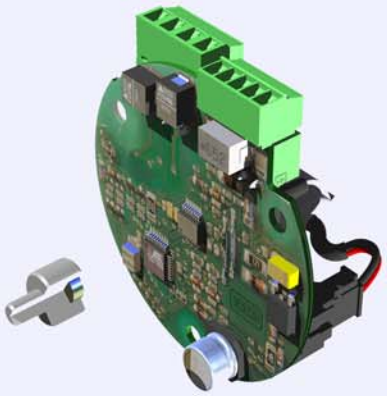
# EPS 02



- Electronic Limit Switches
- Very Accurate
- Easy to use
- Robust
- Dependable
- High Resolution
- Non Contact Measurement
- Wide Temp. Range

## EPS 02 Operating Instructions
## RACO Electronic Position Sensor

### Introduction

The RACO electronic positioning system EPS 02 has been especially designed for end of stroke limit switch detection in electro-mechanical linear actuators. The operating principal is based on a non contact coupling through a magnetic field. It detects angular movement of the rotating motor shaft or actuator screw in relationship to the stationary sensor on the printed circuit board and converts this signal into an absolute linear position signal.

EPS 02 in rear housing type A1

The electronic position sensor EPS 02 is typically integrated into the actuators accessory housing "A" mounted at the opposite side of the motor drive shaft.

If the actuator is equipped with additional auxiliary equipment like hand wheel, etc.. the electronic position sensor will be mounted in the lateral accessory housing "D" located at the coupling housing connecting the actuator screw with the drive motor.

EPS 02 in rear housing type G

In the EPS 02 the two end of stroke limits can be set via on board push buttons and / or the TTL level communication interface. In addition an optional external reference limit switch can be used. Three on board LED's will guide the user through the initial setup procedure and will function thereafter as operation control signals.

### Function

The EPS 02 consists of two potential free relay contacts, an input channel for the motor over-temperature switch, and the optional external reference limit switch.

### Motor Over-Temperature Switch

To protect the RACO actuator motor from overheating, for example from frequent starts and stops or excessive overloading of the actuator, the opening of the motor thermal switch will be monitored. If the motor thermal switch is wired into terminals X1 pin 4 and pin 5, both limit switch relay contacts will open up in the event of an over temperature. The red LED will blink on and off to indicate that condition.

### External Reference Switch

An optional external reference switch can be used to indicate the retracted position. The external device has to be a normally open limit switch or a PNP proximity switch. The switch will be connected between terminal X1 pin 3 and pin 4. In the mode external reference switch, the actuator will retract until the external switch is made. With the rising voltage edge at the input X1 Pin 3 the internal EPS 02 position reference point will be set to zero each time. The extended stroke limit position is defined by the stored stroke length and the above described zero position.
Make sure that the external reference switch is positioned in front of the

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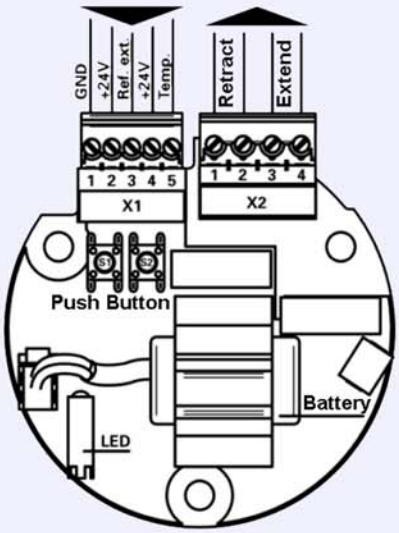


- EPS 02 Circuit Board Layout
- Pluggable Connections
- Manual Push Button Setup
- LED Indicator
- Backup Battery

mechanical limit of the actuator or the attached equipment. Failure hereof can cause mechanical damage of the actuator or the equipment. Please be advised that by moving the external reference switch the extended position will be moved as well by the same distance in the same direction. The stroke is stored as a fixed length with the zero position defined by the external limit switch.

**Connection**

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**

The five pole female connector is equipped with screw terminals for easy interface to customers control wires. Each terminal will accept one # 16 AWG wire.

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**

There are two potential free relay output contacts available to shut down the actuator. The contacts should be hard wired into the reversing motor starter or VFD control circuit to provide reliable end of stroke protection. Within the permissible stroke range of the actuator the contacts are closed. Relay output contact landed on terminal X2 pin 1+2 will be opened if the selected retract position is reached or if 24V DC on the external reference switch input X1 pin 3 is present. Relay output contact landed on terminal X2 pin 3+4 will be opened if the selected extend position is reached.

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 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: +/- 1% of stroke

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

**LED Display**

The operating status of the EPS 02 will be indicated via three on board LED's.

LED yellow:
LED is on steady if the actuator is in its selected stroke range. The LED is off if

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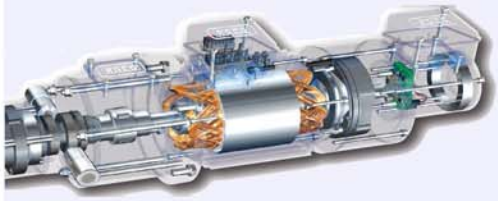

**EPS 02 Mounted in "A" Housing**

**EPS 02 Mounted in "A" Housing**

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 LED's 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 can not be guaranteed.

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

**Manual Setup Procedure**

The EPS 02 limit switch function can be configured via the two onboard push buttons. This is only necessary during startup or maintenance of the actuator if end of stroke limits have to be changed or if changes to the working condition, mounting position or operational changes have to be made.
In general the push buttons have fixed functions.

Push button S1 is used to advance from one function to the next.
Push button S2 is used to select the value in each of the selected function.

There are two settings which can be made independent from each other:

1) Setting of the end of stroke position in the retracted position and
2) Setting of the end of stroke position in the extended position

Please find below the manual set up procedure to adjust the retracted and extended end of stroke position.

Note: The EPS 02 comes factory preset with the maximum stroke length and a safety limit on both sides. As well the actuator dependant settings for clock wise or counter clock wise operation, and the activation of the external limit switch function.

To activate the manual setup mode both push buttons S1 & S2 have to be simultaneously pushed down for more than 8 seconds. To acknowledge entering the manual setup mode all three LED's will flash at the same time. Release both push buttons at the same time and the yellow LED will remain flashing and the green and red LED will turn off. You are now in mode 1.

**Mode 1**
**Adjustment retracted position:**

Note for units with external limit switch: As mentioned before, do not make any adjustments in mode 1 if the unit is configured for an external limit switch. Always start out with the desired retracted position since this is your reference point for the setting of the stroke length.

If no adjustment to the retracted position is required, go to the section "Change to Mode 2".

If adjustments are required the actuator should be jogged to the desired retracted position. To store the value of that position hold down the push button S2 for 0.5 to 1 seconds.

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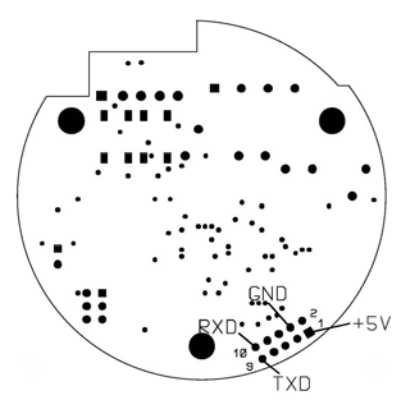
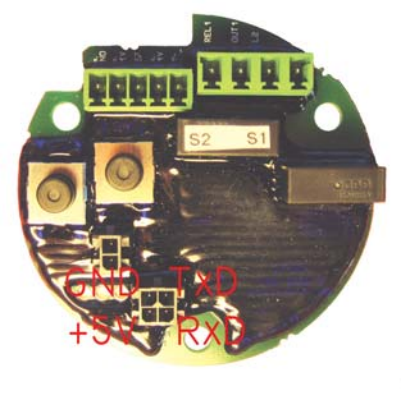



**Pin Layout for EPS02 with double Row 10pin square Post Connector**




**Pin Layout for EPS02 with 4 pin connector**


**RACO Galvanic Isolated TTL to RS232 Signal Converter**

If a previously stored value for the retract position does not allow you to jog to the new desired retracted position, hold down the push button S2 for longer than one second. The retracted limit switch function is now disabled. Pay close attention to the physical end limits of the actuator and as well the attached equipment.
To store the value of that position hold down the push button S2 for 0.5 to 1 second.

### Change to Mode 2

Press push button S1 for 0.5 to 1 second. The LED pattern will change to a flashing green LED and the yellow LED will turn off.

### Mode 2
### Adjustment extended position:

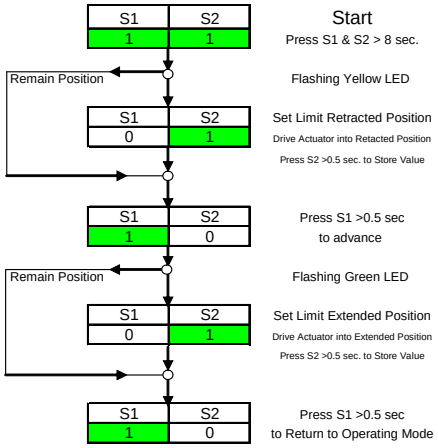
If no adjustment to the extended position is required go to the section "Change to Operating Mode".

If adjustments are required the actuator should be jogged to the desired extended position. To store the value of that position hold down the push button S2 for 0.5 to 1 seconds.
If a previously stored value for the extended position does not allow you to jog to the new desired extended position, hold down the push button S2 for longer than one second. The extended limit switch function is now disabled. Pay close attention to the physical end limits of the actuator and as well the attached equipment.
To store the value of that position hold down the push button S2 for 0.5 to 1 second.

### Operating Mode

Hold down the push button S1 for 0.5 to 1 second. The LED pattern will change to its normal operational condition. See above "LED Display" section.

### Manual Position Setting Diagram




Yellow LED ON: Actator in operating stroke limits
Yellow LED OFF: Actator in retracted position

Green LED ON: Actator in operating stroke limits
Green LED OFF: Actator in extended position

Red LED ON: Motor over temperature or thermal switch not connected

Red LED Flashing: Check the axes between the magnet and the sensor
Red, Yellow, Green LED in rotational order: Check distance and allignment

### TTL Level Communication Interface

The EPS02 is equipped with a TTL level communication interface. To connect the unit to a standard RS232 interface, a signal converter is required. It is strongly recommended, especially in non laboratory environments, to use a galvanic isolated converter to protect the RS232 serial or USB port of your laptop or computer from transient voltage spikes or other magnetic fields which can be introduced into the connection cable. The 10 pin square post connector as well as the 4 pole plug connector provide the +5V to power up the optically isolated side of the converter. The other side of the converter will be powered up by the RS232 or USB port of the laptop or computer.

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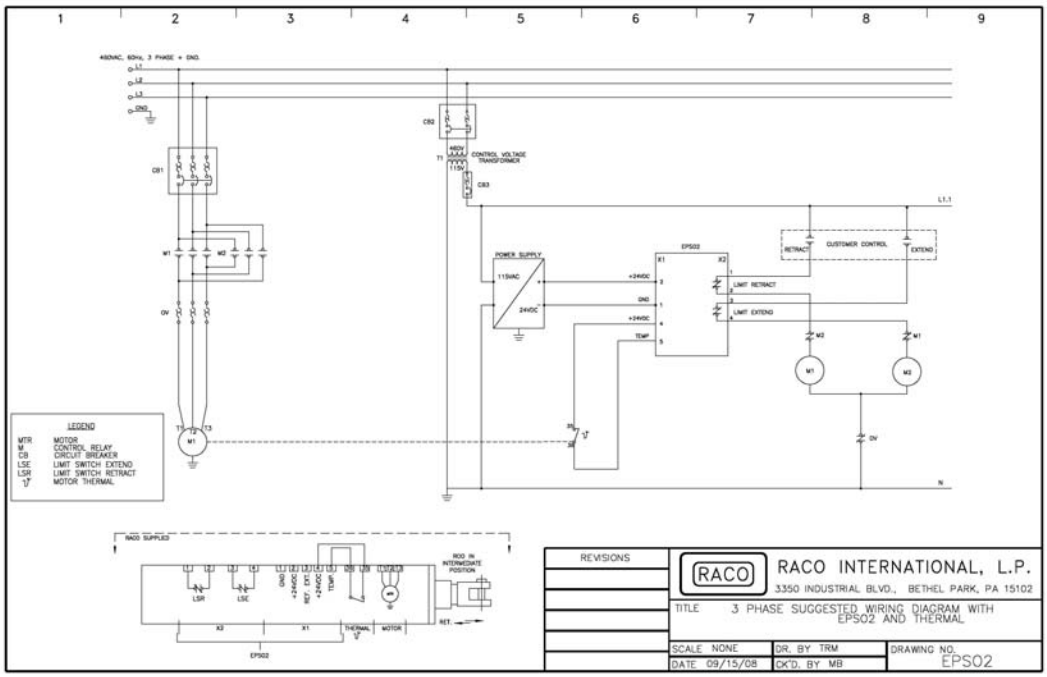
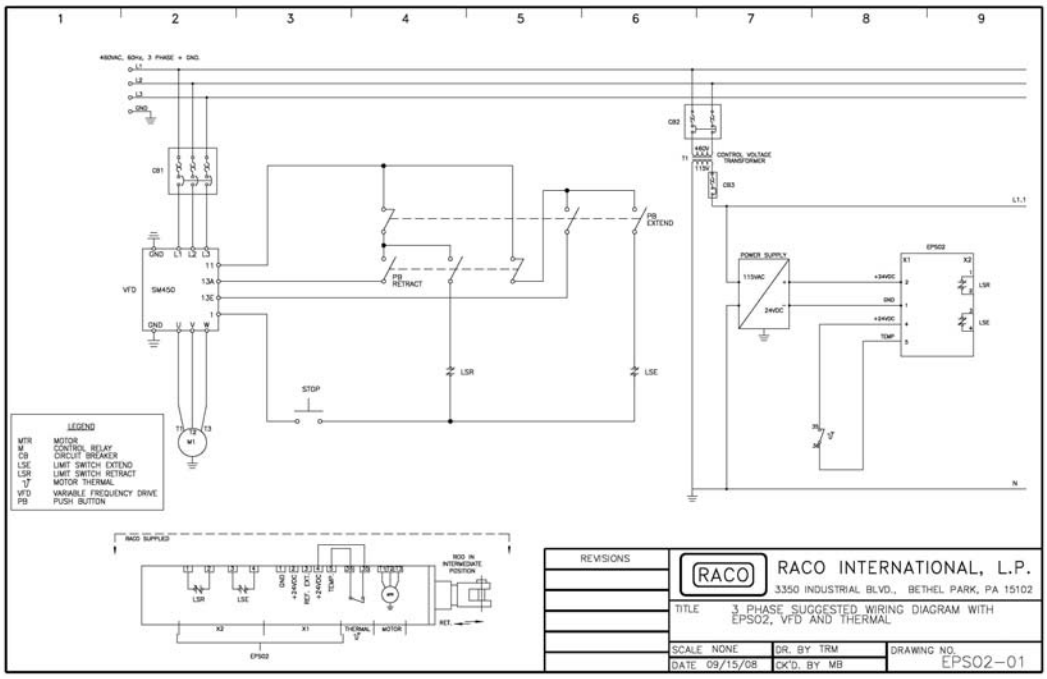
# EPS 02

## Wiring Diagram

## Examples




The EPS 02 limit switch contacts are hard wired into the reversing motor starter circuit.




The EPS 02 output signals are wired as permissive signals into the control circuit of a variable frequency drive.