

Motor Protection Relay

REM 610

Buyer's Guide - ANSI version



Features

- Three-phase thermal overload protection
- Three-phase motor start-up supervision based on thermal stress calculation with speed switch blocking ability
- Three-phase overcurrent protection with definite-time characteristic and speed switch blocking ability
- Three-phase short-circuit protection with instantaneous or definite-time characteristic
- Three-phase undercurrent (loss of load) protection with definite-time characteristic
- Non-directional ground-fault protection with definite-time characteristic
- Three-phase unbalance protection based on the negative-phase-sequence current with inverse definite minimum time characteristic
- Phase reversal protection based on the negative-phase-sequence current
- Cumulative start-up time counter with restart disable function
- Circuit-breaker failure protection
- Temperature protection elements with definite-time characteristic
- Emergency start function
- Optional RTD module
 - with six measuring inputs
 - supports PTC thermistors and various RTD sensors
 - three additional galvanically isolated digital inputs
- Disturbance recorder
 - recording time up to 80 seconds
 - triggering by one or several internal or digital input signals
 - records four analogue 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
- Battery back-up for real-time clock
- Battery charge supervision
- Four accurate current inputs
- Two galvanically isolated digital inputs and three additional digital inputs on the optional RTD module
- Time synchronization via a digital input
- All settings can be modified with a PC
- HMI with an alphanumeric LCD and manoeuvring buttons
 - eight programmable LEDs
- Detachable plug-in unit
- Three normally open power output contacts
- Trip-circuit supervision
- Two change-over signal output contacts
- Output contact functions freely configurable for desired operation
- Optical front communication connection: wirelessly or via cable
- Optional rear communication module with plastic fibre-optic, combined fibreoptic (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
- Continuous self-supervision of electronics and software. At an internal relay fault, all protection elements and outputs will be blocked.
- User-selectable rated frequency 50/60 Hz
- User-selectable password protection for the HMI
- Display of primary current values
- Demand values
- Multi-language support

Application

REM 610 is a versatile multifunction protection relay mainly designed for protection of standard medium and large MV asynchronous motors in a wide range of motor applications. It handles fault conditions during motor start up, normal run, idling, and cooling down at standstill, e.g. in pump, fan, mill or crusher applications.

The large number of integrated protection functions makes REM 610 a complete protection against motor damage.

The relay can be used with both circuit-breaker controlled and contactor controlled drives.

REM 610 can equally well be used to protect, for instance, feeder cables and power transformers which require thermal overload protection and single-, two- or three-phase overcurrent or non-directional ground-fault protection.

Design

REM 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.

REM 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 3.

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

Settings

There are two alternative setting groups available, setting groups 1 and 2. Either of these setting groups can be used as the actual settings, one at a time. Both groups have their related registers. By switching between the setting groups, a whole group of settings can be changed at the same time. This can be done in any of the following ways:

Group configuration:

- via the HMI
- entering parameter V150 via serial communication

Group selection:

- switching between group 1 and group 2 is accomplished by means of a digital input

The setting values can be altered via the HMI or with a PC provided with the Relay Setting Tool.

Before the relay is connected to a system it must be assured that the relay has been given the correct settings, refer to the Table 1.

Table 1: Setting values

| Setting | Description | Setting range | Default setting |
|-------------------------|--|------------------------------|------------------------|
| FLA SEC. | FLA secondary scaling factor | 0.50...2.50 ¹⁾ | 1 |
| t _{6x} | Safe stall time | 2...120 s ²⁾ | 2 s |
| p | Weighting factor | 20...100% | 50% |
| K _c | Time constant multiplier | 1...64 | 1 |
| 49 ALARM | Prior alarm level | 50...100% | 95% |
| 49 RESTDIS | Restart disable level | 20...80% | 40% |
| T _{amb} | Ambient temperature | 0...70°C | 40°C |
| 48/14 PICUP/FLA | Start-up current for motor or picup value of element 48/14 | 1.00...10.0 x FLA | 1.00 x FLA |
| 48/14 TDLY | Start-up time for motor or operate time of element 48/14 | 0.30...80.0 s | 0.30 s |
| 50P/FLA | Picup value of element 50P | 0.50...20.0 x FLA | 1.00 x FLA |
| 50P TDLY | Operate time of element 50P | 0.05...30.0 s | 0.05 s |
| 51N / I _n CT | Picup value of element 51N | 1.0...100% I _n CT | 1.0% I _n CT |
| 51N TDLY | Operate time of element 51N | 0.05...300 s | 0.05 s |
| 37/FLA | Picup value of element 37 | 30...80% FLA | 50% FLA |
| 37 TDLY | Operate time of element 37 | 2...600 s | 2 s |
| 46 PICUP/FLA | Picup value of element 46 | 0.10...0.50 x FLA | 0.20 x FLA |
| 46 DIAL | Time constant of element 46 at IDMT characteristic | 5...100 | 5 |
| 66 | Restart disable value | 5...500 s | 5 s |
| 66 COOL/Δt | Countdown rate of start-up time counter | 2...250 s/h | 2 s/h |
| Trip Fail | Operate time of CBFAIL | 0.10...60.0 s | 0.10 s |
| RTD1A | Alarm value RTD1A | 0...200°C | 0°C |
| RTD1A TDLY | Operate time RTD1A TDLY | 1...100 s | 1 s |
| RTD1T | Trip value RTD1T | 0...200°C | 0°C |
| RTD1T TDLY | Operate time RTD1T TDLY | 1...100 s | 1 s |
| RTD2A | Alarm value RTD2A | 0...200°C | 0°C |
| RTD2A TDLY | Operate time RTD2A TDLY | 1...100 s | 1 s |
| RTD2T | Trip value RTD2T | 0...200°C | 0°C |
| RTD2T TDLY | Operate time RTD2T TDLY | 1...100 s | 1 s |
| RTD3A | Alarm value RTD3A | 0...200°C | 0°C |
| RTD3A TDLY | Operate time RTD3A TDLY | 1...100 s | 1 s |
| RTD3T | Trip value RTD3T | 0...200°C | 0°C |
| RTD3T TDLY | Operate time RTD3T TDLY | 1...100 s | 1 s |
| RTD4A | Alarm value RTD4A | 0...200°C | 0°C |
| RTD4A TDLY | Operate time RTD4A TDLY | 1...100 s | 1 s |
| RTD4T | Trip value RTD4T | 0...200°C | 0°C |
| RTD4T TDLY | Operate time RTD4T TDLY | 1...100 s | 1 s |
| RTD5A | Alarm value RTD5A | 0...200°C | 0°C |
| RTD5A TDLY | Operate time RTD5A TDLY | 1...100 s | 1 s |
| RTD5T | Trip value RTD5T | 0...200°C | 0°C |
| RTD5T TDLY | Operate time RTD5T TDLY | 1...100 s | 1 s |

Table 1: Setting values

| Setting | Description | Setting range | Default setting |
|---------------|-------------------------|---------------|-----------------|
| RTD6A | Alarm value RTD6A | 0...200°C | 0°C |
| RTD6A TDLY | Operate time RTD6A TDLY | 1...100 s | 1 s |
| RTD6T | Trip value RTD6T | 0...200°C | 0°C |
| RTD6T TDLY | Operate time RTD6T TDLY | 1...100 s | 1 s |
| PTC1 | Trip value PTC1 | 0.1...15.0 kΩ | 0.1 kΩ |
| PTC2 | Trip value PTC2 | 0.1...15.0 kΩ | 0.1 kΩ |

1) The FLA secondary scaling factor has only one setting and thus switching between setting groups does not apply.

2) The setting step is 0.5.

Technical data

Table 2: 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 |

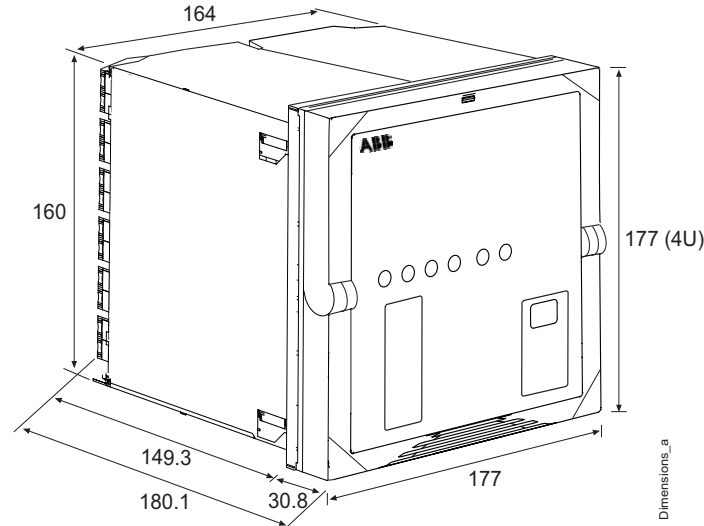


Fig. 1 Dimensions of the relay

Table 3: Power supply

| | |
|--|--|
| U _{aux} rated REM610BxxHxxx | Ur=100/110/120/220/240 V ac Ur=110/125/220/250 V dc |
| REM610BxxLxxx | Ur=24/48/60 V dc |
| U _{aux} variation (temporary) REM610BxxHxxx | 85...110% of U _r (ac) 80...120% of U _r (dc) |
| REM610BxxLxxx | 80...120% of U _r (dc) |
| 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 ¹⁾ | <350 ms |
| Internal over temperature limit | +100°C |
| Fuse type | T2A/250 V |

1) Time to trip of elements 50P and 51N

Technical data (cont'd)

Table 4: Energizing inputs

| | | |
|------------------------------|-----------------|--------|
| Rated frequency | 50/60 Hz ± 5 Hz | |
| Rated current, FLA | 1 A | 5 A |
| Thermal withstand capability | | |
| - continuously | 4 A | 20 A |
| - for 1 s | 100 A | 500 A |
| - for 10 s | 25 A | 100 A |
| Dynamic current withstand | | |
| - half-wave value | 250 A | 1250 A |
| Input impedance | <100 mΩ | <20 mΩ |

Table 5: Measuring range

| | |
|--|----------------------------|
| Measured currents on phases I _a , I _b and I _c as multiples of the rated currents of the energizing inputs | 0...50 x I _n CT |
| Ground-fault current as a multiple of the rated current of the energizing input | 0...8 x I _n CT |

Table 6: Digital inputs

| | | |
|-------------------------|-------------------------------|-------------------------------|
| Operating range | ±20% of the rated voltage | |
| Rated voltage: | DI1...DI2 | DI3...DI5 (optional) |
| • REM610BxxHxxx | 110/125/220/250 V dc | 24/48/60/110/125/220/250 V dc |
| • REM610BxxLxxx | 24/48/60/110/125/220/250 V dc | |
| • REM610BxxxxMx | | |
| Current drain | 2...18 mA | |
| Power consumption/input | <0.9 W | |

Table 7: Signal outputs SO1

| | |
|---|----------------------|
| 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 |
| Minimum contact load | 100 mA at 24 V ac/dc |

Table 8: Signal outputs SO2 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 9: Power outputs (PO1, PO2, 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 |
| TCS | |
| - Control voltage range | 20...265 V ac/dc |
| - Current drain through the supervision circuit | ~1.5 mA |

Technical data (cont'd)

Table 9: Power outputs (PO1, PO2, PO3)

| | |
|----------------------------------|------------------------|
| - Minimum voltage over a contact | 20 V ac/dc (15...20 V) |
|----------------------------------|------------------------|

Table 10: Enclosure class of the flush-mounted relay

| | |
|---------------------------------|-------|
| Front side | IP 54 |
| Rear side, top of the relay | IP 40 |
| Rear side, connection terminals | IP 20 |

Table 11: RTD/analogue inputs

| | | |
|--|--|----------------------------|
| Supported RTD sensors | 100 Ω platinum | TCR0.00385 (DIN 43760) |
| | 250 Ω platinum | TCR 0.00385 |
| | 1000 Ω platinum | TCR 0.00385 |
| | 100 Ω nickel | TCR 0.00618 (DIN 43760) |
| | 120 Ω nickel | TCR 0.00618 |
| | 120 Ω nickel (US) | TCR 0.00672 |
| | 10 Ω copper | TCR 0.00427 |
| Supported PTC thermistor range | 0...20 kΩ | |
| Maximum lead resistance (three-wire measurement) | 200 Ω per lead | |
| Isolation | 2 kV (inputs to protective ground) | |
| Sampling frequency | 5 Hz | |
| Response time | <8 s | |
| RTD/Resistance sensing current | Maximum 4.2 mA rms 6.2 mA rms for 10 Ω copper | |

Table 12: 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 the IEC 60068-2-48 |
| Dry heat test | According to the IEC 60068-2-2 |
| Dry cold test | According to the IEC 60068-2-1 |
| Damp heat test, cyclic | According to the IEC 60068-2-30 |

Table 13: 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 the IEC 60255-22-1 2.5 kV 1.0 kV |
| Electrostatic discharge test, class IV: - for contact discharge - for air discharge | According to the 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 the IEC 61000-4-6 and IEC 60255-22-6 (2000) 10 V (rms), f = 150 kHz...80 MHz According to the 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: | According to the IEC 60255-22-4 and IEC 61000-4-4 |

Technical data (cont'd)

Table 13: Electromagnetic compatibility tests

| | |
|---|--|
| • Power outputs, energizing inputs, power supply | 4 kV |
| • I/O ports | 2 kV |
| Surge immunity test: • Power outputs, energizing inputs, power supply • I/O ports | According to the IEC 61000-4-5 4 kV, line-to-ground 2 kV, line-to-line 2 kV, line-to-ground 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 the IEC 61000-4-11 30%/10 ms 60%/100 ms 60%/1000 ms >95%/5000 ms |
| 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 14: Standard tests

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

Table 15: Data communication

| |
|--|
| Rear interface, connector X5.3 X5.4 or X5.5 - Fibre-optic or RS-485 connection - SPA bus, IEC 60870-5-103 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 diagrams

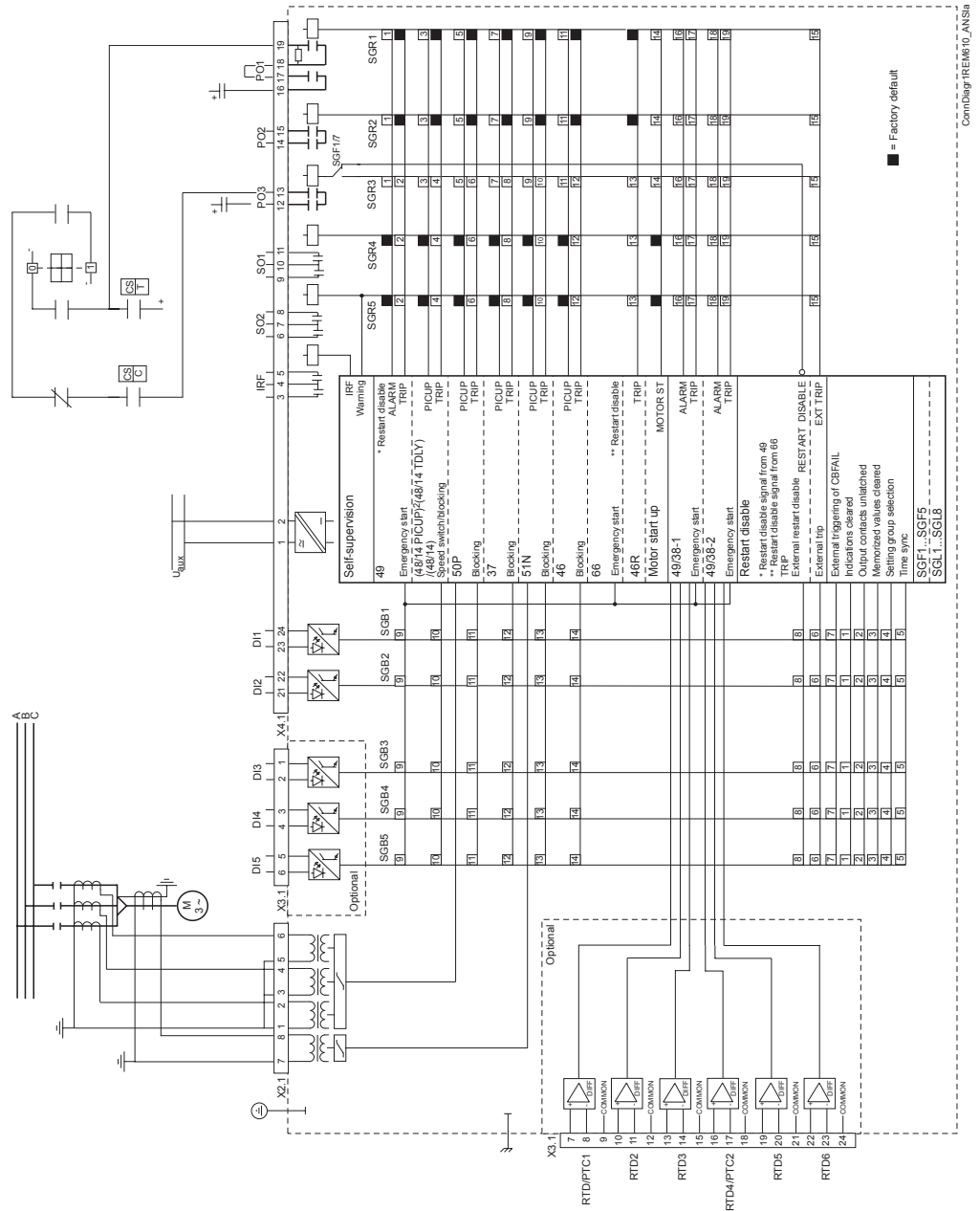


Fig. 2 Residual current is measured via a core-balanced current transformer.

Connection diagrams
(cont'd)

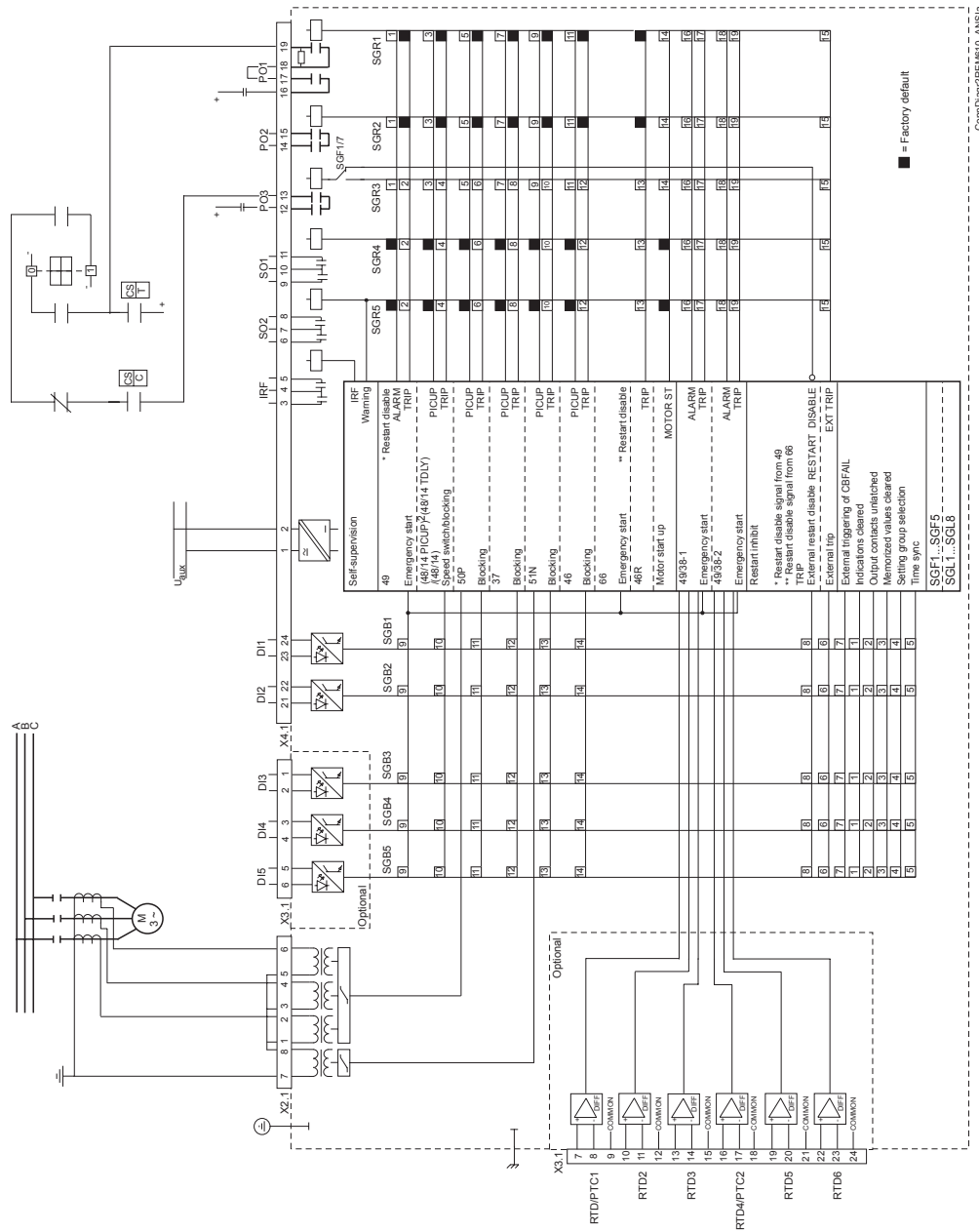


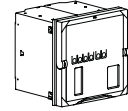
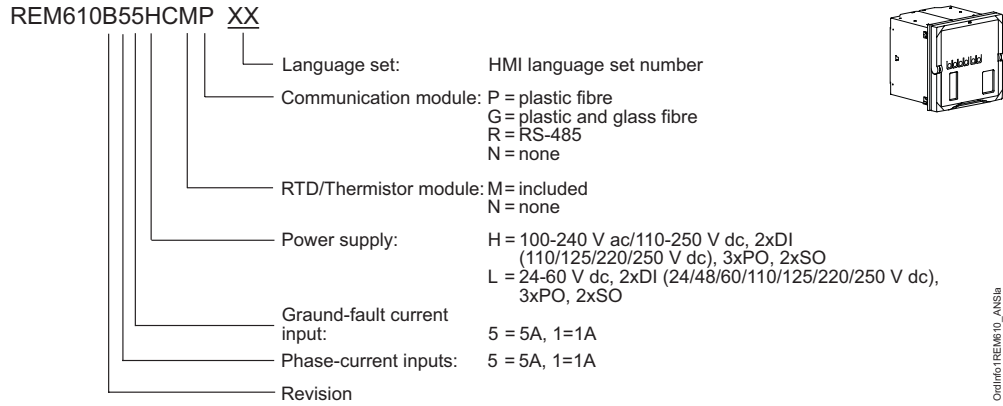
Fig. 3 Residual current is measured via a summation connection of the phase current transformers.

Ordering information

When ordering REM 610 protection relays and/or accessories, please specify the following:

- Order number
- HMI language set number
- Quantity

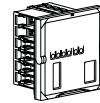
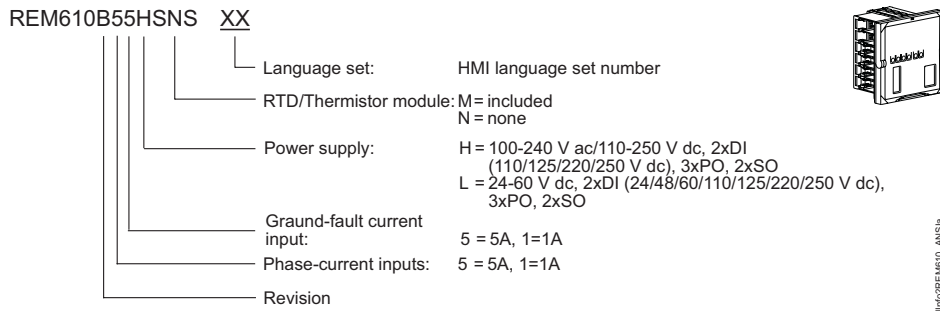
The order number identifies the protection relay type and hardware as described in figures below and is labelled on the marking strip under the lower handle of the relay. Use the ordering key below to generate the order number when ordering complete protection relays.



Ordinfo REM610_ANSIa

Fig. 5 Ordering key

Use the ordering key in fig. 6 to generate the order number when ordering spare units.



Ordinfo REM610_ANSIa

Fig. 6 Ordering key for spare units

HMI language set numbers, corresponding terminology and languages included, are described in table 16 below:

Table 16: HMI language set numbers

| Language set number | Terminology | Languages |
|---------------------|-------------|---|
| 01 | IEC | English, Svenska, Suomi |
| 02 | IEC | English, Deutsch, Francais, Italiano, Español |
| 11 | ANSI | English (US), Español, Portuguese |

Note: The spare unit is a plain plug-in unit without enclosure, terminal connections and the optional communication module.

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 |
| Front communication cable | 1MRS050698 |

Configuration, setting and SA system tools

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

| | |
|---|-----------------------------|
| CAP 501 Relay Setting Tool | CAP 501 v. 2.3.0-5 or later |
| CAP 505 Relay Setting Tool | CAP 505 v. 2.3.0-5 or later |
| SMS 510 Substation Monitoring System | SMS 510 v. 1.1.0 or later |
| LIB 510 Library for MicroSCADA v. 8.4.4 | LIB 510 v. 4.0.5-3 or later |

References

Available manuals:

| Item | Order number |
|--|---------------------|
| Technical Reference Manual, ANSI version | 1MRS755537 |
| Operator's Manual, ANSI version | 1MRS755538 |
| Installation Manual | 1MRS752265-MUM |



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