

# Contactors

## Utilization Categories

For easier choice of devices and in order to make the comparison of different products simpler are utilization categories for contactors and motor-starters according to IEC 947-4-1 and VDE 0660 Part 102, for

control circuit devices and switching elements according to IEC 947-5-1 and VDE 0660 Part 200 determined. The table offers different utilization categories, typical applications and assorted test conditions.

| Type of current     | Category   | Typical applications  | Rated operational current    | Test conditions for the number of on-load operating cycles |             |                      |                  |                      |                      | Test conditions for making and breaking capacities |                      |                      |                  |                      |                      |
|---------------------|--|---|------------------------------|--|-------------|----------------------|------------------|----------------------|----------------------|--|----------------------|----------------------|------------------|----------------------|----------------------|
|                     |  |   |                              | Make   |             |                      | Break            |                      |                      | Make   |                      |                      | Break            |                      |                      |
|                     |  |   |                              | $I/I_e$  | $U/U_e$     | $\cos\phi$           | $I/I_e$          | $U/U_e$              | $\cos\phi$           | $I/I_e$  | $U/U_e$              | $\cos\phi$           | $I/I_e$          | $U/U_e$              | $\cos\phi$           |
| Alternating Current | AC1  | Non-inductive or slightly inductive loads resistance furnaces                               | all values                   | 1  | 1           | 0,95                 | 1                | 1                    | 0,95                 | 1,5  | 1,05                 | 0,8                  | 1,5              | 1,05                 | 0,8                  |
|                     | AC2  | Slip-ring motors: starting, switching off   | all values                   | 2,5  | 1           | 0,65                 | 2,5              | 1                    | 0,65                 | 4  | 1,05                 | 0,65                 | 4                | 1,05                 | 0,65                 |
|                     | AC3  | Squirrel-cage motors: starting, switching off motors during running                         | $I_e < 17A$<br>$I_e > 100A$  | 6<br>6<br>6  | 1<br>1<br>1 | 0,65<br>0,35<br>0,35 | 1<br>1<br>1      | 0,17<br>0,17<br>0,17 | 0,65<br>0,35<br>0,35 | 10<br>10<br>10                                     | 1,05<br>1,05<br>1,05 | 0,45<br>0,45<br>0,35 | 8<br>8<br>8      | 1,05<br>1,05<br>1,05 | 0,45<br>0,45<br>0,35 |
|                     | AC4  | Squirrel-cage motors: starting, plugging, inching   | $I_e < 17A$<br>$I_e > 100A$  | 6<br>6<br>6  | 1<br>1<br>1 | 0,65<br>0,35<br>0,35 | 6<br>6<br>6      | 1<br>1<br>1          | 0,65<br>0,35<br>0,35 | 12<br>12<br>12                                     | 1,05<br>1,05<br>1,05 | 0,45<br>0,45<br>0,35 | 10<br>10<br>10   | 1,05<br>1,05<br>1,05 | 0,45<br>0,45<br>0,35 |
|                     | AC5a   | Switching of electric discharge lamp controls   | all values                   | -  | -           | -                    | -                | -                    | -                    | 3  | 1,05                 | 0,45                 | 3                | 1,05                 | 0,45                 |
|                     | AC5b   | Switching of incandescent lamps   | all values                   | -  | -           | -                    | -                | -                    | -                    | 1,5  | 1,05                 | <sup>1)</sup>        | 4                | 1,05                 | <sup>1)</sup>        |
|                     | AC6a   | Switching of transformers   | $I_e < 100A$<br>$I_e > 100A$ | -<br>-   | -<br>-      | -<br>-               | -<br>-           | -<br>-               | -<br>-               | 4,5<br>4,5   | 1,05<br>1,05         | 0,45<br>0,35         | 3,6<br>3,6       | 1,05<br>1,05         | 0,45<br>0,35         |
|                     | AC6b   | Switching of capacitors   | -                            | -  | -           | -                    | -                | -                    | -                    | <sup>2)</sup>                                      |                      |                      | <sup>2)</sup>    |                      |                      |
|                     | AC7a   | Slightly inductive loads in household appliances and similar applications                   | all values                   | -  | -           | -                    | -                | -                    | -                    | 1,5  | 1,05                 | 0,8                  | 1,5              | 1,05                 | 0,8                  |
|                     | AC7b   | Motor loads for household applications  | $I_e < 100A$<br>$I_e > 100A$ | -<br>-   | -<br>-      | -<br>-               | -<br>-           | -<br>-               | -<br>-               | 8<br>8   | 1,05<br>1,05         | 0,45<br>0,35         | 6<br>6           | 1,05<br>1,05         | 0,45<br>0,35         |
|                     | AC8a   | Hermetic refrigerant compressor motor control with manual resetting of overload releases    | $I_e < 100A$<br>$I_e > 100A$ | -<br>-   | -<br>-      | -<br>-               | -<br>-           | -<br>-               | -<br>-               | 6<br>6   | 1,05<br>1,05         | 0,45<br>0,35         | 6<br>6           | 1,05<br>1,05         | 0,45<br>0,35         |
|                     | AC8b   | Hermetic refrigerant compressor motor control with automatic resetting of overload releases | $I_e < 100A$<br>$I_e > 100A$ | -<br>-   | -<br>-      | -<br>-               | -<br>-           | -<br>-               | -<br>-               | 6<br>6   | 1,05<br>1,05         | 0,45<br>0,35         | 6<br>6           | 1,05<br>1,05         | 0,45<br>0,35         |
|                     | AC12   | Control of resistive loads and solid state loads with isolation by opto couplers            | all values                   | -  | -           | -                    | -                | -                    | -                    | 1  | 1                    | 0,9                  | 1                | 1                    | 0,9                  |
|                     | AC13   | Control of solid state loads with transformer isolation                                     | all values                   | -  | -           | -                    | -                | -                    | -                    | 10   | 1,1                  | 0,65                 | 1,1              | 1,1                  | 0,65                 |
|                     | AC14   | Control of small electromagnetic loads ( $\leq 72VA$ )                                      | -                            | -  | -           | -                    | -                | -                    | -                    | 6  | 1,1                  | 0,7                  | 6                | 1,1                  | 0,7                  |
| AC15                | Control of electromagnetic load ( $> 72VA$ )                         | -   | 10                           | 1  | 0,7         | 1                    | 1                | 0,4                  | 10                   | 1,1  | 0,3                  | 10                   | 1,1              | 0,3                  |                      |
| Direct Current      |  |   |                              | Make<br>$I/I_e$  | $U/U_e$     | L/R [ms]             | Break<br>$I/I_e$ | $U/U_e$              | L/R [ms]             | Make<br>$I/I_e$                                    | $U/U_e$              | L/R [ms]             | Break<br>$I/I_e$ | $U/U_e$              | L/R [ms]             |
|                     | DC1  | Non-inductive or slightly inductive loads resistance furnaces                               | all values                   | 1  | 1           | 1                    | 1                | 1                    | 1                    | 1,5  | 1,05                 | 1                    | 1,5              | 1,05                 | 1                    |
|                     | DC3  | Shunt-motors: starting, plugging, inching dynamic braking of d.c. motors                    | all values                   | 2,5  | 1           | 2                    | 2,5              | 1                    | 2                    | 4  | 1,05                 | 2,5                  | 4                | 1,05                 | 2,5                  |
|                     | DC5  | Series-motors: starting, plugging, inching dynamic braking of d.c. motors                   | all values                   | 2,5  | 1           | 7,5                  | 2,5              | 1                    | 7,5                  | 4  | 1,05                 | 15                   | 4                | 1,05                 | 15                   |
|                     | DC6  | Switching of incandescent lamps   | all values                   | -  | -           | -                    | -                | -                    | -                    | 1,5  | 1,05                 | <sup>1)</sup>        | 4                | 1,05                 | <sup>1)</sup>        |
|                     | DC12   | Control of resistive loads and solid state loads with isolation by opto couplers            | all values                   | -  | -           | -                    | -                | -                    | -                    | 1  | 1                    | 1                    | 1                | 1                    | 1                    |
|                     | DC13   | Control of electromagnets   | all values                   | 1  | 1           | $\leq 300$           | 1                | 1                    | $\leq 300$           | 1,1  | 1,1                  | $\leq 300$           | 1,1              | 1,1                  | $\leq 300$           |
| DC14                | Control of electromagnetic loads having economy resistors in circuit | all values  | -                            | -  | -           | -                    | -                | -                    | 10                   | 1,1  | 15                   | 10                   | 1,1              | 15                   |                      |

$U_e$  Rated operational voltage,  $U$  Voltage before make,  $U_r$  Recovery voltage,  $I_e$  Rated operational current,  $I$  Current make,  $I_c$  Current broken

1) Test with incandescent lamps

2) Test conditions according to standard