

Valvcon™

I-series I6600 option "DN"

DeviceNet protocol

Installation, maintenance and
operating instructions

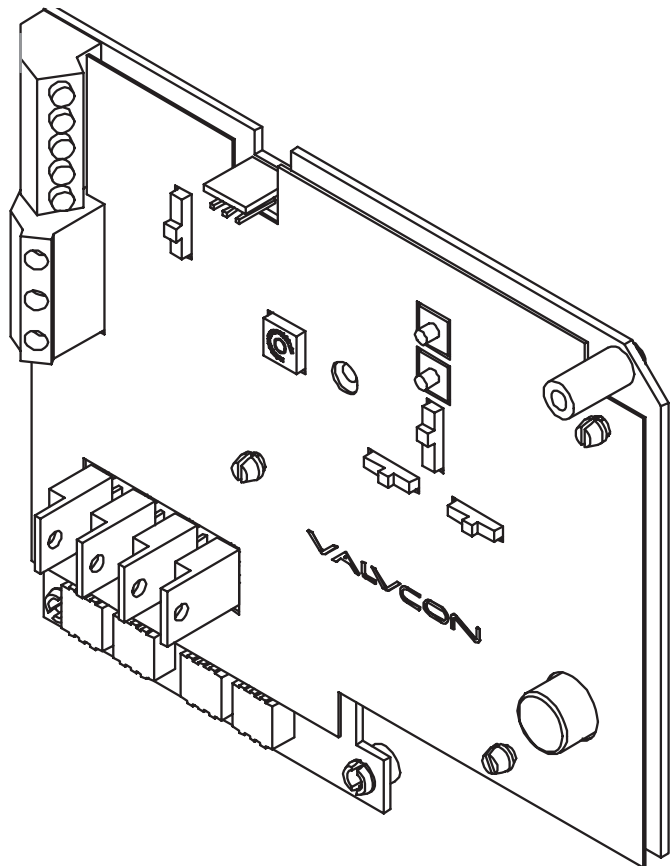


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READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.

If you require additional assistance, please contact the manufacturer or manufacturer's representative.

SAVE THESE INSTRUCTIONS!

Addresses and phone numbers are printed on the back cover.

1. GENERAL

This instruction manual contains important information regarding the installation, maintenance and troubleshooting of I-Series I6600 Option "DN" DeviceNet Protocol. Please read these instructions carefully and save them for future reference.

1.1 DESCRIPTION

The I-Series Option "DN" is an option for 115/230 VAC actuators that provides digital control via DeviceNet Protocol. Communications data (DeviceNet Signal) is carried over two wires; a second pair of wires carries signal power (24 VDC). Each actuator has its own address on the network, and can be operated as a discrete (on/off) or positioning device.

The DeviceNet option consists of two components, which can be added to Valvcon's standard electric actuators. The first component is the Network Interface Board, which is a printed circuit board that plugs into the standard motor board. The second component is the DeviceNet I/O Module, which is wired to the Network Interface Board. Line power (115/230 VAC) is connected to the motor board. Both the DeviceNet signal (CAN-L, CAN-H) and the DeviceNet signal power (24 VDC) are connected to the DeviceNet I/O module.

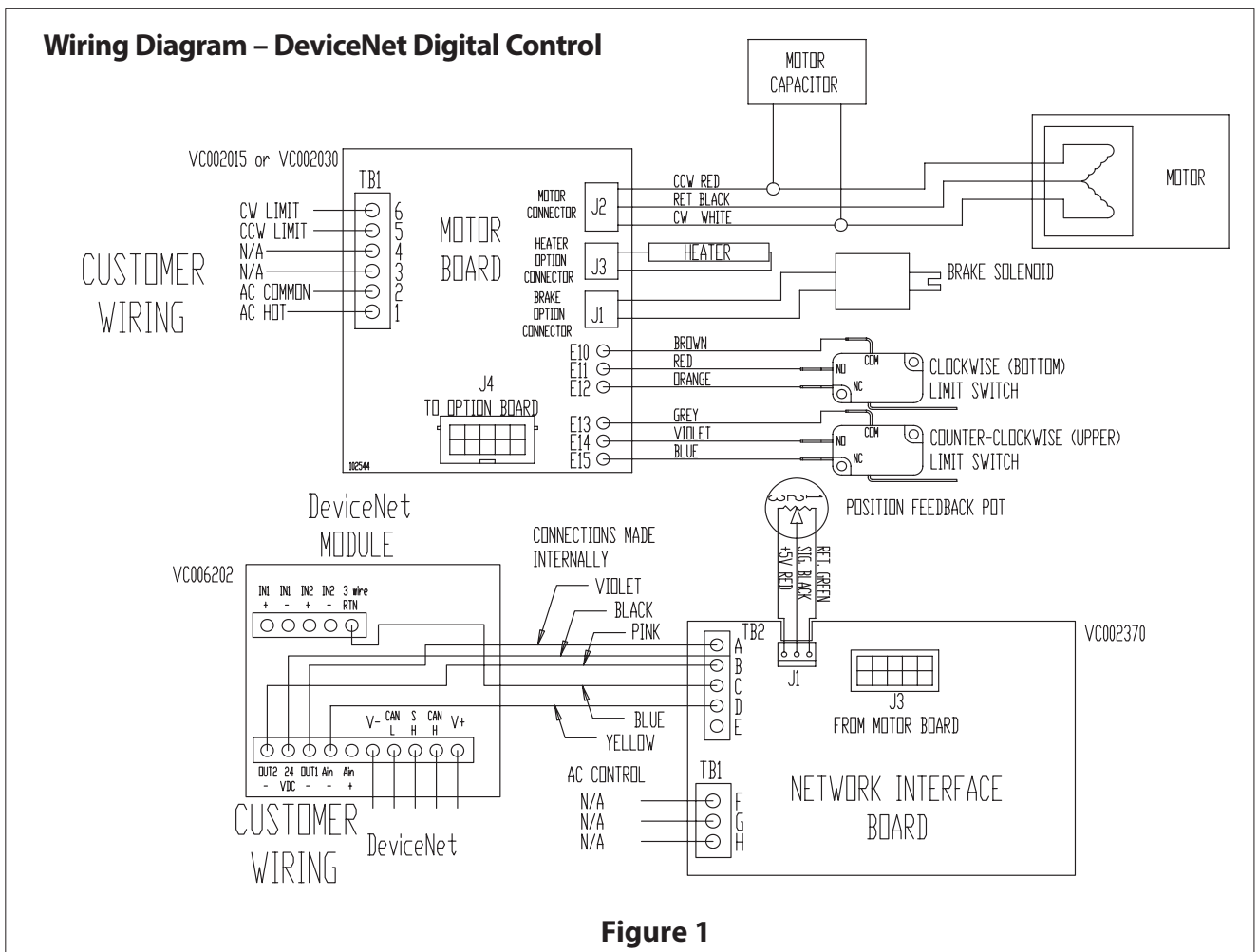
1.2 DEVICENET PROVISIONS

- Supervisory control via a mode selector switch and on-board clockwise (CW) and counter-clockwise (CCW) push buttons. The supervisory control mode overrides a remote signal for simple and uninterrupted system set-up.
- DeviceNet input signal status indication via red and green LEDs on the DeviceNet module.

1.3 OPERATION FOR APPLICATIONS WITH DEVICENET PROTOCOL

SET UP FOR OPERATION

Two limit switches operated by the cams on the output shaft determine the exact positions where the actuator will stop at each end of travel. The bottom limit switch determines the clockwise stop position. The next limit switch up from the bottom determines the counter-clockwise stop position. The end of travel limit switches can be adjusted to provide from 5 to 320 degrees of actuator rotation.



The two standard limit switches may be used to indicate the open and closed status of the actuator. Terminals 5 (counter-clockwise) and 6 (clockwise) provide the position indication at line voltage. If dry contacts or intermediate position indication are needed, additional limit switches and cams may be installed in the actuator. When additional limit switches are installed, they can be set in any position and are wired to a separate terminal block provided with the option. See (Section 2), **I-Series Standard Options**.

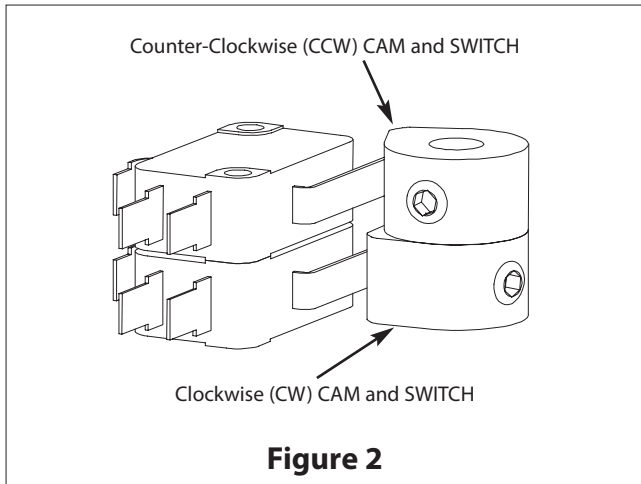


Figure 2

SETTING ACTUATOR STOP POSITIONS

Note: To gain more access to cams, move the capacitor and terminal strip, if installed.

1. Loosen the set screw in the cam using a 1/16" hex wrench. Clockwise for the bottom cam and counter-clockwise for the next cam up from the bottom cam as indicated in (Figure 2).
2. Move the actuator to the desired STOP position
3. Apply DeviceNet signal to drive [CCW] or [CW] to desired position (see Figure 1) or use the manual override.
4. Remove the power and rotate cam in the direction of travel to the exact point the switch "clicks" closed.
5. Tighten the set screw.
6. Repeat this procedure to set the opposite end of the travel limit.

POSITION READBACK

The Network Interface Board provides a 4-20 mA analog signal to the DeviceNet module for position indication. This function has been factory wired and set. If calibration is necessary:

1. Calibrate the Zero position (4 mA) by selecting the "Man" mode and use the on-board CW push button to drive to the full clockwise position. Using the 1/16" Allen wrench provided, loosen the setscrew on the larger, white nylon gear. Adjust that gear until the "Zero Calibration" LED turns on. Tighten the setscrew.
2. Calibrate the Span position by using the on-board CCW push button to drive to the full counter-clockwise position. Adjust the "Set Span" potentiometer until you read the desired Span signal (20 mA). Return the selector switch to the "Run" mode.

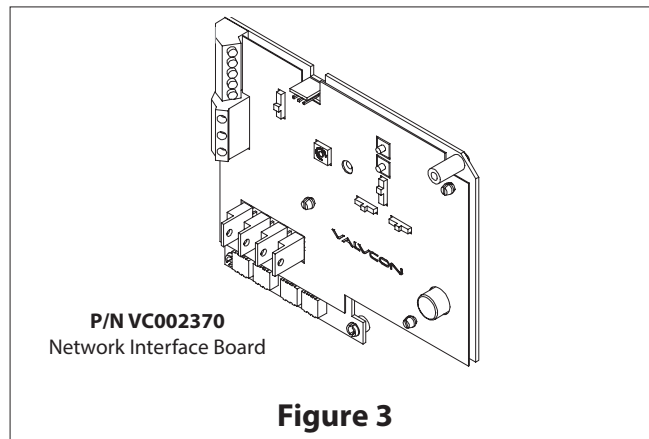


Figure 3

2. I-SERIES STANDARD OPTIONS

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

2.1 OPTION "H" – TROPICAL HEATER AND THERMOSTAT P/N VC099716, VC099723

The tropical 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 recommended in high-humidity applications. The tropical heater option is also recommended in installations that experience wide temperature swings in order to evaporate any condensation. Thermostat is pre-set to activate at or below 90°F and deactivate at or above 110°F. The tropical heater draws 15 watts @ 115 VAC; 40 watts @ 230 VAC.

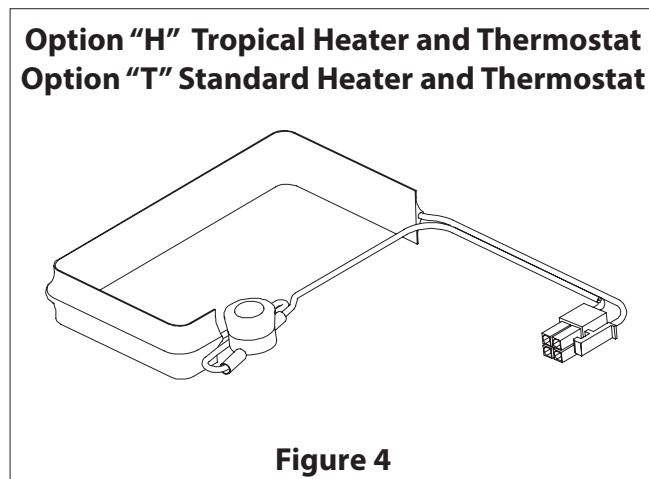


Figure 4

This option can be installed in the field; for 115 VAC applications, order kit **P/N VC099716** and for 230 VAC applications order kit **P/N VC099723**.

2.2 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.

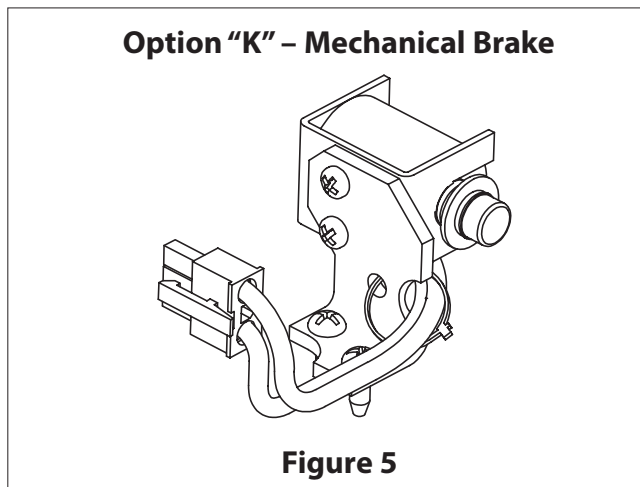
1000 – 3000 in•lb models are supplied with a 1" female square output coupling; when the “I” option is selected, 1000 in•lb models are supplied with a 19 mm female square and 1500 – 3000 in•lb models are supplied with a 22 mm female square.

This option is factory installed only.

2.3 OPTION “K” – MECHANICAL BRAKE P/N VC099715

The highly efficient hardened steel spur gear system requires that the brake option be installed on all butterfly valve and damper applications. It is also recommended on PVC ball valves and resilient seated valves. The brake will hold the valve in position against a force as great as the torque rating of the actuator. The brake option draws 4 watts and is universal to all standard I-Series actuators.

It is simple to install with a plug-in connector and two philips head mounting screws. No additional brackets are required. This option can be installed in the field; order kit **P/N VC099715**.



2.4 OPTION “S2” – TWO AUXILIARY NETWORK LIMIT SWITCHES P/N VC099400

The extra switches and stainless steel cams provide dry contacts and are fully adjustable to trip at any position. The switches connect to the Network Module to provide position feedback to the network. The switches are single pole, double throw switches rated for 0.1 amps @ 125 VAC with gold alloy contacts, CSA certified. Auxiliary Network switch kit **P/N VC099400**. This option can be installed in the field; order kit **P/N VC099400**.

Option “S2” – Two Auxiliary Limit Switches

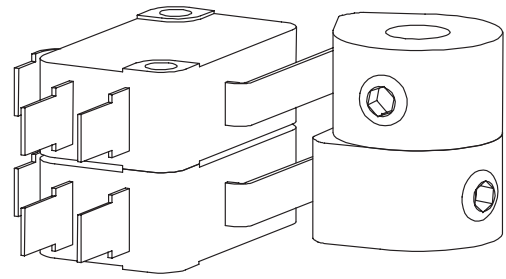


Figure 6

2.5 OPTION “T” – HEATER AND THERMOSTAT P/N VC099515, P/N VC099523

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. Thermostat is pre-set to activate at or below 40°F and deactivate at or above 60°F. The heater draws 15 watts @ 115 VAC; 40 watts @ 230 VAC. This option can be installed in the field; for 115 VAC applications, order kit **P/N VC099515** and for 230 VAC applications order kit **P/N VC099523**. (see **Figure 4**)

2.6 OPTION “Y” - KEYED OUTPUT

150 – 600 in-lb actuators are supplied with a 3/4" female square output coupling; when the “Y” option is selected they are supplied with a 15mm female keyed output.

1000 – 3000 in-lb models are supplied with a 1" female square output coupling; when the “Y” option is selected they are supplied with a 20mm female keyed output.

This option is factory installed only.

2.7 OPTION “Z” – HANDWHEEL OVERRIDE P/N VC009097, P/N VC009098

All I-Series actuators are supplied with a wrench-operated manual override shaft. If the Handwheel Override option is selected the shaft is replaced by a declutchable shaft and a six-inch handwheel.

This option can also be installed in the field; for 150 – 600 in•lb models order kit **P/N VC009097** and for 1000 – 3000 in•lb models order kit **P/N VC009098**.

2.8 VOLTAGE

115 VAC or 230 VAC. I-Series actuators are rated for full torque at +/- 10% of the nominal voltage at 50 Hz or 60 Hz. At 50 Hz operation, the duty cycle decreases proportionally and the cycle time increase. I-Series actuators are rated for a minimum of 75%* duty cycle @ 60 Hz @ 104°F. They provide a 75% duty cycle and are rated for 50 Hz or 60 Hz as a standard feature.

* 55% duty cycle for 3000 in•lb actuators.

3. GENERAL OPERATING INFORMATION

For enclosure specifications and dimensions, see (Tables 1-2 and Figure 6)

3.1 NEMA RATINGS AND CSA CERTIFICATION

Neles manufactures two styles of I-Series actuator 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, Class 2, Division 1, Groups E, F and G and Class 3) standards.

Actuators are certified by CSA to meet Canadian and U.S. standards for applications in both Hazardous and Non-Hazardous locations. The "WX" option must be specified at the time of ordering and can only be installed at the factory. Ensure that the actuator's ratings are appropriate for the application environment prior to installation. Use extreme care when removing the cover. Scratches or nicks on the flanges may cause the enclosure not to meet NEMA or CSA specifications.

3.2 WIRING

Neles AC voltage actuators use reversing induction motors which cause high voltages **Devices connected to terminal 3 and to terminal 4 must be rated for minimum 250 VAC (440 VAC for 230 VAC applications)**. Controllers with solid state outputs must be rated for more than 250 VAC. We strongly recommend that relay outputs be used on connected devices. Due to the induction feedback voltage, multiple actuators can not be wired in parallel. Separate (isolated contacts) must be provided for each actuator. If the actuator is driven by contacts on a PC or PLC, make sure the contacts have the proper ratings.

3.3 DUTY CYCLE AND MOTOR PROTECTION

I-Series actuators can operate continuously for up to 15 minutes at 104°F. After 15 minutes of continuous operation they are rated for 75% duty cycle operation at 104°F and for 30 starts per minute. Duty cycles decrease at temperatures in excess of 104°F. Duty cycle is the maximum proportion of "on" time and the minimum required "off" time to prevent thermal overloading. Actuators with cycle times of 30 seconds must rest at least 10 seconds between cycles. Higher temperature applications decrease duty cycle.

Metso's AC motors contain thermal overload protection. Exceeding the rated duty cycle may cause the thermal overload switch to temporarily remove power to the motor and cause it to stall. After the motor cools, the actuator will resume normal operation. The thermal protector is a safety device, designed for infrequent use. Constant tripping of the thermal overload protector may cause premature motor failure.

3.4 OPERATING TEMPERATURE LIMITS

I-Series actuators are designed to operate in ambient environments between 32°F and 150°F. If the ambient temperature may drop below 32°F, the heater and thermostat option must be installed. The actuator is rated to operate at -40°F with the heater and thermostat option installed. In outdoor applications where ambient temperatures exceed 80°F, 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 maintain ambient temperatures at the actuator 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.

3.5 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.

3.6 MANUAL OVERRIDE

To use the manual override, push the override shaft down approximately 1/4 inch to disengage the motor from the gear train. Failure to disengage motor prior to turning override will cause damage to the actuator. While holding the shaft down, turn the shaft with a wrench or handle to the desired position. The override shaft on actuators below 1000 in•lb must be rotated in the opposite direction of the desired direction of the output shaft. In actuators 1000 in•lb and above, the override and the output shaft turn in the same direction.

Do not drive the actuator beyond the limit switch settings; it is possible to damage installed options such as a feedback potentiometer. The manual override shaft must be returned to its fully upward position before the motor is re-engaged. Rotate the shaft slightly to align the spur gears until the shaft "springs" back to its re-engaged position. **Note:** The rotation direction of the output may not be the same as the rotation of the override shaft!

3.7 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.

3.8 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.

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.

3.9 WARRANTY

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

3.10 TECHNICAL ASSISTANCE, REPLACEMENT PARTS, OPTIONS AND REPAIRS

All replacement parts, plug-in options, accessories, and repair services for I-Series actuators are available through a network of qualified Neles Stocking Representatives. For further technical information or to locate the Neles Stocking Representative closest to you, contact www.neles.com/valvcon.

4. SPECIFICATIONS & TECHNICAL INFORMATION

Table 1 - Torque & VA Ratings

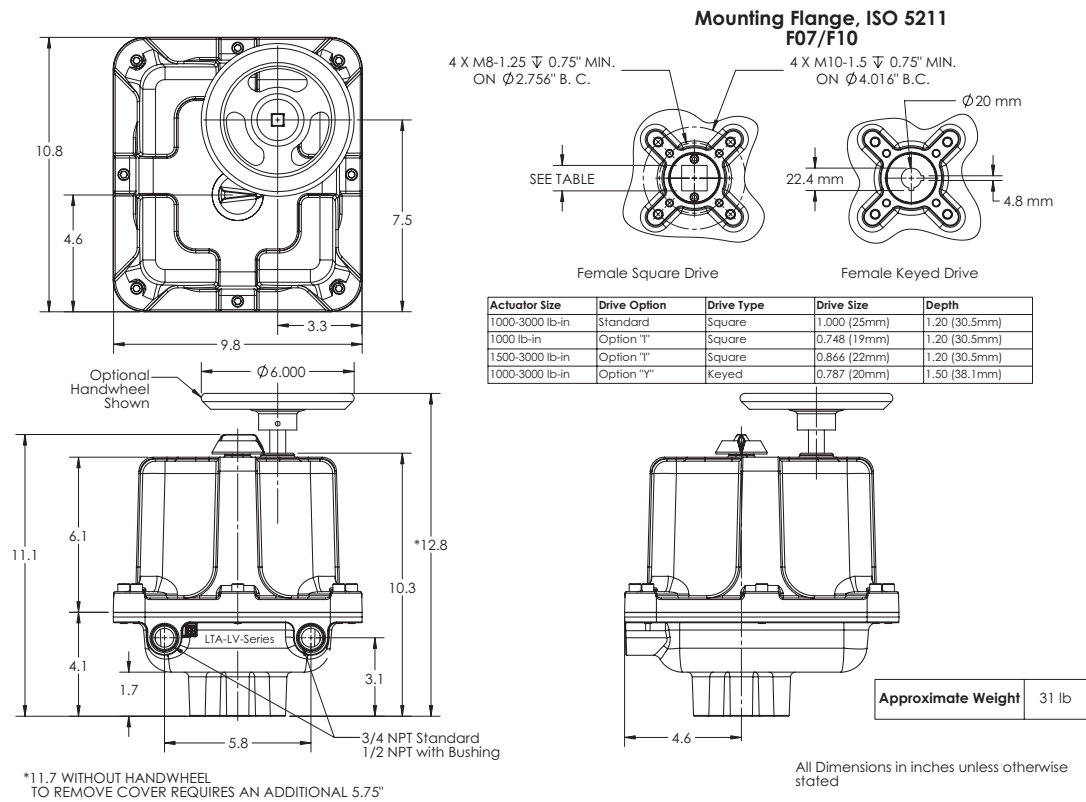
Torque @ breakaway	Speed (seconds per 90° rotation)	Duty Cycle	VA Rating		Max Running Current at Full Load (True MS)		Max Effective Peak Inrush Current (= .66 x) Peak rush	
			115 VAC	230 VAC	115 VAC	230 VAC	115 VAC	230 VAC
150 in•lb	8	75%	70 vA	115 vA	.6 amps	.5 amps	1.25 amps	.942 amps
300 in•lb	15	75%	70 vA	115 vA	.6 amps	.5 amps	1.25 amps	.942 amps
600 in•lb	30	75%	70 vA	115 vA	.6 amps	.5 amps	1.25 amps	.942 amps
1000 in•lb	25	75%	92 vA	161 vA	.8 amps	.7 amps	1.66 amps	1.29 amps
1500 in•lb	40	75%	92 vA	161 vA	.8 amps	.7 amps	1.66 amps	1.29 amps
2000 in•lb	55	75%	92 vA	161 vA	.8 amps	.7 amps	1.66 amps	1.29 amps
2500 in•lb	70	75%	92 vA	161 vA	.8 amps	.7 amps	1.66 amps	1.29 amps
3000 in•lb	75	55%	92 vA	161 vA	.8 amps	.7 amps	1.66 amps	1.29 amps

Table 2 - Specifications

Temperature Range	32°F to 150°F (without heater and thermostat) -40°F to 150°F (with heater and thermostat)
Conduit Connections	(2) 3/4" NPT in sizes up to 600 in•lb (3/4" to 1/2" reducing bushings included) (2) 3/4" NPT in sizes 1000 in•lb and above (3/4" to 1/2" reducing bushings included)
Output	150 to 600 in-lbs: ISO 5211 F05 and F07 bolt circles, 3/4" female square (14mm female square w/ "I" Option; 15mm female keyed output w/ "Y" Option). 1000 to 3000 in-lbs: ISO 5211 F07 and F10 bolt circles, 1" female square (1000 in-lbs: 19mm female square w/ "I" Option; 1500 - 3000 in-lbs: 22mm female square w/ "I" Option; 1000 to 3000 in-lbs: 20mm female keyed output w/ "Y" Option)
Duty Cycle	The actuator may run continuously at temperatures below 104° F for up to 15 minutes. After that 15 minutes, the actuators may run up to 75% duty cycle (between each full cycle), the actuator must rest for 1/3 of the 90 degree cycle time. NOTE: At 50 Hz, the duty cycle is 60% @ 104° F.
Voltage	115 VAC: 103.5 to 126.5 VAC, 50 or 60 Hz 230 VAC: 207 to 253 VAC, 50 or 60 Hz
Limit Switches (End-of-Travel)	(2) Single pole, double throw switches rated for 1/2 HP, 11 amps @ 250 VAC, CSA certified, fuse protected. Two standard switches are used for end of travel control, and for pilot or position indication at terminal 5 and terminal 6. Indication outputs are protected by 0.25 AMP permanent auto reset polyfuses – reset time approximately 3 mins.
Motor	Split phase, capacitor driven motor with Class B or better insulation; sub-fractional horsepower
Lubrication	Permanently lubricated gear train and bearings
Gear Train	Hardened steel spur gears
Approximate Weight	17 lbs for sizes up to 600 in•lb 31 lbs for sizes 1000 in•lb and above
Enclosure	Die cast aluminum
Auxiliary Limit Switches	(2) Single pole, double throw switches rated for 0.1 amps @ 125 VAC, CSA certified. Two auxiliary provide position feedback to the network via the network module.
DeviceNet Current Consumption	< 60mA (with no outputs energized)
Data Rate	125, 250, 500 Kb/s

4.1 DIMENSIONS

LI-SERIES



I-SERIES

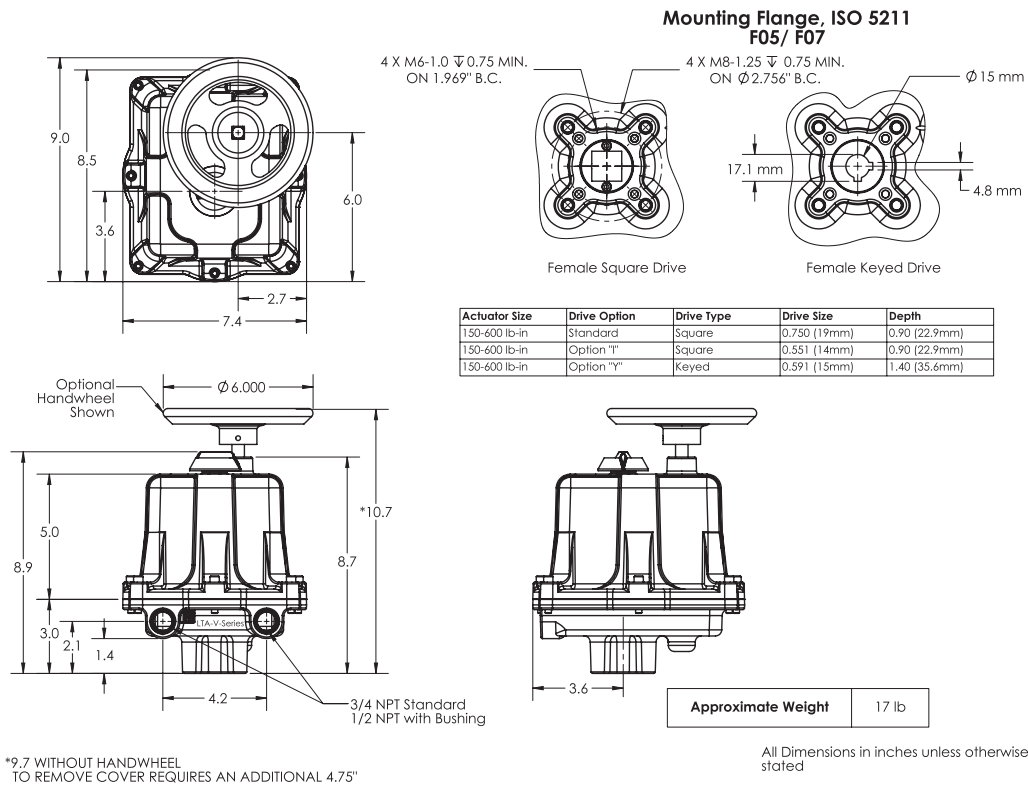


Figure 7

5. I-SERIES ACTUATORS BY PART NUMBERS

Table 4										
How to Order – I-Series Electric Actuators										
Series	Enclosure Type		Torque		Board Options ¹		Other Options		Operating Voltage	
	Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
V	W	Weathertight NEMA 4/4X	150 300 600	150 in•lb 300 in•lb 600 in•lb	AS DN	AS-i DeviceNet	H ² I ^{3a} K S ²⁴ T ⁵ Y ^{7a} Z	Tropical Heater/Thermostat ISO 5211 Output Brake Two Auxiliary Limit Switches Heater/Thermostat Keyed Output Handwheel	N115AC N230AC	115 VAC 230 VAC
	WX	Weathertight & Explosionproof NEMA 4/4X/7&9								
LV	W	Weathertight NEMA 4/4X	1000 1500 2000	1000 in•lb 1500 in•lb 2000 in•lb	AS DN FF ⁶ MB ⁶	AS-i DeviceNet Foundation Fieldbus MODBUS	H ² I ^{3b} K S ²⁴ T ⁵ Y ^{7b} Z	Tropical Heater/Thermostat ISO 5211 Output Brake Two Auxiliary Limit Switches Heater/Thermostat Keyed Output Handwheel	N115AC N230AC	115 VAC 230 VAC
	WX	Weathertight & Explosionproof NEMA 4/4X/7&9	2500 3000	2500 in•lb 3000 in•lb						

- Notes:
1. Must select only one protocol option.
 2. This heater option activates at or below 90°F and deactivates at 110°F; it is recommended in high-humidity applications.
 - 3a. 150 – 600 in•lb models with "I" option are supplied with a 14 mm female square (note that without option "I" the female square is 3/4")
 - 3b. 1000 in•lb models with "I" option are supplied with a 19 mm female square and 1500 – 3000 in•lb models are supplied with a 22 mm female square (note that without option "I" the female square is 1")
 4. These switches have gold contacts for use in Network applications.
 5. This heater option activates at or below 40°F and deactivates at 60°F; it is recommended in applications where the temperature may drop below 32°F.
 6. This option only available in the LI-Series enclosure.
 - 7a. 150 - 600 lb-in models with "Y" option are supplied with a 15mm female keyed output.
 - 7b. 1000 - 3000 lb-in models with "Y" option are supplied with a 20mm female keyed output.

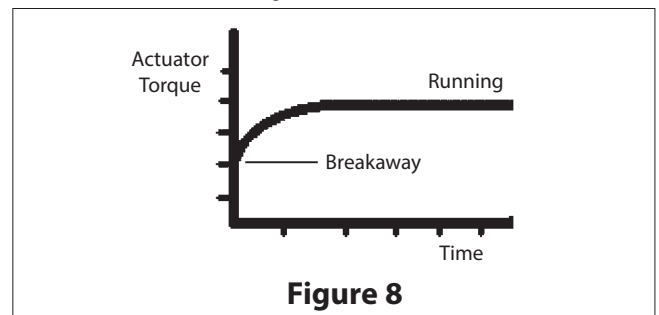
For enclosure specifications and dimensions see (Tables 1-2 and Figure 7).

- **Enclosure "W"** (weathertight) is certified by CSA 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, windblown 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 certified by CSA 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 (Ethyl-ether vapors, ethylene or cyclopropane)
 - NEMA Class I, Division 1, Group D (Gasoline, hexane, naphtha, 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

Sample Model Code: LIWX1500ASHIKS2N230AC

Actuator Series	LI
Enclosure Type	WX
Torque	1500
Protocol Board Option	AS
Other Options (if applicable)	H I K S2
Operating Voltage	N230AC

- **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.



6. ADDITIONAL ACTUATOR PRODUCTS AND ACCESSORIES FROM METSO

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

ADC-Series

- Up to 3000 inch pounds for On/Off or Modulating applications
- Optional Internal Battery Back-Up
- Continuous Duty Cycle
- 115VAC, 230VAC, 24VAC, 12VDC and 24VDC voltages
- Options include extra limit switches, heater/thermostats and handwheel override

QX-Series

- Up to 3000 inch pounds for On/Off applications
- Economical NEMA 4/4X/7&9 solution
- 12VDC & 24VDC voltages
- 80% Duty Cycle
- CSA (C US) Certification

ESR-Series

- Up to 600 inch pounds for True "Two-Wire" On/Off applications
- 80% Duty Cycle
- 115VAC and 230VAC voltages
- Options include extra limit switches and heater/thermostats

LC Series

- Up to 600 inch pounds
- Economical actuators for Reversing or Unidirectional applications
- 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)

Q6-Series for Remote Solar Applications

- 600 inch pounds
- 12VDC
- Low current draw

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