

MOTOR and WIRE RATING DATA

Control Circuit Transformer Selection



A control circuit transformer will not overheat when operated at its maximum continuous volt-ampere (VA) rating, nor will its secondary output voltage fall below 95% of rated output voltage when selected according to the following recommendations:

- (A) The continuous VA capacity of the transformer should be equal to or greater than any continuous maximum VA requirement of the controller.
- (B) The inrush VA capacity of the transformer should be equal to or greater than maximum VA inrush which can occur for any combination of sealed and inrush VA requirements of the controller.

The VA values which fulfill these requirements may be readily calculated:

- (A) The continuous sealed VA requirement is found by combining with the aid of the chart on page 275 the total sealed WATTS with the total sealed VAR. These two totals may be obtained from the Component VA Table. Tentatively choose a transformer with a VA or (KVA) rating equal to or greater than this value.
- (B) The maximum VA inrush is similarly found by combining the maximum inrush WATTS which can occur with the corresponding maximum inrush VAR again with the aid of the chart on Page 275 and the Table. It may be necessary to use inrush values for all devices or a combination of inrush and sealed values depending upon what condition produces the maximum VA inrush for the specific controller.

The Percent Load Power Factor is found as follows:

$$\%PF = \frac{\text{Maximum Inrush WATTS}}{\text{Maximum Inrush VA}} \times 100$$

This maximum VA inrush at the calculated PF must be less than the value allowable on the inrush curve for the transformer selected according to (A).

Example: Assume that in a given circuit one size 1 starter, one type BG relay, and one type PT timer are energized. After an interval of time, one type DM, 2 N.O. relay and one size 5 starter are energized.

Select the transformer as follows:

(A) Continuous VA requirement:

Device	VAR	Watts
1 Size 1 starter sealed	43	16
1 Type BG relay sealed	40	14
1 Type PT—on delay timer sealed	25	8
1 Type DM relay sealed	---	(Latched)
1 Size 5 starter sealed	120	50
TOTAL SEALED	228	88
	(VAR)	(Watts)

From Chart (Nomograph) Total Sealed
VA = 243.

Tentatively select a .25KVA transformer.

Percent Load Power Factor:

$$\text{PF in \%} = \frac{\text{Max. Inrush Watts} \times 100}{\text{Max. Inrush VA}} = \frac{88 \times 100}{2300} = 28.4\%$$

The inrush (selection) curve for the .25 KVA transformer shows that 2300 VA at 28% power factor is higher than the inrush availability.

Therefore, the secondary voltage would drop below 95% (NEMA STD.) with this inrush, and the next larger, or .35 KVA transformer must be selected.

(B) Maximum VA inrush requirements:

Device	VAR	Watts
1 Size 1 starter sealed	43	16
1 Type BG relay sealed	40	14
1 Type PT—on delay timer sealed	25	8
1 Type DM relay inrush	210	255
1 Size 5 starter inrush	1894	360
TOTAL MAXIMUM INRUSH	2212	653
	(VAR)	(Watts)

From Chart (Nomograph) Total Max. Inrush
VA = 2300.

COMPONENT VA TABLE

Component	Inrush			Sealed		
	VAR	Watts	VA	VAR	Watts	VA
Relays						
Type AA	18	8	20	8	7	10
Type BG and BC	102	21	105	40	14	42
Type CF	42	15	45	14	3	14
Type CF with latch	10	9	15	4	4	6
Type BJ	8	6	10	5	6	8
Type AF	8	6	10	5	6	8
Type DM — 1 N.O. or 1 N.O. and 1 N.C.	73	98	122	---	---	---
— All others	210	255	330	---	---	---
Type ET	---	4	---	---	4	---
Type MX	18	8	20	8	7	10
Type RS	---	4	---	---	4	---
Type TF	3	3	4	3	3	4
Type TH	4	4	5	4	4	5

Component	Inrush			Sealed		
	VAR	Watts	VA	VAR	Watts	VA
Timers						
Type SP — Motor	3	3	4	3	3	4
— Solenoid	57	50	76	13	2	13
Type PT — AD and AE	97	94	135	19	7	20
— BD off Delay	74	64	98	24	8	25
— BE on Delay	87	88	124	25	8	26
Contactors and Starters						
Size 0	102	24	105	40	14	42
Size 1	151	33	154	43	16	46
Size 2	532	136	550	83	21	86
Size 3	844	150	900	86	24	110
Size 4	946	164	960	83	26	87
Size 5	1894	360	1925	120	50	132