

# Contactors for Switching Motors

Contactors with DC solenoid system  
3-pole, 55 ... 200 kW

## Technical specifications

Contactors	Type	3TB50		3TB52 to 3TB56	
<b>Rated data for the auxiliary contacts</b>		to IEC 60947-5-1/DIN VDE 0660 Part 200			
<b>Rated insulation voltage <math>U_i</math></b> (Pollution degree 3)	V	690			
<b>Conventional thermal current</b> $I_{th}$ = Rated operating current $I_e$ /AC-12	A	10			
<b>AC load</b>					
<b>Rated operating current <math>I_e</math>/AC-15/AC-14</b> For rated operating 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	-		
<b>DC load</b>					
<b>Rated operating current <math>I_e</math>/DC-12</b> For rated operating voltage $U_e$					
	24 V	A	10	10	
	48 V	A	10	10	
	110 V	A	3.2	8	
	125 V	A	2.5	6	
	220 V	A	0.9	2	
	440 V	A	0.33	0.6	
	600 V	A	0.22	0.4	
<b>Rated operating current <math>I_e</math>/DC-13</b> For rated operating voltage $U_e$					
	24 V	A	10 (10) <sup>1)</sup>	10 (10) <sup>1)</sup>	
	48 V	A	5 (7)	5 (4)	
	110 V	A	1.14 (3.2)	2.4 (1.8)	
	125 V	A	0.98 (2.5)	2.1 (1.6)	
	220 V	A	0.48 (0.9)	1.1 (0.9)	
	440 V	A	0.13 (0.33)	0.32 (0.27)	
	600 V	A	0.075 (0.22)	0.21 (0.18)	

Contactors	Type	3TB50 to 3TB56	
<b>CSA and UL rated data for the auxiliary contacts</b>			
Rated voltage	AC V, max.	600	
Switching capacity		A 600, P 600	

1) Values in brackets apply to auxiliary contacts with offset NC contact.

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### Contact endurance of main contacts

The characteristics show the contact endurance of contactors when switching resistance and inductive AC loads (AC-1/AC-3) depending on the breaking current and rated operating voltage. It is assumed that the operating mechanisms are switched randomly, i.e. not synchronized with the phase angle of the supply system.

The rated operating current  $I_e$  complies with utilization category AC-4 (breaking of 6 times the rated operating current) and is intended for a contact endurance of about 200 000 operating cycles.

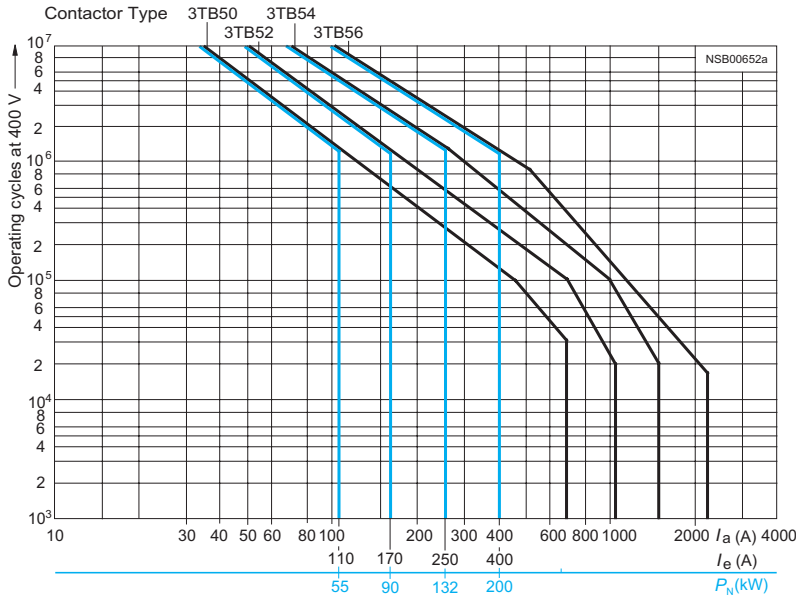
If a shorter endurance is sufficient, the rated operating current  $I_e/AC-4$  can be increased.

If the contacts are used for mixed operation i.e. if standard switching (breaking of the rated operating current in accordance with utilization category AC-3) is sometimes mixed with jog mode (breaking of multiples of the rated operating current in accordance with utilization category AC-4), the endurance of the contacts can be estimated with the following formula:

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

The following abbreviations are used in the formula:

- X Contact endurance for mixed operation in operating cycles
- A Contact endurance for normal operation ( $I_a = I_e$ ) in operating cycles
- B Contact endurance for jog mode ( $I_a = \text{multiples of } I_e$ ) in operating cycles
- C Number of jog operations of total operations in percent



3TB50 to 3TB56 contactors

Legend for the diagrams:

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

$I_a$  = Breaking current

$I_e$  = Rated operating current

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Contactor	Type Size		3TB50 6	3TB52 8	3TB54 10	3TB56 12	
<b>General data</b>							
<b>Permissible mounting position, assembly note<sup>1)</sup></b> The contactors have been designed for operation on a vertical mounting surface.							
<b>Mechanical endurance</b>	Operating cycles		10 million				
<b>Electrical endurance</b>			2)				
<b>Rated insulation voltage <math>U_i</math></b>	V		1000				
<b>Safe isolation</b> between coil and main contacts (to DIN VDE 0106 Part 101 and A1 Draft 02/89)	V		690				
<b>Positively-driven/mirror contacts</b> Positively-driven operation applies when the NC and NO contact cannot be closed at the same time.			Yes, between main contacts and auxiliary NC contacts as well as within the auxiliary switch blocks to ZH 1/457, IEC 60947-4-1, Appendix F				
<b>Permissible ambient temperature</b>	For operation For storage	°C °C	-25 ... +55 -50 ... +80				
<b>Degree of protection</b> to IEC 60947-1/IEC 60529			IP00 (open), coil assembly IP40				
<b>Shock resistance</b> (rectangular pulse)	g/ms		5/10	5.9/10	5.9/10	5.9/10	
<b>Short-circuit protection</b>							
<b>Main circuit</b>							
Fuse-links gL/gG	Type of coordination "1"	A	250	315	400	630	
NH 3NA, DIAZED 5SB	Type of coordination "2"	A	224	250	315	500	
<b>Auxiliary circuit</b> short-circuit current $I_k \geq 1$ kA							
• Fuse-links gL/gG, DIAZED 5SB, NEOZED 5SE		A	16				
• Miniature circuit-breaker with C characteristic		A	10				
<b>Control circuit</b>							
<b>Coil operating range</b>			0.8 ... 1.1 x $U_s$				
<b>Power consumption of the magnetic coil</b> (for cold coil and 1.0 x $U_s$ ) Closing = Closed			W	25	30	60	86
<b>Operating times at 0.8 to 1.1 x <math>U_s</math></b> Total break time = Opening delay + Arcing time				(Values apply to 20 % low voltage, 10 % overvoltage as well as when the coil is cold and warm)			
• Closing delay	ms		105 ... 360	105 ... 400	105 ... 400	110 ... 400	
• Opening delay <sup>3)</sup>	ms		18 ... 30	22 ... 35	24 ... 55	40 ... 110	
• Arcing time	ms		10 ... 15	10 ... 15	10 ... 15	10 ... 15	
<b>Operating times at 1.0 x <math>U_s</math></b>							
• Closing delay	ms		120 ... 230	130 ... 250	115 ... 250	120 ... 250	
• Opening delay <sup>3)</sup>	ms		20 ... 26	24 ... 32	35 ... 50	60 ... 95	
<b>Main circuit</b>							
<b>Load rating with AC</b>							
<b>Utilization category AC-1, switching resistive loads</b>							
Rated operating current $I_e$	at 40 °C up to 690 V	A	170	230	325	425	
	at 55 °C up to 690 V	A	160	200	300	400	
Rated output power of AC loads <sup>4)</sup> p.f. = 0.95 (for 55 °C)	230 V	kW	61	76	114	152	
	400 V	kW	105	132	195	262	
	500 V	kW	138	173	260	345	
	690 V	kW	183	228	340	455	
Minimum conductor cross-section for loads with $I_e$		mm <sup>2</sup>	70	95	185	240	
<b>Utilization category AC-2 and AC-3</b> 5)							
<b>Utilization category AC-4</b> (for $I_a = 6 \times I_e$ )							
• The following applies to contact endurences of about 200,000 operating cycles:							
- Rated operating current $I_e$			52	72	103	120	
- Rated output power for squirrel-cage motors at 50 Hz and 60 Hz	230 V	kW	15.6	21	31	37.5	
	400 V	kW	27	37	55	65	
	500 V	kW	35	48	72	85.5	
	690 V	kW	45	64	92	106	
Maximum permissible rated operating voltage $I_e/AC-4$	for 400 V	A	110	170	250	400	

1) For reversing duty, deviations from the vertical axis are not permitted.

2) See Page 2/80.

3) The opening delays can increase if the contactor coils are damped against voltage peaks.

4) Industrial furnaces and electric heaters with resistance heating, for example (increased power consumption on heating up has been taken into account).

5) See selection tables, Page 2/84

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<b>Main circuit</b>						
<b>Load rating with AC</b>						
<b>Switching of low-inductance (low-loss, metallized dielectric) AC capacitors <sup>1)</sup></b>						
Rated operating current $I_b$ at 400 V		A	87	144	217	289
Rated output power of single capacitors at 50 Hz	230 V	kvar	35	58	87	115
	400 V	kvar	60	100	150	200
	500 V	kvar	80	130	190	265
	690 V	kvar	60	100	150	200
Rated output power of bank of capacitors (minimum inductance between 6 $\mu$ H connected in parallel capacitors) at 50 Hz	230 V	kvar	30	40	66	85
	400 V	kvar	50	70	115	150
	500 V	kvar	66	90	145	195
	690 V	kvar	50	70	115	150
<b>Load rating with DC</b>						
<b>Utilization category DC-1</b>						
<b>Switching of resistive load (L/R <math>\leq</math> 1 ms)</b>						
<b>Rated operating current <math>I_b</math> (for 55 °C)</b>						
• 1 conducting path	24 V	A	160	200	300	400
	60 V	A	80	80	300	330
	110 V	A	18	18	33	33
	220 V	A	3.4	3.4	3.8	3.8
	440 V	A	0.8	0.8	0.9	0.9
	600 V	A	0.5	0.5	0.6	0.6
• 2 series-connected conducting paths	24 V	A	160	200	300	400
	60V	A	160	200	300	400
	110 V	A	160	200	300	400
	220 V	A	20	20	300	400
	440 V	A	3.2	3.2	4	4
	600 V	A	1.6	1.6	2	2
• 3 series-connected conducting paths	24 V	A	160	200	300	400
	60 V	A	160	200	300	400
	110 V	A	160	200	300	400
	220 V	A	160	200	300	400
	440 V	A	11.5	11.5	11	11
	600 V	A	4	4	5.2	5.2
<b>Utilization category DC-3 and DC-5</b>						
<b>Shunt-wound and series-wound motors (L/R <math>\leq</math> 15 ms)</b>						
<b>Rated operating current <math>I_b</math> (for 55 °C)</b>						
• 1 conducting path	24 V	A	16	16	35	35
	60 V	A	7.5	7.5	11	11
	110 V	A	2.5	2.5	3	3
	220 V	A	0.6	0.6	0.6	0.6
	440 V	A	0.17	0.17	0.18	0.18
	600 V	A	0.12	0.12	0.125	0.125
• 2 conducting paths in series	24 V	A	160	200	300	400
	60 V	A	160	200	300	400
	110 V	A	160	200	300	400
	220 V	A	2.5	2.5	2.5	2.5
	440 V	A	0.65	0.65	0.65	0.65
	600 V	A	0.37	0.37	0.37	0.37
• 3 series-connected conducting paths	24 V	A	160	200	300	400
	60 V	A	160	200	300	400
	110 V	A	160	200	300	400
	220 V	A	160	200	300	400
	440 V	A	1.4	1.4	1.4	1.4
	600 V	A	0.75	0.75	0.75	0.75
<b>Operating frequency</b>						
<b>Operating frequency z in operating cycles/hour</b>						
• Contactors without overload relay	AC-1	h <sup>-1</sup>	1000			
	AC-2	h <sup>-1</sup>	500			
	AC-3	h <sup>-1</sup>	500			
	AC-4	h <sup>-1</sup>	250			
• Contactors with overload relay (mean value)		h <sup>-1</sup>	15			

1) Contact lifetime 0.1 million operating cycles.

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Contactor	Type		3TB50 6	3TB52 8	3TB54 10	3TB56 12	
<b>Conductor cross-sections</b>							
<b>Screw terminals</b>	<b>Main conductors</b>	• Finely stranded with cable lug	mm <sup>2</sup>	16 ... 70	35 ... 95	50 ... 240	50 ... 240
		• Stranded with cable lug	mm <sup>2</sup>	25 ... 70	50 ... 120	70 ... 240	70 ... 240
		• Busbars	mm	15 x 3	20 x 3	25 x 5	2 x (25 x 3)
		• Terminal screw		M 6	M 8	M 10	M 10
	<b>Auxiliary conductors</b>	• Solid	mm <sup>2</sup>	1 ... 2.5			
		• Finely stranded with end sleeve	mm <sup>2</sup>	0.75 ... 1.5			
		• Pin-end connector (DIN 46231)	mm <sup>2</sup>	2 x 1 ... 2.5			
	<b>Protective conductor:</b>		mm <sup>2</sup>	-	25 ... 70	35 ... 70	50 ... 120
	• Stranded with cable lug						
<b>CSA and UL rated data</b>							
<b>CSA rated data</b>							
Continuous current	Open	A	150	170	240	300	
	Enclosed	A	135	153	215	270	
Rated output power for induction motors at 60 Hz (enclosed)		115 V	hp	25	30	40	50
		230 V	hp	50	60	75	100
		460 V	hp	100	120	150	200
		575 V	hp	125	160	200	250
Overload relay	Type		3RB1056	3RB1056	3RB1066	3RB1066	
	Adjustment range	A	50 ... 200	50 ... 200	50 ... 250	200 ... 540	
NEMA/EEMAC size	Contactors		4	4	4	5	
	Starter (= contactors + overload relay, enclosed)		3	4	4	5	
<b>UL rated data</b>							
Continuous current	Open	A	150	150	240	390	
	Enclosed	A	135	135	215	350	
Rated output power for induction motors at 60 Hz		115 V	hp	25	25	30	-
		230 V	hp	50	50	75	125
		460 V	hp	100	100	150	250
		575 V	hp	125	125	200	300 <sup>1)</sup>
Overload relay	Type		3RB1056	3RB1056	3RB1066	3RB1066	
	Adjustment range		50 ... 200	50 ... 200	50 ... 250	200 ... 540	
NEMA/EEMAC size	Contactors		4	4	4	5	
	Starter (= contactors + overload relay, enclosed)		3	4	4	5	
<b>Short-circuit protection devices</b>							
	• Fuse CLASS RK5	A	400	400	450	600	
	• Power switch to UL 489	A	175	175	250	600	

1) At AC 575/AC 600 V.