



RELAYS

MEASURING RELAYS

MOK-V2 SERIES

USER SECTORS



Power generation



Nuclear



Power transmission



Rolling Stock



Fixed railway installations



Shipbuilding



Petroleum industry



Heavy industry



MOK-V2

PRODUCT ADVANTAGES

- MOK-V2 voltage threshold relay
- Pick-up and drop-out thresholds adjustable by way of two independent potentiometers
- Electronic circuit requiring no auxiliary power supply
- Solid and rugged construction for heavy or intensive duty
- Long life expectancy
- 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

DESCRIPTION

The products in the **MOK series** are measuring relays with adjustable hysteresis. The device measures an electrical quantity (voltage or current, depending on the model) registering in a monitored circuit; the contacts switch to 'make' status when this same quantity exceeds the pick-up threshold, selected by the user and expressed as a percentage of the nominal voltage/current.

The relay reverts to 'break' status when the measured quantity drops below the drop-out threshold (also selected by the user), expressed as a percentage of the pick-up threshold. **These models are suitable for the supervision and protection of electrical equipment used in the most demanding of sectors such as**, for example, electricity generating stations, electrical transformer stations, industries using continuous production processes, and railways - fixed equipment and rolling stock alike.

MOK-V2 voltage threshold relay

The MOK-V2 is a measuring relay with two adjustable voltage thresholds: Pick-up voltage and Drop-out voltage. The setting, which is made by way of the potentiometers located on the top of the relay, pilots an electronic circuit that does not require an auxiliary power supply. The PICK-UP VOLTAGE can be set at between 60% and 120% of nominal voltage. The DROP-OUT VOLTAGE can be set at between 70% and 98% of the pick-up voltage. The MOK-V2 model is equipped with two change-over contacts rated 8A. In the case of the direct current version, the relay is equipped with a polarization diode that protects the circuits against an accidental inversion of polarities. Particularly suitable for monitoring battery voltages in the rail-tram-trolley vehicles sector.

	Models	Function	Threshold setting		Number of contacts	Rolling stock application
			Pick-up	Drop-out		
	MOK-V2	Voltage threshold relay	•	•	2	•

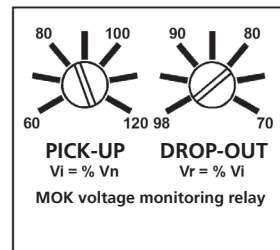
FOR CONFIGURATION OF PRODUCT CODE, SEE "ORDERING SCHEME" TABLE

Coil specifications	
Nominal voltages Un	DC: 24-48-36-72-110-125-132-144-220 AC: 24-48-110-125-220 ⁽¹⁾
Max. consumption at Un (DC/AC)	3.5 W / 4 VA
Maximum operating range	130% Un for 1 min.
Type of duty	Continuous

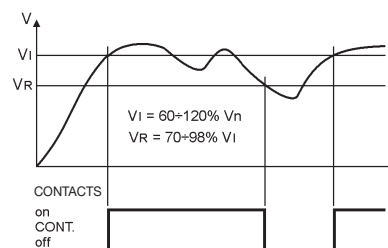
(1) Other values on request.

Operating thresholds	
Setting	By potentiometer, with flat head slotted screw
Selectable ranges	-
Pick-up threshold	$V(i) = 60\% - 120\% U_n$
Drop-out threshold	$V(r) 70\% - 98\% V(i)$
Accuracy, setting (t=20°C)	$\pm 1.5\% U_n$
Additional error (-40°C, +70°C)	+1% U_n
Accuracy, repeatability	1%

Front



Functional diagram



Important: the drop-out voltage Vr is expressed as a percentage of the pick-up thresholds.

Contact specifications	
Number and type	2 CO, form C
Current Nominal ⁽¹⁾	8 A
Example of electrical life expectancy ⁽²⁾	8 A – 250 Vac – $\cos\phi = 1$: 10^5 operations 0.2 A – 110 Vdc – L/R = 40 ms : 10^5 operations
Minimum load	100 mW (10 V, 5 mA)
Maximum breaking voltage	150 Vdc / 400 Vac
Contact material	AgSnO
Operating time at Un (ms)	Pick-up (NO contact closing): ≤ 100 ms Drop-out (NC contact closing): ≤ 30 ms

(1) Nominal current: on all contacts simultaneously.

(2) 450 operations/hour.



Insulation

Insulation resistance (at 500Vdc) between electrically independent circuits and between these circuits and ground between open contact parts	> 1,000 MΩ > 1,000 MΩ
Withstand voltage at industrial frequency between electrically independent circuits and between these circuits and ground between open contact parts	2 kV (1 min) - 2.2 kV (1 s) 1 kV (1 min) - 1.1 kV (1 s)
Impulse withstand voltage (1.2/50μs - 0.5J) between electrically independent circuits and between these circuits and ground between open contact parts	5 kV 3 kV



Mechanical specifications

Mechanical life expectancy	10x10 ⁶ operations
Degree of protection (with relay mounted)	IP40
Dimensions (mm) ⁽¹⁾	48x48x118.5
Weight (g)	~ 180

(1) Excluding output terminals and adjuster knob, if specified.



Environmental specifications

Operating temperature	Rolling stock version	-25 to +55 °C
Storage and shipping temperature		-25 to +70 °C
Relative humidity		-50 to +85 °C
Resistance to vibrations		Standard: 75% RH, Tropicalized: 95% RH
Resistance to shock		5g - 10 to 55 Hz - 1min.
Fire behavior		20g - 11ms
		V0 - to EN 60695-2-10



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 behavior Electromagnetic compatibility Degree of protection provided by enclosures
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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

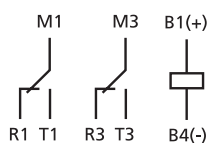
EN 60077 EN 50155 EN 61373 EN 45545-2 ASTM E162, E662	Electric equipment for rolling stock - General service conditions and general rules Electronic equipment used on rolling stock Shock and vibration tests, Cat 1, Class B Fire behavior, Cat E10, Requirement R26, V0 Fire behavior
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Configurations - 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 the combination of humidity with certain chemical agents, such as those found in acid or saline atmospheres.
LOW TEMPERATURE	Minimum operating temperature -40 °C, only for the "rolling stock" version ("L" option).

Wiring diagram



Selection of the range is made by connecting to the respective terminal.



MOK-x2 Ordering scheme

Product code	Application ⁽¹⁾	Configuration A	Configuration B	Label	Type of power supply	Nominal voltage (V) ⁽²⁾	Keying position ⁽³⁾ / Options
MOK-V2	E: Energy Railway Fixed Equipment R: Railway Rolling Stock	1: Standard (fixed range)	0: Standard 2: P2	F	C: Vdc ⁽⁴⁾ A: Vac 50 Hz	024 - 036 - 048 072 - 110 - 125 128 - 132 - 144 220 - 230	XXX L = low temperature

Example

MOKV2	R	1	2	F	C	024	
MOKV2R12F-C024 - MOK-V2 relay, ROLLING STOCK series, 24Vdc coil, with P2 coil tropicalization							

(1) **E = ENERGY:** all applications, except for railways rolling stock.

Suitable on energy production, transport and distribution plants, railways fixed equipment, petrochemical and heavy industry.

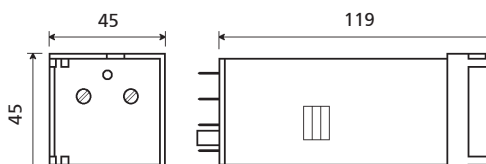
R = RAILWAYS, ROLLING STOCK: Application on board rolling stock (rail-tram-trolley vehicles). Electrical characteristics according to EN60077.

(2) Other values on request.

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

(4) Railways and Rolling Stock version, Vdc only available.

Dimensions



Sockets and retaining clips

Number of terminals (standard dimensions 5x0.8mm)	16	Retaining clip ⁽²⁾
For wall or rail mounting		
Spring clamp, wall or DIN H35 rail mounting	PAIR160	RM48
Screw, wall or DIN H35 rail mounting	48BIP20-I DIN	RM48
Screw, wall mounting	48BL	RM48
Double faston, wall mounting	48L	RM48
For flush mounting		
Double faston (4.8 x 0.8 mm)	ADF2	RM48
Screw	43IL ⁽¹⁾	RM43
For mounting on PCB	65	RM43

(1) Insert the clip before fastening the socket on the panel.

(2) Assume two clips for use on rolling stock.

For more details, see specifications of mounting accessories.

Mounting tips

The preferred mounting position is on the wall, with the relay positioned horizontally in the reading direction on the nameplate. For correct use of the relays, they should be spaced apart by at least 5 mm in the horizontal direction and 20 mm in the vertical direction. This is to allow correct upward dissipation of the heat generated by the coil. Set these distances according to the socket used. Distances can be reduced depending on the environmental application conditions and on the relay duty cycle. For safe and secure operation, it is advisable to use retaining clips. No special maintenance is required. Condensation can form inside the relay when powered up and the outside ambient temperature is cold; this is quite normal and does not affect the operation of the relay. The plastic materials of the relay do not possess hygroscopic properties.