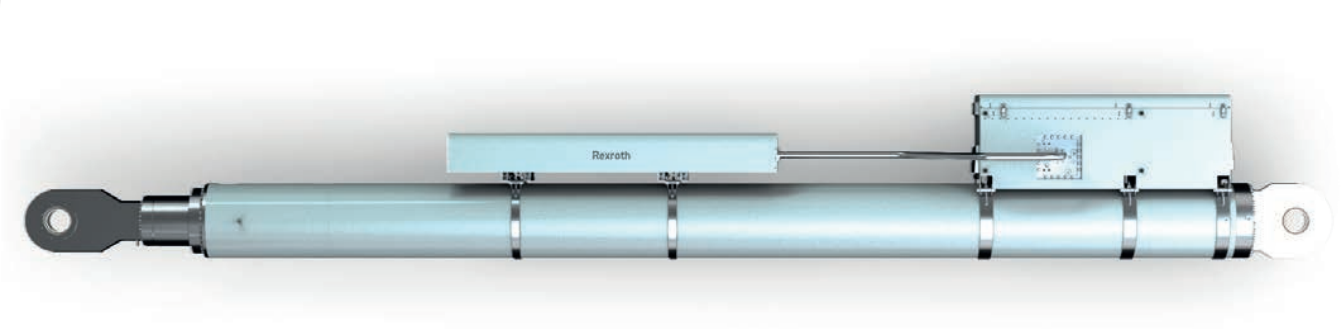
rexroth
A Bosch Company

Electro Hydraulic Actuator – EHA

Fields of application

Technical Information



KEY FEATURES

The EHA provides users with a complete package which is optimized and tested from the network connection to the piston rod – including pre-configured drive control parameters, software, firmware and technology functions for “alternating control”. The EHA combines the power density of hydraulics and flexible networking capability of an electric driven actuator, and has the benefits of an hydraulic operating principle (e.g. the capability to absorb high external shock loads).

- Dedicated for outdoor use in an harsh environment
- Designs available according recognized (civil) engineering standards and guidelines
- Designs available with approval from a certifying authority, such as especially for Marine & Offshore applications
- Suitable to use an environment-friendly bio-degradable fluid

The portfolio according to the construction kit principle offers:

- Maximum forces up to 10000 kN
- Stroke lengths up to 27 m
- Installed power up to 150 kW

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PRODUCT DESCRIPTION

The Electro Hydraulic Actuator (EHA) is a heavy duty plug & run actuator especially developed for an outside harsh (salty) environment with high humidity and extreme temperatures. In comparison with the SHA, which is dedicated for the Industrial market, the EHA is suitable to use in the civil and marine & offshore market. High forces in combination with large strokes are available.

The EHA provides users a standard configurable Electro Hydraulic Actuator including a control cabinet with an IndraDrive drive system. A Smart, freely programmable drive system allows the realization of complex travel profiles (parameters for force, position and travel speed can be set as required over the complete working travel range).

STRUCTURE

The main components of the EHA comprise an IndraDrive controller with technology function position-force control (PFC), an asynchronous servo motor, a hydraulic cylinder with position measuring system and axial piston pump(s) for the hydraulic system.
In addition, pressure and temperature sensors, a compensating tank, a filter and valves are integrated in the hydraulic block.

Optionally, various functions (e.g. safety technology) may be added in the form of valves or electronics.
It is also possible to drive the EHA in “open-loop” control, meaning movement stops when a limit switch is reached, or a maximum pressure is reached.

The system is based on proven components of Bosch Rexroth.

KEY FEATURES

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- Designs available according recognized (civil) engineering standards and guidelines
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The portfolio according to the construction kit principle offers:

- Maximum forces up to 10000 kN
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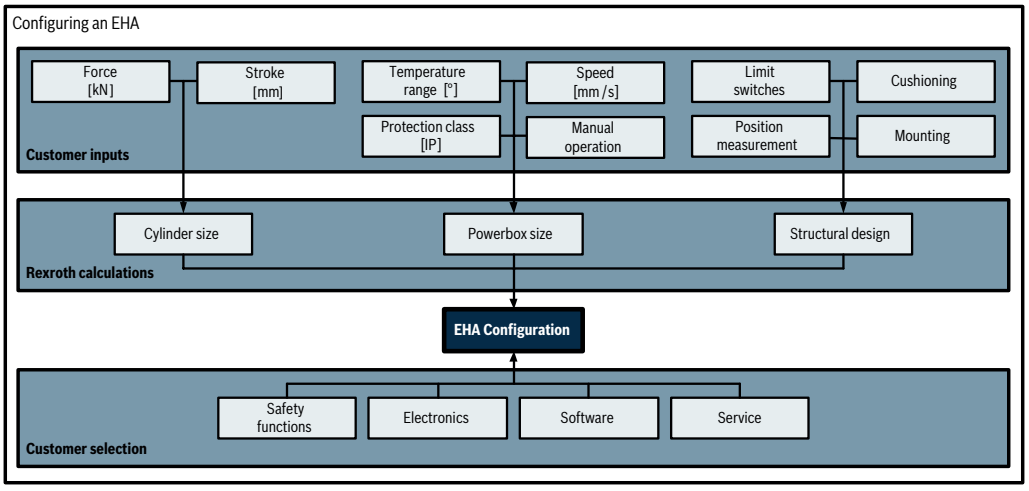
- Installed power up to 150 kW

☞ On request, larger forces, longer strokes and a higher installed power may be realized outside the standard product portfolio.

CONFIGURABLE

The size and type of an electrohydraulic actuator is mainly determined by the cylinder. To determine the size of the cylinder, following input is required; load case, stroke, speed and required lifetime in cycles. When the size of the cylinder is determined, the Power box can be sized and selected. The customer determines the (bus) interface, an IoT gateway is optional if desired.



FIELDS OF APPLICATION

Electro Hydraulics Actuators can be used in a multitude of applications, and has the attributes to use it in an “outdoor harsh” environment. Due to natural environments or ambient conditions in waters there are special structural and anti-corrosion requirements applicable. Fields of application where EHA is specially developed for, are Civil, Offshore and Marine. Featuring a flexible construction with either compact or decentralized design, the EHA can be easily adapted to the available installation space for integration in a construction.

The hydraulic cylinder will have the following options specially for the outdoor harsh environment e.g.:

- Ice scraper – Massive metal brass scraper with perforated design to break ice or fouling
- Separate piston rod seal – To prevent water infiltration via the piston rod
- Special piston rod coatings (Chrome/Enduroq 2x00, 1 & 3)
- Maintenance- free spherical bearing with optional stainless steel cover, sealed
- Sandblasting and special painting
- Material certificates for all force transmitting components according to DIN EN 10240 – 3.1 or 3.2
- Calculations according to DIN 19704

ADVANTAGES

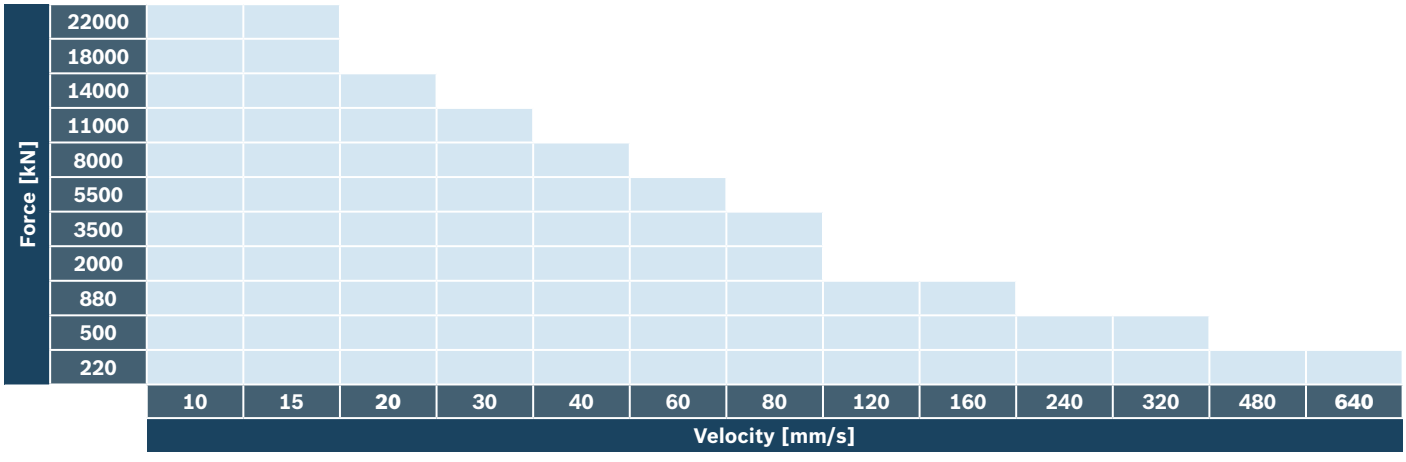
- Reduced footprint – No space required for HPU
- Reduced installation costs, no interconnecting hydraulic piping and hoses required
- Ready to install solution – pre-assembled, filled and with only a few defined interfaces
- Easy startup – Plug & Run
- Little maintenance expenditure – closed system, diagnostics capable
- Energy efficient operation – power on demand
- Self-contained, separated from central hydraulic – flexibility
- Cost saving trough open standards in the control concept
- “Safety on board” – functional safety optional speed controlled electric motors and converters
- Connectivity – flexible connection to bus
- Control and diagnostics – technology function, position – force control (PFC) with monitoring and protective function
- Remote access/I4.0 capability
- Bosch Rexroth – custom system solutions, worldwide after-sales service

ADVANTAGES EHA VS. EMA

- Large actuating forces – hydraulic operating
- Robustness – long life service
- Overload protection (over total stroke) – pressure relief valves

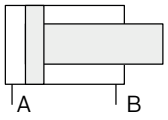
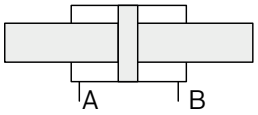
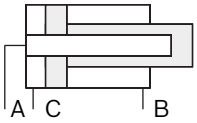
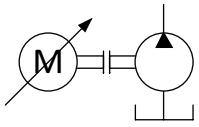
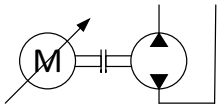
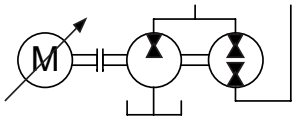
TECHNICAL DATA OF SOLUTION MATRIX

The following graph describes the performance data of an EHA. The pulling or pushing force per solution is depending on the chosen cylinder type. The maximum force is generated at a pressure of 300 bar.



SOLUTION MATRIX

The EHA solution matrix shown below offers a multitude of combination options for realizing Electro Hydraulic Actuators.

	Single rod cylinder	Double rod cylinder	Multiple area cylinder
			
	A0	B0	
	A1	B1	C1
	A3		

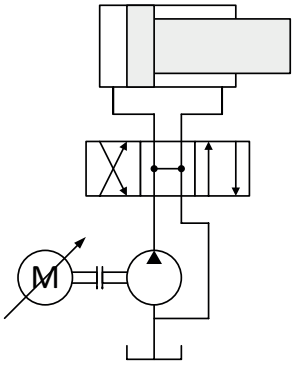
The focus is on the following system solutions:

- Single rod cylinders with 1 fixed displacement pump – open loop – A0
- Multiple area cylinder with fixed displacement pump – closed loop – C1
- Single rod cylinders with 2 fixed displacement pumps – semi-closed loop – A3

☞ Application stand-still time has to be sufficient to dissipate the heat to the environment (specific heat dissipation ~10 W/m²/K).

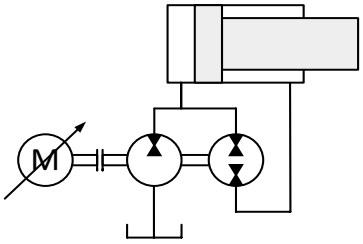
Operating principle of solution A0

- The moving direction of the cylinder is determined by a switching valve
- Single direction rotation of pump-motor combination, the rotation speed of the pump-motor combination determines the moving speed of the cylinder
- When the load is driving the cylinder, a counterbalance valve brakes and converts the hydraulic energy into heat



Operating principle of solution A3

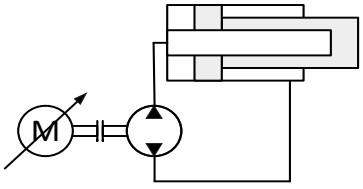
- The moving direction of the cylinder is determined by the rotation direction of the pump-motor combination
- The rotation speed of the pump-motor combination determines the speed of the cylinder
- When the load is driving the cylinder, the hydraulic pumps are acting as hydraulic motors and driving the electric motor. The electric motor is acting as a generator, and delivers electric power to the grid.



☞ In this situation, it has to be taken into account that the electrical grid is able to take the generated power from the electric motor, otherwise an brake resistor has to be used.

Operating principle of solution C1

- Operating principle is identical to a A3 solution
- There is an almost identical pulling and pushing area in the multiple area cylinder allowing the fluid to be displaced from A to B and vice versa. An accumulator is added for temperature variances



☞ The second pushing area is conventionally plugged and filled with nitrogen for preservation purpose. It can be utilized for applications were a static load is permanently present.

STANDARD CONTROL CABINET CAB-X FOR ELECTRO-HYDRAULIC ACTUATORS EHA

CAB-X is a standard solution for electro-hydraulic actuators of the EHA variant which can be used as simple package solution.

Electrical control, wired and tested for function, consisting of:

- Control cabinet – size depending on frequency drive/controller, RAL7035
- Controller outlet including HCS drive controller
- Protective PTC thermistor function
- Regulated mains adaptor, 24 VDC
- Circuitry variants

Operation:

- Main switch
- Emergency stop button
- Signal lamps (fault/warning/operation)

Options:

- Housing in special colors or made of stainless steel
- External filters in case of special requirements
- Protection class higher than IP54
- Reserve space for ancillary equipment

Brief description of PFC Function

The Rexroth IndraDrive technology function Position Force Control (PFC) is used for positioning and for controlling the force of a hydraulic cylinder. This system function is an integral part of the scope of supply of an EHA and just has to be parametrized. The positon is controlled by means of a position encoder. The sensor is mostly installed directly in the cylinder. The force is controlled by means of pressure sensors in the cylinder chambers or via a force sensor at the cylinder.

The transition between controllers is alternating.
The accuracy of the control depends on the resolution, the encoder accuracy/jitter, freedom of signals from disturbance and the entire hydraulic system setup.

Further information can be found in our commissioning Manual: R911379550 Rexroth Sytronix – SvP 7020 PFC Variable-Speed Positioning of Hydraulic Axes.

It is also possible to drive the EMA in “open-loop” control. This means speed set point in rpm, and movement stops when a limit switch is reached, or a max. torque (current) is reached.

STEPS TO FIND A SOLUTION

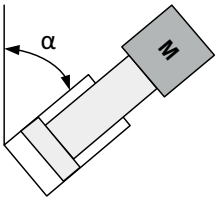
Project description with picture

For target-oriented engineering, the following information must be available completely:

- Brief project description with picture(s)
- Cylinder orientation within the machine
- Additional boundary conditions
- Process sequence in the form of an F/s/t or F/v/t profile

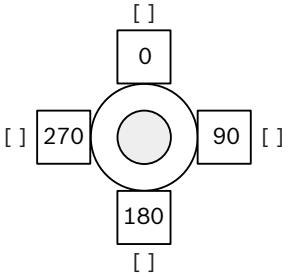
Please send inquiries to large.cylinders@boschrexroth.com

Cylinder orientation



α .....°

Motor orientation



Maximum pulling force*	static .....**kN**	dynamic .....**kN**	Operating cycles per day .....**cycle(s)**
Maximum pushing force*	static .....**kN**	dynamic .....**kN**	Operating days per year .....**day(s)**
Required stroke*	.....**mm**		Requested lifetime .....**year(s)**
*Minimum input for budget quo tation			Linear speed* .....**mm/s**
Description of the application:			

Ambient temperature	operational .....**°C** to .....**°C**		o-operational .....**°C** to .....**°C**
Protection class	**IP**-.....		Explosion protection .....
Outdoors	[ ] coastal [ ]		Dry [ ]
Indoors	[ ]		Humid [ ]
Dusty	[ ]		Splash zone (fresh water) [ ]
Tropical	[ ]		Splash zone (salt water) [ ]
Chemical influences	[ ]		Submerged (depth & time) .....**m**.....**h**
Description of the environment:			

Distance from Electrical cabinet to EHA (Cable length)		..... m.
3-Phase AC	[ ]	
1-Phase AC	[ ]	
DC	[ ]	
Voltage	.....**V**	
Frequency	.....**Hz**	
Rules and regulations	.....	
Other requirements:		

SYSTEM CODE

01		02		03	04	05		06	07		08	09		10	11	12	13	
EHA	–		–				/			–			–					

01	Electro Hydraulic Actuator	**EHA**

Functional solution

02	Single rod cylinder with fixed displacement pump – open loop	**A0**
	Single rod cylinder with fixed displacement pump(s) – semi closed loop	**A1**
	Single rod cylinder with fixed displacement pumps – semi closed loop	**A3**
	Double rod cylinder with fixed displacement pump – open loop	**B0**
	Double rod cylinder with fixed displacement pump(s) – closed loop	**B1**
	Multi-chamber cylinder with fixed displacement pump(s) – closed loop	**C1**

Nominal force

03	Force in kN, e.g. 800	**800**

Construction

04	Hard chromium plated	**C**
	Enduroq 2000	**Q**
	Enduroq 2200	**R**
	Enduroq 1	**E**
	Enduroq 3	**D**
	Other	**X**

Stroke

05	Stroke length in mm, e.g. 3000	**3000**

Shell group mounting

06	No external mounting	**00**
	Mid flange	**E4**
	Front flange	**E7**
	Clevis with spherical bearing	**P5**
	Trunnion	**T4**
	Other	**XX**

Rod group mounting

07	Threaded rod end	**G**
	Clevis with spherical bearing	**L**
	Female clevis	**R**
	Other	**X**

Motor type

08	Synchronous servo motor	**SSM**
	Asynchronous servo motor	**ASM**
	Asynchronous motor (IEC size)	**AMS**
	Non-standard motor	**NSM**

Motor size

09	e.g. 131	**180**

Switches

10	Specify amount of limit switches, e.g. 2	**2**

SYSTEM CODE

01		02		03	04	05		06	07		08	09		10	11	12	13	
EHA	–		–				/			–			–					

Position measurement system

11	Without	**N**
	With position sensor	**E**

Cushioning

12	Without cushioning	**N**
	With cushioning	**C**

Additional functions

13	No additional functions	**N**
	Other	*****

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