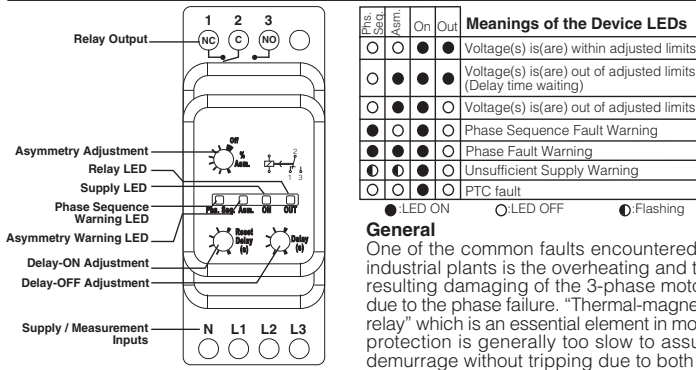


PHASE FAILURE DEVICES

MKC-05, MKC-05P, MKC-06, MKC-06P and FR-02

EN



Phs. Seq.	On	Out	Meanings of the Device LEDs
●	●	●	Voltage(s) is(are) within adjusted limits
○	●	●	Voltage(s) is(are) out of adjusted limits (Delay time waiting)
○	○	●	Voltage(s) is(are) out of adjusted limits
●	○	○	Phase Sequence Fault Warning
○	○	○	Phase Fault Warning
○	○	○	Uninsufficient Supply Warning
○	○	○	PTC fault

General

One of the common faults encountered in industrial plants is the overheating and the resulting damaging of the 3-phase motors due to the phase failure. "Thermal-magnetic relay" which is an essential element in motor protection is generally too slow to assure demurrage without tripping due to both its

electromechanical structure and the use of high current setting range. MKC-05/05P, MKC-06/06P and FR-02 Motor Protection Relays which are designed to protect the desired equipment against phase failure, asymmetry and phase sequence failure on 3 phase systems with or without neutral connection, are manufactured to serve the following purposes.

Utilisation and Working Principle

By using the asymmetry adjustment knob(%asm.) on the front panel, the upper asymmetry limit of the system which will be protected is determined. If the unbalance on the system (asymmetry) exceeds the adjusted value, the device waits as long as the Delay-OFF time(Delay) and if the unbalance is still over the adjusted value, the relay of the device breaks contact(OUT LED turns off and Asm. LED turns on). If the unbalance on the system(asymmetry) falls under the adjusted value, the device waits as long as the Delay-ON time(Reset Delay) and if the unbalance is still under the adjusted value, the relay of the device makes contact(OUT LED turns on and Asm. LED turns off).

PROTECTION FEATURES :

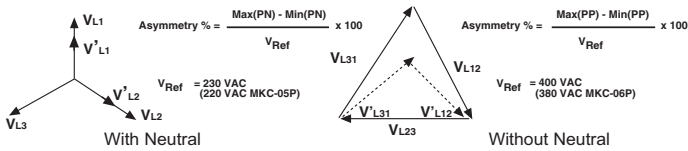
1- Voltage Unbalance (Can be Adjusted or Disabled) (MKC-05 / 05P / 06 / 06P)

Unbalanced voltage(asymmetry) may occur when;

The mains are loaded with unbalanced distribution, One of the 3 phases of the motor has lost. In this case, some amount of voltage which is produced by other phases will be induced on the lost phase. Amount of this voltage depends on both the motor type and amount of load.

Output relay is making contact when a phase has been lost or an unbalanced Phase-Phase voltage value, which is occurred for any reason, is smaller than the user defined asymmetrical value. If this unbalanced voltage value exceeds the adjusted asymmetrical value(5-15%); output relay will break contact and switch off the motor at the end of adjusted time delay(0.1-20 sec.); relays LED on the front panel is turned off. Asymmetry error LED is turned ON. If the fault disappears within the delay time, the output relay will not break contact and will not switch off the motor.

In applications; a proper asymmetrical value should be adjusted considering the induced voltage value in two-phase which are remained after the other one has lost.



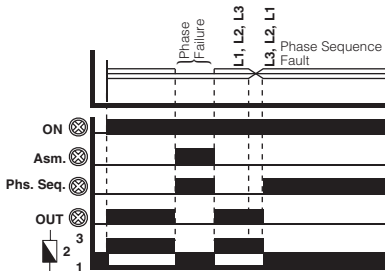
The voltage asymmetry causes the rise in motor temperature and a reduction of the rated motor power. Voltage asymmetry limit values can be adjusted between 5%-15% by the user or can be disabled. Hysteresis is 30% of the adjusted asymmetry value. Example: Given 3x380 V supply with 10% asymmetry, Relay switches OFF at: $380 - (10 \times 380 / 100) = 342 \text{ V}$ Relay switches ON at: $380 - ((10 - (10 \times 30)) \times 380 / 100) = 353,2 \text{ V}$

2- Phase Sequence Protection (MKC-05 / 05P / 06 / 06P and FR-02):

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 turns ON.

3-Lost Phase Fault (MKC-05 / 05P / 06 / 06P):

If the value for any of the phases drop down the lost phase limit value(Unx0.5), Phs. Seq. - Asm. LEDs turn on simultaneously and the relay breaks contact without delay.



Phase Sequence Fault Function Diagram

4- Insufficient Supply Voltage (MKC-05 / 05P / 06 / 06P and FR-02)

In devices which are supplied from a 3 phase capacitive source(MKC-05/06), the supply voltage is the mean value of voltages from all three phases. If this mean value (L3 phase for MKC-05P/06P devices) is less than half the supply voltage, the relay gives an insufficient supply voltage warning(asm. and Phs. Seq. LEDs flash alternately) and the relay breaks contact without delay.

- MKC-05 and FR-02 with Neutral => $(VL1+VL2+VL3)/3 < 115 \text{ VAC (P-N)}$
- MKC-05P => $VL3 < 110 \text{ VAC (P-N)}$
- MKC-06 without Neutral => $(VL12+VL23+VL31)/3 < 200 \text{ VAC (P-P)}$
- MKC-06P => $VL31 < 190 \text{ VAC (P-P)}$

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 before operation.

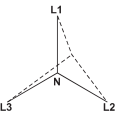
Mount device to the panel.

Electrical equipment should be serviced only by your competent seller.

No responsibility is assured by the manufacturer or any of its subsidiaries for any consequences arising out of the use of this material.

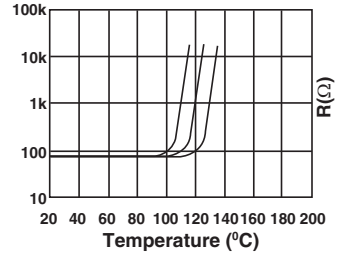
BREAK OF THE NEUTRAL CONNECTION FOR DEVICES WITH NEUTRAL (MKC-05/05P/FR-02):

Measurement is done between Phase and Neutral for devices with capacitive supply. If the neutral connection is lost, the neutral point of the system shifts because of the asymmetrical phase loading. The device continues the take measurements according to the shifted neutral system point. When the neutral connection is lost on devices supplied with transformer and SMPS, the device supply is cut and relay of the device opens.

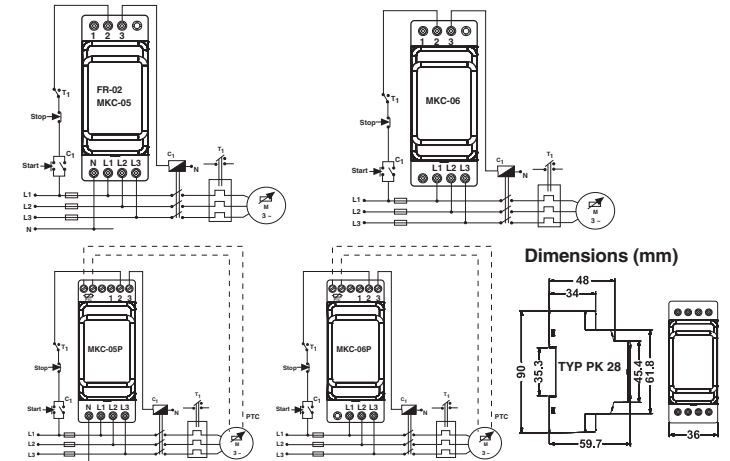


3- PTC Protection (MKC-05P / 06P)

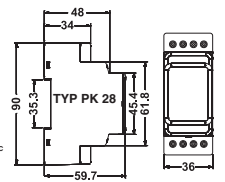
If motor coil temperature exceeds the temperature limit of PTC, the motor is disconnected immediately. The output relay is opened and Relay LED turns off. This feature is only available for MKC-05P and MKC-06P. Resistance-Temperature values for three PTC with different temperature limit values (110 °C, 120 °C, 130 °C) are shown on the figure on the right. If you want to cancel PTC protection on a device with PTC protection feature, the PTC terminals on the device should be short-circuited.



Connection Diagrams



Dimensions (mm)



TECHNICAL PROPERTIES

Measurement and Supply Circuit	
Supply Voltage (Un)	: 230V AC MKC-05 / FR-02, 220V AC MKC-05P, 400V AC MKC-06, 380V AC MKC-06P
Supply Voltage Gap (ΔU)	: Please refer to the side label on the device.
Supply Frequency	: 48 ... 63 Hz. MKC-05 / 06, FR-02 : 50/60 Hz. MKC-05P / 06P
Power Consumption (max.)	: 30 VA / 2 W (50 Hz.)
Measurement Method	: True RMS
Settings	
Asymmetry Adjustment Range(asm. %)	: 5%...15% (With/Without Neutral) Can be disabled.
Hysteresis	: 30% of the adjusted asymmetry value
Delay-Off(Delay)	: 0.1 ... 20 sec.
Delay-On(Reset Delay)	: 0.1 ... 20 sec.
Voltage Adjustment Accuracy	: ± 3%
Repetition Accuracy(Voltage)	: ± 0.5%
Accuracy of the Set Times	: ± 5% + 100 msec.
Repetition Accuracy(Time)	: ± 3%
Output	
Output Type	: 1 Change-over(CO) Contact, 8A, 250V, 2000VA (Cosφ=1)
Electrical Life	: 10 ⁵
Mechanical Life	: 10 ⁷
Ambient Conditions	
Operating Temperature / Storage Temperature	: -20°C ... +55°C / -40°C ... +70°C
Relative Humidity	: < 90% (without condensation)
Connection	
Cable Cross-sections for Terminals	: 4mm ² (12AWG) stranded rigid cable : 6mm ² (10AWG) solid conductor cable : 2x2.5mm ² (14AWG) solid conductor cable
Screw-On Force	: 0.5 Nm (4.5in.lbs)
Body	
Installation	: Inside the panel vertically or on to the rail
Material Type	: Plastic Compliant with UL 94 V0
Protection Class	: IP 20 (Terminals), IP 40 (Front Panel)
Dimensions	: Type PK 28
Weight	: 100 gr. Only MKC-05P / 06P 200gr
Isolation	
Isolation Voltage (EN 60255-5)	: 400 V
Isolation Coordination (EN 60255-5)	: Exceeding Voltage Category III, Pollution Degree 3
Instant Burst Voltage (EN 60255-5)	: 4 kV 1.2 / 50 μS
Dielectric Resistance (EN 60255-5)	: 2 kV AC 50 Hz. 1 minute.
Isolation Resistance (EN 60255-5)	: >500 MOHM / 500 V DC
Followed Standards	
EN-60255-6	: Product Standard
EN-61000-6-2	: Immunity
EN-61000-6-3, EN-61000-6-4	: Emission
Directives/Regulations To Be Followed	
73/23/EEC	: LVD
89/336/EEC	: EMC

