AQ-F255D Distance Protection Device

Description

AQ-F255D offers a modular protection and control solution for distance protection applications that require a large I/O capacity. Additionally, AQ-F255D integrates full feeder protection functionality.

Innovative line segment-based distance protection provides fast, selective and reliable protection by operating based on the principle of impedance measurement between the relay location and the fault point. The function allows protection schemes to be adjusted individually for each line segment using their real, independent impedance values instead of average values. This reduces the risk of unwanted operations through enhanced resistive reach and fault location accuracy, and improves selectivity and overall reliability. The segment-based distance protection can also distinguish between faults in underground cables and overhead line segments. Line segment-based distance protection also includes power swing block and out-of-step protection functions.

You can add up to eleven (11) I/O or communication modules into the device for extensive monitoring and control applications. AQ-F255D communicates using various communication protocols, including communication according to the IEC 61850 standard.

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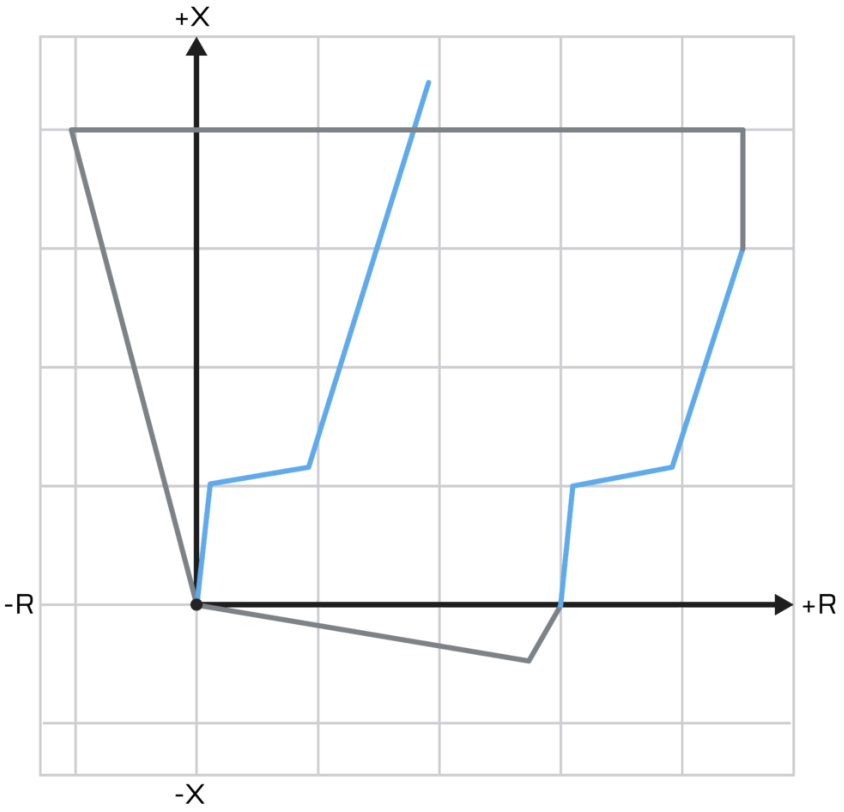

Highlights:

- Innovative line segment-based distance protection function enhances resistive reach and fault location accuracy, particularly in mixed network, reducing the risk of unwanted operations.
- Full feeder protection functionality.
- 5-shot scheme-controlled auto-recloser.
- IEC 62443-4-2 compliant cybersecurity (security level 1).
- IEC 61850 2nd Edition.
- A large I/O capacity.
- Optional power and energy measurement accuracy of 0.2 %.

See all AQ-F255 line protection devices

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Technical data

PROTECTION

- Non-directional overcurrent (I>; 50/51) - 4 stages
- Non-directional earth fault (IO>; 50N/51N) - 4 stages
- Directional overcurrent (Idir>; 67) - 2 stages
- Directional earth fault (IOdir>; 67N/32N) - 4 stages
- Intermittent earth fault (IOint>; 67NT)
- Negative sequence overcurrent/ Phase current reversal/ Current unbalance (I2>; 46/46R/46L) - 4 stages
- Harmonic overcurrent (Ih>; 50H/51H/68H) - 4 stages
- Circuit breaker failure protection (CBFP; 50BF/52BF)
- High-impedance or low-impedance restricted earth fault/ Cable end differential (IOd>; 87N)
- Overvoltage (U>; 59) - 4 stages
- Undervoltage (U<; 27) - 4 stages
- Neutral overvoltage (UO>; 59N) - 4 stages
- Sequence voltage (U1/U2>/<; 47/27P/59PN) - 4 stages
- Overfrequency and underfrequency (f>/<; 81O/81U) - 8 stages
- Rate-of-change of frequency (df/dt>/<; 81R) - 8 stages
- Low-voltage ride-through (LVRT; 27T)
- Voltage-restrained overcurrent (Iv>; 51V)
- Power protection (P, Q, S>/<; 32) - 4 stages
- Line thermal overload (TF>; 49F)
- Distance protection (Z<; 21)
- Power Swing Block (PSB; 68)
- Out of step (OOS; 78)
- Teleprotection (85)
- Resistance temperature detectors (RTD)
- Programmable stage (PSx>/<; 99)
- Arc protection (IArc>/IOArc>; 50Arc/50NArc) (optional)

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CONTROL

- Number of objects to control and monitor: 10
- Number of indicators to monitor: 10
- Number of setting groups: 8
- Cold load pick-up (CLPU)
- Switch-on-to-fault (SOTF)
- Auto-recloser (0 → 1; 79)
- Zero sequence recloser (U0> RECL; 79N)
- Vector jump (Δφ; 78)
- Synchrocheck (ΔV/Δa/Δf; 25)

MONITORING

- Current transformer supervision
- Voltage transformer supervision (VTS; 60)
- Circuit breaker wear monitoring
- Total harmonic distortion (current)
- Total harmonic distortion (voltage)
- Fault locator (21FL)
- Measurement recorder
- Measurement value recorder
- Event recorder (max. 15,000 permanent event records)
- Disturbance recorder (max. 100 records á 5 seconds at 3.2 kHz sampling)

MEASURING AND MONITORING

- Phase, sequence and residual currents (IL1, IL2, IL3, I01, I02)
- Phase, sequence and residual voltages (UL1, UL2, UL3, UL12, UL23, UL31, U0)
- Frequency (f)
- Power and energy measurement accuracy of 0.5 %
- Power and energy measurement accuracy of up to 0.2 % (optional)

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HARDWARE

Standard hardware

- Current inputs: 5
- Voltage inputs: 4
- Digital inputs: 3
- Digital outputs: 5
- Number of empty slots: 11

Optional hardware modules

- Digital input module (8 x DI)
- Digital output module (5 x DO)
- High-speed high-current output module (3 x out)
- Milliampere input module (4 x mA in, 1 x mA out)
- Milliampere output module (4 x mA out, 1 x mA in)
- RTD input module (8 RTD inputs)
- Arc protection module (4 x channels, 2 x HSO, 1 x BI)
- Communication media (see "Communication" below)
- External I/O modules (see "Accessories" below)

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COMMUNICATION

Communication inputs

- RJ-45 100 Mbps Ethernet (front panel)
- RJ-45 100 Mbps Ethernet and RS-485 (rear panel)

Optional communication modules

- Double RJ-45 Ethernet & IRIG-B communication module
- Double ST Ethernet & IRIG-B communication module
- Double SFP Ethernet & IRIG-B communication module
- Double LC (HSR/PRP) Ethernet communication module
- Double RJ-45 (HSR/PRP) Ethernet communication module
- RS-232 & serial fiber communication module

Communication protocols

- IEC 61850 (edition 1)
- IEC 61850 (edition 2)
- IEC 60870-5-101/104
- IEC 60870-5-103
- Modbus/RTU and Modbus/TCP
- DNP3
- SPA

ACCESSORIES

- AX007 External 6-channel 2-/3-wire RTD input module (pre-configured)
- AX008 External 8-channel thermocouple and mA input module (pre-configured)
- AX013 Raising frame (120 mm)
- AX014 Raising frame (40 mm)
- AX015 Wall mounting bracket
- AX020 SFP module (2 km, MM)
- AX021 SFP module (40 km, SM)
- AX022 SFP module (120 km, SM)

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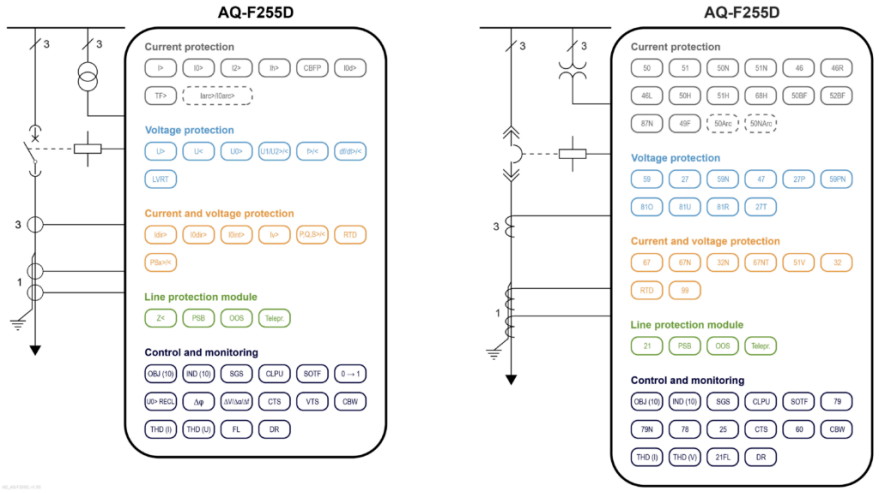
Application Drawing



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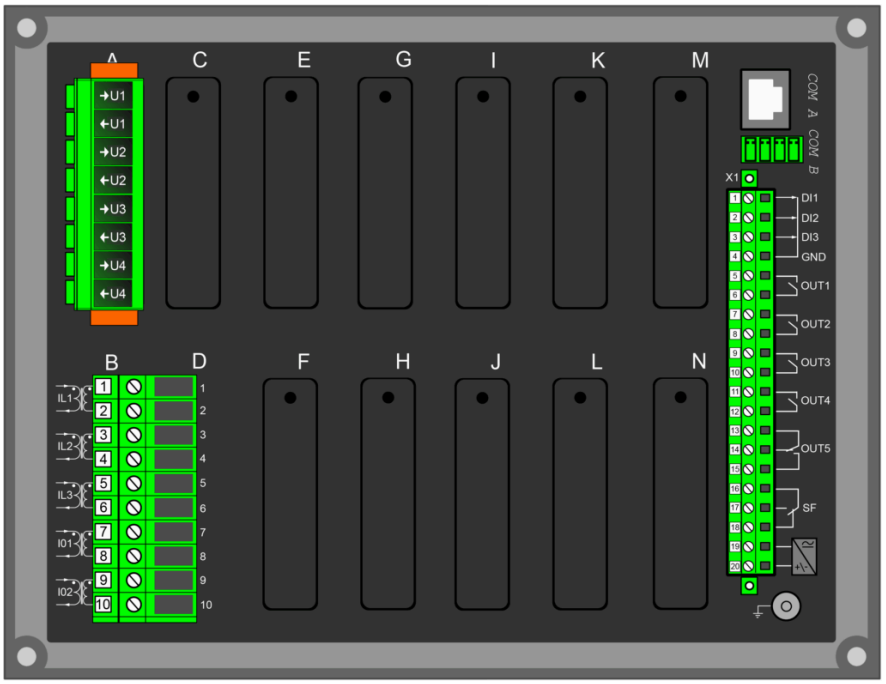
Device Rear Image



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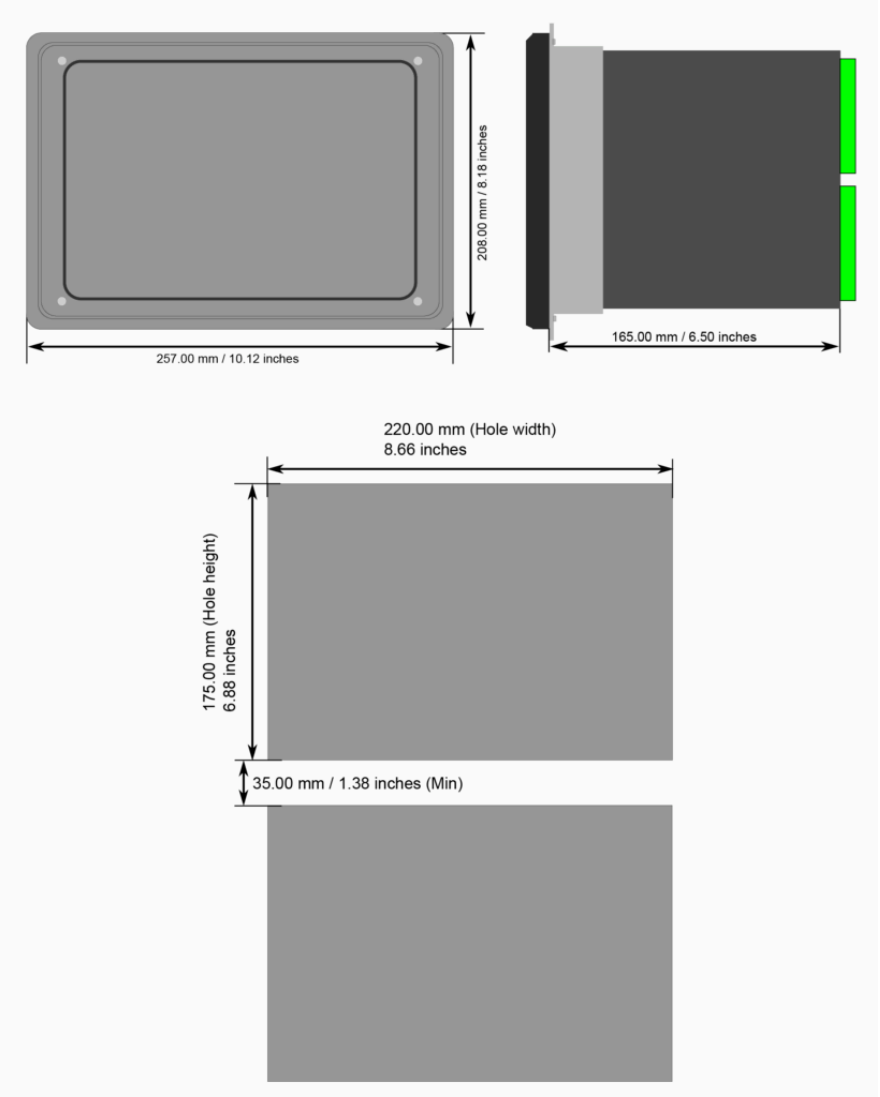
Device and Cut-out Image



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Order Code

AQ - F 2 5 5 X - P X X X A X A - X X X X X X X X X X X X

Model
- F Feeder protection

Device size
- 5 1/2 of 19" rack

Analog measurement
- 5 5 Current measurement channels and 4 voltage measurement channels

Functionality package
- A Standard feeder protection package
- B Line differential protection package (no voltage measurements)
- C Line differential and standard feeder protection package
- D Distance and standard feeder protection package
- E Line differential, distance and standard feeder protection package
- R Standard feeder protection package + single pole breaker control
- S Standard feeder protection package + synchronizer function
- V Standard feeder protection package + AVR + transformer protection

Mounting
- P Panel mounted

Auxiliary voltage
- H 80...265 VAC/DC
- L 18...72 VDC

Measurement accuracy
- 0 Power/Energy measurement accuracy 0.5%
- 2 Power/Energy measurement accuracy 0.2%

Terminals
- A Standard
- B Ring-lug current terminals
- C Standard current terminals, spring cage voltage and I/O terminals
- D Ring-lug current terminals, spring cage voltage and I/O terminals

Reserved for future use
- A N/A

Digital inputs on power supply module
- A 3 Digital inputs, 24 V nominal threshold
- B 3 Digital inputs, 110 V nominal threshold
- C 3 Digital inputs, 220 V nominal threshold

Reserved for future use
- A N/A

Slots C, E, F, G, H, I, J, K, L, M, N (11 pcs)
- A Empty
- B 8 Digital inputs
- C 5 Output relays (max. 6 pcs)
- D Arc protection with 4 point sensor channels, 2 x HSO, 1 x BI (max. 1 pcs)
- F 8 x RTD input (max. 2 pcs)
- G 2 x RJ-45 100Mb Ethernet & IRIG-B (max. 1 pcs) *
- H 2 x ST 100Mb Ethernet & IRIG-B (max. 1 pcs) *
- I 4 x mA outputs - 1 x mA input (max. 2 pcs)
- J Double LC 100Mb Ethernet (HSR, PRP redundant protocols) (max. 1 pcs) *
- K Double RJ45 100Mb Ethernet (HSR, PRP redundant protocols) (max. 1 pcs) *
- L RS-232 - Serial fiber (Plastic-Plastic) (max. 1 pcs) *
- M RS-232 - Serial fiber (Plastic-Glass) (max. 1 pcs) *
- N RS-232 - Serial fiber (Glass-Glass) (max. 1 pcs) *
- O RS-232 - Serial fiber (Glass-Glass) (max. 1 pcs) *
- Q 2 x SFP 100Mb Ethernet & IRIG-B (max. 4 pcs) **
- R 3 x High-speed high current output (max. 3 pcs)
- T 4 x mA inputs - 1 x mA output (max. 2 pcs)

* Can only be applied to the two last slots.

** Can only be applied to the four last slots. Requires an SFP adapter. See "Accessories" list.

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