

## ECON HYDRAULIC RACK & PINION ACTUATOR

**Fig. 21501 Spring Return Actuator, type ESR**



**Fig. 21502 Double Acting Actuator, type EDR**



**Installation & Operation Manual for Hydraulic Actuator:  
Fig. 21501, 21502**

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## 1 INTRODUCTION

### 1.1 Purpose

The purpose of this manual is to introduce and explain the installation, operation and maintenance of the ESR / EDR Hydraulic Rack & Pinion Actuators.

### 1.2 Safety Notices

This manual contains safety notices and precautions the user must take to reduce the risk of personal injury and damage to the equipment. The user(s) must read these instructions before the installation, operation or maintenance of the ESR / EDR Hydraulic Rack & Pinion Actuators.



**DANGER:** Refers to personal safety and alerts the user for danger and/or injury.  
*Hazardous or unsafe practice may result in severe injury or death.*



**WARNING:** Refers to personal safety. Alerts the user for potential danger.  
*Not following warning notices could result in personal injury or death.*



**CAUTION:** Directs the user's attention to general precautions that, if not followed, could result in personal injury and/or equipment damage.

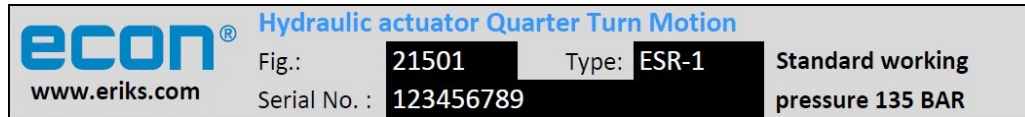
**Note:** Information in this manual is critical to the user's understanding of the actuator's installation and operation.

## 2 PRODUCT IDENTIFICATION

### 2.1 Product Identification

The product name plate is located on top of the connection flange. The name plate contains the following:

#### 2.1.1 Marking



- ECON logo (trademark)
- Figure number
- Serial number
- Actuator type
- Standard Hydraulic working pressure

#### 2.1.2 Applied Standards

- ISO 5211

#### 2.1.3 Certification

- LRS Type Approval Certificate

### 2.2 Initial Inspection

Upon the receipt of the actuator, the user should inspect the condition of the product and ensure that the product specification stated on the name plate matches with the order sheet.

- Remove the packing wrap or wooden box carefully. Inspect the product for any physical damage that may have occurred during shipment.
- Check the product specification of the received product. If a wrong product has been supplied, please immediately report this to the distributing company.

### 2.3 Storage

Actuators must be stored in a clean, cool and dry area. The unit should be stored with the top cover installed and the connection ports plugged. Storage must be off the floor, covered with a sealed dust protector.

### 3 GENERAL INFORMATION AND FEATURES

#### 3.1 General Information

ECON Rack & Pinion actuators are equipped with a standardised connecting flange for direct mounting of Hydraulic Accessories and with ¼ inch threaded connection ports for BSP Hydraulic couplers.

- Fig. 21501 – Single acting Hydraulic actuator
- Fig. 21502 – Double acting Hydraulic actuator

##### 3.1.1 Standard Technical Data

<b>Standard working pressure</b>	135 bar
<b>Test pressure</b>	240 bar
<b>Torque output</b>	180 Nm up to 4725 Nm
<b>Valve connection</b>	According ISO 5211
<b>Indication</b>	Standard visual indicator for open/closed position indication, optional limit switches or Potentiometer available
<b>Local Control</b>	Minimess quick connection couplers, type SMK20 M16x2
<b>Hydraulic connections</b>	¼ inch BSP
<b>Ambient Temperature</b>	-20°C (-4°F) up to +80°C (176°F)
<b>External Coating</b>	Acryl 2K AC (Lechler), RAL5015

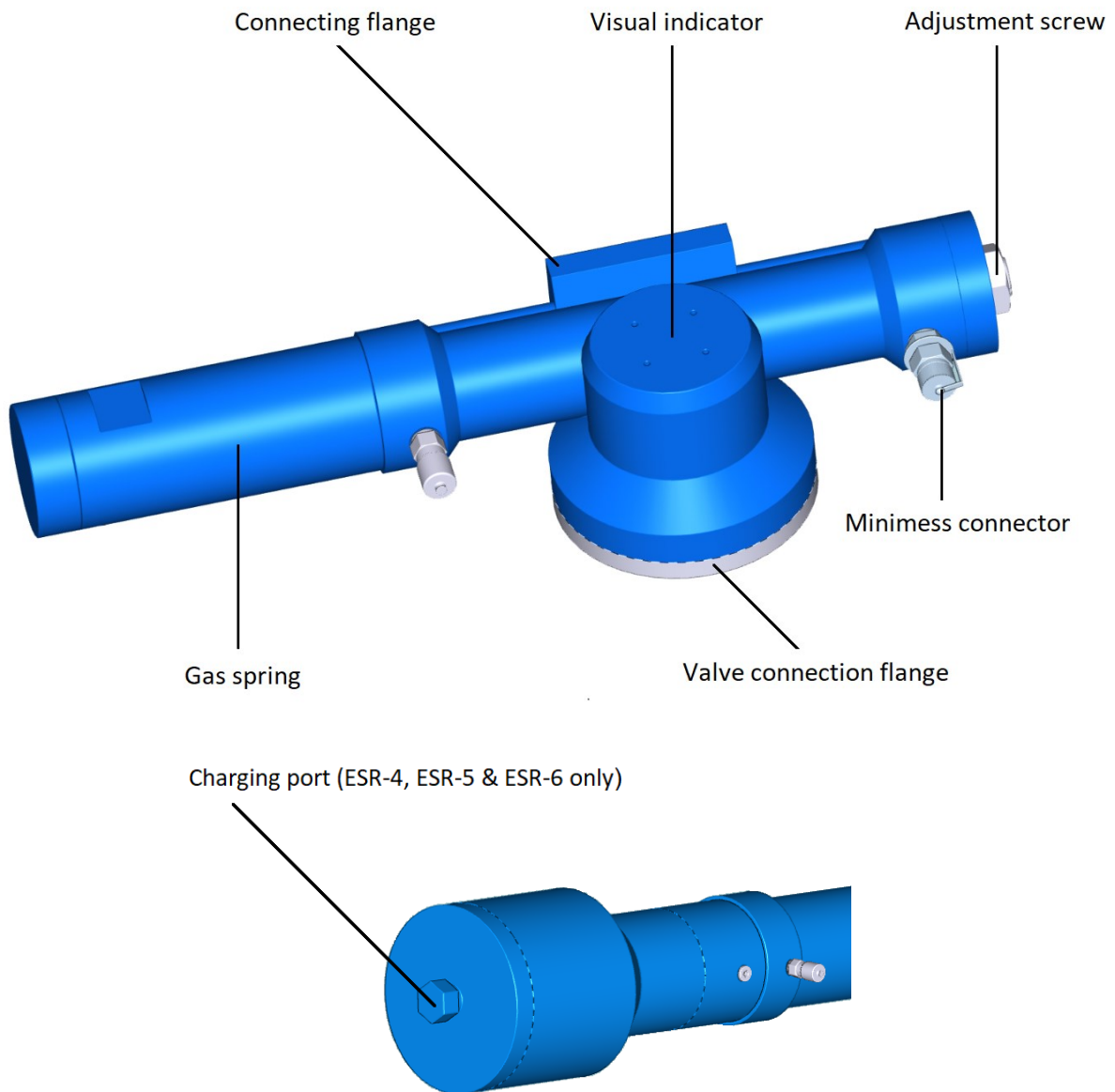
##### 3.1.2 Actuator Versions

<b>Fig. 21502</b> Double acting	Nominal torque in Nm	Displacement in cc	Weight in KG
<b>EDR-1</b>	180	27	7
<b>EDR-2</b>	398	60	12
<b>EDR-3</b>	872	131	19
<b>EDR-4</b>	1444	189	28
<b>EDR-5</b>	2254	338	39
<b>EDR-6</b>	4725	707	80

<b>Fig. 21501</b> Single acting	Hydraulic opening torque in Nm	Hydraulic torque at 90 degree in Nm	Spring closing torque in Nm	Spring torque at 90 degree in Nm	Displacement in cc	Weight in KG
<b>ESR-1</b>	86	63	84	107	27	10
<b>ESR-2</b>	193	142	185	236	60	17
<b>ESR-3</b>	428	308	400	520	131	27
<b>ESR-4</b>	718	513	670	875	189	46
<b>ESR-5</b>	1120	800	1040	1360	338	59
<b>ESR-6</b>	2315	1655	2140	2800	707	116

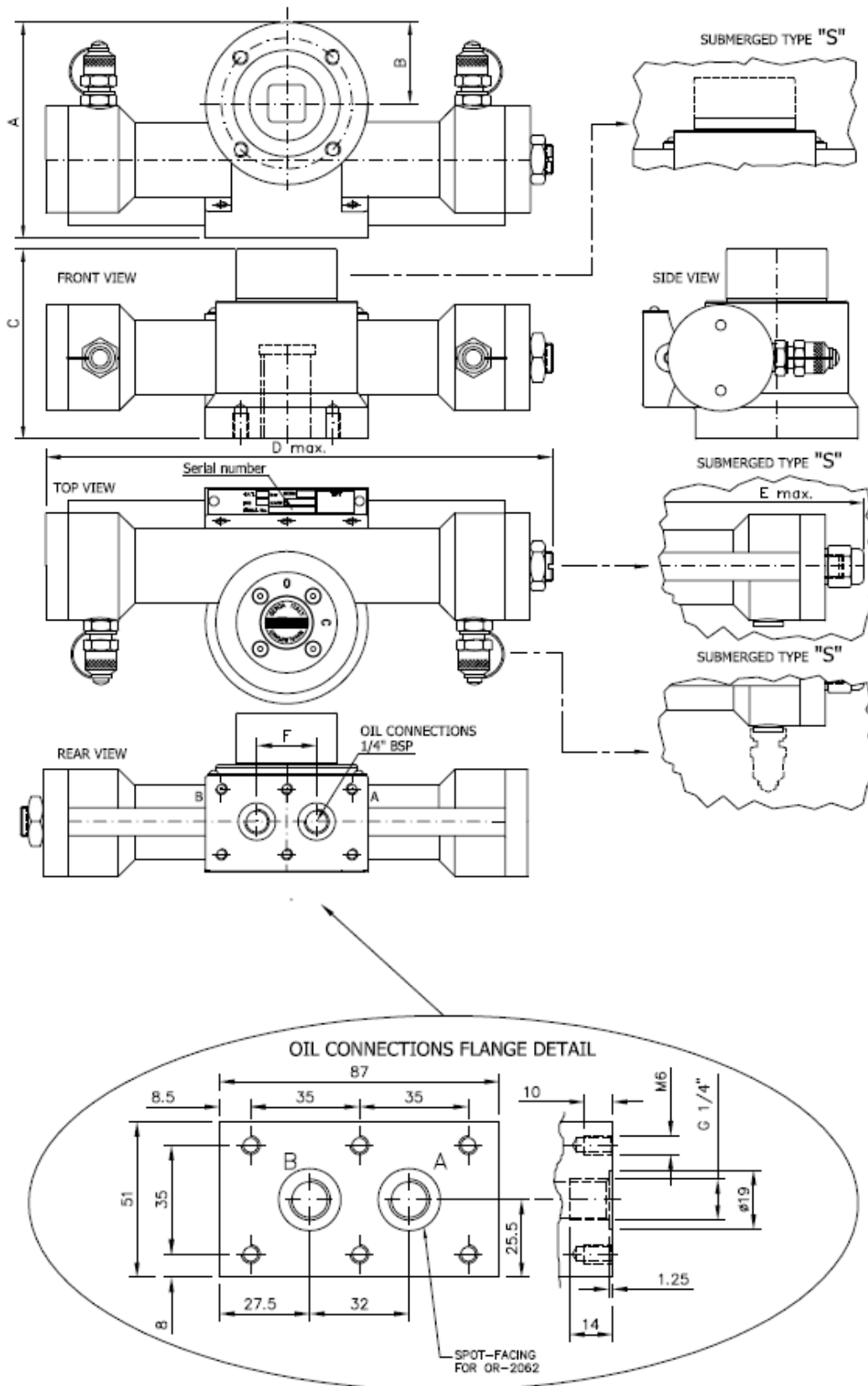
### 3.2 External Parts for Double & Single acting actuator

#### 3.2.1 ESR (EDR)



Gas springs on ESR single acting actuators are charged with Nitrogen gas (N<sub>2</sub>).  
The bigger models can be re-charged, see maintenance section for this procedure.

**3.2.2 EDR**



## 4 INSTALLATION & HYDRAULIC REQUIREMENTS

### 4.1 Pre-installation

**Note:** *Prior to mounting, actuator assembly must be checked for any damage. Damaged parts must be replaced by original spare parts.*

Verify the actuator's nameplate to ensure that actuator type, model number, torque output are correct before installation or use.

Check if the hydraulic control pressure corresponds with your system specification and the information on the actuator type plate.

#### 4.1.1 Actuator application

ECON hydraulic actuators are used for operation of quarter turn valves. The actuators are designed for severe operating conditions. For use in extreme conditions e.g. aggressive, corrosive environments it is recommended to mention this at the ordering stage, in order to verify if the actuator is suitable. The installation designer is responsible for the hydraulic actuator selection and must determine if the actuator is suitable for the working conditions.

ECON hydraulic actuators are also available for submerged application up to 50 mt depth. For submerged application a gasket should always be placed in between the actuator and valve table to avoid water from penetrating the assembly.

#### 4.1.2 Actuator orientation

The actuator can be installed in any position on to the valve, make sure that both the actuator and valve are; in the same position, open or closed. The normal performance of the actuators is to close clockwise and to open counter clockwise. However, this may be inverted under request.

When the actuator does not have an Electric Hydraulic Powerpack the valve assembly can be mounted in any position; horizontal, vertical, level and upside down. When the actuator has an Electric Hydraulic Powerpack there can be restrictions in installing the assembly. Check the Powerpack specifications before installing.

#### 4.1.3 Actuator Installation

The handling and transportation of actuators must be carried out with extreme precaution and using the necessary and adequate means depending on their size and weight in order to avoid risks to the operators handling them.

When mounting the actuator on to the valve, check for proper alignment between the valve and actuator. The coupling bolts, whether the actuator connects directly to the valve or uses a bracket, must be tightened proportionally, distributing the stress, before tightening them completely.

ECON hydraulic actuators are provided with rack/pinion travel adjustment. The standard rotation is adjustable at  $90^\circ + / - 5^\circ$  on close stroke end, fixed at  $92^\circ$  on open stroke end. At any time an easy and accurate angle adjustment is possible by a sealed mechanical limit screws on stroke end (no oil leaks during the adjustment).

Actuators should be installed in such a way that they are easy to access in order to do the periodic inspections and corresponding maintenance operations necessary to guarantee the performance qualities that they have been designed for.



## 4.2 Recommended Oil Quality

The use of clean oil increases the lifetime of the actuators, as well as the lifetime of their accessories, solenoids and other hydraulic accessories

Any type of mineral oil can be used, the HLP type (DIN 51524-2) is recommended.

Also many fire-resistant fluids (as HFC) or polyglycole can be used.

Viscosity Range: 15 , 200 mm<sup>2</sup>/sec (Oil ISO VG 46 mm<sup>2</sup>/sec DIN 51519 is recommended)

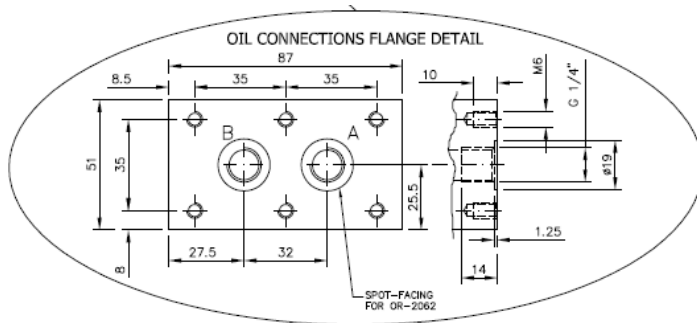
### 4.2.1 Hydraulic System flushing

The actuators are supplied cleaned and plugged; **before to start up, the connection piping and the hydraulic system have to be flushed according to ISO 4406 16/13 (NAS 1638/7) or better.**

## 5 OPERATION

### 5.1 General Operation

The EDR/ESR standard connection flange includes two hydraulic ports, threaded for 1/4" BSP couplings. When hydraulic pressure is supplied to these ports the piston (rack) moves and slides through the housing. The linear stroke is converted into a rotation movement by the pinion. The pinion connects to the valve spindle and transfers the quarter turn rotation of the actuator into an opening and closing of the valve.



#### 5.1.1 Double Acting actuator

When the oil is supplied to port A the actuator will make clockwise rotation (closing), when oil is supplied to port B will cause counter clockwise rotation (opening).

#### 5.1.2 Single Acting actuator

On a single acting actuator one of the movements (opening or closing) is done by hydraulic pressure and the other movement is done by a spring.

This spring can be mounted (by the factory) on either side of the actuator creating a "normally open" or "normally closed" actuator.

For normally closed; oil should be supplied to port B to hydraulically open the valve

For normally open; oil should be supplied to port A to hydraulically close the valve

### 5.2 Manual (emergency) operation

Besides operation through the main system the actuator can also be operated through a handpump. Each actuator is equipped with two Handpump connectors. In order to use these connectors, the actuator must be isolated from the main system through pilot control valves, a ball valve, or a solenoid valve with a closed (mid) position.

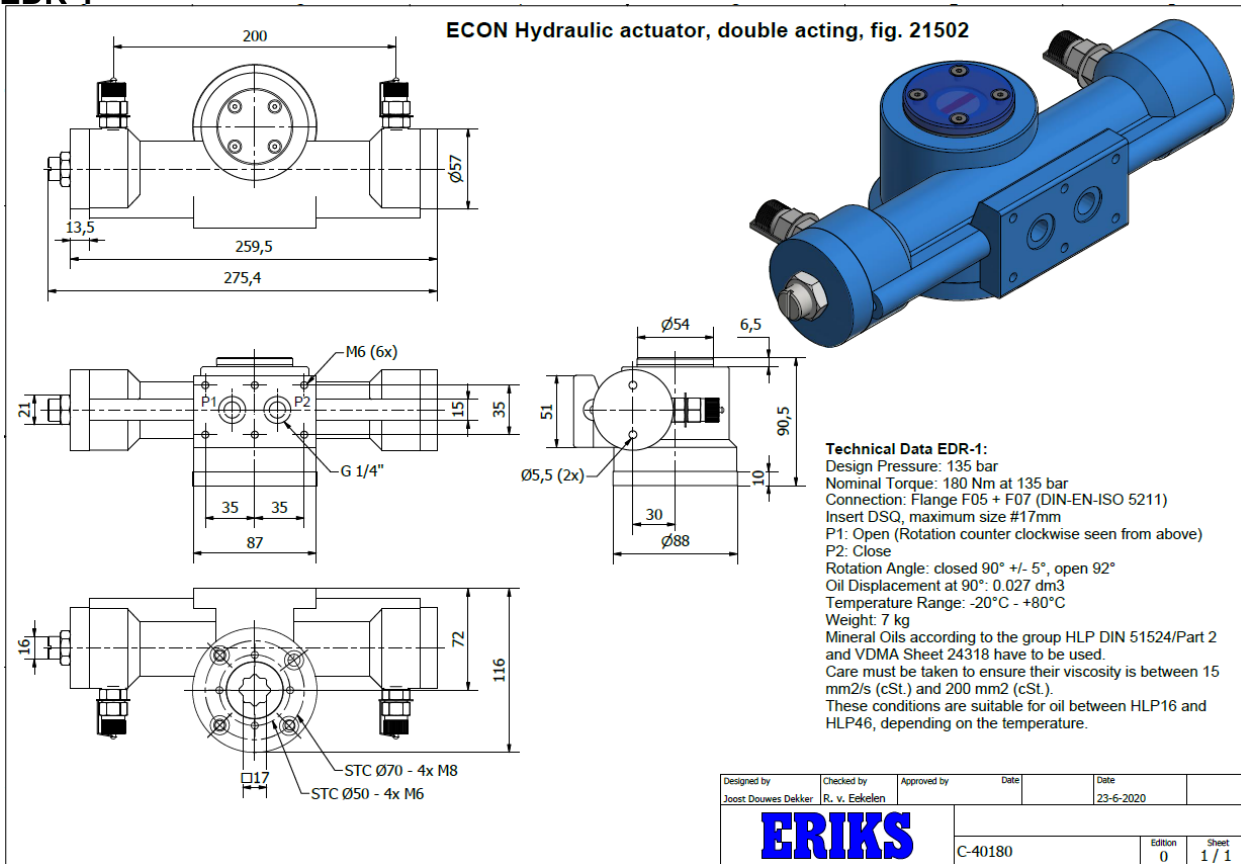
- Double acting actuators have two type QC3 connectors
- Single acting actuators have one type QC3 for pressure side and a smaller type QC5 for spring side.

Operation is the same as described before; the connector on the side of port A will close the valve, when the connector on the side of port B will open the valve.

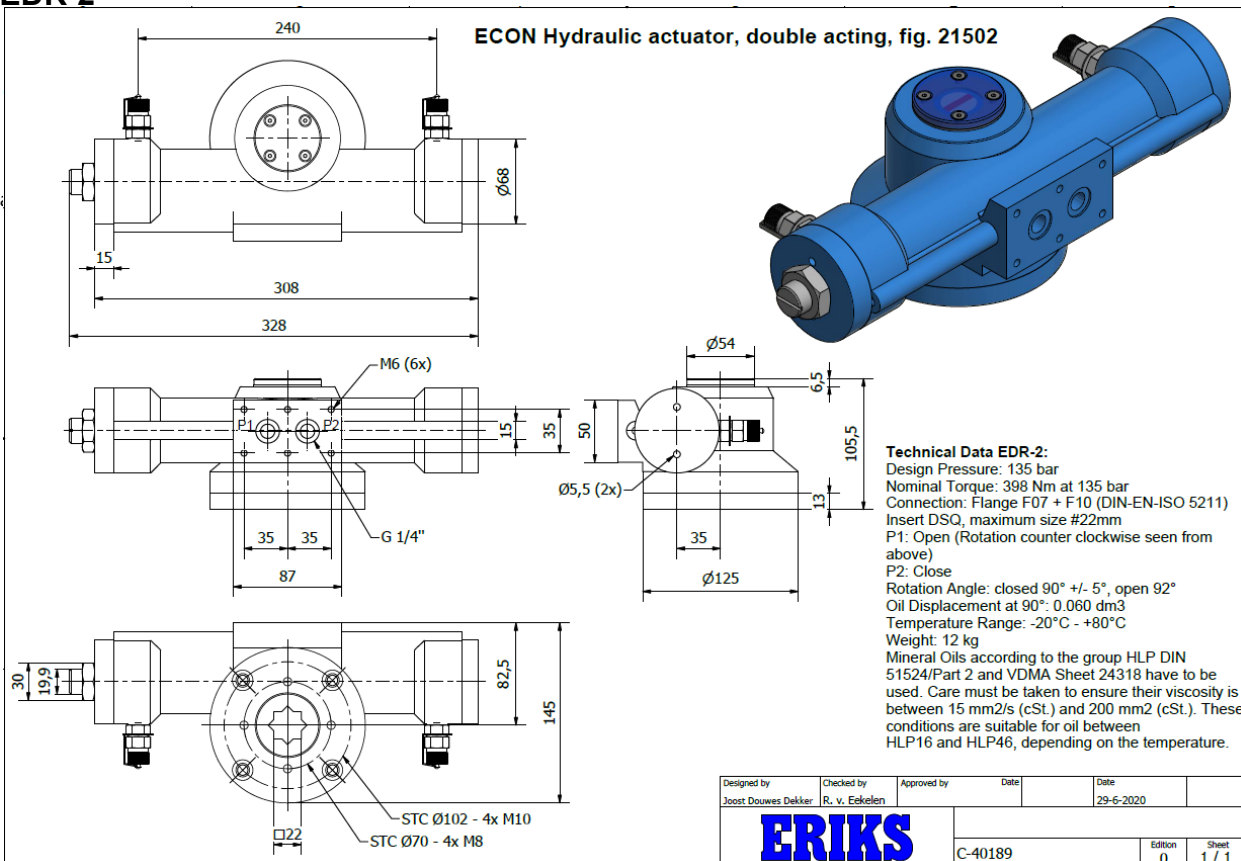
The QC5 connector on a single acting actuator is only used when the spring is defect.

6 ACTUATOR DRAWINGS & DIMENSIONS

EDR-1



EDR-2



**EDR-3**

**ECON Hydraulic actuator, double acting, fig. 21502**

**Technical Data EDR-3:**  
 Design Pressure: 135 bar  
 Nominal Torque: 872 Nm at 135 bar  
 Connection: Flange F10 + F12 (DIN-EN-ISO 5211)  
 Insert DSQ, maximum size #27mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.131 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 19 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.). These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**EDR-4**

**ECON Hydraulic actuator, double acting, fig. 21502**

**Technical Data EDR-4:**  
 Design Pressure: 135 bar  
 Nominal Torque: 1444 Nm at 135 bar  
 Connection: Flange F12 + F14 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #36mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.189 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 28 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.). These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**EDR-5**

**ECON Hydraulic actuator, double acting, fig. 21502**

**Technical Data EDR-5:**  
 Design Pressure: 135 bar  
 Nominal Torque: 2254 Nm at 135 bar  
 Connection: Flange F14 + F16 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #46mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.338 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 39 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**EDR-6**

**ECON Hydraulic actuator, double acting, fig. 21502**

**Technical Data EDR-6:**  
 Design Pressure: 135 bar  
 Nominal Torque: 4725 Nm at 135 bar  
 Connection: Flange F14 + F16 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #55mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.707 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 80 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-1**

**ECON Hydraulic actuator, single acting, fig. 21501**

**Technical Data ESR-1:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 84 Nm  
 Opening Torque: 86 Nm at 135 bar  
 90° Opening Torque: 63 Nm at 135 bar  
 Connection: Flange F05 + F07 (DIN-EN-ISO 5211)  
 Insert DSO, maximum size #17mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0,027 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 10 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used.  
 Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-2**

**ECON Hydraulic actuator, single acting, fig. 21501**

**Technical Data ESR-2:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 185 Nm  
 Opening Torque: 193 Nm at 135 bar  
 90° Opening Torque: 140 Nm at 135 bar  
 Connection: Flange F07 + F10 (DIN-EN-ISO 5211)  
 Insert DSO, maximum size #22mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0,060 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 17 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used.  
 Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-3**

**ECON Hydraulic actuator , single acting, fig. 21501**

**Technical Data ESR-3:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 400 Nm  
 Opening Torque: 428 Nm at 135 bar  
 90° Opening Torque: 308 Nm at 135 bar  
 Connection: Flange F10 + F12 (DIN-EN-ISO 5211)  
 Insert DSQ, maximum size #27mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0,131 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 27 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used.  
 Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-4**

**ECON Hydraulic actuator, single acting, fig. 21501**

**Technical Data ESR-4:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 670 Nm  
 Opening Torque: 718 Nm at 135 bar  
 90° Opening Torque: 518 Nm at 135 bar  
 Connection: Flange F12 + F14 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #36mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0,189 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 46 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.).  
 These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-5**

**ECON Hydraulic actuator, single acting, fig. 21501**

**Technical Data ESR-5:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 1040 Nm  
 Opening Torque: 1120 Nm at 135 bar  
 90° Opening Torque: 800 Nm at 135 bar  
 Connection: Flange F14 + F16 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #46mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.338 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 59 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.). These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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**ESR-6**

**ECON Hydraulic actuator, single acting, fig. 21501**

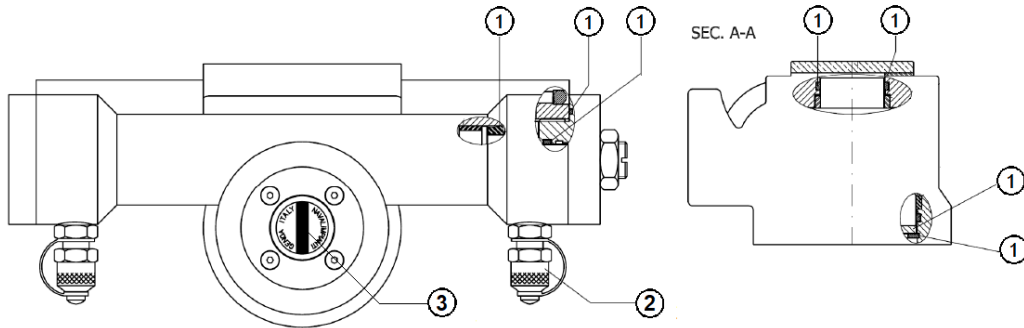
**Technical Data ESR-6:**  
 Design Pressure: 135 bar  
 Gas Spring Closing Torque: 2140 Nm  
 Opening Torque: 2315 Nm at 135 bar  
 90° Opening Torque: 1655 Nm at 135 bar  
 Connection: Flange F14 + F16 (DIN-EN-ISO 5211)  
 Insert SQ, maximum size #46mm  
 P1: Open (Rotation counter clockwise seen from above)  
 P2: Close (Spring closed)  
 Rotation Angle: closed 90° +/- 5°, open 92°  
 Oil Displacement at 90°: 0.707 dm<sup>3</sup>  
 Temperature Range: -20°C - +80°C  
 Weight: 116 kg  
 Mineral Oils according to the group HLP DIN 51524/Part 2 and VDMA Sheet 24318 have to be used. Care must be taken to ensure their viscosity is between 15 mm<sup>2</sup>/s (cSt.) and 200 mm<sup>2</sup> (cSt.). These conditions are suitable for oil between HLP16 and HLP46, depending on the temperature.

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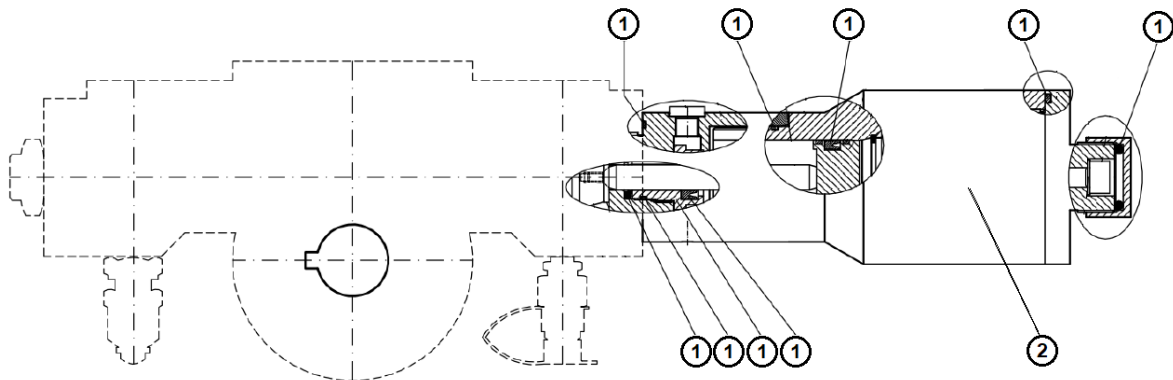
**7 SPARE PARTS**

**7.1 Fig. 21501/21502 EDR/ESR Hydraulic Actuator**



position	part description
1	Gasket & Soft seal kit actuator
2	Quick Connection Coupling (set)
3	Visual Indicator set

**7.2 Fig. 21501 ESR Gas Spring**



position	part description
1	Gasket & Soft seal kit gas spring ESR 4-6
2	Gas spring complete (re-chargeable) ESR 4-6
2	Gas spring complete ESR 1-3
-	Precharge kit for Gas spring

## 8 MAINTENANCE

**WARNING:**

*Turn off all power before performing maintenance on the actuator.*

**POTENTIALLY HIGH-PRESSURE VESSEL.** *Before removing or disassembling, ensure that the actuator or other actuated device is isolated and not under pressure.*

The hydraulic Rack & Pinion actuators do not require periodic maintenance operations, but only of a visual check, verification of the oil, verification of the gas spring pressure (ESR actuator size 4-6).

### 8.1 Visual check

Check list:

- Screws are tight.
- Quick couplings are tight and closed with its cap.
- Gas bottle cap (if present) is tight.
- Electrical (switch) box (if present) is correctly connected, screws tightened and the cable connected.
- No external leakage of Hydraulic oil.

### 8.2 Inspection of the oil

The oil in the system must be checked after about 1000 valve maneuvers but at least every 5 years.

The oil must be clear and of the same transparency and color as new oil.

The oil must be HLP DIN 51524-2, standard viscosity class VG 46mm<sup>2</sup>/sec DIN 51519.

A spot oil test is suggested after 5 years: no sludge and oil contamination are tolerated by the system. The oil cleanness must be according NAS 3801 class 9.

### 8.3 Inspection of the gas spring Nitrogen pressure ESR actuator size 4-6.

For this procedure and recharging of the gas spring a separate work instruction is available as appendix.

The main steps of this procedure are:

- Unscrew the brass nut of the gas filling connection and unlock the screw.
- Install the pre-charging kit on the gas filling connection.
- Unscrew the screw inside the gas intake using the proper black handle of the pre-charging kit.
- Read and check nitrogen pre-charge pressure by manometer:

**Standard nitrogen pre-charge pressure is 65 bar** (exception made only for different instruction given by Eriks or different instruction in the manual).

#### 8.1.4 Inspection of the gas spring Nitrogen pressure ESR actuator size 1-3.

The gas spring on these actuator type/sizes is maintenance free. If any problems do occur, contact Eriks

## 9 TROUBLESHOOTING

The main issues on this hydraulic actuator and the right actions are schematized in below trouble shooting table. The table helps the operator to detect the problem and how to solve it.

### ► Double acting actuator does not open or close

Check; Control pressure on the handpump connectors of the actuator

A pressure of between 100-135bar should be present to operate the actuator when installed on a valve.

- If a normal control pressure is present check if the valve is not blocked
- If the valve is not blocked check for external oil leakage on the actuator

### ► Single acting actuator does not open

Check; Control pressure on the (open side) handpump connector of the actuator

A pressure of between 100-135bar should be present to open the actuator when installed on a valve.

- If a normal control pressure is present check if the valve is not blocked
- If the valve is not blocked check for external oil leakage on the actuator

Check; if oil is trapped on the gas spring side of the actuator

Remove the handpump connector on the gas spring side and operate the actuator.

### ► Single acting actuator does not close

Check: Gas spring pressure

A pressure of 65bar should be present to properly close the actuator when installed on a valve.

- With model ESR 4-6 the gas spring can be recharged

**If you have questions about this product,  
Please contact the nearest ECON distributor.  
You can find them on [www.eriks.com](http://www.eriks.com)**

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**ERIKS Flow Control**

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