

# rotork<sup>®</sup>

Keeping the World Flowing  
for Future Generations



## R series

RCx-xxxDC-10.41 user manual



 **HANBAY INC.**  
A rotork Brand

RCx-xxxDC-10.41



# RCx-xxxDC-10.41

(12-24 VDC; TTL Control for Multi-Turn Valves)

**Hazardous Location** (Only models RCx-**B**xxxDC w/ ex-proof lid engraving)

## USER MANUAL

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## INTENDED USE

Rotork R-Series actuators are intended to be used in combination with any valve to regulate the flow automatically. The output of the actuator is rotary or linear, and is paired with the valve stem to achieve the desired flow control.

## MANUFACTURER DETAILS

Rotork manufactures the R-Series actuator at the following facilities:

Hanbay Inc.  
135 Brunswick Blvd.  
Pointe-Claire, QC H9R5N2 Canada

Fairchild Industrial Products Company  
3920 West Point Blvd.  
Winston Salem, NC 27103 USA

## MEANING OF SYMBOLS



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.



The Lightning Flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.

## INSTALLATION

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

### Environmental Conditions

The R-Series actuator has an IP68 rating and is recommended for outdoor use. The relative humidity of the environment has no effect on the R-Series.

The ambient temperature range for the standard R-Series is -20 to 40 °C (-4 to 104 °F).  
The internal heater option shifts the temperatures to a lower range of -40 to 40 °C (-40 to 104 °F).

The standard R-Series has been approved for use at altitudes of up to 2000 m.



## Mounting

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

## Grounding and Securing

The other two visible holes are threaded 10-32, 0.50" deep, and are intended to be used to lock the lid in position (top) and as an external grounding connection (bottom) using user-supplied screws.

For detailed dimensions see p.13.

Additionally, there is a grounding connection supplied internally.



## Wiring

### Wiring for Explosion Proof Actuators



The **RCx-BxxDC** 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 1/2" FNPT thread cable entry. See p.13 for location of 1/2" FNPT housing access. A cable with 6 wires is required; it is recommended to use 16-24 AWG for all wires.



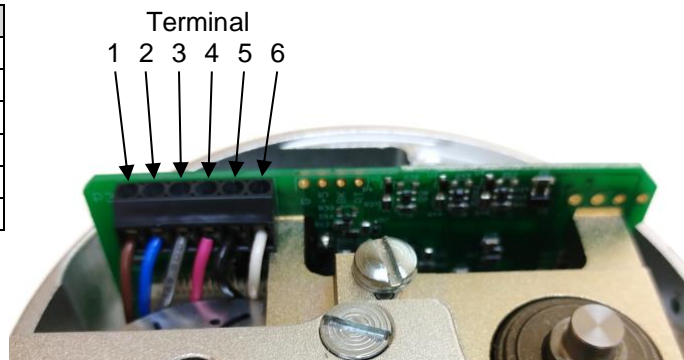
#### Standards for cable gland and cable in hazardous locations:

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	+24 VDC
5	Power gnd.
4	Output TTL2
3	Output TTL1
2	Input TTL2
1	Input TTL1



## Wiring for Non-Explosion Proof Actuators

The actuator comes standard with a Turck 6-position connector and a 20' cable (6x 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 6” cable:

Pin	Color	DC power supply only
6	White	+24 VDC
5	Black	Power gnd.
4	Pink	Output TTL2
3	Grey	Output TTL1
2	Blue	Input TTL2
1	Brown	Input TTL1



**Note:** Power ground must be externally connected to earth ground, or one of the case grounding screws (see INSTALLATION section) must be used to connect a grounding wire of minimum 22AWG.

## Power Supply and Current Draw

The **RCx-xxxDC** may be connected to voltages ranging within 12-24 VDC. The DC supply to the actuator must be limited by a 4 A fuse or circuit breaker; it is recommended to have this installed near the actuator.

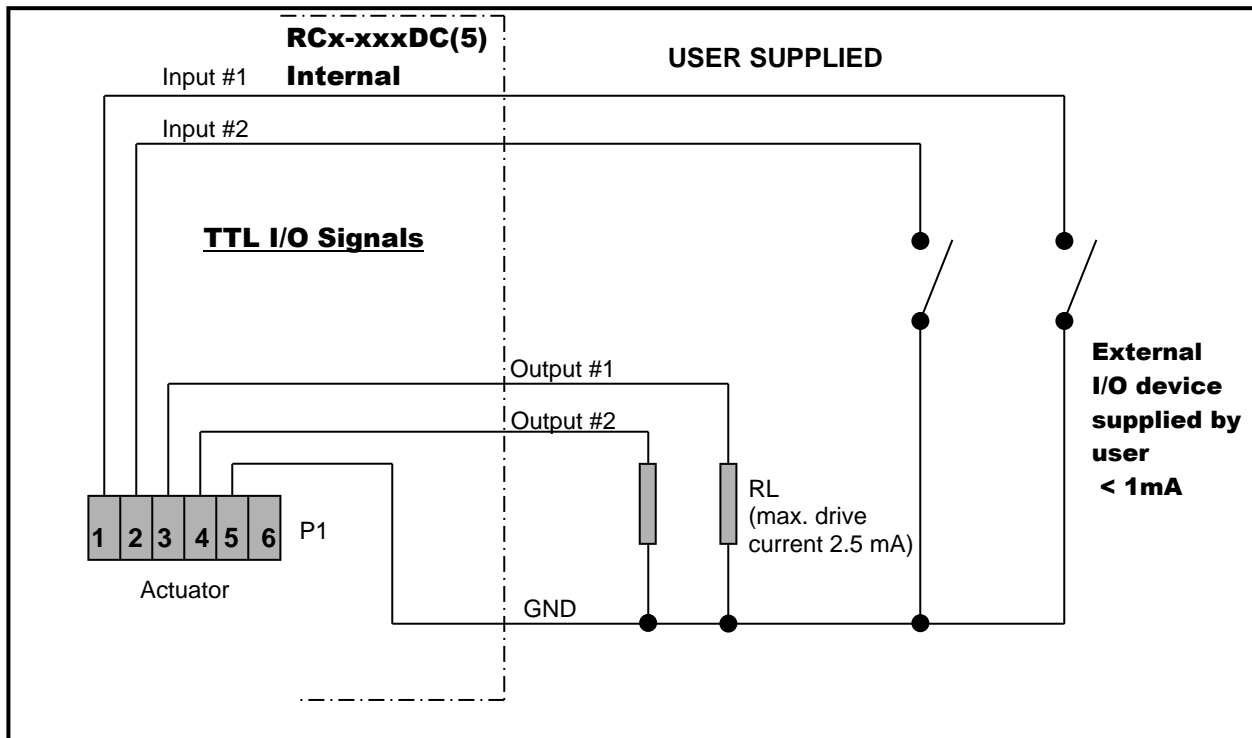
The current draw will range from minimum 100 mA to maximum 3 A while the actuator is active. When not moving, the actuator draws approx. 50 mA.

## Control Signal and Feedback

### RCx-xxxDC and RCx-xxxDC5

Actuators with part numbers RCx-xxxDC and RCx-xxxDC5 have the old standard 5 V TTL control and feedback signals. Locate the correct connection terminals/wires (as shown on the previous page), then set-up the PLC as shown below.

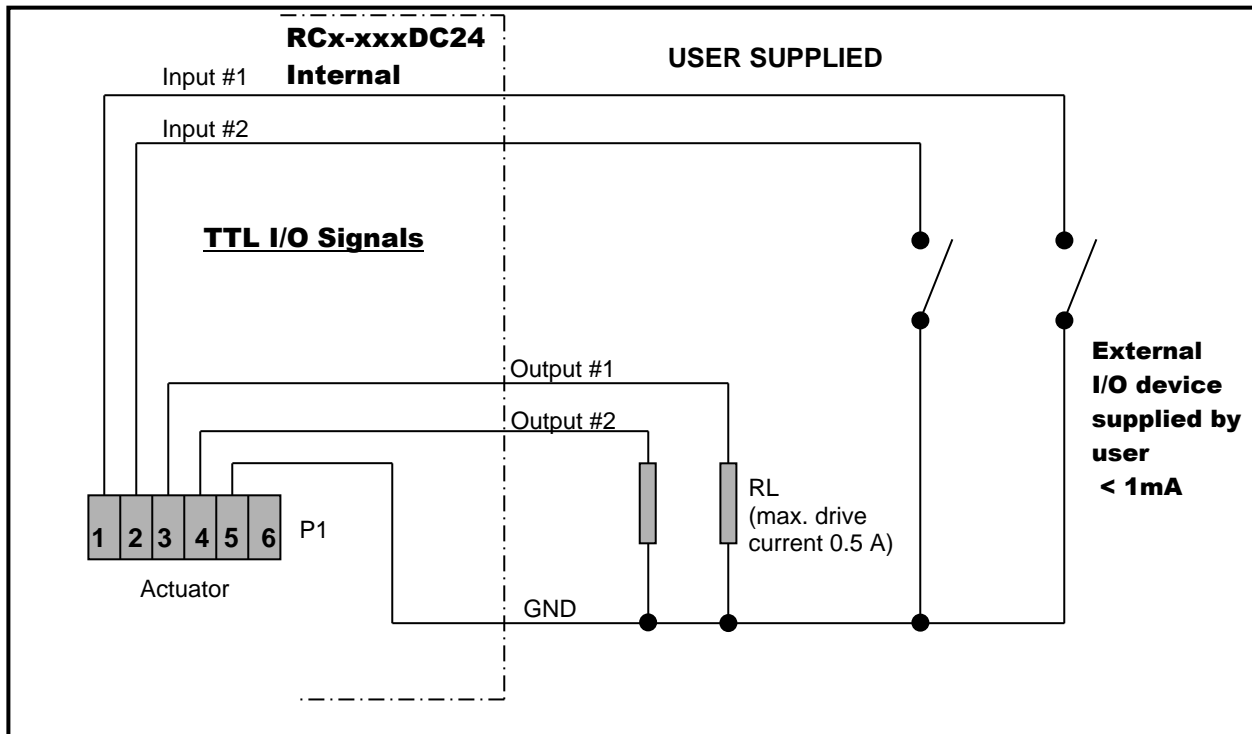
- Connect your input signal on positions 1 and 2 (brown and blue wires)  
**The input signals are high by default (+5 V).** To change the value, send a low signal (0 V ↔ pull to ground).  
 See the Functionality section for details
- Feedback is connected to positions 3 and 4 (grey and pink wires)  
 The maximum drive current is 2.5 mA.



**RCx-xxxDC24**

Actuators with part numbers RCx-xxxDC24 have the new standard 24 V TTL control and feedback signals. Locate the correct connection terminals/wires (as shown on the previous page), then set-up the PLC as shown below.

- Connect your input signal on positions 1 and 2 (brown and blue wires)  
**The input signals are high by default (24 V).** To change the value, send a low signal (0 V ↔ pull to ground).  
 See the Functionality section for details.
- Feedback is connected to positions 3 and 4 (grey and pink wires)  
 The maximum drive current is 0.5 A.





## GENERAL SPECIFICATIONS

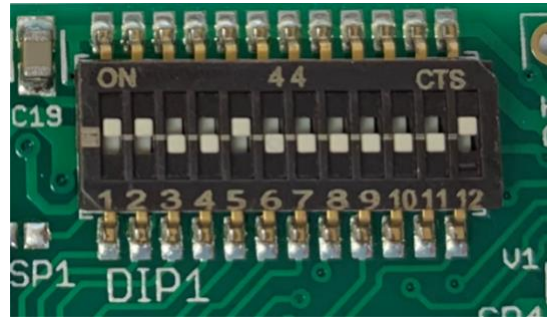
<b>Stall protection</b>	Electronic position and motion detection
<b>Gears &amp; Bearings</b>	Metal and bronze, oiled/greased for life
<b>External fasteners</b>	Stainless Steel
<b>Life Expectance</b>	250'000 cycles in specified conditions
<b>Motor</b>	Brushless DC motor, computer control
<b>Positioning precision</b>	$\pm 3^\circ$
<b>Positioning resolution</b>	$\pm 0.15^\circ$ max.
<b>Power setting</b>	Adjustable
<b>Mechanical Shock</b>	Repeated $\leq 130$ g-force, no effect Occasional $\leq 150$ g-force, no effect >150 g-force not tolerated
<b>Mechanical Vibration</b>	Random SAE J1211, Chassis, Exterior
<b>Thermal Shock</b>	-20 to +60 °C (-4 to 140 °F) in 10 min.
<b>Weight</b>	RxJ, RxL, RxM: 980 g RxH, RxF: 1700 g
<b>TTL Signals in</b>	Internal pull up < 1 mA required to pull down
<b>TTL signals out (feedback)</b>	Standard: 5 V at 2.5 mA max. Option: 24 V at 1 A max.

# 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 the table below for DIP switch functionality.



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

DIP 1	DIP 2	Description	Recommended Use
Off	Off	Fastest settling	Use only for low torque valves
Off	On	Medium-fast	Typical setting
On	Off	Medium-slow	Typical setting
On	On	Slowest settling	Use for high torque valves

DIP switches 1 and 2 set the actuator position control parameters. High settling speed settings are suitable for fast positioning of light valves. Longer settling times will allow heavier valves to reach their target positions; trying to use a fast settling setting on a high torque valve will increase current consumption when holding position, and cause heating of the motor.

DIP 10	DIP 11	Torque description	Approximate stall current (A)	Approximate stall torque (in-lbs)			
				RCL-xxxDC	RCM-xxxDC	RCH-xxxDC	RCF-xxxDC
Off	Off	Low	1.0	63	212	430	715
Off	On	Medium-low	1.5	72	236	522	832
On	Off	Medium-high	2.0	77	243	525	949
On	On	High	3.0	83	247	532	1067

DIP switches 10 and 11 set the actuator torque. These settings are adapted to the valve at the factory. Worn-in valves may require a higher torque setting after some time. The actuator will use 100% of available torque to try and reach maximum speed.



**Note:** Medium-high and high settings require voltage supply minimum values as follows:

- Supply voltage needs to be min 14 VDC for medium-high
- Supply voltage needs to be 16 VDC for high
- When operating above 20 VDC 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)

<b>DIPs 3-8</b>	Reserved for custom functions.
<b>DIP 9</b>	Run / Calibrate Putting DIP 9 into the off position will disable the actuator positioning control, and the motor will not move regardless of the input signals. When DIP 9 is moved back into the on position, the actuator will perform its homing routine, and then move to the position commanded by the input signals.
<b>DIP 12</b>	DIP 12 sets the direction of rotation

## Functionality

The RCx-xxxDC operates as a continuous TTL. It can open or close to end positions or move to the center position.

### Direction of rotation

To change the direction of rotation on the actuator change the setting on DIP 12 and cycle power to the actuator.

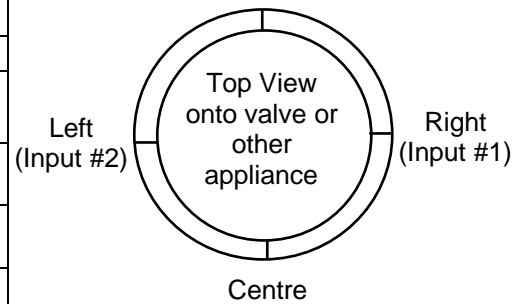
Inputs 1 & 2 (pins 1 & 2) are HIGH by default – a LOW signal must be sent to change the value.

**Low** ≤ 0.8 VDC for all models  
**High** ≥ 4.5 VDC for RCx-xxxDC and RCx-xxxDC5  
 ≥ 20 VDC for RCx-xxxDC24



**Sending a signal of more than 24 VDC may be harmful to the internal circuit board.**

Input #1 (Pin 1)	Input #2 (Pin 2)	Action taken
Low	High	Moves in clockwise [closes the valve]
High	Low	Moves in counterclockwise [opens the valve]
Low	Low	Moves to midway point between fully open and fully closed
High	High	Does not move
<b>The feedback is as follows</b>		
Output #1 (Pin 3)	Output #2 (Pin 4)	Meaning High = 4.5 VDC Low = 0.8 VDC
High	High	Actuator is standing still or moving in its range
High	Low	Actuator has stopped moving because the valve is fully closed
Low	High	Actuator has stopped moving because the valve is fully open
Low	Low	Actuator has stopped moving because the valve is at the midway point



## Calibration

The center position calibration routine can be initiated by switching DIP 9 momentarily “off” then “on”. This will cause the actuator to go through a series of movements to determine the fully open and fully closed positions of the valve. This function should be used if the valve was decoupled from the actuator or if the actuator was turned manually while the power was off.

## Manual Override

The RDx actuator with manual override can also be certified for hazardous locations. 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 power is applied 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 Calibration section).**



## Troubleshooting

Upon noticing a problem, your first step should almost always be to recalibrate the actuator by toggling DIP 9 while the actuator is powered. This alone can solve basic problems.

**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 Rotork for technical support.

**Any parts found to be defective should be examined and/or replaced by Rotork.**

## CERTIFICATIONS

### Hazardous Location Rating (Ex)

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

#### Canada:

Class I, Division 1, Groups B, C, D (T5)  
Class II, Division 1, Groups E, F, G (T5)

CSA C22.2 No. 30-M1986  
CSA C22.2 No. 25-17

Ambient temperature range: -50°C to +40°C

\* Serial number will be engraved on lid.  
**Lid engraving with Canadian hazardous location certification:**



#### USA:

Class I, Division 1, Groups B, C, D (T5)  
Class II, Division 1, Groups E, F, G (T5)

UL 1203 (Edition 5.0)

Ambient temperature range: -20°C to +40°C

\* Serial number will be engraved on lid.  
**Lid engraving with USA hazardous location certification:**



### International (IECEEx) – available upon request:

Ex db IIB+H2 T3 Gb

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

\*Serial number will be engraved on the lid.

## Electrical Compliance (EC)

### Canada & USA:

CSA.UL 61010-1

### Europe:

EC Declaration of Conformity (CE)

UK Declaration of Conformity (UKCA)

## Electromagnetic Compatibility (EMC)

United States:

**FCC 47 CFR Part 15, Subpart B (Unintentional radiators), Class A**

Canada:

**ICES-001 Issue 5, July 2020, Class A**

Europe:

**EN 61326-1:2013** (Group 1, Class A; Industrial electromagnetic environment)

**IEC 61000-6-2:2016**

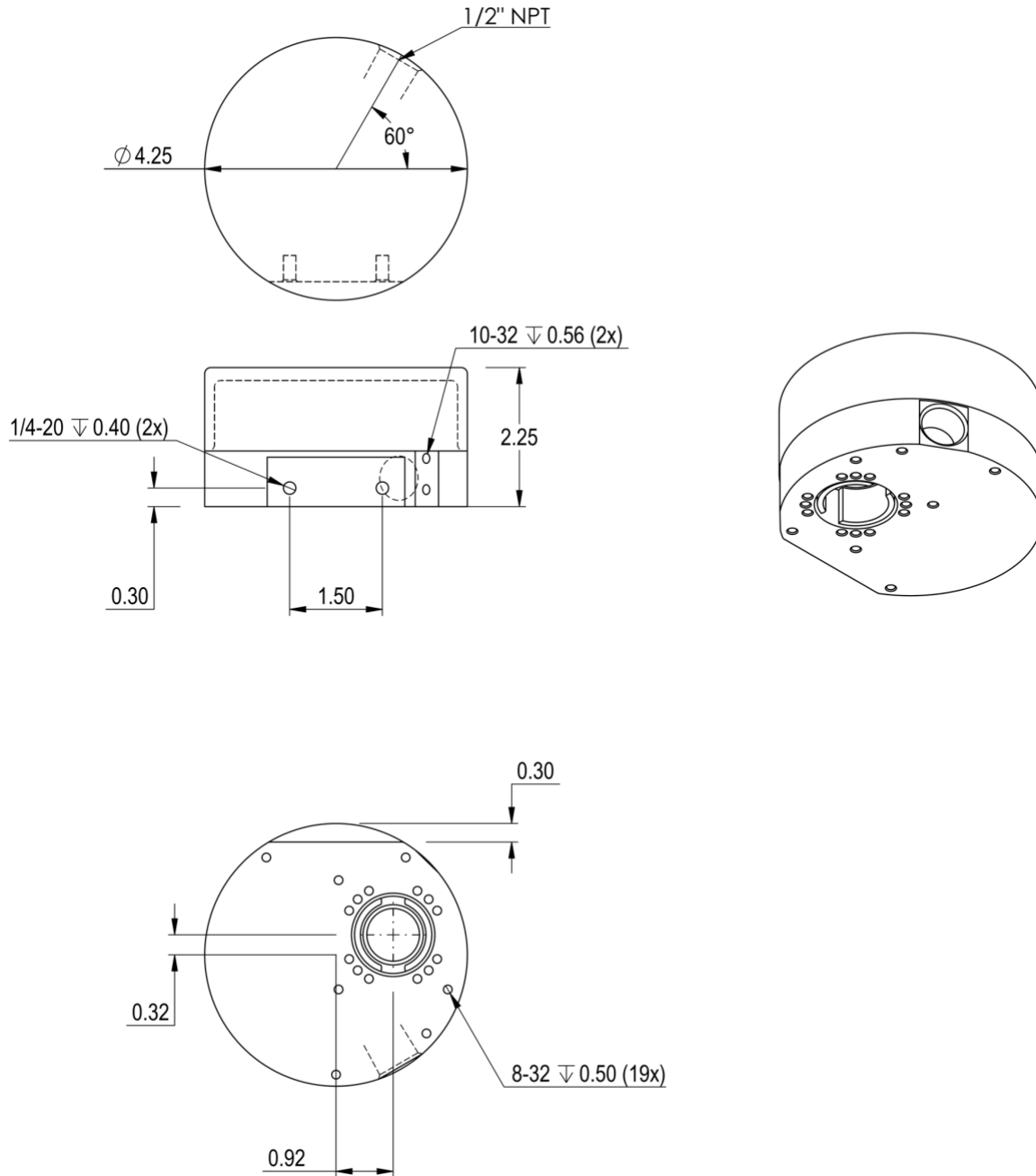
**IEC 61000-6-4:2018**

## Dust and Water Ingress Protection (IP)

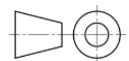
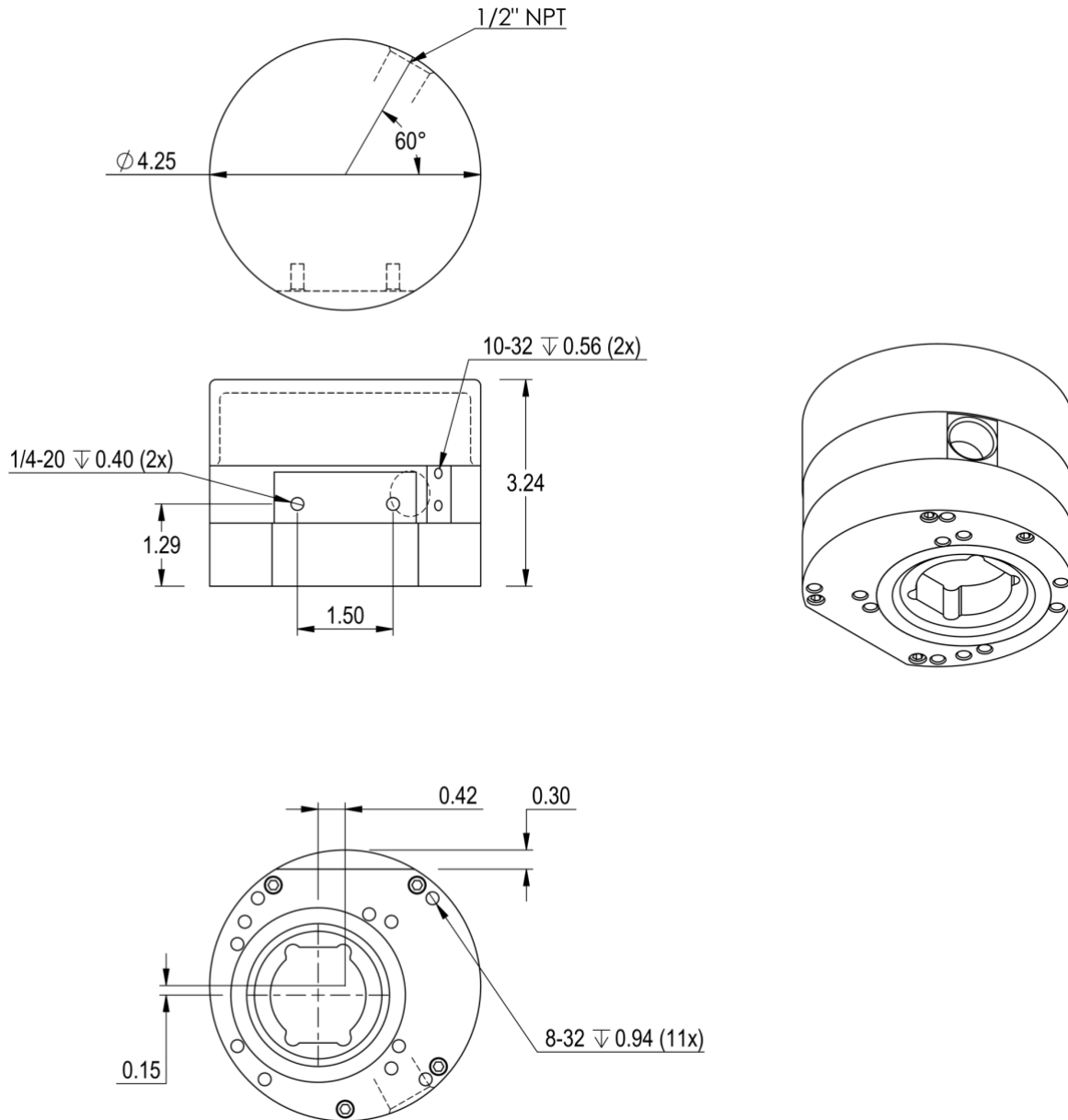
IP68, certified using standard IEC 60529:2013.

# ACTUATOR DIMENSIONS

## RCJ/ RCL/ RCM -xxxDC models

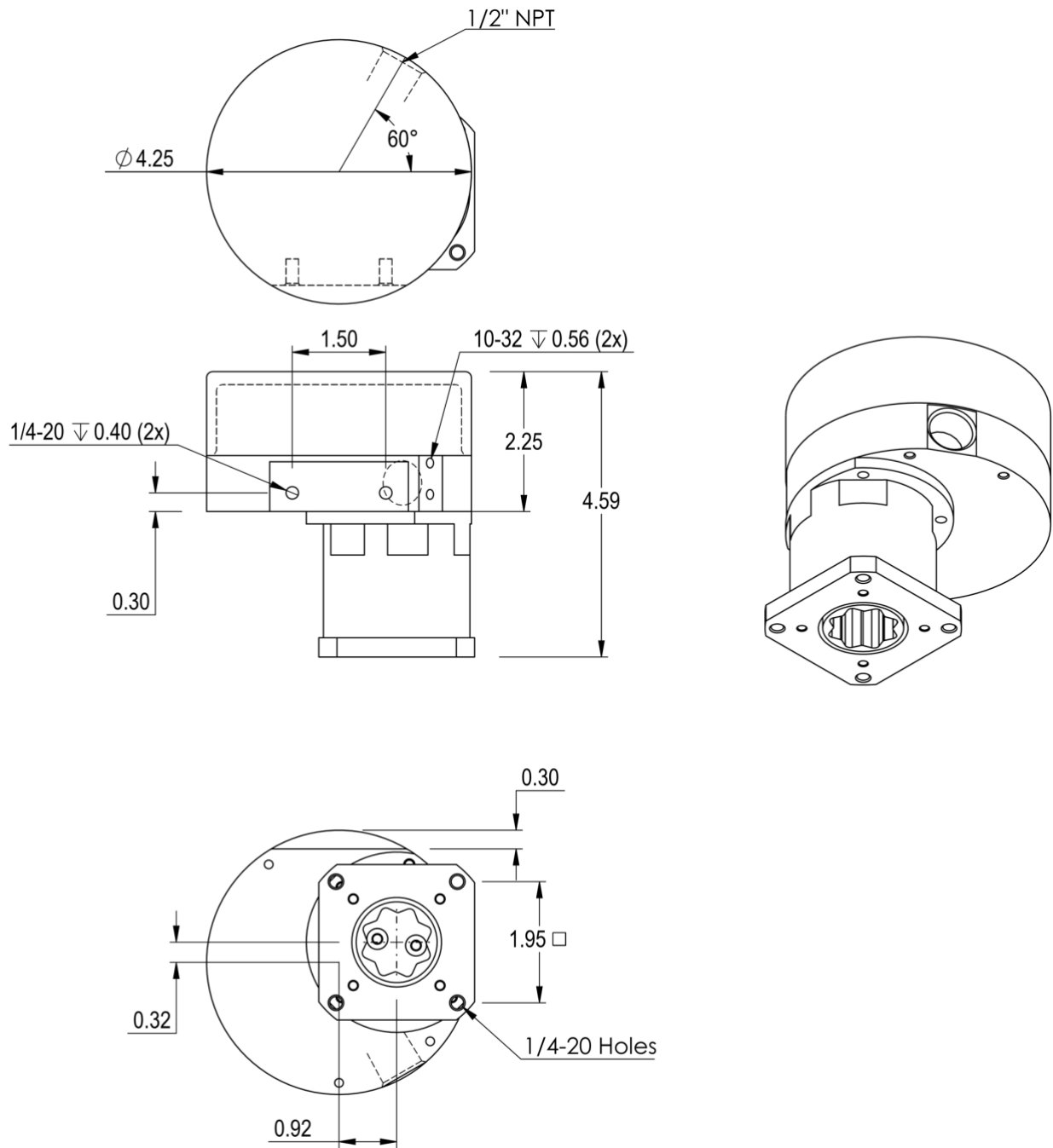


**RCH-xxxDC models**





**RCF-xxxDC models**



# PART NUMBER BREAKDOWN

Full Part Number: **R C** - - **DC** - -

Base Enclosure	Positioning	Gear Train	Special Options	Enclosure Options	Wiring	Thermal Management	PCB	Mounting Kit	Valve Part Number
R			-	-				-	Valve Manufacturers Part # / CU #
R	R-Series								<b>0</b> No Valve or Mounting Kit <b>1</b> Mounting Kit, Customer Supplies Valve, does not send valve to Hanbay <b>2</b> Mounting Kit, Customer Supplies Valve, sends valve to Hanbay <b>3</b> Mounting Kit, Hanbay Provides Valve
C	Continuous								
D	Discrete								
J	Extra Low Torque								
L	Low Torque								
M	Medium Torque								
H	High Torque (Add. Gear Stage)								
F	F-Gear Stage (Add. Gear Stage)								
									<b>AB</b> Analog Signal Board <b>AF</b> Analog Signal Board Isolated with Feedback <b>AI</b> Analog Signal Board Isolated Input <b>AS</b> Modbus Control with Feedback <b>DC24</b> Continuous TTL Board, 0V input / 24V feedback signal <b>DC5</b> Continuous TTL Board, 0V Input / 5V feedback signal <b>DT24</b> Discrete TTL Board, 0V Input / 24V feedback signal <b>DT5</b> Discrete TTL Board, 0V Input / 5V feedback signal <b>PT</b> Propane Board, Limit Switches, Thermal Cut Off
									<b>0</b> No Option <b>H</b> Internal Heater
									<b>0</b> Cable Gland (Specify Cable & length at added cost) *If the actuator has an ex-proof enclosure, 0 indicates an NPT plug <b>4</b> Custom Dual Gauge Cable, 10ft. <b>5</b> TURCK 5 Position Connector w. 20' Cable and Plug <b>6</b> TURCK 6 Position Connector w. 20' Cable and Plug <b>7</b> TURCK 5 Position Connector Only <b>9</b> TURCK 6 Position Connector Only
									<b>0</b> Standard Anodised Alloy Enclosure <b>B</b> Hazardous Locations-Rated <b>S</b> Stainless Steel Enclosure <b>E</b> Stainless Steel Hazardous Locations-Rated
									<b>0</b> No Special Options <b>AC</b> 110-240 VAC Power Supply <b>B</b> Battery Backup <b>BS</b> Bottom Stop <b>G</b> G-Stage Gate Valve (with MCM or MCL) <b>HT</b> High Temperature Mounting Kit <b>L1</b> Linear 16 TPI <b>L2</b> Linear 8 TPI <b>M</b> Manual Override <b>PM</b> Position Indicator (Multi-turn) <b>QR</b> Quick Release Mounting Kit <b>RS</b> Reverse Spring Return <b>S</b> Spring Return

## LABEL BREAKDOWN

### 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  
 M-Dx V2.34

### Actuator Supply Voltage

12-24 VDC @ 3.0 A or  
 110-240 VAC, 50/60 Hz @ 1.5 A


### Actuator Series

M-Series or R-Series

### Circuit Board Version

Ax-8.09  
 Dx-10.41  
 Px-10.3

**rotork**  
**HANBAY**

www.hanbayinc.com  
 (336) 659 3400  
 NC, 27103

R-Series 12-24 VDC 3.0A

**RCM-050AB**

POWER OFF UNIT BEFORE REMOVING COVER

Made in USA

S/N: 19103201-01

Ax-8.09  
 AB-1.05MM

User Manual:



### Actuator Part Number

Refer to part number breakdown for available options.

### Actuator Serial Number

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

### QR Code

Scan this QR code for a direct link to the user manual for your unit!

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