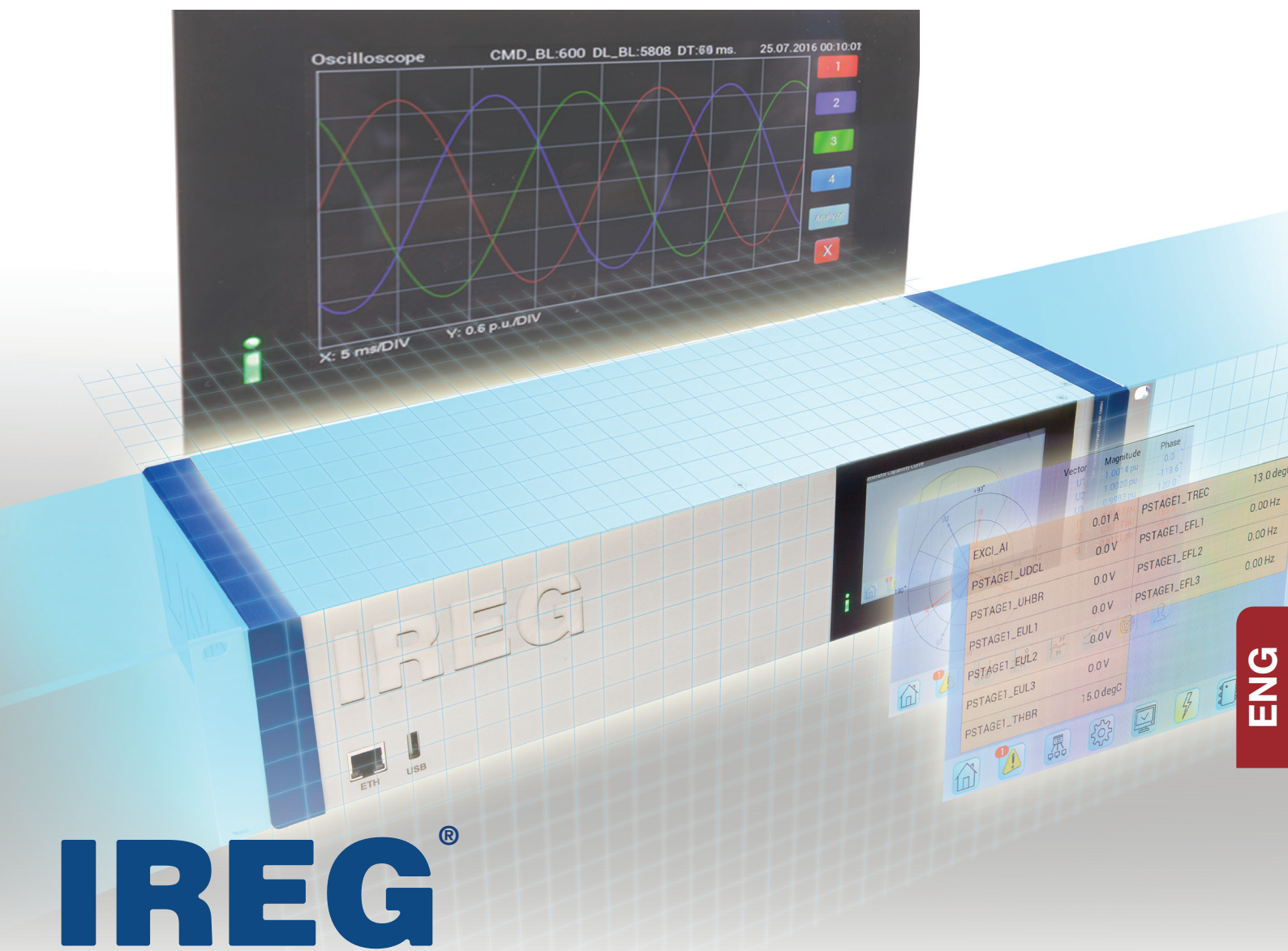


# L|S|T

LLOYD SYSTEMTECHNIK



# IREG<sup>®</sup>

## The Latest Generation of Digital Voltage Regulators



## Concept

**IREG** is a compact, modular designed system for excitation and voltage control of synchronous machines. It also uses alternating and direct current exciters for static systems.

**IREG** provides a wide performance and flexibility for motor- and generator applications. Limitation and additional control functions can easily be designed and implemented by the operator, according to the specific plant capabilities.

**IREG** is connected to a power stage called “**IREG-power**” in the basic version. The implemented CAN-Bus topology allows the operation of up to 3 **IREG** voltage regulators and 3 **IREG-power** modules simultaneously. Hot-Standby, redundancy and TMR (Triple Modular Redundancy) can be implemented easily, according to the needs of the mission-critical plant processes.

## Firmware

The **IREG** firmware was developed based on the IEEE 421.5 standards with a modular design which is completely adaptable in its functionality. All the controls, auxiliary functions and limitations are divided into individual blocks that are able to be simulated separately and are parameterized with a graphical user interface.

The Firmware updates or extensions of functionality can be loaded via the USB port located on the front panel or over the engineering software directly.

An extensive, permanent self-monitoring guarantees a high degree of system stability.

## Engineering

With the clearly structured function groups and the innovative commissioning tools, it is easy to modify the parameters to plant-specific conditions.

## Operation

An innovative and full graphic colour touch screen provides access to the necessary control and monitoring functions, as well as the diagnostic and alarm lists.

Using the CONFIG interface, an external control and monitoring system can be connected with the **IREG**. In the case of several **IREG** devices installed at the same plant, these can be managed through a central system.

The time stamping of events and alarms that occur is performed with a resolution of 1 ms, and stored in an internal permanent FLASH memory. The data of the last voltage build up and synchronization are also stored. If no permanent control and monitoring system is in use, the data can be transferred to a memory stick via the USB interface.

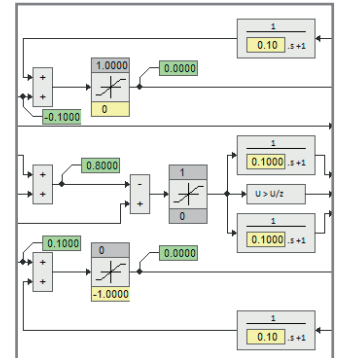
## External Setpoint Selection

	Digital + / -	Analog	FIELD BUS	Ramp	Jump	Limiter
Generator Voltage	✓	✓	✓	✓	✓	✓
Excitation Current	✓	✓	✓	✓	✓	✓
Reactive Power	✓	✓	✓	✓	✓	✓
Power Factor Control	✓	✓	✓	✓	✓	✓
Reactive Power Grid	✓	✓	✓	✓	✓	✓
Power Factor Grid	✓	✓	✓	✓	✓	✓

The set point can be selected through multiple sources.  
The corresponding priority rule is determined via the engineering tool.

## Functions

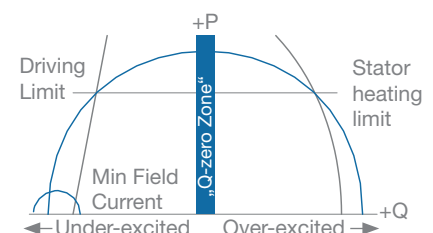
	Qty	I REG	I REG power	Note
Voltage Control	1	✓		Regulating accuracy <=0.2%
Current Control	1	✓		
Reactive Power Control	2	✓		IEEE 421.5 Typ II PI
Reactive Power Control (q/u)	1	✓		VDE-AR-N 4110 / 4120
Reactive Power Control (q/p)	1	✓		VDE-AR-N 4110 / 4120
Power Factor Control	2	✓		IEEE 421.5 Typ II PI
Diode Monitoring	1		✓	On rotating diodes
Motor Soft Start	1	✓		
Synchronizing	1	✓		3 phase, own CPU
Synchrocheck 1	1	✓		3 phase, own CPU
LB response time measurement	1	✓		10-1000 ms



Available functions can be activated or combined via the engineering tool. Thereby it is possible to parameterize a superimposed control (voltage regulator output = current regulator input), resulting in the ability to customize the corresponding IEEE models.

## Limitations

	Qty	I REG	I REG power	Note
Underexcitation	1	✓		IEEE 421.5 Model II
U/F	1	✓		
Overexcitation	1	✓		
Stator Current	1	✓		
Stator Voltage	1	✓		
PSS	1	✓		PSS2A/B PSS4B
Alpha min max	1		✓	



The **IREG** complies to all requirements of TAR medium voltage (VDE-AR-N 4110) and TAR high voltage (VDE-AR-N 4120)

## Power Modules

Currently there are 3 **IREG-power** modules available.

The **IF** module uses a DC intermediate circuit, which provides a fully controlled IGBT H bridge with energy. At the measuring input, a rectification is carried out using a B6 bridge circuit. This allows either a DC or a three phase AC voltage source to be used as excitation energy.

The **TS** module generates the firing pulses for an external thyristor bridge, and provides the interface between the digital voltage regulator and the power electronics.

The **TF** module generates the firing pulses for an external B6 bridge, and provides the interface between the digital voltage regulator and the power electronics.

IREG-power	power source	Output power	Technology	Note
IF	AC 3 phase AC 1 phase DC	25A	IGBT Indirect Inver- ter	Primary and secondary feed via separate bridges DC Auxiliary power supply
TS	Compound	max. 1500 A		Thyristor firing for external bridges
TF	AC 3 phases	max. 1500 A		Thyristor firing for fully controllable B6 bridges

## Inputs and Outputs

	Qty	IREG	IREG power	Specification	Sampling	Note
Digital Inputs	24-72	✓		24-250VDC	1kHz	Programmable
Digital Outputs	24-72	✓		250VDC, 8A constantly		Programmable
Potential Transformer Inputs	6	✓		100-400VAC 16,7-400Hz	16bit, 10kHz	
Current Transformer Inputs	3	✓		1A or 5A 16,7-400Hz	16bit, 10kHz	
Analog Inputs	8-16	✓		0-20mA, 4-20mA	16bit, 1kHz	Programmable
Analog Outputs	8-16	✓		0-20mA, 4-20mA	16bit, 1kHz	Programmable
CAN-A CAN-B CAN-C	3	✓	✓	CAN Bus		
Exc. Current Measurement	1		✓	Module dependent		
Excitation Energy	2		✓	Module dependent		
Excitation Power Output	1		✓	Module dependent		
Sync. Breaker On	2	✓		250VDC, 8A constantly		1x Sync, 1x Check
Sync. Digital Inputs	8	✓		24VDC		4x Sync, 4x Check
CONFIG	1	✓		TCP/IP	100MBit	TMOS Protocol
USB	1	✓		USB 2.0		
FIELD BUS	1	✓		PROFIBUS		Optional
FIELD BUS	1	✓		PROFINET		Optional
FIELD BUS	1	✓		MODBUS TCP		Optional

The inputs and outputs of the **IREG** are grouped on the corresponding I/O cards. The signals of the I/O cards provide them to the processor. The signals of the I/O cards are made available to the processor in an isolated manner. The general input and output functionality is freely programmable. The transducer signals are hardware decoupled and led up in double to each DSP.

The DSP processor provides the actual current, voltage, power factor, active power, reactive power, phase angle, and other measurement values. On different measurement results, a secure system state is entered.

The synchronization feature is carried out directly by the DSP's, where one processor executes the synchronization task and the other one the synchro-check function.

The connection to the field is implemented using industrial connectors.

## General Technical Information

Size:	2HE 19" Insertion, 270mm deep
Supply Voltage:	24 VDC-250 VDC
Test Voltage:	2 kV <sub>eff</sub> according to EN 50178/1997
EMC Strength:	IEC 60255

