


REGAVOLT® VARIABLE TRANSFORMERS



 **CLAUDE
LYONS**




Claude Lyons Limited introduced the variable transformer to the United Kingdom as long ago as 1933

This publication describes the latest range of Claude Lyons Regavolt® Variable Transformers — reliable, versatile controls backed by the engineering and application experience accumulated during their long period of leadership.

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Regavolt[®] Variable Transformers

The REGAVOLT range of variable transformers described in this catalogue is the latest development in a type of power control pioneered in this country by Claude Lyons.

The variable transformer is one of the most useful and efficient devices ever invented for the low-loss control of a.c. voltage and of voltage-dependent parameters such as current, power, temperature, light intensity, motor speed etc. Although originally developed as voltage regulating and testing devices for use in the laboratory, variable transformers have since found countless applications in every branch of industry. This catalogue describes and illustrates an extremely wide range of models which are available to suit virtually every possible requirement.

Essentially, the REGAVOLT is a continuously-adjustable auto-transformer in which the action of specially designed brushgear traversing a prepared track on the winding produces a smooth on-load variation in transformation ratio, and so in output voltage.

REGAVOLT transformers are much smaller than resistive controllers of equal power rating, and unlike resistive controls they do not waste power in the form of heat. In contrast to solid-state a.c. power controllers, REGAVOLT variable transformers do not affect waveform purity or power factor. Because they are transformers, REGAVOLTS cannot operate on direct current; they can, however, provide variable d.c. voltage and current through rectifiers.

FEATURES

GOOD REGULATION — Output voltage is substantially independent of load.

SMOOTH CONTROL — Output voltage is continuously adjustable from near zero to supply voltage or above.

HIGH EFFICIENCY — Modern design and advanced materials ensure very low losses under all load conditions.

SMALL SIZE — The variable transformer is much smaller than resistive controls of equal power rating.

LINEAR OUTPUT VOLTAGE — Output voltage varies linearly with angle of rotation of control knob.

MODERATE TEMPERATURE RISE — No derating required for ambients to 45°C.

GOLD PLATED TRACKS — All 1200, 700 and some 400 series REGAVOLTS have hard gold plated tracks to increase resistance to wear and to short-term overloads.

LONG LIFE — Used correctly, REGAVOLT variable transformers will give many years of reliable service.

WARRANTY - REGAVOLTS are guaranteed in respect of materials and workmanship for a full 12 months from date of dispatch.

ADVANCED MECHANICAL DESIGN — Excellent electrical specification is matched by rugged, compact construction. Brush replacement is simple and convenient. Two, three or more units can be ganged on one shaft for series, parallel or three-phase operation.

WIDE RANGE OF MODELS — Extremely wide range of REGAVOLT models to suit virtually every requirement, including types with special voltage ratings and high-frequency models. REGAVOLTS available include:—

- **Uncovered** (normal or component type), **covered and enclosed models.**
- **Portable models** with or without meters.
- **Oil-immersed models** for increased ratings or adverse environments.
- **Motor-driven models** for remote control or automatic systems.
- **Many optional features** such as special tapings, right-angle drive, limit stops, micro-switches, etc.

Regavolt®

— CONSTRUCTION
— APPLICATIONS

CORE

All REGAVOLTS use grain-oriented strip wound silicon steel cores ensuring low losses and high output vs. weight of core material.

WINDINGS

The winding, which is insulated from the core by precision-moulded winding formers, comprises a single layer carefully wound to provide a flat surface for the brushgear. Windings are prevented from movement in use by epoxy-resin embedding. The prepared track on which the brushes operate is located on one face of the winding except in the largest series (1200 frame) where it is formed on the outer edge.

BRUSHGEAR

Easily replaceable carbon brush units are used, the resistance of the brush being carefully calculated to limit the current circulating in the bridged turns. It is therefore most important that only the correct replacement brush is used in any particular REGAVOLT. Brushes are mounted in robust brush carriers insulated from the shaft, and designed so that metal parts cannot come into contact with the winding in the event of brush fracture.

FRAMES

The wound core and brushgear are mounted on a rugged base frame providing strength combined with minimum weight. The bases incorporate mounting holes providing interchangeable fixing centres with other British and imported variable transformers. Outline drawings are included on the following pages (9-24).

MOUNTING

Series 400, 700 and 1200 REGAVOLTS, including ganged types, are supplied as standard for surface (bench or front-of-panel) mounting, for protection in transit, but can easily be converted to back-of-panel mounting. It is only necessary to remove the knob, loosen the shaft and push it through, adjust it to project the correct amount through the panel, re-tighten and replace the knob. When a REGAVOLT is to be mounted some distance behind a panel, longer shafts can be supplied. The small series 200 and 300 REGAVOLTS are designed for back-of-panel mounting only (in uncovered form), but series 300 can be surface-mounted when covered.

TERMINALS

All standard models, except series 200 and 300, are equipped with robust moulded terminal panels bearing clearly marked terminals for screw or solder connections. 400 series terminals are additionally suitable for push-on connectors. Series 200 and 300, and component-form series 400 REGAVOLTS, do not have terminal panels, connections being made direct to solder tags which are clearly identified, and in 300 and 400 series can also be used with push-on connectors.

KNOBS AND DIALS

REGAVOLTS are supplied with easily read single-reading dials and large, clear numerals. Dials are double-sided, graduations being clockwise one side and anti-clockwise the other, for use with the dial attached to a panel or moving with the knob against a fixed pointer. Precision-moulded ribbed, easy-to-grip, collet-fixing operating knobs are normally fitted to all models. Grub screw fixing types can be supplied to order.

Regavolt® APPLICATIONS

The REGAVOLT is a device of almost universal application, and new uses are being found for it almost every day. No list of applications can ever, therefore, be comprehensive and our applications engineering staff are at your service for the discussion and design of new control systems incorporating REGAVOLTS.

Some of the current applications of these extremely versatile controls are —

- Voltage and current control in development and experimental work.
- Over- and under-voltage testing of electrical and electronic equipment.
- Heating control of ovens, furnaces, infra-red heaters, etc. in production and experimental work.
- Testing and calibration of voltmeters, ammeters, wattmeters, power-factor meters, etc.
- Breakdown testing, and gradual application of voltage or current to detect defects before breakdown or burn-out.
- Built in as integral control elements in electrical, electronic and automatic control and process equipment.
- Supply voltage adjustment. Boosting of low lines and line voltage stabilisation, either manually or automatically in automatic voltage stabilisers. (Claude Lyons series TS distortionless servomechanical stabilisers are available in a very wide range of models from 1 kVA single-phase to 850 kVA three-phase. Literature is available on request).
- Incandescent (tungsten) lighting control in theatres, auditoriums, hotels, restaurants, photographic studios and darkrooms, rearing houses, etc. (Not recommended for discharge or hot-cathode fluorescent lighting).
- Motor speed control, either direct or through suitable circuits, dependent on motor type.
- Control of d.c. voltage and current through rectifiers. Control of rectifiers in electroplating, etc.

Regavolt®

— TYPES AVAILABLE — TERMINOLOGY

FRAME SIZES

REGAVOLT variable transformers are made in five basic series or frame sizes — 200, 300, 400, 700 and 1200. Electrical specifications are given opposite and in the detailed tabulations for the various models on pages 9 - 22 following. Outlined below are the various mountings, mechanical configurations and optional features that can be provided.

UNCOVERED MODELS

All basic REGAVOLTS in frame sizes 400, 700 and 1200 are available in uncovered form, equipped with terminal panels. These units are designated by the basic REGAVOLT type number (e.g. 402, 708, 1225) without suffix.

COMPONENT MODELS

Series 400 REGAVOLTS are also available in component form (suffix 'K'). These types are provided with solder tags only, at lower cost than the corresponding uncovered types and are recommended for incorporation in customers' equipment. Series 200 and 300 uncovered models are offered in component form only and the suffix is therefore not used.

COVERED MODELS

All single unit REGAVOLTS, with the exception of series 200, are available in attractively styled universal enclosure with cable or conduit entry holes and suitable for bench or panel mounting (suffix 'E'). Ganged models are fitted with metal ventilated covers providing convenient maintenance access to each unit. (Also suffix 'E').

Single unit series 300, 400 and 700 types are also available in a traditional round enclosure (suffix 'R') for use where space is at a premium.

LABORATORY MODELS

For convenience in bench and laboratory use, covered single unit series 400 and 700 REGAVOLTS are available in rectangular enclosures, fitted with mains input cable, switch, neon, output fuse and insulated terminals (suffix 'LAB'). Note that the terminals are live and these units should only be used by skilled technicians.

PORTABLE MODELS

Single unit series 400 and 700 REGAVOLTS are also available in robust portable cases with carrying handle, input cable, mains switch, output fuse and socket outlet (suffix 'PS') or insulated output terminals (suffix 'PT'). A voltmeter (suffix 'PSV' or 'PTV') or ammeter (suffix 'PSA' or 'PTA') can be provided. Series 700 are also available fitted with both voltmeter and ammeter (suffix 'PSVA' or 'PTVA'). The models with output terminals must only be used by skilled technicians.

WALL-MOUNTING MODELS

Series 400 single and ganged types and series 700 single units are available mounted in robust industrial enclosures with fixing straps and conduit entry (suffix 'W').

GANGED ASSEMBLIES

REGAVOLTS are available in ganged assemblies of two, three or more units operating on one common shaft for three-phase, parallel (with limiting chokes — see page 6) or series (see page 7) connection. The numeral following the suffix 'G' indicates the number of ganged REGAVOLTS; add 'P' for parallel connection.

OIL-IMMERSED REGAVOLTS (page 20)

The larger REGAVOLTS, series 700 and 1200, are available in oil-immersed versions. Oil immersion, in addition to increasing power rating, also enables REGAVOLTS to operate under adverse environmental conditions.

MOTOR DRIVE (page 21)

All open, covered and oil-immersed REGAVOLTS, including ganged versions, are available with reversing motor drive for remote control and automatic applications. Standard speeds are 1 r.p.m. motor (suffix 'D1') or 2 r.p.m. motor ('D2'). Other speeds to order. Can also be fitted with slipping clutch for manual over-ride.

OPTIONAL FEATURES

Non-standard voltages, tapplings, limit switches, special shafts and right-angle drives can be supplied to customers' special requirements.

REGAVOLT TYPE NUMBERS

The type number of a basic 240V REGAVOLT indicates the series (frame size) and approximate rated output current. Suffixes indicate 120V supply ('L') or 440V supply ('H'). Ganging, mounting arrangements, motor drive, oil immersion, etc., are indicated by further suffixes, explained above, after a hyphen, e.g.:—

402-LAB	Type 402, with covers, input cable, mains switch, output fuse and terminals.
706L-G2E	Two-gang assembly of type 706L (120V) units, with covers.
1225-G3POCD1	Three-ganged parallel connected assembly of type 1225 units, oil-immersed, with motor drive at 1 r.p.m.

HAZARD WARNING

REGAVOLTS operate at mains voltage and above, and installation, connection and maintenance must be carried out in accordance with good engineering practice by qualified personnel. Open models are intended only for installation as components and must **never** be used unprotected. Specifications on pages 5 and 9 - 23 must be considered carefully and the notes on installation and maintenance (page 25), and any specific information supplied with the REGAVOLT adhered to strictly.

No warranty is implied as to fitness for use in any specific application or installation unless full details have been provided and we have given specific approval in writing.

The data given in the tables on pages 9-24 should be read in conjunction with the following general specifications, which apply to all REGAVOLT variable transformers except where individually indicated.

INPUT VOLTAGE: Standard 240 volt REGAVOLTS are wound for a maximum voltage across the whole winding of 275 volts. The input voltage can be up to the full winding voltage when the REGAVOLT is used in line-voltage connection (see below). In over-voltage connection, the listed input voltage must not be exceeded. 200 and 300 series REGAVOLTS are wound for line-voltage connection only, unless tapped to special order.

REGAVOLTS can be used on lower voltages than rated, but no increase in current rating is permissible. An optional centre-tap can be provided on standard 400, 700 and 1200 series units, which can be used to give 0-240 volt output from a 120 volt input, with output current limited to one-half of rated current. 120 volt units are wound for a maximum voltage of 135 volts, and are also provided with the same centre-tap option.

When a 240 volt model is used on 220 or 230 volts supply, the output voltage is reduced in proportion. When required REGAVOLTS can be supplied tapped for 220, 230 (or 250) volt input, to give full output. In addition to the standard types, REGAVOLTS are available for other input and output voltages (page 22), and can be supplied with special tappings if required.

In the case of models not provided with the over-voltage feature, including 440 volt types, the listed input voltage must not be exceeded.

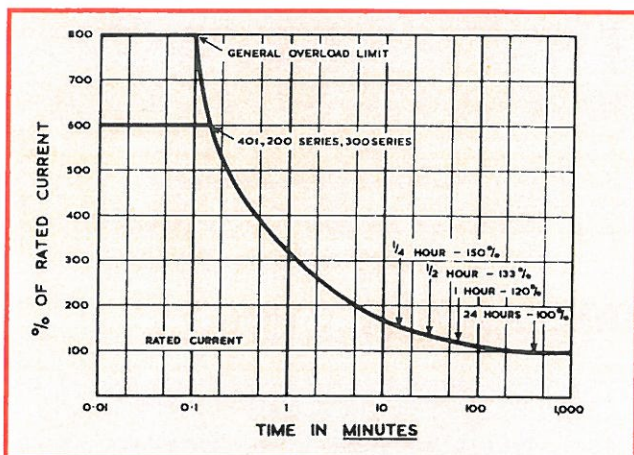


Fig. 1. Short-time overload curve

CURRENT RATINGS:

Rated current can be drawn at any brush setting. When the over-voltage connection is used, the load should not draw more than rated current.

Maximum Current can only be drawn in line-voltage connection with listed (or lower) input voltage across the whole REGAVOLT winding (e.g. 240 volts on a 240/275 volt unit), and can only be drawn near zero or at or near full output voltage. A load having a linear voltage/current load line (constant impedance load) drawing maximum current at line voltage can be controlled from zero to line voltage.

In the case of incandescent lamps, or other loads which are not of constant impedance, the current drawn at line voltage should normally be limited to the rated current.

Short-Time Overloads: Several times the rated current can be drawn for short periods as shown in Fig. 1. This curve applies only to non-recurrent overloads or starting surges.

Intermittent Operation: When operation is intermittent, the current rating may be multiplied by the square root of the duty cycle ratio (ratio of off-plus-on-time to on-time), provided this up-rated current does not exceed the short-time overload rating (Fig. 1) for the on-time.

Ambient Temperature: At high ambient temperature, current ratings must be reduced in accordance with Fig. 2.

FREQUENCY: Ratings of REGAVOLTS (except high-frequency types) are for 47-65 Hz supply. They can be used at higher frequencies (e.g. 400 Hz) at rated voltage, and rated current in the case of 200, 300 and 400 series, but with worse regulation; 700 and 1200 series models must be de-rated by 25% when used at 400 Hz. REGAVOLTS can also be used at lower frequencies if the input voltage is reduced in proportion; there is no increase in current rating.

High Frequency Types: REGAVOLTS specially designed for use at 400 Hz and above are listed on page 22.

OUTPUT VOLTAGE:

Line-Voltage Connection: The input is applied across the whole winding and the output is variable from near zero up to input line voltage, e.g. 0-240 volts from a 240V supply (Fig. 3, page 6).

Over-Voltage Connection: The input is applied across less than the whole winding by means of the tapping provided, giving a step-up in voltage, e.g. 0-275 volts from a 240 volt supply (Fig. 4, page 6).

INSULATION: All REGAVOLTS are flash-tested at 2 kV rms 50 Hz.

NO-LOAD LOSS: The listed no-load loss is measured at rated frequency and voltage, and includes both core and brush(es).

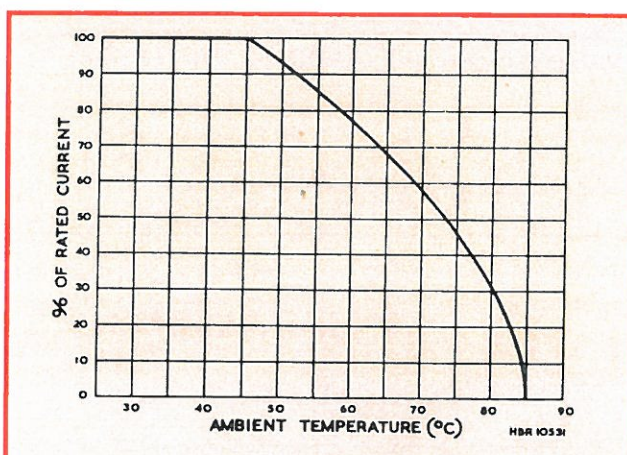


Fig. 2. Temperature de-rating curve

LOAD RATING: The nominal kVA rating given in the tables is the maximum current multiplied by the nominal input voltage and is equivalent to the rating of a constant impedance load as defined under 'maximum current'. The kVA output in over-voltage connection is equal to output voltage multiplied by rated current. Note that **output current** is always the limiting factor and cannot be exceeded at lower voltage settings.

OVERLOAD PROTECTION: The most important position for a protective device is in the output from the brush. Information on selection and installation is given in 'Installation and Maintenance' (page 25).

DRIVING TORQUE: The figures given in the individual specification pages are expressed in kg cm, and are maxima. To convert to oz ins, multiply by 14; to convert to Nm, multiply by 0.098.

ANGLE OF ROTATION: 320° for all models except series 200 and 300 (310°).

NUMBER OF TURNS: The number of turns given for each model in the individual specifications is nominal and is provided to give a general indication of resolution.

DIMENSIONS: Outline dimensions are included on the individual pages for each series. Detailed drawings can be supplied on request.

Regavolt[®] CIRCUITS

BASIC SINGLE-PHASE CONNECTIONS

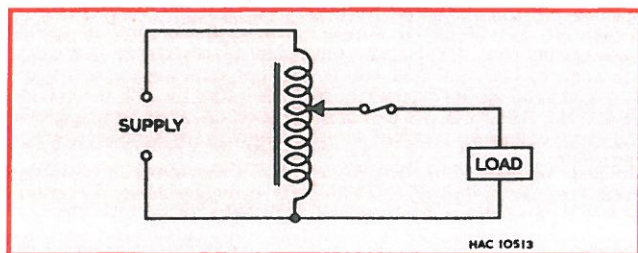


Fig. 3 Line-voltage connection

The input is applied across the whole winding, and the output voltage is variable from zero up to the input voltage (e.g. 0-240 volts output from a 240 volt supply). Rated current can be drawn at any brush setting, and maximum current can be drawn at or near full output. A constant-impedance load which draws maximum current at the REGAVOLT's rated input voltage can be controlled from zero to line voltage.

OVERLOAD PROTECTION: Figs. 3 and 4 have been drawn with a fuse in the output (brush) lead to emphasise that this is the most essential location for a protective device. See 'Installation and Maintenance', page 25.

CAUTION: It is most important to note that a REGAVOLT must **never** be connected in series with the load as if it were a rheostat (Fig. 5). This can cause a burn-out. The input must always be connected **across** the REGAVOLT winding.

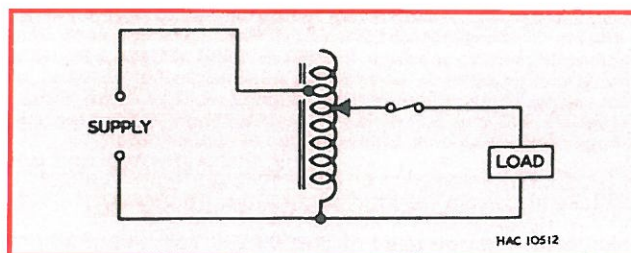


Fig. 4 Over-voltage connection

The input is applied across less than the whole winding by means of the tapping provided, and the output voltage is variable from zero to above input voltage (e.g. 0-275 volts output from a 240 volt supply). Rated current can be drawn at any brush setting, but should not be exceeded.

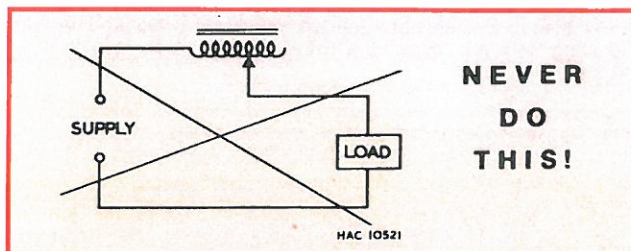


Fig. 5 Incorrect connection

GANGED ASSEMBLIES — PARALLEL CONNECTION

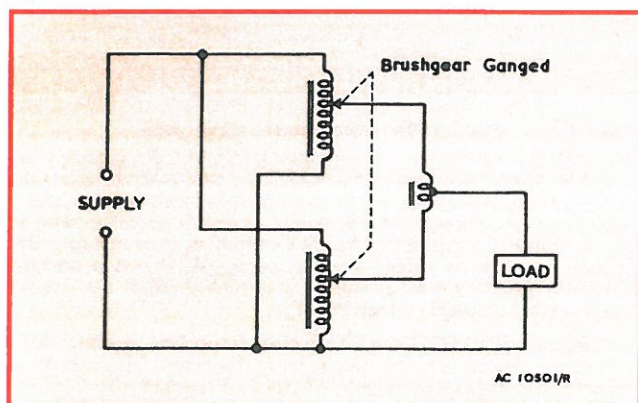


Fig. 6 Two-gang parallel-connected assembly

Two, three or more identical REGAVOLTS may be ganged in parallel to supply a single-phase load greater than a single unit can accommodate. Chokes are included to limit circulating current, two-gang assemblies requiring one choke and three-gang assemblies two chokes.

The output current from two units in parallel is twice that of a single unit; for three units in parallel it is three times that of a single unit, etc. The voltage rating remains that of a single unit.

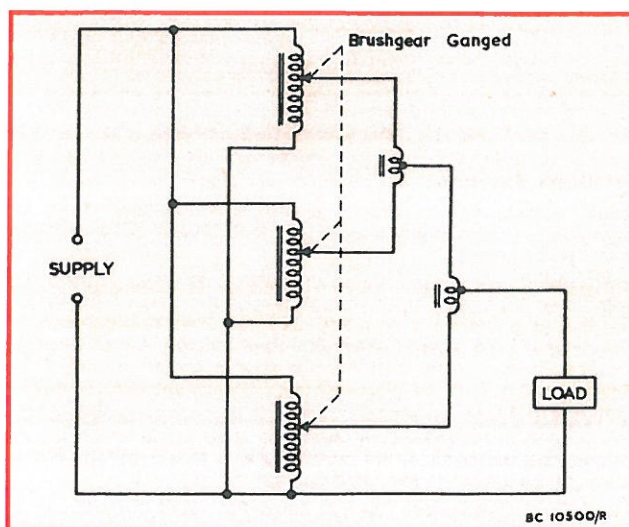


Fig. 7 Three-gang parallel-connected assembly

Parallel operation is only suitable for the larger models since, in the case of smaller models, it is more economical to use the next larger single unit.

Regavolt[®] CIRCUITS

GANGED ASSEMBLIES — SERIES CONNECTION

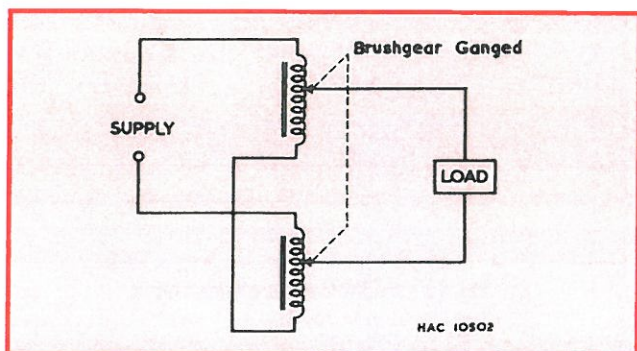


Fig. 8 Two-ganged series-connected assembly

Two identical REGAVOLTS may be ganged in series for operation at up to twice the input voltage of a single unit. The current rating remains that of a single unit. It is important to note that the load cannot be earthed, or commoned to the input neutral, in the circuit of Fig. 8. When it is necessary to earth the load, an isolating transformer must be included.

For both increased voltage and current rating in the largest frame size (series 1200), series-parallel assemblies can be used, for example a four-gang assembly consisting of two parallel-connected pairs with chokes, the two pairs being connected in series. Again, the load cannot be earthed unless an isolating transformer is included.

THREE-PHASE — STAR CONNECTION

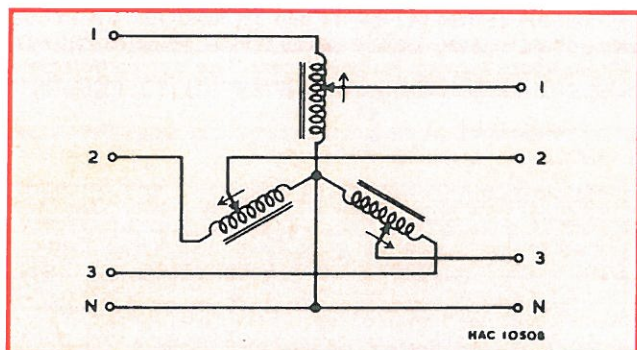


Fig. 9 Three-gang star connection

The most commonly used three-phase circuit is the star connection of a three-gang assembly, in which the line-to-neutral voltage (phase voltage) is applied across each REGAVOLT unit. 240 volt models are used on 415/240 volt supplies, and 120 volt models on 208/120 volt supplies, in either line-voltage or over-voltage connection. Note that the star point must **always** be connected as shown; otherwise an excessive voltage could be applied to one REGAVOLT.

For increased power rating in the largest models (series 1200) a six-gang star-parallel assembly can be used, having a parallel-connected pair of REGAVOLTS on each of the three phases.

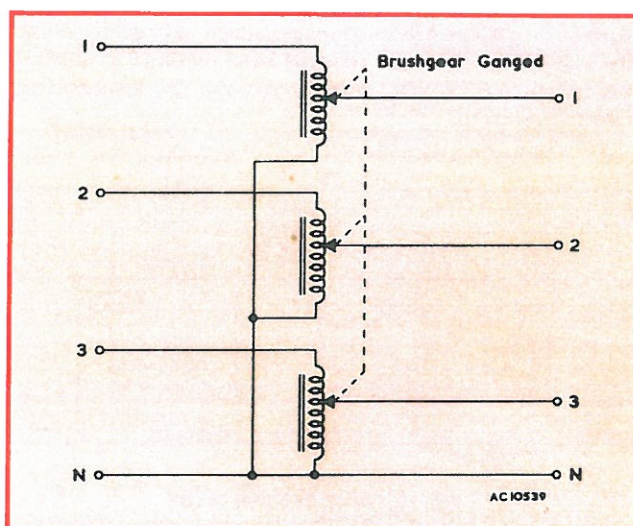


Fig. 9A Three-gang star connection
(alternative diagram)

The same arrangement is shown in Fig. 9A, where the diagram has been redrawn. Whilst Fig. 9 shows the operation of the 'star' connection system most clearly, Fig. 9A shows best the operation of the three ganged REGAVOLTS.

THREE-PHASE — OPEN-DELTA CONNECTION

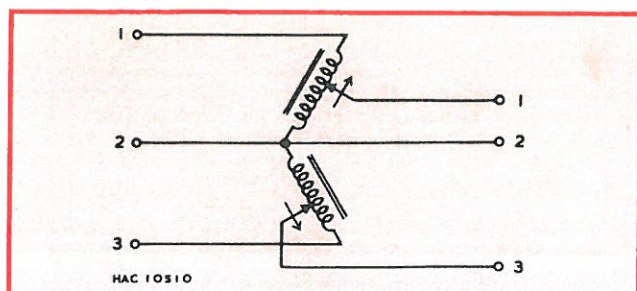


Fig. 10 Two-gang open-delta connection

With this connection, a two-gang assembly of 240 volt units can be used to control a three-phase load from a 208 or 220V three-phase supply. The line-to-line voltage (line voltage) is applied across each REGAVOLT unit, and over-voltage connection may be used if the line voltage does not exceed 240 volts. Each leg may consist of two or three parallel-connected units for increased power rating (series 1200).

The 440 volt models can be used similarly on 415V 3-wire three-phase supplies (over-voltage is not available on these types).

Note that a neutral cannot be used in this circuit, and that there is a common input-output connection for one phase. This is of value in instances where one phase is earthed, such as in some 400 Hz aircraft supplies.

Regavolt[®] CIRCUITS

REGAVOLTS WITH AUXILIARY TRANSFORMERS

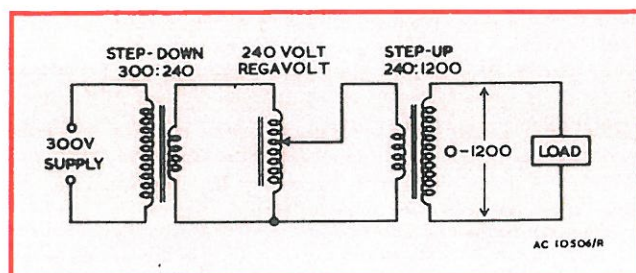


Fig. 11 Supply and load voltages beyond REGAVOLT range

In the example shown, the REGAVOLT is preceded by a step-down transformer and followed by a step-up transformer to obtain a variable output of 0-1200 volts from a 300 volt supply. In this case, the REGAVOLT's current rating would have to be 1200/240, i.e. five times the required output current.

This arrangement can be used for voltages either above or substantially below the rated input voltage. Of course, if either the supply voltage or the required output voltage is within the ratings of the REGAVOLT transformer, only one auxiliary transformer is required.

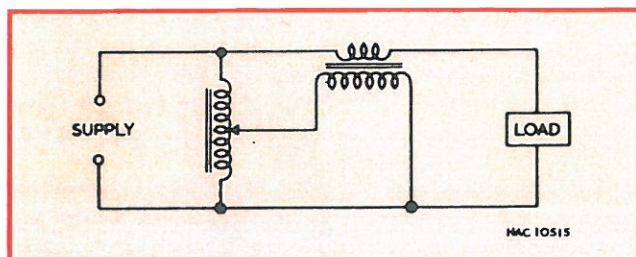


Fig. 13 Buck or boost circuit

For limited-range variation in one direction from supply voltage, boosting of low mains, etc.

The output of the REGAVOLT feeds the primary of the step-down transformer, the secondary of which is connected in series with the supply. According to the way the fixed transformer is connected, this gives limited-range variation from supply voltage upwards (boost) or downwards (buck). The range of voltage variation is the REGAVOLT's output range divided by the ratio of the fixed transformer, and the output current available is the REGAVOLT's current rating multiplied by that ratio.

Fig. 15 Coarse and fine voltage control

Two REGAVOLT transformers can be used with a fixed transformer in a buck-and-boost circuit to provide a coarse and fine voltage control. In the example shown, the fine adjustment is one-tenth of the coarse adjustment, and can be as required according to the ratio of the step-down transformer.

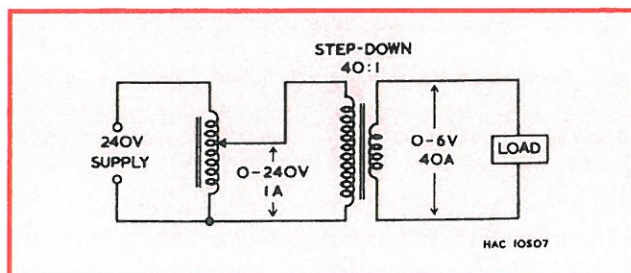


Fig. 12 Variable low-voltage output
(See also Series 360 and 420, page 23)

In the example shown, a 1 ampere, 240 volt REGAVOLT (Type 401) is used with a 40:1 step-down transformer to provide a variable output of 0-6 volts at 40 amperes rated current. The larger units or ganged assemblies can be used in this way to provide low-voltage output at very high current (a Type 1225-G3P assembly used in the above circuit would give 0-6 volts at 3600 amperes rated current).

In both the circuits of Figs. 11 and 12, fixed auto-transformers may often be used instead of the double-wound transformers shown where isolation is unnecessary. This is more economical where the transformation ratio is not high. (Up to 2:1 typically).

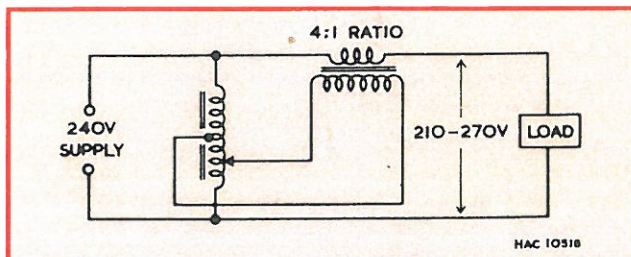
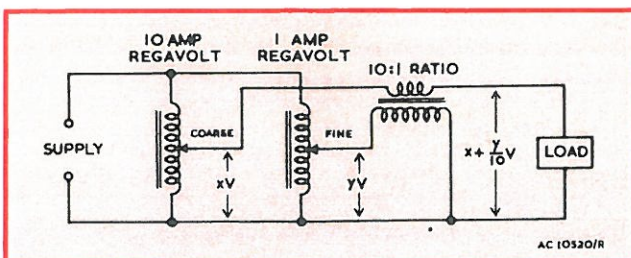


Fig. 14 Buck-and-boost circuit

For limited-range voltage adjustment both above and below supply voltage, i.e., for under- and over-voltage testing, stabilisation of varying mains voltages, etc.

The primary of the fixed transformer is connected between the brush and a tapping on the REGAVOLT winding. The tap position is determined by the relative amounts of buck and boost required. In the example shown, a centre-tapped REGAVOLT and 4:1 fixed transformer provide a total variation of 25% of supply voltage, with equal swings above and below. The output current available is four times the REGAVOLT rating.



SINGLE UNITS for single-phase operation

	INPUT 250V Type 301	INPUT 230V Type 301C	INPUT 120V Type 301L
Uncovered, Component only			
Covered — Round (R) or Rectangular (E)	301-R, E	301C-R, E	301L-R, E
INPUT VOLTAGE	250V	230V	120V
LOAD RATING (see page 5)	187 VA	187 VA	210 VA
" " with heatsink *	250 VA	250 VA	240 VA
OUTPUT VOLTAGE	0-250V	0-250V	0-120V
RATED CURRENT	0-5A	0-5A	1-75A
" " with heatsink *	0-7A	0-7A	2A
MAXIMUM CURRENT (see page 5)	0-75A	0-75A	1-75A
" " with heatsink *	1A	1A	2A
NO-LOAD LOSS	3W	3W	3W
NUMBER OF TURNS ON WINDING	1010	1010	475

* The higher ratings apply when mounted on a metal panel 1.6 mm thick x 300 mm square (or equivalent heatsink).
In other cases the lower figure should not be exceeded.

TWO-GANG ASSEMBLIES for single-phase series operation †
THREE-GANG ASSEMBLIES for three-phase star operation

	TWO-GANG †		THREE-GANG	
	INPUT 500V single-phase	INPUT 240V single-phase	INPUT 415V three-phase	INPUT 208V three-phase
Uncovered, Component only	Type 301-G2	Type 301L-G2	Type 301-G3	Type 301L-G3
Covered — Rectangular (E)	301-G2E	301L-G2E	301-G3E	301L-G3E
INPUT VOLTAGE	500V	240V	415V	208V
LOAD RATING (see page 5)	375 VA	420 VA	540 VA	630 VA
OUTPUT VOLTAGE	0-500V	0-240V	0-415V	0-208V
RATED CURRENT	0-5A	1-75A	0-5A per ph	1-75A per ph
MAXIMUM CURRENT (see page 5)	0-75A	1-75A	0-75A per ph	1-75A per ph

† Two-gang assemblies can also be used on three-phase supply in open-delta connection (see page 7).
Series connected models cannot be used with earthed load.

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Specifications,
Definitions and
Terminology

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Circuits

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DIALS

Double-sided dials are fitted, graduated 0 - 100 each side. Marking is clockwise one side and anti-clockwise the other, for use with dial attached to panel or moving with knob.

MOTOR DRIVE (page 21)

Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

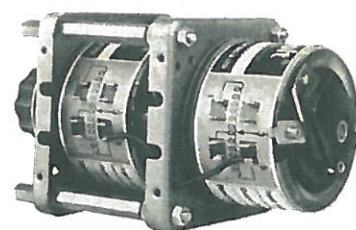
ANGLE OF ROTATION 310°
UNIT DRIVING TORQUE
(see page 5) 0.5 kgcm



Uncovered 300 Series REGAVOLTS are available in component form only, and are designed for back-of-panel mounting.



Covered model (round enclosure). Also available in rectangular enclosure, as series 300-E (pp. 10/11).

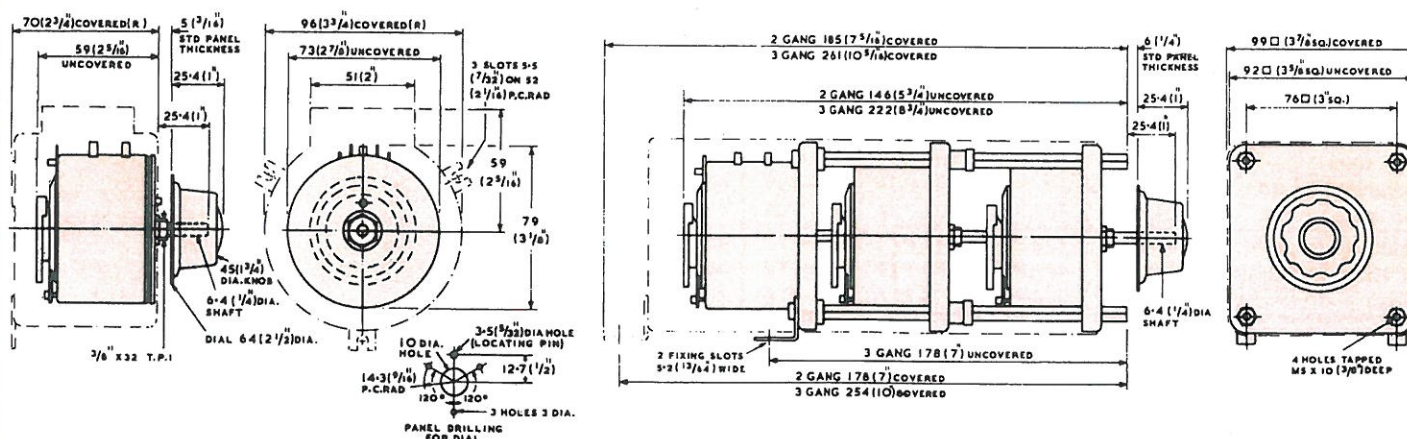


Uncovered two-gang assembly

OTHER 300 FRAME MODELS

50/60 Hz models for other voltages } Page 22
High-frequency models }
Low output voltage models } 23

OUTLINE DIMENSIONS



SINGLE UNITS for single-phase operation

(two-gang assemblies for single-phase series or three-phase open-delta operation and three-gang assemblies for three-phase star operation are listed on pages 12 - 13)

ANGLE OF ROTATION 320°

DRIVING TORQUE

(see page 5) 1.8 kgcm

240 VOLT MODELS

Component	Type 401-K	Type 402-K	Type 403-K	Type 404-K
Uncovered	401	402	403	404
Covered — Round (R) or Rectangular (E)	401-R, 401-E	402-R, 402-E	403-R, 403-E	404-R, 404-E
Covered, with Switch, Fuse, Terminals and Lead	—	402-LAB	403-LAB	404-LAB
In Robust Wall-Mounting Enclosure	401-W	402-W	403-W	404-W
INPUT VOLTAGE	240V*	240V*	240V*	240V*
LOAD RATING (see page 5)	290 VA	660 VA	840 VA	1140 VA
OUTPUT VOLTAGE				
over-voltage connection	0-275V	0-275V	0-275V	0-275V
line-voltage connection	0-240V	0-240V	0-240V	0-240V
RATED CURRENT (do not exceed in over-voltage connection)	1A	2.5A	3A	4A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	1.2A	2.75A	3.5A	4.75A
NO-LOAD LOSS	7W	10W	12W	12W
NUMBER OF TURNS ON WINDING	945	590	380	380

* These models are centre-tapped and can be used on 120 volt input to give 0-240 volt output. In this case, the current drawn must not exceed one half of rated current.

120 VOLT AND 440 VOLT MODELS

Component	INPUT 120 VOLTS			INPUT 440 VOLTS		
	Type 401L-K	Type 402L-K	Type 403L-K	Type 402H-K	Type 403H-K	Type 404H-K
Uncovered	401L	402L	403L	402H	403H	404H
Covered — Round (R) or Rectangular (E)	401L-R, E	402L-R, E	403L-R, E	402H-R, E	403H-R, E	404H-R, E
Covered, with Switch, Fuse, Terminals and Lead	—	402L-LAB	403L-LAB	—	—	—
In Robust Wall-Mounting Enclosure	401L-W	402L-W	403L-W	402H-W	403H-W	404H-W
INPUT VOLTAGE	120V*	120V*	120V*	440V	440V	440V
LOAD RATING (see page 5)	360 VA	720 VA	970 VA	440 VA	530 VA	880 VA
OUTPUT VOLTAGE						
over-voltage connection	0-135V	0-135V	0-135V	—	—	—
line-voltage connection	0-120V	0-120V	0-120V	0-440V	0-440V	0-440V
RATED CURRENT (do not exceed in over-voltage connection)	2.25A	5A	6.75A	0.8A	1A	1.6A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	3A	6A	8.1A	1A	1.2A	2A
NO-LOAD LOSS	7W	10W	10W	10W	12W	12W
NUMBER OF TURNS ON WINDING	505	314	260	972	640	640

* The 120 volt models are centre-tapped and can be used on 60 volt input to give 0-120 volt output. In this case, the current drawn must not exceed one half of rated current.
440 volt models do not have a centre-tap, or over-voltage connections.

PORTABLE MODELS

Portable models are ideal for general laboratory and test use.

The REGAVOLT is mounted in a robust case, with carrying handle, input cable, mains switch, output fuse, and either a socket outlet or insulated terminals on 19 mm ($\frac{3}{4}$ ") spacing. A voltmeter or ammeter can be fitted if required.

OUTPUT ARRANGEMENTS	INPUT 240V, OUTPUT 0-275V RATED CURRENT				INPUT 120V, OUTPUT 0-135V RATED CURRENT		
	1A	2.5A	3A	4A	2.25A	5A	6.75A
Socket Outlet	401-PS	402-PS	403-PS	404-PS	401L-PS	402L-PS	403L-PS
Socket and Voltmeter	401-PSV	402-PSV	403-PSV	404-PSV	401L-PSV	402L-PSV	403L-PSV
Socket and Ammeter	401-PSA	402-PSA	403-PSA	404-PSA	401L-PSA	402L-PSA	403L-PSA
Insulated Terminals	401-PT	402-PT	403-PT	404-PT	401L-PT	402L-PT	403L-PT
Terminals and Voltmeter	401-PTV	402-PTV	403-PTV	404-PTV	401L-PTV	402L-PTV	403L-PTV
Terminals and Ammeter	401-PTA	402-PTA	403-PTA	404-PTA	401L-PTA	402L-PTA	403L-PTA

Portable models are supplied connected in over-voltage connection, unless otherwise ordered.

MOTOR DRIVE (page 21)

Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

DIALS

Double-sided dials are fitted. Marking is clockwise one side, anti-clockwise the other, for use with dial attached to panel or moving with knob.

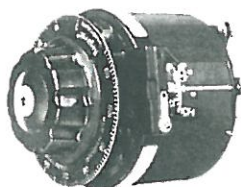
240 volt and 120 volt models have dials graduated 0-115%. If requested, dials graduated 0-100 or in voltage can be supplied instead. 440 volt models are supplied with 0-100 dials.



Single Units
120, 240 and 440 volt input
Unit load ratings from 290 VA to 1140 VA

General Specifications
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Component models are intended for permanent incorporation in user's equipment and have solder tag terminations in place of the terminal panel.



The REGAVOLT is supplied in bench mounting form for protection in transit. Adjustment of the shaft for panel mounting is readily carried out, but state panel thickness on the order if greater than 6 mm ($\frac{1}{4}$ ").



Uncovered and covered models have moulded terminal panels with screw terminals and tabs for push-on or solder connection.



Covered models are available in round (above) or rectangular (at right) enclosures.



'LAB' models are intended for laboratory bench use and have input lead, double-pole switch, output fuse and insulated terminals on 19 mm spacing. Supplied connected in over-voltage connection unless otherwise ordered.



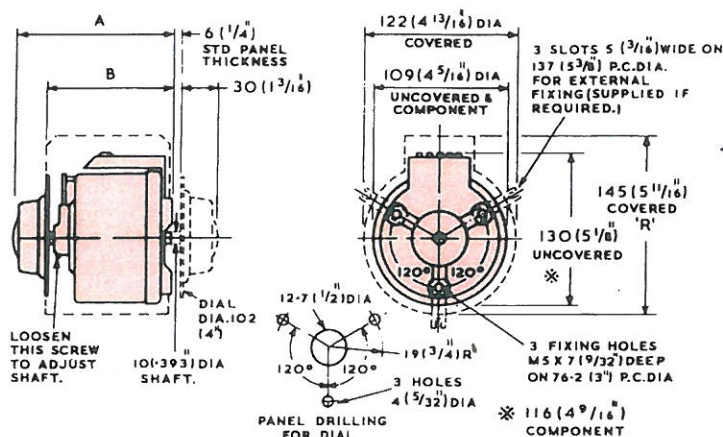
'W'-type enclosure provides a robust installation for industrial use, with 19 mm ($\frac{3}{4}$ ") cable entries and fixing straps.

OTHER 400 FRAME MODELS
50/60 Hz models for other voltages
High-frequency models
Low output voltage models

Page 22
Page 23

OUTLINE DIMENSIONS

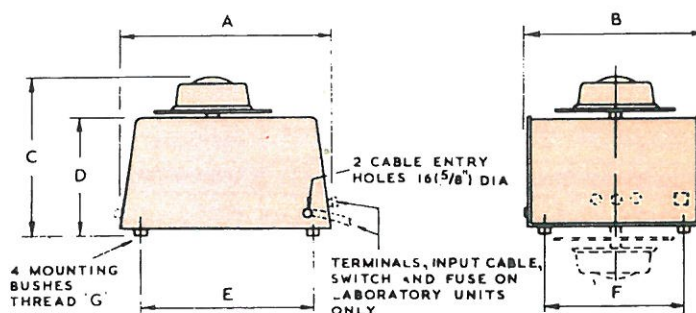
COMPONENT, UNCOVERED AND 'R'-TYPE COVERED



SIZE	A		B	
	mm	in	mm	in
401	110	4 5/16	79	3 1/8
402	133	5 1/4	104	4 1/16
403, 404	156	6 1/8	125	4 15/16

'E' AND 'LAB'-TYPE ENCLOSURES

(For 'W' and Portable types see page 15)

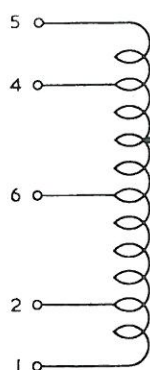


SIZE	A		B		C		D		E		F		G
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	
300 SERIES	140	5 1/2	135	5 3/16	119	4 11/16	92	3 5/8	100	3 15/16	100	3 15/16	M5
401, 402	190	7 1/2	135	5 3/16	147	5 3/4	116	4 9/16	150	5 7/8	100	3 15/16	M5
403, 404	190	7 1/2	135	5 3/16	170	6 11/16	139	5 7/16	150	5 7/8	100	3 15/16	M5
700 SERIES	268	10 1/2	225	8 7/8	195	7 11/16	150	5 7/8	220	8 11/16	180	7 1/8	M6

Terminal numbering & basic single unit connections

APPLIES TO ALL STANDARD REGAVOLTS

FOR INCREASE OF VOLTAGE WITH CLOCKWISE ROTATION



BENCH (SURFACE) MOUNTING	Input	Output
	L - N	L - N
	Over-Voltage Connection	4 - 1
Line-Voltage Connection	5 - 1	3 - 1
	Terminal 1 Common	

BACK-OF-PANEL MOUNTING	Input	Output
	L - N	L - N
	Over-Voltage Connection	2 - 5
Line-Voltage Connection	1 - 5	3 - 5
	Terminal 5 Common	

440 volt models do not have a centre-tap and are for line-voltage connection only. Terminals are 1, 3, 5.

GANGED ASSEMBLIES (single units are listed on pages 10 - 11)

ANGLE OF ROTATION 320°

DRIVING TORQUE -G2 2.9 kgcm
(see page 5) -G3 4.3 kgcm

TWO-GANG ASSEMBLIES for single-phase series operation †

† Two-gang assemblies can also be used on three-phase supply in open-delta connection (see page 7).
Series-connected models cannot be used with earthed load.

	INPUT 480 VOLTS single-phase				INPUT 240 VOLTS single-phase		
	Type	Type	Type	Type	Type	Type	Type
	401-G2	402-G2	403-G2	404-G2	401L-G2	402L-G2	403L-G2
	401-G2E	402-G2E	403-G2E	404-G2E	401L-G2E	402L-G2E	403L-G2E
Uncovered							
Covered							
In Robust Wall-Mounting Enclosure	401-G2W	402-G2W	403-G2W	404-G2W	401L-G2W	402L-G2W	403L-G2W
INPUT VOLTAGE	480V	480V	480V	480V	240V	240V	240V
LOAD RATING (see page 5)	0.58 kVA	1.32 kVA	1.68 kVA	2.3 kVA	0.72 kVA	1.44 kVA	1.94 kVA
OUTPUT VOLTAGE							
over-voltage connection	0-550V	0-550V	0-550V	0-550V	0-275V	0-275V	0-275V
line-voltage connection	0-480V	0-480V	0-480V	0-480V	0-240V	0-240V	0-240V
RATED CURRENT (do not exceed in over-voltage connection)	1A	2.5A	3A	4A	2.25A	5A	6.75A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	1.2A	2.75A	3.5A	4.75A	3A	6A	8.1A

	INPUT 880 VOLTS single-phase		
	Type	Type	Type
	402H-G2	403H-G2	404H-G2
	402H-G2E	403H-G2E	404H-G2E
Uncovered			
Covered			
In Robust Wall-Mounting Enclosure	402H-G2W	403H-G2W	404H-G2W
INPUT VOLTAGE	880V	880V	880V
LOAD RATING (see page 5)	0.88 kVA	1.06 kVA	1.76 kVA
OUTPUT VOLTAGE			
line-voltage connection only	0-880V	0-880V	0-880V
RATED CURRENT	0.8A	1A	1.6A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	1A	1.2A	2A



Three-gang assembly
in 'W'-type robust
enclosure.

THREE-GANG ASSEMBLIES for three-phase star operation

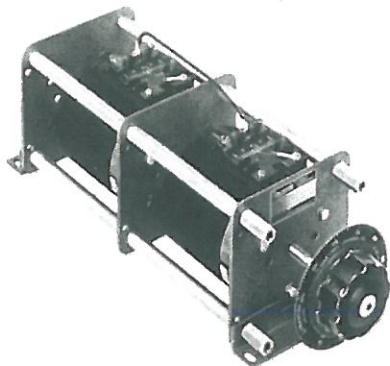
	INPUT 415 VOLTS three-phase				INPUT 208 VOLTS three-phase		
	Type	Type	Type	Type	Type	Type	Type
	401-G3	402-G3	403-G3	404-G3	401L-G3	402L-G3	403L-G3
	401-G3E	402-G3E	403-G3E	404-G3E	401L-G3E	402L-G3E	403L-G3E
Uncovered							
Covered							
In Robust Wall-Mounting Enclosure	401-G3W	402-G3W	403-G3W	404-G3W	401L-G3W	402L-G3W	403L-G3W
INPUT VOLTAGE (line-to-line)	415V	415V	415V	415V	208V	208V	208V
LOAD RATING (see page 5)	0.86 kVA	2 kVA	2.52 kVA	3.4 kVA	1.08 kVA	2.16 kVA	2.9 kVA
OUTPUT VOLTAGE (line-to-line)							
over-voltage connection	0-475V	0-475V	0-475V	0-475V	0-239V	0-239V	0-239V
line-voltage connection	0-415V	0-415V	0-415V	0-415V	0-208V	0-208V	0-208V
RATED CURRENT per phase (do not exceed in over-voltage connection)	1A	2.5A	3A	4A	2.25A	5A	6.75A
MAXIMUM CURRENT per phase (line-voltage connection only — see page 5)	1.2A	2.75A	3.5A	4.75A	3A	6A	8.1A

Two-gang and three-gang assemblies

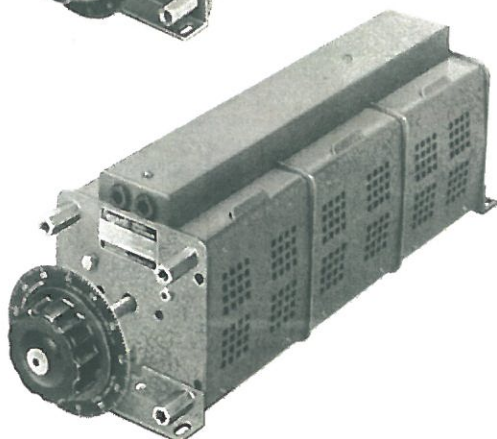
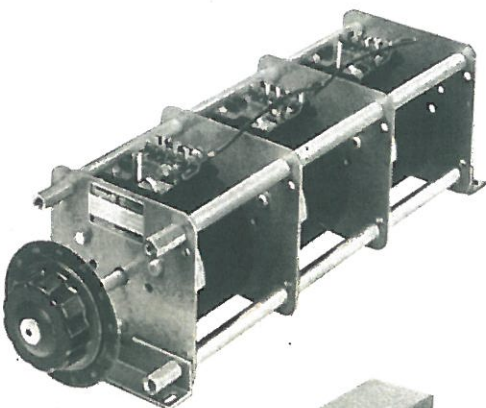
General Specifications,
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Two-gang



DIALS

Ganged assemblies are fitted with double-sided dials graduated 0-115% or 0-100 as appropriate on each side. Marking is clockwise one side and anti-clockwise the other, for use with dial attached to panel or moving with knob.

MOTOR DRIVE (page 21)

Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

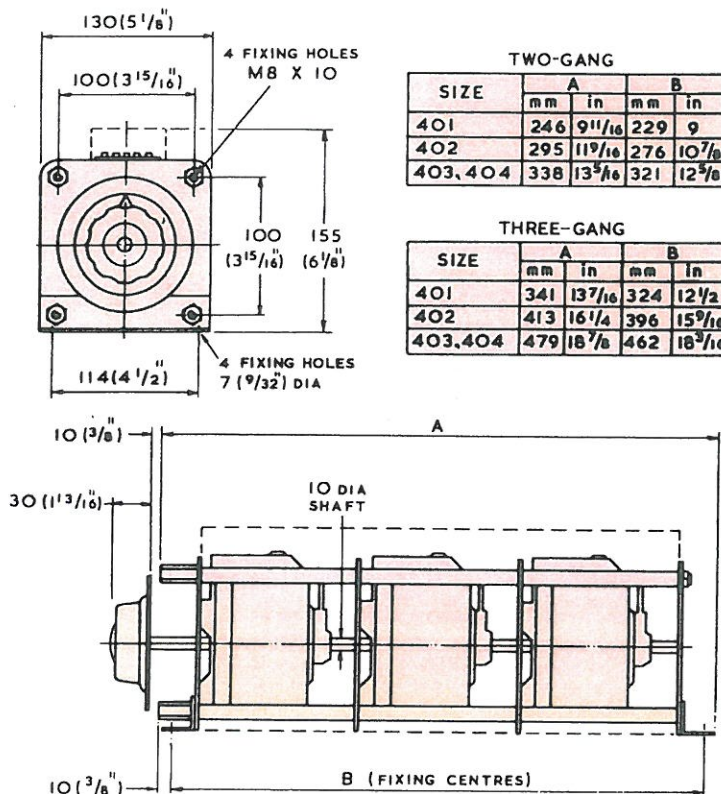
OTHER 400 FRAME MODELS

50/60 Hz models for other voltages
High-frequency models

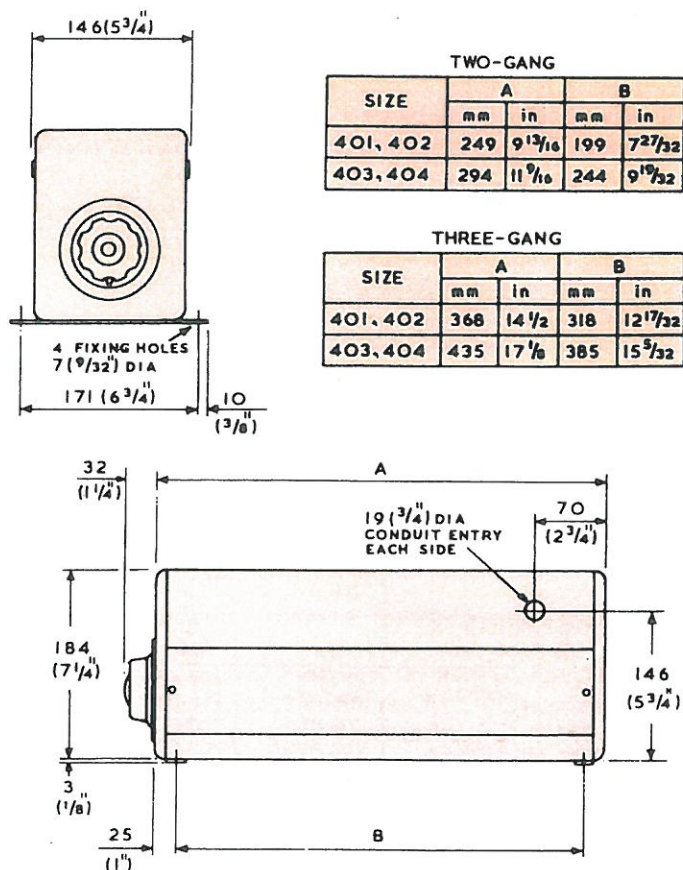
Page 22

OUTLINE DIMENSIONS

UNCOVERED AND 'E'-TYPE COVERED



'W'-TYPE ENCLOSURE



SINGLE UNITS for single-phase operation

(Two-gang and three-gang parallel-connected assemblies for higher current output, two-gang assemblies for single-phase series or three-phase open-delta operation, and three-gang assemblies for three-phase star operation are listed on pages 16 and 17).

ANGLE OF ROTATION 320°**DRIVING TORQUE**
(see page 5) 2.9 kgcm**240 VOLT MODELS**

	Type 706	Type 708	Type 710	Type 715
Uncovered				
Covered — Round (R) or Rectangular (E)	706-R, 706-E	708-R, 708-E	710-R, 710-E	715-R, 715-E
Covered, with Switch, Fuse, Terminals and Lead	706-LAB	708-LAB	710-LAB	715-LAB
In Robust Wall-Mounting Enclosure	706-W	708-W	710-W	715-W
INPUT VOLTAGE	240V*	240V*	240V*	240V*
LOAD RATING (see page 5)	1.73 kVA	2.4 kVA	2.9 kVA	4.3 kVA
OUTPUT VOLTAGE				
over-voltage connection	0-275V	0-275V	0-275V	0-275V
line-voltage connection	0-240V	0-240V	0-240V	0-240V
RATED CURRENT (do not exceed in over-voltage connection)	6A	8A	10A	15A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	7.2A	10A	12A	18A
NO-LOAD LOSS	15W	15W	30W	30W
NUMBER OF TURNS ON WINDING	383	383	305	258

* These models are centre-tapped and can be used on 120 volt input to give 0-240 volt output. In this case, the current drawn must not exceed one half of rated current.

120 VOLT AND 440 VOLT MODELS

	INPUT 120 VOLTS		INPUT 440 VOLTS	
	Type 706L	Type 706H	Type 710H	Type 715H
Uncovered				
Covered — Round (R) or Rectangular (E)	706L-R, 706L-E	706H-R, 706H-E	710H-R, 710H-E	715H-R, 715H-E
Covered, with Switch, Fuse, Terminals and Lead	706L-LAB	—	—	—
In Robust Wall-Mounting Enclosure	706L-W	—	—	—
INPUT VOLTAGE	120V*	440V	440V	440V
LOAD RATING (see page 5)	2.2 kVA	1.32 kVA	2.2 kVA	3.3 kVA
OUTPUT VOLTAGE				
over-voltage connection	0-135V	—	—	—
line-voltage connection	0-120V	0-440V	0-440V	0-440V
RATED CURRENT (do not exceed in over-voltage connection)	15A	3A	5A	7.5A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	18A	3A	5A	7.5A
NO-LOAD LOSS	15W	15W	30W	30W
NUMBER OF TURNS ON WINDING	225	614	504	420

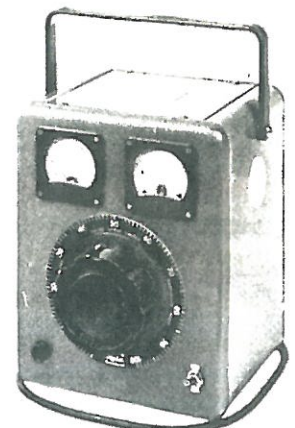
* Type 706L is centre-tapped and can be used on 60 volt input to give 0-120 volt output. In this case, the current drawn must not exceed one half of rated current.
440 volt models do not have a centre-tap, or over-voltage connections.

PORTABLE MODELS

Portable models are ideal for general laboratory and test use. The REGAVOLT is mounted in a robust case, with carrying handle, input cable, mains switch, output fuse, and either a socket outlet or insulated terminals. A voltmeter or ammeter, or both voltmeter and ammeter, can be fitted if required.

OUTPUT ARRANGEMENTS	INPUT 240V, OUTPUT 0 - 275V				INPUT 120V Output 0 - 135V Rated Current 13A(S)†, 15A(T)†
	6A	8A	10A	13A(S),† 15A(T)†	
Socket Outlet	706-PS	708-PS	710-PS	715-PS	706L-PS
Socket and Voltmeter	706-PSV	708-PSV	710-PSV	715-PSV	706L-PSV
Socket and Ammeter	706-PSA	708-PSA	710-PSA	715-PSA	706L-PSA
Socket, Voltmeter and Ammeter	706-PSVA	708-PSVA	710-PSVA	715-PSVA	706L-PSVA
Insulated Terminals	706-PT	708-PT	710-PT	715-PT	706L-PT
Terminals and Voltmeter	706-PTV	708-PTV	710-PTV	715-PTV	706L-PTV
Terminals and Ammeter	706-PTA	708-PTA	710-PTA	715-PTA	706L-PTA
Terminals, Voltmeter and Ammeter	706-PTVA	708-PTVA	710-PTVA	715-PTVA	706L-PTVA

Portable models are supplied connected in over-voltage connection, unless otherwise ordered.
† The Regavolt is rated at 15A, but the output is limited to 13A by the socket when fitted.



Single Units

120, 240 and 440 volt input

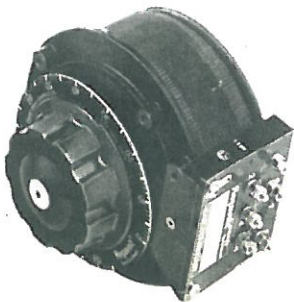
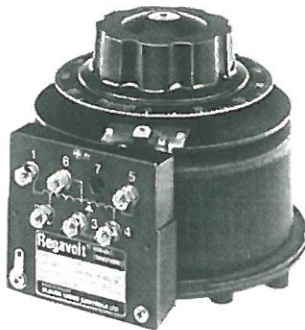
Unit load ratings from 1.6 kVA to 4.3 kVA

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Uncovered Model



Back-of-panel mounting.
The REGAVOLT is supplied in bench mounting form for protection in transit. Adjustment of the shaft for panel mounting is readily carried out, but state panel thickness on the order if greater than 12 mm ($\frac{1}{2}$ ").

Covered Model



'E' enclosure: 'LAB' Model is similar, but with input cable, terminals, etc.

DIALS

Double-sided dials are fitted. Marking is clockwise one side and anti-clockwise the other, for use with dial attached to panel or moving with knob. 240 volt and 120 volt models have dials graduated 0-115%; if requested dials graduated 0-100 can be supplied instead. 440 volt models are supplied with 0-100 dials.

MOTOR DRIVE (page 21)

Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

OTHER 400 FRAME MODELS

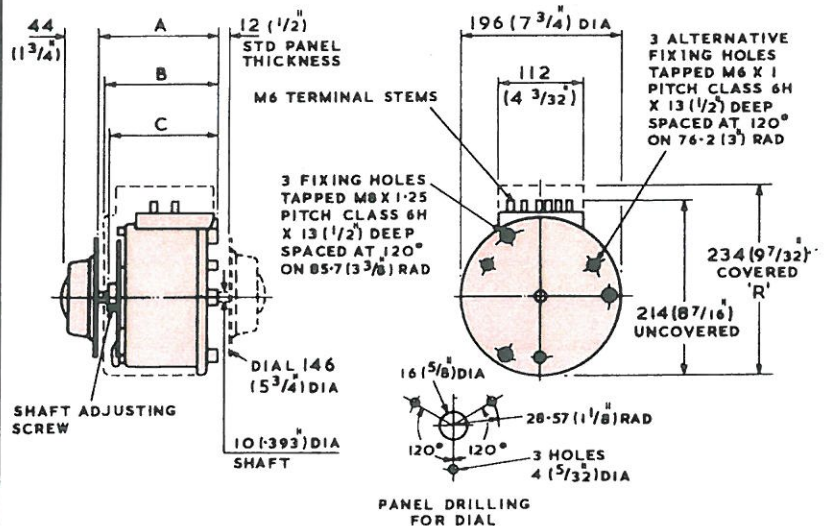
Oil-immersed models
50/60 Hz models for other voltages
High-frequency models

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OUTLINE DIMENSIONS

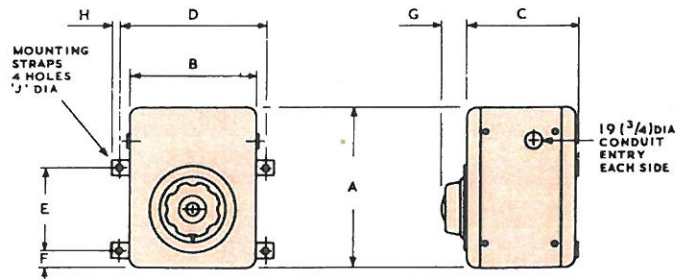
UNCOVERED AND 'R'-TYPE COVERED



SIZE	A		B		C	
	mm	in	mm	in	mm	in
706, 708, 757, 775, 776	124	$4\frac{7}{8}$	—	—	114	$4\frac{1}{2}$
710, 715	143	$5\frac{5}{8}$	—	—	133	$5\frac{1}{4}$
ALL 700(R) COVERED TYPES	143	$5\frac{5}{8}$	140	$5\frac{1}{2}$	—	—

'W'-TYPE ENCLOSURE

(Portable models have similar case dimensions)
(For 'E' and 'LAB'-type enclosures see page 11)

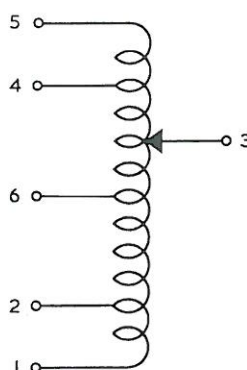


SIZE	A		B		C		D		E		F		G		H		J	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
401, 402	184	$7\frac{1}{4}$	146	$5\frac{3}{4}$	125	$4\frac{1}{16}$	171	$6\frac{3}{4}$	95	$3\frac{3}{4}$	19	$\frac{3}{4}$	32	$1\frac{1}{4}$	9.5	$\frac{3}{8}$	7	$\frac{9}{32}$
403, 404	184	$7\frac{1}{4}$	146	$5\frac{3}{4}$	141	$5\frac{5}{16}$	171	$6\frac{3}{4}$	95	$3\frac{3}{4}$	19	$\frac{3}{4}$	32	$1\frac{1}{4}$	9.5	$\frac{3}{8}$	7	$\frac{9}{32}$
700 SERIES	279	11	222	$8\frac{3}{4}$	191	$7\frac{1}{2}$	267	$10\frac{1}{2}$	175	$6\frac{7}{8}$	24	$1\frac{1}{16}$	44	$1\frac{3}{4}$	19	$\frac{3}{4}$	11	$\frac{7}{16}$

Terminal numbering & basic single unit connections

APPLIES TO ALL STANDARD REGAVOLTS

FOR INCREASE OF VOLTAGE WITH CLOCKWISE ROTATION



BENCH (SURFACE) MOUNTING	Input	Output
	L - N	L - N
Over-Voltage Connection	4 - 1	3 - 1
Line-Voltage Connection	5 - 1	3 - 1
Terminal 1 Common		
BACK-OF-PANEL MOUNTING	Input	Output
	L - N	L - N
Over-Voltage Connection	2 - 5	3 - 5
Line-Voltage Connection	1 - 5	3 - 5
Terminal 5 Common		

440 volt models do not have a centre-tap and are for line-voltage connection only. Terminals are 1, 3, 5.

GANGED ASSEMBLIES (single units are listed on pages 14 - 15)

ANGLE OF ROTATION 320°

DRIVING TORQUE -G2 6.2 kgcm
(see page 5) -G3 9.4 kgcm**TWO-GANG AND THREE-GANG PARALLEL-CONNECTED ASSEMBLIES**

Single-phase for higher current output, with choke(s) to limit circulating current.

	INPUT 240 VOLTS TWO-GANG		THREE-GANG	INPUT 120 VOLTS TWO-GANG
	Type 710-G2P 710-G2PE	Type 715-G2P 715-G2PE	Type 715-G3P 715-G3PE	Type 706L-G2P 706L-G2PE
Uncovered				
Covered				
INPUT VOLTAGE	240V	240V	240V	120V
LOAD RATING (see page 5)	5.8 kVA	8.6 kVA	12.9 kVA	4.3 kVA
OUTPUT VOLTAGE				
over-voltage connection	0-275V	0-275V	0-275V	0-135V
line-voltage connection	0-240V	0-240V	0-240V	0-120V
RATED CURRENT (do not exceed in over-voltage connection)	20A	30A	45A	30A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	24A	36A	54A	36A

TWO-GANG ASSEMBLIES for single-phase series operation †† Two-gang assemblies can also be used on three-phase supply in open-delta connection (see page 7).
Series-connected models cannot be used with earthed load.

	INPUT 480 VOLTS				INPUT 240 VOLTS
	Type 706-G2 706-G2E	Type 708-G2 708-G2E	Type 710-G2 710-G2E	Type 715-G2 715-G2E	Type 706L-G2 706L-G2E
Uncovered					
Covered					
INPUT VOLTAGE	480V	480V	480V	480V	240V
LOAD RATING (see page 5)	3.4 kVA	4.8 kVA	5.8 kVA	8.6 kVA	4.3 kVA
OUTPUT VOLTAGE					
over-voltage connection	0-550V	0-550V	0-550V	0-550V	0-270V
line-voltage connection	0-480V	0-480V	0-480V	0-480V	0-240V
RATED CURRENT (do not exceed in over-voltage connection)	6A	8A	10A	15A	15A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	7.2A	10A	12A	18A	18A

	INPUT 880 VOLTS		
	Type 706H-G2 706H-G2E	Type 710H-G2 710H-G2E	Type 715H-G2 715H-G2E
Uncovered			
Covered			
INPUT VOLTAGE	880V	880V	880V
LOAD RATING (see page 5)	2.64 kVA	4.4 kVA	6.6 kVA
OUTPUT VOLTAGE (line-voltage connection only)	0-880V	0-880V	0-880V
RATED CURRENT (do not exceed in over-voltage connection)	3A	5A	7.5A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	3A	5A	7.5A

THREE-GANG ASSEMBLIES for three-phase star operation

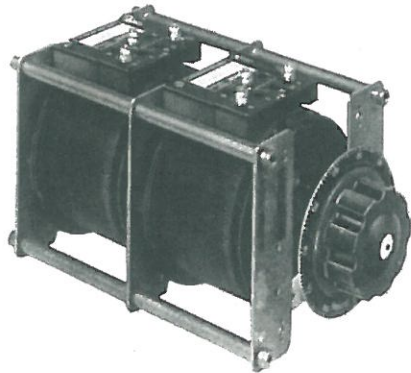
	INPUT 415 VOLTS three-phase				INPUT 208 VOLTS three-phase
	Type 706-G3 706-G3E	Type 708-G3 708-G3E	Type 710-G3 710-G3E	Type 715-G3 715-G3E	Type 706L-G3 706L-G3E
Uncovered					
Covered					
INPUT VOLTAGE (line-to-line)	415V	415V	415V	415V	208V
LOAD RATING (see page 5)	5.2 kVA	7.2 kVA	8.6 kVA	12.9 kVA	6.5 kVA
OUTPUT VOLTAGE (line-to-line)					
over-voltage connection	0-476V	0-476V	0-476V	0-476V	0-234V
line-voltage connection	0-415V	0-415V	0-415V	0-415V	0-208V
RATED CURRENT per phase (do not exceed in over-voltage connection)	6A	8A	10A	15A	15A
MAXIMUM CURRENT per phase (line-voltage connection only — see page 5)	7.2A	10A	12A	18A	18A

Two-gang and three-gang assemblies

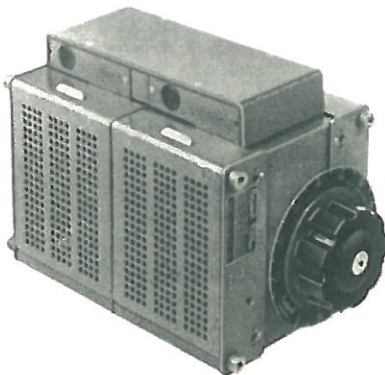
General Specifications,
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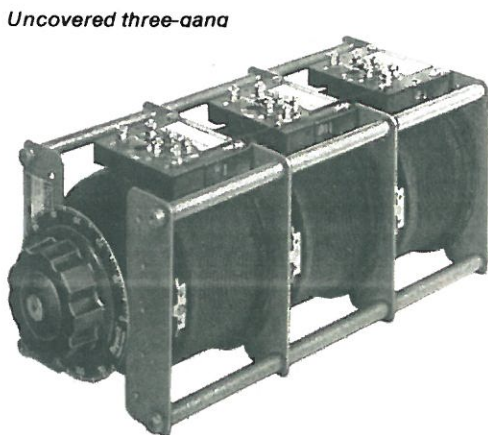
Pages 6 - 8



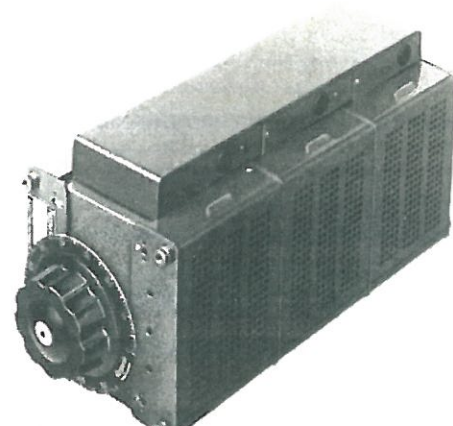
Two-gang



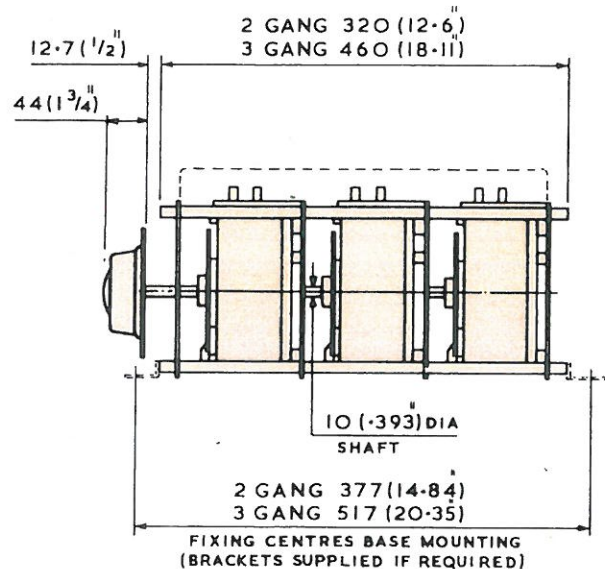
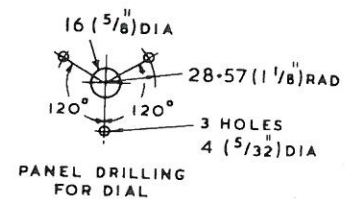
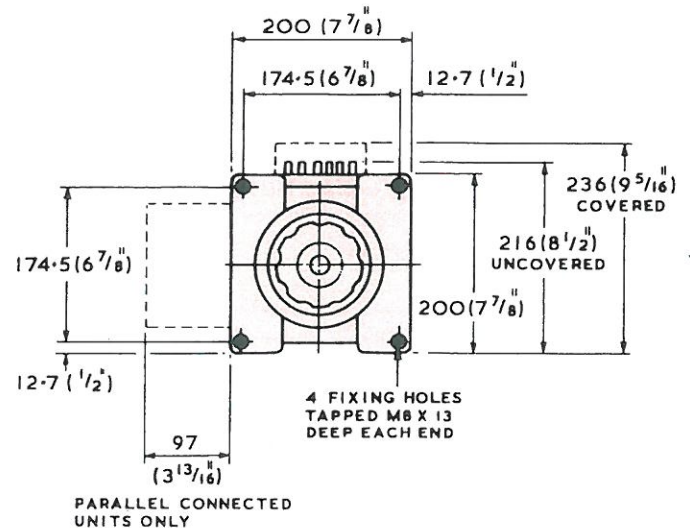
Two-gang assembly.



Uncovered three-gang



OUTLINE DIMENSIONS



DIALS

Ganged assemblies are fitted with double-sided dials graduated 0 - 115% or 0 - 100 as appropriate on each side. Marking is clockwise one side and anti-clockwise the other, for use with dial attached to panel or moving with knob.

MOTOR DRIVE (page 21)

Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

OTHER 700 FRAME MODELS

Oil-immersed models
50/60 Hz models for other voltages
High-frequency models

Page 20

Page 22

1200 SERIES

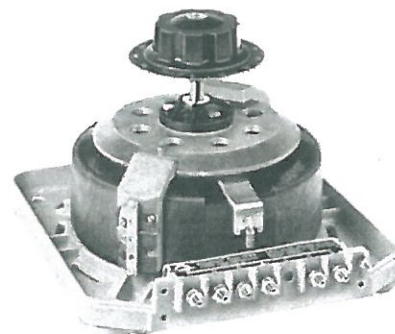
Regavolts

SINGLE UNITS for single-phase operation

	INPUT 240V	INPUT 120V	INPUT 440V
Uncovered	Type 1225	Type 1225L	Type 1225H
Covered	1225-E	1225L-E	1225H-E
INPUT VOLTAGE	240V*	120V*	440V
LOAD RATING (see page 5)	7.2 kVA	7.2 kVA	5.5 kVA
OUTPUT VOLTAGE			
over-voltage connection	0-275V	0-135V	—
line-voltage connection	0-240V	0-120V	0-440V
RATED CURRENT (do not exceed in over-voltage connection)	25A	50A	12.5A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	30A	60A	12.5A
NO-LOAD LOSS	40W	40W	40W
NUMBER OF TURNS ON WINDING	295	190	475

- * Type 1225 is centre-tapped and can be used on 120 volt input to give 0-240 volt output.
Type 1225L is centre-tapped and can be used on 60 volt input to give 0-120 volt output.
In both cases, the current drawn must not exceed one half of rated current.
440V models do not have a centre-tap, or over-voltage connections.

ANGLE OF ROTATION320°
DRIVING TORQUE3.6 kgcm
(see page 5) ...-G2 7.2 kgcm
 -G3 10.8 kgcm



Uncovered model

GANGED ASSEMBLIES for single-phase operation

Two-gang and three-gang parallel-connected assemblies for higher current output, with choke(s) to limit circulating current

* Two-gang assemblies for series operation †

	PARALLEL-CONNECTED ASSEMBLIES				TWO-GANG ASSEMBLIES FOR SERIES OPERATION †		
	INPUT 240 VOLTS		INPUT 120 VOLTS		INPUT 480V	INPUT 240V	INPUT 880V
	2-GANG Type 1225-G2P 1225-G2PE	3-GANG Type 1225-G3P 1225-G3PE	2-GANG Type 1225L-G2P 1225L-G2PE	3-GANG Type 1225L-G3P 1225L-G3PE	Type 1225-G2 1225-G2E	Type 1225L-G2 1225L-G2E	Type 1225H-G2 1225H-G2E
Uncovered							
Covered							
INPUT VOLTAGE	240V	240V	120V	120V	480V	240V	880V
LOAD RATING (see page 5)	14.4 kVA	21.6 kVA	14.4 kVA	21.6 kVA	14.4 kVA	14.4 kVA	11 kVA
OUTPUT VOLTAGE							
over-voltage connection	0-275V	0-275V	0-135V	0-135V	0-550V	0-270V	—
line-voltage connection	0-240V	0-240V	0-120V	0-120V	0-480V	0-240V	0-880V
RATED CURRENT (do not exceed in over-voltage connection)	50A	75A	100A	150A	25A	50A	12.5A
MAXIMUM CURRENT (line-voltage connection only — see page 5)	60A	90A	120A	180A	30A	60A	12.5A

- † Two-gang assemblies can also be used on three-phase supply in open-delta connection (see page 7).
Series-connected models cannot be used with earthed load.
* Four and six-gang assemblies also available for parallel and star-parallel connections. Details on request.

THREE-GANG ASSEMBLIES for three-phase star operation

	INPUT 415 VOLTS three-phase	INPUT 208 VOLTS three-phase
Uncovered	Type 1225-G3	Type 1225L-G3
Covered	1225-G3E	1225L-G3E
INPUT VOLTAGE (line-to-line)	415V	208V
LOAD RATING (see page 5)	21.6 kVA	21.6 kVA
OUTPUT VOLTAGE (line-to-line)		
over-voltage connection	0-476V	0-234V
line-voltage connection	0-415V	0-208V
RATED CURRENT per phase (do not exceed in over-voltage connection)	25A	50A
MAXIMUM CURRENT per phase (line-voltage connection only — see page 5)	30A	60A



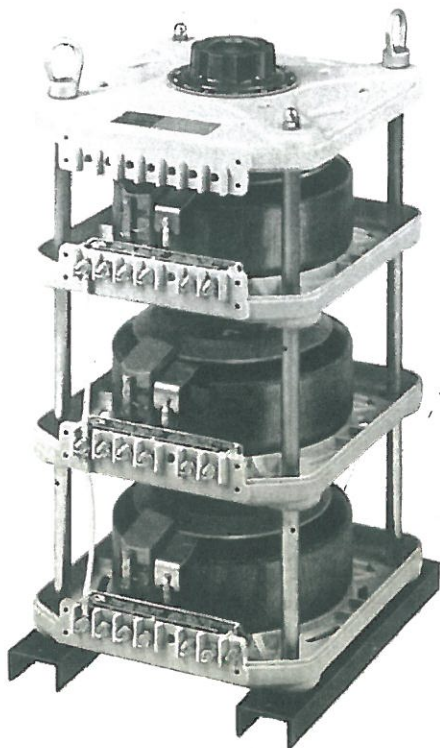
Covered model

**Single Units and
Ganged Assemblies**
Unit load rating up to 7.2 kVA

General Specifications
Definitions and Terminology
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Pages 3 - 5

Pages 6 - 8



Uncovered three-gang assembly.

Ganged assemblies of up to six units are available to order.

BACK-OF-PANEL MOUNTING

The REGAVOLT is supplied in bench mounting form for protection in transit. Adjustment of the shaft for panel mounting is readily carried out, but state panel thickness on the order if greater than 12 mm ($\frac{1}{2}$ ").

DIALS

Double-sided dials are fitted, graduated 0 - 115% or 0 - 100 as appropriate on each side. Marking is clockwise one side and anti-clockwise the other, for use with dial attached to panel or moving with knob.

MOTOR DRIVE (page 21)

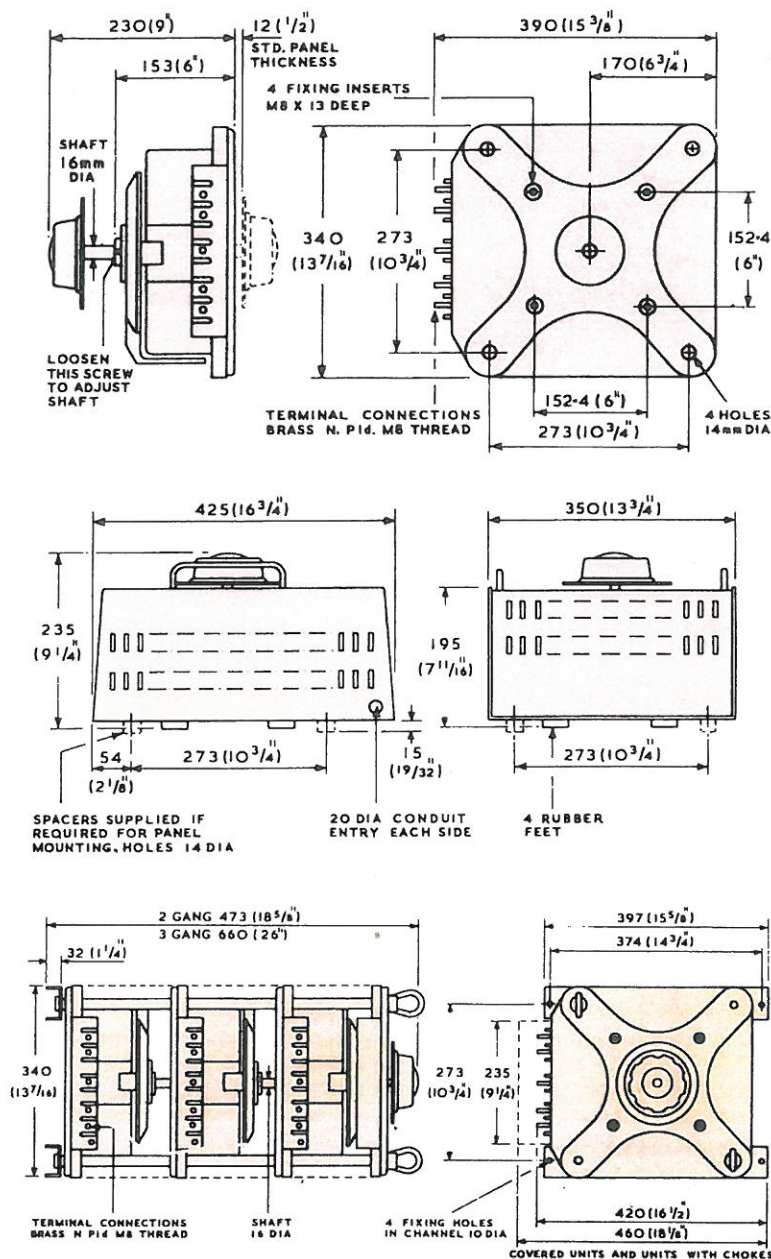
Motor drive is available for remote control and automatic applications, denoted by the suffix '-D' and numeral indicating speed, e.g. '-D1' for 1 rpm.

OTHER 1200 FRAME MODELS

Oil-immersed models

Page 20

OUTLINE DIMENSIONS



Terminal numbering & basic single unit connections

APPLIES TO ALL STANDARD REGAVOLTS

FOR INCREASE OF VOLTAGE WITH CLOCKWISE ROTATION

BENCH (SURFACE) MOUNTING		Input	Output
Over-Voltage Connection		L - N	L - N
Line-Voltage Connection		4 - 1	3 - 1
Terminal 1 Common		5 - 1	3 - 1
BACK-OF-PANEL MOUNTING		Input	Output
Over-Voltage Connection		L - N	L - N
Line-Voltage Connection		2 - 5	3 - 5
Terminal 5 Common		1 - 5	3 - 5

440 volt models do not have a centre-tap and are for line-voltage connection only. Terminals are 1, 3, 5.

Oil-Immersed Regavolts

Oil immersion provides increased current rating of approximately 70% and protection for use in adverse environments.

Listed below are models which are economical on a rating/cost basis when compared with air-cooled types, providing intermediate or increased ratings. When environmental protection is the prime consideration, all models in 700 and 1200 series are available in oil-immersed form.

Right-angle drive: Right-angle drive can be fitted, for use when the oil-immersed REGAVOLT stands behind a panel.

Motor drive: Standard speeds are 1 or 2 rpm (add suffix 'D1' or 'D2' to type number). A wide range of alternative speeds can be provided, together with microswitches, variable-dwell cams, remote control facilities, etc., as required.

Wheels can be fitted if required.



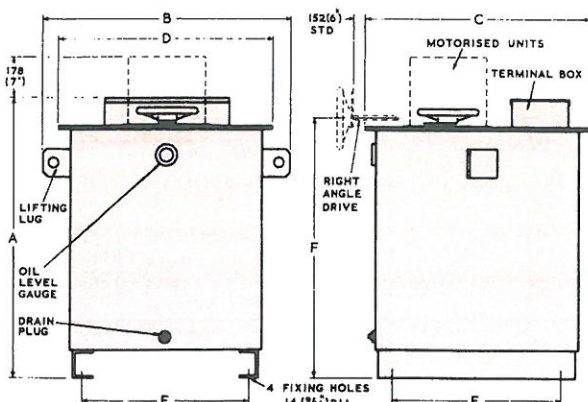
	Input Volts	Output Volts	Type	Description	Rated & Max. Amps	Weight (kg) Manual	Motor-Driven †
SINGLE-PHASE	120	0-120 } 0-135 }	1225L-OC	Single Unit	85	159	163
			1225L-G2POC	2-Gang Parallel Connection	170	234	238
			1225L-G3POC	3-Gang " "	255	304	308
	240	0-240 } 0-275 }	1225-OC	Single Unit	42	159	163
			715-G2POC	2-Gang Parallel Connection	50	143	146
			715-G3POC	3-Gang " "	75	192	195
			1225-G2POC	2-Gang " "	84	234	238
			1225-G3POC	3-Gang " "	126	304	308
	440	0-440	1225H-OC	Single Unit	21	159	163
			715H-G2POC	2-Gang Parallel Connection	25	143	146
			715H-G3POC	3-Gang " "	37	192	195
			1225H-G2POC	2-Gang " "	42	234	238
			1225H-G3POC	3-Gang " "	63	304	308
3-PHASE	480 *	0-480 } 0-550 }	710-G2OC	2-Gang Series Connection	17	139	142
			715-G2OC	" " "	25	139	142
			1225-G2OC	" " "	42	227	231
	880 *	0-880	710H-G2OC	2-Gang Series Connection *	8.5	139	142
			715H-G2OC	" " "	12.5	139	142
			1225H-G2OC	" " "	21	227	231
	208	0-208 } 0-234 }	706L-G3OC	3-Gang Star Connection	25	177	180
			1225L-G3OC	" " "	85	295	299
3-PHASE	415	0-415 } 0-476 }	710-G3OC	3-Gang Star Connection	17	186	189
			715-G3OC	" " "	25	186	189
			1225-G3OC	" " "	42	295	299

Two-gang assemblies can also be used on three-phase supply in open-delta connection (see page 7).

† Standard 'D1'

- * Series-connected models cannot be used with earthed load.
- Four and six-gang series 1225 oil-immersed assemblies are also available.

OUTLINE DIMENSIONS



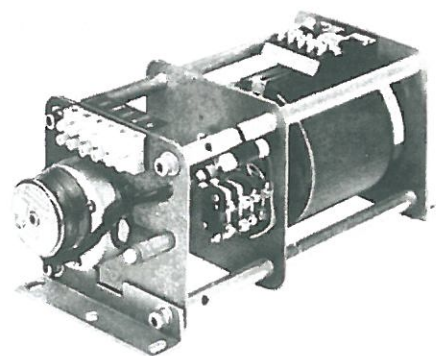
UNIT TYPE	A		B		C		D		E		F	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
700 SINGLE	508	20	514	20 1/2	495	19 1/2	432	17	305	12	450	17 3/4
700 2-G	686	27	514	20 1/2	495	19 1/2	432	17	305	12	620	24 1/2
700 3-G	686	27	514	20 1/2	495	19 1/2	432	17	305	12	686	27
1200 SINGLE	559	22	680	26	597	23 1/2	571	22 1/2	445	17 1/2	505	19 7/8
1200 2-G	750	29 1/2	680	26	597	23 1/2	571	22 1/2	445	17 1/2	686	27
1200 3-G	965	38	680	26	597	23 1/2	571	22 1/2	445	17 1/2	911	35 7/8

Motor-Driven Regavolts

For remote control and automatic applications REGAVOLT units and ganged assemblies are available with motor drive, denoted by the suffix 'D' followed by a numeral giving final shaft speed.

In the standard arrangements, the REGAVOLT is driven by a geared a.c. continuously-rated reversing motor at a speed of 1, 2 or 4 rpm ('-D1', '-D2' or '-D4') except in the case of series 1200 ganged assemblies where the standard speeds are limited to 1 or 2 rpm. Other speeds are also available to order, but may be at additional cost and on longer delivery than standard speeds.

Note that the standard motors are always 200/250 volts single-phase, capacitor reversing, regardless of the rating of the REGAVOLT.



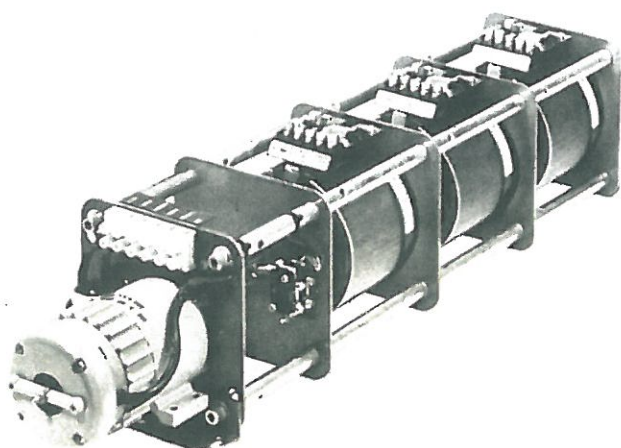
EMERGENCY HAND CONTROL

Slipping clutches are available on all models as an optional extra.

SPECIAL MODELS

Universal series connected motors, d.c. motors or low voltage motors can be supplied to special order.

Special assemblies can be provided, with switching and relays, giving a programmed automatic sequence of operations.



LIMIT SWITCHES

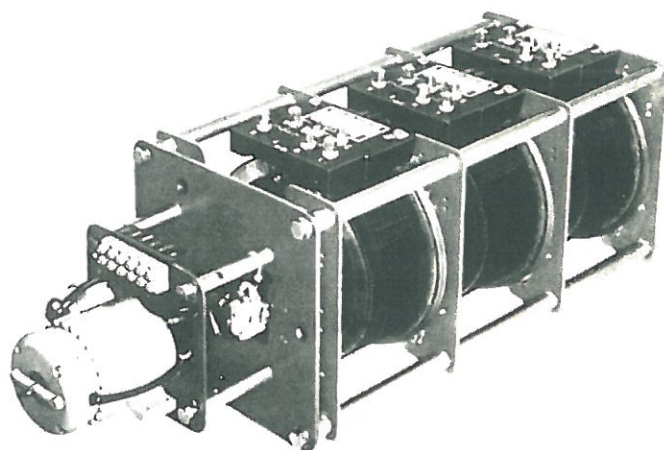
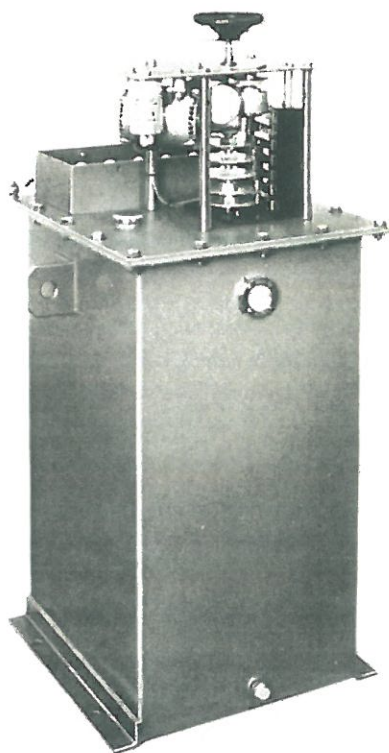
Limit micro-switches to prevent over-run are always fitted as standard, and are fully adjustable.

ADDITIONAL SWITCHES

Additional micro-switches, with fully adjustable striker arms, can also be fitted, these being denoted by the further suffix 'X' and a numeral denoting the number of *extra* switches.

e.g. 708-G3D2X2 . . . Three-gang assembly of type 708 units, with motor drive at 2 rpm and two additional micro-switches

Variable-dwell cams are available as an alternative to the normal striker arms or cams.

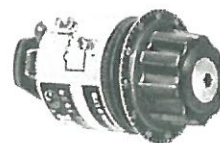


Regavolts

for other Voltages
and Frequencies

50/60 Hz MODELS with non-standard voltage ratings

The table lists a number of useful special voltage models. When a special requirement cannot be met by any listed REGAVOLT, alternative designs can be considered if the quantities involved make production economically practicable.



Type	Description	Input Voltage	Output Voltage	Rated & Maximum Current	Dimensions	
					Page	Size
351	Uncovered, Component only	15V	0 - 15V	6A	9	As 301
351-R	Covered					
201	Uncovered, Component only	25V	0 - 25V	1A	See below	
258	Uncovered, Component only	50V	0 - 50V	0.75A		
453(K)	Uncovered	50V	0 - 50V	9A	11	As 404
453-R	Covered					
757	Uncovered	50V	0 - 50V	18A	15	As 706
757-R	Covered					
454(K)	Uncovered	55V	0 - 55V	3.5A	11	As 401
454-R	Covered					
352	Uncovered, Component only	150V	0 - 150V	1.25A	9	As 300
352-R	Covered					
455(K)	Uncovered	240V	0 - 300V	1.85A	11	As 404
455-R	Covered					
456(K)	Uncovered	240V	0 - 300V	3A	11	As 404
456-R	Covered					

HIGH-FREQUENCY MODELS

for operation at 400 Hz and above

All models are available in two-gang and three-gang assemblies. The table gives the ratings for single units, from which the ratings of the ganged assemblies can be calculated.

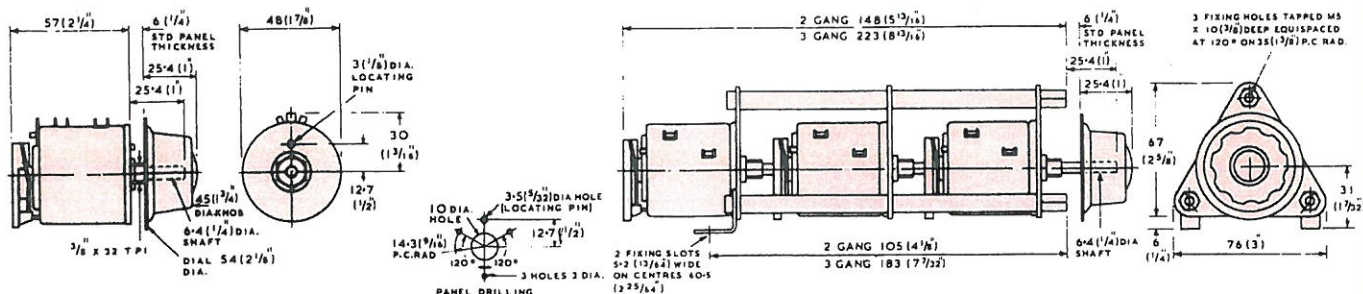


Type 773-R

Type	Description	Input Voltage	Output Voltage	Rated & Maximum Current	Page	Dimensions Size
201	Uncovered, Component only	120V	0 - 120V	1A	See below	
371	Uncovered, Component only	120V	0 - 120V	1.75A *		
371-R, E	Covered		0 - 135V		9	As 301
473-K	Component	120V	0 - 120V	6A	11	As 401
473	Uncovered		0 - 135V			
473-R	Covered	120V	0 - 120V	15A	15	As 706
775	Uncovered		0 - 135V			
775-R	Covered	208V	0 - 208V	1.5A *	9	As 301
372	Uncovered, Component only		0 - 208V	0.75A *		
372-R	Covered	208V	0 - 208V	4A	11	As 401
474-K	Component		0 - 208V	2A		
474	Uncovered	208V	0 - 208V	7A	15	As 706
474-R	Covered		0 - 208V	3.5A		
776	Uncovered	120V	0 - 208V			
776-R	Covered	120V	0 - 208V			

* When mounted on metal panel 1.6 mm thick x 30 mm square (or equivalent heatsink), 300 ratings can be increased to: — 371, 2A; 372, 1.75/0.87A.

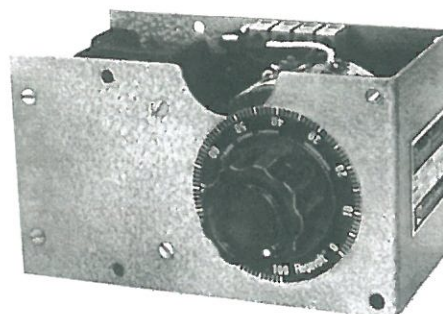
OUTLINE DIMENSIONS — 200 SERIES



Series 360 and 420 REGAVOLTS are compact, inexpensive variable/fixed transformer assemblies providing variable low-voltage a.c. output as shown in Fig. 12 (page 8) with output voltage and current ratings to customer's requirements within the overall limits of 25A maximum current and 60 VA or 200 VA power rating.

These models also offer the advantages of *isolated* output and fine resolution, and are available in open construction for incorporation in equipment or as enclosed laboratory bench units complete with input cable, mains switch, fuse and insulated output terminals.

The table gives examples of output voltage and current ratings, but the customer can select any other output within the limits given above, e.g. 420/16 would give 0-16V output at 12.5A (200 VA). For enclosed models, add the suffix '-LAB', e.g. 360/10-LAB.



Open model

	360 SERIES (60 VA)			420 SERIES (200 VA)		
	Type	Output Voltage	Output Current	Type	Output Voltage	Output Current
Examples of type Nos. and ratings	360/5	0-5V	12A	420/10	0-10V	20A
	360/6	0-6V	10A	420/12	0-12V	16.7A
	360/8	0-8V	7.5A	420/15	0-15V	13.3A
	360/10	0-10V	6A	420/20	0-20V	10A
	360/12	0-12V	5A	420/25	0-25V	8A
Input 240V 50/60 Hz	360/15	0-15V	4A	420/30	0-30V	6.7A
	360/20	0-20V	3A	420/40	0-40V	5A
	360/30	0-30V	2A	420/50	0-50V	4A

ADDITIONAL TYPES AVAILABLE

120 volt Input: Similar models are available for 120 volt input, series 360L (60 VA) and 420L (200 VA).

Example 420L/25. Input 120V, Output 25V, 8A.

Buck/boost assemblies: Buck/boost assemblies as shown in Fig. 14 (page 8), can be accommodated in the same construction, for 120V or 240V input and with output voltage swing to suit customer's requirements.

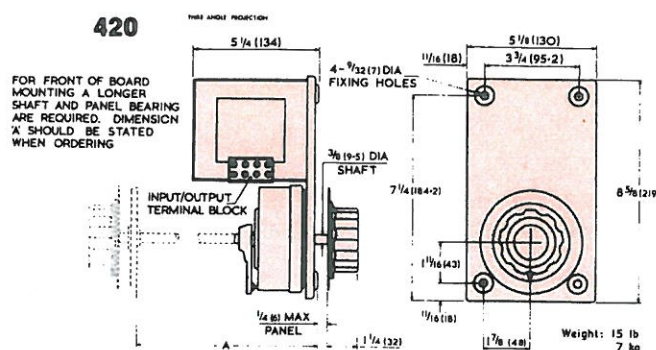
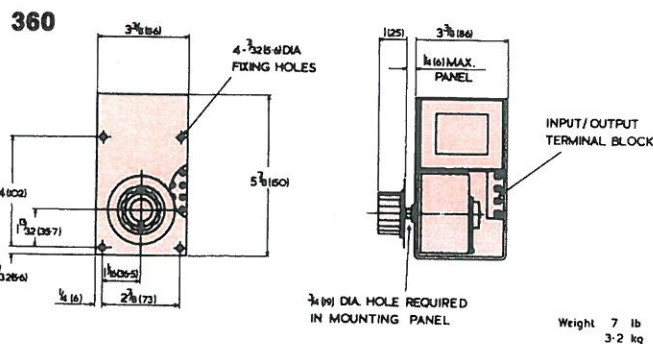


360-LAB Enclosed model



420-LAB Enclosed model

OUTLINE DIMENSIONS — OPEN MODELS



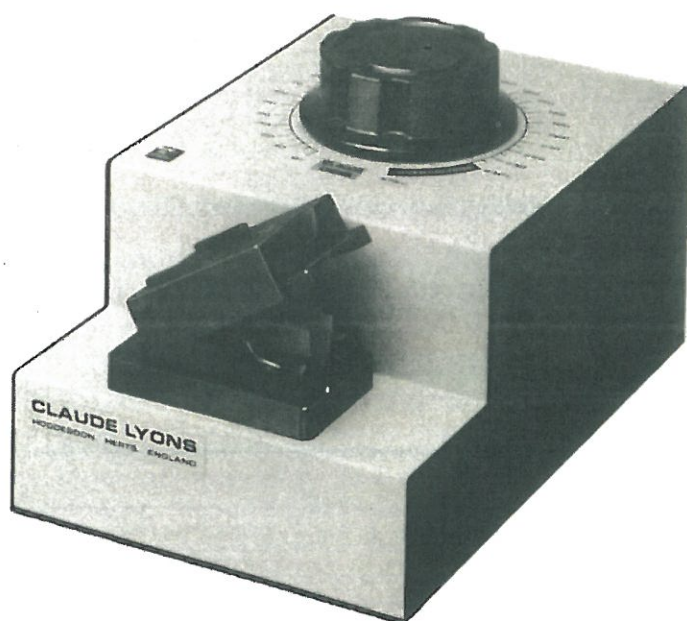
Regasafe Safety Variable Transformer

A range of four fully enclosed and protected benchtop safety variable transformers with applications in schools, colleges, laboratories, test departments and industry.

Designed with a special emphasis on safety from accidental electric shock whilst at the same time maintaining exceptionally easy output connection access, the **Regasafe** range of benchtop safety transformers is constructed in an attractively finished robust steel case and provides a fuse protected variable AC output voltage of 0-275V from a normal 240V mains input.

Incorporating a standard Regavolt variable transformer the **Regasafe** mains input connection is via a securely earthed 3-core PVC cable. The easily accessible output terminals L, N and E being located in the widely accepted Rendar 'Safebloc'. Once opened, the output becomes completely isolated from the variable transformer. Careful internal and external design has ensured that the possibility of electric shock during unauthorised use or access is kept to an absolute minimum.

A mains 'ON' neon indicator light is fitted as standard. Output voltage adjustment is achieved from a top mounted control knob directly calibrated from 0-275V.



Regasafes 708 and 715.

Models 402 and 404 Regasafe

Construction

Totally enclosed sheet steel case with top mounted output voltage adjustment knob.

Termination

Input via captive 3-core PVC cable.
Output via easy access Rendar 'Safebloc'.

Overload protection

Fuse in output 'Safebloc'.

Overall dimensions

140 × 190 × 230 mm.

Calibration

Directly calibrated 0 to 275 (figured to 260).

Model	402 Regasafe	404 Regasafe
Input Voltage	240V, 47/65 Hz	240V, 47/65Hz
Output Voltage	0-275V	0-275V
Output Current	2.5A	4.0A
No-load losses	10W at 50 Hz	12W at 50 Hz

Models 708 and 715 Regasafe

Construction

Totally enclosed sheet steel case with top mounted output voltage adjustment knobs.

Termination

Input via captive 3-core PVC cable.
Output via easy access Rendar 'Safebloc'.

Overload protection

Fuse in output 'Safebloc'.

Overall dimensions

220 × 190 × 330 mm.

Calibration

Directly calibrated 0 to 275 (figured to 260).

Model	708 Regasafe	715 Regasafe
Input Voltage	240V, 47/65 Hz	240V, 47/65Hz
Output Voltage	0-275V	0-275V
Output Current	8.0A	13.0A
No-load losses	15W at 50 Hz	30W at 50 Hz

NOTES ON INSTALLATION AND MAINTENANCE

MOUNTING AND CONNECTIONS

Series 200 and 300 REGAVOLTS are designed for back-of-panel mounting only. Series 400, 700 and 1200 can be used in either bench (surface) mounting or back-of-panel mounting; these models are supplied for bench mounting unless otherwise ordered but can easily be converted to panel mounting.

Terminal numbering has been standardised throughout the REGAVOLT range. The ends of the winding are numbered 1 and 5, the tapings for over-voltage connection 2 and 4, and the brush 3. The principal additional tapping (which is a centre-tap in standard 240 volt and 120 volt models) is numbered 6, and further special tapings 7, 8 etc. when fitted.

The REGAVOLT must **never** be connected in series with the load as if it were a rheostat. The input must always be connected **across** the winding (see Figs. 3-5, page 6). As REGAVOLTS are auto-transformers, the common terminal (1 or 5) must always be the neutral; connection can only be made to an earthed load when one side of the supply and one side of the load are both earthed, these being connected to the common terminal.

When using a two-gang series-connected assembly (Fig. 8, page 7), both sides of the load are floating. The load cannot be earthed unless an isolating transformer is included.

It must be remembered that even when turned to zero the REGAVOLT is still live and therefore independent means of isolation must be provided to permit connection and servicing of the transformer and load.

EARTHING CLIPS

Each REGAVOLT unit is fitted as standard with a clip which earths the shaft to the frame. When panel mounting, care must be taken to ensure (by an adequate size clearance hole, or use of an insulating bush) that the shaft does not make electrical contact with the panel and thus create a single-turn loop.

Similarly ganged and motorised assemblies must have only one earth point per shaft, i.e. ganged assemblies require only one earth clip and others should be removed if present. Motor drive assemblies normally provide an earth for the shaft and therefore all clips should be removed.

INSPECTION

When a REGAVOLT is first installed, the brush should be checked to ensure it has not been damaged in transit, and the knob turned to note that the brushgear moves smoothly around the track. Damaged brushes must be replaced before putting the REGAVOLT in circuit.

OVERLOAD PROTECTION

In considering overload protection, it must be remembered that a REGAVOLT is a variable-ratio transformer. In a fixed-ratio transformer, safe primary and secondary currents are related by the ratio of secondary to primary turns and input or output fuses of appropriate ratings will provide similar protection.

This is not so with a REGAVOLT. As the brush traverses the winding, the transformation ratio continually changes. The safe current is set by the wire of the winding (rated current) or the brush (maximum current), and it is **output current** which must be held within safe limits. Input fusing does not properly protect the REGAVOLT.

For this reason REGAVOLTS should always be protected by a fuse or circuit breaker **in the output lead from the brush**. ('LAB' and portable models have built-in fuses in this position).

Where the load draws an inrush current or starting surge, 'slow-blow' fuses or circuit breakers are recommended. Time delay breakers with instantaneous trips enable advantage to be taken of the short-time overload capabilities of the REGAVOLT (Fig. 1, page 5) while retaining protection against short-circuits or sustained overloads. The peak inrush current must not exceed the absolute maximum ratings given in Fig. 1. In three-phase circuits, triple-pole circuit breakers permit all phases to be disconnected if a fault occurs on one phase.

Neutrals should not be fused. With an auto-transformer, such as the REGAVOLT, if the input neutral is disconnected while the live is still connected, the output neutral rises to supply voltage. If circuit breakers are used, the live and neutral can be disconnected simultaneously by the use of a single-pole-and-neutral type with the trip coil in the live lead.

Input fusing may be fitted as an added precaution to protect against accidental connection to a d.c. supply or one of too high a voltage or too low a frequency. Since REGAVOLTS can, under certain conditions, draw a momentary inrush current many times rated current, 'slow-blow' fuses or circuit breakers are necessary. 'Quick-blow' fuses are not suitable for input protection.

MAINTENANCE

Used correctly, REGAVOLTS require little attention. However, regular inspection of the brushgear and the track, at intervals determined by usage and environment, is strongly recommended. Brush inspection is important, as damaged or over-worn brushes can result in damage to the winding.

It is extremely important that only the correct brushes are used in any particular model as the brush resistance is carefully calculated to limit the current flowing in the bridged turns. Always quote the full type number of the REGAVOLT when ordering spares. Many users maintain a small stock of replacement brushes to ensure the correct type is immediately available.

REGAVOLTS are intended for adjustment of voltage, not as fixed tap-selectors. If, nevertheless, a REGAVOLT is operated continuously at one setting, the brush should be moved from time to time, e.g. during an off period.

If the REGAVOLT is operated in a location where there is considerable dust or grit or corrosive fumes, it is important to clean the winding frequently to ensure positive contact between brush and winding and so prevent arcing which can damage the track. The brush track can be cleaned by dusting with a soft brush or wiping with alcohol.

If the REGAVOLT is subjected to a severe overload, the carbon of the brush may be damaged, even if there is no apparent damage to the winding. In such a case it is advisable to install a new brush before the REGAVOLT is again placed in service.

REPAIR SERVICE

We provide an efficient, fast repair service for REGAVOLTS, including reconditioned replacement exchange for the most popular models. REGAVOLTS for repair should be carefully packed to avoid further damage in transit, the cost of which can be greater than that of the required repair.

SEE HAZARD WARNING — Page 4



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