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

USER MANUAL

Contents

***Only model numbers: RDx-BxxDT w/ ex-proof lid engraving (see p.8)**

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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.9.

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.9 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.

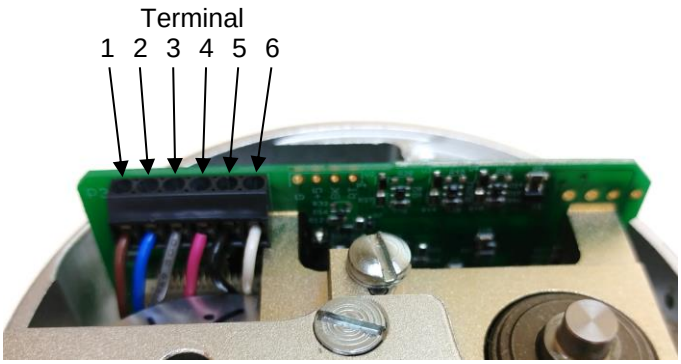
Standards for cable gland and cable in hazardous locations:

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.

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

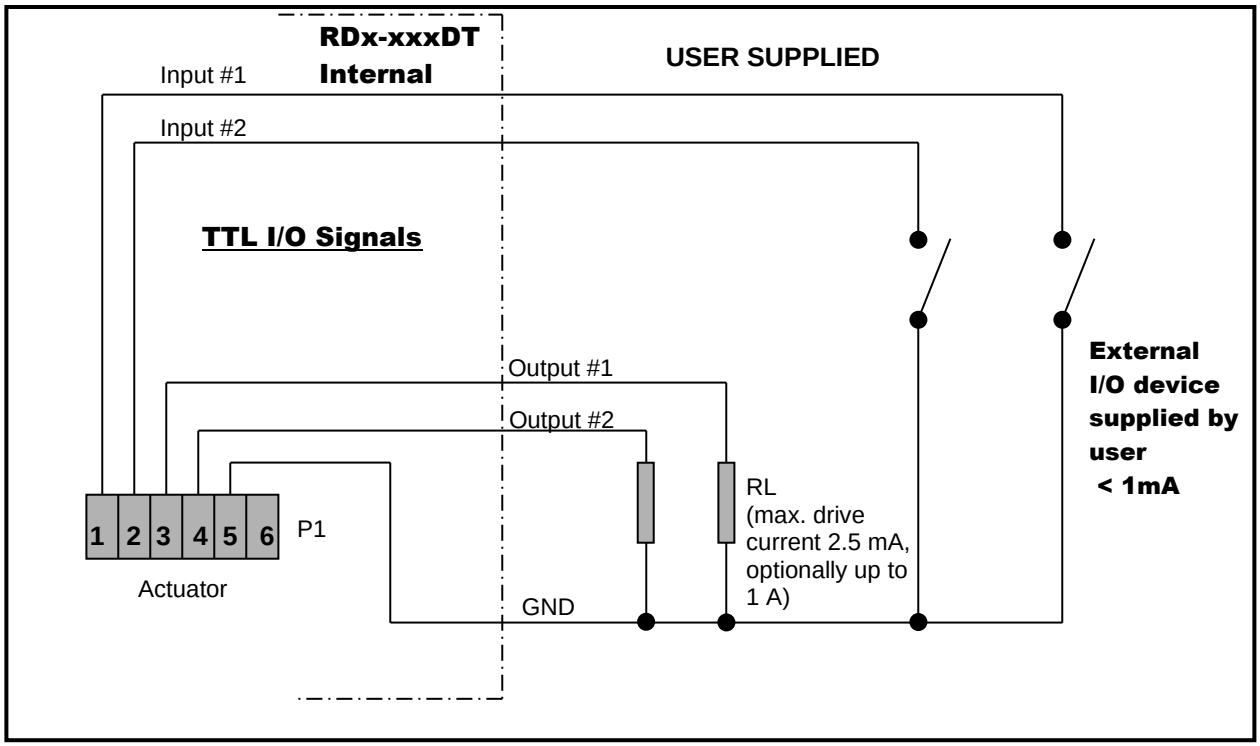
Power Supply and Current Draw

The **RDx-xxxDT** 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.

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).



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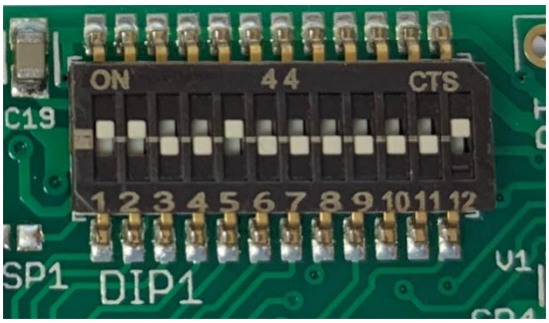
OPERATION

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	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)

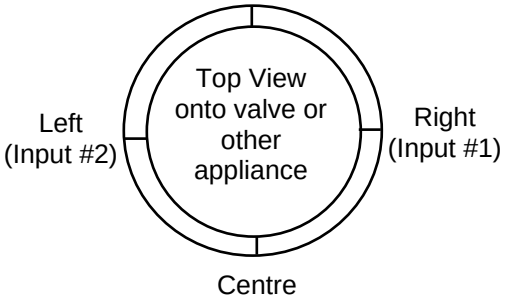
DIP 3	Reserved for custom function.
DIP 4	Sets direction of offset (offset only required in RD**H** and RD**F** models).
DIP 5	Sets the highest amount of offset, typically 12°. **NOTE:** To set maximum offset DIPs 5,6, and 7 will need to be high for a total of 21°. The maximum offset can also be set 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.**

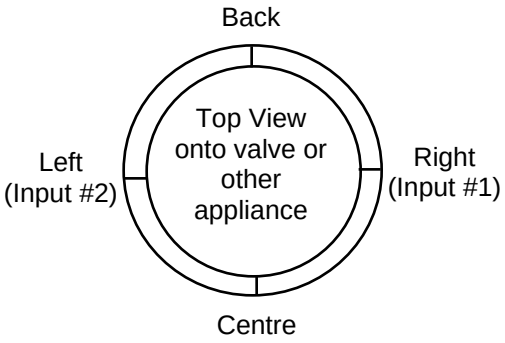
3-pos Functionality (DIP 8 OFF)

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.

EXPLOSION PROOF CERTIFICATIONS

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

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:

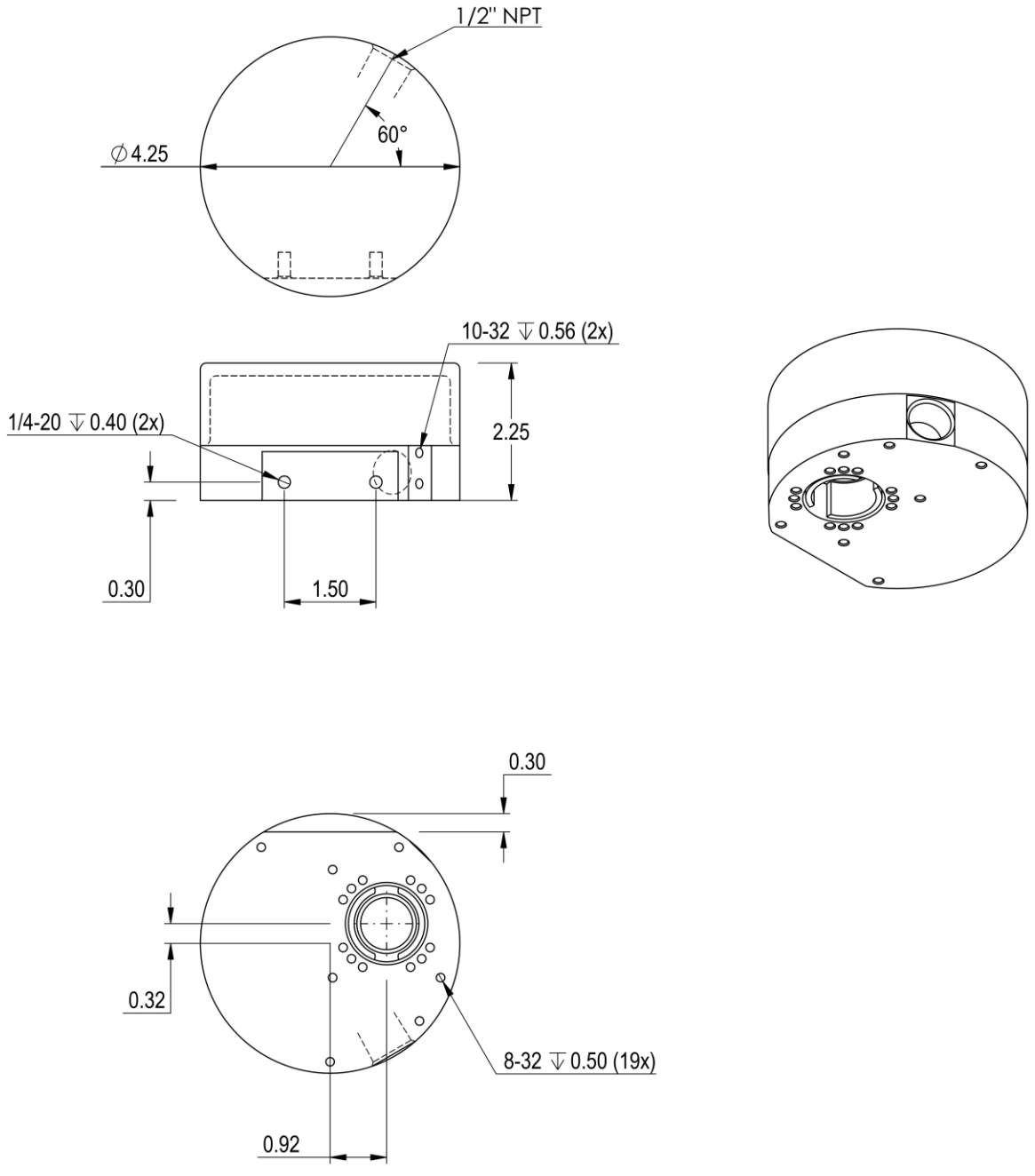
Class I, Div 1, Groups B, C, D (T6)
Class II, Groups E, F, G (T6)

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

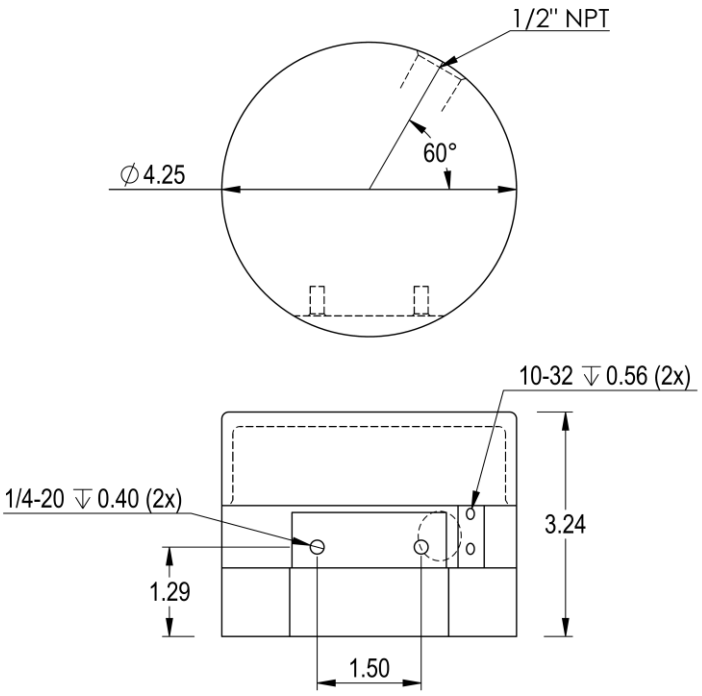
Lid engraving with CSA & IECEX certifications.

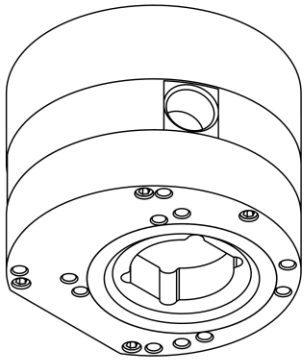
ACTUATOR DIMENSIONS

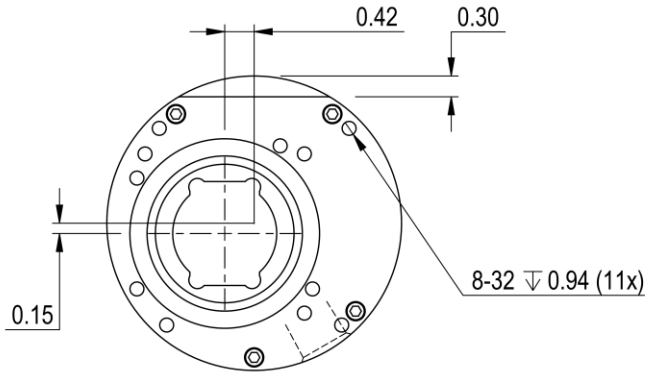
RDL & RDM -xxxDT models



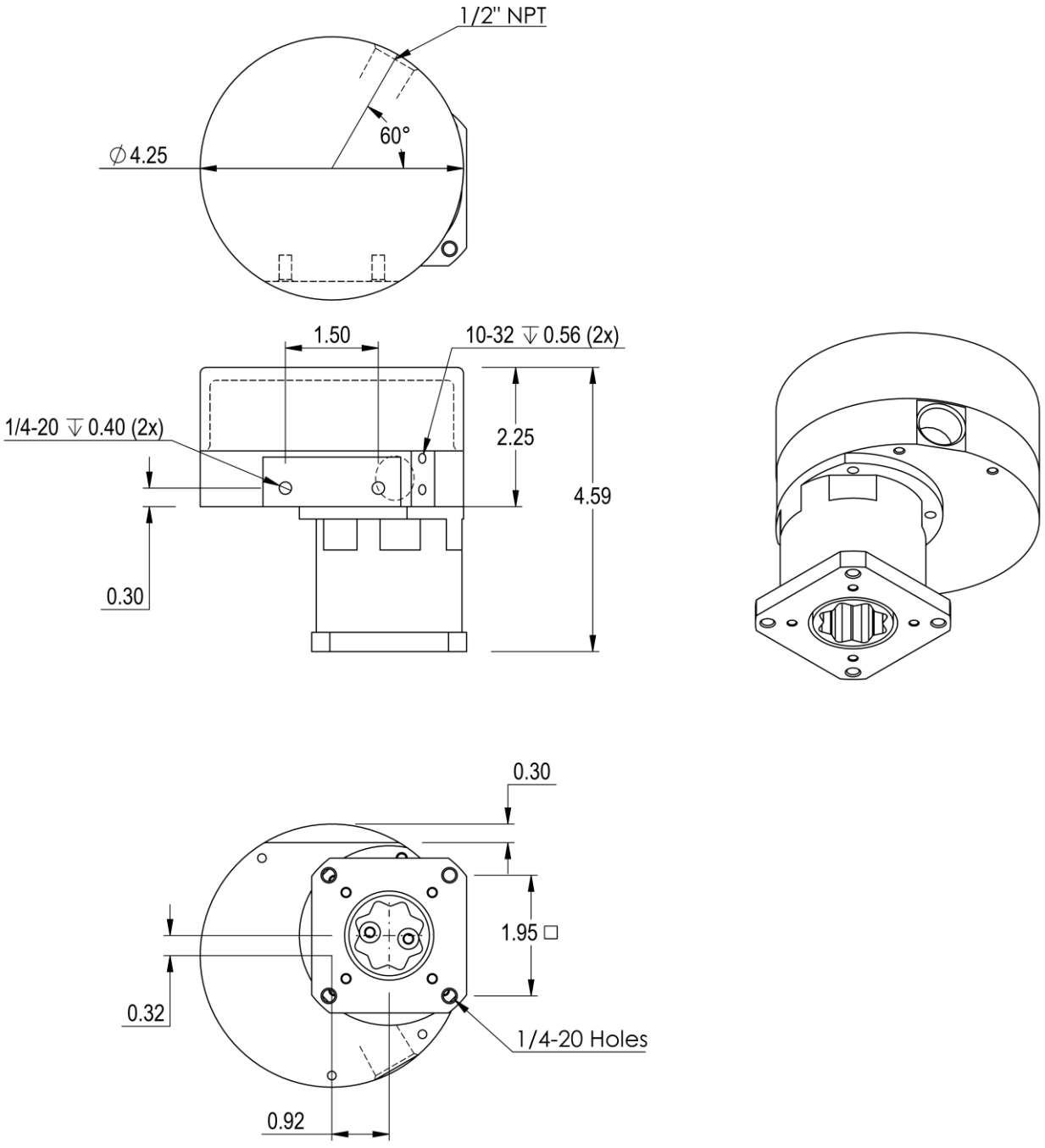
RDH-xxxDT models





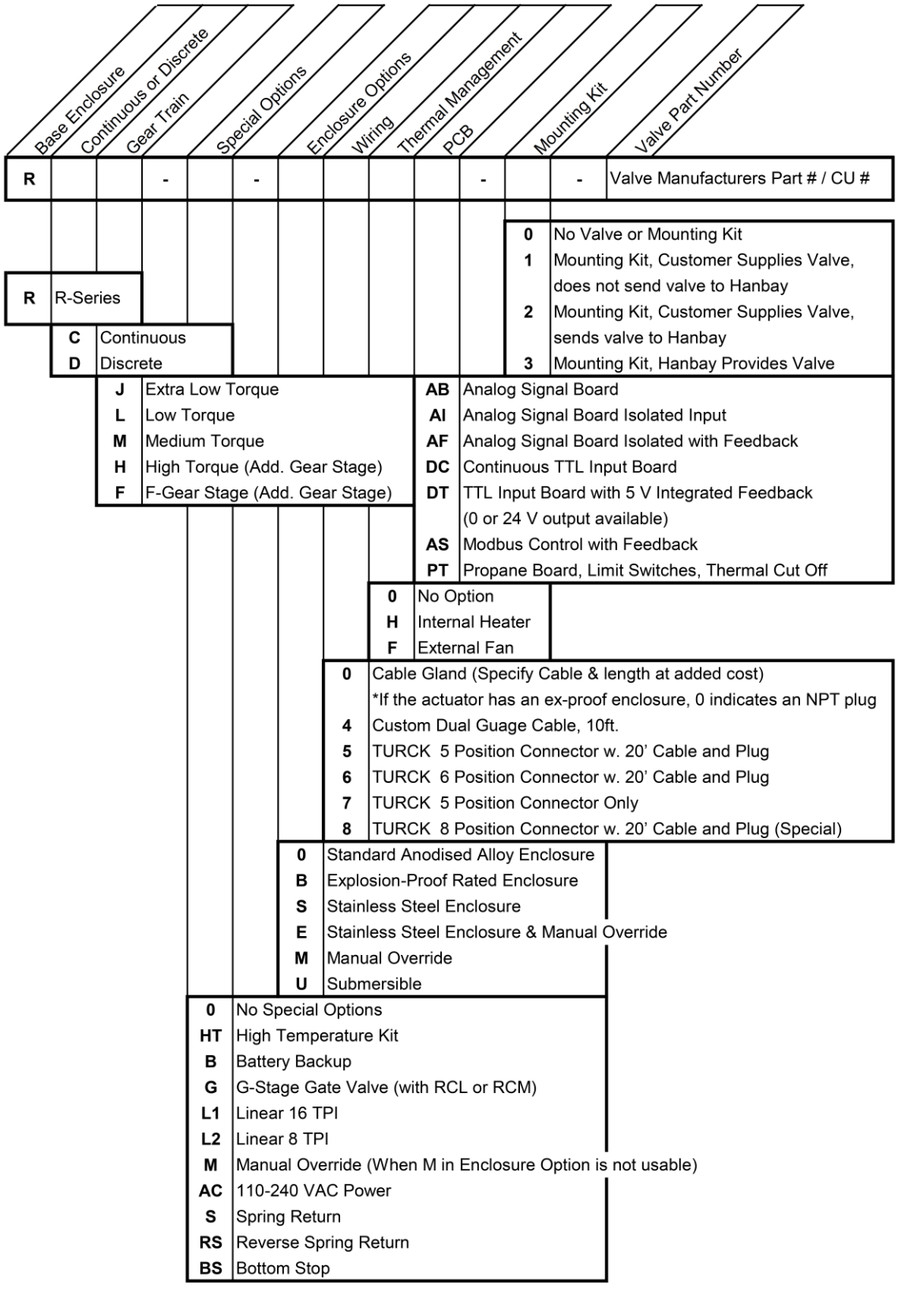


RDF-xxxDT models



PART NUMBER BREAKDOWN

Full Hanbay Part Number: R D [ ] - [ ] - [ ] [ ] [ ] DT - [ ] - [ ]



LABEL BREAKDOWN

Firmware Version

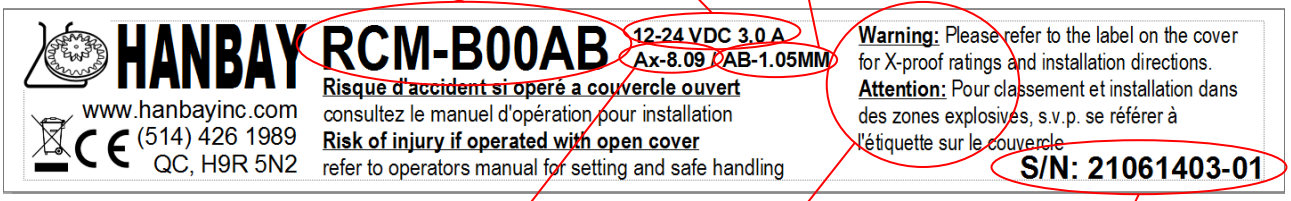
AF-1.05
AB-1.05
AS-1.05

- 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.