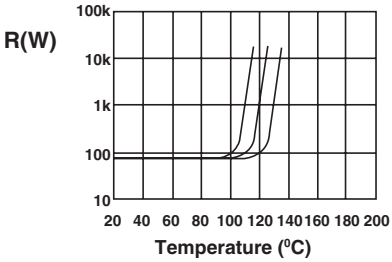
PHASE FAILURE DEVICES
MK-05 / 05P / 06 / 06P, MKC-05 / 05P / 06 / 06P

General
One of the common faults faced in industrial plants is overheating and damaging of 3 phase motors due to the phase failure. “Thermic-magnetic device” which is an essential element in motor protection is generally too slow due to both its electromechanical structure and the use of hing current setting range to assure demarrage without tripping. Being designed to eliminate the above disadvantages, MK-05, MKC-05, MKC-06 and MK-06 Phase Failure Devices serve the following protection features

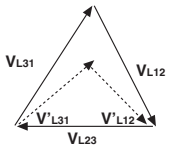
1.Phase Failure
When the monitored 3 phase voltages are valid, the output relay is activated; İf any of 3 phases fails, the output device switches OFF immediately. Relay LED is OFF, Asymmetry and Phase Sequence error LEDs are ON.

2. Phase Sequence
When the phase sequence is correct (L1, L2, L3 in clockwise direction) the output relay is activated; however, if the sequence is changed by any reason, the output relay switches OFF immediately. Relay LED is OFF, Phase Sequence error LED is ON.

3.PTC Protection (Only Available in MK-05P, MKC-05P, MKC-06P & MK-06P versions)
When the coil temperature in motors exceeds Tc, the limit temperature of PTC, the output relay switches off immediately, Relay LED is OFF. This feature is included only in MK-05P,MKC-05P,MK-06P and MKC-06P. See following figure for typical resistance of PTC vs temperature characteristics for three different swiching temperatures (110 ^{O}C, 120 ^{O}C, 130 ^{O}C). Normally, PT-110 is used and it can be changed upon request.



4.Voltage Unbalance(Both Unbalance and Delay Adjustable)
When the phase-phase voltage unbalance is less than the adjusted value by the user, output relay is activated. If the unbalance value exceeds the limit value (5%-15%) set by the user, output relay is switched OFF at the end of delay time (0.1...10s) that is also set by the user. Relay LED is OFF, Asymmetry eror LED is ON. If the fault disappears within the delay time, the output relay is not switched OFF.



$$\text{Asymmetry \%} = \frac{|V'_{L31} - V'_{L12}|}{V_{Ref}} \times 100$$

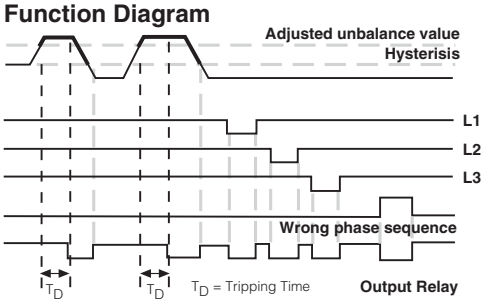
$$V_{Ref} = 380 \text{ VAC}$$

The voltage unbalance occurs if the phases L1, L2, L3 are loaded unequally. This case is caused by a non-uniform distribution of loads on the lines. The voltage asymmetry causes rise in of the motor temperature and a reduction of the rated motor power.
Voltage asymmetry limit values are adjusted (5%-15%) by the user. Hysteresis is fixed at 20%

Example: Given 3x380 V supply with 10% asymmetry,
Relay switches OFF at: 380-(380 x10%)=342 V
Relay switches ON at: 342 + (342 x 10% x 20%)=348.8 V

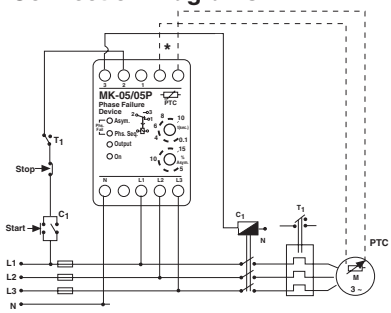
5. Insufficient Supply
L1 is the supply phase of the MK-05 and MK-05P in PK21 package while L3 is the suply phase of MKC-05 and MKC-05P devices. For MK and MKC devices if supply voltage falls below 60-65% of rated voltage, output relay switches off without delay and error leds start to blink one after another sequentially.

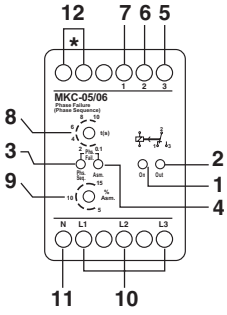
Function Diagram

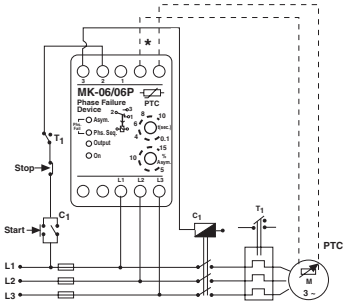


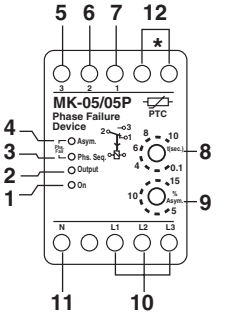
PRECAUTIONS FOR INSTALLATION AND SAFE USE
Failure to follow those instructions will result in death or serious injury.
- **Disconnect all power before working on equipment.**
- **When the device is connected to the network, do not remove the front panel.**
- **Do not try to clean the device with solvent or the like. Only clean the device with a dried cloth.**
- **Verify correct terminal connections when wiring.**
- **Electrical equipment should be serviced only by your compedent seller. No responsibility is assured by the manufacturer or any of its subsidiaries for any consequences arising out of the use of this material.**
- **Mount device to the panel**

Connection Diagrams









1. On LED
2. Output LED
3. Phase sequence fault LED
4. Asymmetry fault LED
   (While LED no. 3 and 4 are ON at the same time, it means there is phase failure)
5. Contact (3) normally ON connection of output relay
6. Contact (2) common connection of output relay
7. Contac (1) normally OFF connection of output relay
8. Time adjusment (0.1 sec.-10 sec.)
9. Asymmetry adjusment (5%-15%)
10. L1, L2, L3 phase connection
11. Neutral connection
    (Only for 05 and 05P series)
12. PTC connection*

*: Only available in MK-05P,MKC-05P If PTC is not used in MK-06P, MKC-06P by any reason, the PTC terminals should be short circuited.

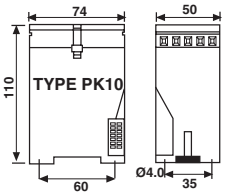
Tecnical Data

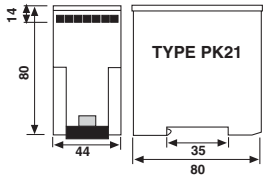
Rated Voltage (Un)	: 220 VAC (For MK-05/05P, MKC-05/05P) 3 phase + neutral: 4 wires connection 120 VAC 3 phase + neutral: 4 wires connection (MKC-05/05P Special design) 380 VAC 3 phase :3 wires connection (For MK-06/06P, MKC-06/06P) 440 VAC 3 phase :3 wires connection (MKC-06/06P Special design)

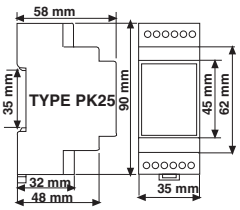
The three phase network being protected is used as the device power supply.

Operating Range	: (0.9-1.1) x Un
Rated Frequency	: 50/60 Hz
Output Contacts	:1 C/O with 8A, 2000 VA (For resistive load)
Asymmetry Range	: 5% - 15%; 3 x 380 VAC
Tripping Time	: 0.1 - 10 sec. (adjustable)
Phase Sequence	: Available
Ambient Temperature	: -5 ^{O}C to + 50 ^{O}C
Protection Class	: IP 20
Diemensions	: Type PK 10 (For MK-05/05P, MK-06/06P) Type PK 21 (For MK-05/05P) Type PK 25 (For MKC-05/05P, MKC-06/06P)
Installation	: Surface mounting or on the mounting rails
Weight	: 0.3 kg (For MK-05/05P, MK-06/06P) 0.2 kg (For MKC-05/05P/06/06P)

Dimensions







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