



# MVR-200 series

Medium Voltage Relay





**MVR 210 series**

Series	Display	Free option slots
MVR 210	4" monochrome	3 to 5



**MVR 250 series**

Series	Display	Free option slots
MVR 250	7" colour	9 to 11

# MVR-200 series protection relay

## Optimal protection and control solution

The MVR-200 series provides an optimal protection and control solution for any utility, power plant, wind-power, off-shore, marine, industrial, commercial or institutional electrical protection.

The MVR-200 series offers integrated or segregated protection with powerful complementary monitoring, measuring, communication and diagnostics information. The MVR-200 is developed using the latest available technologies providing a totally new dimension and options to protection and control engineers.

### Versatile Protection Design

MVR-200 series is characterized by fast, versatile and dependable protection functions with uniquely wide operating frequency band of 6...75Hz making MVR-200 perfect choice for the most demanding protection applications including rotating machines.

### Modularity

Fully modular hardware construction gives a high level of flexibility; additional I/O or communication cards can be simply plugged in according to application needs.

### Usability

Maximum use of the relay is guaranteed by features such as, sophisticated setting aids, highly customizable HMI, file storage of pdf or other supportive documents and extensive user log information. Track down a complete user history register including setting change and other operational history.

### Performance

The MVR-200 series offers truly sub-cycle instantaneous triptimes. Powerful PLC programming is included for the most demanding applications allowing for extensive customization. Up to 100 disturbance records of up to 10 seconds each and 10 000 events are stored in non-volatile memory.

### Communication

Native Ethernet communication provides for fast and seamless communication. The MVR-200 communicates using variety of standard protocols including IEC 61850 substation communication standard with fast GOOSE messaging.

### Savings in Engineering Time

MVR Utility Software free of charge software suite saves valuable engineering time by offering an intuitive and easy to use human machine interface. Download all relay settings instantly using native 100Mb/s Ethernet connection either at relay front port or rear port through Ethernet network.

### Standardized Hardware

Trouble free logistics and stocking with highly standardized hardware design. Five CT inputs with software settable secondary currents and software configurable digital input thresholds for voltage are standard features of MVR-200 series.

### IEC 61850 & IEEE 1588

- High-availability Seamless Redundancy (HSR) support
- Parallel Redundancy Protocol (PRP) support
- Precision Time Protocol (PTP) according to IEEE 1588

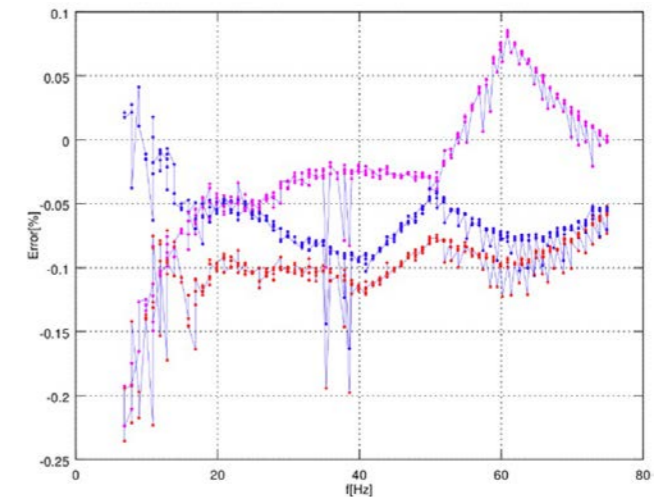
# Innovation

## Ultra-accurate measurement technology

### Accurate and frequency independent

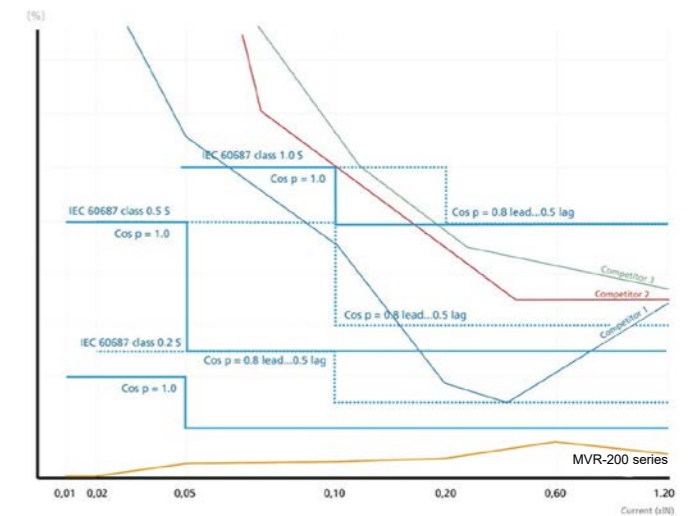
The MVR-200 series protection and control relays are deploying patented measurement technology. This has resulted in a very unique combination of class 0.2S power and energy measurement accuracy, full dynamic measurement range and frequency independent measurement and protection in a single device.

Therefore the MVR-200 series is well applicable for any applications requiring accurate measurement alone, or combination of measurement and protection. Frequency independent measurement technology allows for more accurate rotating machine protections as well.



The frequency tracking functionality keeps the measurement accuracy in the protection relays within class 0.2S between 6 and 75 Hz frequency.

*The MVR-200 series provides an optimal protection solution for any utility.*



The measurement accuracy in the protection relays stays within 0.2% even at extremely low currents.

## Intermittent earth fault protection

### Patented solution

The breakthrough relay technology in MVR-200 series with patented very accurate measurement technology (better than 0.2% for energy and power measurement) combined with up to 3.2kHz sampling rate lays the foundation for accurate algorithms of fast phenomenon such as intermittent earth-fault protection.

The algorithm makes use of the accurate measurement and sampling technology by searching for spikes in I0 and U0 generated by intermittent earth fault strike through. Algorithm is able to remove all unnecessary and confusing data and concentrate

only on the spikes. By calculating the delta of raw samples using an innovative patented admittance based formula the polarity of the spikes in I0 and U0 is determined accurately distinguishing effectively a faulty feeder over healthy background feeder. The algorithms have been proven effective in extensive field tests with electrical utilities, and have been installed in networks since 2014.

## Innovation

### Broad range multi-criteria earth-fault protection

#### The Solution: New broad range mode with multi-criteria detection

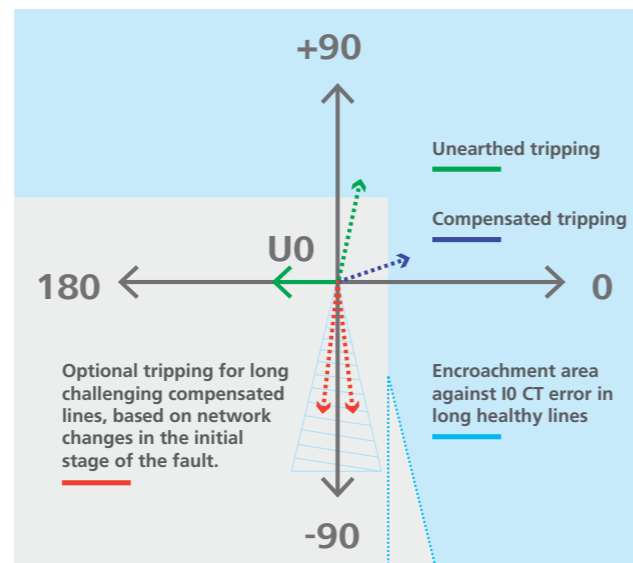
New broad range mode available in MVR-200 series protection and control relays can protect against earth-fault in both ungrounded and compensated networks without setting changes. The algorithm reliability is further increased using a new multi-criteria detection. This optional additional tripping condition for compensated networks uses the patented, high-resolution intermittent earth-fault algorithm with added symmetrical component calculation of phase currents and voltages. If this mode is activated the tripping criteria comprises of a measured residual current in the third or fourth quadrant and the symmetrical components of voltages and currents detecting a fault. No extra parameterization is required compared to traditional method.

Multi-criteria algorithm can be tested with Comtrade files supplied by DEIF. Function requires connection of 3-phase currents, residual current and zero sequence voltage to operate correctly. To avoid unnecessary trips due to CT errors, encroachment area in compensated long healthy feeders can be added.

#### DISTURBANCE RECORDER CAPACITY

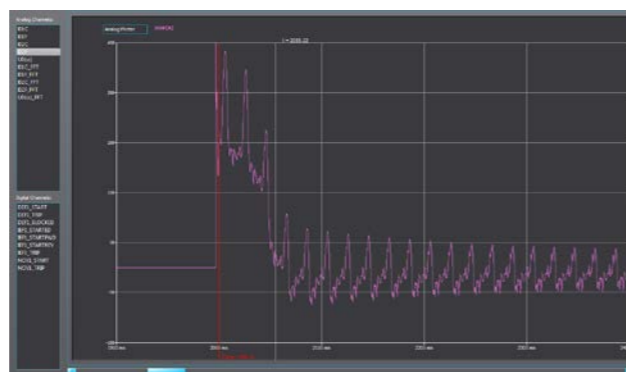
The disturbance recorder in MVR-200 series relays is a high capacity and fully digital recorder integrated to protection relay. Maximum sample rate of the recorder analog channels is 64 samples per cycle. The recorder supports 96 digital channels simultaneously with measured 9 analog channels. Even all measured and calculated values can be registered as digital channels with 5ms sample time. This feature is useful in for instance motor start up sequence, as users can track fully sampled analogue waveform values and every 5ms sampled RMS values simultaneously. The memory capacity in MVR-200 series relays allows for up to 100 non-volatile records with total of 500 second recording time with full sample rate and maximum number of recorded channels.

Recorder output is in general comtrade format and it is compatible with most viewers and relay test sets. The comtrade file is based on the IEEE Std C37.111-1999 standard.



**New broad range mode**  
The measurement accuracy in the protection relays stays within 0.2% even at extremely low currents.

**MVR-200 series' disturbance recorder is a great tool for analyzing the performance of the power system in network disturbance situations.**



Example recording with high harmonic content.

## Protection functions

### General protection algorithms

#### Non-directional and directional overcurrent and earth-fault protection (ANSI 50/51, 50/51N, 67, 67N)

Up to four stages of non-directional overcurrent and earth-fault protection functions and four stages of directional overcurrent and earth-fault functions with wide setting range of 0.1...40xIn for overcurrent and 0.005...40xIn for earth-fault. Directional overcurrent decision is based on positive sequence voltage and voltage memory is used for close in faults. Definite time, IEC or ANSI inverse time curves with settable reset delays to coordinate with electromechanical relays. Instantaneous operate time is <20ms. Includes option for internal harmonic blocking (2nd and 5th harmonic).

#### Harmonic overcurrent protection (ANSI 50/51H, 68)

Configurable trip or alarm or blocking signal based on extensive harmonic content. Up to four stages based on 2nd, 3rd, 4th, 5th or 7th, 11th, 13th, 15th 17th or 19th harmonic. Definite time, IEC or ANSI inverse time curves with settable reset delays.

#### PROGRAMMABLE STAGE PGX >/< (99)

"The programmable stage (PGS) is a stage that can be programmed by the user to create more advanced applications either as an individual stage or together with programmable logic. The relay has ten programmable stages, of which each can be set to compare from one to three analog measurements. The programmable stages have over-, under- and rate-of-change available with definite time delay to trip from pick-up included."

#### CABLE AND TRANSFORMER THERMAL PROTECTION (ANSI 49L/49T)

Thermal protection for cable or transformer overloading based on single (cable) or dual (transformer) time constants used for heating and cooling calculation of the thermal image. Provides maximum allowed load current, two alarm stages and tripping stage. Supports also close request inhibit.

#### CABLE END DIFFERENTIAL PROTECTION (ANSI 87N)

This protection stage can be configured either as a low impedance restricted earth-fault protection or cable end differential protection. When monitoring

cable end healthy condition the function compares differential current of measured phase and core balance CT currents. Natural unbalance compensation due to CT inaccuracies is included for enabling sensitive operation. The function serves for pre-emptive arc fault protection purposes.

#### Transient/Intermittent earth-fault protection (ANSI 67NT)

This sample based intermittent earth-fault algorithm makes use of MVR-200 series' accurate measurement and sampling technology by searching the transient spikes in both I0 and U0 generated by intermittent earth fault strike through. Algorithm is able to remove all unnecessary and confusing data and concentrate only on the spikes. By calculating the delta of raw samples using an innovative admittance based formula the polarity of the spikes in I0 and U0 is determined accurately distinguishing effectively a faulty feeder over healthy background feeder. Freely settable function operation time guarantees simple coordination with back-up residual voltage protection.

#### Circuit breaker failure protection (50BF/52BF)

User settable function initiation based on overcurrent or digital input or digital output status alone or in any combination. Two separate levels for Re-Trip and CBFP.

### VOLTAGE AND FREQUENCY PROTECTION ALGORITHMS

#### Voltage protection (ANSI 59/27/59N/47)

Up to four under and overvoltage and residual overvoltage and positive/negative sequence voltage stages with DT or IDMT characteristics and settable voltage thresholds.

#### Frequency protection (ANSI 81U/81O/81R)

Up to eight under and overfrequency stages and eight rate of change of frequency stages with DT characteristics. May be applied for extensive load shedding logic or simple underfrequency protection.

### Vector jump protection (ANSI 78)

The vector jump (or vector shift) protection is suitable to detect most islanding situations and switch off the mains breaker in order to let the generator supply only loads under their rated power value. The algorithm follows the samples of chosen measured voltages (64samples/cycle). Used reference voltage can be all or any phase- to phase or phase- to neutral voltages.

## Machine protection algorithms

### Differential protection (ANSI 87T/87G/87M)

Generic differential protection applicable for transformers, motors, generators or other machines requiring sensitive protection stabilized for out-zone faults. Stage features integrated 2nd and 5th harmonic blocking and predefined or custom setting of protected objects' connection group. Stage verifies object nominal values and connection group settings.

### Motor and generator thermal protection (ANSI 49M/49G)

Highly accurate motor and generator thermal modeling based on up to total of five time constants. Stator and rotor heating and cooling time constants can be set independently according to the application. Dedicated cooling time constant may be used for running and stopped machine independently. Contribution of the stator and rotor time constant effect can be set freely. Negative phase sequence current bias setting guarantees an optimal thermal image in unbalanced conditions. Ambient temperature biasing is supported either from manually set level or reading from RTD. Thermal image function calculates and displays the estimated temperatures in percentage, Celsius or Fahrenheit for easy reading of the motor thermal capacity used. Two independent alarm levels and trip and restart inhibit levels can be set easily.

### Motor start-up supervision/locked rotor protection (ANSI 48, 14)

Start-up/locked rotor protection with speed switch provides definite and inverse time protection for motor starting situations. Optional speed switch can be connected to function via a normally open (NO) or normally closed (NC) contact. Accurate protection starting from 6Hz in soft start applications.

### Frequent start supervision (ANSI 66/86)

The function inhibits motor starting based on maximum permitted starts per hour and/or motor thermal capacity. Maximum starts in cold or hot situation can be set separately as well as the minimum time in between starts. If allowed amount of starts is used the function will inhibit further starts until the motor is cooled enough to allow a new starting attempt.

### Loss of load protection (ANSI 37)

Undercurrent based loss of load protection is typically applied for conveyor controlling motors or other applications where loss of mechanical load is possible. Instant operation may be set for the most critical applications preventing further damage in case of lost load.

### Mechanical jam protection (ANSI 51M)

Motor mechanical jam protection is activated only after the motor has started. The mechanical jam protection can be set very sensitive due to being disabled during motor start.

### Unbalance protection (ANSI 46/46R/46L)

Up to four user settable stages based on either negative sequence current I2 or ratio of negative/positive sequence currents I2/I1 (broken conductor or loss of phase protection).

### Power protection (ANSI 32/37/32R)

Over power, under power and reverse power protection may be applied for overload, loss-of-load and generator turbine protection with DT characteristics and settable 3 phase active power thresholds.

### Synchronous machine protection (ANSI 40/51V/64S/21U/24/55)

Among other stages the loss of field, voltage restrained overcurrent, 100% stator earth-fault, under impedance and volts per hertz and power factor protection stages do provide all necessary for efficient generator and other synchronous machine protection.

*Highly accurate motor and generator thermal modeling based on up to total of five time constants.*

## Control functions

### General control algorithms

### Setting group change control

Change between up to 8 setting groups by any digital signal including GOOSE message or force change overrule of local controls either from setting tool, HMI or SCADA.

### Object control

Up to 5 locally or remotely controllable objects and 5 status indications. Visualize and control objects locally by means of large graphic MIMIC display.

### Auto-reclose (ANSI 79)

Up to 5 independent or scheme controlled shots initiated by five priority requests with possibility to set parallel signals in each request. Request inputs may be binary inputs, virtual inputs or GOOSE messages.

### Cold-load pick-up function

Programmable cold-load pick-up function for blocking protection functions based on cold-loads.

### Switch on to fault function

Speed up protection in case of closing on fault or forgotten protective earthing. Function may control other protection function or initiate direct tripping. Typical operate time <20ms.

### Synchrocheck (ANSI 25)

Synchrocheck function has three stages SYN1, SYN2 and SYN3. Function may be applied to check of synchronism over one or two or three circuit breakers. Algorithm checks voltages, frequencies and phase angles. All "dead" and "live" bus combinations are supported.

### Automatic transformer voltage regulator, AVR (ANSI 90)

Voltage regulator keeps the transformer secondary voltages in the given voltage window based in to the measured phase-to-phase voltage. Transformer tap can be controlled with low and high speed schemes. Internal overcurrent and low voltage blockings prevent burning of the tap during overcurrent faults and traverse of the tap to high position on bus de-energisations. In case of high overvoltage instant voltage low function controls tap to low position as fast as tap changer mechanics allows to reduce the high voltage time to minimum.

### Excitation control

Synchronous machine excitation control can be used for any machines of up to 250MVA. Different control modes include automatic voltage regulator, field current regulator and reactive power control among others.

## MVR-200 MONITORING FUNCTIONS

### CT supervision

Alarms or blocks in case of lose wiring by constantly monitoring phase current instant values as well as key calculated magnitudes of the phase currents. Monitor the residual current circuit also if the residual current is measured from dedicated residual current CT.

### Fuse failure (VT supervision)

Alarm or block in case of lose wiring or blown fuse by constantly monitoring connected instant values and calculated magnitudes. In relay where both voltage and current measurements are available the magnitudes are cross compared in order to segregate VT failure from fault. Also MCB trip direct connect is supported in the VT supervision function.

### Circuit breaker wear

Monitor the circuit breaker lifetime and maintenance needs due to interrupting currents and mechanical wearing. Function monitors the circuit breaker manufacturer given data for the breaker operating cycles in relation to the interrupted current magnitudes.

### Total harmonic distortion

Measure constantly phase and residual current and voltage magnitudes and the harmonic content of the monitored signals up to 31st harmonic component. Display THD online and create alarm limits for each channel individually.

### UNIQUE MEASUREMENT ACCURACY

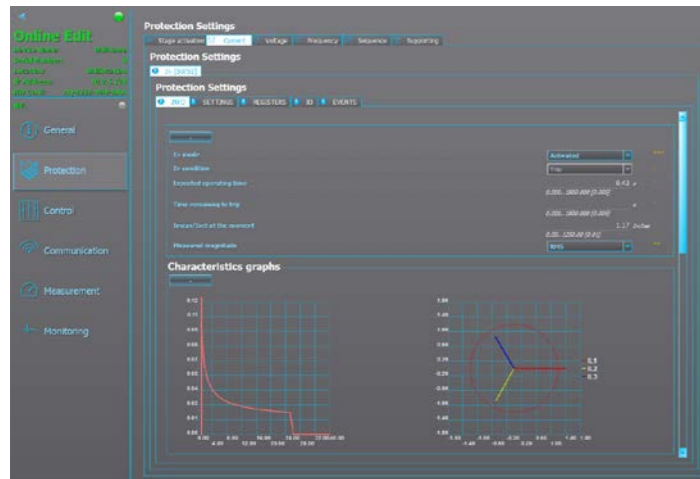
- Up to class 0.2S power and energy measurement
- Cost savings in eliminating external measurement devices
- More accurate protection

## MVR Utility Software

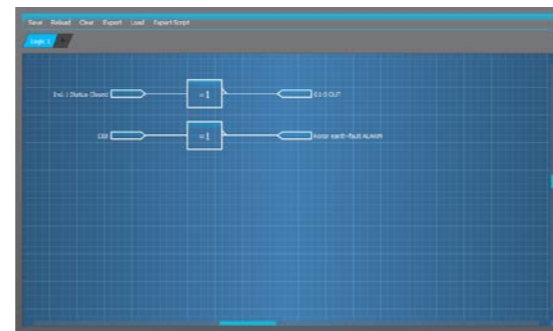
### Setting and configuration software suite

All MVR-200 series relays can be conveniently configured and set using easy to use and powerful MVR Utility Software free of charge software suite. Protection setting, I/O configuration, logic programming, HMI display, communication protocol parameters and sophisticated on-line monitoring are in-built functions of the software suite. MVR Utility Software can be used in off-line or on-line mode through Ethernet connection at the relay front port or network at relay rear ports. Inbuilt MVR Viewer software provides for comtrade disturbance recorder analysis. The MVR Utility Software runs on all Windows operating systems and is backwards compatible with older firmware versions.

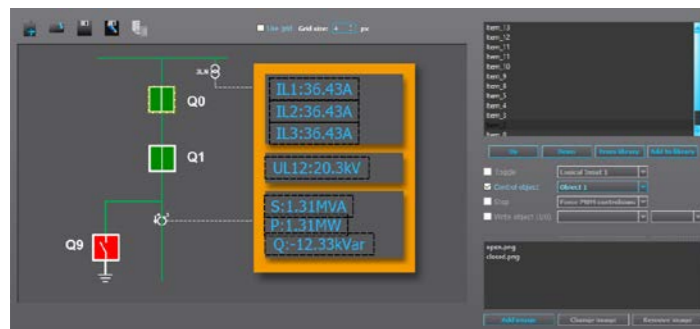
**All MVR-200 series relays can be conveniently configured and set using easy to use and powerful MVR Utility Software free of charge software suite.**



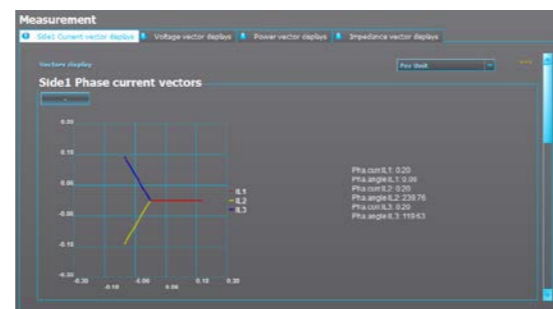
Clear grouping of relay functions guarantees familiar working experience with MVR Utility software suite. Only the activated functions are displayed for convenient setting and commissioning.



With the logic editor the functionality of the relay can be extended by using common logic gates.



With the MVR-250 graphical mimic editor it is easy to build informative color displays for the relays.



On-line status displays of vectors, logic, blocking and matrix signals save time in troubleshooting and project commissioning and testing stage.

## MVR-F201

### Overcurrent and earth-fault relay



The MVR-F201 offers a compact solution for any application requiring non-directional overcurrent and earth-fault protection. Selection of supportive functions for protection, measurement, monitoring, control and communication along with large programmable HMI guarantee the best in class price performance ratio for basic range of relays.

- Basic range
- Price performance ratio

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 3 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 3 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 1 stage INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 1 stage INST, DT or IDMT (46/46R/46L)
- High impedance restricted earth fault (87N)
- Breaker failure protection (50BF,52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Current THD and harmonics (up to 31st)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Trip circuit supervision (TCS)
- Control
- Controllable objects: 1
- Cold-load pick-up block
- Switch onto fault logic
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Digital inputs: 3 (fixed)
- Output relays: 5+1 (fixed)

#### EVENT RECORDING

- Non-volatile disturbance records:100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-F210

### Feeder protection relay



The MVR-F210 offers a modular feeder protection and control solution for non-directional overcurrent and earth-fault protection with automatic reclosing. Up to four optional I/O or communication cards are available for more comprehensive monitoring and control applications.

The MVR-F210 communicates using various protocols including IEC 61850 substation communication standard.

- Cable end differential protection
- Low-impedance REF protection
- Harmonics protection and control
- 5-shot scheme controlled autorecloser

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- High/low impedance restricted earth fault / cable end differential (87N)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Current THD and harmonics (up to 31st)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- Autorecloser (79)
- Cold-load pick-up block
- Switch onto fault logic
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Digital inputs: 3 (fixed)
- Output relays: 5+1 (fixed)

#### OPTIONS

- Digital inputs optional: +8/16/24/32
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000
- Communication media
- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-F205

### Feeder protection relay



The MVR-F205 is suitable for any application requiring directional overcurrent and earth-fault protection along with voltage and frequency protections. The MVR-F205 comes with complimentary measurement, monitoring, control and communication features. Its standard configuration of 11 digital inputs and 10 relay outputs along with large programmable HMI allows for variety of adaptations.

- Integrated protection, control and measurement
- Price performance ratio

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional earth-fault, 4 stages INST, DT or IDMT (67N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- High/low impedance restricted earth fault / cable end differential (87N)
- Cable thermal protection (49L)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Over/under frequency, 8 stages INST or DT (81O/81U)
- Rate of change of frequency, 8 stages INST or DT or IDMT (81R)
- Over/Under/Reverse power (32/37/32R)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Fault locator (21FL)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- Synchro-check (25)
- Autorecloser (79)
- Cold-load pick-up block
- Switch onto fault logic
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 11 (fixed)
- Output relays: 10+1 (fixed)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-F215

### Feeder protection relay



The MVR-215 offers a modular feeder protection and control solution for applications requiring both current and voltage based protections along with complete measurements. Up to three optional I/O or communication cards are available for more comprehensive monitoring and control applications.

The MVR-F215 communicates using various protocols including IEC 61850 substation communication standard.

- Double busbar control
- Directional and voltage protection
- Cable end differential protection
- Low-impedance REF protection
- Harmonics protection and control
- 5-shot scheme controlled auto-recloser
- Up to class 0.2S power and energy measurement

## MVR-F255

### Feeder protection relay



The MVR-F255 offers a modular feeder protection and control solution for applications requiring large I/O capacity. Up to 11 optional I/O or communication cards are available for extensive monitoring and control applications.

The MVR-F255 communicates using various protocols including IEC 61850 substation communication standard.

- Large I/O capability
- Directional and voltage protection
- Cable end differential protection
- Low-impedance REF protection
- Harmonics protection and control
- 5-shot scheme controlled autore-closer
- Up to class 0.2S power and energy measurement

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional earth-fault, 4 stages INST, DT or IDMT (67N)
- Transient earth-fault (67NT)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT 46/46R/46L
- High/low impedance restricted earth fault / cable end differential \* (87N)
- Cable thermal protection (49L)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Vector jump, 1 stage (78) Over/under frequency, 8 stages INST or DT (81O/81U)
- Rate of change of frequency, 8 stages INST or DT or IDMT (81R)
- Over/Under/Reverse power (32/37/32R)

- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- Synchro-check (25)
- Autorecloser (79)
- Cold-load pick-up block
- Switch onto fault logic
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (3 SLOTS)

- Digital inputs optional: +8/16/24
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional earth-fault, 4 stages INST, DT or IDMT (67N)
- Transient earth-fault (67NT)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT
- 46/46R/46L
- High/low impedance restricted earth fault / cable end differential \* (87N)
- Cable thermal protection (49L)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Vector jump, 1 stage (78) Over/under frequency, 8 stages INST or DT (81O/81U)
- Rate of change of frequency, 8 stages INST or DT or IDMT (81R)
- Over/Under/Reverse power (32/37/32R)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Energy (E+, E-, Eq+, Eq-)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 10
- Synchro-check (25)
- Autorecloser (79)
- Cold-load pick-up block
- Switch onto fault logic
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (11 SLOTS)

- Digital inputs optional: +8/16/24/32/4 0/48/56/64/72/80/88
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA



PROTECTION FUNCTION	ANSI	MVR-F201	MVR-F210	MVR-F205	MVR-F215	MVR-F255
Three phase overcurrent protection stages INST, DT or IDMT	50/51	x	•	•	•	•
(Sensitive) Earth-fault protection stages INST, DT or IDMT	50/51N(S)	x	•	•	•	•
Harmonic overcurrent protection / inrush blocking stages INST, DT or IDMT	50/51h/68	•	•	•	•	•
Cold-load pick-up block	68	•	•	•	•	•
Current unbalance / broken conductor protection stages INST, DT or IDMT	46R/46L/4646	•	•	•	•	•
Thermal overload protection (line)	49L	•	•	•	•	•
Restricted earth fault protection (low-imp)	87N		•	•	•	•
Cable-end differential protection	87N		•	•	•	•
Directional three-phase overcurrent protection stages DT or IDMT	67			•	•	•
Directional (sensitive) residual overcurrent protection stages DT or IDMT	67N			•	•	•
Intermittent earth fault	67NT				•	•
Fault locator	21FL			•	•	•
Overvoltage protection stages INST, DT or IDMT	59			•	•	•
Undervoltage protection stages INST, DT or IDMT	27			•	•	•
Positive sequence under/overvoltage protection stages INST, DT or IDMT	59P/27P/47			•	•	•
Residual voltage protection stages INST, DT or IDMT	59N			•	•	•
Frequency protection stages	81O/U			•	•	•
Rate of change of frequency	81R			•	•	•
Vector Jump / surge	78				•	•
Reverse/under/over power protection stages INST, DT or IDMT	32			•	•	•
Synchrocheck	25			•	•	•
Auto-reclose	79		•	•	•	•
Fuse failure	60			•	•	•
Current transformer supervision		•	•	•	•	•
Switch onto fault logic		•	•	•	•	•
Breaker failure protection	50BF	•	•	•	•	•
Programmable stage	99		•		•	•

•: 1 stage  
x: 3 stage

## MVR-M210

### Motor protection relay



The MVR-M210 offers a modular motor protection and control solution for small and medium size motors. Up to four optional I/O or communication cards are available for more comprehensive monitoring and control applications. Up to 12 RTD signals can be connected for thermal alarming and tripping.

The MVR-M210 communicates using various protocols including IEC 61850 substation communication standard.

- 5 time constant accurate thermal model
- Soft-start protection starting from 6Hz
- Star-delta started motor supervision
- 2-speed motor protection

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- Cable end differential (87N)
- Motor thermal overload (49M)
- Motor start-up / locked rotor supervision with speed switch (48, 14)
- Restart inhibit / frequent starts (66/86)
- Undercurrent/loss of load (37)
- Mechanical jam (51M)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Current THD and harmonics (up to 31st)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (4 SLOTS)

- Digital inputs optional: +8/16/24/32
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSO+BI)
- 2xA in + 4xRTD in OR 8xRTD in
- 4xA out+1xA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-M215

### Motor protection relay



The MVR-M215 offers a modular motor protection and control solution for larger and more important motors requiring both current and voltage based protection functions along with complete measurements. Up to three optional I/O or communication cards are available for more comprehensive monitoring and control applications. Up to 16 RTD signals can be connected for thermal alarming and tripping. The MVR-M215 communicates using various protocols including IEC 61850 substation communication standard.

- **Powerful motor management**
- **5 time constant accurate thermal model**
- **Soft-start protection starting from 6Hz**
- **Star-delta started motor supervision**
- **2-speed motor protection**
- **Up to class 0.2S power and energy measurement**

## MVR-M255

### Motor protection relay



The MVR-M255 offers a modular motor protection and control solution for larger and more important motors with large I/O capacity. Up to 11 optional I/O or communication cards are available for extensive monitoring and control applications. Up to 16 RTD signals can be connected for thermal alarming and tripping.

The MVR-M255 communicates using various protocols including IEC 61850 substation communication standard.

- **Powerful motor management with large I/O capability**
- **5 time constant accurate thermal model**
- **Soft-start protection starting from 6Hz**
- **Star-delta started motor supervision**
- **2-speed motor protection**
- **Up to class 0.2S power and energy measurement**
- **Asynchronous or synchronous motors**

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- Cable end differential (87N)
- Motor thermal overload (49M)
- Motor start-up / locked rotor supervision with speed switch (48, 14)
- Restart inhibit / frequent starts (66/86)
- Undercurrent/loss of load (37)
- Power factor protection (55)
- Mechanical jam (51M)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Over/under frequency, 8 stages INST or DT (81O/81U)

- Over/Under/Reverse power (32/37/32R)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (3 SLOTS)

- Digital inputs optional: +8/16/24
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSD +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- Cable end differential (87N)
- Motor thermal overload (49M)
- Motor start-up / locked rotor supervision with speed switch (48, 14)
- Restart inhibit / frequent starts (66/86)
- Undercurrent/loss of load (37)
- Power factor protection (55)
- Mechanical jam (51M)
- Loss of field (40)
- Impedance and reactance protection (21Z / 21X)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)

- Over/under frequency, 8 stages INST or DT(81O/81U)
- Over/Under/Reverse power (32/37/32R)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 10
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (11 SLOTS)

- Digital inputs optional: +8/16/24/32/40/48/56/64/72/80/88
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors +2xHSD +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### Communication protocols standard

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-M257

### Motor protection relay



The MVR-M257 offers a modular motor protection and control solution for large and important asynchronous or synchronous motors requiring differential protection. Up to 9 optional I/O or communication cards are available for extensive monitoring and control applications. Up to 16 RTD signals can be connected for thermal alarming and tripping.

The MVR-M257 communicates using various protocols including IEC 61850 substation communication standard.

- Differential protection
- Large I/O capability
- 5 time constant accurate thermal model
- Soft-start protection starting from 6Hz
- Star-delta started motor supervision
- 2-speed motor protection
- Up to class 0.2S power and energy measurement
- Asynchronous or synchronous motors

#### PROTECTION FUNCTIONS

- Motor differential (87M)
- Three-phase overcurrent, 4 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 4 stages INST, DT or IDMT (50/51N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 4 stages INST, DT or IDMT (46/46R/46L)
- Cable end differential (87N)
- Motor thermal overload (49M)
- Motor start-up / locked rotor supervision with speed switch (48, 14)
- Restart inhibit / frequent starts (66/86)
- Undercurrent/loss of load (37)
- Power factor protection (55)
- Mechanical jam (51M)
- Loss of field (40)
- Impedance and reactance protection (21Z / 21X)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)

- Over/under frequency, 8 stages INST or DT (81O/81U)
- Over/Under/Reverse power (32/37/32R)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 10
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (11 SLOTS)

- Digital inputs optional: +8/16/24/32/40/48/56/64/72
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors +2xHSD +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double RJ 45 or LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### Communication protocols standard

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-G215

### Generator protection relay



The MVR-G215 generator protection relay is well suited for machines requiring complete generator protections. It can be combined with MVR-T216 to protect larger machines requiring differential protection and greater protection redundancy.

The MVR-G215 communicates using various protocols including IEC 61850 substation communication standard.

- Cost efficient generator protection

#### PROTECTION FUNCTIONS

- Three-phase overcurrent, 2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 2 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2 stages INST, DT or IDMT (46/46R/46L)
- High/low impedance restricted earth fault / cable end differential \* (87N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Overvoltage, 2 stages INST, DT or IDMT (59)
- Undervoltage, 2 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 2 stages INST, DT or IDMT (59N)
- Negative sequence overvoltage, 2 stages INST, DT or IDMT (59N/47)
- Over/under frequency, 4 stages INST or DT (81O/81U)
- Rate of change of frequency, 4 stages INST or DT or IDMT (81R)
- Loss of field (40)
- Voltage restrained overcurrent (51V)
- Field ground / 100% stator earth-fault (64S)
- Over/Under/Reverse power (32/37/32R)
- Generator thermal overload (49G/49RTD)

- Under impedance (21U)

- Volts per hertz (24)
- Power factor protection (55)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- Synchro-check (25)
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (3 SLOTS)

- Digital inputs optional: +8/16/24
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSD+BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double RJ 45 or LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

# MVR-G257

## Generator protection relay



The MVR-G257 generator protection relay is well suited for large machines requiring complete generator protection and differential protection. Up to 9 optional I/O or communication cards are available for extensive monitoring and control applications. Up to 16 RTD signals can be connected for thermal alarming and tripping.

The MVR-G257 communicates using various protocols including IEC 61850 substation communication standard.

- Complete synchronous machine protection
- Power measurements up to class 0.2S
- Synchronizer and synchro-check for safe power grid connection

### PROTECTION FUNCTIONS

- Generator/transformer differential (87G/T)
- Three-phase overcurrent, 2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 2 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2 stages INST, DT or IDMT (46/46R/46L)
- High/low impedance restricted earth fault / cable end differential \* (87N)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Overvoltage, 2 stages INST, DT or IDMT (59)
- Undervoltage, 2 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 2 stages INST, DT or IDMT (59N)
- Positive/Negative sequence overvoltage, 2 stages INST, DT or IDMT (59N/47)
- Over/under frequency, 4 stages INST or DT (81O/81U)
- Rate of change of frequency, 4 stages INST or DT or IDMT (81R)
- Loss of field (40)
- Voltage restrained overcurrent (51V)
- Field ground / 100% stator earth-fault (64S)
- Rotor earth-fault protection (64R)

- Over/Under/Reverse power (32/37/32R)
- Generator thermal overload (49G/49RTD)
- Under impedance (21U)
- Volts per hertz (24)
- Power factor protection (55)
- Out of step / pole slip (78)
- Breaker failure protection (50BF/52BF)
- Inadvertant energizing (50/27)

### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, IO1, IO2)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

### CONTROL

- Controllable objects: 10
- Synchro-check (25)
- 8 setting groups
- Synchronizer (option)

### HARDWARE

- Current inputs: 5

- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

### OPTIONS (9 SLOTS)

- Digital inputs optional: +8/16/24/32/40/48/56/64/72
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors+2xHSO+BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

MACHINE FUNCTION	ANSI	MVR-M210	MVR-M215	MVR-M255	MVR-M257	MVR-G215	MVR-G257
Three phase overcurrent protection stages INST, DT or IDMT	50/51	•	•	•	•	•	•
(Sensitive) Earth-fault protection stages INST, DT or IDMT	50/51N(S)	•	•	•	•	•	•
Harmonic overcurrent protection / inrush blocking stages INST, DT or IDMT	50/51h/68	•	•	•	•	•	•
Current unbalance/broken conductor protection stages INST, DT or IDMT	46/46R/46L	•	•	•	•	•	•
Restricted earth-fault protection (low-imp)	87N	•	•	•	•	•	•
Cable-end differential protection	87N	•	•	•	•	•	•
Directional three-phase over-current protection stages DT or IDMT	67		•	•	•	•	•
Directional (sensitive) residual over-current protection stages DT or IDMT	67N		•	•	•	•	•
Over-voltage protection stages INST, DT or IDMT	59		•	•	•	•	•
Under-voltage protection stages INST, DT or IDMT	27		•	•	•	•	•
Positive sequence under-/over-voltage protection stages INST, DT or IDMT	59P/27P/47		•	•	•	•	•
Residual voltage protection stages INST, DT or IDMT	59N		•	•	•	•	•
Frequency protection stages	81 O/U		•	•	•	•	•
Rate of change of frequency	81R		•	•	•	•	•
Vector jump/surge	78					•	•
Reverse-/under-/over-power protection stages INST, DT or IDMT	32		•	•	•	•	•
Transformer, motor or generator differential protection, 2-winding	87T/G/M					•	•
Machine thermal overload protection	49M	•	•	•	•	•	•
Motor start-up supervision element	14/48	•	•	•	•		
Power factor	55		•	•	•	•	•
Restart inhibit/frequent starts	66/86	•	•	•	•		
Under-current monitor	37	•	•	•	•		
Load jam monitor	51m	•	•	•	•		
Synchrocheck	25					•	•
Under-impedance protection	21					•	•
Voltage-controlled/-dependent over-current protection	51V					•	•
Loss of field	40					•	•
Over-excitation protection	24					•	•
100 % stator earth-fault protection	64F3					•	•
Out of Step	78					•	•
<b>PROTECTION</b>							
Inadvertent energising							•
Fuse failure			•	•	•	•	•
Current transformer supervision		•	•	•	•	•	•
Breaker failure protection		•	•	•	•	•	•
Programmable stage		•	•	•	•	•	•

## MVR-T215

### Voltage regulating relay



MVR-T215 is a voltage regulating relay. It comes with current and voltage based protection functions as well making it suitable for combined transformer voltage regulation and back-up protection. Transformer monitoring module included as a standard feature provides for statistical information for preventive maintenance purposes.

The MVR-T215 communicates using various protocols including IEC 61850 substation communication standard.

- Automatic / manual voltage regulating (AVR)
- Transformer back-up protection
- Through fault and overloading statistics for preventive maintenance

#### PROTECTION FUNCTIONS

- High/low impedance restricted earth fault / cable end differential \* (87N1, 87N2)
- Transformer thermal overload (49T/49RTD)
- Three-phase overcurrent, 2+2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 3 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2+2 stages INST, DT or IDMT (46/46R/46L)
- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Volts per hertz (24)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)

- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Automatic voltage regulator (90)
- Controllable objects: 5
- 8 setting groups

#### HARDWARE

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (3 SLOTS)

- Digital inputs optional: +8/16/24
- Digital outputs optional: +5/10/15
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-T216

### Transformer protection relay



MVR-T216 is a transformer protection relay with sophisticated and easy to use differential protection function. The MVR-T216 transformer protection relay provides for both low and high side overcurrent, earth-fault, negative sequence and two independent restricted earth-fault instances. The MVR-T216 can be applied for generator and motor differential protection as well.

The MVR-T216 communicates using various protocols including IEC 61850 substation communication standard.

- Predefined or custom connection group selection
- 2nd and 5th harmonic blocking
- Automatic verification of connection group and nominal value settings
- Through fault and overloading statistics for preventive maintenance

#### PROTECTION FUNCTIONS

- 2 winding transformer differential (87T)
- High/low impedance restricted earth fault / cable end differential \* (87N1, 87N2)
- Transformer thermal overload (49T/49RTD)
- Three-phase overcurrent, 2+2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 3 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2+2 stages INST, DT or IDMT (46/46R/46L)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Current THD and harmonics (up to 31st)
- Frequency (f)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS), 2 instances
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 5
- 8 setting groups

#### HARDWARE

- Current inputs: 10
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (2 SLOTS)

- Digital inputs optional: +8/16
- Digital outputs optional: +5/10
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-T256

### Transformer protection relay



MVR-T256 is a transformer protection relay with sophisticated and easy to use differential protection function. The MVR-T256 transformer protection relay provides for both low and high side overcurrent, earth-fault, negative sequence and two independent restricted earth-fault instances. Up to 10 optional I/O or communication cards are available for extensive monitoring and control applications.

The MVR-T256 communicates using various protocols including IEC 61850 substation communication standard.

- Large I/O capability
- Predefined or custom connection group selection
- 2nd and 5th harmonic blocking
- Automatic verification of connection group and nominal value settings
- Through fault and overloading statistics for preventive maintenance

#### PROTECTION FUNCTIONS

- 2 winding transformer differential (87T)
- High/low impedance restricted earth fault/cable end differential \* (87N1, 87N2)
- Transformer thermal overload (49T/49RTD)
- Three-phase overcurrent, 2+2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 3 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2+2 stages INST, DT or IDMT (46/46R/46L)
- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Current THD and harmonics (up to 31st)
- Frequency (f)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS), 2 instances
- Trip circuit supervision (TCS)

#### CONTROL

- Controllable objects: 10
- 8 setting groups

#### HARDWARE

- Current inputs: 10
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (10 SLOTS)

- Digital inputs optional: +8/16/24/32/40/48/56/64/72/80
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

## MVR-T257

### Transformer protection relay



MVR-T257 is a transformer protection relay with differential protection function and integrated AVR function. The MVR-T257 transformer protection relay provides also for complete current and voltage based protection functions and full measurements. Up to 9 optional I/O or communication cards are available for extensive monitoring and control applications.

The MVR-T257 communicates using various protocols including IEC 61850 substation communication standard.

- Large I/O capability
- Automatic / manual voltage regulating (AVR)
- Complete transformer protection
- 2nd and 5th harmonic blocking
- Automatic verification of connection group and nominal value settings
- Through fault and overloading statistics for preventive maintenance
- Up to class 0.2S power and energy measuring

#### PROTECTION FUNCTIONS

- 2-winding transformer differential (87T)
- High/low impedance restricted earth fault / cable end differential \* (87N1, 87N2)
- Transformer thermal overload (49T/49RTD)
- Three-phase overcurrent, 2+2 stages INST, DT or IDMT (50/51)
- Earth-fault (sensitive), 3 stages INST, DT or IDMT (50/51N)
- Harmonic overcurrent / inrush blocking, 4 stages INST, DT or IDMT (50/51H, 68)
- Current unbalance / broken conductor, 2+2 stages INST, DT or IDMT (46/46R/46L)
- Directional overcurrent, 4 stages INST, DT or IDMT (67)
- Directional (sensitive) earth-fault, 4 stages INST, DT or IDMT (67N)
- Overvoltage, 2 stages INST, DT or IDMT (59)
- Undervoltage, 2 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 2 stages INST, DT or IDMT (59N)
- Positive/Negative sequence overvoltage, 2 stages INST, DT or IDMT (59N/47)
- Over/under frequency, 4 stages INST or DT (81O/81U)
- Rate of change of frequency, 4 stages INST or DT or IDMT (81R)

- Volts per hertz (24)

- Breaker failure protection (50BF/52BF)

#### MEASURING AND MONITORING

- Phase and residual currents (IL1, IL2, IL3, I01, I02)
- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Current and voltage THD and harmonics (up to 31st)
- Frequency (f)
- Power (P, Q, S, pf)
- Energy (E+, E-, Eq+, Eq-)
- Circuit breaker wear (CBW)
- Disturbance recorder (3.2 kHz)
- Current transformer supervision (CTS)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

#### CONTROL

- Automatic voltage regulator (90) (option)
- Controllable objects: 10
- Synchro-check (25)
- 8 setting groups

#### HARDWARE

- Current inputs: 10
- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

#### OPTIONS (9 SLOTS)

- Digital inputs optional: +8/16/24/32/40/48/56/64/72
- Digital outputs optional: +5/10/15/20/25
- Arc protection (12 sensors +2xHSO +BI)
- 2xmA in + 4xRTD in OR 8xRTD in
- 4xmA out+1xmA in
- Communication media (specified below)

#### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

#### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

#### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

# MVR-V211

## Voltage protection relay



The MVR-V211 offers a modular voltage protection solution for substations. Voltage and frequency protection, synchro-check and synchronizer with up to five optional I/O or communication cards and powerful logic programming possibility make MVR-V211 optimal for demanding load shedding or automatic transfer applications.

The MVR-V211 communicates using various protocols including IEC 61850 substation communication standard.

- 8 frequency stages and 8 setting groups for load shedding
- Synchrocheck for up to three circuit breakers
- Synchronizer for machine frequency and voltage control

### PROTECTION FUNCTIONS

- Overvoltage, 4 stages INST, DT or IDMT (59)
- Undervoltage, 4 stages INST, DT or IDMT (27)
- Zero sequence overvoltage, 4 stages INST, DT or IDMT (59N)
- Negative/positive sequence overvoltage, 4 stages INST, DT or IDMT (47)
- Vector jump, 1 stage (78)
- Over/under frequency, 8 stages INST or DT (81O/81U)
- Rate of change of frequency, 8 stages INST or DT or IDMT (81R)

### MEASURING AND MONITORING

- Voltage measurements (UL1-UL3, U12-U31, U0, SS)
- Voltage THD and harmonics (up to 31st)
- Disturbance recorder (3.2 kHz)
- Fuse failure (VTS)
- Trip circuit supervision (TCS)

### CONTROL

- Controllable objects: 5
- Synchro-check (25)
- 8 setting groups
- Synchronizer (option)

### HARDWARE

- Voltage inputs: 4
- Digital inputs: 3 (standard)
- Output relays: 5+1 (standard)

### OPTIONS (5 SLOTS)

- Digital inputs optional: +8/16/24/32/40
- Digital outputs optional: +5/10/15
- 2mA in + 4xRTD in OR 8xRTD in
- 4mA out+1mA in
- Communication media (specified below)

### EVENT RECORDING

- Non-volatile disturbance records: 100
- Non-volatile event records: 15000

### COMMUNICATION MEDIA

- RJ 45 Ethernet 100Mb (front standard)
- RJ 45 Ethernet 100Mb and RS 485 (rear standard)
- Double LC Ethernet 100Mb (option)
- RS232 + serial fibre PP/PG/GP/GG (option)

### COMMUNICATION PROTOCOLS STANDARD

- IEC 61850
- IEC 60870-5-103/101/104
- Modbus RTU, Modbus TCP/IP
- DNP 3.0, DNP 3.0 over TCP/IP
- SPA

TRANSFORMER PROTECTION	ANSI	MVR-T215	MVR-T216	MVR-T256	MVR-T257	MVR-V211
Three phase overcurrent protection stages INST, DT or IDMT	50/51	•	•	•	•	
(Sensitive) Earth-fault protection stages INST, DT or IDMT	50/51N(S)	•	•	•	•	
Harmonic overcurrent protection / inrush blocking stages INST, DT or IDMT	50/51h/68	•	•	•	•	
Cold-load pick-up block	68	•				
Current unbalance/broken conductor protection stages INST, DT or IDMT	46/46R/46L	•	•	•	•	
Restricted earth-fault protection (low-imp)	87N	•	•	•	•	
Cable-end differential protection	87N	•	•	•	•	
Directional three-phase over-current protection stages DT or IDMT	67				•	
Directional (sensitive) residual over-current protection stages DT or IDMT	67N				•	
Over-voltage protection stages INST, DT or IDMT	59	•			•	•
Under-voltage protection stages INST, DT or IDMT	27	•			•	•
Positive sequence under-/over-voltage protection stages INST, DT or IDMT	59P/27P/47	•			•	•
Residual voltage protection stages INST, DT or IDMT	59N	•			•	•
Frequency protection stages	81 O/U				•	•
Rate of change of frequency	81R				•	•
Vector jump/surge	78					•
Reverse-/under-/over-power protection stages INST, DT or IDMT	32				•	
Transformer, motor or generator differential protection, 2-winding	87T/G/M		•	•	•	
Transformer thermal overload protection	49T		•	•	•	
Automatic voltage regulator	90	•			•	
Synchrocheck	25				•	•
Under-impedance protection	21	•			•	
Over-excitation protection	24	•				
Fuse failure	60	•			•	•
Current transformer supervision		•	•	•	•	
Switch onto fault logic		•	•	•	•	
<b>PROTECTION</b>						
Breaker failure protection		•	•	•	•	•
Programmable stage		•	•	•	•	•

## Technical specifications

### POWER SUPPLY

Low DC supply	24/48 V +30/-25 %
High AC/DC supply	100 to 240 V DC $\pm 10$ % 100 to 240 V AC, 50/60 Hz $\pm 10$ %
Power consumption	210 series typically: 20 W 250 series typically: 30 W

### OPERATION CONDITIONS

Operation temp.	-25 to +60 °C (-13 to +140 °F)
Storage temp.	-40 to +70 °C (-40 to +158 °F)

### ENVIRONMENT

Altitude	0 to 2000 m
Humidity	55 °C at 93 % RH
Protection degree	IP54 (front) IP20 (back)
Over-voltage CAT	III

### ENVIRONMENT

<b>VOLTAGE RANGE</b>	0.5 to 480 V RMS
Thermal withstand	630 V RMS continuous
Accuracy	2 to 480 V $\pm 0.5$ %

### CURRENT RANGE

Thermal withstand	25 A continuous 100 A for 10 s 500 A for 1 s 1250 A for 0.01 s
Accuracy	0.005 x In to 20 x In $\pm 0.5$ % or $< \pm 15$ mA 20 x In to 50 x In $\pm 1.0$ %

### FREQUENCY RANGE

Accuracy	6 to 75 Hz, fundamental 10 mHz
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### POWER P, Q AND S

Accuracy	Frequency range 6 to 75 Hz $\pm 1$ % of nominal / 3 VA of secondary
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### ENERGY & POWER

Accuracy	Frequency range 6 to 75 Hz IEC 62053-22 class 0.5 S (50/60Hz)
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### Digital inputs and outputs

<b>PSU CARD (DI)</b>	24 V, 110 V or 220 V
Pick-up threshold (fixed)	20 V, 90 V, 180 V
Release threshold (fixed)	10 V, 60 V, 120 V

<b>PSU CARD (DO)</b>	220 V AC, 3 A 220 V DC, 0.2 A
Thermal cont. rating at 50 °C	Max. continuous carry 4 A

<b>OPTION B (DI)</b>	10 to 200 V DC
Pick-up threshold (fixed)	16 to 200 V DC (1 V step)
Release threshold (fixed)	10 to 200 V DC (1 V step)

<b>OPTION C (DO)</b>	220 V AC, 3 A 220 V DC, 0.2 A
Thermal cont. rating at 50 °C	Max. continuous carry 4 A

### ANALOGUE INPUTS AND OUTPUTS

Option F (RTD)	Pt100, Pt1000
Option I (AO)	0 to 24 mA outputs
Accuracy	0.5 % of full scale

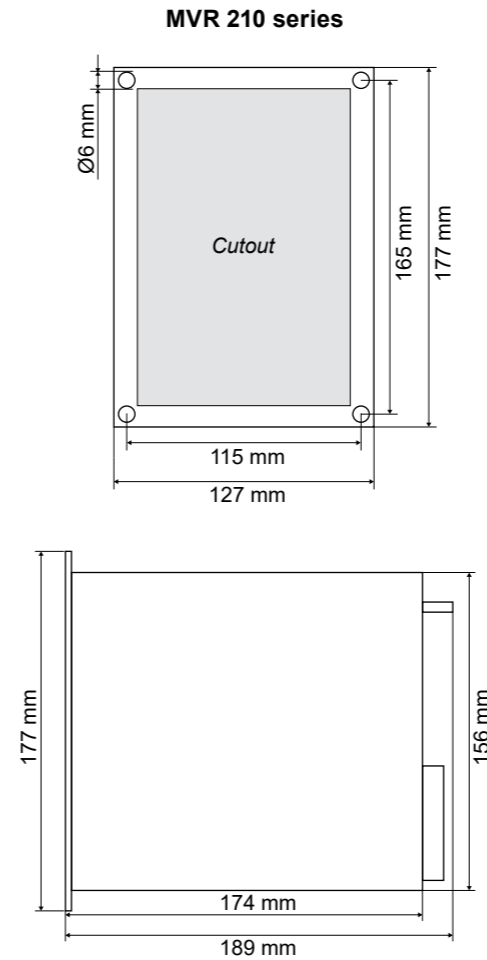
### COMMUNICATION

RS-485, rear	Modbus
TCP/IP, rear	Ethernet (full access)
TCP/IP, front	Ethernet (service port)

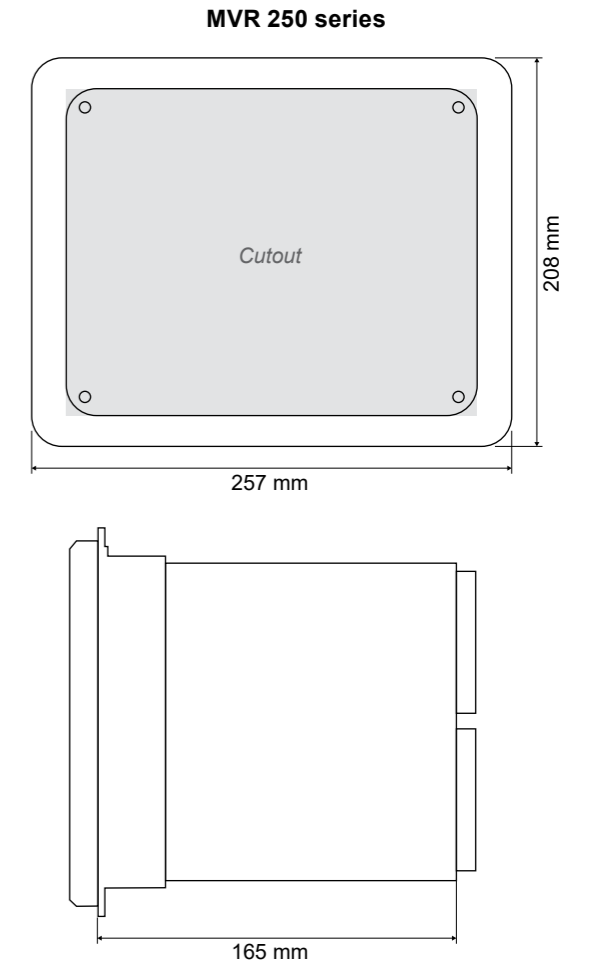
### ADDITIONAL OPTION CARDS

OPTION	DESCRIPTION
B	8 x Digital inputs
C	5 x Relay outputs (max. five cards)
D	Arc protection
F	2 x mA input and 8 x RTD input (max. two)
I	4 x Analogue output + 1 x Analogue input
J	Double LC 100 Mb Ethernet Redundant
L	Serial RS-232 - Serial fiber (PP)
M	Serial RS-232 - Serial fiber (PG)
N	Serial RS-232 - Serial fiber (GP)
O	Serial RS-232 - Serial fiber (GG)

## Dimensions



Cutout: 160 x 106 mm  $\pm 3$  mm



Cutout: 220 x 175 mm  $\pm 3$  mm



