

# 3RT, 3TB, 3TF Contactors for Switching Motors

3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

## Technical specifications

Contactors	Type	3TF68 and 3TF69
Rated data of the auxiliary contacts		According to IEC 60947-5-1/DIN VDE 0660 Part 200
Rated insulation voltage $U_i$ (degree of pollution 3)	V	690
Continuous thermal current $I_{th}$ = Rated operational current $I_e$ /AC-12	A	10
AC load		
Rated operational current $I_e$ /AC-15/AC-14 for rated operational voltage $U_e$		
	24 V A	10
	110 V A	10
	125 V A	10
	220 V A	6
	230 V A	5.6
	380 V A	4
	400 V A	3.6
	500 V A	2.5
	660 V A	2.5
	690 V A	2.3
DC load		
Rated operational current $I_e$ /DC-12 for rated operational voltage $U_e$		
	24 V A	10
	60 V A	10
	110 V A	3.2
	125 V A	2.5
	220 V A	0.9
	440 V A	0.33
	600 V A	0.22
Rated operational current $I_e$ /DC-13 for rated operational voltage $U_e$		
	24 V A	10
	60 V A	5
	110 V A	1.14
	125 V A	0.98
	220 V A	0.48
	440 V A	0.13
	600 V A	0.07
CSA and UL rated data for the auxiliary contacts		
Rated voltage	V AC, max.	600
Switching capacity		A 600, P 600

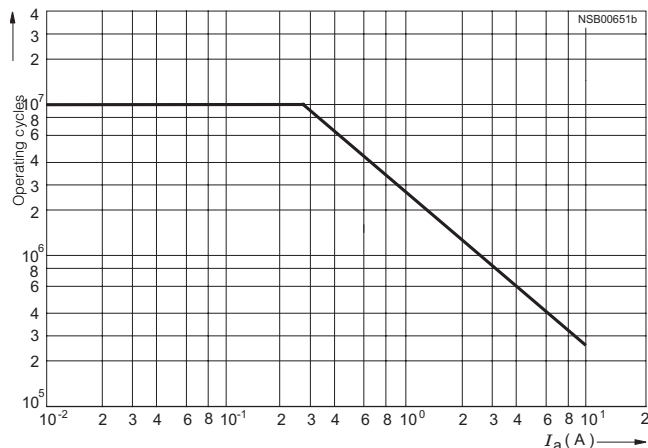
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### Endurance of the auxiliary contacts

The contact endurance for utilization category AC-12 or AC-15/AC-14 depends mainly on the breaking current. It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system.

3TF68 and 3TF69 contactors at 230 V AC



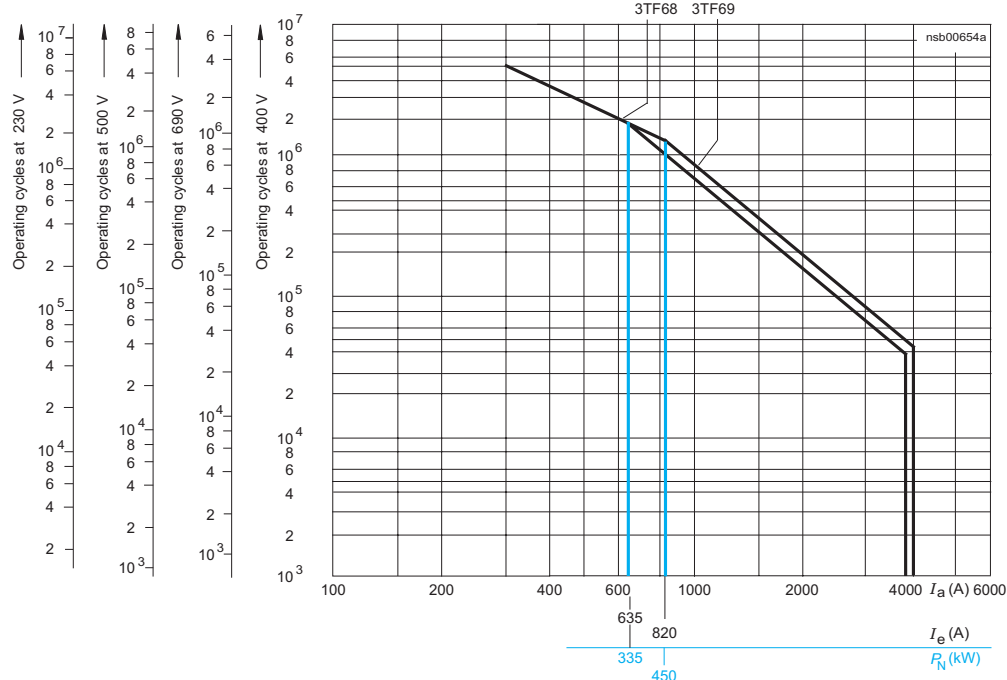
### Contact erosion indication with 3TF68 and 3TF69 vacuum contactors

The contact erosion of the vacuum interrupters can be checked during operation with the help of 3 white double slides on the contactor base.

If the distance indicated by one of the double slides is < 0.5 mm while the contactor is in the closed position, the vacuum interrupter must be replaced. To ensure maximum reliability, it is recommended to replace all 3 vacuum interrupters.

### Endurance of the main contacts

Contactor Type



3TF68 and 3TF69 contactors

Legend for the diagrams:

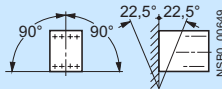
$P_N$  = Rated power for squirrel-cage motors at 400 V

$I_a$  = Breaking current

$I_e$  = Rated operational current

# 3RT, 3TB, 3TF Contactors for Switching Motors

## 3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Contactor		Type Size	3TF68 14	3TF69 14	
General data					
<b>Permissible mounting position</b> <sup>1) 2)</sup> The contactors are designed for operation on a vertical mounting surface.					
<b>Mechanical endurance</b>		Operating cycles	5 million		
<b>Electrical endurance</b>		Operating cycles	<sup>3)</sup>		
<b>Rated insulation voltage</b> $U_i$ (degree of pollution 3)		kV	1		
<b>Rated impulse withstand voltage</b> $U_{imp}$		kV	8		
<b>Safe isolation</b> between the coil and the main contacts according to EN 60947-1, Appendix N		kV	1		
<b>Mirror contacts</b> A mirror contact is an auxiliary NC contact that cannot be closed simultaneously with a NO main contact. One NC contact each must be connected in series for the right and left auxiliary switch block respectively.			Yes, according to EN 60947-4-1, Appendix F		
<b>Permissible ambient temperature</b>		During operation During storage	°C -25 ... +55 °C -55 ... +80		
<b>Degree of protection</b> according to EN 60947-1, Appendix C			IP00/open, coil assembly IP40		
<b>Touch protection</b> according to EN 50274			Finger-safe with cover		
<b>Shock resistance</b>					
• Rectangular pulse	AC operation	g/ms	8.1/5 and 4.7/10	9.5/5 and 5.7/10	
	DC operation	g/ms	9/5 and 5.7/10	8.6/5 and 5.1/10	
• Sine pulse	AC operation	g/ms	12.8/5 and 7.4/10	13.5/5 and 7.8/10	
	DC operation	g/ms	14.4/5 and 9.1/10	13.5/5 and 7.8/10	
<b>Conductor cross-sections</b>			See Conductor Cross-Sections		
<b>Electromagnetic compatibility (EMC)</b>			See Electromagnetic compatibility (EMC)		
Short-circuit protection					
<b>Main circuit</b> Fuse links, gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE					
- According to IEC 60947-4-1/ EN 60947-4-1	• Type of coordination "1" • Type of coordination "2" • Weld-free <sup>4)</sup>	A	1000	1250	
		A	500	630	
		A	400	500	
<b>Auxiliary circuit</b>					
• Fuse links gL/gG LV HRC 3NA, DIAZED 5SB, NEOZED 5SE (weld-free protection at $I_k \geq 1\text{ kA}$ )		A	10		
• Or miniature circuit breakers with C characteristic ( $I_k < 400\text{ A}$ )		A	10		

<sup>1)</sup> To easily replace the laterally mounted auxiliary switches it is recommended to maintain a minimum distance of 30 mm between the contactors.

<sup>2)</sup> If mounted at a 90° angle (conducting paths are horizontally above each other), the switching frequency is reduced by 80 % compared with the normal values.

<sup>3)</sup> See endurance of the auxiliary contacts.

<sup>4)</sup> Test conditions according to IEC 60947-4-1.

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Contactor	Type Size		3TF68 14	3TF69 14
Control				
Magnetic coil operating range			$0.8 \times U_{s \text{ min}} \dots 1.1 \times U_{s \text{ max}}$	
Power consumption of the magnetic coils (when coil is cold and $1.0 \times U_s$ )				
• AC operation, $U_{s \text{ max}}$	- Closing	VA/p.f.	1850/1	950/0.98
	- Closed	VA/p.f.	49/0.15	30.6/0.31
• AC operation, $U_{s \text{ min}}$	- Closing	VA/p.f.	1200/1	600/0.98
	- Closed	VA/p.f.	13.5/0.47	12.9/0.43
• DC economy circuit <sup>1)</sup>	- Closing at 24 V	W	1010	960
	- Closed	W	28	20.6
For contactors of type 3TF68/69, - Q:				
• AC operation, $U_{s \text{ min}}$ <sup>2)</sup>	- Closing	VA/p.f.	1000/0.99	1150/0.99
	- Closed	VA/p.f.	11/1	11/1
Operating times at $0.8 \dots 1.1 \times U_s$ (Total break time = Opening delay + Arcing time)			(Values apply to cold and warm coil)	
• AC operation	- Closing delay	ms	70 ... 120 (22 ... 65) <sup>3)</sup>	80 ... 120
	- Opening delay	ms	70 ... 100	70 ... 80
• DC economy circuit	- Closing delay	ms	76 ... 110	86 ... 280
	- Opening delay	ms	50	19 ... 25
• Arcing time		ms	10 ... 15	10
For contactors of type 3TF68/69, - Q:				
• AC operation	- Closing delay	ms	35 ... 90	45 ... 160
	- Opening delay	ms	65 ... 90	30 ... 80
Operating times at $1.0 \times U_s$ (Total break time = Opening delay + Arcing time)				
• AC operation	- Closing delay	ms	80 ... 100 (30 ... 45) <sup>3)</sup>	85 ... 100
	- Opening delay	ms	70 ... 100	70
• DC economy circuit	- Closing delay	ms	80 ... 90	90 ... 125
	- Opening delay	ms	50	19 ... 25
Minimum command duration for closing	Standard	ms	120	120
	Reduced make-time	ms	90	--
Minimum interval time between two ON commands		ms	100	300

1) At 24 V DC; for further voltages, deviations of up to  $\pm 10 \%$  are possible.

2) Including reversing contactor.

3) Values in brackets apply to contactors with reduced operating times.

# 3RT, 3TB, 3TF Contactors for Switching Motors

## 3TF6 vacuum contactors, 3-pole, 335 ... 450 kW

Contactor	Type Size		3TF68 14	3TF69 14
<b>Main circuit</b>				
<b>AC capacity</b>				
<b>Utilization category AC-1</b>				
<b>Switching resistive loads</b>				
Rated operational currents $I_e$	at 40 °C up to 690 V	A	700	910
	at 55 °C up to 690 V	A	630	850
	at 55 °C up to 1000 V	A	450	800
Rated power for AC loads with p.f = 0.95 at 55°C	230 V	kW	240	323
	400 V	kW	415	558
	500 V	kW	545	735
	690 V	kW	720	970
	1000 V	kW	780	1385
Minimum conductor cross-sections for loads with $I_e$	at 40°C	mm <sup>2</sup>	2 x 240	$I_e \geq 800$ A: 2 x 260 x 5
	for 55°C	mm <sup>2</sup>	2 x 185	$I_e < 800$ A: 2 x 240
<b>Utilization category AC-2 and AC-3</b>				
Rated operational currents $I_e$	up to 690 V	A	630	820
	1000 V	A	435	580
Rated power for slipping or squirrel-cage motors at 50 Hz and 60 Hz	at 230 V	kW	200	260
	400 V	kW	347	450
	500 V	kW	434	600
	690 V	kW	600	800
	1000 V	kW	600	800
<b>Utilization category AC-4 (for <math>I_a = 6 \times I_e</math>)</b>				
Rated operational current $I_e$	up to 690 V	A	610	690
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 400 V	kW	355	400
• The following applies to a contact endurance of about 200000 operating cycles:				
Rated operational currents $I_e$	up to 690 V	A	300	360
	1000 V	A	210	250
Rated power for squirrel-cage motors with 50 Hz and 60 Hz	at 230 V	kW	97	110
	400 V	kW	168	191
	500 V <sup>1)</sup>	kW	210	250
	690 V <sup>1)</sup>	kW	278	335
	1000 V <sup>1)</sup>	A	290	350
<b>Utilization category AC-6a</b>				
<b>Switching AC transformers</b>				
Rated operational currents $I_e$	up to 400 V			
		A	513	675
• For inrush current n = 20		A	342	450
Rated power $P$ For inrush current n = 20	230 V	kVA	195	256
	400 V	kVA	338	445
	500 V	kVA	444	584
	690 V	kVA	586	771
	1000 V	kVA	752	1003
For inrush current n = 30 <sup>2)</sup>	230 V	kVA	130	171
	400 V	kVA	226	297
	500 V	kVA	296	389
	690 V	kVA	390	514
	1000 V	kVA	592	778
<b>Utilization category AC-6b</b>				
<b>Switching low-inductance (low-loss, metallized dielectric) AC capacitors</b>				
Rated operational currents $I_e$	up to 400 V	A	433	
Rated power for single capacitors at 50 and 60 Hz	at 230 V	kvar	175	
	400 V	kvar	300	
	500 V	kvar	400	
	690 V	kvar	300	
Rated power for banks of capacitors (minimum inductance is 6 µH between capacitors connected in parallel) at 50 and 60 Hz	at 230 V	kvar	145	
	400 V	kvar	250	
	500 V	kvar	333	
	690 V	kvar	250	

1) Max. permissible rated operational current  $I_e$ /AC-4 =  $I_e$ /AC-3 up to 500 V, for reduced contact endurance and reduced switching frequency.

2) For deviating inrush current factors x, the power must be recalculated as follows:  
 $P_x = P_{n30} \cdot 30/x$ .

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Contactors	Type Size		3TF68 14	3TF69 14
<b>Main circuit</b>				
<b>AC capacity</b>				
<b>Short-time current carrying capacity</b> (5 ... 30 s)				
• CLASS 5 and 10	A		630	820
• CLASS 15	A		630	662
• CLASS 20	A		536	572
• CLASS 25	A		479	531
• CLASS 30	A		441	500
Thermal current-carrying capacity 10-s-current <sup>1)</sup>	A		5040	7000
<b>Power loss per conducting path</b> at $I_e$ /AC-3 /690 V	W		45	70
<b>Switching frequency</b>				
<b>Switching frequency z</b> in operating cycles/hour				
• Contactors without overload relays	No-load switching frequency AC	1/h	2000	1000
	No-load switching frequency DC	1/h	1000	1000
	AC-1	1/h	700	700
	AC-2	1/h	200	200
	AC-3	1/h	500	500
	AC-4	1/h	150	150
• Contactors with overload relays (mean value)		1/h	15	15
<b>Conductor cross-sections</b>				
• <b>Screw terminals</b>				
<b>Main conductors:</b>				
• <u>Busbar connections</u>				
- Finely stranded with cable lug	mm <sup>2</sup>		50 ... 240	50 ... 240
- Stranded with cable lug	mm <sup>2</sup>		70 ... 240	50 ... 240
- Solid or stranded	AWG		2/0 ... 500 MCM	2/0 ... 500 MCM
- Connecting bar (max. width)	mm		50	60 ( $U_e \leq 690$ V) 50 ( $U_e > 690$ V)
• Terminal screw				
- Tightening torque	Nm		M10 x 30 14 ... 24 (124 ... 210 lb.in)	M12 x 40 20 ... 35 (177 ... 310 lb.in)
• <u>With box terminal<sup>2)</sup></u>				
- Connectable copper bars				
- Width	mm		15 ... 25	15 ... 38
- Max. circumference	mm		1 x 26 or 2 x 11	1 x 46 or 2 x 18
- Terminal screw			A/F 6 (hexagon socket)	A/F 8 (hexagon socket)
- Tightening torque	Nm		25 ... 40 (221 ... 354 lb.in)	35 ... 50 (266 ... 443 lb.in)
<b>Auxiliary conductors:</b>				
• Solid	mm <sup>2</sup>		2 x (0.5 ... 1) <sup>3)/2</sup> x (1 ... 2.5) <sup>3)</sup>	
• Finely stranded with end sleeve	mm <sup>2</sup>		2 x (0.5 ... 1) <sup>3)/2</sup> x (0.75 ... 2.5) <sup>3)</sup>	
• Pin-end connector to DIN 46231	mm <sup>2</sup>		2 x (1 ... 1.5)	
• Solid or stranded	AWG		2 x (18 ... 12)	
• Tightening torque	Nm		0.8 ... 1.4 (7 ... 12 lb.in)	
<b>CSA and UL rated data</b>				
<b>Rated insulation voltage</b>		V AC	600	600
<b>Uninterrupted current</b>	Open and enclosed	A	630	820
<b>Maximum horsepower ratings</b> (CSA and UL approved values)				
Rated power for induction motors with 60 Hz	at 200 V	hp	231	290
	230 V	hp	266	350
	460 V	hp	530	700
	575 V	hp	664	860
<b>NEMA/EEMAC ratings</b>				
SIZE		hp	6	7
Uninterrupted current	Open	A	600	820
	Enclosed	A	540	810
Rated power for induction motors with 60 Hz	at 200 V	hp	150	--
	230 V	hp	200	300
	460 V	hp	400	600
	575 V	hp	400	600
<b>Overload relays</b>				
Type			3RB12 .	
	Setting range	A	200 ... 820	

**For short-circuit protection with overload relays see Protection Equipment: Overload Relays**

<sup>1)</sup> According to IEC 60947-4-1.

<sup>2)</sup> See Accessories and Spare Parts.

<sup>3)</sup> If two different conductor cross-sections are connected at one clamping point, then the two cross-sections must lie within the range quoted. If identical cross-sections are used, this restriction does not apply.