

AQ-F255C Line Differential and Feeder Protection Device

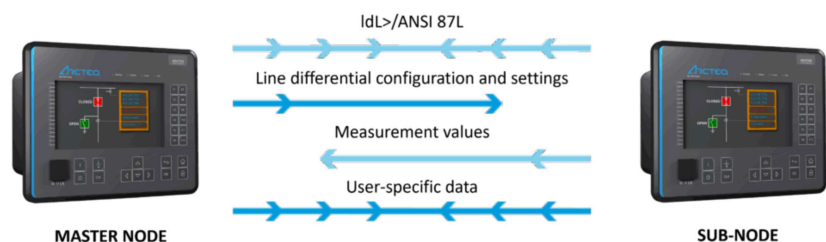
Description

AQ-F255C offers a modular protection and control solution for line differential protection applications that require a large I/O capacity. Additionally, AQ-F255C integrates full feeder protection functionality.



Communication between the master node and sub-node devices is performed over a smart process bus and it is easy to set. The process bus transfers both standard and user-defined data, and it automatically synchronizes the line differential protection settings from the master node device to the sub-node device. The process bus handles the compensation for delays in communication, which means that no external time synchronization is needed.

You can add up to eleven (11) I/O or communication modules into the device for extensive monitoring and control applications. AQ-F255C communicates using various communication protocols, including communication according to the IEC 61850 standard.



Line differential protection with a smart dedicated process bus.

Highlights:

- A large I/O capacity.
- Line differential protection for two line terminal ends.
- Especially suitable for e.g. substations connecting wind and solar power facilities to the power grid.
- Standard settings for communication – only the leader unit needs to be selected.
- Master node device synchronizes transfers, configurations, and settings to the sub-node device.
- Transformer in the protected zone.
- Full feeder protection functionality.
- IEC 62443-4-2 compliant cybersecurity (security level 1).

See all AQ-F255 variants

Technical data

PROTECTION

- Non-directional overcurrent ($I_{>}$; 50/51) - 4 stages
- Non-directional earth fault ($I_{O>}$; 50N/51N) - 4 stages
- Directional overcurrent ($I_{dir>}$; 67) - 2 stages
- Directional earth fault ($I_{Odir>}$; 67N/32N) - 4 stages
- Intermittent earth fault ($I_{Oint>}$; 67NT)
- Negative sequence overcurrent/ Phase current reversal/ Current unbalance ($I_{2>}$; 46/46R/46L) - 4 stages
- Harmonic overcurrent ($I_{h>}$; 50H/51H/68H) - 4 stages
- Circuit breaker failure protection (CBFP; 50BF/52BF)
- High-impedance or low-impedance restricted earth fault/ Cable end differential ($I_{Od>}$; 87N)
- Line thermal overload ($TF_{>}$; 49F)
- Line differential protection ($I_{dL>}$; 87L)
- Overvoltage ($U_{>}$; 59) - 4 stages
- Undervoltage ($U_{<}$; 27) - 4 stages
- Neutral overvoltage ($U_{O>}$; 59N) - 4 stages
- Sequence voltage ($U_1/U_2>/<$; 47/27P/59PN) - 4 stages
- Overfrequency and underfrequency ($f>/<$; 81O/81U) - 8 stages
- Rate-of-change of frequency ($df/dt>/<$; 81R) - 8 stages
- Load shedding (81LSH)
- Low-voltage ride-through (LVRT; 27T)
- Voltage-restrained overcurrent ($I_{v>}$; 51V)
- Power protection (P, Q, S>/<; 32) - 4 stages
- Resistance temperature detectors (RTD)
- Programmable stage ($PS_{x>/<}$; 99)
- Arc protection ($I_{Arc>}/I_{OArc>}$; 50Arc/50NArc) (optional)

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 ($\Delta\phi$; 78)
- Synchrocheck ($\Delta V/\Delta a/\Delta f$; 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)

MEASUREMENTS

- Phase, sequence and residual currents (IL1, IL2, IL3, IO1, IO2)
- 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)

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)

COMMUNICATION

Standard communication ports

- 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

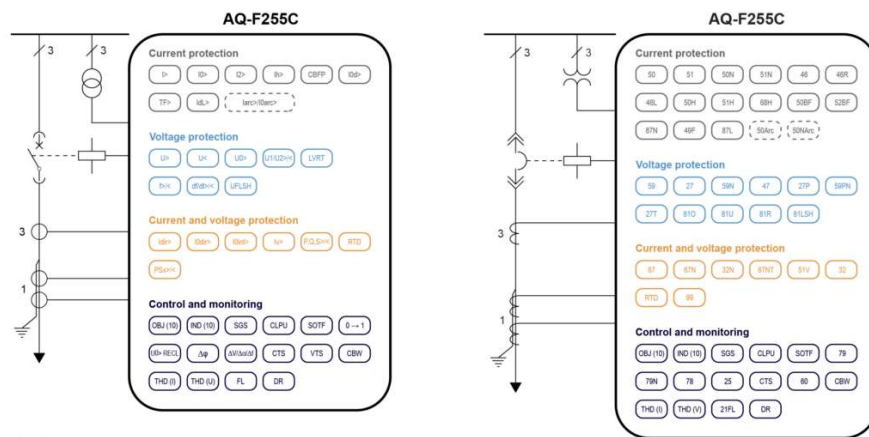
Communication protocols

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

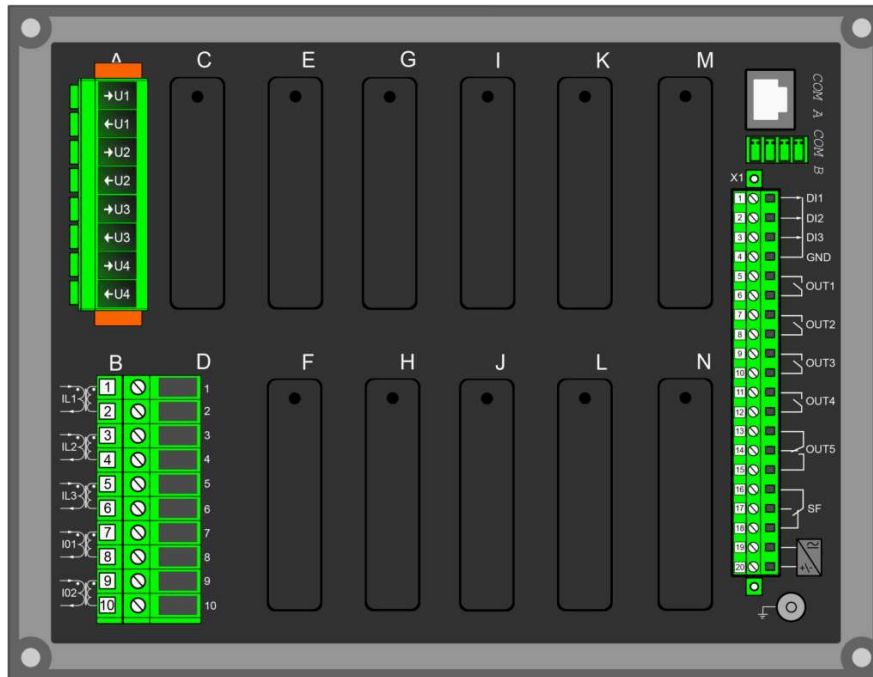
ACCESSORIES

- 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)

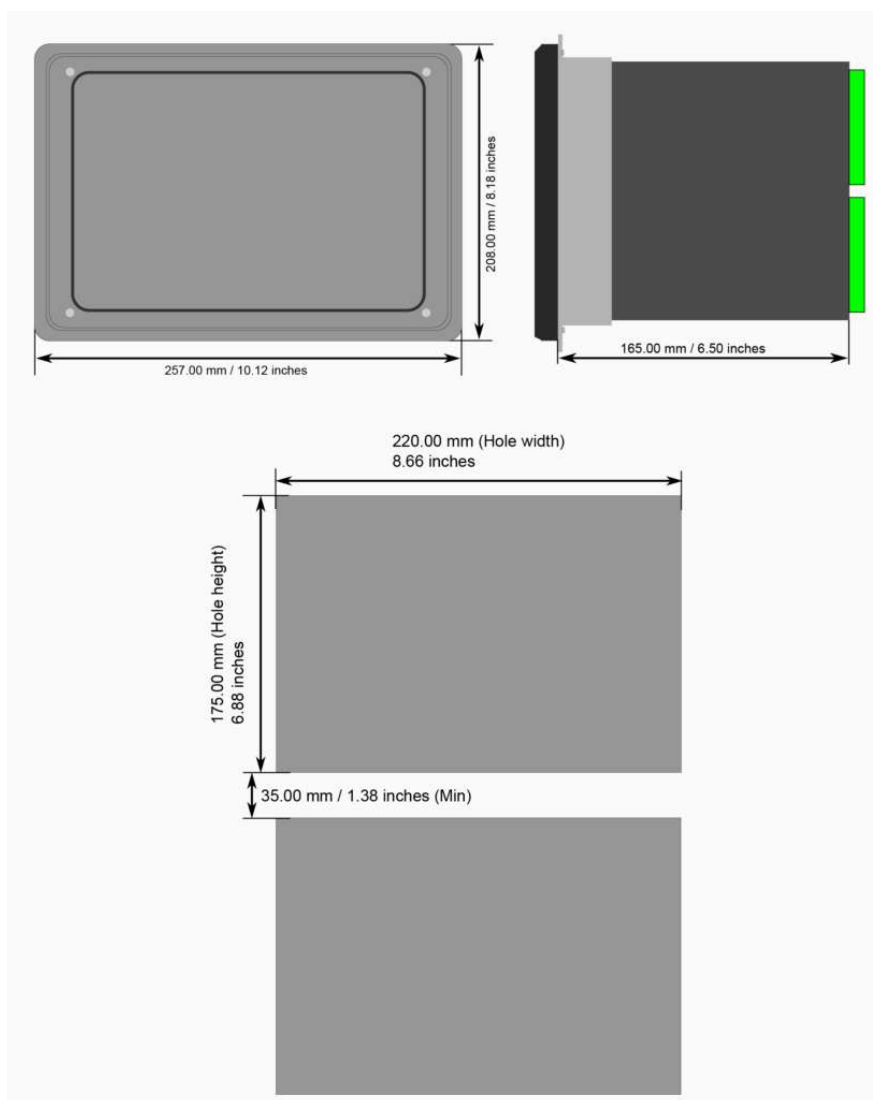
Application Drawing



Device Rear Image



Device and Cut-out Image



Order Code

	AQ - F 2 5 X - P X X X A X A - X X X X X X X X X X
Model	
F Feeder protection	
Device size	
5 1/2 of 19" rack	
Analogue 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 RJ45 100Mb Ethernet & IIRIG-B (max. 1 pcs) *	
H 2 x ST 100Mb Ethernet & IIRIG-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-Plastic) (max. 1 pcs) *	
O RS-232 - Serial fiber (Glass-Glass) (max. 1 pcs) *	
Q 2 x SFP 100Mb Ethernet & IIRIG-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.