

# AQ-F213 Feeder Protection IED

The AQ-F213 IED provides optimal performance for main medium voltage or back-up high voltage protection, control and monitoring applications. The AQ-F213 integrates protection, control, monitoring, measuring, communication and extensive diagnostics information in a one compact package. 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.

The AQ-F213 is developed using the latest available technologies providing a totally new dimension and options to protection engineers. Maximum usability of the IED is guaranteed by features such as graphical interfaces, highly customizable HMI, file storage of pdf or other supportive documents and extensive user log information. Easy to use and powerful configuration and setting software tools are provided free of charge.

The AQ-F213 communicates using variety of standard protocols including IEC 61850 substation communication standard.

## Benefits

### Scalable functionality

- From basic to comprehensive protection packages
- Allows for on-site upgrades
- Integrated protection, control, measurement, monitoring, communication and extensive diagnostic functions

### Ultimate usability

- Large customizable HMI with configurable
- Mimic diagram
- Integrated file storage for protection documentation and note pages for user comments
- Extensive log and diagnostics information of all executed and received events
- 16 freely configurable multi-colour LEDs

## Performance

- Sub-cycle instantaneous trip times
- Distinctive protection accuracy
- Fast integrated arc protection
- Fast power up for protection
- Powerful PLC programming included for the most demanding applications allowing for extensive customization

## High recording capacity

- 60MB memory for disturbance records
- Up to 15000 events in permanent flash memory

## Software Tools

- Easy to use and powerful AQtivate 200 freeware for setting and configuration
- AQviewer freeware for comtrade file analysis

## Wide range of standard serial or Ethernet based communication protocols

- IEC 61850, HSR, PRP
- IEC 103/101/104, Modbus, DNP 3.0, SPA
- NTP, Precision Time Protocol (PTP) according to IEEE 1588



## Exclusive features

- Frequency independent protection at 6...75Hz
- Download test reports, manuals or comment files to IED memory
- Safe Setting mode for secure setting change and commission or maintenance testing

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## Features

| Name   | IEC          | ANSI         | Description  | Function package |   |   |   |   |
|--------|--------------|--------------|--|------------------|---|---|---|---|
|        |              |              |  | A                | B | C | D | E |
| NOC(4) | I>           | 50/51        | Overcurrent protection (4 stages)  | ✓                | ✓ | ✓ | ✓ | ✓ |
| NEF(4) | I0>          | 50N/51N      | Earth fault protection (4 stages)  | ✓                | ✓ | ✓ | ✓ | ✓ |
| CUB(4) | I2>          | 46/46R/46L   | Negative sequence overcurrent / phase current reversal / unbalance protection (4 stages) | ✓                | ✓ | ✓ | ✓ | ✓ |
| HOC(4) | Ih>          | 50h/51h/68H  | Detection/blocking/tripping from selectable 2nd ... 19th harmonic (4 stages)             | ✓                | ✓ | ✓ | ✓ | ✓ |
| DOC(4) | IDir>        | 67           | Directional overcurrent protection (4 stages)  |                  |   |   | ✓ | ✓ |
| DEF(4) | IDir>        | 67N          | Directional residual overcurrent protection (4 stages)                                   |                  |   | ✓ | ✓ | ✓ |
| CBF(1) | CBFP         | 50BF/52BF    | Breaker failure protection   | ✓                | ✓ | ✓ | ✓ | ✓ |
| REF(1) | I0d>         | 87N/64REF    | Low and high impedance restricted earth fault, cable end differential protection         | ✓                | ✓ | ✓ | ✓ | ✓ |
| TOLF1  | TF>          | 49L          | Feeder thermal overload protection   | ✓                | ✓ | ✓ | ✓ | ✓ |
| OV(4)  | U>           | 59           | Overvoltage protection (4 stages)  |                  |   |   | ✓ | ✓ |
| UV(4)  | U<           | 27           | Undervoltage protection (4 stages)   |                  |   |   | ✓ | ✓ |
| NOV(4) | U0>          | 59N          | Neutral voltage protection (4 stages)  |                  |   | ✓ | ✓ | ✓ |
| FRQV1  | f>/<         | 81O/81U      | Frequency protection (8 stages)  |                  |   |   | ✓ | ✓ |
| VUB(4) | U1&U2>/<     | 59P/27P/47   | Sequence voltage protection (4 stages)   |                  |   |   |   | ✓ |
| OPW(1) | P>           | 32O          | Over power   |                  |   |   |   | ✓ |
| UPW(1) | P<           | 32U          | Under power  |                  |   |   |   | ✓ |
| RPW(1) | Pr           | 32R          | Reverse power  |                  |   |   |   | ✓ |
| ROCOF1 | df/dt        | 81R          | Rate of change of frequency (8 stages)   |                  |   |   |   | ✓ |
| IMP(1) | Z<           | 78           | Vector Jump  |                  |   |   |   | ✓ |
| ARC(1) | IArc>/I0Arc> | 50Arc/50NArc | Arc protection (Option)  | ✓                | ✓ | ✓ | ✓ | ✓ |
| SG     | -            | -            | Set group settings (8)   | ✓                | ✓ | ✓ | ✓ | ✓ |
| OBJ    | -            | -            | Object control (5)   | ✓                | ✓ | ✓ | ✓ | ✓ |
| AR     | 0 → 1        | 79           | Autoreclosing function   | ✓                | ✓ | ✓ | ✓ | ✓ |
| CLP    | CLPU         | -            | Cold load pick-up  | ✓                | ✓ | ✓ | ✓ | ✓ |
| SOF    | SOTF         | -            | Switch on to fault logic   | ✓                | ✓ | ✓ | ✓ | ✓ |
| CTS    | -            | -            | Current transformer supervision  | ✓                | ✓ | ✓ | ✓ | ✓ |
| VT     | -            | 60           | Fuse failure   |                  |   | ✓ | ✓ | ✓ |
| DR     | -            | -            | Disturbance recorder   | ✓                | ✓ | ✓ | ✓ | ✓ |
| CBW    | -            | -            | Circuit breaker wear monitor   | ✓                | ✓ | ✓ | ✓ | ✓ |
| THD    | -            | -            | Total harmonic distortion  |                  |   | ✓ | ✓ | ✓ |
| FLOC   | -            | 21FL         | Fault locator  |                  |   |   | ✓ | ✓ |

| Measurement function              | Function package |   |   |   |   |
|-----------------------------------|------------------|---|---|---|---|
|                                   | A                | B | C | D | E |
| Current (IL1, IL2, IL3, I01, I02) | ✓                | ✓ | ✓ | ✓ | ✓ |
| Voltages (U1, U2, U3)             |                  |   | ✓ | ✓ | ✓ |
| Power (P, Q, S & PF)              |                  |   | ✓ | ✓ | ✓ |
| Energy (E+, E-, Eq+, Eq-)         |                  |   | ✓ | ✓ | ✓ |
| Voltage and current harmonics     |                  |   | ✓ | ✓ | ✓ |

| Communication protocols | Function package |   |   |   |   |
|-------------------------|------------------|---|---|---|---|
|                         | A                | B | C | D | E |
| IEC 61850               |                  | ✓ | ✓ | ✓ | ✓ |
| FTP, SNTP               | ✓                | ✓ | ✓ | ✓ | ✓ |
| IEC 60870-5-103         | ✓                | ✓ | ✓ | ✓ | ✓ |
| IEC 60870-5-101         | ✓                | ✓ | ✓ | ✓ | ✓ |
| IEC 60870-5-104         | ✓                | ✓ | ✓ | ✓ | ✓ |
| Modbus RTU              | ✓                | ✓ | ✓ | ✓ | ✓ |
| Modbus TCP/IP           | ✓                | ✓ | ✓ | ✓ | ✓ |
| DNP 3.0                 | ✓                | ✓ | ✓ | ✓ | ✓ |
| DNP 3.0 over TCP/IP     | ✓                | ✓ | ✓ | ✓ | ✓ |
| SPA                     | ✓                | ✓ | ✓ | ✓ | ✓ |

### Hardware (all function packages)

|  |          |
|--|----------|
| Phase current inputs (1/5A settable)       | 3        |
| Residual current inputs (0.2/15A settable) | 2        |
| Voltage inputs                             | 3        |
| Digital inputs standard                    | 6        |
| Output relays standard                     | 6        |
| Digital inputs optional                    | up to 24 |
| Output relays optional                     | up to 15 |
| RTD / mA inputs optional                   | 8        |
| Power supply (85-265Vac/dc or 18-72 Vdc)   | ✓        |

### Communications (all function packages)

|                                      |        |
|--------------------------------------|--------|
| RJ 45 Ethernet 100M (Front)          | ✓      |
| RJ 45 Ethernet 100M (rear)           | ✓      |
| RS 485 (rear)                        | ✓      |
| 2 x Fiber optic Ethernet 100M (rear) | option |
| Serial fiber & RS 232 (rear)         | option |

### Electrical environment compatibility (all function packages)

|                                  |   |
|----------------------------------|---|
| CE approved                      | EN 50081-2, EN 50082-2                        |
| Emission (conducted, emitted)    | EN 55011 Class A                              |
| Electrostatic discharge (ESD)    | IEC 244-22-2 and EN61000-4-2, class III       |
| Burst immunity                   | IEC 60255-22-1                                |
| Electrical Fast Transients (EFT) | EN 61000-4-4, class III and IEC801-4, level 7 |
| Surge                            | EN61000-4-5, level 4                          |
| RF electromagnetic field test    | EN 61000-4-3, class III                       |
| Conducted RF field               | EN 61000-4-6, class III                       |
| Power frequency magnetic field   | EN 61000-4-8                                  |
| Insulation test voltage          | IEC 60255-5                                   |
| Impulse test voltage             | IEC 60255-5                                   |

### Physical environment compatibility (all function packages)

|   |                       |
|---|-----------------------|
| Vibration test                          | IEC 60255-21-1        |
| Shock/Bump test acc. to                 | IEC 60255-21-2        |
| Damp heat                               | IEC 60068-2-30        |
| Dry heat                                | IEC60068-2-2          |
| Cold test                               | IEC 60068-2-1         |
| Casing protection degree                | IP54 front, IP21 rear |
| Ambient service temperature range       | -35... +70°C          |
| Transport and storage temperature range | -40...70°C            |