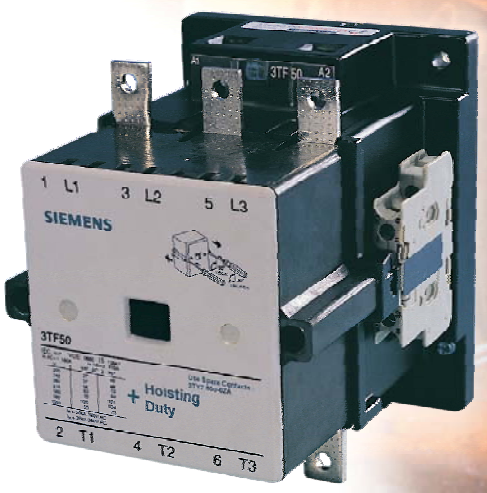
SIEMENS

SICOP Contactors for Hoisting Duty

- Best suited for tough application
- High on performance & reliability
- High Electrical & Mechanical life



Introduction

Siemens contactors have been performing successfully over the last 50 years in the most critical applications and in rough conditions. Siemens now introduces for the Indian industry special "Hoisting Duty" Contactors for crane duty and hoisting applications. These contactors incorporate special features, which make them ideal for the most demanding switching application.

For cranes and similar hoisting equipment, the common practice is to use AC slipring motors. Hence the contactor used to switch these motors perform AC-2 duty. [AC-2 operation is the typical duty for starting and switching off fully loaded slipring motors in starting phase.]

The rating of contactor, to switch these motors, is selected primarily on the basis of rated make & break capacity and the desired electrical endurance. In case of hoisting duty, braking current is the starting current and frequency of switching is high.

"SICOP" Range of Power contactors are extensively used for hoisting and other critical applications. In this series we have now introduced **new 3TF50/52/54/56 "Hoisting Duty Contactors"** which have high electrical and mechanical endurance. The electrical endurance depends on the type of operation, the amount of inching involved and the current interruption by contacts. The contacts close bounce free and hence the making current has no effect on the electrical endurance.

Application

The use of AC contactors is classified in different utilization categories according to DIN VDE 0660, Part 102. Three-phase motors with slipring rotors are often used in hoisting gear operation. Utilization category AC-2 applies to this application.

Utilization categories AC-3 and AC-4 apply to the switching of three-phase squirrel cage motors.

AC-2 Hoisting operation is the typical duty for starting and switching off fully-loaded slipring motors in the starting phase, during braking by reversal as well as during reversing and jogging mode. However, the typical hoisting gear mixed operation represents lower stress because switching-off operations in stationary duty and partial loads occur.

Degree of Protection

The contactors comply with degree of protection IP 00 to IEC 947-1 and DIN 40 050.

Standard Specification

The contactors comply with the "Regulations to low voltage switchgear" of DIN VDE 0660 and IEC-947-4-1.

Service Temperature : -25°C to 55°C

Features

These new "Hoisting Duty" Contactors are mechanically similar to our existing 3TF contactors.

In addition to this, they are electrically superior in taking care of excessive stresses coming on contactors during their operations in crane applications.

"Hoisting Duty " Contactors are provided with new design of contacts resulting in high electrical and mechanical life.

Reliability

The "Hoisting Duty" Contactors have specially treated coils which are suitable for high frequency switching and high vibrations. This helps in reducing coil failures.

Benefits

"Hoisting Duty" Contactors offer cost savings by reducing down time, less inventory. This offers value for money.

Recommended selection of contactors for hoisting duty

In hoisting operation, slipring motors are generally used. For this typical hoisting duty, we recommend the contactors listed in the following table.

Contactor Type	**Stator Protection** Maximum load current with hoisting motor. For intermittent duty S3				**Rotor Protection** Maximum load current with hoisting motor(Delta circuit). For intermittent duty S3				Max rotor standstill voltage
	25%	40%	60%	100%	25%	40%	60%	100%	
	A	A	A	A	A	A	A	A	V
3TF31	10	10	9	8	15	14	13	12	660
3TF33	17	16	15	13	25	24	22	20	660
3TF45	28	25	23	20	42	38	35	30	660
3TF47	49	45	40	30	73	68	60	45	750
3TF49	68	62	54	45	100	95	80	68	1000
3TF50 00 0A	100	88	78	65	150	130	115	95	1000
3TF52 00 0A	145	130	115	95	220	195	170	150	1000
3TF54 00 0A	225	200	180	160	340	300	270	240	1000
3TF56 00 0A	355	325	290	250	530	490	435	375	1000
3TF68/69	570	520	465	400	850	780	695	600	1000

When 3 conducting paths are connected in parallel, the maximum load current rises to 2.5 times the value given in this table. When 2 conducting paths are connected in parallel, it rises to 1.8 times the value given in this table.

Contact Life Curve

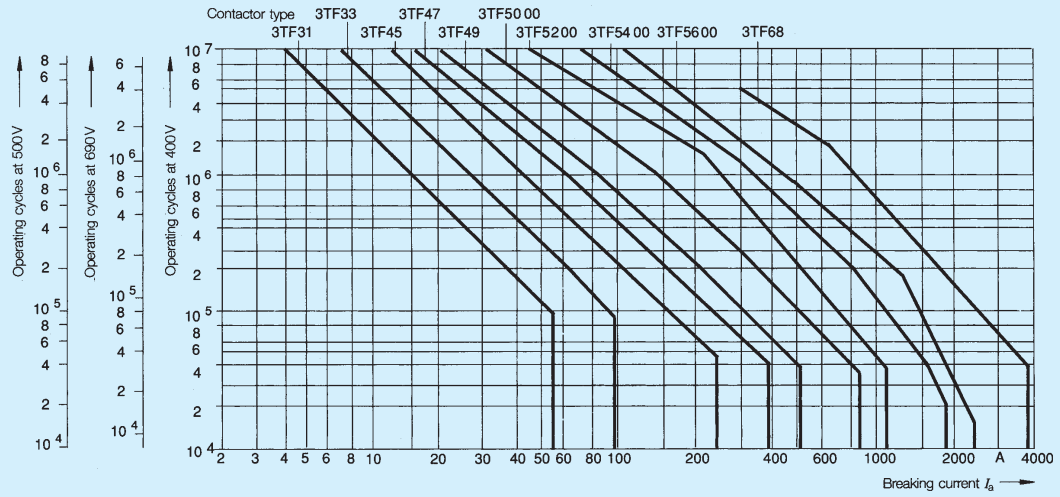


Fig. 1 Contact endurance of 3TF contactors as a function of breaking current when switching resistive and inductive AC loads.

Selection of contactors for contact endurance with normal and inching operation

Contactors suffer more erosion during inching operation than when stopping motors from a steady speed, i.e. normal operation. With slipring motors the starting current can be up to 2.5 times the rated current of the motor which means that this current has to be broken when inching is taking place. During normal operation, on the other hand, only the rated current has to be broken under full-load; under part-load it is even less. Determining contact endurance from AC-2 duty (I_c = 2.5 x I_e) will only give correct results when 100% inching operation is involved.

Max. permissible current and attainable contact endurance when braking starting current given below PF ≥ 0.4 (2.5 x Ie)		**Contact life when breaking the stator contactor load currents for S3-100% duty, Ic = Ie, no inching**		**Contactor Type**
A	Opearting cycles Approx.	A	Approx. Operating cycles	
30	280,000	8	2,000,000	3TF31
55	280,000	13	3,500,000	3TF33
80	230,000	20	2,800,000	3TF45
112	250,000	30	2,700,000	3TF47
187	250,000	45	2,800,000	3TF49
275	280,000	65	3,500,000	**3TF5000**
425	250,000	95	3,100,000	**3TF5200**
625	250,000	160	2,700,000	**3TF5400**
1000	150,000	250	2,500,000	**3TF5600**
1575	250,000	400	2,500,000	3TF68

The maximum permitted current (e.g. locked-rotor current of motor) must not exceed the values given in the "Max. starting current and attainable contact endurance" column. The values cannot be increased by paralleling pole assemblies.

Recommended selection for special operating conditions

Selection of contactors for contact endurance with mixed operation

When mixed operation is involved, i.e. primarily breaking of the motor rated current but with some breaking of higher currents due to inching, the endurance of the contacts can be calculated approximately from the following equation:

$$X = \frac{A}{1 + \frac{C}{100}\left(\frac{A}{B} - 1\right)}$$

X Contact endurance with mixed operation cycles.

A Contact endurance with normal operation (Ia = Ie) in operating cycles, from Fig. 1.

B Contact endurance with inching operation (Ia = Multiple of Ie) in operating cycles, from Fig. 2, Breaking current Ia/AC-2=2.5xIe.

C Proportion of inching in total operating Cycles in %.

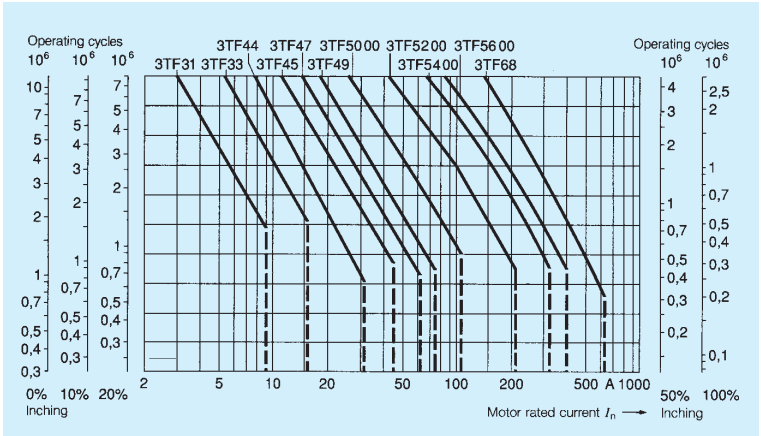


Fig. 2 Contact endurance for mixed operation as a function of motor rated current. Motor on rated load, inching at 2.5 times motor rated current (slipring motor).

The contact endurance as a function of the motor rated current with mixed operation can be determined from Fig. 2 for proportions of inching of 0, 10, 20, 50 and 100%. The values obtained are only applicable if rated motor load is used continuously. In practice therefore, the contact endurance should be greater.

Example 1

Motor rated current 150A. Selected contactor : **3TF5600**

Contact endurance in operating cycles at 400V With inching of				
0%	10%	20%	50%	100%
5.4×10^6	4.6×10^6	3.9×10^6	2.3×10^6	1.4×10^6

Example 2

Maximum permitted motor rated current for a contact endurance of 2,000,000 operating cycles at 400V.

Stator contactor	Permitted rated current of slipring motor with inching			
Type	10% approx. A	20% approx. A	50% approx. A	100% approx. A
3TF31 3TF33	7.5 14.5	6.8 13	4.8 8.8	3.8 6.8
3TF45 3TF47	25 38	20 34	16 23	14 18
3TF49 3TF50 00	48 75	42 68	29 48	23 33
3TF52 00 3TF54 00	110 175	95 160	66 125	48 80
3TF56 00 3TF68	240 340	230 330	160 240	120 180

Recommended selection for special operating conditions

Apart from knowing the figure for contact endurance in operating cycles, users are also interested to know what period of time this amounts to before the contacts have to be changed. The value can be ascertained from the nomogram in Fig. 3.

Using the Nomogram

Draw a line from the point on the left-hand scale indicating the required number of operating cycles to the point on the right hand scale indicating the required number of operating cycles per hour. Then, from the point where this line intersects with the centre axis, draw a horizontal line to the left or right scale for the actual number of daily operating hours.

Note :

If a figure of 365 days per annum is being employed instead of 250, the total operating time obtained from the nomogram must be multiplied by 0.68.

Example :

Service requirements: 1.4 million operating cycles endurance, 200 operating cycles per hour, 16 hours service per day.

Result :

Total operating time approx. 18 months.

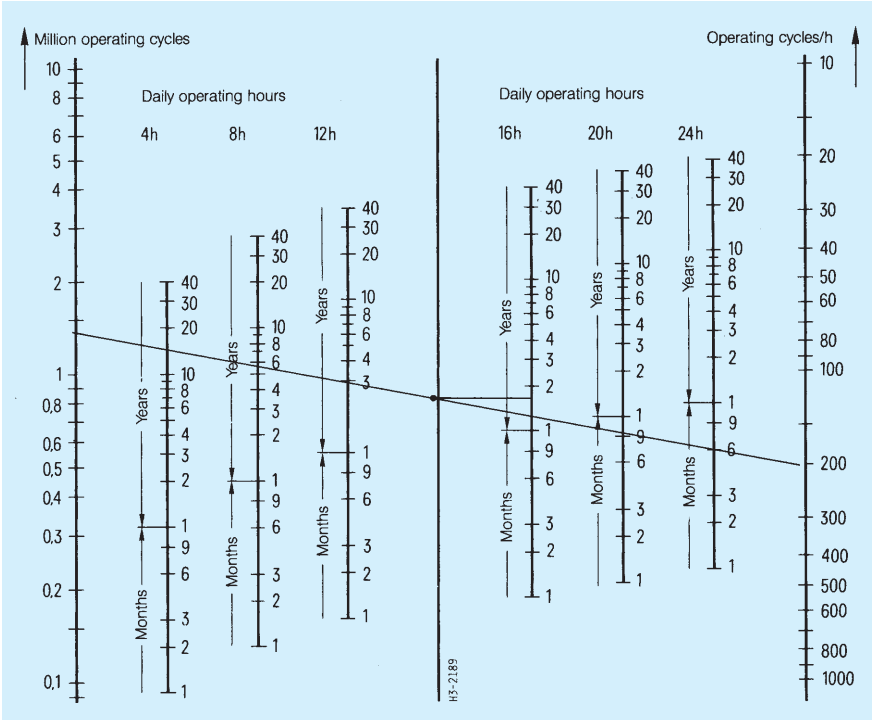


Fig. 3 Nomogram for determining contact endurance in year (250 working days) and months with daily operating hours of 4, 8, 12, 16, 20 and 24 h.

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