

— Static excitation systems for hydro generators

Static excitation systems, controlled by microprocessor voltage regulator type DRN, are based on own hardware and software solutions. The development is based on over 50 years of activities on the area of electronics and regulation, 40 years of organised industrial production both devices and systems of power electronics and regulations and 25 years of applying micro processor control technology.

Končar excitation systems are operating in over 25 countries in the world.

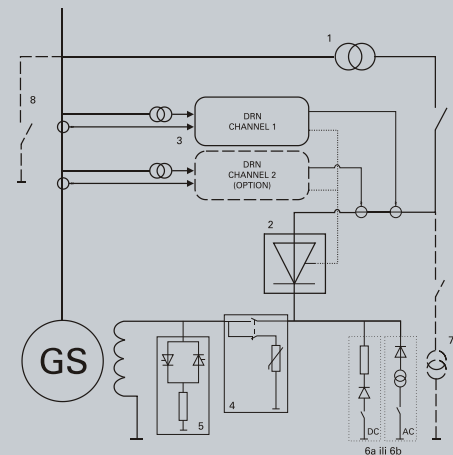
APPLICATION AREA

Synchronous generators power larger than 3 MVA, supply voltage frequency 50 Hz, 60 Hz or 16 2/3 Hz and field current of 100Adc up to 5000Adc.

The supply of the main excitation system power circle is realised over excitation transformer connected to generator outputs (self-excitation connection) or from some other AC source (independent or external excitation) and thyristor converter in fully controllable six pulse bridge connection.

MAIN PARTS OF EXCITATION SYSTEM:

1. Excitation transformer
2. Thyristor converter
3. Digital regulator
4. De-excitation circle
5. Over-voltage protection
6. Initial excitation (ac or dc)
7. Transformer for electrical braking
8. Device for short connecting



Digital voltage regulator DRN

Voltage regulator type DRN is realised as modular. DRN hardware is based on 16/32-bit processor Motorola, while the software support is realised on the regulation and control system DIREMK (Digital Regulation of Electric Machines Končar).

Basic characteristics:

- Three phase generator current and voltage measuring
- Sampling of measuring variables via signal processor
- Independent regulator per field current
- Possibility of extension of digital and analogue inputs and outputs
- Possibility of two-channel configuration

Additional functions:

- Possibility of additional functions via software modules, without additional hardware.



— Software support

BASIC FUNCTIONS

- Generator voltage regulator (PI/PID type)
- Field current regulator (PI type)
- Limiters
 - Maximal field current
 - Maximal stator current
 - P/Q under excitation limiter
- Compensation per generator current
- Compensation per generator frequency
- Automatic follow-up
- Logical and sequential operation
- Integration into the plant control system
- Monitoring and self diagnostic

ADDITIONAL FUNCTIONS

- Power system stabilizer
 - according IEEE Std. 421.5 PSS2B
 - according IEEE Std. 421.5 PSS3A
- Q regulator
- Cos ϕ regulator

— Electrical braking

Electrical braking is used for faster stopping of hydropower unit by using electromagnetic counter moment of short-connected generator.

ADVANTAGES OF ELECTRICAL BRAKING:

- Shorter stopping time
- Less wear of bearings
- Less dust (from mechanical brake)

ADDITIONAL EQUIPMENT FOR ELECTRICAL BRAKING

- Transformer for electrical braking
- Circuit breakers for supply selection
- Device for generator stator short-connecting

Process of electrical braking is controlled over digital voltage regulator.

ADDITIONAL ADVANTAGES:

- Transformer for electrical braking can be used as reserve in case of failure of excitation transformer
- The test sequences of generator, excitation and generator protection are simplified.

THYRISTOR CONVERTER

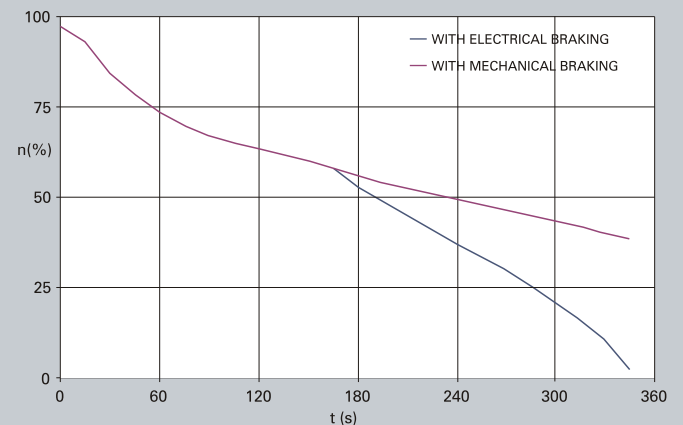
- GTN - natural cooling up to 1000 Adc
- GMP - forced air cooling up to 530 Adc
- GTB - forced air cooling up to 2500 Adc
- MMF - forced air cooling up to 5000 Adc

Possible configurations of converters:

- n+1
- 1+1



DIAGRAM OF UNIT STOPPING



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