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

### Technical specifications

| Contactor Type | | | 3TF68 and 3TF69 |
|---|---|---|---|
| **Rated data of the auxiliary contacts** | | | Acc. to IEC 60947-5-1 (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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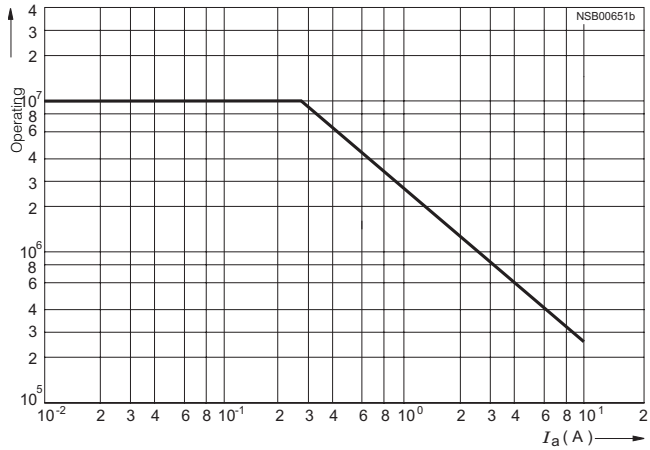
### Endurance of the auxiliary contacts

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

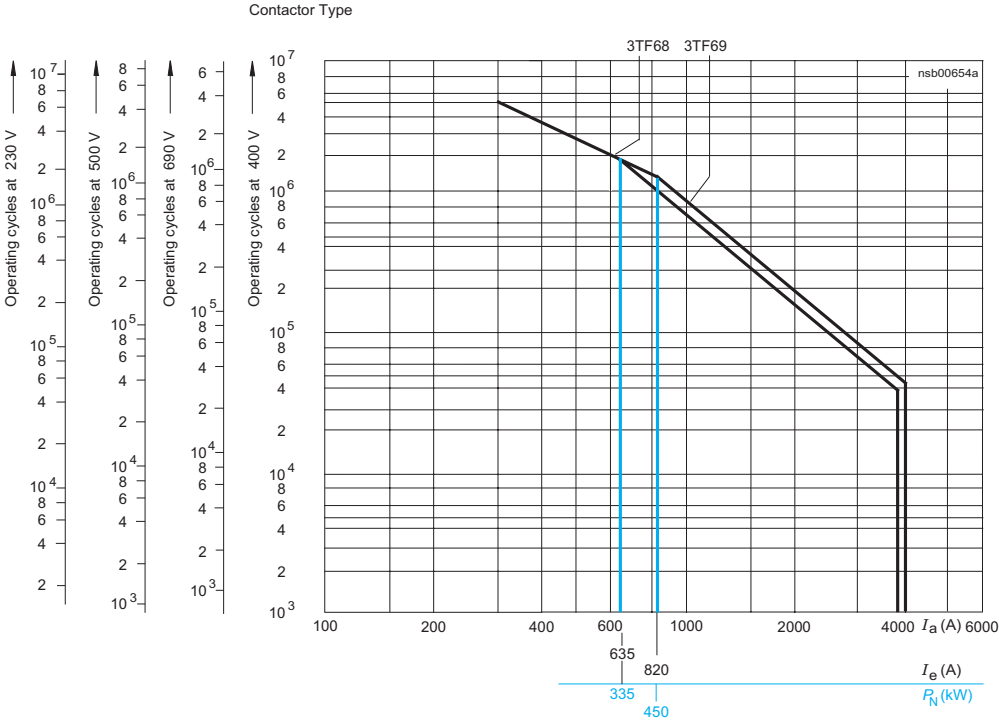



### Contact erosion indication with 3TF68 and 3TF69 vacuum contactors

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.

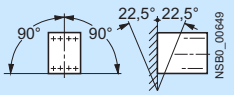
### Endurance of the main contacts




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

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

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

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

2) 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.

3) See endurance of the auxiliary contacts.

4) Test conditions according to IEC 60947-4-1.

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

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

[1] At 24 V DC; for further voltages, deviations of up to ±10 % are possible.

[2] Including reversing contactor.

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

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

| Contactor | Type<br>Size | | 3TF68<br>14 | 3TF69<br>14 |
|---|---|---|---|---|
| **Main circuit** | | | | |
| ***AC capacity*** | | | | |
| **Utilization category AC-1<br>Switching resistive loads** | | | | |
| 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<br>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<br>with $I_e$ | at 40°C | $mm^2$ | 2 x 240 | $I_e \geq 800$ A: 2 x 60 x 5 (Cu busbars) |
| | at 55°C | $mm^2$ | 2 x 185 | $I_e < 800$ A: 2 x 240 |
| **Utilization category AC-2 and AC-3** | | | | |
| Rated operational currents $I_e$ | up to 690 V | A | 630 | 820 |
| | 1000 V | A | 435 | 580 |
| Rated power for slipring or squirrel-cage<br>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 |
| **Utilization category AC-4** (for $I_a = 6 \times I_e$) | | | | |
| Rated operational current $I_e$ | up to 690 V | A | 610 | 690 |
| Rated power for squirrel-cage motors with 50<br>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<br>with 50 Hz and 60 Hz | at 230 V | kW | 97 | 110 |
| | 400 V | kW | 168 | 191 |
| | 500 V[1] | kW | 210 | 250 |
| | 690 V[1] | kW | 278 | 335 |
| | 1000 V[1] | A | 290 | 350 |
| **Utilization category AC-6a<br>switching AC transformers** | | | | |
| Rated operational currents $I_e$ | up to 400 V | | | |
| • For inrush current n = 20 | | A | 513 | 675 |
| • For inrush current n = 30 | | A | 342 | 450 |
| Rating *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[2] | 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 |
| **Utilization category AC-6b,<br>switching low-inductance (low-loss, metallized dielectric)<br>AC capacitors** | | | | |
| Rated operational currents $I_e$ | up to 400 V | A | 433 | |
| Rated power for single capacitors<br>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<br>inductance is 6 µH between capacitors con-<br>nected 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:
$P_x = P_{n30} \cdot 30/x$.

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

| Contactor | Type<br>Size | | | 3TF68<br>14 | 3TF69<br>14 |
|---|---|---|---|---|---|
| **Main circuit** | | | | | |
| ***AC capacity*** | | | | | |
| **Short-time current carrying capacity** (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[1] | | | A | 5040 | 7000 |
| **Power loss per conducting path** at $I_e$/AC-3 /690 V | | | W | 45 | 70 |
| ***Switching frequency*** | | | | | |
| **Switching frequency z** 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 |
| **Conductor cross-sections** | | | | | |
| • **Screw terminals** | **Main conductors:** | | | **Screw terminals** | |
| | • Busbar connections | | | | |
| | - finely stranded with cable lug | | $mm^2$ | 50 ... 240 | 50 ... 240 |
| | - stranded with cable lug | | $mm^2$ | 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)<br>50 ($U_e >$ 690 V) |
| | • Terminal screw | | | M10 x 30 | M12 x 40 |
| | - tightening torque | | Nm | 14 ... 24 (124 ... 210 lb.in) | 20 ... 35 (177 ... 310 lb.in) |
| | • With box terminal[2] | | | | |
| | - connectable copper bars | | | | |
| | - width | | mm | 15 ... 25 | 15 ... 38 |
| | - max. thickness | | 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) |
| | **Auxiliary conductors:** | | | | |
| | • Solid | | $mm^2$ | 2 x (0.5 ... 1)[3]/2 x (1 ... 2.5)[3] | |
| | • Finely stranded with end sleeve | | $mm^2$ | 2 x (0.5 ... 1)[3]/2 x (0.75 ... 2.5)[3] | |
| | • Pin-end connector to DIN 46231 | | $mm^2$ | 2 x (1 ... 1.5) | |
| | • Solid or stranded | | AWG | 2 x (18 ... 12) | |
| | • Tightening torque | | Nm | 0.8 ... 1.4 (7 ... 12 lb.in) | |
| **CSA and UL rated data** | | | | | |
| **Rated insulation voltage** | | | V AC | 600 | 600 |
| **Uninterrupted current** | Open and enclosed | | A | 630 | 820 |
| **Maximum horsepower ratings**<br>(CSA and UL approved values) | | | | | |
| Rated power for induction motors at 60 Hz | | at 200 V | hp | 231 | 290 |
| | | 230 V | hp | 266 | 350 |
| | | 460 V | hp | 530 | 700 |
| | | 575 V | hp | 664 | 860 |
| **NEMA/EEMAC ratings** | | | | | |
| SIZE | | | hp | 6 | 7 |
| Uninterrupted current | Open | | A | 600 | 820 |
| | Enclosed | | A | 540 | 810 |
| Rated power for induction motors at 60 Hz | | at 200 V | hp | 150 | -- |
| | | 230 V | hp | 200 | 300 |
| | | 460 V | hp | 400 | 600 |
| | | 575 V | hp | 400 | 600 |
| **Overload relays** | Type | | | 3RB12 | |
| | Setting range | | A | 200 ... 820 | |

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

[1] According to IEC 60947-4-1.

[2] See Accessories and Spare Parts.

[3] If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified. If identical cross-sections are used, this restriction does not apply.