

Models M2, M5, M10, and M20

VARIAC® adjustable autotransformers

with DURATRAK® contact surface

GENERAL INSTRUCTIONS

1.1 LINE VOLTAGE AND FREQUENCY. The M series Variac® autotransformers are designed for use at frequencies between 350 and 1200 cycles per second (c/s) on 120-volt lines. Operation at frequencies below 350 c/s is permissible if the line input voltage does not exceed $120 \times \frac{f}{350}$, where f is the lower frequency. Under no circumstances should the input voltage exceed 125 volts for the overvoltage connection (147 volts across the complete winding), since, above this value, the voltage across the brush will be excessive.

Variac autotransformers cannot be operated on direct current. Any attempt to do so will result in a burned-out unit.

1.2 FUSES AND LINE CAPACITY. Protect your unit by placing a fusing device of proper rating between terminal 3 and the load. The input line capacity must be adequate for the Variac autotransformer, its load, additional loads that may be required, and a margin for slight overload. Because these transformers are iron-cored devices using high-performance core material, normal inrush surges up to 10 times the rated current of the unit may be encountered when the unit is first connected to the line. Fuses must be selected with this in mind.

Slow-blow (thermal delay) fuses or magnetic or thermal time-current integrating breakers are preferable to the quick-blow fuse, for the input line and the load circuits. Such devices as Klixon and Heinemann circuit breakers are particularly useful where the load is subject to high inrush.

The short-term overload curve, Figure 1, shows what your

autotransformer will stand under initial surge conditions, as in motor starting, incandescent lamp lighting, etc. At no time should the unit be called upon to furnish a current in excess of ten times its rated current.

1.3 LOADS. Variac autotransformers are adaptable to any load that is subject to control by voltage variation. As a rule, induction motors cannot thus be smoothly controlled. However, dc motors (with rectifiers), universal motors (with or without rectifiers), capacitor motors with fan loads, heaters, lights, and many other devices are suitable for such control.

The overvoltage connection should be avoided where the load may be damaged by the higher-than-line voltage available. When the overvoltage connection is omitted, with a fixed, known load, maximum current may be drawn at line voltage. Since losses (which vary with brush setting) are at a minimum near line and zero voltages, higher current can be drawn at these settings without exceeding normal temperature ratings. This higher (maximum) current is of such value that, as the brush setting is reduced below line voltage, with a constant-impedance load, the current fall-off with decreasing output voltage keeps the current within safe limits. To find the impedance in ohms of the minimum ohmic load, divide line volts by maximum amperes. The power rating of this load in watts is the product of line volts and maximum amperes.

For continuous operation, the rated current of the transformer should not be exceeded. Derate the unit in accordance with Figure 2 for ambient temperatures above 50 C.

Figure 1. Overload limits for line-voltage connection.

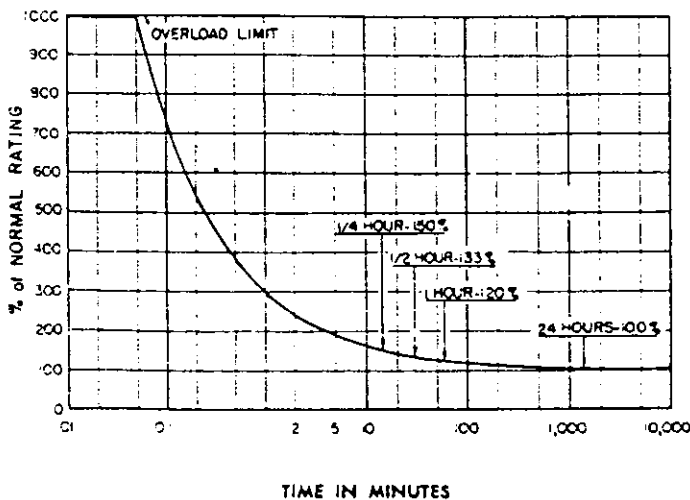
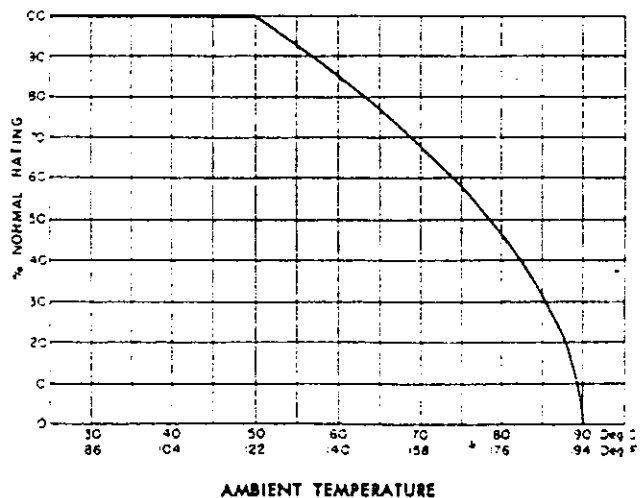


Figure 2. Temperature derating curve.



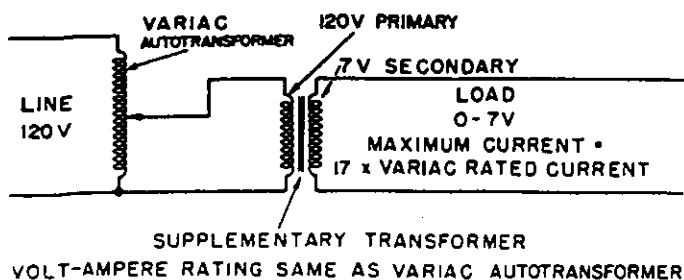


Figure 3. Supplementary low-voltage transformer useful for applications such as control of vacuum-tube heaters.

When a load requires regulation over a limited range only, a supplementary, fixed, step-down transformer gives more satisfactory and economical operation. This practice results in:

- an increase in current rating in the ratio of line voltage to operating range.
- finer adjustment, since the operating range is spread out over the entire winding.
- longer unit life, as the brush traverses the entire winding rather than a limited arc.

Typical examples are illustrated in Figures 3 and 4.

1.4 SWITCHING. To avoid dangerous surges, always set the pointer to zero before switching in the load circuit.

1.5 MAINTENANCE.

WARNING

Always disconnect the Variac autotransformer from both sides of the line before attempting any maintenance work.

1.5.1 Brush Track. The brush track is stabilized by the Duratrak® contact surface. If cleaning becomes necessary use only a soft cloth and a safe solvent such as alcohol or "white" (non-leaded) gasoline. Do not use abrasives; their action may destroy the stabilized surface.

1.5.2 Brushes. Normally, brushes will last indefinitely. Rapid brush wear is an almost certain sign of overload, although the presence of an abrasive dust can accelerate wear of both brush and brush track. Brush extension is limited to prevent contact between the metal brush shell and the winding.

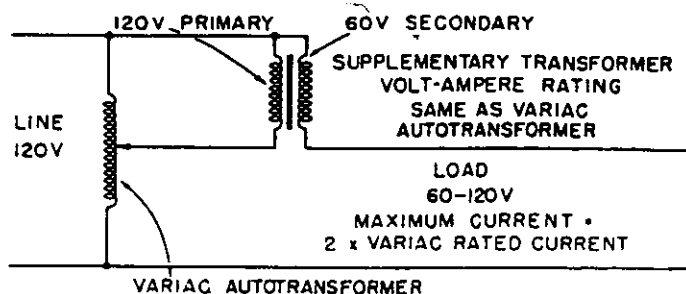


Figure 4. Supplementary 2:1 transformer useful for applications such as control of resistance furnaces.

Operation of the brush beyond its extension limit results in arcing, indicated by a voltage drop under load. Replace brushes before this limit is reached.

The Type M2 uses the Technipower Variac® Type VB1 brush assembly; the Type M5, the Type VB2 assembly. To replace either assembly, rotate the top plate to clear the retaining pins. Proper brush insertion is indicated by a click, or detent action, as the long axis of the top plate is aligned with the retaining pins.

The Type M10 uses the Technipower Variac® Type VBT10 brush assembly; the Type M20, the Type VBT8 assembly. To replace either assembly, remove the two screws that secure the assembly to the radiator.

The "pigtail(s)" on the new assembly must be securely fastened under the mounting screws.

Newly installed or reinstalled brushes must be correctly seated for proper operation. With power off, a few swings of the brush over the abrasive side of a piece of crocus cloth resting on the brush track will effectively mate brush and track. Remove the crocus cloth and blow or brush loose carbon from the brush track before applying power.

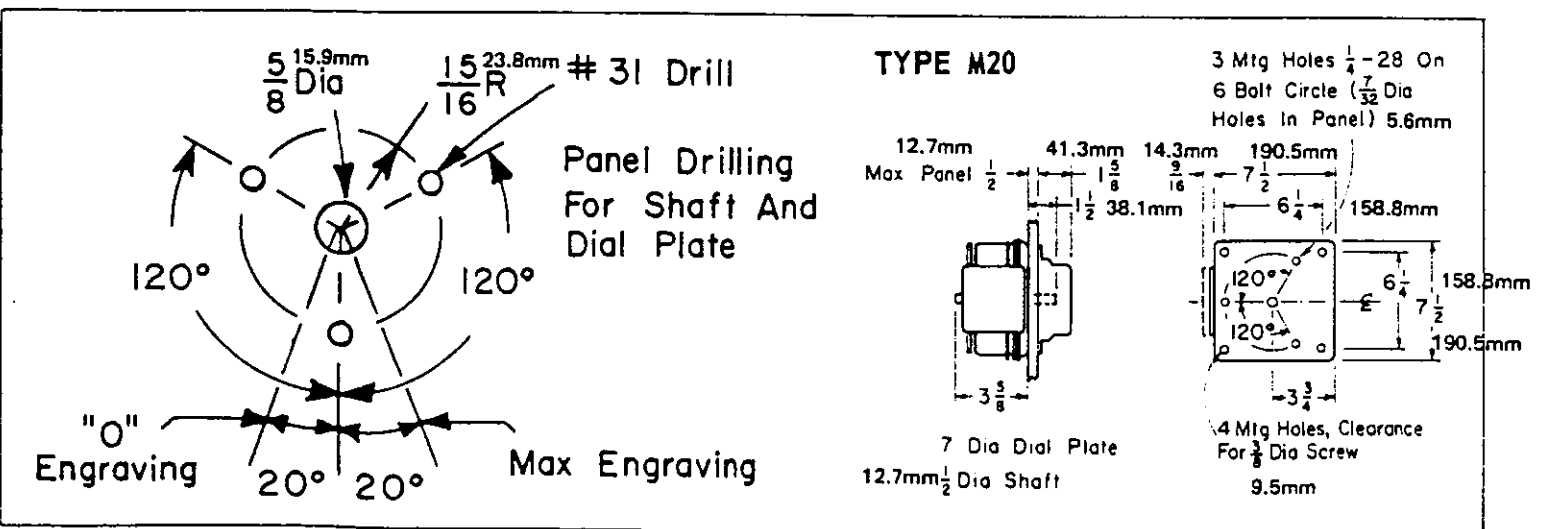
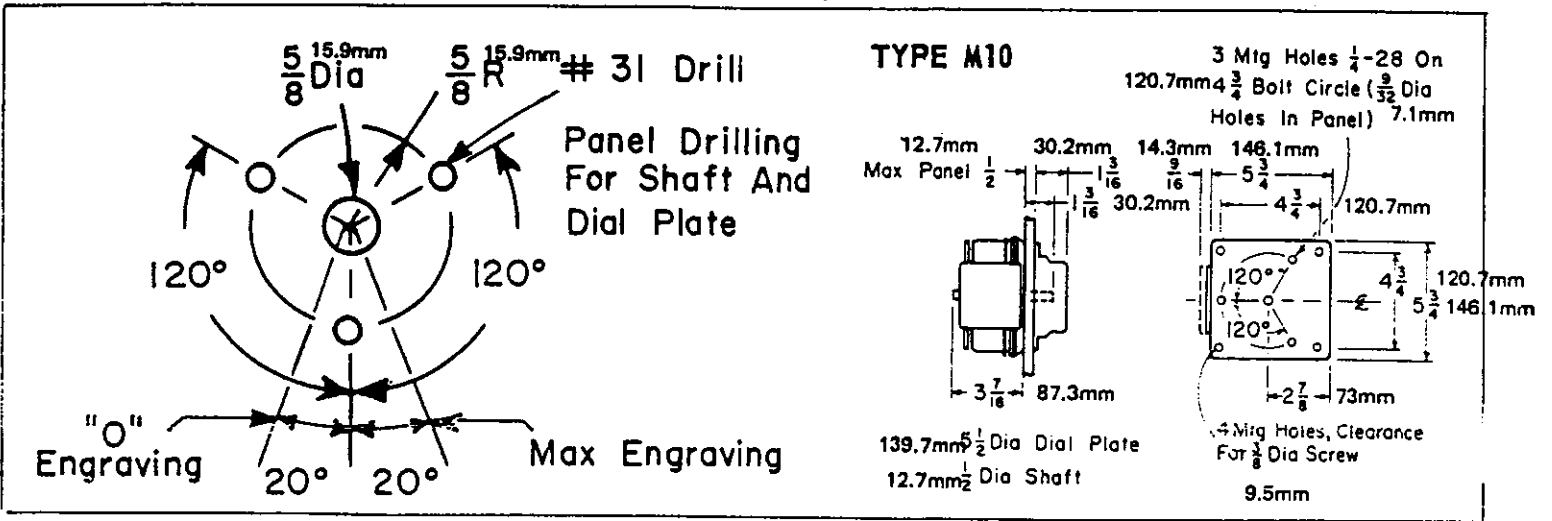
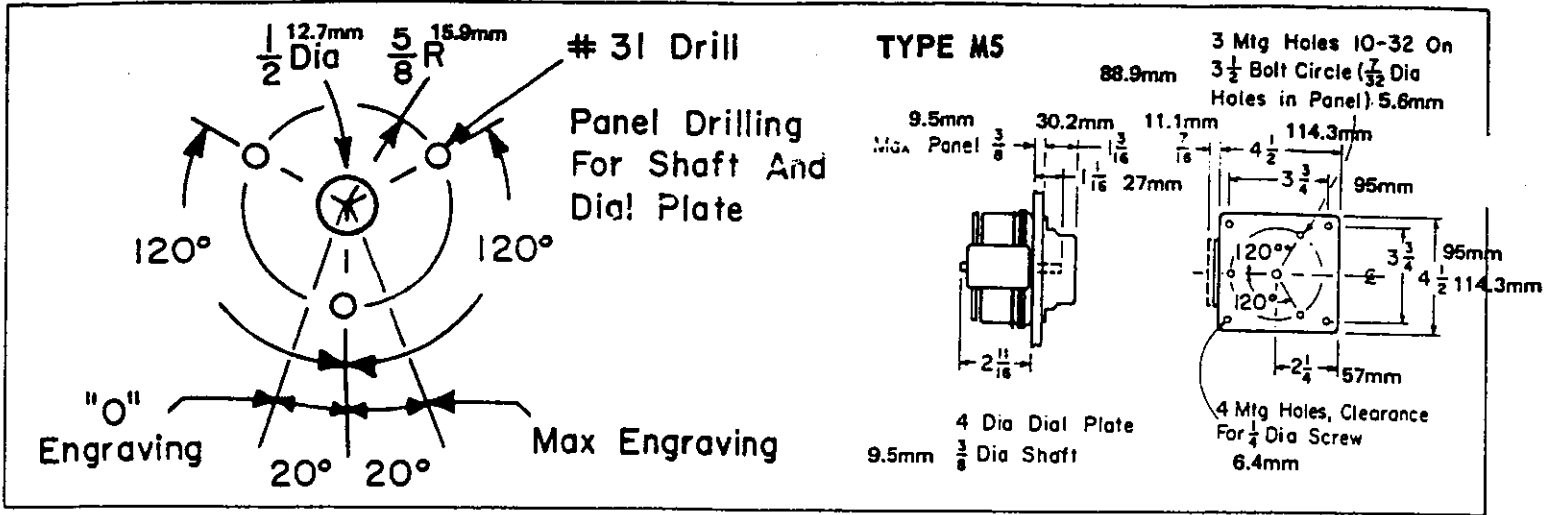
1.6 SERVICE. If, for any reason, you feel that your unit does not operate properly, write to our Service Department, giving operating details, circuit diagram, input and output voltages and current, and load type and rating.

When returning a unit for repair, or for any other reason, please write to our Service Department first, requesting shipping instructions. State the type number and the date of purchase. Pack the unit carefully. Returned units often suffer more damage in shipment than in service.

SPECIFICATIONS

Type	Input Volts	Output Volts	Rated Output Amperes	Max Output Amperes	Max KVA	400-c/s No-load Watts	Ounce-Inch Driving Torque	Net Weight Pounds	
M2	120	{ 0-120 0-140	2.4 2.4	3.1 2.4	0.37 —	3.5	5-10	2	0.9 kg
M5	120	{ 0-120 0-140	6.0 6.0	7.8 6.0	0.94 —	9	10-20	3 1/2	1.6 kg
M10	120	{ 0-120 0-140	10.0 10.0	13.0 10.0	1.56 —	17	15-30	6 1/2	2.9 kg
M20	120	{ 0-120 0-140	20.0 20.0	26.0 20.0	3.12 —	27	45-90	13	5.9 kg

Figure 7. Mounting Dimensions (Cont.)



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