

## VARIMETER PRO

### Over- and Undervoltage Relay

IL 9077, IP 9077, SL 9077, SP 9077

Translation  
of the original instructions



0222093

#### Your advantages

- Preventive maintenance
- For better productivity

#### Features

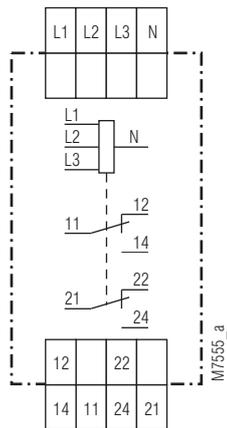
- According to IEC/EN 60255-1
- Identification of overvoltage, undervoltage and phase failure
- With asymmetry identification as an option
- Mains fault diagnostics with a number of LEDs
- Setting values for overvoltage and undervoltage can be set separately
- Large Setting Ranges 0.9 ... 1.3  $U_N$  and 0.7 ... 1.1  $U_N$
- Time delay variable between 0.1 ... 20 s
- Closed circuit operation
- No auxiliary voltage
- Independent of phase sequence
- As option with phase sequence detection
- Single-phase connection possible
- Optionally for 3P3W Systems
- 2 changeover contacts, at IP/SP 9077 2 x 2 changeover contacts
- Devices available in 2 enclosure versions:
  - I-model: depth 59 mm, with terminals at the bottom for installation systems and industrial distribution systems according to DIN 43880
  - S-model: depth 98 mm, with terminals at the top for cabinets with mounting plate and cable duct
- IL 9077, SL 9077: Width 35 mm
- IP 9077, SP 9077: Width 70 mm

#### Product Description

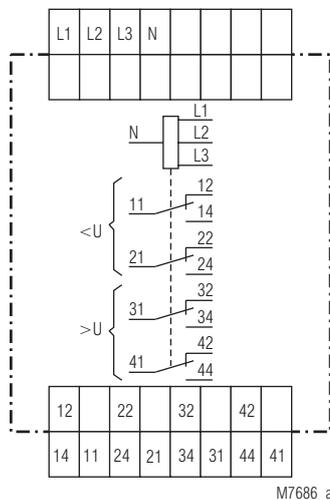
The Over- and Undervoltage relays IL / SL / IP / SP 9077 of the VARIMETER PRO series monitor overvoltage, undervoltage and phase failure in three-phase or single-phase networks.

The measurement is simple and without extensive wiring, as no separate auxiliary supply is necessary. The early detection of up-coming break downs and preventive maintenance avoid expensive damages. As user you profit from the reliability and availability of your plant.

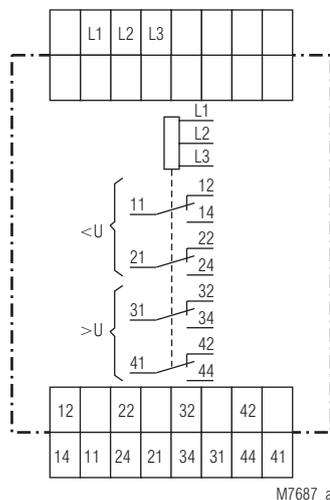
#### Circuit Diagrams



IL 9077.12, SL 9077.12



IP 9077.39, SP 9077.39



IP 9077.39/001, SP 9077.39/001  
IP 9077.39/002, SP 9077.39/002

#### Approvals and Markings



\*) Only IL 9077

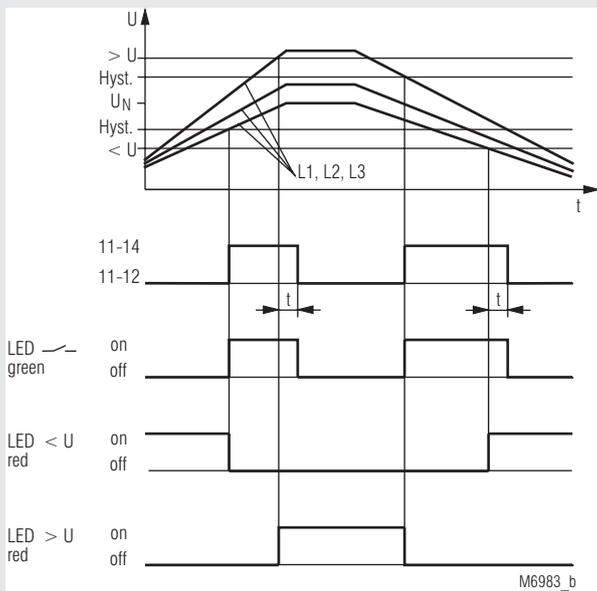
#### Applications

Monitoring of three-phase voltage systems to identify overvoltage and undervoltage, e.g. to monitor in-house generation equipment in accordance with VDE 0100.

#### Connection Terminals

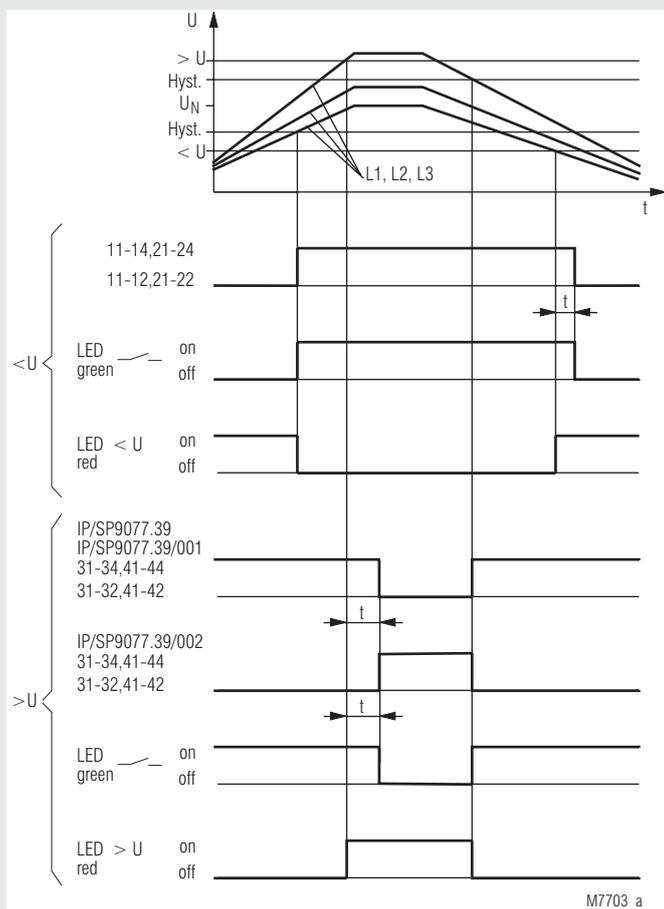
Terminal designation	Signal description
L1, L2, L3	Phase voltages L1, L2, L3
N	Neutral
IL/SL devices: 11, 12, 14; 21, 22, 24	Changeover contact (outputrelays) Over and Undervoltage
IP/SP devices: 11, 12, 14; 21, 22, 24	Changeover contact (outputrelays) Undervoltage
IP/SP devices: 31, 32, 34; 41, 42, 44	Changeover contact (outputrelays) Overvoltage

## Function Diagram IL 9077



M6983\_b

## Function Diagram IP 9077



M7703\_a

## Function

All 3 phase voltages are measured with N (L1 and L2 are measured against L3 in the case of equipment without an N connection). If they are in the acceptable range, a green LED goes on and the output relay is activated. If at least one phase exceeds the setting value for overvoltage (variable between  $0.9 \dots 1.3 U_N$ ) or if at least one phase falls short of the setting value for undervoltage (variable between  $0.7 \dots 1.1 U_N$ ), the output relay releases after the set time delay and the green LED goes off (fault state). 2 red LEDs then indicate the cause of the fault:

- Undervoltage " $< U$ "
- Overvoltage " $> U$ "

When all 3 phase voltages are below the chosen setting value for overvoltage and above the chosen setting value for undervoltage again, the relevant red LED goes out, the output relay is activated again and the green LED goes on again (acceptable state).

When the system returns to an acceptable state, there is a hysteresis of about 4 % of the set value with both the set voltage thresholds.

On the unit with phase sequence detection IL/SL 9077/003 (only available without neutral) the wrong phase sequence is handled like undervoltage: The red LED " $< U$ " is active and the output relay switches off.

The model with asymmetry identification IL/SL 9077/010 monitors the symmetry of the three-phase voltage system as well. When all 3 voltages are in the acceptable range between the two setting values here, but there is voltage asymmetry of more than about 6 ... 8 %, the output relay releases after the set time delay and the LED that is green when the state is acceptable goes red. (This model can, for example, also be used for immediate identification of the regeneration of failed phases by feedback).

The IP/SP 9077.39 is an under- and overvoltage relay with separate output relays (each with 2 changeover contacts) for undervoltage and overvoltage monitoring. For every output a separate delay  $0.1 \dots 20$  s is adjustable.

## Indicators

Green LED $\text{---}$ / $\text{---}$ :	State
Green LED goes red:	Voltage asymmetry (only IL/SL 9077/010)
Red LED " $< U$ ":	Fault message / undervoltage
Red LED " $> U$ ":	Fault message / overvoltage

## Notes

The terminals L1, L2 and L3 have to be bridged if the relay is used in single phase systems. (For 3p3w units L1 and L2 have to be linked).

The maximum fault delay amounts to only about 0.6 s if there is a total failure of phase L3.

The overvoltage output on IP/SP 9077.39/002 can only switch if the voltage between L2 and L3 is  $> 0.7 U_N$  as the unit works without auxiliary supply.

Technical Data	
<b>Input</b>	
<b>Nominal voltage <math>U_N</math>:</b>	
Single-phase connection:	AC 100 V, 115 V, 220 V, 230 V, AC 400 V, 415 V, 440 V, 500 V
3-phase without Neutral connection::	3AC 100 V, 115 V, 220 V, 230 V, 3AC 400 V, 415 V, 440 V, 480 V, 500 V
3-phase with Neutral connection:	3/N AC 100 V / 58 V; 3/N AC 110 V / 64 V; 3/N AC 200 V / 115 V; 3/N AC 220 V / 127 V; 3/N AC 230 V / 133 V; 3/N AC 400 V / 230 V; 3/N AC 415 V / 240 V; 3/N AC 440 V / 254 V; 3/N AC 480 V / 277 V; 3/N AC 500 V / 290 V
<b>Voltage range:</b>	0.7 ... 1.3 $U_N$
<b>Maximum overload:</b>	1.35 $U_N$ , permanent
<b>Nominal consumption:</b>	Approx. 8 VA (L3-N) (approx. 16 VA for IP 9077)
<b>Nominal frequency:</b>	50 / 60 Hz

### Setting Ranges

<b>Setting value for overvoltage "&gt; U":</b>	Variable between 0.9 ... 1.3 $U_N$
<b>Setting value for undervoltage "&lt; U":</b>	Variable between 0.7 ... 1.1 $U_N$
<b>Hysteresis:</b>	Approx. 4 % of the set value in each case
<b>Time delay:</b>	Variable between 0.1 ... 20 s
<b>Threshold for asymmetry identification</b>	
IL/SL 9077/010:	Approx. 6 ... 8 % phase asymmetry

### Output

<b>Contacts</b>	
IL/SL 9077.12:	2 changeover contacts
IP/SP 9077.39:	2 x 2 changeover contacts
<b>Contact material:</b>	AgNi
<b>Switching voltage:</b>	AC 250 V
<b>Thermal current <math>I_{th}</math>:</b>	4 A
<b>Switching capacity</b>	
To AC 15:	
NO contact:	3 A / AC 230 V IEC/EN 60947-5-1
NC contact:	2 A / AC 230 V IEC/EN 60947-5-1
<b>Electrical life:</b>	IEC/EN 60947-5-1
To AC 15 at 1 A, AC 230 V:	$\geq 1.5 \times 10^5$ switching cycles
<b>Short circuit strength</b>	
<b>max. fuse rating:</b>	4 A gG / gL IEC/EN 60947-5-1
<b>Mechanical life:</b>	$30 \times 10^6$ switching cycles

### General Data

<b>Operating mode:</b>	Continuous operation	
<b>Temperature range:</b>		
Operation:	- 20 ... + 60 °C	
Storage:	- 25 ... + 60 °C	
Relative air humidity:	93 % at 40 °C	
<b>Altitude:</b>	$\leq 2000$ m	
<b>Clearance and creepage distances</b>		
Rated rated impulse voltage voltage / pollution degree:	4 kV / 2	IEC 60664-1
<b>EMC</b>		
Electrostatic discharge:	8 kV (air)	IEC/EN 61000-4-2
HF irradiation		
80 MHz ... 1 GHz:	10 V / m	IEC/EN 61000-4-3
1 GHz ... 2 GHz:	10 V / m	IEC/EN 61000-4-3
2 GHz ... 2.7 GHz:	10 V / m	IEC/EN 61000-4-3
Fast transients:	4 kV	IEC/EN 61000-4-4
<b>Surge voltages</b>		
Between		
wires for power supply:	2 kV	IEC/EN 61000-4-5
Between wire and ground:	2 kV	IEC/EN 61000-4-5
Interference suppression:	Limit value class B	EN 55011

Technical Data	
<b>Degree of protection</b>	
Housing:	IP 40 IEC/EN 60529
Terminals:	IP 20 IEC/EN 60529
<b>Housing:</b>	Highly non-flammable thermoplastic with V0 behaviour according to UL subject 94
<b>Vibration resistance:</b>	Amplitude 0.35 mm, frequency 10 ... 55 Hz IEC/EN 60068-2-6 20 / 060 / 04 IEC/EN 60068-1
<b>Climate resistance:</b>	
<b>Wire connection:</b>	2 x 2.5 mm <sup>2</sup> solid or 2 x 1.5 mm <sup>2</sup> stranded ferruled DIN 46228-1/-2/-3/-4
<b>Wire fixing:</b>	Flat terminals with self-lifting clamping piece IEC/EN 60999-1
<b>Fixing torque:</b>	0.8 Nm
<b>Mounting:</b>	DIN rail IEC/EN 60715
<b>Weight</b>	
IL 9077:	110 g
SL 9077:	137 g
IP 9077:	210 g
SP 9077:	259 g

### Dimensions

#### Width x height x depth

IL 9077:	35 x 90 x 59 mm
SL 9077:	35 x 90 x 98 mm
IP 9077:	70 x 90 x 59 mm
SP 9077:	70 x 90 x 98 mm

### Standard Types

IL 9077.12	3/N AC 400 / 230 V	0.1 ... 20 s
Article number:	0045788	
• Output:	2 changeover contacts	
• Nominal voltage $U_N$ :	3/N AC 400/230 V	
• De-energized on trip		
• Variable time delay	0.1 ... 20 s	
• Width:	35 mm	

SL 9077.12	3/N AC 400 / 230 V	0.1 ... 20 s
Article number:	0054758	
• Output:	2 changeover contacts	
• Nominal voltage $U_N$ :	3/N AC 400/230 V	
• De-energized on trip		
• Variable time delay	0.1 ... 20 s	
• Width:	35 mm	

### Variants

IL 9077.../001:	3p3w, de-energized on trip
IL 9077.12/003:	3p3w, de-energized on trip with phase sequence detection
IL 9077.12/010:	3p4w, de-energized on trip with asymmetry detection
IL 9077.12/011:	3p3w, de-energized on trip with asymmetry detection
IL 9077.12/800:	With fast response and high overload at overvoltage. See datasheet IL 9077/800.
IP 9077.39:	3p4w, de-energized on trip
IP 9077.39/002:	3p3w, undervoltage output de-energized on trip, overvoltage output energized on trip

### Ordering example for variants

IL 9077	.12	/	...	3/N AC 400/230 V	50 / 60 Hz	0.1 ... 20 s
						Time delay
						Nominal frequency
						Nominal voltage
						Variant, if required
						Contacts
						Type

