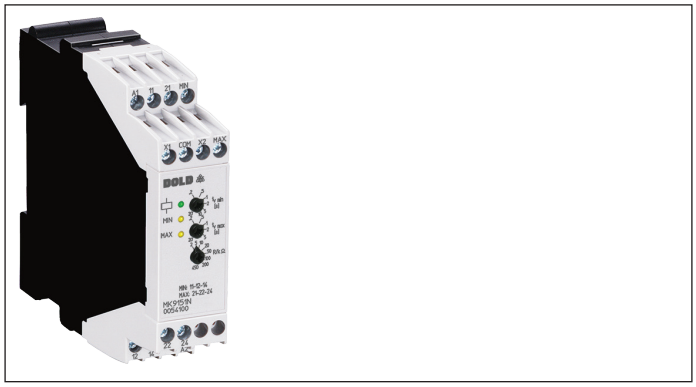
VARIMETER
Level Sensing Relay
MK 9151N

Translation of the original instructions

DOLD



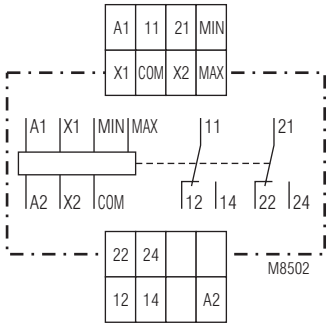
Product Description

The MK 9151N level sensing relay of the VARIMETER series have 3 electrode connections that can be used for 2-point and 1-point level control. The response value can be set using a rotary switch, as can the response and release delay. The device can be programmed for the open and closed-circuit operation.

Your Advantages
- 3 probe connections for 2-point and 1-point level control
- Large setting range: 2 ... 450 kΩ

Features
- According IEC/EN 60255-1
- Separately adjustable response and release time delay for MIN- and MAX-level
- Programmable for:
  - 2 separate controllable output relays for MIN and MAX level
  - Common controlled output relays for 2-point hysteresis level control
  - Fixed programming of the output relays on request
  - Open circuit operation (output relay activated in case of error)
  - Closed circuit operation (output relay not activated in case of error)
- For auxiliary voltages of AC 24 ... 400 V or DC 24 V
- LEDs for operation and state of contact
- 2 changeover relays with 1 changeover contact each
- Depth 98 mm, with terminals at the top for cabinets with mounting plate and cable duct
- Width: 22.5 mm

Circuit Diagram



Approvals and Markings

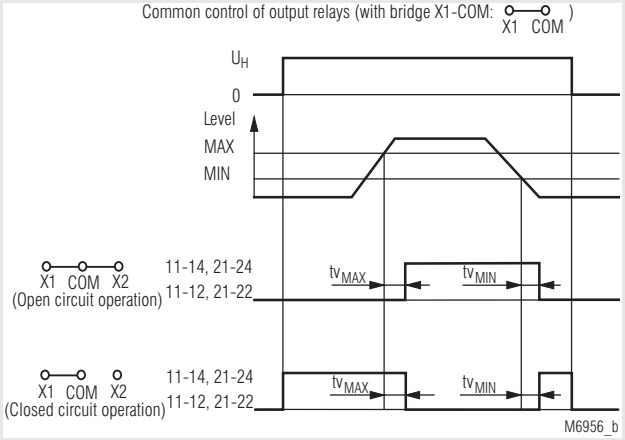
Application

- Level monitoring and control for conductive liquids and powders, e.g. maximum and minimum filling levels, overfilling and protection against dry running
- Monitoring and control of the mixing ratio of conductive liquids
- General resistance monitoring tasks, e.g. limit temperature detection with PTC
- Contact protection relay with time delay

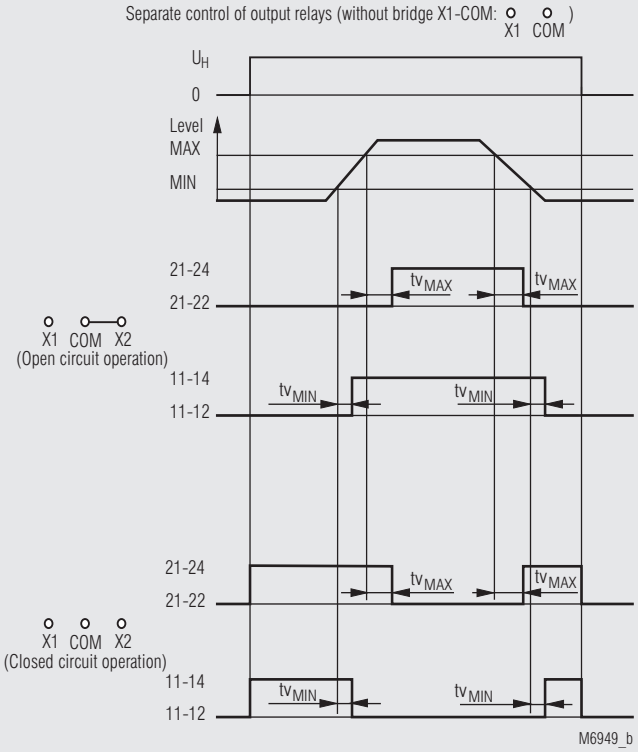
Connection Terminals

Terminal designation	Signal description
A1, A2	Auxiliary voltage AC oder DC
MIN, MAX, COM	Electrode connection
X1 - COM	Selection operating mode via bridge
X2 - COM	Selection de-energized or energized via bridge
11, 12, 14	Contacts Rel. 1
21, 22, 24	Contacts Rel. 2

Function Diagrams



Common control of output relays



Seperate control of output relay

Indicators

Green LED:	On, when auxiliary supply connected
Yellow LED "MIN":	On, when relay MIN active
Red LED "MAX":	On, when relay MAX active

Notes

All commercially available probes are suitable.
The reference probe for level measurement is generally located at the lowest point of the container and must always be connected to the "COM" terminal. The container itself can be used as a reference probe if it consists of conductive material.

On the level "MIN" and "MAX" the other probes are installed and connected to the corresponding inputs of IL 9151. It is also possible to connect only one probe.

2-point level control
The 2-point control is selected when a liquid should be kept between "MIN" and "MAX" level. 2 operation modes can be selected:

Without bridge X1 - COM:	Separate control of output relays for "MIN" and "MAX" level
With bridge X1 - COM:	Common control of both output relays

When the relays are separately controlled each output relay is operated by the corresponding probe circuit. For each level the time delay can be set separately (tv_{MIN} and tv_{MAX}).

When the relays are controlled together, these work like a relay with 2 changeover contacts as follows:

If the liquid rises above the "MAX" level the output relays switch over after the delay time of tv_{MAX} and start e.g. a pumpt to sink the liquid. If the level goes under the "MAX" level the output relays remain activated until the "MIN" level is reached. Now the output relays switch back after the time delay of tv_{MIN} and stop the pump. The whole process starts again when the level reaches the "MAX" probe.

1-point level control
1-point level control (see Figure) is especially suitable for protection against overfilling and dry running on containers with a free inlet/outlet. In this configuration, all that is required besides the reference probe "COM" is the "MAX", which must be located at the desired limit level. The output relay switches over after the set delay time if the fluid level exceeds or falls below the limit level, which permits fluid to be pumped out or added.

Without bridge X1 - COM only relay "MAX" (contacts 21-22-24) switch, with bridge X1 - COM both relays switch together. If for each output relay a separate time delay is necessary, the unit has to be set to separate control of the outputs and the "MIN" and "MAX" inputs are connected to the same probe. Please note that the resistance of the liquid is divided up on both input circuits. Therefore the response value must be setted to the double value.

If separate output control is selected with 1-point control for each output relay the time delay can be setted separately.

Because of the settable time delay of 0.2 to 20 sec for each probe circuit, it is possible to suppress early switching caused by waves on the liquid. Also time depending level control can be realised. The delay works integrating and is active when the liquid goes over as well as under the probe level.

The wide setting range allows easily an optimum setting so that the unit can differentiate between foam and liquid. The response value must be set to a value high enough, that the unit reacts when the liquid, but not when the foam reaches the probe (for setting procedure the time delay is set to min. value).

Technical Data

Input

Setting range of the fluid resistance:	2 ... 450 kΩ; 0.02 ... 4.5 MΩ (response value)	
Setting:	On logarithmically divided absolute scale	
Switching point hysteresis:	Approx. 4 % (at 450 kΩ) ... 15 % (at 2 kΩ) of the set value	
Voltage and temperature influence:	< 2 % of the set value	
Max. cable length to the probes:	Set value	Cable length (at 100 nF/km)
	450 kΩ	50 m
	100 kΩ	200 m
	35 kΩ	500 m
	10 kΩ	1500 m
	5 kΩ	3000 m
Max. sensing voltage:	Approx. AC 10 V (internally generated)	
Max. sensing current:	Approx. AC 1.5 mA (internally generated)	
Response and release times		
tv_{MIN}, tv_{MAX}:	0.2 ... 20 s, 0.2 ... 40 s, 0.2 ... 100 s for both output relays separate settable Setting on logarithmically-divided absolute scale	

Auxiliary Circuit

Auxiliary voltage U_H:	AC 24, 42, 48, 110, 115, 127, 230, 240, 400 V DC 24 V	
Voltage range of U_H		
AC:	0.8 ... 1.1 U_N	
DC:	0.85 ... 1.25 U_N	
Nominal power consumption		
AC:	Approx. 2 VA	
DC:	Approx. 1 W	
Frequency range:	45 ... 400 Hz	

Output

Contacts:	2 x 1 changeover contact	
Thermal current I_{th}:	4 A	
Switching capacity		
to AC 15		
NO contact:	3 A / AC 230 V	IEC/EN 60947-5-1
NC contact:	1 A / AC 230 V	IEC/EN 60947-5-1
To DC 13:	1 A / DC 24 V	IEC/EN 60947-5-1
Electrical life		
to AC 15 at 1 A, AC 230 V:	1.5 x 10^5 switch. cycl.	IEC/EN 60947-5-1
Short circuit strength		
max. fuse rating:	4 A gG / gL	IEC/EN 60947-5-1
Mechanical life:	≥ 10^8 switching cycles	

General Data

Operating mode:	Continuous operation	
Temperature range:		
Operation:	- 20 ... + 60 °C	
Storage:	- 25 ... + 70 °C	
Altitude:	≤ 2000 m	
Clearance and creepage distances		
Rated rated impulse voltage voltage / pollution degree		IEC 60664-1
Input / Auxiliary Circuit:	4 kV / 2 (at U_H = DC 24 V: 1 kV)	
Input / output circuit:	4 kV / 2	
Auxiliary / output circuit		
A1-A2 (AC):	4 kV / 2	
EMC		
Electrostatic discharge:	8 kV (air)	IEC/EN 61000-4-2
HF irradiation		
80 MHz ... 2.7 GHz:	10 V / m	IEC/EN 61000-4-3
Fast transients:	2 kV	IEC/EN 61000-4-4
Surge voltages between		
wires for power supply:	1 kV	IEC/EN 61000-4-5
Between wire and ground:	2 kV	IEC/EN 61000-4-5
HF wire guided:	10 V	IEC/EN 61000-4-6

Technical Data

Interference suppression		
Auxiliary voltage AC:	Grenzwert Klasse B EN 55011	
Auxiliary voltage DC:	Grenzwert Klasse A*) EN 55011 *) The device is designed for the usage under industrial conditions (Class A, EN 55011). When connected to a low voltage public system (Class B, EN 55011) radio interference can be generated. To avoid this, appropriate measures have to be taken.	
Degree of protection		
Housing:	IP 40	IEC/EN 60529
Terminals:	IP 20	IEC/EN 60529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94	
Vibration resistance:	Amplitude 0.35 mm, frequency 10 ... 55 Hz,	IEC/EN 60068-2-6
Climate resistance:	20 / 060 / 04	IEC/EN 60068-1
Terminal designation:	EN 50005	
Wire connection:	1 x 4 mm² solid or 1 x 2.5 mm² stranded ferruled or 2 x 1.5 mm² stranded ferruled DIN 46228-1/-2/-3/-4	
Min. cross section:	0.5 mm²	
Insulation of wires:	8 mm	
Wire fixing:	Box terminal with wire protection	
Fixing torque:	0.8 Nm	
Mounting:	DIN rail	IEC/EN 60715
Weight:	Approx. 180 g	

Dimensions

Width x height x depth:	22.5 x 90 x 98 mm

CCC-Data

Nominal voltage U_N:	AC 24, 42, 48, 110, 115, 127, 230, 240 V DC 24 V	
Switching capacity		
to AC 15		
NO contact:	1.5 A / AC 230 V	IEC/EN 60947-5-1

Technical data that is not stated in the CCC-Data, can be found in the technical data section.

Standard Type

MK 9151N.12 2 ... 450 kΩ AC 230 V 0.2 ... 20 s

Article number:	0054100
• Settable response value:	2 ... 450 kΩ
• Auxiliary voltage U_H:	AC 230 V
• Response and release delay:	0.2 ... 20 s
• 2 output relays with 1 changeover contact each	
• Width:	22.5 mm

Variants

MK 9151N.12/001: Time delay, when level drops under setting value

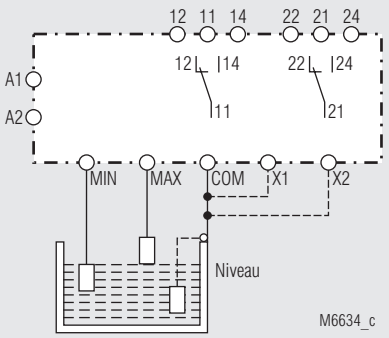
MK 9151N.12/002: Time delay, when level rises over setting value

Ordering example for variants

MK 9151 N .12 /00_ 2 ... 450 kΩ AC 230 V 0.2 ... 20 s

- 0.2 ... 20 s: Response and release delay
- AC 230 V: Auxiliary voltage
- 2 ... 450 kΩ: Response value
- /00_: Variant, if required
- .12: Contacts
- MK 9151 N: Type

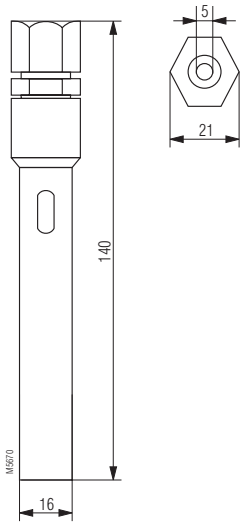
Application Example



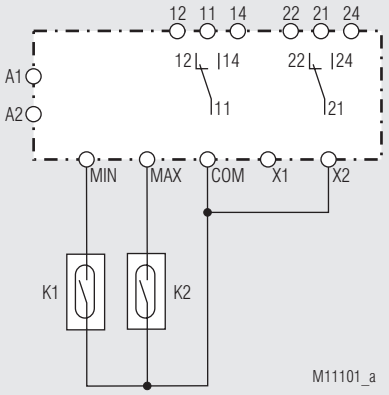
2-point level control

Accessories

OA 5640: Standard probe
Article number: 0016045



Stainless steel immersion electrode,
Temperature range: 0 ... + 60 °C,
Weight: Approx. 0.1 kg
Wire connection: 1.5 mm² stranded wire with sleeve without plastic collar
Stripping length: 10 mm
Fixing torgue: 0.6 Nm



Application as contact protection relay, e.g. for two reed contact switches (K1, K2).