

PHILIPS

Data handbook



Electronic
components
and materials

Components and materials

Part 8 February 1977

Variable mains transformers

COMPONENTS AND MATERIALS

Part 8

February 1977

Variable mains transformers (auto-transformers)

Variable mains transformers (separate windings)

Accessories

Contents

DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, subassemblies and materials; it is made up of three series of handbooks each comprising several parts.

ELECTRON TUBES

BLUE

SEMICONDUCTORS AND INTEGRATED CIRCUITS

RED

COMPONENTS AND MATERIALS

GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

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ELECTRON TUBES (BLUE SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a	Transmitting tubes for communication and Tubes for r.f. heating Types PE05/25 - TBW15/125	December 1975
Part 1b	Transmitting tubes for communication Tubes for r.f. heating Amplifier circuit assemblies	January 1976
Part 2	Microwave products Communication magnetrons Magnetrons for microwave heating Klystrons Travelling-wave tubes	May 1976
	Diodes Triodes T-R Switches Microwave semiconductor devices Isolators - circulators	
Part 3	Special Quality tubes; Miscellaneous devices	January 1975
Part 4	Receiving tubes	March 1975
Part 5a	Cathode-ray tubes	August 1976
Part 5b,	Camera tubes; Image intensifier tubes	May 1975
Part 6	Products for nuclear technology Channel electron multipliers Geiger-Mueller tubes Neutron tubes	January 1977
Part 7	Gas-filled tubes Voltage stabilizing and reference tubes Counter, selector, and indicator tubes Trigger tubes Switching diodes	August 1975
	Thyratrons Ignitrons Industrial rectifying tubes High-voltage rectifying tubes	
Part 8	TV Picture tubes	October 1975
Part 9	Photomultiplier tubes Phototubes (diodes)	June 1976

SEMICONDUCTORS AND INTEGRATED CIRCUITS (RED SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1a	Rectifier diodes, thyristors, triacs		March 1976
	Rectifier diodes	Rectifier stacks	
	Voltage regulator diodes (> 1,5 W)	Thyristors	
	Transient suppressor diodes	Triacs	
Part 1b	Diodes		October 1975
	Small signal germanium diodes	Voltage regulator diodes (< 1,5 W)	
	Small signal silicon diodes	Voltage reference diodes	
	Special diodes	Tuner diodes	
Part 2	Low-frequency transistors		December 1975
Part 3	High-frequency and switching transistors		April 1976
Part 4a	Special semiconductors		June 1976
	Transmitting transistors	Dual transistors	
	Microwave devices	Microminiature devices for thick- and thin-film circuits	
	Field-effect transistors		
Part 4b	Devices for optoelectronics		July 1976
	Photosensitive diodes and transistors	Photocouplers	
	Light emitting diodes	Infrared sensitive devices	
	Displays	Photoconductive devices	
Part 5a	Professional analogue integrated circuits		November 1976
	N.B. Consumer circuits will be issued in part 5b		
Part 6	Digital integrated circuits		May 1976
	LOC MOS HE family		
	GZ family		

COMPONENTS AND MATERIALS (GREEN SERIES)

This series consists of the following parts, issued on the dates indicated.

Part 1	Functional units, Input/output devices, Peripheral devices		November 1975
	High noise immunity logic FZ/30-Series	Circuit blocks 90-Series	
	Circuit blocks 40-Series and CSA 70	Input/output devices	
	Counter modules 50-Series	Hybrid integrated circuits	
	NORbits 60-Series, 61-Series	Peripheral devices	
Part 2a	Resistors		February 1976
	Fixed resistors	Negative temperature coefficient thermistors (NTC)	
	Variable resistors	Positive temperature coefficient thermistors (PTC)	
	Voltage dependent resistors (VDR)	Test switches	
	Light dependent resistors (LDR)		
Part 2b	Capacitors		April 1976
	Electrolytic and solid capacitors	Ceramic capacitors	
	Paper capacitors and film capacitors	Variable capacitors	
Part 3	Radio, Audio, Television		January 1977
	FM tuners	Components for black and white television	
	Loudspeakers	Components for colour television	
	Television tuners and aerial input assemblies		
Part 4a	Soft ferrites		October 1976
	Ferrites for radio, audio and television	Ferroxcube potcores and square cores	
	Beads and chokes	Ferroxcube transformer cores	
Part 4b	Piezoelectric ceramics, Permanent magnet materials		December 1976
Part 5	Ferrite core memory products		July 1975
	Ferroxcube memory cores	Core memory systems	
	Matrix planes and stacks		
Part 6	Electric motors and accessories		September 1975
	Small synchronous motors	Miniature direct current motors	
	Stepper motors		
Part 7	Circuit blocks		September 1971
	Circuit blocks 100 kHz-Series	Circuit blocks for ferrite core memory drive	
	Circuit blocks 1-Series		
	Circuit blocks 10-Series		
Part 8	Variable mains transformers		February 1977
Part 9	Piezoelectric quartz devices		March 1976
Part 10	Connectors		November 1975

INTRODUCTION

APPLICATION

The main fields of our variable transformers are :

distortion free voltage control for
measuring equipment
voltage stabilizers etc.

power control for
electric heating
heat sealing of plastics
motor speed

current control for
galvanizing plants

light control in
hotels, cinemas, homes

ventilation control in
buildings, livestock houses, greenhouses, etc.

They have the following features :

continuous voltage control

small dimensions and high efficiency by using core material of high quality

very low stray losses by using toroid coil shape and specially treated contact surface with low and stable contact resistance between brush and contact surface resulting in low losses at the most critical place

corrosion proof

long life carbon brushes and smooth contact surface

simple replacement of carbon brushes

simple coupling in parallel or three-phase combinations

adjustable spindle length

low coil resistance

high overload characteristics.

The transformers are arranged by increasing nominal input voltage and, within each block, by increasing current.

A detailed specification can be found in the data sheets.

The data sheets are divided into two sections (with tabbed dividers):

Variable mains transformers (auto-transformers);

Variable mains transformers (separate windings)

Data sheets are arranged according to **transformer size code**.

Available versions

All transformers are available as **panel model** and some also as **bench model** or **laboratory model**.

A **panel model transformer** is a transformer of which the live parts are not protected.

A **bench model transformer** is a bench model transformer in a protective housing and provided with a knob and dial.

A **laboratory model transformer** is a bench model transformer provided with a handle, a 3-core cable (including earth) with plug for input connection, an outlet socket, and a fuse.

Both plug and socket are of the side-contact earth model (except the socket of the model with separate windings).

The dimensions of the laboratory models are essentially the same as those of the corresponding bench models. See also page S3.

For further information contact your supplier.

Note to page S2

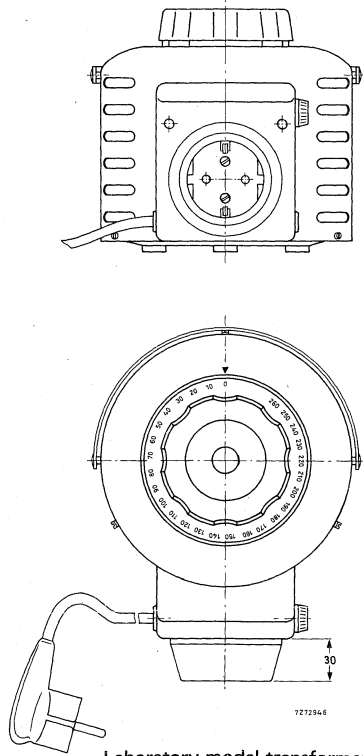
"Over-wind" transformers (transformers with a maximum output voltage higher than the input voltage) may be used with the input voltage connected to the complete winding.

The permissible output current for this type of connection is given in these columns.

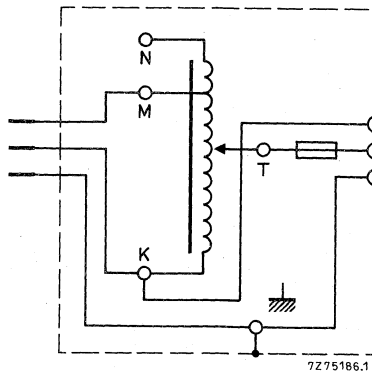
VARIABLE MAINS TRANSFORMERS

SURVEY

			see note on page S1				catalogue no. 2422 530			
input voltage nom. V	output current		output voltage no-load V	output current		output voltage no-load V	trans- former size code	panel model	bench model	lab. model
	nom. A	max. A		nom. A	max. A					
42	4	4,8	0- 42				E2	90031		
60	1,2	1,32	0- 60				E1	00007		
110	0,6	0,7	0-110				E1	00107		
115	1,2	1,4	0-130	1,32	1,54	0-115	E2	01607		
	1,4	1,7	0-115				E2	11607		
127	2,5	3,2	0-150	2,75	3,25	0-127	C1	02306		
	5	6,3	0-150	5,5	6,5	0-127	C2	03306		
	10	12,6	0-150	11	13	0-127	C3	04306		
220	0,7	0,83	0-240	0,77	0,91	0-220	E2	01407		
	0,83	1	0-220				E2	11407		
	1	1,25	0-260	1,1	1,3	0-220	C1	02406	02401	
	1,2	1,4	0-260	1,32	1,56	0-220	E3	08407		
	1,4	1,7	0-220				E3	18407		
	2	2,4	0-260	2,2	2,6	0-220	E4	03407		
	2,5	3	0-220				E4	13407		
	2,5	3,2	0-260	2,75	3,25	0-220	C2	03406	03401	03405
	4	4,8	110-220				E5	90023		
	4	4,8	0-220				E5	90024		
	4,5	5	0-253	5	5,85	0-220	E6	90028		
	5	6,3	0-260	5,5	6,5	0-220	C3	04406	04401	04405
	8,5	11,2	0-260	9,3	11,5	0-220	C4	05406	05401	05405
	10	12	0-220				C4	15406		
12	15	0-260	13,2	15,6	0-220	E8	06407			
15	18	0-220				E8	16407			
23	30	0-260	25,3	30	0-220	E10	07407	07411		
240	0,5	0,55	120- 0				E1	00407		
			120-240							
	0,5	0,55	120- 0				E1	90004		
			120-240							
	0,5	0,55	0-120				E1	90011		
			240-120							
	1	1,25	0-270	1	1,25	0-240	C1	02506	02501	
	1,2	1,4	0-260	1,2	1,4	0-240	E3	08407		
	2	2,4	0-260	2	2,4	0-240	E4	03507		
	2,5	3,2	0-270	2,5	3,2	0-240	C2	03506	03501	
	4,5	5	0-276	4,5	5	0-240	E6	90028		
5	6,3	0-270	5	6,3	0-240	C3	04506	04501		
8,5	11,2	0-270	8,5	11,2	0-240	C4	05506	05501		
12	15	0-260	12	15	0-240	E8	06507			
23	30	0-260	23	30	0-240	E10	07507	07511		
type with separate windings							2422 529			
220	3		0-242				C4	00006		00005



Laboratory model transformer



Variable mains transformers
(auto-transformers)



OPERATIONAL NOTES

Deviations from the following are given in the data sheets.

1. General *

A variable mains transformer is an auto-transformer with a secondary voltage which is continuously variable.

The common winding which serves as both primary and secondary is usually a single layer, wound on an annular core. A carbon brush, serving as the movable secondary tap, is made to contact the partly bared winding. The brush track needs no maintenance. The primary may be provided with one or more fixed taps.

2. Input voltage

The input voltage is connected to all or part of the primary of the transformer. In the data sheets the two input terminals for a stated input voltage are indicated. The second letter indicates the common input and output terminal.

Unless otherwise stated the input/output terminals indicated are given so that a clockwise rotation of the spindle results in an increasing output voltage when the transformer is mounted behind a panel.

The nominal input voltage may continuously be exceeded by 10%.

3. Output voltage

The output voltage (at no load) cannot always be set at exactly the same value as the input voltage as the carbon brush contact point with the slider against the end stop does not always coincide with the beginning or the end of the winding. The deviation from the exact value is given in volts.

4. Terminals

The input terminals are denoted N, K, L or M.

Z is a mid-tap.

The output voltage is taken between T (carbon brush) and one of the other terminals.

5. Nominal output current

This is the current which the transformer may continuously supply under the most unfavourable brush condition and ambient temperature.

*) Not applicable to variable mains transformers with separate windings.

6. Continuous overload (Maximum output current)

In an auto-transformer the distribution of the currents, and consequently the copper losses and heat generation in the windings, depends on the brush position. The nominal continuous current is defined by the most unfavourable brush position and the cooling capacity of the transformer. Starting from that cooling capacity it is obvious that the output current may be adapted to the brush position. Measurements have shown that a certain overload is permissible within 10% from the primary tapings. In the graphs, Fig. 1, Fig. 2 and Fig. 3, the maximum load current is plotted as a function of the no-load output voltage which corresponds with the brush position. For the values of input voltage, nominal output current and maximum output current see under "Electrical data" in the data sheets.

If any doubt arises as to the cooling, do not overload the transformer. A considerable overload can be tolerated if the transformer, and especially the brush track contact, is artificially cooled or immersed in oil. Since this depends greatly on given circumstances, the only hard-and-fast directive is that the temperature rise (ΔT) of the brush track contact may not exceed 70 °C or 90 °C (see the relevant data sheet), or the maximum temperature is attained (see Fig. 6).

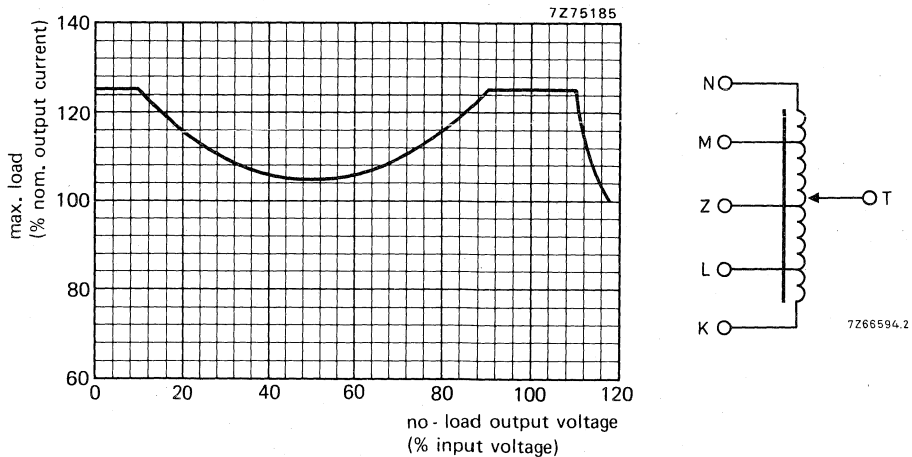


Fig. 1. Maximum load as a function of the output voltage; input voltage M to K or L to N.

When the ends of the winding are used as input terminals, an even higher overload is permitted.

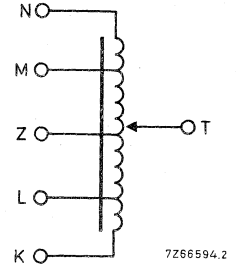
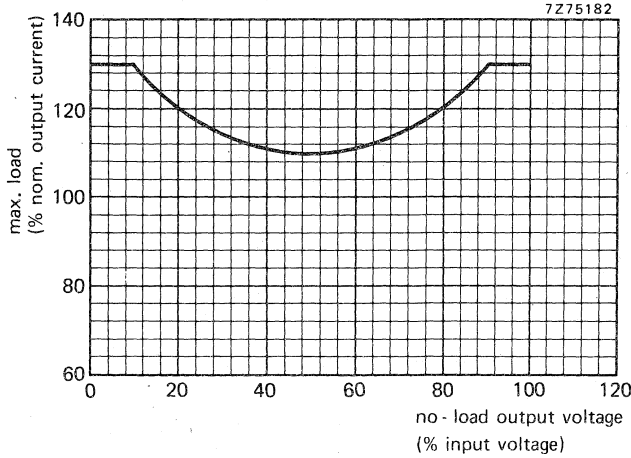


Fig. 2. Maximum load as a function of the output voltage; input voltage N to K.

For a transformer without taps the maximum load as a function of the output voltage is given in Fig. 3.

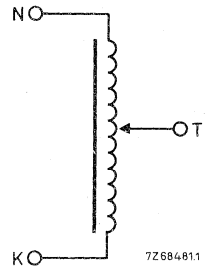
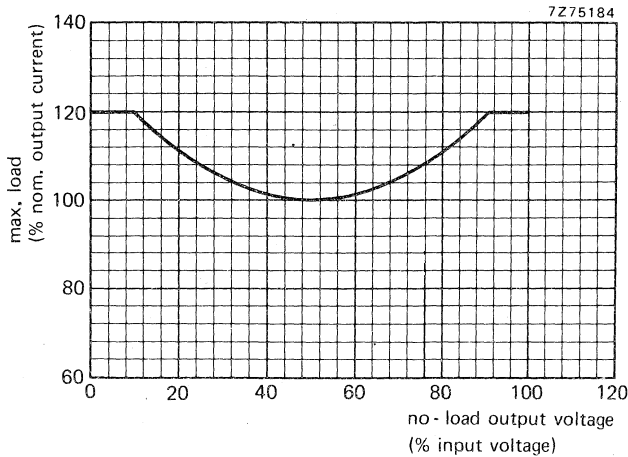


Fig. 3. Maximum load as a function of the output voltage; input voltage N to K.

7. Momentary overloads

High momentary overloads can be permitted due to the construction of the brush track and of the brush gear.

The curve (Fig. 4) gives the relation between maximum permissible load and time. It is based on the maximum permissible temperature of the brush and on the unfavourable brush position. Therefore, after occasional overloading, no additional cooling of the transformer is required.

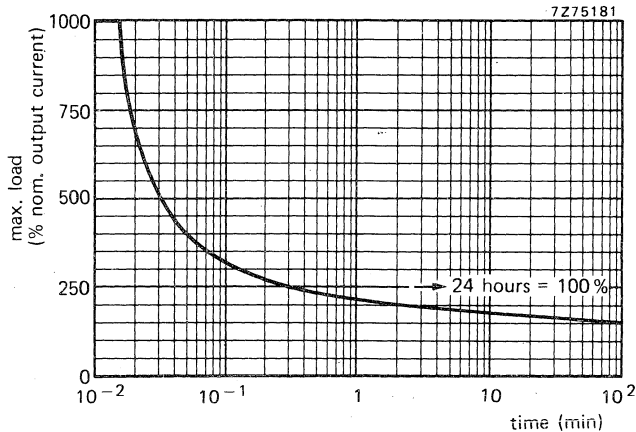


Fig. 4. Maximum non-repetitive overload as a function of time.

For other output voltages the curve can be combined with the overload curve above. To avoid damage to the brush and the track the absolute limit for instantaneous loads is 1000%.

8. Overload protection and inrush current

Protection of the transformer can be effected by inserting appropriate overload protection in the output line.

Due to the high permeability of the core material, high inrush currents (up to 20 times the nominal current) may occur. Although these last only a few cycles, and will not damage the transformer, primary fuses may be blown. It is therefore necessary to employ delayed fuses or other delayed protection devices.

9. Voltage per turn of winding

The smallest step of voltage regulation (finest resolution) is that which occurs as the carbon brush "switches over" from one turn of the winding to the next.

10. Voltage drop

Due to copper and brush losses the output voltage will drop in proportion to the output current.

The curves (Fig. 5) show the voltage drop as a percentage of the maximum voltage drop given in the data sheets as a function of brush setting.

The upper curve applies to a constant current load (nominal output current).

The lower curve applies to a constant impedance load (current approximately proportional to the voltage, increasing to maximum current at nominal input voltage).

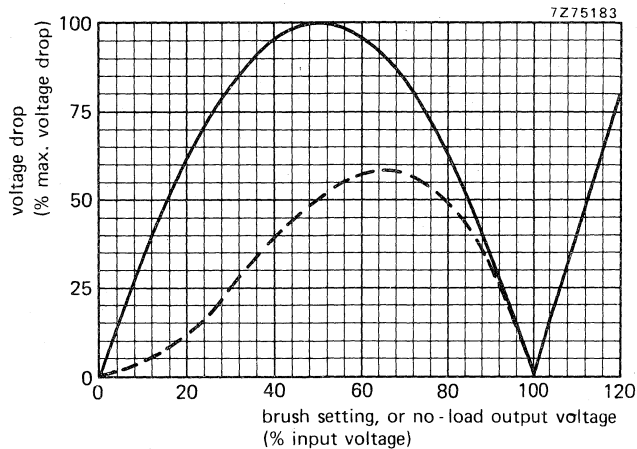


Fig. 5. Voltage drop as a function of brush setting.

11. Losses, no load

The core material has a practically constant specific no-load loss for frequencies of 50 to 400 Hz. The values given in the data sheets, refer to a mains frequency of 50 Hz. For lower frequencies the mains voltage must be decreased proportionally to avoid saturation of the core, and hence excessive core losses. Theoretically, the mains voltage can be increased for higher frequencies. However, the brush losses, being related to the voltage per turn of winding, would cause overheating of the brush contact point. For this reason it is not advisable to increase the input voltage.

12. Ambient temperature range

The data refer to an ambient temperature range of -15 to +40 °C.
 See also following paragraph.

13. Derating for higher ambient temperatures

The nominal data refer to a maximum ambient temperature of 40 °C.

For higher temperatures the current must be derated in conformity with the curves of the figure below. These curves are also based on the most unfavourable brush position and should be combined with figures of preceding pages for different conditions.

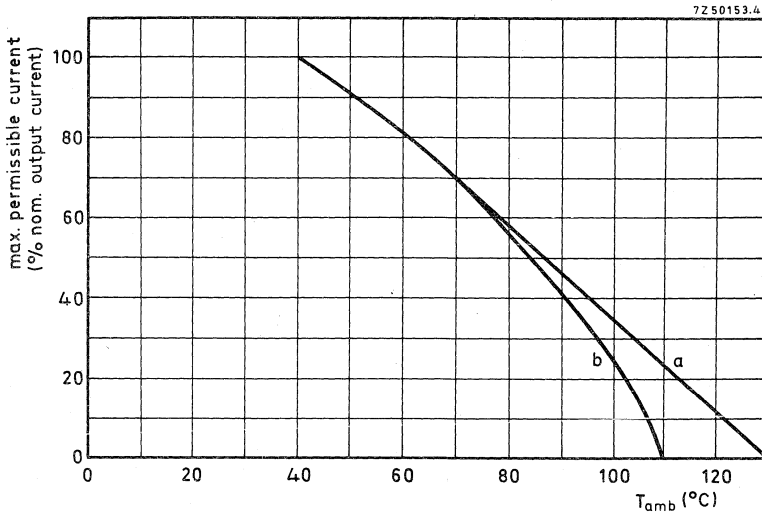


Fig. 6. Maximum permissible output current as a function of temperature.

Curve a applies to transformers for which the maximum permissible temperature rise at any point is 90 °C.

Curve b applies to transformers for which the maximum permissible temperature rise at any point is 70 °C.

14. Frequency range

The transformers may be used at frequencies between 50 and 400 Hz.
See also "Losses, no load".

15. Insulation resistance

The insulation resistance between live and non-live parts after the damp heat test (IEC 68-2-3, test Ca, 21 days) is > 5 MΩ.

16. Test voltage

All transformers are tested for 1 min at 2000 V, 50 Hz.

17. Air gap

The air gap between live and non-live parts is ≥ 4 mm.

18. Leakage path

The leakage path between live and non-live parts is ≥ 5 mm.

19. Earthing the output circuit

If it necessary to earth the output circuit, an isolating transformer must be connected between the mains and the variable transformer, so as to prevent short circuits.

20. Angle of rotation

The total angle of rotation is $\approx 320^\circ$.

21. Life

The guaranteed life of the variable mains transformers, if used within the ratings, is $> 100\,000$ two-way turns, however, the life expectancy is $\geq 250\,000$ two-way turns.

22. Parallel connection

For parallel connection of two or more transformers, chokes should be inserted between the secondaries to prevent high interchange currents caused by small differences in ganging.

See Handbook section "Accessories".

23. Environmental tests

The transformers are designed to meet the following tests:

Damp heat test	IEC 68-2-3, test Ca, 21 days
Temperature cycling	IEC 68-2-14, test Na, $-10/+85$ °C, 1 cycle
Shock test	IEC 68-2-27, test Ea Acceleration, peak, 30 g (294 m/s^2) Pulse duration 6 ms Number of shocks 3 in 3 x 2 directions
Vibration test	IEC 68-2-6, test Fc, Procedure B4 10-55-10 Hz, 1 oct./min, amplitude 0,35 mm, 3 x 2 h

24. Climatic category

The climatic category of the transformers is, according to IEC 68-1: 15/040/21.



25. Accessories

A wide range of accessories is available :

Control knobs

Ganging units

Motor drive modules

Chokes for parallel connection of transformers

A.C. stabilizer module

See Handbook section "Accessories".



**VARIABLE MAINS TRANSFORMERS
transformer size code C1**

QUICK REFERENCE DATA				
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530	
			bench model	panel model
127/150	2,5	0 to 150		02306
220/260	1	0 to 260	02401	02406
240/270	1	0 to 270	02501	02506

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting or bench model transformers are designed for use in laboratories and in industrial and professional equipment.

DESCRIPTION

These transformers have a single layer of copper wire wound on an annular core. This part is vacuum-impregnated and it is mounted in a diecast aluminium frame. The construction permits an adjustment down to exactly 0 V.

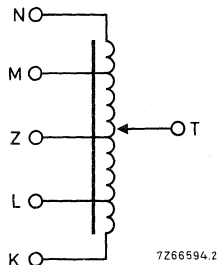
The fixed-length spindle protrudes at both sides; the amount of side-to-side protrusion is adjustable. The spindle can be easily replaced by one of another length.

Screw terminals are provided for connecting the leads.

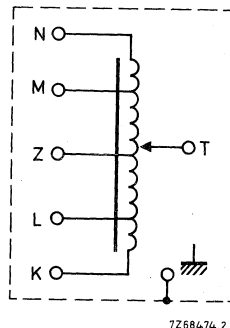
The bench models can also be used for panel mounting.

ELECTRICAL DATA

Circuit diagram



KL = NM
Z = centre tap



panel model

bench model

2422 530

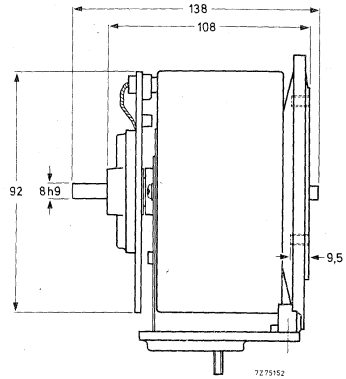
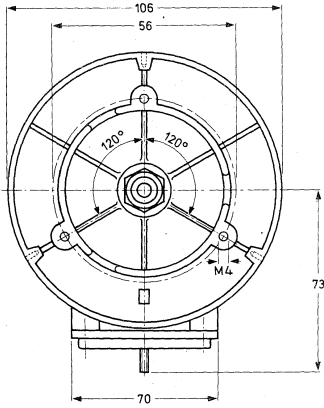
	02306	02401 02406	02501 02506
Input voltage L to N * K to N	127 V + 10% 150 V + 10%	220 V + 10% 260 V + 10%	240 V + 10% 270 V + 10%
Output voltage T to N 1)	0 to \geq 150 V	0 to \geq 260 V	0 to \geq 270 V
Nominal output current over the whole control range	2,5 A	1 A	1 A
Maximum output current 2)	3,2 A	1,25 A	1,25 A
Voltage per turn of winding	0,4 V	0,38 V	0,39 V
Voltage drop at nominal output current 3)	\leq 6 V	\leq 13 V	\leq 13 V
Losses, no load	\leq 7 W	\leq 5 W	\leq 6,2 W
Permissible temperature rise at any point 4)	max. 90 °C	max. 70 °C	max. 70 °C

* Second letter denotes the common input/output terminal.

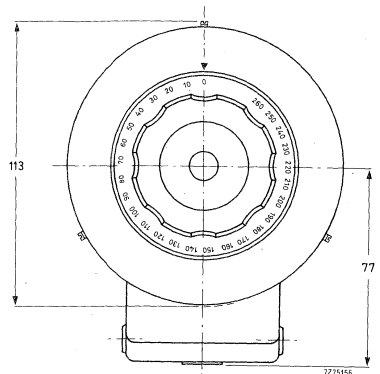
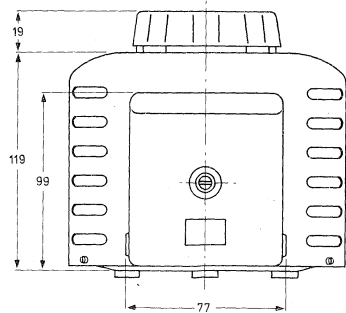
- 1) The input voltage is stated for clockwise rotation when the transformer is mounted behind a panel.
- 2) See "Operational notes" paragraph "Continuous overload".
- 3) See "Operational notes" paragraph "Voltage drop".
- 4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



panel model



The pads protrude approximately 5 mm.

bench model

Degree of protection (IEC144)	
bench models	IP20
panel models	IP00
Mass	
panel model	≈ 2,4 kg
bench model	≈ 2,8 kg
Operating torque	0,07 to 0,15 Nm
Permissible end stop torque	max. 4 Nm

Mounting

Mounting position: any.

The transformer can be fitted to a panel or a chassis by means of 3 screws M4 (maximum length = panel thickness +9,5 mm).

The pads of the bench models have to be removed before mounting.

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 026 19310 (or service number 5322 362 40011).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive module.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use transformer size code C1 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
transformer size code C2**

QUICK REFERENCE DATA					
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530		
			bench model	panel model	lab. model
127/150	5	0 to 150		03306	
220/260	2,5	0 to 260	03401	03406	03405
240/270	2,5	0 to 270	03501	03506	

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

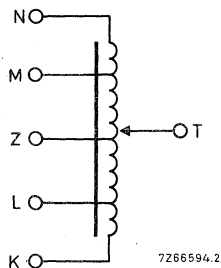
These panel mounting, bench model and laboratory model transformers are designed for use in laboratories and in industrial and professional equipment.

DESCRIPTION

These transformers have a single layer of copper wire wound on an annular core. This part is vacuum-impregnated and mounted in a diecast aluminium frame. The construction permits an adjustment down to exactly 0 V. The fixed-length spindle protrudes at both sides; the amount of protrusion is adjustable. The spindle can be easily replaced by one of another length. Screw terminals are provided for connecting the leads. The bench models can also be used for panel mounting. The laboratory model is a bench model provided with a cable with plug, a fuse, a socket, and a handle. See also drawing page S3.

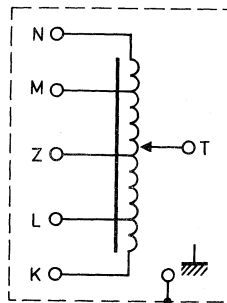
ELECTRICAL DATA

Circuit diagram



panel model

KL = NM
Z = centre_tap



bench model **

2422 530

Input voltage L to N *
K to N

Output voltage T to N

Nominal output current

Maximum output current

Voltage per turn of winding

Voltage drop at nominal output current

Losses, no load

Permissible temperature rise
at any point

	03306	03401 03406	03501 03506
1)	127 V + 10% 150 V + 10%	220 V + 10% 260 V + 10%	240 V + 10% 270 V + 10%
2)	0 to ≥150 V	0 to ≥260 V	0 to ≥270 V
3)	5 A	2,5 A	2,5 A
4)	6,3 A	3,2 A	3,2 A
	0,5 V	0,48 V	0,51 V
	≤ 5 V	≤ 9 V	≤ 9 V
	≤ 7 W	≤ 8 W	≤ 8,5 W >

max. 90 °C

* Second letter denotes the common input/output terminal.

** Circuit diagram laboratory model see page S3.

1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

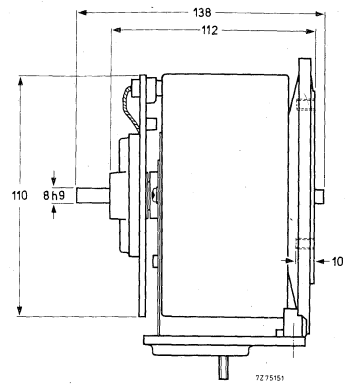
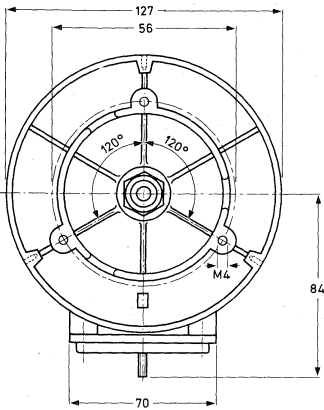
2) See "Operational notes" paragraph "Continuous overload".

3) See "Operational notes" paragraph "Voltage drop".

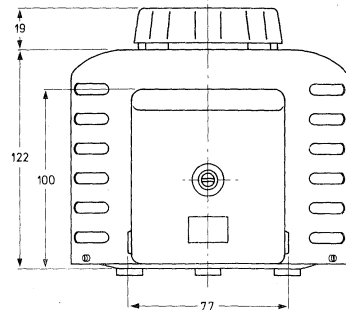
4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

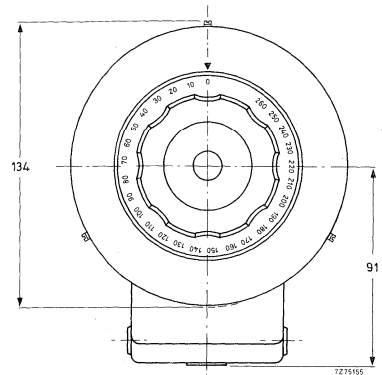
Dimensions in mm



panel model



For laboratory model see page S3.



The pads protrude approximately 5 mm.

bench model

Degree of protection (IEC144)	
bench model	IP20
panel model	IP00
Mass	
panel model	≈ 3,65 kg
bench model	≈ 4,1 kg
laboratory model	≈ 4,35 kg
Operating torque	0,1 to 0,2 Nm
Permissible end stop torque	max. 4 Nm

Mounting

Mounting position: any.

The transformer can be fitted to a panel or a chassis by means of 3 screws M4 (maximum length = panel thickness + 10 mm). The pads of the bench models have to be removed before mounting.

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 027 75160 (service number 5322 362 40044).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive module.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use transformer size code C2 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
transformer size code C3**

QUICK REFERENCE DATA					
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530		
			bench model	panel model	lab. model
127/150	10	0 to 150		04306	
220/260	5	0 to 260	04401	04406	04405
240/270	5	0 to 270	04501	04506	

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

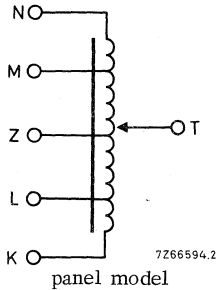
These panel mounting, bench model and laboratory model transformers are designed for use in laboratories and in industrial and professional applications.

DESCRIPTION

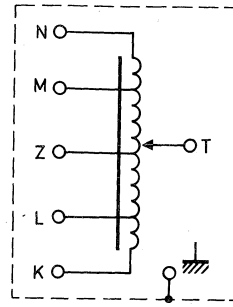
These transformers have a single layer of copper wire wound on an annular core. This part is vacuum-impregnated and mounted in a diecast aluminium frame. The construction permits an adjustment down to exactly 0 V. The fixed-length spindle protrudes at both sides: the amount of protrusion is adjustable. The spindle can be easily replaced by one of another length. Screw terminals are provided for connecting the leads. The bench models can also be used for panel mounting. The laboratory model is a bench model provided with a cable with plug, a fuse, a socket, and a handle. See also drawing page S3.

ELECTRICAL DATA

Circuit diagram



KL = NM
Z = centre tap



bench model **

2422 530

	04306	04401 04406	04501 04506
Input voltage L to N * K to N	127 V + 10% 150 V + 10%	220 V + 10% 260 V + 10%	240 V + 10% 270 V + 10%
Output voltage T to N	1) 0 to ≥ 150 V	0 to ≥ 260 V	0 to ≥ 270 V
Nominal output current	10 A	5 A	5 A
Maximum output current	2) 12,6 A	6,3 A	6,3 A
Voltage per turn of winding	0,65 V	0,63 V	0,66 V
Voltage drop at nominal output current	3) ≤ 5 V	≤ 6 V	≤ 6 V
Losses, no load	$\leq 10,5$ W	≤ 9 W	$\leq 10,5$ W
Permissible temperature rise at any point	4) max. 90 °C		

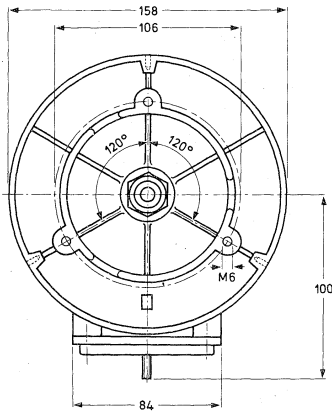
* Second letter denotes the common input/output terminal.

** Circuit diagram laboratory model see page S3.

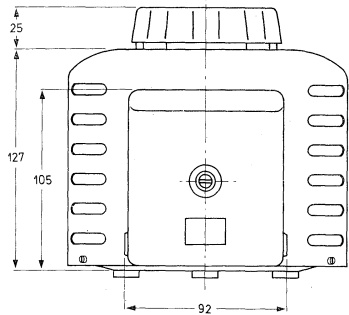
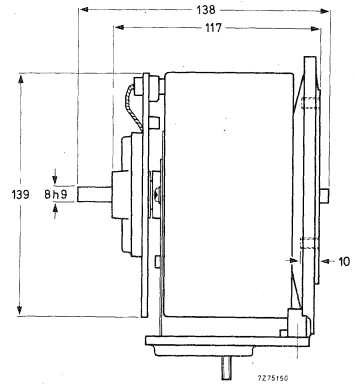
- 1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.
- 2) See "Operational notes" paragraph "Continuous overload".
- 3) See "Operational notes" paragraph "Voltage drop".
- 4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

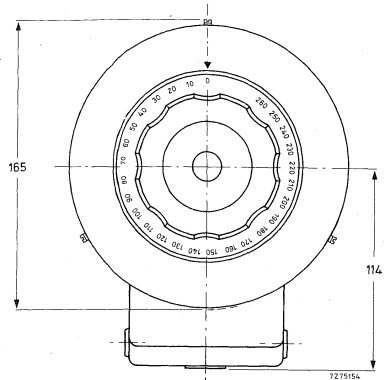
Dimensions in mm



panel model



For laboratory model see page S3.



The pads protrude approximately 5 mm.

bench model

Degree of protection	
bench model	IP20
panel model	IP00
Mass	
panel model	≈6 kg
bench model	≈6,6 kg
laboratory model	≈6,9 kg
Operating torque	0, 15 to 0, 25 Nm
Permissible end stop torque	max. 4 Nm

Mounting

Mounting position: any.

The transformer can be fitted to a panel or a chassis by means of 3 screws M6 (maximum length = panel thickness + 10 mm). The pads of the bench models have to be removed before mounting.

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 027 75160 (service number 5322 362 40044).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

A.C. stabilizer module.

Chokes for parallel connection.

Motor drive module.

See Handbook section "Accessories".

Use transformer size code C3 at selecting accessories.

Further information on request.

**VARIABLE MAINS TRANSFORMERS
transformer size code C4**

QUICK REFERENCE DATA					
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530		
			bench model	panel model	lab. model
220	10	0 to 220		15406	
220/260	8,5	0 to 260	-05401	05406	05405
240/270	8,5	0 to 270	05501	05506	

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting, bench model and laboratory model transformers are designed for use in laboratories and in industrial and professional equipment.

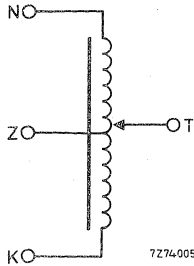
DESCRIPTION

These transformers have a single layer of copper wire wound on an annular core. This part is vacuum-impregnated and mounted in a diecast aluminium frame. The construction permits an adjustment down to exactly 0 V. The fixed-length spindle protrudes at both sides; the amount of protrusion is adjustable. The spindle can be easily replaced by one of another length. Screw terminals are provided for connecting the leads. The bench models can also be used for panel mounting. The laboratory model is a bench model provided with a cable with plug, a fuse, a socket, and a handle. See also drawing page S3.

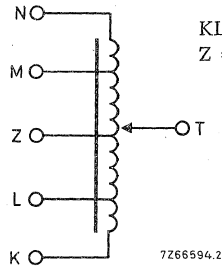


ELECTRICAL DATA

Circuit diagram

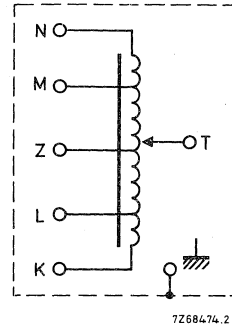


panel model
2522 530 15406
only



panel model

KL = NM
Z = centre_ tap



bench model**

Input voltage L to N *
K to N

Output voltage T to N

Nominal output current

Maximum output current

Voltage per turn of winding

Voltage drop at nominal output current

Losses, no load

Permissible temperature rise
at any point

1)

2)

3)

4)

	2422 530	
15406	05401 05406	05501 05506
220 V + 10%	220 V + 10%	240 V + 10%
260 V + 10%	260 V + 10%	270 V + 10%
0 to ≥220V	0 to ≥260 V	0 to ≥270 V
10 A	8,5 A	8,5 A
12 A	11,2 A	11,2 A
0,81 V	0,81 V	0,85 V
≤4 V	≤6 V	≤6 V
≤16 W	≤16 W	≤17,5 W

max. 90 °C

* Second letter denotes the common input/output terminal.

** Circuit diagram laboratory model see page S3.

1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

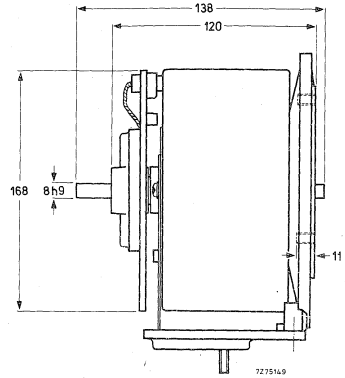
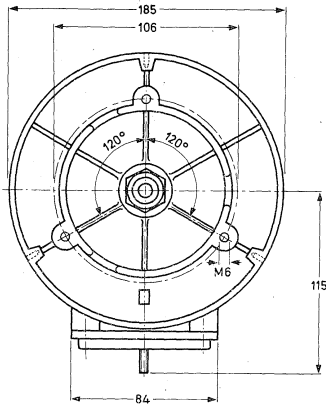
2) See "Operational notes" paragraph "Continuous overload".

3) See "Operational notes" paragraph "Voltage drop".

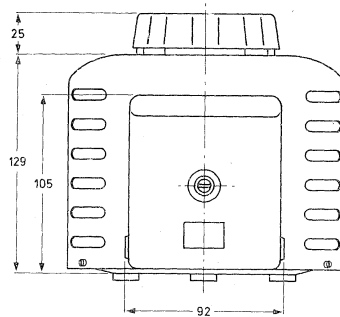
4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

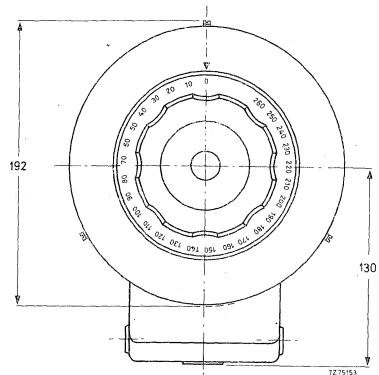
Dimensions in mm



panel model



For laboratory model see page S3.



The pads protrude approximately 5 mm.

bench model

Degree of protection (IEC144)

bench model

IP20

panel model

IP00

Mass

panel model

≈ 8,8 kg

bench model

≈ 9,6 kg

laboratory model

≈ 9,85 kg

Operating torque

0,2 to 0,3 Nm

Permissible end stop torque

max. 4 Nm

Mounting

The transformer can be fitted to a panel or chassis by means of 3 screws M6 (maximum length = panel thickness + 11 mm). The pads of the bench models have to be removed before mounting.

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 027 75160 (service number 5322 362 40044).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive module.

A. C. stabilizer module.

Chokes for parallel connection.

Further information on request.

See Handbook section "Accessories".

Use transformer size code C4 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E1**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
240	0,5	120 to 0 or 120 to 240	00407
120 or 240	0,25/0,5	120 to 0 or 120 to 240	90004
240	0,5	0 to 120 or 240 to 120	90011
110	0,6	0 to 110	00107
60	1,2	0 to 60	00007

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting transformers will find their main application in those cases, where inefficient load potentiometers or adjustable series resistors are used. They can also successfully replace tapped transformers in some types of inductive voltage control.

DESCRIPTION

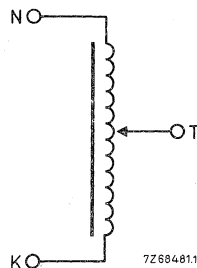
The transformers are moulded in reinforced polyester resin. The construction is rugged and professional; the winding is protected by the moulding. The mounting is simple by means of a nut on a threaded bushing.

Soldering tags are provided for the connecting leads.

The coils of the 240 V types are wound in two layers. The outer layer forms the brush track, so that the brush sweeps half the total winding.

ELECTRICAL DATA

Circuit diagram



Input voltage K to N *

Output voltage, no load, T to N 1)

Nominal output current over the whole control range

Maximum output current 2)

Voltage per turn of winding

Voltage drop at nominal output current 3)

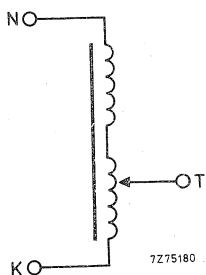
Losses, no load

Permissible temperature rise at any point 4)

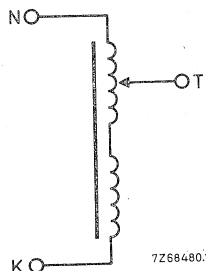
2422 530	
00007	00107
60 V +10%	110 V +10%
0 (+2) to 60 (-2) V	0 (+3) to 110 (-3) V
1, 2 A	0, 6 A
1, 32 A	0, 7 A
0, 122 V	0, 12 V
≤ 6 V	≤ 10 V
≤ 1, 1 W	≤ 1, 8 W
max. 70 °C	

* Second letter denotes the common input/output terminal.

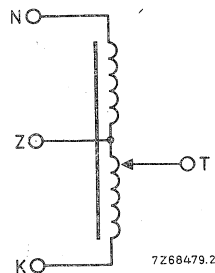
- 1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.
- 2) See "Operational notes" paragraph "Continuous overload".
- 3) See "Operational notes" paragraph "Voltage drop".
- 4) See "Operational notes" paragraph "Derating for higher ambient temperatures".
- 5) 0, 25 A/0, 28 A for input connection between terminals Z and N.



2422 530 00407



2422 530 90011



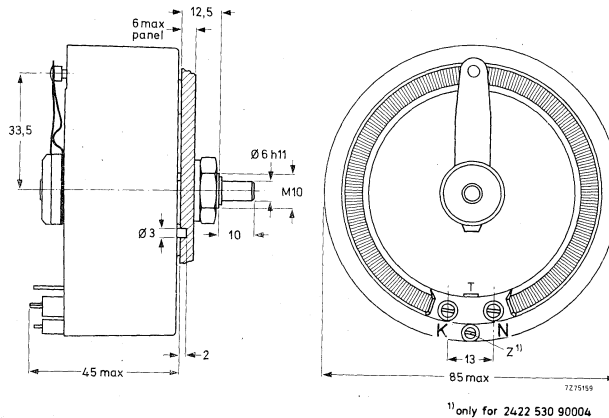
2422 530 90004

	2422 530		
	00407	90011	90004
Input voltage N to K *	240 V +10%	240 V +10%	240 V +10%
Output voltage, no load, T to K ¹⁾	120 (±2) to 0 (+3) V	240(-3) to 120 (±2) V	120 (±2) to 0 (+3) V
Input voltage K to N	240 V +10%	240 V +10%	240 V +10%
Output voltage, no load, T to N ¹⁾	120 (±2) to 240 (-3) V	0 (+3) to 120 (±2) V	120 (±2) to 240 (-3) V
Input voltage Z to N			120 V +10%
Output voltage, no load, T to N ¹⁾			120 (±2) to 240 (-3) V
Input voltage Z to K			120 V +10%
Output voltage, no load, T to K ¹⁾			120(±2) to 0 (+3) V
Nominal output current over the whole control range	0,5 A	0,5 A	0,5 A (0,25 A ⁵⁾)
Maximum output current ²⁾	0,55 A	0,55 A	0,55 A (0,28 A ⁵⁾)
Voltage per turn of winding			0,133 V
Voltage drop at nom. output current ³⁾			≤ 20 V
Losses, no load			≤ 1,8 W
Permissible temperature rise at any point ⁴⁾			max. 70 °C

Notes see preceding page.

MECHANICAL DATA

Dimensions in mm



¹⁾ only for 2422 530 90004

Degree of protection (IEC 144)

IP00

Mass

≈ 700 g

Operating torque

0,03 to 0,07 Nm

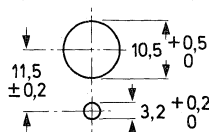
Permissible end stop torque

max. 1 Nm

Mounting

Mounting position: any.

The transformers can be fitted to a panel or a chassis (maximum thickness 6 mm) by means of the nut on the threaded bushing. The mounting hole pattern is given in the figure below.



Carbon brushes

Spare carbon brushes, already mounted in the contact arm, can be supplied under catalogue number 4322 027 78660 (or service number 5322 362 40038).

ACCESSORIES

Available accessories:

Control knob and dial See Handbook section "Accessories".

Further information on request.

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E2**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220/240	0,7	0 to 240	01407
220	0,83	0 to 220	11407
115/130	1,2	0 to 130	01607
115	1,4	0 to 115	11607
42	4	0 to 42	90031

To be read in conjunction with "Operational Notes Variable Mains Transformers".

APPLICATION

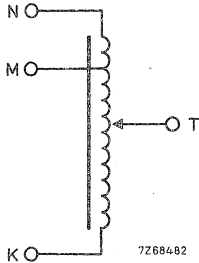
These panel mounting transformers will find their main application in those cases, where inefficient load potentiometers or adjustable series resistors are used. They can also successfully replace tapped transformers in some types of inductive voltage control.

DESCRIPTION

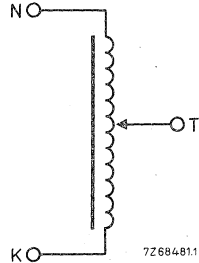
The transformers are moulded in reinforced polyester resin. The construction is rugged and professional: the winding is protected by the moulding. The mounting hole pattern is simple, the support area is relatively wide and therefore the transformers can be mounted on thin chassis or panels. The fixed-length spindle protrudes at both sides: the amount of side-to-side protrusion is adjustable. The spindle can be easily replaced by one of another length. Screw terminals are provided for the connecting leads.

ELECTRICAL DATA

Circuit diagram



2422 530 01407
2422 530 01607



2422 530 11407
2422 530 11607
2422 530 90031

2422 530

Input voltage M to K *
N to K

Output voltage, no load, T to K ¹⁾

Nominal output current over the
whole control range

Maximum output current ²⁾

Voltage per turn of winding

Voltage drop at nom. output current ³⁾

Losses, no-load

Permissible temperature rise at any point ⁴⁾

2422 530		
01407	11407	90031
220 V +10%	220 V +10%	42 V +10%
240 V +10%		42 V (-1) V
0 (+3) to 240 (-3 V)	0 (+3) to 220 (-3) V	0 (+1) to 42 (-1) V
0,7 A	0,83 A	4 A
0,83 A	1 A	4,8 A
0,242 V	0,23 V	0,206 V
≤16 V	≤13 V	≤2 V
≤4 W	≤4 W	≤2 W

max. 70 °C

* Second letter denotes the common input/output terminal.

1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

2) See "Operational notes" paragraph "Continuous overload".

3) See "Operational notes" paragraph "Voltage drop".

4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

2422 530

Input voltage M to K *
N to K

Output voltage, no load, T to K 1)

Nominal output current over the whole
control range

Maximum output current 2)

Voltage per turn of winding

Voltage drop at nominal output current 3)

Losses, no load

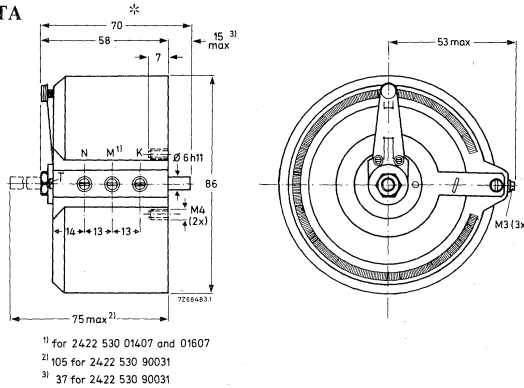
Permissible temperature rise at any point 4)

01607	11607
115 V +10%	115 V +10%
130 V +10%	
0 (+2) to 130 (-2) V	0 (+2) to 115 (-2) V
1, 2 A	1, 4 A
1, 4 A	1, 7 A
0, 211 V	0, 186 V
≤7 V	≤6 V
≤4 W	≤4 W

max. 70 °C

Notes see preceding page.

MECHANICAL DATA



* for 2422 530 90031 : 95 mm

Degree of protection (IEC 144)

IP00

Mass

1250 g

Operating torque

0,05 to 0,1 Nm

Permissible end stop torque

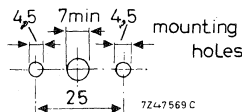
max. 1 Nm

Mounting

Mounting position: any

The transformers can be fitted to a panel or a chassis by means of 2 screws M4 (maximum length = panel thickness +7 mm).

The mounting hole pattern is given in the figure below.



Carbon brushes

Spare carbon brushes, already mounted in the contact arm, can be supplied under catalogue number 4322 026 16310 (or service number 5322 362 40054).

For 2422 530 90031: 4322 027 78720 (or service number 5322 362 44015).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive modules.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories". use size code E2 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E3**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220/260	1,2	0 to 260	08407
220	1,4	0 to 220	18407

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting transformers are used as power or voltage controls in mass produced apparatus, such as air heaters, ventilator controls, etc.

DESCRIPTION

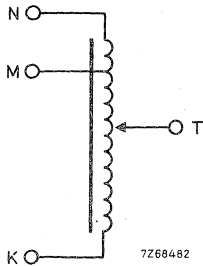
The transformers are moulded in reinforced polyester resin. The construction is rugged and professional; the winding is protected by the moulding.

The mounting hole pattern is simple, the support area is relatively wide and therefore the transformers can be mounted on thin chassis or panels.

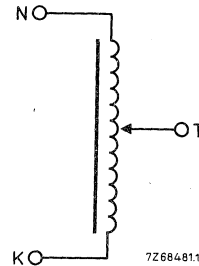
The fixed-length spindle protrudes at both sides: the amount of side-to-side protrusion is adjustable. The spindle can be easily replaced by one of another length. Screw terminals are provided for connecting the leads.

ELECTRICAL DATA

Circuit diagram



2422 530 08407



2422 530 18407

Input voltage M to K *
N to K

Output voltage T to K ¹⁾

Nominal output current over the
whole control range

Maximum output current ²⁾

Voltage per turn of winding

Voltage drop at nominal output current ³⁾

Losses, no load

Permissible temperature rise at any point ⁴⁾

* Second letter denotes the common input/output terminal.

2422 530	
08407	18407
220 V +10%	220 V +10%
260 V +10%	
0 (+3) to	0 (+3) to
260 (-3) V	
1, 2 A	1, 4 A
1, 4 A	1, 7 A
0, 36 V	0, 36 V
≤13 V	≤14 V
≤6 W	≤5 W

max. 70 °C

¹⁾ The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

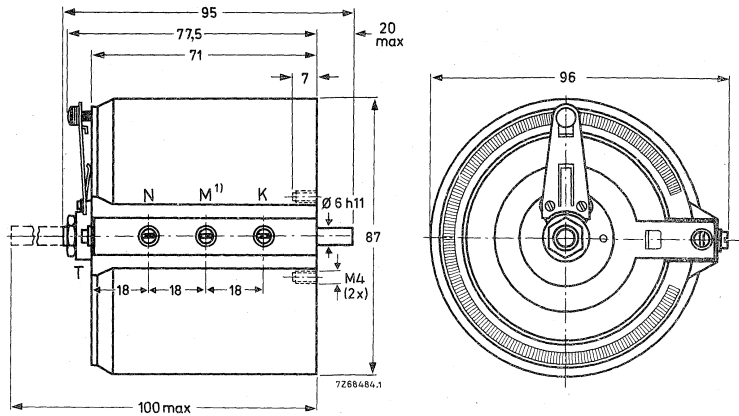
²⁾ See "Operational notes" paragraph "Continuous overload".

³⁾ See "Operational notes" paragraph "Voltage drop".

⁴⁾ See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



¹⁾ only for 2422 530 08407

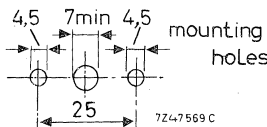
Degree of protection (IEC144)	IP00
Mass	≈ 1800 g
Operating torque	0,03 to 0,07 Nm
Permissible end stop torque	1 Nm

Mounting

Mounting position: any

The transformers can be fitted to a panel or a chassis by means of 2 screws M4 (maximum length = panel thickness +7 mm).

The mounting hole pattern is given in the figure below.



Carbon brushes

Spare carbon brushes, already mounted in the contact arm, can be supplied under catalogue number 4322 026 16310 (or service number 5322 362 40054).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive module.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use size code E3 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E4**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220/260	2	0 to 260	03407
240/260	2	0 to 260	03507
220	2,5	0 to 220	13407

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting transformers are used as power or voltage controls in mass produced apparatus, such as air heaters, ventilator controls, etc.

DESCRIPTION

The transformers are moulded in reinforced polyester resin. The construction is rugged and professional; the winding is protected by the moulding.

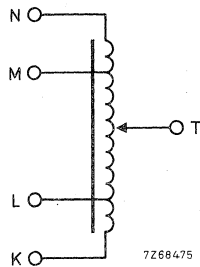
The mounting hole pattern is simple, the support area is relatively wide and therefore the transformers can be mounted on thin chassis or panels.

The fixed-length spindle protrudes at both sides: the amount of side-to-side protrusion is adjustable. The spindle can easily be replaced by one of another length.

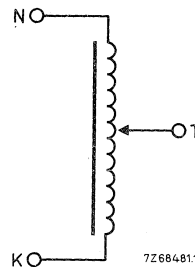
Screw terminals are provided for connecting the leads.

ELECTRICAL DATA

Circuit diagram



2422 530 03407 and 2422 530 03507



2422 530 13407

2422 530

Input voltage M to K *
N to K

Output voltage, no load, T to K ¹⁾

Nominal output current over the whole
control range

Maximum output current ²⁾

Voltage per turn of winding

Voltage drop at nominal output current ³⁾

Losses, no load

Permissible temperature rise at any point ⁴⁾

2422 530		
03407	03507	13407
220 V +10%	240 V +10%	220 V +10%
260 V +10%	260 V +10%	
0 (+3) to 260 (-3) V	0 (+3) to 260 (-3) V	0 (+3) to 220 (-3) V
2 A	2 A	2,5 A
2,4 A	2,4 A	3 A
0,488 V	0,488 V	0,478 V
≤7 V	≤7 V	≤7 V
	≤8 W	
	70 °C	

* Second letter denotes the common input/output terminal.

¹⁾ The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

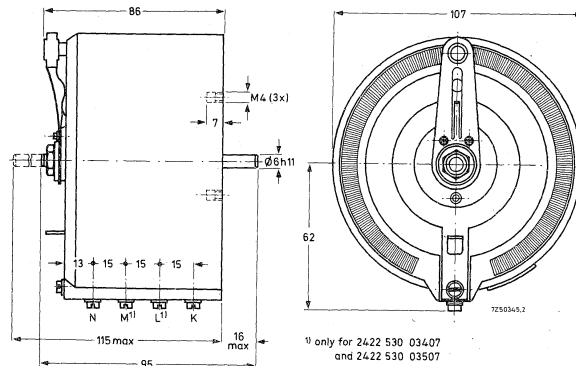
²⁾ See "Operational notes" paragraph "Continuous overload".

³⁾ See "Operational notes" paragraph "Voltage drop".

⁴⁾ See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



Degree of protection

IP00

Mass

≈ 3100 g

Operating torque

0,05 to 0,1 Nm

Permissible end stop torque

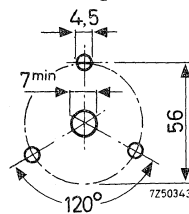
1 Nm

Mounting

Mounting position: any

The transformers can be fitted to a panel or a chassis by means of 3 screws M4 (maximum length = panel thickness + 7 mm).

The mounting hole pattern is given in the figure below.



Carbon brushes

Spare carbon brushes, already mounted in the contact arm, can be supplied under catalogue number 4322 026 65540 (or service number 5322 362 40079).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Motor drive module.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use size code E4 at selecting accessories.

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E5**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220	4	110 to 220	90023
220	4	0 to 220	90024

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting transformers are designed to be built in laboratory, industrial and professional equipment.

DESCRIPTION

The transformers are partly moulded in reinforced polyester resin. The construction is simple but rugged; the impregnated winding is unprotected.

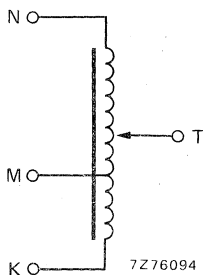
The transformers do not require maintenance.

Screw terminals are provided for the connecting leads.

The mounting hole pattern is simple, the support area is relatively wide and therefore the transformers can be mounted on thin chassis or panels. The transformers are supplied without knob or dial.

ELECTRICAL DATA

Circuit diagram



Input voltage N to K *

Output voltage, no load, T to K ¹⁾

M to K

Nominal output current over the whole control range

Maximum output current ²⁾

Voltage per turn of winding

Voltage drop at nominal output current ³⁾

Losses, no load

Permissible temperature rise at any point ⁴⁾

2422 530	
90023	90024
220 V +10 %	220 V +10%
110 (±3) to 220 (-3) V	0 (+3) to 220 (-3) V
80 (±3) V	80 (±3) V

4 A

4,8 A

0,61 V

≤8,1 V

≤6,5 W

70 °C

* Second letter denotes the common input/output terminal.

1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

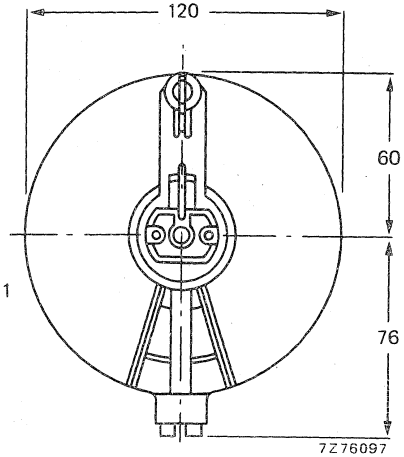
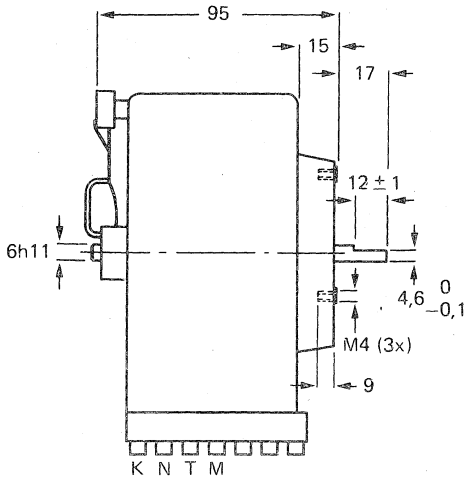
2) See "Operational notes" paragraph "Continuous overload".

3) See "Operational notes" paragraph "Voltage drop".

4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



Degree of protection (IEC 144)

IP00

Mass

≈4030 g

Operating torque

0,05 to 0,15 Nm

Permissible end stop torque

max. 1 Nm

Total angle of rotation, 2422 530 90023
2422 530 90024

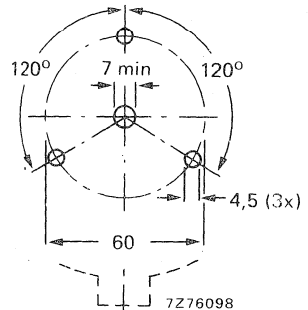
approx. 160°
approx. 320°

Mounting

Mounting position: any

The transformer can be fitted to a panel or a chassis by means of 3 M4 screws (maximum length = panel thickness + 9 mm).

The mounting hole pattern is shown in the drawing.



Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 028 01821 (service number 5322 362 44017).

ACCESSORIES

Available accessories:

Ganging units.

Motor drive module.

A.C. stabilizer module.

Further information on request.



**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E6**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220/240/276	4,5	0 to 253 or 0 to 276	90028

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

This panel mounting transformer is designed for use in laboratories and in industrial and professional equipment.

DESCRIPTION

This transformer is partly moulded in reinforced polyester resin. The construction is simple but rugged; the impregnated winding is unprotected.

The transformer does not require maintenance.

Screw terminals are provided for connecting the leads.

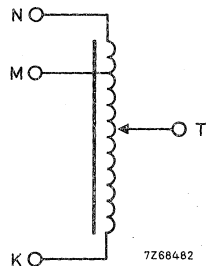
The mounting hole pattern is simple, the support area is relatively wide and therefore the transformers can be mounted on thin chassis or panels.

The fixed-length spindle protrudes at both sides; the amount of side-to-side protrusion is adjustable. The spindle can be easily replaced by one of another length.



ELECTRICAL DATA

Circuit diagram



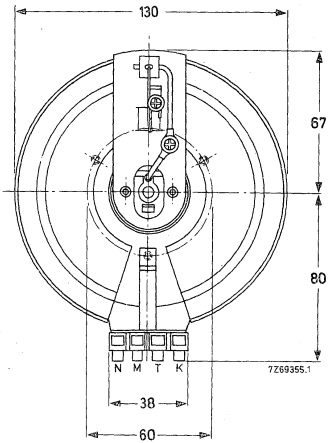
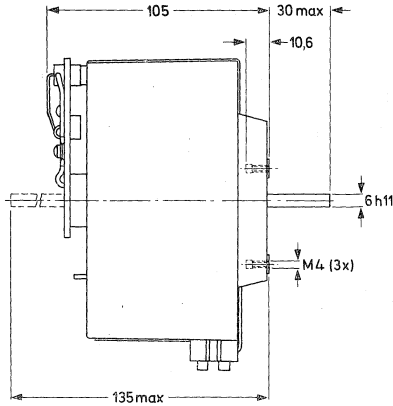
		2422 530 90028
Input voltage M to K *		220 V
Output voltage T to K	1)	0 (+3) to 253 (-3) V
Input voltage M to K		240 V
Output voltage T to K	1)	0 (+3, 3) to 276 (-3, 3) V
Input voltage N to K		276 V
Output voltage T to K	1)	0 (+3, 3) to 276 (-3, 3) V
Nominal output current over the whole control range		4, 5 A
Maximum output current	2)	5 A
Voltage per turn of winding input 220 V		0, 56 V
input 240 V		0, 61 V
Voltage drop at nominal output current	3)	≤ 6 V
Losses, no load (input voltage M to K = 220 V)		≤ 8 W
Permissible temperature rise at any point	4)	70 °C

*Second letter denotes the common input/output terminal.

- 1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.
- 2) See "Operational notes" paragraph "Continuous overload".
- 3) See "Operational notes" paragraph "Voltage drop".
- 4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



Degree of protection (IEC144)

IP00

Mass

≈ 4,5 kg

Operating torque

0,05 to 0,15 Nm

Permissible end stop torque

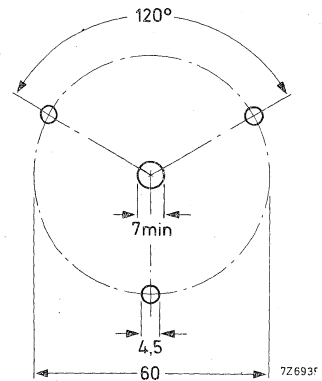
max. 1 Nm

Mounting

Mounting position: any.

The transformer can be fitted to a panel or chassis by means of 3 screws M4 (maximum length = panel thickness + 10 mm).

The mounting hole pattern is in accordance with DIN42595 and shown in the figure.



Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 027 75750 (or service number 5322 362 44012).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Chokes for parallel connection.

Motor drive module.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use size code E6 at selecting accessories.

#####

**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E8**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530
220/260	12	0 to 260	06407
240/260	12	0 to 260	06507
220	15	0 to 220	16407

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting transformers have been developed to meet the demand for larger power requirements e.g. power plants, studios, cinemas, etc.

DESCRIPTION

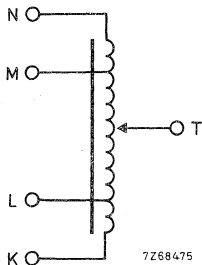
The annular core with a single layer of insulated copper wire is moulded in a reinforced polyester resin bottom part. The contact surface is on the cylindrical outside and it has a special metal finish to ensure permanently perfect contact and to prevent any oxidation by overheating.

The fixed-length spindle protrudes at both sides: the amount of side-to-side protrusion is adjustable. The spindle can easily be replaced by one of another length. Screw terminals are provided for connecting the leads.



ELECTRICAL DATA

Circuit diagram



2422 530 06407

2422 530 06507

KL = MN

Input voltage L to N *
K to N

Output voltage, no load, T to N ¹⁾

Nominal output current over the whole
control range

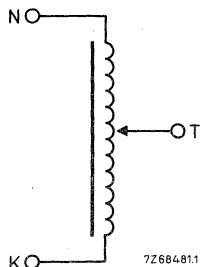
Maximum output current ²⁾

Voltage per turn of winding

Voltage drop at nominal output current ³⁾

Losses, no load

Permissible temperature rise at any point ⁴⁾



2422 531 16407

2422 530

06407	06507	16407
220 V + 10%	240 V + 10%	220 V + 10%
260 V + 10%	260 V + 10%	
0 to 260 (+3) V	0 to 260 (+3) V	0 to 260 (+3) V
12 A	12 A	15 A
15 A	15 A	18 A
0,75 V	0,75 V	0,75 V
≤ 6 V	≤ 6 V	≤ 4,5 V
	≤ 19,5 W	
	max. 90 °C	

* Second letter denotes the common input/output terminal.

¹⁾ The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

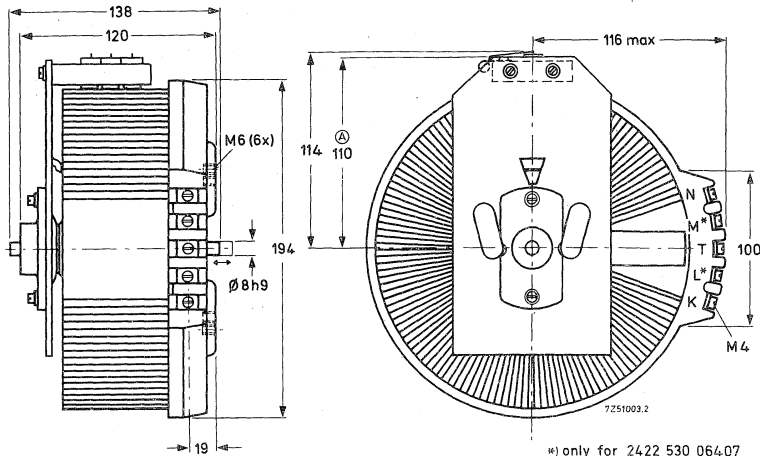
²⁾ See "Operational notes" paragraph "Continuous overload".

³⁾ See "Operational notes" paragraph "Voltage drop".

⁴⁾ See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA

Dimensions in mm



*) only for 2422 530 06407
and 2422 530 06507

Degree of protection (IEC144)

IP00

Mass

≈ 10 kg

Operating torque

0, 25 to 0, 5 Nm

Permissible end stop torque

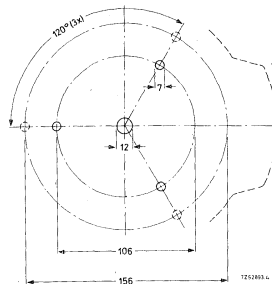
max. 4 Nm

Mounting

Mounting position: any.

The transformers can be fitted to a panel or chassis by means of 3 screws M6 (maximum length = panel thickness + 10 mm).

The mounting hole pattern is given in the figure. 3 Holes on the outer circle or on the inner circle are sufficient for mounting.



Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 028 01801 (service number 5322 362 44016).

For older transformers with a dimension A = 102 mm -see drawing- the catalogue number of the carbon brushes is 4322 027 54810 (service number 5322 362 40096).

ACCESSORIES

Available accessories:

Control knobs.

Ganging units.

Chokes for parallel connection'

Motor drive module.

A. C. stabilizer module.

Further information on request.

See Handbook section "Accessories"

Use size code E8 at selecting accessories.



**VARIABLE MAINS TRANSFORMERS
moulded type; transformer size code E10**

QUICK REFERENCE DATA				
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 530	
			bench model	panel model
220/260	23A	0 to 260	07411	07407
240/260	23A	0 to 260	07511	07507

To be read in conjunction with "Operational notes Variable mains transformers".

APPLICATION

These panel mounting or bench model transformers have been designed for industrial use e.g. cinemas, studios, power plants etc.

DESCRIPTION

The transformers are partly moulded in reinforced polyester resin.

The construction is simple but rugged.

The transformers need no maintenance.

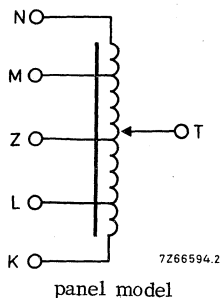
Screw terminals are provided for connecting the leads.

The fixed-length spindle protrudes at both sides; the amount of side-to-side protrusion is adjustable. The spindle can be easily replaced by one of another length.

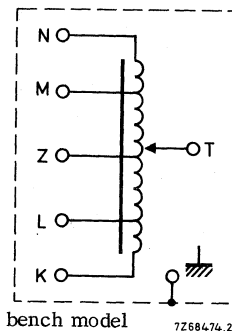


ELECTRICAL DATA

Circuit diagrams



KL = MN
Z = centre_tap



2422 530

07411	07511
07407	07507
220 V + 10%	240 V + 10%
260 V + 10%	

Input voltage L to N *
K to N

Output voltage, no load, T to N 1)

Nominal output current over the whole control range

Maximum output current 2)

Voltage per turn of winding

Voltage drop at nominal output current 3)

Losses, no load

Permissible temperature rise at any point 4)

0 to 260 (+3) V

23 A

30 A

0,9 V

≤ 6 V

≤ 40 W

90 °C

* Second letter denotes the common input/output terminal.

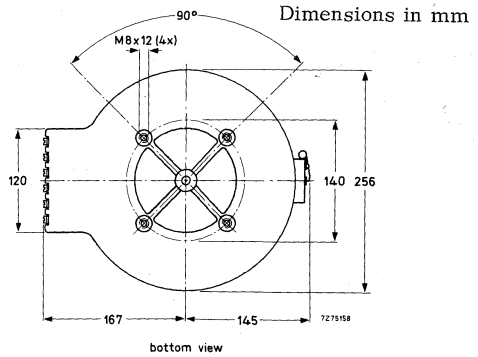
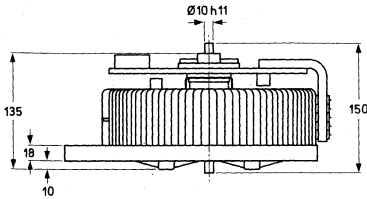
1) The output voltage is stated for clockwise rotation when the transformer is mounted behind a panel.

2) See "Operational notes" paragraph "Continuous overload".

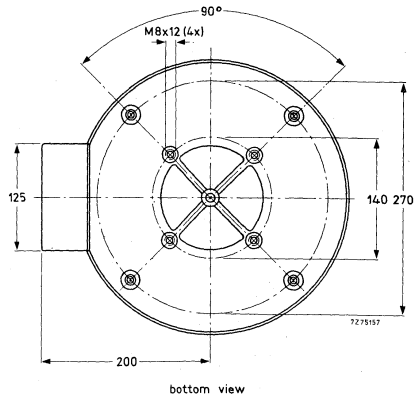
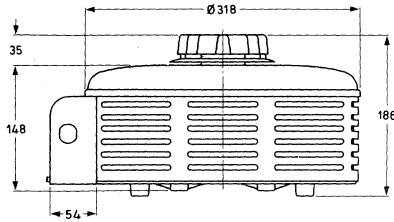
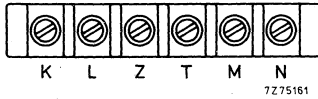
3) See "Operational notes" paragraph "Voltage drop".

4) See "Operational notes" paragraph "Derating for higher ambient temperatures".

MECHANICAL DATA



2422 530 07407
07507



2422 530 07411
07511

Degree of protection (IEC144)
Mass
Operating torque
Permissible end stop torque

bench model	panel model
IP20	IP00
≈19,8 kg	≈17,9 kg
	1 to 1,5 Nm
	max. 5 Nm

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 028 01801 (service number 5322 362 44016).

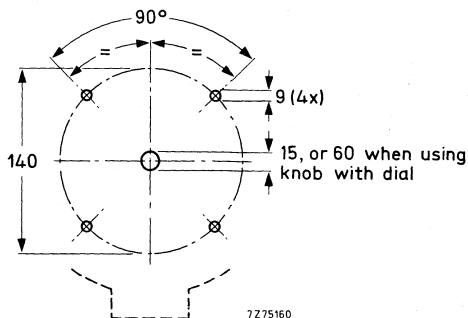
Mounting

Mounting position: any.

The transformers (both panel and bench models) can be fitted to a panel or chassis by means of 4 screws M8 (maximum length = panel thickness +12 mm).

The mounting hole pattern is shown below.

Remove pads of bench model before mounting.



ACCESSORIES

Available accessories:

Control knobs.

Ganging unit.

Motor drive module.

Chokes for parallel connection.

A.C. stabilizer module.

Further information on request.

See Handbook section "Accessories".

Use size code E10 at selecting accessories.

**Variable mains transformers
(separate windings)**



**VARIABLE MAINS TRANSFORMERS
with separate windings; transformer size code C4**

QUICK REFERENCE DATA			
input voltage (V)	output current (A)	output voltage (V)	catalogue number 2422 529
220	3	0 to 242	panel model
			lab. model
			00006 00005

APPLICATION

These variable transformers find their main application as isolating transformers in radio and television repair shops and in laboratories.

DESCRIPTION

The annular core with two separated layers of insulated copper wire is insulated from and supported in a cast aluminium frame.

The coil resistance is very low (3,7 Ω).

The contact surface is on the top of the coil.

The angle of rotation is 320°; end stops prevent the two brushes, which operate in parallel, from overrunning the contact track.

The fixed-length spindle protrudes at both sides; the amount of side-to-side protrusion is adjustable. The spindle can easily be replaced by one of another length.

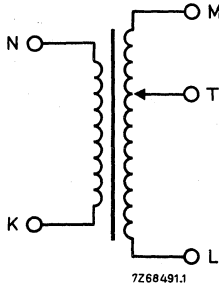
Screw terminals are provided for connecting the leads.

The laboratory model has a sturdy metal housing with handle and is provided with a cable with a mains plug with side-contact earth, a socket, a fuse, and a voltmeter indicating the output voltage.

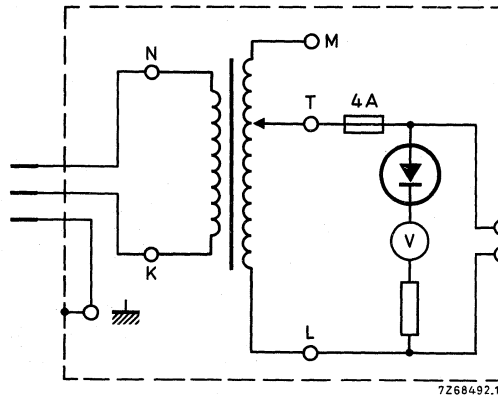


ELECTRICAL DATA

Circuit diagram



panel model



laboratory model

Input voltage N to K	220 V + 10%
Output voltage, no load M to T *	0 to ≥ 242 V
Nominal output current over the whole control range	3 A
Short term overload current	5 A
Voltage per turn of winding	0,76 V
Voltage drop at nominal output current	≤ 12 V
Losses, no load	≤ 11 W
Frequency range	50 to 60 Hz
Insulation resistance ²⁾ after damp heat test (IEC 68-2, test Ca, 21 days)	> 5 M Ω
Test voltage for 1 min ²⁾	2000 V, 50 Hz
Air gap ²⁾	≥ 4 mm
Leakage path ²⁾	≥ 5 mm
Ambient temperature range	-10 to +40 °C
Climatic category, IEC 68-1	10/040/21
Maximum temperature rise at any point	70 °C

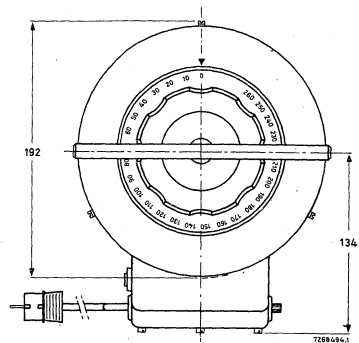
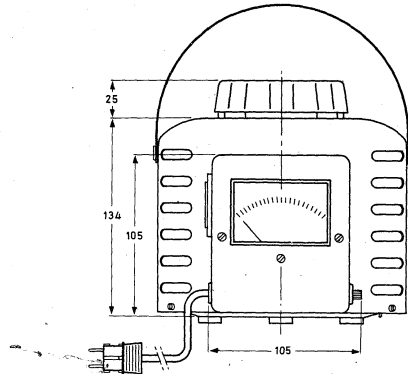
*) Clockwise rotation of the spindle results in an increasing output voltage when the transformer is mounted behind a panel.

1) For inductive loads it may be necessary to replace the fuse by one which can stand high transient currents.

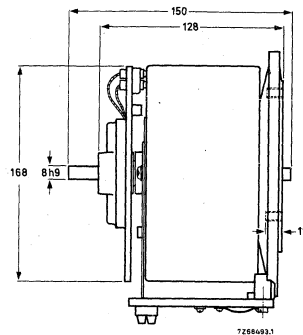
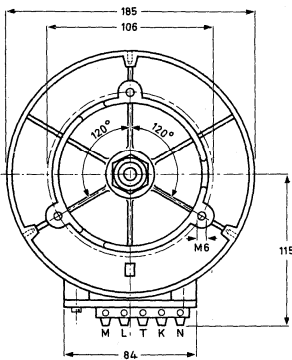
2) Between windings and between live and non-live parts.

MECHANICAL DATA

Dimensions in mm



laboratory model



panel model

Degree of protection (IEC 144) panel model	IP00
lab. model	IP20
Mass, panel model	≈ 8,5 kg
laboratory model	≈ 9,6 kg
Operating torque	0,15 to 0,3 Nm
Permissible end stop torque	max. 4 Nm
Total angle of rotation	320°
Life, guaranteed	> 100 000 complete rotations
Life expectancy	> 250 000 complete rotations

Mounting

Mounting position: any

The transformers can be fitted to a panel or a chassis by means of 3 screws M6 (maximum length = panel thickness + 11 mm).

Carbon brushes

Spare carbon brushes can be supplied under catalogue number 4322 027 75160 (or service number 5322 362 40044). ¹⁾

ACCESSORIES

Available accessories:

Control knobs.

Ganging unit

See Handbook section
"Accessories".

Motor drive module

Use size code C4 at selecting
accessories.

Further information on request

¹⁾ Spare carbon brushes for moulded transformer (previous version) are available under catalogue number 4322 027 55830 (or service number 5322 362 44003).

Accessories



GANGING AND MOTOR DRIVE

operational notes

Ganging units are used for the mechanical ganging of two or three variable transformers. They are supplied in an assembly kit. The stacked transformers may be hand or motor driven.

Most transformers, either stacked or individual, can be provided with a remote-controlled **motor drive**.

Two or three transformers may be mechanically and electrically connected in parallel (**electrical ganging**).

To prevent high interchange currents, caused by differences in output voltage between the ganged transformers, **chokes** should be inserted between the output terminals of the transformers.

In the following tables the required parts to be ordered - with catalogue number and number of pieces - are given for the various transformer size codes.

Simple motor drive components for various rotational frequencies (rotation times) as well as components for mechanical ganging (hand or motor driven) or electrical ganging may be derived from the tables.

ORDERING

1. For **mechanical ganging without motor drive** order ganging unit and spindle.
2. For **motor drive** order in addition to 1 the components given under the heading "motor drive".
3. For **electrical ganging** order also a parallel choke.

Notes to tables

- 1) The effective rotation angle of the variable mains transformers is 320° , so the actual rotation time between end stops is $\frac{320}{360}$ x listed rotation time.
- 2) A series of gear-boxes with gear ratio from 25:6 to 15 000:1, catalogue number 9904 130 01... is available. With these gear-boxes a pinion set 2422 532 00037 must be ordered.
For further information ask your supplier.

ACCESSORIES

Ganging and motor drive transformer size code E2, E3, E4, C1 and C2

transformer size code	rotation time for 1 rev. of 360° ¹	numbers of transf. used	mechanical ganging		motor drive														
			ganging unit	spindle	top plate kit 2422 532 0007	ganging unit for motor drive 2422 532 0008	gear box ²						revers. synchr. motor 220 V 50 Hz 9904 111	phasing capac. 330 V a.c.		adapter spindle 4322 026 68990			
							gear ratio							0,18 µF	0,056 µF				
			2422 532	4322 026	5:1	25:2	25:1	50:1	100:1	1500:1	3000:1	06131	04131						
E2, E3 and E4	6 s	1				1	1	1						1		1		1	
		2	1		1									1		1		1	
		3		1		1													1
	15 s	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	30 s	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	1 min	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	2 min	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	30 min	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	1 h	1				1	1		1						1		1		1
		2	1		1				1						1		1		1
		3		1		1			1						1		1		1
	C1 and C2	6 s	1				1	1	1						1		1		
			2		1		1	1	1						1		1		
			3			1		1											
15 s		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1
30 s		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1
1 min		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1
2 min		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1
30 min		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1
1 h		1				1	1		1						1		1		1
		2		1		1	1		1						1		1		1
		3			1		1		1						1		1		1

¹ + ² = see operational notes "Ganging and motor drive".

Ganging and motor drive
transformer size code E6, C3 and C4

ACCESSORIES

transformer size code	rotation time for 1 rev. of 360°	number of transf. used	mechanical ganging		connecting parallel choke		ganging unit for motor drive		gear box ² gear ratio						revers. synchr. motor 220 V 50 Hz 9904 111		phasing capac. 330 V a.c.		adapter spindle 4322 026 68990		
			ganging unit		spindle		2422 532		2422 532 00058		4322 026						0,18 µF	0,056 µF			
			2422 532	4322 026	2422 532	2422 532	2422 532 00058	2422 532 00028	5:1	25:2	25:1	50:1	100:1	1500:1	3000:1						
			00055	00056	66750	66740	08350	08360	00014*	00013	top plate kit 2422 532 00027	65761	65771	65781	65791	65801	65811	65821		06131	04131
E6	6 s	1						1	1								1		1		
		2	1					1	1		1	1					1		1		
		3		1				1	1												1
	15 s	1							1	1										1	1
		2	1		1				1	1		1	1					1		1	1
		3		1		1			1	1		1	1					1		1	1
	30 s	1							1	1										1	1
		2	1		1				1	1		1	1					1		1	1
		3		1		1			1	1		1	1					1		1	1
	1 min	1							1	1										1	1
		2	1		1				1	1		1	1					1		1	1
		3		1		1			1	1		1	1					1		1	1
	2 min	1							1	1										1	1
		2	1		1				1	1		1	1					1		1	1
		3		1		1			1	1		1	1					1		1	1
	30 min	1							1	1										1	1
		2	1		1				1	1		1	1					1		1	1
		3		1		1			1	1		1	1					1		1	1
	1 h	1							1	1										1	1
		2	1						1	1		1	1					1		1	1
		3		1					1	1		1	1					1		1	1
	C3 and C4	6 s	1						1	1										1	1
			2	1			1	1		1	1								1	1	
			3		1			1	1												
15 s		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	
30 s		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	
1 min		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	
2 min		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	
30 min		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	
1 h		1							1	1										1	1
		2	1			1	1		1	1		1	1						1	1	
		3		1			1	1	1		1	1							1	1	

* = 4322 532 00014 may be replaced by 00013.
¹ + ² = see operational notes "Ganging and motor drive".

ACCESSORIES

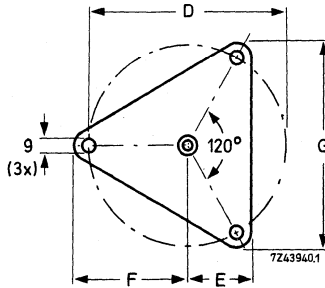
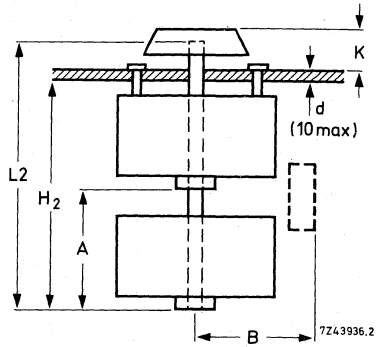
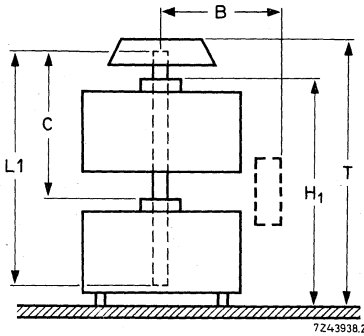
Ganging and motor drive transformer size code E8 and E10

transformer size code	rotation time for 1 rev. of 360° 1	mechanical ganging						connecting parallel choke 2422 532 00017	motor drive																
		numbers of transf. used	ganging unit 2422 532			spindle	top plate kit 2422 532		ganging unit for motor drive		gear box ² gear ratio				revers. synchr. motor 9904 11106131 220 V, 50 Hz	phasing capac. 0,18 µF; 330 V a.c.									
			00039	00041	00063				00064	incl. in kit 4322 028 01850	4322 028 01860	00042	00065	incl. in top plate kit. 2422 532 00062			4322 026								
		5:1				25:2	25:1								50:1										
		100:1				1500:1	3000:1																		
E8	6 s	1																							
		2	1			1																			
		3		1																					
	15 s	1							1		1													1	1
		2	1			1								1											
		3		1			1																		
	30 s	1							1		1													1	1
		2	1				1				1				1										
		3		1				1																	
	1 min	1							1		1													1	1
		2	1				1				1				1										
		3		1				1								1								1	1
	2 min	1							1		1													1	1
		2	1				1				1				1										
		3		1				1									1							1	1
	30 min	1							1		1													1	1
		2	1				1				1					1									
		3		1				1										1						1	1
	1 h	1							1		1													1	1
		2	1				1				1													1	1
		3		1				1																1	1
	E10	45 s	1							1		1		1										1	1
			2		1			1																	
			3			1			1															2	
90 s		1								1		1			1									1	1
		2		1			1				1				1									1	1
		3			1			1																2	
3 min		1								1		1				1								1	1
		2		1			1				1				1										
		3			1			1																2	
6 min		1								1		1					1							1	1
		2		1			1				1					1									
		3			1			1																2	
90 min		1								1		1						1						1	1
		2		1			1				1						1								
		3			1			1																2	
180 min		1								1		1												1	1
		2		1			1				1														
		3			1			1																2	

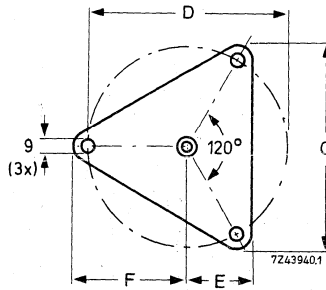
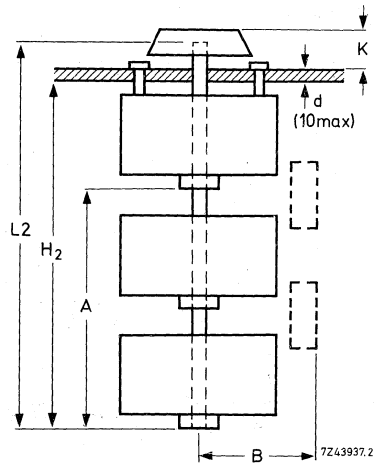
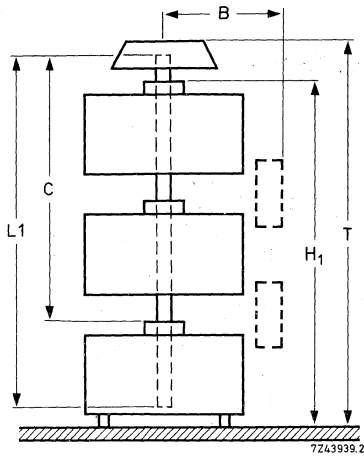
¹ + ² = see operational notes "Ganging and motor drive".

Dimensions

Transformers with size codes C1, C2, C3, C4, E2, E3, E4, E6



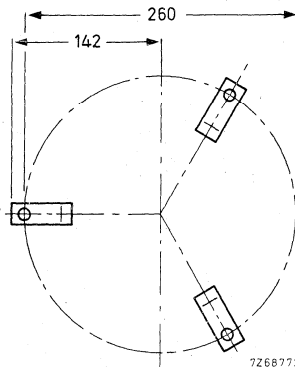
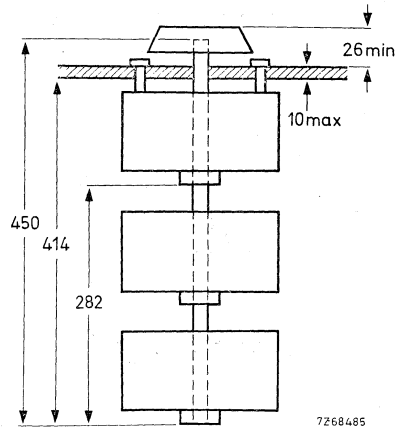
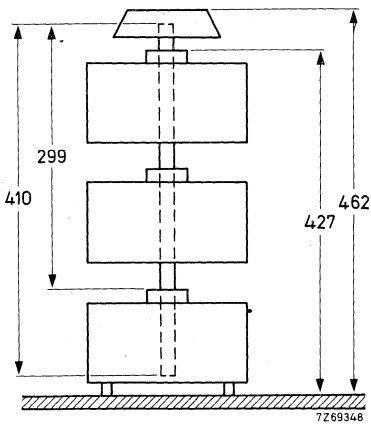
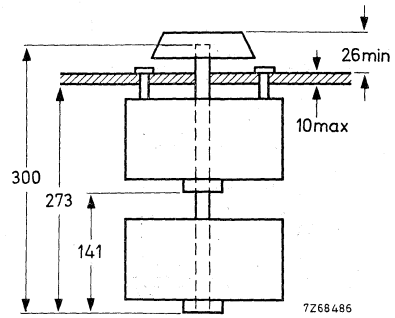
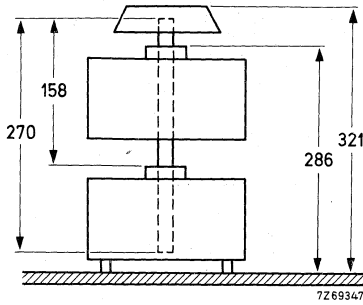
transformer size code	dimensions (mm)												
	A	B	C _{min}	D	E	F	G	H ₁	H ₂	K	L ₁	L ₂	T
E2	110	-	120	155	54	93	164	198	180	25	175	190+d	223
E3	110	-	120	155	54	93	164	217	199	25	195	219+d	242
E4	110	-	120	155	54	93	164	229	211	25	205	221+d	252
C1	141	-	158	155	54	93	164	282	264	25	270	274+d	313
C2	141	-	158	155	54	93	164	286	268	25	270	276+d	317
C3	141	161	158	212	68	121	214	291	273	29	270	284+d	326
C4	141	176	158	212	68	121	214	294	276	29	270	287+d	329
E6	141	-	158	212	68	121	214	265	247	25	255	257+d	300



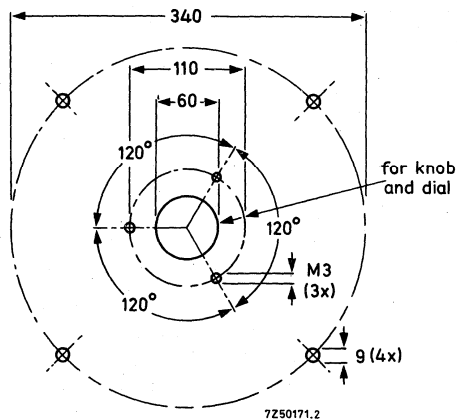
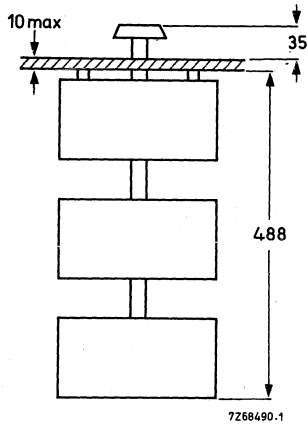
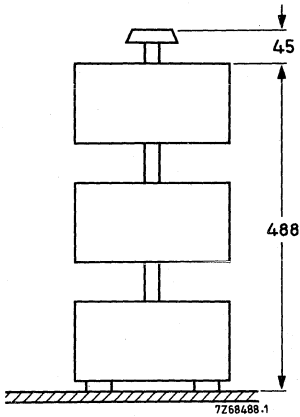
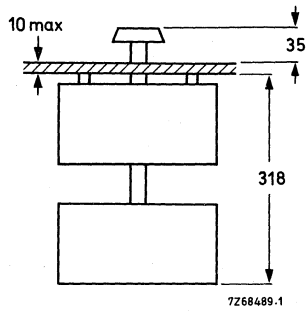
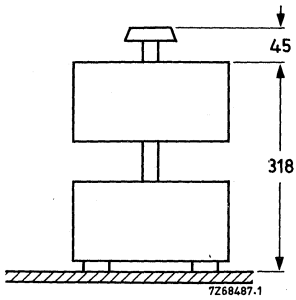
transformer size code	dimensions (mm)												
	A	B	C _{min}	D	E	F	G	H ₁	H ₂	K	L ₁	L ₂	T
E2	220	-	229	155	54	93	164	308	290	25	285	300+d	333
E3	220	-	229	155	54	93	164	327	309	25	305	329+d	352
E4	220	-	229	155	54	93	164	339	321	25	315	331+d	362
C1	282	-	299	155	54	93	164	423	405	25	410	415+d	454
C2	282	-	299	155	54	93	164	427	409	25	410	417+d	458
C3	282	161	299	212	68	121	214	432	414	29	410	425+d	467
C4	282	176	299	212	68	121	214	435	417	29	410	428+d	470
E6	282	-	299	212	68	121	214	406	388	25	396	398+d	441

Note - The supplied spindles (300 mm or 450 mm length) should be shortened to the required length L₁ or L₂.

Transformers with size code E8



Transformers with size code E 10

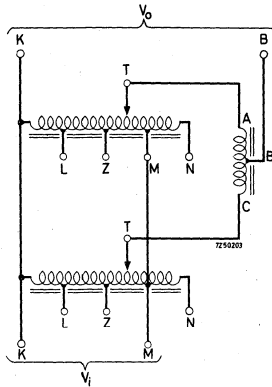


ELECTRICAL GANGING

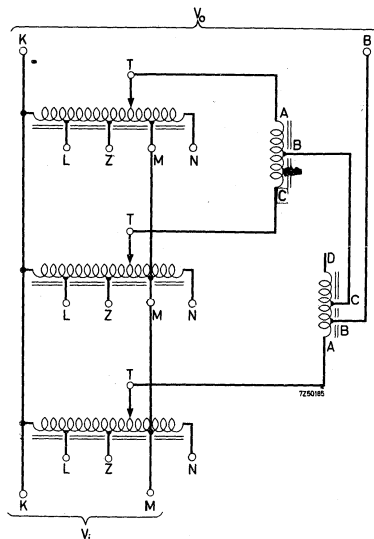
Parallel ganging

Two or three variable mains transformers can be ganged in parallel for the supply of higher single-phase secondary currents. Chokes must be used to prevent high interchange currents between the parallel-connected circuits.

Transformers with size code E6, C3 and C4

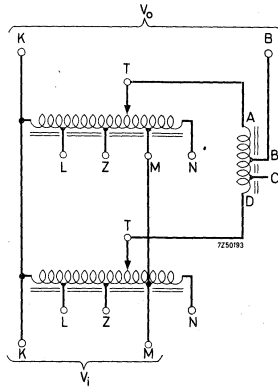


Two transformers connected in parallel

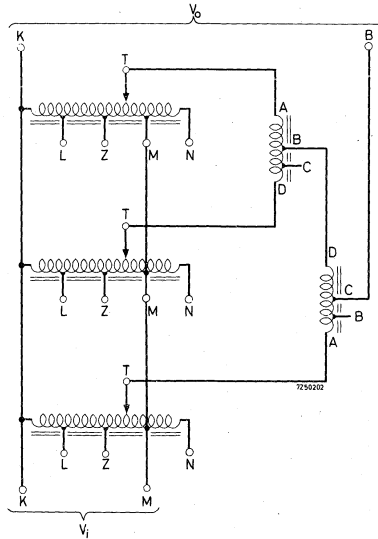


Three transformers connected in parallel

Transformers with size code E 8 and E 10



Two transformers connected in parallel

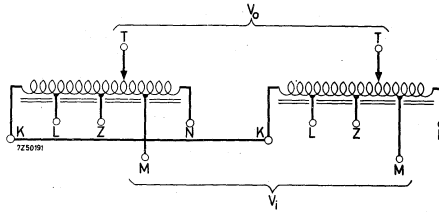


Three transformers connected in parallel

Series ganging

Two variable mains transformers can be ganged in series for connection of high input voltages (max. 520 V).

The two brushes move simultaneously toward, or away from, the line terminals of the transformers, which means that the load is "floating".

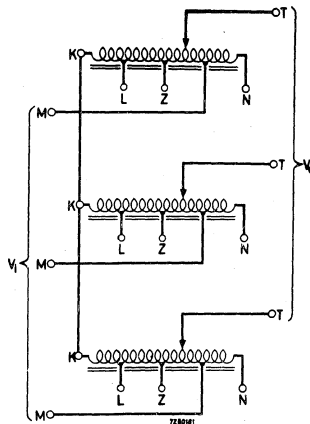


Two transformers connected in series

Three-phase ganging

Three transformers in Δ circuit

To control three-phase voltages, three transformers can be connected in star.

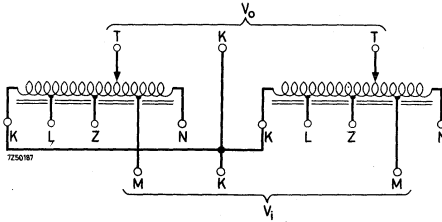


Three transformers connected in Δ circuit

Two transformers in open Δ circuit

Voltage control of the three-phase mains can also be obtained by using two variable transformers, connected in "open delta".

The circuit applies to 127/220 V mains for transformers with 220 V input. This circuit provides full control without phase shift.



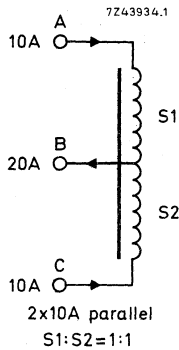
Two transformers connected in open Δ circuit



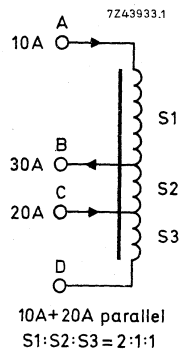
Chokes

For parallel connection of two or three transformers, chokes must be inserted between the output terminals to prevent high interchange currents caused by differences in ganging. The permissible output voltage difference between the ganged transformers is ≤ 2 V.

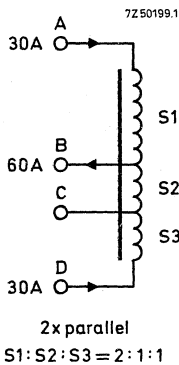
The following chokes are available:



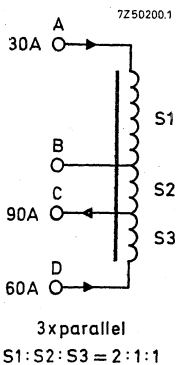
Catalogue number
2422 532 00014



Catalogue number
2422 532 00013



Catalogue number 2422 532 00017



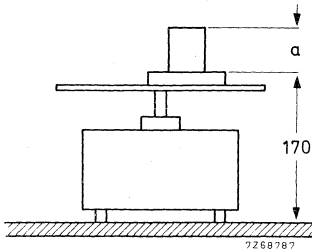
MOTOR DRIVE MODULES

Some transformers, either stacked or individual, can be provided with a remote-controlled motor drive module.

A motor drive module consists of the following parts :

- reversible synchronous motor
 - phasing capacitor
 - gear box
 - ganging unit for the motor drive
 - top plate with connecting block, switches and auxiliary parts (supplied in assembly kit).
- Instructions for use are packed with the kit for assembling the top plate.

The main dimensions are given in the figures below.



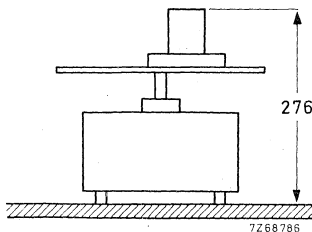
Transformer size codes E2, E3, E4, E6, E8 and C1 to C4 inclusive.

- a = 75 mm, if motor 9904 111 06131 is used
- = 25 mm, if motor 9904 111 04131 is used

If 2 or 3 ganged transformers are used add table dimension (mm) to the height given in the Figure.

transformer size	2 transformers	3 transformers
C1, C2, C3, C4 E6, E8	141	282
E2, E3, E4	110	220
E10	170	340

Transformer size code E10



Further dimensions see under "Mechanical ganging".

The synchronous motors are 220 V, 50 Hz.

Motors for other voltages and frequencies: contact your supplier.

A.C. STABILIZER MODULE

2422 532 00061

QUICK REFERENCE DATA

Input voltage	220 V, +10%, -15%; 50 Hz
Stabilized output voltage of the controlled transformer	5 to 115% of input voltage
Maximum stabilization accuracy	$\pm 0,5$ V
Ambient temperature range	-10 to +45 °C

APPLICATION

This automatic stabilizer module can be used in combination with motor driven transformers for correction of voltage variations. Its main use will be in those applications where the speed of response is of secondary importance to waveform distortion, and where the price per kVA of controlled power must be kept low. Examples of areas of application are test and research laboratories, service shops, and factories with complex machinery. The module can also be used as a voltage, light or temperature-sensitive control for different power sources.

DESCRIPTION

A complete a. c. stabilizer circuit consists of:

- one or more mains transformers
- a transformer ganging unit, if two or three transformers are used
- a motor drive module with 220 V reversible synchronous motor, see chapter "Motor drive modules"
- the a. c. stabilizer module
- a control potentiometer

The stabilizer circuit is shown in Fig. 1 in block diagram form. A stabilized power supply provides a d. c. reference voltage (V_{ref}), which is applied to the control potentiometer. This potentiometer reduces the reference voltage by a factor k_1 , thus the voltage $k_1 V_{ref}$ is applied to the comparator. The output voltage of the variable mains transformer is applied to the primary of a step-down transformer whose secondary output is rectified. The output of the rectifier, $k_2 V_{out}$, is applied to the other comparator input. The comparator provides an output e to the switching amplifier when the difference between $k_2 V_{out}$ and $k_1 V_{ref}$ exceeds the value set by the accuracy potentiometer on the module. The output of the switching amplifier energizes the appropriate relay for driving the motor in the direction which corrects the voltage variation of the transformer.

The accuracy potentiometer (see Fig. 2) adjusts the stabilization accuracy between $\pm 0,5 V$ and $\pm 2,5 V$; correct adjustment is necessary to prevent the system hunting. The system has a tendency to hunt because the rotor of a synchronous motor has permanent magnets and cannot stop between pole pairs, and also because the movement of the transformer brush from winding to winding causes a stepping voltage. A coincidence of these conditions can exceed the accuracy potentiometer setting causing the stabilizer to hunt for the accurate transformer brush position, therefore the accuracy potentiometer would need re-adjustment. The phenomenon is dependent on control speed, i.e. the total gear ratio between motor and transformer drive spindle, thus a high control speed must be combined with a large voltage tolerance.

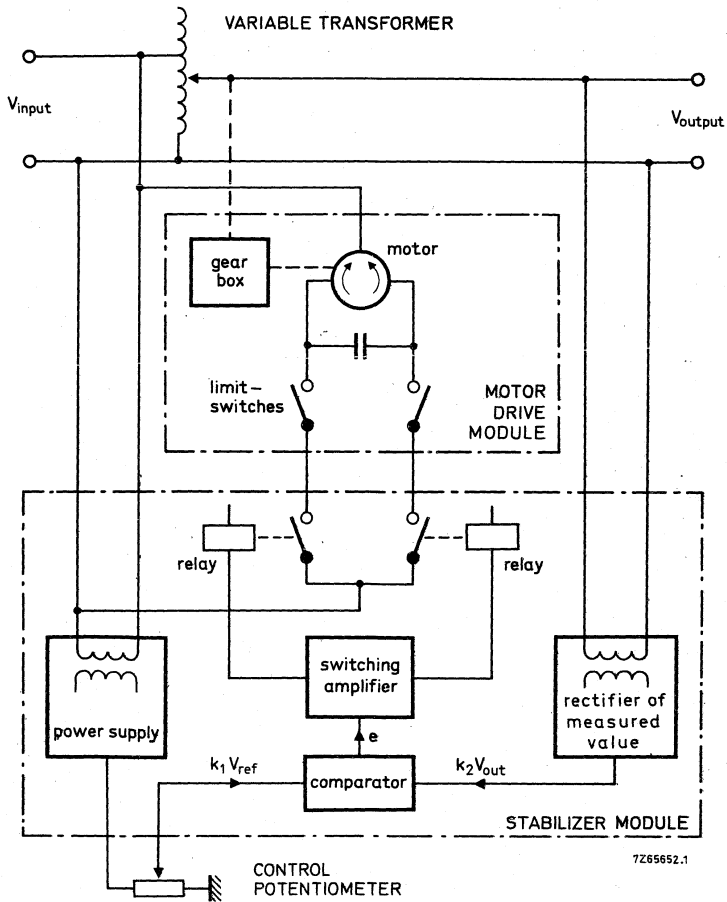


Fig. 1

MECHANICAL DATA

Dimensions in mm

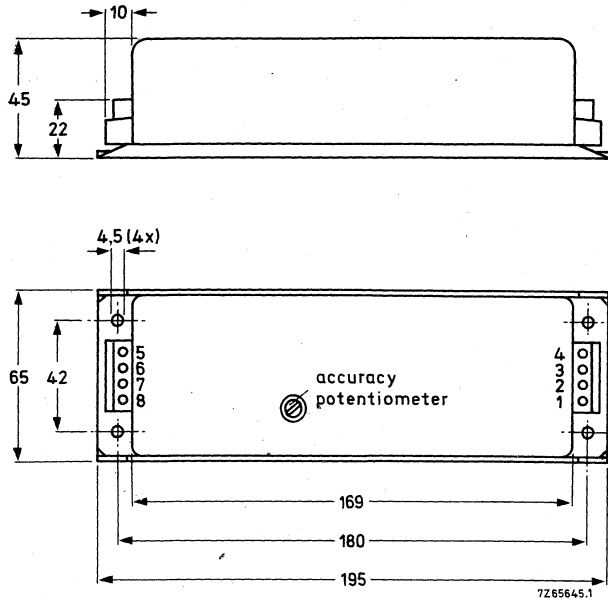


Fig. 2

Weight : approx. 700 g

Housing: lacquered metal

Connections are made via two screw-terminal blocks.

ELECTRICAL DATA

Terminals 1 and 2

Input voltage

220 V, +10%, -15%; 50 Hz

Power consumption, relays not operating

2,5 W

relays operating

3 W

Terminals 2 and 3

Voltage to be stabilized

0 to 260 V a.c.

Impedance

5 k Ω

Terminals 1 and 4

and 1 and 8

Maximum switching capability of relays

250 V a.c., 1 A, $\cos \varphi = 0,7$

Terminals 5(+) and 7(-)

Reference output voltage

+12 V d.c.

Maximum load

5 mA

Terminals 6(+) and 7(-)

Reference input voltage

0 to +12 V d.c.

Maximum current consumption

1 mA

Stabilized output voltage
transformers 220 V/0-220 V
transformers 220 V/0-260 V

adjustable between 5 and 100% of input voltage
adjustable between 5 and 115% of input voltage

Accuracy

adjustable with accuracy potentiometer
between $\pm 0,5$ V a.c. or voltage per turn
of winding, whichever is the higher, 1)
and $\pm 2,5$ V a.c.

Maximum control speed

23 A transformers
other transformers

6,5 V/s 2)
50 V/s 2)

Operating temperature range

-10 to +45 °C

Storage temperature range

-25 to +85 °C

Connections

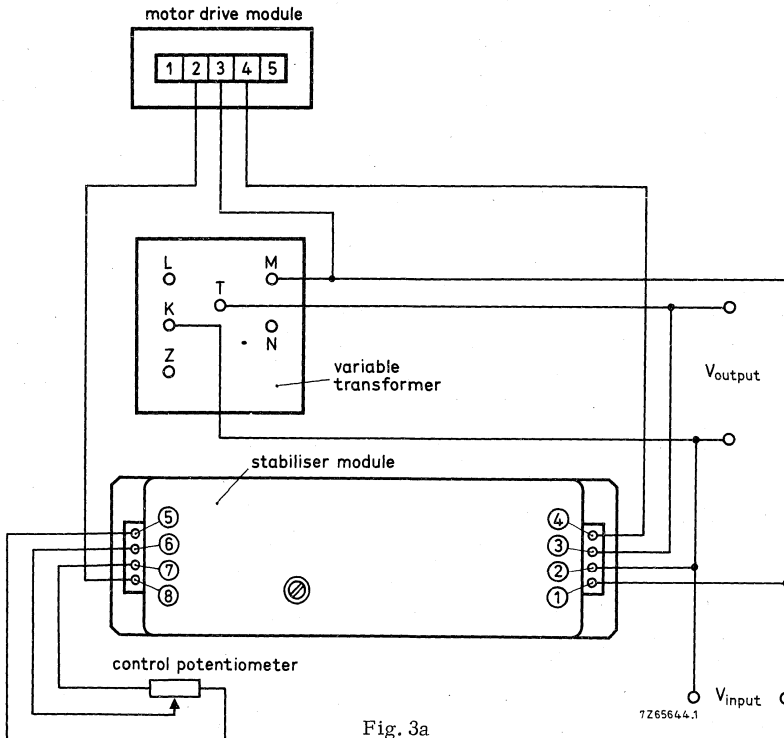
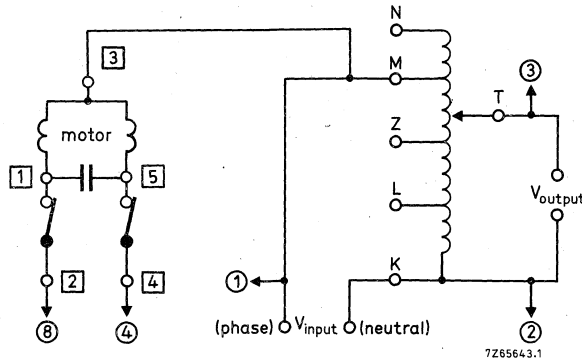


Fig. 3a

726564.1

- 1) Valid for gear ratios $> 10:1$, see Tables 2 and 3 of chapter "Motor drive modules".
- 2) Provided the motor and gearbox are selected from Tables 2 and 3 of chapter "Motor drive modules".



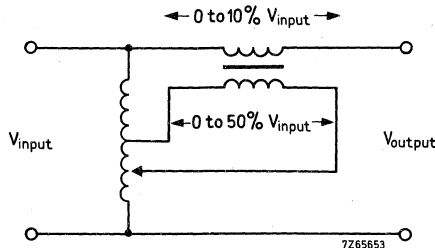
Notes - Connections to terminals 1 and 5 of the motor drive module may require interchanging to produce correct direction of rotation (depends on type of gear box used).

- The recommended value of the control potentiometer is $5\text{ k}\Omega$, $\pm 20\%$, $0,25\text{ W}$.
- If only stabilization or positioning at a lower voltage than the input voltage is required the phase can be connected to N in stead of M.
- For the value of the phasing capacitor, see chapter "Motor drive modules".

APPLICATION INFORMATION

Heavy load application

Stabilizing a heavy load so that it is independent of input or total load current variations can be achieved by a boost transformer connected in series with the variable transformer. The permissible load is thus increased by the boost ratio factor. For example, with an input voltage of 220 V, an 8,5 A variable transformer can supply 0 to 110 V to a 5:1 ratio boost transformer thus controlling 42,5 A over 22 V.



Programmed stabilization

An external programmed voltage source can be injected into the stabilizer module. This can be done by connecting a control voltage (V_{control}) of max. 12 V to terminals 6(+) and 7(-); terminal 5 is not used. Then the stabilized output voltage is:
 $V_{\text{output}} = k \cdot V_{\text{control}}$, in which $k = 23 \pm 7\%$.

Temperature and illumination level control

Instead of a control potentiometer a combination of fixed resistors and NTC thermistors or LDRs can be used to control a temperature or illumination level respectively.



CONTROL KNOBS

A selection of combined control knob and dial accessories is listed below. These items are intended for **panel model** transformers, to enable ease of adjustment and to provide a visual setting indication.

Choice of control knob is determined by the spindle diameter and output voltage range of the transformer. The selection includes large diameter dials which allows panel screws to be concealed.

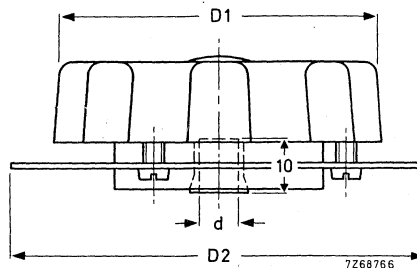
All control knobs have a clamping collet enabling them to be locked in any position on the spindle.

dial calibration	d (mm)	D1 (mm)	D2 (mm)	catalogue number	intended for transformer size code ...
0 - 260 V	6	60	78	2922 511 90043	E1, E2, E3, E4, E6
0 - 115 %	6	60	78	90044	
0 - 270 V	6	60	78	90045	
0 - 100 %	6	60	78	90046	
0 - 100 %	8	60	78	2922 511 90047	C1, C2
0 - 115 %	8	60	78	90048	
0 - 260 V	8	60	78	90049	
0 - 270 V	8	60	78	90051	
0 - 100 %	8	80	106	2922 511 90052	C3, C4, E8
0 - 115 %	8	80	106	90053	
0 - 260 V	8	80	106	90054	
0 - 270 V	8	80	106	90055	
0 - 100 %	8	80	125	2922 511 90056	
0 - 115 %	8	80	125	90057	
0 - 260 V	8	80	125	90058	
0 - 270 V	8	80	125	90059	

The control knob and dial for E10 size transformers are separate items (the dial must be fitted onto the panel):

- knob: D1 = 100 mm,
d = 10 mm, 19 mm deep cat. no. 2922 511 90028
- dial: calibration 0-260 V, D2 = 155 mm cat. no.
4322 026 18560

E10



CONTENTS

SURVEY VARIABLE MAINS TRANSFORMERS

Catalogue no.	See under size code	Catalogue no.	See under size code
2422 529 00005	C4 1)	2422 530 05405	C4
00006	C4 1)	05406	C4
2422 530 00007	E1	05501	C4
00107	E1	05506	C4
00407	E1	06407	E8
01407	E2	06507	E8
01607	E2	07407	E10
02306	C1	07411	E10
02401	C1	07507	E10
02406	C1	07511	E10
02501	C1	08407	E3
02506	C1	11407	E2
03306	C2	11607	E2
03401	C2	13407	E4
03405	C2 2)	15406	C4
03406	C2	16407	E8
03407	E4	18407	E3
03501	C2	90004	E1
03506	C2	90011	E1
03507	E4	90023	E5
04306	C3	90024	E5
04401	C3	90028	E6
04405	C3	90031	E2
04406	C3		
04501	C3		
04506	C3		
05401	C4		

ACCESSORIES

- Operational notes
- Mechanical ganging units
- Motor drive modules
- Electrical ganging (chokes)
- Control knobs
- A. C. stabilizer module

1) Section "Variable mains transformers with separate windings".

2) Section "Variable mains transformers auto-transformers".



Variable mains transformers (auto-transformers)

Variable mains transformers (separate windings)

Accessories

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Electronic components and materials for professional, industrial and consumer uses from the world-wide Philips Group of Companies

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