

HIPASE

Simplify your solution



HIPASE

Integration on highest level



ANDRITZ HYDRO has extensive and long-term experience in the fields of excitation, electrical protection, synchronization, turbine controllers and automation of hydropower plants, forming the basis for the development of the new HIPASE product platform. Highly performing and perfectly adapted, HIPASE integrates the specific requirements of the different fields in a single device.

The new and innovative HIPASE platform has especially been developed for the use in hydropower plants and covers the following applications:

- Excitation (HIPASE-E)
- Protection (HIPASE-P)
- Synchronization (HIPASE-S)
- Turbine controller (HIPASE-T)

All devices are based on identical hardware and use the same engineering tool. For specific requirements, additional application boards are used resulting in perfectly designed voltage regulators as well as protection and synchronization devices and turbine controllers.

Hardware

The HIPASE device consists of a half size 19" housing incorporating up to 32 digital

inputs and outputs as well as 12 current and 8 voltage transformer inputs. For all applications with extensive signal requirements (e.g. 6-system differential protection), a standard 19" full size housing is used.

All HIPASE devices usually comprise four boards to be combined individually according to the type of application. The central processor module is the core component, also supporting different standard communication interfaces (e.g. IEC 61850, IEC 60870-5-104 and Modbus). For processing of analogue and digital signals appropriate analogue and digital interface boards are provided.

A key characteristic of the HIPASE platform is its safety architecture. HIPASE ensures both, the protection of humans and property (safety) and data integrity (security) by hardware and software measures.

Engineering

Due to the predefined functions included in HIPASE, all devices can easily be fitted to the requested demands and plant-specific requirements. The functional scope of the new HIPASE platform consists additionally of up-to-date functions like an innovative and fully graphical color touch display, mul-

iple open communication features, security features as well as a simple plant-specific configuration of the devices.

Security

Due to the complex interconnection of the overall infrastructure of electrical energy generation and distribution, the issue of "cyber security" has become increasingly important. This importance particularly becomes clear in the related policies of key power utilities (e.g. the White Paper of German BDEW and the North American NERC CIP Standard).

A comprehensive and consistent security architecture protects the HIPASE device against cyber attacks from outside, as well as from the internal network. The core elements of this architecture are an internal firewall as well as encrypted transmission (communication between HIPASE Engineering Tool and the HIPASE devices). The HIPASE security features are supported by the hardware – every HIPASE device is equipped with a TPM chip (trusted platform module), which clearly identifies each device and provides unique keys for authentication.

HIPASE-E

Excitation

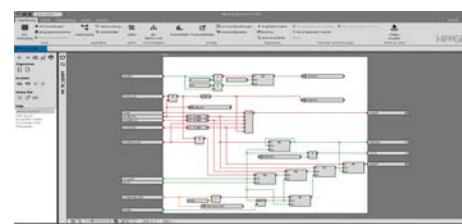
HIPASE-E is an automatic voltage regulator (AVR) with all limiters, additional regulators and a gate control for all synchronous single- and three-phase generators used in a wide frequency range.

The AVR has a modular structure and uses the long-term experience of the GMR3 voltage regulator of ANDRITZ HYDRO. The proven control and regulator functions were used further and are modified to the

latest requirements of power generation. Limiters and additional regulators may be enabled by the user in respect to the plant requirements.

The HIPASE-E application board includes the field current regulator and the generation of firing pulses for the SCRs. For analogue and digital signal processing, appropriate analogue and digital interface boards are provided.

Using the compact housing (half size 19"), up to 36 digital inputs and outputs may be processed. For advanced applications using a larger amount of input and output signals, a full size 19" housing is used.



Smart Bridge

The HIPASE-E voltage regulator controls the Smart Bridge thyristor bridge. The Smart Bridge is characterized by easy maintainability and high availability.

Particular highlights of this solution are:

- space-saving arrangement of the thyristor bridges
- consistent ventilation concept with optional speed-controlled ventilation
- consistent fan redundancy
- good accessibility of individual components
- increased protection class (up to IP 54)

Technical data

Supply voltage:	24 VDC-250 VDC
Voltage metering:	100-125 VAC / 3 VA Kl.1, 3-phase or 1-phase
Current metering:	1 A or 5 A / 3 VA, Kl.3, 3-phase or 1-phase
Voltage control range:	0,9-1,1 UGN
Control accuracy:	<= +- 0,2%
Power system stabilizer:	PSS2A/B, PSS4B
Nominal generator frequency:	16,7 Hz-400 Hz
Generator operating range:	10 - 440 Hz
Digital inputs:	24 VDC-250 VDC
Digital outputs:	250 VDC, 8 A continuous
Test voltage:	2 kV _{eff} according EN 50178/1997
Electromagnetic compatibility:	IEC 60255

HIPASE-P

Protection

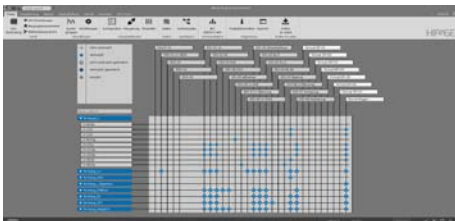
HIPASE-P is a perfect solution for powerful generator and transformer protection designed for different frequencies (50 Hz, 60 Hz and 16.7 Hz).

The structure of the protection functions is modular and may be customized. Based on the long-term experience with the DRS protection device family of ANDRITZ HYDRO the proven numeric algorithms are used and modified to the new requirements in the power generation.

For HIPASE-P a special application board has been developed to generate or process analogue signals for specific protection functions.

Examples for these protection functions are:

- Rotor earth fault protection
- Stator earth fault protection by signal injection method
- Shaft current protection
- SFC protection
- Temperature measurement
- etc.



Technical data

Nominal frequencies:	50/60/16,7 Hz
Current transducers:	Amount 12/24, $I_n = 1 \text{ A}$ and 5 A
Voltage transducers:	Amount 8/16, $U_n = 100\text{-}125 \text{ VAC}$
Digital wide range inputs:	Amount 8-64, $U_n = 24\text{-}250 \text{ VDC}$
Digital outputs:	Amount 8-72, trip- and indication contacts
Protection functions:	Generator- and transformer protection (modular)

Using the compact housing (half size 19"), up to 32 digital inputs and 36 outputs may be processed. For more comprehensive applications with a larger amount of digital input and output signals, a full size 19" housing is used. Generator protection requires numerous functions which are needed for advanced applications like pump turbines or even large thermal blocks.

The HIPASE Engineering Tool supports the protection engineer with proven tools such as software trip matrix, test inputs for the protection functions or simple interface testing.

The engineering of protective functions can be done with the help of a simple selection of all available HIPASE-P functions. With this action all required steps for the engineering will be fully automatically generated. This includes even the creation of process displays.

In addition, a parameter window for a simple parameter setting is available.



HIPASE-T

Turbine controller

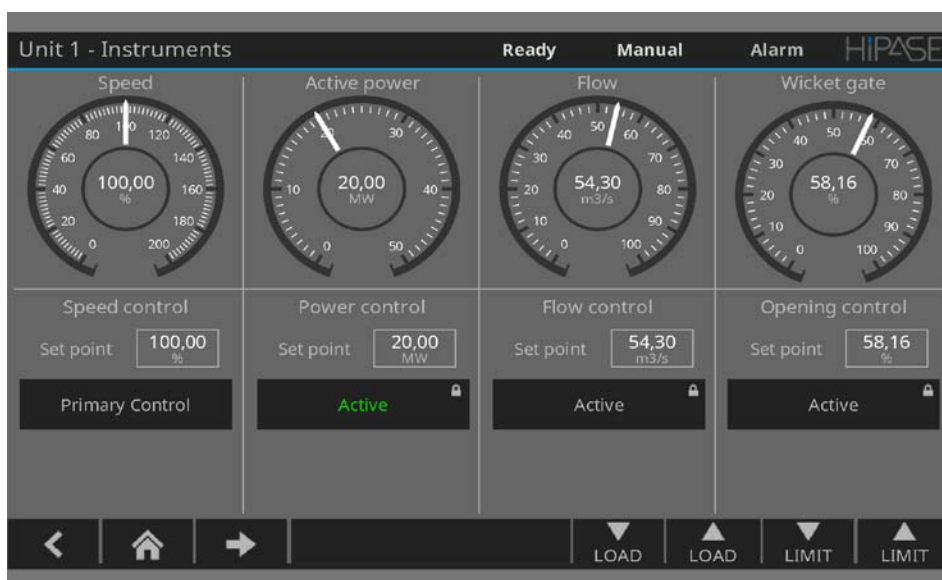
The turbine controller is as a main part of an unit used to convert the existing hydraulic energy to electrical energy on a most efficient way. It ensures a stable speed of the turbine in no-load-operation as well as island-mode and guarantees the adherence of setpoint in grid operation.

The ongoing developed core algorithm copes with the increased challenges for the turbine controller with regards to frequency and primary controls. The requirements of the different turbine types (Francis, Kaplan or Pelton) and sizes of the units are supported by a modular application concept.

In order to secure an easy interface to project specific requirements, the application board contains all types of in-/ output signals.

Thus interfaces for speed sensors as well as generator voltage measurements for the speed measurement are foreseen. In addition analog in-/outputs for the measurement of positions and CT/VT interfaces are available.

The analog outputs can be configured as voltage or current outputs with variable limits. If required an oscillating signal can be generated in order to support all types of servo valves.



Technical Data

Speed/frequency-Inputs:	max. 6, passiv or active, VT
Analog in-/outputs	max. 12/14, -20...20mA, -10...10V
Binary in-/outputs	max. 64
Speed deadband:	0,02%
Measuring range speedmeasurement:	1,2-10.000 Hz
Resolution speed measurement:	0,1%
International Standards:	IEC 61362, IEC 60308



HIPASE-S

Synchronization

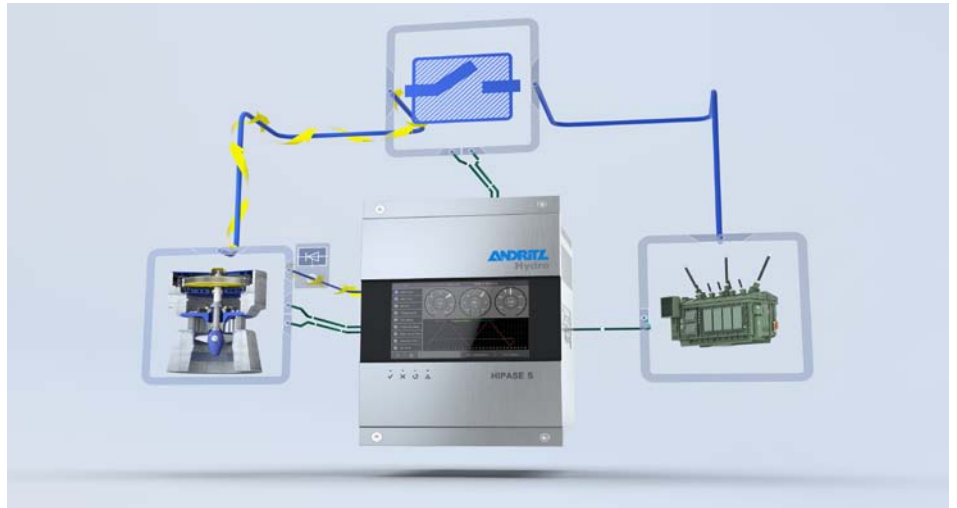
HIPASE-S is a new synchronization device for paralleling generators to grids in electrical systems used in a wide frequency range (50, 60, 16.7 Hz nominal).

HIPASE-S provides enhanced setting features for the synchronization, covering all requirements of up-to-date grids.

HIPASE-S represents the improvement of the synchronization device type SYN3000 which has been used for decades.

HIPASE-S has very large non-volatile data memories. This enables long-time records of several synchronization operations.

The measurement of the three phase voltage and current allows a detailed qualitative offline evaluation of the synchronization operation. The stored graphs and result evaluations may be out read either directly



on the innovative touch panel or by using the engineering tool.

Parameterization is performed in separate input windows. The fully graphical function block diagram editor can be used to create

user-defined logic functions outside of the actual synchronization functions in order to minimize external controls. For additional logic functions up to 32 digital inputs and 36 outputs are available.

Technical data

Supply voltage:	24 VDC-250 VDC
Nominal frequency:	50 / 60 / 16.7 Hz
Voltage metering accuracy:	0,2%
Phase angle measuring accuracy:	0,5°
Frequency measuring accuracy:	0,0025 Hz
Digital inputs:	$U_n = 24-250$ VDC (Wide-range inputs)
Current metering channel:	for synchronization evaluation
Selective input:	Amount: 10
CB closing time measurement:	10-1000 ms

HIPASE

Consistent engineering

The HIPASE Engineering Tool is the perfect tool for an easy and efficient engineering of the overall HIPASE platform. It is used for all applications such as excitation, protection and synchronization.

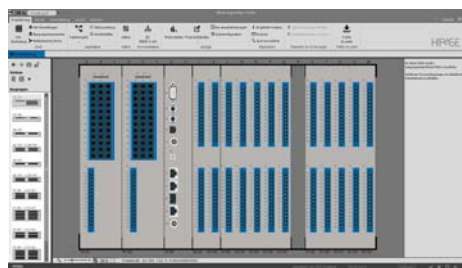
The HIPASE Engineering Tool is characterized by a future-oriented user interface and, in combination with the workflow-oriented menu structure, offers a new quality of user-friendliness.

The HIPASE engineering tool fits perfectly to user requirements and demands. All engineering steps of a project are supported by using the tool. In detail these are:

- Parameterization
- System test
- Commissioning
- System monitoring
- Maintenance

Functions

In addition to standard functions user-specific application templates are available for protection, excitation, and synchronization applications and allow fast and efficient engineering.



Device configuration

The device configuration allows board equipment as well as adjusting of various parameters (e.g.: threshold voltage). In addition, the device configuration window is used for online indication of input and output status.

IEC 61131 Function diagram

The fully graphical function block diagram complies with IEC 61131. Additional application-specific function blocks are available in an extended function block library.

An integrated online test feature supports the system test and commissioning. Other functions are the simulation of process data through “forcing” or the individual blocking of process data.

Process displays

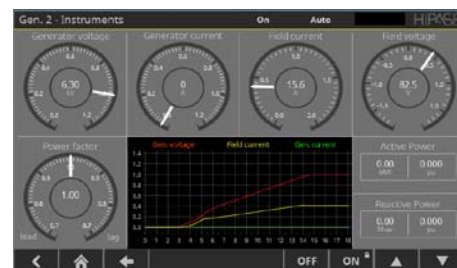
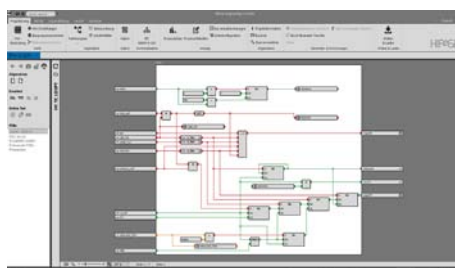
The fully graphical process display allows online visualization of process signals as well as the indication of internal process data.

Data backup and restore

The HIPASE Engineering Tool is capable of reading and processing all parameters of a HIPASE device. The parameters read may be processed and reloaded to the device at any time.

Multilanguage

The HIPASE engineering tool is designed multilingual and the support of additional tool languages is already prepared. A context-sensitive multilingual help function supports all the engineering activities perfectly.



Highlights

- IEC 61131 Function block diagram including online test
- Device configuration
- Trip matrix
- Image editor including online indication of process data
- Graph display and disturbance records evaluation
- Screenshots for test documentation
- Event list
- User and role management

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