

Series 92 Multiturn Electric Actuator



Installation, Operation and Maintenance Manual



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Series 92 Electric Actuator Introduction

Description

The Series 92 multiturn electric actuators feature a reversing, capacitor run motor, with a permanently lubricated gear train, and hardened steel spur gears. These actuators are equipped with integral thermal overload protection with automatic reset, independently adjustable limit switches, 2-auxiliary limit switches, declutchable manual override, beacon position indication, baked powder coating with stainless steel trim, ISO bolt circle, and 2 (two) ½” NPT conduit entries.

Models are offered in 115 VAC, feature a combination enclosure of Nema-4X, 7 & 9, and, provide up to 700 in-lbs. of output torque.

The Multi-Turn Option is designed to allow the actuator to make between 1.25 and 7 turns, and is used with Gate and Diaphragm Valves. Inside the actuator enclosure a [3-pole(3-layer)] – 10 position rotary switch is wired in parallel with the standard limit switches, and auxiliary limit switches. The rotary switch is driven by the actuator shaft through a worm-gear drive, so that the rotary switch advances one position for each complete turn of the actuator. The number of turn is established by the number of jumpers wired to each layer of the rotary switch.

One layer of the rotary switch works in parallel with the limit switch that controls the clockwise or “close” rotation, the second layer works the limit switch that controls counter-clockwise or “open” rotation, and the third layer is used for auxiliary switches in both the “open” and “close” positions of the actuator. Wired in this manner the actuator cannot stop until both the rotary switch and the limit switch are open.

Electrical Requirement

CAUTION: Proper voltage must be supplied to actuator or damage will result.



CAUTION: If 115vac & 220vac models are PLC driven, output contacts of PLC should be rated at a minimum of 1.5 times required input voltage of actuator

NOTE: To conform to various electrical codes, a green grounding screw has been installed (on the baseplate) inside of actuator.

Terminal strip is suitable for up to #14 AWG wire, and should be wired as per the attached diagrams or the wiring diagram affixed inside of actuator cover.

Model	Torque (in/lbs)	Amp Draw	Duty Cycle	Cycle Time per 90 Degrees (seconds)	Weight (lbs)
S92MT	400	0.5	25%	10	15.3
A92MT	700	0.8	25%	10	15.3

NOTE: Amp rating is considered locked rotor.
Duty cycles are for ambient temperature (73°F)

Installation

Electrical

Reference Drawing #289S92

1. To gain access to terminal strip (Part #24) it is necessary to remove manual override knob (Part #18) by loosening slotted setscrew (Part #39). Remove 2 cover screws and cover; the remaining 6 cover screws are packaged inside the actuator.
2. Make electrical connections to terminal strip as shown on wiring schematic located inside the cover (per various electrical codes there is a green screw on the actuator base plate for grounding purposes). Terminals are suitable for up to #14 AWG wire. All units are completely calibrated prior to shipment, and no internal adjustments should be required.
3. Install 1/2" NPT conduit fitting(s) to actuator base.
Proper conduit fitting must be used to maintain enclosure rating (weatherproof, explosion proof or combination weather proof/explosion proof).

NOTE: We recommend sealing conduit openings on units installed outdoors or exposed to large temperature swings (15°F or more).

We also recommend the heater and thermostat option in these applications.

4. Replace actuator cover, and install 8 cap screws supplied and tighten securely. For outdoor or wet locations it is recommended prior to replacing the cover that the top shaft seal be cleaned and coated with silicone grease. Also clean shaft and lightly coat seal area of shaft with silicone grease. Unit is now ready for operation.



CAUTION: If mounted unit is installed other than straight up, the actuator should be supported independently to prevent side loading and loosening of fasteners.

Operation

Reference Drawing Number 0025EL

Open/Close wiring to the Multiturn Actuator is as follows:

- 1) Terminal #1 = Neutral
- 2) Terminal #2 = Hot to OPEN (Counter-clockwise command)
- 3) Terminal #3 = Hot to CLOSE (Clockwise command)

Power must be maintained to the unit for the full travel time of the valve. The electrically operated multiturn valves are factory set and adjusted. Fine tuning for absolute seating can be accomplished by adjusting cam of clockwise limit switch to delay opening of switch.

Manual Override Operation

Reference Drawing #289S92

CAUTION: The manual override should only be used when there is no power applied to actuator. When power is restored the actuator will automatically resume normal operation.

Pull up the declutching knob (Part #18) and apply a 5/8" open end wrench to exposed flats and rotate within labeled limits as indicated by arrows. To re-engage simply rotate actuator shaft in the opposite direction until declutching knob drops back down into position.

Manual Override rotation from closed to open (Counter-clockwise) must not exceed the values shown in the following chart.

Actuator Size	Type 14 Sizes	Number of 360° turns *		Gate Valve Sizes
		close to open	or open to close	
S92MTM2XWJ	1/2"	3.25	N/A	N/A
S92MTM2XWJ	3/4"	3.25	N/A	N/A
S92MTM2XWJ	1"	3.25	N/A	N/A
S92MTM2XWJ	1 1/2"	4.25	5.25	1 1/2"
S92MTM2XWJ	2"	5.25	5.25	2
S92MTM2XWJ	2 1/2"	6.25	N/A	2 1/2"
A92MTM2XWJ	3"	6.25	5.25	3
A92MTM2XWJ	4"	6.25	N/A	N/A

**Do not exceed the number of 360° turns specified from close to open as this will exceed the calibration range and unit will not operate properly causing excessive strain to the actuator.*

Setting Limit Switches
Reference Drawing #289S92



Disconnect power!

Close Travel Limit Switch (Bottom Switch Part #25):

Using declutchable manual override, move the valve to a full closed position, loosen set screws on bottom cam (Part #40) and rotate cam (CW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full closed position. Tighten 2 set screws (Part #40) on cam.

Open Travel Limit Switch (Top Switch Part #25):

With the valve in the fully closed position, move the valve to the open position by using declutchable manual override, as per chart on page 6?. Then loosen set screws on top cam (Part #40) and rotate cam (CCW) into limit switch arm until a click is heard, this designates the switch circuit has opened and defines a full open position. Tighten 2 set screws (Part #40) on cam.

Manually position valve to midstroke. Reapply power to actuator and drive to open or closed position. Actuator motor will run. The shaft will not turn until drive pins (Part #7) reseal in drive gear.

Options

The Heater and Thermostat is the only option that can be installed in the field. Any other option required MUST be installed at the factory

Heater and Thermostat

Install Heater into threaded hole located between actuator base gasket and motor module.

Wiring is as follows:

Heater lead = Terminal #12

Thermostat lead = Terminal #13

Wire tie loose wiring and check operation before installing cover.

Extra Limit Switch(es)

Fine tuning of additional limit switches has the same procedure as above, keeping in mind that **the cam(s) must be set so that the additional switch(es) trip ahead of travel limit switch.**

Series 92 Options Codes for Serial # Tags

M2	2 extra limit switches
HT	Heater & thermostat
P	Feedback potentiometer
C1	4-20 mA Positioner
C3	4-20mA Output Transducer

Example 1: S92MTHTPXWJ
Heater & thermostat and feedback potentiometer installed.

Example 2: S92MTC1XWJ
Positioner installed.

Troubleshooting

Q: *What if there is no output, but the motor runs?*

A: Manual override possibly engaged.

When the manual override is engaged, the motor will run, but no output will be observed until the manual override re-engages with the output shaft.

A: Valve stem broken. When the valve stem is broken, there will not be a change in fluid movement, making it seem as if the actuator has no output.

Q: *What if valve does not cycle?*

A: No power source to actuator. Check for power.

A: Power source disconnected. Check for broken wire, loose connection or no connection as per appropriate wiring diagram.

A: Low or wrong power source. Check for proper voltage.

A: Mechanical Brake jammed or misaligned. Check alignment of brake assembly.

This could occur during installation when someone would rest their hand on the Mechanical Brake to steady themselves.

Q: *What if there is water and/or moisture inside of the unit?*

A: Conduit fitting installed improperly. Re-install correctly.

A: Cover and/or base seal damaged. Replace damaged seal(s).

A: Base gasket damaged or installed improperly. Check gasket and replace if necessary.

A: Temperature swings of more than 15 degrees F. Install heater and thermostat to eliminate condensation.

When these temperature swings occur, the unit will “sweat” on the inside causing internal corrosion unless the actuator is equipped with a heater and thermostat to keep a constant temperature inside of the housing.

A: Unit has been submerged. Raise unit above liquid level.

An actuator that is to be submerged **MUST** meet NEMA 6 for the proper protection of the actuator and the elimination of a potential hazard. We do not recommend submerging the Series 92 Actuator as the electrical rating does not meet NEMA 6.

Q: *What if unit is oscillating?*

A: Valve torque exceeds output torque of actuator. Check for chemical compatibility of valve, and flange torque.

Q: *What if thermal overload frequently cuts out motor?*

A: Frequency of operation exceeds duty cycle rating. Check cycling period.

A: Unit is oscillating. Refer to above.

Q: *What if motor hums and no output is observed?*

A: Foreign material caught in valve. Remove material and inspect valve for damaged and/or worn parts. Replace parts as necessary.

A: Unit wired incorrectly (simultaneously powering open and closed). Check wiring as per appropriate wiring diagram.

A: Capacitor worn. Replace.

Q: *What if actuator “over-shoots” limit switches without stopping?*

A: Actuator wired in parallel to each other. Please note that each actuator requires it's own set of switch contacts.

Maintenance

Disconnect power!



NEVER REMOVE ACTUATOR COVER WHILE CIRCUITS ARE LIVE!

CAUTION: It is imperative for reducing the chance of electrical shock, and to prevent ignition of hazardous atmospheres that you

Disconnect power
before any maintenance or repairs are performed.

Series 92 actuators are virtually maintenance free. We do however, recommend that periodic checks are made to ensure that all fasteners are tight and properly torqued to extend the life of the actuator and valve.

Series 92 Actuators are manufactured with factory lubricated grease in the gear case and gearbox. In most cases, this lubricant should never have to be replenished, however if deemed necessary, we recommend using Aeroshell Grease #33MS, mfg. by Shell Oil Co.

Consult our technical department before replenishing lubricant.

For outdoor or wet locations keep top and bottom seals coated with a silicone based grease.

Spare Parts **Reference Drawing #289S92**

We recommend that the following be kept on hand as spare parts.

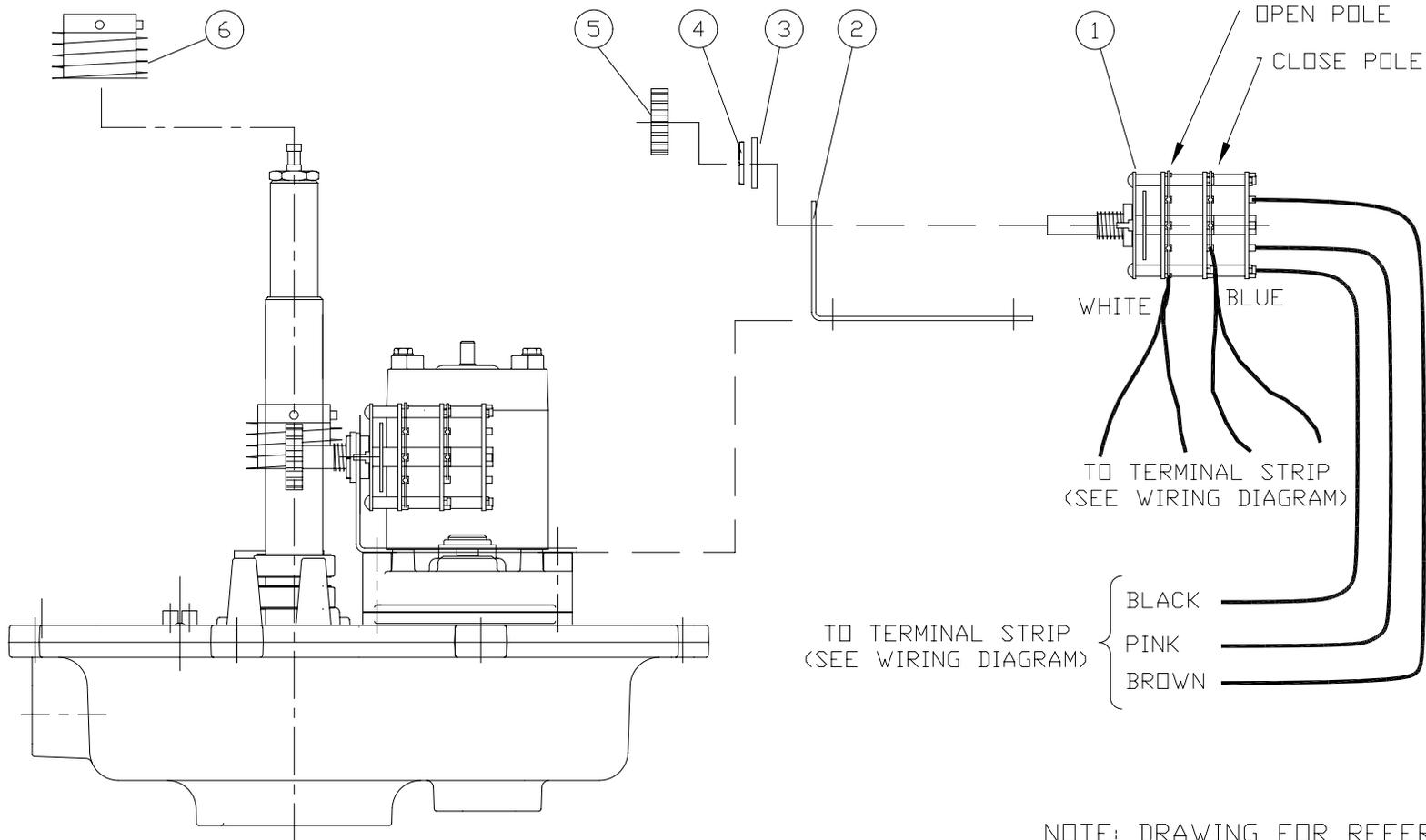
- 1 --- Limit Switch (Part #25)
- 1 --- Capacitor (Part #27 or #28)

NOTE: When ordering replacement motor parts and/or options specify model # and voltage.

Attachments:

5 drawings: 0054DI, 0015GT, 0025EL, 0008A92, 289S92

ITEM	DESCRIPTION
1	MULTI-TURN SWITCH
2	MULTI-TURN MTG BRACKET
3	WASHER
4	NUT
5	WORM
6	WORM GEAR



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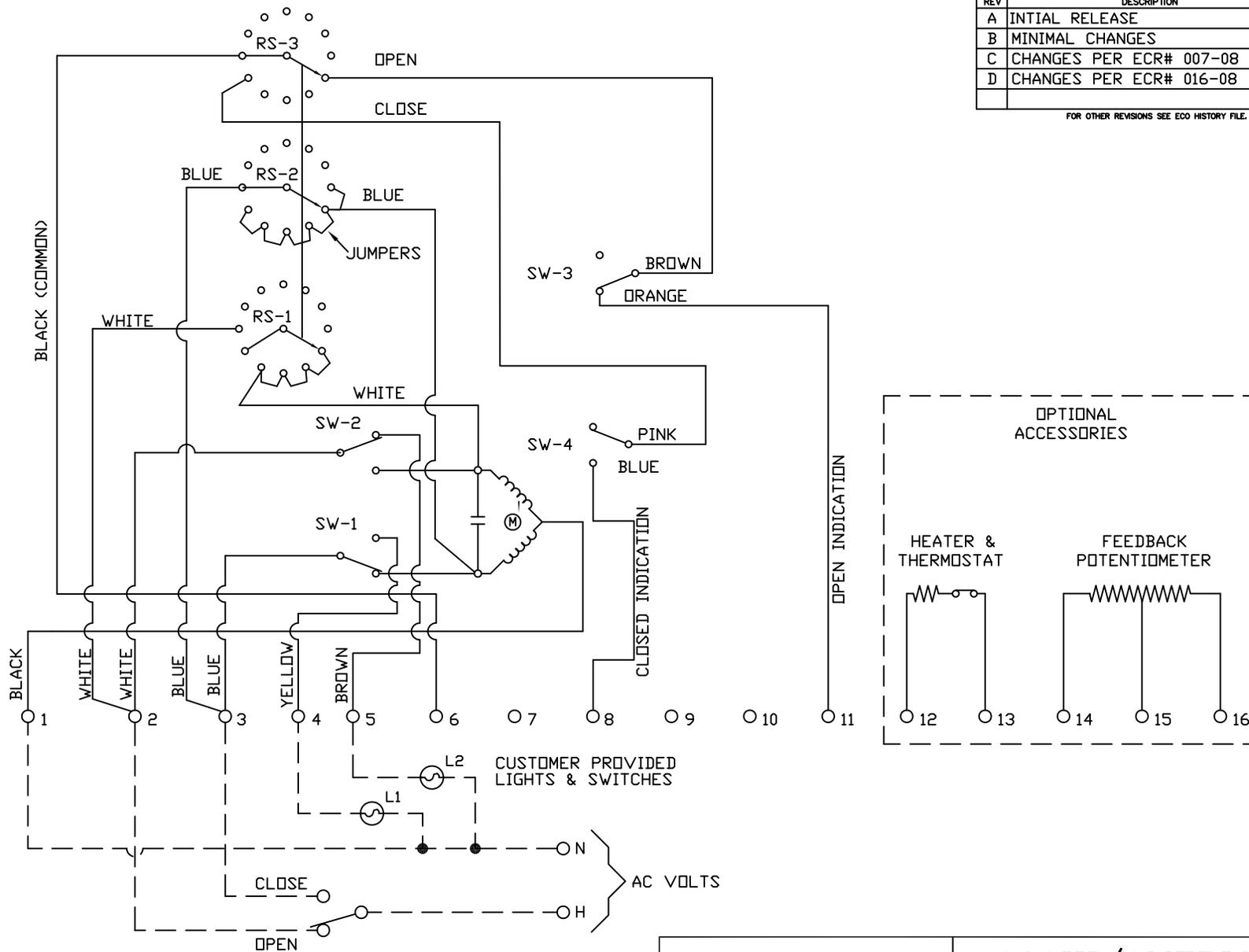
SERIES 92
WITH THREE PLATES
MULTI-TURN SWITCH

	NAME	DATE
DR	KENICHI MIYAZAKI	10/25/01
APPD	DAVE HURLEY	10/25/01
PROD	LED LESTER	10/25/01
WO#/SO#		
FILE ACT\ACT92		

SIZE	A	DWG. NO.	0008A92	REV	A
SCALE	NTS		SHEET 1		OF 1

REV	DESCRIPTION	DFTG	CHK	DATE
A	INITIAL RELEASE	---	---	---
B	MINIMAL CHANGES	JJG	DH/LL	3/21/07
C	CHANGES PER ECR# 007-08	JJG	KB	4/2/08
D	CHANGES PER ECR# 016-08	JJG	KB	8/28/08

FOR OTHER REVISIONS SEE ECO HISTORY FILE.



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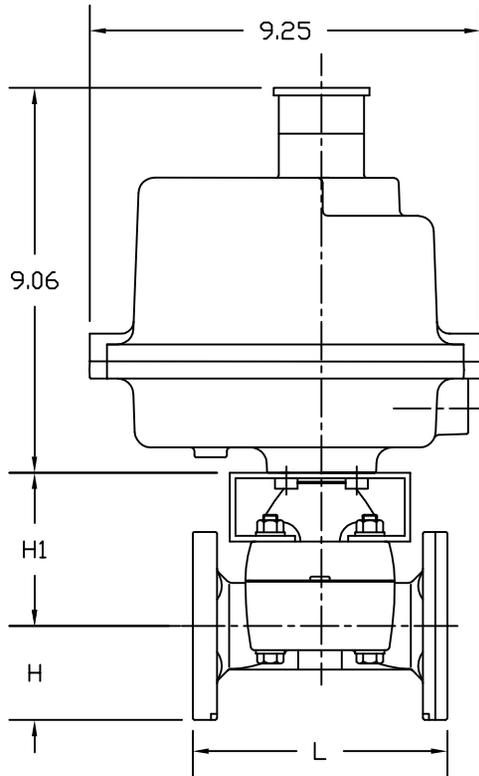
	NAME	DATE
DR	JOHN GLASSFORD	3/21/07
APPD	DAVE HURLEY	3/21/07
PROD	LED LESTER	3/21/07
WO#/CO#		
FILE		

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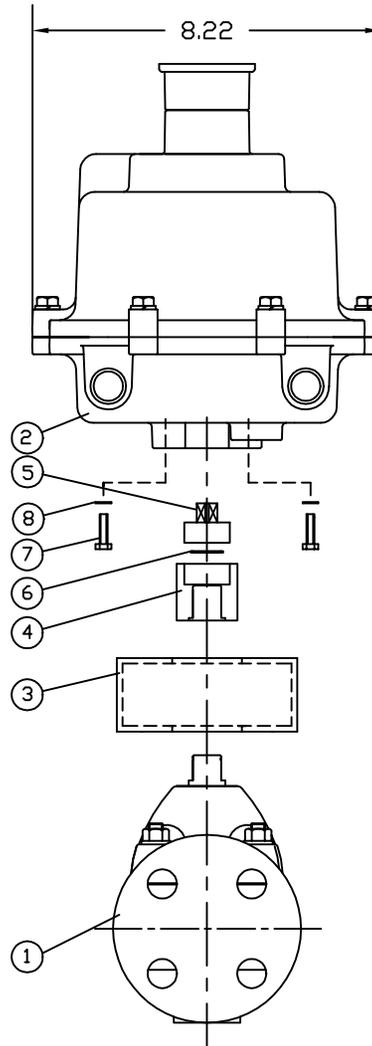
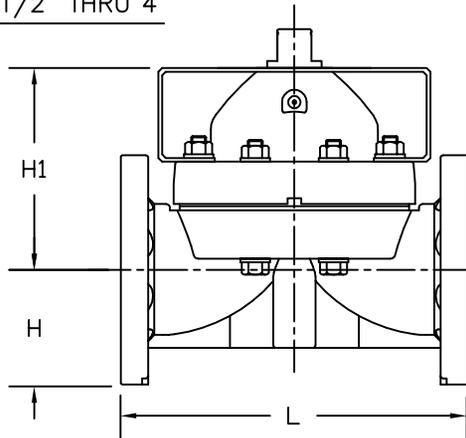
**SERIES 92 WIRING DIAGRAM
 MULTITURN 2XLS H&T
 FEEDBACK POT**

SIZE	DWG. NO.	REV
A	0025EL	D
SCALE	SHEET 1 OF 1	
NTS		

1/2" THRU. 2"



2-1/2" THRU 4"



UNIT: INCH									
VALVE SIZE	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
H	1.75	1.94	2.13	2.31	2.50	3.00	3.50	3.75	4.50
H1	3.55	3.61	3.77	5.94	6.50	7.02	9.52	10.25	11.00
L	4.25	5.88	5.88	6.38	6.94	7.94	9.84	10.38	12.94

NOTE; 1) THE SHAPE AND APPEARANCE OF ASSEMBLY DIFFER A LITTLE WITH NOMINAL SIZE COMPARED TO THIS DRAWING.

2) FOR DETAILED VALVE DIMENSIONS, REFER TO DWG. NO. 0055DI (1/2" THRU 3") REFER TO DWG. NO. 0060DI (2-1/2" THRU 4")

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8	FLAT WASHER (M8.0)	STAINLESS STEEL 303	4
7	BOLT (M8.0x1.25-16LG)	STAINLESS STEEL 303	4
6	RETAINING RING-C TYPE	STAINLESS STEEL 304	1
5	COUPLING (B)	STAINLESS STEEL 303	1
4	COUPLING (A)	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	STAINLESS STEEL 303	1
2	ACTUATOR SERIES 92	POWDER COATED ALUMINUM	1
1	DIAPHRAGM VALVE	PVC, CPVC, PP, PVDF	1
ITEM	DESCRIPTION	MATERIAL	QTY

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	NAME	DATE
DR	KENICHI MIYAZAKI	9/14/04
APPD	DAVE HURLEY	9/15/04
PROD	LEO LESTER	9/15/04
WO#/SO#		
FILE		

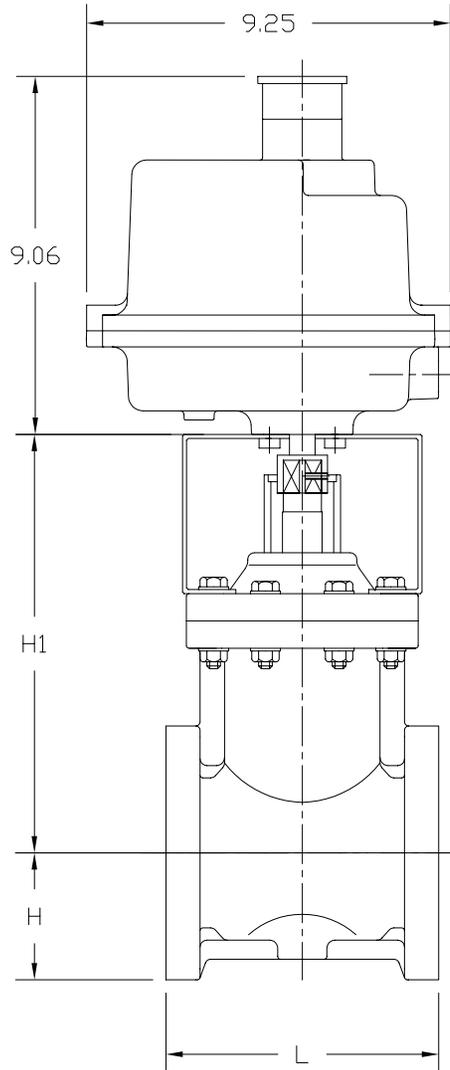
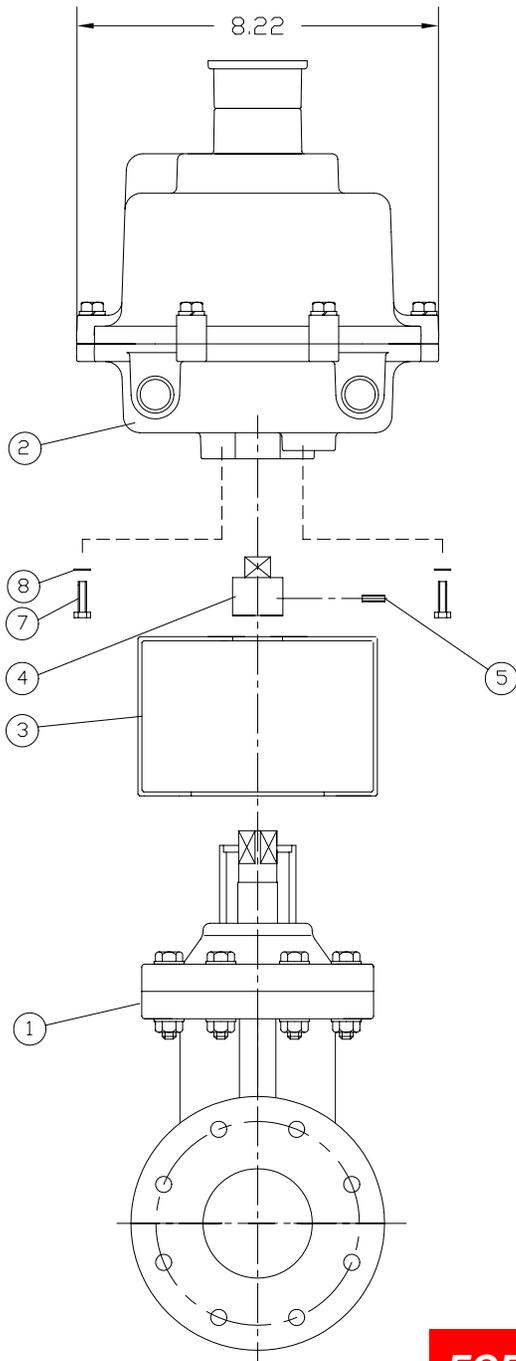
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DIAPHRAGM VALVE TYPE14
SERIES94 ELECTRIC ACTUATOR
1/2" THRU. 4"

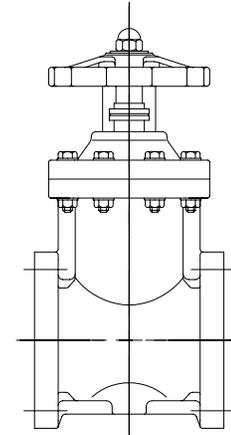
SIZE	A	DWG. NO.	0054DI	REV	B
SCALE	NTS		SHEET 1 OF 1		



UNIT: INCH

VALVE SIZE	1-1/2"	2"	3"
H	2.50	3.00	3.75
H1	9.00	10.46	14.06
L	6.50	7.01	7.99

NOTE. The shape and appearance of assembly differ a little with nominal size compared to this drawing.



ORIGINAL GATE VALVE

7	BOLT (M8.0x1.25-16LG)	STAINLESS STEEL 303	4
6	FLAT WASHER (M8.0)	STAINLESS STEEL 303	4
5	SET SCREW	STAINLESS STEEL 303	1
4	COUPLING	STAINLESS STEEL 303	1
3	MOUNTING BRACKET	STAINLESS STEEL 303	1
2	ACTUATOR SERIES 92	POWER COATED ALUMINUM	1
1	GATE VALVE	PVC	1
ITEM	DESCRIPTION	MATERIAL	QTY

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GATE VALVE
SERIES92 ELECTRIC ACTUATOR
1-1/2" THRU. 3"

	NAME	DATE
DR	KENICHI MIYAZAKI	10/1/01
APPD	DAVE HURLEY	10/1/01
PROD	LED LESTER	10/1/01
WO#/SO#		
FILE		

SIZE	A	DWG. NO.	0015GT	REV	A
SCALE	NTS		SHEET 1 OF 1		

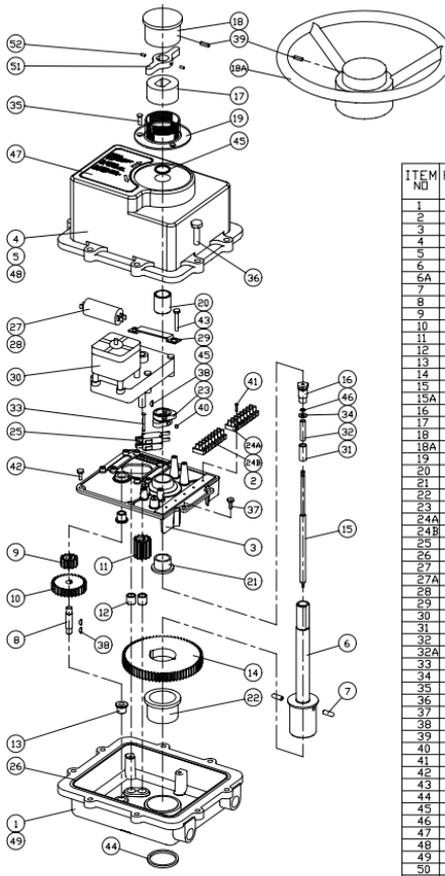
SERIES 92

PARTS LIST & MATERIALS OF CONSTRUCTION

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S92= 400 IN*LBS
A92= 700 IN*LBS
B92= 1100 IN*LBS
C92=2000 IN*LBS

ITEM NO	PART NO	QUANTITY			DESCRIPTION	
		S92	A92	B92		C92
1	7401920	1	1	1	1	BASE
2	7401440	1	1	1	1	WIRING HARNESS - 4 PCS
3	7401060	1	1	1	1	BASE PLATE
4	7401940	1	1	1	1	COVER
5	7401925	1	1	1	1	WIRING DIAGRAM LABEL
6	7401900	1	1	1	1	SHAFT MAIN
6A	7401905	-	-	-	-	SHAFT MAIN
7	7401360	2	2	2	2	PIN
8	7401280	-	-	-	-	SHAFT STUB
9	7402003	-	-	-	-	SPUR GEAR 1A
10	7402002	-	-	-	-	SPUR GEAR 1A
11	7401400	1	1	1	1	GEAR PINION
12	7401540	1	1	1	1	BEARING PINION
13	7402006	-	-	-	-	BEARING FL - SPUR GEAR
14	7401380	1	1	1	1	GEAR MAIN
15	7401200	1	1	1	1	SHAFT INNER
15A	7401210	-	-	-	-	SHAFT INNER
16	7401180	1	1	1	1	SHAFT RETAINER
17	7401300	1	1	1	1	KNOB LOWER
18	7401320	1	1	1	1	KNOB UPPER
18A	7401995	-	-	-	-	HANDWHEEL
19	7401260	1	1	1	1	COLLAR
20	7401120	1	1	1	1	BEARING UPPER COVER
21	7401080	1	1	1	1	BASE PLATE BEARING
22	7401020	1	1	1	1	BASE BEARING
23	7401480	2	2	2	2	CAM
24A	7401420	2	2	2	2	TERMINAL BLOCK 1-B
24B	7401425	2	2	2	2	TERMINAL BLOCK 9-16
25	7401460	2	2	2	2	SWITCH ACTUATOR
26	7401560	1	1	1	1	O-RING BASE/COVER
27	7401948	1	1	1	1	CAPACITOR 4.2 MFD
27A	7402004	-	-	-	-	CAPACITOR 6.7 MFD
28	7403008	-	-	-	-	CAPACITOR 7.6 MFD
29	7401520	1	1	1	1	CLAMP CAPACITOR
30	7401340	1	1	1	1	MOTOR
31	7401250	1	1	1	1	SHELL
32	7401220	1	1	1	1	SPRING
32A	7401230	-	-	-	-	SPRING
33	7401620	2	2	2	2	SCREW ROUND HD. 4-40 x 100 LG
34	7401240	1	1	1	1	WASHER, FLAT #10 6.450 x .06 THK
35	7401680	3	3	3	3	SCREW FLAT HD. 8-32 x .25 LG. SS.
36	7401640	8	8	8	8	SCREW HEX HD. 5/16-18 x 1.00 LG. SS.
37	7401521	1	1	1	1	SCREW SELF TAP (GREEN) #10 x .50 LG.
38	7401880	1	1	3	5	KEY WOODRUF 3/32
39	7401700	1	1	1	1	SCREW SLOT SET 8-32 x .50 LG. SS.
40	7401740	4	4	4	4	SCREW SET 8-32 x .12 LG.
41	7401600	4	4	4	4	BASE NAMEPLATE
42	7401660	5	5	5	5	SCREW SELF TAP SLOT/HEX #10 x .50 LG.
43	7401720	4	4	4	4	SCREW SLOT/HEX 10-32 x 1.62 LG.
44	7401040	1	1	1	1	SEAL BASE
45	7401140	1	1	1	1	SEAL COVER
46	7401580	1	1	1	1	O-RING SHAFT
47	7401950	1	1	1	1	DIVERIDE LABEL
48	7401960	1	1	1	1	COVER NAMEPLATE
49	7401970	1	1	1	1	BASE NAMEPLATE
50	7401430	1	1	1	1	CAPACITOR HARNESS- 2 PCS
51	7401485	-	-	-	-	HANDWHEEL CAM
52	8100179	-	-	-	-	CAM SCREW SET 1/4-20 x .750 LG.



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SERIES 92 EXPLODED VIEW

NAME	DATE
DR A.SELEZNEV	2/17/98
CHK DAVE HURLEY	2/17/98
APPD LEO LESTER	2/17/98
PATH \ACAD11\S92	
DO NOT SCALE DRAWING	

SIZE	DWG. NO.	REV
A	289S92	3
SCALE	SHEET 1 OF 1	
NTS		