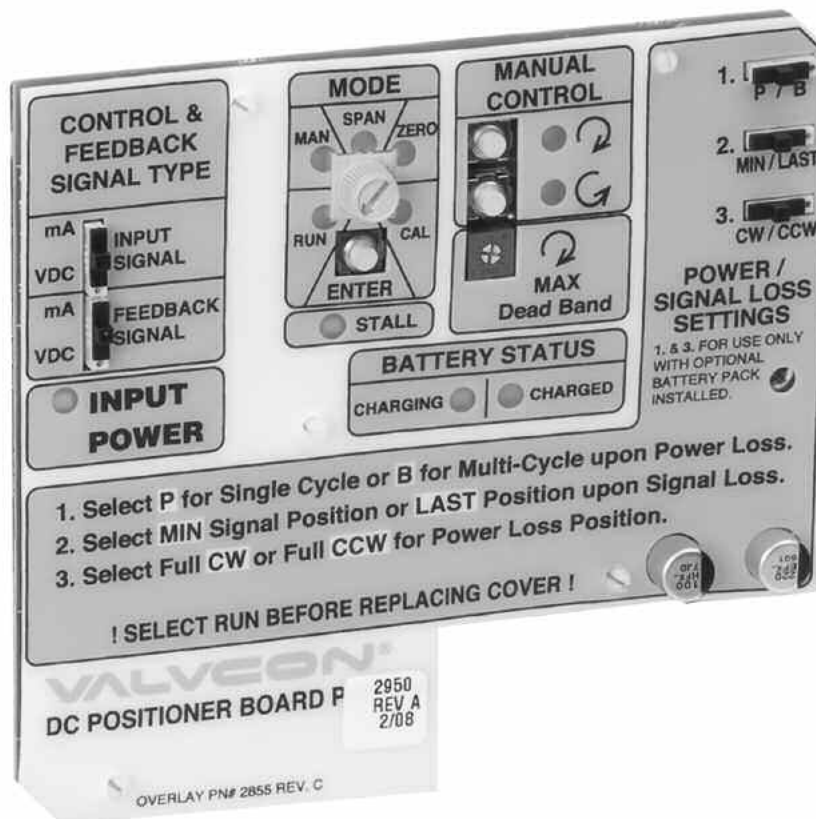


# ADC Series MODULATING ELECTRIC ACTUATORS With C, CL2 & CL3 Options With "N" In The Model Number

Installation, Maintenance and  
Operating Instructions



# Table of Contents

<b>1</b>	<b>GENERAL .....</b>	<b>3</b>
1.1	ADC Series Modulating Fail-Safe Actuators . . .	3
1.2	Motor Board P/N 2360. ....	3
1.3	Control LED Indicators. ....	3
<b>2</b>	<b>OPERATION P/N 2950 .....</b>	<b>4</b>
2.1.1	Control Board P/N 2950 .....	7
2.1.2	Operating Modes .....	4
2.1.3	Features, Settings and Controls .....	4
2.2	Basic Set-Up - Modulating Operation .....	5
2.2.1	Travel Limit Cam and Switch Operation .....	5
2.3	Set-Up for Operation .....	6
2.3.1	Potentiometer Calibration .....	7
2.3.2	Setting Zero and Span Positions .....	7
<b>3</b>	<b>BATTERY POWER OPTION CL2 AND CL3 .....</b>	<b>7</b>
3.1	Battery Charging Circuit .....	8
3.2	Battery Replacement .....	8
<b>4</b>	<b>ADC SERIES STANDARD OPTIONS .....</b>	<b>8</b>
4.1	Option "H" – Tropical Heater and Thermostat .	8
4.2	Option "I" – ISO 5211 Output. ....	8
4.3	Option "S2" – Two Auxiliary Limit Switches . .	9
4.4	Option "T" – Heater and Thermostat .....	9
4.5	Option "Z" – Handwheel Override. ....	9
4.6	Voltage .....	9
<b>5</b>	<b>GENERAL OPERATING INFORMATION .....</b>	<b>9</b>
5.1	NEMA Ratings and CSA Certification .....	9
5.2	Duty Cycle and Motor Protection .....	9
5.3	Operating Temperature Limits .....	9
5.4	Actuator Mounting. ....	10
5.5	Lubrication .....	10
5.6	Problem Prevention .....	10
5.7	Warranty. ....	10
5.8	Technical Assistance .....	10
<b>6</b>	<b>SPECIFICATIONS &amp; TECHNICAL INFO .....</b>	<b>11</b>
6.1	Analog Control (Positioning) Board .....	12
6.2	Dimensions .....	13
6.3	Exploded View .....	14
<b>7</b>	<b>ADC SERIES ACTUATORS BY PART NUMBERS . .</b>	<b>15</b>
<b>8</b>	<b>ADDITIONAL ACTUATOR PRODUCTS .....</b>	<b>16</b>

## READ THESE INSTRUCTIONS FIRST!

This instruction manual contains important information regarding the installation, operation, and troubleshooting of Metso Automation's ADC Series Modulating Electric Actuators with C, CL2 & CL3 Options. Please read these instructions carefully and save them for future reference.

## SAVE THESE INSTRUCTIONS!

# 1 GENERAL

## 1.1 ADC Series Modulating Actuators (with Optional Battery Back-up)

The modulating actuators are based on the ADC and LADC platform and provide an optional internal battery pack to power the actuator in the event of a loss of external power. ADC designates sizes from 150 to 600 in·lbs. LADC designates sizes from 1000 to 3000 in·lbs. (see Figure 6)

The electronic package consists of three separate boards; **P/N 2360** Power Board and the **P/N 2950** Control Board, and either switching power supply or a DC Isolator board. Modulating actuators are identified by a “C” in the model number. Modulating actuators with battery back-up are identified by “CL2” and “CL3” in the model number.

## 1.2 Power Board P/N 2360

The **P/N 2360** Power Board provides terminals for input and output wiring to the actuator as well as plug-in connectors for ADC Series options and accessories.

**IMPORTANT!** Jumper must be set to “POSITIONER” (45°) when 2950 board or similar positioning control board is installed. Failure to do so could result in damage to the positioner control board.

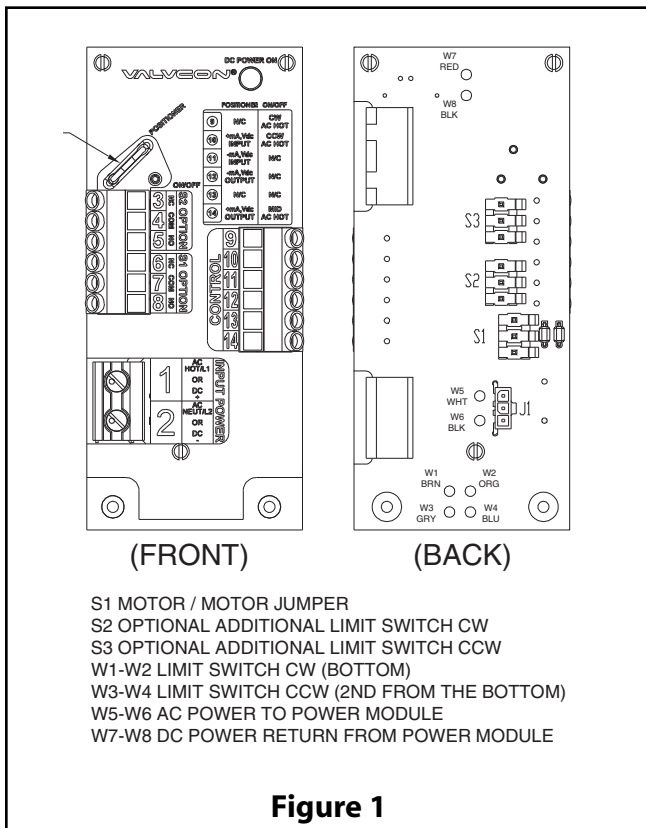


Figure 1

## 1.3 LED Indicators

Visible on the **P/N 2360** Power Board, (see Figure 1):

DC POWER ON – This green LED indicator shows that the user-supplied power is present.

Visible on the **P/N 2950** Control Board board, (see Figure 2):

INPUT POWER– A continuous green LED indicates that external or battery power is present.

STALL– A flashing red LED indicates a stall condition exists and that the actuator has been prevented from reaching the position commanded by the control signal. A STALL of more than several seconds will cause power to be automatically removed from the motor circuit, placing the actuator in a safe mode. A reverse signal or a manual mode [CW] or [CCW] movement is required to clear the stall condition. A STALL condition can be initiated by a blockage in the valve or damper, cam limit settings that are inside of the electronically saved travel stop positions, or some other increase in the torque load on the actuator.

CLOCKWISE – A continuous yellow LED indicates that the actuator is driving in the CW direction.

COUNTER-CLOCKWISE – A continuous yellow LED indicates the actuator is driving in the CCW direction.

CHARGING – A continuous yellow LED indicates that the battery is charging and is not fully charged.

CHARGED – A continuous green LED indicates that the battery is fully charged. A flashing green LED indicates the actuator is running on battery power.

RUN – A continuous green LED indicates that the normal operating mode has been selected.

MAN – A continuous yellow LED indicates that MANUAL mode has been selected. The actuator will not respond to external control signals and the CW and CCW push buttons are enabled for manually driving the actuator in either direction. The manual push buttons are also enabled in SPAN, ZERO and CAL modes.

SPAN – A continuous yellow LED indicates that the SPAN mode has been selected. (See Section 2.3.3 – **Setting Zero and Span Positions** for more on the SPAN setting)

ZERO – A continuous yellow LED indicates that the ZERO mode has been selected. (See Section 2.3.3 – **Setting Zero and Span Positions** for more on the ZERO setting)

CAL – A continuous yellow LED indicates that the CAL (calibration) mode has been selected. (See Section 2.3.2 – **Potentiometer Calibration** for more on the CAL setting)

## 2 OPERATION P/N 2950

### 2.1.1 Control Board P/N 2950

The **P/N 2950** Control Board connects to the **P/N 2360** Power Board via two plug-in connectors and a bracket and hardware that anchors to the motor/gearbox. The Control Board allows the actuator to modulate (change position) in response to a change in an analog control signal. The **P/N 2950** accepts either current, such as 4-20 mA, or voltage such as 0-10 VDC, or 2-10 VDC as the input control. The control board also features analog position output, signal fail options, external power fail options (with internal battery option installed), adjustable input signal dead band, external power "ON" indication, charge indication, stall protection, manual push button control, simple travel limit set-up, and auto calibration. Connections for the optional Back-Up battery board are located on **P/N2950**.

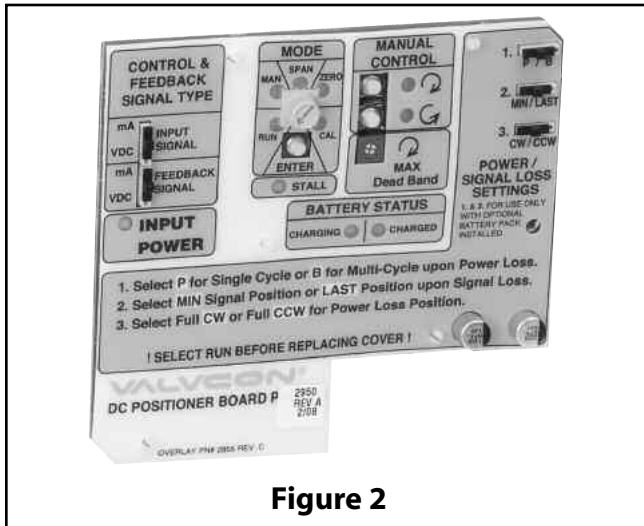


Figure 2

### 2.1.2 Mode Selection

The **P/N 2950** Control Board has five operating modes which can be enabled by turning the yellow mode selector knob. LED indicators around the knob correspond to one of the five modes; **Run**, **Manual (MAN)**, **Set Span**, **Set Zero** and **CAL** (calibrate). When the Control Board mode dial is set to any mode, the corresponding LED turns on, indicating the mode is selected.

- **Run** mode is the basic operating mode. The actuator will respond to a command control signal which is supplied to terminal 10 and terminal 11 on the **P/N 2360** Power Board.
- **MAN (Manual)** mode permits the user to override the control signal and drive the actuator by using the **[CW]** and **[CCW]** push buttons. In Manual mode the actuator will not travel beyond the saved settings for the Zero and Span stop positions.

- **Set Span** mode permits the user to precisely correlate the end of span travel stop with a corresponding control signal value. Typically, the Span position is the fully counter-clockwise position and maximum control signal value, but Span may be set at any position.
- **Set Zero** mode permits the user to precisely correlate the opposite end of travel stop position with a corresponding control signal value. The Zero position is typically the fully clockwise position and minimum control signal value, but Zero may be set at any position.
- **Cal** mode allows the user to automatically calibrate the position tracking potentiometer without the use of an ohmmeter or other electronic instruments.

### 2.1.3 Features, Settings and Controls

- **Enter** is located directly below the mode selector and permits the user to activate modes and confirm settings by pressing the **[ENTER]** button.
- **Input Signal** The board can accept a current, (**mA**) or voltage, (**VDC**) input control signal. The **Input Signal** select switch must be correctly positioned for the desired input control signal.
- **Feedback Signal** The board provides an independent analog Feedback Signal indicating actuator output position. This signal can be current, (**mA**) or voltage, (**VDC**). The Feedback Signal select switch must be correctly positioned for the desired feedback signal; current, (**mA**) or voltage (**VDC**). Feedback Signal is provided at terminals 12 (-) and 14 (+) on the **P/N 2360** Power Board. If the feedback signal is not used, the switch may be set in either position.
- **Manual Control** Selecting Manual (Man) Mode will override the connected control signal and allow driving the actuator to any position between Zero and Span, using the **[CW]** and **[CCW]** push buttons.
- **Deadband** Deadband is the window of control signal change which the actuator will ignore. The sensitivity of the actuator to respond to changes in the control signal is adjustable. Minimum deadband allows the actuator to respond to small control signal changes. Maximum deadband allows the actuator to ignore small control signal changes (such as noise on the control signal).
- **Stall Indication** The Control Board provides protection and Stall LED Alarm in the event of a condition such as a jammed valve or damper. In the event of a stall, the control board will remove power to the motor within 5 seconds. The Stall LED continues to flash until a reverse direction control signal or a manual mode **[CW]** or **[CCW]** movement clears the stall condition.

- **Power/Signal Loss Settings**

- **Switch 1 P / B** Single or Multi-Cycle – (Battery Back-up Option) Upon loss of external power, this selector switch provides options to drive the actuator immediately to the “P” Power Loss Position or to continue to cycle on “B” battery power while control signal and adequate battery power is available (approximately 10 full cycles). When “B” is selected, the actuator will drive to and remain at the “P” Power Loss Position when low battery power level is detected.

- **Switch 2 MIN / LAST “Signal Fail Position”** In the event that the control signal to the actuator is lost and external power is still applied, the Fail Position Selector Switch on the Control Board provides options for the actuator to remain at its LAST (current) position or to drive the actuator to the minimum signal position  
**Note:** If you use a 0-10 VDC control signal, the actuator will drive to the zero position regardless of the switch setting.

- **Switch 3 CW / CCW** External Power Loss Setting – (Battery Back-up Option) The **CW/CCW** Selector Switch in the field directs the actuator to drive to the full CW or CCW position upon loss of power.

- **“Sleep” and “Wake”** (Battery Back-up Option) When the battery drives the actuator to the Power Loss Position, the **P/N 2950** board remains in “**Sleep**” mode until external power returns to terminals 1 & 2 on the **P/N 2360** Power Board. To “**Wake**” the actuator, enabling the [CW] or [CCW] push buttons, select position “B” on the **P / B** selector switch and turn the mode selector dial to **MAN**. Pushing the push button on the upper left back side of the **P/N 2950** board will “**Wake**” the electronics and the actuator can be manually operated until low battery power level is detected. To preserve battery power after manual positioning is completed the actuator can be put back into “**Sleep**” mode by returning the mode selector knob to **RUN**.

## 2.2 Basic Set-Up – Modulating Operation

For modulating operation, external power must be applied to terminals 1 and 2, and a “control signal” must be applied to terminals 10 and 11. (See Figure 3)

If a dry contact (volt free) or position indication is required, auxiliary limit switches and cams may be installed. Auxiliary limit switches plug into connectors S2 and S3 on the back of the **P/N 2360** Power Board. Auxiliary switches may be set to operate in any position and connection is made at terminals 3 through 8. (See Section 4), ADC Series Standard Options.

### 2.2.1 Travel Limit Cam and Switch Operation

With the **P/N 2950** Control Board installed, the travel limit stops are set electronically as the Zero and Span position. With the Battery Back-up Option installed, the actuator will drive to the user-selected Power Loss position upon loss of external power.

Two limit switches operated by the cams on the output shaft are safety stops, only. They function to prevent damage in the event of a failure of the electronic limits. Therefore: **Each cam must be set to operate the switch slightly outside of the electronic Zero and Span position range.** (Loosen set screw in cam; 1/16 hex wrench, provided) Failure to set the cams properly may cause the actuator to stall when it can not reach the commanded, electronically set, end of travel position.

The bottom limit switch determines the clockwise safety stop position. The next limit switch up from the bottom determines the counter-clockwise safety stop position. If the auxiliary switch option is installed the corresponding cams and switches will be the third and fourth up from the bottom.

With the Battery Back-up Option installed, the actuators are factory set to drive to the full clockwise position upon loss of external power. To change this “Power Loss” position to full counter-clockwise, move the **Switch 3 CW / CCW** selector switch to the CCW position.

#### **CAUTION:**

#### **Dangerous Voltages Inside Actuator**

Use extreme caution when working on the actuator with the cover removed.

## Wiring Diagram – P/N 2360 Power Board (with P/N 2950 Installed)

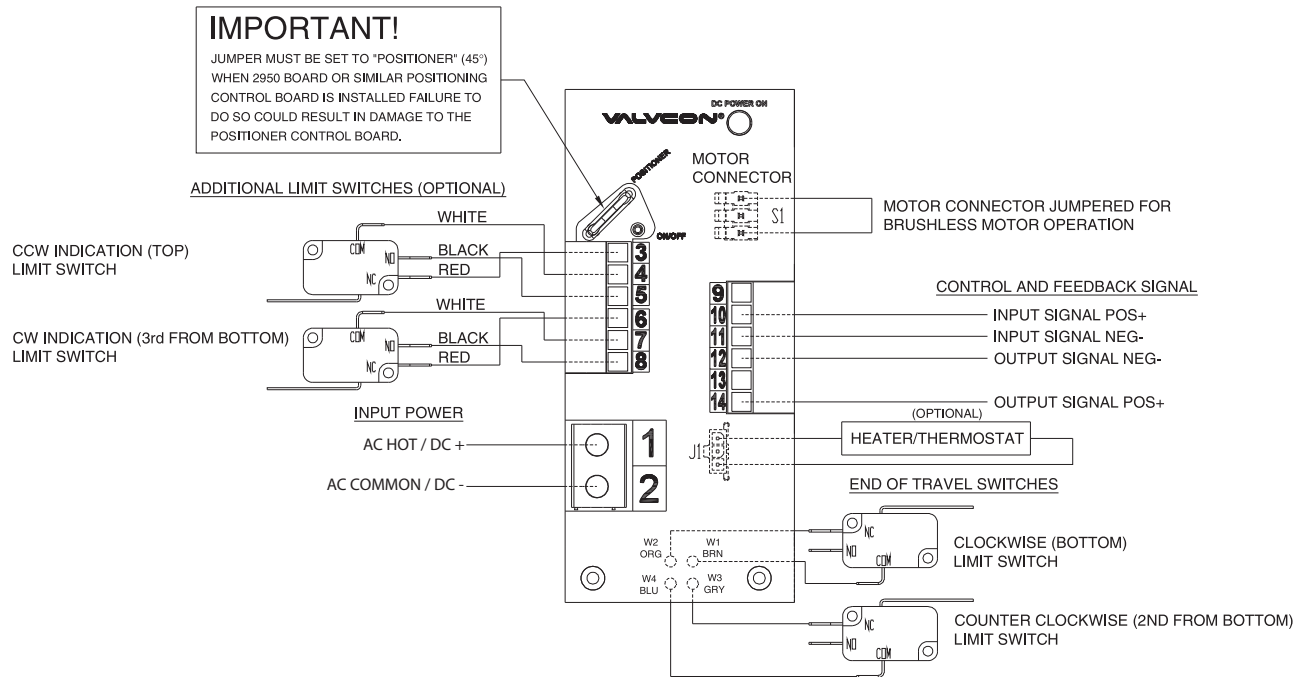


Figure 3

### 2.3 Set Up for Operation

- Remove actuator cover.
- Select **Input Control Signal** type – “mA” or “VDC” (current or voltage), the actuator will accept 4-20 mA or 0-10 VDC. The unit will also accept a split range signal, i.e. 4-12 mA, 12-20 mA or a 2-10 VDC signal. Slide the **[INPUT SIGNAL]** switch up to select **mA** or down to select **VDC**.
- Select **Output Feedback Signal** type – “mA” or “VDC” (current or voltage), the actuator will provide a 4-20 mA or 0-10 VDC feedback signal. Slide the **[FEEDBACK SIGNAL]** switch up to select **mA** or down to select **VDC**.
- Select **Power Loss Mode** – “P” or “B” (**Switch 1**) – Slide the **[P/B]** to the right to select **B** or to the left to select **P**. Selecting **P** will drive the actuator to the selected Power Loss position upon loss of input power and the system will go to “sleep” until input power is restored. If **B** is selected the actuator will continue to respond to changes in input control signal for up to ten cycles; the battery monitoring circuit will drive to the Power Loss position when it detects that the battery should be charged. Upon reaching the Power Loss position the system will go to “sleep” until input power is restored.
- Select **Signal Loss Position** – “MIN” or “LAST” (**Switch 2**) – Slide the **[MIN/LAST]** to the right to select **LAST** or to the left to select **MIN**. Selecting **MIN** will drive the actuator to the minimum input control signal position upon loss of control signal. If **LAST** is selected the actuator will remain in place upon loss of input control signal. If using 0 VDC as the minimum input control signal, the actuator cannot differentiate between a commanded minimum signal or a loss of signal; therefore, **MIN** should be selected.
- Select **Power Loss Position** – “CW” or “CCW” (**Switch 3**) – Slide the **[CW/CCW]** to the right to select **CCW** or to the left to select **CW**. Selecting **CW** will drive the actuator to the clockwise position upon loss of input power. Selecting **CCW** will drive the actuator to the counterclockwise position upon loss of input power.

### 2.3.1 Potentiometer Calibration

Field installation of the Control Board option or replacement of the position tracking potentiometer requires calibration of the position tracking potentiometer prior to setting positions and values for Zero and Span. Control Board options installed at the factory are fully calibrated at the factory and should not require further calibration.

To confirm proper potentiometer calibration:

1. Turn the Mode Selector Dial to **[CAL]** and press **[ENTER]** for 2 seconds.
2. Using the **CW** pushbutton, drive the actuator to the full clockwise position.
  - If the **[CAL]** LED is flashing, potentiometer calibration is required; proceed to step 3 below.
  - If the **[CAL]** LED remains on, calibration is not required; proceed to Setting Zero and Span Positions section below.
3. Loosen the set screw in the larger Nylon gear with a 1/16" hex wrench.
4. Rotate the gear until the LED remains on constantly; hold the gear in place and tighten the set screw. Ensure that the LED remains on after the set screw is tightened. **Note:** The LED assists the user in locating the proper calibration window; it will flash faster as you approach the calibration window and slower as you move away from it.
5. Press the **[ENTER]** button to save the potentiometer setting.

### 2.3.2 Setting Zero and Span Positions

**Setting Zero and Span Positions** - Once calibration has been confirmed, set the desired end of travel positions. **Make certain that the limit switch cams are set to operate the switches beyond the desired range for the Zero and Span positions.** Zero and Span may be set at any position between 0 degrees and 94 degrees of travel. Zero or Span may be either clockwise or counter-clockwise and may be set to either a high value or low value control signal. The Control Board features full reverse acting set up, requiring no wiring changes.

#### Set Zero:

1. Turn the Mode Selector Dial to **[ZERO]** and press **[ENTER]** for 2 seconds. The Zero LED will begin to flash.

2. Drive the actuator to desired minimum signal position using the CW or CCW pushbutton. If the **"STALL"** LED begins to flash; check to see if the limit switch cam is preventing actuator from reaching desired end-of-travel. If necessary back the cam off so that it will trip the switch slightly beyond the desired end-of-travel.
3. Apply input control signal, (i.e. 4 mA).
4. Press the **[ENTER]** button to save the Zero setting.

#### Set Span:

1. Turn the Mode Selector Dial to **[SPAN]** and press **[ENTER]** for 2 seconds. The Span LED will begin to flash.
2. Drive the actuator to desired maximum signal position using the CW or CCW pushbutton. If the **"STALL"** LED begins to flash; check to see if the limit switch cam is preventing actuator from reaching desired end-of-travel. If necessary back the cam off so that it will trip the switch slightly beyond the desired end-of-travel.
3. Apply input control signal, (i.e. 20 mA).
4. Press the **[ENTER]** button to save the Span setting.

#### Verify Zero and Span Settings:

1. Turn the Mode Selector Dial to **[RUN]**.
2. Apply various control signals to verify operation.
3. Replace actuator cover.

**At any point during Set-Up you may exit without changing the stored data, by simply selecting a different operational mode.**

## 3 BATTERY PACK INFORMATION CL2 AND CL3

The optional Battery Pack is capable of supplying sufficient power to ensure operation of the actuator during power outages. The battery voltage of a fully charged battery should read 13.6 volts as measured at the battery connector, (with the battery disconnected). This voltage will vary with temperature; see "Battery Charging Circuit" below.

Replacement battery packs should be stored only after a full charge and at less than 80°F. Temperature can affect battery shelf life. Generally lower temperatures will increase shelf life while higher temperatures will decrease shelf life.

When recharging battery packs, they should only be recharged from the **P/N 2950** Control Board charging circuit, which is calibrated to provide the proper voltage and current for maximum battery pack life.



### 3.1 Battery Charging Circuit

The battery charging voltage has been designed for optimum battery performance. When charging, the yellow **CHARGING** LED will light. After reaching full charge, the green **CHARGED** LED will light. The voltage on the battery terminals, connector "J4," will be between 10.5 and 12 volts, when external power is off, and the battery is connected to the 2950 Control Board. Fully charged, the battery voltage will reach approximately 13.6 volts. This voltage is designed to vary with temperature, and could be as high as 14.4 volts if in a very cold environment, or as low as 12.8 volts if in a very warm environment. This is normal operation.

A battery case that is swollen or cracked must be replaced. Please consult the factory for replacement. If the battery does not reach full charge (the green **CHARGED** LED remaining on and the yellow **CHARGING** LED turning off) within 24hrs, consult the factory or your local representative.

### 3.2 Battery Replacement

The only suggested maintenance is to examine, and if necessary, replace the batteries every two years. Battery life can vary with temperature. Cooler environments will generally prolong battery life and under ideal conditions ADC batteries will last in excess of five years. To change the batteries, perform the following:

#### SMALL ENCLOSURE (150 – 600 in•lb)

1. Remove power to the actuator.
2. Disconnect battery connection at the daughter board.
3. Pry back the battery retaining tab on the battery bracket.
4. Remove the battery.
5. Install new battery.
6. Slide battery into bracket so that the retaining tab secures the battery in place.
7. Plug battery connector into the connector on the back of the **P/N 2870** board, and re-apply power.

#### LARGE ENCLOSURE (1000 – 3000 in•lb)

1. Remove power to the actuator.
2. Unplug the battery wire from the daughter board.
3. Remove battery hold-down bracket.
4. Unplug the wires from the battery tabs.
5. Remove and replace the battery. Re-install the wires on the battery tabs, Black wire to Black terminal and Red wire to Red terminal.

6. Re-install the hold-down bracket.
7. Plug the battery connector into the daughter board, and re-apply power.

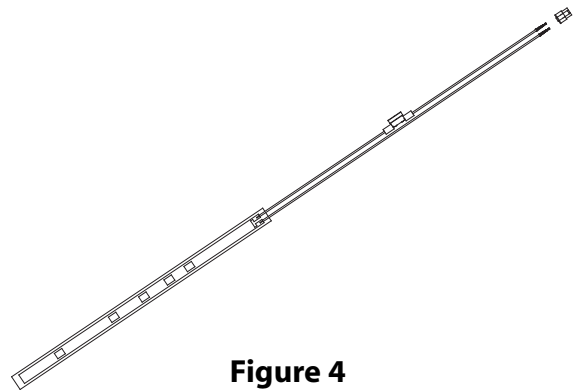
## 4 ADC SERIES STANDARD OPTIONS

All ADC Series options are designed to be easily installed in the field. Options for all standard ADC Series actuators are universal and completely interchangeable with each enclosure size. For additional ADC Series Options, see **(Table 3)**. Voltage is not field changeable.

### 4.1 Option "H" – Tropical Heater and Thermostat P/N 99035, P/N 99036, P/N 99037, P/N 99038

The tropical heater and thermostat option is a self-adhesive, resistant heater strip which is applied to primary gear-box. It installs with a plug-in connector and is recommended in high-humidity applications. The tropical heater option is also recommended installations that experience wide temperature swings in order to evaporate any condensation. Thermostat is pre-set to active at or below 90°F and deactivate at or above 110°F. The tropical heater draws 15 watts @ 115 VAC, 12 VDC and 24V; 40 watts at 230 VAC. This option can be installed in the field; for 115 VAC applications, order kit **P/N 99035**; for 230 VAC applications, order kit **P/N 99036**; for 12 VDC applications, order kit **P/N 99037** and for 24 V applications, order kit **P/N 99038**. (See **Figure 4**)

#### Option "H" Tropical Heater and Thermostat Option "T" Standard Heater and Thermostat



**Figure 4**

### 4.2 Option "I" – ISO 5211 Output

150 – 600 in•lb models are supplied with a 3/4" female square output coupling; when the "I" option is selected they are supplied with a 14 mm female square.

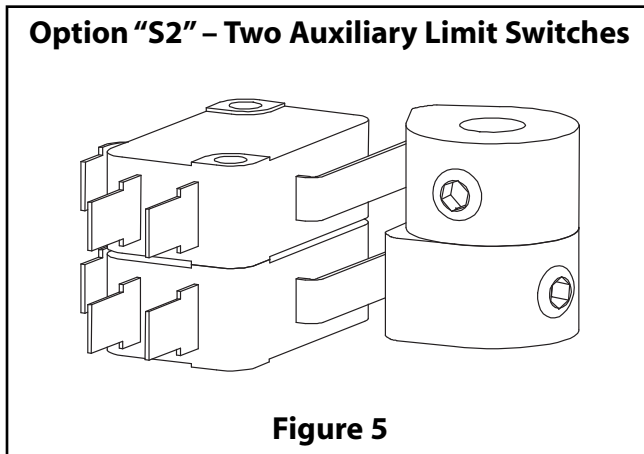
1000 – 3000 in•lb models are supplied with a 1" female square output coupling; when the "I" option is selected, 1000 in•lb models are supplied with a 19 mm female square and 1500 – 3000 in•lb models are supplied with a 22 mm female square.

This option is factory installed only.



### 4.3 Option "S2" – Two Auxiliary Limit Switches P/N 99900

The extra switches and stainless steel cams provide dry contacts and are fully adjustable to trip at any position. They are often used for position indication or to interlock other devices (such as in sequencing operations). The switches are single pole, double throw switches rated for 1/2 HP, 15 amps @250 VAC, CSA certified. Auxiliary switch kit **P/N 99900** is universal to all standard ADC Series actuators. (See Figure 5)



### 4.4 Option "T" – Heater and Thermostat P/N 99015, P/N 99016, P/N 99017, P/N 99018

The heater and thermostat option is a self-adhesive, resistance heater strip which is applied to the primary gearbox. It installs with a plug-in connector and is required in installations where the ambient temperatures drop below 32°F. The heater option is also recommended in installations that experience wide temperature swings in order to evaporate any condensation. The thermostat is pre-set to activate at or below 40°F and deactivate at or above 60°F. The heater draws 15 watt @115 VAC, 12 VDC and 24 V; 40 watts @ 230 VAC. This option can be installed in the field; for 115 VAC order kit **P/N 99015**; for 230 VAC applications, order kit **P/N 99016**; for 12 VDC applications, order kit **P/N 99017** and 24 V applications, order kit **P/N 99018**. (See Figure 4)

### 4.5 OPTION "Z" – Handwheel Override P/N 9097, P/N 9098

Standard ADC Series actuators are supplied with a plugged cover. Note that this not recommended for ADC Series actuators equipped the optional internal battery back-up. If the handwheel override option is selected at the time of order a declutchable shaft and six-inch handwheel are provided for manual positioning. This option can be replaced in the field; for 150 - 600 in·lb models, order kit **P/N 9097** and for 1000 - 3000 in·lb models, order kit **P/N 9098**.

### 4.6 Voltage

115 VAC, 230 VAC, 24 VAC, 12 VDC and 24 VDC. ADC Series actuators are rated for full torque at +/- 10% of the nominal voltage at 50Hz or 60 Hz. ADC Series positioning actuators are rated continuous duty. (**Note:** at 50Hz the cycle time will increase by approximately 20%)

## 5 GENERAL OPERATING INFORMATION

For enclosure specifications and dimensions, see (Tables 1-4 and Figure 7)

### 5.1 NEMA Ratings

Metso Automation manufactures two styles of Valvcon enclosures: the "W" enclosure is weathertight and designed to NEMA 4/4X standards the "WX" enclosure is "explosion-proof" and designed to NEMA 4/4X/7&9 (Class 1, Division 1, Groups C and D, and Class 2, Division 1, Groups E, F and G) standards.

Use extreme care when removing the cover. Scratches or nicks on the flanges may cause the enclosure not to meet NEMA specifications.

### 5.2 Duty Cycle and Motor Protection

ADC Series modulating actuators are equipped with brushless DC motor or can operate continuously; they are rated for 100% duty cycle operation up to 104°F and for a maximum of 30 starts per minute. Higher temperature applications decrease the available duty cycle.

### 5.3 Operating Temperature Limits

ADC Series actuators are designed to operate in ambient environments between 32°F, (0°C) and 130°F, (55°C). If the ambient temperature may drop below 32°F, (0°C), the heater and thermostat option must be installed. The actuator is rated to operate at -40°F, (-40°C) with the heater and thermostat option installed. In outdoor applications where ambient temperatures exceed 80°F, (27°C), actuators should be shielded from direct sunlight. In applications with high media temperatures, insulating blankets, heat shields and/or extended mounting shafts should be used to keep temperatures within normal operating limits.

Heaters and thermostats are required for all outdoor applications and may also be used to dry condensation in high humidity environments.

## 5.4 Actuator Mounting

The actuator may be mounted in any position including upside-down. It must be firmly secured to a direct mount flange or sturdy mounting bracket. A minimum of four bolts with lock washers should be used to secure the actuator to the bracket. Flexibility in the bracket is not allowed, and backlash, or "play", in the coupling should be minimized. The actuator output shaft must be in line (centered) with the valve shaft to avoid side-loading the shaft. See **(Figure 7)** for output drive dimensions and mounting hardware specifications.

## 5.5 Lubrication

All rotating power train components are permanently lubricated with multi-purpose Lithium grease suitable for the operating temperature range of the actuator. Additional lubrication is not required in normal operation.

## 5.6 Problem Prevention

Most actuator problems result from improper installation.

- **Incorrect Wiring and Set Up** Make certain the actuator is wired correctly and travel stops are properly set before power is applied.
- **Potentiometer Calibration** Confirm potentiometer calibration setting during installation. **(See Section 2.3.1)** for calibration details.
- **Coupling, Alignment, and Mounting** Do not add extra torque! Make certain that the mounting arrangement is sturdy, centered, properly aligned, and that all mounting hardware is secure and properly tightened.
- **Moisture** Replace the cover tightly and make certain conduit entry holes are sealed properly to prevent moisture infiltration.
- **Temperature** Excessive temperatures affect duty cycle, actuator performance and the condition of the internal battery. ADC Series actuators with the "CL2" or "CL3" option installed are designed to operate in environments below 130°F. In applications with high media temperatures, insulating blankets, heat shields, extended mounting shafts or off-set mounting may be used to maintain ambient temperatures at the actuator within normal operating limits.

## 5.7 Warranty

All ADC Series actuators are backed by a 2 year warranty that covers materials and workmanship.

## 5.8 Technical Assistance, Replacement Parts, Options and Repairs

All replacement parts, plug-in options, accessories, and repair services for ADC Series actuators are available through a network of qualified Metso Automation Stocking Representatives. For further technical information or to locate the Metso Automation Stocking Representative closest to you, contact [www.valvcon.com](http://www.valvcon.com).

## 6 SPECIFICATIONS & TECHNICAL INFORMATION

Torque (in-lbs)	Duty Cycle	12VDC		24VDC		24VAC		115VAC		230VAC	
		Cycle Time (sec/90°)	Current Draw (Amps)	Cycle Time (sec/90°)	Current Draw (Amps)	Cycle Time (sec/90°)	Current Draw (Amps)	Cycle Time (sec/90°)	Current Draw (Amps)	Cycle Time (sec/90°)	Current Draw (Amps)
150	100%	11	2.2	13	1.2	8	1.8	9	0.4	9	0.4
300	100%	17	2.5	13	1.4	12	2.1	13	0.5	13	0.4
600	100%	17	2.8	13	1.7	13	2.5	14	0.6	14	0.5
1000	100%	21	4	14	2.4	15	3.5	15	0.9	15	0.6
1500	100%	40	4	24	2.4	27	3.5	29	0.9	29	0.6
2000	100%	40	4.3	33	2.4	28	3.5	29	0.9	29	0.6
2500	100%	55	3.3	40	2	38	3.1	39	0.8	39	0.6
3000	100%	60	3.7	42	2.2	40	3.5	42	0.8	43	0.6

<b>Temperature Range</b>	32°F to 130°F (0°C to 55°C) (without heater and thermostat) -40°F to 130°F (-40°C to 55°C) (with heater and thermostat)
<b>Conduit Connections</b>	(2) 3/4" NPT all sizes (3/4" to 1/2" reducing bushings included)
<b>Output</b>	150 to 600 in•lb: ISO 5211 F05 and F07 bolt circles, 3/4" inch female square (14 mm w/"I" Option) 1000 in•lb and above: ISO 5211 F07 and F10 bolt circles, with 1" inch female square (19 mm 1000 in•lb, 22 mm 1500-3000 in•lb w/"I" Option)
<b>Voltage</b>	12 VDC: 10.8 to 13.2 VAC 24 VDC: 21.6 to 26.4 VDC 24 VAC: 21.6 to 26.4 VAC, 50 or 60 Hz 115 VAC: 103.5 to 126.5 VAC, 50 or 60 Hz 230 VAC: 207 to 253 VAC, 50 or 60 Hz
<b>Limit Switches</b>	<b>(2) Single pole, double throw switches rated for 1/2 HP, 15 amps @ 250 VAC, CSA certified.</b>
<b>Motor</b>	Brushless DC motor with Class B or better insulation; sub-fractional horsepower
<b>Lubrication</b>	Permanently lubricated gear train and bearings
<b>Gear Train</b>	Hardened steel, machine cut spur gears
<b>Approximate Weight</b>	17 lbs for sizes up to 600 in•lb (ADC models) 31 lbs for sizes 1000 in•lb and above (LADC models)
<b>Enclosure</b>	Die cast aluminum

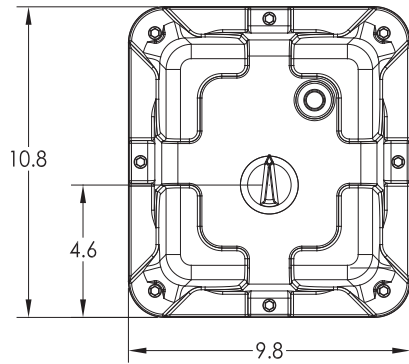
## 6.1 ANALOG CONTROL (POSITIONING) - CONTROL BOARD OPTION

**Table 3 - Control Board Specifications**

<b>Input Impedance</b>	Voltage Input: 35K ohms Current Input: 200 ohms
<b>Control Signal</b>	May be either 4-20mA or 0-10VDC (selectable via on-board slide switch) Fully compatible with ISA-S50.1 as a type 4, class L, power isolated device. Input minus (-) and transmit minus (-) are tied together and isolated from power and earth ground.
<b>Position Out Signal</b>	May be either 4-20mA or 0-10VDC (selectable via on-board slide switch) Minimum resistive load for voltage output: 1K ohm Maximum resistive load for current output: 500 ohm
<b>Stall Protection</b>	If the actuator cannot achieve the position commanded by the control signal, this feature will remove all power to the motor after 5 seconds. The actuator will not restore power to the motor until the control signal commands the actuator to drive in the opposite direction.
<b>Power Loss Position</b>	In the event of a loss of main power, user can choose either the Zero position or the Span position, via slide switch, as the power loss "Park" position.
<b>Power Fail Park or Battery Cycle</b>	In the event of a loss of main power, user can choose either to drive the actuator immediately to the "Park" Power Loss Position or continue to cycle (if control signal is available) until battery level is detected before driving to the "Park" position.
<b>Control Fail Position</b>	In the event of a loss of control signal (with power still supplied), user can choose either the Zero position or the Last position via slide switch NOTE: <u>If</u> the minimum control signal = 0, the fail position <u>must</u> be Last
<b>Position Potentiometer</b>	360° Rotation, 0 ohms to 1k ohms.
<b>Local Supervisory Control</b>	User can select manual (MAN) to override control signal and drive actuator by pushing the CW or CCW buttons. Actuator may be manually positioned to any location between the existing Zero and Span settings. For additional range, reset the ZERO and Span locations.
<b>Split Range Control</b>	Actuator will accept split range control signal (i.e. 4-12mA or 12-20mA; 0-5V or 5-10V) with no wiring changes.
<b>Reverse Acting</b>	With no wiring changes required, the actuator may be calibrated to drive clockwise upon an increasing control signal, and counter-clockwise upon a decreasing signal.
<b>Dead Band</b>	The amount of change in control signal that the actuator will ignore before the output shaft begins to move. Adjustable from 1% to 3%.

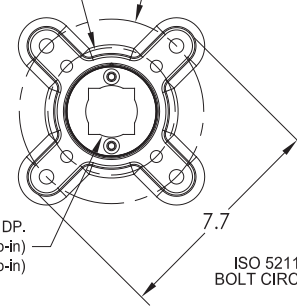
### 6.2 DIMENSIONS

#### MOUNTING FLANGE, ISO 5211 F10/F07



4 X M8 - 1.25  $\nabla$  0.75" MIN.  
ON  $\varnothing$  2.76" B.C.

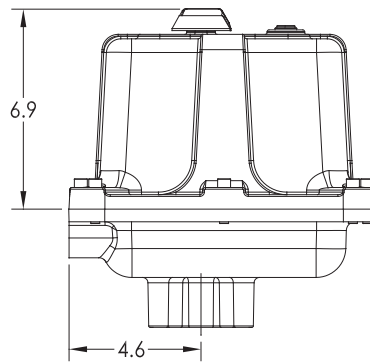
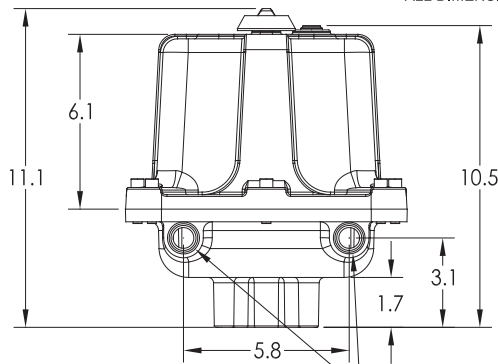
4 X M10 - 1.5  $\nabla$  0.75" MIN.  
ON  $\varnothing$  4.02" B.C.



1.00 SQU. (STANDARD)  $\nabla$  1.20 DP.  
0.748 SQU. (19mm; I OPTION, 1000 lb-in)  
0.866 SQU. (22mm; I OPTION, 1500-3000 lb-in)

ISO 5211 F07 AND F10  
BOLT CIRCLES STANDARD

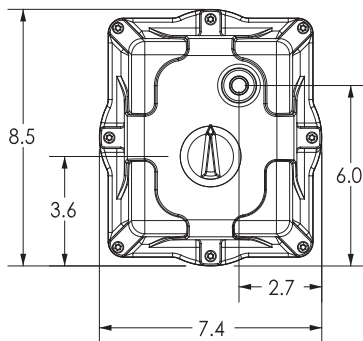
ALL DIMENSIONS IN INCHES



3/4 NPT STANDARD  
1/2 NPT WITH BUSHING

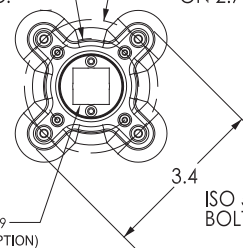
102500

#### MOUNTING FLANGE, ISO 5211 F 07/F 05



4 X M6-1.0  $\nabla$  0.75" MIN.  
ON  $\varnothing$  2.0" B.C.

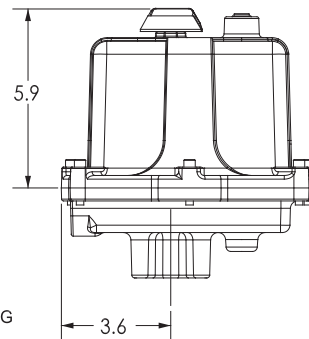
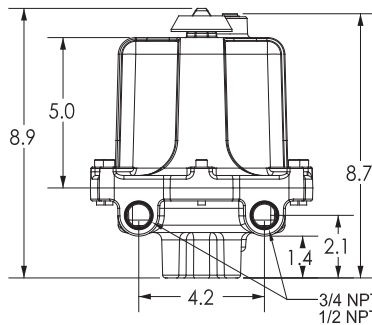
4 X M8-1.0  $\nabla$  0.75" MIN.  
ON 2.76" B.C.



0.75 SQU. (STANDARD)  $\nabla$  0.9  
0.551 SQU. (14mm; WITH I OPTION)

ISO 5211 F05 AND F07  
BOLT CIRCLES STANDARD

ALL DIMENSIONS IN INCHES



3/4 NPT STANDARD  
1/2 NPT WITH BUSHING

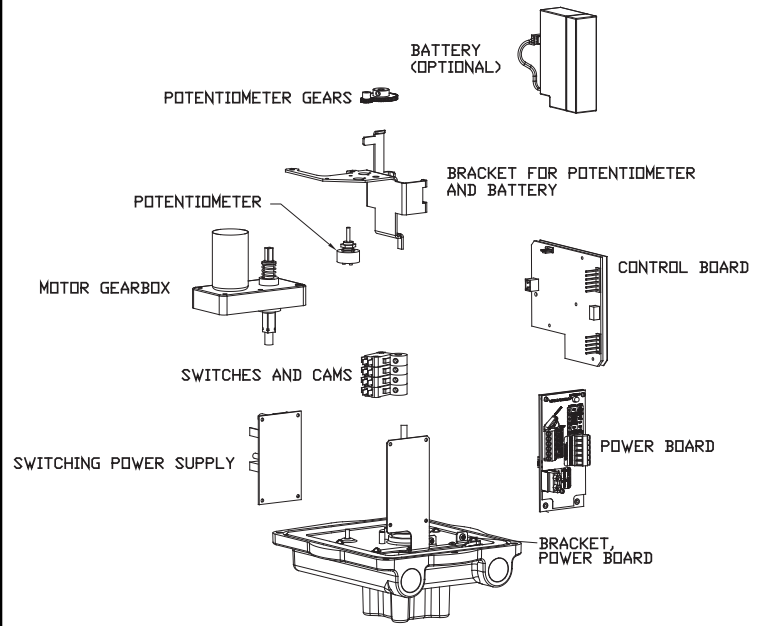
102653

Figure 6

### 6.3 EXPLODED VIEW

## ADC SERIES SPARE PARTS

PART	DESCRIPTION
	<b>Cover with Position Indicator (not shown)</b>
9304	ADC - Small enclosure (150 - 600 in•lb)
9307	LADC - Large enclosure (1000 - 3000 in•lb)
	<b>Cover Screw (8 required)</b>
91340	ADC - Small NEMA 4/4X enclosure (150 -600 in•lb)
91336	ADC Small NEMA 4/4X/7/9 enclosure (150-600 in•lb)
91564	LADC Large enclosure (1000 - 3000 in•lb)
	<b>Motor Gearbox</b>
6229	ADC 150 - 600 in•lb
6144	LADC 1000 - 2000 in•lb
6230	LADC 2500 - 3000 in•lb
	<b>Potentiometer and Switches</b>
92067	Potentiometer with Gears (90° Operation)
99900	Two Auxiliary Switch Kit w/Cams
1020	Limit Switch - Replacement
	<b>Brackets with Hardware</b>
92665	Bracket, Power Board ADC (150-600 in•lb)
92670	Bracket, Power Board LADC (1000-3000 in•lb)
92450	Bracket, Battery & Potentiometer ADC
92445	Bracket, Potentiometer LADC
91760	Bracket, Battery LADC
	<b>Power Board Kit Includes Switching Power Supply or Isolator Board (decided by voltage)</b>
92361	ADC 115/230 VAC
92362	LADC 115/230 VAC
92363	ADC/LADC 12/24 VDC
92364	ADC/LADC 24 VAC
	<b>Tropical Heater and Thermostat Kits</b>
99035	Tropical Heater Thermostat 115 VAC
99036	Tropical Heater Thermostat 230 VAC
99037	Tropical Heater Thermostat 12 VDC
99038	Tropical Heater Thermostat 24 VAC or 24 VDC
	<b>Heater and Thermostat Kits</b>
99015	Heater Thermostat 115 VAC
99016	Heater Thermostat 230 VAC
99017	Heater Thermostat 12 VDC
99018	Heater Thermostat 24 VAC or 24 VDC



Control Board Kits	
99060	ADC Control Board Kit with Battery Back-Up
99065	LADC Control Board Kit with Battery Back-Up
99070	ADC Control Board Kit (without Battery Back-Up)
99075	LADC Control Board Kit (without Battery Back-Up)
Replacement Battery	
1573	ADC Battery
2509	LADC Battery

NOTES:

Brake – Holding Brake Is Standard On all ADC/LADC Series Actuators.

Manual Override Is Not A Standard Feature On ADC/LADC Series Actuators.

Figure 7

## 7 ENCLOSURE

- **Enclosure “W”** (weathertight) is designed to meet specifications for NEMA 4/4X for weathertight and dusttight, environments. It is intended for non-hazardous locations in indoor or outdoor use and provides a degree of protection against corrosion, wind-blown dust and rain, splashing water, hose-directed water, and damage from external ice formation. It is not designed to be submersible.
- **Enclosure “WX”** (explosionproof & weathertight) is designed to meet specifications for NEMA 7&9, explosionproof environments as well as to meet NEMA 4/4X specifications. Explosionproof means that an internal explosion will be contained, with no sparking that could ignite external atmospheric gases. The enclosure is rated for the following environments:

NEMA Class I, Division 1, Group C (Ehtyl-ether vapors, ethylene or cyclopropane)

NEMA Class I, Division 1, Group D (Gasoline, hexane, naptha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, solvent, vapors or natural gas)

NEMA Class II, Division 1, Group E (Metal dust, including aluminum, magnesium, their commercial alloys, and other metals of similarly hazardous characteristics)

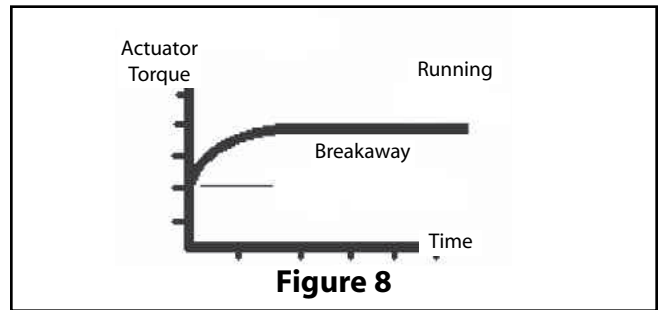
NEMA Class II, Division 1, Group F (Carbon black, coal or coke dust)

NEMA Class II, Division 1, Group G (Flour, starch or grain dust)

NEMA Class III

**(For enclosure specifications and dimensions see Table 2 and Figure 6).**

- **Torque = Breakaway Torque** Valvcon actuators are rated at breakaway torque; the amount of torque the actuator will provide from a fully loaded stop upon immediate power-up. With running momentum and inertia, the amount of torque supplied by the actuator at full speed (running torque) or upon entering a stall condition (stall torque) always exceeds the minimum rated breakaway torque. Since valves require most torque at breakaway, only breakaway torque should be considered when sizing actuators.





## 8 ADDITIONAL ACTUATOR PRODUCTS AND ACCESSORIES FROM VALVCON

### ❖ V Series

- Up to 3000 inch pounds for On/Off, Modulating or Automatic Cycling applications
- 75% Duty Cycle
- 115VAC and 230VAC voltages
- NEMA 4/4X and NEMA 4/4X/7&9 enclosures
- CSA Certified (Canadian & U.S. Standards)
- Options include Modulating Control Board, Speed Control/TimerBoard, ISO Readback Board, extra limit switches, heater/thermostats, motor brake, feedback potentiometer and handwheel override

### ❖ "LC" Series

- Up to 600 inch pounds
- 25% duty cycle
- NEMA 4/4X enclosures
- 115VAC, 230VAC, 24VAC, 12 VDC and 24VDC voltages
- Options include extra limit switches and heater/thermostats
- Male output (standard) or female output (optional)

### ❖ "I" Series Network Capable

- Modbus®
- AS-interface
- DeviceNet™
- LonWorks®
- Foundation Fieldbus
- Other fieldbus protocols (consult factory)

### ❖ "Q6" Series for Remote Solar Applications

- 600 inch pounds
- 12VDC
- Low current draw

Subject to change without prior notice.

#### Metso Automation, Flow Control

Europe, Levytie 6, P.O.Box 310, 00811 Helsinki, Finland. Tel. int. +358 20 483 150. Fax int. +358 20 483 151

North America, 28 Bowditch Drive, P.O.Box 8044, Shrewsbury, Massachusetts, 01545-8044 USA. Tel. int. +1 508 595 5083. Fax int. +1 508 595 5183

[www.valvcon.com](http://www.valvcon.com)

