

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS





HZSN1 Series


TO PREVENT POTENTIAL INJURY OR DAMAGE TO PROPERTY, READ THIS MANUAL CAREFULLY AND COMPLETELY.

IMPORTANT SAFETY INSTRUCTIONS

Basic safety precautions should always be followed, including the following: Failure to follow instructions can cause severe injury and/or death.


 This is the safety-alert symbol. When you see this symbol on your equipment or in this manual, look for one of the following signal words and be alert to the potential for personal injury.

 **WARNING** warns about hazards that could cause serious personal injury, death or major property damage and if ignored presents a potential hazard.


 **CAUTION** warns about hazards that will or can cause minor or moderate personal injury and/or property damage and if ignored presents a potential hazard. It can also make consumers aware of actions that are unpredictable and unsafe.


Notice: A notice indicates special instructions that are important but not related to hazards.




 **WARNING** - Read and follow all instructions in this IOM manual and on the equipment. Failure to follow instructions can cause severe injury and/or death.





 **WARNING** – Risk of Electric Shock. All electrical wiring **MUST** be in conformance with applicable local codes, regulations, and the National Electric Code (NEC). Hazardous voltage can shock, burn, and cause death or serious property damage. To reduce the risk of electric shock, do NOT use an extension cord to connect unit to electric supply. Provide a properly located electrical receptacle. **Before working on any electrical equipment, turn off power supply to the equipment.**

 **WARNING** – To reduce the risk of electric shock replace damaged wiring immediately.

 **WARNING** – Ground all electrical equipment before connecting to electrical power supply. Failure to ground all electrical equipment can cause serious or fatal electrical shock hazard.

 **WARNING** – Do NOT ground to a gas supply line.

 **WARNING** – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

 **WARNING** – Failure to bond all electrical equipment to system structure will increase risk for electrocution and could result in injury or death. To reduce the risk of electric shock, see installation instructions and consult a professional electrician on how to bond all electrical equipment. Also, contact a licensed electrician for information on local electrical codes for bonding requirements.




 **CAUTION** – Potential pinch point. Equipment connected to or driven by this device may start unexpectedly and may cause personal injury or entrapment in linkage systems.

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ACTUATOR OPERATIONAL CONCEPTS

HZSN1 actuators range in complexity from simple models with basic operability to proportional models with more precise control of position and feedback.

Notice: Read the project specifications and understand the application before making an actuator selection. If in doubt, consult with the project engineer to clarify what is actually required for a fully operational installation. We have provided in this document all the tools necessary to determine how the various levels interface to the outside world. If there are any questions, please contact Hayward Flow Control Technical Services.

Notice: HZSN1 Series actuators rotate CW to CLOSE the OUTPUT shaft (out the bottom of the actuator) when viewed from ABOVE. However, the HZSN1 Series is the only product in the HRS Series family that has the CCW (OPEN) travel cam in the #1 position in the cam stack (see pg 9).

Notice: HZSN1 Series actuators have three status LED indicators for visual indication of actuator status: green for open, red for closed, and a white power LED indicator showing when power is available AT the actuator.

Notice: HZSN1 Series actuators are fully assembled, calibrated and tested prior to leaving our factory. In most cases, after you have mounted the actuator to your device, you should be able to operate the actuator from fully CLOSED (CW) to fully OPEN (CCW) and back again, and find that no adjustments are needed. The assembly can be put into service immediately. However, should it be necessary to make adjustments to the end-of-travel positions to overcome any device related issues (i.e. valve shaft incorrectly timed to the drive stem), the procedures outlined below should be followed to put the assembly into service. Note that there is a maximum adjustment range of +/- 3° at each end of travel.

[Pages 8-9](#) - Travel limits for CW (CLOSED) & CCW (OPEN) positions, HZSN1 Series

[Page 10](#) - Auxiliary switch cams for CW & CCW positions, HZSN1 Series

TECHNICAL INFORMATION

ACTUATOR SPECIFICATIONS		HZSN1	
Supply	Torque Output (in-lb / Nm)	266 / 30	
	Current Draw (Start / Run / LRA)	1.3A / 0.7A / 2.0A	
24VAC	Speed (90°) DC-60Hz / 50Hz, seconds	11 / 11	
	Motor - 24V DC Perm Magnet 2 Pole Brush	10W	
24VDC	On/Off / Proportional	Duty Cycle (IEC60034)	75% (S2-15 min) / 75% (S4-75%)
		Motor Protection, Temp / Class	All - 130°C / Class B
	Motor Starts, per hour, Max	All - 600	
	Current Draw (Start / Run / LRA)	1.3A / 0.7A / 2.0A	
120VAC	Speed (90°) 60Hz / 50Hz, seconds	11 / 11	
	Motor - 24V DC Perm Magnet 2 Pole Brush	10W	
120VDC	On/Off / Proportional	Duty Cycle (IEC60034)	25% (S2-15 min) / 75% (S4-75%)
		Motor Protection, Temp / Class	All - 130°C / Class B
	Motor Starts, per hour, Max	All - 600	
	Current Draw (Start / Run / LRA)	1.3A / 0.7A / 2.0A	
230VAC	Speed (90°) 60Hz / 50Hz, seconds	11 / 11	
	Motor - 24V DC Perm Magnet 2 Pole Brush	10W	
230VDC	On/Off / Proportional	Duty Cycle (IEC60034)	25% (S2-15 min) / 75% (S4-75%)
		Motor Protection, Temp / Class	All - 130°C / Class B
	Motor Starts, per hour, Max	All - 600	
	Current Draw (Start / Run / LRA)	1.3A / 0.7A / 2.0A	
All	Manual Override	Bottom 5mm Hex Shaft	
	Environmental Rating	NEMA 4/4X & IP67	
	Electrical Entry (1)	1M cable thru PG6 Polyamide gland	
	Control	On/Off / Proportional	
	Position Feedback - On/Off ONLY	(2) Form A Volt-Free, Rated 1A @ 250vac	
	Position Feedback - Proportional ONLY	4-20mA / 2-10vdc	
	Ambient Operating Range	-22°F to +158°F (-30°C to +70°C)	
	Humidity Range	0-95% RH	
Altitude Limit	9850 ft / 3000 m		

Note: The HZSN1 Series does NOT have an internal condensate heater.

CONVENTIONS USED IN THIS MANUAL

Below are Terms and Definitions used throughout this manual.

1. XTS/TS product manufactured without/with Torque Switches. **Note: No HZSN1 models are available with TS.**
2. XFS/FS product manufactured without/with Fail Safe built-in. **Note: No FS HZSN1 models are available.**
3. LCS is an industry acronym for a Local Control Station. **Note: No LCS HZSN1 models are available.**
4. CW is Clockwise and CCW is Counterclockwise.

Use this table to efficiently select the actuator and wiring diagram you require.

ACTUATOR OPTIONS

Control	Voltage	Torque Switches	Fail Safe	Local Control Station	IOM	Wiring Diagram Page
On/Off	24VDC/VAC	XTS	XFS	None	This IOM	20
Proportional	24VDC/VAC	XTS	XFS	None	This IOM	21
On/Off	120VAC	XTS	XFS	None	This IOM	22
Proportional	120VAC	XTS	XFS	None	This IOM	23
On/Off	230VAC	XTS	XFS	None	This IOM	22
Proportional	230VAC	XTS	XFS	None	This IOM	23

ACTUATOR HANDLING AND INSTALLATION

SHIPPING AND HANDLING

- This actuator Position on arrival:
 - A separate actuator arrives in the FULLY CLOSED (CW) position. The red pointer type position indicator (see illustration) points to the] – [graphic.
 - A 2 way ball valve assembly arrives in the FULLY OPEN (CCW) position and the red pointer points to the] | [graphic.
 - A 2 way butterfly valve assembly arrives nearly CLOSED (5°) position and the red pointer points to approximately 5° from the] – [graphic.
- Storage: This unit should not be stored outside unless it is powered up and has proper conduit terminations. When not powered up, it should be stored in a clean, dry environment at all times.
- This quarter-turn actuator has been factory tested and calibrated to operate between 0° and 90°. Most products will not require recalibration of these settings. If any travel adjustment is necessary, please refer to the Adjusting CW/CCW End of Travel section for instructions.
- Notice:** The HZSN1 Series actuators have fixed mechanical stops which limit rotation. Do not attempt to operate with a rotation greater than 95°.
- Notice:** Protect the actuator from moisture by installing it with water tight electrical fittings and proper conduit drainage. Supply power to the unit to keep the internal heater warm at the time of installation.



The actuator has a red pointer type position indicator. Pointing at the “] – [” means the actuator is fully CW. Pointing at the “] | [” means it is fully CCW.



WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

INSTALLATION NOTES



CAUTION – Please follow the following guidelines for proper installation.

- These actuators are designed to be used between a horizontal and upright position. Do NOT mount the assembly with the actuator top below a horizontal position (i.e. upside down).
- When installing conduit, use proper techniques for entry into the actuator. Use drip loops to prevent conduit condensate from entering the actuator.
- Mechanical travel stops are fixed. They cannot be adjusted.
- The ABS gland and all wiring terminations MUST use proper equipment to protect the NEMA 4X integrity of the housing.
- The internal heater (if supplied) is to be used in ALL applications.
- Do NOT install the actuator outdoors or in humid environments unless it is powered up and the heater is functioning.
- Use proper wire size to prevent actuator failure (see Wire Sizing Chart for proper wire sizing).
- The 1M flying lead is a jacketed multi-conductor 24ga cable. Field connections are made external to the actuator housing.
- Notice:** Do NOT parallel wire multiple HZSN1 Series actuators.

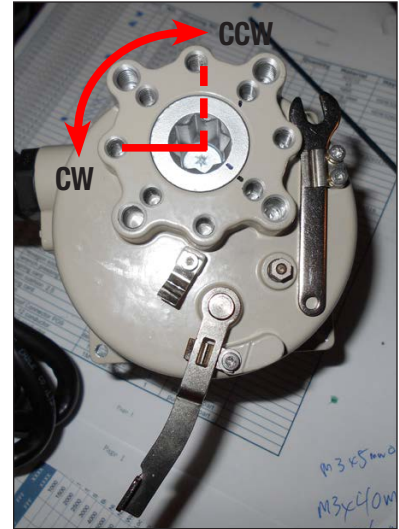


The 5mm hex manual override allows a user to position the valve or damper with or without power. See Declutch Lever for Manual Override section for details.

PRODUCT MOUNTING AND SETUP

Notice: All HZSN1 Series actuators rotate CW to close the output shaft out the bottom of the actuator **when viewed from above**. On all HZSN1 models, the cam shaft **rotates CCW** when the output shaft rotates **CW**.

1. Fully CLOSE the valve or damper to which the actuator is to be mounted.
2. Assemble necessary linkage hardware and attach the actuator to the valve or damper.
3. Center the actuator on the valve or damper drive shaft and tighten all hardware.
4. **Before applying power to the unit**, use the **declutching lever** (clipped lever on bottom of actuator) and rotate the **manual override** (5mm hex output drive on bottom of actuator) from the fully CW to the fully CCW position to check for unobstructed manual operation of the valve or damper.
5. Refer to your product part number to determine which wiring diagram to follow when wiring up the actuator.
6. HZSN1 Series actuators utilize a 39" pre-wired cable to simplify field wiring and testing.
 - The cable exits the actuator though an IP68 entry gland (NEMA 4X).
 - Field connections to the free ends of the cable should be performed in a local-code approved wiring box (by others).
7. Make the electrical connections per the appropriate Wiring Diagram for your actuator.
 - Connect POWER and CONTROL to the correct wires.
 - For on/off actuators note that control voltage is **ONLY** available from wire #7 and connects to wire #5 (open) or #6 (closed)
 - For proportional actuators, the control signal connects to wires #5 (+) and #6 (-). The position feedback exits wires #7 (+) and #8 (-).
 - For on/off actuators wires #8, 9 & 10 are for (adjustable) aux switches. These are dry type (volt free) Form A contacts rated 250VAC @ 3A Max
 - There are NO auxiliary switches available on the proportional control models.



Note that the rotation seen from below is a mirror of the direction viewed from above.

This series utilizes a clutch-arm to disengage the geartrain drive so it will free-wheel in manual override mode.



The cable exits the actuator through an IP68 entry gland (NEMA 4X).

MANUAL OPERATION

1. The manual override is a 5mm hex output drive on bottom of actuator. The declutch lever shown in the photo at right is in the in manual position. **Refer to the next page for details.**
2. Manual override shaft turns 3.5 revolutions for 90° rotation of the 11mm double square output shaft. Return Declutch lever to automatic position for normal operation.



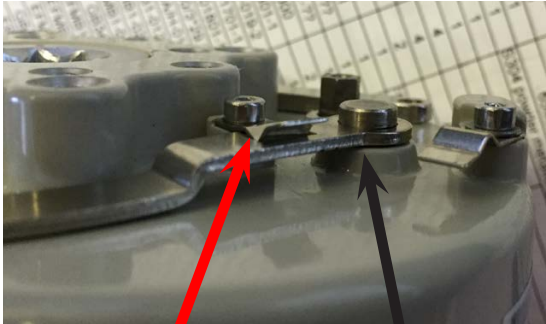
WARNING – You MUST disengage the geartrain BEFORE operating the manual override.

Do not use powered tools to turn the manual override -- it will DAMAGE the gear train or motor and VOID the warranty.



DECLUTCH LEVER FOR MANUAL OVERRIDE

⚠ WARNING – You **MUST** disengage the geartrain **BEFORE** operating the manual override. Do not use powered tools to turn the manual override -- it will **DAMAGE** the gear train or motor and **VOID** the warranty.



Transmission shaft is pushed IN.

Normal (operating) spring plate.
Arm goes **UNDER** the plate!



Normal (operating) position has the clutch arm pushed under and parked under this spring plate.

Manual (override) position has the clutch arm unclipped, rotated and parked **OVER** this spring plate. The transmission shaft will be pulled out.



Disengaged spring plate.
Arm goes **OVER** the plate!

Transmission shaft is pulled OUT.

HZSN1 Geartrain

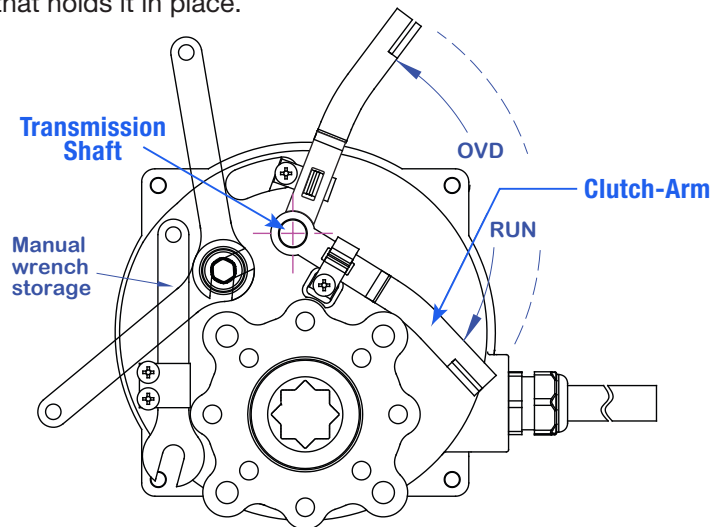
The HZSN1 Series has a limited travel geartrain. Maximum angle of rotation is 90° +/- 5° total. There are NO mechanical stops to adjust, but the geartrain is designed to travel only to this angle.

HZSN1 actuators utilize a clutch-arm to pull out the transmission shaft which disengages the geartrain drive so it will free-wheel in manual override mode. During normal operation the clutch-arm lever is held in the dis-engaged (storage) position by a spring plate. (see photos).

Electric Running Mode (Normal Operation)

For normal operation, store the clutch-arm folded under the actuator body with the transmission shaft pushed up and IN.

- In the photo at top left, the arm is shown in its stored position.
- Note that the arm not only rotates, but is attached to a vertical shaft that extends and retracts into the transmission.
- In the stored position, the vertical shaft is retracted into the transmission and the clutch-arm presses against the geartrain housing while it is rotated and pushes **UNDER** the spring clip that holds it in place.



The clutch-arm will pull the transmission shaft **OUT**, which disengages the geartrain drive so it will free-wheel in manual override mode.

Manual Override Mode (Declutched Operation)

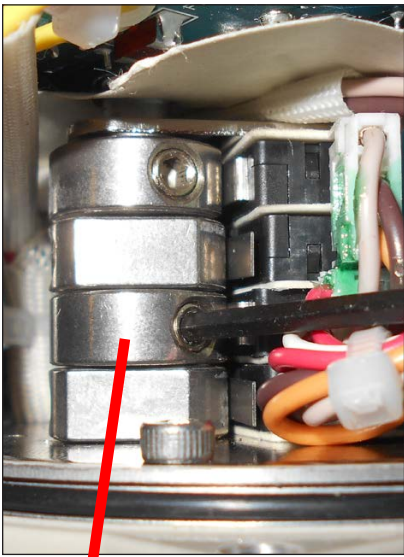
For manual override mode, unclip the clutch-arm from the stored position, rotate it, and lever the transmission shaft down and OUT.

- When the clutch-arm is rotated into the de-clutched position, the entire arm and attached transmission shaft are released from the storage spring plate.
- Rotate the arm CCW (viewed from the bottom) to a point **BETWEEN** the two spring plates.
- Lift the clutch-arm away from the transmission housing (pulling the transmission shaft **OUT** of the transmission) and rotate the clutch-arm up and **ON TOP** of the declutched spring plate. This plate now holds the transmission shaft out.

ADJUSTING CW END OF TRAVEL

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required. Note that for most actuators these positions are independent - for instance the CW position is accurate while the CCW position might need adjustment.

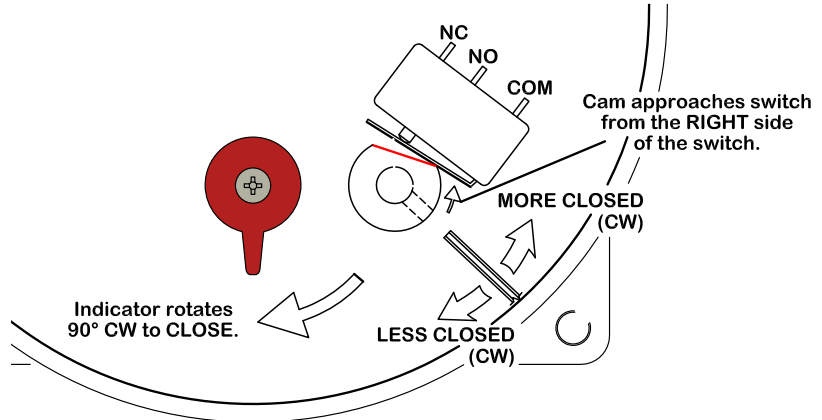
⚠ WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections or changing cam positions.



Cam 2 - CW Cam

Adjust CW Cam (Second from Bottom)

1. Cam 2 is the second cam up from the bottom and is the end-of-travel adjustment for the actuator CW position. With POWER OFF and the actuator at its required CW position, use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the second switch. The click means correct adjustment has been achieved.
 - Tighten the cam set screw.

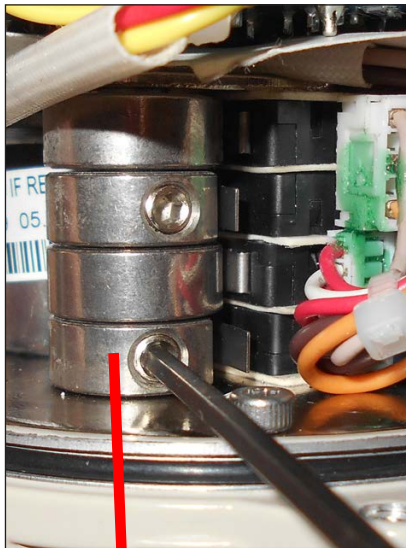


2. **Apply power** and test for the correct CW position:
 - Drive the actuator CCW at least 15-20 degrees.
 - Drive the actuator CW until the cam stops the electrical travel.
 - Check to be sure this is the correct CW position you require
3. Repeat the steps of item 1 if further adjustment is needed.

ADJUSTING CCW END OF TRAVEL

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. Most installations onto valves or dampers will likely not require recalibration of these settings. Please mount the valve or damper and proceed on these pages **only** if adjustments are required. Note that for most actuators these positions are independent - for instance the CW position is accurate while the CCW position might need adjustment.

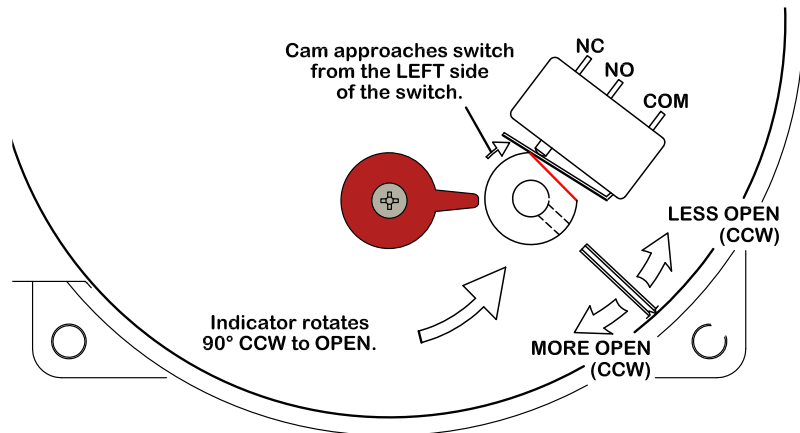
⚠ WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections or changing cam positions.



Cam 1 - CCW Cam

Adjust CCW Cam (Bottom)

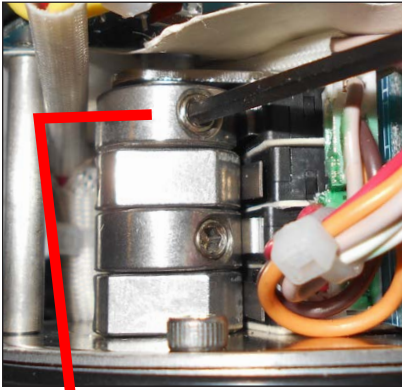
1. Cam 1 is the bottom cam and is the end-of-travel adjustment for the actuator CCW position. With POWER OFF and the actuator at its required CCW position, use a 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the bottom switch. The click means correct adjustment has been achieved.
 - Tighten the cam set screw.



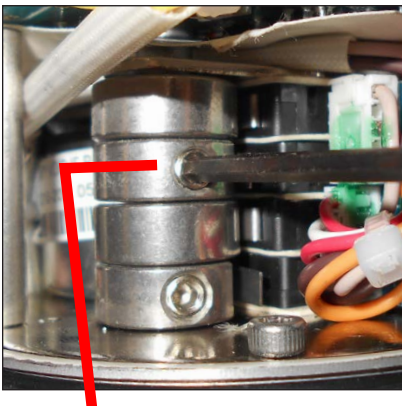
2. **Apply power** and test for the correct CCW position:
 - Drive the actuator CW at least 15-20 degrees.
 - Drive the actuator CCW until the cam stops the electrical travel.
 - Check to be sure this is the correct CCW position you require
3. Repeat the steps of item 1 if further adjustment is needed.

ADJUSTING AUXILIARY SWITCHES

This actuator has been factory calibrated and tested to stop at 0 degrees for CW position and to stop at 90 degrees for CCW position. The Auxiliary Switch settings are based on those stops. Ideally the Auxiliary Switches are set a few degrees in advance of the respective stop switches, so if you had adjusted either the CW or CCW you may need to adjust these as well.



Cam 4 - CW Auxiliary Cam



Cam 3 - CCW Auxiliary Cam

Notice: The proportional control models do not have auxiliary switches. They DO have an analog feedback which matches the position of the actuator.

Adjust CW Auxiliary Cam (Top)

1. Cam 4 is the fourth cam up from the bottom and is the CW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CW position.
2. Drive the actuator to its CW position. Use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the RIGHT 10-15 degrees until you hear a click. This will reset the switch arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the LEFT, pushing the cam, until you hear the “click” on the top switch.
 - Continue to rotate the cam between 3 and 5 degrees to the LEFT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - An easy indicator of correct CW Aux cam setting is to look at the setscrew on the #4 cam. It should be about one-half the setscrew diameter to the LEFT of the #2 cam setscrew.
 - Tighten the cam set screw.

Adjust CCW Auxiliary Cam (Second from Bottom)

1. Cam 3 is the third cam up from the bottom and is the CCW auxiliary switch adjustment, an optional switch typically used to indicate the actuator reached its CCW position.
2. Drive the actuator to its CCW position. Use a sharp 2.5mm hex key to free up the cam set screw. **Take care not to let the hex key slip at this stage, it can easily strip out.** Once it is free adjust it as described below:
 - Rotate the hex key to the LEFT 10-15 degrees until you hear a click. This will reset the switch arm.
 - Gently tighten (CW) the set screw only until slight pressure is felt. Ideally the set screw rides along the camshaft.
 - Now SLOWLY rotate the hex key to the RIGHT, pushing the cam, until you hear the “click” on the third switch.
 - Continue to rotate the cam between 3 and 5 degrees to the RIGHT to make sure the auxiliary cam switch changes state before the actuator reaches its end of travel electrically.
 - An easy indicator of correct CCW Aux cam setting is to look at the setscrew on the #3 cam.
 - Tighten the cam set screw.

COMMISSIONING

The end stop travel (cams) of this actuator have been factory set and tested to respond between 0° and 90° degrees rotation. If NO changes to end stops are required, this unit is ready to be put into service immediately using this procedure. IF changes to the cam positions are required, refer to pages 8-10 before proceeding.

Conceptually this procedure first establishes correct direction and control; these **MUST** be verified in order to proceed. Any actuator must drive CW when commanded to do so, and STOP when the actuator reaches the full CW travel position. The same applies for the CCW operation.


 **WARNING** – Follow these directions carefully and in order. Actuator damage due to improper testing and commissioning will **NOT** be covered under warranty.

Notice: The HZSN1 Series have a declutching lever and a bottom mounted 5mm hex override shaft for manual operation. These units will not operate electrically with the declutching lever in the manual (OUT) mode, and the manual override shaft is locked in position (cannot rotate) when the declutching lever is in automatic (IN) mode.

Also, the HZSN1 Series have LIMITED rotation angles of less than 95°. There are HARD mechanical stops in the geartrain which prevent the manual or automatic operation of the actuator beyond those limitations. Attempts to use the manual override to move the geartrain beyond those limits will void the product warranty.

Commissioning - On/Off Control

After the actuator and valve (damper) assembly have been installed with power and control connected, BEFORE applying power, use the manual override (see the Declutch Lever for Manual Override section) to rotate the actuator to a mid-travel position.

1. Be sure there are NO movement commands active, and apply power.
 - A. The WHT power LED indicator should come on.
 - B. The actuator should NOT move.
 - I. If it does move, **IMMEDIATELY remove power from the actuator to STOP movement.**
 - a. Proceed to step 2.
 - II. If it does NOT move, proceed to step 3.
 2. Check control wiring to leads 1~10 on the actuator.
 - A. Re-apply power.
 3. **Generate a remote CW move command** and verify the DIRECTION of the position indicator is CW.
 - A. If it is NOT, there is a problem with the field logic or wiring, troubleshoot accordingly.
 - B. If it is, proceed to step 4.
 - When the actuator reaches its full CW end of travel the “closed” LED indicator will come ON.
 4. **Generate a remote CCW move command** and verify the DIRECTION of the position indicator is CCW.
 - A. If it is NOT, there is a problem with the field logic or wiring, troubleshoot accordingly.
-  **WARNING** – **LETHAL** voltages may be present inside this actuator.
- B. If it is, proceed to step 5.
 - When the actuator reaches its full CCW end of travel the “open” LED indicator will come ON.
 5. **If the actuator does NOT stop at the correct positions**, fails to move in the correct directions, or on fails to stop movement when the respective torque switch levers are depressed, **IMMEDIATELY STOP the operation of the actuator** and refer to the Table of Contents for the section to reference for the corrective action needed.
 6. **Return Field control to automatic mode. Actuator is now commissioned and operational.**

COMMISSIONING

The end stop travel (cams) of this actuator have been factory set and tested to respond between 0° and 90° degrees rotation. If NO changes to end stops are required, this unit is ready to be put into service immediately using this procedure. IF changes to the cam positions are required, refer to pages 8-10 before proceeding.

Conceptually this procedure first establishes correct direction and control; these **MUST** be verified in order to proceed. Any actuator must drive CW when commanded to do so, and STOP when the actuator reaches the full CW travel position. The same applies for the CCW operation.



WARNING – Follow these directions carefully and in order. Actuator damage due to improper testing and commissioning will **NOT** be covered under warranty.

Notice: This procedure has many sections with the text “**IMMEDIATELY remove power from the actuator to STOP movement**”. Quick action is necessary in case of any unexpected or uncontrolled movement to keep the actuator from possibly driving past the limits of the valve or damper attached, and to simply keep the actuator in a known position for a quick, efficient installation.

Commissioning - Proportional Control

WARNING – **LETHAL** voltages may be present inside this actuator.

1. After the actuator and valve (damper) assembly have been installed with power and control connected, BEFORE applying power, use the manual override (see the **Declutch Lever for Manual Override** section) to rotate the actuator to a mid-travel position.
2. Set the control signal selection jumpers, refer to the Proportional Calibration page.
3. **Generate a mid-travel command (12mA)**, and apply power.
 - A. The actuator should move only to match the incoming signal, if at all.
 - I. If the actuator moves and continues to move **away** from midpoint, **IMMEDIATELY remove power from the actuator to STOP movement**.
 - a. Place a meter in series with wire #5 (meter (+) connects to inbound signal, meter (-) connects to wire #5). It **MUST** read +12mA (with power ON).
 - i. If it does **NOT**, check the polarity of the incoming analog signal to make sure it is (+)12mA.
 - ii. Return to step 3.
 - II. If the actuator moves momentarily and then **STOPS** at the mid stroke position, proceed to step 4.
 - III. If the actuator does not move at all, generate a 10mA command and then back to 12mA to offset the actuator position.
 - a. The actuator should move back to the midpoint position and then STOP.
 - b. Proceed to step 4.
4. **Generate a CW move command (4mA)** and verify the **DIRECTION** of the position indicator is CW.
 - A. The actuator should run CW and run until it reaches its CW end of travel and the **CLOSE LED** is ON.
 - B. While power is on, an analog feedback signal **OUT** provides an electronic position of the actuator... i.e. 4mA = full CW and 20mA = full CCW positions (reference actuator terminals #7 (+) and #8(-)).
5. **Generate a CCW move command (20mA)** and verify the **DIRECTION** of the position indicator is CCW.
 - A. The actuator should run CCW and run until it reaches its CCW end of travel and the **OPEN LED** is ON.



WARNING – Serious Damage to the actuator will result if the motor is allowed to drive the gear train into the mechanical stop! Remove power from this device **BEFORE** making any travel adjustments.

COMMISSIONING - CONTINUED

- B. While power is on, an analog feedback signal OUT provides an electronic position of the actuator... i.e. 4mA = full CW and 20mA = full CCW positions (reference actuator terminals #7 (+) and #8(-)).
6. **If the actuator does NOT stop at the correct positions**, fails to move in the correct directions **IMMEDIATELY STOP the operation of the actuator** and refer to the Table of Contents for the section to reference for the corrective action needed.
 7. Check the full scale response of the analog signals into and out of the actuator by referring to the section: Calibration - Proportional Control for the proper voltage of the actuator.
 8. **If the actuator stops at the correct positions and generates a feedback signal representative of the position of the actuator, the actuator can be put into service and is fully operational.**

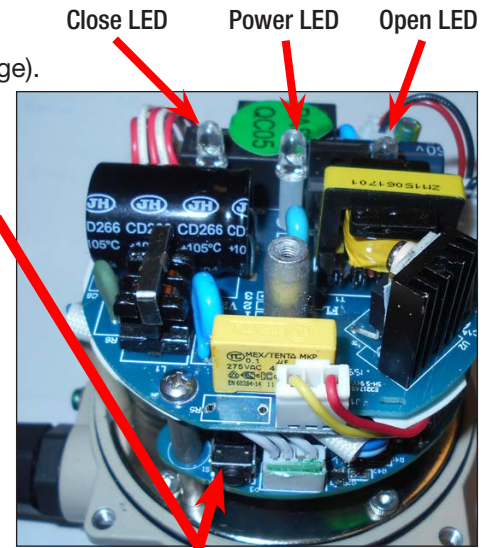
PROPORTIONAL CALIBRATION

⚠ WARNING – Follow these directions carefully and in order. Actuator damage due to improper calibration will NOT be covered under warranty.

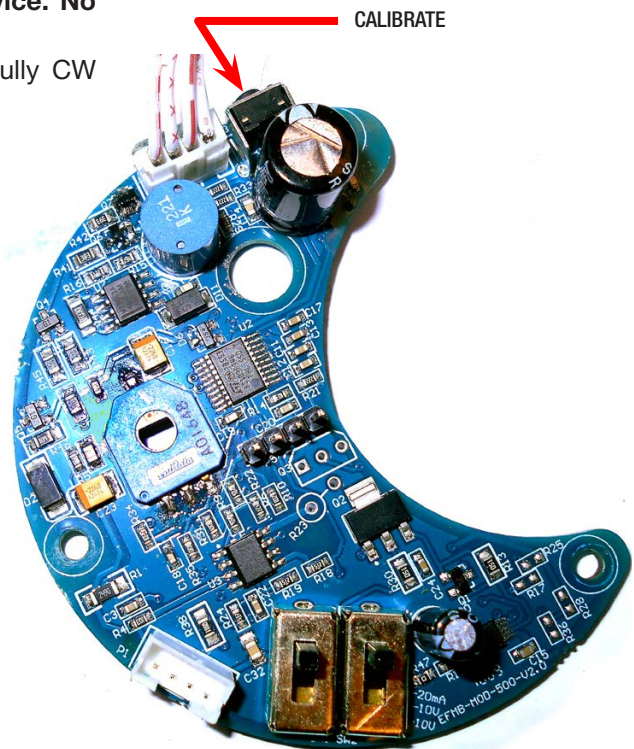
Calibration Procedure - Proportional Control

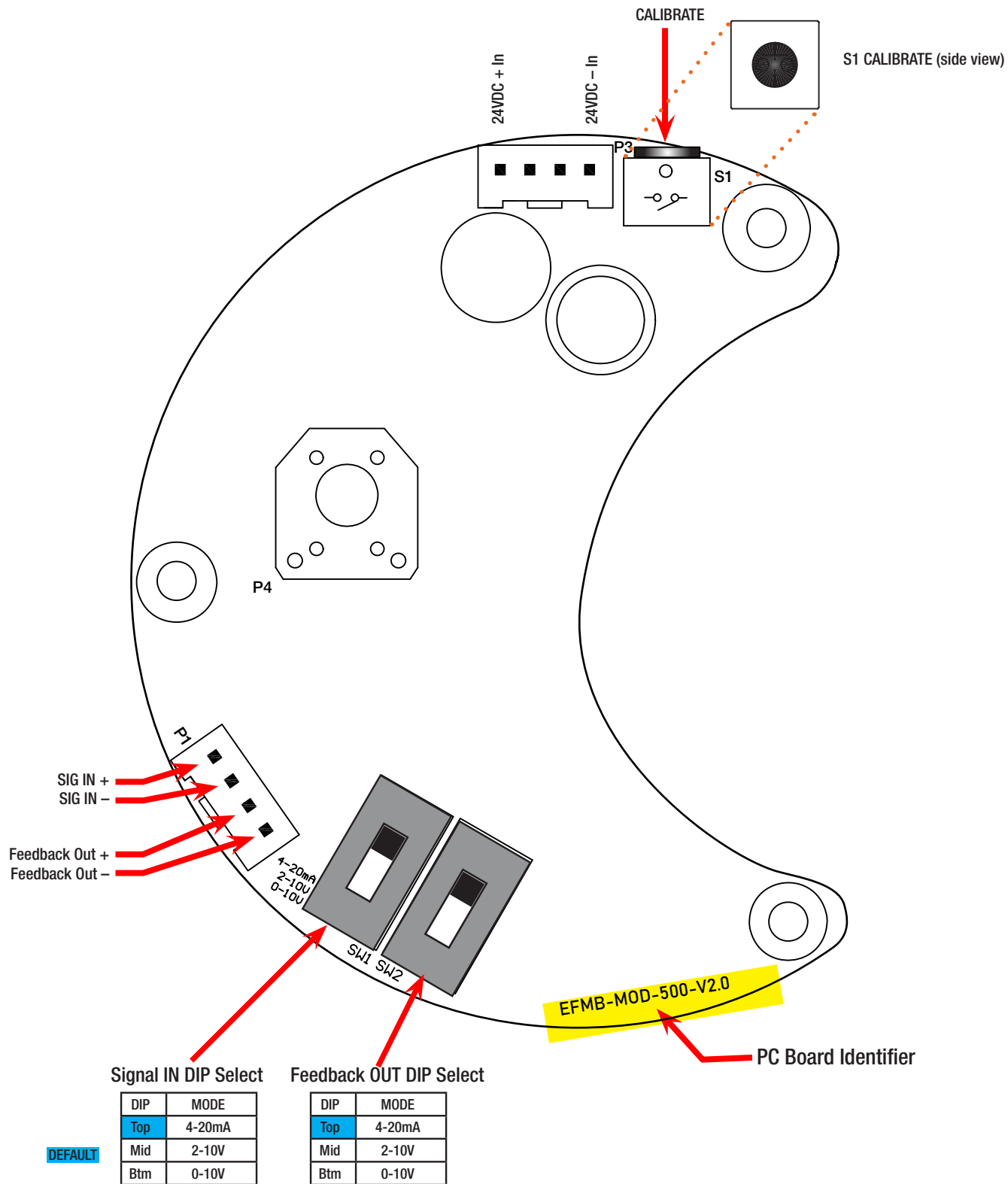
After completing all mounting and wiring procedures and the commissioning has been performed, it is now possible to calibrate the analog response of the actuator.

1. Before applying power or making any wiring connections:
2. Set the DIP switches for correct signal IN and feedback OUT (ref next page).
3. Apply correct power according to the actuator model.
 - A. The power LED will turn on.
4. **Press the “Calibrate” black S1 pushbutton** on the Mod control board and hold it down for about three seconds, then release.
 - A. The unit will run to its full CCW position, stop for a few seconds, then run back to its full CW position.
 - B. Wait 20 seconds, the unit will complete the calibration routine and will return to active operation mode by responding to the incoming 4-20mA control signals being sent to the actuator.
 - This procedure reads and saves the potentiometer readings into microcontroller EEPROM.
 - Loss of power does not erase these settings.
 - At CCW end of travel the OPEN LED turns ON.
 - At CW end of travel the CLOSE LED turns ON.
5. The unit will start to respond to the incoming 4-20mA control signal being sent to the actuator.
6. **Unit is now calibrated and is ready to be put into service. No other calibration is necessary.**
7. Note that upon loss of SIGNAL, the unit will go to the fully CW position, until the SIGNAL is restored.

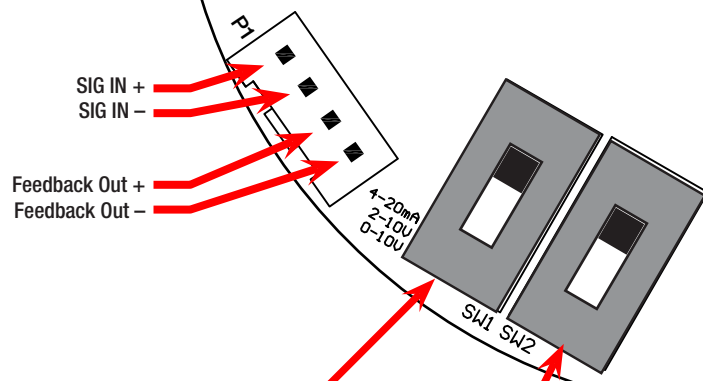


Proportional control PCB is mounted under main drive board. This unit is VERY compact, use caution when making changes!



CALIBRATION - CONTINUED


S1 CALIBRATE (side view)


Signal IN DIP Select
DEFAULT

DIP	MODE
Top	4-20mA
Mid	2-10V
Btm	0-10V

Feedback OUT DIP Select

DIP	MODE
Top	4-20mA
Mid	2-10V
Btm	0-10V

TROUBLESHOOTING


WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections. If it is necessary to troubleshoot with live power to the actuator, please use **EXTREME CAUTION**, and follow your company's safety protocols and procedures at all times.

After completing all mounting and wiring procedures and main power is available, if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem.

Symptom	Target	Action
Actuator does not move when commanded to do so.	Power Source	Measure incoming power AT the end of the actuator wiring lead. Reference the correct wiring diagram.
	Control Problem	Generate move commands by the field device. Measure correct voltage changes between wires 5 and 7 (CCW) and wires 5 and 6 (CW).
	Wire Sizing	Check for correct wire size per Wire Sizing Chart.
Supply and controls are measured to be correct, but actuator still does not move.	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems.
	Insufficient power supply and/or incorrect wire size during installation.	For 120/230v units, measure the voltage between wires 1 & 2 WHILE commanding the actuator to move. For 24v units, measure the voltage between wires 3 & 4. The measured voltage cannot drop more than 10%.
	Cams improperly set.	REMOVE POWER. Check to see if cams rotate freely on the cam shaft using your finger. Cams MUST be secure and set according to the procedures in the Adjusting CW/CCW End of Travel section.
Motor is extremely hot to the touch.	Control “noise” or excessive duty cycle	Check for stray voltage fluctuations on the incoming control signals. The on/off line actuators have a 75% duty cycle.
		Check for parallel wiring of multiple on/off actuators. Review the site as-built wiring diagrams to verify. Do NOT parallel wire HZSN1 Series actuators!!
Actuator does not stop at correct position at either end of travel	Actuator is out of quadrant	The manual override system has been employed to rotate the actuator beyond its intended angle of rotation. Use the manual override to rotate the actuator back into its correct quadrant of operation.
	Travel cams and/or mechanical stops not positioned correctly	Reset end-of-travel cams and/or mechanical stops as detailed in the Adjusting CW/CCW End of Travel section.

TROUBLESHOOTING

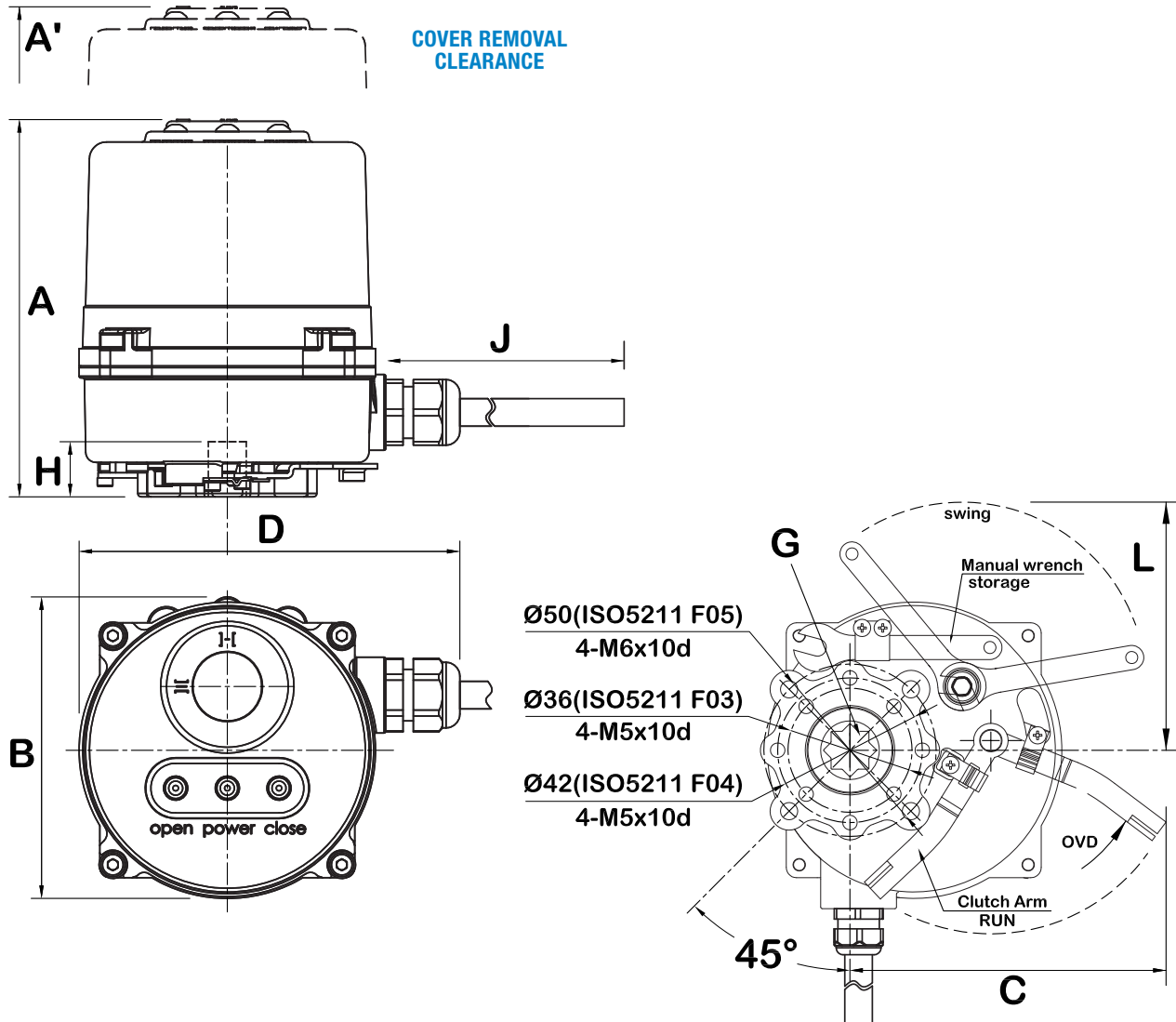

WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections. If it is necessary to troubleshoot with live power to the actuator, please use **EXTREME CAUTION**, and follow your company's safety protocols and procedures at all times.

After completing all mounting and wiring procedures and main power is available, if the actuator does NOT respond as expected, the following procedure(s) may help in identifying the problem.

Symptom	Target	Action
Actuator does not move when commanded to do so.	Power Source	Measure incoming power AT the end of the actuator wiring lead. Reference the correct wiring diagram.
	Control Problem	Generate move commands by the field device. For most analog control systems, reversing the polarity will render the control system output as invalid. Check the polarity of the analog control signals as they are connected to the actuator. The actuator will NOT respond to inverted control signals.
	Wire Sizing	Check for correct wire size per Wire Sizing Chart.
Supply and controls are measured to be correct, but actuator still does not move.	Overtorque	Remove the actuator from the driven device. If the actuator now moves, the torque required by the mechanical device exceeds that of the actuator. Increase actuator size.
		With the actuator removed from the mechanical equipment, manually rotate the valve or damper through its intended range of travel to check for mechanical problems.
	Insufficient power supply and/or incorrect wire size during installation.	For 120/230v units, measure the voltage between wires 1 & 2 WHILE commanding the actuator to move. For 24v units, measure the voltage between wires 3 & 4. The measured voltage cannot drop more than 10%.
	Travel cams improperly set	Reset end-of-travel cams and/or mechanical stops as detailed in the Adjusting CW/CCW End of Travel section.
Motor is extremely hot to the touch.	Control “noise” or excessive duty cycle	Check for stray voltage fluctuations on the incoming control signals. Analog control signals are susceptible to “noise” and send unstable control data to the actuator. This results in a never-ending motor drive scenario with the usual result being thermal overload of the drive motor.

MECHANICAL DATA

All data subject to change without notification.
Contact Hayward if certified drawings are required.


DIMENSIONS

MODEL	A in/mm	A' in/mm	B in/mm	C in/mm	D in/mm	G in/mm	H in/mm	J in/mm	L	WEIGHT lbs/kg
HZSN1	4.33 / 110	2.95 / 75	3.44 / 87.5	4.49 / 114	4.35 / 111	.433 / 11	.63 / 16	39.4 / 1000	2.83 / 72	3.5 turns 90°

No Aux Switches on Modulating Models

WIRE SIZING CHART

Wire sizing data is provided in the table below to assist in the selection of the proper wire size for HZSN1 Series actuators using various wire sizes over distance. Be sure to reference the correct voltage and do not exceed the indicated length of the wire run for each model.

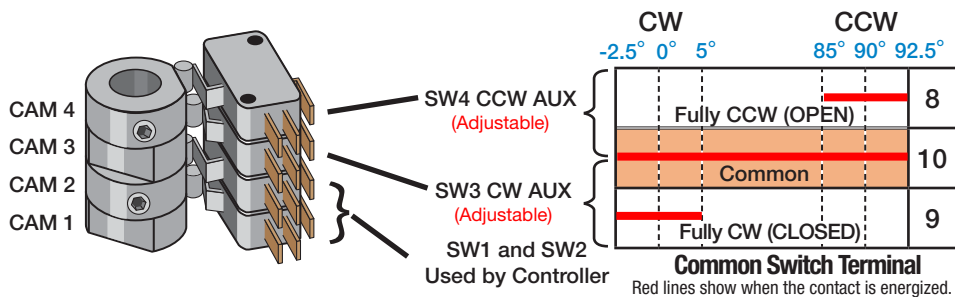


WARNING – To avoid dangerous or fatal electrical shock, turn OFF power to all electrical equipment before working on electrical connections.

Maximum distance between Actuator and Power Supply (ft)

ACTUATOR	HZSN1	HZSN1	HZSN1
Voltage	24VAC/VDC	120VAC	230VAC
AWG \ Amperes	1.3	1.3	1.3
20	83	413	792
18	131	657	1260
16	209	1045	2002
14	332	1662	3185
12	528	2642	5064

AUXILIARY SWITCH CAM MAPPING



Auxiliary Switch Function (On/Off Only)

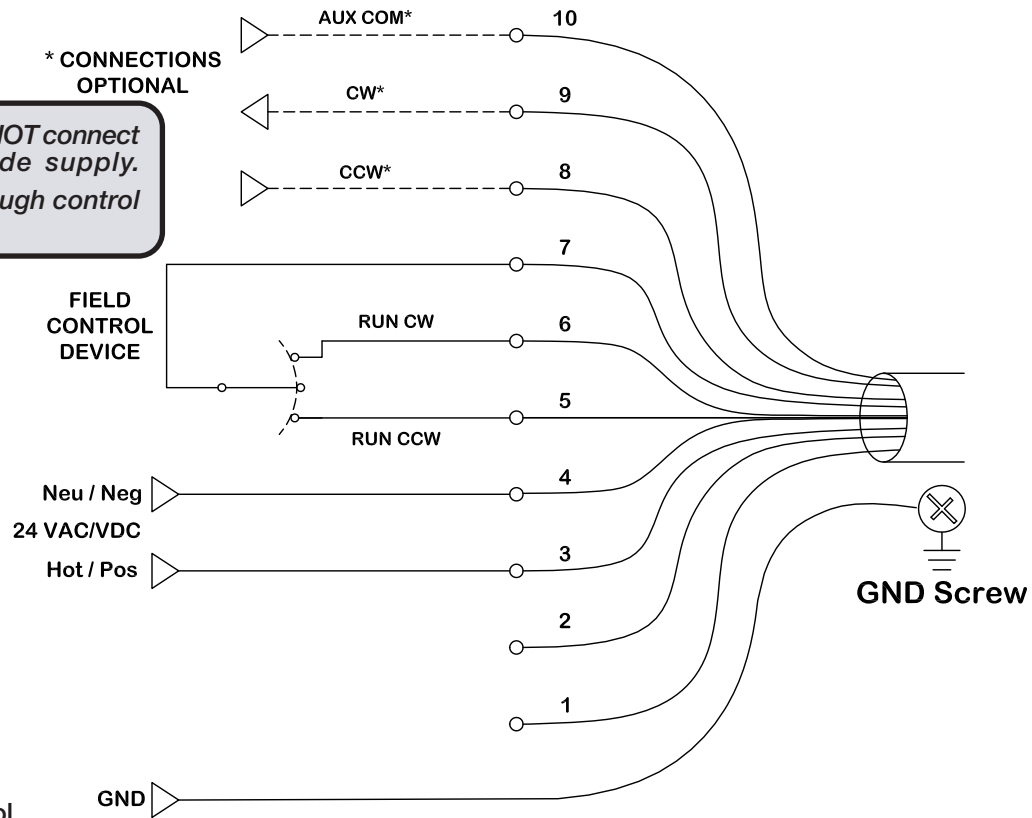
The illustration above describes how the rotation of the actuator drive shaft activates either auxiliary switch depending on the position, CW or CCW. The auxiliary switches allow a signal current to flow along different paths and ultimately allows the actuator position to be known by reading the electrical outputs of 8 or 9 (On/Off Only). Reference the proper wiring diagram for your actuator as needed.

- There are NO auxiliary switches available on the proportional control models.

WIRING DIAGRAMS

HZSN1 24vdc On/Off
HZSN1 24vac On/Off

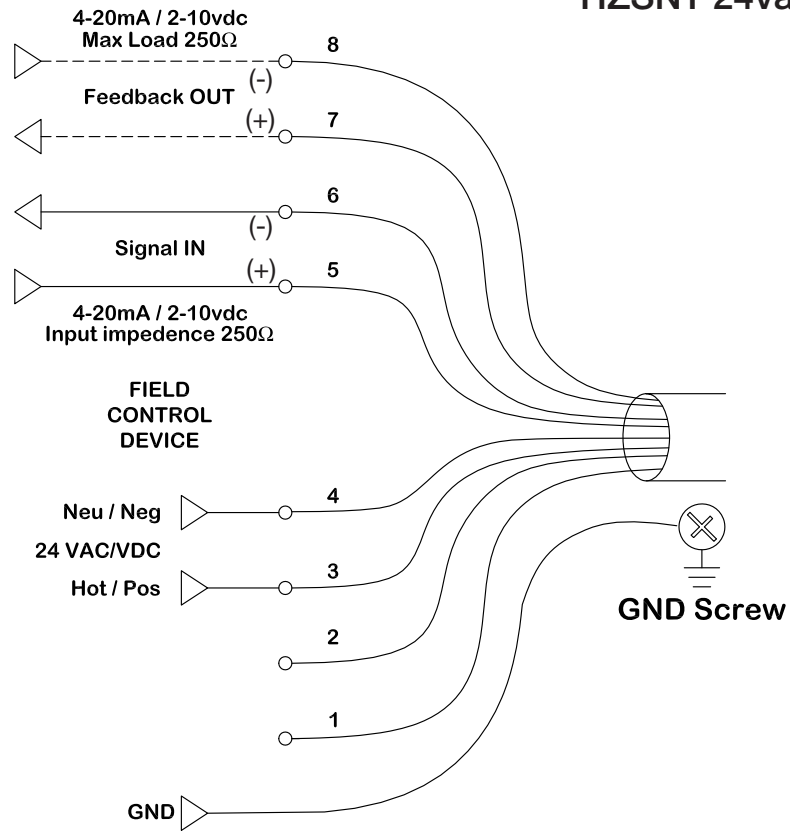
CAUTION! - Do NOT connect #5 or #6 to outside supply. Connect ONLY through control device to #7!



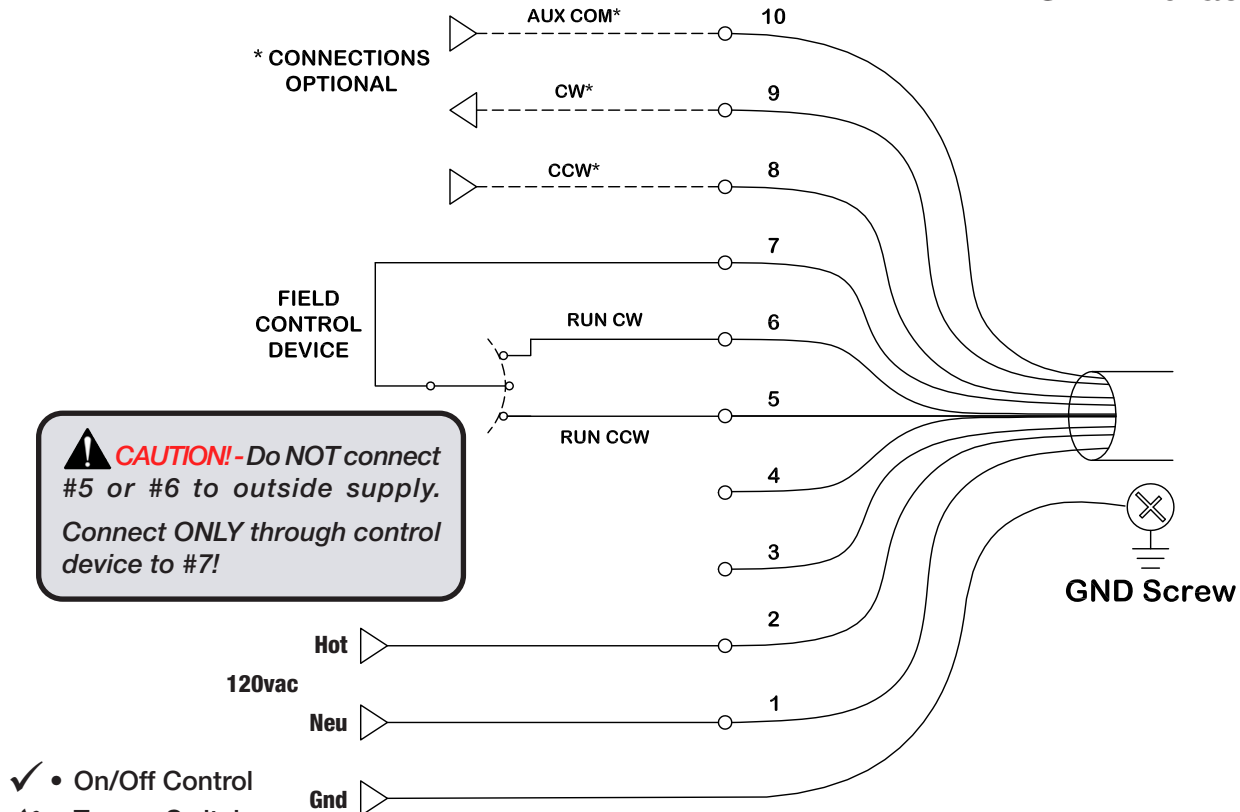
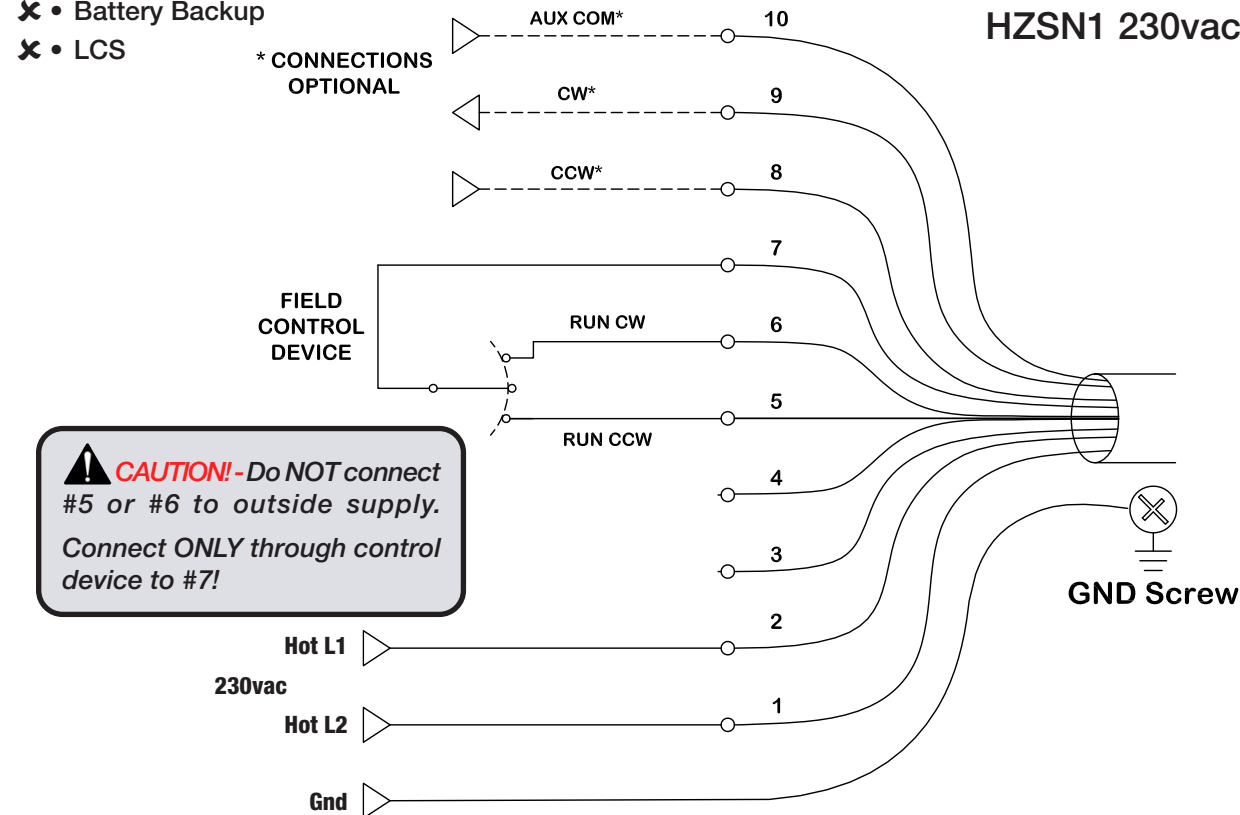
- ✓ • On/Off Control
- ✗ • Torque Switches
- ✗ • Battery Backup
- ✗ • LCS

WIRING DIAGRAMS

HZSN1 24vdc Proportional
HZSN1 24vac Proportional



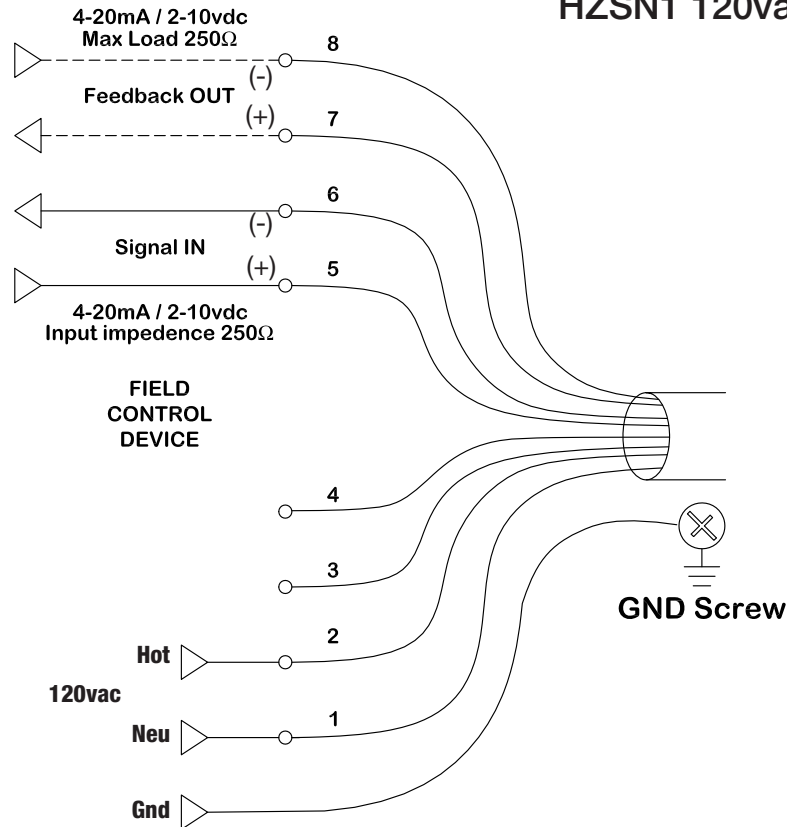
- ✓ • Proportional Control
- ✗ • Torque Switches
- ✗ • Battery Backup
- ✗ • LCS

WIRING DIAGRAMS
HZSN1 120vac On/Off

HZSN1 230vac On/Off

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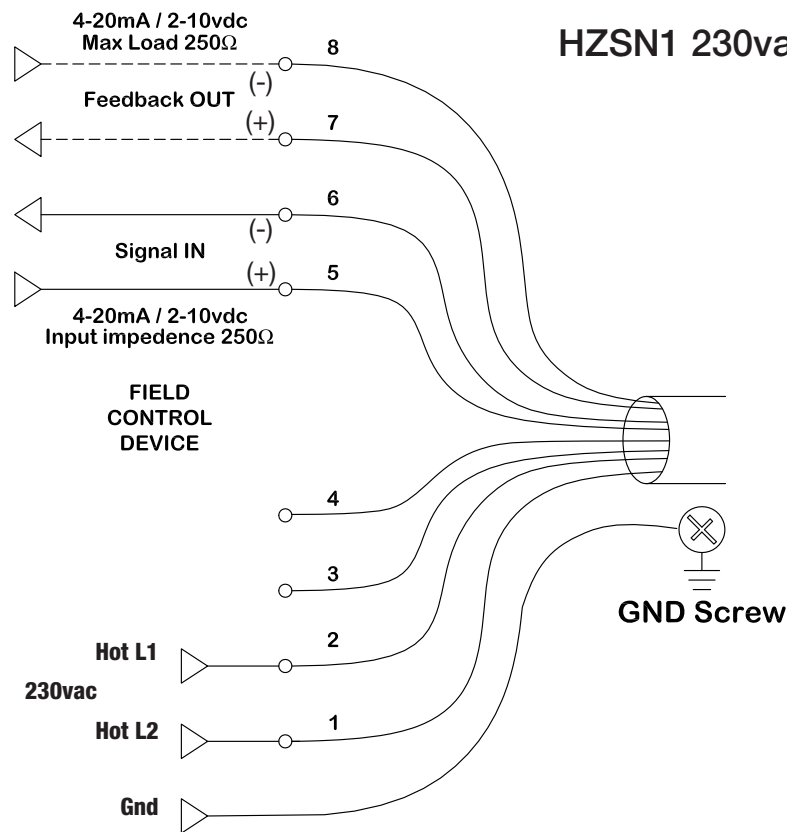
WIRING DIAGRAMS

HZSN1 120vac Proportional



- ✓ • Proportional Control
- ✗ • Torque Switches
- ✗ • Battery Backup
- ✗ • LCS

HZSN1 230vac Proportional



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