# Capacitor Switching Contactors


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Modular Switches
Key Operated Switches

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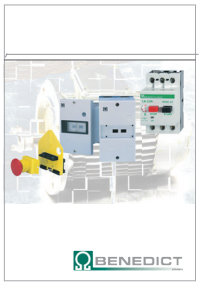
On-Off-Switches
Add-On-Module

Catalogue **D656E..**

Contactors
for reactive
and non reactive
capacitor banks

Catalogue **D385E..**



MU25A up to 25A

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Trip Alarm Auxiliary Switches
Busbar Connectors
Enclosure

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Emergency Stop
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Emergency Off Switches
Main Switches
On-Off Switches
Control Switches

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D.O.L. Starters
Overload Relays
Manual Motor Starters
Main Switches
Circuit Breakers
Cam Switches
Push Buttons

Catalogue **D651E..**

# Capacitor Switching Contactors

for use with reactive or non-reactive capacitor banks

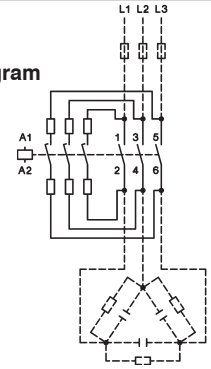
| **Rated Operational Power** at 50/60Hz Ambient Temperature 50°C | | | 60°C | | | Aux. Contacts Built-in Add. | | | **Type** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **380V** | 415V | 660V | 380V | 415V | 660V | | | | | Coil voltage [1] | |
| **400V** | 440V | 690V | 400V | 440V | 690V | | | | **230** | 220-240V 50Hz | |
| **kVAr** | kVAr | kVAr | kVAr | kVAr | kVAr | NO | NC | pcs. | ↓ | Pack pcs. | Weight kg/pc. |
| 0-**12,5** | 0-13 | 0-20 | 0-12,5 | 0-13 | 0-20 | 1 | - | 1 [2] | **K3-18NK10 . . .** | 1 | 0,34 |
| 0-**12,5** | 0-13 | 0-20 | 0-12,5 | 0-13 | 0-20 | - | 1 | 1 [2] | **K3-18NK01 . . .** | 1 | 0,34 |
| 0-**12,5** | 0-13 | 0-20 | 0-12,5 | 0-13 | 0-20 | 1 | - | 1 [2] | **K3-18NBK10 . . .** | 1 | 0,40 |
| 10-**20** | 10,5-22 | 17-33 | 10-20 | 10,5-22 | 17-33 | - | - | 3 [3] | **K3-24K00 . . .** | 1 | 0,62 |
| 10-**25** | 10,5-27 | 17-41 | 10-25 | 10,5-27 | 17-41 | - | - | 3 [3] | **K3-32K00 . . .** | 1 | 0,62 |
| 20-**33,3** | 23-36 | 36-55 | 20-33,3 | 23-36 | 36-55 | - | - | 3 [3] | **K3-50K00 . . .** | 1 | 1,0 |
| 20-**50** | 23-53 | 36-82 | 20-50 | 23-53 | 36-82 | - | - | 3 [3] | **K3-62K00 . . .** | 1 | 1,0 |
| 20-**75**[4] | 23-75[4] | 36-120[4] | 20-60 | 23-64 | 36-100 | - | - | 3 [3] | **K3-74K00 . . .** | 1 | 1,0 |
| 33-**80** | 36-82 | 57-120 | 33-75 | 36-77 | 57-120 | - | - | 6 [5] | **K3-90K00 . . .** / VS [7] | 1 | 2,3 |
| 33-**100**[6] | 36-103[6] | 57-148[6] | 33-90[6] | 36-93[6] | 57-148[6] | - | - | 6 [5] | **K3-115K00 . . .** / VS [7] | 1 | 2,3 |

**Specification:** Contactors K3-..K are suitable for switching low-inductive and low loss capacitors in capacitor banks (IEC70 and 831, VDE 0560) without and with reactors.
Capacitor switching contactors are fitted with early make contacts and damping resistors, to reduce the value of make current <70 x $I_e$.
**Operating Conditions:** Capacitor switching contactors are protected against contact welding for a prospective making current of 200 x $I_e$.

## **Technical Data** acc. to IEC 947-4-1, IEC 947-5-1, EN 60947-4-1, EN 60947-5-1, VDE 0660

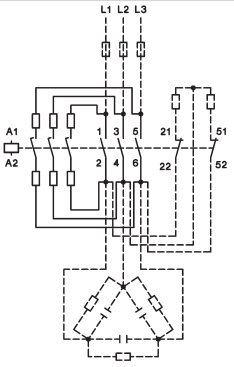
| **Type** | | | **K3-18NK** | **K3-18NBK** [8] | **K3-24K** | **K3-32K** | **K3-50K** | **K3-62K** | **K3-74K** | **K3-90K** | **K3-115K** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Max. frequency of operations z | | 1/h | 120 | 120 | 120 | 120 | 120 | 120 | 80 | 80 | 80 |
| Contact life non reactive cap. banks | | S x $10^3$ | 250 | 250 | 150 | 150 | 150 | 150 | 120 | 120 | 120 |
| reactive cap. banks | | S x $10^3$ | 400 | 400 | 300 | 300 | 300 | 300 | 200 | 200 | 200 |
| **Rated operational current** $I_e$ | at 50°C | A | **0-18** | **0-18** | **14-28** | **14-36** | **30-48** | **30-72** | **30-108** | **50-115** | **50-144** |
| **AC6b** | at 60°C | A | **0-18** | **0-18** | **14-28** | **14-36** | **30-48** | **30-72** | **30-87** | **50-108** | **50-130** |
| Rated operational current $I_{th}$ | at 50°C | A | 32 | 45 | 45 | 60 | 100 | 110 | 120 | 155 | 190 |
| AC1 | at 60°C | A | 32 | 40 | 40 | 55 | 90 | 100 | 110 | 145 | 170 |
| Overload factor | at 50°C | % | 78 | 150 | 60 | 67 | 108 | 53 | 11 | 35 | 32 |
| acc. to EN 61921: 30% min. | at 60°C | % | 78 | 122 | 43 | 53 | 88 | 39 | 26 | 34 | 31 |
| Fuses gL (gG) | from / to | A | 35 / 63 | 35 / 63 | 50 / 80 | 63 / 100 | 80 / 160 | 125 / 160 | 160/200 | 160/200 | 160/250 |

**Typical Circuit Diagram**




**Wiring Diagram for Quick Discharge Resistors**
Make sure that the current of the discharge resistors is not higher than the rated current (AC1) of the auxiliary contacts

**Mounting instructions:**
In the area of capacitor switching contactors, difficulty inflammable and self-extinguishing materials shall be used only, because abnormal temperatures within the area of the resistor spirals cannot be excluded.




1) Coil voltage range and non-standard coil voltages see page 57
2) 1 HN.. or HA.. snap-on
3) 2HB.. for side mounting and 1 HN.. or HA.. snap-on
4) Consider the max. thermal current of the contactor K3-74A: $I_{th}$ 130A
5) 2 HB.. on the left or right side and 4 HN.. or HA.. snap-on
6) Consider the min. cross-section of conductor at max. load
7) Type 230 for AC- and DC-operating 220-240V 50/60Hz and 220V DC (with integrated coil suppressor)
Type 230VS for AC-operating 220-240V 50Hz (with integrated coil suppressor)
8) Cable cross sections: 2,5 - 16mm²

## Contactors

for use with reactive capacitor banks

| | **Rated Operational Power** at 50/60Hz Ambient Temperature 50°C | | | 60°C | | | Aux. Contacts Built-in | | Add. | **Type** | Coil Voltage 220-240V 50Hz | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **380V** | 415V | 660V | 380V | 415V | 660V | | | | **230** | | Pack | Weight |
| | **400V** | 440V | 690V | 400V | 440V | 690V | | | | | | | |
| | **kVAr** | kVAr | kVAr | kVAr | kVAr | kVAr | NO | NC | pcs. | | | pcs. | kg/pc. |
|  | **5** | 5,5 | 8 | 5 | 5,5 | 8 | 1 | - | 4 [1] | **K3-10ND10 . . .** | | 1 | 0,23 |
| | **9** | 9,5 | 15 | **9** | 9,5 | 15 | 1 | - | 4 [1] | **K3-14ND10 . . .** | | 1 | 0,23 |
|  | **12,5** | 13 | 20 | 12,5 | 13 | 20 | 1 | - | 4 [1] | **K3-18ND10 . . .** | | 1 | 0,23 |
| | **13** | 14 | 22 | 13 | 14 | 22 | 1 | - | 4 [1] | **K3-22ND10 . . .** | | 1 | 0,23 |
|  | **20** | 22 | 33 | 20 | 22 | 33 | - | - | 6 [2] | **K3-24A00 . . .** | | 1 | 0,48 |
| | **25** | 27 | 41 | 25 | 27 | 41 | - | - | 6 [2] | **K3-32A00 . . .** | | 1 | 0,48 |
| | **27,5** | 30 | 48 | 27,5 | 30 | 48 | - | - | 6 [2] | **K3-40A00 . . .** | | 1 | 0,48 |
| | **33,3** | 36 | 55 | 33,3 | 36 | 55 | - | - | 6 [2] | **K3-50A00 . . .** | | 1 | 0,85 |
| | **50** | 53 | 82 | 50 | 53 | 82 | - | - | 6 [2] | **K3-62A00 . . .** | | 1 | 0,85 |
| | **75** [3] | 75 [3] | 100 | 60 | 64 | 100 | - | - | 6 [2] | **K3-74A00 . . .** | | 1 | 0,85 |
|  | **80** | 82 | 120 | 75 [5] | 77 [5] | 120 [5] | - | - | 9 [4] | **K3-90A00 . . .** / VS [7] | | 1 | 2,2 |
| | **100** [5] | 103 [5] | 148 [5] | 90 [5] | 93 [5] | 148 [5] | - | - | 9 [4] | **K3-115A00 . . .** / VS [7] | | 1 | 2,2 |

## Auxiliary Contact Blocks

| | **Rated Operational Current** **AC15** **230V** A | AC1 400V A | AC1 690V A | For Contactors | Contacts NO | NC | **Type** | Pack pcs. | Weight kg/pc. |
|---|---|---|---|---|---|---|---|---|---|
|  | **6** | 4 | 25 | K3-10.. to K3-115.. | - | 1 | **HA01** | 10 | 0,03 |
|  | **3** | 2 | 10 | K3-24.. to K3-115.. | 1 | 1 | **HB11** | 10 | 0,02 |
| | **3** | 2 | 10 | for side mounting | - | 2 | **HB02** | 10 | 0,02 |
|  | **3** | 2 | 10 | K3-10.. to K3-115.. | 1 | - | **HN10** | 10 | 0,02 |
| | **3** | 2 | 10 | K3-10.. to K3-115.. | - | 1 | **HN01** | 10 | 0,02 |

| **Suffix to contactor type** e.g. K3-18NK10 24 | **for contactor-Type K3-10.. to K3-74..** Voltage Marking at the coil for 50Hz V | for 60Hz V | Rated Control Voltage $U_s$ range for 50Hz min. V | max. V | for 60Hz min. V | max. V |
|---|---|---|---|---|---|---|
| 24 | 24 | 24 | 22 | 24 | 24 | 27 |
| 48 | 48 | 48 | 44 | 48 | 48 | 52 |
| 110 | 110 | 110-120 | 100 | 110 | 110 | 122 |
| 180 | 180-210 | 200-240 | 180 | 210 | 200 | 240 |
| **230** | **220-240** | **230-264** | **220** | **240** | **230** | **264** |
| 400 | 380-415 | 400-440 | 380 | 415 | 400 | 460 |

| **Suffix to contactor type** z.B.: K3-90K00 230 | **for contactor-Type K3-90.. to K3-115..** Voltage Marking at the coil for 50/60Hz V | for DC V | Rated Control Voltage $U_s$ range for 50Hz min. V | max. V | for 60Hz min. V | max. V |
|---|---|---|---|---|---|---|
| 24 | 24 | 24 | 22 | 24 | 22 | 24 |
| 48 | 48 | 48 | 44 | 48 | 44 | 48 |
| 110 | 110-120 | 110 | 110 | 120 | 110 | 120 |
| 200 | 200-220 | 200 | 200 | 220 | 200 | 220 |
| **230** | **220-240** | **220** | **220** | **240** | **220** | **240** |
| 400 | 380-415 | - | 380 | 415 | 380 | 415 |

1) 4 HN.. or HA.. snap-on
2) 2 HB.. on the left or right side and 4 HN.. or HA.. snap-on
3) Consider the max. thermal current: $I_{th}$ 130A
4) 2 HB.. on the left or right side and 7 HN.. or HA.. snap-on
5) Consider the min. cross-section of conductor at max. load
7) Type 230 for AC- and DC-operating 220-240V 50/60Hz and 220V DC ( with integrated coil suppressor )
Type 230VS for AC-operating 220-240V 50Hz ( with integrated coil suppressor )

# Capacitor Switching Contactors

## Data according to IEC 947-4-1, EN 60947-4-1, VDE 0660

| Main Contacts | | Type | K3-18N(B)K | K3-24K | K3-32K | K3-50K | K3-62K | K3-74K | K3-90K | K3-115K |
|---|---|---|---|---|---|---|---|---|---|---|
| **Utilization category AC6b Switching of non-reaktive and reactiv 3-phase capacitor banks** | | | | | | | | | | |
| Ambient temperature ≤50°C | | | | | | | | | | |
| Rated operational current $I_e$ | 690V | A | 0-18 | 14-28 | 14-36 | 30-48 | 30-72 | 30-108 [1] | 50-115 | 50-144 [2] |
| Rated operational power | 220-240V | kVAr | 0-7 | 5-11 | 5-14 | 12-20 | 12-28 | 12-33 | 20-45 | 20-55 [2] |
| | 380-400V | kVAr | 0-12,5 | 10-20 | 10-25 | 20-33,3 | 20-50 | 20-75 [1] | 33-80 | 33-100 [2] |
| | 415-440V | kVAr | 0-13 | 10,5-22 | 10,5-27 | 23-36 | 23-53 | 23-75 [1] | 36-82 | 36-103 [2] |
| | 500V | kVAr | 0-15 | 12-25 | 12-30 | 26-40 | 26-60 | 26-75 | 43-100 | 43-120 [2] |
| | 525V | kVAr | 0-15 | 12-25 | 12-32 | 26-43 | 26-64 | 26-80 | 45-105 | 45-125 [2] |
| | 660-690V | kVAr | 0-20 | 17-33 | 17-41 | 36-55 | 36-82 | 36-120 | 57-120 | 57-148 [2] |
| | 750V | kVAr | - | - | - | - | - | - | 65-130 | 65-165 [2] |
| | 1000V | kVAr | - | - | - | - | - | - | 85-150 | 85-180 [2] |
| Ambient temperature ≤60°C | | | | | | | | | | |
| Rated operational current $I_e$ | 690V | A | 0-18 | 14-28 | 14-36 | 30-48 | 30-72 | 30-87 | 50-108 | 50-130 [2] |
| Rated operational power | 220-240V | kVAr | 0-7 | 5-11 | 5-14 | 12-20 | 12-28 | 12-30 | 20-40 | 20-50 [2] |
| | 380-400V | kVAr | 0-12,5 | 10-20 | 10-25 | 20-33,3 | 20-50 | 20-60 | 33-75 | 33-90 [2] |
| | 415-440V | kVAr | 0-13 | 10,5-22 | 10,5-27 | 23-36 | 23-53 | 23-64 | 36-77 | 36-93 [2] |
| | 500V | kVAr | 0-15 | 12-25 | 12-30 | 26-40 | 26-60 | 26-70 | 43-90 | 43-110 [2] |
| | 525V | kVAr | 0-15 | 12-25 | 12-32 | 26-43 | 26-64 | 26-75 | 45-95 | 45-115 [2] |
| | 660-690V | kVAr | 0-20 | 17-33 | 17-41 | 36-55 | 36-82 | 36-100 | 57-120 | 57-148 [2] |
| | 750V | kVAr | - | - | - | - | - | - | 65-130 | 65-165 [2] |
| | 1000V | kVAr | - | - | - | - | - | - | 85-150 | 85-180 [2] |

# Contactors

## Data according to IEC 947-4-1, EN 60947-4-1, VDE 0660

| Main Contacts | | Type | K3-10 | K3-14 | K3-18(B) | K3-22 | K3-24 | K3-32 | K3-40 | K3-50 | K3-62 | K3-74 | K3-90 | K3-115 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Utilization category AC6b Switching of reactive capacitor banks** | | | | | | | | | | | | | | |
| Ambient temperature ≤50°C | | | | | | | | | | | | | | |
| Rated operational current $I_e$ | 690V | A | 8 | 13 | 18 | 20 | 28 | 36 | 42 | 48 | 72 | 108 [1] | 115 | 144 [2] |
| Rated operational power | 220-240V | kVAr | 2,9 | 5 | 7 | 7,5 | 11 | 14 | 16 | 20 | 28 | 33 | 45 | 55 [2] |
| | 380-400V | kVAr | 5 | 9 | 12,5 | 13 | 20 | 25 | 27,5 | 33,3 | 50 | 75 [1] | 80 | 100 [2] |
| | 415-440V | kVAr | 5,5 | 9,5 | 13 | 14 | 22 | 27 | 30 | 36 | 53 | 75 [1] | 82 | 103 [2] |
| | 500V | kVAr | 6 | 11 | 15 | 17 | 25 | 30 | 36 | 40 | 60 | 75 | 100 | 125 [2] |
| | 525V | kVAr | 6 | 11 | 15 | 17 | 25 | 32 | 36 | 43 | 64 | 80 | 105 | 125 [2] |
| | 660-690V | kVAr | 8 | 15 | 20 | 22 | 33 | 41 | 48 | 55 | 82 | 120 | 120 | 148 [2] |
| | 750V | kVAr | - | - | - | - | - | - | - | - | - | - | 130 | 165 [2] |
| | 1000V | kVAr | - | - | - | - | - | - | - | - | - | - | 150 | 180 [2] |
| Ambient temperature ≤60°C | | | | | | | | | | | | | | |
| Rated operational current $I_e$ | 690V | A | 8 | 13 | 18 | 20 | 28 | 36 | 42 | 48 | 72 | 87 | 108 | 130 [2] |
| Rated operational power | 220-240V | kVAr | 2,9 | 5 | 7 | 7,5 | 11 | 14 | 16 | 20 | 28 | 30 | 40 | 50 [2] |
| | 380-400V | kVAr | 5 | 9 | 12,5 | 13 | 20 | 25 | 27,5 | 33,3 | 50 | 60 | 75 | 90 [2] |
| | 415-440V | kVAr | 5,5 | 9,5 | 13 | 14 | 22 | 27 | 30 | 36 | 53 | 64 | 77 | 93 [2] |
| | 500V | kVAr | 6 | 11 | 15 | 17 | 25 | 30 | 36 | 40 | 60 | 70 | 90 | 110 [2] |
| | 525V | kVAr | 6 | 11 | 15 | 17 | 25 | 32 | 36 | 43 | 64 | 75 | 95 | 115 [2] |
| | 660-690V | kVAr | 8 | 15 | 20 | 22 | 33 | 41 | 48 | 55 | 82 | 100 | 120 | 148 [2] |
| | 750V | kVAr | - | - | - | - | - | - | - | - | - | - | 130 | 165 [2] |
| | 1000V | kVAr | - | - | - | - | - | - | - | - | - | - | 150 | 180 [2] |

1) Consider the max. thermal current: $I_{th}$ 130A
2) Consider the min. cross-section of conductor at max. load

## Data according to IEC 947-4-1, EN 60947-4-1, VDE 0660

| **Main Contacts** | Type | **K3-10** | **K3-14** | **K3-18** | **K3-22** | **K3-24** | **K3-32** | **K3-40** | **K3-50** | **K3-62** | **K3-74** | **K3-90** | **K3-115** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rated insulation voltage $U_i$** [1] | V AC | 690 | 690 | 690 | 690 | 690 | 690 | 690 | 830 | 830 | 830 | 1000 | 1000 |
| Rated operational current $I_e$ (=$I_{th}$) at 40°C, open 690V | **A** | **25** | **25** | **32** | **32** | **50** | **65** | **80** | **110** | **120** | **130** | **160** | **200** |
| **Maximum ambient temperature** | | | | | | | | | | | | | |
| Operation open | °C | -40 to +60 (+90) [2] | | | | | | | | | | | |
| enclosed | °C | -40 to +40 | | | | | | | | | | | |
| Storage | °C | -50 to +90 | | | | | | | | | | | |
| **Short circuit protection** | | | | | | | | | | | | | |
| Coordination-type „1" acc. to IEC 947-4-1 | | | | | | | | | | | | | |
| Contact welding without hazard of persons | | | | | | | | | | | | | |
| fuse size from gL (gG) | A | 35 | 35 | 35 | 35 | 50 | 63 | 63 | 80 | 125 | 160 | 160 | 160 |
| to gL (gG) | A | 63 | 63 | 63 | 80 | 100 | 100 | 160 | 160 | 200 | 200 | 250 | |
| **Cable cross-sections** | | | | | | | | | | | | | |
| for contactors without thermal overload relay | | | | | | | | | | | | | |
| 1 cable per clamp | | | | | | | | | | | | | |
| main connector solid or stranded | mm² | 0,75 - 6 | | | | 1,5 - 25 | | | 4 - 50 | | | 0,5 - 95 | |
| 10 - 120 | | | | | | | | | | | | | |
| flexible | mm² | 1 - 4 | | | | 2,5 - 16 | | | 10 - 35 | | | 0,5 - 70 | |
| 25 - 95 | | | | | | | | | | | | | |
| flexible with multicore cable end | mm² | 0,75 - 4 | | | | 1,5 - 16 | | | 6 - 35 | | | 0,5 - 70 | |
| 10 - 95 | | | | | | | | | | | | | |
| 2 cables per clamp | | | | | | | | | | | | top | below |
| solid or stranded | mm² | 6+(1-6) / 4+(0,75-4) | | | | 16+(2,5-6) / 10+(4-10) | | | 50+4 / 35+6 / 25+(6-16) | | | 0,5-95 | + 10-120 |
| | | 2,5+(0,75-2,5) / 1,5+(0,75-1,5) | | | | 6+(4-6) / 4+(2,5-4) | | | 16+(6-16) / 10+(6-16) | | | | |
| flexible | mm² | 6+(1,5-6) / 4+(1-4) | | | | 16+(2,5-6) / 10+(4-10) | | | 50+(4-10) / 35+(4-16) | | | 0,5-70 | + 10-95 |
| | | 2,5+(0,75-2,5) / 1,5+(0,75-1,5) | | | | 6+(4-6) / 4+(2,5-4) | | | 25+(4-25) / 16+(4-16) | | | | |
| Cables per clamp | | 2 | | | | 2 | | | 2 | | | 1+1 | |
| Screw / screw driver | | M3,5 / Pz2 | | | | M5 / Pz2 | | | M6 / Pz3 | | | M8 / 4mm-inbus | |
| Tightening torque | Nm/*lb.inch* | 0,8-1,4 / *7-12* | | | | 2,5-3 / *22-26* | | | 3,5-4,5 / *31-40* | | | 4-6,5 / *35-57* | |
| for main connector solid | AWG | 18 - 10 | | | | 16 - 10 | | | 12 - 10 | | | - | |
| flexible | AWG | 18 - 10 | | | | 14 - 4 | | | 10 - 0 | | | - | |
| Cables per clamp | | 2 | | | | 1 | | | 1 | | | - | |
| | | | | | | | | | | | | top | below |
| solid | AWG | 10+(16-10) / 12+(18-12) | | | | 10+(16-10) / 12+(18-12) | | | 10+(12-10) / 12+12 | | | 18-10 | - |
| | | 14+(18-14) / 16+(18-16) | | | | 14+(18-14) / 16+(18-16) | | | | | | | |
| flexible | AWG | 10+(14-10) / 12+(18-12) | | | | 4+(18-12) / 6+(18-8) | | | 1+(12-10) / 2+(8-12) | | | 18-3/0 | 8-4/0 |
| | | 14+(18-14) / 16+(18-16) | | | | 8+(18-8) / 10+(18-12) | | | 3+(12-8) / 4+(10-6) | | | | |
| Cables per clamp | | 2 | | | | 2 | | | 2 | | | 1+1 | |
| **Mechanical life** | | | | | | | | | | | | | |
| AC operated | S x $10^6$ | 10 | | | | 10 | | | 10 | | | 5 | |
| DC operated | S x $10^6$ | 10 | | | | 10 | | | 10 | | | 5 | |
| **Short time current** 10s-current | A | 96 | 120 | 144 | 176 | 184 | 240 | 296 | 360 | 504 | 592 | 680 | 880 |
| **Power loss** | | | | | | | | | | | | | |
| per pole at $I_e$/AC3 400V | W | 0,21 | 0,35 | 0,5 | 0,75 | 0,7 | 1,3 | 2 | 2,2 | 3,9 | 5,5 | 4,3 | 6,0 |
| **Auxiliary Contacts** | | | | | | | | | | | | | |
| **Rated insulation voltage $U_i$** [1] | V~ | 690 | | | | - | | | - | | | - | |
| **Thermal rated current $I_{th}$** to 690V | | | | | | | | | | | | | |
| Ambient temperature 40°C | A | 16 | | | | - | | | - | | | - | |
| 60°C | A | 12 | | | | - | | | - | | | - | |
| **Utilization category AC15** 220-240V | A | 12 | | | | - | | | - | | | - | |
| Rated operational 380-415V | A | 4 | | | | - | | | - | | | - | |
| current $I_e$ 440V | A | 4 | | | | - | | | - | | | - | |
| 500V | A | 3 | | | | - | | | - | | | - | |
| 660-690V | A | 1 | | | | - | | | - | | | - | |
| **Utilization category DC13** 60V | A | 8 | | | | - | | | - | | | - | |
| Rated operational 110V | A | 1 | | | | - | | | - | | | - | |
| current $I_e$ 220V | A | 0,1 | | | | - | | | - | | | - | |
| **Short circuit protection** | | | | | | | | | | | | | |
| short-circuit current 1kA, | | | | | | | | | | | | | |
| contact welding not accepted | | | | | | | | | | | | | |
| max. fuse size gL (gG) | A | 25 | | | | - | | | - | | | - | |

1) Suitable at 690V for: earthed-neutral systems, overvoltage category I to IV, pollution degree 3 (standard-industry): Uimp = 8kV.
Data for other conditions on request.

2) With reduced control voltage range 0,9 up to 1,0 x $U_s$ and with reduced rated current $I_e$ /AC1according to $I_e$ /AC3

## Data according to IEC 947-4-1, EN 60947-4-1, VDE 0660

| | | Type | K3-10 | K3-14 | K3-18(B) | K3-22 | K3-24 | K3-32 | K3-40 | K3-50 | K3-62 | K3-74 | K3-90 | K3-115 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Control Circuit** | | | | | | | | | | | | | | |
| **Power consumption of coils** | | | | | | | | | | | | | | |
| AC operated | inrush | VA | | | 33-45 | | | 90-115 | | | 140-165 | | | 190-280 |
| | sealed | VA | | | 7-10 | | | 9-13 | | | 13-18 | | | 2,5-5 |
| | | W | | | 2,6-3 | | | 2,7-4 | | | 5,4-7 | | | 2,5-5 |
| DC operated | inrush | W | | | 75 | | | 140 | | | 200 | | | 190-280 |
| | sealed | W | | | 2 | | | 2 | | | 6 | | | 2,5-5 |
| **Operation range of coils** | | | | | | | | | | | | | | |
| in multiples of control voltage $U_s$ | | | | | | | | | | | | | | |
| AC operated | | | | | 0,85-1,1 | | | 0,85-1,1 | | | 0,85-1,1 | | | 0,85-1,1 |
| DC operated | | | | | 0,8-1,1 | | | 0,8-1,1 | | | 0,8-1,1 | | | 0,8-1,1 |
| **Switching time** | | | | | | | | | | | | | | |
| at control voltage $U_s$ ±10% [1) 2)] | | | | | | | | | | | | | | |
| AC operated | make time | ms | | | 8-16 | | | 10-25 | | | 12-28 | | | 20-35 |
| | release time | ms | | | 5-13 | | | 8-15 | | | 8-15 | | | 35-50 |
| | arc duration | ms | | | 10-15 | | | 10-15 | | | 10-15 | | | 10-15 |
| DC operated | make time | ms | | | 8-12 | | | 10-20 | | | 12-23 | | | 20-35 |
| | release time | ms | | | 8-13 | | | 10-15 | | | 10-18 | | | 35-50 |
| | arc duration | ms | | | 10-15 | | | 10-15 | | | 10-15 | | | 10-15 |
| **Cable cross-section** | | | | | | | | | | | | | | |
| Auxiliary connector | solid | mm² | | | 0,75-6 | | | - | | | - | | | - |
| | flexible | mm² | | | 1-4 | | | - | | | - | | | - |
| flexible with multicore cable end | | mm² | | | 0,75-4 | | | - | | | - | | | - |
| Magnet coil | solid | mm² | | | 0,75-2,5 | | | 0,75-2,5 | | | 0,75-2,5 | | | 0,75-2,5 |
| | flexible | mm² | | | 0,5-2,5 | | | 0,5-2,5 | | | 0,5-2,5 | | | 0,5-2,5 |
| flexible with multicore cable end | | mm² | | | 0,5-1,5 | | | 0,5-1,5 | | | 0,5-1,5 | | | 0,5-1,5 |
| Clamps per pole | | | | | 2 | | | 2 | | | 2 | | | 2 |
| Screw / screw driver | | | | | M3,5 / Pz2 | | | M3,5 / Pz2 | | | M3,5 / Pz2 | | | M3,5 / Pz2 |
| Tightening torque | | Nm/*lb.inch* | | | 0,8-1,4 / *7-12* | | | 0,8-1,4 / *7-12* | | | 0,8-1,4 / *7-12* | | | 0,8-1,4 / *7-12* |
| Auxiliary connector | solid | AWG | | | 18 - 10- | | | - | | | - | | | - |
| | flexible | AWG | | | 18 - 10 | | | - | | | - | | | - |
| Magnet coil | solid | AWG | | | 14 - 12 | | | 14 - 12 | | | 14 - 12 | | | 14 - 12 |
| | flexible | AWG | | | 18 - 12 | | | 18 - 12 | | | 18 - 12 | | | 18 - 12 |
| Clamps per pole | | | | | 2 | | | 2 | | | 2 | | | 2 |

# Capacitor Switching Contactors for North America

## Data according to UL508

| **Main Contacts (cULus)** | | Type | K3-18N(B)K | K3-24K | K3-32K | K3-50K | K3-62K | K3-74K | K3-90K | K3-115K |
|---|---|---|---|---|---|---|---|---|---|---|
| Rated operational power | | | | | | | | | | |
| of 3-phase capacitor banks | 110-120V | kVAr | 0-3,5 | 3-5,5 | 3-7 | 6,5-10 | 6,5-15 | 6,5-18 [3)] | 10-24 | 10-28 [4)] |
| at 60Hz (3ph) | 200V | kVAr | 0-6 | 4,5-10 | 4,5-12,5 | 10-16,7 | 10-25 | 10-32 [3)] | 17-40 | 17-46 [4)] |
| | 220-240V | kVAr | 0-7 | 5,5-11 | 5,5-15 | 12,5-20 | 12,5-30 | 12,5-36 [3)] | 20-47 | 20-56 [4)] |
| | 440-480V | kVAr | 0-15 | 11,5-25 | 11,5-30 | 25-40 | 25-60 | 25-72 [3)] | 40-95 | 40-114 [4)] |
| | 550-600V | kVAr | 0-18 | 14,5-30 | 14,5-35 | 31-50 | 31-75 | 31-90 [3)] | 50-120 | 50-143 [4)] |
| Fuse Class RK5 / Short-circuit current | | A/kA | 50/5 | 90/5 | 125/5 | 200/5 | 250/5 | 300/5 | 300/10 | 300/10 |
| Fuse Class T / Short-circuit current | | A/kA | 70/100 | 110/100 | 150/100 | 175/100 | 175/100 | 175/100 | 300/100 [5)] | 300/100 [5)] |
| Rated voltage | | V | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| **Auxiliary Contacts (cULus)** | | | A600 | - | - | - | - | - | - | - |

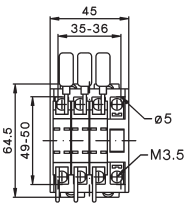
1) Total breaking time = release time + arc duration
2) Values for delay of the release time of the make contact and the make time of the break contact will be increased, if magnet coils are protected against voltage peaks (varistor, RC-unit, diode-unit)
3) Consider the max. thermal current of the contactor K3-74A: $I_{th}$ 130A
4) Consider the min. cross-section of conductor at max. load
5) Class T and Class RK1

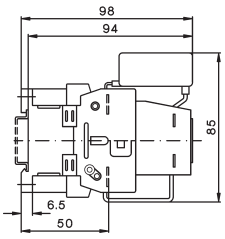
# Contactors

## Dimensions

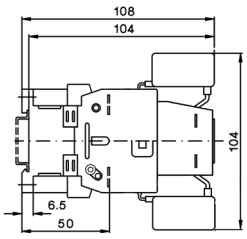
Capasitor switching contactors, AC operated

K3-18NK..



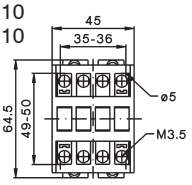



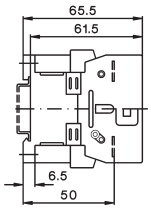

K3-18NBK..



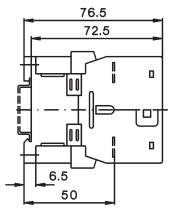

**Contactors AC-operated**

K3-10ND10
K3-14ND10
K3-18ND10
K3-22ND10

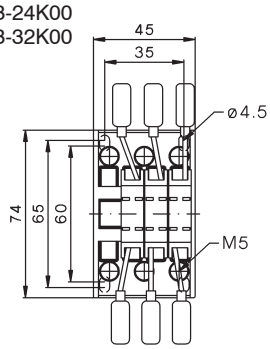


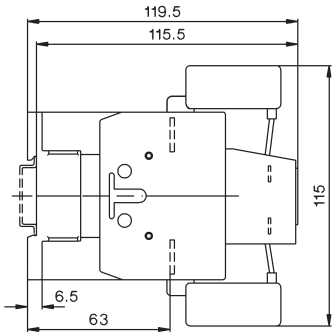




K3-18NB..

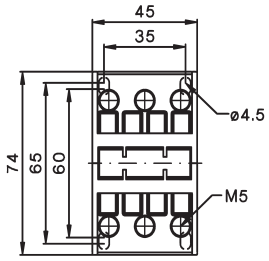


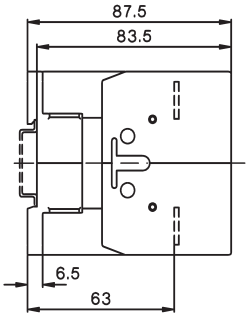

K3-24K00
K3-32K00



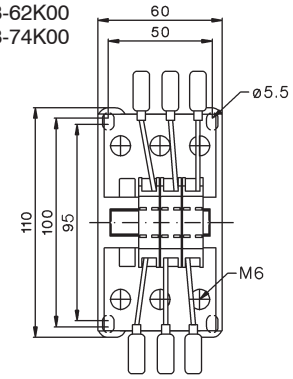



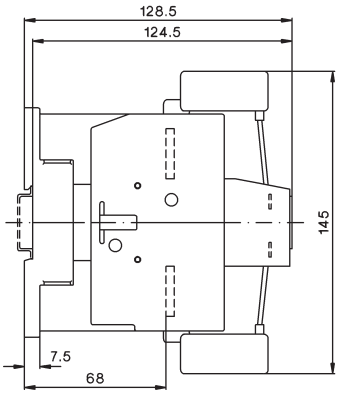

K3-24A00
K3-32A00
K3-40A00



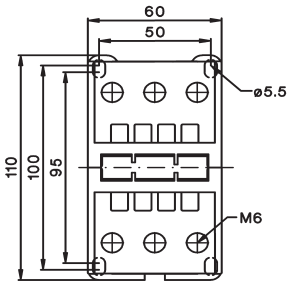



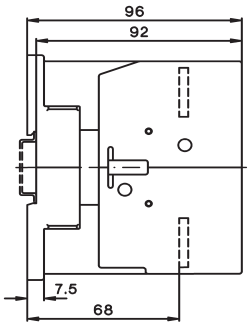

K3-50K00
K3-62K00
K3-74K00



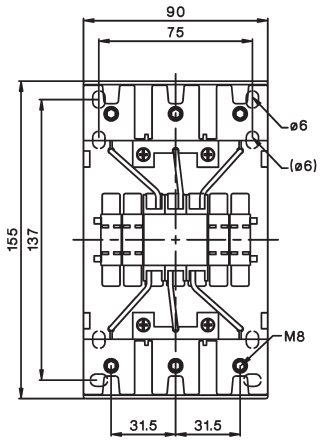



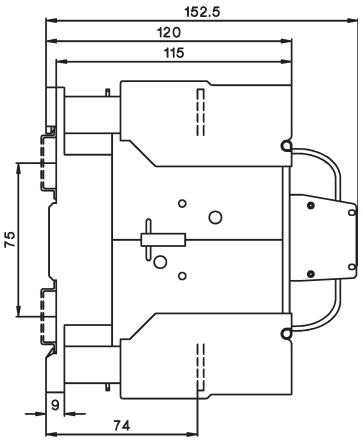

K3-50A00
K3-62A00
K3-74A00



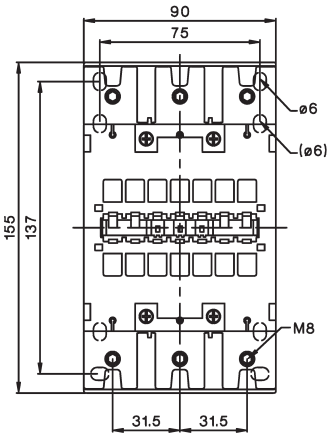



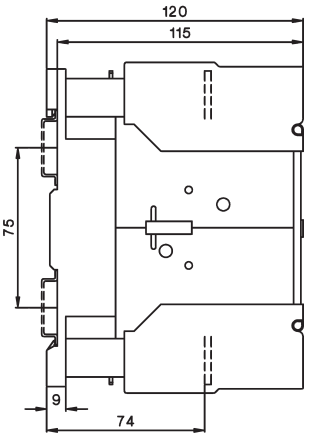

K3-90K00
K3-115K00



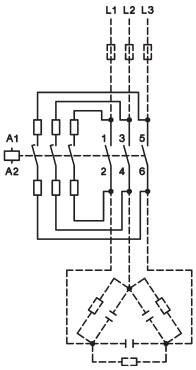




K3-90A00
K3-115A00

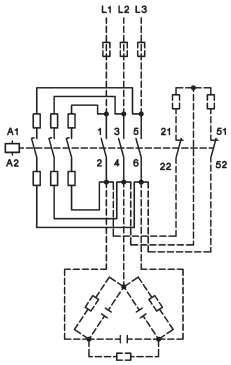


## Typical Circuit Diagram of Capacitor Switching Contactors




**Typical Circuit Diagram**




**Wiring Diagram for Quick Discharge Resistors**
Make sure that the current of the discharge resistors is not higher than the rated current (AC1) of the auxiliary contacts

## Contactor operation at direct switching of capacitors

### Theoretic view of function

### Make

In case of the pre-contacts during make, the current peaks are attenuate by resistor wires.
These current peaks would weld the main-contacts of contactor and they are also not good for the capacitors.

The total resistance of the resistor wires is mostly ohmic, the inductive one can be ignored.
The looking like a coil is only a case of construction.

The single controlled pre-contacts are increasing the safety of operating, in opposite of contamination during operation.

### Operation:

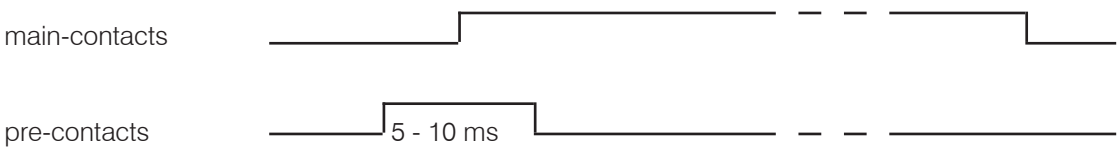
During operation the resistor wires are not getting warmer, because they are not in the circuit.

### Break:

Important: these contactors can be used for both installations, because the pre-contacts have no function during break, thus means that the peaks of the break-over voltage (power) of the chokes can´t make any damage.

## Description

### Function diagram

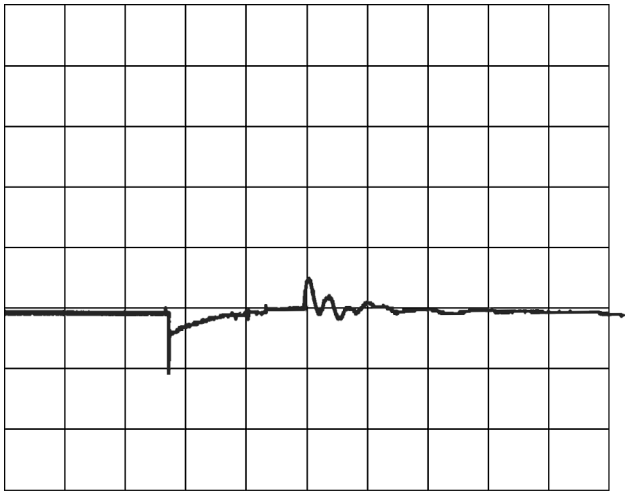



### Practical function - oscillogram

make with pre-contacts (B&J\Oszi11)

K3-18NK 12.5kVAr (18A / 400V)

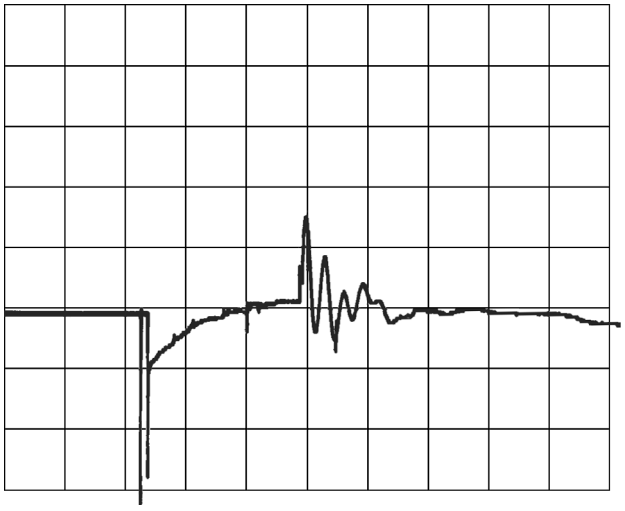
vertical: **250A** / div horizontal: 1ms / div



make with pre-contacts (B&J\Oszi10)

K3-18NK 12.5kVAr (18A / 400V)

vertical: **100A** / div horizontal: 1ms / div



Description:

The difference of the diagrams is the current scale only.

First current peak due to make of pre-contacts.

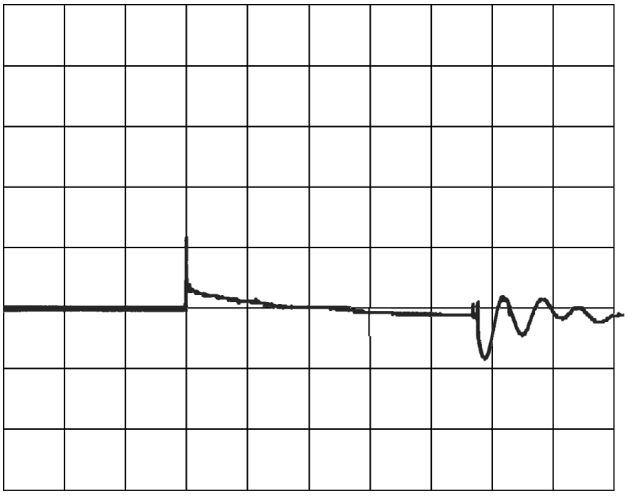
Second current peak due to building-up the main-circuit with noteable lower amplitude as the first and not so steep, that means lower frequency.

## Description

make **with** pre-contacts (B&J\Oszi13)

K3-18NK 12.5kVAr (18A / 400V)

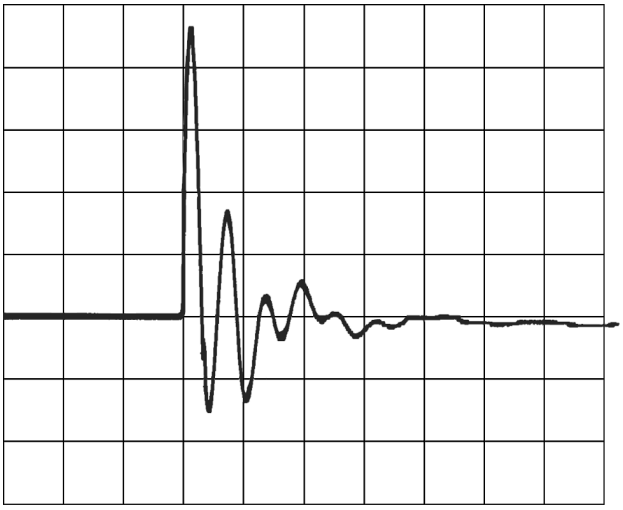
vertical: 250A / div horizontal: 0.5ms / div



make **without** pre-contacts (B&J\Oszi12)

K3-18ND 12.5kVAr (18A / 400V)

vertical: 250A / div horizontal: 0.5ms / div



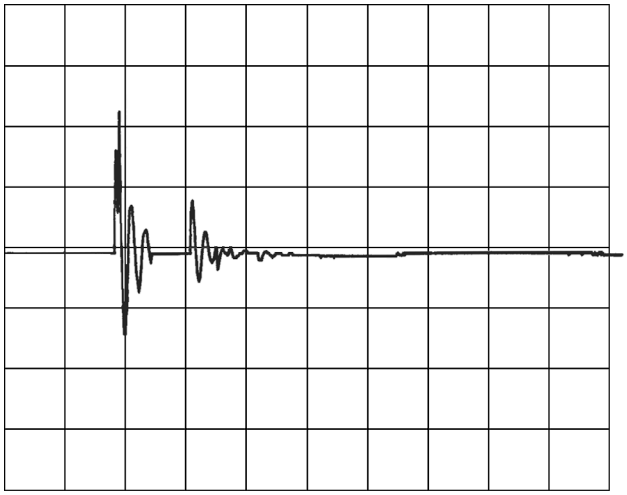
The right picture shows a make current peak without pre-contacts with about 1200A with high power in opposite to 280A with low power (power = integrated area).
Of course, the contactors endure a few switches without pre-contacts.

## Switching of capacitor banks at different conditions

make **without** pre-contacts (B&J\Oszi16)
**without** chokes

K3-62A 50kVAr (72A / 690V)

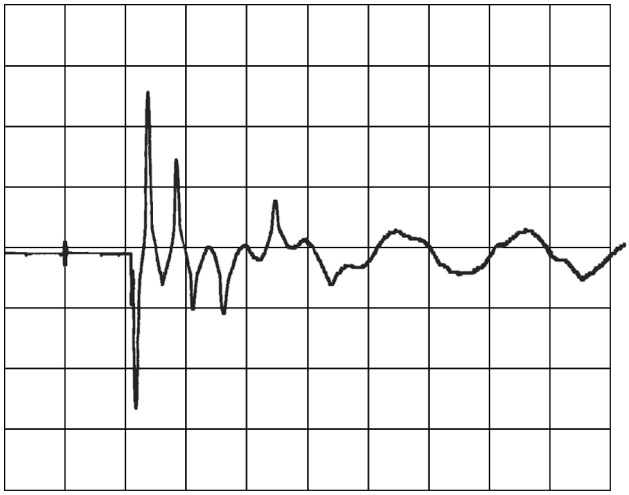
vertical: **2000A** / div horizontal: 0.625ms / div
10ms / div



make **without** pre-contacts (B&J\Oszi15)
**with** chokes

K3-62A 50kVAr (72A / 690V)

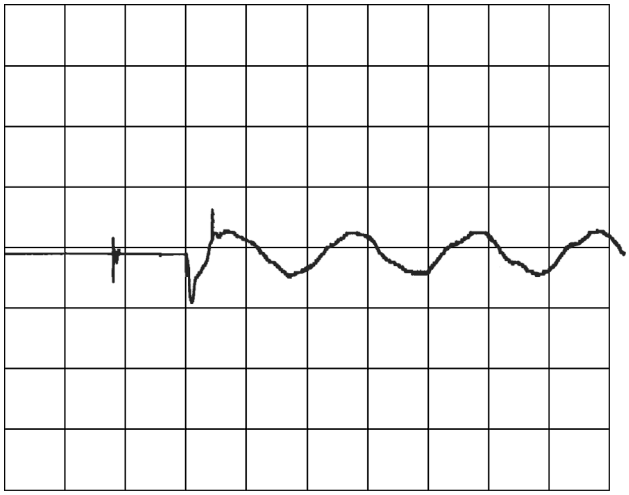
vertical: **200A** / div horizontal:



make **with** pre-contacts (B&J\Oszi14)
**with** chokes

K3-62K 50kVAr (72A / 690V)

vertical: **200A** / div horizontal: 10ms / div



The make current peak without pre-contacts and without chokes is higher than 4000A.

This peak can be reduced by the influence of chokes to approx. 500A.

In the last case we see the influce of chokes and pre-contacts of the „capacitor contactor“. The peak is reduced to approx. 200A.

Also the sinus-weave is very clear by the influence of chokes because you have reduced harmonic frequences.

**Notice:**

**Notice:**


Quality made in AUSTRIA

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