



Step voltage regulator

---VR-8 series



Product brochure

2014/6 revision 5

Zhejiang Farady Electric Co., Ltd.

ISO9001&ISO14001 Certificated Enterprise

General

Farady Electric Co.,Ltd VR-8 single phase step voltage regulators are tap-changing autotransformers. They regulate distribution line voltages from 10% raise (boost) to 10% lower (buck) in thirty-two steps of approximately 5/8% each. Voltage ratings are available from 2400 volts (60 kV BIL) to 34,500 volts (200 kV BIL) for 60 Hz and 50 Hz systems. Internal potential winding taps and an external ratio correction transformer are provided on all ratings so that each regulator may be applied to more than one system voltage. Smaller kVA sizes are supplied with support lugs for pole mounting and with substation or platform tie down provisions. Larger sizes are provided with substation bases with pad-mounting provisions

++++Application

VR-8 voltage regulators are designed for reliable operation and ease of maintenance and are supplied with a full array of standard features for routine applications. Optional accessories are available to accommodate special applications. It is also suitable for the energy saving projects for railway and urban grid. Farady Electric series voltage regulators are available with a full complement of standard features for routine applications, as well as a full line of optional accessories for unique applications. In addition, the regulator offers desirable features that enhance operation and service.

++++Standard Features

- SEL control box
- Tap changer with motor and power supply
- Position indicator with ADD-AMP adjustment
- Two laser-etched nameplates
- Lifting lugs
- Oil drain valve and sampling device
- Upper filter press connection
- Oil sight gauge
- Mounting provisions for shunt arresters
- High-creep bushings with clamp-type connectors
- Bolt-down provisions (overhead units)
- Pole-type mounting brackets (overhead units)
- Substation base (substation units)
- External series arrester
- Automatic pressure relief device
- Control cabinet with removable front panel
- Ratio correction transformer
- Conformally coated circuit boards
- Shunt arresters



++++optional Accessories

- Extra-length control cables
- Elevating structure
- 4-hole NEMA® H-spades
- Cooling fans
- Nameplates in alternate languages or metric units
- Internal differential potential transformer for complete reverse power flow w/metering
- SEL control accessories
- Multi-phase functionality
- Front panel overlays in alternate languages
- Serial communications interfaces:
 - RS232
 - Fiber Optic - ST
 - RS485
- Ethernet communications interfaces:
 - Fiber Optic - LC, MTRJ, ST, and SC
 - Copper - RJ45
- Communications protocols:

VR-8 OF FARADY



Technical Specification

VR-8 single-phase step voltage regulators are tap-changing autotransformers designed to automatically regulate distribution line voltages in a range of plus or minus 10% in 32 steps of approximately 5/8% each. The following ratings are available:

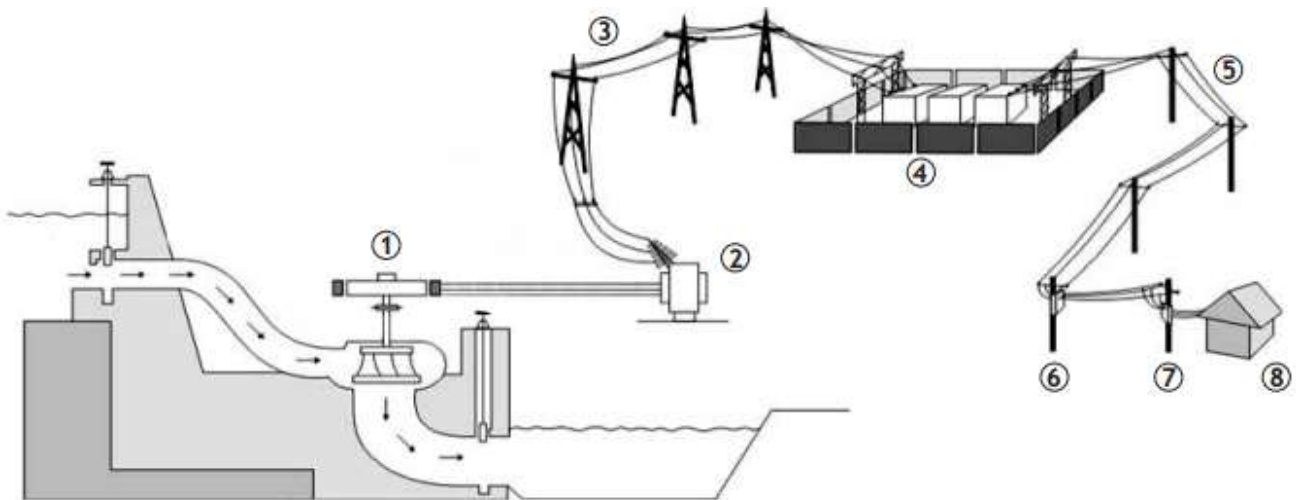
- Voltage: 2500 Volts (60 kV BIL) through 34500 Volts (200 kV BIL)
- Current: 50 through 1665 Amps
- KVA: 33 through 1000
- Frequency: 50 or 60 Hertz

Internal potential winding taps and/or an external ratio correction transformer are provided on all ratings so that each regulator may be applied within a range of system voltages.

A digital control system automatically operates the tap changer mechanism to maintain system voltage within desired limits. The control system is externally programmable to allow precise setting of control limits and provides sophisticated capabilities for special control requirements, communication, and data logging.

Overhead type voltage regulators are supplied with support brackets for pole mounting and have bolt-down provisions for pad-mounted applications. Substation type voltage regulators are provided with rectangular substation bases. Elevating platforms are available as an option.

Basic scheme of power transmission and distribution



1. Generator
2. Step-up Transformer
3. Transmission line
4. Step-down transformer
5. Distribution network
6. Monophasic Voltage regulator up to 36kV
7. Distribution Transformer

8. Consumer

++++Overall size and weight

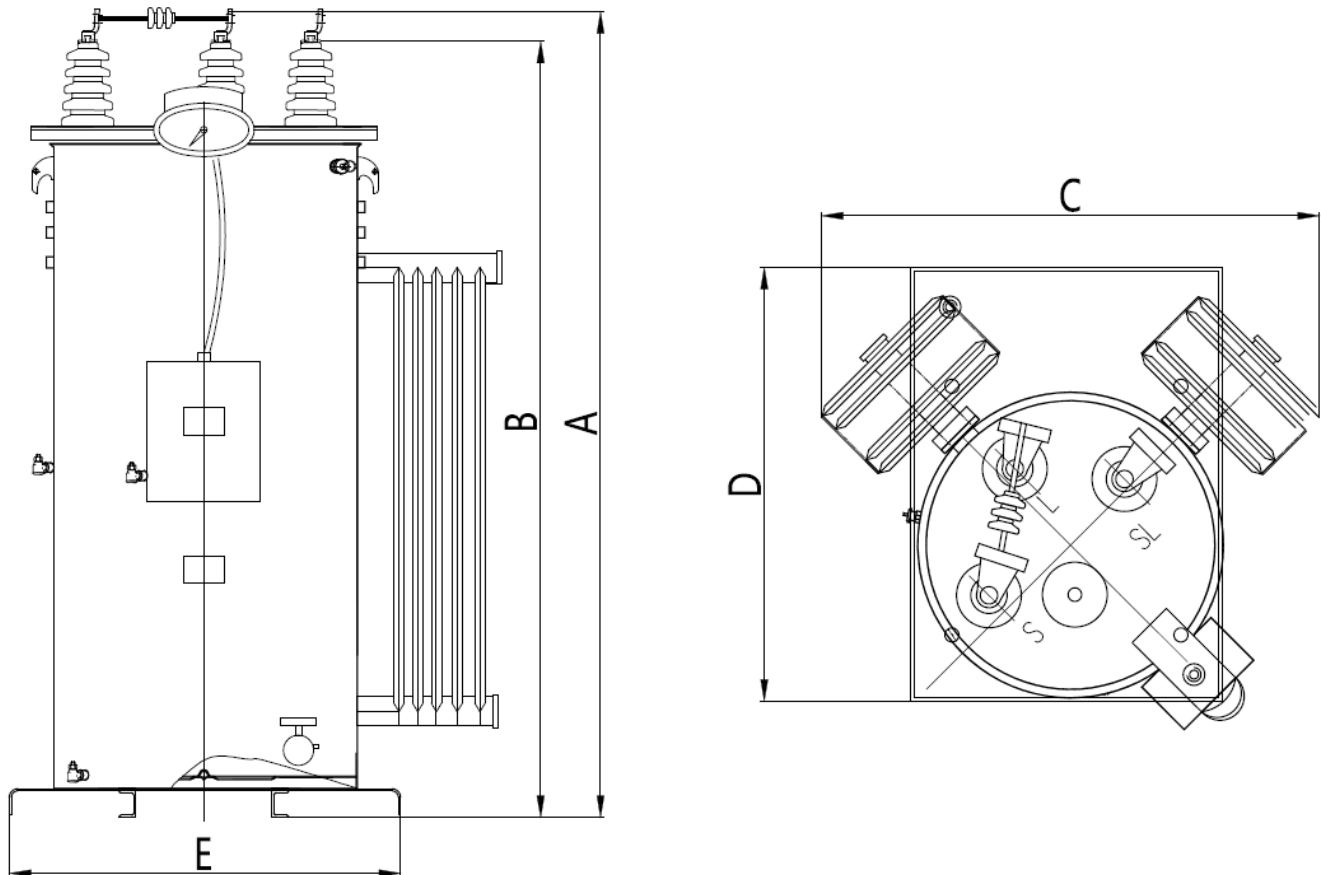


TABLE 1
Ratings and Dimensions – 50 Hz

Voltage (kV)	Load Current (Amperes)	kVA	Dimensions(mm)					Oil (Liters)	Untanking Weight (kgs.)	Total Weight (kgs.)
			A	B	C	D	E			
6.6	50	33	1893	1716	800	965	508	217	341	609
	100	66	1892	1715	813	965	508	231	341	609
	150	99	1892	1755	853	995	508	250	380	700
	200	132	1975	1818	915	1232	559	303	445	860
95kV BIL	300	198	2070	1908	988	1333	611	500	678	1200
	400	264	2170	1958	1008	1353	680	550	870	1450
	500	330	2270	1958	1008	1353	750	620	1000	1780
	600	396	2270	1990	1220	1450	800	980	1200	2150
11.0	50	55	1994	1817	694	890	508	208	389	661
	100	110	1993	1818	864	1194	559	275	432	816
	150	165	2043	1869	1193	1161	610	370	560	1080
	200	220	2073	1920	1003	1320	635	360	649	1211

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	300	330	2370	2208	998	1633	711	674	1007	1964
	400	440	2624	2462	1081	1784	838	1060	1059	2545
	500	550	2724	2562	1081	1784	838	1060	1200	2670
	600	660	2824	2580	1081	1784	838	1060	1300	2800
15.0 150kV BIL	50	75	1900	1769	1007	1010	610	344	500	875
	100	150	2068	1869	1107	1110	610	344	573	1007
	150	225	2145	1971	1163	1278	660	479	707	1334
	200	300	2371	2209	1095	1445	711	555	910	1800
	300	450	2472	2310	1022	1701	762	791	1191	2252
	400	600	2700	2539	1275	1786	838	1098	1434	2904
	500	750	2750	2600	1275	1786	900	1098	1560	3200
22.0 150kV BIL	50	110	2093	1920	927	1270	635	371	455	945
	100	220	2174	2031	1005	1405	711	550	783	1494
	150	330	2326	2183	1075	1467	737	659	1005	1873
	200	440	2396	2234	1036	1704	762	765	1223	2243
	300	660	2675	2414	1330	1848	889	1213	1566	3086
33.0 200kV BIL	50	165	2895	2754	799	1294	761	757	1080	1957
	100	330	3100	2947	1003	1585	965	1480	1638	3249
	150	495	3142	2981	1285	1839	965	1567	1765	3616
	200	660	3264	3086	1166	1921	965	1648	1835	3915

TABLE 2
Ratings and Dimensions – 60 Hz

Voltage (kV)	Load Current (Amperes)	kVA	A (inch)	B (inch)	C (inch)	D (inch)	E (inch)	Oil (L)	Untanking WGT(LBS)	WGT (LBS)
7.62	50	38	75	68	24	38	20	220	800	1450
	100	76	75	68	25	38	20	225	820	1650
	150	114	80	75	32	45	22	250	850	1750
95kV BIL	219	167	82	78	36	49	22	305	980	1890
	328	250	86	80	40	61	27	511	1580	3250
	438	333	96	90	42	63	29	731	1988	3887
	546	416	106	100	44	67	29	855	2222	4730
13.8 110kV BIL	50	69	80	72	28	35	20	220	860	1450
	100	138	80	72	28	47	22	275	950	1800
	150	207	82	76	40	52	25	360	1450	2665
	200	276	95	87	40	65	28	680	2200	4320
	300	414	105	98	43	72	33	1100	2350	5700
	400	552	110	105	47	72	38	1500	2900	7500

Voltage (kV)	Load Current (Amperes)	kVA	A (inch)	B (inch)	C (inch)	D (inch)	E (inch)	Oil (L)	Untanking WGT(LBS)	WGT (LBS)
14.4	50	72	75	68	27	49	22	265	860	1680
	100	144	82	74	44	45	24	350	1280	2250
	200	288	95	87	45	57	28	555	2000	4000
150kV BIL	300	432	98	91	46	67	30	800	2650	5000
	400	576	110	100	51	71	33	1150	3165	6400
19.92 200kV BIL	50	100	85	76	37	50	25	400	1000	2100
	100	200	88	80	40	56	28	580	1800	3300
	167	333	92	86	43	58	29	680	2200	4120
	200	400	95	88	42	67	30	800	2700	5000
	335	667	106	95	53	73	35	1300	3500	6800
34.5 200kV BIL	50	165	122	108	32	51	30	757	1080	2000
	100	330	125	112	39	63	40	1480	1638	3350
	150	495	128	118	51	73	40	1567	1765	3760
	200	660	130	121	46	76	40	1648	1835	4100

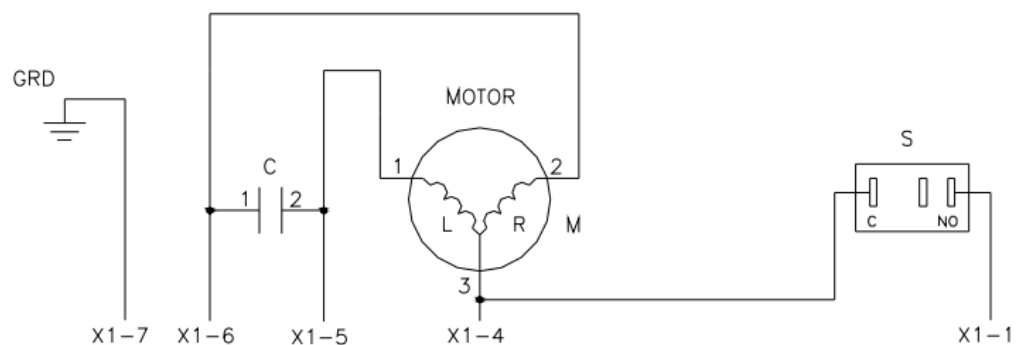
Tap changer

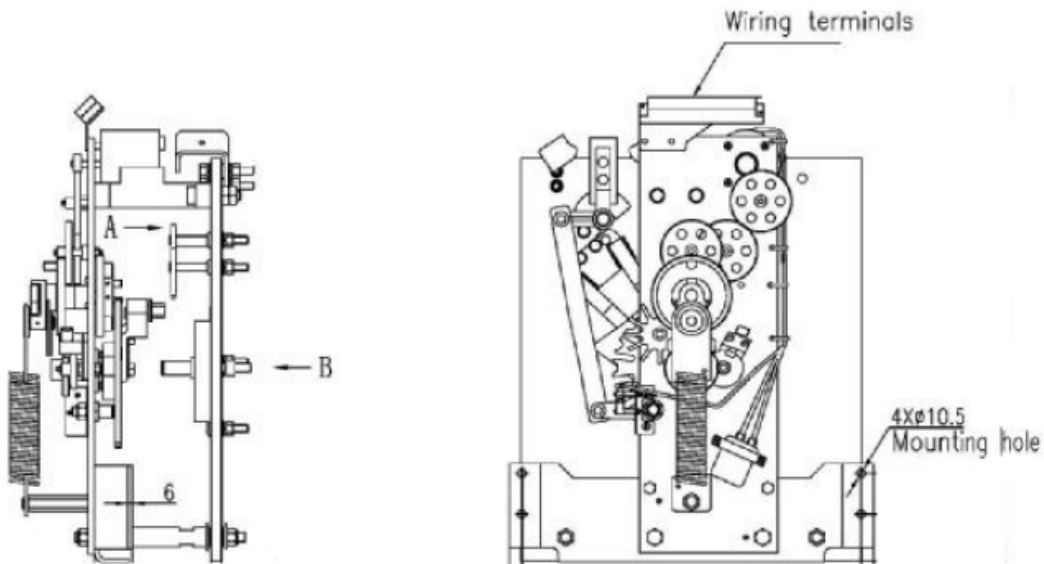


+++Operation conditions

- a) The LTC shall operate in oil with temperature ranging from -25 °C to 100 °C.
- b) The LTC should be stored in air with ambient temperature within [-25 °C, 40 °C].
- c) The LTC should be mounted on voltage regulator with perpendicularity not less than 5%.
- d) No sever dust and explosive & corrosive gas in field.

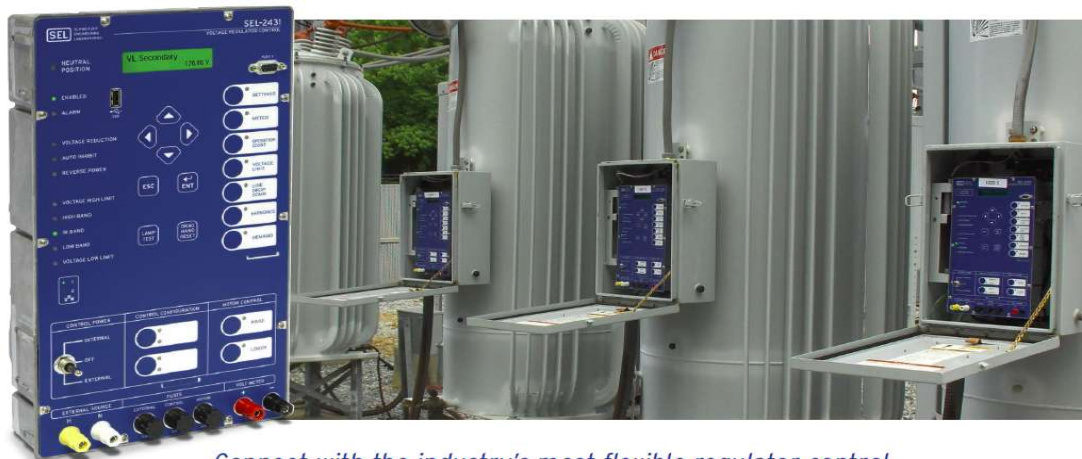
+++control circuit diagram





Controller box (Option 1)

VR-8 series step voltage regulator use Schweitzer Engineering Laboratories ,Inc(SEL) universal controller box model number SEL-2431



Connect with the industry's most flexible regulator control.

Features and Benefits

Built-In Reliability, Ten-Year Warranty

Reduce maintenance and repair costs with a voltage regulator control designed and tested to relay standards. Mounted in a rugged, castaluminum housing, the SEL-2431 Voltage Regulator Control includes the SEL worldwide, ten-year, no-questions-asked warranty.

Plug-In Voltage Regulator Compatibility

Quickly upgrade existing voltage regulator controls without removing the regulator from service. The SEL-2431 mounts directly into existing control cabinets for Cooper, GE, Howard Industries, and

Siemens 32-step, single-phase voltage regulators.

Advanced Tap-Position Tracking

Know your tap position with the SEL-2431. The SEL-2431 monitors and records motor current and lets you quickly review and analyze tap-change waveform reports for better visibility into the condition of your voltage regulator.

Easy Application Settings

Accelerate installation and commissioning with application-specific settings. Regulate voltage while applying advanced metering and event recording capabilities with fewer

VR-8 SINGLE PHASE VOLTAGE REGULATOR

than 20 settings.

Simple and Flexible Communications

Quickly integrate the SEL-2431 into Ethernet or serial communications networks with DNP3, SEL, and synchrophasor protocols. Both the serial and Ethernet ports are available with copper and fiber-optic connection options.

Connect and Retrieve Data Quickly

With a USB flash drive, you can conveniently

transfer settings, upgrade firmware, retrieve data, and expand onboard storage capacity. The data that can be retrieved through this interface include event reports, tap-change history, load profile data, and Sequential Events Recorder (SER) data.

General Specification:

Operating temperature -40-+85

power supply 120VAC,

range 88-132VAC,

Burden less than 35VA,

Interruption less than 50ms at 120VAC per IEC60255-11

120VAC whetting source

Range 88-132 VAC,

Rated Current 6A(motor fuse) 120VAC

auxiliary output source Range 11-14vdc,

output power 6w at 12vdc

Metering Accuracy:load current+_ 0.3%+-500uA(0.001-2.000A)and 0.5 degree (0.020-2.000A)

harmonics(2nd-15th) current:+-5% of

fundamental(0.02-0.64A) voltage +10.3% and

+/-0.5 degree (80-145vac) Synchrophasor

Accuracy

Maximun data rate in messages per second

IEEE C37.118 protocol 60(nominal 60hz

system) or 50(nominal 50hz system)

IEEE C37.118 accuracy Level 1 at maximum

message rate when frequency-based phasor

compensation is enabled

Nominal current 450mA,

Current range 45 to 540mA

Frequency range+_ 5hz of nominal(50-60Hz)

voltage range 80-145V(voltage range is limited

by power supply ratings)

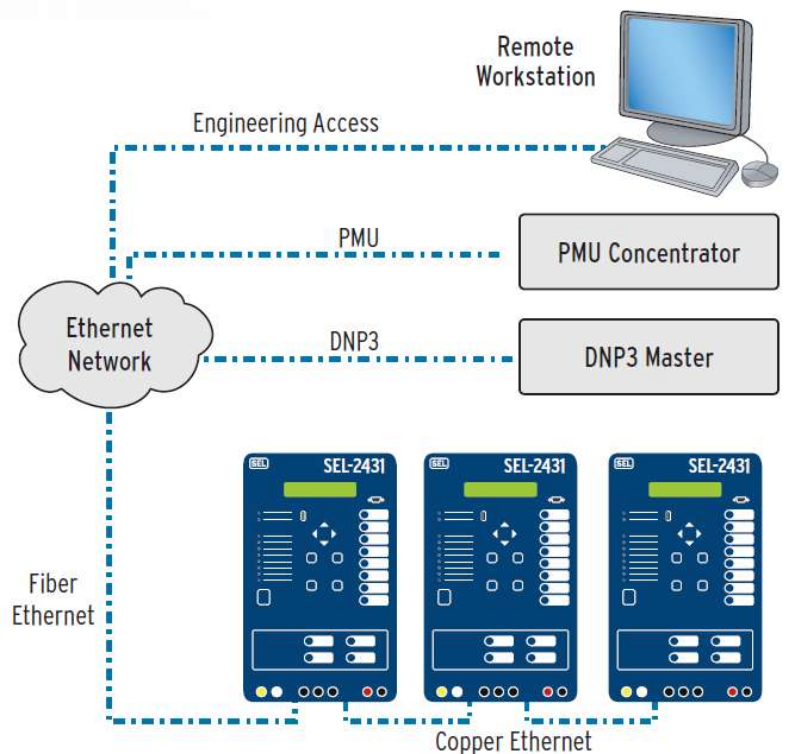
phase angle range-180 to 180 degree

VR-8 series step voltage regulator use

Schweitzer Engineering Laboratories ,Inc(SEL)

universal controller box model number

SEL-2431



Flexible Communications Options

Simply network connections in the field

Simplify Network Connections in the Field Quickly integrate the SEL-2431 into Ethernet or serial communications networks with DNP3, SEL, and synchrophasor protocols. The SEL-2431 comes standard with a copper or fiber serial communications card of your choice in Port 1. Port 2 may be populated with another serial communications card or with a dual Ethernet communications card. Ethernet port options include copper and/or fiber. The dual Ethernet card provides the functionality of an unmanaged Ethernet switch, so you can connect a series of SEL-2431 Voltage Regulator Controls in a daisy-chain configuration. No local Ethernet switch is required.

Creating the perfect voltage profile

Apply the SEL-2431 to your single-phase voltage regulators to optimize your voltage profile—now and in the future. After initial construction, feeder load growth causes drastic, unplanned voltage deviations. Single-phase voltage regulators installed at the midpoint or cascaded throughout the feeder can dynamically flatten the voltage profile.

Stay Connected to Your System, Even Without a Network

Use the SEL-2431 to capture event reports, load profile, tap history, and other system parameters; then use a USB flash drive to retrieve the data.

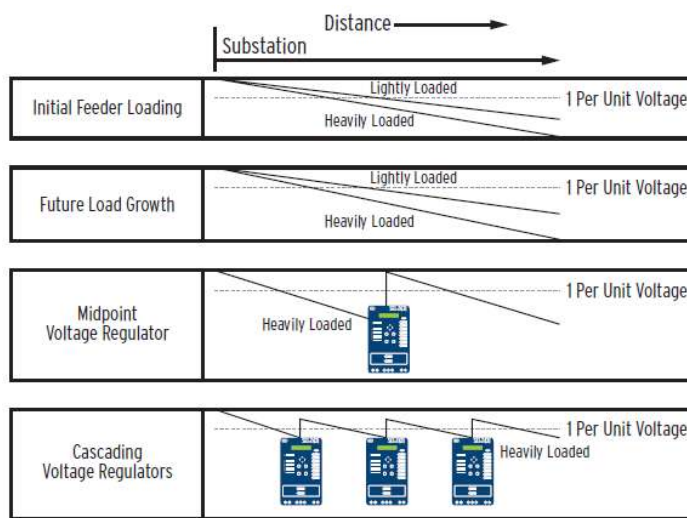
Event reports and load profile capture valuable data about the events on your system, while tap history,

motor current oscillography , and SER contain valuable data about the state of

your voltage regulator. Together, these data enable you to stay connected for troubleshooting, analysis, and planning

Available Retrofit Kits

Replace existing voltage regulator controls with the SEL-2431 direct replacement mounting and wiring kits. These kits provide all the parts needed to easily replace existing controls with the SEL-2431.

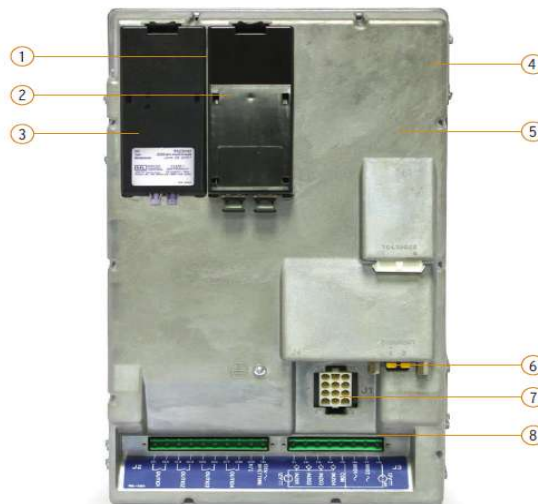
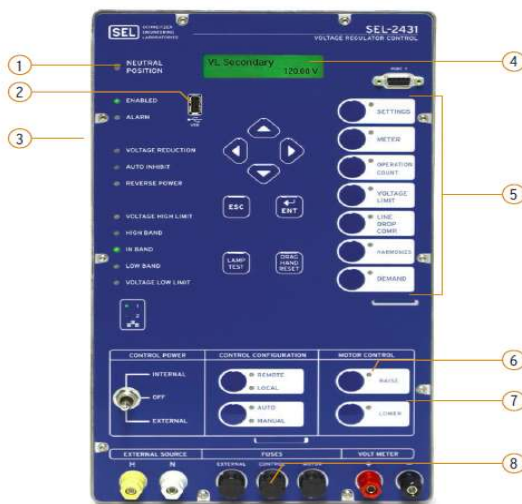
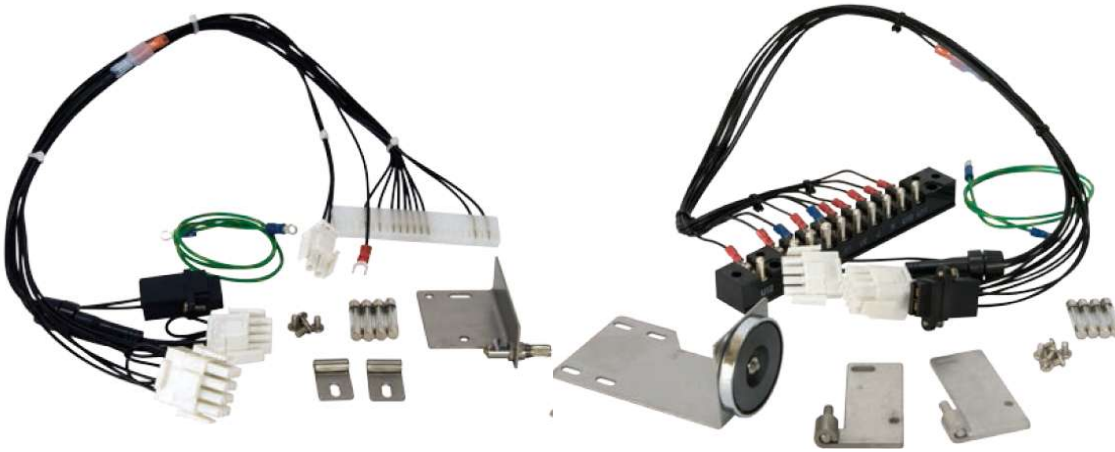


Apply voltage regulators to level your voltage profile.

Direct Replacement Mounting/ Wiring Kit	Part Number
Siemens/Allis-Chalmers: 10-position polarized disconnect switch (PDS) interface	9253002
Howard Industries: 10-position connector terminal strip (CTS) interface	9253003
Cooper/McGraw-Edison: 18/10-position fanning strip (traditional interface)	9253004
Cooper: 20-position connector (dead-front interface)	9253005
GE: fork-terminal connections	9253006

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(traditional interface to cabinet NN terminals)	
GE: 24-position connector (power disconnect interface)	9253007



- ① Neutral-position indication
- ② USB flash drive port
- ③ Comprehensive metering: instantaneous, energy, demand/peak demand, maximum/minimum, harmonics
- ④ Easily navigable menu structure

- ⑤ Configurable operator pushbuttons and LEDs
- ⑥ LEDs indicate running motor
- ⑦ Traditional toggle switch or pushbutton motor control
- ⑧ Fuses for external power, control, and motor

- ① One standard and one optional communications port, i.e., EIA-485, EIA-232, and fiber-optic interface (available with ASCII, SEL ASCII, Compressed ASCII, Fast Meter, Fast Operate, and Serial DNP3 protocols)
- ② Optional dual Ethernet communications on Port 2/E
- ③ Port 1 includes IRIG-B time synchronization

- ④ Fits into any existing single-phase voltage regulator control cabinet
- ⑤ Rugged cast-aluminum housing
- ⑥ Built-in Connectorized® CT shorting system
- ⑦ Quick disconnects for all terminations
- ⑧ Six digital inputs and four digital outputs

Controller box (Option 2)



ICMI UVR-1

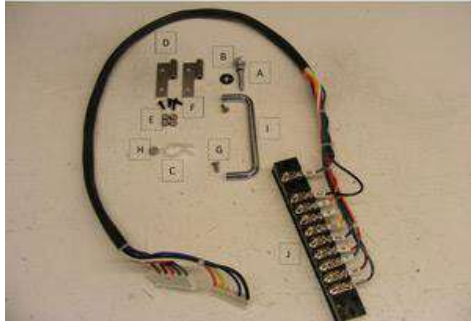
ICMI regulator controller have over 40 years ICMI has set the standard for technology and reliability in control technology for the utility industry.

1. Simple, intuitive, controls for voltage regulators, LTC transformers and reclosers
2. Flexible communication options integrate the controls to SCADA/DMS systems for remote control monitoring, volt/VAR optimization and distributed generation
3. Low cost of ownership delivered with industry leading warranties, a software based design approach and outstanding customer service and technical support

- DNP3 Subset Definition Level 2 Slave Device with Report By Exception
- Integrates seamlessly to SCADA/DMS Systems
- Multiple power flow modes and voltage reduction methods
- Locked Forward, Locked Reverse, Idle Reverse, Neutral Reverse, Bi-directional, Bi-directional with Tap to Neutral and Co-generation
- Ideal fit for centralized and distributed volt/VAR optimization
- Protocol Port – serial EIA-232, EIA-485 and daughter board selectable
- Hardened EIA-485 daughter board
- Fiber-optic daughter board
- Wi-Fi/Ethernet fiber-optic daughter board
- 5 or 8 port XIO interface boards
- Supports multi-drop and loop configurations
- Comprehensive data logging & metering
- Tapchanger contact wear log with alerts
- Tap timeout feature to prevent voltage runaway
- Quick programming via front panel or the included UVR-1 Configuration Utility
- Battery backup available
- Compatible with any single and multi-phase step voltage regulators including Type “A” regulators without load side PT’s
- Rail and Harness Kits: GE (SM3,NN Strip), Siemens (IJ,SJ,MJ-XL,MJ-4), Cooper (CL1-5, CL6) and Howard Industries

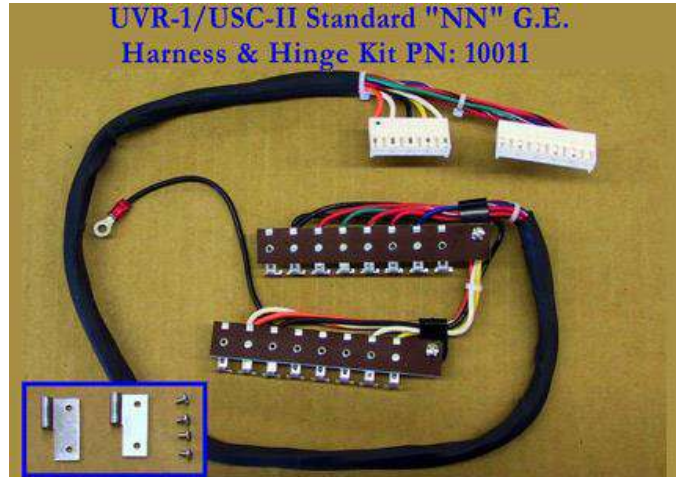
UVR-1 Regulator Control Rail and Harness Kit Details

ICMI UVR-1/USC-II HOWARD HINGE KIT (PN: 11004)

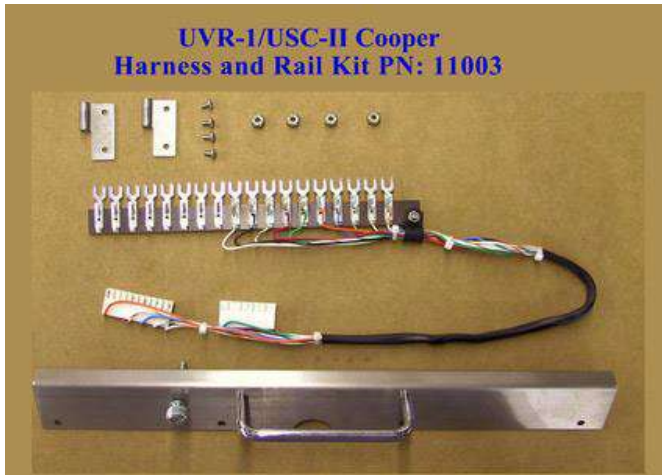


- A. Latch Thumb Screw
- B. Latch Screw Retainer
- C. Cable Clamp
- D. Howard Hinges (2)
- E. #6-32x5/16 Lock Nuts (4)
- F. #6-32 Allen Screws (4)
- G. #8-32 Philips Screw (2)
- H. #10-32 Nylon Nut
- I. Chrome Handle
- J. Howard Harness With PDS Block

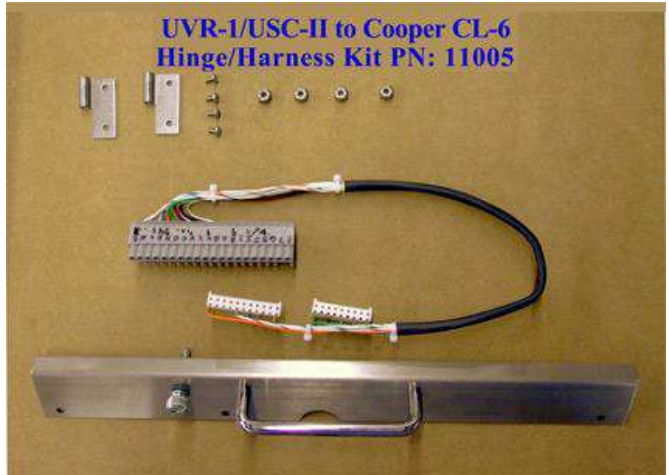
UVR-1/USC-II Standard "NN" G.E. Harness & Hinge Kit PN: 10011



UVR-1/USC-II Cooper Harness and Rail Kit PN: 11003



UVR-1/USC-II to Cooper CL-6 Hinge/Harness Kit PN: 11005



UVR-1/USC-II Siemens Rail and Harness kit PN: 11002



UVR-1/USC-II Siemens Rail and Harness kit PN: 11002



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