WESTLOCK CONTROLS

DIGITAL EPIC D200 MODELS
OPERATING MANUAL

IOM: Tech-546-EN		**Revision:** C	
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Reviewed By: Mita Patel	**Date:** 6/23/22	**Approved By:** Terrence Lee	**Date:** 6/23/22
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Revision History

Revision

Revision C	10/20/2021
Revision B	08/23/2020
Revision A	06/30/2020
Initial release	1/9/2020

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1 Introduction

1.1 Product Certification

Model	North America	ATEX/IECEx/*UKEx
D230 D240 D250	IS Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G; Class III; T6; Type 4X	II 1 G Ex ia IIC T4 Ga II 1 D Ex tb IIIC T135 Db IP6X Ta= -40°C to +60°C Comply with the following standards: IEC 60079-0 : 2011, IEC 60079-11 : 20011 and IEC 60079-31 : 2008.
D241 D251	IS Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G; Class III; T6; Type 4X	II 1 G Ex ia IIC T4 Ga II 1 D Ex tb IIIC T135 Db IP6X Ta= -40°C to +60°C Comply with the following standards: IEC 60079-0 : 2011, IEC 60079-11 : 20011 and IEC 60079-31 : 2008.
D260 D270	Class I, Div. 1, Groups A, B, C, D; Class II, III, Div. 1, Groups E, F, G; T*	II 2 G Ex db IIC T4 Gb II 2 D Ex tb IIIC T135 Db, IP66/67 Ta: -20°C to +60°C Valve opt. X Ta: -40°C to +52°C
D261 D271	Class I, Div. 1, Groups A, B, C, D; Class II, III, Div. 1 Groups E, F, G; T*	II 2 G Ex db IIC T4 Gb II 2 D Ex tb IIIC T135 Db, IP66/67 Ta: -60°C to +110°C
D280 D290	Class I, Div. 1, Groups C, D; Class II, Div. 1, Groups E, F, G; T6; Type 4/4X	II 2 G Ex db IIB+H2 T4 Gb II 2 D Ex tb IIIC T135 Db, IP6X Ta: -20°C to +60°C Valve opt. X Ta: -40°C to +52°C
D281 D291	Class I, Div. 1, Groups C, D; Class II, Div. 1, Groups E, F, G; T6; Type 4/4X; IP66/67	II 2 G Ex db IIB+H2 T4 Gb II 2 D Ex tb IIIC T135 Db, IP6X D281 Ta: -50°C to +110°C D291 Ta: -70°C to +110°C

***UKEx available for D26X, D27X, D28X and D29X Series only.**

1.2 Warnings

Conditions of Use for Intrinsically Safe:

- The user/installer shall install these products taking into account any restrictions or special conditions for safe use that are applicable to the previously certified devices that are used in them.
- The various devices (switches, sensors and transmitters) shall be treated as separate intrinsically safe circuits.
- Potential electrostatic charging hazard- Clean the equipment safely and prevent static charge build-up on the Grilamid enclosure or beacon (when fitted) with a damp cloth only.
- When the enclosure is manufactured from aluminum ignition sources due to impact and friction sparks may occur. This shall be considered when the

monitor is being installed, particularly in locations that specifically require Group II, Category 1G equipment.
- For all types of enclosures the maximum dust layer shall be no greater than 5 mm (T5 135°C)
- Refer to the manufacturers control drawings WD-12410 for installation in hazardous areas in Appendix C and MS-10982 for intrinsically safe areas in Appendix D.

Conditions of Use for Explosionproof/Flameproof Areas

- Temperatures at the cable entry point can exceed 70°C and 80°C at the branching point. Selection of cable must be appropriate for the ambient temperature range.
- The certification applies to the enclosure without cable glands, only suitably approved flameproof cable glands may be used with an ingress protection rating of IP6X.
- When conduit is utilized the conduit must be sealed in accordance with clause 13.2.2 of IEC 60079-1:2007 with a suitably approved conduit sealing device.
- All unused entries must be plugged with suitably approved flameproof blanking elements with an ingress protection rating of IP6X.
- No modifications must be made to the flamepaths of the unit without consultation of the drawings.
- Only suitably certified thread adapters must be used.
- Flamepath joints are not intended to be repaired.
- Do not open when energized or when an explosive atmosphere is present.
- Electrostatic hazard, clean only with damp cloth.
- Confirm that the area is known to be non-hazardous before opening the cover of the enclosure and making or breaking any electrical connections.
- Perform all wiring in accordance with site and local codes and the National Electric Code ANSI-NFPA-A-70 (US) or the Canadian Electric Code Part I (Canada), for ATEC installations EN 60079-14 must be followed for the appropriate area classification.
- Confirm that the unit identification label of the Digital EPIC model being installed meets the hazardous area before installation.
- Confirm that power supplied to switches and solenoid is within rated specifications listed on the unit identification label.
- Protect the unit from exposure to aggressive substances or atmospheres to ensure that hazard rating is not compromised
- Disconnect power to solenoids and the inlet air supply before conducting any valve service or maintenance. Avoid introduction of any contaminants into the valve.

General Warnings:

- Before using this product, please ensure that the product and its certification (Section 1.1) are suitable for the intended application.
- If the equipment is likely to be exposed to aggressive substances, it is the responsibility of the user to take suitable precautions to prevent it from adverse effects, thus ensuring that the type of protection provided by the equipment is not compromised.
- The D200 transmitter should be handled with care when being installed or stored.
- Before electrical installation, please read the applicable I.D. label for the entity parameters and certificate conditions of safe use.
- Do not remove D200 transmitter from unit and install outside of the enclosure or in a 3rd party switchboxes.

- Before commissioning, ensure control loop is not in automatic mode.

1.3 Description

The Digital EPIC D200 is a position transmitter with HART® 7 protocol. The Digital EPIC valve position transmitter is intended for use as both visual and electrical position indicators for discrete rotary devices, most commonly pneumatically actuated 2-way quarter-turn or 3-way valves.

The Digital EPIC comes standard with non-contact sensing technology to measure the positon of the automated valve and provide continuous position indication through the use of an analog 4 mA to 20 mA current signal. Calibration, configuration and diagnostic information can be accessed through the HART communication protocol. The non-contact position transmitter has the ability to measure the degree of travel for actuated valves between 30 to 270 degrees. In case of any application where analog position sensing device is preferred, an optional gearless potentiometer is available. For a potentiometer the degree of travel measured for actuated valves is between 30 and 210.

The communication protocol and the EDD is HART® 7 compliant. The Device Description can be downloaded from the Fieldcomm Group™ website. HART® is a registered trademark of the HART Communication Foundation, Texas, USA. Any use of the term HART hereafter in this document, or in any document referenced by this document, implies the registered trademark.

The Digital EPIC series valve position transmitter has an option to provide numerous methoD200 of end of travel indication by the means of proximity switches (Magnum XT-90), mechanical switches, inductive proximity switches and an external visual indicator (Beacon) or 4-20mA feedback and HART 7 communication. The switches are activated by cams/triggers mounted on the rotary shaft.

The Digital EPIC series enclosure is available in cast aluminum, engineered resin or 316 stainless steel. The enclosure construction comprises of a shaft passing through the enclosure housing and cover, when fitted with visual indicator, and has an integral gasket seal with up to two O-ring seals in the bearing areas.

Explosionproof/flameproof models are available with either a screwed or a bolted cover. Depending on the Digital EPIC model, the housing has the option of up to four conduit entries of either M20 x 1.5p, or 3/4” – 14 NPT with appropriate certified cable glands.

The Digital EPIC series also has the option to include a solenoid.

The Digital EPIC transmitter is not limited for use in only quarter-turn valve applications, but that application will be assumed for the purpose of this document. In addition to the monitoring features, the transmitter may serve as wiring junctions for accessories where additional terminals, conduit entries and wiring codes permit.

1.4 Principles of Operation

The Digital EPIC D200 is a position transmitter with HART® 7 Protocol. The Digital EPIC transmitter mounts to an actuator via a mounting kit, usually sold separately. The unit shaft couples to the actuator shaft directly via NAMUR adaptation, or via a coupling provided in the mounting kit.

The D200 measures the position movement of the actuated valve through the use of a magnetic sensor for non-contact models which measures the magnetic field of a magnet attached to the rotating shaft. The sensor converts the changing magnetic field to an electrical signal and the microprocessor of the D200 electronics converts this electrical signal to the corresponding 4-20 mA current output signal. In potentiometer models, the unit shaft is pinned to a potentiometer which tracks rotation and provides current output.

The D200 4-20mA output signal conforms to the HART® revision 7 communication protocol. The HART communication provides the ability to configure, calibrate, and read diagnostics remotely via handheld or through a host system.

The D200 transmitter has the ability to integrate up to four independent switches and sensors according to the series ordered. As the actuator rotates the unit shaft, adjustable cams on the shaft actuate mechanical or proximity switches inside the unit enclosure, at the limits of rotary travel set by the customer. The switches are pre-wired to a terminal strip in the enclosure, permitting easy connection of switch output to external electrical monitoring systems or indication devices.

The visual Beacon indicator on the enclosure cover indicates 90° rotary travel between OPEN and CLOSED valve positions, unless ordered optionally for other angular strokes or 3-way valve applications.

2 Order Guide

Ordering guides for all Digital EPIC D200 product series covered by this IOM are available through a local Westlock distributor, the current Westlock Controls catalog literature or the Westlock Controls website at www.westlockcontrols.com. Spare parts lists for refurbishments or repairs are also available for common D200 models.

3 Definitions

NAMUR- NAMUR is an international user association of automation technology. This term, in the context of mounting brackets and shafts, refers to the NAMUR VDI/VDE 3845 standard for the dimensions of actuator output shafts and auxiliary equipment mounting hole patterns. In the context of inductive proximity sensors, NAMUR refers to conformance of the sensor to DIN 19 234, allowing its use with any NAMUR style amplifier/isolator.
Switch- A manual or mechanically actuated device for making, breaking or changing the connections in an electric circuit. This term will be used also for magnetic or inductive proximity sensors for the purpose of this document.
NE-43- NAMUR NE43 is a recommendation that gives a guideline how a sensor fault can be indicated to a control system by means of the 4-20mA signal. It can be configured with up (21mA) or down (3.6mA) scale signal
NE-107 – NAMUR specification for Self-Monitoring and Diagnosis of Field Devices
Position Cutoff – The value used to saturate the measurement output. Below the low cutoff value, the measurement drop to 0% (4 mA). Above the high cutoff value, the measurement saturates to 100% or (20 mA).

Dead Band – A range where the device is insensitive to the physical position or displacement variation.
DD – Device Description
EDD – Enhanced DD
DTM – Device Type Manager

4 Mounting Instructions

Required tools: open-end wrenches or adjustable wrench to fit all sizes of hex head bolts in the mounting kit.
NOTE: To ensure that the Digital EPIC unit is mounted correctly, it may be necessary to stroke the actuator to the fully closed position. See figure A for graphic overview of mounting.

1. Obtain a mounting kit suited for the actuator/valve, commonly available through a local Westlock Controls distributor.
2. Attach the bracket and coupler (if required) to the unit housing with the hardware provided.
3. Ensure actuator is in the correct position. Attach the unit and mounting system to the actuator.
4. Ensure that the transmitter unit is mounted such that the shaft indication mark travels within the valid operating range of the non-contact sensor or potentiometer, in accordance with the relevant Appendix diagram (Appendix A).
5. If mounting kit includes coupler, ensure proper axial alignment between unit shaft, coupler and actuator shaft. Failure to ensure this alignment could result in long- term stress-related failure of unit shaft in high cycle or high torque applications

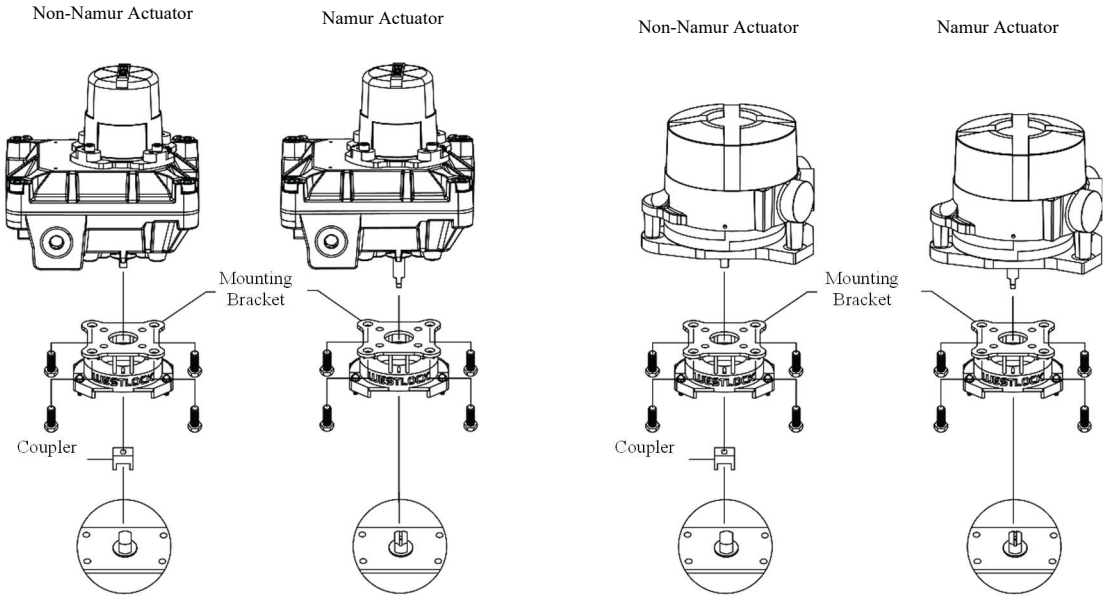


Figure A: Mounting

5 Field Wiring

Installation of any cable entry devices, conduit entry devices or blanking devices shall not compromise the degree of ingress protection level IP6X for use in the presence of combustible dusts.

The unit has an ingress protection of IP66/67 and therefore any conduit device fitted must maintain this.

WARNINGS

See the warnings section of this document for important warnings pertaining to the wiring of this unit. Remove and replace cover before and after wiring, per instructions given in the Switch Adjustment section above.

The Digital EPIC should always be handled with care when the cover is removed and wired to electrical power source.

Field wiring must be carried out in accordance with site, local, and national electrical codes/requirements. This includes special attention to earth bond to the enclosure using the internal and external earth point provided.

Installation of this product shall be carried out by competent personal in accordance with the application code of practice such as EN 60079-14 or IEC 60079-14.

Required tools: slotted screwdrivers for terminal strip screws (#2); hex (Allen) keys for cover screws, if applicable (M5 or M8 by model), and grounding screw (#8 or M5 by model); wire strippers as required for field wires.

1. Remove cover from switch adjustments.
2. Before electrical installation, please read the wiring diagram located inside the cover. The electrical ratings can be found on the product identification label. Wire the Digital EPIC strictly according to the wiring diagram.
3. Confirm that the ground wire is secure under the grounding screw in the enclosure.
4. The certification applies to equipment without cable glands. When mounting the enclosure in the hazardous area, only suitable certified cable glands and blanking elements must be used to maintain ingress protection of IP67.
5. Ensure that the temperature rating of all field wiring meets the service temperature range of the application.
6. Coil voltage for the Digital EPIC include 24 VDC or 120 VAC, except for Intrinsically Safe models, which restrict coil voltage to 24VDC only
7. Ensure that separate power is supplied to switches/sensors that conforms to the ratings in the tables below.

FLAMEPROOF – Ex d

TRANSMITTER	D2XX	4-20mA @ 9-30 VDC
SWITCHES / SENSORS	M04	DPDT MECH 10 Amp - 125/250 VAC, 10 Amp - 24 VDC
	M06	SPDT 3 Amp - 120 VAC, 2 AMP - 24 VDC
	M08	NJ2-V3-N 5-25 VDC
	M09	SPDT MECH 15 Amp - 125/250 VAC, 6 Amp - 24 VDC
	M12	SPDT 200 mA - 120 VAC, 1 AMP - 24 VDC
COIL	24 VDC	1.8W
	120 VAC	1.8W, 3.2VA

INTRINSICALLY SAFE – Ex ia

TRANSMITTER	D2XX	Ui = 30 V, Ii = 100 mA, Pi = 750 mW, Ci = 5 nF, Li = 10 µH
SWITCHES / SENSORS	M08	NJ2-V3-N :- Ci = 40 nF, Li = 50 µH (CONSULT LATEST REVISION OF P&F CERTIFICATE FOR Ui, Li & Pi)
	M09	Ui = 30V, Ii = 25mA, Pi = 2W, Ci = 0, Li = 0
	M12	Ui = 30V, Ii = 25mA, Pi = 2W, Ci = 0, Li = 0
COIL	24 VDC - I	Ui = 31V, Ii = 0.67A, Pi = 2.98W, Ci = 0µF, Li = 0mH - ATEX / IECEx
		Ui = 35V, Ii = 300mA, Pi = 2.98W, Ci = 0µF, Li = 0mH - FM

Note: The switch designation signifies the maximum electrical rating of the product, suitable overloading protection must be provided to prevent these values being exceeded.

Polarity insensitive, two wire 4-20 mA, Namur NE43
Normal operation: adjustable 3.8 ≤ 20.5 mA
Minimum operating voltage: 9 VDC
Maximum operating voltage: 30 VDC

Before replacing the enclosure cover, ensure gaskets are in place and that both of the housing and cover surfaces are clean and undamaged. Pay special attention flanges and threaded surfaces in explosionproof/flameproof models. Tighten the cover screws hand tight using a standard 6mm A/F Allen key ensuring there are no gaps and a torque of approximately 20 in-lb is applied to each bolt.

For screw top models, lock the cover as follows:

- Using a 3 mm A/F Allen key/wrench, rotate the jackscrew in a counterclockwise direction until sufficient pressure has been applied to the bottom edge of the cover to prevent the cover from being removed by hand.

6 D200 Transmitter

6.1 Description

Westlock Controls' next-generation D200 digital transmitter provides highly repeatable, accurate, and precise valve position via 4-20 mA feedback. D200 comes standard with a non-contact sensor, which measures the position movement of the actuated valve using a magnetic sensor for non-contact models that measures the magnetic field of a magnet attached to the rotating shaft. The D200 has an optional state-of-the-art through-shaft potentiometer to measure position and transmit data within 20 ms. The D200 transmitter is offered in conjunction with a variety end-of-travel switches and sensor options, (Mechanical, Magnetic, or Inductive). The D200 transmitter has integrated LCD and pushbuttons with LED indicators for quick and intuitive calibration. The D200 transmitter component is globally approved with ratings as per the table shown in section 1.1, and is an option in Westlock AccuTrak™ and Quantum™ families. The D200 transmitter is certified for Explosionproof, Intrinsically Safe, and Non-Incendive applications.

6.2 Principles of Operation

The D200 transmitter utilizes two pushbuttons with two bi-color LEDs for calibration and changing transmitter settings. The LCD displays valve position (% Open) as well as various setting options. The through-shaft potentiometer is aligned with the shaft, allowing for mounting Westlock Beacon on the same shaft. It is directly pinned to the shaft, avoiding gears that wear and create position reading inaccuracy.

7 D200 Transmitter Keypad & User Interface

NOTE: The device takes about 20 seconds to start up

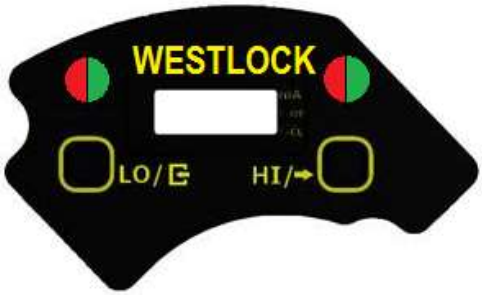
7.1 Electronics

Figure B below represents the transmitter electronics module.

Figure B: D200 Transmitter Module

7.2 User Interface

The User Interface (see figure C), consists of the following features:



- 2 buttons: LO/"SELECT ICON" and HI/"NEXT ICON"
- 2 Bicolor LEDs (RED/GREEN)
- A Digital Display

Figure C: User interface layout

The SELECT key is located on the left side of the user interface and the NEXT key is on the right side of the user interface. Refer to section 8 for the full operation of the buttons.

7.3 LED

There are two Bicolor (RED/GREEN) LED200 available. The LEDs general behavior is as follows:

- Both LEDs flashing GREEN: Operation is successful
- Both LEDs flashing RED: Operation has failed
- Left LED flashing in alternate RED and GREEN: Waiting for user confirmation
- Right LED flashing in alternate RED and GREEN: Processing selected function. User has to wait.

7.4 LCD

The D200 display is a 4-digit numeric reflective LCD display module (see figure D).

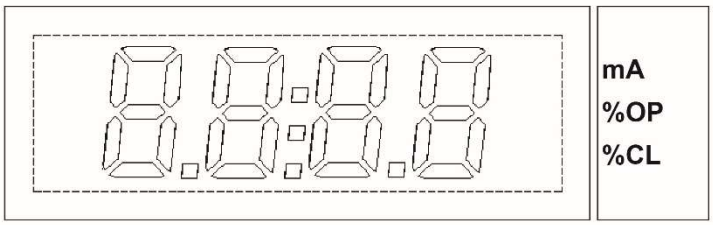


Figure D: LCD Screen

The fourth character of the LCD display indicate engineering units used (mA, %OP or %CL). By default, the LCD display will depict percentage open (%OP). The LCD screen can be configured to display any of the three options; consult Appendix B, Configuration Menu for configuration instructions. Figure E shows the location of the display units.

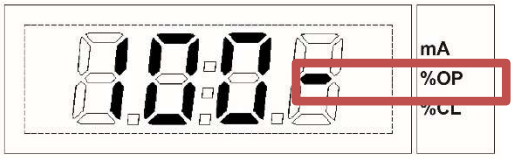


Figure E: LCD Screen percentage Open

8 Transmitter Menu Tree

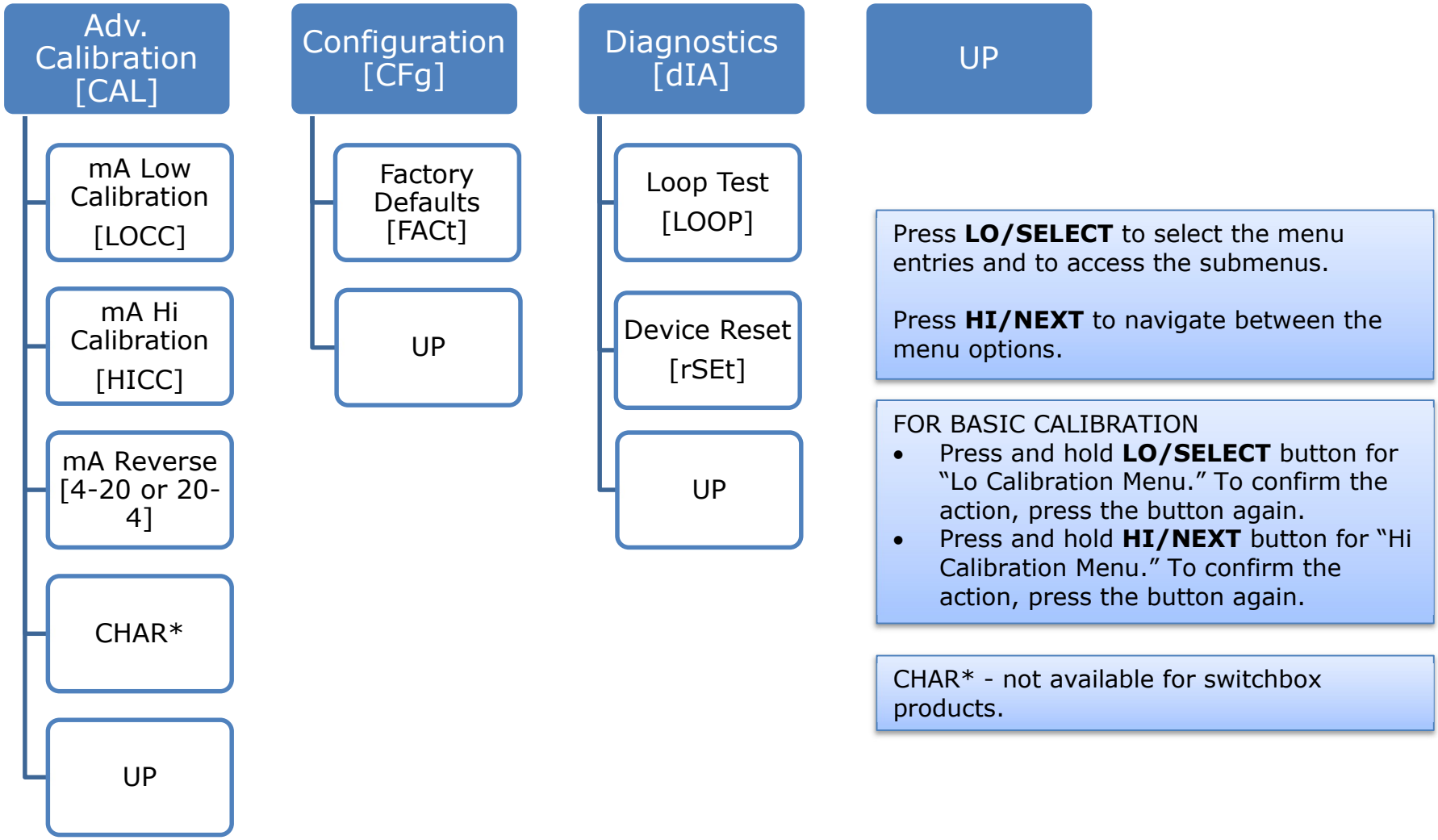
Navigate the local D200 menu tree as follows:

- Press **and hold** LO/SELECT button for "Lo Calibration Menu" (LCAL). To confirm the action, press the LO/SELECT button again.
- Press **and hold** HI/NEXT button for "Hi Calibration Menu" (HCAL). To confirm the action, press the button again.
- Press **and hold both buttons** to access the advanced menu options.
  - Press HI/NEXT button to view other options such Calibration (CAL), Configuration (CFg), Diagnostic (dIA) and UP. Press HI/NEXT to return to the Calibration (CAL) screen.
- Review section 7.4 for LCD operation.

To see full menu tree of advanced menu options, please see figure F on page 13.

NOTE: Basic LO and HI calibration are the two most used options. About 90% of all functions can be completed with basic LO and HI calibration.

Figure F: Advanced D200 Menu Tree



9 Calibration

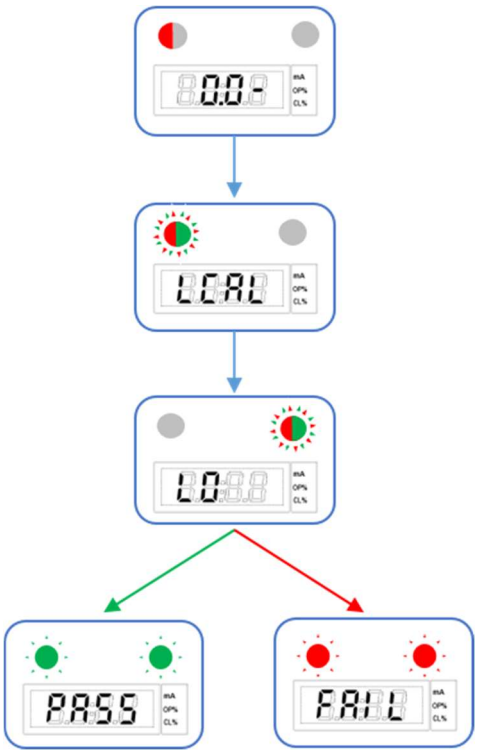
9.1 Basic Low Calibration

Move the valve to the desired low position.

1. Press **and hold** LO/SELECT to enter low calibration mode
2. Press LO/SELECT to confirm the action
3. Note: If no selection is confirmed approx. 6 min, device will time out. If this occurs, repeat the steps above.
4. Device will flash GREEN for successful calibration or RED for failure.
5. If calibration fails, consult Troubleshooting section 19 and repeat the steps above.

Figure G shows a visual of accessing low calibration. See section 21 for information on calibration cutoff and dead band.

NOTE: Device may report failure if current calibration value is significantly different (greater than 30°) from previous calibrated position. A failure will clear the low and high calibration data. In the event the calibration fails, run both low and high calibration again.



- Left LED flashing in alternate RED and GREEN: Waiting for user confirmation
- Right LED flashing in alternate RED and GREEN: Processing time. User has to wait.

Figure G: Basic Low Calibration

9.2 Basic High Calibration

Move the valve to the desired high position.

1. Press **and hold** HI/NEXT to enter high calibration mode
2. Press HI/NEXT to confirm the action
3. Note: If no selection is confirmed approx. 6 min, device will time out. If this occurs, repeat the steps above.
4. Device will flash GREEN for successful calibration or RED for failure.
5. If calibration fails, consult Troubleshooting section 19 and repeat the steps above.

Figure H shows a visual of accessing high calibration. See section 21 for information on calibration cutoff and dead band.

NOTE: Device may report failure if current calibration value is significantly different (greater than 30°) from previous calibrated position. A failure will clear the low and high calibration data. In the event the calibration fails, run both low and high calibration again.

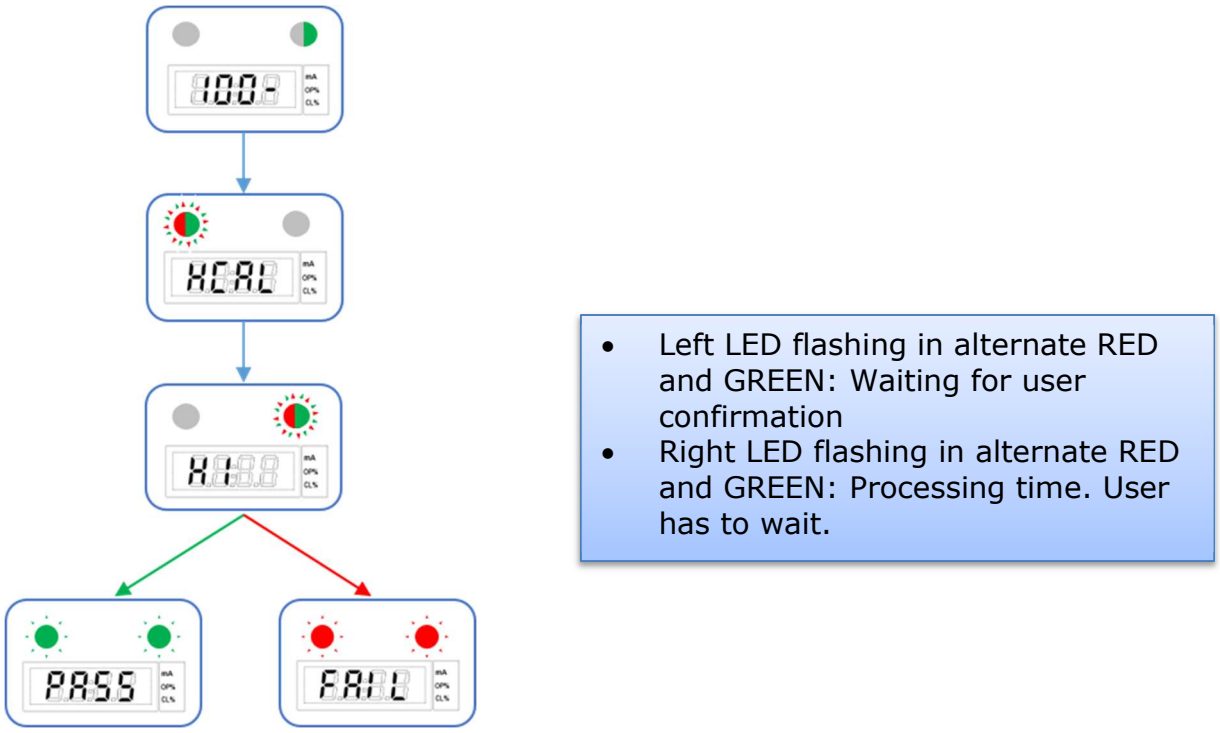


Figure H: Basic High Calibration

10 Advanced Calibration

Adjust (Trim) the calibrated low current value.

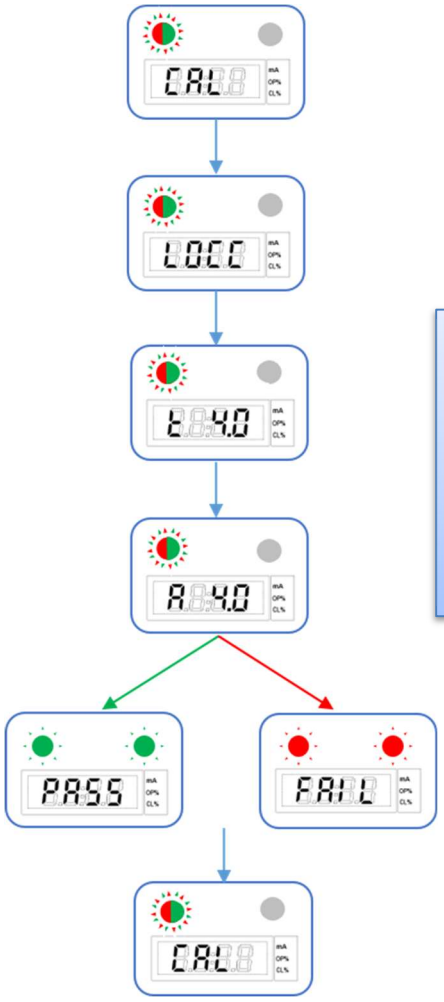
Required tools: In order to perform advanced current calibration, an external current meter or multimeter is necessary.

To enter the advanced calibration menu, press **and hold** both LO/SELECT and HI/NEXT until CAL displays. See figure I for low current calibration and figure J for high current calibration.

Note: To skip to the Configuration/Diagnostics Menu, press HI/NEXT

10.1 *Advanced Low Current Calibration*

1. Press LO/SELECT to enter Low Current Calibration/Low mA Calibration (LOCC).
2. Press LO/SELECT to start Low mA Calibration.
3. Press either button to increase/decrease the target (t) mA at 0 percent.
4. Press **and hold** LO/SELECT to confirm the target (t) mA calibration.
5. Adjust current meter (A) to target mA output position. Press **and hold** LO/SELECT to confirm adjustment.
6. After execution, BOTH LEDs will flash GREEN to signify a successful calibration or RED for a failure. After operation is complete, device will enter the calibration (CAL) menu. See figure I for a visual display of how to access low current calibration.



NOTE: If you enter this menu by mistake, press **and hold** LO/SELECT button to exit target (t) screen, then press **and hold** to exit adjust screen. You can also reset the device by cycling power.

Figure I: Low Current Calibration

10.2 *Advanced High Current Calibration*

Adjust (Trim) the calibrated high current value.

1. Press LO/SELECT to select CAL for calibration. Press HI/NEXT to display High Current Calibration/High mA Calibration (HICC).
2. Press LO/SELECT to start High mA Calibration.
3. Press either button to increase/decrease the target (t) mA at 100 percent.
4. Press **and hold** LO/SELECT to confirm High mA calibration.
5. Adjust the current meter (A) to target mA output position. Press **and hold** LO/SELECT to confirm adjustment.
7. After execution, BOTH LEDs will flash GREEN to signify a successful calibration or RED for a failure. After operation is complete, device will enter the calibration (CAL) menu. See figure J for a visual display of how to access high current calibration.

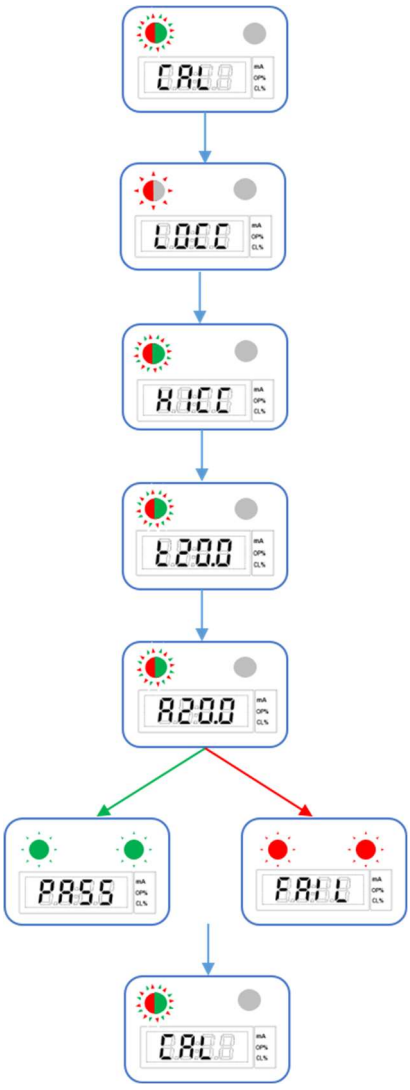


Figure J: High Current Calibration

NOTE: If you enter this menu by mistake, press **and hold** LO/SELECT button to exit target (t) screen, then press **and hold** to exit adjust screen. You can also reset the device by cycling power.

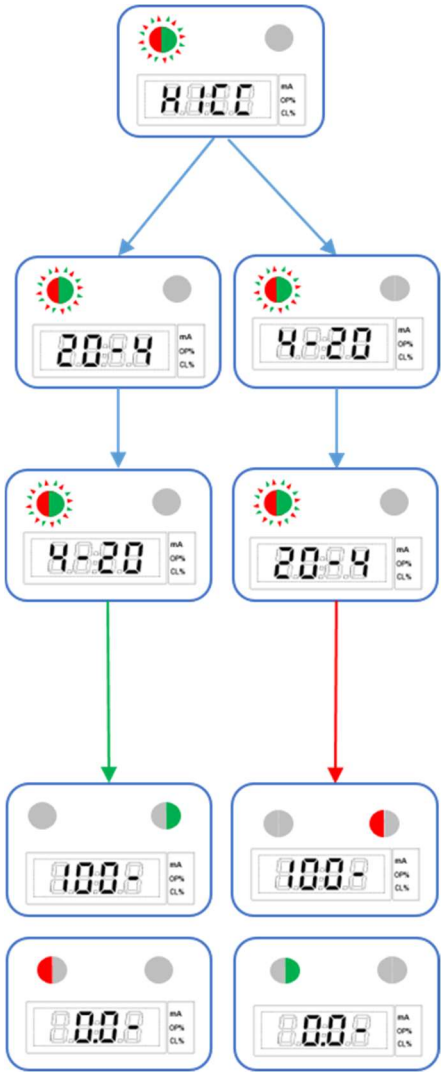
11 Reverse Current Option

Invert/reverse low and high current relevant to position.

Enter Advanced Calibration menu (see section 10).

1. Press HI/NEXT to navigate to mA reverse.
2. Press LO/SELECT to confirm mA reverse option.
3. Please wait while mA reverse operation takes place. See figure K for a visual display of mA reverse operation.

NOTE: After device time out or if any key is pressed, the device returns to the main screen.



LED color definition is as follows:

- GREEN LED follows 20 mA (High)
- RED LED follows 4 mA (Low)

Figure K: Reverse Current Option

12 Loop Test Mode

To test/verify installation during commissioning.

To enter Loop Test Mode, press both LO/SELECT and HI/NEXT to enter advanced calibration. Please see figure L for a visual display of the Loop Test operation.

1. Press HI/NEXT to navigate to the Diagnostics menu (dIAG).
2. Press LO/SELECT to confirm entering the diagnostics menu.
3. Press HI/NEXT to navigate to LOOP (4, 12 or 20).
4. Press LO/SELECT to confirm LOOP selection. Screen will display selected output current 4, 12 or 20.

NOTE: After device time out or if any key is pressed, the device returns to the main screen

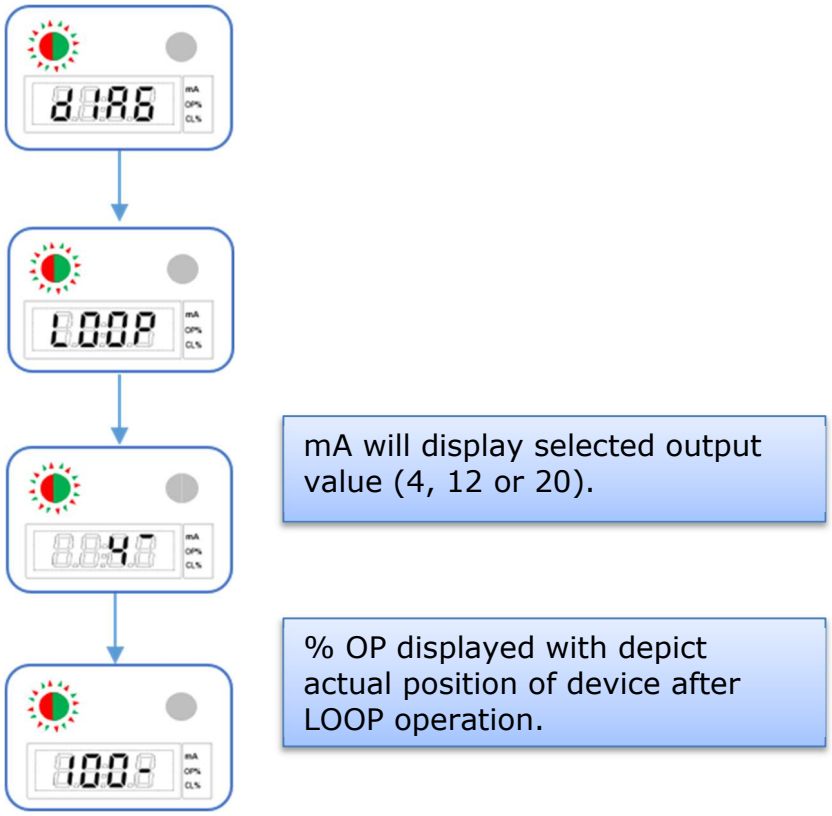


Figure L: Loop Test

13 Device Reset

Reset device without erasing configuration data.

Enter Advanced Calibration menu (see section 10).

1. Press HI/NEXT to navigate to Diagnostics [dIA].
2. Press LO/SELECT to confirm entering the dIA menu.
3. Press HI/NEXT to navigate until you reach Device Reset [rSEt].
4. Press LO/SELECT to confirm rSET selection.

NOTE: Device will flash RED/GREEN when resetting. After reset, device will enter the main screen. Please see figure M for visual display.

Figure M: Device Reset

14 Factory Reset

Reset device to factory settings; configuration data will be erased!

Enter Advanced Calibration menu (see section 10).

1. Press HI/NEXT to navigate to Configuration [CFg].
2. Press LO/SELECT to confirm CFg selection. The screen will display dEF.
3. Press LO/SELECT again to start factory reset. The screen will display FACt.

NOTES:

- Device will flash RED/GREEN when resetting. After reset, device will enter the main screen. Please see figure S for visual display.
- Device may reset 2 or 3 times during factory reset.
- Process should take approx. 5 min.
- Once factory reset is complete, you may perform either advanced low current calibration, high current calibration, or both. See section 10.1 and 10.2.

Figure N: Factory Reset

15 Calibration of Unit (if fitted with optional switches/sensors)

Note 1: Switch actuation can be confirmed using a signal detection device such as a multimeter or ohmmeter, set for "continuity".
Note 2: For NAMUR P+F NJ2-V3-N type sensors, use test meter, P+F model #1-1350 or equivalent to check sensor actuation and calibration. If the proper meter is not available, contact the factory for additional assistance with the test procedure.
Note 3: Adjust cams by hand by pushing/pulling the cam against the shaft spring to disengage from the mating spline, rotating to adjust and reengaging firmly onto spline.

Required tools: Signal detection device (see note 1); slotted screw driver/hex (Allen) key for cover screws (M4, M5 or M8 by model)

15.1 Switch Adjustments (two switches)

1. Remove unit cover as follows: loosen (but do not remove) captive screws, rotate cover slightly to grip corners, pull firmly. DO NOT PRY COVER WITH TOOLS. See Figure P.
2. With valve in the closed position, adjust bottom cam until bottom switch (#2) actuates. See Figure B for 2-switch setting graphics.
3. Stroke valve to the open position, adjust top cam until top switch (#1) actuates.
4. Cycle actuator several times to confirm proper switch indication at each end of stroke. Finely adjust cams if necessary.
5. Skip to Field Wiring section or replace unit cover, applying approximately 20 in lbs of torque to cover screws.

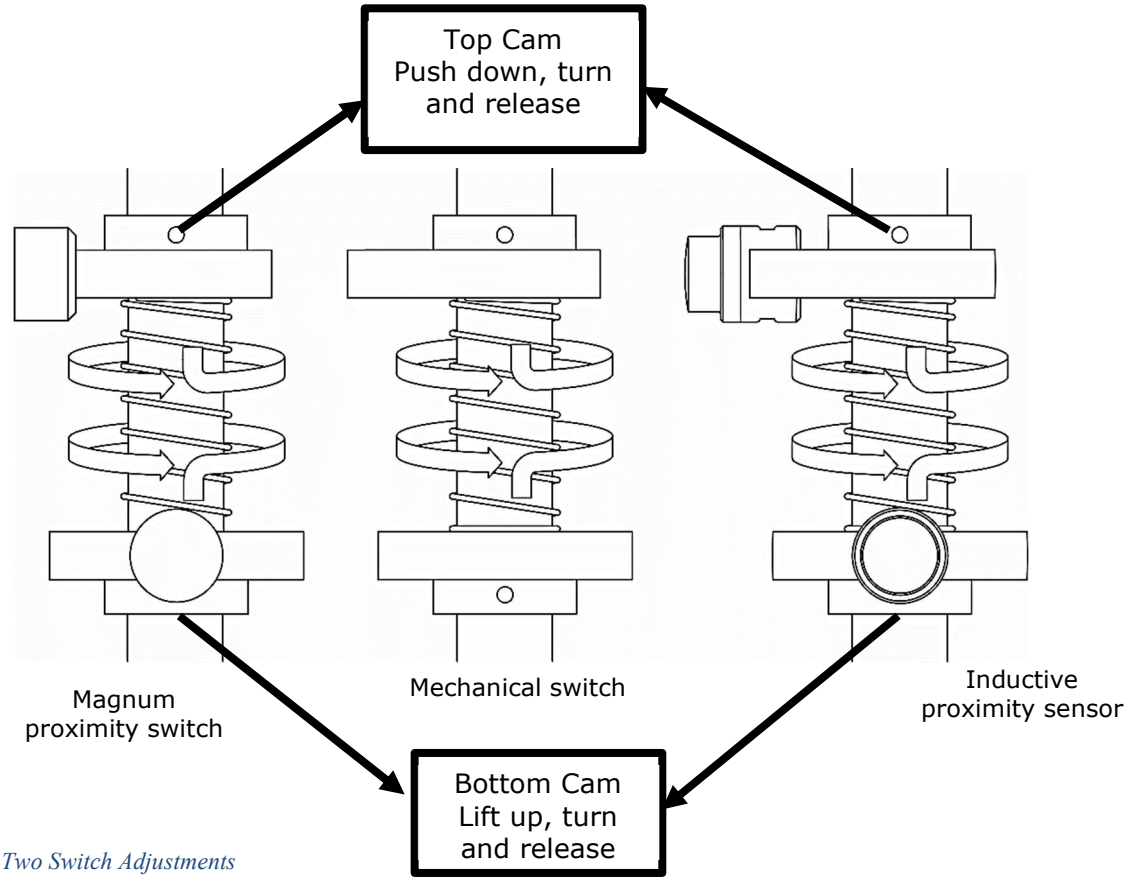


Figure P: Two Switch Adjustments

15.2 Switch Adjustments (four switches)

Follow the steps as above for the calibration of the four switches (Figure P).
NOTE: Top switch is #1 and bottom switch is #4. (See Figure Q).

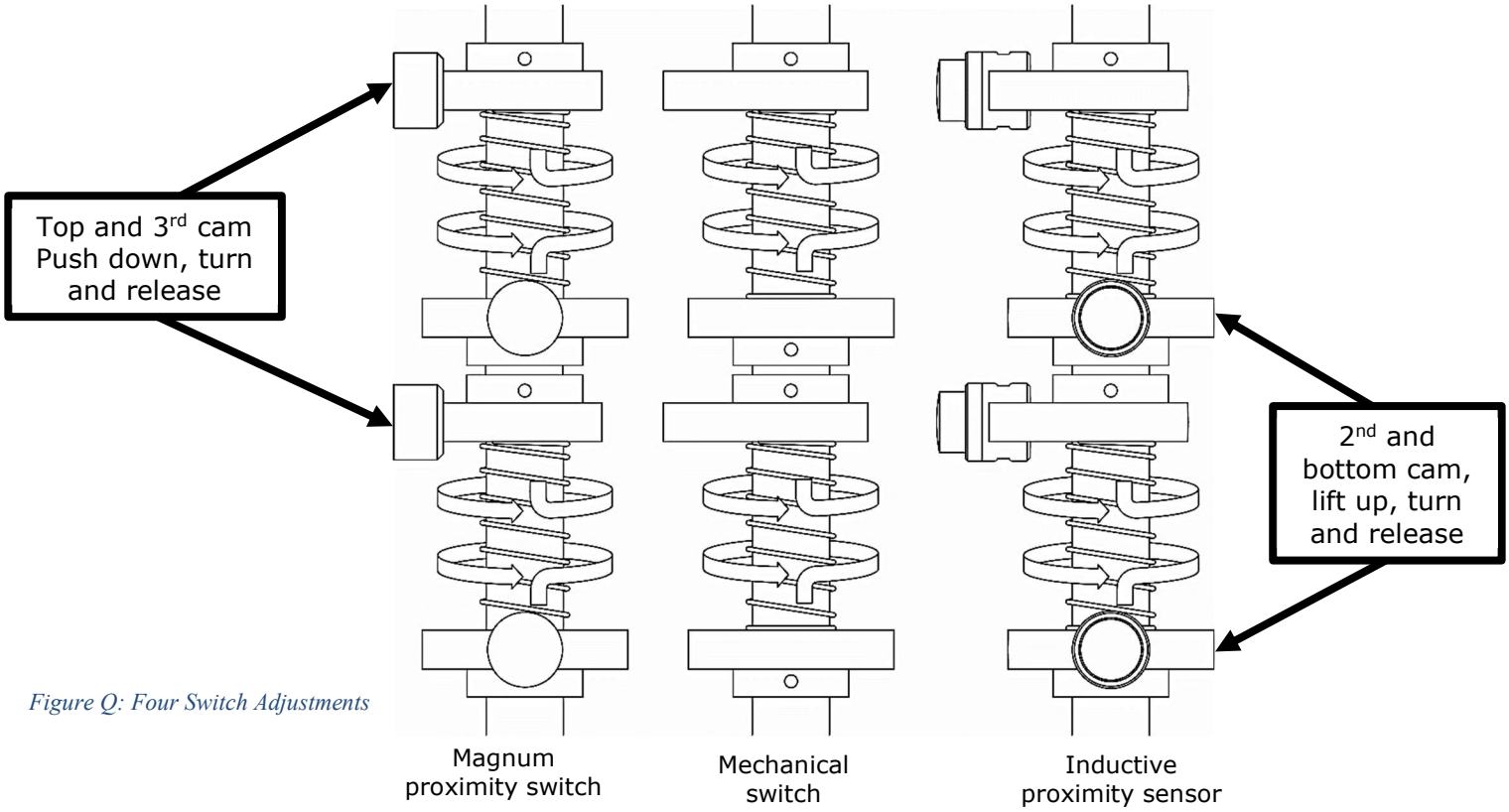


Figure Q: Four Switch Adjustments

16 Beacon Adjustment

Note: Skip this step if the cover is flat or Beacon already displays the correct valve status.
Required tools: Hex (Allen) key for M5 socket head screws.

1. For two-way OPEN/CLOSED: remove, rotate and re-fasten outer Beacon to synchronize display position with valve position. See figure R.
2. For three-way flow paths: remove, rotate and re-fasten outer Beacon and/or inner Beacon coupler to synchronize displayed flow path with valve/actuator flow path.

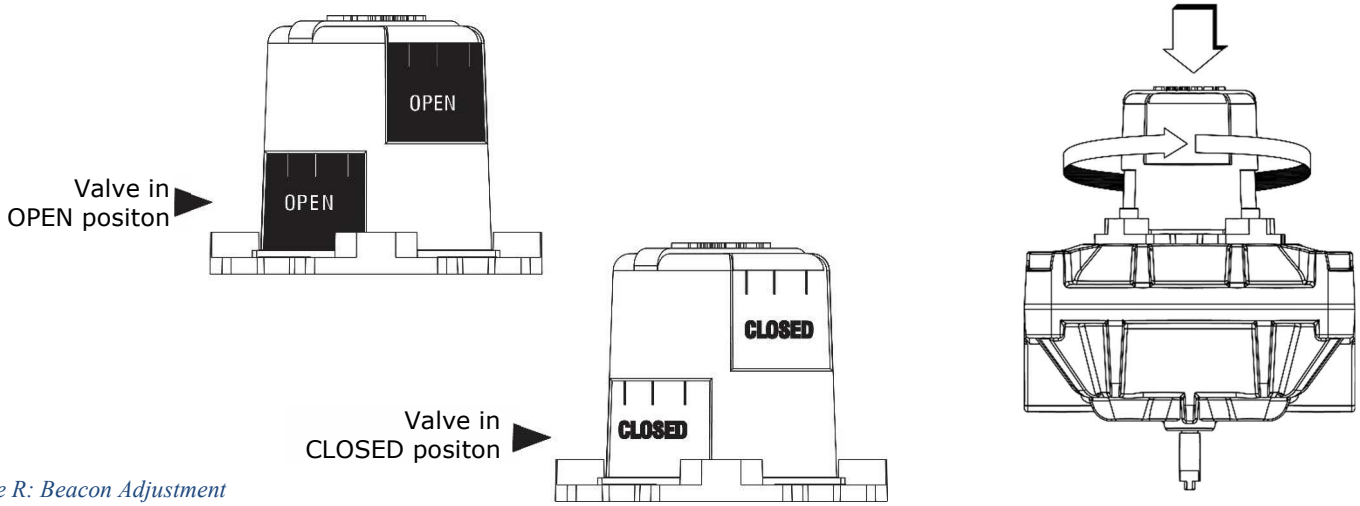


Figure R: Beacon Adjustment

17 Beacon Adjustment for D260/D270 and D261/D271

Note: Skip this step if the cover is flat or Beacon already displays the correct valve status.
Required Tools: set screwdriver for M4 set screws.

1. Disengage setscrews from outer Beacon, rotate and re-fasten outer Beacon to synchronize displayed position with valve position. See figure S.

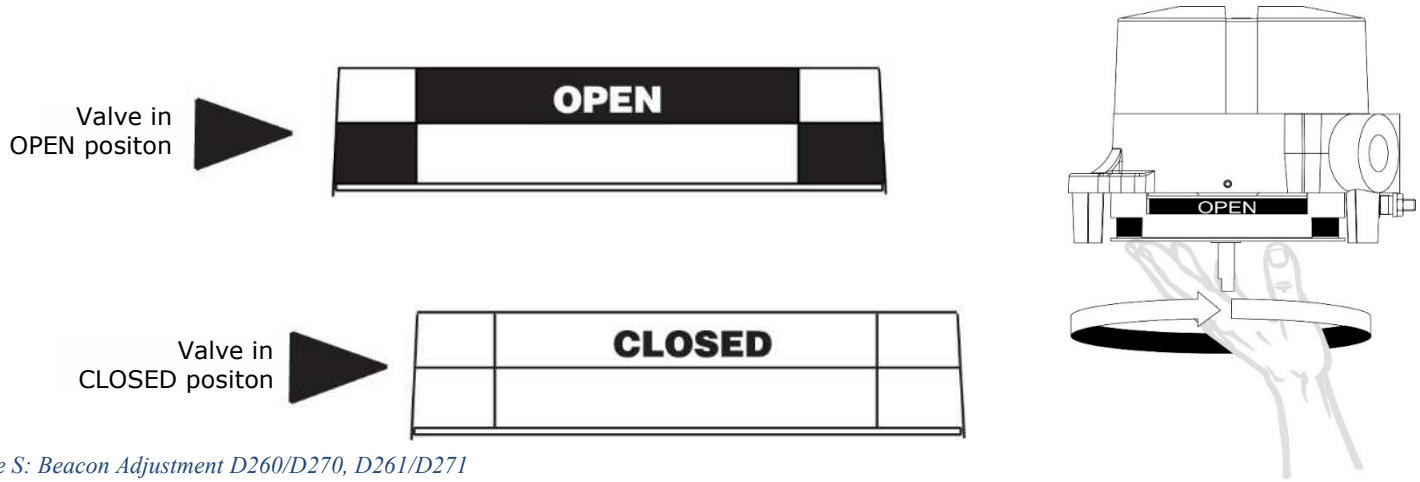


Figure S: Beacon Adjustment D260/D270, D261/D271

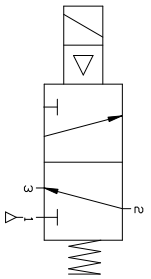
18 Solenoid Valve Connection and Operating Instructions

18.1 Standard Falcon V Valve Specifications

Note: ALWAYS consult the EPIC product ID label for coil electrical specifications and for pressure and temperature specifications for each unit, as they will vary with area classification, valve option and other factors.

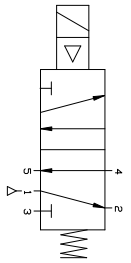
Specifications
Operating Pressure: 30-120 PSIG for single-coil valves; 20-120 PSIG for dual coil valves.
Operating Temperature:
Intrinsically safe coils: (-40°C to +85°C)
Standard valve bodies with Viton Seals: -20°C to +93° (-5°F to +200°F)
Low temperature valve bodies with low temperature Buna Seals: -48°C to +93°C (-55°F to +200°F)
(Agency approvals may not encompass full operating temperature range).
Operating Media: Lubricated or dry air, filtered to 40 microns. If air line lubricators are used, use appropriate oil distribution equipment and oil grades, such as ISO and UNI FD22.

18.2 Installation/Connection of Falcon V Directional Control Valve



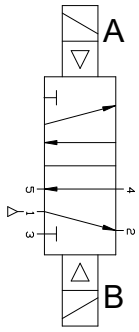
Porting Designation
1/4" NPT air ports for inlet, outlet, and exhaust
(4.3 Cv FalconV valve has 1/2" NPT air ports)

Figure T: Air Flow Diagrams



Spring Return 3-Way (3/2) Valve
Description of Operation: Solenoid De-energized - air flows from Outlet Port 2 to Exhaust Port 3.
Solenoid Energized - air flows from Inlet Port 1 to Outlet Port 2.

Spring Return 4-way (5/2) Valve
Description of Operation: Solenoid De-energized - air flows from Inlet Port 1 to Outlet Port 2 and exhausts from Port 4 to Port 5. Solenoid Energized - air flows from Inlet Port 1 to Outlet Port 4 and exhausts from Port 2 to Port 3.



Dual Coil 4-way (5/2) Valve
Description of Operation: Coil B Energized - air flows from Inlet Port 1 to Outlet Port 2 and exhausts from Port 4 to Port 5.
Coil A Energized - air flows from Inlet Port 1 to Outlet Port 4 and exhausts from Port 2 to Port 3.

Note: The valve will not change state until the energized coil is de-energized and the opposite coil is energized in that order.

NOTES – For Dual Coil Valves

1. The valve may be in either position upon installation. Refer to the Air Flow Diagram (Fig. T) and energized the appropriate coil (with supply air present) to reset valve to the desired position.
2. Dual coil valves rewuire both an electrical signal and appropriate air pressure to operate. If either or both inputs are lost the valve will remain in its current position.
3. Both coils should never be energized simultaneously.
4. If using overrides on a dual coil valve, the coils must be de-energized.

18.3 Plumbing and Air Supply Considerations

Proper drying and filtration of air supply per specification in section 18.1: operating media, is critical to prevent premature failure of solenoid valves. The following general valve plumbing procedure should be followed:

1. Inspect port and connectors to ensure that the threads are free of dirt, burrs and excessive nicks.
2. Apply sealant/lubricant or Teflon tape to the make pipe threads. With any sealant or tape, the first one or two threads should be left uncovered and care must be taken to avoid the application of excessive sealant media to avoid system contamination.
3. Install connectors into ports and wrench tighten per the fitting manufacturer's recommendation to achieve an air-tight joint.

19 Troubleshooting

In case of calibration issues, (e.g. "FAIL" message is persistent after calibration) perform the following troubleshooting:

1. Ensure that the transmitter is wired correctly. Please refer to product wiring diagram.
2. Ensure that the transmitter unit is mounted such that the shaft indication mark travels within the valid operating range of the non-contact sensor or potentiometer, in accordance with the relevant Appendix diagram (Appendix A).
3. Ensure that the potentiometer cable is connected to the sensor board.
4. Repeat Basic Low and Basic High calibration.

In the LOCC and HICC functions, there is no way to abort. In case either function is selected, follow the instructions in section 10.1 and 10.2.

20 Maintenance and Repair of D200 Transmitter

1. Inspection of this product shall be carried out periodically by suitably trained personnel in accordance with the applicable code of practice such as EN60079-17 or IEC 60079-17 to ensure that the electronics are in satisfactory condition.
2. The D200 transmitter electronics are not intended to be repaired. Please contact your local Westlock Controls sales office for replacement retrofit kits.
3. In the event of any repairs that may be required of the unit, such tasks must be carried out by suitably trained/competent personnel in accordance with the applicable code of practice such as EN60079-19 or IEC 60079-19.
4. The certification of this product has been approved based on the material of construction as per the drawing listed in the schedule within this certificate. Any replacement parts that are not made in accordance to the listed drawing will invalidate the approval/certification.
5. Replacement parts must be purchased through Westlock Controls or via an approved Westlock Controls distributor.

21 Calibration Cutoff & Dead Band

The D200 electronics has the following default values implemented for cutoff (hysteresis) and dead band:

CUTOFF NEAR 0% AND 100%: **2%**

DEAD BAND: ***0.5%***

This means that near the limits, the transmitted position will be defined by Cutoff + Dead band.

Using the default values noted above it will be **2.5%**. For the 0% and 100% position the output will be:

1. At 0% (4 mA) until the actual positon reaches **+2.5%** or **-2.5%** *OR*
2. At 100% (20 mA) until the actual position reaches **97.5%** or **102.5%**.

The D200 is preconfigured to signal any failure in the low current (3.6 mA), as per NE-43.

NOTE: The user can reconfigure this alarm to be on the high side (21 mA) using the HART configuration menu tree (Burnout configuration). See the figures below for more detail.

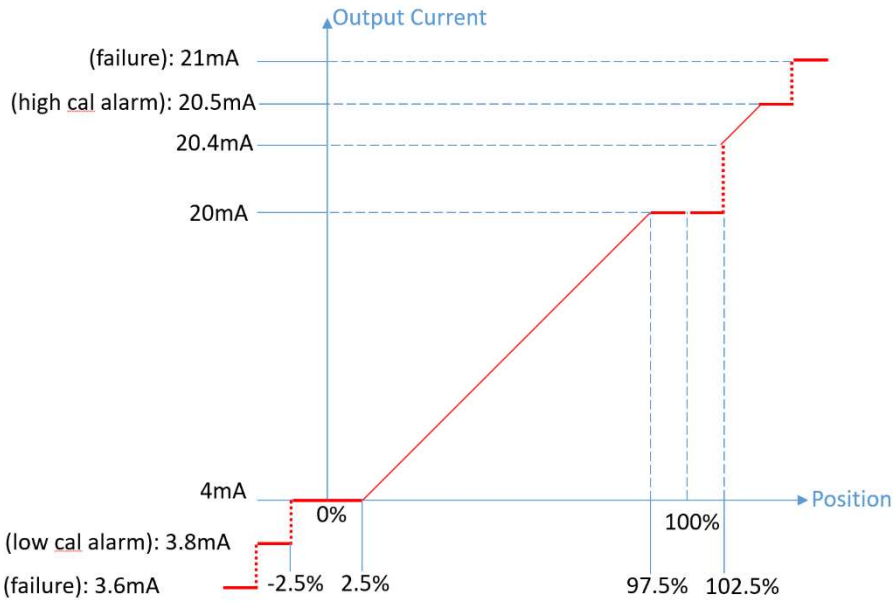


Figure U: Calibration Cutoff

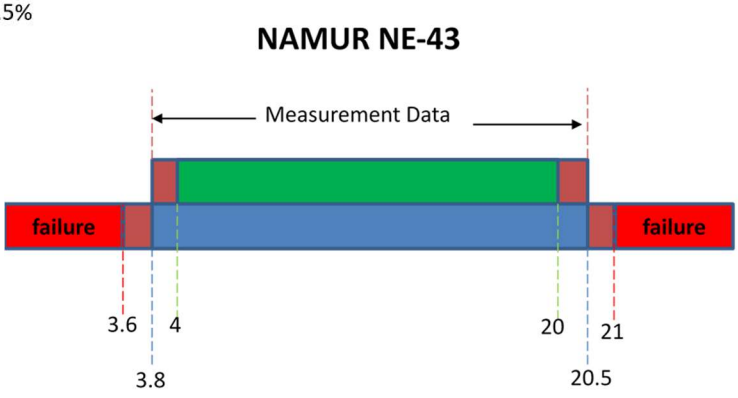


Figure V: NAMUR NE-43

Appendix A

Operating range for non-contact sensor for units WITHOUT Integral Falcon Solenoid

NON-CONTACT SENSOR – *Standard for Digital EPIC D200 Models with HART®*
See below the stroke operation range for models with and without solenoid valves. End of travel tolerance is 10°. Do not to use, calibrate or operate past the dashed lines.

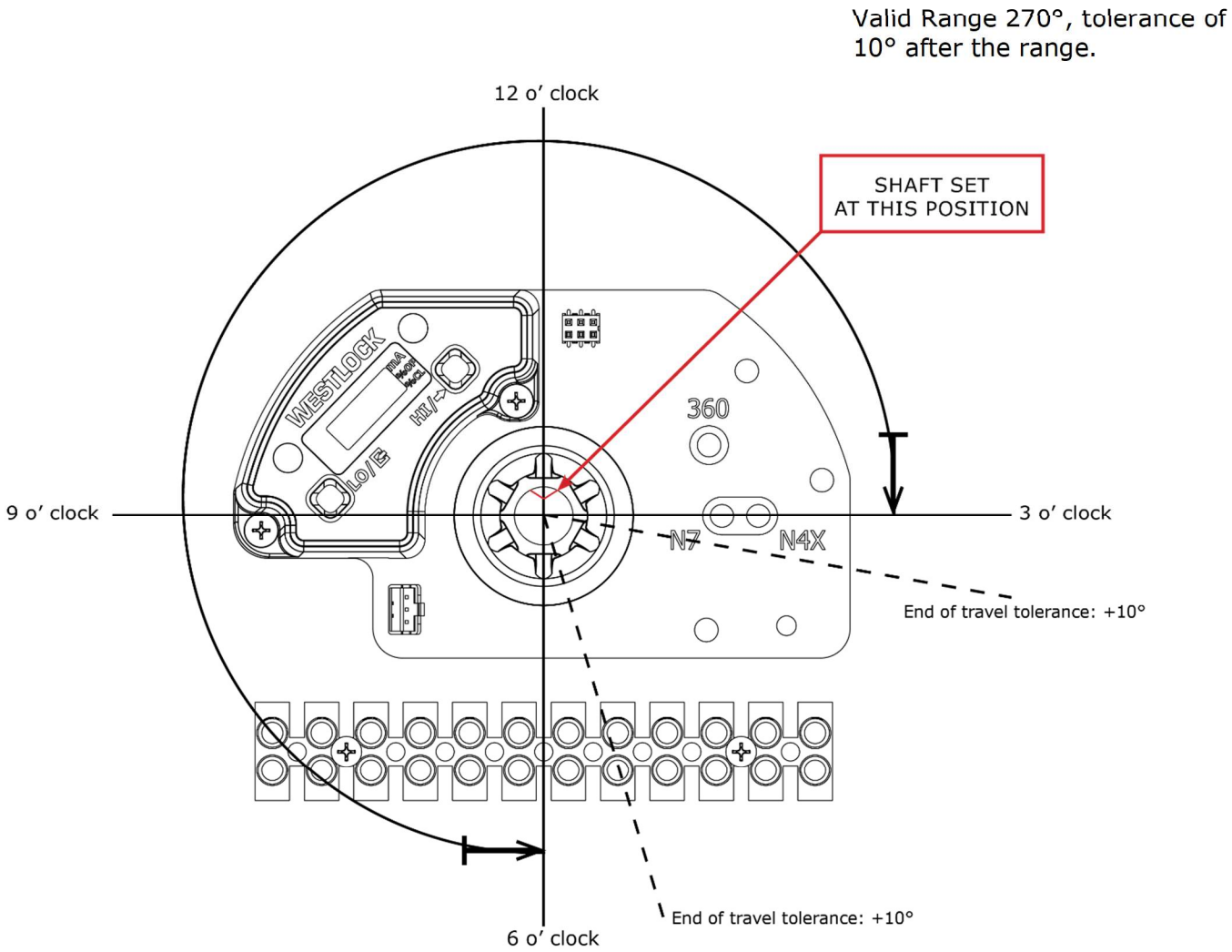


Figure W: Non Contact Sensor –Without Solenoid

Operating range for non-contact sensor for units WITH Integral Falcon Solenoid

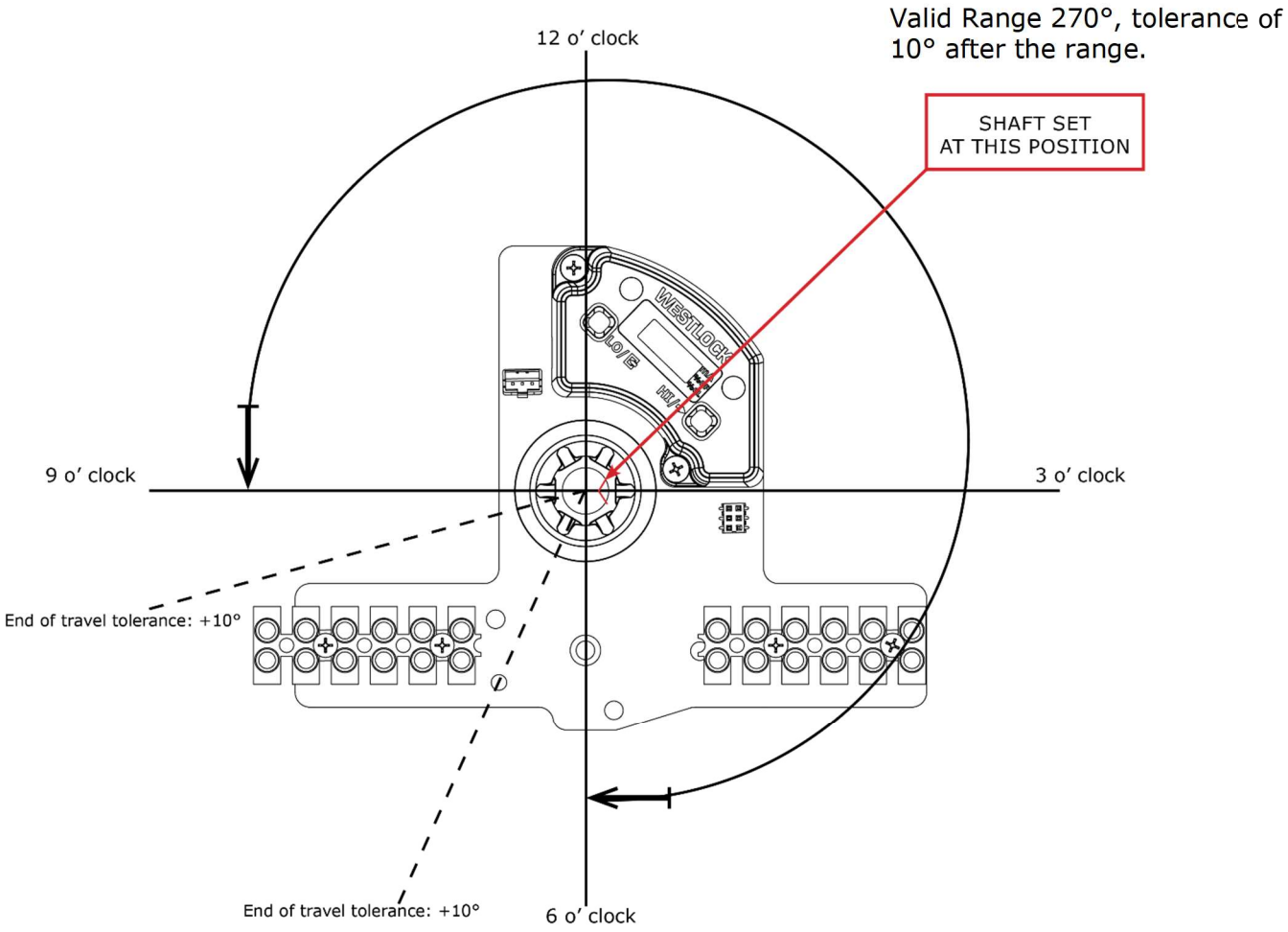


Figure X: Non Contact Sensor – With Solenoid

POTENTIOMETER

Operating range for Potentiometer for units WITHOUT Integral Falcon Solenoid

See below the stroke operation range for Westlock Controls D200 series potentiometer models with and without solenoid. End of travel tolerance is 10°. Do not to use, calibrate or operate past the dashed lines.

Valid Range 180°, tolerance of 10° after the range.

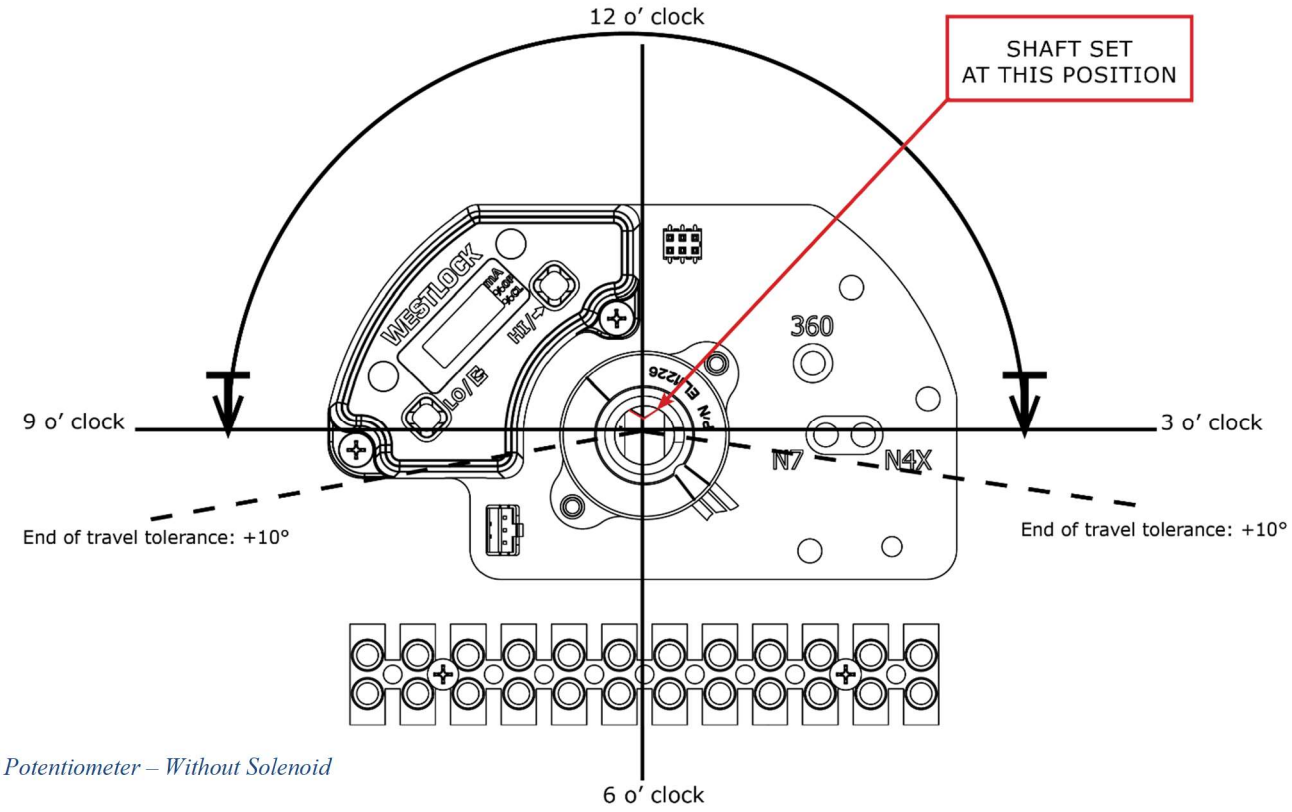


Figure Y: Potentiometer – Without Solenoid

Operating range for Potentiometer for units WITH Integral Falcon Solenoid

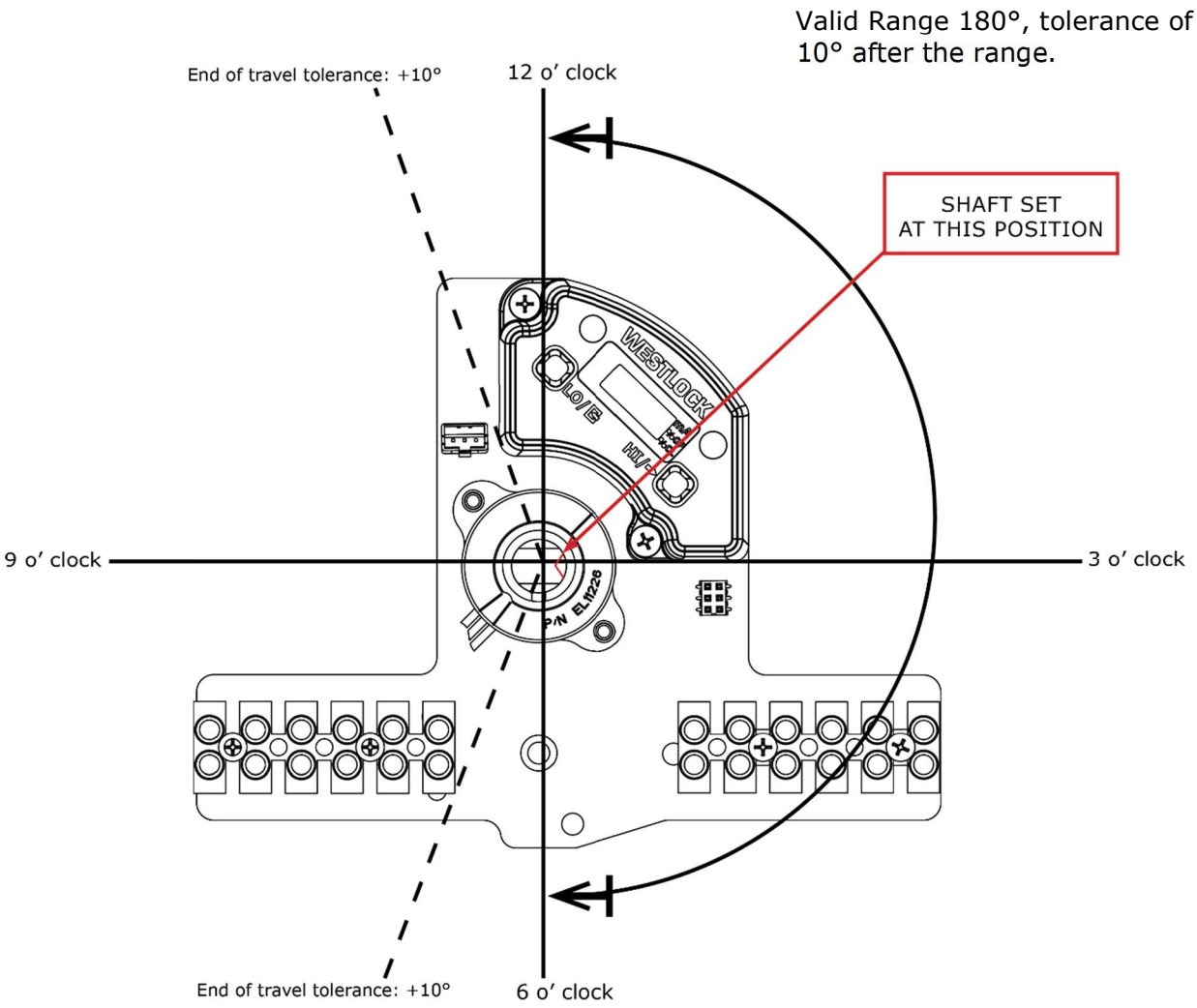


Figure Z: Potentiometer – With Solenoid

Appendix B (HART® Menus: EL40272-164-YYY)

NOTE: The following main menu screen and Non-Contact sensor (TMR) characterization is only available for HART® version EL40272-164-YYY.

D200 Main Menu

The D200 main menu screen is divided into the following sub-menus: "Diagnostics", "Calibration/Setup", "Process Variables" and "Final Position Chart".

All menu options are available through the HART command and can be accessed using the D200 EDD or DTM. Menu entries that are marked in **BOLD** can be accessed in the local device's LCD/Keypad. For a visual breakdown of the menu, please see figure AA. For a complete view of the menu options see figure AB for Diagnostics, figure AC for Calibration/Setup and figure AD for configuration.

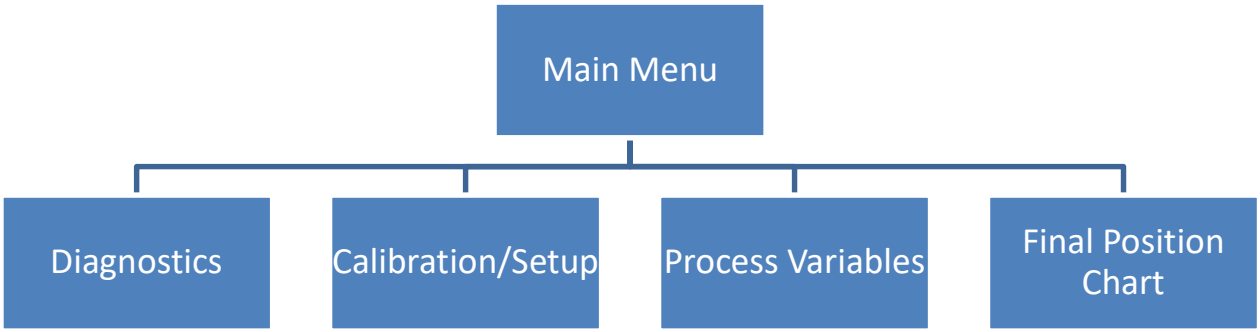


Figure AA: D200 Main Menu

Diagnostics Menu

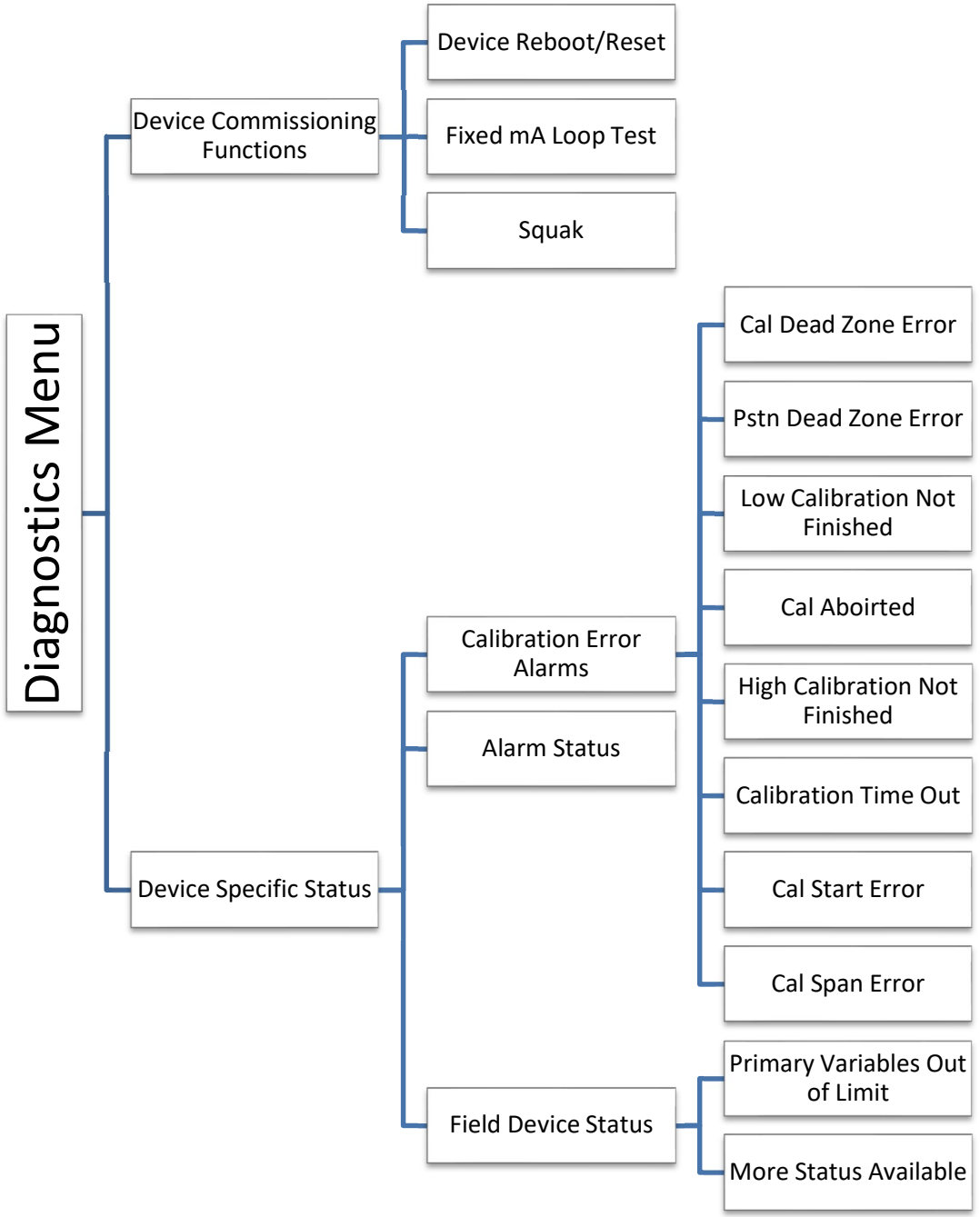


Figure AB: D200 Diagnostics Menu

Calibration/Setup

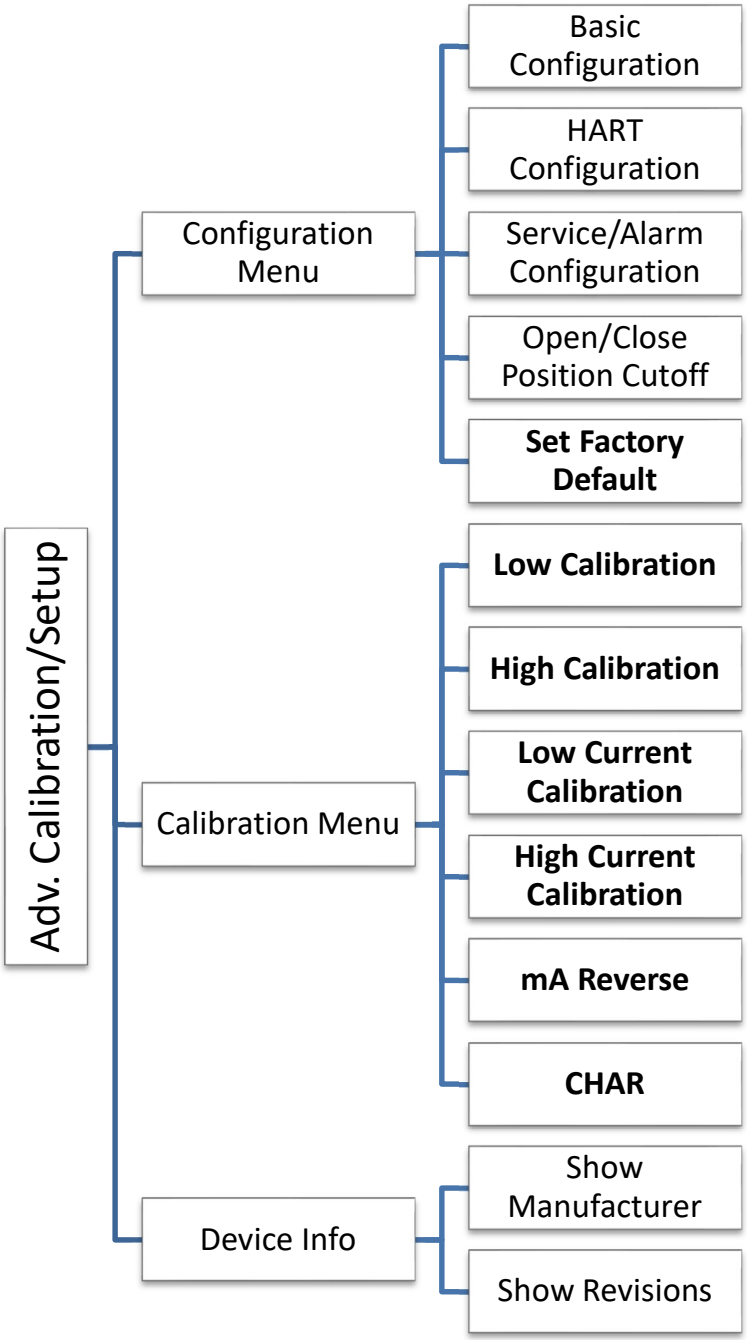


Figure AC: D200 Calibration/Setup

Configuration Menu

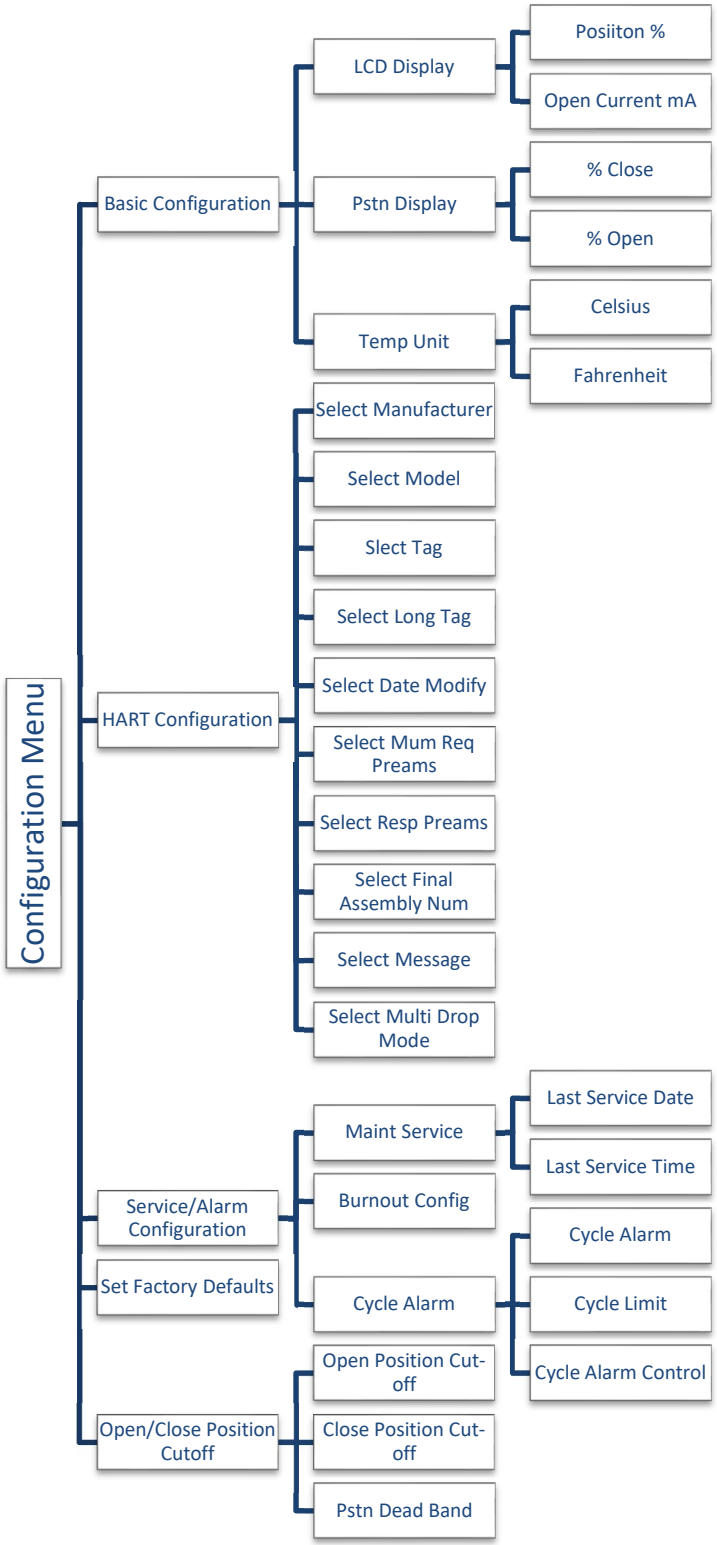


Figure AD: D200 Configuration

Appendix C – WD12410

LET	DESCRIPTION	DWN.	D.W.O.	APPROVED	DATE

HAZARDOUS (CLASSIFIED) LOCATION
CLASS I, DIVISION 1, GROUPS A, B, C, D
OR
CLASS I, ZONE 0, GROUPS IIC T4 (Ta=85°C)

TERMINAL POINTS

DS TRANSMITTER Ui (Vmax)=30V; Ii (Imax)=100mA; Pi=0.75W; Ci=5nF; Li=10µH	4-20mA INPUT
SWITCH OPTIONS 2M09 MECH SPDT 2M12 MGM SPDT Ui (Vmax)=30V; Ii (Imax)=25mA; Pi=2W; Ci=0; Li=0	
2M08 NJ2-V3-Na Ui (Vmax)=16V; Ii (Imax)=25mA; Pi=34mW; Ci=40nF; Li=50uH	

4

SEE NOTE 5

SEE NOTE 5

SEE NOTE 5

NONHAZARDOUS LOCATION

ANY CSA / FM CERTIFIED ASSOCIATED APPARATUS WITH APPLICABLE DIVISION AND GROUP OR ZONE AND GROUP APPROVAL AND WITH ENTITY PARAMETERS:

DIVISIONS	ZONES
Voc ≤ Vmax	Uo ≤ Ui
Isc ≤ Imax	Io ≤ Ii
Ca ≥ Ci + Ccable	Ca ≥ Ci + Ccable
La ≥ Li + Lcable	Lo ≥ Li + Lcable

AGENCY CONTROLLED DRAWING NO CHANGES WITHOUT PRIOR AGENCY APPROVAL

NOTES:

1. FOR INSTALLATION IN A DIVISION 1 HAZARDOUS (CLASSIFIED) LOCATION, THE WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NFPA 70, ARTICLE 504. FOR INSTALLATION IN A ZONE 0 HAZARDOUS (CLASSIFIED) LOCATION, THE WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NFPA 70, ARTICLE 505. FOR ADDITIONAL INFORMATION REFER TO ISA RP-12.6

2. THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE AND ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN THE APPROVED VALUES OF Voc (OR Uo) AND Isc (OR Io) FOR THE ASSOCIATED APPARATUS ARE LESS THAN OR EQUAL TO Vmax (OR Ui) AND Imax (OR Li) FOR THE INTRINSICALLY SAFE APPARATUS AND THE APPROVED VALUES OF Ca (OR Co) AND La (OR Lo) FOR THE ASSOCIATED APPARATUS ARE GREATER THAN Ci + Ccable, Li + Lcable, RESPECTIVELY FOR THE INTRINSICALLY SAFE APPARATUS.

3. BARRIERS SHALL NOT BE CONNECTED TO ANY DEVICE THAT USES OR GENERATES IN EXCESS OF 250V RMS OR DC UNLESS IT HAS BEEN DETERMINED THAT THE VOLTAGE IS ADEQUATELY ISOLATED FROM THE BARRIER.

4. NOTE ASSOCIATED APPARATUS WITH ONLY ZONE 1 APPROVED CONNECTIONS LIMITS THE MOUNTING OF THE SENSORS TO ZONE 1.

5. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE FM APPROVED UNDER THE ENTITY CONCEPT. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT. NO REVISION TO DRAWING WITHOUT PRIOR AUTHORIZATION FROM FM APPROVAL.

6. ENTITY APPROVED ASSOCIATED APPARATUS USED IN AN APPROVED CONFIGURATION

7. DS TRANSMITTER MUST BE INSTALLED IN A SUITABLE ENCLOSURE TO ACHEIVE THE SPECIFIED RATINGS.

8. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

9. BARRIER MUST BE A CSA CERTIFIED, SINGLE CHANNEL GROUNDED SHUNT-DIODE ZENER BARRIER OR A SINGLE CHANNEL ISOLATING BARRIER OR ONE DUAL CHANNEL OR TWO SINGLE CHANNEL BARRIERS MAY BE USED WHERE BOTH CHANNELS HAVE BEEN CERTIFIED FOR USE TOGETHER WITH COMBINED ENTITY PARAMETERS. THE FOLLOWING CONDITIONS MUST BE SATISFIED:
   Voc OR Vo ≤ Vmax OR Ui Ca >Ci + C CABLE
   Isc OR Io ≤ Imax OR Ii La > Li + L CABLE

10. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250V.

11. TO MAINTAIN INTRINSIC SAFETY, EACH FIELD WIRING PAIR (4-20 mA AND SWITCH OPTIONS) MUST BE RUN IN SEPERATE CABLES OR SEPERATE SHIELDS CONNECTED TO INTRINSICALLY SAFE (ASSOCIATED APPARATUS) GROUND.

12. FOR CLASS II AND III LOCATIONS WHERE RIGID METAL CONDUIT IS NOT AN APPROPRIATE NRTL LISTED CABLE GLAND FITTING.

13. INSTALL IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE PART 1.

14. SCHEDULE OF LIMITATIONS:

   a) THE MODULES SHALL BE INSTALLED IN THE ACCUTRAK AND QUANTUM SERIES FAMILY OF INDUSTRIAL DISCRETE VALVE CONTROLLERS.
   b) THE EQUIPMENT MAY CONTAIN A T4 RATING PROVIDED THE SERVICE TEMPERATURE WITHIN THE ENCLOSURE SHALL BE NOT MORE THAN 85°C.

THIS DRAWING CONTAINS CONFIDENTIAL INFORMATION AND IS ISSUED IN CONFIDENCE ON THE CONDITION THAT IT BE RETURNED ON DEMAND AND NOT BE COPIED, REPRODUCED, DISCLOSED TO OTHERS OR USED IN MANUFACTURE OF THE SUBJECT MATTER THEREOF WITHOUT THE WRITTEN CONSENT OF WESTLOCK CONTROLS CORP.

UNITS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

TOLERANCES UNLESS OTHERWISE SPECIFIED:

INCHES		MILLIMETERS	
.XX	± .015	.X	± .4
.XXX	± .005	.XX	± .13
ANGLE	± 1/2°	ANGLE	± 1/2°

THIRD ANGLE PROJECTION

APPROVAL	DATE
DRAWN: CMI	3/28/18
CHECKED: ETB	1/3/20
APPROVED: CMI	1/3/20
DRAFTING WORK ORDER: 23344	
MATERIAL: N/A	
DO NOT SCALE DRAWING	

WESTLOCK CONTROLS

TITLE: CONTROL DRAWING DS TRANSMITTER

SIZE: B | DWG NUMBER: WD-12410 | REV:

SCALE: N/A | SHEET: 1 OF 1

Appendix D – MS10982

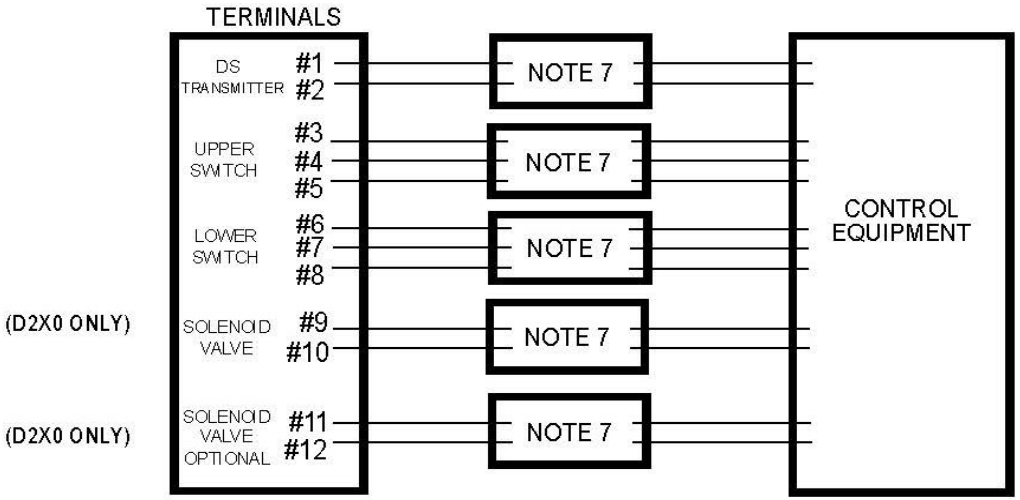
LET	DESCRIPTION	DWN.	D.W.O.	APPROVED	DATE

HAZARDOUS (CLASSIFIED) LOCATION
Ex ia IIC T* Ga
Ex tb IIIC T135ºC Db IP6X

NONHAZARDOUS LOCATION

ASSOCIATED APPARATUS
(INTRINSIC SAFETY BARRIERS)

MODEL D230/D240/D250/D241/D251



Entity Parameters: Ui (Vmax) = 30 V
(DS Transmitter) Ii (Imax) = 100 mA
Pi = 0.75 W
Ci = 5 nF
Li = 10 µF

Entity Parameters: Ui (Vmax) = 30 V
(Switches - M09 & M12) Ii (Imax) = 100 mA
Pi = 1 W, Ci = 10 nF
Li = 10 µH

Entity Parameters: Ui (Vmax) = See note 9
(Switch - M08) Ii (Imax) = See note 9
(P+F - NJ2-V3-N) Pi = See note 9, Ci = 40 nF, Li = 50 µH

Coil Entity Parameters:		
Entity Paramenters	Coil "I" (Solenoid Valve)	Coil "P" (Solenoid Valve)
Ui (Vmax)	31 V	28 V
Ii (Imax)	670 mA	115 mA
Pi	2.98 W	1.6 W
Ci	0 µF	0 µF
Li	0 mH	0 µF

MODEL	QTY / SWITCHES
D230/D240/D250/D241/D251	2 M08 - P&F 2 M09 - MCH-SPDT (Gold Contacts) 2 M12 - MGM-SPDT (Rhodium Contacts)

1. To maintain intrinsic safety for the model D230/D240/D250 with one transmitter, up to two optional switches (3 wires). The transmitters, switches and solenoid coils shall be segregated. Segregation may be accomplished by running each wiring group in separate cables or in separate shields connected to intrinsically safe (barrier) ground.
2. To maintain intrinsic safety for the model D230/D240/D250 with one transmitter, up to two optional inductive proximity sensor (2 wires). The transmitters, inductive proximity sensor and solenoid coils shall be segregated. Segregation may be accomplished by running each wiring group in separate cables or in separate shields connected to intrinsically safe (barrier) ground.
3. Model D230/D240/D250/D241/D251:
   Ui ≥ barrier Uo
   Ii ≥ barrier Io
   Pi ≥ barrier Po
   Ci ≤ barrier Co + Ccable capacitance
   Li ≤ barrier Lo + Lcable Inductance
4. Use a cable gland fitting at the conduit entry which is rated IP6X.
5. Control equipment connected to barriers must not use or generate more than 250 V.
6. Installation should be in accordance with EN60079-14 or IEC60079-14 current Edition.
7. Entity Approved associated apparatus used in an Approved configuration.
8. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
9. The maximum upper ambient temperature of the equipment when installed with P+F sensors is dependant on its certificate parameters with regards to "T" Class and Barrier type. See P+F (NJ2-V3-N) certificate PTB 00 ATEX 2032 X latest supplement.
10. No revision to this drawing without prior CSA Approval.

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UNITS ARE IN INCHES UNLESS OTHERWISE SPECIFIED

TOLERANCES UNLESS OTHERWISE SPECIFIED

INCHES	MILLIMETERS
.XX ±.015	.X ±.4
.XXX ±.005	.XX ±.13
ANGLE ±1/2º	ANGLE ±1/2º

MATERIAL: N/A

APPROVAL	DATE
DRAWN: ETB	10/21/19
CHECKED: TL	1/8/20
APPROVED: CMI	1/8/20

DRAFTING WORK ORDER: 23971

DO NOT SCALE DRAWING

WESTLOCK CONTROLS

TITLE: MODEL D230/D240/D250/D241/D251 INSTALLATION DRAWING FOR INTRINSICALLY SAFE APPARATUS

SIZE: A | DWG NUMBER: MS-10982 | REV: -

SCALE: N/A | SHEET: 1 OF 1

22 Retrofit Kit List for Digital EPIC D200 Series

If Retrofit Kits are required for purchase or for contractual purposes, please contact your local sales office for appropriate part number(s).

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