

# Voltage Relay

REU 610

Product Guide -ANSI version





**Features**

- Overvoltage protection with definite-time or IDMT characteristic, low-set element
- Overvoltage protection with definite-time or IDMT characteristic, high-set element
  - Based on phase-to-phase voltage measurement or negative phasesequenece (NPS) voltage
- Undervoltage protection with definite-time or IDMT characteristic, lowset element
  - Can also be used as alarm element
- Undervoltage protection with definite-time or IDMT characteristic, highset element
  - Based on phase-to-phase voltage measurement or positive phasesequenece (PPS) voltage
- Residual overvoltage protection with definite-time characteristic, low-set element
- Residual overvoltage protection with definite-time characteristic, high-set element
- Circuit-breaker failure protection
- Trip counters for circuit-breaker condition monitoring
- Trip-circuit supervision with possibility to route the warning signal to a non-trip output
- Trip lockout function
- Four accurate voltage inputs
  - User-selectable rated voltage 100/110/115/120 V
- User-selectable rated frequency 50/60 Hz
- Three normally open trip contacts
- Two change-over (form c) non-trip contacts and three additional changeover (form c) non-trip contacts on the optional I/O module
- Output contact functions freely configurable for wanted operation
- Two galvanically isolated digital inputs and three additional galvanically isolated digital inputs on the optional I/O module
- Disturbance recorder:
  - Recording time up to 80 seconds
  - Triggering by one or several internal or digital input signals
  - Records four analog channels and up to eight user-selectable digital channels
  - Adjustable sampling rate
- Non-volatile memory for:
  - Up to 100 event codes with time stamp
  - Setting values
  - Disturbance recorder data
  - Recorded data of the five last events with time stamp
  - Number of pickups for protection elements
  - Operation target messages and LEDs showing the status at the moment of power failure
- HMI with an alphanumeric LCD and navigation buttons
- Eight programmable LEDs
- Multi-language support
- User-selectable password protection for the HMI
- Display of primary voltage values
- All settings can be modified with a PC
- Optical front communication connection: wirelessly or via cable
- Optional rear communication module with plastic fibre-optic, combined fibre-optic (plastic and glass) or RS-485 connection for system communication using the SPA-bus, IEC 60870-5-103 or Modbus (RTU and ASCII) communication protocol
- Optional DNP 3.0 rear communication module with RS-485 connection for system communication using the DNP 3.0 communication protocol
- Battery back-up for real-time clock
- Time synchronization via a digital input
- Battery charge supervision
- Continuous self-supervision of electronics and software
  - At an internal relay fault, all protection elements and outputs are locked
- Detachable plug-in unit

## Application

REU 610 is a versatile multifunction voltage relay which is used in general voltage supervision applications. It complements the range of feeder protection relay REF 610 and motor protection relay REM 610 in industrial outgoing feeder and motor feeder applications. The relay can also be used as back-up protection for industrial as well as utility applications.

The large number of integrated protection functions, including two overcurrent protection elements, two undervoltage protection elements and two residual overvoltage protection elements, makes the relay a complete protection against various voltage fault conditions.

The large number of digital inputs and output contacts allows a wide range of applications.

## Design

REU 610 is based on a microprocessor environment. A self-supervision system continuously monitors the operation of the relay.

The HMI includes a Liquid Crystal Display (LCD) which makes the local use of the relay safe and easy.

Local control of the relay via serial communication can be carried out with a computer connected to the front communication port. Remote control can be carried out via the rear connector connected to the control and monitoring system through the serial communication bus.

### Auxiliary voltage

REU 610 requires a secured auxiliary voltage supply to operate. The internal power supply of the relay forms the voltages required by the relay electronics. The power supply is a galvanically isolated (flyback-type) DC/DC converter. When the auxiliary voltage is connected, the green indicator LED (ready) on the front panel will be on. For detailed information on power supply, refer to table 2.

The primary side of the power supply is protected with a fuse located on the PCB of the relay.

## Protection functions

### symbols and ANSI device numbers

Function description	IEC symbol	IEEE device number
Overvoltage protection, low-set stage	U>	59P-1
Overvoltage protection, high-set stage	U>>	59P-2
Negative phase-sequence overvoltage protection	U <sub>2</sub> >	47
Undervoltage protection, low-set stage	U<	27P-1
Undervoltage protection, high-set stage	U<<	27P-2
Positive phase-sequence undervoltage protection	U <sub>1</sub> <	27D
Residual overvoltage protection, low-set stage	U <sub>0</sub> >	59N-1
Residual overvoltage protection, high-set stage	U <sub>0</sub> >>	59N-2
Circuit-breaker failure protection	CBFP	CBFAIL
Lockout relay	-	86

## Technical data

Table 1: Dimensions

Width	frame 177 mm, case 164 mm
Height	frame 177 mm (4U), case 160 mm
Depth	case 149.3 mm
Weight of the relay	~3.5 kg
Weight of the spare unit	~1.8 kg

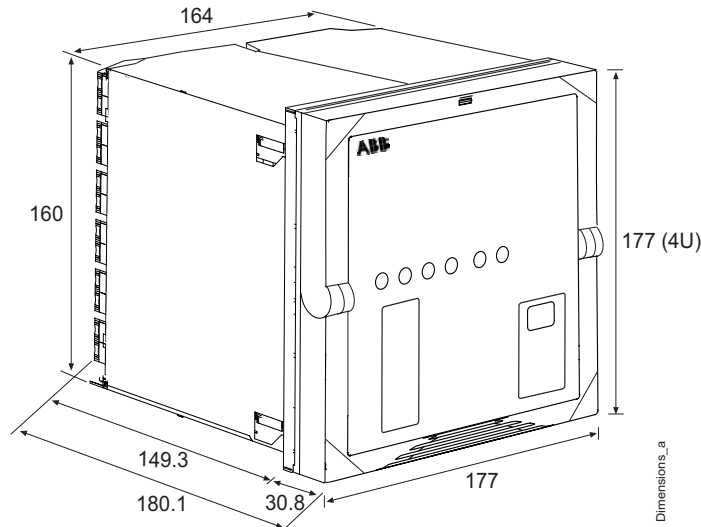


Fig. 1 Dimensions of the relay

Table 2: Power supply

Type:	REU 610xxxHxxx	REU 610xxxLxxx
$U_{aux}$ rated	$U_r=100/110/120/220/240$ V ac $U_r=110/125/220/250$ V dc	$U_r=24/48/60$ V
$U_{aux}$ variation	85...110% x $U_r$ (ac) 80...120% x $U_r$ (dc)	80...120% x $U_r$
Burden of auxiliary voltage supply under quiescent ( $P_Q$ )/operating condition	<9 W/13 W	
Ripple in the dc auxiliary voltage	Max 12% of the dc value	
Interruption time in the auxiliary dc voltage without resetting the relay	<50 ms at $U_{aux}$ rated	
Time to trip from switching on the auxiliary voltage (trip of elements 59P-2 and 59N-1)	<350 ms	
Internal over temperature limit	+100°C	
Fuse type	T2A/250 V	

Table 3: Energizing inputs

Rated frequency	50/60 Hz $\pm$ 5 Hz
Rated voltage, $U_n$ (VT)	100/110/115/120 V
Thermal withstand capability:	2 x $U_n$ (VT) (240 V) 3 x $U_n$ (VT) (360 V)
• continuously • for 10 s	
Burden at rated voltage	<0.5 VA

Technical data (cont'd)

**Table 4: Measuring range**

Measured phase-to-phase voltages $U_{ab}$ , $U_{bc}$ and $U_{ca}$ as multiples of the rated voltages of the energizing inputs	$0...2 \times U_n$ (VT)
Measured residual voltage $U_n$ as a multiple of the rated voltage of the energizing input	$0...2 \times U_n$ (VT)

**Table 5: Digital inputs**

Operating range	$\pm 20\%$ of the rated voltage
Rated voltage • DI1...DI2 REU 610xxxHxxx • DI1...DI2 REU 610xxxLxxx • DI3...DI5 (optional) REU 610xxxxHx • DI3...DI5 (optional) REU 610xxxxLx	110/125/220/250 V dc 24/48/60/110/125/220/250 V dc 110/125/220/250 V dc 24/48/60/110/125/220/250 V dc
Current drain	2...18 mA
Power consumption/input	$\leq 0.9$ W

**Table 6: Signal outputs SO1, optional outputs SO4 and SO5**

Rated voltage	250 V ac/dc
Continuous carry	5 A
Make and carry for 3.0 s	15 A
Make and carry for 0.5 s	30 A
Breaking capacity when the control-circuit time constant $L/R < 40$ ms, at 48/110/220 V dc	1 A/0.25 A/0.15 A 5 A/3 A/1 A for series connection of SO4 and SO5
Minimum contact load	100 mA at 24 V ac/dc

**Table 7: Signal outputs SO2, optional SO3 and self-supervision (IRF) output**

Rated voltage	250 V ac/dc
Continuous carry	5 A
Make and carry for 3.0 s	10 A
Make and carry for 0.5 s	15 A
Breaking capacity when the control-circuit time constant $L/R < 40$ ms, at 48/110/220 V dc	1 A/0.25 A/0.15 A
Minimum contact load	100 mA at 24 V ac/dc

**Table 8: Power outputs PO1, PO2 and PO3**

Rated voltage	250 V ac/dc
Continuous carry	5 A
Make and carry for 3.0 s	15 A
Make and carry for 0.5 s	30 A
Breaking capacity when the control-circuit time constant $L/R < 40$ ms, at 48/110/220 V dc (PO1 with both contacts connected in series)	5 A/3 A/1 A
Minimum contact load	100 mA at 24 V ac/dc
Trip circuit supervision (TCS) • Control voltage range • Current drain through the supervision circuit • Minimum voltage over a contact	20...265 V ac/dc ~1.5 mA 20 V ac/dc (15...20 V)

Technical data (cont'd)

**Table 9: Enclosure class of the flush-mounted relay**

Front side	IP 54
Top of the relay	IP 40
Rear side, connection terminals	IP 20

**Table 10: Environmental tests and conditions**

Recommended service temperature range (continuous)	-10...+55°C
Limit temperature range (short-term)	-40...+70°C
Transport and storage temperature range	-40...+85°C according to IEC 60068-2-48
Dry heat test	According to IEC 60068-2-2
Dry cold test	According to IEC 60068-2-1
Damp heat test, cyclic	According to IEC 60068-2-30

**Table 11: Electromagnetic compatibility tests**

EMC immunity test level meets the requirements listed below	
1 MHz burst disturbance test, class III • Common mode • Differential mode	According to IEC 60255-22-1 2.5 kV 1.0 kV
Electrostatic discharge test, class IV  • For contact discharge • For air discharge	According to IEC 61000-4-2, IEC 60255-22-2 and ANSI C37.90.3-2001 8 kV 15 kV
Radio frequency interference tests • Conducted, common mode  • Radiated, amplitude-modulated  • Radiated, pulse-modulated	According to IEC 61000-4-6 and IEC 60255-22-6 (2000) 10 V (rms), f=150 kHz...80 MHz According to IEC 61000-4-3 and IEC 60255-22-3 (2000) 10 V/m (rms), f=80...1000 MHz According to the ENV 50204 and IEC 60255-22-3 (2000) 10 V/m, f=900 MHz
Fast transient disturbance tests  • Power outputs, energizing inputs, power supply • I/O ports	According to IEC 60255-22-4, and IEC 61000-4-4 4 kV 2 kV
Surge immunity test • Power outputs, energizing inputs, power supply  • I/O ports	According to IEC 61000-4-5 4 kV, line-to-earth 2 kV, line-to-line 2 kV, line-to-earth 1 kV, line-to-line
Power frequency (50 Hz) magnetic field IEC 61000-4-8	300 A/m continuous
Voltage dips and short interruptions	According to IEC 61000-4-11 30%/10 ms 60%/100 ms 60%/1000 ms >95%/5000 ms

Technical data (cont'd)

**Table 11: Electromagnetic compatibility tests**

Electromagnetic emission tests • Conducted, RF-emission (Mains terminal) • Radiated RF-emission	According to the EN 55011 EN 55011, class A, IEC 60255-25 EN 55011, class A, IEC 60255-25
CE approval	Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC

**Table 12: Standard tests**

<b>Insulation tests</b>	
Dielectric tests • Test voltage	According to IEC 60255-5 2 kV, 50 Hz, 1 min
Impulse voltage test • Test voltage	According to IEC 60255-5 5 kV, unipolar impulses, waveform 1.2/50 $\mu$ s, source energy 0.5 J
Insulation resistance measurements • Isolation resistance	According to IEC 60255-5 >100 M $\Omega$ , 500 V dc
<b>Mechanical tests</b>	
Vibration tests (sinusoidal)	According to IEC 60255-21-1, class I
Shock and bump test	According to IEC 60255-21-2, class I

**Table 13: Data communication**

Rear interface, connector X5.3, X5.4, X5.5 or X5.8 • Fibre-optic or RS-485 connection • SPA bus, IEC 60870-5-103 DNP3.0 or Modbus protocol • 9.6 or 4.8 kbps (additionally 2.4, 1.2 or 0.3 kbps for Modbus)
Front interface • Optical connection (infrared): wirelessly or via the front communication cable (1MRS050698) • SPA bus protocol • 9.6 or 4.8 kbps (9.6 kbps with front communication cable)



Connection diagram

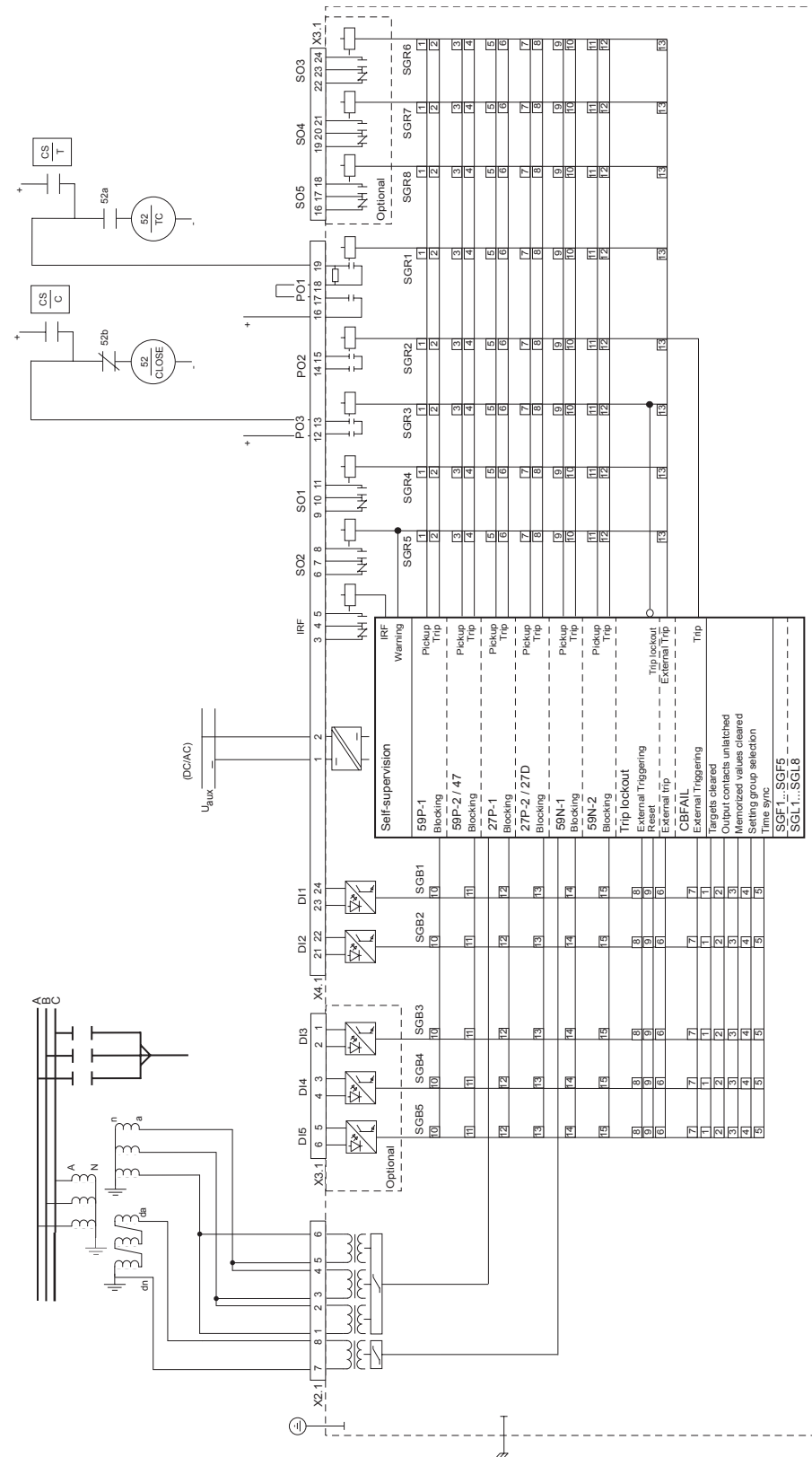


Fig. 2 Example connection

## Ordering

When ordering voltage relays and/or accessories, please specify the following:

- Order number
- HMI language set number
- Quantity

The order number identifies the voltage relay type and hardware as described in the figures below and is labelled on the marking strip under the lower handle of the relay.

Use the ordering key in Fig. 3 to generate the order number when ordering complete voltage relays:

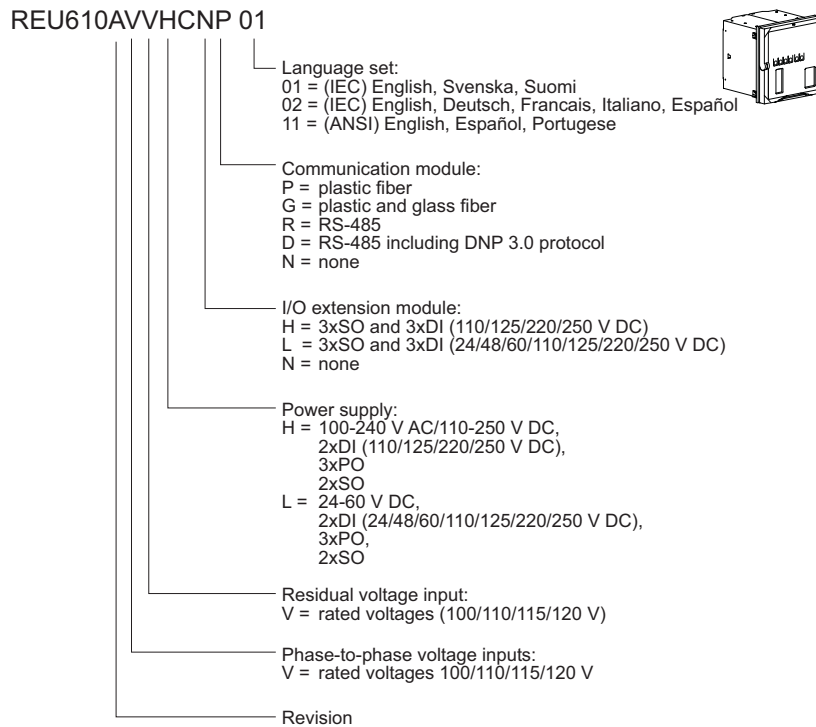


Fig. 3 Ordering key for complete relays

Use the ordering key in Fig. 4 to generate the order number when ordering spare units:

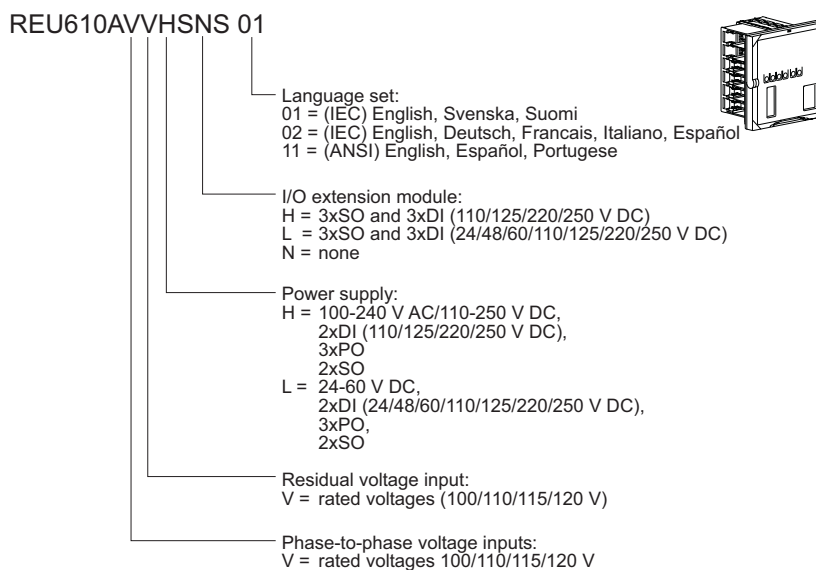


Fig. 4 Ordering key for spare units

The following accessories are available:

Item	Order number
Semi-flush mounting kit	1MRS050696
Inclined ( $\angle 25^\circ$ ) semi-flush mounting kit	1MRS050831
Wall mounting kit	1MRS050697
19" Rack mounting kit, side-by-side	1MRS050695
19" Rack mounting kit, single relay	1MRS050694
19" Rack mounting kit for single relay and RTXP18	1MRS050783
19" equipment frame mounting (Combiflex), plain bracket	1MRS061208
19" equipment frame mounting (Combiflex), bracket for RTXP18	1MRS061207
Front communication cable	1MRS050698
Communication modules:	
Plastic fibre	1MRS050889
RS-485	1MRS050892
Plastic and glass fibre	1MRS050891
RS-485 including DNP 3.0 protocol	1MRS050887

## References

### Available manuals:

Item	Order number
Technical Reference Manual (ANSI)	1MRS 755972
Operator's Manual (ANSI)	1MRS 755971
Installation Manual	1MRS 752265-MUM

### Configuration, setting and SA system tools:

The following tool versions are needed to support the new functions and features of REU 610 release A:

CAP 501 Relay Setting Tool	CAP 501 v. 2.4.0 or later
CAP 505 Relay Setting Tool	CAP 505 v. 2.4.0 or later
SMS 510 Substation Monitoring System	SMS 510 v. 1.3.0 or later
LIB 510 Library for MicroSCADA 8.4.4 and later and MicroSCADA Pro	LIB 510 v. 4.2.-1 or later



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