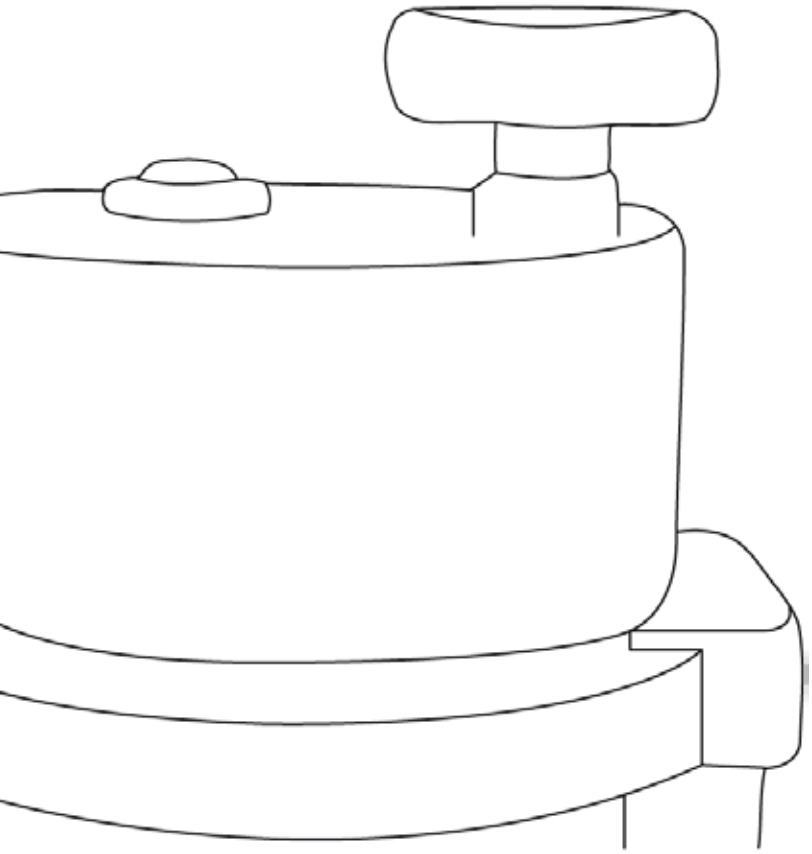


LAKOS
FILTRATION SOLUTIONS

ABV2 (Auto Purge with Motorized Ball Valve) & **EFS** (Electric Fail-Safe Valve)

INSTALLATION & OPERATIONS MANUAL

For Electric Actuators Models VB030-VB350

Please read the entire manual carefully prior to installing, operating or servicing this product. Failure to comply with these instructions may cause personal injury and/or property damage, and may void the warranty of the unit. Always retain this manual for future reference.

Repairing this equipment while under warranty without prior permission of LAKOS/Claude Laval Corp. or the direction of an approved LAKOS service location may void warranty.

The shipping container has been specifically designed to prevent damage while in transit. Please check the unit thoroughly upon receipt and note any damage on the delivery receipt. If damage is found, you must then file a claim promptly with the carrier.

LS-914A (8/20)

WARNINGS

Please read the following instructions prior to installation of the actuator. Damage may occur and the warranty voided if these instructions are not observed. This documentation should be kept dry and available for use. Installation and maintenance must be made by qualified personnel only. Contact LAKOS for special applications that may require unique actuator specifications, or for additional inquires not covered in this guide.

- Refer to the National Electric Code and local code regulations for proper grounding of equipment. Proper grounding will protect maintenance personnel, and the unit.
- Before making electrical connections, always ensure that the supply voltage is identical to the actuator nameplate voltage to avoid damage to the unit, electrical shock, or personal injury.
- Always use caution while installing or maintaining the actuator while the supply power is on. Electrical shock, personal injury, and/or damage to the unit can occur while the power is on, and is therefore recommended to use care when servicing with the power supply on. Auxiliary switch wiring may use different power sources and must be realized before servicing the unit.
- Use of the de-clutchable hand drive may be required to establish the correct valve position during set-up, or an emergency. DO NOT FORCE THE HAND DRIVE. If an obstruction is in the line, damage to the actuator can result by over-exerting a force to the gear train via the hand drive. The hand drive is not intended for extended use.
- LAKOS reserves the right to modify the contents of this guide at any time without notice, as well as the specifications resulting in improvements. LAKOS will not be liable for personal injury, property, or loss of profits due to improper use of equipment, damage to the unit (s) in shipping, or circumstances beyond our control.

GENERAL DATA

DEVICE OBJECTIVE	ELECTRIC ACTUATOR
CONSTRUCTION TYPE	ELECTRONIC CONTROL DEVICE
PROTECTION LEVEL	NEMA 4/4X IP65 IP67
CERTIFICATIONS	CE UL
COVER TYPE	UL 50
AMBIENT TEMPERATURE RANGE	-4F to 131F
AUXILIARY CONTACT RATING	1A @ 30VDC/250VAC RESISTIVE
TERMINAL WIRE SIZE	26 – 12 AWG (0.5 – 1.5mm)
TERMINAL SCREW TORQUE	4.4 in-Lb
COVER SCREW TORQUE	22.2 in-Lb
PROTECTION AGAINST ELECTRICAL SHOCK	CLASS I
ACTION TYPE	TYPE I
POLLUTION TYPE	LEVEL III
OVER-VOLTAGE CATEGORY	CLASS III
CABLE CONNECTORS	PG11 (1/2" FNPT CONDUIT OPTIONAL)

This product conforms to 73/23 CEE (LVD), 89/336/CEE (EMC), 93/68/CEE (CE MARK) and UL NEMA 4X.

TECHNICAL CHARACTERISTICS

LAKOS electric actuators have microprocessor controlled DC drives, and have several standard technical characteristics/features noted here:

- IEC CE IP65-67 and NEMA 4X UL conformities are standard on all actuator enclosures in this series. The mounting design conforms to ISO5211/DIN3337.
- Using light-weight fire-resistant techno-polymer construction, application weight requirements are not jeopardized while maintaining tough performance. These enclosures generate torque from 266 – 3100 inch pounds, are water-tight to 1 meter, and are corrosion resistant. The self-extinguish class is V0.
- The use of thermal resistors (heaters) is standard and active when the motor is working and the temperature inside the actuator is below 77ºF. This reduces condensation and helps maintain the enclosure's integrity. It is not possible to disable this feature by removing the directional control signal (supply voltage) in Fail-Safe units.
- For safe operation and protection of the motor and actuator internal gear drive, a special electronic shut-off was designed called a “torque limiter” circuit. When over-current is detected due to valve failure or over-torque requirements caused by the system or valve, the motor will pause for 3 seconds, reverse direction, and then resume. After three attempts, the unit will shut down in its last position of the failure, and a red LED on the internal circuit board will begin to flash.
- Two sets of dry contacts are provided on every electric actuator for use as auxiliary control signals. Simple control circuits supplied by the user can determine a failure, link other valves, control pump start/stop functions, and provide status control signals. Both sets of switches can be adjusted for different opening and closing positions.
- A valve position indicator locates the Open/Closed position between standard 0-90° versions, with optional indicators available for 0-180/270/3-way.
- A declutchable hand-drive is available on all models for use with set-up and emergencies. It is not intended for normal valve use.
- The low power consumption of this device is ideal for battery, and solar powered applications.
- Fail-Safe Models have a rechargeable Nickel-Metal-Hydride battery pack that provides 400 charge/discharge cycles for near infinite operation when properly applied. The batteries are automatically charged with when the supply is connected. More cost-effective than spring-return types, these reliable actuators are offered in normally open, closed, or fail in current position options.
- Positioner Models have dual front-end analog signal inputs (0-10VDC and/or 4-20mA) and dual analog output feedback; plus, a +10VDC on board power supply for adapting a 1000 to 4700 ohm potentiometer for panel modulation without a controller. With a resolution of 1.8°/0.1mA and a repeatability error of <3%/full scale, these actuators are ideal for control valve and process applications.

ELECTRICAL SPECIFICATIONS

MODEL	VB030	VB060	VB110	VB190	VB270	VB350
OPENING TIME 0-90° SEC	8	9	27	27	50	50
TORQUE (inLb)	266	530	975	1680	2390	3100
VOLTAGE HT	100 – 240VAC					
MAXIMUM CURRENT HT	0.38 – 0.25	0.75 – 0.38				
MAXIMUM POWER HT	38 – 60 VA	75 – 90 VA				
FREQUENCY	50/60 Hz					
VOLTAGE LT	24V AC/DC					
MAXIMUM CURRENT LT	1.25	1.25	2.25	2.25	2.25	2.25
MAXIMUM POWER LT	30 VA	30 VA	55 VA	55 VA	55 VA	55 VA

FIELD APPLICATIONS

LAKOS electric actuators have been designed and tested to operate all types of valves in industrial environments. The standard rotation is quarter-turn, 0 to 90º, CW Close/CCW Open; however, upon request, we can supply actuators with rotations of half-turn, 0 - 180º, and/or three-quarter turn, 0 - 270º. For other application possibilities, please contact LAKOS. Additional charges may apply for optional rotation specifications. ALLOW 6" or more clearance to remove the cover. NEVER lift the valve assembly by the actuator. *Never install these units in ambient temperature conditions above 131°F, or below -4°F.*

All LAKOS electric actuators are shipped water-tight. Make sure that the installation and wiring maintain the integrity of the case NEMA 4X/IP65-IP67 rating. Avoid installing the actuator and leaving the cover open for extended periods of time, especially in wet areas or areas with highly corrosive chemicals. If the installation takes on several stages, i.e. mounting the valve, checking the actuator, and then wiring, take care to always re-cover the device and keep the shipping glands of the conduit connectors in place to avoid any contaminations. The integrity of the enclosure is only as good as the weakest connection, and typically, this is the cable or conduit connector. Make sure that the connectors are watertight, and that the o-ring rests in the seal groove of the enclosure flange.

ATTENTION: Electric actuators can be mounted in any position or orientation provided the case and connections to the case do not compromise the IP65-IP67/NEMA 4X electrical protection of the device. LAKOS cannot be responsible for failure of the unit when improperly installed, or if the sealing connections have been defeated.

Before re-assembling the case, always check that the o-ring seal is in place, and that the cover does not pinch the o-ring. Occasionally, it may be necessary to use a non-petroleum lube to help the o-ring stay in the groove provided. Applying a dab in the corner turns usually works well. NEVER have dirt, debris, or other obstructions between the case and cover.

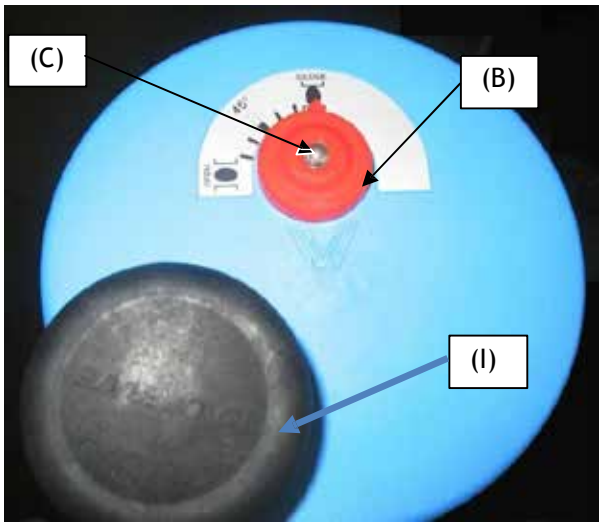
ELECTRICAL CONNECTIONS

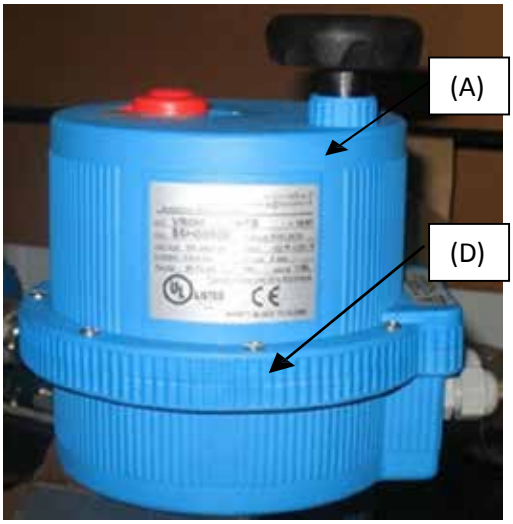
The electrical connections are made through either of the two cable ports on the side of the case. It is not possible to wire the unit without opening the cover; therefore, refer to the field installation section 3.0 for warnings and conditions. The unit is shipped from the factory with PG11 (IP68) DIN10 style cable connectors. Threaded, ½" FNPT conduit box connectors are available from LAKOS upon request as an option. ALWAYS insure that the cable ports are watertight. **Damage caused by improper installation will void the warranty.**

Open the cover to realize the entrance of the wiring and the terminal strips used to make the wiring connections. Check that your supply voltage requirements match those of the actuator. **Applying the incorrect voltage to the actuator will void the warranty.**

REMOVING THE COVER

- Always allow a minimum of 6" (150mm) clearance above the actuator in order to remove the cover.
- Remove position indicator (B) by loosening the Allen screw (C).
- Unscrew the fasteners (D) to remove the cover (A).
- Carefully raise the cover straight up to avoid contact with the internal circuit boards.





(A) ENCLOSURE COVER

(B) POSITION INDICATOR

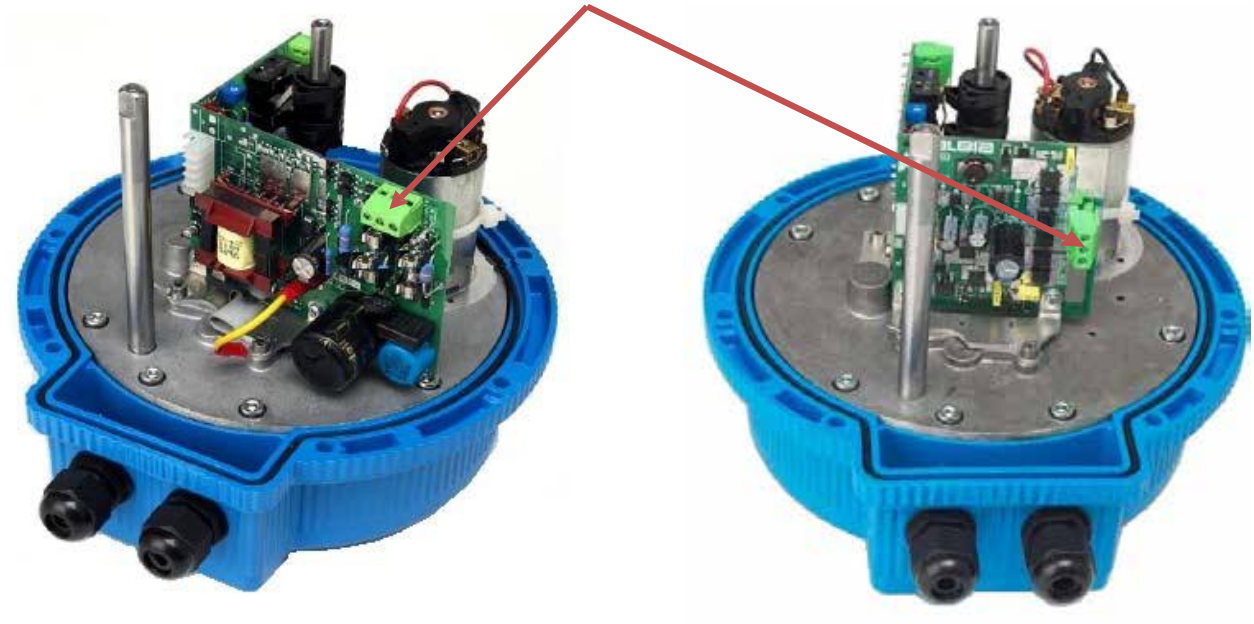
(C) ALLEN SCREW 1.5mm

(D) ENCLOSURE FASTENERS

(I) DECLUTCHABLE HAND DRIVE

Wiring Diagrams, Mechanical Adjustments

Terminals for Directional Control (Supply Voltage)

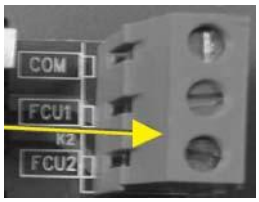


High Voltage Models (100-240 VAC)

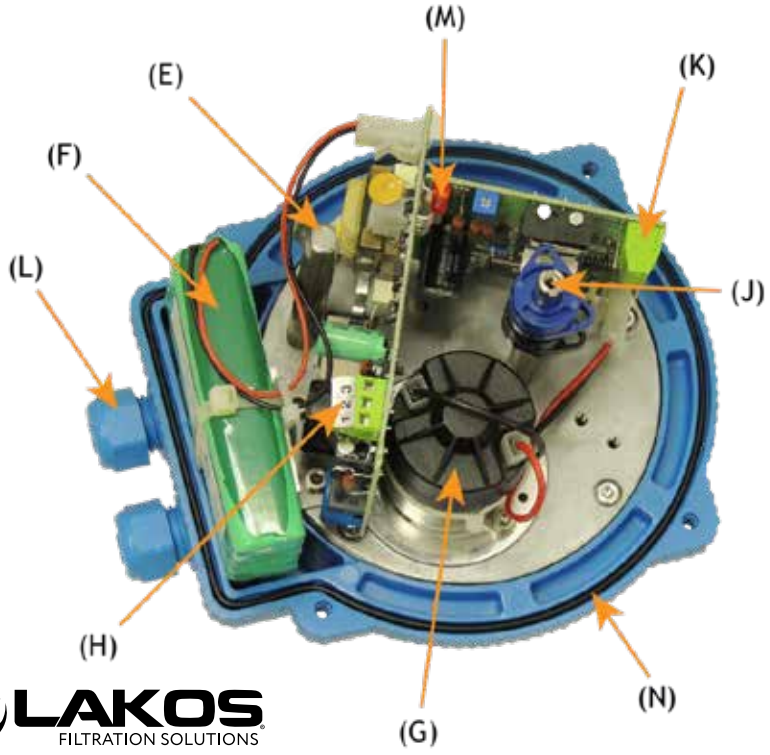
[1 - CLOSE][2 - NEUTRAL][3 - OPEN]

Low Voltage Models (12, 24V AC/DC)

[1 - CLOSE][2 - NEUTRAL][3 - OPEN]



AUXILIARY FIELD CONNECTIONS
SPST W/COMMON TERMINAL



(E) HAND-WHEEL DRIVE SHAFT

(F) BATTER PACK 20-1.2VDC NiMH

(G) 24VDC DRIVE MOTOR

(H) SUPPLY VOLTAGE TERMINAL

(J) ADJUSTABLE CAM - AUX SWITCHES

(K) AUXILIARY SWITCHES

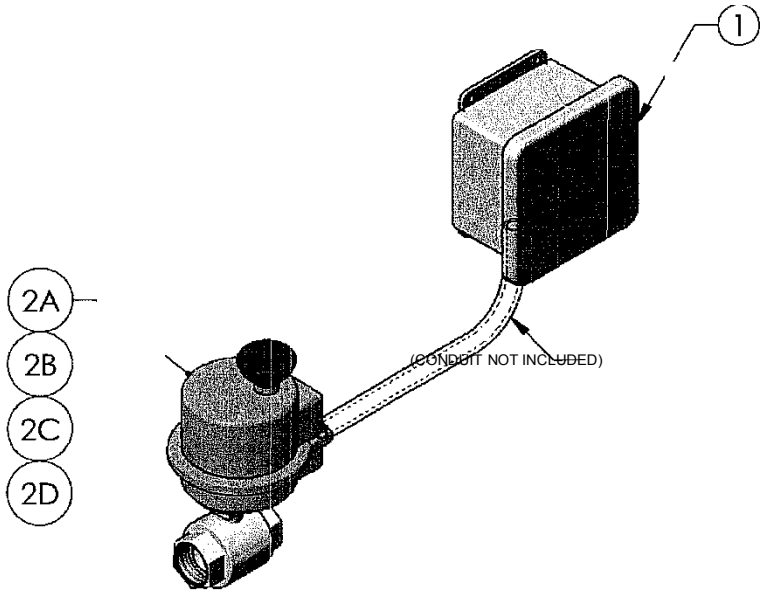
(L) CABLE CONNECTOR

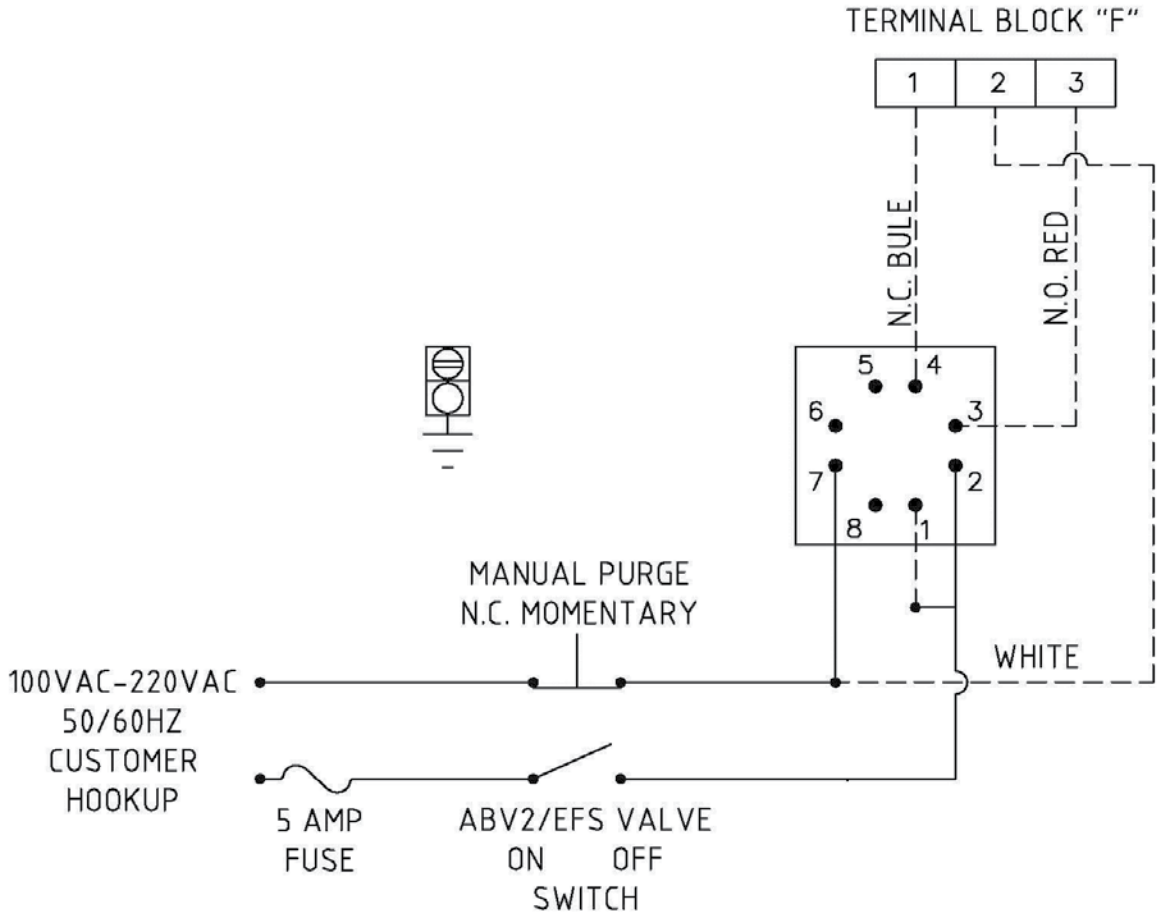
(M) RED LED

(N) O-RING

EFS FAIL SAFE PURGE 07 & 15 EQUIPMENT

WIRING SCHEMATIC FROM CONTROL TO ACTUATOR





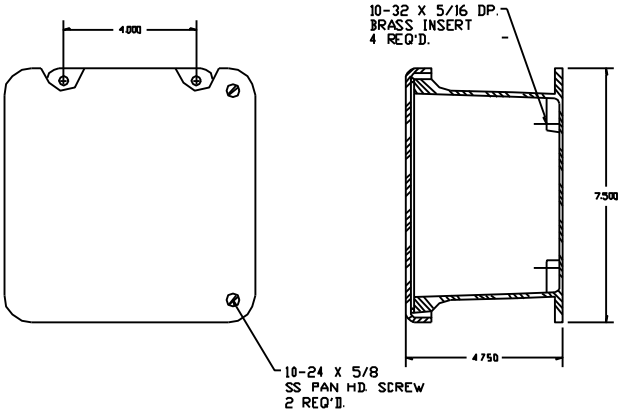
Valve Controller Specification Sheet

Auto Purge Controllers

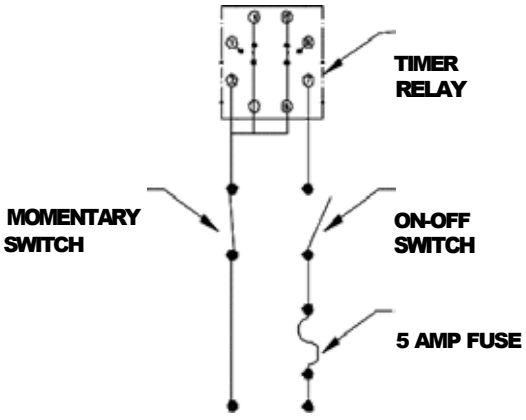
Part # 121187
Time Range: 0 sec – 300 hr (Purge & Frequency)
Voltage: 100-240 VAC 50/60 Hz
Amperage: 5Amp
Certification: **CE**
Temperature: -10°C - 55°C (WITH NO INTERNAL ICING)
Internal Humidity: 35….85%
Shock Resistance: Malfunction at 98 m/s2 (10 G)
Accuracy: ±10 ms max in range of 1.2 s
HP Rating: 120 VAC – 1/4 HP / 240 VAC – 1/3 HP
Fuse: 1/4" X 1 1/4" 250VAC 5Amp
Wire: 14 GA, THNN, 105 C, 600 V
Enclosure: NEMA 4X

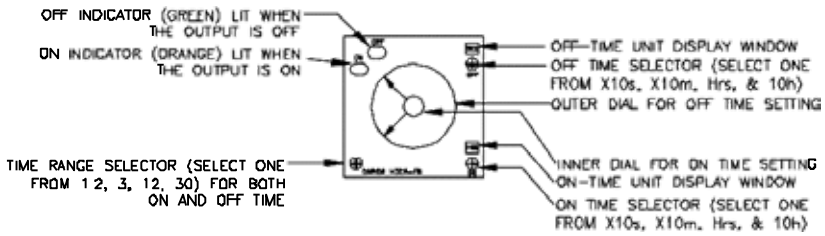
Enclosure

Rating: NEMA 4X / IP66 Equivalent
Construction Material: Compression Molded, Fiberglass Reinforced Polyester.
Gasket: Continuous Silicon Door Gasket
Panel Inserts: Molded In
Hinge: Stainless Steel Piano Hinge
Screwheld Cover
Mounting Holes: 6.75" X 4" Hole Dia 0.31"
Dimensions: 7.50" X 7.50" X 4.75"
Certification: **UL, CSA**



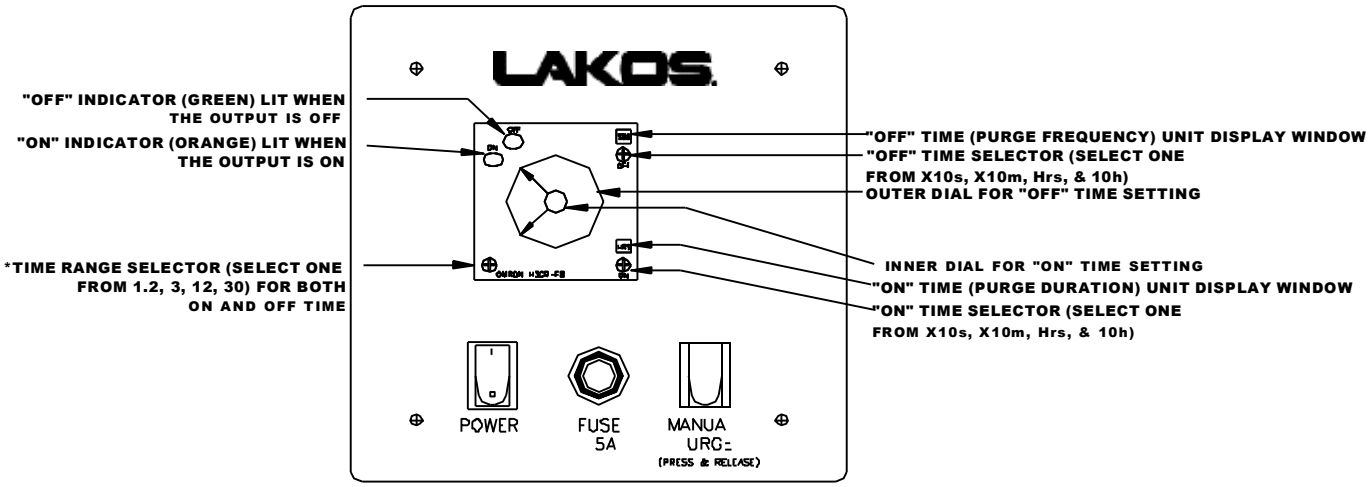
Schematic & Timer Layout





Auto Purge Controller Instruction Sheet

LAYOUT: AUTO PURGE



TIME RANGE	TIME UNITS			
	10s	10min	hrs	10h
1.2	1.2 TO 12	1.2 TO 12	.12 TO 1.2	1.2 TO 12
3	3 TO 30	3 TO 30	.3 TO 3	3 TO 30
12	12 TO 120	12 TO 120	1.2 TO 12	12 TO 120
30	30 TO 300	30 TO 300	3 TO 30	30 TO 300

NOTE: The Time range number corresponds with the last number on the scale.

INSTRUCTIONS

Setting Purge Frequency ("OFF" Time): Use the chart above to select the appropriate display window setting. Use outer dial to adjust time setting.

Setting Purge Duration ("On" Time): Use the chart above to select the appropriate display window setting. Use inner dial to adjust time setting.
"Motorized Ball Valve Purge Duration Must be a Minimum of 10sec"

***Time Range Selector:** The time range is factory set for a range of 1.2.

Manual Purge: The manual purge can be performed at any time when the timer is not purging. Press and release the purge switch. A timed purge will occur at the current time setting. Repeat as necessary.

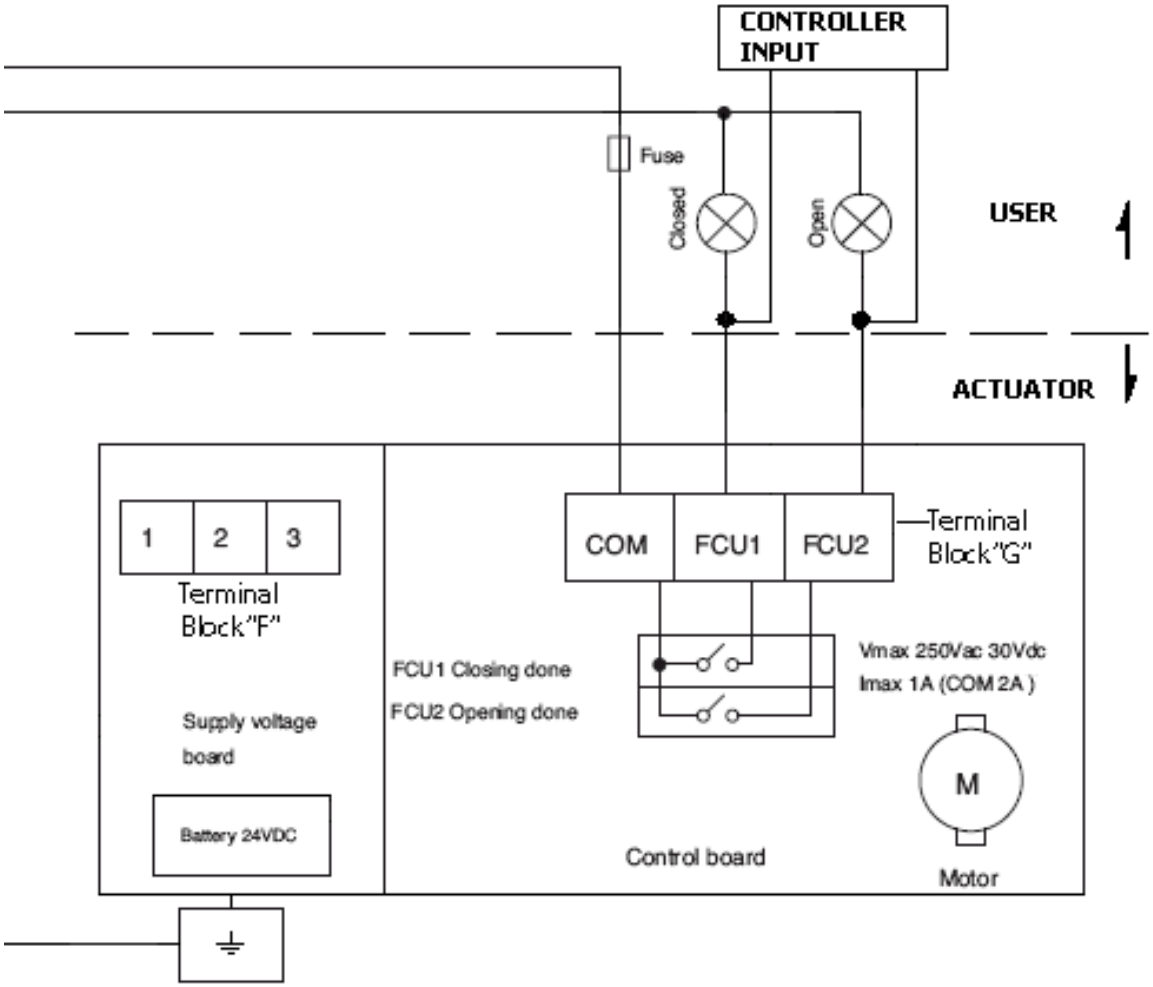
WARNING: All time adjustments are to be made with the power switch off!

CHECK OUT OUR TIMER SETTING VIDEO ON YOUTUBE:
http://youtu.be/v4OJ7qMLyGY

ELECTRICAL CONNECTIONS

- There are 2 terminal strips for wiring connections on all LAKOS electric actuators: One for directional control (supply voltage), and one for auxiliary contacts (digital feedback).
- For Fail-Safe models, the directional control wiring (line voltage) is made to the control terminals and requires a Neutral (+0V), terminal 2, and a Line (+V), terminal 1 or 3.

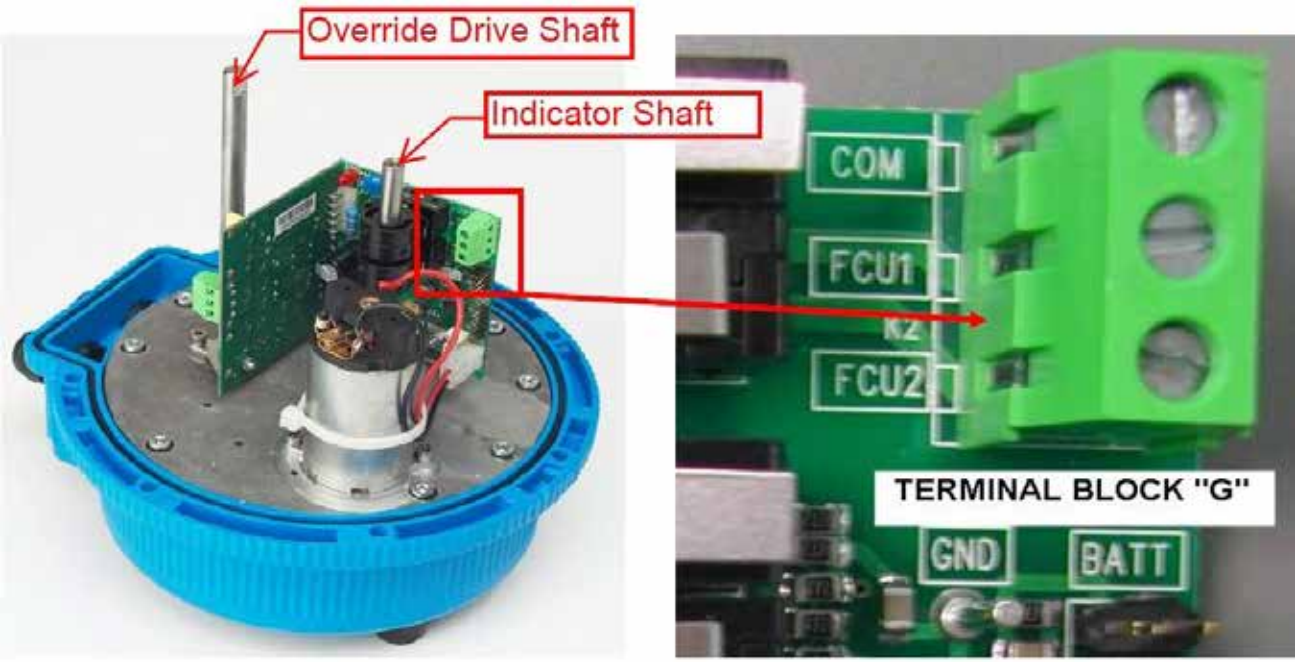
DIGITAL FEEDBACK WIRING DIAGRAM (by others)

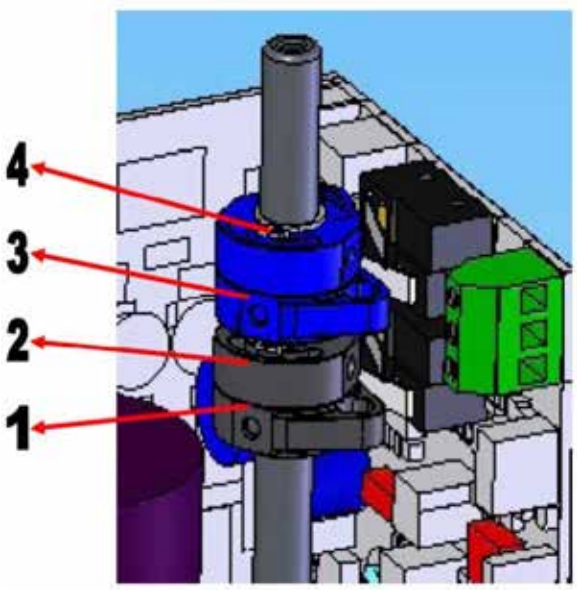


Fail-Safe Wiring Connections

AUXILIARY SWITCH CONNECTIONS/MECHANICAL ADJUSTMENTS

- The auxiliary switch connections are located on the control card. It is a 3 position terminal strip labeled FCU1, FCU2, and COM (Terminal Block G). They are used for ON/OFF feedback for a variety of applications where dual SPST switches are required.
- The maximum current through the switch is 2A, and maximum voltage is 250VAC.
- NEVER CONNECT Power to common AND Neutral to the field connections (auxiliary switch FCU1 or FCU2), as this will result in a direct short not covered by the warranty.
- Refer to Section 4.1 and 4.2 for the location and wiring diagrams.
- Use of the de-clutchable gear drive may be required to re-establish the correct valve position. DO NOT FORCE THE HAND DRIVE. If an obstruction is in the line, damage to the actuator can result of over-exerting force to the gear train via the hand drive.
- NEVER utilize the hand drive while the actuator is in motion via electrical control. Hand drives used in this manner resulting in failure(s) are not covered under the warranty, and should be avoided. The hand drive is used for initial positioning and for emergency situations, and is not intended for regular use for valve positioning.





LIMIT SWITCH CAM ADJUSTMENT

- Remove the cover (page 6).
- Realize the position of the actuator (full clockwise is closed). The direction of the actuator and the direction of the micro-switch actuator (lever) must be the same. For example, using the above illustration, cam 4 is an adjustment for a clockwise rotation because when it rotates in that direction, it will meet the micro switch lever from its lowest point, as will cam 2. This will prevent the cam from "jamming" into the limit switch, as could be the case if cam 4 (or 2) arrived from the CCW rotation.
- The Black cams are for the actuator maximum travel stops. These can safely be adjusted to any angle between 0 and 270 degrees.
- The Blue cams are for user adjustment of the auxiliary switches.
- Disconnect all power prior to servicing cam switches.
- For standard operation, arrange the valve to its open position, and mount it to the actuator.
- Loosen the 0.5mm set screw of CAM 1, and rotate CCW until it maintains secure contact with the limit switch, and tighten the set screw. CAM 3 represents the valve position of the auxiliary switch FCU2, OPEN. Adjust it the same direction to make contact with the respective limit switch and insure that the set screw is secure.
- Using an adjustable wrench, rotate the Override Drive clockwise until the valve is completely closed (90 degree rotation).
- Loosen the 0.5mm set screw of CAM 2, and rotate CW until it maintains secure contact with the limit switch, and tighten the set screw. CAM 4 represents the valve position of the auxiliary switch FCU1, CLOSED. Adjust it the same direction to make contact with the respective limit switch and insure that the set screw is secure.
- Replace the cover, and secure. Always check for water tightness of the conduit connections, and that the o-ring seal is in place. Failure to do so may damage the unit.

FAIL-SAFE OPERATION

- The battery-backup fail-safe model actuators provide dependable control for applications requiring automatic valve positioning during a particular event, namely, loss of power. The most common applications are diverter, main water supply, main machine/plant supply, solar switching, etc. that all require an immediate need in the event of power loss. They are offered in voltages 24V AC/DC and 100-240VAC.
- These units automatically charge the battery pack completely during normal operation, and with 20, 1.2V, Nickel Metal Hydride batteries (24 VDC), (or 16-1.5VDC) easily
  maneuver the valve. The battery pack has a life expectancy of over 400 charge/discharge cycles; but, when properly used, will never completely discharge. The frequency of discharge (valve operation) depends on the load (the valve torque requirements). Since the actuator must have power restored to re-establish the valve position (open or closed), there is always a charge cycle for the battery packs. Although intended as a fail-safe unit, with careful sequencing, 50,000 or more duty cycles is possible, making it a cost effective replacement for low Cv, 2-wire solenoid valves with over 1.5" port sizes. Applications include tank level control, 3-Way diversion, solar-powered irrigation, relief valves, fire systems, and many more.
- Power supply terminations are to standard directional control terminals, maximum wire size is 16 AWG (1.3mm). Refer to Section 4.2 and 4.3 for the wiring connections and diagrams.
- The auxiliary switches are the same as the standard units in Section 4.2, 4.3., and have a current rating of 2A maximum combined.
- The unit has a 5 second delay prior to the failure movement to prevent unnecessary valve positioning with sporadic power supplies; therefore, it is necessary to consider valve closing times when developing the application control.
- The battery will finish the movement during a power loss, and will regain the normal position only after power has been restored. This movement will not be interrupted until it has reached the limit of the configuration, even if power is restored during the move.
- The batteries are Nickel Metal Hydride (NiMH). They have 30% greater life expectancy than Nickel Cadmium (NiCAD), better temperature compensation, and, unlike NiCAD, are eco-friendly and non-toxic.
- Since there is no status indication nor failure feedback, it is recommended to fully charge the batteries for 24 hours prior to service. A cycle test is also recommended once per month for true fail-safe applications.
- The expected life time of these batteries is 12-15 years. Replacement battery packs are not available in case of damage or improper connections.
- Reliability, cost-effective design, performance, and cost easily make the unit an ideal choice for most emergency situations and many control applications.

The gear train of these actuators are permanently lubricated, and do not need to be maintained. All automated products need to be cycle tested semi-annually.

Maintenance

Electrical connection for model supplied with 100-240 V AC 50/60 Hz (fig. 3)
-The signal cable of **"closing"** (clockwise rotation) (signal of phase) must be connected to the input **1** of terminal-block **(F)**
-The signal cable of **"opening"** (counter-clockwise rotation) (signal of phase) must be connected to the contact **(3)** of terminal-block **(F)**
-The signal cable **"neutral"** must be connected to the contact **(2)** of the terminal block **(F)**
-The cable of **"earth"** must be connection to the **"faston"** put on the metallic parts on the actuator.
The ground wiring system is MANDATORY

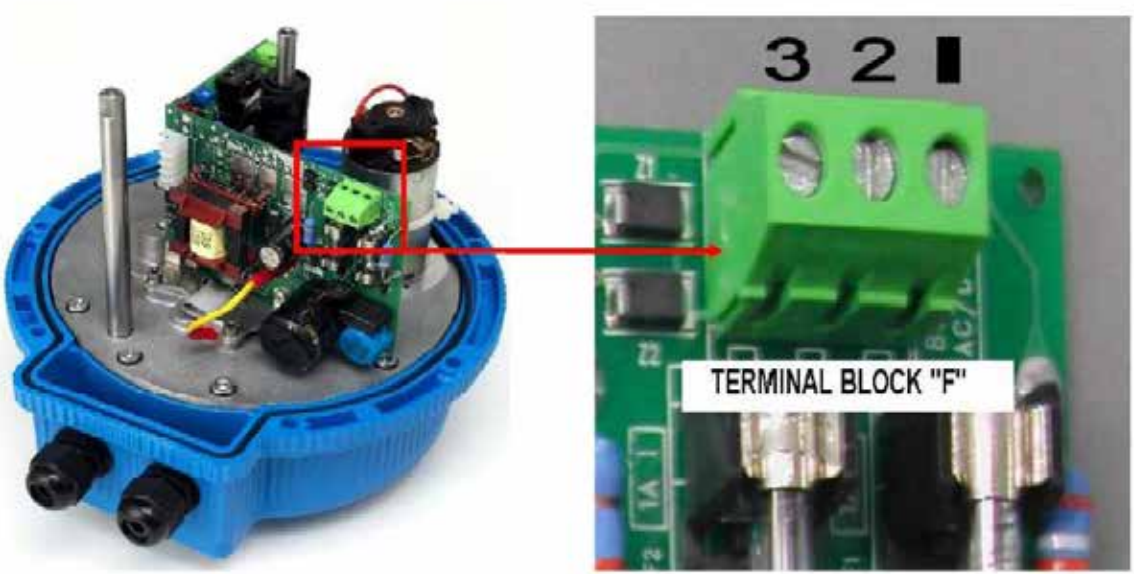
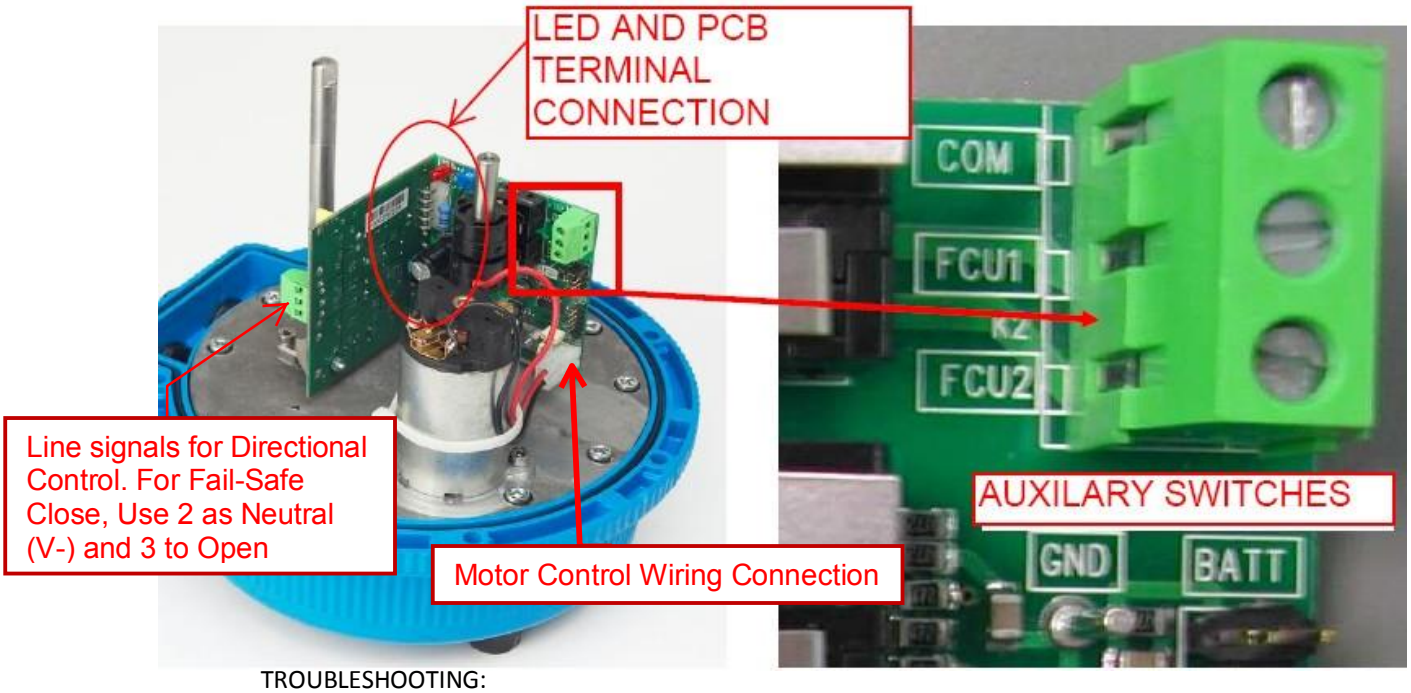


Fig. 3 Plate for supply 100-240V ac/dc and particular of terminal-block "F"

Working in Emergency with Battery (optional)
For the models which have the batter (option) it is possible to set up the actuator so that, in case of failure supply, actuator will carry out automatically one of the following actions:

-**Complete the operation:** the motor continues the stroke up to the reach of the limit switch
-**Open:** an eventual opposite operation is interrupted
-**Close:** an eventual opposite operation is interrupted

Working with battery is enabled only if supply absence lasts at least 3 seconds; during this lapse the motor is steady.
Working by batter will be stopped at the end of the action expected and actuator will start functioning again only after the recovering of the net tension.
Unless concluded, the working cannot be interrupted by an eventual recovering of the net tension.



TROUBLESHOOTING:

- Determine the model that you are using. All fail-safe units will have a 16 piece battery pack located between the supply and control printed circuit boards (PCB). Standard units will have only the supply and control card, and Positioner Models will have 7 additional terminal connections on the control PCB.
- Determine that your supply voltage (signal) is the same as that of the unit (24V, 100-240V, etc.). The Model Number for low voltage uses LT, while the high voltage models use HT as designations found on the cover of the unit.
- Determine that the junction of the 2 printed circuit boards are closed tightly together.
- Determine that the signal connections are to the terminal shown above. For fail-safe (battery back-up) operation, terminals 2 (Neutral or -), and 3 (Line Voltage or +) are used. When the signal is applied, the valve should open. When the signal is removed the valve should close. If the valve does not close, re- connect the signal to open the valve. This opens the valve AND charges the battery pack. Leave the signal connected for 12 hours or more to fully charge the battery pack.
- Determine if the valve and actuator torque is compatible. If the RED LED is flashing, or if the unit goes into current-limit mode while testing, disconnect the power, and remove the actuator from the valve. Determine the torque of the valve, and test the unit without the valve mounted. This should give an indication of the problem.
- Determine that the battery cable is connected to the 2 terminals on the supply PCB. With the battery disconnected, the Fail-Safe unit will work like a standard ON/OFF unit, with terminals 2 as neutral, and 1 and 3 as directional control.
- Check the position of the limit switches to determine if the motor limits have changed. If necessary, use the hand wheel (or other wrench) to rotate the cams for the limit switches back to the normal position.
- If all of the conditions above have been met and the unit will not function, return the unit for repair and/or replacement.

Limited Warranty

The LAKOS ABV2 and EFS are warranted to be free of defects in material or workmanship for a period of one year from date of delivery.

If a fault develops, notify us, giving a complete description of the alleged malfunction. Include the model number(s), date of delivery and operating conditions of subject product(s). We will subsequently review this information and, at our option, supply you with either servicing data or shipping instructions and returned goods authorization. Upon prepaid receipt of subject product(s) at the instructed designation, we will then either replace such product(s) at our option and, if determined to be a warranted defect, we will perform such necessary product repairs or replace such product(s) at our expense.

This limited warranty does not cover any products, damages or injuries resulting from misuse, neglect, accident, normal expected wear, improper installation or operation contrary to factory recommendations. Nor does it cover equipment that has been modified, tampered with or altered without factory authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or costs resulting from any such defective product(s).

LAKOS FILTRATION SOLUTIONS®

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