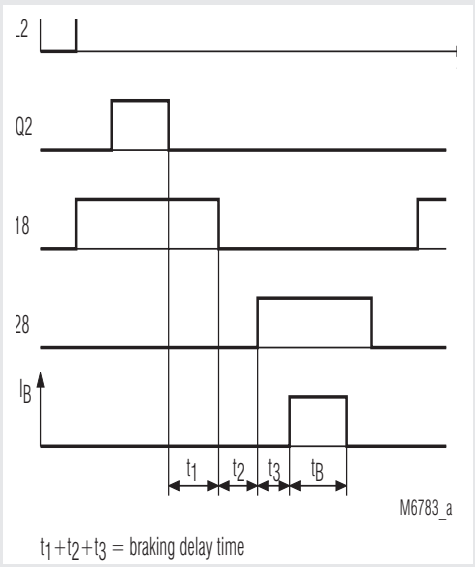
MINISTOP
Motor Brake Relay
AR 9021

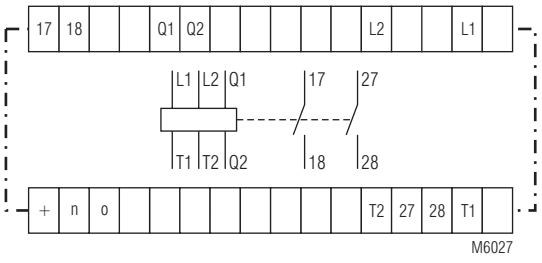
0224437

- Thyristor electronic motor brake relay for motors up to 5.5 kW
- Adjustable braking current, optional up to max. 26 A
- Adjustable braking time, optional up to max. 60 s
- Internal braking contactor
- Optional with standstill monitoring
- Optional with protection against overtemperature
- Width 150 mm

Function Diagram



Circuit Diagram



Approvals and Marking

CE

Applications

DC-brake for squirrel cage motors in:
- woodworking machines
- centrifuges, conveyor belts
- mills, grinding machines
- shaker conveyors

Construction and Action

With the supply voltage connected to terminals L1-L2, the interlock contact 17-18 for the motor contactor is closed. A red LED indicates that supply voltage is present. The motor can started by the "ON" button. The DC braking current can be collected at the T1 and T2 terminals.

The relay operates in the following manner:
When the motor contactor has been deenergized, the braking current contactor is closed, after a fixed safety time delay to allow inductive voltages to decay. After that the braking current is flowing through the stator windings for the set braking time.

Indicators

LED red (L1/L2):	supply voltage is present
LED red (ϑ):	thermal protection has responsed
LED green (I_B):	braking current is present

Notes

Because the DC braking current is produced by a phase controlled thyristor rectification circuit and the DC current is a product of the supply voltage applied to L1-L2 and the winding resistance, the max. current can be significantly larger than the permissible current, if the potentiometer is turned to right end.

Standstill is monitoring at 3 Hz. One mark for the proximity switch is equivalent to 180 rpm. With more marks the standstill speed can be reduced.

Technical Data

Input

Nominal voltage L1, L2: AC 24, 110, 230, 240, 400, 415, 440, 480, 500 V
Voltage range: 0.8 ... 1.1 U_N
Nominal frequency: 50 / 60 Hz
Nominal consumption: 5 VA

Output

Contacts: 2 NO contacts
Rated motor power: 4 kW at 400 V
Permissible braking current: 0.2 ... 16 A
DC braking voltage (RMS): 0.695 x nominal voltage ± 5 %
Braking time: 3 s, 10 s, 20 s, 60 s ± 10 %
Braking delay time: 300 ms ± 20 %
Percentage load factor (ED):

Braking currrent I_e / Temperature	6 A	12 A	16 A
20°C	100 %	40 %	25 %
30°C	82 %	33 %	20 %
40°C	62 %	25 %	17 %
50°C	40 %	17 %	11 %
55°C	31 %	14 %	9 %

$$ED = \frac{\text{braking time}}{\text{period of switching cycle}}$$

Switching capacity of the monitoring contacts to AC15: 5 A / AC 230 V IEC/EN 60 947-5-1
Fuse, superfast: 16 A
25 A at variant /200
Mechanical life: 30 x 10^6 switching cycles
EN 60 947-5-1

General Data

Temperature range: - 20 ... + 55 °C
Storage temperature: - 25 ... + 70 °C
Clearance and creepage distances
rated impuls voltage / pollution degree: 4 kV / 2 IEC 60 664-1
EMC
Electrostatic discharge: 4 kV (air) IEC/EN 61 000-4-2
Fast transients: 4 kV IEC/EN 61 000-4-4
Surge voltages between
wires for power supply: 2 kV IEC/EN 61 000-4-5
between wire and ground: 4 kV IEC/EN 61 000-4-5
Degree of protection: Housing: IP 40 IEC/EN 60 529
Terminals: IP 20 IEC/EN 60 529
Housing: Thermoplastic with V0 behaviour according to UL subject 94
Vibration resistance: Amplitude 0.35 mm
frequency 10...55Hz IEC/EN 60 068-2-6
Wire connection: 2 x 2.5 mm² solid or
2 x 1.5 mm² stranded ferruled
DIN 46 228-1/-2/-3
Wire fixing: Flat terminals with self-lifting clamping piece IEC/EN 60 999-1
Mounting: DIN rail IEC/EN 60 715
Screw-fixing: 50 x 135 mm and 60 x 135 mm DIN 46 121
Weight: 850 g

Dimensions

Width x height x depth: 150 x 78 x 115 mm

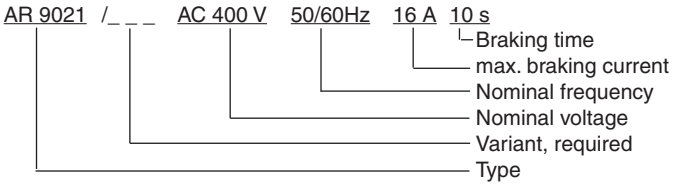
Standard Type

AR 9021 AC 400 V 50/60 Hz 16 A 10 s
Article number: 0027199 stock item
- Nominal voltage U_N: AC 400 V
- Max. braking current: 16 A
- Braking time: 10 s
- Width: 150 mm

Variants

AR 9021/100: Temperature monitoring of the power rectifiers
AR 9021/110: Standstill monitoring by proximity switch
AR 9021/120: Temperature and standstill monitoring
AR 9021/150: Q_1, Q_2 operates like NC-contact t_V = 100 ms, t_B = 3 s
AR 9021/200: Braking current up to 26 A, external braking contactor necessary
AR 9021/201: wie AR 9021/200 mit Mehrgangpoti
AR 9021/300: Interruption of the braking current via Q_1/Q_2

Ordering example for variants



Control Input

If the connection between Q1-Q2 is made, the device turned into standby mode. After opening the connection, the device starts with braking.

Monitoring Output

17, 18: interlock contact for motor contactor
27, 28: activation of braking contactor

Adjustment Facilities

Potentiometer	Description	Fundamental adjustment
I_B	braking current	left position
t_B	braking time	mid position

Commissioning

The braking time t_B has to be determined experimentally. Braking current I_B is adjusted to be 1.8 ... 2 times the rated motor current I_N. If the motor stops and hums the time t_B is too long. If motor is still turning after time t_B has elapsed, t_B is too short and has to be increased.

In the basic circuit braking current I_B is injected into one stator winding. For high inertia applications braking current I_B should be injected into two or more stator windings. Combining 2 stator windings with the built-in contact 27-28 increases braking efficiency for the same braking current I_B. If contact 27-28 is used to switch an aux. relay also 3 stator windings may be connected in line.

Braking with time delay t_B and current I_B

As soon as relay S1 opens it is recognized by the motor brake via the inputs Q1-Q2 (contact opening principle). After a fixed delay of approx. 80 msec. the braking current I_B is injected for the duration of the set braking time t_B. During this time contacts 17-18 are opened to prevent the motor contactor energizing while braking. The lit green LED I_B indicates the presence of the braking current I_B. After t_B has elapsed the current I_B is switched off, the green LED I_B extinguishes and contacts 17-18 closes. The motor can be restarted.

Commissioning

Braking with standstill monitoring

Under certain running conditions the rise in temperature of the stator windings may cause the actual braking time t_B to standstill to be less than the time set under cold conditions. The speed condition may be used to override time by connecting a proximity switch to terminals "+", "n" and "o" with potentiometer t_B set to maximum. When standstill is registered the brake relay switches off after 300 msec. As a safety feature, should the sensor fail, the brake relay will continue to time out and switch off when the max. set time is reached.

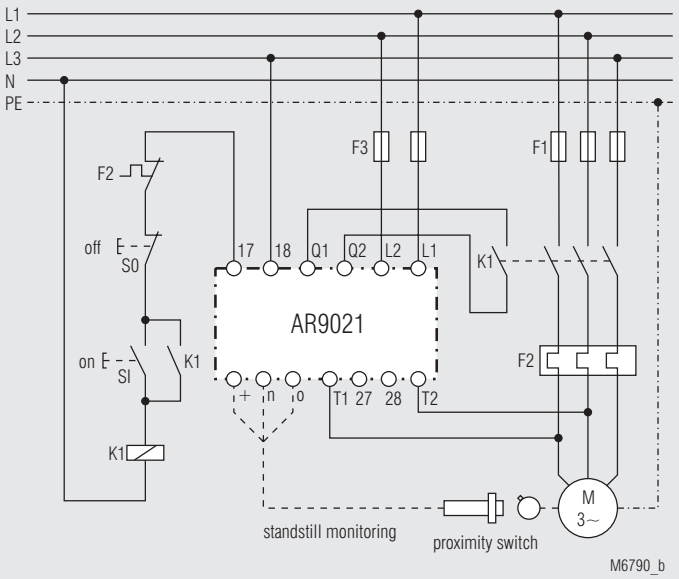
Overtemperature protection

It is possible under very arduous operating conditions that the relay power components will overheat. A thermal cut-out will disconnect the brake relay and by opening contacts 17-18 prevent reenergization of the motor until a suitable cooling period elapses. A red LED (ϑ) indicates the overheat condition.

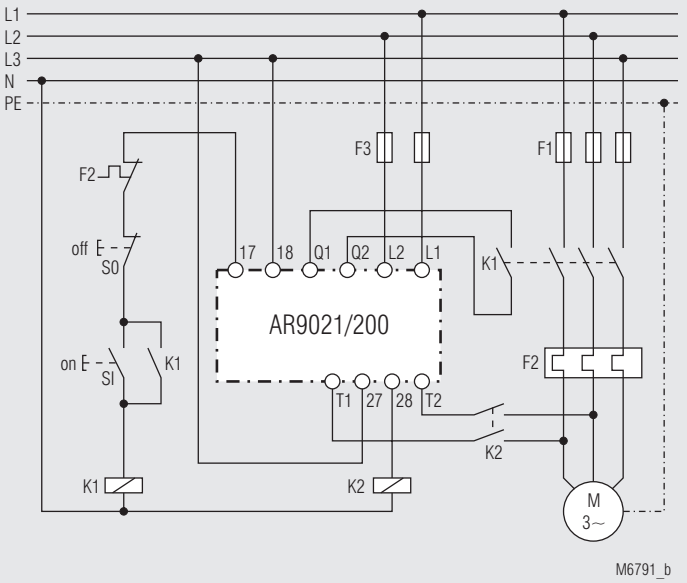
Response temperature:	90 ... 95 °C
Hysteresis:	approx. 5 %

Safety Instructions

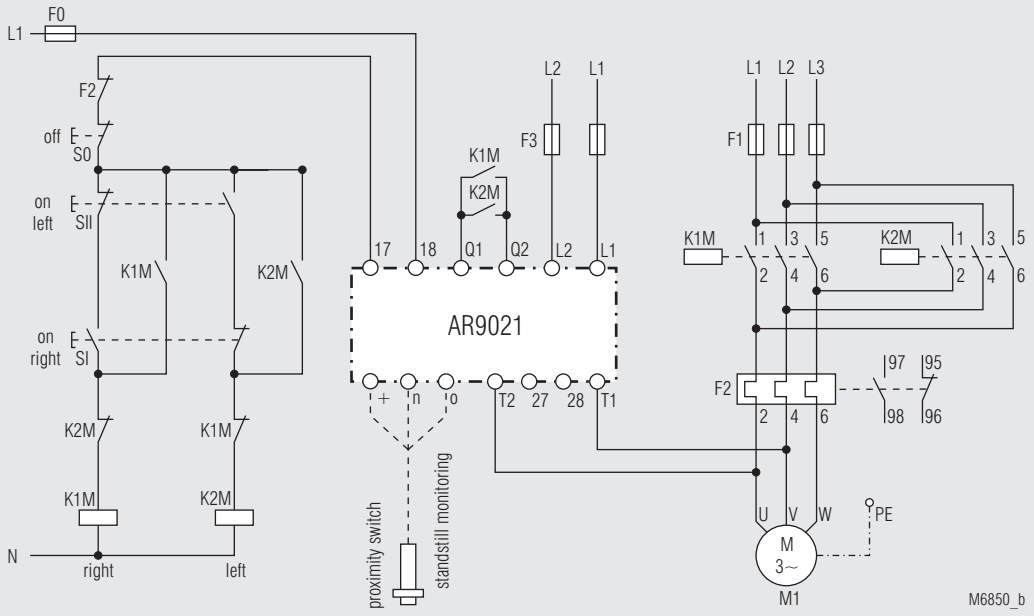
- Never clear a fault when the device is switched on
- The user must ensure that the device and the necessary components are mounted and connected according to the locally applicable regulations and technical standards
- Adjustments may only be carried out by instructed specialist staff, while the applicable safety rules must be observed.



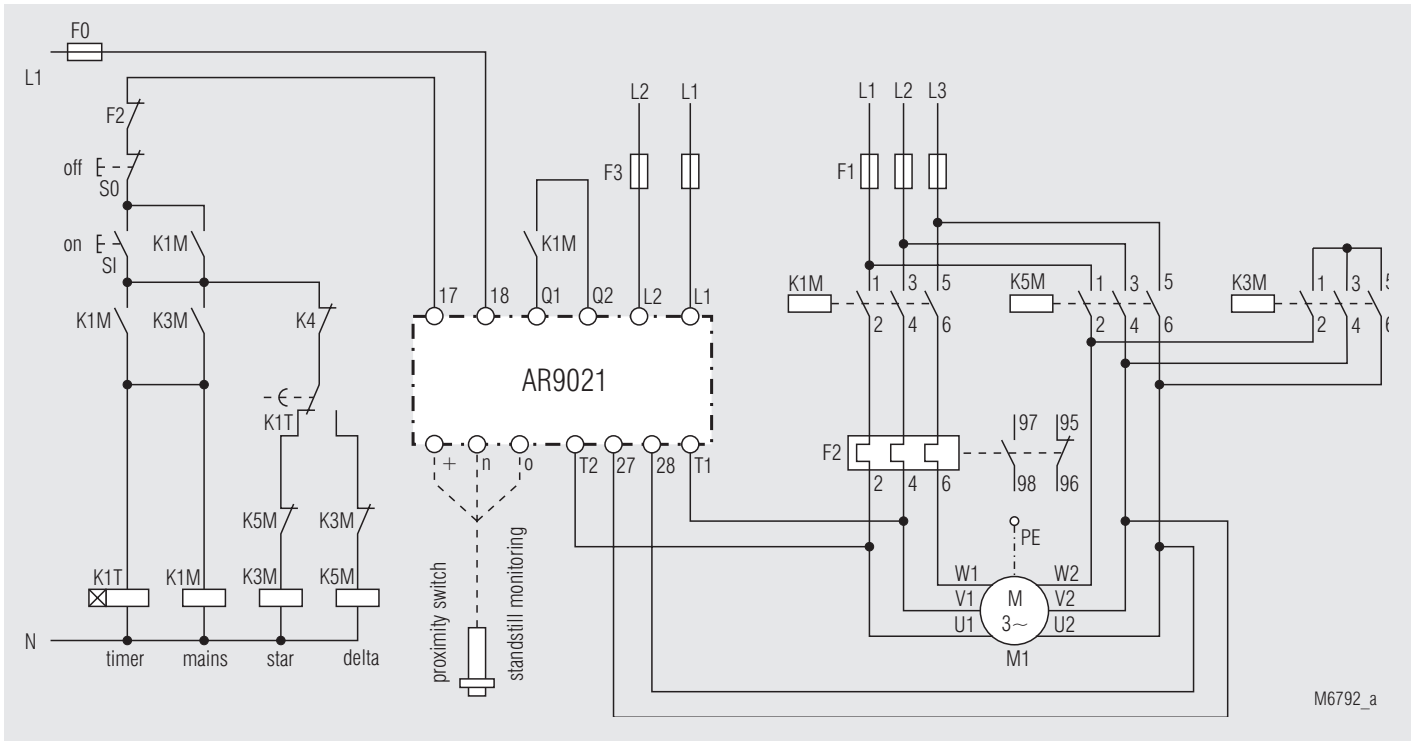
Braking with stand still monitoring



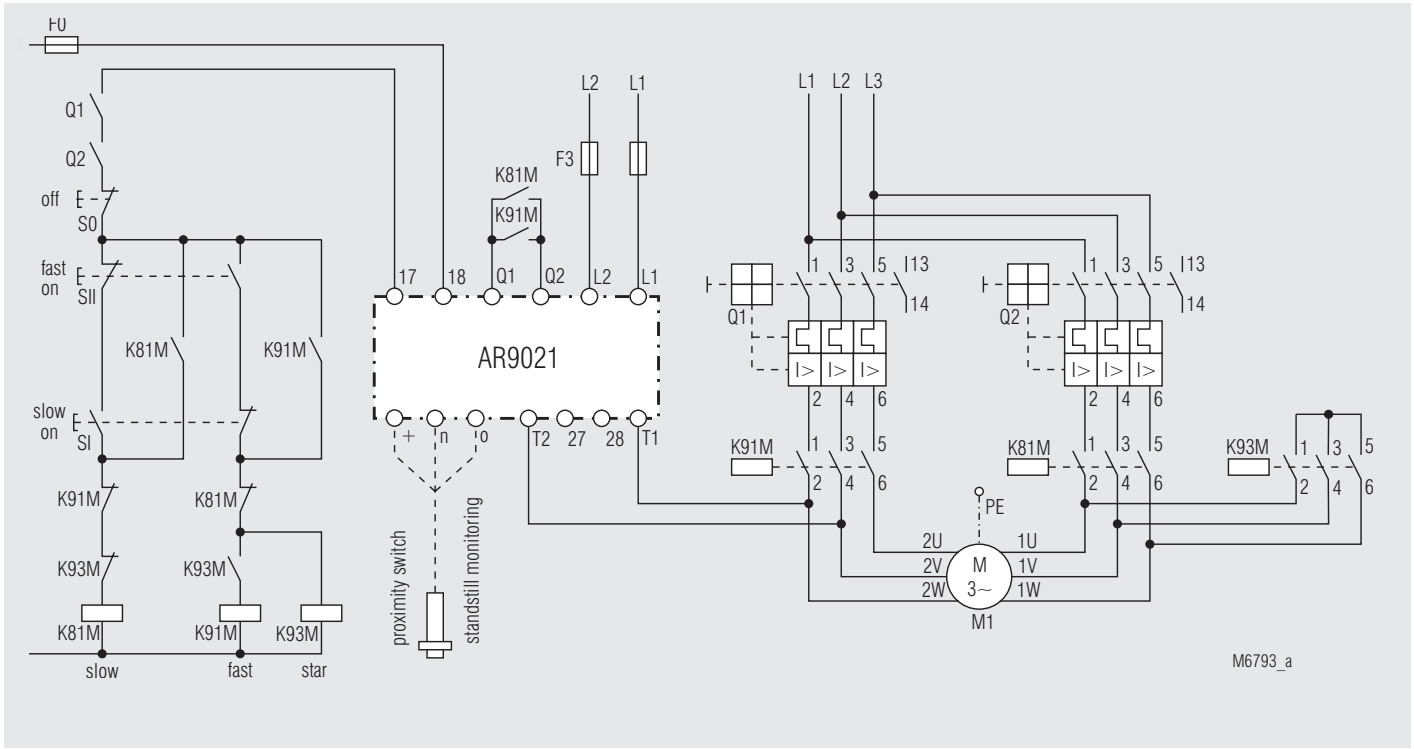
Branking with external brake contactor



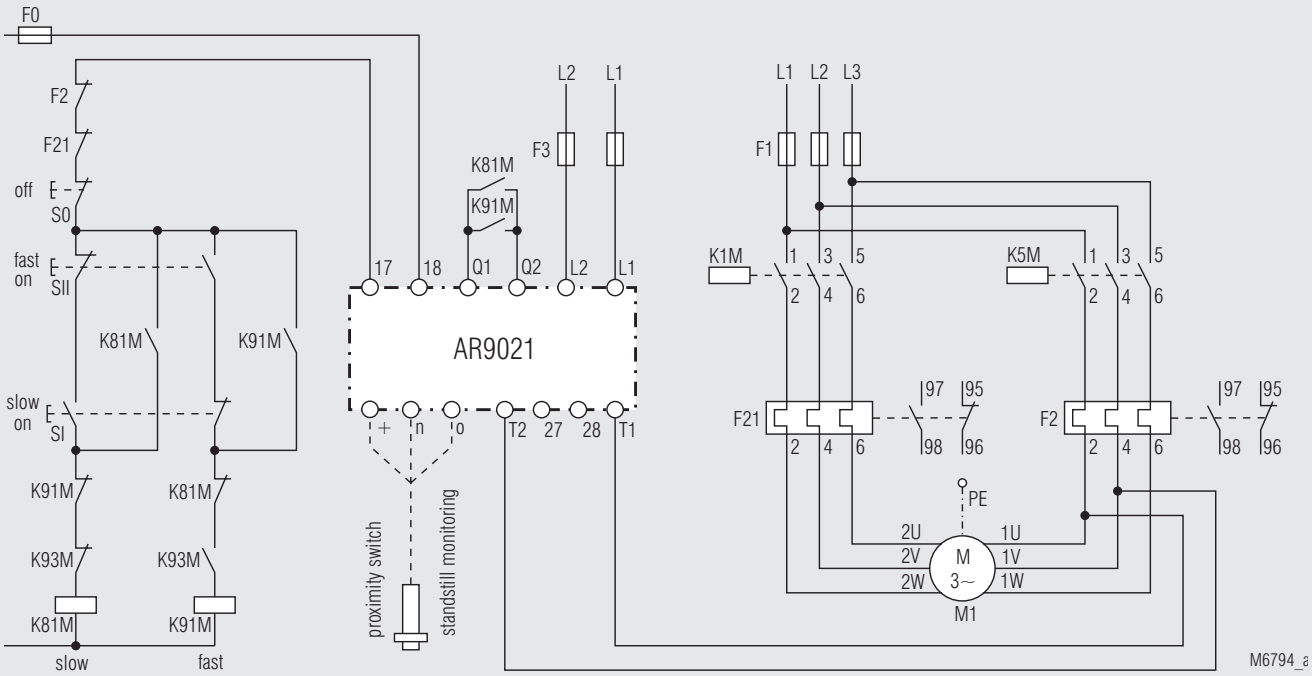
Reversing control connection (direct switching). Braking while turning left or right with AR 9021



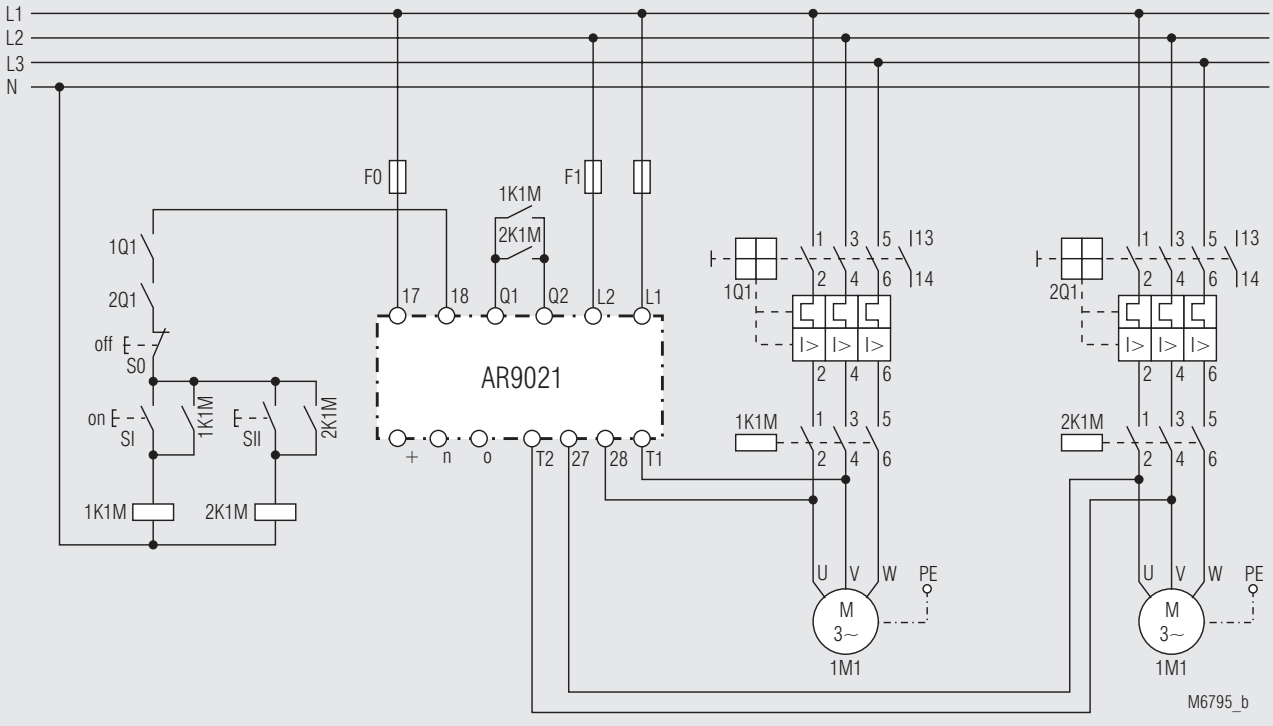
Y - Δ - control, braking with AR 9021



Dahlander Control Circuit, braking of low and high revolutions with AR 9021



Pole commutation (seperate windings), braking of low and high revolutions with AR 9021



Multi motor braking (2 motors switched in series) with AR 9021. Braking circuit must to be adhered to.