mounting style

The mounting style represents the cylinder's connection to the radial gate and interface with the dam structure. The mounting style and position have effect on the cylinder's behavior. Bosch Rexroth helps you optimize this behavior for the best fit in your application.

Mounting position optimization

With sophisticated design tools, Bosch Rexroth can support in an early design stage to optimize the position of cylinder mounting to the dam structure. We are able to determine the minimum required bore, rod and bearing diameters, the initial shell thickness, the best angles of rotation of all pivot points, including the involved frictional moments and reaction loads in pivot points, while maintaining the required built-in dimensions and associated stroke.

With the required input, like e.g. gate radius, drive torque, position of gate pivot point and available area for position of cylinder mounting in the dam structure, we are able to determine the maximum and minimum forces on the cylinder (at angle), calculate guide bearing pressure and deflection of the cylinder and thus optimize the complete design of the cylinder. This results in a cost effective design, from which we all benefit.

Shell side

The connection on shell side mounts the cylinder shell to the dam structure. The most common mounting styles in radial gates are the:

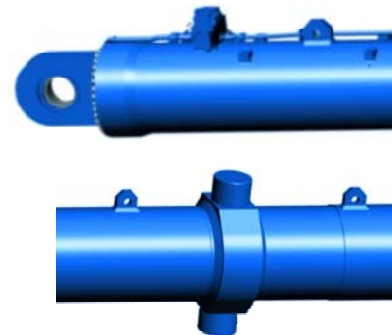
- Clevis with spherical bearing (MP5)
- Trunnion mounting (MT4)

MP5 mounting

The MP5 mounting style is an clevis connection with a spherical bearing. The special bearings reduce side forces (introducing wear) caused by small misalignments between dam and gate. Bosch Rexroth only works with premium suppliers of spherical bearings.

MT4 mounting

The MT4 mounting style is a connection in the form of a trunnion. This extra connection creates extra stability and less deflection. In some situations, this can improve the performance of your cylinder.



Rod side

The connection on rod side mounts your cylinder's piston rod to the radial gate. Depending on the radial gate's design, the cylinder is designed with a male or a female clevis.

Female clevis

The female clevis is a double bladed connection that requires a male clevis equipped with a spherical bearing to be mounted on your radial gate. This connection is locked with a pin.

Male clevis

The male clevis is a single bladed connection, mounted on your radial gate with a female clevis. This connection is locked with a pin.

Enduroq 2000/2200



The piston rod surface of large hydraulic cylinders is one of the most essential parts of the hydraulic cylinder. With insufficient protection, water, chemicals, mechanical impacts or abrasive materials can influence the cylinders performance. Bosch Rexroth helps you choose the best surface technology for your application to optimize reliability and to minimize your total costs of ownership.

Enduroq

As world market leader in designing and manufacturing of customized large hydraulic cylinders, Bosch Rexroth is a prominent pioneer in the field of piston rod protection. With the introduction of the in-house developed Enduroq 2000/2200 surface layers, Bosch Rexroth has set a new global standard for piston rod surface technologies.

Worldwide, over 3,000 Large Hydraulic Cylinders with an Enduroq 2000 or 2200 coating are installed, performing in very diverse environmental situations. The Enduroq 2000 series have high corrosion- and extremely high wear resistance. They also have a low porosity level and zero permeability. Applying Enduroq surface technologies in the right circumstances considerably increases your cylinder lifetime and minimizes the chance of leakages. The HVOF process, used to spray the Enduroq 2000/2200 surface technology, has been continuously improved since its first release. These improvements ensure a consistent and durable surface coating. Enduroq can be sprayed as a single or dual layer.

Test program

Enduroq 2000 and Enduroq 2200 have undergone a series of tests at the in-house research facilities in Boxtel. Tests have pointed out the following characteristics.

Tested characteristic	Enduroq 2000	Enduroq 2200
Layer thickness	≥ 250 µm	≥ 440 µm
Max. coating stress	250 N/mm ²	250 N/mm ²
Hardness (avg.)	650 HV	650 HV
Corrosion (hours to failure in DNV-c1 testing)	> 25.000	> 60.000

Enduroq 2000

This thermal sprayed coating is a single layer surface coating with all the characteristics for an optimal cylinder functionality in extreme environments and intensive use. Enduroq 2000 offers a very high abrasive wear resistance, and the finished coating surface provides excellent sealing properties for low friction and maximal seal lifetime. Enduroq 2000 also offers a very high corrosion protection in neutral environments. The excellent high alloyed coating material combined with an extremely low porosity level and a suitable thickness create a lasting surface protection.

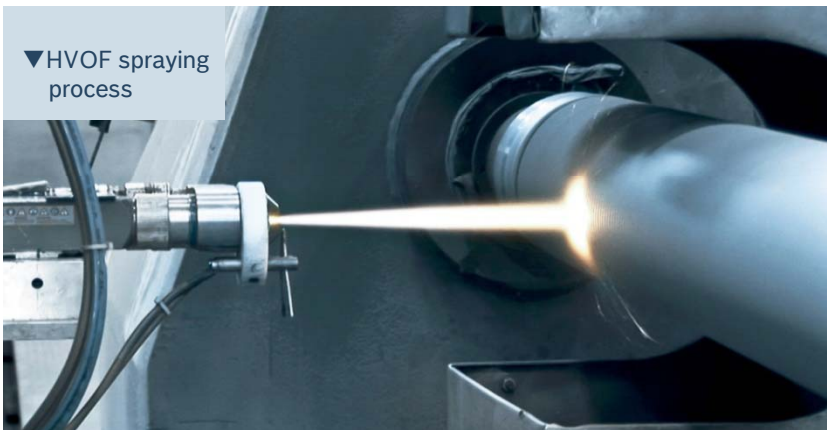
Enduroq 2200

To protect your piston rod against corrosion in most severe maritime circumstances Enduroq 2200 is the perfect choice. This dual layer coating combines the excellent properties of Enduroq 2000 with an extremely high corrosion protection.

The Enduroq 2200 surface technology meets the intentional standards and is accepted by governmental agencies for civil engineering worldwide for applications in coastal areas.

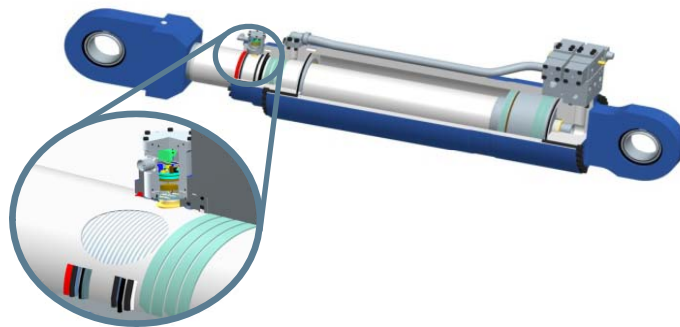
Stainless steel chromium

As an alternative for Enduroq, your cylinders can be equipped with a stainless steel piston rod surface technology with a chromium layer. Due to its robustness, a chromium surface technology on a stainless steel rod is perfect for heavy duty conditions and a long life time in mild environments.



Cylinder integrated measuring system

The Bosch Rexroth cylinder integrated measuring system (CIMS), provides a highly reliable solution to measure the movement of a hydraulic cylinder. Fully integrated in the hydraulic cylinder, CIMS requires the application of the Enduroq 2000 series rod surface technology, as grooves underneath this coating are measured by using magnetic sensor elements. The CIMS measuring system works in every environmental situation, such as dredging vessels, offshore plants, ship loading and unloading systems, tunneling machines and bridges.



Features:

- High accuracy combined with unlimited stroke lengths.
- Sensor integrated in sealing flange, out of the pressure zone of the cylinder.
- Easy installation or replacement possible without infringement of the hydraulic integrity of the cylinder.
- Reliable redundancy possible with multiple CIMS sensors per cylinder.
- Very robust stainless steel housing, protecting the electronics from almost any environment.
- Waterproof, IP68 10bar.
- In combination with Enduroq 2000 series rod coating.
- As option available for potentially explosive atmospheres, ATEX zone 1 certified.

CIMS Mk III Properties:

• Output:

-Incremental, digital RS422, 1024 pulses/cm

-Analog out (mA, V) possible by using an external converter module

- | | |
|----------------------------------|-------------------|
| • Non-linearity | < ± 1 mm |
| • Temperature drift | ± 0.025 mm / °C |
| • Hysteresis and reproducibility | ± 0.05 mm |
| • Max speed : | 1500 mm/s |
| • Temperatures: | -25 °C to +70 °C |
| • Protection : | IP68 up to 10 bar |



Chevron sealing technology

Bosch Rexroth has developed in-house technologies to reduce wear in situations of tribological interactions decrease abrasion, friction, erosion and corrosion. Part of this technology is selecting the most efficient sealing system for your cylinder.

Bosch Rexroth has developed a Seal Matrix for all kind of applications and piston rod surfaces. This matrix is the result of an extensive 'tribology' development program in co-operation with world leading seal manufacturers. Tribology analyzes friction, lubrication and wear of interacting surfaces in motion, aiming to increase the cylinders lifetime and reduce the risk of failing. A good tribological system improves the sealing properties and lowers wear, friction and the chance of friction problems.

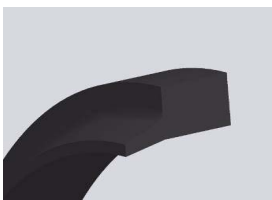
Bosch Rexroth's customized sealing solutions are available for all piston rod surface technologies and fields of applications .



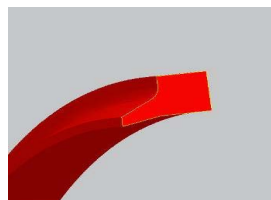
To form the large hydraulic cylinders tribological system, each cylinder is equipped with a scraper, seals and bearing strips.

Scraper

Scrapers prevent dirt from being dragged into the hydraulic cylinder. Bosch Rexroth offers two types of scrapers: standard and special self lubricated. Self lubricating scrapers are used in applications with insufficient lubrication properties of the hydraulic fluid.



Standard scraper



Self lubricated scraper

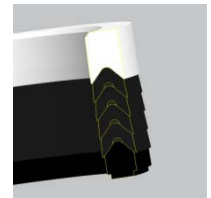
Chevron seals

Chevron seals are used to seal off piston rods and pistons in hydraulic cylinders, preventing oil loss from the hydraulic system. With its robust design, Chevron Seals have been developed to withstand heavily damaged surfaces of the counter parts.

Chevron seals are designed for applications with a long lifetime and few movement. Performing best at medium speeds ($>0,05$ m/sec - $<0,5$ m/sec), the minimum life time under normal circumstances is 500 km of piston rod movement. Finally, Chevron seals are maintenance friendly. Bosch Rexroth uses two different types of materials to get the best fit with your application:

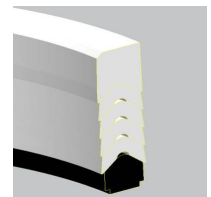
NBR Fabrics

NBR-fabric material is designed for piston rods with chromium surface technology. It gives very good wear resistance and has no delamination.



UHMWPE 1000

UHMWPE material is developed for the piston rods with Enduroq 2000 series surface technology. produced with a special process that gives a very good wear and creep resistance.



Bearing strips

Bearing strips are used to ensure low friction between the moving parts in the cylinder. They reduce wear and increase the cylinder's lifetime.



Self lubricated



Standard

The Bosch Rexroth tribological system has the following properties:

- Heavy duty performance
- High loads compressive strength
- Extreme chemical resistance
- Extreme wear/tear resistance
- Low friction

Sealing system of spherical bearings

Cylinders are often equipped with clevises to connect the cylinder to your application. To reduce stress on this connection, Bosch Rexroth can place a spherical bearing in the clevis. This bearing creates a movement margin for the cylinder. When cylinders are situated in a dirty environment or under water, it is vital to protect the spherical bearing from corrosion and dirt. Our extra protection system and the seals in the bearing itself, increase the service life time of your spherical bearing.

To shield the spherical bearings from elements that cause wear, extra friction or corrosion, we have developed a special sealing system.

Bosch Rexroth delivers maintenance free- and steel on steel bearings. The sealing system is optimized for both types of bearings.

Maintenance free bearings

The sealing system on a maintenance free bearing consist of an O-ring that runs directly on the sphere of the inner ring. In front of this O-ring, a grease filled chamber is sealed off from the environment by a V-ring. The V-ring allows grease out of the bearing to prevent dirt from entering. Maintenance free bearings require additional grease holes in the pin to form a dirt barrier.

Steel on steel bearings

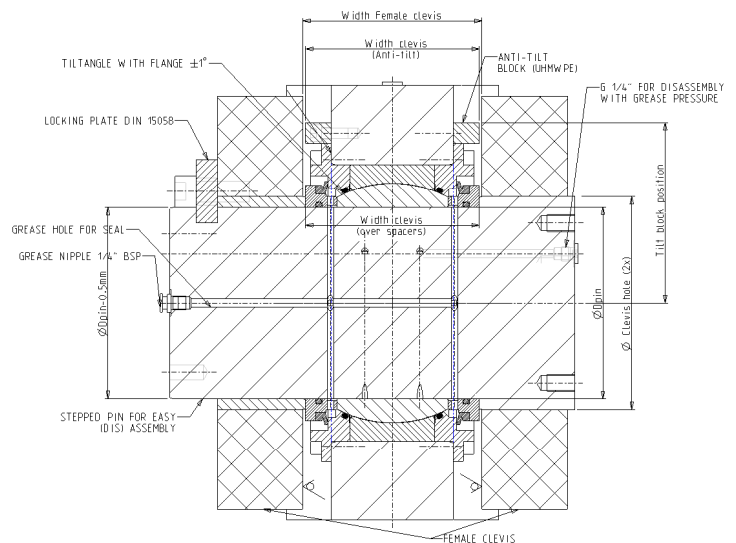
The steel on steel bearings require lubrication in the sliding surface of the bearing. This lubricant comes out of the bearing sideways. Using an O-ring would cause pressure to build up in the seals, leading to defects in the retaining flanges. Therefore the bearings are equipped with a labyrinth groove. This lets the pressure off if necessary. The rest of the system is identical to the maintenance free bearing sealing system.

Our sealing system of spherical bearings is designed to maintain a tilt angle of +/- 1° available for the cylinder. We advise you to design your system with a stepped pin for easy assembly and disassembly.

Anti tilt blocks

Since the tilting of the bearing seal system is limited to +/- 1° in all directions, rotation of the bearing in the female clevis must also be limited. To accomplish this, Anti tilt blocks fill the gap between the bodies of the male and female clevis to prevent rotation over 1°. Anti tilt blocks are always required, even if no pin and spacers are delivered. Design your female clevis accordingly.

The added table shows reference sizes for your cylinders design.



Dpin [mm]	Clevis Hole H8 [mm]	Width Clevis [mm]	Width female clevis ± 1 [mm]	Tilt block position [mm]
45	50	66	69	68.5
50	55	71	74	72.5
60	66	83.6	87	81
70	77	88	91	84.5
80	89	95	99	92
90	98	109	113	101
100	109	119	123	111
110	121	119	124	116
120	135	139	144	130
140	155	143	149	145
160	170	154	160	155
180	198	163	169	170
200	213	184	191	195
220	239	204	212	214
240	265	199	207	224
260	288	210	219	239
280	313	224	233	254
300	336	234	244	269
320	344	261	271	284
340	366	261	272	294
360	388	261	272	304

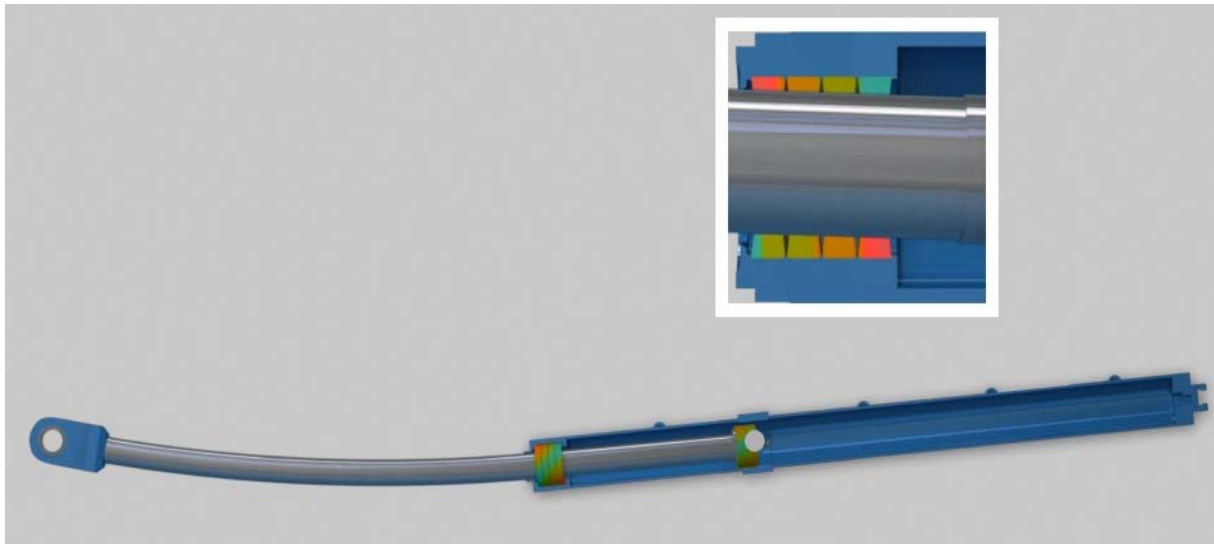
Deflection simulation

Large hydraulic cylinders are typically used to transfer immense forces. To prevent a cylinder malfunction, all forces that the cylinder will encounter in its application are calculated in the engineering phase. To speed up this engineering process, our experts use our in-door developed Deflection and Buckling Routine (DBR) tool.

The DBR is used to calculate the deflection and buckling safety of hydraulic cylinders. All typical mounting styles, friction moments in spherical bearings, transverse loads, accelerations of its own weight and eccentric loads are taken into account. The calculations also encompass typical phenomena as ballooning of the shell, fabrication clearances in the cylinder guiding and identification of the bearing material. The result is a precise prediction of the cylinder under pushing as well as pulling loads during its complete stroke.

The eccentric position of the rod in the head, as well as the piston in the shell, is thoroughly analyzed. Local stresses in the rod, shell and bearings are precisely calculated. In several cases a force diagram is required. These advances and detailed calculations are the basis for a reliable and cost effective cylinder design.

Typical for the radial gate is that its cylinder's angle changes when lifting the gate. The more the gate is lifted, the more horizontal your cylinder has to transfer its force. As the picture below shows, this angle change increases the stress on the piston rod and the seals. Due to years of experience and our professional designing tools, Bosch Rexroth can calculate the forces working on the cylinder and adjust the cylinders design and material to avoid any malfunctions during its lifetime.



Inquiry list: General data

The inquiry list below provides Bosch Rexroth with all the necessary information to design your specific hydraulic cylinder and make a quotation. Therefore, please complete the inquiry list carefully and clearly. For further questions, do not hesitate to contact your Bosch Rexroth country unit.

Country unit/region				
Name			Name	
Phone			Fax.	
Company/customer				
Contact (technical)			Phone	Fax.
Contact (commercial)			Phone	Fax.
Customer-No.			Order-No.	
Inquiry-No.			Project-No.	
Project name				
Customer has order	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Customers idea of price			EUR	
Quotation prepared as	<input type="checkbox"/> Budget price	<input type="checkbox"/> Detailed price		
Quotation required before			Delivery data	
Order will be placed on				
Type of business	<input type="checkbox"/> Components <input checked="" type="checkbox"/> System/projects <input type="checkbox"/> Batch		Qty/	/Year
			OI	TEUR/Year
Long-term conservation/internal	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Year(s)	
Material test certification	<input type="checkbox"/> No	<input type="checkbox"/> to EN 10204/2.1 ¹	<input type="checkbox"/> to EN 10204/3.1* ¹	
		<input type="checkbox"/> to EN 10204/2.2* ¹	<input type="checkbox"/> to EN 10204/3.2* ^{1,2}	
	<input type="checkbox"/> ¹ Please state which parts			
	<input type="checkbox"/> ² Acceptance company			
Function test certificate	<input type="checkbox"/> No	<input type="checkbox"/> to EN 10204/2.1	<input type="checkbox"/> to EN 10204/3.1* ²	
		<input type="checkbox"/> to EN 10204/2.2*	<input type="checkbox"/> to EN 10204/3.2* ²	
	<input type="checkbox"/> ² Acceptance company			
*Customer acceptance test	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Designation	
*Other certificate	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Designation	
*Documentation	<input type="checkbox"/> No	<input type="checkbox"/> Yes (Standard version; see Intranet BRH-SY/PA2) <input type="checkbox"/> Yes (State version under "Remarks")		
Additional requirements/remarks				
Date			Signature	
Must be filled out				

*Attention: extra costs

Inquiry list: Technical data

Quantity	
Type code	
Type designation	CY
Application code	CRR
External mounting shell side	
Bore dimension	
Rod dimension	
Stroke length	
Working stroke	
Spare stroke rod side	
Spare stroke bottom side	
Cylinder construction	A
Revision index	10
Oil connections	
Position oil connection rod side	
Position oil connection bottom	
Piston rod surface	
Mounting rod side	
Cushioning	U
Sealing system	A
Position sensor system	
Option 2	
Country code	

Remarks

All details can be found on page 4

Miscellaneous

Paint system
Submerged
Paint type

No	Yes	
Bosch Rexroth standard (3 layer)		
Other, please specify...		
DIN19704	IS10210	ASME
Other, please specify...		

Design standard

Built-in Length	
Mounting angle	
Pulling force	kN
Holding force	kN
Operational pressure	MPa
Design pressure	MPa
Test pressure	MPa
Viscosity range of the medium	cSt
Rod extension	mm

Retracted:	mm	Extended:	mm
Retracted:	mm	Extended:	mm
Will be calculated by Bosch Rexroth			
Will be calculated by Bosch Rexroth			
Will be calculated by Bosch Rexroth			

Displacement transducer
Output signal

CIMS	MTS	No option
4-20 mA	0-10 V	SSI
Other, please specify...		
Both sides	Front only	Rear only

Position indicator	Limit/proximity switch
Moving frequency	
Moving amplitude	mm
Design temperature range	°C
Environmental humidity	%
The rod end is	Guided
Preservation dope added	No
Weight cylinder (approximately)	kg
Piston bearing	
Rod bearing	
Country to operate	

Per month
Working stroke during operation
The exact weight without oil is found on the drawing

Date Signature

Must be filled out

Bosch Rexroth B.V.
Postbus 32
5280 AA Boxtel
Kruisbroeksestraat 1
5281 RV Boxtel
The Netherlands
Tel. +31 411 65 1951
Fax +31 411 65 1483
www.boschrexroth.nl