These drawings and single line diagrams provide an outlook of Basler Electric solutions for Excitation System installations and retrofit applications. These schematics are based on Basler past experience and reflect only a part of Basler Electric capabilities. Systems are usually custom design per customer requirements and therefore what is proposed here is only designed to provide an idea of what our system could look like.
Making a decision on replacing or renovating a power generation system is nowhere near easy:

- Should we replace the complete generating set or simply the control system?
- Is it best to remove an aging exciter for a more modern one or go for static excitation?
- How can we meet budget requirements and optimize the operation and control of the Power generation system?
- How can we make operators become familiar and supporters of the new solution?

All these questions make decisions a complex compromise between human, technical and budgetary concerns. We are here to help you answering these questions and offer you the best custom developed solution for any kind of application:

- Marine/offshore applications
- Hydro and thermal power plants
- Gas turbine generators
- Diesel gensets

After more than 10 years of digital automatic voltage regulation experience with the DECS-15, Basler is now able to offer a family of digital automatic voltage regulators adapted to any generator, making old analog solutions obsolete: the Digital Excitation Control System “DECS”.

- DECS 125-15
- DECS 200
- DECS 300

Thanks to its experience with the Decs 125-15, Basler has launched the DECS 200 which responds even better to the needs of the market. Decs 200 will be used in brushless applications for excitation currents up to 15A and provides more functions like EDM, autotracking between control modes... For higher excitation currents, DECS 300 will be used either for Brushless or Static application according to your needs.
**DECS 15 EXCITATION SYSTEM**

**Design Features:**
- Application: Brush- / Brush-less exciter
- Machine Size: Between 0.5 and 50 Mw
- Bridge rating: Up to 15 Amps, 180 Vdc continuous
- Configuration: Internal Power stage

**Scope of Supply:**
- System can be supplied:
  - Stand-alone
  - On a Chassis
  - Inside a cubicle

**Option for:**
- Discrete Manual Voltage Controller type MVC 236
- Generator Protection system type BE1 GPS 100
- Generator Parameters metering and/or protection (ie: Stator Current Limiting, Thermal overload)
- Metering and/or Control devices upon customer's request
- Remote control and communication

**DECS-15 features**
- 0.25% voltage regulation (AVR mode)
- PID Control (stability selection)
- Generator voltage softstart
- Voltage matching
- Var or power factor control
- True RMS Sensing
- Under/Over excitation limiting
- Over voltage protection
- 0-3 P.U. V/Hz
- 15.0 Adc Output PWM Power Stage (continuous)
- Parallel (Droop) Compensation
- Front Panel LED Display & Alphanumeric Display
- BESTCOMS™ Software for Windows 3.1 & 95/NT
- Filters designed to handle distortions of voltage and current waveforms caused by SCR loads.
Example of a DECS 15 system configuration with Manual back up, RA 70 Auto-tracking device and Voltage balance protection for system transfer mode.

DECS 125-15 Excitation system cabinet  

DECS 125-15 mounting plate
DECS 200 EXCITATION SYSTEM

Design Features:
- Application:  Brush- / Brush-less exciter
- Machine Size:  Between 0.5 and 50 Mw
- Bridge rating:  Up to 17 Amps, 180 Vdc continuous
- Configuration:  Internal Power stage

Scope of Supply:
System can be supplied:
- Stand-alone
- On a Chassis
- Inside a cubicle

Option for:
- Discrete Manual Voltage Controller type MVC 236
- Generator Protection system type BE1 GPS 100
- Generator Parameters metering and/or protection (ie: Stator Current Limiting, Thermal overload)
- Metering and/or Control devices upon customer’s request
- Remote control and communication
- Power System Stabilizer

DECS-200 features
- 0.25% voltage regulation
- PID Control (stability selection)
- Generator voltage softstart
- Voltage matching
- Single or three phases true RMS Sensing
- On and off line over excitation limiting (OEL)
- Customizable under excitation limitation
- Diode monitoring (EDM 200)
- Generator Under/Over voltage protection
- Field overcurrent
- Field overvoltage
- Loss of sensing detection
- Underfrequency compensation 0-3 P.U. V/Hz
- 15.0 Adc Output PWM Power Stage (continuous)
- Parallel provisions for Droop or cross current Compensation
- Front Panel Display (HMI)
- Front panel RS 232 BESTCOMS™ communication port
- Rear panel RS 485 Modbus™ communication port
- Auto-tracking between modes (internal tracking)
- Auto-transfer between DECS 200 units (external tracking)
- Sequence of event recording (SER)
- Oscillography
Dual DECS 200 system with PSS, GPS and PLC.
DECS 300 EXCITATION SYSTEMS

DECS 300 SYSTEM
FOR GENERATOR BETWEEN 3 AND 10 MW

The microprocessor-based DECS-300 provides precision control for generators of virtually any size and is equally suited for exciter field or main field applications.

**Design Features:**
- Application: Brush-/ Brush-less exciter
- Machine Size: Between 3 and 10 Mw
- Bridge rating: Between 30 and 200 Amps
- Configuration: 3 or 6 SCR

**Scope of Supply:**
- Single controller including AVR, MVR and Var/PF controller together with:
  - Over Excitation limiting, Under Excitation limiting, Volt/Hz protection
  - Boost System or Field Flashing for Start-up operation
  - Field discharge equipment (Crow Bar)

**Option for**
- Power System Stabilizer
- Generator Protection
- Synchronization
- Remote control and communication
- Redundancy of control system and/or Power Bridge
- Generator parameters Monitoring and/or protection (ie: thermal overload, Stator current limiting…)

**DECS- 300 features**
- Modbus™ communication
- Real time metering
- 32-bit microprocessor
- Non-volatile flash memory
- 40 standard stability curves and customizable function
- 0.25% voltage regulation (AVR mode)
- Generator voltage softstart
- Adjustable underfrequency threshold
- True rms voltage sensing, single or three phase voltage sensing
- Field current regulation
- Bus voltage matching
- Reactive droop current compensation
- Under and over excitation limiting (on-line and off-line)
- Var or power factor control
- Autotracking of all operating modes
- Auto tracking between 2 DECS 300 units
- Reference adjuster for remote raise/lower control
- Control via a contact input, front panel switches or communication serial link (RS232 and RS485)
- Output annunciation via general alarm contacts or RS-485 communication port
- Event reporting and oscillography
- Watchdog timer alarm output contact
- Protection including:
  - Generator under and overvoltage
  - Generator underfrequency
  - Field overvoltage
  - Field overcurrent
  - Loss of voltage sensing
Simple configuration for DECS 300 system

DECS 300 cubicles for small size power Bridges (up to 200 Amps).
CUSTOM DESIGNED DECS 300 SYSTEM FOR GENERATOR BETWEEN 15 AND 100 MW

Design Features:
- Application: Brush- / Brush-less exciter
- Machine Size: Between 3 and 10 Mw
- Bridge rating: Between 300 and 1 500 Amps
- Configuration: 3 or 6 SCR

Scope of Supply:
- Single controller including AVR, MVR and Var/PF controller together with:
  - Over Excitation limiting, Under Excitation limiting, Volt/Hz protection
  - Boost System or Field Flashing for Start-up operation
  - Field discharge equipment (Crow Bar)

Option for
- Power System Stabilizer
- Generator Protection
- Synchronization
- Remote control and communication
- Redundancy of control system and/or Power Bridge
- Generator parameters Monitoring and/or protection (ie: thermal overload, Stator current limiting...)

BE1 GPS GENERATOR PROTECTION SYSTEM FEATURES

- Phase & Neutral Instantaneous Overcurrent
- Phase, Neutral, and Negative Sequence Time Overcurrent
- Phase Overcurrent includes capability of voltage restraint or control.
- Negative sequence overcurrent element (46)
  - Includes algorithm for timing based on generator K factors or TOC curves.
- Phase Undervoltage and Overvoltage elements.
- Auxiliary Undervoltage and Overvoltage elements.
- Negative Sequence Overvoltage element.
- Four Under/Over Frequency elements.
- Forward/Reverse Power.
- Loss of Excitation (offset sloped VAR flow algorithm).
- Breaker Failure protection function: BF
- Inadvertent energization
- 100% stator ground fault protection for ground overvoltage and 3rd harmonic ground undervoltage
- Sync check and/or dead bus close supervision
- Fuse loss detection (60FL) false trip due to loss of voltage sensing.

INSTRUMENTATION
- Real time A, B, C phase current, voltage, frequency,
  - and derived neutral and negative sequence current and voltage.
- Real Time 3 phase Watts, VARs, and Power Factor.

REPORTS
- Current demands for phase, ground, and negative sequence currents, and forward and reverse Watts and VARs—
  - kWh and kVARh, forward and reverse
  - 255 sequence of events report with I/O & alarm subreports
  - Fault Reporting: 1 or 2 oscillography records / fault report

PROGRAMMABLE I/O
- Four programmable inputs
- Five programmable outputs & one dedicated
  - programmable alarm output.
System Configuration for a complete Generator Control system including
Synchronization, Generator Differential Protection, Generator Protection and Control
DECS 300 SYSTEM
FOR GENERATOR BETWEEN 50 and 100 MW

Design Features:
- Application: Static Excitation
- Machine Size: Between 50 and 100 Mw
- Bridge rating: Between 500 and 1 500 Amps
- Configuration: 6 SCR

Scope of Supply:
- Single controller including AVR, MVR and Var/PF controller together with:
  Over Excitation limiting, Under Excitation limiting, Volt/Hz protection
- Power System Stabilizer
- Control Equipment include PLC for Control and LCD for Control / Monitoring
- Field discharge equipment (Crow Bar)

Option for
- Synchronization
- Redundancy of control system (DECS 300 and PSS) and/or Power Bridge
- Generator parameters Monitoring and/or protection (ie: thermal overload, Stator current limiting…)
- DC Field breaker for field discharge

PSS- 100 features
- Calculates integral of accelerating Power (dual Input)
- Frequency and Power sensing
- Isolated output signal with gain adjustment
- Metering for system voltage, current, frequency watts, Var, power factor, positive and negative sequence voltage and current
- Data recording and capture for commissioning and system disturbance
- Automatic or external triggering of data recorder
- Programmable logic timers
- Self diagnosis
- Automatic system supervisory functions
- Sequence of event recording
- Built-in test and commissioning features
  - Self generated test signals for Sine, Step, Sine sweep Square wave modes
  - Dedicated input for external test signal generators
  - Data logging of PSS 100 internal variables for tests results review
  - Software controlled switches for test signal insertion
  - Programmable logic and serial command to control test and data logs
- Control via a contact input, front panel switches or communication serial link (RS232 and RS485)
- Non volatile flash memory
- Watchdog timer alarm output contact
- Adjustment settings:
  - Up to three lead/lag stages
  - Terminal voltage limiter
  - Adjustable washout time constant
  - Low power threshold
  - Stabilizer gain setting
  - Upper and Lower output limits
  - Output scale adjustments
  - Ramp tracking filter time constant
  - Machine inertia constant
  - Machine reactance
Dual DECS 300 System composed of a 500 Amps Power Bridge (with optional redundancy), Excitation control and discharge equipment, Generator Control and protection.

System described above in its mechanical assembly.
DECS 300 SYSTEM
FOR GENERATOR BETWEEN 100 AND 500 MW

Design Features:
- Application: Static Excitation
- Machine Size: Between 100 and 500 Mw
- Bridge rating: Between 500 and 4 000 Amps,
- Configuration: 6 SCR, redundant Power Bridge

Scope of Supply:
- Dual Controller including AVR, MVR and Var/PF controller together with:
  Over Excitation limiting, Under Excitation limiting, Volt/Hz protection
- Other Control Equipment include PLC for Transfer Control and LCD for Control / Monitoring
- PSS (Power System Stabilizer) is also provided
- Protection equipment include BE1 GPS (Generator Protection System) for Transfer to back up Controller
  An Overcurrent relay is also provided to protect the Power transformer
  A field ground Fault relay is provided as option
- Fans to dissipate heat generated by the Bridge are added to those provided on top of the cubicle

Bestcom Software Features

Bestcom software is a communication and setting software now available for all Basler digital products.
The advantage of this software are the following:
- Easy system parameters setting to enable fast and simple commissioning
- Metering and data acquisition on site
- User friendly interface for operation
- Supplied free of charge with each Basler digital product

Bestcom software provides a flexible, easy to use, yet equipped with multi level password access to set the system parameters. The software is suitable for Windows® interface: Windows NT, Windows 95 or Windows 3.1.
DECS 300 System composed of a dual DECS 300, dual Power bridge rated at 1000 Amps, Excitation system field discharge equipment Power System Stabilizer and protective devices.

System described above in its mechanical assembly
DECS 300 System composed of a dual DECS 300 with Triple bridge for large applications up to 3,600 Amps