RADE KONČAR
KONTAKTORI I RELEI

72 YEARS TRADITION

GENERAL CATALOG

Safe and affordable

- Contactors
- Thermal Overload Relays
- Rotary Cam Switches
- Pushbuttons and Indicator Lights
- Motor Protection Circuit Breakers
- Molded Case Circuit Breakers
- Air Type Circuit Breakers
- Miniature Circuit Breakers
- Electronic Time Relays
- Power Factor Correction Units

RADE KONCAR KONTAKTORI I RELEI D.O.O.

For more than 70 years we have been building a company that values knowledge, hard work and dedication. With headquarters in Skopje, North Macedonia we have grew into a company that has a worldwide network of satisfied customers and clients in over 40 countries.

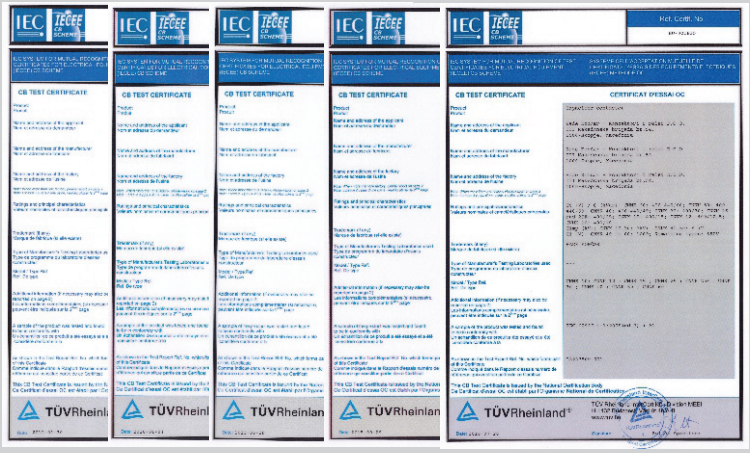
We are producing low voltage electrical equipment for industrial applications. Our range of products includes AC-DC contactors from 9A to 1000A (Ac3, 400v 50Hz) with AC or DC control circuit, thermal overload relays, rotary cam switches, push buttons, motor protection breakers, molded case circuit breakers, air type circuit breakers, miniature circuit breakers and electronic time relays. These products are produced in standard configuration, however we can quickly customize our production for the client's unique requests.

Our research and development sector is constantly working on making the design of our products more reliable, flexible and customizable. These efforts are in accordance with all the international standards of production and quality of the products.

We have also successfully developed systems for energy monitoring and management (EMMS), power factor correction units, and system for intelligent street lighting (RK-Light).

Our Quality Management System has been certified by TUV CERT - Certification Body, which means that we are fully compliant with the ISO 9001 standard. Because we care about the environment and our employees, we have also implemented all the necessary policies and procedures for the standard ISO 14001 and ISO 45001.

GREEN ORIENTED COMPANY



TÜVRheinland® CERT ISO 9001

EAC CE

RADE KONČAR
KONTAKTORI I RELEI

PRODUCTION PROGRAM

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CONTACTORS

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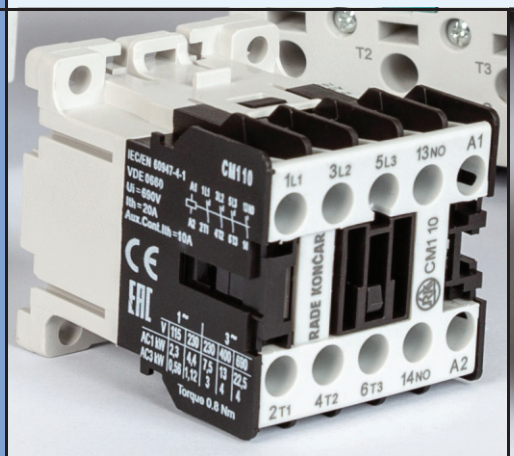
Low voltage contactors



Motor contactors **CNN** series

Application:

Contactors CNN series are using for remote control and protection (in combination with overload relays) of three-phase motors with a nominal power of 4.5 kW to 55 kW (400 V/50 Hz for the use category AC3), and other a.c. and d.c. loads, such as electric ovens, bulbs, electromagnets, capacitors etc.

Advantages:

- In conformity with: IEC 60947-1, IEC 60947-4-1
- High performance and reliability
- Low power loss
- Protection of direct contact from front side - IP20
- Large selection of accessories
- Standard control voltages: 24 VAC, 48 VAC, 110 VAC, 230 VAC, 400 VAC
- Installation on DIN rail and mounting plate
- Small mounting dimensions and overall size
- Up to 4 extended auxiliary contacts (1NO + 1NC or 2NO + 2NC)
- Snap on auxiliaries

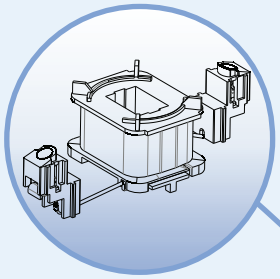
Ordering:

CNN	9	1	0	220/230V	50Hz
1	2	3	4	5	6

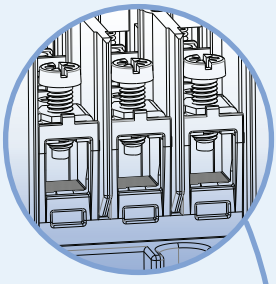
1 - Contactor series
2 - Rated operational current Ie (AC3,400V/50Hz)
3 - Number of NO auxiliary contacts
4 - Number of NC auxiliary contacts
5 - Control voltage (coil voltage)
6 - Frequency of the control voltage

Technical data - page 62; Accessories - page 12

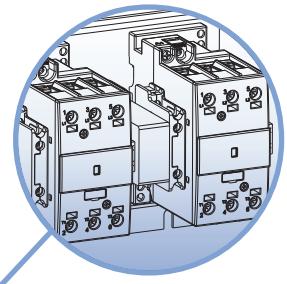
Possibilities



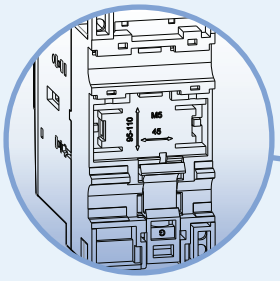
Wide range of coil voltages are provided. The users can change the coil by themselves. AC and DC coils are not compatible with each other. Possible is only the replacement of AC coils with AC and DC coils with DC.



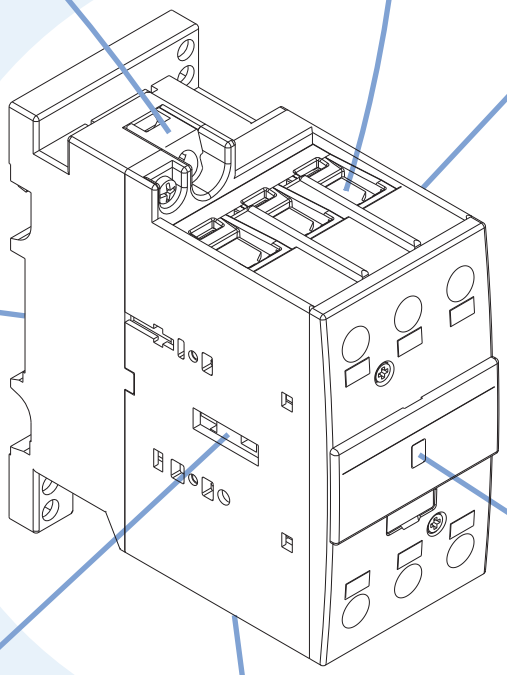
Special clamp terminals are provided for reliable connection of conductors for CNN 50 - CNN 100

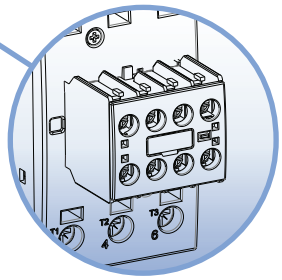


Mechanical interlock is used to prevent the contactors from being energized simultaneously or closing together and causing a short circuit

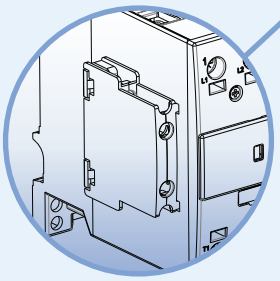


Contactors type CNN can be mounted on DIN rail or directly on the mounting plate. Type CNN 9 to CNN 40 DIN rail 35mm and type CNN 50 to CNN 100 DIN rail 35mm or 75mm

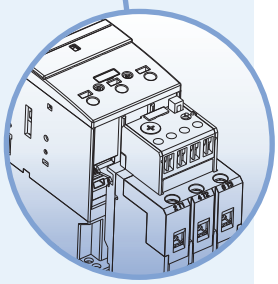




Auxiliary contacts (front mounting)



Auxiliary contacts (side mounting)



Overload relay (bimetal) can be mounted directly on the contactor or on special carrier adapter.

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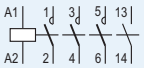
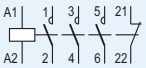
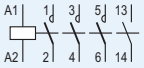
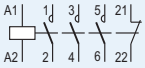
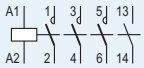
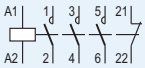
Motor contactor CNN 9; 9A/4.5kW (AC3,400V/50Hz); 25A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 9 10 24V 50Hz	603143		260	24
CNN 9 10 48V 50Hz	604586		260	24
CNN 9 10 110V 50Hz	604372		260	24
CNN 9 10 220/230V 50Hz	**604750**		**260**	**24**
CNN 9 10 380/400V 50Hz	605022		260	24
CNN 9 10 24V DC	606473		275	1
CNN 9 10 220V DC	609001		275	1
CNN 9 01 24V 50Hz	603144		260	24
CNN 9 01 48V 50Hz	609002		260	24
CNN 9 01 110V 50Hz	603446		260	24
CNN 9 01 220/230V 50Hz	**604749**		**260**	**24**
CNN 9 01 380/400V 50Hz	605023		260	24
CNN 9 01 24V DC	607570		275	1
CNN 9 01 220V DC	609003		275	1

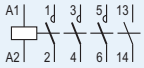
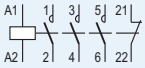
integrated auxiliary contact (1NO or 1NC)
for DC control voltage with auxiliary contact block BP3 01 DC
*second level packing

Motor contactor CNN 12; 12A/5.7kW (AC3,400V/50Hz); 25A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 12 10 24V 50Hz	603145		260	24
CNN 12 10 48V 50Hz	604585		260	24
CNN 12 10 110V 50Hz	603002		260	24
CNN 12 10 220/230V 50Hz	**604752**		**260**	**24**
CNN 12 10 380/400V 50Hz	606562		260	24
CNN 12 10 24V DC	605834		275	1
CNN 12 10 220V DC	609004		275	1
CNN 12 01 24V 50Hz	603450		260	24
CNN 12 01 48V 50Hz	609005		260	24
CNN 12 01 110V 50Hz	603740		260	24
CNN 12 01 220/230V 50Hz	**604751**		**260**	**24**
CNN 12 01 380/400V 50Hz	603779		260	24
CNN 12 01 24V DC	609006		275	1
CNN 12 01 220V DC	609007		275	1

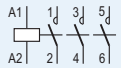
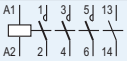
integrated auxiliary contact (1NO or 1NC)
for DC control voltage with auxiliary contact block BP3 01 DC
*second level packing

Motor contactor CNN 18; 18A/7.5kW (AC3,400V/50Hz); 30A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 18 10 24V 50Hz	603325		265	24
CNN 18 10 48V 50Hz	604034		265	24
CNN 18 10 110V 50Hz	603021		265	24
CNN 18 10 220/230V 50Hz	**604754**		**265**	**24**
CNN 18 10 380/400V 50Hz	605024		265	24
CNN 18 10 24V DC	606440		285	1
CNN 18 10 220V DC	609008		285	1
CNN 18 01 24V 50Hz	603287		265	24
CNN 18 01 48V 50Hz	609009		265	24
CNN 18 01 110V 50Hz	609010		265	24
CNN 18 01 220/230V 50Hz	**604753**		**265**	**24**
CNN 18 01 380/400V 50Hz	605025		265	24
CNN 18 01 24V DC	609011		285	1
CNN 18 01 220V DC	609012		285	1

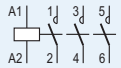
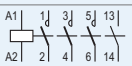
integrated auxiliary contact (1NO or 1NC)
for DC control voltage with auxiliary contact block BP3 01 DC
*second level packing

Motor contactor CNN 22; 22A/11kW (AC3,400V/50Hz); 30A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 22 10 24V 50Hz	609013		270	24
CNN 22 10 48V 50Hz	609014		270	24
CNN 22 10 110V 50Hz	609015		270	24
CNN 22 10 220/230V 50Hz	**606669**		**270**	**24**
CNN 22 10 380/400V 50Hz	609016		270	24
CNN 22 10 24V DC	609017		290	1
CNN 22 10 220V DC	609018		290	1
CNN 22 01 24V 50Hz	609019		270	24
CNN 22 01 48V 50Hz	609020		270	24
CNN 22 01 110V 50Hz	609021		270	24
CNN 22 01 220/230V 50Hz	**609022**		**270**	**24**
CNN 22 01 380/400V 50Hz	609023		270	24
CNN 22 01 24V DC	609024		290	1
CNN 22 01 220V DC	609025		290	1

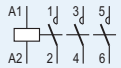
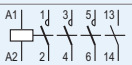
integrated auxiliary contact (1NO or 1NC)
for DC control voltage with auxiliary contact block BP3 01 DC
*second level packing

Motor contactor CNN 25; 25A/11kW (AC3,400V/50Hz); 40A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 25 00 24V 50Hz	603425		280	24
CNN 25 00 48V 50Hz	604587		280	24
CNN 25 00 110V 50Hz	603003		280	24
CNN 25 00 220/230V 50Hz	**604755**		**280**	**24**
CNN 25 00 380/400V 50Hz	603395		280	24
CNN 25 10 24V DC	606506		305	1
CNN 25 10 220V DC	609026		305	1

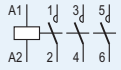
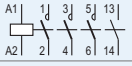
for DC control voltage with auxiliary contact block BP3 11 DC
*second level packing

Motor contactor CNN 30; 30A/15kW (AC3,400V/50Hz); 40A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 30 00 24V 50Hz	606008		285	24
CNN 30 00 48V 50Hz	609027		285	24
CNN 30 00 110V 50Hz	606870		285	24
CNN 30 00 220/230V 50Hz	**605359**		**285**	**24**
CNN 30 00 380/400V 50Hz	606009		285	24
CNN 30 10 24V DC	606507		310	1
CNN 30 10 220V DC	607784		310	1

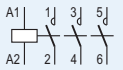
for DC control voltage with auxiliary contact block BP3 11 DC
*second level packing

Motor contactor CNN 32; 32A/15kW (AC3,400V/50Hz); 50A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 32 00 24V 50Hz	603451		395	18
CNN 32 00 48V 50Hz	604942		395	18
CNN 32 00 110V 50Hz	603447		395	18
CNN 32 00 220/230V 50Hz	**604756**		**395**	**18**
CNN 32 00 380/400V 50Hz	603396		395	18
CNN 32 10 24V DC	605973		420	1
CNN 32 10 220V DC	609028		420	1

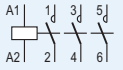
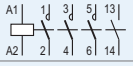
for DC control voltage with auxiliary contact block BP3 11 DC
for connecting multi-wire conductor up to 25 mm^2 must be ordered additional terminal blocks - see page 13
*second level packing

Motor contactor CNN 40; 38A/18.5kW (AC3,400V/50Hz); 50A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 40 00 24V 50Hz	603452		400	18
CNN 40 00 48V 50Hz	604771		400	18
CNN 40 00 110V 50Hz	603004		400	18
CNN 40 00 220/230V 50Hz	**604757**		**400**	**18**
CNN 40 00 380/400V 50Hz	606010		400	18
CNN 40 10 24V DC	605835		425	1
CNN 40 10 220V DC	606139		425	1

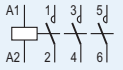
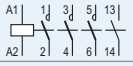
for DC control voltage with auxiliary contact block BP3 11 DC
for connecting multi-wire conductor up to 25 mm^2 must be ordered additional terminal blocks - see page 13
*second level packing

Motor contactor CNN 50; 50A/22kW (AC3,400V/50Hz); 85A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 50 00 24V 50Hz	604742		875	10
CNN 50 00 48V 50Hz	605820		875	10
CNN 50 00 110V 50Hz	605557		875	10
CNN 50 00 220/230V 50Hz	**604744**		**875**	**10**
CNN 50 00 380/400V 50Hz	604971		875	10
CNN 50 10 24V DC	605836		895	1
CNN 50 10 220V DC	604948		895	1

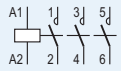
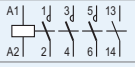
for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Motor contactor CNN 60; 60A/30kW (AC3,400V/50Hz); 85A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 60 00 24V 50Hz	604743		880	10
CNN 60 00 48V 50Hz	605821		880	10
CNN 60 00 110V 50Hz	605169		880	10
CNN 60 00 220/230V 50Hz	**604745**		**880**	**10**
CNN 60 00 380/400V 50Hz	604972		880	10
CNN 60 10 24V DC	607278		900	1
CNN 60 10 220V DC	604947		900	1

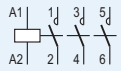
for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Motor contactor CNN 70; 65A/33kW (AC3,400V/50Hz); 90A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 70 00 24V 50Hz	605817		900	10
CNN 70 00 48V 50Hz	605818		900	10
CNN 70 00 110V 50Hz	605819		900	10
CNN 70 00 220/230V 50Hz	**605338**		**900**	**10**
CNN 70 00 380/400V 50Hz	605923		900	10
CNN 70 10 24V DC	606501		920	1
CNN 70 10 220V DC	605895		920	1

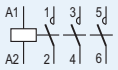
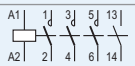
for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Motor contactor CNN 80; 80A/37kW (AC3,400V/50Hz); 95A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNN 80 00 24V 50Hz	605528		1.3	8
CNN 80 00 48V 50Hz	606095		1.3	8
CNN 80 00 110V 50Hz	605921		1.3	8
CNN 80 00 220/230V 50Hz	**605150**		**1.3**	**8**
CNN 80 00 380/400V 50Hz	605922		1.3	8
CNN 80 10 24V DC	605837		1.33	1
CNN 80 10 220V DC	609029		1.33	1

for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Motor contactor CNN 90; 90A/45kW (AC3,400V/50Hz); 105A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNN 90 00 24V 50Hz	605529		1.3	8
CNN 90 00 48V 50Hz	606106		1.3	8
CNN 90 00 110V 50Hz	605883		1.3	8
CNN 90 00 220/230V 50Hz	**605203**		**1.3**	**8**
CNN 90 00 380/400V 50Hz	605646		1.3	8
CNN 90 10 24V DC	605896		1.33	1
CNN 90 10 220V DC	606140		1.33	1

for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Motor contactor CNN 100; 100A/55kW (AC3,400V/50Hz); 115A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNN 100 00 24V 50Hz	609030		1.33	8
CNN 100 00 48V 50Hz	609031		1.33	8
CNN 100 00 110V 50Hz	609032		1.33	8
CNN 100 00 230V 50Hz	**606454**		**1.33**	**8**
CNN 100 00 400V 50Hz	609033		1.33	8
CNN 100 10 24V DC	609034		1.36	1
CNN 100 10 220V DC	609035		1.36	1

for DC control voltage with auxiliary contact block BP5 11 DC
*second level packing

Reversing contactor assemblies

Application:
Mechanical interlock is used to prevent the contactors from being energized simultaneously or closing together and causing a short circuit

Features:

- Mechanically and electrically interlocked
- Includes power wiring
- DIN rail mounting for MBCNN 9 - MBCNN 40
- Utilizing contactors with snap-on auxiliary contact blocks

Reversing contactor MBCNN 9	9A/4.5kW (AC3,400V/50Hz); 25A (AC1) 9A/1.9kW (AC4,400V/50Hz); 25A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 9 00 24V 50Hz	609036	0NO - 0NC	540	1
MBCNN 9 00 48V 50Hz	609037		540	1
MBCNN 9 00 110V 50Hz	609038		540	1
MBCNN 9 00 220/230V 50Hz	**603659**		**540**	**1**
MBCNN 9 00 380/400V 50Hz	609039		540	1
MBCNN 9 11 24V 50Hz	609040	1NO - 1NC*	580	1
MBCNN 9 11 48V 50Hz	609041		580	1
MBCNN 9 11 110V 50Hz	609042		580	1
MBCNN 9 11 220/230V 50Hz	**603660**		**580**	**1**
MBCNN 9 11 380/400V 50Hz	609043		580	1

*for push button control

Reversing contactor MBCNN 12	12A/5.7kW (AC3,400V/50Hz); 25A (AC1) 12A/2.2kW (AC4,400V/50Hz); 25A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 12 00 24V 50Hz	609044	0NO - 0NC	540	1
MBCNN 12 00 48V 50Hz	609045		540	1
MBCNN 12 00 110V 50Hz	609046		540	1
MBCNN 12 00 220/230V 50Hz	**603661**		**540**	**1**
MBCNN 12 00 380/400V 50Hz	609047		540	1
MBCNN 12 11 24V 50Hz	609048	1NO - 1NC*	580	1
MBCNN 12 11 48V 50Hz	609049		580	1
MBCNN 12 11 110V 50Hz	609050		580	1
MBCNN 12 11 220/230V 50Hz	**609051**		**580**	**1**
MBCNN 12 11 380/400V 50Hz	609052		580	1

*for push button control

Main and control circuits are wired according to the circuits diagrams on page 90

Reversing contactor MBCNN 18	18A/7.5kW (AC3,400V/50Hz); 30A (AC1) 18A/3kW (AC4,400V/50Hz); 30A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 18 00 24V 50Hz	609053	0NO - 0NC	560	1
MBCNN 18 00 48V 50Hz	609054		560	1
MBCNN 18 00 110V 50Hz	609055		560	1
MBCNN 18 00 220/230V 50Hz	**609056**		**560**	**1**
MBCNN 18 00 380/400V 50Hz	609057		560	1
MBCNN 18 11 24V 50Hz	609058	1NO - 1NC*	600	1
MBCNN 18 11 48V 50Hz	609059		600	1
MBCNN 18 11 110V-50Hz	609060		600	1
MBCNN 18 11 220/230V 50Hz	**609061**		**600**	**1**
MBCNN 18 11 380/400V 50Hz	609062		600	1

*for push button control

Reversing contactor MBCNN 22	22A/11kW (AC3,400V/50Hz); 30A (AC1) 22A/4kW (AC4,400V/50Hz); 30A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 22 00 24V 50Hz	609063	0NO - 0NC	570	1
MBCNN 22 00 48V 50Hz	609064		570	1
MBCNN 22 00 110V 50Hz	609065		570	1
MBCNN 22 00 220/230V 50Hz	**609066**		**570**	**1**
MBCNN 22 00 380/400V 50Hz	609067		570	1
MBCNN 22 11 24V 50Hz	609068	1NO - 1NC*	610	1
MBCNN 22 11 48V 50Hz	609069		610	1
MBCNN 22 11 110V 50Hz	609070		610	1
MBCNN 22 11 220/230V 50Hz	**609071**		**610**	**1**
MBCNN 22 11 380/400V 50Hz	609072		610	1

*for push button control

Main and control circuits are wired according to the circuits diagrams on page 90

Reversing contactor MBCNN 25	25A/11kW (AC3,400V/50Hz); 40A (AC1) 25A/4kW (AC4,400V/50Hz); 40A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 25 10 24V 50Hz	609073	1NO - 0NC	630	1
MBCNN 25 10 48V 50Hz	609074		630	1
MBCNN 25 10 110V 50Hz	609075		630	1
MBCNN 25 10 220/230V 50Hz	**603005**		**630**	**1**
MBCNN 25 10 380/400V 50Hz	609076		630	1

Reversing contactor MBCNN 30	30A/15kW (AC3,400V/50Hz); 40A (AC1) 30A/4.4kW (AC4,400V/50Hz); 40A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 30 10 24V 50Hz	609077	1NO - 0NC	630	1
MBCNN 30 10 48V 50Hz	609078		630	1
MBCNN 30 10 110V 50Hz	609079		630	1
MBCNN 30 10 220/230V 50Hz	**609080**		**630**	**1**
MBCNN 30 10 380/400V 50Hz	609081		630	1

Reversing contactor MBCNN 32	32A/15kW (AC3,400V/50Hz); 50A (AC1) 32A/6.5kW (AC4,400V/50Hz); 50A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN32 10 24V 50Hz	609082	1NO - 0NC	800	1
MBCNN32 10 48V 50Hz	609083		800	1
MBCNN32 10 110V 50Hz	609084		800	1
MBCNN32 10 220/230V 50Hz	**603665**		**800**	**1**
MBCNN32 10 380/400V 50Hz	609085		800	1

Reversing contactor MBCNN 40	38A/18.5kW (AC3,400V/50Hz); 50A (AC1) 38A/7.5kW (AC4,400V/50Hz); 50A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCNN 40 10 24V 50Hz	609086	1NO - 0NC	820	1
MBCNN 40 10 48V 50Hz	609087		820	1
MBCNN 40 10 110V 50Hz	609088		820	1
MBCNN 40 10 220/230V 50Hz	**603226**		**820**	**1**
MBCNN 40 10 380/400V 50Hz	609089		820	1

Main and control circuits are wired according to the circuits diagrams on page 90

Reversing contactor MBCNN 50	50A/22kW (AC3,400V/50Hz); 85A (AC1) 50A/12kW (AC4,400V/50Hz); 85A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 50 10 24V 50Hz	609090	1NO - 0NC	2.8	1
MBCNN 50 10 48V 50Hz	609091		2.8	1
MBCNN 50 10 110V 50Hz	609092		2.8	1
MBCNN 50 10 220/230V 50Hz	**609093**		**2.8**	**1**
MBCNN 50 10 380/400V 50Hz	609094		2.8	1

Reversing contactor MBCNN 60	60A/30kW (AC3,400V/50Hz); 85A (AC1) 60A/14kW (AC4,400V/50Hz); 85A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 60 10 24V 50Hz	609095	1NO - 0NC	2.8	1
MBCNN 60 10 48V 50Hz	609096		2.8	1
MBCNN 60 10 110V 50Hz	609097		2.8	1
MBCNN 60 10 220/230V 50Hz	**609098**		**2.8**	**1**
MBCNN 60 10 380/400V 50Hz	609099		2.8	1

Reversing contactor MBCNN 70	65A/33kW (AC3,400V/50Hz); 90A (AC1) 65A/15.1kW (AC4,400V/50Hz); 90A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 70 10 24V 50Hz	609100	1NO - 0NC	2.85	1
MBCNN 70 10 48V 50Hz	609101		2.85	1
MBCNN 70 10 110V 50Hz	609102		2.85	1
MBCNN 70 10 220/230V 50Hz	**609103**		**2.85**	**1**
MBCNN 70 10 380/400V 50Hz	609104		2.85	1

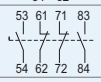
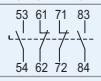
Reversing contactor MBCNN 80	80A/37kW (AC3,400V/50Hz); 95A (AC1) 80A/17kW (AC4,400V/50Hz); 95A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 80 10 24V 50Hz	609105	1NO - 0NC	3.8	1
MBCNN 80 10 48V 50Hz	609106		3.8	1
MBCNN 80 10 110V 50Hz	609107		3.8	1
MBCNN 80 10 220/230V 50Hz	**609108**		**3.8**	**1**
MBCNN 80 10 380/400V 50Hz	609109		3.8	1

Reversing contactor MBCNN 90	90A/45kW (AC3,400V/50Hz); 105A (AC1) 90A/18kW (AC4,400V/50Hz); 105A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 90 10 24V 50Hz	609110	1NO - 0NC	3.8	1
MBCNN 90 10 48V 50Hz	609111		3.8	1
MBCNN 90 10 110V 50Hz	609112		3.8	1
MBCNN 90 10 220/230V 50Hz	**609113**		**3.8**	**1**
MBCNN 90 10 380/400V 50Hz	609114		3.8	1

Reversing contactor MBCNN 100	100A/55kW (AC3,400V/50Hz); 105A (AC1) 100A/19kW (AC4,400V/50Hz); 105A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNN 100 10 24V 50Hz	609115	1NO - 0NC	3.84	1
MBCNN 100 10 48V 50Hz	609116		3.84	1
MBCNN 100 10 110V 50Hz	609117		3.84	1
MBCNN 100 10 230V 50Hz	**609118**		**3.84**	**1**
MBCNN 100 10 400V 50Hz	609119		3.84	1

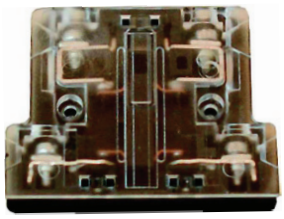
Main and control circuits are wired according to the circuits diagrams on page 90

Accessories

Auxiliary contact block - upper mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP2 11	602594	1NO - 1NC	CNN 9-CNN 70 TKN 65,TKN 115		30	1
BP2N 11	605810	1NO - 1NC	CNN 80-CNN 100		30	1
BP4 22	602593	2NO - 2NC	CNN 9-CNN 70 TKN 65,TKN 115		40	1
BP4N 22	605811	2NO - 2NC	CNN 80-CNN 100		40	1

Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP3 11	602595	1NO - 1NC	CNN 9-CNN 70 TKN 65,TKN 115		20	2

Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP5 11	604839	1NO - 1NC	CNN 80-CNN 100 TKN 115		50	1



Up to 4 extended auxiliary contacts can be added on the contactors CNN series (max. 2NO + 2NC)

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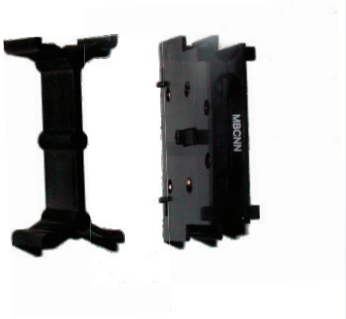
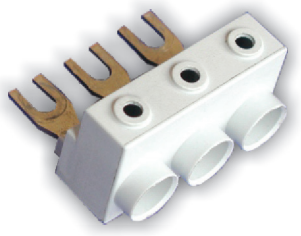


Mechanical interlock				
Type	Order number	Usage	Weight [g]	Packing [pcs]
MB2	602596	CNN 9-CNN 40	20	1

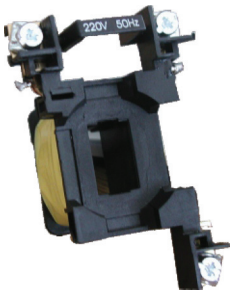


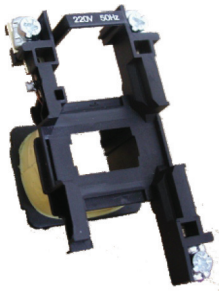
Additional terminal block				
Type	Order number	Usage	Weight [g]	Packing [pcs]
Additional terminal block	601478	CNN 32,CNN 40	70	2

Set of two additional terminal blocks for 25mm^2 connection cable

Spare coils

Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CNN 25 24V 50Hz	603028	AC	CNN 9 CNN 12 CNN 18 CNN 22 CNN 30	50	1
Coil CNN 25 48V 50Hz	603030	AC			
Coil CNN 25 110V 50Hz	603032	AC			
Coil CNN 25 220/230V 50Hz	**605227**	**AC**			
Coil CNN 25 380/400V 50Hz	605231	AC			
Coil CNN 25 24V DC	606536	DC			
Coil CNN 25 220V DC	609120	DC			
Coil CNN 40 24V 50Hz	603042	AC	CNN 32 CNN 40 TKN 65	80	
Coil CNN 40 48V 50Hz	603044	AC			
Coil CNN 40 110V 50Hz	603046	AC			
Coil CNN 40 220/230V 50Hz	**605228**	**AC**			
Coil CNN 40 380/400V 50Hz	605233	AC			
Coil CNN 40 24V DC	606537	DC			
Coil CNN 40 220V DC	609121	DC			
Coil CNN 60 24V 50Hz	604795	AC	CNN 50 CNN 60 TKN 115	130	
Coil CNN 60 48V 50Hz	604796	AC			
Coil CNN 60 110V 50Hz	604797	AC			
Coil CNN 60 220/230V 50Hz	**604762**	**AC**			
Coil CNN 60 380/400V-50Hz	604798	AC			
Coil CNN 60 24V DC	606538	DC			
Coil CNN 60 220V DC	609122	DC			
Coil CNN 70 24V 50Hz	604795	AC	CNN 70		
Coil CNN 70 48V 50Hz	604796	AC			
Coil CNN 70 110V 50Hz	609123	AC			
Coil CNN 70 220/230V 50Hz	**609124**	**AC**			
Coil CNN 70 380/400V-50Hz	604798	AC			
Coil CNN 70 24V DC	606538	DC			
Coil CNN 70 220V DC	609122	DC			
Coil CNN 90 24V 50Hz	605564	AC	CNN 80 CNN 90	140	
Coil CNN 90 48V 50Hz	605565	AC			
Coil CNN 90 110V-50Hz	605534	AC			
Coil CNN 90 220/230V 50Hz	**605532**	**AC**			
Coil CNN 90 380/400 50Hz	605533	AC			
Coil CNN 90 24V DC	607279	DC			
Coil CNN 90 220V DC	606498	DC			
Coil CNN 100 24V 50Hz	609125	AC	CNN 100		
Coil CNN 100 48V 50Hz	609126	AC			
Coil CNN 100 110V-50Hz	609127	AC			
Coil CNN 100 230V 50Hz	**609128**	**AC**			
Coil CNN 100 400 50Hz	609129	AC			
Coil CNN 100 24V DC	607279	DC			
Coil CNN 100 220V DC	606498	DC			





Replacement only AC coils with AC and DC coils with DC.

Technical data - page 62

Motor contactors **CNM** series

Main contacts of the contactor for managing the electric loads (motors and other loads) for nominal power of 55 kW to 580 kW (400 V/50 Hz for the use category AC3).
Possibility of overload protection using overload relays (bimetals).
In conformity with: IEC 60947-1, IEC 60947-4-1
Rugged construction

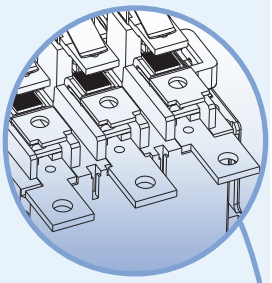
Auxiliary contacts:
- CNM 110 to CNM 400 up to 8 auxiliary contacts, 4 on each side (2NO + 2NC or 4NO + 4NC)
- CNM 450 to CNM 860 4 auxiliary contacts
- CNM 1000 3 auxiliary contacts

Ordering:

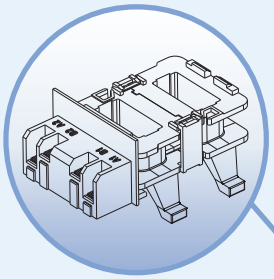
CNM	110	2	2	220/230V	50Hz
1	2	3	4	5	6

1 - Contactor series
2 - Rated operational current Ie (AC3,400V/50Hz)
3 - Number of NO auxiliary contacts
4 - Number of NC auxiliary contacts
5 - Control voltage (coil voltage)
6 - Frequency of the control voltage

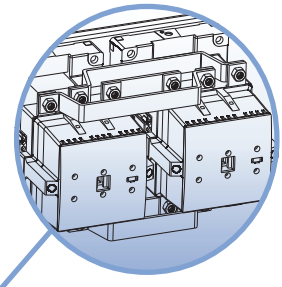
Possibilities



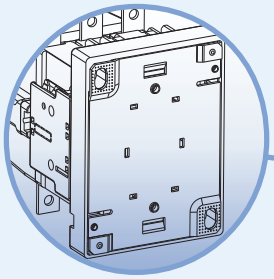
Wide terminals sections are provided for reliable connection of conductors



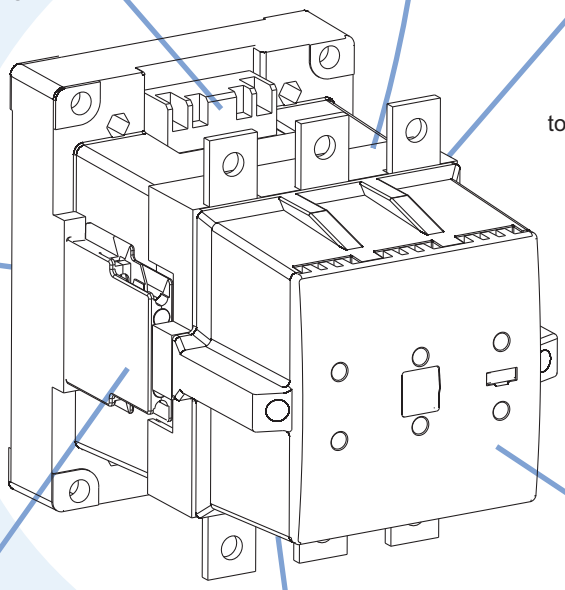
The users can change the coil by themselves. AC and DC coils are not compatible with each other. Possible is only the replacement of AC coils with AC and DC coils with DC.

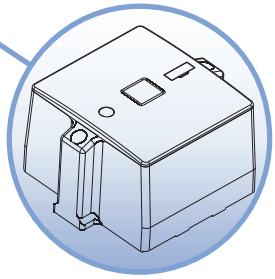


Mechanical interlock is used to prevent the contactors from being energized simultaneously or closing together and causing a short circuit

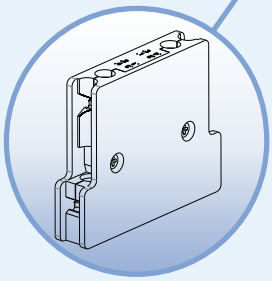


Contactors type CNM can be mounted directly on the mounting plate

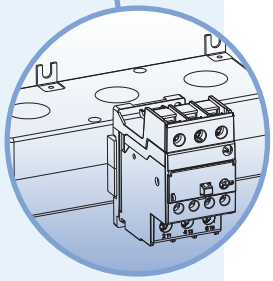




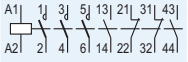
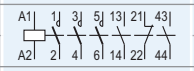
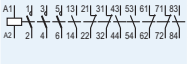
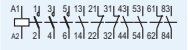
The users can change arc chamber by themselves



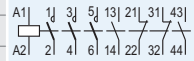
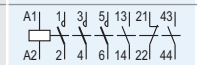
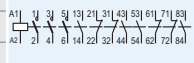
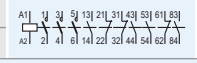
Auxiliary contacts (side mounting)



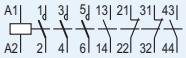
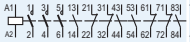
Overload relay (bimetal) is connected with the contactor with appropriate cable conductor

Motor contactor CNM 110; 110A/55kW (AC3,400V/50Hz); 115A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 110 22 24V 50Hz	600285		2.3	1
CNM 110 22 48V 50Hz	155146		2.3	1
CNM 110 22 110V 50Hz	155177		2.3	1
CNM 110 22 220/230V 50Hz	**601699**		**2.3**	**1**
CNM 110 22 380/400V 50Hz	155176		2.3	1
CNM 110 21 24V DC	155202		2.3	1
CNM 110 21 220V DC	155844		2.3	1
CNM 110 44 24V 50Hz	609130		2.4	1
CNM 110 44 48V 50Hz	609131		2.4	1
CNM 110 44 110V 50Hz	609132		2.4	1
CNM 110 44 220/230V 50Hz	**601203**		**2.4**	**1**
CNM 110 44 380/400V 50Hz	600619		2.4	1
CNM 110 43 24V DC	601165		2.4	1
CNM 110 43 220V DC	S30819		2.4	1

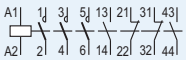
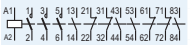
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor contactor CNM 110ST; 110A/55kW (AC3,400V/50Hz); 115A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 110ST 22 24V 50Hz	604392		2.33	1
CNM 110ST 22 48V 50Hz	609133		2.33	1
CNM 110ST 22 110V 50Hz	604393		2.33	1
CNM 110ST 22 220/230V 50Hz	**604238**		**2.33**	**1**
CNM 110ST 22 380/400V 50Hz	606384		2.33	1
CNM 110ST 21 24V DC	609134		2.33	1
CNM 100ST 21 220V DC	609135		2.33	1
CNM 110ST 44 24V 50Hz	609136		2.33	1
CNM 110ST 44 48V 50Hz	609137		2.33	1
CNM 110ST 44 110V 50Hz	609138		2.33	1
CNM 110ST 44 220/230V 50Hz	**609139**		**2.33**	**1**
CNM 110ST 44 380/400V 50Hz	609140		2.33	1
CNM 110ST 43 24V DC	609141		2.33	1
CNM 110ST 43 220V DC	609142		2.33	1

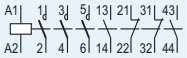
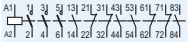
ST-main conductor with box terminal max. 1x50mm^2 or 2x35mm^2
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)
Technical information for contactor CNM 110ST is same as CNM 110

Motor contactor CNM 140; 140A/75kW (AC3,400V/50Hz); 160A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 140 22 24V 50Hz	600332		5.1	1
CNM 140 22 48V 50Hz	605122		5.1	1
CNM 140 22 110V 50Hz	S30945		5.1	1
CNM 140 22 220/230V 50Hz	**601700**		**5.1**	**1**
CNM 140 22 380/400V 50Hz	S30892		5.1	1
CNM 140 22 24V DC	S30965		5.1	1
CNM 140 22 220V DC	602926		5.1	1
CNM 140 44 24V 50Hz	609143		5.1	1
CNM 140 44 48V 50Hz	609144		5.1	1
CNM 140 44 110V 50Hz	602731		5.1	1
CNM 140 44 220/230V 50Hz	**604433**		**5.1**	**1**
CNM 140 44 380/400V 50Hz	609145		5.1	1
CNM 140 44 24V DC	S30965		5.1	1
CNM 140 44 220V DC	602926		5.1	1

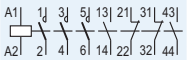
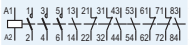
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor Contactor CNM 170; 170A/90kW (AC3,400V/50Hz); 200A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 170 22 24V 50Hz	600286		5.2	1
CNM 170 22 48V 50Hz	S30921		5.2	1
CNM 170 22 110V 50Hz	155147		5.2	1
CNM 170 22 220/230V 50Hz	**601701**		**5.2**	**1**
CNM 170 22 380/400V 50Hz	605584		5.2	1
CNM 170 22 24V DC	S30946		5.2	1
CNM 170 22 220V DC	600605		5.2	1
CNM 170 44 24V 50Hz	609146		5.6	1
CNM 170 44 48V 50Hz	155849		5.6	1
CNM 170 44 110V 50Hz	S30813		5.6	1
CNM 170 44 220/230V 50Hz	**600298**		**5.6**	**1**
CNM 170 44 380/400V 50Hz	155189		5.6	1
CNM 170 44 24V DC	609147		5.6	1
CNM 170 44 220V DC	609148		5.6	1

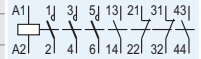
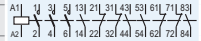
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor Contactor CNM 200; 200A/110kW (AC3,400V/50Hz); 250A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 200 22 24V 50Hz	600466		5.3	1
CNM 200 22 48V 50Hz	609149		5.3	1
CNM 200 22 110V 50Hz	602470		5.3	1
CNM 200 22 220/230V 50Hz	**601204**		**5.3**	**1**
CNM 200 22 380/400V 50Hz	605549		5.3	1
CNM 200 22 24V DC	609150		5.3	1
CNM 200 22 220V DC	602927		5.3	1
CNM 200 44 24V 50Hz	609151		5.7	1
CNM 200 44 48V 50Hz	609152		5.7	1
CNM 200 44 110V 50Hz	609153		5.7	1
CNM 200 44 220/230V 50Hz	**601799**		**5.7**	**1**
CNM 200 44 380/400V 50Hz	603925		5.7	1
CNM 200 44 24V DC	609154		5.7	1
CNM 200 44 220V DC	609155		5.7	1

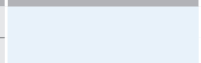
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor contactor CNM 250; 250A/132kW (AC3,400V/50Hz); 300A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 250 22 24V 50Hz	155474		8.4	1
CNM 250 22 48V 50Hz	155671		8.4	1
CNM 250 22 110V 50Hz	155650		8.4	1
CNM 250 22 220/230V 50Hz	**601703**		**8.4**	**1**
CNM 250 22 380/400V 50Hz	155641		8.4	1
CNM 250 22 24V DC	600578		8.4	1
CNM 250 22 220V DC	155476		8.4	1
CNM 250 44 24V 50Hz	609157		8.9	1
CNM 250 44 48V 50Hz	155671		8.9	1
CNM 250 44 110V 50Hz	155660		8.9	1
CNM 250 44 220/230V 50Hz	**155680**		**8.9**	**1**
CNM 250 44 380/400V 50Hz	155681		8.9	1
CNM 250 44 24V DC	S30948		8.9	1
CNM 250 44 220V DC	609158		8.9	1

4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

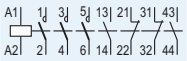
Motor Contactor CNM 315; 315A/160kW (AC3,400V/50Hz); 390A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 315 22 24V 50Hz	600603		8.5	1
CNM 315 22 48V 50Hz	602290		8.5	1
CNM 315 22 110V 50Hz	602471		8.5	1
CNM 315 22 220/230V 50Hz	**601704**		**8.5**	**1**
CNM 315 22 380/400V 50Hz	606736		8.5	1
CNM 315 22 24V DC	605897		8.5	1
CNM 315 22 220V DC	609159		8.5	1
CNM 315 44 24V 50Hz	609160		9	1
CNM 315 44 48V 50Hz	609161		9	1
CNM 315 44 110V 50Hz	601125		9	1
CNM 315 44 220/230V 50Hz	**600300**		**9**	**1**
CNM 315 44 380/400V 50Hz	609162		9	1
CNM 315 44 24V DC	609163		9	1
CNM 315 44 220V DC	609164		9	1

4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor contactor CNM 400; 400A/200kW (AC3,400V/50Hz); 400A (AC1)				
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 400 22 24V 50Hz	600331		8.5	1
CNM 400 22 48V 50Hz	155607		8.5	1
CNM 400 22 110V 50Hz	155654		8.5	1
CNM 400 22 220/230V 50Hz	**601205**		**8.5**	**1**
CNM 400 22 380/400V 50Hz	605592		8.5	1
CNM 400 22 24V DC	155486		8.5	1
CNM 400 22 220V DC	155678		8.5	1
CNM 400 44 24V 50Hz	609165		9	1
CNM 400 44 48V 50Hz	155670		9	1
CNM 400 44 110V 50Hz	155661		9	1
CNM 400 44 220/230V 50Hz	**155593**		**9**	**1**
CNM 400 44 380/400V 50Hz	S30959		9	1
CNM 400 44 24V DC	604504		9	1
CNM 400 44220V DC	609166		9	1

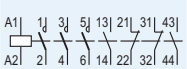
4 auxiliary contacts (2NO + 2NC) or 8 auxiliary contacts (4NO + 4NC)

Motor contactor CNM 450; 450A/250kW (AC3,400V/50Hz); 700A (AC1)

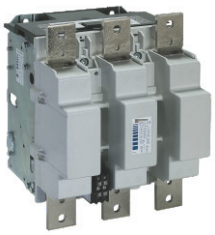
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 450 22 **AC: 220-240V 50-60Hz** **DC: 200-220V**	**603817**		**13.5**	**1**

4 auxiliary contacts (2NO + 2NC)

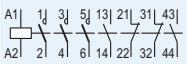
Motor contactor CNM 550; 550A/315kW (AC3,400V/50Hz); 800A (AC1)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 550 22 **AC: 220-240V 50-60Hz** **DC: 200-220V**	**604442**		**14**	**1**

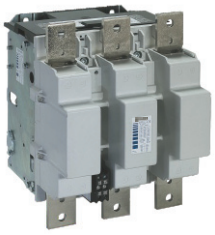
4 auxiliary contacts (2NO + 2NC)



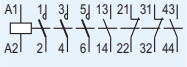
Motor contactor CNM 700; 700A/400kW (AC3,400V/50Hz); 1000A (AC1)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 700 22 **AC: 220-240V 50-60Hz** **DC: 200-220V**	**603816**		**26.4**	**1**

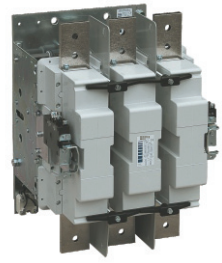
4 auxiliary contacts (2NO + 2NC)



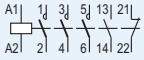
Motor contactor CNM 860; 860A/500kW (AC3); 1100A (AC1)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 860 22 **AC: 220-240V 50-60Hz** **DC: 200-220V**	**604443**		**27.6**	**1**

4 auxiliary contacts (2NO + 2NC)



Motor contactor CNM 1000; 1000A/580kW (AC3,400V/50Hz); 1200A (AC1)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNM 1000 11 **AC: 220-230V 50-60Hz** **DC: 220V**	**604444**		**51**	**1**

2 auxiliary contacts (1NO + 1NC)

Reversing contactor assemblies

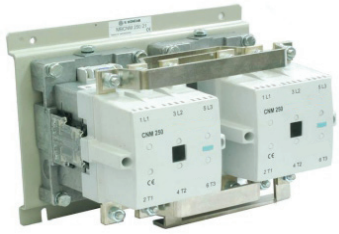
Application:
Mechanical interlock is used to prevent the contactors from being energized simultaneously or closing together and causing a short circuit

Features:

- Mechanically and electrically interlocked
- Includes power wiring
- Utilizing contactors with fixed auxiliaries

Reversing contactor MBCNM 110	110A/55kW (AC3,400V/50Hz); 115A (AC1) 110A/27kW (AC4,400V/50Hz); 115A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNM 110 21 24V 50Hz	609167	2NO - 1NC	5.78	1
MBCNM 110 21 48V 50Hz	609168		5.78	1
MBCNM 110 21 110V 50Hz	609169		5.78	1
MBCNM 110 21 220/230V 50Hz	**601025**		**5.78**	**1**
MBCNM 110 21 380/400V 50Hz	602110		5.78	1

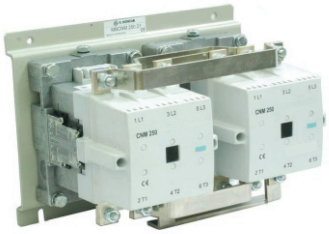
Reversing contactor MBCNM 140	140A/75kW (AC3,400V/50Hz); 160A (AC1) 140A/35kW (AC4,400V/50Hz); 160A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNM 140 21 24V 50Hz	609170	2NO - 1NC	14.2	1
MBCNM 140 21 48V 50Hz	609171		14.2	1
MBCNM 140 21 110V 50Hz	603913		14.2	1
MBCNM 140 21 220/230V 50Hz	**601026**		**14.2**	**1**
MBCNM 140 21 380/400V 50Hz	609172		14.2	1



Reversing contactor MBCNM 170	170A/90kW (AC3,400V/50Hz); 200A (AC1) 170A/37kW (AC4,400V/50Hz); 200A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNM 170 21 24V 50Hz	609173	2NO - 1NC	14.4	1
MBCNM 170 21 48V 50Hz	609174		14.4	1
MBCNM 170 21 110V 50Hz	609175		14.4	1
MBCNM 170 21 220/230V 50Hz	**601027**		**14.4**	**1**
MBCNM 170 21 380/400V 50Hz	609176		14.4	1

Reversing contactor MBCNM 200	200A/105kW (AC3,400V/50Hz); 250A (AC1) 200A/40kW (AC4,400V/50Hz); 250A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [kg]	Packing [pcs]
MBCNM 200 21 24V 50Hz	609177	2NO - 1NC	14.6	1
MBCNM 200 21 48V 50Hz	609178		14.6	1
MBCNM 200 21 110V 50Hz	609179		14.6	1
MBCNM 200 21 220/230V 50Hz	**601028**		**14.6**	**1**
MBCNM 200 21 380/400V 50Hz	609180		14.6	1

Main and control circuits are wired according to the circuits diagrams on page 90



Reversing contactor MBCNM 250	250A/132kW (AC3,400V/50Hz); 300A (AC1) 250A/55kW (AC4,400V/50Hz); 300A (AC1)			
Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
MBCNM 250 21 24V 50Hz	609181	2NO - 1NC	23	1
MBCNM 250 21 48V 50Hz	609182		23	1
MBCNM 250 21 110V 50Hz	604504		23	1
MBCNM 250 21 220/230V 50Hz	**609183**		**23**	**1**
MBCNM 250 21 380/400V 50Hz	609184		23	1

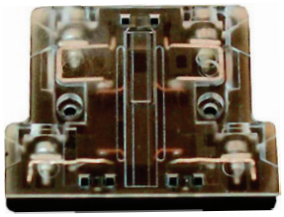
Reversing contactor MBCNM 315	315A/160kW (AC3,400V/50Hz); 390A (AC1) 315A/65kW (AC4,400V/50Hz); 390A (AC1)			
Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
MBCNM 315 21 24V 50Hz	609185	2NO - 1NC	23.2	1
MBCNM 315 21 48V 50Hz	609186		23.2	1
MBCNM 315 21 110V 50Hz	609187		23.2	1
MBCNM 315 21 220/230V 50Hz	**601030**		**23.2**	**1**
MBCNM 315 21 380/400V 50Hz	609188		23.2	1

Reversing contactor MBCNM 400	400A/200kW (AC3,400V/50Hz); 400A (AC1) 400A/69kW (AC4,400V/50Hz); 400A (AC1)			
Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
MBCNM 400 21 24V 50Hz	609189	2NO - 1NC	23.4	1
MBCNM 400 21 48V 50Hz	609190		23.4	1
MBCNM 400 21 110V 50Hz	603912		23.4	1
MBCNM 400 21 220/230V 50Hz	**601031**		**23.4**	**1**
MBCNM 400 21 380/400V 50Hz	609191		23.4	1

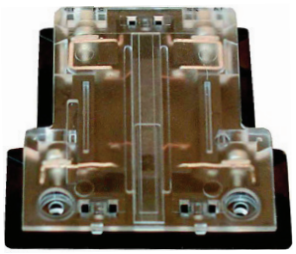
Main and control circuits are wired according to the circuits diagrams on page 90

Accessories

Auxiliary contact block CNM110 - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
Left block	733889S	1NO - 1NC	CNM 110 TK 130-TK 175		50	1
Right block	733890S	1NO - 1NC	CNM 110 TK 130-TK 175		50	1
Additional left block	733891S	1NO - 1NC	CNM 110 TK 130-TK 175		50	1
Additional right block	733892S	1NO - 1NC	CNM 110 TK 130-TK 175		50	1
Right block DC	733888S	1NO - 1NC	CNM 110		50	1



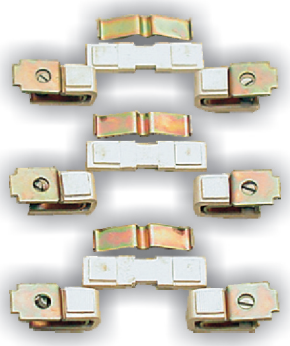
Auxiliary contact block CNM140/400 - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
Left block	155129S	1NO - 1NC	CNM140-400		75	1
Right block	155113S	1NO - 1NC	CNM140-400		75	1
Additional left block	155089S	1NO - 1NC	CNM140-400		75	1
Additional right block	155087S	1NO - 1NC	CNM140-400		75	1



Up to 8 auxiliary contacts can be added on the contactors CNM series (max. 4NO + 4NC)

Additional terminal covers				
Type	Order number	Usage	Weight [g]	Packing [pcs]
Additional terminal block	603311	CNM 110	135	1
Additional terminal block	604128	CNM 140-200	150	1

Set of 6 terminal covers for protection against inadvertent contact with the exposed busbar connections (DIN VDE 0106 Part 100)



Set of main contacts				
Type	Order number	Usage	Weight [g]	Packing [pcs]
Set of main contacts	733856S	CNM 110	195	1
Set of main contacts	155093S	CNM 140	390	1
Set of main contacts	155091S	CNM 170	400	1
Set of main contacts	155090S	CNM 200	410	1
Set of main contacts	155603S	CNM 250	700	1
Set of main contacts	155618S	CNM 315	710	1
Set of main contacts	155619S	CNM 400	720	1

Set of 3 moving and 6 fixed contacts

Arc chamber				
Type	Order number	Usage	Weight [kg]	Packing [pcs]
Arc chamber	733847S	CNM 110	0.46	1
Arc chamber	155101S	CNM 140	1.16	1
Arc chamber	155102S	CNM 170	1.16	1
Arc chamber	155103S	CNM 200	1.16	1
Arc chamber	155588S	CNM 250	1.88	1
Arc chamber	155527S	CNM 315	1.88	1
Arc chamber	155506S	CNM 400	1.88	1

Spare coils

Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CNM 110 24V 50Hz	158850S	AC	CNM 110 TK 130 TK 175	230	1
Coil CNM 110 48V 50Hz	158852S	AC			
Coil CNM 110 110V 50Hz	158853S	AC			
Coil CNM 110 220/230V 50Hz	**158854S**	**AC**			
Coil CNM 110 380/400V 50Hz	158855S	AC			
Coil CNM 110 24V DC	158836S	DC			
Coil CNM 110 220V DC	158865S	DC			
Coil CNM 200 24V 50Hz	155117S	AC	CNM 140 CNM 170 CNM 200	380	
Coil CNM 200 48V 50Hz	155119S	AC			
Coil CNM 200 110V 50Hz	155120S	AC			
Coil CNM 200 220/230V 50Hz	**155195S**	**AC**			
Coil CNM 200 380/400V 50Hz	155122S	AC			
Coil CNM 200 24V DC	158835S	DC			
Coil CNM 200 220V DC	158830S	DC			
Coil CNM 400 24V 50Hz	155610S	AC	CNM 250 CNM 315 CNM 400	650	
Coil CNM 400 48V 50Hz	155612S	AC			
Coil CNM 400 110V 50Hz	155613S	AC			
Coil CNM 400 220/230V 50Hz	**155615S**	**AC**			
Coil CNM 400 380/400V 50Hz	155616S	AC			
Coil CNM 400 24V DC	158976S	DC			
Coil CNM 400 220V DC	155627S	DC			

Replacement only AC coils with AC and DC coils with DC.

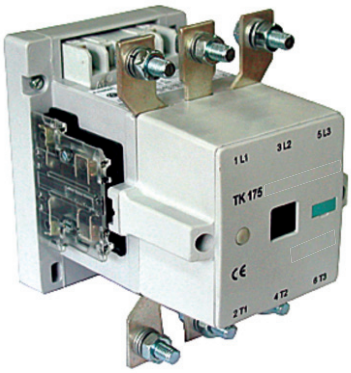
Technical data - page 62

Contactors for resistive loads **TKN** and **TK** series

Application:
Contactors are using for remote control resistive loads with a nominal power of 43 kW to 115 kW (400 V for the use category AC1).

Advantages:

- In conformity with: IEC 60947-1, IEC 60947-4-1
- Switching resistive loads at 55°C
- Rugged constaction
- High performance and reliability
- Low power loss
- Standard control voltages: 24 VAC, 48 VAC, 110 VAC, 230 VAC, 400 VAC

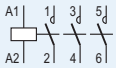


Ordering:

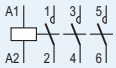
TKN	65	0	0	220/230V	50Hz
1	2	3	4	5	6

1 - Contactor series
2 - Rated operational current Ie (AC1)
3 - Number of NO auxiliary contacts
4 - Number of NC auxiliary contacts
5 - Control voltage (coil voltage)
6 - Frequency of the control voltage

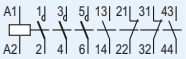
Motor contactor TKN 65; 65A(AC1), 43kW(400V), 25kW(230V)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
TKN 65 00 24V 50Hz	604594		0.45	1
TKN 65 00 48V 50Hz	609192		0.45	1
TKN 65 00 110V 50Hz	609193		0.45	1
TKN 65 00 220/230V 50Hz	**603620**		**0.45**	**1**
TKN 65 00 380/400V 50Hz	609194		0.45	1

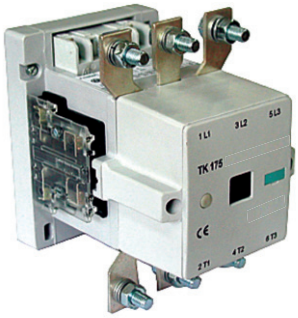
Motor contactor TKN 115; 115A(AC1), 76kW(400V), 44kW(230V)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
TKN 115 00 24V 50Hz	606295		0.9	1
TKN 115 00 48V 50Hz	609195		0.9	1
TKN 115 00 110V 50Hz	609196		0.9	1
TKN 115 00 220/230V 50Hz	**605344**		**0.9**	**1**
TKN 115 00 380/400V 50Hz	609197		0.9	1

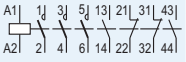
Motor contactor TK 130; 130A(AC1), 85kW(400V), 50kW(230V)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
TK 130 22 24V 50Hz	609198		2.42	1
TK 130 22 48V 50Hz	609199		2.42	1
TK 130 22 110V 50Hz	609200		2.42	1
TK 130 22 220/230V 50Hz	**603218**		**2.42**	**1**
TK 130 22 380/400V 50Hz	609201		2.42	1

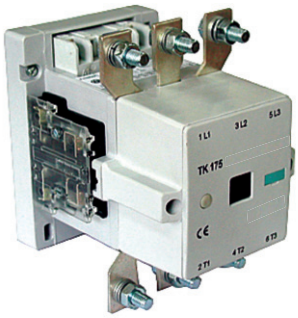
4 auxiliary contacts (2NO + 2NC)



Motor contactor TK 175; 175A(AC1), 115kW(400V), 67kW(230V)

Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
TK 175 22 24V 50Hz	609202		2.44	1
TK 175 22 48V 50Hz	609203		2.44	1
TK 175 22 110V 50Hz	609204		2.44	1
TK 175 22 220/230V 50Hz	**600257**		**2.44**	**1**
TK 175 22 380/400V 50Hz	S54954		2.44	1

4 auxiliary contacts (2NO + 2NC)



Accessories and spare coils for TKN contactors see page 12-14
Accessories and spare coils for TK contactors see page 24-26

Capacitor contactors **CNNK..N** series

Precharging resistors are an integral component of the CNNK..N contactors, equipped with early-make contacts. This special type of contacts has the purpose of connecting for a very short time up to 5ms, during the contactor closing resistors which limit the connecting current of the capacitors. These resistors are then excluded when the closing operation is complete and the current capacity is conveyed to the main contacts. With this type of circuit, it is possible to obtain minor wear of all the components of the system especially fuses and capacitors ensuring a longer life and better reliability. Suitable for capacitors with and without reactor protection.

Advantages:

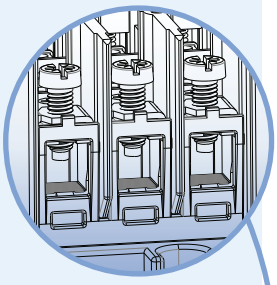
- In conformity with: IEC 60947-1, IEC 60947-4-1
- Installation on DIN rail and mounting plate
- Switching of 3 phase capacitors
- Ambient temperature of 55 ^{0}C
- Maximum permissible peak current I ≤ 200 Ie
- For contactors without resistors maximum permissible peak current I ≤ 100 Ie
- Standard control voltages: 24 VAC, 48 VAC, 110 VAC, 230 VAC, 400 VAC
- Up to 2 extended auxiliary contacts (0NO + 1NC or 1NO + 1NC)
- Space saving: 45mm width up to 30kVAr
  55mm width up to 60kVAr
  70mm width up to 75kVAr

Ordering:

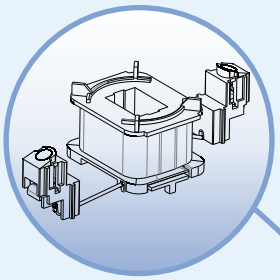
CNNK	10	1	0	230V	50/60Hz
1	2	3	4	5	6

1 - Contactor series
2 - kVar in (AC-6b,400V/50Hz)
3 - Number of NO auxiliary contacts
4 - Number of NC auxiliary contacts
5 - Control voltage (coil voltage)
6 - Frequency of the control voltage

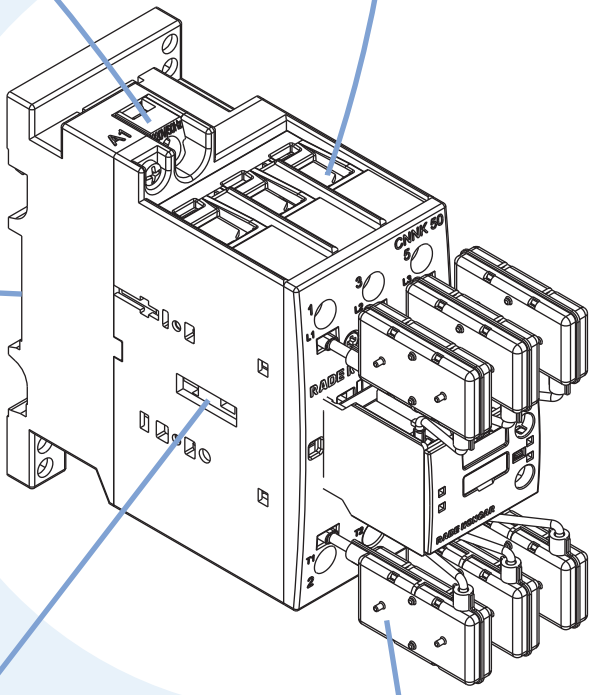
Possibilities

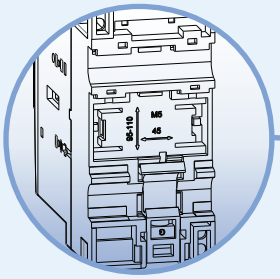


Special clamp terminals are provided for reliable connection of conductors for CNNK 40 - CNNK 75

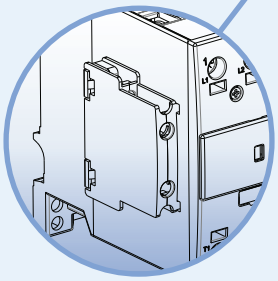


Wide range of coil voltages are provided. The users can change the coil by themselves.

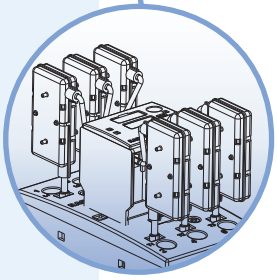




Contactors type CNNK can be mounted on DIN rail or directly on the mounting plate. Type CNNK 10..N to CNNK 30..N only DIN rail 35mm and type CNN 40..N to CNNK 75..N DIN rail 35mm or 75mm

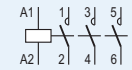
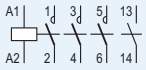
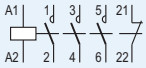


Auxiliary contacts - side mounting



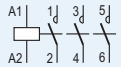
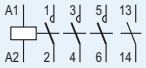
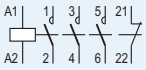
Precharging resistors with special type of contacts has the purpose of connecting for a very brief interval, up to 5ms, during the contactor closing, resistors limit the connecting current of the capacitors

Capacitor contactor CNNK 2.5; 2.5kVar (AC6-b,400V/50Hz); 3.6A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 2.5 00 230V 50/60Hz	606811		250	24
CNNK 2.5 10 230V 50/60Hz	6047786		250	24
CNNK 2.5 01 230V 50/60Hz	609205		250	24

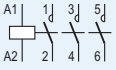
integrated auxiliary contact 1NO or 1NC, contactor without precharging resistors
*second level packing

Capacitor contactor CNNK 5; 5kVar (AC6-b,400V/50Hz); 7.2A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 5 00 230V 50/60Hz	606812		260	24
CNNK 5 10 230V 50/60Hz	6047796		260	24
CNNK 5 01 230V 50/60Hz	609206		260	24

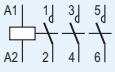
integrated auxiliary contact 1NO or 1NC, contactor without precharging resistors
*second level packing

Capacitor contactor CNNK 7.5; 7.5kVar (AC6-b,400V/50Hz); 11A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 7.5 00 230V 50/60Hz	609207		270	24

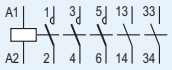
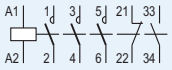
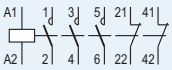
contactor without precharging resistors
*second level packing

Capacitor contactor CNNK 12.5; 12.5kVar (AC6-b,400V/50Hz); 18A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 12.5 00 230V 50/60Hz	609208		400	18

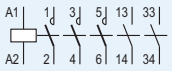
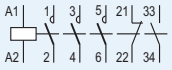
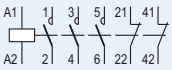
contactor without precharging resistors
*second level packing

Capacitor contactor CNNK 10..N; 10kVar (AC6-b,400V/50Hz); 14A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 10 20N 230V 50/60Hz	609209N		320	24
CNNK 10 11N 230V 50/60Hz	6047816N		320	24
CNNK 10 02N 230V 50/60Hz	609210N		320	24

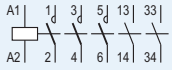
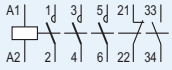
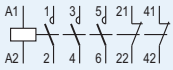
integrated auxiliary contact 2NO or 1NO+1NC or 2NC
*second level packing

Capacitor contactor CNNK 12..N; 12.5kVar (AC6-b,400V/50Hz); 18A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 12 20N 230V 50/60Hz	609211N		320	24
CNNK 12 11N 230V 50/60Hz	6047826N		320	24
CNNK 12 02N 230V 50/60Hz	609212N		320	24

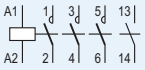
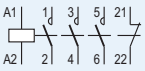
integrated auxiliary contact 2NO or 1NO+1NC or 2NC
*second level packing

Capacitor contactor CNNK 15..N; 15kVar (AC6-b,400V/50Hz); 22A (ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 15 20N 230V 50/60Hz	609213N		325	24
CNNK 15 11N 230V 50/60Hz	6047836N		325	24
CNNK 15 02N 230V 50/60Hz	609214N		325	24

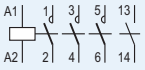
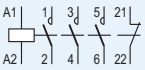
integrated auxiliary contact 2NO or 1NO+1NC or 2NC
*second level packing

Capacitor contactor CNNK 20..N; 20kVar (AC6-b,400V/50Hz); 29A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 20 10N 230V 50/60Hz	6049056N		333	24
CNNK 20 01N 230V 50/60Hz	609215N		333	24

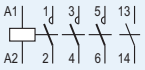
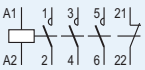
integrated auxiliary contact 1NO or 1NC
*second level packing

Capacitor contactor CNNK 25E..N; 25kVar (AC6-b,400V/50Hz); 36A (Ie)

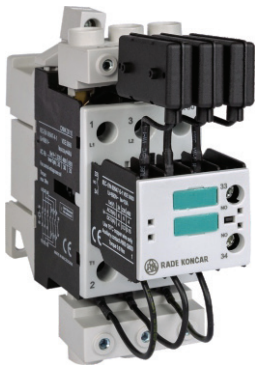
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 25E 10N 230V 50/60Hz	6047616N		450	10
CNNK 25E 01N 230V 50/60Hz	609216N		450	10

integrated auxiliary contact 1NO or 1NC; without terminal blocks
*second level packing

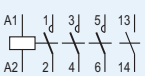
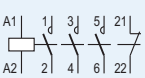
Capacitor contactor CNNK 25..N; 25kVar (AC6-b,400V/50Hz); 36A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 25 10N 230V 50/60Hz	6047856N		520	10
CNNK 25 01N 230V 50/60Hz	609217N		520	10

integrated auxiliary contact 1NO or 1NC
*second level packing

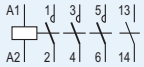
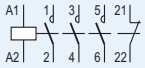


Capacitor contactor CNNK 30..N; 30kVar (AC6-b,400V/50Hz); 44A (Ie)

Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNNK 30 10N 230V 50/60Hz	6047866N		520	10
CNNK 30 01N 230V 50/60Hz	609218N		525	10

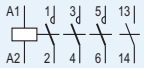
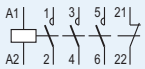
integrated auxiliary contact 1NO or 1NC
*second level packing

Capacitor contactor CNNK 40..N; 40kVar (AC6-b,400V/50Hz); 58A (Ie)

Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNNK 40 10N 230V 50/60Hz	6047916N		0.94	10
CNNK 40 01N 230V 50/60Hz	6054896N		0.94	10

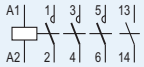
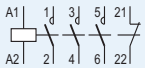
integrated auxiliary contact 1NO or 1NC
*second level packing

Capacitor contactor CNNK 50..N; 50kVar (AC6-b,400V/50Hz); 72A (Ie)

Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNNK 50 10N 230V 50/60Hz	6044536N		0.94	10
CNNK 50 01N 230V 50/60Hz	6054906N		0.94	10

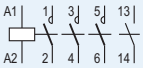
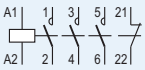
integrated auxiliary contact 1NO or 1 NC
*second level packing

Capacitor contactor CNNK 60..N; 60kVar (AC6-b,400V/50Hz); 87A (Ie)

Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNNK 60 10N 230V 50/60Hz	606362N		0.97	10
CNNK 60 01N 230V 50/60Hz	6054916N		0.97	10

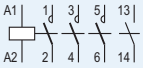
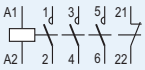
integrated auxiliary contact 1NO or 1 NC
*second level packing

Capacitor contactor CNNK 70..N; 70kVar (AC6-b,400V/50Hz); 101A (Ie)

Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNNK 70 10N 230V 50Hz	605760N		1.4	8
CNNK 70 01N 230V 50Hz	609219N		1.4	8

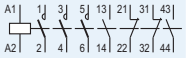
integrated auxiliary contact 1NO or 1NC
*second level packing

Capacitor contactor CNNK 75..N; 75kVar (AC6-b,400V/50Hz); 108A (Ie)

Type	Order number	Wiring diagram	Weight [kg]	Packing* [pcs]
CNNK 75 10N 230V 50Hz	607181N		1.5	8
CNNK 75 01N 230V 50Hz	607087N		1.5	8

integrated auxiliary contact 1NO or 1NC
*second level packing

Capacitor contactor CNKM 80; 80kVar (AC6-b,400V/50Hz); 116A (Ie)

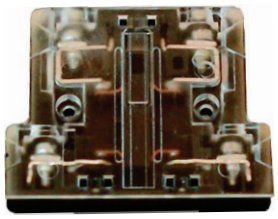
Type	Order number	Wiring diagram	Weight [kg]	Packing [pcs]
CNKM 80 22 230V 50/60Hz	606637		2.45	1

4 auxiliary contacts (2NO+2NC)

Accessories

Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP3 11	602595	1NO - 1NC	CNNK 2.5 - CNNK 60..N		20	2

Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP5 11	604839	1NO - 1NC	CNNK 70..N CNNK 75..N		50	1



Spare coils

Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CNNK 20 230V 50/60Hz	**606500**	**AC**	**CNNK 2.5 - CNNK 20**	**50**	**1**
Coil CNNK 20 380/400V 50Hz	605231	AC			
Coil CNNK 30 230V 50/60Hz	**609220**	**AC**	**CNNK 25E - CNNK 30**	**80**	
Coil CNNK 30 380/400V 50Hz	605233	AC			
Coil CNNK 60 230V 50/60Hz	**609221**	**AC**	**CNNK 40 - CNNK 60**	**130**	
Coil CNNK 60 380/400V-50Hz	604798	AC			
Coil CNNK 75 230V 50Hz	**609129**	**AC**	**CNNK 70 CNNK 75**	**140**	
Coil CNNK 75 400V 50Hz	609130	AC			

Up to 2 extended auxiliary contacts can be added on the contactors CNNK..N series (max. 1NO + 1NC)

Technical data - page 82

Mini motor contactors **CM1**

Application:

Contactors are using for remote control and protection of electrical engines and other electrical consumers with a nominal power of 4 kW to 5.5 kW (400 V/50 Hz for the use category AC3).

Advantages:

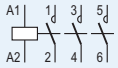
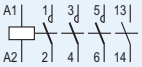
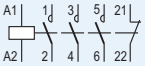
- In conformity with: IEC 60947-1, IEC 60947-4-1
- Small mounting dimensions and overall size
- Installation on DIN rail and mounting plate
- High performance and reliability
- Low power loss
- Protection of direct contact from front side - IP20
- Large selection of accessories
- Standard control voltages: 24 VAC, 48 VAC, 110 VAC, 230 VAC, 400 VAC
- Up to 4 extended auxiliary contacts
- Snap-on auxiliaries

Ordering:

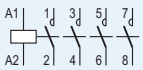
CM1	1	0	220/230V	50Hz
1	2	3	4	5

1 - Contactor type
2 - Number of NO auxiliary contacts
3 - Number of NC auxiliary contacts
4 - Control voltage (coil voltage)
5 - Frequency of the control voltage

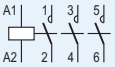
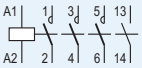
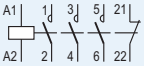
Technical data - page 62; Accessories - page 45

Motor contactor CM1; 9A/4kW (AC3,400V/50Hz); 20A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CM1 00 24V 50Hz	609224		175	1
CM1 00 48V 50Hz	609225		175	1
CM1 00 110V 50Hz	609226		175	1
CM1 00 220/230V 50Hz	**602654**		**175**	**1**
CM1 00 380/400V 50Hz	609227		175	1
CM1 10 24V 50Hz	S34915		175	1
CM1 10 48V 50Hz	S34916		175	1
CM1 10 110V 50Hz	S34917		175	1
CM1 10 220/230V 50Hz	**601688**		**175**	**1**
CM1 10 380/400V 50Hz	S34928		175	1
CM1 01 24V 50Hz	S34920		175	1
CM1 01 48V 50Hz	S34921		175	1
CM1 01 110V 50Hz	S34922		175	1
CM1 01 220/230V 50Hz	**604897**		**175**	**1**
CM1 01 380/400V 50Hz	S34929		175	1

integrated auxiliary contact 1NO or 1NC

Motor contactor CM1; 9A/4kW (AC3,400V/50Hz); 20A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CM1 004 24V 50Hz	S34962		175	1
CM1 004 48V 50Hz	609228		175	1
CM1 004 110V 50Hz	S34946		175	1
CM1 004 220/230V 50Hz	**604838**		**175**	**1**
CM1 004 380/400V 50Hz	S34931		175	1

4 main contacts

Motor contactor CM1..N; 12A/5.5kW (AC3,400V/50Hz); 20A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CM1 00N 24V 50Hz	609229		180	1
CM1 00N 48V 50Hz	609230		180	1
CM1 00N 110V 50Hz	609231		180	1
CM1 00N 220/230V 50Hz	**609232**		**180**	**1**
CM1 00N 380/400V 50Hz	609233		180	1
CM1 10N 24V 50Hz	609234		180	1
CM1 10N 48V 50Hz	609235		180	1
CM1 10N 110V 50Hz	609236		180	1
CM1 10N 220/230V 50Hz	**606331**		**180**	**1**
CM1 10N 380/400V 50Hz	609237		180	1
CM1 01N 24V 50Hz	609238		180	1
CM1 01N 48V 50Hz	609239		180	1
CM1 01N 110V 50Hz	609240		180	1
CM1 01N 220/230V 50Hz	**606375**		**180**	**1**
CM1 01N 380/400V 50Hz	609241		180	1

integrated auxiliary contact 1NO or 1NC

Reversing contactor assemblies

Application:
Mechanical interlock is used to prevent the contactors from being energized simultaneously or closing together and causing a short circuit

Features:

- Mechanically and electrically interlocked
- Includes power wiring
- DIN rail mounting
- Utilizing contactors with snap-on auxiliary contact blocks

Reversing contactor MBCM1	9A/4kW (AC3,400V/50Hz); 20A (AC1) 9A/1.5kW (AC4,400V/50Hz); 20A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCM1 00 24V 50Hz	601546	0NO - 0NC	400	1
MBCM1 00 48V 50Hz	609242		400	1
MBCM1 00 110V 50Hz	609243		400	1
MBCM1 00 220/230V 50Hz	**602766**		**400**	**1**
MBCM1 00 380/400V 50Hz	609244		400	1
MBCM1 10 24V 50Hz	600743	1NO - 0NC*	410	1
MBCM1 10 48V 50Hz	609247		410	1
MBCM1 10 110V 50Hz	609248		410	1
MBCM1 10 220/230V 50Hz	**600117**		**410**	**1**
MBCM1 10 380/400V 50Hz	609249		410	1

*for push button control

Reversing contactor MBCM1..N	12A/5.5kW (AC3,400V/50Hz); 20A (AC1) 12A/1.6kW (AC4,400V/50Hz); 20A (AC1)			
Type	Order number	Auxiliary contacts per contactor	Weight [g]	Packing [pcs]
MBCM1 00N 24V 50Hz	609250	0NO - 0NC	400	1
MBCM1 00N 48V 50Hz	609251		400	1
MBCM1 00N 110V 50Hz	609252		400	1
MBCM1 00N 220/230V 50Hz	**609253**		**400**	**1**
MBCM1 00N 380/400V 50Hz	609254		400	1
MBCM1 10N 24V 50Hz	609255	1NO - 0NC*	410	1
MBCM1 10N 48V 50Hz	609256		410	1
MBCM1 10N 110V 50Hz	609257		410	1
MBCM1 10N 220/230V 50Hz	**609258**		**410**	**1**
MBCM1 10N 380/400V 50Hz	609259		410	1

*for push button control

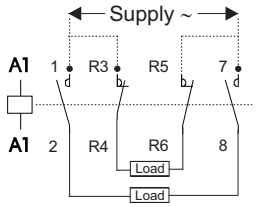
Main and control circuits are wired according to the circuits diagrams on page 90

4-pole contactors **CNN** (2NO + 2NC) main poles

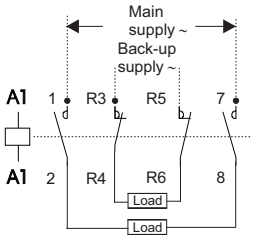
Remark for (CNN 9 0022...CNN 12 0022) 4-pole contactors fitted with 2NO + 2NC main poles
These contactors are suitable for controling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK before MAKE.
In conformity with: IEC 60947-1, IEC 60947-4-1
These contactors are not suitable for reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

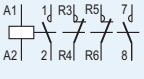
Block diagrams:

Single supply and 2 separate loads

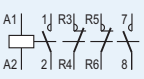


2 separate supplies and 2 separate loads



4-pole contactor CNN 9; 1.1kW/1~50Hz (AC3,230V)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 9 0022 24V 50Hz	609260		250	24
CNN 9 0022 48V 50Hz	609261		250	24
CNN 9 0022 110V 50Hz	606609		250	24
CNN 9 0022 220/230V 50Hz	**604590**		**250**	**24**
CNN 9 0022 380/400V 50Hz	609262		250	24

*second level packing

4-pole contactor CNN 12; 1.5kW/1~50Hz (AC3,230V)				
Type	Order number	Wiring diagram	Weight [g]	Packing* [pcs]
CNN 12 0022 24V 50Hz	604741		260	24
CNN 12 0022 48V 50Hz	604941		260	24
CNN 12 0022 110V 50Hz	609263		260	24
CNN 12 0022 220/230V 50Hz	**604589**		**260**	**24**
CNN 12 0022 380/400V 50Hz	609264		260	24

*second level packing

Contactor relays **CP0** and **CNNP**

Application:

Contactors are using for closing and opening operations of the control circuit as well as for the control of small size motors and other a.c. and d.c. loads with a operational current of 6 A (for the use category AC 15/AC 14).

Advantages:

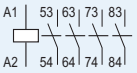
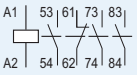
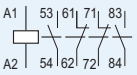
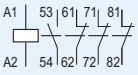
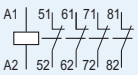
- In conformity with: IEC 60947-1, IEC 60947-5-1
- Small mounting dimensions and overall size
- Installation on DIN rail and mounting plate
- High performance and reliability
- Low power loss
- Protection of direct contact from front side - IP20
- Large selection of accessories
- Standard control voltages: 24 VAC, 48 VAC, 110 VAC, 230 VAC, 400 VAC
- Up to 6 extended auxiliary contacts for CP0
- Up to 8 extended auxiliary contacts for CNNP
- Snap-on auxiliaries

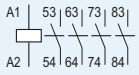
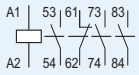
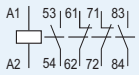
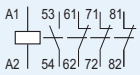
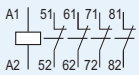
Ordering:

CP0	4	0	220/230V	50Hz
1	2	3	4	5

1 - Contactor type
2 - Number of NO auxiliary contacts
3 - Number of NC auxiliary contacts
4 - Control voltage (coil voltage)
5 - Frequency of the control voltage

Technical data - page 86-87; Accessories - page 45

Contactor relay CP0; 6A (AC15/AC14,230V/50Hz)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CP0 40 24V 50Hz	S34907		175	1
CP0 40 48V 50Hz	609265		175	1
CP0 40 110V 50Hz	S34908		175	1
CP0 40 220/230V 50Hz	**S34953**		**175**	**1**
CP0 40 380/400V 50Hz	S34925		175	1
CP0 31 24V 50Hz	S34904		175	1
CP0 31 48V 50Hz	602133		175	1
CP0 31 110V 50Hz	S34905		175	1
CP0 31 220/230V 50Hz	**603220**		**175**	**1**
CP0 31 380/400V 50Hz	S34926		175	1
CP0 22 24V 50Hz	S34900		175	1
CP0 22 48V 50Hz	S34901		175	1
CP0 22 110V 50Hz	S34902		175	1
CP0 22 220/230V 50Hz	**603221**		**175**	**1**
CP0 22 380/400V 50Hz	S34927		175	1
CP0 13 24V 50Hz	609266		175	1
CP0 13 48V 50Hz	609267		175	1
CP0 13 110V 50Hz	609268		175	1
CP0 13 220/230V 50Hz	**609269**		**175**	**1**
CP0 13 380/400V 50Hz	609270		175	1
CP0 04 24V 50Hz	609271		175	1
CP0 04 48V 50Hz	609272		175	1
CP0 04 110V 50Hz	609273		175	1
CP0 04 220/230V 50Hz	**S34955**		**175**	**1**
CP0 04 380/400V 50Hz	609274		175	1

Contactor relay CNNP; 6A (AC15/AC14,230V/50Hz)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNP 40 24V 50Hz	605840		230	24
CNNP 40 48V 50Hz	609275		230	24
CNNP 40 110V 50Hz	607099		230	24
CNNP 40 220/230V 50Hz	**605756**		**230**	24
CNNP 40 380/400V 50Hz	605944		230	24
CNNP 31 24V 50Hz	605383		230	24
CNNP 31 48V 50Hz	609276		230	24
CNNP 31 110V 50Hz	605932		230	24
CNNP 31 220/230V 50Hz	**605757**		**230**	24
CNNP 31 380/400V 50Hz	605978		230	24
CNNP 22 24V 50Hz	605459		230	24
CNNP 22 48V 50Hz	609245		230	24
CNNP 22 110V 50Hz	605803		230	24
CNNP 22 220/230V 50Hz	**605750**		**230**	24
CNNP 22 380/400V 50Hz	605558		230	24
CNNP 13 24V 50Hz	609278		230	24
CNNP 13 48V 50Hz	609277		230	24
CNNP 13 110V 50Hz	609279		230	24
CNNP 13 220/230V 50Hz	**603992**		**230**	24
CNNP 13 380/400V 50Hz	606290		230	24
CNNP 04 24V 50Hz	607730		230	24
CNNP 04 48V 50Hz	609280		230	24
CNNP 04 110V 50Hz	609281		230	24
CNNP 04 220/230V 50Hz	**603993**		**230**	24
CNNP 04 380/400V 50Hz	609282		230	24

*second level packing

Accessories

Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP1 10	S32643S	1NO - 0NC	CM1,CP0		13	1
BP1 01	S32644S	0NO - 1NC	CM1,CP0		13	1

Auxiliary contact block - upper mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP0 40	S52679S	4NO - 0NC	CM1,CP0		40	1
BP0 31	S52676S	3NO - 1NC	CM1,CP0		40	1
BP0 22	S52677S	2NO - 2NC	CM1,CP0		40	1
BP0 13	S52678S	1NO - 3NC	CM1,CP0		40	1
BP0 04	S52680S	0NO - 4NC	CM1,CP0		40	1

Mechanical interlock				
Type	Order number	Usage	Weight [g]	Packing [pcs]
MB1	S32597S	CM1,CP0	2	1

Up to 4 extended auxiliary contacts can be added on the contactor relays

Auxiliary contact block - upper mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP2 11	602594	1NO - 1NC	CNN,CNNP		30	1
BP4 22	602593	2NO - 2NC	CNN,CNNP		40	1
BP4 40	605903	4NO - 0NC	CNN,CNNP		40	1

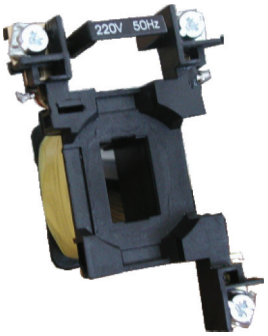
Auxiliary contact block - side mounting; 6A (AC15/AC14, 230V/50Hz)						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP3 11	602595	1NO - 1NC	CNN,CNNP		20	2

Up to 4 extended auxiliary contacts can be added on the contactor relays

Technical data - page 86-87

Spare coils

Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CM1 24V 50Hz	S32617S	AC	CM1 CP0	42	1
Coil CM1 48V 50Hz	S32619S				
Coil CM1 110V 50Hz	S32620S				
Coil CM1 220/230V 50Hz	**S32621S**				
Coil CM1 380/400V 50Hz	S32806S				



Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CNN 25 24V 50Hz	603028	AC	CNN CNNP	50	1
Coil CNN 25 48V 50Hz	603030				
Coil CNN 25 110V 50Hz	603032				
Coil CNN 25 220/230V 50Hz	**605227**				
Coil CNN 25 380/400V 50Hz	605231				

Motor contactors with DC solenoid system **CNNB** series

Application:

Contactors are suitable for d.c. operated (special electromagnet) and for particular conditions of application where reduced noise at closing operation and complete elimination of noise in closed position are required. Motor contactors are using for remote control and protection of electrical engines and other electrical consumers with a nominal power of 4.2 kW to 11 kW (400 V/50 Hz for the use category AC3).

Advantages:

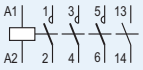
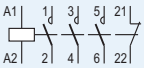
- In conformity with: IEC 60947-1, IEC 60947-4-1
- Installation on DIN rail and mounting plate
- High performance and reliability
- Low power loss
- Protection of direct contact from front side - IP20
- Large selection of accessories
- Standard control voltages: 24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC
- Snap-on auxiliaries
- For front mounting up to 4 auxiliary contacts (2NO + 2NC)
- For side mounting up to 2 auxiliary contacts (1NO + 1NC)

Ordering:

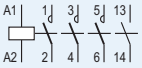
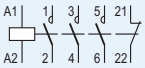
CNNB	9	1	0	220V	DC
1	2	3	4	5	6

1 - Contactor series
2 - Rated operational current Ie (AC3,400V/50Hz)
3 - Number of NO auxiliary contacts
4 - Number of NC auxiliary contacts
5 - Control voltage (coil voltage)
6 - DC control voltage

Technical data - page 88; Accessories - page 53

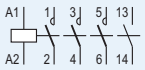
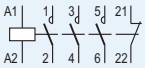
Contactor CNNB 9; 9A/4.5kW (AC3,400V/50Hz), 25A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNB 9 10 24V DC	603761		580	1
CNNB 9 10 48V DC	609283		580	1
CNNB 9 10 60V DC	603469		580	1
CNNB 9 10 110V DC	603604		580	1
CNNB 9 10 220V DC	603859		580	1
CNNB 9 01 24V DC	603904		580	1
CNNB 9 01 48V DC	604641		580	1
CNNB 9 01 60V DC	603470		580	1
CNNB 9 01 110V DC	603605		580	1
CNNB 9 01 220V DC	603858		580	1

integrated auxiliary contact 1NO or 1NC

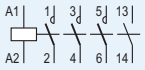
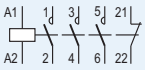
Contactor CNNB 12; 12A/5.7kW (AC3,400V/50Hz); 25A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNB 12 10 24V DC	603797		580	1
CNNB 12 10 48V DC	604640		580	1
CNNB 12 10 60V DC	602876		580	1
CNNB 12 10 110V DC	603602		580	1
CNNB 12 10 220V DC	603855		580	1
CNNB 12 01 24V DC	604980		580	1
CNNB 12 01 48V DC	609284		580	1
CNNB 12 01 60V DC	602877		580	1
CNNB 12 01 110V DC	603603		580	1
CNNB 12 01 220V DC	603854		580	1

integrated auxiliary contact 1NO or 1NC

For front mounting up to 4 auxiliary contacts (2NO + 2NC)
For side mounting up to 2 auxiliary contacts (1NO + 1NC)

Contactor CNNB 18; 18A/7.5kW (AC3,400V/50Hz); 30A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNB 18 10 24V DC	603782		590	1
CNNB 18 10 48V DC	603793		590	1
CNNB 18 10 60V DC	602874		590	1
CNNB 18 10 110V DC	603601		590	1
CNNB 18 10 220V DC	603857		590	1
CNNB 18 01 24V DC	609285		590	1
CNNB 18 01 48V DC	609286		590	1
CNNB 18 01 60V DC	602875		590	1
CNNB 18 01 110V DC	603600		590	1
CNNB 18 01 220V DC	603856		590	1

integrated auxiliary contact 1NO or 1NC

Contactor CNNB 22; 22A/11kW (AC3,400V/50Hz); 30A (AC1)				
Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNB 22 10 24V DC	607629		600	1
CNNB 22 10 48V DC	609287		600	1
CNNB 22 10 60V DC	609288		600	1
CNNB 22 10 110V DC	609289		600	1
CNNB 22 10 220V DC	609290		600	1
CNNB 22 01 24V DC	607631		600	1
CNNB 22 01 48V DC	609291		600	1
CNNB 22 01 60V DC	609292		600	1
CNNB 22 01 110V DC	609293		600	1
CNNB 22 01 220V DC	609294		600	1

integrated auxiliary contact 1NO or 1NC

For front mounting up to 4 auxiliary contacts (2NO + 2NC)
For side mounting up to 2 auxiliary contacts (1NO + 1NC)

Technical data - page 88; Accessories - page 53

Contactor relay with DC solenoid system **CNNPB**

Application:

Contactors are suitable for d.c. operated (special electromagnet) and for particular conditions of application where reduced noise at closing operation and complete elimination of noise in closed position are required. Contactor relays are using for closing and opening operations of the control circuit as well as for the control of small size motors. Rated operational current of 6 A/230V 50Hz (for the use category AC 15/ AC 14).

Advantages:

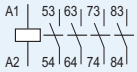
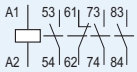
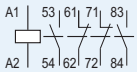
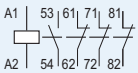
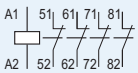
- In conformity with: IEC 60947-1, IEC 60947-5-1
- Installation on DIN rail and mounting plate
- High performance and reliability
- Low power loss
- Protection of direct contact from front side - IP20
- Large selection of accessories
- Standard control voltages: 24 VDC, 48 VDC, 60 VDC, 110 VDC, 220 VDC
- Snap-on auxiliaries
- For front mounting up to 4 auxiliary contacts (2NO + 2NC)
- For side mounting up to 2 auxiliary contacts (1NO + 1NC)

Ordering:

CNNPB	4	0	220V	DC
1	2	3	4	5

1 - Contactor type
2 - Number of NO auxiliary contacts
3 - Number of NC auxiliary contacts
4 - Control voltage (coil voltage)
5 - DC control voltage

Contactor relay CNNPB; 6A (AC15/AC14,230V/50Hz)

Type	Order number	Wiring diagram	Weight [g]	Packing [pcs]
CNNPB 40 24V DC	605560		600	1
CNNPB 40 48V DC	609295		600	1
CNNPB 40 60V DC	609296		600	1
CNNPB 40 110V DC	605394		600	1
CNNPB 40 220V DC	605559		600	1
CNNPB 31 24V DC	605574		600	1
CNNPB 31 48V DC	606968		600	1
CNNPB 31 60V DC	605801		600	1
CNNPB 31 110V DC	605395		600	1
CNNPB 31 220V DC	607268		600	1
CNNPB 22 24V DC	605573		600	1
CNNPB 22 48V DC	609297		600	1
CNNPB 22 60V DC	609298		600	1
CNNPB 22 110V DC	605396		600	1
CNNPB 22 220V DC	605705		600	1
CNNPB 13 24V DC	605576		600	1
CNNPB 13 48V DC	609299		600	1
CNNPB 13 60V DC	609300		600	1
CNNPB 13 110V DC	605397		600	1
CNNPB 13 220V DC	609301		600	1
CNNPB 04 24V DC	606482		600	1
CNNPB 04 48V DC	609302		600	1
CNNPB 04 60V DC	609303		600	1
CNNPB 04 110V DC	605398		600	1
CNNPB 04 220V DC	609304		600	1

For front mounting up to 4 auxiliary contacts (2NO + 2NC)
For side mounting up to 2 auxiliary contacts (1NO + 1NC)

Technical data - page 87; Accessories - page 53

Accessories

Auxiliary contact block - upper mounting						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP2 11	602594	1NO - 1NC	CNNB - CNNPB		30	1
BP4 22	602593	2NO - 2NC	CNNB - CNNPB		40	1
BP4 40	605903	4NO - 0NC	CNNPB		40	1

Auxiliary contact block - side mounting						
Type	Order number	Contacts	Usage	Wiring diagram	Weight [g]	Packing [pcs]
BP3 11	602595	1NO - 1NC	CNNB - CNNPB		20	2

Spare coils

Spare coils					
Type	Order number	AC/DC coil	Usage	Weight [g]	Packing [pcs]
Coil CNNB 24V DC	603860	DC	CNNB CNNPB	215	1
Coil CNNB 48V DC	603861				
Coil CNNB 60V DC	605634				
Coil CNNB 110V DC	605633				
Coil CNNB 220V DC	604195				

Contactor assemblies in enclosure

Ordering:

PNNRT	18	220/230V	50Hz	16A
1	2	3	4	5

1 - Series
2 - Rated operational current Ie (AC3,400V/50Hz)
3 - Control voltage (coil voltage)
4 - Frequency of the control voltage
5* - Setting range of thermal overload relay (upper value)

*Only with thermal overload relay

Technical data - page 62

Contactor assembly in enclosure PNNT 9; 9A/4.5kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 9 00 24V 50Hz	609305	0NO - 0NC	0.71	1
PNNT 9 00 48V 50Hz	609306		0.71	1
PNNT 9 00 110V 50Hz	609307		0.71	1
PNNT 9 00 220/230V 50Hz	606527		0.71	1
PNNT 9 00 380/400V 50Hz	609308		0.71	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 12; 12A/5.7kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 12 00 24V 50Hz	609309	0NO - 0NC	0.71	1
PNNT 12 00 48V 50Hz	609310		0.71	1
PNNT 12 00 110V 50Hz	609311		0.71	1
PNNT 12 00 220/230V 50Hz	606528		0.71	1
PNNT 12 00 380/400V 50Hz	609312		0.71	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 18; 18A/7.5kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 18 00 24V 50Hz	609313	0NO - 0NC	0.72	1
PNNT 18 00 48V 50Hz	609314		0.72	1
PNNT 18 00 110V 50Hz	609315		0.72	1
PNNT 18 00 220/230V 50Hz	606529		0.72	1
PNNT 18 00 380/400V 50Hz	609316		0.72	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 22; 22A/11kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 22 00 24V 50Hz	609317	0NO - 0NC	0.72	1
PNNT 22 00 48V 50Hz	609318		0.72	1
PNNT 22 00 110V 50Hz	609319		0.72	1
PNNT 22 00 220/230V 50Hz	609320		0.72	1
PNNT 22 00 380/400V 50Hz	609321		0.72	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 25; 25A/11kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 25 12 24V 50Hz	609322	1NO - 2NC	0.73	1
PNNT 25 12 48V 50Hz	609323		0.73	1
PNNT 25 12 110V 50Hz	609324		0.73	1
PNNT 25 12 220/230V 50Hz	606530		0.73	1
PNNT 25 12 380/400V 50Hz	609325		0.73	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 30; 30A/15kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 30 12 24V 50Hz	609326	1NO - 2NC	0.74	1
PNNT 30 12 48V 50Hz	609327		0.74	1
PNNT 30 12 110V 50Hz	609328		0.74	1
PNNT 30 12 220/230V 50Hz	606531		0.74	1
PNNT 30 12 380/400V 50Hz	609329		0.74	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT 32; 32A/15kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 32 12 24V 50Hz	609330	1NO - 0NC	0.84	1
PNNT 32 12 48V 50Hz	609331		0.84	1
PNNT 32 12 110V 50Hz	609332		0.84	1
PNNT 32 12 220/230V 50Hz	606533		0.84	1
PNNT 32 12 380/400V 50Hz	609333		0.84	1

direct on line starters with (I - 0) push button
protection degree IP 54

Contactor assembly in enclosure PNNT40; 38A/18.5kW (AC3,400V/50Hz)

Type	Order number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNT 40 12 24V 50Hz	609334	1NO - 2NC	0.85	1
PNNT 40 12 48V 50Hz	609335		0.85	1
PNNT 40 12 110V 50Hz	609336		0.85	1
PNNT 40 12 220/230V 50Hz	606533		0.85	1
PNNT 40 12 380/400V 50Hz	609337		0.85	1

direct on line starters with (I - 0) push button
protection degree IP 54

Technical data - page 62

Contactor assembly in enclosure PNNRT 9; 9A/4.5kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 9 00 24V 50Hz	Setting range	0NO - 0NC	0.86	1
PNNRT 9 00 48V 50Hz	Setting range		0.86	1
PNNRT 9 00 110V 50Hz	Setting range		0.86	1
PNNRT 9 00 220/230V 50Hz	Setting range		0.86	1
PNNRT 9 00 380/400V 50Hz	Setting range		0.86	1

direct online starters with (I - 0) push button contactor with overload relay protection degree IP 54

Contactor assembly in enclosure PNNRT 12 ; 12A/5.7kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 12 00 24V 50Hz	Setting range	0NO - 0NC	0.86	1
PNNRT 12 00 48V 50Hz	Setting range		0.86	1
PNNRT 12 00 110V 50Hz	Setting range		0.86	1
PNNRT 12 00 220/230V 50Hz	Setting range		0.86	1
PNNRT 12 00 380/400V 50Hz	Setting range		0.86	1

direct online starters with (I - 0) push button contactor with overload relay protection degree IP 54

Contactor assembly in enclosure PNNRT 18; 18A/7.5kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 18 00 24V 50Hz	Setting range	0NO - 0NC	0.87	1
PNNRT 18 00 48V 50Hz	Setting range		0.87	1
PNNRT 18 00 110V 50Hz	Setting range		0.87	1
PNNRT 18 00 220/230V 50Hz	Setting range		0.87	1
PNNRT 18 00 380/400V 50Hz	Setting range		0.87	1

direct online starters with (I - 0) push button contactor with overload relay protection degree IP 54

Contactor assembly in enclosure PNNRT 22; 22A/11kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 22 00 24V 50Hz	Setting range	0NO - 0NC	0.88	1
PNNRT 22 00 48V 50Hz	Setting range		0.88	1
PNNRT 22 00 110V 50Hz	Setting range		0.88	1
PNNRT 22 00 220/230V 50Hz	Setting range		0.88	1
PNNRT 22 00 380/400V 50Hz	Setting range		0.88	1

direct online starters with (I - 0) push button contactor with overload relay protection degree IP 54

*Depends on overload relay setting range

Contactor assembly in enclosure PNNRT 25; 25A/11kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 25 12 24V 50Hz	Setting range	1NO - 2NC	0.88	1
PNNRT 25 12 48V 50Hz	Setting range		0.88	1
PNNRT 25 12 110V 50Hz	Setting range		0.88	1
PNNRT 25 12 220/230V 50Hz	Setting range		0.88	1
PNNRT 25 12 380/400V 50Hz	Setting range		0.88	1

direct online starters with (I - 0) push button
contactor with overload relay
protection degree IP 54

Contactor assembly in enclosure PNNRT 30; 30A/15kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 30 12 24V 50Hz	Setting range	1NO - 0NC	0.89	1
PNNRT 30 12 48V 50Hz	Setting range		0.89	1
PNNRT 30 12 110V 50Hz	Setting range		0.89	1
PNNRT 30 12 220/230V 50Hz	Setting range		0.89	1
PNNRT 30 12 380/400V 50Hz	Setting range		0.89	1

direct online starters with (I - 0) push button
contactor with overload relay
protection degree IP 54

Contactor assembly in enclosure PNNRT 32; 32A/15kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 32 12 24V 50Hz	Setting range	1NO - 2NC	0.95	1
PNNRT 32 12 48V 50Hz	Setting range		0.95	1
PNNRT 32 12 110V 50Hz	Setting range		0.95	1
PNNRT 32 12 220/230V 50Hz	Setting range		0.95	1
PNNRT 32 12 380/400V 50Hz	Setting range		0.95	1

direct online starters with (I - 0) push button
contactor with overload relay
protection degree IP 54

Contactor assembly in enclosure PNNRT 40; 38A/18.5kW (AC3,400V/50Hz)

Type	Order* number	Auxiliary contacts	Weight [kg]	Packing [pcs]
PNNRT 40 12 24V 50Hz	Setting range	1NO - 2NC	1	1
PNNRT 40 12 48V 50Hz	Setting range		1	1
PNNRT 40 12 110V 50Hz	Setting range		1	1
PNNRT 40 12 220/230V 50Hz	Setting range		1	1
PNNRT 40 12 380/400V 50Hz	Setting range		1	1

direct online starters with (I - 0) push button
contactor with overload relay
protection degree IP 54

*Depends on overload relay setting range

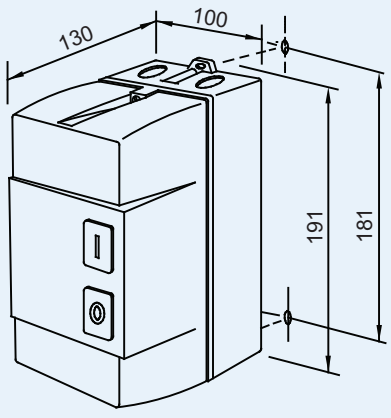
Technical data - page 62

Enclosures

Enclosure without push buttons					
Type	Order number	Usage	Degree of protection	Weight [g]	Packing [pcs]
PNN	604232	PNN 9 - PNN 40	IP 65	325	1

Enclosure with push buttons					
Type	Order number	Usage	Degree of protection	Weight [g]	Packing [pcs]
PNNT	604233	PNN 9 - PNN 40	IP 54	325	1

Dimension drawing (mm)



Star-delta starters in enclosures

Star - delta starters are used for starting three-phase induction cage motors which are not overloaded during the starting. When starting, the windings of the stator are connected to the mains in a position of a start. After the starting operation they assume a delta position. Due to this change of the position of the windings the value of the starting current of the motor is 0,58 of the current of direct starting in delta position of the windings. When starting the motor in this way the starting moment is three times shorter , so this starters can only be used for motors whose starting moment , due to lack of overloading, is much shorter , and for those starting in idle or under light load. The windings can change their start position into a delta position after the motor achieves a nominal numbers of rotations. Motors which require an early change of the position of the windings cannot be started with SDS type of starters.

In table 1 quoted currents and capacities are valid only if special star-delta timer EVRK 40 is used.

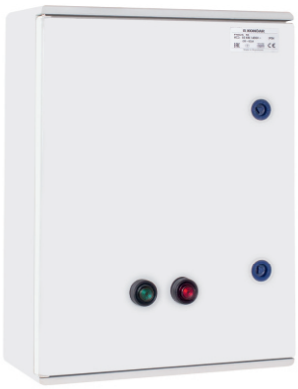
The change of the windings from star position to delta position occurs automatically after the starting operations is over. Starting can be adjusted to last from 2-20 s with a switch delay of about 100ms by means of an embedded timer.
The thermal overload relay can operate accurately during permanent duty if the number of starts per hour does not exceed 15, and during intermittent duty (with 40% working time) if the number of starts per hour does not exceed 60.

Overload protection
The thermal overload relay is set to cca 0,58 x motor rated current.
Technical data for current range of thermal overload relays are given in table 2.

Ordering:

PNSDS	18.5	220/230V	50Hz
1	2	3	4

1 - Series
2 - Power (kW, 400V/50Hz)
3 - Control voltage (coil voltage)
4 - Frequency of the control voltage



Star-delta starters in enclosure - Table 1

Type	In (400V) A	Max. motor output (50Hz) 220V kW	**400V kW**	500V kW	690V kW	Dimensions (axbxc) mm
PNSDS 7.5	16	4	**7.5**	7.5	10	210x260x185
PNSDS 11	22	5.5	**11**	11	15	
PNSDS 15	29	7.5	**15**	15	18.5	
PNSDS 18.5	37	11	**18.5**	22	22	
PNSDS 22	44	15	**22**	25	34	
PNSDS 25	50	15	**25**	25	34	240x320x205
PNSDS 30	60	18.5	**30**	30	37	
PNSDS 37	72	22	**37**	37	37	400x500x207
PNSDS 45	85	26	**45**	45	45	
PNSDS 55	105	37	**55**	55	55	400x600x217

Star-delta starters in enclosure - Table 2

Type	Pn kW	K1	K2	K3	EVRK	TM40	Range A	Ir A	Max. starting time from cold state*
PNSDS 7.5	7.5	CNN9	CNN9	CNN9	EVRK40	TM40	6.3-10	9	15s
PNSDS 11	11	CNN12	CNN12	CNN9	EVRK40	TM40	10-16	12.7	
PNSDS 15	15	CNN18	CNN18	CNN12	EVRK40	TM40	12.5-20	16.8	
PNSDS 18.5	18.5	CNN25	CNN25	CNN25	EVRK40	TM40	16-25	20.3	
PNSDS 22	22	CNN30	CNN30	CNN25	EVRK40	TM40	16-25	23.7	
PNSDS 25	25	CNN32	CNN32	CNN32	EVRK40	TM40	22-30	29	
PNSDS 30	30	CNN40	CNN40	CNN32	EVRK40	TM40	28-38	31.9	
PNSDS 37	37	CNN50	CNN50	CNN32	EVRK40	TM70	16-25	23.7	30s
PNSDS 45	45	CNN60	CNN60	CNN40	EVRK40	TM70	22-30	29	
PNSDS 55	55	CNN70	CNN70	CNN40	EVRK40	TM70	28-38	31.9	

*Usual starting time 6-10s

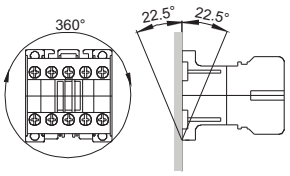
Technical data

Standards

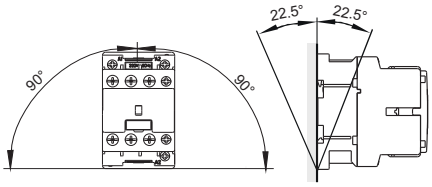
Motor and capacitor contactors CM1, CNN, CNM and CNNK
are in comformity with IEC 60947-4-1 and EN 60947-4-1.
Contactor relays type CPO, CNNP and CNNPB are in conformity with
International standard IEC 60947-5-1 and EN 60947-5-1
Designations of contactors, conform to EN 50 005, EN 50 012.

Installation

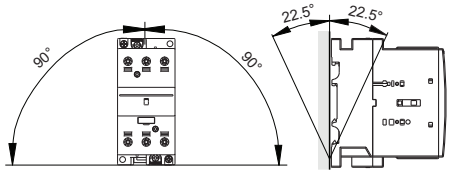
Contactors can be mounted on the baseplate with two or four screws. Contactors type CPO, CNNP, CNNB, CNB, CM1, CNN 9 - 100 and CNNK 2.5 - CNNK 75..N are designed for quick installation on vertical standard support 35 mm width and CNN 50 - 100 and CNNK 40..N - CNNK..75N on 75 mm width according to DIN EN 50022. Permissible deviations of mounting surfaces from the vertical base are shown on sketches:



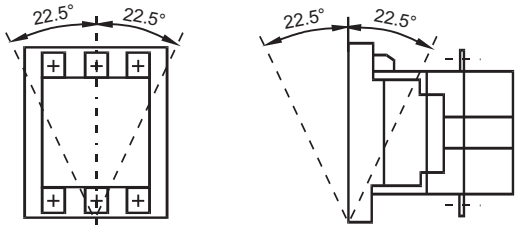
CM1,CP0



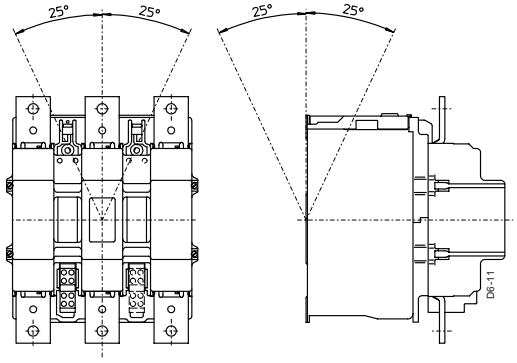
CNN 9 - CNN 40 , CNNK 2.5 - CNNK 30..N, CNNP and CNNB 9 - CNNB 30



CNN 50 - CNN 100, CNNK 40..N - CNNK 75..N



CNM 110 - CNM 400
CNKM 80



CNM 450 - CNM1000

Electrical endurance of the main contacts

The characteristic curves show the contact endurance of the contactors when used to switch resistive and inductive three-phase loads (AC1/AC3), depending on the breaking current and rated operational voltage it is assumed that the operating mechanisms are switched randomly, i.e. Not synchronized with the phase angle of the supply system.
The rated operational current Ie for the AC4 utilization category (breaking six times the rated operational current) is designed for a contact endurance of approximately 120 000 operating cycles if a shorter endurance is sufficient, the rated operational current Ie/AC4 ca be increased.
For mixed operation, i.e. normal switching (breaking the rated operational current according to the AC3 utilization category) in combination with intermittent inching (breaking several times the rated operational current according to the AC4 utilization category),

the contact endurance can be calculated approximately from the following equation:

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

Where:
X - Contact endurance for mixed operation in operating cycles
A - Contact endurance for normal operation (Ic=Ie) in operating cycles
B - Contact endurance for inching (Ic= multiple of Ie) in operating cycles
C - Inching operations as a percentage of total switching operations

Diagram of electrical endurance of CM, CNN contactors - AC3

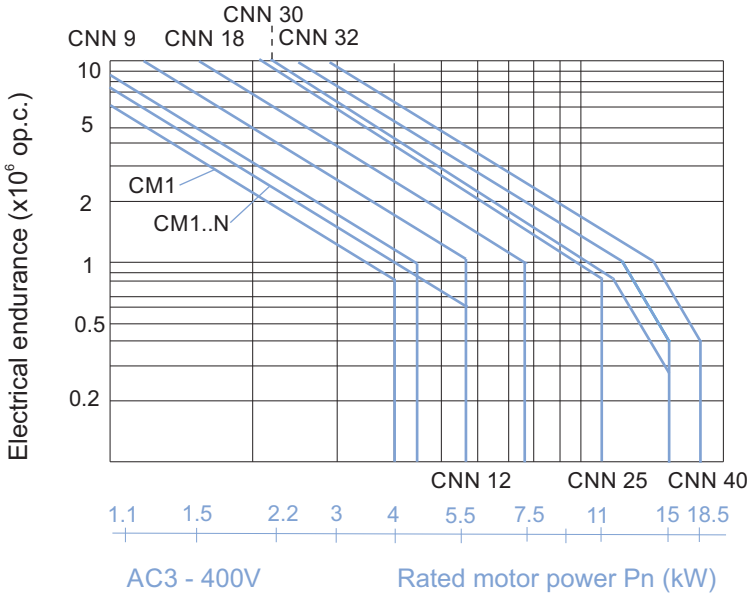


Diagram of electrical endurance of CM, CNN contactors - AC4

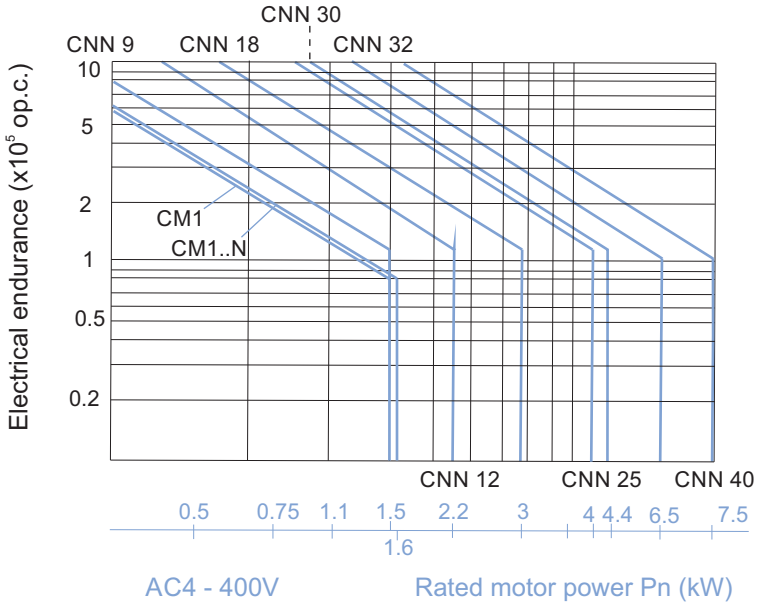


Diagram of electrical endurance of CP0 and CNNP contactor relayes

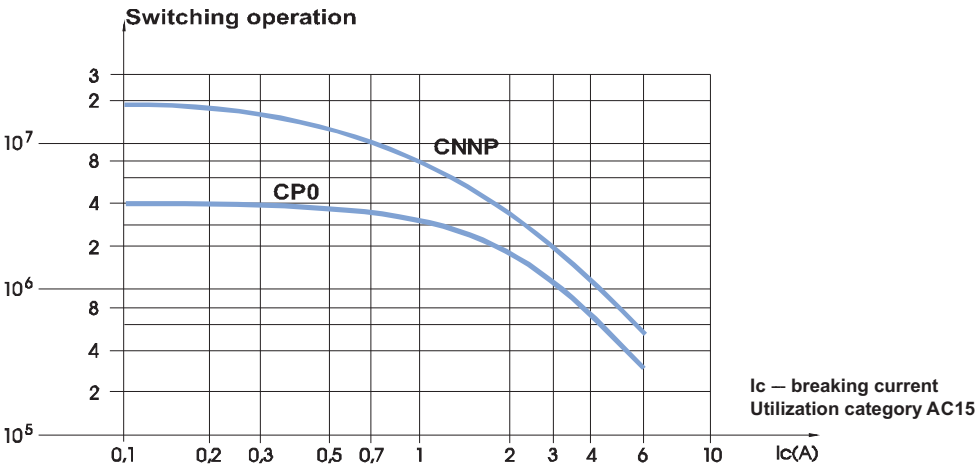


Diagram of electrical endurance of CNN and CNM contactors - AC3

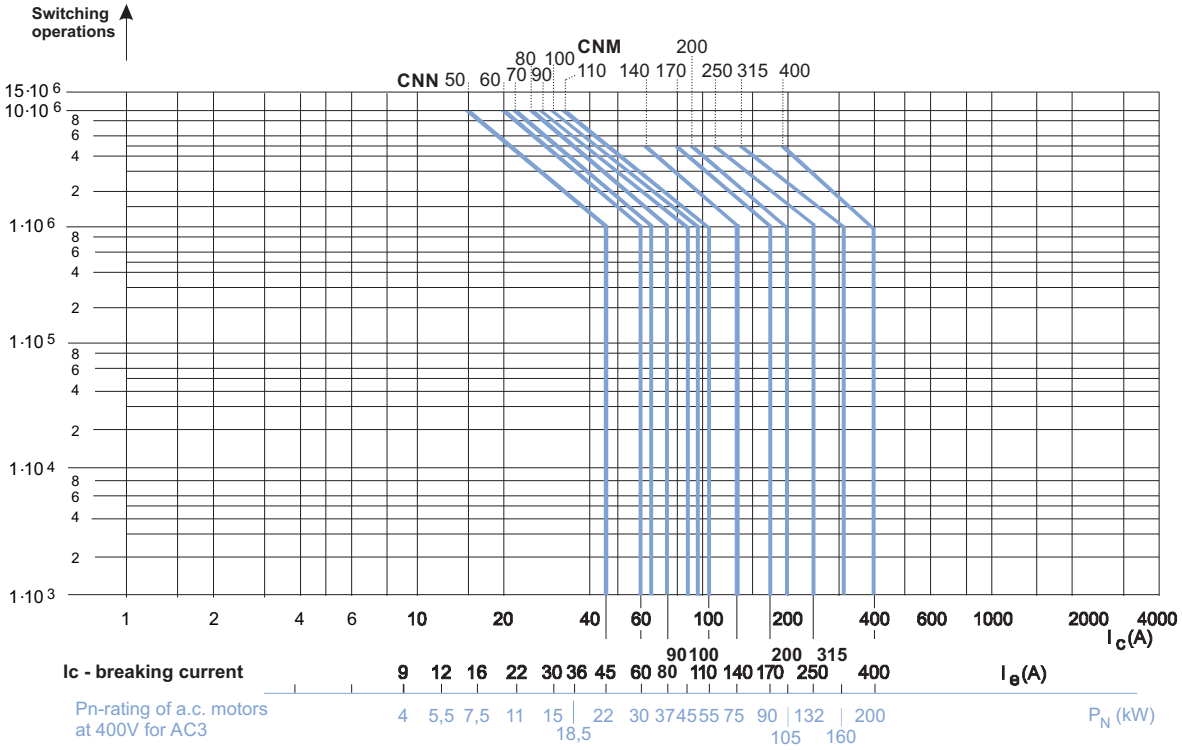
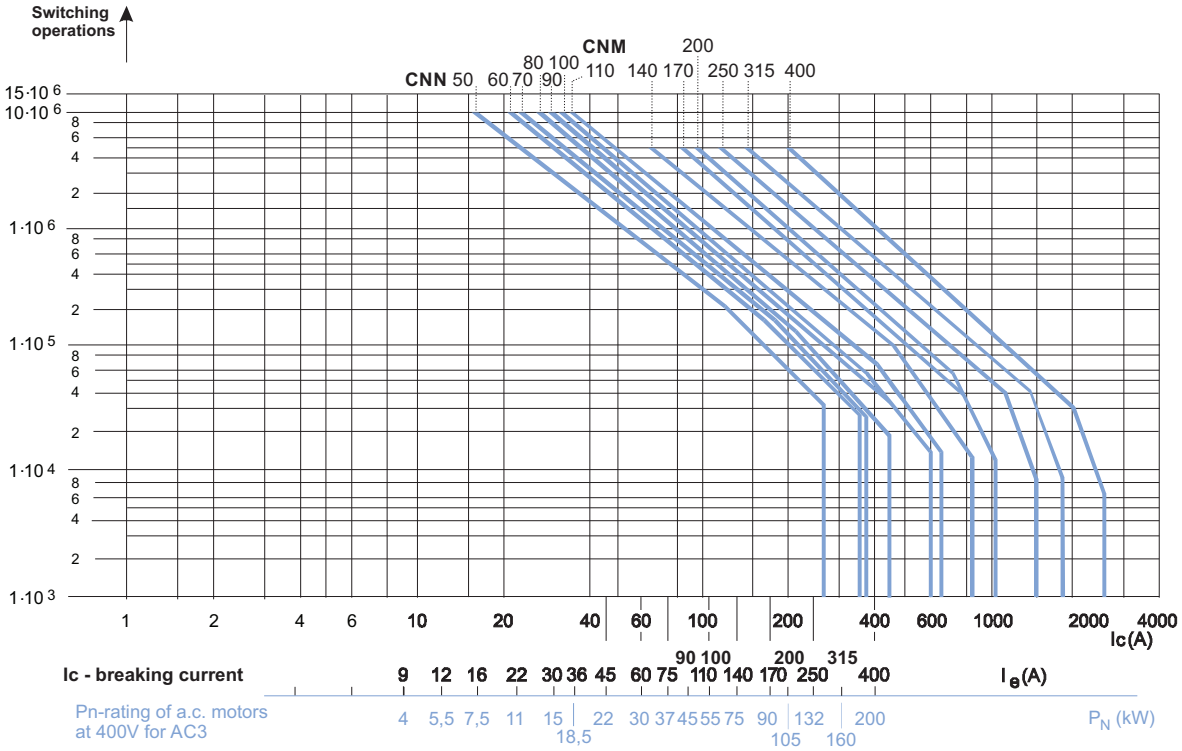


Diagram of electrical endurance of CNN and CNM contactors - AC4



Utilization categories for contactors

IEC 60947-4-1, IEC 60947 -5-1

		ELECTRICAL DURABILITY						MAKE AND BREAK CONDITIONS					
Category	Typical applications	MAKE			BREAK			MAKE			BREAK		
		Current I/Ie	Voltage U/Ue	p.f.	Current Ic/Ie	Voltage Ur/Ue	p.f.	Current I/Ie	Voltage U/Ue	p.f.	Current Ic/Ie	Voltage Ur/Ue	p.f.
AC-1	Non-inductive or slightly inductive loads, electro-resistance furnaces	1	1	0,95	1	1	0,95	1,5	1,05	0,8	1,5	1,05	0,8
AC-2	Slip ring motors: Starting, switching off	2,5	1	0,65	2,5	1	0,65	4	1,05	0,65	4	1,05	0,65
AC-3	Squirrel-cage motors: Ie(A)≤17 Starting, switching off 17<Ie≤100 motors during running. Ie > 100	6 6 6	1 1 1	0,65 0,35 0,35	1 1 1	0,17 0,17 0,17	0,65 0,35 0,35	10 10 10	1,05 1,05 1,05	0,45 0,45 0,35	8 8 8	1,05 1,05 1,05	0,45 0,45 0,35
AC-4	Squirrel-cage motors: Ie(A)<17 Starting, plugging[1], 17<Ie<100 inching[2]. Ie > 100	6 6 6	1 1 1	0,65 0,35 0,35	6 6 6	1 1 1	0,65 0,35 0,35	12 12 12	1,05 1,05 1,05	0,45 0,45 0,35	10 10 10	1,05 1,05 1,05	0,45 0,45 0,35
AC-5a	Switching of electric discharge lamp control.							3	1,05	0,45	3	1,05	0,45
AC-5b	Switching of incandescent lamps.							1,5 [3]	1,05	[3]	1,5 [3]	1,05	[3]
AC-6a	Switching of transformers.							To be derived from test values for AC-3 or AC-4					
AC-6b	Switching of capacitor banks.							1,5	1,05		1,5	1,05	
AC-7a	Slightly induktive loads in household appliances and similar applications.							1,5	1,05	0,8	1,5	1,05	0,8
AC-7b	Motor-loads for household applications.							8	1,05	[4]	8	1,05	[4]
AC-8a	Hermetic refrigerant compressor motor control with manual reseting of overload releases.							6	1 ,05	[4]	6	1,05	[4]
AC-8b	Hermetic refrigerant compressor motor control with automatic reseting of overload releases.							6	1,05	[4]	6	1,05	[4]
AC-13	Control of solid-state loads with transformer isolation.							10	1,1	0,65	1,1	1,1	0,65
AC-14	Control of small electro-magnetic loads (≤72 VA)							6	1,1	0,7	6	1,1	0,7
AC-15	Control of electro-magnetic loads (> 72 VA)	10	1	0,7	1	1	0,4	10	1,1	0,3	10	1,1	0,3
		I/Ie	U/Ue	L/R ms	I/Ie	U/Ue	L/R ms	I/Ie	U/Ue	L/R ms	I/Ie	U/Ue	L/R ms
DC-1	Non-inductive or slightly inductive loads, electro-resistance furnaces.	1	1	1	1	1	1	1,5	1,05	1	1,5	1,05	1
DC-3	Shunt motors: starting, plugging[1], inching[2],dynamic breaking of motors.	2,5	1	2	2,5	1	2	4	1,05	2,5	4	1,05	2,5
DC-5	Series motors: starting, plugging[1], inching[2], dynamic breaking of motors.	2,5	1	7,5	2,5	1	7,5	4	1,05	15	4	1,05	15
DC-6	Switching of incandescent lamps.							1,5	1,05	[3]	1,5	1,05	[3]
DC-13	Control of d.c. electromagnets.	1	1	6P	1	1	6P	1,1	1,1	6P	1,1	1,1	6P
DC-14	Control of d.c. electromagnetic loads having economy resistors in circuit.							1 0	1,1	15	10	1,1	15

1) By plugging is understood stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
2) By inching (jogging) is understood energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.
3) Tests to be carred out with an incandescent light load.
4) p.f.=0,45 for Ie ≤100 A ; 0,35 for Ie > 100 A.

I - making current
U - voltage before breaking
Ie - rated operational current
Ue rated operational voltage
Ic - breaking current
Ur - recovery voltage
P = Ue x Ie (W)

Degrees of protection for enclosed equipment

In an installation, the degree of protection required for electrical equipment depends of the environmental characteristics. The degree of protection, ensured by the enclosure of equipment or by the cubicle containing the equipment is expressed by the IP code which gives the level of protection against access to hazardous parts, the ingress of foreign bodies and/or the ingress of water, in compliance with IEC 529, EN 60529, IEC 60947-1 and EN60947-1.Besides the IP symbol,the complete code has two figures followed (optionally) by two additional letters. A short description of the elements used in IP coding is given below.

Element	Figures or letters	Specifications for installation protection	Protection of personnel
Codes		**IP**	
First figure		**Against ingress of foreign bodies**	**Against access to hazardous parts with**
	0	No protection	Non-protected
	1	Diameter ≥ 50 mm	Back of hand
	2	Diameter ≥ 12,5 mm	Finger
	3	Diameter ≥ 2,5 mm	Tool
	4	Diameter ≥ 1 mm	Wire
	5	Limited protection against dust	Wire
	6	Total protection against dust	Wire
Second figure		**Against entrance of water having a harmful effect**	
	0	No protection	
	1	Vertical dripping	
	2	Dripping up to 15^0 from the vertical	
	3	Rain at a vertical angle of $\leq 60^0$	
	4	Splashing from all directions	
	5	Hosing jets from all directions	
	6	Strong hosing jets from all directions	
	7	Temporary immersion	
	8	Permanent immersion	
Additional letter (opt.) **for use with:**		**Against ingress of foreign bodies**	**Against access to hazardous parts with**
First figure 0	**A**	Stopped by a barrier with a 50 mm ϕ sphere	Back of hand
First figure 0 or 1	**B**	Entrance of test finger limited to 80 mm	Finger
First figure 1 or 2	**C**	Wire with 2.5 mm ϕ and length of 100 mm	Tool
First figure 2 or 3	**D**	Wire with 1 mm ϕ and length of 100 mm	Wire
Additional letter (opt.)		**Specific additional information**	
	H	High voltage apparatus	
	M	Moving parts which are moving during water test	
	S	Moving parts which are stationary during water test	
	W	Specifed atmospheric conditions	

Note: The type of enclosure or cubicle in which the equipment must be installated prevails with respect to the degree of protection.

Over voltage limiter (surge suppressors)

When cutting off the inductive circuits the over voltage appears. The over voltage can damage used equip ment that is why it is useful to limit the amplitudes and duration of the over voltage with some of the blocking systems. In practice this overvoltages may disconnect the coil of the contactor. Cutting off the coil (wounding) is connected with high frequencies and remarkable amplitudes (several KV) but regularly with short duration. With reference to the place of the implementation, it is frequently necessary to limit the over voltage, because they can cause problems such as:

Radio interference
- Interference with the electronic devices and components (programmable automation)
- Damage of the electronic systems and components (diodes, bridges, etc.)
-

The most often used systems for over voltage blockade are:

R-C elements
- Varistors
- Diodes (with or without resistor in serial)
-

The advantages and disadvantages when using these elements are following:

R-C Advantages

Theoretically can be used with AC and DC circuits
- Big limitation of voltage peaks
- Time stability of R-C elements
-

Disadvantages

Resonance
- Limited infuence on the period of activating contactor
- Contactors with DC magnet swith out current limiting resistor, difficulties with limiting overvoltage
- due to big powers.

Varistors Advantages

Very short period of cutting off, so that there is no infuence on the contactor activity
- Without resonance
- Usage in AC and DC circuits
-

Disadvantges

Not enough limitation of voltage peaks
- Growing old equipment because of prolonged thermal loading
-

Diodes Advantages (see page 1/30)

Optimal muffing
-

Disadvantges

Delay when cutting off
- Only DC circuits
-

Voltage drop in main circuits and current transformers

When the distance between the energy source and the consumer is long, it is advisable to calculate the voltage drop for example at the moment of starting the motor (when tripping current gets peak value) and to check if the remaining voltage is in the consumers working limits.
For calculating the voltage drop the following formula has been used:

$\Delta V = \Delta V_0 * L * I$

Where ΔV = voltage drop in Volts
ΔV_0 = unit voltage drop from table
L = cable length in km
I = current

This formula is valid for calculating the voltage drop for motors, when insuffcient voltage disable running up the motor.
In the table below are listed active and reactive resistances of the cables for calculating the voltage drop when the power factor is different from 0.8. In that case the following formulas should be used:

Single phase $\Delta V = 2\ I*L\ (\cos f + X_l \sin f)$
Three phase $\Delta V = \sqrt{3}\ I*L\ (\cos f + X_l \sin f)$

Rated cross-section	**Single wire cable** active resistance r	reactive resistance x	**DC**	**AC** cosf = 0,8 1 fase	3 fases	**Two and three wire cable** active resistance r	reactive resistance x	**DC**	**AC** cosf = 0,8 1 fase	3 fases
[mm²]	[Ω /km]	[Ω /km]	ΔV [V/Akm]	ΔV [V/Akm]	ΔV [V/Akm]	[Ω/km]	[Ω/km]	ΔV [V/Akm]	ΔV [V/Akm]	ΔV [V/Akm]
1	22.1	0.176	44.2	35.6	30.8	22.5	0.125	45.0	36.1	31.3
1.5	14.8	0.168	29.7	23.9	20.7	15.1	0.118	30.2	24.3	21.0
2.5	8.91	0.155	17.8	14.4	12.5	9.08	0.109	18.2	14.7	12.7
4	5.57	0.143	11.1	9.08	7.87	5.68	0.101	11.4	9.21	7.98
6	3.71	0.135	7.41	6.10	5.28	3.78	0.0955	7.56	6.16	5.34
10	2.24	0.119	4.47	3.72	3.22	2.27	0.0861	4.55	3.73	3.24
16	1.41	0.112	2.82	2.39	2.07	1.43	0.0817	2.87	2.39	2.07
25	0.889	0.106	1.78	1.55	1.34	0.907	0.0813	1.81	1.55	1.34
35	0.641	0.101	1.28	1.15	0.993	0.654	0.0783	1.31	1.14	0.988
50	0.473	0.101	0.947	0.878	0.760	0.483	0.0779	0.966	0.866	0.750
70	0.328	0.0965	0.655	0.641	0.555	0.334	0.0751	0.667	0.624	0.541
95	0.236	0.975	0.472	0.494	0.428	0.241	0.0762	0.482	0.476	0.472
120	0.187	0.0939	0.373	0.413	0.358	0.190	0.0740	0.381	0.394	0.342
150	0.152	0.0928	0.304	0.356	0.308	0.156	0.0745	0.311	0.341	0.295
185	0.122	0.0908	0.243	0.306	0.265	0.124	0.0742	0.247	0.289	0.250
240	0.0933	0.0902	0.185	0.259	0.224	0.0954	0.0752	0.188	0.245	0.212

Current transformers

Typical for the current transformers is that the power on the secondary has got influence on the precsion of the transmitting ratio as big as the phase angle.
The power of the secondary in the current transformer is made by the impendence of cables and attached instruments. The cable consumption is shown in the table below.

Secondary coil	**Consumption per meter of the two-wire cable at 20 °C** for different cross section 1 mm²	1,5 mm²	2,5 mm²	4,5 mm²	6 mm²	10 mm²	16 mm²
A	VA	VA	VA	VA	VA	VA	VA
5	1	0,685	0,41	0,254	0,169	0,0975	0,062
1	0,04	0,0274	0,0164	0,0102	0,0068	0,0039	0,0025

NOTE: Each temperature increased for 10°C is followed by increasing of the consumption in VA for 4%.
Consumption of instruments is defined by the producer. Here are listed just informative values for some instruments.

Electromagnetic ammetar	1,1 VA	Cos f - meter	0,5 VA	Counter	0,5 VA
Wattmeter - Varmeter	0,5 VA	Ammeter - printer	0,5-1,5-2,5 VA	Wattmeter - printer	0,5 VA

Auxiliary current circuits

Voltage drop in auxiliary current circuit

The maximal cable length with allowed maximal voltage drop of 5 % for AC and DC circuits is calculated from the formula:

$L = L_0 / P$ where is:
L = Maximal cable length in km
L_0=Cable coefficient depending on the voltage drop and the cross section
P = Active load power when tripping (for AC=VA cosf)

The maximal length of the cable depends on the allowed voltage drop and it is changing proportionally. Ex. for 10 % voltage drop the cable length should be doubled.

NOTE: The voltage drop is not dependent only on the length and the cross section of the cable, but as well on all other resistances (clamps, contacts), which are connected in the auxiliary circuit.

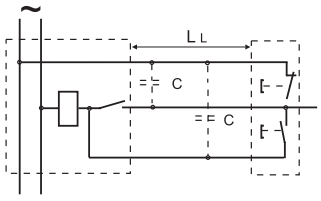
Rated cross-section [mm^2]	Coefficient L_0					
	24V [kmW]	48V [kmW]	110V [kmW]	220/230V [kmW]	380/400V [kmW]	500V [kmW]
1,5	1,08	4,32	22,7	90,8	272	471
2,5	1,80	7,20	37,8	151	453	785
4	2,88	11,5	60,5	242	725	1260

Cable capacity

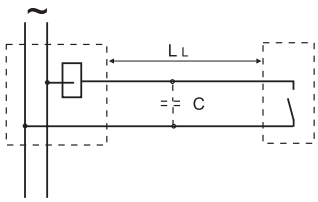
If the length of the cables in the auxiliary current circuits is excessive the voltage drop is not only the one that should be considered but the cable capacity as well. The cable capacity can get such a high value to hold the contactor closed even when the voltage is cut off.

The control circuit confguration is shown below (permanent contact control) in the case of two-wire cable.
This effect is more expressed at small auxiliary relays where is required smaller energy for holding in closed position.
The conductor's critical capacity and appropriate critical length of the conductors for nominal control voltage
(coil voltage) 220 V, 50 Hz, at permissible 10% increasemant of control voltage.

Contractors (Type)	Critical conductor capacity (µF)	Critical conductor length (m)	(m)
		Control with push button	Control with permanent
CNN 50 - CNN 70 TKN 115	0,137	228	455
CNN 80 - CNN 100, CNM 110 TK 130 - TK 175	0,222	370	740
CNM 140 - CNM 200	0,376	626	1252
CNM 250 - CNM 400	0,717	1195	2390



Control with push button



Control with permanent contact switch

Squirred-cage induction motors rated motor current

Single phase				Three phase 4 Poles 50 and 60 Hz											
[kW]	[HP]	220V [A]	240V [A]	[kW]	[HP]	220V [A]	230V [A]	380V [A]	400V [A]	415V [A]	440V [A]	500V [A]	660V [A]	690V [A]	1000V [A]
0.37	0.5	3.9	3.6	0.37	0.5	1.8	1.7	1.04	0.9	0.9	0.9	0.8	0.6	0.6	0.4
0.55	0.75	5.2	4.8	0.55	0.75	2.5	2.4	1.5	1.4	1.4	1.3	1.1	0.9	0.9	0.6
0.75	1	6.6	6.1	0.75	1	3.4	3.2	2	1.9	1.8	1.7	1.5	1.1	1	0.75
1.1	1.5	9.6	8.8	1.1	1.5	4.5	4.3	2.6	2.5	2.4	2.3	2	1.5	1.4	1
1.5	2	12.7	11.7	1.5	2	6.1	5.8	3.5	3.5	3.3	3	2.7	2	1.9	1.35
1.8	2.5	15.7	14.4	2.2	3	8.8	8.4	5.1	4.8	4.7	4.4	3.8	3	2.9	2
2.2	3	18.6	17.1	3	4	11.4	10.9	6.6	6.3	6	5.7	5	3.8	3.6	2.5
3	4	24.3	22.2	3.7	5	14	13.3	8	7.6	7.4	7	6.1	4.6	4.4	3
3.5	5	29.6	27.1	4	5.5	14.8	14.1	8.6	8.1	8	7.5	6.5	5	4.8	3.3
4.4	6	34.7	31.8	5.5	7.5	20	19.1	11.7	11.1	11	10	9	6.7	6.4	4.5
5.2	7	39.8	36.5	7.5	10	27	25.8	15.5	14.7	14.3	13.5	12	9	8.6	6
5.5	7.5	42.2	38.7	9	12	32	30.6	18.7	17.7	17	16	14	10.7	10.2	7
6	8	44.5	40.8	10	13.5	36	34.4	20.5	19.5	19	18	15.6	12	11.5	8
7	9	49.5	45.4	11	15	38.5	36.8	22	20.9	20.5	19.5	17	13	12.4	9
7.5	10	54.4	50	15	20	52.5	50.2	30	28.5	28	26.5	23	17.5	16.7	12
				18.5	25	64	61.2	37	35.1	34	32	28	21.3	20.3	14
				22	30	76	72.6	44	42	40	38	33.5	25.3	24.2	17
				25	34	86	82.2	50	47.5	46	43	38	29	27.7	19
				30	40	102	97.5	59	56	54	51	45	34	32.5	23
				33	45	112	107	65	62	60	56	50	38	36.3	25
				37	50	124	119	72	68.4	66	62	55	42	40	28
				40	54	133	127	77	73	71	67	58.5	45	43	30
				45	60	146	140	85	81	78	73	65	49	47	33
				51	70	167	160	97	92	89	84	74	56	53	37
				55	75	179	171	104	99	95	90	79	60	57	40
				59	80	192	184	111	105	102	96	85	64	61	43
				63	85	204	195	118	112	109	103	90	69	66	45
				75	100	240	230	139	132	128	121	106	81	77	53
				80	110	257	246	149	141	136	129	113	86	82	57
				90	125	295	282	171	162	157	148	148	130	95	65
				100	136	321	307	186	177	171	161	142	107	102	71
				110	150	353	338	205	195	188	177	156	118	113	78
				129	175	415	397	240	228	220	207	183	138	132	92
				132	180	424	406	245	233	225	212	187	142	136	94
				140	190	450	430	260	247	239	225	198	150	143	99
				147	200	472	451	273	259	250	236	208	158	151	104
				150	204	482	461	280	266	256	241	212	161	154	106
				160	220	520	497	300	285	276	260	229	174	166	115
				180	245	578	553	335	318	306	289	254	193	185	128
				185	250	591	565	342	325	314	296	260	197	188	130
				200	270	637	609	372	353	341	321	283	214	205	142
				220	300	706	675	409	389	375	353	311	236	226	156
				250	340	803	768	465	442	426	402	353	268	256	177
				257	350	825	789	478	454	438	413	363	275	263	182
				280	380	900	861	520	494	476	450	396	300	287	200
				295	400	944	903	547	520	500	472	416	315	301	208
				300	408	963	921	558	530	511	482	424	321	307	212
				315	430	1000	956	580	551	530	500	440	334	319	220
				335	455	1065	1020	616	585	565	531	468	355	339	234
				358	480	1120	1070	650	617	594	560	493	374	358	247
				368	500	1170	1120	676	642	620	584	514	390	373	260
				400	545	1270	1115	735	698	673	635	560	423	405	280
				425	580	1350	1290	781	742	715	675	594	450	430	297
				440	600	1400	1340	810	769	742	700	616	467	447	308
				450	610	1430	1370	827	786	757	714	629	476	455	315
				475	645	1510	1445	873	829	800	754	664	503	481	332
				500	680	1590	1520	920	874	841	794	698	529	506	350
				530	720	1660	1590	950	902	870	825	720	545	521	360
				560	760	1760	1680	1000	950	920	870	760	575	550	380
				600	810	1880	1800	1090	1035	978	920	830	630	603	410

Stated current values are only indicative and can slightly vary depending on the type of motor and manufacturer.
NOTE: The choice of contactors and starters in this catalogue are based on current values indicated in this table.

Motor contactors - CM1 and CNN with AC or DC control circuit

Contactor type				CM1 / CM1..N	CNN 9	CNN 12	CNN 18	CNN 22	CNN 25	CNN 30	CNN 32	CNN 40
Mechanical endurance	make/break operations		x10^6	5								
Insulation rating			V	690								
Permissible ambient temperature			°C	- 25 to +55								
Consumption of electromagnet in cold state with Un												
AC operated	closing		VA	26	62	62	62	62	62	62	65	65
	p.f.			0.8	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	closed		VA	4	7	7	7	7	7	7	8	8
	p.f.			0.35	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
DC operated	closing		W	-	-	123	123	123	123	125	125	125
	closed		W	-	-	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Coil voltage tolerances				0,85 —1,1Un								
duration of making and breaking (values are also valid for voltages of electromagnet from 0,8 to 1,1 Un for each coil in cold and warm state). Total breaking time is addition of opening time and duration of electric arc.												
AC operated	closing time		ms	12 - 21	12 - 22	12 - 22	12 - 22	12 - 22	12 - 22	12 - 22	12 - 22	12 - 22
	opening time		ms	9 -18	4 - 19	4 - 19	4 - 19	4 - 19	4 - 19	4 - 19	4 - 19	4 - 19
	duration of electric arc		ms	10	10	10	10	10	10	10	10	10
Frequency of switching operations without thermal relay												
	utilization category	AC1	s/h	1200	1000	1000	1000	1000	1000	1000	1000	1000
		AC2 ; AC3	s/h	1000	750	750	750	750	750	750	750	750
		AC4	s/h	250	250	250	250	250	250	250	250	250
with thermal relay			s/h		15	15	15	15	15	15	15	15
Resistivity to shocks	(square shock)		g/ms	7/5 and 4.2/10	7/5 and 4.2/10	7/5 and 4.2/10	7/5 and 4.2/10	8.2/5 and 4.9/10	8.2/5 and 4.9/10	8.2/5 and 4.9/10	8.2/5 and 4.9/10	8.2/5 and 4.9/10
Short-circuit protection of contactors without overload relays												
Main circuit With fuse links												
-acc. to IEC 60947-4-1	Type of coord. "1" gL/gG		A	20	25	25	40	50	50	50	63	63
DIN VDE 0660 Part 102	Type of coord. "2"		A	16	20	20	25	35	35	35	40	40
Sizes of connecting conductors for contact without thermal relay												
main circuit	single-wire conductor		mm^2	1-2.5	1,5-6	1,5-6	1,5-6	2,5-10	2,5-10	2,5-10	2,5-10	2,5-10
	multi-wire conductor with cable shoe		mm^2	0,75-1,5	1,5-6	1,5-6	1,5-6	2,5-10	2,5-10	2,5-10	2,5-16	2,5-16
	Screw			M3.5	M4	M4	M4	M4	M4	M4	M4	M4
	Screw head			PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2
	Tightening torque		Nm	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.6	1.6
auxiliary circuit	single-wire conductor		mm^2	1 - 2,5								
	multi-wire conductor with cable shoe		mm^2	0,75 - 1,5								
	Screw			M3.5								
	Screw head			PZ2								
	Tightening torque		Nm	0.8								
Loadability of auxiliary contacts of contactors CM1 and CNN rated continuous current I_{th} ; 35°C			A	10	10	10	10	-	-	-	-	-
rated operational current Ie/AC15		for 24 V	A	6	6	6	6	-	-	-	-	-
		230 V	A	6	6	6	6	-	-	-	-	-
		400 V	A	4	4	4	4	-	-	-	-	-
		500 V	A	2	2	2	2	-	-	-	-	-
		690 V	A	1	1	1	1	-	-	-	-	-
rated operational current Ie/DC13		for 24 V	A	4	4	4	4	-	-	-	-	-
		110 V	A	0.6	0.6	0.6	0.6	-	-	-	-	-
		230 V	A	0.2	0.3	0.3	0.3	-	-	-	-	-
Load carrying capacity of the main contacts rated continuous current I_{th} ; 55°C AC1 utilization category			A	20	25	25	30	40	40	40	50	50
rated operational current Ie/AC1; 55°C			A	20	25	25	30	40	40	40	50	50

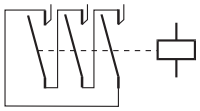
Contactor type			CM1 / CM1..N	CNN 9	CNN 12	CNN 18	CNN 22	CNN 25	CNN 30	CNN 32	CNN 40
AC2 and AC3 utilization categories	for 230 V	kW	3/3.2	3.2	3.5	4	5.5	5.5	7.5	7.5	11
(slip-ring and cage motors at 50Hz)	**400 V**	**kW**	**4/5.5**	**4.5**	**5.7**	**7.5**	**11**	**11**	**15**	**15**	**18.5**
	690 V	kW	4/5.5	5.5	7.5	10	11	15	15	18.5	22
AC4 utilization category (50.000 for CM1..N)											
(electrical endurance of contacts:120.000 (80.000 for CM1))											
rated current	Ie/AC4	A	4/4.3	4.5	5	6.7	7	8.5	9	13.5	15.8
ratings of squirrel-cage motors at 50 Hz	for 230 V	kW	0.75	0.75	1.1	1.5	1.7	2.2	2.5	4	5.5
	400 V	**kW**	**1.5/1.6**	**1.9**	**2.2**	**3**	**3.3**	**4**	**4.4**	**6.5**	**7.5**
	500 V	kW	1.5/1.6	1.9	2.2	3	3.3	4	4.4	6.5	7.5
	690 V	kW	1.5/1.6	1.5	2.2	3	3.3	4	4.4	6.5	7.5
Loadability by direct current											
DC1 utilization category, non-inductive loads L/R≤1 ms											
rated operational current I_e, 55°C	for 24 V	A	12	20	20	20	20	35	35	45	50
through one pole	48 V	A	10	20	20	20	20	20	20	20	23
	110 V	A	1.5	2.1	2.1	2.1	2.1	4.5	4.5	4.5	4.5
	220 V	A	0.6	0.8	0.8	0.8	0.8	1	1	1	1
	440 V	A	0.42	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4
	600 V	A	0.42	0.6	0.6	0.6	0.6	0.6	0.6	0.25	0.25
through three poles connected in series	for 24 V	A	16	20	20	20	20	35	35	45	50
	48 V	A	16	20	20	20	20	35	35	45	45
	110 V	A	10	20	20	20	20	35	35	45	45
	220 V	A	15	20	20	20	20	35	35	45	45
	440 V	A	0.9	1.3	1.3	1.3	1.3	2.9	2.9	2.9	2.9
utilization categories DC3 to DC5	600 V	A	0.7	1	1	1	1	1.4	1.4	1.4	1.4
series and shunt motors (L/R≤15 ms)											
rated operational current I_e, 55°C	for 24 V	A	7	20	20	20	20	20	20	35	35
through one pole	60 V	A	4	5	5	5	5	5	5	6	6
	110 V	A	1	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5
	220 V	A	-	0.75	0.75	0.75	0.75	1	1	1	1
	440 V	A	-	-	-	0.09	0.09	0.09	0.09	0.1	0.1
	600 V	A	-	-	-	0.06	0.06	0.06	0.06	0.06	0.06
through three poles connected in series	for 24 V	A	10	20	20	20	20	35	35	50	50
	60 V	A	10	20	20	20	20	35	35	50	50
	110 V	A	5	20	20	20	20	35	35	50	50
	220 V	A	1.2	1.5	6	6	6	10	10	25	25
	440 V	A	0.14	0.2	0.2	0.2	0.2	0.6	0.6	0.6	0.6
	600 V	A	0.14	0.2	0.2	0.2	0.2	0.3	0.3	0.35	0.35

AUXILIARY CONTACT BLOCKS BP0; BP1; BP2; BP3 and BP4

Block type			BP0	BP1	BP2; BP2N	BP3	BP4; BP4N
Insulation rating		V	690				
Permissible ambient temperature		°C	- 25 to +55				
Short-circuit protection - max. fuse rating gL			20				
Loadability of auxiliary contacts of blocks							
rated continuous current Ith ; 35°C		A	10				
AC rated operational current Ie/AC15	for 24V	A	6				
	230V	A	6				
	400V	A	4				
	690V	A	1				
rated operational current Ie/DC13	for 24V	A	4				
	110V	A	0.6				
	230V	A	0.2				
	400V	A	0.15				
Sizes of connecting conductors							
single-wire conductor		mm_2	1 - 2,5				
multi-wire conductor with cable shoe		mm^2	0,75 - 1,5				
Screw			M3.5				
Screw head			PZ2				
Tightening torque		Nm	0.8				

Contactor type				CNN 50 CNN 60 CNN 70	CNN 80 CNN 90 CNN 100	CNM 110	CNM 140 CNM 170 CNM 200	CNM 250	CNM 315 CNM 400
Mechanical endurance	make/break operations		x10^6	5			3		
Insulation rating			V	1000					
Permissible ambient temperature			°C	- 25 to +55					
Consumption of electromagnet in cold state with U_n									
AC operated	closing		VA	155	204	300	580	1340	1340
	p.f.			0.6	0.54	0.5	0.45	0.46	0.41
	closed		VA	12	16	26	44	84	84
	p.f.			0.29	0.26	0.24	0.24	0.23	0.25
DC operated	closing		W	90	200	690	550	1180	1180
	closed		W	3.5	3.5	4	5	8	8
Coil voltage tolerances				0,85 – 1,1 Un					
Duration of making and breaking (values are also valid for voltages of electromagnet from 0,8 to 1,1 U_n for each coil in cold and warm state). Total breaking time is addition of opening time and duration of electric arc.									
AC operated	closing time		ms	10-24	9 - 35	20-50	20-50	20-50	20-50
	opening time		ms	7-10	9 - 15	8-30	10-30	10-30	10-30
	duration of electric arc		ms	10-15	10-15	10-15	10-15	10-15	10-15
DC operated	closing time		ms	15-40	20-50	20-50	20-50	25-80	30-100
	opening time		ms	100-120	120-150	150-190	22-35	15-30	15-30
	duration of electric arc		ms	10-15	10-15	10-15	10-15	10-15	10-15
Frequency of switching operations without thermal relay									
	utilization category	AC1	s/h	1000	1000	1000	1000	1000	1000
		AC2 ; AC3	s/h	750	600	500	500	500	500
		AC4	s/h	250	200	250	250	250	250
with thermal relay			s/h	15	15	15	15	15	15
Resistivity to shocks	(square shock)		g/ms	9,2/5 and 5,4/10	9,6/5 and 5,2/10	10/5 and 5/10	10/5,5 and 5/12	10/5,6 and 5/12	10/5,6 and 5/12
Short-circuit protection of contactors without overload relays									
Main circuit With fuse links									
-acc. to IEC 60947-4-1,	Type of coord. "1" gL/gG		A	80/100/125	125/160/160	200	250/315/355	400	500/ 630
DIN VDE 0660 Part 102	Type of coord. "2"		A	40/50/63	63/80/100	10	125/160/200	250	315/500
Sizes of connecting conductors for contact without thermal relay									
main circuit	Rigid: solid		mm^2	1 x 6 - 50					
	stranded		mm^2	2 x 6 - 25	25-70	–	–	–	–
	multi-wire conductor with cable shoe		mm^2	1 x 6 - 35	–	–	–	–	–
	stranded with cable lug		mm^2	2 x 6 - 16	25-50	6-35	25 -70	70 -150	2x150
				–	–	25-50	50 -120		
	flatbar		mm	–	–	15x2,5	15x3	25x3	2x25x3
				–	–	15x3	20x3		
	protective conductor with cable lug		mm^2	–	–	–	25 -70	35 -70	50 -120
	Screw			M6	M8	M6	M8	M10	M10
	Screw head			PZ2	⎔				
	Tightening torque		Nm	3-4	4-4,5	2,5	3,5	4	4
auxiliary circuit	single-wire conductor		mm^2	1 – 2,5					
	multi-wire conductor with cable shoe		mm^2	0,75 – 1,5					
	Screw			M3,5					
	Screw head			PZ2					
	Tightening torque		Nm	0,8					

Contactor type			CNN 50 CNN 60 CNN 70	CNN 80 CNN 90 CNN 100	CNM 110	CNM 140 CNM 170 CNM 200	CNM 250	CNM 315 CNM 400
Loadability of auxiliary contacts of contactors CNN + BP5; CNM								
rated continuous current I_{th} ; 35°C		A	16	16	16	16	16	16
AC								
rated operational current I_e/AC15	for 230 V	A	6	6	6	6	6	6
	400 V	A	4	4	4	4	4	4
	500 V	A	2.5	2.5	2.5	2.5	2.5	2.5
	690 V	A	2.5	2.5	2.5	2.5	2.5	2.5
DC								
rated operational current I_e/DC1 ; L/R≤1ms	for 24 V	A	10	10	10	10	10	10
	110 V	A	3.2	3.2	3.2	8	8	8
	220 V	A	0.9	0.9	0.9	2	2	2
	440 V	A	0.33	0.33	0.33	0.6	0.6	0.6
	600 V	A	0.22	0.22	0.22	0.4	0.4	0.4
rated operational current I_e/DC13								
	for 24 V	A	10	10	10	10	10	10
	110 V	A	1.8	1.8	1.8	2.4	2.4	2.4
	220 V	A	0.9	0.9	0.9	1.1	1.1	1.1
	440 V	A	0.27	0.27	0.27	0.32	0.32	0.32
	600 V	A	0.18	0.18	0.18	0.21	0.2	0.21
Load carrying capacity of the main contacts rated continuous current I_{th} ; 35°C		A	85/85/125	135/135/135	115	160/200/250	300	390/400
AC1 utilization category rated current I_e/AC1 ; 55°C		A	85/85/90	95/105/115	115	160/200/250	300	350/400
AC2 and AC3 utilization categories (slip-ring and cage motors at 50Hz)	for 230 V	kW	15/18.5/18.5	22/26/30	37	45/55/60	75	90/115
	400 V	**kW**	**22/30/33**	**37/45/55**	**55**	**75/90/110**	**132**	**160/200**
	690 V	kW	33/37/37	55/67/67	90	100/132/155	160	200/355
AC4 utilization category (electrical endurance of contacts 120.000) rated current	I_e/AC4	A	24/28/30	32/34/36	42	68/72/75	100	125/150
ratings of squirrel-cage motors at 50 Hz for	230 V	kW	6,9/7,3/8,5	8,7/10.4	12	20/21/23	31	35/ 37,5
	400 V	**kW**	**12/14/15.1**	**17/18**	**22**	**35/37/40**	**55**	**65/69**
	500 V	kW	15,8/16,2/18,4	21/24	27	46/48/50	72	76/85,5
	690 V	kW	20,8/21,8/24,3	20/30	36	60/64/69	92	100/106
Load carrying capacity of contactors at switching on and off of a.c. capacitors (electrical endurance amounts to 0,1 million switching operations)	Ie	(A)			58	87/116/144	216	
ratings of individual capacitors at 50 Hz	for 230 V	kvar	-	-	24	45/45/58	87	90/115
	400 V	kvar	-	-	40	60/80/100	150	150/ 200
	500 V	kvar	-	-	50	80/100/130	190	190/265
	690 V	kvar	-	-	40	50/80/100	150	150/200
ratings of capacitor banks (minimum inductive reactance between two capacitors switched on in parallel amounts to 6µH, 50 Hz)								
	for 230 V	kvar	-	-	24	30/37/40	66	66/85
	400 V	kvar	-	-	40	50/55/70	115	115/150
	500 V	kvar	-	-	50	66/75/90	145	145/195
	690 V	kvar	-	-	40	50/60/70	115	115/150
Application in stator circuit of motor intermittent operation, AC2 stator current [1] at duty factor in intermittent periodic duty [2]								
	20%	A	103	135	153	245/308/308	462	462/617
	40%	A	98	110	122	195/245/245	367	367/490
	60%	A	87	100	109	174/218/218	327	327/436
	80%	A	80	90	100	160/200/200	300	300/400

Contactor type			CNN 50 CNN 60 CNN 70	CNN 80 CNN 90 CNN 100	CNM 110	CNM 140 CNM 170 CNM 200	CNM 250	CNM 315 CNM 400
Application in rotor circuit of motor								
intermittent opertaion								
rotor current [1] at duty factor in intermittent periodic duty [2]								
	10%	A	163	193	293	395/560/560	759	864/1075
	20%	A	163	193	242	388/487/487	730	730/ 975
	40%	A	155	173	193	308/380/380	580	580/ 775
	60%	A	138	158	173	275/345/345	517	517/689
	80%	A	127	138	158	252/316/316	474	474/632
continuous operation		A	127	138	158	252/316/316	474	474/632
permissible voltage of motionless rotor								
	starting	V	1500	1800	2000	2000	2000	2000
	regulation	V	750	880	1000	1000	1000	1000
	counter current breaking	V	660	750	880	880	880	880
Loadability by direct current								
DC1 utilization category, non-inductive loads L/R≤1 ms								
rated operational current I_e, 55°C								
through one pole	for 24 V	A	70	90	160	160/200/200	300	300/400
	60 V	A	30	75	80	160/200/200	300	300/330
	110 V	A	6	12	18	18/18/30	33	33/ 33
	220 V	A	1.2	2,5	3,4	3,4/3,4/3,4	3,8	3,8/ 3,8
	440 V	A	0.48	0,6	0.8	0,8/0,8/0,8	0,9	0,9/0,9
	600 V	A	0.35	0,48	0,5	0,5/0,5/0,5	0,6	0,6/ 0,6
through three poles connected in series	for 24 V	A	70	100	100	160/200/200	300	400
	60 V	A	70	100	100	160/200/200	300	400
	110 V	A	70	100	100	160/200/200	300	400
	220 V	A	70	100	100	160/200/200	300	400
	440 V	A	3	6	6	11,5	11	11
	600 V	A	1	3,4	3,4	4	5,2	5,2
utilization categories DC3 to DC5								
series and shunt motors (L/R≤15 ms)								
rated operational current I_e, 55°C								
through one pole	for 24 V	A	5	6	16	16	35	35
	60 V	A	2	3	7.5	7.5	11	11
	110 V	A	0.75	1.25	2.5	2.5	3	3
	220 V	A	0.2	0.35	0.6	0.6	0.6	0.6
	440 V	A	0.1	0.15	0.17	0.17	0.18	0.18
	600 V	A	0.08	0.1	0.12	0.12	0.12	0.12
through three poles connected in series	for 24 V	A	70	90	100	200	300	400
	60 V	A	70	90	100	200	300	400
	110 V	A	70	90	100	200	300	400
	220 V	A	3.5	3.8	4	200	300	400
	440 V	A	0.6	0.7	0.8	1.4	1.4	1.4
	600 V	A	0.35	0.40	0.45	0.75	0.75	0.75

[1] Electrical endurance of contacts at these loads, see page 68.

[2] Intermittent periodic duty in % = $\frac{\text{on-load period}}{\text{duration of total cycle}}$ x 100. The total cycle duration can amount up to 10 minutes

Permissible ambient temperature: -25 to +55◦C

Contactor type			CNM 450	CNM 550	CNM 700	CNM 860	CNM 1000
MECHANICAL DATA							
Protection degree			IP00				
Mechanical endurance	(make/brake oper.x 10^6)		5				1
Max. frequency of no load operation		(op/h)	1200				300
Fixing			Screws fixing				
ELECTRICAL DATA OF POWER CIRCUIT							
Number of main poles			3 (with facility to fit 4th add-on neutral switching pole)				
Rated insulation voltage		Ui (V)	1000				690
Thermal current		Ith (A)	700	800	1000	1100	1200
Rated operational current Ie AC1 Ue = 690V t.amb. = 40°C		(A)	700	800	1000	1100	1200
Ie AC3 Ue = 440V t.amb. = 55°C		**(A)**	**450**	**550**	**700**	**860**	**1000**
Max. Ratings of 3-fase motor at 400V 50 HZ in AC2, AC3		**(kW)**	**250**	**315**	**400**	**500**	**580**
Rated short time withstand current t.amb. = 40°C	1 s	(A)	4500	5500	7000	8000	10000
	4 s	(A)	4500	5500	7000	8000	10000
	10 s	(A)	3600	4400	5600	6900	8000
	15 s	(A)	3000	3800	5000	6000	7400
	30 s	(A)	2300	3000	3700	4500	5500
Cooling time (without current)	1 min	(A)	1800	2300	2800	3400	4000
	2 min	(A)	1400	1750	2200	2600	3000
	6 min	(A)	900	1150	1600	1800	2100
	15 min	(A)	720	850	1150	1350	1600
Short circuit protection fuses (Ue = 440V) coordination to IEC 60947-4-1	Type 1 gG (A)	(A)	630	630	800	1000	1000
	Type 2 gG (A)	(A)	500	560	-	-	-
	Type 2 aM (A)	(A)	-	-	-	-	-
Making capacity	coordination to EN 60947- 4-1	(A)	10 x Ie in AC3				
	690V	(A)	4500	5500	7000	8600	10000
	max. values 1000V	(A)	2000	2500	-	-	-
Breaking capacity	coordination to EN 60947- 4-1		8 x Ie in AC3				
	500V	(A)	4500	5500	7000	8000	8000
	690V	(A)	3200	4400	5600	6900	7000
	max. values 1000V	(A)	1600	2000	-	-	-
Main pole resistance		(mΩ)	0.13	0.11	0.1	0.08	0.06
Sizes of connectiong conductors	Cables	mm^2					
	Bars	mm	2 x (40x5)	2 x (50x5)	2 x (60x5)	2 x (60x6)	
Tightening torque		(Nm)	35	50	60	75	60
Weignt (kg)			13.5	14	26.4	27,6	51
ELECTRICAL DATA OF CONTROL CIRCUIT							
Rated control voltage	a.c 50-60Hz	(V)	24...600V				48...600V
	d.c	(V)	24...440V				48...440V
Coil operation limits	a.c/d.c pick-up	(V)	0,85 ... 1,1 Uc				
	a.c drop-out	(V)	0,2 ... 0,75 Uc				
	d.c drop-out	(V)	0,1 ... 0,6 Uc				
Average coil consumption	a.c/d.c pick-up	(VA)	800 ... 950		1350 ... 1600		2400
	d.c pick-up	(W)	700 ... 850		1300 ... 1550		2100
	a.c sealed (VA)/	(W)	9 ... 11 / (9...11)		21 ... 25 / (21...25)		70 (69)
	d.c sealed	(W)	8 ... 10		18 ... 22		60

Contactors type TKN and TK for switching resistive loads

Contactor type			**TKN 65**	**TKN 115**	**TK 130**	**TK 175**
Mechanical endurance make/break operations		x10^6	5			
Insulation rating			690			
Permissible ambient temperature		°C	- 25 to +55		- 25 to +40	
Consumption of electromagnet in cold state with Un						
AC operated	closing	VA	62	155	350	350
	p.f.		0.75	0.6	0.5	0.5
	closed	VA	7	12	26	26
	p.f.		0.3	0.29	0.24	0.24
Coil voltage tolerances			0,85 — 1,1 Un			
Degree of protection per IEC 60947 - 1			IP 20		IP 00	
Rated control voltages AC		V	24-500 at 50 Hz; standard voltages: 24, 48, 110, 220/230, 380/400			
Frequency of switching operations without thermal relay						
utilization category	AC1	s/h	**650**	**650**	**650**	**650**
	AC2/ AC3	s/h	750	750	500	500
Maximum permissible fuse ratings for contactors without relays						
main circuit gL/gG		A	100	200	250	315
Electrical endurance		x10^6	0,5			
Sizes of connecting conductors for contact without thermal relay						
main circuit	multi-wire conductor	mm^2	6-16	16-35		
	multi-wire conductor with cable shoe	mm^2			50	70
Terminal screw			M5	M6	M8	M8
Screw head			Hexagon socket		-	-
Tightening torqu		Nm	2	3 - 4	4	4
auxiliary circuit						
	single-wire conductor	mm^2	1 - 2,5			
	multi-wire conductor with cable shoe	mm^2	0,75 - 1,5			
Terminal screw			M3.5			
Screw head			PZ2			
Tightening torque		Nm	0.8			
AC-1 utilization category, switching resistive load						
Rated operational currents Ie at 40 °C		**A**	**65**	**115**	**130**	**175**
Ratings of	230 /220 V	kW	25	44	50	67
three-phase loads with	400 /380 V	kW	43	76	85	115
p.f.=1						
AC-2 and AC-3 utilization categories						
Rated operational currents Ie at	**400/380 V**	**A**	**32**	**60**	**90**	**110**
Ratings of motors	230 /220 V	kW	7.5	18.5	26	37
	400 /380 V	kW	15	30	45	55
	500 V	kW	15	37	59	75
	690 /660 V	kW	18.5	37	67	90

Control of lighting circuits

General

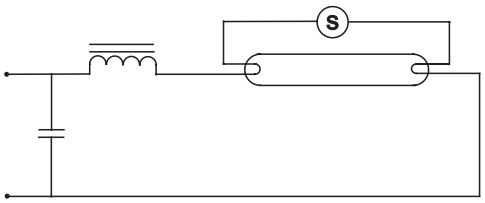
- Contactor choice criteria for control of lighting circuits are as follows:
- Type, power rating and number of lamps
- Connection mode
- Current values on closing and in steady state
- Power factor cosf of the lamps
- Presence or not of compensation capacitors

Lighting circuits

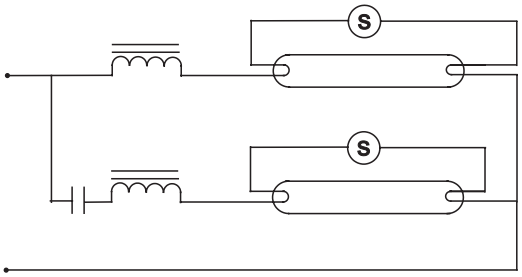
In a given circuit,the number and power rating of lamps are defined and cannot result in overload. Only short-circuit protection has to be provided. GG fuses or modular circuit-breakers will be chosen for this purpose.The lamps have very specifc technical data,according to their construction type.

- Incandescent lamps have a very high current on clossing: more than 15 times normal current. They do not introduce a large phase displacement beween current and voltage.
- Fluorescent tubes are equipped with a ballast whose purpose is two-fold: conttribute to ignition and limit current to nominal value once steady state is reached. This ballast is a reactor that considerably lowers the power factor. It may or may not be compensated.

Individual compennsation mounting



Serial compensation in dual



Choice of contactors

The following tables indicate, for each contactor type, the maximum permissible number of lamps per phase.

Air temperature, near the contactor, must be limited to 55^{0}C.

Number are given for a 230 V voltage distributed between phase and neutral: single-phase (phase + neutral) or three-phase (3 phases + neutral) distribution.

In the case of a three-phase supply without neutral, 230 V phase- to-phase, the permissible number of lamps per phase will be that given in the tables multiplied by 0,58.

Table of technical characteristic for lighting switching

Type of lamps	compensation	Start curret x In[1]	cos φ	Starting time s	Important for choosing contactor type
Light gas lamp connection	without	1	0,5	-	Rated continuous current Ith[2] (A)
	with	20	0,9	-	Start current Ie
Lamps with mercury vapour - High pressure lamps	without	1,6	0,4-0,6	< 5	Rated continuous current Ith[2] (A)
	with	2	0,95	< 5	Start current Ie (A)
DUO-wiring (most frequent applied wiring)		1	1	-	Rated continuous current Ith[2] (A)
Serial wiring (Tandem connection)	without	1	0,5		Rated continuous current Ith[2] (A)
	with	20	0,9		Start current Ie (A)
Lighting gas lamps without starter	without	1	0,5	-	Rated continuous current Ith[2] (A)
Halogen - metal vapour lamps	without	1	0,4-0,6	-	Rated continuous current Ith[2] (A)
	with	1	0,4-0,6	-	Rated continuous current Ith[2] (A)
215 W - High capacity lighting gas lamps 380 V (High pressure vapour lamps)	without	1,4	0,5	5...12	70% Rated continuous current Ith[2] (A)
	with	20	0,95	5...12	
(Low pressure vapour lamps)	without	1	0,3	5...12	70% Rated Continuous current Ith[2] (A)
	with	20	0,95	5...12	
High pressure sodium vapour lamps	without	1,6	0,4-0,6	5...8	70% Rated continuour current Ith[2] (A)
	with	20	0,95	5..8	70% Rated continuous current Ith (A) and Start current Ie (A)

[1] In = Rated lamp current
[2] Ith = Rated continuous contactor current

Type				TKN 65	TKN 115	TK 130	TK 175
Switching incandescent lamps, per main conducting path at 220/230 V			kW	5,8	9	14,5	17,3
Type of lamp	W	A	µF	Maximum permissible number of lamps per phase			
Fluorescent lamps without compensatin							
220-240 V AC	18	0,37	-	121	216	243	270
	36	0,43	-	104	186	209	232
	58	0,67	-	67	119	134	149
Fluorescent lamps with parallel compensation							
220-240 V AC	18	0,11	4,5	78	111	160	197
	36	0,21	4,5	78	111	160	197
	58	0,32	7	50	71	103	127
Fluorescent lamps in dual mounting							
220-240 V AC	2x18	2x0,11	-	408	726	-	-
	2x36	2x0,21	-	214	380	-	-
	2x58	2x0,32	-	140	250	-	-
High pressure sodium vapour lamps without compensation							
220-240 V AC	150	1,8	-	17	26	34	41
	250	3	-	10	16	21	25
	400	4,4	-	7	10	13	17
	600	6,2	-	5	8	10	12
	1000	10,3	-	3	5	5	7
High pressure sodium vapour lamps with compensation							
220-240 V AC	150	1	20	30	58	73	88
	250	1,5	36	20	38	48	59
	400	2,5	48	12	23	29	36
	600	3,3	65	9	17	21	27
	1000	6,2	100	5	9	11	14
High pressure mercury vapour lamps without compensation							
220-240 V AC	80	0,8	-	75	120	150	200
	125	1,2	-	45	83	95	130
	250	2,2	-	26	47	57	71
	400	3,3	-	17	31	38	47
	700	5,5	-	10	19	23	29
	1000	7,5	-	7	14	17	21
	2000	8	-	4	7	9	11
High pressure mercury vapour lamps with compensation							
220-240 V AC	80	0,41	8	53	178	200	238
	125	0,65	10	35	107	154	165
	250	1,3	18	24	59	83	102
	400	2	25	15	38	54	67
	700	3,5	40	9	22	30	38
	1000	5	64	6	15	21	26
	2000	5	37	3	9	13	

Capacitor contactor type CNNK 2.5 - CNNK 12.5

In confomity with: IEC 60947-1, IEC 60947-4-1

Choice criteria

The contactor during the closing transition is influenced by electrical currents with high frequencies and high amplitudes. The frequencies of these currents have ranges between 1 and 10kHz and the amplitudes must have values lower than the maximum permissible peak current I ≤ 100 times the nominal rms current of the switched capacitor.

Type designation		**CNNK 2.5**	**CNNK 5**	**CNNK 7.5**	**CNNK 12.5**
Capacitor rating at operating voltage 50/60Hz	230V kVAr	1,4	2,8	4	6,7
	400-440V kVAr	**2,5**	**5**	**7,5**	**12,5**
	500-550V kVAr	3	5,5	9	15
	660-690V kVAr	3,7	7,5	11	18
Rated operational current **Ie**/AC-6b et **400 V**	**A**	**3,6**	**7,2**	**11**	**18**
Insulation rating Ui	V	690			
Permissible ambient temperature	°C	- 25 to + 55			
Rated impuls wihtstand voltage Uimp	kV	8			
Consumption of electromagnet in cold state with Un AC operated					
closing	VA	62			65
p.f.		0,75			0,75
closed	VA	7			8
p.f.		0,3			0,3
Coil Voltage tolerances		0,85 - 1,1 Un			
Coil Tightening torque	Nm	0,8			
Coil Terminal screw/Screw head		M3,5/PZ2			
Degree of protection		IP 20			
Maximum permissible fuse ratings main circuit gL/gG	A	20	25	40	50
auxilliary circuit	A	16	16	16	16
Frequency of switching operations	s/h	240			
Electrical endurance	min.	150.000	120.000	100.000	100.000
Sizes of connecting conductors - main circuit multi-wire conductor	mm^2	1.5-6	1.5-6	2.5-10	2.5-10
multi-wire conductor with cable shoe	mm^2	1.5-6	1.5-6	2.5-10	2.5-10
Terminal screw		M4	M4	M4	M4
Screw head		PZ2	PZ2	PZ2	PZ2
Tightening torque	Nm	1,2	1,2	1,4	1,6
- auxiliary circuit multi-wire conductor	mm^2	1-2,5			
multi-wire conductor with cable shoe	mm^2	0,75-1,5			
Terminal screw		M3,5			
Screw head		PZ2			
Tightening torque	Nm	0,8			
Loadability of auxiliary contacts rated continuous current I_{th}; 35°C	A	10			
AC rated operational current I_e/AC15 for 230V	A	6			
400V	A	4			
500V	A	2			
690V	A	1			

Capacitor contactors type CNNK 10..N - CNNK 30..N

In confomity with: IEC 60947-1, IEC 60947-4-1

Main characteristics

These contactors are equipment with early - make contacts. This special type of contact has the purpose of connecting for a very brief interval, up to 5 ms, during the contactor closing, resistors which limit the connecting current of the capacitors. These resistors are then excluded when the closing operation is complete and the current capacity is conveyed to the main contacts. Maximum permissible peak current 1≤200 times the nominal rms current of the switched capacitor.

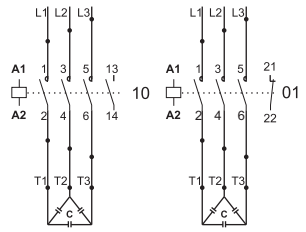
Type designation		**CNNK 10..N**	**CNNK 12..N**	**CNNK 15..N**	**CNNK 20..N**	**CNNK 25E..N**	**CNNK 25..N**	**CNNK 30..N**
Capacitor rating at operating voltage 50/60Hz	230V kVAr	5	6,7	8,5	11	14	14	20
	400-440V kVAr	**10**	**12,5**	**15**	**20**	**25**	**25**	**30**
	500-550V kVAr	12,5	15	18	24	30	30	35
	660-690V kVAr	15	18	22	30	35	35	40
Rated operational current **Ie**/AC-6b at **400V**	**A**	**14**	**18**	**22**	**29**	**36**	**36**	**44**
Rated operational current Ith at 400V	A	25	25	30	40	50	60	60
Insulation rating Ui	V	690						
Permissible ambient temperature	°C	- 25 to + 55						
Rated impuls wihtstand voltage Uimp	kV	8						
Consumption of electromagnet in cold state with Un AC operated								
closing	VA	62				65		
p.f.		0,75				0,75		
closed	VA	7				8		
p.f.		0,3				0,3		
Coil Voltage tolerances		0,85 - 1,1 Un						
Coil Tightening torque	Nm	0,8						
Coil Terminal screw/Screw head		M3,5/PZ2						
Degree of protection		IP 20						
Maximum permissible fuse ratings main circuit gL/gG	A	25	35	50	50	63	63	80
auxilliary circuit	A	16	16	16	16	16	16	16
Frequency of switching operations	s/h	240			120			
Electrical endurance	min.	250.000			175.000	125.000		
Sizes of connecting conductors - main circuit multi-wire conductor	mm^2	1.5-6	1.5-6	1.5-6	2.5-10	2.5-10	6-25	6-25
multi-wire conductor with cable shoe	mm^2							
Terminal screw		M4	M4	M4	M4	M4	M5	M5
Screw head		PZ2	PZ2	PZ2	PZ2	PZ2	Hexagon socket 2.5	
Tightening torque	Nm	1,2	1,2	1,2	1,4	1,6	2	2
- auxiliary circuit multi-wire conductor	mm^2	1-2,5						
multi-wire conductor with cable shoe	mm^2	0,75-1,5						
Terminal screw		M3,5						
Screw head		PZ2						
Tightening torque	Nm	0,8						
Loadability of auxiliary contacts rated continuous current 35°C	A	10						
AC rated operational current Ie/AC15 for 230V	A	6						
400V	A	4						
500V	A	2						
690V	A	1						

Capacitor contactor type CNNK 40N - CNKM 80

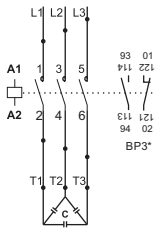
In confomity with: IEC 60947-1, IEC 60947-4-1

Type designation			**CNNK 40..N**	**CNNK 50..N**	**CNNK 60..N**	**CNNK 70..N**	**CNNK 75..N**	**CNKM 80**
Capacitor rating at operating voltage 50/60Hz	230V	kVAr	25	29	32	35	38	45
	400-440V	**kVAr**	**40**	**50**	**60**	**70**	**75**	**80**
	500-550V	kVAr	50	60	70	75	80	100
	660-690V	kVAr	58	70	80	90	105	115
Rated operational current **Ie**/AC-6b et **400 V**		**A**	**58**	**72**	**87**	**101**	**108**	**116**
Rated operational current Ith at 400V		A	85	100	125	137	150	165
Insulation rating Ui		V	1000					
Permissible ambient temperature		^{0}C	- 25 to + 55					
Rated impuls wihtstand voltage Uimp		kV	8					
Consumption of electromagnet in cold state with Un AC operated	closing	VA	155			204		310
	p.f.		0,6			0,54		0,5
	closed	VA	12			16		26
	p.f.		0,29			0,26		0,24
Coil	Voltage tolerances		0,85 - 1,1 Un					
	Tightening torque	Nm	0,8					
	Terminal screw/Screw head		M3,5/PZ2					
Degree of protection			IP 20					IP 00
Maximum permissible fuse ratings main circuit gL/gG		A	100	125	160			
auxilliary circuit		A	16	16	16			
Frequency of switching operations		s/h	100					
Electrical endurance		min.	125.000			100.000		75.000
Sizes of connecting conductors - main circuit multi-wire conductor		mm^2	16-35	16-35	16-35	25-50		50-70
multi-wire conductor with cable shoe		mm^2						
Terminal screw			M6			M8		M8
Screw head			PZ2			⎔4		
Tightening torque		Nm	3 - 4			4 - 4.5	5 - 6	3.5
- auxiliary circuit multi-wire conductor		mm^2	1-2,5					
multi-wire conductor with cable shoe		mm^2	0,75-1,5					
Terminal screw			M3,5					
Screw head			PZ2					
Tightening torque		Nm	0,8					
Loadability of auxiliary contacts rated continuous current I_{th}; 35^{0}C		A	16					
AC rated operational current I_e/AC15 I_{th};	for 230V	A	10					
	400V	A	6					
	500V	A	4					
	690V	A	2					

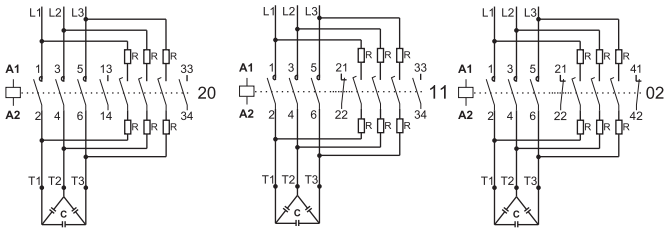
CONNECTION DIAGRAMS AND TERMINAL MARKINGS FOR SINGLE COMPENSATION



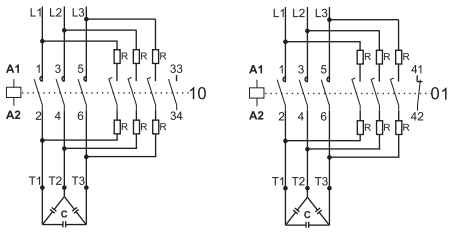
CNNK 2.5, CNNK 5



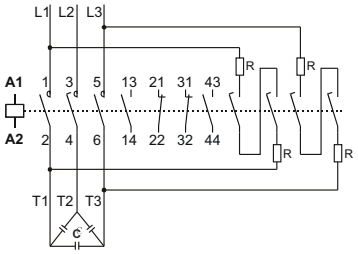
CNNK 7.5 00
CNNK 7.5 11*
CNNK 12.5 00
CNNK 12.5 11*



CNNK 10..N, CNNK 12..N, CNNK 15..N



CNNK 20..N, CNNK 25E..N, CNNK 25..N, CNNK 30..N, CNNK 40..N
CNNK 50..N, CNNK 60..N, CNNK 70..N, CNNK 75..N



CNKM 80

VERY IMPORTANT NOTES:

For single compensation air coils or 3 - phase reactors (coils with magnetic core and air gap) are not necessary.

When the contactor is used for group compensation it is recommendable to use appropriate 3-phase filter circuit reactors (coils with magnetic core and air gap).
This will reduce the value of higher harmonics and will prevent resonant current to prevail.

For single compensation the power of selected contactor is according to capacitor rated power.

For group and central compensation, when reactors are not in use, one step higher rating of the contactor is recommendable.

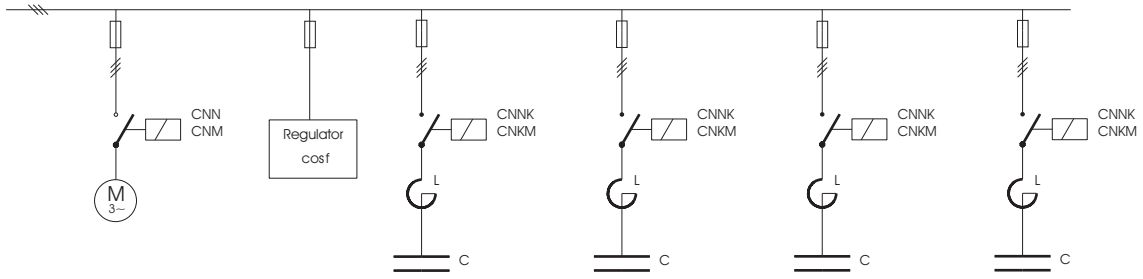
Maximum permissible peak current 1≤200 times the nominal rms current of the switched capacitor.

Switching onto discharged capacitors is permitted with CNNK contactors. (the voltage at the terminals must be < 50 V).

Manual operation for function tests is not permitted. The series resistors must not be removed. During exploitation, current value must not exceed the declared values.

CONNECTION DIAGRAM FOR GROUP (CENTRAL) COMPENSATION

380/400 V / 50Hz



Mini contactor relay type CP0

Contactor type				**CP0**
Mechanical endurance	make/break operations		$x10^6$	5
Insulation rating			V	690
Permissible ambient temperature			°C	- 25 to +55
Consumption of electromagnet in cold state with U_n				
AC operated	closing		VA	26
	p.f.			0,9
	closed		VA	4
	p.f.			0,34
Coil voltage tolerances				0,8 - 1,1Un
Duration of making and breaking				
(values are also valid for voltages of electromagnet from 0,8 to 1,1 U_n for each coil in cold and warm state). Total breaking time is addition of opening time and duration of electric arc.				
AC operated	closing time		ms	7 - 12
	opening time		ms	6 -10
	duration of electric arc		ms	3
Frequency of switching operations				
without thermal relay	utilization category	AC 15	s/h	1200
with thermal relay			s/h	15
Resistivity to shocks	(square shock)		g/ms	7/5 and 4/10
Maximum permissible fuse rating	for contactors without relays			
max short circuit current 10 kA				
main circuit	fuse-links, time-lagging		A	10
	fuse-links, quick-acting		A	16
Sizes of connecting conductors	for contactors without thermal relay			
main circuit	single-wire conductor		mm^2	1 –2,5
	multi-wire conductor with cable shoe		mm^2	0,75 –1,5
Terminal screw				M3.5
Screw head				PZ2
Tightening torque			Nm	0.8
Loadability of auxiliary contacts of contactor CP0				
rated continuous current I_{th} ; 35°C			A	16
AC rated operational current I_e/AC15	for	230 V	A	6
		400 V	A	4
		500 V	A	2,5
		690 V	A	1,5
rated operational current I_e/DC13	for	24 V	A	4
		110 V	A	0.6
		220 V	A	0,2

Contactor type CNNP (AC control) and CNNPB (DC control) with solenoid system

Contactor type				CNNP	CNNPB
Mechanical endurance	make/break operations		x10⁶	10	5
Insulation rating			V	690	
Permissible ambient temperature			°C	-25 to +55	-25 to +45
Consumption of electromagnet in cold state with U_n					
AC operated	closing		VA	62	–
	p.f.			0.75	–
	closed		VA	7	–
	p.f.			0.3	–
DC operated	closing		W	128	6.5
	closed		W	2.8	6.5
Coil voltage tolerances				0,8 - 1,1Un	
Duration of making and breaking					
AC operated	closing time		ms	12 - 22	–
	opening time		ms	4 - 19	–
	duration of electric arc		ms	10	–
DC operated	closing time		ms	–	21 - 172
	opening time		ms	–	10 - 23
	duration of electric arc		ms	–	10
Frequency of switching operations					
without thermal relay					
utilization category	AC 15		s/h	3600	3600
	AC1		s/h	2000	1000
	AC2 ; AC3		s/h	1000	250
	AC4		s/h	250	250
with thermal relay			s/h	15	15
Resistivity to shocks	(square shock)		g/ms	10/4 and 5/8	10/4 and 5/8
Maximum permissible fuse rating for contactors without relays					
max short circuit current 1 kA					
main circuit fuse-links, time-lagging			A	16	16
	fuse-links, quick-acting		A	20	20
	high-rupturing capacity fuses		A	16	16
Sizes of connecting conductors					
for contactors without thermal relay					
main circuit	single-wire conductor		mm²	1 - 2,5	
	multi-wire conductor with cable shoe		mm²	0,75 - 1,5	
Loadability of auxiliary contacts of contactors CNNP and CNNPB					
rated continuous current		I_{th} ; 35°C	A	16	16
AC rated operational current I_e/AC15		for 230 V	A	6	6
		400 V	A	4	4
		500 V	A	4	4
		690 V	A	2,5	2
DC rated operational current I_e/DC1 ; L/R≤1ms		for 24 V	A	6 (6)[1]	6 (6)[1]
(with series connection of 3 current paths)[1)]		110 V	A	2 (6)[1]	2 (6)[1]
		220 V	A	0.6 (6)[1]	0.6 (6)[1]
		440 V	A	0.3 (1,2)[1]	0.3 (1,2)[1]
		600 V	A	0.15 (0,8)[1]	0.15 (0,8)[1]
rated operational current I_e/DC13		for 24 V	A	4 (6)[1]	4 (6)[1]
(with series connection of 3 current paths)[1)]		110 V	A	0.9 (3)[1]	0.9 (3)[1]
		220 V	A	0.2 (1,2)[1]	0.2 (1,2)[1]
		440 V	A	0.14 (0,5)[1]	0.14 (0,5)[1]
		600 V	A	0.15 (0,26)[1]	0.15 (0,26)[1]
Motor ratings for utilization categories AC2, AC3					
		at 230 V	kW	2,2	
		400 V	kW	4	
		500 V	kW	4	
		690 V	**kW**	**4**	

Motor contactors - CNNB with solenoid system

Contactor type				CNNB 9	CNNB 12	CNNB 18	CNNB 22
Mechanical endurance	make/break operations		x10^6	5			
Insulation rating			V	690			
Permissible ambient temperature			°C	- 25 to +45			
Consumption of electromagnet in cold state with Un							
DC operated		inrush	W	6.5	6.5	6.5	6.5
		sealed	W	6.5	6.5	6.5	6.5
Coil voltage tolerances		operating		0,85 to 1,1 Un			
		drop out		0,1 to 0,25 Un			
duration of making and breaking (values are also valid for voltages of electromagnet from 0,8 to 1,1 Un for each coil in cold and warm state). Total breaking time is addition of opening time and duration of electric arc.							
DC operated	closing time		ms	40 - 48	40 - 48	40 - 48	40 - 48
	opening time		ms	6 -14	6 -14	6 -14	6 -14
Frequency of switching operations without thermal relay							
	utilization category	AC1	s/h	1000	1000	1000	1000
		AC2 ; AC3	s/h	750	750	750	750
		AC4	s/h	250	250	250	250
Resistivity to shocks	(square shock)		g/ms	7/5 and 4.2/10	7/5 and 4.2/10	7/5 and 4.2/10	7/5 and 4.2/10
Short-circuit protection of contactors without overload relays							
Main circuit With fuse links							
-acc. to IEC 60947-4-1	Type of coord. "1" gL/gG		A	25	25	40	40
DIN VDE 0660 Part 102	Type of coord. "2"		A	20	20	25	25
Sizes of connecting conductors for contact without thermal relay							
main circuit	single-wire conductor		mm^2	1,5-6	1,5-6	1,5-6	1,5-6
	multi-wire conductor with cable shoe		mm^2	1,5-6	1,5-6	1,5-6	1,5-6
	Screw			M4	M4	M4	M4
	Screw head			PZ2	PZ2	PZ2	PZ2
	Tightening torque		Nm	1.2	1.2	1.2	1.2
auxiliary circuit	single-wire conductor		mm^2	1 - 2,5			
	multi-wire conductor with cable shoe		mm^2	0,75 - 1,5			
	Screw			M3.5			
	Screw head			PZ2			
	Tightening torque		Nm	0.8			
Loadability of auxiliary contacts of contactors CNNB							
rated continuous current I_{th} ; 35°C			A	10	10	10	10
AC rated operational current Ie/AC15		for 24 V	A	6	6	6	6
		230 V	A	6	6	6	6
		400 V	A	4	4	4	4
		500 V	A	2	2	2	2
		690 V	A	1	1	1	1
rated operational current Ie/DC13		for 24 V	A	4	4	4	4
		110 V	A	0.6	0.6	0.6	0.6
		230 V	A	0.3	0.3	0.3	0.3
Load carrying capacity of the main contacts rated continuous current I_{th} ; 55°C			A	25	25	30	30
AC1 utilization category rated operational current Ie/AC1; 55°C			A	25	25	30	30

Contactor type			CNNB 9	CNNB 12	CNNB 18	CNNB 22
AC2 and AC3 utilization categories (slip-ring and cage motors)	for 230 V	kW	3.2	3.5	4	5.5
	400 V	**kW**	**4.5**	**5.7**	**7.5**	**11**
	690 V	kW	5.5	7.5	10	11
AC4 utilization category (electrical endurance of contacts 120.000)	Ie/AC4	A	4.5	5	6.7	6.7
rated current ratings of squirrel-cage motors at 50 c/s	for 230 V	kW	0.75	1.1	1.5	1.5
	400 V	**kW**	**1.5**	**2.2**	**3**	**3**
	500 V	kW	1.5	2.2	3	3
	690 V	kW	1.5	2.2	3	3
Loadability by direct current						
DC1 utilization category, non-inductive loads L/R≤1 ms						
rated operational current I_e, 55°C through one pole	for 24 V	A	20	20	20	20
	48 V	A	20	20	20	20
	110 V	A	2.1	2.1	2.1	2.1
	220 V		0.8	0.8	0.8	0.8
	440 V		0.4	0.4	0.4	0.4
	600 V		0.25	0.25	0.25	0.25
through three poles connected in series	for 24 V	A	20	20	20	20
	48 V	A	20	20	20	20
	110 V	A	20	20	20	20
	220 V	A	20	20	20	20
	440 V	A	1.3	1.3	1.3	1.3
utilization categories DC3 to DC5 series and shunt motors (L/R≤15 ms)	600 V	A	1	1	1	1
rated operational current I_e, 55°C through one pole	for 24 V	A	20	20	20	20
	60 V	A	5	5	5	5
	110 V	A	1.5	1.5	1.5	1.5
	220 V	A	0.75	0.75	0.75	0.75
	440 V	A	-	-	-	-
	600 V	A	-	-	-	-
through three poles connected in series	for 24 V	A	20	20	20	20
	60 V	A	20	20	20	20
	110 V	A	20	20	20	20
	220 V	A	1.75	6	6	6
	440 V	A	0.2	0.2	0.2	0.2
	600 V	A	0.2	0.2	0.2	0.2

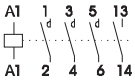
AUXILIARY CONTACT BLOCKS BP2; BP3 and BP4

Block type		BP2	BP3	BP4
Insulation rating	V	690		
Permissible ambient temperature	°C	- 25 to +55		
Short-circuit protection - max. fuse rating gL		20		
Loadability of auxiliary contacts of blocks				
rated continuous current Ith ; 35°C	A	10		
AC rated operational current Ie/AC15 for 24V	A	6		
230V	A	6		
400V	A	4		
690V	A	1		
rated operational current Ie/DC13 for 24V	A	4		
110V	A	0.6		
230V	A	0.2		
400V	A	0.15		
Sizes of connecting conductors				
single-wire conductor	mm_2	1 - 2,5		
multi-wire conductor with cable shoe	mm^2	0,75 - 1,5		
Screw		M3.5		
Screw head		PZ2		
Tightening torque	Nm	0.8		

Wiring diagrams

Motor contactors

AC coil operation



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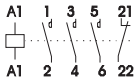
CM1, CNN 9, CNN 12
CNN 18, CNN 22



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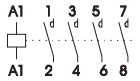
CM1, CNN 9, CNN 12
CNN 18, CNN 22



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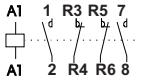
CM1,CNN 9, CNN 12



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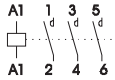
CNN 9, CNN 12



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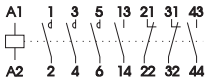
CM1, CNN 25, CNN 30, CNN 32,
CNN 40,CNN 50, CNN 60,
CNN 70, CNN 80, CNN 90, CNN 100



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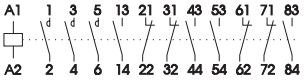
CNM 110, CNM 140, CNM 170, CNM 200,
CNM 250, CNM 315, CNM 400



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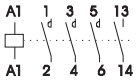
CNM 110, CNM 140,
CNM 170, CNM 200,
CNM 250,CNM 315, CNM 400

DC coil operation



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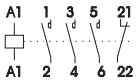
CNNB 9, CNNB 12,
CNNB 18, CNNB 22



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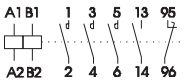
CNNB 9, CNNB 12,
CNNB 18, CNNB 22



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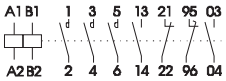
CNN 9, CNN 12, CNN 18, CNN 22
CNN 25, CNN 30, CNN 32,
CNN 40, CNN 50, CNN 60,
CNN 70, CNN 80, CNN 90, CNN 100



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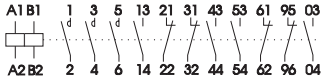
CNM 110



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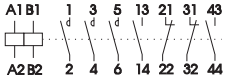
CNM 110



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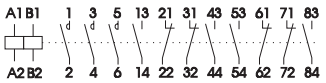
CNM 140, CNM 170, CNM 200,
CNM 250,CNM 315, CNM 400



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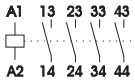
CNM 140, CNM 170, CNM 200,
CNM 250,CNM 315, CNM 400

Contactor relays

AC and DC coil operation



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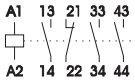
CP0, CNNP , CNNPB



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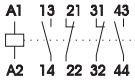
CP0, CNNP , CNNPB



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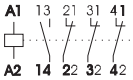
CP0, CNNP , CNNPB



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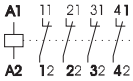
CNNP , CNNPB



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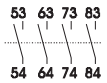
CNNP , CNNPB

Snap-on auxiliary contact blocks



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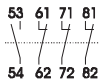

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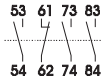

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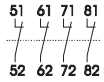

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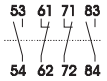

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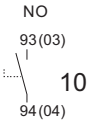
BP0



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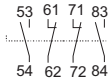
01

BP1

11

BP2; BP2N



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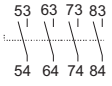
BP4; BP4N



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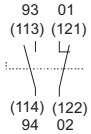
BP4



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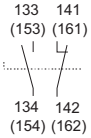
BP3



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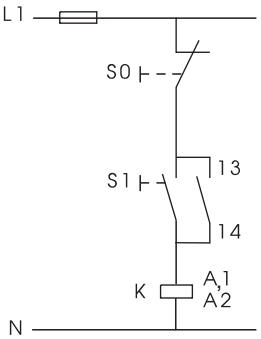
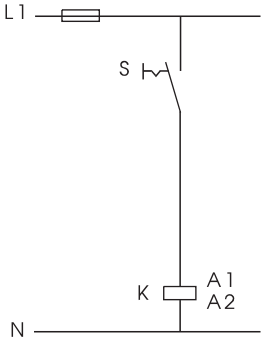
BP5

Schematic diagrams for AC operated contactors

CPO, CNNP, CM1, CNN 9 - CNN 100, CNM 110 - CNM 400



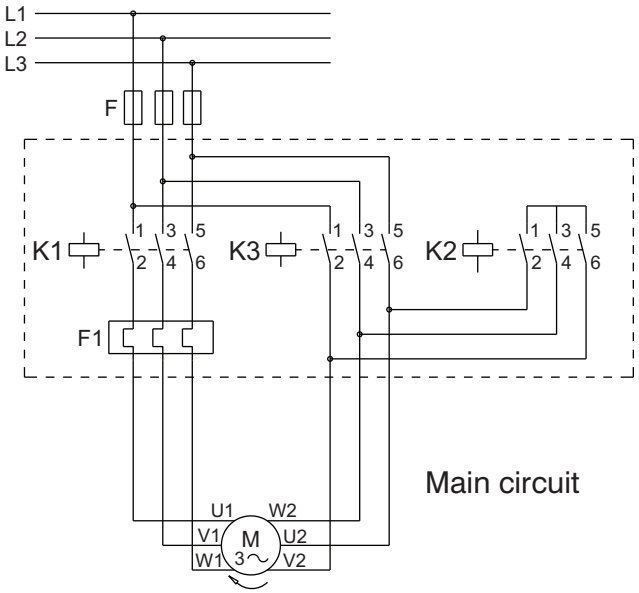
With push button "S0, S1"



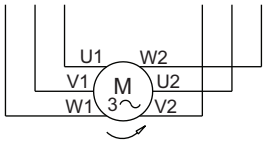
With permanent contact switch "S"

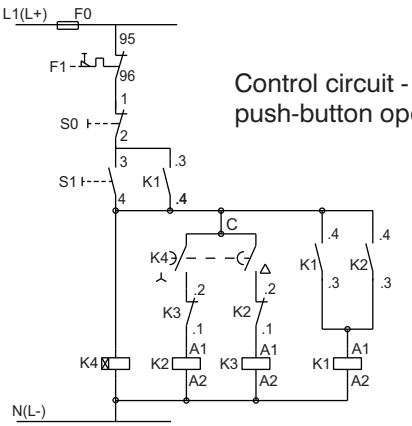
IMPORTANT:

When used in **star-delta starters** the time between change over connection from star to delta must be bigger than 100ms which is achieved with electronic time relays (e.g. **Rade Koncar type EVRK 40**).

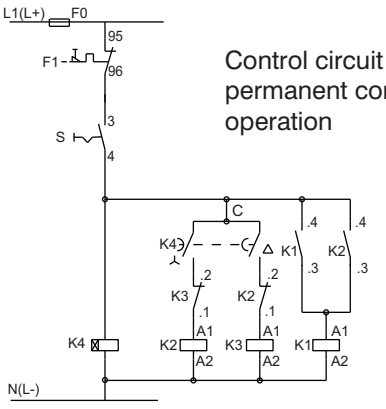


Main circuit

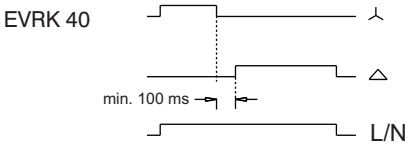




Control circuit - push-button operation

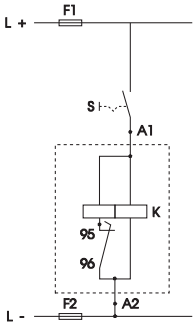


Control circuit - permanent contact operation

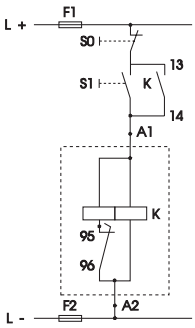


Schematic diagrams for DC operated contactors

CNN 9 - CNN 40

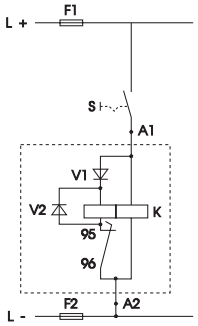


Permanent contact control

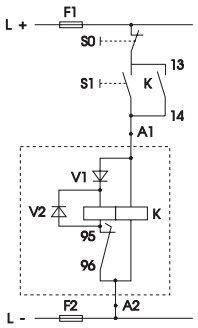


Push button control

CNN 50 - CNN 100

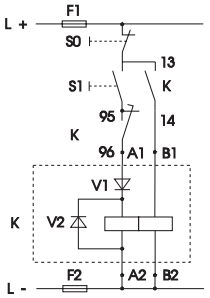


Permanent contact control

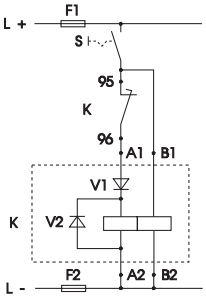


Push button control

CNM 110

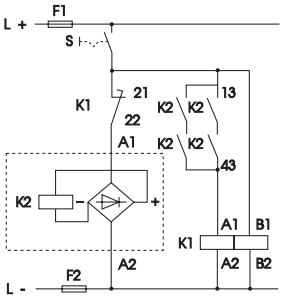


Push button control



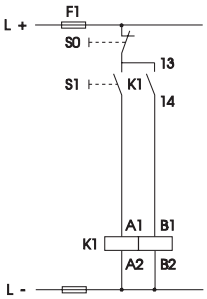
Permanent contact control

CNM 140 - CNM 200
CNM 250 - CNM 400



K1 = CNM 140, CNM 400
K2 = CNP 21 40 EG

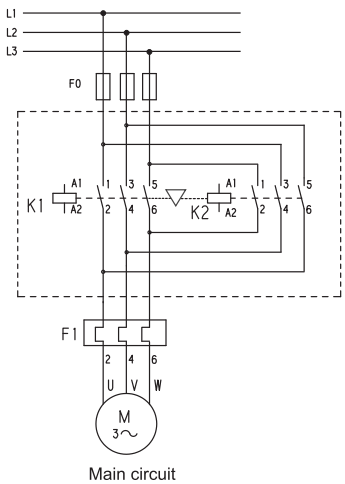
Permanent contact control



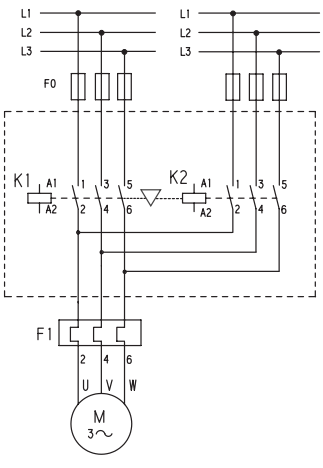
Push button control

Schematic diagrams for reversing contactors and “AVR”

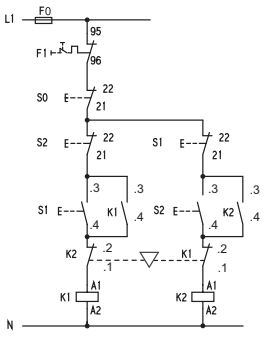
MBCM1, MBCNN 9 - MBCNN 100, MBCNM 110 -MBCNM 400



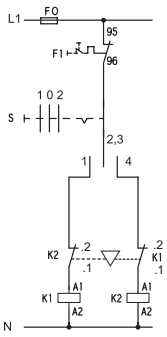
Main circuit



AVR



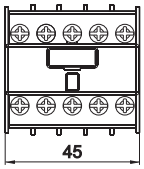
Control circuit - push-button operation



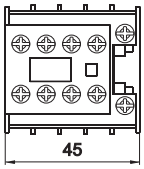
Control circuit - permanent contact operation

Dimension drawings (mm)

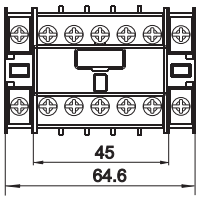
CP0,
CM1,
CM1..N

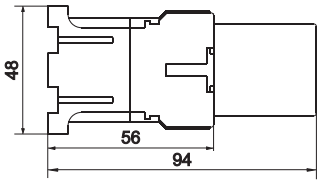


CP0 + BP0,
CM1 + BP0



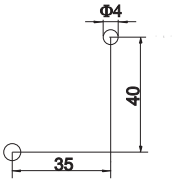
CP0 + 2xBP1,
CM1 + 2xBP1



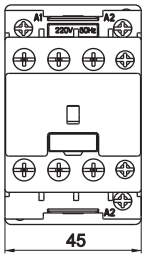


Drilling plan (mm)

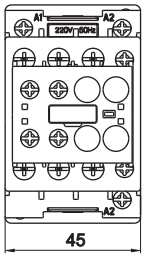
CP0; CM1



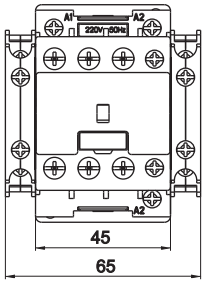
CNN 9; CNN 12;
CNN 18; CNN 22
CNNB 9; CNNB 12;
CNNB 18; CNNB 22

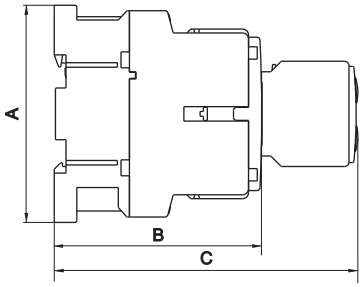


CNN 9 (CNNB 9) + BP2 (BP4)
CNN 12 (CNNB 12) + BP2 (BP4)
CNN 18 (CNNB 18) + BP2 (BP4)
CNN 22 (CNNB 22) + BP2 (BP4)

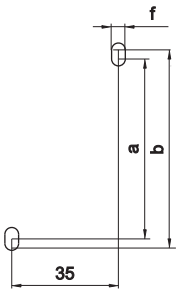


CNN 9 (CNNB 9) + 2xBP3
CNN 12 (CNNB 12) + 2xBP3
CNN 18 (CNNB 18) + 2xBP3
CNN 22 (CNNB 22) + 2XBP3





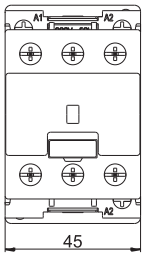
CNN 9; CNN 12; CNN 18;
CNNB 9; CNNB 12; CNNB 18



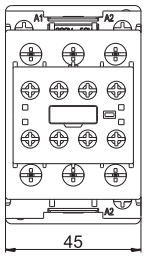
TYPE	CNN 9 - CNN 22	CNNB 9 - CNNB 22
A	72.2	74.2
B	71	114.5
C	101	146.8

TYPE	CNN 9 - CNN 22	CNNB 9 - CNNB 22
a	60	50
b	65	60
f	4.5	4.6

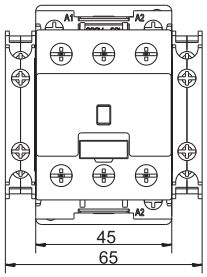
CNN 25; CNN 30

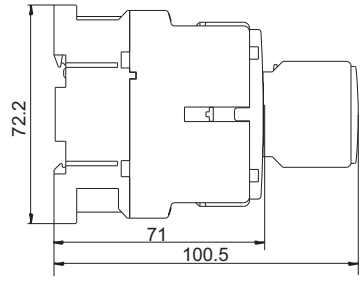


CNN 25, CNN 30 + BP 2 (BP 4)

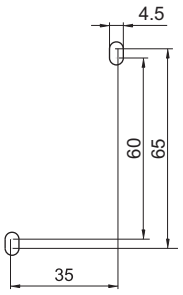


CNN 25, CNN 30 + 2XBP3

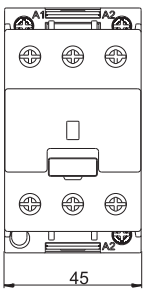




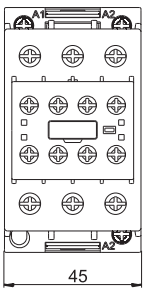
CNN 25; CNN 30



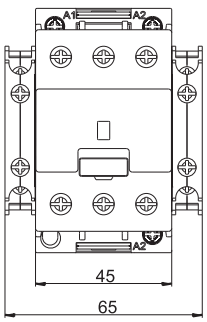
CNN 32;
CNN 40

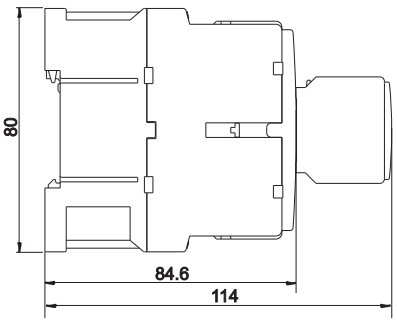


CNN 32 + BP2 (BP4);
CNN 40 + BP2 (BP4)

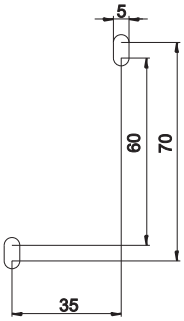


CNN 32 + 2xBP3;
CNN 40 + 2xBP3

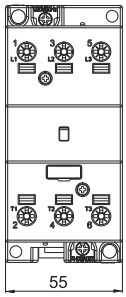




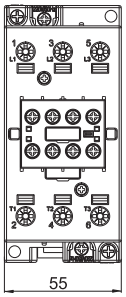
CNN 32; CNN 40



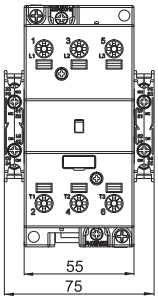
CNN 50;
CNN 60;
CNN 70

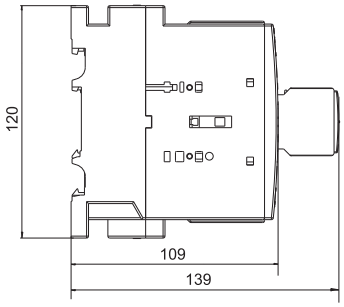


CNN 50 + BP2(BP4);
CNN 60 + BP2(BP4)
CNN 70 + BP2(BP4)

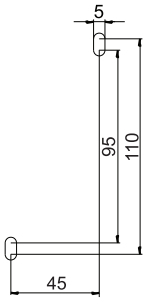


CNN 50 + 2BP3;
CNN 60 + 2BP3
CNN 70 + 2BP3

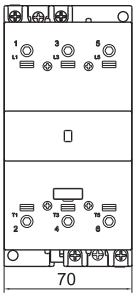




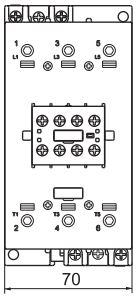
Drilling plan (mm)



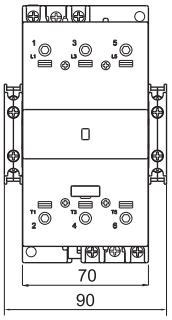
CNN 80;
CNN 90
CNN 100

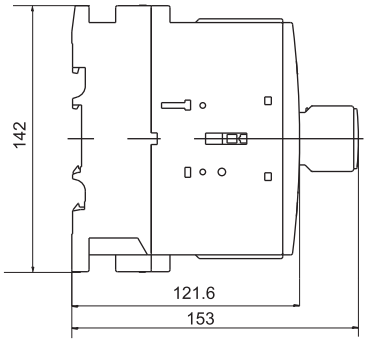


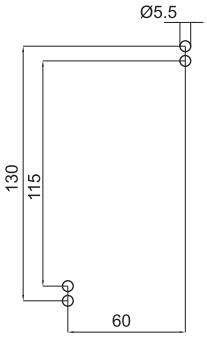
CNN 80 + BP2N(BP4N);
CNN 90 + BP2N(BP4N);
CNN 100 + BP2N(BP4N)



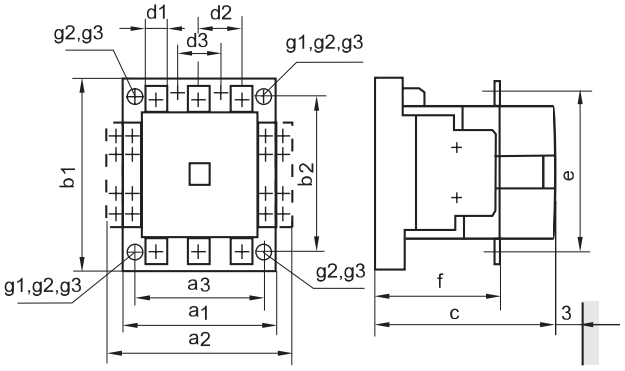
CNN 80 + 2BP3;
CNN 90 + 2BP3;
CNN 100 + 2BP3



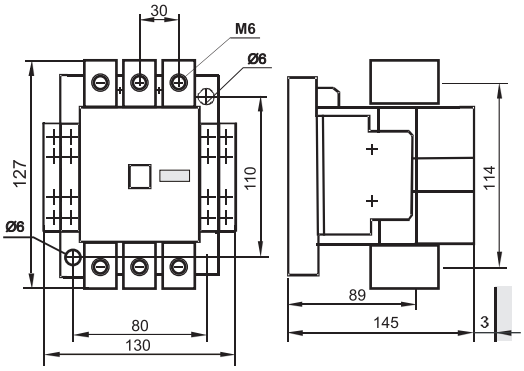




CNM 110, CNM 140, CNM 170, CNM 250, CNM 400



CNM 110ST



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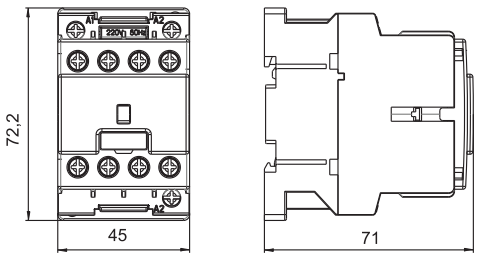
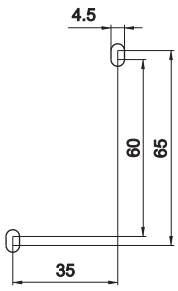
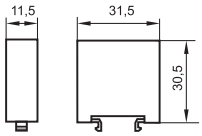
CNM 110	100	125	80	132	110	142	15	30	44	113	86.5	Ø6		
CNM 140	135	162	110	180	160	189	20	42	44	162	116		Ø7	
CNM 170	135	162	110	180	160	189	20	42	44	162	116		Ø7	
CNM 200	135	162	110	180	160	189	20	42	44	162	116		Ø7	
CNM 250	160	187	130	200	180	226	25	48	44	178	141			Ø10,5
CNM 315	160	187	130	200	180	226	25	48	44	178	141			Ø10,5
CNM 400	160	187	130	200	180	226	25	48	44	178	141			Ø10,5

CNNP, CNN 9 004, CNN 12 004
CNN 9 0022, CNN 12 0022



Driling plan (mm)

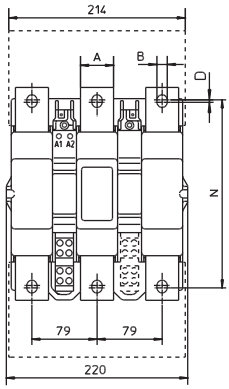


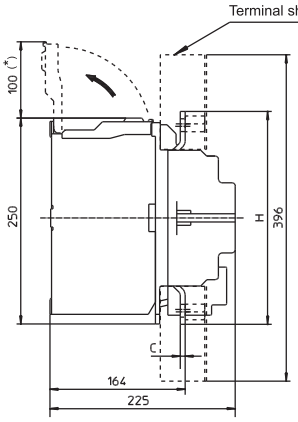


RC 1

Drilling plan (mm)

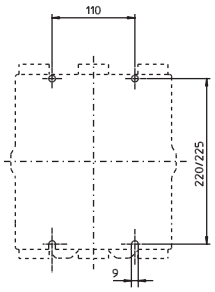
CNM 450; CNM 550;



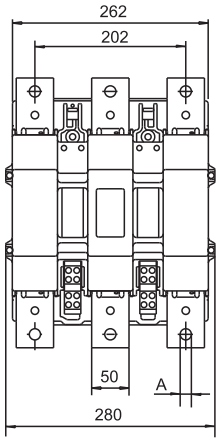


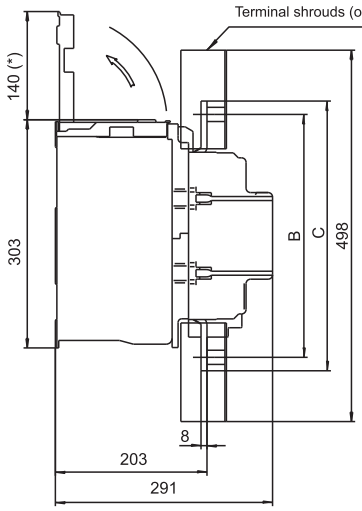
	A	B	C	D	N	H
CNM 450	40	10,5	4	4	208	235
CNM 550	40	12,5	6	3	228	258

(*) Necessary distance to remove coil and/or feeder group.



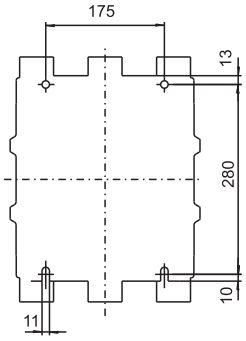
CNM 700; CNM 860



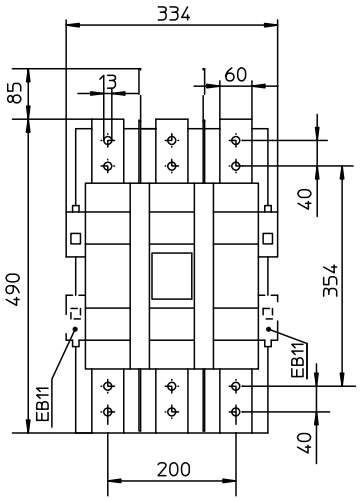


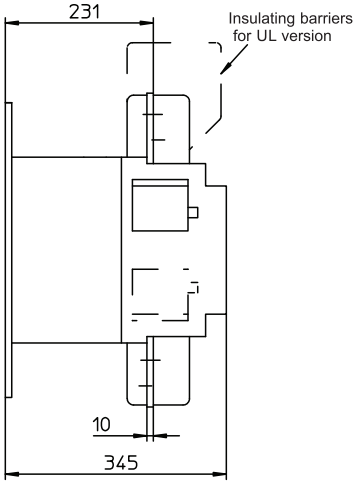
	A	B	C
CNM 700	13	277	307
CNM 860	15	325	361

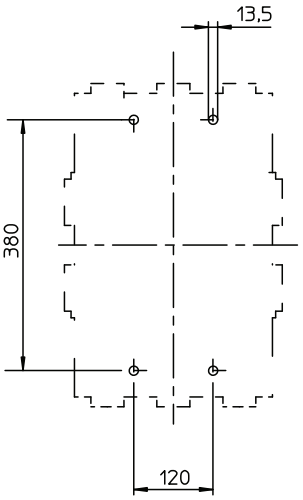
(*) Necessary distance to remove coil and/or feeder group.



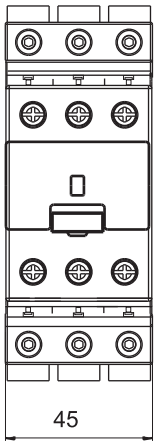
CNM 1000

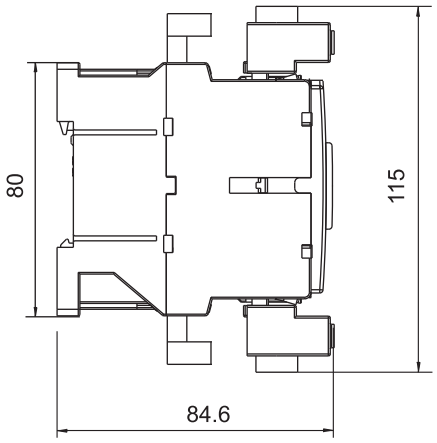




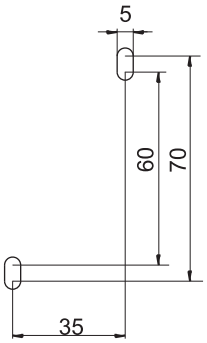


TKN 65

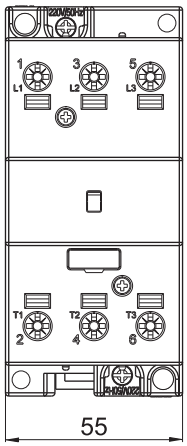


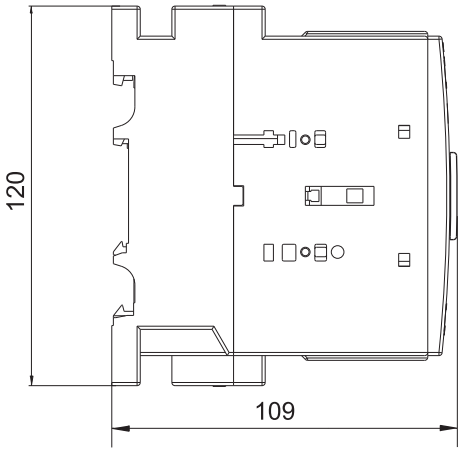


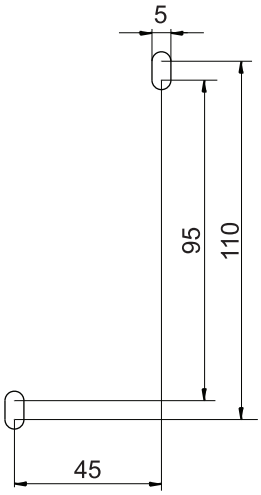
Drilling plan (mm)



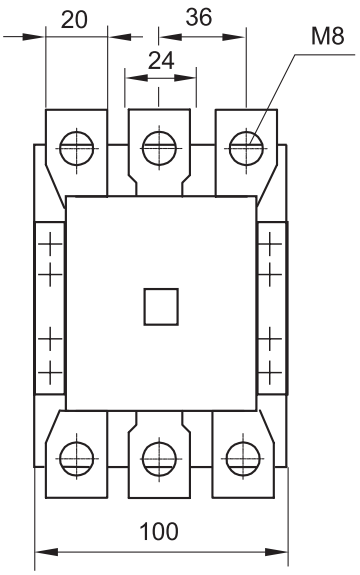
TKN 115

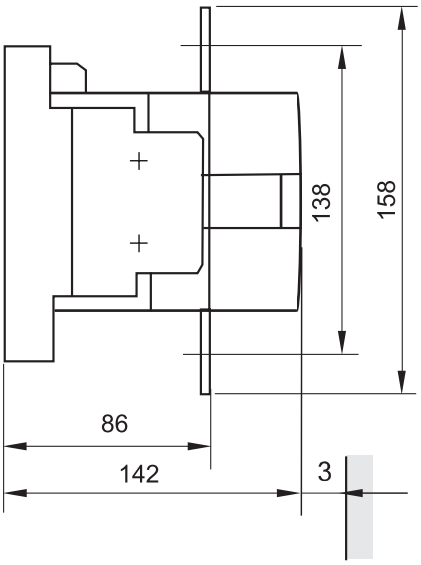


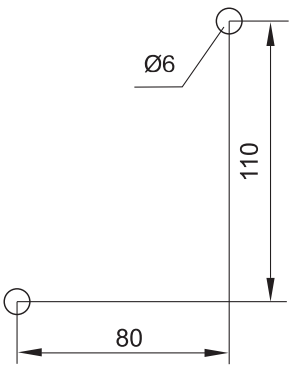




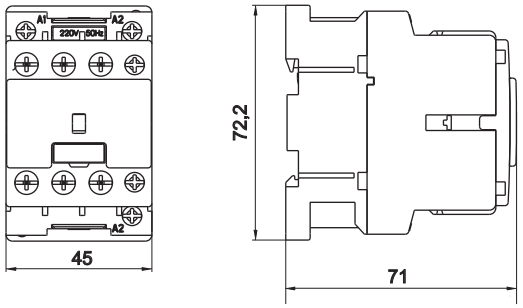
TK 130, TK 175



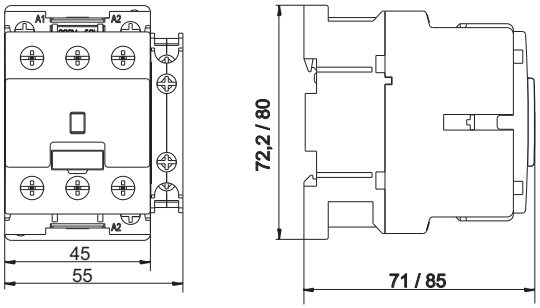




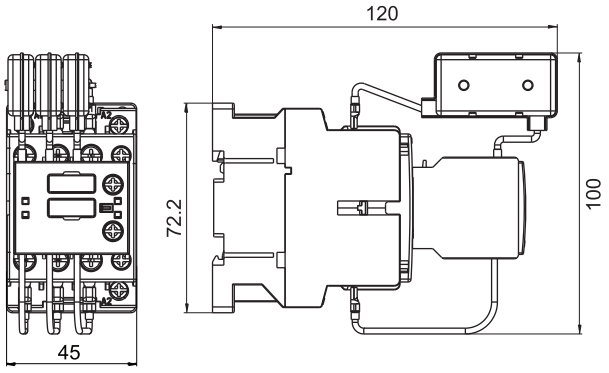
CNNK 2,5; CNNK 5



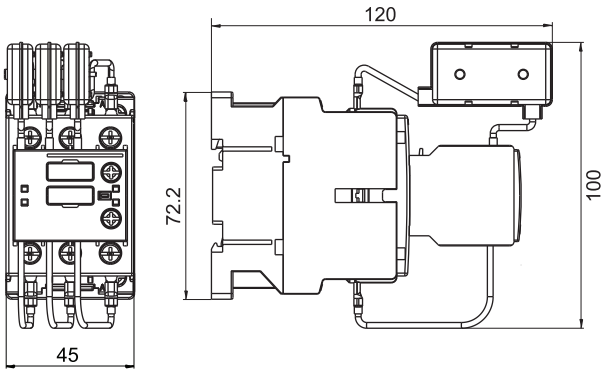
CNNK 7,5 / CNNK12



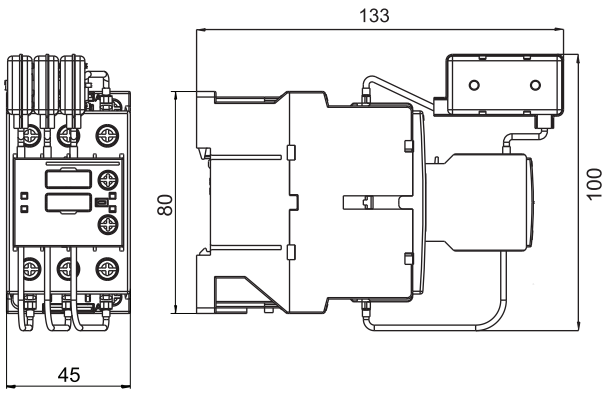
CNNK 10..N; CNNK 12..N; CNNK 15..N



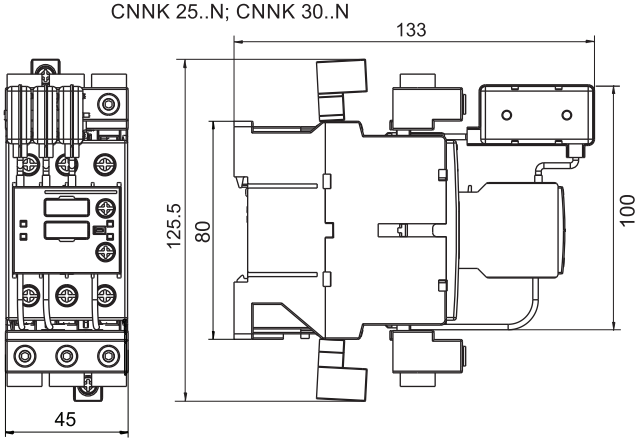
CNNK 20..N



CNNK 25E..N

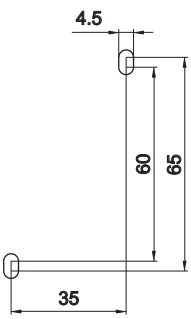


CNNK 25..N; CNNK 30..N

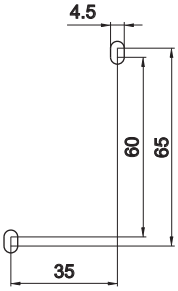


Drilling plan (mm)

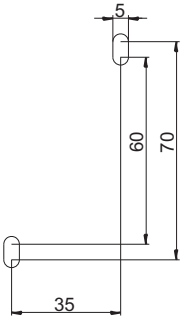
CNNK 2,5; CNNK 5
CNNK 7,5; CNNK 12



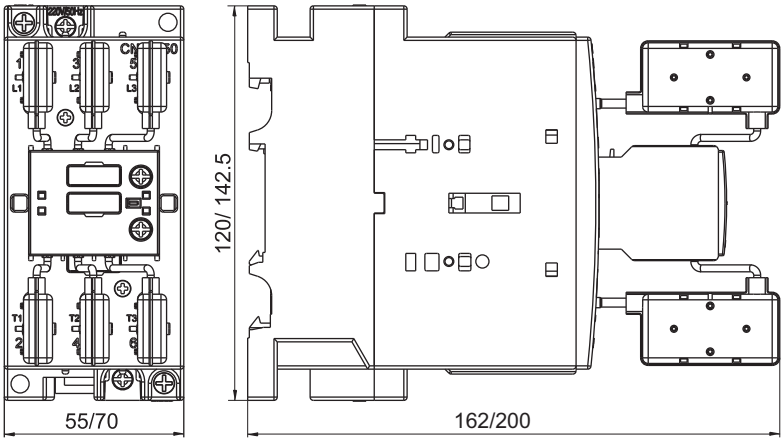
CNNK 10..N; CNNK 12..N
CNNK 15..N; CNNK 20..N



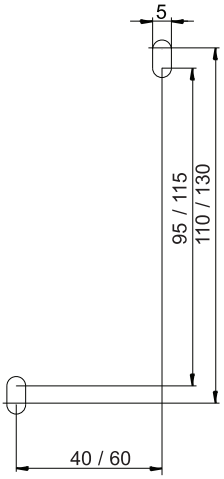
CNNK 25E..N; CNNK 25..N,
CNNK 30..N



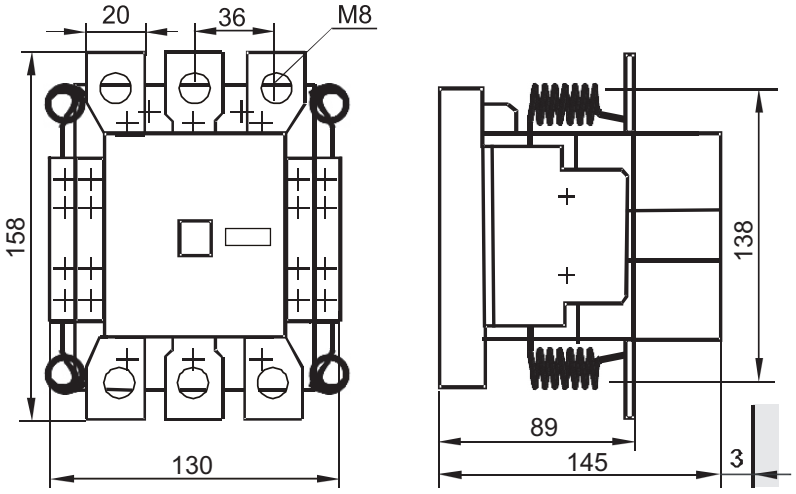
CNNK 40..N, CNNK 50..N, CNNK 60..N / CNNK 70..N, CNNK 75..N



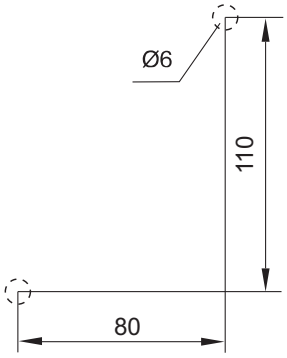
Drilling plan (mm)



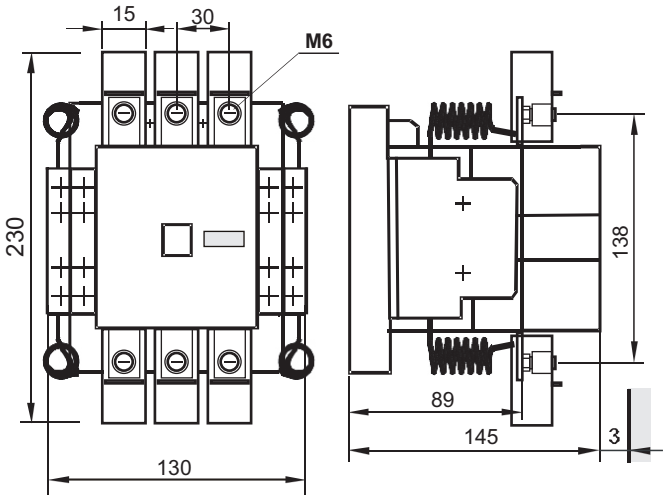
CNKM 80 without IP 20



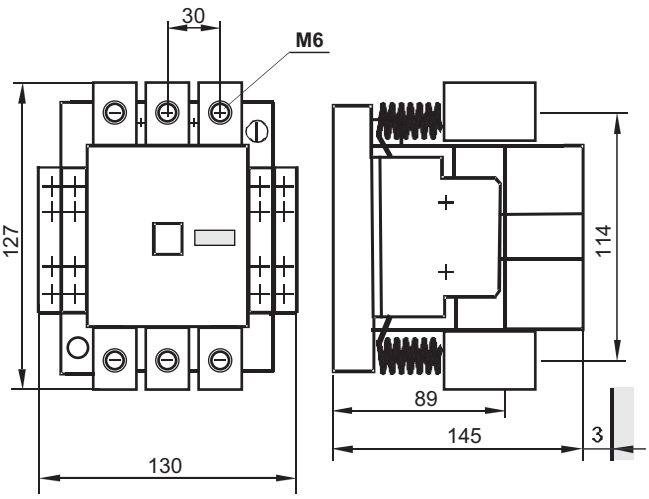
CNKM 80



CNKM 80 with IP 20

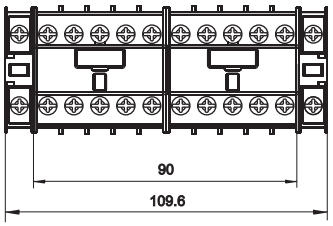


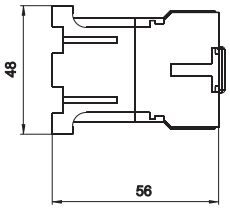
CNKM 80ST

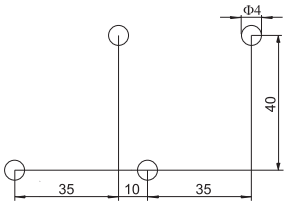


Driling plan (mm)

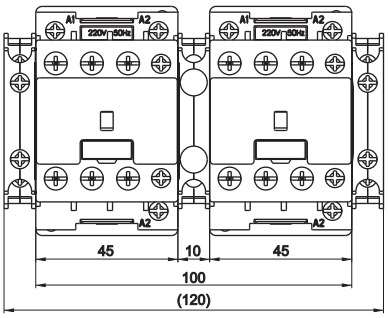
MBCM1 00; MBCM1 11
MBCM1..N 00; MBCM1..N 11

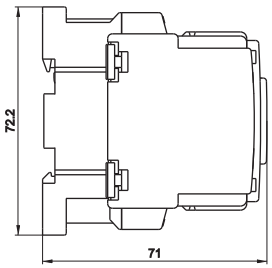


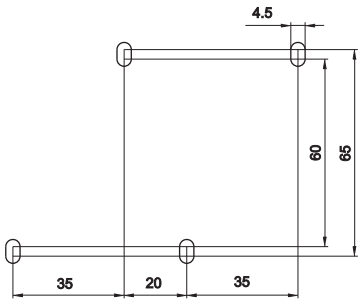




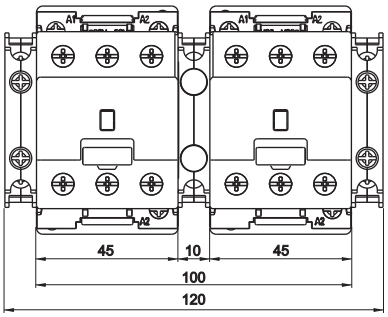
MBCNN 9 00 (11); MBCNN 12 00 (11);
MBCNN 18 00 (11); MBCNN 12 00 (11)

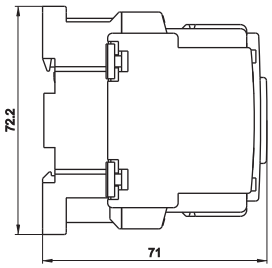


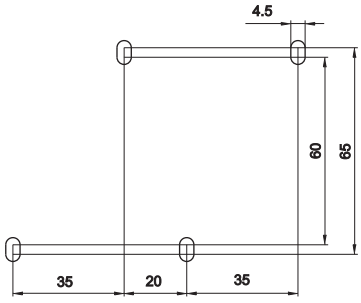




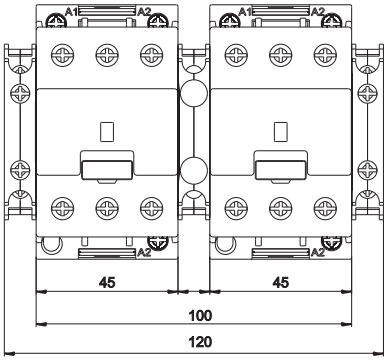
MBCNN 25 10; MBCNN 30 10

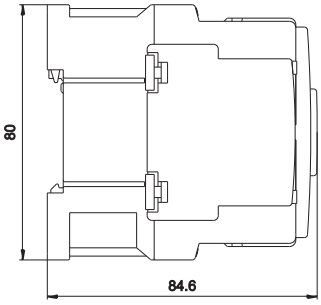


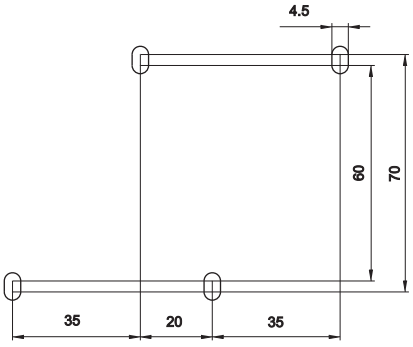




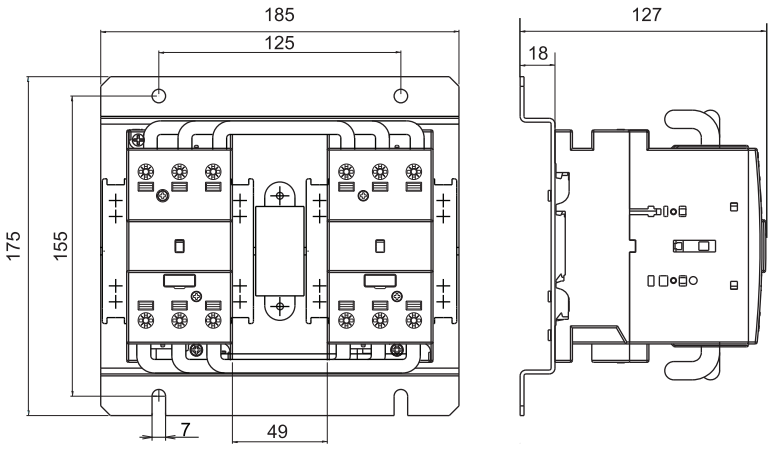
MBCNN 32 10 ; MBCNN 40 10



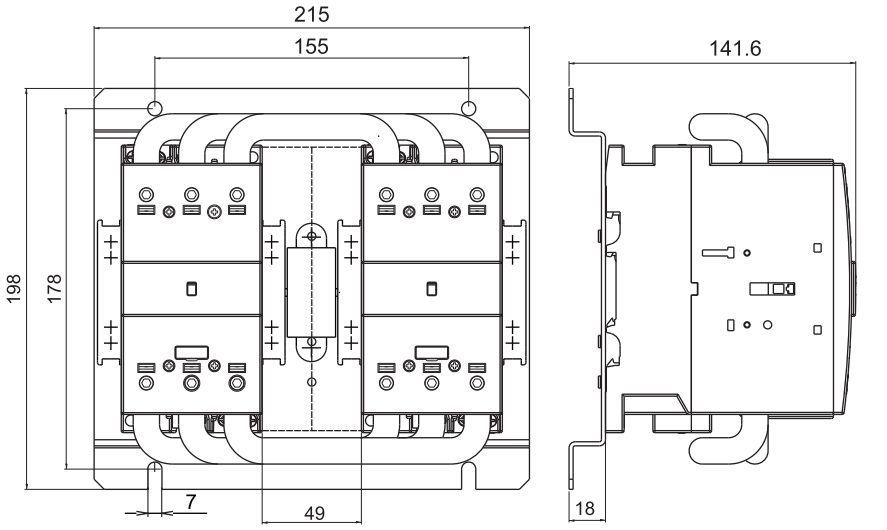


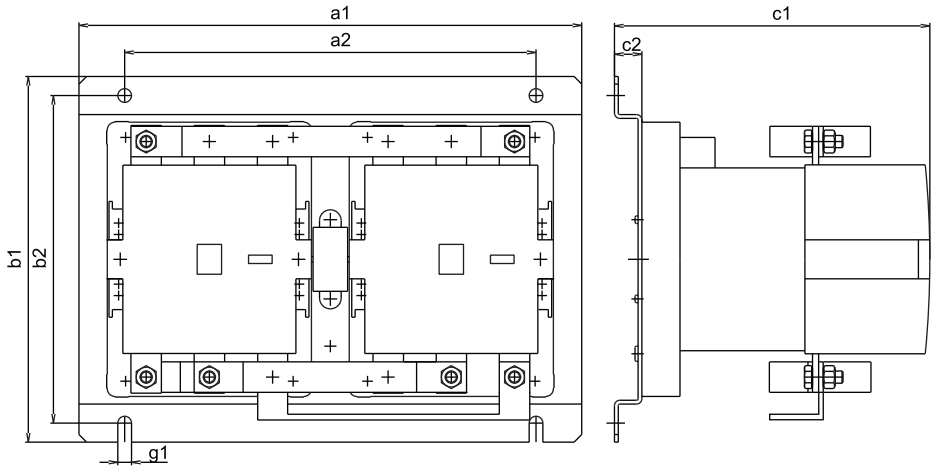


MBCNN 50 - MBCNN 70



MBCNN 80 - MBCNN 100





TYPE	a1	a2	b1	b2	c1	c2	g1
MBCNM 110	260	200	175	155	163	18	7
MBCNM 140 - MBCNM 200	330	270	240	215	210	18	9
MBCNM 250 - MBCNM 400	380	310	265	240	250	21	11

THERMAL OVERLOAD RELAYS

Thermal overload relays 101

Technical data 104

Dimension drawings 106

Thermal overload relays

Thermal overload relays

Application:
Thermal overload relays TM and TRM are designed to protect low voltage motors and other consumers against nonpermissible overloads and phase-failure operations.

Advantages:

- In conformity with: IEC 60947-1, IEC 60947-4-1
- Ambient temperature compensated
- Differential tripping
- Selective manual or auto reset
- Trip indication
- Auxiliary contacts (1NO + 1NC)
- Small mounting dimensions and overall size

Ordering:

TM 40	16A
1	2

1 - Type
2 - Overload setting range (Upper value)

Technical data - page 104

Thermal overload relays - direct mounting on the contactor

Thermal overload relay TM 40

Type	Order number	Overload setting range (A)	Usage	Weight [g]	Packing [pcs]
TM 40 - 0.16A	680001	0.1 - 0.16	CNN 9 CNN 12 CNN 18 CNN 22 CNN 25 CNN 30 CNN 32 CNN 40	115	1
TM 40 - 0.25A	680002	0.16 - 0.25			
TM 40 - 0.4A	680003	0.25 - 0.4			
TM 40 - 0.63A	680004	0.45 - 0.63			
TM 40 - 0.8A	680005	0.55 - 0.8			
TM 40 - 1A	680006	0.75 - 1			
TM 40 - 1.3A	680007	0.9 - 1.3			
TM 40 - 1.6A	680008	1.1 - 1.6			
TM 40 - 2.0A	680009	1.4 - 2.0			
TM 40 - 2.5A	680010	1.8 - 2.5			
TM 40 - 3.2A	680011	2.3 - 3.2			
TM 40 - 4.0A	680012	2.9 - 4.0			
TM 40 - 4.8A	680013	3.5 - 4.8			
TM 40 - 6.3A	680014	4.5 - 6.3			
TM 40 - 7.5A	680015	5.5 - 7.5			
TM 40 - 10A	680016	7.2 - 10			
TM 40 - 12.5A	680017	9 - 12.5			
TM 40 - 16A	680018	11.3 - 16			
TM 40 - 20A	680019	15 - 20			
TM 40 - 25A	680020	21 - 25*		145	
TM 40 - 30A	680021	24.5 - 30*			
TM 40 - 36A	680022	29 - 36*			
TM 40 - 38A	680023	33 - 38*			

*with additional screw terminals

Thermal overload relay TRM 75 - N60

Type	Order number	Overload setting range (A)	Usage	Weight [g]	Packing [pcs]
TRM 75 N60 - 25A	605732	16 - 25	CNN 50 CNN 60 CNN 70	390	1
TRM 75 N60 - 32A	605726	20 - 32			
TRM 75 N60 - 40A	605274	25 - 40			
TRM 75 N60 - 50A	604944	32 - 50			
TRM 75 N60 - 57A	604945	40 - 57			
TRM 75 N60 - 63A	604946	50 - 63			
TRM 75 N60 - 70A	607729	57 - 70			

Thermal overload relay TRM 75 - N90

Type	Order number	Overload setting range (A)	Usage	Weight [g]	Packing [pcs]
TRM 75 N90 - 25A	605733	16 - 25	CNN 80 CNN 90 CNN 100	400	1
TRM 75 N90 - 32A	605734	20 - 32			
TRM 75 N90 - 40A	605735	25 - 40			
TRM 75 N90 - 50A	605736	32 - 50			
TRM 75 N90 - 57A	605737	40 - 57			
TRM 75 N90 - 63A	605691	50 - 63			
TRM 75 N90 - 70A	605692	57 - 70			
TRM 75 N90 - 80A	605530	63 - 80			

Technical data - page 104; Dimension drawings - page 106

Thermal overload relays - direct mounting on the contactor

Thermal overload relay TRM 75 - 110

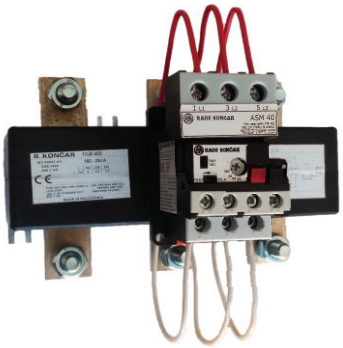
Type	Order number	Overload setting range (A)	Usage	Weight [g]	Packing [pcs]
TRM 75 110 - 25A	739159	16 - 25	CNM 110	400	1
TRM 75 110 - 32A	739171	20 - 32			
TRM 75 110 - 40A	739172	25 - 40			
TRM 75 110 - 50A	739173	32 - 50			
TRM 75 110 - 57A	739174	40 - 57			
TRM 75 110 - 63A	739160	50 - 63			
TRM 75 110 - 70A	739176	57 - 70			
TRM 75-110 - 80A	739195	63 - 80			

Thermal overload relays - individual mounting

Thermal overload relay TRM 400D*

Type	Order number	Overload setting range (A)	Usage	Weight [kg]	Packing [pcs]
TRM 400D - 100A	680051	70 - 100	CNM 110 CNM 140 CNM 170 CNM 200 CNM 250 CNM 315 CNM 400	1.58	1
TRM 400D - 130A	680052	90 - 130			
TRM 400D - 160A	680053	110 - 160			
TRM 400D - 200A	680054	140 - 200			
TRM 400D - 250A	680055	180 - 250			

*TRM400D with straight-through transformer



Thermal overload relay TRM 400

Type	Order number	Overload setting range (A)	Usage	Weight [kg]	Packing [pcs]
TRM 400 - 100A	680044	70 - 100	CNM 110 CNM 140 CNM 170 CNM 200 CNM 250 CNM 315 CNM 400	2.2	1
TRM 400 - 130A	680045	90 - 130			
TRM 400 - 160A	680046	110 - 160			
TRM 400 - 200A	680047	140 - 200			
TRM 400 - 250A	680048	180 - 250			
TRM 400 - 320A	680049	230 - 320			
TRM 400 - 400A	680050	280 - 400			

Separate mounting adapter for TM 40 and TRM 75

Adapter ASM 40				
Type	Order number	Usage	Weight [g]	Packing [pcs]
ASM 40	680043	TM 40	57	1

Adapter ASM 75				
Type	Order number	Usage	Weight [g]	Packing [pcs]
ASM 75	600009	TRM 75	135	1

Technical data

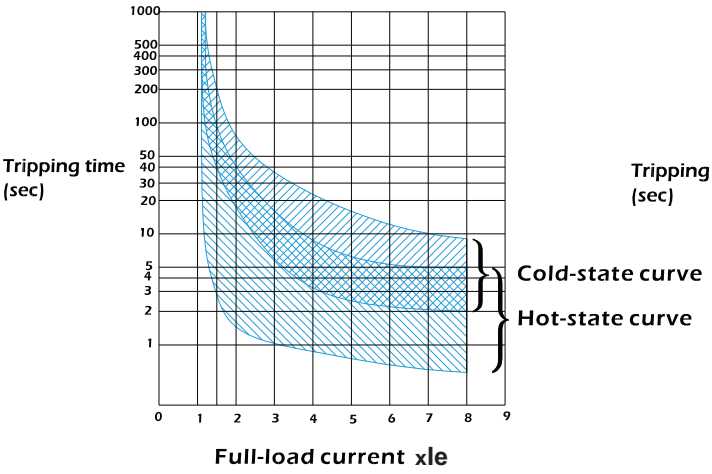
Relay type		TM 40	TRM 75	TRM 400/TRM 400D
Insulation rating U_i	V	690	1000	690
Rated impulse withstand voltage Uimp	kV	6		
Permissible ambient temperature	°C	- 5 to +50		
Degree of protection		IP20	IP00	
Class		10A	10	10A
Temperature compensation		+	+	+
Phase failure protection by differential phase shift		+	+	+
Test button		+	+	+
Reset button		+	+	+
Switch position indicator		+	+	+
Changeover to hand or automatic reseting		+	+	+
Vibration resistance	g	8	8	8
Overvoltage category and pollution degree acc.to IEC/EN60947-1		III/3		
Main circuit conductor cross - section solid or stranded finely stranded with end sleeve Screw/Screw head Tightening torque	 mm^2 mm^2 Nm	 1 - 6 (10*) 1,5 - 6 (10*) M4 (M5*) 1.2 (2*)	 2,5 - 35 1,5 - 25 M6 2.5	 240/120 M10/-
Power input per pole max. at setting range min. max. at setting range max.	 W/VA W/VA	 0,9 2,25	 2,6 4	 5 12
Auxiliary circuit number and type of contacts conductor cross - section solid or stranded finely stranded with end sleeve Screw/Screw head Tightening torque Thermal current (both contacts) Ith ; 35 °C	 mm^2 mm^2 Nm A	1 NO + 1 NC (galvanically separated) 2 x (1 - 2,5) 2 x (0,75 - 1,5) M3.5/PZ2 0.8 6		
Rated operational currents (both contacts) AC-15 240V Ie AC-15 400V Ie AC-15 500V Ie	A	3 1.7 1	1.15 1.1 1	3 1.7 1
Rated operational currents (both contacts) DC-13 110V Ie DC-13 230V Ie	A	0.25 0.10	0.22 0.10	0.25 0.10

*for additional screw terminals up to 10 mm^2

Tripping curves of thermal overload relays

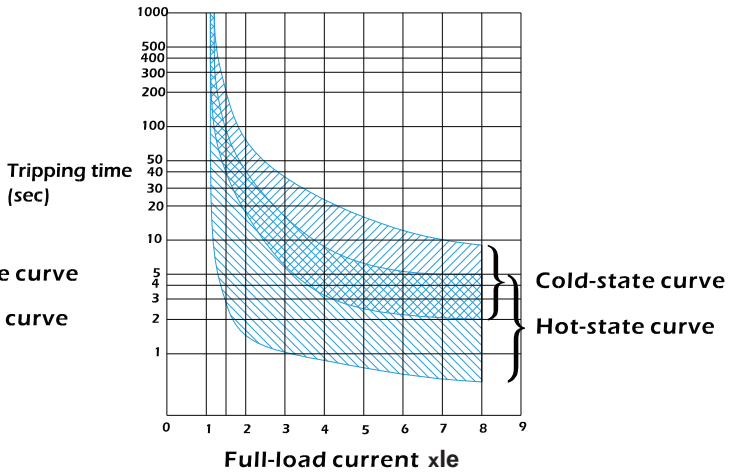
TM 40 - Current range 0.1 - 38A

Three-phase protection characteristics

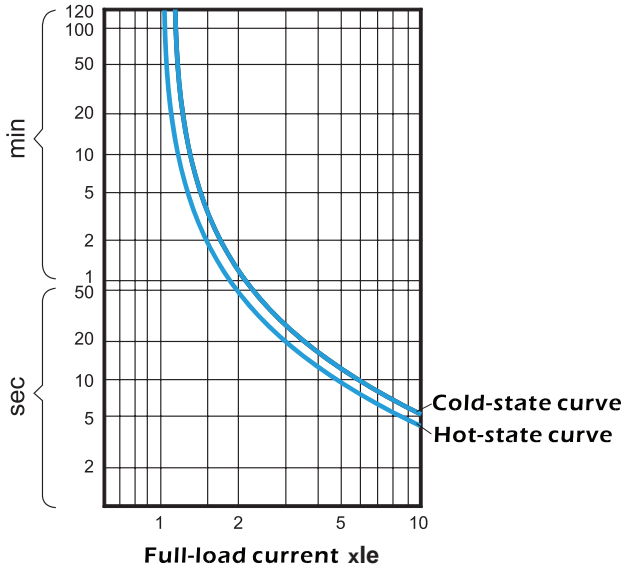


TRM 400 - Current range 70 - 400A

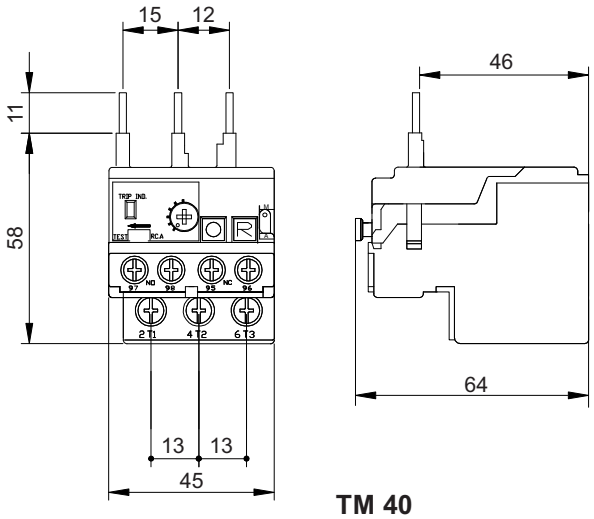
Three-phase protection characteristics



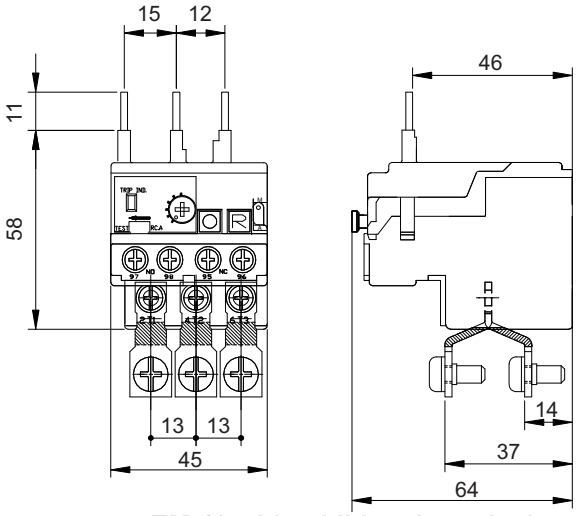
TRM 75 - Current range 16 - 80A



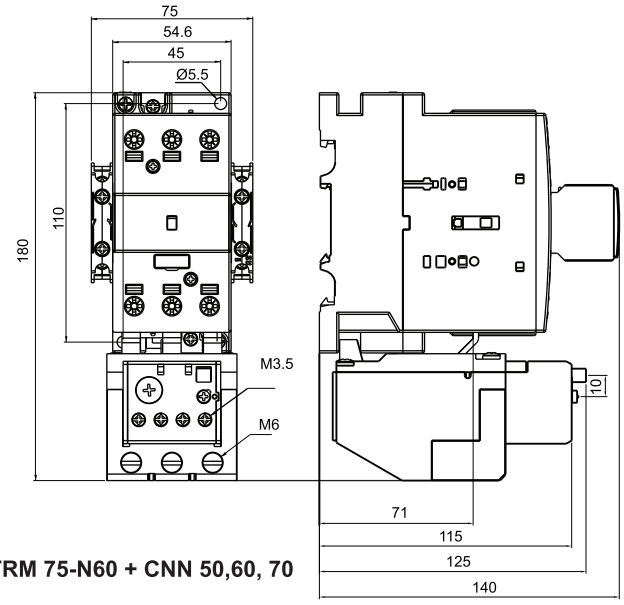
Dimension drawings (mm)



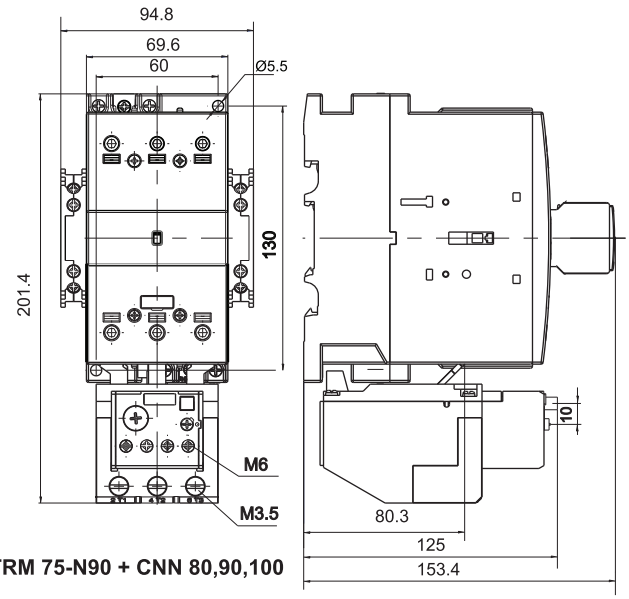
TM 40



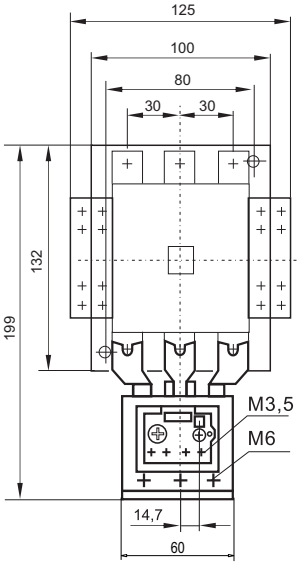
TM 40 with additional terminals

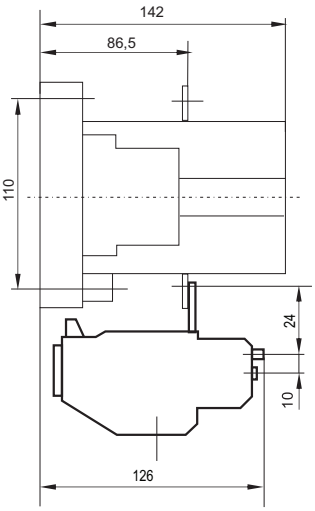


TRM 75-N60 + CNN 50,60, 70



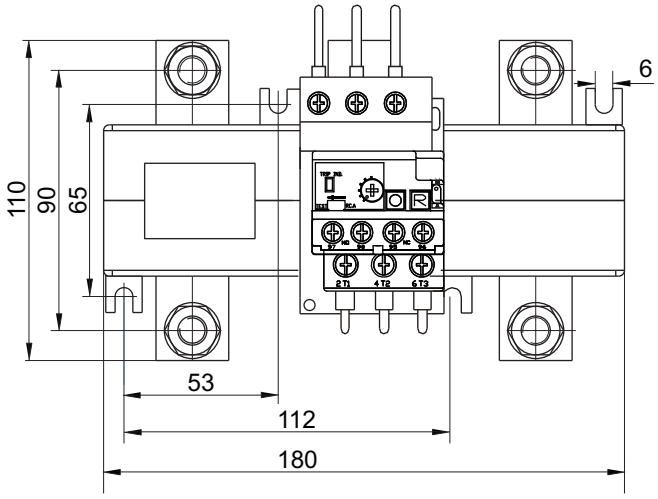
TRM 75-N90 + CNN 80,90,100

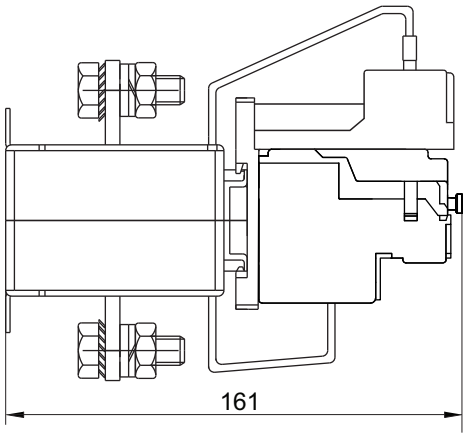


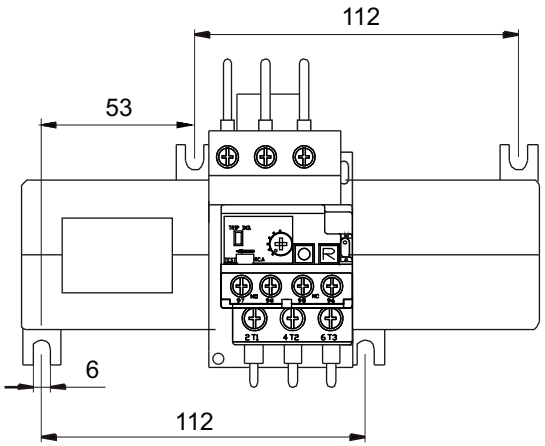


TRM 75-110 + CNM 110

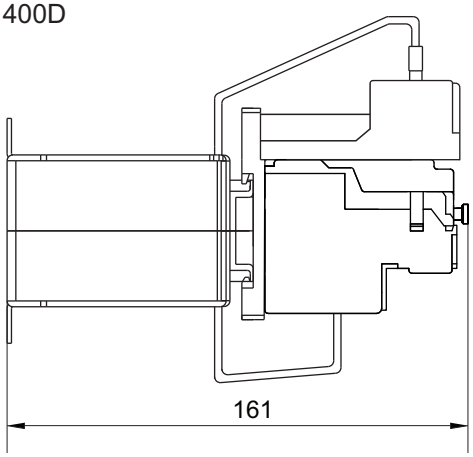
TRM 400

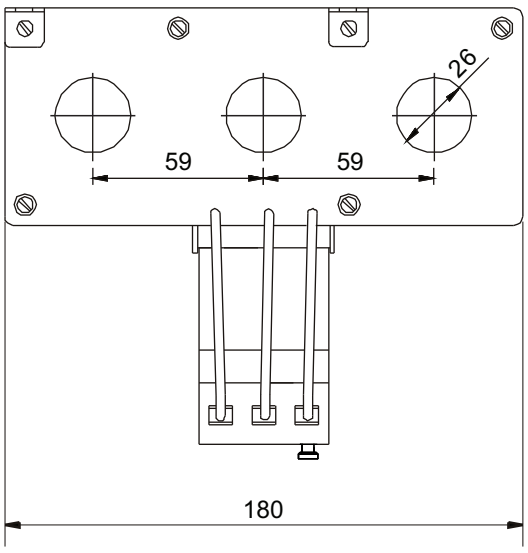






TRM 400D





ROTARY CAM SWITCHES
BS Series

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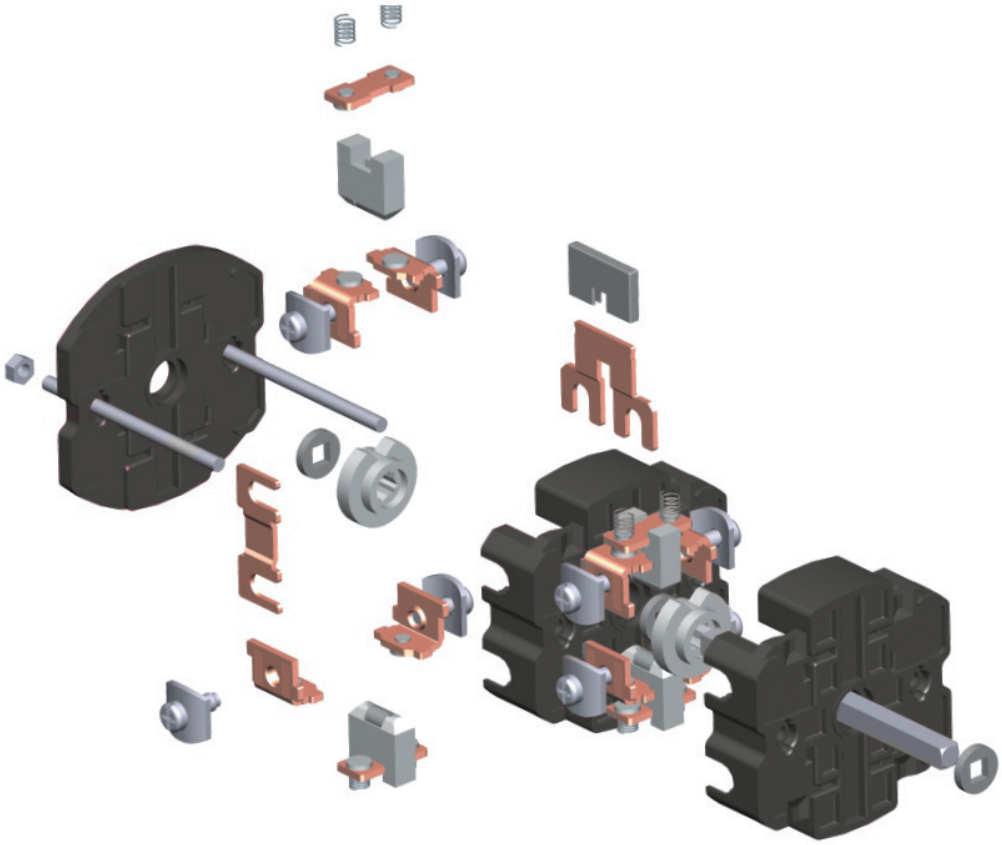
Mounting forms	110
Front Plate	112
Ordering codes	113
Rotary cam switches in enclosures	121
Dimensions	123
Ordering form	127

Rotary Cam Switches



BS 16, BS 25

BS 32

BS 40

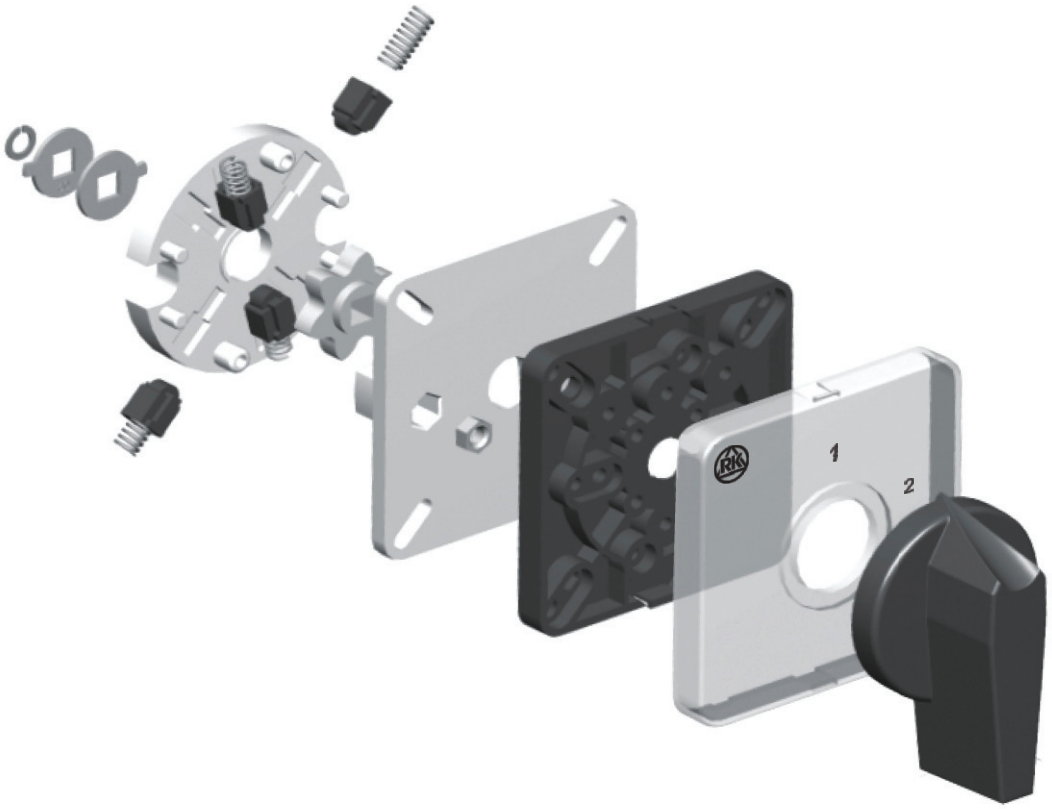
BS 63

BS 80/BS 100

BS 125

BS 200

BS 400, 630



TÜVRheinland® CERT ISO 9001

Rotary Cam Switches series BS

ROTARY CAM SWITCHES "BS"

Rotary cam switches series "BS" are intended for multiple switching operations in main as well as in auxiliary circuits. As motor switches they are designed for direct-online starting and stopping of single-phase and three-phase motors. They also come out as star-delta switches, reversing switches, pole-change over motor switches. In auxiliary circuits they are assembled in compliance with the switching programme according to preference: switches for control, signalling and measuring circuits. Switches, selector switches and step switches e.g. for transformers and welding apparatuses. Group switches e.g. for switching operations of resistors and heaters. Control switch with automatic return The advantages of rotary cam switches are: high making and breaking capacities, electrical and mechanical endurance and small dimensions. Rotary cam switches comply with international standards such as: IEC 60947-3 and EN 60947-3. The rotary cam switches "BS 16" to "BS 63" can have 24 contacts (12 switching elements) maximum and can be made with turning angle of 30, 45, 60 and 90 degrees.The rotary cam switches "BS 80" and "BS 100" can have 24 contacts (12 switching elements) maximum and can be made with turning angle of 45, 60 and 90 degrees.The rotary cam switches "BS" 125 to "BS 630" can have 18 contacts (9 switching elements) maximum and can be made with turning angle of 60 and 90 degrees.

UTILIZATION CATEGORY

Category	Utilization
AC-20	Connecting and disconnecting under no-load conditions
AC-21	ON-OFF switching of resistive loads, including moderate overloads
AC-22	Switching of mixed resistive and induktive loads, including moderate overloads
AC-2	Staring slip-ring motors and plugging
AC-23	Switching of motor loads or other highly induktive loads
AC-3	Starting squirrel-cage motor and switching off motors when running
AC-4	Starting squirrel-cage motors, plugging, inching, reversing
AC-15	Control switch for switching magnetic devices, contactors, valves

ORDERING INFORMATION

When ordering please define:

1.- Switch type
2.- Number of schematic diagram
3.- Mounting form (for front "U" or rear mount "O"
4.- Front part - Optional:

PS - (handle black and front plate model PS) - on request.
LK - (red knob and yellow plate for main emergency on - off switch).
ES - (handle-red and front plate-yellow)

EXAMPLE:

1	2	3
BS 25	10	U

Type **- BS 25**, schematic diagram **- 10,** mounting form **- U,** with standard **black** handle and front plate standard **gray**.

1	2	3	4
BS 40	10	U	PS

Type **- BS 40,** schematic diagram **- 10,** mounting form **- U,** with black handle and PS front plate.

1	2	4
BS 63	10	LK

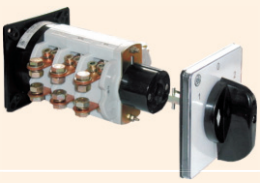
Type **- BS 63,** shematic diagram **- 10,** Main emergency on-off switch with 3 padlock facility in "0" position **- LK**

TECHNICAL DATA

TYPE			BS 16	BS 25	BS 32	BS 40	BS 63	BS 80	BS 100	BS 125	BS 200	BS 400	BS 630
Rated insulation voltage	U_i	V				690					690		
Rated impulse withstand voltage	U_{imp}	kV				6					8		
Rated thermal current	Ith	**A**	**20**	**25**	**32**	**40**	**63**	**80**	**100**	**125**	**200**	**400**	**630**
Max. fuse size for short circuit protection	gL 10 kA	A	20	25	32	40	63	80	100	125	200	400	630
Rated Short-time Withstand current	1 sek	A	250	400	600	800	800	1000	1800	2100	3000		
	3 sek	A	150	250	400	530	700	800	900	1300	1700		
Icw	10 sek	A	80	140	240	290	350	400	450	700	850		
	30 sek	A	50	90	150	200	250	250	300	400	500		
	60 sek	A	40	70	120	150	150	160	200	300	400		
Rated operational current I_e AC1 / AC21		A	20	25	32	40	63	70	75	120	200	400	630
Rated operational current I_e AC15	110V	A	10	20	25	40	50	-	-	-	-	-	-
	220/230V	A	8	20	25	30	40	-	-	-	-	-	-
	380/400V	A	6	16	20	25	40	-	-	-	-	-	-
	660/690V	A		8	8.5	8.5	10	-	-	-	-	-	-
Motor switch in utilization category AC3													
3-phaze	220/230V	kW	3	5.5	7.5	9	11	12	19	26	37	37	37
	380/400V	**kW**	**5**	**7.5**	**11**	**15**	**18.5**	**22**	**32**	**41**	**60**	**60**	**60**
	500/690V	kW	-	11	15	19	22	28	42	55	75	75	75
1-phase 2 poles	110V	kW	0.8	1.5	2.5	2.5	3	-	-	-	-	-	-
	220/230V	kW	2.2	3	4.8	5.5	6	-	-	-	-	-	-
	380/400V	kW	3	5.5	6.5	7.5	11	-	-	-	-	-	-
AC23													
	220/230V	kW	5	6.5	8	9	15	18.5	22	26	37	37	37
3-phaze	**380/400V**	**kW**	**7.5**	**11**	**15**	**18.5**	**22**	**32**	**37**	**41**	**60**	**60**	**60**
	500/690V	kW	-	11	18.5	22	30	45	55	55	75	75	75
1-phase 2 poles	110V	kW	0.8	1.5	2.5	3	3.5	-	-	-	-	-	-
	220/230V	kW	2.5	3.7	5	6	9	-	-	-	-	-	-
	380/400V	kW	3.7	5.5	7.5	9	15	-	-	-	-	-	-
AC4													
	220/230V	kW	1.5	2.5	3	5	6	7	9.5	17	17		
3-phase	380/400V	kW	3	4	5.5	8	11	12	16	30	30		
	500/690V	kW	-	4	7.5	8	11	12	16	32	32		
Mechanical endurance switching cycles		10^6	3	3	3	3	2	10	10	3	1	0.5	0.5
Terminal screw			M3.5	M3.5	M4	M5	M5	2xM5	2xM5	M8	M10	M12	M16
Screw head			PZ2	PZ2	PZ2	PZ2	PZ2						
Tightening torque			0.8	0.8	1.2	1.8	2						
Cable cross-section	Rigid	mm^2	2x(1-4) 1-6*	2x(1-4) 1-6*	2x(2.5-6) 1-10*	2x(2.5-10)	2x(4-16)	6-25 2x(6-16)	6-25 2x(6-16)	16-35	70-95 (2)	70-240	70-240
	Flexible		2x(1-4)	2x(1-4)	2x(2.5-6) 1-10*	2x(2.5-10)	2x(4-16)					△	△

(1) Valid for neutral earthed systems, overvoltage category III, polution degree 3
(*) Only for diagrams without inside links
△ Connection valid to connect copper bars

STANDARD MOUNTING FORMS

Mounting form	Marking	Switch type	Protection Front	Protection Rear	Outlook
Front mounting	U	BS 16 BS 25 BS 32 BS 40 BS 63	IP 40	IP 20	
		BS 80 BS 100 BS 125 BS 200 BS 400 BS 630	IP 40	IP 00	
Front mounting without indicating plate cover	M	BS 16 BS 25 BS 32 BS 40 BS 63	IP 40	IP 20	
		BS 80 BS 100	IP 40	IP 00	
Rear mounting	O	BS 16 BS 25 BS 32 BS 40 BS 63	IP 40	IP 20	
		BS 80 BS 100	IP 40	IP 00	
Mounting on rail * maximum up to 4 elements	L	BS 16 BS 25 BS 32	IP 40	IP 20	
Switch with door interlock device. Door opening only in “0”	S8	BS 125 BS 200 BS 400 BS 630	IP 40	IP 00	
Switch in insulated enclosures	PN	PNBS 16 PNBS 25	IP 65		
Switch in insulated enclosures	PNG	PNGBS 25 PNGBS 32 PNGBS 40	IP 65		

STANDARD MOUNTING FORMS

Mounting form	Marking	Switch type	Protection Front	Protection Rear	Outlook
Switch in insulated enclosures	**PNG LK**	PNGBS 25 .. LK PNGBS 32 .. LK PNGBS 40 .. LK	IP 65		
Switch in insulated enclosures	**PN1**	PN1BS 16 PN1BS 25	IP 55		
Switch in insulated enclosures	**PN2**	PN2BS 32 PN2BS 40 PN2BS 63	IP 55		
Switch in insulated enclosures	**PN3**	PN3BS 80 PN3BS 100	IP 54		
Switch in insulated enclosures	**PN4**	PN4BS 80 PN4BS 100 PN4BS 125 PN4BS 200	IP 54		

FRONT PLATES MODEL EXAMPLES

FRONT PLATE BS

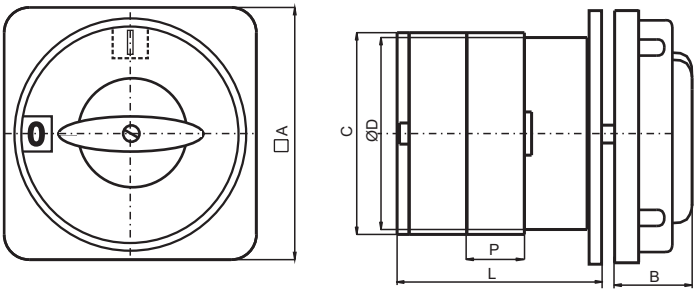
FRONT PLATE PS

"ES" - GENERAL EMERGENCY ON - OFF SWITCH

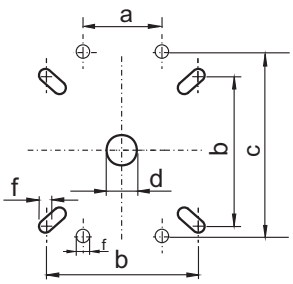
GENERAL EMERGENCY ON - OFF SWITCH VERSION “LK” WITH PADLOCKING ONLY IN "0"

- Emergency switch have to make electrical separation beetwen el. supply and electrical equipment.
- Control handle according the Standards is Red, and the plate behind the handle yellow.
- Emergency switch is able to lock in the open position "0" up to three padlocks.

DIMENSIONAL DRAWINGS VERSION “LK” (mm)



DRILLING PLAN

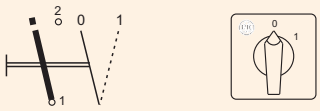


TYPE	□A	C	ØD	P	B	L* / 2	b	d	f	a	c
BS 16 .. LK BS 25 .. LK	49	45.2	38.6	12.8	35	45.3	36	10	3.2		
BS 32 .. LK	72	53	38.6	12.8	32	49.8	58	10	4.2		
BS 40 .. LK	72	61	56.4	17.5	32	68.1	58	10	4.2		
BS 63 .. LK	72	68.6	56.4	20.5	32	63	58	10	4.2		
BS 80 .. LK BS 100 .. LK	105	84	80	25	44	92.5	85	14	5.3		
BS 125 .. LK BS 200 .. LK	130		110	39	62	100		18	5.3	30	90

* L for 2 elements

Switches with 60° switching

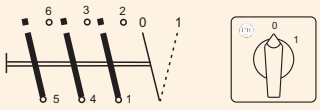
1 pole / 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 90 U	602367R	16A		65	1
BS 25 90 U	602368	25A		70	
BS 32 90 U	602460	32A		90	
BS 40 90 U	602378	40A		155	
BS 63 90 U	602247	63A		245	
BS 80 90 U	602383	80A		360	
BS 100 90 U	602653	100A		410	

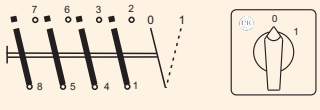
2 poles / 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 91 U	602363R	16A		60	1
BS 25 91 U	602484	25A		75	
BS 32 91 U	602373	32A		95	
BS 40 91 U	602377	40A		160	
BS 63 91 U	602248	63A		250	
BS 80 91 U	602850	80A		365	
BS 100 91 U	602851	100A		420	

3 poles / 2 elements (3 elements for BS 400; 5 elements for BS 630)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 10 U	602361R	16A		95	1
BS 25 10 U	600338	25A		100	
BS 32 10 U	602375	32A		140	
BS 40 10 U	602379	40A		240	
BS 63 10 U	602033	63A		375	
BS 80 10 U	602380	80A		550	
BS 100 10 U	602384	100A		635	
BS 125 10 U	602463	125A		1330	
BS 200 10 U	600267	200A		1820	
BS 400 10 U	601804	400A		2900	
BS 630 10 U	602307	630A		4420	

4 poles / 2 elements (4 elements for BS 400; 6 elements for BS 630)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 92 U	602481R	16A		100	1
BS 25 92 U	602506	25A		105	
BS 32 92 U	601903	32A		145	
BS 40 92 U	602578	40A		245	
BS 63 92 U	602577	63A		380	
BS 80 92 U	602510	80A		560	
BS 100 92 U	602852	100A		640	
BS 125 92 U	603798	125A		1405	
BS 200 92 U	600268	200A		2200	
BS 400 92 U	602134	400A		3060	
BS 630 92 U	602135	630A		4650	

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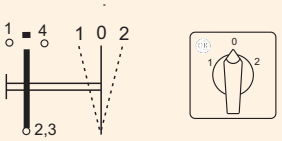
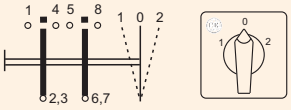
Changeover switches with “0” - 60º switching

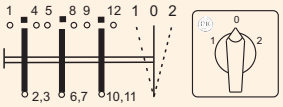
1 pole / 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 51 U	602364R	16A		85	1
BS 25 51 U	602370	25A		90	
BS 32 51 U	601891	32A		120	
BS 40 51 U	601907	40A		185	
BS 63 51 U	602249	63A		275	
BS 80 51 U	603228	80A		390	
BS 100 51 U	609339	100A		445	

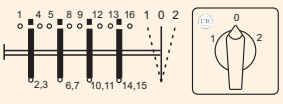
2 poles / 2 elements (4 elements for BS 400; 6 elements for BS 630)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 52 U	602365R	16A		100	1
BS 25 52 U	601867	25A		105	
BS 32 52 U	602374	32A		165	
BS 40 52 U	602513	40A		245	
BS 63 52 U	602250	63A		380	
BS 80 52 U	602849	80A		560	
BS 100 52 U	631245	100A		640	
BS 125 52 U	604770	125A		1545	
BS 200 52 U	600269	200A		2010	
BS 400 52 U	602136	400A		3050	
BS 630 52 U	602137	630A		4630	

3 poles / 3 elements (6 elements for BS 400; 9 elements for BS 630)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 53 U	602366R	16A		140	1
BS 25 53 U	602369	25A		145	
BS 32 53 U	602372	32A		190	
BS 40 53 U	602419	40A		345	
BS 63 53 U	602251	63A		450	
BS 80 53 U	602381	80A		790	
BS 100 53 U	602386	100A		795	
BS 125 53 U	602512	125A		1943	
BS 200 53 U	600270	200A		2737	
BS 400 53 U	602046	400A		5060	
BS 630 53 U	602048	630A		7580	

4 poles / 4 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 75 U	602710R	16A		180	1
BS 25 75 U	602569	25A		185	
BS 32 75 U	602503	32A		375	
BS 40 75 U	602405	40A		460	
BS 63 75 U	602444	63A		565	
BS 80 75 U	602571	80A		1015	
BS 100 75 U	602859	100A		1030	

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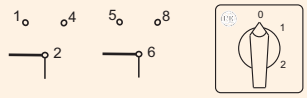
Multi-step switches with “0”

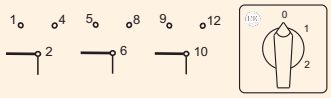
1 pole / 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 107 U	602584R	16A		70	1
BS 25 107 U	603556	25A		75	
BS 32 107 U	609340	32A		95	
BS 40 107 U	609341	40A		160	
BS 63 107 U	609342	63A		250	
BS 80 107 U	609343	80A		365	
BS 100 107U	609344	100A		420	

2 poles / 2 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 123 U	603795R	16A		130	1
BS 25 123 U	631215	25A		135	
BS 32 123 U	609345	32A		165	
BS 40 123 U	609346	40A		250	
BS 63 123 U	609347	63A		375	
BS 80 123 U	609348	80A		550	
BS 100 123U	609349	100A		630	

3 poles / 3 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 135 U	609350	16A		135	1
BS 25 135 U	602727	25A		140	
BS 32 135 U	609351	32A		190	
BS 40 135 U	607194	40A		345	
BS 63 135 U	604704	63A		450	
BS 80 135 U	603276	80A		790	
BS 100 135U	609352	100A		795	

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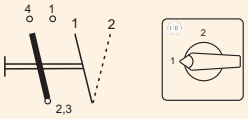
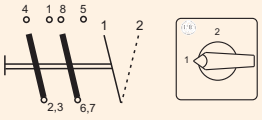
Changeover switches without “0” - 90º switching

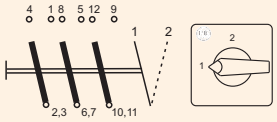
1 pole / 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 54 U	602364R	16A		85	1
BS 25 54 U	602370	25A		90	
BS 32 54 U	601891	32A		120	
BS 40 54 U	601907	40A		185	
BS 63 54 U	602249	63A		275	
BS 80 54 U	603228	80A		390	
BS 100 54 U	602385	100A		445	

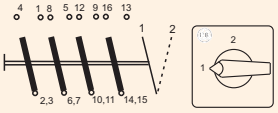
2 poles / 2 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 55 U	602522R	16A		100	1
BS 25 55 U	602623	25A		105	
BS 32 55 U	603971	32A		145	
BS 40 55 U	602419	40A		245	
BS 63 55 U	603415	63A		380	
BS 80 55 U	609353	80A		560	
BS 100 55 U	607718	100A		640	

3 poles / 3 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 56 U	603438R	16A		140	1
BS 25 56 U	601873	25A		145	
BS 32 56 U	603823	32A		190	
BS 40 56 U	609354	40A		345	
BS 63 56 U	609355	63A		450	
BS 80 56 U	609356	80A		790	
BS 100 56 U	603516	100A		795	

4 poles / 4 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 69 U	602523R	16A		180	1
BS 25 69 U	602567	25A		185	
BS 32 69 U	603824	32A		375	
BS 40 69 U	631194	40A		460	
BS 63 69 U	605886	63A		565	
BS 80 69 U	606439	80A		1015	
BS 100 69 U	609357	100A		1030	

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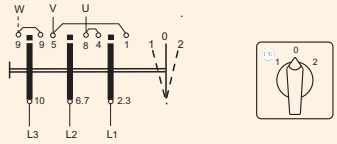
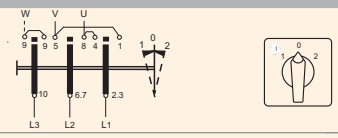
Motor Switches

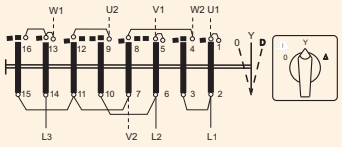
Motor reversing switches - 3 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 11 U	602547R	16A		140	1
BS 25 11 U	602546	25A		145	
BS 32 11 U	601887	32A		190	
BS 40 11 U	602598	40A		345	
BS 63 11 U	602356	63A		450	
BS 80 11 U	606732	80A		790	
BS 100 11 U	603307	100A		795	
BS 125 11 U	602813	125A		2020	
BS 200 11 U	600271	200A		2395	

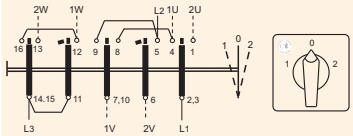
Motor reversing switches - 3 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 26 U	609358	16A		140	1
BS 25 26 U	602947	25A		145	
BS 32 26 U	603938	32A		190	
BS 40 26 U	602660	40A		345	

Star-delta switch - 4 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 12 U	602847R	16A		170	1
BS 25 12 U	602479	25A		175	
BS 32 12 U	602797	32A		270	
BS 40 12 U	602376	40A		435	
BS 63 12 U	602355	63A		600	
BS 80 12 U	602382	80A		1090	
BS 100 12 U	602387	100A		1130	

Motor control switches (Dahlander) - 4 elements (Δ-0-YY)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 13 U	602919R	16A		180	1
BS 25 13 U	602465	25A		185	
BS 32 13 U	603284	32A		375	
BS 40 13 U	602794	40A		460	
BS 63 13 U	609359	63A		565	
BS 80 13 U	609360	80A		1015	
BS 100 13 U	609361	100A		1030	

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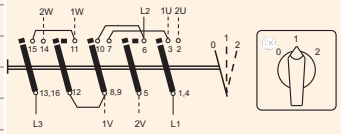
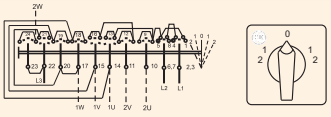
Motor Switches

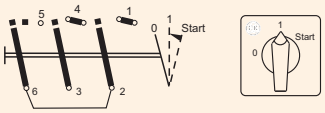
Motor control switches (Dahlander) - 4 elements (0-Δ-YY)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 19 U	603440R	16A		170	1
BS 25 19 U	602455	25A		175	
BS 32 19 U	602632	32A		270	
BS 40 19 U	602521	40A		435	
BS 63 19 U	609362	63A		600	
BS 80 19 U	603806	80A		1090	
BS 100 19 U	609363	100A		1130	

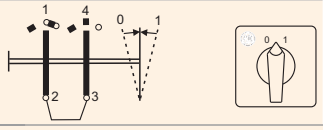
Motor control switches (Dahlander) - 6 elements (YY-Δ-0-Δ-YY)

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 20 U	609364	16A		205	1
BS 25 20 U	602508	25A		210	
BS 32 20 U	609365	32A		270	
BS 40 20 U	609366	40A		465	

Start and run switches - 2 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 15 U	601842R	16A		95	1
BS 25 15 U	602477	25A		100	
BS 32 15 U	603760	32A		140	
BS 40 15 U	602825	40A		240	
BS 63 15 U	609367	63A		375	
BS 80 15 U	609368	80A		550	
BS 100 15 U	609369	100A		635	

Control switches (with spring return) - 1 element

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 207 U	631106R	16A		70	1
BS 25 207 U	602485	25A		75	
BS 32 207 U	603766	32A		95	
BS 40 207 U	602753	40A		160	

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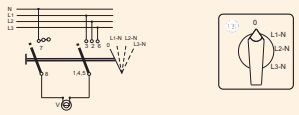
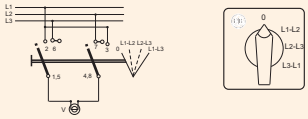
Voltmeter switches

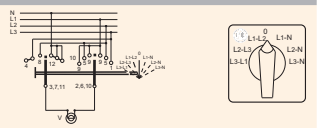
To measure 3 phase voltages L1-N, L2-N, L3-N - 2 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 68 U	602547R	16A		100	1
BS 25 68 U	609370	25A		105	
BS 32 68 U	609371	32A		145	
BS 40 68 U	609372	40A		245	

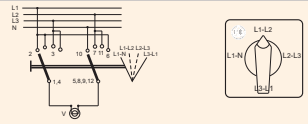
To measure 3 line voltages L1-L2/L2-L3/L3-L1 - 2 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 67 U	602547R	16A		105	1
BS 25 67 U	609373	25A		105	
BS 32 67 U	609374	32A		145	
BS 40 67 U	609375	40A		245	

To measure 3 phase and 3 line voltages - 3 elements

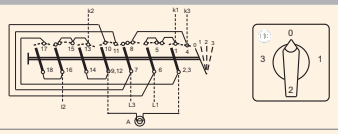
Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 66 U	602547R	16A		140	1
BS 25 66 U	609376	25A		145	
BS 32 66 U	609377	32A		190	
BS 40 66 U	609378	40A		345	

To measure 1 phase and 3 line voltages - 3 elements

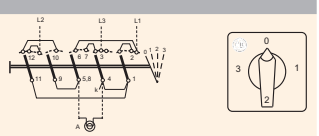
Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 60 U	602547R	16A		140	1
BS 25 60 U	609379	25A		145	
BS 32 60 U	609380	32A		190	
BS 40 60 U	609381	40A		345	

Ammeter switches

2 pole, 0 position, 3 current (with current transformers) - 6 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 97 U	602547R	16A		200	1
BS 25 97 U	609382	25A		205	
BS 32 97 U	609383	32A		265	
BS 40 97 U	609384	40A		460	

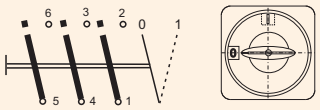
1 pole and 3 currents (with current transformers) - 4 elements

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 98 U	602547R	16A		165	1
BS 25 98 U	609385	25A		170	
BS 32 98 U	609386	32A		380	
BS 40 98 U	609387	40A		425	

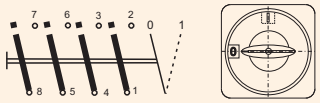
Technical data - page 109; Dimensional drawings - page 123

General emergency ON-OFF switches version “LK” with padlocking only in 0

3 poles

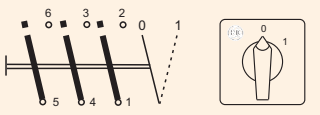
Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 10 LK	605908R	16A		135	1
BS 25 10 LK	602824	25A		140	
BS 32 10 LK	602488	32A		180	
BS 40 10 LK	600991	40A		280	
BS 63 10 LK	602646	63A		425	
BS 80 10 LK	602666	80A		600	
BS 100 10LK	603435	100A		685	
BS 125 10LK	605696	125A		1330	
BS 200 10LK	605697	200A		1820	
BS 400 10LK	609388	400A		2900	
BS 630 10LK	607474	630A		4420	

4 poles

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 92 LK	609484	16A		100	1
BS 25 92 LK	603720	25A		105	
BS 32 92 LK	604366	32A		145	
BS 40 92 LK	631250	40A		245	
BS 63 92 LK	602715	63A		380	
BS 80 92 LK	607246	80A		560	
BS 100 92LK	602714	100A		640	
BS 125 92LK	609389	125A		1405	
BS 200 92LK	606782	200A		1900	
BS 400 92LK	609390	400A		2980	
BS 630 92LK	609391	630A		4500	

General emergency ON-OFF switches version “ES”

3 poles

Type	Order number	Thermal current Ith	Connection diagram	Weight [g]	Packing [pcs]
BS 16 10 ES	609392	16A		95	1
BS 25 10 ES	605417	25A		100	
BS 32 10 ES	602712	32A		140	
BS 40 10 ES	602982	40A		240	
BS 63 10 ES	602713	63A		375	
BS 80 10 ES	602765	80A		550	
BS 100 10ES	605416	100A		635	

Technical data - page 109; Dimensional drawings - page 123

Rotary cam switches in insulated enclosures

PNBS 16, PNBS 25

PNGBS 25, PNGBS 32, PNGBS 40

PNGBS 25..LK, PNGBS 32..LK, PNGBS 40..LK

PNGBS 16, PNGBS 25

	Degree of protection	Type	No.	
Number of elements 1-3	IP 65	**PNBS 16** **PNBS 25 ***	.. ..	. .
Number of diagram - (90, 91,10, 92, 51, 52, 53, 54, 55, 56, 11, 15)				
Front part: Black handle and front plate gray - standard				
Number of elements 1-3 for BS 25, BS 32, BS 32 .. LK Number of elements 1-2 for BS 40, BS 40 .. LK	IP 65	**PNGBS 25** **PNGBS 32** **PNGBS 40**	.. .. ..	. . .
		PNGBS 25 **PNGBS 32** **PNGBS 40**	.. .. ..	LK LK LK
Number of diagram for PNGBS 25 - (90, 91,10, 92, 51, 52, 53, 54, 55, 56, 11, 15) Number of diagram for PNGBS 32 - (90, 91,10, 92, 51, 52, 53, 54, 55, 56, 11, 15) Number of diagram for PNGBS 40 - (90, 91,10, 92, 51, 52, 54, 55)				
Front part: Black handle and front plate gray - standard				
Number of elements 4-6	IP 55	**PN1BS 16** **PN1BS 25**	.. ..	. .
No. of diagram - (12, 13, 75, 69, 19, 97, 98)				
Front part: Black handle and front plate gray - standard				

NOTES:
Color of enclosures is grey (RAL 7035)
* Only with conection cable up to 2.5 mm^2
No. - Number of diagram

Rotary cam switches in insulated enclosures

PN2BS 32, PN2BS 40,
PN2BS 63

	Degree of protection	Type	No.
Number of elements 4-5 for BS 32	IP 55	**PN2BS 32**	.. .
Number of elements 3-5 for BS 40		**PN2BS 40**	.. .
Number of elements 1-4 for BS 63		**PN2BS 63**	.. .

Number of diagram for PN2BS *32* - (75, 69, 13, 12, 19, 97, 98)
Number of diagram for PN2BS *40* - (53,75, 56, 69, 11,13, 12, 26,19, 97, 98)
Number of diagram for PN2BS 63 - (90, 91, 10, 92, 51, 52, 53, 75, 54,
55, 56, 69, 11, 13, 12, 26, 19, 15, 207, 98)

Front part:
Black handle and front plate gray - standard

PN3BS 80, PN3BS 100

Number of elements 1-3	IP 54	**PN3BS 80**	.. .
		PN3BS 100	.. .

Number of diagram - (90, 91, 10, 92, 51, 52, 53, 54, 55, 56, 11, 26, 15,)

Front part:
Black handle and front plate gray - standard

PN4BS 80, PN4BS 100
PN4BS 125, PN4BS 200

Number of elements 4 for BS 80	IP 54	**PN4BS 80**	.. .
Number of elements 4 for BS 100		**PN4BS 100**	.. .
Number of elements 1-3 for BS 125		**PN4BS 125**	.. .
Number of elements 1-2 for BS 200		**PN4BS 200**	.. .

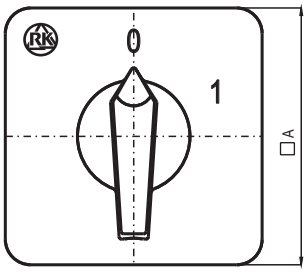
Number of diagram for PN4BS 80, 100 - (12, 13, 19, 75, 98)
Number of diagram for PN4BS 125 - (10, 11, 51, 52, 53, 54, 55, 56, 92)
Number of diagram for PN4BS 200 - (10, 51, 52, 54, 55, 92)

Front part:
Black handle and front plate gray - standard

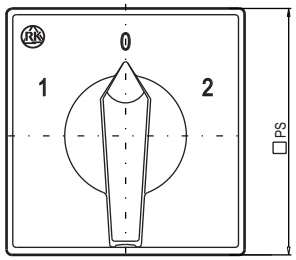
No. - Number of diagram

Technical data - page 109; Dimensional drawings - page 123

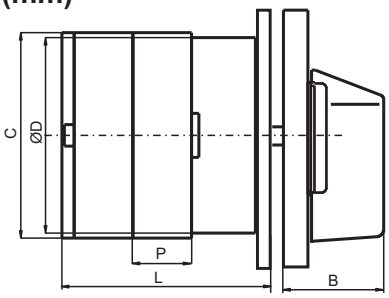
DIMENSIONAL DRAWINGS (mm)



Front Plate Standard



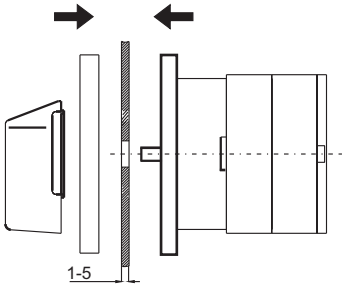
Front Plate PS



TYPE			MARKING			NUMBER OF ELEMENTS (L/mm)												
	□A	□PS	B	C	ØD	P	1	2	3	4	5	6	7	8	9	10	11	12
BS 16 BS 25	51,2	48	27,2	45,2	38,6	12,8	32,5	45,3	58,1	70,9	83,7	96,5	109,3	122,1	134,9	147,7	160,5	173,3
BS 32	72	65	33	53	38,6	12,8	37	49.8	62.6	75,4	88,2	101	113,8	126,6	139,4	152,2	165	177,8
BS 40	72	65	33	61	56,4	17,5	50,6	68,1	85,6	103,1	120,6	138,1	155,6	173,1	190,6	208,1	225,6	243,1
BS 63	72	65	33	68,6	56,4	20,5	42,5	63	83,5	104	124,5	145	165,5	186	206,5	227	247,5	268
BS 80 BS 100	105	90	41	84	80	25	67,5	92,5	117,5	142,5	167,5	192,5	217,5	242,5	267,5	292,5	317,5	342,5
BS 125	130	130	62	110	110	30	91	121	151	181								
BS 200						39	100	139	178	217								
BS 400						39	100	139	178	217	-	295						
BS 630						39	-	139	178	–	256	295	-	-	412			

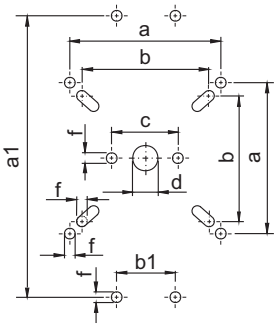
(*) For the switch with 5-9 elements see the dimensional drawing on page 13.

FRONT MOUNTING "U"



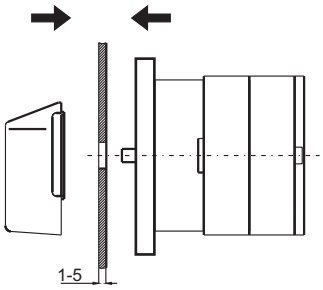
* for PS front plate

DRILLING PLAN

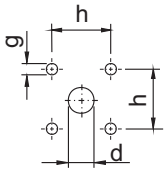


TYPE	a	b	a1	b1	c	d	f
BS 16 BS 25		34-36 *36			30	10	3.2
BS 32					*30*		3.2
BS 40	58	48			*45*	10	4.2
BS 63							
BS 80 BS 100	85	68-74 *72			40	14	5.3
BS 125							
BS 200			90	30		18	5.3
BS 400							
BS 630							

FRONT MOUNTING "M"

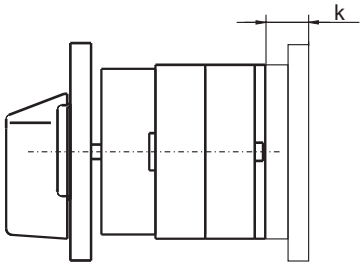


DRILLING PLAN

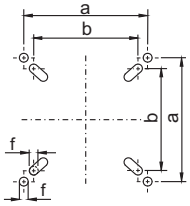


TYPE	h	d	g
BS 16 BS 25	13.5	10 10	3.5
BS 32 BS 40 BS 63	16.2	10	4
BS 80 BS 100	20	14	4.5

REAR MOUNTING "O"

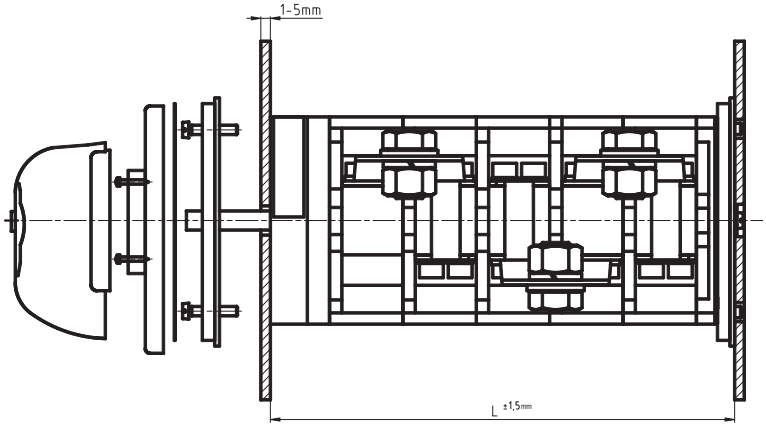


DRILLING PLAN

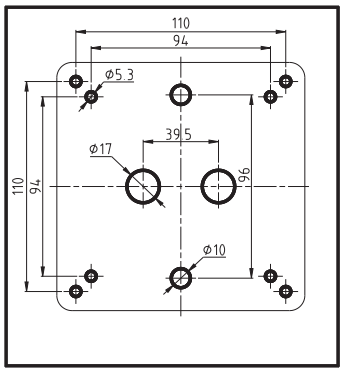


TYPE	a	b	f	k
BS 16 BS 25	36	36	4.2	15.5
BS 32 BS 40	58	48	4.5	17
BS 63	58	48	4.5	
BS 80 BS 100	85	68	5.3	20.5

Dimensional drawings for “U” type BS 125 - 630 with 5-9 elements (mm)



DRILLING PLAN FROM REAR SITE



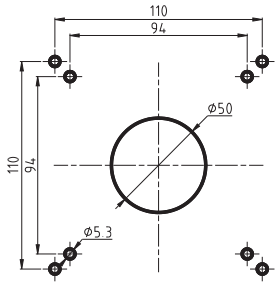
Size	Number of elements - L (mm)				
	5	6	7	8	9
BS 125	191	251	281	311	341
BS 200	236	305	344	383	422
BS 400	236	305	344	383	422
BS 630	236	305	-	383	422

Note

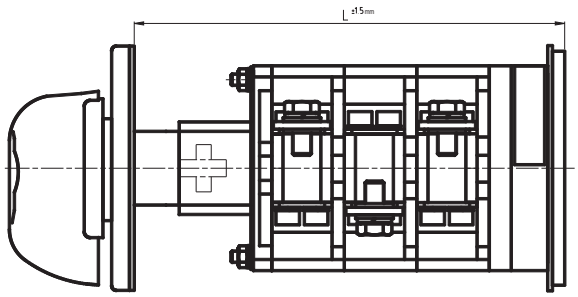
- For the switch with 5-9 elements the front plate is also mounted at the back side

DIMENSIONAL DRAWINGS FOR “S8” FOR BS 125 - 630

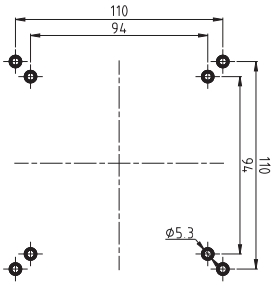
ON THE DOOR



DRILLING PLAN



LOOK FROM REAR SITE



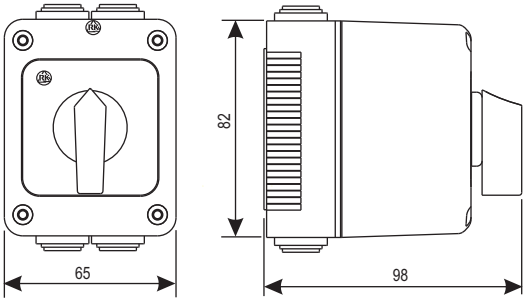
Size	Number of elements - L (mm)				
	1	2	3	4	5
BS 125	150	180	210	240	270
BS 200	159	198	237	276	315
BS 400	159	198	237	276	315
BS 630	-	198	237	-	315

SWITCHES SERIES BS 125 - BS 630

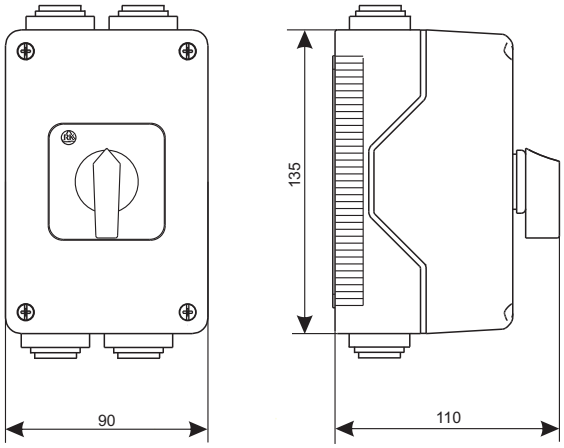
CODE	Number of elements			
	BS 125	**BS 200**	**BS 400**	**BS 630**
10	2	2	3	5
92	2	2	4	6
52	2	2	4	6
53	3	3	6	9
11	3	3		

DIMENSION DRAWINGS (mm)

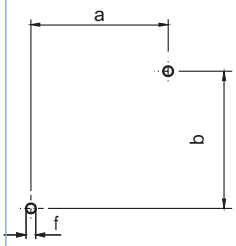
PNBS 16, 25



PNGBS 25, 32, 40



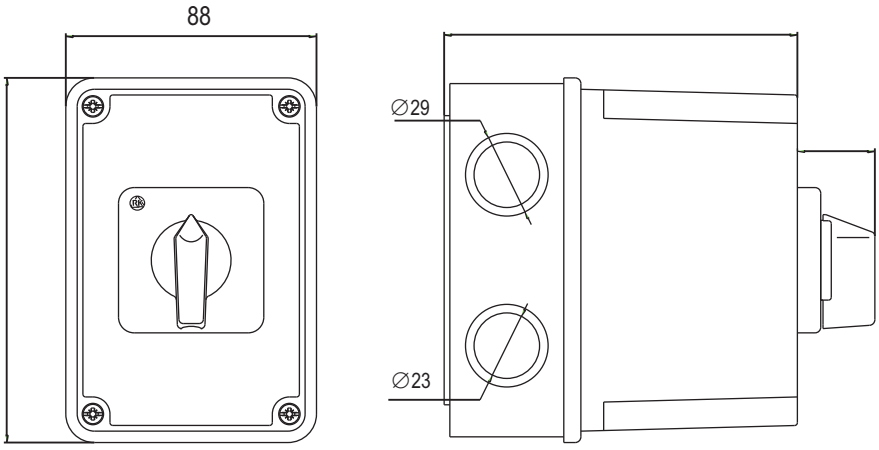
DRILLING PLAN



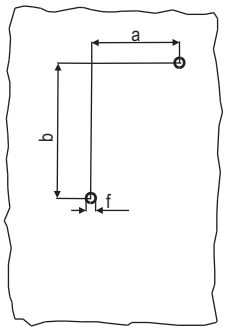
TYPE	a	b	f
PNBS 16 * PNBS 25 *	44	48	4,3
PNGBS 25 PNGBS 32 (LK) PNGBS 40 (LK)	48	100	4,3

NOTES
* Color of enclosures is grey (RAL 7035)
* Only with connections cable up to 2.5 mm^2

PN1BS 16, 25

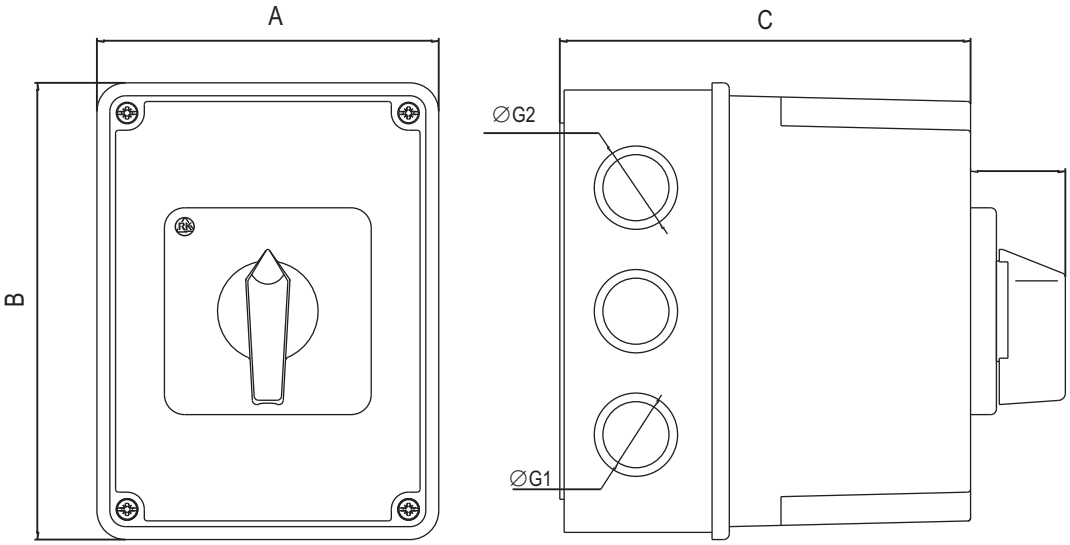


DRILLING PLAN



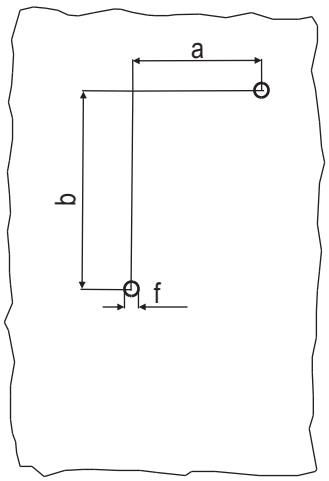
TYPE	a	b	f
PN1BS 16 PN1BS 25	42	82	4,3

DIMENSION DRAWINGS (mm)



TYPE	MARKING					
	A	B	C	D	ØG1	ØG2
PN2BS 32 PN2BS 40 PN2BS 63	119	159	143	33	23	29
PN3BS 80 PN3BS 100	155	201	148	41	29	37
PN4BS 80 PN4BS 100	210	260	168	41	29	37
PN4BS 125 PN4BS 200	210	260	168	57	29	37

DRILLING PLAN



TYPE	a	b	f
PN2BS 32 PN2BS 40 PN2BS 63	72	112	4,5
PN3BS 80 PN3BS 100	98	144	4,5
PN4BS 80 PN4BS 100 PN4BS 125 PN4BS 200	140	194	4,3

SWITCHES WITH SPECIAL SWITCHING PROGRAM

When ordering cam switches with special switching program that are not included in the catalogue, the purchaser is required to submit a developed diagram for switching of contacts. For this purpose we have created an order form, which besides the diagram, purchaser should fill in data for rated current, rated voltage, utilization category, mounting form, type of handle, special version and marks on the front plate.
Example of filled order form.

Order Sheet for special rotary cam switches

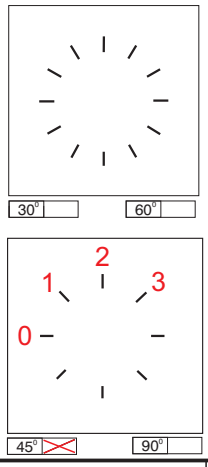
RADE KONČAR KONTAKTORI I RELEI

Voltage 400 V/50Hz	Power 15 kW	Current 29 A	Utilization category AC 23	Mounting form ☒ U Front ☐ O Rear

Front parts ☒ **Note: Standard combination of front parts.**

Optional	Optional	Optional	Optional
Model of front plate ☐ Standard ☐ PS ☐ M	Color of Handle ☐ Black ☐ Blue ☐ Red	Color of front plate ☐ Grey ☐ Yellow	Emergency on-off swich with padlocking only in "0" ☐ LK

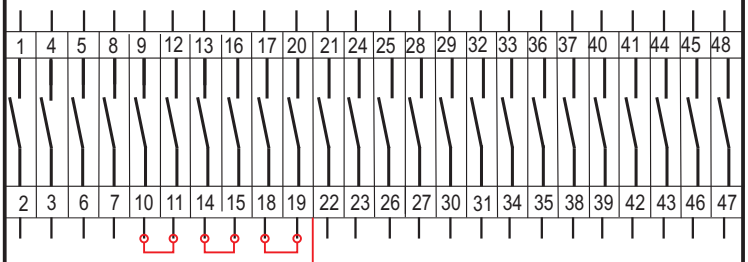
Arrangement of position marks on front plate



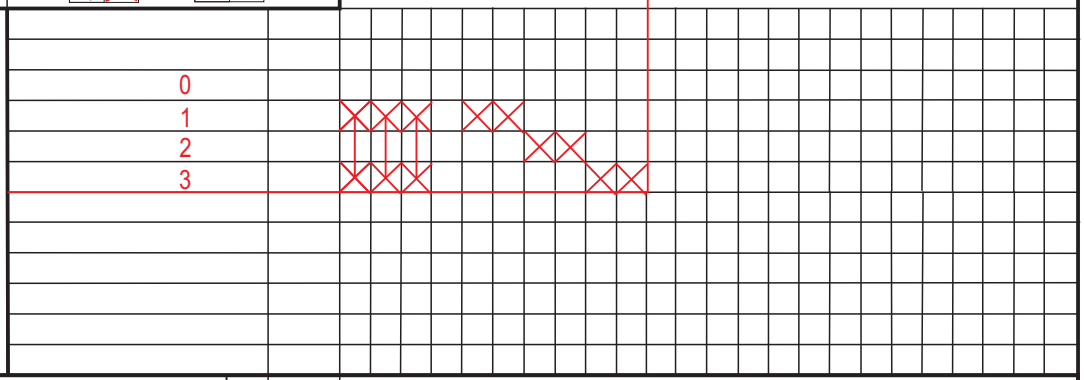
☐ Full rotation 360°

Additional requirements

Contact scheme and jumpers (pre-wired)



Connection diagram



Note:

∢ 45°

1			X			X			X			X				X				X	
2						X			X				X							X	

Contact closed · Contact closed no break · Contact closed with break · Overlapping of contacts · Passing contact · Self return 30° max.

Order no. _____

Purchaser _____

Address _____

Telephone _____ E-mail _____ Date _____

Order Sheet for special rotary cam switches

RADE KONČAR KONTAKTORI I RELEI

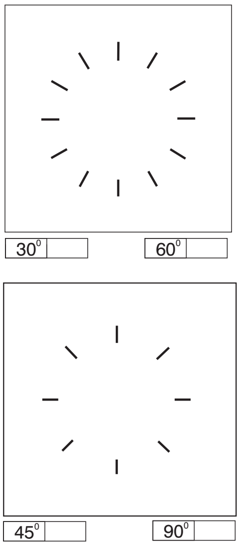
Voltage ______V/50Hz | Power ______kW | Current______A | Utilization category AC____ | Mounting form ☐ U Front ☐ O Rear

Front parts

☐ Note: Standard combination of front parts.

Optional	Optional	Optional	Optional
Model of front plate ☐ Standard ☐ PS ☐ M	Color of Handle ☐ Black ☐ Blue ☐ Red	Color of front plate ☐ Grey ☐ Yellow	Emergency on-off swich with padlocking only in "0" ☐ LK

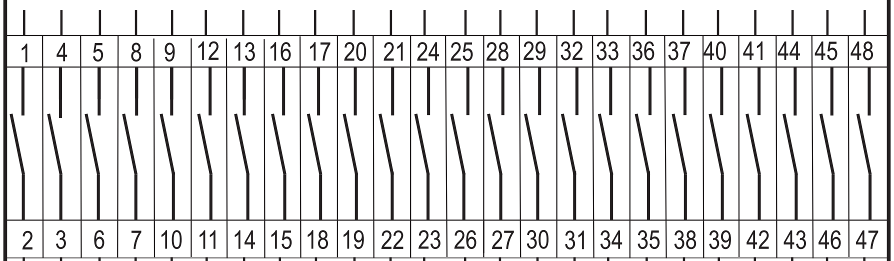
Arrangement of position marks on front plate



Full rotation 360° ☐

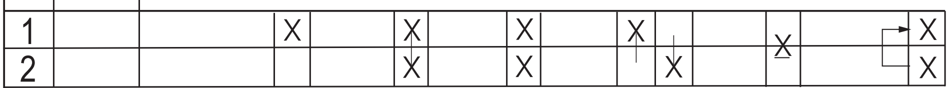
Additional requirements

Contact scheme and jumpers (pre-wired)



Connection diagram

Note:



Contact closed | Contact closed no break | Contact closed with break | Overlapping of contacts | Passing contact | Self return 30° max.

Order no. ____________________

Purchaser ____________________

Address ____________________

Telephone ____________________ E-mail ____________________ Date ____________________

PUSHBUTTONS AND INDICATOR LIGHTS - PBN

General information	129
Mounting instruction	130
Ordering codes	131
Pushbuttons in insulated enclosures - PNPBN	136
Technical data	136
Dimensions drawings	137

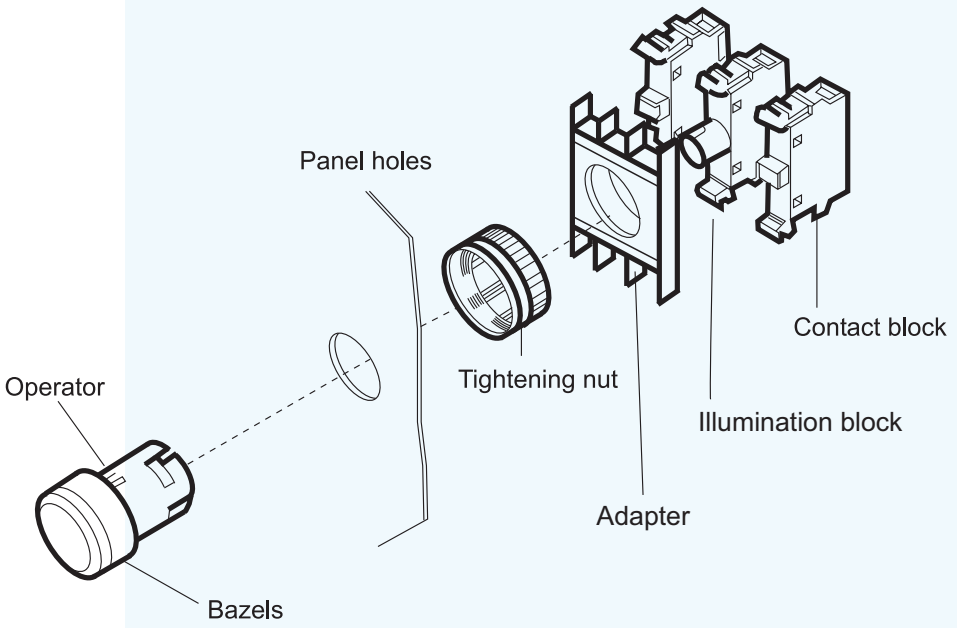
Pushbuttons and indicator lights

Pushbuttons and indicator lights

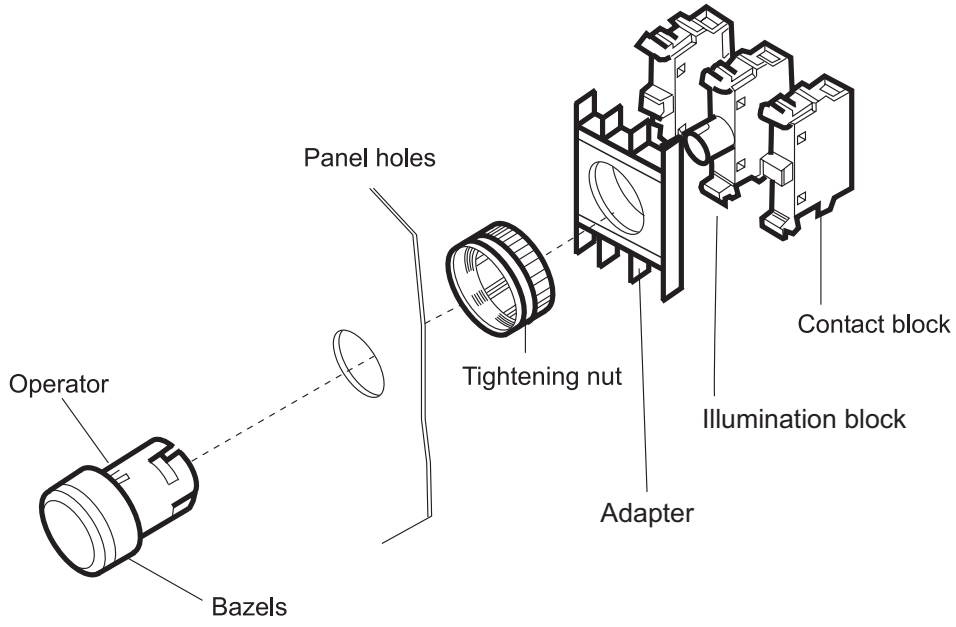
PUSHBUTTONS AND INDICATOR LIGHTS - PBN

Push-button is a control switch having an actuator intended to be operated by force exerted by a part of the human body, usually the finger or palm of the hand, and having stored energy (spring) return. push-buttons communicate information, both ways. It sends information from the human to the machine (trning it on and off) and from the machine to the human (current state of the machine). Pilot devices are widely spread products and can be found in residential, commercial and industrial buildings.

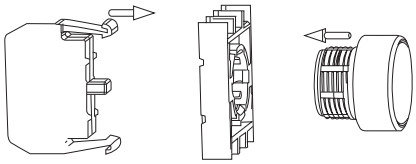
Rade Koncar Kontaktori I Relei offers a wide range of push-buttons and indicator lights like flat and extended pushbuttons, toggle switch, selector switches, double pushbuttons, pilot lights and buzzers, mushrooms and other. We also have insulated enclosures to insulate the product.



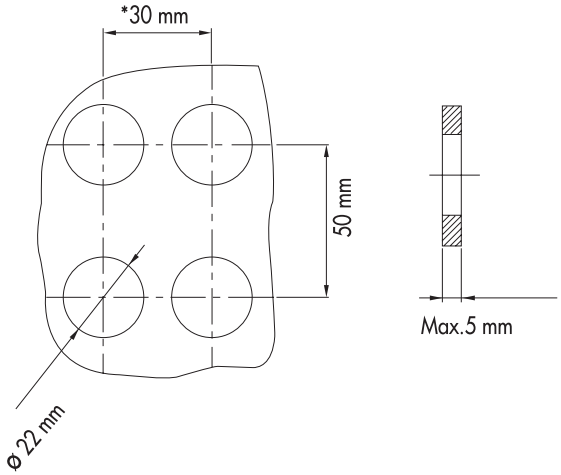
MOUNTING INSTRUCTION



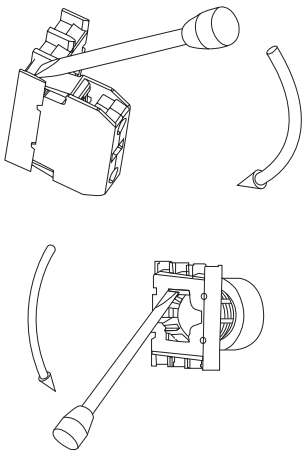
ASSEMBLY



DRILLING PLAN



DISASSEMBLY



*The mounting distance in emergency and mushroom buttons increases up to max. 75 mm instead of 30 mm

Pushbuttons 22 mm diameter

Non-illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-1-01 R	605647	red	1NC	27.0	1
PBN 22-1-01 G	609416	green	1NC	27.0	
PBN 22-1-01 Y	609393	yellow	1NC	27.0	
PBN 22-1-01 BL	609394	blue	1NC	27.0	
PBN 22-1-01 B	609395	black	1NC	27.0	
PBN 22-1-01 W	609396	white	1NC	27.0	

Non-illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-1-10 R	607690	red	1NO	27.0	1
PBN 22-1-10 G	605648	green	1NO	27.0	
PBN 22-1-10 Y	607702	yellow	1NO	27.0	
PBN 22-1-10 BL	607704	blue	1NO	27.0	
PBN 22-1-10 B	607705	black	1NO	27.0	
PBN 22-1-10 W	607703	white	1NO	27.0	

Non-illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-1-11 R	607691	red	1NO+1NC	37.0	1
PBN 22-1-11 G	607692	green	1NO+1NC	37.0	
PBN 22-1-11 Y	607693	yellow	1NO+1NC	37.0	
PBN 22-1-11 BL	609397	blue	1NO+1NC	37.0	
PBN 22-1-11 B	609398	black	1NO+1NC	37.0	
PBN 22-1-11 W	609399	white	1NO+1NC	37.0	

Non-illuminated extended pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-2-01 R	605649	red	1NC	27.0	1
PBN 22-2-01 G	609400	green	1NC	27.0	
PBN 22-2-01 Y	609401	yellow	1NC	27.0	
PBN 22-2-01 BL	609402	blue	1NC	27.0	
PBN 22-2-01 B	609403	black	1NC	27.0	
PBN 22-2-01 W	609404	white	1NC	27.0	

Non-illuminated extended pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-2-10 R	609405	red	1NO	27.0	1
PBN 22-2-10 G	605650	green	1NO	27.0	
PBN 22-2-10 Y	609406	yellow	1NO	27.0	
PBN 22-2-10 BL	609407	blue	1NO	27.0	
PBN 22-2-10 B	609408	black	1NO	27.0	
PBN 22-2-10 W	609409	white	1NO	27.0	

Non-illuminated extended pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-2-11 R	609410	red	1NO+1NC	37.0	1
PBN 22-2-11 G	609411	green	1NO+1NC	37.0	
PBN 22-2-11 Y	609412	yellow	1NO+1NC	37.0	
PBN 22-2-11 BL	609413	blue	1NO+1NC	37.0	
PBN 22-2-11 B	609414	black	1NO+1NC	37.0	
PBN 22-2-11 W	609415	white	1NO+1NC	37.0	

Technical data - page 136; Dimensional drawings - page 137

Pushbuttons 22 mm diameter

Illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-8-01 R 24V AC/DC	609417	red	1NC	39.0	1
PBN 22-8-01 G 24V AC/DC	609418	green	1NC	39.0	
PBN 22-8-01 Y 24V AC/DC	609419	yellow	1NC	39.0	
PBN 22-8-01 BL 24V AC/DC	609420	blue	1NC	39.0	
PBN 22-8-01 B 24V AC/DC	609421	black	1NC	39.0	
PBN 22-8-01 W 24V AC/DC	609422	white	1NC	39.0	

Illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-8-10 R 24V AC/DC	605655	red	1NO	39.0	1
PBN 22-8-10 G 24V AC/DC	607709	green	1NO	39.0	
PBN 22-8-10 Y 24V AC/DC	609423	yellow	1NO	39.0	
PBN 22-8-10 BL 24V AC/DC	609424	blue	1NO	39.0	
PBN 22-8-10 B 24V AC/DC	609425	black	1NO	39.0	
PBN 22-8-10 W 24V AC/DC	609426	white	1NO	39.0	

Illuminated flat pushbuttons					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-8-11 R 24V AC/DC	609427	red	1NO+1NC	49.5	1
PBN 22-8-11 G 24V AC/DC	609428	green	1NO+1NC	49.5	
PBN 22-8-11 Y 24V AC/DC	609429	yellow	1NO+1NC	49.5	
PBN 22-8-11 BL 24V AC/DC	609430	blue	1NO+1NC	49.5	
PBN 22-8-11 B 24V AC/DC	609431	black	1NO+1NC	49.5	
PBN 22-8-11 W 24V AC/DC	609432	white	1NO+1NC	49.5	

* for illumination block see page 135
** led light is also available in 230V AC
Example: PBN 22-8-10 R 230V AC

Toggle switch					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-6-10 W	609433	white	1NO	28.5	1
PBN 22-6-01 W	609434	white	1NC	28.5	
PBN 22-6-11 W	607845	white	1NO+1NC	39.0	

Pilot lights*					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-31-00 R 24V AC/DC	607697	red	X1 — ⊗ — X2	24.0	1
PBN 22-31-00 G 24V AC/DC	607696	green		24.0	
PBN 22-31-00 Y 24V AC/DC	607699	yellow		24.0	
PBN 22-31-00 BL 24V AC/DC	607698	blue		24.0	
PBN 22-31-00 W 24V AC/DC	607701	white		24.0	

* for illumination block see page 135
** led light is also available in 230V AC
Example: PBN 22-31-00 R 230V AC

Pilot devices 22 mm diameter

Mushroom pushbutton - Ø 30					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-4-10 R F30	609435	red	1NO	36.0	1
PBN 22-4-01 R F30	609436	red	1NC	36.0	
PBN 22-4-11 R F30	609437	red	1NO+1NC	46.5	

Mushroom pushbutton - Ø 40					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-4-10 R F40	605651	red	1NO	38.0	1
PBN 22-4-01 R F40	605652	red	1NC	38.0	
PBN 22-4-11 R F40	607689	red	1NO+1NC	48.5	

Mushroom pushbutton - Ø 60					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-4-10 R F60	609438	red	1NO	43.0	1
PBN 22-4-01 R F60	609439	red	1NC	43.0	
PBN 22-4-11 R F60	609440	red	1NO+1NC	53.5	

Non-illuminated selector switches						
Type	Order number	Button color	Included blocks	Diagrams	Weight [g]	Packing [pcs]
PBN 22-13-10	607720	black	1NO	Two position maintained	28.5	1
PBN 22-11-10	607717	black	1NO	Two position momentary, spring return from 1 to 0	28.5	
PBN 22-16-20	607855	black	2NO	Three position maintained	39.0	
PBN 22-24-20	609441	black	2NO	Three position momentary, spring return from 2 to 0 maintained 1	39.0	
PBN 22-12-20	609442	black	2NO	Three position momentary, spring return from 2 to 0 and 1 to 0	39.0	

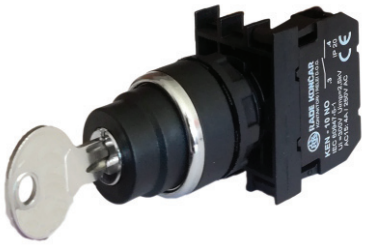
Technical data - page 136; Dimensional drawings - page 137

Pilot devices 22 mm diameter

Illuminated selector switches

Type	Order number	Button color	Included blocks	Diagrams	Weight [g]	Packing [pcs]
PBN 22-14-10 R 24V AC/DC	609443	red	1NO	Two position maintained	41.0	1
PBN 22-14-10 G 24V AC/DC	609444	green				
PBN 22-14-10 Y 24V AC/DC	609445	yellow				
PBN 22-14-10 BL 24V AC/DC	609446	blue				
PBN 22-14-10 W 24V AC/DC	609447	white				
PBN 22-25-10 R 24V AC/DC	609448	red	1NO	Two position momentary, spring return from 1 to 0	41.0	
PBN 22-25-10 G 24V AC/DC	609449	green				
PBN 22-25-10 Y 24V AC/DC	609450	yellow				
PBN 22-25-10 BL 24V AC/DC	609451	blue				
PBN 22-25-10 W 24V AC/DC	609452	white				
PBN 22-17-20 R 24V AC/DC	609453	red	2NO	Three position maintained	51.5	
PBN 22-17-20 G 24V AC/DC	609454	green				
PBN 22-17-20 Y 24V AC/DC	609455	yellow				
PBN 22-17-20 BL 24V AC/DC	609456	blue				
PBN 22-17-20 W 24V AC/DC	609457	white				
PBN 22-24-20 R 24V AC/DC	609458	red	2NO	Three position momentary, spring return from 2 to 0 maintained 1	51.5	
PBN 22-24-20 G 24V AC/DC	609459	green				
PBN 22-24-20 24V AC/DC	609460	yellow				
PBN 22-24-20 BL 24V AC/DC	609461	blue				
PBN 22-24-20 W 24V AC/DC	609462	white				
PBN 22-26-20 R 24V AC/DC	609463	red	2NO	Three position momentary, spring return from 2 to 0 and 1 to 0	51.5	
PBN 22-26-20 G 24V AC/DC	609464	green				
PBN 22-26-20 Y 24V AC/DC	609465	yellow				
PBN 22-26-20 BL 24V AC/DC	609466	blue				
PBN 22-26-20 W 24V AC/DC	609467	white				

* for illumination block see page 135
** led light is also available in 230V AC
Example: PBN 22-14-10 R 230V AC



Non-illuminated, key-operated swithces

Type	Order number	Color		Included blocks	Diagrams	Weight [g]	Packing [pcs]
PBN 22-18-10	609468	black	0	1NO	Two position Stay put	40.0	1
PBN 22-18-20	609469			2NO		50.5	
PBN 22-18-11	609470			1NO+1NC		50.5	
PBN 22-19-10	609471	black	0	1NO	Two position Spring return	40.0	
PBN 22-20-20	609472	black	0	2NO	Three position Stay put	50.5	
PBN 22-21-20	609473	black	0	2NO	Three position Single spring return	50.5	
PBN 22-22-20	609474	black	0	2NO	Three position Double spring return	50.5	
PBN 22-23-20	609475	black	All	2NO	Two position Stay put	50.5	
PBN 22-23-11	609476			1NO+1NC			
PBN 22-27-20	609477	black	All	2NO	Three position stay put	50.5	

Pilot devices 22 mm diameter

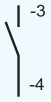
Non-illuminated double pushbutton - Double return button					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-41-11 GR	605653	red/green	1NO+1NC	61.0	1

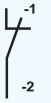
Illuminated double pushbutton * - Double return button					
Type	Order number	Button color	Included blocks	Weight [g]	Packing [pcs]
PBN 22-42-11 GR 24V AC/DC	609478	red/green	1NO+1NC	73.5	1

* for illumination block see page 135
** led light is also available in 230V AC
Example: PBN 22-42-11 GR 230V AC

For illuminated double pushbuttons the lamp is only white color.

Elements which are delivered separately

Contact block - normal open					
Type	Order number	Color	Included blocks	Weight [g]	Packing [pcs]
KEN 10 NO	605656	green		10.5	1

Contact block - normal closed					
Type	Order number	Color	Included blocks	Weight [g]	Packing [pcs]
KEN 01 NC	605657	red		10.5	1

Illumination block					
Type	Order number	Color	Included blocks	Weight [g]	Packing [pcs]
PFN-Ba9s	605658	white		12.5	1

Transparent protective cap					
Type	Order number	Color		Weight [g]	Packing [pcs]
TPC - PBN 22-1	609479	no		5	1

Technical data - page 136; Dimensional drawings - page 137

Pushbuttons in insulated enclosures type PNPB

Ordering data for PNPB

IP 50 **PNPBN 22** .. ..

Code: 1, 2, 4, 6, 8, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23 24, 25, 26, 27, 28 41, 42

(NO) (NC)

Red - R, Green-G, Yellow-Y, Blue-Bl, White-W, Black-B

If ordering illuminated pushbutton, add voltage of led light (24V AC/DC or 230V AC)

NOTES: Color of enclosures is grey (RAL 7035)

TECHNICAL DATA

Mechanical life

Pushbuttons	0.5 million operations
Toggle switches	0.3 million operations
Mushroom pushbuttons	0.5 million operations
Selector switches	0.5 million operations
Double pushbuttons	0.5 million operations

Illumination block

Base	Ba9s
Max.permissible power	2W

Temperature

Ambient temperature during operation	-5^0 to $+40^0$C

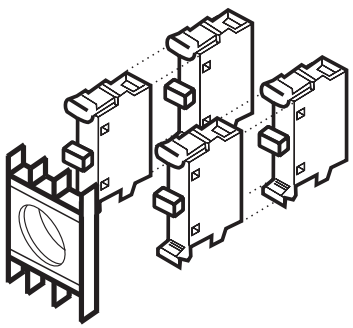
Terminals

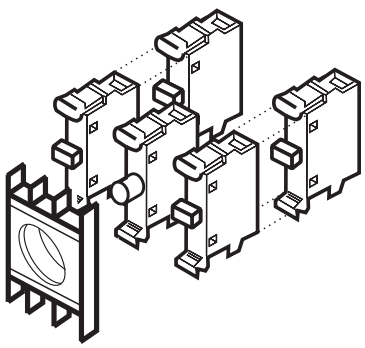
Connection cable cross-section	$1.5mm^2$ - $2.5mm^2$
Recommended torque	0.8Nm

Contact blocks

Mechanical endurance	0.5 million operation
Electrical endurance	0.1 million operation
Rated insulation voltage	300V
Rated operational current Ie	4A
Rated operational voltage Ue	250V AC
Protection degree	IP20 (IP50 if the product is in panel)
Operating frequency	without load 3000 operations/hour; at full load 1200 operations/hour
Switching power in AC15	1000VA 1kA

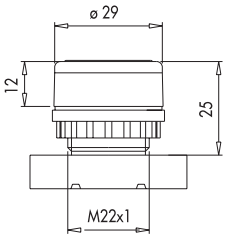
Max. Number of contact blocks per button



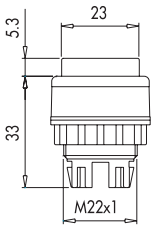


Buttons type PBN 22 IEC 60529; IEC 60947-5-1
- Non- standard schemes can be produced on request of the clients.

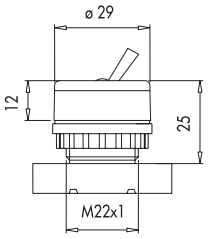
DIMENSIONS DRAWINGS (mm)



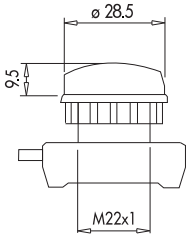
Flat



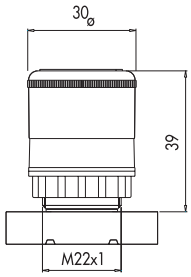
Extended



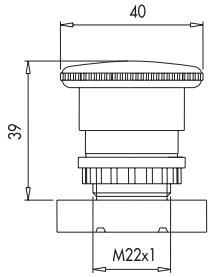
Handle Button



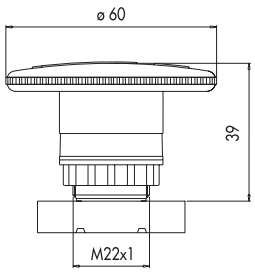
Pilot Light



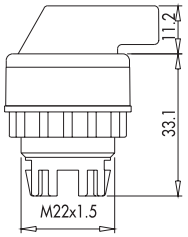
Emergency Stop Ø 30 mm



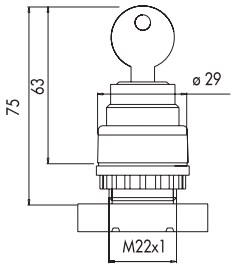
Emergency Stop Ø 40 mm



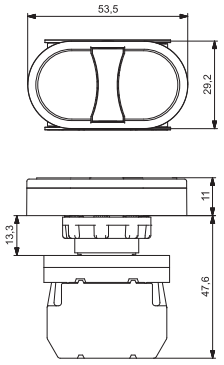
Emergency Stop Ø 60 mm



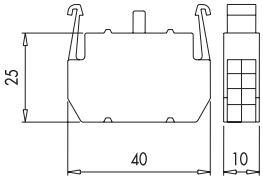
Selector switch



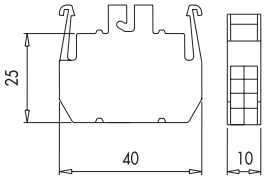
Key Operated



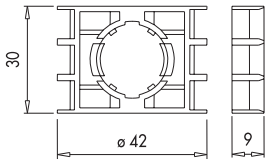
Double pushbuttons



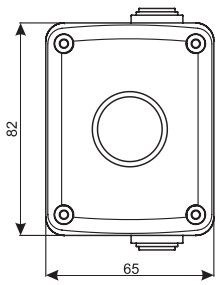
Contact Block

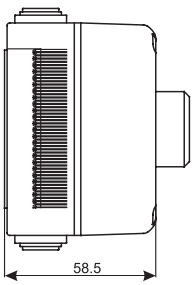


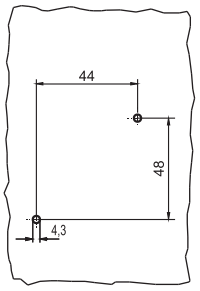
Illumination block



Adapter







DRILLING PLAN

MOTOR PROTECTION CIRCUIT BREAKER

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Motor protection circuit breaker

Motor protection circuit breaker

MOTOR PROTECTION CIRCUIT BREAKER

Motor protection circuit breakers are a specialized type of electrical protection device that are designed specifically for electric motors, like their name implies. Electric motors have plenty of applications and are used to drive mechanical devices of all types, so it is very important to protect them adequately with MPCBs. In all of these industrial and commercial applications of electric motors, the MPCB has the key role of providing electrical protection. The following are just a few examples of devices driven by electric motors in commercial and industrial buildings:

- Rooftop air conditioners, chillers, compressors, heat pumps and cooling towers.
- Extraction and injection fans, as well as air handling units.
- Water pumping systems.
- Elevators and other hoisting devices.
- Industrial conveyor belts and other machinery used in manufacturing processes

Features:

- With overload and short circuit release
- Ambient temperature compensated
- Phase failure protection
- In conformity with IEC 60947-4-1 and EN 60947-4-1
- Wide range from 0.1 - 25 A
- Compact dimensions, consumes less panel space

Motor protection circuit breakers - DMS 25

DMS 25						
Type	Order number	Rated continuous current **(A)**	Switching capacity Icu/400V **(kA)**	Responded Current of short-circuit release **(A)**	Weight [g]	Packing [pcs]
DMS 25 - 0.16	620001	0.1 - 0.16	100	1.92	220	1
DMS 25 - 0.25	620002	0.16 - 0.25	100	3	220	
DMS 25 - 0.4	620003	0.25 - 0.4	100	4.8	220	
DMS 25 - 0.63	620004	0.4 - 0.63	100	7.6	220	
DMS 25 - 1	620005	0.63 - 1	100	12	220	
DMS 25 - 1.6	620006	1 - 1.6	6	19.2	220	
DMS 25 - 2.5	620007	1.6 - 2.5	6	30	220	
DMS 25 - 4	620008	2.5 - 4	6	48	220	
DMS 25 - 6.3	620009	4 - 6.3	6	75.6	220	
DMS 25 - 10	620010	6.3 - 10	6	120	220	
DMS 25 - 16	620011	10 - 16	6	192	220	
DMS 25 - 20	620012	16 - 20	6	240	220	
DMS 25 - 25	620013	20 - 25	6	300	220	

Motor protection circuit breakers in enclosures - PNDMS 25

PNDMS 25 (protection degree IP65)						
Type	Order number	Rated continuous current **(A)**	Switching capacity Icu/400V **(kA)**	Responded Current of short-circuit release **(A)**	Weight [g]	Packing [pcs]
PNDMS 25 - 0.16	620014	0.1 - 0.16	100	1.92	410	1
PNDMS 25 - 0.25	620015	0.16 - 0.25	100	3	410	
PNDMS 25 - 0.4	620016	0.25 - 0.4	100	4.8	410	
PNDMS 25 - 0.63	620017	0.4 - 0.63	100	7.6	410	
PNDMS 25 - 1	620018	0.63 - 1	100	12	410	
PNDMS 25 - 1.6	620019	1 - 1.6	6	19.2	410	
PNDMS 25 - 2.5	620020	1.6 - 2.5	6	30	410	
PNDMS 25 - 4	620021	2.5 - 4	6	48	410	
PNDMS 25 - 6.3	620022	4 - 6.3	6	75.6	410	
PNDMS 25 - 10	620023	6.3 - 10	6	120	410	
PNDMS 25 - 16	620024	10 - 16	6	192	410	
PNDMS 25 - 20	620025	16 - 20	6	240	410	
PNDMS 25 - 25	620026	20 - 25	6	300	410	

Technical data - page 141; Accessories - page 140

Accessories for DMS 25

Auxiliary contact							
Type	Order number	Voltage	Current rating (Ie) AC15	NO	NC	Weight [g]	Packing [pcs]
DMS -BP 02	620027	250V AC	3A	0	2	36.5	4
DMS -BP 11	620028	250V AC	3A	1	1	36.5	
DMS -BP 20	620029	250V AC	3A	2	0	36.5	

Shunt trip				
Type	Order number	Voltage	Power	Packing [pcs]
DMS - DO 230	620033	250V AC 50Hz	2.7 / 1.8 VA/W	1
DMS - DO 400	620034	250V AC 50Hz	2.7 / 1.8 VA/W	

Pick up: 70% Ue

Undervoltage release				
Type	Order number	Voltage	Power	Packing [pcs]
DMS - PO 230	620035	250V AC 50Hz	2.7 / 1.8 VA/W	1
DMS - PO 400	620036	250V AC 50Hz	2.7 / 1.8 VA/W	

Pick up: 85% Ue
Drop out: (70% - 35%)Ue

Cilyndrical head emergency button		
Type	Order number	Packing [pcs]
DMS - G30	620037	1

Mushroom emergency button		
Type	Order number	Packing [pcs]
DMS - G40	620038	1

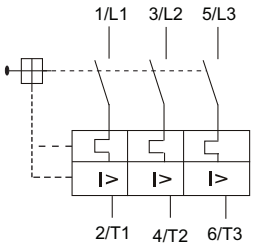
N-Terminal		
Type	Order number	Packing [pcs]
MKS1 - N	604459	1

Indication light		
Type	Order number	Packing [pcs]
MKS1 - S	604460	1

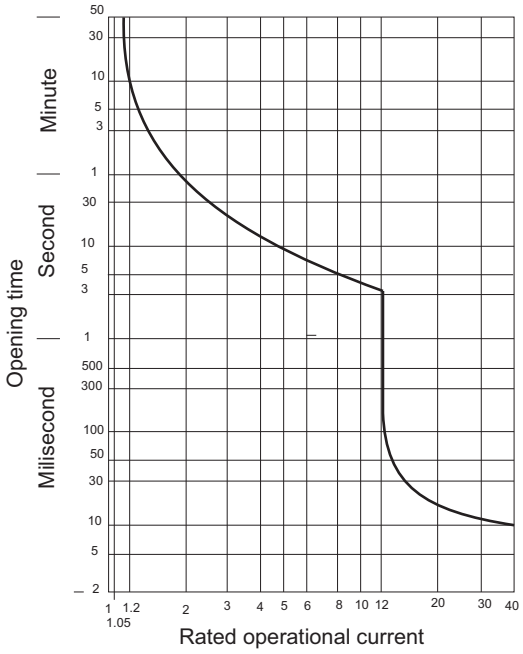
DMS 25

- Short circuit releases factor set at 12xIe
- Short circuit breaking capacity minimum 6 kA / 400V
- Fast and simple mounting feature to 35 mm mounting rail
- Rated impulse withstand voltage 6kV

Mechanical Life	100 000 operations min.
Electrical Life	100 000 operations min.
Operating Temperature	min./max. ^{0}C -5/+40
Operating Frequency	30 operations/hours
Operating Voltage Ue	400 V AC
Insulation Voltage Ui	690 V AC
Operating Current Ie	0.1-25 A acc. to setting range
Continuous Current Ith	32 A
Connection Cable Cross-Section	1.5-4 mm^2
Standard	**IEC 60947-4-1; EN 60947-4-1**
Protection degree	IP40



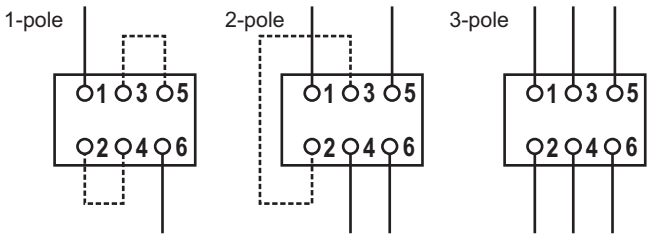
Schematic diagram DMS 25



Tripping Characteristics

The tripping characteristics show the tripping time in relation to the response current. They show main values of the tolerance range at an ambient temperature of 20 ^{0}C, starting from cold. The tripping of overload releases at operational temperature is reduced to approximately 1/4 of the shown. Specific characteristics for each individual setting range are available on request.

Connection diagram



Mounting position: normally any.
Tightening torque for terminal screws:
- Main terminals: 1.2 Nm
- Auxiliary terminals: 1 Nm
- Pollution level III/3

Rated frequency: 40...60 Hz
Heating losses due to the current: 6 W
Switching Times at Short Circuit DMS 25
- Minimum command Time ms 2
- Opening Delay ms 2
- Opening Time ms 7

Utilization Category AC 3 max. 690 V

Current Setting (A)	Fuse (A)	Current Setting (A)	Fuse (A)	Current Setting (A)	Fuse (A)
0.4 - 0.63	2	2.5 - 4	10	16 - 20	50
0.63 - 1	4	4 - 6.3	16	20 - 25	50
1 - 1.6	6	6.3 - 10	25		
1.6 - 2.5	6	10 - 16	35		

Thermic and Magnetic Protection

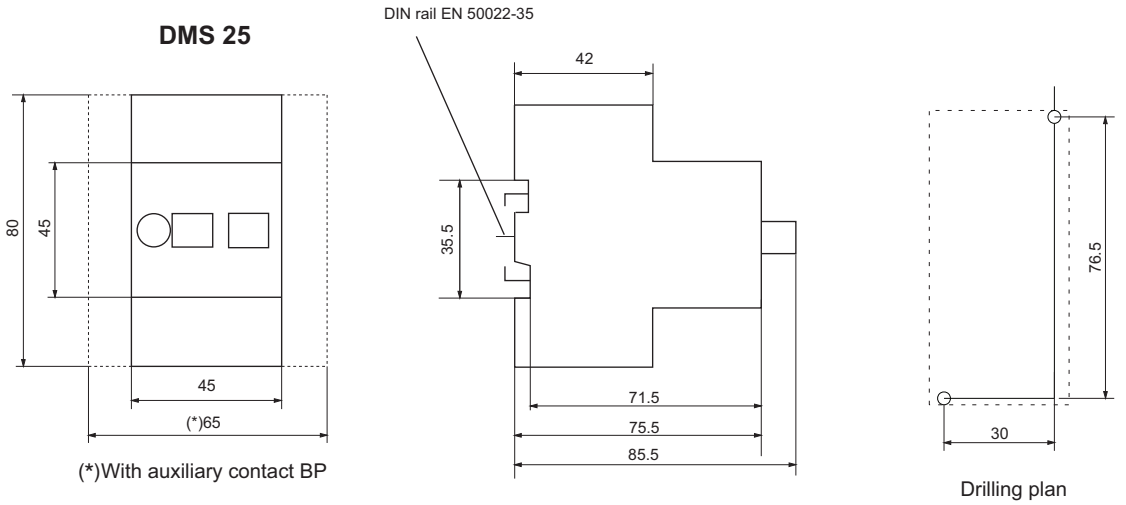
Order Code	Maximum Rating (kW) AC 3 3 phase					Thermal Current Calibration Interval	Overload Release Setting Range (A)	Respondent Current of Short-Circuit Release
	220V 230V 240V	380V 400V 415V	440V	500V	600V 690V	[A]	[A]	[A] I>
DMS 25 - 0.16	-	0.02	-	-	0.06	0.1 - 0.16	0.16	1.92
DMS 25 - 0.25	-	0.06	0.06	0.06	0.12	0.16 - 0.25	0.25	3
DMS 25 - 0.4	0.06	0.09	0.12	0.12	0.18	0.25 - 0.4	0.4	4.8
DMS 25 - 0.63	0.09	0.12	0.18	0.25	0.25	0.4 - 0.63	0.63	7.6
DMS 25 - 1	0.12	0.25	0.25	0.37	0.55	0.63 - 1	1	12
DMS 25 - 1.6	0.25	0.55	0.55	0.75	1.1	1 - 1.6	1.6	19.2
DMS 25 - 2.5	0.37	0.75	1.1	1.1	1.5	1.6 - 2.5	2.5	30
DMS 25 - 4	0.75	1.5	1.5	2.2	3	2.5 - 4	4	48
DMS 25 - 6.3	1.1	2.2	3	3	4	4 - 6.3	6.3	75.6
DMS 25 - 10	2.2	4	5	5.5	7.5	6.3 - 10	10	120
DMS 25 - 16	4	7.5	9	9	12.5	10 - 16	16	192
DMS 25 - 20	5.5	9	11	12.5	15	16 - 20	20	240
DMS 25 - 25	7.5	12.5	12.5	15	22	20 - 25	25	300

Switching Capacity and Fuse Selection

Order Code	Rated Continuous Current (A)	Back up-Fuse (required if the prospective fault current is greater than the short-circuit breaking capacity) Fuses(gl.aM)(a)				Switching Capacity Icu (kA)			
		230V	400V	500V	690V	230V	400V	500V	690V
DMS 25 - 0.16	0.1 - 0.16	-	-	-	-	100	100	100	100
DMS 25 - 0.25	0.16 - 0.25	-	-	-	-	100	100	100	100
DMS 25 - 0.4	0.25 - 0.4	-	-	-	-	100	100	100	100
DMS 25 - 0.63	0.4 - 0.63	-	-	-	-	100	100	100	100
DMS 25 - 1	0.63 - 1	-	-	-	-	100	100	100	100
DMS 25 - 1.6	1 - 1.6	-	-	-	-	6	6	3	2.5
DMS 25 - 2.5	1.6 - 2.5	-	-	25	20	6	6	3	2.5
DMS 25 - 4	2.5 - 4	-	-	35	25	6	6	3	2.5
DMS 25 - 6.3	4 - 6.3	-	-	50	35	6	6	2.5	2
DMS 25 - 10	6.3 - 10	-	80	50	35	6	6	2.5	2
DMS 25 - 16	10 - 16	80	80	63	35	6	6	2.5	2
DMS 25 - 20	16 - 20	80	80	63	50	6	6	2.5	2
DMS 25 - 25	20 - 25	80	80	60	50	6	6	2.5	2

DIMENSION DRAWINGS (mm)

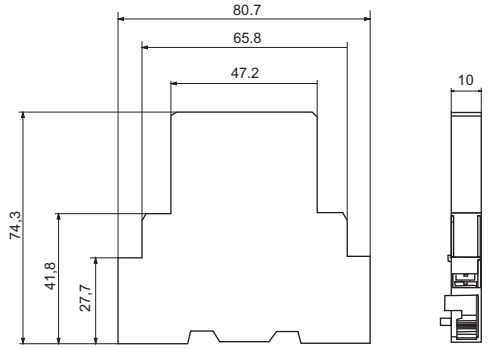
DMS 25



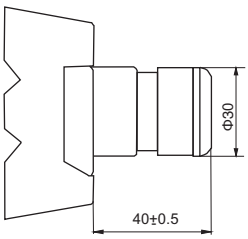
(*)With auxiliary contact BP

Drilling plan

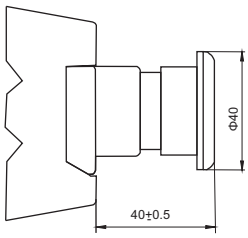
DMS-BP



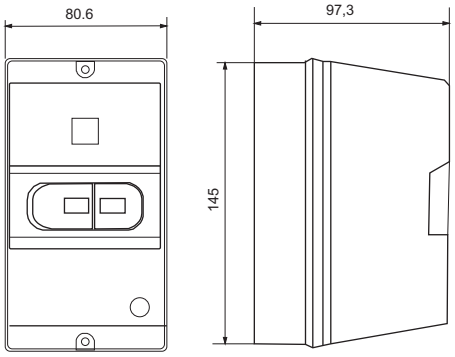
DMS - G30



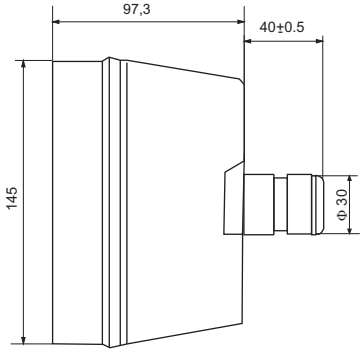
DMS - G40



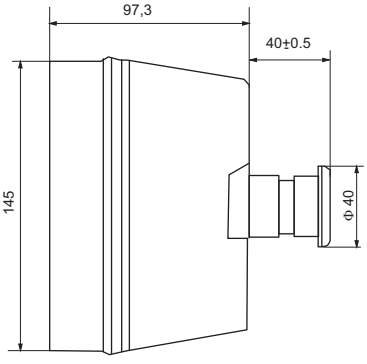
PNDMS 25



PNDMS 25 - G30



PNDMS 25 - G40



MOLDED CASE CIRCUIT BREAKERS - KP

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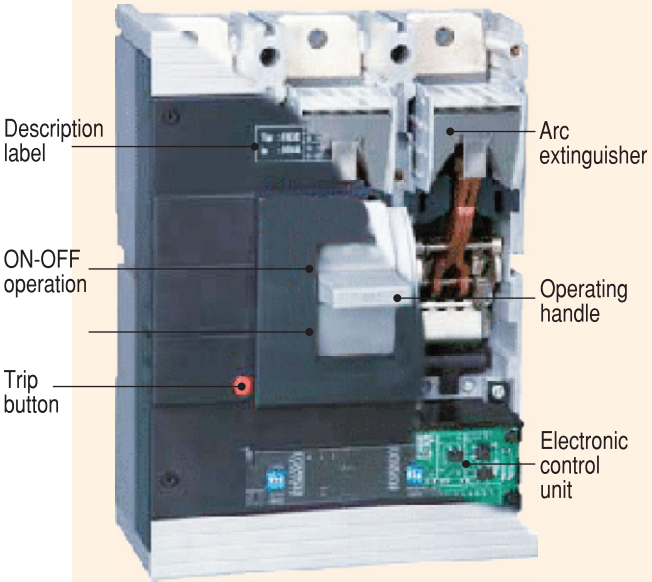
Molded case circuit breaker

Molded case circuit breakers - KP

MOLDED CASE CIRCUIT BREAKERS - KP

Molded Case Circuit Breaker as devices designed to open or close a circuit by nonautomatic means and to open the circuit automatically on a predetermined over-current without damage to itself when properly applied within its rating. The circuit breaker is a mechanical open-closing device, witch is used for closing, breaking, separating circuit and carrying current of that circuit under ordinary conditions and for automatically breaking the circuit under extraordinary conditions like short circuit and over current.
The most important function of the circuit breaker, in addition to opening and closing the circuit, is to protect the circuit under abnormal power picks.
Features:

- In conformity with IEC 60947-2, EN 60947-2
- Wide range from 16 - 2500 A
- Compact dimensions



Molded case circuit breakers - KP

KP 125-F (16-125) A - 3 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 125-F 16A 3P	606770	16	3	25/18	0.8-1*	1000	1
KP 125-F 25A 3P	606766	25	3	25/18	0.8-1*	1000	
KP 125-F 40A 3P	606767	40	3	25/18	0.8-1*	1000	
KP 125-F 63A 3P	606768	63	3	25/18	0.8-1*	1000	
KP 125-F 80A 3P	606769	80	3	25/18	0.8-1/8	1000	
KP 125-F 100A 3P	606588	100	3	25/18	0.8-1/8	1000	
KP 125-F 125A 3P	606605	125	3	25/18	0.8-1/8	1000	

* Magnetic operating limit - 600A

KP 125-F (16-125) A - 4 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 125-F 16A 4P	609480	16	4	25/18	0.8-1*	1500	1
KP 125-F 25A 4P	606944	25	4	25/18	0.8-1*	1500	
KP 125-F 40A 4P	606945	40	4	25/18	0.8-1*	1500	
KP 125-F 63A 4P	606946	63	4	25/18	0.8-1*	1500	
KP 125-F 80A 4P	606947	80	4	25/18	0.8-1/8	1500	
KP 125-F 100A 4P	606948	100	4	25/18	0.8-1/8	1500	
KP 125-F 125A 4P	606949	125	4	25/18	0.8-1/8	1500	

* Magnetic operating limit - 600A

KP 250-F (160-250) A - 3 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 250-F 160A 3P	606591	160	3	35/35	0.7-1/5-10	2300	1
KP 250-F 200A 3P	606589	200	3	35/35	0.7-1/5-10	2300	
KP 250-F 250A 3P	606590	250	3	35/35	0.7-1/5-10	2300	

KP 250-F (160-250) A - 4 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 250-F 160A 4P	606950	160	4	35/35	0.7-1/5-10	3100	1
KP 250-F 200A 4P	606951	200	4	35/35	0.7-1/5-10	3100	
KP 250-F 250A 4P	606952	250	4	35/35	0.7-1/5-10	3100	

KP 800-F (300-630) A - 3 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 800-F 300A 3P	606592	300	3	50/25	0.7-1/5-10	8000	1
KP 800-F 400A 3P	606593	400	3	50/25	0.7-1/5-10	8000	
KP 800-F 500A 3P	606594	500	3	50/25	0.7-1/5-10	8000	
KP 800-F 630A 3P	606595	630	3	50/25	0.7-1/5-10	8000	

Technical data - page 151; Accessories - page 147

Molded case circuit breakers - KP

KP 800-F (800) A - 3 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 800-F 800A 3P	606596	800	3	50/50	0.7-1/5-8	10000	1

KP 800-F (800) A - 4 pole

Type	Order number	Rated current at 40 °C (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 800-F 800A 4P	606957	800	4	50/50	0.7-1/5-8	15000	1

KP 800-FE (300-800) A - 3 pole

Type	Order number	Rated current at (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 800-FE 300A 3P	609561	300	3	50/50	0.4-1/2-10	10000	1
KP 800-FE 400A 3P	607524	400	3	50/50	0.4-1/2-10	10000	
KP 800-FE 500A 3P	609562	500	3	50/50	0.4-1/2-10	10000	
KP 800-FE 630A 3P	607523	630	3	50/50	0.4-1/2-10	10000	
KP 800-FE 800A 3P	607522	800	3	50/50	0.4-1/2-10	10000	

KP 800-FE* (300-800) A - 4 pole

Type	Order number	Rated current at (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 800-FE 300A 4P	609563	300	4	50/50	0.4-1/2-10	10000	1
KP 800-FE 400A 4P	609564	400	4	50/50	0.4-1/2-10	10000	
KP 800-FE 500A 4P	609565	500	4	50/50	0.4-1/2-10	10000	
KP 800-FE 630A 4P	609566	630	4	50/50	0.4-1/2-10	10000	
KP 800-FE 800A 4P	609567	800	4	50/50	0.4-1/2-10	10000	

* electronic circuit breaker

KP 1250-FE* (1000-1250) A - 3 pole

Type	Order number	Rated current (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 1250-FE 1000A 3P	606597	1000	3	50/25	0.4-1/2-10	18000	1
KP 1250-FE 1250A 3P	606597	1250	3	50/25	0.4-1/2-10	18000	

* electronic circuit breaker

KP 1250-FE* (1000-1250) A - 4 pole

Type	Order number	Rated current (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 1250-FE 1000A 4P	606958	1000	4	50/25	0.4-1/2-10	37000	1
KP 1250-FE 1250A 4P	606959	1250	4	50/25	0.4-1/2-10	37000	

* electronic circuit breaker

KP 1600-FE* (1000-1600) A - 3 pole

Type	Order number	Rated current (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 1600-FE 1000A 3P	602217	1000	3	50/25	0.4-1/2-10	27000	1
KP 1600-FE 1250A 3P	601398	1250	3	50/25	0.4-1/2-10	27000	
KP 1600-FE 1600A 4P	601397	1600	3	50/25	0.4-1/2-10	27000	

* electronic circuit breaker

KP 2500-FE* (2000-2500) A - 3 pole

Type	Order number	Rated current (In) A	No. of poles	Icu/Ics 415V(kA)	Adjustment thermal/magnetic .. x In	Weight [g]	Packing [pcs]
KP 2500-FE 2000A 3P	607532	2000	3	50/50	0.4-1/2-10	54000	1
KP 2500-FE 2500A 3P	606997	2500	3	50/50	0.4-1/2-10	54000	

* electronic circuit breaker

Technical data - page 151; Accessories - page 147

Accessories

Auxiliary contacts

Auxiliary contacts - KP-125-F

Type	Order number	Voltage	Current rating (In)	Configuration	Packing [pcs]
KP BPKF1	606694	250V AC	5A	14 — 12 / 11	1
		250V DC	3A		

Auxiliary contacts - KP-250-F

Type	Order number	Voltage	Current rating (In)	Configuration	Packing [pcs]
KP BPKF2	606696	250V AC	5A	14 — 12 / 11	1
		250V DC	3A		

Auxiliary contacts - KP-800-F

Type	Order number	Voltage	Current rating (In)	Configuration	Packing [pcs]
KP BPKF3	606697	250V AC	5A	14 — 12 / 11	1
		250V DC	3A		

Auxiliary contacts - KP-1250-FE

Type	Order number	Voltage	Current rating (In)	Configuration	Packing [pcs]
KP BPKF4	606693	250V AC	5A	14 — 12 / 11	1
		250V DC	3A		

Auxiliary contacts - KP-1600-FE

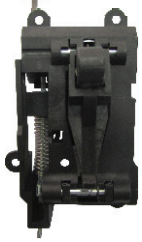
Type	Order number	Voltage	Current rating (In)	Configuration	Packing [pcs]
KP BPKF5	606698	250V AC	5A	14 — 12 / 11	1
		250V DC	3A		

Under voltage release

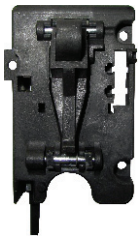
Under voltage release - KP-250-F					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP UF2	606709	220-250V	220-250V	D1—□—D2	1

Under voltage release - KP-800-F (300-630A)					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP UF3	606707	220-250V	220-250V	D1—□—D2	1

Under voltage release - KP-800-F (800A)					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP UF4	606705	220-250V	220-250V	D1—□—D2	1



Under voltage release - KP-1250-FE					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP UF5	606708	220-250V	220-250V	D1—□—D2	1



Under voltage release - KP-1600-FE					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP UF6	606706	220-250V	220-250V	D1—□—D2	1

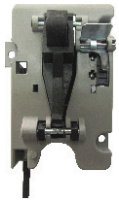
Shunt trip release

Shunt trip release - KP-125-F					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF1	606700	110-250V	110-250V	B1–□–⌒–B2	1

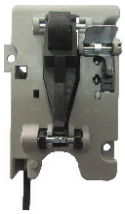
Shunt trip release - KP-250-F					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF2	606702	110-250V	110-250V	B1–□–⌒–B2	1

Shunt trip release - KP-800-F (300-630A)					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF3	606703	110-250V	110-250V	B1–□–⌒–B2	1

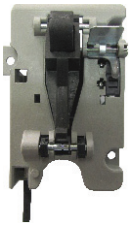
Shunt trip release - KP-800-F (800A)					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF4	606704	110-250V	110-250V	B1–□–⌒–B2	1



Shunt trip release - KP-1250-FE					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF5	606699	110-250V	110-250V	B1–□–⌒–B2	1



Shunt trip release - KP-1600-FE					
Type	Order number	Voltage AC	Voltage DC	Configuration	Packing [pcs]
KP DF6	606701	110-250V	110-250V	B1–□–⌒–B2	1



Extended rotary handle

Extended rotary handle - KP-250-F			
Type	Order number	Ampere ranges	Packing [pcs]
KP HF1	609554	160-250A	1

Extended rotary handle - KP-800-F (300-630A)			
Type	Order number	Ampere ranges	Packing [pcs]
KP HF2	609555	300-630A	1

Extended rotary handle - KP-800-F (800A)			
Type	Order number	Ampere ranges	Packing [pcs]
KP HF3	609556	800A	1

Extended rotary handle - KP-1250-FE			
Type	Order number	Ampere ranges	Packing [pcs]
KP HF4	609557	1000-1250A	1

Note: It is not plug-in.

Motor control mechanism

Motor control mechanism - KP-250-F					
Type	Order number	Voltage AC	Power	Opening/closing time (sec)	Packing [pcs]
KP MF1	609558	220V	100W	1/1	1

Motor control mechanism - KP-800-F - KP-1600-FE					
Type	Order number	Voltage AC	Power	Opening/closing time (sec)	Packing [pcs]
KP MF2	609559	220V	100W	4/3.5	1

Motor control mechanism - KP-2500-FE					
Type	Order number	Voltage AC	Power	Opening/closing time (sec)	Packing [pcs]
KP MF3	609560	220V	500W	1.5/1.5	1

Technical data

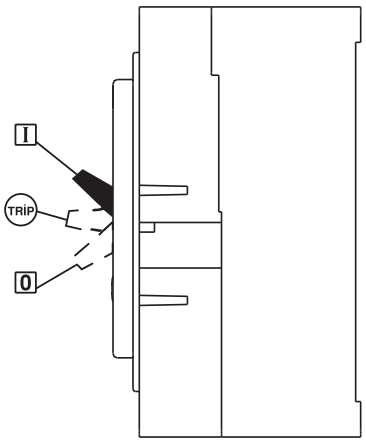
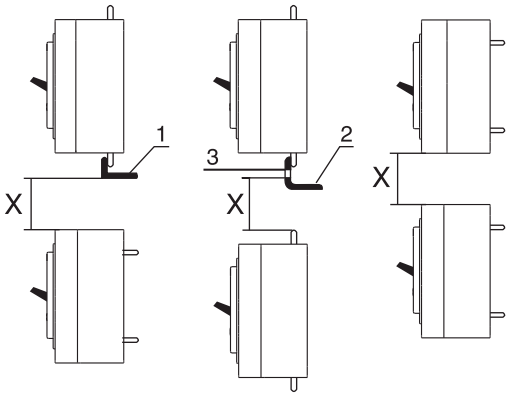


Figure 1



1) Busbar
2) Cable
3) Cable terminal

Type	x (mm)
KP 125-F KP 250-F	140
KP 800-F KP 800-FE	180
KP 1600-FE KP 2500-FE	

Figure 2

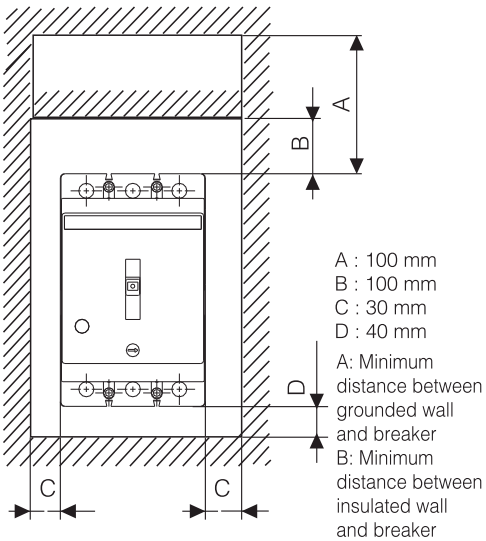


Figure 3

Utilization Type of the Circuit Breaker:
There are 3 positions indicating position of the breaker. These positions are shown in Figure-1.

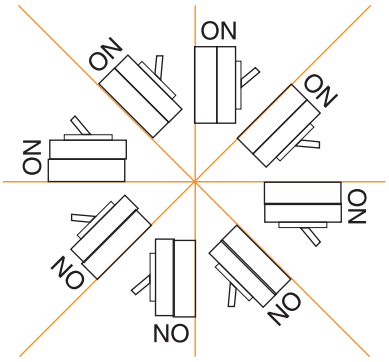
ONII Position:
It indicates that contacts of the breaker are closed. In this position, the breaker lever is in the top position.

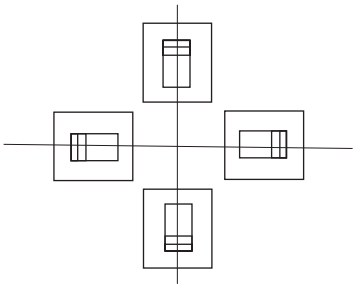
TRIP Position:
It indicates that the breaker is opened due to any failure (overload or short circuit). In this case, breaker lever is in the middle position between ON and OFF positions. In order to take the breaker, which is in trip position, to ON position; push the breaker lever downwards as shown by the OFF sign. Breaker shall be set with “click” sound. After that, pull the lever as shown by ON sign to close the breaker.

OFF/0 Position:
It indicates that contacts of the breaker are open. In this way, the breaker lever is in the bottom position.

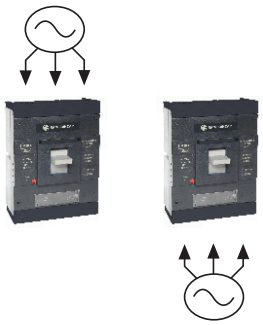
Assembly:
Important considerations during assembly are listed below.
- The place to assemble the breaker should be free of dust and moisture.
-Breaker should be assembled in a way not to be subject to gas and vapour.
- If the environment is dusty and moist, the breaker must be assembled in a housing with appropriate protection degree.
- While the breaker is in operation, it should not be exposed to vibration and sudden impacts.
- Minimum distances between two breakers assembled one on another should be as shown in Figure-2.
- Minimum distances between grounded or insulated wall and the breaker should be as shown in Figure-3.
- Assembly method of the connectors (for KP-250-F) vary according to connection at the front or at the back. Connector may be de-mounted, reversed and mounted again if required.
- Cable connections of measurement devices should be made through busbar, no connection should be made through terminals of the breaker (Please request extension busbar from factor for connections to be made with cable shoes.)
- End insert should be used in connections of multi-wire cables to breaker connector and no brazing should be made at cable ends.
- If connection is made to the breaker via copper busbars, busbars should be painted and feather edges should be rounded to minimize the risk of jumping.
- Phase curtains must be placed in the conduit between two busbars in the breaker body.
- Grounding should be made in accordance with the regulations.

Assembly





Assembly can be made in any angle.



Line can be connected to Rade Koncar circuit breakers from above and from below, however connection from above should be preferred.

Temperature Compensation:
Current load capacity of device decrease if the operating temperature is exceed to given value on indoor conditions Standard Circuit breakers was calibrated for 40 °C. Values in the chart show the highest operating currents to be applied as a function of the ambient temperature. Increase in ambient temperature of the breaker shall result in decrease in allowed operating current of the breaker. Therefore, by considering the ambient temperature of the breaker, the rated current should be calibrated according to ambient temperature or the circuit breaker should be selected according to operating currents suitable for the value in the table. If the breaker is operated in an environment with a temperature higher than the calibrated ambient temperature, it opens earlier than the nominal values. If it is operated in a colder environment, it opens later than the nominal values.

In(A)	20° C	30°C	40°C	50° C	60°C
Thermal-Magnetic Circuit Breakers					
16	17,1	16,6	16,0	15,2	14,6
20	21,4	20,8	20,0	19,0	18,2
25	26,7	26,0	25,0	23,8	22,8
32	34,2	33,3	32,0	30,4	29,1
40	42,8	41,6	40,0	38,0	36,4
50	53,5	52,0	50,0	47,5	45,5
63	67,4	65,5	63,0	59,9	57,3
80	85,6	83,2	80,0	76,0	72,8
100	107,0	104,0	100,0	95,0	91,0
125	133,8	130,0	125,0	118,8	113,8
160	171,2	166,4	160,0	152,0	145,6
200	214,0	208,0	200,0	190,0	182,0
200	240.8	234,0	225,0	213,8	204,8
250	267.5	260,0	250,0	237,5	227,5
300	321.0	312,0	300,0	285,0	273,0
400	428.0	416,0	400,0	380,0	364,0
500	535.0	520,0	500,0	475,0	455,0
630	674.1	655,2	630,0	598,5	573,3
800	856.0	832,0	800,0	760,0	728,0

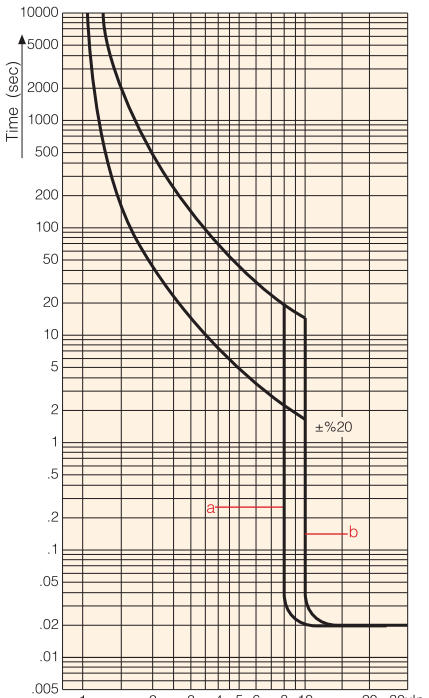
Example: Highest operating current of an KP 250-F type breaker with 100A rated current calibrated to 40°C would be 95A in an environment of 50°C.

TECHNICAL DATA

TYPE			KP 125-F	KP 250-F	KP 800-F	KP 800-F/ KP 800-FE	KP 1250-FE	KP 1600-FE	KP 2500-FE
Standard conformity			IEC 60947-2/EN 60947-2						
No. of poles			3,4P	3,4P	3P	3,4P	3,4P	3P	3P
Standard current range/ratings	In	A	16, 25, 40, 63, 80, 100, 125	160, 200, 250	300, 400, 500, 630	800/300, 400, 500, 630, 800	1000, 1250	1600	2000, 2500
Rated operational voltage	Ue~	V	415	415	415	415	415	415	415
Rated insulation voltage	Ui~	V	800	800	800	800	800	800	800
Rated impulse withstand voltage	U_{imp}	kV	8	8	8	8	8	8	8
Category of use			A	A	A	A	A	A	A
Degree of protection: Appliance with terminal shields Appliance in enclosure with front plate			IP 30 IP 40				IP 00 IP 40		
Polution degree			III						
Ambient temperature		^{0}C	-5 to +60			-5 to +60/ -5 to +40	-5 to + 40		
Ultimate breaking capacity Icu*	230/240 V ~	kA	35	65	70	75	80	80	85
	400/415 V ~	**kA**	**25**	**35**	**50**	**50**	**50**	**50**	**50**
	440 V ~	kA	20	25	40	40/35	35	40	35
	480/500 V ~	kA	12	18	35	30	25	25	30
	690 V ~	kA	8	12	25	20	18	20	20
	250 V -	kA	15	22	22	20/-	-	-	-
Standard breaking capacity Ics (%Icu)*		kA	75	100	50	100	50	50	100
Rated short circuit making capacity (415 V~)		kA peak	53	74	74	105	105	105	105
Endurance (o.c. cycle)	mechanical		≥15 000	≥15 000	≥15 000	≥15 000	≥15 000	≥15 000	≥15 000
	electrical		3 000	3 000	3 000	3 000	3 000	3 000	3 000
Type of protection									
Rated current adjustment area - I_1			(0,8 - 1)In	(0,7 - 1)In	(0,7 - 1)In	(0,7 - 1)/ (0,4 - 1)In	(0,4 - 1)In	(0,4 - 1)In	(0,4 - 1)In
Instant opening current adjustment - I_2			8In (min 600A)	(5 - 10)In	(5 - 10)In	(5 - 10)In/ (2 - 10)I_1	(2 - 10)I_1	(2 - 10)I_1	(2 - 10)I_1

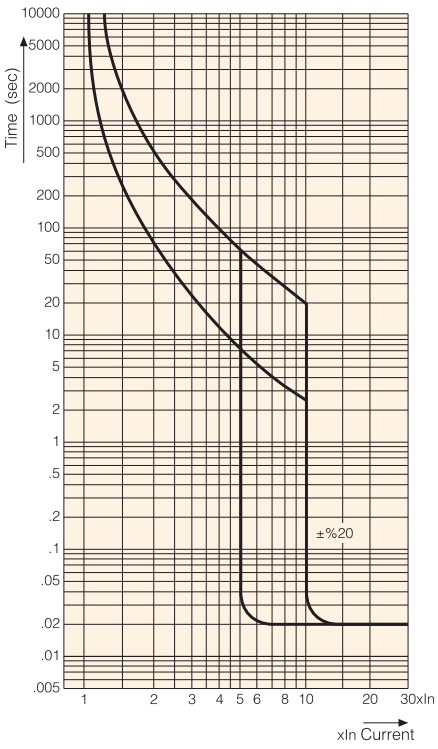
* The LINE side is the upper side. LOAD is to be connected on the down side.

KP 125-F - KP 250-F
Thermal magnetic circuit breakers

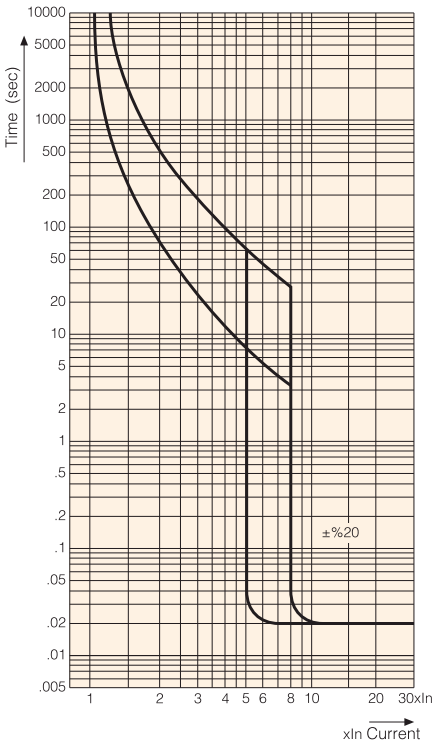


a: KP 250-F
b: KP 125-F (min600A)

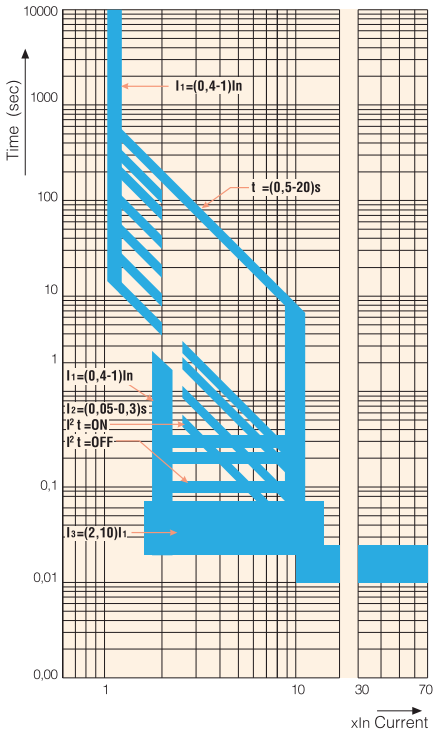
KP 800-F (300-630A)
Thermal magnetic circuit breakers



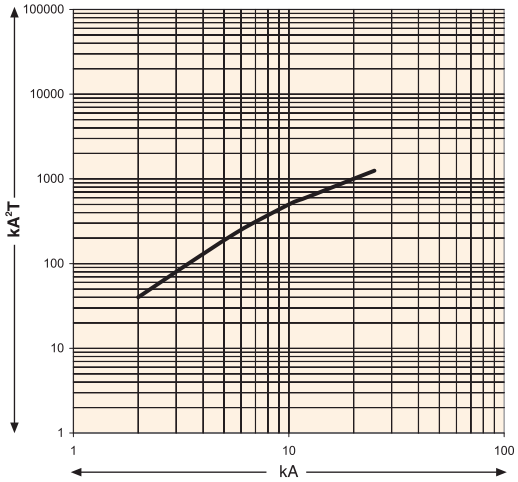
KP 800-F (800A)
Thermal magnetic circuit breakers



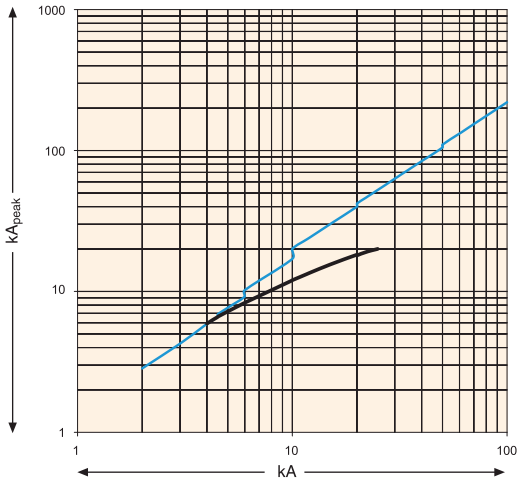
KP 800-FE - KP 2500-FE
Electronic circuit breakers



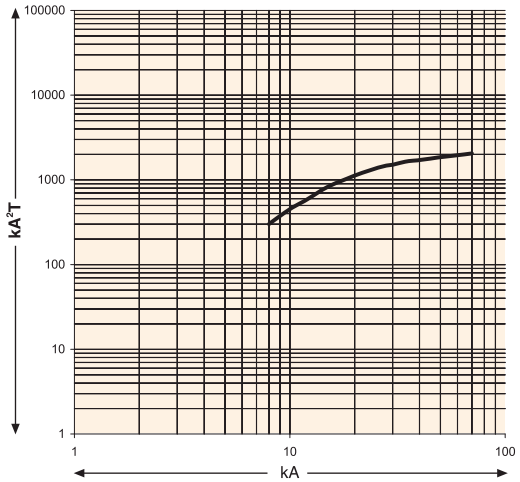
KP 125-F I^2T Curve



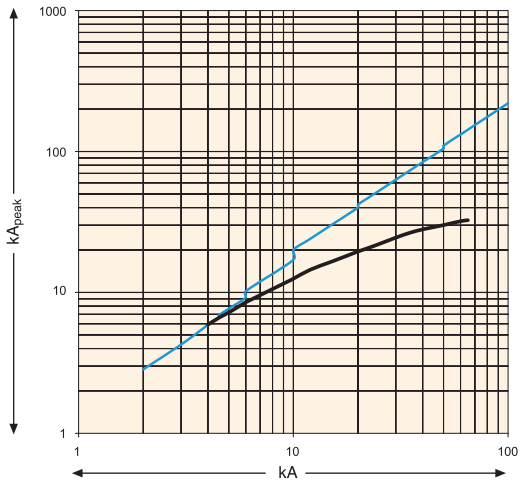
KP 125-F I_{peak} Curve



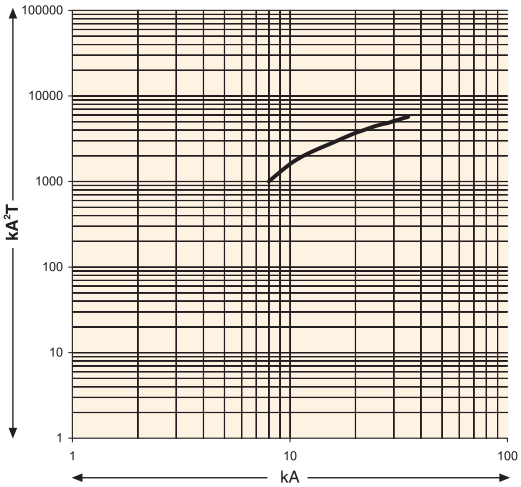
KP 250-F I^2T Curve



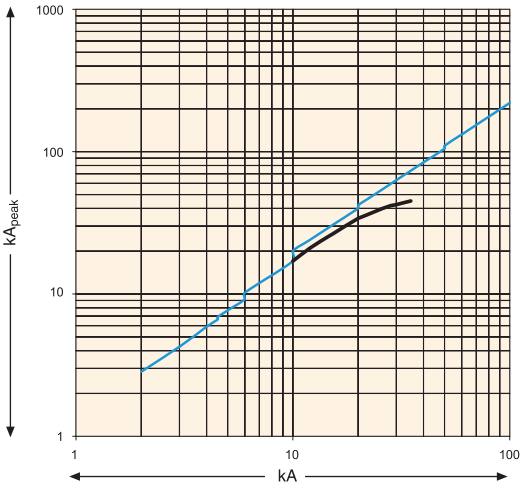
KP 250-F I_{peak} Curve



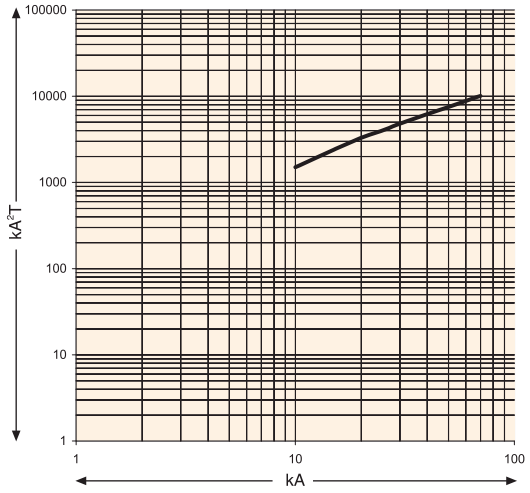
KP 800-F (300-630)A I^2T Curve



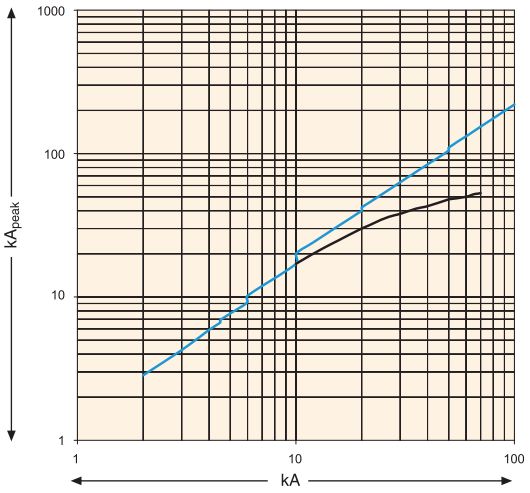
KP 800-F (300-630)A I_{peak} Curve



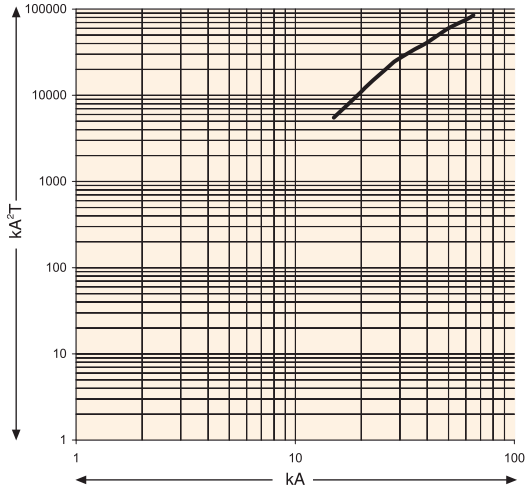
KP 800-F (800)A/KP 800-FE I^2T Curve



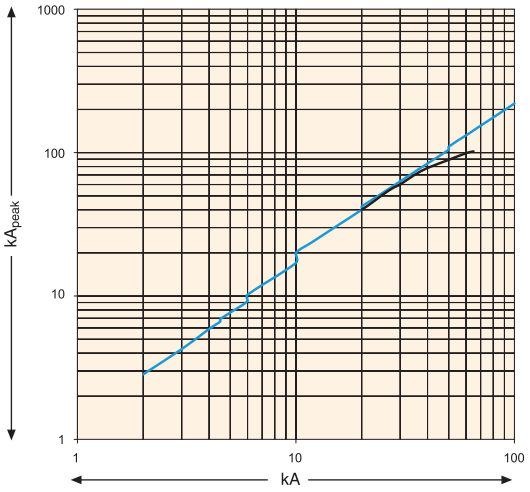
KP 800-F (800)/KP 800-FEA I_{peak} Curve



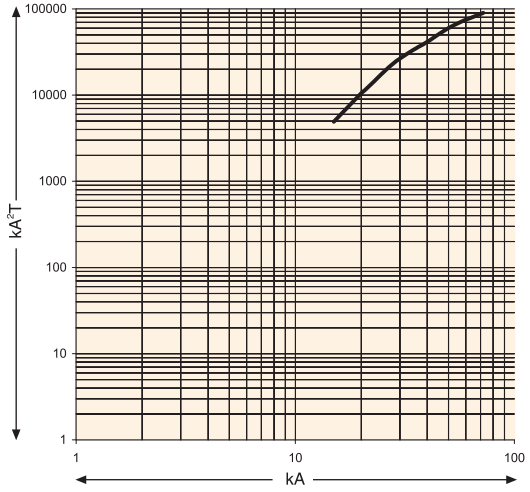
KP 1250-FE I^2T Curve



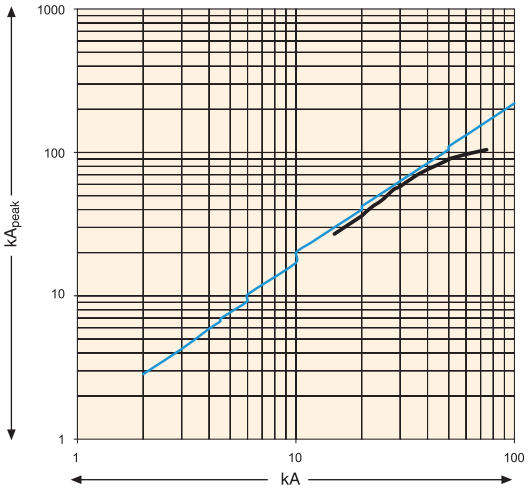
KP 1250-FE I_{peak} Curve



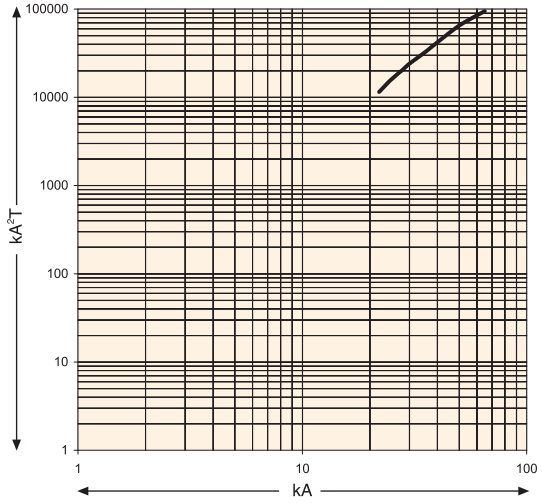
KP 1600-FE I^2T Curve



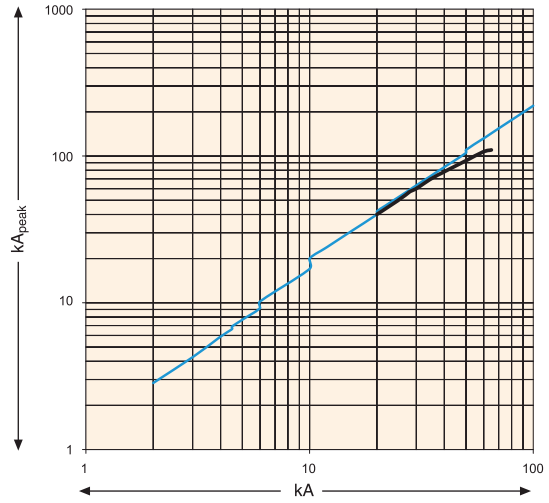
KP 1600-FE I_{peak} Curve



KP 2500-FE I^2T Curve

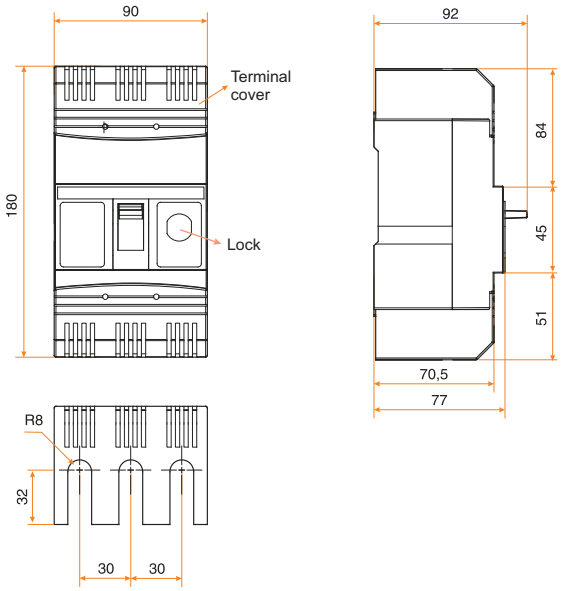


KP 2500-FE I_{peak} Curve

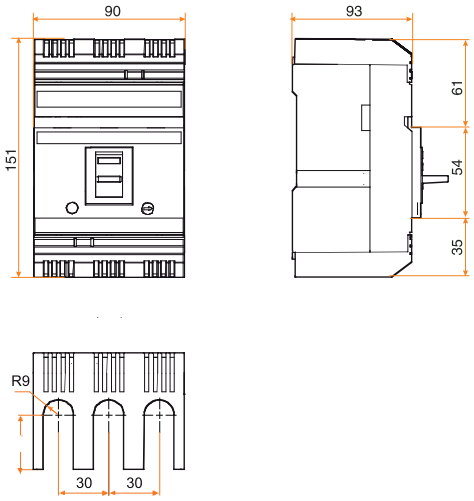


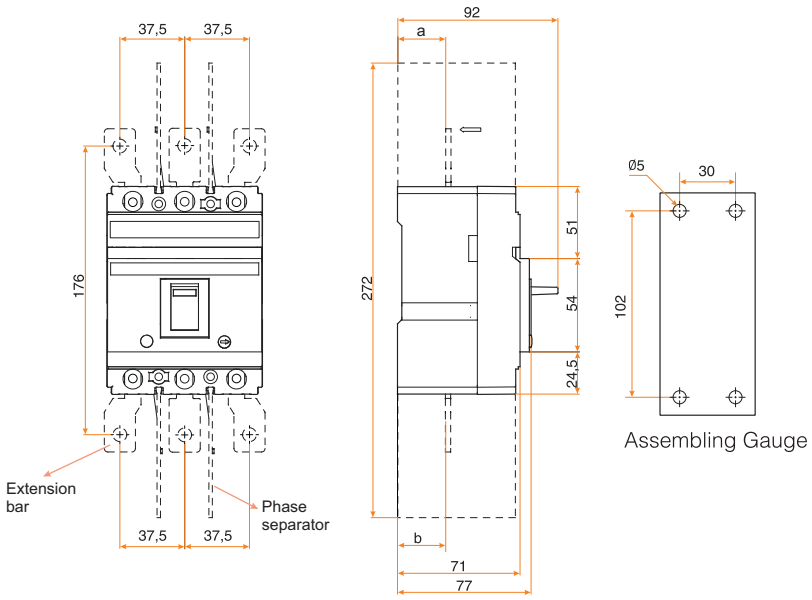
Dimensional drawings

KP 125-F With lock
(With long terminal cover)



KP 125-F Thermal adjustable
(With terminal cover)



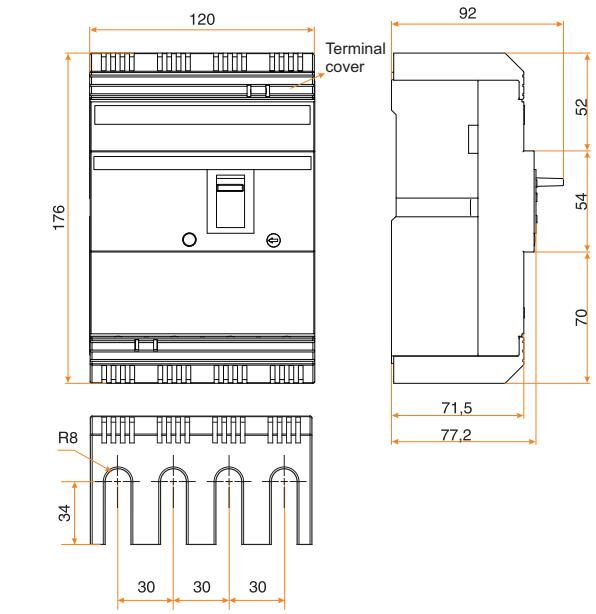


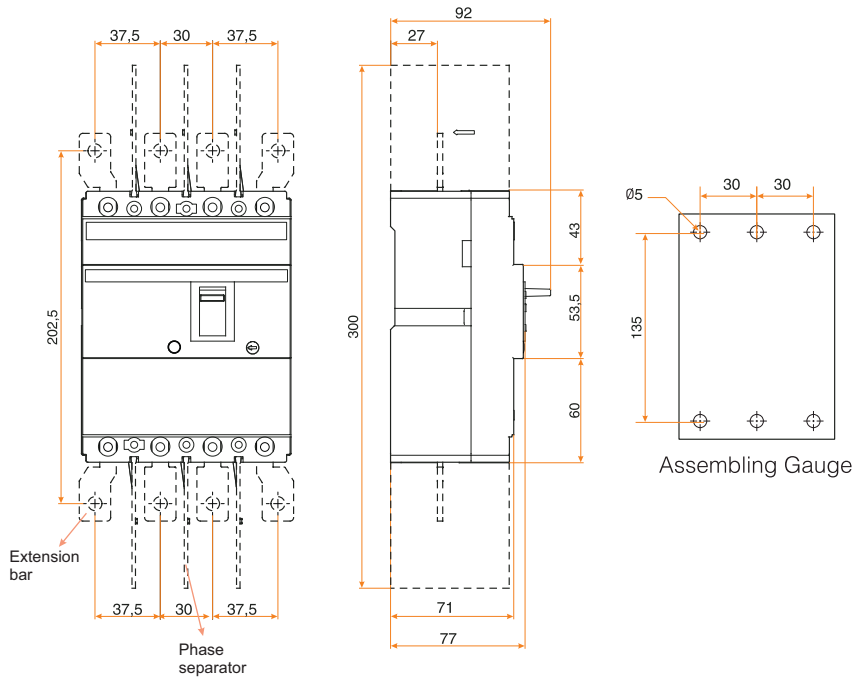
Assembling Gauge

Current (A)	Dimensions (mm)	
	a	b
16	27,5	26
25	27,5	26
40	27,5	27
63	27,5	27
80	27,5	27
100	27,5	27
125	27,5	27

Parts drawn with dotted line are manufactured upon request.

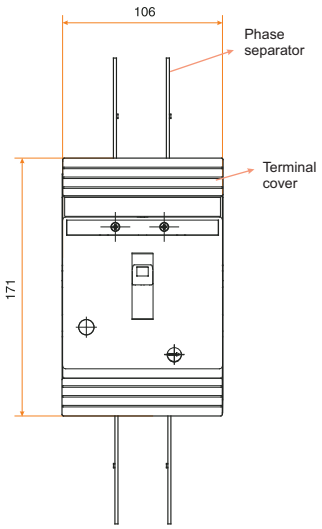
KP 125-F Thermal adjustable (4 poles)

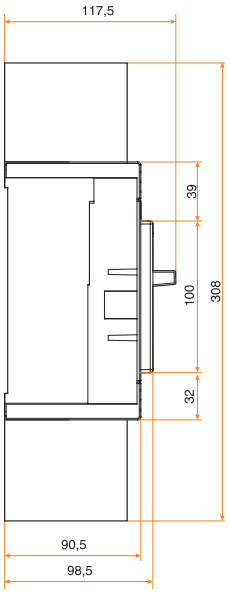


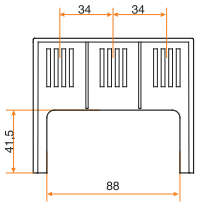


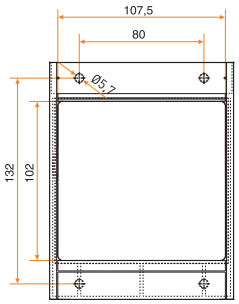
Parts drawn with dotted line are manufactured upon request.

KP 250-F (3pole)

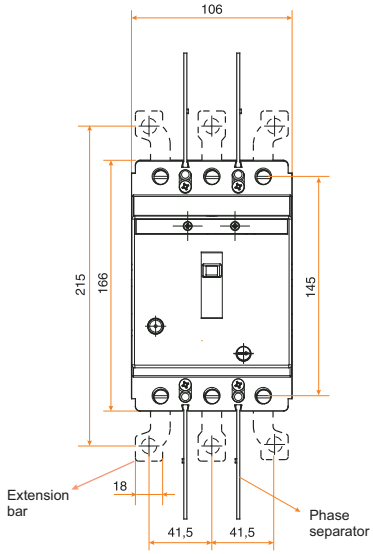


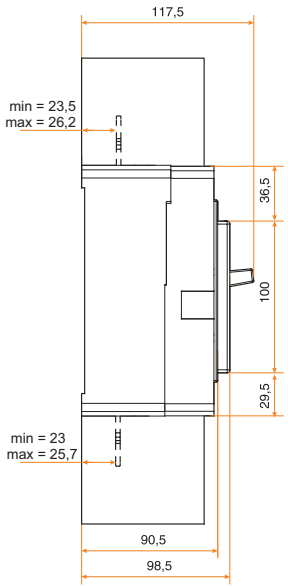






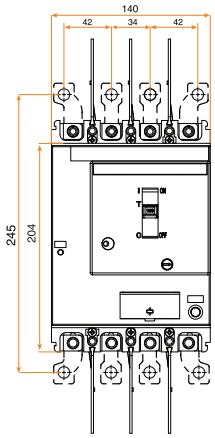
Panel Frame

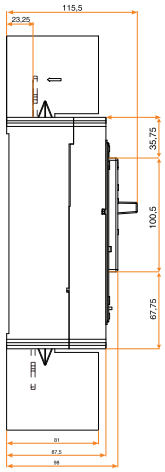


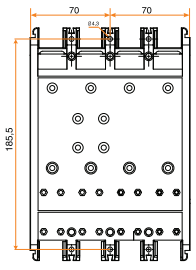


Assembling Gauge

KP 250-F (4 pole)



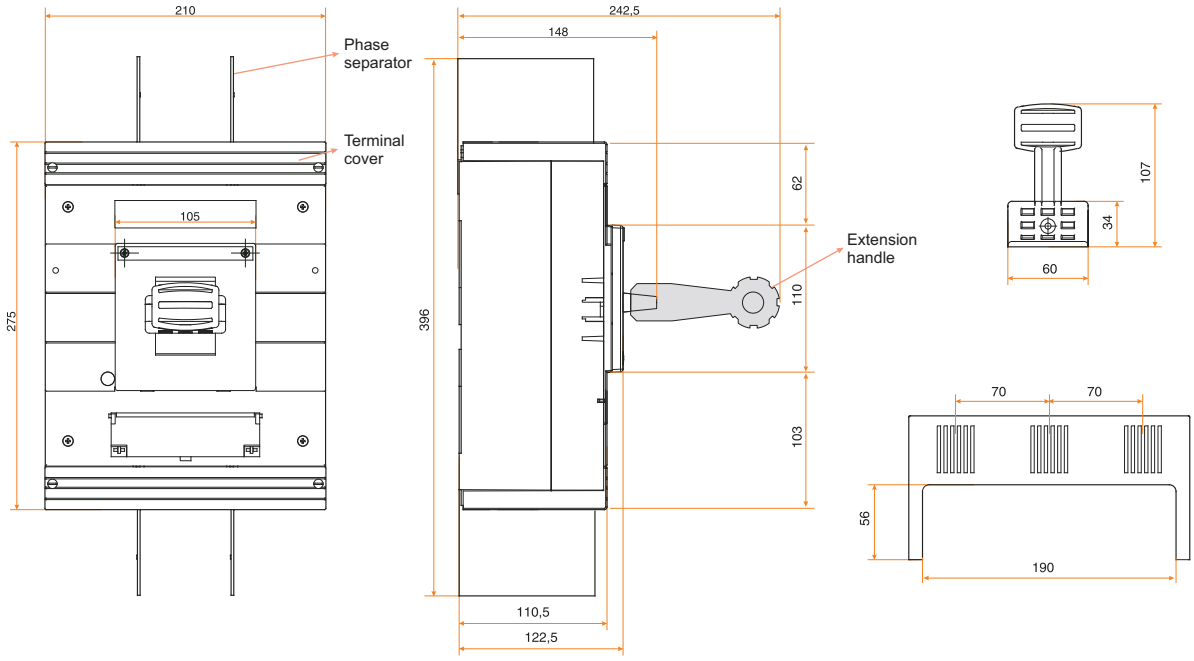


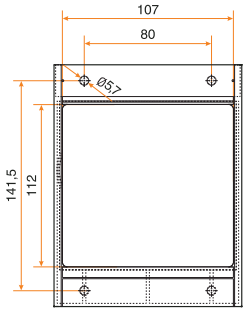


Assembling Gauge

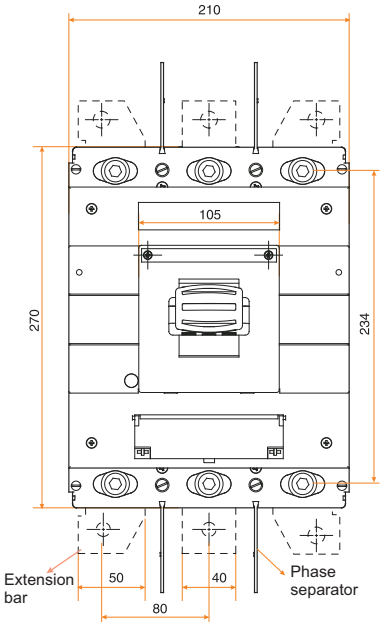
Parts drawn with dotted line are manufactured upon request.

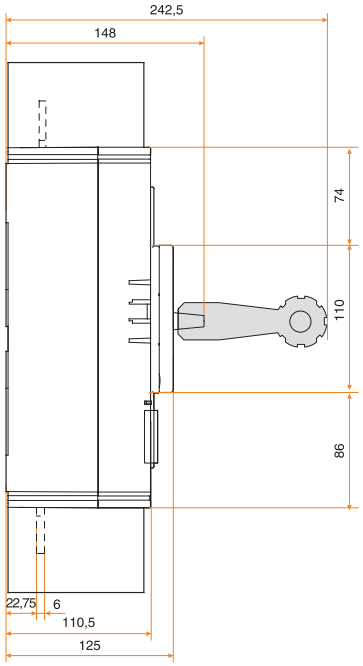
KP 800-F (300-630)A

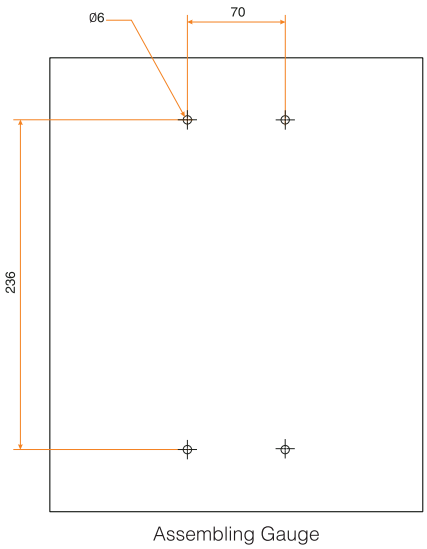




Panel Frame



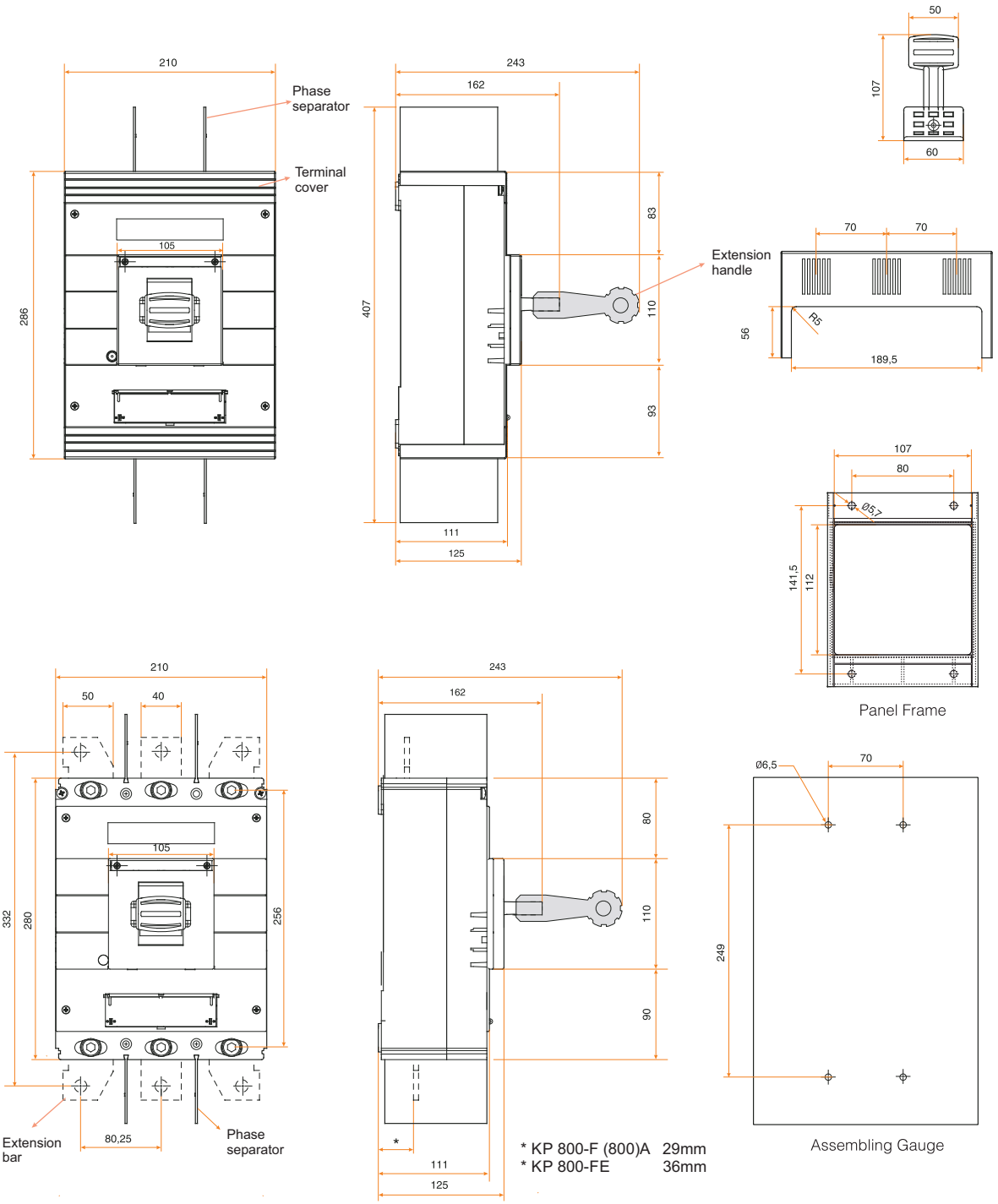




Assembling Gauge

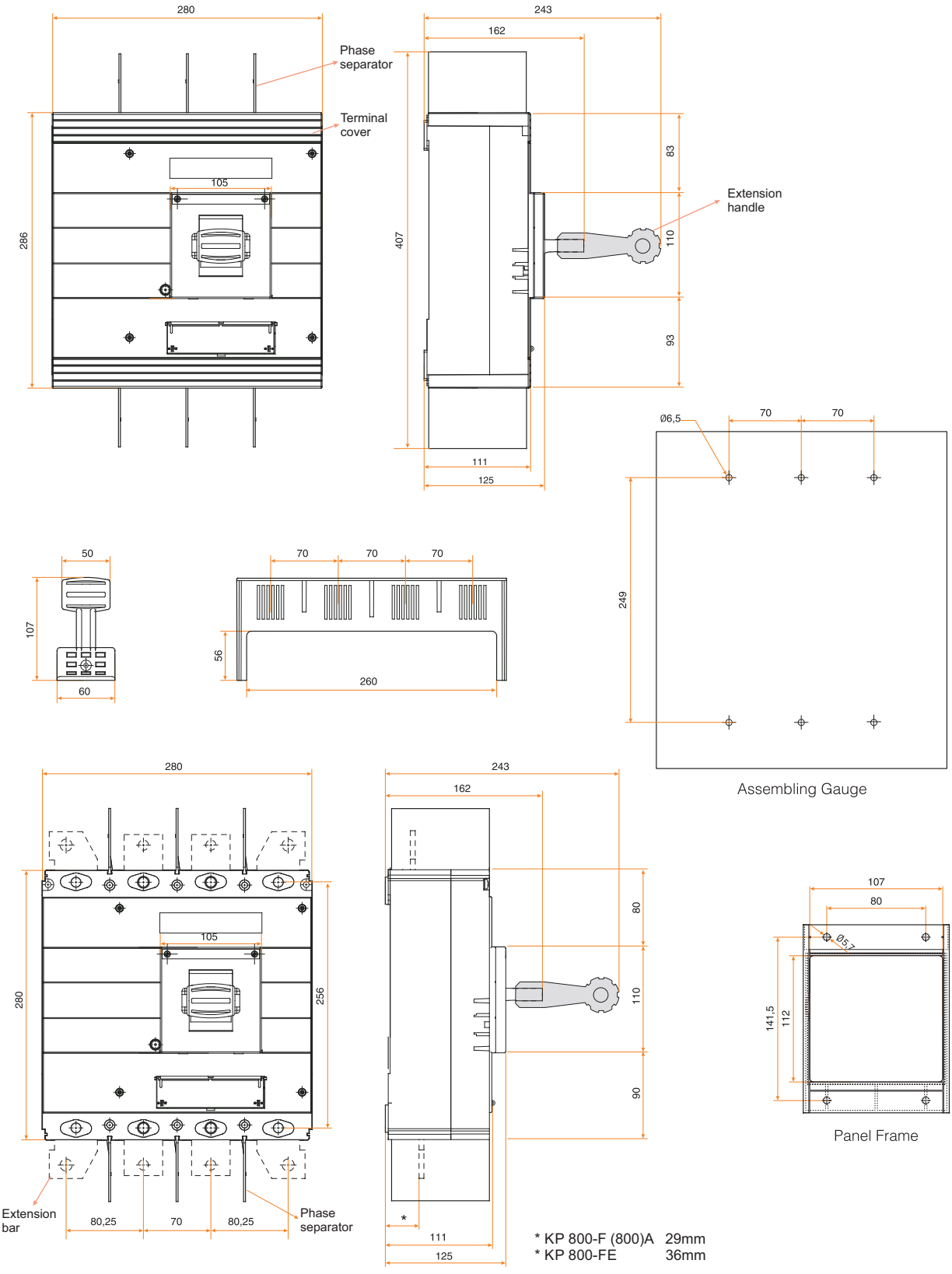
Parts drawn with dotted line are manufactured upon request.

KP 800-F (800)A, KP 800-FE



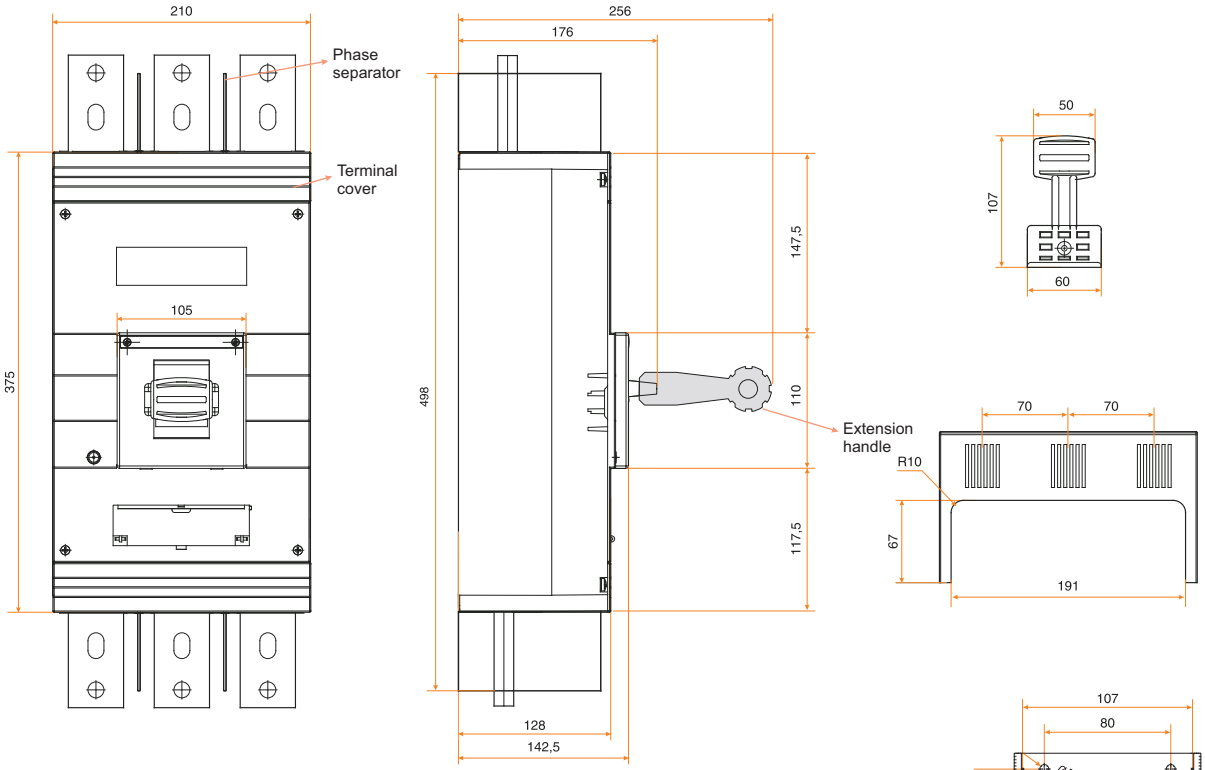
Parts drawn with dotted line are manufactured upon request.

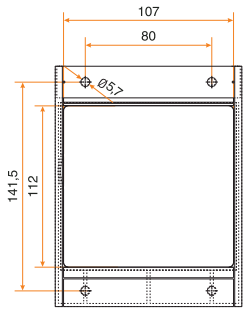
KP 800-F (800)A, KP 800-FE (4 pole)



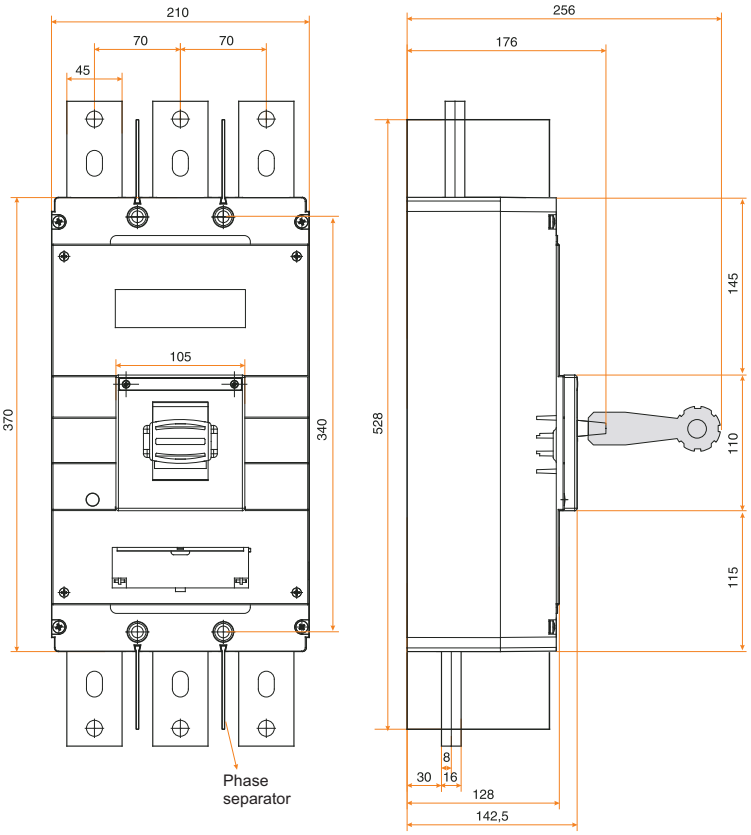
Parts drawn with dotted line are manufactured upon request.

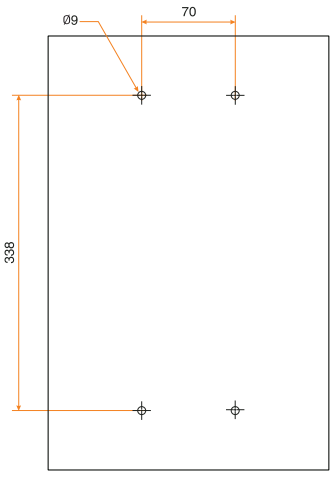
KP 1250-FE





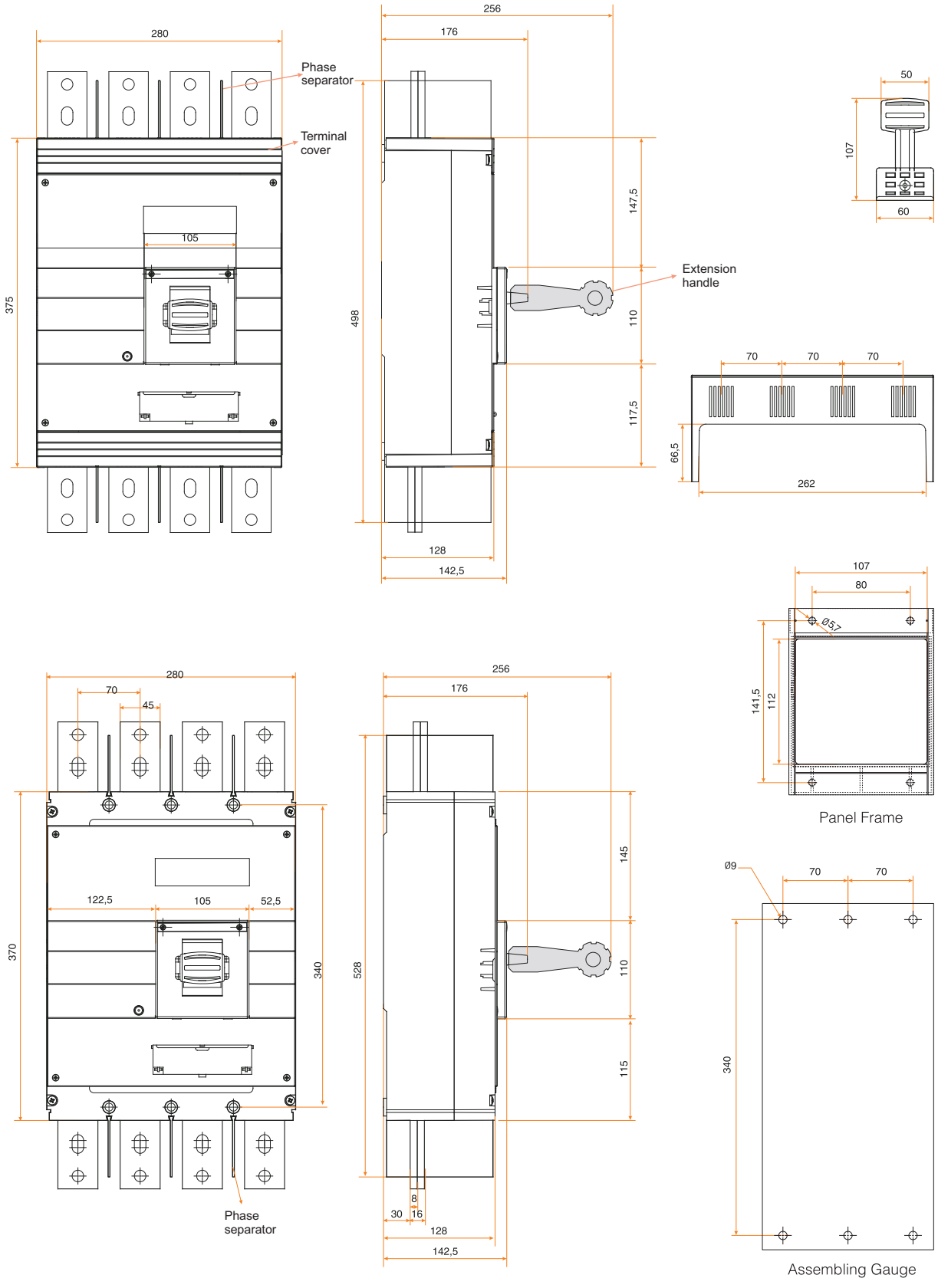
Panel Frame



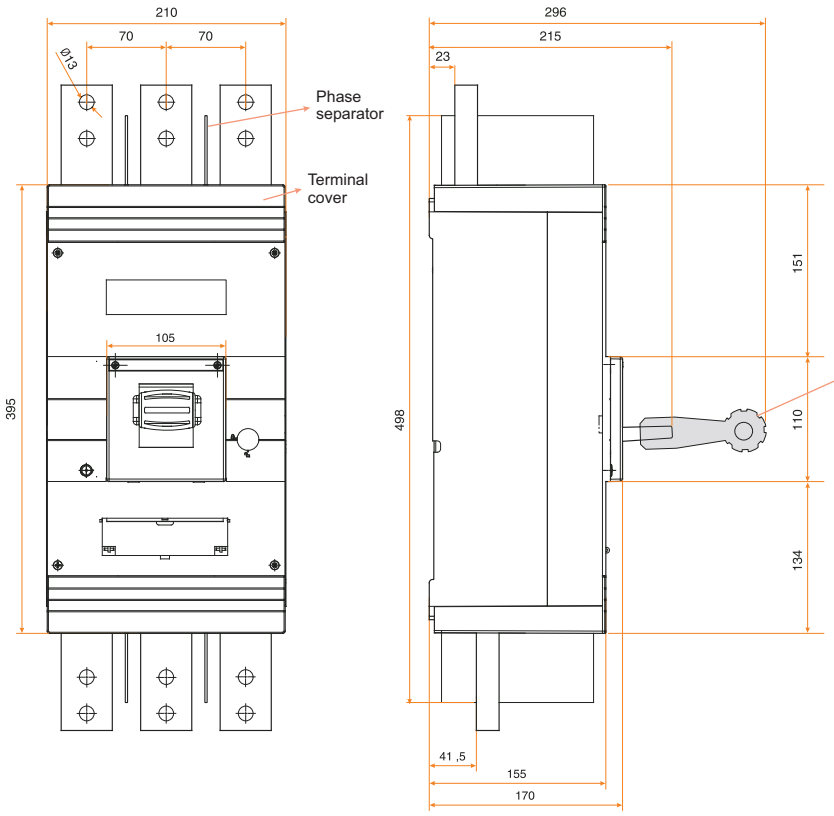


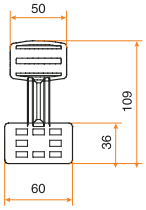
Assembling Gauge

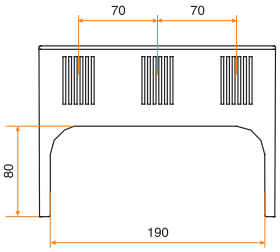
KP 1250-FE (4 poles)

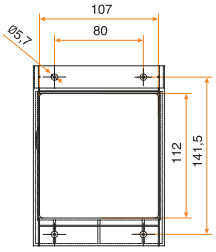


KP 1600-FE

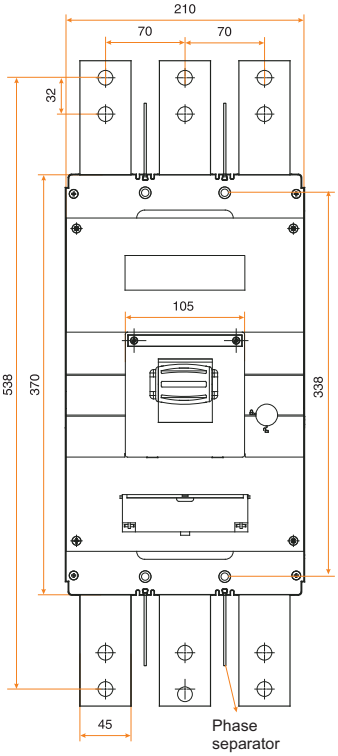


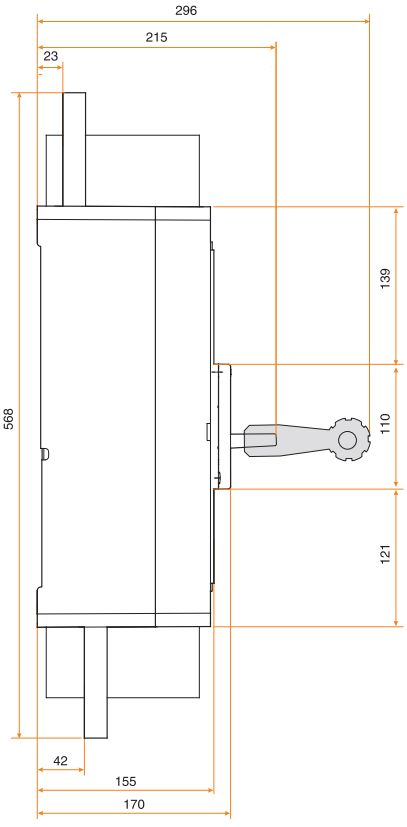


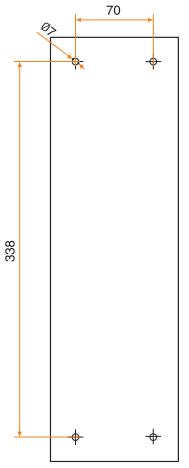




Panel Frame

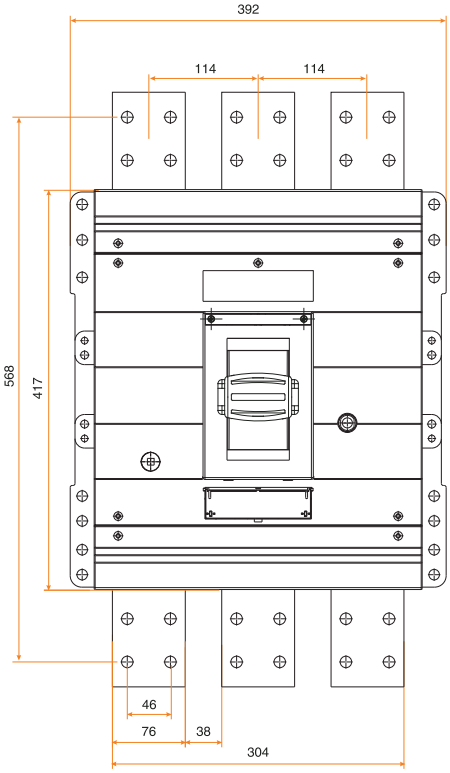


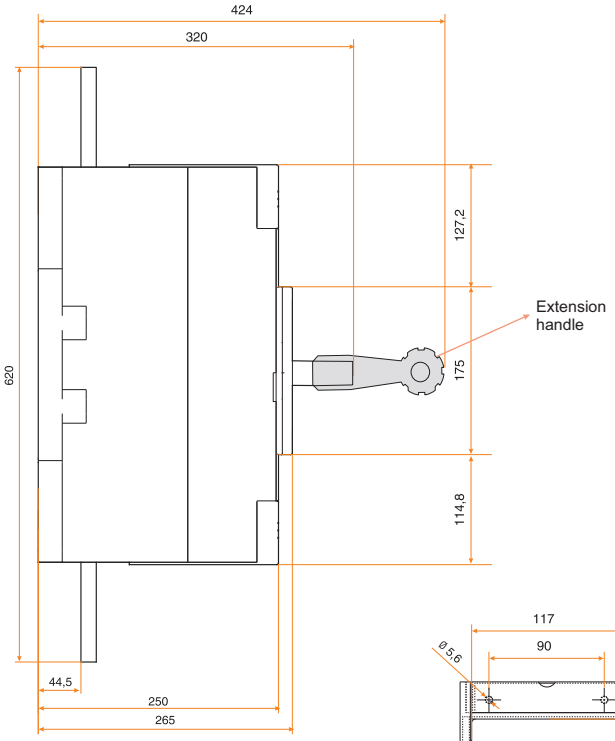


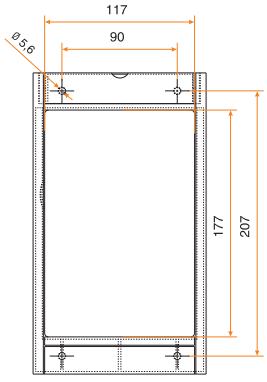


Assembling Gauge

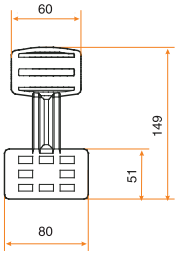
KP 2500-FE

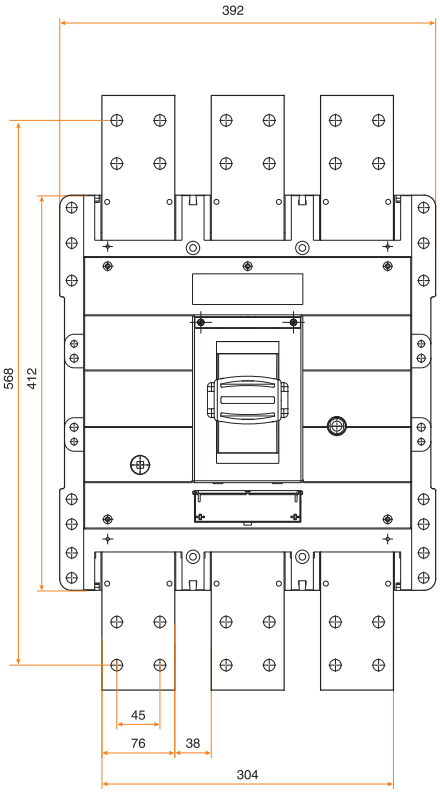


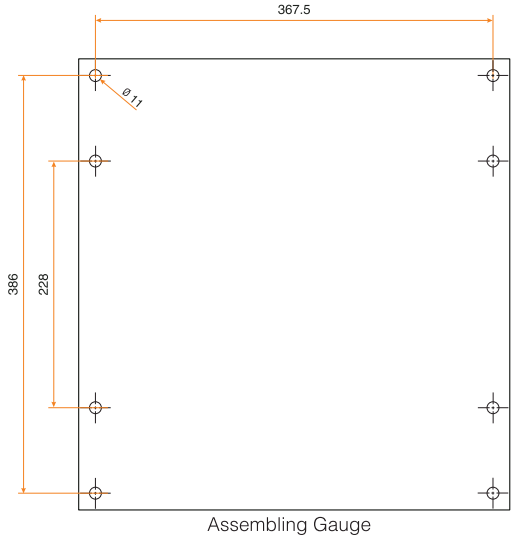




Panel Frame

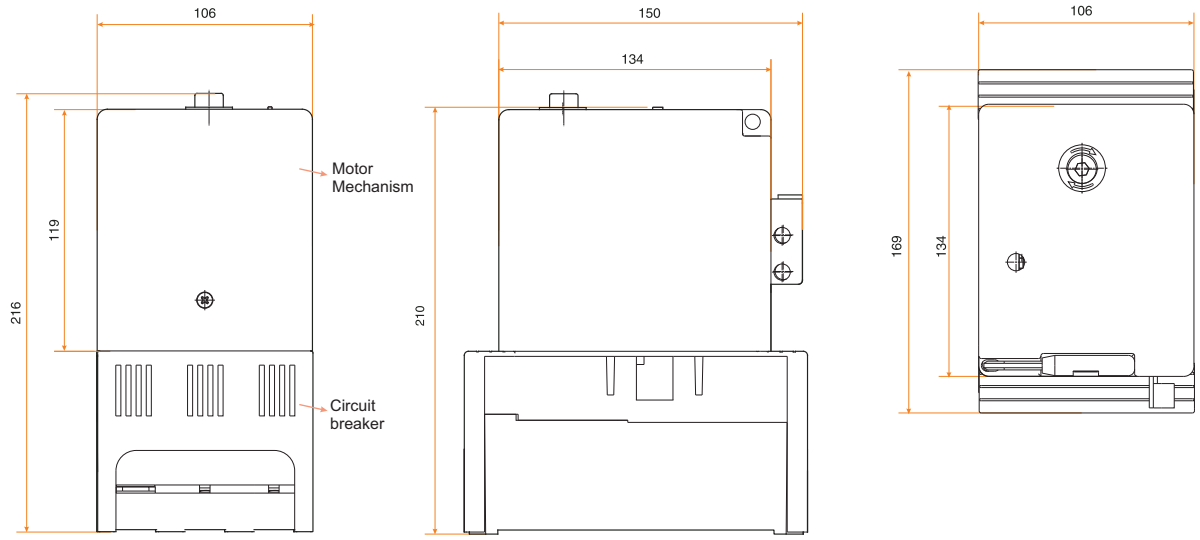




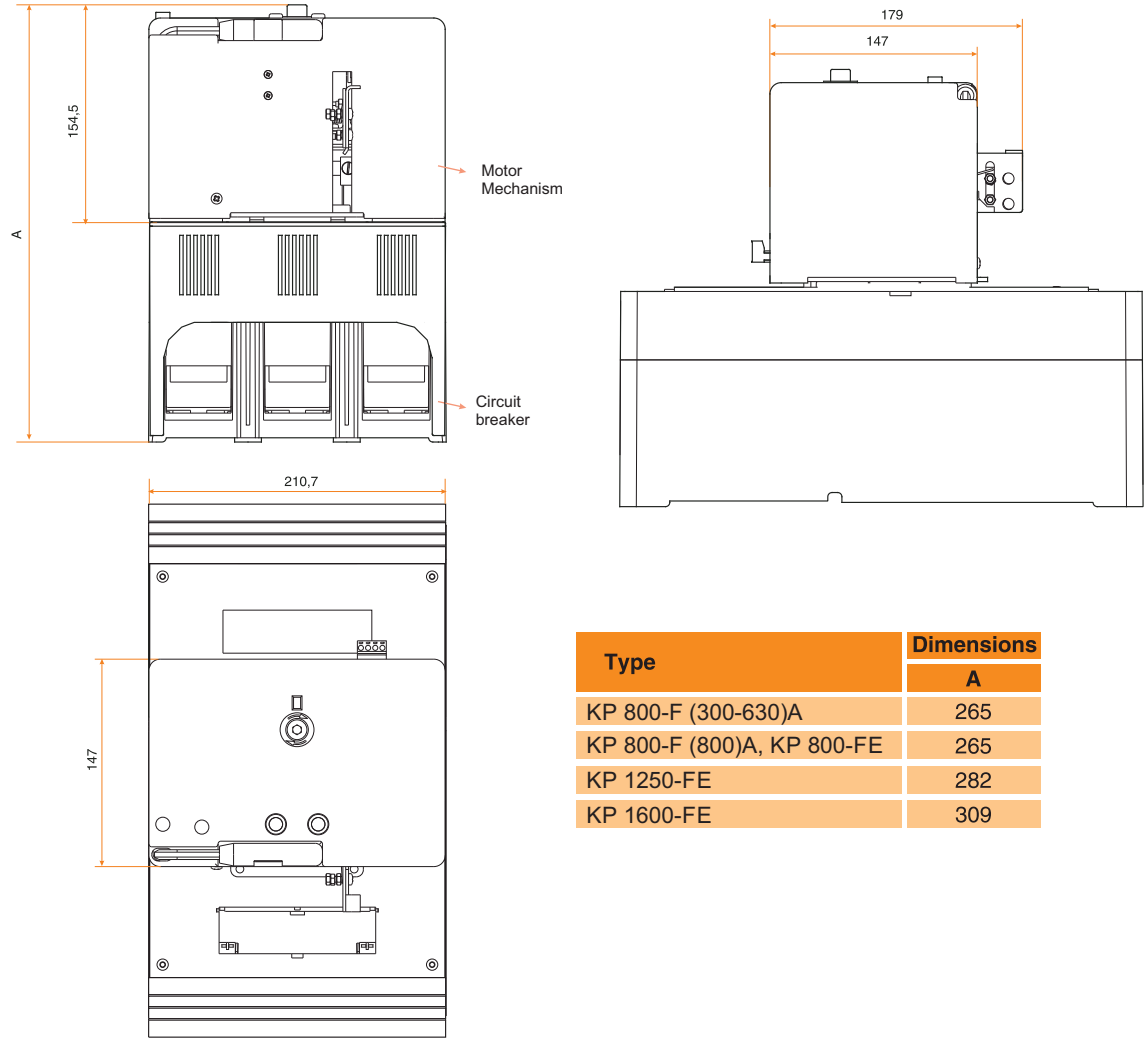


Assembling Gauge

Motor control mechanism for KP 250-F

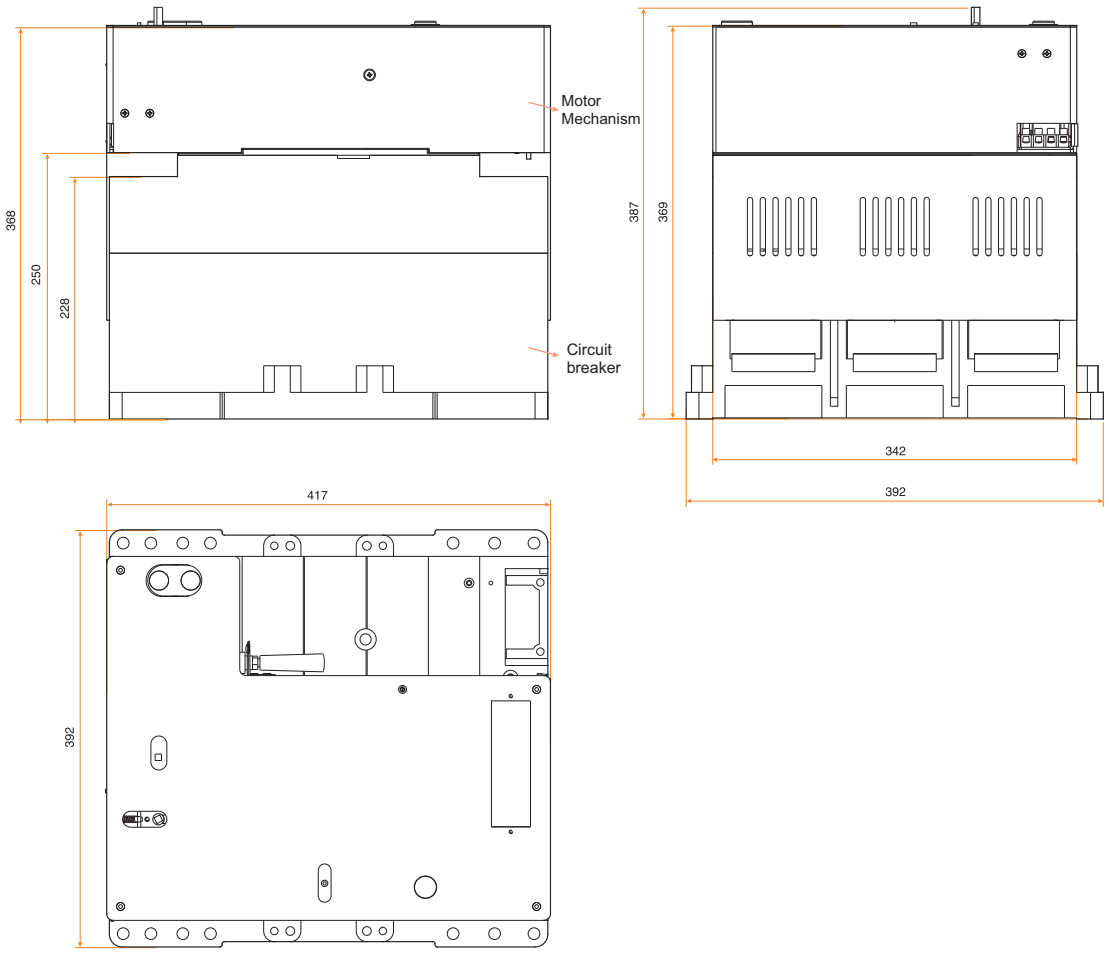


Motor control mechanism for KP 800-F (300-630)A, KP 800-F (800)A, KP 800-FE, KP 1250-FE, KP 1600-FE

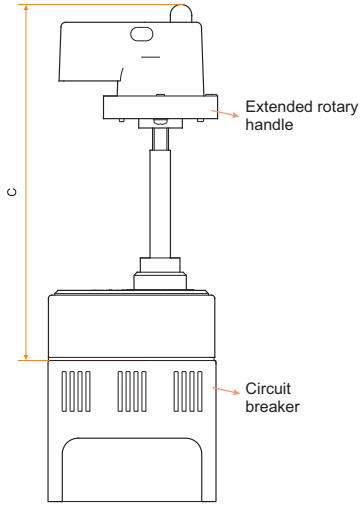


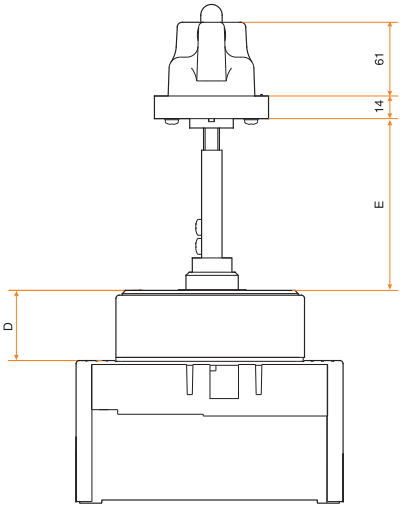
Type	Dimensions
	A
KP 800-F (300-630)A	265
KP 800-F (800)A, KP 800-FE	265
KP 1250-FE	282
KP 1600-FE	309

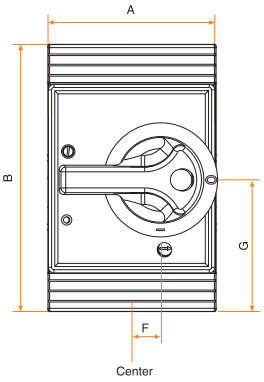
Motor control mechanism for KP 2500-FE



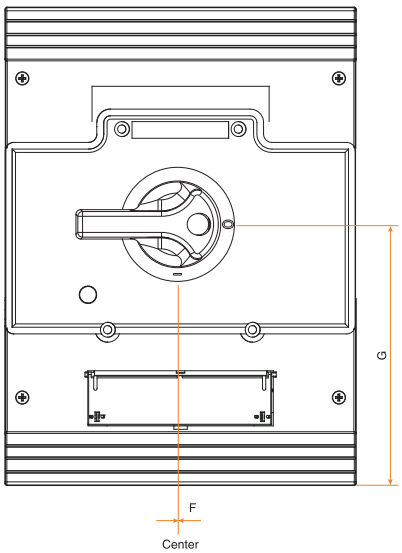
Extended rotary handle







Type	Dimensions							
	A	B	C	D	E		F	G
					min	m%x		
KP 250-F	105	119,5	225	45	100	172	18	85
KP 800-F (300-630)	210	135	310	63,5	100	180	0	145
KP 800-F (800), KP 800-FE	210	135	310	63,5	100	180	0	142
KP 1250-FE	210	135	310	63,5	100	180	0	180



Please ask special design dimensions CD for panel builder.

AIR TYPE CIRCUIT BREAKERS - VP

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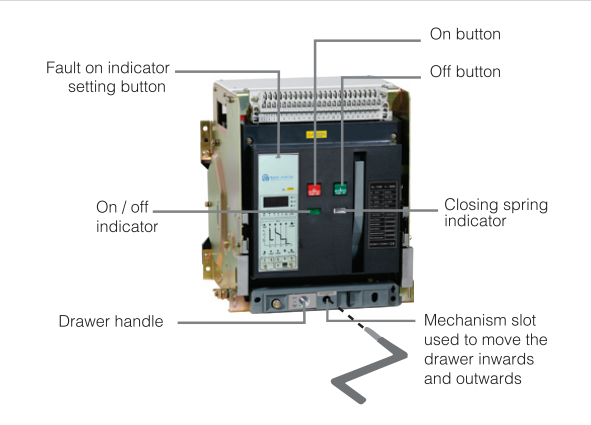
Technical data 179
Dimensions drawings 181

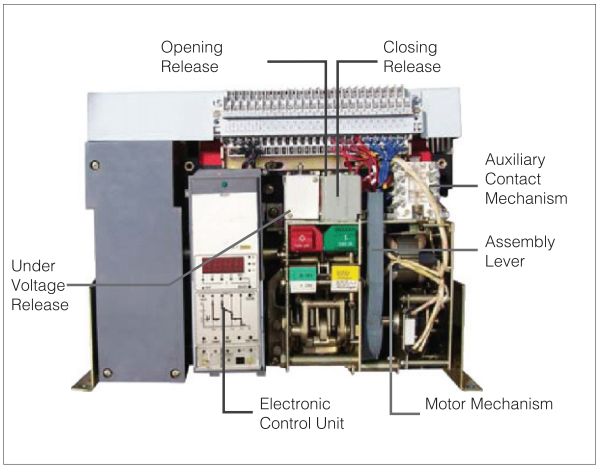
Air type circuit breakers

Air type circuit breakers - VP

AIR TYPE CIRCUIT BREAKERS - VP

Air type circuit breakers are used for protection of generators with large powers, motor, capacitor groups and transformers, as well as general protection of factories, shopping malls, business centers and else.





Air type circuit breakers are used for protection of generators with large powers, motor, capacitor groups and transformers, as well as general protection of factories, shopping malls, business centers.

Drawout Type Circuit Breaker:
Circuit breakers are automatically turned on during pull and push of the drawer via lever. When drawer-type switches fail, they can be quickly replaced with the spare one.

Features of Control Circuit

Protection Functions:
Various functions such as overload, long reverse time delayed, short reverse time delayed, short time delayed, fixed time curves are available for users demanding various protection features.

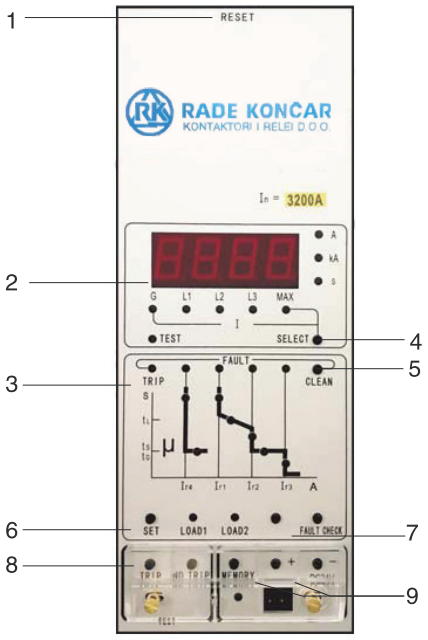
Indicator Function:
There is current adjustment indicator and operating current indicator.

Ammeter Function:
It shows the current passing through the circuit.

Alarm Feature:
It shows overload status.

Self-Control Feature:
It separates itself from the system with protection and control units against overheating.

Test Feature:
It is used to test features of the breaker.



Functions of buttons:

1- RESET: Press reset button after breaker trips, the breaker will get ready to close again.

2- CURRENT-TIME indicator: It shows the current and opening time.

3- LED: It shows status and features of the breaker.

4- SELECT: It shows maximum phase current under normal conditions. Current of each phase is displayed when you press this button.

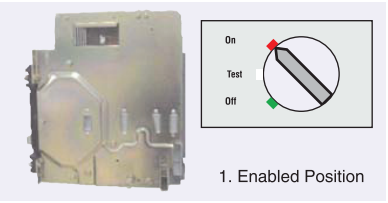
5- CLEAN: Reset button must be pressed to close the breaker after adjusting operating current or opening breaker fault current.

6- SET: You may press this button to adjust and check current and time characteristics and each status may be displayed in order.

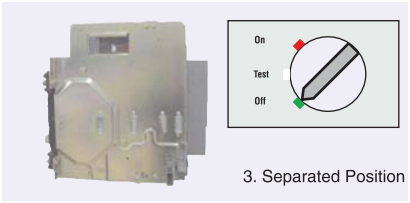
7- FAULT CHECK: When you press this button, the last fault status, faulty current and time is displayed.

8- TRIP and NON-TRIP: Only for test.

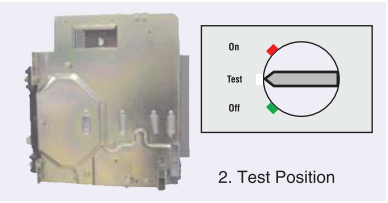
9- MEMORY: Features adjusted with (+) and (-) buttons are saved.



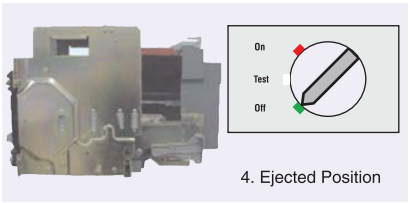
1. Enabled Position



3. Separated Position



2. Test Position



4. Ejected Position

Air type circuit breaker may be in four positions on the drawer:

1. Enabled Position: All the power circuits and auxiliary contacts are enabled.

2. Test Position: Power circuits are separated, but auxiliary contacts are enabled. This is the position of testing.

3. Separated Position: All the power circuits and auxiliary contacts are separated.

4. Ejected Position: All the power circuits and auxiliary contacts are separated. This is the position of ejecting the breaker from its drawer.

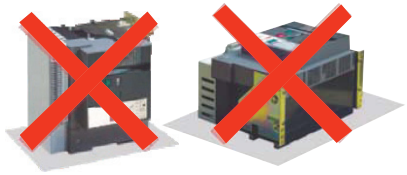
Protection Features of Over Current Breaker:
Adjustment values of the breaker are given in the table below.

Long delay		Short delay		Instantaneous		Ground fault	
I_{r1} (0.4-1)xIn	Accuracy ±10%	I_{r2} (0,4-15)x I_n	Accuracy ±10%	I_{r3} 1.0xIn-50kA	Accuracy ±15%	I_{r4} (0.2-0.8)xIn	Accuracy ±10%

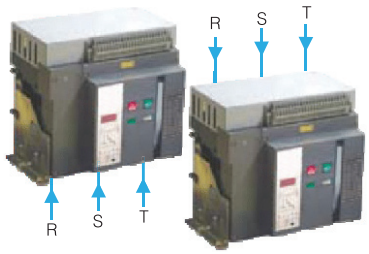
Opening Time Features:
Over current protection, long time delay, reverse time opening features are given in the table below.

1,05xI_L	1,3xI_L	1.5xI_L time setting	(s)	15	30	60	120	240	480
>2h non tripping	<1h tripping	2.0xI_L action time	(s)	8.4	16.9	33.7	67.5	135	270

Assembly of air type circuit breakers should be made in vertical position only.



Brackets to assemble air type circuit breakers should be latitudinal as shown in the figure.



Energy connection of air type circuit breakers can be made at both bottom and top connection terminals.

Short time delay over current protection, opening features:
Reverse time (in short time delay current) protection feature of the breaker.
$I^2t = (8xI_{r1})^2xts$,
T: Opening time of the breaker
I: Fault current (Opening current)
ts: Adjusted short delay time
Ir1: If the adjusted long delay opening current is higher than over current 8 Ir1, the opening time (ts) shall automatically turn into the adjustmed delay time.

Ammeter Feature:
The ammeter shows the main circuit current on display screen. When SELECT button is pressed, it shows current of the phase with LED on or maximum phase current. When the button is pressed again, current of the other phase is shown.

Test Feature:
The breaker test be performed by pressing the test button. There are two kind of test buttons. One of them is non-trip test button and the other is trip test button. Non-trip test is performed when the breaker is connected to the network. Test is automatically broken when there is over current on the network.

Adjustment Feature:
Current and delay times are adjusted by pressing "+/-" buttons according to user needs. When you see the required current or delay time on the display, save it by pressing Storage button. When over current is present, this function is broken automatically.

Load-Dependent Features:
Two values can be set:
Load 1 current (Ic1) adjustment range (0,2-1)xIn and Load 2 current (Ic2) adjustment range (0,2-1)xIn, Ic1 time delay is adjusted to half of long time delay.
Ic2 time delay has two features; first one is reverse time delay adjusted to _ of long time delay and second one is fixed time delay set to 60 sec. Ic1 and Ic2 current values are used for disabling and enabling insignificant loads.

Air type circuit breakers - VP

VP 2000-FE (630-2000) A - (0.4-1)In - 70kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609485	630	3	70	(0.4-1)In	1
VP 2000-FE 800A	609486	800	3	70	(0.4-1)In	
VP 2000-FE 1000A	609487	1000	3	70	(0.4-1)In	
VP 2000-FE 1250A	609488	1250	3	70	(0.4-1)In	
VP 2000-FE 1600A	607528	1600	3	70	(0.4-1)In	
VP 2000-FE 2000A	607663	2000	3	70	(0.4-1)In	

VP 2000-FE (630-2000) A - (0.4-1)In - 70kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609489	630	4	70	(0.4-1)In	1
VP 2000-FE 800A	609490	800	4	70	(0.4-1)In	
VP 2000-FE 1000A	609491	1000	4	70	(0.4-1)In	
VP 2000-FE 1250A	609492	1250	4	70	(0.4-1)In	
VP 2000-FE 1600A	609493	1600	4	70	(0.4-1)In	
VP 2000-FE 2000A	609494	2000	4	70	(0.4-1)In	

VP 2000-FE (630-2000) A - (0.4-1)In - 80kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609495	630	3	80	(0.4-1)In	1
VP 2000-FE 800A	609496	800	3	80	(0.4-1)In	
VP 2000-FE 1000A	609497	1000	3	80	(0.4-1)In	
VP 2000-FE 1250A	609498	1250	3	80	(0.4-1)In	
VP 2000-FE 1600A	609499	1600	3	80	(0.4-1)In	
VP 2000-FE 2000A	609500	2000	3	80	(0.4-1)In	

VP 2000-FE (630-2000) A - (0.4-1)In - 80kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609501	630	4	80	(0.4-1)In	1
VP 2000-FE 800A	609502	800	4	80	(0.4-1)In	
VP 2000-FE 1000A	609503	1000	4	80	(0.4-1)In	
VP 2000-FE 1250A	609504	1250	4	80	(0.4-1)In	
VP 2000-FE 1600A	609505	1600	4	80	(0.4-1)In	
VP 2000-FE 2000A	609506	2000	4	80	(0.4-1)In	

VP 2000-FE (630-2000) A - (0.4-1)In - 100kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609507	630	3	100	(0.4-1)In	1
VP 2000-FE 800A	609508	800	3	100	(0.4-1)In	
VP 2000-FE 1000A	609509	1000	3	100	(0.4-1)In	
VP 2000-FE 1250A	609510	1250	3	100	(0.4-1)In	
VP 2000-FE 1600A	609511	1600	3	100	(0.4-1)In	
VP 2000-FE 2000A	609512	2000	3	100	(0.4-1)In	

VP 2000-FE (630-2000) A - (0.4-1)In - 100kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 2000-FE 630A	609513	630	4	100	(0.4-1)In	1
VP 2000-FE 800A	609514	800	4	100	(0.4-1)In	
VP 2000-FE 1000A	609515	1000	4	100	(0.4-1)In	
VP 2000-FE 1250A	609516	1250	4	100	(0.4-1)In	
VP 2000-FE 1600A	609517	1600	4	100	(0.4-1)In	
VP 2000-FE 2000A	609518	2000	4	100	(0.4-1)In	

Technical data - page 179; Accessories - page 178

Air type circuit breakers

VP 3200-FE (2500-3200)A - (0.4-1)In - 70kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	607627	2500	3	70	(0.4-1)In	1
VP 3200-FE 3200A	609519	3200	3	70	(0.4-1)In	

VP 3200-FE (2500-3200)A - (0.4-1)In - 70kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	609520	2500	4	70	(0.4-1)In	1
VP 3200-FE 3200A	609521	3200	4	70	(0.4-1)In	

VP 3200-FE (2500-3200)A - (0.4-1)In - 80kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	609522	2500	3	80	(0.4-1)In	1
VP 3200-FE 3200A	609523	3200	3	80	(0.4-1)In	

VP 3200-FE (2500-3200)A - (0.4-1)In - 80kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	609524	2500	4	80	(0.4-1)In	1
VP 3200-FE 3200A	609525	3200	4	80	(0.4-1)In	

VP 3200-FE (2500-3200)A - (0.4-1)In - 100kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	609526	2500	3	100	(0.4-1)In	1
VP 3200-FE 3200A	609527	3200	3	100	(0.4-1)In	

VP 3200-FE (2500-3200)A - (0.4-1)In - 100kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 3200-FE 2500A	609528	2500	4	100	(0.4-1)In	1
VP 3200-FE 3200A	609529	3200	4	100	(0.4-1)In	

Technical data - page 179; Accessories - page 178

Air type circuit breakers

VP 4000-FE (4000)A - (0.4-1)In - 70kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609530	4000	3	70	(0.4-1)In	1

VP 4000-FE (4000)A - (0.4-1)In - 70kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609531	4000	4	70	(0.4-1)In	1

VP 4000-FE (4000)A - (0.4-1)In - 80kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609532	4000	3	80	(0.4-1)In	1

VP 4000-FE (4000)A - (0.4-1)In - 80kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609533	4000	4	80	(0.4-1)In	1

VP 4000-FE (4000)A - (0.4-1)In - 100kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609534	4000	3	100	(0.4-1)In	1

VP 4000-FE (4000)A - (0.4-1)In - 100kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 4000-FE 4000A	609535	4000	4	100	(0.4-1)In	1

VP 6300-FE (5000-6300)A - (0.4-1)In - 70kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609536	5000	3	70	(0.4-1)In	1
VP 6300-FE 6300A	609537	6300	3	70	(0.4-1)In	

VP 6300-FE (5000-6300)A - (0.4-1)In - 70kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609538	5000	4	70	(0.4-1)In	1
VP 6300-FE 6300A	609539	6300	4	70	(0.4-1)In	

Technical data - page 179; Accessories - page 178

Air type circuit breakers

VP 6300-FE (5000-6300)A - (0.4-1)In - 80kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609540	5000	3	80	(0.4-1)In	1
VP 6300-FE 6300A	609541	6300	3	80	(0.4-1)In	

VP 6300-FE (5000-6300)A - (0.4-1)In - 80kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609542	5000	4	80	(0.4-1)In	1
VP 6300-FE 6300A	609543	6300	4	80	(0.4-1)In	

VP 6300-FE (5000-6300)A - (0.4-1)In - 100kA - 3 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609544	5000	3	100	(0.4-1)In	1
VP 6300-FE 6300A	609545	6300	3	100	(0.4-1)In	

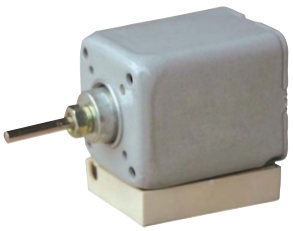
VP 6300-FE (5000-6300)A - (0.4-1)In - 80kA - 4 pole						
Type	Order number	Rated current-In	No. of poles	Icu 415V	Rated current adjustments	Packing [pcs]
VP 6300-FE 5000A	609546	5000	4	100	(0.4-1)In	1
VP 6300-FE 6300A	609547	6300	4	100	(0.4-1)In	

Technical data - page 179; Accessories - page 178

Accessories

Undervoltage release - VP UF1 - non-delayed

Type	Order number	Voltage AC	Actuation voltage (V)	Release voltage	Power consum.	Packing [pcs]
VP UF1	609548	230, 400V	(0.85-1.1) Ue	(0.35-0.7) Ue	48W	1



Undervoltage release - VP UF2 - delayed

Type	Order number	Voltage AC	Actuation voltage (V)	Release voltage	Power consum.	Packing [pcs]
VP UF1	609549	230, 400V	(0.85-1.1) Ue	(0.35-0.7) Ue	48W	1

Closing coil - VP CF

Type	Order number	Voltage AC	Operating voltage (V)	Power consumption	Closing time	Packing [pcs]
VP CF	606550	230, 400V	(0.85-1.1) Us	40W	70ms	1

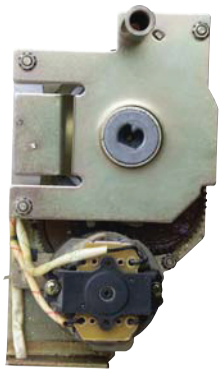
Shunt trip coil - VP DF

Type	Order number	Voltage AC	Operating voltage (V)	Power consumption	Closing time	Packing [pcs]
VP DF	609551	230, 400V	(0.7-1.1) Us	40W	30ms	1

Motor mechanism - VP MF1

Type	Order number	Voltage AC	Operating voltage (V)	Power consumption	Closing time	Packing [pcs]
VP MF1	609552	230, 400V	(0.85-1.1) Us	190W	30ms	1

For VP2000-FE ...



Motor mechanism - VP MF2

Type	Order number	Voltage AC	Operating voltage (V)	Power consumption	Closing time	Packing [pcs]
VP MF2	609553	230, 400V	(0.85-1.1) Us	190W	30ms	1

For VP 3200-FE ..., VP 4000 ..., VP 6300-FE ...

Technical data

Type		VP 2000-FE			VP 3200-FE			VP 4000-FE			VP 6300-FE			
Rated current - In	A	630,800,1000 1250,1600,2000			2500, 3200			4000*			5000, 6300			
Number of poles		3 / 4			3 / 4			3 / 4			3 / 4			
Rated operating voltage - Ue (a.c.) 50-60 Hz	V	415			415			415			415			
Rated insulation voltage - Ui (a.c.) 50-60 Hz	V	1000 V			1000 V			1000 V			1000 V			
Rated impulse withstand voltage - Uimp	kV	8			8			8			8			
Test voltage (1 min) (a.c.) 50-60 Hz	kV	3			3			3			3			
Rated Current Adjustment field	In	(0,4-1)In			(0,4-1)In			(0,4-1)In			(0,4-1)In			
Rated ultimate short circuit breaking capacity - Icu 415V~	(kA rms)	70	80	100	70	80	100	70	80	100	70	80	120	
Rated service short circuit breaking capacity - Ics 415V~	(kA rms)	35	50	65	35	65	80	35	65	80	35	65	100	
Rated short time withstand capacity - Icw 1s 415 V~	(kA rms)	35	50	65	35	65	80	50	65	80	50	65	100	
Category (EN 60947-2 / IEC 60947-2)		A, B			A, B			A, B			A, B			
Opening type		Electronic			Electronic			Electronic			Electronic			
Assembly method		Fixed / Drawout			Fixed / Drawout			Fixed / Drawout			Drawout			
Long time delay current (I_L)	Ir1	(0,4-1)In			(0,4-1)In			(0,4-1)In			(0,4-1)In			
Long time delay interval	tl s	15-500			15-500			15-500			15-500			
Short time delay current (I_S)	Ir2	(0,4-15)In			(0,4-15)In			(0,4-15)In			(0,4-15)In			
Short time delay interval	ts s	0,1 - 1			0,1 - 1			0,1 - 1			0,1 - 1			
Instantaneous breaking current (I_I)	Ir3	In-50 kA			In-50 kA			In-50 kA			In-50 kA			
Ground fault current (I_G)	Ir4	(0,2-0,8)In			(0,2-0,8)In			(0,2-0,8)In			(0,2-0,8)In			
Mechanical life	With maintenance	10000			10000			10000			10000			
	Without maintenance	3000			3000			3000			3000			
Power losses per pole	Drawout	38, 47, 77, 110, 150, 160			210, 240			320			350, 420			
	Fixed	15, 21, 35, 50, 75, 85			90, 150			230			-			
Accessories														
Undervoltage release **		❒			❒			❒			❒			
Undervoltage release with time delay		❒			❒			❒			❒			
Shunt trip		❒			❒			❒			❒			
Closing coil		❒			❒			❒			❒			
Auxiliary contact block		◨			◨			◨			◨			
Motor control mechanism		❒			❒			❒			❒			
Inverser lock		❒			❒			❒			❒			

* 4 pole 4000A switch is produced with drawer.
◨ standards, ❒ optional
** Opening time can be set as 1s, 3s, 5s, 7s, 9s, 10s.

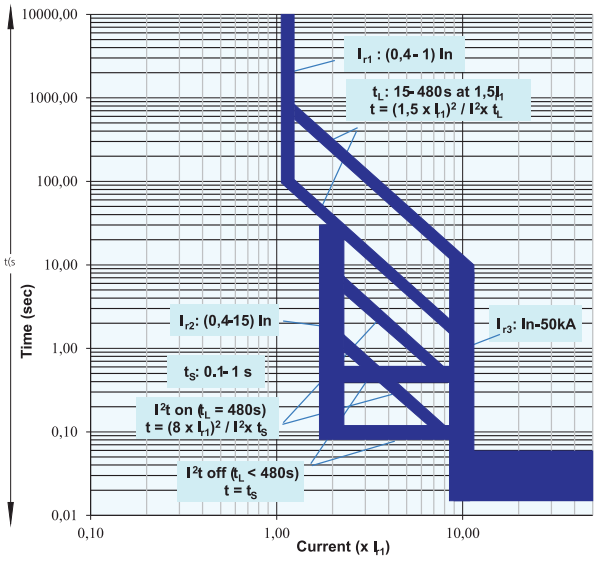
Generator			Breaker
kVA	kW	A	A
375	300	546	630
438	350	637	800
500	400	730	800
625	500	910	1000
750	600	1090	1250
875	700	1274	1600
1000	800	1460	1600
1125	900	1640	2000
1250	1000	1820	2000
1563	1250	2280	2500
1875	1500	2730	3200
2188	1750	3180	3200
2500	2000	3640	4000

Motor		Breaker
kW	A	A
220	368	630
250	415	630
315	521	800
355	588	800
400	665	800
450	743	1000
500	819	1000
560	916	1250
630	1022	1250

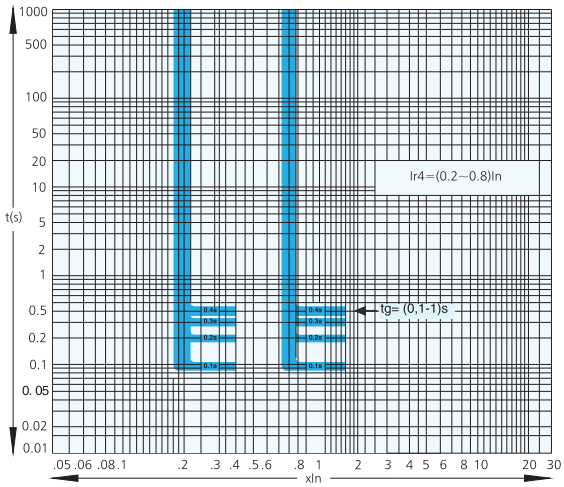
Capacitor Power	Capacitor Current	Breaker Current
kVAr	A	A
578	834	1250
739	1067	1600
924	1334	2000
1155	1667	2500
1478	2134	3200

Characteristic Curves:

Current-Time Curve:



Ground Fault Protection Current-Time Curve:



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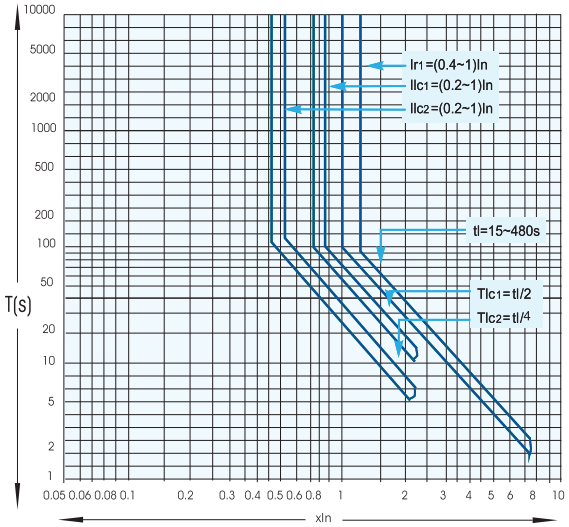
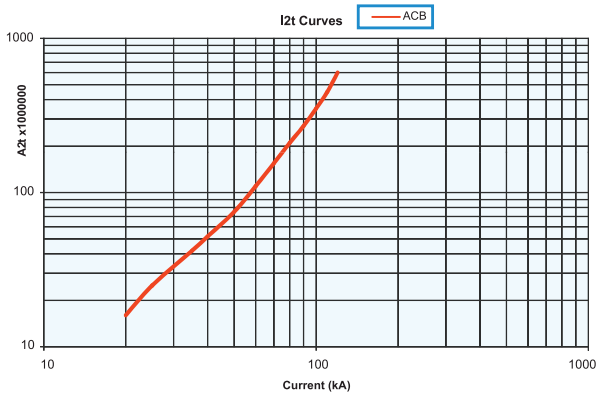


I^2 T Curve:



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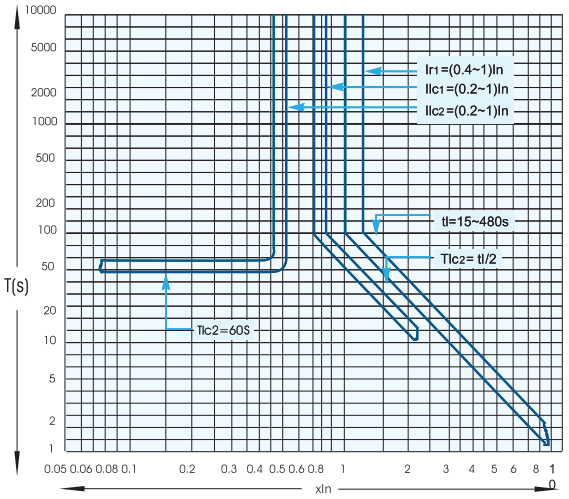
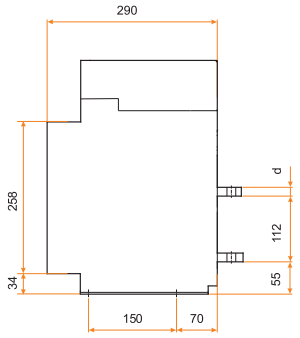
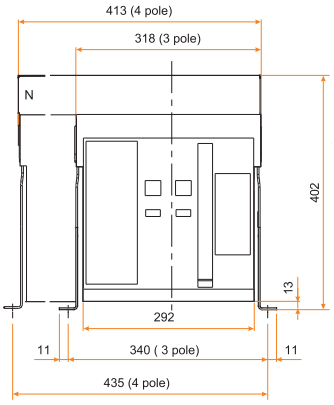
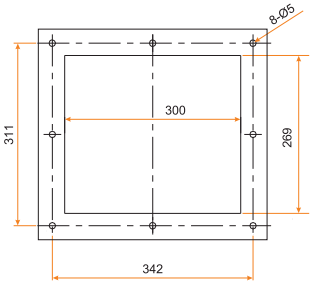


Dimensional drawings

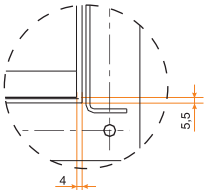
VP 2000-FE (Fixed type)

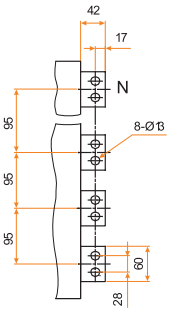




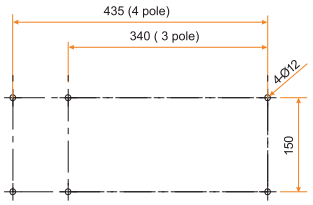


Panel Frame





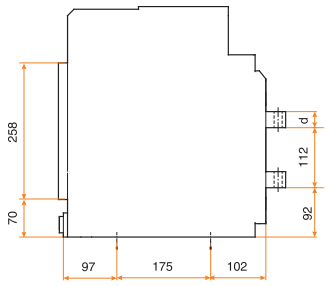
Busbar Connections

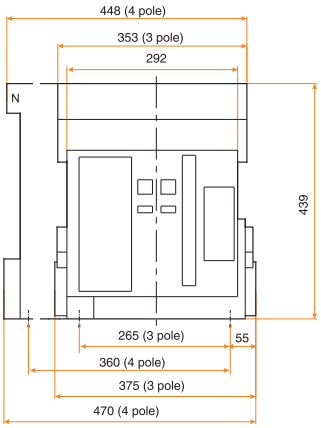


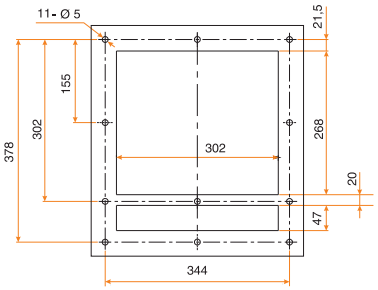
Assembling Gauge

In A	busbar thicknes d (mm)
630-800	10
1000-1600	15
2000	20

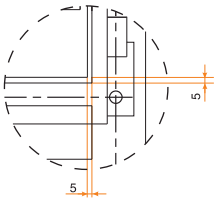
VP 2000-FE (Drawout type)

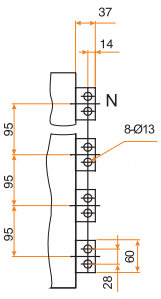




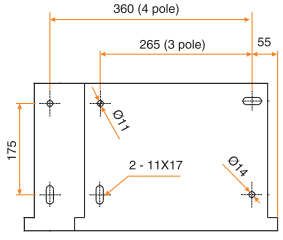


Panel Frame





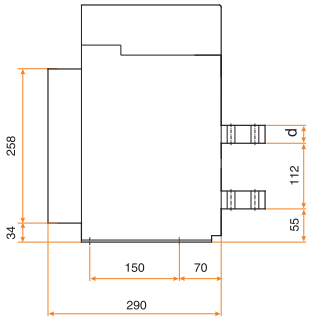
Busbar Connections

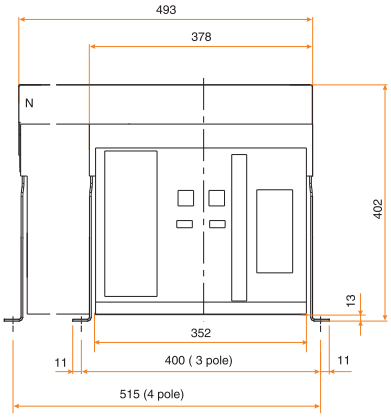


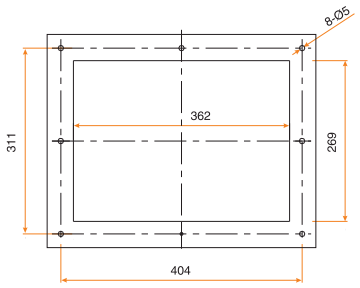
Assembling Gauge

In A	busbar ticknes d (mm)
630-800	10
1000-1600	15
2000	20

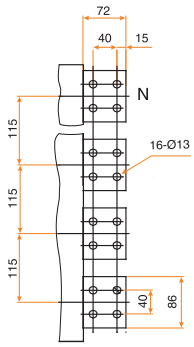
VP 3200-FE (Fixed type)



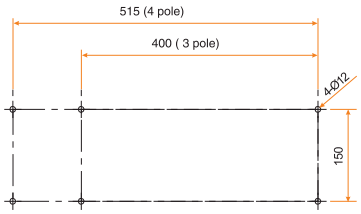




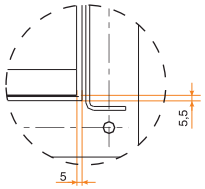
Panel Frame



Busbar Connections

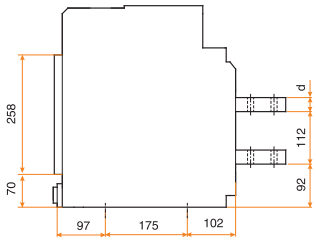


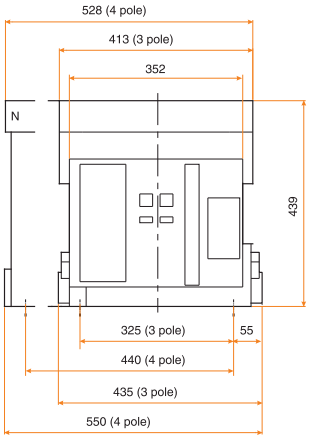
Assembling Gauge

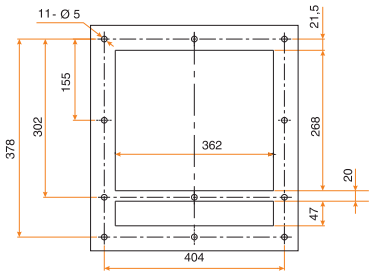


In A	busbar thickness d (mm)
2000-2500	20
3200	30

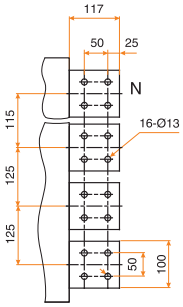
VP 3200-FE (Drawout type)



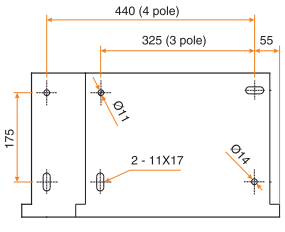




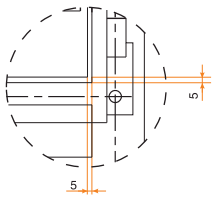
Panel Frame



Busbar Connections

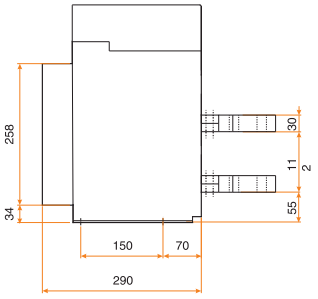


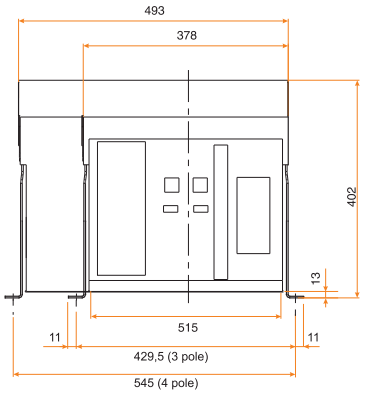
Assembling Gauge

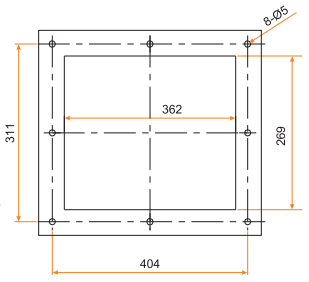


In A	busbar thickness d (mm)
2000-2500	20
3200	30

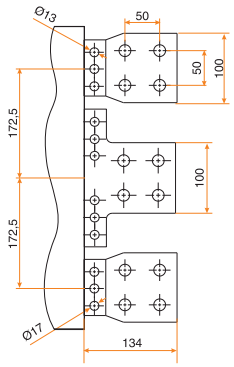
VP 4000-FE (Fixed type)



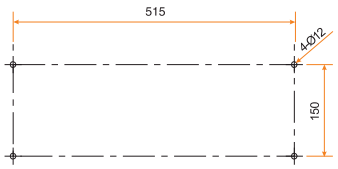




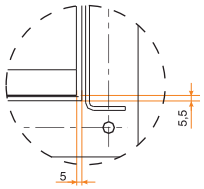
Panel Frame



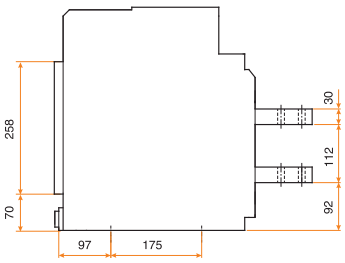
Busbar Connections

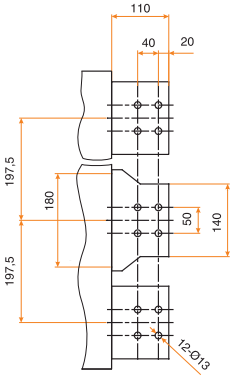


Assembling Gauge

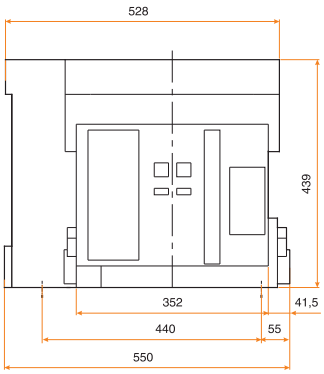


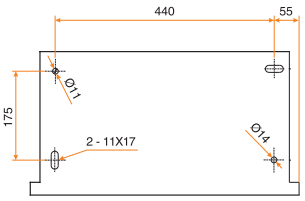
VP 4000-FE (Drawout type)



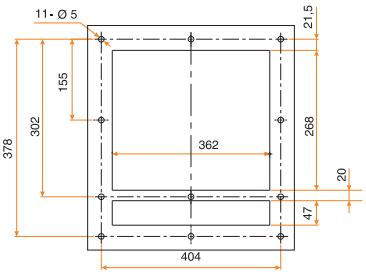


Busbar Connections

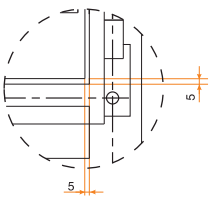




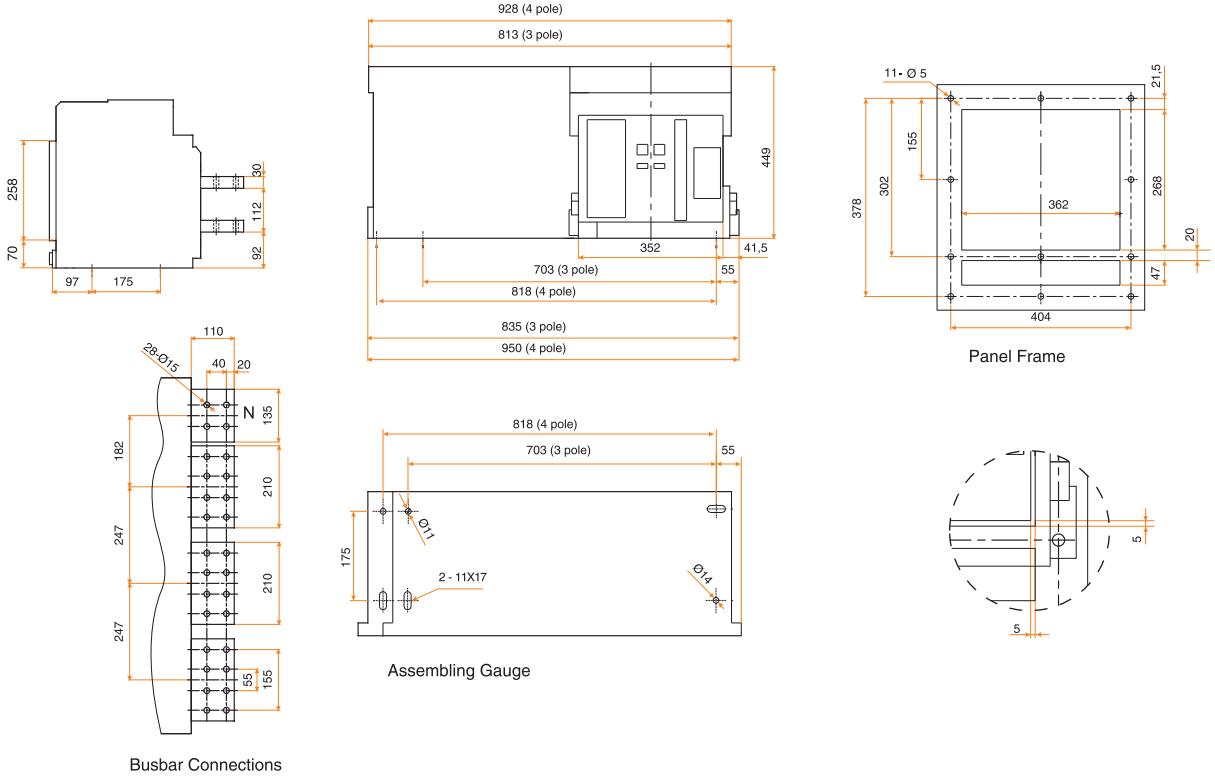
Assembling Gauge



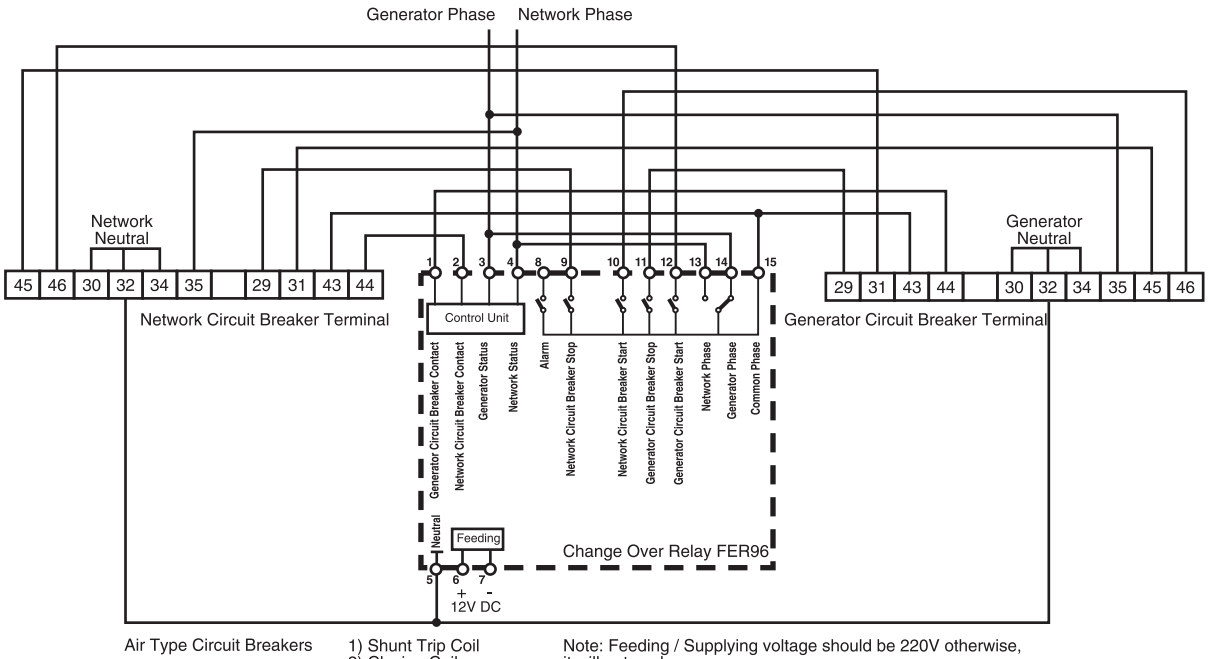
Panel Frame



VP 6300-FE (Draw-out type)



Wiring Diagram Of Change Over Systems For Air Circuit Breakers



MINIATURE & RESIDUAL CIRCUIT BREAKERS

General information 185
Ordering codes 186
Accessories 192
Technical data 197

Miniature and residual circuit breakers

Miniature and residual circuit breakers - IZP and DZP

MINIATURE CIRCUIT BREAKERS

Miniature circuit breakers are mechanical switching devices able to switch on, conduct and switch off the current under standard conditions and are able to switch on, conduct and switch off the current under abnormal circuit conditions such as short-circuit. They are used to protect house and similar installations against over currents. They are also designed to be safe when operating by untrained person, and they are maintenance free. Tripping characteristics B and C.

RESIDUAL CIRCUIT BREAKERS

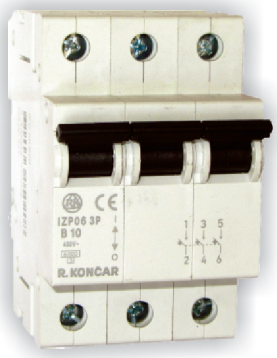
- Protection in case of indirect contact
- Protection in case of direct contact
- Suitable for protection of electrical circuits in residential buildings
- Conformity with IEC 61008-1 and EN 61008-1

Miniature circuit breakers IZP 06 range 6 - 63A; B Characteristics

Type IZP06 1P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 B6 1P	608001	6	1	6	115	12
IZP06 B10 1P	608002	10	1	6	115	
IZP06 B16 1P	608003	16	1	6	115	
IZP06 B20 1P	608004	20	1	6	115	
IZP06 B25 1P	608005	25	1	6	115	
IZP06 B32 1P	608006	32	1	6	115	
IZP06 B40 1P	608007	40	1	6	115	
IZP06 B50 1P	608008	50	1	6	115	
IZP06 B63 1P	608009	63	1	6	115	

Type IZP06 2P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 B6 2P	608082	6	2	6	230	6
IZP06 B10 2P	608083	10	2	6	230	
IZP06 B16 2P	608084	16	2	6	230	
IZP06 B20 2P	608085	20	2	6	230	
IZP06 B25 2P	608086	25	2	6	230	
IZP06 B32 2P	608087	32	2	6	230	
IZP06 B40 2P	608088	40	2	6	230	
IZP06 B50 2P	608089	50	2	6	230	
IZP06 B63 2P	608090	63	2	6	230	

Type IZP06 3P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 B6 3P	608019	6	3	6	340	4
IZP06 B10 3P	608020	10	3	6	340	
IZP06 B16 3P	608021	16	3	6	340	
IZP06 B20 3P	608022	20	3	6	340	
IZP06 B25 2P	608023	25	3	6	340	
IZP06 B32 3P	608024	32	3	6	340	
IZP06 B40 3P	608025	40	3	6	340	
IZP06 B50 3P	608026	50	3	6	340	
IZP06 B63 3P	608027	63	3	6	340	

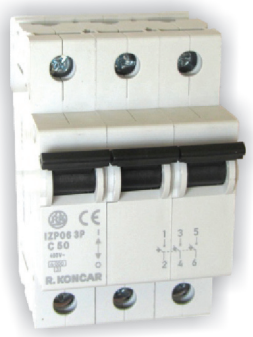


Technical data - page 197; Accessories - page 192

Miniature circuit breakers IZP 06 range 6 - 63A; C Characteristics

Type IZP06 1P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 C6 1P	608010	6	1	6	115	12
IZP06 C10 1P	608011	10	1	6	115	
IZP06 C16 1P	608012	16	1	6	115	
IZP06 C20 1P	608013	20	1	6	115	
IZP06 C25 1P	608014	25	1	6	115	
IZP06 C32 1P	608015	32	1	6	115	
IZP06 C40 1P	608016	40	1	6	115	
IZP06 C50 1P	608017	50	1	6	115	
IZP06 C63 1P	608018	63	1	6	115	

Type IZP06 2P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 C6 2P	608091	6	2	6	230	6
IZP06 C10 2P	608092	10	2	6	230	
IZP06 C16 2P	608093	16	2	6	230	
IZP06 C20 2P	608094	20	2	6	230	
IZP06 C25 2P	608095	25	2	6	230	
IZP06 C32 2P	608096	32	2	6	230	
IZP06 C40 2P	608097	40	2	6	230	
IZP06 C50 2P	608098	50	2	6	230	
IZP06 C63 2P	608099	63	2	6	230	



Type IZP06 3P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP06 C6 3P	608028	6	3	6	340	4
IZP06 C10 3P	608029	10	3	6	340	
IZP06 C16 3P	608030	16	3	6	340	
IZP06 C20 3P	608031	20	3	6	340	
IZP06 C25 2P	608032	25	3	6	340	
IZP06 C32 3P	608033	32	3	6	340	
IZP06 C40 3P	608034	40	3	6	340	
IZP06 C50 3P	608035	50	3	6	340	
IZP06 C63 3P	608036	63	3	6	340	

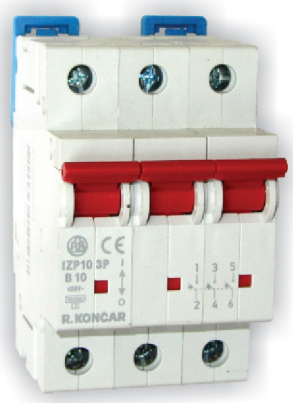
Technical data - page 197; Accessories - page 192

Miniature circuit breakers IZP 10 range 6-63A; B Characteristics

Type IZP10 1P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 B6 1P	608037	6	1	10	115	12
IZP10 B10 1P	608038	10	1	10	115	
IZP10 B16 1P	608039	16	1	10	115	
IZP10 B20 1P	608040	20	1	10	115	
IZP10 B25 1P	608041	25	1	10	115	
IZP10 B32 1P	608042	32	1	10	115	
IZP10 B40 1P	608043	40	1	10	115	
IZP10 B50 1P	608044	50	1	10	115	
IZP10 B63 1P	608045	63	1	10	115	

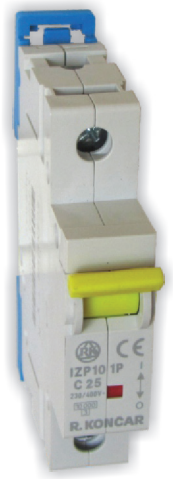
Type IZP10 2P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 B6 2P	609001	6	2	10	230	6
IZP10 B10 2P	609002	10	2	10	230	
IZP10 B16 2P	609003	16	2	10	230	
IZP10 B20 2P	609004	20	2	10	230	
IZP10 B25 2P	609005	25	2	10	230	
IZP10 B32 2P	609006	32	2	10	230	
IZP10 B40 2P	609007	40	2	10	230	
IZP10 B50 2P	609008	50	2	10	230	
IZP10 B63 2P	609009	63	2	10	230	

Type IZP10 3P (6 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 B6 3P	608055	6	3	10	340	4
IZP10 B10 3P	608056	10	3	10	340	
IZP10 B16 3P	608057	16	3	10	340	
IZP10 B20 3P	608058	20	3	10	340	
IZP10 B25 2P	608059	25	3	10	340	
IZP10 B32 3P	608060	32	3	10	340	
IZP10 B40 3P	608061	40	3	10	340	
IZP10 B50 3P	608062	50	3	10	340	
IZP10 B63 3P	608063	63	3	10	340	



Technical data - page 197; Accessories - page 192

Miniature circuit breakers IZP 10 range 6 - 63A; C Characteristics

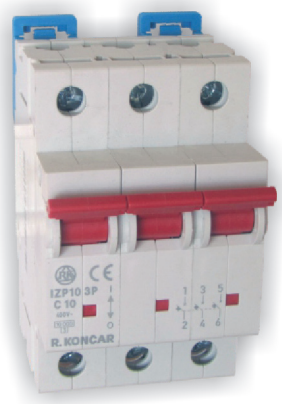


Type IZP10 1P (6 - 63) A

Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 C6 1P	608046	6	1	10	115	12
IZP10 C10 1P	608047	10	1	10	115	
IZP10 C16 1P	608048	16	1	10	115	
IZP10 C20 1P	608049	20	1	10	115	
IZP10 C25 1P	608050	25	1	10	115	
IZP10 C32 1P	608051	32	1	10	115	
IZP10 C40 1P	608052	40	1	10	115	
IZP10 C50 1P	608053	50	1	10	115	
IZP10 C63 1P	608054	63	1	10	115	

Type IZP10 2P (6 - 63) A

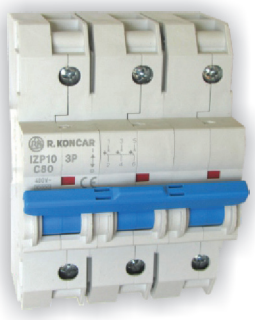
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 C6 2P	609010	6	2	10	230	6
IZP10 C10 2P	609011	10	2	10	230	
IZP10 C16 2P	609012	16	2	10	230	
IZP10 C20 2P	609013	20	2	10	230	
IZP10 C25 2P	609014	25	2	10	230	
IZP10 C32 2P	609015	32	2	10	230	
IZP10 C40 2P	609016	40	2	10	230	
IZP10 C50 2P	609017	50	2	10	230	
IZP10 C63 2P	609018	63	2	10	230	



Type IZP10 3P (6 - 63) A

Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 C6 3P	608064	6	3	10	340	4
IZP10 C10 3P	608065	10	3	10	340	
IZP10 C16 3P	608066	16	3	10	340	
IZP10 C20 3P	608067	20	3	10	340	
IZP10 C25 2P	608068	25	3	10	340	
IZP10 C32 3P	608069	32	3	10	340	
IZP10 C40 3P	608070	40	3	10	340	
IZP10 C50 3P	608071	50	3	10	340	
IZP10 C63 3P	608072	63	3	10	340	

Miniature circuit breakers IZP 10 range 80 - 125A; C Characteristics



Type IZP10 3P (80 - 125) A

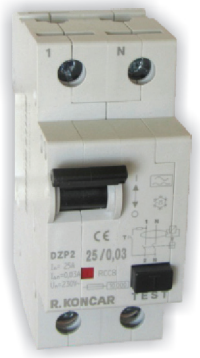
Type	Order number	Rated current (In) A	No. of poles	Short circuit breaking capacity kA	Weight [g]	Packing [pcs]
IZP10 C80 3P	608073	80	3	10	660	1
IZP10 C100 3P	608074	100	3	10	660	
IZP10 C125 3P	608075	125	3	10	660	

Technical data - page 197; Accessories - page 192

Signal lamps

Type RKRS (24 - 230) V						
Type	Order number	Voltage (AC) V	Voltage (DC) V	Color	Weight [g]	Packing [pcs]
RKRST 24V	608131	24	24	Transparent	60	
RKRST 48V	608132	48	48	Transparent	60	
RKRST 110V	608133	110	110	Transparent	60	
RKRST 230V	608111	230	220	Transparent	60	
RKRSR 24V	608134	24	24	Red	60	
RKRSR 48V	608135	48	48	Red	60	
RKRSR 110V	608136	110	110	Red	60	
RKRSR 230V	608112	230	220	Red	60	
RKRSG 24V	608137	24	24	Green	60	1
RKRSG 48V	608138	48	48	Green	60	
RKRSG 110V	608139	110	110	Green	60	
RKRSG 230V	608113	230	220	Green	60	
RKRSB 24V	608140	24	24	Blue	60	
RKRSB 48V	608141	48	48	Blue	60	
RKRSB 110V	608142	110	110	Blue	60	
RKRSB 230V	608143	230	220	Blue	60	
RKRSY 24V	608144	24	24	Yellow	60	
RKRSY 48V	608145	48	48	Yellow	60	
RKRSY 110V	608146	110	110	Yellow	60	
RKRSY 230V	608114	230	220	Yellow	60	

Residual circuit breakers DZP2 range 16 - 63A



Type DZP2 2P (16 - 40) A						
Type	Order number	Rated current (In) A	No. of poles	Residual current (IΔn) mA	Weight [g]	Packing [pcs]
DZP2 B16/0.03 2P	608147	16	2	0.03	250	1
DZP2 B25/0.03 2P	608101	25	2	0.03	250	
DZP2 B40/0.03 2P	608102	40	2	0.03	250	

Type DZP2 2P (16 - 40)A						
Type	Order number	Rated current (In) A	No. of poles	Residual current (In)	Weight [g]	Packing [pcs]
DZP2 B16/0.5 2P	608148	16	2	0.5	250	1
DZP2 B25/0.5 2P	608103	25	2	0.5	250	
DZP2 B40/0.5 2P	608149	40	2	0.5	250	

Type DZP4 4P (16 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Residual current (IΔn) mA	Weight [g]	Packing [pcs]
DZP4 B16/0.03 4P	608104	16	4	0.03	435	1
DZP4 B25/0.03 4P	608115	25	4	0.03	435	
DZP4 B40/0.03 4P	608105	40	4	0.03	435	
DZP4 B63/0.03 4P	608106	63	4	0.03	435	

Type DZP4 4P (16 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Residual current (IΔn) mA	Weight [g]	Packing [pcs]
DZP4 B16/0.3 4P	608129	16	4	0.3	435	1
DZP4 B25/0.3 4P	608127	25	4	0.3	435	
DZP4 B40/0.3 4P	608107	40	4	0.3	435	
DZP4 B63/0.3 4P	608116	63	4	0.3	435	

Type DZP4 4P (16 - 63) A						
Type	Order number	Rated current (In) A	No. of poles	Residual current (IΔn) mA	Weight [g]	Packing [pcs]
DZP4 B16/0.5 4P	608130	16	4	0.5	435	1
DZP4 B25/0.5 4P	608108	25	4	0.5	435	
DZP4 B40/0.5 4P	608109	40	4	0.5	435	
DZP4 B63/0.5 4P	608110	63	4	0.5	435	

Technical data - page 197; Accessories - page 192

Accessories

Shunt trip - RKVC

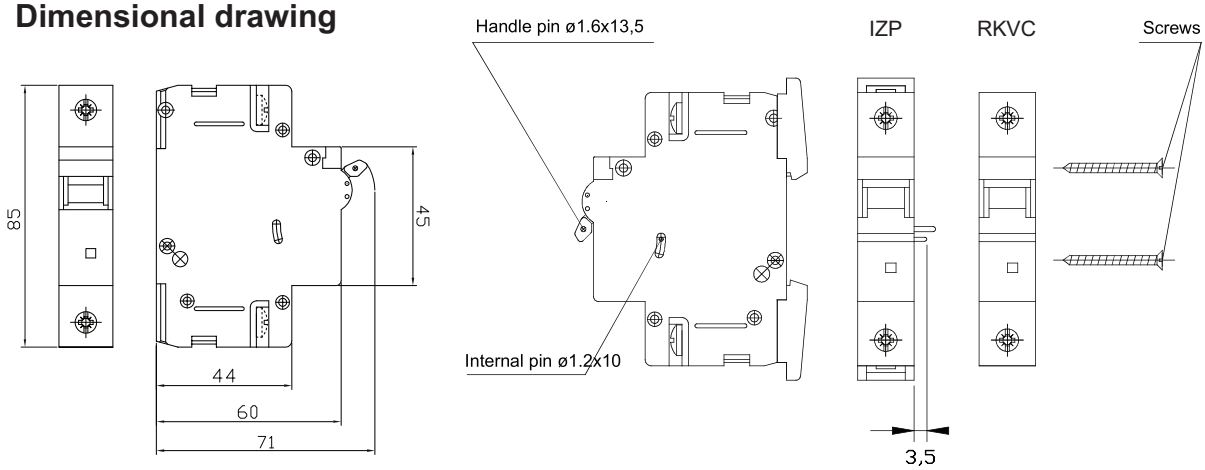
Features

- Accessories to the circuit-breaker, modular switches and residual current devices
- Utilized for the tripping of circuit-breaker (modular switch) by means of outer source of voltage in instantaneous trip-ping of the circuit
- It is delivered asseparate unit or assembled together with circuit-breaker (modular switch)
- It is mounted on right hand side of the circuit-breaker (switch), left side of residual current devices

RKVC Technical data

Standards		EN60947-1 (IEC60947-1)
Rated voltage	V	AC: 400, 230,110, 60, 48, 24,12 DC: 110, 48, 24
Rated insulation voltage	V	400
Max.switching of current (voltage of RKVC)	A(V)	AC: 0,5(400); 0,6(230; 0,5(110); 0,9(60); 0,8(48); 2,8(24; 6(12) DC: 0,6(110); 2(48); 3(24)
Rated impulse withstand voltage	kV	4
Rated making over voltage	kV	4
Range of activity voltage	%	70-110
Tripping time	ms	max. 50
Rated frequency	Hz	50
Mounting		on right side of circuit breaker (switch), left side of residual current device
Degree of protection		IP 20
Terminal capacity	mm^2	1-6 Cu

Dimensional drawing



Instructions guide for the mounting of a shunt trip RKVC

- on right side of all executions and modular switches
- circuit breaker and shunt trip have to be in switch-of position
- insert pin Ø1,6mm into aperture of operating lever and into aperture of switching system Ø1,2mm (pins are part of delivery)
- approach shunt trip to the circuit breaker in order to achieve engagement of pins into appropriate parts of circuit breaker and switching system of RKVC
- into free holes in shunt trip RKVC enter stainless steel screws and slightly tight the screws to attach it to the IZP
- check the function of RKVC with IZP by switching on the MCB and pushing the mechanism through the hole for pin Ø1.2mm with appropriate tool.

Operational voltage	Type
24 V ~	RKVC 24 V ~
48 V ~	RKVC 48 V ~
110 V ~	RKVC 110 V ~
230 V ~	RKVC 230 V ~
400 V ~	RKVC 400 V ~
24V=	RKVC 24V=
48V=	RKVC 48V=
110V=	RKVC 110V=

Accessories

Under voltage trip - RKPC

Features

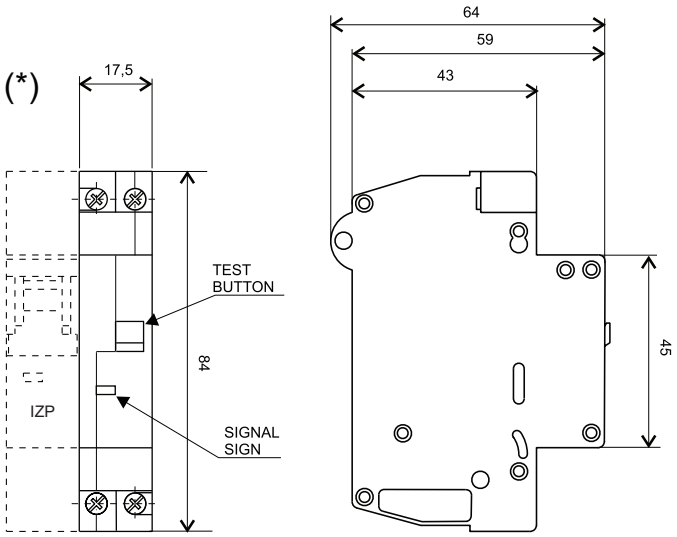
- Accessories to IZP
- They are using to protection against rerun - up of motor by failure in mains
- Signalisation of release position green / red
- Auxiliary button for correct function control
- Mounting to circuit breakers in factory(*)

IZP+RKPC

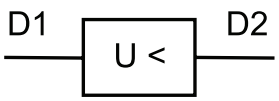
Technical data

Standards	EN60947–1
Rated voltage	24, 48, 120, 230, 400 V AC
Rated frequency	50 Hz
Maximal using	3 W
Attachment	on the right side
Connecting wires	0,75–2,5mm ^{2}
Degree of protection	IP 20
Turn on limit	up 85 % from U_n
	down 35 % from U_n

Dimensional drawing



Connecting scheme



Type
RKPC 24 V~
RKPC 48 V~
RKPC 120 V~
RKPC 230 V~
RKPC 400 V~

Accessories

Auxiliary contacts PKJ, 2PKJ, PSKJ

Features

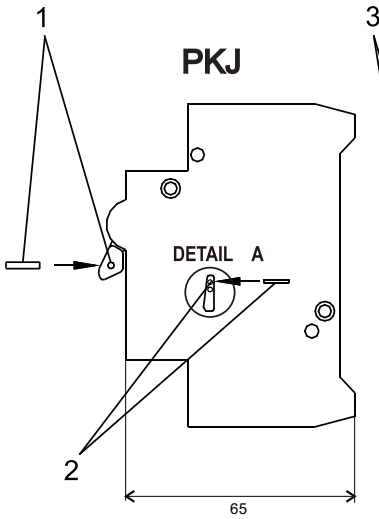
- These are accessories to circuit - breakers and residual current devices
- Can be obtained as separate units or mounted together with circuit - breaker (modular switch)
- They are mounted on the left hand side of the circuit - breaker (modular switch) by means of pins and screws

PKJ 2PKJ PSKJ

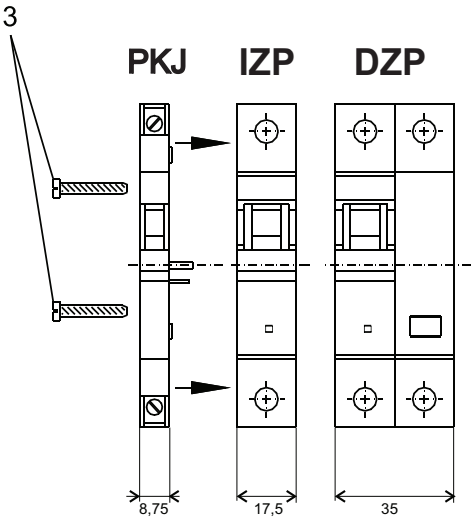
Technical data

Standards		EN60947-5-1 (IEC60947-5-1)
Rated insulation voltage U_i	V	400
Rated operational voltage U_e	V	230
Rated thermal current I_{th}	A	16
Rated operational current I_e	A	4 (AC15 at U_e = 230V) 0,5 (DC13 at U_e =110V)
Conditional short circuit current with fuse 16A I_k	A	800
Max. conventional back-up fuses	A	16 gL
Rated frequency	Hz	50-60
Mounting		on left side of device
Degree of protection		IP 20
Terminal capacity	mm^2	0,5-2,5 Cu

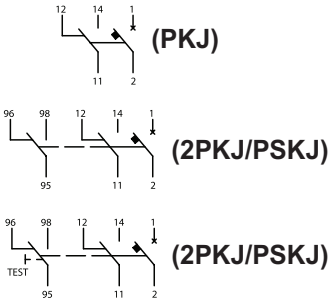
INSERT PINS



CONNECT WITH 2 SCREWS



Contacts scheme



1.Pin of handle Ø1,6mm
2.Pin Ø1,2mm, l=10mm
3. Screws

1. In the block of auxiliary insert into handle the pin of ø1,6 mm and into the opening of the switching system the pin ø1,2 mm.
2. Approach contacts block to IZP/DZP to let the pins snap in to relevant device pieces. During the assembly must be both handles the IZP/DZP and the contact block handle OFF.
3. Insert in to free openings in the contact block the tapping screw and attach freely to IZP/DZP.
4. Verify mechanical function of auxiliary contact with IZP/DZP by pushing through the device opening ø1,2 mm with appropriate device the mechanical part (pin, needle etc.)

Accessories

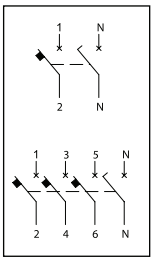
N-POLE

Features

- Assembling with circuit breaker at manufacturer's site according to the requirement of the customer
- Neutral pole can be assembled to all AC circuit breakers (current ratings, tripping characteristics)
- Neutral pole is without release, on making of circuit breaker it makes before the other contacts and during breaking it breakes after the other poles
- On ordering of neutral pole please state type and ordering number of the circuit breaker and type and ordering number of the neutral pole

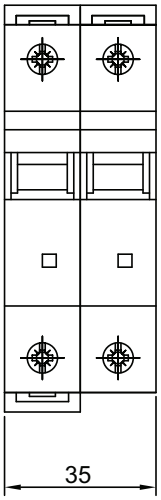
N-POLE

Scheme

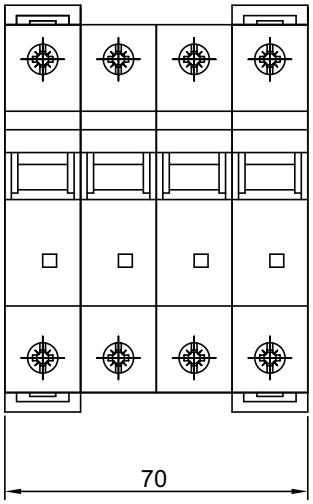


Type
N-pole of circuit breaker IZP 0,2 - 25 A
N-pole of circuit breaker IZP 32 - 63 A

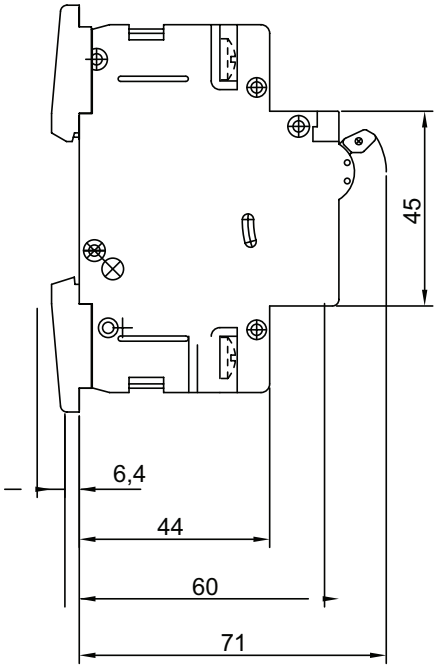
Dimensional drawing



IZP 1P + N



IZP 3P + N



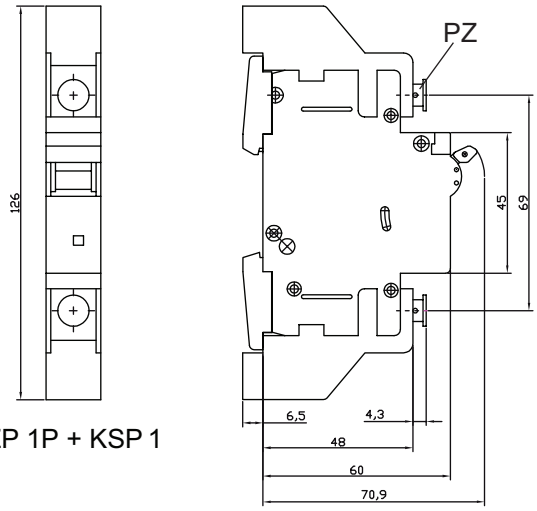
Accessories

TERMINAL COVERS

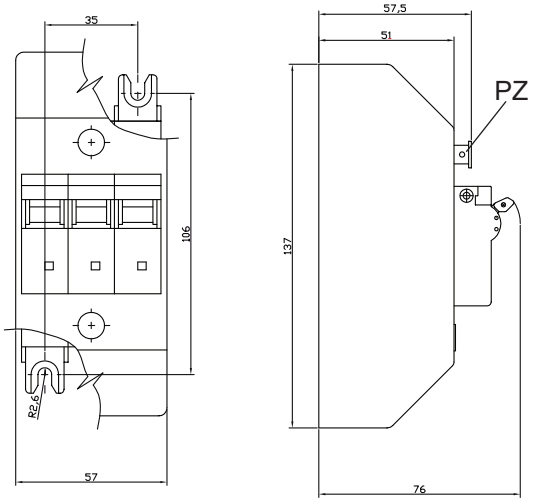
Features

- Accessories to the circuit-breaker and modular switches
- Used for the improving of degree of protection to value IP30 and together with sealing blind also for sealing of terminals
- Single pole cover of terminals do not increase width of module of circuit breaker (modular switch); for the protection of both terminals two covers are needed
- Three pole cover of terminals is applicable only for IZP; the width of three pole module will change from 52,5 to 57 mm.
- For the fixing of cover to circuit-breaker (modular switch) there is necessary sealing blind PZ

Dimensional drawing



IZP 1P + KSP 1



IZP 3P + KSP 3

KSP 1

with single pole cover of terminals (KSP 1)

KSP 3

IZP with clips for mounting on board
and with three pole cover of terminals (KSP 3)
Incorporating sealing blind (PZ)

SEALING BLIND-PZ

Features

- Accessories to the circuit-breaker and modular switches
- Utilized for sealing of single pole covers KSP 1 and three pole covers KSP 3 and for mounting three pole covers KSP 3 too
- For sealing can be used sealing wire with maximum diameter Ø1,5mm

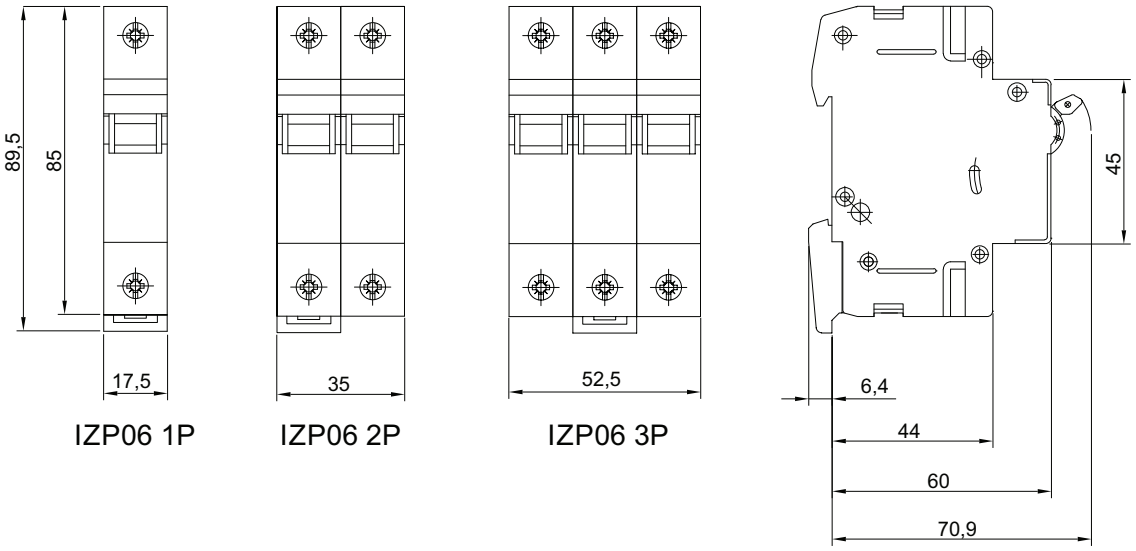
PZ

Technical data - IZP 06 range 6 - 63A

Standards		EN 60898-1
Pole configuration		1, 2, 3
Tripping characteristics		B, C
Rated current In	A	6 - 63
Rated voltage Un	V	230; 230/400; 400
Rated insulation voltage Ui	V	400
Rated impulse withstand voltage Uimp	V	4 000
Rated DC voltage Un	V	max.60-(for one pole τ=15ms)
Rated frquency	Hz	50 - 60
Short circuit breaking capacity	kA	6
Selection category		3
Electrical endurance		4 000 cycles
Mechanical endurance		100 000 cycles
Terminal capacity	mm^2	1 - 25 for Cu wires 2,5 - 25 for Al wires - special type
Mounting		on rail DIN 35x7,5 EN 60 715; on panel
Degree of protection		IP 20, IP 40 front
Ambient temperature	°C	-25 up to +55
Mounting position		optional
Vibrations resistance		3g(8-50Hz)
Approved		CE
Accessories		Auxiliary and signal contacts - PKJ, 2PKJ, PKJ+SKJ Shunt trips–RKVC

- circuit breakers IZP06 series are mechanical switching devices able to switch on, conduct and switch of the current under standard conditions and able to switch on, conduct and switch of the current under abnormal circuit conditions such as short-circuit
- they are used to protect house and similar installations against over currents
- they are designed to be handled by untrained persons and they are maintenance free
- tripping characteristics B,C
- simple assembly-lower clip for fastening to the rail 35x7,5 EN 60715 enables taking the circuit breaker out from the device line connected by lower busbar without breaking the current circuit
- sealable in ON and OFF position of a lever
- there is a possibility to use throught covers for both terminals, that are sealed with sealing blind
- **connection :** - conductors 1 -25 mm^2
  - connection busbars (pin or fork type)
  - connection of conductors and busbars at the same time
  - optional way of connection
  - possibility to mount additional accessories

Dimensional drawing



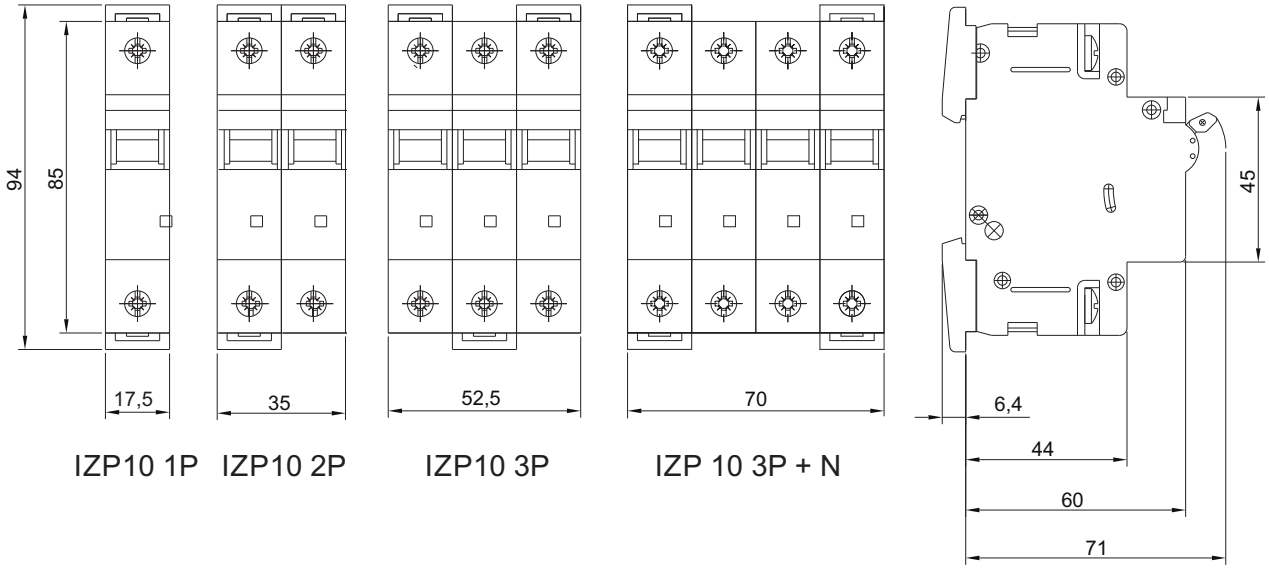
IZP06 1P IZP06 2P IZP06 3P

Technical data - IZP 10 range 6 - 63A

Standards		EN 60898-1
Pole coniguration		1, 1+N, 2, 3, 3+N
Tripping characteristics		B, C
Rated current In	A	6 - 63
Rated voltage Un	V	230; 230/400; 400
Rated insulation voltage Ui	V	400
Rated impulse withstand voltage Uimp	V	4 000
Rated DC voltage Un	V	max.60-(for one pole τ=15ms)
Rated frequency	Hz	50 - 60
Shortcircuitbreakingcapacity	kA	10
Selectioncategory		3
Electrical endurance		4 000 cycles
Mechanical endurance		100 000 cycles
Terminal capacity	mm^2	1 - 25 for Cu wires 2,5 - 25 for Al wires - special Type
Mounting		on rail DIN 35x7,5 EN 60 715; on panel
Degree of protection		IP 20 IP 40 front
Ambient temperature	°C	-25 up to +55
Mounting position		optional
Vibration resistance		3g(8-50Hz)
Approvals		CE
Accessories		Auxiliary and signal contacts - PKJ, 2PKJ, PKJ+SKJ Shunt trips–RKVC, under voltage trip

- circuit breakers IZP10 series are mechanical switching devices able to switch on, conduct and switch of the current under standard conditions and able to switch on, conduct and switch of the current under abnormal circuit conditions such as short-circuit
- they are used to protect house and similar installations against over currents
- they are designed to be handled by untrained persons and they are maintenance free
- tripping characteristics B,C
- simple assembly-lower clip for fastening to the rail 35x7,5 EN 60715 enables taking the circuit breaker out from the device line connected by lower busbar without breaking the current circuit
- sealable in ON and OFF position of a lever
- there is a possibility to use throught covers for both terminals, that are sealed with sealing blind
- **connection :** - conductors 1 -25 mm^2
  - connection busbars (pin or fork type)
  - connection of conductors and busbars at the same time
  - optional way of connection
  - possibility to mount additional accessories

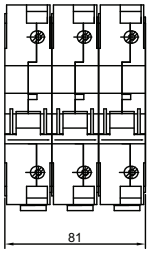
Dimensional drawing



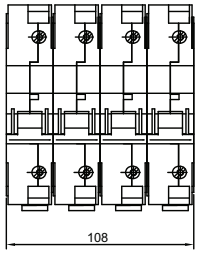
Technical data - IZP 10 range 80 - 125A

Standards			EN 60 898 - 1
Pole conigurations			3; 3+N
Rated current	I	A	80, 100, 125
Tripping chracteristics			C
Rated voltage	U	V	230, 230/400, 400
Rated frequency		Hz	50
Breaking capacity	I_c	kA	10
Electrical endurance			4 000 cycles
Conductors		mm2	1 - 50
Mounting			on rail DIN 35x7,5 EN 60 715
Protection degree			IP 20, IP 40 front
Ambient temperature			-5°C up to +40°C
Approved			according to label
Rated DC			max110DC(foronepole,τ=4ms)
Accesories			shunt trips RKVC, auxiliary contacts PKJ, 2PKJ

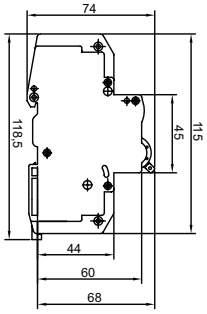
Dimensional drawing



IZP10 3P



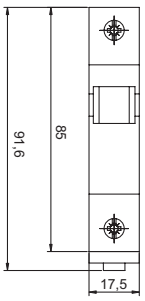
IZP10 3P+N



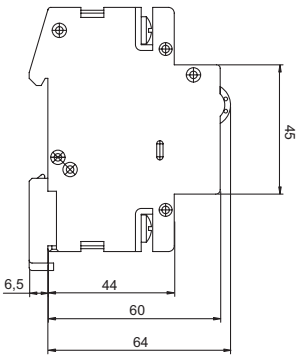
Technical data - RKRS

Standards		EN 60 947-5-1
Number of poles		1
Rated voltage U_n	V	AC 24, 48, 110, 230
		DC 24, 48, 110, 220
Light source		high capacity LED diode
Light source capacity	W	0,8
Colours		green - G, red - R, blue - B, transparent - T, yellow - Y
Illumination		constant - RKRS
Terminal capacity	mm^2	0,75 - 6 for Cu conductors
Mounting		on rail DIN 35x7,5 EN 60 715
		on board
Degree of protection		IP 20
		IP 40 from the front panel
Ambient air temperature	°C	from -25 to +55
Working positions		optional

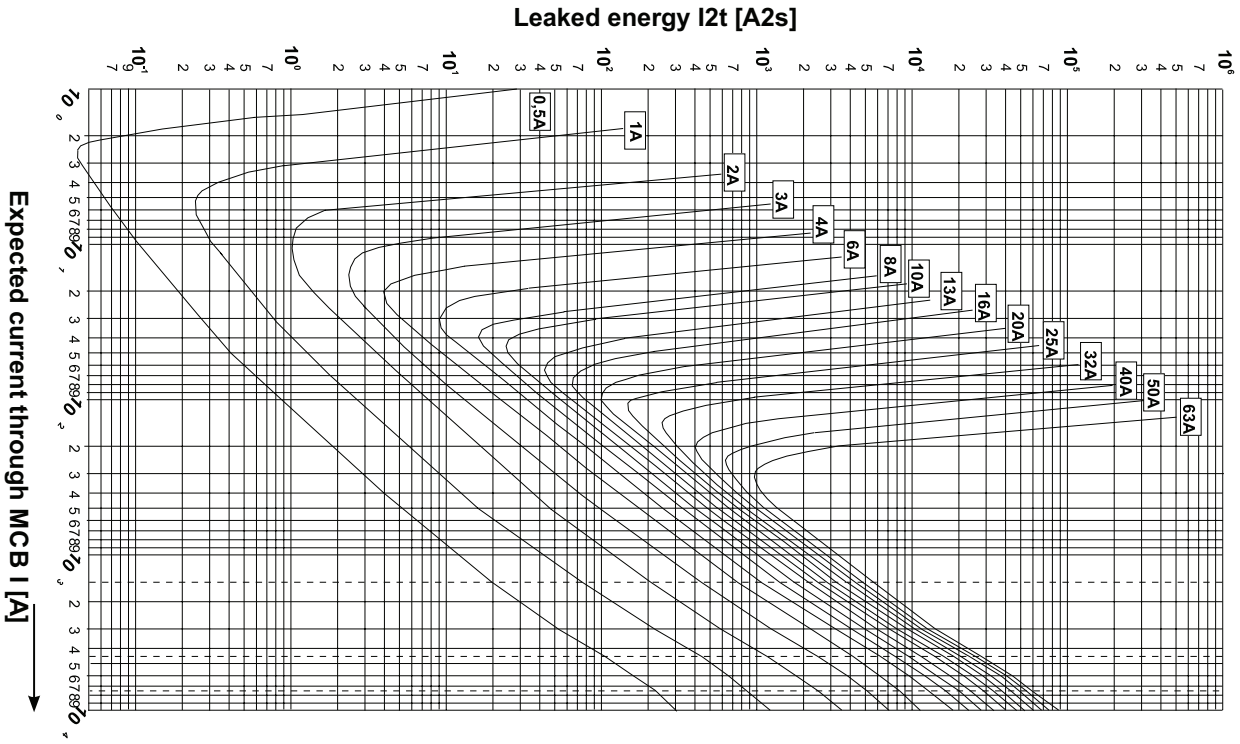
Dimensional drawing



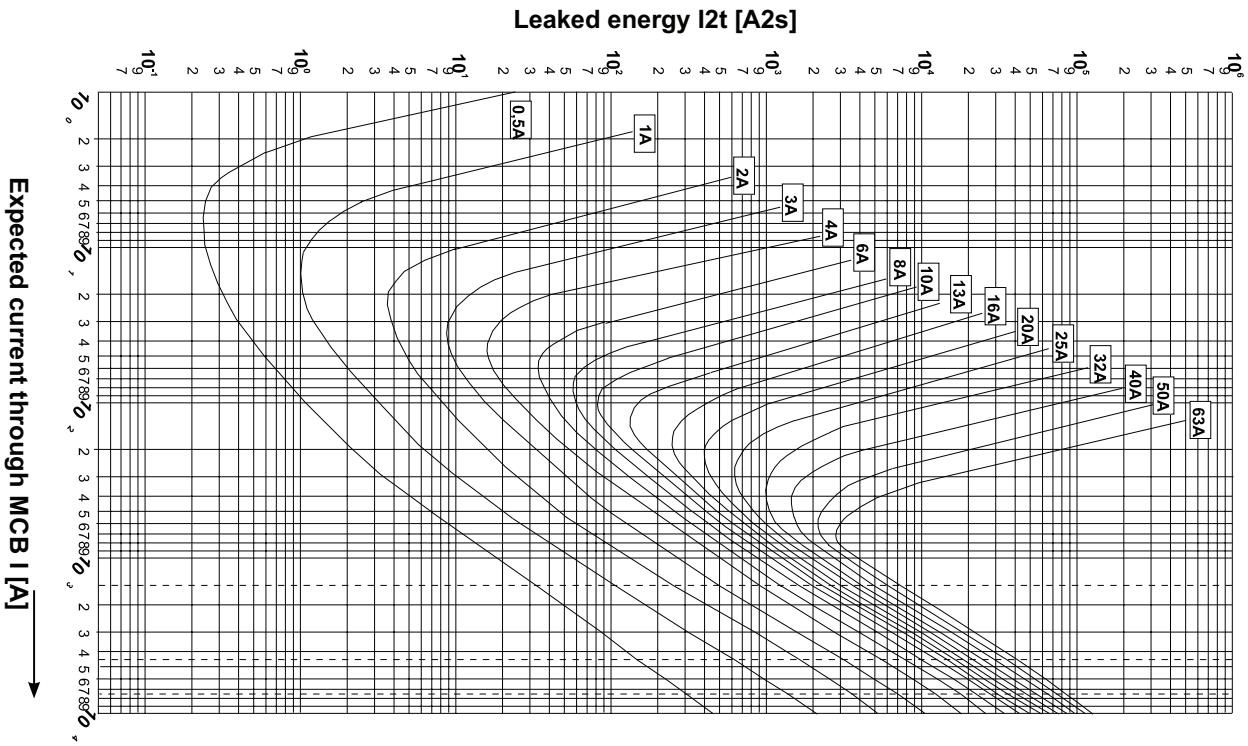
RKRS



Charts of leaked energy I^2t of MCBS IZP 06/10 with tripping characteristic B



Charts of leaked energy I^2t of MCBS IZP 06/10 with tripping characteristic C

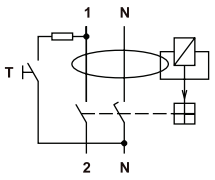


Technical data - DZP

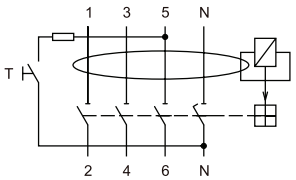
Versions			DZP2	DZP4
Types			A	
Number of poles			2	4
Rated current	I_n	A	16 - 63	16 - 63
Rated residual operating current	I_{Dn}	A	0,01 - 0,5	0,03 - 0,5
Rated voltage	U_n	V	230	230/400
Rated frequency		Hz	50	50
Rated res. making and				
breaking capacity	I_m	$I_{\Delta m}$	630	630
Rated res. making and				
breaking capacity	$I_{\Delta m}$			
Max. conventional				
back-up fuses GL	I_n	A	63;80 for In=63 and 80A; 100 for In=100A	
Rated conditional				
short-circuit current	I_{nc}	A	10000;6000 for In=100A	
Protection degree			IP 20; IP40 after installation	
Mounting position			optional	
Ambient temperature		°C	from -25°C to +40°C	
Weight		g	250	435
Terminal capacity		mm^2	1 to 25	
Accessories			auxiliary and signal contacts	

- protection in cases of indirect contact
- protection in cases of direct contact
- preventionofirescausedbyground-faultcurrents
- suitable for protection of electrical circuits in residential buildings, non-residential buildings or industrial applications
- DZP devices are working according IEC/EN 61008-1
- simple and solid fxing to 35 mm mounting rail in compliance to EN6071
- range of rated residual operating currents I10,30,100,300,500 mA (I=10mA is for devices with rated current up to 25A include)
- optical indicator, on the front side indicating operating state of device (green target visible, closed contact red target visible opened contacts)
- connected clamp headed/stirrupted range of connecting wires1,5-25 mm^2
- working position optional
- there is possibility to use auxiliary contacts for type DZP
- DZP devices are compatible with IZP circuit breakers dimensions
- type A - sensitive to alternating and pulsating dc residual operating currents

Schematic diagram

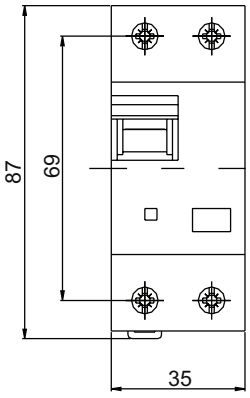


DZP2

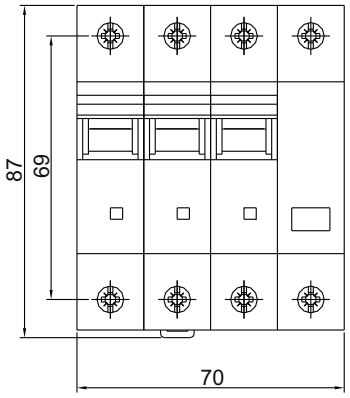


DZP4

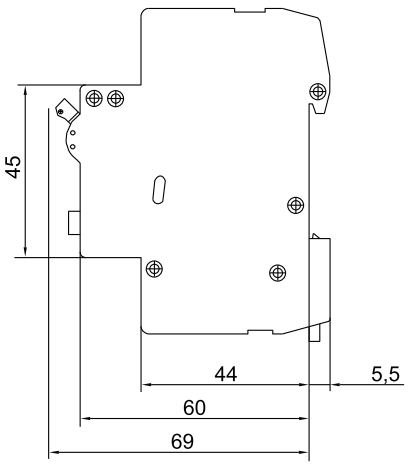
Dimensional drawing



DZP2



DZP4



ELECTRONIC TIME RELAYS

General information 202
Technical data 203

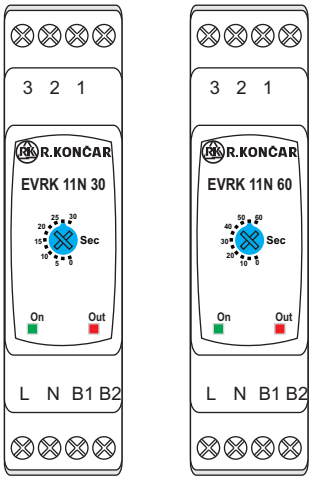
Electronic time releys

Electronic time relays - EVRK and EVRU

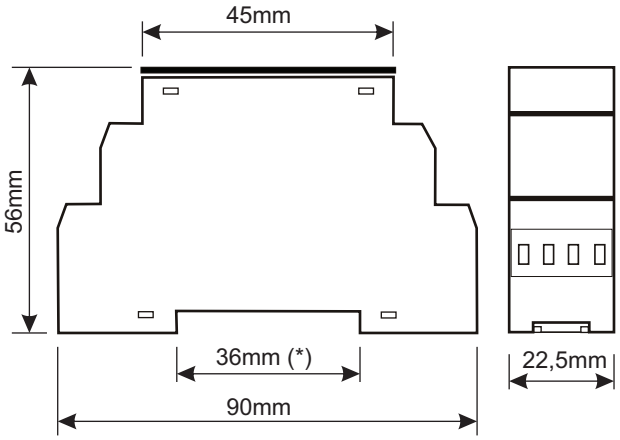
ELECTRONIC TIME RELAYS

Time relays are electronic relays which can switch on or off connected loads after the predefined time has elapsed. Our time relays are available in various designs

Timer EVRK 11N 30 and 60



Dimensions



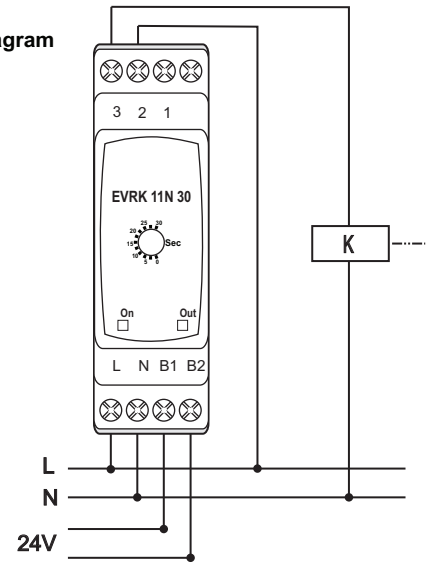
General Specifications

EVRK 11N are the delay on timers. When the application of voltage to the timer's supply inputs, the counter starts counting (1 - 2 contacts are short cut). End of the adjusted time, counter stops counting and the output becomes on (2 -3 contacts are short cut). When the supply voltage cut off, the timer reset.

Supply Voltage : 220 Vac ± %20 (L,N), 50 / 60 Hz
B1,B2(Vac) : 24 ☑ ; 12☐
B1,B2(Vdc) : B1:+ ; B2: -

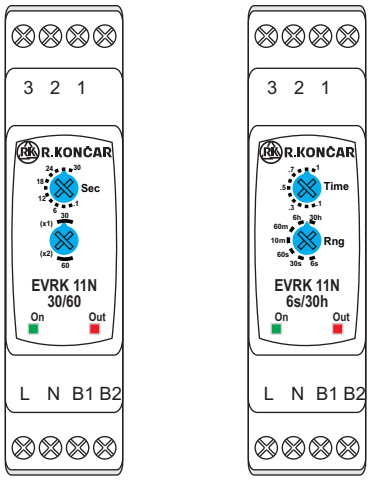
Electrical Connector : PCB Connectors (2,5 mm2)
Power Consumption : < 7 VA
Ambient Temperature : -5 ºC...+55
Control Output : Relay, 1 Changeover, 10A / 250 Vac
Electrical Life : 100.000 ops. (Ressistive Load)
Connection : DIN 35 rail or Vertical Installation (Installation springs behind the box should be pushed outward to enable screwing).

Shematic diagram



Type EVRK 11N					
Type	Order number	Time interval	Electrical connection	Weight [g]	Packing [pcs]
EVRK 11N 30	604538	0.3...30 sec	PCB Clamp	90	1
EVRK 11N 60	604539	0.6...60sec	PCB Clamp	90	

Multi range timers EVRK 11N 30/60 and 6s/30h



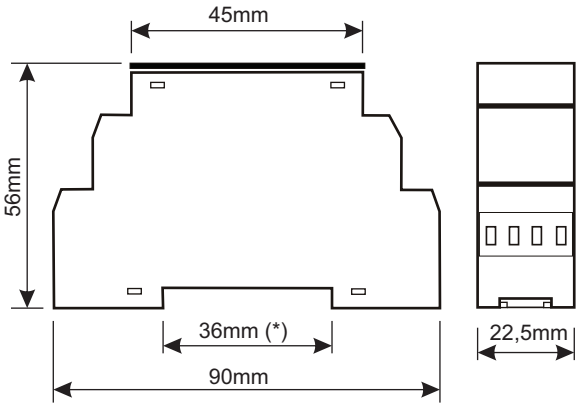
General Specification:

EVRK 11N 30/60 and 6s/30h multi range timer are delay on timers. When the supply is ON timers "ON" led is lighted and waits till adjusted period of time (meanwhile relay contacts 1-2 is short-cut). After adjusted period of time "Relay" led is ON and relay suppies to the system (meanwhile realy contacts 2-3 is short-cut). When the supply is cut than timer returns to the first position.

EVRK 11N 30/60 timer is adjusted 30 sec. or 60 sec. with the adjustment pot on the front panel. Upper adjustment pot sale shows for 30 second. For the 60 second applications scale is multiplied by 2.

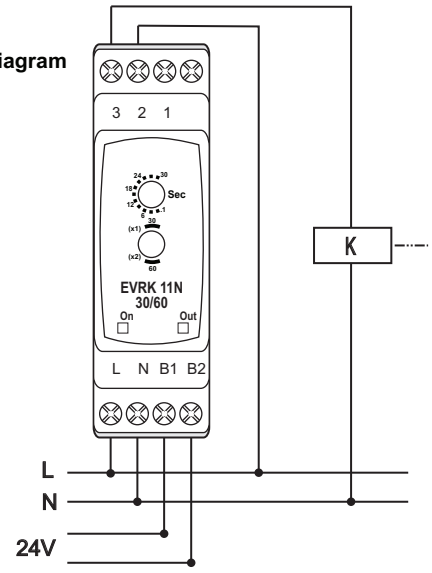
EVRK 11N 6s/30h multirange timer has 7 time range. Upper adjustment pot has multplier of 10 pieces. Maximum value is 1. Time value is the value that is adjusted in "time range".
Both relays does not accept any user interuptions while process has already begun.

Dimensions



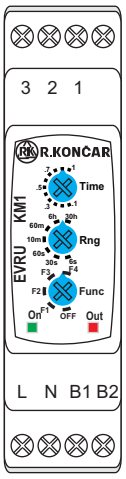
Supply Voltage	: 220 Vac ± %20 (L,N), 50 / 60 Hz
B1,B2(Vac)	: 24 ✓ ; 12
B1,B2(Vdc)	: B1: - ; B2: +
B,N(Vac)	: 24 ✓ ; 12
B,N(Vdc)	: B:+ ; N: -
Power Consumption	: < 7 VA
Ambient Temperature	: -5 ºC...+55 °C
Control Output	: Relay,1 Change Over, 10A / 250 Vac
Electrical Life	: 100.000 ON / OFF (Resistive)
Montage Type	: By closing back side montage spring, it can be montaged to the DIN 35 rail. For plain surfaces, montage is done by montage spring in outward position.

Shematic diagram

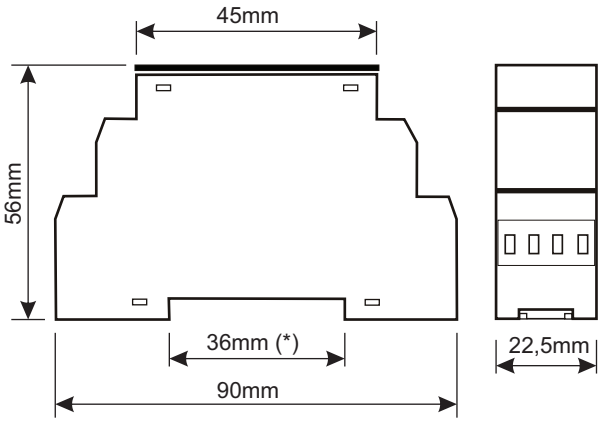


Type EVRK 11N					
Type	Order number	Time interval	Electrical connection	Weight [g]	Packing [pcs]
EVRK 11N 30/60	604542	0.1...60 sec	PCB Connectors	90	1
EVRK 11N 6s/30h	604541	0.6s...30h	PCB Connectors	90	

Multi function timers EVRU KM1



Dimensions



General Specification:

EVRU KM1:
Multi functional Timer is micro controller based and has 4 functions. Working functions, time ranges and time adjustments can be done at front of the timer.

A) Time Adjustment: This is a multiplier which multiplies the time range according to the adjusted function. Multiplier is between 0,01 to 1. With this button you can divide time ranges till 100 times.

B) Time Range Adjustment: This for choosing the time ranges. Time adjustment are between 6 seconds till 30 hours.

C) Function Adjustment: This is for choosing appropriate function to your need. Relay has 5 steps, four of them is for functions and one of them is to CUT relay output in every condition.

OFF: It cuts relay output in every condition. S`pecially good for checking the system.

F1: Delay ON Function: When relay is energised, ON led is lights, after adjusted time OUT led is light.

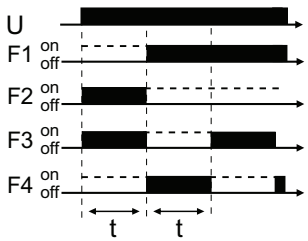
F2: Delay OFF Function: When relay is energised, ON led OUT led islight on, after adjusted time OUT led is off.

F3: Equal Time ON Flasher Function: When relay is energised, ON led and OUT led is on, after adjused time OUT led is off, than again after same adjusted time OUT led id on, and this continues in cycle.

F4: Equal Time off Flasher Function: When relay is energised, ON led is on and OUT led is off, after adjused time OUT led is on, than after again same adjusted time OUT led is off, and this continues in cycle.

Note: "On" and "Off" time ranges are equal for F3 and F4 functions

Function Schemes



Relay Contacts:

t: Adjusted Time

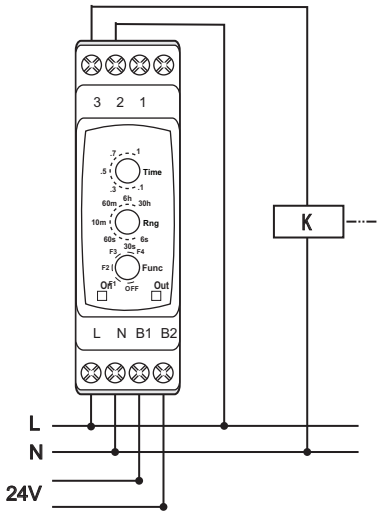
U: Supply Voltage

Time Range		
Step	**Min. Multiplier =0,01**	**Max. Multiplier =1**
6 s	**0,06 s**	**6 s**
30 s	**0,3 s**	**30 s**
60 s	**0,6 s**	**60 s**
10 m	**0,1 m**	**10 m**
60 m	**0,6 m**	**60 m**
6 h	**0,06 h**	**6 h**
30 h	**0,3 h**	**30 h**

Technical Specifications:

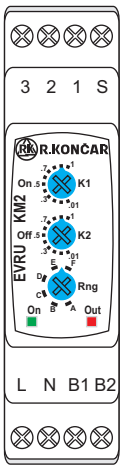
Supply Voltage	: 220 Vac ± %20, (L , N)
B1,B2(Vac)	: 24 ☑ ; 12 ☐
B1,B2(Vdc)	: B1:+ ; B2:-
Adjustment Accuracy	: ± %3
Time Range	: 0,06 sec...30 hour
Functions	: F1: Delay ON F2: Delay OFF F3: Equal ON/OFF ON start Flasher F4: Equal ON/OFF OFF start Flasher
Power Consumption	: <= 3 W
Ambiant Temperature	: -5...+55 °C
Contacts Type	: 10A, 250 Vac(Omron)
Electrical Connections	: PCB Connectors (2,5 mm2)

Shematic diagram

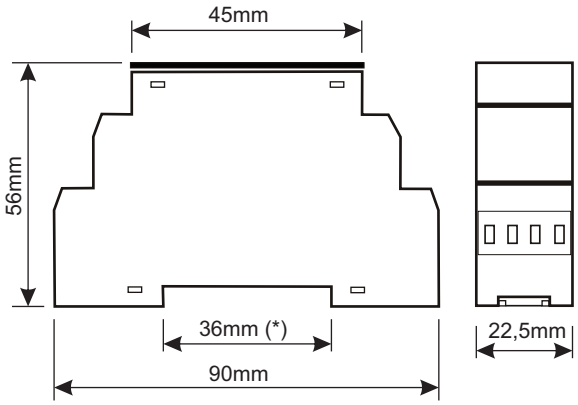


Type EVRU KM1					
Type	Order number	Time interval	Electrical connection	Weight [g]	Packing [pcs]
EVRU KM1	604536	0.6s...30h	PCB Connectors	90	1

Multi function timers EVRU KM2



Dimensions



General Specification:

It is based microprocessor and 6 ranges for asymmetrical flicker, Ranges can be adjusted from front panel.

1) On Time (k1) : On time multiplier can be adjustable between 0.01 to 1

2) Off Time (k2) : Off time multiplier can be adjustable between 0.01 to 1

3) Range : Gives the range of asymmetrical work

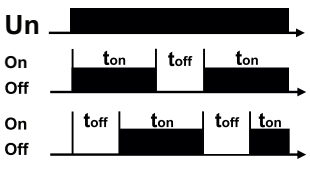
When A1-A2 is energised "pwr" led and "OUT" led is on. Relay is on (2-3 contacts short cut) till the adjusment time "ON" time relay remains on then "OUT" led is off and relay is off (1-2 contacts are short cut) and remains till the adjusted "OFF" time and "OUT" led is on. This continues in cycle.

	Max. Times	Time Adjustment	
(Range)	ON_{max} / OFF_{max}	ON	OFF
A	60 sec/60 sec	k1 x 60 sec	k2 x 60 sec
B	10 m /60 sec	k1 x 10 m	k2 x 60 sec
C	60 m /60 sec	k1 x 60 m	k2 x 60 sec
D	10 m /10 m	k1 x 10 m	k2 x 10 m
E	60 m /60 m	k1 x 60 m	k2 x 60 m
F	10 h /10 h	k1 x 10 h	k2 x 10 h

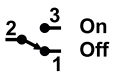
Technical Specifications

Supply voltage : 220 Vac ± %20 (L - N)
B1,B2(Vac) : 24 ☑ ; 12 ☐
B1,B2(Vdc) : B1:+ ; B2:-
Ranges :
A : 60 sec / 60 sec
B : 10 m / 60 sec
C : 60 m / 60 sec
D : 10 m / 10 m
E : 60 m / 60 m
F : 10 h / 10 h
Power Consumption : < 7 VA
Ambiant Temperature : -5°C...+55 °C
Contacts Type : Relay, 1 CO, 10A /250 Vac (Omron)
Electrical Connections : PCB Connectors (2,5 mm2)
Connection : Vertical inside panel or DIN 35 rail
Weight : 0,09kg

Function Sheme



ton: "On" time
toff: "Off" time
Un : Supply Voltage



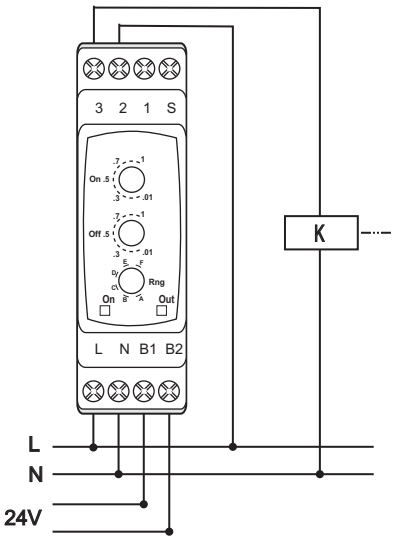
"ON" start when "S" is not connected
"ON" start when "S1" and "S2"are not connected

"OFF" start when "S-B2" is connected
"OFF" start when"S1-S2"is connected

Example: C Range is choosen "ON" time can be adjusted between 0.6m..60m "OFF" time can be adjusted 0.6sec..60sec

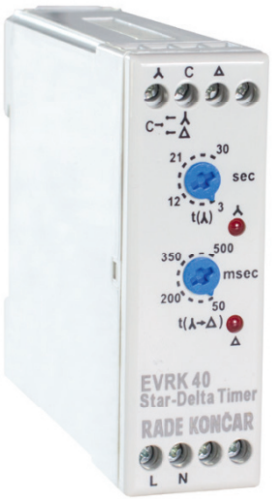
Note: 1) For range recognition relay should be re-energised.
2) "ton" , "toff" adjustment can be done during the usage

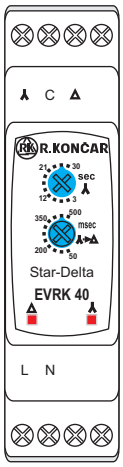
Shematic diagram



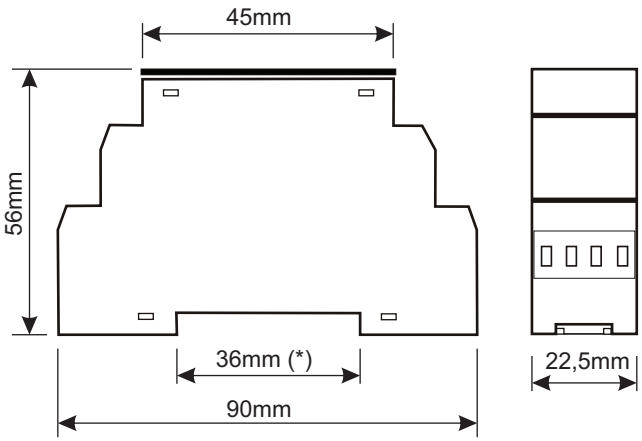
Type EVRU KM2					
Type	Order number	Time interval	Electrical connection	Weight [g]	Packing [pcs]
EVRU KM2	604537	60s...10h	PCB Connectors	90	1

Star-delta timer EVRK 40





Dimensions



General Specification:

When supply is connected to L and N "λ" led is on and "C" is close contact with "λ". Device remains this position till "t(λ)" . After "t(λ)" is passed "C" is open contact during "t(λ→Δ)" time period. After "t(λ→Δ)"is passed "C" is connected to the "Δ" and "Δ" led is on. Device remains this position till supply is disconnected.

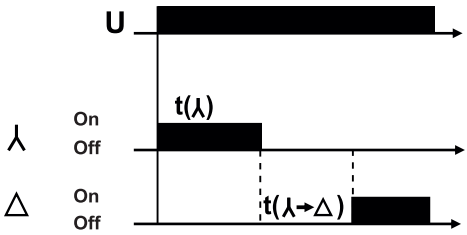
1- "t(λ)" Time Adjusment: it adjust star working time that is between3sec to 30sec.

2- "t(λ→Δ) Time Adjusment: it adjust star-delta transfer time that is between 50msec to 500,sec.

Technical Specifications

Supply Voltage	**:** 220 Vac ± %20, 50/60 Hz (L - N)
Star Working Time	: 3sec...30sec
Star-Delta Transfer Time	: 50msec...500msec
Power Consumption	**:** < 7VA
Ambient Temprature	**:** -5...+55 °C
Contact Type	**:** 2 NO, Relay,10A / 250 Vac(Omron)
Electrical Connector	: PCB Connectors (2,5 mm2)
Connection	**:** Vertical inside panel or DIN 35 rail
Weight	: 0,09 kg

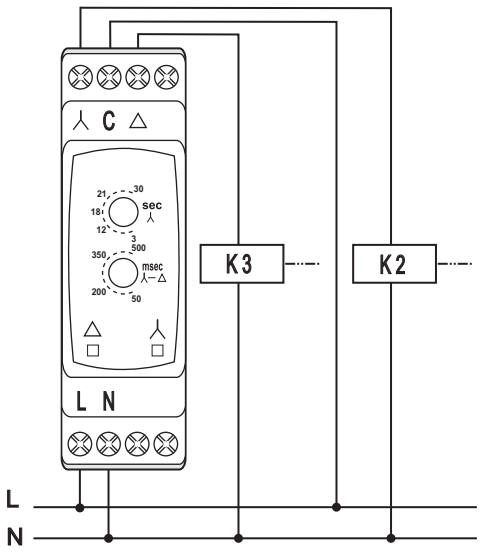
Function Sheme



U : Supply Voltage
t(λ) : Star working time
t(λ→Δ) : Star-delta transfer time
λ : Star connection
Δ : Delta connection

Relay Contacts: Common in C→ λ 1. Relay / Δ 2. Relay

Shematic diagram



Type EVRK 40					
Type	Order number	Time interval	Electrical connection	Weight [g]	Packing [pcs]
EVRK 40	159117	3sec-30sec 50ms-500ms	PCB Connectors	90	1

AUTOMATIC POWER FACTOR CORRECTION UNITS AND COMPONENTS

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Power capacitors 215
Detuned filter reactors 220
Reactive power controllers 225
Capacitor duty contactors 229

Automatic power factor correction units

Automatic power factor correction units

Solutions for compensation of reactive power

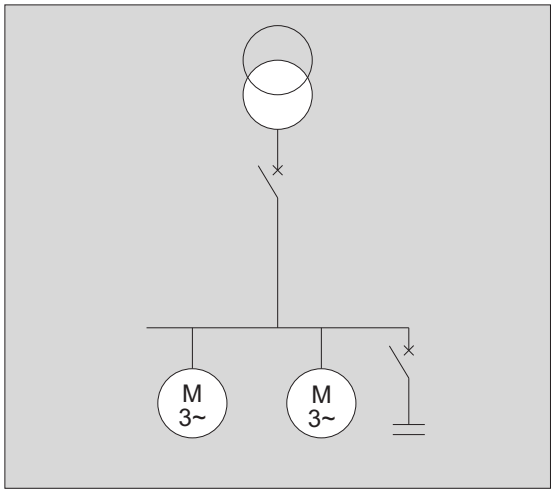
Automatic Power factor correction unit is fully automatic in operation and can achieve desired power factor under fluctuating load conditions

Components
- Capacitor banks
- Contactors for capacitor switching
- Power factor controllers
- Detuned filter reactors

SYSTEMS AND TYPES OF COMPENSATION

When selecting capacitor bank, there are two compensation systems.

Fixed type capacitor banks

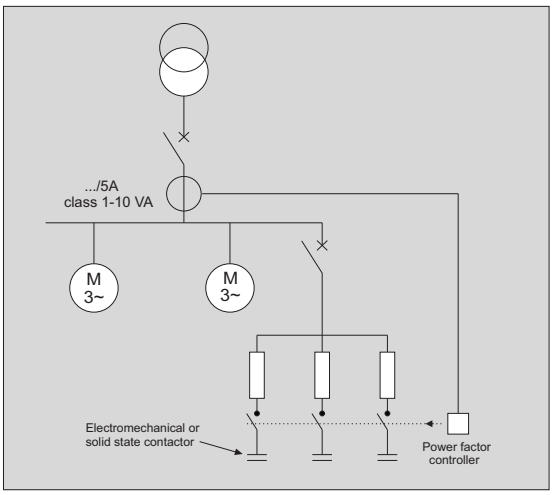


- The reactive power supplied by the capacitor bank is constant irrespective of any variations in the power factor and the load of the receivers, thus of the reactive energy consumption of the installation.

- These capacitor banks are switched on:
- Either manually by a circuit breaker or switch
- Or semi-automatically by a remote-controlled contactor

This type of capacitor bank is generally used in the following situations:
- Electrical installations with constant load operating 24 hours a dey
- Reactive compensation of transformers
- Individual compensation of motors
- Installation of a capacitor bank whose power is less than or equal to 15% of the power of the transformer

Automatic type capacitor banks



- The reactive power supplied by the capacitor bank can be adjusted according to variations in the power factor and the load of the receivers, thus of the reactive energy consumption of the installation.

- These capacitor banks are made up of a combination of capacitor steps (step = capacitor + contactor) connected in parallel. Switching on and off of all or part of the capacitor bank is controlled by an integrated power factor controller.

- These capacitor banks are also used in the following situations:
- Variable load electrical installations
- Compensation of main LV distribution boards or major outgoing lines.
- Installation of a capacitor bank whose power is more than 15% greater than the power of the transformer

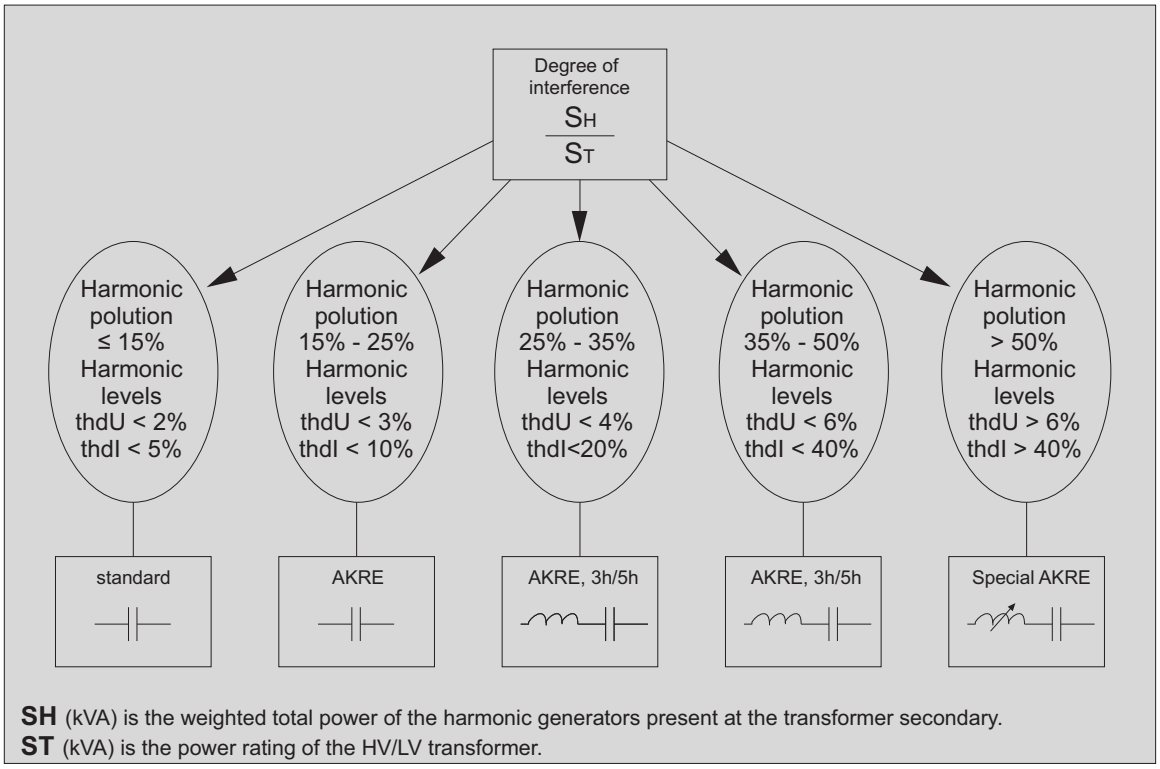
PROTECTING CAPACITORS FROM HARMONICS

By design and in accordance with current standards, capacitors are capable of continuously withstanding an rms current equal to **1.3 times the nominal current** defined at the nominal voltage and frequency values.

This overcurrent coefficient has been determined to take account of the combined effects of the presence of harmonics and overvoltages (the capacitance variation parameter being negligible).

It can be seen that depending on the degree of harmonic pollution SH (power of the harmonic generators), this coefficient is generally insufficient and that the parameter Ssc (short-circuit power), directly related to the power of the source ST, is preponerant in the value of the parallel resonance frequency (Fr.p).

By combining these two parameters, SH and ST, three types of mains supply can be defined, with a corresponding “type” of capacitor to be installed:



SH (kVA) is the weighted total power of the harmonic generators present at the transformer secondary.
ST (kVA) is the power rating of the HV/LV transformer.

TECHNICAL DATA:

AKRE capacitor banks are automatic banks with switching via electromechanical contactors.
- Rated Voltage: 400V, 50Hz; 3;
- Admissible working voltage range for the capacitors:
  AKRE: 380 - 440V
  AKRE 5h: 380 - 440V
  AKRE 3h: 380 - 525V
- Regulation Voltage: 230V, 50Hz
- Temperature class:
  Operation -10/+45°C (average over 24 hours: 40°C)
  Operation -10/+40°C (average over 24 hours: 40°C)
  Storage -30/+60°C
- Ventilation: natural or forced
- Colour grey cabinet (RAL 7035), black base
- Tolerance: 1,1 x Un & 1,3-1,5 x Ie
- Mechanical protection: IP 31
- Standards: EN 60439-1; IEC 60439-1 and 2

CONSTRUCTION OF THE ELECTRICAL CABINETS

The electrical cabinets have a metal case, they are prepared for a standing mounting position with a low voltage switches MCCB built-in as a standard mode.
W - wide , H - height, D - depth

Other powers, voltages, frequencies on request.
Fix capacitor banks on request.

PAKRE capacitor banks are Semi - automatic banks with switching via electromechanical contactors.
- Rated Voltage: 400V, 50Hz; 3;
- Admissible working voltage range for the capacitors:
  AKRE: 380 - 440V
- Regulation Voltage: 230V, 50Hz
- Temperature class:
  Operation -10/+45°C (average over 24 hours: 40°C)
  Storage -30/+60°C
- Ventilation: natural or forced
- Colour grey cabinet (RAL 7035), black base
- Tolerance: 1,1 x Un & 1,3 x Ie
- Mechanical protection: IP 31
- Standards: EN 60439-1; IEC 60439-1 and 2

Fixed capacitor banks

AKRE capacitor banks with built-in circuit breaker
Assembly filled and wired in an IP 31
- Rated Voltage: 400V, 50Hz; 3;
- Admissible working voltage range for the capacitors:
  380 - 440V
- Regulation Voltage: 230V, 50Hz
- Temperature class:
  Operation -10/+45°C (average over 24 hours: 40°C)
  Storage -30/+60°C
- Ventilation: natural
- Colour grey cabinet (RAL 7035),
- Tolerance: 1,1 x Un & 1,3-1,5 x Ie
- Mechanical protection: IP 31
- Standards: EN 60439-1; IEC 60439-1 and 2

Automatic Power Factor correction unit from **15 to 65 kVAr/440V**

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 15/440	15	440	5 + 5 + 5	600x900x280
AKRE 20/440	20	440	5 + 5 + 10	600x900x280
AKRE 25/440	25	440	5 + 10 + 10	600x900x280
AKRE 30/440	30	440	5 + 10 + 15	600x900x280
AKRE 35/440	35	440	5 + 10 + 20	600x900x280
AKRE 40/440	40	440	10 + 10 + 20	600x900x280
AKRE 50/440	50	440	10 + 20 + 20	600x900x280
AKRE 65/440	65	440	10 + 15 + 20 + 20	600x900x280

Automatic Power Factor correction unit from **75 to 160 kVAr/440V**

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 75/440	75	440	12,5+12,5+25+25	700x1200x300
AKRE 80/440	80	440	10+10+20+20+20	700x1200x300
AKRE 90/440	90	440	10+20+20+20+20	700x1200x300
AKRE 100/440	100	440	20+20+20+20+20	700x1200x300
AKRE 125/440	125	440	25+25+25+25+25	700x1200x300
AKRE 150/440	150	440	10 + 7x 20	700x1200x300
AKRE 160/440	160	440	8x20	700x1200x300

Automatic Power Factor correction unit from 175 to 300kVAr/440V

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 175/440	175	440	3x25+2x50	680x2150x430
AKRE 200/440	200	440	4x25+2x50	680x2150x430
AKRE 225/440	225	440	3x25+3x50	680x2150x430
AKRE 250/440	250	440	2x25+4x50	680x2150x430
AKRE 275/440	275	440	25+5x50	680x2150x430
AKRE 300/440	300	440	2x25 +57x 50	680x2150x430

Automatic Power Factor correction unit from 325 to 420kVAr/440V

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 325/440	325	440	3x25+5x50	900x2150x430
AKRE 350/440	350	440	2x25+6x50	900x2150x430
AKRE 375/440	375	440	3x25+6x50	900x2150x430
AKRE 380/440	380	440	2x20+4x40+3x60	900x2150x430
AKRE 400/440	400	440	20+5x40+3x60	900x2150x430
AKRE 420/440	420	440	6x40 +3x 60	900x2150x430

Automatic Power Factor correction unit from 450 to 660kVAr/ 440V

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 450/440	450	440	2x25+6x50	1400x2150x430
AKRE 500/440	500	440	4x25+8x50	1400x2150x430
AKRE 550/440	550	440	2x25+10x50	1400x2150x430
AKRE 600/440	600	440	12x50	1400x2150x430
AKRE 660/440	660	440	12x60	1400x2150x430

Automatic Power Factor correction unit from 30 to 75kVAr/ 440V; p=7%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 30/440; 7%	30	440	2x5+2x10	850x1450x360
AKRE 40/440; 7%	40	440	4x50	850x1450x360
AKRE 45/440; 7%	45	440	3x15	850x1450x360
AKRE 50/440; 7%	50	440	5x10	850x1450x360
AKRE 60/440; 7%	60	440	4x15	850x1450x360
AKRE 75/440; 7%	75	440	5x15	850x1450x360

With detuned filter reactors.
Resonance frequency = 189Hz.
Blocking factor p%= 7%.

Automatic Power Factor correction unit from 80 to 200kVAr/ 440V; p=7%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 80/440; 7%	80	440	2x15+2x25	850x1950x520
AKRE 100/440; 7%	100	440	4x25	850x1950x520
AKRE 125/440; 7%	125	440	3x25+50	850x1950x520
AKRE 150/440; 7%	150	440	2x25+2x50	850x1950x520
AKRE 175/440; 7%	175	440	25+3x50	850x1950x520
AKRE 200/440; 7%	200	440	4x50	850x1950x520

With detuned filter reactors.
Resonance frequency = 189Hz.
Blocking factor p%= 7%.

Automatic Power Factor correction unit from 225 to 375kVAr/ 440V; p=7%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 225/440; 7%	225	440	3x25+3x50	1200x2270x600
AKRE 250/440; 7%	250	440	2x25+4x50	1200x2270x600
AKRE 275/440; 7%	275	440	3x25+4x50	1200x2270x600
AKRE 300/440; 7%	300	440	2x25+5x50	1200x2270x600
AKRE 325/440; 7%	325	440	3x25+5x50	1200x2270x600
AKRE 350/440; 7%	350	440	2x25+6x50	1200x2270x600
AKRE 375/440; 7%	375	440	3x25+6x50	1200x2270x600

With detuned filter reactors.
Resonance frequency = 189Hz.
Blocking factor p%= 7%.

Automatic Power Factor correction unit from 400 to 660kVAr/ 440V; p=7%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 400/440; 7%	400	440	8x50	1600x2270x600
AKRE 450/440; 7%	450	440	2x25+8x50	1600x2270x600
AKRE 500/440; 7%	500	440	10x50	1600x2270x600
AKRE 550/440; 7%	550	440	2x25+10x50	1600x2270x600
AKRE 600/440; 7%	600	440	12x50	1600x2270x600
AKRE 660/440; 7%	660	440	12x60	1600x2270x600

With detuned filter reactors.
Resonance frequency = 189Hz.
Blocking factor p%= 7%.

Automatic Power Factor correction unit from 45 to 75kVAr/525V; p=14%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 45/525; 14%	45	525	3x15	850x1450x360
AKRE 60/525; 14%	60	525	4x15	850x1450x360
AKRE 75/525; 14%	75	525	5x15	850x1450x360

With detuned filter reactors.
Resonance frequency = 134Hz.
Blocking factor p%=14%.

Automatic Power Factor correction unit from 90 to 210kVAr/525V; p=14%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 90/525; 14%	90	525	2x15+2x30	850x1950x520
AKRE 120/525; 14%	120	525	4x30	850x1950x520
AKRE 150/525; 14%	150	525	3x30+1x60	850x1950x520
AKRE 180/525; 14%	180	525	2x30+2x60	850x1950x520
AKRE 210/525; 14%	210	525	1x30+3x60	850x1950x520

With detuned filter reactors.
Resonance frequency = 134Hz.
Blocking factor p%=14%.

Automatic Power Factor correction unit from 240 to 360kVAr/525V; p=14%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 240/525; 14%	240	525	4x60	1200x2270x600
AKRE 270/525; 14%	270	525	30+4x60	1200x2270x600
AKRE 300/525; 14%	300	525	2x30+4x60	1200x2270x600
AKRE 330/525; 14%	330	525	1x30+5x60	1200x2270x600
AKRE 360/525; 14%	360	525	6x60	1200x2270x600

With detuned filter reactors.
Resonance frequency = 134Hz.
Blocking factor p%=14%.

Automatic Power Factor correction unit from 390 to 720kVAr/525V; p=14%

Type	Power (kVar)	Voltage (V)	Steps	Dimensions WxHxD
AKRE 390/525; 14%	390	525	1x30+6x60	1600x2270x600
AKRE 450/525; 14%	450	525	1x30+7x60	1600x2270x600
AKRE 510/525; 14%	510	525	1x30+8x60	1600x2270x600
AKRE 570/525; 14%	570	525	1x30+9x60	1600x2270x600
AKRE 630/525; 14%	630	525	1x30+10x60	1600x2270x600
AKRE 690/525; 14%	690	525	1x30+11x60	1600x2270x600
AKRE 720/525; 14%	720	525	12x60	1600x2270x600

With detuned filter reactors.
Resonance frequency = 134Hz.
Blocking factor p%=14%.

Semi-Automatic Power Factor correction unit from 10 to 60kVAr/440V;

Type	Power (kVar)	Voltage (V)	Dimensions WxHxD
PAKRE 10/440	10	440	500x600x225
PAKRE 15/440	15	440	500x600x225
PAKRE 20/440	20	440	500x600x225
PAKRE 25/440	25	440	500x600x225
PAKRE 30/440	30	440	500x600x225
PAKRE 40/440	40	440	500x600x225
PAKRE 50/440	50	440	500x600x225
PAKRE 60/440	60	440	500x600x225

Cylindrical capacitor standard duty

Construction

- Dielectric: Polypropylene film
- Non PCB, Soft Polyurethane resin
- Extruded round aluminium can with stud
- Provided with discharge resistors
- Overpressure disconnector

Features

- Three phase, delta connected
- Self-healing technology
- Naturally air cooled (or forced air cooling)
- Indoor mounting

Typical applications

- For Power Factor correction

Terminals

- 6.3mm fast-on terminals for plastic top -2,5 to 5 kvar
- Screw terminal for metal top – 7.5 to 30 kvar

Mounting parts

Threaded stud at bottom of can
(max. torque = 4Nm for M8 & 10Nm for M12)

Technical data and specifications

Characteristics	
Rated capacitance C_R	As per table
Tolerance	-5/ + 10%
Connection	D (Delta)
Rated voltage	As per table
Rated frequency f_R	50 Hz
Output	As per table
Rated current I_R	As per table
tan δ_0 (dielectric)	≤ 0,2 W / kVar

Maximum ratings	
V_{max} (up to 8 h daily)	(VR+10% VR) V AC
V_{max} (up to 1 min)	(VR+30% VR) V AC
$I_{n\ by}$	1.3 to 1.5· I_R !)B*
I_S	200 · I_R !)B*

Cylindrical capacitor standard duty

Test data	
V_{TT}	1,75* V_R, AC, 2s
V_{TC}	3,600 V AC / 50 Hz, 2 s
* Losses	≤ 0,5 W / kVar * Without discharge resistor

Climatic category / -10/D	
$T_{n\ jo}$	–10 ºC
$T_{n\ by}$	+55 ºC
Rel. humidity	max. 95%
Maximum altitude	4,000 m above sea level

Mean life expectancy	
t_{LD}	up to 100,000 hours
Max. 5,000 switchings per year to IEC 60831	

Design data	
Dimensions (d xh)	As per table
Impregnation	Biodegradable soft resin
Fixing with threaded bolt	M12 for case size dia. > 53mm M8 for case size dia. ≤ 53mm
Mounting position	Vertical position.

Terminals	
Plastic top -1 to 5 kvar	6.3mm fast-on
Metal top – 7.5 to25 kvar	Sigut terminal
Sigut terminals	
Degree of protection	Isolated terminals, IP20
Max. torque	1.2 Nm
Cable cross section	16 mm^2
Maximum terminal current	50 A
Creepage distance	12.7 mm
Clearance	9.6 mm

Safety	
Mechanical safety	Overpressure disconnector
Max. short circuit current	AFC: 10 kA
Discharge resistor time	≤ 1 min (50 V)

Reference Standards
IEC 60831–1/2, UL 810-5th edition

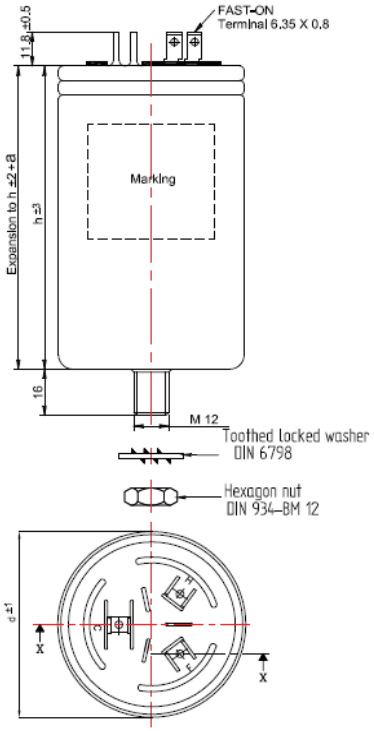
Cylindrical capacitor standard duty

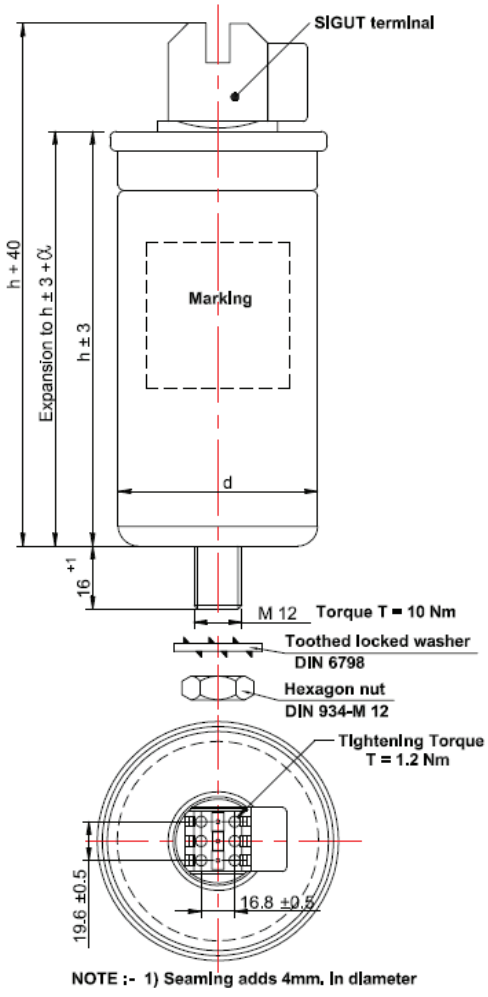
ORDERING CODE:

TYPE	Voltage (V)	Power (Q) kvar		Capacitance Cn (µf)	Rated current (A)		Dimension (mm)	Part No.
		50 Hz	60 Hz		50 Hz	60 Hz	d x h	
I	440	**2.5**	3.0	13.7	3.3	3.9	63.5 x 130	**RKC 440 2.5 S**
i	440	**5.0**	6.0	27.5	6.6	7.9	63.5 x 154	**RKC 440 5 S**
II	440	**7.5**	9.0	41	9.8	11.8	78.4 x 159	**RKC 440 7.5 S**
II	440	**10.0**	12.0	55	13.1	15.7	78.4 x 195	**RKC 440 10 S**
II	440	**12.5**	15.0	68.5	16.4	19.7	88.4 x 195	**RKC 440 12.5 S**
II	440	**15.0**	18.0	82.2	19.7	23.6	88.4 x 270	**RKC 440 15 S**
II	440	**20.0**	24.0	110	26.2	31.5	88.4 x 270	**RKC 440 20 S**
II	440	**25.0**	30.0	137.1	32.8	39.4	88.4 x 345	**RKC 440 25 S**
II	440	**30.0**	36.0	164.5	39.4	47.2	88.4 x 345	**RKC 440 30 S**

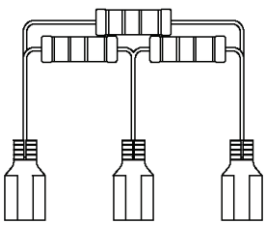
I - Types with Plastic top
II - Types with Metal top

Dimensional drawing





Discharge resistor assembly



Cylindrical capacitor standard duty

ORDERING CODE:

Type	Voltage (V)	Power (Q) kvar		Capacitance Cn (µf)	Rated current (A)		Dimension (mm)	Part No.
		50 Hz	60 Hz		50 Hz	60 Hz	d x h	
II	525	**7.5**	9.0	28.9	8.2	9.9	78.4 x 159	**RKC 525 7.5 S**
II	525	**10.0**	12.0	38.5	11.0	13.2	88.4 x 195	**RKC 525 10 S**
II	525	**12.5**	15.0	48.1	13.7	16.5	88.4 x 270	**RKC 525 12.5 S**
II	525	**15.0**	18.0	57.8	16.5	19.8	88.4 x 345	**RKC 525 15 S**
II	525	**30.0**	36.0	115.5	33.0	39.6	121.5 x325	**RKC 525 30 S**

II - Types with Metal top

Discharging
Capacitors must be discharged to a maximum of 10% of rated voltage before they are switched on again. This prevents an electric impulse discharge in the application, influences the capacitor's service life and protects against electric shock. The capacitor must be discharged to 50 V or less within 60 seconds. There must be not any switch, fuse or any other disconnecting device in the circuit between the power capacitor and the discharging device. Discharge and short circuit capacitor before handling!

Service life expectancy
Electrical components do not have an unlimited service life expectancy; this applies to self-healing capacitors too. The maximum service life expectancy may vary depending on the application the capacitor is used in.

Thermal load/over-temperature
After installation of the capacitor it is necessary to verify that maximum hot-spot temperature is not exceeded at extreme service conditions.

Overpressure Disconnector
To ensure full functionality of an overpressure disconnector, the following must be observed:
1. Maximum allowed fault current of 10000 A in accordance with UL 810 standard must be assured by the application.
2. Stress parameters of the capacitor must be within the IEC60831/IS13340 specification.

Over current and short circuit protection
- Use HRC fuses or MCCB-s for short circuit protection. Short circuit protection and connecting cables should be selected so that 1.5 times the rated capacitor current can be permanently handled.
- HRC fuses do not protect a capacitor against overload - they are only for short circuit protection.
- The HRC fuse rating should be 1.6 to 1.8 times rated capacitor current.
- Do not use HRC fuses to switch capacitors (risk of arcing).
- Use thermal magnetic over current relays for overload protection.

Resonance cases
Resonance cases must be avoided by appropriate application design in any case. Maximum total RMS capacitor current (incl. fundamental harmonic current) specified in technical data must not be exceeded.

Re-switching vs. phase-opposition
In case of voltage interruption, a sufficient discharge time has to be ensured to avoid phase-opposition and resulting high inrush currents.

Cylindrical capacitor standard duty

Vibration resistance
The resistance to vibration of capacitors corresponds to IEC 68, part 2–6.

Max. test conditions:	
Test duration	6 h*
Frequency range 1	10 ... 55 Hz*
Displacement amplitude	0.75 mm*

*corresponding to max. 98.1 m/s” or 10 g
These figures apply to the capacitor alone. Because the fixing and the terminals may influence the vibration properties, it is necessary to check stability when a capacitor is built in and exposed to vibration. Irrespective of this, you are advised not to locate capacitors where vibration amplitude reaches the maximum in strongly vibrating equipment.

Mechanical protection
The capacitor has to be installed in a way that mechanical damages and dents in the aluminum can are avoided.

Grounding
The threaded bottom stud of the capacitor has to be used for grounding. In case grounding is done via metal chassis that the capacitor is mounted to, the layer of varnish beneath the washer and nut should be removed. The maximum tightening torque is 10 Nm for M12 stud and 4Nm for M8 stud.

DETUNED FILTER REACTORS

Detuned Filter Reactors, are used in series with capacitors in power factor correction units - AKRE. By using these types of detuned reactors it is possible to avoid following negative effects on system.

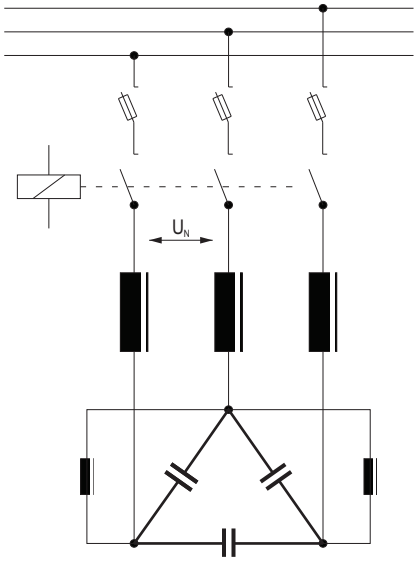
- Overcurrect during switching on the capacitor banks
- Overload of capacitors because of the harmonic resonance.
- Short lifetime on capacitors
- Overheating of the utility transmission cables.
- Overheating of the distribution transformer.
- Unintended triggering of the protective devices.
- Distortion of utility voltage waveform and problems on voltage sensitive devices
- Interferences on data transmission systems
- Unexplainable faults in electronic boards

Choosing the correct detuned filter reactor and capacitor value on detuned power factor correction systems is very important. To obtain optimum performance form a detuned power factor correction system following criteria must be controlled and met during the pairing of the reactors and capacitors.

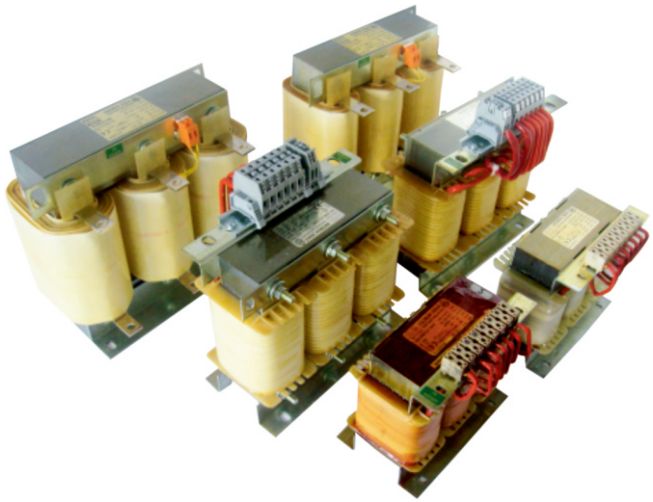
CHOOSING CORRECT DETUNED FILTER REACTOR

- The resonance frequency must be chosen according to harmonic analysis of the system
- The voltage across the terminals of the capacitor will increase because of the inductive reaction of the rector. The rated voltage of the capacitors must be chosen according to the resonance frequency.
- In detuned power factor correction systems, presence of higher voltage rated capacitors and reactors causes a difference between rated capacitor power and obtained reactive power. The obtained power must be calculated in order to avoid low compensation.
- The reactors will genereate extensive heat dur to heavy harmonic load on them. The cabinets must be designed to disperse this heat.

Installation od detuned (reactor-connected)capacitors



Defuned filter reactors are high quality reactors designed to be used in detuned power factor correction units.These reactors are compatible with european standards.



TECHNICAL SPECIFICATIONS

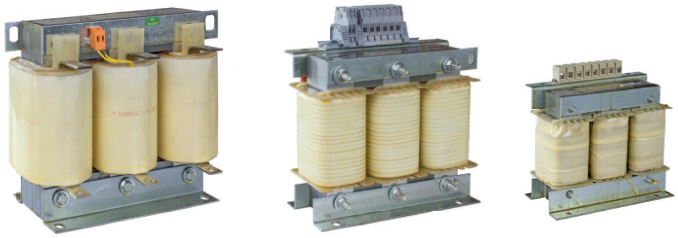
- Rated Voltages: 400V
- Rated Frequencies: 50HZ
- Mean value across three phases: ± 5%
- Linearity: I_{lin} = 1,56 - 2,2In
- Single or three phase, high permeable iron core, air gapped design
- High quality copper or aluminium windings
- Availiable at any resonance frequency
- Linearty according to resonance frequency
- Harmonic loads according to EN 6100-2-2
  U_1 = %106 x Un
  U_3 = %0,5 x Un
  U_5 = %5 x Un
  U_7 = %5 x Un
- Protection class: IP00 indoor mounting
- Cooling: natural cooling
- Thermal Switch for overload protection
- Thermal block, bar or cable connection depending on current value
- Vacuum impregnated varnish to ensure silent and moisture-immune operation
- Compatibility with EN 61558 2-20

VALUES TO BE SPECIFIED FOR CUSTOM DETUNED FILTER REACTORS

- Utility Voltage
- Resonance frequency
- Information on the availiable capacitors.

Most common mistake made at detuned filter applications is chosing inappropriate reactor and capacitor pairs. Especially the reactors stated in manufacturer cataloques are used in conjunction with a specifict capacitor value. While chosing the necessary capacitor reactor pair, the selection tables in catalogs must be controlled to ensure that proper pair is chosen, if a different brand capacitor is going to be chosen, the capacity value must be the same as the original. In a mismatchcase the resonance frequency will shift and cause severeproblems for the system.

DETUNED FILTER REACTOR SELECTION TABLE



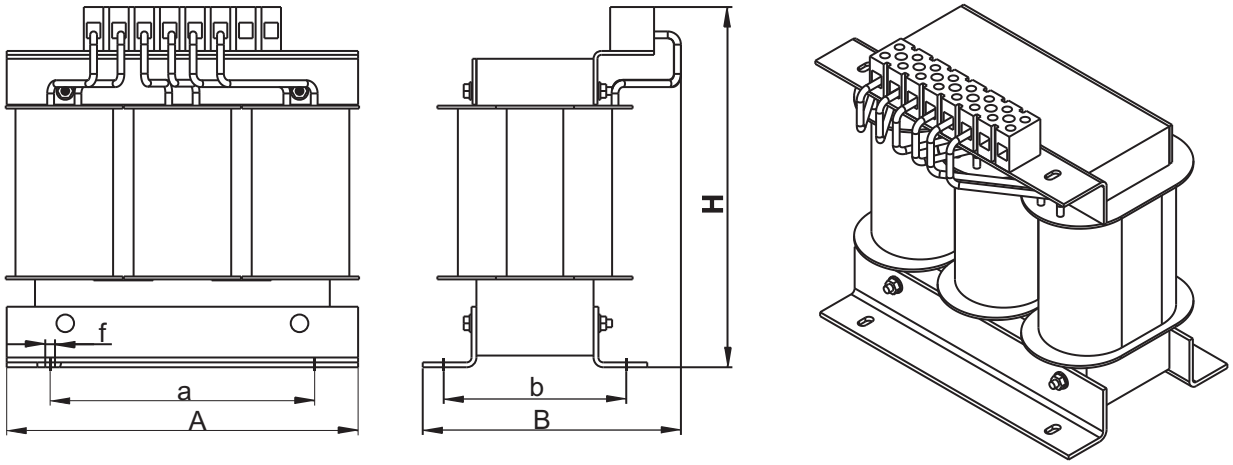
Detuned filter reactors with:
- Resonance frequency = 134Hz.
- Blocking factor p%= 14%.

400V 50Hz Utility Voltage, 134Hz Resonance Frequency (p=14%)								
Type	Capacitor RKC 525..S	Target Power	L	Irms	Ith	Ilin	C	Weights
	kVar	kVar	mH	A	A	A	µF	kg
ERH-14/400/6,25	10.00	6.25	12.3	10.4	7.98	11.4	38,50	9
ERH-14/400/7,5	12.50	7.5	9.99	12.8	15.98	14.1	42,35	9.5
ERH-14/400/10	15.00	10	8.3	16.4	23.96	16.9	57,74	9.8
ERH-14/400/20	30.00	20	4.15	30.8	31.94	33.8	115,49	18
ERH-14/400/40	60.00	40	2.07	61,5	39.93	67.7	230,97	33.3

Detuned filter reactors with:
- Resonance frequency = 189Hz.
- Blocking factor p%= 7%.

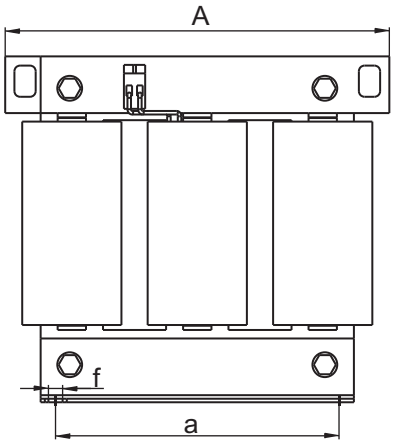
400V 50hz Utility Voltage, 189Hz Resonance Frequency (p=7%)								
Type	Capacitor RKC 440 .. S	Target Power	L	Irms	Ith	Ilin	C	Weights
	kVar	kVar	mH	A	A	A	µF	kg
ERH-7/400/4,44	5.00	4.44	8.63	7.25	7.98	15.57	27.38	5
ERH-7/400/8,89	10.00	8.89	4.31	14.52	15.98	31.18	54.83	6.5
ERH-7/400/13,33	15.00	13.33	2.88	21.78	23.96	46.75	82.21	9.5
ERH-7/400/17,77	20.00	17.77	2.16	29.03	31.94	62.32	109.59	12
ERH-7/400/22,22	25.00	22.22	1.73	36.30	39.93	77.93	137.04	16
ERH-7/400/26,66	30.00	26.66	1.44	43.56	47.91	93.50	164.42	18
ERH-7/400/35,55	40.00	35.55	1.08	58.08	63.89	124.68	219.25	21
ERH-7/400/44,43	50.00	44.43	0.86	72.59	79.85	155.82	274.01	22.5
ERH-7/400/53,33	60.00	53.33	0.72	87.13	95.85	187.04	325.90	25

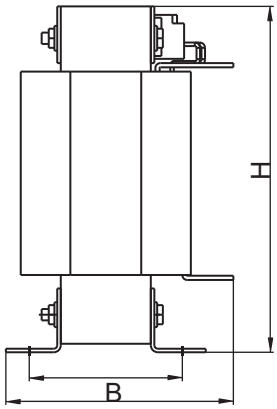
DIMENSIONS

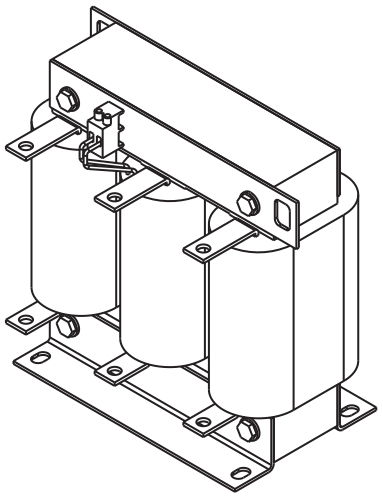


DRAWING DIMENSIONS				
Type	Dimensions	Fixing holes	Hole	Weights
	A x B x H	a x b	f	kg
ERH-7/400/4,44	150x100x150	110x70	5x10	5
ERH-7/400/8,89	180x115x180	135x74	5x10	6.5
ERH-7/400/13,33	180x140x180	135x94	5x10	9.5
ERH-7/400/17,77	225x140x220	175x80	10x15	12
ERH-7/400/22,22	240x156x265	185x100	10x15	16
ERH-7/400/26,66	240x156x265	185x100	10x15	18
ERH-7/400/35,55	240x156x265	185x100	10x15	21
ERH-14/400/6,25	180x125x180	135x85	5x10	9
ERH-14/400/7,5	180x125x180	135x85	5x10	9.5
ERH-14/400/10	180x125x180	135x95	5x10	9.8
ERH-14/400/20	240x155x270	185x100	10x15	18

DIMENSIONS







DRAWING DIMENSIONS				
Type	Dimensions	Fixing holes	Hole	Weights
	A x B x H	a x b	f	kg
ERH-7/400/44,43	265x170x245	200x108	10x15	22.5
ERH-7/400/53,33	265x170x245	200x108	10x15	25
ERH-14/400/40	300x190x260	224x120	10x15	33.3

*Specified capacitor values are used during the reactor design. Severe problems may occur when using another capacitor in conjunction with these reactors. Custom reactor designs are possible.
*Dimensions values may change depending on design.

Reactive power controllers

The RKPFR power factor controller calculates the active and reactive power in the mains from the measured current and voltage. The intelligent control algorithm optimizes the switching sequences and guarantees for short regulation times with minimum number of switching. At the same time, switching operations are equally shared among the available capacitor branches where possible. The integrated connection control immediately detects in which phases voltage and current are measured, and adapts the entire system automatically. The very low current threshold of 10mA allows for very reliable and exact PF controller 1A as well as 5A current transformers can be used without additional manual adjustments. The power supply covers a voltage range of 90....550V.

GENERAL SPECIFICATIONS for RKPFR

RKPFR compensates the system according to total reactive power by measuring voltage and current from single phase.

- It compensates according to systemic cosϕ value. It is recommended that it is used for electro-mechanical energy meters, it must be used with three phase capacitors.
- Measures current and voltage values.
- Computes systemic cosf value.
- Operates according to first out (FIFO) principle.
- Target cosϕ value can be adjusted to be inductive or capacitive.
- Capacitor switch-on time and switch-off time can be adjusted individually.
- C/k value can be adjusted.
- It indicates Over Current and Over Voltage Alarms. Alarm outputs can be activated by user in Menu mode.
- It indicates Under Current Alarm.
- It indicates Over and Under Compensation Alarms.
- It has a fan output to cool the panel and temperature value can be adjusted. Fan can be made passive by user in Menu mode.
- Device sense current directions of phase.
- Automatic set and easy installation.

GENERAL SPECIFICATIONS for RKPFR plus

RKPFK Plus compensate by measuring 3 phase current & voltage and controls according to 3 phases individual reactive power needs. - 3 different methods can be chosen.

P1: compensate according to 3 phases average cosf value. It is suggested to use with electro-mechanical electricity meter and balanced loads.

P2: Mixed method. Compensate 3 phase according to individual reactive power need switching Three Phase & Single Phase capacitor.

P3: Compensates individually with Single phase capacitor. It can be used with electromechanical & Electronic electricity meter.

- Monitors 3 Phase Reactive Power need, Reactive Ratio, Apparent Power, Active Power, Current, Voltage at the same time.
- Intelligent working, switching ON and OFF capacitors that is needed without any program.
- Recognition of Capacitors Automatically.
- Measures Capacitors and monitors their actual values.
- Reactive power ratios of 3 phase can be monitored and adjusted individually.
- Heat of panel is measured and automatically controlled by fun output.
- 15 steps:
  P1: 15 steps 3 phase capacitors
  P2: 6 steps 3 phase capacitors and 3 step single phase capacitors for every phases.
  P3: 5 step single phase capacitors for every phase.

Standard Power Factor Controllers

Type	Maximum Steps	Supply	App.	Screen	Measure.	Control	Measurements						Accesory	Dimensions (mm)
		1 Phase-Neatral 220-230Vac	Low Voltage	LED	1 Phase 1 Current	3 Phase 1 Capasitor	Voltage (V)	Cuurent (A)	Cosϕ	Active Power	Reactive Power	Apparent Power	Temperature (Fan Output)	144 x 144
RKPFK4	4	*	*	*	*	*	*	*	*		*		*	*
RKPFK6	6	*	*	*	*	*	*	*	*		*		*	*
RKPFK8	8	*	*	*	*	*	*	*	*		*		*	*
RKPFK12	12	*	*	*	*	*	*	*	*		*		*	*

Type	Maximum Steps	Dimensions (mm)
RKPFK Plus	15	144 x 144

- 3 Phase, 3 CT
- 15 steps
- Inductive & capacitive reactive power can be controlled
- Automatic step recogniton
- Phase are recongnized and controlled separately
- All parameters are shown for system
- Compensate on low currents
- Temperature inside panel is checked

TECHNICAL SPECIFICATIONS for RKPFR

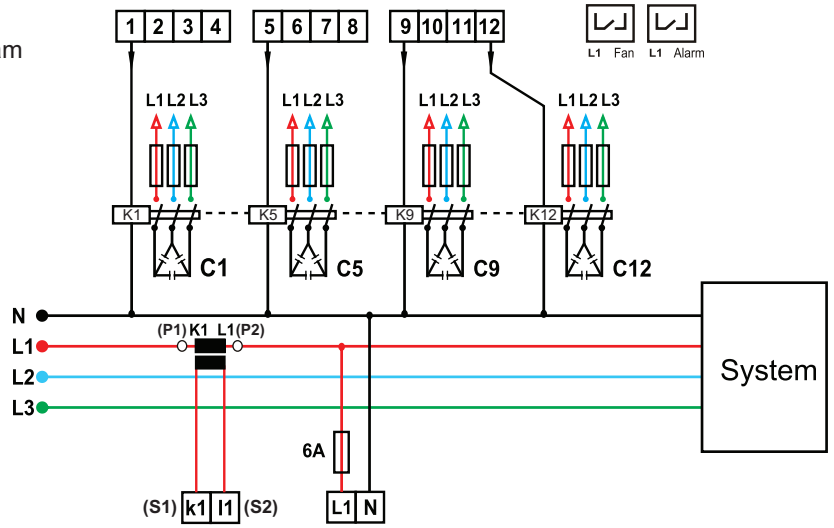
Supply voltage	: 220Vac ±%20(L1-N), 50/60Hz
Power consumption	: <5VA
Current transformer	: .../5A
Current measuring range	: 40mA..6A
Temperature measuring range	: -10..100 °C
Control output	: Relay, 5A/250Vac (resistive load)
cosϕ range	: 0,95 (Ind.)...095 Cap.)
Step delay: Switch-on time	: 1..99sec. adj. (1sec. in man. mode)
Switch-off time	: 1..99sec. adj. (1sec. in man. mode)
Over current alarm ranges	: 4..6A adj.
Under current alarm	: <0,05A
Over voltage alarm range	: 231..286Vac adj.
Comp. alarm delay	: 60sec.
Temperature setting range	: 30..65 °C
Factory set values	: cosϕ=1,00; k=20; C1=1000kVar ton=2sec.; toff=2sec. Over current alarm=6A (alarm ON) Over voltage alarm=250V (alarm ON) Temperature=50°C (alarm ON)
Ambient temperature	: -5...+55 °C
Display	: 3 Digits red display
Protection class	: In front : IP 54 In rear: IP 20
Weight	: 0,90 kg

TECHNICAL SPECIFICATIONS for RKPFR plus

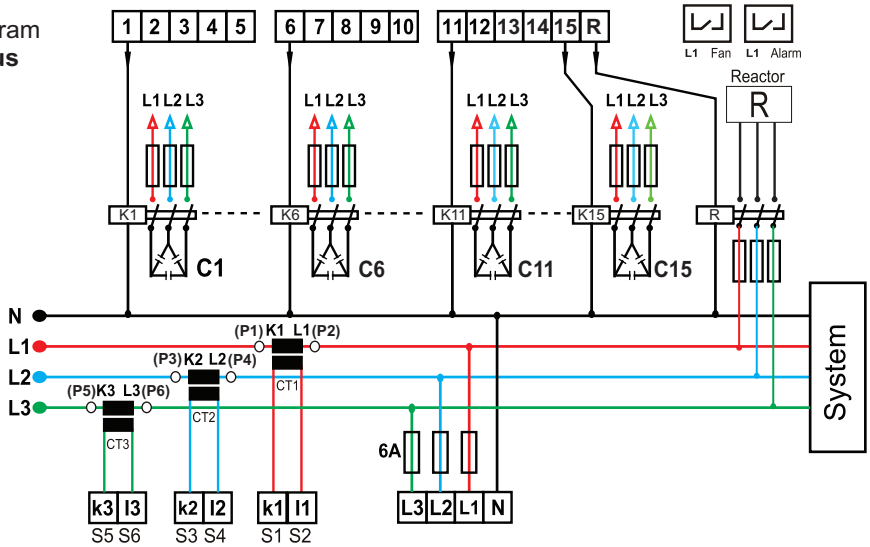
Supply voltage	: 220Vac ±%20(L1-N), 50/60Hz
Power consumption	: <5VA
Current transformer	: .../5A
Current measuring range	: 10mA..7A
Control output	: Relay, 5A/250Vac (Resistive Load)
cosf adjusment	: Inductive 0,95...1,00; Capasitive 0,95...1,00
cosϕ adjusment steps	: 0,05
Step delay: Switch-on time	: 1..99sec. adjustable
Switch-off time	: 1..99sec. adjustable
Discharge time	: 1..99sec. adjustable
Alarm delay	: 60sec.
Temperature control range	: 30..65 °C
Factory set values	: cosϕ=1,00; Temperature=50°C Current transformer rate (k)=10; ton=1sec.; toff=1sec; tdischarge=1sec. Inductive reactive rate: 15%; Capacitive reactive rate: 10%
Operation temperature	: -5...+55 °C
Display	: 3x4 Digitst display
Protection Class	: In front: IP 54 Connecting terminals: IP 20
Weight	: 1,0 kg

CONNECTIONS DIAGRAMS

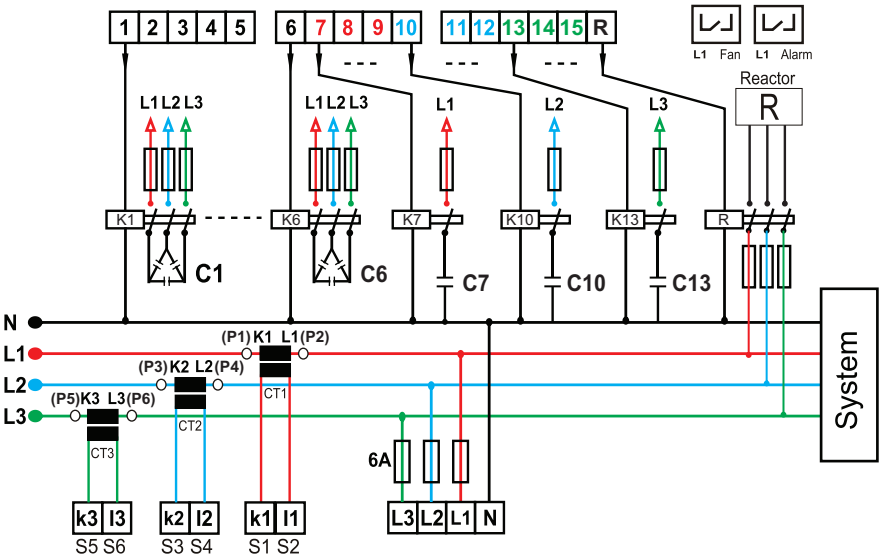
Connection diagram for **RKPFR**



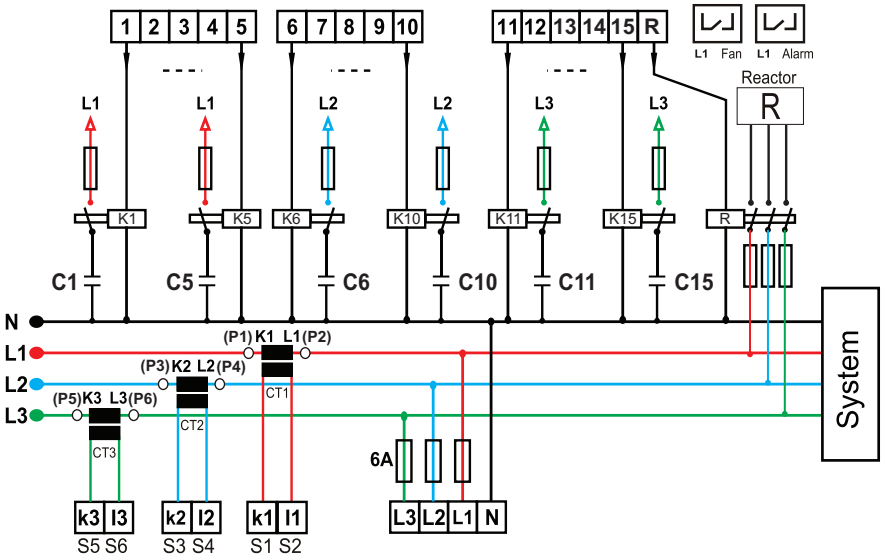
Connection diagram for **RKPFR plus P1** - method



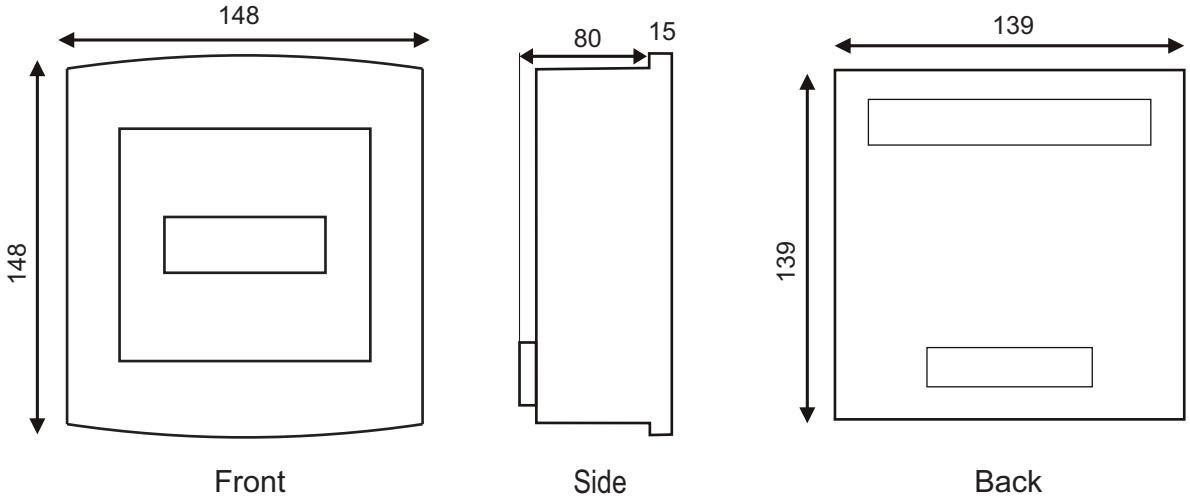
Connection diagram for **RKPFR plus P2** - method



Connection diagram for **RKPFR plus P3** - method



DIMENSIONS

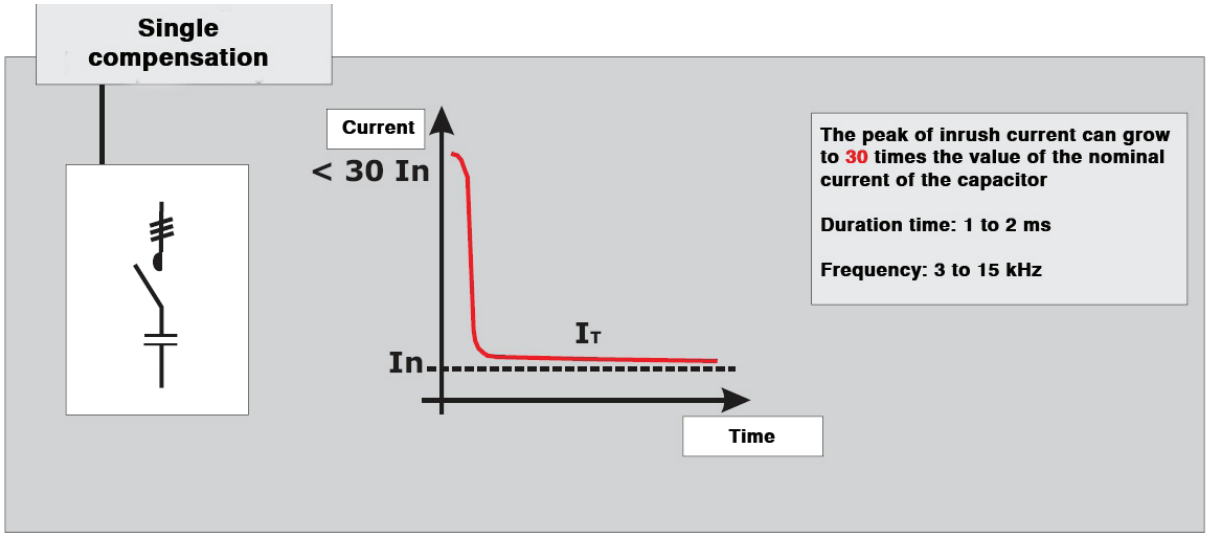


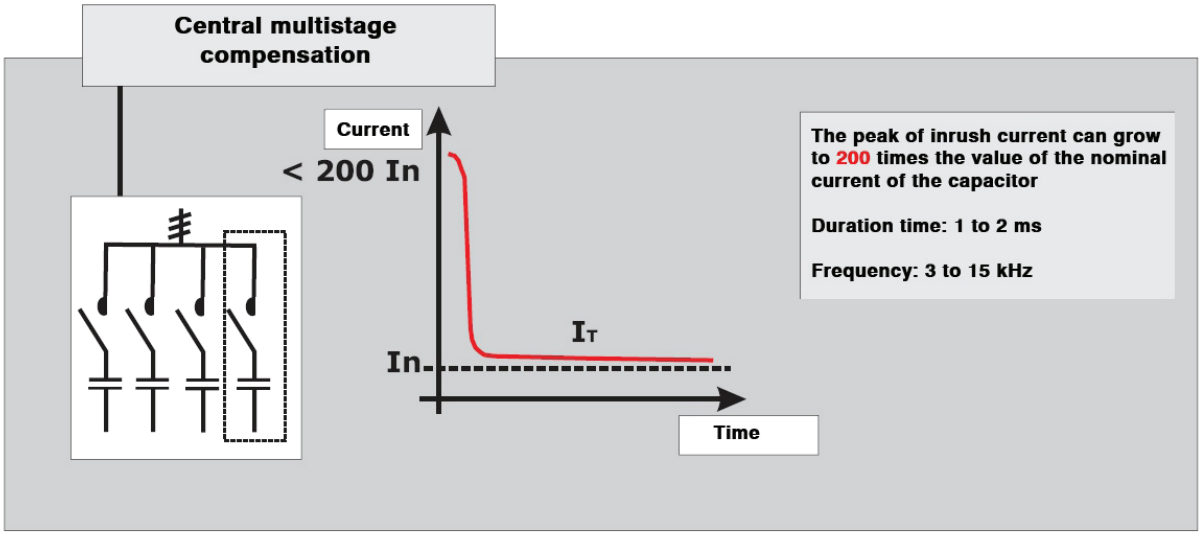
Contactors for controlling three phase capacitor banks

While switching on and switching off the capacitor banks under load, it comes to short - circuit overloads on the order of the short - circuit current. Therefore, in order to protect staff and electrical installation is necessary to be used contactors for controlling of capacitor banks. The use of standard contactors are jeopardizing personnel and complete electrical installation.

While switching on the capacitor in the AC system, it's created a resonant current circuit, which in greater or lesser extent is damping, and the already bruised capacitors cause inrush current of 200 times the nominal current.

The great value of the making current can lead to melting of the main contacts of the contactor, it is also detrimental to capacitors. The value of the making current depends on the type of compensation, which is displayed with the following schedules:





In the automatic compensation systems, contactors which throttle the making current have to be used. With throttling of the making current, the voltage drops and transit currents are also avoided.

In these capacitor contactors pre-contacts are used to limit making current. Each pre - contact is connected in series with a resistor to limit the making current (current charge) of the capacitors. Pre-contacts are closing before main contacts, and open when latest are surely closed. This is achieved with using the system of permanent magnets, not with mechanical lever. Such construction of capacitor contactors ensure effective functioning in their working lifetime. The functioning of capacitor contactor is shown in Figure 1.

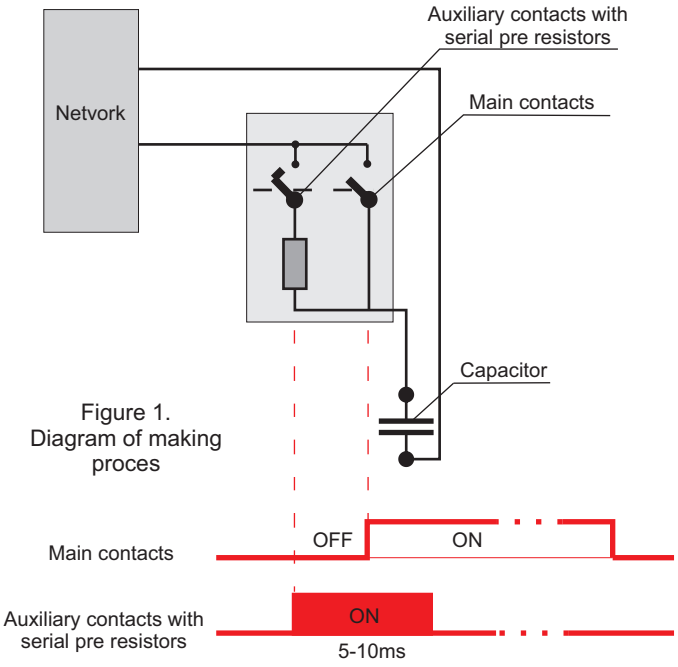
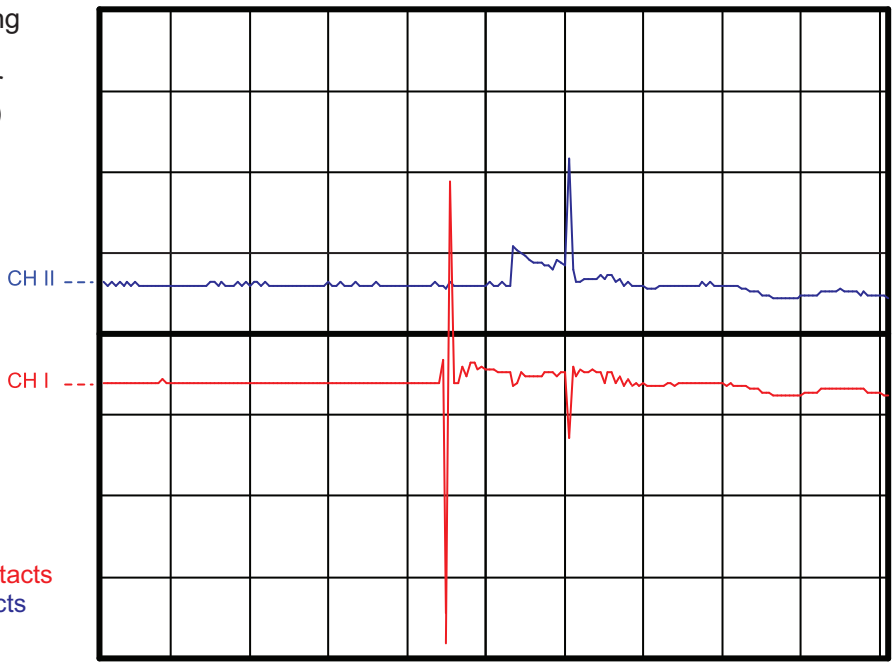


Figure 1.
Diagram of making proces

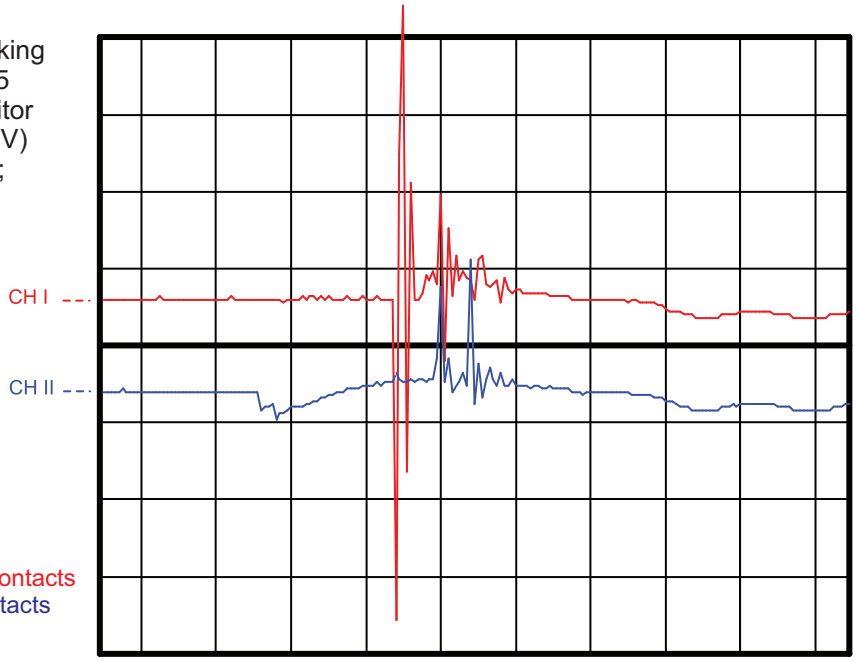
Efficient operation of the capacitor contactors can be vividly seen from the comparison diagrams for making current of capacitor contactor without pre-contacts and with pre-contacts.

1.) Diagram of the making current for CNNK 15 with 15 kVar capacitor (In = 22A; Un = 400V)
Scale: I: 200A / unit;
t: 2ms / unit



CH I: make without pre-contacts
CH II: make with pre-contacts

2.) Diagram of the making current for CNNK 25 with 25 kVAr capacitor (In = 36A; Un = 400V)
Scale: I: 200A / unit;
t: 2ms / unit



CH I: make without pre-contacts
CH II: make with pre-contacts

The capacitor contactors of "Rade Koncar – Kontaktori i relei" DOO – Skopje, series CNNK 2,5; CNNK 5; CNNK 7,5; CNNK10 - CNNK30; CNNK 40 – CNNK 75; CNKM 60 – CNKM 80 have modern design with top constructive solutions fully complied with IEC requirements. They are suitable for controlling of capacitors with order without reactors. Because of the pre-contacts and resistors , the making current is <70 times In.

The backup fusses gl(gG) should be scaled for 1.6 to 1.8 times In .

Features of contactors series CNNK10 –CNNK 75 and CNKM 60–CNKM 80:

- pre-switching on:
  - excellent damping of making current by wire resistors
  - contactors are equipped with pre-contacts for fast folding operating
  - pre-contacts open after the main contacts are closed
  - This is achieved with using the system of permanent magnets, not with mechanical lever
  - single (independent) controlled pre-contacts as a whole increase the resistance of the device from dust
- switching on:
  - no loss of power in the resistors because resistors are disconnected from the current circuit
- switching off:
  - while main contacts switch off, pre-contacts remain hold

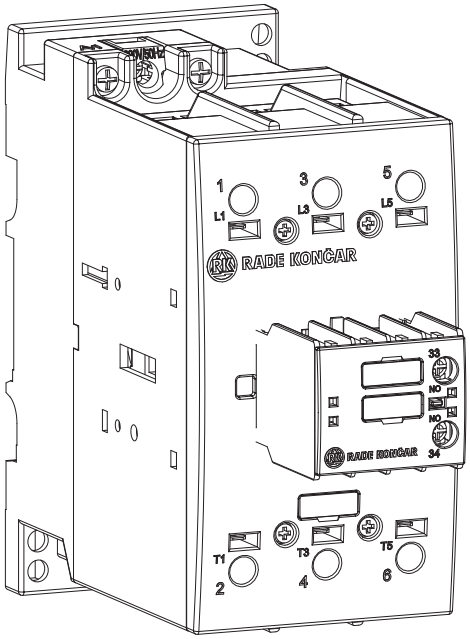
Capacitor contactors series CNNK and CNKM can be used in other cases where high making current exist.

Selection of Capacitor contactor

Capacitor contactors series CNNK and CNKM are selected according to the power of the capacitor. For groups and central compensation, when three phase reactor is not used, it's recommended selection of contactor with a higher degree of nominal value for the appropriate capacitor value.

NEW PRODUCTS

NEW MOTOR CONTACTORS **CNN 150, CNN 110** AND CONTACTORS FOR CAPACITOR SWITCHING **CNNK 80, CNNK 75**



New series of contactors CNN and CNNK

In the year 2020 we are starting a project to develop a new product in our production program. We are starting to develop new series of motor contactors CNN 150 and CNN 110 and new contactors for capacitor switching CNNK 80 and CNNK 75. Our project is in cooperation and co-finance with the Fund for innovation and technology development of North Macedonia.

Visit us at **www.radekoncar.com.mk** for updates.

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