Low Voltage Switchgear and Industrial Automation Product

Makel's quality is the guarantee of your safety

MAKEL®

Our priorities are human and nature

RoHS

RoHS is the acronym for Restriction of Hazardous Substances like Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls. RoHS, also known as originated in the European Union and restricts the use of specific hazardous materials found in electrical and electronic products.

Makel is aware of its responsibility for healthy environment and the production are in complience with RoHS Directive.

Halogen Free

Makel Distribution Boxes produced from halogene free materials does not contain halogene elements such as bromine, fluorine, iodine and chlorine thus they do not produce toxic gases in case of a fire and they can be used safely in public areas such as schools, hospitals, hotels, malls, cinemas etc.

Contents

Miniature Circuit Breakers (MCBs)

Prevent electric mishaps

Makel miniature circuit breakers used in homes and similar places are the circuit breakers to connect or disconnect an electrical device and cut the supply automatically when the current level exceeds a certain level.

Makel miniature circuit breakers protects their corresponding electrical devices in cases of excessive current and short circuit while it makes it easy to turn the device on and off easily.

Miniature Circuit Breakers (MCBs)

Makel miniature circuit breakers are produced to work in a temperature range of -5°C to +40°C and the connection terminals have IP20 protection level.

With 4 different poles and 3kA, 6kA and 10kA short circuit cutting capacity, Makel miniature circuit breakers provides safe protection with easy mounting and rich product choices availability. Mounting of Makel miniature circuit breakers can be done with 35mm EN 50022 DIN rail easily with availability to connect 25 mm^2 cables. With joint automation bus connection availability, the maximum moment applicable to screws is 2Nm.

The miniature circuit breakers opens the circuit in case of a failure. By moving the crown upwards, set the fuses again. The thermal and magnetic forcings of the short circuit is limited with the circuit rapidly opened by the automatic fuse.

There are B and C types of these fuses produced compatible with TS 5018-1 and EN 60898-1 standards.

B Type

MCB fuses are generally used in houses, offices and villas in distribution boxes, line protection, household lighting, electrical heaters, outlets and control circuits.
The magnetic protection range of the “B” type fuses is 3 to 5 of the nominal current level.

C Type

MCB are generally used in production facilities, constructions, conductor isolation, panel mounting, inductive loads, transformer, in electric machines such as air conditioners, refrigerators, engines. In “C” type fuses, magnetic protection range is 5 to 10 times the nominal current level.

Miniature Circuit Breakers (MCBs)

- Provide ideal protection with the latest technology in electricity distribution systems
- Provide magnetic and thermal protection for electric lines
- Automatically disconnect energy from the network in case of overcurrent and short circuit
- Used in control circuits of automatic asynchronous motors
- Terminals are protected against finger touch, suitable for TN and IT grounding systems
- Provide protection about vibration in case of natural disasters (earthquake, lightning, etc.)
- All products contain 100% electronic copper (Cu) and argentine (Ag) contacts
- MCBs are used in residential and commercial areas

General Specifications

- Ergonomic design provides easy assembly
- Reinforced body structure resistant to external impacts
- Resistant to heat and flame up to 960 °C
- PA 66, V0 non-flammable thermoplastic body and cover
- Halogen free
- 100% domestic production, Made in Turkey
- 100% Quality Control during production
- Product range of 456 items

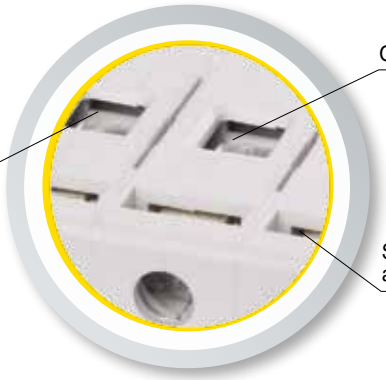
Houses, workplaces, shopping malls, industrial facilities and all other living spaces.

3 kA Technical Specifications

Assembling Method	Attaching to 35 mm rail complying with DIN EN 50022
Rated Voltage Un (V)	230/400 V AC 1P, 1P+N, 400 V AC 2P, 3P, 3P+N, 4P
Rated Current In (A)	1 A, 2 A, 3 A, 4 A, 5 A, 6 A, 10 A, 16 A, 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A
Protection Class	IP 20
Number of Poles	1P, 1P+N, 2P, 3P, 3P+N, 4P
Opening Curve	Type B and C
Conductor cross-section	0.5mm^2 - 25mm^2
Mechanical endurance	40.000 Periods
Electric endurance	20.000 Periods
Working Frequency	50/60 Hz
Cutting Capacity Inc (kA)	3 kA
Applicable Standard	TS 5018-1 EN 60898-1
Environment Temperature	-5°C to+40°C

Ideal protection with the new technology
in electrical distribution system.

3 kA Product Specifications



When completely open, constituting a 25mm^2 cross-section, preventing cables to slid through, special design electric terminal slots.

Cable inlet

Suitable for any automat busbar input

Fitting screw Multiple riveting system (Suitable for any type of screwdriver)

Multiple

Body suitable for rail assembly

Label and label glass

Red and Green ON/OFF indicator

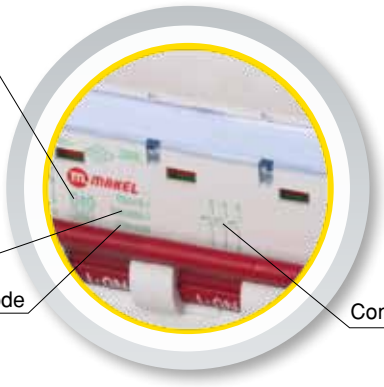
Body resistant to high temperature

Cocking lever

Accessory

Embossed conductor Cross-section diagram

Breakable part for busbar connection

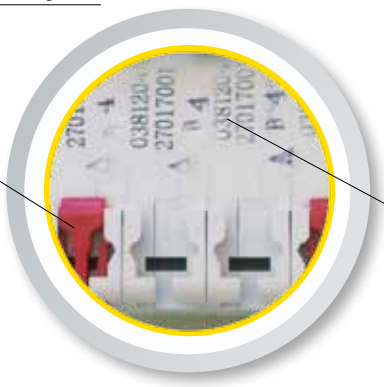


Technical Specifications

International standards

Product code

Connection diagram



Two-stage rail lock

Continuous traceability (production date, assembly operator etc.)

3 kA, B Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
1 Poled, B Type					
1	27009026	12	120	12,52	430 x 230 x 165
2	27009000	12	120	12,52	430 x 230 x 165
3	27009027	12	120	12,58	430 x 230 x 165
4	27009001	12	120	12,58	430 x 230 x 165
5	27009028	12	120	12,06	430 x 230 x 165
6	27009002	12	120	12,06	430 x 230 x 165
10	27009003	12	120	12,01	430 x 230 x 165
16	27009004	12	120	12,01	430 x 230 x 165
20	27009005	12	120	12,12	430 x 230 x 165
25	27009006	12	120	12,19	430 x 230 x 165
32	27009007	12	120	12,28	430 x 230 x 165
40	27009008	12	120	12,18	430 x 230 x 165
50	27009009	12	120	12,92	430 x 230 x 165
63	27009010	12	120	12,79	430 x 230 x 165
New 80	27009011	12	120	18,30	453 x 333 x 175
New 100	27009012	12	120	18,54	453 x 333 x 175
New 125	27009013	12	120	18,42	453 x 333 x 175
1 P+N Poled, B Type					
1	27011026	6	60	11,81	430 x 165 x 230
2	27011000	6	60	11,81	430 x 165 x 230
3	27011027	6	60	11,77	430 x 165 x 230
4	27011001	6	60	11,77	430 x 165 x 230
5	27011028	6	60	11,74	430 x 165 x 230
6	27011002	6	60	11,74	430 x 165 x 230
10	27011003	6	60	11,35	430 x 165 x 230
16	27011004	6	60	11,38	430 x 165 x 230
20	27011005	6	60	11,38	430 x 165 x 230
25	27011006	6	60	11,40	430 x 165 x 230
32	27011007	6	60	11,63	430 x 165 x 230
40	27011008	6	60	11,84	430 x 165 x 230
50	27011009	6	60	12,01	430 x 165 x 230
63	27011010	6	60	11,97	430 x 165 x 230
New 80	27011011	6	60	18,15	470 x 337 x 180
New 100	27011012	6	60	18,24	470 x 337 x 180
New 125	27011013	6	60	18,09	470 x 337 x 180
2 Poled, B Type					
1	27013026	6	60	12,71	430 x 230 x 165
2	27013000	6	60	12,71	430 x 230 x 165
3	27013027	6	60	12,66	430 x 230 x 165
4	27013001	6	60	12,66	430 x 230 x 165
5	27013028	6	60	12,61	430 x 230 x 165
6	27013002	6	60	12,61	430 x 230 x 165
10	27013003	6	60	12,02	430 x 230 x 165
16	27013004	6	60	12,05	430 x 230 x 165
20	27013005	6	60	12,27	430 x 230 x 165
25	27013006	6	60	12,42	430 x 230 x 165
32	27013007	6	60	12,34	430 x 230 x 165
40	27013008	6	60	12,66	430 x 230 x 165
50	27013009	6	60	13,00	430 x 230 x 165
63	27013010	6	60	12,91	430 x 230 x 165
New 80	27013011	6	60	18,51	453 x 333 x 175
New 100	27013012	6	60	18,66	453 x 333 x 175
New 125	27013013	6	60	18,45	453 x 333 x 175

3 kA, B Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Poled, B type					
1	27015026	4	40	12,72	430 x 230 x 165
2	27015000	4	40	12,72	430 x 230 x 165
3	27015027	4	40	12,60	430 x 230 x 165
4	27015001	4	40	12,60	430 x 230 x 165
5	27015028	4	40	12,10	430 x 230 x 165
6	27015002	4	40	12,10	430 x 230 x 165
10	27015003	4	40	11,85	430 x 230 x 165
16	27015004	4	40	11,96	430 x 230 x 165
20	27015005	4	40	12,05	430 x 230 x 165
25	27015006	4	40	12,19	430 x 230 x 165
32	27015007	4	40	12,20	430 x 230 x 165
40	27015008	4	40	12,24	430 x 230 x 165
50	27015009	4	40	12,85	430 x 230 x 165
63	27015010	4	40	12,84	430 x 230 x 165
New 80	27015011	4	40	18,44	453 x 333 x 175
New 100	27015012	4	40	18,66	453 x 333 x 175
New 125	27015013	4	40	18,46	453 x 333 x 175
3 P+N Poled, B Type					
1	27017026	3	30	12,22	430 x 230 x 165
2	27017000	3	30	12,22	430 x 230 x 165
3	27017027	3	30	12,15	430 x 230 x 165
4	27017001	3	30	12,15	430 x 230 x 165
5	27017028	3	30	12,14	430 x 230 x 165
6	27017002	3	30	12,14	430 x 230 x 165
10	27017003	3	30	11,81	430 x 230 x 165
16	27017004	3	30	11,83	430 x 230 x 165
20	27017005	3	30	11,84	430 x 230 x 165
25	27017006	3	30	11,85	430 x 230 x 165
32	27017007	3	30	11,99	430 x 230 x 165
40	27017008	3	30	12,16	430 x 230 x 165
50	27017009	3	30	12,56	430 x 230 x 165
63	27017010	3	30	12,46	430 x 230 x 165
New 80	27017011	3	30	18,27	453 x 333 x 175
New 100	27017012	3	30	18,45	453 x 333 x 175
New 125	27017013	3	30	18,30	453 x 333 x 175
4 Poled, B Type					
1	27019026	3	30	12,74	430 x 230 x 165
2	27019000	3	30	12,74	430 x 230 x 165
3	27019027	3	30	12,58	430 x 230 x 165
4	27019001	3	30	12,58	430 x 230 x 165
5	27019028	3	30	12,60	430 x 230 x 165
6	27019002	3	30	12,60	430 x 230 x 165
10	27019003	3	30	12,61	430 x 230 x 165
16	27019004	3	30	12,62	430 x 230 x 165
20	27019005	3	30	12,64	430 x 230 x 165
25	27019006	3	30	12,66	430 x 230 x 165
32	27019007	3	30	12,70	430 x 230 x 165
40	27019008	3	30	12,68	430 x 230 x 165
50	27019009	3	30	12,94	430 x 230 x 165
63	27019010	3	30	12,94	430 x 230 x 165
New 80	27019011	3	30	18,41	453 x 333 x 175
New 100	27019012	3	30	18,66	453 x 333 x 175
New 125	27019013	3	30	18,50	453 x 333 x 175

3 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
1 Poled, C Type					
1	27010026	12	120	12,73	430 x 230 x 165
2	27010000	12	120	12,73	430 x 230 x 165
3	27010027	12	120	12,56	430 x 230 x 165
4	27010001	12	120	12,56	430 x 230 x 165
5	27010028	12	120	12,15	430 x 230 x 165
6	27010002	12	120	12,15	430 x 230 x 165
10	27010003	12	120	11,95	430 x 230 x 165
16	27010004	12	120	12,04	430 x 230 x 165
20	27010005	12	120	12,14	430 x 230 x 165
25	27010006	12	120	12,18	430 x 230 x 165
32	27010007	12	120	12,34	430 x 230 x 165
40	27010008	12	120	12,30	430 x 230 x 165
50	27010009	12	120	12,81	430 x 230 x 165
63	27010010	12	120	12,82	430 x 230 x 165
New 80	27010011	12	120	18,30	453 x 333 x 175
New 100	27010012	12	120	18,60	453 x 333 x 175
New 125	27010013	12	120	18,42	453 x 333 x 175
1 P+N Poled, C type					
1	27012026	6	60	11,94	430 x 230 x 165
2	27012000	6	60	11,94	430 x 230 x 165
3	27012027	6	60	11,92	430 x 230 x 165
4	27012001	6	60	11,92	430 x 230 x 165
5	27012028	6	60	11,74	430 x 230 x 165
6	27012002	6	60	11,74	430 x 230 x 165
10	27012003	6	60	11,35	430 x 230 x 165
16	27012004	6	60	11,38	430 x 230 x 165
20	27012005	6	60	11,38	430 x 230 x 165
25	27012006	6	60	11,40	430 x 230 x 165
32	27012007	6	60	11,63	430 x 230 x 165
40	27012008	6	60	11,82	430 x 230 x 165
50	27012009	6	60	12,10	430 x 230 x 165
63	27012010	6	60	12,09	430 x 230 x 165
New 80	27012011	6	60	17,88	453 x 333 x 175
New 100	27012012	6	60	18,30	453 x 333 x 175
New 125	27012013	6	60	18,15	453 x 333 x 175
2 Poled, C Type					
1	27014026	6	60	12,87	430 x 230 x 165
2	27014000	6	60	12,87	430 x 230 x 165
3	27014027	6	60	12,73	430 x 230 x 165
4	27014001	6	60	12,73	430 x 230 x 165
5	27014028	6	60	12,61	430 x 230 x 165
6	27014002	6	60	12,61	430 x 230 x 165
10	27014003	6	60	12,02	430 x 230 x 165
16	27014004	6	60	12,05	430 x 230 x 165
20	27014005	6	60	12,27	430 x 230 x 165
25	27014006	6	60	12,42	430 x 230 x 165
32	27014007	6	60	12,34	430 x 230 x 165
40	27014008	6	60	12,71	430 x 230 x 165
50	27014009	6	60	12,87	430 x 230 x 165
63	27014010	6	60	12,93	430 x 230 x 165
New 80	27014011	6	60	18,42	453 x 333 x 175
New 100	27014012	6	60	18,75	453 x 333 x 175
New 125	27014013	6	60	18,51	453 x 333 x 175

3 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Poled, C Type					
1	27016026	4	40	12,75	430 x 230 x 165
2	27016000	4	40	12,75	430 x 230 x 165
3	27016027	4	40	12,68	430 x 230 x 165
4	27016001	4	40	12,68	430 x 230 x 165
5	27016028	4	40	12,10	430 x 230 x 165
6	27016002	4	40	12,10	430 x 230 x 165
10	27016003	4	40	12,85	430 x 230 x 165
16	27016004	4	40	11,96	430 x 230 x 165
20	27016005	4	40	12,05	430 x 230 x 165
25	27016006	4	40	12,19	430 x 230 x 165
32	27016007	4	40	12,20	430 x 230 x 165
40	27016008	4	40	12,26	430 x 230 x 165
50	27016009	4	40	12,96	430 x 230 x 165
63	27016010	4	40	12,92	430 x 230 x 165
New 80	27016011	4	40	18,42	453 x 333 x 175
New 100	27016012	4	40	18,74	453 x 333 x 175
New 125	27016013	4	40	18,56	453 x 333 x 175

3 P+N Poled, C Type					
1	27018026	3	30	12,26	430 x 230 x 165
2	27018000	3	30	12,26	430 x 230 x 165
3	27018027	3	30	12,16	430 x 230 x 165
4	27018001	3	30	12,16	430 x 230 x 165
5	27018028	3	30	12,14	430 x 230 x 165
6	27018002	3	30	12,14	430 x 230 x 165
10	27018003	3	30	11,82	430 x 230 x 165
16	27018004	3	30	11,83	430 x 230 x 165
20	27018005	3	30	11,84	430 x 230 x 165
25	27018006	3	30	11,85	430 x 230 x 165
32	27018007	3	30	11,99	430 x 230 x 165
40	27018008	3	30	12,31	430 x 230 x 165
50	27018009	3	30	12,62	430 x 230 x 165
63	27018010	3	30	12,49	430 x 230 x 165
New 80	27018011	3	30	18,15	453 x 333 x 175
New 100	27018012	3	30	18,51	453 x 333 x 175
New 125	27018013	3	30	18,33	453 x 333 x 175

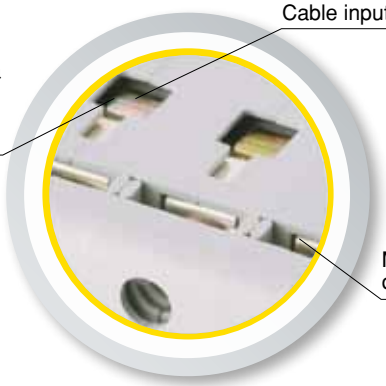
4 Poled, C Type					
1	27020026	3	30	12,68	430 x 230 x 165
2	27020000	3	30	12,68	430 x 230 x 165
3	27020027	3	30	12,61	430 x 230 x 165
4	27020001	3	30	12,61	430 x 230 x 165
5	27020028	3	30	12,60	430 x 230 x 165
6	27020002	3	30	12,60	430 x 230 x 165
10	27020003	3	30	12,61	430 x 230 x 165
16	27020004	3	30	12,62	430 x 230 x 165
20	27020005	3	30	12,64	430 x 230 x 165
25	27020006	3	30	12,66	430 x 230 x 165
32	27020007	3	30	12,70	430 x 230 x 165
40	27020008	3	30	12,65	430 x 230 x 165
50	27020009	3	30	13,03	430 x 230 x 165
63	27020010	3	30	12,88	430 x 230 x 165
New 80	27020011	3	30	18,44	453 x 333 x 175
New 100	27020012	3	30	18,74	453 x 333 x 175
New 125	27020013	3	30	18,53	453 x 333 x 175

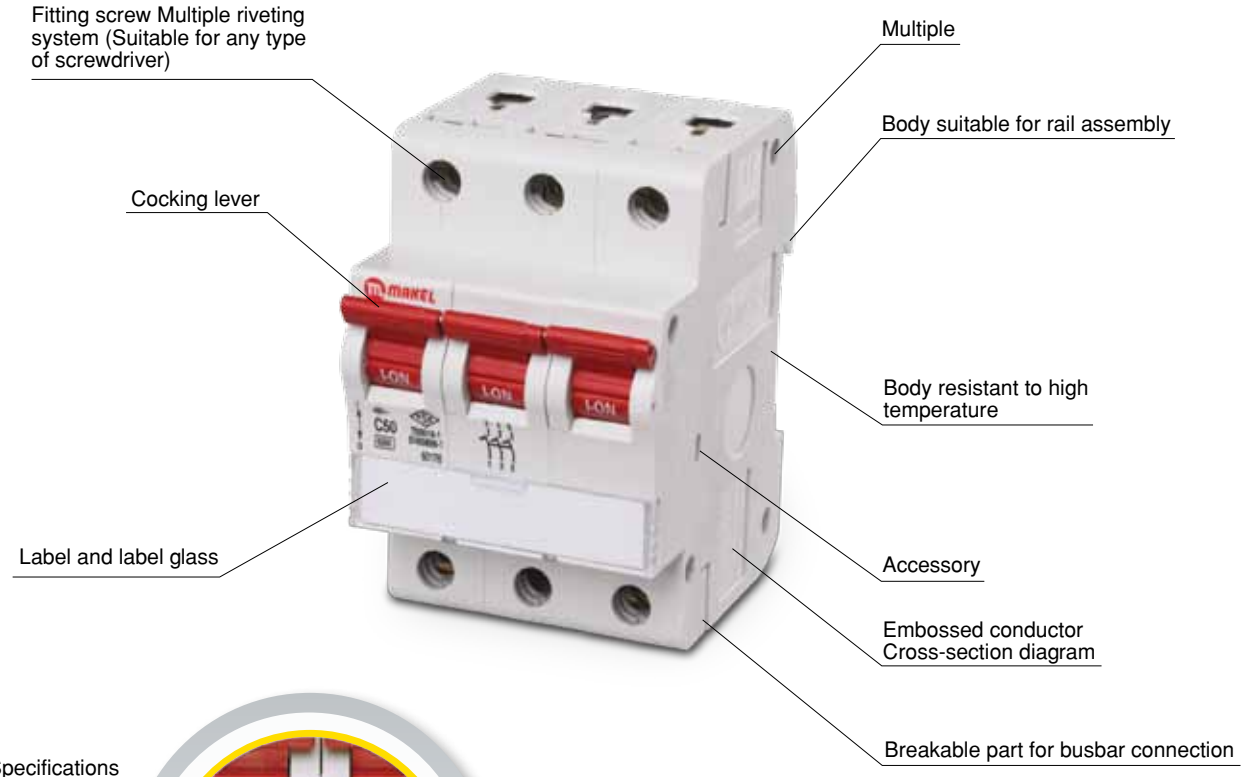
6 kA - 10 kA Technical Specifications

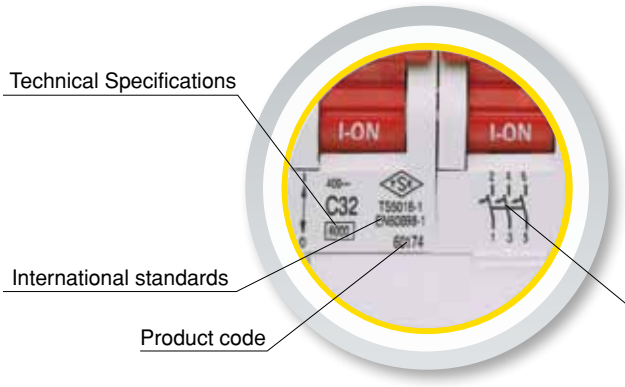
Assembling Method	Attaching to 35 mm rail complying with DIN EN 50022
Rated Voltage Un (V)	230/400 V AC 1P, 1P+N, 400 V AC 2P, 3P, 3P+N, 4P
Rated Current In (A)	6 kA Automatic Fuses 1 A, 2 A, 3 A, 4 A, 5 A, 6 A, 10 A, 16 A, 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A
	10 kA Automatic Fuses 6 A, 10 A, 16 A, 20 A, 25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A
Protection Class	IP 20
Characteristic	6 kA: “B” and “C” Type, 10 kA: “C” Type
Conductor cross-section	0.5 mm^2 - 25 mm^2
Mechanical Endurance	40.000 periods
Electric Endurance	20.000 periods
Working Frequency	50/60 Hz
Cutting Capacity Inc (kA)	6 kA, 10 kA
Applicable Standard	TS 5018-1 EN 60898-1
Environment Temperature	-5°C to +40°C

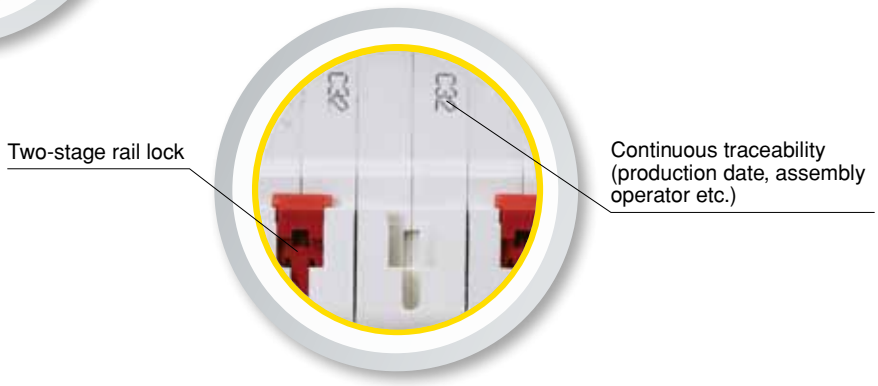
Circuit Breakers provides easy installation and wide product range of users with a safe environment.

6 kA - 10 kA Product Specifications









6 kA, B Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
1 Poled, B Type					
1	60002	12	120	14,96	460 x 225 x 165
2	60004	12	120	14,96	460 x 225 x 165
3	60003	12	120	14,98	460 x 225 x 165
4	60006	12	120	14,98	460 x 225 x 165
5	60005	12	120	14,67	460 x 225 x 165
6	60007	12	120	14,67	460 x 225 x 165
10	60009	12	120	14,46	460 x 225 x 165
16	60011	12	120	14,54	460 x 225 x 165
20	60012	12	120	14,66	460 x 225 x 165
25	60013	12	120	14,78	460 x 225 x 165
32	60014	12	120	14,92	460 x 225 x 165
40	60015	12	120	15,04	460 x 225 x 165
50	60016	12	120	15,58	460 x 225 x 165
63	60017	12	120	15,58	460 x 225 x 165
New 80	60018	8	80	17,97	516 x 225 x 175
New 100	60010	8	80	18,44	516 x 225 x 175
New 125	60019	8	80	18,25	516 x 225 x 175
1 P+N Poled, B Type					
1	60022	6	60	14,21	460 x 225 x 165
2	60024	6	60	14,21	460 x 225 x 165
3	60023	6	60	14,34	460 x 225 x 165
4	60026	6	60	14,34	460 x 225 x 165
5	60025	6	60	14,19	460 x 225 x 165
6	60027	6	60	14,19	460 x 225 x 165
10	60029	6	60	14,04	460 x 225 x 165
16	60031	6	60	14,12	460 x 225 x 165
20	60032	6	60	14,15	460 x 225 x 165
25	60033	6	60	14,35	460 x 225 x 165
32	60034	6	60	14,33	460 x 225 x 165
40	60035	6	60	14,48	460 x 225 x 165
50	60036	6	60	14,72	460 x 225 x 165
63	60037	6	60	14,72	460 x 225 x 165
New 80	60038	4	40	17,55	516 x 225 x 175
New 100	60030	4	40	18,15	516 x 225 x 175
New 125	60039	4	40	18,21	516 x 225 x 175
2 Poled, B Type					
1	60042	6	60	14,97	460 x 225 x 165
2	60044	6	60	14,97	460 x 225 x 165
3	60043	6	60	15,02	460 x 225 x 165
4	60046	6	60	15,02	460 x 225 x 165
5	60045	6	60	14,74	460 x 225 x 165
6	60047	6	60	14,74	460 x 225 x 165
10	60049	6	60	14,52	460 x 225 x 165
16	60051	6	60	14,64	460 x 225 x 165
20	60052	6	60	14,72	460 x 225 x 165
25	60053	6	60	14,79	460 x 225 x 165
32	60054	6	60	14,96	460 x 225 x 165
40	60055	6	60	15,14	460 x 225 x 165
50	60056	6	60	15,48	460 x 225 x 165
63	60057	6	60	15,57	460 x 225 x 165
New 80	60058	4	40	17,81	516 x 225 x 175
New 100	60050	4	40	17,92	516 x 225 x 175
New 125	60059	4	40	17,73	516 x 225 x 175

6 kA, B Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Poled, B type					
1	60062	4	40	14,98	460 x 225 x 165
2	60064	4	40	14,98	460 x 225 x 165
3	60063	4	40	15,00	460 x 225 x 165
4	60066	4	40	15,00	460 x 225 x 165
5	60065	4	40	14,82	460 x 225 x 165
6	60067	4	40	14,82	460 x 225 x 165
10	60069	4	40	14,51	460 x 225 x 165
16	60071	4	40	14,63	460 x 225 x 165
20	60072	4	40	14,70	460 x 225 x 165
25	60073	4	40	14,85	460 x 225 x 165
32	60074	4	40	14,92	460 x 225 x 165
40	60075	4	40	15,12	460 x 225 x 165
50	60076	4	40	15,55	460 x 225 x 165
63	60077	4	40	15,55	460 x 225 x 165
New 80	60078	3	30	20,33	509 x 250 x 175
New 100	60070	3	30	20,16	509 x 250 x 175
New 125	60079	3	30	19,98	509 x 250 x 175
3 P+N Poled, B Type					
1	60082	3	30	14,43	460 x 225 x 165
2	60084	3	30	14,43	460 x 225 x 165
3	60083	3	30	14,47	460 x 225 x 165
4	60086	3	30	14,47	460 x 225 x 165
5	60085	3	30	14,53	460 x 225 x 165
6	60087	3	30	14,53	460 x 225 x 165
10	60089	3	30	14,30	460 x 225 x 165
16	60091	3	30	14,37	460 x 225 x 165
20	60092	3	30	14,44	460 x 225 x 165
25	60093	3	30	14,63	460 x 225 x 165
32	60094	3	30	14,68	460 x 225 x 165
40	60095	3	30	14,81	460 x 225 x 165
50	60096	3	30	15,23	460 x 225 x 165
63	60097	3	30	15,22	460 x 225 x 165
New 80	60098	2	20	17,55	516 x 225 x 175
New 100	60090	2	20	18,05	516 x 225 x 175
New 125	60099	2	20	17,85	516 x 225 x 175
4 Poled, B Type					
1	60202	3	30	14,86	460 x 225 x 165
2	60204	3	30	14,86	460 x 225 x 165
3	60203	3	30	14,89	460 x 225 x 165
4	60206	3	30	14,89	460 x 225 x 165
5	60205	3	30	14,83	460 x 225 x 165
6	60207	3	30	14,83	460 x 225 x 165
10	60209	3	30	14,60	460 x 225 x 165
16	60211	3	30	14,66	460 x 225 x 165
20	60212	3	30	14,77	460 x 225 x 165
25	60213	3	30	14,97	460 x 225 x 165
32	60214	3	30	15,12	460 x 225 x 165
40	60215	3	30	15,33	460 x 225 x 165
50	60216	3	30	15,79	460 x 225 x 165
63	60217	3	30	15,69	460 x 225 x 165
New 80	60218	2	20	17,84	516 x 225 x 175
New 100	60210	2	20	18,23	516 x 225 x 175
New 125	60219	2	20	18,05	516 x 225 x 175

6 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
1 Poled, C Type					
1	60102	12	120	14,96	470 x 165 x 225
2	60104	12	120	14,96	470 x 165 x 225
3	60103	12	120	14,98	470 x 165 x 225
4	60106	12	120	14,98	470 x 165 x 225
5	60105	12	120	14,75	470 x 165 x 225
6	60107	12	120	14,75	470 x 165 x 225
10	60109	12	120	14,48	470 x 165 x 225
16	60111	12	120	14,48	470 x 165 x 225
20	60112	12	120	14,63	470 x 165 x 225
25	60113	12	120	14,93	470 x 165 x 225
32	60114	12	120	14,90	470 x 165 x 225
40	60115	12	120	15,11	470 x 165 x 225
50	60116	12	120	15,57	470 x 165 x 225
63	60117	12	120	15,56	470 x 165 x 225
New 80	60118	8	80	17,77	520 x 232 x 180
New 100	60110	8	80	18,24	520 x 232 x 180
New 125	60119	8	80	18,15	520 x 232 x 180
1 P+N Poled, C type					
1	60122	6	60	14,21	460 x 225 x 165
2	60124	6	60	14,21	460 x 225 x 165
3	60123	6	60	14,34	460 x 225 x 165
4	60126	6	60	14,34	460 x 225 x 165
5	60125	6	60	14,24	460 x 225 x 165
6	60127	6	60	14,24	460 x 225 x 165
10	60129	6	60	14,12	460 x 225 x 165
16	60131	6	60	14,12	460 x 225 x 165
20	60132	6	60	14,21	460 x 225 x 165
25	60133	6	60	14,35	460 x 225 x 165
32	60134	6	60	14,35	460 x 225 x 165
40	60135	6	60	14,48	460 x 225 x 165
50	60136	6	60	14,66	460 x 225 x 165
63	60137	6	60	14,72	460 x 225 x 165
New 80	60138	4	40	17,35	516 x 225 x 175
New 100	60130	4	40	18,05	516 x 225 x 175
New 125	60139	4	40	18,19	516 x 225 x 175
2 Poled, C Type					
1	60142	6	60	14,97	460 x 225 x 165
2	60144	6	60	14,97	460 x 225 x 165
3	60143	6	60	15,02	460 x 225 x 165
4	60146	6	60	15,02	460 x 225 x 165
5	60145	6	60	14,75	460 x 225 x 165
6	60147	6	60	14,75	460 x 225 x 165
10	60149	6	60	14,52	460 x 225 x 165
16	60151	6	60	14,52	460 x 225 x 165
20	60152	6	60	14,72	460 x 225 x 165
25	60153	6	60	14,93	460 x 225 x 165
32	60154	6	60	14,85	460 x 225 x 165
40	60155	6	60	15,24	460 x 225 x 165
50	60156	6	60	15,40	460 x 225 x 165
63	60157	6	60	15,51	460 x 225 x 165
New 80	60158	4	40	17,61	516 x 225 x 175
New 100	60150	4	40	17,72	516 x 225 x 175
New 125	60159	4	40	17,53	516 x 225 x 175

6 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Poled, C Type					
1	60162	4	40	14,98	460 x 225 x 165
2	60164	4	40	14,98	460 x 225 x 165
3	60163	4	40	15,00	460 x 225 x 165
4	60166	4	40	15,00	460 x 225 x 165
5	60165	4	40	14,75	460 x 225 x 165
6	60167	4	40	14,75	460 x 225 x 165
10	60169	4	40	14,56	460 x 225 x 165
16	60171	4	40	14,50	460 x 225 x 165
20	60172	4	40	14,64	460 x 225 x 165
25	60173	4	40	14,85	460 x 225 x 165
32	60174	4	40	14,91	460 x 225 x 165
40	60175	4	40	15,22	460 x 225 x 165
50	60176	4	40	15,52	460 x 225 x 165
63	60177	4	40	15,57	460 x 225 x 165
New 80	60178	3	30	20,13	509 x 250 x 175
New 100	60170	3	30	20,16	509 x 250 x 175
New 125	60179	3	30	19,78	509 x 250 x 175
3 P+N Poled, C Type					
1	60182	3	30	14,43	460 x 225 x 165
2	60184	3	30	14,43	460 x 225 x 165
3	60183	3	30	14,47	460 x 225 x 165
4	60186	3	30	14,47	460 x 225 x 165
5	60185	3	30	14,54	460 x 225 x 165
6	60187	3	30	14,54	460 x 225 x 165
10	60189	3	30	14,35	460 x 225 x 165
16	60191	3	30	14,37	460 x 225 x 165
20	60192	3	30	14,39	460 x 225 x 165
25	60193	3	30	14,65	460 x 225 x 165
32	60194	3	30	14,68	460 x 225 x 165
40	60195	3	30	14,83	460 x 225 x 165
50	60196	3	30	15,21	460 x 225 x 165
63	60197	3	30	15,25	460 x 225 x 165
New 80	60198	2	20	17,45	516 x 225 x 175
New 100	60190	2	20	18,05	516 x 225 x 175
New 125	60199	2	20	17,65	516 x 225 x 175
4 Poled, C Type					
1	60402	3	30	14,86	460 x 225 x 165
2	60404	3	30	14,86	460 x 225 x 165
3	60403	3	30	14,89	460 x 225 x 165
4	60406	3	30	14,89	460 x 225 x 165
5	60405	3	30	14,84	460 x 225 x 165
6	60407	3	30	14,84	460 x 225 x 165
10	60409	3	30	14,65	460 x 225 x 165
16	60411	3	30	14,66	460 x 225 x 165
20	60412	3	30	14,77	460 x 225 x 165
25	60413	3	30	14,97	460 x 225 x 165
32	60414	3	30	15,12	460 x 225 x 165
40	60415	3	30	15,33	460 x 225 x 165
50	60416	3	30	15,79	460 x 225 x 165
63	60417	3	30	15,69	460 x 225 x 165
New 80	60418	2	20	17,54	516 x 225 x 175
New 100	60410	2	20	18,13	516 x 225 x 175
New 125	60419	2	20	18,05	516 x 225 x 175

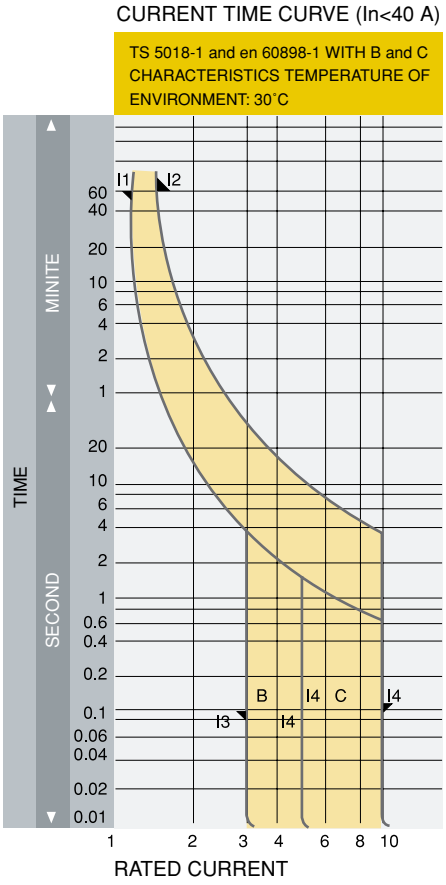
10 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
1 Poled, C Type					
6	60307	12	120	14,75	460 x 225 x 165
10	60309	12	120	14,48	460 x 225 x 165
16	60311	12	120	14,48	460 x 225 x 165
20	60312	12	120	14,63	460 x 225 x 165
25	60313	12	120	14,93	460 x 225 x 165
32	60314	12	120	14,90	460 x 225 x 165
40	60315	12	120	15,11	460 x 225 x 165
50	60316	12	120	16,49	460 x 225 x 165
63	60317	12	120	16,49	460 x 225 x 165
New 80	60318	8	80	17,97	516 x 225 x 175
New 100	60310	8	80	18,44	516 x 225 x 175
New 125	60319	8	80	18,25	516 x 225 x 175
1 P+N Poled, C Type					
6	60327	6	60	14,24	460 x 225 x 165
10	60329	6	60	14,12	460 x 225 x 165
16	60331	6	60	14,12	460 x 225 x 165
20	60332	6	60	14,21	460 x 225 x 165
25	60333	6	60	14,35	460 x 225 x 165
32	60334	6	60	14,35	460 x 225 x 165
40	60335	6	60	14,48	460 x 225 x 165
50	60336	6	60	15,77	460 x 225 x 165
63	60337	6	60	15,79	460 x 225 x 165
New 80	60338	4	40	17,55	516 x 225 x 175
New 100	60330	4	40	18,15	516 x 225 x 175
New 125	60339	4	40	18,21	516 x 225 x 175
2 Poled, C Type					
6	60347	6	60	14,75	460 x 225 x 165
10	60349	6	60	14,52	460 x 225 x 165
16	60351	6	60	14,52	460 x 225 x 165
20	60352	6	60	14,72	460 x 225 x 165
25	60353	6	60	14,93	460 x 225 x 165
32	60354	6	60	14,85	460 x 225 x 165
40	60355	6	60	15,24	460 x 225 x 165
50	60356	6	60	16,50	460 x 225 x 165
63	60357	6	60	16,58	460 x 225 x 165
New 80	60358	4	40	17,81	516 x 225 x 175
New 100	60350	4	40	17,92	516 x 225 x 175
New 125	60359	4	40	17,73	516 x 225 x 175
3 Poled, C Type					
6	60367	4	40	14,75	460 x 225 x 165
10	60369	4	40	14,56	460 x 225 x 165
16	60371	4	40	14,50	460 x 225 x 165
20	60372	4	40	14,64	460 x 225 x 165
25	60373	4	40	14,85	460 x 225 x 165
32	60374	4	40	14,91	460 x 225 x 165
40	60375	4	40	15,22	460 x 225 x 165
50	60376	4	40	16,53	460 x 225 x 165
63	60377	4	40	16,53	460 x 225 x 165
New 80	60378	3	30	20,33	509 x 250 x 175
New 100	60370	3	30	20,16	509 x 250 x 175
New 125	60379	3	30	19,98	509 x 250 x 175

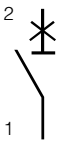
10 kA, C Type

Rated current	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 P+N Poled, C Type					
6	60387	3	30	14,54	460 x 225 x 165
10	60389	3	30	14,35	460 x 225 x 165
16	60391	3	30	14,37	460 x 225 x 165
20	60392	3	30	14,39	460 x 225 x 165
25	60393	3	30	14,65	460 x 225 x 165
32	60394	3	30	14,68	460 x 225 x 165
40	60395	3	30	14,83	460 x 225 x 165
50	60396	3	30	15,97	460 x 225 x 165
63	60397	3	30	15,97	460 x 225 x 165
New 80	60398	2	20	17,55	516 x 225 x 175
New 100	60390	2	20	18,05	516 x 225 x 175
New 125	60399	2	20	17,85	516 x 225 x 175
4 Poled, C Type					
6	60507	3	30	14,84	460 x 225 x 165
10	60509	3	30	14,65	460 x 225 x 165
16	60511	3	30	14,66	460 x 225 x 165
20	60512	3	30	14,77	460 x 225 x 165
25	60513	3	30	14,97	460 x 225 x 165
32	60514	3	30	15,12	460 x 225 x 165
40	60515	3	30	15,33	460 x 225 x 165
50	60516	3	30	16,61	460 x 225 x 165
63	60517	3	30	16,61	460 x 225 x 165
New 80	60518	2	20	17,84	516 x 225 x 175
New 100	60510	2	20	18,23	516 x 225 x 175
New 125	60519	2	20	18,05	516 x 225 x 175

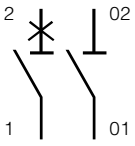
6 kA - 10 kA Technical Specifications



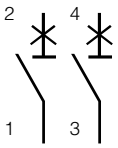
Wiring Diagrams



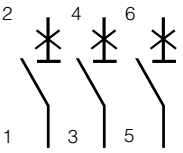
1P



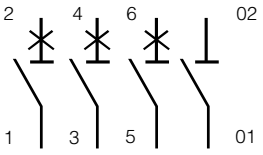
1P+N



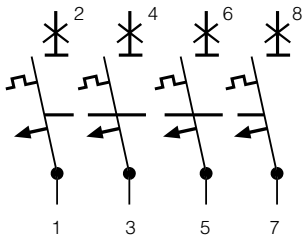
2P



3P

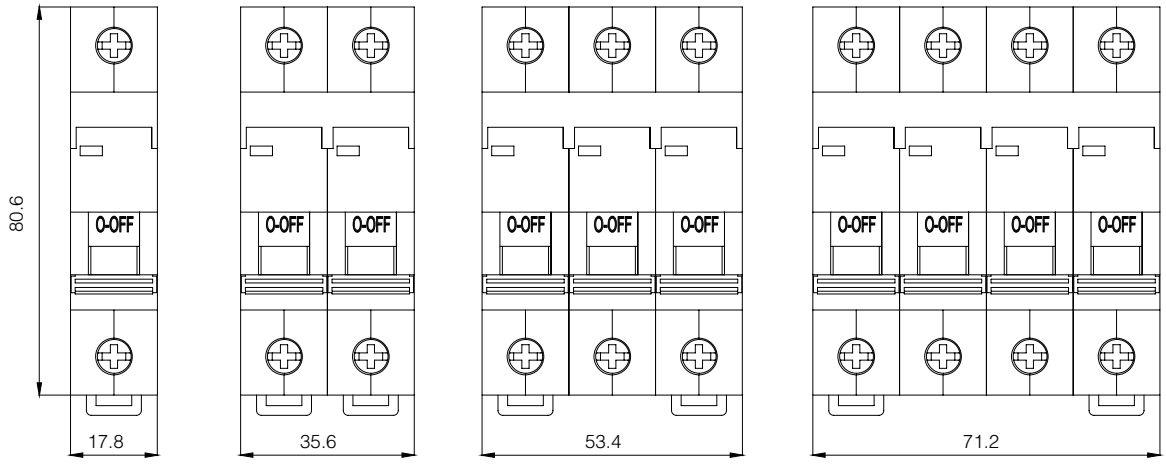


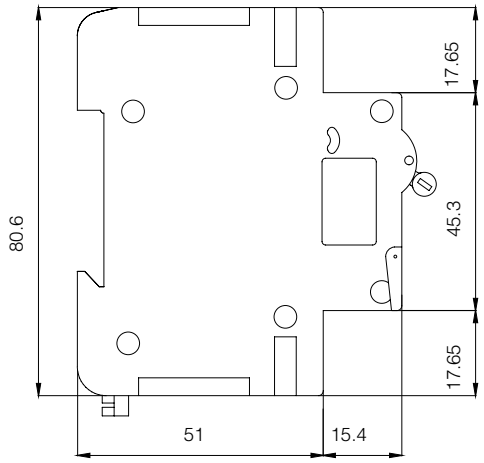
3P+N



4P

Technical Drawings





Residual Current Circuit Breakers (RCCBs)

Protect your valuables

Leakage current protection switches become activated in case of a leakage current in your connected mains and protects you and your environment from possible electric shock and fire dangers.

Residual Current Circuit Breakers (RCCBs)

Makel Leakage Current Protection Switches are produced in accordance with TS EN 61008-1 standard, it comes with 3 kA, 6 kA and 10 kA short circuit cutting capacity, provided with 2 and 4 pole product choices, it presents easy mounting and safe protection with 92 different product types.

Life protection leakage current protection switches;

Within international standards, a current level over 30mA passing through human body is the lethal threshold for life. Life protection leakage current protection switches cuts the current in case it exceed this level and provides a secure safety.

Leak Current Protection Switches With Fire Protection;

In the same time, 300mA leakage current is the threshold for the nominal cable installation materials to melt, burn or set flames. With the heat level achieved in 300mA current level, fire hazard becomes the issue. The leakage current protection with 300mA threshold value for fire protection cuts the energy of the current and provides secure protection.

Houses, workplaces, shopping malls, industrial facilities and all other living spaces.

General Information About Using Switch

1. A 30mA value current protection switch for human life protection and a 300mA value current protection switch for fire protection shall be used.
2. Fire protection leakage current protection switches shall be mounted to the terminal box and human life protection switch with appropriate current threshold shall be mounted to the counter colon circuit.
3. The neutral line of the system with leakage current protection shall be isolated and it shall not be earthed in between the switch and load.
4. Because the leakage current protection switches do not provide protection for short circuit or thermic-magnetic current, there shall be automatic fuses or similar device(s) for short circuits and overload.
5. Because a short circuit in the leakage current protection switch output may harm the application systems and products, it shall not be tried.
6. After connecting the leakage current protection switch to the installation, in order to test its performance, press “Test Button”.
7. In order to prevent the device from overheating, the nominal current value of the leakage current protection switch shall be bigger than the current value passing through the circuit.
8. The neutral line must pass through residual current circuit breakers with phase and phases.
9. The phase and neutral line shall pass through the protection switch.The capacitive leaks of the cable and isolation faults shall be also taken into account.
10. In single phase mains, a 2 pole and in 3 phase mains, 4 pole leak current protection switch shall be used.

General Specifications

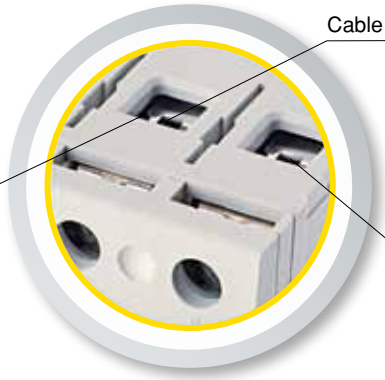
- Ergonomic design provides easy assembly
- Reinforced body structure resistant to external impacts
- Resistant to heat and flame up to 960 °C
- PA 66, V0 non-flammable thermoplastic body and cover
- Halogen free
- 100% domestic production, Made in Turkey
- 100% Quality Control during production
- 212 different product types (25 A - 125 A)
- 3 kA, 6 kA, 10 kA RCCBs with cutting capacity
- 2P, 4P, human protective 30 mA and fire protective 300 mA product options
- IEC 61008-1, EN 61008-2-1, TURKISH TS EN 61008-1 / 61008-2-1 Standard Certificates

Technical Specifications

Rated Current In (A)	25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A
Rated Voltage Un (V)	230/400V AC
Rated Residual Current IΔ (mA)	30 mA - Life Protective, 300 mA Fire Protective
Rated Working Frequency (Hz)	50/60 Hz
Cutting Capacity Inc (kA)	3 kA, 6 kA, 10 kA
Number of Poles	2P, 4P
WorkingAir Temperature (°C)	- 25°C to + 40°C
IP Protection Level	IP 20
Assembly Method	DIN EN 50 022 35mm
RCCB Type	Electromechanical, AC, A, S
Conductor Cross-section (mm2)	0.5 mm^2 - 25 mm^2
Applicable Standard	TSE EN 61008-1/61008-2-1
Protection Method	Residual Current Protection

Life and fire protection and safe environment

Product Specifications



Cable inlet

When completely open, constituting a 25mm² cross-section, preventing cables to slid through, special design electric terminal slots.

Suitable for any automat busbar input

Fitting screw Multiple riveting system (Suitable for any type of screwdriver)

Label and label glass

Monthly test button

Cocking lever

Technical specifications

Perfect isolation and dielectric property

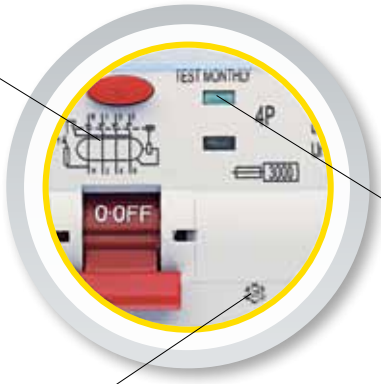
Body suitable for rail assembly

Body resistant to high temperature

Product code

International standards

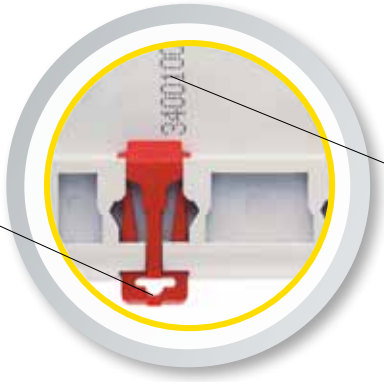
Breakable part for busbar connection



Wiring diagram

Red and Green ON/OFF Indicator (Applies to 3 kA RCCBs)

The lowest working temperature



Continuous Traceability

Dual-stage rail lock

3 kA

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34000006	1	100	21,85	470 x 421 x 171
32	230	34000007	1	100	21,75	470 x 421 x 171
40	230	34000008	1	100	21,71	470 x 421 x 171
50	230	34000009	1	100	22,49	470 x 421 x 171
63	230	34000010	1	100	22,49	470 x 421 x 171
New 80	230	34000011	1	50	15,08	513 x 400 x 179
New 100	230	34000012	1	50	15,08	513 x 400 x 179
2 Poled, 300 mA						
25	230	35000006	1	100	20,45	470 x 421 x 171
32	230	35000007	1	100	20,93	470 x 421 x 171
40	230	35000008	1	100	20,83	470 x 421 x 171
50	230	35000009	1	100	21,21	470 x 421 x 171
63	230	35000010	1	100	21,37	470 x 421 x 171
New 80	230	35000011	1	50	14,53	513 x 400 x 179
New 100	230	35000012	1	50	14,53	513 x 400 x 179
4 Poled, 30 mA						
25	230/400	34001006	1	50	17,78	470 x 396 x 171
32	230/400	34001007	1	50	17,68	470 x 396 x 171
40	230/400	34001008	1	50	17,73	470 x 396 x 171
50	230/400	34001009	1	50	18,20	470 x 396 x 171
63	230/400	34001010	1	50	18,20	470 x 396 x 171
New 80	230/400	34001011	1	50	18,75	513 x 400 x 179
New 100	230/400	34001012	1	50	18,75	513 x 400 x 179
4 Poled, 300 mA						
25	230/400	35001006	1	50	17,20	470 x 396 x 171
32	230/400	35001007	1	50	16,20	470 x 396 x 171
40	230/400	35001008	1	50	17,00	470 x 396 x 171
50	230/400	35001009	1	50	17,61	470 x 396 x 171
63	230/400	35001010	1	50	17,67	470 x 396 x 171
New 80	230/400	35001011	1	50	18,05	513 x 400 x 179
New 100	230/400	35001012	1	50	18,05	513 x 400 x 179

6 kA - AC Type

	Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA							
	25	230	34002006	1	100	22,01	470 x 421 x 171
	32	230	34002007	1	100	22,13	470 x 421 x 171
	40	230	34002008	1	100	22,08	470 x 421 x 171
	50	230	34002009	1	100	22,64	470 x 421 x 171
	63	230	34002010	1	100	22,66	470 x 421 x 171
New	80	230	34002011	1	50	16,67	513 x 400 x 179
New	100	230	34002012	1	50	16,69	513 x 400 x 179
New	125	230	34002013	1	50	16,71	513 x 400 x 179

2 Poled, 300 mA							
	25	230	35002006	1	100	22,01	470 x 421 x 171
	32	230	35002007	1	100	21,97	470 x 421 x 171
	40	230	35002008	1	100	21,71	470 x 421 x 171
	50	230	35002009	1	100	22,18	470 x 421 x 171
	63	230	35002010	1	100	22,20	470 x 421 x 171
New	80	230	35002011	1	50	16,37	513 x 400 x 179
New	100	230	35002012	1	50	16,39	513 x 400 x 179
New	125	230	35002013	1	50	16,41	513 x 400 x 179

4 Poled, 30 mA							
	25	230/400	34003006	1	50	19,37	470 x 396 x 171
	32	230/400	34003007	1	50	19,49	470 x 396 x 171
	40	230/400	34003008	1	50	19,70	470 x 396 x 171
	50	230/400	34003009	1	50	20,18	470 x 396 x 171
	63	230/400	34003010	1	50	19,88	470 x 396 x 171
New	80	230/400	34003011	1	50	20,35	513 x 400 x 179
New	100	230/400	34003012	1	50	20,37	513 x 400 x 179
New	125	230/400	34003013	1	50	20,40	513 x 400 x 179

4 Poled, 300 mA							
	25	230/400	35003006	1	50	18,94	470 x 396 x 171
	32	230/400	35003007	1	50	19,02	470 x 396 x 171
	40	230/400	35003008	1	50	18,66	470 x 396 x 171
	50	230/400	35003009	1	50	19,20	470 x 396 x 171
	63	230/400	35003010	1	50	19,34	470 x 396 x 171
New	80	230/400	35003011	1	50	20,05	513 x 400 x 179
New	100	230/400	35003012	1	50	20,07	513 x 400 x 179
New	125	230/400	35003013	1	50	20,10	513 x 400 x 179

10 kA - AC Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34004006	1	100	22,12	470 x 421 x 171
32	230	34004007	1	100	22,27	470 x 421 x 171
40	230	34004008	1	100	22,16	470 x 421 x 171
50	230	34004009	1	100	22,72	470 x 421 x 171
63	230	34004010	1	100	22,56	470 x 421 x 171
New 80	230	34004011	1	50	16,67	513 x 400 x 179
New 100	230	34004012	1	50	16,69	513 x 400 x 179
New 125	230	34004013	1	50	16,71	513 x 400 x 179

2 Poled, 300 mA						
25	230	35004006	1	100	21,81	470 x 421 x 171
32	230	35004007	1	100	21,85	470 x 421 x 171
40	230	35004008	1	100	21,76	470 x 421 x 171
50	230	35004009	1	100	22,33	470 x 421 x 171
63	230	35004010	1	100	22,20	470 x 421 x 171
New 80	230	35004011	1	50	16,37	513 x 400 x 179
New 100	230	35004012	1	50	16,39	513 x 400 x 179
New 125	230	35004013	1	50	16,41	513 x 400 x 179

4 Poled, 30 mA						
25	230/400	34005006	1	50	19,74	470 x 396 x 171
32	230/400	34005007	1	50	19,74	470 x 396 x 171
40	230/400	34005008	1	50	19,53	470 x 396 x 171
50	230/400	34005009	1	50	20,00	470 x 396 x 171
63	230/400	34005010	1	50	20,05	470 x 396 x 171
New 80	230/400	34005011	1	50	20,35	513 x 400 x 179
New 100	230/400	34005012	1	50	20,37	513 x 400 x 179
New 125	230/400	34005013	1	50	20,40	513 x 400 x 179

4 Poled, 300 mA						
25	230/400	35005006	1	50	18,78	470 x 396 x 171
32	230/400	35005007	1	50	18,79	470 x 396 x 171
40	230/400	35005008	1	50	18,53	470 x 396 x 171
50	230/400	35005009	1	50	19,47	470 x 396 x 171
63	230/400	35005010	1	50	19,17	470 x 396 x 171
New 80	230/400	35005011	1	50	20,05	513 x 400 x 179
New 100	230/400	35005012	1	50	20,07	513 x 400 x 179
New 125	230/400	35005013	1	50	20,10	513 x 400 x 179

3 kA - A Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34048006	1	100	22,55	470 x 421 x 171
32	230	34048007	1	100	22,45	470 x 421 x 171
40	230	34048008	1	100	22,40	470 x 421 x 171
50	230	34048009	1	100	23,20	470 x 421 x 171
63	230	34048010	1	100	23,20	470 x 421 x 171

2 Poled, 300 mA						
25	230	35048006	1	100	21,15	470 x 421 x 171
32	230	35048007	1	100	21,60	470 x 421 x 171
40	230	35048008	1	100	21,50	470 x 421 x 171
50	230	35048009	1	100	21,90	470 x 421 x 171
63	230	35048010	1	100	22,10	470 x 421 x 171

4 Poled, 30 mA						
25	230/400	34049006	1	50	18,30	470 x 396 x 171
32	230/400	34049007	1	50	18,20	470 x 396 x 171
40	230/400	34049008	1	50	18,25	470 x 396 x 171
50	230/400	34049009	1	50	18,70	470 x 396 x 171
63	230/400	34049010	1	50	18,70	470 x 396 x 171

4 Poled, 300 mA						
25	230/400	35049006	1	50	17,70	470 x 396 x 171
32	230/400	35049007	1	50	17,40	470 x 396 x 171
40	230/400	35049008	1	50	17,50	470 x 396 x 171
50	230/400	35049009	1	50	18,10	470 x 396 x 171
63	230/400	35049010	1	50	18,15	470 x 396 x 171

6 kA - A Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34050006	1	100	22,70	470 x 421 x 171
32	230	34050007	1	100	22,80	470 x 421 x 171
40	230	34050008	1	100	22,75	470 x 421 x 171
50	230	34050009	1	100	23,35	470 x 421 x 171
63	230	34050010	1	100	23,35	470 x 421 x 171

2 Poled, 300 mA						
25	230	35050006	1	100	22,70	470 x 421 x 171
32	230	35050007	1	100	22,65	470 x 421 x 171
40	230	35050008	1	100	22,40	470 x 421 x 171
50	230	35050009	1	100	22,90	470 x 421 x 171
63	230	35050010	1	100	22,90	470 x 421 x 171

4 Poled, 30 mA						
25	230/400	34051006	1	50	19,85	470 x 396 x 171
32	230/400	34051007	1	50	20,00	470 x 396 x 171
40	230/400	34051008	1	50	20,20	470 x 396 x 171
50	230/400	34051009	1	50	20,65	470 x 396 x 171
63	230/400	34051010	1	50	20,35	470 x 396 x 171

4 Poled, 300 mA						
25	230/400	35051006	1	50	19,85	470 x 396 x 171
32	230/400	35051007	1	50	19,95	470 x 396 x 171
40	230/400	35051008	1	50	20,20	470 x 396 x 171
50	230/400	35051009	1	50	20,65	470 x 396 x 171
63	230/400	35051010	1	50	20,35	470 x 396 x 171

10 kA - A Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34052006	1	100	22,80	470 x 421 x 171
32	230	34052007	1	100	22,95	470 x 421 x 171
40	230	34052008	1	100	22,85	470 x 421 x 171
50	230	34052009	1	100	23,40	470 x 421 x 171
63	230	34052010	1	100	23,25	470 x 421 x 171

2 Poled, 300 mA						
25	230	35052006	1	100	22,50	470 x 421 x 171
32	230	35052007	1	100	22,55	470 x 421 x 171
40	230	35052008	1	100	22,45	470 x 421 x 171
50	230	35052009	1	100	23,00	470 x 421 x 171
63	230	35052010	1	100	22,90	470 x 421 x 171

4 Poled, 30 mA						
25	230/400	34053006	1	50	20,25	470 x 396 x 171
32	230/400	34053007	1	50	20,25	470 x 396 x 171
40	230/400	34053008	1	50	20,05	470 x 396 x 171
50	230/400	34053009	1	50	20,50	470 x 396 x 171
63	230/400	34053010	1	50	20,55	470 x 396 x 171

4 Poled, 300 mA						
25	230/400	35053006	1	50	19,30	470 x 396 x 171
32	230/400	35053007	1	50	19,30	470 x 396 x 171
40	230/400	35053008	1	50	19,05	470 x 396 x 171
50	230/400	35053009	1	50	19,95	470 x 396 x 171
63	230/400	35053010	1	50	19,65	470 x 396 x 171

3 kA - S Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34054006	1	100	22,05	470 x 421 x 171
32	230	34054007	1	100	21,95	470 x 421 x 171
40	230	34054008	1	100	21,90	470 x 421 x 171
50	230	34054009	1	100	22,70	470 x 421 x 171
63	230	34054010	1	100	22,70	470 x 421 x 171

2 Poled, 300 mA						
25	230	35054006	1	100	20,65	470 x 421 x 171
32	230	35054007	1	100	21,10	470 x 421 x 171
40	230	35054008	1	100	21,00	470 x 421 x 171
50	230	35054009	1	100	21,40	470 x 421 x 171
63	230	35054010	1	100	21,60	470 x 421 x 171

4 Poled, 30 mA						
25	230/400	34055006	1	50	18,30	470 x 396 x 171
32	230/400	34055007	1	50	18,20	470 x 396 x 171
40	230/400	34055008	1	50	18,25	470 x 396 x 171
50	230/400	34055009	1	50	18,70	470 x 396 x 171
63	230/400	34055010	1	50	18,70	470 x 396 x 171

4 Poled, 300 mA						
25	230/400	35055006	1	50	17,70	470 x 396 x 171
32	230/400	35055007	1	50	17,40	470 x 396 x 171
40	230/400	35055008	1	50	17,50	470 x 396 x 171
50	230/400	35055009	1	50	18,10	470 x 396 x 171
63	230/400	35055010	1	50	18,15	470 x 396 x 171

6 kA - S Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Poled, 30 mA						
25	230	34056006	1	100	22,20	470 x 421 x 171
32	230	34056007	1	100	22,30	470 x 421 x 171
40	230	34056008	1	100	22,25	470 x 421 x 171
50	230	34056009	1	100	22,85	470 x 421 x 171
63	230	34056010	1	100	22,85	470 x 421 x 171

2 Poled, 300 mA						
25	230	35056006	1	100	22,20	470 x 421 x 171
32	230	35056006	1	100	22,15	470 x 421 x 171
40	230	35056006	1	100	21,90	470 x 421 x 171
50	230	35056006	1	100	22,40	470 x 421 x 171
63	230	35056006	1	100	22,40	470 x 421 x 171

4 Poled, 30 mA						
25	230/400	34057006	1	50	19,85	470 x 396 x 171
32	230/400	34057007	1	50	20,00	470 x 396 x 171
40	230/400	34057008	1	50	20,20	470 x 396 x 171
50	230/400	34057009	1	50	20,65	470 x 396 x 171
63	230/400	34057010	1	50	20,35	470 x 396 x 171

4 Poled, 300 mA						
25	230/400	35057006	1	50	19,85	470 x 396 x 171
32	230/400	35057007	1	50	19,95	470 x 396 x 171
40	230/400	35057008	1	50	20,20	470 x 396 x 171
50	230/400	35057009	1	50	20,65	470 x 396 x 171
63	230/400	35057010	1	50	20,35	470 x 396 x 171

10 kA - S Type

Rated Current In (A)	Rated Voltage Un (V)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Kutuplu, 30 mA						
25	230	34058006	1	100	22,30	470 x 421 x 171
32	230	34058007	1	100	22,45	470 x 421 x 171
40	230	34058008	1	100	22,35	470 x 421 x 171
50	230	34058009	1	100	22,90	470 x 421 x 171
63	230	34058010	1	100	22,75	470 x 421 x 171

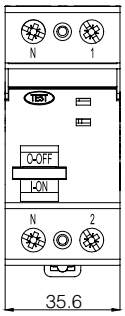
2 Kutuplu, 300 mA						
25	230	35058006	1	100	22,00	470 x 421 x 171
32	230	35058007	1	100	22,05	470 x 421 x 171
40	230	35058008	1	100	21,95	470 x 421 x 171
50	230	35058009	1	100	22,50	470 x 421 x 171
63	230	35058010	1	100	22,40	470 x 421 x 171

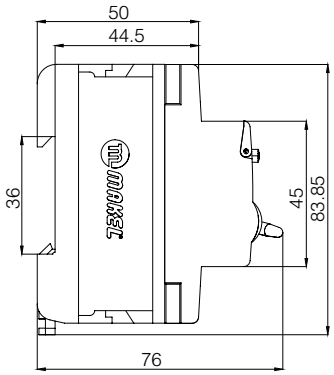
4 Kutuplu, 30 mA						
25	230/400	34059006	1	50	20,25	470 x 396 x 171
32	230/400	34059007	1	50	20,25	470 x 396 x 171
40	230/400	34059008	1	50	20,05	470 x 396 x 171
50	230/400	34059009	1	50	20,50	470 x 396 x 171
63	230/400	34059010	1	50	20,55	470 x 396 x 171

4 Kutuplu, 300 mA						
25	230/400	35059006	1	50	19,30	470 x 396 x 171
32	230/400	35059007	1	50	19,30	470 x 396 x 171
40	230/400	35059008	1	50	19,05	470 x 396 x 171
50	230/400	35059009	1	50	19,95	470 x 396 x 171
63	230/400	35059010	1	50	19,65	470 x 396 x 171

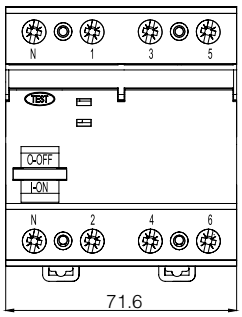
Technical Drawings

2 Poles
(RCCB) 3kA

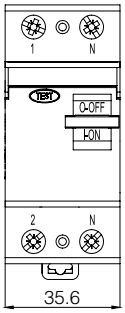


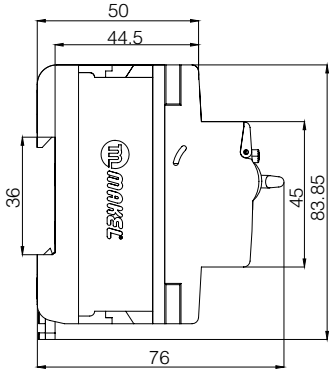


4 Poles
(RCCB) 3kA

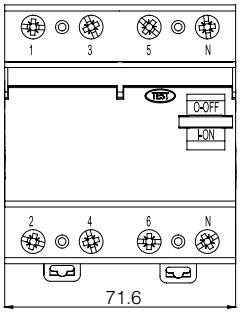


2 Poles
(RCCB) 6kA-10kA

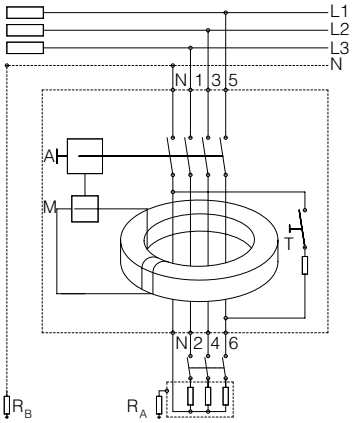




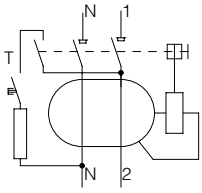
4 Poles
(RCCB) 6kA-10kA

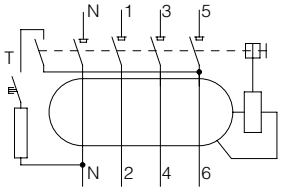


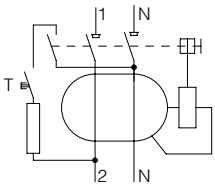
Wiring Diagrams

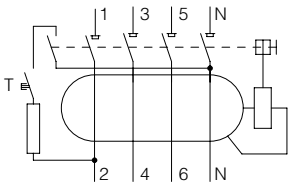


A : Shunt relay
M : Shunt trip
R_A : Protection grounding
R_B : Facility Grounding
T : Test Button









Moulded Case Circuit Breakers (MCCBs)

Your energy is secured

Makel Compact Switches protect the circuit in thermal and magnetic means. Wide product ranges from 25 A to 800 A.

Moulded Case Circuit Breakers (MCCBs)

The circuit breakers are mechanical assemblies for turning the circuit on and off in normal operational conditions whilecutting the circuit in abnormal conditions (short circuit and overcircuit). Compact switches are in low voltage circuitbreaker class with thermal and magnetic protection.

Makel Compact Switches are produced in accordance with IEC 60947-2 standards and they are used in energy distributiontables and their transmission lines for safe protection against overcurrents and instantaneous short circuits. Putting safety as a priority, Makel isolates all the contacts carrying voltage.

Provided with a product range from 25 A to 800 A, Makel Compact Switches comes with magnetic and thermal openingmechanisms thus providing high safety and quality together.

Makel Compact Switches provided with mechanic opening buttons (trips) carries sticker glass in front of it for naming whileit carries technical information regarding to the product.

Makel Compact Switches provides easy usage with different accessories. Low voltage coil, shunt trip coil, adaptors forcable shoes, control arm, connection terminals, auxiliary contact, bus connection accessories, plug in and withdrawabletype pedestals, manual full automatic mains - generator switching systems provide more effective protection.

Leak current protection blocks can be integrated to the Makel Compact Switches providing thermal and magneticprotection. This way, the product will also have fire protection and life protection properties.

The working condition of Makel Compact switches can be controlled with electronic test device in detail.It is easily controlled to see how many times the product is opened and for what reasons in this method.

Makel Compact Switches protect the circuit in **thermal** and **magnetic** means.

Thermal protection (overload protection):

Thermal protection is to protect the circuit against overload. This protection process uses bimetal material which has two metals with different temperature coefficients.When the bimetal is heated, it bends towards the metal side with smaller thermal coefficient.

When overload happens, the current value exceeds the nominal current value and with current increase, the bimetal temperature and the temperature of contacts increase.This way, the bending bimetal helps a cutting mechanism and opens the current with this movement in this mechanism.The switch protects the circuit from overload and over current with this method.

Magnetic protection (short circuit protection):

When two conductor touches with each other or when one of them touches to the ground connection, this causes short circuit. In short-circuit, the resistance is near to zero.For this reason, the short circuit current may reach thousands of times of the normal operational current values.If not prevented, short circuit is very harmful and destructive.For this reason, the circuits shall be cut in very short times. A big magnetic field is inducted on the magnetic protection mechanism of the switch in short circuit conditions and the force created by this magnetic field pulls the moving core to the stable core quickly and the moving core hits the opening mechanism with its rapid hitting.

Apart from the magnetic and thermal protection, limitor feature is the most important protection system. This current limitation feature named limitator provides the currents in each contact to pass in opposite directions with U shaped stable contact. During shortcut, the reverse magnetic field created in between stationary and moving contacts produce a pushing force and the moving 75 % of its value thus preventing devices connected to the circuit from getting harmed seriously.

There are three positions showing the position of the Compact switch.

ON / I: Shows that the contacts of the switches are closed. In this case, the crown of the switch is at top position.

TRİP: It shows that the switch is open for a failure reason (overload or short circuit). In this case, the switch crown is in between ON and OFF positions.

OFF / 0: Shows that the contacts of the switches are open. In this case, the crown of the switch is at bottom position.

In order to take the switch in Trip position to ON position;

Press the switch arm towards the OFF label. The switch will be set with the “Click” sound (reset position).In order to turn the switch off, press on the arm towards ON direction.

NOTE: If the switch is equipped with low voltage coil, shutting the switch off is only possible when the low voltage coil voltage is energised with nominal value.

Trip butonu: This is the red button on the cover controlling opening mechanism. When this button is pressed, themechanism starts working and the contacts of the switch opens rapidly.

Mechanic operation control (test): The switch is closed and opened 5 times. The arm shall be able to move easily and itshall be able to stay in between I and 0 positions in a stable way.w

General Specifications

- MCCBs; 160 A, 250 A, 400 A, 500 A, 630 A ve 800 A rated current
- A wide product range with 50 different types
- Provides easy installation the custom-made ergonomic design
- Body structure resistant to external impacts
- Compliance with 950 °C glow wire test against heat and flame
- 100% domestic production, Made in Turkey
- Body resistant to abnormal heat and flame
- BMC nonflammable, VO thermoplastic raw materials, Halogen free
- Adjustable current and magnetic range
- Products resistant to mechanical and electrical impacts
- Products with aesthetic, transparent polycarbonate cover
- Products passing 5000 V dielectric and isolation tests
- Products passing short circuit tests with 25 kA, 35 kA, 50 kA, 65 kA options
- Protection IP20
- 100% Quality Control during production

Houses, workplaces, shopping malls, mass housing sits, industrial facilities and all other living spaces.

Technical Specifications

Rated Current In (A)	25 A, 32 A, 40 A, 50 A, 63 A, 80 A, 100 A, 125 A, 160 A, 200 A, 225 A, 250 A, 315 A, 400 A, 500 A, 630 A, 800 A
Rated Voltage Un (V)	380/415 V AC
Protection Method	Thermal/Magnetic Fixed, Magnetic/Thermal Adjustable
Rated Working Frequency (Hz)	50/60 Hz
Cutting Capacity Inc (kA)	25 kA, 35 kA, 50 kA, 65 kA
Number of Poles	3P, 4P
Environment Air Temperature (°C)	-5 ˚C / +40 ˚C
IP Protection Level	IP 20
Assembly Method	DIN EN 50 022 35mm, 70 mm rail and board assembly
MCCB Type	Electromechanical, AC
Conductor Cross-section (mm^2)	$1mm^2$-$100mm^2$
Applicable Standard	TSE EN 60947-2

Molded case circuit breakers with thermic and magnetic protection and limiter protection provides high-quality security in industry environment, large transformer stations and housing estates.

Product Specifications

MCCB Thermal Magnetic Fixed

	Thermal setting current Ir (A)	Breaking capacity Icu (kA)	Rated Current In (A)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Pole, 380 V AC								
	Fix	25	25	46006006	1	10	11,89	505 x 260 x 105
	Fix	25	32	46006007	1	10	11,89	505 x 260 x 105
	Fix	25	40	46006008	1	10	11,89	505 x 260 x 105
	Fix	25	50	46006009	1	10	11,89	505 x 260 x 105
	Fix	25	63	46006010	1	10	11,89	505 x 260 x 105
	Fix	25	80	46006011	1	10	11,89	505 x 260 x 105
	Fix	25	100	46006012	1	10	11,89	505 x 260 x 105
	Fix	25	125	46006013	1	10	11,89	505 x 260 x 105
	Fix	25	160	46006014	1	10	11,87	505 x 260 x 105
3 Pole, 380 V AC								
	Fix	35	200	46007015	1	6	17,31	548 x 225 x 181
	Fix	35	225	46007016	1	6	17,32	548 x 225 x 181
	Fix	35	250	46007017	1	6	17,33	548 x 225 x 181
3 Pole, 380 V AC								
	Fix	35	315	46007018	1	4	21,11	610 x 300 x 150
	Fix	35	400	46007019	1	4	21,20	610 x 300 x 150
3 Pole, 380 V AC								
New	Fix	50	500	46008020	1	2	18,34	445 x 285 x 180
New	Fix	50	630	46008021	1	2	18,68	445 x 285 x 180
New	Fix	65	800	46060022	1	2	18,91	445 x 285 x 180

MCCB Thermal Adjustable

	Thermal setting current Ir (A)	Breaking capacity Icu (kA)	Rated Current In (A)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Pole, 380 V AC								
	20-25	25	25	47006006	1	10	11,89	505 x 260 x 105
	25-32	25	32	47006007	1	10	11,89	505 x 260 x 105
	32-40	25	40	47006008	1	10	11,89	505 x 260 x 105
	40-50	25	50	47006009	1	10	11,89	505 x 260 x 105
	50-63	25	63	47006010	1	10	11,89	505 x 260 x 105
	63-80	25	80	47006011	1	10	11,89	505 x 260 x 105
	80-100	25	100	47006012	1	10	11,89	505 x 260 x 105
	100-125	25	125	47006013	1	10	11,89	505 x 260 x 105
	125-160	25	160	47006014	1	10	11,89	505 x 260 x 105
3 Pole, 380 V AC								
	160-200	35	200	47006015	1	6	17,32	548 x 225 x 181
	200-250	35	250	47007017	1	6	17,29	548 x 225 x 181
3 Pole, 380 V AC								
	250-315	35	315	47007018	1	4	21,07	610 x 300 x 150
	315-400	35	400	47007019	1	4	21,05	610 x 300 x 150
3 Pole, 380 V AC								
New	160-400	50	400	47008019	1	2	10,52	610 x 300 x 150
New	200-500	50	500	47008020	1	2	18,34	445 x 285 x 180
New	250-630	50	630	47008021	1	2	18,67	445 x 285 x 180
New	320-800	65	800	47060022	1	2	18,91	445 x 285 x 180

Accessories of MCCBs

Rated Current In (A)	Code No.	Technical Specifications	Use Compact Switch	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Use Compact Switch							
160	67000001	1N/A+1 N/K	46006006-14 / 47006006-14	1	120	4,69	510 x 375 x 290
250	67000002	1N/A+1 N/K	46007015-17 / 47006015-17	1	120	6,13	510 x 375 x 290
400	67000003	2N/A+2 N/K	46007018-19 / 47007018-19	1	120	8,53	510 x 375 x 290
500	67000060	2N/A+2 N/K	46008020-21 / 47008020-21	1	100	6,32	530 x 390 x 180
630	67000060	2N/A+2 N/K	46008020-21 / 47008020-21	1	100	6,32	530 x 390 x 180
800	67000107	2N/A+2 N/K	48007022	1	100	6,32	530 x 390 x 180
Alarm Contacts							
160	67000004	1 N/A+1 N/K	46006006-14 / 47006006-14	1	120	4,57	510 x 375 x 290
250	67000005	1 N/A+1 N/K	46007015-17 / 47006015-17	1	120	6,25	510 x 375 x 290
400	67000006	1 N/A+1 N/K	46007018-19 / 47007018-19	1	120	6,25	510 x 375 x 290
500	67000061	1 N/A+1 N/K	46008020-21 / 47008020-21	1	100	5,82	530 x 390 x 180
630	67000061	1 N/A+1 N/K	46008020-21 / 47008020-21	1	100	5,82	530 x 390 x 180
800	67000108	1 N/A+1 N/K	48007022	1	100	5,82	530 x 390 x 180
Shunt releases							
160	67000007	220/380 VAC	46006006-14 / 47006006-14	1	120	9,01	510 x 375 x 290
250	67000008	220/380 VAC	46007015-17 / 47006015-17	1	120	12,37	510 x 375 x 290
400	67000009	220/380 VAC	46007018-19 / 47007018-19	1	120	12,25	510 x 375 x 290
500	67000063	220/380 VAC	46008020-21 / 47008020-21	1	100	18,42	530 x 390 x 180
630	67000063	220/380 VAC	46008020-21 / 47008020-21	1	100	18,42	530 x 390 x 180
800	67000110	220/380 VAC	48007022	1	100	18,42	530 x 390 x 180
Under voltage releases							
160	67000010	220/380 VAC	46006006-14 / 47006006-14	1	120	12,49	510 x 375 x 290
250	67000011	220/380 VAC	46007015-17 / 47006015-17	1	120	12,13	510 x 375 x 290
400	67000012	220/380 VAC	46007018-19 / 47007018-19	1	120	12,25	510 x 375 x 290
500	67000064	220/380 VAC	46008020-21 / 47008020-21	1	100	19,52	530 x 390 x 180
630	67000064	220/380 VAC	46008020-21 / 47008020-21	1	100	19,52	530 x 390 x 180
800	67000111	220/380 VAC	48007022	1	100	19,52	530 x 390 x 180

Accessories of MCCBs

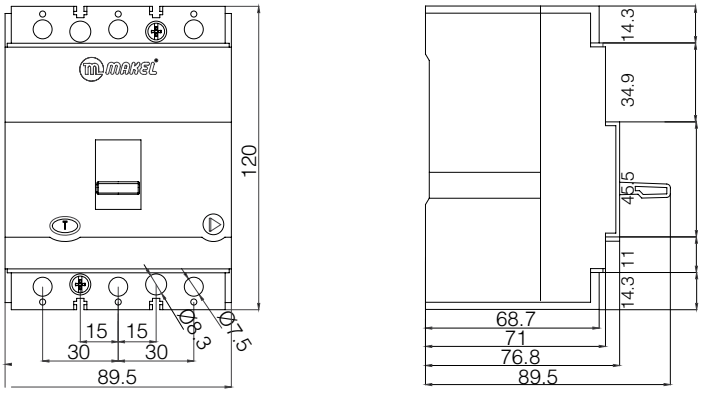
Rated Current In (A)	Code No.	Technical Specifications	Use Compact Switch	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Rail Installed parts							
160	67000028	-	46006006-14 / 47006006-14	1	120	9,30	510 x 375 x 290
250	67000029	-	46007015-17 / 47006015-17	1	12	2,59	390 x 325 x 180
Extension bars							
160	67000030	-	46006006-14 / 47006006-14	6	120	2,45	405 x 235 x 105
250	67000031	-	46007015-17 / 47006015-17	6	120	6,65	405 x 235 x 105
400	67000032	-	46007018-19 / 47007018-19	6	120	7,49	405 x 235 x 105
500	67000065	-	46008020-21 / 47008020-21	6	120	17,20	260 x 160 x 175
630	67000065	-	46008020-21 / 47008020-21	6	120	17,20	260 x 160 x 175
800	67000112	-	48007022	6	120	17,20	260 x 160 x 175
Extended rotary handle							
160	67000033	-	46006006-14 / 47006006-14	1	12	7,60	390 x 325 x 180
250	67000034	-	46007015-17 / 47006015-17	1	12	11,46	390 x 325 x 180
400	67000035	-	46007018-19 / 47007018-19	1	8	10,10	390 x 325 x 180
500	67000062	-	46008020-21 / 47008020-21	1	8	15,05	400 x 265 x 225
630	67000062	-	46008020-21 / 47008020-21	1	8	15,05	400 x 265 x 225
800	67000109	-	48007022	1	8	15,05	533 x 288 x 200
Motor control mechanisms							
160	67000047	-	46006006-14 / 47006006-14	1	10	13,25	535 x 240 x 115
250	67000048	-	46007015-17 47006015 / 47007017	1	6	9,02	365 x 320 x 120
400	67000049	-	46007018-19 / 47007018-19 47008018	1	4	15,44	630 x 235 x 150
500	67000043	-	46008020 / 47008020	1	4	15,70	642 x 270 x 164
630	67000044	-	46008021 / 47008021	1	4	15,70	642 x 270 x 164

MCCB Thermal and Magnetic Fixed Type (3P+N)

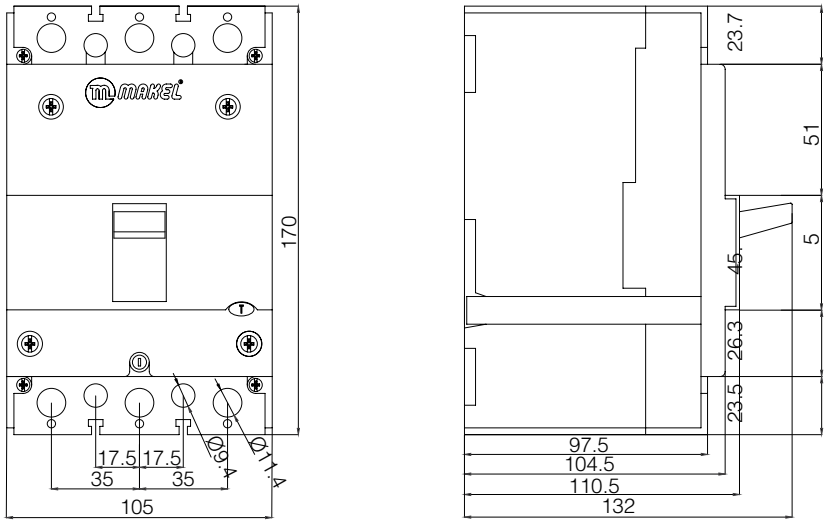
	Thermal setting current Ir (A)	Breaking capacity Icu (kA)	Rated Current In (A)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3P+N								
	Sabit	35	25	46060006	1	8	16,35	372 x 304 x 273
	Sabit	35	32	46060007	1	8	16,30	372 x 304 x 273
	Sabit	35	40	46060008	1	8	16,40	372 x 304 x 273
	Sabit	35	50	46060009	1	8	16,30	372 x 304 x 273
	Sabit	35	63	46060010	1	8	16,35	372 x 304 x 273
	Sabit	35	80	46060011	1	8	16,35	372 x 304 x 273
	Sabit	35	100	46060012	1	8	16,40	372 x 304 x 273
3P+N								
	Sabit	35	125	46060013	1	8	25,35	390 x 340 x 313
	Sabit	35	160	46060014	1	8	24,50	390 x 340 x 313
	Sabit	35	200	46060015	1	8	24,50	390 x 340 x 313
	Sabit	35	225	46060016	1	8	25,40	390 x 340 x 313
3P+N								
	Sabit	50	250	46061017	1	2	15,10	350 x 285 x 385
	Sabit	50	315	46061018	1	2	15,15	350 x 285 x 385
	Sabit	50	400	46061019	1	2	15,15	350 x 285 x 385
3P+N								
	Sabit	65	500	46062020	1	1	15,15	370 x 340 x 210
	Sabit	65	630	46062021	1	1	15,10	370 x 340 x 210

Technical Drawings

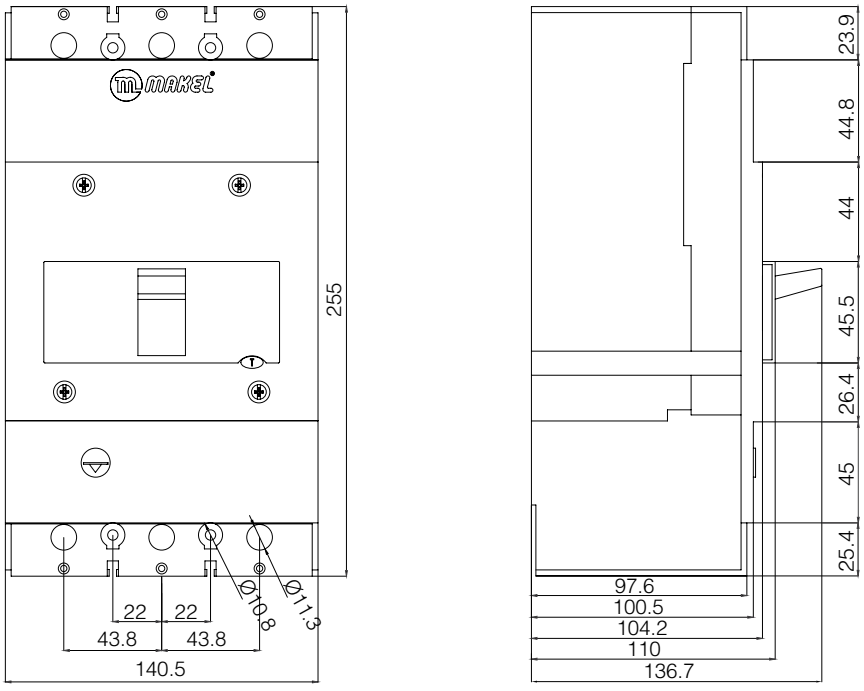
160 A Moulded Case Circuit Breakers (MCCBs)



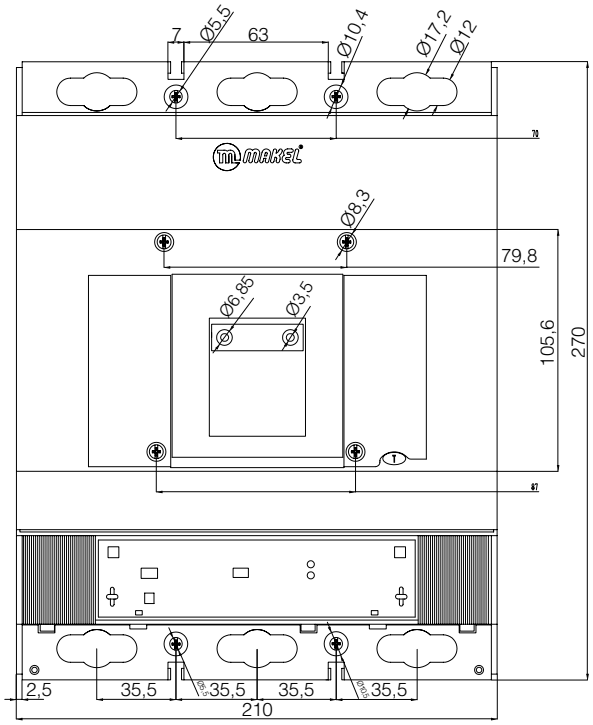
250 A Moulded Case Circuit Breakers (MCCBs)

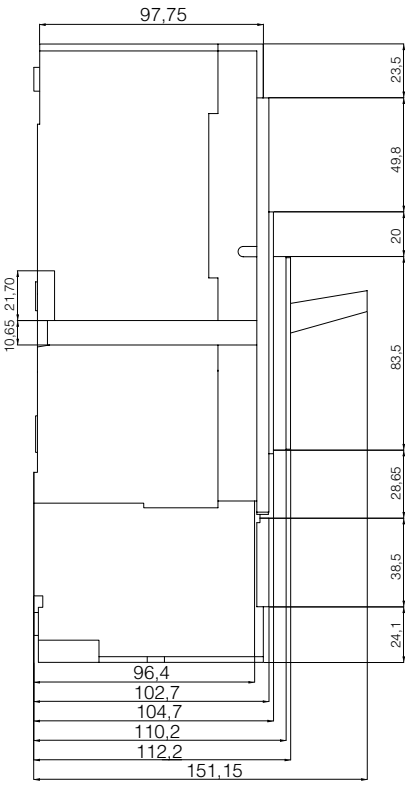


400 A Moulded Case Circuit Breakers (MCCBs)

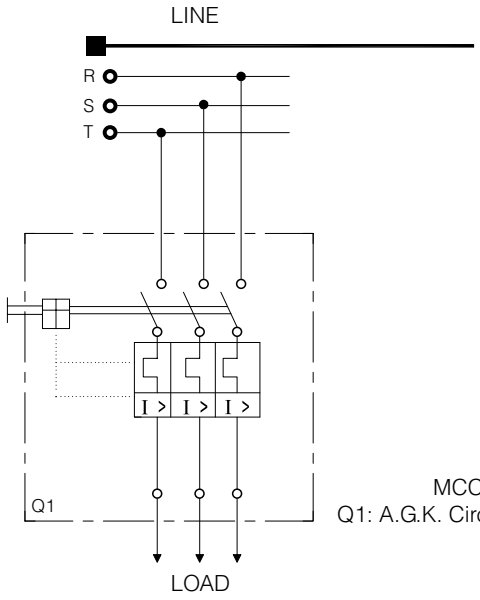


500 A, 630 A, 800 A Moulded Case Circuit Breakers (MCCBs)





Wiring Diagram



MCCB
Q1: A.G.K. Circuit Breaker

Moulded Case Circuit Breakers with Residual Current Circuit Breaker (LCCB)

Precise Measurement

An effective secure protection against over current, short circuit, leakage current and grounding and isolation faults that can cause fire.

Moulded Case Circuit Breakers with Residual Current Circuit Breaker (LCCB)

The circuit breakers are mechanical assemblies for turning the circuit on and off in normal operational conditions while cutting the circuit in abnormal conditions (short circuit and over circuit). Compact switches are in low voltage circuit breaker class with thermal and magnetic protection.

Makel Compact Switches are produced in accordance with IEC 60947-2 standards and they are used in energy distribution tables and their transmission lines for safe protection against over currents and instantaneous short circuits. Putting safety as a priority, Makel isolates all the contacts carrying voltage.

Provided with a product range from 25 A to 800 A, Makel Compact Switches comes with magnetic and thermal opening mechanisms thus providing high safety and quality together.

In the electric circuits the arisen ground leakage current including very small values (30mA) is quite dangerous in terms of safety and fire. Additional protection must be done againts small ground leakage currents because normal circuit breakers cannot feel these small leakages. To electronic circuit breakers the ground leakage protection system may be added externally without an additional mechanism. Protection in this system are made with sensitivity (0,1-1) xIn. In non-electronic breakers and in electronic breakers which need protection lower than above value, system is protected with Makel LCCB with leakage protection to trip off in the case of ground leakage currents , before LCCB must be installed with together or one of the remote shunt release or auixilary contact blocks.

30 mA value current protection switch for human life protection and a (100-300-500-1000)mA value current protection switch for fire protection shall be used.

Points of Caution During Installation

- The fixture that is to be connected must be grounded
- The neutral line of the fixture that is to be connected must be insulated.
- The Residual Current Protected Compact Breakers must be attached according to the panel electrical inlets. The power entry must be installed from the network entrance of the compact breaker. In panels with power inlets from the bottom the product must be connected from the network entrance. If a connection is made from the load section the residual current unit and trip coil may be damaged.

General Specifications

- Made in Turkey
- 28 different leakage current protected compact switch product types
- Abnormal heat and flame resistant body
- 960 ˚C hot wire test resistant products
- BMC nonflammable, VO thermoplastic raw materials, Halogen free
- Stylish and ergonomic design
- Adjustable leak current and time span
- Products resistant to mechanical and electrical impacts
- Products with aesthetic, transparent polycarbonate cover
- Products passing 5000 V dielectric and isolation tests
- Products passing short circuit tests with 35 kA, 50 kA, 65 kA options
- Wide product ranges from 40 A to 800 A
- Protection IP40

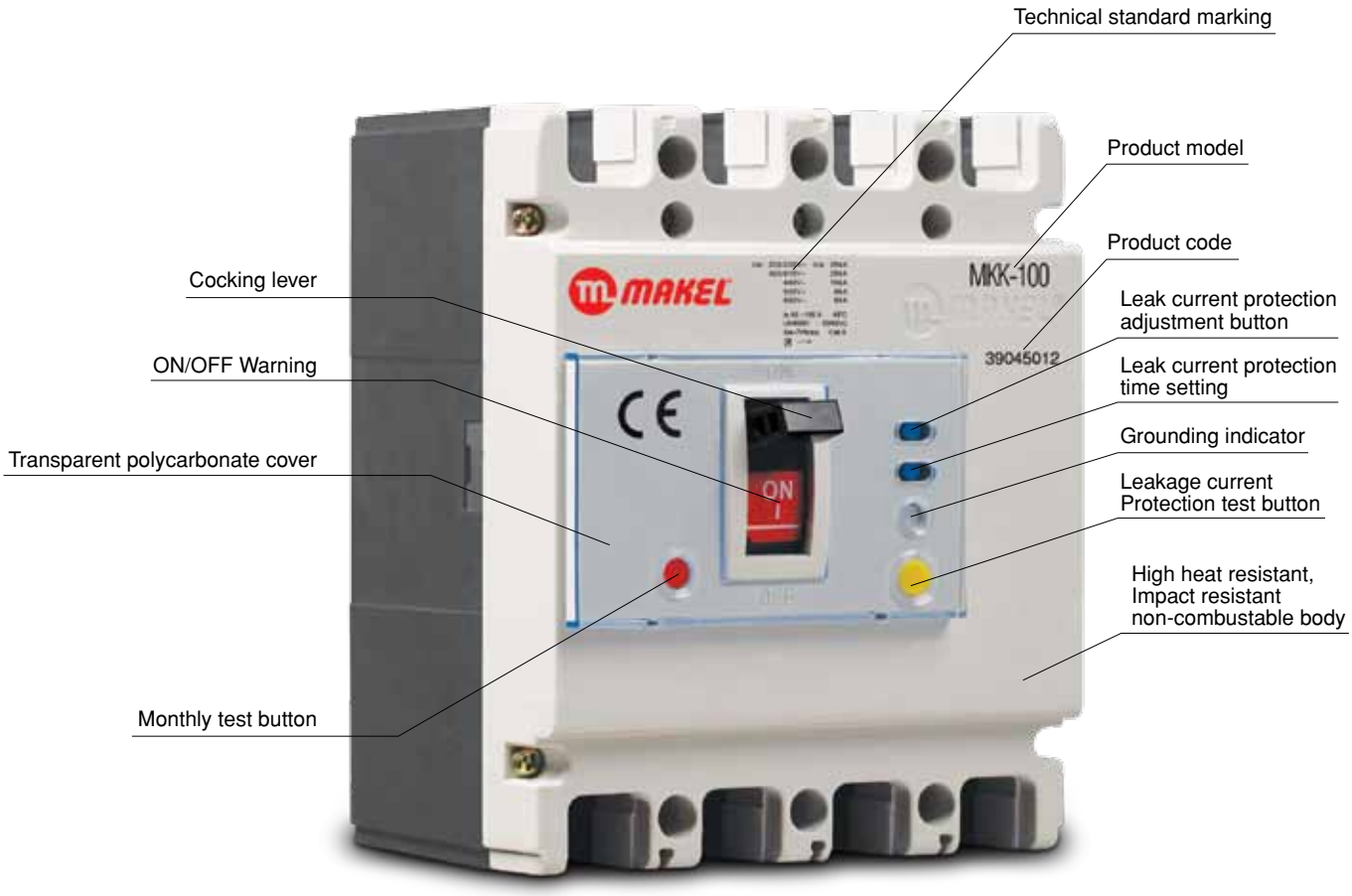
Production facilities, heavy duty industrial facilities, transformer, mains electricity distribution centers, buildings, sites, household and similar environments

Technical Specifications

Rated Current In (A)	40 A, 50 A, 63 A, 80 A, 100 A, 125 A, 160 A, 225 A, 250 A, 400 A, 500 A, 630 A, 800 A
Rated Voltage Un (V)	380/415 V AC
Protection Method	Thermal/Magnetic, Leakage Current
Rated Working Frequency (Hz)	50/60 Hz
Cutting Capacity Inc (kA)	35 kA, 50 kA, 65 kA
Number of Poles	4P
Environment Air Temperature (°C)	-5 °C / +40 °C
IP Protection Level	IP 40
Assembly Method	Fixed
MCCB Type	Electromechanical, AC
Conductor Cross-section (mm^2)	$1mm^2$-$100mm^2$
Applicable Standard	TSE EN 60947-2

Can be used safely in boards of energy distribution and in the transmission lines against overcurrents and short circuits.

Product Features



Leakage Case Circuit Breakers

(with Shunt Releases)

	Breaking Capacity Icu (kA)	Threshold Current (mA)	Threshold Time (s)	Rated Current In (A)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
4 Pole									
	35	30-100-300	0,1-0,3-0,5	40	39045008	1	8	24,15	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	50	39045009	1	8	24,16	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	63	39045010	1	8	24,17	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	80	39045011	1	8	24,14	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	100	39045012	1	8	24,14	415 x 395 x 345
4 Pole									
	35	30-100-300	0,1-0,3-0,5	125	39045013	1	8	30,15	455 x 420 x 340
	35	30-100-300	0,1-0,3-0,5	160	39045014	1	8	29,96	455 x 420 x 340
	35	30-100-300	0,1-0,3-0,5	225	39045015	1	8	30,04	455 x 420 x 340
	35	30-100-300	0,1-0,3-0,5		39045016	1	8	30,04	455 x 420 x 340
4 Pole									
	50	100-300-500	0,1-0,3-0,5	250	39046017	1	2	16,33	325 x 305 x 490
	50	300-500-1000	0,1-0,3-0,5	315	39046018	1	2	16,34	325 x 305 x 490
	50	300-500-1000	0,1-0,3-0,5	400	39046019	1	2	16,34	325 x 305 x 490
4 Pole									
New	50	300-500-1000	0,1-0,3-0,5	500	39046020	1	1	12,68	385 x 350 x 255
New	50	300-500-1000	0,1-0,3-0,5	630	39046021	1	1	12,89	385 x 350 x 255
New	65	300-500-1000	0,1-0,3-0,5	800	39047022	1	1	13,14	385 x 350 x 255

Leakage Case Circuit Breakers with

(Shunt releases and mounted auxiliary contact blocks)

	Breaking Capacity Icu (kA)	Threshold Current (mA)	Threshold Time (s)	Rated Current In (A)	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
4 Kutup									
	35	30-100-300	0,1-0,3-0,5	40	39045008-Y	1	8	24,24	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	50	39045009-Y	1	8	24,25	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	63	39045010-Y	1	8	24,25	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	80	39045011-Y	1	8	24,23	415 x 395 x 345
	35	30-100-300	0,1-0,3-0,5	100	39045012-Y	1	8	24,22	415 x 395 x 345
4 Kutup									
	35	30-100-300	0,1-0,3-0,5	125	39045013-Y	1	8	30,24	455 x 420 x 340
	35	30-100-300	0,1-0,3-0,5	160	39045014-Y	1	8	30,50	455 x 420 x 340
	35	30-100-300	0,1-0,3-0,5	225	39045016-Y	1	8	30,13	455 x 420 x 340
4 Kutup									
	50	100-300-500	0,1-0,3-0,5	250	39046017-Y	1	2	16,52	325 x 305 x 490
	50	300-500-1000	0,1-0,3-0,5	315	39046018-Y	1	2	16,53	325 x 305 x 490
	50	300-500-1000	0,1-0,3-0,5	400	39046019-Y	1	2	16,53	325 x 305 x 490
4 Kutup									
Yeni	50	300-500-1000	0,1-0,3-0,5	500	39046020-Y	1	1	12,95	385 x 350 x 255
Yeni	50	300-500-1000	0,1-0,3-0,5	630	39046021-Y	1	1	13,07	385 x 350 x 255
Yeni	65	300-500-1000	0,1-0,3-0,5	800	39047022-Y	1	1	13,38	385 x 350 x 255

Accessories of Leakage Case Circuit Breakers

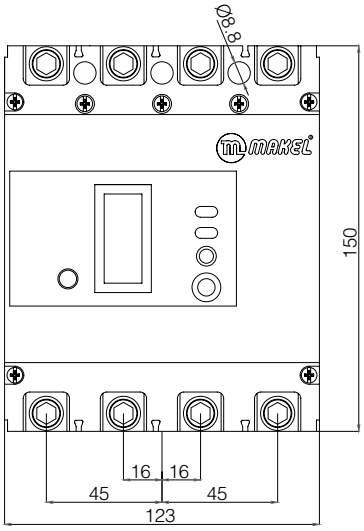
	Rated Current In (A)	Code No.	Use Compact Switch	Explanation	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Alarm Contacts	100	67000013	39045008 39045009 39045010 39045011 39045012	Operating Voltage 220V AC	1	120	6,49	510 x 375 x 290
	225	67000014	39045013 39045014 39045016	Operating Voltage 220V AC	1	120	6,61	510 x 375 x 290
	400	67000015	39045017 39045018 39045019	Operating Voltage 220V AC	1	120	8,29	510 x 375 x 290
	500	67000066	39046020 39046021	Operating Voltage 220V AC	1	100	8,20	578 x 283 x 303
	630	67000066	39046020 39046021	Operating Voltage 220V AC	1	100	8,20	578 x 283 x 303
	800	67000092	39047022 39047022 - Y	Operating Voltage 220V AC	1	100	8,20	578 x 283 x 303
Shunt Release	100	67000016	39045008 39045009 39045010 39045011 39045012	Operating Voltage 220V AC	1	120	9,73	510 x 375 x 290
	225	67000017	39045013 39045014 39045016	Operating Voltage 220V AC	1	120	9,85	510 x 375 x 290
	400	67000018	39045017 39045018 39045019	Operating Voltage 220V AC	1	20	3,15	405 x 235 x 105
	500	67000067	39046020 39046021	Operating Voltage 220V AC	1	100	17,00	578 x 283 x 303
	630	67000067	39046020 39046021	Operating Voltage 220V AC	1	100	17,00	578 x 283 x 303
	800	67000094	39047022 39047022 - Y	Operating Voltage 220V AC	1	100	17,00	578 x 283 x 303
Undervoltage Releases	100	67000019	39045008 39045009 39045010 39045011 39045012	Operating Voltage 220V AC	1	20	2,55	405 x 235 x 105
	225	67000020	39045013 39045014 39045016	Operating Voltage 220V AC	1	20	2,55	405 x 235 x 105
	400	67000021	39045017 39045018 39045019	Operating Voltage 220V AC	1	20	3,81	405 x 235 x 105
	500	67000068	39046020 39046021	Operating Voltage 220V AC	1	100	18,60	578 x 283 x 303
	630	67000068	39046020 39046021	Operating Voltage 220V AC	1	100	18,60	578 x 283 x 303
	800	67000096	39047022 39047022 - Y	Operating Voltage 220V AC	1	100	18,60	578 x 283 x 303

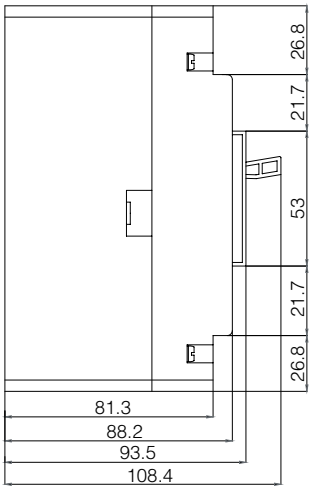
Accessories of Leakage Case Circuit Breakers

	Rated Current In (A)	Code No.	Use Compact Switch	Explanation	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Auxiliary Contact Blocks	100	67000022	39045008 39045009 39045010 39045011 39045012	Operating Voltage 220V AC, 1NO+1NC	1	120	6,61	510 x 375 x 290
	225	67000023	39045013 39045014 39045016	Operating Voltage 220V AC, 1NO+1NC	1	120	6,61	510 x 375 x 290
	400	67000024	39045017 39045018 39045019	Operating Voltage 220V AC, 1NO+1NC	1	120	10,69	510 x 375 x 290
	500	67000069	39046020 39046021	Operating Voltage 220V AC, 1NO+1NC	1	100	14,72	530 x 390 x 180
	630	67000069	39046020 39046021	Operating Voltage 220V AC, 1NO+1NC	1	100	14,72	530 x 390 x 180
	800	67000098	39047022 39047022 - Y	Operating Voltage 220V AC, 1NO+1NC	1	100	14,72	530 x 390 x 180
Extension Bars	100	67000025	39045008 39045009 39045010 39045011 39045012	-	8	160	3,37	405 x 235 x 105
	225	67000026	39045013 39045014 39045016	-	8	160	7,53	405 x 235 x 105
	400	67000027	39045017 39045018 39045019	-	8	160	14,73	405 x 235 x 105
	500	67000070	39046020 39046021	-	8	80	16,20	238 x 205 x 95
	630	67000070	39046020 39046021	-	8	80	16,20	238 x 205 x 95
	800	67000100	39047022 39047022 - Y	-	8	80	16,20	238 x 205 x 95
Motor Control Mechanisms	100	67000050	39045008 - 12	-	1	10	13,68	555 x 295 x 115
	225	67000051	39045013 39045014 39045016	-	1	6	9,01	365 x 320 x 120
	400	67000052	39045017 39045018 39045019	-	1	4	15,45	630 x 235 x 150
	500	67000045	39046020	-	1	4	16,24	642 x 270 x 164
	630	67000046	39046021	-	1	4	16,24	642 x 270 x 164

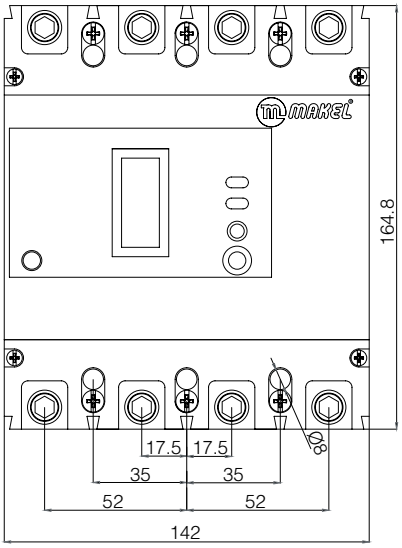
Technical Drawings

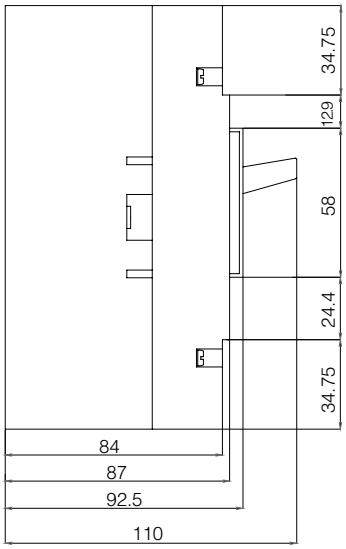
100 A Leak Current Protected Compact Switch





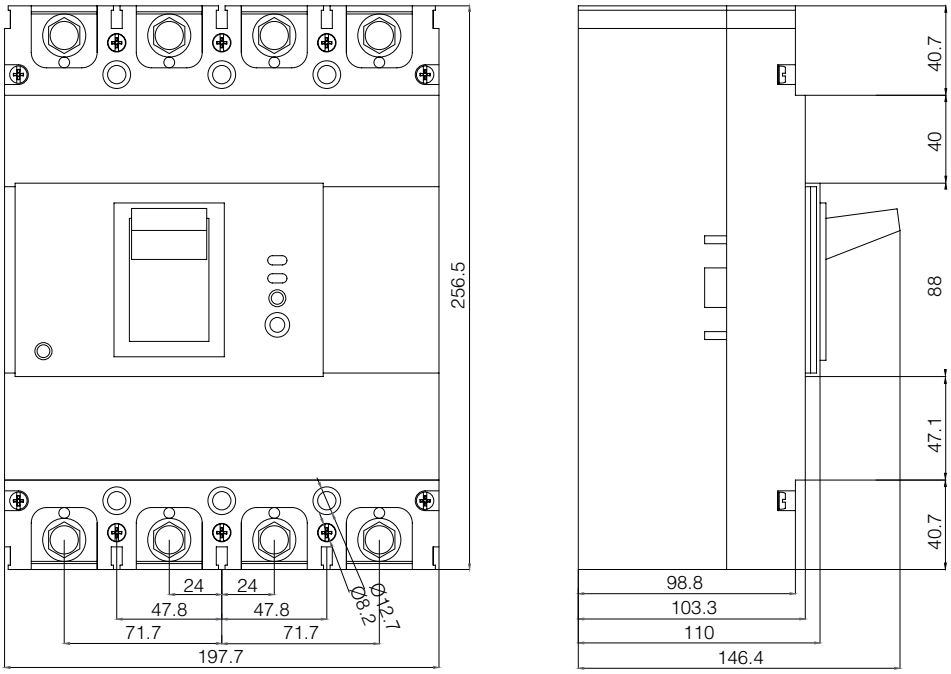
225 A Leak Current Protected Compact Switch



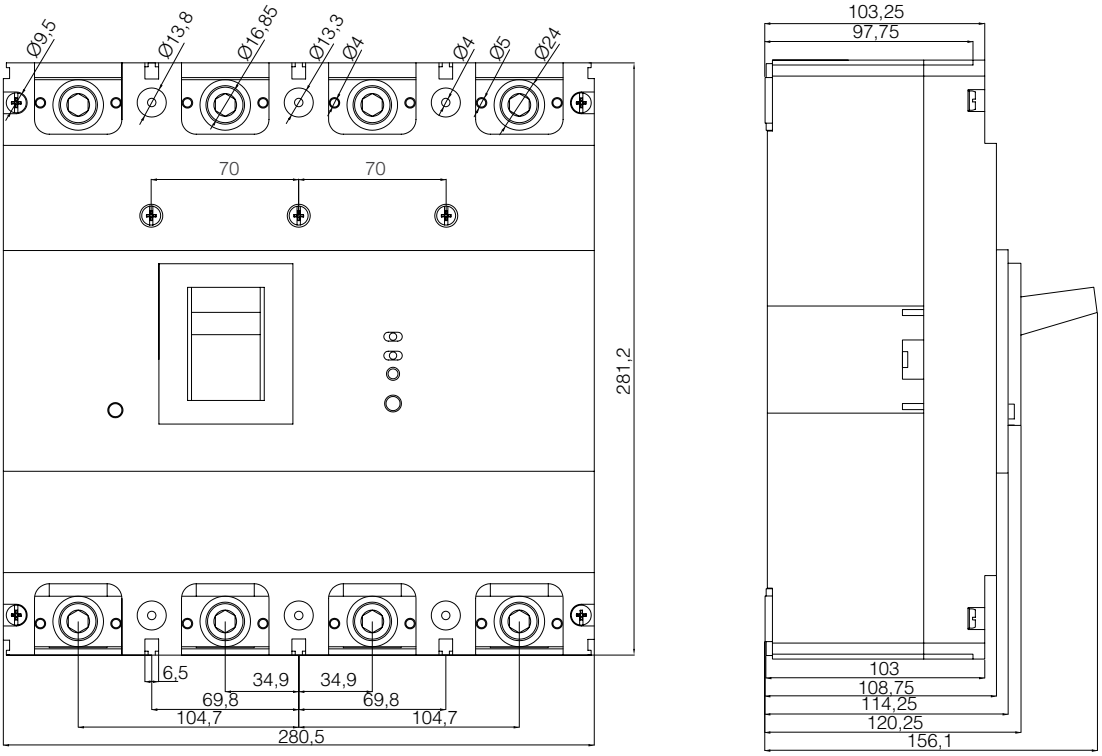


Technical Drawings

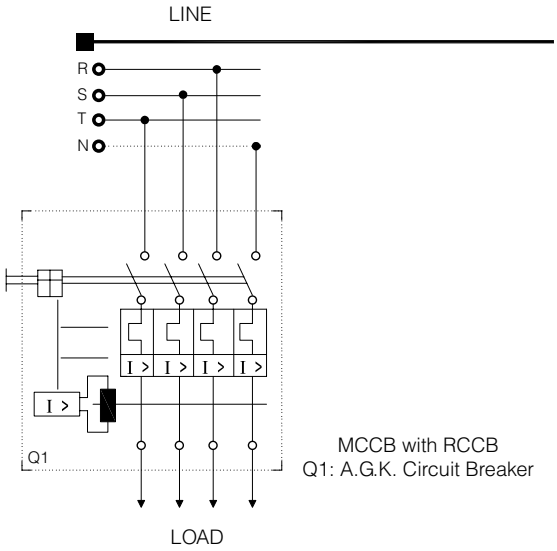
400 A Leak Current Protected Compact Switch



500 A, 630 A, 800 A Leak Current Protected Compact Switch



Wiring Diagrams



MCCB with RCCB
Q1: A.G.K. Circuit Breaker

Three Poles Power Contactors

Precise control and maximum protection for electric motors

Makel Contactors are connection devices that enable the opening and closing of an electrical circuit which have a normal position of on.

Low Voltage Contactors

Makel Contactors are connection devices that enable the opening and closing of an electrical circuit which have a normal position of on. The most important feature that distinguishes Makel Contactors from other switch types in terms of operation and type of use is that it can open and close the circuit more frequently and by remote control.

Contactors are generally comprised of a main conductor component and a switch triggering mechanism. The main current conductor components, main and auxiliary contacts are the separator (arc extinguishing cells) and connection ends that are used on the high amperage contactors. The triggering system components are comprised of iron core, bobbin and spring.

Contactors are produced and tested according to IEC 60947-4-1, TS EN60947-4-1 standards.

The contactors cannot be used on their own as circuit protection elements but when used together with thermal relays they protect the circuit against excessive current loads.

Fields of Application

Especially used in turning over electrical motors, compensation, activating and inactivating heating and cooling systems, being processed in overload, in the passing of current from a normal electrical circuit, closing and transmitting circuits. Contactors have a remote control feature.

Contactors are produced in accordance with the IEC 60947-4-1, TS EN60947-4-1 standards and CE and RoHS directives.

The main and auxiliary contact blocks of Makel Contactors are easily attached and removed. Also since Makel contactors have three end bobbins they are easy to assemble and provide connection flexibility.

The contactor bobbins are specially designed so that the nominal bobbin voltage can be safely controlled between 0.8 to 1.1 fold (176 V-240 V AC). Since our contactors are double bobbin insulated, sound, heat, noise, contact vibration and shifting does not occur.

The contactors work efficiently between -5°C and 55°C ambient temperature and are mounted on panels with screws or standard 35 mm DIN rails. The AC Contactors are resistant to voltage up to 1000 V with the raw material that is used.

The Main Tasks of Contactors

Contactors must carry high current values without any kind of deterioration or fusion.

This feature is dependent on the quality of contactors (contact surface technology and fusion technology).

Contactor selection is especially important in AC-3 class and condenser commands.

When the contactor is off the current that flows over the contactors causes them to get heated. This heating has been classified in international standards. According to the international IEC 60947-4-1 and TS EN60947-4-1 standards when constant thermal current (Ith) is passed through the main contactors for 8 hours the maximum increase in heat on the contactor terminals should not exceed 65 K.

When the contactor is cutting of the current an electrical arc is formed between the separating contacts. An arc is a flow of electrons and ions that disconnect from the material due to thermal effect.

Arc temperature can reach thousands of degrees which are far beyond the temperature that the cutting cells and metals and insulators used in the production of contactors can withstand.

Therefore the arc that takes place during the opening and closing of contactors must end as quickly as possible

This is why arc cells are used in contactors just like in circuit breakers for high voltages.

The Selection and Categories of Use for Contactors

On one of the most important points in contactor selection is to analyze the load that will be used well and determine the characteristic sizes of sudden loads.

The categories of use for contactors are determined by the opening current, cutting off current and power factors of the contactor and the AC class under the categories of use means contactors operating under alternative current while the DC class means working under the direct current.

According to the international IEC 60947-4-1, TS EN60947-4-1 standards the categories are AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8.

AC1 - Use Category: Alternative current loads that draw active loads and have a power factor between 0.95 and 1 like heaters are in this class.

AC2 - Use Category: Used in the commanding of asynchronous ringed motors. Throughout the progress of the motor 2.5 times the nominal current is drawn, the main contacts of the contactor are designed to handle this current.

AC3 - Use Category: Used in the commanding of asynchronous caged motors. The most common among the use categories. They are used by many instruments like elevators, conveyors, escalators, coolers and pumps.

AC4 - Use Category: Commands the braking in reverse currents and intermittent operation of asynchronous ringed motors and asynchronous caged motors. At the moment of start up the motors draw 6-7 times the nominal current. AC4 class contactors have been designed to be able to go on and off at this current value.

AC5 - Use Category: Used in the switches of control arrangements for electrical discharge and incandescent filament lamps.
AC-5a AC current switches of discharge lamps
AC-5b AC current switches of incandescent filament lamps

AC7 - Use Category: Used in home appliances, similar applications and low inductive load systems.

AC8 - Use Category: Used in the control of impermeable cooling compressor motors with manually set excessive load releasers and automatically returning to start position.
AC-8a AC current control of hermetic type compressor motors equipped with manual reset thermal relays
AC-8b AC current control of hermetic type compressor motors equipped with automatic reset thermal relays

Precise control and maximum protection for electric motors

Technical Specifications

AC Contactor

	M06 -6A	M06 -9A	K09-9A-1	K09 12A	KNC1 -0911	KNC1 -1211	KNC1 -1811
Use Category	AC 3	AC 3	AC 3	AC 3	AC 3	AC 3	AC 3
Nominal Current (A)	6	9	9	12	9	12	18
Nominal Insulation Voltage (V)	690	690	690	690	690	690	690
Nominal Resistance to Impact Voltage Uimp (kV)	6	6	6	6	6	6	6
Thermal Current I th(A)	20	20	20	20	20	20	32
Motor Control 3 ph AC A/K (kW)	220 V/1,5 380 V/2,2 660 V/3	1,5 2,2 3	2,2 4 4	2,2 4 4	2,2 4 5,5	3 5,5 7,5	4 7,5 9
Mechanical Life (A/K/A/K (Hour))	1 000 000	1 000 000	1 000 000	1 000 000	1 000 000	1 000 000	1 000 000
Electrical Life (A/K/A/K (Hour))	100 000	100 000	100 000	100 000	100 000	100 000	100 000
Number of Auxiliary Contacts	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK
Conductor Section (mm^2)	1	1	1	1	1,5	1,5	2,5
Metric Bolt (M)	M3	M3	M3	M3	M3,5	M3,5	M3,5
Max. tightening torque (Nm)	0,6N	0,6N	0,6N	0,6N	0,8N	0,8N	0,8N
Operation Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Protection Class	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Weight (Kg)	0,355	0,355	0,355	0,355	0,355	0,355	0,355

	KNC1 -2511	KNC1 -3211	KNC1 -4011	KNC1-5011	KNC1-6511	KNC1-8011	KNC1-9511
Use Category	AC 3	AC 3	AC 3	AC 3	AC 3	AC 3	AC 3
Nominal Current (A)	25	32	40	50	65	80	95
Nominal Insulation Voltage (V)	690	690	690	690	690	690	690
Nominal Resistance to Impact Voltage Uimp (kV)	8	8	8	8	18,5	22	25
Thermal Current I th(A)	50	50	60	80	80	125	125
Motor Control 3 ph AC A/K (kW)	5,5 11 15	7,5 15 18,5	11 18,5 30	15 22 33	18,5 30 37	22 37 45	25 45 45
Mechanical Life (A/K/A/K (Hour))	1 000 000	800 000	800 000	800 000	800 000	600 000	600 000
Electrical Life (A/K/A/K (Hour))	100 000	80 000	80 000	80 000	80 000	60 000	60 000
Number of Auxiliary Contacts	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK
Conductor Section (mm^2)	4	6	10	10	16	25	35
Metric Bolt (M)	M4	M4	M4	M8	M8	M8	M10
Max. tightening torque (Nm)	1,2N	1,2N	1,2N	3,5N	3,5N	3,5N	4N
Operation Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Protection Class	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Weight (Kg)	0,549	0,553	1,125	1,128	1,130	1,375	1,375

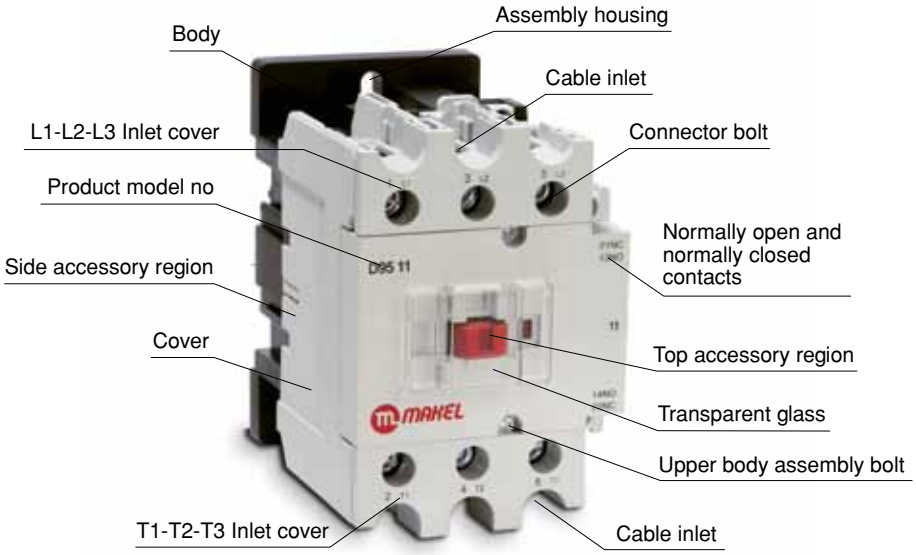
AC Capacitive Contactor

	KNC19 -09	KNC19 -12	KNC19 -18	KNC19 -25	KNC19 -32
Use Category	AC - 6b	AC - 6b	AC - 6b	AC - 6b	AC - 6b
Nominal Current (A)	9	12	18	25	32
Nominal Insulation Voltage (V)	660	660	660	660	660
Nominal Resistance to Impact Voltage Uimp (kV)	6	6	6	8	8
Thermal Current I th(A)	20	20	32	50	50
3 ph AC A/K 400/440 V (kVAr)	4	6	9	12	18
Mechanical Life (A/K/A/K (Hour))	1 000 000	1 000 000	1 000 000	1 000 000	800 000
Electrical Life (A/K/A/K (Hour))	100 000	100 000	100 000	100 000	80 000
Number of Auxiliary Contacts	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK
Conductor Section (mm^2)	1,5	1,5	2,5	4	6
Metric Bolt (M)	M3,5	M3,5	M3,5	M4	M4
Max. tightening torque (Nm)	0,8N	0,8N	0,8N	1,2N	1,2N
Operation Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Protection Class	IP 20	IP 20	IP 20	IP 20	IP 20
Weight (Kg)	0,432	0,437	0,437	0,622	0,633

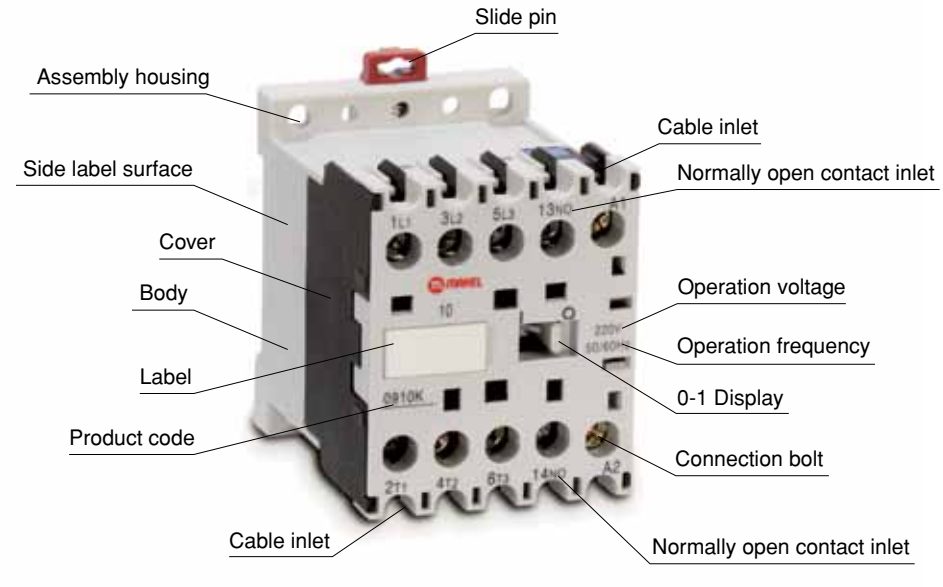
	KNC19 -40	KNC19 -50	KNC19 -65	KNC19 -80	KNC19 -95
Use Category	AC - 6b	AC - 6b	AC - 6b	AC - 6b	AC - 6b
Nominal Current (A)	40	50	65	80	95
Nominal Insulation Voltage (V)	660	660	660	660	660
Nominal Resistance to Impact Voltage Uimp (kV)	8	8	18,5	22	25
Thermal Current I th(A)	60	80	80	125	125
3 ph AC A/K 400/440 V (kVAr)	20	25	30	36	45
Mechanical Life (A/K/A/K (Hour))	800 000	800 000	800 000	600 000	600 000
Electrical Life (A/K/A/K (Hour))	80 000	80 000	80 000	60 000	60 000
Number of Auxiliary Contacts	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK	1NA or 1NK
Conductor Section (mm^2)	10	10	16	25	35
Metric Bolt (M)	M4	M8	M8	M8	M10
Max. tightening torque (Nm)	1,2N	3,5N	3,5N	3,5N	4N
Operation Frequency (Hz)	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Protection Class	IP 20	IP 20	IP 20	IP 20	IP 20
Weight (Kg)	1,204	1,209	1,209	1,451	1,451

Product Features

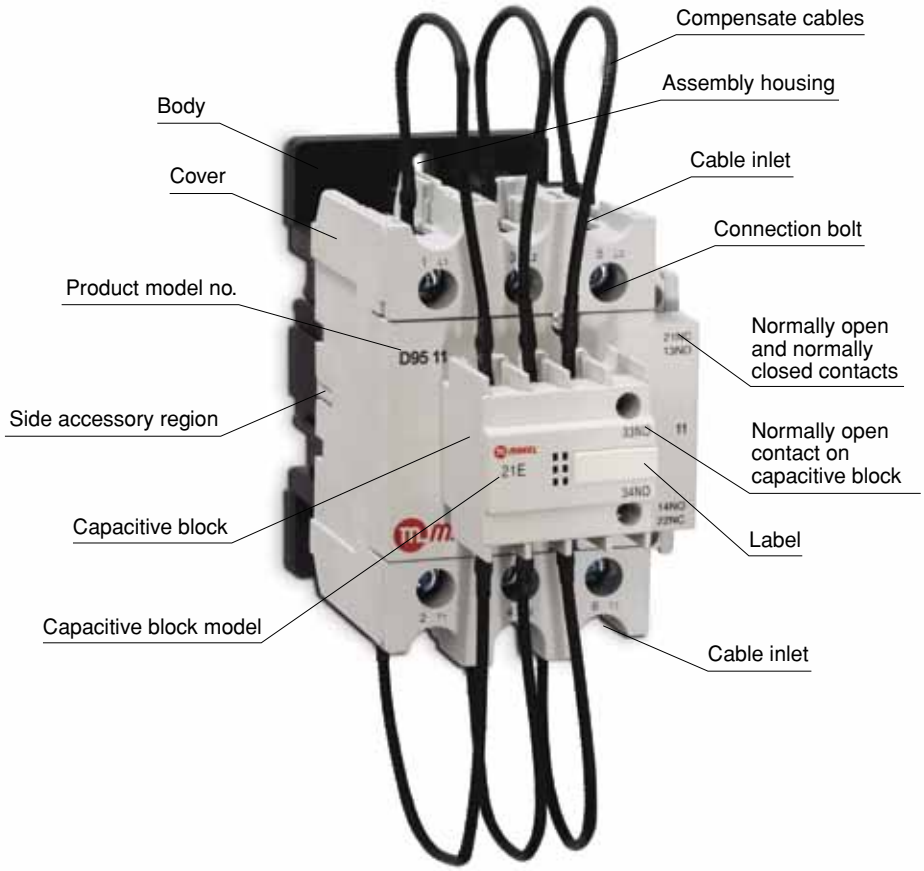
AC Contactor



Mini Contactor



AC Compensation Contactor



Three Poles Power Contactors

Product Name	Code No.	Nominal power kW (380V/415V) 50 HZ	AC3 Nominal current (A)	ACI (Ith) Thermal current (A)	Coil voltage (V AC)	Auxiliary contact	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
AC Contactor										
KNC1-0911	68000001	4	9	20	220 VAC	1 NA+1NK	1	20	7,69	410 x 220 x 100
KNC1-1211	68000002	5,5	12	25	220 VAC	1 NA+1NK	1	20	7,69	410 x 220 x 100
KNC1-1811	68000003	7,5	18	30	220 VAC	1 NA+1NK	1	20	7,69	410 x 220 x 100
KNC1-2511	68000004	11	25	32	220 VAC	1 NA+1NK	1	20	11,76	470 x 250 x 115
KNC1-3211	68000005	15	32	45	220 VAC	1 NA+1NK	1	20	11,84	470 x 250 x 115
KNC1-4011	68000015	18,5	40	50	220 VAC	1 NA+1NK	1	10	12,12	435 x 280 x 135
KNC1-5011	68000016	22	50	70	220 VAC	1 NA+1NK	1	10	12,14	435 x 280 x 135
KNC1-6511	68000017	30	65	80	220 VAC	1 NA+1NK	1	10	12,16	435 x 280 x 135
KNC1-8011	68000018	37	80	100	220 VAC	1 NA+1NK	1	10	14,67	470 x 278 x 143
KNC1-9511	68000019	45	95	120	220 VAC	1 NA+1NK	1	10	14,67	470 x 278 x 143
AC Mini contactor										
M06	68000011	2,2	6	20	220 VAC	1NA	1	100	17,42	540 x 273 x 135
M06	68000012	4	9	20	220 VAC	1NA	1	100	17,42	540 x 273 x 135
K09	68000013	4	9	20	220 VAC	1NA	1	100	18,83	520 x 345 x 145
K09	68000014	4	12	20	220 VAC	1NA	1	100	18,83	520 x 345 x 145

Product Name	Code No.	Contactor Type	Type of Mounting	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Auxiliary Contact Blocks							
2NO	67000036	KNC1-0911…..9511	Top	8	400	15,60	548 x 237 x 252
1NO+1NC	67000037	KNC1-0911…..9511	Top	8	400	15,60	548 x 237 x 252
2NO+2NC	67000038	KNC1-0911…..9511	Top	4	200	14,40	548 x 237 x 252
3NO+1NC	67000039	KNC1-0911…..9511	Top	4	200	14,40	548 x 237 x 252
1NO+3NC	67000040	KNC1-0911…..9511	Top	4	200	14,40	548 x 237 x 252
4NO	67000041	KNC1-0911…..9511	Top	4	200	14,40	548 x 237 x 252
4NC	67000042	KNC1-0911…..9511	Top	4	200	14,40	548 x 237 x 252

AC Contactor

AC Mini Contactor

Auxiliary Contact Blocks

Auxiliary Coils (AC Contactor AC Mini Contactor)

Coil Voltage (V AC)	Code No.	Contactor Type	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
220 VAC	67000071	KNC1-0911-1211-1811	4	200	15,50	435 x 258 x 246
220 VAC	67000072	KNC1-2511-3211	2	100	9,30	435 x 258 x 246
220 VAC	67000073	KNC1-4011-5011-6511-8011-9511	2	100	13,50	548 x 237 x 252
220 VAC	67000077	Mini 6A (M06)	6	300	10,40	435 x 258 x 246
220 VAC	67000078	Mini 9A (M06)	6	300	10,40	435 x 258 x 246
220 VAC	67000079	Mini 9A-1(K09)	4	200	7,70	435 x 258 x 246
220 VAC	67000080	Mini 12A (K09)	4	200	7,70	435 x 258 x 246
24 VAC	67000081	KNC1-0911-1211-1811	4	200	15,50	435 x 258 x 246
24 VAC	67000082	KNC1-2511-3211	2	100	9,30	435 x 258 x 246
24 VAC	67000083	KNC1-4011-5011-6511-8011-9511	2	100	13,50	548 x 237 x 252
24 VAC	67000087	Mini 6A (M06)	6	300	10,40	435 x 258 x 246
24 VAC	67000088	Mini 9A (M06)	6	300	10,40	435 x 258 x 246
24 VAC	67000089	Mini 9A-1(K09)	4	200	7,70	435 x 258 x 246
24 VAC	67000090	Mini 12A (K09)	4	200	7,70	435 x 258 x 246

Capacitive Contactors

Product Name	Code No.	Rated Current (A)	Operating Power AC3 400/440V (kVAr)	Bobbin Voltage (V AC)	Auxiliary Contac Q-nty	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
AC Compensation Contactor									
KNC19-09	68000006	9	4	220 VAC	1 NA+1NK	1	20	9,98	535 x 298 x 140
KNC19-12	68000007	12	6	220 VAC	1 NA+1NK	1	20	10,08	535 x 298 x 140
KNC19-18	68000008	18	9	220 VAC	1 NA+1NK	1	20	10,02	535 x 298 x 140
KNC19-25	68000009	25	15	220 VAC	1 NA+1NK	1	20	13,86	630 x 295 x 145
KNC19-32	68000010	32	20	220 VAC	1 NA+1NK	1	20	14,06	630 x 295 x 145
KNC19-40	68000020	40	25	220 VAC	1 NA+1NK	1	10	13,12	408 x 330 x 173
KNC19-50	68000021	50	30	220 VAC	1 NA+1NK	1	10	13,17	408 x 330 x 173
KNC19-65	68000022	65	33	220 VAC	1 NA+1NK	1	10	13,16	408 x 330 x 173
KNC19-80	68000023	80	40	220 VAC	1 NA+1NK	1	10	15,95	468 x 420 x 180
KNC19-95	68000024	95	45	220 VAC	1 NA+1NK	1	10	15,95	468 x 420 x 180

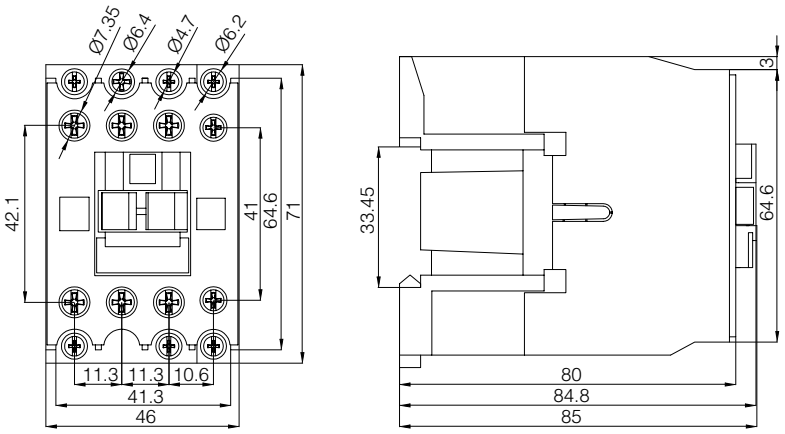
	Code No.	Bobbin Voltage (V AC)	Contactor Type
Spare Bobbins	67000074	220 V AC	KNC19-09-KNC19-12-KNC19-18
	67000075	220 V AC	KNC19-25-KNC19-32
	67000076	220 V AC	KNC19-40……95
	67000084	24 V AC	KNC19-09-KNC19-12-KNC19-18
	67000085	24 V AC	KNC19-25-KNC19-32
	67000086	24 V AC	KNC19-40……95

Spare Bobbins

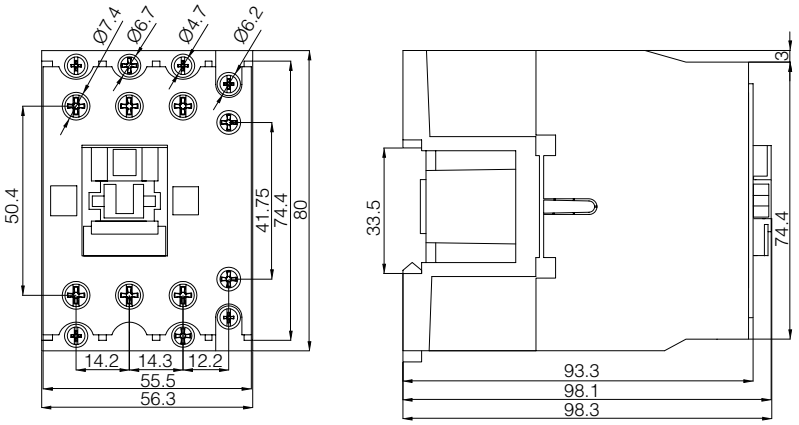
AC Compensation Contactor

Technical Drawings

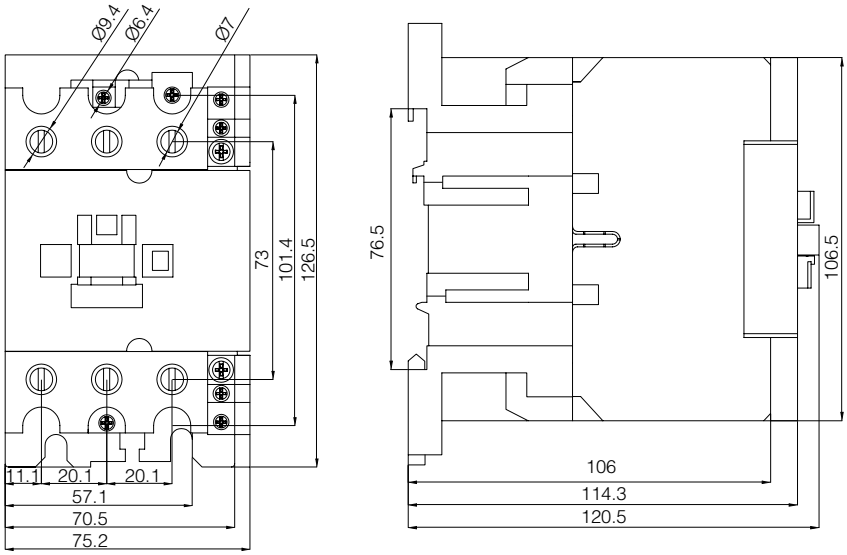
AC Contactor 18A



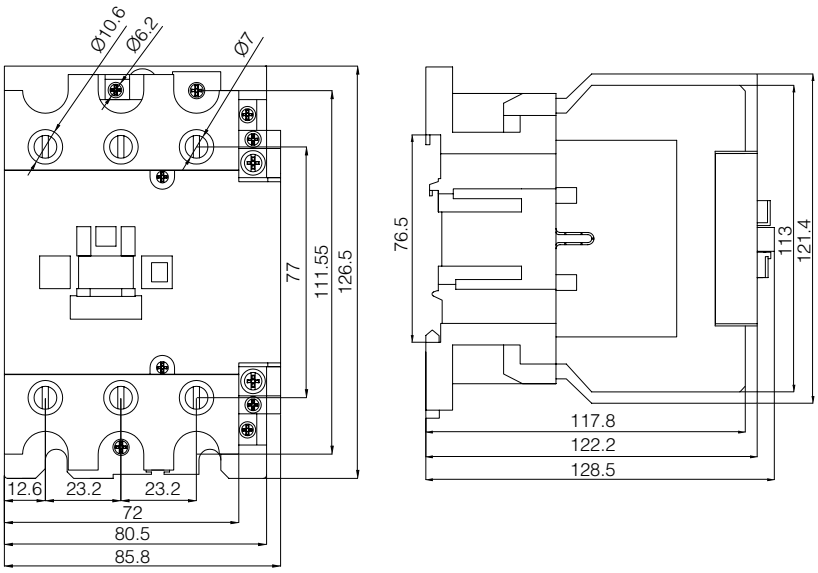
AC Contactor 32A



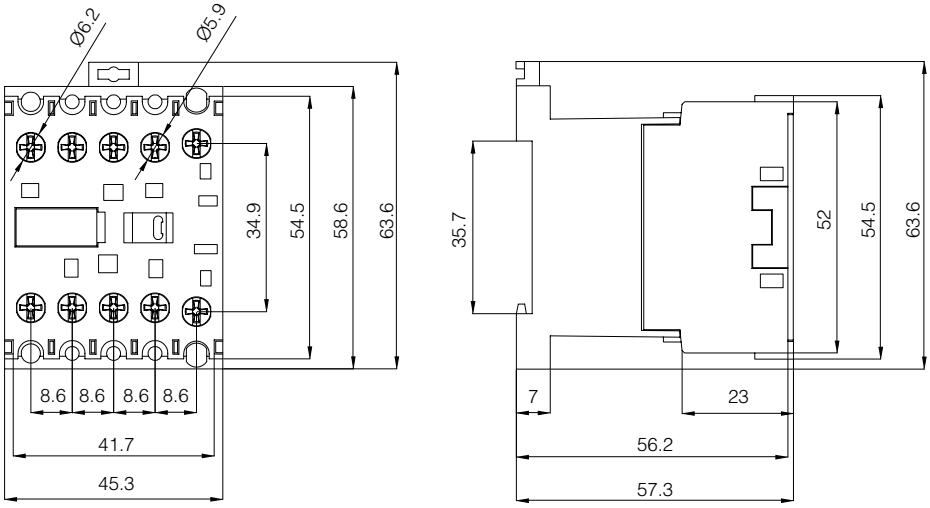
AC Contactor 65A



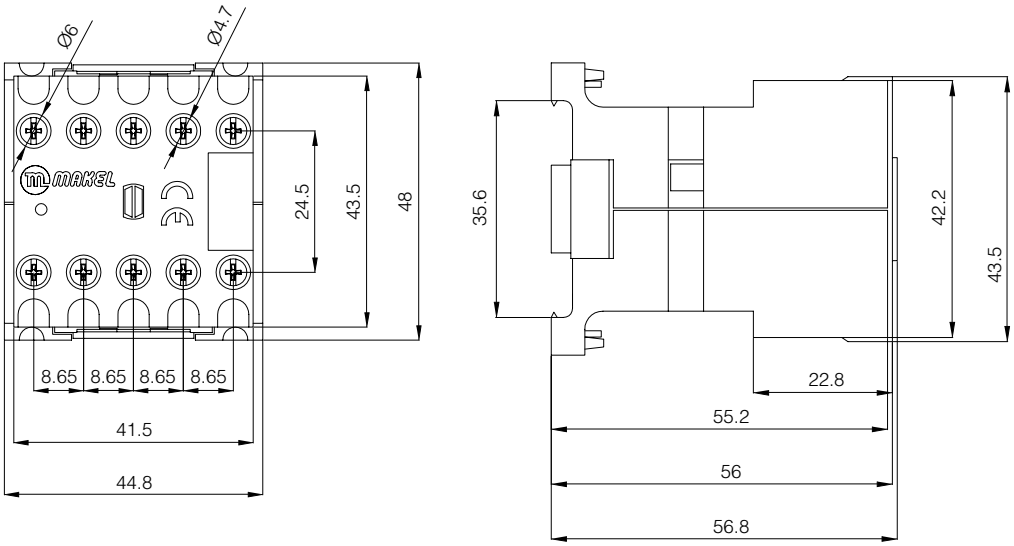
AC Contactor 95A



Mini Contactor K09

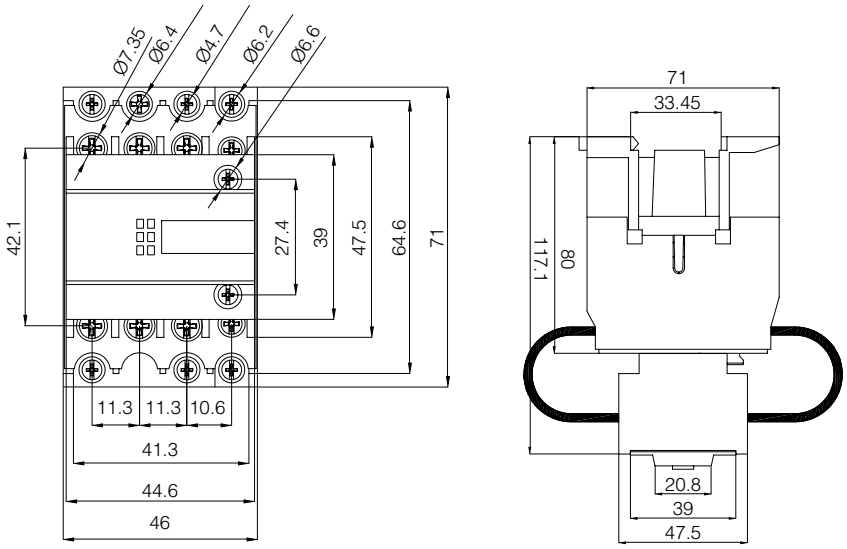


Mini Contactor M06



Technical Drawings

Capacitive Contactor 18A



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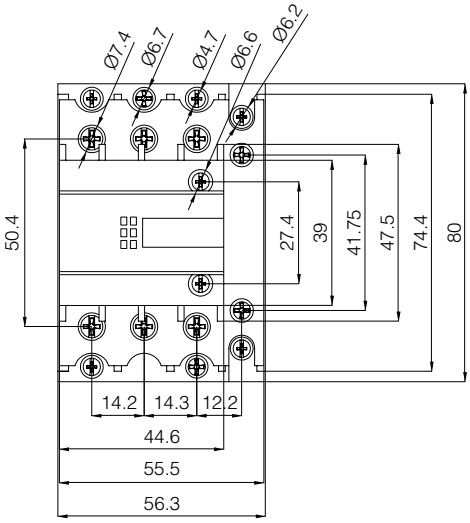
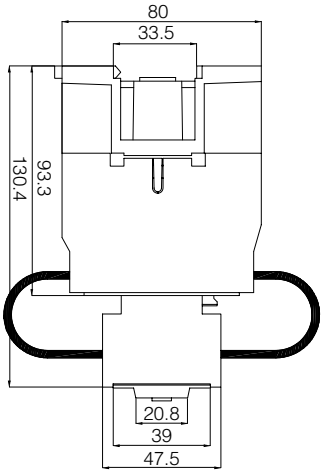
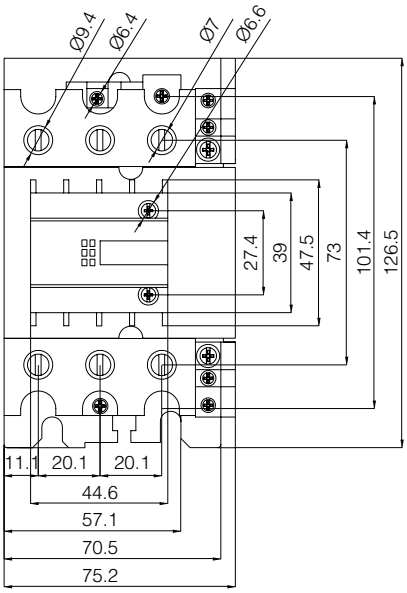
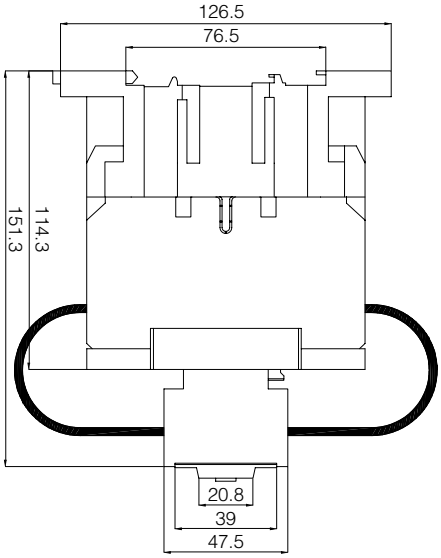


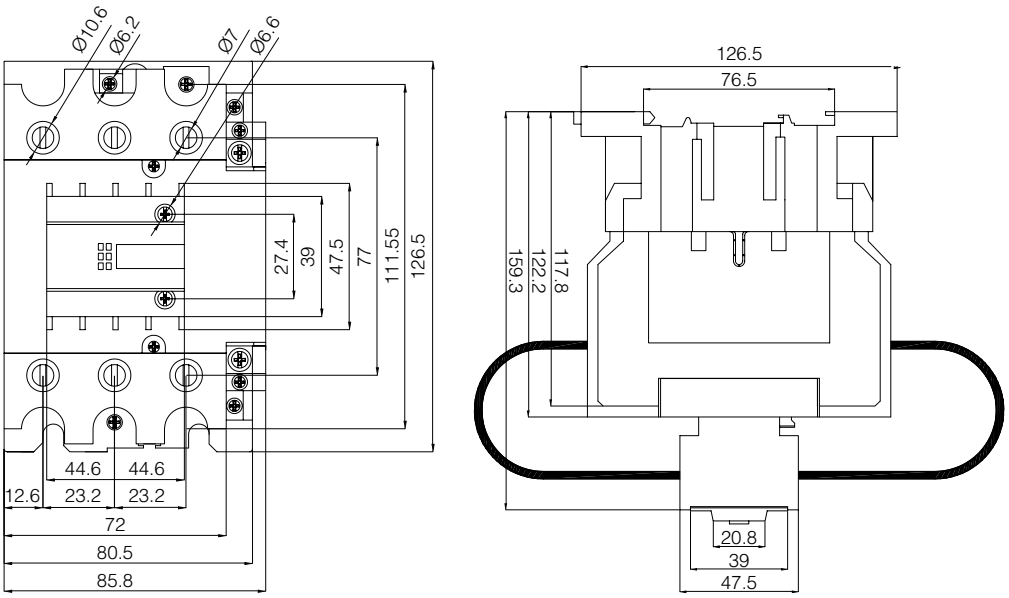


Capacitive Contactor 65A

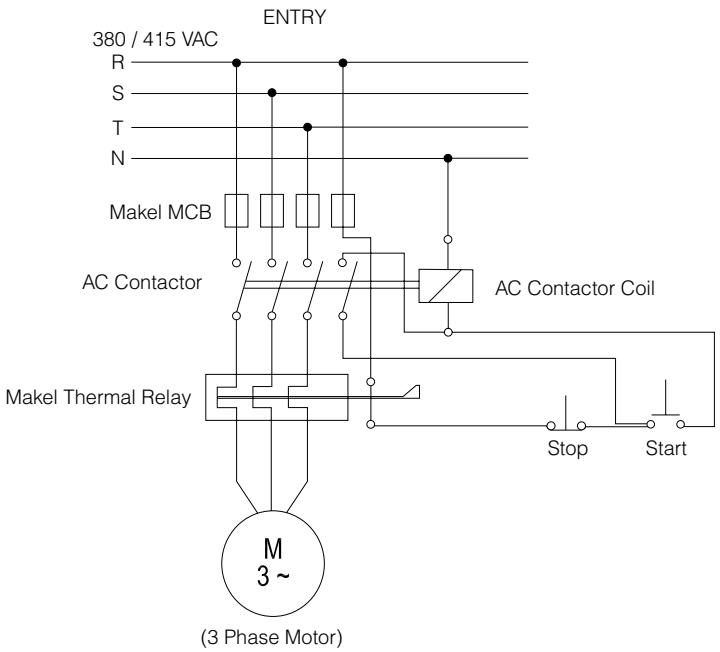




Capacitive Contactor 95A



Wiring Diagram



Motor Protection Starters

Maximum protection

The Makel Motor Protection Breakers are equipped with two opening elements which are thermal-overload and magnetic short circuit current.

Motor Protection Starters

The Makel Motor Protection Breakers are electrical switch products that thermal-magnetically protect the motor in situations that don't require the remote control of electrical motors, from start phase loss, overload and short circuits.

They are produced in accordance with TS EN 60947-4-1 standards, in 3kA short circuit breaker capacity in various nominal currents from 0.1A up to 32 A and CE and RoHS certified in compliance with the ISO 9001:2000 management system.

The Makel Motor Protection Breakers are equipped with two opening elements which are thermal-overload and magnetic short circuit current. The most important features that set the Makel Motor Protection Breakers apart from circuit breakers and automatic fuses are:

- By breaking all the phases at the same time when overload or short circuit occurs, it protects the motor and system.
- By turning off the motor in a very short time (millisecond) when a short circuit occurs it prevents possible damage.

The Makel KNS 12 type breakers have been designed especially for motor protection. They are stabilized using TS EN 60947-4-1. KNS 12 type breakers are used in the protection of electrical motors up to 15kW (380/400). Any user needs can be accommodated with a variety of accessories.

Fields of Application

The fields of application for the Makel Motor Protection Breakers are varied. Mainly they are used in starting electrical motors, compensation, activation and deactivation of heating and cooling systems, function under excessive loads, passage of current through a normal electrical circuit and in closing and transmit circuits and systems. Motor protection breakers are able to be operated remotely.

With a wide range of accessories and product diversity all user needs are fulfilled. If the Makel Motor Protection Relays (with PTC) are used with the Motor Protection Breakers the motor's temperature is maintained under control as well.

The accessory blocks of motor protection breakers are easily attached and detached. Also the motor protection breakers have a storage box for wet situations. Easy assembly and connection flexibility has been provided.

The motor protection breakers work with full efficiency in ambient temperatures between -5°C and 55°C and are mounted on panels using bolts or standard 35 mm DIN rails. The motor protection breakers are resistant to 1000 V voltage with the raw materials that are used.

Features of the Motor Protection Breakers

- Motor protection is achieved with the thermal magnetic protection instruments within the motor protection breakers.
- The opening threshold of magnetic elements (short circuit protection) is equal to 13 times the value of the maximum motor protection breaker used for thermal opening currents and cannot be set to another value.
- The thermal elements (overload protection) have automatic protection against changes in ambient temperature.
- The nominal operation current of the motor is shown with a button that has different levels. Personnel protection has also been provided.
- All electrical parts are protected against direct contact.
- By adding a low voltage opening unit the power can be cut off when the voltage of the motor protection breaker gets low. Since the user needs to push the "I" start button to restart the motor the machine is protected against suddenly moving forward when normal voltage is provided.
- By adding a shunt opener the device power can be cut off remotely.
- Both the open and cased motor protection breaker operators can be locked with up to 3 locks on the "O" stop position. Since they are suitable for insulation these motor protection breakers in open position provide sufficient insulation and show the actual location of the operators and moving contacts.

General Specifications

Makel Motor Protection Breakers (low voltage motor starters) are produced from 0.1A to 32 A in accordance with the TS EN 60947-4-1 standard. Motor protection breakers are AC motor starters that start motors in order to get them to the right speed, make sure they operate continuously, protect them against heat loads in operation and enable the protection of relevant circuits and motors by cutting off the motor's supply voltage. They protect the motor circuits they are attached to both thermally and magnetically. The Motor Protection Breakers are used in protection against overload and short circuits in motors up to 15kW (380V).

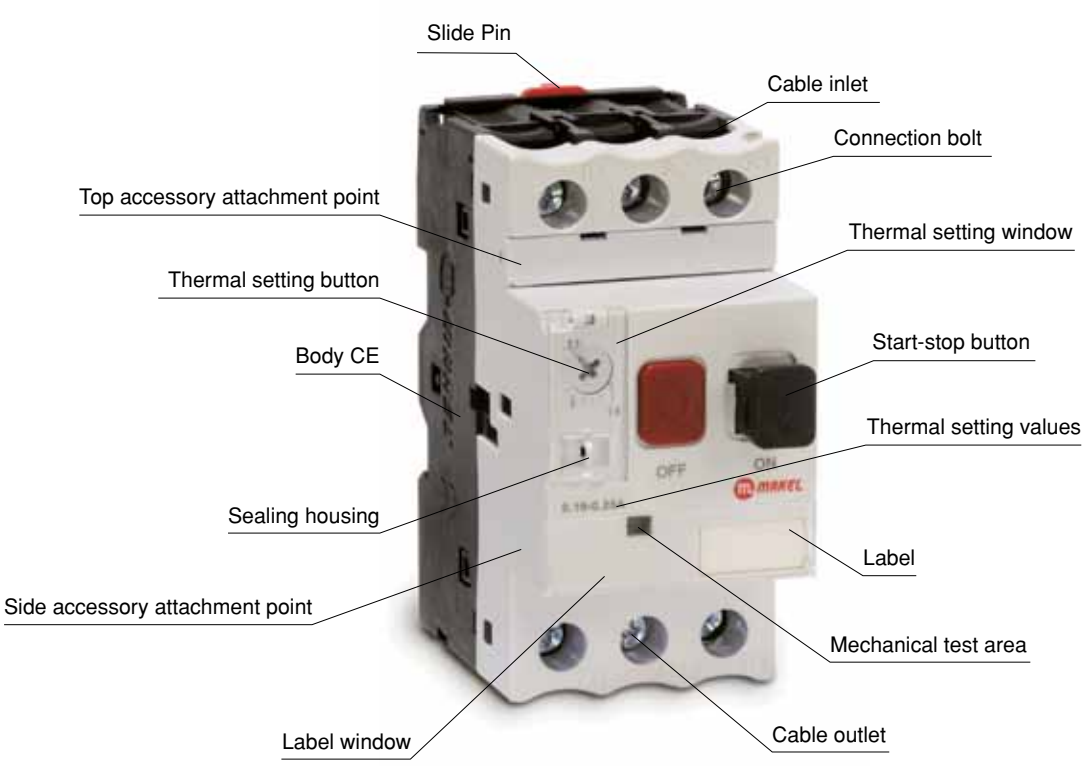
Motor protection starters are used for overload and short circuit protection.

Technical Specifications

Features	KNS 12
Use Class	AC 3
Number of Poles	3 Poles
Nominal Voltage (V) AC	380V/415 V
Nominal Current (A) AC	from 0.1 A to 32 A
Nominal Insulation Voltage (V)	690
Nominal Impact Resistance Voltage Uimp (kV)	6
Thermal Current I th max. = In max. (A)	32
Mechanical Life (operation)	1 000 000
Electrical Life (according to AC 3 class)	100 000 operation
Short Circuit Breaking Capacity (I cu) 400 V	3 kA
Operation Short Circuit Breakage Capacity (Ics)400V	> (8-12) *In
Min. - max. conductor section (mm)	0.75…4
Min. - max. tightening torque(Nm)	2--3
Operation Frequency (Hz)	50/60 Hz
Protection Class	IP 20
Useful Life	10 Years
Weight (Kg)	0.260

All electrical parts are protected against direct contact.

Product Features



Thermal Magnetic Motor Protection Breakers (Starters)

	Code No.	Nominal Power AC3 400V (kW), 50/60Hz	Thermal Setting Field [A] (40°)	Short Circuit Breaking Capacity (KA) 400V-415V	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
AC Compensation Contactor	69000001	0,02	0,10-0,16	100 kA	1	50	14,21	480 x 255 x 180
	69000002	0,06	0,16-0,25	100 kA	1	50	14,21	480 x 255 x 180
	69000003	0,09	0,25-0,40	100 kA	1	50	14,21	480 x 255 x 180
	69000004	0,12	0,40-0,63	100 kA	1	50	14,21	480 x 255 x 180
	69000005	0,25	0,63-1,00	100 kA	1	50	14,21	480 x 255 x 180
	69000006	0,37	1,00-1,60	100 kA	1	50	14,21	480 x 255 x 180
	69000007	0,75	1,60-2,5	100 kA	1	50	14,21	480 x 255 x 180
	69000008	1,5	2,5-4	100 kA	1	50	14,21	480 x 255 x 180
	69000009	2,2	4-6,3	100 kA	1	50	14,21	480 x 255 x 180
	69000010	4	6-10	100 kA	1	50	14,21	480 x 255 x 180
	69000011	5,5	9-14	15 kA	1	50	14,21	480 x 255 x 180
	69000012	7,5	13-18	15 kA	1	50	14,21	480 x 255 x 180
	69000013	9	17-23	15 kA	1	50	14,21	480 x 255 x 180
	69000014	11	20-25	15 kA	1	50	14,21	480 x 255 x 180
	69000015	15	24-32	10 kA	1	50	14,21	480 x 255 x 180

Motor Protection Breakers

Product Name	Code No.	Technical Features	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Accessories						
Storage Box (Empty)	67000053	-	1	50	13,696	500 x 500 x 315
Auxiliary Contact (Mountedon Left)	67000054	1NO +1NC	1	100	5,59	467 x 200 x 157
Auxiliary Contact (Mounted on Front)	67000055	1NO +1NC	4	400	9,59	467 x 200 x 157
Shunt Release	67000057	220 V AC	1	50	5,981	465 x 290 x 74
Under Voltage	67000058	220V AC	1	50	6,181	465 x 290 x 74
Alarm Outlet Contact Release	67000059	1NO +1NC	1	100	5,49	467 x 200 x 157

Storage Box

Under Voltage Release

Shunt Release

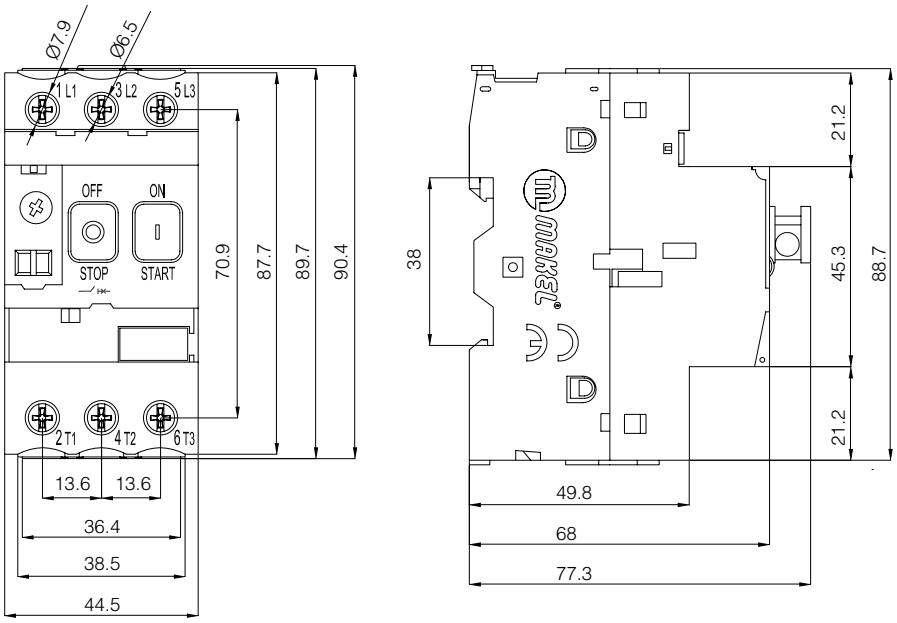
Alarm Outlet Contact

Auxiliary Contact (Mounted Left)

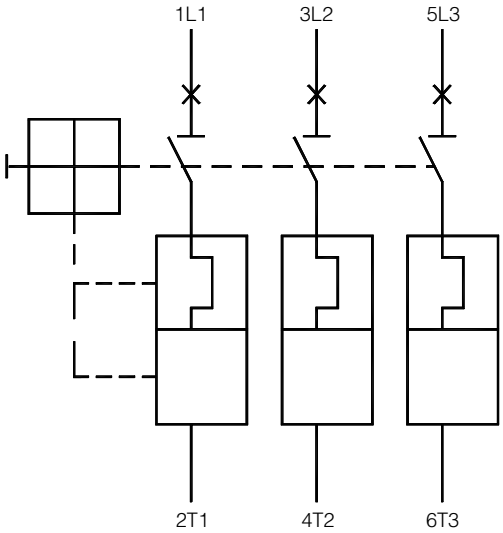
Auxiliary Contact (Mounted on Front)

Technical Drawing

Motor Protection Breaker



Wiring Diagram



Thermal Relays

Phase loss protection

Thermic Relays are electrical switchgear products providing protection against excess current.

Thermal Relays

The Makel Thermal Relays protect the motor by inactivating the motor through the contactor when there is an overload or one of the phases is cut off.

Thermal relays are produced in accordance with TS EN 60947-4-1 standards, in 3kA short circuit breaker capacity in various nominal currents from 9A up to 95 A and CE and RoHS certified in compliance with the ISO 9001:2000 management system.

Thermal relays are produced in compensation against ambient temperatures and sensitive to phase loss. Compensated against ambient temperatures, thermal relays operate within limits without being affected by ambient temperatures (the thermal relays specified in the standard).

In the event of one of the phase conductors detaching the motors are left to 2 phases and may draw more voltage than normal causing them to burn. To prevent this the thermal relays, which are sensitive to phase loss, open faster than usual when one of the phases is cut off to protect the motor.

Auxiliary Contacts: The opener activates two contacts, one that closes and one that cuts off. The cut off contact inactivates the motor contact to cut off the power going to the motor whereas the closing contact is used for other purposes.

Reset Button: Used in automatic and manual setting. In (A) automatic setting after the bimetals have cooled down the thermal relay automatically makes the contactor activated. In (M) manual setting the reset button must be pressed after the bimetals have cooled in order to reactivate the contactor.

Test Button: Whether or not the motor contactor has been inactivated is checked by pressing the test button.

Stop Button: Used to inactivate the motor contactor in emergency situations.

Fields of Application

Makel Thermal Relays have many varied fields of application.

Thermal relays are electrical switch products which protect the electrical circuit they are attached to from excessive currents. They are produce in compliance with the international IEC 60947-4-1 and TS EN 60947-4-1 standards and the ISO 9001:2000 management system and are CE and RoHS certified.

The bimetal material in thermal relays heats up and show mechanical change when the electrical equipment the relays are attached to are exposed to excessive currents, one of the phases breaks away and the equipment malfunctions. As a result of this change the thermal relays cut off conduction. Through auxiliary contact exits the relays ensure that the circuit of the control contactor they are attached to is cut off as well.

The thermal relays are manufactured in various nominal currents from 0.16 A to 50 A.

Makel Thermal Relays are easily attached and detached with DIN rail accessories. Also easy assembly and connection flexibility is provided with the DIN rail accessories for the thermal relays.

The thermal relays work with full efficiency in ambient temperatures between -5°C and 55°C and are mounted on panels using bolts or standard 35 mm DIN rails. The thermal relays are resistant to 1000 V voltage with the raw materials that are used.

Thermal relays are produced in a variety of nominal currents from 0.16 to 95 A.

General Specifications

- 1NA +1NK auxiliary contact
- Easy assembly
- Bimetal opening feature
- Phase line protection
- Release display
- Current setting
- Automatic and manual reset button
- Test and stop button
- Unaffected by motor starting
- Mountable on DIN rail with the help of an electrical terminal block
- Useful Life: 10 years

The thermal relays are resistant to 1000 V voltage with the raw materials that are used.

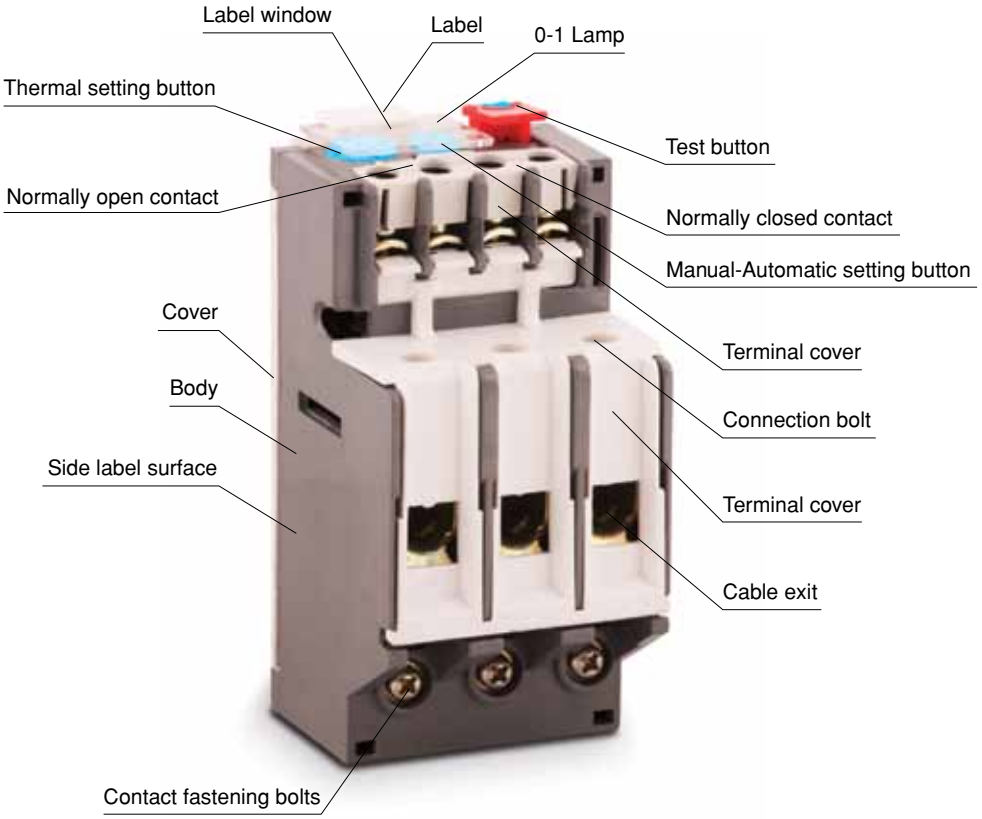
Technical Specifications

Thermal Relay

	KNR 25	KNR 32	KNR 65	KNR 95
Use Class	AC 3	AC 3	AC 3	AC 3
Number of Poles	3 Poles	3 Poles	3 Poles	3 Poles
Nominal Voltage (V) AC	380V /415 V	380V /415 V	380V /415 V	380V /415 V
Nominal Current (A) AC	0.1 … 25 A	25 … 32 A	45 ... 65 A	65 A … 95 A
Nominal Insulation Voltage (V)	690	690	690	690
Nominal Impact Resistance Voltage Uimp (kV)	6	6	6	6
Current Setting Field (A)	From 0.1 A to 25 A	From 25A to 32 A	From 32 A to 65 A	From 65 A to 95 A
Opening Class (A)	10	10	10	10
Maximum Operation Height (m)	2000	2000	2000	2000
Heat Compensation (°C)	25 … + 55 degrees	25 … + 55 degrees	25 … + 55 degrees	25 … + 55 degrees
Auxiliary Contactor 1Na + 1NK	230 V (Ie)/95-95 (NK)/3A /97-98 (NA)/2A 400 V (Ie) /95-95 (NK)/1,5 A /97-98 (NA)/1A	3A 2A 1,5 A 1A	3A 2A 1,5 A 1A	3A 2A 1,5 A 1A
Types of Contactors Can be Used With	(KNC1-0911-1211 1811-2511), (KNC19-09-12-18-25)	(KNC1-2511-3211), KNC19-25-32)	(KNC1-4011-5011-6511), (KNC19-40-50-65)	(KNC1 - 8011-9511), (KNC19-80-95)
Mechanical Life (operation)	100 000	100 000	100 000	100 000
Electrical Life (according to AC 3 class)	10 000 operation	10 000 operation	10 000 operation	10 000 operation
Min.-max. conductor section (mm)	0,75 …. 4	0,75 …. 4	0,75 …. 16	0,75 …. 25
Min.-max. tightening torque (Nm)	2,5 -- 4,5	2,5 -- 4,5	2,5 --4,5	2,5 -- 4,5
Operation Frequency (Hz)	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Protection Class	IP 20	IP 20	IP 20	IP 20
Useful Life	10 Years	10 Years	10 Years	10 Years
Weight (Kg)	0,131	0,145	0,325	0,346

Thermal relays are produced in compensation against ambient temperatures and sensitive to phase loss.

Product Features



Thermal Relays

Product Name	Code No.	Thermic Setting Field	Contactor Type	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
KNR 25	70000018	0,1 - 0,16 A	KNC1-09 KNC1-12 KNC1-18 KNC1-25	1	100	16,172	530 x 390 x 180
	70000019	0,16 - 0,25 A		1	100	16,172	530 x 390 x 180
	70000001	0,25 - 0,40 A		1	100	16,172	530 x 390 x 180
	70000002	0,40 - 0,63 A		1	100	16,172	530 x 390 x 180
	70000003	0,63 - 1 A		1	100	16,172	530 x 390 x 180
	70000004	1,0 - 1,6 A		1	100	16,172	530 x 390 x 180
	70000020	1,3 - 1,8 A		1	100	16,172	530 x 390 x 180
	70000005	1,6 - 2,5 A		1	100	16,172	530 x 390 x 180
	70000021	2,2 - 3,1 A		1	100	16,172	530 x 390 x 180
	70000006	2,5 - 4 A		1	100	16,172	530 x 390 x 180
	70000022	3,5 - 5 A		1	100	16,172	530 x 390 x 180
	70000007	4,0 - 6,0 A		1	100	16,172	530 x 390 x 180
	70000008	5,5 - 8,0 A		1	100	16,172	530 x 390 x 180
	70000009	7,0 - 10 A		1	100	16,172	530 x 390 x 180
	70000010	9 - 13 A		1	100	16,172	530 x 390 x 180
	70000011	12 - 18 A		1	100	16,172	530 x 390 x 180
	70000012	18 - 26 A		1	100	16,172	530 x 390 x 180
KNR 32	70000023	23 - 32 A	KNC1-25	1	100	17,832	510 x 390 x 200
	70000013	28 - 36 A	KNC1-32	1	100	17,832	510 x 390 x 200
KNR 65	70000024	8 - 26 A	KNC1-40 KNC1-50 KNC1-65	1	50	18,432	490 x 315 x 245
	70000025	22 - 32 A		1	50	18,432	490 x 315 x 245
	70000026	28 - 40 A		1	50	18,432	490 x 315 x 245
	70000014	34 - 50 A		1	50	18,432	490 x 315 x 245
	70000015	45 - 65 A		1	50	18,432	490 x 315 x 245
KNR 95	70000016	63 - 85 A	KNC1-80	1	50	18,832	490 x 315 x 245
	70000017	80 -100 A	KNC1-95	1	50	18,832	490 x 315 x 245

Mini-Thermal Overload Relay

Product Name	Code No.	Thermic Setting Field	Contactor Type	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
KNRK-09	70000027	0,36 - 0,54 A	M06 - K09	1	100	14,95	530 x 390 x 180
	70000028	0,54 - 0,80 A		1	100	14,85	530 x 390 x 180
	70000029	0,80 - 1,20 A		1	100	14,95	530 x 390 x 180
	70000030	1,20 - 1,80 A		1	100	14,95	530 x 390 x 180
	70000031	1,80 - 2,60 A		1	100	15,00	530 x 390 x 180
	70000032	2,60 - 3,70 A		1	100	14,95	530 x 390 x 180
	70000033	3,70 - 5,50 A		1	100	14,95	530 x 390 x 180
	70000034	5,50 - 8 A		1	100	14,75	530 x 390 x 180
	70000035	8 - 11,50 A		1	100	15,00	530 x 390 x 180
	70000036	10 - 14 A		1	100	14,85	530 x 390 x 180
	70000037	12 - 16 A		1	100	14,90	530 x 390 x 180

Product Name	Code No.	Thermic Setting Field	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Accessories						
DIN Rail Part For The Mini-Thermal Overload Relay	67000120	(18-32A)	1	100	7,55	530 x 415 x 195
DIN Rail Part For The Mini-Thermal Overload Relay	67000121	(65-95A)	1	50	6,62	505 x 328 x 258
DIN Rail Part For The Mini-Thermal Overload Relay (KNRK-09)	67000122	(0,36-16A)	1	100	5,90	530 x 390 x 180


KNR 25


KNR 32

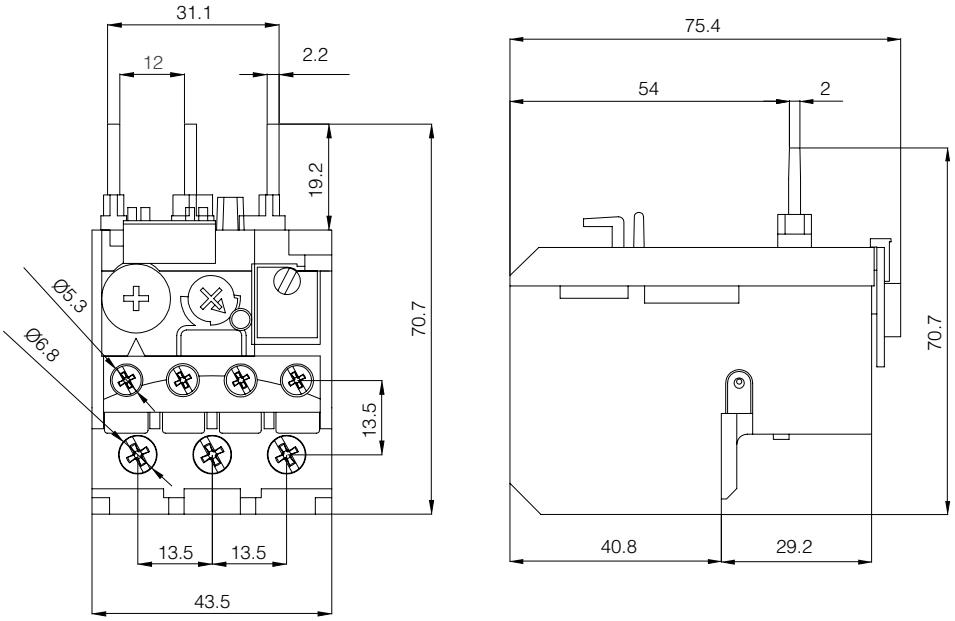

KNR 65


KNR 95

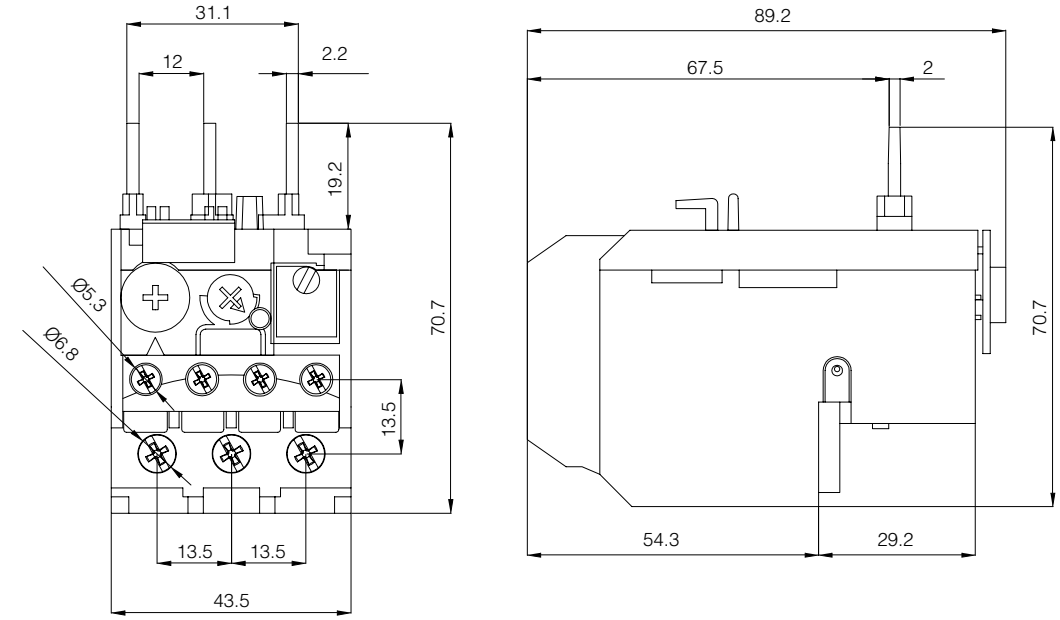

Mini-Thermal Overload Relay

Technical Drawings

Thermal Relay 18A

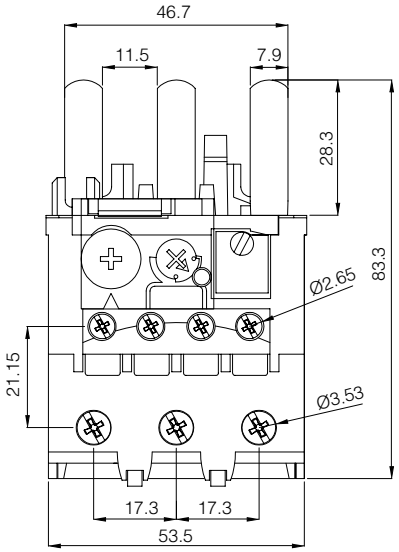


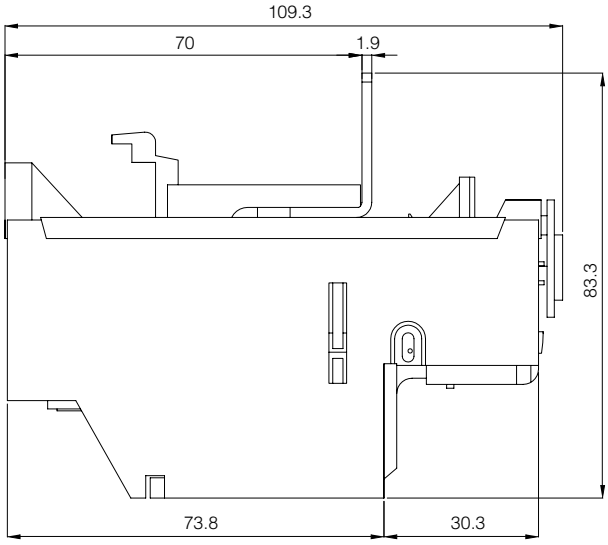
Thermal Relay 32A



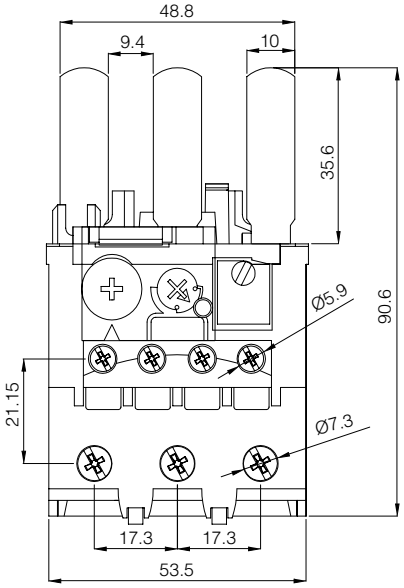
Technical Drawings

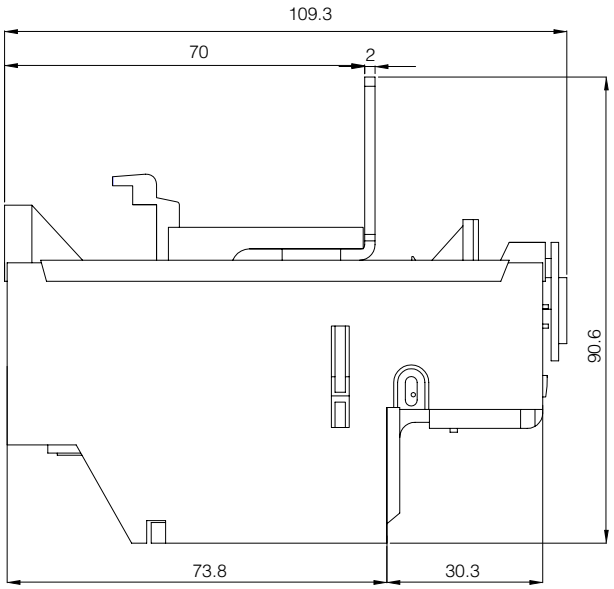
Thermal Relay 65A



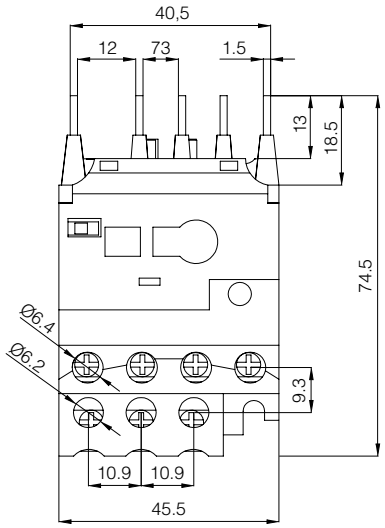


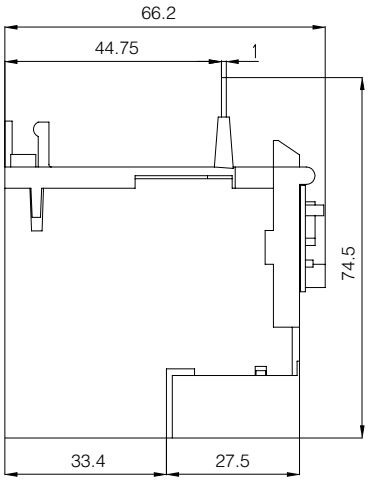
Thermal Relay 95A



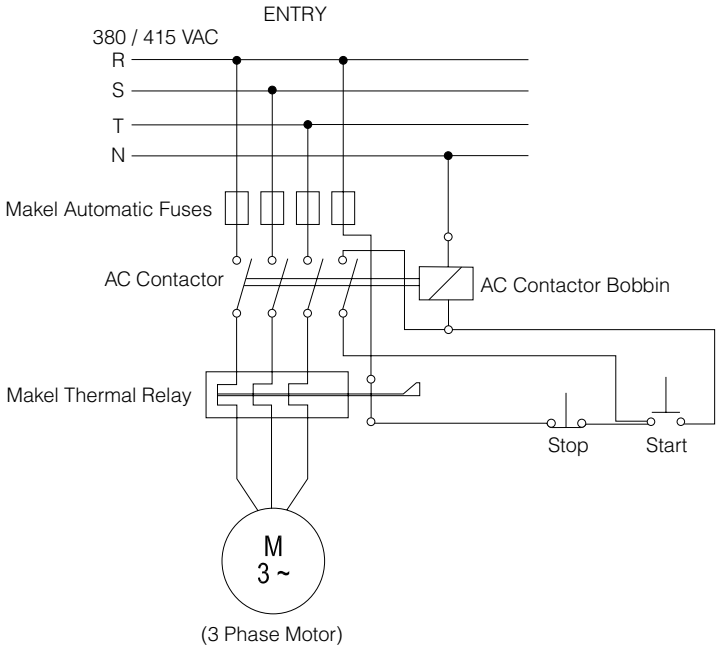


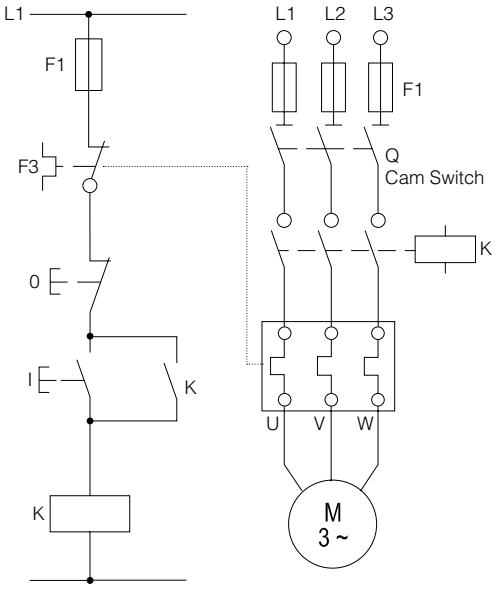
Mini-Thermal Overload Relay

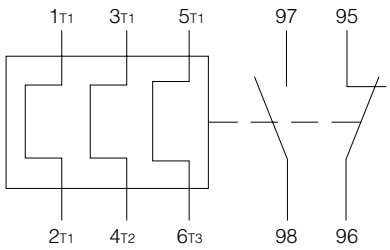


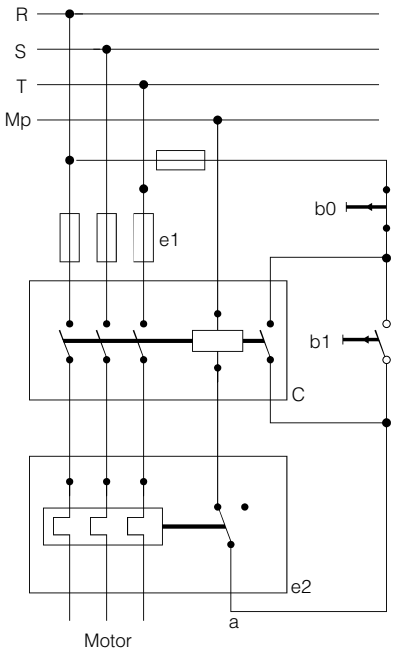


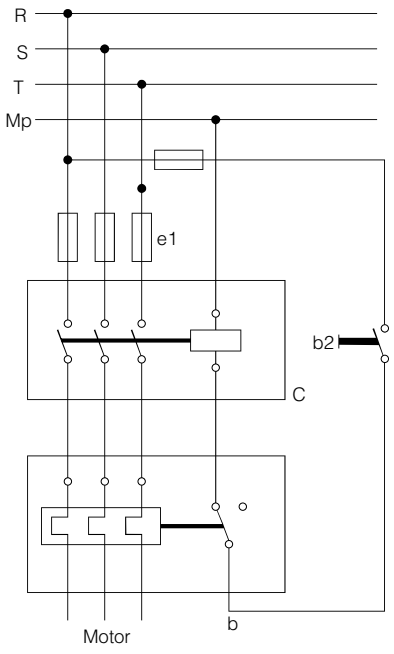
Wiring Diagrams











a: The opening and closing of the contactor with the command button; no re-closing prevention on the relay.

b: Command with constant contact; relayed equipped with re-closing prevention.

c: Contactor

e1: Fuses

e2: Thermal Relay

b0: Open Button

b1: Operation Button

b2: Constant Contact

b3: Button to turn on reclosing prevention

Reactive Power Compensation Relay
Multimeter / Ampermeter / Voltmeter

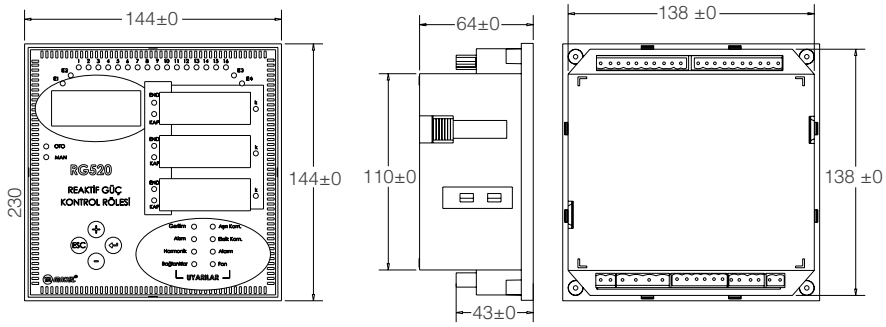
Your energy is protected

Makel Reactive power control relays meet your compensation needs perfectly, the panelmeters seamlessly tracks your energy, will allow you to monitoring and controlling over the internet with modem and gateway products.

Reactive Power Compensation Relay

Makel RG500 series Reactive Power Compensation Relay offers professional solutions for companies reactive power compensation needs, with its superior features such as wide current operating ranges starting from very low currents, ability and the ability to make inductive and capacitive compensation in 20 steps and other features

Technical Drawing



General Specifications

- It has 16 Capacitor ranges and 4 (2 alarm and fan choice) inductance ranges. These ranges can be established as mono phase, three phases or between phases connection. Due to the ability to compensate separately for each phase, especially in systems with unbalanced loads produces successful solutions.
- Two-way compensation can be made. This means that both capacitors and inductors can be used. With this feature places where have capacitive loads (air conditioning, SMPS, PC, Fluorescent and CFL-based lighting) such as banks, hotels, shopping centers, service sector companies, successful compensation can be done.
- Displays voltage, powers, cosφ, frequencies, total energies for all three phases and time and temperature.
- Harmonic measurement is available up to 21. harmonic and provides current and voltage harmonics protection.
- Overvoltage, undervoltage, overcurrent, ratio error, harmonic error, compensation error, and such as overtemperature error can be detected and alarm relay output for each one, or compensation control can be set.
- Keeps error log records. The times at which errors occur, and recovery time with the error types are recorded.
- Total active, inductive and capacitive energies are fixed and 3 phase x 3 channels load profile recording are optional. User replaceable 3 channels optional parts. For example; such as cosφ, currents, voltages. In addition, the period of recording is left to the user's needs.
- Using Fan output, a fan can be started and stopped between the desired temperatures Thus, temperature control for compensation panel doesn't need another temperature measurement system.
- Automatic test are available for the finding the reactive loads in ranges. In this way, the range powers are perceived automatically without the need to manually entering the capacitor or inductor powers. Additionally, daily control is available for the power values whether or not defective. User can disable or enable this control.
- If the current flow direction is false, it corrects reversed phase automatically in the Test mode. If phase sequence error is detected, system will continue compensation and will give corresponding error warning.
- Password protection is available also left to the user's request. When the password protection is active, all programming menu will protected. Thus, the compensation settings and alarm operations will be protected from accidental accesses and system will run properly as set before.
- It supports modbus protocol on RS485 communication. A Special PC software are available for reading or manipulating relay settings remotely.
- Enables easy usage with four separate screen.
- With its improved compensation algorithm decreases the number of switching. Thus, life of the capacitors and contactors will be longer.
- Ranges ON, OFF and discharge time settings are adjustable.

Model No.	Code No.	Max. Number of Ranges	Measurement Devices with RS485 VL1, VL2, VL3 IL1, IL2, IL3 Hz P1, P2, P3, Q1,Q2, Q3, S1, S2, S3 Cosφ1, Cosφ2, Cosφ3, ΣkWh ΣkVARh(ind) %ind ve %kap Load Profile Error Record	3 Phase	V (Voltage)	I (Current)	Cosφ	Three-Phase Capacitor	Three-Phase Capacitor	Support For Balanced and Unbalanced Loads	Active Power (W)	Reactive Power (Var)	Apparent power (VA)	kWh	kVARh	% THD-I	% THD-V	1-21. Harmonics (for current and voltage)	Shunt Reactor	Generator Detection	RS-485 Modbus	Temperature Measurement and Fan Output Relay	Alarm Functions	Real Time-clock	Equal Aging	Load Profile	Error Record	Password Protection	Led Display	144 x 144
RG 520 EC	152033007	20	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RG 520 E	152033008	20	–	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–	■	■	■	■	■	–	–	■	■	■
RG 518C	152033009	16	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–	■	■	–	■	■	■	■	■	■	■	■	■
RG 518	152033010	16	–	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	–	■	■	–	■	■	■	■	■	–	–	■	■	■

Technical Specifications

Operating Voltage (Un)	220V AC
Operating Measuring Range	3mA – 6A
Operating Voltage Range	(0,68 – 1,36)xUn (150-300V)
Operating Current Range	0,015 – 6A
Operating Frequency	50Hz
Operating Temperature Range	-30 to +85 degree
Number of Ranges	16 capacitors, 2+2 inductors (+2 alarm and fan out change)
Range Powers	Mono phase, three phase and between phases able to connecting Capacitors or Inductors,automatic steps power sense
Power Consumption	<4VA
Relay Contact capacity	5A
Screen	1 line 4 digits alpha numeric and 3 line 4 digits 7 segment led display
Wire Diameter	2,5 mm
Safety Class	IP20 and IP40
Connection Type	Terminal connection
Displayed Parameters	Cosφ, Current, Voltage, frequency, Total active, inductive, capacitive energies Apparent power, active power, reactive power Harmonic measuring (include 21. harmonic) Temperature measuring, real time calendar and hour
Measuring Accuracy	Voltage, current and Cos = 1%
	Active, reactive and apparent power = 1%
Setting Limits	Temperature between 25 to 85 degree = +/- 5 degree Target Cosφ = 0.8 inductive to 0.8 capacitive Current transformer ratio = 5/5 to 5000/5 Voltage transformer ratio = 220 /220 Step On, Off and discharge times = 1to 180 second
RS 485 Communication ModBus	Address range = 1 to 247 Baud rate = 1200, 2400, 4800, 9600, 19200 and 38400 bps
Load Profile	Record period = 1, 5, 10, 15, 30, 60 minute Record type = Energies and 3 phase x 3 channel change Max record time = 19 hours to 48 days
Error Log Records	Max record number = 192 number
Alarm Functions	Low and over voltage, Over current, over temperature, Harmonic protection, Poor or over compensation, Rate error
Fan Function	On board temperature control relay
Password Protection	Exist

	Model No.	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Reactive Power Compensation Relay						
New	RG 520-EC	152033007	1	6	10,26	285 x 475 x 275
New	RG 520-E	152033008	1	6	10,26	285 x 475 x 275
New	RG 518-C	152033009	1	6	10,26	285 x 475 x 275
New	RG 518	152033010	1	6	10,26	285 x 475 x 275

Multimeter / Ampermeter / Voltmeter

Industries can keep their energy supply healthy, by monitoring and supervising their power system with the help of Makel Panelmeter solutions. Makel panelmeter products with reactive power control relay offer complete product portfolio to its customers.

Panelmeter product portfolio includes 3-phase measuring M6T, M3T Multimeters, V3T Voltmeters and 1-phase measuring A1M Ammeter, V1M Voltmeter products. A1M and V1M have single display group, M3T and V3T have 3 display group and M6T has 6 display group.

General Specifications

- Voltmeters are three phase devices and can measure line-neutral voltages, line-line voltages and phase frequencies.
- Multimeters are multifunctional devices which can measure many electrical parameters of the system. Multimeters can measure phase currents, line-neutral voltages, line-line voltages and phase frequencies. They can also calculate the neutral current and cosφ values.
- Panelmeter models can generate alarms via relays if the system parameters like currents and voltages go out of the boundary limits which user configures or if there is a phase sequence error.
- Panelmeters have 3 or 6 group of 4 digit seven segment displays. User can see 3 phase data at the same time.
- Maximum values of currents, line-neutral voltages, line-line voltages, demands of currents and minimum values of currents, line-neutral voltages, line-line voltages are recorded in its flash memory and can be displayed.
- The metering menu of the multimeter can be changed automatically in period of from 1 to 15 seconds.
- Maximum demand period can be adjusted.
- Current and voltage transformer ratio can be configured.
- To prevent unauthorized person to change the configuration, it is possible to activate password control.
- Current starting delay can be set for motor applications.
  Instant tripping property can be activated separately for current, voltage and frequency values.
- Latch property of relays of the panelmeter can be activated and the default position of the relays can be reversed.
- Modbus RTU protocol is supported over RS485 line. So the measured values and configuration values can be read and configuration values can also be changed.

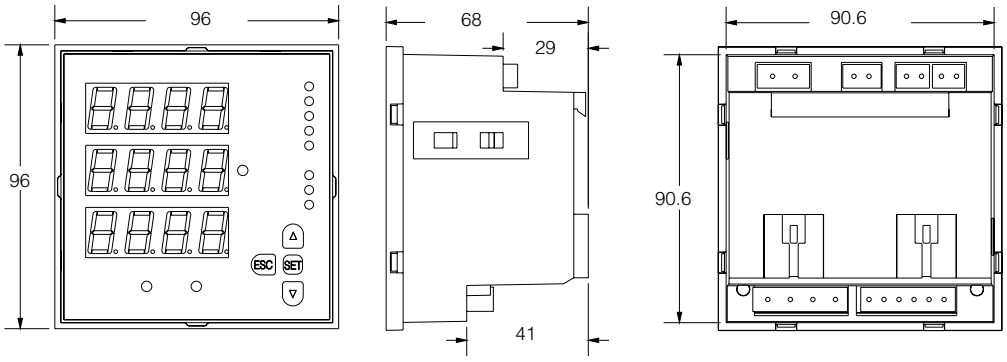
Multimeter M3T

Multimeter M6T

Voltmeter V3T

	Model No.	Code No.	Panel type I1, I2, I3	Voltage Phase-neutral VL1N,VL2N,VL3N	Voltage phase-phase VL12 , VL23, VL13	Cosφ	Hz	I Neutral	V, Hz, Overflow and Underflow Protection	IV, Hz, Overflow and Underflow Protection	Demand ((Current))	Phase Sequence Protection	Contact (Single relay)	(Current)	RS-485 Modbus	...X/5A (Voltage transformer range)	Voltage Transformer Tate	96X96	Panel Type	Rail Type	3 Display 4 Digit	6 Display 4 Digit	Password Protection
	V3T - 21	152050003	–	●	●	–	●	–	●	–	–	●	●	–	–	–	●	●	●	●	●	–	●
	M3T - 22	152050001	●	●	●	●	●	●	–	●	●	●	–	●	–	●	●	●	●	●	●	–	●
	M6T - 22C	152050004	●	●	●	●	●	●	–	●	●	●	–	●	●	●	●	●	●	●	–	●	●
New	M3T - 22C	152050002	●	●	●	●	●	●	–	●	●	●	–	●	●	●	●	●	●	●	●	–	●
New	M3T - 21	152050006	●	●	●	–	●	●	–	●	●	●	●	–	–	●	●	●	●	●	●	–	●
New	M3T - 20	152050005	●	●	●	–	●	●	–	–	●	●	–	–	–	●	●	●	●	●	●	–	●

Technical Drawing



Ampermeter A1M

Model No.	Code No.	Single-phase Current	Demand	Max Demand	Contact Output (single relay)	Over/Low protection	...X/5A (Current transformer ratio)	96X96	Panel Type	Rail Type	1 Display 4 Digit	150-300V AC/DC Feeding
A1M - 10	152070017	●	●	●	–	–	●	●	●	●	●	●
A1M - 11	152070018	●	●	●	●	●	●	●	●	●	●	●
A1M - 10T *	152070030	●	●	●	–	–	–	●	●	●	●	●

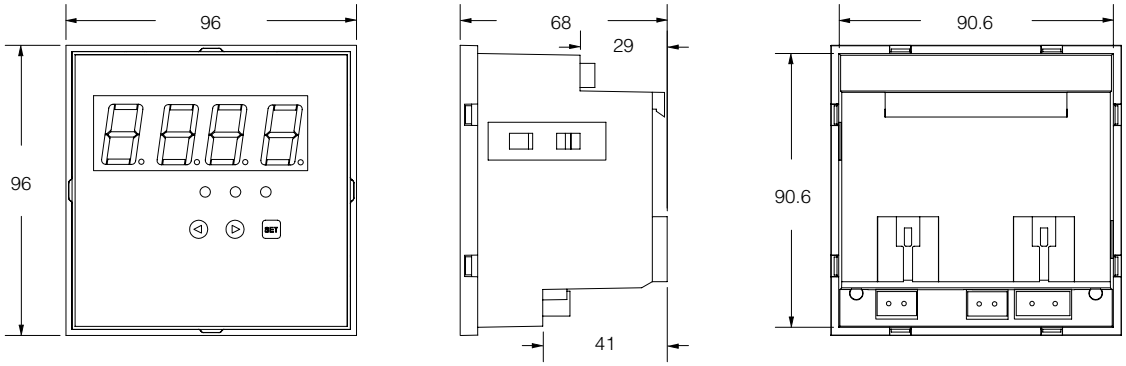
*AT-20 is supplied with current transformer.

Voltmeter V1M

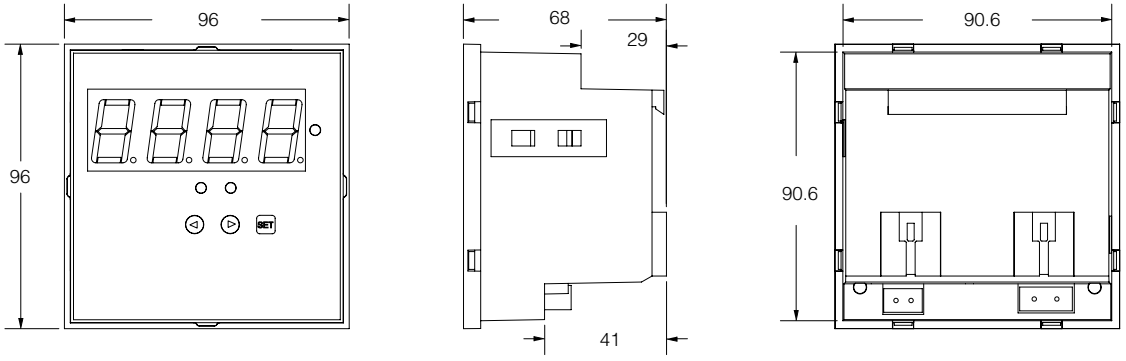
Model No	Kod No	Single-phase Voltage	Max Voltage	Min. Voltage	Contact Output (single relay)	Over/Low Protection	Voltage Transformer Ratio	96X96	Panel Type	Rail Type	1 Display 4 Digit	150-300V AC/DC Feeding
V1M-10	152070019	●	●	●	–	–	●	●	●	●	●	●
V1M-11	152070027	●	●	●	●	●	●	●	●	●	●	●

Technical Drawings

Ampermeter A1M



Voltmeter V1M



Technical Specifications

	V3T - 21	M3T - 22	M6T - 22C
Operating voltage	24V-300V AC/DC	24V-300V AC/DC	24V-300V AC/DC
Operating frequency	50/60Hz	50/60Hz	50/60Hz
Temperature range	-10 C° / +70 C°	-10 C° / +70 C°	-10 C° / +70 C°
Supply power consumption	< 6 VA	< 6 VA	< 6 VA
Class	%1 ±1 digit	%1 ±1 digit	%1 ±1 digit
Outputs relay	1 piece NO 5A 250V	2 piece NO 5A 250V	2 piece NO 5A 250V
Safety class	IP20	IP20	IP20
Cable thickness for terminal connection	2,5mm²	2,5mm²	2,5mm²
Weight	< 300g	< 300g	< 300g

	M3T - 22C	M3T - 21	M3T - 20
Operating voltage	24V-300V AC/DC	24V-300V AC/DC	24V-300V AC/DC
Operating frequency	50/60Hz	50/60Hz	50/60Hz
Temperature range	-10 C° / +70 C°	-10 C° / +70 C°	-10 C° / +70 C°
Supply power consumption	< 6 VA	< 6 VA	< 6 VA
Class	%1 ±1 digit	%1 ±1 digit	%1 ±1 digit
Outputs relay	2 piece NO 5A 250V	1 piece NO 5A 250V	-
Safety class	IP20	IP20	IP20
Cable thickness for terminal connection	2,5mm²	2,5mm²	2,5mm²
Weight	< 300g	< 300g	< 300g

	A1M - 10 / A1M - 10T	A1M - 11	V1M - 10	V1M - 11
Operating voltage	150-300V AC/DC	150-300V AC/DC	150-300V AC/DC	150-300V AC/DC
Operating frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Temperature range	-20 C° / +70 C°	-20 C° / +70 C°	-20 C° / +70 C°	-20 C° / +70 C°
Supply power consumption	4VA (max)	4VA (max)	4VA (max)	4VA (max)
Class	%1 ±1 digit	%1 ±1 digit	%1 ±1 digit	%1 ±1 digit
Outputs relay	-	1 Pcs NO 5A 250V	-	1 Pcs NO 5A 250 V
Safety class	IP20	IP20	IP20	IP20
Cable thickness for terminal connection	2,5mm²	2,5mm²	2,5mm²	2,5mm²
Weight	220g / 275g	235g	225g	240g

	Model No.	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (m)
Multimeter / Ampermeter / Voltmeter						
	V3T - 21	152050003	1	12	3,71	250 x 235 x 220
	M3T - 22	152050001	1	12	4,14	250 x 235 x 220
	M6T - 22C	152050004	1	12	4,17	250 x 235 x 220
New	Multimeter M3T - 22C	152050002	1	12	4,17	250 x 235 x 220
New	Multimeter M3T - 21	152050006	1	12	4,04	250 x 235 x 220
New	Multimeter M3T - 20	152050005	1	12	3,88	250 x 235 x 220
	A1M - 10	152070017	1	12	2,96	250 x 235 x 220
	A1M - 11	152070018	1	12	3,12	250 x 235 x 220
	A1M - 10 T	152070030	1	12	3,60	250 x 235 x 220
	V1M - 10	152070019	1	12	3,02	250 x 235 x 220
	V1M - 11	152070027	1	12	3,18	250 x 235 x 220

Protection and Control Relays

Your facility in safe hands.

Motor Protection relays, Current and Voltage Protection relays protect the motor and equipment from energy irregularities and faults. The Liquid level, time and photocell relays meet reliably the needs of process and automation.

Motor Protection Relays

During the operation of three phase motors if voltage imbalance or voltage outage occurs the motor overheats. This situation can cause damage in the motors. Motor protection relays are designed to cut off the motor's power supply in such situations to prevent any kind of malfunction. Also by doing phase checks it makes sure that motor connections run smoothly.

Control Functions

During Phase Control: Makes sure whether or not the phase connection order is done correctly as L1, L2, L3.

If the connection order is different the relay (out) cannot be made to draw and the motor will not be operated. In this case the "Phs. Seq." on the device will be lit up.

Ptc Control (in MKx02P models): This control is done in order for the motor winding temperature to be measured. If the winding temperature reaches dangerous levels the relay will release without delay and the motor will be stopped. When Ptc error occurs or the Ptc connection is left idle the "Phs.Seq." led flashes.

Insufficient Supply Control: When the 3 phase voltages fall below the margin to the point that the device cannot be supplied with power the relay will release without delay and the motor will be stopped. During this time the "Asm" led flashes.

Absence of Phase Control: When at least one of the 3 phase voltages falls below the set Phs. Abs. setting the relay will release without delay and the motor will be stopped. During this time the "Phs.Abs" led flashes.

Operating the Device

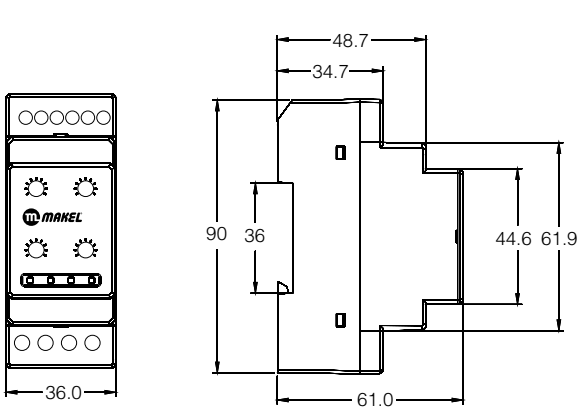
The necessary connections are made by studying the connection chart. Care must be taken to avoid Phase order and Ptc error (in Ptc models). If Ptc is not to be used the Ptc ends must be made into short circuits. When the system is operated if there is no error the out relay draws and the "out" led lights up. If there is an error the out relay will not extract and the relevant error light will go on.

Asymmetry Error During Normal Operation: If the voltage imbalance is higher than the asymmetry setting in the system a period that is as long as the Off-Delay setting will be waited. If the problem continues after this period the drawn relay is released and the motor is stopped the "Asm" led lights up, the "Out" led turns off, if the error is not continuing the relay remains drawn.

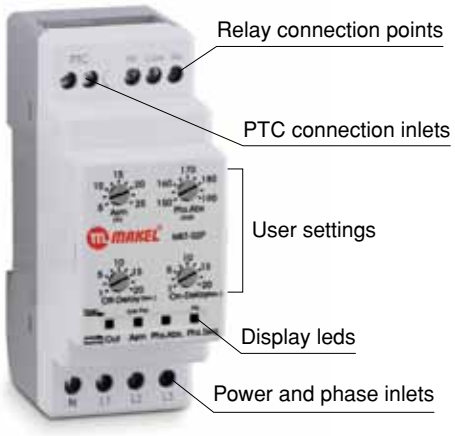
Moving to Normal Operation While an Asymmetry Error is Ongoing: If the voltage imbalance is lower than the asymmetry setting in the system, a period that is as long as the On-Delay setting will be waited out. If there is no asymmetry error at the end of the period the released relay is drawn and the motor is operated, the "Asm" led turns off, the "Out" led turns on, if the error continues the relay remains released.

Note: *In the event that a single phase is cut off while the motor is operating, the cut off phase's voltage cannot be zero because the other phase voltages pass over the motor windings and appear in the entry of the cut off phase. Therefore make the asymmetry setting lower.*

Technical Drawing



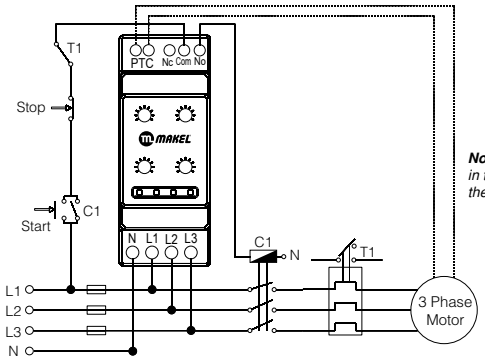
MKN - 02P



Meanings of the display leds	Out	Asm.	Phs. Abs	Phs. Seq
No problem, normal operation, exit relay active	x			
Asm. error occurred (period being counted)	x	x		
Asymmetry error		x		
Phase order error (Phs. Seq)				x
Ptc error (Ptc)				Flash
Insufficient supply (Low Pwr.)		Flash		
Absence of phase error (Phs. Abs)			x	

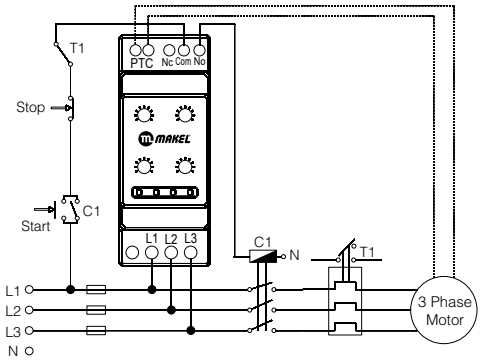
Wiring Diagrams

MKT-01, MKT-02P



Note: *The only difference in the MKT-01 model is that there is no PTC connection.*

MKN-02P



Technical Specifications

Specifications	MKT-01 / MKT-01S	MKT-02P	MKN-02P
Operation Voltage (Un)	230 V AC	230 V AC	400 V AC
Operation Voltage Interval (U)	150-300 V AC / 65-300 V AC	150-300 V AC	260-520 V AC
Insufficient Supply Interval	100-120 V AC / 58-60 V AC	100-120V AC	175-210 V AC
Operation Frequency	50 Hz	50 Hz	50 Hz
Power Consumption (Max)	2.5 VA	2.5 VA	2.5 VA
Measurement Method	TrueRMS	TrueRMS	TrueRMS
Asymmetry	%15 Fixed	%5...%25	%5...%25
Phs. Abs. (Absence of Phase)	170 V Fixed	Set at 150…190 V	Set at 260…330 V
Hysteresis	20% of asymmetry value	20% of asymmetry value	20% of asymmetry value
Off-Delay (Release Delay)	1sec	Set at 1…20 sec	Set at 1…20 sec
On-Delay (Draw Delay)	1sec	Set at 1…20 sec	Set at 1…20 sec
Ptc Operation Interval	None	Opening: more than 1600 ohm Closing: less than 1400 ohm	Opening: more than 1600 ohm Closing: less than 1400 ohm
Setting Accuracy	None	+ or - %5	+ or - %5
Exit Relay	5 A 250 V AC	5 A 250 V AC	5 A 250 V AC
Operation Temperature	Between -20°C…50°C	Between -20°C…50°C	Between -20°C…50°C
Relative Humidity	Less than 90% (Without condensation)	Less than 90% (Without condensation)	Less than 90% (Without condensation)
Cable Sections	2.5 mm² multi vessel cable	2.5 mm² multi vessel cable	2.5 mm² multi vessel cable
Assembly Types	Rail type	Rail type	Rail type
Protection Class	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)
Dimensions	36x90x61	36x90x61	36x90x61
Weight	125gr	125gr	125gr
Insulation	400 V insulation voltage 4 KV source impact	400 V insulation voltage 4 KV source impact	400 V insulation voltage 4 KV source impact

Current Protection Relays

Current protection relays monitor the current in every phase of motors and similar devices and make sure that the devices operate in the desired power intervals. When the devices draw currents at intervals other than what is set the system's power is cut off to prevent the device from malfunctioning.

Current protection relays are designed to protect the systems they are attached to from excessive and low currents. It is possible to enter the operation current interval. The relays can also be used as only "excessive current protection" and "low current protection". The first start currents in motors are high, therefore they have a start delay to prevent incorrect excessive currents that may occur.

Operation of Device

The necessary connections are made according to the connection chart. Imax and Imin current margin values cannot be set close to each other or Imax cannot be smaller than Imin. If they are set as such an error will occur and the "Set.Err." led will light up. This must be checked. When the system is operated if there is no error the out relay will draw and the "Out" led will light up. If there is an error the relay-out will not draw and the relevant led will light up.

Normal Operation and Excessive or Low Current Error: When the system is first started up the period of time that the Star-delay has been set at is waited out. The current levels measured during the wait period are not evaluated. Thus the start-up current of the motor being high will not cause a problem. After the Start-Delay period is finished the system will go back to working normally.

If the system's current value goes above the excessive current level or falls below the low current level, a PERİOD AS LONG AS THE Off-Delay period is waited out. If the error is ongoing after the waiting period the drawn relay is released, the system it is attached to is stopped and the "Imax" or "Imin" led lights up. If the error is not continuing the relay will continue to be drawn.

Important Explanation

• The excessive current margin and low current margin can be set close to each other or
• If the excessive current margin is set lower than the low current margin there will be an error, the current protection device will not work and the "Set.Err." led will light up.

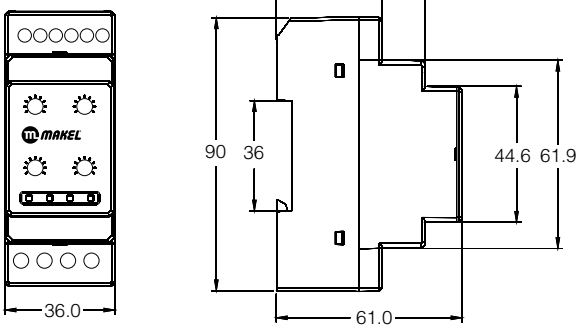
To use as **"excessive current protection"** set Imin current margin to min. ampere,

To use as **"low current protection"** set Imax current margin to max. ampere.

Off-Delay: As soon as an excessive or low current error is detected the Off-Delay waiting period must be waited out.

Start Delay: At the first point that the system operates the Start-Delay period must be waited out. The current levels that are measured at this time are not taken into account and no excessive load error occurs.

Technical Drawing

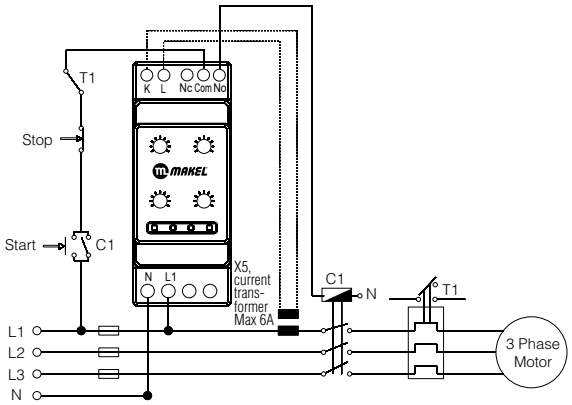


AKM-01

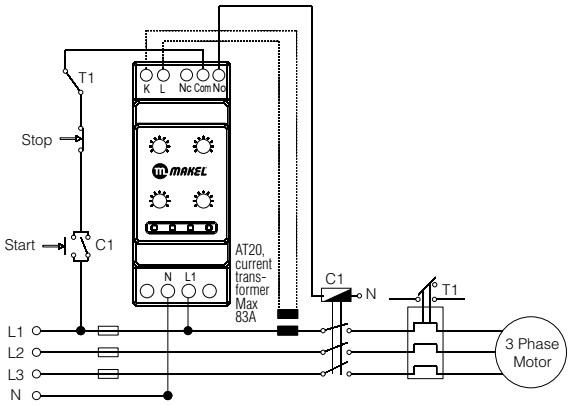
Meaning of the display leds	Out	Imin	Imax	Set.Err.
No problem, normal operation, axit relay active	x			
Excessive error occurred (period being counted)	x		x	
Over current error			x	
Low current occurred (period being counted)	x	x		
Low current error		x		
Outside the boundary of the Imax and Imin settings				x

Wiring Diagrams

AKM-01



AKM-01T



Technical Specifications

Specifications	AKM-01	AKM-01T
Operation Voltage (Un)	230 V AC	230 V AC
Operating Voltage Interval (U)	150-300 V AC	150-300V AC
Operation Frequency	50 Hz	50 Hz
Power Consumption (Max)	2.5 VA	2.5 VA
Measurement Method	TrueRMS	TrueRMS
Imax (Over Current Setting)	0,5...5,5 A	7,5...82,5 A
Imin (Low Current Limit Setting)	0,5...5,5 A	7,5...82,5 A
Hysteresis	200 mA	3 A
Off-Delay (Release Delay)	Set at 1…4 sec	Set at 1…4 sec
Start-Delay (Start-up Delay)	Set at 1…8 sec	Set at 1…8 sec
Setting Accuracy	+ or -%5	+ or -%5
Exit Relay	5 A 250 V AC	5A 250 V AC
Operation Temperature	Between -20°C…50°C	Between -20°C…50°C
Relative Humidity	Less than 90% (Without condensation)	%90'dan küçük (Yoğunlaşma olmadan)
Cable Sections	2.5 mm² multi vessel cable	2.5 mm² multi vessel cable
Assembly Types	Rail type	Rail type
Protection Class	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)
Dimensions	36x90x61	36x90x61
Weight	125gr	125gr
Insulation	400 V insulation voltage, 4 KV source impact	400 V insulation voltage, 4 KV source impact

Voltage Protection Relays

Used to protect triphase motors and similar devices from phase interruptions, voltage imbalances, incorrect connections and overheating. In any error situation the system's power is cut off to prevent the device from malfunctioning.

The voltage protection relay has been designed to protect the systems they are connected to from excessive voltage, low voltage and overheating. Also in 3 phase models they control the phase order to make sure that the motor connections work properly.

Control Functions

During Phase Control (in GKx02P models): Makes sure whether or not the phase connection order is done correctly as L1, L2, L3.

If the connection order is different the relay (out) cannot be made to draw and the motor will not be operated. In this case the "Phs. Seq." on the device will be lit up.

Ptc Control (in GKx02P models): This control is done in order for the motor winding temperature to be measured. If the winding temperature reaches dangerous levels the relay will release without delay and the motor will be stopped. When Ptc error occurs or the Ptc connection is left idle and the "Phs.Seq." led flashes.

Insufficient Supply Control (in GKx02P models): When the 3 phase voltages fall below the margin to the point that the device cannot be supplied with power, the relay will release without delay and the motor will be stopped. During this time the "Vmax" led flashes.

Absence of Phase Control (in GKx02P models): When at least one of the 3 phase voltages is cut off the relay releases without delay and the motor is stopped. During this time the "Vmin" led flashes.

Operating the Device

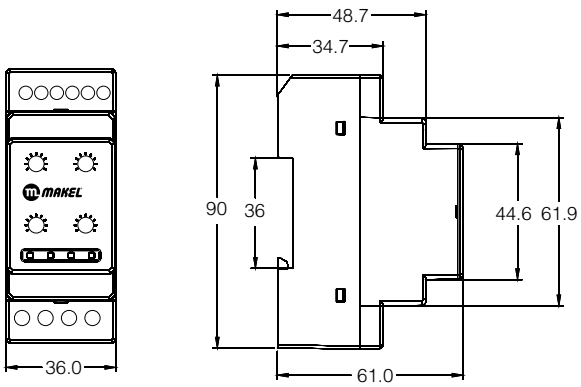
The necessary connections are made by studying the connection chart. Care must be taken to avoid Phase order and Ptc error (in Ptc models). If Ptc is not to be used the Ptc ends must be made into short circuits. When the system is operated if there is no error the out relay draws and the "out" led lights up. If there is an error the out relay will not draw and the relevant error light will go on.

Excessive and/or Low Voltage Occurring During Normal Operation: If any of the system's phase voltages rise above the excessive voltage margin and/or fall below the low voltage margin period that is as long as the Off-Delay setting will be waited. If the problem continues after this period the drawn relay is released, the system it is connected to is stopped and the "Vmin" and/or "Vmax" led lights up and the "Out" led turns off. If the problem continues the relay stay drawn.

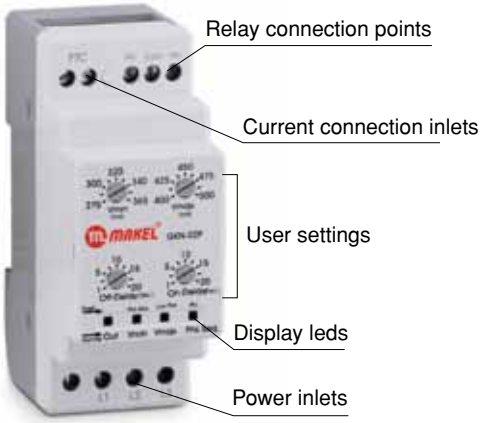
Moving to Normal Operation While there is an Excessive and/or Low Voltage Error: If the system's 3 phase voltages are lower than the set Vmax voltage and lower than the set Vmin voltage, a period that is as long as the On-Delay setting will be waited. If there is no error at the end of the period the released relay is drawn and the system is operated. The "Vmax" and "Vmin" led turns off, the "Out" led turns on, if the error is continuing the relay remains released.

Note: *In the event that a single phase is cut off while the motor is operating, the cut off phase's voltage cannot be zero because the other phase voltages pass over the motor windings and appear in the entry of the cut off phase. Therefore make the Vmin setting higher.*

Technical Drawing



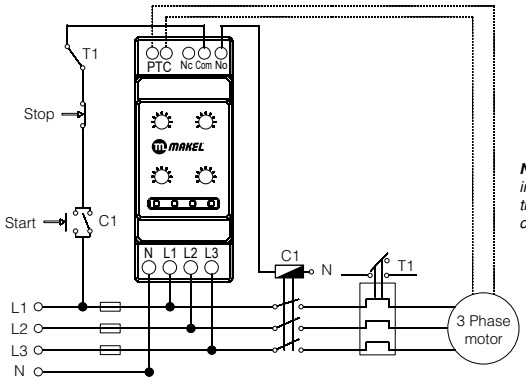
GKT-02P



Meaning of the display leds	Out	Vmin	Vmax	Phs. Seq.
No problem, normal operaion, exit relay active	x			
Overvoltage error occurred(period being counted)	x		x	
Overvoltage error			x	
Low voltage error occurred (period being counted)	x	x		
Low voltage error		x		
Phase order error (Phs. Seq)				x
Ptc error (Ptc)				Flash
Insufficient supply (Low Pwr.)			Flash	
Absence of phase error (Phs. Abs)		Flash		

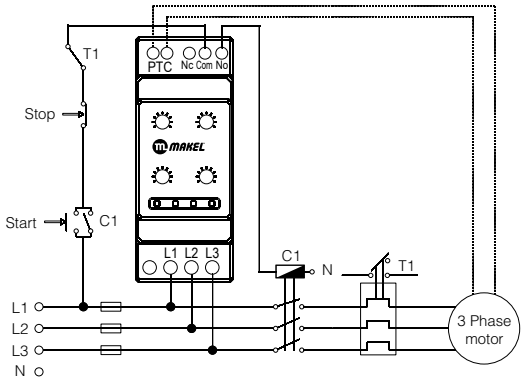
Wiring Diagrams

GMK-01 / GKT-02P



Note: *The only difference in the GKM 01 model is that there are no PTC connection and L2, L3.*

GKN-02P



Technical Specifications

Specifications	GKM-01	GKT-02P/ GKT-01S	GKN-02P
Operation Voltage (Un)	230 V AC	230 V AC	400 V AC
Operation Voltage Interval (U)	150-300 V AC	150-300 V AC / 65-300 V AC	260-520 V AC
Insufficient Supply Interval	100-120 AC	100-120V AC / 58-60V AC	175-210 V AC
Operation Frequency	50 Hz	50 Hz	50 Hz
Power Consumption (Max)	2.5VA	2.5 VA	2.5 VA
Measurement Method	TrueRMS	TrueRMS	TrueRMS
Vmax (Over Voltage Setting)	230...290 V AC	230...290 V AC	400..500 V AC
Vmin (Low Voltage Setting)	160...210 V AC	160...210 V AC / Ayar yok	275...365 V AC
Hysteresis	%5 of Vmax Vmin value	Vmax-Vmin değerinin %5'i	Vmax-Vmin değerinin %5'i
Off-Delay (Release Delay) On-Delay (Draw Delay)	Set at 1 ... 20 sec.	Set at 1 ... 20 sec. / 1sec. constant	Set at 1 ... 20 sec.
Ptc Operation Interval	None	Opening: more than 1600 ohm / PCT none Closing: less than 1400 ohm / PCT none	Opening: more than 1600 ohm Closing: less than 1400 ohm
Setting Accuracy	+ or -%5	+ veya -%5	+ or -%5
Exit Relay	5A 250 V AC	5A 250 V AC	5A 250 V AC
Operation Temperature	Between -20°C…50°C	Between -20°C…50°C	Between -20°C…50°C
Relative Humidity	Less than 90% (Without condensation)	Less than 90% (Without condensation)	Less than 90% (Without condensation)
Cable Sections	2.5 mm^2 multi vessel cable	2.5 mm^2 multi vessel cable	2.5 mm^2 multi vessel cable
Assembly Types	Rail type	Rail type	Rail type
Protection Class	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)
Dimensions	36x90x61	36x90x61	36x90x61
Weight	125gr	125gr	125gr
Insulation	400 V insulation voltage, 4 KV source impact	400 V insulation voltage, 4 KV source impact	400 V insulation voltage, 4 KV source impact

Liquid Level Control Relays

When liquids with certain conductivity are emptied from storage tanks or while the tanks are being filled these relays prevent the tanks from overflowing and the motors working unnecessarily.

The liquid level relay has 3 electrodes. It is used for emptying liquid reservoirs or water wells. The liquid needs to be conductive in order for the electrodes to be detected. The relay may not be used for flammable or explosive liquids.

Operation of the Device

The necessary connections are made according to the connection chart. If the liquid reservoir surface is conductive the E connection terminal may be connected to the reservoir surface. If the reservoir is conductive an electrode must be also be connected to the E terminal.

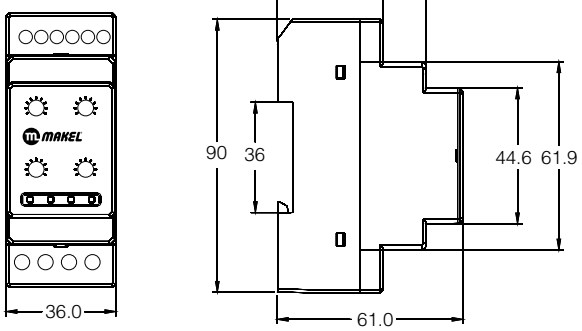
Attention must be paid to the order of the electrodes in the reservoir or well. The E electrode must be placed in the bottom, the T electrode determining the motor operation point must be placed at the very top and the B electrode determining the stopping point of the motor must be placed in between.

The liquid must be conductive. The relay may not be used with flammable or explosive liquids. If the electrodes are not being detected in the SRM-02A model you can change the perception level and enable it to be detected with the Adj. setting.

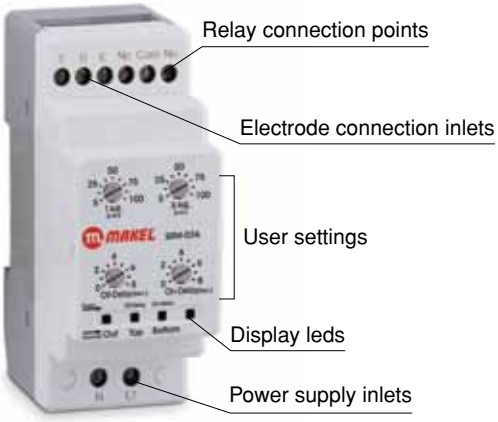
Operation When the Relay is Passive: When the T and E electrodes are outside of the liquid the “Top” and “Bottom” leds lights up. During this process the out relay is in passive state. The leds of the electrodes that enter the liquid will turn off. When both of the electrodes enter the liquid the On-Delay wait period is counted down. During this period the “Bottom” led will flash. At the end of the period the relay becomes active and the “Out” led goes on.

Operation When the Relay is Active: When the T and E electrodes are inside the liquid the “Top” and “Bottom” leds are off. During this process the out relay is in active state. The leds of the electrodes that come out of the liquid will turn on. When both of the electrodes come out of the liquid the Off-Delay wait period is counted down. During this period the “Top” led will flash. At the end of the period the relay becomes passive and the “Out” led goes off.

Technical Drawing



SRM-02A

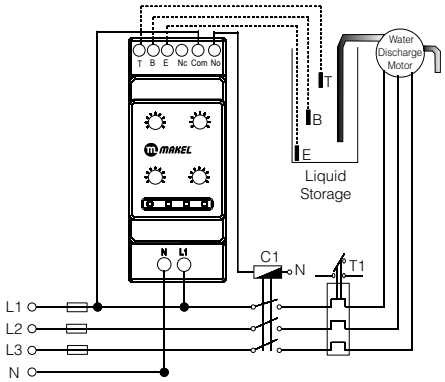


Meanings of the display leds	Out	Top	Bottom
Top and bottom electrodes are outside of the liquid		x	x
Top electrode is outside of the liquid, bottom is inside		x	
Exit active, top and bottom electrodes in liquid	x		
Exit active, top electrode outside liquid	x	x	
The period that exit relay is to be Off is counting down	x	Flash	x
The period that exit relay is to be On is counting down			Flash

Note: *There are no T Adj., B Adj., Off-Delay and On-Delay settings on the SRM-01 model.*

Wiring Diagram

SRM-01 / SRM-02A



Technical Specifications

Specifications	SRM-01	SRM-02A
Operation Voltage (Un)	230 V AC	230 V AC
Operation Voltage Interval (U)	150-300 V AC	150-300 V AC
Operation Frequency	50 Hz	50 Hz
Power Consumption (Max)	2.5 VA	2.5 VA
T- adj. (Top electrode sensitivity setting)	Fixed between 0-50 kohm	Set between 0-100 kohm
B- adj. (Top electrode sensitivity setting)	Fixed between 0-50 kohm	Set between 0-100 kohm
Off-Delay (Release period)	1 sec fixed	Set at 1-8 sec
On-Delay (Draw period)	1 sec fixed	Set at 1-8 sec
Setting Accuracy	+ or -5%	+ or -5%
Exit Relay	5 A 250 V AC	5 A 250 V AC
Operation Temperature	Between -20°C…50°C	Between -20°C…50°C
Relative Humidity	Less than 90% (Without condensation)	Less than 90% (Without condensation)
Cable Sections	2.5 mm² multi vessel cable	2.5 mm² multi vessel cable
Assembly Types	Rail type	Rail type
Protection Class	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)
Dimensions	36x90x61	36x90x61
Weight	125gr	125gr
Insulation	400 V insulation voltage 4 KV source impact	400 V insulation voltage 4 KV source impact

Time Relay TMR-01

Used especially for process control in industrial automation. They activate or inactivate systems with set delays or start or stop events with a delay.

Draw Delayed Relays: draw contact at the end of the T period after voltage is applied to the time relay.

Release Delayed Relays: draw contact when voltage is applied to the time relay and release contact at the end of the t period.

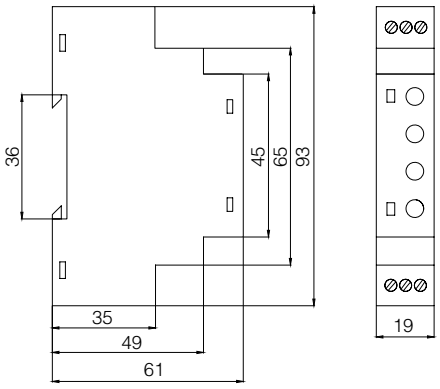
Note: *In order for time settings which have been made when the time relay is with power to be valid, the time relay power supply needs to be provided again.*

General Specifications

Time Relays are used in industry for their following feature.

- General purpose use
- Easily adjustable time interval
- Easy attachment to rail
- Narrow and small size

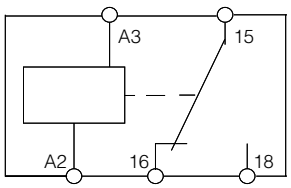
Technical Drawing



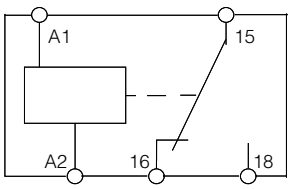
TMR-01

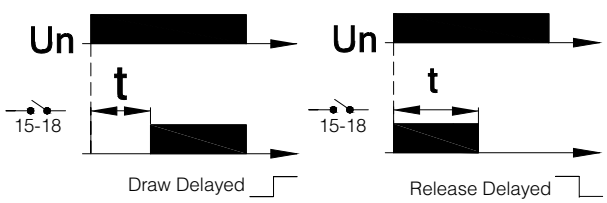
Wiring Diagrams

24 V AC / DC ± %10



220 / 230 V AC ± %20





Safety Warnings

- The assembly and electrical connections must be done by technical personnel according to the instructions.
- While the device is being assembled there should be no power on the connection cables.
- Check the cable connections before operating the device.
- Do not open the device.
- Do not operate the device in dirty, wet or vibrating conditions.
- Use a dry cloth to clean the device, never use a solvent or chemical substance.

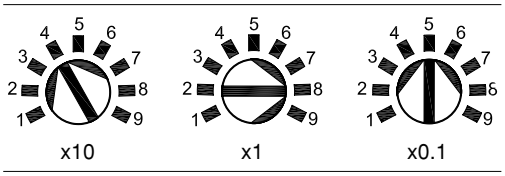
Time Setting

X10 trimpot value show the tens digit of the desired time, x1 shows the ones digit and x0.1 show the one tenths digit of the desired time.

Example: x10 = 4, x1= 8, x0.1 = 5 and

Mode= if 1s has been set the contact outlets will change position after 48.5 seconds.

x10	x1	x0.1	Mode	Set Time
4	8	5	1s	48,5 sec
4	8	5	10s	485 sec
4	8	5	1m	48,5 min
4	8	5	10m	485 min
4	8	5	1h	48,5 hour



Technical Specifications

Specifications	TMR-01
Time Interval	0.5sec – 99.9 hours
Accuracy	<1%
Power Supply	220/230 Vac ± 20% 24 Vac / dc ± 10%
Power Consumption * (220 Vac 50 Hz)	Active Power 0.9 W Visible Power 8 VA
Sudden Impact Voltage Resistance * Surge (IEC 61000-4-5)	2 kV
Quick Temporary Sudden Impact Voltage * Resistance Burst (IEC 61000-4-4)	4.4 kV
Electromagnetic RF Fields Resistance * (IEC 61000-4-3)	10 V/m
Assembly Form	Th Rail assembly (EN 60715)
Protection Class	IP20 (EN 60529),
Ambient Temperature	-5°C + 50°C (Operation) -25°C + 75°C (Storage)
Contact Current /Power	1 C/O, 8A, 2000 VA

* Applies to 220/230 Vac (A1-A2) supply line

Time Relay TMR-02

Draw Delayed Relays: draw contact at the end of the T period after voltage is applied to the time relay.

Release Delayed Relays: draw contact when voltage is applied to the time relay and release contact at the end of the t period.

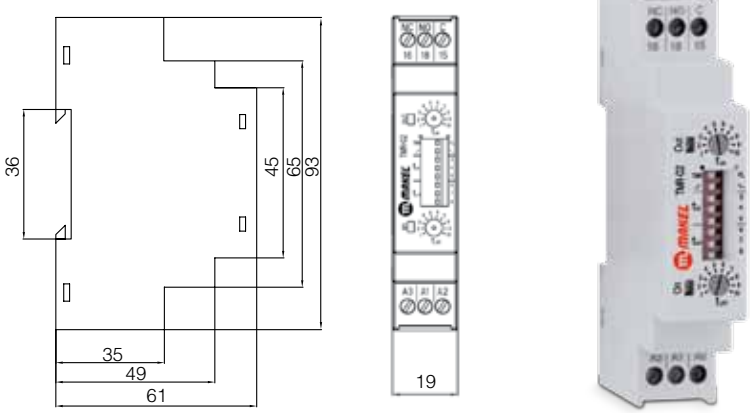
Note: *In order for time settings which have been made when the time relay is with power to be valid, the time relay power supply needs to be provided again.*

General Specifications

Time Relays are used in industry for their following feature.

- General purpose use
- Easily adjustable time interval
- Easy attachment to rail
- Narrow and small size

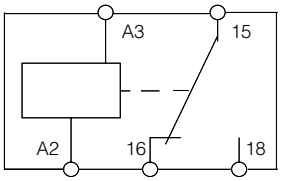
Technical Drawing



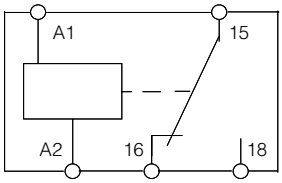
TMR-02

Wiring Diagrams

24 VAC/DC ± 10%



220 / 230 V AC ± %20

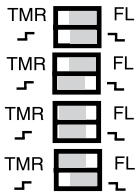


Safety Warnings

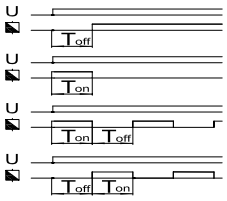
- The assembly and electrical connections must be done by technical personnel according to the instructions.
- While the device is being assembled there should be no power on the connection cables.
- The device should be mounted inside of the panel.
- Check the cable connections before operating the device.
- Do not open the device.
- Do not operate the device in dirty, wet or vibrating conditions.
- Use a dry cloth to clean the device, never use a solvent or chemical substance.

Time Setting

TM-02 timer operated as On-Delay (ER), Off Delay(EM), On Flash mode or Off Flasher mode according to user needs. Adjustable time range of TMR-02 is between 0.5 second- 30 hours.



●	●	TMR	On-Delay
●	○	TMR	Off-Delay
○	○	FL	Off Flasher
○	●	FL	On Flasher



TMR-02

5	4	3	**T on** Time Setting	
8	7	6	**T off** Time Setting	
			Time Range	Adjustable Time Range
○	○	○	5 sec	0,5-5 sec
○	○	●	10 sec	1-10 sec
○	●	○	30 sec	3-30 sec
○	●	●	60 sec	6-60 sec
●	○	○	10 min	1-10 min
●	○	●	60 min	6-60 min
●	●	○	10 hour	1-10 hour
●	●	●	30 hour	3-30 hour

T on time is setting by 3,4,5 switches and ton trimmer,
T off time is setting are by 6,7,8 switches and toff trimmer.

T on and/or **T off** time settings are calculated according to the following formulas

a: Selected time range (by switches)

x: Position of timmer

t: Desired time

$$x=\frac{10.t}{a} \text{ ve } t=\frac{x.a}{10}$$

Technical Specifications

Specifications	TMR-02
Time Interval	0,5sec – 30 hours
Accuracy	<1%
Power Supply	220/230 Vac ± 20% 24 Vac / dc ± 10%
Power Consumption* (220 Vac 50 Hz)	Active Power 0.9 W Visible Power 8 VA
Sudden Impact Voltage Resistance* Surge (IEC 61000-4-5)	2 kV
Quick Temporary Sudden Impact Voltage* Resistance Burst (IEC 61000-4-4)	4.4 kV
Electromagnetic RF Fields Resistance* (IEC 61000-4-3)	10 V/m
Assembly Form	Th Rail assembly (EN 60715)
Protection Class	IP20 (EN 60529),
Ambient Temperature	-5°C + 50°C (Operation) -25°C + 75°C (Storage)
Contact Current /Power	1 C/O, 8A, 2000 VA

* Applies to 220/230 Vac (A1-A2) supply line

Time Relay TMR-30 / TMR-60

Draw Delayed Relays: draw contact at the end of the T period after voltage is applied to the time relay.

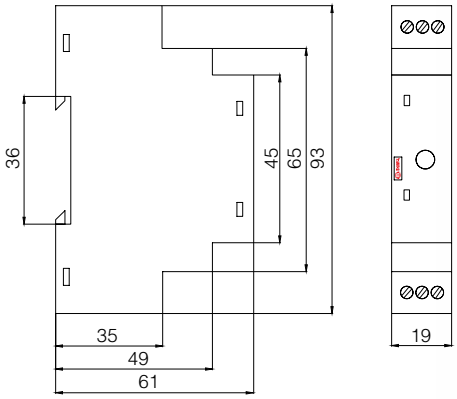
Note: *In order for time settings which have been made when the time relay is with power to be valid, the time relay power supply needs to be provided again.*

General Specifications

Time Relays are used in industry for their following feature.

- General purpose use
- Easily adjustable time interval
- Easy attachment to rail
- Narrow and small size

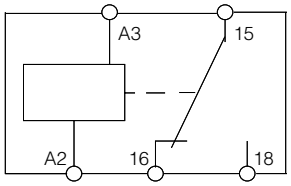
Technical Drawing



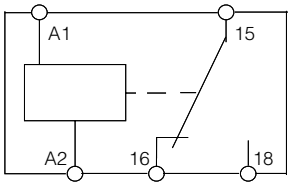
TMR-30 TMR-60

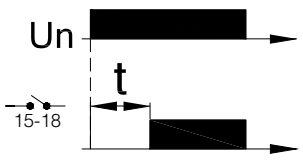
Wiring Diagrams

24 V AC / DC ± %10



220 / 230 V AC ± %20





Safety Warnings

- The assembly and electrical connections must be done by technical personnel according to the instructions.
- While the device is being assembled there should be no power on the connection cables.
- Check the cable connections before operating the device.
- Do not open the device.
- Do not operate the device in dirty, wet or vibrating conditions.
- Use a dry cloth to clean the device, never use a solvent or chemical substance.

Technical Specifications

Specifications	TMR-30	TMR-60
Time Interval	2-30 sec	2-60 sec
Power Supply	220/230 Vac ± 20% 24 Vac / dc ± 10%	220/230 Vac ± 20% 24 Vac / dc ± 10%
Power Consumption* (220 Vac 50 Hz)	Active Power 0.9 W Visible Power 8 VA	Active Power 0.9 W Visible Power 8 VA
Sudden Impact Voltage Resistance* Surge (IEC 61000-4-5)	2 kV	2 kV
Quick Temporary Sudden Impact Voltage* Resistance * Burst (IEC 61000-4-4)	4.4 kV	4.4 kV
Electromagnetic RF Fields Resistance* (IEC 61000-4-3)	10 V/m	10 V/m
Assembly Form	TH Rail assembly (EN 60715)	TH Rail assembly (EN 60715)
Protection Class	IP20 (EN 60529)	IP20 (EN 60529)
Ambient Temperature	-5°C + 50°C (Operation) -25°C + 75°C (Storage)	-5°C + 50°C (Operation) -25°C + 75°C (Storage)
Contact Current /Power	1 C/O, 8A, 2000 VA	1 C/O, 8A, 2000 VA

* Applies to 220/230 Vac (A1-A2) supply line.

Photocell Relays

These relays turn lights on and off according to the level of daylight and the sleep mode keeps the lights on for a set period to provide energy efficiency.

Photocell relays have a sensor that can detect light intensity and a relay-out that operates according to the light intensity. The device controls the lighting systems that are connected to this outlet. Thus lighting can be turned on automatically when dark and turned off when light.

Operation of the Device

The necessary connections are made according to the connection chart. The sensor optic connected to the photocell relay must be attached so that the lighting system is not exposed to direct light. Also it is recommended that the optic be attached to areas which are less likely to get dirty.

If the Sleep Mode is not desired in FRM-02S this setting must be brought to Off. When the lux adjustment is being set it should be on 0 Lux for moderate darkness and 1 Lux for the darkest.

Normal Operation: If the ambient light intensity is lower than the set Lux level it means it has gotten dark and the “Dark” led will light up. The On-Delay period will be waited out. (30 sec is fixed on FRM-01). If at the end of the period the setting is dark the “Out” led goes on and the relay-out becomes active.

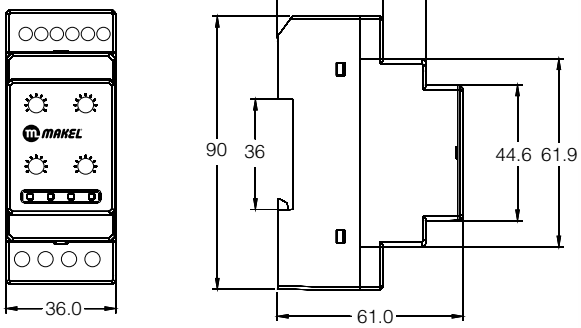
If the ambient light intensity is higher than the set Lux level it means it has gotten light and the “Light” led will light up. The Off-Delay period will be waited out. (30 sec is fixed on FRM-01). If at the end of the period the setting is light the “Out” led goes off and the relay-out becomes passive.

Operation in Sleep Mode (In the FRM-02S model): After it has gotten dark the relay-out becomes active for as long as the number of hours in the sleep setting. After this period is over the “Sleep” led goes on, the “Out” led goes off and the relay-out becomes passive. Thus the lighting will have operated for as long as the set Sleep time and energy efficiency will have been achieved for the time remaining until morning.

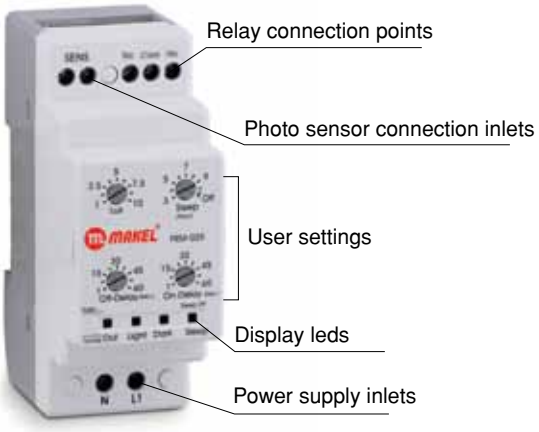
After the intensity of the light increases 1 minute goes by. If it is still light when the period is up the “Sleep” led goes off and the normal operation mode starts.

If you do not want the photocell relay to work in Sleep mode set it to “Off”. In this situation the “Sleep” led will flash to inform that the Sleep mode has been cancelled.

Technical Drawing



FRM-01

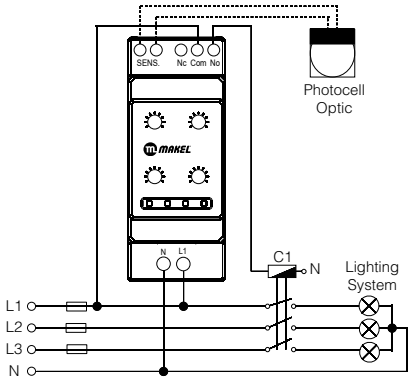


Meanings of the display leds	Out	Light	Dark	Sleep
Operate in daylight (Light)		X		
Dark Has Set (On Delay period countdown)			X	
Operate in dark (Dark)	X		X	
Light Has Set (Off Delay period countdown)	X	X		
Operation in sleep mode (Sleep)			X	X
Exit Sleep Mode (Period countdown)		X		X
Sleep Mode off (Sleep off)				Flash

Note: *There are no Sleep leds and Off-Delay and On-Delay settings on the FRM-01 model.*

Wiring Diagram

FRM-01 / FRM-02S



Technical Specifications

Specifications	FRM-01	FRM-02S
Operation Voltage (Un)	230 V AC	230 V AC
Operation Voltage Interval (U)	150-300 V AC	150-300 V AC
Operation Frequency	50 Hz	50 Hz
Power Consumption (Max)	2.5 VA	2.5 VA
Lux adjustment	1…10	1…10
Sleep Adjustment	None	3-10 hours Set/Sleep off
Off-Delay (Release delay)	30 sec fixed	1…60 sec Set
On-Delay (Draw delay)	30 sec fixed	1…60 sec Set
Setting Accuracy	+ or -5%	+ or -5%
Exit Relay	5 A 250 V AC	5 A 250 V AC
Operation Temperature	Between -20°C…50°C	Between -20°C…50°C
Relative Humidity	Less than 90% (Without condensation)	Less than 90% (Without condensation)
Cable Sections	2.5 mm^2 multi vessel cable	2.5 mm^2 multi vessel cable
Assembly Types	Rail type	Rail type
Protection Class	IP20 (Terminals), IP40 (Front Panel)	IP20 (Terminals), IP40 (Front Panel)
Dimensions	36x90x61	36x90x61
Weight	125gr	125gr
Insulation	400 V insulation voltage 4 KV source impact	400 V insulation voltage 4 KV source impact

Motor Protection Relays

	Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Absence of Phase	Phase Order	Ptc	Fixed Asymmetry	Set Asymmetry	Without Neutral	Draw Delay	Open Delay	Insufficient Power Supply Warning
New	MKT - 01	152070001	1	12	1,40	253 x 138 x 103	●	●	–	●	–	–	–	–	●
New	MKT - 02P	152070002	1	12	1,40	253 x 138 x 103	●	●	●	–	●	–	●	●	●
New	MKN - 02P	152070003	1	12	1,40	253 x 138 x 103	●	●	●	–	●	●	●	●	●
New	MKT - 01S	152070028	1	12	1,40	253 x 138 x 103	●	●	–	●	–	–	–	–	●

Current Protection Relays

	Product Name	Code No.	Technical Specifications	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Low Current Warning	Excessive Current Warning	Monophase	External Current Transformer	Relay Delay	Start Delay
New	AKM-01	152070007	1-10.000/5 A veya 0.5-5 A Poles	1	12	1,75	253 x 138 x 103	●	●	●	–	●	●
New	AKM-01T	152070008	7,5-82,5 A (AT-20 included Current Transformer)	1	12	2,10	265 x 138 x 112	●	●	●	●	●	●

Low Voltage Current Transformer

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
AT-20	152070025	1	50	2,90	185 x 230 x 45

Technical Specifications	
Current Rating	200 A / 80 mA
Wrap Interval	1 / 2500
Frequency	50/60 Hz
Accuracy	Class 1 (%1)
RL	3.3 Ohm
Operation Temperature	-10°C...65°C
Hole Diameter	12.8 mm
Out Diameter	37 mm

AT-20

Voltage Protection Relays

	Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Absence of Phase	Phase Order	Ptc	Low Voltage Warning	Over Voltage Warning	Monophase	Three-phase	Neutral	Draw Delay	Open Delay	Insufficient Power Supply Warning
New	GKM-01	152070004	1	12	1,40	253 x 138 x 103	●	–	–	●	●	●	–	●	●	●	●
New	GKT-02P	152070005	1	12	1,40	253 x 138 x 103	●	●	●	●	●	–	●	●	●	●	●
New	GKN-02P	152070006	1	12	1,40	253 x 138 x 103	●	●	●	●	●	–	●	–	●	●	●
New	GKT-01S	152070029	1	12	1,40	253 x 138 x 103	–	●	–	–	●	–	●	●	–	–	●

Liquid Level Protection Relays

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Fixed Sensitivity	Set Sensitivity	Monophase	Fixed Draw Delay	Fixed Open Delay	Set Draw Delay	Set Open Delay	1 C/O Kontak	Small Size Electrode	Large Size Electrode
SRM-01	152070013	1	12	1,40	253 x 138 x 103	●	–	●	●	●	–	–	●	–	–
SRM-02A	152070026	1	12	1,40	253 x 138 x 103	–	●	●	–	–	●	●	●	–	–
SRE-01(Small Electrode)	152070015	1	12	0,38	-	–	–	–	–	–	–	–	–	●	–

Time Relays

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Draw Delayed (ER)	Release Delayed (ER)	Control Entry Release Delayed (R)	Drawn Control Entry (R)	Triggered in Release Delayed in Release (TS)	Triggered in Release Delayed in Draw (TA)	Symmetric Flasher (EF)	Trigger Entry	Open Flasher	Closed Flasher	Down Meter	Right- Left	Delayed Fall	24V AC/DC	220/230V AC	12-240C AC/DC	24-240C AC/DC
TMR-30 (2-30sn)	152070009	1	22	-	253 x 138 x 103	●	–	–	–	–	–	–	–	–	–	–	–	–	●	●	–	–
TMR-60 (4-60sn)	152070010	1	22	-	253 x 138 x 103	●	–	–	–	–	–	–	–	–	–	–	–	–	●	●	–	–
TMR-01 (0,1sn-999dk)	152070011	1	22	-	253 x 138 x 103	●	●	–	–	–	–	–	–	–	–	–	–	–	●	●	–	–
TMR-02 (0,1sn-60 h. featured blinker)	152070012	1	22	-	253 x 138 x 103	●	●	–	–	–	–	–	–	●	●	–	–	–	●	●	–	–

Photocell Relays

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)	Light Intensity Setting	Sleep Economy Mode	Monophase	Fixed Draw Delay	Fixed Open Delay	Set Draw Delay	Set Open Delay
FRM-01*	152070014	1	10	1,45	330 x 180 x 98	●	–	●	●	●	–	–
FRM-02S*	152070016	1	10	1,45	330 x 180 x 98	●	●	●	–	–	●	●
FRG-01 (Lens)	152070024	1	15	0,48	-	–	–	–	–	–	–	–

* Optical lens is included.

Wport Gsm-Gprs Modem/Gateway
E Port Ethernet Gateway
Optus USB Optic Reader

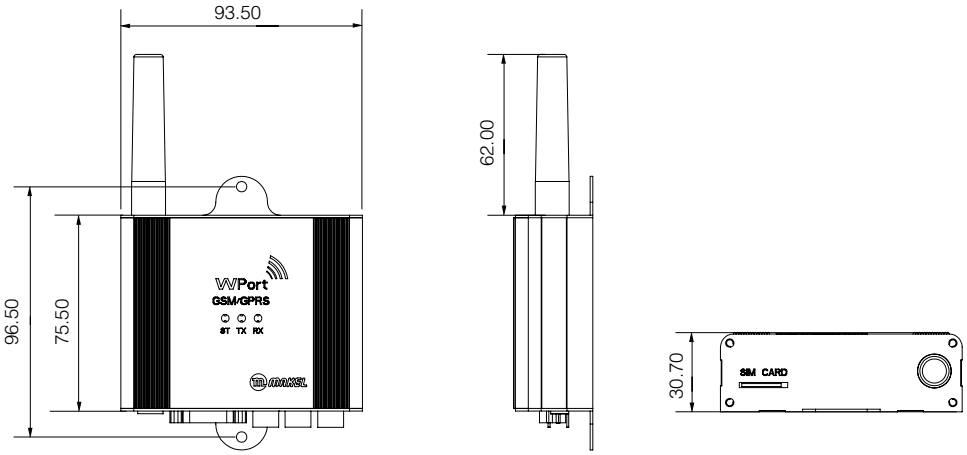
Reliable, integrated, uninterrupted communication

Wport; is remote control and data acquisition equipment that is developed in order to remote reading and control of measured values of electronic electric meters and similar devices, with ease of installation and use, integrated best structure.

Wport Gsm-Gprs Modem/Gateway

With its easy usage and installation, Compact and high quality design , Wport is a data collection and supervision device intended to read and control of electronic electricity meters and such devices which build an AMI/AMR system.

Technical Drawing



Technical Specifications

Model	GM1
Communication type	GSM/GPRS/EDGE
Frequency Band	850/900/1800/1900
GPRS Class	Class 10
TCP/IP Support	Available
RS232 Communications	Exist
RS485 Communications	Exist
Digital Alarm Input	Max 12 V
Relay Capacity	250V/5A
DC Power Supply	12V DC
Sim Card	1.8 – 3V
External Antenna	50 Ohm, SMA
RTC	Available
Operating Temperature	-30 , +70
Operating Voltage	220 V/ 100 V
Dimensions	105.5 x 30.7 x 93.5
Weight	210 gr
Remote SW upload	Exist
Data Security	DES

General Specifications

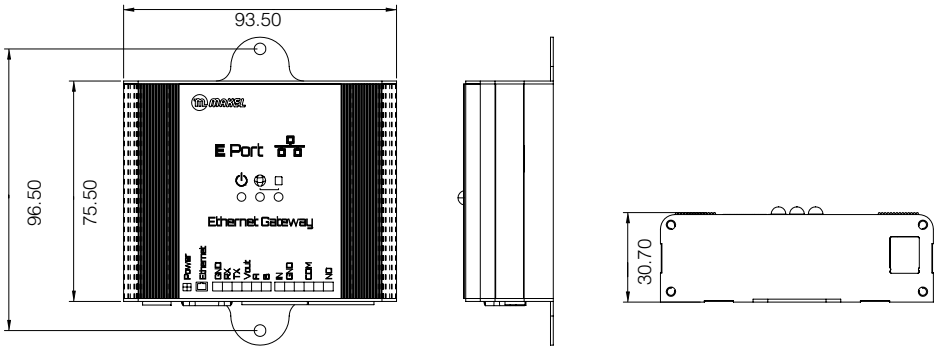
- Supports simultaneous multiple port TCP/IP protocols on GPRS/EDGE
- Operator independent
- Provides secure communication with its powerful DES algorithm
- Supports software upgrade through air.
- RTC and other parameters can be modified locally or by SMS. RTC can also be updated using time data from GSM Network.
- Supports IEC 62056-21 mod C and DLMS-COSEM protocols for meter communication with variable speeds.
- Wport, Logs many events up to 1000 records such as, Local or remote firmware upgrades, parameters, Access trials from unauthorized users, poor signal levels, some errors related to network with all time stamped fashion
- Periodic and a-periodic work instructions with variable contents can be defined According to these work instructions, Wport automatically communicates with meters and collects requested data and stores them in to its 256 KB memory and realizes requested control operations.
- Wport has one digital input to detect various events.
- Wport has 220V /5A contact capacity relay to activate external devices.
- Supports GSM/GPRS/EDGE, 900/1800/1900 Class B communication.
- External antenna can be connected in case of poor signal conditions.
- Wport has signal led's for indications GSM connection status and communication activities.
- Sim card can be inserted and removed with its push/push type sim card connector without opening the device case.
- Wport has simultaneously working RS232 and RS485 communication interfaces. RS485 interface supports up to 255 meters connected simultaneously.
- All connections terminals are sealable
- Variable interval automatic reset feature provides a failsafe mechanism to recover from locks.
- 100% compatible to web based Makel Usobim AMI/AMR system.

Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Wport Gsm-Gprs Modem/Gateway				
152040001	1	10	6,18	293 x 386 x 257

E Port Ethernet Gateway

The EPort is a remote control and data collection device developed to enable remote reading of measurement values and control of the electrical meters on electronic and similar devices. Since communication is provided over the internet no extra costs are required. By connecting to the network via the RJ-45 Ethernet socket on the device remote reading is made possible by simply connecting with the RS232, RS485 or Optic Port to the meter.

Technical Drawing



General Specifications

- TCP/IP support
- 10BASE-T and 100BASE-TX Ethernet connection
- RS232 and RS485 ports can be used at the same time. The RS485 port supports up to 255 connections.
- It supports optic port connection to the meter
- Numerical alarm entry: compatible to dry contact or 0-24 V input.
- 220V/5 A capacity relay output.
- Compatible with IEC 62056-21 Mod C and DLMS meters.
- Supports all brands and models of meters.
- 100% Compatible with the Makel USOBİM (OSOS- automatic meter reading system).
- The MAC, IP, gateway, sub network mask and port numbers can be adjusted with the E Port configuration software.
- Has input/output with ESD protection

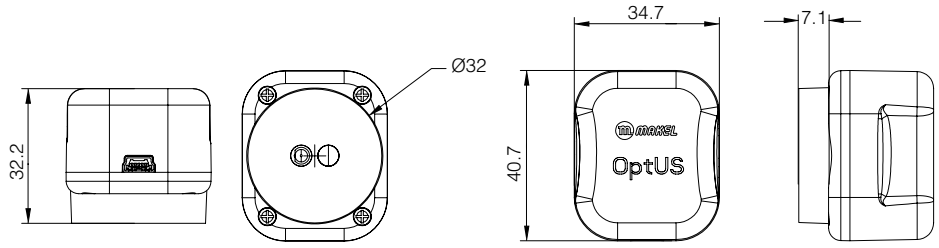
Technical Specifications

Communication Protocol	TCP/IP
Network connection	10BASE-T ve 100BASE-TX Ethernet
Network connection	RJ-45
RS232 port	1 item, 300-115200 bps
RS485 port	1 item, 300-115200 bps, max 255 device
Numerical input	1 item
Relay output	1 item, 250V/5A NO
Adaptor input	12V DC
Operation temperature	-40˚C / +85˚C
Dimensions	77 x 30.7 x 93.5 mm
Weight	180gr

Optus USB Optic Reader

Optus is a device that can use the computer's USB port to read the meter over the Optic Port.

Technical Drawing



Technical Specifications

Mechanical Properties		Electrical Properties	
Dimensions	40.5mm x 34.5mm x 32.5mm	Standard	IEC 62056-21
Body Material	ABS	Cable Length	1.5m
Weight	~150gr	Operation voltage	obtains power from the USB port
		Electrical Interface	USB 2.0

Software

The driver needs to be loaded in order for Optus to be operated on this computer. The address where the driver can be downloaded **http://www.makelamr.com/Setup/OptusSetup.exe**

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (m)
E Port / Optus					
E port	152040002	1	10	6,18	293 x 386 x 257
Optus	152060001	1	-	-	-

Distribution Boxes

Difference on walls

Providing aesthetic solutions for eye distorting views on your walls, the Makel Distribution Box provides secure installation and with opaque cover and flush and surface mounted options, they are ready to take their places in your places.

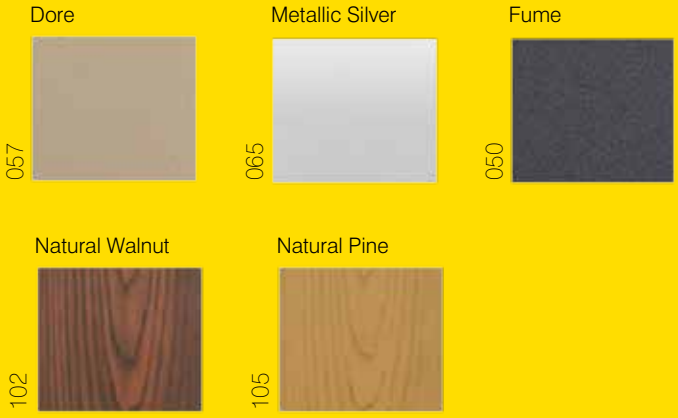
Distribution Boxes

Makel Distribution Boxes offer appropriate solutions for any place a choice of colors apart from opaque and transparent cover models.

Halogen free

Makel Distribution Boxes produced from halogene free material does not contain halogene elements such as bromine, fluorine, iodine and chlorine thus they do not produce toxic gases in case of a fire and they can be used safely in public areas such as schools, hospitals, hotels, malls, cinemas etc.

Color Options

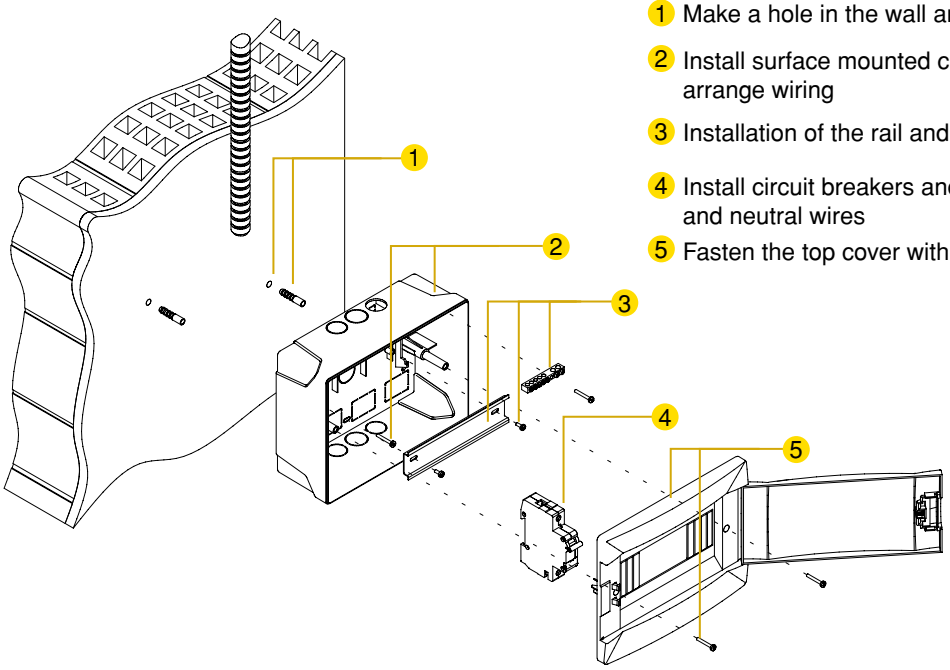


General Specifications

- Halogen free
- Body resistant to heat and impacts
- Body resistant to flames and burning up to 650°C
- Easy to mount inner volume
- Easy usage with cover mechanism with spring
- Cover usable dual sided
- 180° moving cover
- In conformity with international standards
- Transparent and opaque colored cover options
- 35 mm rail
- IP 40 Protection Class
- Isolated neutral electrical connection

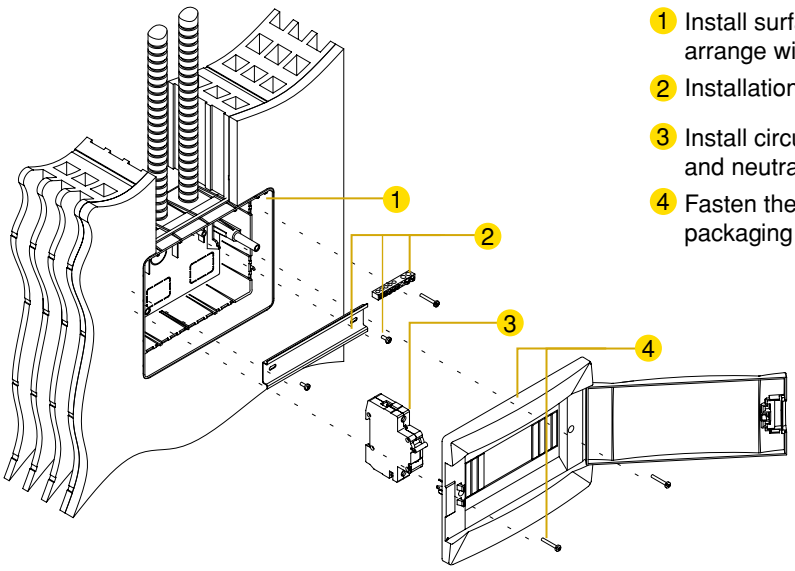
Assembly

Surface Mount Distribution Box



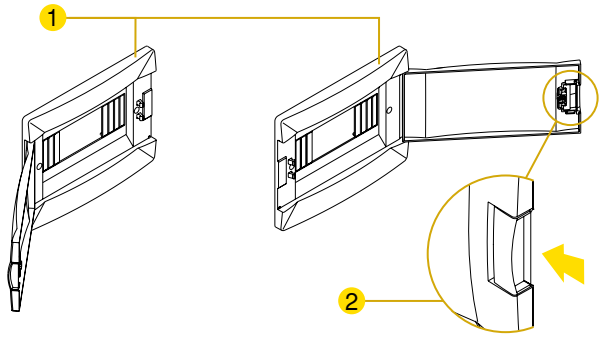
1. Make a hole in the wall and install a peg into the hole
2. Install surface mounted case to the wall and arrange wiring
3. Installation of the rail and the ground block with screws
4. Install circuit breakers and connect phase, ground and neutral wires
5. Fasten the top cover with screws included in packaging

Flush Mount Distribution Box



1. Install surface mounted case to the wall and arrange wiring
2. Installation of the rail and the ground block with screws,
3. Install circuit breakers and connect phase, ground and neutral wires
4. Fasten the top cover with screws included in packaging

Cover Assembly



1. Upper frame can be mounted according to the direction of door opening
2. Push the mechanism in the direction of the arrow to open the cover and pull it toward you.

Flush Mount Distribution Box (With Terminal)

Flush Mount Distribution Box with Terminal Module 2

63002
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,54
Piece in Box / Package - 1 / 36

Flush Mount Distribution Box with Terminal Module 4

63004
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 8,84
Piece in Box / Package - 1 / 24

Flush Mount Distribution Box with Terminal Module 6

63006
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,08
Piece in Box / Package - 1 / 20

Flush Mount Distribution Box with Terminal Module 8

63008
Color - White
IEC 60670-24
Size of Package (mm) - 450x757x220
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 16

Flush Mount Distribution Box with Terminal Module 12

63012
Color - White
IEC 60670-24
Size of Package (mm) - 475x595x215
Gross Weight (kg) - 7,35
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box (With Terminal)

Surface Mount Distribution Box with Terminal Module 2

63102
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,55
Piece in Box / Package - 1 / 36

Surface Mount Distribution Box with Terminal Module 4

63104
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 9,25
Piece in Box / Package - 1 / 24

Surface Mount Distribution Box with Terminal Module 6

63106
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,02
Piece in Box / Package - 1 / 20

Surface Mount Distribution Box with Terminal Module 8

63108
Color - White
IEC 60670-24
Size of Package (mm) - 450x680x212
Gross Weight (kg) - 9,45
Piece in Box / Package - 1 / 16

Surface Mount Distribution Box with Terminal Module 12

63112
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 7,3
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box (With Terminal)

Flush Mount Distribution Box with Terminal Module 16

63016
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box with Terminal Module 16 Double Decker

28001426
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 11,76
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box with Terminal Module 24

63024
Color - White
IEC 60670-24
Size of Package (mm) - 320x455x368
Gross Weight (kg) - 6,7
Piece in Box / Package - 1 / 4

Flush Mount Distribution Box with Terminal Module 36

63036
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 4

Surface Mount Distribution Box (With Terminal)

Surface Mount Distribution Box with Terminal Module 16

63116
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box with Terminal Module 16 Double Decker

28001427
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 11,44
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box with Terminal Module 24

63124
Color - White
IEC 60670-24
Size of Package (mm) - 312x460x350
Gross Weight (kg) - 6,55
Piece in Box / Package - 1 / 4

Surface Mount Distribution Box with Terminal Module 36

63136
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,7
Piece in Box / Package - 1 / 4

Opaque Flush Mount Distribution Box

Flush Mount Distribution Box with Terminal Module 2 -Opaque

28001218
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,54
Piece in Box / Package - 1 / 36

Flush Mount Distribution Box with Terminal Module 4 - Opaque

28001219
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 8,84
Piece in Box / Package - 1 / 24

Flush Mount Distribution Box with Terminal Module 6 - Opaque

28001220
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,08
Piece in Box / Package - 1 / 20

Flush Mount Distribution Box with Terminal Module 8 - Opaque

28001221
Color - White
IEC 60670-24
Size of Package (mm) - 450x757x220
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 16

Flush Mount Distribution Box with Terminal Module 12 - Opaque

28001222
Color - White
IEC 60670-24
Size of Package (mm) - 475x595x215
Gross Weight (kg) - 7,35
Piece in Box / Package - 1 / 8

Opaque Surface Mount Distribution Box

Surface Mount Distribution Box with Terminal Module 2 - Opaque

28001226
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,55
Piece in Box / Package - 1 / 36

Surface Mount Distribution Box with Terminal Module 4 - Opaque

28001227
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 9,25
Piece in Box / Package - 1 / 24

Surface Mount Distribution Box with Terminal Module 6 - Opaque

28001228
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,2
Piece in Box / Package - 1 / 20

Surface Mount Distribution Box with Terminal Module 8 - Opaque

28001229
Color - White
IEC 60670-24
Size of Package (mm) - 450x680x212
Gross Weight (kg) - 9,45
Piece in Box / Package - 1 / 16

Surface Mount Distribution Box with Terminal Module 12 - Opaque

28001230
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 7,3
Piece in Box / Package - 1 / 8

Opaque Flush Mount Distribution Box

Flush Mount Distribution Box with Terminal Module 16 - Opaque

28001225
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box with Terminal Module 16 Double Decker - Opaque

28001475
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 7,04
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box with Terminal Module 24 - Opaque

28001223
Color - White
IEC 60670-24
Size of Package (mm) - 320x455x368
Gross Weight (kg) - 6,7
Piece in Box / Package - 1 / 4

Flush Mount Distribution Box with Terminal Module 36 - Opaque

28001224
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 4

Opaque Surface Mount Distribution Box

Surface Mount Distribution Box with Terminal Module 16 - Opaque

28001233
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box with Terminal Module 16 Double Decker - Opaque

28001476
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 6,21
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box with Terminal Module 24 - Opaque

28001231
Color - White
IEC 60670-24
Size of Package (mm) - 312x460x350
Gross Weight (kg) - 6,55
Piece in Box / Package - 1 / 4

Surface Mount Distribution Box with Terminal Module 36 - Opaque

28001232
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,7
Piece in Box / Package - 1 / 4

Sealed Distribution Box

Dual Surface Mounted Sealed Distribution Box

63140
Color - White
IEC 60670-24
Size of Package (mm) - 51x136x65
Gross Weight (kg) - 13,86
Piece in Box / Package - 1 / 240

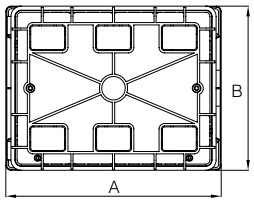
Sealed Distribution Box

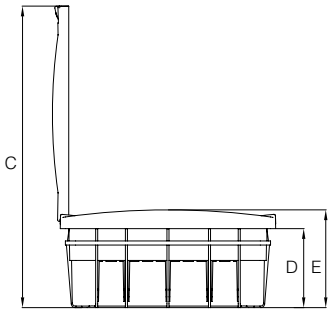
Quadrapole Surface Mounted Sealed Distribution Box

63141
Color - White
IEC 60670-24
Size of Package (mm) - 87x136x65
Gross Weight (kg) - 12,5
Piece in Box / Package - 1 / 120

Technical Dimensions (mm)

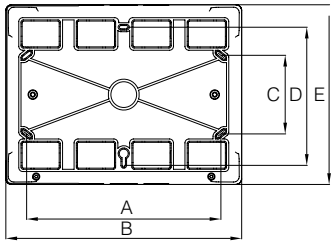
Flush Mount Distribution Box

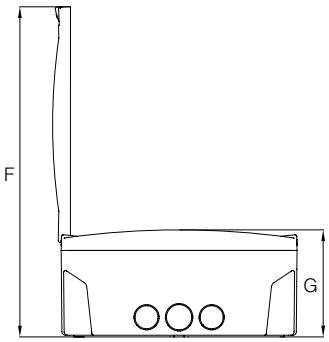




Product Name	A	B	C	D	E
Flush Mount Distribution Box with Terminal Module 2	100	140	182	77	92,35
Flush Mount Distribution Box with Terminal Module 4	136	140	219,35	77	94,35
Flush Mount Distribution Box with Terminal Module 6	172	140	256	77	95,36
Flush Mount Distribution Box with Terminal Module 8	210	175	294	77	95,30
Flush Mount Distribution Box with Terminal Module 12	285	225	369,50	77	97,35
Flush Mount Distribution Box with Terminal Module 16	357	225	442	77	97,35
Flush Mount Distribution Box with Terminal Module 16 Double Decker	228,50	340	317,55	77	104,30
Flush Mount Distribution Box with Terminal Module 24	300	345	389	77	104,30
Flush Mount Distribution Box with Terminal Module 36	320	445	409	77	104,30

Surface Mount Distribution Box





Product Name	A	B	C	D	E	F	G
Surface Mount Distribution Box with Terminal Module 2	60	100	60	100	140	182	92,35
Surface Mount Distribution Box with Terminal Module 4	96	136	50	100	140	219,35	94,35
Surface Mount Distribution Box with Terminal Module 6	132	172	50	100	140	256	95,36
Surface Mount Distribution Box with Terminal Module 8	173	210	70	120	160	294	95,30
Surface Mount Distribution Box with Terminal Module 12	180	285	120	170	210	369,50	97,35
Surface Mount Distribution Box with Terminal Module 16	250	357	120	170	225	442	97,35
Surface Mount Distribution Box with Terminal Module 16 Double Decker	108,50	228,50	192	295	340	317,55	104,30
Surface Mount Distribution Box with Terminal Module 24	180	300	200	290	330	389	104,30
Surface Mount Distribution Box with Terminal Module 36	200	320	315	405	445	409	104,30

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2'pcs.	63002	1	36	10,54	330 x 603 x 315
4'pcs.	63004	1	24	8,84	445 x 600 x 210
6'pcs.	63006	1	20	9,08	375 x 505 x 310
8'pcs	63008	1	16	9,62	450 x 757 x 220
12'pcs.	63012	1	8	7,35	475 x 595 x 215
16'pcs.	63016	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28001426	1	8	11,76	455 x 470 x 355
24'pcs.	63024	1	4	6,70	320 x 455 x 368
36'pcs.	63036	1	4	9,62	450 x 475 x 330
Surface Mount Distribution Box - Halogen Free					
2'pcs	63102	1	36	10,55	330 x 603 x 315
4'pcs	63104	1	24	9,25	445 x 600 x 210
6pcs	63106	1	20	9,20	375 x 505 x 310
8'pcs	63108	1	16	9,45	450 x 680 x 212
12'pcs	63112	1	8	7,30	445 x 600 x 210
16'pcs	63116	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28001427	1	8	11,44	455 x 470 x 355
24'pcs	63124	1	4	6,55	312 x 460 x 350
36'pcs	63136	1	4	9,70	450 x 475 x 330
2'pcs. Sealed	63140	1	40	3,30	283 x 266 x 272
4'pcs. Sealed	63141	1	30	3,55	335 x 283 x 275

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Opaque Flush Mount Distribution Box - Halogen Free					
2'pcs.	28001218	1	36	10,54	330 x 603 x 315
4'pcs.	28001219	1	24	8,84	445 x 600 x 210
6'pcs.	28001220	1	20	9,08	375 x 505 x 310
8'pcs	28001221	1	16	9,62	450 x 757 x 220
12'pcs.	28001222	1	8	7,35	475 x 595 x 215
16'pcs.	28001225	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28001475	1	8	7,04	455 x 470 x 355
24'pcs.	28001223	1	4	6,70	320 x 455 x 368
36'pcs.	28001224	1	4	9,62	450 x 475 x 330
Opaque Surface Mount Distribution Box - Halogen Free					
2'pcs	28001226	1	36	10,55	330 x 603 x 315
4'pcs.	28001227	1	24	9,25	445 x 600 x 210
6'pcs	28001228	1	20	9,20	375 x 505 x 310
8'pcs.	28001229	1	16	9,45	450 x 680 x 212
12'pcs.	28001230	1	8	7,30	445 x 600 x 210
16'pcs.	28001233	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28001476	1	8	6,21	455 x 470 x 355
24'pcs.	28001231	1	4	6,55	312 x 460 x 350
36'pcs.	28001232	1	4	9,70	450 x 475 x 330

Special Color Options

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Flush Mount Distribution Box - Halogen Free					
2'pcs	28 xxx 284	1	36	10,54	330 x 603 x 315
4'pcs	28 xxx 285	1	24	8,84	445 x 600 x 210
6pcs	28 xxx 286	1	20	9,08	375 x 505 x 310
8'pcs	28 xxx 287	1	16	9,62	450 x 757 x 220
12'pcs	28 xxx 288	1	8	7,35	475 x 595 x 215
16'pcs	28 xxx 291	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28 xxx 475	1	8	11,76	455 x 470 x 355
24'pcs	28 xxx 289	1	4	6,70	320 x 455 x 368
36'pcs	28 xxx 290	1	4	9,62	450 x 475 x 330
Surface Mount Distribution Box - Halogen Free					
2'pcs	28 xxx 292	1	36	10,55	330 x 603 x 315
4'pcs	28 xxx 293	1	24	9,25	445 x 600 x 210
6pcs	28 xxx 294	1	20	9,20	375 x 505 x 310
8'pcs	28 xxx 295	1	16	9,45	450 x 680 x 212
12'pcs	28 xxx 296	1	8	7,30	445 x 600 x 210
16'pcs	28 xxx 299	1	8	8,80	475 x 735 x 220
16'pcs. double layer	28 xxx 476	1	8	11,44	455 x 470 x 355
24'pcs	28 xxx 297	1	4	6,55	312 x 460 x 350
36'pcs	28 xxx 298	1	4	9,70	450 x 475 x 330

Please specify your choice of color by applying below color codes into the 'xxx' marked space.

Colors	Code No. XXX
Dore	057
Metallic Silver	065
Fume	050
Natural Pine	105
Natural Walnut	102


Dore
057


Metallic Silver
065


Fume
050


Natural Pine
105


Natural Walnut
102

Terminal (With screw)

Product Name	Code No.	Terminal Specification	Piece in Package
Terminal Block with 3 holes	10151	[Ø5,5x1]+[Ø4,5x2]	100
Terminal Block with 5 holes	10152	[Ø5,5x2]+[Ø4,5x3]	70
Terminal Block with 7 holes	10153	[Ø5,5x2]+[Ø4,5x5]	60
Terminal Block with 9 holes	10154	[Ø5,5x2]+[Ø4,5x7]	50
Terminal Block with 12 holes	10155	[Ø5,5x3]+[Ø4,5x9]	40
Terminal Block with 18 holes	10156	[Ø5,5x5]+[Ø4,5x13]	25

Note: Upon request can be provided additional terminal.

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Notes


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Makel Elektrik Malzemeleri San. ve Tic. A.Ş.
Osmangazi Mah. Mareşal Fevzi Çakmak Cad.
No: 38 34522 Esenyurt - İSTANBUL
Tel: 0212. 689 50 50 (pbx) • Fax: 0212. 689 50 61

www.makel.com.tr • makel@makel.com.tr

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