

RDx-B-xxxDT-10.31
 (12-24 VDC; Battery Backup, TTL Control)
CSA/IECEX Rated*

USER MANUAL

Contents

INSTALLATION	2
Mounting	2
Wiring	2
<i>Wiring for Explosion Proof Actuators</i>	2
<i>Wiring for Non-Explosion Proof actuators</i>	4
Power Supply and Current Draw	4
Control Signal and Feedback	4
OPERATION	5
DIP Switches	5
Functionality	6
Calibration	7
Manual Override	7
Troubleshooting	8
Battery Fail Safe Function	8
<i>Testing Battery Fail-Safe</i>	8
EXPLOSION PROOF CERTIFICATION	9
ACTUATOR DIMENSIONS	10
PART NUMBER BREAKDOWN	12
LABEL BREAKDOWN	14



***Only model numbers:
 RDx-B-BxxDT w/ ex-proof
 lid engraving (p.9)**

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.10.



Wiring

Wiring for Explosion Proof Actuators



The **RDx-BxxDT** 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.10 for location of ½” 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.

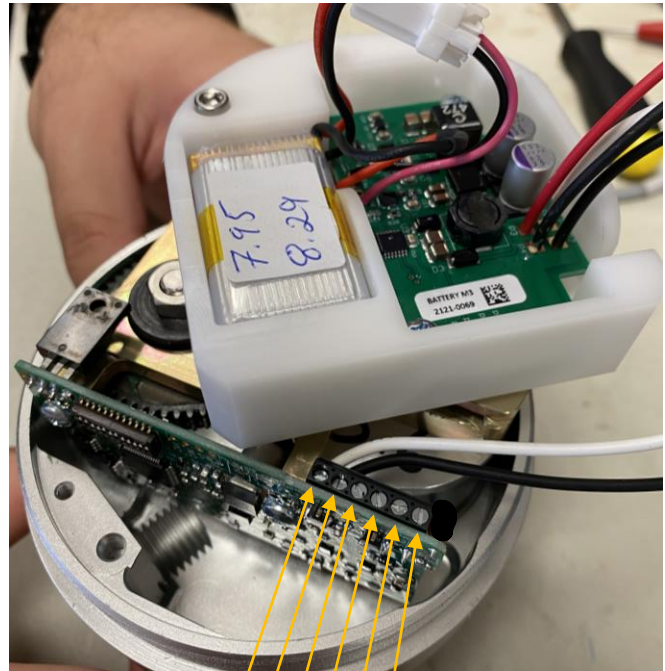
The battery board holder (white plastic part, see image below) will have to be unscrewed to access the terminal block on the circuit board for wiring. When wiring is complete screw the battery board holder back into place.



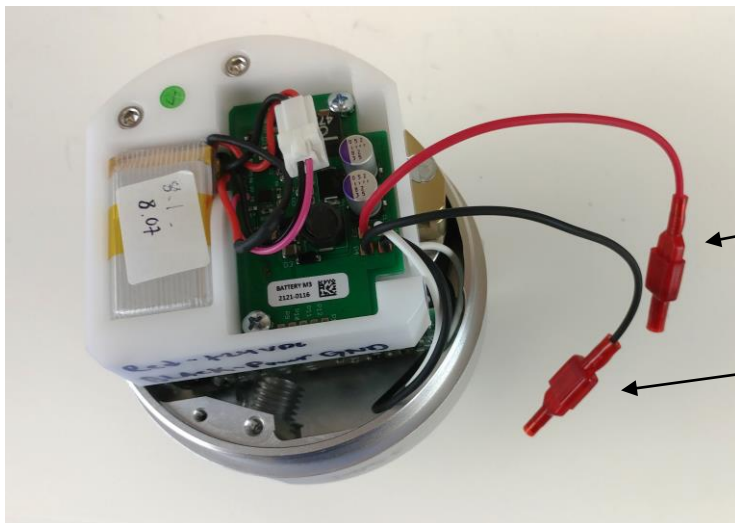
Do not remove or change the existing **BLACK** and **WHITE** wires that connect the battery board to the processor board.

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

Pin	Function
6	Already Connected to battery board Connect +24 VDC wire to loose red cable with crimp connector (see below)
5	Already Connected to battery board Connect power ground wire to loose black cable with crimp connector (see below)
4	Output TTL2
3	Output TTL1
2	Input TTL2
1	Input TTL1



6 5 4 3 2 1
Terminal



+24VDC

Power Ground

Wiring for Non-Explosion Proof actuators

The actuator comes standard with a Turck 6 position connector and a 20' cable with plug. Cut the cable to the length required and then connect according to the following wire color schematic:

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

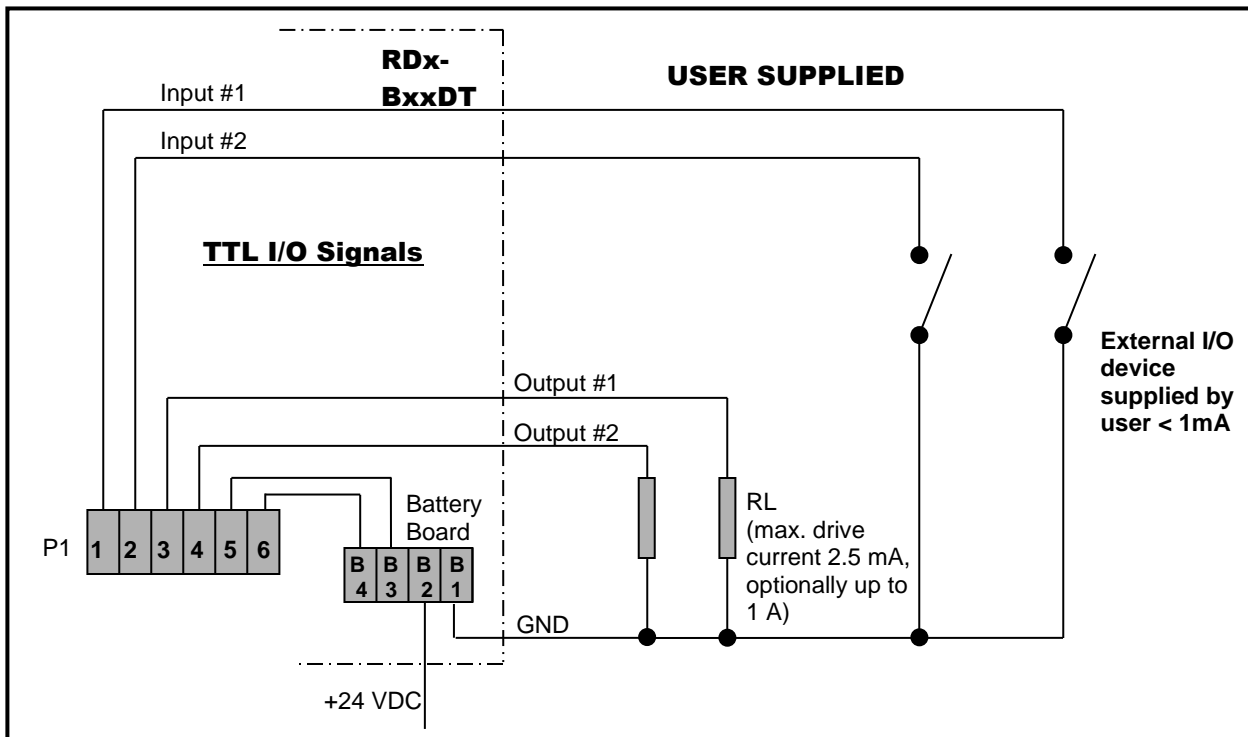
Power Supply and Current Draw

The **RCx-B-xxxAx** can **ONLY** be connected to 24 VDC +/- 10%.

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

Locate the correct connection terminals/wires, as shown on the previous page, then connect your input signal on positions 1 and 2 (brown and blue wires) as shown below. Feedback, if applicable is connected to positions 3 and 4 (grey and pink wires).

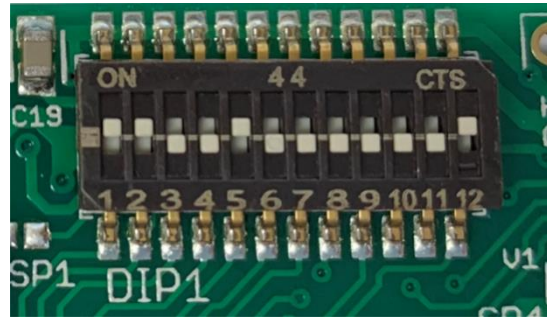


OPERATION

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)			
				RDL	RDM	RDH	RDF
Off	Off	Low	0.75	70	212	430	715
Off	On	Medium-low	1.0	79	236	522	832
On	Off	Medium-high	2.0	81	243	525	949
On	On	High	3.0	82	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)

DIP 3	Reserved for custom function.
DIP 4	Sets direction of offset (offset only required in RDH and RDF models).
DIP 5	Sets the highest amount of offset, typically 12°. NOTE: To set maximum offset DIPs 5,6, and 7 will need to be high for a total of 21°. The maximum offset can also be set differently at the factory (upon customer request).
DIP 6	Sets medium offset, typically 6°.
DIP 7	Sets the lowest amount of offset, typically 3°.
DIP 8	With DIP 8 in the ON position, the actuator will move to 4 positions. When DIP 8 is in the OFF position, the actuator is limited to three positions. DIP 8 also changes the function of the output signals. See p.6 for details.
DIP 9	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.
DIP 12	DIP 12 sets the direction of rotation

Functionality

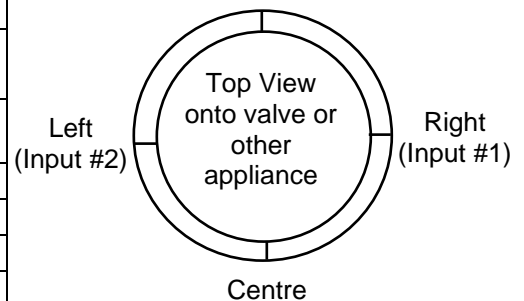
The RDx can operate as a 3-position or 4-position actuator. The 4th position is enabled by turning DIP 8 ON. **Note that inputs 1 & 2 (pins 1 & 2) are HIGH by default – a LOW signal must be sent to change the value. Sending a HIGH signal may be harmful to the internal circuit board.**

3-pos Functionality (DIP 8 OFF)

Input #1 (Pin 1)	Input #2 (Pin 2)	Action taken
High	High	Moves to or remains in center position
Low	High	Moves to or remains in right position
High	Low	Moves to or remains in left position
Low	Low	Moves to or remains in right position (Input #2 has precedence over Input #1)

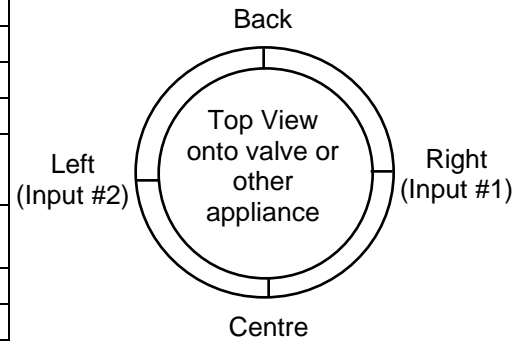
The feedback from the RDx-xxxDT is as follows:

Output #1 (Pin 3)	Output #2 (Pin 4)	Meaning High = 4.5 VDC Low = 0.8 VDC
High	High	Actuator output is in center position
High	Low	In Right position
Low	High	In Left position
Low	Low	Actuator is moving, or has stalled and given up trying to reach a requested position. You may retry to reach any position by cycling both inputs one after the other. Repeated failures to reach position will require troubleshooting.



4-pos Functionality (DIP 8 ON)

Input #1 (Pin 1)	Input #2 (Pin 2)	Action taken
High	High	Moves to or remains in center position
Low	High	Moves to or remains in right position
High	Low	Moves to or remains in left position
Low	Low	Moves to or remains in back position
The feedback from the RDx-xxxDT is as follows:		
Output #1 (Pin 3)	Output #2 (Pin 4)	Meaning High = 4.5 VDC Low = 0.8 VDC
Low	Low	Actuator is at requested position
High	Low	Actuator is moving
Low	High	Actuator has stalled. The stall can be cleared by making the actuator turn in the other direction.



Direction of rotation and using input 1

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



VERY IMPORTANT: Input 1 must always be used if only one input is used to operate the valve. When the actuator is operated using input 1 an automatic calibration is done every time the valve is actuated. This does not happen on input 2.

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 proper center position. This function is useful if the actuator’s output gear gets manually rotated while the actuator is powered down and can’t properly realign to the center by itself.

Manual Override

The RDx 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 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 Hanbay for technical support.

Battery Fail Safe Function

1. In the event of a loss of power or signal, the battery will maintain power to the P1 processor and trigger the actuator to move the valve to its designated fail-safe position, using power from the battery.
2. Once the valve has reached its fail-safe position, and after about one minute, the P1 processor will go into sleep mode to preserve the battery life.
3. The actuator will not respond to commands until the power supply is restored.

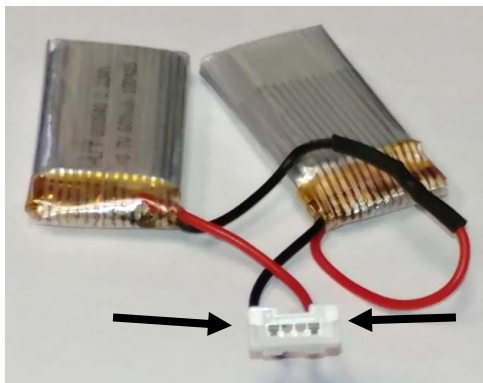
Note: The battery will maintain a charge for up to 2 months without power being applied. The fail-safe actuation can be performed for 30 cycles on the charge available in the battery. During normal operation, from totally discharged, the batteries will take 2 hours to re-charge.



If in a critical fail-safe application, the battery function should be tested monthly.

Testing Battery Fail-Safe

- The batteries will be continuously on charge when power is available to the actuator.
- Regardless of application, the fail-safe function should be tested monthly by signaling the unit to the position opposite the fail position, removing the power to the actuator and observing whether the actuator reaches the desired fail position.
- The battery voltage can be measured with a multimeter set for DC volt measurement.



Measure battery voltage between the connector terminals. Value should be:
 7.9 ± 0.4 VDC



EXPLOSION PROOF CERTIFICATION

Actuator model number: RDx-B-**B**xxxDT

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)

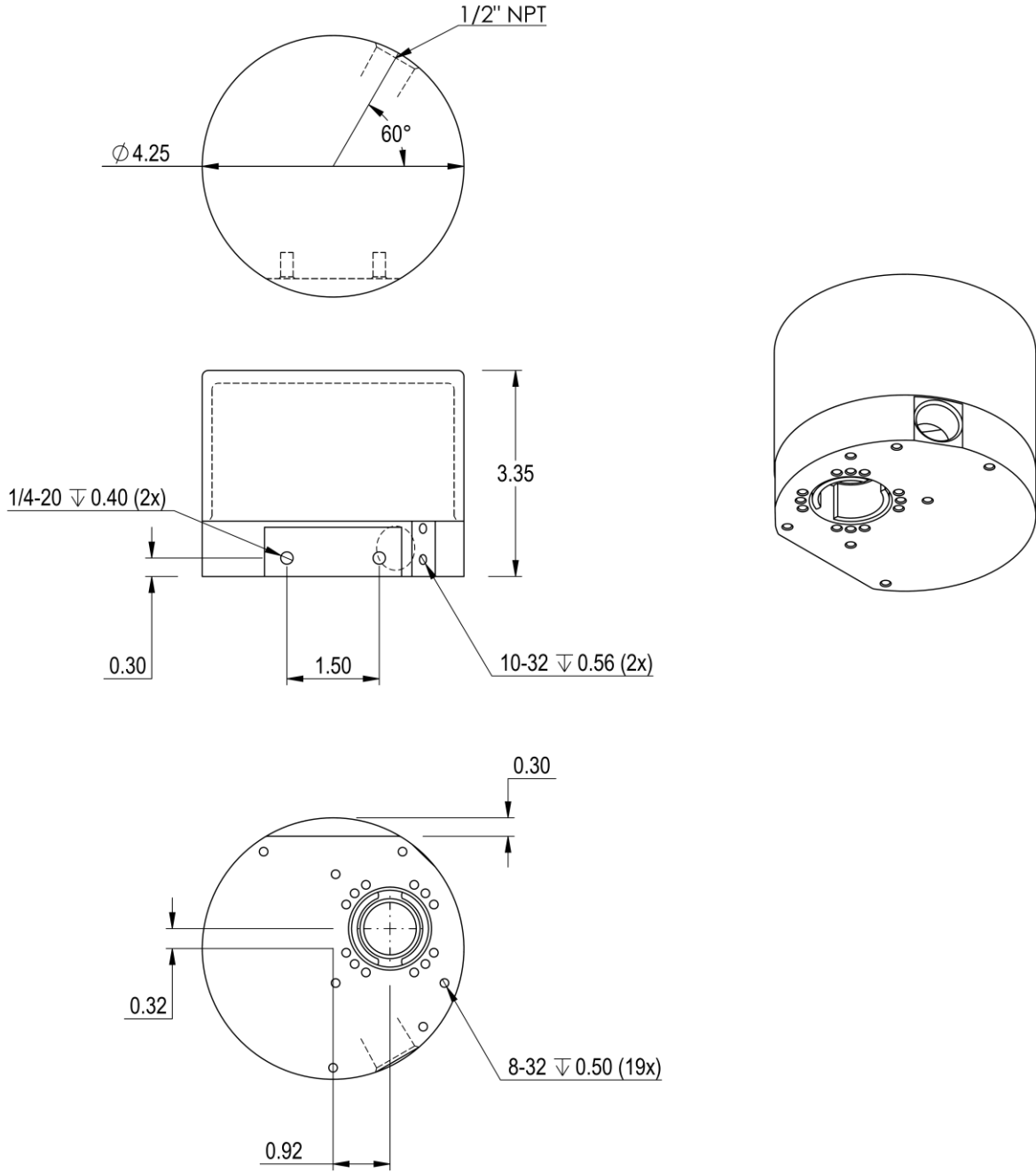
CAN/CSA Std. C22.2 No. 0-M91 (R2001)
CSA Std C22.2 No. 25-1966 Locations
CSA Std C22.2 No. 30-M1986 Locations
UL 1203-2006



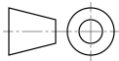
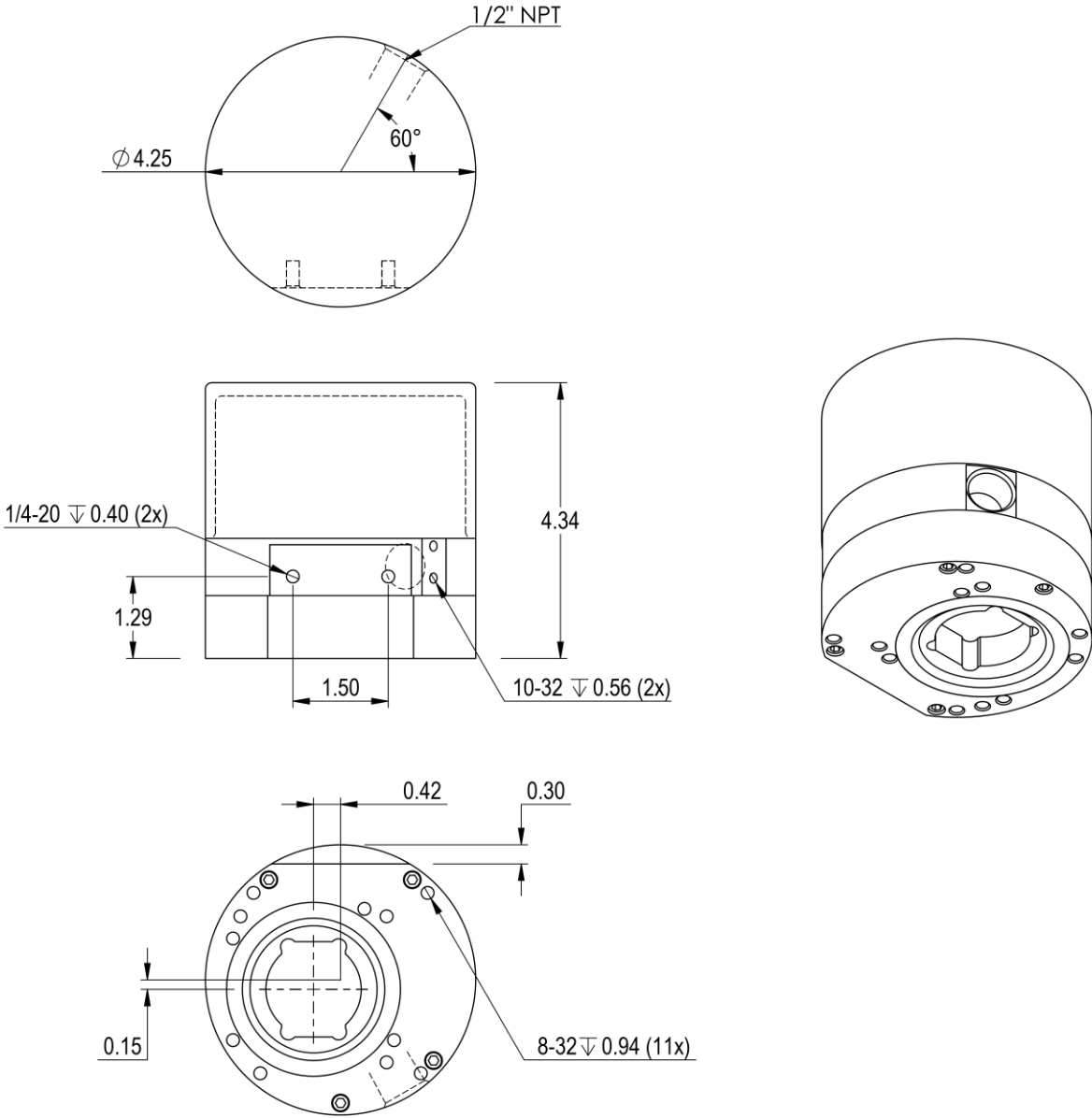
Lid engraving with CSA & IECEX certifications.

ACTUATOR DIMENSIONS

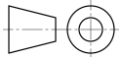
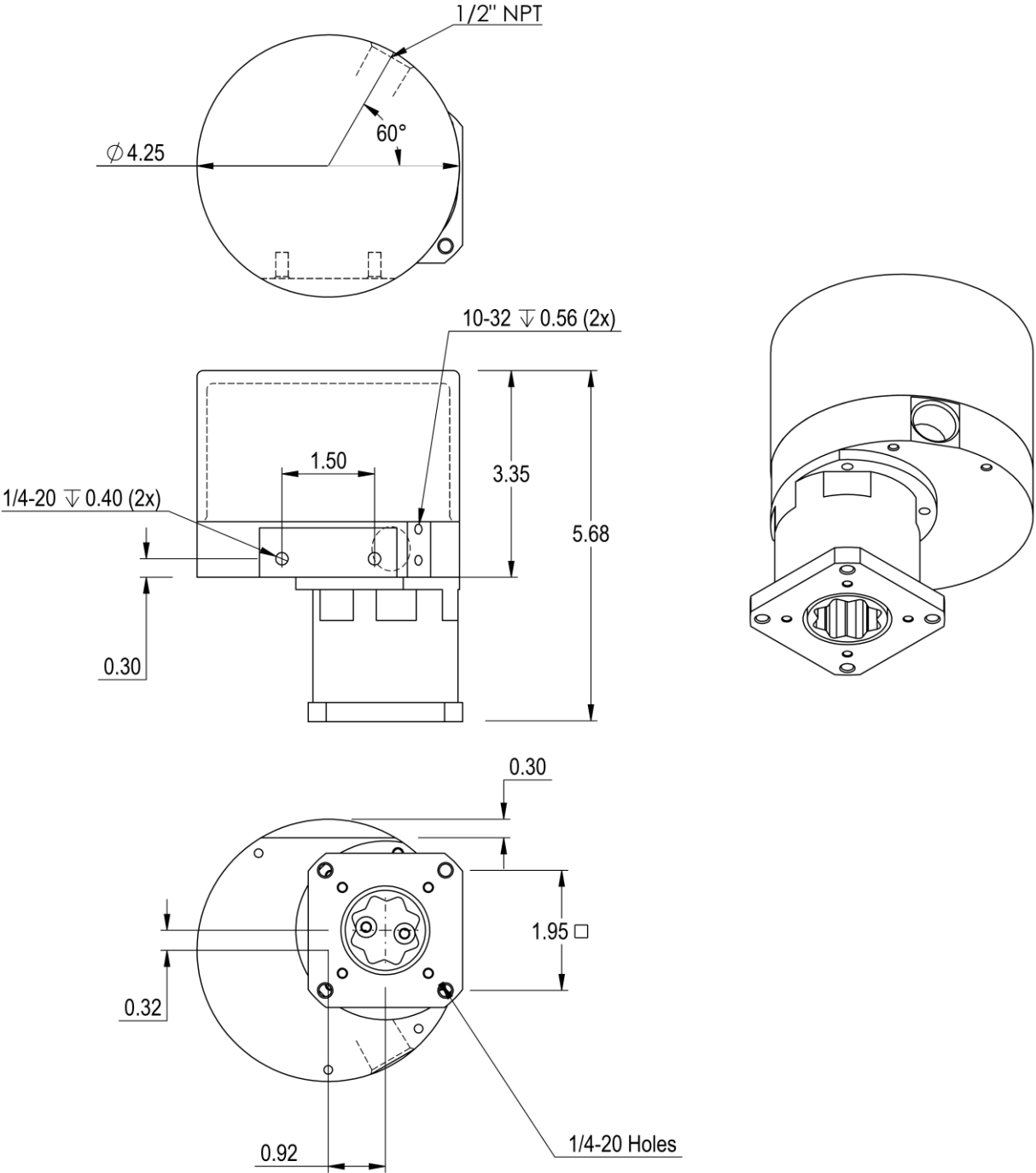
RDL & RDM -B-xxxDT models



RDH-B-xxxDT models



RDF-B-xxxDT models



PART NUMBER BREAKDOWN

Full Hanbay Part Number:

R	D	
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B				
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 DT -

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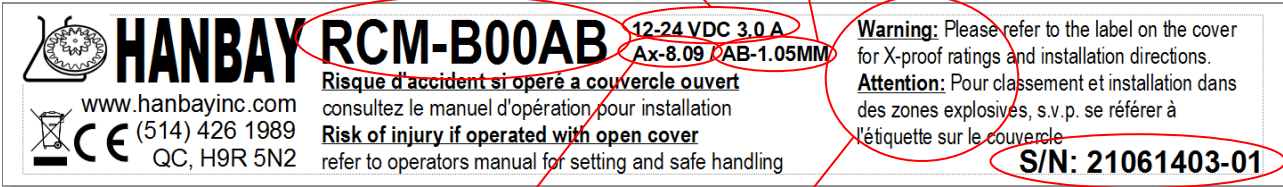
	Base Enclosure	Continuous or Discrete	Gear Train	Special Options	Enclosure Options	Wiring	Thermal Management	PCB	Mounting Kit	Valve Part Number	
R			-						-	-	Valve Manufacturers Part # / CU #
											0 No Valve or Mounting Kit 1 Mounting Kit, Customer Supplies Valve, does not send valve to Hanbay 2 Mounting Kit, Customer Supplies Valve, sends valve to Hanbay 3 Mounting Kit, Hanbay Provides Valve
R	R-Series										
		C Continuous D Discrete									
				J Extra Low Torque L Low Torque M Medium Torque H High Torque (Add. Gear Stage) F Higher Torque (Add. Gear Stage)							
											AB Analog Signal Board AI Analog Signal Board Isolated Input AF Analog Signal Board Isolated with Feedback DC Continuous TTL Input Board DT TTL Input Board with Integrated Feedback AS Modbus Control with Feedback PT Propane Board, Limit Switches, Thermal Cut Off
											0 No Option H Internal Heater F External Fan
											0 Cable Gland (Specify Cable & length at added cost) 4 Custom Dual Gauge Cable, 10ft. 5 TURCK 5 Position Connector w. 20' Cable and Plug 6 TURCK 6 Position Connector w. 20' Cable and Plug 7 TURCK 5 Position Connector Only 8 TURCK 8 Position Connector w. 20' Cable and Plug (Special)
											0 Standard Silver Alloy Enclosure B Explosion-Proof Rated Enclosure M Manual Override S Stainless Steel Enclosure U Submersible
											0 No Special Options HT High Temperature Kit B Battery Backup G G-Stage Gate Valve (RCM or RCL) L1 Linear 16 TPI (not for use with RCM) L2 Linear 8 TPI M Manual Override (When M in Enclosure Option is not usable) AC 110VAC Power Supply S Spring Return RS Reverse Spring Return TS Top Stop BS Bottom Stop

LABEL BREAKDOWN

Actuator Supply Voltage
12-24 VDC @ 3.0 A or
110-240 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.



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

Ex-proof Certification
Info on ex-proof ratings
and installation
instructions.

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