



TRUST. WELL EARNED.

PRISMIC® A50 Excitation System

Many years experience gained manufacturing world-class excitation systems and generators, with output ratings up to 1000MW, enables BRUSH to provide superior systems incorporating the cCSAus approved and CE compliant PRISMIC® A50 excitation controller.



Introduction

BRUSH PRISMIC® A50 excitation systems provide both high performance and stable voltage regulation with high reliability using advanced microprocessor and software technologies.

BRUSH PRISMIC® A50 Turnkey Excitation Systems

BRUSH expertise is available to provide help with specification of system requirements right through manufacturing and factory testing of the equipment to support of on-site testing and putting the equipment into service.

Factory testing can include testing of the actual system with a real-time power system simulator to ensure optimum stability settings.

Excitation systems are provided with most major components included within one or more suitable equipment cubicles or panels.

Equipment and functionality provided typically includes the following components:

- Operator console for quick and easy adjustment of settings and modes.
- Customised logic to simplify the tasks of excitation system startup and shutdown.
- De-excitation and field suppression system to ensure satisfactory de-excitation for both operational and emergency shut down.
- Overvoltage protection / crowbar circuit to prevent excitation system damage in fault conditions.

BRUSH is able to provide additional separate auxiliary equipment such as excitation power supply transformers, circuit breakers for special applications such as electrical braking of hydro generators etc. as necessary to complete the excitation system. Please discuss particular requirements with BRUSH sales personnel.

Flexibility of BRUSH PRISMIC® A50 Excitation Systems

Systems are available to satisfy most generator excitation current ratings from under 20A to over 7000A.

The high degree of flexibility afforded by the PRISMIC® A50 controller enables BRUSH to provide many different configurations to satisfy a wide range

of generator excitation requirements including the following:

- A50-S type static excitation systems, where fast response time is required. For these systems the PRISMIC® A50 is equipped with a large controlled power bridge providing excitation current to the main generator field through sliprings. In these cases the PRISMIC® A50 typically implements the IEEE421.5 model ST4C.
- A50-B type brushless excitation systems, where an a.c. excitation generator feeds through a rotating rectifier bridge to provide excitation current to the main generator field without the need for sliprings and brushes. In these cases the PRISMIC® A50 typically implements the IEEE421.5 model AC7C.
- A50-A type a.c. excitation systems where an a.c. excitation generator typically on the same shaft as the main generator provides the supply to the A50 power bridge which provides excitation current to the main generator via sliprings. The a.c. excitation generator may be provided with a dedicated PRISMIC® A50 controller to regulate the excitation system supply voltage.
- A50-D type d.c. excitation systems where an old d.c. excitation generator provides the excitation power supply. These systems are normally only provided for refurbishment projects.

Dual Redundancy for Increased Integrity

Depending upon customer requirements various levels of redundancy can be provided. Typically for high integrity systems full dual redundant control units and dual redundant power converters are provided.

The PRISMIC® A50 controller includes automatic follower functionality to ensure that transfer to standby is bumpless with no noticeable system disturbance.

Voltage Regulation and Other Modes of Operation

BRUSH PRISMIC® A50 systems provide voltage regulation to an accuracy of $\pm 0.25\%$ voltage regulation. When operating in interconnected mode, power factor or reactive power set point control is available.

Power factor or reactive power set point control is available when operating in interconnected mode. The flexibility of the PRISMIC® A50 controller enables any practical reactive current compensation setting to be programmed, including drooping voltage profile or line-drop compensation.

The PRISMIC® A50 control loop implements limiter functionality to override the primary control operating mode when necessary to ensure the generator operating point remains within allowable limits. The following limiter functionality is typically included:

- Under Excitation Limiter.
- Stator Current Limiter.
- Over Excitation (Rotor Current) Limiter.
- Over Flux (Under Frequency U/f ratio) Limiter.
- Terminal Voltage Limiter.
- Fast Acting Field Current Limiter.

For commissioning and maintenance work the PRISMIC® A50 includes a manual mode of operation where excitation current may be directly adjusted.

Each PRISMIC® A50 system includes power system stabiliser functionality to enhance damping of power system oscillations by adjustment of excitation.

The stabiliser is typically specified as either type IEEE PSS2C or type IEEE PSS3C.

Optional Features

Many other optional features are available as follows:

- Communication links to plant monitoring or prime mover control systems (DCS / SCADA systems) are available with PRISMIC® A50 systems using protocols such as Modbus, ProfibusDP, Modbus/TCP, Ethernet Global Data etc. Other protocols are available as required.
- Communication link to provide remote monitoring and site maintenance support by BRUSH engineering staff.
- Paralleling of the generator to the power system by means of PRISMIC® A50 built in synchroniser.

Windows Human Machine Interface (HMI) Software

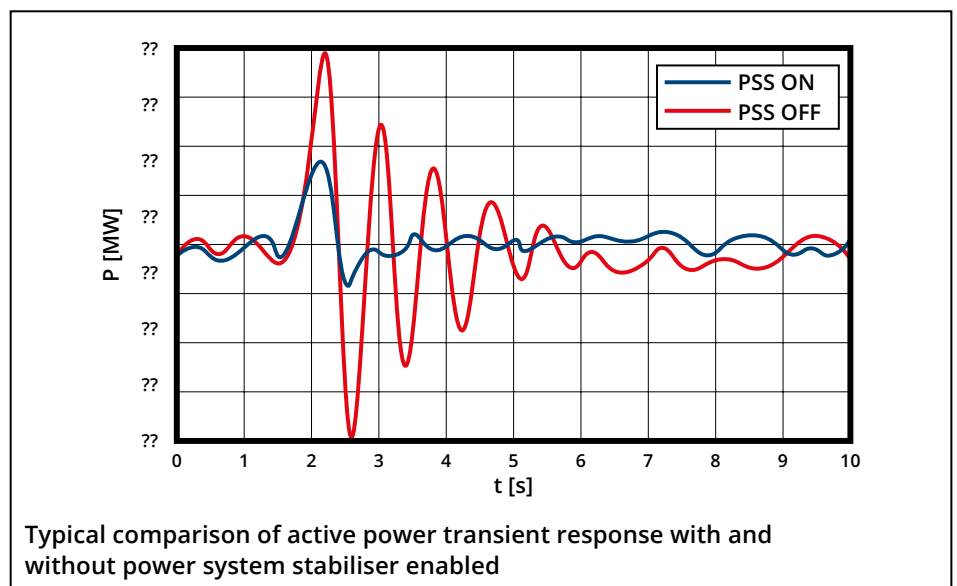
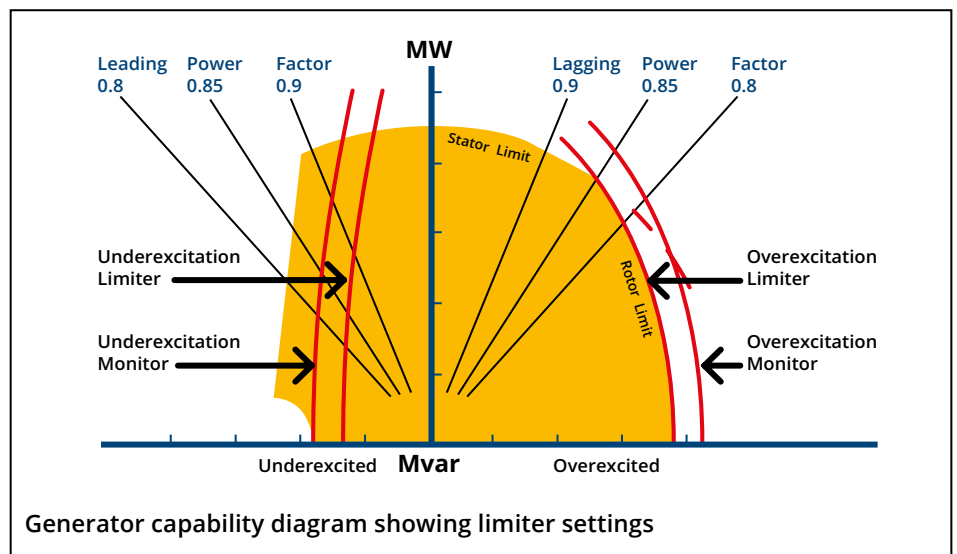
Software is included to enable commissioning using a Windows PC.

The software facilitates adjustment of stability settings, initiation of tests and downloading of response test data and display of detailed diagnostic data.

For static excitation systems the following optional features are available:

- Various configurations of field circuit breaker arrangement can be provided, for example an a.c. breaker on the supply side of the power converter and / or d.c. breaker on the output side of the power converter.
- Various field flashing options can be provided to utilize the customer's preferred power source to energize the generator field during start-up.
- Excitation power supply transformer can be provided.
- Dual redundant converter fans can be provided to give increased excitation system integrity at a lower cost than a dual redundant bridge.

BRUSH offers flexibility in implementation to ensure that customer's requirements are satisfied. Please contact BRUSH to discuss particular requirements.



PRISMIC® A50 product designation codes

PRISMIC® A50 systems are provided in many configurations to suit particular applications. To help identify key facets of each particular system BRUSH uses a designation code system in the following form: PRISMIC® A50-TC.RM.

T – Type of Excitation System

- S: Static excitation system
- B: Brushless excitation system
- A: Excitation system with a.c. exciter
- D: Excitation system with d.c. exciter

R – System Redundancy

- 1: Single channel
- 2: Twin channel converter and controller
- A: Twin channel controller with single converter

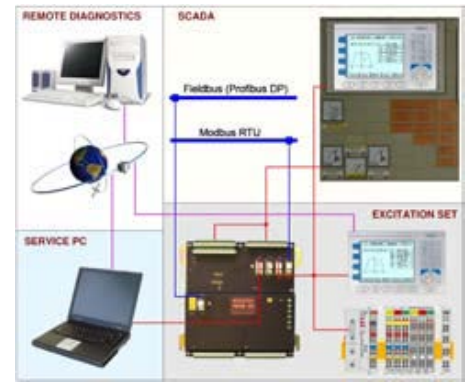
M – Mechanical Design

- C: Excitation cubicle with front access
- D: Excitation cubicle with front and rear access
- P: Plate mounted equipment
- R: 19inch rack mounted equipment

The characters T,C,R and M are replaced with the characters below according to the attributes of the particular system as shown. Note: Other variations are available – please discuss with BRUSH if required.

C – Power Converter

- IGBT: Pulse width modulation H bridge converter
- B2C: Single phase fully controlled thyristor bridge
- B3C: Three phase fully controlled thyristor bridge
- IEN: Nominal d.c. output current
- ULN: Nominal line to line excitation supply voltage
- 0: IGBT IEN=10A, ULN=250V
- 1: B6C IEN=20A, ULN=400V
- 2: B2C IEN=20A, ULN=300V
- 5: B6C IEN=370A, ULN=400V
- 6: B6C IEN=600A, ULN=400V
- 7: B6C IEN=800A, ULN=400V
- A: B6C IEN=1500A, ULN=800V
- B: B6C IEN=2000A, ULN=850V
- C: B6C IEN=2800A, ULN=660V
- D: B6C IEN=4000A, ULN=800V
- E: B6C IEN=8000A, ULN=800V



PRISMIC® A50 excitation system interfacing options



A BRUSH excitation system utilising modular power converters for a 140MVA turbogenerator

Summary of PRISMIC® A50 features

- Stable and reliable operation
- Fast acting regulation with efficient damping
- Power system stabiliser included
- Voltage regulation accuracy +/-0.25%
- All necessary limiters included
- Dual redundancy option with bumpless transfer to standby channel
- Manual mode of operation available (exciter field current control mode) with bumpless transfer
- Field de-energizing in normal operation and fault conditions
- Conforms to CE directives, cCSAus approved
- Three phase or single phase sensing
- Customised sequence logic included for startup and shutdown
- Event recording for easy system monitoring
- Internal analog data recording for easy logging of response tests
- Cubicle mounted operator console available for easy diagnostics and mode selection etc.
- Communications interfaces available for data transfer to plant monitoring and control systems such as turbine controller, DCS or SCADA system
- Interfaces directly to BRUSH R10 equipment for monitoring of rotor earth fault status in brushless excitation systems.
- Optional synchroniser included with both main and check channels
- Rotating diode failure detection included for brushless generator applications
- Comprehensive factory testing always included to reduce on-site commissioning time



Part of a PRISMIC® A50 excitation system for a 259MVA turbogenerator

BRUSH

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