

EPS 02 Mounted in “A” Housing

- **Electronic Limit Switches**
- **Analog Output Position Signal**
- **Very Accurate**
- **Easy To Use**
- **Robust**
- **Dependable**
- **High Resolution**
- **Non-Contact Measurement**
- **Wide Temp. Range**

## Field Installation and / or Replacement of RACO Electronic Position Sensor Board EPS 02 & EPS 06

### Introduction

The EPS 02 and EPS 06 have been specially designed to interface the electro-mechanical linear actuator with process automation systems. The operating principle of the position sensor is based on a non-contact coupling through a magnetic field. The stationary sensor on the printed circuit board detects angular movement of the rotating motor shaft or actuator screw and converts this signal into an absolute linear position signal.

The electronic position sensors EPS 02 and EPS 06 are typically integrated into the actuator’s accessory housing “A” mounted on the opposite side of the motor drive shaft.



EPS 06 in rear housing type A1

If the actuator is equipped with additional auxiliary equipment such as a hand wheel, etc. the electronic position sensor can also be mounted in the lateral accessory housing “D” located at the coupling housing that connects the actuator power screw with the drive motor.

The EPS 02 and EPS 06 boards are preset by the factory. The original setup parameters are stored in an RDF (RACO Data File) for each actuator. Field adjustments to the stroke length and/or end-of-stroke limits of the actuator need to be documented prior to the exchange of the EPS 02 and/or EPS 06.

### Safety and Operating Instructions

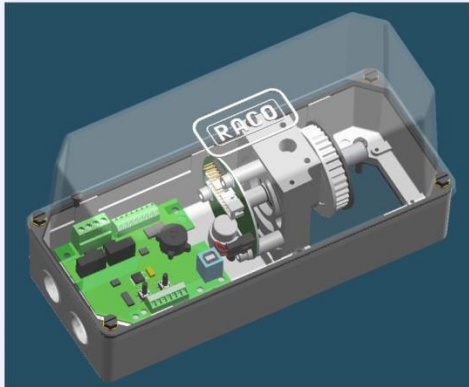
Before starting any service, repair, disassembly, or other work, please familiarize yourself with the installation conditions. Study the electrical drawings, in particular, the voltage level and power requirements. Compare the nameplate serial number of the actuator with the serial number of your installation drawings so that they match. Observe all applicable Occupational Safety and Health Act (OSHA) requirements during installation, operation, maintenance, and/or service of the supplied RACO electrical actuators. In particular, observe the lockout and tag-out procedures. All electrical power must be securely disconnected before performing any work on the actuator. Please be reminded that stored energy may be present. Secure all hanging, spring loaded or otherwise possible shifting equipment. Failure to do so can cause harm, injuries, or death, and/or damage to the equipment.

#### WARNING

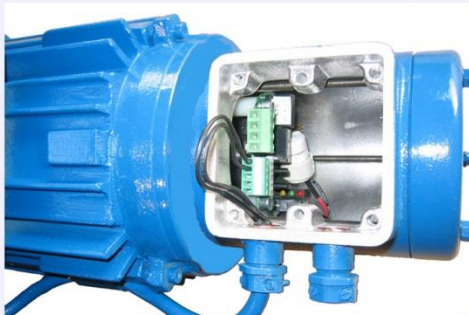


### Required Tools

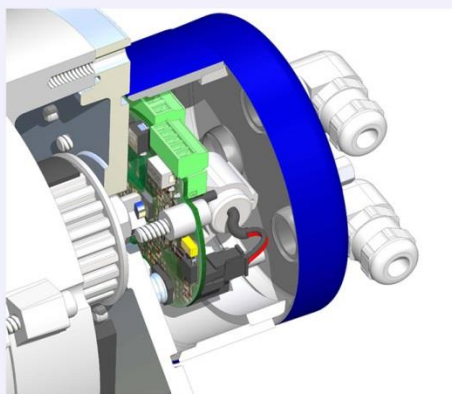
- Hand tools
- Laptop
- TTL to USB com. cable (EPS02)
- USB communication cable (EPS06)
- RACO Tools Software Version 1.8.7
- XXXXX.RDF RACO Data File
- Documented field adjustments
- Joint sealant (if applicable)
- Measuring tape (if applicable)



**EPS 06 Mounted in Lateral  
Accessory Housing “D”**



**EPS 02 Mounted in “A” Housing**



**EPS 02 Mounted on “C” Housing**

### Replacing the EPS 02 or EPS 06

Before beginning, please verify that all power has been shut off and all precautions have been taken to secure the actuator as described in the “Introduction” and “Safety and Operating Instructions.” Make certain that all “Required Tools” are handy before proceeding. Additionally, record the last actual stroke position to be capable of reestablishing an accurate stroke position after the exchange.

If the last actual stroke position is unknown, determine if the actuator can be manually returned into the fully retracted position to establish the physical zero position. If possible, proceed with disassembly. If this is not possible, then measure the distance between the center of the clevis pin to the center of the trunnion pin and deduct the applicable “a3 Dimension.” This is not the most accurate way to reestablish the previous absolute position. Caution has to be taken during startup of the actuator.

### Disassembly:

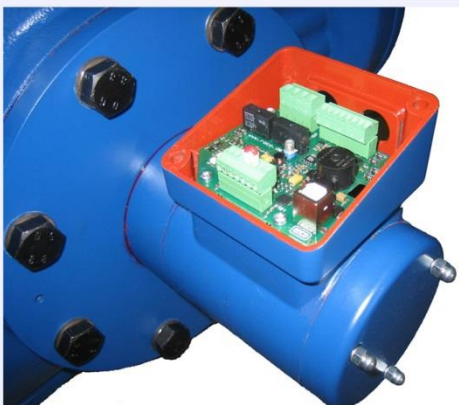
1. Remove Cover on D-Box or Fasteners on A1, A or B Housing and slide A1, A, B Housing over the board(s).
2. Remove Cable Connection Plugs. Please see chapter “EPS 02 Connection” or “EPS 06 Connection” for additional details.
3. Unplug battery.
4. Do not remove Bearing Block or Timing Belt in D-Housing.
5. Do not remove or adjust Lock-Nuts to keep spacing between board and the rotating magnet unchanged.
6. Unbolt the board(s) from the frame.
7. Physically inspect the board(s) for obvious damage.
8. If obvious damage is found (water intrusion, burned components, physical damage, corrosion, etc.), then try to rectify situation before installing new device.
9. If you have additional questions please consult RACO International, L.P. at [raco@racointernational.com](mailto:raco@racointernational.com)

### Reassembly:

1. Reinstall the EPS 02 or EPS 06 at its original place.
2. Fasten Lock-Nuts with hand tool until tight.
3. Check alignment and spacing between magnet and sensor board. Ensure that a 1mm to 2mm clearance gap is present between the board and the magnet.
4. Reconnect new battery.
5. Reconnect cable connection plugs. For reference please see chapter “EPS 02 Connection” or “EPS 06 Connection.”
6. Reassemble (as required) A1, A, B housing.
7. Reestablish 24V DC control power only to the EPS 02 or EPS 06 to function.
8. The red, yellow, green LED on the EPS 02 or EPS 06 board will start to blink in a sequential order. This indicates that the 24V DC supply power was shut down and that the battery voltage was too low or the battery power had been removed.
9. Connect the appropriate laptop communication cable to the USB port on the laptop and to the designated communication port on the EPS 02 (USB to TTY RS232) or EPS 06 (USB).
10. Power up laptop computer and start “RACO Tools 1.8.7” or higher.
11. Establish communication between the laptop and the EPS 02 or EPS 06. If you have any difficulty, please see chapter “Installation and Help in Case of Connection Problems” and/or “Connection Problem Trouble Shooting.”
12. By pressing the “Set Zero Position” the LED lights should stop blinking, and only one LED should remain illuminated.

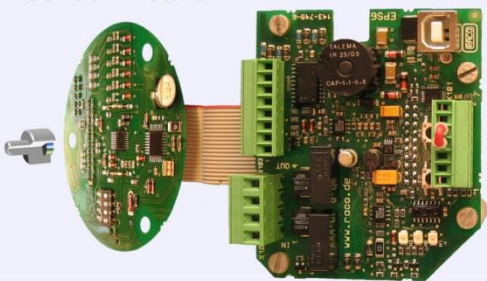


**EPS 06 Mounted in Rear Accessory Housing “A1”**



**EPS 06 Mounted on Right Angle Gearbox Size 11**

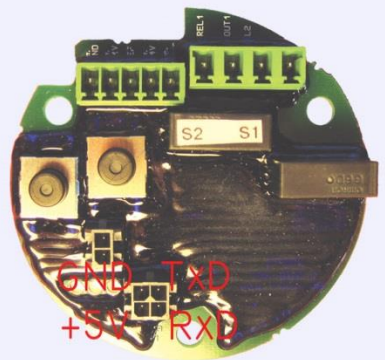
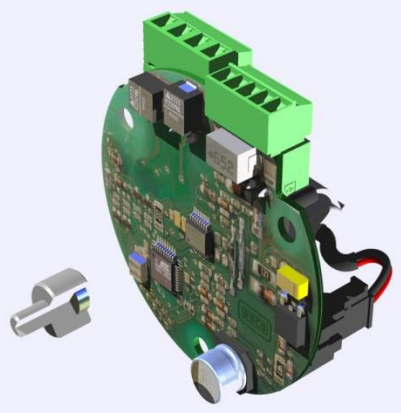
**EPS 06 Sensor Board**



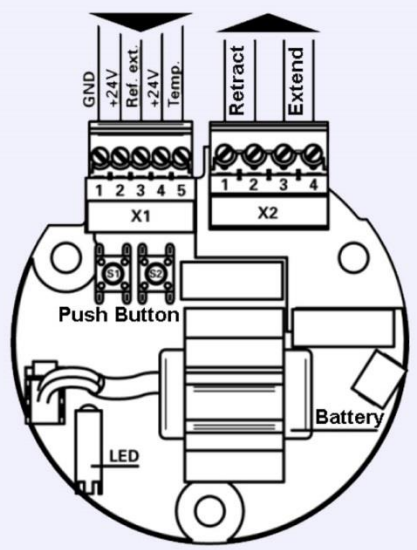
**EPS 06 Expansion Board**

13. If the EPS 02 or EPS 06 board is correctly aligned, the “Sensor Misalignment” indicator on the RACO Tools on the Cylinder Setting Tab screen should be gray.
14. Reload the RACO Data File (XXXXX.RDF) into the RACO Tools software and hit the “Send Parameter Block” button on the screw.
15. Make any adjustments to the parameters of the previously filed startup document.
16. If the last actual stroke position was recorded, refer to chapter “Mid Stroke Position Setting Instructions” and continue with step 19.
17. If the actuator can be manually returned to the fully retracted position, which is the old physical zero position, click the “Set Zero Position” a second time and continue with step 19.
18. If this is not possible, perform physical measurement and refer to chapter “Mid Stroke Position Setting Instructions.”
19. Recheck all parameters and then download final parameters into the EPS 02 or EPS 06.
20. Store final copy of parameters on your laptop.
21. Disconnect communication cable.
22. Check seals on D-Box and/or A1, A, B housing.
23. If joint sealant was used, reapply joint sealant on prepared surfaces.
24. Tighten nuts and bolts on cover.
25. Remove any bracing and apply main power.
26. Observe end-of-stroke shut-off in the retracted and extended position.

# EPS 02



**TTL Communication Plug Layout**



**- EPS 02 Circuit Board Layout**

The EPS 02 is equipped with a four-pole pluggable X2 connector for the limit switch output relay contacts and a five-pole pluggable X1 connector for the 24V DC power supply, external limit switch, and the motor thermal switch. For the physical layout please refer to the connection diagram.

**Power Supply Connector X1**

- Pin 1 GND
- Pin 2 +24V DC
- Pin 3 External reference switch
- Pin 4 Aux 24V DC supply
- Pin 5 Motor-over-temperature switch

**Relay Contact Plug**

- X2 pin 1+2: Limit retract
- X2 pin 3+4: Limit extend

Note: If the 24V DC supply power is turned off, both relay output contacts will open up.

**Technical Data EPS 02**

EPS 02 Power supply requirement:  
 Voltage: 24V DC  
 Range: +20% / -30%  
 Current: 50 mA

Output relay contact:  
 Max voltage: 250V AC @ 1A  
 30V DC @ 1A

Digital input:  
 Voltage level: 24V DC  
 Range: +20% / -30%

Motor-over-temperature protection:  
 Input Type: Thermal Switch

Position accuracy: Stroke length /  
 10 Bit \* RPM on sensor shaft

Data Storage  
 Duration: 10 Years  
 Battery: Lithium 1.2Ah

Operating temperature: -40° F to 185° F  
 Protective rating: IP 00, circuit board sealed  
 Enclosure: Without

Connector: Pluggable terminal connection  
 Interface: TTL Level RS232

**LED Display**

The operating status of the EPS 02 will be indicated via three on-board LEDs.

LED yellow:  
 LED is on steady if the actuator is in its selected stroke range. The LED is off if the actuator has reached its retracted end position or the external limit switch signal is on.

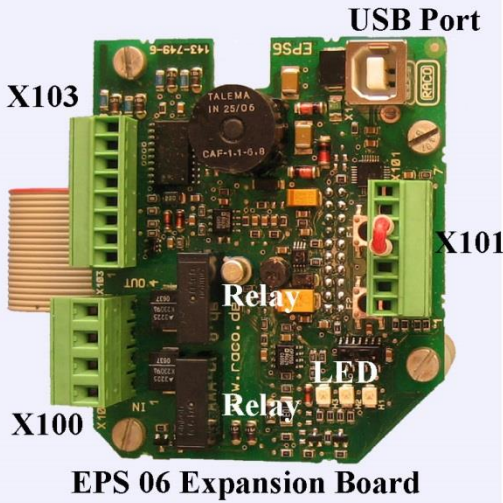
LED green:  
 LED is on steady if the actuator is in its selected stroke range. The LED is off if the actuator has reached its extended end position.

LED red:  
 LED is on steady if the motor over temperature switch is open or not connected. The LED is flashing if the rotating motor axis has an offset to one side or another.

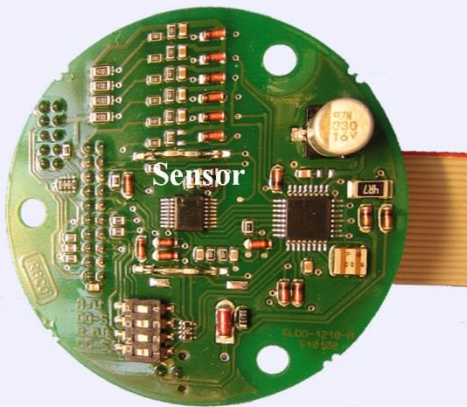
If all LEDs are flashing in the rotating order yellow, green, red the printed circuit board is not mounted properly. As a result, the distance between the magnet on the rotating shaft may be too large or too small or not pointing to the center of the sensor. The mounting of the printed circuit board should be checked. Without proper mechanical adjustment the board is not operational; therefore, a reliable function of the limit switches cannot be guaranteed.

Further LED display patterns are described in the below manual setup procedure.

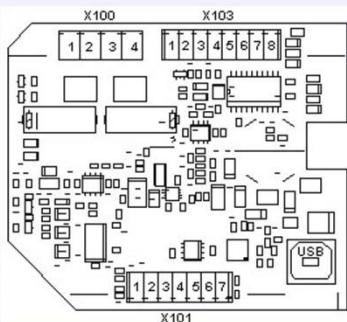
# EPS 06



**EPS 06 Expansion Board**



**Sensor Board**



**Expansion Board Layout**

## EPS 06 Connection

The EPS 06 is equipped with a four-pole pluggable X100 connector for the limit switch output relay contacts, and a seven-pole pluggable X101 connector for the 24V DC power supply, external limit switch, the motor thermal switch, and two binary input signals identifying the forward / reverse stroke direction. The eight-pole pluggable X103 connector provides the four additional open collector limit output signals and the 0-20mA / 0-10V absolute position signal. For the physical layout please refer to the connection diagram.

## Power Supply Connector X101

- Pin 1 Time delay extend
- Pin 2 Time delay retract
- Pin 3 External reference switch
- Pin 4 Aux 24V DC supply
- Pin 5 Motor-over-temperature switch
- Pin 6 GND
- Pin 7 +24V DC

## Relay Contact Plug X100

- X100 pin 1+2: Limit retract
- X100 pin 3+4: Limit extend

Note: If the 24V DC supply power is turned off, both relay output contacts will open up.

## Binary & Analog Output Plug X103

- Pin 1 Signal ground
- Pin 2 Signal ground
- Pin 3 Analog output current loop
- Pin 4 Analog output voltage
- Pin 5 Stroke limit output 3
- Pin 6 Stroke limit output 4
- Pin 7 Stroke limit output 5
- Pin 8 Stroke limit output 6

## LED Display

The operating status of the EPS 06 will be indicated via three on-board LEDs.

### LED green:

LED is on steady if the actuator is in its selected stroke range. The LED is off if the actuator has reached its retracted end position or the external limit switch signal is on.

### LED yellow:

LED is on steady if the actuator is in its selected stroke range. The LED is off if the actuator has reached its extended end position.

### LED red:

LED is on steady if the motor over temperature switch is open or not connected. The LED is flashing if the rotating magnetic sensor axis is not in line with the stationary circuit board sensor head.

If all LEDs are flashing in the rotating order yellow, green, red the stationary circuit board sensor head is not mounted properly. As a result, the distance between the magnet on the rotating shaft may be too large or too small or not pointing to the center of the sensor. The mounting of the printed circuit board should be checked. Without proper mechanical adjustment the board is not operational; therefore, a reliable function of the limit switches and the analog output signal cannot be guaranteed.

## Additional Technical Data EPS 06

Current: min 50 mA, max 600 mA

Dependent on Output Configuration  
Four Open Collector Output Channels:  
24V DC; max 100mA, short circuit protections

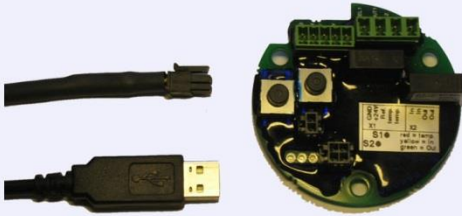
Two Analog Output Channels:  
0-10V DC; max 5mA or 0(4)-20mA  
Resolution: 10 Bit

Four Digital Inputs:  
Voltage Level: 24V DC  
Range: +20% / -30%

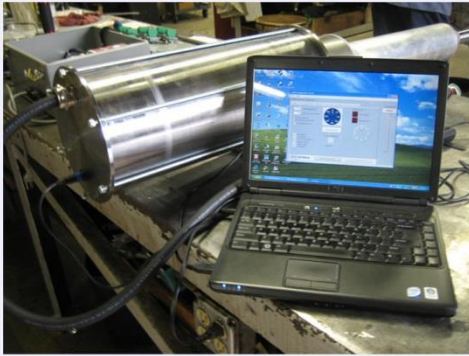
### Stroke Direction:

- Two Aux. contacts reversing starter
  - Motor-over-temperature protection: Thermal switch
  - External limit: Proximity or position switch
- Position accuracy: Stroke length / 10 Bit \* RPM on sensor shaft

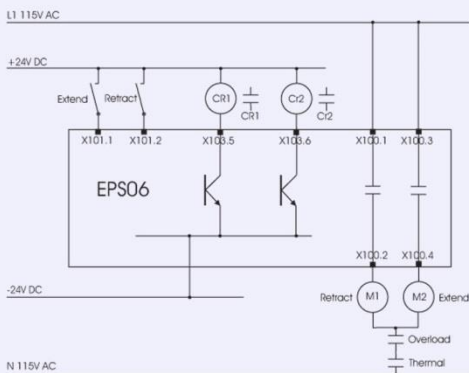
Interface: Optical isolated USB Port



**EPS 02 with TTL to USB Communication Cable**



**External EPS 02 Setup via IP68 plugable TTL to USB Connection Cable**



**EPS 06 Thrust Overload Schematic**

### Installation and Help in Case of Connection Problems

The latest version of the RACO Tools setup software can be downloaded in the form of a ZIP file from the RACO website [www.racointernational.com](http://www.racointernational.com) under Products / Actuator Accessories / Electronic Limit Switches. Download the ZIP file and store the content in a separate folder. Extract the file with all subfolders. To install RACO Tools onto your laptop, double click the Setup.EXE file under administrative privileges. Please be advised that with Microsoft Windows operating systems Vista and Windows 7, user rights have been changed. To install the RACO Tools software the user has to be logged in properly with administrative rights. After starting the "setup.exe" software with the right mouse click and selecting in the pull-down menu the setting install as administrator, the RACO Tools software will be installed hereafter automatically. Follow the instructions during setup.

After installation of the RACO Tools software, please check the connectivity between your laptop and the EPS06 Electronic Position Sensor. Power up the EPS 06 with a 24V DC power supply and connect the USB ports with an appropriate USB cable. Start the RACO Tools application program via the icon or the start program menu.

The connection is made successfully if the LED symbol next to the text COM X Connection in the upper left-hand corner of the main cylinder setting screen changes from red to green.

### Connection Problem Trouble Shooting

The most common problem is the incorrect selection of the COM Port. With the EPS 06 connected and powered up, please check under Control Panel / System / Hardware / Device Manager / Universal Serial Bus Controllers that the communication driver CP210x USB Composite Device is loaded. Now click on Ports (COM & LPT). The CP210x USB to UART Bridge Controller should be loaded and be pointing to the selected COM port number. Use this COM port number in conjunction with the RACO Tool software. In the main RACO Tools desktop window, select the Setup pull-down command / Comport, which will open a popup screen. Under "Please choose COM-Port" select the assigned COM port number and click OK. The LED symbol should change to green. COM port numbers should be single digit.

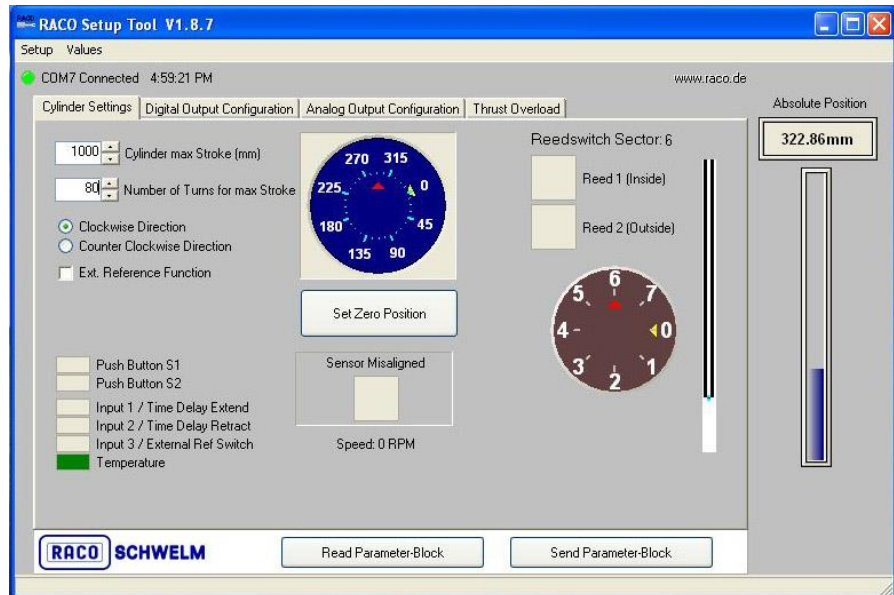
If after the USB connection cable is plugged both the laptop and the ESP 06, and the CP210x USB Composite Device is not loaded in the device manager's screen, then the communication driver has to be installed manually. Please select the subfolder USB and the appropriate driver subfolder based on your laptop's operating system. Find the file PreInstaller.exe and execute that program. Follow the instructions of the driver. Please make sure that you have administrative rights.

There may be other vendor programs installed on your laptop that may bind the UART Controller to a driver program during startup even if the main program is not launched. These programs are typically programs that rely on a serial connection to talk to an external device. One remedy is to uninstall that particular program or use a different laptop.

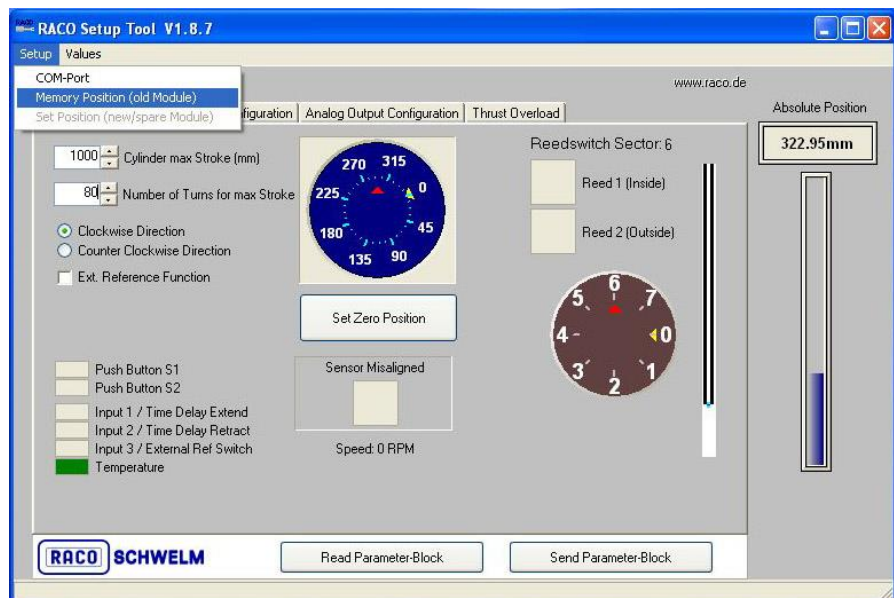
### Mid Stroke Position Setting Instructions

Connect your laptop with the appropriate connection cable to the EPS 02 or EPS 06. Start the RACO Tools application software Version 1.8.7 or higher. Under the “Setup” pull-down menu select the “Com-

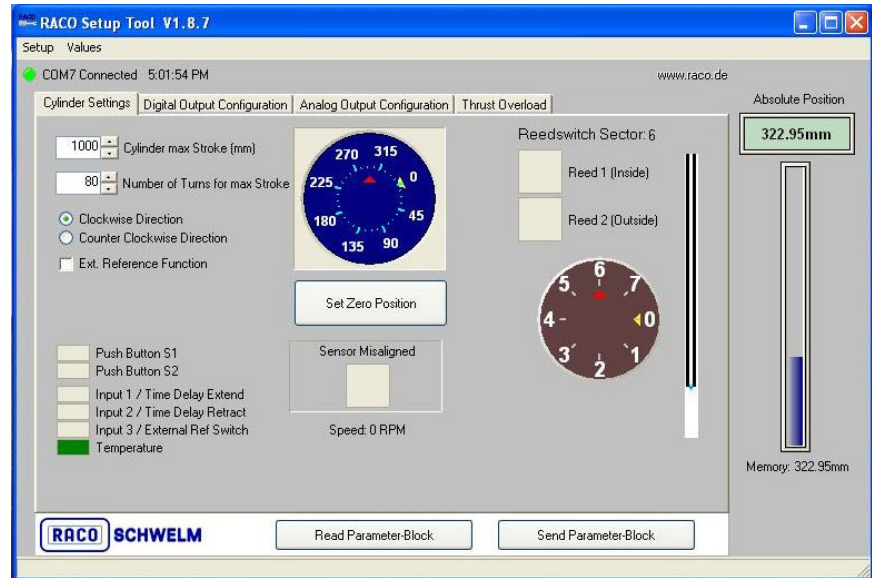
Port” selection. If the connection is made the indicator light below the “Setup” pull-down menu will change from red to green indicating the selected com port.



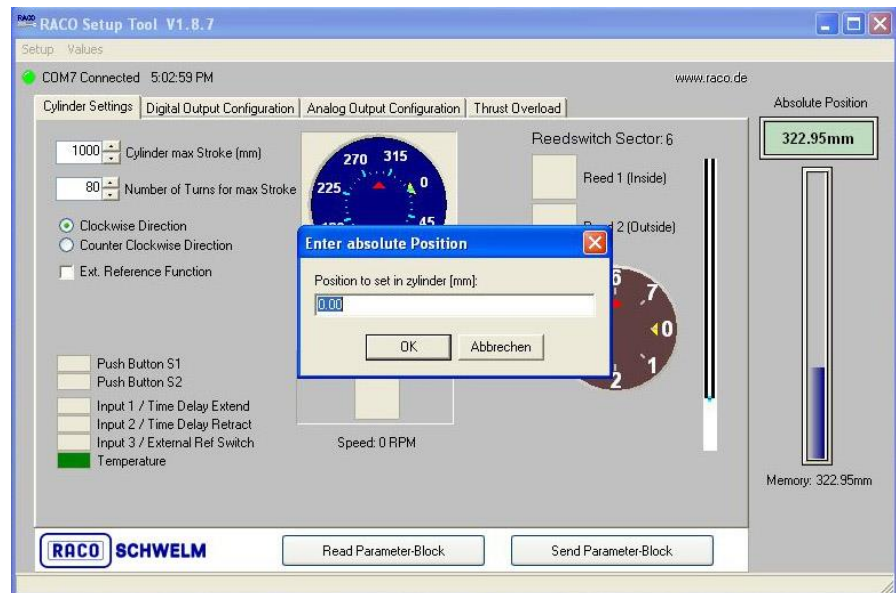
Under the “Setup” pull down menu select the “Memory Position (old Module)” selection.



Underneath the “Absolute Position” bar found on the right-hand side of the screen, the “Memory Position Field” will appear.

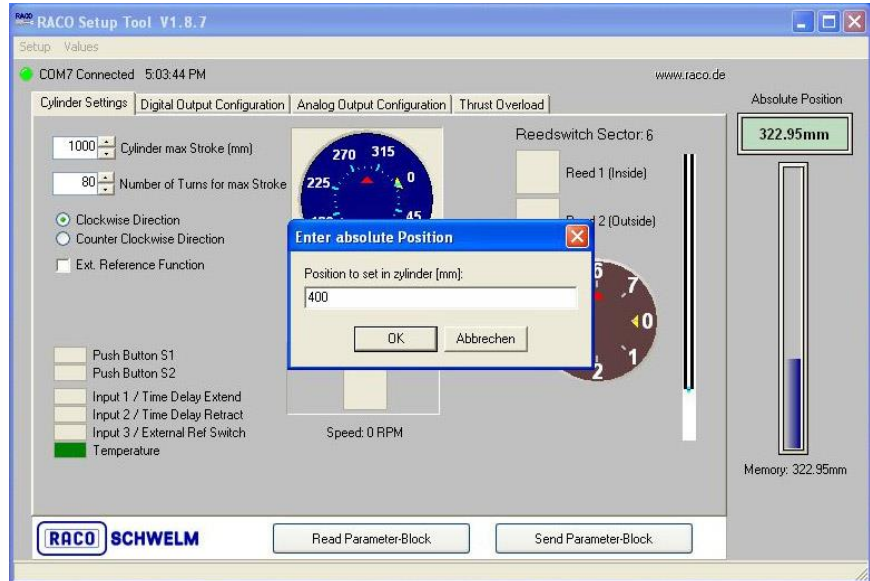


Point the cursor to that field, and by right-clicking on your mouse a popup box will appear on your screen.

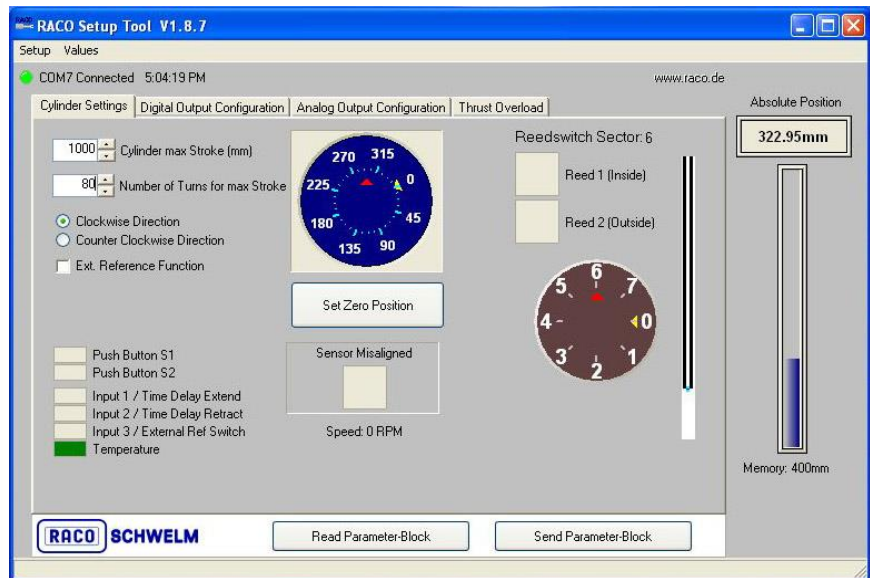




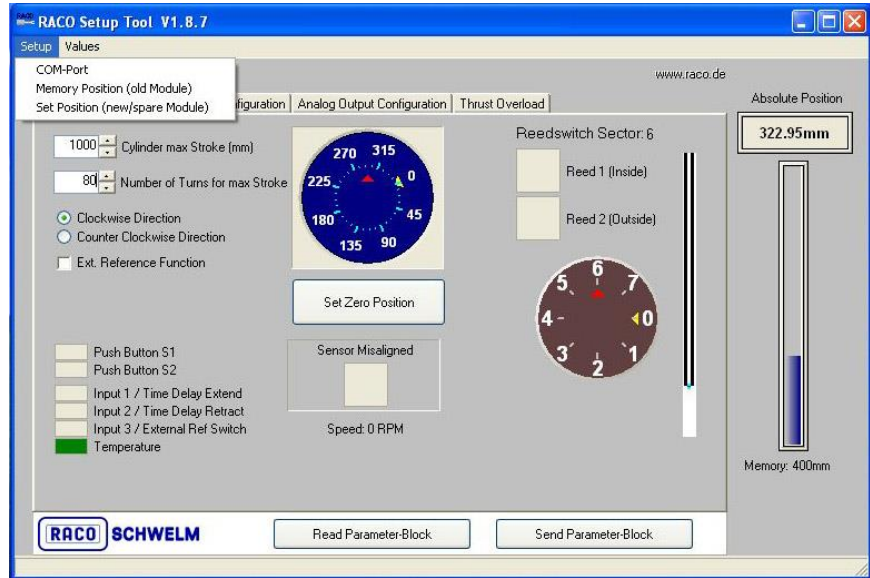
Enter the actual stroke position in (mm) into that field and then click the “OK” button.



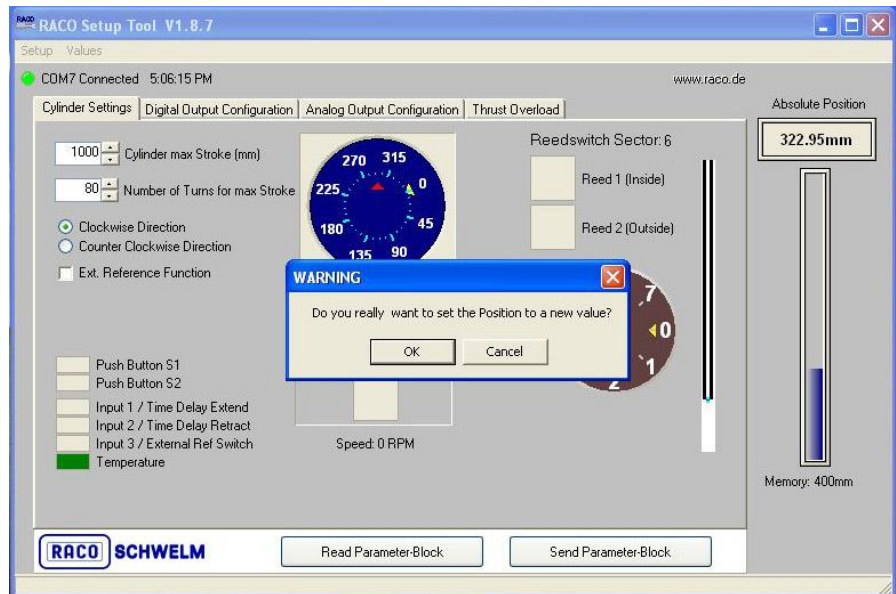
The new stroke position will appear next to the text “Memory.”



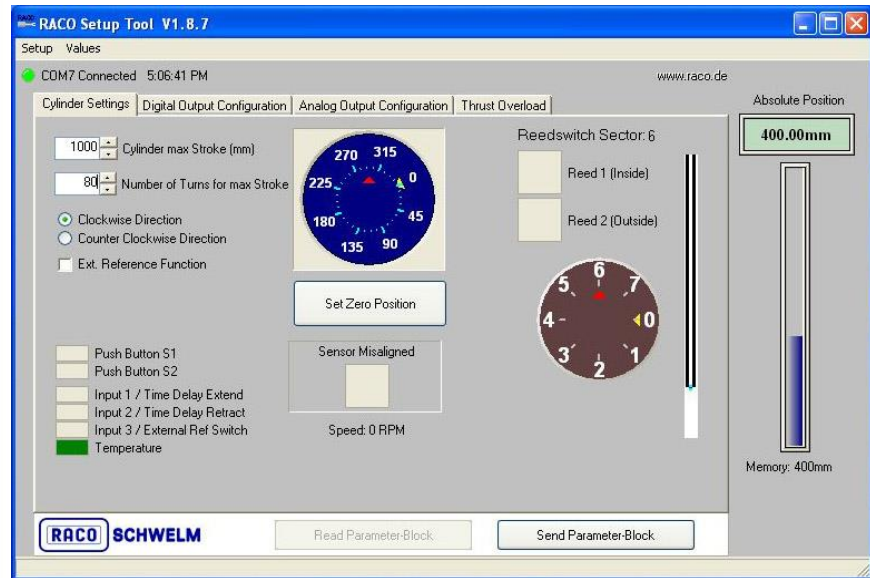
Under the “Setup” pull-down menu select “Set Position (new/spare Module)”.



A WARNING pop-up box will appear to validate the previous position entry. If the entered position value is correct click the “OK” button.



The new position value will appear now in the upper “Absolute Position” value. Any position movement of the actuator will be tracked as an absolute measurement from here on. With the first detected movement on the absolute encoder the field color will change from green to gray.



You have successfully reestablished your actuator absolute position.

### a3 Dimension

Size	a1	a3
4	12.99"	a1 + Stroke Length
5	13.98"	a1 + Stroke Length
6	18.50"	a1 + Stroke Length
7	21.46"	a1 + Stroke Length
8	22.83"	a1 + Stroke Length
9	26.77"	a1 + Stroke Length
10	35.83"	a1 + Stroke Length
11	41.34"	a1 + Stroke Length