

Selection

General

A heating circuit is a power switching circuit supplying one or more resistive heating elements switched by a contactor.

The same general rules apply as for motor circuits, except that heating circuits are not normally subjected to overload currents. It is therefore only necessary to provide short-circuit protection.

Characteristics of heating elements

The examples below are based on resistive heating elements used for industrial furnaces or for the heating of buildings (infra-red or resistive radiant type, convector heaters, closed loop heating circuits, etc.).

The variation in resistance values between hot and cold states causes a current peak at switch-on which never exceeds 2 to 3 times the rated operational current (I_n). This initial peak does not recur during normal operation where subsequent switching is thermostatically controlled.

The rated power and current of a heater are given for the normal operating temperature.

Protection

The steady state current drawn by a heating circuit is constant when the voltage is stable. In fact:

- It is unlikely that the number of loads in an existing circuit will be modified;
- This type of circuit cannot create overloads. It is therefore only necessary to provide short-circuit protection.

This can be provided by:

- gG type fuses, or
- modular circuit-breakers.

Nevertheless, it is always possible and sometimes more economical (smaller cable size) to protect the circuit by a thermal overload relay and associated aM type fuses.

Switching, control, protection

A heating element or group of heating elements of a given power may be either single-phase or 3-phase and may be supplied from a 220/127 V or a 400/230 V distribution system.

Excluding a single-phase 127 V system (which is no longer commonly used), the following 3 types of circuit arrangement are possible:

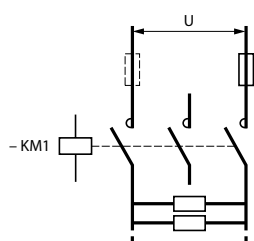
- Single-phase, 2-pole switching
- Single-phase, 4-pole switching
- 3-phase switching

Component selection according to the power switched

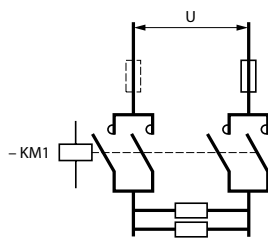
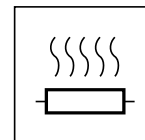
The combinations suggested below are based on an ambient temperature of 55 °C and for powers at the nominal voltage, but they also ensure switching in the event of prolonged overloads up to 1.05 U_e .

Single-phase, 2-pole switching

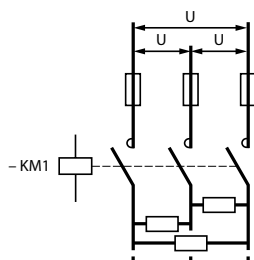
Maximum power (kW)				Contactor rating
220/240 V	380/415 V	660/690 V	1000 V	
3.5	6.5	11	—	LC1, LP1 K09
4.5	8	14	—	LC1 D12
6	10.5	18.5	—	LC1 D18
7	13	22.5	—	LC1 D25
10	18	30.5	—	LC1 D32, LC1 D38
13	22.5	39.5	48	LC1 D40A
16.5	28.5	43.5	68	LC1 D65A
24	42	73	82.5	LC1, LP1 D80
44	76	118	157	LC1 D115, LC1 D150
48	83	130	170	LC1 F185
52	90	145	185	LC1 F225
60	104	160	210	LC1 F265
75	130	200	250	LC1 F330
86	145	230	300	LC1 F4002
116	200	310	400	LC1 F5002
170	290	450	695	LC1 F6302, LC1 F800
270	460	715	945	LC1 F780
140	242	370	490	LC1 BL32
220	380	580	770	LC1 BM32
350	605	925	1225	LC1 BP32
480	830	1270	1680	LC1 BR32



Circuit controlled by 2 poles of the contactor.



Circuit controlled by a 4-pole contactor with the poles parallel connected in pairs using appropriate connecting links. This solution enables the control of power values approximately equivalent to those controlled by the same contactor on 3-phase.



Circuit controlled by 3 poles of the contactor.

Component selection according to the power switched (continued)

Single-phase, 4-pole switching

Maximum power (kW)				Contactor rating
220/240 V	380/415 V	660/690 V	1000 V	
4.5	8	13.5	—	LC1, LP1 K09004
7	13	22.5	—	LC1 DT25
12	21	36.5	—	LC1 DT40
26	45.5	79.5	109	LC1 DT80A
38	66	117.5	132	LC1, LP1 D80004
70	121	190	251	LC1 D115004
76	132	202	270	LC1 F1854
80	142	230	295	LC1 F2254
96	166	253	335	LC1 F2654
120	205	320	400	LC1 F3304
137	236	363	480	LC1 F4004
185	320	490	650	LC1 F5004
272	470	718	950	LC1 F6304
425	735	1140	1520	LC1 F7804
224	387	590	785	LC1 BL34
352	608	930	1230	LC1 BM34
560	968	1478	1960	LC1 BP34
768	1328	2025	2685	LC1 BR34

3-phase switching

Maximum power (kW)				Contactor rating
220/240 V	380/415 V	660/690 V	1000 V	
4.5	8	13.5	—	LC1, LP1 K09
7	13	22.5	—	LC1 D12
10	18	30.5	—	LC1 D18
13	22.5	39.5	—	LC1 D25
18	31	52.5	—	LC1 D32, LC1 D38
22.5	38	68	78	LC1 D40A
28.5	49	86	112.5	LC1 D65A
40.5	70.5	126	135.5	LC1, LP1 D80
76	131	206	275	LC1 D115, LC1 D150
82	143	220	295	LC1 F185
90	155	250	320	LC1 F225
103	179	275	370	LC1 F265
130	225	345	432	LC1 F330
149	256	395	525	LC1 F400
200	346	530	710	LC1 F500
294	509	780	1030	LC1 F630, LC1 F800
463	800	1235	1650	LC1 F780
242	419	640	850	LC1 BL33
380	658	1005	1350	LC1 BM33
606	1047	1600	2150	LC1 BP33
830	1437	2200	2950	LC1 BR33

Application example

For a 220 V, 50 Hz, single-phase circuit supplying a total heating load of 12.5 kW.
Select a 3-pole contactor **LC1 D65A**.