

## OKPH MOK-PH2 SERIES



OKPh

### OVERVIEW

- Plug-in relay for monitoring the cycle direction of three phase voltages
- 1 or 2 contacts available, according to model
- Fixed hysteresis cycle
- Monitoring of individual phase voltages
- Operation in alternating current at industrial frequency
- Solid and rugged construction for heavy or intensive duty
- Considerable long-life
- Excellent shock and vibration resistance
- Wide range of sockets
- Retaining clip for secure locking of relay on socket
- Positive mechanical keying for relay and socket

### APPLICATIONS



Shipbuilding



Petroleum industry



Heavy industry



Power generation



Power distribution



Railway equipment

### DESCRIPTION

Relays of the OKPh and MOK-Ph2 series are supervision devices for monitoring the directional sequence of phases or detecting the loss of one or more voltages in three phase systems. These components are used typically for detecting faults affecting either the power supply or the sequences of the individual phases. The supervision relay can identify undervoltages on one of the 3 phases, against a fixed threshold, or detect a phase break: this advantageously prevents the risk of three phase motors operating in single phase mode. In addition, monitoring of the correct R-S-T sequence enables permanent supervision of the status of power supplies to three-phase users, and the avoidance of dangerous wrong connections. These relays are connected directly to the 400Vac three-phase power line. When system under supervision is operating correctly, the relay contact remains closed. The OKPh relay detects the direction of rotation using passive electronic components (R and C) of high quality which, in combination with the superior reliability of the electromechanical section, allow these relays to cover key roles in the systems where they are installed. The MOK-PH2 relay is equipped with a completely static control circuit. The ultra high reliability and long life expectancy of these components allow their use in particularly demanding environments such as, for example, electricity generating stations, electrical transformer stations, and industries using continuous production processes, notably drilling and refining operations in the petrochemical sector.

Models	Function	Number of contacts	Rolling stock application
OKPh	Measuring relay for monitoring phase cycle direction	1 NO (Reed)	•
MOK-Ph2		2 SPDT	

**FOR CONFIGURATION OF PRODUCT CODE, SEE "ORDERING SCHEME" TABLE**

Coil data	OKPh	MOK-Ph2
Nominal voltages Un	AC : 100 - 110 - 220 - 380 - 400Vac 50 - 60 Hz	AC : 220 - 380Vac (45 - 65 Hz)
Max. consumption at Un	≤ 4.5 VA	
Operating range	80...120% Un, 80 - 115% Un per 400Vac	85...115% Un
Type of duty	Continuous	

(1) See "Ordering scheme" table for order code.

Fixed operating thresholds	OKPh	MOK-Ph2
Pick-up threshold	$V > 0.80\% U_n$	$V > 0.85\% U_n$
Drop-out threshold	$V \leq 50\% U_n$ on 3 phases	$V \leq 30\% U_n$ on single phase
Accuracy	± 5%	

Contact data	OKPh	MOK-Ph2
Number and type	1 NO, form A (REED)	2 SPDT, form C
Current Nominal <sup>(1)</sup>	4 A	3 A
Breaking capacity	120W (max.3A, max 300Vac)	-
Minimum load	100mW (10V, 5mA)	
Maximum breaking voltage	300 Vac	230 Vac
Contact material	Rh	-
Operating time at Un (ms) <sup>(2)</sup>	-	
Pick-up (NO contact closing)	8 ms (at Un)	-

(1) Nominal current: on all contacts simultaneously.

(2) Unless specified otherwise, the operating time signifies until stabilization of the contact (including bounces).

Insulation	
Insulation resistance (at 500Vdc) between electrically independent circuits and between these circuits and ground	> 1,000 MΩ
between open contact parts	> 1,000 MΩ
Withstand voltage at industrial frequency between electrically independent circuits and between these circuits and ground	2 kV (1 min.) - 2.2kV (1 s)
between adjacent contacts	1 kV (1 min.) - 1.1kV (1 s)
Impulse withstand voltage (1.2/50μs - 0.5J) between electrically independent circuits and between these circuits and ground	5 kV
between open contact parts	2 kV

Mechanical specifications	OKPh	MOK-Ph2
Mechanical life expectancy	10 <sup>7</sup> operations	
Degree of protection (with relay mounted)	IP40	
Dimensions (mm)	45x45x109 <sup>(1)</sup>	45x45x109 <sup>(1)</sup>
Weight (g)	~ 280	~ 300

(1) Output terminals excluded.

Environmental specifications	OKPh	MOK-Ph2
Operating temperature	-25 to + 55 °C	-25 to + 55 °C
Rolling stock version	-25 to + 70 °C	-
Storage and shipping temperature	-40 to + 85 °C	-40 to + 70 °C
Relative humidity	Standard: 80% RH, Tropicalized: 95% RH	
Resistance to vibrations	5g - 10 to 55 Hz - 1min.	-
Resistance to shock	20g - 11ms	-
Fire behaviour	V0 - to EN 60695-2-10	

See the "Operation" chapter of this document for more information and operating notes.

## Standards and reference values

EN 61810-1, EN 61810-2, EN 61810-7  
 EN 60695-2-10  
 EN 61000  
 EN 60529

Electromechanical elementary relays  
 Fire behaviour  
 Electromagnetic compatibility  
 Degree of protection provided by enclosures

Unless otherwise specified, the products are designed and manufactured according to the requirements of the above-mentioned European and International standards. In accordance with EN 61810-1, all items of technical data are referred to ambient temperature 23 °C, atmospheric pressure 96kPa and 50% humidity.

## Railways, rolling stock - Standards

EN 60077	Electric equipment for rolling stock - General service conditions and general rules
EN 50155	Electronic equipment used on rolling stock
EN 61373	Shock and vibration tests, Cat 1, Class B
EN 45545-2	Fire behaviour, Cat E10, Requirement R26, V0
ASTM E162, E662	Fire behaviour

## Configurations - Options

P2	Tropicalization of coil with epoxy resin for use with 95% RH (@ T 50 °C). This treatment also protects the coil against corrosion which could occur by combination of the humidity with certain chemical agents, such as those present in acid atmospheres (typical of geothermal power stations) or saline atmospheres.
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## OKPh - MOK-Ph2 Ordering scheme

Product code	Application <sup>(1)</sup>	Configuration A	Configuration B	Type of power supply	Nominal voltage (V)	Keying position <sup>(2)</sup>
OKPh	E: Energy F: Railway Fixed Equipment R: Railway Rolling Stock	1: Standard (fixed range)	0: Standard 2: P2	A: Vac 50 Hz H: Vac 60 Hz	100 110 220 380	XXX
MOK-Ph2	E: Energy F: Railway Fixed Equipment			A: Vac (45 - 65Hz)	220 380	

Example	OKPh	R	1	2	H	220	
	OKPh-R12-H220 - OKPh relay, ROLLING STOCK series, 220 Vac 60Hz coil, with P2 tropicalization treatment						
	MOK-Ph2	E	1	0	A	380	
	MOK-Ph2E10-A380 - MOK-Ph2 relay, ENERGY series, 380Vac coil						

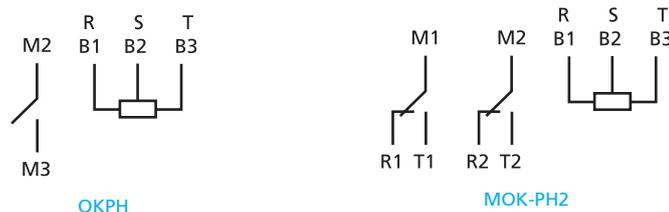
(1) ENERGY: all applications except for railway.

**RAILWAYS, FIXED EQUIPMENT:** application on fixed power systems and electrical railway traction. Construction according to RFI (FS Group) specification no. RFI DPRIM STF IFS TE 143 A, if applicable. For list of RFI approved and conforming products, consult dedicated catalogue "RAILWAY SERIES – RFI APPROVED".

**RAILWAYS, ROLLING STOCK:** application on board rolling stock (rail-tram-trolley vehicles). Electrical characteristics according to EN60077.

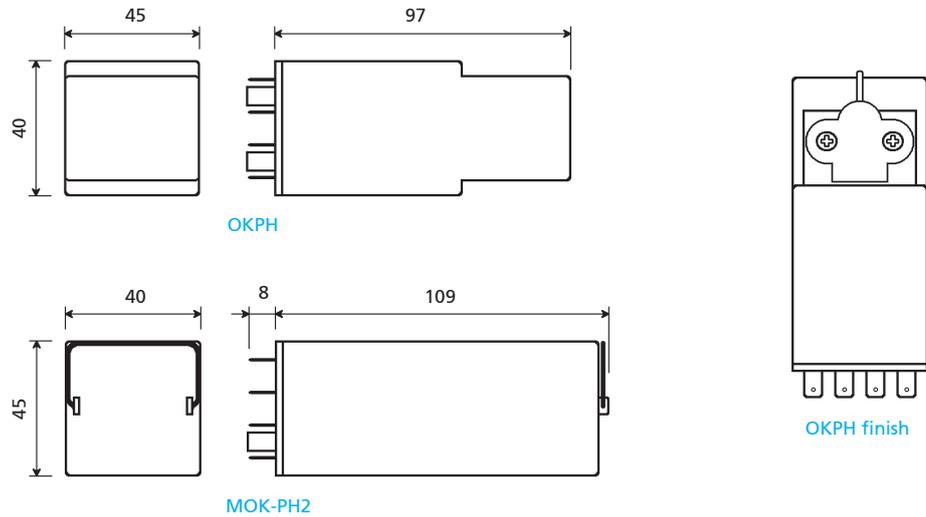
(2) Optional value. The positive mechanical keying is applied according to the manufacturer's model.

## Wiring diagram



The OKTr relay requires connection of the 1B/R1 terminal with 3B/T1.

## Dimensions



Sockets and retaining clips		OKPh	MOK-Ph2
Number of terminals (standard dimensions 5x0.8mm)	16	Retaining clip	Retaining clip
For wall or rail mounting			
Spring clamp, wall or DIN H35 rail mounting	PAIR160	RL48	RM48
Screw, wall or DIN H35 rail mounting	48BIP20-I DIN	RL48	RM48
Screw, wall mounting	48BL	RL48	RM48
Double faston, wall mounting	48L	RL48	RM48
For flush mounting			
Double faston (4.8 x 0.8 mm)	ADF2	RL48	RM48
Screw	43IL <sup>(1)</sup>	RL43	RM43
For mounting on PCB	65	RL43	RM43

(1) Insert the clip before fastening the socket on the panel.  
For more details, see specifications of mounting accessories.

## Installation, operation and maintenance

### Installation

**Before installing** the relay on a wired socket, disconnect the power supply.

The preferential mounting position is on the wall, with the relay positioned horizontally in the "reading orienting" of marking so that the label is readable in the correct sense.

Spacing: the distance between adjacent relays depends on use' conditions.

If a relay is used in the "less favorable" conditions that occur with "simultaneously":

- Power supply: the maximum allowed, permanently
- Ambient temperature: the maximum allowed, permanently
- Current on the contacts: the maximum allowed, permanently
- Number of contacts used: 100%

it is strongly recommended to space relay at least 5 mm horizontally and 20 mm vertically, to allow for proper upward heat' dissipation and increase the longevity of the component.

Actually, relays could be used in less severe conditions. In this case, the distance between adjacent relays can be reduced or abolished. A correct interpretation of the use' conditions allows the optimization of the available spaces. Contact AMRA for more information.

To increase relay' longevity, we recommend mounting relays intended for "continuous use" (permanent power supply), alternating them with relays intended for less frequent use.

For a safe use, the retaining clip is recommended.

For use on rolling stock, relays have been tested to EN 61373 standard equipped with retaining clip(s).

## Operation

**Before use:** if relay is not used, for example after long storage periods, contact resistance may increase due to a natural and slight oxidation or polluting deposits.

In order to restore the optimal conductivity and for standard contacts (**NOT gold plated**) it is recommended to switch several time a load of at least 110Vdc - 100mA or 24Vdc - 2A. The contacts will be "cleaned" thanks to the electric arc generated during the current interruption and the mechanical self-cleaning action.

The common contact rubs against the fixed poles (NO and NC contacts) both when opening and when closing, which ensures a self-cleaning action.

An increase in contacts' resistance, in most cases, does not represent a problem. Many factors contribute to the correct use of contact and consequently to the relay' long-term reliability:

- **Load:** the current switching generates an electric arc with cleaning effects. For proper electrical cleaning and performance keeping we recommend:
  - o Standard contacts: Minimum current = 20mA (20V)
  - o Gold plated contacts: Minimum current = 10mA (20V)
- **Operating frequency:** relays are components that can operate with a wide range of switching frequency. High frequency operation also allows a continuous cleaning effect by "sliding" (mechanical cleaning). In case of low frequency operation (for example few time a day), we advise:
  - o Use of contact with currents twice compared to those indicated.
  - o For currents lower than 10mA, use gold plated contacts and connect 2 contacts in parallel, in order to reduce the equivalent contact resistance
- **Pollution:** the presence of pollution can cause impurities on contact surface. Electric charges attract organic molecules and impurities that are deposited on the contact surface. Electrical and mechanical cleaning, respectively, burn and remove such impurities. In pollution presence, the minimum recommended currents must be respected. In extreme cases, provide double the cleaning current.

While a contact open high loads, impurities develop inside the relay due to the formation and interruption of the electric arc. These impurities are greater the higher the load and the more frequent the switching operation. These impurities could deposit on the adjacent contacts and alter the initial conductivity characteristics. If all contacts are used with similar loads, this is not a problem. Please, contact AMRA for further informations.

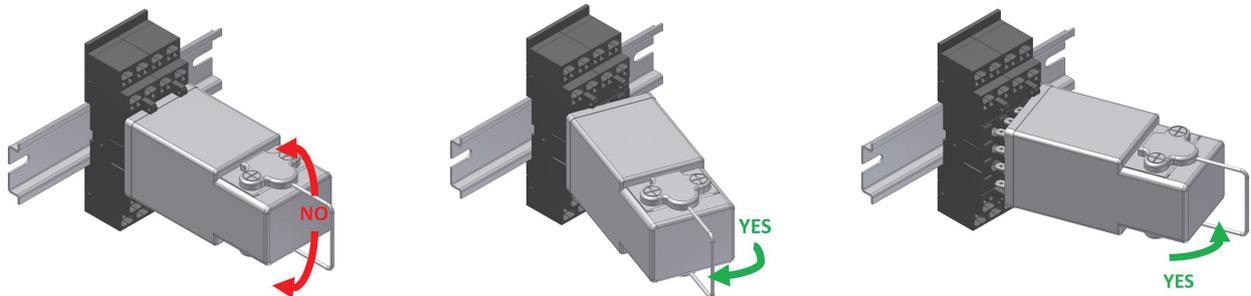
The possible formation of condensation inside the relay, when it is powered and the external ambient temperature is cold, is a normal phenomenon that has no effect on the electrical safety of the relay. In case of polluted or saline atmosphere, any condensation deposits on the contacts can degrade their performance in terms of conductivity.

## Maintenance

No maintenance is required.

In case of normal relay wear (reaching the end of electrical or mechanical life), the relay cannot be restored and must be replaced.

To check the component, relay removal must be carried out with slight lateral movements. An "up and down" movement can cause terminals damage.



Often the malfunctions are caused by power supply with inverted polarity, by external events or by use with loads exceeding the contact performance.

In case of suspected malfunction, energize relay and observe if mechanical operation of contacts / relay mechanism is performed. Pay attention to the power supply polarity, if relay is equipped with polarized components (example: diode, led).

- In case of expected operation, clean the contacts (see paragraph "OPERATION") and check if the circuit load ranges within the contact performance. If necessary, replace with relays with gold contacts. Note: the electrical continuity of contacts must be checked with adequate current.
- If it does not work, we recommend to use a relay of the same model and configuration.

If an investigation by AMRA is required, pull-out the relay from the socket, don't remove the cap, avoid any other manipulation and contact us. You will be asked for the following data: environmental conditions, power supply, switching frequency, contact load, number of operations performed.

The fault can be described through the "TECHNICAL SUPPORT" section of the website [www.amra-chauvin-arnoux.it](http://www.amra-chauvin-arnoux.it).

In any case, the relay cannot be repaired by the user.

## Storage

Storage conditions must guarantee the environmental conditions (temperature, humidity and pollution) required for the product conservation, in order to avoid deterioration.

The product must be stored in an environment sheltered from atmospheric agents and not polluted, with an ambient temperature between -25 and +70°C with max 75% RH. In any case, there must be no condensation. Before use, please read carefully "OPERATION" section.