Fact Sheet

INDUCTROL Voltage Regulator

INDUCTROL®

Voltage Regulator

CPO 97.09F

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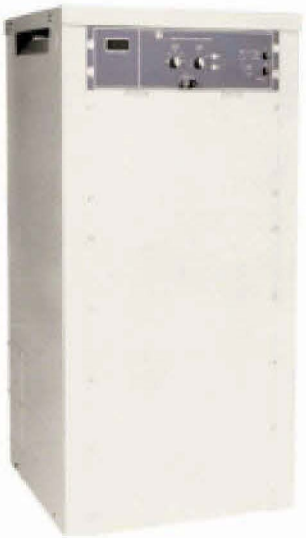
Are voltage ups & downs costing you money?

GE INDUCTROL® voltage regulators can eliminate irregularities



VOLTAGE ups and downs may be costing you thousands of dollars. Fluctuating voltage is the constant enemy of electrical and electronic equipment. It can reduce operating efficiency, increase maintenance costs, damage expensive electronics and cost you plenty in the process.

All electrical equipment is designed to operate at a specific voltage. Unfortunately, input voltage does not always remain constant. While you can operate most electrical equipment over a wide range of input voltage, you do so at the sacrifice of life, economy or optimum performance — or all three. Modern electrical equipment is much more sensitive to voltage variations than electrical equipment of the past, and therefore more vulnerable to damage.

GE INDUCTROL® voltage regulators supply a constant voltage tailored to your equipment. They actually sense inadequate or excessive voltage and quickly make uninterrupted corrections automatically. No need to calculate impedance between source bus and the INDUCTROL — the INDUCTROL maintains the voltage to the load.

The Inside Story

INDUCTROL voltage regulators are designed to perform either of two basic functions on electric circuits (or a combination of both):

- Maintain an output voltage or current at ± 1% despite variations in the supply voltage or the connected load.
- Provide a widely adjustable output voltage or current from an essentially constant supply.

The design is simple and reliable. Essentially, the INDUCTROL voltage regulator is a variable ratio auto-transformer consisting of laminated steel rotor and stator. The construction is similar to that of an electric motor except that the rotor rotates only 180 mechanical and electrical degrees. The rotor contains the exciting (or shunt) winding and the stator has the regulating or series winding. In operation, the automatic control circuit monitors the output voltage, senses any need for voltage correction and actuates a reversible electric motor which drives the regulator rotor. As the position of the rotor winding changes, the flux linkages between windings change to increase or decrease the magnitude of the voltage induced in the series winding, thus adding to or subtracting from the supply voltage and producing a precisely controlled output voltage. The voltage correction is obtained solely by transformer action by varying the degree of mutual coupling between the shunt and series windings of the regulator. There are no sliding contacts or brushes.

You get outstanding performance

- *Trouble-free operation* - because there are no brushes or sliding contacts, very little maintenance is required.
- *Fast, accurate response* - with automatic control the INDUCTROL starts correction in 2 cycles and completes within one second for the usual 2% change in line voltage. Unlike step voltage regulators, the dynamic voltage regulation on the INDUCTROL maintains the voltage within ± 1% of the pre-selected value at all times.
- *No wave form distortion* - unlike impedance changing regulators, no harmful wave distortion is induced. Problems with sensitive electronic equipment are therefore eliminated.
- *Rugged construction* - the INDUCTROL voltage regulator can take up to 100% overload for one hour with ±10% units rated through 225 circuit kVA. It has a short circuit capability of 15 times rated current for 2 seconds.
- *High power factor*- since it is a variable transformer, the INDUCTROL voltage regulator has almost no effect on the system power factor. This results in a substantial cost reduction.
- *Efficient performance* - INDUCTROL voltage regulators are highly efficient. Typical efficiencies exceed 99% at full load and are maintained at relatively high values even at reduced loads.

INDUCTROL voltage regulators pay for themselves

No matter what the application, variations in voltage can cause considerable loss of time and money. By reducing unnecessary downtime and costs, GE INDUCTROL regulators can actually pay for themselves.

What's more, alternative methods for solving poor voltage problems are usually more expensive than INDUCTROL regulators. Contact your local GE Sales Engineer. He or she will welcome the opportunity to review your problem and help you solve it.

How to spot a voltage fluctuation and what to do about it

You can't see fluctuating voltage, but you can easily recognize the results. Look for these danger signals - they are a dead giveaway to voltage irregularity:

Lighting

Problem: Dim lights or fast lamp burn-out; fluorescent lamps slow to start; high pressure sodium and mercury lights go out.

Cause: Under-voltage cuts light output, reduces lamp efficiency. Over-voltage sharply cuts lamp life, increases power costs, lamp replacement costs soar, ballasts or transformers may be damaged.

Solution: GE INDUCTROL regulator maintains voltage to within ±1% of pre-selected output.

Computers

Problem: Incorrect information, lost data resulting in downtime to restore inputs. PC boards and other electrical components burn out due to high voltage.

Cause: Fluctuating voltage.

Solution: GE INDUCTROL voltage regulator maintains constant output voltage without generating radio interference.

Medical Equipment

Problem: X-ray, MRI, CAT Scan, and other diagnostic monitoring equipment malfunctions or behaves erratically. Problem cannot be traced to failure of the equipment.

Cause: Fluctuating voltage hits and runs, often leaving no visible evidence. Technicians may waste hours looking for the cause within the equipment.

Solution: GE INDUCTROL voltage regulator prevents costly downtime during critical or emergency situations by supplying correct voltage under varying loads and source voltage.

Communication Equipment

Problem: Power output of the transmitter decreases when voltage decreases, causing poor reception. Also, costly printed circuit boards burn out due to excessive voltage.

Cause: Variations in input voltages result in corresponding variations in output power levels.

Solution: GE INDUCTROL voltage regulators can provide either a substantially constant output from a variable supply or a variable output from a relatively constant supply.

Long Feeder Runs

Problem: Expensive over-bussing or over-cabling is required to compensate for voltage drop on low-voltage distribution feeders.

Cause: Expensive voltage drop on long feeders.

Solution: Combine INDUCTROL regulators with load-rated conductors to save money.

Electrical Seam Welding and Plating

Problem: High rejection rate on welded products due to inadequate heat during welding.

Cause: Variations in voltage.

Solution: GE INDUCTROL voltage regulator maintains voltage levels necessary to provide sufficient heat.

Motors

Problem: Insulation breaks down when reduced starting torque results from inadequate voltage.

Cause: Under-voltage causes overheating; over-voltage decreases power factor.

Solution: GE INDUCTROL voltage regulator increases motor life and reduces maintenance.

Resistance Heating & Infrared Ovens

Problem: High rejection rate results from either too much heat (which causes blistering) or too little heat (which causes sticky surfaces).

Cause: Varying in-plant load demands.

Solution: GE INDUCTROL regulator permits production of correct amounts of heat under varying loads.

These are only a few of the most common applications for GE INDUCTROL voltage regulators; the list is practically endless. Wherever there is electrically-operated equipment, voltage ups and downs can cause problems. Here are some of the other types of equipment that GE regulators can help operate more effectively:

Electronic Appliances

- carrier telephone equipment
- d-c power supplies
- electronic precipitators
- ground-support equipment
- power supplies
- radar equipment
- radio transmitters
- sonar
- spectrographs
- television transmitters
- medical equipment

Commercial Applications

- blueprinting
- film processing
- office machinery
- photoengraving
- power distribution in buildings
- air renewal and A/C systems
- refrigerating chambers

Industrial Applications

- anodizing and plating
- automotive parts
- battery-plate forming
- capacitor charging
- carton sealing equipment
- cement manufacturing
- corona detection
- electric hoist
- manufacturing and testing
- electrochemical processes
- glass products
- high-voltage power supplies
- induction heaters
- in-plant power distribution
- machine-tool control
- materials-handling equipment
- metalworking machinery
- motor testing
- pumps
- fans
- compressor manufacturing
- printing-press devices
- radiant heaters
- switchboard panel and control manufacturing
- test equipment
- textile processes
- vacuum equipment
- welding
- wire enameling
- wood products

INDUCTROL voltage regulators pay for themselves - No matter what the application, variations in voltage can cause considerable loss of time and money. By reducing unnecessary downtime and costs, GE INDUCTROL regulators can actually pay for themselves.

What's more, alternative methods for solving poor voltage problems are usually more expensive than INDUCTROL regulators.

Contact your local GE Sales representative today. He or she will welcome the opportunity to review your problem and help you solve it.

PSC
Parts Super Center

1223 FAIRGROVE CHURCH ROAD
CONOVER, NORTH CAROLINA 28613

Telephone	(828) 466-7824
Fax	(828) 466-5441
Toll Free (US only)	(800) 500-0662

Ordering Information for automatic INDUCTROL Voltage Regulators

Standard Design, Single-Phase, Dry-Type, TYPE AIRS (60 Hertz)

10% Raise and Lower

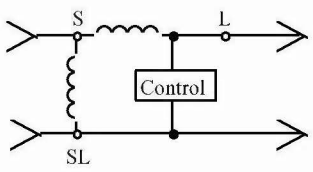
Circuit			Approx. Dimensions in Inches			Approx. Wt. in Lb.	
KVA	Amps	Cat. No.	Height	Width	Depth	Net	Ship
120 VOLTS, 2-WIRE (Connection Sketch 1)							
8.5	71	31D6500A+	21	25	28	160	210
15	125	31D6501A+	21	25	28	160	210
25	208	31D6502A	21	25	28	160	210
50	416	31D6503A	21	25	28	230	280
75	625	31D6504A	21	25	28	300	350
100	832	31D6505A	53	25	28	530	580
150	1250	31D6506A	53	25	28	670	720
225	1875	31D6507A	53	25	28	950	1000
240 VOLTS, 2-WIRE (Connection Sketch 1)							
8.5	35.5	31D6510A+	21	25	28	160	210
15	62.5	31D6511A+	21	25	28	160	210
25	104	31D6512A	21	25	28	160	210
50	208	31D6513A	21	25	28	230	280
75	312	31D6514A	21	25	28	300	350
100	416	31D6515A	48	25	28	530	580
150	625	31D6516A	48	25	28	670	720
225	937	31D6517A	53	25	28	950	1000
120/240 VOLTS, 3-WIRE (Connection Sketch 2)							
8.5	35.5	31D6520A+	21	25	28	160	210
15	62.5	31D6521A+	21	25	28	160	210
25	104	31D6522A	21	25	28	160	210
50	208	31D6523A	21	25	28	230	280
75	312	31D6524A	21	25	28	300	350
100	416	31D6525A	48	25	28	550	600
150	625	31D6526A	48	25	28	690	740
225	937	31D6527A	53	25	28	950	1000
480 VOLTS, 2-WIRE (Connection Sketch 1)							
8.5	17.7	31D6530A+	21	25	28	160	210
15	31.2	31D6531A+	21	25	28	160	210
25	52	31D6532A	21	25	28	160	210
50	104	31D6533A	21	25	28	230	280
75	156	31D6534A	21	25	28	300	350
100	208	31D6535A	48	25	28	550	600
150	312	31D6536A	48	25	28	690	740
225	468	31D6537A	48	25	28	950	1000

+ This unit can operate at either 50 or 60 Hertz.

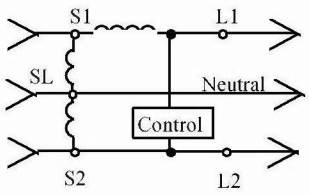
Standard Design, Single-Phase, Dry-Type, TYPE AIRS (60 Hertz)
20 % Raise and Lower

Circuit			Approx. Dimensions in Inches			Approx. Wt. in Lb.	
KVA	Amps	Cat. No.	Height	Width	Depth	Net	Ship
120 VOLTS, 2-WIRE (Connection Sketch 1)							
4.25	35.5	31D6600A+	21	25	28	160	210
7.50	62.5	31D6601A+	21	25	28	160	210
12.5	104	31D6602A	21	25	28	160	210
25.0	208	31D6603A	21	25	28	230	280
37.5	312	31D6604A	21	25	28	300	350
50.0	416	31D6605A	48	25	28	530	580
75.0	625	31D6606A	48	25	28	670	720
112.5	937	31D6607A	53	25	28	950	1000
240 VOLTS, 2-WIRE (Connection Sketch 1)							
4.25	17.7	31D6610A	21	25	28	160	210
7.50	31.2	31D6611A	21	25	28	160	210
12.5	52	31D6612A	21	25	28	160	210
25.0	104	31D6613A	21	25	28	230	280
37.5	156	31D6614A	21	25	28	300	350
50.0	208	31D6615A	48	25	28	550	580
75.0	312	31D6616A	48	25	28	690	720
112.5	468	31D6617A	48	25	28	950	1000
480 VOLTS, 2-WIRE (Connection Sketch 1)							
4.25	8.9	31D6630A+	21	25	28	160	210
7.50	15.6	31D6631A+	21	25	28	160	210
12.5	26	31D6632A	21	25	28	160	210
25.0	52	31D6633A	21	25	28	230	280
37.5	78	31D6634A	21	25	28	300	350
50.0	104	31D6635A	48	25	28	530	580
75.0	156	31D6636A	48	25	28	670	720
112.5	234	31D6637A	48	25	28	950	1000

+ This unit can operate at either 50 or 60 Hertz.



Connection Sketch 1

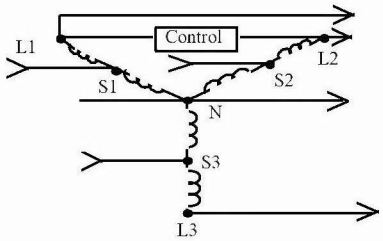


Connection Sketch 2

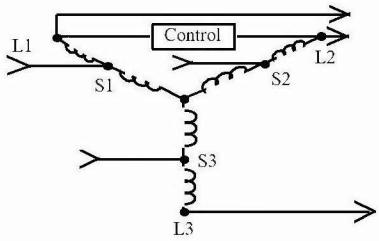
Standard Design, Three-Phase, Dry-type TYPE AIRT (60 Hertz)
10 % Raise and Lower

Circuit		Cooling AA = Self	Cat. No.	Approx. Dimensions in Inches			Approx. Wt. in Lb.	
kVA	Amps	FA = Forced		Height	Width	Depth	Net	Ship
208Y/120 VOLTS, 4-WIRE (Connection Sketch 3)								
10	27.8	AA	31D6550A+	21	25	28	160	210
15	41.6	AA	31D6551A+	21	25	28	160	210
20	55.6	AA	31D6552A	21	25	28	160	210
40	111	AA	31D6553A	21	25	28	230	280
60	167	AA	31D6554A	21	25	28	300	350
75	208	AA	31D6555A	48	25	28	520	570
150	416	AA	31D6556A	48	25	28	740	790
225	624	AA	3156557A	48	25	28	950	1000
300	832	FA	31D6801A	58	23	45	1075	1175
500	1387	FA	31D6802A	70	29	53	1900	2000
240 VOLTS, 3-WIRE (Connection Sketch 4)								
10	24	AA	31D6700A+	21	25	28	160	210
15	36	AA	31D6701A+	21	25	28	160	210
20	48	AA	31D6562A	21	25	28	160	210
40	96	AA	31D6563A	21	25	28	230	280
60	144	AA	31D6564A	21	25	28	300	350
75	180	AA	31D6540A	48	25	28	520	620
150	360	AA	31D6541A	48	25	28	740	840
225	540	AA	31D6542A	48	25	28	950	1050
300	720	FA	31D6841A	58	23	45	1075	1175
500	1200	FA	31D6842A	70	29	53	1900	2000
480Y/277, 4-WIRE (Connection Sketch 3)								
10	12	AA	31D6570A+	21	25	28	160	210
15	18	AA	31D6571A	21	25	28	160	210
20	24	AA	31D6572A	21	25	28	160	210
40	48	AA	31D6573A	21	25	28	230	280
60	72	AA	31D6574A	21	25	28	300	350
75	90	AA	31D6575A	48	25	28	520	570
150	180	AA	31D6576A	48	25	28	740	810
225	270	AA	31D6577A	48	25	28	950	1000
300	360	FA	31D6821A	58	23	45	1075	1175
500	600	FA	31D6822A	58	23	45	1165	1265
750	900	FA	31D6823A	58	23	45	1420	1520
1000	1200	FA	31D6824A	70	29	53	1900	2000

+ This unit can operate at either 50 or 60 Hertz.



Connection Diagram 3



Connection Diagram 4

Standard Design, Three-Phase, Dry-type TYPE AIRT (60 Hertz)
20 % Raise and Lower

Circuit		Cooling AA = Self	Cat. No.	Approx. Dimensions in Inches			Approx. Wt. in Lb.	
kVA	Amps	FA = Forced		Height	Width	Depth	Net	Ship
208Y/120 VOLTS, 4-WIRE (Connection Sketch 3)								
5	13.9	AA	31D6650A+	21	25	28	160	210
7.5	20.8	AA	31D6651A+	21	25	28	160	210
10	27.8	AA	31D6652A	21	25	28	160	210
20	55.6	AA	31D6653A	21	25	28	230	280
30	83.4	AA	31D6654A	21	25	28	300	350
37.5	104	AA	31D6655A	48	25	28	520	570
75	208	AA	31D6656A	48	25	28	740	790
112.5	312	AA	31D6657A	48	25	28	950	1000
150	416	FA	31D6811A	59	23	45	1075	1175
250	693	FA	31D6812A	59	23	45	1165	1265
375	1040	FA	31D6813A	70	29	53	1900	2000
500	1387	FA	31D6814A	70	29	53	2050	2150
240 VOLTS, 3-WIRE (Connection Sketch 4)								
5	12	AA	31D6706A+	21	25	28	160	210
7.5	18	AA	31D6707A+	21	25	28	160	210
10	24	AA	31D6708A	21	25	28	160	210
20	48	AA	31D6709A	21	25	28	230	280
30	72	AA	31D6710A	21	25	28	300	350
37.5	90	AA	31D6711A	48	25	28	520	620
75	180	AA	31D6712A	48	25	28	740	840
112.5	270	AA	31D6713A	48	25	28	950	1050
150	360	FA	31D6851A	58	23	45	1075	1175
250	600	FA	31D6852A	58	23	45	1165	1265
375	900	FA	31D6853A	58	23	45	1420	1520
500	1200	FA	31D6854A	70	29	53	1900	2000
480Y/277, 4-WIRE (Connection Sketch 3)								
5	6	AA	31D6670A+	21	25	28	160	210
7.5	9	AA	31D6671A+	21	25	28	160	210
10	12	AA	31D6672A	21	25	28	160	210
20	24	AA	31D6673A	21	25	28	230	280
30	36	AA	31D6674A	21	25	28	300	350
37.5	45	AA	31D6675A	48	25	28	520	570
75	90	AA	31D6676A	48	25	28	740	810
112.5	135	AA	31D6677A	48	25	28	950	1000
150	180	FA	31D6831A	58	23	45	1075	1175
250	300	FA	31D6832A	58	23	45	1165	1265
375	450	FA	31D6833A	58	23	45	1420	1520
500	600	FA	31D6834A	70	29	53	1900	2000
750	900	FA	31D6835A	70	29	53	2200	2300

+ This unit can operate at either 50 or 60 Hertz.