RCx-AC-xxxAx-8.09
(110-240 VAC; 4-20 mA Control)
CSA/IECEX Rated*

USER MANUAL

Contents

***Only model numbers:**
RCx-AC-BxxAx w/ ex-proof lid engraving (see p.12)

www.hanbayinc.com | 1 800 315 4461
hanbaysales@hanbayinc.com

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.13.

Wiring

Wiring for Explosion Proof Actuators

The **RCx-AC-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.13 for location of ½” FNPT housing access. A cable with 6 wires is required; it is recommended to use 3x 16 AWG for wires supplying power and ground, and 3x 20 AWG for wires used for the control and feedback signals.

Standards for cable gland and cable in hazardous locations:

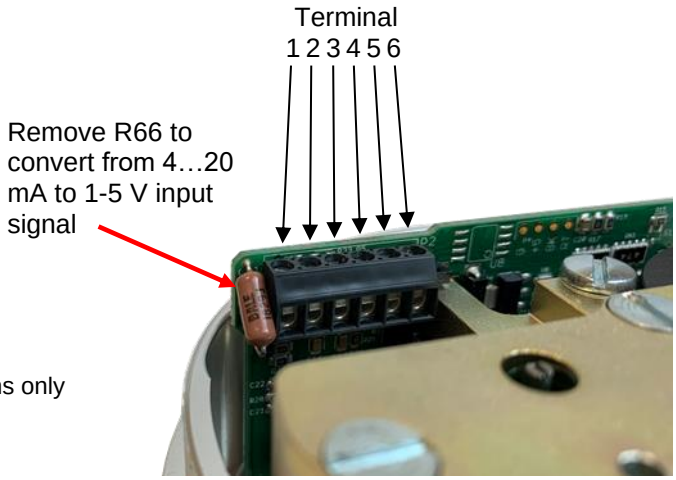
Compliance Standards Required to be Met	Cable Types Permitted in Class I Division 1 Hazardous Locations
ANSI / UL 514B, ANSI / UL 1203, ANSI / UL 2225, C22.2	Non-Armored Extra Hard Usage Cord & TC-ER-HL
ANSI / UL 514B, ANSI / UL 1203, ANSI / UL 2225	Armored IEEE 45 & IEEE 1580 Marine Shipboard Cable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

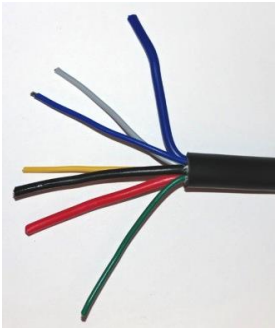
Pin	Function
6	*Pre-wired to transformer* Connect live wire to loose black cable with crimp connector (see p.4)
5	*Pre-wired to transformer* Connect neutral wire to loose white cable with crimp connector (see p.4)
4	Feedback signal (4-20 mA)*
3	*Not connected*
2	Isolated** input signal gnd.
1	Isolated** input signal (4-20 mA)

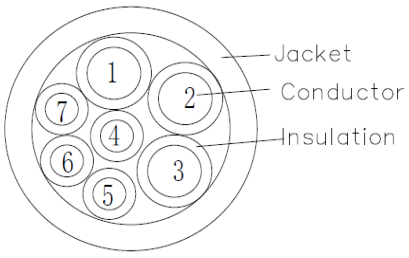
* "feedback" available in RCx-AC-xxxA**F** version only
** "isolated" available in RCx-AC-xxxA**I** and xxxA**F** versions only



Wiring for Non-Explosion Proof actuators

The actuator comes standard with a pre-installed cable gland and a 10' cable. Cut the cable to the length required, then connect according to the following wire color schematic:





Wire color schematic for cable

Colour	Function
Red (1)	Live 110-240 VAC (16 AWG)
Black (2)	Neutral 110-240 VAC (16 AWG)
Blue (3)	Ground ⏚ (16 AWG)
Green (4)	*Not connected*
Grey (5)	Feedback* signal (20 AWG)
Yellow (6)	Isolated** input signal gnd. (20 AWG)
Blue (7)	Isolated** input signal 4…20 mA (20 AWG)

* "feedback" available in RCx-AC-xxxA**F** version only
** "isolated" available in RCx-AC-xxxA**I** and xxxA**F** versions only

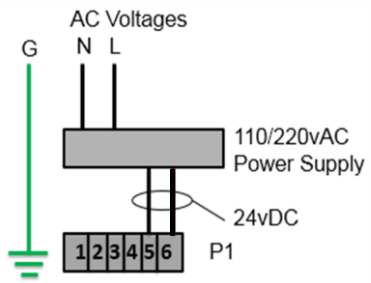
Power Supply and Current Draw

The **RCx-AC-xxxAx** actuator may be connected to voltages within 110-240 VAC.

The current draw will range from minimum 10 mA to maximum 1.5 A while the actuator is active. When not moving, the actuator draws approx. 5 mA.

AC power is connected to the **WHITE** & **BLACK** wires with crimp connectors (WM18225-DN & WM18230-ND 18-22 AWG).
Ground is connected on the **GREEN** ground screw, shown below.

AC Voltages



AC Gnd common to PWR Gnd

AC Input
Black – Live
White – Neutral

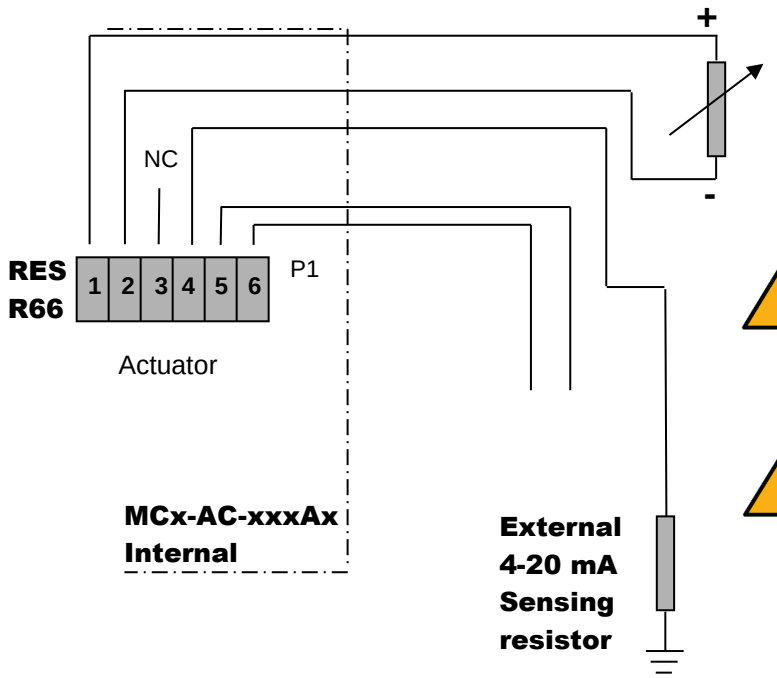
Internal Wires for 24 VDC (Already Connected)
White +24 VDC
Black 0 VDC

Ground Connection

www.hanbayinc.com | 1 800 315 4461
hanbaysales@hanbayinc.com

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 (yellow and blue wires) as shown below. Feedback, if applicable, is connected to position 4 (grey wire).



NOTE 1: Usually, the actuators are shipped for 4-20 mA signal input.

For 1-5 V signal input, remove 250 ohm resistor R66.

NOTE 2: Signal Gnd. is NOT ISOLATED from Power Gnd. in all RCx-AC-xxxAB basic models. If your signal Gnd. is different from Power Gnd. use HANBAY RCx-AC-xxxAI or RCx-AC-xxxAF model actuators.

NOTE 3: DO NOT CONNECT pin 4 directly or through a multimeter only to ground. A sensing resistor of 50 ohms or more needs to be present. Not observing this warning will damage the equipment.

The actuator 4-20 mA output is internally supplying the signal current and can drive sufficient voltage for any sensing resistor of up to 250 ohms.

The potential of the external GND after the sensing resistor may not be more than +6 VDC / -2 VDC away from the power GND of the actuator.

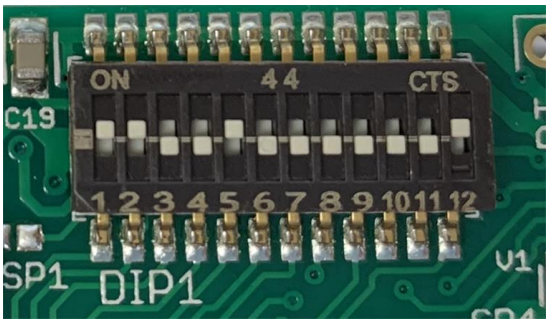
This feedback signal output is only available in HANBAY RCx-AC-xxxAF model actuators.

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 table below for DIP switch functionality.



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

DIP	Function
1 **2**	**Speed:** Choose how quickly the actuator will turn the valve. See p.8.
3	Only in the ON position for actuator model RCH (with external gear stage).
4 **5** **6** **7** **8**	**Turns:** The actuator usually ships from the factory with the recommended number of turns for the valve. However, this number can be changed. Turning on a switch will add a specific number of turns to the actuator's movement. See p.8 for relation between positions of the DIP switches and number of turns. Example: Turning on DIP 6 adds four turns, turning on DIP 8 adds one turn. If both DIP 6 and 8 are on, then the total turns of the actuator would be five.
9	**Signal loss:** See p.10.
10 **11**	**Seating torque:** Set how much torque the actuator exerts on the valve lever during the calibration (finding valve seat) procedure. See p.8.
12	**Direction/Calibration:** 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.10. 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 counter-clockwise 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 represents a total span of a number of turns.
I.e.: If you set the number of turns to 2, then a signal of 12 mA will set the actuator to exactly 1 turn from the fully closed position. 15 mA will give: (15-4)/16=0.6875 ⇒ 68.75% of 2 turns ⇒ 1.375 turns from closed.

Changing the number of turns

With the DIP switch settings, you can adjust anything between 1 and 31 turns to represent the full signal range of 4-20 mA. Check in the table below. (1 = “On”, 0 = “Off”).

Total Turns Dip4=0	DIP 5	DIP 6	DIP 7	DIP 8
reserved	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

For more turns, set DIP 4 to the ON position. This will add 16 turns to the number set by DIPs 5 through 8, as shown in the table.

DIP 4=0	**+0 turns**
DIP 4=1	**+16 turns**

WARNING: Be sure that the number of turns the actuator is set for is **LESS** than the number of turns for 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.

Torque Settings

To accommodate different valves and other applications with different torque requirements, the actuator can be set to apply different torque 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% torque to try and reach the selected speed, regardless of the positions of DIP 10 and DIP 11. Current draw is limited to 1.5 A regardless of settings.

Seating power settings:

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

Please see the box to the right and the tables below to select the power setting that is right for your application.

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 torque to damage your valve. Please be cautious, especially when using the 100% power setting.

Speed and Torque 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 to complete one turn.
The seating torque depends on the voltage provided in the power connection and on the seating power settings on DIP 10, 11 as shown below.

RC**L**-AC-xxxAx Actuators

Speed:		
DIP 1	**DIP 2**	**Time for 1 turn (sec)**
OFF	OFF	7
OFF	ON	3
ON	OFF	2
ON	ON	1

Torque:			
DIP 10	**DIP 11**	**Seating Torque (in-lbs)**	Operating torque is 100%
OFF	OFF	12	
OFF	ON	20	
ON	OFF	38	
ON	ON	48	
NOTE: If actuator is RC**J**-AC-xxxAx, divide torque values by 3. **To convert in-lbs to Nm, divide by 9.**			

RC**M**-AC-xxxAx Actuators

Speed:		
DIP 1	**DIP 2**	**Time for 1 turn (sec)**
OFF	OFF	23
OFF	ON	11
ON	OFF	7
ON	ON	4

Torque:			
DIP 10	**DIP 11**	**Seating Torque (in-lbs)**	Operating torque is 100%
OFF	OFF	35	
OFF	ON	60	
ON	OFF	115	
ON	ON	145	
NOTE: If actuator is RC**K**-AC-xxxAx, divide torque values by 3. **To convert in-lbs to Nm, divide by 9.**			

RC**H**-AC-xxxAx Actuators

Speed:		
DIP 1	**DIP 2**	**Time for 1 turn (sec)**
OFF	OFF	90
OFF	ON	45
ON	OFF	30
ON	ON	18

Torque:			
DIP 10	**DIP 11**	**Seating Torque (in-lbs)**	Operating torque is 100%
OFF	OFF	120	
OFF	ON	205	
ON	OFF	400	
ON	ON	497	
To convert in-lbs to Nm, divide by 9.			

RC**F**-AC-xxxAx Actuators

Speed:		
DIP 1	**DIP 2**	**Time for 1 turn (sec)**
OFF	OFF	186
OFF	ON	94
ON	OFF	56
ON	ON	38

Torque:			
DIP 10	**DIP 11**	**Seating Torque (in-lbs)**	Operating torque is 100%
OFF	OFF	230	
OFF	ON	380	
ON	OFF	720	
ON	ON	915	
To convert in-lbs to Nm, divide by 9.			

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 (0.700V 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-AC-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.

Manual Override

The RCx-xxxAx actuator with manual override can also be certified for hazardous locations (CSA and/or IECEX). The additional manual override gear case and handle has no effective ignition sources and can therefore be used in all hazardous locations for which the actuator enclosure is certified for.

Operation of the manual override when the actuator is powered will be difficult as the actuator will try to maintain the valve in the position it has been commanded to.

Power should be removed if the valve is to be moved manually. If the valve is moved with the manual override when its power is turned off, it will lose its position, and it will need to be re-zeroed (as described in the Signal Loss and Calibration section).

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-AC-BxxAx

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:

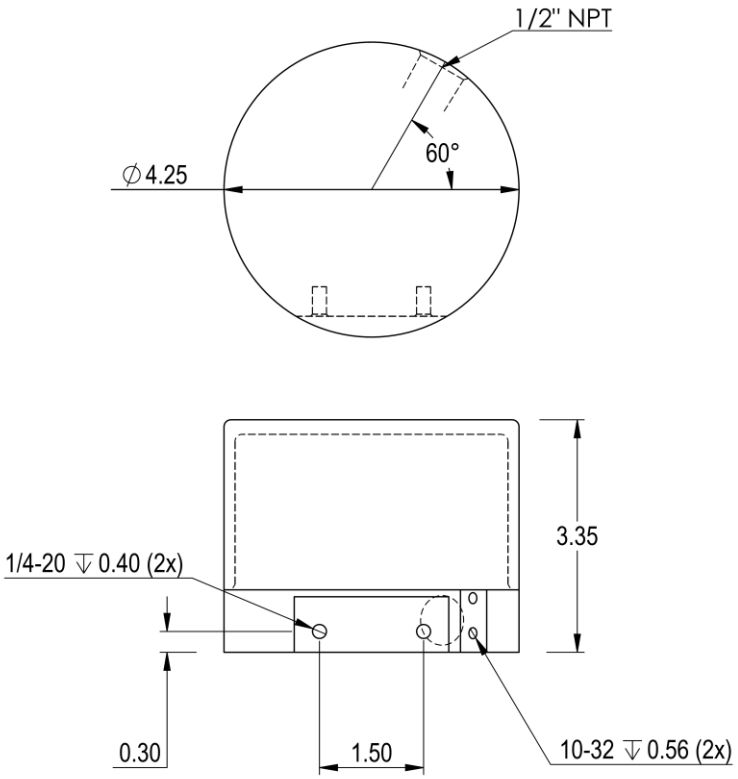
Class I, Div 1, Groups B, C, D (T6)
Class II, Groups E, F, G (T6)

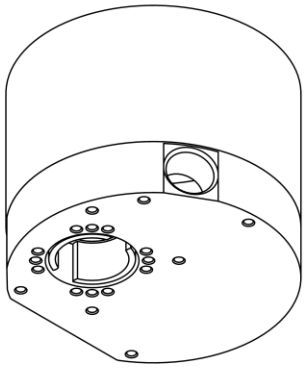
CAN/CSA Std. C22.2 No. 0-M91 (R2001)
CSA Std C22.2 No. 25-1966 Locations
CSA Std C22.2 No. 30-M1986 Locations
UL 1203-2006

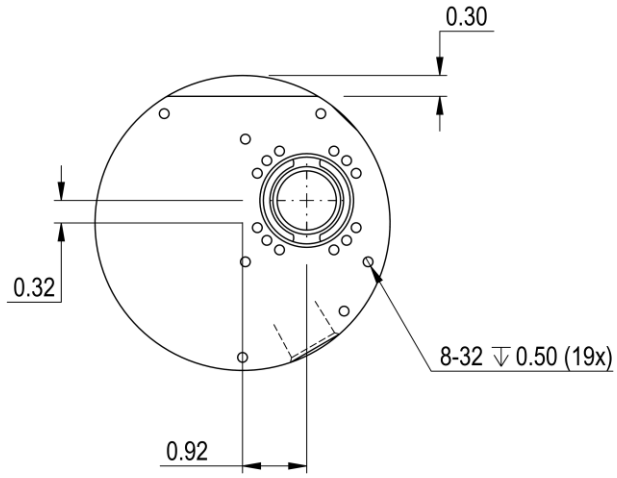
Lid engraving with CSA & IECEX certifications.

ACTUATOR DIMENSIONS

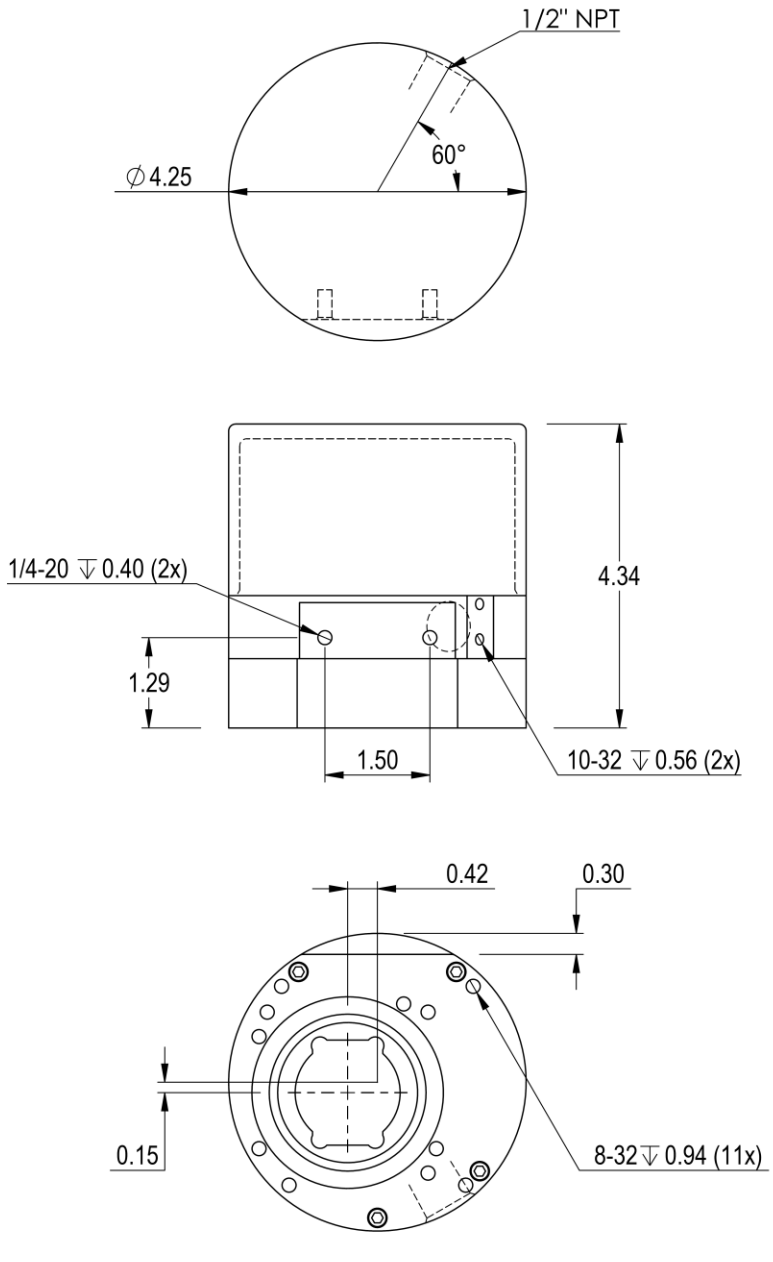
RCJ/ RCL/ RCM -AC-xxxAx models

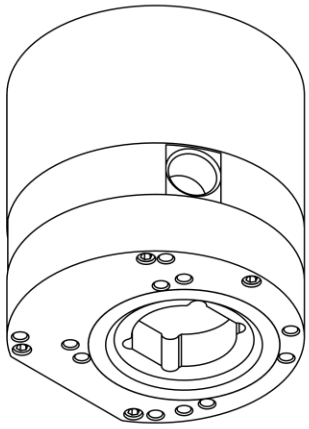




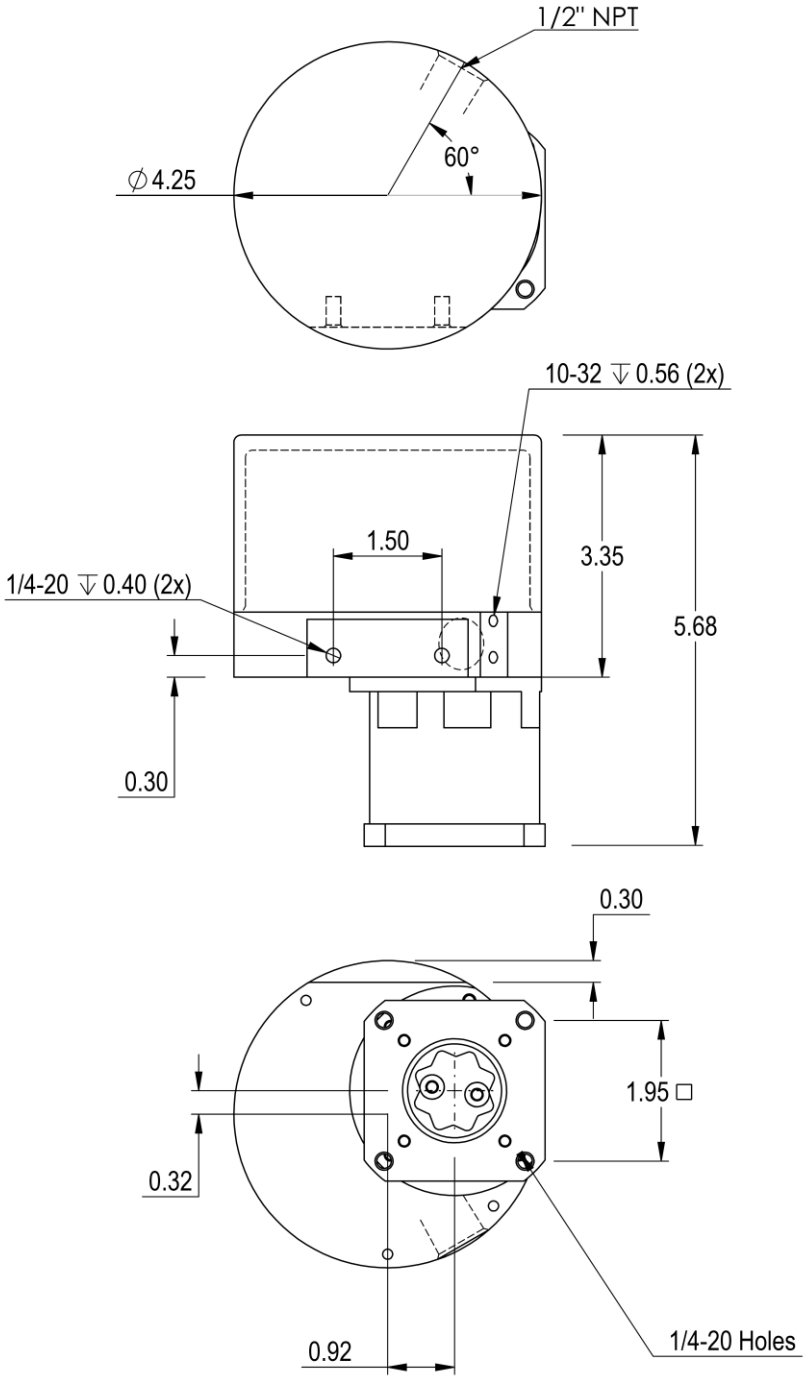


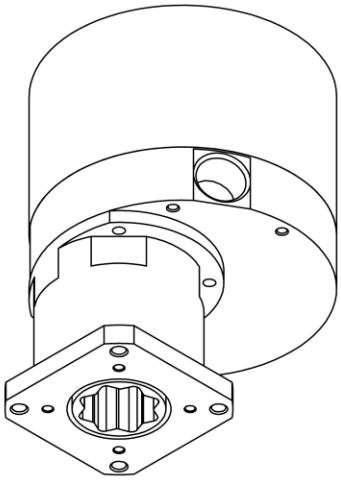
RCH-AC-xxxAx model





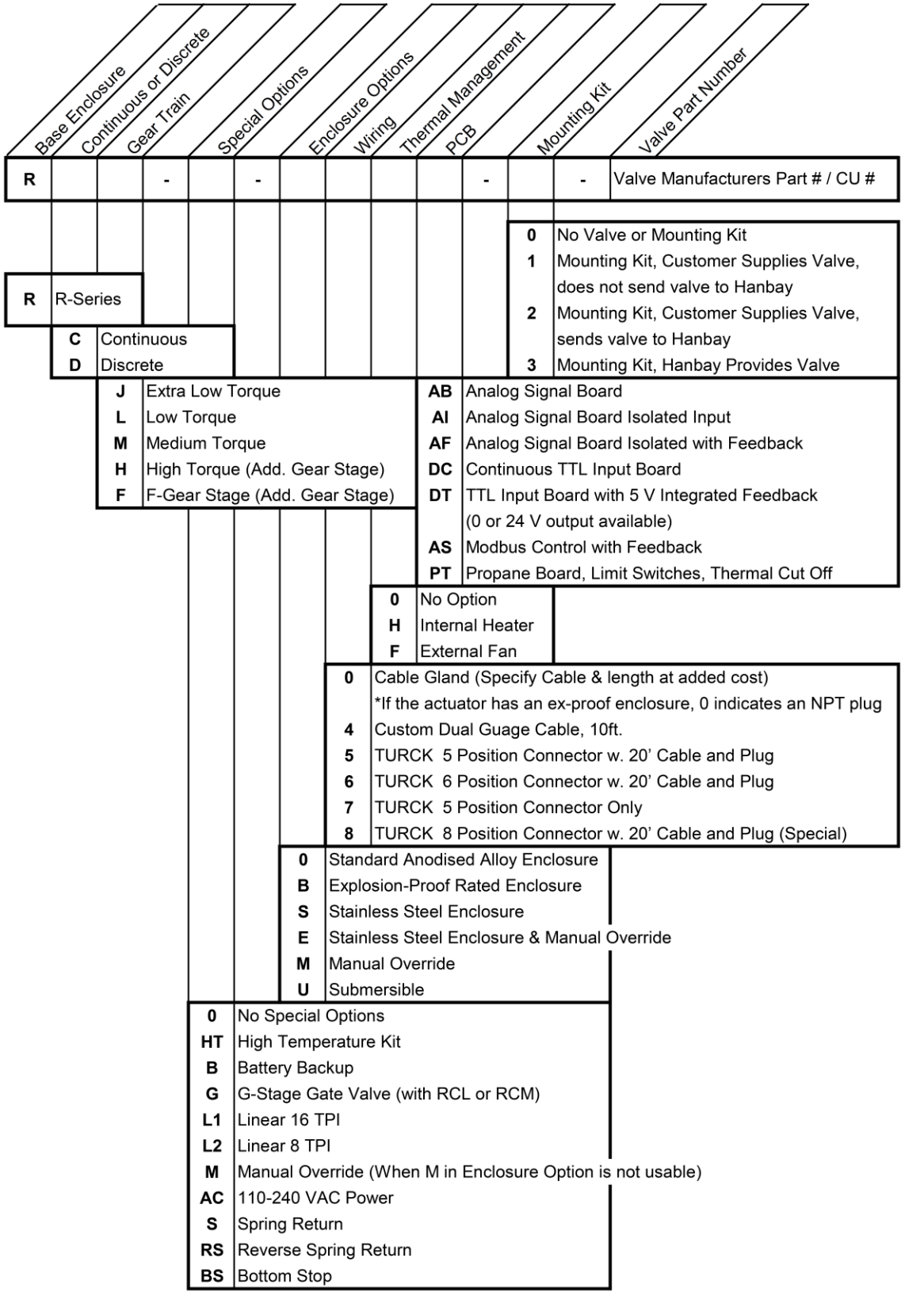
RCF-AC- xxxAx models





PART NUMBER BREAKDOWN

Full Hanbay Part Number: R C [ ] - [ ] - AC - [ ] [ ] [ ] Ax - [ ] - [ ]



LABEL BREAKDOWN

Firmware Version

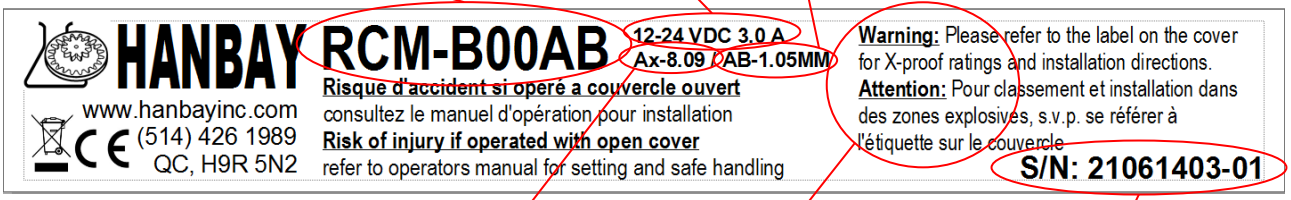
AF-1.05
AB-1.05
AS-1.05

- MM = Multiturn
- MML = Multiturn Low Torque
- 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 Supply Voltage
12-24 VDC @ 3.0 A or
110-240 VAC @ 1.5 A

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.