# Motor Protection Switches



## Index

## Motor Protection Switches Series BE5


BE500400

### Schrack-Info

- Motor protection switch 3-pole from 0.16A up to 32A

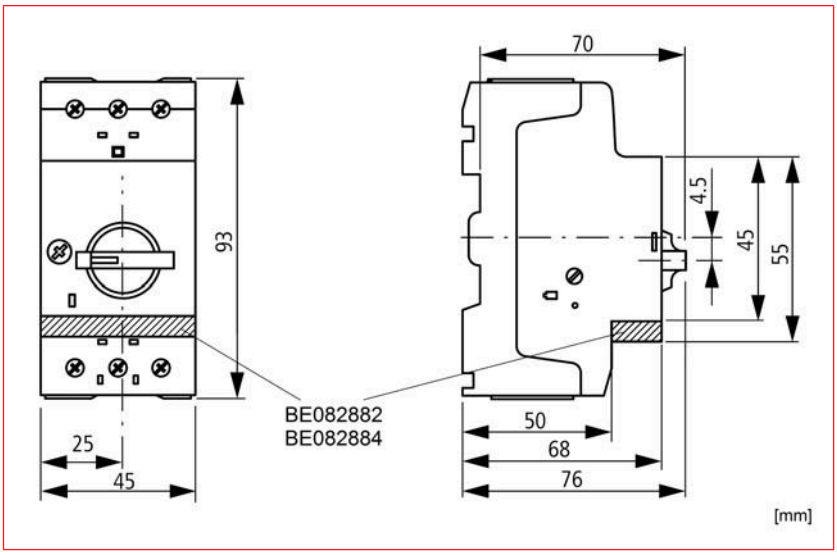
| | | | |
|---|---|---|---|
| Standards | | | EN 60647, IEC 60947 |
| Rated current $I_n$ | | | 0,1 - 25A |
| Rated uninterrupted current = rated operational current $I_u = I_e$ | | | 25A or current setting of the overcurrent release |
| Rated operational voltage $U_e$ | | | 690VAC |
| Rated frequency | | | 40 – 60Hz |
| Tripping | Overload | | adjustable 0,6 - 1 x $I_n$ |
| | Short circuit | | set permanently on 14 x $I_n$ |
| Phase failure protection | | | Yes |
| Tripping capacity | 0,1 - 10A | | 0,1 - 10A: inherently stable (100kA) |
| | 10 - 16A | | 50kA |
| | 16 - 25A | | 16kA |
| Direction of electric current | | | any |
| Rated impulse withstand voltage $U_{imp}$ | | | 6000VAC |
| Overvoltage category | | | III |
| Current heat loss (3 pole at operating temperature) | | | 6W |
| Lifespan | mechanical | | 10.000 operations |
| | electrical (AC-3At 400V) | | 10.000 operations |
| Maximum operating frequency | | | 40 operations per hour |
| Short-circuit rating | AC-3 (up to 690V) | | 25A |
| | DC-5 (up to 250V) | | 25A (3 contacts in series) |
| Rated making capacity | cos φ = 0,45 | 230 - 690VAC | 110A |
| Rated breaking capacity | cos φ = 0,45 | 230VAC | 90A |
| | cos φ = 0,45 | 400VAC | 90A |
| | cos φ = 0,45 | 500VAC | 64A |
| | cos φ = 0,45 | 690VAC | 54A |
| Rated operational current enclosed, not enclosed $I_e$ | AC-1-application | 230VAC | 16A |
| | | 400VAC | 16A |
| | | 440VAC | 16A |
| | | 500VAC | 16A |
| | | 690VAC | 16A |
| | AC-3-application | 230VAC | 8,7A |
| | | 400VAC | 8,8A |
| | | 440VAC | 7,7A |
| | | 500VAC | 6,4A |
| | | 690VAC | 4,8A |
| | AC-4-application | 230VAC | 6,6A |
| | | 400VAC | 6,6A |
| | | 440VAC | 6A |
| | | 500VAC | 5A |
| | | 690VAC | 3,4A |

## Motor Protection Switches Series BE5

| | | |
|---|---|---|
| Degree of protection | Device | Device IP20 |
| | Terminations | Terminations IP00 |
| Protection against direct contact | | Finger and back-of-hand proof |
| Mechanical shock resistance half-sinusoidal shock 10ms to IEC 60068-2-27 | | 25g |
| Altitude | | max. 2000m |
| Climatic proofing | | Damp heat, constant, to IEC 60068-2-78 |
| | | Damp heat, cyclic, to IEC 60068-2-30 |
| Pollution degree | | 3 |
| Ambient temperature | | Stock -25°C up to 80°C |
| | | Not enclosed -25°C up to 55°C |
| | | Enclosed -25°C up to 40°C |
| Terminals | Screw-terminals | Single wire 1 x 1 - 6mm$^2$ / 2 x 1 - 2,5mm$^2$ |
| | | Flexible with ferrule 1 x 1 - 4mm$^2$ / 2 x 1 - 2,5mm$^2$ |
| Torque | | Mains 1,7Nm |

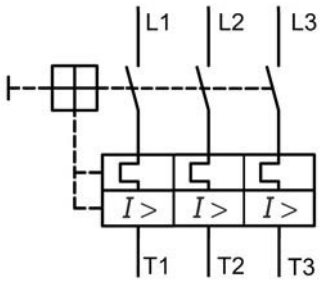
| Article | max. rated operational power AC-3 | | | | | Continuous rated current | Setting range | |
|---|---|---|---|---|---|---|---|---|
| | 220V, 230V, 240V P [kW] | 380V, 400V, 415V P [kW] | 440V P [kW] | 500V P [kW] | 660V, 690V P [kW] | $I_u$ | Overload tripping $I_r$ | Short circuit tripping $I_{rm}$ |
| BE500160 | - | - | - | - | 0.06 | 0.16 | 0.1 - 0.16 | 2.2 |
| BE500250 | - | 0.06 | 0.06 | 0.06 | 0.12 | 0.25 | 0.16 - 0.25 | 3.5 |
| BE500400 | 0.06 | 0.09 | 0.12 | 0.12 | 0.18 | 0.4 | 0.25 - 0.4 | 5.6 |
| BE500630 | 0.09 | 0.12 | 0.18 | 0.25 | 0.25 | 0.63 | 0.4 - 0.63 | 8.8 |
| BE501000 | 0.12 | 0.25 | 0.25 | 0.37 | 0.55 | 1 | 0.63 - 1 | 14 |
| BE501600 | 0.25 | 0.55 | 0.55 | 0.75 | 1.1 | 1.6 | 1 - 1.6 | 22 |
| BE502500 | 0.37 | 0.75 | 1.1 | 1.1 | 1.5 | 2.5 | 1.6 - 2.5 | 35 |
| BE504000 | 0.75 | 1.5 | 1.5 | 1.5 | 3 | 4 | 2.5 - 4 | 56 |
| BE506300 | 1.1 | 2.2 | 3 | 3 | 4 | 6.3 | 4 - 6.3 | 88 |
| BE510000 | 2.2 | 4 | 4 | 4 | 7.5 | 10 | 6.3 - 10 | 140 |
| BE516000 | 4 | 7.5 | 9 | 9 | 12.5 | 16 | 10 - 16 | 224 |
| BE520000 | 5.5 | 9 | 11 | 12.5 | 15 | 20 | 16 - 20 | 280 |
| BE525000 | 5.5 | 12.5 | 12.5 | 15 | 22 | 25 | 20 - 25 | 350 |

## Dimensions

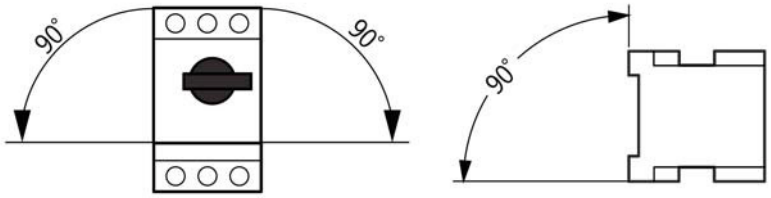


## Motor Protection Switches Series BE5

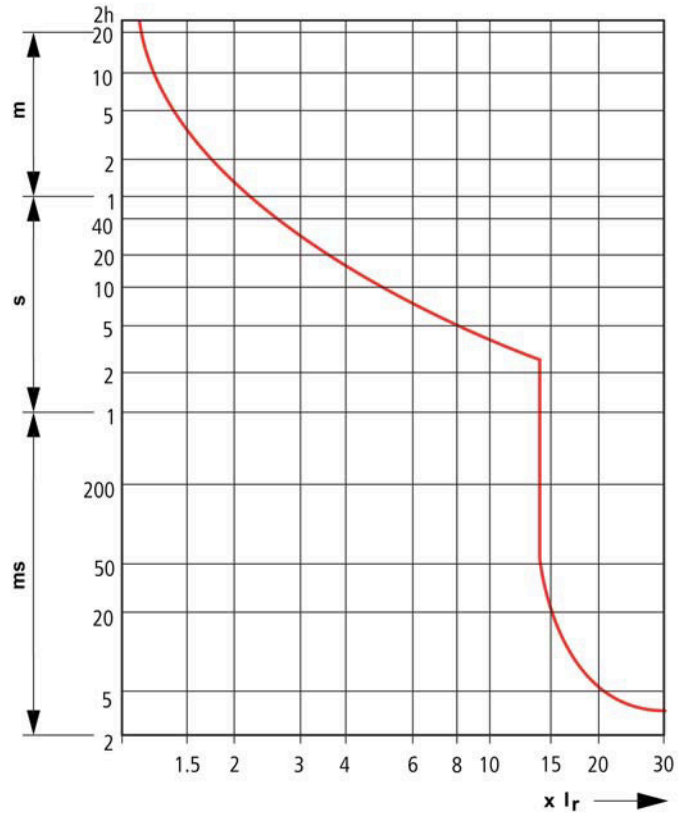
### Circuit Diagram




### Mounting Position

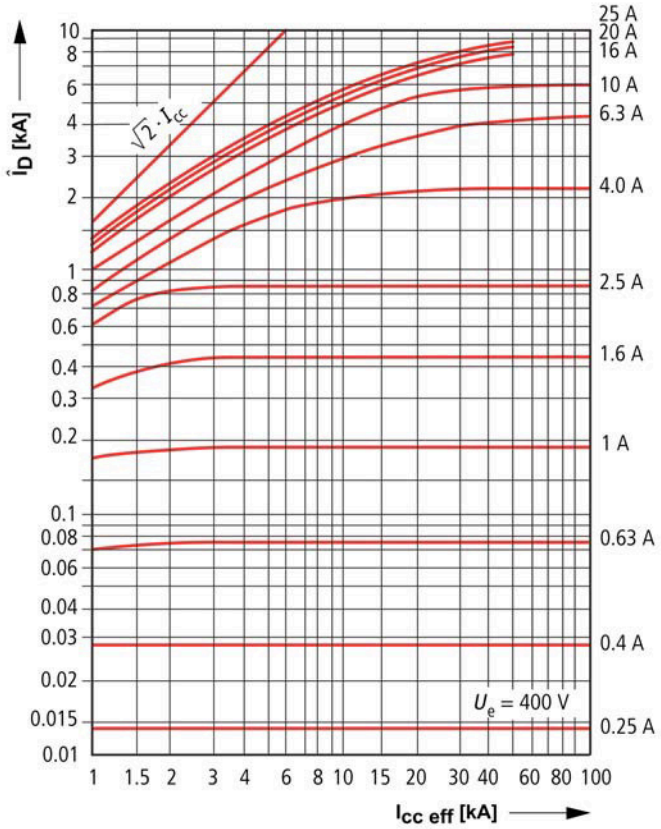



### Tripping Characteristic Curve



## Motor Protection Switches Series BE5

### Let-through Energy Diagram




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor protection switches series BE5** | | | |
| 0.16 - 0.25A | | | **BE500250** |
| 0.25 - 0.40A | | | **BE500400** |
| 0.40 - 0.63A | | | **BE500630** |
| 0.63 - 1.00A | | | **BE501000** |
| 1.00 - 1.60A | | | **BE501600** |
| 1.60 - 2.50A | | | **BE502500** |
| 2.5A-4.0A | | | **BE504000** |
| 4.0-6.3A | | | **BE506300** |
| 6.3-10A | | | **BE510000** |
| 10-16A | | | **BE516000** |
| 16-20A | | | **BE520000** |
| 20-25A | | | **BE525000** |
| 25-32A | | | **BE532000** |
| **Auxiliary contacts** | | | |
| Auxiliary contact front, 1NO+1NC | BE5/6-HIF11 | | **BE082882** |
| Auxiliary contact front, 1NO | BE5/6-HIF10 | | **BE082884** |

## Motor Protection Switches Series BE6

BE632000

### Schrack-Info

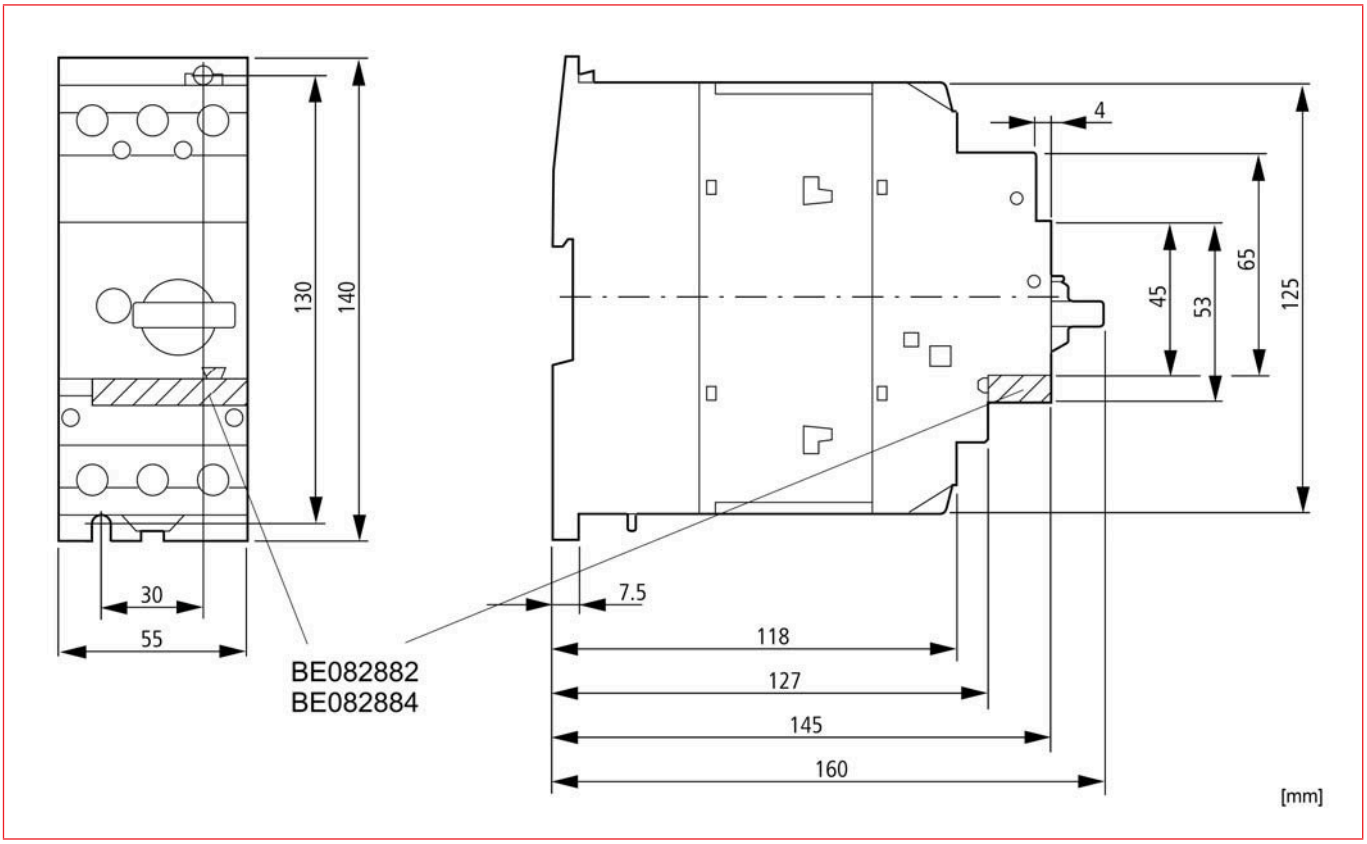
- Motor protection switch 3-pole from 24A up to 63A

| | | |
|---|---|---|
| Standards | | EN 60647, IEC 60947 |
| Rated current $I_n$ | | 32 - 63A |
| Rated uninterrupted current = rated operational current $I_u = I_e$ | | 63 A or current setting of the overcurrent release |
| Rated operational voltage g $U_e$ | | 690VAC |
| Rated frequency | | 40 – 60Hz |
| Tripping | Overload | adjustable 0,6 - 1 x $I_n$ |
| | Short circuit | set permanently on 14 x $I_n$ |
| Phase failure protection | | yes |
| Tripping capacity | | 50kA |
| Direction of electric current | | any |
| Rated impulse withstand voltage $U_{imp}$ | | 6000VAC |
| Overvoltage category | | III |
| Current heat loss (3 pole at operating temperature) | | 9,5W |
| Lifespan | mechanical | 30.000 operations |
| | electrical (AC-3 at 400V) | 30.000 operations |
| Maximum operating frequency | | 40 operations per hour |
| Short-circuit rating | AC-3 (up to 690V) | 63A |
| | DC-5 (up to 250V) | 63A (3 contacts in series) |
| Degree of protection | Device | IP20 |
| | Terminations | IP00 |
| Protection against direct contact | | Finger and back-of-hand proof |
| Mechanical shock resistance half-sinusoidal shock 10 ms to IEC 60068-2-27 | | 15g |
| Altitude | | max. 2000 m |
| Climatic proofing | | Damp heat, constant, to IEC 60068-2-78 |
| | | Damp heat, cyclic, to IEC 60068-2-30 |
| Pollution degree | | 3 |
| Ambient temperature | | Stock -25°C up tp 70°C |
| | | Not enclosed -25°C up to 55°C |
| | | Enclosed -25°C up to 40°C |
| Terminals | Screw-terminals | Single wire 1 x 1 - 50mm$^2$ / 2 x 1 - 35mm$^2$ |
| | | Flexible with ferrule 1 x 1 - 35mm$^2$ / 2 x 1 -35mm$^2$ |
| Torque | | Mains 3Nm |

## Motor Protection Switches Series BE6

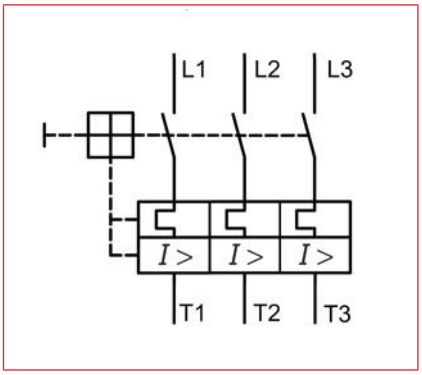
| Article | max. rated operational power AC-3 | | | | | Continuous rated current | Setting range | |
|---|---|---|---|---|---|---|---|---|
| | 220V, 230V, 240V P [kW] | 380V, 400V, 415V P [kW] | 440V P [kW] | 500V P [kW] | 660V, 690V P [kW] | $I_u$ | Overload tripping $I_r$ | Short circuit tripping $I_{rm}$ |
| BE632000 | 7,5 | 15 | 17,5 | 22 | 22 | 32 | 25 - 32 | 448 |
| BE640000 | 11 | 20 | 22 | 24 | 30 | 40 | 32-40 | 560 |
| BE650000 | 14 | 25 | 30 | 30 | 45 | 50 | 40-50 | 700 |
| BE658000 | 17 | 30 | 37 | 37 | 55 | 58 | 50-58 | 812 |
| BE663000 | 18,5 | 34 | 37 | 45 | 55 | 65 | 55-63 | 882 |

## Dimensions

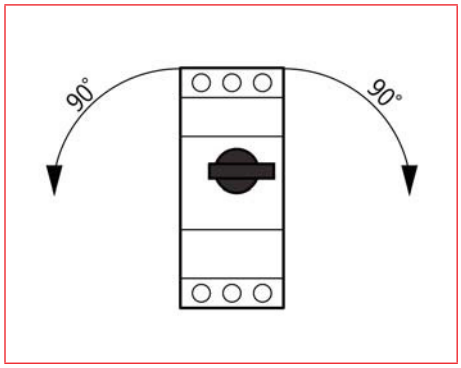


## Motor Protection Switches Series BE6

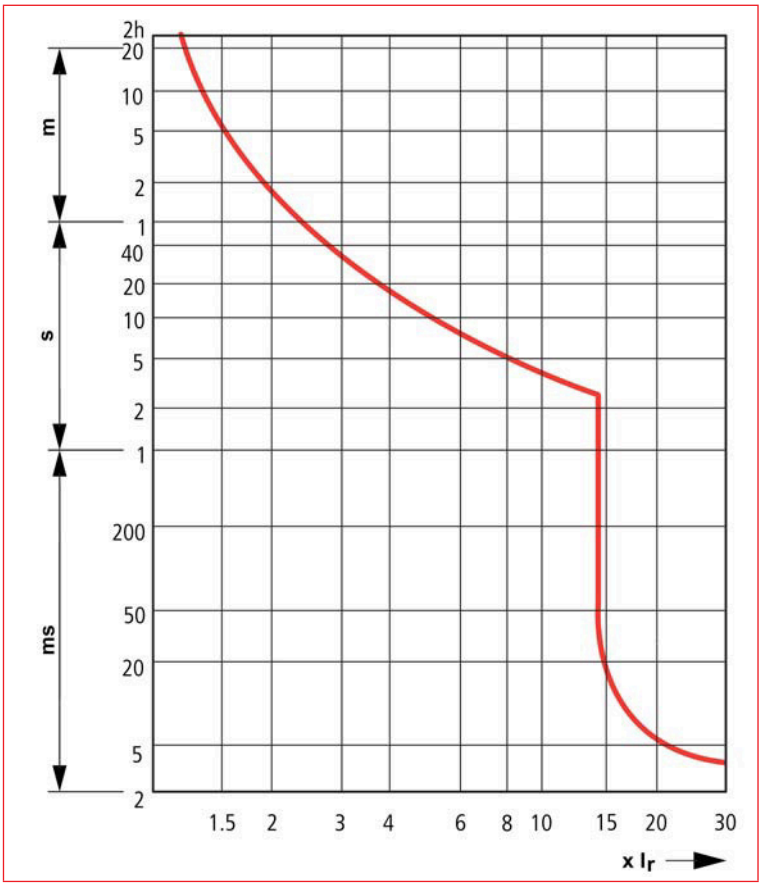
### Circuit Diagram




### Mounting Position

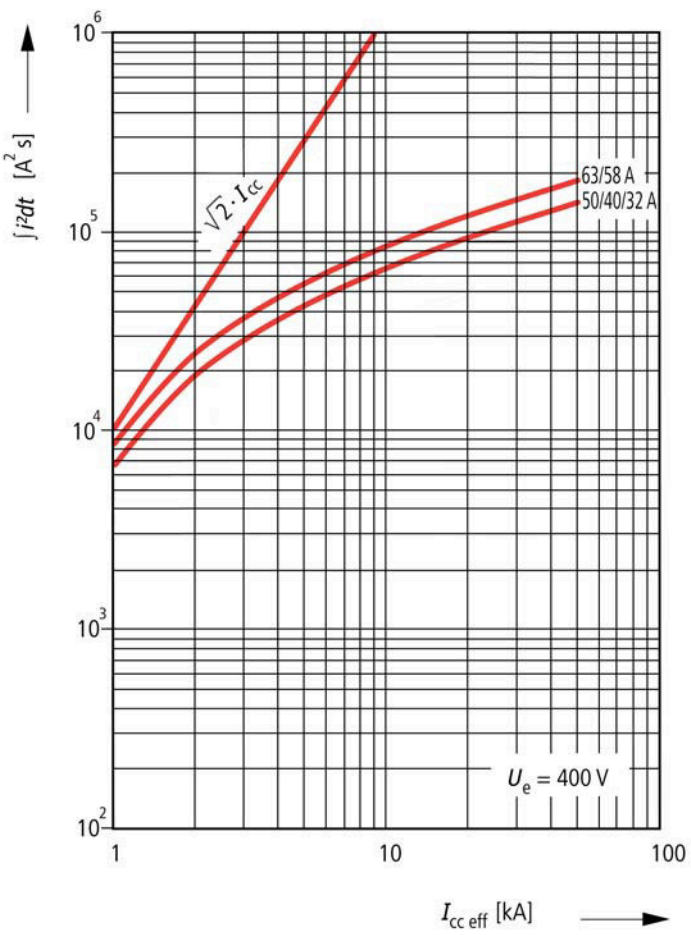



### Tripping Characteristic Curve



## Motor Protection Switches Series BE6

### Let-through Energy Diagram




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor Protection Switches Series BE6** | | | |
| 24-32A | | | **BE632000** |
| 32-40A | | | **BE640000** |
| 40-50A | | | **BE650000** |
| 50-58A | | | BE658000 |
| 55-63A | | | **BE663000** |
| **Auxiliary contacts** | | | |
| Auxiliary contact front, 1NO+1NC | BE5/6-HIF11 | | **BE082882** |
| Auxiliary contact front, 1NO | BE5/6-HIF10 | | **BE082884** |

## Feeding Terminal Blocks for BE5

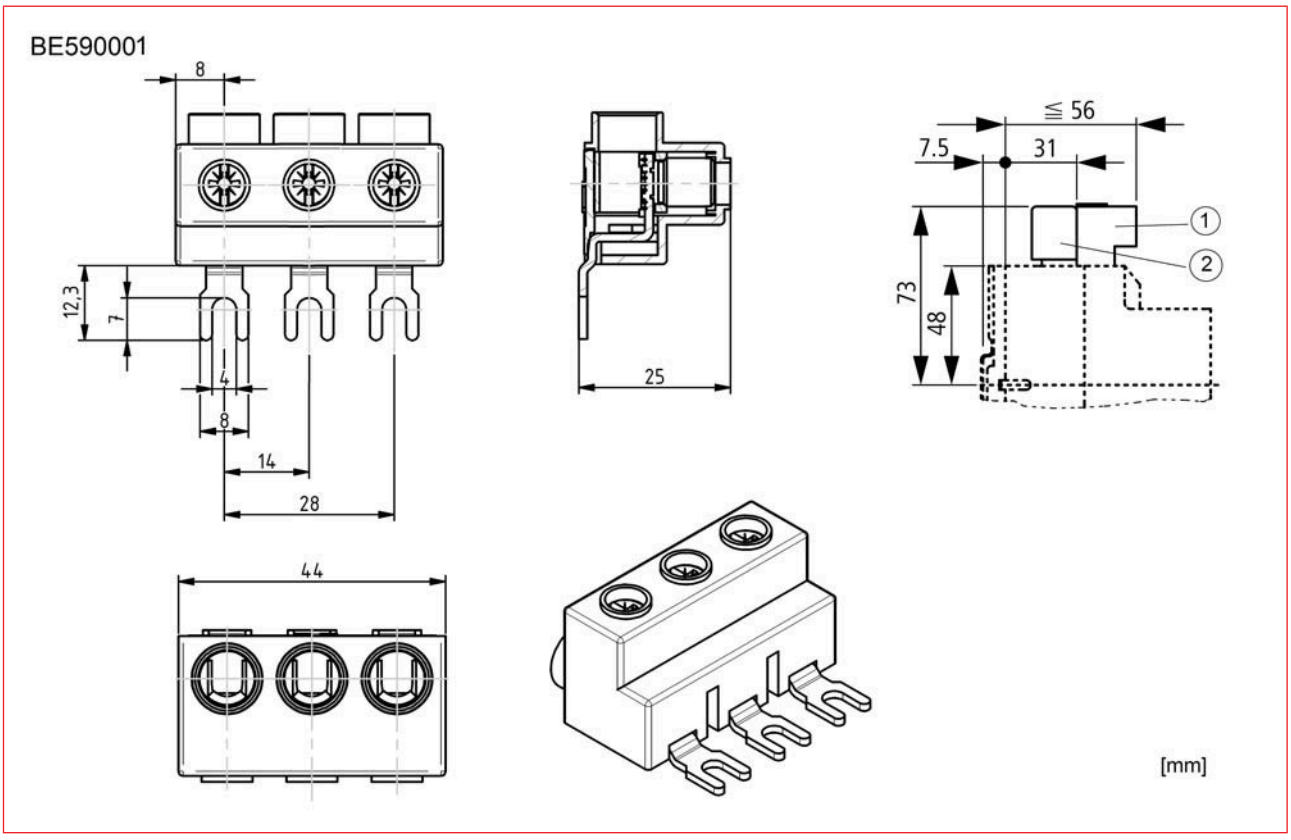
BE590001

### Schrack-Info

- Feed terminals BE590001 for Motor protection switches, additionally mountable to busbars, cover for modular devices (slot 45mm) can be mounted
- Feed terminals BE590002 for Motor protection switches, additionally mountable to busbars, cover for modular devices (slot 45mm) can not be mounted

| | BE590001 | BE590002 |
|---|---|---|
| Max.current: | 63 A | |
| Max. voltage: | 690 V | |
| Terminal-material: | brass | |
| Pin-material: | brass | |
| Cover: | PC / ABS - UL-V0 | |
| Thermal properties: | EN ISO 306 = 138°C | |
| Screw: | St 5.8 | |
| Stripped insulation: | 12 mm | |
| Terminal cross section: | U - single wire: 6 - 25 $mm^2$ | |
| | R - stranded wire: 6 - 25$mm^2$ | |
| | K - flexible with sleeve: 4 - 16 $mm^2$ | |
| | F - flexible with sleeve: 4 - 16 $mm^2$ | |
| Torque of screw: | 2 Nm | |

### Dimensions

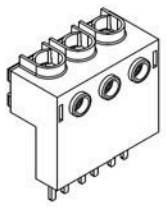


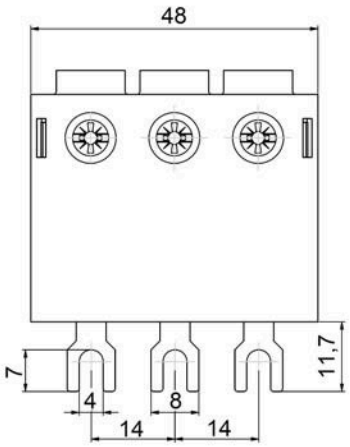

1) Feeding terminal block 2) Busbar

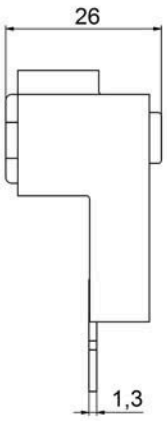
## Feeding Terminal Blocks for BE5

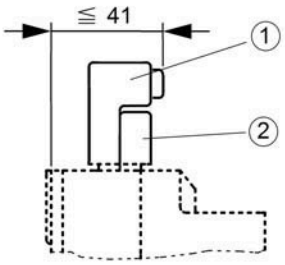
### Dimensions

BE590002






[mm]

1) Feeding terminal block 2) Busbar

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| 3-pole infeed terminal for BE5, 63A, up to 25mm², no cover can be mounted | BE5 | | **BE590001** |
| 3-pole infeed terminal for BE5, 63A, up to 25mm², cover can be mounted | BE5 | | **BE590002** |

## Busbars for BE5

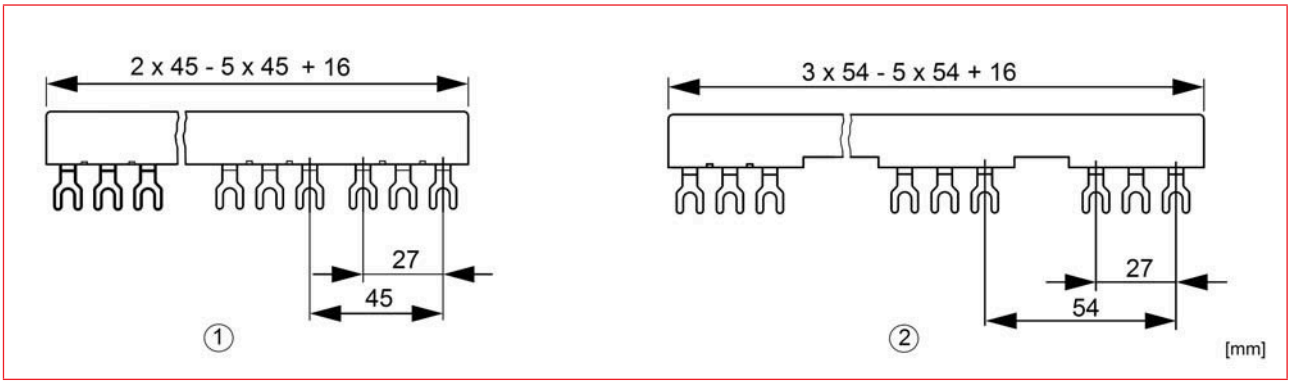

BE590245

### Schrack-Info

- Fork-busbar, rated current 63A
- Busbar for up to 5 Motor protection switches BE5, available for BE5 with or without "side mounted" auxiliary contacts
- Front mounted auxiliary contacts do not increase width of Motor protection switches
- When total current exceeds 63A - use busbar with 63A and feed in "centric" (middle infeed)

| | |
|---|---|
| Bausbar type: | Fork-busbar |
| Number of poles: | 3-pole |
| Max. current Is/Phase | 63 A |
| Mounting type: | not possible to break off |
| Cross section: | 10 $mm^2$ |
| Phase sequence: | L1, L2, L3,... |
| Standards: | EN 60947-1 / IEC 60947-1 |
| Material of busbar: | E – Cu 58 F25 |
| Insulation coordination: | Overvoltage category III |
| | Degree of pollution 2 |
| Protection class: | IP20 |
| Impulse voltage strength: | ≥ 4,5 kV (1 kV/mm clearance) |

### Dimensions



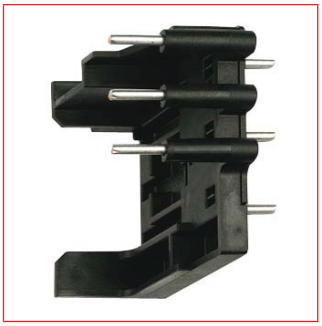

1) BE5 without auxiliary contact

2) BE5 with auxiliary contact

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| 3 phase busbar for 2xBE5 45mm fork | BE5 | | **BE590245** |
| 3 phase busbar for 3xBE5 45mm fork | BE5 | | **BE590345** |
| 3 phase busbar for 3xBE5+auxiliary contact, 54mm fork 63A | BE5 | | **BE590354** |
| 3 phase busbar for 4xBE5 45mm fork | BE5 | | **BE590445** |
| 3 phase busbar for 4xBE5+auxiliary contact, 54mm fork 63A | BE5 | | **BE590454** |
| 3 phase busbar for 5xBE5 45mm fork | BE5 | | **BE590545** |
| 3 phase busbar for 5xBE5+auxiliary contact, 54mm fork 63A | BE5 | | **BE590554** |



## Connection Link for Motor Protection Switches BE5, BE6



BE590011

### Schrack-Info

- Connection links for BE5 and contactors K3-10 up to K3-22 for construction of D.O.L. (direct on line) combinations, coordination type "1" 3~ 400V

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Connection block for BE5 to LA3 contactor | BE5 | | BE590011 |

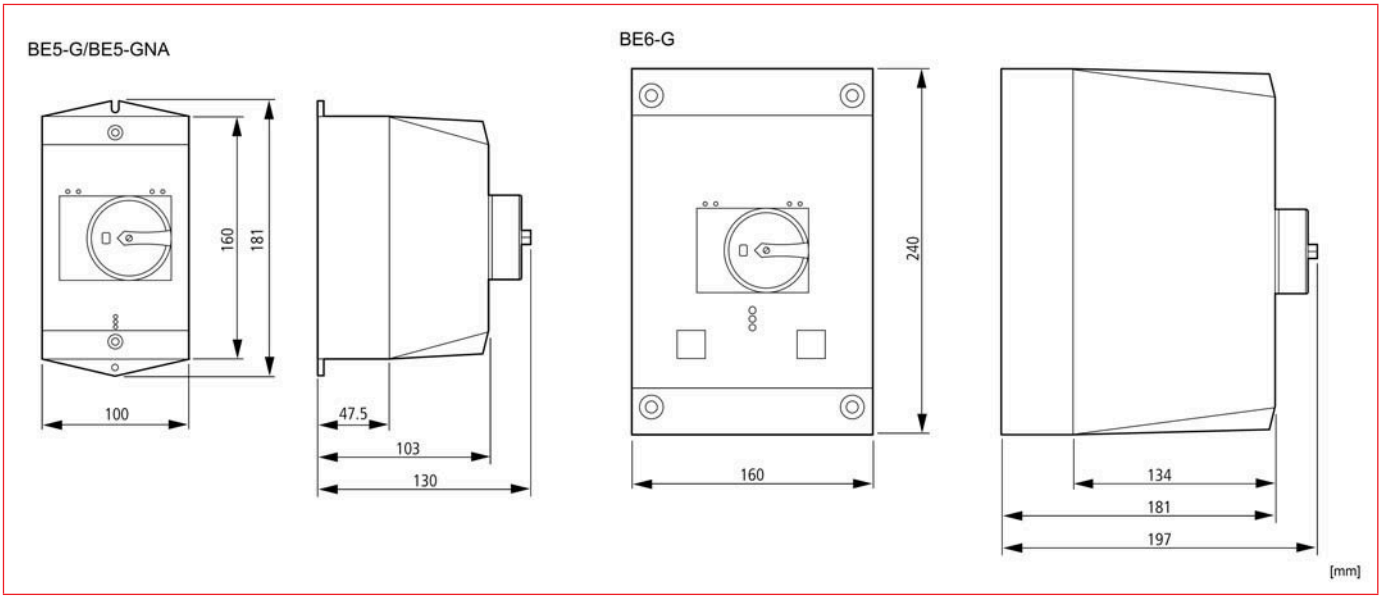
## Enclosures for BE5, BE6

BE599654

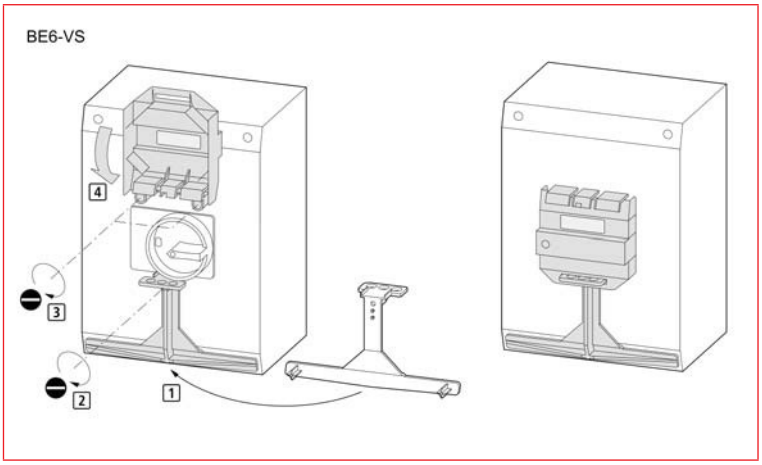
### Schrack-Info

- Plastic-housings for Motor protection switches series BE5 and BE6

### Dimensions

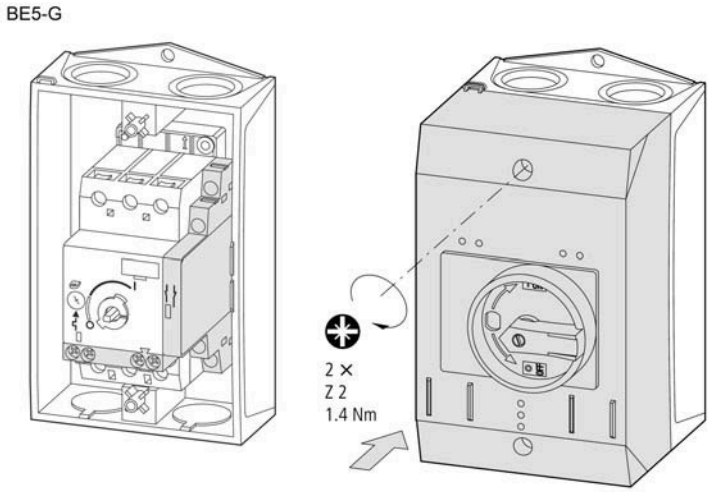



### Application

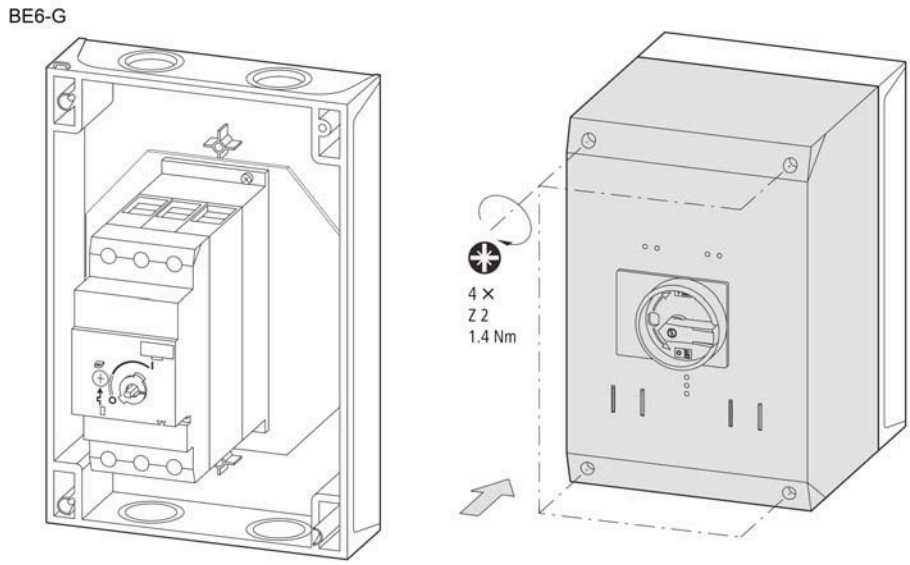


## Enclosures for BE5, BE6

### Application




### Application




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Box for motor protection switch BE5 | BE5-G | | **BE599654** |
| Box with emergency stop button for BE5 | BE5-GNA | | BE599655 |
| Box for motor protection switch BE6 | BE6-G | | **BE695524** |
| Padlock for box with main-switch for BE6 | BE6-VS | | BE695526 |

## Accessories for BE5, BE6


BE082884


BE072896

BE590851

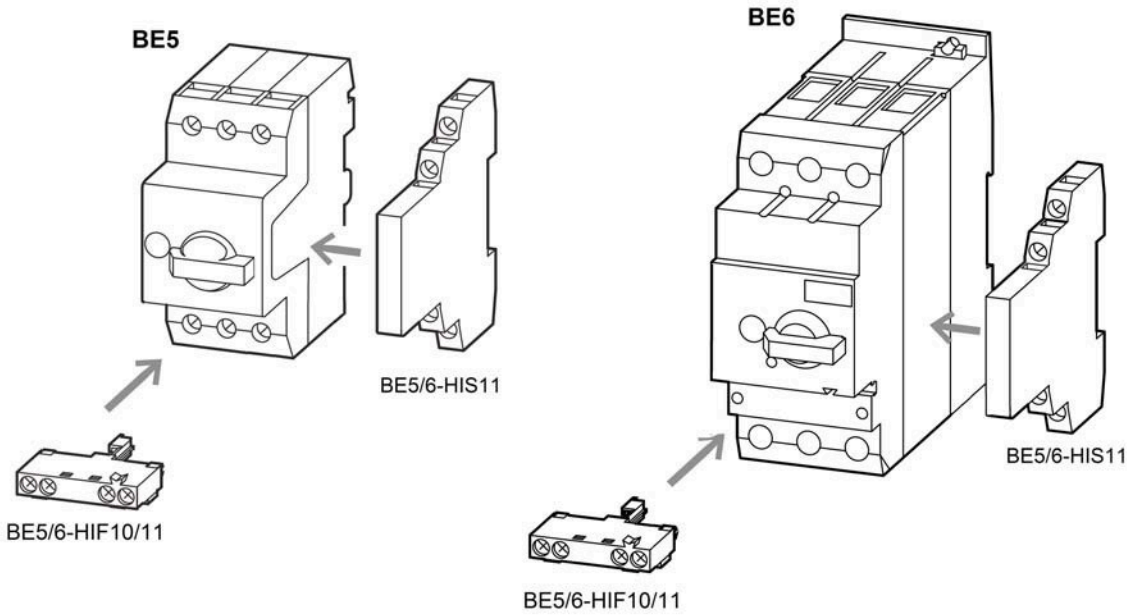
## Schrack-Info

- Accessories for Motor protection switches series BE5 or BE6

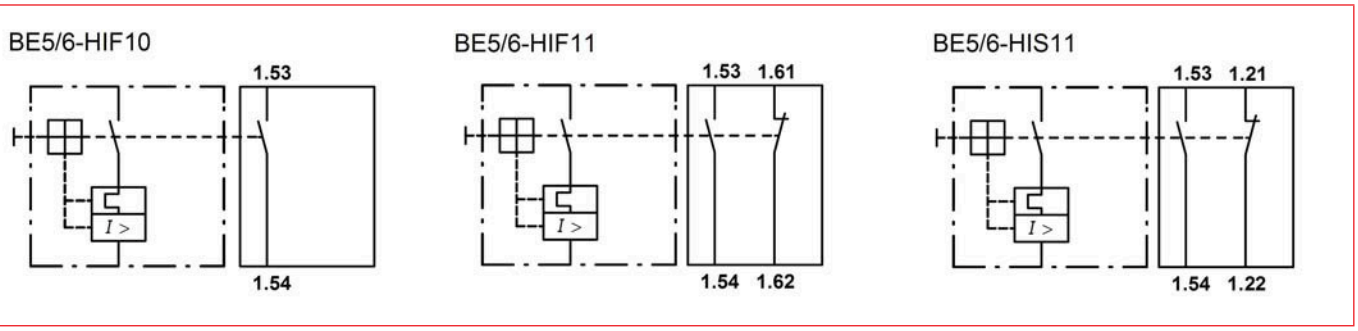
| **Articles** | | | **BE082884** | **BE082882** | **BE072896** |
|---|---|---|---|---|---|
| Type | | | Auxiliary-contact | Auxiliary-contact | Auxiliary-contact |
| Mounting | | | front | front | side |
| For product | | | BE5 and BE6 | BE5 and BE6 | BE5 and BE6 |
| Contacts | | | 1 NO | 1 NO + 1 NC | 1 NO + 1 NC |
| Rated impulse withstand voltage $U_{imp}$ | | | 4 kV-AC | | 6 kV-AC |
| Overvoltage category / Pollution degree | | | III/3 | | |
| Rated operational voltage | | | 440 V-AC | | 500 V-AC |
| | | | 250 V-DC | | 250 V-DC |
| Safe isolation according VDE 0106 part 101 and part 101/A1 between auxiliary contacts and main contacts | | | 690 V-AC | | 690 V-AC |
| Rated current | AC-15 | 220 – 240 V $I_e$ | 1 A | | 3,5 A |
| | | 380 - 415 V $I_e$ | - | - | 2 A |
| | | 440 - 550 V $I_e$ | - | - | 1 A |
| | DC-13 L/R F 100 ms | 24 V $I_e$ | - | - | 2 A |
| | | 60 V $I_e$ | - | - | 1,5 A |
| | | 110 V $I_e$ | - | - | 1A |
| | | 220 V $I_e$ | - | - | 0,25 A |
| Lifespan | mechanical | | > 10000 operations | | > 10000 operations |
| | electrical | | > 10000 operations | | > 5000 operations |
| Contact reliability | (at $U_e$ = 24 V DC, $U_{min}$ = 17 V, $I_{min}$= 5.4 mA) | | Failure rate $< 10^{-8} < 1$ Failure on 1 x $10^8$ operations | | |
| Force guided contacts according ZH 1/457 | | | - | - | yes |
| Short circuit rating without welding of contacts | without melting-fuse | | - | - | BM918104 |
| | with melting-fuse | | 10 A gG/gL | 10 A gG/gL | 10 A gG/gL |
| Terminals | Single or flexible wire with ferrule | | 0,75 – 1,5 $mm^2$ | | 0,75 – 2,5 $mm^2$ |
| | Single- or stranded wire AWG | | 18 - 16 | | 18 – 14 |

## Accessories for BE5, BE6

### Application




### Circuit Diagrams




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Auxiliary contact front, 1NO | BE5/6-HIF10 | | **BE082884** |
| Auxiliary contact front, 1NO+1NC | BE5/6-HIF11 | | **BE082882** |
| Auxiliary contact side, 1NO+1NC | BE5/6-HIS11 | | **BE072896** |
| Rotary knob for BE5, lockable with up to 3 pad-locks | BE5-DK | | **BE590851** |

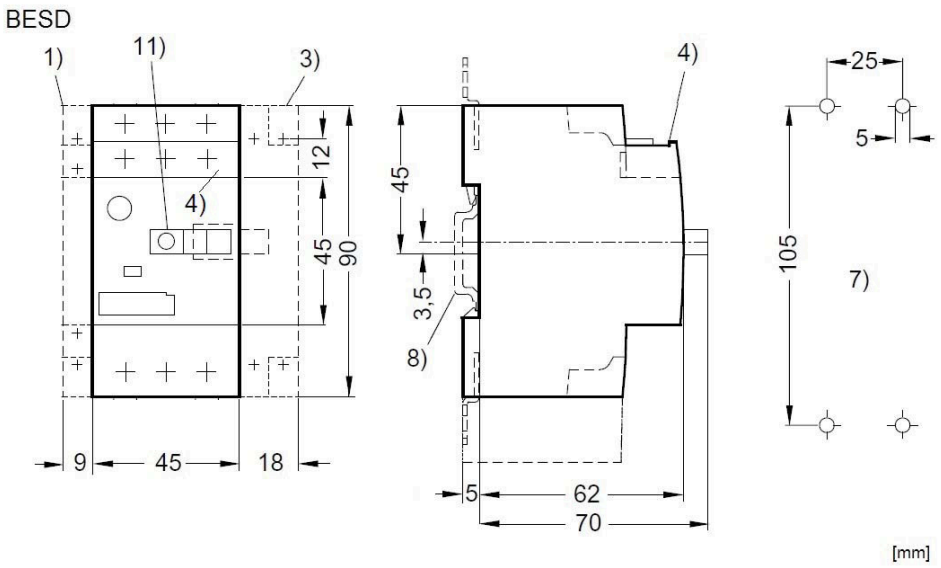
## Motor Protection Switches BES, Size 00

BESD0100

### Schrack-Info

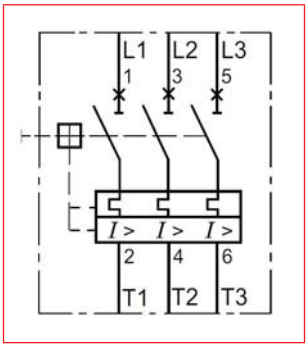
- Motor protection switch Class 10 for rated current of motors from 0.11A up to 6.3A (0.04kW up to 2.2kW) at Icu = 100kA
- Motor protection switch Class 10 for rated current of motors from 5.5A up to 12A (3kW up to 5.5kW) at Icu = 50kA
- Frontside transverse arranged and "side mounted" auxiliary contacts, shunt release and undervoltage release can be snapped on
- Can be combined with contactors of size 00
- Busbars for up to zu 5 Motor protection switches (without "side mounted" accessories) are available
- Busbars for Motor protection switches with "side mounted" auxiliary contact - on request
- For assembling of BESD with AC or DC-operated contactors size 00 (D.O.L.- Combination) the connection link LSZDD005 has to be used
- Mountable to DIN-rail TS35/TH35 or mounting plate
- Further accessories find attached

### Dimensions




1) Side mounted auxiliary switch, 2-pole – BEZ00001,2
3) Auxiliary trip unit: undervoltage release – BEZ00006,7; shunt trip – BEZ00008,9
4) Front mounted auxiliary switch – BEZ00003,4
7) Drilling pattern
8) Standard mounting rail TH 35 according to EN 60715
11) Lockable in "OFF" position with 3.5 ... 4.5mm shackle diameter

### Circuit Diagram



## Motor Protection Switches BES, Size 00

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor protection switches size 00 / 100kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 0.11-0.16A, Class 10 | BESD | | **BESD0016** |
| 0.14-0.20A, Class 10 | BESD | | **BESD0020** |
| 0.18-0.25A, Class 10 | BESD | | **BESD0025** |
| 0.22-0.32A, Class 10 | BESD | | **BESD0032** |
| 0.28-0.40A, Class 10 | BESD | | **BESD0040** |
| 0.35-0.50A, Class 10 | BESD | | **BESD0050** |
| 0.45-0.63A, Class 10 | BESD | | **BESD0063** |
| 0.55-0.80A, Class 10 | BESD | | **BESD0080** |
| 0.7-1.00A, Class 10 | BESD | | **BESD0100** |
| 0.9-1.25A, Class 10 | BESD | | **BESD0125** |
| 1.1-1.6A, Class 10 | BESD | | **BESD0160** |
| 1.4-2.0A, Class 10 | BESD | | **BESD0200** |
| 1.8-2.5A, Class 10 | BESD | | **BESD0250** |
| 2.2-3.2A, Class 10 | BESD | | **BESD0320** |
| 2.8-4,0A, Class 10 | BESD | | **BESD0400** |
| 3.5-5,0A, Class 10 | BESD | | **BESD0500** |
| 4,5-6,3A, Class 10 | BESD | | **BESD0630** |
| **Motor protection switches size 00 / 50kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 5.5-8A, Class 10 | BESD | | **BESD0800** |
| 7-10A, Class 10 | BESD | | **BESD1000** |
| 9-12A, Class 10 | BESD | | **BESD1200** |





**Order no. blue:** on stock, usually ready for delivery on the day of order

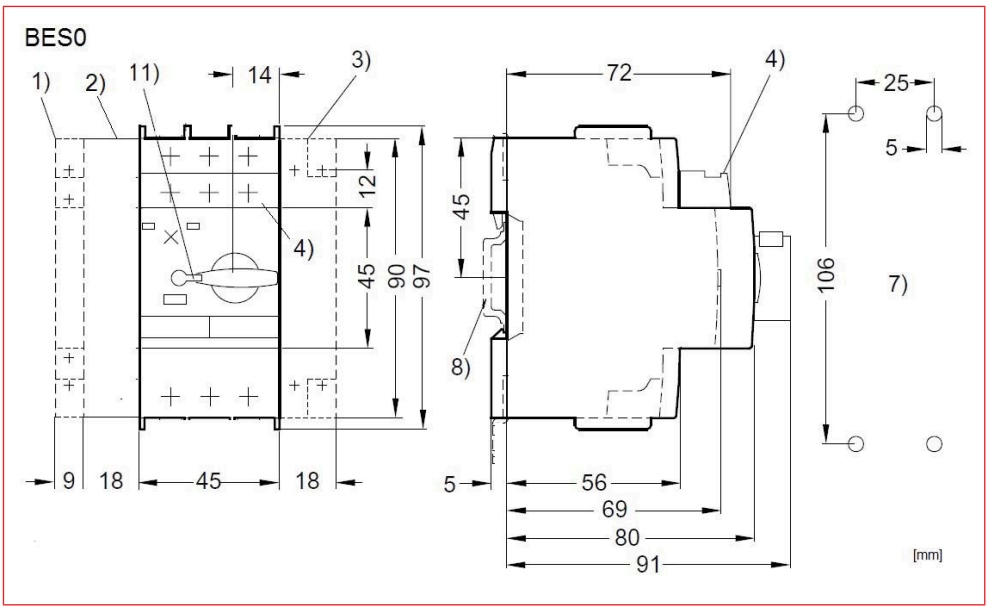
## Motor Protection Switches BES, Size 0

BES00400

## Schrack-Info

- Motor protection switch Class 10 for rated current of motors from 0.11A up to 12.5A (0.04kW up to 5.5kW) at Icu = 100kA
- Motor protection switch Class 10 for rated current of motors from 11A up to 25A (7.5kW up to 11kW) at Icu = 50kA
- Frontside transverse arranged and "side mounted" auxiliary contacts, signaling switch, shunt release and undervoltage release can be snapped on
- Can be combined with contactors of size 00 and 0
- Busbars for up to zu 5 Motor protection switches (without "side mounted" accessories) are available
- When using busbar for 5 Motor protection switch and summary load current > 63A, double infeed (left and right end of busbar) is recommended
- Busbars for Motor protection switches with "side mounted" auxiliary contact - on request
- For assembling of BES0 with AC or DC-operated contactors size 00 (D.O.L.- Combination) the connection link LSZDD006 has to be used
- For assembling of BES0 with AC-operated contactors size 0 (D.O.L.- Combination) the connection link LSZ0D002 has to be used
- For assembling of BES0 with DC-operated contactors size 0 (D.O.L.- Combination) the connection link LSZ0D004 has to be used
- Mountable to DIN-rail TS35/TH35 or mounting plate
- Further accessories find attached

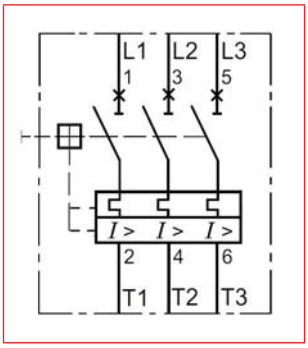
## Dimensions




1) Side mounted auxiliary switch, 2-pole – BEZ00001,2
2) Signal switch
3) Auxiliary trip unit: undervoltage release – BEZ00006,7; shunt trip – BEZ00008,9
4) Front mounted auxiliary switch – BEZ00003,4
7) Drilling pattern
8) Standard mounting rail TH 35 according to EN 60715
11) Lockable in "OFF" position with 3.5 ... 4.5 mm shackle diameter

## Motor Protection Switches BES, Size 0

### Circuit Diagram




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor protection switches size 0 / 100kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 0.11-0.16A, Class 10 | BES0 | | **BES00016** |
| 0.14-0.20A, Class 10 | BES0 | | **BES00020** |
| 0.18-0.25A, Class 10 | BES0 | | **BES00025** |
| 0.22-0.32A, Class 10 | BES0 | | **BES00032** |
| 0.28-0.40A, Class 10 | BES0 | | **BES00040** |
| 0.35-0.50A, Class 10 | BES0 | | **BES00050** |
| 0.45-0.63A, Class 10 | BES0 | | **BES00063** |
| 0.55-0.80A, Class 10 | BES0 | | **BES00080** |
| 0.7-1.00A, Class 10 | BES0 | | **BES00100** |
| 0.9-1.25A, Class 10 | BES0 | | **BES00125** |
| 1.1-1.6A, Class 10 | BES0 | | **BES00160** |
| 1.4-2.0A, Class 10 | BES0 | | **BES00200** |
| 1.8-2.5A, Class 10 | BES0 | | **BES00250** |
| 2.2-3.2A, Class 10 | BES0 | | **BES00320** |
| 2.8-4,0A, Class 10 | BES0 | | **BES00400** |
| 3.5-5,0A, Class 10 | BES0 | | **BES00500** |
| 4,5-6,3A, Class 10 | BES0 | | **BES00630** |
| 5.5-8A, Class 10 | BES0 | | **BES00800** |
| 7-10A, Class 10 | BES0 | | **BES01000** |
| 9-12.5A, Class 10 | BES0 | | **BES01200** |
| **Motor protection switches size 0 / 50kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 11-16A, Class 10 | BES0 | | **BES01600** |
| 14-20A, Class 10 | BES0 | | **BES02000** |
| 17-22A, Class 10 | BES0 | | **BES02200** |
| 20-25A, Class 10 | BES0 | | **BES02500** |

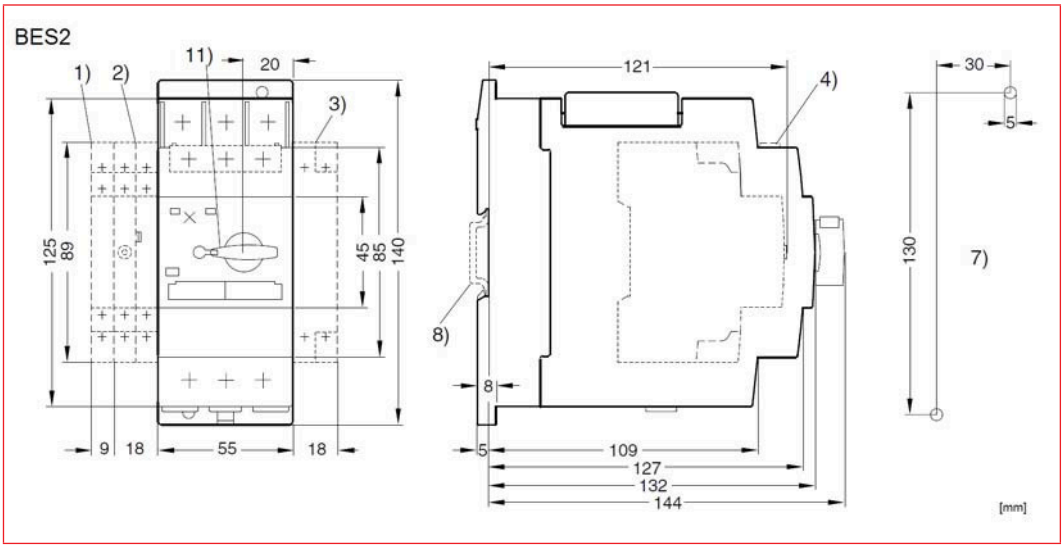
## Motor Protection Switches BES, Size 2

BES22500

### Schrack-Info

- Motor protection switch Class 10 for rated current of motors from 18A up to 50A (11kW up to 22kW) at Icu = 50kA
- Frontside transverse arranged and "side mounted" auxiliary contacts, signaling switch, shunt release and undervoltage release can be snapped on
- Can be combined with contactors of size 2
- Busbars for up to zu 3 Motor protection switches (without "side mounted" accessories) are available
- When using busbar for 3 Motor protection switches and summary load current > 108A), double infeed (left and right end of busbar) is recommended
- Busbars for Motor protection switches with "side mounted" auxiliary contact - on request
- For assembling of BES2 with AC-operated contactors size 2 (D.O.L.- Combination) the connection link LSZ2D004 has to be used
- For assembling of BES2 with DC-operated contactors size 2 (D.O.L.- Combination) the connection link LSZ2D005 has to be used
- Mountable to DIN-rail TS35/TH35 or mounting plate
- Further accessories find attached

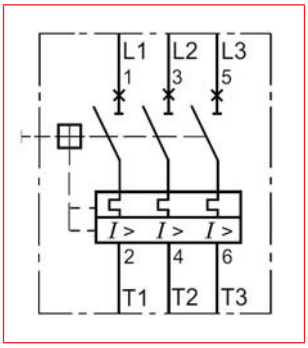
### Dimensions




1) Side mounted auxiliary switch, 2-pole – BEZ00001,2
2) Signal switch
3) Auxiliary trip unit: undervoltage release – BEZ00006,7; shunt trip – BEZ00008,9
4) Front mounted auxiliary switch – BEZ00003,4
7) Drilling pattern
8) Standard mounting rail TH 35 according to EN 60715
11) Lockable in "OFF" position with 3.5 ... 4.5 mm shackle diameter

## Motor Protection Switches BES, Size 2

### Circuit Diagram




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor protection switches size 2 / 50kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 18-25A, Class 10 | BES2 | | **BES22500** |
| 22-32A, Class 10 | BES2 | | **BES23200** |
| 28-40A, Class 10 | BES2 | | **BES24000** |
| 36-45A, Class 10 | BES2 | | **BES24500** |
| 40-50A, Class 10 | BES2 | | **BES25000** |





**Order no. blue:** on stock, usually ready for delivery on the day of order

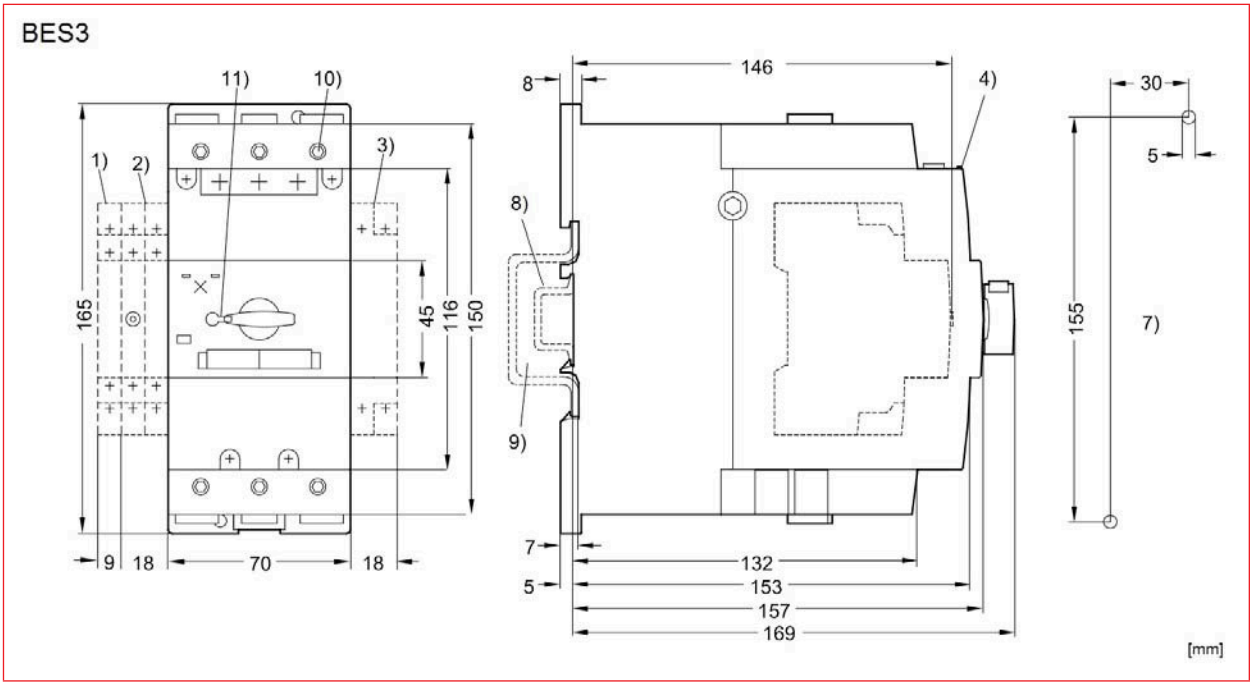
## Motor Protection Switches BES, Size 3

BES37500

### Schrack-Info

- Motor protection switch Class 10 for rated current of motors from 45A up to 100A (30kW up to 45kW) at Icu = 50kA
- Frontside transverse arranged and "side mounted" auxiliary contacts, signaling switch, shunt release and undervoltage release can be snapped on
- Can be combined with contactors of size 3
- For assembling of BES3 with AC-operated contactors size 3 (D.O.L.- Combination) the connection link LSZ3D004 has to be used
- For assembling of BES3 with DC-operated contactors size 3 (D.O.L.- Combination) the connection link LSZ3D003 has to be used
- Mountable to DIN-rail TS35/TH35, TS75/TH75 or mounting plate
- Further accessories find attached

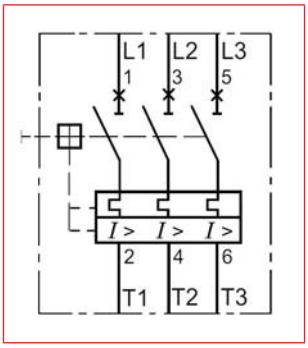
### Dimensions




1) Side mounted auxiliary switch, 2-pole – BEZ00001,2
2) Signalling switch (S0 ... S3) side mounted – BEZ00005
3) Auxiliary trip unit: undervoltage release – BEZ00006,7; shunt trip – BEZ00008,9
4) Front mounted auxiliary switch – BEZ00003,4
7) Drilling pattern
8) Standard mounting rail TH 35 according to EN 60715
9) For mounting on TH 75 standard mounting rail
10) Allen screw 4mm
11) Lockable in "OFF" position with 3.5 ... 4.5mm shackle diameter

## Motor Protection Switches BES, Size 3

### Circuit Diagram




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Motor protection switches size 3 / 50kA (Short circuit switching capacity Icu at 400VAC)** | | | |
| 45-63A, Class 10 | BES3 | | **BES36300** |
| 57-75A, Class 10 | BES3 | | **BES37500** |
| 70-90A, Class 10 | BES3 | | **BES39000** |
| 80-100A, Class 10 | BES3 | | **BES39999** |





**Order no. blue:** on stock, usually ready for delivery on the day of order

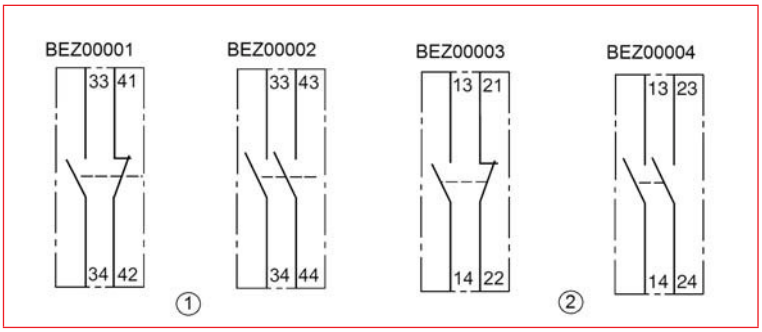
## Auxiliary Contacts for Motor Protection Switches

BEZ00001

### Schrack-Info

- Frontside or "side mounted" auxiliary contacts for signaling of operating state “ON” or “OFF”
- Arranged at left side of Motor protection switch
- Fitting to all sizes
- Busbars for Motor protection switches with " side arranged" auxiliary contact only is realisable by special version of busbars - on request

### Circuit Diagrams




**1) Lateral auxiliary switch (side mounted)**
BEZ00001 - 1NO + 1NC
BEZ00002 - 2NO
**2) Transverse auxiliary switch (front mounted)**
BEZ00003 - 1NO + 1NC
BEZ00004 - 2NO

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Auxiliary Contact, side mounted, 1 NO+1NC | BEZ0 | | **BEZ00001** |
| Auxiliary Contact, front mounted, 1 NO+1NC | BEZ0 | | **BEZ00003** |
| Auxiliary Contact, side mounted, 2 NO | BEZ0 | | **BEZ00002** |
| Auxiliary Contact, front mounted, 2 NO | BEZ0 | | **BEZ00004** |

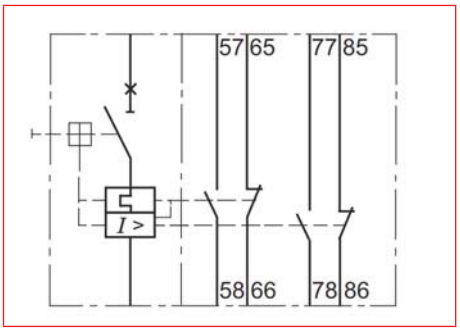
## Signaling Switch for Motor Protection Switches

BEZ00005

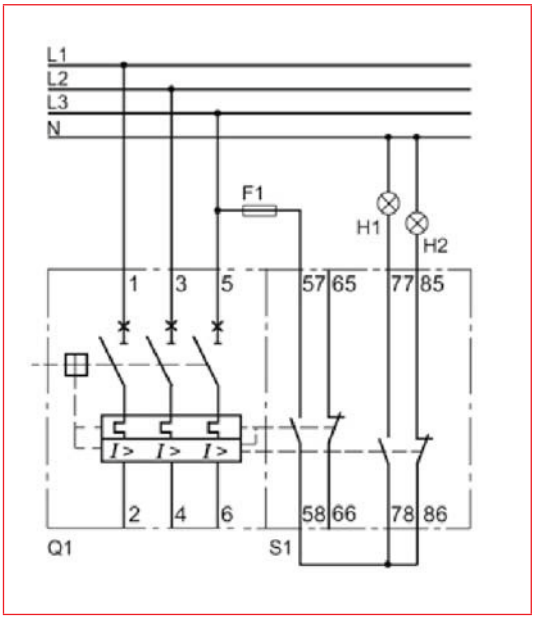
### Schrack-Info

- Signaling switch for signaling of “Tripped by overload or short circuit” for Motor protection switch of size 0 up to 3
- Left side mounted
- When necessary to monitor Motor protection switch of size 00 for overload or short circuit, the Motor protection switch size 00 has to be replaced by such of size 0
- Signaling switch is provided with 2 contacts for "overload" (1 NO + 1 NC) and 2 contacts for "short circuit" (1 NO + 1 NC)
- Busbars for Motor protection switches with side arranged signaling switch are not available

### Circuit Diagram




### Switching Example




BES0 to BES3 motor protection switches with BEZ00005 signalling switch
Separate "tripped" and "short-circuit" signals:
S1 Signalling switch
Q1 Motor protection switch
F1 Fuse (gL/gG), max. 10A
H1 Signal lamp "Short-circuit"
H2 Signal lamp "Overload" or "Tripping by auxiliary trip unit"

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Signalling switch 1NO+1NC, for BES size 0,2,3 | BEZ0 | | **BEZ00005** |

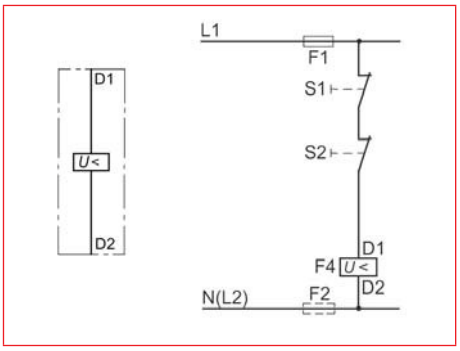
## Under Voltage Release Motor Protection Switches

BEZ00006

### Schrack-Info

- Under voltage release unit for remote "switching off" the Motor protection switches (closed-circuit principle)
- Right side mounted
- Fitting to all sizes
- Only one release unit can be mounted at Motor protection switch (either undervoltage or shunt release)
- Busbars for Motor protection switches with side arranged release unit are not available

### Connection and Control Diagram




S0, S1, S2 OFF pushbutton in the system
Q1 Motor protection switch
S Auxiliary switch of the motor protection switch Q1
F1; F2 Fuse (gL/gG) max. 10A
F3 Shunt trip
F4 Undervoltage releases

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Under voltage release 230VAC/50Hz, 240VAC/60Hz | BEZ0 | | **BEZ00006** |
| Under voltage release 400VAC/50Hz, 440VAC/60Hz | BEZ0 | | **BEZ00007** |

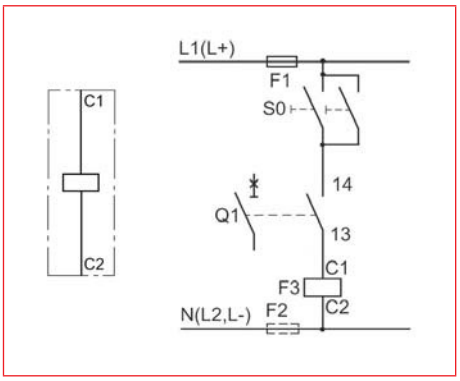
## Shunt Release for Motor Protection Switches

BEZ00008

### Schrack-Info

- Shunt release unit for remote "switching off" the Motor protect • Right side mounted ion switches (open-circuit principle)
- Right side mounted
- Fitting to all sizes
- Only one release unit can be mounted at Motor protection switch (either undervoltage or shunt release)
- Busbars for Motor protection switches with side arranged release unit are not available

### Connection and Control Diagram




S0, S1, S2 OFF pushbutton in the system
Q1 Motor protection switch
S Auxiliary switch of the motor protection switch Q1
F1; F2 Fuse (gL/gG) max. 10A
F3 Shunt trip
F4 Undervoltage releases

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Shunt trip 20-24VAC, 50/60Hz | BEZ0 | | BEZ00008 |
| Shunt trip 210-240VAC, 50/60Hz | BEZ0 | | **BEZ00009** |

## Housings and Locking Plate for Motor Protection Switches

BEZ00012

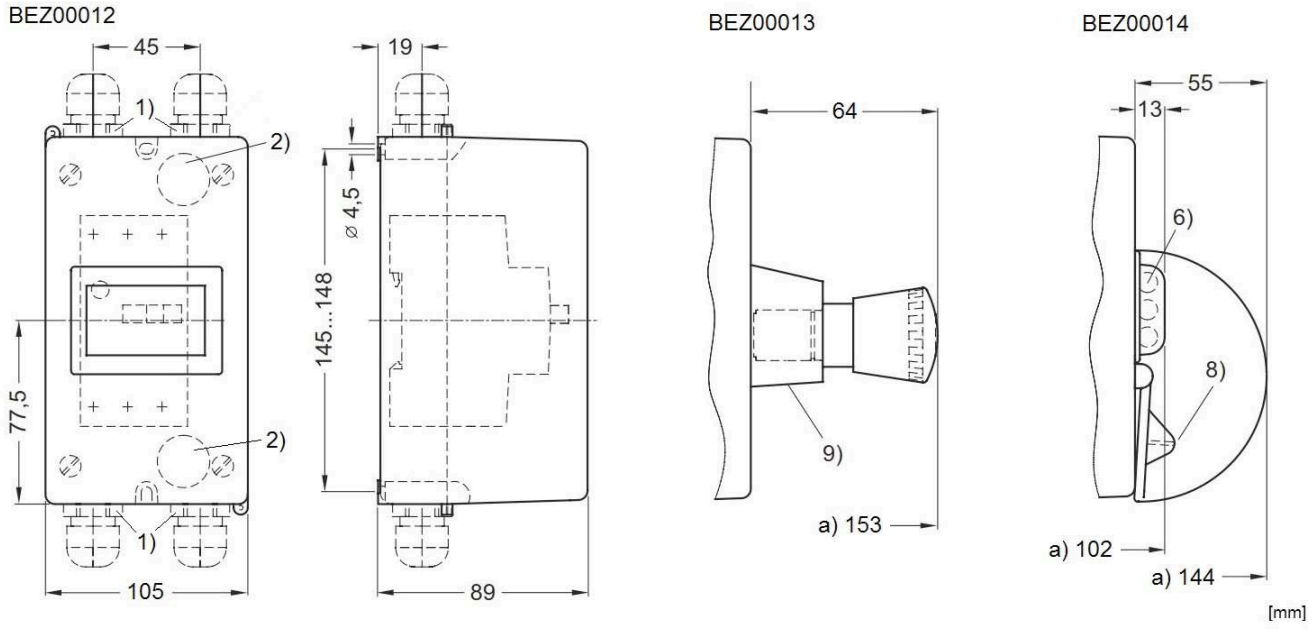
BEZ00112

BEZ00014

## Schrack-Info

- All housings fulfill the protection degree IP55, the rated operational voltage Ue for built-in Motor protection switches is reduced from 690VAC to 500VAC
- Housings for Motor protection switch of size 00 with membrane (optional Emergency -Stop mushroom button available)
- Housings for Motor protection switch of size 0-2 are fitted with lockable black or red/yellow rotary handle
- Housings for Motor protection switch of size 3 are not available
- All housings are fitted with Neutral conductor- and PE-terminal
- The housings are prepared with cable entry cut-outs for metric cable glands at upper side and bottom of housing. Also the rear sides of housings are prepared with cable entry cut-outs
- Installation of Motor protection switches with Signaling switch is not possible
- Installation of Motor protection switches with front or side mounted auxiliary contacts is possible at all housings
- Installation of Motor protection switch with auxiliary contacts and overvoltage/shunt release in housings of size 2 is possible
- Housings of size 00 with membrane can be fitted with an additional locking plate (for 3 padlocks, 8mm shackle-diameter)

## Dimensions

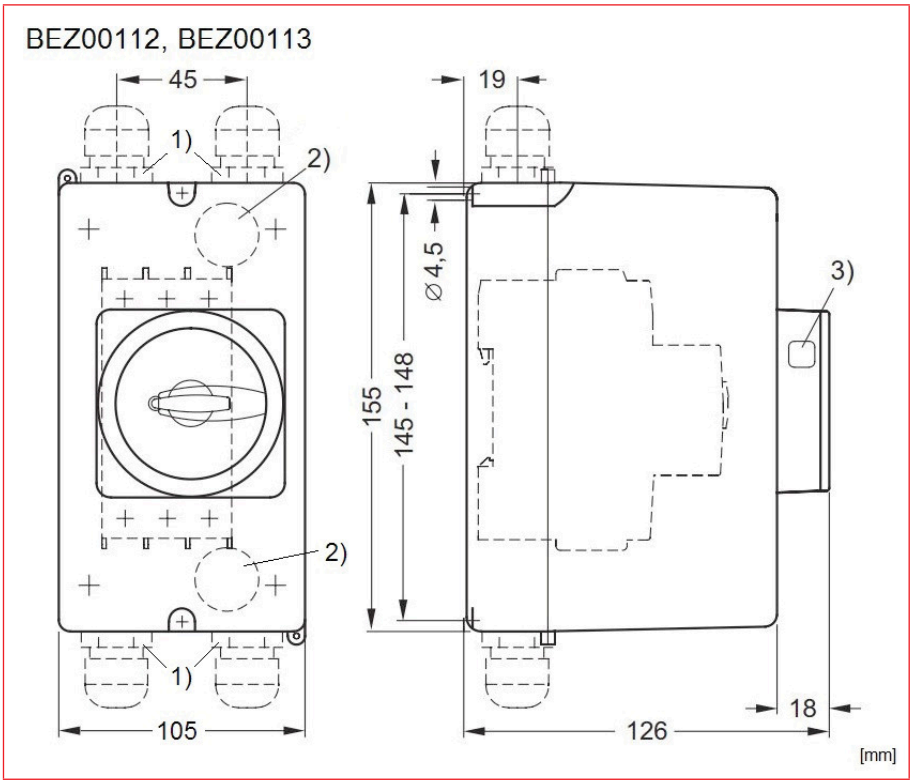



BEZ00012 with membrane, BEZ00013 with emergency stop mushroom head for motor protection switches size 00

1) Knock-outs for M25
2) Knock-outs for rear cable entry M20
6) Max. shackle diameter for padlock 8mm
8) Locking plate BEZ00014
9) EMERGENCY-STOP mushroom button
a) Dimensions refer to mounting surface

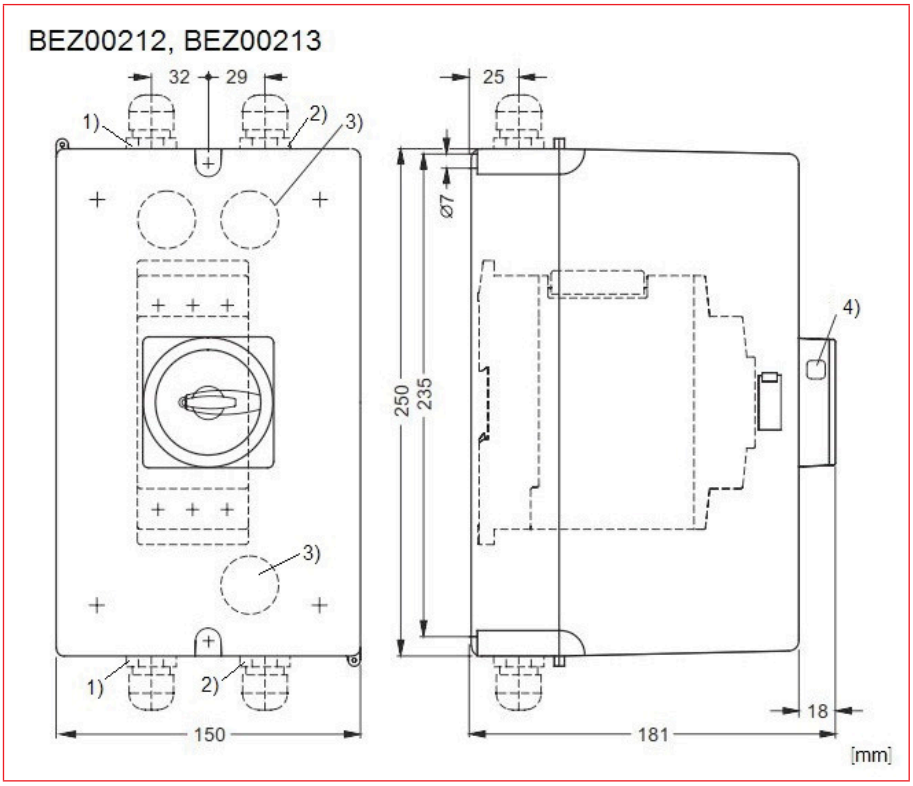
## Housings and Locking Plate for Motor Protection Switches

### Dimensions




BEZ00112 rotary handle, BEZ00113 rotary handle for emergency stop for motor protection switches size 0
1) Knock-outs for M25
2) Knock-outs for rear cable entry M20
3) Opening for padlock with shackle diameter max. 6-8mm

### Dimensions




BEZ00212 rotary handle, BEZ00213 rotary handle for emergency stop for motor protection switches size 2
1) Knock-outs for M32 (left)
2) Knock-outs for M40 (right)
3) Knock-outs for rear cable entry M32
4) Opening for padlock with shackle diameter max. 6 ... 8mm

## Housings and Locking Plate for Motor Protection Switches

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| **Housings** | | | |
| Insulated enclosure with membrane, size 00, IP55 | BEZ0 | | **BEZ00012** |
| Emergency Stop button for insulated enclosure, size 00, IP55 | BEZ0 | | **BEZ00013** |
| Insulated enclosure with rotary handle, size 0, IP55 | BEZ0 | | **BEZ00112** |
| Insulated enclosure with rotary handle, size 2, IP55 | BEZ0 | | BEZ00212 |
| Insulated enclosure with Emergency Stop, size 2, IP55 | BEZ0 | | BEZ00213 |
| **Locking plate** | | | |
| Locking plate for 3 padlocks, size 00 | BEZ0 | | BEZ00014 |

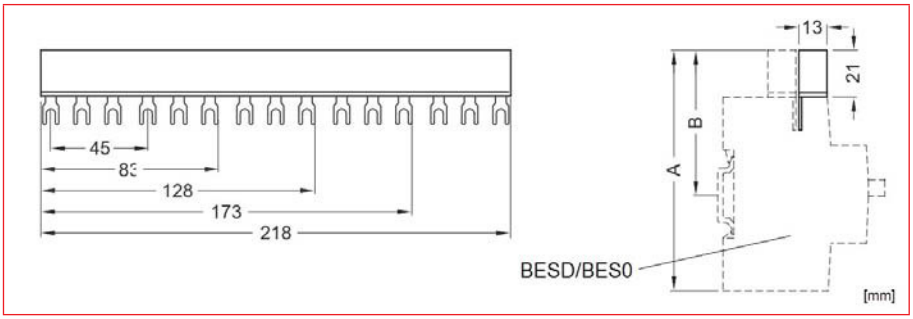
## Bus Bars for Motor Protection Switches

BEZ00017

### Schrack-Info

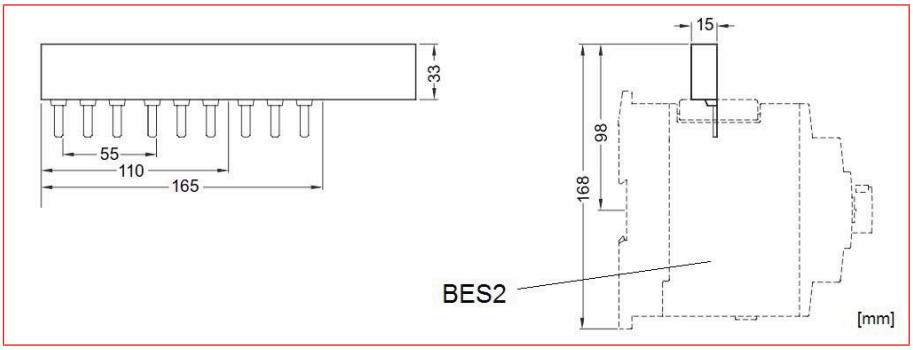
- Busbars for Motor protection switches without side mounted accessories, for size 00 up to 2
- Maximum rated current In for busbars size 00/0 ... 63A, for size 2 ... 108A
- Motor protection switches size 00 and 0 can not wired with the same busbar because of different position (hight) of their terminals
- Busbars for for Motor protection switches with side mounted auxiliary contacts - on request
- Busbars for Motor protection switch with side mounted Signaling switch are not available
- Busbars for Motor protection switches of size 3 are not available

### Dimensions




| | A | B |
|---|---|---|
| BESD | 111 | 67 |
| BES0 | 119 | 70 |

### Dimensions




| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Busbar for 2 BESD/BES0 | BEZ0 | | **BEZ00017** |
| Busbar for 3 BESD/BES0 | BEZ0 | | **BEZ00018** |
| Busbar for 4 BESD/BES0 | BEZ0 | | **BEZ00020** |
| Busbar for 5 BESD/BES0 | BEZ0 | | **BEZ00021** |
| Busbar for 2 BES2 | BEZ0 | | BEZ00217 |
| Busbar for 3 BES2 | BEZ0 | | BEZ00218 |

## Covers for Spare Places of Motor Protection Switches

BEZ00019

### Schrack-Info

- For covering of empty places of installation (spare places) at busbar (protection against contact)

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Cover for spare place size 00/0 (45mm) | BEZ0 | | BEZ00019 |
| Cover for spare place size 2 (55mm) | BEZ0 | | BEZ00219 |

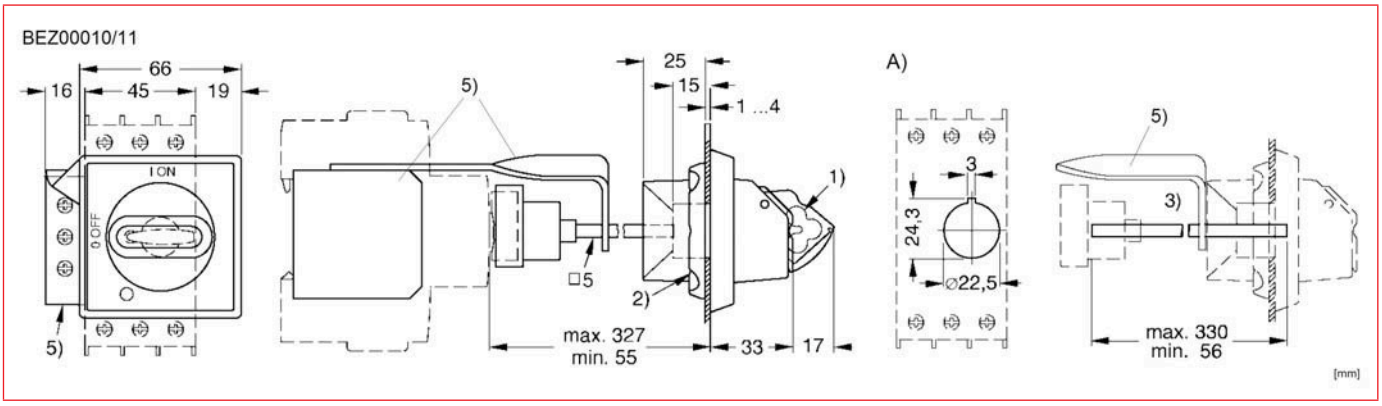
## Rotary Operating Mechanisms (Door Coupling) for Motor Protection Switches

BEZ00011

### Schrack-Info

- Door couplig- rotary handles for Motor protection switches size 0 up to 3
- Available in black or for "Emergency Off" applications in red/yellow
- Included door(cover) interlock against opening the housing at position "ON" of Motor protection switch
- Lockable in "Off"-position with in maximum 3 padlocks, shackle diameter 8mm
- PE-terminal for wires up to 35mm² and support bracket for actuation axle included

### Dimensions




BEZ00010/11 for motor protection switches size 0, 2, 3
Long shaft (with bracket)[3)]
A) Drilling pattern
1) Lockable in neutral position with max. 8mm shackle diameter.
2) Mounted with screw cap.
3) Supplied with a shaft length of 330mm; can be adjusted by shortening the shaft.
5) Grounding terminal 35mm² and sheet-metal bracket for shaft.

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Door coupling rotary handle for size 0-3 | BEZ0 | | **BEZ00010** |
| Door coupling rotary handle Emergency-Stop, for size 0-3 | BEZ0 | | BEZ00011 |

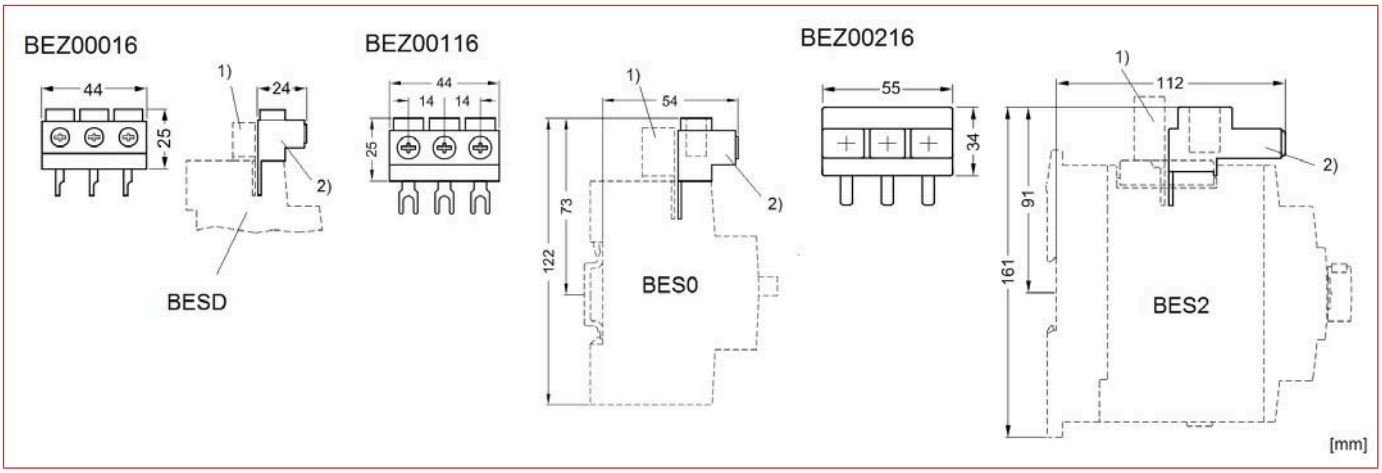
## Feed Terminals for Motor Protection Switches

BEZ00016

### Schrack-Info

- Feed terminals for busbar of Motor protection switch size 0 up to 2
- Feed terminals size 00 and 0 for in maximum Anschlussquerschnitt Ye and Ym 25mm², Yf 16mm²
- Feed terminals size 2 for in maximumen Anschlussquerschnitt Ye and Ym 50mm², Yf 35mm²
- For feeding busbar, centered (middle) position of terminal or - when summary load current exceeds rated current of busbar - both sided arrangement of feeding terminals is recommended

### Dimensions




1) Bus bars
2) Feed terminals

| DESCRIPTION | TYPE NO. | AVAILABLE | ORDER NO. |
|---|---|---|---|
| Feed terminal 3-phase up to 25mm², for BES size 00 | BEZ0 | | **BEZ00016** |
| Feed terminal 3-phase up to 25mm², for BES size 0 | BEZ0 | | **BEZ00116** |
| Feed terminal 3-phase up to 50mm², for BES size 2 | BEZ0 | | BEZ00216 |

## Motor Protection Switches Series BES - Overview

| Type | BESD / BES0 / BES2 / BES3 | | | |
|---|---|---|---|---|
| **Applications** | | | | |
| System protection | yes [1] | | | |
| Motor protection | yes | | | |
| **Size** | 00, 0, 2, 3 | | | |
| **Rated current In** | | | | |
| • Size 00 | up to 12A | | | |
| • Size 0 | up to 25A | | | |
| • Size 2 | up to 50A | | | |
| • Size 3 | up to 100A | | | |
| **Rated operational voltage Ue according to IEC** | 690VAC[2] | | | |
| **Rated frequency** | 50/60Hz | | | |
| **Trip class** | Class 10 | | | |
| **Thermal overload release** | 0.11 ... 0.16A<br>up to 80 ... 100A | | | |
| **Electronic trip units a multiple of the rated current** | 13 Times | | | |
| **Short-circuit breaking capacity Icu at 400VAC** | 50/100kA | | | |
| **Accessories for sizes** | 00 | 0 | 2 | 3 |
| Auxiliary switches | yes | yes | yes | yes |
| Signalling switches | -- | yes | yes | yes |
| Undervoltage releases | yes | yes | yes | yes |
| Shunt trip units | yes | yes | yes | yes |
| Insulated three-phase busbar systems | yes | yes | yes | -- |
| Busbar adapters | yes | yes | yes | yes |
| Door-coupling rotary operating mechanisms | -- | yes | yes | yes |
| Link modules | yes | yes | yes | yes |
| Enclosures for surface mounting | yes | yes | yes | -- |
| Feed terminal | yes | yes | yes | -- |

1) For symmetrical loading of the three phases
2) 500VAC with moulded-plastic enclosure
yes: Has this function or can use this accessory.
-- : does not have this function or cannot use this accessory.

**Mounting location and function**
The BES motor protection switches have three main contact elements. In order to achieve maximum flexibility, auxiliary switches, signalling switches, auxiliary trip units and door coupling rotary operating mechanism can be supplied separately.
These components can be fitted as required on the motor protection switches without using tools.

| | | |
|---|---|---|
| **Front side**<br>Notes:<br><br>A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor protection switch. | **Transverse auxiliary switches**<br>1 NO + 1 NC / 2 NO | An auxiliary switch block can be inserted transversely on the front.<br>The overall width of the motor protection switches remains unchanged. |
| **Left-hand side**<br>Notes:<br><br>A maximum of 4 auxiliary contacts with auxiliary switches can be attached to each motor protection switch. Auxiliary switches (2 contacts) and signalling switches can be mounted separately or together. | **Lateral auxiliary switches (2 contacts)**<br>1 NO + 1 NC / 2 NO | One of the two auxiliary switches can be mounted laterally for each motor protection switches The contacts of the auxiliary switch close and open together with the main contacts of the motor protection switches. The overall width of the lateral auxiliary switch with 2 contacts is 9 mm. |
| | **Signalling switches for sizes 0, 2 and 3**<br>Tripping 1 NO + 1 NC<br>Short-circuit 1 NO + 1 NC | One signalling switch can be mounted at the side of each motor protection switches with a rotary operating mechanism. The signalling switch has two contact systems. One contact system always signals tripping irrespective of whether this was caused by a short-circuit, an overload or an auxiliary trip unit. The other contact system only switches in the event of a short-circuit. There is no signalling as a result of switching off with the handle. In order to be able to switch on the motor protection switches again after a short-circuit, the signalling switch must be reset manually after the error cause has been eliminated. The overall width of the signalling switch is 18mm. |
| **Right-hand side**<br>Notes:<br><br>One auxiliary trip unit can be mounted per motor protection switch. | **Shunt trip units** | For remote-controlled tripping of the motor protection switches. The release coil should only be energized for short periods (see schematics). |
| | or | |
| | **Undervoltage releases** | Trips the motor protection switches when the voltage is interrupted and prevents the motor from being restarted accidentally when the voltage is restored. Used for remote-controlled tripping of the motor protection switches. Particularly suitable for EMERGENCY-STOP disconnection by way of the corresponding EMERGENCY-STOP pushbutton according to DIN VDE 0113. |

# Motor Protection Switches Series BES - General Information

## Schrack-Info

Motor Protection Switches BES are used for the switching and protecting of 3-phase motors up to 45kW at 400VAC, as well as for electrical consumers up to 100A.

**TYPE OF CONSTRUCTION**

The motor protection switches are available in four sizes:

- Size 00 – width 45mm, max. rated current 12A,At 400VAC suitable for induction motors up to 5.5kW
- Size 0 – width 45mm, max. rated current 25A,At 400VAC suitable for induction motors up to 11kW
- Size 2 – width 55mm, max. rated current 50A,At 400VAC suitable for induction motors up to 22kW
- Size 3 – width 70mm, max. rated current 100A,At 400VAC suitable for induction motors up to 45kW

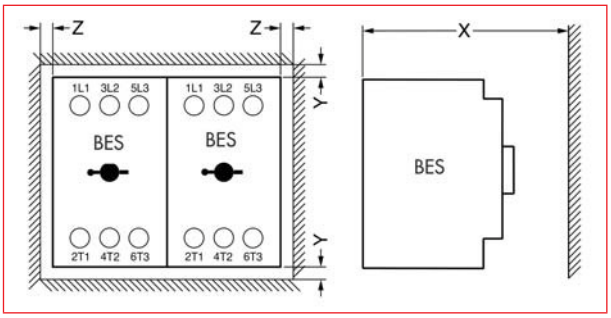
**SCREW TERMINALS**

BES motor protection switches of sizes 00 and 0 are fitted with terminals with captive screws and clamping pieces, allowing the connection of 2 conductors with different cross-sections. The box terminals of the size 2 and 3 motor protection switches also enable 2 conductors with different cross-sections to be connected. With the exception of size 3 motor protection switches which are equipped with 4 mm Allen screws, all terminal screws are tightened with a Pozidriv screwdriver size 2. The box terminals of the size 3 motor protection switches can be removed in order to connect conductors with cable lugs or connecting bars. A terminal cover is available as touch protection and to ensure that the required clearances and creepage distances are maintained if the box terminals are removed.

**MOUNTING**

The motor protection switches are snap-fitted an a 35mm standard mounting rail. A standard mounting rail with a height of 15mm is required for size 3 motor protection switches. A 75mm standard mounting rail can be used as an alternative for size 3. Size 2 and 3 motor protection switches can also be screwed directly onto a base plate. When mounting the motor protection switches, the following clearances must be maintained to grounded or live parts and to cable ducts made of molded plastic.

## Clearences to Grounded or Live Parts




| Motor protection switches / circuit breakers | | | Distance to grounded or live parts acc. To IEC 60947-2 | | |
|---|---|---|---|---|---|
| Type | Size | $I_e$ V | Y mm | X mm | Z mm |
| BESD | 00 | up to 690 | 20 | 70 | 9 |
| BES0 | 0 | up to 500 | 30 | 90 | 9 |
| | | up to 690 | 50 | 90 | 30 |
| BES2 | 2 | up to 690 | 50 | 140 | 30 |
| BES3 | 3 | up to 240 | 50 | 167 | 10 |
| | | up to 440 | 70 | 167 | 10 |
| | | up to 500 | 110 | 167 | 10 |
| | | up to 690 | 150 | 167 | 30 |

**TRIP UNITS**

BES motor protection switches are equipped with

- inverse-time delayed overload release based on the bimetal principle
- instantaneous electronic trip units (electromagnetic short-circuit releases).

The Motor protection switch BES can be adjusted to the rated current of the load.
Its short circuit release is automatically fixed to 13 times of rated current, to enable an unproblematic "running up" of the motor. When BES size 00 trips, its rocker changes to position "OFF", at BES size 0 up to size 3 the rotary operating handle changes to position "TRIP" and optical indicates a tripping.
Before switching on again, the handle has to be moved mechanical in the "OFF"-position, to prevent a unwanted switching on to an existing short circuit. The tripping of BES with rotary handle can a be monitored electrically by an additional signalling switch BEZ00005.

**TRIP CLASSES**

The trip classes of thermally delayed trip units are based on the tripping time (t A ) at 7.2 times the set current in cold state (excerpt from IEC 60947-4):

- CLASS 10: 4 s < t A < 10 s

The motor protection switches must trip within this time!

**OPERATING MECHANISMS**

Size 00 motor protection switches are actuated by a rocker operating mechanism and size 0, 2 and 3 motor protection switches by a rotary operating mechanism. If the motor protection switches trips, the rotary operating mechanism switches to the tripped position to indicate this. Before the motor protection switches is reclosed, the rotary operating mechanism must be reset manually to the 0 position. Only then can the motor protection switches be set again to the I position. In the case of motor protection switches with rotary operating mechanisms, an electrical signal can be output by a signalling switch to indicate that the motor starter protector has tripped. All operating mechanisms can be locked in the 0 position with a padlock (shackle diameter 3.5 mm to 4.5 mm). The motor protection switches isolating function complies with IEC 60947-2.

**PREVENTION OF UNINTENDED TRIPPING**

In order to prevent premature tripping due to the integrated phase failure sensitivity, motor protection switches should always be connected to ensure current flows through all three main current paths.

**SHORT-CIRCUIT PROTECTION**

If a short-circuit occurs, the short-circuit releases of BES motor protection switches isolate the faulty load feeder from the network and thus prevent further damage. Motor protection switches with a short-circuit breaking capacity of 50 kA or 100 kA are virtually short-circuit resistant at a voltage of 400 V AC, since higher short-circuit currents are not to be expected in practice.

**MOTOR PROTECTION**

The tripping characteristics of BES motor protection switches are designed mainly to protect induction motors. The motor protection switches are therefore also referred to as motor circuit breakers. The rated current In of the motor to be protected is set on the setting scale. Factory setting of the short-circuit release is 13 times the rated current of the motor protection switches. This permits trouble-free starting and ensures that the motor is properly protected. The phase failure sensitivity of the motor protection switches ensures that it is tripped in time in the event of a phase failure and overcurrents that occur as a result in the other phases. Motor protection switches with thermal overload releases are normally designed in accordance with trip class 10.

## Motor Protection Switches Series BES - General Information

**SYSTEM PROTECTION**

The BES motor protection switches for motor protection are also suitable for plant protection. In order to prevent premature tripping due to phase failure sensitivity, the three conducting paths must always be uniformly loaded. The conducting paths must be connected in series the case of single-phase loads.

**MAIN AND EMERGENCY-STOP SWITCHES**

The BES motor protection switches comply with the isolating function to IEC 60947-2, therefore they can be used – taking IEC 60204-1 into account – as main and EMERGENCY-STOP switches. BES door-coupling rotary operating mechanisms for heavy duty also comply with the requirements for the isolating function.

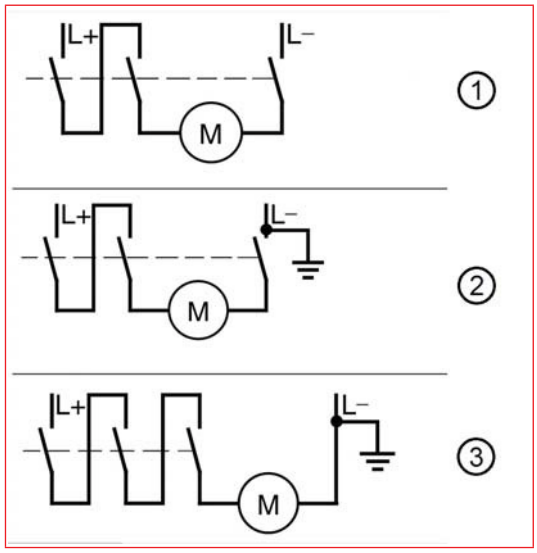
**USE IN IT SYSTEMS (IT NETWORKS)**

BES motor protection switches are suitable for operation in IT systems according to IEC 60947-2. In the event of a 3-pole short-circuit, their response in this system is the same as in others: Therefore, the same short-circuit breaking capacity $I_{cu}$ and $I_{cs}$ applies, see "Technical specifications". An initial fault (ground fault) does not necessarily force immediate disconnection of the network when operating IT systems. If a second independent error occurs (ground fault), the switching capacity of the motor protection switches might be reduced. This is the case if both ground faults occur in different phases and if one of the ground faults occurs on the input side and the other on the outgoing terminal of the motor protection switches. In order to maintain the short-circuit function of the motor protection switches even with two independent ground faults (double ground faults), the reduced short-circuit breaking capacity with double ground faults must be taken into account in IT systems I cuIT (see "Technical specifications"). If a ground fault is instantaneously recognized and remedied (ground-fault monitoring), the risk of double ground fault and thus reduced short-circuit breaking capacity I cuIT can be minimized.

**SWITCHING OF DC CURRENTS**

BES motor protection switches for alternating currents are also suitable for DC switching. The maximum permissible DC voltage per conducting path must, however, be adhered to. Higher voltages require a series connection with 2 or 3 conducting paths. The response values of the overload release remain unchanged; the response values of a short-circuit release increase by approximately 30% for DC. The example circuits for DC switching can be seen in the table below.

## Example Circuit for Size 00 to 3 BES Motor Protection Switches




| | Maximum permitted DC voltage $U_e$ | Notes |
|---|---|---|
| 1 | 150VDC | **2-pole switching, non-grounded system**[1)]<br>If there is no possibility of a ground fault, or if every ground fault is rectified immediately<br>(ground-fault monitoring), then the maximum permitted DC voltage can be tripled. |
| 2 | 300VDC | **2-pole switching, grounded system**<br>The grounded pole is always assigned to the individual conducting path, so that there<br>are always 2 conducting paths in series in the event of a ground fault. |
| 3 | 450VDC | **1-pole switching, grounded system**<br>3 conducting paths in series. The grounded pole is assigned to the unconnected<br>conducting path. |

1) It is assumed that this circuit always provides safe disconnection even in the event of a double ground fault that bridges two contacts.

## Motor Protection Switches Series BES - Size 00 up to 3

This table shows the rated ultimate short-circuit breaking capacity $I_{cu}$ and the rated service short-circuit breaking capacity $I_{cs}$ of the BES motor protection switches with different inception voltages dependent of the rated current $I_n$ of the motor protection switches. Motor protection switches infeed is permissible at the upper or lower terminals without restricting the rated data. If the short-circuit current at the place of installation exceeds the rated short-circuit breaking capacity of the motor protection switches as specified in the table, a back-up fuse is required. Alternatively, a motor protection switches with a limiter function can be connected upstream. The maximum rated current for the back-up fuse is specified in the tables. The rated ultimate short-circuit breaking capacity then applies as specified on the fuse.

| Circuit breakers/ Motor starter protectors | Rated current $I_n$ | Up to AC 240V[1] | | | Up to AC 400V[1]/415V[2] | | | Up to AC 440V[1]/460V[2] | | | Up to AC 500V[1]/525V[2] | | | Up to AC 690V[1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $I_{cu}$ | $I_{cs}$ | max. fuse (gL/gG) | $I_{cu}$ | $I_{cs}$ | max. fuse (gL/gG)[3] | $I_{cu}$ | $I_{cs}$ | max. fuse (gL/gG)[3] | $I_{cu}$ | $I_{cs}$ | max. fuse (gL/gG)[3] | $I_{cu}$ | $I_{cs}$ | max. fuse (gL/gG)[3] |
| **Type** | A | kA | kA | A | kA | kA | A | kA | kA | A | kA | kA | A | kA | kA | A |
| **Size 00** | | | | | | | | | | | | | | | | |
| **BESD** | 0.16 ... 1 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° |
| | 1.25; 1.6 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 2 | 2 | 20 |
| | 2; 2.5 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 10 | 10 | 35 | 2 | 2 | 35 |
| | 3.2; 4 | 100 | 100 | ° | 100 | 100 | ° | 50 | 10 | 40 | 3 | 3 | 40 | 2 | 2 | 40 |
| | 5; 6.3 | 100 | 100 | ° | 100 | 100 | ° | 50 | 10 | 50 | 3 | 3 | 50 | 2 | 2 | 50 |
| | 8 | 100 | 100 | ° | 50 | 12.5 | 80 | 50 | 10 | 63 | 3 | 3 | 63 | 2 | 2 | 63 |
| | 10 | 100 | 100 | ° | 50 | 12.5 | 80 | 10 | 10 | 63 | 3 | 3 | 63 | 2 | 2 | 63 |
| | 12 | 100 | 100 | ° | 50 | 12.5 | 80 | 10 | 10 | 80 | 3 | 3 | 80 | 2 | 2 | 80 |
| **Size 0** | | | | | | | | | | | | | | | | |
| **BES0** | 0.16 ... 1.6 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° |
| | 2; 2.5 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 8 | 8 | 25 |
| | 3.2 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 8 | 8 | 32 |
| | 4; 5 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 6 | 3 | 32 |
| | 6.3 | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 100 | 100 | ° | 6 | 3 | 50 |
| | 8 | 100 | 100 | ° | 100 | 100 | ° | 50 | 25 | 63 | 42 | 21 | 63 | 6 | 3 | 50 |
| | 10 | 100 | 100 | ° | 100 | 100 | ° | 50 | 25 | 80 | 42 | 21 | 63 | 6 | 3 | 50 |
| | 12.5 | 100 | 100 | ° | 100 | 100 | ° | 50 | 25 | 80 | 42 | 21 | 80 | 6 | 3 | 63 |
| | 16 | 100 | 100 | ° | 50 | 25 | 100 | 50 | 10 | 80 | 10 | 5 | 80 | 4 | 2 | 63 |
| | 20 | 100 | 100 | ° | 50 | 25 | 125 | 50 | 10 | 80 | 10 | 5 | 80 | 4 | 2 | 63 |
| | 22; 25 | 100 | 100 | ° | 50 | 25 | 125 | 50 | 10 | 100 | 10 | 5 | 80 | 4 | 2 | 63 |
| **Size 2** | | | | | | | | | | | | | | | | |
| **BES2** | 16 | 100 | 100 | ° | 50 | 25 | 100 | 50 | 25 | 100 | 12 | 6 | 63 | 5 | 5 | 63 |
| | 20 | 100 | 100 | ° | 50 | 25 | 100 | 50 | 25 | 100 | 12 | 6 | 80 | 5 | 5 | 63 |
| | 25 | 100 | 100 | ° | 50 | 25 | 100 | 50 | 15 | 100 | 12 | 6 | 80 | 5 | 5 | 63 |
| | 32 | 100 | 100 | ° | 50 | 25 | 125 | 50 | 15 | 125 | 10 | 5 | 100 | 4 | 4 | 63 |
| | 40; 45 | 100 | 100 | ° | 50 | 25 | 160 | 50 | 15 | 125 | 10 | 5 | 100 | 4 | 4 | 63 |
| | 50 | 100 | 100 | ° | 50 | 25 | 160 | 50 | 15 | 125 | 10 | 5 | 100 | 4 | 4 | 80 |
| **Size 3** | | | | | | | | | | | | | | | | |
| **BES3** | 40 | 100 | 100 | ° | 50 | 25 | 125 | 50 | 20 | 125 | 12 | 6 | 100 | 6 | 3 | 63 |
| | 50 | 100 | 100 | ° | 50 | 25 | 125 | 50 | 20 | 125 | 12 | 6 | 100 | 6 | 3 | 80 |
| | 63 | 100 | 100 | ° | 50 | 25 | 160 | 50 | 20 | 160 | 12 | 6 | 100 | 6 | 3 | 80 |
| | 75 | 100 | 100 | ° | 50 | 25 | 160 | 50 | 20 | 160 | 8 | 4 | 125 | 5 | 3 | 100 |
| | 90; 100 | 100 | 100 | ° | 50 | 25 | 160 | 50 | 20 | 160 | 8 | 4 | 125 | 5 | 3 | 125 |

Short-circuit resistant up to at least 50kA

° No back-up fuse required, since short-circuit resistant up to 100kA

1) 10% overvoltage.

2) 5% overvoltage.

3) Back-up fuse only required if the short-circuit current at the place of installation > $I_{cu}$.

## Motor Protection Switches Series BES - Size 00 up to 3

BES motor protection switches are suitable for operation in IT systems. Values valid for triple-pole short-circuit are $I_{cu}$ up to $I_{cs}$. In case of double ground fault on different phases at the input and output side of a motor protection switches, the special short-circuit breaking capacity $I_{cuIT}$ applies. The specifications in the table below apply to BES motor protection switches. In the coloured areas, $I_{cuIT}$ is 100kA, or in some ranges it is 50kA. Therefore the motor protection switches are short-circuit resistant in these ranges. If the short-circuit current at the place of installation exceeds the rated short-circuit breaking capacity of the motor protection switches as specified in the table, a back-up fuse is required. The maximum rated current for the back-up fuse is specified in the tables. The rated short-circuit breaking capacity then applies as specified on the fuse.

| Motor starter protectors | Rated current $I_n$ | Up to AC 240V[1] | | Up to AC 400V[1]/415V[2] | | Up to AC 500V[1]/525V[2] | | Up to AC 690V[1] | |
|---|---|---|---|---|---|---|---|---|---|
| | | $I_{cuIT}$ | Max. fuse (gL/gG)[3] | $I_{cuIT}$ | Max. fuse (gL/gG)[3] | $I_{cuIT}$ | Max. fuse (gL/gG)[3] | $I_{cuIT}$ | Max. fuse (gL/gG)[3] |
| **Type** | A | kA | A | kA | A | kA | A | kA | A |
| **Size 00** | | | | | | | | | |
| **BESD** | 0.16 ... 0.63 | 100 | ° | 100 | ° | 100 | ° | 100 | ° |
| | 0.8; 1 | 100 | ° | 100 | ° | 100 | ° | 2 | 16 |
| | 1.25; 1.6 | 100 | ° | 2 | 20 | 2 | 20 | 2 | 20 |
| | 2; 2.5 | 100 | ° | 2 | 35 | 2 | 35 | 2 | 35 |
| | 3.2; 4 | 100 | ° | 2 | 40 | 2 | 40 | 2 | 40 |
| | 5; 6.3 | 100 | ° | 2 | 50 | 2 | 50 | 2 | 50 |
| | 8; 10 | 50 | 80 | 2 | 63 | 2 | 63 | 2 | 63 |
| | 12 | 50 | 80 | 2 | 80 | 2 | 80 | 2 | 80 |
| **Size 0** | | | | | | | | | |
| **BES0** | 0.16 ... 0.63 | 100 | ° | 100 | ° | 100 | ° | 100 | ° |
| | 0.8; 1 | 100 | ° | 100 | ° | 100 | ° | 6 | 16 |
| | 1.25; 1.6 | 100 | ° | 100 | ° | 8 | 20 | 6 | 20 |
| | 2; 2.5 | 100 | ° | 8 | 25 | 8 | 25 | 6 | 25 |
| | 3.2 | 100 | ° | 8 | 32 | 8 | 32 | 6 | 32 |
| | 4; 5 | 100 | ° | 6 | 32 | 4 | 32 | 3 | 32 |
| | 6.3... 10 | 100 | ° | 6 | 50 | 4 | 50 | 3 | 50 |
| | 12.5 | 100 | ° | 6 | 63 | 4 | 63 | 3 | 63 |
| | 16...25 | 50 | 80 | 4 | 63 | 3 | 63 | 2 | 63 |
| **Size 2** | | | | | | | | | |
| **BES2** | 16 | 50 | 100 | 8 | 100 | 6 | 80 | 5 | 63 |
| | 20 | 50 | 125 | 8 | 100 | 6 | 80 | 5 | 63 |
| | 25 | 50 | 125 | 8 | 100 | 6 | 80 | 5 | 63 |
| | 32 | 50 | 125 | 6 | 125 | 4 | 100 | 3 | 80 |
| | 40... 50 | 50 | 160 | 6 | 125 | 4 | 100 | 3 | 80 |
| **Size 3** | | | | | | | | | |
| **BES3** | 40 | 50 | 125 | 10 | 63 | 5 | 50 | 5 | 50 |
| | 50 | 50 | 125 | 8 | 80 | 3 | 63 | 3 | 63 |
| | 63 | 50 | 160 | 6 | 80 | 3 | 63 | 3 | 63 |
| | 75 | 50 | 160 | 5 | **100** | **2** | 80 | 2 | 80 |
| | 90; 100 | 50 | 160 | 5 | 125 | 2 | 100 | 2 | 100 |

Short-circuit resistant up to at least 50kA

° No back-up fuse required, since short-circuit resistant up to 100kA

1) 10% overvoltage.

2) 5% overvoltage.

3) Back-up fuse only required, if short-circuit current at the place of installation > $I_{cuIT}$.

## Motor Protection Switches Series BES - Size 00 up to 3

**General technical specifications**

| **Type** | | | **BESD** | **BES0** | **BES2** | **BES3** |
|---|---|---|---|---|---|---|
| **Standards** | | | | | | |
| • IEC 60947-1, EN 60947-1 (VDE 0660 Part 100) | | | | Yes | | |
| • IEC 60947-2, EN 60947-2 (VDE 0660 Part 101) | | | | Yes | | |
| • IEC 60947-4-1, EN 60947-4-1 (VDE 0660 Part 102) | | | | Yes | | |
| • UL489, CSA C22.2-No.5-02 | | | | No | | |
| **Size** | | | 00 | 0 | 2 | 3 |
| **Number of poles** | | | | 3 | | |
| **Max. rated current $I_n$ max (= max. rated operational current $I_e$)** | | A | 12 | 25 | 50 | 100 |
| **Permissible ambient temperature** | | | | | | |
| • Storage/transport | | °C | | –50... +80 | | |
| • Operation | | °C | | –20... +70[2] | | |
| **Permissible rated current at inside temperature of control cabinet** | | | | | | |
| • +60°C | | % | | 100 | | |
| • +70°C | | % | | 87 | | |
| **Motor protection switches/circuit breaker inside enclosure** | | | | | | |
| **Permissible rated current at ambient temperature of enclosure** | | | | | | |
| • +35°C | | % | | 100 | | |
| • +60°C | | % | | 87 | | |
| **Rated operational voltage $U_e$** | | | | | | |
| • Acc. to IEC | | VAC | | 690[3] | | |
| • Acc. to UL/CSA | | VAC | | 600 | | |
| **Rated frequency** | | Hz | | 50/60 | | |
| **Rated insulation voltage $U_i$** | | V | | 690 | | |
| **Rated impulse withstand voltage $U_{imp}$** | | kV | | 6 | | |
| **Utilization categories** | | | | | | |
| • IEC 60947-2 (motor protection switches/circuit breaker) | | | | A | | |
| • IEC 60947-4-1 (motor starter) | | | | AC-3 | | |
| **Trip class CLASS Acc. to IEC60947-4-1** | Acc. to IEC60947-4-1 | | | 10 | | |
| **DC short-circuit breaking capacity (time constant t = 5ms)** | | | | | | |
| • 1 conducting path 150VDC | | kA | | 10 | | |
| • 2 conducting paths in series 300VDC | | kA | | 10 | | |
| • 3 conducting paths in series 450VDC | | kA | | 10 | | |
| **Power loss Pv per motor starter** | $I_n$: ... 1.25A | W | 5 | -- | | |
| **protector/circuit breaker** | $I_n$: 1.6 ... 6.3A | W | 6 | -- | | |
| Dependent on rated current $I_n$ | $I_n$: 8 ... 12A | W | 7 | -- | | |
| (upper setting range) | $I_n$: ... 0.63A | W | -- | 5 | -- | |
| | $I_n$: 0.8 ... 6.3A | W | -- | 6 | -- | |
| $R_{per\ conducting\ path} = P/I^2 \times 3$ | $I_n$: 8 ... 16A | W | -- | 7 | -- | |
| | $I_n$: 20 ... 25A | W | -- | 8 | -- | |
| | $I_n$: ... 25A | W | -- | | 12 | -- |
| | $I_n$: 32A | W | | | 15 | |
| | $I_n$: 40 ... 50A | W | -- | | 20 | -- |
| | $I_n$: ... 63A | W | -- | | | 20 |
| | $I_n$: 75 and 90A | W | -- | | | 30 |
| | $I_n$: ... 100A | W | -- | | | 38 |
| **Shock resistance** | Acc. to IEC 60068-2-27 | g/ms | | 25/11 (square and sine pulse) | | |
| **Degree of protection** | Acc. to IEC 60529 | | | IP20[4] | | |
| **Touch protection** | Acc. to EN 50274 | | | Finger-safe | | |
| **Temperature compensation** | Acc. to IEC 60947-4-1 | °C | | –20 ...+60 | | |
| **Phase failure sensitivity** | Acc. to IEC 60947-4-1 | | | Yes | | |
| **Isolating function** | Acc. to IEC 60947-2 | | | Yes | | |
| **Main and EMERGENCY-STOP switch characteristics**[5] | Acc. to IEC 60204-1 (VDE 0113) | | | Yes | | |
| **Safe isolation between main and auxiliary circuits, req. for PELV applications** | Acc. to EN 60947-1 | | | | | |
| • Up to 400V + 10% | | | | Yes | | |
| • Up to 415V + 5% (higher voltages on request) | | | | Yes | | |
| **Permissible mounting positions** | | | | Any, acc. to IEC60447 start command "I" right-hand side or top | | |
| **Mechanical endurance** | | Operating cycles | | 100000 | | 50000 |
| **Electrical endurance** | | Operating cycles | | 100000 | | 25000 |
| **Max. switching frequency per hour (motor starts)** | | 1/h | | 15 | | |

2) Above +60°C current reduction.
3) 500V with moulded-plastic enclosure.
4) Terminal compartment IP00.
5) With appropriate accessories.

## Motor Protection Switches Series BES - Size 00 up to 3

| **Type** | | **BESD** | **BES0** | **BES2** | **BES3** |
|---|---|---|---|---|---|
| **Connection type** | | **Screw terminals** | | **Screw terminals with box terminals** | |
| Terminal screw | | Pozidriv size 2 | | Pozidriv size 2 | 4mm Allen screw |
| Prescribed tightening torque | Nm | 0.8...1.2 | 2...2.5 | 3...4.5 | 4...6 |
| Conductor cross-sections (1 or 2 conductors connectable) | | | | | |
| • Solid | $mm^2$ | 2 x (0.5... 1.5)[4] 2 x (0.75... 2.5)[4] | 2 x (1... 2.5)[4] 2 x (2.5... 6)[4] | 2 x (0.75... 16) | 2 x (2.5... 16) |
| • Finely stranded with end sleeve | $mm^2$ | 2 x (0.5... 1.5)[4] 2 x (0.75... 2.5)[4] | 2 x (1... 2.5)[4] 2 x (2.5... 6)[4] | 2 x (0.75... 16), 1 x (0.75... 25) | 2 x (2.5... 35), 1 x (2.5... 50) |
| • Stranded | $mm^2$ | 2 x (0.5... 1.5)[4] 2 x (0.75... 2.5)[4] | 1 x (1... 2.5)[4] 2 x (2.5... 6) | 2 x (0.75... 25), 1 x (0.75... 35) | 2 x (10...50), 1 x (10...50) |
| • AWG cables, solid or stranded | AWG | 2 x (18... 14) | 2 x (14... 10) | 2 x (18... 2), 1 x (18... 2) | 2 x (10... 1/0), 1 x (10... 2/0) |
| Ribbon cable conductors (number x width x thickness) | mm | -- | | 2 x (6 x 9 x 0.8) | |
| Removable box terminals[1] | | | | | |
| • With copper bars[2] | | -- | | -- | 18 x 10 |
| • With cable lugs[3] | | -- | | -- | up to 2 x 70 |
| Connection type | | Cage Clamp terminals on request | | | |
| Conductor cross-sections (1 or 2 conductors connectable) | | | | | |
| • Solid | $mm^2$ | 2 x (0.25... 2.5) | -- | -- | |
| • Finely stranded with end sleeve | $mm^2$ | 2 x (0.25... 1.5) | -- | -- | |
| • Finely stranded without end sleeve | $mm^2$ | 2 x (0.25... 2.5) | -- | -- | |
| • AWG cables, solid or stranded | AWG | 2 x (24... 14) | -- | -- | |
| Max. external diameter of the cable insulation | mm | 3.6 | | | |

1) Cable-lug and busbar connection possible after removing the box terminals.
2) If bars larger than 12mmx10mm are connected, a terminal cover is needed to comply with the phase clearance (on request).
3) If conductors larger than 25$mm^2$ are connected, a terminal cover is needed to comply with the phase clearance (on request).
4) 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.

## Motor Protection Switches Series BES - Size 00 up to 3

Motor protection switches of the BES series are approved for UL/CSA and according to UL 508 and CSA C22.2 No. 14 they can be used on their own or as a load feeder in combination with a contactor. These motor protection switches can be used as "Manual Motor Controllers" for "Group Installations", as "Manual Motor Controllers Suitable for Tap Conductor Protection in Group Installations" and as "Self-Protected Combination Motor Controllers" (Type E).

**BES motor protection switches as "Manual Motor Controllers"**

If used as a "Manual Motor Controller", the motor protection switches is always operated in combination with an upstream short-circuit protection device. Approved fuses or a circuit breaker according to UL489/CSAC22.2 No. 5-02 can be used. These devices must be dimensioned according to the National Electrical Code (UL) or Canadian Electrical Code (CSA).

| **Motor protection switches** | | **hp rating[1] for FLA[2] max.** | | **Rated current** | **240VAC** | | **480VAC** | | **600VAC** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $I_n$ | **UL** $I_{bc}$[3] | **CSA** $I_{bc}$[3] | **UL** $I_{bc}$[3] | **CSA** $I_{bc}$[3] | **UL** $I_{bc}$[3] | **CSA** $I_{bc}$[3] |
| **Type** | V | 1-phase | 3-phase | A | kA | kA | kA | kA | kA | kA |
| **Size 00** | | | | | | | | | | |
| **BESD** | | | | 0.16 ... 2 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 2.5 | 65 | 65 | 65 | 65 | 10 | 10 |
| **FLA[2] max. 12A,** | 115 | 1/2 | -- | 3.2 | 65 | 65 | 65 | 65 | 10 | 10 |
| 600V | 200 | 1 1/2 | 3 | 4 | 65 | 65 | 65 | 65 | 10 | 10 |
| **NEMA size 00** | 230 | 2 | 3 | 5 | 65 | 65 | 65 | 65 | 10 | 10 |
| | 460 | -- | 7 1/2 | 6.3 | 65 | 65 | 65 | 65 | 10 | 10 |
| | 575/600 | -- | 10 | 8 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 10 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 12 | 65 | 65 | 65 | 65 | 10 | 10 |
| **Size 0** | | | | | | | | | | |
| **BES0** | | | | 0.16 ... 3.2 | 65 | 65 | 65 | 65 | 30 | 30 |
| | | | | 4 | 65 | 65 | 65 | 65 | 30 | 30 |
| **FLA[2] max. 25A,** | 115 | 2 | -- | 5 | 65 | 65 | 65 | 65 | 30 | 30 |
| 600V | 200 | 3 | 5 | 6.3 | 65 | 65 | 65 | 65 | 30 | 30 |
| **NEMA size 1** | 230 | 3 | 7 1/2 | 8 | 65 | 65 | 65 | 65 | 30 | 30 |
| | 460 | -- | 15 | 10 | 65 | 65 | 65 | 65 | 30 | 30 |
| | 575/600 | -- | 20 | 12.5 | 65 | 65 | 65 | 65 | 30 | 30 |
| | | | | 16 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 20 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 22 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 25 | 65 | 65 | 65 | 65 | 10 | 10 |
| **Size 2** | | | | | | | | | | |
| **BES2** | | | | 16 | 65 | 65 | 65 | 65 | 30 | 25 |
| | | | | 20 | 65 | 65 | 65 | 65 | 30 | 25 |
| **FLA[2] max. 50A,** | 115 | 3 | -- | 25 | 65 | 65 | 65 | 65 | 30 | 25 |
| 600V | 200 | 7 1/2 | 15 | 32 | 65 | 65 | 65 | 65 | 30 | 25 |
| **NEMA size 2** | 230 | 10 | 20 | 40 | 65 | 65 | 65 | 65 | 30 | 25 |
| | 460 | -- | 40 | 45 | 65 | 65 | 65 | 65 | 30 | 25 |
| | 575/600 | -- | 50 | 50 | 65 | 65 | 65 | 65 | 30 | 25 |
| **Size 3** | | | | | | | | | | |
| **BES3** | | | | 16 | 65 | 65 | 65 | 65 | 30 | 30 |
| | | | | 20 | 65 | 65 | 65 | 65 | 30 | 30 |
| **FLA[2] max. 99A,** | 115 | 7 1/2 | -- | 25 | 65 | 65 | 65 | 65 | 30 | 30 |
| 600V | 200 | 20 | 30 | 32 | 65 | 65 | 65 | 65 | 30 | 30 |
| **NEMA size 3** | 230 | 20 | 40 | 40 | 65 | 65 | 65 | 65 | 30 | 30 |
| | 460 | -- | 75 | 50 | 65 | 65 | 65 | 65 | 30 | 30 |
| | 575/600 | -- | 100 | 63 | 65 | 65 | 65 | 65 | 30 | 30 |
| | | | | 75 | 65 | 65 | 65 | 65 | 30 | 30 |
| | | | | 90 | 65 | 65 | 65 | 65 | 10 | 10 |
| | | | | 100 | 65 | 65 | 65 | 65 | 10 | 10 |

1) hp rating = Power rating in horse power (maximum motor rating).
2) FLA = Full Load Amps/Motor full load current.
3) Complies with "short-circuit breaking capacity" according to UL.

## Motor Protection Switches Series BES - Size 00 up to 3

The application "Manual Motor Controllers" is only accepted by UL. CSA does not recognize this approval!
When application "Manual Motor Controller" according CSA is prescribed - an upstream short-circuit protection device - e.g. a certified pre-fuse or a motor protection switch according UL489 has to be used. These devices must apply to the current national regulations.

| **Circuit breaker** | | **hp rating[1] for FLA[2] Max.** | | **Rated current $I_n$** | **240VAC UL $I_{bc}$[3]** | **Up to 480VAC UL $I_{bc}$[3]** | **Up to 600VAC UL $I_{bc}$[3]** |
|---|---|---|---|---|---|---|---|
| **Type** | V | 1-phase | 3-phase | A | kA | kA | kA |
| **Size 00** | | | | | | | |
| **BESD** | | | | 0.16 ... 0.8 | 65 | 65 | 10 |
| | | | | 1 | 65 | 65 | 10 |
| **FLA[2] max. 8A,** | 115 | 1/3 | -- | 1.25 | 65 | 65 | 10 |
| 480V | 200 | 3/4 | 2 | 2 | 65 | 65 | 10 |
| **NEMA size 0** | 230 | 1 | 2 | 2.5 | 65 | 65 | 10 |
| | 460 | -- | 5 | 3.2 | 65 | 65 | 10 |
| | 575/600 | -- | -- | 4 | 65 | 65 | 10 |
| | | | | 5 | 65 | 65 | 10 |
| | | | | 6.3 | 65 | 65 | 10 |
| | | | | 8 | 65 | 65 | 10 |
| **Size 0** | | | | | | | |
| **BES0** | | | | 0.16 ... 1.6 | 65 | 65 | 30 |
| | | | | 2 | 65 | 65 | 30 |
| **FLA[2]max.** | 115 | 2 | -- | 2.5 | 65 | 65 | 30 |
| 22A, 480V | 200 | 3 | 5 | 3.2 | 65 | 65 | 30 |
| 12.5A, 600V | 230 | 3 | 7 1/2 | 4 | 65 | 65 | 30 |
| | 460 | -- | 15 | 5 | 65 | 65 | 30 |
| **NEMA size 1** | 575/600 | -- | 10 | 6.3 | 65 | 65 | 30 |
| | | | | 8 | 65 | 65 | 30 |
| | | | | 10 | 65 | 65 | 30 |
| | | | | 12.5 | 65 | 65 | 30 |
| **Size 2** | | | | | | | |
| **BES3** | | | | 16 | 65 | 65 | 25 |
| | | | | 20 | 65 | 65 | 25 |
| **FLA[2] max.** | 115 | 3 | -- | 25 | 65 | 65 | 25 |
| 50A, 600V | 200 | 7 1/2 | 15 | 32 | 65 | 65 | 25 |
| **NEMA size 2** | 230 | 10 | 20 | 40 | 65 | 65 | 25 |
| | 460 | -- | 40 | 45 | 65 | 65 | 25 |
| | 575/600 | -- | 50 | 50 | 65 | 65 | 25 |
| **Size 3** | | | | | | | |
| **BES4** | | | | 16 | 65 | 65 | 30 |
| | | | | 20 | 65 | 65 | 30 |
| **FLA[2]max.** | 115 | 7 1/2 | -- | 25 | 65 | 65 | 30 |
| 100A, 480V | 200 | 20 | 30 | 32 | 65 | 65 | 30 |
| 75A, 600V | 230 | 20 | 40 | 40 | 65 | 65 | 30 |
| | 460 | -- | 75 | 50 | 65 | 65 | 30 |
| **NEMA size 3** | 575/600 | -- | 75 | 63 | 65 | 65 | 30 |
| | | | | 75 | 65 | 65 | 30 |
| | | | | 90 | 65 | 65 | -- |
| | | | | 100 | 65 | 65 | -- |

1) hp rating = Power rating in horse power (maximum motor rating).
2) FLA = Full Load Amps/Motor full load current.
3) Complies with "short-circuit breaking capacity" according to UL.

## Motor Protection Switches Series BES - Accessories

| Type | | Lateral auxiliary switches with 1NO + 1NC and signalling switch | Transverse auxiliary switches with 1NO + 1NC |
|---|---|---|---|
| **Max. rated voltage** | | | |
| Acc. to NEMA (UL) | VAC | 600 | 250 |
| Acc. to NEMA (CSA) | VAC | 600 | 250 |
| **Uninterrupted current** | A | 10 | 2.5 |
| **Switching capacity** | | A600 | C300 |
| | | Q300 | R300 |

| Front transverse auxiliary switches (front mounted) | | Switching capacity for different voltages 1NO + 1NC, 2NO |
|---|---|---|
| **Rated operational current $I_e$** | | |
| • At AC-15, alternating voltage | | |
| - 24V | A | 2 |
| - 230V | A | 0.5 |
| - 400V | A | -- |
| - 690V | A | -- |
| • At AC-12 = $I_{th}$, alternating Voltage | | |
| - 24V | A | 2.5 |
| - 230V | A | 2.5 |
| - 400V | A | -- |
| - 690V | A | -- |
| • At DC-13, direct voltage L/R 200ms | | |
| - 24V | A | 1 |
| - 48V | A | 0.3 |
| - 60V | A | 0.15 |
| - 110V | A | -- |
| - 220V | A | -- |
| **Minimum load capacity** | V | 17 |
| | mA | 1 |

| Lateral auxiliary switches and signalling switch (side mounted) | | Switching capacity for different voltages 1 NO + 1 NC, 2 NO and signalling switch |
|---|---|---|
| **Rated operational current $I_e$** | | |
| • At AC-15, alternating Voltage | | |
| - 24V | A | 6 |
| - 230V | A | 4 |
| - 400V | A | 3 |
| - 690V | A | 1 |
| • At AC-12 = $I_{th}$, alternating Voltage | | |
| - 24V | A | 10 |
| - 230V | A | 10 |
| - 400V | A | 10 |
| - 690V | A | 10 |
| • At DC, direct Voltage L/R 200 ms | | |
| - 24V | A | 2 |
| - 110V | A | 0.5 |
| - 220V | A | 0.25 |
| - 440V | A | 0.1 |
| **Minimum load capacity** | V | 17 |
| | mA | 1 |

| Auxiliary trip units | | Undervoltage release | Shunt trip unit |
|---|---|---|---|
| **Power consumption** | | | |
| • During pick-up | | | |
| - AC voltages | VA/W | 20.2 / 13 | 20.2 / 13 |
| - DC voltages | W | 20 | 13 ... 80 |
| • During continuous duty | | | |
| - AC voltages | VA/W | 7.2 / 2.4 | -- |
| - DC voltages | W | 2.1 | -- |
| **Response voltage** | | | |
| • Tripping | V | 0.35 ... 0.7 x $U_s$ | -- |
| • Pickup | V | 0.85 ... 1.1 x $U_s$ | 0.7 ... 1.1 x $U_s$ |
| **Maximum opening time** | ms | 20 | |

## Motor Protection Switches Series BES - Accessories

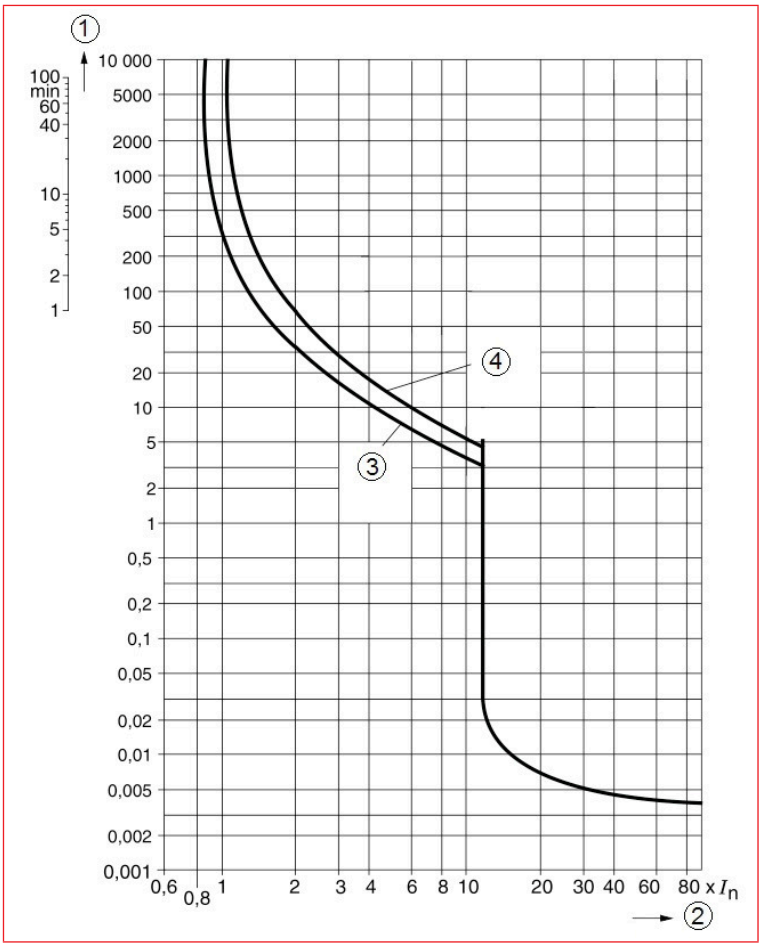
| | | | |
|---|---|---|---|
| **Short-circuit protection for auxiliary and control circuits** | | | |
| • Melting fuses gL/gG | A | 10 | |
| • Miniature circuit breaker, C characteristic | A | 6 | Prospective short-circuit current < 0.4 kA |
| **Conductor cross-sections for auxiliary and control circuits** | | | |
| **Connection type** | | **Screw terminals** | |
| **Terminal screw** | | Pozidriv size 2 | |
| **Prescribed tightening torque** | Nm | 0.8 ... 1.2 | |
| **Conductor cross-sections (1 or 2 conductors)** | | | |
| • Solid | $mm^2$ | 2 x (0.5 ... 1.5)[1)]/2 x (0.75 ... 2.5)[1)] | |
| • Finely stranded with end sleeve | $mm^2$ | 2 x (0.5 ... 1.5)[1)]/2 x (0.75 ... 2.5)[1)] | |
| • Stranded | $mm^2$ | 2 x (0.5 ... 1.5)[1)]/2 x (0.75 ... 2.5)[1)] | |
| • AWG cables | AWG | 2 x (18 ... 14) | |
| **Connection type** | | **Cage Clamp terminals (on request)** | |
| Conductor cross-sections (1 or 2 conductors connectable) | | | |
| • Solid | $mm^2$ | 2 x (0.25... 2.5) | |
| • Finely stranded with end sleeve | $mm^2$ | 2 x (0.25... 1.5) | |
| • Finely stranded without end sleeve | $mm^2$ | 2 x (0.25 ... 2.5) | |
| • AWG cables, solid or stranded | AWG | 2 x (24... 14) | |
| Max. external diameter of the cable insulation | mm | 3.6 | |

1) 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.

## Motor Protection Switches Series BES - Characteristic Curve

The time/current characteristic, the current limiting characteristics and the $I^2t$ characteristic curves were determined according to DIN VDE 0660 and IEC 60947.
The tripping characteristic applies to the time/current characteristic of DC and AC with a frequency of 0Hz to 400Hz
The characteristic curves apply to the cold state. At operating temperature, the tripping times of the thermal trip units are reduced to approximately 25%.
Under normal operating conditions, all three poles of the device must be loaded. To protect single-phase or DC loads, the current paths must be connected in series.
The shown characteristic curve for the motor protection switch BES is a typical, individual curves for all ranges are available (on request).

### Representation of Typical Time / Current Characteristic of BES




1) Opening time
2) Current
3) 2-pole loading Class 10
4) 3-pole loading Class 10