

STEP VOLTAGE REGULATOR



Comprehensive solutions
from design to delivery



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INTRODUCTION



The step type voltage regulator takes an incoming voltage that will change with load settings and maintains a constant output voltage. The voltage will drop as the loading rises along the distribution feeder. This voltage drop decreases the amount of power used by the lighting portion of the load. By increasing the voltage to this lighting load, more power is used up. They control distribution line voltages from 10% increase (boost) to 10% lower (buck) in thirty-two steps of approximately 5/8% each. The 5/8% step voltage is now a typical industry standard. There is a full range from 2400 volts (60 kV BIL) to 34,500 volts (200 kV BIL) for 60 Hz and 50 Hz system voltages and current uses. These voltage regulators can be used in more than one system voltage due to internal potential winding taps and an external ratio correction transformer on all ratings. Smaller kVA sizes are provided with support lugs for pole mounting and with substation or platform tie down provisions. Larger sizes are delivered with substation bases with pad-mounting provisions. Static controls and the microprocessor based control panels keep voltage within desired limits.



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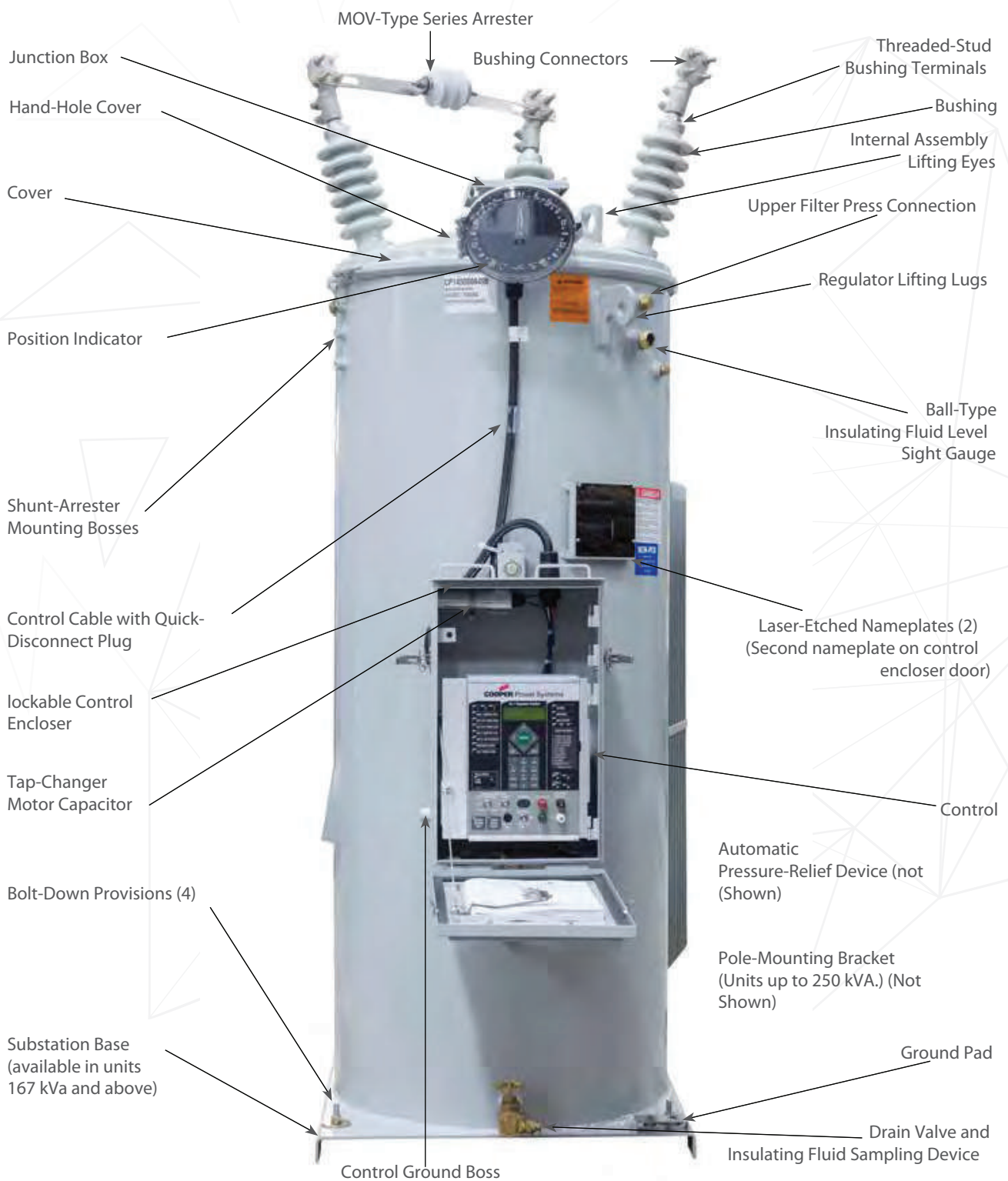


Figure 1. External features on the VR-32 volta ge regula tor.



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STANDARD FEATURES

01. Stainless steel tank construction that provides zero corrosion.
02. Sealed tank with pressure relief device for gases to escape during tap changes.
03. External MOV-type bypass arrester that allows higher protection to the regulator series winding from surge and system transients.
04. Oil sight gauge to check oil levels and oil conditions without de-energizing the regulator.
05. Motor capacitor installed in the control cabinet which gives replacement without bypassing and taking the regulator out of service.
06. Polarized disconnect switch (PDS) facilitates quick control installation or change out without taking the regulator out of service.
07. Cover mounted terminal block gives easier access to wiring without going under oil to change tap connections.

OPTIONAL FEATURES

01. Shunt arresters
02. Extra-length control cables
03. Elevating structure
04. 4-hole NEMA® H-spades
05. Cooling fans
06. Nameplates in alternate languages or metric units
07. Internal differential potential transformer for complete reverse power flow with metering
08. Controller accessories
09. Multi-phase functionality
10. Front panel overlays in alternate languages
11. Serial communications interfaces:
 - RS232
 - Fiber Optic - ST
 - RS485
12. Ethernet communications interfaces:
 - Fiber Optic - LC, MTRJ, ST, and SC
 - Copper - RJ45
13. Communications protocols:
 - DNP
 - IEC 61850 – IEC 60870-5 – 2179 – MODBUS
15. 13.5 Vdc radio power supply
16. 13A-Hr control power battery backup
17. 48/125 Vdc substation battery power
18. 240 V external source



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CONTROLLER

EMCO EE-402 Features:

1. Independent Raise / Lower settings
2. Independent Undervoltage & Overvoltage settings for cut off
3. Variable Time Delay settings
4. LED indications for Raise, Lower, UV, OV and Time Delay Operations
5. Projection / Wall Mounting

VOLTAGE CONTROLLER

Control Unit: EE - 402



CONSTRUCTION

The step voltage regulator with step switching mechanism is an automatically-controlled, tapped, auto-transformer. It consists of a core, coil and switch assembly mounted inside a liquid-filled sealed tank. Voltage regulation is obtained by changing taps on a series or regulating winding.

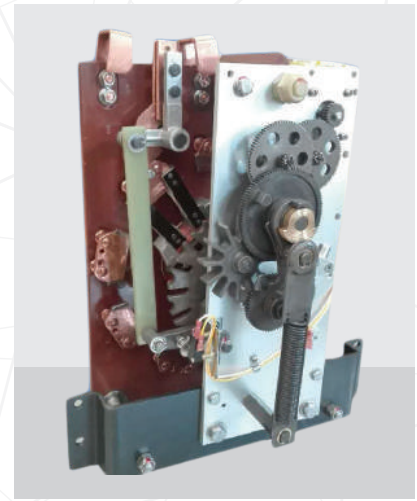
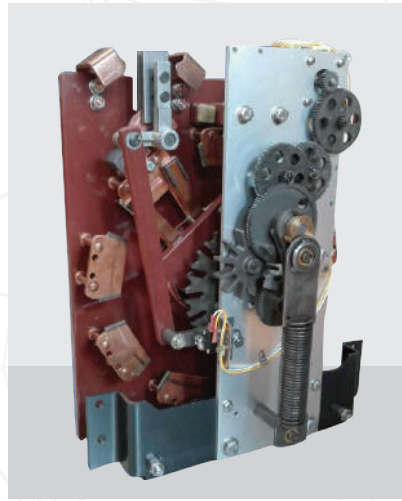
Continuity of service is guaranteed by service-proven tap-changers and core and-coil assemblies working with the control. These voltage regulators are offered with standard features for regular applications and option for accessories that provide unique applications.



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CORE AND COIL ASSEMBLY

Due to the design of the core-and-coil, tap-changer, and reactor assembly, service is very easy. The complete assembly is cover suspended for comfort of removal from the tank for inspection or maintenance. The coil assembly features an aluminum strip in the series winding that achieves the optimum in ampere turn balance for exceptional strength under through-fault conditions. The core is grain-oriented steel with a low reluctance lap joint. The rugged core clamp assembly secures the coil effectively and positions the core for the optimum in quiet operation and low core loss. With sealed-tank construction, the external oxygen supply is eliminated from the tank environment.



RELATED ACCESSORIES OF HMDK ON LOAD TAP CHANGER



Position Indicator



Flexible Shaft



Wire Harness



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HUAMING TAP CHANGER AND ACCESSORIES

Huaming's HMDK series products include: reactance on load tap changer, position indicator, flexible shaft, and wire harness. They are designed and used for the step voltage regulator which permits voltage regulation from 10 percent above to 10 percent below line voltage in (32) 5/8 percent steps.



Technical Data

Type		HMDK 200A	HMDK 300A	HMDK 640A	HMDK 640A HV
Rated current (A)		200	300	640	640
Max. rated through current (A)		300	480	668	668
Rated short-circuit withstand current (kA)	2Srsm	6	7.5	16	16
	0.8Srsm	10	12	20	20
	Peak value	15	27.12	45.2	45.2
Rated voltage (kV)		24	27.6	27.6	35
Step voltage (V)		150	172.5	172.5	219
Insulation to ground	Rated lightning impulse withstand voltage 1.2/50µs	125kV	150kV	150kV	200kV
	Rated Power frequency withstand voltage 50Hz, 1min	50kV	50kV	50kV	85kV
Number of phases		Single phase	Single phase	Single phase	Single phase
Frequency (Hz)		60Hz	60Hz	60Hz	60Hz
Max. operating positions		33	33	33	33
Mechanical life (times)		Not less than 2,000,000	Not less than 2,000,000	Not less than 2,000,000	Not less than 2,000,000
Electrical life (times)		Not less than 300,000	Not less than 180,000	Not less than 180,000	Not less than 180,000
Operating temperature		-30°C~90°C	-30°C~90°C	-30°C~90°C	-30°C~90°C
Drying temperature		120°C~125°C	120°C~125°C	120°C~125°C	120°C~125°C
Time interval between operations		Not less than 1s	Not less than 1s	Not less than 1s	Not less than 1s
Weight (kg)		22.5	22.5	33	36
Motor parameter	Rated voltage (V)	115	115	115	115
	Nomina Output Power (W)	20	20	20	20
	Frequency (Hz)	60/50	60/50	60/50	60/50
	Current (A)	0.58	0.58	0.58	0.58



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096 96 62 83 42

www.technopowerbd.net

e-mail: technopowerbdltd@gmail.com

CORPORATE OFFICE:

Baitul Khair, 48/A-B,
Purana Paltan,
Dhaka - 1000, Bangladesh

FENI OFFICE:

Nokshi Rokeya Tower
306 S. S. K. Road,
Feni, Bangladesh

UAE OFFICE:

Techno Industrial Centre
W.L.L., P.O. Box 10098
Kingdom of Bahrain.
Cell: +97334247032



HOTLINE:

01707 08 22 44
01707 08 22 55

SALES & SERVICE:

+ 88 01714 07 83 42
+ 88 01714 07 83 43
+ 88 01714 07 83 47
+ 88 01714 07 83 48
+ 88 01714 07 83 49
+ 88 01714 07 83 50
+ 88 01714 07 83 51
+ 88 01714 07 83 52
+ 88 01714 07 83 53
+ 88 01714 07 83 54

FACTORY:

Banagram, Teghoria
South Keranigonj, Bangladesh
WIRE HOUSE
2279, Newazbagh, 13No Road
Khilgaon, Dhaka, Bangladesh

