

Marine Technology: RAHC – Active Heave Compensation with Secondary-Controlled Winch Drive

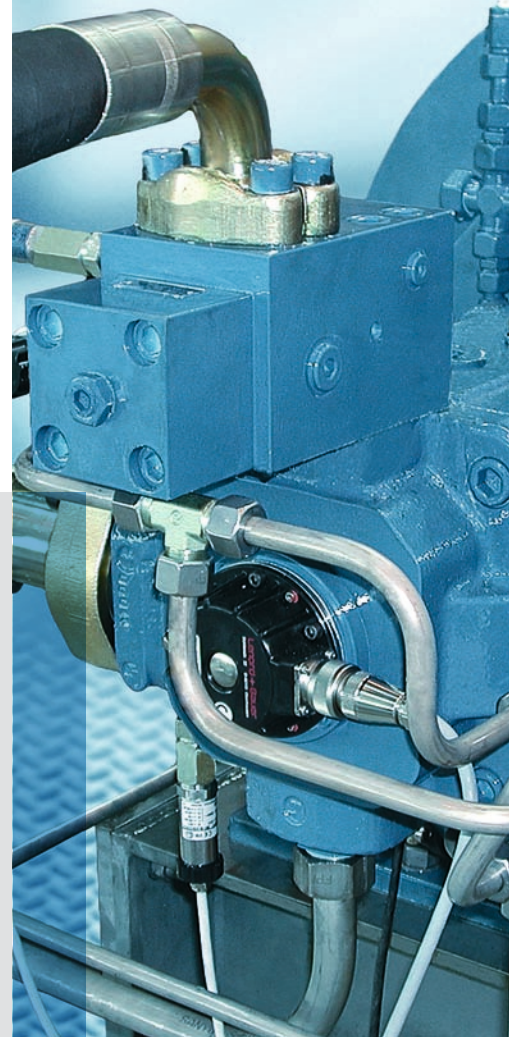


Fast, Accurate, Flexible, Efficient



Getting the Balance Right with Dynamics

Positioning loads accurately on the seabed represents a challenge for any crane driver when a ship is heaving in rough seas. With the active heave compensation from Rexroth the ship's movements are recorded and integrated into the closed-loop control process, with the result that over 95% of the motions are compensated with the aid of secondary-controlled drives.



Secondary-controlled drives from Rexroth have been proving themselves in a wide range of applications for over 20 years now and are ideal for active heave compensation. More than 100 crane and winch systems are currently in service positioning loads from 5 to over 250 tons safely on the seabed.

Pump and Motor

In order to keep the load in position, the drive winds up the winch cable during a downward movement of the ship. The drives operate as motors and use energy.

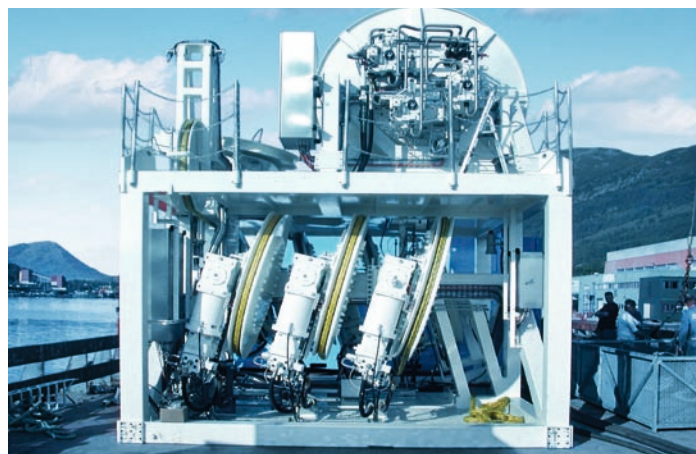
When the ship moves upwards, the drives unwind the cable, operating as a pump in generator mode. The energy recovered is stored by the hydraulic system for the next downward motion.

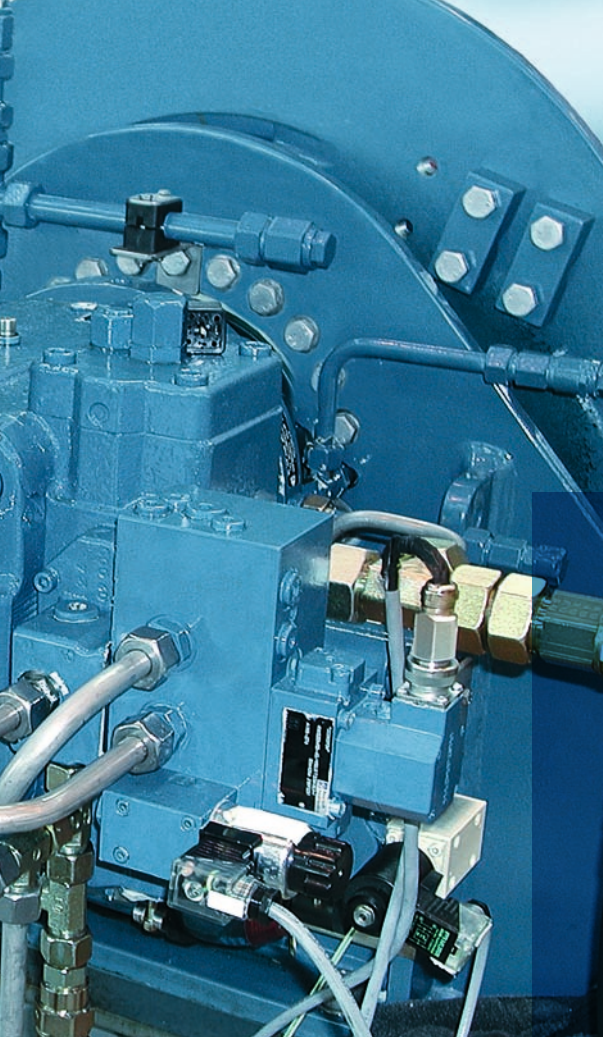
The system can recover up to 70% of the energy by this method, meaning that the installed power required for the power unit can be considerably reduced!

Launch And Recovery System (LARS) from ODIM, Photo: Tony Hall



Cable Traction Control Unit (CTCU) from ODIM





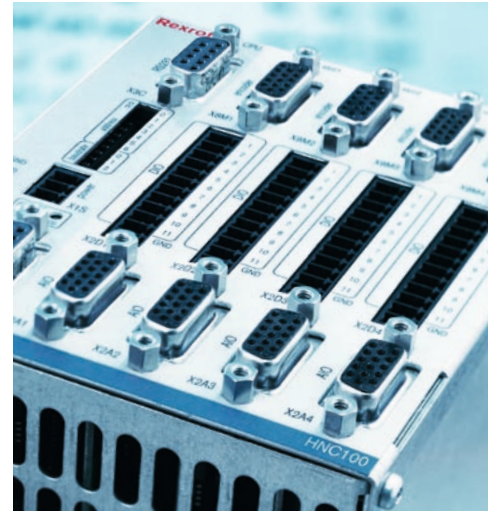
Secondary-controlled drive unit
A4VSO 71DS1

Power Unit



The Advantages:

- High level of reliability and availability
- High precision compensation
- High energy recovery
- Minimal installation space required
- Easy and precise operation
- High level of safety for personnel, machinery, materials and environment



HNC100-3X Closed-loop Control Electronics

The ease of operation, the precision with which the winch and crane drives are put into motion, combined with swift and accurate compensation of heavy seas – this is what distinguishes the Rexroth RAHC.

Standard Operating Modes and Safety Functions:

- **H&L** Hoisting and Lowering in Speed Control
- **AHC** Active Heave Compensation
- **ART** Active Rope Tensioning
- **MFM** Monitored Freefall Mode
- **CTM** Constant Tension Mode
- **AOPS** Automatic Overload Protection System
- **MOPS** Manual Overload Protection System

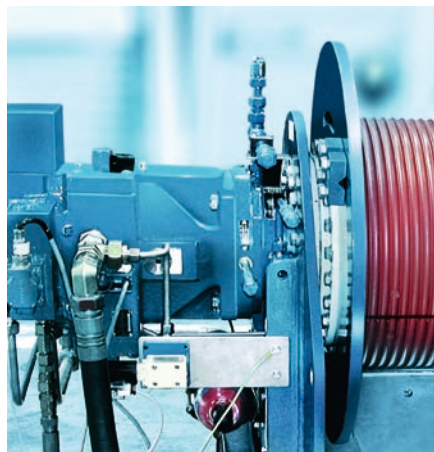
Another advantage of the Rexroth RAHC Drive is the gentle switch-over between these operating modes.

Project-specific functions can easily be integrated with the aid of software additions.

160-ton crane for multi-purpose vessel from KENZ-FIGEE

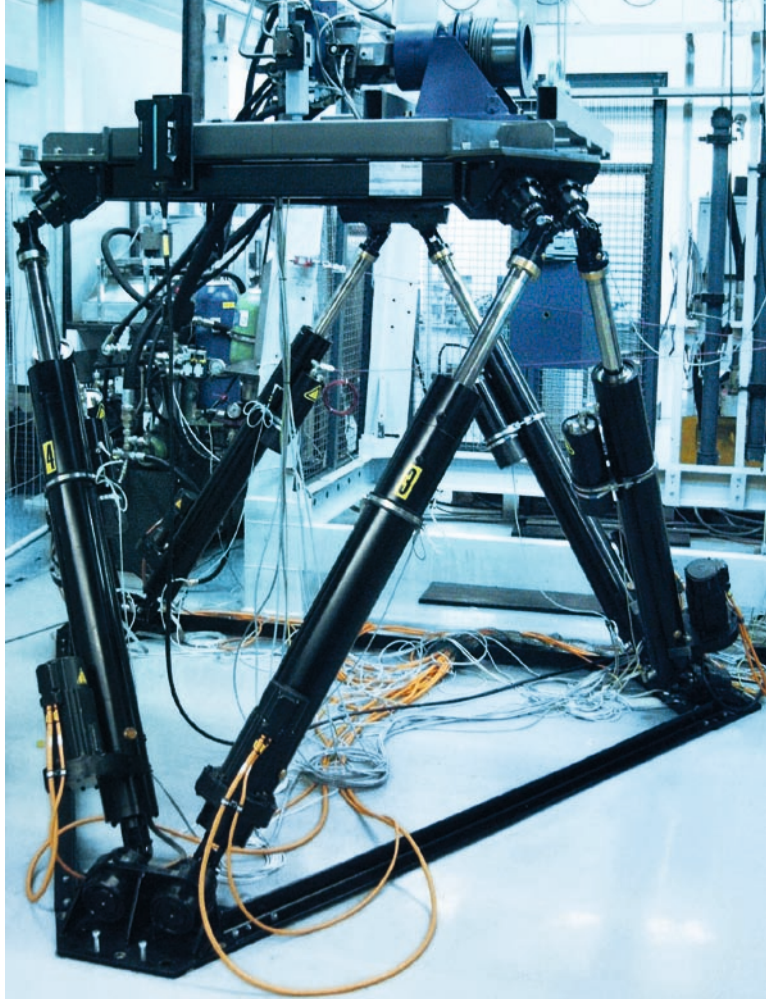


Moonpool winch from National Oilwell Varco



5-ton crane for FPSO from SEVAN marine





In-house System Test

Maximum safety and reliability in all standard operating modes: Rexroth achieved these goals by multi-stage testing and optimization with simulations and trials. Potential faults were systematically determined and risks thus recognized at an early stage; these were then either rectified or safeguarded against with the use of redundant systems. New functions were tested and optimized in complex in-house system trials. More

information on these in-house system trials is available as a film presentation on CD.

No Power Limits

The modular system structure sets no power limits: whether a 5-ton winch or a 500-ton crane with hoisting and slewing, Rexroth will always come up with the optimum drive design.

RAHC-Breakdown into Power Classes

Winch capacity (t)	5	50	100	250	500
Installed power (kW)	55	480	950	2,350	4,700
Maximum power of winch (kW)	200	1,800	3,600	8,800	17,600
No. of drive units	2	6	12	14	28
Capacity of drive units (cm ³)	71	355	355	1,000	1,000

Wave amplitude: ±3m; Wave period: 9 sec; Hoisting speed: 30 m/min;
Maximum power of winch: AHC mode without additional hoisting movements



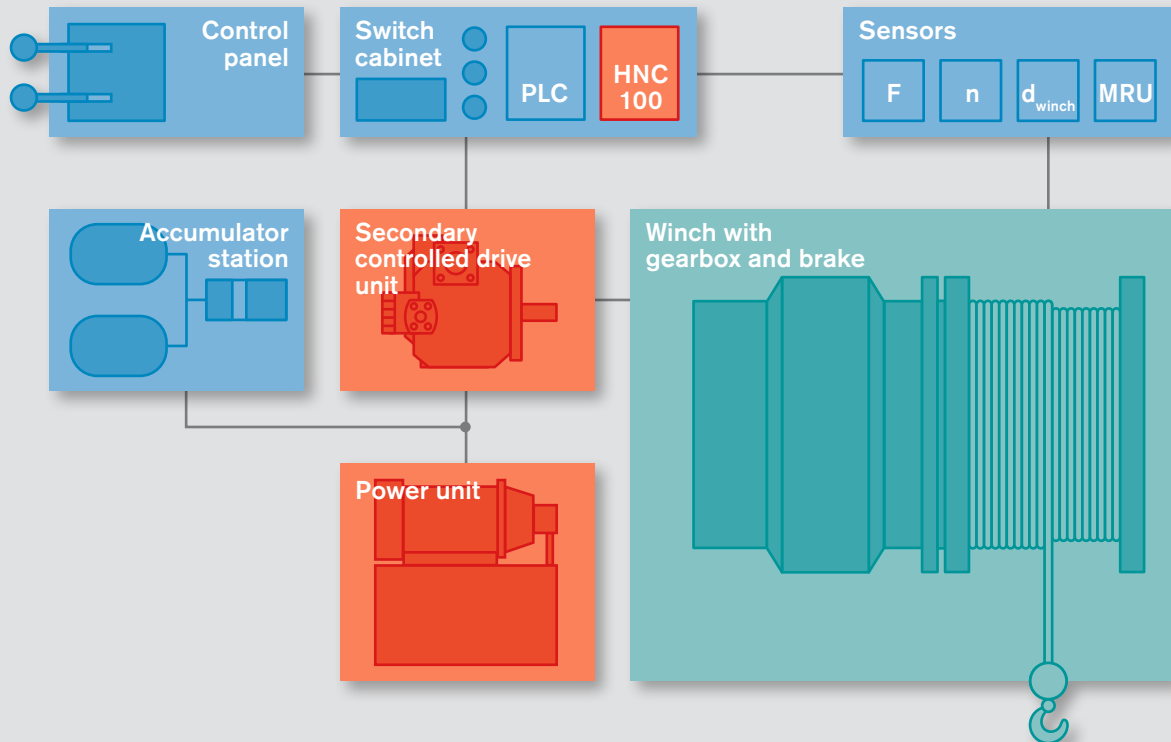
The Drive & Control Company

Rexroth is unique. No other brand on the world market can offer its customers the full range of drive and control technologies, both on a specialized and integrated basis. This is one of the reasons why we are best-in-class on a worldwide basis when it comes to furnishing technological driving, controlling and motion solutions; a standard to be constantly confirmed by mastering new challenges. In more than 80 countries around the world, with about 30,000 employees. This is possible thanks to an infrastructure purposefully designed with partnership and customer proximity in mind.

As a company Bosch Rexroth looks 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

Integration Completely to Your Requirements



The modular RAHC system structure is an ideal addition to customer-specific winch concepts: from the integration of individual components and secondary-controlled drives through to complete, heave-compensating winch drives.

Here Rexroth takes into consideration not only existing individual components, but also customer know-how. Tried-and-tested operator control panels can be integrated into the system just as easily as existing hydraulic power units and additional functions.

Customer ■
 Bosch Rexroth basis ■
 Bosch Rexroth advanced ■

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