TruTorq E-Type Installation Manual

Product Description

TruTorq actuators are pneumatic quarter turn actuators. The basic design is of double rack and pinion. Unique features of the actuator are:

- The “patented” spring encapsulation (no special tools required to change DA to SR, same overall dimensions remain the same for both types).
- The dual encapsulated wear pads “POM” on the piston prevent metal to metal contact between piston and cylinder wall,
- The piston racks each have an encapsulated support “GUIDE BAR” which rolls against the drive shaft and thus relieves any side loading which reduces pinion & rack wear.
- Triple shaft bearing system to prevent any adverse loading on the driveshaft
- Piston back-up bearings, which are situated behind the pistons ‘o’ ring to ensure linear movement and prevent wear on the cylinder surface
- Integral body adaptor kit, which is interchangeable with a wide range of valves for direct mounting by using an interchangeable insert sleeve, which is retained by a circlip.
- Dual end stop adjustments which are integral to the body adaptor and operate in conjunction with the machined cam on the single piece driveshaft

TruTorq actuator torques at 5.5 bar / 80 psig provide torque outputs of 9.5 to 3853 Nm / 83 to 34103 in.lbs and conforms to all the latest standards which include:

DIN3337	- orientation of insert sleeve is 45 deg. Offset, not in-line.
ISO5211	- orientation of actuator to valve mounting flange (i.e. f05, f07…)
VDI/VDE3845	- aka Namur mounting for switches, solenoids and positioners
CEN/TC69	- new European standard incorporating all of the above

Installation

Prior to assembly, determine the following:

- Mode of operation of valve (valve normally closed or open)
- Required quadrant for bracket (if required) and direction of mounting actuator in line cross line
- Avoid mounting ancillary equipment until valve/actuator is correctly mounted.

Assembly

1. Turn valve stem (ball, plug, disc) to required position
2. Remove handle etc… (see valve manual)
3. Attach mounting bracket to actuator – **DO NOT TIGHTEN BOLTS**
4. Insert coupling into actuator driveshaft – **ENSURE COUPLINGS FITS WELL**
5. Mount bracket / actuator / coupling assembly to valve – **ENSURE COUPLING ENGAGES ONTO VALVE STEM**
6. Fasten bracket to valve – caps screws and lock washers are preferred

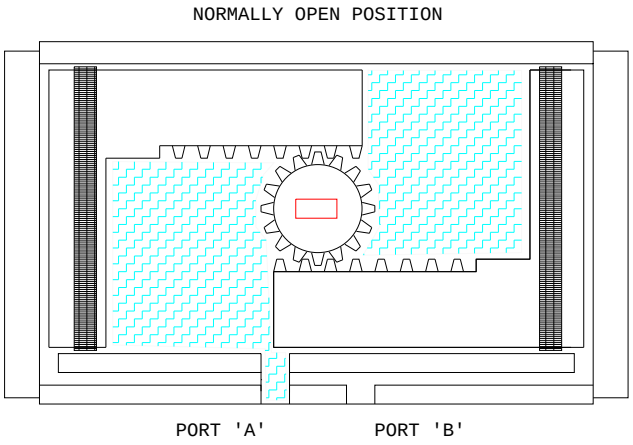
ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

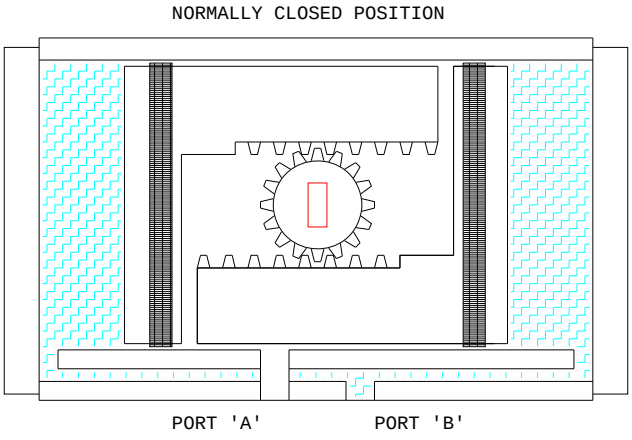
7. Ensure valve and actuator are in the required mode of operation. If not, rotate the actuator 90 degrees while engaged.
8. Fasten bracket to actuator
9. Mount accessories to actuator (if required)

Actuator Operation

Double Acting

The TruTorq actuator driveshaft rotates through a full 95 degrees. Rotation/Movement is achieved by supplying air to the center chamber thus forcing the two opposing pistons outward. This is a counter-clockwise operation and the actuator driveshaft will be in the “open” position.



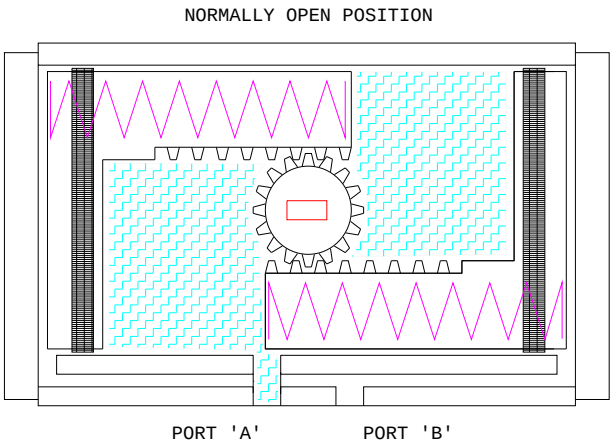


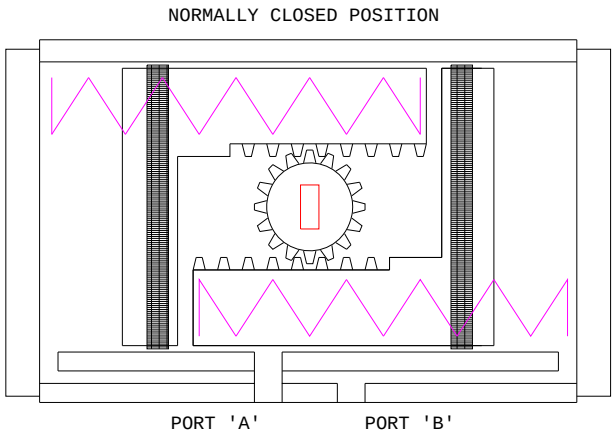
Spring Return (Fail Safe Close)

As with the double acting, air supply to the center chamber will force the two opposing pistons outward. The actuator driveshaft will be in the “open” position.

Spring to close is achieved by means of the springs contained within the piston (rack) and end-caps, which by loss of air in the center chamber will force the pistons to the “closed” position.

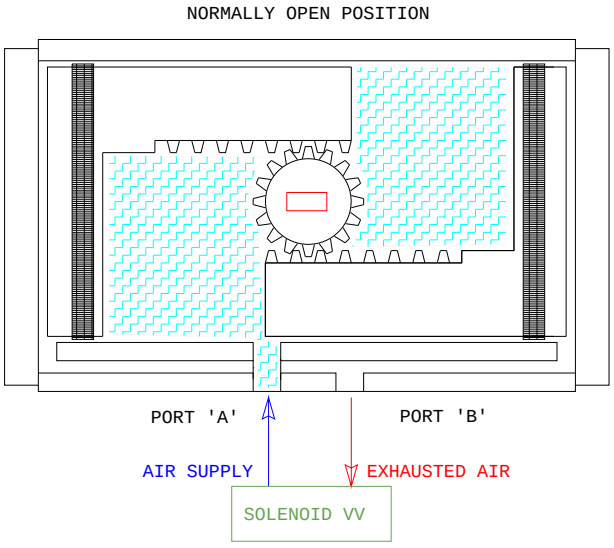
ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

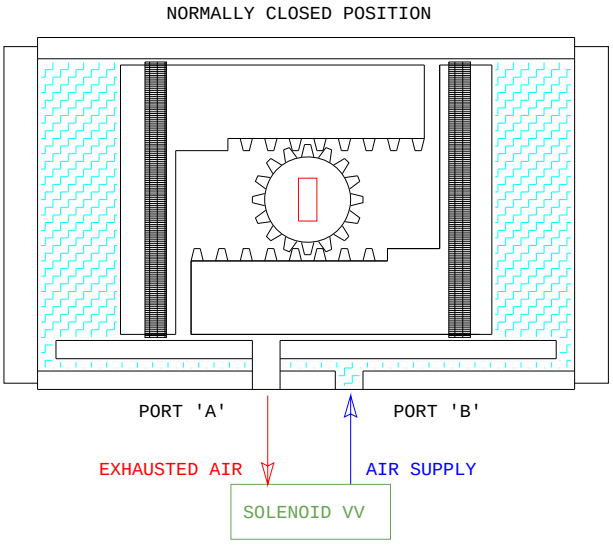




Actuator Operation with Solenoid Valve

Double Acting – Air supply is connected to port ‘1’ on the NAMUR solenoid valve body. When the solenoid is energized the internal pilot air moves the directional control spool allowing main air supply through the actuators port ‘A’ into the center chamber. Air in the end chambers of the actuator will exhaust through port ‘B’ via the solenoid into atmosphere.





When the solenoid is de-energized the spring loaded core returns to normal and blocks the flow of air to the center chamber. The control spool will now shift and allow main air supply through port ‘B’ to enter the end chambers of the actuator. Air from the center chamber will exhaust through port ‘A’ via the solenoid into atmosphere.

The double acting solenoid valve assembly is fail-safe in that in the event of loss of power the solenoid valve will return to it’s de-energized position and cycle the actuator to the closed position, providing main air supply is available.

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

If fail-safe action is required to the open position, mounting of the solenoid valve should be inverted. **De-energized condition will pressurize port 'A'.**

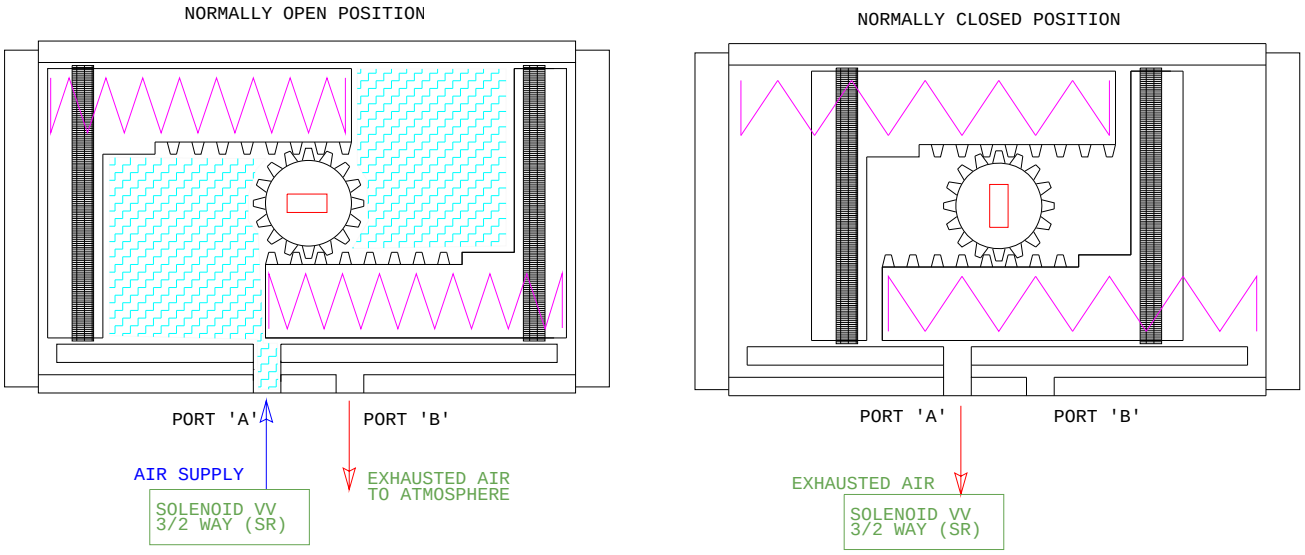
As standard all Namur block solenoid valves are fitted with manual over-rides.

Speed controls if required can be fitted to each of the exhaust ports thus enabling one to control the speed of operation in on or both directions.

Spring Return –

Type "A": miniature banjo mounting or nipple mounting for sizes up to TSR 20. Solenoid is directly screwed into port 'A' with main air supply to port 1 of the solenoid block.

Type "B": standard namur block solenoid valve can used either as a 5/2 way (double acting) or as a 3/2 way (single acting), depending on the orientation of seal at the back of the valve outlet port (port 4).



Type "A"
Air is supplied to the inlet port on the solenoid valve. When the solenoid coil is energized, the spool (plunger) moves, allowing main air supply to enter the center chamber through port "A". Air from the spring-loaded chambers is exhausted directly to atmosphere through port "B". When the solenoid coil is de-energized the spool (plunger) returns to its original position allowing air from the center chamber of the actuator to exhaust to atmosphere via the solenoid valve body. The spring-loaded pistons will move under the spring force to fail close (fail open if actuator is in this way set up).

Type "B"
Air supply is connected to port 1 on the Namur solenoid valve body. When the solenoid coil is energized the internal spool (plunger) moves, allowing main air supply to enter the center chamber through port "A". Air from the end chambers is exhausted through port "B" via the solenoid valve into atmosphere. When the solenoid coil is de-energized the spring-loaded spool (plunger) returns to its original position allowing main air supply to enter the end chamber through port "B". Air from the center chamber is exhausted through port "A", via the solenoid valve, into atmosphere. On spring return models using a 3/2 way namur solenoid

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

valve, when the coil is de-energized the spring loaded spool (plunger) returns to it's original position allowing air from the center chamber of the actuator to exhaust to atmosphere via the solenoid valve body. The spring-loaded pistons will move under the spring force to fail close (fail open if actuator is in this way set up).

As standard all solenoid valves are fitted with a manual over-ride
Speed control if required should be fitted to the solenoid valve exhaust ports.

Preventive Maintenance

Caution:

The actuator must be isolated pneumatically and electrically before any maintenance is carried out. It is recommended to make period checks and to make certain that all fasteners remain tight. TruTorq actuators are lubricated for their normal working life. The recommended lubricant as used by TruTorq is:

STATOIL UNIWAY LIX 42 PA – ISO-L-XDDDB2 according to ISO6743-9

OR

STATOIL MOLYWAY LI 712 – ISO-L-XCCFB2 according to ISO6743-9

Subject to the working conditions under which the actuator must operate i.e. extended duty, fast operation/high cycle, other abnormal operating conditions, etc…. It is recommended to replace internal seals as required.

TruTorq ISO repair kits contain all the necessary seals and can be obtained through any authorized distributor (see diagram below for listing as published in the TruTorq catalogue)

Spring return actuators may need spring replacements after extended duty as they may fatigue. It is highly recommended that springs are to be replaced in complete sets only. TruTorq spring kits are available through any authorized distributor.

Cycle check (test):

Manual operation (functional test) can be done without the use of electrical power, by rotating "clockwise" the manual over-ride lever on the solenoid valve. This simulates the electrical operation of the coil allowing air to enter port 'A' of the actuator. Rotating the manual over-ride back (anti-clockwise) will cause the solenoid valve coil (and hence the actuator) to revert to the normally de-energized condition.

Actuator Malfunction

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

Actuators fitted with solenoid valve

- if actuator malfunctions, verify the following:

  - Valve (disc/ball/plug) is free to rotate
  - Actuator is correct size
  - Air supply is sufficient to operate actuator
  - Correct voltage is supplied to solenoid valve (see solenoid valve coil for voltage)
  - If solenoid valve is fitted with speed regulators, ensure these are not fully closed, as actuator will not function.

- valve is free to rotate, voltage and air supply are correct continue with the following Verifications:

  - Apply voltage to solenoid coil, check for clicking sound
  - If no clicking sound is heard:
    i. Unscrew coil from solenoid block
    ii. Apply voltage to coil
    iii. If solenoid plunger (spool) does not retract, replace solenoid valve
  - For maintenance of solenoid valves, see appropriate data sheet or consult manufacturer for assistance.

Actuators fitted without solenoid valve

- Disassemble actuator from valve

  - Apply air pressure to actuator to ensure it functions under no load conditions
  - If actuator works properly then most probable cause of malfunction will be the valve, if this is the case consult valve manufacturer I.O.M. manual
  - If actuator does not cycle properly, disassemble as per “actuator maintenance instructions”

NOTE:

NEVER DISASSEMBLE A UNIT THAT IS PRESSURIZED

Actuator Maintenance Instructions

Caution: before removing actuator from valve, ensure that valve has been properly isolated in the piping system and that the valve has been de-pressurized.

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

- Disconnect actuator's electrical and air supply
- Remove mounting bracket and actuator from valve
- Remove all accessory equipment (switches, solenoids, etc…) and mounting bracket from actuator.

Remove body adaptor kit

- ✓ Remove stop end lock screws (25) and loosen stop end adjustment screws (24) so they do not interfere with removal of body adaptor.
- ✓ Remove body adaptor bolts (23)
- ✓ Remove body adaptor bearing (16) and check for signs of wear or damage

Remove end-covers:

- ✓ Spring Return: endcap bolts (6) are long enough on all actuators to fully relax springs (20). Unscrew diagonally (OPPOSITE PAIR) one full turn at a time until fully relaxed *(for large bore actuators it is recommended to use a hydraulic ram or press for assistance and ease).* Remove spring packs (20) from each end.
- ✓ Double acting: endcap bolts (6) are same as spring return actuators. Once loosened, unscrew at will.
- ✓ To remove endcap (4), use spanner to turn shaft (3) anti-clockwise (open position) until pistons press out the endcap. Remove end covers gently, care should be taken not to damage endcap 'o' seals (8).

Remove pistons:

- ✓ Continue rotation of shaft (anti-clockwise) until pistons (2) have been driven out of actuator body (1) and disengaged from driveshaft.

Remove driveshaft:

- ✓ Remove circlip (18) from top of driveshaft (3)
- ✓ remove upper washer (11) from top of driveshaft (3)
- ✓ Remove driveshaft (pinion gear) (3) through bottom of the actuator by pushing downwards from the top of the actuator.

Remove all 'o' seals, wear pads and guide bars from components and clean parts thoroughly, using kerosene or equivalent cleaning agent.

Ensure that you have a complete seal kit available and that the kit has all the required parts that need replacement.

PRIOR RE-ASSEMBLY VERIFY FOLLOWING

- ➢ Ensure that all internal porting is clear and free from foreign particles.

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

- Check that driveshaft (3) and piston rack “teeth” do not have excessive wear. If worn, replace driveshaft, pistons and guide bars.

- Check that piston wear pads (12), shaft bearings (14,15 & 16) do not have excessive wear. If worn, replace pads (2 on each piston) and bearings. All necessary bearings are included in the TruTorq repair kit.

- For spring return actuators, check that springs (20) are not broken. If broken, replace springs. (springs should always be replaced as complete sets)

- Check that internal body (1) bore is not scored or scratched. If scratched replace body “if necessary”.

Actuator Re-Assembly

NOTE: TRUTORQ ACTUATORS ARE LUBRICATED FOR THEIR NORMAL WORKING LIFE

Prior to re-assembly, lubricate all ‘o’ seals with silicon free ‘o’ seal grease. Use the same grease for all grooves where ‘o’ rings are to be fitted and in the recess where wear pads, shaft bearings and back-up bearings are located.

Shaft and cylinder:

- ✓ Place lower (15) and upper (14) bearing on shaft (3), upper in the second groove from the top. Apply a thin layer of grease.
- ✓ Grease ’O’ seals and place one in the groove above lower bearing, the other in the groove below the upper bearing.
- ✓ Place driveshaft gently in actuator body through the bottom entry hole. (Bottom hole is the one with counter sink) Make sure that ’O’ seals are not pinched in the entering phase.
- ✓ Fit washer (11) to driveshaft.
- ✓ Fit circlip (18) to top of driveshaft.
- ✓ Grease internal cylinder bore and holes and insert ball bearing (21) into each side of the air conduit.
- ✓ Place insert sleeve (26) into shaft, ensuring key is attached, and place circlip (19) into the recess to lock.

Piston assembly:

- ✓ Fit guide bar (17) in piston rack. Apply richly with grease.
- ✓ Apply grease on wear pad groove and insert wear pads (12). Apply grease on wear pads.
- ✓ Grease ’O’ seals (7) and place in groove on piston.
- ✓ Place piston back-up bearing (13) behind ’O’ seal.
    - o **Important:** Back-up ring must be placed closest to the piston face!!

Piston insertion:

- ✓ Align driveshaft (3) in line with the body (1) (air inlets facing you) and driveshaft cam on the left side.

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL

- ✓ Rotate shaft approx. 45 degrees or 3-4 teeth anti clockwise so that pinion gear will ”pick up” the piston rack teeth
- ✓ Gently push one piston (2) with wear pads (12) facing the back of body into the left side until rack teeth and pinion gear engage simultaneously. Repeat this for the right piston (2), but wearpads (12) facing front of body.
- ✓ Now rotate shaft (3) clockwise to the closed position. The flats on the driveshaft should be at 90 degrees to the body in the fully closed position.

Note: For Fail Open Assembly the pistons should be rotated at 180 degrees about their own axis. Driveshaft cam should be on right side for assembly.

Endcap assembly:

- ✓ Grease ’O’ seals (10) for endcaps, place in groove on endcaps (4)
- ✓ Place endcaps (4) into the body with spring recesses aligned with spring holes on the piston (2)
- ✓ Insert endcap bolts (6) and fasten, **always tighten crossway and balance out.** Make sure that ’O’ seals (10) are not pinched in the assembly phase.
- ✓ For **spring return,** grease springs (20) then place them in piston spring holes.

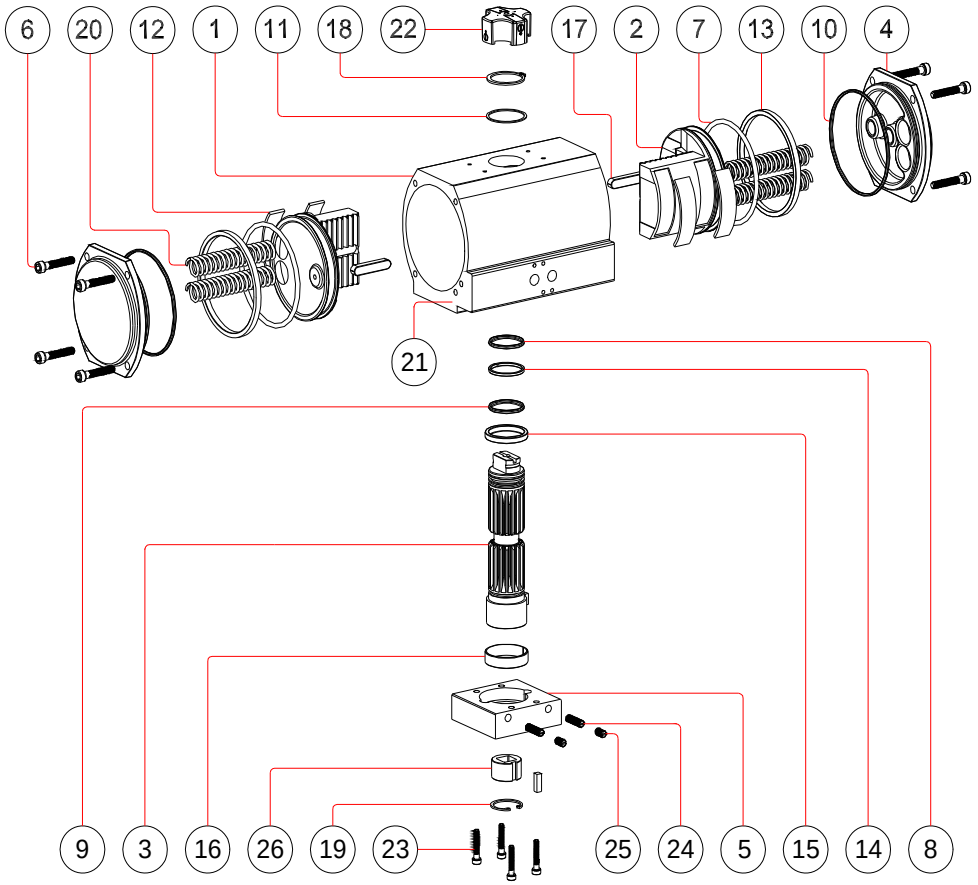
Body Adaptor Assembly:

- ✓ Place adaptor bearing (16) in body adaptor (5) apply a thin layer of grease.
- ✓ Place body adaptor (5) over top of the shaft cam with threaded holes facing in the same direction as air inlets on actuator.
- ✓ Insert body adaptor bolts and fasten.
- ✓ Place stop end adjustment screws (24) and adjust to proper position and lock with lock screws (25).

Note: if you have any technical questions that have not been taken into account in this manual, then please contact the nearest TruTorq distributor for assistance.

TruTorq enhanced actuator parts listing

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL



Ref No	Description	Qty	Material Std Unit	Material CNI® unit	Comments
1	Cylinder	1	Alum. Anodized	CNI 530T	
2	Piston	2	Alum. Anodized	CNI 425	
3	Driveshaft	1	Steel	Stainless Steel	CNI 55 and up = CNI Shaft
4	Endcap	2	Alum. Anodized	CNI 530T	
5	Adaptor Plate	1	Alum. Anodized	CNI 530T	
6	Endcap Bolt	8	Stainless Steel	Stainless Steel	
7*	Piston 'O' ring	2	Buna Nitrile	Buna Nitrile	Option Viton or Silicone
8*	Driveshaft upper 'O' ring	1	Buna Nitrile	Buna Nitrile	Option Viton or Silicone
9*	Driveshaft lower 'O' ring	1	Buna Nitrile	Buna Nitrile	Option Viton or Silicone
10*	Endcap 'O' ring	2	Buna Nitrile	Buna Nitrile	Option Viton or Silicone
11*	Washer	1	Polyethylene	Polyethylene	
12*	Wear Pads	4	POM Delrin	POM Delrin	
13*	Backup Bearing	2	POM Delrin	POM Delrin	
14*	Driveshaft Upper Bearing	1	POM Delrin	POM Delrin	
15*	Driveshaft Lower Bearing	1	POM Delrin	POM Delrin	
16*	Body Adaptor Bearing	1	POM Delrin	POM Delrin	
17*	Guide Bar	2	Steel	Stainless Steel	
18*	Circlip Upper	1	Steel	Stainless Steel	
19	Circlip Lower	1	Steel	Stainless Steel	
20	Spring	4	SiCr	SiCr	
21*	Ball Bearing	2	Composite	Composite	
22	TruVision Indicator	1	POM Delrin	POM Delrin	TruVision optional on Std unit
23	Body Adaptor Bolts	4	Stainless Steel	Stainless Steel	
24	Stop Adjustment Screws	2	High Tensile Steel	High Tensile Steel	Dacrolit Coated
25	Lock Screws	2	Steel	Steel	Dacrolit Coated
26	Insert Sleeve	1	Stainless Steel	Stainless Steel	

REPAIR KIT INCLUDES ITEMS MARKED WITH AN ASTERISKS

ROMYNOX HENRICUSKADE 119A | 2497 NB THE HAGUE | THE NETHERLANDS | T +31 (0)85 043 31 10 | E INFO@ROMYNOX.NL | I WWW.ROMYNOX.NL