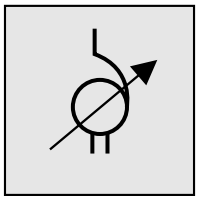

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## Contents:

**Page**

VOLTAGE REGULATORS



*leader in voltage regulators since 1946*

BELOTTI VARIATORI SRL


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# Voltage Regulators

The BELOTTI autotransformer is an efficient, trouble-free device for controlling A.C. voltage.
Unlike most transformers, our voltage regulator has a transformation ratio that can be smoothly and continuosly changed so the output of the unit can be controlled from zero to line voltage or even higher.

Fig. 1

## Features:

**EFFICIENT -** transforms power more efficiently than rheostats
**DURABLE -** because it runs cool (40/50° C max)
**OVERLOAD-ABLE** withstands 1000% overloads short term

- Independent of load size or power factor - voltage to the load changes little from full load to none.

**- Easy to control with simple raise-lower switches or standard process controllers. Motor drive control provides complete isolation between power and control circuits and Belotti units are immune to power line noise.**

**- Do not produce harmonic distortion.**
**- Reduce utility bills.**
**- Avoid interference with other equipment.**

- Produce an adjustable output voltage that is a sine wave. Only the voltage magnitude is changed; the shape of the voltage is not distorted.
- Handle all load power factors.
- Can be used to adjust banks of capacitors and/or inductors.

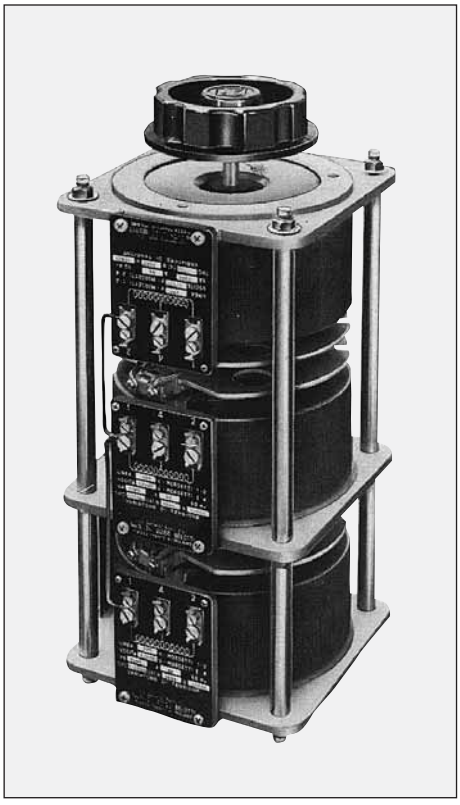


Fig. 2

## Applications:

- Regulate voltage (over and under-voltage testing of electrical and electronic equipments).
- Speed control
- Lighting control in theatres, hotels, photographic studios
- Motor test stands
- Power supplies
- Industrial process heating control
- Source voltage & load banks for electrical testing:
  - circuit breaker
  - uninterruptible power supplies
  - generators
- Control of D.C. voltage and current through rectifiers
- Control of rectifiers in electroplating etc.
- Supply voltage adjustment (automatic voltage stabilisers)

# Construction:

**Manufacturing standards**
Designed and tested according to VDE-0552 and IEC 61558-2-14; designed as toroidal autotransformer.

**Core**
All regulators use grain-oriented strip wound silicon steel cores ensuring low losses and reduce magnetizing current.

**Windings**
The winding, wich is insulated from the core by precision moulded winding formers, comprises a single layer (class H wire) carefully wound to provide a flat surface for the brushgear.

**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 Belotti's. 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 cast aluminium frame providing strenght combined with minimum weight. The bases incorporated mounting holes providing interchangeable fixing centres with many other variable autotransformers.

# General specifications and terminology

The data given in the table on pag. 6-7 should be read in conjunction with the following general specifications.

**Input Voltage:**
the supply voltage to which the variable transformer is connected.

**Output Voltage:**
the range of voltage available at the output terminals.

**Frequency:**
all units in this catalog operate in the range of 50 to 400 Hz.

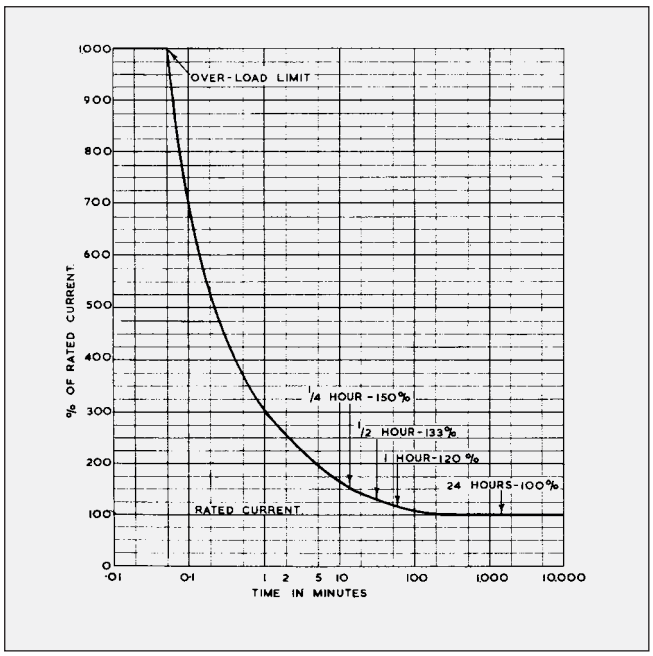



**Fig. 3** - *Short-time overload curve*

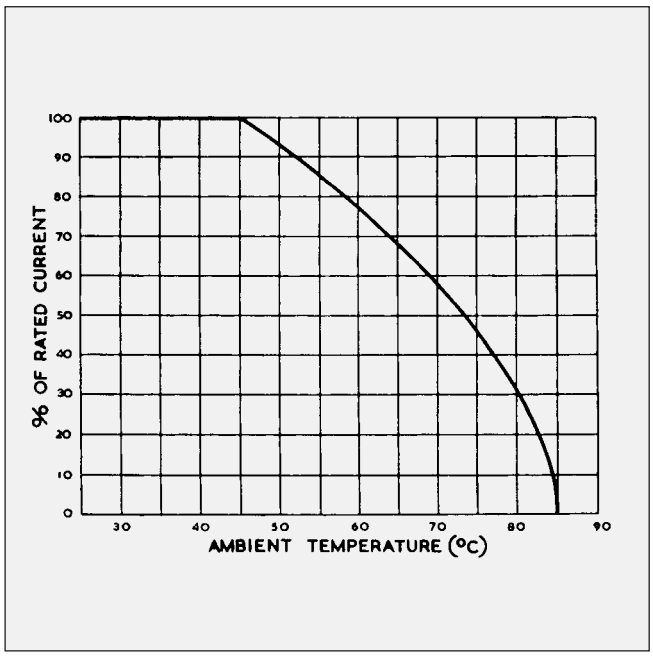



**Fig. 4** - *For ambient temperatures above 45° C, rated current should be reduced according to this curve*

**Rated Current:**
output current that can be drawn at any brush setting for a continous duty.

**Intermittent Operation:**
the current rating may be multiplied by the square root of the Duty Cycle Ratio, this being defined as the off-plus-on-time divided by on-time. The resulting up-rated current must be compared with the short-time overload current (see Fig. 3), the lower of the two figures being the maximum permissible current.

**Ambient Temperature:**
current ratings apply up to 45°C ambient. Fig. 4, must be applied for more elevated temperatures.

**KVA Rating:**
the maximum output current at maximum output line voltage multiplied by that max voltage and divided by 1000 for single-phase. Divide by 577 for three-phase (1000/$\sqrt{3}$).

**Line-Voltage and over-Voltage connection:**
with line-voltage connections, the supply is connected across the whole winding, and the maximum output equals the applied voltage.
In over-voltage connection, the supply is applied to a tapping provided instead of to the whole winding, giving e.g.: 0-280 Volt from a 220 Volt supply.

**Insulation:**
all Belotti variable transformers are flash-tested at 2,5 KV. rms 50 Hz.

# *Types Available: Terminology*

**Frame Sizes**
BELOTTI variable autotransformers are made in seven basic series or frame size V1 - V3 - V5 - V10 - V20 - V40 - V70
Electrical specifications are given in the detailed tabulations for the various models on pag. 6-7 following.
Optional features can be provided.

**Single and three phase**
Single phase - Suffix V (ex V5)
Three phase - Suffix T (ex T5)

**Uncovered models**
All basic variable transformers are available in uncovered form.
These units are designed with the suffix: NA (ex V5 NA Single phase uncovered, T5 NA Three phase uncovered).

**Covered models**
All single units and ganged assemblies are available in acratively styled enclosure
Suffix: NC (ex V 5 NC single phase covered).

**Portable models**
V1 - V3 - V5 - V10 - V20 series can be supplied in portable cases with carrying handles, input lead, switch, output fuse.
A digital voltmeter LED (suffix PV) can be provided.
The portable models are also available with voltmeter and ammeter (suffix PVA)

**Output receptacles**
In the models covered and portable the output can be taken through:
a) socket type “schuko” (up to 10 A) suffix **SCH**
b) CEE socket 16-32-64 A suffix **CES16, CES32, CES64**
c) insulated terminals suffix **ILT**

**Motor Drive** *(pag. 15)*
All open and covered voltage regulators are available with reversing motor drive for remote control and automatic applications.
Suffix: M (ex V 5 NA/M is a motor-drive single phase open construction-uncovered)

**Ganged assemblies**
All voltage regulators are available assemblies of two, three, four, five, six units operating on one common shaft for parallel (See pag. 18) or series. The number following the suffix NA or NC indicated the number of ganged regulators (add SR for series connection)
Exemple: V 70 NA/6-M is a single phase uncovered motor-drive regulator with six units in parallel.
V 70 NA/2SR-M two units series connection.

**Optional features**
Non standard voltage or non standard current, limit switches, special shaft and special motors can be supplied to customer’s special requirements.

# Single phase voltage regulators

**Fig. 5 -** *Uncovered Model*

**Fig. 6 -** *Covered Model*


**Fig. 7 -** *Portable Model with optional digital volt meter*

## TYPE V - 3

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 3NA *(fig. 5)* | COVERED MODEL TYPE V 3NC *(fig. 6)* | PORTABLE MODEL TYPE V 3NP *(fig. 7)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | VA. | Code nr. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 2,4 | 300 | 361 | 370 | 381 | 298 |
| 125 | 0-145 | 1,4 | 200 | 362 | 376 | 382 | 298 |
| 220 | 0-220 | 0,9 | 200 | 368 | 387 | 388 | 298 |
| 220 | 0-220 | 2 | 440 | 368/S | 387/S | 388/S | 298 |
| 220 | 0-240 | 1,5 | 350 | 369 | 377 | 389 | 298 |
| 220 | 0-260 | 1 | 260 | 315 | 316 | 317 | 298 |
| 230 | 0-230 | 2 | 450 | 357/E | 358/E | 359 | 298 |
| 230 | 0-250 | 1,5 | 380 | 369/E | 377/E | 389/E | 298 |
| 230 | 0-260 | 1 | 260 | 315/E | 316/E | 317/E | 298 |

## TYPE V - 5

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 5NA *(fig. 5)* | COVERED MODEL TYPE V 5NC *(fig. 6)* | PORTABLE MODEL TYPE V 5NP *(fig. 7)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | VA. | Code nr. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 5,6 | 700 | 601 | 607 | 641 | 386 |
| 125 | 0-160 | 1,8 | 300 | 602 | 613 | 642 | 298 |
| 220 | 0-220 | 2,2 | 500 | 608 | 627 | 648 | 298 |
| 220 | 0-220 | 4 | 900 | 608/S | 627/S | 648/S | 298 |
| 220 | 0-240 | 3 | 720 | 637 | 638 | 639 | 298 |
| 220 | 0-260 | 2,5 | 650 | 609 | 647 | 649 | 298 |
| 220 | 0-280 | 2 | 560 | 610 | 667 | 650 | 298 |
| 230 | 0-230 | 3,6 | 830 | 640/E | 643/E | 646/E | 298 |
| 230 | 0-260 | 3 | 780 | 653/E | 655/E | 656/E | 298 |
| 230 | 0-280 | 2 | 560 | 657/E | 658/E | 659/E | 298 |
| 250 | 0-250 | 3,5 | 875 | 660 | 661 | 662 | 298 |
| 380 | 0-380 | 1,2 | 500 | 670 | 671 | 672 | 298 |

## TYPE V - 10

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 10NA *(fig. 5)* | COVERED MODEL TYPE V 10NC *(fig. 6)* | PORTABLE MODEL TYPE V 10NP *(fig. 7)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | VA. | Code nr. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 9 | 1100 | 1401 | 1443 | 1441 | 2536 |
| 125 | 0-160 | 3,7 | 600 | 1402 | 1446 | 1442 | 2498 |
| 220 | 0-220 | 4 | 900 | 1408 | 1480 | 1448 | 2498 |
| 220 | 0-220 | 9 | 1980 | 1408/S | 1480/S | 1448/S | 2498 |
| 220 | 0-240 | 5 | 1200 | 1416/S | 1417/S | 1418/S | 2498 |
| 220 | 0-260 | 5 | 1300 | 1409 | 1481 | 1449 | 2498 |
| 220 | 0-280 | 4 | 1100 | 1410 | 1482 | 1450 | 2498 |
| 230 | 0-230 | 9 | 2000 | 1419/E | 1420/E | 1423/E | 2498 |
| 230 | 0-260 | 5 | 1300 | 1426/E | 1427/E | 1433/E | 2498 |
| 230 | 0-280 | 4 | 1100 | 1435/E | 1436/E | 1437/E | 2498 |
| 250 | 0-250 | 7 | 1750 | 1490 | 1491 | 1492 | 2498 |
| 380 | 0-380 | 2,8 | 1100 | 1414 | 1486 | 1484 | 2498 |

# Single phase voltage regulators

## TYPE V - 20

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 20NA *(fig. 5)* | COVERED MODEL TYPE V 20NC *(fig. 6)* | PORTABLE MODEL TYPE V 20NP *(fig. 7)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | Code nr. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 19 | 2,4 | 2601 | 2690 | - | 2583 |
| 125 | 0-160 | 12,5 | 2 | 2613 | 2691 | 2825 | 2583 |
| 220 | 0-220 | 10 | 2,2 | 2608 | 2694 | 2648 | 2571 |
| 220 | 0-220 | 15 | 3,3 | 2608/S | 2694/S | 2648/S | 2583 |
| 220 | 0-240 | 7,5 | 1,8 | 2619 | 2620 | 2623 | 2571 |
| 220 | 0-240 | 10 | 2,4 | 2619/S | 2620/S | 2623/S | 2571 |
| 220 | 0-260 | 7 | 1,8 | 2687 | 2695 | 2827 | 2571 |
| 220 | 0-280 | 6,5 | 1,8 | 2688 | 2696 | 2828 | 2571 |
| 230 | 0-230 | 14 | 3,2 | 2626/E | 2627/E | 2633/E | 2571 |
| 230 | 0-260 | 10 | 2,6 | 2640/E | 2643/E | 2646/E | 2571 |
| 230 | 0-280 | 7,5 | 2,1 | 2647/E | 2653/E | 2655/E | 2571 |
| 250 | 0-250 | 13 | 3,2 | 2606 | 2639 | 2649 | 2583 |
| 380 | 0-380 | 5,2 | 2 | 2614 | 2699 | 2654 | 2571 |

## TYPE V - 40

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 40NA *(fig. 8)* | COVERED MODEL TYPE V 40NC *(fig. 10)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 32 | 4 | 4061 | 4062 | 2583 |
| 125 | 0-160 | 22 | 3,5 | 4403 | 4423 | 2583 |
| 220 | 0-220 | 18 | 4 | 4408 | 4448 | 2583 |
| 220 | 0-220 | 25 | 5,5 | 4408/S | 4408/S | 2583 |
| 220 | 0-240 | 14,5 | 3,5 | 4030 | 4039 | 2571 |
| 220 | 0-260 | 13,5 | 3,5 | 4407 | 4427 | 2571 |
| 220 | 0-280 | 12,5 | 3,5 | 4413 | 4430 | 2571 |
| 230 | 0-230 | 20 | 4,6 | 4042/E | 4044/E | 2583 |
| 230 | 0-230 | 25 | 5,7 | 4043/E | 4045/E | 2583 |
| 230 | 0-260 | 13,5 | 3,5 | 4046/E | 4047/E | 2571 |
| 230 | 0-280 | 12,5 | 3,5 | 4048/E | 4049/E | 2571 |
| 380 | 0-380 | 9 | 3,5 | 4414 | 4454 | 2571 |

## TYPE V - 70

| VOLTAGE | | RATED CURRENT | POWER RATING | UNCOVERED MODEL TYPE V 70NA *(fig. 8)* | COVERED MODEL TYPE V 70NC *(fig.10)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | Code nr. | Code nr. | Code nr. |
| 125 | 0-125 | 44 | 5,5 | 7423 | 7428 | 2596 |
| 125 | 0-160 | 37 | 6 | 7424 | 7429 | 2596 |
| 220 | 0-220 | 32 | 7 | 7408 | 7448 | 2599 |
| 220 | 0-220 | 36 | 8 | 7408/S | 7448/S | 2599 |
| 220 | 0-240 | 25 | 6 | 7434 | 7439 | 2599 |
| 220 | 0-260 | 23 | 6 | 7491 | 7495 | 2599 |
| 220 | 0-280 | 23 | 6,5 | 7492 | 7496 | 2599 |
| 230 | 0-230 | 32 | 7,4 | 7440/E | 7441/E | 2599 |
| 230 | 0-260 | 23 | 6 | 7442/E | 7443/E | 2599 |
| 230 | 0-280 | 23 | 6,5 | 7446/E | 7447/E | 2599 |
| 380 | 0-380 | 18 | 7 | 7413 | 7454 | 2599 |

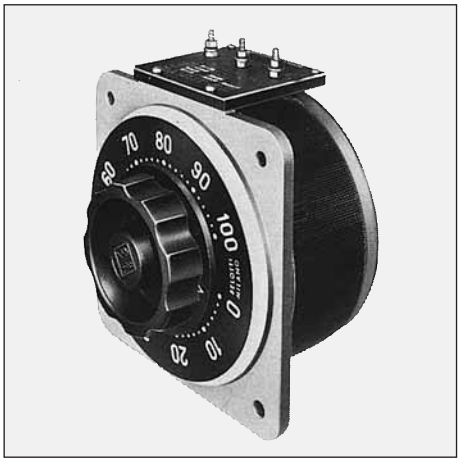


**Fig. 8 -** *Type V 40NA and V 70NA variable autotransformers (uncovered)*

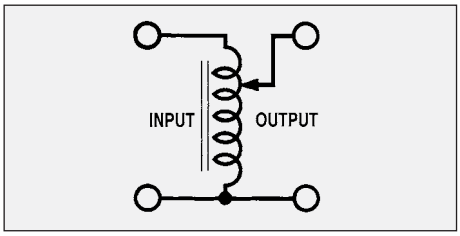



**Fig. 9 -** *Single-phase connection input voltage = output voltage*

**Fig. 10 -** *Type V 40NC and V 70NC variable autotransformers (covered)*

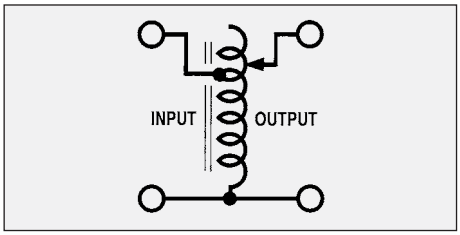



**Fig. 11 -** *Over voltage connection (max output voltage is higher than max input voltage)*

# Three phase voltage regulators

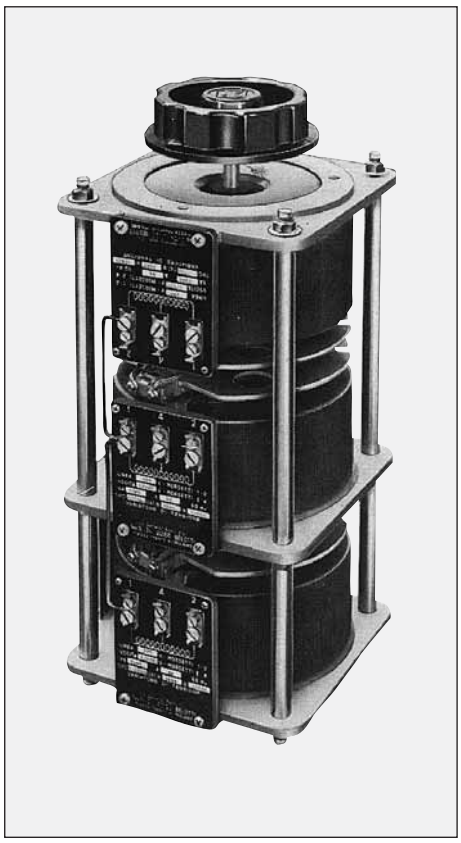


**Fig. 12 -** *Uncovered Model*

**Fig. 13 -** *Covered Model*

## TYPE T - 3

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 3NA *(fig. 12)* | COVERED MODEL TYPE T 3NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input | Output | Output | | | | | |
| Volt | Volt | Ampere | VA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 2,4 | 900 | 3 | 344 | 393 | 298 |
| 220 | 0-260 | 1,3 | 600 | 3 | 346 | 395 | 298 |
| 380 | 0-380 | 0,9 | 600 | 3 | 360 | 400 | 298 |
| 380 | 0-380 | 2 | 1320 | 3 | 360/S | 400/S | 298 |
| 380 | 0-420 | 1,5 | 1050 | 3 | 363 | 422 | 298 |
| 380 | 0-450 | 1 | 780 | 3 | 311 | 312 | 298 |
| 400 | 0-400 | 2 | 1350 | 3 | 313/E | 314/E | 298 |
| 400 | 0-430 | 1,5 | 1140 | 3 | 323/E | 324/E | 298 |
| 400 | 0-450 | 1 | 780 | 3 | 311/E | 312/E | 298 |

## TYPE T - 5

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 5NA *(fig. 12)* | COVERED MODEL TYPE T 5NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input | Output | Output | | | | | |
| Volt | Volt | Ampere | VA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 5,6 | 2100 | 3 | 826 | 857 | 386 |
| 220 | 0-260 | 2 | 900 | 3 | 828 | 859 | 298 |
| 220 | 0-280 | 1,8 | 900 | 3 | 830 | 861 | 298 |
| 380 | 0-380 | 2,2 | 1500 | 3 | 844 | 875 | 298 |
| 380 | 0-380 | 4 | 2700 | 3 | 844/S | 875/ S | 298 |
| 380 | 0-420 | 3 | 2160 | 3 | 811 | 812 | 298 |
| 380 | 0-450 | 2,5 | 1950 | 3 | 845 | 876 | 298 |
| 380 | 0-480 | 2 | 1680 | 3 | 846 | 877 | 298 |
| 400 | 0-400 | 3,6 | 2500 | 3 | 813/E | 814/E | 298 |
| 400 | 0-450 | 3 | 2350 | 3 | 815/E | 816/E | 298 |
| 400 | 0-480 | 2 | 1680 | 3 | 846/E | 877/E | 298 |

## TYPE T - 10

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 10NA *(fig. 12)* | COVERED MODEL TYPE T 10NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input | Output | Output | | | | | |
| Volt | Volt | Ampere | KVA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 9 | 3,3 | 3 | 1459 | 1506 | 2536 |
| 220 | 0-260 | 4 | 1,8 | 3 | 1461 | 1508 | 2498 |
| 220 | 0-280 | 3,7 | 1,8 | 3 | 1463 | 1510 | 2498 |
| 380 | 0-380 | 4 | 2,7 | 3 | 1477 | 1525 | 2498 |
| 380 | 0-380 | 9 | 5,9 | 3 | 1477/S | 1525/S | 2498 |
| 380 | 0-420 | 5 | 3,6 | 3 | 1495/S | 1496/S | 2498 |
| 380 | 0-450 | 5 | 3,9 | 3 | 1478 | 1526 | 2498 |
| 380 | 0-480 | 4 | 3,3 | 3 | 1479 | 1527 | 2498 |
| 400 | 0-400 | 9 | 6 | 3 | 1493/E | 1593/E | 2498 |
| 400 | 0-450 | 5 | 3,9 | 3 | 1494/E | 1594/E | 2498 |
| 400 | 0-480 | 4 | 3,3 | 3 | 1479/E | 1527/E | 2498 |

# Three phase voltage regulators

## TYPE T - 20

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 20NA *(fig. 12)* | COVERED MODEL TYPE T 20NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 19 | 7,2 | 3 | 2706 | 2547 | 2583 |
| 220 | 0-260 | 13 | 6 | 3 | 2711 | 2552 | 2583 |
| 220 | 0-280 | 12,5 | 6 | 3 | 2717 | 2554 | 2583 |
| 380 | 0-380 | 10 | 6,6 | 3 | 2724 | 2567 | 2571 |
| 380 | 0-380 | 15 | 9,9 | 3 | 2724/S | 2567/S | 2583/S |
| 380 | 0-420 | 7,5 | 5,4 | 3 | 2716 | 2558 | 2571 |
| 380 | 0-420 | 10 | 7,2 | 3 | 2716/S | 2558/S | 2571 |
| 380 | 0-450 | 7 | 5,4 | 3 | 2728 | 2572 | 2571 |
| 380 | 0-480 | 6,5 | 5,4 | 3 | 2729 | 2573 | 2571 |
| 400 | 0-400 | 14 | 9,6 | 3 | 2740/E | 2569/E | 2583 |
| 400 | 0-450 | 10 | 7,8 | 3 | 2744/E | 2568/E | 2571 |
| 400 | 0-480 | 7,5 | 6,3 | 3 | 2729/E | 2573/E | 2571 |

## TYPE T - 40

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 40NA *(fig. 12)* | COVERED MODEL TYPE T 40NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 32 | 12 | 3 | 4679 | 4740 | 2583 |
| 220 | 0-280 | 22 | 10,5 | 3 | 4706 | 4763 | 2583 |
| 380 | 0-380 | 18 | 12 | 3 | 4703 | 4732 | 2583 |
| 380 | 0-380 | 25 | 16,5 | 3 | 4703/S | 4732/S | 2583 |
| 380 | 0-450 | 13,5 | 10,5 | 3 | 4735 | 4781 | 2571 |
| 380 | 0-480 | 12,5 | 10,5 | 3 | 4736 | 4782 | 2571 |
| 400 | 0-400 | 20 | 13,8 | 3 | 4743/E | 4783/E | 2583 |
| 400 | 0-400 | 25 | 17 | 3 | 4703/E | 4732/E | 2583 |
| 400 | 0-450 | 13,5 | 10,5 | 3 | 4744/E | 4784/E | 2571 |
| 400 | 0-480 | 12,5 | 10,5 | 3 | 4736/E | 4782/E | 2571 |

## TYPE T - 70

| VOLTAGE | | RATED CURRENT | POWER RATING | NR. GANG | UNCOVERED MODEL TYPE T 70NA *(fig. 16)* | COVERED MODEL TYPE T 70NC *(fig. 13)* | REPLACE CARBON BRUSHES |
|---|---|---|---|---|---|---|---|
| Input Volt | Output Volt | Output Ampere | KVA. | | Code nr. | Code nr. | Code nr. |
| 220 | 0-220 | 44 | 16,5 | 3 | 7500 | 7499 | 2596 |
| 220 | 0-280 | 37 | 18 | 3 | 7506 | 7525 | 2596 |
| 380 | 0-380 | 32 | 21 | 3 | 7435 | 7538 | 2599 |
| 380 | 0-380 | 36 | 24 | 3 | 7435/S | 7538/S | 2599 |
| 380 | 0-450 | 23 | 18 | 3 | 7510 | 7537 | 2599 |
| 380 | 0-480 | 21 | 18 | 3 | 7511 | 7543 | 2599 |
| 400 | 0-400 | 32 | 22 | 3 | 7540/E | 7583/E | 2599 |
| 400 | 0-450 | 23 | 18 | 3 | 7544/E | 7584/E | 2599 |
| 400 | 0-480 | 23 | 19,5 | 3 | 7511/E | 7543/E | 2599 |

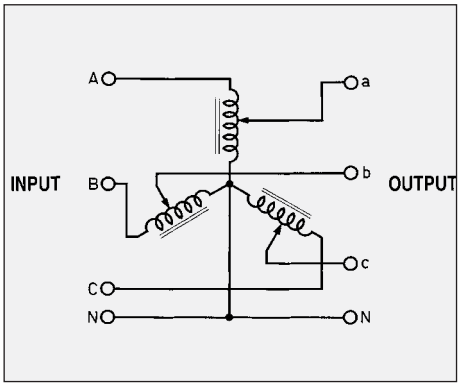



**Fig. 14 -** *Three-phase star connection*

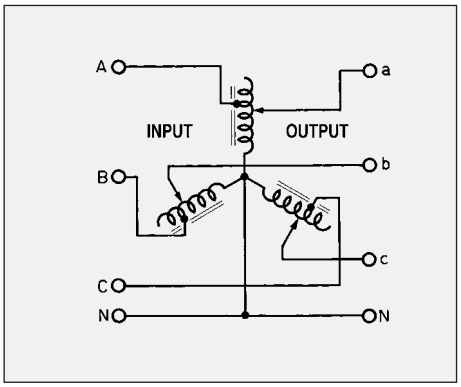



**Fig. 15 -** *Three-phase with over voltage connection*

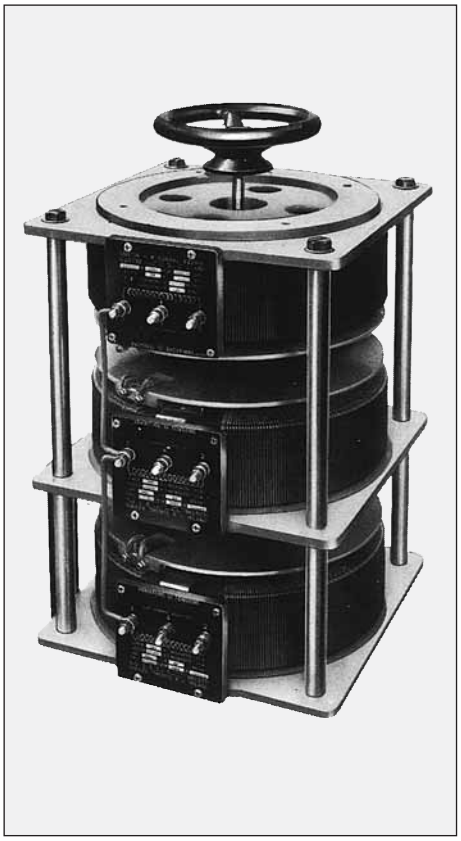


**Fig. 16 -** *Variable autotransformer type T 70 NA - uncovered -*

# Single phase voltage regulators (dimensions and weights)

## Uncovered models (NA)

| Type | Weight Kg | Dimensions mm | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G |
| V - 3 NA | 2,8 | 105 | 115 | 110 | 38 | 5,5 | 15 | 25 |
| V - 5 NA | 4 | 125 | 140 | 115 | 45 | 5,5 | 15 | 25 |
| V - 10 NA | 6,7 | 160 | 175 | 125 | 60 | 6,5 | 17 | 35 |
| V - 20 NA | 12 | 200 | 220 | 130 | 76 | 8,5 | 17 | 40 |
| V - 40 NA | 18 | 230 | 260 | 130 | 90 | 8,5 | 17 | 40 |
| V - 70 NA | 35 | 330 | 360 | 150 | 126 | 11 | 17 | 40 |

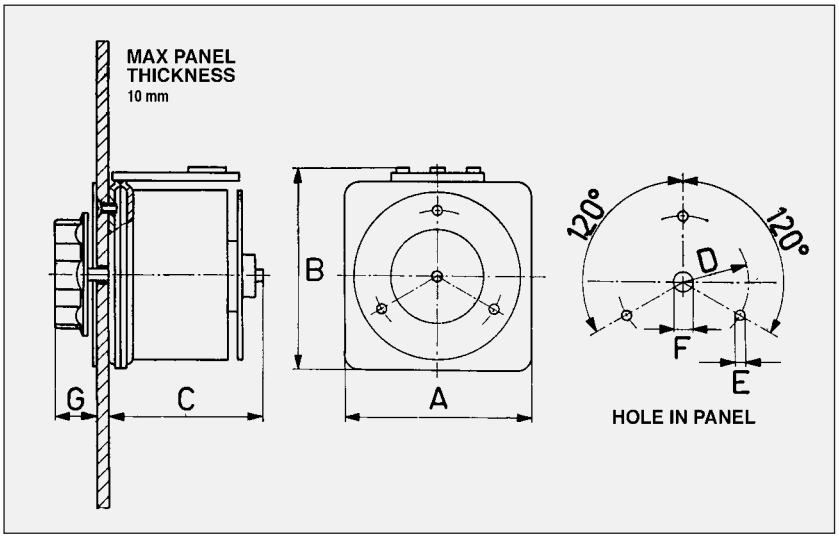



**Fig. 17 -** *Uncovered models*

## Covered models (NC)

| Type | Weight Kg | Dimensions mm (1) | | | | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| V - 3 NC | 3,2 | 120 | 170 | 150 | 60 | 6 |
| V - 5 NC | 4,5 | 135 | 180 | 160 | 71 | 6 |
| V - 10 NC | 8 | 185 | 250 | 180 | 94 | 10 |
| V - 20 NC | 13 | 215 | 290 | 185 | 112 | 10 |
| V - 40 NC | 19 | 255 | 340 | 190 | 130 | 10 |
| V - 70 NC | 33 | 345 | 430 | 220 | 193 | 12 |

**(1)** *All dimensions are subject to undergo some modifications.*

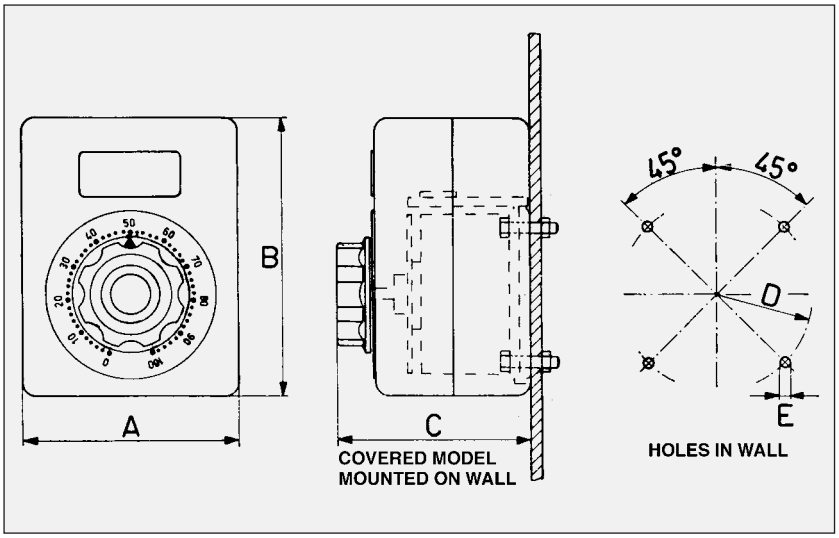



**Fig. 18 -** *Covered models*

## Portable models (NP)

| Type | Weight Kg | Dimensions mm | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| V- 3 NP | 3,5 | 140 | 220 | 150 | 170 |
| V- 5 NP | 4,9 | 150 | 235 | 160 | 180 |
| V-10 NP | 9 | 200 | 320 | 180 | 250 |
| V-20 NP | 15 | 235 | 360 | 185 | 290 |

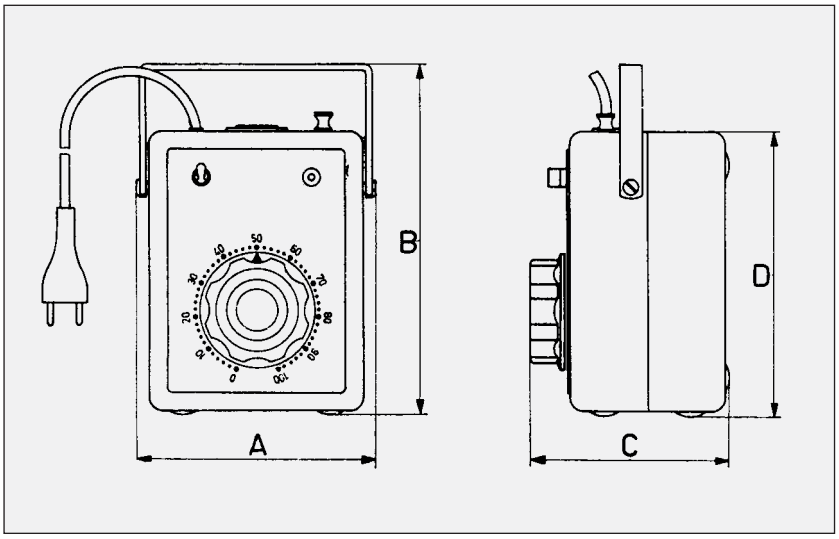



**Fig. 19 -** *Portable models*

# *Three phase regulators* (dimensions and weights)

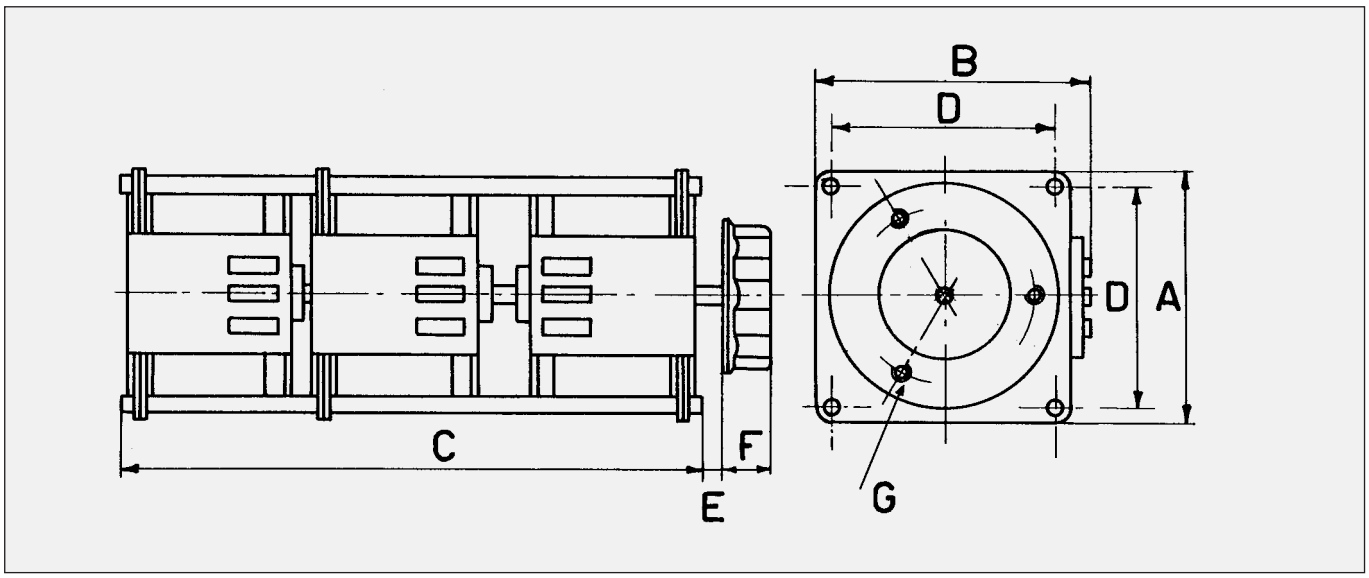



**Fig. 20 -** *Uncovered models*

| Type *(Fig. 20)* | Weight Kg | Dimensions mm | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G |
| **T - 3 NA/3** | 9 | 105 | 115 | 350 | 85 | 32 | 25 | M 5x0,8 |
| **T - 5 NA/3** | 13 | 125 | 140 | 385 | 100 | 32 | 25 | M 5x0,8 |
| **T - 10 NA/3** | 22 | 160 | 175 | 400 | 133 | 42 | 35 | M 6x1 |
| **T - 20 NA/3** | 39 | 200 | 220 | 435 | 158 | 42 | 40 | M 8x1,25 |
| **T - 40 NA/3** | 51 | 230 | 260 | 450 | 188 | 42 | 40 | M 8x1,25 |
| **T - 70 NA/3** | 107 | 330 | 350 | 490 | 273 | 42 | 57 | M10x1,5 |

| Type *(Fig. 21)* | Weight Kg | Dimensions mm (1) | | |
|---|---|---|---|---|
| | | A | B | C |
| **T - 3 NC/3** | 10 | 120 | 170 | 365 |
| **T - 5 NC/3** | 15 | 135 | 180 | 400 |
| **T - 10 NC/3** | 24 | 185 | 250 | 415 |
| **T - 20 NC/3** | 42 | 215 | 290 | 450 |
| **T - 40 NC/3** | 55 | 255 | 340 | 465 |
| **T - 70 NC/3** | 112 | 345 | 430 | 505 |

**(1)** *All dimensions are subject to undergo some modifications.*

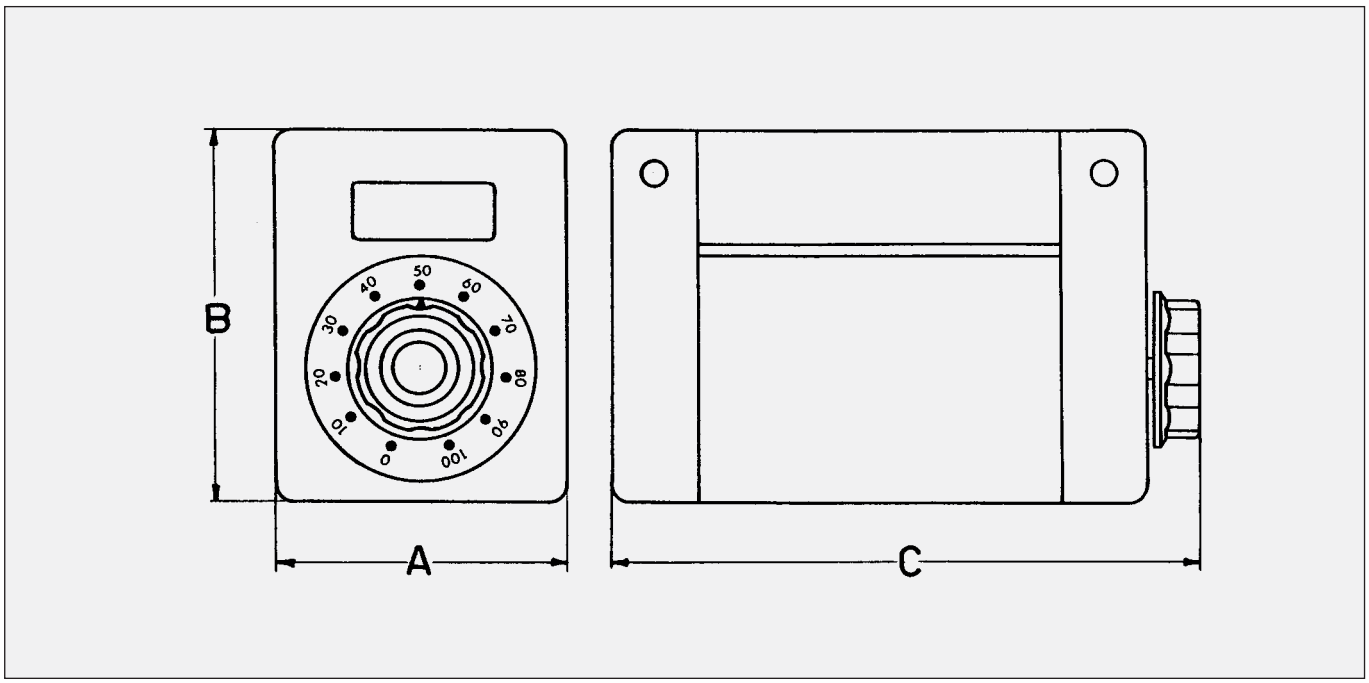



**Fig. 21 -** *Covered Models*

# Voltage regulators “X” series

**Fig. 22 -** Type X1 - *Variable autotransformer cod.104*

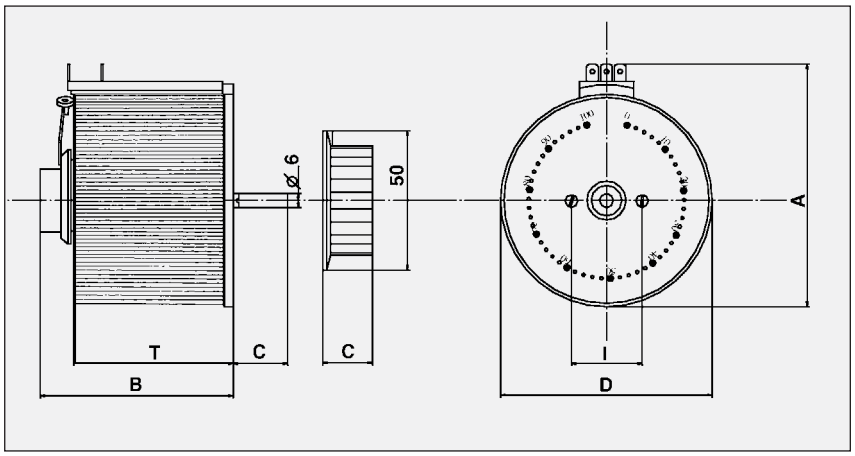
| MODEL | IN / OUT | CURRENT | POWER | CODE |
|---|---|---|---|---|
| X 1 | 230V 0-230V | 0.7A | 160VA | CODE 104 |
| | 50V 0-50V | 3A | 150VA | CODE 102 |
| | 24V 0-24V | 4.5A | 108VA | CODE 101 |
| X 2 | 230V 0-230V | 1.2A | 275VA | CODE 104/S |
| | 230V 0-230V | 1.6A | 360VA | CODE 116 |
| | 230V 0-250V | 0.6A | 150VA | CODE 105 |
| | 125V 0-125V | 2A | 250VA | CODE 106 |
| X 3 | 230V 0-230V | 2A | 460VA | CODE 304 |
| | 230V 0-260V | 1.3A | 340VA | CODE 305 |
| | 110V 0-110V | 3A | 330VA | CODE 301 |
| X 5 | 230V 0-230V | 3.4A | 800VA | CODE 504 |
| | 230V 0-260V | 2.2A | 570VA | CODE 505 |
| | 110V 0-110V | 6A | 650VA | CODE 502 |
| | 50V 0-50V | 6A | 300VA | CODE 501 |
| X 10 | 230V 0-230V | 7.5A | 1650VA | CODE 1001 |
| | 230V 0-260V | 4A | 1000VA | CODE 1002 |

*The new “X” series is suitable for low power between 100 and 1.700 VA.*
*The “X” regulators have reduced dimensions.*
*General features are similar to traditional model (V3, V5) that are described at pag. 4 and 6.*


**Fig. 23**

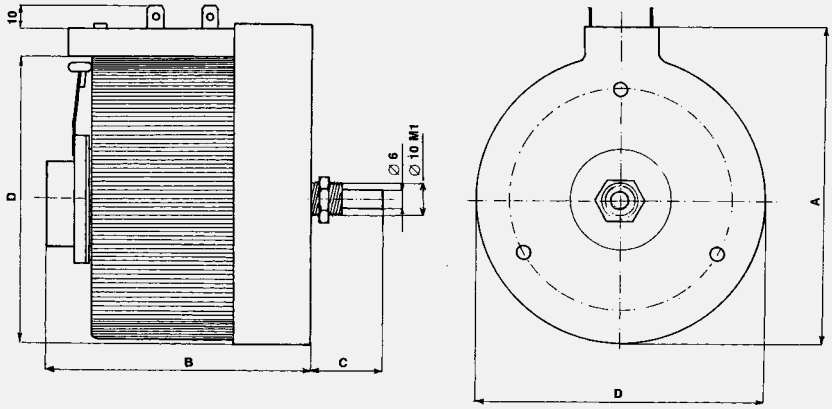
# Dimensions and weights X types

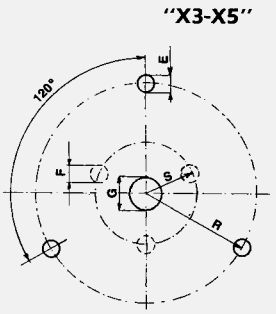
## Type X1-X2




| Type | Weight Kg | Dimensions mm | | | | | |
|---|---|---|---|---|---|---|---|
| | | D | A | T | B | C | I |
| **X1** (24V and 50V) Cod.101/102 | 1 | 83 | 97 | 41 | 59 | 21 | 28 |
| **X1** (230V)Cod.104 | 1,1 | 83 | 97 | 46 | 65 | 21 | 28 |
| **X2** all | 1,35 | 83 | 97 | 55 | 72 | 21 | 28 |
| **X2** Cod.116 only | 1,85 | 83 | 97 | 72 | 91 | 21 | 28 |

## Type X3 - X5

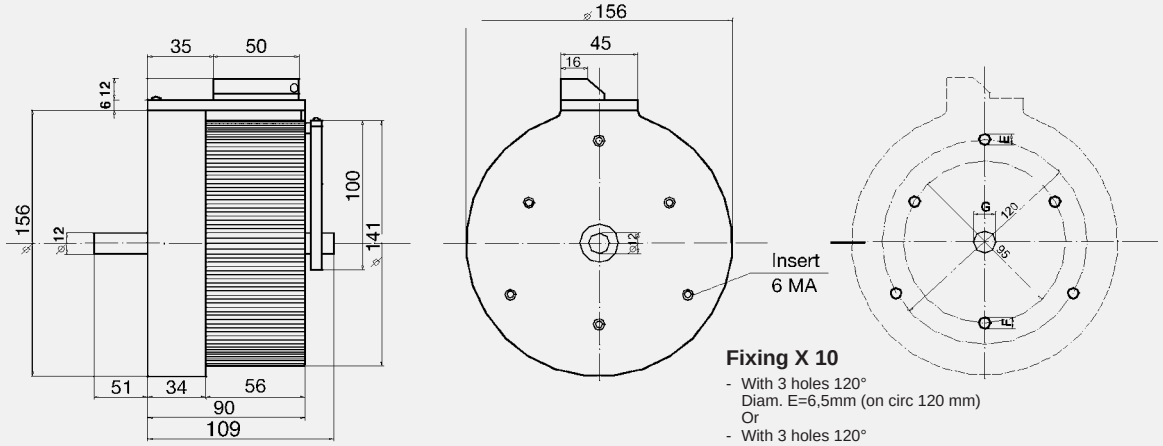



- Regulators type "X3"
  3 Holes 120° on circ.: R
- Regulators type "X5"
  3 Holes 120° on circ.: R
  3 Holes 120° on circ.: S

| Type | Dimensions mm | | | | | | | | | Weight Kg |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D (∅) | E (∅) | F (∅) | G (∅) | R | S | |
| **X3** | 106 | 95 | 30 | 98 | 6 | – | 10.5 | 38 | – | 2.3 |
| **X5** | 128 | 105 | 25 | 121 | 6 | 7 | 7 | 45 | 17 | 3.9 |

## Type X10




**Fixing X 10**

- With 3 holes 120°
  Diam. E=6,5mm (on circ 120 mm)
  Or
- With 3 holes 120°
  Diam. F=6,5 mm (on circ 95 mm)
- Shaft hole in panel
  G=13mm

# Three phase voltage regulators type TX

| | | | | | |
|---|---|---|---|---|---|
| | T 504 | 400 | 0-400 | 3,4 | 2350 |
| | T 505 | 400 | 0-450 | 2 | 1560 |
| | T 506 | 400 | 0-480 | 1,6 | 1350 |
| | T 507 | 415 | 0-415 | 3,4 | 2400 |
| | T 1001 | 400 | 0-400 | 7,5 | 5190 |
| | T 1002 | 400 | 0-450 | 4 | 3100 |

# Remote voltage program board 0-10 Vd.c.

This option provides control voltage by an electronic board having an input signal from a PLC 0-10 Vdc and supplying an output signal (go-stop) to a gear motor of variac.

As input signal changes from zero up to 10V output voltage, i.e. voltage supplied by variac changes from zero to maximum rated voltage.
Output voltage is directly proportional to output signal, i.e. if signal is 5 V output voltage will be just half of maximum voltage. Output voltage can be controlled also by a potentiometer (remote control).

## Rating and distinctives features

- Suitable for motor 24 Vdc
- Input control voltage 0-10 Vdc
- Supply voltage 220 Va.c.
- Regulation directly proportional
- Output voltage stability ±1,5% (Whether for load change 0-100% or supply mains change ±10%)

## STANDARD KIT CODE NR. RVP 570

- *Electronic printed board with*
  *Supply mains 220/24 Vdc Input/output terminal board*
  *All components secured to aluminium plate of variac.*

**Fig. 28 -** *Single phase V70NA/M Motor Driven Autotransformer with voltage program board 0-10 Vdc*

**Fig. 29 -** *Three phase T20NA/M Motor Driven Autotransformer with voltage program board 0-10 Vdc*

# Motor driven variable autotransformers (dimensions and weights)

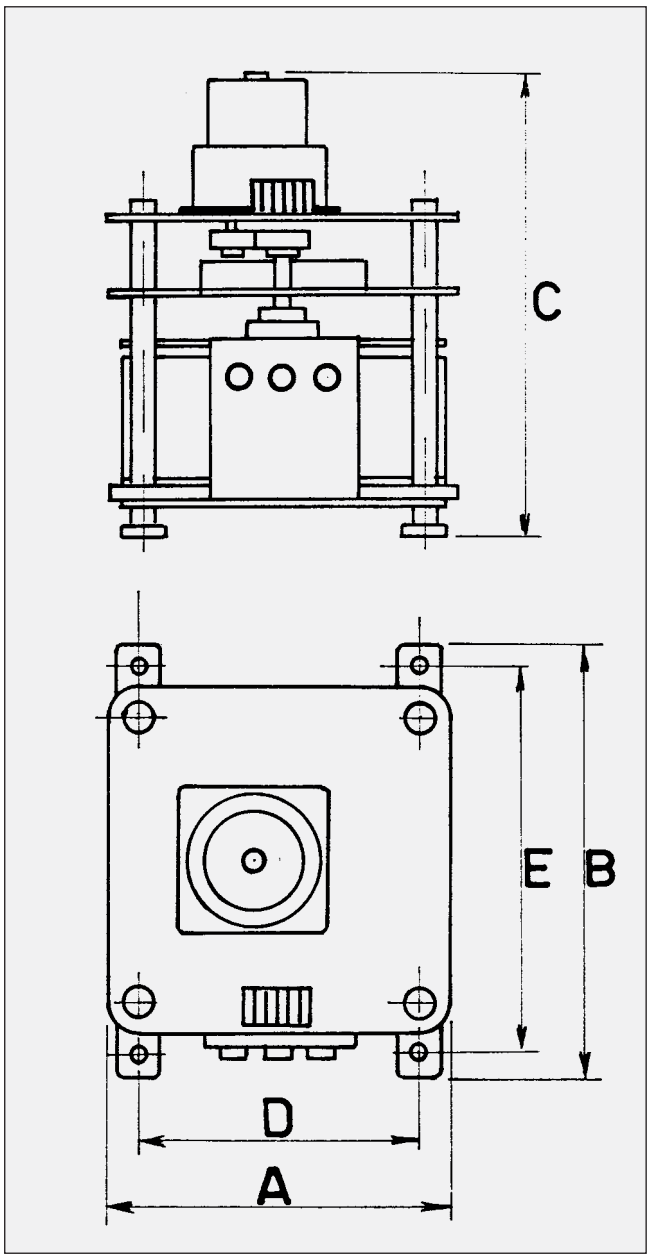



Fig. 30

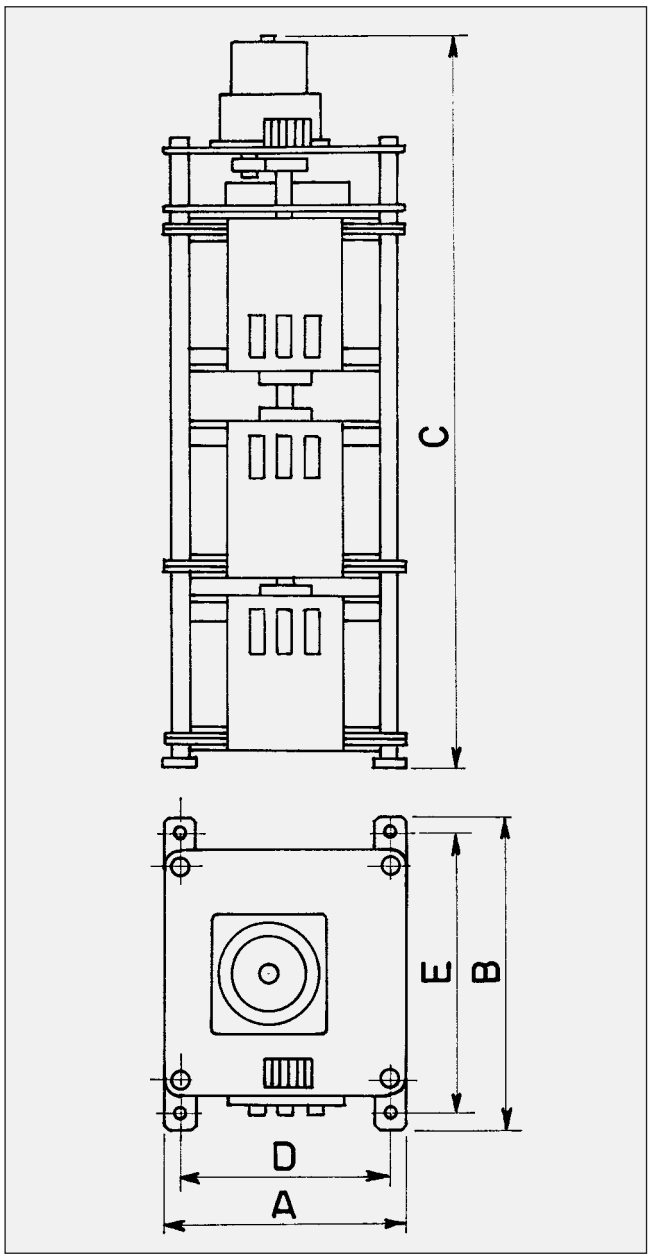



Fig. 31

## Single phase

| Type | Dimensions mm | | | | | Weight Kg |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| V 3 NA - M | 160 | 180 | 260 | 85 | 160 | 5,8 |
| V 5 NA - M | 160 | 180 | 270 | 100 | 160 | 7 |
| V 10 NA - M | 160 | 210 | 300 | 133 | 186 | 11 |
| V 20 NA - M | 200 | 250 | 300 | 158 | 226 | 17 |
| V 40 NA - M | 230 | 280 | 300 | 188 | 256 | 23 |
| V 70 NA - M | 330 | 380 | 320 | 273 | 356 | 40 |

## Three phase

| Type | Dimensions mm | | | | | Weight Kg |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| T 3 NA/3 - M | 160 | 180 | 500 | 85 | 160 | 12 |
| T 5 NA/3 - M | 160 | 180 | 530 | 100 | 160 | 16 |
| T 10 NA/3 - M | 160 | 210 | 570 | 133 | 186 | 27 |
| T 20 NA/3 - M | 200 | 250 | 605 | 158 | 226 | 44 |
| T 40 NA/3 - M | 230 | 280 | 620 | 188 | 256 | 56 |
| T 70 NA/3 - M | 330 | 380 | 730 | 273 | 356 | 114 |

# Voltage Regulators for Higher Power ratings

## SINGLE PHASE REGULATORS

| Power ratings | Input voltage | Output voltage | Rated current | UNCOVERED MODELS | | | COVERED MODELS | | | UNCOVERED MOTOR DRIVEN MODELS (1) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KVA | V | V | A | Type | Dimensions mm. | Weight Kg. | Type | Dimensions mm. | Weight Kg. | Type | Dimensions mm. | Weight Kg. |
| 14 | 220 | 0-220 | 64 | V 70 NA/2 | 330x550x320 | 75 | V 70 NC/2 | 600x600x700 | 80 | V 70 NA/2M | 330x550x490 | 80 |
| 21 | 220 | 0-220 | 96 | V 70 NA/3 | 330x550x490 | 110 | V 70 NC/3 | 600x600x700 | 125 | V 70 NA/3M | 330x550x730 | 115 |
| 28 | 220 | 0-220 | 128 | V 70 NA/4 | 330x550x650 | 145 | V 70 NC/4 | 600x600x900 | 160 | V 70 NA/4M | 330x550x950 | 150 |
| 35 | 220 | 0-220 | 160 | V 70 NA/5 | 330x550x820 | 180 | V 70 NC/5 | 600x600x1200 | 250 | V 70 NA/5M | 330x550x1150 | 185 |
| 42 | 220 | 0-220 | 192 | V 70 NA/6 | 330x550x980 | 215 | V 70 NC/6 | 600x600x1200 | 285 | V 70 NA/6M | 330x550x1300 | 225 |
| 48 | 220 | 0-220 | 216 | V70 NA/6 spec. | 330x550x980 | 220 | V70 NC/6 spec. | 600x6000x1200 | 290 | V70 NA/6M spec. | 330x550x1300 | 230 |

## THREE PHASE REGULATORS

| Power ratings | Input voltage | Output voltage | Rated current | UNCOVERED MODELS | | | UNCOVERED MOTOR DRIVEN MODELS (2) | | | COVERED MOTOR DRIVEN MODELS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KVA | V | V | A | Type | Dimensions mm. | Weight Kg. | Type | Dimensions mm. | Weight Kg. | Type | Dimensions mm. | Weight Kg. |
| 42 | 380 | 0-380 | 64 | T 70 NA/6 | 330x550x980 | 215 | T 70 NA/6-M | 330x550x1200 | 230 | T 70 NC/6-M | 600x600x1600 | 300 |
| 63 | 380 | 0-380 | 96 | T 70 NA/9 | 330x550x1450 | 335 | T 70 NA/9M | 350x550x1600 | 350 | T 70 NC/9M | 600x600x1900 | 420 |
| 84 | 380 | 0-380 | 128 | T 70 NA/12-3 | 1220x550x850 | 520 | T 70 NA/12M-3 | 1220x550x1150 | 550 | T 70 NC/12M-3 | 1560x640x1800 | 630 |
| 105 | 380 | 0-380 | 160 | T 70 NA/15-3 | 1220x550x1000 | 630 | T 70 NA/15M-3 | 1220x550x1300 | 660 | T 70 NC/15M-3 | 1560x640x2000 | 780 |
| 126 | 380 | 0-380 | 192 | T 70 NA/18-3 | 1220x550x1150 | 750 | T 70 NA/18M-3 | 1220x550x1450 | 800 | T 70 NC/18M-3 | 1560x640x2000 | 900 |

**(1)** On request covered model (type V 70 NC/2M ...)
**(2)** " " " " (type T 70 NC/6M....)

***Special voltage and power ratings on request***

**Fig. 32 -** *Three-phase variable autotransformer power 42 KVA enclosed construction T 70 NC/6*

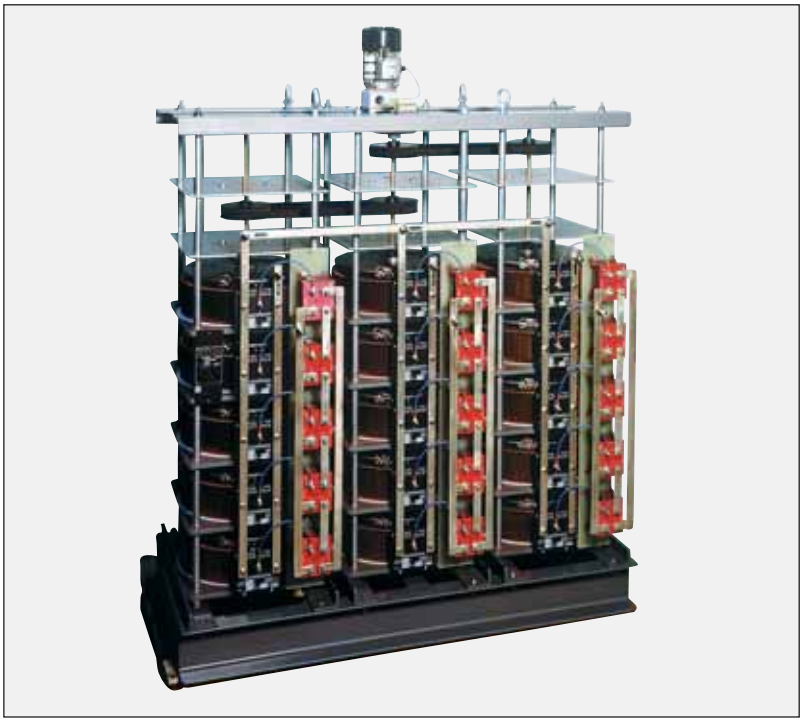


**Fig. 33 -** *Motor-driven three phase variable autotransformer power 105 KVA T 70 NA/15 M-3*

**Fig. 34 -** *Motor driven three phase variable autotransformer power 63 KVA T 70 NA/9M*

# Metered variable autotransformers

All covered and portable models are available with voltmeter, ammeter and wattmeter.
The suffixes for meter identification are:
V = Voltmeter;  A = Ammeter;  W = Wattmeter

## Isolated variable autotransformers

In addition to the complete line of standard products illustrated and described in this catalog, “Belotti Variatori” manufactures a variety of special variable autotransformers.
Typical example is the apparatus showed in Fig. 37: the variable autotransformer have a separate transformer with primary winding which is electrically isolated from the secondary or output winding.
There is no common connection between the input and output of the transformer.

**Fig. 35 -** *Three phase variable autotransformer type T70NC/V*

**Fig. 36 -** *Three-phase variable autotransformer type T 40 NC/V - A 12 KVA. with voltmeter and three ammeters.*

**Fig. 37 -** *Single-phase variable autotransformer type V 20 NC/V - A - INS 2 KVA. including a isolated transformer.*

# Voltage regulators - circuits

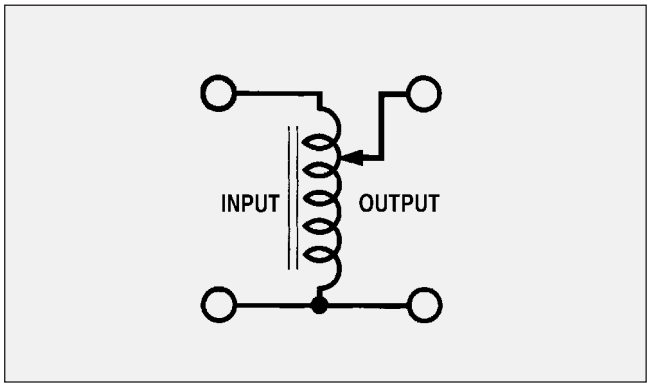



**Fig. 38 -** *Line-voltage connection*

**Basic single-phase connection** *(Fig. 38)*

The input is applied across the whole winding and the output voltage is variable from zero up to the input voltage (e.g. 0-220 V output from a 220 V supply).

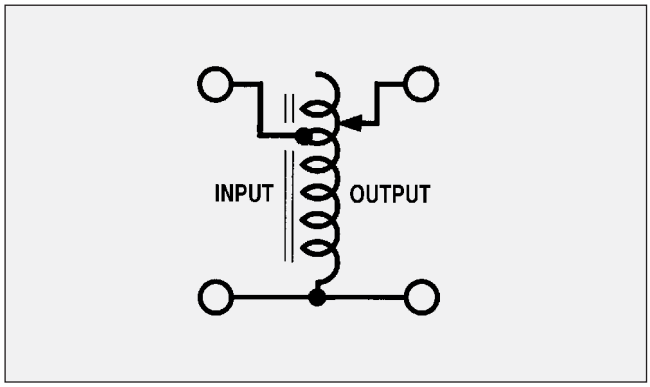



**Fig. 39 -** *Over-voltage connection*

**Over voltage connection** *(Fig. 39)*

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. 0-280 V output from 0-220 V supply).

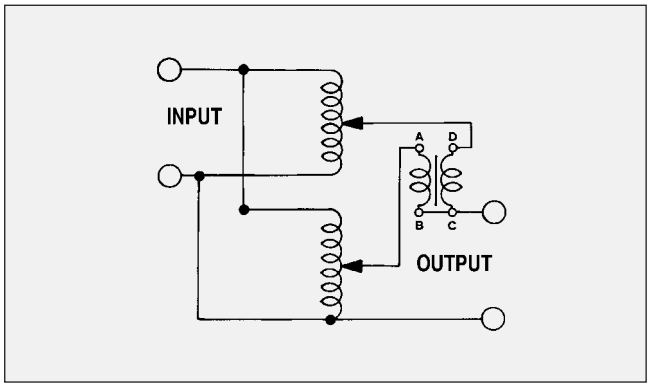



**Fig. 40 -** *Two-gang parallel-connected assembly*

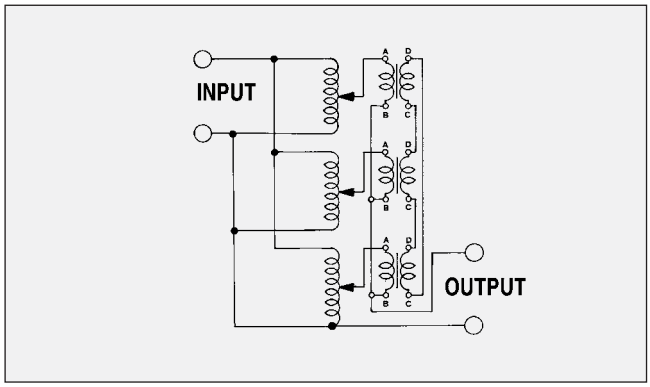



**Fig. 41 -** *Three-gang parallel-connected assembly*

**Parallel connection** *(Fig. 40 and Fig. 41)*

Two, three or more identical BELOTTI variable autotransformers may be ganged in parallel to supply a single-phase load greater than a single unit can accomodate. Chokes are included to ensure the total current is divided equally between all parallel decks.

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

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.

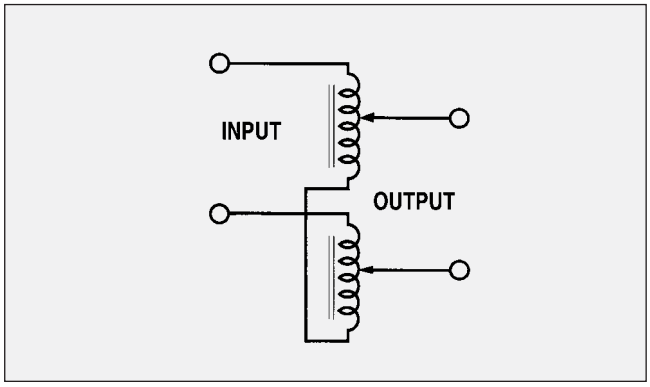



**Fig. 42-** *Two-ganged series-connected assembly*

**Series connection** *(Fig. 42)*

Two identical BELOTTI variable autotransformers 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. 42. When it is necessary to earth the load, an isolating transformer must be included.

**Three-phase — star connection** *(Fig. 43)*

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 variable autotransformer unit. 240 volt models are used on 415/240 volt supplies, and 120 volt models on 208/210 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 variable autotransformer.

For increased power rating in the largest models (series T 70 NA/6) a six-gang star-parallel assembly can be used, having a parallel-connected pair of autotransformers on each of the three phases.

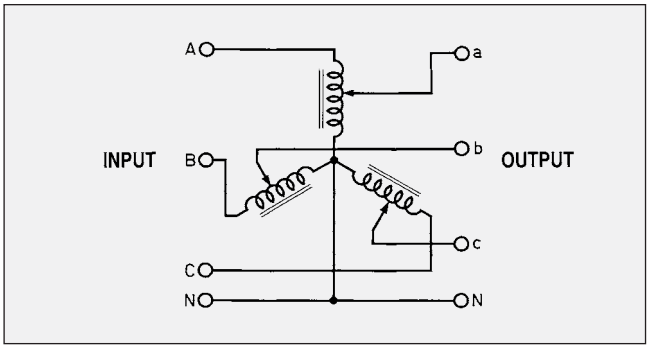



**Fig. 43 -** *Three-gang star connection*

# Variable autotransformer with auxiliary transformers

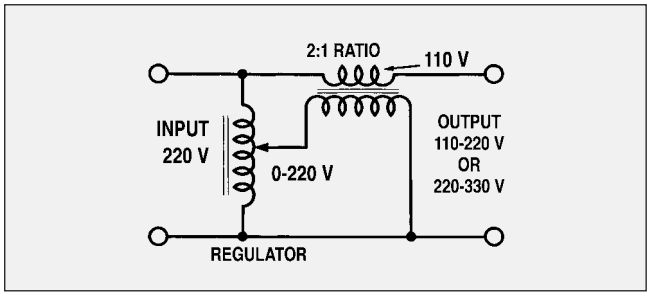



**Fig. 44 -** *Buck or boost circuit*

**Buck or boost circuit** *(Fig. 44)*

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

The output of the voltage regulator 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 regulator's output range divided by the ratio of the fixed transformer, and the output current available is the regulator's current rating multiplied by that ratio.

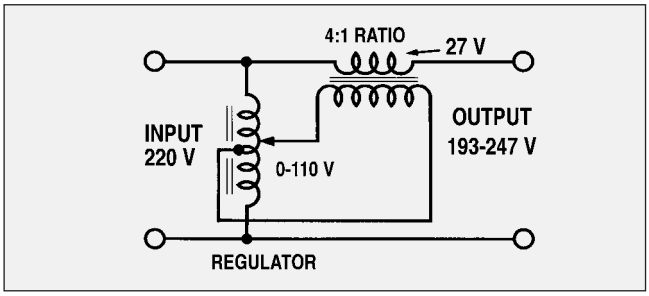



**Fig. 45 -** *Buck-and-boost circuit*

**Buck-and-boost circuit** *(Fig. 45)*

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 regulator winding. The tap position is determined by the relative amounts of buck and boost required. In the example shown, a centre-tapped regulator 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 regulator rating.

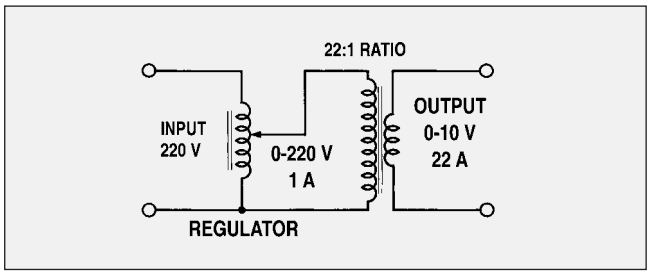



**Fig. 46 -** *Variable low-voltage output*

**Variable low-voltage output** *(Fig. 46)*

In the example shown, 1 ampere, 220 V regulator is used with a 22 : 1 step-down transformer to provide a variable output of 0-10 volts at 22 ampere rated current. The larger units or ganged assemblies can be used in this way to provide low-voltage output at very high current. In both the circuits of Figs. 46 and 47 fixed autotransformers 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).

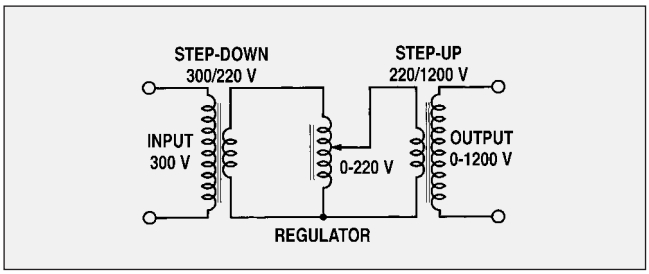



**Fig. 47 -** *Supply and load voltages beyond regulator range*

**Supply and load voltages beyond regulator range** *(Fig. 47)*

In the example shown, the regulator 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.

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 variable autotransformer, only one auxiliary transformer is required.