

**RCx-Lx-xxxAx-8.09**  
 (12-24 VDC; Linear Drive; 4-20 mA Control)  
**CSA/IECEX Rated\***

**USER MANUAL**

*Contents*

<b>INSTALLATION</b>	<b>2</b>
Mounting	2
Wiring	2
<i>Wiring for Explosion Proof Actuators</i>	2
<i>Wiring for Non-Explosion Proof Actuators</i>	3
Power Supply and Current Draw	4
Control Signal and Feedback	4
<b>OPERATION</b>	<b>5</b>
DIP switches	5
Controlling the Actuator	5
<i>Changing the stroke length</i>	6
Thrust Settings	7
<i>Speed and Thrust Details</i>	7
Signal Loss and Calibration	8
Troubleshooting	9
<b>EXPLOSION PROOF CERTIFICATIONS</b>	<b>10</b>
<b>ACTUATOR DIMENSIONS</b>	<b>11</b>
<b>PART NUMBER BREAKDOWN</b>	<b>12</b>
<b>LABEL BREAKDOWN</b>	<b>13</b>



**\*Only model numbers:  
 RCx-Lx-BxxxAx w/ ex-proof  
 lid engraving (p.10)**

# INSTALLATION

## Mounting

The holes indicated in the image are intended for a mounting bracket. They are threaded for ¼-20 and are 0.4” deep.

The other two visible holes are threaded 10-32, 0.50” deep, and are intended to be used to lock the lid in position with screws.

For detailed dimensions see p.11.



## Wiring

### Wiring for Explosion Proof Actuators



The **RCx-Lx-BxxAx** Explosion-Proof actuator does **not** come with a pre-installed cable, nor cable gland. A cable gland that meets site specifications for the appropriate hazardous location rating is required for installation. The cable gland and the cable for hazardous location should be installed by qualified personnel in accordance with site and local requirements.

The actuator comes standard with a ½” FNPT thread cable entry. See p.11 for location of ½” FNPT housing access. A cable with 5 wires is required; it is recommended to use 16-24 AWG for all wires.



### Standards for cable gland and cable in hazardous locations:

Compliance Standards Required to be Met	Cable Types Permitted in Class I Division 1 Hazardous Locations
ANSI / UL 514B, ANSI / UL 1203, ANSI / UL 2225, C22.2	Non-Armored Extra Hard Usage Cord & TC-ER-HL
ANSI / UL 514B, ANSI / UL 1203, ANSI / UL 2225	Armored IEEE 45 & IEEE 1580 Marine Shipboard Cable
ANSI / UL 514B, ANSI / UL 1203, ANSI / UL 2225	MC-HI, ITC-HL
ANSI / UL 514B, ANSI / UL 1203, C22.2	Teck 90 (Canada Only)

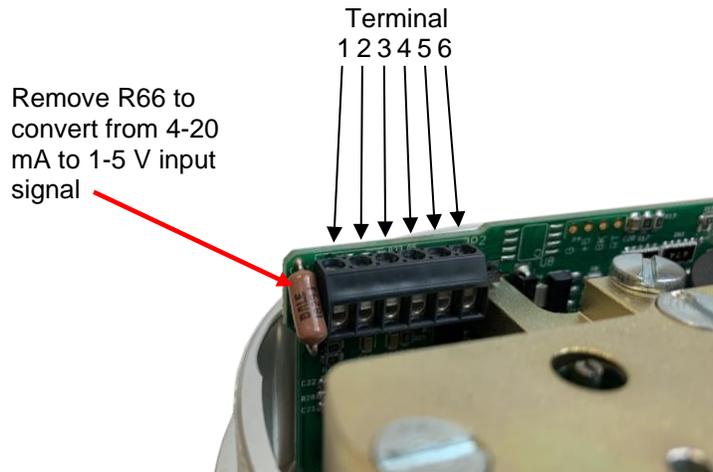
\* In explosion-proof models, the FNPT thread is not intended for conduit connection. Cable gland only.

Once the cable and cable gland are installed, connect the wires to the pins on the terminal block as indicated here:

Pin	Function
6	+24VDC
5	Power gnd.
4	Feedback signal (4-20 mA)*
3	<i>Not connected</i>
2	Isolated** input signal gnd.
1	Isolated** input signal (4-20 mA)

\* “feedback” available in RCx-Lx-xxxAF version only.

\*\* “isolated” available in RCx-Lx-xxxAI and xxxAF versions only.



### Wiring for Non-Explosion Proof Actuators

The actuator comes standard with a Turck 5-position connector and a 20’ cable (5x 22 AWG) with plug. Cut the cable to the length required, then connect according to the following wire color schematic.

Pins indicate the connection of the cables to the terminal block on the PCB board within the actuator. These are pre-wired at the factory for non-explosion proof actuators.

#### Wire color schematic for “Turck 5” cable:

Pin	Colour	DC power supply only
6	White	+24VDC
5	Black	Power gnd.
4	Grey	Feedback signal (4-20 mA) *
3		<i>Not connected</i>
2	Brown	Isolated** input signal gnd.
1	Blue	Isolated** input signal (4-20 mA)

\* “feedback” available in RCx-Lx-xxxAF version of actuator only

\*\* “isolated” available in RCx-Lx-xxxAI and xxxAF versions of actuator only

## Power Supply and Current Draw

The RCx-Lx-xxxAx may be connected to voltages ranging within 12-24 VDC.

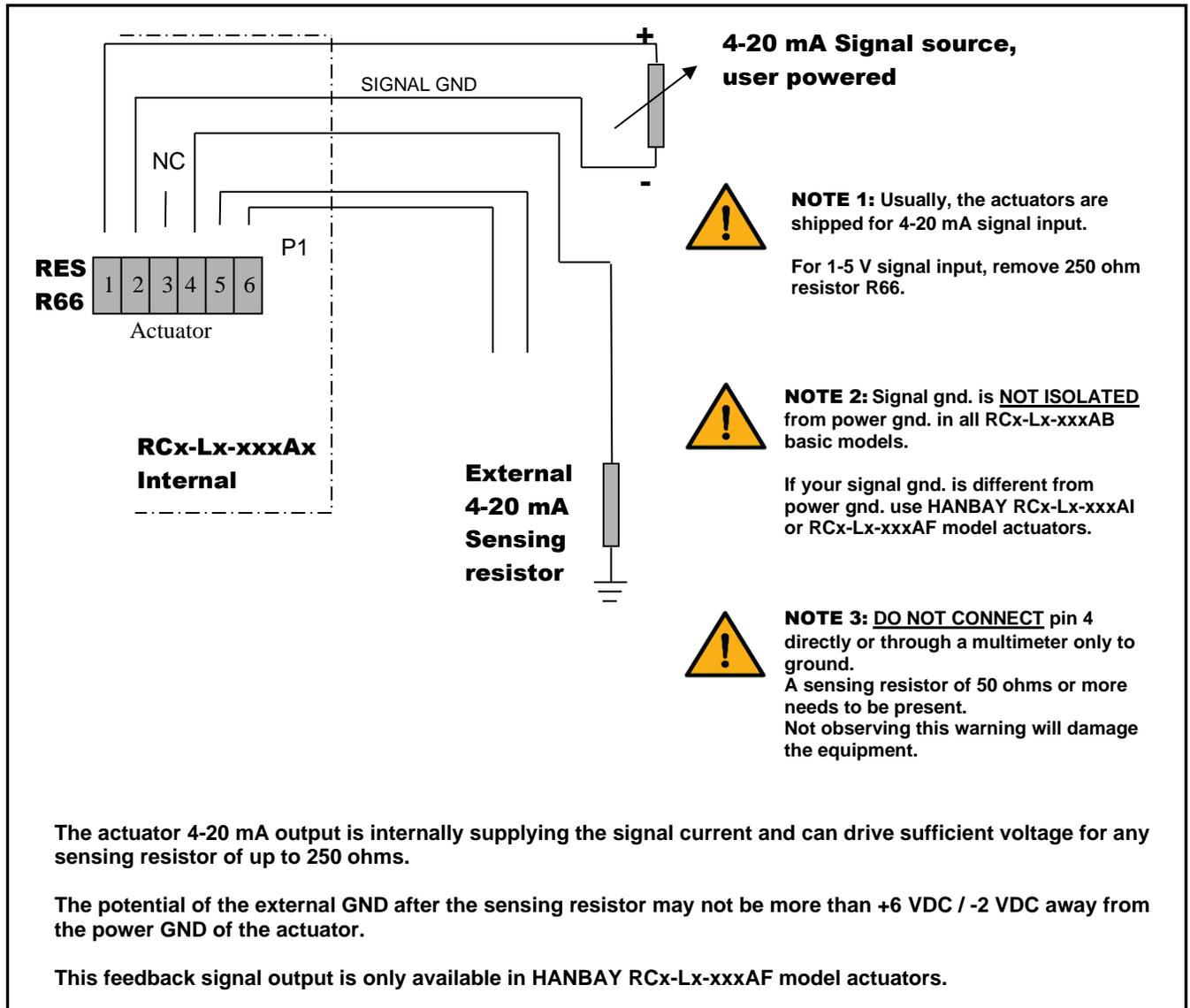
The current draw will range from minimum 100 mA to maximum 3 A while the actuator is active. When not moving, the actuator draws approx. 50 mA.



**Note:** Digital potentiometer functionality is disabled for supply voltages below 18 VDC, so the actuator position will not be retained on power-loss, on power-up the actuator will need to be re-zeroed every time.

## Control Signal and Feedback

Locate the correct connection terminals/wires as shown on the previous page, then connect your input signal on positions 1 and 2 (blue and brown wires) as shown below. Feedback, if applicable is connected to position 4 (grey wire).



## OPERATION

### DIP switches

The DIP switches allow you to change the settings on your actuator. To flip a switch, gently use a small flat-head screwdriver.

See chart on next page for DIP switch functionality.



In this example DIPs 1, 2, 5 and 12 are on.

DIP	Function
1	<b>Speed:</b> Choose how quickly the actuator will turn the drive wheel. See p.7.
2	
3	Not used.
4	<b>Stroke:</b> The actuator usually ships from the factory with the recommended stroke for the valve.
5	However, this value can be changed. Turning on a switch will add a specific amount of travel to the
6	actuator's stroke.
7	See p.7 for relation between position of the dip switches and stroke.
8	
9	<b>Signal loss:</b> See p.8.
10	<b>Seating thrust force:</b> Set how much torque the actuator exerts on the valve lever during the
11	calibration (finding valve seat) procedure. See p.7.
12	<b>Direction/Calibration:</b> Toggle switch on and off while powered to re-calibrate actuator (find valve seat). Also sets direction in which the actuator will open and close. See p.8.

Example: The RCM model actuator turns clockwise when the signal is decreased with DIP 12 in the OFF position. Putting DIP 12 in the ON position will cause counterclockwise turning for a decrease in signal. For changes in DIP 12 position to take effect, the power to the actuator must be cycled.

### Controlling the Actuator

The 4-20 mA (or 1-5 V / 1-10 V) input signal is proportional to the stroke of the valve.

#### Example:

You have an actuator with TPI = 16 (standard). Valve stroke is 0.75". You wish to move the actuator so the valve's position is 0.122" above the closed position:

$$0.122/0.750 = 0.163 \qquad 20 \text{ mA} - 4 \text{ mA} = \text{range of } 16 \text{ mA}$$

$$0.163 * 16 \text{ mA} = 2.608 \text{ mA} \qquad 2.608 \text{ mA} + 4 \text{ mA} = \mathbf{6.608 \text{ mA}}$$

To get 0.122" above the closed position, supply a signal of 6.608 mA to the actuator.

## Changing the stroke length

The standard HANBAY linear actuator (RCx-L1-xxxAx models) has a maximal stroke of 1", and has 16 threads per inch (TPI). With the DIP switch settings, the actual stroke can be adjusted between 0.0625" and 1" in 1/16" increments, as indicated in the table below.

Non-standard RCx-L2-xxxAx models have 8 TPI instead. The stroke of these actuator models can be adjusted between 0.125" and 1" in 1/8" increments.

Additional non-standard models with a maximal stroke of 2" & 4" are also available. For such models, use the same DIP switch settings as indicated below, and multiply the stroke by 2 or 4 (for both 16 & 8 TPI models).

16 TPI (RCx-L1 models):				
Total Stroke (DIP 4 = 0)	DIP 5	DIP 6	DIP 7	DIP 8
<i>reserved</i>	0	0	0	0
0.0625"	0	0	0	1
0.1250"	0	0	1	0
0.1875"	0	0	1	1
0.2500"	0	1	0	0
0.3125"	0	1	0	1
0.3750"	0	1	1	0
0.4375"	0	1	1	1
0.5000"	1	0	0	0
0.5625"	1	0	0	1
0.6250"	1	0	1	0
0.6875"	1	0	1	1
0.7500"	1	1	0	0
0.8125"	1	1	0	1
0.8750"	1	1	1	0
0.9375"	1	1	1	1

8 TPI (RCx-L2 models):				
Total Stroke (DIP 4 = 0)	DIP 5	DIP 6	DIP 7	DIP 8
<i>reserved</i>	0	0	0	0
0.125"	0	0	0	1
0.250"	0	0	1	0
0.375"	0	0	1	1
0.500"	0	1	0	0
0.625"	0	1	0	1
0.750"	0	1	1	0
0.875"	0	1	1	1
1.00"	1	0	0	0

\* Turn on DIP 4 **only** for 1.000" stroke.



**WARNING:** The stroke should not be set to exceed 1", otherwise the unit will stall. Also be sure that the stroke of the actuator is **LESS** than the stroke of the valve. The actuator should not stop itself on a fully opened valve. It can damage the valve, and the actuator will lose its position.

## Thrust Settings

To accommodate different valves and other applications with different thrust requirements, the actuator can be set to apply different amounts of force on the valve stem when in the seating mode.

During normal operation, the actuator will try to reach the speed set by DIP 1 and DIP 2. It will use 100% thrust to try and reach the selected speed, regardless of the positions of DIP 10 and DIP 11. Current draw is limited to 3 A regardless of settings.

### Seating power settings: (when operating at 24 VDC)

DIP 10	DIP 11	Power
OFF	OFF	16%
OFF	ON	33%
ON	OFF	66%
ON	ON	100%

To deal with sticking valves, at the beginning of the first reversing movement after the seating (“zeroing”) of the valve, the actuator will apply double the power set by DIP 10 and DIP 11 (up to 100% power.) This “pull out” function is always enabled.



**WARNING:** High power settings can supply enough thrust to damage your valve. Please be cautious, especially when using the 100% power setting.



**NOTE: 66% setting and 100% setting require voltage supply minimum values as follows:**

- Supply voltage needs to be min 14 VDC for 66% setting
- Supply voltage needs to be 16 VDC for 100% setting
- When operating above 20VDC and 66% power, Duty cycle is reduced to 50% - 25% maximum. At these levels, the electronics produce more heat which must be dissipated (depending on environmental temperature)

## Speed and Thrust Details

The maximum speed of the actuator can be set by using the first two positions of the **DIP switch selector**. As a result of this setting, the actuator will limit the maximum speed. The tables below show the time required for 1” of travel.

The seating thrust depends on the voltage provided in the power connection and on the seating power settings on DIP 10, 11 as shown below. The values shown are for a 24 VDC power connection.

### RCL-Lx-xxxAx Actuators

Speed:			
DIP 1	DIP 2	Seconds per inch	
		8 TPI	16 TPI
OFF	OFF	63	120
OFF	ON	32	64
ON	OFF	20	38
ON	ON	13	26

Thrust:			
DIP 10	DIP 11	Seating Thrust (lbs)	
		8 TPI	16 TPI
OFF	OFF	37	13
OFF	ON	83	44
ON	OFF	149	88
ON	ON	180	138
Running Thrust		200	175

**NOTE:** If actuator is RCJ-Lx-xxxAx, divide thrust values by 3.  
**NOTE:** If actuator is powered by 12 VDC, divide thrust values by 2.  
**To convert lbs to N, divide by 4.5.**

## RCM-Lx-xxxAx Actuators

Speed:			
DIP 1	DIP 2	Seconds per inch	
		8 TPI	16 TPI
OFF	OFF	189	360
OFF	ON	96	192
ON	OFF	60	114
ON	ON	40	78

Thrust:			
DIP 10	DIP 11	Seating Torque (lbs)	
		8 TPI	16 TPI
OFF	OFF	110	35
OFF	ON	245	128
ON	OFF	445	256
ON	ON	535	400
Running Thrust		600	517
<small>NOTE: If actuator is RCK-Lx-xxxAx, divide thrust values by 3.  NOTE: If actuator is powered by 12 VDC, divide thrust values by 2.  To convert lbs to N, divide by 4.5.</small>			

## Signal Loss and Calibration

1. **For actuators that are not connected to a UPS** (Uninterruptible Power Supply), the loss of signal will be simultaneous with power loss. Consequently, the actuator will not be able to move anywhere. In the shutdown process, the actual position is automatically saved to the internal EEPROM. [This saving of the position only happens for min. 18 VDC supplies] When power is restored, the actuator will “know” its location and will simply start to follow the signal as received.



**IF YOU HAVE TO** turn the actuator manually when its power is turned off, it will lose its position, and it will need to be re – zeroed (as described in sub-section 3).

2. **For actuators that are connected to a UPS** the behavior on signal loss can be set as follows:

**Normal position of DIP 9: OFF**

With DIP 9 in the off position, the actuator will ignore the signal if it is lost (i.e.: if the signal falls below 0.700 V or 2.80 mA) and simply remain in its current position.

**Note:** if the sensing resistor R66 is removed (for 1-5 V input signals), we recommend placing a 10K resistor between signal and signal GND.

**Predetermined signal loss position DIP 9: ON**

With DIP 9 in the on position, the actuator will move to a predetermined position when the signal is lost (i.e.: if the signal falls below 2.80 mA or 0.700 V).

Setting of the predetermined signal loss position:

- a.- turn DIP 9 to the “off” position
- b.- re-zero the actuator by sending and holding an input signal between 2.80 and 4.16 mA (0.700 and 1.04 V) wait until the device is re-zeroed, (i.e.: valve is closed)
- c.- by varying the input signal, move the actuator to the position that is going to be the predetermined signal loss position.
- d.- switch DIP 9 to the “on” position. The current actuator position will be saved as the default signal loss position. (The default signal position is an absolute actuator position, not a signal value.)

3. **Re-zeroing the actuator and initiating calibration routine:**

The actuator will re-zero when the input signal is between 2.80 and 4.16 mA (0.700 and 1.04 V). It will turn clockwise until the actuator has reached the fully closed position of the valve.

**If the valve is removed for any reason, the calibration routine must be initiated on the actuator manually.** This is done by toggling DIP 12 (switch position, then back to the original position) while the actuator is powered. This will prevent damage to the valve.

**If you need to re-zero in the opposite direction** (i.e.: for pressure regulators, which typically go to the “top” fully open position at 4 mA) change the setting of DIP 12 and cycle power.

4. **Feedback calibration: [RCx-Lx-xxxAF model actuators only]**

The current feedback will be calibrated from the factory.

**To re-calibrate the feedback:**

- a.- Turn off the actuator and disconnect the feedback and input signals. If possible, remove the actuator from the valve.
- b.- Connect the feedback signal to the signal input. Also connect the power and signal grounds.
- c.- Power up the actuator with this “signal loop-back” setup.
- d.- Short SP1. It will automatically run a special routine to calibrate the feedback signal to the signal input. The whole process takes about 1.5 seconds.
- e.- turn off the power and reconnect the actuator as normal.

## Troubleshooting

Upon noticing a problem, your first step should almost always be to recalibrate the actuator by toggling DIP 12 while the actuator is powered. This alone can solve basic problems. See sub-section 3 above for more details.

**If the actuator does not move, try following these steps:**

- 1) Re-calibrate the actuator. This will move the actuator regardless of what signal it is receiving.
- 2) A sticking valve may be the problem. Remove the valve from the actuator, and re-test the actuator.
- 3) Remove power. Re-check the wiring and the power/signal apparatus. Power actuator and re-calibrate. If the problem persists, please call Hanbay for technical support.

## EXPLOSION PROOF CERTIFICATIONS

Actuator model number: RCx-Lx-**B**xxAx

### IECEX

Standards & Editions:

IEC 60079-0:2017, 7th Edition  
IEC 60079-1:2014, 7th Edition

\*Serial number will be engraved on the lid.

### CSA

Standards:

Class I, Div 1, Groups B, C, D (T6)  
Class II, Groups E, F, G (T6)

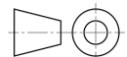
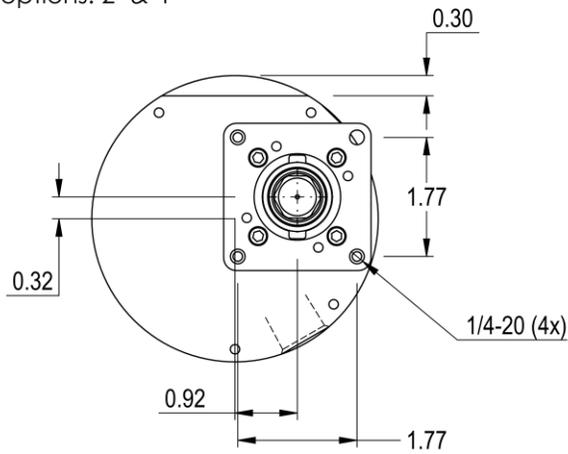
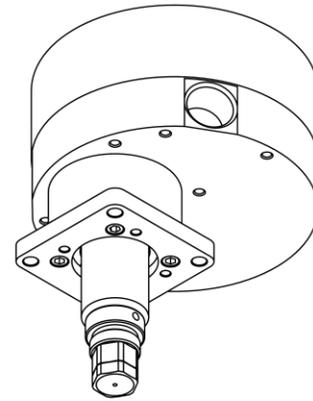
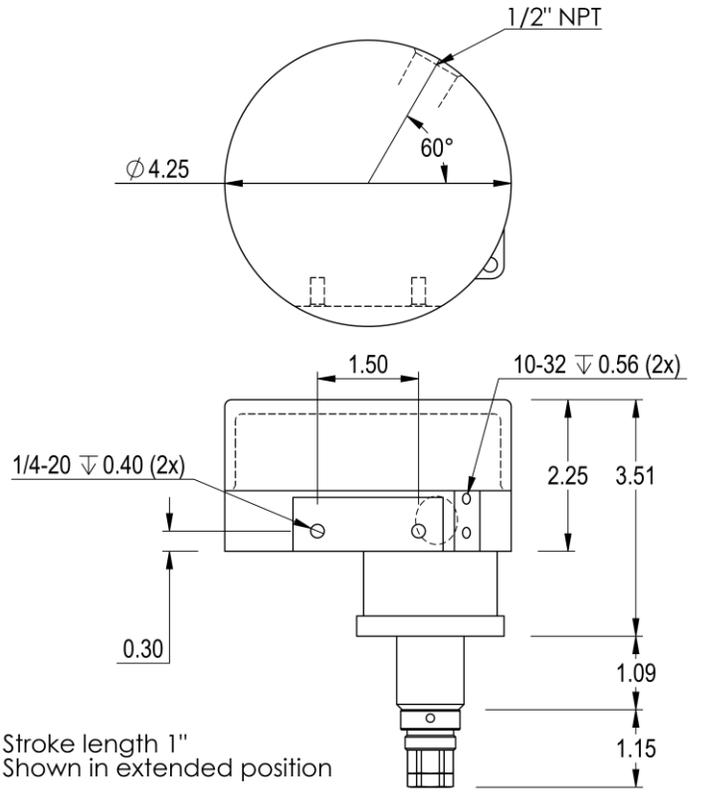
CAN/CSA Std. C22.2 No. 0-M91 (R2001)  
CSA Std C22.2 No. 25-1966 Locations  
CSA Std C22.2 No. 30-M1986 Locations  
UL 1203-2006



Lid engraving with CSA & IECEX certifications.

# ACTUATOR DIMENSIONS

## RCx-Lx-xxxAx models





## LABEL BREAKDOWN

### Actuator Supply Voltage

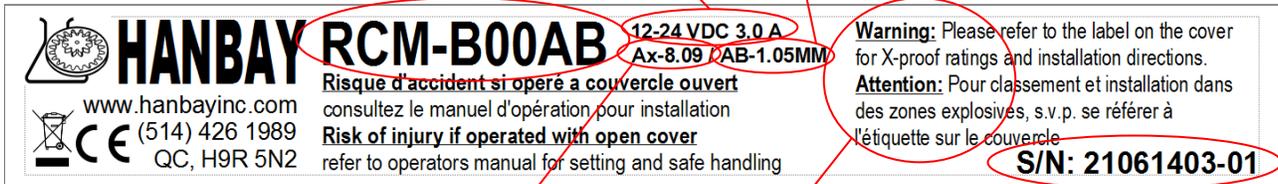
12-24 VDC @ 3.0 A or  
120-240 VAC @ 1.5 A

### Firmware Version

AF-1.05	}	MM = Multiturn
AB-1.05		MML = Multiturn Low Torque
AS-1.05		MMUL = Multiturn Extra Low Torque
		QM = Quarter turn
		QM97 = Quarter turn 97°
DT-2.01		
DC-2.01		
DT-4.06		(Obsolete since 2019)
M-Dx		V2.31

### Actuator Part Number

Refer to part number breakdown for available options.



### Ex-proof Certification

Info on ex-proof ratings and installation instructions.

### Circuit Board Version

Ax-8.09  
Dx-10.31  
Dx-4.10 (Obsolete since 2019)  
Px-10.3

### Actuator Serial Number

This serial number is unique for each individual unit and is directly tied to your order/invoice number.