REGASENSE®

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Installation Manual

RCL40, RCL41 & RCL41P

Inductive cylinder sensor with

RCL41 & RCL43

Control box

Regal

Introduction

Intended use

Regasense RCL40/41 sensors are designed to be installed in hydraulic cylinders with the purpose of absolute linear positioning.

This manual shall be read together with the data-sheet.

Used symbols

⚠ General attention

Safety instructions

Installation and commissioning shall be performed by technical personnel with appropriate training and expertise. Whom are trained in the field of applicable automation technology and installation, commissioning and/or service operations of the hydraulic cylinder in use.

If sensor failure or malfunction can cause injury to person or damage to property, design the system with additional safety measures to prevent injury or damage.

Storage instructions

The sensor must be stored in a dry environment within the temperature range specified in the da-tasheet. The sensor shall not be under mechanical stress that can cause damage to the sensor rod.

Correct storage prior too installation is necessary to ensure proper function.

Warranty

Regal Components AB grants warranty according to Nordiska leveransbestämmelser (NL09) in applicable areas or Orgalime S2012. Warranty is not provided for defects due to improper use, storage or excessive stress on the product.

Warranty is not provided if the product has been modified. No repairs are allowed, in event of sensor mal-function contact Regal Components AB.

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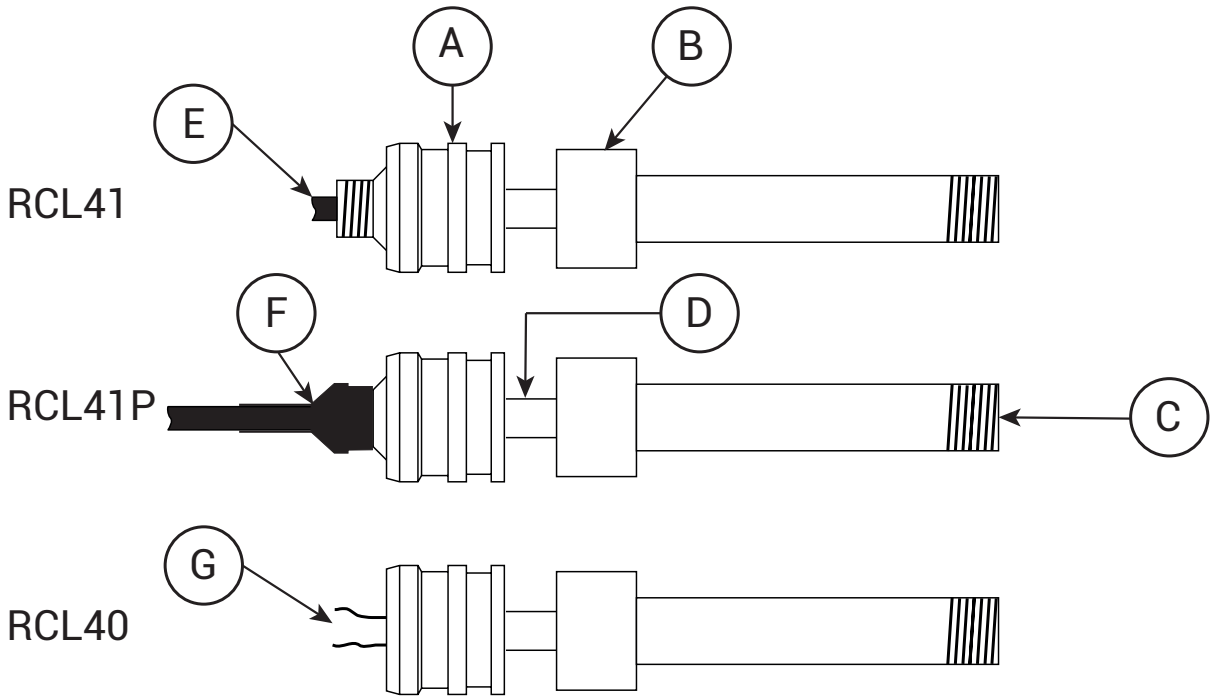
Product description

Part design



Sensor body

A. Sensor header
B. Flange sensor tube
C. Sensor tube
D. Sensor rod
E. PUR cabel output
F. PUR cabel seal
G. Wire output

Inductive technology

Regasense RCL40 and RCL41 are inductive linear sensors and the sensors are based on the eddy current principle. The sensor tube is mounted in the piston of the cylinder and the sensor rod contains a coil. The sensor will detect the change in inductance that is proportional to how much of the sensor rod is in the sensor tube.

RCL40 and RCL41 sensors require an RCL-controller to operate. The RCL40 and RCL41 sensor probe can be used with both variants of controller, so a RCL40-sensor can be used with a RCL41-controller and vise versa. However the controller is calibrated for a specific stroke length according to the product configuration code.

Scope of delivery

RCL40 or RCL41 sensor with installation accessories:
- 1 pcs support ring
- 1 pcs o-ring
- 2 pcs wave spring washer
- 2 pcs retaining ring

RCL43 controller
RCL41 DIN controller

Sensor and control box are sold separate.

Accessories

Additional accessories, not included in the standard scope of delivery are connectors and cables.

Connectors 6140 is a pressure sealed M12 connector suitable when the installation is not pressure sealed at the sensor header or/and when the hydraulic cylinder is exposed to extremely harsh environment requiring a hermetically sealed connector. 6140 suits wire sensors (RCL40) and require soldering

Connector 6160 is an M12 connector with IP67 protection suitable for applications with pressure seal at the sensor header. 6160 require no soldering and can be used with sensors with wire connection (RCL40). When RCL40 is used with 6160 connector, the sensor and connector must be ordered together as the crimp contacts for the connector are mounted from factory.

Shielded PUR sensor cables with overmolded M12-connector are available in different lengths.
More information on the different connectors and cables are availible in the datasheets.

Installation of sensor rod

Pre-installation checklist

Make sure that there is no damage to the sensor.

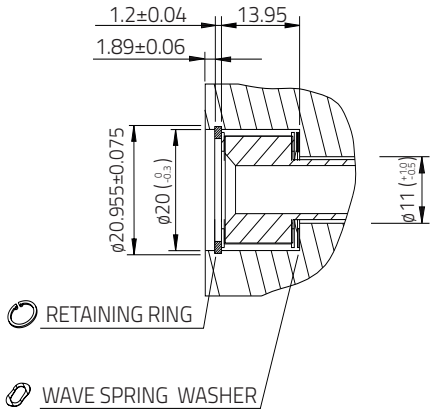
- The sensor rod and tube shall be straight and intact without dents and scratches.
- The sensor header shall be intact.
- Make sure that the electrical connection is in good condition. Wires shall be firmly attached to the back-side of the header and the cable jacket shall be intact.
- Installation accessories shall be in good condition.

⚠ The drilling dimensions in the cylinder must be within specified tolerances. Otherwise there is risk of malfunction and/or vibration can cause increased wear.

Inspekt the controller so the casing, electronic connection etc. is in good condition, free from damage and contamination such as liquids or dirt.

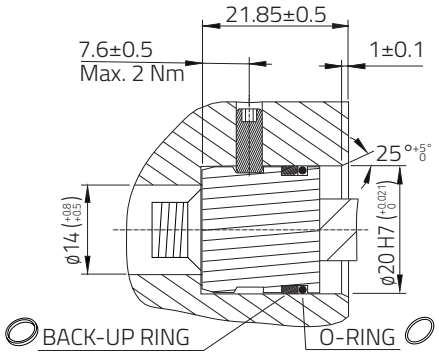
Installation of sensor tube

1. Place the wave spring washer in the mounting hole in the piston.
2. Mount the sensor tube in the piston.
3. Fix the sensor tube with the retaining ring.

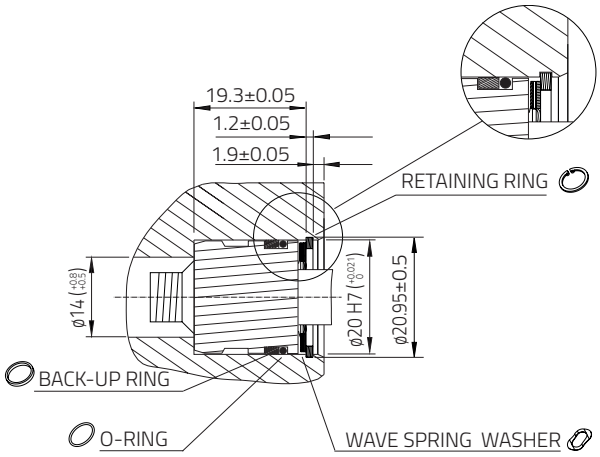


Installation of sensor rod

1. Mount the o-ring and and back-up ring on the sensor header according to drawing below.
⚠ Do not install the senor rod without o-ring and back-up ring. The sensor is not designed for hydraulic pressure on the backside of the sensor header.
2. Feed the sensor wires or cable thru the drill hole in the cylinder body to the location where the connector or cable gland shall be mounted. This step may vary depending on the design of the cylinder.
⚠ Make sure that the wires are free from mechanical stress. Do not pull in the wires/cable to pull the sensor in place.
3. Mount the sensor firmly in place.
4. Fix the sensor in position:
   a. By a M4 flat pointed set-screw. Recommended tightening torgue < 2 Nm. Seal the set screw with suitable sealing compound. ⚠ The force from the hydraulic pressure shall apply on the back side of the sensor head against the cylinder body, the set-screw shall not hold this force.
   b. Or use the retaining ring: Place the wave spring washer on the header and then install the retaining ring.
5. Install the electric connection:
   a. RCL41: It is recommended to install RCL41 sensors with a cable gland through the cylinder.
   b. RCL40: Connect the wires to a suitible connector. Recommended options is 6140 or 6160 and follow the instructions in this manual. When RCL40 is used with 6160 connector, the sensor and connector must be ordered together as the crimp contacts for the connector are mounted from factory.



Installation using set screw



Installation using retaining ring

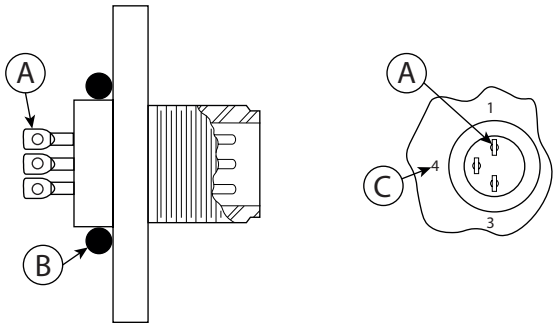
Installation of connector 6140

1. Place o-ring on connector. Recommended o-ring: 14 x 1,78 mm NBR70. Not included in scope of delivery.
2. Cut the sensor wires to suitable length.
3. Place heat shrink tube on the wires.
4. Strip 10 mm of the wires and twist them in place in the pins of the connector. See connection in table below.
5. Solder the joints.

⚠ Soldering shall be done by personnel with proper training.

6. Heat the heat shrink wires in place over the solder joints.
7. Mount the connector in place.

⚠ Make sure that the wires are free from mechanical stress.



A. Solder pins
B. O-ring
C. Pin number

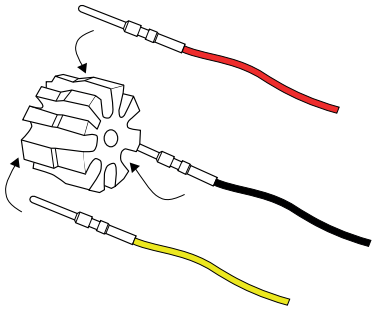
Electrical connection 6140		
Solder pin	Sensor wire	Function
1	Red	Ib
3	Black	Vb
4	-	

Installation of connector 6160

⚠ 6160 connectors can only be used when the sensor is pressure sealed at the header.

6160 consists of crimp contacts, splice ring, contact carrier and flange housing. When a RCL40 sensor is supplied with 6160 connector the crimp contacts is crimped to the sensor wires from factory.

1. Assemble the crimp contacts with sensor wire to the splice ring. Connection shown in table below.
2. Attach the contact carrier.
3. Insert the o-ring into the groove on the housing.
4. Slide the contact carrier in the housing until they snap together.
5. Mount the assembled contact to the cylinder. Recommended tightening torgue 0.3-0.5 Nm.



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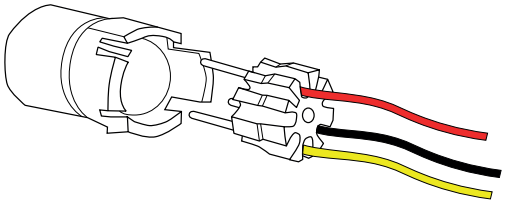

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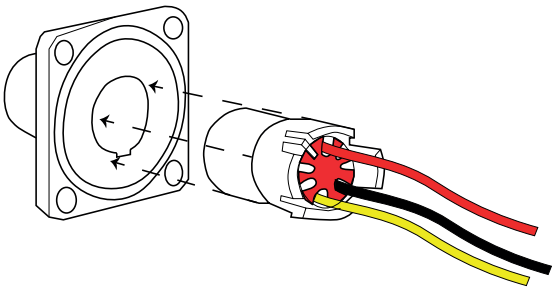

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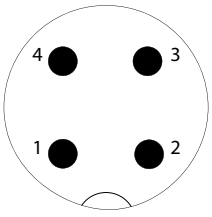
* Note wires is not colour coded in above drawings. Follow connection in table.

Electrical connection 6160		
Connector pin	Sensor wire	Function
1	Red	Ib
2	-	
3	Black	Vb
4	-	



Pin connection, view plug side

Installation of control box

General information

Both RCL40 and RCL41 sensors can be used with both RCL41 and RCL43 control boxes. Choose the control box best suited for your application. RCL41 control box is designed for DIN mounting and RCL43 control box is designed with a sealed aluminium housing. The controller can be placed up to 50 meters away from the sensor.

⚠ Do not supply power to the controller until all wires or cables are connected properly for selected output. Connect the wires from the sensor, power supply and 0V as well as choosen output configuration before the power is switched on. Find the schematic under the instructions for each controller.

⚠ Always use shielded cables to connect the sensor probe and keep in mind that the cable shield on RCL41 and RCL41P sensor is connected to the header of the sensor. That may cause damage if there is a potential difference between the location of the sensor and the grounding point of the cable shield.

To ensure proper EMC-performance:
- The shield of the sensor should be connected to an EMC-cable gland when entering the cabinet in which the controller is placed.
- The sensor wires inside the cabinet should be kept as short as possible.
- If the cabinet contains EMC-noisy equipment there may be need to EMC-protect the wires and the control box.

RCL41 - DIN Controller box

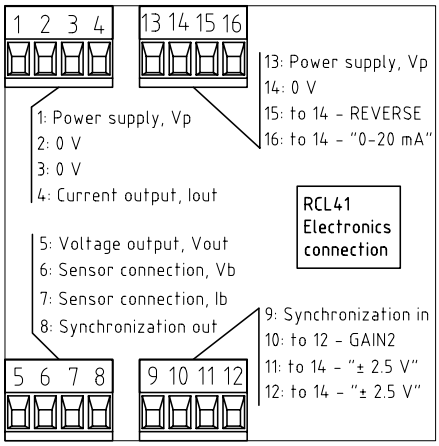
Connect the control box and sensor according the schematic figure and choose preffered output configuration.

Output signal and jumper settings
The controllers have two parallel outputs; current and voltage. There are various options for output signals depending on how the controller is installed, if no jumper setting is used the standard factory setting is:

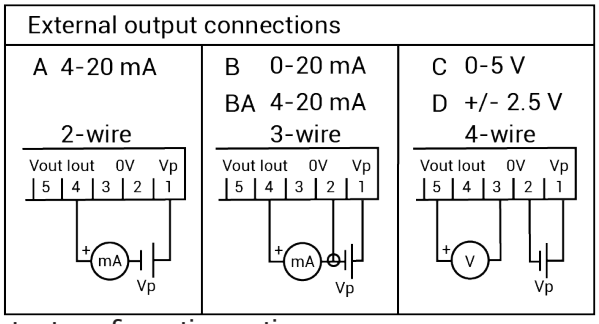
- Increasing output when the piston is moving away from the sensor head.
- Terminal 4: 4-20 mA
- Terminal 5: 0-5 V

The output can be configured by adding jumper wires to special terminals on the controller according to the table.

0-10 V output
It is possible to achieve a 0-10V output from the system. This require a 500 Ω temperature stable resistor.
- Place a jumper to select 0-20mA output, see table and schemtic for instructions.
- The resistor should be installed between terminal 4 and 0V. For best EMC-performance place the resistor at the receiving end of the signal (for instance at the PLC). By doing this the signal is transmitted using a noise resistant 0-20 mA signal. The voltage over the resistor is 0-10V.



RCL41 DIN Control box terminals



Output configuration options

Jumper settings		
Terminal	Terminal	Function
15	14	Reverse output
16	14	0-20 mA output
10	12	Gain x2
11 or 12	14	Output -2.5...+2.5 V

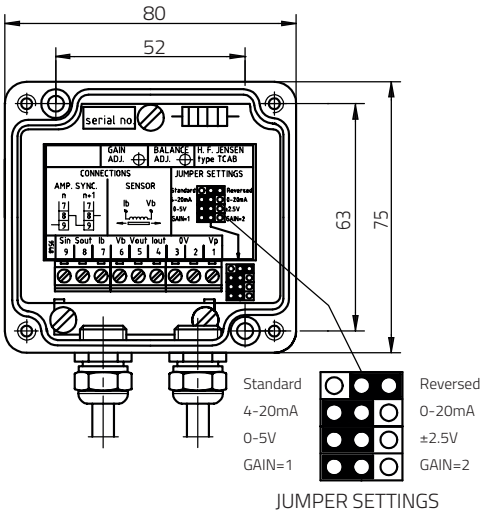
RCL43 - Aluminum Controller box

Connect the control box and sensor according the schematic figure and choose preffered output configuration.

Output signal and jumper settings
The controllers have two parallel outputs; current and voltage. There are various options for output signals depending on how the controller is installed, if no jumper setting is used the standard factory setting is:

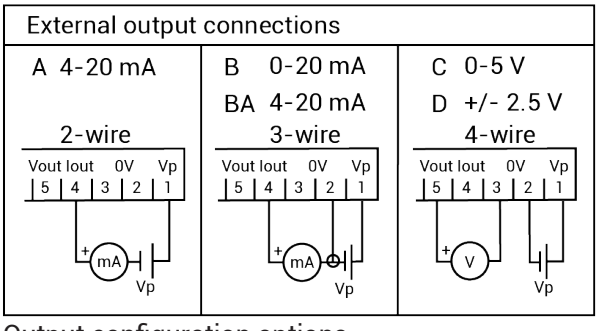
- Increasing output when the piston is movin away from the sensor head.
- Terminal 4: 4-20 mA
- Terminal 5: 0-5 V

The output can be configured by adding jumper wires to special terminals on the controller according to the figure.



RCL43 Control box terminals

0-10 V output
It is possible to achieve a 0-10V output from the system. This require a 500 Ω temperature stable resistor.
- Place a jumper to select 0-20mA output, see table 4 and schemtic for instructions.
- The resistor should be installed between terminal 4 and 0V. For best EMC-performance place the resistor at the receiving end of the signal (for instance at the PLC). By doing this the signal is transmitted using a noise resistant 0-20 mA signal. The voltage over the resistor is 0-10V.



Output configuration options

Comissioning

Check that the controller and sensor are connected properly. ⚠Do not supply power to the controller until all wires or cables are connected properly for selected output.

The sensor probe and the control box are calibrated before shipment. The output should be checked before and after mounting and is adjustable as described below.

Adjusting / trimming the output

A shorter electrical stroke is possible by adjusting on the controller, maximum 10-15 % on each end. Before adjusting the output check that the jumper settings are in the right position for the desired output.

Output adjustment using the mid-position

This approach to adjusting the output require a way to move the piston to the center of its movement (mid-position). I some cases that can be difficult, in that case use adjustment by end positions as described below.

1. Move the piston rod to its mid-position (half of the desired stroke length).
2. Adjust on the screw "BALANCE" until 50 % of the output is achieved, for example 12 mA on 4-20 mA output.
3. Run the piston rod to the desired inner position. Adjust with the screw "GAIN" until 0 % of the output (or 100 % if reversed).
4. Check that output at outer position is 100 % and repeat if necessary.

Output adjustment using the end positions

If the mid-position is impossible to find accurately the following procedure may be used instead. This way of output adjustment requires some calculations and a calculator is recommended.

1. Move to inner position and adjust the BALANCE until the target value 0% of output is reached (or as close to the target value as possible in case it can't be reached).
2. Move to outer position and note the measured value. Adjust the BALANCE until the signal is half-way to the target value. Example: target value is 20.00 mA in outer position and the measured value is 19.00 mA. Then adjust the BALANCE screw until the value is 19.5 mA.
3. Still at outer position, adjust the GAIN screw until the target value has been reached.
4. Move to inner position to check that the value still match the target value for that position. If further adjustment is necessary repeat the steps above until the signal is correct.

Troubleshooting

This system is very robust and does usually work for many years of constant operation. However if there is a problem use this guide to troubleshoot if there is a sensor or controller malfunction.

⚠ Note that repairs is not allowed. Contact Regal Components AB in case of malfunction.

Sensor
The sensor is simply put a winded coil. Its DC-resistance, which can be measured with a multimeter tool, is therefore constant and independent of the position. To check the sensor for error measure the resistance and check that it is in the range of 9 – 100 Ω. Also check that there is insulation between the sensor wires and the shield or ground of the system.

Control box
If a system is malfunctioning with a sensor that has been tested according instructions above, then it is probably the controller that is failing.

It is also possible to check that the communication with the sensor works as it should, but this requires an oscilloscope. With the system running; attach the oscilloscope parallel to the port 6 and 7 at the control box, same as the two wires from the probe are attached.
- When measuring the DC voltage it should be around 20-40 mV depending on stroke.
- When measuring the AC voltage it should be around 50-300 mV and 5 kHz.