

Driving dredgers, a strong tradition Dredge Technology

Complete Drive and Control Solutions





Your Demand Is Our Challenge: You Define The Task – We Supply The Solution

Rexroth Systems & Engineering Your Solution Partner

For each application, there is a specialist department at Rexroth Systems and Engineering. These “Corporate Centers of Competence”, are formed by engineers with decades of experience in hydraulic drive and control, focused on specific application areas.

Customers, e.g. designers of technical installations, are often faced with a wide range of technological disciplines which they have to implement into their product. The strategy of offering application related package solutions (up to turn-key) is of decisive advantage, especially for the plant designer and operator.

They can concentrate on the key questions of project planning without having to deal with the Drive & Control system itself. The customer is able to ask for performance instead of technical details.

Especially if it comes to highly sophisticated drive and control functions this implementation turns out to become very demanding. It even becomes one of the success factors to the whole installation created by the customer.

That is where Rexroth Systems and Engineering comes into place. We have specialized in implementing complete drive and control systems into the clients products and installations, generally on a turn-key basis.

Rexroth Systems and Engineering is able to select a close-knit team from its staff of experienced, creative and highly trained engineers and project managers, experts in the field of each specific application.

The unique marriage between application know-how with Drive & Control technology could be ideally achieved for the benefit of the customers of Rexroth.



Project implementation is carried out in close cooperation with the client. The four most important Systems & Engineering competences for successful projects are

- **Market and application know how**

This means knowledge and experience with customer needs and the translation of his requirements into a sound and economic solution.

- **Technical and commercial project management**

The technical capability to design, simulate and detail systems together with the knowledge of legal aspects, risk & insurance management, and claim & site management for instance.

- **Drive and Control Competence**

We take the opportunity to use the wide range of technologies and first class components like cylinders, power units, valves, pumps, control systems and piping, that are available within the Bosch Rexroth organization.

- **Worldwide network**

Our representation gives us the opportunity to offer our know how where it is most needed: close to our customers. Bosch Rexroth is represented in over 80 countries, has sales and service subsidiaries in 37 countries and 85 production facilities in Europe, Americas and Asia/ Pacific. You can find your partner on www.boschrexroth.com



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Special Technology
Special Solutions for Special Demands



Stage Technology
Standing Ovations



Testing Technology
Putting Ideas into Practice



Transport Technology
Moving Knowledge on Track



Special Projects
From Scratch to Match

Driving dredgers, a strong tradition

Can you imagine what could happen if essential systems like hydraulics on board of dredgers would fail? It would mean that the dredger cannot perform its duty, and ports, rivers or canals cannot be deepened or maintained, landreclamation processes would stop.

Therefore the dredge industry strongly depends on reliable, specialized drive and control technology. The majority and especially the world's largest and complex installations and vessels of the dredging fleet are equipped with Rexroth Drive and Controls. From engineering, production of power packs, valve blocks, heavy-duty hydraulic cylinders and pipe work, to the commissioning on site, anything can be realized within Bosch Rexroth. Together with local Bosch Rexroth offices and a 24 hour service and maintenance support system by the worldwide service organization, you can rely on Bosch Rexroth Drive & Control systems. Particularly the Netherlands has a long dredging tradition. No wonder the Bosch Rexroth's Systems & Engineering Center of Competence for the dredge industry is located in this country. Besides the dredging vessels, Bosch Rexroth is experienced with the drive and control installations of a wide range of offshore applications and special vessels.

Bosch Rexroth has experience with third party certification, such as Bureau Veritas, DNV, LROS, GL, RINA and ABS, which can be included from design to final testing of the drive and control system.



Cutter dredgers

Cutter suction dredgers are equipped with a cutting device to increase the dislodging force. These “Cutter” dredgers are suitable for use in high strength materials such as clays, packed or compact sands and rocks. Stationary dredgers are moored by means of anchors and/or spuds and is swung around the spudpole powered by winches. The main advantages of this type of vessel are its ability to operate in shallow water and to dredge a wide range of materials. The mentioned spuds and winches are mostly hydraulically operated. The hydraulic installations on board of these cutter dredgers usually are very exhaustive, because a lot of specific movements (each with it's own requirements) have to be carried out. To tackle these movements, product-packages have been developed.

Cutter drives

While dredging with a cutter dredger the cutter head describes arcs and is swung around the spudpole. The cutterhead is often driven by means of a hydraulic motor.

Winches for ladder and anchor booms

Hydraulic motors usually power the winches. As the controls for these winches are essential for



the proper function of the cutter dredger, a series of counter-balance valves, brake operation valves and speed control valves are developed.

Spudhandling

With a spud carriage system a cutter acquires the means to move up and down its working track independently, step by step advancing on its working spud (in the carriage) and held by the auxiliary spud each time the carriage has run its span.

The spud carriage cuts out the need of a number of spud changes, which gives a considerable production increase. The spud carriage system needs two spuds: one auxiliary spud working aft in a fixed position (in the horizontal plane that is); and the working spud in a carriage, which allows it to travel fore-and-aft. The spuds are lifted and free-fall lowered by means of special (single acting) hydraulic cylinders with a ball bearing at the bottom-end.

Spudcarrier

The spud carrier can optionally be equipped with a proportional control system, which enables position and force control of the spud carrier cylinder. This control

system can accelerate the vessel or spud-carrier, up to maximum hydraulic pump-pressure. When stopping, the system can decelerate the vessel or spud-carrier.

When in position, the control system will dynamically keep the cylinder in the wanted position; while at the same time monitoring the pressure at bottom and roside. This system will automatically compensate this movement when the pressure drops, and resume the wanted position of the spud-carrier cylinder.

Spudtilting

To make a cutterdredger more mobile it can be equipped with a spud tilting system. For tilting the spuds, a tilting construction is provided on the spud carrier as well as on the auxiliary spud gantry. The tilting is done by means of separate hydraulic cylinders which work in first instance as pulling and then change to pushing cylinders. To ensure safe and smooth operation of these tilting cylinders at all time, counterbalance valves are mounted directly on bottom- and roside of both cylinders. Lowering and lifting is simply achieved using only one 4/3 way directional valve with flow control valves.

Hopper dredgers

This type of dredger excavates materials from the seabed, primarily by its forward movement and suction power, through suction pipes and dragheads.

Hydraulic installations on board of these hopper dredgers usually are very exhaustive, because a lot of specific movements (each with its own requirements) have to be carried out. To tackle these movements, product packages have been developed.

Loading and unloading valves:

Bottom doors

The key function of bottom discharge systems is to discharge soil via the hopper bottom. These bottom discharge systems are bottom doors operated by rods actuated by hydraulic cylinders, which are generally mounted above the hopper, regenerative operated by means of special 4/3 way valves.

Pre-dumping doors

When a vessel discharges hopper

contents in very shallow water, bottom doors cannot be opened, pre-dumping doors can be used. These pre-dumping doors are operated by means of hydraulic cylinders which are controlled by 4/3 way directional valves.

Self-suction channel doors

Self-suction channel doors are doors installed above the bottom doors forming the topside of the suction channel and are controlled by a hydraulic cylinder located above the hopper.

Overflow

Overflow systems are designed to optimize the efficiency of the dredging process by ensuring the maximum retention of solids in the hopper in parallel with fast discharge of water overboard. The overflow system must thus optimally encourage separation of solids and water. This it does by reducing mixture turbulence and giving the solids maximum time to settle and is operated by means of a hydraulic cylinder, which – on its turn is controlled by means of (proportional) 4/3 way directional hydraulic valves.

Gantries

Gantries are designed and built to suit all suction pipe-handling requirements. Usually draghead,





intermediate and trunnion gantries are installed on hopper dredgers. Gantries can have a hoisting capacity from 30 tons to 630 tons. These gantries have one or two hydraulic cylinders, which are protected by means of flow-control valves and controlled by (proportional) 4/3 way-valves, which are located below deck.

Heave compensators and rope strainers

Traditional Heave Compensators

The dredging process will be made far more effective when the draghead is equipped with a swell compensating system. A swell compensator system ensures the draghead to continue work with the right pressure on the seabed despite unavoidable rolling and pitching of the ship. Rope strainers improve workability and control by ensuring that the cables are always under tension. These compensators consist of single acting hydraulic cylinders, a series of air/oil pressure vessels and a locking valve block, which enables the operator to lift the draghead without compressing the cylinders and provides a safety function in case the steel wire rope breaks.

Active Heave Compensators

In addition to traditional (passive) heave compensating systems, Bosch Rexroth also offers active

heave compensating systems. In addition to the functions described in the previous chapter, this system will position the draghead accurately on the seabed and requires an additional hydraulic powerunit and accumulator, but relatively little additional deck space.

Bow coupling and rainbow equipment

Efficient dredge results are unlikely without the ideal bow coupling and/or rainbow system.

One effective means of raising dredger productivity and functionality is by installing a bow coupling. This bow coupling consists of a hydraulic driven winch and several hydraulic locking cylinders. For rainbow and bow coupling functions, also sluice valves with hydraulic cylinders are required.

Active draghead (moveable visors and waterflaps)

The draghead of a trailing suction hopper dredger represents the first mechanical contact with bottom material, so its design, quality and sturdiness are critical in dredging and alluvial mining tasks.

To optimize the dredging process, dragheads are frequently equipped with hydraulics for visor adjustment and water admission.

Together with various draghead designers, Bosch Rexroth has

engineered optimal solutions for these active dragheads.

Gravel dredgers

Loading gravel requires special equipment in the form of screening towers which are placed on deck. This equipment screens the material won from the sea bed and separates the better part of the cargo from the poor. The worthless part of the cargo gets rejected overboard and simultaneously the desired sand-gravel mixture gets led into the hopper. Discharging gravel from the ship also requires special equipment in the form of a grab and an intricate conveyor belt system. The hydraulic cylinders for the luffing and the hydraulics for the belt drive and swivel drive for the conveyor belt require protection against the aggressive gravel and grab. The rotation of the loading towers is realized by use of a hydraulic motor. The discharge chute is provided with a hydraulic luffing cylinder. Amongst others, the discharging system consists of hydraulic driven conveyor belts. The grab drops its contents on a travelling feeder conveyor belt, where it goes to the shore by fore and aft rigged conveyor belts, inclined conveyor belt and slewing boom conveyor belt. These belts are controlled by hydraulic motors and the boom is luffed by hydraulic cylinders.

Split barges

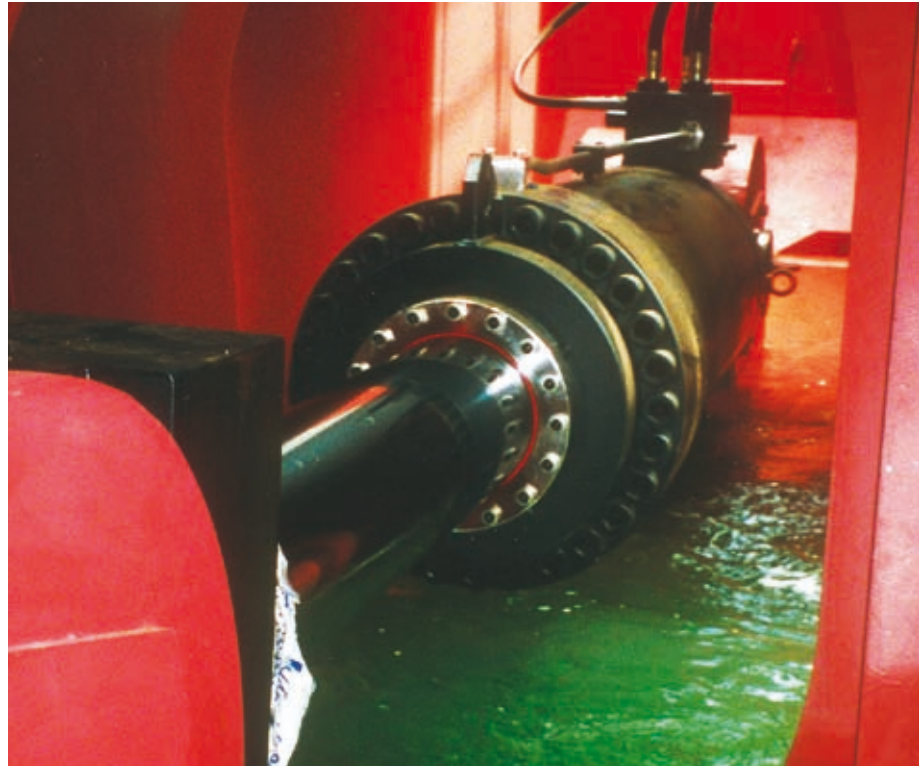
Split barges take care of transport of soil that hopper- and cutter dredgers obtain during their work.

A split barge comprises two halves, which can turn around each other by hinges. These hinges on both halves are connected with hydraulic cylinders. When unlocking these two halves SB and PS, the vessel splits in longitudinal direction and the load will be dumped automatically due to the design of the hull. Once the load is discharged, the hull shape/construction also forces the two halves to join again and the hydraulic cylinders are retracted.

Controls

In order to optimize the proper function of this essential part of the split barge, Bosch Rexroth also supplies the complete drive and controls for split barges. The controls consists of a central control panel with all relevant functions of the hydraulic installation. Optionally a local control panel can be used.





Hydraulic cylinders

The hydraulic cylinders for split barges, form an essential part of the vessel. As these cylinders determine the proper functioning, special care and attention must be paid to each and every element. No wonder that Bosch Rexroth delivers these cylinders worldwide for the dredging industry. The split cylinder is a double working pulling cylinder of the regenerative type.

Hydraulic control valve blocks

The hydraulic cylinders and winches on board of the split barges need to be safely controlled by means of hydraulic control valve blocks. The winch blocks can be provided with optional function like adjustable hydraulic motors, brake control, speed control, constant tensioning etc.

Hydraulic power unit

The powerunit in the hydraulic room is especially designed, because of the 20° angle the two halves make while dumping their freight.



Interconnecting piping

Pipework is an essential component of a hydraulic installation. Not only do increasing loads have to be endured due to higher work pressure and dynamic loads, but higher and higher standards are also being set with respect to the quality and availability of the total hydraulic installation in the context of economic and environmental considerations. This is why the cleanliness and quality of the hydraulic pipework system is of equal importance. The Bosch Rexroth concept is based on careful material choices and extensive standardization such

that continued high quality, rapid availability and a good price/quality ratio is guaranteed. Our basic philosophy is that pipework must be easy to dismantle and inspect, facilitating (partial) replacement and tracking down faults. To guarantee total system responsibility, Bosch Rexroth can carry out your complete project, from engineering to commissioning, in addition to offering complete project support and site management.



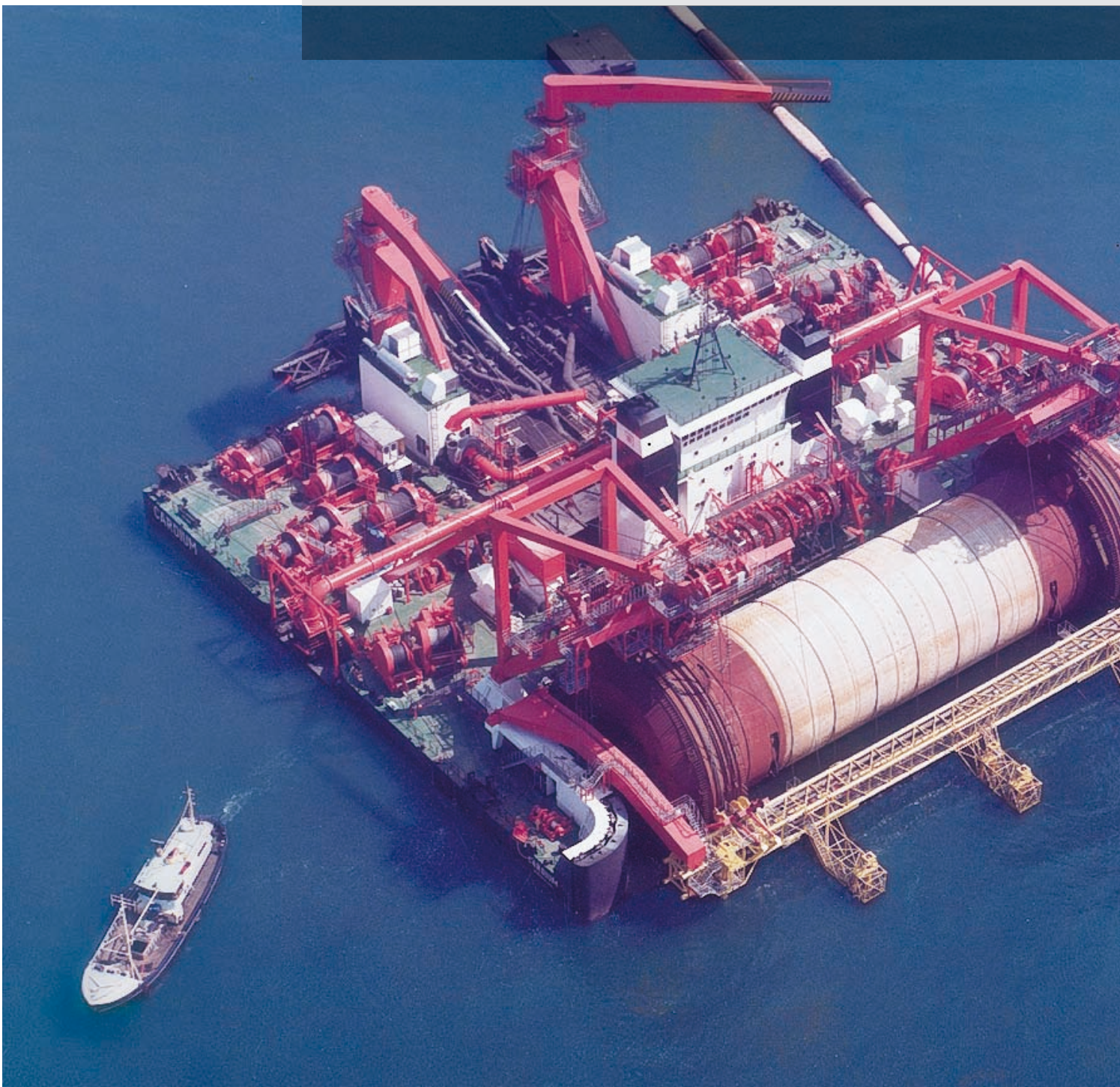


Power units

All the hydraulic consumers are being powered by (a central) hydraulic powerunit. These powerunits are carefully designed for the application. In most cases, a central hydraulic powerunit is the most feasible solution as this results in an optimum between the amount of installed hydraulic pumps and hydraulic piping. The hydraulic powerunits are engineered, produced, assembled, painted and tested at Bosch Rexroth's facility and meets Quality Assurance standards according ISO 9001. Further more all systems, valveblocks, powerunits etc can be produced according to Bureau Veritas' DNV, ABS, LROS, RINA and other international standards. In some cases however, a containerized powerunit is required. Bosch Rexroth also has experience in producing these powerunits for the dredging industry. Powerunits are usually completely mounted together, preserved, tested and ready for placing below deck in the hydraulic room. Optionally, starters and control panels can be added to make the powerunit complete.

Special dredgers and work ships

Apart from the above-mentioned standard vessels, Bosch Rexroth also is experienced in supplying drive and control systems for special projects. These “special projects” do not fit into a regular product range or system package. Bosch Rexroth is able to design and deliver based on a functional system description and can accept the performance responsibility on a turnkey basis.



Bosch Rexroth around the corner

Rexroth offers a complete range of pumps and motors exploiting all design principles. These include in particular axial piston pumps, internal gear pumps, variable- and fixed-displacement vane pumps, external gear pumps and radial piston pumps. The range is supplemented by pump combinations and compact units, composed of an electric motor and pump unit as a ready-built subassembly.



Pumps and Motors

The cylinders for industrial hydraulics comprise tie-rod cylinders, mill-type cylinders, servo cylinders with hydrostatic bearings, and special cylinders up to 45 m long. For many branches of industry, tried-and-tested application-adapted cylinder systems are available on demand.



Cylinders

With Rexroth's comprehensive industrial hydraulics range, which comprises products and system technology containing on/off valves, servo and proportional valves, control electronics, open- and closed-loop control systems, and control plates, solutions are possible for every conceivable application.



Controls

In industrial hydraulics, Rexroth builds small, customized and large scale units for virtually any application to uniform specifications at its various production locations worldwide. Modularization extends to drive units, motor-pump groups, oil tankers, filter-cooler heat exchanger units, accumulator stations and pressure relief blocks for pumps.



Power Units

In a training environment, simulator availability is the key success factor. In order to provide maximum availability Bosch Rexroth offers preventive maintenance and service contracts. These contracts can be optimized for your specific requirements, budget, workforce skills and application. With Bosch Rexroth present in more than 80 countries, 24-hour service and maintenance support of your motion system is readily available.



Services

Intelligent Hydraulics in New Dimensions

Whether it's a case of raising or lowering loads smoothly, undertaking linear or rotational movements, achieving even acceleration or accurate positioning, maintaining preset speeds, transmitting power or linking motion sequences – in fact, wherever economical power is required, this is where hydraulics comes into its own.

Rexroth is technology and market leader in industrial hydraulics with an extensive product program and proven applications know-how. With the widest selection of hydraulic products in the world, Rexroth will provide you with standard products, application-orientated systems and customized solutions of the highest quality. Furthermore, with the aid of the latest micro-electronics, Rexroth has made hydraulics even more powerful than ever.

Rexroth is the ideal partner if you want to develop highly efficient machines and production facilities – from the first point of contact right through to commissioning and across the complete life cycle. Teams operating worldwide will take on the complete project design work of your systems, even producing a turnkey solution if required.

Whether it's competent support on the telephone, urgent repairs or supply of spare parts, or a callout by one of our engineers – whichever service you require, experienced personnel and a worldwide service network will guarantee that the problem is swiftly solved.

Using hydraulic drive and control technology from Rexroth will help you become more competitive than ever.

The Drive & Control Company

Rexroth is unique. No other brand on the world market can offer its customers all drive and control technologies, both on a specialized and integrated basis. We are considered to be the worldwide benchmark when it comes to drives, controls and motion. Our technological leadership is continually setting us new challenges, with approximately 28,000 employees in more than 80 countries around the world. This is possible thanks to an infrastructure designed with partnership and customer proximity in mind.

As a company Bosch Rexroth can look back on more than 200 years of tradition. As a wholly owned subsidiary of Robert Bosch GmbH, we are part of a globally operating technology group. All this is both our drive and our commitment. And it is unique – just like Bosch Rexroth. The Drive & Control Company.

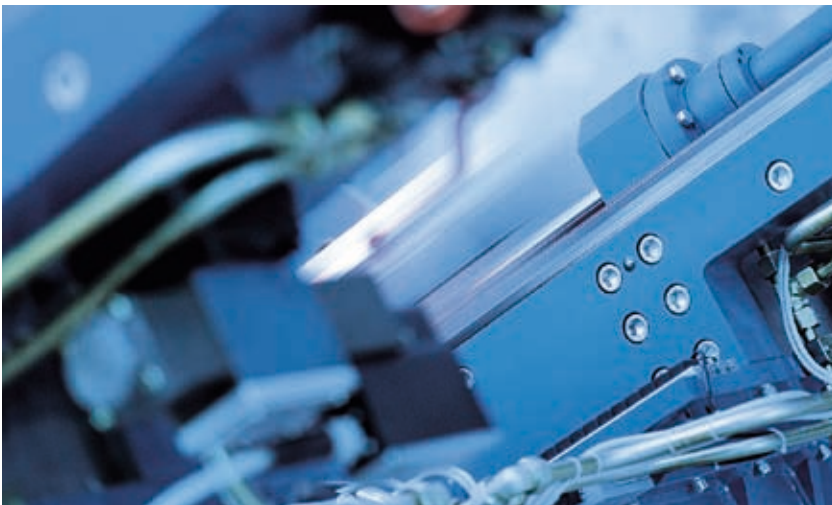
Electric Drives and Controls

Hydraulics

Linear Motion and Assembly Technologies

Pneumatics

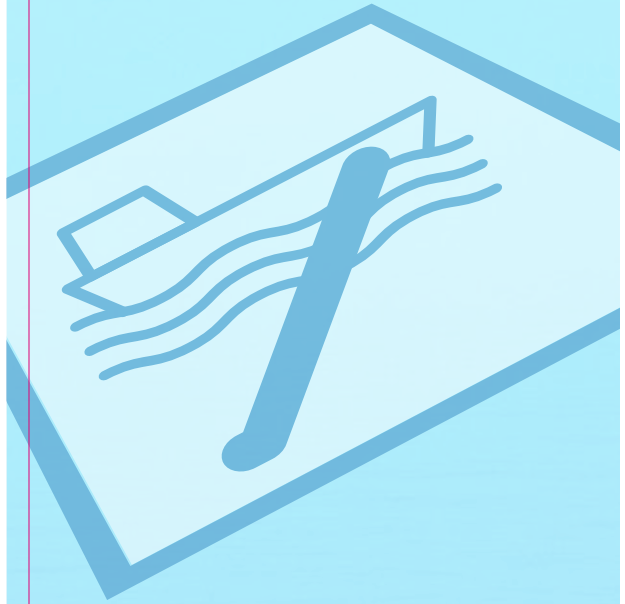
Service



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Bosch Rexroth AG
Hydraulics
BRH-SY/ST02
5281 RV Boxtel,
the Netherlands
Phone: +31(0)411 65 19 51
Fax: +31(0)411 65 14 53
dredge@boschrexroth.nl
www.boschrexroth.com/s&e