
OPERATION AND MAINTENANCE MANUAL

Kinetics Industries

GVR

FUSELESS[†] DIODE RECTIFIER

And

RGA - REGENERATION ABSORPTION CONTROLS

GVR MODEL:	NYC ELEVATOR RATING:
<input type="checkbox"/> GVR005M22-002CUL	5kW with 2kW RGA
<input type="checkbox"/> GVR010M22-005CUL	10kW with 5kW RGA
<input type="checkbox"/> GVR015M22-005CUL	15kW with 5kW RGA
<input type="checkbox"/> GVR020M22-005CUL	20kW with 5kW RGA
<input type="checkbox"/> GVR025M22-010CUL	25kW with 10kW RGA
<input type="checkbox"/> GVR050M22-015CUL	50kW with 15kW RGA
<input type="checkbox"/> GVR075M22-020CUL	75kW with 20kW RGA
<input type="checkbox"/> GVR100M22-025CUL	100kW with 25kW RGA
<input type="checkbox"/> GVR125M22-025CUL [†]	125kW with 25kW RGA
<input type="checkbox"/> GVR150M22-030CUL [†]	150kW with 30kW RGA

([†] - The 125kW and 150kW size GVR models have individually-fused rectifier bridge diodes)

INPUT

208 VOLTS 3 PHASE
60 HERTZ

OUTPUT

230 VOLTS DC



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DESCRIPTION:

KINETICS type GVR Rectifiers use silicon power diodes, connected in a three-phase bridge configuration, to convert three-phase AC power to DC power. All Kinetics diode-type rectifiers are direct ratio units where the DC output is regulated directly by the level of the AC input voltage.

Incremental DC voltage adjustment can be achieved by manually changing taps on the rectifier power transformer while the system is de-energized. These taps (5% above and below rated input) allow the end user to correct for variations in distribution voltage present in different locations.

The dry type Rectifier Power Transformer is used to provide isolation between the input and output and to convert the incoming AC power from utility distribution voltage to that required for the correct DC output voltage.

The Kinetics GVR type rectifiers are fuse-less [†] (100kW systems and below). They are designed to withstand a "bolted fault" (direct short circuit) on the DC output without rectifier damage for the duration required for the AC Input Circuit Breaker to trip and remove the AC power from the system. These units are designed and rated for applications where short circuits on the DC output bus are common or probable and it is desired not to have to replace fuses. The Input Circuit Breaker trips in the event of a fault and, after a fault is cleared, the circuit breaker is simply reset and the unit is again operational. No tools or entry into the unit's enclosure are required to reset the unit's circuit breaker. These units are ideally suited for applications such as scrap lifting magnets, cranes, and elevators, or for operation in conditions where replacement renewal parts are probably not readily available.

Standard Kinetics GVR rectifier features includes:

- **AC molded case Circuit Breaker with through-door operator (with Lock-out Capability)**
- **Isolation, dry type, Rectifier Power Transformer**
- **Fuse-less, six pulse, full wave diode bridge rectifier [†] (100kW systems and smaller)**
- **Heavy Duty (MOV) surge suppression on both the AC & DC sides of the rectifier bridge.**
- **Power-On indication light located on system door**
- **Analog DC Voltmeter and DC Ammeter located on system door**
- **Regeneration Absorption (RGA) Controls are built into the rectifier units and the RGA resistors are mounted on top of the rectifier enclosure.**

([†] - The 125kW and 150kW size GVR models have individually-fused rectifier bridge diodes)

STANDARD PARAMETERS OF OPERATION OF TYPE GVR RECTIFIERS

- * BASIC STANDARD INPUT: 208 Volts, 3 phase, 60 Hertz
- * OTHER STANDARD INPUTS ^{††}: 240 Volts, 3 phase, 60 Hertz
480 Volts, 3 phase, 60 Hertz
- * BASIC STANDARD OUTPUT: 230 Volts DC

(^{††} - UL Standard certification for 208VAC 60Hz input only)

Table 1: GVR Comparison / Information Table

GVR Model	kW	AC Amps	DC Amps	Elec. DWG	Mech. DWG	Weight (lbs.)	Special Notes
GVR005M22-002CUL	5	14.6	21.7	A	1	220	
GVR010M22-005CUL	10	29.1	43.5	B	2	265	
GVR015M22-005CUL	15	43.7	66	B	2	280	
GVR020M22-005CUL	20	58.3	87	B	2	290	
GVR025M22-010CUL	25	72.9	108	A	3	400	
GVR050M22-015CUL	50	146	217	A	3	550	
GVR075M22-020CUL	75	218	326	A	3	700	
GVR100M22-025CUL	100	290	434	A	4	1400	
GVR125M22-025CUL	125	365	543	C	4	1600	
GVR150M22-030CUL	150	437	650	C	4	1800	

SERVICE FACTOR / RATING: TRANSFORMER & RECTIFIER

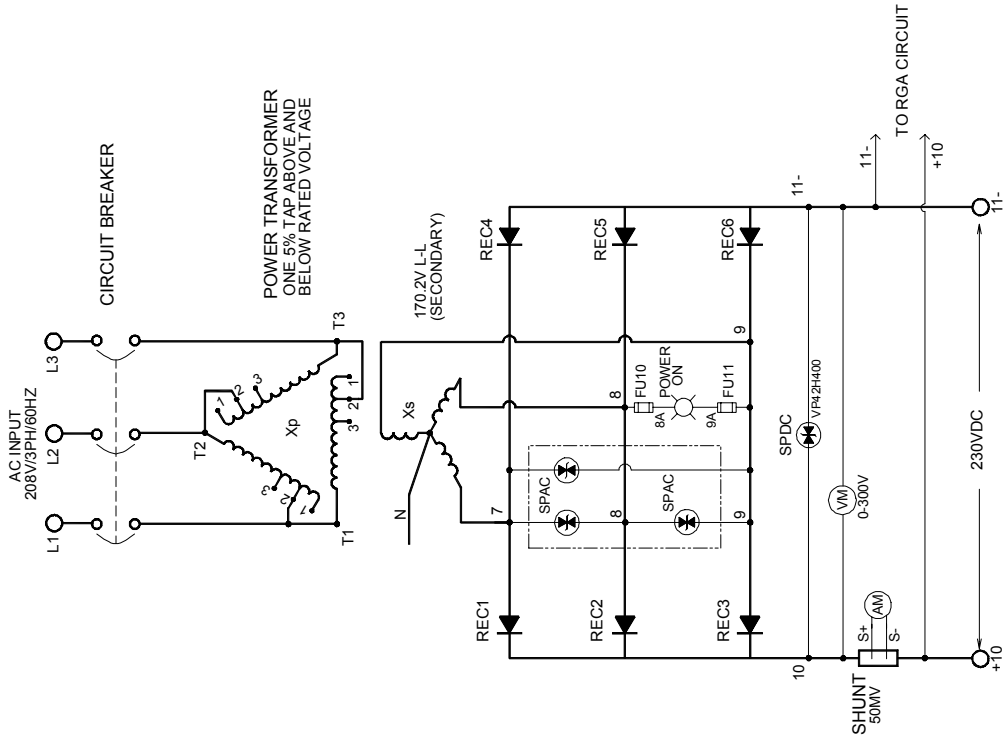
- * GVR kW Sizing indicates nameplate 1-Hour Ratings at 40°C ambient
- Continuous Duty Service Factor: 0.80 (5-20kW & 100-150kW GVRs)
0.55 (25kW-75kW GVRs)
- DC OUTPUT RIPPLE: 4.63% (rms at 100% resistive load)
- OUTPUT REGULATION: 8% (with 10% to 100% load change)
- SYSTEM EFFICIENCY: 95% or better (at 100% load)
- POWER FACTOR: 95% (at 100% load)

All GVR units have standard output connections for 230 Volts DC. An output of 230 Volts DC is obtained with a connection between the Positive and Negative outputs. The GVR Rectifier outputs are capable of operation at 100% (Full Volts) rated current, in any of the output connections. i.e. 100 kW 230VDC GVR is rated to carry a maximum of 437 Amperes – see table 1 above.

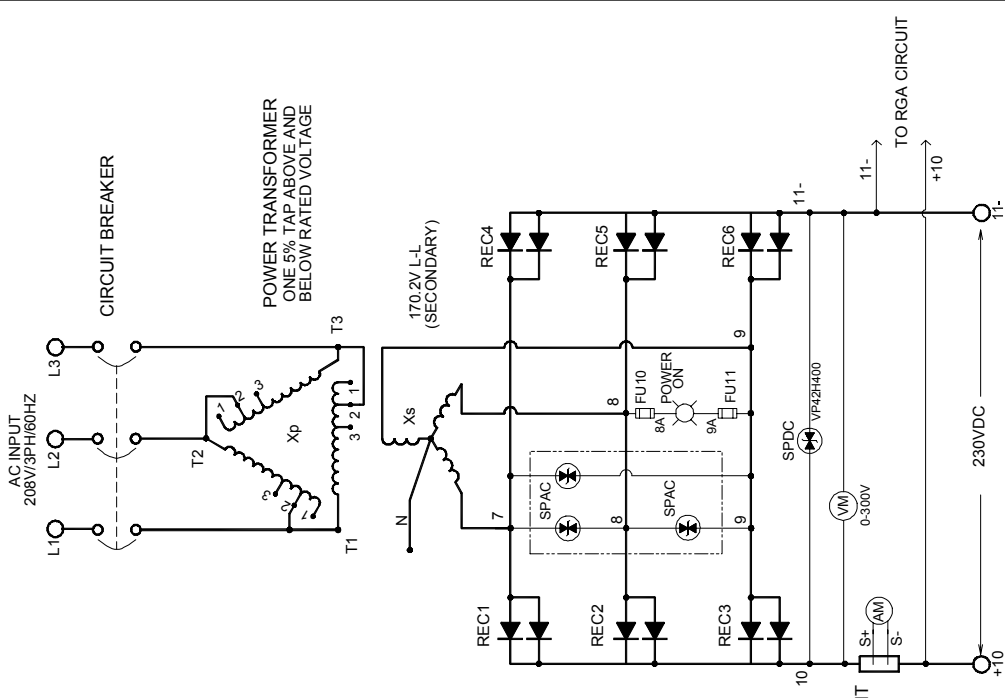
Kinetics Industries can add an *optional* (Transformer Neutral) output to the standard Positive and Negative DC output configuration. A connection made from either the Positive or Negative bridge output, to this Neutral output of the Rectifier Power Transformer will provide a ½ volts (115VDC) output. This ½ volts, half wave, 115 Volt DC, configuration gives a higher ripple voltage (approx. 43% vs 5%) on this output. This increased ripple is suitable for loads such as motors, relays, heating, lighting or other loads where higher ripple content would not affect the load.

**** CAUTION ** - Due to the higher output ripple, this optional (115 VDC) connection is not suitable for use with inverter or chopper loads such as electronically commutated DC motors or variable frequency drives.**

A



B



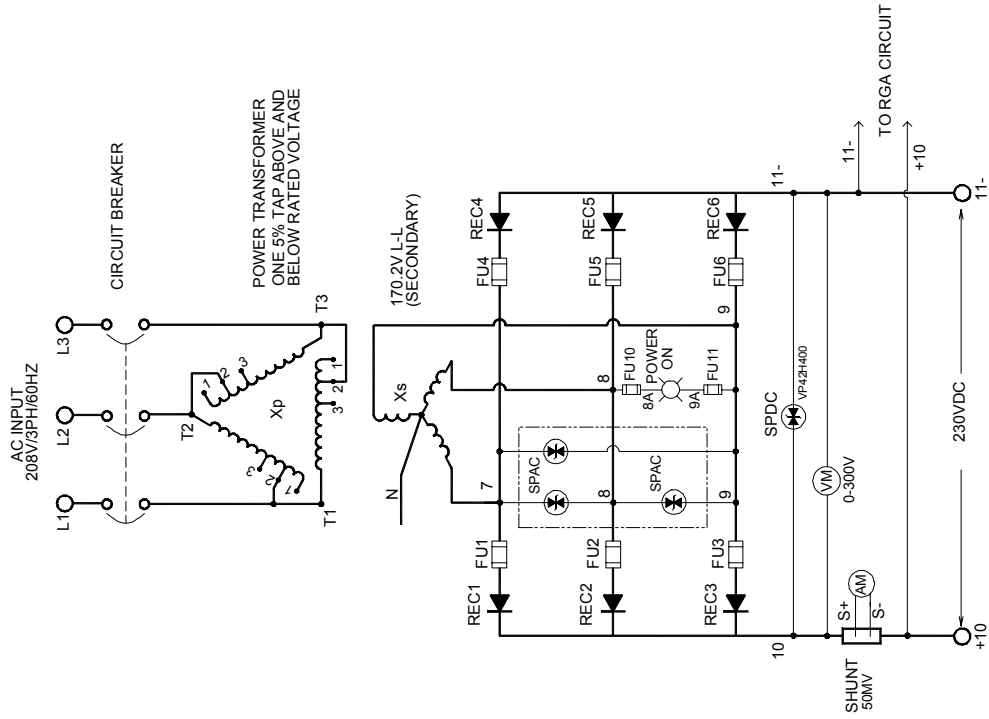
ELECTRICAL SCHEMATIC DIAGRAMS

CONSTANT VOLTAGE RECTIFIER
GVR Series Three-Phase Diode Rectifiers
NO FUSE - HIGH SPEED BREAKER SYSTEM

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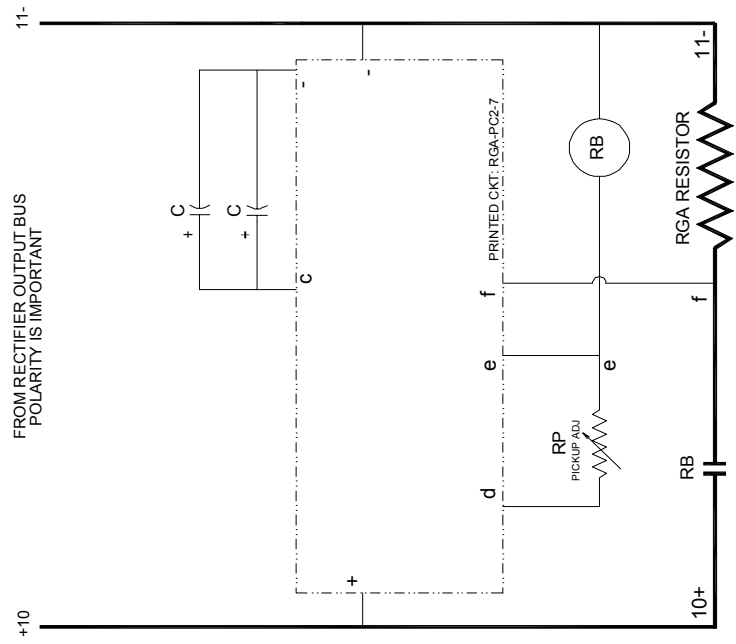


ELECTRICAL SCHEMATIC DIAGRAM

CONSTANT VOLTAGE RECTIFIER
 GVR Series Three-Phase Diode Rectifiers
 FUSED - HIGH SPEED BREAKER SYSTEM

D

**REGERATION ABSORPTION (RGA) CIRCUIT
 SCHEMATIC DIAGRAM**



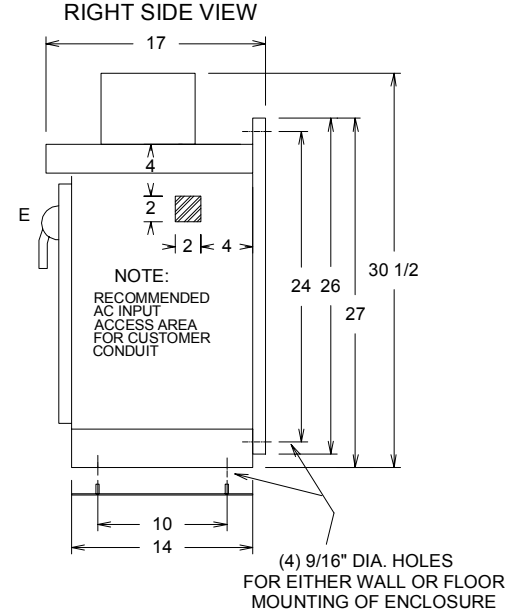
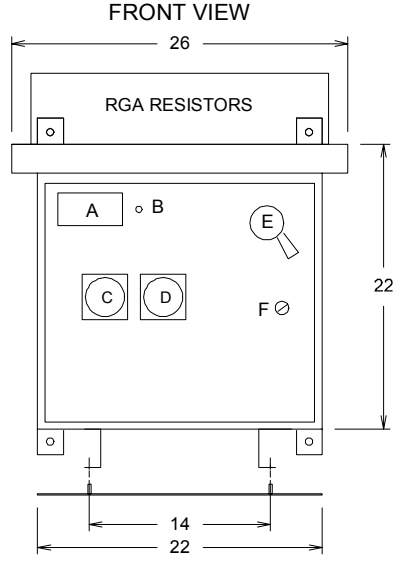
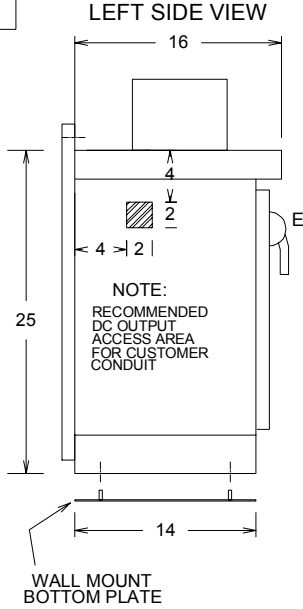
FROM RECTIFIER OUTPUT BUS
 POLARITY IS IMPORTANT

STANDARD RGA PICKUP LEVEL	RGA PICKUP VOLTS	RECTIFIER OUTPUT
→ 230 VDC	267 VDC	←

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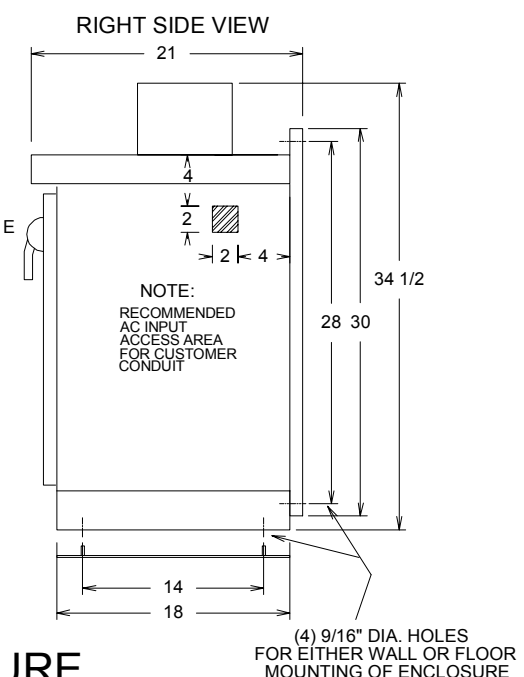
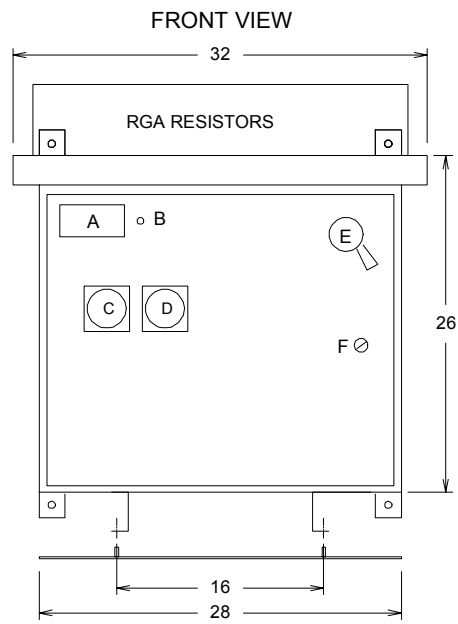
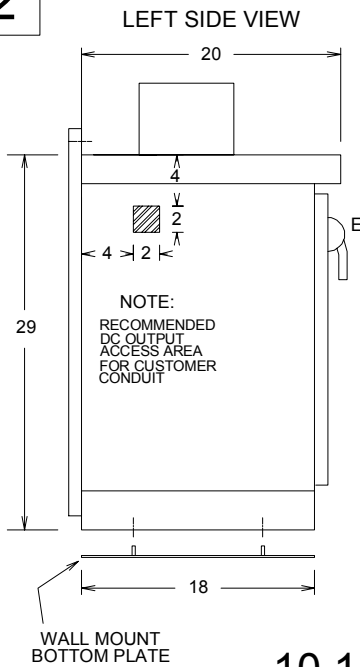
1



5kW GVR ENCLOSURE

MOUNTING:
 MINIMUM SIZE MOUNTING HARDWARE = (4) 1/2-13 BOLTS (GRADE 5 BOLTS)
 STEEL BASE PLATE MUST BE INSTALLED ON WALL-MOUNTED ENCLOSURES
 FLOOR MOUNTED ENCLOSURES MUST BE INSTALLED ON NON-COMBUSTIBLE FLOOR

2



10,15 & 20kW GVR ENCLOSURE

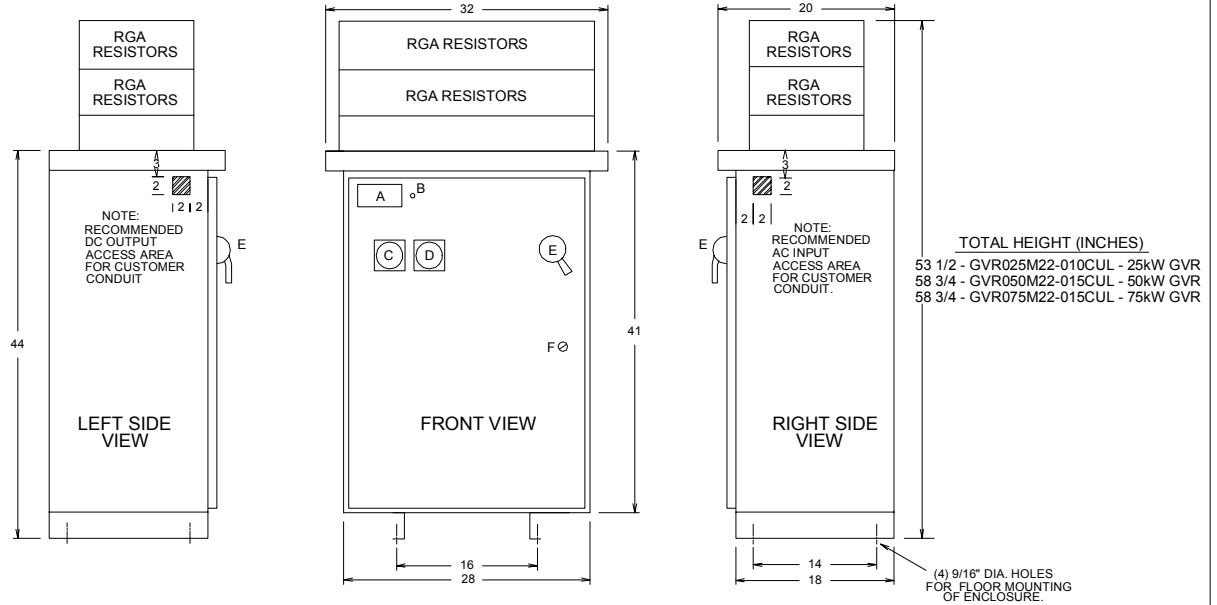
MOUNTING:
 MINIMUM SIZE MOUNTING HARDWARE = (4) 1/2-13 BOLTS (GRADE 5 BOLTS)
 STEEL BASE PLATE MUST BE INSTALLED ON WALL-MOUNTED ENCLOSURES
 FLOOR MOUNTED ENCLOSURES MUST BE INSTALLED ON NON-COMBUSTIBLE FLOOR

NOTES:
 CUBICLE OF 16 GA. STEEL
 NEMA 1 DESIGN
 DOOR HINGED ON LEFT
 SCREENED BOTTOM
 SCREENED OUTLET VENTS AT TOP, FRONT AND SIDES
 ENCLOSURE DOOR HAS SELF GRIPPING GASKET SEAL
 ESTIMATED WEIGHT OF ENCLOSURE: 80lbs
 ESTIMATED WEIGHT OF RECTIFIER: See Table 1
 RGA RESISTOR RACKS ARE ROOF MOUNTED WITH PROTECTIVE SCREEN COVERS

DOOR MOUNTED COMPONENTS
 A = SYSTEM NAMEPLATE
 B = POWER ON LIGHT
 C = DC AMMETER
 D = DC VOLTMETER
 E = AC BREAKER OPERATOR
 F = ENCLOSURE DOOR LATCH

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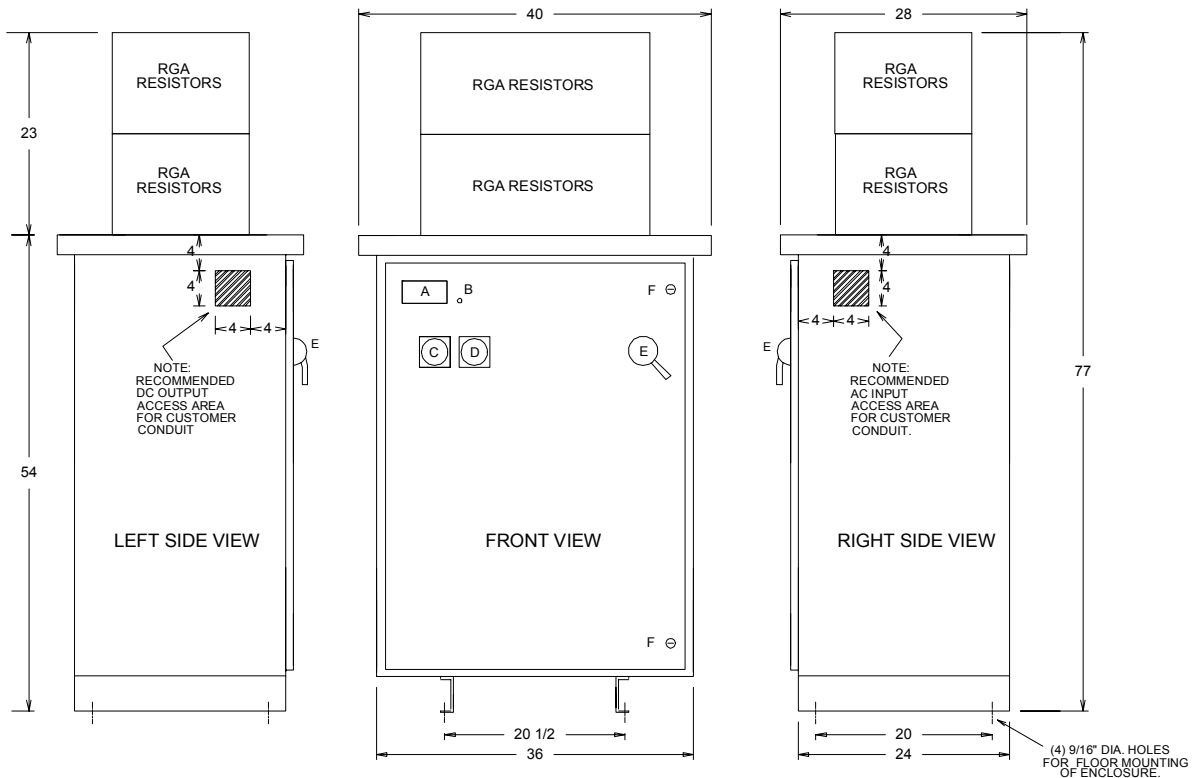


25, 50, & 75kW GVR ENCLOSURE

CUBICLE OF 16 GA. STEEL
SCREENED OUTLET VENTS AT TOP FRONT & SIDES

MOUNTING:
RECOMMENDED MOUNTING HARDWARE SIZE = (4) 1/2-13 BOLTS
ENCLOSURES MUST BE INSTALLED ON NON-COMBUSTIBLE FLOOR

4



100, 125 & 150kW GVR ENCLOSURE

CUBICLE OF 14 GA. STEEL
SCREENED OUTLET VENTS AT TOP FRONT, REAR & SIDES

MOUNTING:
RECOMMENDED MOUNTING HARDWARE SIZE = (4) 1/2-13 BOLTS
ENCLOSURES MUST BE INSTALLED ON NON-COMBUSTIBLE FLOOR

NOTES:

NEMA 1 DESIGN
DOOR HINGED ON LEFT
SCREENED BOTTOM
ENCLOSURE DOOR HAS SELF GRIPPING GASKET SEAL
RGA RESISTOR RACKS ARE ROOF MOUNTED WITH PROTECTIVE SCREEN COVERS
25kW GVR OVERALL HEIGHT DIFFERS FROM 50kW & 75kW DUE TO DIFFERENT RESISTOR RACK SIZE

DOOR MOUNTED COMPONENTS

A = SYSTEM NAMEPLATE
B = POWER ON LIGHT
C = DC AMMETER
D = DC VOLTMETER
E = AC BREAKER OPERATOR
F = ENCLOSURE DOOR LATCH

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DESCRIPTION OF TYPE GVR RECTIFIER COMPONENTS

******* AC LINE CIRCUIT PROTECTION: *******

An AC molded case circuit breaker is provided on the GVR rectifier for both circuit protection and as a connect-disconnect device for the rectifier unit. The breaker is manually operated with a thru-door operator to apply power to the rectifier unit. This Input AC Breaker has been selected specifically to integrate into the GVR for operation as a fuse-less rectifier system. It should only be replaced with an identical molded case breaker from the same manufacturer.

A red Power On indicating light on the GVR door indicates AC power is on.

A door-mounted DC Voltmeter and DC Ammeter are provided for annunciation of the output power provided by the GVR rectifier.

******* ISOLATION DRY TYPE RECTIFIER TRANSFORMER *******

Dry type, isolation, transformers used in Kinetics rectifiers are designed and manufactured by Kinetics for Kinetics rectifiers. GVR transformers are designed specifically to coordinate system impedances to the surge ratings of the rectifier semiconductors and the Input Circuit Breakers. This design relationship is an essential element in the Kinetics GVR fuse-less rectifier concept. These transformers should not be replaced with anything other than Kinetics GVR transformers designed and rated specifically for "fuse-less" rectifiers.

- Insulation system materials and bonding varnish are class H (180°C)
- Temperature of operation, class F (155°C) or 105°C rise above 40°C ambient at sea level at 100% load and proper non-restricted air flow
- Standard cooling design is convection
- Matching service factors for the Rectifier Power Transformer and Diode Bridge
- Transformers are provided with one 5% tap above and below rated AC voltage

******* RECTIFICATION SECTION *******

The rectification section converts the AC voltage from the three-phase Power Transformer secondary to the desired DC output voltage. The rectifying devices are heavy duty, industrially rated, silicon diodes. Oversized extruded aluminum heat sinks are used to conduct heat away from the diodes. Diodes are rated so that ample capacity for overloads or unbalances is provided.

**** Semi-Conductors ****

** Kinetics uses three types of diode packaging: Packs, Studs, and Pucks.

"Bridge Pack": Diodes mounted in a packaged case with screw terminals. These devices have a complete three-phase bridge inside the hermetically sealed packaging. Bridge packs can be connected using either a single pack or two packs connected in parallel. The Bridge Packs are electrically isolated from the heat sinks they are mounted to. (Used in 5-20kW GVR systems)

"Stud-type": Diodes are bolted to the heat sink through a seating-mounting hole. A flexible lead cable extends from the device for connection to the AC input connection. (Used in 25-75kW GVR systems)

(Note: stud-type diodes come in two polarity types: *Normal* <base cathode> for mounting on the positive heat sink; and *Reverse* <base anode> for mounting on the negative heat sink).

****CAUTION**** The two (Stud-Type) heat sinks are electrically "hot", making up the Positive and Negative bus for connection to the DC output.

"Puck-type": Diodes have the appearance of a "hockey puck". The devices are compressed between the front (AC) and back (DC) heat sinks for proper operation. The puck-type device manufacturer specifies the minimum clamping force required for proper device operation. A detailed and simple procedure for changing a puck device while assuring the proper clamping force is provided with this manual for units sized 100kW and larger.

****CAUTION**** The (Puck-Type) heat sink assemblies are electrically "hot"; the three heat sinks on the front of each assembly are at the AC potential of the Power Transformer secondary voltage; the long heat sinks on the back side of the assemblies make up the Positive and Negative bus for connection to the DC output.

***** Diode Ratings *****

The diode peak reverse voltage (PRV) is the peak voltage that a diode can withstand in the non-conducting direction without breaking down. Kinetics GVR rectifier diodes have a (minimum) PRV rating that exceeds 3.5 times AC RMS voltage to the rectifier bridge element.

GVR rectifier diodes are selected both on their capacity for operating at rated load and for their short circuit surge capability to withstand a bolted fault short circuit for the time it takes the circuit breaker to operate and remove power from the rectifier.

****CAUTION**** Different manufacturers of diodes may have different surge current ratings for diodes of the same continuous load rating. If diodes are replaced for any reason, it is essential that replacement devices either equal or exceed the surge ratings of the original devices. Kinetics assumes no responsibility for system protection if devices are used which are not provided by Kinetics.

***** Transient Voltage Surge Suppression *****

Protection against voltage transients is provided by MOVs (metal oxide varistors) on both the AC and DC sides of the rectifier bridge. Unprotected silicon semi-conductors are vulnerable to damage due to high voltage noise spikes from system disturbances such as switching transients or lightning surges that may exceed the PRV of the device. The MOV surge suppressors included in GVR model rectifiers are selected to conduct voltage disturbances past the bridge diodes when a transient spike exceeds the operating voltage of the MOV.

***** Short Circuit Protection *****

Kinetics GVR type rectifiers are fuse-less systems [†]. A proprietary Kinetics design relationship protects the Bridge diodes from damage in the event of a short-circuited output. Fault current is limited to prevent damage to the bridge diodes while allowing the Input Circuit Breaker to trip and remove AC power.

([†] - The 125kW and 150kW size GVR models have individually-fused rectifier bridge diodes)

***** Regeneration Protection *****

Diode rectifiers cannot absorb the extra energy generated when inertial type (DC Motor) loads are mechanically overdriven (regeneration). This regeneration energy is created when a motor is overdriven such as: cranes in their lowering mode, elevators in their raise operation, or field controlled machine tools in a slow down mode. The (motor) load essentially becomes a generator for a short time and can cause high rectifier bus voltages that can damage diodes or DC controls by exceeding their voltage ratings. Protection of the GVR against regeneration effects is accomplished by use of a Regeneration Absorption (RGA) control circuit. See the section of this manual on RGA Circuit description.

***** Cooling *****

- All GVR rectifier power transformers are 100% convection cooled.
- Rectifier Bridge Diodes (5kW thru 150kW at 230VDC) are 100% convection cooled.

NOTE: Ample clear space, non-pressurized air, must be provided for the rectifier air inlets and outlet to permit adequate airflow for the convection cooling system. See Installation Instructions for guidelines for locating GVR equipment.

******* REGENERATION ABSORPTION (RGA) CIRCUIT *******

The Regeneration Absorption (RGA) Circuit (fig. D) consists of a bank of continuously rated, mill duty resistors and voltage sensitive circuitry to apply the resistor bank across the DC bus to absorb regenerative energy when it is present. The Rp Resistor factory adjustment controls the pick-up point (voltage) of the RB Contactor coil. When the bus voltage is raised above 267 volts, the RB Contactor closes and connects the RGA Resistor across the bus. The “A” Relay (on RGA PC board) energizes which shorts out the Rp Resistor, applying full voltage to RB Contactor to assure full closure and contact wipe. The energized “A” Relay disconnects the TD Relay circuit (on RGA PC board) from the DC bus voltage and the RGA Capacitors start discharging through TD Relay (keeping TD Relay energized). The capacitors discharge and TD times open in about 5 seconds. When the TD Relay opens, the RB Contactor is de-energized and the RGA resistor is removed from across the DC bus. If the high voltage condition remains on the DC bus (Higher than Rp pick-up voltage), the RGA circuit recycles and will continue to do so on approximately 5-second intervals until the regenerative condition is dissipated. Proper sizing of the RGA will provide normal dissipation in one to three cycles of operation. If the RGA resistors remain energized for several cycles they will achieve temperatures in excess of 300°C – Under no circumstance should GVR rectifier systems be operated without the RGA resistor rack covers secured properly in place.

WARNING: The RGA Resistor Racks can become HOT! Never Store or Place objects on top of the RGA Resistor Rack Screen Cover.

INSTALLATION

***** GVR Installation Location *****

Kinetics GVR model Rectifiers are designed to operate in a non-restrictive free-air environment. 24" spacing must be maintained on the Left, Right, and Front sides of the system enclosures on all GVR models. Additionally 24" spacing must be provided on the Backside of GVR rectifiers sized 100kW through 150kW.

In equipment rooms with forced-air cooling, (cool) air input should be located lower than the exhaust location(s) so that it will not interfere with the normal convection airflow through the GVR rectifier.

WARNING: The RGA Resistor Rack is Hot! The GVR equipment should be located so that it is not likely to be in contact with people.

WARNING: Floor-mount GVR units must be installed on Non-Combustible floors.

***** Connections and Sizing *****

WARNING: Outputs are intended for systems requiring ungrounded DC Power.

The system input cable (line side of input circuit breaker) should be sized for 75°C or better operation (per NEC Table 310.17).

Kinetics GVRs are designed for side entry of the supply and output cables. Recommended cable input locations on the side of the enclosure are detailed on the enclosure outline drawings (figures 1-4).

When field-punching conduit holes in GVR enclosures, care should be taken to prevent metal fragments from dropping into the Power Transformer or other components inside the GVR enclosure. Prior to energizing equipment, check the GVR system enclosure for the removal of any material used to guard against metal fragment droppings.

On 25kW and Larger GVRs the bridge heat sinks are live DC Parts. Supply and output cable must be routed to avoid contact with the bridge heat sinks.

Intermingling of AC supply wire with un-insulated live parts of the DC is not allowed; route input AC cables to avoid live DC parts. AC Supply cable should be routed in the upper right quadrant of the cubicle to avoid live DC parts inside the enclosure.

CAUTION: When laying out input and output cable locations, be sure not to block airflow vents at the top and bottom of the GVR enclosures with supply or output cables. Interfering with the normal convection airflow through the enclosure can cause the equipment to exceed design temperature limits.

When routing or "laying out" input and output cables inside the enclosure, care should be taken to avoid sharp edges that may damage cable insulation.

Wall Mount Install Instructions (5 to 20kW)

Consolidated Edison Commercial Grade Rectifiers

- 5kW GVR005M22-002CUL 220 lbs
- 10kW GVR010M22-005CUL 265 lbs
- 15kW GVR015M22-005CUL 280 lbs
- 20kW GVR020M22-005CUL 290 lbs

The GVR unit should be mounted to either Uni-Strut or a non-flammable support structure using all four mounting holes on the enclosure vertical mounting channels.

An open-air clearance of 1 $\frac{3}{4}$ " is required between the back surface of the rectifier enclosure to the mounting wall.

The installer-supplied mounting and anchoring materials, for mounting the GVR to the building wall, should be sufficient to support a minimum of four times the rectifier's weight (see above). The installer is responsible for adhering to local, city, and state building and electrical codes.

Mounting channels are to be mounted directly to a fixed structural support member approved for mounting of electrical enclosures of the rectifier's size and weight.

The enclosure vertical mounting channels require that the rectifier be secured with four (4) $\frac{1}{2}$ "- 13, grade 5 bolts (minimum). Washers and locker washer are required for proper bolt head seating.

Open air space of 24" must be maintained to the left, right and front sides of the unit for proper convection airflow cooling.

Note: Wall-mount GVR units come with a protective bottom drip plate installed. If wall mount features are not used and protective plate is removed, the floor-mounted unit must be installed on a non-combustible floor.

Floor Mount Install Instructions (25 to 150kW)

Consolidated Edison Commercial Grade Rectifiers

- 25kW GVR025M22-010CUL 400 lbs
- 50kW GVR050M22-015CUL 550 lbs
- 75kW GVR075M22-020CUL 700 lbs
- 100kW GVR100M22-025CUL 1400 lbs
- 125kW GVR125M22-025CUL 1600 lbs
- 150kW GVR150M22-030CUL 1800 lbs

The installer supplied, mounting and anchoring materials for mounting of the unit to the building floor, must be sufficient to support the rectifier's weight. The installer is responsible for adhering to local city and state building and electrical codes.

The enclosure base mounting channels require that the rectifier be secured with four (4) $\frac{1}{2}$ "- 13, grade 5 bolts. Washers and locker washer are required for proper bolt head seating.

Open air space of 12" must be maintained at the rear of the units of the 25kW, 50kW and 75kW rectifier enclosures for air flow convection cooling.

Open air space of 24" must be maintained in front of the unit, left side and right side for air flow convection cooling for the 25kW, 50kW, 75kW, 100kW, 125kW and 150kW Rectifier.

Open air space of 24" must be maintained at the rear of the units of the 100kW, 125kW and 150kW rectifier enclosures for air flow convection cooling.

WARNING: Floor mounted units must be mounted on non-combustible floor.

GVR TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSES	POSSIBLE REMEDY
NO POWER ON LIGHT NO DC POWER OUTPUT	NO AC INPUT POWER CIRCUIT BREAKER TRIPPED	RESTORE AC POWER RESET & CLOSE CIRCUIT BREAKER ** CHECK OUTPUT FOR FAULTS **
POWER ON LIGHT LIT NO DC POWER OUTPUT	OPEN BRIDGE DIODE BLOWN BRIDGE POWER FUSES [†]	REPLACE DEFECTIVE DEVICE REPLACE BLOWN FUSES [†] ** CHECK OUTPUT FOR FAULTS **
CIRCUIT BREAKER TRIPPED	SHORT CIRCUIT OR OVERLOAD ON RECTIFIER OUTPUT OVERLOAD CAUSING RECTIFIER OR TRANSFORMER OVERTEMPERATURE SHORTED DIODE OR SURGE SUPPRESSOR	REMOVE SHORT CIRCUIT OR OVERLOAD CONDITION ON OUTPUT REPLACE DEFECTIVE COMPONENT AFTER ASCERTAINING CAUSE OF FAILURE
SHORTED DIODE OR SURGE SUPPRESSOR	EXCESSIVE REGENERATIVE POWER OR FAILURE OF REGENERATION ABSORPTION CIRCUIT	INSTALL ADEQUATE REGEN CAPACITY REPAIR REGEN CIRCUIT REPLACE DEFECTIVE COMPONENT
CKT BKR TRIPS AGAIN AFTER BEING RESET AND RECLOSED	POSSIBLE CONTINUED LOAD FAULT SHORTED DIODE OR SURGE SUPPRESSOR TRANSFORMER FAILURE	REMOVE FAULT REPLACE DEFECTIVE PART REPAIR OR REPLACE TRANSFORMER
VERY HOT REGEN RESISTORS. CONTINUAL OPERATION OF (RGA) REGEN ABSORPTION CIRCUIT	DYNAMIC BRAKING ON ELEVATOR CONTROL NOT FUNCTIONING IMPROPER SETTING OF R _p RESISTOR CAUSING TOO SOON PICKUP OR SHORTED RESISTOR HIGH AC INPUT AND DC OUTPUT VOLTS	REPAIR DEFECTIVE CONTROL PROPERLY ADJUST RESISTOR OR REPLACE IF DEFECTIVE CHANGE TRANSFORMER TAP
LOW DC OUTPUT VOLTS	SINGLE PHASE TO UNIT OPEN DIODE OR FUSE [†] LOW AC VOLTS INPUT	CHECK / RESTORE THREE PHASE POWER REPAIR OR REPLACE DEFECTIVE DEVICE CHANGE TRANSFORMER TAP
HIGH DC OUTPUT VOLTS	HIGH AC VOLTS	CHANGE TRANSFORMER TAP
LOAD HUMMING NOISE	SINGLE PHASE INPUT OR OVERVOLTS INPUT	CHECK / RESTORE THREE PHASE CHANGE TRANSFORMER TAP

([†] - The 125kW and 150kW GVR models have individually-fused Bridge Diodes)

PERIODIC MAINTENANCE SCHEDULE

Model GVR diode rectifiers are static devices, only requiring periodic maintenance for cleanliness and annunciation calibration.

- Every three (3) Months, the inlet should be checked and cleared of any dust or airflow blockage.
- Every six (6) Months, internal hardware should be inspected for any loosening. Electrical terminal points, screws, and lugs should be checked for loose connections or loose hardware.
- Every twelve (12) Months, Calibration of meters should be checked for accuracy and an internal check for dirt and corrosion should be performed.

WARNING: Kinetics GVR model diode rectifiers should never be serviced while energized. De-energize equipment before performing work. Only qualified electrical workers should work on Kinetics GVR equipment.

Table 2: REPLACEMENT PARTS BILL OF MATERIALS

GVR MODEL	INPUT BREAKER	POWER TRANSFORMER	RECTIFIER DIODES	SPAC (Assembly)	SPDC	POWER ON LIGHT	FUSES FU10 & 11	AMMETER	VOLTMETER	POWER FUSES	RGA CIRCUIT RB CONTACTOR
GVR005M22-002CUL	TE015	J005B63SCO-E	BR3-185PB	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA0303	MEDV3003	N/A	REPJ2NO0NC1D-MBC
GVR010M22-005CUL	TE040	J010B63SCO-E	BR3-185PB (2 in parallel)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA0753	MEDV3003	N/A	MCD1NO0NC12-SQ-D
GVR015M22-005CUL	TE045	J015B63SCO-E	BR3-185PB (2 in parallel)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA1003	MEDV3003	N/A	MCD1NO0NC12-SQ-D
GVR020M22-005CUL	TE060	J021B63SCO-E	BR3-185PB (2 in parallel)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA1503	MEDV3003	N/A	MCD1NO0NC12-SQ-D
GVR025M22-010CUL	TE090	J026B63SCO-E	RK95PB (Pos. heat sink) RK95RPB (Neg. heat sink)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA1503	MEDV3003	N/A	MCD1NO0NC22-SQ-D
GVR050M22-015CUL	TFJ150	J052B63SCO-E	RK95PB (Pos. heat sink) RK95RPB (Neg. heat sink)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA3003	MEDV3003	N/A	MCD1NO0NC22-SQ-D
GVR075M22-020CUL	TFJ225	J078B63SCO-E	RK95PB (Pos. heat sink) RK95RPB (Neg. heat sink)	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA4003	MEDV3003	N/A	MCD1NO0NC32-SQ-D
GVR100M22-025CUL	TJJ300	J100B63SCO-EE	RK430M	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA5003	MEDV3003	N/A	MCD1NO0NC32-SQ-D
GVR125M22-025CUL	TJJ400	J125B63VCO-EE#	RK430M	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA6003	MEDV3003	FU25X600	MCD1NO0NC32-SQ-D
GVR150M22-030CUL	TJK600	C158B63SCOT-CU#	RK430M	MOV3D-25L40	VP42H400	MIL37250R	FU25X1	MEDA8003	MEDV3003	FU25X800	MCD1NO0NC32-SQ-D

Table 2 (above) specifies Kinetics part numbers for GVR components that may require replacement by the customer. This parts list is not a complete bill of material. Contact Kinetics for repair or replacement of components not listed above.

To ensure continuity of service, Kinetics Industries recommends that spare parts supply be maintained for all GVR systems.

Table 3: Recommended Spares

GVR Part (see Table 2 for part number)	# Spares
Rectifier Diodes	2
SPAC (MOV3D-25L40 circuit board)	1
SPDC	1 each
Power On Light	1
Fuses (Control & Power fuses if applicable)	2 complete sets

For information concerning replacement parts, prices, and ordering, contact **Kinetics Industries Parts Department** at:

Phone: (609) 883-9700 (ext. 25) or
email: info@kinetics-industries.com

When ordering parts please be prepared to provide the GVR model number and system number to ensure prompt service.

Contact Information:

Kinetics Industries, Inc.
140 Stokes Ave.
Trenton, NJ 08638
Phone: (609) 883-9700
Fax: (609) 883-0025
Email: Info@kinetics-industries.com

OPERATION AND MAINTENANCE MANUAL

Kinetics Industries

GVR

FUSELESS[†] DIODE RECTIFIER

And

RG A - REGENERATION ABSORPTION CONTROLS

Manufacturers of:

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