

# ARCTEQ®

## RELIABLE POWER



## GENERATOR AND MOTOR COMMANDER™

CONTROL & PROTECTION IN ONE PACKAGE

# GENERATOR AND MOTOR COMMANDER

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**THE GENERATOR AND MOTOR COMMANDER** is a unique innovation combining machine protection and control into one unit. The Commander is ideal for any power plant or industrial application where both protection and control of generators or motors is needed.

Compared to traditional systems with several separate units and software, the Commander takes less space and saves considerable hours of engineering time. Operation is smooth as there is only one interface to the system.

The Commander is based on powerful AQ 200 series IED technology. AQ 200 is the most accurate protection and control IED on the market. The signature features include ultra accurate measurement and protection, high performance logic, high resolution disturbance recording and all non-volatile memory.

## BENEFITS

- Up to 40 % savings in time & cost for installation and commissioning
- Reduced maintenance and life cycle cost. Only two spareparts needed for the whole system
- Up to 86% space saving
- Easy to duplicate for redundancy
- One tool, one interface to all functionality
- Software wizards for automatic setting calculations

## EXCLUSIVE FEATURES

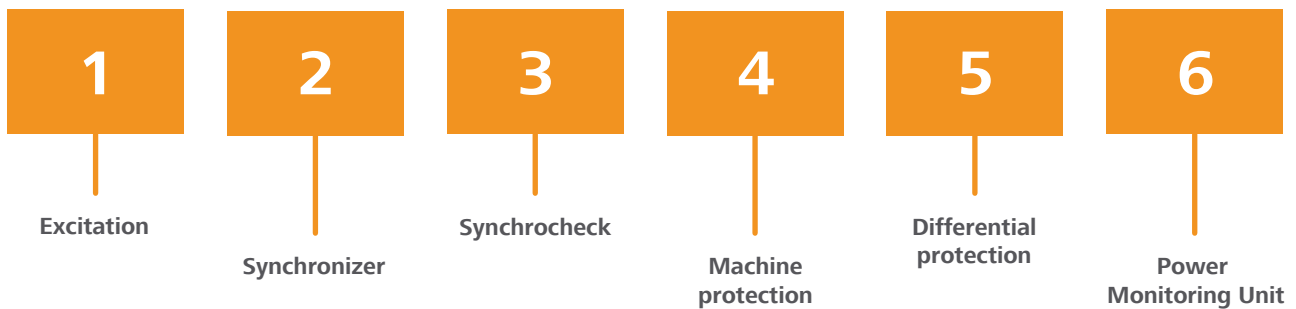
- For 1 - 250 MW brushless synchronous generators and motors
- Sophisticated network compensation and Power System Stabilizer included → Complies with most rigorous grid codes
- Versatile motor start-up sequences
- Synchronizer and synchrocheck features for safe power grid connection
- Unique 0.2S measurement accuracy

ALL IN ONE

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**Traditional machine protection and control requiring up to 6 separate units.**

- Excitation
- Synchronizer
- Synchrocheck
- Machine protection
- Differential protection
- Power Monitoring Unit



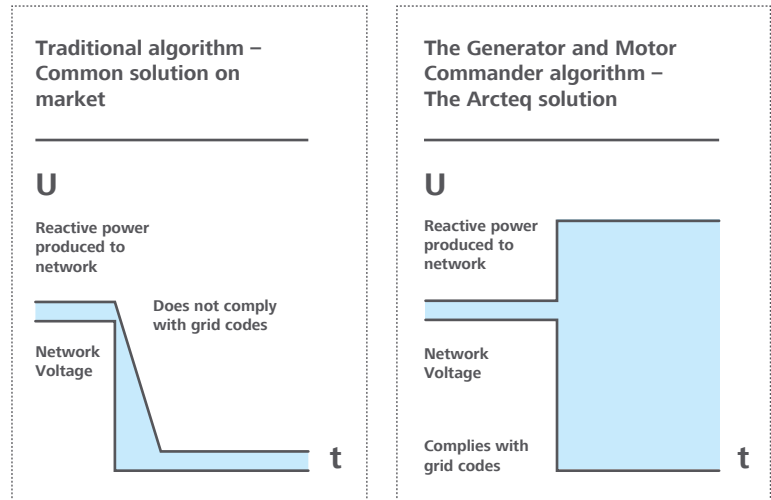
*In the past all systems and even single protection functions were divided to separate units.*

*The Generator and Motor Commander does the same job with one unit.*



# FUNCTIONALITY OF GENERATOR COMMANDER

- Generator Protection
- Differential Protection
- Synchronizer with synchro check
- Excitation control with ext. IGBT bridge
- Power and Energy measurement (0.2S)
- Sophisticated network compensation
- Power System Stabilizer (PSS)



Traditional solutions where MVAR control will follow the network voltage dip. The Commander compensates the network dip by applying AVR and MVAR control modes simultaneously.

## GENERATOR COMMANDER FUNCTIONALITY

### Functionality packages

- Protection + Excitation control
- Protection + Excitation control + PSS
- Protection + Excitation control + Synchronizer
- Protection + Excitation control + Synchronizer + PSS

### 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)
- Vector jump (78)
- Breaker failure protection (50BF/52BF)
- Arc protection (option) (50ARC/50NARC)

### 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-, Eeq+, Eeq-)
- 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

### 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 +2xH50 +BI)
- 2 x mA input + 6-8 x RTD input
- Communication media (specified below)

### Event recording

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

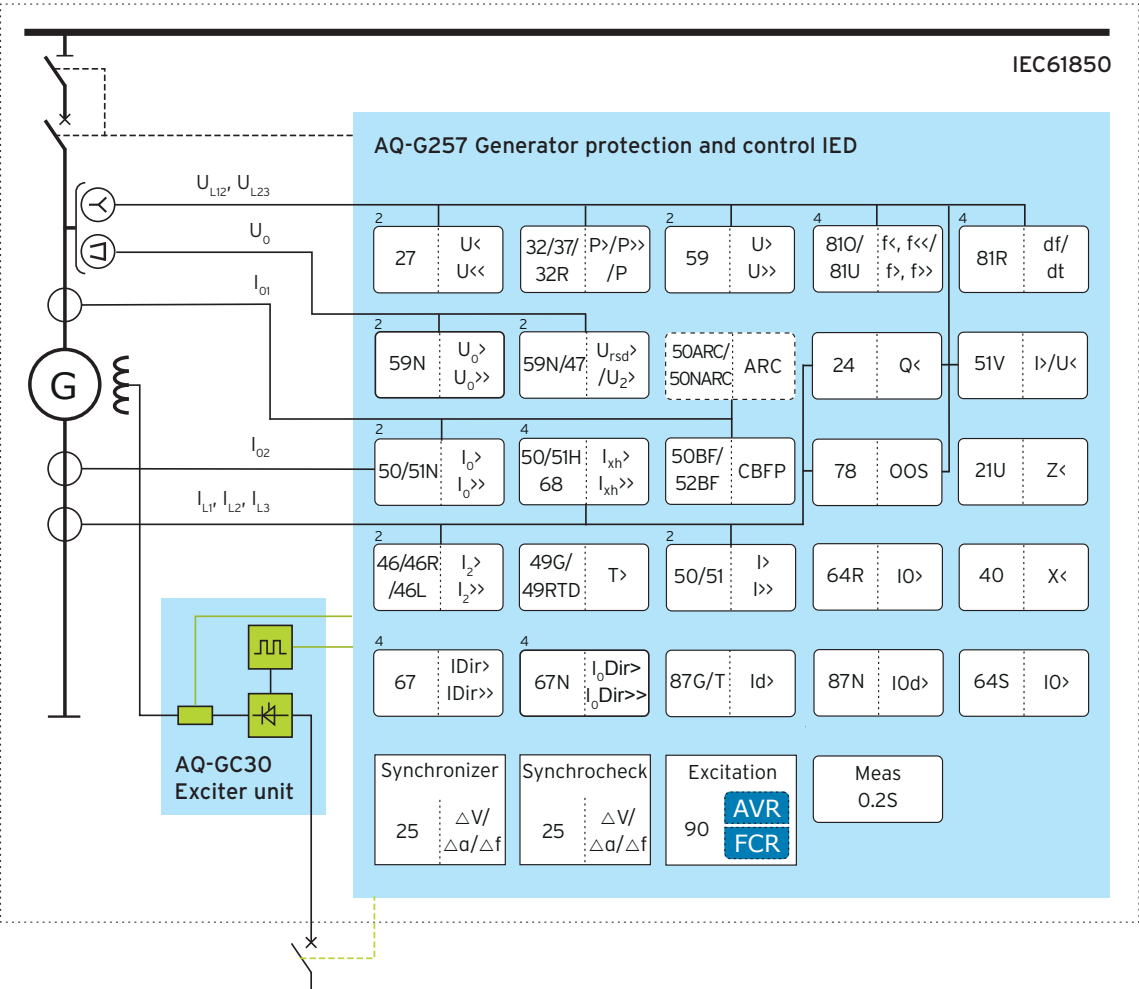
### Communication media

- 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)

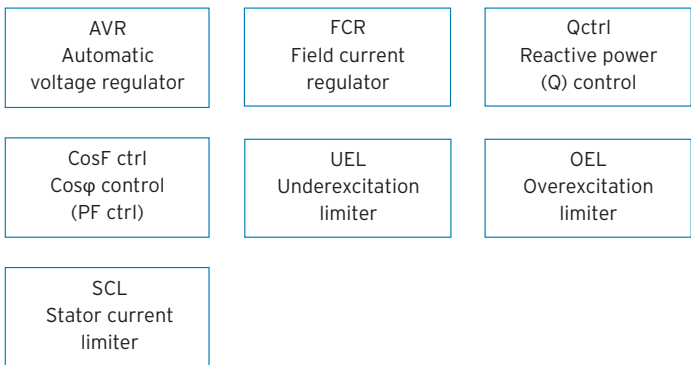
### Communication protocols standard

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

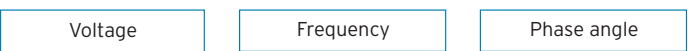
# GENERATOR COMMANDER APPLICATION



## Excitation



## Synchronizer



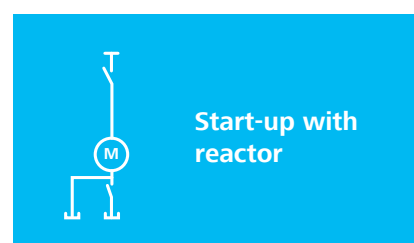
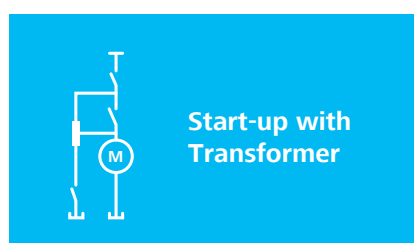
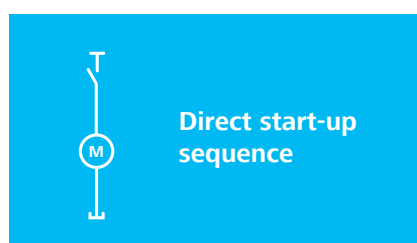
## AQ 200 SERIES PLATFORM FEATURES

- 7" color display
- 16 freely configurable alarm leds and 12 function buttons
- 10 controllable objects
- IEC 61850 + extensive set of legacy protocols

# FUNCTIONALITY OF MOTOR COMMANDER

- Motor Protection
- Differential Protection
- Startup sequence control
- Excitation with ext. IGBT bridge
- Power and Energy measurement (0.2S)

## FLEXIBLE START-UP SEQUENCE



## MOTOR COMMANDER FUNCTIONALITY

### Functionality packages

- Synchronous motor protection & Excitation control

### 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)
- 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)

- Arc protection (optional) (50ARC/50NARC)

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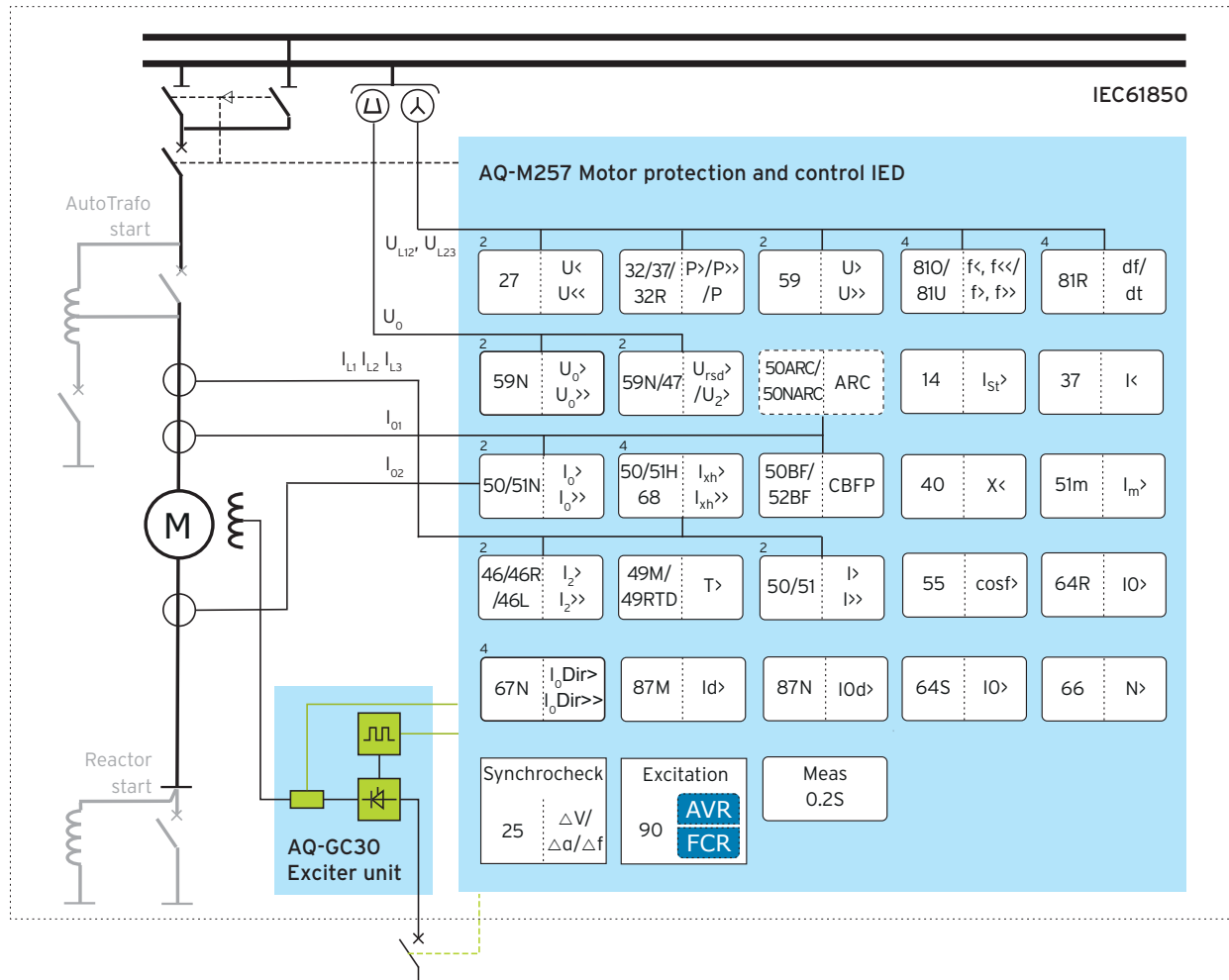
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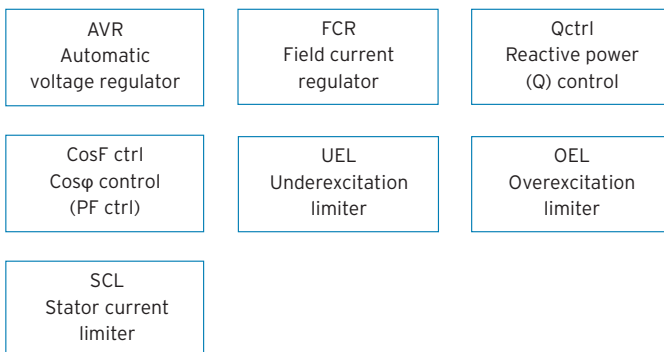
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# MOTOR COMMANDER APPLICATION



## Excitation



## Start-up sequence control



## AQ 200 SERIES PLATFORM FEATURES

- 100 disturbance records in non volatile memory
- 64 samples per cycle sampling rate (3.2 kHz)
- Instant protection operation time typically 15ms
- Freely programmable and advanced logic performed in 5ms cycles



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